HIRDLS

HIGH RESOLUTION DYNAMICS LIMB SOUNDER

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(with inputs from LMMS and UCB) Date: 18 Aug 99

Subject / Title **COMMAND & TELEMETRY HANDBOOK (C&TH) - Vol. I - Part 1**

Contents / Description / Summary:

This document includes descriptions of all aspects of the HIRDLS Instrument command, control, telemetry, activation and autonomous health & safety and fault management.

Two major related computer files are the "HIRDLS Command Database" and the "HIRDLS Telemetry Database". To minimise the risk of discrepancies between the details given in this document and the contents of the database files, formatted outputs from the latter have been electronically inserted into Volume I of this document.

Operational aspects of this document are intended to apply primarily post-launch. Pre-launch command and telemetry usage will be basically the same, except where indicated herein (e.g. Section 5), and allowing for any operational constraints and requirements given in the (TRW) Integration & Test documentation (not yet available), which - in the event of conflict - will take precedence until the conflict is resolved.

THIS DOCUMENT APPLIES TO PROTO-FLIGHT MODEL INSTRUMENT. For EM exceptions see separate document

Summary of Volumes

VOLUME I HIRDLS Operation, Commanding, Verification & Telemetry (in 2 parts)
VOLUME II Compendium of HIRDLS Command & Telemetry Files & Databases
VOLUME III Command & Telemetry Packet Formats, Data Blocks, Protocols &Timing

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Database Configuration Status

This release of the HIRDLS Command & Telemetry Handbook, Volume I corresponds with the following Database/ASCII file versions:

Command Database: Version: 4.0 Date: 99-07-30

Telemetry Database: Version: 4.1 Date: 99-08-18

Change/Release History (Vol. I - parts 1 & 2)

* R = release; C = changes since previous release

Minor errors, typos, etc. corrected where found but not listed below

Important Note: Changes to the Command Database or Telemetry Database are automatically reproduced in this document via the command summaries, individual command tables and telemetry summaries. Due to the large number of changes since the previous release in September 1998 (the "26 March 99" version is identical!), the following change log shows changes to the "text" only and does not list actual database changes. Database changes WILL be explicitly listed in future.

Event *	Date	Version	Section / Table	Change / Comment	SCR ref.
R	98-08-11	informal draft	ALL	Significantly expanded Vol. I draft	
C			SEVERAL (Vol. I only)	Numerous small changes to correct errors, add missing details and bring contents into line with changes to Command and Telemetry Databases.	
R	98-09-02	first formal release for review	Vol. I only	"Formal" release in the sense that **future changes will be recorded**. However, this release will not be submitted to the formal CCB review process.	
C			various	Minor amendments (for clarification) to some Command Notes; all references toEngineering Variable Fields deleted; references added to C&TH Vol. III for telemetry formatting information	
			T 1.0-1	Deleted line item: "Available diagnostic options"	

			T 1.4.4-1	Footnote modified; now refers to C&TH Vol III; last row of table (Eng Sub-comm) deleted.	
			1.4.5	Data Type-code definitions corrected and expanded; wording added to the subsection "Conversion Algorithm" referring the reader to (new) Section 1.5	
			1.5	New section (conversion algorithms, etc.)	
			1.6	New section (Modes & Submodes)	
			2.0.5, 2.0.6, 2.0.7	Sections 2.0.5 & 2.0.6 amalgamated& heading simplified; final para. of 2.0.5 added to describe SEU recovery; section 2.0.7 renumbered 2.0.6.	
			T.2.0.5-1 (was 2.0.6-1)	3rd col: heading updated; added a reference to the HIR_SPU_FIR command after the table.	
			1.5	New section containg explanatory notes on some telemetry conversions and calibrations.	
			2.2.4.2	References to 8-bit telemetry deleted; all now 16 bits; "MASK" col. deleted from table; new para added after table, describing operation of Sun Sensors	
			2.2.4.3	New section inserted describing the Door position potentiometer telemetry and the Door Safe Angle command	
			T 2.2.4.4-1 (was 2.2.4.3-1)	Table re-numbered and lists microswitches only; SSH DOOR POSITION deleted (covered in new section 2.2.4.3)	
			2.3.2.2 / 3 / 4	Minor wording changes, deleting specific references to number of operational Gyro channels.	
			2.3.3	Subsections consolidated into expanded table; TBDs & TBV eliminated	
			2.3.4.3.1	"TBD" replaced with "500"; TBV removed from Table.	
			2.3.4.3.2 T 2.3.4.3.2-2	"(i.e. within 0.5 sec)" added at end; Word "motor" added; more ?? 2.3.4.3.2.1: last sentence deleted	
			2.3.4.4 T 2.3.4.4-1	Sentence added to end of 1st paragraph. Minor corrections	
			2.3.5.2.1	Wording expanded to describe data overflows	
			T 2.3.5.2.2-1	Bits #10-12 now TBD	
			T 2.3.5.2.3-1	Bit #5: "motor" added; Bit #0: "drive" added; Bit #9 now spare (Heater Status deleted); Bits #10-12 now TBD	
			2.2.3.1	Heading modified; SVA Commands inserted	

			2.2.3.2	Heading modified; SVA Commands inserted	
			2.3.4.3.1	Last sentence deleted.	
			T.2.3.4.4-1	"SYNC" changed to "STROBE"	
			2.3.5.2.1 T.2.3.5.2.1-1	"sync" changed to "strobe"	
			T 2.3.5.2.3-2	Table heading and contents updated	
			2.4.4.3.6	_SCIACCDIAG command replaced by new _ENCSEL command	TEU 0004 / 0034
			2.4.4.3.7	Deleted reference to Ground Command HIR_IPU_TSSENDTBL	IPU 0025
			2.4.4.3.11	Deleted	TEU 0026
			2.4.4.3.16	Added: "6=Deselect Test Angle (both encoders)", changed Command name from _ENCSELECT to _EEASELECT	TEU 0004 / 0034
			2.4.4.3.18	Added: "3=Set Chopper to high current mode" and "4=Disable Chopper high current mode"	TEU 0001
			2.4.4.3.23	New Instruction	TEU 0036
			2.4.4.3.24	New Instruction	TEU 0037
			2.4.5.2.4	Deleted	TEU 0026
			2.6.1	Last sentence: deleted reference to +28V supply from PCU.	
			2.6.3.2.1	power setting range changed from "0 to 2.3 W" to "0 to 0.9 W"	
			2.6.3.2.2 T 2.6.3.2.2-2	Last sentence deleted ["Four complete ... Frame."] DRW4 now spare (was +28V rail)	
			2.6.4.2	"immediately following" changed to "in response to"	
			2.6.4.3	Words added to clarify purpose of this channel	
			2.7.4	Tables in 2.7.4.9 & 10 ("UPL" commands) were duplicated in 2.7.4.11 & 12. Latter should have listed "IPU" commands. Corrected !	
			2.7.5.4 and subsections	New tables and expanded description of IPU tlm. Based on SCRs NOT YET COMPLETED	IPU 0010, 0027
			2.8.2.1	New Heading: Note on Stroke & Phase Angle in Thermostatic State and Warm-up State	
			2.9.2	New para. added at end	

			2.9.3	Last line of section headed "Parameter #0:" - "15 msec" deleted [intervals are 100 msec]. "delay" changed to "interval". Intervals are defined later in Section 2.9. Last line of section headed "Parameter #1:" - "2.9.4 Discrete Pulse Commands" deleted (spurious entry)	
			2.9.4.2	Two new paras added at end	
			2.9.4.3 T 2.9.4.3-1	First sentence: added requirement for 45 ms min. interval. Notes 1 & 2 added before table; SPU supply telemetry verification corrected to refer to SPU power rail analog telemetry	
			2.9.4.4 T. 2.9.4.4-1	Wording clarified and expanded. Heading modified; in second col., "missing" PSM numbers assigned, beginning at #58; in first col., previous PFC codes re-assigned for 10,1 through 13,1.; in last col., heading modified to specify approx. 100 ms interval between IRCs; * footnote deleted. Following PFCs changed: 46, 1; 46, 2; 48, 1; 48, 2 [15V OFF commands deleted]; 47, 1; 47, 2; 49, 1; 49, 2 [+5 OFF commands deleted]; "Verification" column added; error corrected - wrong sequence for PSM 34; PSM-38 and PSM-40 modified at LMMS request to turn SPU +/-15V ON before +5V	
			3.3.2.2	Sentence added (Instrument Mode word)	
			5 + subsections	Words "DURING TEST" deleted from main heading; introductory para. re-worded; more detail added to Activation Stage tables; new 5.2.4 (subsequent sub-paras re-numbered); additional subsections added to define Mode & Submode transitions	
R	99-08-18	**first formal release**	**Vol. I only**	Submitted to CCB review dated 99-08-18 **Final release date per front sheet**	

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VOL I - PART 1

1 INTRODUCTION & OVERVIEW

1.0 Organisation and Scope of this Document

The HIRDLS Command & Telemetry Handbook is arranged in three Volumes as summarised in Table 1.0-1

Table 1.0-1 Scope and Contents of C&TH Volumes

VOL.	SCOPE & CONTENTS
I	**HIRDLS Operation, Commanding, Verification & Telemetry** • Summary of Instrument operation and programmable features • General description of Instrument commanding and monitoring • Detailed description of HIRDLS default command and telemetry functions • Summary of SAIL Task concept and use • Start-up (SUROM) telemetry formats; error flags, etc. • Autonomous (on-board) Instrument management functions • External (S/C and Ground) Instrument commanding & management
II	**Compendium of HIRDLS Command & Telemetry Files & Databases** • Instrument Command List • List of IPU Macros • Instrument Normal Science Telemetry List; Telemetry List attributes • Telemetry Conversion Algorithms • Engineering Telemetry • Summary of CSTOL Procedures used for Post-Cal. Test & Flight Operations • List of Tables and Microloads used for Post-Cal. Test & Flight Operations
III	**Command & Telemetry Packet Formats, Data Blocks, Protocols &Timing** • HIRDLS-S/C (1553) interface details • Command structure, bit pattern and packet headers • Science & Engineering telemetry formats and packet headers • Diagnostic data options and formats; memory dump formats

1.1 Summary Description of the HIRDLS Instrument

HIRDLS is a multi-channel, infrared radiometer proposed for the NASA EOS CHEM platform. It is designed to scan the stratosphere and mesosphere in the anti-flight (-X) direction. The instrument measures radiated thermal emissions from the atmospheric limb at various spectral intervals in the range 6 to 18 microns, chosen to correspond to specific gases and atmospheric "windows". The final output will be a set of global, 3-D fields of atmospheric temperature, several minor constituents and horizontal gradients of geopotential height.

A single, fixed array of twenty-one detectors is placed in the focal plane of a non-obscuring reflecting telescope. Each detector element corresponds to an atmospheric field of 0.19 deg (10 km) horizontal by 0.019 deg (1 km) vertical. The detector array will be cooled to about 65K by a Stirling cycle mechanical cooler. A toothed-disc mirror placed at an intermediate focus of the telescope chops the incoming radiation against a cold reference view. The telescope views the atmosphere via a two-axis tilting mirror which provides the necessary altitude and azimuth scanning. A multi-axis gyroscope module mounted on the optical bench will provide relative pointing knowledge with the accuracy necessary for the determination of geopotential height gradients.

In-flight radiance calibration is checked at frequent intervals by tilting the scan mirror to view cold space (just above the atmospheric limb), and an internal black body reference target of accurately known temperature. Normal instrument functions, including scanning, in-flight calibration, thermostat heaters and a moveable sun-baffle will be controlled by stored routines in an on-board microprocessor. The instrument is packaged as a single module. Clear views to rearward are needed for the optical beam. Instrument heat will be dissipated by radiation.

1.2 Main Operational Features by Subsystem

Note:- the term "operational session" in this document means an period of continuous Instrument operation in Mission Mode or in a selected Test Mode, or in a sequence of operational modes [according to context].

1.2.1 General

The HIRDLS Instrument contains a high degree of operational flexibility and autonomy which have been achieved by means of the following:-

a) adaptive and flexible scan patterns executed under microprocessor control;

b) in-flight calibration and adaptive exclusion of sunlight synchronised with Scanner operation to ensure optimum radiometric accuracy and geographical coverage;

c) science (radiance) data will be digitally filtered;

d) heaters and Coolers microprocessor-controlled and programmable for optimum radiometric performance;

e) alternative telemetry data formats will be selectable in flight if required;

f) Instrument operational scenarios will be readily adjustable by uplinking new control parameters, tables and routines;

g) Instrument health and safety will be continuously monitored, and selected actions performed automatically on detection of certain error or fault conditions;

h) all parameters, tables, routines, criteria and other autonomous features will be capable of being inhibited or re-loaded as required;

1.2.2 Sunshield Subsystem (SSH)

The SSH includes three mechanisms: -

a) the Hold-down & Release Mechanism (HRM) is the latch which keeps the Main Viewing Aperture Door closed during shipping, vibration testing and launch. It consists of a spring-biased roller arm which can be moved to the 'release' position by means of a hot wax actuator (HWA), the heater in which is energised for a specified time.

b) the Aperture Door Drive Mechanism is the motor/gearbox assembly mounted on the door hinge bar. After unlatching, door position may be adjusted by driving the stepper motor at a pre-determined rate to achieve any door angle in the range from fully closed (0˚) to fully open (123˚).

c) the Space View Aperture (SVA) door mechanism is a separate subassembly which is used to open or close the flap which covers the Chopper Reference View aperture during launch. It consists of a DC motor/gearbox assembly which is operated for a specified time in a specified direction.

1.2.3 Gyroscope Subsystem (GSS)

The GSS consists of four separate mechanical gyroscopes, three of which are used in normal operation, the fourth being in reserve in case of a failure. Each channel is activated in turn at the beginning of an operational session, and thereafter operates autonomously.

1.2.4 Telescope Subsystem (TSS)

This Subsystem consists of microprocessors, mechanisms and operational heaters, as follows:-

a) a microprocessor (the TProc) in the Telescope Electronics Unit (TEU) runs the Telescope SoftWare (TSW) and performs the following functions: (i) control of the Scanner mechanism; (ii) control of the Chopper mechanism; (iii) control of the EEA [see below]; (iv) EEA and local housekeeping data collection; (v) 2-way communication with the Instrument Processor Unit (IPU)

b) a microprocessor (?) in the Encoder Electronics Assembly (EEA) which processes the outputs from the Scanner Elevation and Azimuth angle encoders.

c) the Scanner - a 2-axis gimballed mechanism which carries the Scan Mirror. Each axis is driven by servo-controlled DC motors to perform pre-determined, repetitive scanning routines. The Scanner motor coils are 'shorted' during shipping, vibration testing and launch; they are "unlatched" by command prior to applying power.

d) the Chopper Mechanism - a simple servo-controlled DC motor which is activated at the beginning of an operational session, and thereafter operates autonomously. The motor shaft carries a 6-tooth, reflecting disc which is placed in the optical beam of the Telescope. The disc rotates at a constant nominal speed of 5000 RPM and 'chops' the detector array view at 500 Hz between the main aperture view (via the Scan Mirror) and the Chopper Reference View to cold space. The motor speed is adjustable between 4800 RPM and 5200 RPM.

e) low-power operational heaters - these are attached to the Calibration Mirror and each of the two Germanium Lens assemblies. Each heater can be commanded to operate in a Constant Temperature (CT) mode or a Constant Power (CP) mode. Heater power settings are controlled by software within the IPU.

1.2.5 Detector Subsystem (DSS)

Not applicable - the DSS is a purely passive subsystem.

1.2.6 In-flight Calibrator Subsystem (IFC)

This Subsystem is passive except for an operational heater as described in para. 1.2.4.e) and mounted within the IFC Black Body

1.2.7 Instrument Processor Subsystem (IPS)

This Subsystem comprises the IPU and the Signal Processor Unit (SPU); the latter being passive in operation. The IPU includes:-

a) the main Instrument Processor (IProc);

b) drive circuits for the SSH mechanisms described in para. 1.2.2;

c) drive circuits for the TSS operational heaters;

d) analog data multiplexing and digitising circuits;

e) RS-422A interface circuits for 2-way communication with the other active subsystems

IProc software performs the following control and communications functions:-

(i) communications with the spacecraft;

(ii) communications with all active Instrument subsystems;

(iii) control and monitoring of, and 2-way communication with, the TSS microprocessor;

(iv) operation of SAIL tasks (see Section 3);

(v) execution of pre-defined control sequences (Macros);

(vi) acquisition of subsystem science and status data, and formatting of these data for output to the HIRDLS Science and Engineering Telemetry Data Packets

(vii) autonomous error/fault detection and correction.

1.2.8 Cooler Subsystem (CSS)

The CSS comprises a Stirling Cycle mechanical refrigerator assembly (the Cooler Mechanical Unit - CMU) and a drive and control electronics assembly (the Cooler Control Unit - CCU). The CMU consists of a dual (balanced) Compressor assembly and a single (balanced) Displacer-regenerator assembly. The CSS motor coils are 'shorted' during shipping, vibration testing and launch; they are "unlatched" by command prior to applying power. The CSS is activated at the beginning of an operational session, and thereafter operates autonomously. Various operational modes and settings are available, a selected combination of these normally being fixed for the duration of an operational session.

1.2.9 Power Supply Subsystem (PSS)

The PSS is activated at the beginning of an operational session, and thereafter operates autonomously. Activation consists of sending to the Power Converter Unit (PCU) a series of pre-defined switch-control sequences stored in the IPU as "Macros". Each Power Switching Macro (PSM) is invoked by a Ground Command, except for some "safeing" (power off) sequences which may be invoked as a result of automatic fault detection by the IPU.

1.3 HIRDLS Commands - General

1.3.1 Introduction

The descriptions which follow represent the planned, baseline operational approach. Due to the considerable number of 're-programmable' aspects of the HIRDLS Instrument design a large number of variations, exceptions and different combinations of operational attributes can be selected or uplinked - almost without exception. Accordingly, the core on-board software has been designed to provide a high degree of protection against illegal or hazardous configurations, and all critical commands must be immediately preceded by a separate "allow" instruction.

1.3.2 General Aspects of Instrument Commanding, Control and Monitoring

The following considerations and desires have been taken into account in the design and proposed commanding and monitoring of the HIRDLS Instrument:-

a) to minimise the risks associated with "blind" commanding (i.e. when real-time telemetry and responsive command capability are not available);

b) to minimise the extent to which reliance need normally be placed on the Operations Control Center to monitor and ensure Instrument health & safety;

c) to optimise the balance between the extent of autonomous Instrument monitoring and fault detection/correction, and the occurrence of disruptive 'nuisance' responses;

d) to facilitate simple and reliable adjustment of Instrument operation in orbit, and to minimise operational complexity as far as practicable;

e) to maximise the content and usage of information available from ground-station passes (GSPs) for routine Instrument health, safety and performance monitoring

1.3.3 Use and Verification of Ground Commands

Consistent with a) above, all Instrument Activation and other operations involving the application of power to subsystems, and - where practicable - the activation of mechanisms and for any major changes to the Instrument operational configuration, will be performed by means of commands and real-time command verification during GSPs only. These command and verification sequences will be embodied in STOL Procedures which will be used for Instrument Activation from the IEGSE or STC prior to launch, and will be resident in the Operations Control Center computer procedure 'library' for in-flight use.

Since GSP periods are restricted, a maximum of 3-4 minutes per Activity has been assumed for HIRDLS Ground Operations, and the commands, command sequences and command verification protocols have been/will be designed accordingly. For example, the instrument design allows for Activation in stages, with transitions from one Mode to the next, with the option to continue or wait until a future GSP. HIRDLS Ground Operations should occur relatively infrequently.

1.3.4 Use and Verification of Spacecraft Stored Commands

Single commands, mainly for changing parameter values, will be needed on a regular basis - possibly up to several per week. These commands, which will be time- or event-tagged, will be submitted ahead of time for uplinking by the FOT as part of the daily command upload to the spacecraft, where they will be stored for transmission to various subsystems and instruments over the following 24-hour period. The commands transmitted to the HIRDLS Instrument will, on the whole, occur "blind" and will not be verified on the ground until the next GSP, when near-real-time (NRT) telemetry data should be available.

1.3.5 Use of SAIL Commands

The capability exists to run re-loadable, routine control tasks within the IPU. These tasks can access all subsystem data acquired by the IPU, and can generate many of the HIRDLS command set, permitting a high degree of autonomous Instrument operation. These control tasks, compiled on the ground using the SAIL [language] and uplinked as required, are described in Section 3.

1.3.6 Summary of Command Attributes and Fields

(For a detailed definition of the HIRDLS command format, see Volume III of the C&TH)

1.3.6.1 Command Mnemonic

HIRDLS command mnemonics (names) are of the form HIR_GGG_FFFFF, where GGG is the name assigned to a command Group, i.e. an Instrument Subsystem or other commandable entity, and FFFFF is a functional designator unique to that Group.

1.3.6.2 Command Number

This is a unique reference number assigned to the command. Numbers 1 to 99 are 'normal' commands, 100 to 127 are critical commands which require an extra verification prior to sending them to the instrument, and numbers above 128 are spacecraft commands which are sent to the instrument in a non-standard fashion.

1.3.6.3 Class (C)

This specifies when the command may be sent to the instrument, and any special characteristics of the command. Currently defined classes are as follows:-

Booting - this refers to the initial time after power-up or reset where a switch to Boot Hold is permitted.

Boot Hold - this is an IProc State which is either commanded during Booting, or which will be automatically invoked if an error occurs during the boot process.

Normal - normal-class commands may be sent once the IProc has successfully booted.

Power - this class includes the main power-switching commands, and may be sent at any time.

Spacecraft - this class includes the commands relating to the status and operation of the HIRDLS-S/C interface (1553 bus). Spacecraft-class commands may be sent at any time.

1.3.6.4 Type (T)

The type is used to further specify the characteristics of a command. Currently defined types are as follows:-

Flight - this refers to a normal command which requires no special handling.

Critical - critical commands are defined as those for which a separate 'GO' directive is recommended. Critical commands are never generated on board.

1553 Mode Code - these commands perform direct actions to the 1553 RTR, most of which do not require instrument involvement.

1.3.6.5 SAIL (S)

This attribute specifies how SAIL tasks can control this command, and will be 'Enabled', 'Disabled' or 'Never'. SAIL is always allowed to send commands which are 'SAIL-enabled'. A 'SAIL-disabled' command can only be sent by SAIL after being 'SAIL-enabled' by the HIR_SAI_COMMAND command. If this field is marked as 'Never', SAIL cannot generate this command.

1.3.6.6 Parameters

A command may have one or more parameters. Each parameter has the following attributes: number (beginning with #0); length in bits; range of allowable values.

1.3.7 Formats for Command Directive

NOTE - HIRDLS commands originating from different sources require different formats. These are defined in the following documents :-

a) from the HIRDLS IEGSE:- see IEGSE Users' Guide, SP-OXF-TBD.

b) from a CSTOL procedure:- see TBD.

c) from a SAIL Task:- see SAIL Specification Document, SP-LOC-117 and SAIL Users' Guide, SP-LOC-126.

1.4 HIRDLS Telemetry - General

1.4.1 Summary Description of HIRDLS Telemetry

The HIRDLS telemetry consists of two data streams, the Science Data Stream and the Engineering Data Stream. The Default Science Data Stream Format contains all available HIRDLS telemetry data (except for some diagnosic-only functions), whereas the Engineering Data Stream contains a subset of HIRDLS telemetry data intended for health & safety monitoring and for command & status verification purposes.

Each Data Stream consists of discrete CCSDS packets which are read by the spacecraft via a MIL-STD-1553 bus interface. Science Data Stream packets are generated at nominal intervals of 96 ms, i.e. one packet every 8 Chopper revolutions, with a mean data rate of 65 kbps (TBV). Engineering Data Stream packets are generated one every 4 seconds, with a nominal data rate of 512 bps (except for the Startup Mode, where it will be lower).

Within the Science Data Stream packets, the data items occur at various sample rates defined by the HIRDLS Telemetry List. These rates are related to the Chopper rotation speed, which is programmable over a restricted range. Details of the sample and frame rates are given in Section 1.4.4. Engineering packets are created every 4.00 seconds (unrelated to Chopping rate)

For the initial stages of Instrument Activation, only restricted telemetry data are available (see Section 1.4.6).

1.4.2 Telemetry Data Format Options

Mission Mode Default Science Data Stream Format packets consist of various 'blocks' of data formatted according to a Telemetry Format Table (TFT). For special calibrations and tests, diagnostics, etc. an alternative TFT may be chosen on command. This may require some Default Format data blocks to be omitted from the packet to create space for diagnostic data, increased sample rates for existing data, etc. One alternative table may reside in IPU memory. See Vol. III, Section 5 for descriptions of the various format options and how to select them.

The Engineering Data Stream packets have a fixed format to simplify decommutation, conversion and display at the Operation Control Center. Any data may be placed in the Engineering packets; the only restriction is that the data rate shall not exceed 2048 bits/pkt (512 bps).

During the initial stage of Instrument Activation, while the IProc is booting, a reduced "Startup" Engineering packet will be generated for use in the Operations Control Center.

1.4.3 On-board Use of HIRDLS Telemetry Data

HIRDLS Telemetry Data is available for on-board use in the following ways:-

a) selected items from the fixed-field part of the Engineering Data Stream packets may be used by the spacecraft for health & safety and fault-detection purposes, mainly to cover the situations where Instrument-S/C communications have ceased, or a specific fault is detected while the Instrument is in an early stage of Activation;

b) the SAIL Tasks (see Section 3) can access any item of HIRDLS data, including diagnostic data, thus providing maximum flexibility for compiling conditional and adaptive routines for Instrument operation;

c) the IPU error/fault detection & correction logic can access any item of HIRDLS data, including diagnostic data, once it has been activated.

1.4.4 Telemetry Sample Rates & Timing

The terminology and definitions shown in Table 1.4.4-1 describe time periods and frequencies by which the HIRDLS telemetry is organized.

Table 1.4.4-1 Telemetry Frame Rates & Timing Definitions

NAME	NOMINAL PERIOD	NOMINAL FREQUENCY	RANGE (Hz) **	DESCRIPTION
Chopper **C**ycle (**CC**)	2 ms	500 Hz	480 - 520	Corresponds to 1 chopper tooth + gap = 1 cycle of detector signal waveform.
Chopper **R**evolution (**CR**)	12 ms	83.3 Hz	80.00 - 86.67	6 Chopper Cycles; primary telemetry sample rate; sync pulse will be generated by Chopper once per revolution.
Minor **F**rame (**MiF**)	96 ms	10.8 Hz	10.000 - 10.833	8 Chopper Revolutions; 1 Science data packet is generated every Minor Frame.
Major **F**rame (**MaF**)	768 ms	1.3 Hz	1.250 - 1.354	8 Minor Frames; this is also the "SAIL Frame" period, during which all SAIL tasks must complete.
Engineering Frame	4.00 s		(fixed)	Asynchronous with chopper rotation rate; synchronous with spacecraft clock.

** programmable

Note 1: The above table defines only periods and frequencies. The exact phasing of data samples with respect to the Chopper is defined in the C&TH, Vol III, Section 4.3.4.1.

1.4.5 Summary of Telemetry Data Item Attributes

(For a detailed definition of the HIRDLS telemetry format, see Volume III of the C&TH)

Each of the telemetry items listed in Sections 2 and 3 of this document (Volume I) possesses some or all of the following attributes:-

Mnemonic - this is the alpha-numeric string used to reference the (Science Stream) Telemetry Database or related computer files. Items copied into the Engineering Data Stream possess the same mnemonic as the parent item in the Science Data Stream, but with prefix 'ENG_' .

ID number - This is a unique reference number assigned to the item (Science Data Stream only)

Data Type-code - indicates whether the item is classified as Primary Science (PS), Secondary Science (SS), Housekeeping (HK), Header (HD), Startup (SU), Engineering only (EN), Command verification (CV) or Critical [engineering] (CR).

The PS, SS and HK attributes determine how the data is arranged within the HIRDLS Science Data packets; "HD" is used where a mnemonic is assigned to an item contained within the packet header; "SU" items appear only during the Startup state; "EN" items are modified science telemetry items which appear in this form only in the Engineering packets; the CV attribute indicates that the item is required for verifying the execution of a command; the CR attribute denotes that the [Engineering Data Stream] item is included within the S/C Critical Engineering data Stream. A zero bit rate is shown in the Telemetry List for certain items since they do not contribute to the normal Science Stream bit rate (SU, EN), or they are already accounted for elsewhere (HD).

Telemetry Output Rate - the repetition rate at which samples occur in the Science Data Stream. This is expressed in terms of the Name and Frequency attributes defined in Table 1.4.4-1.

E-Code - a telemetry item possesses an E-code when it is to be copied into the Engineering Data Stream. In the Telemetry List, the items to be copied into the Engineering Data Stream during IProc startup (only) are identified by "S" in the E-code column.

D-Code - a telemetry item possesses a D-code when it is to be copied into the Default Science Data Stream.

Conversion Algorithm - where an 'engineering' parameter P has been converted and/or digitised, the term 'Conversion Algorithm' refers to the function Fc (usually a polynomial) which is used to convert the telemetry count value N to the original parameter P, i.e.

$$P = Fc\ (N)$$

The Conversion Algorithms are identified by means of an alpha-numeric code (e.g. D, K2B, N3, etc.) and are defined by a table of numerical coefficients forming part of the Telemetry Database and reproduced in Volume II of the C&TH. Additional notes on telemetry conversion and calibration characteristics will be found in Section 1.5 below. Nominal curves for each type of conversion will be found appended to this Volume I.

Group - this refers to the Subsystem grouping shown in Table 2-2, except for "OBS" which denotes obsolete items retained so that the IEGSE software can process old test data.

1.4.6 Diagnostic Telemetry

The term 'diagnostic data' refers both to diagnostic-only data items and to Mission Mode items sampled at a higher rate.

Diagnostic data will be transmitted only when required and in separately identified blocks. Content and format will be controlled by means of new or existing Telemetry Format Tables selected by ground or SAIL command. Diagnostic-only items are NOT included in the HIRDLS Telemetry List. Data packet format, header information and options for diagnostic data are described in Volume III of this C&TH, together with any existing diagnostic data tables.

1.5 General Notes on Telemetry Conversion Algorithms and Calibration

The purpose of this section is to describe the various combinations of "A-sides", "B-sides", redundant, non-redundant, etc. sensors, and how these map on to the telemetry calibration characteristic(s) in each case.

1.5.0 Relationship Between 'Redundant' Sensors and 'Redundant' IPU

The HIRDLS telemetry data handling is performed by the Instrument Processor Unit (IPU) which is duplicated for redundancy : either the "A-side" IPU or the "B-side" IPU is powered on at any time. Not all subsystem telemetry sensors are duplicated, and those which are do not always directly 'map' on to the A and B IPUs. These considerations will cause minor differences in sensor calibration characteristics to be observed (which may or may not be important), depending on which subsystem "side" is selected. The following sub-sections explain how each subsystem is configured in this respect, and whether or not two sets of Conversion Algorithms are required.

1.5.1 IPU Multiplexer (mux) and A-D Converter (ADC) Configurations

The circuit configurations for the A_IPU and B_IPU are identical. Each contains three analog sensor mutiplexers, referred to here as the PRMUX (which handles the PRT sensors on the OBA), the ADMUX (which handles the instrument AD590 sensors) and the GPMUX (the "general purpose" mux which handles various other analog signals).

The output of both the PRMUX and the ADMUX feed into the GPMUX, together with the output of the mux in the PSS (PCU) and some other analog channels. The output of the GPMUX is fed to an A-D converter,- thus the same converter (digitiser) is used for all analog data fed into, or originating within, the IPU. Limited differences or changes in A-D scaling or zero offset should be automatically corrected in ground data-processing, since all three muxs include reference inputs for calibration.

1.5.2 AD590 Matrix

Certain instrument temperature sensors are connected to the IPU in the form of an 8 x 8 matrix. These sensors are all Analog Devices generic type 'AD590' with a linear, one microamp per Kelvin characteristic. They are assigned either to the TSS (located within the OBA assembly), or to the STH (located on the main structure, SSH structure, EU boxes and thermal radiator surfaces).

The rows are energised as determined by software from a 10 volt switched source. The columns are connected to the inputs to the ADMUX (section 1.5.1). Each relevant telemetry channel maps on to a specific row and column. Some matrix locations are not used.

The matrix itself is not duplicated for redundancy, being connected simultaneously to both sides of the IPU. However, in many cases two sensors are used to measure the same item. These do not share the same row or column, and both channels are fed to the telemetry stream and correspond to two distinct mnemonics.

The same Conversion Algorithm (D) will be used for all AD590s, irrespective of location or of IPU selection (A-side or B-side).

1.5.3 SSH/SVA Sensors

The SSH & SVA are entirely controlled and monitored from the IPU. Some sensors are duplicated, and some are not. In all cases there is only one telemetry mnemonic assigned to each SSH or SVA sensor function. Details are given in Section 2.2.4. Some additional sensors - assigned to the STH - are mounted on some structural parts of the SSH and SVA. These form part of the AD590 matrix.

1.5.4 GSS Telemetry Calibration

All A-D conversion is performed within GEU, which is NOT duplicated; therefore the conversion algorithms will be identical via either A_IPU and B_IPU

1.5.5 TSS Sensors

The AD590 sensors in the TSS all form part of the matrix described in 1.5.2 above. In addition, there are redundant pairs of platinum sensors (PRTs) connected respectively to the A_IPU and the B_IPU. The Conversion Algorithms may be the same, or may be different according to the IPU selection (A-side or B-side) [**TBD**].

All other analog monitors within the TSS are associated with either the A side or the B side of the TEU, and are digitised within the TEU. It is expected that the same Conversion Algorithms will be used irrespective of TEU selection (A-side or B-side).

1.5.6 IFC Sensors

The IFC is fully duplicated: the A_side is connected (and powered from) the A_IPU and the B_side is connected (and powered from) the B_IPU. The IFCBB PRT sensor channels are 'digitised' within the IFC, each side having its own conversion coefficients.

The BB Front Plate carries a redundant pair of AD590 sensors (A and B) which are connected directly to the A_IPU and B_IPU A-D converters respectively, and will use the same conversion (Algorithm D).

IFC power rail and ref. oven analog telemetry is digitised within the IFC and will use the same conversion coefficients irrespective of IPU/IFC selection.

1.5.7 SPU Monitors

The SPU is not fully duplicated for redundancy. The analog telemetry is digitised within the SPU. The conversion coefficients will be independent of IPU selection.

1.5.8 IPU Monitors

Obviously all IPU monitors will be associated with either the A_IPU or the B_IPU. However, it is currently planned that the same Conversion Algorithms will be used irrespective of IPU selection.

1.5.9 CSS Telemetry Calibration

All A-D conversion is performed within CCU, which is NOT duplicated; therefore the conversion algorithms will be identical via either A_IPU and B_IPU

1.5.10 PSS Telemetry Calibration

Analog telemetry voltages are generated and multiplexed within the PCU. The interface with the IPU is duplicated, the analog mux output being fed simultaneously to both the powered IPU and the unpowered IPU. However, the PCU telemetry circuits are not duplicated, and the conversion algorithms will be identical via either A_IPU and B_IPU.

1.6 Instrument Mode and Submode Definitions Summary

MODE - a Mode is an **Instrument** attribute, and is defined as a steady-state condition in which the instrument subsystems are in defined States. Note: steady-state instrument temperature is NOT a required State or Mode attribute, except for Mission Mode.

SUBMODE - a Submode is an **Instrument** attribute, and is defined as an infrequently used, modified set of States associated with one - or more than one - Mode.

STATE - a State is a **Subsystem** attribute; Subsystem States are given here to the extent that they have been defined.

TRANSITIONAL MODE - a Transitional Mode will occur following a Mode-change command or command sequence. In a Transitional Mode, Subsystem States may be changing (e.g. booting). Transitional Modes usually occur during Instrument Activation. Note: steady-state instrument temperature is NOT a required State or Mode attribute, except for Mission Mode.

INSTRUMENT ACTIVATION - Instrument Activation is the term used to describe the sequential process of powering the instrument - usually from the OFF Mode - in a controlled manner, by means of an Activation Sequence. See Section 5.2.

ACTIVATION SEQUENCE - an Activation Sequence is a pre-programmed series of HIRDLS commands, time delays, telemetry checks and other conditional expressions which will be written in STOL (System Test & Operations Language). STOL Sequences will be run on the HIRDLS IEGSE or OGSE (Observatory Ground Support Equipment) during Instrument test, and in the POCC (Payload Operations Control Center) after launch.

For detailed definitions and descriptions of Mode and Submode attributes, as well as the specified transitions between them, refer to Section 5 of this Volume.

2 COMMAND & TELEMETRY DESCRIPTIONS BY SUBSYSTEM

Table 2-1 shows the assignment of commands of a given Group, either to the Instrument System or to a Subsystem, for the purpose of describing the commands in Section 2 below:

Table 2-1 Assignment of Command 'Groups' to Instrument System/Subsystem

COMMAND GROUP	FUNCTIONAL CATEGORY	ASSIGNED TO:-	SECTION:- (below)
GSE_PWR	Primary power	SYSTEM	2.0
SC_TIM	S/craft (Time Code)	SYSTEM	2.0
MDC	1553 Mode Code	SYSTEM	2.0
TLM	Telemetry format	SYSTEM	2.0 **
SSH	All SSH commands	SSH	2.2
SVA	All SVA commands	SSH	2.2
GSS	All GSS commands	GSS	2.3
TSS	All TSS commands	TSS	2.4
SPU	All SPU commands	IPS	2.7
BIP	Boot IProc	IPS	2.7
MAC	Macros	IPS	2.7
OPH	Operational Heaters (including IFC)	IPS	2.7
SAI	SAIL	IPS	2.7
UPL	Uplinking	IPS	2.7
IPU	All remaining IPS commands	IPS	2.7
CSS	All CSS commands	CSS	2.8
PSS	All PSS commands	PSS	2.9

** The use and formatting of the _TLM_ commands is explained in more detail in Vol. III.

Table 2-2 shows the assignment of telemetry functions of a given Group, either to the Instrument System or to a Subsystem, for the purpose of describing the telemetry functions in Section 2 below:

Table 2-2 Assignment of Telemetry 'Groups' to Instrument System/Subsystem

TELEMETRY GROUP	FUNCTIONAL CATEGORY	ASSIGNED TO:-	SECTION:- (below)
INST	Primary Radiance data	SYSTEM	2.0
INST	S/craft Ancillary data	SYSTEM	2.0
STH	Structure temperature	STH	2.1
SSH	Sunshield/SVA data	SSH	2.2
GSS	Gyro Subsystem data	GSS	2.3
TSS	Telescope Subsys. data	TSS	2.4
DSS	Detector Subsys. data	DSS	2.5
IFC	IFC Subsys. data	IFC	2.6
STK	SAIL Task data	IPS	2.7
IPU	IProc (normal) telemetry data	IPS	2.7
CMD	Command handling status data	IPS	2.7
SPU	SPU telemetry data	IPS	2.7
STP	IProc (start-up mode) telemetry data	IPS	2.7
CSS	Cooler Subsys. data	CSS	2.8
PSS	Pwr Supply Subsys data	PSS	2.9

2.0 Instrument (System)

2.0.1 Primary Power Switching Commands

Prior to integration with the spacecraft, the HIRDLS primary power switching commands are assigned to the HIRDLS Instrument System for switching 28V primary power to the Instrument. These commands will be generated and executed within the IEGSE (Instrument Electrical Ground Support Equipment), usually embodied within STOL Procedures.

Table 2.0.1-1 lists the IEGSE primary power switching commands; there are no parameters:-

Table 2.0.1-1 Primary Power Switching Commands

MNEMONIC	FUNCTION	RESULT
GSE_PWR_QABUSON *	Apply 29V Primary Power to QBA Input	PCU internal circuits powered up; IPU A powered up; IProc auto-booting starts
GSE_PWR_QBBUSON *	Apply 29V Primary Power to QBB Input	PCU internal circuits powered up; IPU B powered up; IProc auto-booting starts
GSE_PWR_QABUSOFF	Remove Primary Power from QBA Input	All Instrument functions cease; PCU QB input relays unlatch
GSE_PWR_QBBUSOFF	Remove Primary Power from QBB Input	All Instrument functions cease; PCU QB input relays unlatch
GSE_PWR_NABUSON	Apply 29V Primary Power to NBA Input	NB Power applied to PCU relays; if relay(s) closed, NB power applied to CSS
GSE_PWR_NBBUSON	Apply 29V Primary Power to NBB Input	NB Power applied to PCU relays; if relay(s) closed, NB power applied to CSS
GSE_PWR_NABUSOFF	Remove Primary Power from NBA Input	Cooler Subsystem functions disabled
GSE_PWR_NBBUSOFF	Remove Primary Power from NBB Input	Cooler Subsystem functions disabled
GSE_PWR_SABUSON **	Apply 29V Primary Power to SBA Input	Survival Heaters (Chain-A) enabled
GSE_PWR_SBBUSON **	Apply 29V Primary Power to SBB Input	Survival Heaters (Chain-B) enabled
GSE_PWR_SABUSOFF **	Remove Primary Power from SBA Input	Survival Heaters (Chain-A) disabled
GSE_PWR_SBBUSOFF **	Remove Primary Power from SBB Input	Survival Heaters (Chain-B) disabled

* Command verification will not be available via HIRDLS telemetry until the IProc has booted.

** Command verification will not be available via HIRDLS

2.0.2 Spacecraft Time Code Commands

The following commands have been defined for test purposes only. They simulate Ancillary Data - including Time Code - which HIRDLS will routinely receive from the spacecraft:-

2.0.2.1 Summary of Spacecraft Time Code Commands

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
152	SC_TIM_CODE	4	Time code from spacecraft
153	SC_TIM_EPHEM1	1	Additional S/C ephemeris data
154	SC_TIM_EPHEM2	1	Additional S/C ephemeris data

2.0.2.2 Description & Verification of Spacecraft Time Code Commands

CMD ID#: 152	**MNEMONIC:** SC_TIM_CODE		
FUNCTION:	Time code from spacecraft		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Leap seconds between UTC and TAI	**RANGE:** 0 to 127	
PARAMETER #:1	Seconds since Jan 1, 1958 (epoch)	**RANGE:** N/A (32 bits)	
PARAMETER #:2	Multiples of 15.28 microseconds	**RANGE:** 0 to 65535	
PARAMETER #:3	Spares	**RANGE:** N/A (64 bits)	
VERIFICATION:			
NOTES:	none		

CMD ID#: 153	**MNEMONIC:** SC_TIM_EPHEM1		
FUNCTION:	Additional S/C ephemeris data		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Ephemeris data	**RANGE:** N/A (512 bits)	
VERIFICATION:			
NOTES:	none		

CMD ID#: 154	**MNEMONIC:** SC_TIM_EPHEM2		
FUNCTION:	Additional S/C ephemeris data		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Ephemeris data	**RANGE:** N/A (512 bits)	
VERIFICATION:			
NOTES:	none		

2.0.3 1553 Mode Code Commands

2.0.3.1 Summary of 1553 Mode Code Commands

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
128	HIR_MDC_SYNC	0	Mode code to synchronize without data
129	HIR_MDC_STWORD	0	Mode code to retransmit last status word
130	HIR_MDC_TEST	0	Mode code to initiate 1553 built-in-test (BIT)
131	HIR_MDC_XOFF	0	Mode code to disable alternate bus transmitter
132	HIR_MDC_XON	0	Mode code to re-enable alternate bus transmitter
133	HIR_MDC_NOTERM	0	Mode code to disable 1553 terminal flag
134	HIR_MDC_OKTERM	0	Mode code to re-enable 1553 terminal flag
135	HIR_MDC_RESET	0	Mode code to reset the 1553 RTR
136	HIR_MDC_VECT	0	Mode code to transmit 16-bit vector word
137	HIR_MDC_SYNCD	2	Mode code to synchronize with data, used on HIRDLS for time mark
138	HIR_MDC_LCMD	0	Mode code to retransmit the last command
139	HIR_MDC_BITWORD	0	Mode code to send the results of the 1553 built-in-test (BIT)

2.0.3.2 Description & Verification of 1553 Mode Code Commands

CMD ID#: 128	**MNEMONIC:** HIR_MDC_SYNC		
FUNCTION:	Mode code to synchronize without data		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** 1553 Mode Code	**SAIL:** Never
VERIFICATION:	N/A		
NOTES:	The IPU software will neither recognize nor respond to this mode code.		

CMD ID#: 129	**MNEMONIC:** HIR_MDC_STWORD		
FUNCTION:	Mode code to retransmit last status word		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** 1553 Mode Code	**SAIL:** Never
VERIFICATION:	N/A		
NOTES:	This operation is automatic. The IPU software will neither recognize nor respond to this mode code.		

CMD ID#: 130	**MNEMONIC:** HIR_MDC_TEST		
FUNCTION:	Mode code to initiate 1553 built-in-test (BIT)		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** 1553 Mode Code	**SAIL:** Never
VERIFICATION:			
NOTES:	This operation is automatic. The 1553 will be off-line for TBD milliseconds, and then the IPU software will reinitialize the 1553 and re-enable both busses (previous transmitter shutdowns are ignored).		

CMD ID#: 131	**MNEMONIC:** HIR_MDC_XOFF		
FUNCTION:	Mode code to disable alternate bus transmitter		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** 1553 Mode Code	**SAIL:** Never
VERIFICATION:			
NOTES:	This operation is automatic. The IPU software will neither recognize nor respond to this mode code, and will re-enable both busses on a power-up, reset, or BIT.		

CMD ID#: 132	**MNEMONIC:** HIR_MDC_XON		
FUNCTION:	Mode code to re-enable alternate bus transmitter		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** 1553 Mode Code	**SAIL:** Never
VERIFICATION:	N/A		
NOTES:	This operation is automatic. The IPU software will neither recognize nor respond to this mode code.		

CMD ID#: 133	**MNEMONIC:** HIR_MDC_NOTERM		
FUNCTION:	Mode code to disable 1553 terminal flag		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** 1553 Mode Code	**SAIL:** Never
VERIFICATION:			
NOTES:	This operation is automatic, and will disable all 1553 hardware error detection. The IPU software will neither recognize nor respond to this mode code.		

CMD ID#: 134	**MNEMONIC:** HIR_MDC_OKTERM		
FUNCTION:	Mode code to re-enable 1553 terminal flag		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** 1553 Mode Code	**SAIL:** Never
VERIFICATION:			
NOTES:	This operation is automatic, and will enable 1553 hardware error detection. The IPU software will neither recognize nor respond to this mode code.		

CMD ID#: 135	**MNEMONIC:** HIR_MDC_RESET		
FUNCTION:	Mode code to reset the 1553 RTR		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** 1553 Mode Code	**SAIL:** Never
VERIFICATION:			
NOTES:	Both busses will be offline for TBD milliseconds until the IPU software can reinitialize the 1553 and reenable both busses.		

CMD ID#: 136	**MNEMONIC:** HIR_MDC_VECT		
FUNCTION:	Mode code to transmit 16-bit vector word		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** 1553 Mode Code	**SAIL:** Never
VERIFICATION:	N/A		
NOTES:	This operation is automatic. The IPU software will neither recognize nor respond to this mode code.		

CMD ID#: 137	**MNEMONIC:** HIR_MDC_SYNCD		
FUNCTION:	Mode code to synchronize with data, used on HIRDLS for time mark		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** 1553 Mode Code	**SAIL:** Never
PARAMETER #:0	Time sync		**RANGE:** 0 to 7
PARAMETER #:1	Reserved		**RANGE:** 0 to 8191
VERIFICATION:			
NOTES:	This mode code is used as described in GIRD section 6.5.7.1.		

CMD ID#: 138	**MNEMONIC:** HIR_MDC_LCMD		
FUNCTION:	Mode code to retransmit the last command		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** 1553 Mode Code	**SAIL:** Never
VERIFICATION:			
NOTES:	This operation is automatic. The IPU software will neither recognize nor respond to this mode code.		

CMD ID#: 139	**MNEMONIC:** HIR_MDC_BITWORD		
FUNCTION:	Mode code to send the results of the 1553 built-in-test (BIT)		
C, T, S ATTRIBUTES:	**CLASS:** Spacecraft	**TYPE:** 1553 Mode Code	**SAIL:** Never
VERIFICATION:			
NOTES:	This operation is automatic. The IPU software will neither recognize nor respond to this mode code.		

2.0.4 Telemetry Formatting Commands

See C&TH Vol. III, Section 5 for details of these telemetry formatting commands and how they correspond to the available telemetry format options (Science and Engineering)

2.0.5 Instrument System Telemetry - Radiance Data

The 21 instrument radiance signal channels are assigned to the Instrument System. The signal channel data are all 16-bit words transmitted once per Chopper revolution (83.3 Hz). These data are not converted to engineering units. Mnemonics are SIG_DAT_01 through SIG_DAT_21 for channels 1 through 21 respectively.

Two channels only are copied to the Engineering Data Stream as follows:-

ENG_SIG_DAT_02: 16 bits; ENG_SIG_DAT_04: 16 bits;

Table 2.0.5-1 lists the alternative formats available for special Submodes of Mission Mode, in addition to the Default Format.

Table 2.0.5-1 Radiance Channel Sampling Options

Sub-Mode Code	No. of Channels Sampled	Radiance Data Sampling Rate (RDSR)
(Default)	All 21	1 per Chopper Rev (nom 83.3 Hz)
SP1	Any 10	2 per Chopper Rev (nom 167 Hz)
SP2	Any 7	3 per Chopper Rev (nom 250 Hz)
SP3	Any 3	6 per Chopper Rev (nom 500 Hz)

The Command HIR_TLM_SCIFMT (Section 2.0.4) is used to select the required channels and format. The associated command HIR_SPU_FIR is used to select /load the FIR-filter tables and 'decimation' coefficients (see section 2.7.4.1)

Each of the 21 radiance signal channels includes a device which is susceptible to SEU (single event upset) due to ionising radiation, and which may occasionally (infrequently) be disabled for approximately 2 seconds to allow for autonomous recovery to normal operation. During this 2-second period the signal telemetry value will be the zero-offset count.

2.0.7 Instrument System Telemetry - Spacecraft & Orbit Data

There are 8 HIRDLS telemetry channels which contain spacecraft or orbit data transmitted by the spacecraft to the HIRDLS Instrument . These are currently assigned mnemonics ORB_DAT_00 through ORB_DAT_07. Each is a 16-bit word tranmitted once per Major Frame (1.3 Hz). Specific word and/or bit assignments are as follows:-

ID#	SCIENCE CHANNEL MNEMONIC	CONV ALG	NAME	DESCRIPTION
0	SIG_DAT_01	-	Radiance channel 1	
1	SIG_DAT_02	-	Radiance channel 2	
2	SIG_DAT_03	-	Radiance channel 3	
3	SIG_DAT_04	-	Radiance channel 4	
4	SIG_DAT_05	-	Radiance channel 5	
5	SIG_DAT_06	-	Radiance channel 6	
6	SIG_DAT_07	-	Radiance channel 7	
7	SIG_DAT_08	-	Radiance channel 8	
8	SIG_DAT_09	-	Radiance channel 9	
9	SIG_DAT_10	-	Radiance channel 10	
10	SIG_DAT_11	-	Radiance channel 11	
11	SIG_DAT_12	-	Radiance channel 12	
12	SIG_DAT_13	-	Radiance channel 13	
13	SIG_DAT_14	-	Radiance channel 14	
14	SIG_DAT_15	-	Radiance channel 15	
15	SIG_DAT_16	-	Radiance channel 16	
16	SIG_DAT_17	-	Radiance channel 17	
17	SIG_DAT_18	-	Radiance channel 18	
18	SIG_DAT_19	-	Radiance channel 19	
19	SIG_DAT_20	-	Radiance channel 20	
20	SIG_DAT_21	-	Radiance channel 21	
21	ORB_DAT_00	?	S/C Ancillary data item #0	
22	ORB_DAT_01	?	S/C Ancillary data item #1	
23	ORB_DAT_02	?	S/C Ancillary data item #2	
24	ORB_DAT_03	?	S/C Ancillary data item #3	
25	ORB_DAT_04	?	S/C Ancillary data item #4	
26	ORB_DAT_05	?	S/C Ancillary data item #5	
27	ORB_DAT_06	?	S/C Ancillary data item #6	
28	ORB_DAT_07	?	S/C Ancillary data item #7	

2.1 STH - Structure/Thermal Subsystem

2.1.1 STH Commands

There are no commands assigned to the STH Subsystem

2.1.2 STH Telemetry

The following telemetry channels are assigned to the STH. They are all temperature sensor channels with 8-bit word length, transmitted once per Major Frame (1.3 Hz):-

ID#	SCIENCE CHANNEL MNEMONIC	CONV ALG	NAME	DESCRIPTION
465	EEAMNTTMP	D	EEA box mount	Sensor located on -Y side of panel near foot
40	EEABOXTMP	D	EEA box temp	Sensor located on external -X face
42	COOLRADTMP1	D	Cooler Radiator temp 1	Sensor located on -Y face of radiator panel near +Z/+X corner
43	COOLRADTMP2	D	Cooler Radiator temp 2	Sensor located on -Y face of radiator panel near +Z/-X corner
44	COMPHEADTMP	D	Compressor head temp	Sensor located on -Y side of mounting flange
45	DISPL1TMP	D	Displacer 1 body temp	Sensor located on -Y side of mounting flange
46	DISPL2TMP	D	Displacer 2 body temp	Sensor located on -Y side of mounting flange
54	SSH_APL_TMP	D	SSH aperture plate temp	Sensor located on outer face of SSH Aperture Plate near -Z edge [assigned to STH]
55	SSH_PZSURF_TMP	D	SSH +Z surface temp	Sensor located on SSH +Z closure panel [assigned to STH]
56	SSH_NZSURF_TMP	D	SSH -Z surface temp	Sensor located on SSH -Z closure panel [assigned to STH]
60	SVA_MTGPLT_TMP	D	SVA mounting plate tmp	Sensor located on internal (-Y) face of SVA mounting platel [assigned to STH]
29	STH_TMP_01	D	Structure temp 01	Sensor located on baseplate near -Y OBA isolator
30	STH_TMP_02	D	Structure temp 02	Sensor located on baseplate near +Y OBA isolator
31	STH_TMP_03	D	Structure temp 03	Sensor located on baseplate near +X OBA isolator
32	STH_TMP_04	D	Structure temp 04	Sensor located on inner surface of +Y wall opposite SPU
37	CCUBOXTMP	D	CCU box temp	Sensor located on external TBD face
38	GEUBOXTMP	D	GEU box temp	Sensor located on external -X face
39	PCUBOXTMP	D	PCU box temp	Sensor located on external +X face
459	BEUBOXTMP	D	BEU box	Sensor located on
460	BEUMNTTMP	D	BEU box mount	Sensor located on
461	SPUBOXTMP	D	SPU box	Sensor located on -Y face
462	IPUBOXTMP	D	IPU box	Sensor located on -Y face
463	TEUBOXTMP	D	TEU box	Sensor located on external -X face
464	TEUMNTTMP	D	TEU box mount	Sensor located on -Y side of panel near foot

2.2 SSH - Sunshield Subsystem

2.2.1 Brief Functional Description

The Sunshield Subsystem (SSH) consists of a fixed external sunshield, moveable Sunshield Door with frame mounted Drive Mechanism, Hold-down/Release Mechanism, and Sun Sensors. The Sunshield Door is moved by a three phase stepper motor with redundant windings. One set of drive windings is operated by the A-side of the IPU and the other side is operated by the B-side IPU. Door position (angle) is monitored by means of a non-redundant potentiometer mounted on the door shaft, as well as microswitches which sense the door fully open and fully closed positions, and sun sensors.

The Hold-down and Release Mechanism (HRM) consists of a hot wax actuator (HWA) with redundant heaters and microswitches to indicate the position of the latch. Heater A is operated by the A-side IPU and Heater B is operated by the B-side IPU.

Also included within the SSH Subsystem is the Space View Aperture (SVA) assembly. The aperture door is driven by a single DC motor with redundant windings A and B driven respectively by the Aand B sides of the IPU. The SVA door position is monitored by microswitches which indicate when the door is fully opened or fully closed. A temperature sensor is mounted on the motor.

2.2.2 Operational States & Transitions

These mechanisms are dormant except when being actively driven by the IPU. The SSH HRM latch has three states: a) fully retracted, b) fully extended, and c) intermediate. The intermediate state is a transitional state only. The stepper motor is powered only in order to change the door angular position. The door is normally stationary, within the angular range zero (fully closed) to 123 degrees (fully open). The door has a defined "safe state" which simply describes the angular range within which sun cannot shine directly into the aperture (for normal spacecraft attitudes), i.e. zero to approximately 60 degrees open.

The SVA has two normal positions - door fully open and door fully closed. It is unpowered except for the few seconds required to change its position.

2.2.3 SSH Command & Control

In its quiescent state, the HWA is retracted, slowly extending when power is continuously applied to one of the heaters. After approximately 3 minutes (depending on initial body temperature), the actuator will be extended sufficiently to release the door-retaining latch. This occurs at a body temperature of about 75C. As soon as latch release occurs - indicated in telemetry by a microswitch - power may be removed and the HWA allowed to cool down, eventually resuming its retracted state.

As soon as the latch releases, the door stepper motor must be driven (TBD) steps in the OPEN direction so that the door tab clears the latch arm and will therefore not re-latch as the HWA actuator cools. If it is required to re-latch the door by command, then either the door is not opened, or - if open - will be driven to its fully closed position. This must be done while the HWA is extended but the door motor does not need to remain powered once the "home" position has been reached.

The door can be unlatched and re-latched manually without the application of power.

2.2.3.1 Summary of SSH & SVA Commands

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
43	HIR_SSH_MOVE	2	Move the sunshield door at a specifed rate
44	HIR_SSH_SAFE	0	Safe the sunshield door as quickly as possible
45	HIR_SSH_SAFEANGLE	1	Set safe angle parameter for sunshield door
46	HIR_SSH_DOORCRIT	0	Disable or enable flag to close, latch, or unlatch the sunshield door
47	HIR_SSH_HEATER	1	Activate the HRM heater to latch or unlatch the sunshield door
95	HIR_SSH_MOVECRIT	1	Close the sunshield door at a specified rate outside the safe angle range.

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
48	HIR_SVA_CRITICAL	0	Must precede HIR_SVA_MOVE.
49	HIR_SVA_MOVE	2	Open or close the space view aperture door.

2.2.3.2 Description & Verification of SSH &SVA Commands

CMD ID#: 43	**MNEMONIC:** HIR_SSH_MOVE		
FUNCTION:	Move the sunshield door at a specifed rate		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Enabled
PARAMETER #:0	Direction (0 = close, 1 = open)	**RANGE:** 0 to 1	
PARAMETER #:1	Number of steps to move door	**RANGE:** 0 to 2400	
VERIFICATION:	DOOR_POT count changes as calculated		
NOTES:	This command will move the door for a total of N steps in direction D at a fixed rate of approximately 28 steps per second. One step is 0.1 degrees. The door will not be closed past the angle specified in the HIR_SSH_SAFEANGLE command. Commands in the 'Open' direction are not restricted. If one of these commands is executing, additional HIR_SSH_MOVE commands will be ignored, except a command with a zero number of steps, which will abort the currently executing command. Note that this command does not examine any of the 'limit' microswitches.		

CMD ID#: 44	**MNEMONIC:** HIR_SSH_SAFE		
FUNCTION:	Safe the sunshield door as quickly as possible		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Enabled
VERIFICATION:	DOOR_POT count changes and indicates SAFE position [nom = DOOR_SAF_ANG value] after allowed time has elapsed		
NOTES:	The door will be moved to the position specifed by the HIR_SSH_SAFEANGLE command. If another HIR_SSH_MOVE command is executing, it will be aborted immediately. This command will only move the door toward the closed position and will be ignored if the door is already within the safe range.		

CMD ID#: 45	**MNEMONIC:** HIR_SSH_SAFEANGLE		
FUNCTION:	Set safe angle parameter for sunshield door		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Safe angle parameter	**RANGE:** 0 to 65535	
VERIFICATION:	DOOR_SAF_ANG value updates correctly		
NOTES:	The units of the safe angle position are counts of the SSH door potentiometer as seen in telemetry.Default value for P0: [36500 = 60 deg]		

CMD ID#: 46	**MNEMONIC:** HIR_SSH_DOORCRIT		
FUNCTION:	Disable or enable flag to close, latch, or unlatch the sunshield door		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Disabled
VERIFICATION:	Door CRIT status flag ? 0 = DISAB; 1 = ENAB [does this reset automatically ?]		
NOTES:	This command must precede a HIR_SSH_HEATER command, or a HIR_SSH_MOVE command which is attempting to close the door past the safe angle.		

CMD ID#: 47	**MNEMONIC:** HIR_SSH_HEATER		
FUNCTION:	Activate the HRM heater to latch or unlatch the sunshield door		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Disabled
PARAMETER #:0	Maximum number of seconds	**RANGE:** 0 to 511	
VERIFICATION:	HWA heater status bit ? 0 = OFF; 1 = ON		
NOTES:	This command will be rejected if not preceded by an enable HIR_SSH_DOORCRIT command. The heater will turn off once another heater command is received (overriding the currently executing command) or the time-out has expired or an overheating condition is detected by the fault management software. If the time-out is specified as zero, the heater will be turned off immediately if already on.		

CMD ID#: 95	**MNEMONIC:** HIR_SSH_MOVECRIT		
FUNCTION:	Close the sunshield door at a specified rate outside the safe angle range.		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Disabled
PARAMETER #:0	Number of steps	**RANGE:** 0 to 2400	
VERIFICATION:	DOOR_POT count changes as calculated		
NOTES:	This command will move the door for a total of N steps in the closed direction at a fixed rate of approximately 28 steps per second. One step is 0.1 degrees. The door will not be moved (the command will be rejected) unless this command was immediately preceded by the HIR_SSH_DOORCRIT command. Note that this command does not examine any of the microswitches		

CMD ID#: 48	**MNEMONIC:** HIR_SVA_CRITICAL		
FUNCTION:	Must precede HIR_SVA_MOVE.		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Disabled
VERIFICATION:	SVA _CRIT status flag ? 0 = DISAB; 1 = ENAB [does this reset automatically ?]		
NOTES:	This command must precede an HIR_SVA_MOVE command.		

CMD ID#: 49	**MNEMONIC:** HIR_SVA_MOVE		
FUNCTION:	Open or close the space view aperture door.		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Disabled
PARAMETER #:0	Close (0) or open (1) the SVA	**RANGE:** 0 to 1	
PARAMETER #:1	Number of seconds	**RANGE:** 0 to 31	
VERIFICATION:	SVA_STATUS word bits should change as follows:- [to be comlpeted]		
NOTES:	This command will be rejected if not preceded by an HIR_SVA_CRITICAL command.The motor will be engaged for the specified number of seconds. The microswitches are ignored.If another command is received during the timeout period it will be ignored, unless the number of seconds is set to zero, in which case the current command will be aborted.		

2.2.4 SSH Telemetry

2.2.4.1 Summary of SSH Telemetry

The following telemetry channels are assigned to the SSH:

ID#	SCIENCE CHANNEL MNEMONIC	CONV ALG	NAME	DESCRIPTION
47	SUNSEN1_TMP	A	Sun sensor 1 (temperature)	Thermistor sun sensor on Aperture Plate
48	SUNSEN2_TMP	A	Sun sensor 2 (temperature)	Thermistor sun sensor on Aperture Plate
49	SUNSEN3_TMP	A	Sun sensor 3 (temperature)	Thermistor sun sensor on Aperture Plate
50	DOOR_POT	B	Door angle sensor	Potentiometer on door hinge
51	DOOR_SAF_ANG	B	Door Safe Angle setting	Commanded value of digital count corresponding to door angle sensor SAFE position (nominally 60 degrees open)
52	SSHWA_TMP	C	Hot Wax Actuator temp	Sensor located on Hot Wax Actuator body
53	SSH_DORMOT_TMP	C	SSH drive motor temp	Sensor located on Door drive motor body
57	SSH_STATUS	-	Sunshield switch status	Bits indicate status of SSH microswitches; refer to Table 2.2.4.4-1
58	SVA_STATUS	-	SVA switch status	Bits indicate status of SVA microswitches; refer to Table 2.2.4.4-1
59	SVA_DORMOT_TMP	C	SVA drive motor temp	Sensor located on SVA door drive motor body

2.2.4.2 SSH & SVA Temperature and Sun Sensors

Temperature Sensors are affixed to the motor housings and to the HWA body. They are AD590 devices. The sun sensors are thermistors. All these devices are wired directly back to the IPU

electronics which supplies the necessary bias and processes the analog sensing signals. Table 2.2.4.2-1 shows how these sensors are mapped on to Instrument Telemetry. All these sensors are duplicated for redundancy - the 'A' and 'B' sensors are connected to the A_IPU and B_IPU respectively.

These telemetry data are all generated in the IPU as 16 bit words and are all copied into the Science telemetry stream as 16 bit words with the mapping showm in Table 2.2.4.2-1.

Table 2.2.4.2-1 Assignment of SSH/SVA Sensor Data to Telemetry List Mnemonics

SUBSYSTEM SENSOR CHANNEL	SUBSYSTEM MNEMONIC **	TLM LIST MNEMONIC
Sun Sensor #1	SSH_SUNSX1	SUNSEN1_TMP
Sun Sensor #2	SSH_SUNSX2	SUNSEN2_TMP
Sun Sensor #3	SSH_SUNSX3	SUNSEN3_TMP
HOP Actuator Temp	SSH_HWATMPX	SSHWA_TMP
SSH Drive Motor Temp	SSH_MOTTMPX	SSH_DORMOT_TMP
SVA Drive Motor Temp	SVA_MOTTMPX	SVA_DORMOT_TMP

** Related analog function at SSH-IPU interface. X is used to represent A or B (only the active side is fed to telemetry)

How the Sun Sensor telemetry will be used operationally is TBD. For pre-launch verification, they should in general all indicate SSH Aperture Plate temperature. Each sensor is mounted with some degree of thermal isolation from the Aperture Plate, and if it is desired - and the sensors are accessible - a "pencil" source of radiant heat may be directed at each one in turn in order to check the individual telemetry responses.

2.2.4.3 SSH Door Angle/Position Telemetry and Commanding

The SSH door fully open position shall correspond with the potentiometer wiper positioned at the SSH_DRPOS_DRV end of the Door Position Potentiometer. This function maps on to the Telemetry Function DOOR_POT (16 bits), which is downlinked at the **MiF** rate (10.4 Hz nom.).

A "Door Safe Angle" is defined. This is the maximum door angle (approx. 60 degrees open) at which the sun will never shine directly into the Main Viewing Aperture, assuming normal S/C attitude. It is defined by the command HIR_SSH_SAFEANGLE, which loads a parameter into an IPU memory location. This parameter corresponds to the 16-bit telemetry count expected from the door position potentiometer when the door is at the Safe Angle. Although the "safe" zone extends from this position to the door-closed position, it is desirable to prevent the door from closing beyond the "safe angle" position to minimise the loss of azimuth coverage, should the door drive system fail at any time.

In normal operation the telemetry count for the potentiometer channel should never be less than the "safe angle" parameter value. Any attempt to close the door beyond the "safe angle" point will be ignored, and if driving, the drive will be terminated as soon as the potentiometer count becomes smaller than the "safe angle" parameter. This limiting position may be over-ridden by means of the HIR_SSH_DOORCRIT and _MOVECRIT commands.

The same or different (TBD) Conversion Algorithms may be used for the door angle telemetry, depending on the difference in calibration scaling between the A_IPU and the B_IPU. There is only one potentiometer. The analog signal name at the SSH-IPU interface is SSH_DRPOS.

2.2.4.4 SSH & SVA Microswitches

The correspondence between microswitch states and mechanical positions - and how these sensors are mapped on to Instrument Telemetry - shall be as listed in Table 2.2.4-4-1. The microswitches are not duplicated for redundancy - they are therefore connected to both the A_IPU and the B_IPU.

Table 2.2.4.4-1 SSH & SVA Limit Microswitch Telemetry

NOTE: THE FOLLOWING TABLE IS AWAITING UPDATING PER REVISED IPU S/W DESIGN DOCUMENT (WHEN RELEASED)

SUBSYSTEM SENSOR CHANNEL	SUBSYSTEM MNEMONIC **	TLM LIST MNEMONIC	INDICATION
SSH SWITCHES:			
HRM LATCH DISENGAGED (NO)	SSH_LATDIS_NC	SSH_STATUS (BIT #7) (MSB)	LATCH NOT FULLY DISENGAGED
HRM LATCH DISENGAGED (YES)	SSH_LATDIS_NO	SSH_STATUS (BIT #6)	LATCH FULLY DISENGAGED
HRM LATCH ENGAGED (NO)	SSH_LATENG_NC	SSH_STATUS (BIT #5)	LATCH NOT FULLY ENGAGED
HRM LATCH ENGAGED (YES)	SSH_LATENG_NO	SSH_STATUS (BIT #4)	LATCH FULLY ENGAGED
SSH DOOR FULLY CLOSED (NO)	SSH_DRCLOS_NC	SSH_STATUS (BIT #3)	DOOR NOT FULLY CLOSED
SSH DOOR FULLY CLOSED (YES)	SSH_DRCLOS_NO	SSH_STATUS (BIT #2)	DOOR FULLY CLOSED
SSH DOOR FULLY OPEN (NO)	SSH_DROPEN_NC	SSH_STATUS (BIT #1)	DOOR NOT FULLY OPEN
SSH DOOR FULLY OPEN (YES)	SSH_DROPEN_NO	SSH_STATUS (BIT #0) (LSB)	DOOR FULLY OPEN
SVA SWITCHES:		(* SVA Status bits 4 through 7 (MSB) are not used)	
SVA DOOR FULLY CLOSED (NO)	SVA_DRCLOS_NC	SVA_STATUS (BIT #3) *	FLAP NOT FULLY CLOSED
SVA DOOR FULLY CLOSED (YES)	SVA_DRCLOS_NO	SVA_STATUS (BIT #2)	FLAP FULLY CLOSED
SVA DOOR FULLY OPEN (NO)	SVA_DROPEN_NC	SVA_STATUS (BIT #1)	FLAP NOT FULLY OPEN
SVA DOOR FULLY OPEN (YES)	SVA_DROPEN_NO	SVA_STATUS (BIT #0) (LSB)	FLAP FULLY OPEN

** Related analog function at SSH-IPU interface. In this column, NO means "Normally Open"

2.3 GSS - Gyroscope Subsystem

2.3.1 Brief Functional Description

The Gyroscope Subsystem makes measurements of motion with respect to inertial space. It consists of two components, the Gyro Mechanical Unit (GMU) and the Gyro Electronics Unit (GEU).

The GMU contains four individual gyroscope instruments, each of which measures motion about a single axis, and is internally thermostated at 70° C. The GMU is electrically connected to the GEU only. The GEU controls the GMU gyroscopes and heaters, and contains the interface to the IPU. The four GSS channels may be individually powered up and down.

There are two sets of interface circuits which are shared between the four channels; these are configured so that only one circuit is powered at any one time, the other being available as a backup. Only the interface driver and receiver chips are shared in this way; all the other functionality of the Gyro interface is replicated in all four GEU channels.

In normal operation, the GEU receives a sync pulse from the IPU once per Chopper Revolution (**CR**). This latches the internal angular measurement from each gyroscope channel into its Readout Counter Output Register (RCOR) at a precise time with respect to the chopper rotation.

Each GEU channel also includes an 8-input, 10-bit A-to-D converter which generates housekeeping data. An IPU control word selects the input and initiates conversion. The results are stored in the Telemetry Output Register (TOR). In addition to the RCOR and the TOR, the GEU maintains digital status information in a Status Word Register (SWR).

Data Request Words are sent from the IPU to the GSS which transfer the contents of either the RCOR, the TOR or the SWR into an Output Data Register (ODR). These control words are referred to below as Angle, Housekeeping or Status Request Words respectively. Each control word includes Gyro channel address (RT) bits, and only that channel responds. After sending a control word, the IPU reads the contents of the ODR by transmitting appropriate signals to the GSS; only the most recently commanded Gyro channel responds.

Instrument commands and corresponding operational control words are available to turn the Gyro motors on or off, to enable and disable the heaters and to select various operating conditions. In each Chopper Revolution the angular measurements from all four Gyro channels will be transferred in turn to the IPU, plus a single Housekeeping or Status word. The Housekeeping Data word is sub-commutated to depth 8.

2.3.2 Operational States

The GSS will have the states of operation described in the following subsections. The GSS can only be operated after the IPU is in an operational state. The normal (typical) correspondence between Instrument Modes and GSS States is shown in Table 2.3.2-1.

Table 2.3.2-1 Mode/State Correspondence

Instrument Mode	GSS State
Off / Survival	Off
Idle	Off
Lower Power	Off
Standby 1	Quiescent --> Ready *
Standby 2	Ready --> Operational **
Mission	Operational

"-->" indicates situation during Instrument Activation, where the Instrument is in other respects in the Mode shown (Standby_1 or _2), but the GSS may still be warming up (*) or the spin motors may still be running up (**).

2.3.2.1 Off State

In this state, all power is off. Commands to the GSS are ignored and no telemetry is generated. The only state which it is possible to enter from power-off is the quiescent state.

2.3.2.2 Quiescent State

In this state, the +5V and ±15V power supplies to the GSS are enabled (in the PSS), and the operational channels powered on. All commands from the IPS to the GSS will be correctly interpreted, and valid housekeeping telemetry will be returned from the GSS to the IPS. Gyro angle data packets will be returned from the GSS to the IPS on request, but these will not contain meaningful angular measurement data.

2.3.2.3 Ready State

In this state, all power supplies to the GSS are enabled, and the operational channels powered on. The heaters for the operational channels are powered on and the GMU mechanisms will have reached the minimum safe temperature for motor spin-up. All operational commands from the IPU to the GEU will be correctly interpreted and valid housekeeping telemetry will be returned from the GEU to the IPU. Gyro angle data packets will be returned from the GEU to the IPU on request, but these will not contain meaningful angular measurement data.

2.3.2.4 Operational State

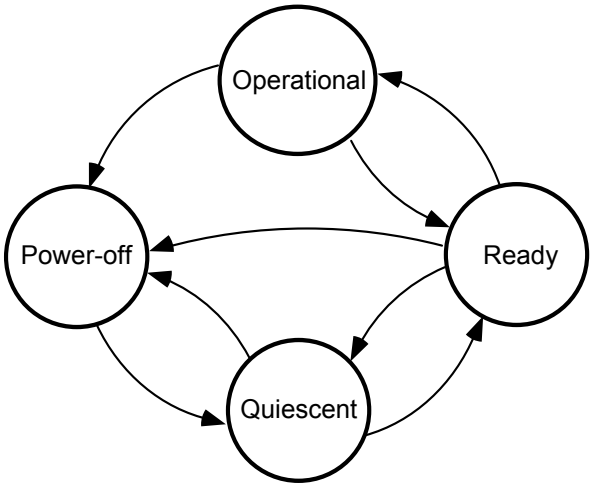
In this state, all power supplies to the GSS are enabled, and the operational channels powered on. All commands from the IPS to the GSS will be correctly interpreted, and valid telemetry, including angular measurement data, will be returned from the GSS to the IPS.

The heater control circuitry in the GMU is powered, and the heaters are on. The gyro mechanisms are running, and the GMU is at operational temperature.

2.3.3 State Transitions

The allowed GSS state transitions are shown in Figure 2.3.3-1. Transitions not indicated by arrows on the transition diagram are explicitly disallowed.

Figure 2.3.3-1 GSS State Transitions



The GSS cannot be explicitly commanded to the defined subsystem states. Each state is achieved via the appropriate sequence of external (PCU) power switching and Power and Operational commands to the GEU. State transition times, command sequnces, etc. are described in Section 2.3.4.3.2.3.

2.3.4 GSS Command & Control

2.3.4.1 Summary of GSS Commands

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
12	HIR_GSS_POWER	2	Turn selected gyro on or off
13	HIR_GSS_CONTROL	2	Set attributes for selected gyro

2.3.4.2 Description & Verification of GSS Commands

CMD ID#: 12	**MNEMONIC:** HIR_GSS_POWER		
FUNCTION:	Turn selected gyro on or off		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Enabled
PARAMETER #:0	Gyro channel		**RANGE:** 0 to 7
PARAMETER #:1	Power off (0) or on (1)		**RANGE:** 0 to 1
VERIFICATION:	GYRXP15V & GYRXN15V, where X is value of param #0: if param #1 = 0 (Power OFF) these telemetry channels should indicate zero volts; if param #1 = 1 (Power ON) they should indicate +/- 15V +/- 0.25 volts respectively.		
NOTES:	This command control solid-state power switches within the GEU. The main usage will be to select which channels are activated. For power-saving, only 3 out of the 4 Gyro channels may be operated.		

CMD ID#: 13	**MNEMONIC:** HIR_GSS_CONTROL		
FUNCTION:	Set attributes for selected gyro		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Enabled
PARAMETER #:0	Gyro channel		**RANGE:** 0 to 7
PARAMETER #:1	Attribute code		**RANGE:** 0 to 1023
VERIFICATION:	Depends on param values: see this doc, Section 2.3.5		
NOTES:	Maps on to IPU-to-GSS Control Word. See C&THB, Vol. I, Section 2.3.4.3.2.		

2.3.4.3 IPU-to-GSS Control Word Formats

This section defines the formats for the control words passing from the IPU to the GEU. They must occur - under IPU control - in a preset sequence for each Chopper Revolution. The sequence is defined in section 2.3.4.4

The content of Control and Data transfers between the IPU and GEU shall conform to the formats specified in the following subsections. Bit conventions shall be as follows:

a. All transfers shall be 16 bits in length.

b. Serial binary words shall be transmitted least significant bit (LSB) first.

c. Bits shall be numbered 0 to 15 where the 0 bit is the LSB.

2.3.4.3.1 Power Command & Control Word

The Power Command and Power Control Word shall use the bit assignments shown in Table 2.3.4.3.1-1. The Power Command (HIR_GSS_POWER) is not decoded by the IPU, but is passed straight through as a Control Word to the GSS.

Table 2.3.4.3.1-1 Power Command & Control Word Bit Assignments

IPU CONTROL WORD		CORRESPONDING GROUND CMD BIT ("HIR_GSS_POWER" CMD)	FUNCTION
BIT #	CODE		
MSB 15	RT2	Param #0 MSB	) (MSB)
14	RT1	Param #0	) Gyro channel select address (0 to 3)
13	RT0	Param #0 LSB	) (LSB)
12	PC	Always 1 (set by IPU)	Power command ident bit
11	PWR	Param #1	Power control bit (0 = OFF; 1 = ON)
10	TR	Always 1 (set by IPU)	
9	SA4		Not used by GSS
8	SA3		Not used by GSS
7	SA2		Not used by GSS
6	SA1		Not used by GSS
5	SA0		Not used by GSS
4	D4		Not used by GSS
3	D3		Not used by GSS
2	D2		Not used by GSS
1	D1		Not used by GSS
LSB 0	D0		Not used by GSS

A Power Command switches the power to a selected gyro channel. Turning a channel on or off takes effect on the last clock transition of the 16-bit power switching command. The +28V, +15V, -15V and +5V supplies to the gyro channel electronics are switched internally to each channel by this command. With the exception of the RS-422 receivers and the power switching command decoding logic, the entire channel electronics can be therefore be turned off. When turned off, there will be no response from that channel of the GSS to any command other than the power-on command.

Once a power-on command has been sent, the channel will respond to all command formats in the manner described in this document within 500 ms. Sending a power-on command to a channel which is already powered on will have no effect, other than clearing from ALL channels any pending channel selection for a subsequent telemetry transfer. No valid telemetry will be produced from a telemetry transfer if the channel selection has been cleared.

2.3.4.3.2 Operational Commands & Control Words

2.3.4.3.2.1 Control Word Bit Assignments

Operational control of the GSS shall be accomplished by issuing appropriate sequences of bit patterns within the Command HIR_GSS_CONTROL. The Command is not decoded by the IPU, but is passed straight through as a Control Word to the GSS. The Command and Control Word bit assignments are shown in Table 2.3.4.3.2-1.

Table 2.3.4.3.2-1 Operational Command & Control Word Bit Assignments

IPU CONTROL WORD		CORRESPONDING GROUND CMD BIT ("HIR_GSS_CONTROL" CMD)	FUNCTION
BIT #	CODE		
MSB 15	RT2	Param #0 MSB	) (MSB)
14	RT1	Param #0	) Gyro channel select address (0 to 3)
13	RT0	Param #0 LSB	) (LSB)
12	PC	Always 0 (set by IPU)	Power command ident bit
11	PWR		Not used by GSS
10	TR	Always 0 (set by IPU)	Transmit/receive ident bit
9	SA4	Param #1 MSB	) for mapping
8	SA3	Param #1	) of these 5 bits
7	SA2	Param #1	) SA4 through SA0
6	SA1	Param #1	) see Table
5	SA0	Param #1	) 2.3.4.3.2-2
4	D4	Param #1	Not used by GSS
3	D3	Param #1	Not used by GSS
2	D2	Param #1	Not used by GSS
1	D1	Param #1	Not used by GSS
LSB 0	D0	Param #1 LSB	Not used by GSS

2.3.4.3.2.2 Functional Assignments and Command Attribute values for 'SA' Bits

Table 2.3.4.3.2-2 lists the valid patterns for the 'SA' bits, the function assigned to each pattern and the numerical value to be used as the second parameter for commanding that function:

Table 2.3.4.3.2-2 Assignment of Bits SA4 through SA0

SA4	SA3	SA2	SA1	SA0	DECML	CMD PARAM VALUE	FUNCTION	
0	0	0	0	1	01	32	spin motor on	
0	0	0	1	0	02	64	spin motor off	
0	1	0	0	0	08	256	fine range select	May be the other way round - TBD!
0	1	0	0	1	09	288	coarse range select	
0	1	0	1	0	10	320	out of synch recovery inhibit	
0	1	0	1	1	11	352	temperature inhibit override	
1	0	0	0	0	16	512	Motor high power select, with auto return to normal power after 60 sec [see notes]	
1	0	0	0	1	17	544	over-current trip inhibit	
1	0	0	1	0	18	576	sample readout count	
1	1	0	0	0	24	768	select motor speed high (246 RPS)	
1	1	0	0	1	25	800	select motor speed low (117 RPS)	
1	1	0	1	0	26	832	Gyro heater on	
1	1	0	1	1	27	864	Gyro heater off	

Notes on Special Command Functions

SA = 08 Selects "fine" angle resolution range (see Table 2.3.5.2.3-2)

SA = 09 Selects "coarse" angle resolution range (see Table 2.3.5.2.3-2)

SA = 10 If the spin motor speed falls out of sync. with the drive frequency, automatic re-synchronisation will occur by default, but can be inhibited by sending this command.

The above action is resettable only by cycling the Subsystem power.

SA = 11 An under-temperature inhibit function is enabled by default to protect against inadvertent operation of the spin wheel below temperatures at which proper lubrication is not assured. This command disables the inhibit function.

SA = 16 The high-power mode will normally last for 60 sec. The duration can be extended by sending a high-power command within 60 sec of a previous high-power command. The extention may be repeated as often as required. The extension of duration may be necessary because the high-power mode is used to establish good magnetisation of the spin motor prior to reducing power for normal mode running. The higher wheel speed will require longer high-power mode duration. Suitable command sequences will be developed.

SA = 17 A spin motor drive over-current trip function is enabled by default, and causes the motor drive to be switched off. This command disables the trip function.

The above action is resettable only by cycling the Subsystem power.

SA = 18 For pre-installation test purposes only

SA = 24, 25 By default, the motor will always start at 246 RPS on power-up. 117 RPS can only be selected while the motor is running. The speed can then be switched from one speed to the other without restriction.

SA = 26, 27 All GSS channels default to the "heater off" state without 28V power. When the GSS +28V supply is switched on in the PSS, the heaters initially remain off. Each heater may be turned on or off independently by sending the appropriate command. If the command corresponds to the existing state for the heater, the command is effectively ignored.

2.3.4.3.2.3 Control Word Sequences for State Transitions (each channel)

Table 2.3.4.3.2.3-1 defines the command sequence required per channel for each transition, and shows the time needed for each transition to be completed after the end of the command sequence. These sequences may be completely or partially programmed via SAIL and/or IPU Macro routines (TBD).

PSS commands marked ** must be sent ahead of the associated GSS command sequence or SAIL Task operation.

Table 2.3.4.3.2.3-1 GSS State Transition Times & Command Sequence Summary

From (State)	To (State)	Nominal Transition time	Sequence / Task		Summary & Comments
			CMD	SAIL	
Off	Quiescent	< 10 seconds	OQT		(PSS cmds: GSS +5/+15/-15 ON) ** GSS cmds: Power ON
Quiescent	Ready	Approx. 2 hrs per channel from heater-ON cmd		GYON	(PSS cmds: GSS +28Q ON) ** GSS cmds: Gyro heater ON (each chan. draws 6 watts while warming up; may be necessary to stagger cmds to the 3 or 4 required channels)
Ready	Operational	3-4 mins per channel		GYON	GSS cmds: Spin motor ON (wait 3-4 mins between channels)
Operational	Ready	< 100 ms	ORD		GSS cmds: Spin motors OFF
Ready	Quiescent	< 100 ms	RQT		GSS cmds: Gyro heaters OFF
Any / All	Off	< 100 ms	AOF		GSS cmds: Power OFF

Table 2.3.4.3.2.3-2 GSS Command Sequences

Code	Commands (in correct sequence)
OQT	HIR_GSS_POWER (**ch**, 1), repeat, repeat, ... where **ch** takes in turn value of each channel to be powered up.
ORD	HIR_GSS_CONTROL (**ch**, 64), repeat, repeat, ... where **ch** takes in turn the values 0 thro' 3.
RQT	HIR_GSS_CONTROL (**ch**, 864), repeat, repeat, ... where **ch** takes in turn the values 0 thro' 3.
AOF	HIR_GSS_POWER (**ch**, 0), repeat, repeat, ... where **ch** takes in turn the values 0 thro' 3.

2.3.4.3.3 Angle Request Word (ARW)

The Angle Request function relates to an IPU Control Word only - there is no corresponding Ground Command. This control word transfers the contents of the RCOR into the ODR for the selected channel, ready for transmission to the IPS.

The Angle Request Word shall use the bit assignments shown in Table 2.3.4.3.3-1.

Table 2.3.4.3.3-1 Angle Request Word Format

BIT #	CODE	FUNCTION	
MSB 15	RT2	) (MSB)	
14	RT1	) Gyro channel select address (0 to 3)	
13	RT0	) (LSB)	
12	PC	Always 0	
11	PWR	Not used by GSS	
10	TR	Always 1	
9	SA4	Always 0	SA bits equivalent to decimal value = 2 for this control word
8	SA3	Always 0	
7	SA2	Always 0	
6	SA1	Always 1	
5	SA0	Always 0	
4	D4	Not used by GSS	
3	D3	Not used by GSS	
2	D2	Not used by GSS	
1	D1	Not used by GSS	
LSB 0	D0	Not used by GSS	

2.3.4.3.4 Housekeeping Conversion Control (HCC)

The Housekeeping Conversion Control function relates to an IPU Control Word only - there is no corresponding Ground Command. This control word selects an input channel to the housekeeping multiplexer and initiates a conversion, the result of which is placed in the Telemetry Output Register (TOR). The TOR contents are not defined until 200 µs after the end of the HCC transmission.

The Housekeeping Conversion Control word shall use the bit assignments shown in Table 2.3.4.3.4-1. The encoding of bits SA4 through SA0 is given in Table 2.3.4.3.4-2.

Table 2.3.4.3.4-1 Housekeeping Conversion Control Format

BIT #	CODE	FUNCTION
MSB 15	RT2	) (MSB)
14	RT1	) Gyro channel select address (0 to 3)
13	RT0	) (LSB)
12	PC	Always 0
11	PWR	Not used by GSS
10	TR	Always 1
9	SA4	) housekeeping
8	SA3	) multiplexer
7	SA2	) channel selection
6	SA1	) see Table
5	SA0	) 2.3.4.3.4-2
4	D4	Not used by GSS
3	D3	Not used by GSS
2	D2	Not used by GSS
1	D1	Not used by GSS
LSB 0	D0	Not used by GSS

Table 2.3.4.3.4-2 Encoding of Bits SA4 through SA0 for Housekeeping Control Word

SA4	SA3	SA2	SA1	SA0	DECML	FUNCTION
0	0	0	1	1	03	gyro motor voltage
0	1	0	0	0	08	gyro unit temperature
0	1	0	0	1	09	-15V supply volts
0	1	0	1	0	10	+15V supply volts
0	1	0	1	1	11	gyro motor current
1	0	0	0	0	16	capture loop output
1	0	0	0	1	17	magnetometer output **
1	0	0	1	0	18	PC board temperature

** To be removed (magnetometers deleted)

2.3.4.3.5 Housekeeping Request Word (HRW)

The Housekeeping Request function relates to an IPU Control Word only - there is no corresponding Ground Command. This control word transfers the contents of the TOR into the ODR. The TOR contains the results of the most recent housekeeping A-to-D conversion.

The Housekeeping Request Word shall use the bit assignments shown in Table 2.3.4.3.5-1.

Table 2.3.4.3.5-1 Housekeeping Request Word Format

BIT #	CODE	FUNCTION	
MSB 15	RT2	) (MSB)	
14	RT1	) Gyro channel select address (0 to 3)	
13	RT0	) (LSB)	
12	PC	Always 0	
11	PWR	Not used by GSS	
10	TR	Always 1	
9	SA4	Always 1	SA bits equivalent to decimal value = 24 for this control word
8	SA3	Always 1	
7	SA2	Always 0	
6	SA1	Always 0	
5	SA0	Always 0	
4	D4	Not used by GSS	
3	D3	Not used by GSS	
2	D2	Not used by GSS	
1	D1	Not used by GSS	
LSB 0	D0	Not used by GSS	

2.3.4.3.6 Status Request Word (SRW)

The Status Request function relates to an IPU Control Word only - there is no corresponding Ground Command. This control word transfers the contents of the digital Status Word Register (SWR) into the ODR.

The Status Request Word shall use the bit assignments shown in Table 2.3.4.3.6-1.

Table 2.3.4.3.6-1 Status Request Word Format

BIT #	CODE	FUNCTION	
MSB 15	RT2	) (MSB)	
14	RT1	) Gyro channel select address (0 to 3)	
13	RT0	) (LSB)	
12	PC	Always 0	
11	PWR	Not used by GSS	
10	TR	Always 1	
9	SA4	Always 0	SA bits equivalent to decimal value = 1 for this control word
8	SA3	Always 0	
7	SA2	Always 0	
6	SA1	Always 0	
5	SA0	Always 1	
4	D4	Not used by GSS	
3	D3	Not used by GSS	
2	D2	Not used by GSS	
1	D1	Not used by GSS	
LSB 0	D0	Not used by GSS	

2.3.4.4 GSS/IPS Control Word & Data Transmission Sequence

The GSS data timing is governed by the receipt of the GSS sync pulse, which occurs once per Chopper Revolution (**CR**). Measurements are made by the GSS instantaneously on receipt of this pulse. The results of the measurements shall be transferred to the IPS before receipt of the next GSS sync pulse, otherwise data will be permanently lost. Time must also be allocated to transfer the (less time-critical) housekeeping and status data from the GSS, and to implement any incoming commands for the GSS. The sequence shown in Table 2.3.4.4-1 will meet these requirements.

The IPU controls the transmission of control words to the GSS, and of data from the GSS. All data transfers to the IPU are from Output Data Register (ODR), so that each data transfer must be preceded by a control word to load the ODR.

Angle data is obtained from each channel every **CR**. A complete set of 8 housekeeping values and a status word from each channel must be read once every Minor Frame (**MiF**).

Table 2.3.4.4-1 defines (from top to bottom) the sequence of control and data transfers which shall occur for each **CR** and within each **MiF**. The parameter G represents the value of the RT Bits in the word, and the parameter M represents the value of the SA Bits. The fact that the total cycle time for acquiring data from all four Gyro channels is 4 **MiF**s means that there will be two such cycles per **MaF**. Alternate GSS data cycles shall begin at a **MaF** boundary. Apart from the angle data (which are output every **CR**), all GSS data are output to the Science Data Stream once per **MaF**.

For convenience the GSS acronyms used here are summarised in Table 2.3.4.4-2

Table 2.3.4.4-1 Transfer Sequence for each CR and Each MiF

ITEM / WORD	FUNCTION
STROBE (SYNC pulse)	Makes an instantaneous measurement of accumulated angle in all channels and stores them in the four RCORs.
HCC (G,M)	Sets the Gyro channel G housekeeping multiplexer to point to its input channel M; carries out a conversion; puts the results in the Telemetry Output Register (TOR). M increments from 0 to 7 beginning at every **MiF** boundary, one count per **CR**. G increments from 0 to 3, one count per **MiF**, at a **MiF** boundary. Total cycle time for 4 Gyro channels = 4 **MiF**s
ARW (G=0)	Transfers Gyro channel 0 angle measurement into the ODR.
(read data)	IPU reads data word from ODR (see section 2.3.5.2 below)
ARW (G=1)	Transfers Gyro channel 1 angle measurement into the ODR.
(read data)	IPU reads data word from ODR (see section 2.3.5.2 below)
ARW (G=2)	Transfers Gyro channel 2 angle measurement into the ODR.
(read data)	IPU reads data word from ODR (see section 2.3.5.2 below)
ARW (G=3)	Transfers Gyro channel 3 angle measurement into the ODR.
(read data)	IPU reads data word from ODR (see section 2.3.5.2 below)
HRW (G)	Transfers the housekeeping data in the Gyro channel G TOR to the ODR. There must be at least 200µs between the HCC word and the HRW. G increments from 0 to 3, one count per **MiF**, at a **MiF** boundary. Total cycle time for 4 Gyro channels = 4 **MiF**s
(read data)	IPU reads data word from ODR (see section 2.3.5.2 below)
SRW (G) (1 per **MiF**)	Transfers the status data in the Gyro channel G SWR to the ODR. G increments from 0 to 3, one count per **MiF**, at a **MiF** boundary. Total cycle time for 4 Gyro channels = 4 **MiF**s
(read data) (1 per **MiF**)	IPU reads data word from ODR (see section 2.3.5.2 below)
[CMD]	Gyro Operational or Power Control Word. This shall be included only if there is a pending Command to be implemented from SAIL, Macro or Ground. Only one command to be implemented every **CR**.

Table 2.3.4.4-2 Summary of Acronyms used in Sections 2.3.4 & 2.3.5

ACRONYM	EXPANSION
ARW	Angle Request Word
HCC	Housekeeping Conversion Control (word)
HRW	Housekeeping Request Word
ODR	Output Data Register
RCOR	Readout Counter Output Register
SRW	Status Request Word
SWR	Status Word Register
TOR	Telemetry Output Register

2.3.5 GSS Telemetry

2.3.5.1 Summary of GSS Telemetry

The following telemetry channels are assigned to the GSS:

ID#	SCIENCE CHANNEL MNEMONIC	CONV ALG	NAME	DESCRIPTION
61	GYR0_TEMP	E	Gyro 0 temperature	Sensor located on
62	GYR1_TEMP	E	Gyro 1 temperature	Sensor located on
63	GYR2_TEMP	E	Gyro 2 temperature	Sensor located on
64	GYR3_TEMP	E	Gyro 3 temperature	Sensor located on
65	GYR0_BDTMP	tbs	Gyro 0 board temp	Sensor located on
66	GYR1_BDTMP	tbs	Gyro 1 board temp	Sensor located on
67	GYR2_BDTMP	tbs	Gyro 2 board temp	Sensor located on
68	GYR3_BDTMP	tbs	Gyro 3 board temp	Sensor located on
69	GYR0_ADAT	-	Gyro 0 angle data	
70	GYR1_ADAT	-	Gyro 1 angle data	
71	GYR2_ADAT	-	Gyro 2 angle data	
72	GYR3_ADAT	-	Gyro 3 angle data	
73	GYR0_MAGDAT	tbs	Gyro 0 mgnetomtr data	
74	GYR1_MAGDAT	tbs	Gyro 1 mgnetomtr data	
75	GYR2_MAGDAT	tbs	Gyro 2 mgnetomtr data	
76	GYR3_MAGDAT	tbs	Gyro 3 mgnetomtr data	
77	GYR0_CAPL	tbs	Gyro 0 cap loop output	
78	GYR1_CAPL	tbs	Gyro 1 cap loop output	
79	GYR2_CAPL	tbs	Gyro 2 cap loop output	
80	GYR3_CAPL	tbs	Gyro 3 cap loop output	
81	GYR0_MOTV	tbs	Gyro 0 motor volts	
82	GYR1_MOTV	tbs	Gyro 1 motor volts	
83	GYR2_MOTV	tbs	Gyro 2 motor volts	
84	GYR3_MOTV	tbs	Gyro 3 motor volts	
85	GYR0_MOTC	tbs	Gyro 0 motor current	
86	GYR1_MOTC	tbs	Gyro 1 motor current	
87	GYR2_MOTC	tbs	Gyro 2 motor current	
88	GYR3_MOTC	tbs	Gyro 3 motor current	
89	GYR0_STAT	-	Gyro 0 status word	
90	GYR1_STAT	-	Gyro 1 status word	
91	GYR2_STAT	-	Gyro 2 status word	
92	GYR3_STAT	-	Gyro 3 status word	
93	GYR0_P15V	tbs	Gyro 0 +15 volts	
94	GYR1_P15V	tbs	Gyro 1 +15 volts	
95	GYR2_P15V	tbs	Gyro 2 +15 volts	
96	GYR3_P15V	tbs	Gyro 3 +15 volts	
97	GYR0_N15V	tbs	Gyro 0 -15 volts	
98	GYR1_N15V	tbs	Gyro 1 -15 volts	
99	GYR2_N15V	tbs	Gyro 2 -15 volts	
100	GYR3_N15V	tbs	Gyro 3 -15 volts	

2.3.5.2 GSS-to-IPU Data Word Formats

There are three data formats, Angle Data format, Housekeeping Data format, and Status Data format. All telemetry packets include the originating Gyro channel RT address.

2.3.5.2.1 Angle Data Format

Gyro angle data is the digital count from the Readout Counter Output Register (RCOR) giving the integrated angular change about the gyro input axis since the previous sync pulse. One such count is produced by each gyro channel. Note that if the integrated gyro angle is greater than permitted by the number of bits allocated, there is no explicit indication of angle overflow (the maximum operational angular rates and accelerations are such that there will be many approximately-regularly spaced samples read out between overflows, thereby avoiding ambiguities in interpretation of the data. The bit assignments for this format shall be as shown in Table 2.3.5.2.1-1, which also shows how these data bits shall be mapped on to the Instrument Telemetry List functions shown in Table 2.3.5.2.1-2.

Table 2.3.5.2.1-1 Angle Data Format

DATA WORD		TELEMETRY WORD BIT	
BIT #	CODE	ASSIGNMENT	FUNCTION
MSB 15	RT2	Bit #15 (MSB)	) (MSB)
14	RT1	Bit #14	) Gyro channel address (0 to 3)
13	RT0	Bit #13	) (LSB)
12	SY1	Bit #12	Interface sync pulse counter bit #1 (MSB)
11	SY0	Bit #11	Interface sync pulse counter bit #0 (LSB)
10	SGN	Bit #10	Read-out counter sign bit: 1 = neg; 0 = pos.
9	RC9	Bit #9	Data read-out counter bit # 9
8	RC8	Bit #8	Data read-out counter bit # 8
7	RC7	Bit #7	Data read-out counter bit # 7
6	RC6	Bit #6	Data read-out counter bit # 6
5	RC5	Bit #5	Data read-out counter bit # 5
4	RC4	Bit #4	Data read-out counter bit # 4
3	RC3	Bit #3	Data read-out counter bit # 3
2	RC2	Bit #2	Data read-out counter bit # 2
1	RC1	Bit #1	Data read-out counter bit # 1
LSB 0	RC0	Bit #0 (LSB)	Data read-out counter bit # 0

The Angle Data functions shall be mapped on to the instrument Telemetry List functions as shown in Table 2.3.5.2.1-2

Table 2.3.5.2.1-2 Assignment of Angle Data to Telemetry List Mnemonics

RT-bit values (Angle Data Request word)			
0	1	2	3
GYR0__ADAT	GYR1_ADAT	GYR2_ADAT	GYR3_ADAT

The gyro readout counter is in a sign-magnitude (not twos-complement) format.

The gyro Angle Data word includes a 2-bit GSS sync pulse counter, which is incremented by one within the GSS on every GSS sync pulse and rolls over at every fourth cycle. This can be used to verify that no gyro data words are missed.

2.3.5.2.2 Housekeeping Data Format

The bit assignments for the Housekeeping Data word shall be as shown in Table 2.3.5.2.2-1, which also shows how these data bits shall be mapped on to the Instrument Telemetry List functions shown in Table 2.3.5.2.2-2.

Table 2.3.5.2.2-1 Housekeeping Data Format

DATA WORD		TELEMETRY WORD BIT	
BIT #	CODE	ASSIGNMENT	FUNCTION
MSB 15	RT2	Bit #15 (MSB)	) (MSB)
14	RT1	Bit #14	) Gyro channel address (0 to 3)
13	RT0	Bit #13	) (LSB)
12	ID2	Bit #12	TBD
11	ID1	Bit #11	TBD
10	ID0	Bit #10	TBD
9	HT9	Bit #9	Housekeeping Telemetry Word bit # 9 (MSB)
8	HT8	Bit #8	Housekeeping Telemetry Word bit # 8
7	HT7	Bit #7	Housekeeping Telemetry Word bit # 7
6	HT6	Bit #6	Housekeeping Telemetry Word bit # 6
5	HT5	Bit #5	Housekeeping Telemetry Word bit # 5
4	HT4	Bit #4	Housekeeping Telemetry Word bit # 4
3	HT3	Bit #3	Housekeeping Telemetry Word bit # 3
2	HT2	Bit #2	Housekeeping Telemetry Word bit # 2
1	HT1	Bit #1	Housekeeping Telemetry Word bit # 1
LSB 0	HT0	Bit #0 (LSB)	Housekeeping Telemetry Word bit # 0 (LSB)

The Housekeeping Data functions correspond to the setting of bits SA4 through SA0 in the immediately preceding Housekeeping Data Request word. These are defined in Table 2.3.4.3.4-2. The Housekeeping Data functions shall be mapped on to the instrument Telemetry List functions as shown in Table 2.3.5.2.2-2

Table 2.3.5.2.2-2 Assignment of H/keeping Data to Telemetry List Mnemonics

	RT-bit values (Housekeeping Data Request word)			
SA field value	0	1	2	3
03	GYR0_MOTV	GYR1_MOTV	GYR2_MOTV	GYR3_MOTV
08	GYR0_TEMP	GYR1_TEMP	GYR2_TEMP	GYR3_TEMP
09	GYR0_N15V	GYR1_N15V	GYR2_N15V	GYR3_N15V
10	GYR0_P15V	GYR1_P15V	GYR2_P15V	GYR3_P15V
11	GYR0_MOTC	GYR1_MOTC	GYR2_MOTC	GYR3_MOTC
16	GYR0_CAPL	GYR1_CAPL	GYR2_CAPL	GYR3_CAPL
17	GYR0_MAGDAT	GYR1_MAGDAT	GYR2_MAGDAT	GYR3_MAGDAT
18	GYR0_BDTMP	GYR1_BDTMP	GYR2_BDTMP	GYR3_BDTMP

2.3.5.2.3 Status Data Word (SDW)

The bit assignments for the SDW shall be as shown in Table 2.3.5.2.3-1, which also shows how thesebits shall be mapped on to the Instrument Telemetry List functions shown in Table 2.3.5.2.3-3.

Table 2.3.5.2.3-1 Status Data Format

DATA WORD		TELEMETRY WORD BIT		
BIT #	CODE	ASSIGNMENT	FUNCTION	
MSB 15	RT2	Bit #15 (MSB)	) (MSB)	
14	RT1	Bit #14	) Gyro channel address (0 to 3)	
13	RT0	Bit #13	) (LSB)	
12	ID2	Bit #12	TBD	
11	ID1	Bit #11	TBD	
10	ID0	Bit #10	TBD	
9	S09	Bit #9	spare	
8	S08	Bit #8	Encoder range 1 = FINE; 0 = COARSE	
7	S07	Bit #7	Motor over-current trip 1 = ENAB; 0 = INHIB	
6	S06	Bit #6	Sync. status 1 = IN SYNC; 0 = NOT IN SYNC	
5	S05	Bit #5	Motor Power mode: 1 = HIGH; 0 = NORM PWR	
4	S04	Bit #4	Temperature Inhib 1 = INHIB; 0 = ENAB	
3	S03	Bit #3	Motor speed code bit #2 (MSB)	see Table 2.3.5.2.3-2
2	S02	Bit #2	Motor speed code bit #1	
1	S01	Bit #1	Motor speed code bit #0 (LSB)	
LSB 0	S00	Bit #0 (LSB)	Motor drive status 1 = ON; 0 = OFF	

The Gyro motor speed code bits in the Status Data word verify the speed setting and indicate the resolution of the gyro channel as shown in Table 2.3.5.2.3-2

Table 2.3.5.2.3-2 Angle Data Resolution vs. Motor Speed

SPIN SPEED BITS			MOTOR SPEED [Hz]	RESOLUTION PER ANGLE DATA LSB (arcsec)	
SO3	SO2	SO1		Fine Range Selected	Coarse Range Selected
0	0	1	117 RPS	0.032	0.221
1	1	1	246 RPS	0.015	0.105

The Status Data functions shall be mapped on to the instrument Telemetry List functions as shown in Table 2.3.5.2.3-3

Table 2.3.5.2.3-3 Assignment of Status Data to Telemetry List Mnemonics

RT-bit values (Status Data Request word)			
0	1	2	3
GYR0_STAT	GYR1_STAT	GYR2_STAT	GYR3_STAT

2.4 TSS - Telescope Subsystem

2.4.1 Brief Functional Description

The Telescope Subsystem consists of four entities:

a) the Optical Bench Assembly (OBA), which includes the Scanner and Chopper mechanisms;

b) the (redundant) Telescope Electronics Unit (TEU), which includes the Telescope Processor (TProc), Scanner drive circuits and power supplies, Chopper control circuits and data interface logic;

c) the (redundant) Encoder Electronics Assembly (EEA);

d) the Wobble Sensor Electronics Assembly (WSEA).

The primary functions of the TProc are to control the Scanner and to exchange data with the IPU. The EEA and WSEA consist of auxiliary electronics for processing the outputs from the Scanner elevation and azimuth encoders and the azimuth bearing-wobble sensors.

The Chopper drive system is synchronised to a nominally 500 Hz signal supplied by the IPU, which is also used to synchronise the operation of the TProc data handling and Scanner control. A sync signal - also at 500 Hz - is derived from an optical sensor on the Chopper disc and is used to synchronise the SPU signal processing electronics. An alternative sync. signal may be selected if the Chopper is not operating.

The PSS supplies primary (QB) and secondary power to the TEU. The primary power is used by TEU DC-DC converters to generate low voltage rails for the Chopper and Scanner mechanisms and for the TProc. The remaining TEU electronics and the WSEA use the secondary power supplied from the PSS. The PSS supplies secondary power directly to the EEA.

2.4.2 Operational States and Transitions

The TProc has three basic states: OFF, Booting and Operational. The TProc will transition automatically from the OFF state to the Booting State on application of TEU power from the PSS. The TProc can then be loaded with the application code from the IPU, initiated by ground command. The application code becomes operational upon further ground command.

The WSEA is automatically powered whenever the TEU is powered, and the EEA will normally be powered (by separate PSS commands) when the TEU is powered and the application code is operational. Primary or secondary EEA channels may be selected by TSS commands. Various operational sub-states may be selected by command for the Chopper and Scanner mechanisms. These are described below.

2.4.3 TSS-to-IPU Communications Interfaces

Control Words issued by the IPU are transmitted to the TEU via QHSS Receive Channel 0.

TSS Housekeeping Data are transmitted to the IPU by the TEU via QHSS Transmit Channel 1. These data are output at the Chopper Rotation frequency - nominally 83.3 Hz.

TSS Encoder position data are transmitted to the IPU via QHSS Transmit Channel 0. These data are output at the Scanner Strobe frequency - nominally 1KHz.

2.4.4 TSS Command & Control

2.4.4.1 Summary of TSS Commands

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
94	HIR_TSS_MTRPWR	1	Turns on or off the scan/chopper motor power converter.
58	HIR_TSS_CLOCKSEL	1	Select if the TSS is to use internal or external clock for the system tick and 83 Hz sync
59	HIR_TSS_WATCHDOG	2	Turns the watchdog time on or off, or sets a new timeout value
60	HIR_TSS_REBOOT	0	Soft reboot of the TSS control processor (software reset)
61	HIR_TSS_HOMEEL	4	Home both elevation encoders with new parameters
62	HIR_TSS_HOMEAZ	4	Home azimuth encoder with new parameters
63	HIR_TSS_ENCSEL	1	Selects which of the two elevation encoders to use for encoder initialization and scan mirror control.
64	HIR_TSS_CNTLTABLE	7	Upload entries to TSW scan mirror table
65	HIR_TSS_START	0	Forces an immediate execution of the scanner table
66	HIR_TSS_SAFE	0	Abort and erase the current scanner table, and move the mirror as fast as possible to the safe position
67	HIR_TSS_FREQINFO	1	Passes the information about the chopper rate to the TEU software
68	HIR_TSS_AZELDATPOS	6	Provides offset values to be used for zero position output when the scan mirror is in its datum position.
69	HIR_TSS_AZDRIVE	1	Select intermittent or continuous mode to control azimuth motor
70	HIR_TSS_SAFEANGLE	2	Set safe azimuth position for scanner
71	HIR_TSS_DRSETUP	1	Elevation and azimuth drive motor configuration
72	HIR_TSS_MOTORAZ	1	Enable or disable use of azimuth motor
73	HIR_TSS_EEASELECT	1	Select (power up) or deselect (power down) the primary and/or secondary encoder set
74	HIR_TSS_EEARESET	0	Restarts the active EEA side
75	HIR_TSS_CHOPSEL	1	Configures the chopper drive motor windings
76	HIR_TSS_CHOPENA	1	Enable (power up) or disable (power down) the chopper drive motor
77	HIR_TSS_MEMDUMP	2	Initiate a TSS RAM dump
78	HIR_TSS_DATAHEAD	3	Header to change entries in a telescope database table
79	HIR_TSS_DATABASE	3	Change entries in a telescope database table
80	HIR_TSS_CSCENC	1	Enable or disable TSW encoder initialization CSC
81	HIR_TSS_CSCSCN	1	Enable or disable TSW scan mirror control CSC
82	HIR_TSS_CSCHW	1	Enable or disable TSW hardware command handling CSC
83	HIR_TSS_CSCACQ	1	Enable or disable TSW data acquisition CSC
84	HIR_TSS_CSCSSS	1	Enable or disable TSW sub-subsystem support CSC
86	HIR_TSS_BOOTLOAD	3	Upload a new program to the TSW
87	HIR_TSS_BOOT	1	Boot the TSW from the specified location

Note: Some of the above commands have recently been modified - the list will be updated at the NEXT release of this document.

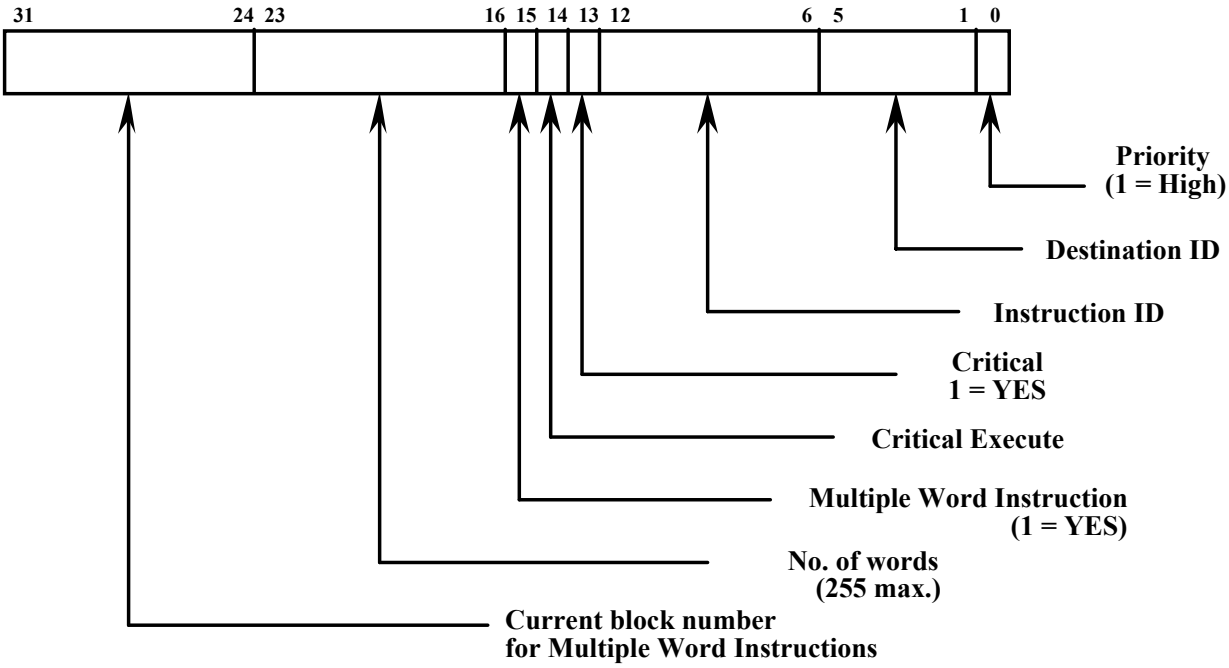
2.4.4.2 Description & Verification of TSS Commands

This section has been omitted from this release as there have been recent changes to several TSS commands. See section 2.4.4.3 for best current information on TSS commands.

2.4.4.3 IPU-to-TSS Control Word (Instruction) Formats

The Telescope Electronics Unit contains a microprocessor, the TProc. All communications between the TEU and the IPU take place between the TProc and the IProc, and generally contain more complex formats and protocols than for other subsystems. For this interface the Control Words transmitted from the IPU to the TEU are referred to as "Instructions".

Instructions shall contain a header followed by the data. The header format shall be as illustrated here; LSB = bit 0, MSB = bit 31, TSW = "TEU Software".



Priority - high priority Instructions are processed immediately.

Destination ID - causes the Instruction to be routed to a given TSW Function (Computer Software Component or CSC - described in document SW-LOC-115).

Table 2.4.4.3-1 contains the list of valid Destination IDs.

Table 2.4.4.3-1 TSW Command Destination IDs

FUNCTION (CSC)	Destination ID (Hex)
Scheduler	14
Encoder Initialization	15
Command Handling	16
Telemetry Handling	17
Scan Mirror Control	18
Hardware Command Handling	19
Data Acquisition	1A
Subsystem Support	1B

Instruction ID - unique within a given CSC

Critical - indicates that the Instruction may result in disruption of TSW operation

Critical Execute - is used to prevent spurious execution of a critical Instruction. All critical Instructions must have this bit set. If clear, a critical Instruction will be rejected.

Multiple Word - indicates that the Instruction contains data in addition to the header.

No. of Words - indicates the number of words - excluding the checksum word - in the Instruction. The total number of words must not exceed 255.

Block Number - if the Instruction is multi-block then this field will contain the block number.

2.4.4.3.0 Checksum

The checksum shall be a column exclusive OR of the Instruction header and the Instruction data words.

2.4.4.3.1 Clock_Select **[TO BE UPDATED WHEN REVISED TSW DES. DOC. AVAIL.]**

This instruction selects the internal processor clock, the external IPU generated scanner strobe signal or the external chopper signals for synchronization. It will cause momentary disruption in IPS/TEU communication. The instruction format is as follows:

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	14
	Instruction ID	6-12	2
	Critical Instruction	13-14	Y
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	1=Select Internal Clock 2=Select External IPU Clock (Scanner Strobe Signal Only) 3=Select External Chopper Clock (Chopper Scanner Strobe and Chopper Rotation Signals) Other = Invalid
2		0-31	Checksum
Corresponding Ground or SAIL Instruction		HIR-TSS-CLOCKSEL	
Ground or SAIL Instruction Mapping		Param #0 value maps directly on to Word 1	

2.4.4.3.2 Watchdog_Timer_Control

This instruction enables/disables the watchdog timer, or changes the timeout value of the watchdog timer. The instruction format is as follows:

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	14
	Instruction ID	6-12	3
	Critical Instruction	13-14	Y
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	1=Disable Watchdog Timer 2=Enable Watchdog Timer 3=Set Timer to value specified in Word 2 Other = Invalid
2		0-31	Watchdog Timer timeout values (ms)
3		0-31	Checksum
Corresponding Ground or SAIL Instruction		HIR-TSS-WATCHDOG	
Ground or SAIL Instruction Mapping		Param #0 value maps directly on to Word 1 Param #1 value maps directly on to Word 2	

2.4.4.3.3 Soft_Reset

This instruction initiates a warm restart of the RAD6000 processor. The RAM is NOT cleared. The instruction format is as follows:

Word	Field	Bit	Description
0	Priority	0	High
	Destination ID	1-5	14
	Instruction ID	6-12	4
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	N
	Number of Blocks in Instruction	16-31	N/A
1		0-31	Checksum
Corresponding Ground or SAIL Instruction		HIR_TSS_REBOOT	
Ground or SAIL Instruction Mapping		This instruction has no parameters	

2.4.4.3.4 Elev_Encoder_Init **[TO BE UPDATED WHEN REVISED TSW DES DOC AVAIL.]**
This instruction performs Elevation Encoder initialization. The instruction format is as follows:

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	15
	Instruction ID	6-12	2
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	Velocity
2		0-31	Acceleration
3		0-31	Maximum Travel Distance
4		0-31	Zero Range Value
5		0-31	Checksum
Corresponding Ground or SAIL Instruction		HIR_TSS_HOMEEL	
Ground or SAIL Instruction Mapping		Param #0 value maps directly on to Word 1 Param #1 value maps directly on to Word 2 Param #2 value maps directly on to Word 3 Param #3 value maps directly on to Word 4	

2.4.4.3.5 Az_Enc_Init **[TO BE UPDATED WHEN REVISED TSW DES. DOC. AVAIL.]**

This instruction performs Azimuth Encoder initialization. The instruction format is as follows:

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	15
	Instruction ID	6-12	3
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	Velocity
2		0-31	Acceleration
3		0-31	Maximum Travel Distance
4		0-31	Zero Range Value
5		0-31	Checksum
Corresponding Ground or SAIL Instruction		HIR_TSS_HOMEAZ	
Ground or SAIL Instruction Mapping		Param #0 value maps directly on to Word 1 Param #1 value maps directly on to Word 2 Param #2 value maps directly on to Word 3 Param #3 value maps directly on to Word 4	

2.4.4.3.6 Encoder_Select

This instruction defines which of the two elevation encoders are to be used for encoder initialization and scan mirror control

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	19
	Instruction ID	6-12	8
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	1= Elevation 1 Encoder 2= Elevation 2 Encoder Other = Invalid
2		0-31	Checksum
Corresponding Ground or SAIL Instruction		HIR_TSS_ENCSEL	
Ground or SAIL Instruction Mapping		Param #0 value maps directly on to Word 1	

2.4.4.3.7 TSS_Control_Table

This instruction transmits the Scan Control List entries to the TSW. Table 2.4.4.3-2 defines the parameters corresponding to each entry in the Scan Control List. Each entry is 32-bit, fixed point.

Table 2.4.4.3-2 Scan Control List Contents

Table Entry	Range	Scale Factor (i.e. LSB) and Unit
Delta Time	0 to 29.8 hours	5E-5 sec
Elevation Shaft Angle	-2.27 deg to +1.62 deg	2E-8 deg
Elevation Shaft Rate	0.01 deg/sec to 1.0 deg/sec	2E-8 deg/sec
Azimuth Shaft Angle	-24.5 deg to 29.0 deg	2E-8 deg
Azimuth Shaft Rate	0 deg/sec to 25.0 deg/sec	2E-8 deg/sec

The instruction format is as follows:

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	18
	Instruction ID	6-12	2
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	Number of entries in Control List. 0=clear entries starting at location specified in Word 2 to End
2		0-31	Starting Location in TSW Control List
3		0-31	Delta time (FIRST ENTRY)
4		0-31	Elevation Shaft Angle; 32-bit fixed point (FIRST ENTRY)
5		0-31	Elevation Shaft Rate; 32-bit fixed point (FIRST ENTRY)
6		0-31	Azimuth Shaft Angle; 32-bit fixed point (FIRST ENTRY)
7		0-31	Azimuth Shaft Rate; 32-bit fixed point (FIRST ENTRY)
8		0-31	IF Last Word (i.e. if N=1) THEN Checksum, ELSE ...
8-12		0-31	Same as Words 3-7, but for SECOND ENTRY
13-17		0-31	Same as Words 3-7, but for THIRD ENTRY
Etc....		0-31	(5 words per entry)
Last		0-31	Checksum (Note: N = number of table entries; Nmax = 25)

/ this table continued on next page . . . . .

TSS_Control_Table (continued)

Corresponding Ground or SAIL Instruction	HIR_TSS_CNTLTABLE
Ground or SAIL Instruction Mapping	HIR_TSS_CNTLTABLE This instruction sends a specified number of entries to the Scan Control List in the TEU. The entries are contained in the parameters to this instruction: Param #0 maps on to Word 1 (number of entries in List) Param #1 maps on to Word 2 (starting location) Param #2 maps on to Word 3 (delta time) Param #3 maps on to Word 5 (Elev shaft angle) Param #4 maps on to Word 6 (Elev shaft rate) Param #5 maps on to Word 7 (Azim shaft angle) Param #6 maps on to Word 8 (Azim shaft rate) etc.

2.4.4.3.8 TSS_Scan_Start

This instruction initiates real-time Scanner operation and, if sent during an active control period, it starts Scan Control List processing at the first entry.

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	18
	Instruction ID	6-12	3
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	N
	Number of Blocks in Instruction	16-31	N/A
1		0-31	Checksum
Corresponding Ground or SAIL Instruction		HIR_TSS_START	
Ground or SAIL Instruction Mapping		This instruction has no parameters	

2.4.4.3.9 Scanner_Move_Safe

This instruction causes the Scanner immediately to move to the specified SAFE position.

Word	Field	Bit	Description
0	Priority	0	High
	Destination ID	1-5	18
	Instruction ID	6-12	4
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	N
	Number of Blocks in Instruction	16-31	N/A
1		0-31	Checksum
Corresponding Ground or SAIL Instruction	HIR_TSS_SAFE		
Ground or SAIL Instruction Mapping	This instruction has no parameters		

2.4.4.3.10 Chopper_Ref_Clk_Freq **[TO BE UPDATED WHEN REVISED TSW DES. DOC. AVAIL.]**

This instruction defines to the TSW the frequency of the chopper reference clock. It is used to determine the frequency of the sampling period used for Scanner control.

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	18
	Instruction ID	6-12	5
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	Frequency Value (.00025 Hz/count)
2		0-31	Checksum

Corresponding Ground or SAIL Instruction	None
Ground or SAIL Instruction Mapping	N/A

2.4.4.3.11 Deleted

2.4.4.3.12 Azimuth_Intermittent/Continuous_Control

This instruction enables/disables the use of the Azimuth axis control equations for Scan Mirror control during an elevation scan. The motor drive itself remains enabled.

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	18
	Instruction ID	6-12	7
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	1=Intermittent use of Azimuth Motor 2=Continuous use of Azimuth Motor Other=Invalid
2		0-31	Checksum
Corresponding Ground or SAIL Instruction		HIR_TSS_AZDRIVE	
Ground or SAIL Instruction Mapping		Param #0 value maps directly on to Word 1	

2.4.4.3.13 Scanner_Safe_Position

This instruction defines the Scanner SAFE position.

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	18
	Instruction ID	6-12	8
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	Safe Position - Elevation Angle
2		0-31	Safe Position - Azimuth Angle
3		0-31	Checksum
Corresponding Ground or SAIL Instruction		HIR_TSS_SAFEANGLE	
Ground or SAIL Instruction Mapping		Param #0 value maps directly on to Word 1 Param #1 value maps directly on to Word 2	

2.4.4.3.14 Drive_Motor_Control

This instruction defines the hardware configuration of the Scanner drive motors.

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	19
	Instruction ID	6-12	2
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	1 = Elevation 1 Motor Disconnect Driver from Coil 2 = Elevation 1 Motor Connect Driver to Coil 3 = Elevation 1 Motor Open Shorted Coil 4 = Elevation 1 Motor Short Coil 5 = Elevation 2 Motor Disconnect Driver from Coil 6 = Elevation 2 Motor Connect Driver to Coil 7 = Elevation 2 Motor Open Shorted Coil 8 = Elevation 2 Motor Short Coil 9 = Azimuth Motor Disconnect Driver from Coil 10= Azimuth Motor Connect Driver to Coil 11= Azimuth Motor Open Short Coil 12= Azimuth Motor Short Coil Others = Invalid
2		0-31	Checksum
Corresponding Ground or SAIL Instruction		HIR_TSS_DRSETUP	
Ground or SAIL Instruction Mapping		TBC	

2.4.4.3.15 Az_Motor_Enable_Disable

This instruction defines the Power Up/Down status of the Azimuth Motor Drive. The default state is "Motor drive Disabled".

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	18
	Instruction ID	6-12	8
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	0=Disable Drive Motor 1=Enable Drive Motor Others = Invalid
2		0-31	Checksum
Corresponding Ground or SAIL Instruction		HIR_TSS_MOTORAZ	
Ground or SAIL Instruction Mapping		Param #0 value maps directly on to Word 1	

2.4.4.3.16 EEA_Select

This instruction defines the Power Up/Down status of the Primary and Secondary EEA.

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	19
	Instruction ID	6-12	4
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	1 = Select Primary EEA Channel 2= Deselect Primary EEA Channel 3 = Select Secondary EEA Channel 4 = Deselect Secondary EEA Channel 5 = Select Test Angle (both EEAs) 6 = Deelect Test Angle (both EEAs) Other = Invalid
2		0-31	Checksum
Corresponding Ground or SAIL Instruction	HIR_TSS_EEASELECT		
Ground or SAIL Instruction Mapping	Param #0 value maps directly on to Word 1		

2.4.4.3.17 EEA_Restart

This instruction Restarts the Active (Primary or Secondary) EEA.

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	19
	Instruction ID	6-12	5
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	N
	Number of Blocks in Instruction	16-31	N/A
1		0-31	Checksum

Corresponding Ground or SAIL Instruction	HIR_TSS_EEARESET
Ground or SAIL Instruction Mapping	This instruction has no parameters

2.4.4.3.18 Chopper_Winding_Control

This instruction defines the status of the Chopper windings and drivers.

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	19
	Instruction ID	6-12	6
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	0=Disconnect Winding A and Winding B 1=Connect Winding A to Driver 2=Connect Winding B to Driver 3=Set Chopper to high current mode 4=Disable Chopper high current mode Other=Invalid
2		0-31	Checksum
Corresponding Ground or SAIL Instruction		HIR_TSS_CHOPSEL	
Ground or SAIL Instruction Mapping		Param #0 value maps directly on to Word 1	

2.4.4.3.19 Chopper_Drive_Motor_Enable_Disable

This instruction defines the Power Up/Down status of the Chopper Drive Motor.

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	19
	Instruction ID	6-12	7
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	0=Disable Chopper Drive Motor 1=Enable Chopper Drive Motor Other=Invalid
2		0-31	Checksum
Corresponding Ground or SAIL Instruction		HIR_TSS_CHOPENA	
Ground or SAIL Instruction Mapping		Param #0 value maps directly on to Word 1	

2.4.4.3.20 TSW_Memory_Dump

This instruction initiates a dump of TBS words from a specified start location in the TSS Processor Memory.

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	1B
	Instruction ID	6-12	2
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	Source Address
2		0-31	Number of words to be dumped
3		0-31	Checksum
Corresponding Ground or SAIL Instruction		HIR-TSS-MEMDUMP	
Ground or SAIL Instruction Mapping		Param #0 value maps directly on to Word 1 Param #1 value maps directly on to Word 2	

2.4.4.3.21 SM_Ctl_Coefficient_Upload **[TO BE UPDATED WHEN REVISED TSW DES. DOC. AVAIL.]**

This instruction uploads the coefficients used by the Scan Mirror Control CSC.

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	1B
	Instruction ID	6-12	3
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	TBD

2		0-31	Checksum
Corresponding Ground or SAIL Instruction	HIR_TSS_DATABASE		
Ground or SAIL Instruction Mapping	TBD		

2.4.4.3.22 CSC_Disable_Enable

This instruction allows execution of the specified CSC to be disabled/enabled. It cannot disable the Executive/Scheduler CSC, the Command Handling CSC or the Telemetry Handling CSC.

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	CSC specific (see Table 2.4.1.2-1)
	Instruction ID	6-12	1
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	0=Disable CSC 1=Enable CSC
2		0-31	Checksum
Corresponding Ground or SAIL Instruction			HIR_TSS_CSCENC (Destination ID set to 15) HIR_TSS_CSCSCN (Destination ID set to 18) HIR_TSS_CSCHW (Destination ID set to 19) HIR_TSS_CSCACQ (Destination ID set to 1A) HIR_TSS_CSCSSS (Destination ID set to 1B)
Ground or SAIL Instruction Mapping			Param #0 value maps directly on to Word 1

2.4.4.3.23 Encoder_Offset

This instruction provides offset values to be used to give zero encoder readings when the scan mirror is in its datum position.

Word	Field	Bit	Description
0	Priority	0	High
	Destination ID	1-5	18
	Instruction ID	6-12	5
	Critical Instruction	13-14	N

	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	Primary Elevation 1 Offset
2		0-31	Primary Elevation 2 Offset
3		0-31	Primary Azimuth Offset
4		0-31	Secondary Elevation 1 Offset
5		0-31	Secondary Elevation 2 Offset
6			Secondary Azimuth Offset
7			Checksum
Corresponding Ground or SAIL Instruction		HIR_TSS_AZELDATPOS	
Ground or SAIL Instruction Mapping		Param #0 value maps directly on to Word 1 Param #1 value maps directly on to Word 2 Param #2 value maps directly on to Word 3 Param #3 value maps directly on to Word 4 Param #4 value maps directly on to Word 5 Param #5 value maps directly on to Word 6	

2.4.4.3.24 MotorPwr_On_Off

This instruction powers on/off the scan drive/chopper drive power converters.

Word	Field	Bit	Description
0	Priority	0	Low
	Destination ID	1-5	19
	Instruction ID	6-12	9
	Critical Instruction	13-14	N
	Multiple Word Instruction	15	Y
	Number of Blocks in Instruction	16-31	N/A
1		0-31	0 = Scan/Chopper Motor Converter Power OFF 1 = Scan/Chopper Motor Converter Power ON

2		0-31	Checksum
Corresponding Ground or SAIL Instruction	HIR_TSS_MTRPWR		
Ground or SAIL Instruction Mapping	Param #0 value maps directly on to Word 1		

2.4.5 TSS Telemetry

2.4.5.1 Summary of TSS Telemetry

The following telemetry channels are assigned to the TSS (CAUTION: this table continues on the following page):

ID#	SCIENCE CHANNEL MNEMONIC	CONV ALG	NAME	DESCRIPTION
101	ELEVDATA	tbs	Elevation encoder A	
102	ELEVDATB	tbs	Elevation encoder B	
103	AZIMDAT	tbs	Azimuth encoder	
104	EEA_STATUS	-	EEA config. status	
105	ELMOTR1_CRRT	tbs	Elev motor 1 current	
106	ELMOTR2_CRRT	tbs	Elev motor 2 current	
107	AZMOTR_CRRT	tbs	Azim motor current	
108	WOBB_SENS1	?	Wobble sensor 1 data	
109	WOBB_SENS2	?	Wobble sensor 2 data	
112	CHOPMOT_CRRT	tbs	Chopper motor current	
113	TEU_TSW_STAT	-	Telescope S/W Status	
114	TEU_STATUS	-	TEU Proc. Config. status	
115	TSS_HW_CFIG	-	TSS hardware config.	
116	TEU_SIGCON_STAT	-	TEU Sig Cond Dat Acq Stat	
117	SCAN_MOT_STAT	-	Scan Mir drive motor status	
118	TEU_ADC0_REF	tbs	TEU ADC0 +5V ref. volts	
119	TEU_ADC1_REF	tbs	TEU ADC1 +5V ref. volts	
120	TEU_ADC2_REF	tbs	TEU ADC2 +5V ref. volts	
121	TEU_ADC3_REF	tbs	TEU ADC3 +5V ref. volts	
122	TEU_ADC0_ZER	tbs	TEU ADC0 +5V zero volts	
123	TEU_ADC1_ZER	tbs	TEU ADC1 +5V zero volts	
124	TEU_ADC2_ZER	tbs	TEU ADC2 +5V zero volts	
125	TEU_ADC3_ZER	tbs	TEU ADC3 +5V zero volts	
126	TEU_P5V	tbs	TEU +5V rail voltage	This is the supply from the PCU
510	TEU_P15V	tbs	TEU +15V rail voltage	This is the supply from the PCU
511	TEU_N15V	tbs	TEU -15V rail voltage	This is the supply from the PCU
41	WSEBOXTMP	D	WSE box temp	Sensor located on external +Z face
133	SMTMP01	D	Scan mirror temp.1	Sensor located on centre support web, +Z end
134	SMTMP02	D	Scan mirror temp.2	Sensor located on centre support web, -Z end
135	SMTMP03	ZC	Scan mirror temp.3	Sensor located on centre of mirror spine [PRT 0]
466	ELMOT1TMP1	D	Elev motor 1 temp 1	Sensor located on motor body
467	ELMOT1TMP2	D	Elev motor 1 temp 2	Sensor located on motor body
468	ELMOT2TMP1	D	Elev motor 2 temp 1	Sensor located on motor body
469	ELMOT2TMP2	D	Elev motor 2 temp 2	Sensor located on motor body
138	AZMOTTMP	D	Azim motor temp	Sensor located on motor body
139	M1TMP01	D	Pri (M1) mir temp. 1	Sensor located on rear face near central stem
140	M1TMP02	D	Pri (M1) mir temp. 2	Sensor located on rear face near central stem
470	M1TMP03	ZC	Pri (M1) mir temp. 3	Sensor located on rear face near central stem [PRT 1]
141	LNS1WFTMP01	D	Lens 1-WF temp. 1	Sensor located on WF carrier mounting flange
142	LNS1WFTMP02	D	Lens 1-WF temp. 2	Sensor located on WF carrier mounting flange
143	LNS1WFTMP03	ZC	Lens 1-WF temp. 3	Sensor located on WF carrier mounting flange
144	LNS2TMP01	D	Lens 2 temp. 1	Sensor located on Lens 2 mounting ring
145	LNS2TMP02	D	Lens 2 temp. 2	Sensor located on Lens 2 mounting ring
146	LNS2TMP03	ZC	Lens 2 temp. 3	Sensor located on Lens 2 mounting ring

147	CHOPHSGTMP01	D	Chopper housing temp #1	Sensor located on Chopper housing
148	CHOPHSGTMP02	D	Chopper housing temp #2	Sensor located on Chopper housing
149	CHOPHSGTMP03	ZC	Chopper housing temp #3	Sensor located on Chopper housing
150	CALMIRTMP01	D	Cal. Mirror temp #1	Sensor located on rear of Cal. mirror
151	CALMIRTMP02	D	Cal. Mirror temp #2	Sensor located on rear of Cal. mirror
152	CALMIRTMP03	ZC	Cal. Mirror temp #3	Sensor located on rear of Cal. mirror
153	M2TMP01	D	Sec. (M2) mir temp #1	Sensor located on rear of Secondary mirror
154	M2TMP02	ZC	Sec. (M2) mir temp #2	Sensor located on rear of Secondary mirror
471	SPVUMIRTMP1	D	Space View Mirror temp #1	Sensor located on rear of Space View mirror
472	SPVUMIRTMP2	D	Space View Mirror temp #2	Sensor located on rear of Space View mirror
473	SPVUMIRTMP3	ZC	Space View Mirror temp #3	Sensor located on rear of Space View mirror
155	SCAN_BASE_TMP	D	OBA Scanner base temp.	Sensor located on stationary base of Scanner
156	LNSASSY_TMP01	D	OBA lens assy temp #1	Sensor located on lens-tube mounting flange
157	LNSASSY_TMP02	D	OBA lens assy temp #2	Sensor located on DSS mounting flange
158	SPVU_BAF_TMP	D	OBA Sp. View baffle tmp	Sensor located on Space View baffle (near mid point)
159	OBA_PLT_TMP	D	OBA aperture plate temp	Sensor located on 'hot dog' Aperture Plate
160	GMU_MNT_TMP	D	GMU Mount temp.	Sensor located on OBA truss - bottom, centre, +X
161	GMU_HSG_TMP	D	GMU Housing temp.	Sensor located on exterior surface of GMU
500	OBA_TMP_00	D	OBA +X Isolator Temp (top)	
501	OBA_TMP_01	D	OBA +Y Isolator Temp (top)	
502	OBA_TMP_02	D	OBA -Y Isolator Temp (top)	
503	OBA_TMP_03	D	OBA external leg beam temp, +Y	
504	OBA_TMP_04	D	OBA external leg beam temp, -Y	
505	OBA_TMP_05	D	OBA truss Temp, top, centre, +X	
506	OBA_TMP_06	D	OBA truss Temp, top, +X, +Y	
507	OBA_TMP_07	D	OBA truss Temp, top, +X, -Y	
508	OBA_TMP_08	D	OBA centre tube, +Z	
509	OBA_TMP_09	D	OBA centre tube, -Z	
476	PRT76_8_REF	ZC	76.8 ohm PRT Mux ref. R	Resistor located in IPU ?
477	PRT100_REF	ZC	100 ohm PRT Mux ref. R	Resistor located in IPU ?
478	PRT123_REF	ZC	123 ohm PRT Mux ref. R	Resistor located in IPU ?
162	TSW_CSCI_BUILD_ID	-	Telescope S/W Bld Versn ID	

2.4.5.2 TSS-to-IPU Data Formats

2.4.5.2.1 TSW Initialization Telemetry

Telemetry transmitted from the TSS to the IPU software by the TEU Start-Up Software (TSUSW) shall be formatted as shown in Table 2.4.5.2.1-1. These data will only be available in the Science

Data Stream as diagnostic data. Normally the IProc will assess the status of the TSW during "startup" and will set the bits of the TEU_TSW_STAT word (see Table 2.4.5.2.1-2).

Table 2.4.5.2.1-1 TSS-IPU TSW-Startup Telemetry Format

WORD	BITS	MONITOR NAME	DESCRIPTION
0	0-15	TSU_FMCNT	Roll-Over Frame Counter
1	0-15	TSU_TLMID	Startup Format ID = 40 (decimal)
2	0-15	TSU_CMDACPT	Command Accept Count
3	0-15	TSU_CMDREJ	Command Reject Count
4	0-15	TSU_REJRES	Command Reject Reason
5	0-15	TSU_PIBKNO	Current Program Image Block Number
6	0-15	TSU_PASRES	PAS Test Result
7	0-15	TSU_SRGRES	Segment Register Test Result
8	0-15	TSU_HSSRES	QHSS Test Result
9	0-15	TSU_RAMRES	RAM Test Result
10	0-15	TSU_ESBRES	EDAC Single Bit Error Test Result
11	0-15	TSU_EDBRES	EDAC Double Bit Error Test Result
12	0-15		TBS
13	0-15		TBS
14	0-15	TSU_RAMADR	RAM Dump Address
15-30	0-15	TSU_RAMVAL	RAM Contents
31	0-15	TSU_TMCKSM	TLM Buffer Checksum (XOR of words 0-30)

Table 2.4.5.2.1-2 TEU_TSW_STAT Bit Assignments

BIT#	FUNCTION	DESCRIPTION
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

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2.4.5.2.2 TSS Housekeeping Data **[TO BE UPDATED WHEN REVISED TSW DES. DOC. AVAIL.]**

Housekeeping data transmitted after application software activation shall be formatted into a 128 word block as shown in Table 2.4.5.2.2-1. Words TBS-127 are reserved for memory dump data. These data are transferred to the IPU once per Chopper Revolution.

Table 2.4.5.2.2-1 also shows how these data are mapped on to Instrument Telemetry. They may not all be copied into the telemetry stream as 16 bit words, and the table therefore indicates the masking to be applied to convert from the source data word to the Telemetry List function.

Table 2.4.5.2.2-1 TSS-IPU Housekeeping Data Format

Word	Bits	Monitor Name	Description	Telemetry List Mnemonic	Mask
0	0-15		Roll-Over Frame Counter	Diagnostic only	
1	0-15		Housekeeping Telemetry Format ID = 50 (decimal)	Diagnostic only	
2	0-15	T_HWCNFG	TSS Hardware Configuration	TSS_HW_CFIG	FFFF
2	0		Azimuth Motor Enable/Disable Status (1 = Enable)		
2	1		Azimuth Motor Short Status (1 = Unshorted)		
2	2		Azimuth Motor Drive Connect Status (1 = Connected)		
2	3		Elevation 1 Motor Short Status (1 = Unshorted)		
2	4		Elevation 1 Motor Connect Status (1 = Connected)		
2	5		Elevation 2 Motor Short Status (1 = Unshorted)		
2	6		Elevation 2 Motor Connect Status (1 = Connected)		
2	7-8		Active EEA (1 = Primary, 2 = Secondary 3 = Both for Test Angle)		
2	9-10		Active Encoder (1 = Elevation 1, 2 = Elevation 2)		
2	11-12		Chopper Connect Status		

Word	Bits	Monitor Name	Description	Telemetry List Mnemonic	Mask
			(1 = A Connected, 2 = B Connected 3 = Both Connected)		
2	13-14		Not used		
2	15		Chopper Motor Enable Status (1 = Enabled)		
3	0-15	T_SYNSTAT	Synchronization Status 1 = Internal Clock Sync 2 = IPU Scanner Strobe Sync 3 = Chopper Signal Sync	TEU_STATUS	FFFF
4-13	0-15	Not used			

/ Table 2.4.5.2.2-1 continued on next page . . . . .

FOLLOWING SECTION BE UPDATED / CORRECTED

Table 2.4.5.2.2-1 continued . . . . .

Word	Bits	Monitor Name	Description	Telemetry List Mnemonic	Mask
14	0-15	T_WBDAT1	Wobble Sensor Data	WOBB_SENS1	FFFF
15	0-15	T_WBDAT2	Wobble Sensor Data	WOBB_SENS2	FFFF
16	0	T_SCONSTAT	Signal Conditioning Module ADC0 Operational State	TEU_SIGCON_STAT	0001
	1		Signal Conditioning Module ADC1 Operational State	TEU_SIGCON_STAT	0002
	2		Signal Conditioning Module ADC2 Operational State	TEU_SIGCON_STAT	0004
	3		Signal Conditioning Module ADC3 Operational State	TEU_SIGCONSTAT	0008
	4		Signal Conditioning Module ADC0 Data Conversion Status	TEU_SIGCON_STAT	0010
	5		Signal Conditioning Module ADC1 Data Conversion Status	TEU_SIGCON_STAT	0020
	6		Signal Conditioning Module ADC2 Data Conversion Status	TEU_SIGCON_STAT	0040
	7		Signal Conditioning Module ADC3 Data Conversion Status	TEU_SIGCON_STAT	0080
	8-15		Not used		
17	0	T_ENCINST	Encoder Initialization Enable/Disable Status	TEU_STATUS Bit #3 **	0004
	1	T_SMCTLST	Scan Mirror Control Enable/Disable Status	TEU_STATUS Bit #4	0008
	2	T_HWCHDST	Hardware Command Handling Enable/Disable Status	TEU_STATUS Bit #5	0010
	3	T_DTACQST	Data Acquisition Enable/Disable Status	TEU_STATUS Bit #6	0020

Word	Bits	Monitor Name	Description	Telemetry List Mnemonic	Mask
	4	T_SSUPST	Subsystem Support Enable/Disable Status	TEU_STATUS Bit #7	0040
	5-15		Not used		

** Note:- TEU Status Word Bit #2 is not used

/ Table 2.4.5.2.2-1 continued on next page . . . . .

Table 2.4.5.2.2-1 continued . . . . .

Word	Bits	Monitor Name	Description	Telemetry List Mnemonic	Mask
18	0-15	T_SMDMST	Scan Mirror Drive Motor Status	SCAN_MOT_STAT	FFFF
19	0-15	T_CMDACT	Command Accept Count	Diagnostic only	
20	0-15	T_CMDRCT	Command Reject Count	Diagnostic only	
21	0-15	T_CMDRRES	Command Reject Reason	Diagnostic only	
22	0-15	T_RJCMSIG	Reject Instruction Signature (Destination ID and Instruction ID)	Diagnostic only	
23	0-15	T_TCMFLST	Task Completion/Failure Status	Diagnostic only	
24	0-15	T_CTLNDX	TSW Control List Current Index	Diagnostic only	
25	0-15	T_SMCTLSTAT	Scan Mirror Control CSC Status	Diagnostic only	
25	0		Scan Start Flag	Diagnostic only	
25	1		Scan Active Flag	Diagnostic only	
25	2		Going To Safe Flag	Diagnostic only	
25	3-15	Not used			
27	0-15	T_A0TEMP	Accelerometer 0 Temp	ACCEL00_TMP	FFFF
28	0-15	T_A1TEMP	Accelerometer 1 Temp	ACCEL01_TMP	FFFF
29	0-15	T_A2TEMP	Accelerometer 2 Temp	ACCEL02_TMP	FFFF
30	0-15	T_A3TEMP	Accelerometer 3 Temperature	ACCEL03_TMP	FFFF
31	0-15	T_EL1CURSENS	Elevation 1 Drive Motor Current Sensor	ELMOTR1_CRRT	FFFF
32	0-15	T_EL2CURSENS	Elevation 2 Drive Motor Current Sensor	ELMOTR2_CRRT	FFFF
33	0-15	T_AZCURSENS	Azimuth Drive Motor Current Sensor	AZMOTR_CRRT	FFFF
34	0-15	T_P5VSUP	Positive 5V Supply	TEU_P5V	FFFF
35	0-15	T_CMCRSENS1	Chopper Drive Motor Current Sensor 1	CHOPMOT_CRRT	FFFF
36	0-15	T_P9VP15V	Positive 9V from Positive 15V Supply	TEU_P15V	FFFF

Word	Bits	Monitor Name	Description	Telemetry List Mnemonic	Mask
37	0-15	T_N9VN15V	Negative 9V from Negative 15V Supply	TEU_N15V	FFFF

/ Table 2.4.5.2.2-1 continued on next page . . . . .

Table 2.4.5.2.2-1 continued . . . . .

Word	Bits	Monitor Name	Description	Telemetry List Mnemonic	Mask
38	0-15	T_A0P5REF	ADC0 Positive 5V Reference	TEU_ADC0_REF	FFFF
39	0-15	T_A1P5REF	ADC1 Positive 5V Reference	TEU_ADC1_REF	FFFF
40	0-15	T_A2P5REF	ADC2 Positive 5V Ref.	TEU_ADC2_REF	FFFF
41	0-15	T_A3P5REF	ADC3 Positive 5V Ref.	TEU_ADC3_REF	FFFF
42	0-15	T_A0P0REF	ADC0 Zero Reference	TEU_ADC0_ZER	FFFF
43	0-15	T_A1P0REF	ADC1 Zero Reference	TEU_ADC1_ZER	FFFF
44	0-15	T_A2P0REF	ADC2 Zero Reference	TEU_ADC2_ZER	FFFF
45	0-15	T_A3P0REF	ADC3 Zero Reference	TEU_ADC3_ZER	FFFF
46 -TBS	0-15	T_TRMDMP	TSW Trickle Memory Dump	Diagnostic only	
TBS-127	0-15	T_MEMDMP	RAM Memory Dump Data	Diagnostic only	

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2.4.5.2.3 TSS Secondary Science Data

Secondary Science (SS) data transmitted during normal operations shall be formatted as shown in Table 2.4.5.2.3-1. When a single side of the EEA is selected, data from that side will appear in its allocated slot in this buffer and the data words for the inactive side will be clear. SS data are transferred to the IPU at the Scanner Strobe rate.

Table 2.4.5.2.3-1 TSS-IPU Secondary Science Data Format

Word	Bits	Monitor Name	Description	Telemetry List Mnemonic	Mask
0	0-15		Roll-Over Counter	Diagnostic only	
1	0-15		Secondary Science Telemetry Format ID = 51 (decimal)	Diagnostic only	
2-3	0-31	T_EL1PPOS	Primary Elevation 1 Position	ELEVDATA *	00FFFFFF
4-5	0-31	T_EL2PPOS	Primary Elevation 2 Position	ELEVDATB *	00FFFFFF
6-7	0-31	T_AZPPOS	Primary Azimuth Position	AZIMDAT *	00FFFFFF
8-9	0-31	T_EL1SPOS	Secondary Elevation 1 Position	ELEVDATA **	00FFFFFF
10-11	0-31	T_EL2SPOS	Secondary Elevation 2 Position	ELEVDATB **	00FFFFFF
12-13	0-31	T_AZSPOS	Secondary Azimuth Position	AZIMDAT **	00FFFFFF
14	0-15	T_ENCPST	EEA Prim. Channel Set Status	EEA_STATUS *	FFFF
15	0-15	T_ENCSST	EEA Sec. Channel Set Status	EEA_STATUS **	FFFF
16	0-15	T_PRIIFST	Primary EEA/TEU Channel Interface Status	Diagnostic only	
17	0-15	T_SECIFST	Secondary EEA/TEU Channel Interface Status	Diagnostic only	
18-27	Each 0-31		Not used		

* These data selected when TBD bit is hi/lo
** These data selected when TBD bit is lo/hi
Position data is scaled at 0.019 microradians/count

2.4.5.2.4 Deleted

2.5 DSS - Detector Subsystem

2.5.1 Brief Functional Description

The DSS comprises the Detector Dewar Assembly containing the 21-channel focal plane array and Cold Filter Assembly. The DSS has a power and data interface only with the SPU (see Section 2.7) and requires no commands.

2.5.2 Operational States & Transitions

There are only two states - ON and OFF. The DSS is automatically powered whenever the SPU is powered.

2.5.3 DSS Telemetry

The following telemetry channels are assigned to the DSS:

ID#	SCIENCE CHANNEL MNEMONIC	CONV ALG	NAME	DESCRIPTION
163	FPA_TEMP_A	tbs	Focal Plane temperature A	Sensor located on detector substrate
164	FPA_TEMP_B	tbs	Focal Plane temperature B	Sensor located on detector substrate

2.6 IFC - InFlight Calibrator Subsystem

2.6.1 Brief Functional Description

The HIRDLS IFC (In-flight Calibrator subsystem) consists of a radiometric reference black target body (IBB = IFC Black Body) mounted on the OBA, a Black body Electronics Unit (BEU) and an interconnecting cable designated U25.

The IBB consists of a double-wall cavity with a small aperture at the focus of the Calibration Mirror (M6). Between the walls there are two sets of three high accuracy, 500 ohm platinum resistance thermometers and two identical low-power heater windings. The PRT sensors and heaters are arranged as independent redundant sets, designated A and B. On the front aperture plate is mounted a redundant pair of AD590 temperature sensors.

The BEU contains two independent identical (redundant) circuits, each of which converts the IBB PRT resistance values to 16-bit digital form, converts some other parameters to 8-bit digital form for housekeeping purposes, and controls the operation of one of the IBB heaters. The AD590 temperature sensors mounted on the IBB front plate are wired through respectively to the A_IPU and the B_IPU where the output is digitised.

The power for the IFC is derived from the internal IPU power converters.

2.6.2 Operational States & Transitions

The IFC A side is powered simultaneously with, and communicates only with, the IPU A side. The IFC B side is powered simultaneously with, and communicates only with, the IPU B side. The IFC has three operational states:

OFF - the Subsystem is OFF when the IPU is OFF;

Warming/Cooling - the Subsystem is ON but steady-state thermal conditions have not been achieved following power-up or a change in temperature set-point;

Operational - the Subsystem is ON and steady-state thermal conditions exist

The operational state of the IBB heater is determined by control words sent from the IPU to the BEU. A SAIL Task 'senses' the IBB temperature and determine the appropriate heater setting, depending on the heater operating mode which is set by ground command.

2.6.3 IFC Command & Control

2.6.3.1 IFC Commands

The only IFC-related command is the HIR_OPH_CONTROL command which is the generic command for setting all HIRDLS Operational Heaters. This can be a ground command (used with the Constant Power option only) or a SAIL-generated command. See Section 2.7.4 below.

2.6.3.2 IPU-to-IFC Control Word Formats

The content of Control Word transfers from the IPU to the BEU shall conform to the formats specified in the following subsections. Bit conventions shall be as follows:

a. Control Words shall be 16 bits in length.

b. Serial binary words shall be transmitted most significant bit (MSB) first.

c. Bits shall be numbered 0 to 15 where the 0 bit is the LSB.

2.6.3.2.1 Heater Control Word (HCW)

The Heater Control word shall use the bit assignments shown in Table 2.6.3.2.1-1:

Table 2.6.3.2.1-1 IFC Heater Control Word Bit Assignments

IPU CONTROL WORD		
BIT #	CODE	FUNCTION
MSB 15	S	S = 0 for 'A' side; S = 1 for 'B' side; set by IPU
14	I	Ident bit: always 1 for HCW
13	-	Not used by IFC
12	-	Not used by IFC
11	-	Not used by IFC
10	-	Not used by IFC
9	-	Not used by IFC
8	-	Not used by IFC
7	V7	Value bit #7
6	V6	Value bit #6
5	V5	Value bit #5
4	V4	Value bit #4
3	V3	Value bit #3
2	V2	Value bit #2
1	V1	Value bit #1
LSB 0	V0	Value bit #0

The 8 Value bits (allowed value range: 0-255) are used in the BEU to provide proportional control of the IBB heater power setting in the range 0 to 0.9 W. In Constant Power (CP) Mode the HCW value bits will be copied from the SAIL Heater Control Table in the IPU. In Constant Temperature (CT) Mode, SAIL will use a PI algorithm to compare the commanded IBB temperature set-point with the actual IBB temperature derived from a specified telemetry channel, and will set the HCW to the required value.

The HCW value used in CP Mode and the algorithm coefficients, temperature set point and telemetry channel number used in CT Mode will all be uplinked into the SAIL Heater Control Table by means of the HIR_SAI_UPLOAD Command. Certain parameters can be modified using the HIR_SAI_SHARED Command. See Section 2.7 for further details.

A Heater Control word shall be sent to the IFC once per Major Frame (approximately 1.3 per sec). The value may or may not be the same as the previously-sent value. The timing within the Major Frame is unimportant.

2.6.3.2.2 Data Request Word (DRW)

The Data Request word shall use the bit assignments shown in Table 2.6.3.2.2-1:

Table 2.6.3.2.2-1 IFC Data Request Word Bit Assignments

IPU CONTROL WORD		
BIT #	CODE	FUNCTION
MSB 15	S	S = 0 for 'A' side; S = 1 for 'B' side; set by IPU
14	I	Ident bit: always 0 for DRW
13	DS2	Data Select Bit #2 (MSB)
12	DS1	Data Select Bit #1
11	DS0	Data Select Bit #0 (LSB)
10	-	Not used by IFC
9	-	Not used by IFC
8	-	Not used by IFC
7	-	Not used by IFC
6	-	Not used by IFC
5	-	Not used by IFC
4	-	Not used by IFC
3	-	Not used by IFC
2	-	Not used by IFC
1	-	Not used by IFC
LSB 0	-	Not used by IFC

One Data Request word shall be sent every Major Frame. The timing within the Major Frame is unimportant, except that interval between the end of one DRW and the beginning of the next shall be not less than 700 ms. Data Request words shall be sent in the sequence DRW0 to DRW7 as shown in Table 2.6.3.2.2-2.

Table 2.6.3.2.2-2 IFC Data Request Word - Functional Assignments

DATA REQST WORD	<---------- BIT PATTERN ---------->					SELECTED FUNCTION	CORRESPONDING TELEMETRY LIST MNEMONIC
		DS BITS					
		2	**1**	**0**			
DRW0	S 0	0	0	0	x x x x x x x x x x x	OVEN TEMP	IFC_OVEN_TMP
DRW1	S 0	0	0	1	x x x x x x x x x x x	PRT #1	IFCBB_TMP1
DRW2	S 0	0	1	0	x x x x x x x x x x x	PRT #2	IFCBB_TMP2
DRW3	S 0	0	1	1	x x x x x x x x x x x	PRT #3	IFCBB_TMP3
DRW4	S 0	1	0	0	x x x x x x x x x x x	SPARE	
DRW5	S 0	1	0	1	x x x x x x x x x x x	+15V MON	IFC_PSV_P15
DRW6	S 0	1	1	0	x x x x x x x x x x x	-15V MON	IFC_PSV_N15
DRW7	S 0	1	1	1	x x x x x x x x x x x	+5V MON	IFC_PSV_P5

2.6.4 IFC Telemetry

2.6.4.1 IFC Telemetry Summary

The following telemetry channels are assigned to the IFC (note: item #170 used in EM only):

ID#	SCIENCE CHANNEL MNEMONIC	CONV ALG	NAME	DESCRIPTION
165	IFCBB_FRPL_TMP	tbs	IFCBB front plate temp	Sensor located on
166	IFC_OVEN_TMP	L	IFC ref. resistor oven temp	Sensor located on
167	IFCBB_TMP1	K1*	IFC BB temp. #1	Sensor located on
168	IFCBB_TMP2	K2*	IFC BB temp. #2	Sensor located on
169	IFCBB_TMP3	K3*	IFC BB temp. #3	Sensor located on
171	IFC_PSV_P15	G	IFC +15V rail volts	
172	IFC_PSV_N15	H	IFC -15V rail volts	
173	IFC_PSV_P5	J	IFC +5V rail volts	

2.6.4.2 IFC-to-IPU Data Word Formats

The IFC Data Word transfers from the BEU to the IPU shall conform to the following protocol:

a. All IFC Data Words shall be 24 bits in length.

b. Serial binary words shall be transmitted most significant bit (MSB) first.

c. Bits shall be numbered 0 to 23 where the 0 bit is the LSB.

Each IFC Data Word shall be transmitted in response to a Data Request Word. The information content of each IFC Data Word shall correspond to the data specified by the immediately preceding DRW.

In the case of the three PRT data words, the lowest 16 bits shall be copied into the telemetry stream. In the case of the OVEN TEMP and MON data words, the lowest 8 bits shall be copied into the telemetry stream.

The bit assignments for IFC Data Words, and the mapping of these bits on to the corresponding Telemetry List functions, are shown in Table 2.6.4.2-1:

/ turn to next page . . . . .

Table 2.6.4.2-1 IFC Data Word Format

IFC-IPU DATA WORD BIT #	TELEMETRY WORD BIT ASSIGNMENT		FUNCTION
	IFCBB_ data word (16 bits)	IFC_OVEN_TMP and IFC_PSV data word (8 bits)	
MSB 23	-	-	SIDE A or B (SAME AS PRECEDING DRW BIT #15)
22	-	-	IDENT BIT (SAME AS PRECEDING DRW BIT #14)
21	-	-	DATA SELECT BIT #2 (Same as preceding DRW BIT #13)
20	-	-	DATA SELECT BIT #1 (Same as preceding DRW BIT #12)
19	-	-	DATA SELECT BIT #0 (Same as preceding DRW BIT #11)
18	-	-	NOT USED
17	-	-	NOT USED
16	-	-	NOT USED
15	BIT #15	-	DATA BIT #15 (IFCBB_ data words only)
14	BIT #14	-	DATA BIT #14 (IFCBB_ data words only)
13	BIT #13	-	DATA BIT #13 (IFCBB_ data words only)
12	BIT #12	-	DATA BIT #12 (IFCBB_ data words only)
11	BIT #11	-	DATA BIT #11 (IFCBB_ data words only)
10	BIT #10	-	DATA BIT #10 (IFCBB_ data words only)
9	BIT #9	-	DATA BIT #9 (IFCBB_ data words only)
8	BIT #8	-	DATA BIT #8 (IFCBB_ data words only)
7	BIT #7	BIT #7	DATA BIT #7
6	BIT #6	BIT #6	DATA BIT #6
5	BIT #5	BIT #5	DATA BIT #5
4	BIT #4	BIT #4	DATA BIT #4
3	BIT #3	BIT #3	DATA BIT #3
2	BIT #2	BIT #2	DATA BIT #2
1	BIT #1	BIT #1	DATA BIT #1
LSB 0	BIT #0 (LSB)	BIT #0 (LSB)	DATA BIT #0

Each IFC Data channel is updated once every 8 Major Frames. However, each IFC data channel is copied into the Science Telemetry Stream once per Major Frame. In the IPU, when a channel has not been updated in that Major Frame, the previously transmitted value shall be used.

2.6.4.3 Telemetry for IFC AD590 Temperature Sensors

The AD590 readings are digitised to 16 bits in the IPU. These channels are mutually redundant (only one side is powered). The corresponding 16-bit Telemetry List function is IFCBB_FRPL_TMP. This is used to determine the temperature contrast between the (external) BB aperture baffle temperature and the (internal) IFC BB temperature as measured by the PRT channels.

2.7 IPS - Instrument Processor Subsystem

2.7.1 Brief Functional Description

The Instrument Processor Subsystem comprises the following major components:-

- Signal Processing Unit (SPU)
- Instrument Processor Unit (IPU)

The SPU receives the analog signals from the 21 channels of the DSS, converts them to digital form and performs various (programmable) manipulations before transferring the data to the IPU. Commands assigned to the SPU are used to select the Chopper reference source and adjust the phasing. The main radiance channel ouputs are described in Section 2.0 above; other SPU telemetry is described below.

The IPU performs several functions and there are several command categories assigned to it (see Table 2-1). The main functional categories are described in Section 1.2.7 above. Two of these - the SAIL Process and Autonomous Instrument Fault Management - are respectively covered in Sections 3 and 4 below. The IPU contains communications interfaces, logic and software relating to many other instrument subsystems - these functions and their associated control & data formats are described in the appropriate subsystem subsection. In particular, there is a special communications interface between the IPU and the TSS, the operation of which is described in Section 2.4.

2.7.2 Operational States

The SPU has only two basic states, ON and OFF. Various Chopper reference options and settings are available - see SPU command descriptions below.

The IPU has three basic states: OFF, Booting and Operational.

2.7.3 State Transitions

The SPU states are determined by commands sent to the PSS, which switch secondary power to the SPU and DSS. The power rails to the SPU are duplicated for redundancy. Power switching will only be performed as part of the Instrument Activation or Deactivation procedures.

The IPU will transition automatically from the OFF state to the Booting State on application of spacecraft primary power (see Table 2.0.1-1). During the Booting State, only the limited 'startup' telemetry is available. An IProc 'boot hold' period of 30 seconds follows, allowing the opportunity to send certain commands in the event that a booting anomaly is observed. In the absence of any anomaly or command, the IProc will transition to its normal operational state, at which point the

'startup' telemetry will cease, the Default Science and Engineering telemetry will appear and normal command verification will become possible.

2.7.4 IPS Command & Control

2.7.4.0 IPS Command Categories

As shown in Table 2-1 above, there are several 'virtual subsystem' command categories assigned to the IPU; these include SPU, BIP, MAC, OPH, SAI, UPL and IPU. Similar categories do not apply to IPS telemetry.

2.7.4.1 Summary of "SPU" Commands

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
39	HIR_SPU_TIMING	3	Change timing delay of detector readouts
40	HIR_SPU_FIR	10	Load FIR Filter Coefficient table or Decimation Coefficients
41	HIR_SPU_OFFSET	2	Change one of the detector data zero offset values
42	HIR_SPU_CLOCKSEL	3	Select clock sources to be used by the RAD6000 for system tick and the SPU for data collection

2.7.4.2 Description & Verification of "SPU" Commands

CMD ID#: 39	**MNEMONIC:** HIR_SPU_TIMING		
FUNCTION:	Change timing delay of detector readouts		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Disabled
PARAMETER #:0	Opcode (see notes)		**RANGE:** 0 to 4
PARAMETER #:1	Item number (see notes)		**RANGE:** 0 to 21
PARAMETER #:2	Value in 160 ns units		**RANGE:** 0 to 65535
VERIFICATION:	Memory Dump (diagnostic)		
NOTES:	For parameter 0: 0= Set detector delay, 1= Set blade open offset, 2= Set blade closed offset,3= Set housekeeping delay, 4= Set SPU filter delay.For parameter 1: Items for detector delay are 1 through 21.Items for blade edges are 0 through 5.Items for housekeeping delay and SPU filter delay are 0 (only one value).		

CMD ID#: 40	**MNEMONIC:** HIR_SPU_FIR		
FUNCTION:	Load FIR Filter Coefficient table or Decimation Coefficients		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Disabled
PARAMETER #:0	Opcode 0 = Start; 1 = Data; 2 = Activate; 3 = Decimation Coeffs.	**RANGE:** 0 to 3	
PARAMETER #:1	Opcode = 1, Number of first FIR coeff within this command; Opcode = 2, RDSR table (1,2,3 or 6)	**RANGE:** 0 to 31	
PARAMETER #:2	Opcode = 1, Number of coeffs within this command.	**RANGE:** 1 to 6	
PARAMETER #:3	Opcode = 0, 32-bit XOR checksum of FIR filter table; Opcode = 2, 16-bit table ID#.	**RANGE:** N/A (32 bits)	
PARAMETER #:4	Opcode = 1 or 3, 64-bit IEEE-formatted double float	**RANGE:** N/A (64 bits)	
PARAMETER #:5	Opcode = 1 or 3, 64-bit IEEE-formatted double float	**RANGE:** N/A (64 bits)	
PARAMETER #:6	Opcode = 1 or 3, 64-bit IEEE-formatted double float	**RANGE:** N/A (64 bits)	
PARAMETER #:7	Opcode = 1, 64-bit IEEE-formatted double float	**RANGE:** N/A (64 bits)	
PARAMETER #:8	Opcode = 1, 64-bit IEEE-formatted double float	**RANGE:** N/A (64 bits)	
PARAMETER #:9	Opcode = 1, 64-bit IEEE-formatted double float	**RANGE:** N/A (64 bits)	
VERIFICATION:	Memory Dump (diagnostic)		
NOTES:	A FIR table upload consists of a START command followed by DATA commands, followed by an ACTIVATE command. OPCODE = START, parm D is the 32-bit XOR checksum of the table to be loaded. For OPCODE = DATA parm B is the number of the first FIR Coeff contained within this command, parm C is the number of coeffs contained within this command, parms U,V,W,X,Y and Z are IEEE-fommatted 64-bit double floats. For OPCODE = ACTIVATE Parm B selects the RDSR table to load, where 1=RDSR1, 2=RDSR2, 3=RDSR3 and 6=RDSR6 and parm D is the 16-bit table ID. If an error or inconsistency occurs the new table is not activated and an error is returned. OPCODE = DECIMATION is a special stand-alone command to load the data decimation coeffs, parm U = decimation coeff D1, parm V = D2, parm W = D3. Refer to TC-UCB-005 1997-03-07.		

CMD ID#: 41	**MNEMONIC:** HIR_SPU_OFFSET		
FUNCTION:	Change one of the detector data zero offset values		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Disabled
PARAMETER #:0	Detector number	**RANGE:** 1 to 21	
PARAMETER #:1	New zero offset value	**RANGE:** 0 to 65535	
VERIFICATION:	SIG_ZERO_nn shows value loaded, where nn is channel number.		
NOTES:	Adds a numerical offset (value = param #0) to the signal count of the channel specified by param #1All channels default to P0 = 1023 at power up.		

CMD ID#: 42	MNEMONIC: HIR_SPU_CLOCKSEL		
FUNCTION:	Select clock sources to be used by the RAD6000 for system tick and the SPU for data collection		
C, T, S ATTRIBUTES:	CLASS: Operational	TYPE: Flight	SAIL: Never
PARAMETER #:0	System tick source select	RANGE: 0 to 1	
PARAMETER #:1	Chopper rotation pulse source select	RANGE: 0 to 2	
PARAMETER #:2	Chopper sync pulse source select	RANGE: 0 to 2	
VERIFICATION:	PSTAT_0 bits used as appropriate. For details see C&TH Vol. I, section 2.7.5.4		
NOTES:	For parameter 0 (Tick Source): 0 = internal RAD6000 clock *1 = Chopper Rotation pulseFor parameter 1 (CR sync pulse source): 0 = internal rotation pulse *1 = Chopper Rotation pulse 2 = External rotation pulseFor parameter 2 Chopping sync source): 0 = internal sync *1 = Chopper sync 2 = External sync* indicates default state after IProc booting has completed		

2.7.4.3 Summary of "BIP" Commands

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
1	HIR_BIP_HOLD	0	Abort IPU countdown to running state and hold the IPU in the idle boot hold state
2	HIR_BIP_EXECUTE	0	Abort IPU countdown and execute the application immediately
3	HIR_BIP_REBOOT	0	Performs a cold reboot of the IPU processor.
4	HIR_BIP_EEREAD	3	Copy a section of EEPROM into IPU RAM
5	HIR_BIP_BOOT	1	Boot IPU from the specified RAM address
6	HIR_BIP_DUMPADDR	1	Change current dump address of IPU rolling dump

2.7.4.4 Description & Verification of "BIP" Commands

CMD ID#: 1	MNEMONIC: HIR_BIP_HOLD		
FUNCTION:	Abort IPU countdown to running state and hold the IPU in the idle boot hold state		
C, T, S ATTRIBUTES:	CLASS: Booting	TYPE: Flight	SAIL: Never
VERIFICATION:			
NOTES:	If this command is used, the program will NOT be loaded from EEPROM into RAM. This must be done manually if required. This command will transition the IPU into the idle boot hold state.The IPU remains in this state until a HIR_IPU_BOOT or HIR_IPU_REBOOT command is received.This command is only valid during the countdown state.		

CMD ID#: 2	MNEMONIC: HIR_BIP_EXECUTE		
FUNCTION:	Abort IPU countdown and execute the application immediately		
C, T, S ATTRIBUTES:	CLASS: Booting	TYPE: Flight	SAIL: Never
VERIFICATION:			
NOTES:	This command is valid only during the countdown state.		

CMD ID#: 3	**MNEMONIC:** HIR_BIP_REBOOT		
FUNCTION:	Performs a cold reboot of the IPU processor.		
C, T, S ATTRIBUTES:	**CLASS:** Boot Hold	**TYPE:** Flight	**SAIL:** Never
VERIFICATION:			
NOTES:	This command will cause all operations (including 1553) to halt for the duration of the IPU boot.Additional commands may be required to return the IPU to an operational state.This command is valid only during any of the boot hold states.Note that if the EEPROM was being programmed, the EEPROM contents may be corruptedif this command is used.		

CMD ID#: 4	**MNEMONIC:** HIR_BIP_EEREAD		
FUNCTION:	Copy a section of EEPROM into IPU RAM		
C, T, S ATTRIBUTES:	**CLASS:** Boot Hold	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	EEPROM start address		**RANGE:** 0 to 16777215
PARAMETER #:1	IPU RAM start address		**RANGE:** 0 to 16777215
PARAMETER #:2	Length in 32-bit words		**RANGE:** 0 to 16777215
VERIFICATION:			
NOTES:	This command is valid only during the idle boot hold state.If either the EEPROM address or RAM address are not on a 32-bit boundary, they will be set to theclosest 32-bit boundary which is less than the address.		

CMD ID#: 5	**MNEMONIC:** HIR_BIP_BOOT		
FUNCTION:	Boot IPU from the specified RAM address		
C, T, S ATTRIBUTES:	**CLASS:** Boot Hold	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	IPU code start address		**RANGE:** 0 to 16777215
VERIFICATION:			
NOTES:	This command will reset the watchdog counter prior to executing the boot.This command is valid only during the idle boot hold state.		

CMD ID#: 6	**MNEMONIC:** HIR_BIP_DUMPADDR		
FUNCTION:	Change current dump address of IPU rolling dump		
C, T, S ATTRIBUTES:	**CLASS:** Boot Hold	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	IPU code dump address		**RANGE:** 0 to 16777215
VERIFICATION:			
NOTES:	This command is valid only during the idle boot hold state.		

2.7.4.5 Summary of "MAC" Commands

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
19	HIR_MAC_ASSIGN	3	Assign a macro to a macro number
20	HIR_MAC_UPLOAD	3	Upload data for a macro
21	HIR_MAC_EXE	1	Execute selected macro immediately
22	HIR_MAC_TIMED	4	Add or delete a timed macro
23	HIR_MAC_ERASE	1	Erase a macro (set to no-operation if executed)
89	HIR_MAC_ACTIVATE	0	Activate the previously uploaded macro

2.7.4.6 Description & Verification of "MAC" Commands

CMD ID#: 19	**MNEMONIC:** HIR_MAC_ASSIGN		
FUNCTION:	Assign a macro to a macro number		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Macro Number	**RANGE:** 0 to 127	
PARAMETER #:1	Total number of 32-bit words in macro. If this parameter is not a multiple of 17, (16 words for each command, plus 1 for the delay) the command will be rejected.	**RANGE:** N/A (16 bits)	
PARAMETER #:2	32-bit XOR checksum of the macro to be uploaded	**RANGE:** N/A (16 bits)	
VERIFICATION:			
NOTES:	This command must precede a number of HIR_MAC_UPLOAD commands.		

CMD ID#: 20	**MNEMONIC:** HIR_MAC_UPLOAD		
FUNCTION:	Upload data for a macro		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Address offset in block (0 = block start)	**RANGE:** 0 to 65535	
PARAMETER #:1	Number of 32-bit words to upload	**RANGE:** 1 to 13	
PARAMETER #:2	H-32 encoded upload	**RANGE:** N/A (416 bits)	
VERIFICATION:			
NOTES:	This command must be preceded by the HIR_MAC_ASSIGN command. Addresses in the H-32 format are relative to 0, which is the start of the selected macro. The format within the upload data is as follows: 16 32-bit words representing a 1553 command, followed by 1 32-bit word representing the delay factor in command ticks relative to the previous command in the macro. One command tick = 4*CR (where CR is time of one chopper rotation, nominal 12ms). So delay = 4*CR + N*4*CR (The minimum time between MACRO commands is 4 CR's) A group of HIR_MAC_UPLOAD commands is assembled into a macro and verified by the HIR_MAC_ACTIVATE command.		

CMD ID#: 21	**MNEMONIC:** HIR_MAC_EXE		
FUNCTION:	Execute selected macro immediately		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Enabled
PARAMETER #:0	Macro Number	**RANGE:** 0 to 127	
VERIFICATION:			
NOTES:	The contents of the selected macro will be added to the command queue.		

CMD ID#: 22	**MNEMONIC:** HIR_MAC_TIMED		
FUNCTION:	Add or delete a timed macro		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Enabled
PARAMETER #:0	Delete (0) or add (1) a timed macro	**RANGE:** 0 to 1	
PARAMETER #:1	Macro Number	**RANGE:** 0 to 127	
PARAMETER #:2	Macro High Time of execution	**RANGE:** N/A (32 bits)	
PARAMETER #:3	Macro Low Time of execution	**RANGE:** N/A (32 bits)	
VERIFICATION:			
NOTES:	Only one macro may be executed at an specified HIRDLS time. Adding a macro at a already used time will replace the existing macro. A timed macro will only be deleted if the time and macro number match the original add request.If a HIR_IPU_SETTIME command is issued, all timed macro entries will be deleted.		

CMD ID#: 23	**MNEMONIC:** HIR_MAC_ERASE		
FUNCTION:	Erase a macro (set to no-operation if executed)		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Macro Number	**RANGE:** 0 to 127	
VERIFICATION:			
NOTES:	This command will affect all future execution of the macro, including any timed requests which have not been executed. Executing an erased macro will generate a command error.		

CMD ID#: 89	**MNEMONIC:** HIR_MAC_ACTIVATE		
FUNCTION:	Activate the previously uploaded macro		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
VERIFICATION:			
NOTES:	This command, which must be preceded by a series of HIR_MAC_UPLOAD commands, signals when the upload is complete. When the HIR_MAC_ACTIVATE command is received, the checksum which has been uploaded in the HIR_MAC_ASSIGN command is verified and the macro marked as ready for execution if the checksums match. If the checksums do not match, the HIR_MAC_ACTIVATE command fails (as reflected in the MAC_CMD_ERR telemetry point) and the uploaded commands are deleted for the macro for which the checksums did not match.		

2.7.4.7 Description & Verification of "OPH" Commands

CMD ID#: 24	**MNEMONIC:** HIR_OPH_CONTROL		
FUNCTION:	Control operational heaters for specified zone		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Enabled
PARAMETER #:0	Heater zone	**RANGE:** 0 to 9	
PARAMETER #:1	Power level value	**RANGE:** 0 to 255	
VERIFICATION:			
NOTES:	The temperature setting is only used in mode 1, and the power level in mode 2. If in another mode, these parameters are ignored.The thermistor select is used to choose which thermistor will be used in temperature control mode.The in-flight calibrator is heater zone 0. This command is intended for use by SAIL but can be sent from the ground for manual heater control (Constant Power settings only). A SAIL Task will normally be used to control operational heaters.		

2.7.4.8 Summary of "SAI" Commands

This group of commands is concerned with the management of SAIL Tasks within the IProc. They are summarised here for reference only. Detailed descriptions, usage and verification is covered in Section 3 below.

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
27	HIR_SAI_START	1	Starts SAIL processor with specified amount of additional shared memory
28	HIR_SAI_STOP	1	Kills all active SAIL tasks, deallocates SAIL memory, and halts the SAIL processor
29	HIR_SAI_CREATE	4	Create a SAIL task using specified code and data sections with a given purpose code
30	HIR_SAI_KILL	1	Kill a SAIL task, code and data areas remain allocated
31	HIR_SAI_SUSPEND	1	Suspends indefinitely a given SAIL task at the next SAIL frame
32	HIR_SAI_RESUME	1	Resumes a given SAIL task at the next SAIL frame
33	HIR_SAI_UPLOADH	3	Header to upload SAIL code or data segment
34	HIR_SAI_UPLOAD	3	Upload a part of a SAIL code or data segment
35	HIR_SAI_ERASE	1	Erase a SAIL code or data segment
36	HIR_SAI_SHARED	4	Modify contents of SAIL shared memory
37	HIR_SAI_COMMAND	2	Disable or enable the use of a command by SAIL
38	HIR_SAI_CONTROL	2	Enable or disable SAIL control of a specified subsystem

2.7.4.9 Summary of "UPL" Commands

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
100	HIR_UPL_HEADER	3	Header to upload IPU RAM
101	HIR_UPL_DATA	3	Upload data to IPU RAM
102	HIR_UPL_COMMIT	0	Copy the uploaded data from the temporary storage array into IPU RAM
7	HIR_UPL_ABORT	0	Abort any non-commited upload, and erase header and temporary area
103	HIR_UPL_EEWRITE	4	Setup to write from IPU RAM into permenant storage in EEPROM (hazardous command)
104	HIR_UPL_EECOMMIT	1	Overwrite IPU EEPROM as specified by the HIR_UPL_EESETUP command (hazardous command)

2.7.4.10 Description & Verification of "UPL" Commands

CMD ID#: 100	**MNEMONIC:** HIR_UPL_HEADER		
FUNCTION:	Header to upload IPU RAM		
C, T, S ATTRIBUTES:	**CLASS:** Boot Hold	**TYPE:** CRITICAL	**SAIL:** Never
PARAMETER #:0	Start address for RAM upload	**RANGE:** 0 to 16777215	
PARAMETER #:1	Number of 32-bit words to upload	**RANGE:** 1 to 2000	
PARAMETER #:2	XOR checksum for the entire upload	**RANGE:** N/A (32 bits)	
VERIFICATION:			
NOTES:	This command must precede the HIR_UPL_DATA command, and will cause a transition to the upload boot hold mode.All upload locations in the temporary area will be zeroed upon receipt of a valid HIR_UPL_HEADER command.If the RAM address is not on a 32-bit boundary, it will be set to the closest 32-bit boundary which is less than the address.This command is valid only during the idle boot hold state.		

CMD ID#: 101	**MNEMONIC:** HIR_UPL_DATA		
FUNCTION:	Upload data to IPU RAM		
C, T, S ATTRIBUTES:	**CLASS:** Boot Hold	**TYPE:** CRITICAL	**SAIL:** Never
PARAMETER #:0	Address offset in block (0 = block start)	**RANGE:** 0 to 65535	
PARAMETER #:1	Number of 32-bit words to upload	**RANGE:** 1 to 13	
PARAMETER #:2	H-32 encoded upload	**RANGE:** N/A (416 bits)	
VERIFICATION:			
NOTES:	This command must be preceeded by the HIR_UPL_HEADER command. Addresses in the H-32 format are relative to the start address given in the HIR_UPL_HEADER command.This command is valid only during the upload boot hold state.		

CMD ID#: 102	**MNEMONIC:** HIR_UPL_COMMIT		
FUNCTION:	Copy the uploaded data from the temporary storage array into IPU RAM		
C, T, S ATTRIBUTES:	**CLASS:** Boot Hold	**TYPE:** CRITICAL	**SAIL:** Never
VERIFICATION:			
NOTES:	If the checksum from the header does not match the uploaded data, the commit will not execute,and the processor will remain in the upload boot hold state.If the checksum does match, the data will be copied from the temporary area into RAM,the temporary area will be zeroed, and the processor will transition back to the idle boot state.This command is valid only during the upload boot hold state.		

CMD ID#: 7	**MNEMONIC:** HIR_UPL_ABORT		
FUNCTION:	Abort any non-commited upload, and erase header and temporary area		
C, T, S ATTRIBUTES:	**CLASS:** Boot Hold	**TYPE:** Flight	**SAIL:** Never
VERIFICATION:			
NOTES:	This command will zero the temporary area, and the processor will transition back to the idle boot state.This command is valid only during the upload boot hold state.		

CMD ID#: 103	**MNEMONIC:** HIR_UPL_EEWRITE		
FUNCTION:	Setup to write from IPU RAM into permenant storage in EEPROM (hazardous command)		
C, T, S ATTRIBUTES:	**CLASS:** Boot Hold	**TYPE:** CRITICAL	**SAIL:** Never
PARAMETER #:0	IPU RAM location for start of copy	**RANGE:** 0 to 16777215	
PARAMETER #:1	IPU EEPROM location for start of copy	**RANGE:** 0 to 16777215	
PARAMETER #:2	Length in 32-bit words for copy	**RANGE:** 0 to 16777215	
PARAMETER #:3	Checksum of entire area to be copied	**RANGE:** N/A (32 bits)	
VERIFICATION:			
NOTES:	This command will setup the IPU to overwrite the EEPROM containing the code and data for the IPU and TEU,by transitioning the processor into the EEPROM setup boot hold state.If either the EEPROM address or RAM address are not on a 32-bit boundary, they will be set to the closest 32-bit boundary which is less than the address.This command is valid only during the idle boot hold state.Note that if the next command is not HIR_UPL_EECOMMIT, an error will be generated,the setup will be aborted by transitioning back to the idle boot hold state.		

CMD ID#: 104	**MNEMONIC:** HIR_UPL_EECOMMIT		
FUNCTION:	Overwrite IPU EEPROM as specified by the HIR_UPL_EESETUP command (hazardous command)		
C, T, S ATTRIBUTES:	**CLASS:** Boot Hold	**TYPE:** CRITICAL	**SAIL:** Never
PARAMETER #:0	Keyword to commit	**RANGE:** X#FADE to X#FADE	
VERIFICATION:			
NOTES:	If the keyword contains a value other than FADE, or if this command is not executed during the EEPROM setup boot hold state,(i.e follows the HIR_UPL_EEWRITE command), the setup will be aborted.If power is interrupted or a reboot is commanded prior to the completion of EEPROM writing, the contents of EEPROM may be damaged.If the write to EEPROM failed, the failed address will be reported with the low 16 bits of the EEPROM address in the EEPROM error word of telemetry, and the high bits in the command error code word of telemetry.Once this command has either sucessfully or unsuccessfully completed, the processor will transition to the idle boot hold state.		

2.7.4.11 Summary of "IPU" Commands

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
14	HIR_IPU_REBOOT	0	Performs a cold reboot of the IPU processor.
15	HIR_IPU_CHOPFREQ	1	Set a chopper reference frequency prescaler
105	HIR_IPU_FAULTSEL	2	Select a primary or redundant unit of a subsystem or device (not IPU processor)
106	HIR_IPU_CRFAULT	0	Enable changes to fault management system
107	HIR_IPU_FAULTOFF	2	Enable or disable autonomous management of selected fault condition
108	HIR_IPU_FAULTVAL	3	Change a value for the autonomous fault management of a selected fault condition
16	HIR_IPU_FAULTCLR	0	Clear all fault condition flags which have been set in the telemetry
88	HIR_IPU_SETTIME	3	Set 64-bit HIRDLS clock.
85	HIR_IPU_TSSRESET	0	Hard reset of the TSS control processor (external reset)

2.7.4.12 Description & Verification of "IPU" Commands

CMD ID#: 14	**MNEMONIC:** HIR_IPU_REBOOT		
FUNCTION:	Performs a cold reboot of the IPU processor.		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
VERIFICATION:			
NOTES:	This command will cause all operations (including 1553) to halt for the duration of the IPU boot.Additional commands may be required to return the IPU to an operational state.		

CMD ID#: 15	**MNEMONIC:** HIR_IPU_CHOPFREQ		
FUNCTION:	Set a chopper reference frequency prescaler		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Prescaler Value	**RANGE:** 2839 to 3472	
VERIFICATION:	CHOP_FREQ value should correspond to command parameter value after execution		
NOTES:	The chopper reference signal is a 500Hz +/- 20Hz programmable square wave. It's period is set by loading the prescaler register. Values between 2839 (0B17) and 3472 (0D90) will yield frequencies between 550.2 Hz and 449.9 Hz respec. A prescaler value of 3124 (0C34) will yield a chopper frequency of 500Hz. Conversion equations: Frequency (Hz) = 1/((prescaler + 1) *0.00000064)Prescaler = 1/(frequency * .00000064)-1.Default value: 3254 (0CB6) 480 Hz.		

CMD ID#: 105	**MNEMONIC:** HIR_IPU_FAULTSEL		
FUNCTION:	Select a primary or redundant unit of a subsystem or device (not IPU processor)		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** CRITICAL	**SAIL:** Never
PARAMETER #:0	Action Code	**RANGE:** 0 to 31	
PARAMETER #:1	Action Parameter	**RANGE:** 0 to 1	
VERIFICATION:			
NOTES:	If the unit is a switchable powered device (such as the TSS), this flag will apply after the unit is powered down, then back up.If the unit is a redundant mechanism (such as the sunshield), the flag will apply after the current movement has completed. The definition of the Action Codes and Action Parameters are: Action Code Action Param Action 0 Ignored SPU ADC calibration reset (SPU data invalid for about 0.5 sec) 1 0 SPU power select side A 1 1 SPU power select side B 2 0 EDAQ parity checking disabled 2 1 EDAQ parity checking enabled The EDAQ parity checking status is contained in subtelemetry parameter EDAQ_PIO_PAR_CK.		

CMD ID#: 106	**MNEMONIC:** HIR_IPU_CRFAULT		
FUNCTION:	Enable changes to fault management system		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** CRITICAL	**SAIL:** Never
VERIFICATION:			
NOTES:	This command must precede an HIR_IPU_FAULTOFF or an HIR_IPU_FAULTVAL command.		

CMD ID#: 107	**MNEMONIC:** HIR_IPU_FAULTOFF		
FUNCTION:	Enable or disable autonomous management of selected fault condition		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** CRITICAL	**SAIL:** Never
PARAMETER #:0	Fault condition number	**RANGE:** 0 to 31	
PARAMETER #:1	Disable (0) or enable (1) fault handling	**RANGE:** 0 to 1	
VERIFICATION:			
NOTES:	This command must be preceded by a HIR_IPU_CRFAULT command. Disabling an action will still detect and mark faults,and will set a flag for another fault action task (VxWorks or SAIL) to take over.		

CMD ID#: 108	**MNEMONIC:** HIR_IPU_FAULTVAL		
FUNCTION:	Change a value for the autonomous fault management of a selected fault condition		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** CRITICAL	**SAIL:** Never
PARAMETER #:0	Fault condition number	**RANGE:** 0 to 31	
PARAMETER #:1	Value to be changed	**RANGE:** 0 to 1023	
PARAMETER #:2	New value	**RANGE:** N/A (32 bits)	
VERIFICATION:			
NOTES:	This command must be preceded by a HIR_IPU_CRFAULT command.		

CMD ID#: 16	**MNEMONIC:** HIR_IPU_FAULTCLR		
FUNCTION:	Clear all fault condition flags which have been set in the telemetry		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
VERIFICATION:			
NOTES:	For any fault, a flag bit will be set in the telemetry stream which will persist until cleared by this command.		

CMD ID#: 88	**MNEMONIC:** HIR_IPU_SETTIME		
FUNCTION:	Set 64-bit HIRDLS clock.		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Disabled
PARAMETER #:0	Control code: 1 = Se Low Time; 2 = Set High Time; 3 = Set Low and High Time.	**RANGE:** 1 to 3	
PARAMETER #:1	High Time value (32 MSBs)	**RANGE:** 0 to 4294967295	
PARAMETER #:2	Low Time value (32 LSBs)	**RANGE:** 0 to 4294967295	
VERIFICATION:	The 64-bit HIRDLS Timestamp appears in the HIRDLS Header field of each Science Data packet (see C&TH Vol. III).		
NOTES:	A HIRDLS Time Word is 64 bits long and consists of a 32 bit hardware counter (PTIM3) and a 32 bit software maintained counter. One LSB of HIRDLS Time is 2.03252 microseconds. This command sets one or both 32-bit parts of the Time Word. If only one part is to be set the command ignores the value uploaded for the other part. If the IPU is powered down the Time Word setting is lost and resets to zero on subsequent power-up.IMPORTANT NOTE: if the HIRDLS Time Word is changed by this command, all TIMED macros will be deleted		

CMD ID#: 85	**MNEMONIC:** HIR_IPU_TSSRESET		
FUNCTION:	Hard reset of the TSS control processor (external reset)		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
VERIFICATION:			
NOTES:	This instruction will abort any operation in progress. The scanner will NOT be safed if this command is used.This command may be used during either TSW boot or application execution.		

2.7.5 IPS Telemetry

2.7.5.0 IPS Telemetry Groups

There are various groups of IPS telemetry which are described separately as follows:

- STK - this refers to the telemetry channels associated with SAIL Tasks. SAIL telemetry is described in Section 3 below.
- SPU - the housekeeping telemetry from the Signal Processing Unit
- CMD - these items relate to the execution of commands within the IPU
- STP - the term 'start-up telemetry' refers to the limited set of telemetry items transmitted from the HIRDLS Instrument during IProc booting.
- IPU - this covers all IPU telemetry not included in the above categories.

2.7.5.1 "SPU" Telemetry

ID#	SCIENCE CHANNEL MNEMONIC	CONV ALG	NAME	DESCRIPTION
269	SIG_ZERO_01	-	Channel 1 Zero Offset	
270	SIG_ZERO_02	-	Channel 2 Zero Offset	
271	SIG_ZERO_03	-	Channel 3 Zero Offset	
272	SIG_ZERO_04	-	Channel 4 Zero Offset	
273	SIG_ZERO_05	-	Channel 5 Zero Offset	
274	SIG_ZERO_06	-	Channel 6 Zero Offset	
275	SIG_ZERO_07	-	Channel 7 Zero Offset	
276	SIG_ZERO_08	-	Channel 8 Zero Offset	
277	SIG_ZERO_09	-	Channel 9 Zero Offset	
278	SIG_ZERO_10	-	Channel 10 Zero Offset	
279	SIG_ZERO_11	-	Channel 11 Zero Offset	
280	SIG_ZERO_12	-	Channel 12 Zero Offset	
281	SIG_ZERO_13	-	Channel 13 Zero Offset	
282	SIG_ZERO_14	-	Channel 14 Zero Offset	
283	SIG_ZERO_15	-	Channel 15 Zero Offset	
284	SIG_ZERO_16	-	Channel 16 Zero Offset	
285	SIG_ZERO_17	-	Channel 17 Zero Offset	
286	SIG_ZERO_18	-	Channel 18 Zero Offset	
287	SIG_ZERO_19	-	Channel 19 Zero Offset	
288	SIG_ZERO_20	-	Channel 20 Zero Offset	
289	SIG_ZERO_21	-	Channel 21 Zero Offset	
290	SPU_P5VOLTS_A	ZD1	SPU +5VA supply volts (analog)	
291	SPU_N5VOLTS_A	ZD2	SPU -5VA supply volts (analog)	
292	SPU_P5VOLTS_DA	ZD1	SPU +5VA supply volts (digital)	
293	SPU_P12VOLTS_A	ZE1	SPU +12VA supply volts	
294	SPU_N12VOLTS_A	ZE2	SPU -12VA supply volts	
295	SPU_P5VOLTS_B	ZD1	SPU +5VB supply volts (analog)	
296	SPU_N5VOLTS_B	ZD2	SPU -5VB supply volts (analog)	
297	SPU_P5VOLTS_DB	ZD1	SPU +5VB supply volts (digital)	
298	SPU_P12VOLTS_B	ZE1	SPU +12VB supply volts	
299	SPU_N12VOLTS_B	ZE2	SPU -12VB supply volts	
403	FIR1_TBL_ID	-	FIR coeffts table ID (1/CR rate)	
404	FIR2_TBL_ID	-	FIR coeffts table ID (2/CR rate)	
405	FIR3_TBL_ID	-	FIR coeffts table ID (3/CR rate)	
406	FIR6_TBL_ID	-	FIR coeffts table ID (6/CR rate)	

2.7.5.2 "CMD" Telemetry

ID#	SCIENCE CHANNEL MNEMONIC	CONV ALG	NAME	DESCRIPTION
254	SCCMDS_RCVCT	-	S/C cmds: received count	
255	SCCMDS_REJCT	-	S/C cmds: rejected count	
256	SCCMD_LAST_RC	-	Last S/C cmd: result code	
257	SCCMD_LAST_CN	-	Last S/C cmd: cmd nmbr	
258	SCCMD_LAST_PC	-	Last S/C cmd: pkt seq cnt	
259	SLCMDS_RCVCT	-	SAIL cmds: received count	
260	SLCMDS_REJCT	-	SAIL cmds: rejected count	
261	SLCMD_LAST_RC	-	Last SAIL cmd: result code	
262	SLCMD_LAST_CN	-	Last SAIL cmd: cmd nmbr	
263	MACMDS_RCVCT	-	Macro cmds: receivd count	
264	MACMDS_REJCT	-	Macro cmds: rejected count	
265	MACMD_LAST_RC	-	Last Macro cmd: reslt code	
266	MACMD_LAST_CN	-	Last Macro cmd: cmd nmbr	

2.7.5.3 "STP" Telemetry

ID#	SCIENCE CHANNEL MNEMONIC	CONV ALG	NAME	DESCRIPTION
306	SU_LIO_STAT	-	SU LIO 6K Test Status	Zero = Board passed LIO and RAD6000 board tests; Non-Zero = Board Failure
307	SU_FIRST_MEM_SEG	-	SU First Good Mem Segment	Value 7 or 12-15 which specifies the 128K RAM Segment which the Startup Software is using for temporary variable storage.
308	SU_EDAC1_ERR_CNT	-	SU EDAC Single Error Count	Count of the number of single bit EDAC errors which have occurred since SUROM initialization. 0xFFFFFFFF = EDAC interrupt disabled.
309	SU_EDAC2_ERR_CNT	-	SU EDAC Double Error Count	Count of the number of double bit EDAC errors which have occurred since SUROM initialization. 0xFFFFFFFF = EDAC interrupt disabled.
310	SU_EDACEE_ERR_CNT	-	SU EDAC EEPROM Err Cnt	Count of the number of single and double bit EDAC errors which have occurred in EEPROM since SUROM initialization. 0xFFFFFFFF = EDAC interrupt disabled.
311	SU_RAM_FAIL	-	SU RAM Readback Fail	Number of RAM readback failures which occurred during non-destructive RAM test
312	SU_EE_ERR_STAT	-	SU EEPROM Error Status	Zero if the IPU application software in EEPROM is usable. Non-zero if IPU application software in EEPROM is not usable.
313	SU_FIRST_1553_SEG	-	SU First Good 1553 Segment	Value 0-3 of the first good 16K 1553 RAM segment
314	SU_1553_READ_ERR	-	SU 1553 Read Failures	Count of the number of 1553 errors which have occurred since SUROM initialization
315	SU_CMD_RCVD_CNT	-	SU Command Rceiv'd Count	Total number of valid and invalid commands received since SUROM initialization
316	SU_CMD_REJ_CNT	-	SU Command Reject'd Count	Total number of invalid commands received since SUROM initialization
317	SU_CMD_NUMBER	-	SU Command Number	
318	SU_CMD_RES_CODE	-	SU Command Result Code	Result code for last command received
319	SU_FRAME_CNT	-	SU Telemetry Frame Count	Total number of telemetry MiF packets transmitted to S/C since SUROM initialization
320	SU_COUNTDOWN	-	SU Countdown Parameter	Seconds remaining until expiration of Startup countdown to automatic Telemetry CSC load and execute
321	SU_STARTUP_STATE	-	SU Startup State	See C&TH, Vol. III, Section 4.3.2
322	SU_ROM_BUILD_ID	-	SU ROM Build Version ID	See C&TH, Vol. III, Section 4.3.2

2.7.5.4 "IPU" Telemetry

2.7.5.4.1 Summary of "IPU" Telemetry

ID#	SCIENCE CHANNEL MNEMONIC	CONV ALG	NAME	DESCRIPTION
251	HIRCLKLSB	-	HIRDLS clock LSBYTES	Low 16 bits of HIRDLS Timestamp (same as part of Science packet Header)
252	TMARK_CLK	-	Time Mark clock word	Low 16 bits of HIRDLS Clock when S/C Time Mark received
253	TMARK_DATA	-	Time mark data word	Data word associated with Time Mark
267	FRAMECNT	-	Minor frame count	Minor Frame Count (in HIRDLS Header)
300	IPU_3P3VOLTS	W	Wkg IPU +3.3V supply volts	3.3V --> 2.2V mon (S.F. = 1.5:1)
301	IPU_5VOLTS	V	Wkg IPU +5V supply volts	5.0V --> 3.88V mon (S.F. = 1.29:1)
302	IPU_P15VOLTS	X1	Wkg IPU +15V supply volts	15.0V --> 3.87V mon (S.F. = 3.87:1)
303	IPU_N15VOLTS	X2	Wkg IPU -15V supply volts	15.0V --> 3.87V mon (S.F. = 3.87:1)
304	IPU_3P3DDC_TMP	D	Wkg IPU +3.3V DDC temp	Sensor located on
305	IPU_5VDDC_TMP	D	Wkg IPU +5V DDC temp	Sensor located on
512	CMD_DB_BUILD_ID	-	Command Database Bld Versn ID	
513	TLM_DB_BUILD_ID	-	Telemetry Database Bld Versn ID	
325	IPU_CSCI_BUILD_ID	-	IPU S/W Build Version ID	
326	SAIL_CSCI_BUILD_ID	-	SAIL S/W Build Version ID	
458	CHOP_FREQ	ZB	Chopper frequency setting	Value calculated from prescaler register
474	AD590MTX_LOREF	D	AD590 matrix 'low' ref. input	Low-end calibration input to AD590 matrix A-D Converter
475	AD590MTX_HIREF	D	AD590 matrix 'high' ref. input	High-end calibration input to AD590 matrix A-D Converter
479	IPU_ADC_REFV	ZF	IPU Primary HK ADC ref. V	Calibration input to main IPU housekeeping A-D Converter
480	TLM_PATT_ID	-	Telem Pattern Ident Code	Telem Pattern Ident Code (in HIRDLS Header)
388	IPERR_0	-	IPU Error Flags 0	See C&TH Vol. I for definitions
390	IPERR_1	-	IPU Error Flags 1	See C&TH Vol. I for definitions
391	IPERR_2	-	IPU Error Flags 2	See C&TH Vol. I for definitions
389	CMDERR_0	-	Command Error Flags	See C&TH Vol. I for definitions
387	IPSTAT_0	-	IPU Status Word 0	See C&TH Vol. I for definitions
402	IPSTAT_1	-	IPU Status Word 1	Placeholder
481	CMD_DBASE_ID	-	Command Database ID	See C&TH Vol. I for definitions
482	TLM_DBASE_ID	-	Telemetry Database ID	See C&TH Vol. I for definitions
499	AD590MTX_ZREF	D	AD590 matrix zero ref. input	Analog ground calibration input to AD590 matrix A-D Converter
397	IPFSTAT_0	-	IPU Fault Managmt. Status	Status word detailing enable/disable status of IPU handling of faults. See C&TH Vol. I for definitions
392	SUBTMI_BUILD_ID	-	Subtmi file version	8.8 version number of hirdls.subtmi file
393	IPU_BUILD_DATE	-	MSbyte year-1900, LSbyte day of year	MSbyte year-1900, LSbyte day of year
394	IPU_BUILD_TIME	-	Minute of day	Minute of day

395	EXEC_OVERRUN_COUNT	-	CR-executive task overrun count	Count of the number of times the Chopper Rotation Executive Task was unable to complete before a new system tick occurred
396	IP_FAULT_OVERIDE	-	Fault action override status	Status of Autonomous Fault Management action override flags
398	QHSS_1_RV_STAT	-	QHSS 1 Receive Status Word TSS HS	QHSS 1 Receive Status Word TSS HS
399	QHSS_2_RV_STAT	-	QHSS 2 Receive Status Word TSS LS	QHSS 2 Receive Status Word TSS LS
400	QHSS_3_RV_STAT	-	QHSS 3 Receive Status Word SPU	QHSS 3 Receive Status Word SPU
401	QHSS_1_TX_STAT	-	QHSS 1 Transmit Status Word TSS CMD	QHSS 1 Transmit Status Word TSS CMD
407	PRF_CR_TOTAL	-	IPU s/w function time - word 1	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
408	PRF_1553	-	IPU s/w function time - word 2	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
409	PRF_QHSS_SPU	-	IPU s/w function time - word 3	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
410	PRF_QHSS_TEU	-	IPU s/w function time - word 4	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
411	PRF_HIRDLSTIME	-	IPU s/w function time - word 5	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
412	PRF_SWAP_DIAG	-	IPU s/w function time - word 6	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
413	PRF_UP_HKTBL	-	IPU s/w function time - word 7	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
414	PRF_UP_SCITBL	-	IPU s/w function time - word 8	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
415	PRF_UP_SCIFMT	-	IPU s/w function time - word 9	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
416	PRF_CLR_CMD	-	IPU s/w function time - word 10	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
417	PRF_EXE_TLM	-	IPU s/w function time - word 11	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
418	PRF_SSH_TLM	-	IPU s/w function time - word 12	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
419	PRF_SVA_TLM	-	IPU s/w function time - word 13	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
420	PRF_CMD_TLM	-	IPU s/w function time - word 14	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
421	PRF_IOBIC_TLM	-	IPU s/w function time - word 15	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
422	PRF_SPU_TLM	-	IPU s/w function time - word 16	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
423	PRF_TSS_TLM	-	IPU s/w function time - word 17	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
424	PRF_TG_TLM	-	IPU s/w function time - word 18	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
425	PRF_SCIFMT_TLM	-	IPU s/w function time - word 19	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
426	PRF_SCIPRO_TLM	-	IPU s/w function time - word 20	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
427	PRF_CSS_TLM	-	IPU s/w function time - word 21	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
428	PRF_UPDATE_MAC	-	IPU s/w function time - word 22	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
429	PRF_EXE_SCCMD	-	IPU s/w function time - word 23	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
430	PRF_EXE_SAICMD	-	IPU s/w function time - word 24	Execution Profile Max Execution

				time, 1 LS Bit = 50 usecs
431	PRF_EXE_MACCMD	-	IPU s/w function time - word 25	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
432	PRF_CNTRL_PSS	-	IPU s/w function time - word 26	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
433	PRF_CNTRL_EDAQ	-	IPU s/w function time - word 27	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
434	PRF_CNTRL_CSS	-	IPU s/w function time - word 28	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
435	PRF_CNTRL_IFC	-	IPU s/w function time - word 29	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
436	PRF_DECIM_SCI	-	IPU s/w function time - word 30	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
437	PRF_FIR_SCI	-	IPU s/w function time - word 31	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
438	PRF_HKPATTERN	-	IPU s/w function time - word 32	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
439	PRF_FMT_HKBLOCK	-	IPU s/w function time - word 33	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
440	PRF_MAKE_SCIPKT	-	IPU s/w function time - word 34	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
441	PRF_MAKE_ENGPKT	-	IPU s/w function time - word 35	Execution Profile Max Execution time, 1 LS Bit = 50 usecs
442	SPARE_0A	-	Spare channel for test purposes	
443	SPARE_1A	-	Spare channel for test purposes	
444	SPARE_2A	-	Spare channel for test purposes	
445	SPARE_3A	-	Spare channel for test purposes	
446	SPARE_4A	-	Spare channel for test purposes	
447	SPARE_5A	-	Spare channel for test purposes	
448	SPARE_6A	-	Spare channel for test purposes	
449	SPARE_7A	-	Spare channel for test purposes	
450	SPARE_8A	-	Spare channel for test purposes	
451	SPARE_9A	-	Spare channel for test purposes	
452	SPARE_10A	-	Spare channel for test purposes	
453	SPARE_11A	-	Spare channel for test purposes	
454	SPARE_12A	-	Spare channel for test purposes	
455	SPARE_13A	-	Spare channel for test purposes	
456	SPARE_14A	-	Spare channel for test purposes	
457	SPARE_15A	-	Spare channel for test purposes	
268	HK_FORMAT_ID	-	Houskeeping format ID	

2.7.5.4.2 Description of Item #251 - HIRCLKLSB (HIRDLS clock LSBYTE)

Later

2.7.5.4.3 Description of Item #252 - TMARK_CLK (Time Mark clock word)

Later

2.7.5.4.4 Description of Item #253 - TMARK_DATA (Time mark data word)

Later

2.7.5.4.5 Description of Item #267 - FRAMECNT (Minor frame count)

This item is included in the HIRDLS Science Packet Telemetry Header. See C&TH Vol. III for description

2.7.5.4.6 Description of Item #268 - HK_FORMAT_ID (Housekeeping format table ID)

This item is included in the HIRDLS Science Packet Telemetry Header. See C&TH Vol. III for description

2.7.5.4.7 Description of Software (CSCI) Build Version IDs

2.7.5.4.7.1 Description of Item #497 - CMD_DB_BUILD_ID (Cmd Database Build Version)

Bit #	No. of bits	Sub-Mnemonic	Meaning
0-7 (LSB)	8	CMD_MINOR_REV	Command DB Minor Revision #
8-15 (MSB)	8	CMD_MAJOR_REV	Command DB Major Revision #

2.7.5.4.7.2 Description of Item #498 - TLM_DB_BUILD_ID (Tlm Database Build Version)

Bit #	No. of bits	Sub-Mnemonic	Meaning
0-7 (LSB)	8	TLM_MINOR_REV	Telemetry DB Minor Revision #
8-15 (MSB)	8	TLM_MAJOR_REV	Telemetry DB Major Revision #

2.7.5.4.7.3 Description of Item #325 - IPU_CSCI_BUILD_ID (IPU Software Build Version)

Bit #	No. of bits	Sub-Mnemonic	Meaning
0 (LSB)	1	CPU_SIDE	= 0 means A side = 1 means B side
1,2	2	KERNEL_TYPE	= 0 means VXworks and IPU code built separately = 1 means VXworks and IPU code built together = 2 means w/o tgtserver. Other values unused.
3-9	7	BUILD_NUM	Minor revision number [see *footnote to this table]
10-12	3	REVISION	Major revision number [see *footnote to this table]
13-15 (MSB)	3	CPU_TYPE	= 0 is unused = 1 means an INTEL PC [see *footnote to this table] = 2 means the EM PSA-32 = 3 is the PFM PSA-32 = 4,5,6,7 are unused

* Format for IPU CSCI Build Version ID is: CPU_TYPE • REVISION • BUILD_NUM
i.e. (CPU type) • (Major rev. number) • (Minor rev. number) e.g. **2.1.3**

2.7.5.4.7.4 Description of Item #326 - SAIL_CSCI_BUILD_ID (SAIL Software Build Version)

Bit #	No. of bits	Sub-Mnemonic	Meaning
			LATER

2.7.5.4.8 Description of Item #409 - TLM_PATT_ID (Telemetry Pattern ID Code)

This item is included in the HIRDLS Science Packet Telemetry Header. See C&TH Vol. III for description

2.7.5.4.9 Description of Item #415 - IPERR_0 (IPU Error Flag Word 0)

Normally all bits in this word should be zero.

Bit #	No. of bits	Sub-Mnemonic	Meaning
0 (LSB)	1	IOBIC_TG_ERR	= 1 means the timing generator didn't respond during initialization.
1	1	IOBIC_SIO_ERR	= 1 means the serial interface didn't respond during initialization.
2	1	IOBIC_EDAQ_ERR	= 1 means the EDAQ board didn't respond during initialization.
3	1	TSS_HS_QHSS_ERR	= 1 means the TSS HS data receive encountered an error. Should be clearable.
4	1	TSS_LS_QHSS_ERR	= 1 means the TSS LS data receive encountered an error. Should be clearable.
5	1	TSS_CMD_QHSS_ERR	= 1 means the TSS cmd transmit encountered an error. Should be clearable.
6	1	SPU_QHSS_ERR	= 1 means the SPU data receive encountered an error. Should be clearable.
7	1	EXEC_OVERRUN_ERR	= 1 means the IPU Executive did not finish within a **CR**. Clearable
8, 9	2	SPU_DATA_ERR	= 1 means the SPU did not send data last **CR**. = 2 means it did not finish sending data. Clearable.
10, 11	2	TSS_LS_DATA_ERR	= 1 means the TSS did not send low data last **CR**. = 2 means it didn't finish. Clearable.
12, 13	2	TSS_HS_DATA_ERR	= 1 means the TSS did not send hi data last **CR**. = 2 means it didn't finish. Clearable.
14, 15 (MSB)	2	TSS_CMD_DATA_ERR	= 1 means the TSS did not accept a command last **CR**. = 2 means it didn't finish accepting commands. Clearable.

2.7.5.4.10 Description of Item #416 - IPERR_1 (IPU Error Flag Word 1)
Normally all bits in this word should be zero.

Bit #	No. of bits	Sub-Mnemonic	Meaning
0 (LSB)	1	SPU_CR_PHASE_ERR	= 1 means the the chopper rotation counter was not constant within a given **CR**
1	1	SPU_CR_DROP_ERR	= 1 means 1 or more **CR** SPU radiance data packets was not received by the QHSS
2	1	SPU_CC_PHASE_ERR	= 1 means the the value for one or more **CR**s was not correct
3	1	SPU_POWER_PILEUP	= 1 means the SPU received a reset command while still processing previous command
4	1	SPU_RESET_PILEUP	= 1 means the SPU received a reset command while still processing previous command
5-10	6	PSS_ERR	(See following 6 entries)
5	1	PSS_IRC_OVFL	= 1 means the PSS received more than 1 IRC per 4 **CR**s
6	1	PSS_IF_BUSY	= 1 means the PSS Interface was busy unexpectedly
7	1	PSS_PILEUP	= 1 means the PSS Interface received a command while latching a relay
8	1	PSS_FUNC_ERR	= 1 means the PSS Switch routine encountered an invalid Function-Action code combination
9	1	PSS_MAC_ERR	= 1 means the PSS Switch routine received an error status from the Macro subsystem while executing a PSM
10	1	PSS_EXE_ERR	= 1 means the PSS encountered an execution error while executing an IRC
11,12	2	IFC_ERR	(See following 2 entries)
11	1	IFC_IF_BUSY	= 1 means the IFC interface was busy unexpectedly
12	1	IFC_TLM_ERR	= 1 means the IFC interface encountered an error while gathering TLM
13	1	MBIC_A_ERR	= 1 means the A MBIC did not respond during initialisation
14	1	MBIC_B_ERR	= 1 means the B MBIC did not respond during initialisation
15+ *	3	EDAQ_ERR	(See following 3 entries) * 2nd & 3rd entries are part of IPERR_2
15	1	EDAQ_BUSY	= 1 means the EDAQ Telemetry Converter was unexpectedly busy

2.7.5.4.11 Description of Item #448 - IPERR_2 (IPU Error Flag Word 2)

Normally all bits in this word should be zero.

Note: to be modified to eliminate split in EDAQ_ERR

Bit #	No. of bits	Sub-Mnemonic	Meaning
0,1	3 *	EDAQ_ERR (contd.)	(See following 2 entries) * 1st entry is part of IPERR_1
0	1	EDAQ_ADC_FAULT	means the ADC is in a latch up state. Telemetry will not be reported for 425ms
1	1	EDAQ_PARITY_ERR	= 1 means the EDAQ Telemetry Converter encountered a parity error. Telemetry will not be valid for 12ms
2	1	SSH_UNSAFE_MOVE	= 1 means the sunshield tried to move past the safe angle without a critical enable command
3	1	MBIC_IDX_OOR	= 1 means the MBIC received an index that was beyond the 2mb limit.
4	1	SCIPKT_LOSS	= 1 means science packet loss has occured.
5	1	ENGPKT_LOSS	= 1 means engineering packet loss has occured.
6	1	SSH_HWA_TIMEOUT	= 1 means the HWA timed out
7	1	SPU_FAULT_A	U fault status bit Read from TG DIO port: 1 = Fault condition on TLM side A
8	1	SPU_FAULT_B	U fault status bit Read from TG DIO port: 1 = Fault condition on TLM side B
9-15	7	Not assigned	

2.7.5.4.12 Description of Item #417 - CMDERR_0 (Command Error Flag Word 0)
Normally all bits in this word should be zero.

Bit #	No. of bits	Sub-Mnemonic	Meaning
0 (LSB)	1	BIP_CMD_ERR	= 1 means an error occured while executing a BIP cmd.
1	1	UPL_CMD_ERR	= 1 means an error occured while executing an UPL cmd.
2	1	CSS_CMD_ERR	= 1 means an error occured while executing a CSS cmd.
3	1	GSS_CMD_ERR	= 1 means an error occured while executing a GSS cmd.
4	1	IPU_CMD_ERR	= 1 means an error occured while executing a IPU cmd.
5	1	MAC_CMD_ERR	= 1 means an error occured while executing a MAC cmd.
6	1	OPH_CMD_ERR	= 1 means an error occured while executing a OPH cmd.
7	1	PSS_CMD_ERR	= 1 means an error occured while executing a PSS cmd.
8	1	SAIL_CMD_ERR	= 1 means an error occured while executing a SAIL cmd.
9	1	SPU_CMD_ERR	= 1 means an error occured while executing a SPU cmd.
10	1	SSH_CMD_ERR	= 1 means an error occured while executing a SSH cmd.
11	1	SVA_CMD_ERR	= 1 means an error occured while executing a SVA cmd.
12	1	TSS_CMD_ERR	= 1 means an error occured while executing a TSS cmd.
13	1	GSE_CMD_ERR	= 1 means an error occured while executing a GSE cmd.
14	1	CMD_ERR	= 1 means a low level error occured processing a command within the command handler.
15 (MSB)	1	Not assigned	

2.7.5.4.13 Description of Item #418 - IPSTAT_0 (IPU Status Word 0)

Bit #	No. of bits	Sub-Mnemonic	Meaning
0 (LSB)	1	TICK_SOURCE	= 0 means the decrementer (RAD6000 clock) = 1 means the Timing Generator (**CR** pulse)
1, 2	2	CR_INT_SOURCE	= 0 means internal rotation sync = 1 means **CR** sync = 2 means external **CR** sync
3, 4	2	CHOP_SYNC_SOURCE	= 0 means internal (TEU) ref. = 1 means chopper ref. = 2 means external chopper ref.
5-7	3	TLM_PATTERN	= 0 means normal pattern = 1 means Fixed HK = 2 means Fixed Sci = 3 means Simulated Data with decimation disabled = 4 means Simulated Data with decimation enabled = 5 means Simulated Data with decimation and 32 tap filter enabled. = 6 and 7 are TBD
8-10	3	SCIFMT_RDSR	The value is the current RDSR value, i.e. 6,3,2 or 1. RDSR = radiance data sampling rate
11-15 (MSB)	5	SCIPKT_Q_SZ	= the current number of buffered Science Packets

2.7.5.4.14 Description of Item #449 - IPSTAT_1 (IPU Status Word 1)

Bit #	No. of bits	Sub-Mnemonic	Meaning
THIS WORD NOT YET DEFINED			

2.7.5.4.15 Description of Items #419 & #420 - Command & Telemetry Database IDs

Telemetry Mnemonic	Bit #	No. of bits	Sub-Mnemonic	Meaning
CMD_DBASE_ID	0-7 (LSB)	8	CMD_MINOR_REV	Cmd minor rev number
CMD_DBASE_ID	8-15 (MSB)	8	CMD_MAJOR_REV	Cmd major rev number
TLM_DBASE_ID	0-7 (LSB)	8	TLM_MINOR_REV	Tlm minor rev number
TLM_DBASE_ID	8-15 (MSB)	8	TLM_MAJOR_REV	Tlm major rev number

2.7.5.4.16 Description of Item #450 - IPFSTAT_0 (IPU Fault Handling Status Word)

Bit #	No. of bits	Sub-Mnemonic	Meaning
0 (LSB)	1	EDAQ_PIO_PAR_CK	= 0 means EDAQ IOBIC PIO parity checking DISABLED = 1 means EDAQ IOBIC PIO parity checking ENABLED
1-6	1	PSS_FM_STATUS	(See following 6 entries)
1	1	PSS_IRC_OVFL_FM	= 0 means Fault Management for this error is OFF = 1 means Fault Management for this error is ON
2	1	PSS_IF_BUSY_FM	= 0 means Fault Management for this error is OFF = 1 means Fault Management for this error is ON
3	1	PSS_PILEUP_FM	= 0 means Fault Management for this error is OFF = 1 means Fault Management for this error is ON
4	6	PSS_FUNC_ERR_FM	= 0 means Fault Management for this error is OFF = 1 means Fault Management for this error is ON
5	1	PSS_MAC_ERR_FM	= 0 means Fault Management for this error is OFF = 1 means Fault Management for this error is ON
6	1	PSS_EXE_ERR_FM	= 0 means Fault Management for this error is OFF = 1 means Fault Management for this error is ON
7-8	2	EDAQ_FM_STATUS	(See following 2 entries)
7	1	EDAQ_BUSY_FM	= 0 means Fault Management for this error is OFF = 1 means Fault Management for this error is ON
8	1	EDAQ_ADC_FLT_FM	= 0 means Fault Management for this error is OFF = 1 means Fault Management for this error is ON
9	1	SSH_ANGLE_FM	= 0 means potentiometer reading will be ignored =1 means potentiometer reading will be checked
10,11	2	IFC_FM_STATUS	(See following 2 entries)
10	1	IFC_IF_BUSY_FM	= 0 means Fault Management for this error is OFF = 1 means Fault Management for this error is ON
11	1	IFC_TLM_ERR_FM	= 0 means Fault Management for this error is OFF = 1 means Fault Management for this error is ON
12-15	4	Not assigned	

2.7.5.4.X More subsections to follow .....

2.8 CSS - Cooler Subsystem

2.8.1 Brief Functional Description

The Cooler Subsystem consists of two main components: a compressor and a displacer. The compressor has two linear oscillatory motors used to compress the helium working fluid. The armatures of the two compressor motors are positioned co-axially so they can be used in tandem to provide active vibration cancellation. The displacer unit has one oscillatory motor as well as a co-axially positioned counter-balance motor used for vibration cancellation. The compressor and displacer are connected via a transfer tube through which the helium working fluid flows.

Each motor is equipped with capacitive position sensors to monitor armature position. Force sensors are attached to the mounting flanges of the compressor and displacer assemblies to measure residual vibration. A current sensor measures the total power consumed by the CSS. Temperature sensors at the displacer cold tip measure the output temperature of the Cooler for feedback control and telemetry. For launch and during vibration testing, the drive motor coils are caged (short-circuited) by means of latching relays to prevent excessive induced motion.

The Cooler Control Unit (CCU) contains duplicated sets of DC-DC converters to supply secondary power for the CSS from the single Noisy Bus input supplied via the PSS. The required converter set is selected by command.

The CSS flight software is implemented as firmware installed in the Cooler Control Unit (CCU). The software supports several modes of operation, selected by command. Command packets are received from the IPU; the parameters and control bits in the command packet allow the software to run the cooler in different modes and at desired set points. Once every "Cooler period", the flight software will generate a data message packet and process the last command packet received. The software executes from PROM on power-up and uses a Watchdog Timer to avoid a single event lockout.

The control algorithm provides both compressor and displacer stroke and phase control for efficient thermal operation. In Stroke amplitude mode (also called Manual Mode) the motor amplitudes are directly commanded via the IPU. In Thermostatic Mode the stroke amplitudes are automatically controlled to maintain a constant temperature at the cold tip. In both cases the phase between the compressor strokes and the displacer stroke is selectable by command.

The control process begins with a Fourier analysis of the amplitudes and phases of the existing position waveforms. It compares these with the commanded values and determines the proper correction to the drive waveforms to reduce any error. In both Manual and Thermostatic Modes, a secondary mode may be invoked to perform the vibration cancellation function. When this function is selected, the force sensors measure the residual vibration of each unit. The drive waveforms are then modified in order to minimiseresidual vibration.

2.8.2 Operational States

At the lowest operational level there is one State - the Electronics Only State - in which the Cooler is not functional and only limited telemetry data is available. The motor drive coils may be uncaged or uncaged while the CSS is in this state

At the next operational level there are three mutually exclusive States: Manual, Thermostatic and Warm-up. In the Manual and Thermostatic States only, an optional Substate is "Vibration Cancellation".

If any invalid combination of states or substates is commanded, the command will be ignored and a 'Last Command Illegal State' error will be generated.

2.8.2.1 Note on Stroke & Phase Angle in Thermostatic State and Warm-up State

The only difference between Thermostatic and Warm-up States is that in Warm-up State the phase angle is "reversed" and the strokes limited to 67% of the normal maximum stroke. The temperature set-point is commandable, and if set to a higher temperature in Thermostatic State, the Compressor & Displacer strokes will go to 10% and the Cold Tip will slowly warm up. To warm up faster, the CSS should be turned off, then back on in Warm-up State. As the set point is reached, the Compressor & Displacer strokes will decrease to zero.

The set-point can be commanded between 57 and 300 K. The temperature sensor diodes are calibrated from approximately 55K to 305 K. Any phase angle from zero to 359 degrees can be selected. Nominal for cooling is 65 degrees.

2.8.3 State Transitions

2.8.3.1 Valid State Transitions

Figure 2.8.3-1 is the valid state transition diagram. From the Electronics Only State any of the other States (Warm-up, Manual, or Thermostatic) may be entered. The Warm-up State may only be entered from, and transition to, the Electronics Only State.

From either the Manual or the Thermostatic State the Vibration Cancellation Substate may be entered. From any state the Electronics Only State may be transitioned to directly.

Any attempt to command an invalid state transition will be ignored and a 'Last Command Illegal State' error will be generated.

2.8.3.2 Autonomous State Transitions (AST)

There are three conditions which can cause an AST to occur. Each AST event will be indicated by an error flag in the Data Message. The first condition is the detection of an overstroke in either the Compressor or Displacer: the CSS will transition to the Electronics Only State and the 'Overstroke' error bit will be set.

The second condition applies if, during the Warm-up State, the temperature of the cold tip exceeds the commanded end-temperature. This causes an AST to the Electronics Only State and the 'Over-temperature' error bit will be set.

Finally, an AST will occur if the Watchdog Timer expires. This condition causes a processor reset; when the processor has re-booted, the CSS will remain in the Electronic Only state and the 'Watchdog Time-out/Just Powered On' bit will be set in the error field.

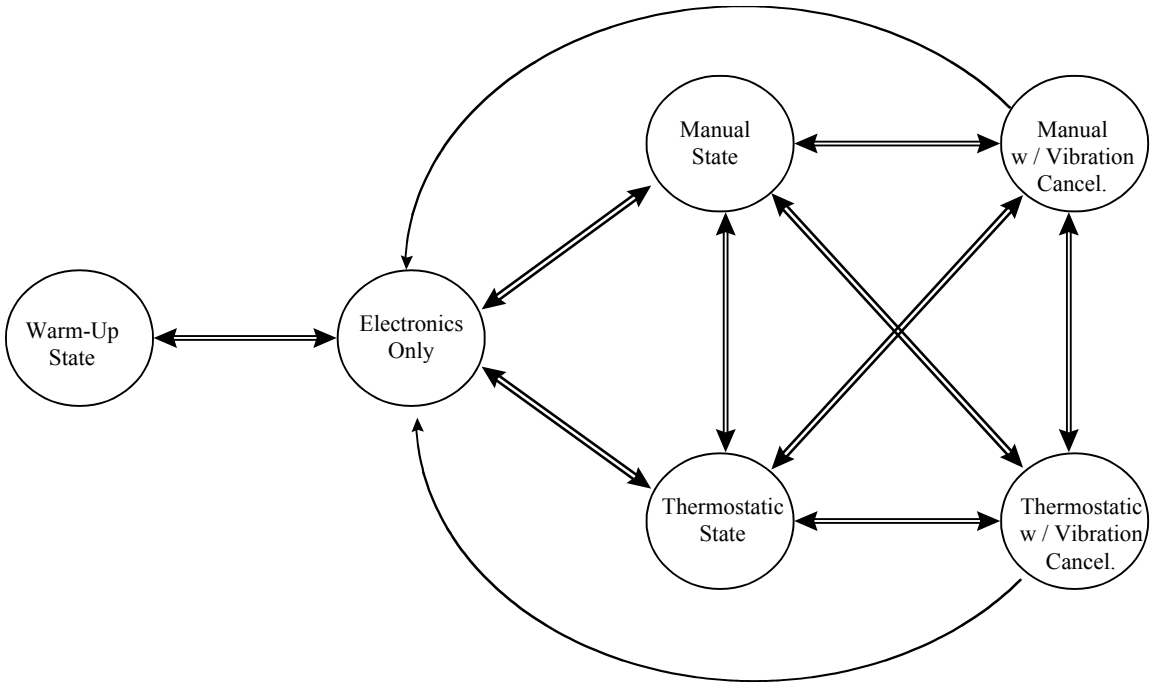

Figure 2.8.3.2-1. Valid state transitions.

2.8.4 CSS Command & Control

The CSS requires two types of control signal: discrete pulses are transmitted by the IPU to cage or uncage the motor drive coil latching relays, and a software UART is used to receive serial command messages from the IPU for all other control functions. This software UART is only enabled for a short period of time (approximately 100 mS) during each CSS control loop. **Data is sent least significant bit (LSB) first.**

2.8.4.1 Summary of CSS Commands

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
8	HIR_CSS_SETTING	4	Set cooler mode, and target temperature or manual settings
9	HIR_CSS_FREQ	2	Set cooler frequency and angles
10	HIR_CSS_CNVRTR	1	Select primary or secondary converters
11	HIR_CSS_LOCK	2	Short or open CSS motor windings

2.8.4.2 Description & Verification of CSS Commands

CMD ID#: 8	**MNEMONIC:** HIR_CSS_SETTING		
FUNCTION:	Set cooler mode, and target temperature or manual settings		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Disabled
PARAMETER #:0	Mode word (see notes)	**RANGE:** 0 to 63	
PARAMETER #:1	Temperature in 0.1 K units in mode 0	**RANGE:** 0 to 3000	
PARAMETER #:2	Compressor stroke level in 0.1% units	**RANGE:** 0 to 1000	
PARAMETER #:3	Displacer stroke level in 0.1% units	**RANGE:** 0 to 1000	
VERIFICATION:	Param #0 reflected by CSS_OPSTATUS bits #0 thro' #5; param #1 by CRYOTIP_SETP; param #2 by COMPAMP_DMD; param #3 by DISPAMP_DMD		
NOTES:	In thermostatic mode, the values for the stroke levels define the maximum levels. In manual mode, the temperature is ignored. For the mode word, the following bit definitions apply: Bit 0 - Electronics Only (0), Control (1),Bit 1 - Manual mode off (0), on (1)Bit 2 - Thermostatic mode off (0), on (1),Bit 3 - Warm-up mode off (0), on (1),Bit 4 - Vibration cancellation mode off (0), on (1),Bit 5 -Diode select, diode 0 or 1.The valid combinations of these bits for the mode word are: 0, 3, 5, 11, 19, 21, 35, 37, 43, 51, 53. All other values will be rejected by the CSS.Default values for parameters are:P0: 0 = Electronics OnlyP1: 650 = Cold Tip temp: 65KP2: 500 = Compressor stroke: 50% (max)P3: 500 = Displacer stroke: 50% (max)		

CMD ID#: 9	**MNEMONIC:** HIR_CSS_FREQ		
FUNCTION:	Set cooler frequency and angles		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Disabled
PARAMETER #:0	Displacer phase angle in 0.1 deg units	**RANGE:** 0 to 3599	
PARAMETER #:1	Operating frequency in 0.1 Hz units	**RANGE:** 306 to 400	
VERIFICATION:	Param #0 reflected by CSSFREQ_DMD; param #1 by CSSPH_DMD		
NOTES:	Default value for P0: 325 = 32.5 HzDefault value for P1: 550 = 55 deg.		

CMD ID#: 10	**MNEMONIC:** HIR_CSS_CNVRTR		
FUNCTION:	Select primary or secondary converters		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Disabled
PARAMETER #:0	Primary cnvrtrs (0) or secondary cnvrtrs (1)	**RANGE:** 0 to 1	
VERIFICATION:	CSS_DDCAG_STAT: bit #0 should reflect value of param #0; bit #1 should be inverse of bit #0.		
NOTES:	Default state for P0: 0 = primary converters selected		

CMD ID#: 11	**MNEMONIC:** HIR_CSS_LOCK		
FUNCTION:	Short or open CSS motor windings		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Compressor(0), Displacer(1).	**RANGE:** 0 to 1	
PARAMETER #:1	Cage(0), Prim_Uncage(1), Sec_Uncage(2).	**RANGE:** 0 to 2	
VERIFICATION:	CSS_DDCAG_STAT: bits #2 through #5: depends on parameter values: see this doc, Section 2.8.5		
NOTES:	The cooler cannot be operated until the motor windings have been uncaged.		

2.8.4.3 IPU-to-CSS Control Message Format

The content of Control and Data transfers between the IPU and CSS shall conform to the formats specified in the following subsections. Bit conventions shall be as follows:

a. Byte #0 shall be sent first. One byte = 8 bits.

b. Bytes shall be transmitted least significant bit (LSB) first.

c. Bits shall be numbered such that the LSB is bit #0.

The format of a Control Message from the IPU to the CSS is shown in Table 2.8.4.3-1. Table 2.8.4.3-2 shows how the bytes of the IPU-CSS Control Message are related to the parameters of the Instrument HIR_CSS_ Commands.

Table 2.8.4.3-1 IPU-CSS Control Message Format

Byte No.	Bits	FUNCTION	DESCRIPTION
0	8	Start-of-Header	Always ASCII SOH char (01hex)
1	8	Mode Word	Bit 0 - Electronics Only(EO)/Control (0 - EO, 1 - Control) Bit 1 - Manual Mode (0 - off, 1 - Man) Bit 2 - Thermostatic Mode (0 - off, 1 - Therm) Bit 3 - Warm-up Mode (0 - off, 1 - Warm-up) Bit 4 - Vibration Cancellation Mode (0 - off, 1 - on) Bit 5 - Diode Select (0 - diode 0, 1- diode 1)
2-3	16	Temp Set Point	Binary value corresponding to Commanded temp. Value (0 - 3000 => 0 - 300.0 K)
4-5	16	Frequency	Binary value corresponding to Commanded freq. Value (306 - 400 => 30.6 - 40.0 Hz)
6-7	16	Phase	Binary value corresponding to Commanded phase Value (0 - 3599 => 0 - 359.9 degrees)
8-9	16	Compressor Stroke Amplitude	Binary value corresponding to Commanded compressor amplitude in stroke mode or Max stroke amplitude in temp mode. Value (0 - 1000 => 0 - 100.0 percent full stroke)
10-11	16	Displacer Stroke Amplitude	Binary value corresponding to Commanded displacer amplitude in stroke mode or Max stroke amplitude in temp mode. Value (0 - 1000 => 0 - 100.0 percent full stroke)
12-13	16	Expansion 1	2 byte expansion word #1 (not currently allocated)
14-15	16	Expansion 2	2 byte expansion word #2 (not currently allocated)
16-17	16	Expansion 3	2 byte expansion word #3 (not currently allocated)
18-19	16	Expansion 4	2 byte expansion word #4 (not currently allocated)
20	8	Checksum	Binary XOR of bytes 0 through 19
21	8	End-of-Text	Always ASCII EOT char (04 hex)

Table 2.8.4.3-2 Mapping of CSS Control Message to Instrument Commands

Byte No.	Bits	FUNCTION	COMMAND MAPPING
0	8	Start-of-Header	N/A
1	8	Mode Word	HIR_CSS_MODE (Param #0 maps directly)
2-3	16	Temp Set Point	HIR_CSS_TEMP (Param #0 maps directly)
4-5	16	Frequency	HIR_CSS_FREQ (Param #0 maps directly)
6-7	16	Phase	HIR_CSS_FREQ (Param #1 maps directly)
8-9	16	Compressor Stroke Amplitude	HIR_CSS_TEMP (Param #1 maps directly)
10-11	16	Displacer Stroke Amplitude	HIR_CSS_TEMP (Param #2 maps directly)
12-13	16	Expansion 1	N/A
14-15	16	Expansion 2	N/A
16-17	16	Expansion 3	N/A
18-19	16	Expansion 4	N/A
20	8	Checksum	N/A
21	8	End-of-Text	N/A

2.8.4.4 Cooler Control Protocol (Summary)

A more detailed description of the Cooler control protocol may be found in the CSS Software Requirements Specification (SW-BLL-036).

2.8.4.5 Control Message

Each field in the Control Message is used at all times. All Control Messages must contain all valid information corresponding to the IPS desired state and parameters. For example, if the state of the CSS is currently:

Control state	On
Temp state	On
Vib cancellation	On
Diode	1
Temp Set Point	69.4
Frequency	34.2
Phase	55.9
Compressor Ampl	76.0%
Displacer Ampl	83.4%

and it is wished to change the Temp Set Point to 69.5, then all the following data must be sent:

Control state	On
Temp state	On
Vib cancellation	On
Diode	1
Temp Set Point	69.5
Frequency	34.2
Phase	55.9
Compressor Ampl	76.0%
Displacer Ampl	83.4%

2.8.4.6 Parameter Checking

At the receipt of each command the parameters will be checked against a priori minimum and maximum values. These will vary depending on the desired state of the system. The following table gives an example of the ranges of these parameters. The values given here are illustrative and are subject to update. If any parameter is outside the permitted range for the given Subsystem State, the command will be discarded and the "Last Command illegal parameter error" bit set in the error field of the Data Message.

Table 2.8.4.6-1 Parameter limits for each State

Parameter	Manual		Thermostatic		Warm-up	
	Min	Max	Min	Max	Min	Max
Temp Set Point	-	-	40	100	-	-
Frequency	30.6	40.0	30.6	40.0	30.6	40.0
Phase	50	70	50	70	290	310
Compressor Ampl	20	95	50	95	20	50
Displacer Ampl	20	95	50	95	20	50

2.8.4.7 Parameter Changing

During operation in a given state all parameters will be allowed to be varied with the exception of the Frequency. The value of the parameter will smoothly change to the new commanded value. The smooth transition will be reflected in the actual values sent back in the Data Message.

To change frequency the unit must be switched to the Electronics Only state and then a new frequency may be commanded.

2.8.4.8 Vibration Cancellation

The Vibration Cancellation Substate may be turned on at any time in either Manual or Thermostatic State. However, when vibration cancellation is first turned on the system goes through a calibration sequence. The parameter values obtained during this calibration are used for as long as Vibration Cancellation is enabled. For optimal results, Vibration Cancellation should not be enabled until the Cooler is close to its commanded operating temperature.

2.8.4.9 Discrete Pulse Control for Converter Selection and Caging Relays

Table 2.8.4.9-1 shows the discrete pulse functions at the IPU-CSS interface and how they map on to the HIR_CSS commands:

Table 2.8.4.9-1 Mapping of CSS Discrete Pulse Functions to Instrument Commands

FUNCTION	IPS-CSS INTERFACE SIGNAL NAME	COMMAND MAPPING	SEE NOTE
Select Primary Converters	CSS_PRI_SPPLY	HIR_CSS_CNVRTR Param #0 = 0	
Select Redundant Converters	CSS_RED_SPPLY	HIR_CSS_CNVRTR Param #0 = 1	
Cage Compressor Drive Coils	CSS_CMCAGE	HIR_CSS_LOCK Param #0 = 1; param #1 = 0	
Uncage Compressor Drive Coils (Prim.)	CSS_PRI_CMUNCAGE	HIR_CSS_LOCK Param #0 = 2; param #1 = 0	
Uncage Compressor Drive Coils (Redt.)	CSS_RED_CMUNCAGE	HIR_CSS_LOCK Param #0 = 2; param #1 = 0	1
Cage Displacer Drive Coils	CSS_DSCAGE	HIR_CSS_LOCK Param #1 = 1; param #0 = 0	1
Uncage Displacer Drive Coils (Prim.)	CSS_PRI_DSUNCAGE	HIR_CSS_LOCK Param #1 = 2; param #0 = 0	2
Uncage Displacer Drive Coils (Redt.)	CSS_RED_DSUNCAGE	HIR_CSS_LOCK Param #1 = 2; param #0 = 0	2

Note 1: Instrument command shall send discrete pulse to both primary & redundant sides.

Note 2: Instrument command shall send discrete pulse to both primary & redundant sides.

2.8.5 CSS Telemetry

2.8.5.1 CSS Telemetry Summary

ID#	SCIENCE CHANNEL MNEMONIC	CONV ALG	NAME	DESCRIPTION
327	CSS_OPSTATUS	-	Cooler operating status	
328	CSS_DDCAG_STAT	-	Cooler DDC & caging status	
329	CSS_ERROR	-	Cooler error flags	
330	CSS_CURRENT	M	Cooler tot mean currt	
331	CRYOTIP_SETP	N1	Cryo tip temp set point	
332	CRYOTIP_TMP_D0	N1	Cryo tip temperature 0	
333	CRYOTIP_TMP_D1	N1	Cryo tip temperature 1	
334	CSS_FREQ_DMD	P	Cooler frequency (dmd'd)	
335	CSS_FREQ_ACT	P	Cooler frequency (actual)	
336	CSS_PH_DMD	N2	Comp/Disp phase (dmd'd)	
337	CSS_PH_ACT	N2	Comp/Disp phase (actual)	
338	COMP_AMP_DMD	N3	Compressor ampl (dmd'd)	
339	COMP_AMP_ACT	N3	Compressor ampl (actual)	
340	DISP_AMP_DMD	N3	Displacer ampl (dmd'd)	
341	DISP_AMP_ACT	N3	Displacer ampl (actual)	
342	CSS_MSG_NUMBER	-	CSS-IPS data msg number	
343	CSS_CSCI_BUILD_ID	-	Cooler F/W Build Version ID	

2.8.5.2 Data Message Format

A Data Message will be updated and sent autonomously at the beginning of each CSS software control loop. The loop rate will vary depending on the current mode of operation. Approximate telemetry rates for each control state are:

- Electronics Only — Approximately every 3 seconds
- Manual Control — Approximately every 9 seconds
- Temp Control — Approximately every 9 seconds
- Warm-up mode — Approximately every 9 seconds
- Manual with Vibration Cancellation — Approximately every 18 seconds
- Temp with Vibration Cancellation — Approximately every 18 seconds
- Vibration Cancellation Calibration — Once, after approximately 70 seconds

The format and content of a Data Message from the CSS to the IPS is shown in Table 2.8.5.2-1. All values will be sent MSB-first..

The “Valid in EO state” column indicates whether the data in the respective field will be valid when the cooler is in the Electronics Only state. All other data will be zeros. At 19,200 bits/s, the time to transmit one telemetry message will be ~21 ms.

The CSS Data words shall be mapped on to the Instrument Telemetry Stream as shown in Table 2.8.5.2-2.

Table 2.8.5.2-1 Format and Content of CSS-IPU Data Message

Byte No.	Bits	FUNCTION	Valid in EO State	De-fault Value	DESCRIPTION
0	8	Start-of-Header	yes	01h	Always ASCII SOH char (01h)
1	8	Status Word	yes	01h	Bit 0 - Electronics Only(EO)/Control (0 - EO, 1 -Control) Bit 1 - Manual Mode (0 - off, 1 - Man) Bit 2 - Thermostatic Mode (0 - off, 1 - Therm) Bit 3 - Warm-up Mode (0 - off, 1 - Warm-up) Bit 4 - Vibration Cancellation Mode (0 - off, 1 - on) Bit 5 - Diode Select (0 - diode 0, 1- diode 1)
2	8	Error Value	yes	00h	Bit 0 - Overstroke error Bit 1 - Just been reset (Watchdog time-out/just powered on) Bit 2 - Last Command transmission error Bit 3 - Last Command illegal state error Bit 4 - Last Command illegal parameter error Bit 5 - Overtemp error in warm-up state
3-4	16	Operating Current	yes	-	Binary value corresponding to operating current Value (0 - 50 => 0 - 5.0 amps)
5-6	16	Temp Set Point	no	-	Binary value corresponding to commanded temp. Value (0 - 3000 => 0 - 300.0 K)
7-8	16	Diode 0 Temp	yes	-	Binary value corresponding to temp read from diode 0. Value (0 - 3000 => 0 - 300.0 K)
9-10	16	Diode 1 Temp	yes	-	Binary value corresponding to temp read from diode 1. Value (0 - 3000 => 0 - 300.0 K)
11-12	16	Commanded Frequency	no	32.5	Binary value corresponding to commanded freq. Value (306 - 400 => 30.6 - 40.0 Hz)
13-14	16	Actual Frequency	no	32.5	Binary value corresponding to actual freq. (not really measured) Value (306 - 400 => 30.6 - 40.0 Hz)

/ Table 2.8.5.2-1 continued on next page . . . . .

Table 2.8.5.2-1 continued ...

Byte No.	Bits	FUNCTION	Valid in EO State	De-fault Value	DESCRIPTION
15-16	16	Commanded Phase	no	55.0	Binary value corresponding to commanded phase Value (0 - 3599 => 0 - 359.9 degrees)
17-18	16	Actual Phase	no	55.0	Binary value corresponding to actual phase Value (0 - 3599 => 0 - 359.9 degrees)
19-20	16	Commanded Compressor Amplitude	no	50.0	Binary value corresponding to commanded compressor amplitude in stroke mode or, Max stroke amplitude in temp mode. Value (0 - 1000 => 0 - 100.0 % full stroke)
21-22	16	Actual Compressor Amplitude	no	-	Binary value corresponding to actual compressor amplitude Value (0 - 1000 => 0 - 100.0 % full stroke)
23-24	16	Commanded Displacer Amplitude	no	50.0	Binary value corresponding to commanded displacer amplitude in stroke mode or Max stroke amplitude in temp mode. Value (0 - 1000 => 0 - 100.0 % full stroke)
25-26	16	Actual Displacer Amplitude	no	-	Binary value corresponding to actual displacer amplitude Value (0 - 1000 => 0 - 100.0 % full stroke)
27-28	16	Expansion 1	yes	See Note	Compressor amplitude at fundamental frequency
29-30	16	Expansion 2	yes	See Note	Compressor amplitude at first harmonic
31-32	16	Expansion 3	yes	See Note	Displacer amplitude at fundamental frequency
33-34	16	Expansion 4	yes	See Note	Displacer amplitude at first harmonic
35	8	Message No.	yes	-	Binary message number (mod 255) of this transmission. Incremented with each new telemetry string.
36	8	Version ID 1	yes	-	Binary main version number of this software.
37	8	Version ID 2	yes	-	Binary subversion number of this software.
38	8	Checksum	yes	-	Binary XOR of bytes 0 through 37
39	8	End-of-Text	yes	04h	Always ASCII EOT char (04h)

Note:- bits 27 through 34 : used on PFM only

Table 2.8.5.2-2 Mapping of CSS Data Message to Telemetry Mnemonics

Byte No.	Bits	FUNCTION	TELEMETRY LIST		
			MNEMONIC	Bits	MASK
0	8	Start-of-Header	Not passed to telemetry		
1	8	Status Word	CSS_OPSTATUS	8	FF
2	8	Error Value	CSS_ERROR	8	FF
3-4	16	Operating Current	CSS_CURRENT	8	00FF
5-6	16	Temp Set Point	CRYOTIP_SETP	16	FFFF
7-8	16	Diode 0 Temp	CRYOTIP_TMP_D0	16	FFFF
9-10	16	Diode 1 Temp	CRYOTIP_TMP_D1	16	FFFF
11-12	16	Commanded Frequency	CSS_FREQ_DMD	8	00FF
13-14	16	Actual Frequency	CSS_FREQ_ACT	8	00FF
15-16	16	Commanded Phase	CSS_PH_DMD	16	FFFF
17-18	16	Actual Phase	CSS_PH_ACT	16	FFFF
19-20	16	Commanded Compressor Amplitude	COMP_AMP_DMD	16	FFFF
21-22	16	Actual Compressor Amplitude	COMP_AMP_ACT	16	FFFF
23-24	16	Commanded Displacer Amplitude	DISP_AMP_DMD	16	FFFF
25-26	16	Actual Displacer Amplitude	DISP_AMP_ACT	16	FFFF
27-28	16	Expansion 1	Unit test only - not passed to telemetry		
29-30	16	Expansion 2	Unit test only - not passed to telemetry		
31-32	16	Expansion 3	Unit test only - not passed to telemetry		
33-34	16	Expansion 4	Unit test only - not passed to telemetry		
35	8	Message No.	CSS_MSG_NUMBER	8	FF
36	8	Version ID 1	CSS_CSCI_BUILD_ID (bits 15 thro' 8)	8	FF
37	8	Version ID 2	CSS_CSCI_BUILD_ID (bits 7 thro' 0)	8	FF
38	8	Checksum	Not passed to telemetry		
39	8	End-of-Text	Not passed to telemetry		

2.8.5.3 Error Flags

Any error flag in the Data Message will be sent continuously until a new (valid) command is received from the IPS. At that time the error flags will be cleared.

2.8.5.4 Checksum

If the checksum on an incoming command does not equal the calculated value the message will be ignored and the "last command transmission error" bit set in the error field.

2.8.5.5 DC-DC Converter Selection and Caging Relay Status Telemetry

Table 2.8.5.5-1 shows the telemetry channels used to verify the status of the internal CCU power converter selection relays, and the state of the Compressor & Displacer caging relays; these items are directly hard-wired from the CCU to the IPU. In each case the monitor relay contact circuit is CLOSED in the CAGED state. Table 2.8.5.5-1 also shows how these monitor functions map on to the Instrument Telemetry List.

Table 2.8.5.5-1 Converter Selection and Caging Status Telemetry

FUNCTION	IPS-CSS INTERFACE SIGNAL NAME	MAPPING TO TELEMETRY LIST MNEMONIC	
Converter ch/over relay status	CSS_SPPLYMON	CSS_DDCAG _STAT: bit #0:	0 = Prim. converters selected 1 = Redt. converters selected
		CSS_DDCAG _STAT: bit #1:	0 = Redt. converters selected 1 = Prim. converters selected
Compressor 1 caging relay status	CSS_C1MON	CSS_DDCAG _STAT: bit #2	0 = Compressor 1 Uncaged 1 = Compressor 1 Caged
Compressor 2 caging relay status	CSS_C2MON	CSS_DDCAG _STAT: bit #3	0 = Compressor 2 Uncaged 1 = Compressor 2 Caged
Displacer 1 caging relay status	CSS_D1MON	CSS_DDCAG _STAT: bit #4	0 = Displacer 1 Uncaged 1 = Displacer 1 Caged
Displacer 2 caging relay status	CSS_D2MON	CSS_DDCAG _STAT: bit #5	0 = Displacer 2 Uncaged 1 = Displacer 2 Caged

2.9 PSS - Power Supply Subsystem

2.9.1 Brief Functional Description

The Power Supply Subsystem (PSS) consists of a single entity, the Power Converter Unit (PCU. The PCU contains redundant groups of DC-DC Converters (DDC), redundant power switching relays and redundant PCU control and telemetry electronics.

The HIRDLS Quiet and Noisy Bus A and B power inputs are routed to the PCU (the Survival Heater power inputs are not). The Quiet Bus power is routed directly to the IPU (A input to A side; B input to B side) without further switching. It is also used within the PCU for all the DDCs, and is also routed - via relay switches - to the TEU and GEU. The PCU A-side control and telemetry electronics interfaces with the A side of the IPU; similarly the B side to B side. The Noisy Bus inputs are routed, via relay switches in the PCU, to the Cooler Subsystem

All relay switches are controlled by means of serial control words transmitted from the IPU to the PCU where they are decoded by the control logic, except for a small number of functions controlled by discrete pulses from the IPU.

2.9.2 Operational States and State Transitions

The Power Supply Subsystem has a large number of state combinations involving input switching status and load switching status, both in prime and redundant configurations. The main operational states and transitions during a normal Instrument Activation Sequence are described below. [Note: Survival Heater Bus power is not handled by the PSS.]

All HIRDLS power OFF:

Both QB and NB inputs from S/C are OFF; PCU non-latching input relays are in the OFF state; no power available to any HIRDLS subsystem.

HIRDLS QB power ON:

S/C QB input (A or B) is ON; primary power available through PCU to IPU, and to internal PCU circuits; PCU telemetry available to IPU; IPU can send control signals to PCU; all other subsystems unpowered.

PCU Subsystem Converters ON:

One of four PCU non-latching input relays ON; power available for all DC-DC converters; converter inputs switched ON in turn; outputs verified via telemetry; no loads connected.

Subsystems (except CSS) ON:

PCU output relays switched on in turn to provide primary and secondary power to subsystems; in each case either A side or B side of subsystem selected (where applicable); for each output either prime or redundant output relay used.

HIRDLS NB power ON:

S/C NB input (A or B) is ON; 29V available to CSS power relays in PCU.

CSS input power ON:

Selected A or B CSS power relay in PCU ON; Noisy Bus power available to CSS; CCU contains further power switching relays.

In the event of an unannounced S/C (QB) power outage, the PCU non-latching input relay will be released, so preventing uncontrolled re-powering of subsystems if S/C power reappears unexpectedly. All latched-ON PCU input and output relays would remain ON, but these will be reset by IPU macros at the beginning of the next Activation Sequence, before power applied to subsystem converters.

The internal PCU control and telemetry circuits are powered from one of two PCU "internal" converters. The default state for these is that one is connected to the QBA input and the other to the QBB input, so that the PCU internal circuits will normally be powered up as soon as either S/C QB input is switched on. For further details see para. 2.9.4.2.

2.9.3 Power Switching Approach

All power switching within the HIRDLS Instrument is controlled by ground commands, except for a limited number of (power OFF) 'safeing' commands which may be generated by the IPU Fault Management process. Two commands, HIR_PSS_SWITCH and HIR_PSS_DISCRETE, are used for power control within HIRDLS. The HIR_PSS _SWITCH command is used to perform the majority of switching functions. This command possesses two parameters, and is interpreted on receipt by the IPU in one of two ways: (a) as a single switching instruction to be passed directly to the PCU, or (b) as an instruction to invoke a Power Switching Macro (PSM).

The two parameters are defined as follows:-

Parameter #0: "PSS Function code (PFC)": range 0 to 63: when Param #0 = 00 the command is interpreted as an IRC (see below); when Param #0 = 01 thro' 63 the command is interpreted either as an IRC (if only one Control Word is required by the PCU) or as a PSM Execute command, where the IRC or PSM to be executed is based on the PFC value; each PSM is a pre-determined sequence of IRCs, with an interval required between consecutive IRCs;

Parameter #1: Param #1 is interpreted according to the value of Param #0:-

When Param #0 = 00, the value of Param #1 lies in the range 0000 to FFFF (hex), and indicates the IRC (individual relay control) Code given in Table 2.9.5-1;

When Param #0 > 00, the value of Param #1 is 0 or 1, where 0 = OFF, Inhibit, A side, etc. and 1 = ON, Enable, B side, etc.2.9.4 Discrete Pulse Commands

2.9.4 PSS Command & Control

2.9.4.1 Description & Verification of PSS Commands

CMD ID#: 25	**MNEMONIC:** HIR_PSS_SWITCH		
FUNCTION:	Send a function code and action to PSS		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Disabled
PARAMETER #:0	PSS Function Code (see notes)		**RANGE:** 0 to 63
PARAMETER #:1	PSS Action (see notes)		**RANGE:** 0 to 65535
VERIFICATION:	PSS_STATUS_nn: depends on parameter values: see this doc, Section 2.9.5		
NOTES:	If P0 = 0, the value of P1 will be passed directly to the PSS as an Individual Relay Command (IRC). If P0 >0 an IPU Power Switching Macro (PSM) will be executed. A PSM contains a sequence of IRCs. See the HIR_MAC_EXE command for additional information.		

CMD ID#: 26	MNEMONIC: HIR_PSS_DISCRETE		
FUNCTION:	Send a discrete pulse to the PSS		
C, T, S ATTRIBUTES:	CLASS: Operational	TYPE: Flight	SAIL: Never
PARAMETER #:0	Discrete Channel (see notes)	RANGE: 1 to 6	
VERIFICATION:	PSS_STATUS_02: bits 12 & 13: depends on whether QBA or QBB is on: see truth table in this doc, Section 2.9.4.2		
NOTES:	Starting at the next chopper revolution, and ending at the following chopper revolution,the IPU software will activate one of the 6 PSS relay discrete pulses. Param #0 = 1 will connect PCU Internal Supply A to QBA and Supply B to QBB. Param #0 = 2 will connect PCU Internal Supply B to QBA and Supply A to QBB. Param #0 = 3 thro' 6 are not used.		

2.9.4.2 Discrete Pulses from IPU to PSS

The command HIR_PSS_DISCRETE may be used to change the cross-strapping configuration between the PCU "internal" converters and the QB inputs. The default configuration is A-to-A, B-to-B, and does not need to be changed except for testing or in the event of a malfunction.

The HIR_PSS_DISCRETE command has a single parameter #0 with the values and functions shown in Table 2.9.4.2-1. According to the value of Parameter #0, the IPU generates a 20 ms pulse routed to the appropriate PCU relay coils.

Table 2.9.4.2-1 HIR_PSS_DISCRETE Command Functions

PARAM #0 VALUE	FUNCTION
1	Connect PCU Internal Supply A to QBA; Connect PCU Internal Supply B to QBB.
2	Connect PCU Internal Supply A to QBB; Connect PCU Internal Supply B to QBA.

Command verification is according to the following truth table:-

Table 2.9.4.2-2 HIR_PSS_DISCRETE Command Verification Truth Table

PARAM #0 VALUE	QUIET BUS STATUS	PSS_STATUS_02	
		BIT #12	BIT #13
1	QBA ON	1	0
1	QBB ON	0	1
2	QBA ON	0	1
2	QBB ON	1	0

2.9.4.3 Individual Relay Control (IRC) Words

Each IRC Word from the IPU to the PCU shall be 16 bits, transmitted MSB-first. Consecutive IRCs shall have a minimum interval between of 45 ms.

Table 2.9.4.3-1 lists each of the individual PCU relay switch functions and the corresponding 16-bit hex code for the IRC Word. Each of these can be initiated by a separate Ground Command, in which case the Command HIR_PSS_SWITCH has Param #0 set to zero, and Param #1 set to the required hex code.

Table 2.9.4.3-1 also indicates the PSS STATUS telemetry item & bit # which may be used to verify execution of the IRC. **Note 1** :- it is assumed here that any normally-preceding power-switching steps have been performed - if not, some of the verification conditions will not apply. **Note 2** :- in some PSM sequences (para. 2.9.4.4) the intermediate states of the power switches do not conform to the condition described in Note 1, and attempts to verify status may fail. The verification data given for each PSM relates to the expected status after the complete PSM has been executed.

Table 2.9.4.3-1 Individual Relay Control (IRC) Codes &Telemetry Verification

INDIVIDUAL RELAY CONTROL FUNCTION	IRC HEX CODE	USED IN PWR SWITCHING MACRO #	VERIFICATION TELEM (PSS_STATUS_ XX) MNEMONIC, BIT
Internal +28QA Power Bus (prim) ON	F00A	-	_07, 0 = 1 AND _07, 4 = 1
Internal +28QA Power Bus (redt) ON	D00A	-	_07, 1 = 1 AND _07, 4 = 1
Internal +28QB Power Bus (prim) ON	F00B	-	_07, 2 = 1 AND _07, 4 = 1
Internal +28QB Power Bus (redt) ON	D00B	-	_07, 3 = 1 AND _07, 4 = 1
NBA (prim) Select	F01C	04	_03, 1 = 1 AND _03, 2 = 1
NBA (prim) Deselect	E01C	03, 05, 07, 08	_03, 1 = 0 AND _03, 2 = 0
NBA (redt) Select	D01C	05	_03, 0 = 1 AND _03, 2 = 1
NBA (redt) Deselect	C01C	03, 04, 07, 08	_03, 0 = 0 AND _03, 2 = 0
NBB (prim) Select	F01D	07	_03, 2 = 1 AND _03, 5 = 1
NBB (prim) Deselect	E01D	04, 05, 06, 08	_03, 2 = 0 AND _03, 5 = 0
NBB (redt) Select	D01D	08	_03, 2 = 1 AND _03, 6 = 1
NBB (redt) Deselect	C01D	04, 05, 06, 07	_03, 2 = 0 AND _03, 6 = 0
SPU +5 V & +/-15 V (Conv. A) ON	B005	10	_02, 14 = 1
SPU +5 V & +/-15 V (Conv. A) OFF	A005	01, 12	_02, 14 = 0
SPU +5 V & +/-15 V (Conv. B) ON	9005	12	_02, 15 = 1
SPU +5 V & +/-15 V (Conv. B) OFF	8005	01, 10	_02, 15 = 0
SYS +5 V & +28 V_REG (Conv. A) ON	B001	13	_00, 12 = 1 AND _00, 14 = 1
SYS +5 V & +28 V_REG (Conv. A) OFF	A001	01, 14	_00, 12 = 0 AND _00, 14 = 0
SYS +5 V & +28 V_REG (Conv. B) ON	9001	14	_00, 13 = 1 AND _00, 15 = 1
SYS +5 V & +28 V_REG (Conv. B) OFF	8001	01, 13	_00, 13 = 0 AND _00, 15 = 0
SYS +15 V & -15 V (Conv. A) ON	B002	15	_01, 12 = 1 AND _01, 14 = 1
SYS +15 V & -15 V (Conv. A) OFF	A002	01, 16	_01, 12 = 0 AND _01, 14 = 0
SYS +15 V & -15 V (Conv. B) ON	9002	16	_01, 13 = 1 AND _01, 15 = 1
SYS +15 V & -15 V (Conv. B) OFF	8002	01, 15	_01, 13 = 0 AND _01, 15 = 0
TEU A (prim) +28Q ON	F014	18	_06, 1 = 1 AND _06, 2 = 1
TEU A (prim) +28Q OFF	E014	02, 17, 19, 21, 22	_06, 1 = 0 AND _06, 2 = 0
TEU A (redt) +28Q ON	D014	19	_06, 0 = 1 AND _06, 2 = 1
TEU A (redt) +28Q OFF	C014	02, 17, 18, 21, 22	_06, 0 = 0 AND _06, 2 = 0

Table 2.9.4.3-1 continued on next page . . . . .

Table 2.9.4.3-1 continued ...

INDIVIDUAL RELAY CONTROL FUNCTION	IRC HEX CODE	USED IN PWR SWITCHING MACRO #	VERIFICATION TELEM (PSS_STATUS_ XX) MNEMONIC, BIT
TEU B (prim) +28Q ON	F015	21	_06, 4 = 1 AND _06, 5 = 1
TEU B (prim) +28Q OFF	E015	02, 18, 19, 20, 22	_06, 4 = 0 AND _06, 5 = 0
TEU B (redt) +28Q ON	D015	22	_06, 4 = 1 AND _06, 5 = 0
TEU B (redt) +28Q OFF	C015	02, 18, 19, 20, 21	_06, 4 = 0 AND _06, 5 = 0
IPU (A Side) +28REG (prim) ON	F002	24	_00, 1 = 1 AND _00, 2 = 1
IPU (A Side) +28REG (prim) OFF	E002	02, 23, 25, 27, 28	_00, 1 = 0 AND _00, 2 = 0
IPU (A Side) +28REG (redt) ON	D002	25	_00, 0 = 1 AND _00, 2 = 1
IPU (A Side) +28REG (redt) OFF	C002	02, 23, 24, 27, 28	_00, 0 = 0 AND _00, 2 = 0
IPU (B Side) +28REG (prim) ON	F003	27	_00, 4 = 1 AND _00, 5 = 1
IPU (B Side) +28REG (prim) OFF	E003	02, 24, 25, 26, 28	_00, 4 = 0 AND _00, 5 = 0
IPU (B Side) +28REG (redt) ON	D003	28	_00, 4 = 1 AND _00, 5 = 0
IPU (B Side) +28REG (redt) OFF	C003	02, 24, 25, 26, 27	_00, 4 = 0 AND _00, 5 = 0
GEU +28Q (prim) ON	F016	30	_06, 6 = 1 AND _06, 7 = 1
GEU +28Q (prim) OFF	E016	02, 29, 31	_06, 6 = 0 AND _06, 7 = 0
GEU +28Q (redt) ON	D016	31	_06, 6 = 0 AND _06, 7 = 1
GEU +28Q (redt) OFF	C016	02, 29, 30	_06, 6 = 0 AND _06, 7 = 0
GEU +5 V (prim) ON	F004	33, 34	_02, 1 = 1 AND _02, 2 = 1
GEU +5 V (prim) OFF	E004	02, 32, 35, 36	_02, 1 = 0 AND _02, 2 = 0
GEU +5 V (redt) ON	D004	35, 36	_02, 0 = 1 AND _02, 2 = 1
GEU +5 V (redt) OFF	C004	02, 32, 33, 34	_02, 0 = 0 AND _02, 2 = 0
GEU +15 V & -15 V (prim) ON	F005	33, 35	_02, 4 = 1 AND _02, 5 = 1 AND _02, 6 = 1 AND _02, 7 = 1
GEU +15 V & -15 V (prim) OFF	E005	02, 32, 34, 36	_02, 4 = 0 AND _02, 5 = 0 AND _02, 6 = 0 AND _02, 7 = 0
GEU +15 V & -15 V (redt) ON	D005	34, 36	_02, 4 = 1 AND _02, 5 = 0 AND _02, 6 = 0 AND _02, 7 = 1

Table 2.9.4.3-1 continued on next page . . . . .

Table 2.9.4.3-1 continued ...

INDIVIDUAL RELAY CONTROL FUNCTION	IRC HEX CODE	USED IN PWR SWITCHING MACRO #	VERIFICATION TELEM (PSS_STATUS_ XX) MNEMONIC, BIT
GEU +15 V & -15 V (redt) OFF	C005	02, 32, 33, 35	_02, 4 = 0 AND _02, 5 = 0 AND _02, 6 = 0 AND _02, 7 = 0
SPU A +5 V ON	F018	38	No verification from PCU telemetry. Verify by inspecting status of SPU_P5VOLTS_A
SPU A +5 V OFF	E018	02, 37, 40	No verification from PCU telemetry. Verify by inspecting status of SPU_P5VOLTS_A
SPU B +5 V ON	D018	40	No verification from PCU telemetry. Verify by inspecting status of SPU_P5VOLTS_B
SPU B +5 V OFF	C018	02, 38, 39	No verification from PCU telemetry. Verify by inspecting status of SPU_P5VOLTS_B
SPU A +15 V & -15 V ON	F019	38	PSS_SPU_P15VA
SPU A +15 V & -15 V OFF	E019	02, 37, 40	
SPU B +15 V & -15 V ON	D019	40	PSS_SPU_P15VB
SPU B +15 V & -15 V OFF	C019	02, 38, 39	
TEU A +5 V (prim) ON	F00C	42	_01, 1 = 1 AND _01, 2 = 1
TEU A +5 V (prim) OFF	E00C	02, 41, 43, 48, 49, 51, 52	_01, 1 = 0 AND _01, 2 = 0
TEU A +5 V (redt) ON	D00C	43	_01, 0 = 1 AND _01, 2 = 1
TEU A +5 V (redt) OFF	C00C	02, 41, 42, 48, 49, 51, 52	_01, 0 = 0 AND _01, 2 = 0
TEU A +15 V & -15 V (prim) ON	F00D	45	_01, 4 = 1 AND _01, 5 = 1 AND _01, 6 = 1 AND _01, 7 = 1
TEU A +15 V & -15 V (prim) OFF	E00D	02, 44, 46, 48, 49, 51, 52	_01, 4 = 0 AND _01, 5 = 0 AND _01, 6 = 0 AND _01, 7 = 0
TEU A +15 V & -15 V (redt) ON	D00D	46	_01, 4 = 1 AND _01, 5 = 0 AND _01, 6 = 0 AND _01, 7 = 1
TEU A +15 V & -15 V (redt) OFF	C00D	02, 44, 45, 48, 49, 51, 52	_01, 4 = 0 AND _01, 5 = 0 AND _01, 6 = 0 AND _01, 7 = 0

INDIVIDUAL RELAY CONTROL FUNCTION	IRC HEX CODE	USED IN PWR SWITCHING MACRO #	VERIFICATION TELEM (PSS_STATUS_ XX) MNEMONIC, BIT
TEU B +5 V (prim) ON	F010	48	_04, 1 = 1 AND _04, 2 = 1
TEU B +5 V (prim) OFF	E010	02, 42, 43, 45, 46, 47, 49	_04, 1 = 0 AND _04, 2 = 0
TEU B +5 V (redt) ON	D010	49	_04, 0 = 1 AND _04, 2 = 1
TEU B +5 V (redt) OFF	C010	02, 42, 43, 45, 46, 47, 48	_04, 0 = 0 AND _04, 2 = 0
TEU B +15 V & -15 V (prim) ON	F011	51	_04, 4 = 1 AND _04, 5 = 1 AND _04, 6 = 1 AND _04, 7 = 1

Table 2.9.4.3-1 continued on next page . . . . .

Table 2.9.4.3-1 continued ...

INDIVIDUAL RELAY CONTROL FUNCTION	IRC HEX CODE	USED IN PWR SWITCHING MACRO #	VERIFICATION TELEM (PSS_STATUS_ XX) MNEMONIC, BIT
TEU B +15 V & -15 V (prim) OFF	E011	02, 42, 43, 45, 46, 50, 52	_04, 4 = 0 AND _04, 5 = 0 AND _04, 6 = 0 AND _04, 7 = 0
TEU B +15 V & -15 V (redt) ON	D011	52	_04, 4 = 1 AND _04, 5 = 0 AND _04, 6 = 0 AND _04, 7 = 1
TEU B +15 V & -15 V (redt) OFF	C011	02, 42, 43, 45, 46, 50, 51	_04, 4 = 0 AND _04, 5 = 0 AND _04, 6 = 0 AND _04, 7 = 0
EEA +5 V (prim) ON	F008	54, 55	_05, 1 = 1 AND _05, 2 = 1
EEA +5 V (prim) OFF	E008	02, 53, 56, 57	_05, 1 = 0 AND _05, 2 = 0
EEA +5 V (redt) ON	D008	56, 57	_05, 0 = 1 AND _05, 2 = 1
EEA +5 V (redt) OFF	C008	02, 53, 54, 55	_05, 0 = 0 AND _05, 2 = 0
EEA +15 V & -15 V (prim) ON	F009	54, 56	_05, 4 = 1 AND _05, 5 = 1 AND _05, 6 = 1 AND _05, 7 = 1
EEA +15 V & -15 V (prim) OFF	E009	02, 53, 55, 57	_05, 4 = 0 AND _05, 5 = 0 AND _05, 6 = 0 AND _05, 7 = 0
EEA +15 V & -15 V (redt) ON	D009	55, 57	_05, 4 = 1 AND _05, 5 = 0 AND _05, 6 = 0 AND _05, 7 = 1
EEA +15 V & -15 V (redt) OFF	C009	02, 53, 54, 56	_05, 4 = 0 AND _05, 5 = 0 AND _05, 6 = 0 AND _05, 7 = 0
SYS +5 V Conv. A Output Select	B009	13	not independently verified
SYS +5 V Conv. B Output Select	9009	14	not independently verified
SYS +28 V_REG Conv. A Output Select	B00C	13	not independently verified
SYS +28 V_REG Conv. B Output Select	900C	14	not independently verified
SYS +15 V Conv. A Output Select	B00A	15	not independently verified
SYS +15 V Conv. B Output Select	900A	16	not independently verified
SYS -15 V Conv. A Output Select	B00B	15	not independently verified
SYS -15 V Conv. B Output Select	900B	16	not independently verified

2.9.4.4 PSS Function Codes & PSM Code Sequences

PSS Function Codes (PFC) have been assigned to each of the switching functions shown in Fig. 2 of document SP-HIR-169 "HIRDLS Power Distribution, Switching & Grounding". Parameters of the command HIR_PSS_SWITCH correspond to each of these PCU power switching functions. Each PFC has been assigned two command parameters as explained in para 2.9.3 above. The first parameter identifies the function and the second parameter defines the required final state of the associated switch(es).

In most cases, a power-switching operation requires two or more IRCs to be transmitted from the IPU to the PCU in a predetermined sequence which includes time delays. These sequences have been implemented as Power Switching Macros (PSM) within the IPU. Table 2.9.4.4-1 defines the PSM and IRC Hex Code sequence to be sent to the PCU on receipt by the IPU of a given PFC. The right hand column shows the telemetry verification status **on completion of the macro**.

Table 2.9.4.4-1 PFCs , PSMs and IRC Hex Code Sequences

PFC (Params #0, #1)	**PSM #**	**SWITCHING FUNCTION**	**IRC CODE SEQUENCE** (control words shall be separated by approx 100 ms interval)	**VERIFICATION TELEM (PSS_STATUS_ XX) MNEMONIC, BIT**
08, 0	PSM-01	Reset Converter Input Relays to OFF	8005 - A005 - 8002 - A002 - 8001 - A001	Verify PSM-01 and -02 together - see next row
09, 0	PSM-02	Reset Load Pwr Relays to OFF	C019 - C018 - E019 - E018 - C016 - E016 - C005 - C004 - E005 - E004 - C009 - C008 - E009 - E008 - C011 - C00D - E011 - E00D - C010 - C00C - E010 - E00C - E014 - C014 - E015 - C015 - E002 - C002 - E003 - C003	ALL bits of all words = 0 ASSUMING PSM-01 also sent. Stan to confirm this is meaningful
10,1	PSM-58	Prim. Internal +28QA Pwr Bus On (self-latch)	F00A	_07, 0 = 1 AND _07, 4 = 1
11,1	PSM-59	Redt. Internal +28QA Pwr Bus On (self-latch)	D00A	_07, 1 = 1 AND _07, 4 = 1
12,1	PSM-60	Prim. Internal +28QB Pwr Bus On (self-latch)	F00B	_07, 2 = 1 AND _07, 4 = 1
13,1	PSM-61	Redt. Internal +28QB Pwr Bus On (self-latch)	D00B	_07, 3 = 1 AND _07, 4 = 1
18, 0	PSM-03	CSS Inhibit Pwr from Noisy Bus A (prim & redt)	E01C - C01C	_03, 0 = 0 AND _03, 2 = 0
18, 1	PSM-04	CSS Enable Pwr to Noisy Bus A (prim)	E01D - C01D - C01C - F01C	_03, 1 = 1 AND _03, 2 = 1
18, 2	PSM-05	CSS Enable Pwr to Noisy Bus A (redt)	E01D - C01D - E01C - D01C	_03, 0 = 1 AND _03, 2 = 1
19, 0	PSM-06	CSS Inhibit Pwr from Noisy Bus B (prim & redt)	E01D - C01D	_03, 2 = 0 AND _03, 6 = 0
19, 1	PSM-07	CSS Enable Pwr to Noisy Bus B (prim)	E01C - C01C - C01D - F01D	_03, 2 = 1 AND _03, 5 = 1
19, 2	PSM-08	CSS Enable Pwr to Noisy Bus B (redt)	E01C - C01C - E01D - D01D	_03, 2 = 1 AND _03, 6 = 1

Table 2.9.4.4-1 continued on next page . . . . .

Table 2.9.4.4-1 continued ...

PFC (Params #0, #1)	PSM #	SWITCHING FUNCTION	IRC CODE SEQUENCE (control words shall be separated by approx 100 ms interval)	VERIFICATION TELEM (PSS_STATUS_ XX) MNEMONIC, BIT
22, 0	PSM-62	SPU +5/+/-15 Converter Group A OFF	A005	_02, 14 = 0
22, 1	PSM-10	SPU +5/+/-15 Converter Group A ON	8005 - B005	_02, 14 = 1
23, 0	PSM-63	SPU +5/+/-15 Converter Group B OFF	8005	_02, 15 = 0
23, 1	PSM-12	SPU +5/+/-15 Converter Group B ON	A005 - 9005	_02, 15 = 1
26, 0	PSM-64	SYSTEM +5/+28 Converter Group A OFF	A001	_00, 12 = 0 AND _00, 14 = 0
26, 1	PSM-13	SYSTEM +5/+28 Converter Group A ON	8001 - B009 - B00C - B001	_00, 12 = 1 AND _00, 14 = 1
27, 0	PSM-65	SYSTEM +5/+28 Converter Group B OFF	8001	_00, 13 = 0 AND _00, 15 = 0
27, 1	PSM-14	SYSTEM +5/+28 Converter Group B ON	A001 - 9009 - 900C - 9001	_00, 13 = 1 AND _00, 15 = 1
28, 0	PSM-66	SYSTEM +15/-15 Converter Group A OFF	A002	_01, 12 = 0 AND _01, 14 = 0
28, 1	PSM-15	SYSTEM +15/-15 Converter Group A ON	8002 - B00A - B00B - B002	_01, 12 = 1 AND _01, 14 = 1
29, 0	PSM-67	SYSTEM +15/-15 Converter Group B OFF	8002	_01, 13 = 0 AND _01, 15 = 0
29, 1	PSM-16	SYSTEM +15/-15 Converter Group B ON	A002 - 900A - 900B - 9002	_01, 13 = 1 AND _01, 15 = 1
35, 0	PSM-17	+28Q Supply to A_TEU OFF	E014 - C014	_06, 0 = 0 AND _06, 2 = 0
35, 1	PSM-18	+28Q Supply to A_TEU ON (prim)	E015 - C015 - C014 - F014	_06, 1 = 1 AND _06, 2 = 1
35, 2	PSM-19	+28Q Supply to A_TEU ON (redt)	E015 - C015 - E014 - D014	_06, 0 = 1 AND _06, 2 = 1

Table 2.9.4.4-1 continued on next page . . . . .

Table 2.9.4.4-1 continued ...

PFC (Params #0, #1)	**PSM #**	**SWITCHING FUNCTION**	**IRC CODE SEQUENCE** (control words shall be separated by approx 100 ms interval)	**VERIFICATION TELEM (PSS_STATUS_ XX) MNEMONIC, BIT**
36, 0	PSM-20	+28Q Supply to B_TEU OFF	E015 - C015	_06, 4 = 0 AND _06, 5 = 0
36, 1	PSM-21	+28Q Supply to B_TEU ON (prim	E014 - C014 - C015 - F015	_06, 4 = 1 AND _06, 5 = 1
36, 2	PSM-22	+28Q Supply to B_TEU ON (redt)	E014 - C014 - E015 - D015	_06, 4 = 1 AND _06, 5 = 0
40, 0	PSM-23	+28REG Supply to A_IPU OFF	E002 - C002	_00, 0 = 0 AND _00, 2 = 0 AND _00, 1 = 0
40, 1	PSM-24	+28REG Supply to A_IPU ON (prim)	E003 - C003 - C002 - F002	_00, 1 = 1 AND _00, 2 = 1
40, 2	PSM-25	+28REG Supply to A_IPU ON (redt)	E003 - C003 - E002 - D002	_00, 0 = 1 AND _00, 2 = 1
41, 0	PSM-26	+28REG Supply to B_IPU OFF	E003 - C003	_00, 4 = 0 AND _00, 5 = 0
41, 1	PSM-27	+28REG Supply to B_IPU ON (prim)	E002 - C002 - C003 - F003	_00, 4 = 1 AND _00, 5 = 1
41, 2	PSM-28	+28REG Supply to B_IPU ON (redt)	E002 - C002 - E003 - D003	_00, 4 = 1 AND _00, 5 = 0
42, 0	PSM-29	+28Q Supply to GSS OFF	E016 - C016	_06, 6 = 0 AND _06, 7 = 0
42, 1	PSM-30	+28Q Supply to GSS ON (prim)	C016 - F016	_06, 6 = 1 AND _06, 7 = 1
42, 2	PSM-31	+28Q Supply to GSS ON (redt)	E016 - D016	_06, 6 = 0 AND _06, 7 = 1

Table 2.9.4.4-1 continued on next page . . . . .

Table 2.9.4.4-1 continued ...

PFC (Params #0, #1)	PSM #	SWITCHING FUNCTION	IRC CODE SEQUENCE (control words shall be separated by approx 100 ms interval)	VERIFICATION TELEM (PSS_STATUS_ XX) MNEMONIC, BIT
43, 0	PSM-32	+5/+15/-15 Supplies to GSS OFF	E005 - C005 - E004 - C004	_02, 0 = 0 AND _02, 2 = 0
43, 1	PSM-33	+5/+15/-15 Supplies to GSS ON (5 prim, 15 prim)	C004 - C005 - F004 - F005	_02, 1 = 1 AND _02, 2 = 1 AND _02, 4 = 1 AND _02, 5 = 1 AND _02, 6 = 1 AND _02, 7 = 1
43, 2	PSM-34	+5/+15/-15 Supplies to GSS ON (5 prim, 15 redt)	C004 - E005 - F004 - D005 ***	_02, 1 = 1 AND _02, 2 = 1 AND _02, 4 = 1 AND _02, 5 = 0 AND _02, 6 = 0 AND _02, 7 = 1
43, 3	PSM-35	+5/+15/-15 Supplies to GSS ON (5 redt, 15 prim)	E004 - C005 - D004 - F005	_02, 0 = 1 AND _02, 2 = 1 AND _02, 4 = 1 AND _02, 5 = 1 AND _02, 6 = 1 AND _02, 7 = 1
43, 4	PSM-36	+5/+15/-15 Supplies to GSS ON (5 redt, 15 redt)	E004 - E005 - D004 - D005	_02, 0 = 1 AND _02, 2 = 1 AND _02, 4 = 1 AND _02, 5 = 0 AND _02, 6 = 0 AND _02, 7 = 1
44, 0	PSM-37	+5/+15/-15 A-side Supplies to SPU OFF	E018 - E019	PSS_SPU_5VA AND PSS_SPU_P15VA both at or near 0V.
44, 1	PSM-38	+5/+15/-15 A-side Supplies to SPU ON	C018 - C019 - F019 - F018	PSS_SPU_5VA AND PSS_SPU_P15VA both within ON limits.
45, 0	PSM-39	+5/+15/-15 B-side Supplies to SPU OFF	C018 - C019	PSS_SPU_5VB AND PSS_SPU_P15VB both at or near 0V.
45, 1	PSM-40	+5/+15/-15 B-side Supplies to SPU ON	E018 - E019 - D019 - D018	PSS_SPU_5VB AND PSS_SPU_P15VB both within ON limits.
46, 0	PSM-41	+5 Supplies to TEU A-side OFF	E00C - C00C	_01, 1 = 0 AND _01, 2 = 0 AND _01, 0 = 0
46, 1	PSM-42	+5 Supplies to TEU A-side ON (prim)	C00C - E010 - C010 - F00C ***	_01, 1 = 1 AND _01, 2 = 1
46, 2	PSM-43	+5 Supplies to TEU A-side ON (redt)	E00C - E010 - C010 - D00C ***	_01, 0 = 1 AND _01, 2 = 1

Table 2.9.4.4-1 continued on next page . . . . .

Table 2.9.4.4-1 continued ...

PFC (Params #0, #1)	**PSM #**	**SWITCHING FUNCTION**	**IRC CODE SEQUENCE** (control words shall be separated by approx 100 ms interval)	**VERIFICATION TELEM (PSS_STATUS_ XX) MNEMONIC, BIT**
47, 0	PSM-44	+15/-15 Supplies to TEU A-side OFF	E00D - C00D	_01, 4 = 0 AND _01, 5 = 0 AND _01, 6 = 0 AND _01, 7 = 0
47, 1	PSM-45	+15/-15 Supplies to TEU A-side ON (prim)	C00D - E011 - C011 - F00D ***	_01, 4 = 1 AND _01, 5 = 1 AND _01, 6 = 1 AND _01, 7 = 1
47, 2	PSM-46	+15/-15 Supplies to TEU A-side ON (redt)	E00D - E011 - C011 - D00D ***	_01, 4 = 1 AND _01, 5 = 0 AND _01, 6 = 0 AND _01, 7 = 1
48, 0	PSM-47	+5 Supplies to TEU B-side OFF	E010 - C010	_04, 1 = 0 AND _04, 0 = 0 AND _04, 2 = 0
48, 1	PSM-48	+5 Supplies to TEU B-side ON (prim)	C010 - E00C - C00C - C00D - E00D - F010 ***	_04, 1 = 1 AND _04, 2 = 1
48, 2	PSM-49	+5 Supplies to TEU B-side ON (redt)	E010 - E00C - C00C - C00D - E00D - D010 ***	_04, 0 = 1 AND _04, 2 = 1
49, 0	PSM-50	+15/-15 Supplies to TEU B-side OFF	E011 - C011	_04, 4 = 0 AND _04, 5 = 0 AND _04, 6 = 0 AND _04, 7 = 0
49, 1	PSM-51	+15/-15 Supplies to TEU B-side ON (prim)	C011 - E00D - C00D - C00C - E00C - F011 ***	_04, 4 = 1 AND _04, 5 = 1 AND _04, 6 = 1 AND _04, 7 = 1
49, 2	PSM-52	+15/-15 Supplies to TEU B-side ON (redt)	E011 - E00D - C00D - C00C - E00C - D011 ***	_04, 4 = 1 AND _04, 5 = 0 AND _04, 6 = 0 AND _04, 7 = 1

Table 2.9.4.4-1 continued on next page . . . . .

Table 2.9.4.4-1 continued ...

PFC (Params #0, #1)	**PSM #**	**SWITCHING FUNCTION**	**IRC CODE SEQUENCE** (control words shall be separated by approx 100 ms interval)	**VERIFICATION TELEM (PSS_STATUS_ XX) MNEMONIC, BIT**
50, 0	PSM-53	+5/+15/-15 Supplies to EEA OFF	E009 - C009 - E008 - C008	_05, 4 = 0 AND _05, 5 = 0 AND _05, 6 = 0 AND _05, 7 = 0 AND _05, 1 = 0 AND _05, 2 = 0 AND _05, 0 = 0
50, 1	PSM-54	+5/+15/-15 Supplies to EEA ON (5 prim, 15 prim)	C008 - C009 - F008 - F009	_05, 1 = 1 AND _05, 2 = 1 AND _05, 4 = 1 AND _05, 5 = 1 AND _05, 6 = 1 AND _05, 7 = 1
50, 2	PSM-55	+5/+15/-15 Supplies to EEA ON (5 prim, 15 redt)	C008 - E009 - F008 - D009	_05, 1 = 1 AND _05, 2 = 1 AND _05, 4 = 1 AND _05, 5 = 0 AND _05, 6 = 0 AND _05, 7 = 1
50, 3	PSM-56	+5/+15/-15 Supplies to EEA ON (5 redt, 15 prim)	E008 - C009 - D008 - F009	_05, 0 = 1 AND _05, 2 = 1 AND _05, 4 = 1 AND _05, 5 = 1 AND _05, 6 = 1 AND _05, 7 = 1
50, 4	PSM-57	+5/+15/-15 Supplies to EEA ON (5 redt, 15 redt)	E008 - E009 - D008 - D009	_05, 0 = 1 AND _05, 2 = 1 AND _05, 4 = 1 AND _05, 5 = 0 AND _05, 6 = 0 AND _05, 7 = 1

***** CHANGED THIS REV !!!**

2.9.5 PSS Telemetry

2.9.5.1 Summary of PSS Telemetry

ID#	SCIENCE CHANNEL MNEMONIC	CONV ALG	NAME	DESCRIPTION
344	QBA_CURRT	tbs	Quiet Bus A input currt	
345	QBB_CURRT	tbs	Quiet Bus B input currt	
346	PSS_SPU_5VA	U1	SPU +5V DDC A volts	5V --> 0.5V mon (S.F. = 10:1); at converter output
347	PSS_SPU_5VB	U1	SPU +5V DDC B volts	5V --> 0.5V mon (S.F. = 10:1); at converter output
348	PSS_SPU_P15VA	U2	SPU +15V DDC A volts	15V --> 1.5V mon (S.F. = 10:1); at converter output
349	PSS_SPU_P15VB	U2	SPU +15V DDC B volts	15V --> 1.5V mon (S.F. = 10:1); at converter output
350	PSS_SPU_N15VA	U3	SPU -15V DDC A volts	-15V --> -1.5V mon (S.F. = 10:1); at converter output
351	PSS_SPU_N15VB	U3	SPU -15V DDC B volts	-15V --> -1.5V mon (S.F. = 10:1); at converter output
352	PSS_PCU_5V	R	PCU Internal +5 Volts	5V --> 5V mon (S.F. = 1:1); at converter output
353	PSS_PCU_P15V	S1	PCU Internal +15 Volts	15V --> 5V mon (S.F. = 3:1); at converter output
354	PSS_PCU_N15V	S2	PCU Internal -15 Volts	-15V --> -5V mon (S.F. = 3:1); at converter output
355	PSS_REG_28VA	U4	REG +28V DDC A volts	28V --> 2.8V mon (S.F. = 10:1); at converter output
356	PSS_REG_28VB	U4	REG +28V DDC B volts	28V --> 2.8V mon (S.F. = 10:1); at converter output
357	PSS_SYS_5VA	U1	SYS +5V DDC A volts	5V --> 0.5V mon (S.F. = 10:1); at converter output
358	PSS_SYS_5VB	U1	SYS +5V DDC B volts	5V --> 0.5V mon (S.F. = 10:1); at converter output
359	PSS_SYS_P15VA	U2	SYS +15V DDC A volts	15V --> 1.5V mon (S.F. = 10:1); at converter output
360	PSS_SYS_P15VB	U2	SYS +15V DDC B volts	15V --> 1.5V mon (S.F. = 10:1); at converter output
361	PSS_SYS_N15VA	U3	SYS -15V DDC A volts	-15V --> -1.5V mon (S.F. = 10:1); at converter output
362	PSS_SYS_N15VB	U3	SYS -15V DDC B volts	-15V --> -1.5V mon (S.F. = 10:1); at converter output
363	PSS_STATUS_00	-	PSS relay status word 0	
364	PSS_STATUS_01	-	PSS relay status word 1	
365	PSS_STATUS_02	-	PSS relay status word 2	
366	PSS_STATUS_03	-	PSS relay status word 3	
367	PSS_STATUS_04	-	PSS relay status word 4	
368	PSS_STATUS_05	-	PSS relay status word 5	
369	PSS_STATUS_06	-	PSS relay status word 6	
370	PSS_STATUS_07	-	PSS relay status word 7	
371	PSS_SPU_5VATMP	ZA	SPU +5VA DDC temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on
372	PSS_SPU_5VBTMP	ZA	SPU +5VB DDC temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on
373	PSS_SPU_15VATMP	ZA	SPU 15VA DDC temp	Scaling: 10mV/K; 2.73V = 0C;

				sensor located on
374	PSS_SPU_15VBTMP	ZA	SPU 15VB DDC temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on
375	PSS_REG_28VATMP	ZA	REG +28VA DDC temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on
376	PSS_REG_28VBTMP	ZA	REG +28VB DDC temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on
377	PSS_SYS_5VATMP	ZA	SYS +5VA DDC temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on
378	PSS_SYS_5VBTMP	ZA	SYS +5VB DDC temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on
379	PSS_SYS_P15VATMP	ZA	SYS +15VA DDC temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on
380	PSS_SYS_P15VBTMP	ZA	SYS +15VB DDC temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on
381	PSS_SYS_N15VATMP	ZA	SYS -15VA DDC temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on
382	PSS_SYS_N15VBTMP	ZA	SYS -15VB DDC temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on
383	PSS_PCU_15VATMP	ZA	PCU (Intnl) 15VA DDC temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on
384	PSS_PCU_15VBTMP	ZA	PCU (Intnl) 15VB DDC temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on
385	PSS_QAFILT_TMP	ZA	PCU QBA Inrush Filter temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on
386	PSS_QBFILT_TMP	ZA	PCU QBB Inrush Filter temp	Scaling: 10mV/K; 2.73V = 0C; sensor located on

2.9.5.2 PSS-to-IPU Data Word Formats

The PCU shall transfer telemetry data to the IPU on request from the IPU. The IPU shall transmit a continuous sequence of Data Request Word (DRW) codes, each corresponding to a specific PCU telemetry function. Immediately following each DRW, the PCU shall make available the corresponding data channel. Two types of PCU telemetry data are requested by a DRW - Analog Data (temperature and voltage) and Digital Data (relay status).

2.9.5.2.1 Analog Data Requests

Each Analog Data Request from the IPU to the PCU shall be a 16-bit serial word, transmitted MSB-first. Table 2.9.5.2.1-1 lists each Analog Data function, the corresponding digital DRW hex code, and shows how each function is mapped on to the Instrument Telemetry List.

Table 2.9.5.2.1-1 Analog Data Request Codes and Telemetry List Mapping

ANALOG TELEMETRY FUNCTION	DRW HEX CODE	TELEMETRY LIST MNEMONIC
QBA Primary Current	0000	QBA_CURRT
Internal PCU +5V supply	0001	PSS_PCU_5V
Internal PCU +15V supply	0002	PSS_PCU_P15V
Internal PCU -15V supply	0003	PSS_PCU_N15V
QBB Primary Current	0007	QBB_CURRT
+5 DC-DC Converter SYS A	1001	PSS_SYS_5VA
+15 DC-DC Converter SYS A	1002	PSS_SYS_P15VA
-15 DC-DC Converter SYS A	1003	PSS_SYS_N15VA
+28REG DC-DC Converter A	1004	PSS_REG_28VA
+5 DC-DC Converter SPU A	1005	PSS_SPU_5VA
+15 DC-DC Converter SPU A	1006	PSS_SPU_P15VA
-15 DC-DC Converter SPU A	1007	PSS_SPU_N15VA
+5 DC-DC Converter SYS B	1009	PSS_SYS_5VB
+15 DC-DC Converter SYS B	100A	PSS_SYS_P15VB
-15 DC-DC Converter SYS B	100B	PSS_SYS_N15VB
+28REG DC-DC Converter B	100C	PSS_REG_28VB
+5 DC-DC Converter SPU B	100D	PSS_SPU_5VB
+15 DC-DC Converter SPU B	100E	PSS_SPU_P15VB
-15 DC-DC Converter SPU B	100F	PSS_SPU_N15VB

Table 2.9.5.2.1-1 continued on next page . . . . .

Table 2.9.5.2.1-1 continued ...

ANALOG TELEMETRY FUNCTION	DRW HEX CODE	TELEMETRY LIST MNEMONIC
+/-15 V PCU A Converter temperature	2000	PSS_PCU_15VATMP
+5 V SYS A Converter temperature	2001	PSS_SYS_5VATMP
+15 V SYS A Converter temperature	2002	PSS_SYS_P15VATMP
-15V SYS A Converter temperature	2003	PSS_SYS_N15VATMP
+28 VREG A Converter temperature	2004	PSS_REG_28VATMP
+5 V SPU A Converter temperature	2005	PSS_SPU_5VATMP
+/-15 V SPU A Converter temperature	2006	PSS_SPU_15VATMP
QBA Inrush Current Filter temperature	2007	PSS_QAFILT_TMP
+/-15V PCU B Converter temperature	2008	PSS_PCU_15VBTMP
+5 V SYS B Converter temperature	2009	PSS_SYS_5VBTMP
+15V SYS B Converter temperature	200A	PSS_SYS_P15VBTMP
-15V SYS B Converter temperature	200B	PSS_SYS_N15VBTMP
+28VREG B Converter temperature	200C	PSS_REG_28VBTMP
+5V SPU B Converter temperature	200D	PSS_SPU_5VBTMP
+/-15V SPU B Converter temperature	200E	PSS_SPU_15VBTMP
QBB Inrush Current Filter temperature	200F	PSS_QBFILT_TMP

2.9.5.2.2 Analog data Format

Analog data are multiplexed, but not digitised, within the PCU. All analog data shall be digitised to 8-bit (or better) accuracy by the IPU. Data will be valid after a delay of 10 ms following the end of a DRW.

2.9.5.2.3 IPS to PSS Digital Data Requests and PSS Data Word Format

Each Digital Data Request from the IPU to the PCU shall be a 16-bit serial word, transmitted MSB-first. Table 2.9.5.2.3-1 lists each Digital Data function, the corresponding digital DRW hex code, and shows how each function is mapped onto the Insrument Telemetry List.

For each Data Word bit:

0 indicates Off, Inhibited, A-side or Primary side as applicable;

1 indicates On, Enabled, B-side or Redundant side as applicable.

Each PCU Digital Data Word shall be 16 bits, transmitted serially to the IPU, MSB-first. Each word shall consist of individual relay status bits as defined in Table 2.9.5.2.3-1.

Bits not listed are not used.

Each bit of the Telemetry List Word corresponds to the same PCU-IPU Data Word bit.

Table 2.9.5.2.3-1 Digital Data Request Codes and Telemetry List Mapping

DRW HEX CODE	DATA WORD BIT	TELEMETRY LIST MNEMONIC	BIT VALUE, FUNCTION & STATUS
4000	0	PSS_STATUS_00	A_IPU +28REG supply redt. relay OFF/ON
	1		A_IPU +28REG supply prim. relay OFF/ON
	2		+28REG supply to A_IPU OFF/ON
	3		PCU internal +5V supply OFF/ON
	4		+28REG supply to B_IPU OFF/ON
	5		B_IPU +28REG supply prim. relay OFF/ON
	6 - 11		not used
	12		+5V SYS Converter A input relay OFF/ON
	13		+5V SYS Converter B input relay OFF/ON
	14		+28REG Converter A input relay OFF/ON
	15		+28REG Converter B input relay OFF/ON
4001	0	PSS_STATUS_01	A_TEU +5V supply redt. relay OFF/ON
	1		A_TEU +5V supply prim. relay OFF/ON
	2		+5V supply to A_TEU OFF/ON
	3		PCU internal +5V supply OFF/ON
	4		+15V supply to A_TEU OFF/ON
	5		A_TEU +15V supply prim. relay OFF/ON
	6		A_TEU -15V supply prim. relay OFF/ON
	7		-15V supply to A_TEU OFF/ON
	8 - 11		not used
	12		+15V SYS Converter A input relay OFF/ON
	13		+15V SYS Converter B input relay OFF/ON
	14		-15V SYS Converter A input relay OFF/ON
	15		-15V SYS Converter B input relay OFF/ON
4002	0	PSS_STATUS_02	GEU +5V supply redt. relay OFF/ON
	1		GEU +5V supply prim. relay OFF/ON
	2		+5V supply to GEU OFF/ON
	3		PCU internal +5V supply OFF/ON
	4		+15V supply to GEU OFF/ON
	5		GEU +15V supply prim. relay OFF/ON
	6		GEU -15V supply prim. relay OFF/ON

DRW HEX CODE	DATA WORD BIT	TELEMETRY LIST MNEMONIC	BIT VALUE, FUNCTION & STATUS
	7		-15V supply to GEU OFF/ON

Table 2.9.5.2.3-1 continued on next page . . . . .

Table 2.9.5.2.3-1 continued ...

DRW HEX CODE	DATA WORD BIT	TELEMETRY LIST MNEMONIC	BIT VALUE, FUNCTION & STATUS
4002	8 - 11	PSS_STATUS_02	not used
	12		PCU Internal Converter A Input OFF/ON
	13		PCU Internal Converter B Input OFF/ON
	14		SPU A Converters Input OFF/ON
	15		SPU B Converters Input OFF/ON
4003	0	PSS_STATUS_03	NBA redt. relay OFF/ON
	1		NBA prim. relay OFF/ON
	2		NB output OFF/ON
	3		PCU internal +5V supply OFF/ON
	4		NB output OFF/ON [duplicates bit 2]
	5		NBB prim. relay OFF/ON
	6		NBB redt. relay OFF/ON
	7 - 15		not used
4004	0	PSS_STATUS_04	B_TEU +5V supply redt. relay OFF/ON
	1		B_TEU +5V supply prim. relay OFF/ON
	2		+5V supply to B_TEU OFF/ON
	3		PCU internal +5V supply OFF/ON
	4		+15V supply to B_TEU OFF/ON
	5		B_TEU +15V supply prim. relay OFF/ON
	6		B_TEU -15V supply prim. relay OFF/ON
	7		-15V supply to B_TEU OFF/ON
	8 - 15		not used
4005	0	PSS_STATUS_05	EEA +5V supply redt. relay OFF/ON
	1		EEA +5V supply prim. relay OFF/ON
	2		+5V supply to EEA OFF/ON
	3		PCU internal +5V supply OFF/ON
	4		+15V supply to EEA OFF/ON
	5		EEA +15V supply prim. relay OFF/ON
	6		EEA -15V supply prim. relay OFF/ON
	7		-15V supply to EEA OFF/ON
	8 - 15		not used

Table 2.9.5.2.3-1 continued on next page . . . . .

Table 2.9.5.2.3-1 continued ...

DRW HEX CODE	DATA WORD BIT	TELEMETRY LIST MNEMONIC	BIT VALUE, FUNCTION & STATUS
4006	0	PSS_STATUS_06	A_TEU 28Q supply redt. relay OFF/ON
	1		A_TEU 28Q supply prim. relay OFF/ON
	2		28Q supply to A_TEU OFF/ON
	3		PCU internal +5V supply OFF/ON
	4		28Q supply to B_TEU OFF/ON
	5		B_TEU 28Q supply prim. relay OFF/ON
	6		GEU 28Q supply prim. relay OFF/ON
	7		28Q supply to GEU OFF/ON
	8 - 15		not used
4007	0	PSS_STATUS_07	+28QA (Prim) N/L relay OFF/ON
	1		+28QA (Redt) N/L relay OFF/ON
	2		+28QB (Prim) N/L relay OFF/ON
	3		+28QB (Redt) N/L relay OFF/ON
	4		+28QC supply OFF/ON
	5		PCU internal +5V supply OFF/ON
	6		+28QA Input Power OFF/ON
	7		+28QB Input Power OFF/ON
	8 - 15		not used

2.9.5.2.4 Spacecraft Power Bus Indication

As indicated in the above table, bits #6 and #7 of telemetry word PSS_STATUS_07 explicitly indicate whether HIRDLS is being powered from Quiet Bus A or Quiet Bus B.

END OF PART 1

HIRDLS

HIGH RESOLUTION DYNAMICS LIMB SOUNDER

Originator: J. G. Whitney
(with inputs from LMMS and UCB) Date: Aug 99

Subject / Title **COMMAND & TELEMETRY HANDBOOK (C&TH) - Vol. I - Part 2**

Contents / Description / Summary:

This document includes descriptions of all aspects of the HIRDLS Instrument command, control, telemetry, activation and autonomous health & safety and fault management.

Two major related computer files are the "HIRDLS Command Database" and the "HIRDLS Telemetry Database". To minimise the risk of discrepancies between the details given in this document and the contents of the database files, formatted outputs from the latter have been electronically inserted into Volume I of this document.

Operational aspects of this document are intended to apply primarily post-launch. Pre-launch command and telemetry usage will be basically the same, except where indicated herein (e.g. Section 5), and allowing for any operational constraints and requirements given in the (TRW) Integration & Test documentation, which - in the event of conflict - will take precedence until the conflict is resolved.

THIS DOCUMENT APPLIES TO PROTO-FLIGHT MODEL INSTRUMENT. For EM exceptions see separate document

Summary of Volumes

VOLUME I HIRDLS Operation, Commanding, Verification & Telemetry (in 2 parts)
VOLUME II Compendium of HIRDLS Command & Telemetry Files & Databases
VOLUME III Command & Telemetry Packet Formats, Data Blocks, Protocols &Timing

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EOS

VOL I - PART 2

3 SCIENCE ALGORITHM IMPLEMENTATION LANGUAGE (SAIL)

3.1 SAIL Overview

3.1.1 Concept

"SAIL" has been developed from the "PCL" (Program Control Language) used on previous instruments of this kind, i.e. remote sensing research instruments which require flexibility in their operational configurations to maximise the value of data collected during non-routine geophysical events such as volcanic and solar eruptions and sudden warmings of the upper atmosphere.

The key attributes of such a Language are that it is easy to use, results in completely deterministic instrument operation, cannot accidentally interfere with the basic instrument (core) system functions and requires minimal flight operations complexity and logistics support over the lifetime of the instrument in orbit.. Use of SAIL Tasks for these purposes will minimise the need for FOT intervention and for uploading large numbers of routine time-tagged commands to the spacecraft. For further details of the use of SAIL, the reader should refer to the SAIL documents listed in Section 6.

The term "SAIL" is used both to describe the Language itself, and its specific implementation within the HIRDLS IProc.

3.1.2 Purpose

The main purpose of the SAIL implementation in HIRDLS is to allow a number of simultaneous "Tasks" to be run in the main IPU processor in order to control the operation of those instrument features which must be easily programmable, and whose operation will vary with time or orbital event, either repetitively or occasionally, and which may require more frequent adjustment early in the mission of following a change to a new operational routine.

3.1.3 Applications Within HIRDLS Instrument

One or more SAIL Tasks will be used for each of the following applications:-

a) to generate Scan Control Lists. Scan Control Tables will be periodically uplinked to the IPU, and the associated SAIL Task(s) will use these as the basis for creating Scan Control Lists - the detailed Scanner control profiles used by the TSW.

b) to control the operation of the Sunshield (SSH) door. The SSH door will remain fully open for the majority of each orbit, but - once per orbit, 10-15 minutes before sunset, depending on season and the exact launch time - must be partially closed used a door-angle/time profile which is optimised from orbit to orbit to minimise impact on geographical coverage, and must be synchronised with the movement of the Scanner.

c) to run the PI(D) control algorithms for controlling the operational heater settings in Thermostatic Mode. There are currently four heater zones, including the IFC BB, and a single SAIL Task would be used for this purpose.

d) to perform other routine operational functions which may be required and for which it would not be appropriate to write or change embedded IPU code. For example, if a fault detection and correction routine needs to be modified, rather than attempt to uplink a 'code patch' to the IPU, the routine would be inhibited by command, and a SAIL Task written to replace it. For another example, if it is necessary to 'tailor' Instrument operation to avoid exceeding a given peak power consumption, a SAIL task would be used.

e) to perform such other operational functions as may be required from time to time. For example, for diagnostic reasons it may be required alternately to select different Science and/or Engineering telemetry format tables, or to run a special Scanning profile for a short period.

3.1.4 SAIL Task Parameters and Shared Memory

'The SAIL Process runs as an IProc Task. It supports up to 16 SAIL Tasks, for each of which a Parameter Area is reserved irrespective of whether a SAIL Task has been created or is running or suspended. Each of the 16 Task Parameter Areas has sixteen 32-bit Parameter words ("slots") assigned to it. These Parameter slots may be written to by Ground or Spacecraft Stored Command and may be copied to telemetry. Each SAIL Task can read the contents of any SAIL Parameter slot, but can only write to its own slots. The 256 32-bit memory locations described here constitute the lower half of the SAIL Shared Memory Area (0 to 255) as described in the SP-LOC-117. To distinguish them from the fully-shared memory locations (see next para.) they are referred to herein as "SAIL Task (Area) Parameters".

In addition to the Parameter Area described above, a further 256 32-bit memory locations constitute the upper half of the SAIL Shared Memory Area (256 to 511). This additional area of SAIL memory can be read and written to by any SAIL Task, and may be copied to telemetry as required and as defined by a Housekeeping Telemetry Format Table.

3.2 SAIL Process Commands

NOTE - the following sub-sections refer to the HIRDLS commands transmitted from the ground which are required to manage the operation of SAIL Tasks.. **They do not refer to the commands which may be generated by a SAIL Task.**

3.2.1 Summary of SAIL Task Management Commands

(Note - this is the same list as that given for reference in Section 2.7.4.8)

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
27	HIR_SAI_START	1	Starts SAIL processor with specified amount of additional shared memory
28	HIR_SAI_STOP	1	Kills all active SAIL tasks, deallocates SAIL memory, and halts the SAIL processor
29	HIR_SAI_CREATE	4	Create a SAIL task using specified code and data sections with a given purpose code
30	HIR_SAI_KILL	1	Kill a SAIL task, code and data areas remain allocated
31	HIR_SAI_SUSPEND	1	Suspends indefinitely a given SAIL task at the next SAIL frame
32	HIR_SAI_RESUME	1	Resumes a given SAIL task at the next SAIL frame
33	HIR_SAI_UPLOADH	3	Header to upload SAIL code or data segment
34	HIR_SAI_UPLOAD	3	Upload a part of a SAIL code or data segment
35	HIR_SAI_ERASE	1	Erase a SAIL code or data segment
36	HIR_SAI_SHARED	4	Modify contents of SAIL shared memory
37	HIR_SAI_COMMAND	2	Disable or enable the use of a command by SAIL
38	HIR_SAI_CONTROL	2	Enable or disable SAIL control of a specified subsystem

3.2.2 Description & Verification of SAIL Task Management Commands

CMD ID#: 27	**MNEMONIC:** HIR_SAI_START		
FUNCTION:	Starts SAIL processor with specified amount of additional shared memory		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Number of 512-byte blocks for shared area	**RANGE:** 0 to 126	
VERIFICATION:	SAIL_PROC_STAT: bits #0 thro' #5 = no. of 512-byte memory blocks allocated; 000000 = SAIL PROCESS NOT RUNNING		
NOTES:	If the SAIL processor is already running, this command will be rejected.Note that the maximum shared memory is limited to 64K (1K preallocated, 63K maximum additional memory)		

CMD ID#: 28	**MNEMONIC:** HIR_SAI_STOP		
FUNCTION:	Kills all active SAIL tasks, deallocates SAIL memory, and halts the SAIL processor		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Kill code to stop SAIL	**RANGE:** X#DEAD to X#DEAD	
VERIFICATION:	SAIL_PROC_STAT: bits #0 thro' #5 = no. of 512-byte memory blocks allocated; 000000 = SAIL PROCESS NOT RUNNING		
NOTES:	If the SAIL processor is not running, this command will be rejected. If the kill (hex) code is not DEAD, the command will be rejected.		

CMD ID#: 29	**MNEMONIC:** HIR_SAI_CREATE		
FUNCTION:	Create a SAIL task using specified code and data sections with a given purpose code		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	SAIL task number	**RANGE:** 0 to 15	
PARAMETER #:1	SAIL code block start	**RANGE:** 0 to 1023	
PARAMETER #:2	SAIL data block start	**RANGE:** 0 to 1023	
PARAMETER #:3	User-defined purpose identifier	**RANGE:** 0 to 65535	
VERIFICATION:	SAILTSKSTAT_nn: bit #7 (MSB): 0 = SAIL TASK KILLED / NOT CREATED; 1 = SAIL TASK ALIVE / CREATED		
NOTES:	This command will be rejected under any of the following conditions: SAIL processor not running, task number in use, code or data area assigned to another task, code or data area is not the start of a series,code or data area not uploaded, or purpose does not match identifier in code block.		

CMD ID#: 30	**MNEMONIC:** HIR_SAI_KILL		
FUNCTION:	Kill a SAIL task, code and data areas remain allocated		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	SAIL task number	**RANGE:** 0 to 15	
VERIFICATION:	SAILTSKSTAT_nn: bit #7 (MSB): 0 = SAIL TASK KILLED / NOT CREATED; 1 = SAIL TASK ALIVE / CREATED		
NOTES:	This command will be rejected if the SAIL processor is not running or the task number is not in use.		

CMD ID#: 31	**MNEMONIC:** HIR_SAI_SUSPEND		
FUNCTION:	Suspends indefinitely a given SAIL task at the next SAIL frame		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	SAIL task number	**RANGE:** 0 to 15	
VERIFICATION:	SAILTSKSTAT_nn: bit #6: 0 = TASK NOT RUNNING; 1 = TASK RUNNING		
NOTES:	This command will be rejected if the SAIL processor is not running or the task number is not in use.		

CMD ID#: 32	**MNEMONIC:** HIR_SAI_RESUME		
FUNCTION:	Resumes a given SAIL task at the next SAIL frame		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	SAIL task number	**RANGE:** 0 to 15	
VERIFICATION:	SAILTSKSTAT_nn: bit #6: 0 = TASK NOT RUNNING; 1 = TASK RUNNING		
NOTES:	This command will be rejected if the SAIL processor is not running or the task number is not in use.		

CMD ID#: 33	**MNEMONIC:** HIR_SAI_UPLOADH		
FUNCTION:	Header to upload SAIL code or data segment		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Type of segment, 0 = code, 1 = data	**RANGE:** 0 to 1	
PARAMETER #:1	Start block number	**RANGE:** 0 to 1023	
PARAMETER #:2	Length in 512 byte blocks	**RANGE:** 0 to 1023	
VERIFICATION:	Memory dump		
NOTES:	The start block number is used as byte 0 for the HIR_SAI_UPLOAD command. This command must proceed one or more HIR_SAI_UPLOAD commands. This command will be rejected if the SAIL processor has not been started.This command will also be rejected if any of the blocks requested are currently in use.		

CMD ID#: 34	**MNEMONIC:** HIR_SAI_UPLOAD		
FUNCTION:	Upload a part of a SAIL code or data segment		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Address offset in block (0 = block start)	**RANGE:** 0 to 65535	
PARAMETER #:1	Number of 32-bit words to upload	**RANGE:** 0 to 13	
PARAMETER #:2	H-32 encoded upload	**RANGE:** N/A (416 bits)	
VERIFICATION:	Memory dump		
NOTES:	A group of HIR_SAI_UPLOAD commands can only be sent after a HIR_SAI_UPLOADH command. Uploads will be accepted until any other HIR_SAI command is sent. Uploads will be commited once thecommand has been verified. If the number of words is set to zero, no further uploads to this area will be permitted.		

CMD ID#: 35	**MNEMONIC:** HIR_SAI_ERASE		
FUNCTION:	Erase a SAIL code or data segment		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Start block of segment to be erased	**RANGE:** 0 to 1023	
VERIFICATION:	Memory dump		
NOTES:	This command will be rejected if any of the following conditions are true: the SAIL processor is not running, the block number is not the start of a code or data segment, the block is not allocated,or the block is currently in use by one of the tasks (running or suspended).		

CMD ID#: 36	**MNEMONIC:** HIR_SAI_SHARED		
FUNCTION:	Modify contents of SAIL shared memory		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	SAIL shared memory location (32-bit entry)	**RANGE:** 0 to 16383	
PARAMETER #:1	Type of upload (0 = int, 1 = float)	**RANGE:** 0 to 1	
PARAMETER #:2	Number of 32-bit values to be loaded	**RANGE:** 1 to 13	
PARAMETER #:3	Binary encoded data (zero padded)	**RANGE:** N/A (416 bits)	
VERIFICATION:	Memory dump		
NOTES:	Note that the contents will be committed immediately after the command is received.		

CMD ID#: 37	**MNEMONIC:** HIR_SAI_COMMAND		
FUNCTION:	Disable or enable the use of a command by SAIL		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Disable (0) or enable (1) command by SAIL	**RANGE:** 0 to 1	
PARAMETER #:1	Command number	**RANGE:** 1 to 127	
VERIFICATION:	SAIL_CMD_STAT: Bit#n corresponds to SAIL Status of Cmd #n: 0 = SAIL DISABLED; 1 = SAIL ENABLED		
NOTES:	This command will be rejected if the specified command can never be used by SAIL.		

CMD ID#: 38	**MNEMONIC:** HIR_SAI_CONTROL		
FUNCTION:	Enable or disable SAIL control of a specified subsystem		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Disable (0) or enable (1) control by SAIL	**RANGE:** 0 to 1	
PARAMETER #:1	Control item (see notes)	**RANGE:** 1 to 127	
VERIFICATION:			
NOTES:	The item is one of sunshield (0), scanner (1), or blackbody heaters (2). Note that these items are enabled by default, but may be autonomously disabled by fault management actions.		

3.3 SAIL Telemetry

3.3.1 SAIL Status Telemetry

3.3.1.1 SAIL Process Status Telemetry

The IPU SAIL Process is the IPU Task environment in which the individual SAIL Tasks run. The status of the SAIL Process is indicated by the telemetry item SAIL_PROC_STAT. Science Data Stream data rate is once per MaF. This item is copied into the Fixed Block of the Engineering Data Stream (once per 4 seconds). Table 3.3.1.1-1 defines the meaning of each bit:

Table 3.3.1.1-1 Assignment of Bits in Telemetry Item SAIL_PROC_STAT

BIT #	MEANING
0 (LSB) thro' 5	Number of 512-byte memory blocks allocated to SAIL Process; 000000 = SAIL Process not running; no memory allocated.
6 thro' 7 (MSB)	Not used

3.3.1.2 SAIL Task Status Telemetry

Each SAIL Task has assigned to it an 8-bit Task Status word with the Telemetry List mnemonic SAILTSKSTAT_nn, where nn is the Task number (00 to 15). Science Data Stream data rate is once per MaF. This item is copied into the Fixed Block of the Engineering Data Stream (once per 4 seconds). Table 3.3.1.2-1 defines the meaning of each bit:

Table 3.3.1.2-1 Assignment of Bits in Telemetry Item SAILTSKSTAT_nn

BIT #	MEANING
0 (LSB)	not used
1	not used
2	not used
3	not used
4	not used
5	not used
6	0 = TASK NOT RUNNING; 1 = TASK RUNNING
7 (MSB)	0 = TASK KILLED / NOT CREATED; 1 = TASK ALIVE / CREATED

3.3.2 SAIL Task Area Parameters

The desire to limit SAIL-related telemetry to 10% of the total Science Data Stream capacity has resulted in a relatively complex arrangement, in which the SAIL parameters are in effect sub-commutated into the Science Data Stream, as described in the following three sub-sections.

Note - in the HIRDLS Telemetry List these SAIL Task Parameters are assigned the Group name STK; also mentioned in Section 2.7.5.0 above

3.3.2.1 SAIL Task Area Parameters in Science Data Stream

There are 16 SAIL Task Areas; each Task Area contains 16 Parameter slots; each Parameter slot contains 32 bits. The Default Science Data Stream Format contains the LOWER (LSB) 16 BITS ONLY of each Parameter slot: for the purposes of this Section a Parameter slot will be assumed to comprise only these 16 LSBs. Each Parameter slot appears in the telemetry stream once per **MaF.**

In the HIRDLS Telemetry List the SAIL Parameter slot mnemonics are of the form SAILTASKnn_XX, where $00 \leq nn \leq 15$ and XX = LO or HI. These mnemonics map on to the Parameter slot data as follows:-

SAILTASK00_LO represents a set of EIGHT slots corresponding to Parameters 00 through 07 of Task 00; the set is contained within a Major Frame, one Parameter per Minor Frame.

SAILTASK00_HI represents a set of EIGHT slots corresponding to Parameters 08 through 15 of Task 00; the set is contained within a Major Frame, one Parameter per Minor Frame.

. . . and so on through SAILTASK15_HI.

The contents of these slots depends on the operation of the associated SAIL Task.

3.3.2.2 SAIL Task Area Parameters in Engineering Data Stream

For each of the 16 SAIL Task areas, Parameter 15 (only) is copied into the Fixed Block of the Engineering Data Stream. The corresponding mnemonics are ENG_SAILTASK00_P15 through ENG_SAILTASK15_P15. Data rate is once per 4 seconds. The contents of these slots depends on the operation of the associated SAIL Task. One slot will be an "Instrument Mode" word (composition is TBD).

3.3.3 SAIL Shared Memory

The Default Science Data Stream contains the highest eight SAIL Shared Memory locations. These are designated by mnemonics SAIL_SHM_256 through SAIL_SHM_263. Science Data Stream data rate is once per MaF. These data are not copied into the default Engineering Data Stream. The contents of these slots depends on the operation of the active SAIL Tasks.

3.3.4 SAIL Attribute Settings for Commands

The four 32-bit status words ...

SAILCMDST_ 0_31; SAILCMDST_32_63; SAILCMDST_64_95; SAILCMDST_96_127

... indicate the current Enable/Disable status of each of the Instrument commands in the Cmd ID range 1 to 127 (bit #0 is not used). Science Data Stream data rate is once per MaF. These data are not copied into the default Engineering Data Stream. Detailed mapping is as follows.

SAILCMDST_ 0_31 bit **#n** corresponds to Instrument Command ID **#n** (zero not used)

SAILCMDST_32_63 bit **#n** corresponds to Instrument Command ID **#n+32**

SAILCMDST_64_95 bit **#n** corresponds to Instrument Command ID **#n+64**

SAILCMDST_96_127 bit **#n** corresponds to Instrument Command ID **#n+96**

3.4 Provisionally Defined SAIL Tasks

SAIL Tasks have been provisionally defined for use in conjunction with the Activation and Mode-changing sequences described in Section 5, and/or for use at various stages of Instrument integration & test. Each Task has been assigned a four-character ID. The Tasks are listed in Table 3.4-1.

Table 3.4-1 Provisionally Defined SAIL Tasks

TASK ID	FUNCTION	COMMENT
ENGD	SAIL-generated Engineering Stream data	Replaces old "variable block" Engineering data
GYON	Gyro heater and spin motor activation sequences	Warm-up times and operational restrictions imply need for on-board programmable, conditional sequences
HKPG	Housekeeping	Contains non-critical functions. Critical H& S is performed by Autonomous Fault Management process (see section 4)
HTRS	Operational heater control	Includes IFCBB heater control; closed-loop (constant temp) or fixed temperature set-point modes optional
SCNT	Scan Table generation	These two tasks may be combined
SSDC	Sunshield door control	
SSUL	Sunshield unlatching sequence	Releases launch latch; opens door TBD deg.

4 AUTONOMOUS INSTRUMENT FAULT MANAGEMENT

4.1 Introduction

Certain potential anomalous or fault conditions in the operation of the HIRDLS instrument require "immediate" instrument or spacecraft action, either to protect the instrument from damage or degradation, or to handle conditions that would be difficult to correct from the ground. In this context the term "immediate" is meant in a relative sense, i.e. compared with the alternative of up to several hours delay associated with ground-based corrective action. For a detailed discussion of these conditions, the reader should refer to document TC-LOC-212, where each condition is described, together with the reasons why autonomous action is required, and the action to be taken.

Faults not listed in the following sections must be handled by ground intervention. These would include science data errors, calibration errors, command errors, and any other conditions determined to be a instrument fault. SAIL Tasks will not be used for the default autonomous fault management actions. However, the default actions can if desired be inhibited by command and replaced with alternative SAIL sequences.

Section 4 summarises the actions which will be taken autonomously by the HIRDLS instrument in the event of a detected hardware or software anomaly, and lists the telemetry data which will indicate that an autonomous action has occurred.

4.2 Summary of Autonomous Protection Functions

4.2.1 Autonomous Protection From Potential Damage to Instrument

Potential faults which could result in permanent damage or degradation if not corrected in a timely way include the following: failure of a power converter; a mechanism failure where continued operation could cause permanent loss of function; overheating (or overcooling) of critical instrument components; multiple memory bit errors, watchdog timeouts or communi-cation failures which would prevent fault condition from being detected - including a failure of communication between the instrument and the spacecraft.

4.2.2 Autonomous Correction of Benign Malfunctions

Some fault conditions will not damage the instrument but will cause a loss of science data until corrective ground actions can be taken. Some such faults can be autonomously corrected without significant additional software complexity. Autonomous actions of this type are limited to simple reinititalizations or safing procedures, including single memory bit error correction, automatic retries in the event of a single event upset (SEU), non-critical communication failures and initialization faults.

4.3 List of Autonomous Protection Telemetry Indications

Table 4.3-1 lists the telemetry flags associated with Autonomous Fault Management, and indicates the action represented by each.

In normal circumstances all flags will be in the RESET state, i.e. at logical zero. If SET as a result of a fault management action, a flag will remain in this state until reset by ground command.

For more detail the reader should refer to document TC-LOC-212.

Table 4.3-1 Autonomous Actions and Telemetry Indications

TELEMETRY MNEMONIC & BIT #	INDICATION / MEANING	FAULT #
		1
		2
		3
		4
THIS TABLE TO BE	COMPLETED	5
		6
		7
		8
		9
		10

this table will be completed later

		18
		19
		20
		21
		22
		23
		24
		25
		26
		27
		28
		29
		30

5 INSTRUMENT MODES, TRANSITIONS & COMMAND SEQUENCES

This Section 5 is intended to summarise the command & telemetry aspects of HIRDLS Instrument operations and control with emphasis on pre-launch operations. It is not intended to replace or summarise the HIRDLS Flight Operations documentation, although there will of course be considerable overlap. It is emphasised again that the Protoflight Instrument attributes are being described here. For Engineering Model differences see separate document.

5.1 Instrument Mode and Submode Descriptions

Table 5.1-1 identifies the Instrument (non-Transitional) Modes and related Submodes, and summarises the associated Mode State attributes. Table 5.1-2 defines the Instrument Submodes and describes their attributes. For a more detailed definition of Mode- and Submode-related states of Instrument mechanisms and electronics, see Table 3.2-1 of the Instrument Technial Specification (ITS).

Table 5.1-1 Instrument (non-Transitional) Modes

MODE NAME	CODE	DESCRIPTION & ATTRIBUTES	POSSIBLE SUBMODES
OFF	**OFF**	HIRDLS QB, NB and SHB power off at S/C i/f	DEFAULT CAGED SAFE SAFE + CAGED
SURVIVAL	**SUR**	HIRDLS QB and NB power off at S/C i/f; SHB power on	DEFAULT CAGED SAFE SAFE + CAGED
IDLE	**IDL**	IPU & TEU data systems powered; telemetry data valid; status monitoring valid; command handling enabled; all other functions powered down, incl. all operational heaters; no SAIL Tasks or Tables loaded. **End of first stage in Activation Sequence**	DEFAULT CAGED SAFE SAFE + CAGED
LOW POWER	**LPR**	IPU & TEU data systems powered; telemetry data valid; status monitoring valid; command handling enabled; SAIL Tasks & Tables loaded & verified; all other systems (incl. heaters) powered down **End of second stage in Activation Sequence**	DEFAULT CAGED SAFE SAFE + CAGED
STANDBY_1	**SB1**	All electronics powered; operational heater status undefined; mechanisms inhibited; Cooler power off; detectors warm or warming; **End of third stage of Activation Sequence**	DEFAULT SAFE (see footnote to next table)
STANDBY_2	**SB2**	Warmup for Decontam or cooldown: ready to transition to Mission. All instrument systems powered; all operational heaters on; all mechanisms enabled but not running (except Coolers); detectors cold, cooling or warming; temperatures stabilising or stabilised **End of fourth stage of Activation Sequence**	DEFAULT SAFE DECONTAM DECONTAM + SAFE
MISSION	**MSN**	All instrument systems powered; all operational heaters on; detectors cold; all mechanisms enabled and operational; all temperatures stable **End of fifth stage of Activation Sequence**	DEFAULT SPECIAL

Table 5.1-2 Instrument Sub-mode Descriptions

SUBMODE NAME	CODE	DESCRIPTION & ATTRIBUTES	POSSIBLE IN FOLLOWING MODES
DEFAULT	DF	All Mode attributes "normal"	ALL
CAGED	CG	Instrument readied for shake-testing or launch; .Sunshield door latched; Scanner elev motors caged; Space View Aperture door closed; Cooler compressor drive coils caged	OFF SURVIVAL IDLE LOW POWER
SAFE	SF	Instrument safed against possible solar influx and thruster fuel contamination. Sunshield door closed (Caged or uncaged) OR in Safe (<60 deg) position; Scan mirror Caged or uncaged and in any position if Sunshield door closed, OR in IFC view position with drive motors unpowered (both axes); Space View Aperture door closed.	ALL EXCEPT MISSION
DECONTAM	DC	Cryo surfaces not being cooled; accreted ice (if any) subliming; Cooler operating in Warm-up mode	STANDBY_2 (see footnote)
SPECIAL	SP	Subsystems configured for special calibrations, science-related special scanning modes, etc.	MISSION

Footnote: Rev. T of the ITS currently shows the Decontam Submode as an option in both Standby_1 and Standby_2 Modes. Strictly speaking this is incorrect since the definition of the Decontam Submode requires Cooler power to be on. The ITS will be corrected at the next release.

5.2 Use and Occurrence of Mode / Submode States

This subsection describes the circumstances in which each of the **Mode**/Submode combinations could occur or will be used. **Mode** and Submode codes are used as given in Tables 5.1-1 and 5.1-2 respectively. **OFF** and **SURVIVAL** Modes do not represent different states of the Instrument per se, and are treated here as the same State; after launch the **OFF** State should not be used but may occur in exceptional circumstances. The phrase "during test" refers to pre-launch testing before or after payload integration. The <u>underlined</u> states are those which are defined as **Specified States** for use during launch and in orbit; other states may occur or may be required during test as indicated below.

OFF / SUR / DF

This state should only occur during test or in exceptional circumstances.

OFF / SUR / CG

This state should only occur during test or in exceptional circumstances.

OFF / SUR / SF

This state could be required at any time* in orbit, usually in the event of certain malfunctions, or during test. [* once initial post-launch Instrument Activation has occurred]

OFF / SUR / SF+CG

This is the intended state for environmental test and launch, and will exist prior to initial post-launch Instrument Activation.

IDL / DF

This state should only occur during test or in exceptional circumstances.

IDL / CG

This state should only occur during test or in exceptional circumstances.

IDL / SF

This state will always occur during Instrument Activation in orbit, except for the first post-launch sequence, and will occur in test.

IDL / SF+CG

This state may occur during Instrument Activation in test, and will occur in orbit during the first post-launch Instrument Activation sequence only.

LPR / DF

This state should only occur during test or in exceptional circumstances.

LPR / CG

This state should only occur during test or in exceptional circumstances.

LPR / SF

This state may occur during Instrument Activation in test and will always occur during Instrument Activation in orbit, except for the first post-launch sequence.

LPR / SF+CG

This state may occur during Instrument Activation in test and will occur in orbit during the first post-launch Instrument Activation sequence only.

SB1 / DF

This state should only occur during test or in exceptional circumstances in orbit.

SB1 / SF

This state may occur during Instrument Activation in test and will always occur during Instrument Activation in orbit, except for the first post-launch sequence. It may also be used at other times in orbit, e.g. in the event of certain malfunctions.

SB2 / DF

This state should only occur during test or in exceptional circumstances.

SB2 / SF

This state may occur during Instrument Activation in test and will always occur during Instrument Activation in orbit. It may also be used at other times in orbit, e.g. in the event of certain malfunctions.

SB2 / DC

This state may be required during test

SB2 / DC+SF

This state may occur during Instrument Activation in test and will be used for some operations in orbit.

MSN / DF

This is the normal operational state in orbit, and will also be used in test

MSN / SP

This state will be used for special operations in orbit, and may also be used in test

5.3 Specified Mode & Submode Transitions

Table 5.3-1 is a matrix of all **Specified** Mode/Submode **Transitions**. A **Specified Transition** is a transition from one **Specified State** to another **Specified State** (underlined in section 5.2). Transitions other than those specified are technically feasible, but it is desirable that only specified states and specified transistions between states be used for several reasons, e.g:

a) in order to limit the number of required STOL procedures;

b) to avoid the inadvertent omission of necessary steps in the sequences to ensure that the intended end-states are attained;

d) to limit the number of sequences which have to be verified;

e) to permit a manageable configuration control situation.

Important Note

As indicated in section 5.2, several Modes/Submodes other than those specified will be needed - and/or will occur - during test. Additional STOL and other Procedures will be written for test purposes only: these are not included in this document!

Other Notes

- In Table 5.3-1, Mode and Submode codes are used as given in Tables 5.1-1 and 5.1-2 respectively. Each row and column represents an Instrument state. The number in a row-col intersection indicates the para number (below) which describes the procedure(s) required to transition between the "FROM" state (row) to the "TO" state (col).
- In this Sub-section, OFF and SURVIVAL Modes are treated as the same State; after launch the OFF State should not be used but may occur in exceptional circumstances.

Table 5.3-1 Specified Mode & Submode Transitions

I had placed a table in here but for some reason the format repeatedly became totaly corrupted, and I had to delete it [possibly due to the use of 'vertical' text in the header row combined with Microsoft Word bug #233 or something]. WATCH THIS SPACE ! - JGW.

5.4 Use of "STOL" Procedures

The generic name 'STOL' (Satellite Test & Operations Language) has been used here pending a final decision on which 'dialect' (e.g. CSTOL, ESTOL, ECL) will be used by TRW and/or NASA for the EOS/CHEM Program. The HIRDLS IEGSE uses the CSTOL dialect as currently specified by the GIRD, and it is not intended to change to a different dialect for use at LMMS during either the EM or the PFM phase of the HIRDLS Program.

For the majority of tests involving Instrument commanding, command sequences will be compiled into STOL Procedures which will run on the IEGSE, or on the TRW STC. Within the Procedures, commands will be called by mnemonic, and STOL will then access the Command Database (e.g. in the IEGSE) in order to retrieve the required command attributes (bit pattern, criticality, etc.)

STOL also supports telemetry verification. Telemetry evaluation statements will typically be included in the Procedure after each command or group of commands; these will include a reference to the relevant Telemetry mnemonic(s) and a condition which should be satisfied. In this case STOL will access the Telemetry Database (e.g. in the IEGSE) in order to retrieve the required telemetry value(s).

Once started, a STOL Procedure will run autonomously unless:-

(a) a critical command is encountered within the Procedure, in which case a manually-entered 'GO' directive is required;

(b) a telemetry verification test fails, in which case the Procedure may wait or terminate, according to the details of the code;

(c) some other condition has been encountered in which the code as written requires the Procedure to wait or terminate;

(d) an externally-generated fault or other condition occurs which causes the procedure to abort.

One of the self-imposed ground rules for HIRDLS STOL Procedures is that they may be nested in the IEGSE up to a depth of 3, which allows (at least) one further (higher) level of nesting by TRW. The following construction would be typical (Level 0 = highest level or outermost block):-

STOL Level 0	S/C integrated test level Procedure (at TRW only)
STOL Level 1	HIRDLS top level procedure (complete test sequence)
STOL Level 2	HIRDLS major sub-routine (e.g. Stage 1 Activation; SMA/Encoder homing)
STOL Level 3	HIRDLS minor routine (e.g. frequent telemetry check; message routine)

Note that the inclusion of telemetry checks within a STOL Procedure is intended purely for real-time health & safety reasons, e.g in case a subsequent command should not be sent if a previous command does not execute properly, or a temperature is outside limits, etc. Telemetry data will be continuously recorded and archived by the IEGSE and will provide the main source of information for post-test analysis.

Typically, a STOL Procedure will include one or more input parameters to allow specific options to be selected, e.g. A or B side, Prim or Redt, etc.

The remainder of this Section contains descriptive summaries of the STOL procedures required to perform the **specified transitions** between Modes / Submodes. No attempt has been made to construct correct STOL syntax, and the following tables do not show the STOL procedure code; the latter (will) initially reside in the HIRDLS IEGSE and will in due course be ported to the TRW System Test Computer and to the EOCC Flight Operations System.

5.5 Instrument Activation

WARNING: PROVISIONAL AND INCOMPLETE AT THIS RELEASE !

The following tables list - in the required order - the commands and telemetry verification checks intended to form the basis for a series of STOL Procedures run individually but in sequence (as would be the case in the flight scenario), or run within a single concatenated 'outer' STOL Procedure (which would be appropriate for the pre-launch test scenario).

The following tables define the functional step (1st col.) and the associated command or telemetry item (2nd col.). No attempt has been made here to construct correct STOL syntax. The Mode/ /Submode states are those defined and described in the foregoing parts of section 5.

NOTE: IProc = Instrument processor TProc = TEU Processor

5.5.1 Stage 1

OFF / SURVIVAL Mode / any Submode ---> **IDLE** Mode / same Submode

This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

FUNCTIONAL STEP C = cmd; T = telemetry	**SPECIFIC COMMAND or TELEMETRY ITEM**	**COMMENT**
C: HIRDLS QB Power Bus On (A or B)	GSE_PWR_QABUSON or GSE_PWR_QBBUSON	all IPU and internal PCU power rails come up
T: Verify IProc booting	TBFI	If not verified after TBD seconds ?
T: Verify IProc running (booted)	TBFI	Normal Instrument telemetry not valid until this point. If not verified after TBD seconds ?
T: Verify PCU Internal supplies within limits	ENG_PSS_PCU_* within limits	If not verified after TBD seconds then ?
T: Verify IPU internal supplies within limits	ENG_IPU_*VOLTS within limits	If not verified after TBD seconds ?
C: Reset all PCU Input relays	HIR_PSS_SWITCH (08, 0)	PSM-01
C: Reset all PCU Load relays	HIR_PSS_SWITCH (09, 0)	PSM-02
T: Verify PCU relays all reset	All bits of all ENG_PSS status words = 0	Stan to confirm this is meaningful If not verified after TBD seconds ?
C: Internal +28Q Power On (A or B; Prim or Redt)	HIR_PSS_SWITCH (*, 1) * = 10 or 11 or 12 or 13	PSM58/59/60/61 (close non-latching relay); +28QC power ON
T: Verify +28QC relay closed	ENG_PSS_STATUS_07 bit 4 = 1	If not verified after TBD seconds ?
C: SYS +5, +28V supplies On (A or B)	HIR_PSS_SWITCH (26, 1 or 27, 1);	PSM-13 or 14
T: Verify SYS +5, +28V supplies within limits	Appropriate ENG_PSS_SYS_* within limits	If not verified after TBD seconds ?
C: SYS +15, -15V supplies On (A or B)	HIR_PSS_SWITCH (28, 1 or 29, 1);	PSM-15 or 16

5.5.1 Stage 1: OFF Mode ---> IDLE Mode (continued on next page)

5.5.1 Stage 1: (continued)

FUNCTIONAL STEP C = cmd; T = telemetry	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT
T: Verify SYS +15, -15V supplies within limits	Appropriate ENG_PSS_SYS_* within limits	If not verified after TBD seconds ?
C: TEU +28Q Power On (A or B; Prim or Redt)	HIR_PSS_SWITCH (35, 1 or 35, 2 or 36, 1 or 36, 2)	PSM-18 or 19 or 21 or 22
T: Verify TEU internal supplies within limits	ENG_TEU_*V within limits	If not verified after TBD seconds ?
C: TEU +5V On (from PCU) (A or B; Prim or Redt)	HIR_PSS_SWITCH (46, 1 or 46, 2 or 48, 1 or 48, 2)	PSM-42 or 43 or 48 or 49
T: Verify TEU +5V present	Appropriate ENG_PSS_STATUS_* bit(s)	If not verified after TBD seconds ?
C: TEU +/-15V On (from PCU) (A or B; Prim or Redt)	HIR_PSS_SWITCH (47, 1 or 47, 2 or 49, 1 or 49, 2)	PSM-45 or 46 or 51 or 52
T: Verify TEU +/-15V present	Appropriate ENG_PSS_STATUS_* bit(s)	If not verified after TBD seconds ?
T: Verify TProc booting	TBFI	If not verified after TBD seconds ?
T: Verify TProc running (booted)	TBFI	If not verified after TBD seconds ?
C: EEA +5, +/-15V On	HIR_PSS_SWITCH (50, 1 or 50, 2 or 50, 3 or 50, 4)	PSM-54 or 55 or 56 or 57
T: Verify EEA supplies present	Appropriate ENG_PSS_STATUS_* bit(s)	If not verified after TBD seconds ?
END	-	HIRDLS now in IDLE Mode

5.5.2 Stage 2

IDLE Mode / any Submode ---> **LOW POWER** Mode / same Submode

This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT
START SAIL Process	HIR_SAI_START(mem)	
C: Uplink SAIL Task code header, code, table header& tables; Create Task	HIR_SAI_UPLOADH (0, s, l) HIR_SAI _UPLOAD (o, l, d) HIR_SAI_UPLOADH (1, s, l) HIR_SAI _UPLOAD (o, l, d) HIR_SAI_CREATE	Uplink evrything for first SAIL Task; repeat sequence for each remaining required Task.
C: Memory dump to verify code ?	Appropriate HIR_TLM cmds	Do we want to do this ?
C: Start SAIL Task HKPG		Do we wnat to wait until code has been verified?
C: IPU +28REG supply (from PCU) On	HIR_PSS_SWITCH (40, 1 or 40, 2 or 41, 1 or 41, 2)	PSM-24 or 25 or 27 or 28
T: Verify IPU +28REG supply present	Appropriate ENG_PSS_STATUS_* bit(s)	If not verified after TBD seconds ?
T: Verify IFC supplies within limits	ENG_IFC_PSV_* within limits	If not verified ?
END	-	HIRDLS now in L/P Mode

5.5.3 Stage 2A

UNCAGE Procedure

NOTE: only if required to take Instrument out of Caged Submode

This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT
C: Open SVA door	HIR_SVA_CRITICAL (1); HIR_SVA_MOVE (1, t)	
T: Verify SVA door OPEN	ENG_SVA_STATUS	may be implem. in SSH_STATUS
T: Record HWA temperature (I)	ENG_SSHWA_TMP	(cold)
C: Initiate Sunshield door latch release sequence	HIR_SSH_DOORCRIT(1) HIR_SSH_HEATER (t)	HWA turned on manually (with timeout)
C: Start SAIL Task SSUL	HIR_SAI_ **?**	Initial Task status to be clarified Task monitors microswitches, turns off HWA and steps door OPEN TBD steps (50?)
T: Verify SAIL Task SSUL is running	ENG_SAILTASK*_P15	If not verified ?
C: Uncage SMA drive motors	HIR_TSS_DRSETUP Parameters to be confirmed	To be sent several times with different parameters
T: Verify SMA uncaged status	Appropriate ENG_TSS_HW_CFIG bits	If not verified ?

C: Uncage CSS drive motors	HIR_CSS_LOCK (a, b)	To be sent several times with different parameters
T: Verify CSS uncaged status	ENG_CSS_DDCAG_STAT	If not verified ?
T: Record HWA temperature (II)	ENG_SSHWA_TMP	Should be warming up If not verified ?
END	-	HIRDLS now Uncaged ?

5.5.4 Stage 2B

Fully UNCAGED Status Verification Procedure

NOTE 1 : only and always follows UNCAGE Procedure

NOTE 2 : allow at least 3 minutes after completion of UNCAGE Procedure. If necessary, run on next GSP.

This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT
T: Record HWA temperature (III)	ENG_SSHWA_TMP	Should be below 100 C
T: Verify SSH microswitch status	Appropriate ENG_SSH_STATUS bits	
T: Verify SSH stepper motor temp.	ENG_SSH_DORMOT_TMP	Actual or rise ?
T: Verify SSH door angle	ENG_DOOR_POT	
T: Re-verify SVA door OPEN	ENG_SVA_STATUS	may be implem. in SSH_STATUS
T: Verify status of SAIL Task SSUL	ENG_SAILTASK*_P15	
END		HIRDLS Uncaged Status verified

5.5.5 Stage 3

LOW POWER Mode/ Safe Submode ---> **STANDBY_1** Mode/ Safe Submode

This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT
C: SPU converters On in PCU	HIR_PSS_SWITCH (22, 1 or 23, 1)	PSM-10 or 12
T: Verify SPU converter ouputs within limits	TBFI	If not OK then ?
C: SPU/DSS Power On	HIR_PSS_SWITCH (44, 1 or 45, 1)	PSM-38 or 40
T: Verify SPU/DSS power supplies within limits	TBFI	If not OK then ?
C: GSS Power On (5V & 15V only)	HIR_PSS_SWITCH (43, 1 or 43, 2 or 43, 3 or 43, 4)	PSM-33 or 34 or 35 or 36
T: Verify GSS power supplies within limits	TBFI	If not OK then ?
C: Power On to selected GSS channels	GSS command sequence OQT (see Table 2.3.4.3.2.3-2)	Turns on Gyro channel electronics (channels as required)
T: Verify selected gyro channels are powered / within limits	GYRn_P15V; GYRn_N15V (where n is Gyro channel # as reqd)	If not OK then ?
C: GSS +28Q supply On	HIR_PSS_SWITCH (42, 1 or 42, 2)	PSM-30 or 31
T: Verify GSS +28Q supply On	TBFI	If not OK then ?
C: Start SAIL Task GYON	HIR_SAI_ **?**	Initial Task status to be clarified Task turns on selected Gyro heaters, waits for warm-up and then turns on spin motors (sequence may be staggered for different channels)
T: Verify SAIL Task GYON is running	ENG_SAILTASK*_P15	If not verified ?
T: Verify Standby_1 Mode status	TBFI	If not OK then ?
END	-	HIRDLS now in Standby_1 Mode

5.5.6 Stage 4

STANDBY_1 Mode/ Safe Submode ---> **STANDBY_2** Mode/ Safe Submode

This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

Reminder: In the Standy_2 Mode/Safe state, the Coolers are operating and cooling the detectors ready for a manual or automatictransition to Mission Mode. If it is desired to transition to Standby_2 Mode without cooling, then the Standby_2/SF+DC Submode must be invoked - see para 5.7.4

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT
HIRDLS NB Power Bus On (A or B)	GSE_PWR_NABUSON or GSE_PWR_NBBUSON	CSS +28V supply enabled (but not connected to CSS)
Verify +28N supply On	TBFI	If not OK then ?
CSS Power On	HIR_PSS_SWITCH (18, 1 or 18, 2 or 19, 1 or 19,2)	PSM-04 or 05 or 07 or 08
Verify CSS Power On	TBFI	If not OK then ?
Start (TBD) SAIL Tasks *		* as applicable in this Mode
Set "Transition to Mission Mode" option		Auto or Manual
Verify Standby_2 Mode status	TBFI	If not OK then ?
END	-	HIRDLS now in Standby_2 Mode

5.5.7 Stage 5

STANDBY_2 Mode/ Safe Submode ---> MISSION Mode (if not set to 'Auto')

This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT
Verify 'Ready for Mission Mode' status	TBFI	If not OK then ?
Set to Mission Mode	TBFI	
Verify Mission Mode status	TBFI	If not OK then ?
END	-	(Mission Mode Health Check performed off-line)

5.6 Instrument De-activation

5.6.1 Overall Power-down Sequence to Power-Off State

The following table defines the sequence to be used during pre-launch activities to achieve COMPLETE instrument power-down. This procedure can be used from any Mode/Submode, with Caging options being available by appropriate choice of procedure parameter. Specifically, the STOL Procedure will need to include an input parameter to define the Caging option, e.g:-

- Proc POWERDOWN (0) = do not change mechanism Launch/Cage Status, i.e. if not Caged, do not (re-)cage; if Caged (in IDL or LPR Mode), leave Caged.
- Proc POWERDOWN (1) = CAGE mechanism Launch/Cage Status, i.e. Cage if not Caged, otherwise leave Caged.

This procedure is assigned to STOL LEVEL 1, since it includes embedded Level 2 procedures. The individual Level 2 procedures are those used to transition from a given Mode to a less functional Mode, and are detailed in the following Subsections.

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT
If in MSN Mode transition to SB2 ..	Call Proc 5.6.2	End state is **SB2** / SF
If in SB2 Mode transition to SB1	Call Proc 5.6.3	End state is **SB1** / SF
If in SB1 Mode transition to LPR ...	Call Proc 5.6.4	End state is **LPR** / SF or SF+CG
If in LPR Mode transition to IDL ...	Call Proc 5.6.5	End state is **IDL** / SF or SF+CG
If in IDL Mode transition to OFF* ..	Call Proc 5.6.6	End state is **OFF / SUR** / SF or **OFF / SUR** / SF+CG

* "OFF" includes "SUR"

5.6.2 **MISSION** Mode / any Submode ---> **STANDBY_2** Mode / Safe Submode
This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT
THIS TABLE TO BE	COMPLETED	

5.6.3 **STANDBY_2** Mode / any Submode ---> **STANDBY_1** Mode / Safe Submode
This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT
THIS TABLE TO BE	COMPLETED	PSM-03 or 06
		PSM_03 or 04 Noisy bus power off

5.6.4 **STANDBY_1** Mode / any Submode ---> **LOW POWER** Mode / Safe Submode ...
or: **STANDBY_1** Mode / any Submode ---> **LOW POWER** Mode / Safe+Caged Submode
This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT
		PSM_29
		PSM_32
THIS TABLE TO BE	COMPLETED	PSM_37 or 39
		PSM_62 or 63

5.6.5 **LOW POWER** Mode / any Submode ---> **IDLE** Mode / Safe Submode ...
or: **LOW POWER** Mode / any Submode ---> **IDLE** Mode / Safe+Caged Submode
This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT
		PSM_23 or 24
THIS TABLE TO BE	COMPLETED	

5.6.6 **IDLE** Mode / any Submode ---> **OFF / SURVIVAL** Mode / Safe Submode ...
or: **IDLE** Mode / any Submode ---> **OFF / SURVIVAL** Mode / Safe+Caged Submode
This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT

5.7 Other Specified Mode / Submode Transitions

5.7.1 Between Submodes of **MISSION** Mode

Such transitions relate only to invoking different scanning scenarios, special calibrations, etc. and will not involve any power switching. These will normally be programmed as part of Daily Operations Planning after launch, and will be the subject of special test procedures prior to launch. STOL Procedures are not required nor appropriate. See separate Plans/Procedures.

5.7.2 From **STANDBY_2** Mode / SF Submode to / SF+DC Submode

This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

This transition halts Detector cooling and allows the "cryo" surfaces to warm in order to sublime accreted water-ice.

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT

5.7.3 From **STANDBY_2** Mode / SF+DC Submode to / SF Submode

This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

This transition terminated 'decontamination' of the "cryo" surfaces and turns on the Coolers in order to resume detector cooling prior to either a commanded or automatic transition to Mission Mode.

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT

5.7.4 From **STANDBY_1** Mode / SF Submode to **STANDBY_2** Mode / SF+DC Submode

This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

This transition may be used in place of Stage 4 of the normal Activation Sequence (para 5.5.6) if it is desired to invoke the Standby_2 Mode without cooling.

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT

5.7.5 Caging Procedure in **LOW POWER** Mode or **STANDBY_1** Mode

This procedure is assigned to STOL LEVEL 2 (see 5.4.d)

This Procedure is the converse of the Uncaging Procedure - described in 5.5.3 - which forms Stage 2A of the normal Activation Sequence. It is intended for use if it is required to cage or re-cage the mechanisms into their Launch State without changing the Instrument Mode.

Note: if caging/re-caging is required as an integral part of a more extensive power-down sequence terminating in the **OFF / SURVIVAL** Mode, then the Procedure described in 5.6.1 should be used.

FUNCTIONAL STEP	SPECIFIC COMMAND or TELEMETRY ITEM	COMMENT

6 RELATED DOCUMENTS

6.1 Applicable Documents

6.2 Reference Documents

7 ACRONYMS & ABBREVIATIONS

ATC	Advanced Technology Center [LMMS, Palo Alto]
AR	Anti-Reflective
BOL	Beginning Of Life
C&DH	Command & Data Handling
C&T	Command & Telemetry
C&TH	Command & Telemetry Handbook
CCD	Charge Coupled Device
CCP	Contamination Control Plan
CCU	Cooler Control Unit
CDR	Critical Design Review
CFA	Cold Filter Assembly
CHEM	Chemistry Mission
CIFOV	Composite Instantaneous Field of View
CLAS	Center for Limb Atmospheric Sounding
CPS	Cooler Power Supply
CPU	Central Processing Unit
CRC	Cyclical Redundancy Code
CSC	Computer Software Component
CSCI	Computer Software Configuration Item
CSS	Cooler Subsystem
DRW	Data Request Word
DSS	Detector Subsystem
EEA	Encoder Electronics Assembly
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
EOL	End Of Life
EOS	Earth Observing System
FOV	Field Of View
FWHM	Full Width at Half Maximum
GEU	Gyro Electronics Unit
GIRD	General Interface Requirements Document
GMU	Gyro Mechanical Unit
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center
GSP	Ground station pass
GSS	Gyro Subsystem
HCW	Heater Control Word (IFC)

HRM	Hold-down and Release Mechanism
I/O	Input/Output
IAC	Interface Alignment Cube
ICD	Interface Control Document
IFC	In-Flight Calibrator
IFOV	Instantaneous field of view
IGSE	Instrument Ground Support Equipment
IICD	Internal Interface Control Document
ILOS	Instantaneous Line Of Sight
IPS	Instrument Processor Subsystem
IR	InfraRed
IRC	Individual relay control (word)
IRCF	Instrument Reference Coordinate Frame
IRD	Instrument Requirements Document
ISO	International Organization for Standardization
ITS	Instrument Technical Specification
LMMS	Lockheed Martin Missiles and Space
LOS	Line Of Sight
LSB	Least Significant Bit
MAR	Mission Assurance Requirements
MLI	Multilayer Insulation
NBA	Noisy Bus A
NBB	Noisy Bus B
NEN	Noise Equivalent Radiance
NVR	Non-Volatile Residue
OB	Optical Bench
OBA	Optical Bench Assembly
OBC	On-Board Computer (spacecraft)
OSS	Optical Subsystem
PAR	Performance Assurance Requirements
PCU	Power Converter Unit
PDR	Preliminary Design Review
PID	Proportional, Integral, Derivative
PLPF	Pointing Low-Pass Filter
POA	Projected Optical Axis
POSIX	Portable Operating System I/F for Computer Environments
PPL	(GSFC) Preferred Parts List
PSM	Power Switching Macro
PSS	Power Subsystem
QBA	Quiet Bus A
QBB	Quiet Bus B

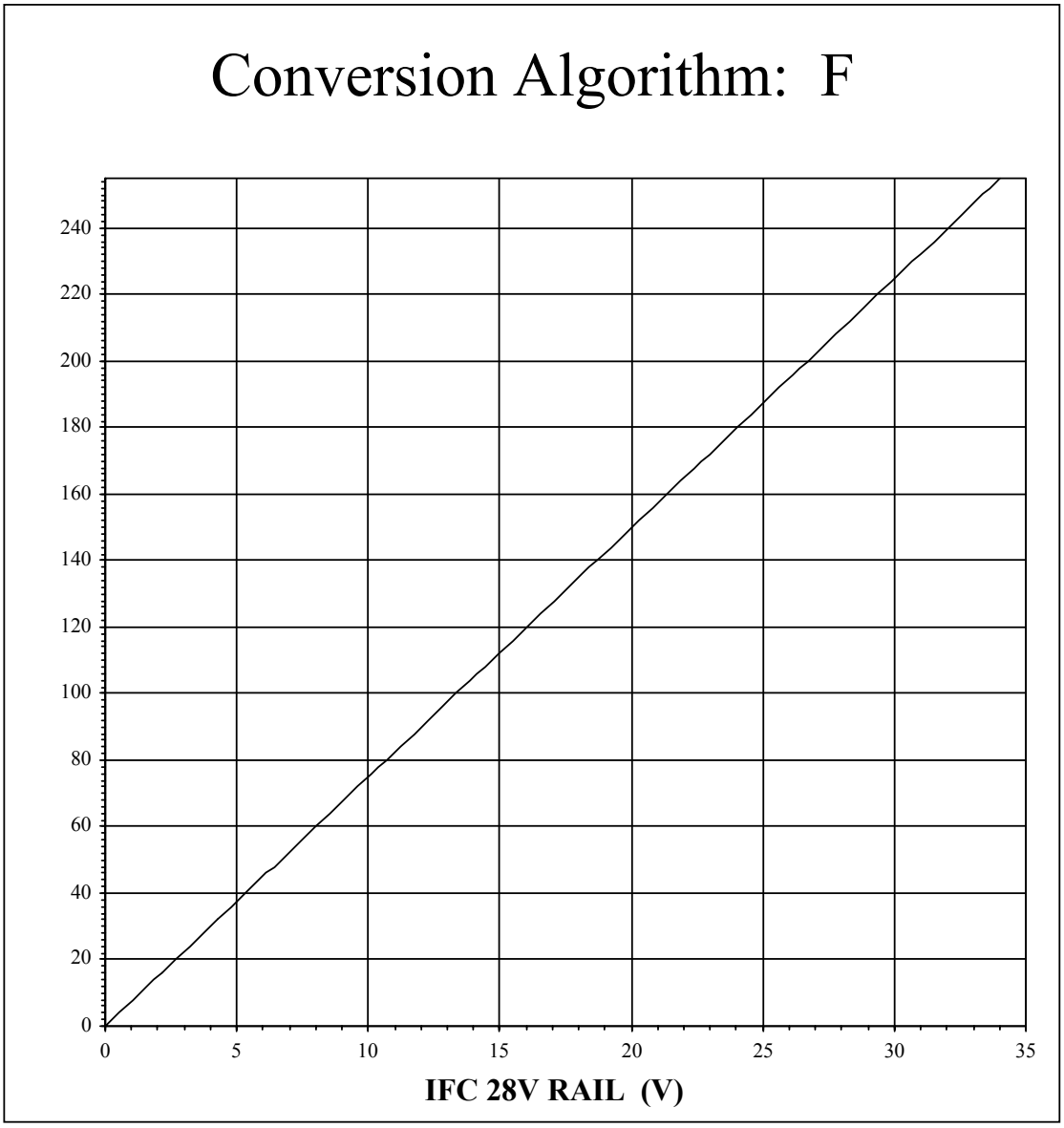
RAL	Rutherford Appleton Laboratory
RRP	Relative Response Point
RSS	Root-Sum-Square
RT	Remote Terminal
SAS	System Aperture Stop
S/C	Spacecraft
SDM	Sunshield Drive Mechanism
SEU	Scanner Electronics Unit
SHA	Survival Heater Bus A
SHB	Survival Heater Bus B
SMDP	Scan Mirror Datum Point
SMU	Scanner Mechanical Unit
SI	Système International d'unités
SPU	Signal Processing Unit
SRCF	Spacecraft Reference Coordinate Frame
SRD	Science Requirements Document
SSD	Subsystem Specification Document
SSH	Sunshield Subsystem
STH	Structure/Thermal Subsystem
SVA	Space View Aperture
SW (S/W)	Software
TBD	To be determined
TBFI	To be filled in
TBV	To be verified
TML	Total Mass Loss
TRCF	Telescope Reference Coordinate Frame
TSS	Telescope Subsystem
TSW	Telescope (TEU microprocessor) SoftWare
UCB	University of Colorado at Boulder
UIID	Unique Instrument Interface Document
UK	United Kingdom
VCM	Volatile Condensable Material
WFA	Warm Filter Array
WSE	Wobble Sensor Electronics

APPENDIX - TELEMETRY CONVERSION CURVES

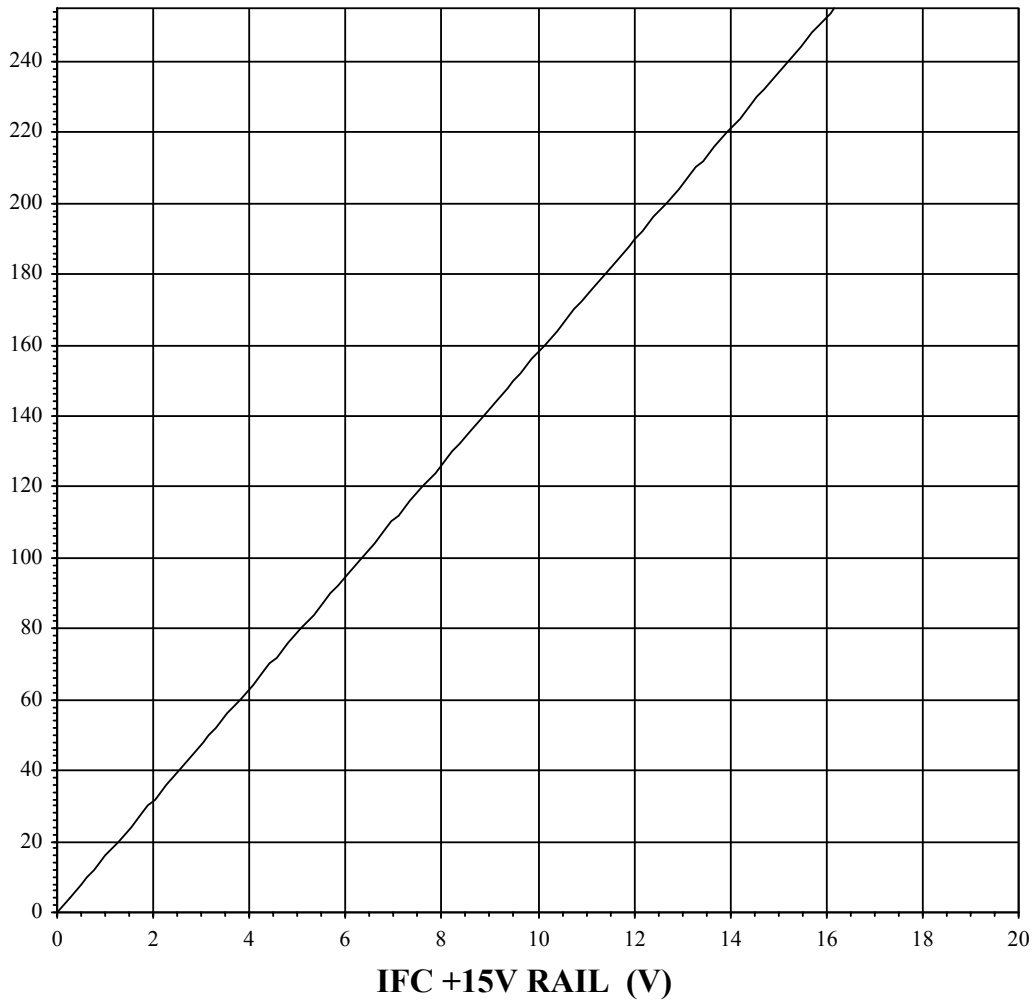
The following curves have been plotted using the specified Conversion Algorithm coefficients listed in Volume II of the C&TH.

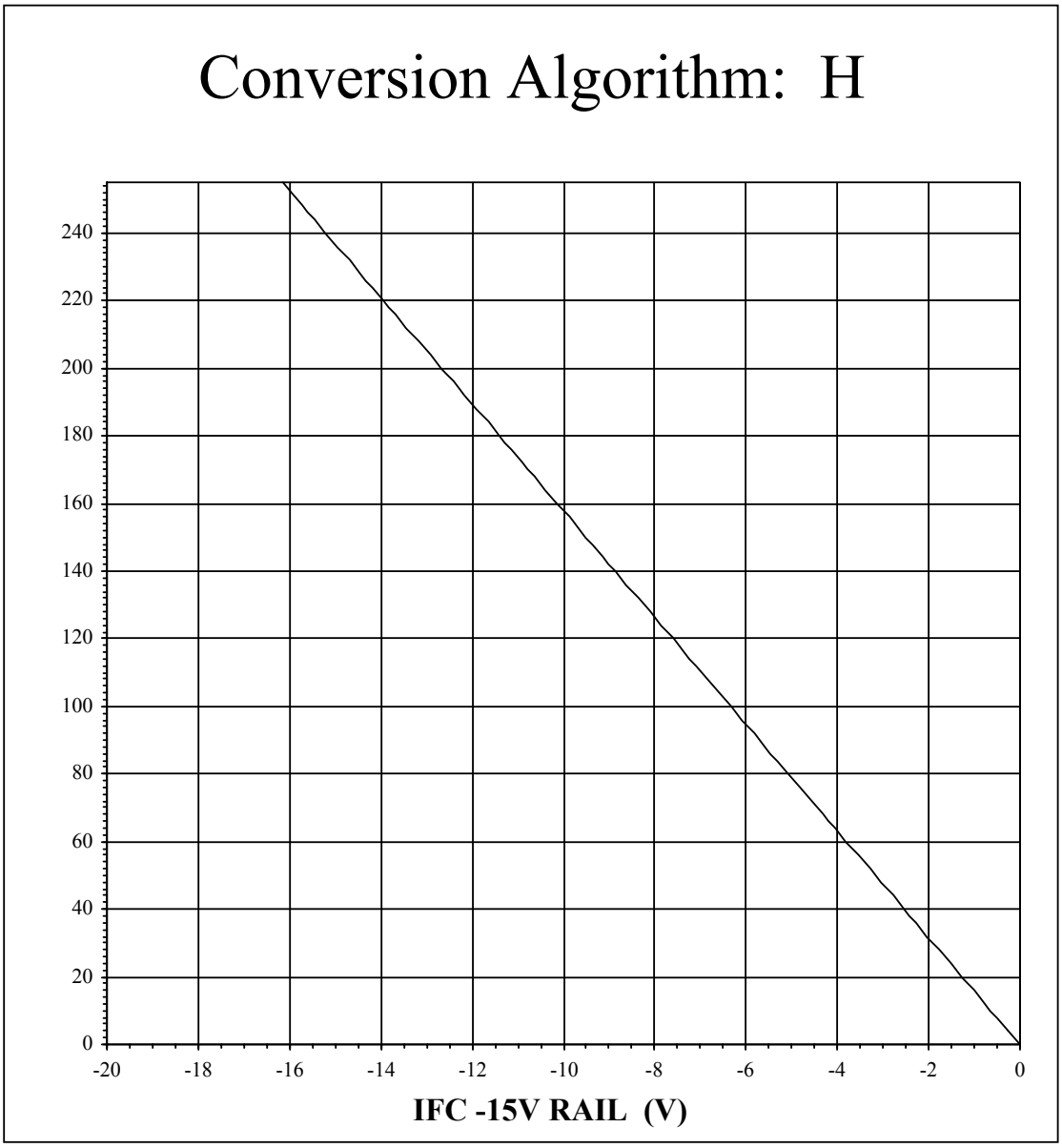
Conversion Algorithms are designated in groups, e.g. A, B, etc., with minor variations (< ± 2%) or scale differences within a group (if any) designated by a numeric suffix, e.g. A1, A2, etc.

In some cases there is only one plot per group, even when there is more than one member of the group. In these cases the plot is the 'nominal' curve for that group - e.g. for Conv. Alg = A1, A2, etc., see curve A., etc.

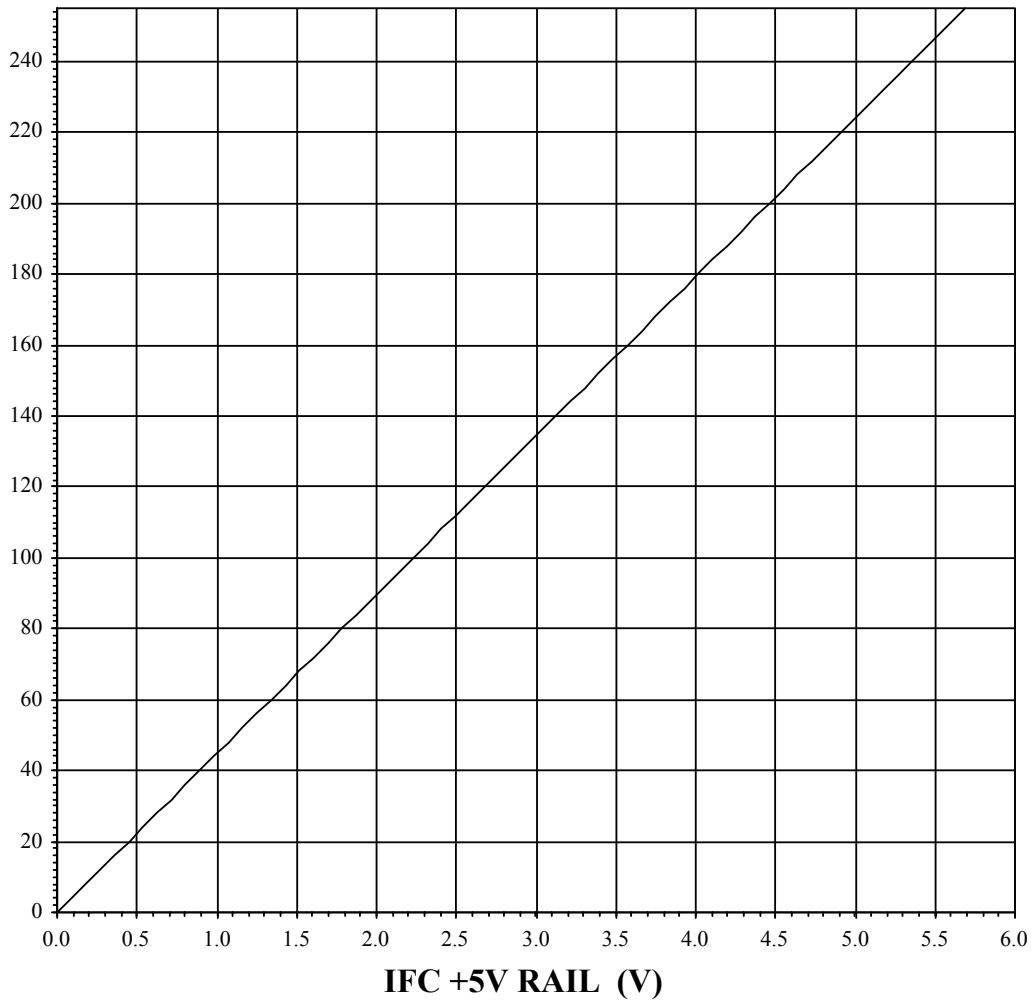

Conversion Algorithm: F
240
220
200
180
160
140
120
100
80
60
40
20
0
0
5
10
15
20
25
30
35
IFC 28V RAIL (V)

Conversion Algorithm: G

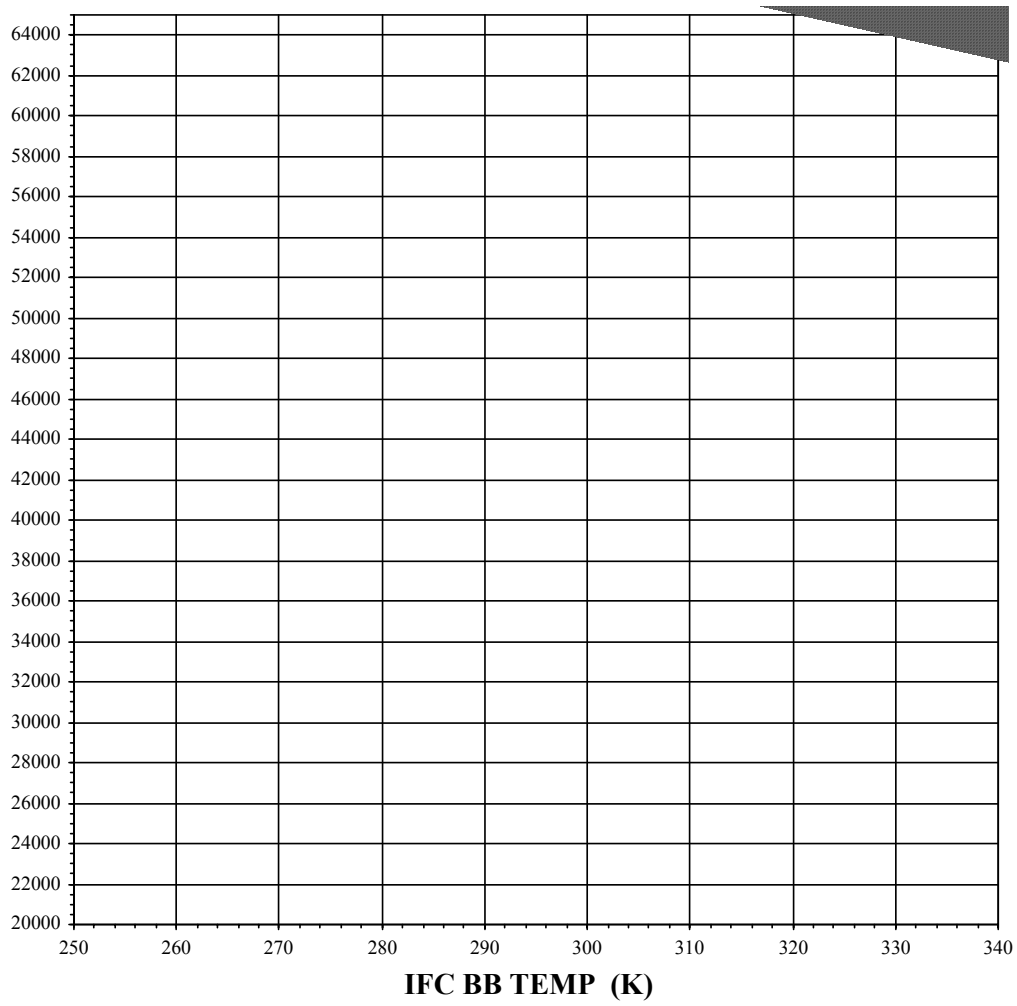



Conversion Algorithm: H
240
220
200
180
160
140
120
100
80
60
40
20
0
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
0
IFC -15V RAIL (V)

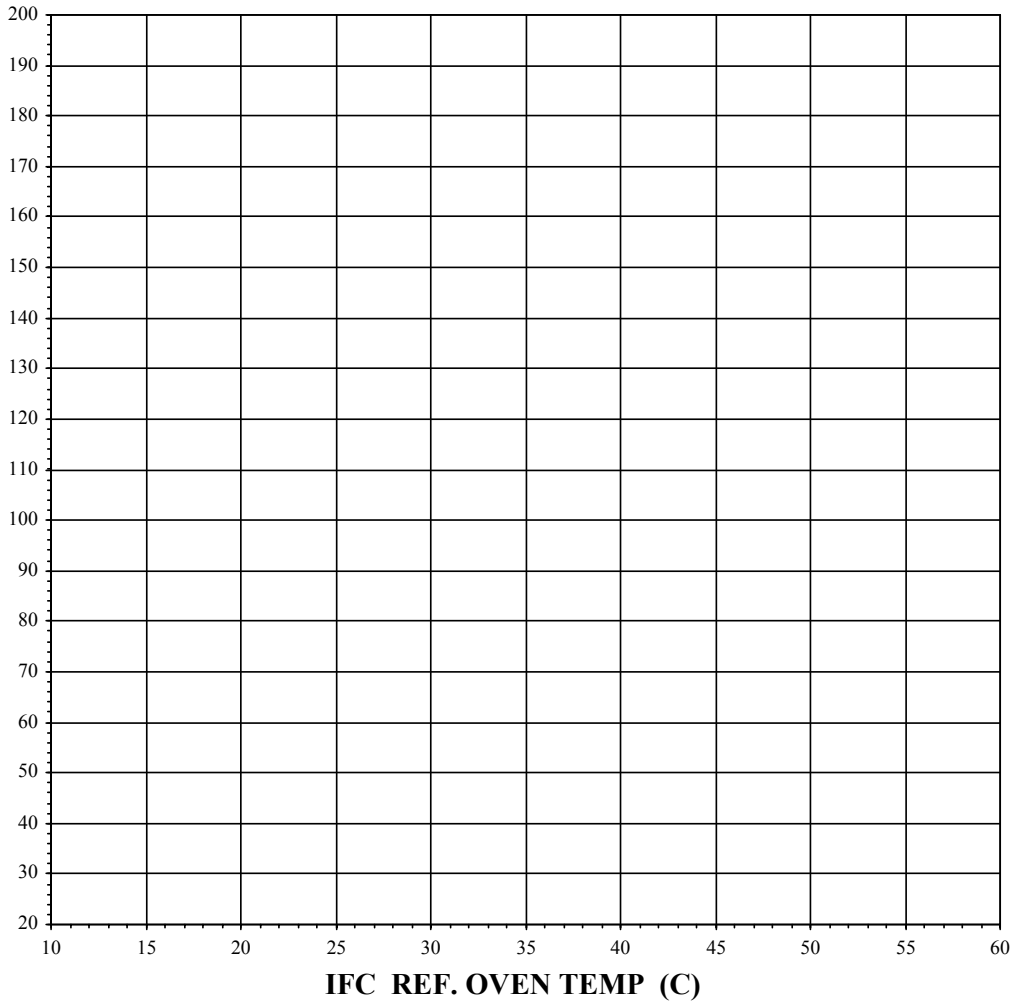
Conversion Algorithm: J



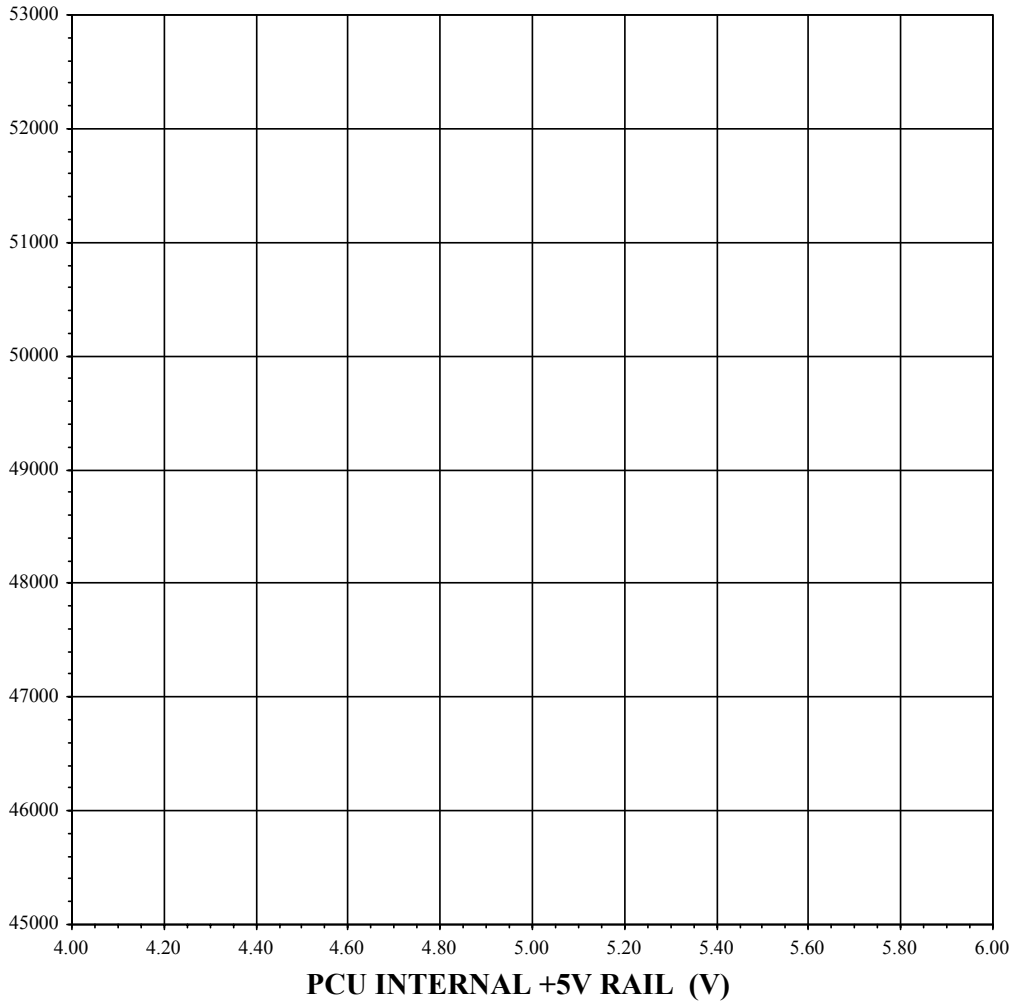
Conversion Algorithm: K

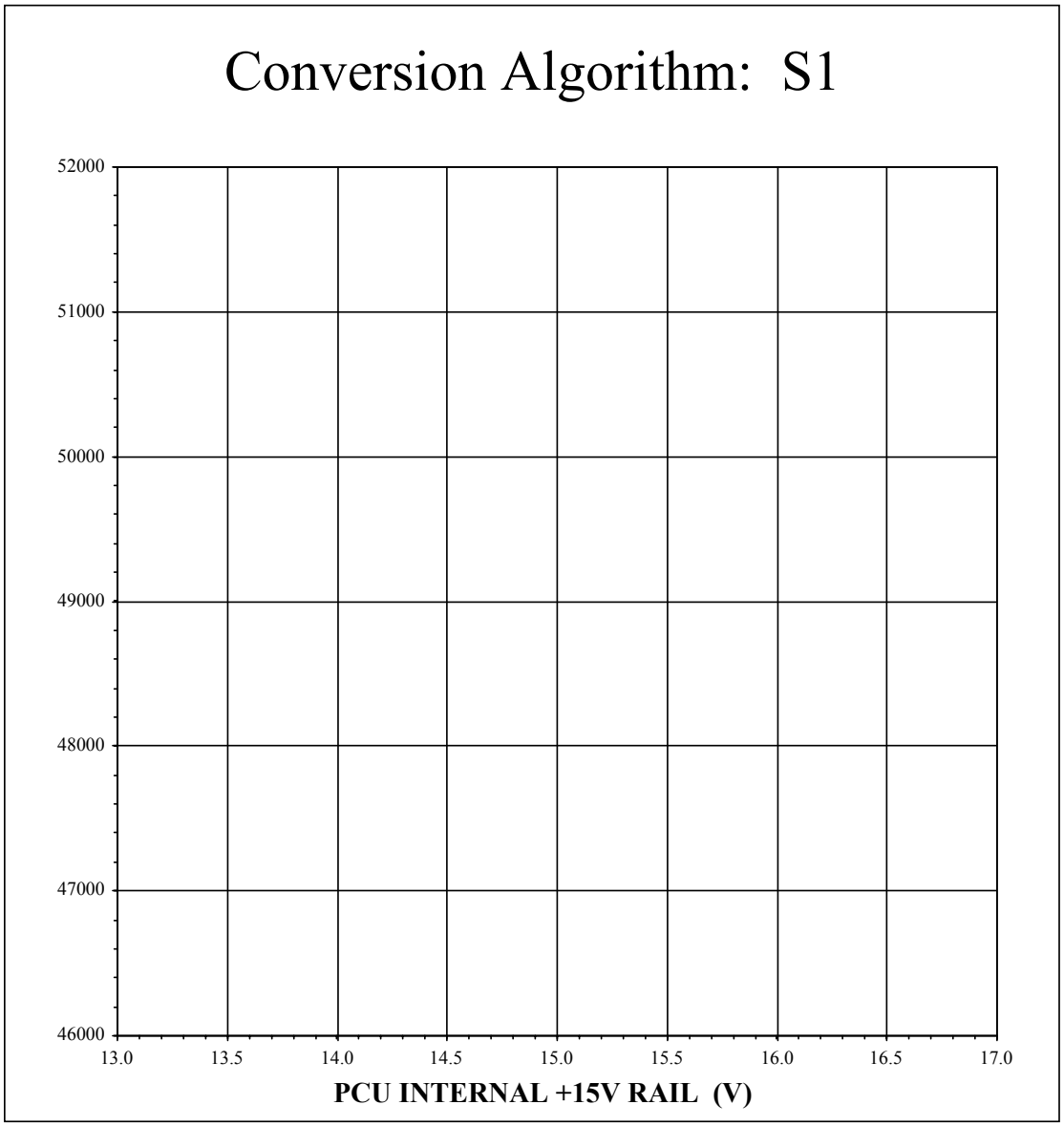


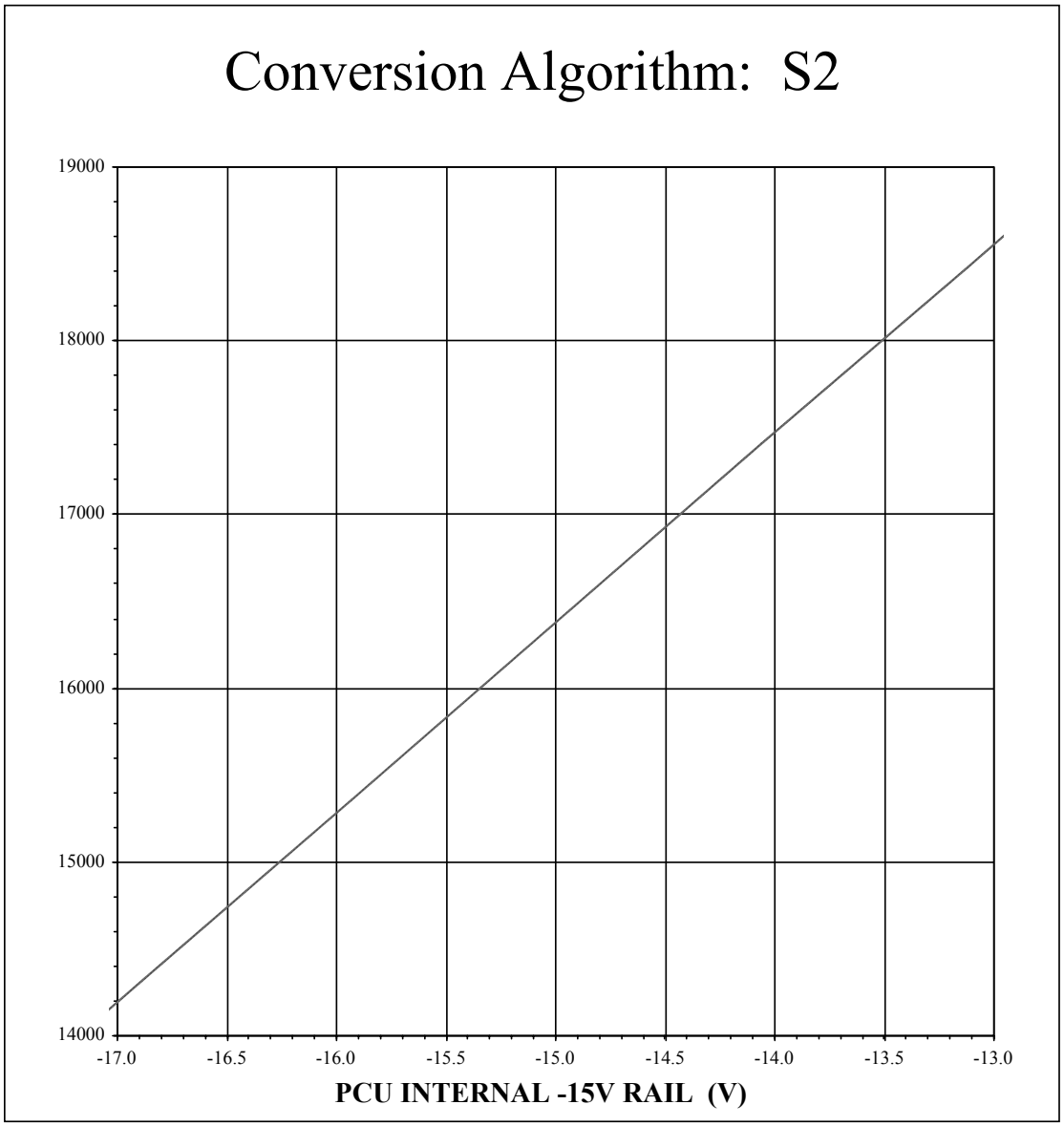
Conversion Algorithm: L



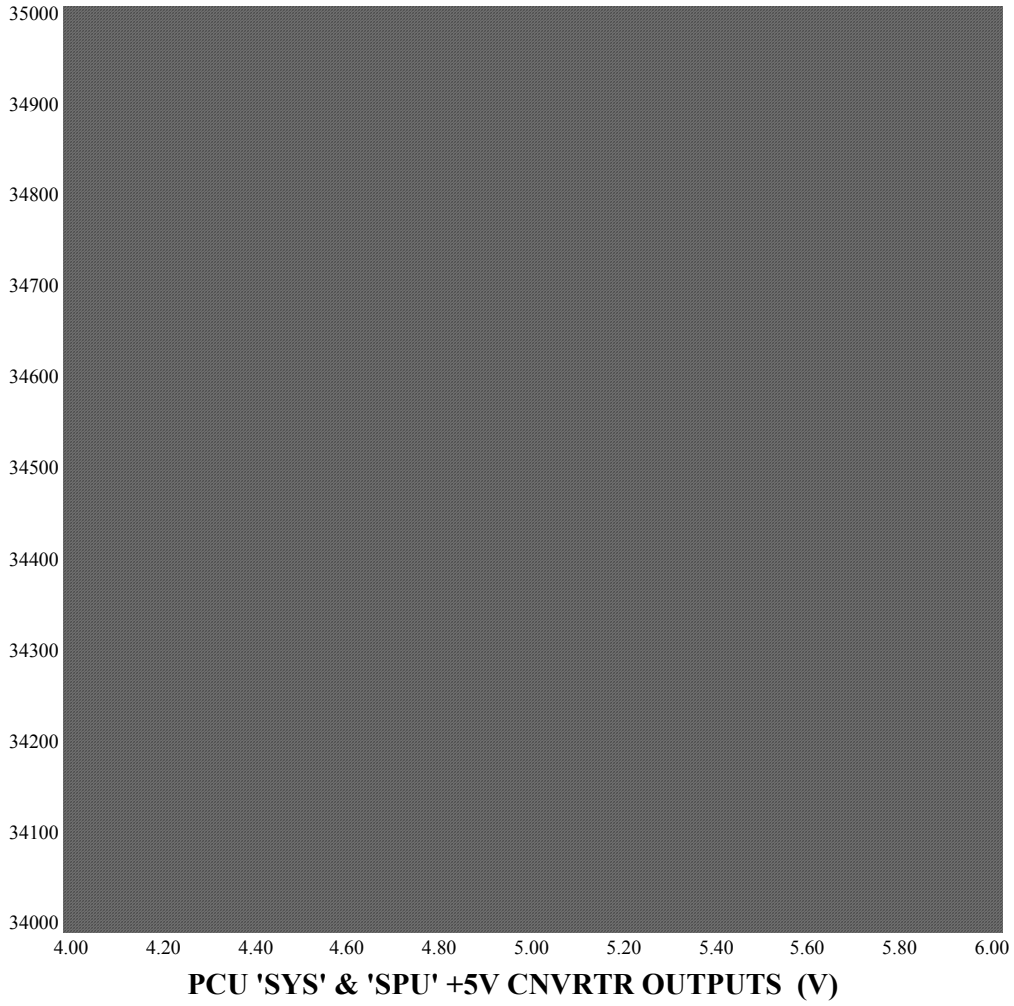
Conversion Algorithm: R



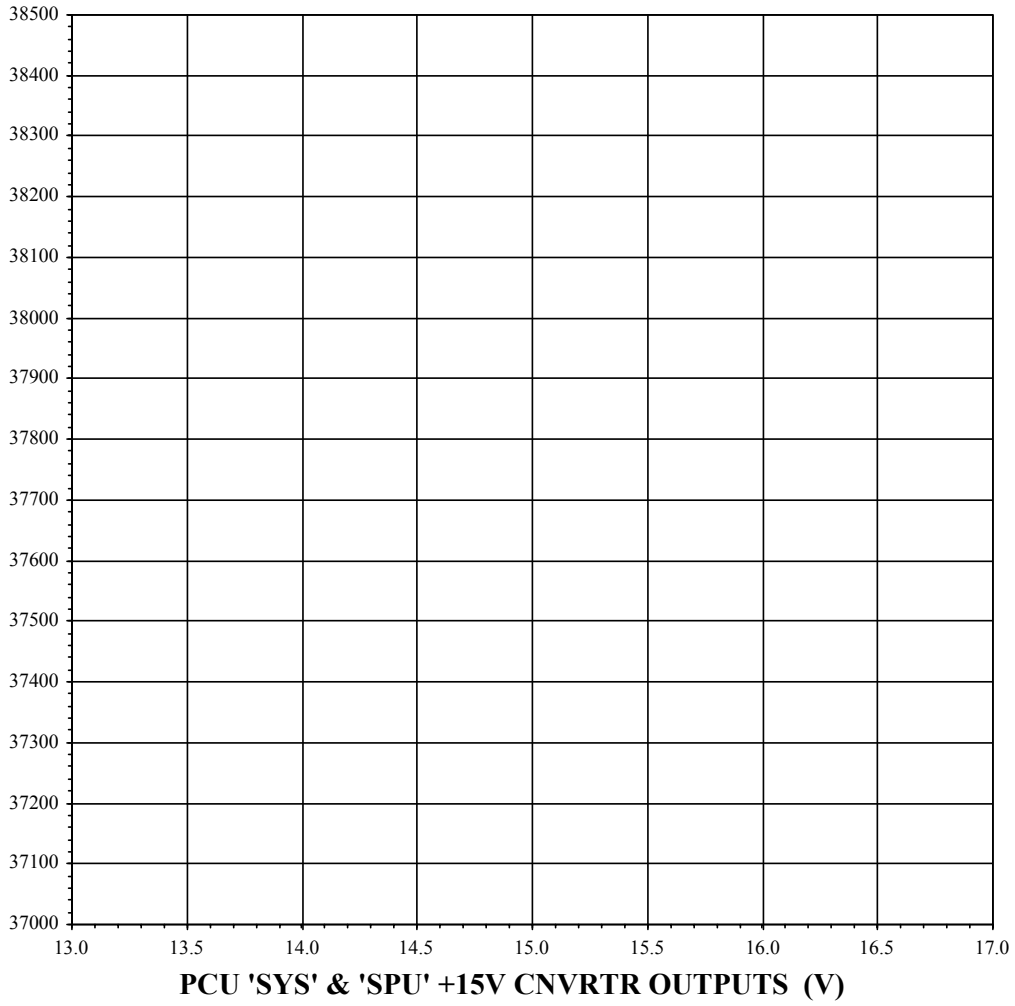

Conversion Algorithm: S1
52000
51000
50000
49000
48000
47000
46000
13.0
13.5
14.0
14.5
15.0
15.5
16.0
16.5
17.0
PCU INTERNAL +15V RAIL (V)


Conversion Algorithm: S2
19000
18000
17000
16000
15000
14000
-17.0
-16.5
-16.0
-15.5
-15.0
-14.5
-14.0
-13.5
-13.0
PCU INTERNAL -15V RAIL (V)

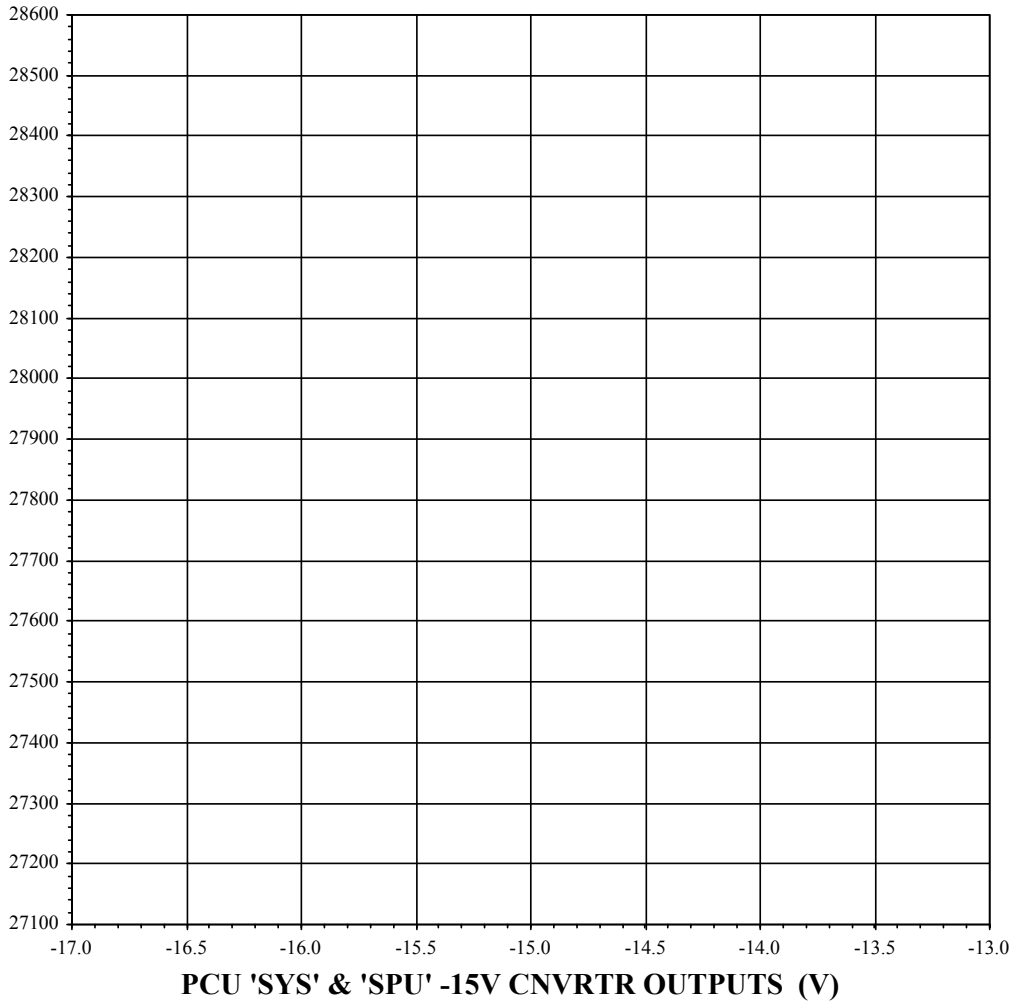
Conversion Algorithm: U1



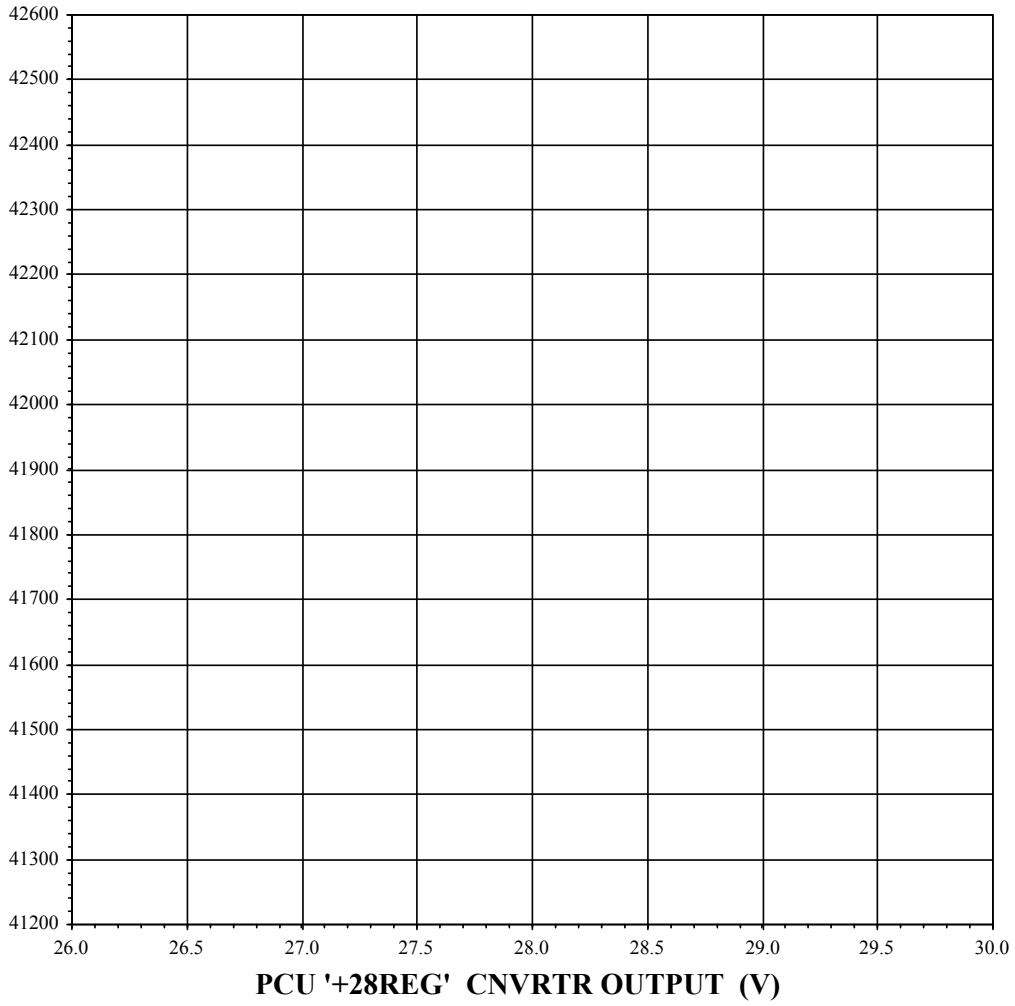
Conversion Algorithm: U2

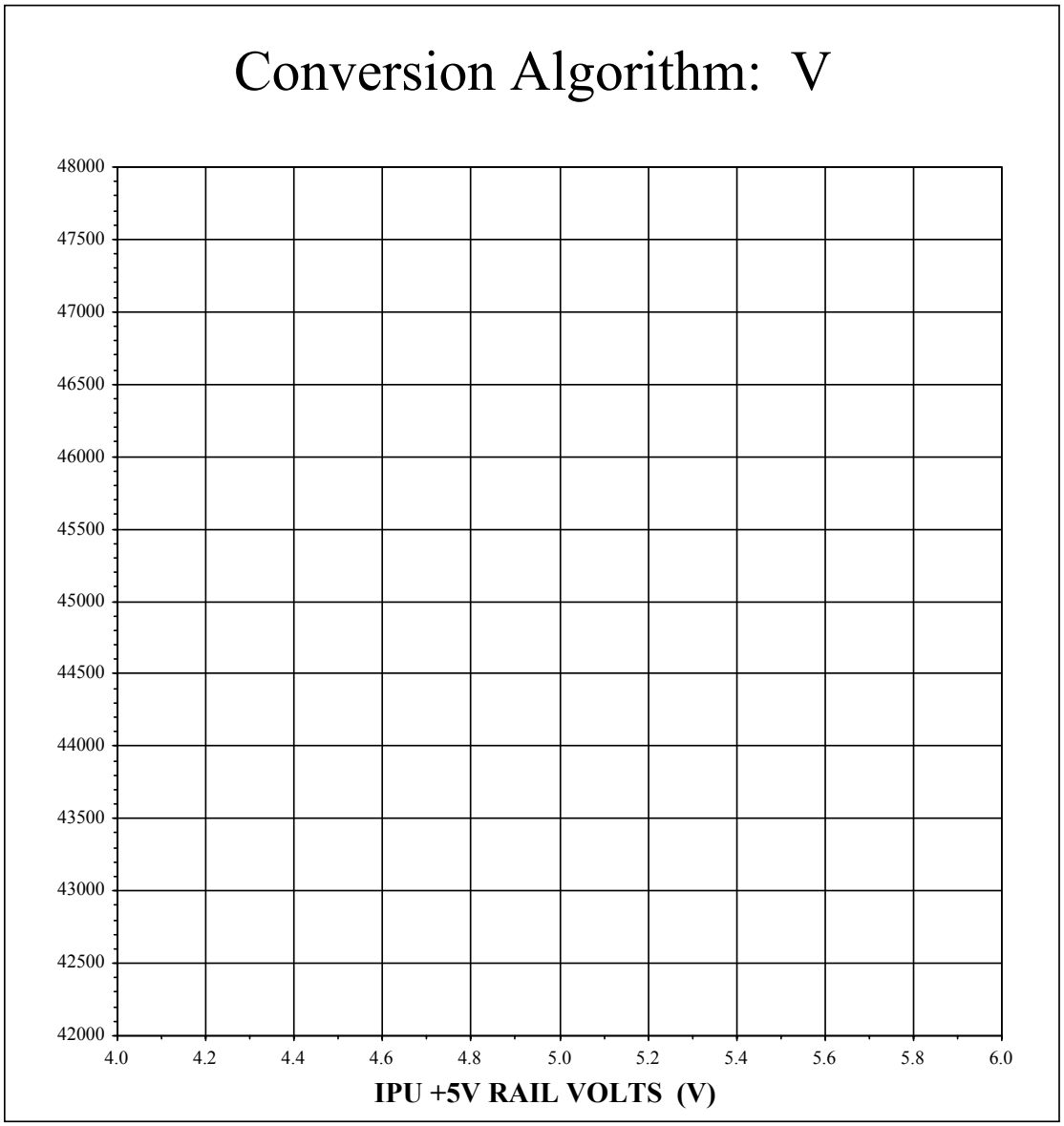


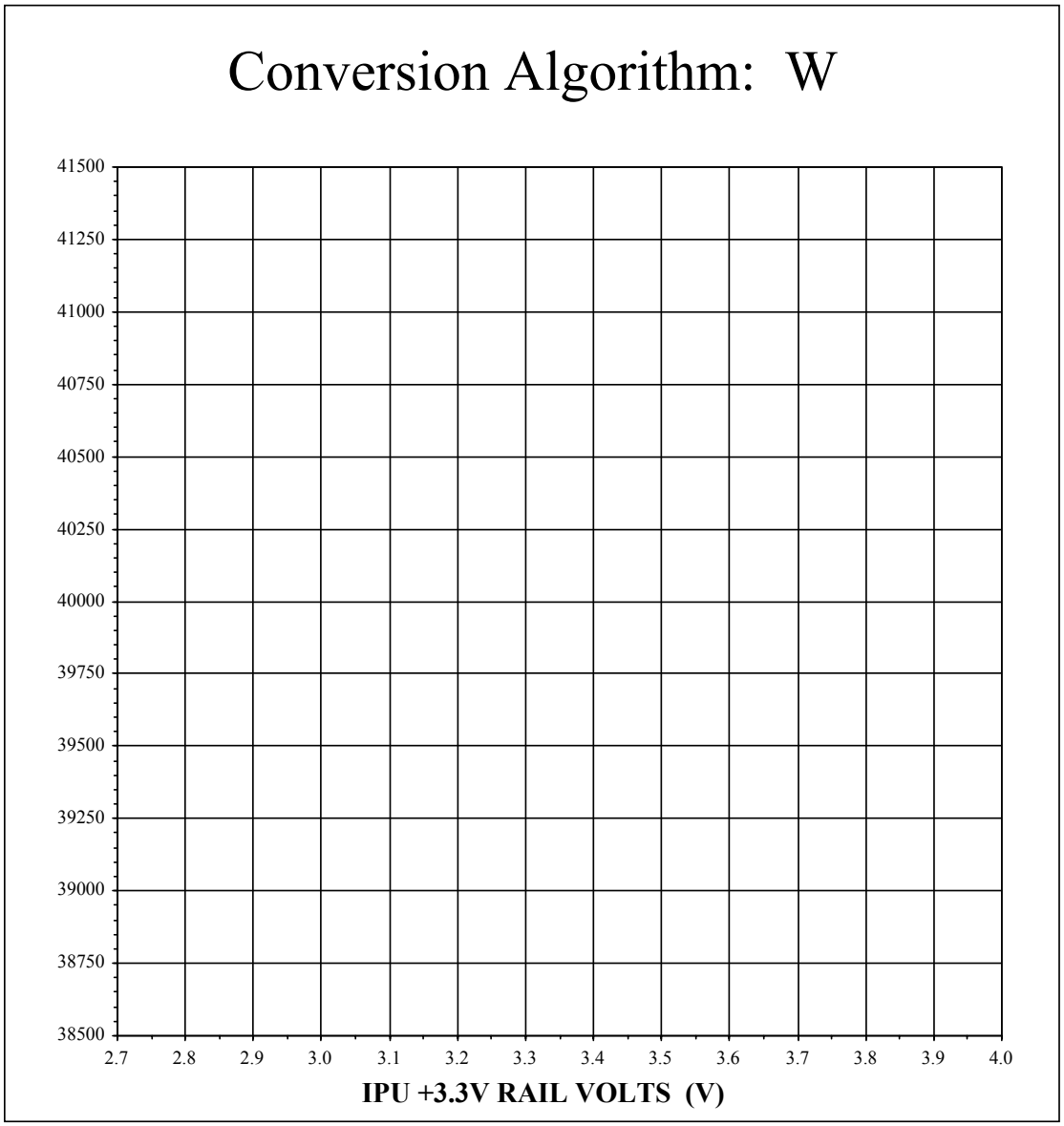
Conversion Algorithm: U3

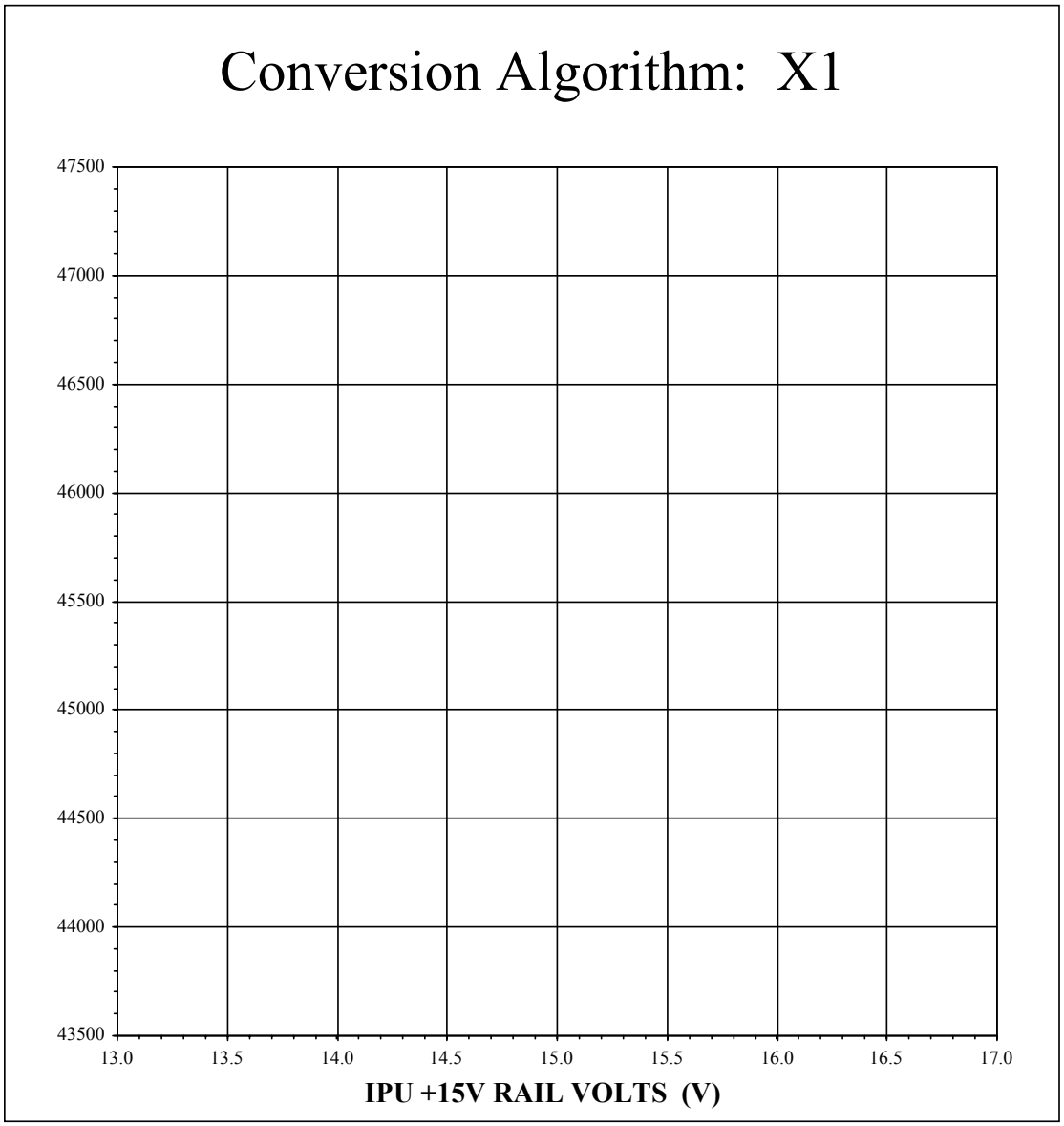


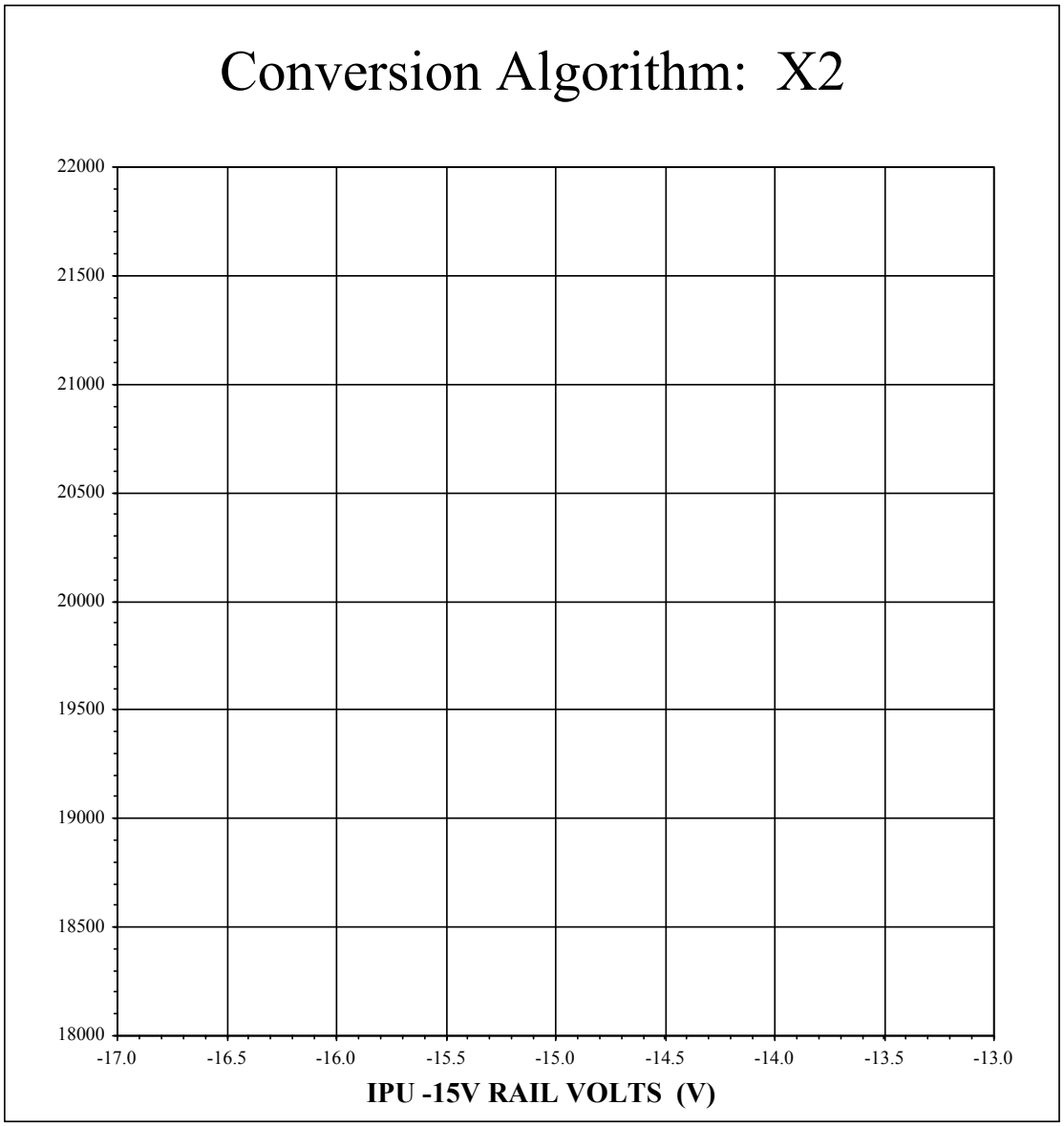
Conversion Algorithm: U4




Conversion Algorithm: V
48000
47500
47000
46500
46000
45500
45000
44500
44000
43500
43000
42500
42000
4.0
4.2
4.4
4.6
4.8
5.0
5.2
5.4
5.6
5.8
6.0
IPU +5V RAIL VOLTS (V)


Conversion Algorithm: W
41500
41250
41000
40750
40500
40250
40000
39750
39500
39250
39000
38750
38500
2.7
2.8
2.9
3.0
3.1
3.2
3.3
3.4
3.5
3.6
3.7
3.8
3.9
4.0
IPU +3.3V RAIL VOLTS (V)


Conversion Algorithm: X1
47500
47000
46500
46000
45500
45000
44500
44000
43500
13.0
13.5
14.0
14.5
15.0
15.5
16.0
16.5
17.0
IPU +15V RAIL VOLTS (V)


Conversion Algorithm: X2
22000
21500
21000
20500
20000
19500
19000
18500
18000
-17.0
-16.5
-16.0
-15.5
-15.0
-14.5
-14.0
-13.5
-13.0
IPU -15V RAIL VOLTS (V)

SP-HIR-103-V2F

HIRDLS

HIGH RESOLUTION DYNAMICS LIMB SOUNDER

Originators: M.A. Dials and D.M. Woodard Date: 2002-07-19

Subject / Title: **COMMAND & TELEMETRY HANDBOOK–Vol. 2**

Contents / Description / Summary:

Summary of Volumes

VOLUME 1 HIRDLS Operation, Commanding, Verification & Telemetry (in 2 parts)
VOLUME 2 Compendium of HIRDLS Command & Telemetry Files
VOLUME 3 Command & Telemetry Packet Formats, Data Blocks, Protocols & Timing

This release of C&TH Volume 2 corresponds to Version 6.15 of the HIRDLS C&T ASCII files.

Key Words:

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Department of Atmospheric, Oceanic & Planetary Physics
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United Kingdom

University of Colorado at Boulder
Center for Limb Atmospheric Sounding
3300 Mitchell Lane, Suite 250
Boulder, Colorado 80301-6303
United States of America

EOS

This volume of the Command and Telemetry Handbook is a listing of the HIRDLS commands and telemetry items; it is intended for use as a convenient reference, but not for automatic ingestion as part of any software build process. The commands and telemetry items listed herein are generated directly from tables which are in the command and telemetry database. These listings include every command and telemetry record in the database tables, but do not include all of the fields in each record (e.g., high and low yellow and red limits and conversion algorithms, etc. are in the database but not in these listings).

HIRDLS Commands

(Sort by Cmd No)

Cmd No	Mnemonic	Subsystem	Class	Type
1	HIR_BIP_HOLD	BIP	Booting	Flight

Description

Abort IPU countdown to running state and hold the IPU in the idle boot hold state

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000001 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If this command is used, the program will NOT be loaded from EEPROM into RAM. This must be done manually if required. This command will transition the IPU into the idle boot hold state.The IPU remains in this state until a HIR_IPU_BOOT or HIR_IPU_REBOOT command is received.This command is only valid during the countdown state.

Cmd No	Mnemonic	Subsystem	Class	Type
2	HIR_BIP_EXECUTE	BIP	Booting	Flight

Description

Abort IPU countdown and execute the application immediately

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000010 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is valid only during the countdown state.

Cmd No	Mnemonic	Subsystem	Class	Type
3	HIR_BIP_REBOOT	BIP	Boot Hold	Flight

Description

Performs a cold reboot of the IPU processor.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000011 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will cause all operations (including 1553) to halt for the duration of the IPU boot.Additional commands may be required to return the IPU to an operational state.This command is valid only during any of the boot hold states.Note that if the EEPROM was being programmed, the EEPROM contents may be corruptedif this command is used.

Cmd No	Mnemonic	Subsystem	Class	Type
4	HIR_BIP_EEREAD	BIP	Boot Hold	Flight

Description

Copy a section of EEPROM into IPU RAM

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	EEPROM section location (0 to 15)	4	S	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000100 ********
00000000 0000SSSS 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Read a section of EEPROM into RAM.

Cmd No	Mnemonic	Subsystem	Class	Type
5	HIR_BIP_BOOT	BIP	Boot Hold	Flight

Description

Boot IPU from the specified RAM address

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000101 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Jump to the loaded RAM address and boot if the program checksums match using the address and checsum from the latest HIR_BIP_HEADER or HIR_BIP_EEREAD command.

Cmd No	Mnemonic	Subsystem	Class	Type
6	HIR_BIP_DUMPADDR	BIP	Boot Hold	Flight

Description

Change current dump address of IPU dump

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	0 means fixed dump, 1 means cyclic dump	1	R	0 to 1
1	Address offset is byte address for location in RAM if 0 or Dword address in EEPROM if 1	1	L	0 to 1
2	IPU address to start dump	24	A	0 to 2097148

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000110 ********
0000000R 0000000L 00000000 AAAAAAAA AAAAAAAA AAAAAAAA 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Start dump at specified location in RAM or EEPROM.

Cmd No	Mnemonic	Subsystem	Class	Type
7	HIR_BIP_JMP	BIP	Boot Hold	CRITICAL

Description

Boot IPU from the specified RAM address

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	IPU RAM address to warm reboot	32	J	0 to 2097148

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000111 ********
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For more detailed notes see latest release of SP_HIR_103 Vol1

Cmd No	Mnemonic	Subsystem	Class	Type
8	HIR_CSS_SETTING	CSS	Operational	Flight

Description

Set cooler mode, and target temperature or manual settings

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Mode word (see notes)	8	M	0 to 255
1	Temperature in 0.1 K units in mode 0	16	T	0 to 3000
2	Compressor stroke level in 0.1% units	16	C	0 to 1000
3	Displacer stroke level in 0.1% units	16	D	0 to 1000

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001000 ********
00000000 MMMMMMMM TTTTTTTT TTTTTTTT CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

In thermostatic mode, the values for the stroke levels define the maximum levels. In manual mode, the temperature is ignored. For the mode word, the following bit definitions apply: Bit 0 - Electronics Only (0), Control (1),Bit 1 - Manual mode off (0), on (1)Bit 2 - Thermostatic mode off (0), on (1),Bit 3 - Warm-up mode off (0), on (1),Bit 4 - Vibration cancellation mode (eliminated/not used), Bit 5 - Diode select, diode 0 or 1. Bit 7 - Over Stroke Disable Mode, 0=O/S on, 1=O/S off.

Cmd No	Mnemonic	Subsystem	Class	Type
9	HIR_CSS_FREQ	CSS	Operational	Flight

Description

Set cooler frequency and angles

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
1	Displacer phase angle in 0.1 deg units	16	A	0 to 3599
0	Operating frequency in 0.1 Hz units	16	F	306 to 400

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001001 ********
FFFFFFFF FFFFFFFF AAAAAAAA AAAAAAAA 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Default value for P0: 325 = 32.5 HzDefault value for P1: 550 = 55 deg.

Cmd No	Mnemonic	Subsystem	Class	Type
10	HIR_CSS_CNVRTR	CSS	Operational	CRITICAL

Description

Select primary or secondary converters

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Primary cnvrtrs (0) or secondary cnvrtrs (1)	1	P	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001010 ********
00000000 0000000P 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Default state for P0: 0 = primary converters selected

Cmd No	Mnemonic	Subsystem	Class	Type
11	HIR_CSS_LOCK	CSS	Operational	CRITICAL

Description

Short or open CSS motor windings

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Compressor(0), Displacer(1).	1	S	0 to 1
1	Cage(0), Prim_Uncage(1), Sec_Uncage(2).	2	F	0 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001011 ********
00000000 0000000S 00000000 000000FF 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The cooler cannot be operated until the motor windings have been uncaged.

Cmd No	Mnemonic	Subsystem	Class	Type
12	HIR_GSS_BSELECT	GSS	Operational	Flight

Description

Select GSS B-side.

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001100 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command issues an IPU discrete pulse to the GSS to switch to GSS side B. The GSS automatically powers on to the GSS A side independent of the IPU.

Cmd No	Mnemonic	Subsystem	Class	Type
13	HIR_GSS_CONTROL	GSS	Operational	Flight

Description

Set attributes for selected gyro

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Gyro channel	3	G	0 to 7
1	Function code	2	F	0 to 3
2	Operation code	5	P	0 to 31

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001101 ********
00000000 00000GGG 00000000 000000FF 00000000 000PPPPP 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Maps directly on to IPU-to-GSS Control Word. See C&THB, Vol. 1, Section 2.3.4.3.2.

Cmd No	Mnemonic	Subsystem	Class	Type
14	HIR_IPU_REBOOT	IPU	Operational	Flight

Description

Performs a cold reboot of the IPU processor.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001110 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will cause all operations (including 1553) to halt for the duration of the IPU boot.Additional commands may be required to return the IPU to an operational state.

Cmd No	Mnemonic	Subsystem	Class	Type
15	HIR_IPU_CHOPFREQ	IPU	Operational	Flight

Description

Set a chopper reference frequency prescaler

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Prescaler Value	12	P	3003 to 3255

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001111 ********
00000000 0000PPPP PPPPPPPP 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The chopper reference signal is a 500 Hz +/- 20 Hz programmable square wave. It's period is set by loading the prescaler register. Values between 3003 (0BBB) and 3255 (0CB7) will yield frequencies between 520.14 Hz and 479.88 Hz respectively. A prescaler value of 3124 (0C34) will yield a chopper frequency of 500 Hz. Conversion equations: Frequency (Hz) = 1/((prescaler + 1) *0.00000064). Prescaler = 1/(frequency * .00000064)-1. Default value: 3124 (0C34) 500.00 Hz.

Cmd No	Mnemonic	Subsystem	Class	Type
16	HIR_IPU_FAULTCLR	IPU	Operational	Flight

Description

Clear all fault condition flags which have been set in the telemetry

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010000 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For any fault, a flag bit will be set in the telemetry stream which will persist until cleared by this command. This command will also protect HIR_IPU_FAULTOFF, HIR_SVA_MOVEPROT, HIR_SSH_MOVEPROT and HIR_SSH_HEATERPROT if they are currently unprotected by their corresponding unprotect commands.

Cmd No	Mnemonic	Subsystem	Class	Type
17	HIR_BIP_EEWIPE	BIP	Boot Hold	CRITICAL

Description

Erase a EEPROM section

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	EEPROM section to erase (0 - 15)	4	E	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010001 ********
00000000 0000EEEE 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For more detailed notes see latest release of SP_HIR_103 Vol1

Cmd No	Mnemonic	Subsystem	Class	Type
18	HIR_BIP_EEREPAIR	BIP	Boot Hold	CRITICAL

Description

Fix a EEPROM index error or clear all EEPROM data.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Action to be performed (0x0000=abort, 0x5555=EEPROM scrub, 0x7777=load MBIC start/end addresses, 0x8888=correct failed index block, 0xAAAA=set safety override word, 0xBBBB=perform IPU autoboot check, 0xFFFF=erase all EEPROM [stage 1], 0xEEEE=erase all EEPROM [stage 3]. All other values invalid and will be rejected	16	A	0 to 65535
1	Parameter (see SW-LOC-502)	32	P	0 to 65535
2	MBICA start address (32-bit word offset, 2^19 - 2, last byte not usable)	19	E	0 to 524286
3	MBICA end address (32-bit word offset, 2^19 - 2, last byte not usable))	19	F	0 to 524286
4	MBICB start address (32-bit word offset, 2^19 - 2, last byte not usable))	19	G	0 to 524286
5	MBICB end address (32-bit word offset, 2^19 - 2, last byte not usable))	19	H	0 to 524286

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010010 ********
AAAAAAAA AAAAAAAA PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP 00000000 00000EEE
EEEEEEEE EEEEEEEE 00000000 00000FFF FFFFFFFF FFFFFFFF 00000000 00000GGG
GGGGGGGG GGGGGGGG 00000000 00000HHH HHHHHHHH HHHHHHHH 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For more detailed notes see latest release of SW-LOC-502.

Cmd No	Mnemonic	Subsystem	Class	Type
19	HIR_MAC_ASSIGN	MACRO	Operational	Flight

Description

Assign a macro to a macro number

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Macro Number	7	M	0 to 127
1	Total number of 32-bit words in macro. If this parameter is not a multiple of 17, (16 words for each command, plus 1 for the delay) the command will be rejected.	16	N	0 to 65535
2	32-bit XOR checksum of the macro to be uploaded	32	C	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010011 ********
00000000 0MMMMMMM NNNNNNNN NNNNNNNN CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede a number of HIR_MAC_UPLOAD commands.

Cmd No	Mnemonic	Subsystem	Class	Type
20	HIR_MAC_UPLOAD	MACRO	Operational	Flight

Description

Upload data for a macro

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	15

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Address offset in block (0 = block start)	16	A	0 to 65535
1	Number of 32-bit words to upload	4	L	1 to 13
2	Data word 1 for upload (zero padded)	32	B	0 to 4294967295
3	Data word 2 for upload (zero padded)	32	C	0 to 4294967295
4	Data word 3 for upload (zero padded)	32	D	0 to 4294967295
5	Data word 4 for upload (zero padded)	32	E	0 to 4294967295
6	Data word 5 for upload (zero padded)	32	F	0 to 4294967295
7	Data word 6 for upload (zero padded)	32	G	0 to 4294967295
8	Data word 7 for upload (zero padded)	32	H	0 to 4294967295
9	Data word 8 for upload (zero padded)	32	J	0 to 4294967295
10	Data word 9 for upload (zero padded)	32	K	0 to 4294967295
11	Data word 10 for upload (zero padded)	32	M	0 to 4294967295
12	Data word 11 for upload (zero padded)	32	P	0 to 4294967295
13	Data word 12 for upload (zero padded)	32	R	0 to 4294967295
14	Data word 13 for upload (zero padded)	32	T	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010100 ********
AAAAAAAA AAAAAAAA 00000000 0000LLLL BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
```

Comments

This command must be preceded by the HIR_MAC_ASSIGN command. Addresses in the H-32 format are relative to 0, which is the start of the selected macro. The format within the upload data is as follows: 16 32-bit words representing a 1553 command, followed by 1 32-bit word representing the delay factor in command ticks relative to the previous command in the macro. One command tick = 4*CR (where CR is time of one chopper rotation, nominal 12ms). (The minimum time between MACRO commands is 4 CR's). A group of HIR_MAC_UPLOAD commands is assembled into a macro and verified by the HIR_MAC_ACTIVATE command.

Cmd No	Mnemonic	Subsystem	Class	Type
21	HIR_MAC_EXE	MACRO	Operational	Flight

Description

Execute selected macro immediately

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Macro Number	7	M	0 to 127

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010101 ********
00000000 0MMMMMMM 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The contents of the selected macro will be added to the command queue.

Cmd No	Mnemonic	Subsystem	Class	Type
22	HIR_MAC_TIMED	MACRO	Operational	Flight

Description

Add or delete a timed macro

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Delete (0) or add (1) a timed macro	1	A	0 to 1
1	Macro Number	7	N	0 to 127
2	Macro High Time of execution	32	M	0 to 4294967295
3	Macro Low Time of execution	32	L	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010110 ********
00000000 0000000A 00000000 0NNNNNNN MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Only one macro may be executed at an specified HIRDLS time. Adding a macro at a already used time will replace the existing macro. A timed macro will only be deleted if the time and macro number match the original add request.If a HIR_IPU_SETTIME command is issued, all timed macro entries will be deleted.

Cmd No	Mnemonic	Subsystem	Class	Type
23	HIR_MAC_ERASE	MACRO	Operational	Flight

Description

Erase a macro (set to no-operation if executed)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Macro Number	7	M	0 to 127

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010111 ********
00000000 0MMMMMMM 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will affect all future execution of the macro, including any timed requests which have not been executed. Executing an erased macro will generate a command error.

Cmd No	Mnemonic	Subsystem	Class	Type
24	HIR_OPH_CONTROL	OPH	Operational	Flight

Description

Control operational heaters for specified zone

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Heater zone	4	Z	0 to 6
1	Power level value. 255= 100% power.For zones 1-6 this is a pulse width of (5.12E-6 seconds) * 0xB7 = .937 msecs	8	P	0 to 255
2	Heater On Pulse delay from start of half chopper cycle (5.12 usecs per bit). Zones 1-6 only	8	D	0 to 255

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011000 ********
00000000 0000ZZZZ 00000000 DDDDDDDD 00000000 00000000 00000000 PPPPPPPP
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The in-flight calibrator is heater zone 0. This command is intended for use by SAIL but can be sent from the ground for manual heater control (Constant Power settings only). A SAIL Task will normally be used to control operational heaters.

Cmd No	Mnemonic	Subsystem	Class	Type
25	HIR_PSS_SWITCH	PSS	Operational	Flight

Description

Send a function code and action to PSS

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	PSS Function Code (see notes)	16	C	0 to 63
1	PSS Action (see notes)	16	A	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011001 ********
CCCCCCCC CCCCCCCC AAAAAAAA AAAAAAAA 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If P0 = 0, the value of P1 will be passed directly to the PSS as an Individual Relay Command (IRC). If P0 >0 an IPU Power Switching Macro (PSM) will be executed. A PSM contains a sequence of IRCs. See the HIR_MAC_EXE command for additional information.

Cmd No	Mnemonic	Subsystem	Class	Type
26	HIR_PSS_DISCRETE	PSS	Operational	Flight

Description

Send a discrete pulse to the PSS

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Discrete Channel (see notes)	3	D	1 to 6

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011010 ********
00000000 00000DDD 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Starting at the next chopper revolution, and ending at the following chopper revolution,the IPU software will activate one of the 6 PSS relay discrete pulses. Param #0 = 1 will connect PCU Internal Supply A to QBA and Supply B to QBB. Param #0 = 2 will connect PCU Internal Supply B to QBA and Supply A to QBB. Param #0 = 3 thro' 6 are not used.

Cmd No	Mnemonic	Subsystem	Class	Type
27	HIR_SAI_START	SAIL	Operational	Flight

Description

Starts SAIL processor with specified amount of additional shared memory

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Number of 512-byte blocks for shared area	9	B	0 to 126

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011011 ********
0000000B BBBBBBBB 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If the SAIL processor is already running, this command will be rejected.Note that the maximum shared memory is limited to 64K (1K preallocated, 63K maximum additional memory)

Cmd No	Mnemonic	Subsystem	Class	Type
28	HIR_SAI_STOP	SAIL	Operational	Flight

Description

Kills all active SAIL tasks, deallocates SAIL memory, and halts the SAIL processor

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Kill code to stop SAIL	16	C	57005 to 57005

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011100 ********
CCCCCCCC CCCCCCCC 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If the SAIL processor is not running, this command will be rejected. If the kill (hex) code is not DEAD, the command will be rejected.

Cmd No	Mnemonic	Subsystem	Class	Type
29	HIR_SAI_CREATE	SAIL	Operational	Flight

Description

Create a SAIL task using specified code and data sections with a given purpose code

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15
1	SAIL code block start	10	C	0 to 1023
2	SAIL data block start	10	D	0 to 1023
3	User-defined purpose identifier	16	P	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011101 ********
00000000 0000TTTT 000000CC CCCCCCCC 000000DD DDDDDDDD PPPPPPPP PPPPPPPP
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected under any of the following conditions: SAIL processor not running, task number in use, code or data area assigned to another task, code or data area is not the start of a series,code or data area not uploaded, or purpose does not match identifier in code block.

Cmd No	Mnemonic	Subsystem	Class	Type
30	HIR_SAI_KILL	SAIL	Operational	Flight

Description

Kill a SAIL task, code and data areas remain allocated

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011110 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if the SAIL processor is not running or the task number is not in use.

Cmd No	Mnemonic	Subsystem	Class	Type
31	HIR_SAI_SUSPEND	SAIL	Operational	Flight

Description

Suspends indefinitely a given SAIL task at the next SAIL frame

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011111 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if the SAIL processor is not running or the task number is not in use.

Cmd No	Mnemonic	Subsystem	Class	Type
32	HIR_SAI_RESUME	SAIL	Operational	Flight

Description

Resumes a given SAIL task at the next SAIL frame.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100000 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if the SAIL processor is not running or the task number is not in use.

Cmd No	Mnemonic	Subsystem	Class	Type
33	HIR_SAI_PARAMCLR	SAIL	Operational	Flight

Description

Clear parameters 0-7 OR 8-15 for specified SAIL task.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15
1	SAIL parameter group	1	U	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100001 ********
00000000 0000TTTT 00000000 0000000U 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command clears selected parameters for a specified SAIL task. Param#1=0 selects slots 0-7. Param#1=1 selects slots 8-15. This is a particular implementation of the HIR_SAI_SHARED command.

Cmd No	Mnemonic	Subsystem	Class	Type
34	HIR_SAI_FLAGCLR	SAIL	Operational	Flight

Description

Clear flags (slot #15) for specified SAIL task

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100010 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command clears the status flags in parameter #15 of the selected SAIL task. It is a particular implementation of the HIR_SAI_SHARED command. Intended for use by FOT on HIRDLS request.

Cmd No	Mnemonic	Subsystem	Class	Type
35	HIR_SAI_ERASE	SAIL	Operational	Flight

Description

Erase a SAIL code or data segment

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Start block of segment to be erased	10	S	0 to 1023

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100011 ********
000000SS SSSSSSSS 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if any of the following conditions are true: the SAIL processor is not running, the block number is not the start of a code or data segment, the block is not allocated,or the block is currently in use by one of the tasks (running or suspended).

Cmd No	Mnemonic	Subsystem	Class	Type
36	HIR_SAI_SETPARAM	SAIL	Operational	Flight

Description

Loads value into specified SAIL task parameter slot

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15
1	SAIL parameter number	4	S	0 to 15
2	Binary encoded data (zero padded)	32	D	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100100 ********
00000000 0000TTTT 00000000 0000SSSS DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command intended primarily to allow SAIL task parameters to be changed by stored (time-tag) commands or RTSs. It is a particular implementation of the HIR_SAI_SHARED command.

Cmd No	Mnemonic	Subsystem	Class	Type
37	HIR_SAI_COMMAND	SAIL	Operational	Flight

Description

Disable or enable the use of a command by SAIL

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) command by SAIL	1	C	0 to 1
1	Command number	7	N	1 to 127

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100101 ********
00000000 0000000C 00000000 0NNNNNNN 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if the specified command can never be used by SAIL.

Cmd No	Mnemonic	Subsystem	Class	Type
38	HIR_SAI_CONTROL	SAIL	Operational	Flight

Description

Enable or disable SAIL control of a specified subsystem

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) control by SAIL	1	C	0 to 1
1	Control item (see notes)	3	N	0 to 5

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100110 ********
00000000 0000000C 00000000 00000NNN 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The item is one of: SSH (0), scanner (1), blackbody heaters (2), HWA (3), CSS (4) and SVA (5). Note that these items are enabled by default, but may be autonomously disabled by fault management actions. A disable of scanner (1) disables all TSS commands from SAIL. A disable of blackbody (2) disables only zone 0 of command HIR_OPH_CONTROL (cmd # 24).

Cmd No	Mnemonic	Subsystem	Class	Type
39	HIR_SPU_TIMING	SPU	Operational	Flight

Description

Change timing delay of detector readouts

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Opcode (see notes)	3	C	0 to 4
1	Item number (see notes)	5	N	0 to 21
2	Value in 160 ns units	16	V	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100111 ********
00000000 00000CCC 00000000 000NNNNN VVVVVVVV VVVVVVVV 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For parameter 0: 0= Set detector delay, 1= Set blade open offset, 2= Set blade closed offset,3= Set housekeeping delay, 4= Set SPU filter delay.For parameter 1: Items for detector delay are 1 through 21.Items for blade edges are 0 through 5.Items for housekeeping delay and SPU filter delay are 0 (only one value).

Cmd No	Mnemonic	Subsystem	Class	Type
40	HIR_TLM_FIR	SPU	Operational	Flight

Description

Load FIR Filter Coefficient table or Decimation Coefficients

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	16

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Opcode: 0 = START; 1 = DATA; 2 = ACTIVATE; 3 = DEMOD	2	A	0 to 3
1	Opcode = 1, Number of first FIR coeff within this command; Opcode = 2, RDSR table (1,2,3 or 6)	6	B	0 to 31
2	Opcode = 1, Number of coeffs within this command.	4	C	1 to 12
3	Opcode = 0, 32-bit XOR checksum of FIR filter table; Opcode = 2, 8-bit table ID#, special cases: 1) For ID=0, disable FIR for that RDSR (return result code S_FIRTBL_DISABLE); 2) For RDSR=1, ID=1; RDSR=2, ID=2; RDSR=3, ID=3; RDSR=6, ID=4 Load default FIR table (return result code S_FIRTBL_DEFAULT, Illegal combinations of default table ID and RDSR returns F_FIRID_MISMATCH); Opcode = 3, 8-bit table ID#, special case: 1) 1 means set default DEMOD coef table (return result code S_DEMODTBL_DEF).	32	D	0 to 4294967295
4	Opcode = 1 or 3, 32-bit signed	32	M	-2147483647 to 2
5	Opcode = 1 or 3, 32-bit signed	32	N	-2147483647 to 2
6	Opcode = 1 or 3, 32-bit signed	32	P	-2147483647 to 2
7	Opcode = 1, 32-bit signed	32	R	-2147483647 to 2
8	Opcode = 1, 32-bit signed	32	S	-2147483647 to 2
9	Opcode = 1, 32-bit signed	32	T	-2147483647 to 2
10	Opcode = 1, 32-bit signed	32	U	-2147483647 to 2
11	Opcode = 1, 32-bit signed	32	V	-2147483647 to 2
12	Opcode = 1, 32-bit signed	32	W	-2147483647 to 2
13	Opcode = 1, 32-bit signed	32	X	-2147483647 to 2
14	Opcode = 1, 32-bit signed	32	Y	-2147483647 to 2
15	Opcode = 1, 32-bit signed	32	Z	-2147483647 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101000 ********
00000000 000000AA 00BBBBBB 0000CCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM NNNNNNNN NNNNNNNN NNNNNNNN NNNNNNNN
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR
SSSSSSSS SSSSSSSS SSSSSSSS SSSSSSSS TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
UUUUUUUU UUUUUUUU UUUUUUUU UUUUUUUU VVVVVVVV VVVVVVVV VVVVVVVV VVVVVVVV
WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX
YYYYYYYY YYYYYYYY YYYYYYYY YYYYYYYY ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ
```

Comments

A FIR table upload consists of a START command followed by DATA commands, followed by an ACTIVATE command. For OPCODE = START, param D is the 32-bit XOR checksum of the table

to be loaded. For OPCODE = DATA, param B is the number of the first FIR Coeff contained within this command, param C is the number of coeffs contained within this command, and params M-Z are 32-bit signed integers representing the desired coeff values *10^9. For OPCODE = ACTIVATE, param B selects the RDSR table to load, where 1 = RDSR1, 2 = RDSR2, 3 = RDSR3 and 6 = RDSR6, and parm D is the 8-bit table ID. If an error or inconsistency occurs, the new table is not activated and an error is returned. OPCODE = DEMOD is a special stand-alone command to load the demodulation coeffs: param M = D1, param N = D2, and param P = D3, where these are 32-bit signed integers representing the desired coeff values *10^9. Refer to TC-UCB-005C.

Cmd No	Mnemonic	Subsystem	Class	Type
41	HIR_SPU_ZERO	SPU	Operational	Flight

Description

Change one of the detector data zero offset values

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Detector number	5	D	0 to 21
1	New zero offset value	16	V	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101001 ********
00000000 000DDDDD VVVVVVVV VVVVVVVV 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Adds a numerical offset (value = param #1) to the signal count of the detector specified by param #0. Special case: If detector 0 selected, set all detector offsets to value specified by Parm #1. Default offsets are 2000 for all detectors.

Cmd No	Mnemonic	Subsystem	Class	Type
42	HIR_SPU_CLOCKSEL	SPU	Operational	Flight

Description

Select clock sources to be used by the RAD6000 for system tick and the SPU for data collection

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	System tick source select	1	T	0 to 1
1	Chopper rotation pulse source select	2	R	0 to 2
2	Chopper sync pulse source select	2	S	0 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101010 ********
00000000 0000000T 00000000 0000RRSS 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For parameter 0 (Tick Source): 0 = internal RAD6000 clock *1 = Chopper Rotation pulseFor parameter 1 (CR sync pulse source): 0 = internal rotation pulse *1 = Chopper Rotation pulse 2 = External rotation pulseFor parameter 2 Chopping sync source): 0 = internal sync *1 = Chopper sync 2 = External sync* indicates default state after IProc booting has completed

Cmd No	Mnemonic	Subsystem	Class	Type
43	HIR_SSH_MOVE	SSH	Operational	Flight

Description

Move the sunshield door at a specifed rate

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Direction (0 = close, 1 = open)	1	D	0 to 1
1	Number of steps to move door	12	N	0 to 2400

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101011 ********
00000000 0000000D 0000NNNN NNNNNNNN 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will move the door for a total of N steps in direction D at a fixed rate of approximately 28 steps per second. One step is 0.1 degrees. The door will not be closed past the angle specified in the HIR_SSH_SAFEANGLE command. Commands in the 'Open' direction are not restricted. If one of these commands is executing, additional HIR_SSH_MOVE commands will be ignored, except a command with a zero number of steps, which will abort the currently executing command. Note that this command does not examine any of the 'limit' microswitches.

Cmd No	Mnemonic	Subsystem	Class	Type
44	HIR_SSH_SAFE	SSH	Operational	Flight

Description

Safe the sunshield door as quickly as possible

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101100 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The door will be moved to the position specifed by the HIR_SSH_SAFEANGLE command. If another HIR_SSH_MOVE command is executing, it will be aborted immediately. This command will only move the door toward the closed position and will be ignored if the door is already within the safe range.

Cmd No	Mnemonic	Subsystem	Class	Type
45	HIR_SSH_SAFEANGLE	SSH	Operational	Flight

Description

Set safe angle parameter for sunshield door

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Safe angle parameter	16	A	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101101 ********
AAAAAAAA AAAAAAAA 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The units of the safe angle position are counts of the SSH door potentiometer as seen in telemetry. Default value for P0 is 36500 for the EM and 46500 for the PFM [equivalent to the 60-degree open position]

Cmd No	Mnemonic	Subsystem	Class	Type
46	HIR_SSH_DOORUNPROT	SSH	Operational	Flight

Description

Disable or enable flag to close, latch, or unlatch the sunshield door

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101110 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede a HIR_SSH_HEATERPROT command, or a HIR_SSH_MOVEPROT command which is attempting to close the door past the safe angle.

Cmd No	Mnemonic	Subsystem	Class	Type
47	HIR_SSH_HEATERPROT	SSH	Operational	Flight

Description

Activate the HRM heater to latch or unlatch the sunshield door

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Maximum number of seconds	9	S	0 to 511

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101111 ********
0000000S SSSSSSSS 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if not preceded by an enable HIR_SSH_DOORUNPROT command. The heater will turn off once another heater command is received (overriding the currently executing command) or the time-out has expired or an overheating condition is detected by the fault management software. If the time-out is specified as zero, the heater will be turned off immediately if already on.

Cmd No	Mnemonic	Subsystem	Class	Type
48	HIR_SVA_UNPROT	SVA	Operational	Flight

Description

Must precede HIR_SVA_MOVEPROT.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110000 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede an HIR_SVA_MOVEPROT command.

Cmd No	Mnemonic	Subsystem	Class	Type
49	HIR_SVA_MOVEPROT	SVA	Operational	Flight

Description

Open or close the space view aperture door.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Close (0) or open (1) the SVA	1	M	0 to 1
1	Number of seconds	5	S	0 to 31

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110001 ********
00000000 0000000M 00000000 000SSSSS 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if not preceded by an HIR_SVA_UNPROT command. The motor will be engaged for the specified number of seconds. The microswitches are ignored. If another command is received during the timeout period it will be ignored, unless the number of seconds is set to zero, in which case the current command will be aborted.

Cmd No	Mnemonic	Subsystem	Class	Type
50	HIR_TLM_SCIFMT	IPU	Operational	Flight

Description

Select the contents of the science packet

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	16

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Timestamp block enable	1	B	0 to 1
1	Radiance block enable	1	C	0 to 1
2	Primary Elevation Encoder block enable. 0=disabled, 1= Var only, 2= El2 only, 3= Both Var and El2	2	D	0 to 3
3	Secondary Elevation Encoder block enable. 0=disabled, 1= Var only, 2= El2 only, 3= Both Var and El2	2	E	0 to 3
4	Azimuth Encoder block enable. 0=disabled, 1= Primary only, 2= Secondary only, 3= Both Primary and Secondary	2	F	0 to 3
5	Gyro 0 block enable	1	G	0 to 1
6	Gyro 1 block enable	1	H	0 to 1
7	Gyro 2 block enable	1	J	0 to 1
8	Gyro 3 block enable	1	K	0 to 1
9	Science housekeeping block enable	1	N	0 to 1
10	Diagnostic block enable	1	P	0 to 1
11	Telemetry Test Pattern select	3	R	0 to 7
12	Radiance Data Sample Rate	3	S	1 to 6
13	Radiance Channel Select	21	T	0 to 2097151
14	Primary Elevation Encoder Var Readhead Data Souce. 1= readhead 1 only, 2= readhead 2 only, 3= average of readheads 1 and 2. If the primary variable elevation encoder block is not enabled, this parameter has no effect.	2	U	1 to 3
15	Secondary Elevation Encoder Var Readhead Data Source. 1= readhead 1 only, 2= readhead 2 only, 3= average of readheads 1 and 2. If the secondary variable elevation encoder block is not enabled, this parameter has no effect.	2	W	1 to 3

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110010 ********
00000000 00000000 00000000 0000000B 00000000 0000000C 00000000 000000DD
00000000 000000EE 00000000 000000FF 00000000 0000000G 00000000 0000000H
00000000 0000000J 00000000 0000000K 00000000 0000000N 00000000 0000000P
00000000 00000RRR 00000000 00000SSS 00000000 000TTTTT TTTTTTTT TTTTTTTT
00000000 000000UU 00000000 000000WW 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For each of the block enables, 0 = block not included, and 1 = block included in order shown above. For normal operations, the telemetry test pattern select must be 0. Non-zero values will

produce telemetry test patterns without any science data.The radiance data sample rate is described in the C&THB, Vol. 3. The radiance data channel select will enable each channel with a high bit in this field. The LSB of the select field will enable channel 1, and the MSB will enable channel 21. If the total amount of data requested exceeds the packet size, data will be truncated. See C&THB, Vol. 3 for the format of the science and diagnostic packet formats.

Cmd No	Mnemonic	Subsystem	Class	Type
51	HIR_TLM_DIAGFMT	IPU	Operational	Flight

Description

Select diagnostic items for diagnostic package

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	5

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Diagnostic item ID	5	D	0 to 15
1	Enable (1) or disable (0) diagnostic item	1	E	0 to 1
2	Length of diagnostic item in 16-bit words	9	L	0 to 392
3	Start address	22	A	0 to 4194300
4	Fixed dump (0) or cyclic dump (1)	1	F	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110011 ********
00000000 000DDDDD 00000000 0000000E 0000000L LLLLLLLL 00000000 00000000
00000000 00AAAAAA AAAAAAAA AAAAAAAA 00000000 0000000F 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The first two parameters of this command allow a diagnostic item (one of 16 defined) to be enabled or disabled for inclusion in the diagnostic block. If the diagnostic item is a memory dump, the remaining 3 parameters are used to specify the length of the diagnostic item, the address from which to start the memory dump and the choice of a fixed dump or a cyclic (rolling) dump.

Cmd No	Mnemonic	Subsystem	Class	Type
52	HIR_SAI_SHARED	SAIL	Operational	Flight

Description

Modify contents of SAIL shared memory

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	16

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL shared memory location (32-bit entry)	14	L	0 to 16383
1	Type of upload (0 = int, 1 = float)	1	T	0 to 1
2	Number of 32-bit values to be loaded	4	N	1 to 13
3	Data word 1 for upload (zero padded)	32	A	0 to 4294967295
4	Data word 2 for upload (zero padded)	32	B	0 to 4294967295
5	Data word 3 for upload (zero padded)	32	C	0 to 4294967295
6	Data word 4 for upload (zero padded)	32	D	0 to 4294967295
7	Data word 5 for upload (zero padded)	32	E	0 to 4294967295
8	Data word 6 for upload (zero padded)	32	F	0 to 4294967295
9	Data word 7 for upload (zero padded)	32	G	0 to 4294967295
10	Data word 8 for upload (zero padded)	32	H	0 to 4294967295
11	Data word 9 for upload (zero padded)	32	J	0 to 4294967295
12	word 10 for upload (zero padded)	32	K	0 to 4294967295
13	Data word 11 for upload (zero padded)	32	M	0 to 4294967295
14	Data word 12 for upload (zero padded)	32	P	0 to 4294967295
15	Data word 13 for upload (zero padded)	32	R	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110100 ********
00LLLLLL LLLLLLLL 0000000T 0000NNNN AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE
FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG
HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ
KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR
```

Comments

Note that the contents will be committed immediately after the command is received.

Cmd No	Mnemonic	Subsystem	Class	Type
53	HIR_TLM_HKFMT	IPU	Operational	Flight

Description

Upload data to housekeeping telemetry table

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	15

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Address 32-bit offset (0 = start of table)	16	A	0 to 65535
1	Number of 32-bit words to upload	4	N	1 to 13
2	Data word 1 for upload (zero padded).	32	B	0 to 4294967295
3	Data word 2 for upload (zero padded).	32	C	0 to 4294967295
4	Data word 3 for upload (zero padded).	32	D	0 to 4294967295
5	Data word 4 for upload (zero padded).	32	E	0 to 4294967295
6	Data word 5 for upload (zero padded).	32	F	0 to 4294967295
7	Data word 6 for upload (zero padded).	32	G	0 to 4294967295
8	Data word 7 for upload (zero padded).	32	H	0 to 4294967295
9	Data word 8 for upload (zero padded).	32	J	0 to 4294967295
10	Data word 9 for upload (zero padded).	32	K	0 to 4294967295
11	Data word 10 for upload (zero padded).	32	M	0 to 4294967295
12	Data word 11 for upload (zero padded).	32	P	0 to 4294967295
13	Data word 12 for upload (zero padded).	32	R	0 to 4294967295
14	Data word 13 for upload (zero padded).	32	T	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110101 ********
AAAAAAAA AAAAAAAA 00000000 0000NNNN BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
```

Comments

This command must be preceded by the HIR_TLM_HKHEAD command.

Cmd No	Mnemonic	Subsystem	Class	Type
54	HIR_TLM_HKACTIVATE	IPU	Operational	Flight

Description

Activate a new housekeeping telemetry table

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Table number	2	H	0 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110110 ********
00000000 000000HH 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Activate a housekeeping telemetry table: 0 = default; 1 = operational; 2 = uploaded

Cmd No	Mnemonic	Subsystem	Class	Type
55	HIR_TLM_CSC	IPU	Operational	Flight

Description

Controls telemetry reporting for CSC's

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	CSC ID: MACRO(0), FAULT(1)	4	C	0 to 15
1	Function Code	32	F	0 to 4294967295
2	Telemetry Item	32	T	0 to 4294967295
3	Secondary Function Code	32	S	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110111 ********
00000000 0000CCCC 00000000 00000000 FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT SSSSSSSS SSSSSSSS SSSSSSSS SSSSSSSS
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is used to give a finer degree of control over how each CSC chooses to report telemetry. Refer to SW-LOC-113 for more detail on the usage of this command.

Cmd No	Mnemonic	Subsystem	Class	Type
56	HIR_TLM_OFFSETS	IPU	Operational	Flight

Description

Set telemetry offsets for encoder and wobble sensor data

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Item Number: 0 = Elevation; 1 = Azimuth; 2 = WOBX; 3 = WOBY	2	A	0 to 3
1	Value	20	B	0 to 1048575

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111000 ********
00000000 00000000 00000000 000000AA 00000000 0000BBBB BBBBBBBB BBBBBBBB
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command sets the telemetry offsets for encoder and wobble sensor data telemetry output. The Value parameter is the number in the unsigned telemetry output which corresponds to zero of the signed data item.

Cmd No	Mnemonic	Subsystem	Class	Type
58	HIR_TSS_CLOCKSEL	TSS	Operational	Flight

Description

Select if the TSS is to use internal or external clock for the system tick and 83 Hz sync

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Internal Test (0), Chopper Test (1), Nominal Flight (2)	2	C	0 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111010 ********
00000000 00000001 11100000 10101000 00000000 00000000 00000000 000000CC
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Mode 0 = Internal Test, Mode 1 = Chopper Test, and Mode 2 = Nominal flight mode (default on boot). This command adjusts the source of timing signals for three items: Scanner Strobe Interrupt, Chopper Ref Signal and Chopper Rotation Signal. (SS, ChRef and CR respectively.) SS source : (0) internal, (1) chopper blade edges, (2) external (IPU). ChRef source : (0) internal (PFM only), (1) internal (PFM only), (2) external (IPU, only source for EM). CR source: (0) internal, (1) Chopper, (2) Chopper.

Cmd No	Mnemonic	Subsystem	Class	Type
59	HIR_TSS_WATCHDOG	TSS	Operational	Flight

Description

Turns the system watchdog or scanner strobe watchdog on or off.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (even) or enable (odd) system or scanner strobe watchdog.	2	A	0 to 3

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111011 ********
00000000 00000010 11100000 11101000 00000000 00000000 00000000 000000AA
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This TSW application code command turns on or off either of two watchdog timers according to the following values: 0 = disable system watchdog, 1 = enable system watchdog, 2 = disable scanner strobe watchdog or 3 = enable scanner strobe watchdog.

Cmd No	Mnemonic	Subsystem	Class	Type
60	HIR_TSS_REBOOT	TSS	Operational	Flight

Description

Soft reboot of the TSS control processor (software reset)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111100 ********
00000000 00000000 00000001 00101001 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This instruction will abort any operation in progress. The scanner will NOT be safed if this command is used. This command may be used during either TSW boot or application execution.

Cmd No	Mnemonic	Subsystem	Class	Type
61	HIR_TSS_ENCINIT	TSS	Operational	Flight

Description

Home both elevation and azimuth encoders with new parameters

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	5

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Azimuth motor torque (Nm scaled by 2E-8)	32	M	-2147483647 to 2
1	Elevation equilibrium angle (deg. scaled by 2E-8)	32	A	-2147483647 to 2
2	Open-loop traversal time (sec. scaled 5E-5)	32	L	0 to 2147483647
3	Torque ramp-up time (sec. scaled 5E-5)	32	R	0 to 2147483647
4	Delta time for EEA restart (sec. scaled 5E-5)	32	T	0 to 2147483647

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111101 ********
00000000 00000101 10000000 11101010 MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM
AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
62	HIR_TSS_EINITTBL	TSS	Operational	Flight

Description

Upload entries to TSW scan mirror table for use during encoder initialization.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	7

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Number of entries (0 = clear from P1)	1	N	0 to 1
1	Starting location in TSW control list	7	E	0 to 127
2	Delta time for movement (5E-5 sec)	32	T	0 to 2147483647
3	Elevation shaft angle (2E-8 deg)	32	P	-2147483647 to 2
4	Elevation shaft rate (2E-8 deg/sec)	32	Q	-2147483647 to 2
5	Azimuth shaft angle (2E-8 deg)	32	V	-2147483647 to 2
6	Azimuth shaft rate (2E-8 deg/sec)	32	W	-2147483647 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111110 ********
00000000 00000111 10000000 10101010 00000000 00000000 00000000 0000000N
00000000 00000000 00000000 0EEEEEEE TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP QQQQQQQQ QQQQQQQQ QQQQQQQQ QQQQQQQQ
VVVVVVVV VVVVVVVV VVVVVVVV VVVVVVVV WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command may be used through the 1553, but it is intended for use internally between the IPU and the TSW to transmit the SAIL generated control list. Usually, multiple entries would be sent instead of a single entry. This is a TSW application command and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
63	HIR_TSS_ENCSEL	TSS	Operational	Flight

Description

Selects which of the encoders (2 read heads for elevation and one for azimuth on both the primary

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Control encoder / readhead selection	4	W	1 to 7

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111111 ********
00000000 00000001 10000010 00110010 00000000 00000000 00000000 0000WWWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command and will not be recognized during TSW boot. Choices for the control encoders are: (1) elevation read head 1, (2) elevation read head 2, (3) average of elevation read heads 1 & 2, (4) elevation control on primary EEA, (5) elevation control on secondary EEA, (6) azimuth control on primary EEA 2, (7) azimuth control secondary EEA.

Cmd No	Mnemonic	Subsystem	Class	Type
64	HIR_TSS_CNTLTABLE	TSS	Operational	Flight

Description

Upload entries to TSW scan mirror table

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	7

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Number of entries (0 = clear from P1)	1	N	0 to 1
1	Starting location in TSW control list	7	E	0 to 127
2	Delta time for movement (5E-5 sec)	32	T	0 to 2147483647
3	Elevation shaft angle (2E-8 deg)	32	P	-2147483647 to 2
4	Elevation shaft rate (2E-8 deg/sec)	32	Q	-2147483647 to 2
5	Azimuth shaft angle (2E-8 deg)	32	V	-2147483647 to 2
6	Azimuth shaft rate (2E-8 deg/sec)	32	W	-2147483647 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000000 ********
00000000 00000111 10000000 10110000 00000000 00000000 00000000 0000000N
00000000 00000000 00000000 0EEEEEEE TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP QQQQQQQQ QQQQQQQQ QQQQQQQQ QQQQQQQQ
VVVVVVVV VVVVVVVV VVVVVVVV VVVVVVVV WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command may be used through the 1553, but it is intended for use internally between the IPU andthe TSW to transmit the SAIL generated control list. Usually, multiple entries would be sent instead of the single entry. This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
65	HIR_TSS_START	TSS	Operational	Flight

Description

Forces an immediate execution of the scanner table

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000001 ********
00000000 00000000 00000000 11110000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is only intended for ground testing, and will be handled automatically for regular operations.This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
66	HIR_TSS_SAFE	TSS	Operational	Flight

Description

Abort and erase the current scanner table, and move the mirror as fast as possible to the safe positi

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000010 ********
00000000 00000000 00000001 00110001 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Note that if the azimuth motor has been disabled with the HIR_TSS_MOTOR command, the mirror will not move in azimuth. This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
67	HIR_TSS_FREQINFO	TSS	Operational	Flight

Description

Passes the information about the chopper rate to the TEU software

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Prescaler value	12	P	3003 to 3255

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000011 ********
00000000 00000001 10000001 01101000 00000000 00000000 0000PPPP PPPPPPPP
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is used to provide information to the TEU software and does not control any hardware functions. This definition is identical to that in the command HIR_IPU_CHOPFREQ. Both HIR_TSS_FREQINFO and HIR_IPU_CHOPFREQ must be sent together to set both the IPU and TEU to the same time base. The chopper reference signal is a 500Hz +/- 20Hz programmable square wave. It's period is set by loading the prescaler register. Values between 3003 (0BBB) and 3255 (0CB7) will yield frequencies between 520.14 Hz and 479.88 Hz respectively. A prescaler value of 3124 (0C34) will yield a chopper frequency of 500Hz. Conversion equations: Frequency (Hz) = 1/((prescaler + 1) *0.00000064). Prescaler = 1/(frequency * .00000064)-1. Default value: 3124 (0C34) 500.00 Hz.

Cmd No	Mnemonic	Subsystem	Class	Type
68	HIR_TSS_AZELDATPOS	TSS	Operational	Flight

Description

Provides offset values to be used for zero position output when the scan mirror is in its datum positi

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Primary Elevation 1 Offset	32	A	-2147483647 to 2
1	Primary Elevation 2 Offset	32	B	-2147483647 to 2
2	Primary Azimuth Offset	32	C	-2147483647 to 2
3	Secondary Elevation 1 Offset	32	X	-2147483647 to 2
4	Secondary Elevation 2 Offset	32	Y	-2147483647 to 2
5	Secondary Azimuth Offset	32	Z	-2147483647 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000100 ********
00000000 00000110 10000001 01110000 AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX YYYYYYYY YYYYYYYY YYYYYYYY YYYYYYYY
ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

None

Cmd No	Mnemonic	Subsystem	Class	Type
71	HIR_TSS_DRSETUP	TSS	Operational	Flight

Description

Elevation and azimuth drive motor configuration

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	See notes above	4	M	1 to 12

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000111 ********
00000000 00000001 10000000 10110010 00000000 00000000 00000000 0000MMMM
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.For parameter 0: (12) Azimuth motor short (EM only, PFM noop), (11) Azimuth open short (EM only, PFM noop), (10) Azimuth connect to drive (9) Azimuth disconnect from drive, (8) Elevation 2 motor short, (7) Elevation 2 open short, (6) Elevation 2 connect to drive, (5) Elevation 2 disconnect from drive, (4) Elevation 1 motor short, (3) Elevation 1 open short, (2) Elevation 1 connect to drive, (1) Elevation 1 disconnect from drive. For PFM noop, the TSW command accept counter will increment.

Cmd No	Mnemonic	Subsystem	Class	Type
73	HIR_TSS_EEASELECT	TSS	Operational	Flight

Description

Select (power up) or deselect (power down) the primary and/or secondary encoder set

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	See notes below	3	S	1 to 6

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01001001 ********
00000000 00000001 10000001 00110010 00000000 00000000 00000000 00000SSS
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.For parameter 0: (1) select primary EEA, (2) deselect primary EEA, (3) select secondary EEA, (4) deselect secondary EEA, (5) test angle (both EEAs selected), (6) remove test angle (both).

Cmd No	Mnemonic	Subsystem	Class	Type
74	HIR_TSS_EEARESET	TSS	Operational	Flight

Description

Restarts the active EEA side

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01001010 ********
00000000 00000000 00000001 01110010 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
75	HIR_TSS_CHOPSEL	TSS	Operational	Flight

Description

Configures the chopper drive motor windings

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Chopper winding and driver control configuration param.	3	W	0 to 4

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01001011 ********
00000000 00000001 10000001 10110010 00000000 00000000 00000000 00000WWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.For parameter 0: (0) disconnect windings A and B, (1) connect winding A to driver (2) connect winding B to driver, (3) set chopper to high current mode and (4) remove high current from chopper.

Cmd No	Mnemonic	Subsystem	Class	Type
76	HIR_TSS_CHOPENA	TSS	Operational	Flight

Description

Enable (power up) or disable (power down) the chopper drive motor

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) chopper drive motor.	1	E	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01001100 ********
00000000 00000001 10000001 11110010 00000000 00000000 00000000 0000000E
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. There is a 10 second delay after receipt of a disable command before an enable command will be acted upon (it will be accepted but not acted upon).

Cmd No	Mnemonic	Subsystem	Class	Type
80	HIR_TSS_CSCENC	TSS	Operational	Flight

Description

Enable or disable TSW encoder initialization CSC

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) CSC.	1	E	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010000 ********
00000000 00000001 10000000 01101010 00000000 00000000 00000000 0000000E
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. This CSC can not be enabled at the same time that the scan mirror contol CSC is enabled. The encoder initialization should be enabled and allowed to disable itself before the scan mirror control CSC is enabled.

Cmd No	Mnemonic	Subsystem	Class	Type
81	HIR_TSS_CSCSCN	TSS	Operational	Flight

Description

Enable or disable TSW scan mirror control CSC

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) CSC.	1	E	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010001 ********
00000000 00000001 10000000 01110000 00000000 00000000 00000000 0000000E
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. This CSC can not be enabled at the same time that the encoder initialization CSC is enabled.

Cmd No	Mnemonic	Subsystem	Class	Type
84	HIR_TSS_CSCSSS	TSS	Operational	Flight

Description

Enable or disable TSW sub-subsystem support CSC

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (even) or Enable (odd) various diagnostic and fault management functions excluding parameters 8 and 9.	4	E	0 to 13

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010100 ********
00000000 00000001 10000000 01110110 00000000 00000000 00000000 0000EEEE
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. This CSC is not enabled as the other CSCs but individual actions are turned on and off in this CSC by this command. The parameter values perform the following actions: 0= disable memory dump, 1= enable memory dump, 2= disable chopper power fault management, 3= enable chopper power fault management, 4= disable EEA fault management, 5= enable EEA fault management, 6= disable TSW telemetry test pattern, 7= enable default TSW telemetry test pattern, 8= enable diagnostic telemetry test pattern, 9= noop, 10= disable measured current FM, 11= enable measured current FM, 12= disable commanded current FM, 13= enable commanded current FM. For noop, the TSW command accept counter will increment.

Cmd No	Mnemonic	Subsystem	Class	Type
85	HIR_IPU_TSSRESET	IPU	Operational	Flight

Description

Hard reset of the TSS control processor (external reset)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010101 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This instruction will abort any operation in progress. The scanner will NOT be safed if this command is used.This command may be used during either TSW boot or application execution.

Cmd No	Mnemonic	Subsystem	Class	Type
86	HIR_CSS_PIDCOEFFS	CSS	Operational	Flight

Description

Proportional, Integral and Derivative coefficients for use by CSS SW.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Proportional Coefficient	16	P	0 to 65535
1	Integral Coefficient	16	I	0 to 65535
2	Derivative Coefficient	16	D	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010110 ********
PPPPPPPP PPPPPPPP IIIIIIII IIIIIIII DDDDDDDD DDDDDDDD 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

None

Cmd No	Mnemonic	Subsystem	Class	Type
87	HIR_TSU_BOOT	TSU	Operational	Flight

Description

Boot the TSW from the specified location from TSU boot state.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	TSU RAM location for boot	24	R	0 to 16777215

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010111 ********
00000000 00000001 10000001 00100000 00000000 RRRRRRRR RRRRRRRR RRRRRRRR
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is only valid during the TSW boot sequence. During normal operation, the command will generate an error.

Cmd No	Mnemonic	Subsystem	Class	Type
88	HIR_IPU_SETTIME	IPU	Operational	Flight

Description

Set 51-bit HIRDLS clock.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Control code: 1 = Set Low Time; 2 = Set High Time; 3 = Set Low and High Time.	2	C	1 to 3
1	High Time value (19 MSBs)	32	H	0 to 524287
2	Low Time value (32 LSBs)	32	L	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011000 ********
00000000 00000000 00000000 000000CC HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

A HIRDLS Time Word is 64 bits long and consists of a 32 bit hardware counter (PTIM3) and a 19 bit software maintained counter. One LSB of HIRDLS Time is 2.03252 microseconds. This command sets one or both parts of the Time Word. If only one part is to be set the command ignores the value uploaded for the other part. If the IPU is powered down the Time Word setting is lost and resets to zero on subsequent power-up. IMPORTANT NOTE: if the HIRDLS Time Word is changed by this command, all TIMED macros will be deleted. This command should not be executed more than once in any 2 second period or else the time code in science and engineering packets may be incorrect for the next 2 seconds. It is possible to have duplicate HIRDLS time stamps.

Cmd No	Mnemonic	Subsystem	Class	Type
89	HIR_MAC_ACTIVATE	MACRO	Operational	Flight

Description

Activate the previously uploaded macro

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011001 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command, which must be preceded by a series of HIR_MAC_UPLOAD commands, signals when the upload is complete. When the HIR_MAC_ACTIVATE command is received, the checksum which has been uploaded in the HIR_MAC_ASSIGN command is verified and the macro marked as ready for execution if the checksums match. If the checksums do not match, the HIR_MAC_ACTIVATE command fails (as reflected in the MAC_CMD_ERR telemetry point) and the uploaded commands are deleted for the macro for which the checksums did not match.

Cmd No	Mnemonic	Subsystem	Class	Type
90	HIR_TSU_REBOOT	TSU	Operational	Flight

Description

Soft reboot of the TSS control processor while in boot state (software reset).

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011010 ********
00000000 00000000 00000000 01100000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This instruction will abort any operation in progress. The scanner will NOT be safed if this command is used. This command may be used during either TSW boot or application execution.

Cmd No	Mnemonic	Subsystem	Class	Type
91	HIR_TSU_DOWNLOAD	TSU	Operational	Flight

Description

Download a TSS memory dump packet while in TSS boot state.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Memory location to start dump (32-bit boundary).	32	A	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011011 ********
00000000 00000010 10000001 01100000 AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Send a download packet to the IPU from the TEU SUROM software only.

Cmd No	Mnemonic	Subsystem	Class	Type
92	HIR_IPU_TSUSECTION	TSU	Operational	Flight

Description

Changes the EEPROM section that the IPU will use when the TSU requests a program load.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Auto boot section	16	S	0 to 65535
1	Override Flags	16	V	0 to 65535
2	MBIC A Start	32	W	0 to 524286
3	MBIC A End	32	X	0 to 524286
4	MBIC B Start	32	Y	0 to 524286
5	MBIC B End	32	Z	0 to 524286

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011100 ********
SSSSSSSS SSSSSSSS VVVVVVVV VVVVVVVV WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW
XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX YYYYYYYY YYYYYYYY YYYYYYYY YYYYYYYY
ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Values of 0 to 15 will load the TEU with the image located in this section of the EEPROM and send the boot command to the TEU if the load is successful. A value of 16 will load the TEU with the image located in the first section of IPU EEPROM marked as autobootable for the TEU and send the boot command to the TEU if the load is successful. A value of 100 - 115 will load the TEU with the image located in this IPU EEPROM section but not send the TEU boot command. A value of 116 will load the TEU with the image located in the first section of the IPU EEPROM marked as autobootable for the TEU but will not send the TEU boot command. For any other values, no load of the TEU from IPU EEPROM nor boot will occur.

Cmd No	Mnemonic	Subsystem	Class	Type
93	HIR_IPU_QLFLAG	IPU	Operational	Flight

Description

Quick look flag in science packet header for use in EOCC

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Quick Look Flag	1	F	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011101 ********
00000000 0000000F 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Quick look flag value (0 = don't process as quick look data, 1 = process as quick look data).

Cmd No	Mnemonic	Subsystem	Class	Type
94	HIR_TSS_MTRPWR	TSS	Operational	Flight

Description

Turns on or off the scan/chopper motor power converter.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Drive motor power configuration parameter.	1	W	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011110 ********
00000000 00000001 10000010 01110010 00000000 00000000 00000000 0000000W
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. For parameter 0: 0 = power off drive motors, 1 = power on drive motors. This command is for the PFM only. It is a noop for the EM and the command counter will increment but no action will be taken.

Cmd No	Mnemonic	Subsystem	Class	Type
95	HIR_SSH_MOVEPROT	SSH	Operational	Flight

Description

Close the sunshield door at a specified rate outside the safe angle range.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Number of steps	12	N	0 to 2400

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011111 ********
0000NNNN NNNNNNNN 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will move the door for a total of N steps in the closed direction at a fixed rate of approximately 28 steps per second. One step is 0.1 degrees. The door will not be moved (the command will be rejected) unless this command was immediately preceded by the HIR_SSH_DOORUNPROT command. Note that this command does not examine any of the microswitches

Cmd No	Mnemonic	Subsystem	Class	Type
96	HIR_BIP_HEADER	BIP	Boot Hold	Flight

Description

Header to upload IPU RAM in IPU boot state only.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Subsystem identifier (0x0000 = IPU startup).	16	S	0 to 0
1	Start address for RAM upload	24	A	0 to 2097148
2	Number of HIR_BIP_DATA commands (blocks) to follow. If number of blocks = 0 and flags word below is also zero, abort the upload.	16	N	0 to 40330
3	XOR checksum for the entire upload	32	C	0 to 4294967295
4	Length in 32-bit words	32	L	0 to 4294967295
5	If 0, data to follow; if 1, calculate checksum based on start address and length and place in telemetry point ISU_CMPCSUM.	1	F	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100000 ********
00000000 00000000 SSSSSSSS SSSSSSSS 00000000 AAAAAAAA AAAAAAAA AAAAAAAA
00000000 00000000 NNNNNNNN NNNNNNNN CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 0000000F
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede a group of HIR_BIP_DATA commands. The address is relative to the beginning of the appropriate memory space and must be on a 4 byte boundary.

Cmd No	Mnemonic	Subsystem	Class	Type
97	HIR_BIP_DATA	BIP	Boot Hold	Flight

Description

Upload data to IPU RAM for IPU boot state only

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	15

Command Parameters

No	Parameter	Bit Size	Symbol	Range
3	Data word 2 for upload (zero padded).	32	C	0 to 4294967295
4	Data word 3 for upload (zero padded).	32	D	0 to 4294967295
5	Data word 4 for upload (zero padded).	32	E	0 to 4294967295
6	Data word 5 for upload (zero padded).	32	F	0 to 4294967295
7	Data word 6 for upload (zero padded).	32	G	0 to 4294967295
8	Data word 7 for upload (zero padded).	32	H	0 to 4294967295
9	Data word 8 for upload (zero padded).	32	J	0 to 4294967295
10	Data word 9 for upload (zero padded).	32	K	0 to 4294967295
11	Data word 10 for upload (zero padded).	32	M	0 to 4294967295
12	Data word 11 for upload (zero padded).	32	P	0 to 4294967295
13	Data word 12 for upload (zero padded).	32	R	0 to 4294967295
14	Data word 13 for upload (zero padded).	32	T	0 to 4294967295
0	Block number.	16	B	1 to 40330
1	Number of 32-bit words to upload	4	N	1 to 13
2	Data word 1 for upload (zero padded).	32	A	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100001 ********
BBBBBBBB BBBBBBBB 00000000 0000NNNN AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
```

Comments

This command must be preceded by the HIR_BIP_HEADER command. The block number must begin with 1 and be sequential.

Cmd No	Mnemonic	Subsystem	Class	Type
98	HIR_BIP_JMPCOMMIT	BIP	Boot Hold	CRITICAL

Description

Boot IPU from the specified RAM address

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100010 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Jump to the specified RAM address (ignoring checksums) once the commit command has been sent.

Cmd No	Mnemonic	Subsystem	Class	Type
100	HIR_UPL_HEADER	UPL	Operational	Flight

Description

Header to upload IPU RAM

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Subsystem identifier (0x1000 = IPU Test Area, 0x2000 = SAIL task data block, 0x2100 = SAIL task code block and 0x8000 = TEU startup)	16	S	0 to 65535
1	Start address for RAM upload	24	A	0 to 2097148
2	Number of HIR_UPL_DATA commands to follow. If number of blocks = 0, abort the upload.	16	N	0 to 40330
3	XOR checksum for the entire upload	32	C	0 to 4294967295
4	Length in 32-bit words	32	L	0 to 4294967295
5	If 0, data to follow; if 1, calculate checksum based on start address and length and compare with uploaded checksum (no data follows this command). The result of the comparison is given by subtelemetry point IPU_UPL_CHKSUMOK = 1 if comparison successful, = 0 if comparison failed. For SAIL uploads, if this parameter is 1 it is ignored.	1	F	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100100 ********
00000000 00000000 SSSSSSSS SSSSSSSS 00000000 AAAAAAAA AAAAAAAA AAAAAAAA
00000000 00000000 NNNNNNNN NNNNNNNN CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 0000000F
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede a group of HIR_UPL_DATA commands. The address is relative to the beginning of the appropriate memory space and must be on a 4 byte boundary.

Cmd No	Mnemonic	Subsystem	Class	Type
101	HIR_UPL_DATA	UPL	Operational	Flight

Description

Upload data to IPU RAM

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	15

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Block number.	16	B	1 to 40330
1	Number of 32-bit words to upload	4	N	1 to 13
2	Data word 1 for upload (zero padded).	32	A	0 to 4294967295
3	Data word 2 for upload (zero padded).	32	C	0 to 4294967295
4	Data word 3 for upload (zero padded).	32	D	0 to 4294967295
5	Data word 4 for upload (zero padded).	32	E	0 to 4294967295
6	Data word 5 for upload (zero padded).	32	F	0 to 4294967295
7	Data word 6 for upload (zero padded).	32	G	0 to 4294967295
8	Data word 7 for upload (zero padded).	32	H	0 to 4294967295
9	Data word 8 for upload (zero padded).	32	J	0 to 4294967295
10	Data word 9 for upload (zero padded).	32	K	0 to 4294967295
11	Data word 10 for upload (zero padded).	32	M	0 to 4294967295
12	Data word 11 for upload (zero padded).	32	P	0 to 4294967295
13	Data word 12 for upload (zero padded).	32	R	0 to 4294967295
14	Data word 13 for upload (zero padded).	32	T	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100101 ********
BBBBBBBB BBBBBBBB 00000000 0000NNNN AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
```

Comments

This command must be preceded by the HIR_UPL_HEADER command. The block number must begin with 1 and be sequential.

Cmd No	Mnemonic	Subsystem	Class	Type
103	HIR_BIP_EEWRITE	BIP	Boot Hold	CRITICAL

Description

Setup to copy a section from IPU RAM into permanent EEPROM (critical command)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
1	RAM address offset of image start	24	R	0 to 2097148
2	Length in 32-bit Dwords for copy	24	L	0 to 393216
3	EEPROM address offset to load image	24	E	0 to 1048572
4	Flags	32	F	0 to 4294967295
5	XOR Checksum of entire area to be copied	32	C	0 to 4294967295
0	EEPROM section location (0 - 15)	4	S	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100111 ********
00000000 0000SSSS 00000000 RRRRRRRR RRRRRRRR RRRRRRRR 00000000 LLLLLLLL
LLLLLLLL LLLLLLLL 00000000 EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF
FFFFFFFF FFFFFFFF CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For more detailed notes see latest release of SP_HIR_103 Vol1

Cmd No	Mnemonic	Subsystem	Class	Type
104	HIR_BIP_EECOMMIT	BIP	Boot Hold	CRITICAL

Description

Perform RAM to EEPROM transfer or other EEPROM action.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Perform RAM to EEPROM transfer or other EEPROM action - Action to be performed: 5=write EEPROM segment, 6=erase EEPROM segment, 8=copy index block 1 to 2, 9=copy index block 2 to 1, 16=EEPROM scrub, 17=erase all EEPROM [stage 2], 19=erase all EEPROM [final stage].	5	E	0 to 19

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101000 ********
00000000 000EEEEE 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Perform RAM to EEPROM transfer or other EEPROM action.

Cmd No	Mnemonic	Subsystem	Class	Type
105	HIR_IPU_FAULTSEL	IPU	Operational	CRITICAL

Description

Select a primary or redundant unit of a subsystem or device (not IPU processor)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Action Code	5	N	0 to 31
1	Action Parameter	1	S	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101001 ********
00000000 000NNNNN 00000000 0000000S 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If the unit is a switchable powered device (such as the TSS), this flag will apply after the unit is powered down, then back up.If the unit is a redundant mechanism (such as the sunshield), the flag will apply after the current movement has completed.

Cmd No	Mnemonic	Subsystem	Class	Type
106	HIR_IPU_CRFAULT	IPU	Operational	CRITICAL

Description

Enable changes to fault management system

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101010 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede an HIR_IPU_FAULTOFF or an HIR_IPU_FAULTVAL command.

Cmd No	Mnemonic	Subsystem	Class	Type
107	HIR_IPU_FAULTOFF	IPU	Operational	CRITICAL

Description

Enable or disable autonomous management of selected fault condition

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Fault condition number	5	F	0 to 31
1	Disable (0) or enable (1) fault handling	1	H	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101011 ********
00000000 000FFFFF 00000000 0000000H 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must be preceded by a HIR_IPU_CRFAULT command. Disabling an action will still detect and mark faults,and will set a flag for another fault action task (VxWorks or SAIL) to take over.

Cmd No	Mnemonic	Subsystem	Class	Type
108	HIR_IPU_FAULTVAL	IPU	Operational	CRITICAL

Description

Change a value for the autonomous fault management of a selected fault condition

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Fault condition number	5	F	0 to 31
1	Value to be changed	10	V	0 to 1023
2	New value	32	N	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101100 ********
00000000 000FFFFF 000000VV VVVVVVVV NNNNNNNN NNNNNNNN NNNNNNNN NNNNNNNN
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must be preceded by a HIR_IPU_CRFAULT command.

Cmd No	Mnemonic	Subsystem	Class	Type
109	HIR_TLM_HKHEAD	IPU	Operational	CRITICAL

Description

Header to upload housekeeping telemetry table

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Housekeeping Identifier	10	I	0 to 1023
1	Number of telemetry format table entries	10	N	1 to 1023
2	Size in words of housekeeping block	10	S	1 to 256
3	32-bit checksum of all data words in upload	32	C	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101101 ********
000000II IIIIIIII 000000NN NNNNNNNN 000000SS SSSSSSSS CCCCCCCC CCCCCCCC
CCCCCCCC CCCCCCCC 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede the HIR_TLM_HKFMT command.The uploaded table cannot be used until the checksum matches the uploaded table.See C&TH section 4 for additional information.

HIRDLS Commands

(Sort by Mnemonic)

Cmd No	Mnemonic	Subsystem	Class	Type
5	HIR_BIP_BOOT	BIP	Boot Hold	Flight

Description

Boot IPU from the specified RAM address

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000101 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Jump to the loaded RAM address and boot if the program checksums match using the address and checsum from the latest HIR_BIP_HEADER or HIR_BIP_EEREAD command.

Cmd No	Mnemonic	Subsystem	Class	Type
97	HIR_BIP_DATA	BIP	Boot Hold	Flight

Description

Upload data to IPU RAM for IPU boot state only

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	15

Command Parameters

No	Parameter	Bit Size	Symbol	Range
3	Data word 2 for upload (zero padded).	32	C	0 to 4294967295
4	Data word 3 for upload (zero padded).	32	D	0 to 4294967295
5	Data word 4 for upload (zero padded).	32	E	0 to 4294967295
6	Data word 5 for upload (zero padded).	32	F	0 to 4294967295
7	Data word 6 for upload (zero padded).	32	G	0 to 4294967295
8	Data word 7 for upload (zero padded).	32	H	0 to 4294967295
9	Data word 8 for upload (zero padded).	32	J	0 to 4294967295
10	Data word 9 for upload (zero padded).	32	K	0 to 4294967295
11	Data word 10 for upload (zero padded).	32	M	0 to 4294967295
12	Data word 11 for upload (zero padded).	32	P	0 to 4294967295
13	Data word 12 for upload (zero padded).	32	R	0 to 4294967295
14	Data word 13 for upload (zero padded).	32	T	0 to 4294967295
0	Block number.	16	B	1 to 40330
1	Number of 32-bit words to upload	4	N	1 to 13
2	Data word 1 for upload (zero padded).	32	A	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100001 ********
BBBBBBBB BBBBBBBB 00000000 0000NNNN AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
```

Comments

This command must be preceded by the HIR_BIP_HEADER command. The block number must begin with 1 and be sequential.

Cmd No	Mnemonic	Subsystem	Class	Type
6	HIR_BIP_DUMPADDR	BIP	Boot Hold	Flight

Description

Change current dump address of IPU dump

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	0 means fixed dump, 1 means cyclic dump	1	R	0 to 1
1	Address offset is byte address for location in RAM if 0 or Dword address in EEPROM if 1	1	L	0 to 1
2	IPU address to start dump	24	A	0 to 2097148

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000110 ********
0000000R 0000000L 00000000 AAAAAAAA AAAAAAAA AAAAAAAA 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Start dump at specified location in RAM or EEPROM.

Cmd No	Mnemonic	Subsystem	Class	Type
104	HIR_BIP_EECOMMIT	BIP	Boot Hold	CRITICAL

Description

Perform RAM to EEPROM transfer or other EEPROM action.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Perform RAM to EEPROM transfer or other EEPROM action - Action to be performed: 5=write EEPROM segment, 6=erase EEPROM segment, 8=copy index block 1 to 2, 9=copy index block 2 to 1, 16=EEPROM scrub, 17=erase all EEPROM [stage 2], 19=erase all EEPROM [final stage].	5	E	0 to 19

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101000 ********
00000000 000EEEEE 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Perform RAM to EEPROM transfer or other EEPROM action.

Cmd No	Mnemonic	Subsystem	Class	Type
4	HIR_BIP_EEREAD	BIP	Boot Hold	Flight

Description

Copy a section of EEPROM into IPU RAM

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	EEPROM section location (0 to 15)	4	S	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000100 ********
00000000 0000SSSS 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Read a section of EEPROM into RAM.

Cmd No	Mnemonic	Subsystem	Class	Type
18	HIR_BIP_EEREPAIR	BIP	Boot Hold	CRITICAL

Description

Fix a EEPROM index error or clear all EEPROM data.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Action to be performed (0x0000=abort, 0x5555=EEPROM scrub, 0x7777=load MBIC start/end addresses, 0x8888=correct failed index block, 0xAAAA=set safety override word, 0xBBBB=perform IPU autoboot check, 0xFFFF=erase all EEPROM [stage 1], 0xEEEE=erase all EEPROM [stage 3]. All other values invalid and will be rejected	16	A	0 to 65535
1	Parameter (see SW-LOC-502)	32	P	0 to 65535
2	MBICA start address (32-bit word offset, 2^19 - 2, last byte not usable)	19	E	0 to 524286
3	MBICA end address (32-bit word offset, 2^19 - 2, last byte not usable))	19	F	0 to 524286
4	MBICB start address (32-bit word offset, 2^19 - 2, last byte not usable))	19	G	0 to 524286
5	MBICB end address (32-bit word offset, 2^19 - 2, last byte not usable))	19	H	0 to 524286

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010010 ********
AAAAAAAA AAAAAAAA PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP 00000000 00000EEE
EEEEEEEE EEEEEEEE 00000000 00000FFF FFFFFFFF FFFFFFFF 00000000 00000GGG
GGGGGGGG GGGGGGGG 00000000 00000HHH HHHHHHHH HHHHHHHH 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For more detailed notes see latest release of SW-LOC-502.

Cmd No	Mnemonic	Subsystem	Class	Type
17	HIR_BIP_EEWIPE	BIP	Boot Hold	CRITICAL

Description

Erase a EEPROM section

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	EEPROM section to erase (0 - 15)	4	E	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010001 ********
00000000 0000EEEE 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For more detailed notes see latest release of SP_HIR_103 Vol1

Cmd No	Mnemonic	Subsystem	Class	Type
103	HIR_BIP_EEWRITE	BIP	Boot Hold	CRITICAL

Description

Setup to copy a section from IPU RAM into permanent EEPROM (critical command)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
1	RAM address offset of image start	24	R	0 to 2097148
2	Length in 32-bit Dwords for copy	24	L	0 to 393216
3	EEPROM address offset to load image	24	E	0 to 1048572
4	Flags	32	F	0 to 4294967295
5	XOR Checksum of entire area to be copied	32	C	0 to 4294967295
0	EEPROM section location (0 - 15)	4	S	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100111 ********
00000000 0000SSSS 00000000 RRRRRRRR RRRRRRRR RRRRRRRR 00000000 LLLLLLLL
LLLLLLLL LLLLLLLL 00000000 EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF
FFFFFFFF FFFFFFFF CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For more detailed notes see latest release of SP_HIR_103 Vol1

Cmd No	Mnemonic	Subsystem	Class	Type
2	HIR_BIP_EXECUTE	BIP	Booting	Flight

Description

Abort IPU countdown and execute the application immediately

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000010 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is valid only during the countdown state.

Cmd No	Mnemonic	Subsystem	Class	Type
96	HIR_BIP_HEADER	BIP	Boot Hold	Flight

Description

Header to upload IPU RAM in IPU boot state only.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Subsystem identifier (0x0000 = IPU startup).	16	S	0 to 0
1	Start address for RAM upload	24	A	0 to 2097148
2	Number of HIR_BIP_DATA commands (blocks) to follow. If number of blocks = 0 and flags word below is also zero, abort the upload.	16	N	0 to 40330
3	XOR checksum for the entire upload	32	C	0 to 4294967295
4	Length in 32-bit words	32	L	0 to 4294967295
5	If 0, data to follow; if 1, calculate checksum based on start address and length and place in telemetry point ISU_CMPCSUM.	1	F	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100000 ********
00000000 00000000 SSSSSSSS SSSSSSSS 00000000 AAAAAAAA AAAAAAAA AAAAAAAA
00000000 00000000 NNNNNNNN NNNNNNNN CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 0000000F
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede a group of HIR_BIP_DATA commands. The address is relative to the beginning of the appropriate memory space and must be on a 4 byte boundary.

Cmd No	Mnemonic	Subsystem	Class	Type
1	HIR_BIP_HOLD	BIP	Booting	Flight

Description

Abort IPU countdown to running state and hold the IPU in the idle boot hold state

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000001 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If this command is used, the program will NOT be loaded from EEPROM into RAM. This must be done manually if required. This command will transition the IPU into the idle boot hold state.The IPU remains in this state until a HIR_IPU_BOOT or HIR_IPU_REBOOT command is received.This command is only valid during the countdown state.

Cmd No	Mnemonic	Subsystem	Class	Type
7	HIR_BIP_JMP	BIP	Boot Hold	CRITICAL

Description

Boot IPU from the specified RAM address

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	IPU RAM address to warm reboot	32	J	0 to 2097148

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000111 ********
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For more detailed notes see latest release of SP_HIR_103 Vol1

Cmd No	Mnemonic	Subsystem	Class	Type
98	HIR_BIP_JMPCOMMIT	BIP	Boot Hold	CRITICAL

Description

Boot IPU from the specified RAM address

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100010 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Jump to the specified RAM address (ignoring checksums) once the commit command has been sent.

Cmd No	Mnemonic	Subsystem	Class	Type
3	HIR_BIP_REBOOT	BIP	Boot Hold	Flight

Description

Performs a cold reboot of the IPU processor.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000011 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will cause all operations (including 1553) to halt for the duration of the IPU boot.Additional commands may be required to return the IPU to an operational state.This command is valid only during any of the boot hold states.Note that if the EEPROM was being programmed, the EEPROM contents may be corruptedif this command is used.

Cmd No	Mnemonic	Subsystem	Class	Type
10	HIR_CSS_CNVRTR	CSS	Operational	CRITICAL

Description

Select primary or secondary converters

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Primary cnvrtrs (0) or secondary cnvrtrs (1)	1	P	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001010 ********
00000000 0000000P 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Default state for P0: 0 = primary converters selected

Cmd No	Mnemonic	Subsystem	Class	Type
9	HIR_CSS_FREQ	CSS	Operational	Flight

Description

Set cooler frequency and angles

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
1	Displacer phase angle in 0.1 deg units	16	A	0 to 3599
0	Operating frequency in 0.1 Hz units	16	F	306 to 400

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001001 ********
FFFFFFFF FFFFFFFF AAAAAAAA AAAAAAAA 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Default value for P0: 325 = 32.5 HzDefault value for P1: 550 = 55 deg.

Cmd No	Mnemonic	Subsystem	Class	Type
11	HIR_CSS_LOCK	CSS	Operational	CRITICAL

Description

Short or open CSS motor windings

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Compressor(0), Displacer(1).	1	S	0 to 1
1	Cage(0), Prim_Uncage(1), Sec_Uncage(2).	2	F	0 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001011 ********
00000000 0000000S 00000000 000000FF 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The cooler cannot be operated until the motor windings have been uncaged.

Cmd No	Mnemonic	Subsystem	Class	Type
86	HIR_CSS_PIDCOEFFS	CSS	Operational	Flight

Description

Proportional, Integral and Derivative coefficients for use by CSS SW.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Proportional Coefficient	16	P	0 to 65535
1	Integral Coefficient	16	I	0 to 65535
2	Derivative Coefficient	16	D	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010110 ********
PPPPPPPP PPPPPPPP IIIIIIII IIIIIIII DDDDDDDD DDDDDDDD 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

None

Cmd No	Mnemonic	Subsystem	Class	Type
8	HIR_CSS_SETTING	CSS	Operational	Flight

Description

Set cooler mode, and target temperature or manual settings

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Mode word (see notes)	8	M	0 to 255
1	Temperature in 0.1 K units in mode 0	16	T	0 to 3000
2	Compressor stroke level in 0.1% units	16	C	0 to 1000
3	Displacer stroke level in 0.1% units	16	D	0 to 1000

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001000 ********
00000000 MMMMMMMM TTTTTTTT TTTTTTTT CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

In thermostatic mode, the values for the stroke levels define the maximum levels. In manual mode, the temperature is ignored. For the mode word, the following bit definitions apply: Bit 0 - Electronics Only (0), Control (1),Bit 1 - Manual mode off (0), on (1)Bit 2 - Thermostatic mode off (0), on (1),Bit 3 - Warm-up mode off (0), on (1),Bit 4 - Vibration cancellation mode (eliminated/not used), Bit 5 - Diode select, diode 0 or 1. Bit 7 - Over Stroke Disable Mode, 0=O/S on, 1=O/S off.

Cmd No	Mnemonic	Subsystem	Class	Type
12	HIR_GSS_BSELECT	GSS	Operational	Flight

Description

Select GSS B-side.

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001100 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command issues an IPU discrete pulse to the GSS to switch to GSS side B. The GSS automatically powers on to the GSS A side independent of the IPU.

Cmd No	Mnemonic	Subsystem	Class	Type
13	HIR_GSS_CONTROL	GSS	Operational	Flight

Description

Set attributes for selected gyro

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Gyro channel	3	G	0 to 7
1	Function code	2	F	0 to 3
2	Operation code	5	P	0 to 31

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001101 ********
00000000 00000GGG 00000000 000000FF 00000000 000PPPPP 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Maps directly on to IPU-to-GSS Control Word. See C&THB, Vol. 1, Section 2.3.4.3.2.

Cmd No	Mnemonic	Subsystem	Class	Type
15	HIR_IPU_CHOPFREQ	IPU	Operational	Flight

Description

Set a chopper reference frequency prescaler

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Prescaler Value	12	P	3003 to 3255

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001111 ********
00000000 0000PPPP PPPPPPPP 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The chopper reference signal is a 500 Hz +/- 20 Hz programmable square wave. It's period is set by loading the prescaler register. Values between 3003 (0BBB) and 3255 (0CB7) will yield frequencies between 520.14 Hz and 479.88 Hz respectively. A prescaler value of 3124 (0C34) will yield a chopper frequency of 500 Hz. Conversion equations: Frequency (Hz) = 1/((prescaler + 1) *0.00000064). Prescaler = 1/(frequency * .00000064)-1. Default value: 3124 (0C34) 500.00 Hz.

Cmd No	Mnemonic	Subsystem	Class	Type
106	HIR_IPU_CRFAULT	IPU	Operational	CRITICAL

Description

Enable changes to fault management system

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101010 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede an HIR_IPU_FAULTOFF or an HIR_IPU_FAULTVAL command.

Cmd No	Mnemonic	Subsystem	Class	Type
16	HIR_IPU_FAULTCLR	IPU	Operational	Flight

Description

Clear all fault condition flags which have been set in the telemetry

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010000 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For any fault, a flag bit will be set in the telemetry stream which will persist until cleared by this command. This command will also protect HIR_IPU_FAULTOFF, HIR_SVA_MOVEPROT, HIR_SSH_MOVEPROT and HIR_SSH_HEATERPROT if they are currently unprotected by their corresponding unprotect commands.

Cmd No	Mnemonic	Subsystem	Class	Type
107	HIR_IPU_FAULTOFF	IPU	Operational	CRITICAL

Description

Enable or disable autonomous management of selected fault condition

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Fault condition number	5	F	0 to 31
1	Disable (0) or enable (1) fault handling	1	H	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101011 ********
00000000 000FFFFF 00000000 0000000H 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must be preceded by a HIR_IPU_CRFAULT command. Disabling an action will still detect and mark faults,and will set a flag for another fault action task (VxWorks or SAIL) to take over.

Cmd No	Mnemonic	Subsystem	Class	Type
105	HIR_IPU_FAULTSEL	IPU	Operational	CRITICAL

Description

Select a primary or redundant unit of a subsystem or device (not IPU processor)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Action Code	5	N	0 to 31
1	Action Parameter	1	S	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101001 ********
00000000 000NNNNN 00000000 0000000S 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If the unit is a switchable powered device (such as the TSS), this flag will apply after the unit is powered down, then back up.If the unit is a redundant mechanism (such as the sunshield), the flag will apply after the current movement has completed.

Cmd No	Mnemonic	Subsystem	Class	Type
108	HIR_IPU_FAULTVAL	IPU	Operational	CRITICAL

Description

Change a value for the autonomous fault management of a selected fault condition

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Fault condition number	5	F	0 to 31
1	Value to be changed	10	V	0 to 1023
2	New value	32	N	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101100 ********
00000000 000FFFFF 000000VV VVVVVVVV NNNNNNNN NNNNNNNN NNNNNNNN NNNNNNNN
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must be preceded by a HIR_IPU_CRFAULT command.

Cmd No	Mnemonic	Subsystem	Class	Type
93	HIR_IPU_QLFLAG	IPU	Operational	Flight

Description

Quick look flag in science packet header for use in EOCC

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Quick Look Flag	1	F	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011101 ********
00000000 0000000F 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Quick look flag value (0 = don't process as quick look data, 1 = process as quick look data).

Cmd No	Mnemonic	Subsystem	Class	Type
14	HIR_IPU_REBOOT	IPU	Operational	Flight

Description

Performs a cold reboot of the IPU processor.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001110 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will cause all operations (including 1553) to halt for the duration of the IPU boot.Additional commands may be required to return the IPU to an operational state.

Cmd No	Mnemonic	Subsystem	Class	Type
88	HIR_IPU_SETTIME	IPU	Operational	Flight

Description

Set 51-bit HIRDLS clock.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Control code: 1 = Set Low Time; 2 = Set High Time; 3 = Set Low and High Time.	2	C	1 to 3
1	High Time value (19 MSBs)	32	H	0 to 524287
2	Low Time value (32 LSBs)	32	L	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011000 ********
00000000 00000000 00000000 000000CC HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

A HIRDLS Time Word is 64 bits long and consists of a 32 bit hardware counter (PTIM3) and a 19 bit software maintained counter. One LSB of HIRDLS Time is 2.03252 microseconds. This command sets one or both parts of the Time Word. If only one part is to be set the command ignores the value uploaded for the other part. If the IPU is powered down the Time Word setting is lost and resets to zero on subsequent power-up. IMPORTANT NOTE: if the HIRDLS Time Word is changed by this command, all TIMED macros will be deleted. This command should not be executed more than once in any 2 second period or else the time code in science and engineering packets may be incorrect for the next 2 seconds. It is possible to have duplicate HIRDLS time stamps.

Cmd No	Mnemonic	Subsystem	Class	Type
85	HIR_IPU_TSSRESET	IPU	Operational	Flight

Description

Hard reset of the TSS control processor (external reset)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010101 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This instruction will abort any operation in progress. The scanner will NOT be safed if this command is used.This command may be used during either TSW boot or application execution.

Cmd No	Mnemonic	Subsystem	Class	Type
92	HIR_IPU_TSUSECTION	TSU	Operational	Flight

Description

Changes the EEPROM section that the IPU will use when the TSU requests a program load.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Auto boot section	16	S	0 to 65535
1	Override Flags	16	V	0 to 65535
2	MBIC A Start	32	W	0 to 524286
3	MBIC A End	32	X	0 to 524286
4	MBIC B Start	32	Y	0 to 524286
5	MBIC B End	32	Z	0 to 524286

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011100 ********
SSSSSSSS SSSSSSSS VVVVVVVV VVVVVVVV WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW
XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX YYYYYYYY YYYYYYYY YYYYYYYY YYYYYYYY
ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Values of 0 to 15 will load the TEU with the image located in this section of the EEPROM and send the boot command to the TEU if the load is successful. A value of 16 will load the TEU with the image located in the first section of IPU EEPROM marked as autobootable for the TEU and send the boot command to the TEU if the load is successful. A value of 100 - 115 will load the TEU with the image located in this IPU EEPROM section but not send the TEU boot command. A value of 116 will load the TEU with the image located in the first section of the IPU EEPROM marked as autobootable for the TEU but will not send the TEU boot command. For any other values, no load of the TEU from IPU EEPROM nor boot will occur.

Cmd No	Mnemonic	Subsystem	Class	Type
89	HIR_MAC_ACTIVATE	MACRO	Operational	Flight

Description

Activate the previously uploaded macro

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011001 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command, which must be preceded by a series of HIR_MAC_UPLOAD commands, signals when the upload is complete. When the HIR_MAC_ACTIVATE command is received, the checksum which has been uploaded in the HIR_MAC_ASSIGN command is verified and the macro marked as ready for execution if the checksums match. If the checksums do not match, the HIR_MAC_ACTIVATE command fails (as reflected in the MAC_CMD_ERR telemetry point) and the uploaded commands are deleted for the macro for which the checksums did not match.

Cmd No	Mnemonic	Subsystem	Class	Type
19	HIR_MAC_ASSIGN	MACRO	Operational	Flight

Description

Assign a macro to a macro number

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Macro Number	7	M	0 to 127
1	Total number of 32-bit words in macro. If this parameter is not a multiple of 17, (16 words for each command, plus 1 for the delay) the command will be rejected.	16	N	0 to 65535
2	32-bit XOR checksum of the macro to be uploaded	32	C	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010011 ********
00000000 0MMMMMMM NNNNNNNN NNNNNNNN CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede a number of HIR_MAC_UPLOAD commands.

Cmd No	Mnemonic	Subsystem	Class	Type
23	HIR_MAC_ERASE	MACRO	Operational	Flight

Description

Erase a macro (set to no-operation if executed)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Macro Number	7	M	0 to 127

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010111 ********
00000000 0MMMMMMM 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will affect all future execution of the macro, including any timed requests which have not been executed. Executing an erased macro will generate a command error.

Cmd No	Mnemonic	Subsystem	Class	Type
21	HIR_MAC_EXE	MACRO	Operational	Flight

Description

Execute selected macro immediately

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Macro Number	7	M	0 to 127

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010101 ********
00000000 0MMMMMMM 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The contents of the selected macro will be added to the command queue.

Cmd No	Mnemonic	Subsystem	Class	Type
22	HIR_MAC_TIMED	MACRO	Operational	Flight

Description

Add or delete a timed macro

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Delete (0) or add (1) a timed macro	1	A	0 to 1
1	Macro Number	7	N	0 to 127
2	Macro High Time of execution	32	M	0 to 4294967295
3	Macro Low Time of execution	32	L	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010110 ********
00000000 0000000A 00000000 0NNNNNNN MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Only one macro may be executed at an specified HIRDLS time. Adding a macro at a already used time will replace the existing macro. A timed macro will only be deleted if the time and macro number match the original add request.If a HIR_IPU_SETTIME command is issued, all timed macro entries will be deleted.

Cmd No	Mnemonic	Subsystem	Class	Type
20	HIR_MAC_UPLOAD	MACRO	Operational	Flight

Description

Upload data for a macro

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	15

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Address offset in block (0 = block start)	16	A	0 to 65535
1	Number of 32-bit words to upload	4	L	1 to 13
2	Data word 1 for upload (zero padded)	32	B	0 to 4294967295
3	Data word 2 for upload (zero padded)	32	C	0 to 4294967295
4	Data word 3 for upload (zero padded)	32	D	0 to 4294967295
5	Data word 4 for upload (zero padded)	32	E	0 to 4294967295
6	Data word 5 for upload (zero padded)	32	F	0 to 4294967295
7	Data word 6 for upload (zero padded)	32	G	0 to 4294967295
8	Data word 7 for upload (zero padded)	32	H	0 to 4294967295
9	Data word 8 for upload (zero padded)	32	J	0 to 4294967295
10	Data word 9 for upload (zero padded)	32	K	0 to 4294967295
11	Data word 10 for upload (zero padded)	32	M	0 to 4294967295
12	Data word 11 for upload (zero padded)	32	P	0 to 4294967295
13	Data word 12 for upload (zero padded)	32	R	0 to 4294967295
14	Data word 13 for upload (zero padded)	32	T	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010100 ********
AAAAAAAA AAAAAAAA 00000000 0000LLLL BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
```

Comments

This command must be preceded by the HIR_MAC_ASSIGN command. Addresses in the H-32 format are relative to 0, which is the start of the selected macro. The format within the upload data is as follows: 16 32-bit words representing a 1553 command, followed by 1 32-bit word representing the delay factor in command ticks relative to the previous command in the macro. One command tick = 4*CR (where CR is time of one chopper rotation, nominal 12ms). (The minimum time between MACRO commands is 4 CR's). A group of HIR_MAC_UPLOAD commands is assembled into a macro and verified by the HIR_MAC_ACTIVATE command.

Cmd No	Mnemonic	Subsystem	Class	Type
24	HIR_OPH_CONTROL	OPH	Operational	Flight

Description

Control operational heaters for specified zone

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Heater zone	4	Z	0 to 6
1	Power level value. 255= 100% power.For zones 1-6 this is a pulse width of (5.12E-6 seconds) * 0xB7 = .937 msecs	8	P	0 to 255
2	Heater On Pulse delay from start of half chopper cycle (5.12 usecs per bit). Zones 1-6 only	8	D	0 to 255

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011000 ********
00000000 0000ZZZZ 00000000 DDDDDDDD 00000000 00000000 00000000 PPPPPPPP
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The in-flight calibrator is heater zone 0. This command is intended for use by SAIL but can be sent from the ground for manual heater control (Constant Power settings only). A SAIL Task will normally be used to control operational heaters.

Cmd No	Mnemonic	Subsystem	Class	Type
26	HIR_PSS_DISCRETE	PSS	Operational	Flight

Description

Send a discrete pulse to the PSS

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Discrete Channel (see notes)	3	D	1 to 6

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011010 ********
00000000 00000DDD 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Starting at the next chopper revolution, and ending at the following chopper revolution,the IPU software will activate one of the 6 PSS relay discrete pulses. Param #0 = 1 will connect PCU Internal Supply A to QBA and Supply B to QBB. Param #0 = 2 will connect PCU Internal Supply B to QBA and Supply A to QBB. Param #0 = 3 thro' 6 are not used.

Cmd No	Mnemonic	Subsystem	Class	Type
25	HIR_PSS_SWITCH	PSS	Operational	Flight

Description

Send a function code and action to PSS

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	PSS Function Code (see notes)	16	C	0 to 63
1	PSS Action (see notes)	16	A	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011001 ********
CCCCCCCC CCCCCCCC AAAAAAAA AAAAAAAA 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If P0 = 0, the value of P1 will be passed directly to the PSS as an Individual Relay Command (IRC). If P0 >0 an IPU Power Switching Macro (PSM) will be executed. A PSM contains a sequence of IRCs. See the HIR_MAC_EXE command for additional information.

Cmd No	Mnemonic	Subsystem	Class	Type
37	HIR_SAI_COMMAND	SAIL	Operational	Flight

Description

Disable or enable the use of a command by SAIL

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) command by SAIL	1	C	0 to 1
1	Command number	7	N	1 to 127

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100101 ********
00000000 0000000C 00000000 0NNNNNNN 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if the specified command can never be used by SAIL.

Cmd No	Mnemonic	Subsystem	Class	Type
38	HIR_SAI_CONTROL	SAIL	Operational	Flight

Description

Enable or disable SAIL control of a specified subsystem

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) control by SAIL	1	C	0 to 1
1	Control item (see notes)	3	N	0 to 5

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100110 ********
00000000 0000000C 00000000 00000NNN 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The item is one of: SSH (0), scanner (1), blackbody heaters (2), HWA (3), CSS (4) and SVA (5). Note that these items are enabled by default, but may be autonomously disabled by fault management actions. A disable of scanner (1) disables all TSS commands from SAIL. A disable of blackbody (2) disables only zone 0 of command HIR_OPH_CONTROL (cmd # 24).

Cmd No	Mnemonic	Subsystem	Class	Type
29	HIR_SAI_CREATE	SAIL	Operational	Flight

Description

Create a SAIL task using specified code and data sections with a given purpose code

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15
1	SAIL code block start	10	C	0 to 1023
2	SAIL data block start	10	D	0 to 1023
3	User-defined purpose identifier	16	P	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011101 ********
00000000 0000TTTT 000000CC CCCCCCCC 000000DD DDDDDDDD PPPPPPPP PPPPPPPP
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected under any of the following conditions: SAIL processor not running, task number in use, code or data area assigned to another task, code or data area is not the start of a series,code or data area not uploaded, or purpose does not match identifier in code block.

Cmd No	Mnemonic	Subsystem	Class	Type
35	HIR_SAI_ERASE	SAIL	Operational	Flight

Description

Erase a SAIL code or data segment

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Start block of segment to be erased	10	S	0 to 1023

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100011 ********
000000SS SSSSSSSS 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if any of the following conditions are true: the SAIL processor is not running, the block number is not the start of a code or data segment, the block is not allocated,or the block is currently in use by one of the tasks (running or suspended).

Cmd No	Mnemonic	Subsystem	Class	Type
34	HIR_SAI_FLAGCLR	SAIL	Operational	Flight

Description

Clear flags (slot #15) for specified SAIL task

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100010 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command clears the status flags in parameter #15 of the selected SAIL task. It is a particular implementation of the HIR_SAI_SHARED command. Intended for use by FOT on HIRDLS request.

Cmd No	Mnemonic	Subsystem	Class	Type
30	HIR_SAI_KILL	SAIL	Operational	Flight

Description

Kill a SAIL task, code and data areas remain allocated

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011110 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if the SAIL processor is not running or the task number is not in use.

Cmd No	Mnemonic	Subsystem	Class	Type
33	HIR_SAI_PARAMCLR	SAIL	Operational	Flight

Description

Clear parameters 0-7 OR 8-15 for specified SAIL task.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15
1	SAIL parameter group	1	U	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100001 ********
00000000 0000TTTT 00000000 0000000U 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command clears selected parameters for a specified SAIL task. Param#1=0 selects slots 0-7. Param#1=1 selects slots 8-15. This is a particular implementation of the HIR_SAI_SHARED command.

Cmd No	Mnemonic	Subsystem	Class	Type
32	HIR_SAI_RESUME	SAIL	Operational	Flight

Description

Resumes a given SAIL task at the next SAIL frame.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100000 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if the SAIL processor is not running or the task number is not in use.

Cmd No	Mnemonic	Subsystem	Class	Type
36	HIR_SAI_SETPARAM	SAIL	Operational	Flight

Description

Loads value into specified SAIL task parameter slot

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15
1	SAIL parameter number	4	S	0 to 15
2	Binary encoded data (zero padded)	32	D	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100100 ********
00000000 0000TTTT 00000000 0000SSSS DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command intended primarily to allow SAIL task parameters to be changed by stored (time-tag) commands or RTSs. It is a particular implementation of the HIR_SAI_SHARED command.

Cmd No	Mnemonic	Subsystem	Class	Type
52	HIR_SAI_SHARED	SAIL	Operational	Flight

Description

Modify contents of SAIL shared memory

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	16

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL shared memory location (32-bit entry)	14	L	0 to 16383
1	Type of upload (0 = int, 1 = float)	1	T	0 to 1
2	Number of 32-bit values to be loaded	4	N	1 to 13
3	Data word 1 for upload (zero padded)	32	A	0 to 4294967295
4	Data word 2 for upload (zero padded)	32	B	0 to 4294967295
5	Data word 3 for upload (zero padded)	32	C	0 to 4294967295
6	Data word 4 for upload (zero padded)	32	D	0 to 4294967295
7	Data word 5 for upload (zero padded)	32	E	0 to 4294967295
8	Data word 6 for upload (zero padded)	32	F	0 to 4294967295
9	Data word 7 for upload (zero padded)	32	G	0 to 4294967295
10	Data word 8 for upload (zero padded)	32	H	0 to 4294967295
11	Data word 9 for upload (zero padded)	32	J	0 to 4294967295
12	word 10 for upload (zero padded)	32	K	0 to 4294967295
13	Data word 11 for upload (zero padded)	32	M	0 to 4294967295
14	Data word 12 for upload (zero padded)	32	P	0 to 4294967295
15	Data word 13 for upload (zero padded)	32	R	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110100 ********
00LLLLLL LLLLLLLL 0000000T 0000NNNN AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE
FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG
HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ
KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR
```

Comments

Note that the contents will be committed immediately after the command is received.

Cmd No	Mnemonic	Subsystem	Class	Type
27	HIR_SAI_START	SAIL	Operational	Flight

Description

Starts SAIL processor with specified amount of additional shared memory

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Number of 512-byte blocks for shared area	9	B	0 to 126

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011011 ********
0000000B BBBBBBBB 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If the SAIL processor is already running, this command will be rejected.Note that the maximum shared memory is limited to 64K (1K preallocated, 63K maximum additional memory)

Cmd No	Mnemonic	Subsystem	Class	Type
28	HIR_SAI_STOP	SAIL	Operational	Flight

Description

Kills all active SAIL tasks, deallocates SAIL memory, and halts the SAIL processor

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Kill code to stop SAIL	16	C	57005 to 57005

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011100 ********
CCCCCCCC CCCCCCCC 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If the SAIL processor is not running, this command will be rejected. If the kill (hex) code is not DEAD, the command will be rejected.

Cmd No	Mnemonic	Subsystem	Class	Type
31	HIR_SAI_SUSPEND	SAIL	Operational	Flight

Description

Suspends indefinitely a given SAIL task at the next SAIL frame

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011111 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if the SAIL processor is not running or the task number is not in use.

Cmd No	Mnemonic	Subsystem	Class	Type
42	HIR_SPU_CLOCKSEL	SPU	Operational	Flight

Description

Select clock sources to be used by the RAD6000 for system tick and the SPU for data collection

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	System tick source select	1	T	0 to 1
1	Chopper rotation pulse source select	2	R	0 to 2
2	Chopper sync pulse source select	2	S	0 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101010 ********
00000000 0000000T 00000000 0000RRSS 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For parameter 0 (Tick Source): 0 = internal RAD6000 clock *1 = Chopper Rotation pulseFor parameter 1 (CR sync pulse source): 0 = internal rotation pulse *1 = Chopper Rotation pulse 2 = External rotation pulseFor parameter 2 Chopping sync source): 0 = internal sync *1 = Chopper sync 2 = External sync* indicates default state after IProc booting has completed

Cmd No	Mnemonic	Subsystem	Class	Type
39	HIR_SPU_TIMING	SPU	Operational	Flight

Description

Change timing delay of detector readouts

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Opcode (see notes)	3	C	0 to 4
1	Item number (see notes)	5	N	0 to 21
2	Value in 160 ns units	16	V	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100111 ********
00000000 00000CCC 00000000 000NNNNN VVVVVVVV VVVVVVVV 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For parameter 0: 0= Set detector delay, 1= Set blade open offset, 2= Set blade closed offset,3= Set housekeeping delay, 4= Set SPU filter delay.For parameter 1: Items for detector delay are 1 through 21.Items for blade edges are 0 through 5.Items for housekeeping delay and SPU filter delay are 0 (only one value).

Cmd No	Mnemonic	Subsystem	Class	Type
41	HIR_SPU_ZERO	SPU	Operational	Flight

Description

Change one of the detector data zero offset values

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Detector number	5	D	0 to 21
1	New zero offset value	16	V	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101001 ********
00000000 000DDDDD VVVVVVVV VVVVVVVV 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Adds a numerical offset (value = param #1) to the signal count of the detector specified by param #0. Special case: If detector 0 selected, set all detector offsets to value specified by Parm #1. Default offsets are 2000 for all detectors.

Cmd No	Mnemonic	Subsystem	Class	Type
46	HIR_SSH_DOORUNPROT	SSH	Operational	Flight

Description

Disable or enable flag to close, latch, or unlatch the sunshield door

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101110 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede a HIR_SSH_HEATERPROT command, or a HIR_SSH_MOVEPROT command which is attempting to close the door past the safe angle.

Cmd No	Mnemonic	Subsystem	Class	Type
47	HIR_SSH_HEATERPROT	SSH	Operational	Flight

Description

Activate the HRM heater to latch or unlatch the sunshield door

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Maximum number of seconds	9	S	0 to 511

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101111 ********
0000000S SSSSSSSS 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if not preceded by an enable HIR_SSH_DOORUNPROT command. The heater will turn off once another heater command is received (overriding the currently executing command) or the time-out has expired or an overheating condition is detected by the fault management software. If the time-out is specified as zero, the heater will be turned off immediately if already on.

Cmd No	Mnemonic	Subsystem	Class	Type
43	HIR_SSH_MOVE	SSH	Operational	Flight

Description

Move the sunshield door at a specifed rate

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Direction (0 = close, 1 = open)	1	D	0 to 1
1	Number of steps to move door	12	N	0 to 2400

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101011 ********
00000000 0000000D 0000NNNN NNNNNNNN 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will move the door for a total of N steps in direction D at a fixed rate of approximately 28 steps per second. One step is 0.1 degrees. The door will not be closed past the angle specified in the HIR_SSH_SAFEANGLE command. Commands in the 'Open' direction are not restricted. If one of these commands is executing, additional HIR_SSH_MOVE commands will be ignored, except a command with a zero number of steps, which will abort the currently executing command. Note that this command does not examine any of the 'limit' microswitches.

Cmd No	Mnemonic	Subsystem	Class	Type
95	HIR_SSH_MOVEPROT	SSH	Operational	Flight

Description

Close the sunshield door at a specified rate outside the safe angle range.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Number of steps	12	N	0 to 2400

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011111 ********
0000NNNN NNNNNNNN 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will move the door for a total of N steps in the closed direction at a fixed rate of approximately 28 steps per second. One step is 0.1 degrees. The door will not be moved (the command will be rejected) unless this command was immediately preceded by the HIR_SSH_DOORUNPROT command. Note that this command does not examine any of the microswitches

Cmd No	Mnemonic	Subsystem	Class	Type
44	HIR_SSH_SAFE	SSH	Operational	Flight

Description

Safe the sunshield door as quickly as possible

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101100 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The door will be moved to the position specifed by the HIR_SSH_SAFEANGLE command. If another HIR_SSH_MOVE command is executing, it will be aborted immediately. This command will only move the door toward the closed position and will be ignored if the door is already within the safe range.

Cmd No	Mnemonic	Subsystem	Class	Type
45	HIR_SSH_SAFEANGLE	SSH	Operational	Flight

Description

Set safe angle parameter for sunshield door

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Safe angle parameter	16	A	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101101 ********
AAAAAAAA AAAAAAAA 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The units of the safe angle position are counts of the SSH door potentiometer as seen in telemetry. Default value for P0 is 36500 for the EM and 46500 for the PFM [equivalent to the 60-degree open position]

Cmd No	Mnemonic	Subsystem	Class	Type
49	HIR_SVA_MOVEPROT	SVA	Operational	Flight

Description

Open or close the space view aperture door.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Close (0) or open (1) the SVA	1	M	0 to 1
1	Number of seconds	5	S	0 to 31

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110001 ********
00000000 0000000M 00000000 000SSSSS 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if not preceded by an HIR_SVA_UNPROT command. The motor will be engaged for the specified number of seconds. The microswitches are ignored. If another command is received during the timeout period it will be ignored, unless the number of seconds is set to zero, in which case the current command will be aborted.

Cmd No	Mnemonic	Subsystem	Class	Type
48	HIR_SVA_UNPROT	SVA	Operational	Flight

Description

Must precede HIR_SVA_MOVEPROT.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110000 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede an HIR_SVA_MOVEPROT command.

Cmd No	Mnemonic	Subsystem	Class	Type
55	HIR_TLM_CSC	IPU	Operational	Flight

Description

Controls telemetry reporting for CSC's

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	CSC ID: MACRO(0), FAULT(1)	4	C	0 to 15
1	Function Code	32	F	0 to 4294967295
2	Telemetry Item	32	T	0 to 4294967295
3	Secondary Function Code	32	S	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110111 ********
00000000 0000CCCC 00000000 00000000 FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT SSSSSSSS SSSSSSSS SSSSSSSS SSSSSSSS
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is used to give a finer degree of control over how each CSC chooses to report telemetry. Refer to SW-LOC-113 for more detail on the usage of this command.

Cmd No	Mnemonic	Subsystem	Class	Type
51	HIR_TLM_DIAGFMT	IPU	Operational	Flight

Description

Select diagnostic items for diagnostic package

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	5

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Diagnostic item ID	5	D	0 to 15
1	Enable (1) or disable (0) diagnostic item	1	E	0 to 1
2	Length of diagnostic item in 16-bit words	9	L	0 to 392
3	Start address	22	A	0 to 4194300
4	Fixed dump (0) or cyclic dump (1)	1	F	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110011 ********
00000000 000DDDDD 00000000 0000000E 0000000L LLLLLLLL 00000000 00000000
00000000 00AAAAAA AAAAAAAA AAAAAAAA 00000000 0000000F 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The first two parameters of this command allow a diagnostic item (one of 16 defined) to be enabled or disabled for inclusion in the diagnostic block. If the diagnostic item is a memory dump, the remaining 3 parameters are used to specify the length of the diagnostic item, the address from which to start the memory dump and the choice of a fixed dump or a cyclic (rolling) dump.

Cmd No	Mnemonic	Subsystem	Class	Type
40	HIR_TLM_FIR	SPU	Operational	Flight

Description

Load FIR Filter Coefficient table or Decimation Coefficients

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	16

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Opcode: 0 = START; 1 = DATA; 2 = ACTIVATE; 3 = DEMOD	2	A	0 to 3
1	Opcode = 1, Number of first FIR coeff within this command; Opcode = 2, RDSR table (1,2,3 or 6)	6	B	0 to 31
2	Opcode = 1, Number of coeffs within this command.	4	C	1 to 12
3	Opcode = 0, 32-bit XOR checksum of FIR filter table; Opcode = 2, 8-bit table ID#, special cases: 1) For ID=0, disable FIR for that RDSR (return result code S_FIRTBL_DISABLE); 2) For RDSR=1, ID=1; RDSR=2, ID=2; RDSR=3, ID=3; RDSR=6, ID=4 Load default FIR table (return result code S_FIRTBL_DEFAULT, Illegal combinations of default table ID and RDSR returns F_FIRID_MISMATCH); Opcode = 3, 8-bit table ID#, special case: 1) 1 means set default DEMOD coef table (return result code S_DEMODTBL_DEF).	32	D	0 to 4294967295
4	Opcode = 1 or 3, 32-bit signed	32	M	-2147483647 to 2
5	Opcode = 1 or 3, 32-bit signed	32	N	-2147483647 to 2
6	Opcode = 1 or 3, 32-bit signed	32	P	-2147483647 to 2
7	Opcode = 1, 32-bit signed	32	R	-2147483647 to 2
8	Opcode = 1, 32-bit signed	32	S	-2147483647 to 2
9	Opcode = 1, 32-bit signed	32	T	-2147483647 to 2
10	Opcode = 1, 32-bit signed	32	U	-2147483647 to 2
11	Opcode = 1, 32-bit signed	32	V	-2147483647 to 2
12	Opcode = 1, 32-bit signed	32	W	-2147483647 to 2
13	Opcode = 1, 32-bit signed	32	X	-2147483647 to 2
14	Opcode = 1, 32-bit signed	32	Y	-2147483647 to 2
15	Opcode = 1, 32-bit signed	32	Z	-2147483647 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101000 ********
00000000 000000AA 00BBBBBB 0000CCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM NNNNNNNN NNNNNNNN NNNNNNNN NNNNNNNN
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR
SSSSSSSS SSSSSSSS SSSSSSSS SSSSSSSS TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
UUUUUUUU UUUUUUUU UUUUUUUU UUUUUUUU VVVVVVVV VVVVVVVV VVVVVVVV VVVVVVVV
WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX
YYYYYYYY YYYYYYYY YYYYYYYY YYYYYYYY ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ
```

Comments

A FIR table upload consists of a START command followed by DATA commands, followed by an ACTIVATE command. For OPCODE = START, param D is the 32-bit XOR checksum of the table

to be loaded. For OPCODE = DATA, param B is the number of the first FIR Coeff contained within this command, param C is the number of coeffs contained within this command, and params M-Z are 32-bit signed integers representing the desired coeff values *10^9. For OPCODE = ACTIVATE, param B selects the RDSR table to load, where 1 = RDSR1, 2 = RDSR2, 3 = RDSR3 and 6 = RDSR6, and parm D is the 8-bit table ID. If an error or inconsistency occurs, the new table is not activated and an error is returned. OPCODE = DEMOD is a special stand-alone command to load the demodulation coeffs: param M = D1, param N = D2, and param P = D3, where these are 32-bit signed integers representing the desired coeff values *10^9. Refer to TC-UCB-005C.

Cmd No	Mnemonic	Subsystem	Class	Type
54	HIR_TLM_HKACTIVATE	IPU	Operational	Flight

Description

Activate a new housekeeping telemetry table

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Table number	2	H	0 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110110 ********
00000000 000000HH 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Activate a housekeeping telemetry table: 0 = default; 1 = operational; 2 = uploaded

Cmd No	Mnemonic	Subsystem	Class	Type
53	HIR_TLM_HKFMT	IPU	Operational	Flight

Description

Upload data to housekeeping telemetry table

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	15

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Address 32-bit offset (0 = start of table)	16	A	0 to 65535
1	Number of 32-bit words to upload	4	N	1 to 13
2	Data word 1 for upload (zero padded).	32	B	0 to 4294967295
3	Data word 2 for upload (zero padded).	32	C	0 to 4294967295
4	Data word 3 for upload (zero padded).	32	D	0 to 4294967295
5	Data word 4 for upload (zero padded).	32	E	0 to 4294967295
6	Data word 5 for upload (zero padded).	32	F	0 to 4294967295
7	Data word 6 for upload (zero padded).	32	G	0 to 4294967295
8	Data word 7 for upload (zero padded).	32	H	0 to 4294967295
9	Data word 8 for upload (zero padded).	32	J	0 to 4294967295
10	Data word 9 for upload (zero padded).	32	K	0 to 4294967295
11	Data word 10 for upload (zero padded).	32	M	0 to 4294967295
12	Data word 11 for upload (zero padded).	32	P	0 to 4294967295
13	Data word 12 for upload (zero padded).	32	R	0 to 4294967295
14	Data word 13 for upload (zero padded).	32	T	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110101 ********
AAAAAAAA AAAAAAAA 00000000 0000NNNN BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
```

Comments

This command must be preceded by the HIR_TLM_HKHEAD command.

Cmd No	Mnemonic	Subsystem	Class	Type
109	HIR_TLM_HKHEAD	IPU	Operational	CRITICAL

Description

Header to upload housekeeping telemetry table

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Housekeeping Identifier	10	I	0 to 1023
1	Number of telemetry format table entries	10	N	1 to 1023
2	Size in words of housekeeping block	10	S	1 to 256
3	32-bit checksum of all data words in upload	32	C	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101101 ********
000000II IIIIIIII 000000NN NNNNNNNN 000000SS SSSSSSSS CCCCCCCC CCCCCCCC
CCCCCCCC CCCCCCCC 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede the HIR_TLM_HKFMT command.The uploaded table cannot be used until the checksum matches the uploaded table.See C&TH section 4 for additional information.

Cmd No	Mnemonic	Subsystem	Class	Type
56	HIR_TLM_OFFSETS	IPU	Operational	Flight

Description

Set telemetry offsets for encoder and wobble sensor data

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Item Number: 0 = Elevation; 1 = Azimuth; 2 = WOBX; 3 = WOBY	2	A	0 to 3
1	Value	20	B	0 to 1048575

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111000 ********
00000000 00000000 00000000 000000AA 00000000 0000BBBB BBBBBBBB BBBBBBBB
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command sets the telemetry offsets for encoder and wobble sensor data telemetry output. The Value parameter is the number in the unsigned telemetry output which corresponds to zero of the signed data item.

Cmd No	Mnemonic	Subsystem	Class	Type
50	HIR_TLM_SCIFMT	IPU	Operational	Flight

Description

Select the contents of the science packet

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	16

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Timestamp block enable	1	B	0 to 1
1	Radiance block enable	1	C	0 to 1
2	Primary Elevation Encoder block enable. 0=disabled, 1= Var only, 2= El2 only, 3= Both Var and El2	2	D	0 to 3
3	Secondary Elevation Encoder block enable. 0=disabled, 1= Var only, 2= El2 only, 3= Both Var and El2	2	E	0 to 3
4	Azimuth Encoder block enable. 0=disabled, 1= Primary only, 2= Secondary only, 3= Both Primary and Secondary	2	F	0 to 3
5	Gyro 0 block enable	1	G	0 to 1
6	Gyro 1 block enable	1	H	0 to 1
7	Gyro 2 block enable	1	J	0 to 1
8	Gyro 3 block enable	1	K	0 to 1
9	Science housekeeping block enable	1	N	0 to 1
10	Diagnostic block enable	1	P	0 to 1
11	Telemetry Test Pattern select	3	R	0 to 7
12	Radiance Data Sample Rate	3	S	1 to 6
13	Radiance Channel Select	21	T	0 to 2097151
14	Primary Elevation Encoder Var Readhead Data Souce. 1= readhead 1 only, 2= readhead 2 only, 3= average of readheads 1 and 2. If the primary variable elevation encoder block is not enabled, this parameter has no effect.	2	U	1 to 3
15	Secondary Elevation Encoder Var Readhead Data Source. 1= readhead 1 only, 2= readhead 2 only, 3= average of readheads 1 and 2. If the secondary variable elevation encoder block is not enabled, this parameter has no effect.	2	W	1 to 3

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110010 ********
00000000 00000000 00000000 0000000B 00000000 0000000C 00000000 000000DD
00000000 000000EE 00000000 000000FF 00000000 0000000G 00000000 0000000H
00000000 0000000J 00000000 0000000K 00000000 0000000N 00000000 0000000P
00000000 00000RRR 00000000 00000SSS 00000000 000TTTTT TTTTTTTT TTTTTTTT
00000000 000000UU 00000000 000000WW 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For each of the block enables, 0 = block not included, and 1 = block included in order shown above. For normal operations, the telemetry test pattern select must be 0. Non-zero values will

produce telemetry test patterns without any science data.The radiance data sample rate is described in the C&THB, Vol. 3. The radiance data channel select will enable each channel with a high bit in this field. The LSB of the select field will enable channel 1, and the MSB will enable channel 21. If the total amount of data requested exceeds the packet size, data will be truncated. See C&THB, Vol. 3 for the format of the science and diagnostic packet formats.

Cmd No	Mnemonic	Subsystem	Class	Type
68	HIR_TSS_AZELDATPOS	TSS	Operational	Flight

Description

Provides offset values to be used for zero position output when the scan mirror is in its datum positi

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Primary Elevation 1 Offset	32	A	-2147483647 to 2
1	Primary Elevation 2 Offset	32	B	-2147483647 to 2
2	Primary Azimuth Offset	32	C	-2147483647 to 2
3	Secondary Elevation 1 Offset	32	X	-2147483647 to 2
4	Secondary Elevation 2 Offset	32	Y	-2147483647 to 2
5	Secondary Azimuth Offset	32	Z	-2147483647 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000100 ********
00000000 00000110 10000001 01110000 AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX YYYYYYYY YYYYYYYY YYYYYYYY YYYYYYYY
ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

None

Cmd No	Mnemonic	Subsystem	Class	Type
76	HIR_TSS_CHOPENA	TSS	Operational	Flight

Description

Enable (power up) or disable (power down) the chopper drive motor

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) chopper drive motor.	1	E	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01001100 ********
00000000 00000001 10000001 11110010 00000000 00000000 00000000 0000000E
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. There is a 10 second delay after receipt of a disable command before an enable command will be acted upon (it will be accepted but not acted upon).

Cmd No	Mnemonic	Subsystem	Class	Type
75	HIR_TSS_CHOPSEL	TSS	Operational	Flight

Description

Configures the chopper drive motor windings

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Chopper winding and driver control configuration param.	3	W	0 to 4

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01001011 ********
00000000 00000001 10000001 10110010 00000000 00000000 00000000 00000WWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.For parameter 0: (0) disconnect windings A and B, (1) connect winding A to driver (2) connect winding B to driver, (3) set chopper to high current mode and (4) remove high current from chopper.

Cmd No	Mnemonic	Subsystem	Class	Type
58	HIR_TSS_CLOCKSEL	TSS	Operational	Flight

Description

Select if the TSS is to use internal or external clock for the system tick and 83 Hz sync

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Internal Test (0), Chopper Test (1), Nominal Flight (2)	2	C	0 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111010 ********
00000000 00000001 11100000 10101000 00000000 00000000 00000000 000000CC
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Mode 0 = Internal Test, Mode 1 = Chopper Test, and Mode 2 = Nominal flight mode (default on boot). This command adjusts the source of timing signals for three items: Scanner Strobe Interrupt, Chopper Ref Signal and Chopper Rotation Signal. (SS, ChRef and CR respectively.) SS source : (0) internal, (1) chopper blade edges, (2) external (IPU). ChRef source : (0) internal (PFM only), (1) internal (PFM only), (2) external (IPU, only source for EM). CR source: (0) internal, (1) Chopper, (2) Chopper.

Cmd No	Mnemonic	Subsystem	Class	Type
64	HIR_TSS_CNTLTABLE	TSS	Operational	Flight

Description

Upload entries to TSW scan mirror table

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	7

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Number of entries (0 = clear from P1)	1	N	0 to 1
1	Starting location in TSW control list	7	E	0 to 127
2	Delta time for movement (5E-5 sec)	32	T	0 to 2147483647
3	Elevation shaft angle (2E-8 deg)	32	P	-2147483647 to 2
4	Elevation shaft rate (2E-8 deg/sec)	32	Q	-2147483647 to 2
5	Azimuth shaft angle (2E-8 deg)	32	V	-2147483647 to 2
6	Azimuth shaft rate (2E-8 deg/sec)	32	W	-2147483647 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000000 ********
00000000 00000111 10000000 10110000 00000000 00000000 00000000 0000000N
00000000 00000000 00000000 0EEEEEEE TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP QQQQQQQQ QQQQQQQQ QQQQQQQQ QQQQQQQQ
VVVVVVVV VVVVVVVV VVVVVVVV VVVVVVVV WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command may be used through the 1553, but it is intended for use internally between the IPU andthe TSW to transmit the SAIL generated control list. Usually, multiple entries would be sent instead of the single entry. This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
80	HIR_TSS_CSCENC	TSS	Operational	Flight

Description

Enable or disable TSW encoder initialization CSC

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) CSC.	1	E	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010000 ********
00000000 00000001 10000000 01101010 00000000 00000000 00000000 0000000E
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. This CSC can not be enabled at the same time that the scan mirror contol CSC is enabled. The encoder initialization should be enabled and allowed to disable itself before the scan mirror control CSC is enabled.

Cmd No	Mnemonic	Subsystem	Class	Type
81	HIR_TSS_CSCSCN	TSS	Operational	Flight

Description

Enable or disable TSW scan mirror control CSC

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) CSC.	1	E	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010001 ********
00000000 00000001 10000000 01110000 00000000 00000000 00000000 0000000E
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. This CSC can not be enabled at the same time that the encoder initialization CSC is enabled.

Cmd No	Mnemonic	Subsystem	Class	Type
84	HIR_TSS_CSCSSS	TSS	Operational	Flight

Description

Enable or disable TSW sub-subsystem support CSC

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (even) or Enable (odd) various diagnostic and fault management functions excluding parameters 8 and 9.	4	E	0 to 13

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010100 ********
00000000 00000001 10000000 01110110 00000000 00000000 00000000 0000EEEE
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. This CSC is not enabled as the other CSCs but individual actions are turned on and off in this CSC by this command. The parameter values perform the following actions: 0= disable memory dump, 1= enable memory dump, 2= disable chopper power fault management, 3= enable chopper power fault management, 4= disable EEA fault management, 5= enable EEA fault management, 6= disable TSW telemetry test pattern, 7= enable default TSW telemetry test pattern, 8= enable diagnostic telemetry test pattern, 9= noop, 10= disable measured current FM, 11= enable measured current FM, 12= disable commanded current FM, 13= enable commanded current FM. For noop, the TSW command accept counter will increment.

Cmd No	Mnemonic	Subsystem	Class	Type
71	HIR_TSS_DRSETUP	TSS	Operational	Flight

Description

Elevation and azimuth drive motor configuration

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	See notes above	4	M	1 to 12

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000111 ********
00000000 00000001 10000000 10110010 00000000 00000000 00000000 0000MMMM
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.For parameter 0: (12) Azimuth motor short (EM only, PFM noop), (11) Azimuth open short (EM only, PFM noop), (10) Azimuth connect to drive (9) Azimuth disconnect from drive, (8) Elevation 2 motor short, (7) Elevation 2 open short, (6) Elevation 2 connect to drive, (5) Elevation 2 disconnect from drive, (4) Elevation 1 motor short, (3) Elevation 1 open short, (2) Elevation 1 connect to drive, (1) Elevation 1 disconnect from drive. For PFM noop, the TSW command accept counter will increment.

Cmd No	Mnemonic	Subsystem	Class	Type
74	HIR_TSS_EEARESET	TSS	Operational	Flight

Description

Restarts the active EEA side

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01001010 ********
00000000 00000000 00000001 01110010 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
73	HIR_TSS_EEASELECT	TSS	Operational	Flight

Description

Select (power up) or deselect (power down) the primary and/or secondary encoder set

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	See notes below	3	S	1 to 6

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01001001 ********
00000000 00000001 10000001 00110010 00000000 00000000 00000000 00000SSS
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.For parameter 0: (1) select primary EEA, (2) deselect primary EEA, (3) select secondary EEA, (4) deselect secondary EEA, (5) test angle (both EEAs selected), (6) remove test angle (both).

Cmd No	Mnemonic	Subsystem	Class	Type
62	HIR_TSS_EINITTBL	TSS	Operational	Flight

Description

Upload entries to TSW scan mirror table for use during encoder initialization.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	7

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Number of entries (0 = clear from P1)	1	N	0 to 1
1	Starting location in TSW control list	7	E	0 to 127
2	Delta time for movement (5E-5 sec)	32	T	0 to 2147483647
3	Elevation shaft angle (2E-8 deg)	32	P	-2147483647 to 2
4	Elevation shaft rate (2E-8 deg/sec)	32	Q	-2147483647 to 2
5	Azimuth shaft angle (2E-8 deg)	32	V	-2147483647 to 2
6	Azimuth shaft rate (2E-8 deg/sec)	32	W	-2147483647 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111110 ********
00000000 00000111 10000000 10101010 00000000 00000000 00000000 0000000N
00000000 00000000 00000000 0EEEEEEE TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP QQQQQQQQ QQQQQQQQ QQQQQQQQ QQQQQQQQ
VVVVVVVV VVVVVVVV VVVVVVVV VVVVVVVV WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command may be used through the 1553, but it is intended for use internally between the IPU and the TSW to transmit the SAIL generated control list. Usually, multiple entries would be sent instead of a single entry. This is a TSW application command and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
61	HIR_TSS_ENCINIT	TSS	Operational	Flight

Description

Home both elevation and azimuth encoders with new parameters

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	5

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Azimuth motor torque (Nm scaled by 2E-8)	32	M	-2147483647 to 2
1	Elevation equilibrium angle (deg. scaled by 2E-8)	32	A	-2147483647 to 2
2	Open-loop traversal time (sec. scaled 5E-5)	32	L	0 to 2147483647
3	Torque ramp-up time (sec. scaled 5E-5)	32	R	0 to 2147483647
4	Delta time for EEA restart (sec. scaled 5E-5)	32	T	0 to 2147483647

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111101 ********
00000000 00000101 10000000 11101010 MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM
AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
63	HIR_TSS_ENCSEL	TSS	Operational	Flight

Description

Selects which of the encoders (2 read heads for elevation and one for azimuth on both the primary

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Control encoder / readhead selection	4	W	1 to 7

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111111 ********
00000000 00000001 10000010 00110010 00000000 00000000 00000000 0000WWWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command and will not be recognized during TSW boot. Choices for the control encoders are: (1) elevation read head 1, (2) elevation read head 2, (3) average of elevation read heads 1 & 2, (4) elevation control on primary EEA, (5) elevation control on secondary EEA, (6) azimuth control on primary EEA 2, (7) azimuth control secondary EEA.

Cmd No	Mnemonic	Subsystem	Class	Type
67	HIR_TSS_FREQINFO	TSS	Operational	Flight

Description

Passes the information about the chopper rate to the TEU software

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Prescaler value	12	P	3003 to 3255

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000011 ********
00000000 00000001 10000001 01101000 00000000 00000000 0000PPPP PPPPPPPP
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is used to provide information to the TEU software and does not control any hardware functions. This definition is identical to that in the command HIR_IPU_CHOPFREQ. Both HIR_TSS_FREQINFO and HIR_IPU_CHOPFREQ must be sent together to set both the IPU and TEU to the same time base. The chopper reference signal is a 500Hz +/- 20Hz programmable square wave. It's period is set by loading the prescaler register. Values between 3003 (0BBB) and 3255 (0CB7) will yield frequencies between 520.14 Hz and 479.88 Hz respectively. A prescaler value of 3124 (0C34) will yield a chopper frequency of 500Hz. Conversion equations: Frequency (Hz) = 1/((prescaler + 1) *0.00000064). Prescaler = 1/(frequency * .00000064)-1. Default value: 3124 (0C34) 500.00 Hz.

Cmd No	Mnemonic	Subsystem	Class	Type
94	HIR_TSS_MTRPWR	TSS	Operational	Flight

Description

Turns on or off the scan/chopper motor power converter.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Drive motor power configuration parameter.	1	W	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011110 ********
00000000 00000001 10000010 01110010 00000000 00000000 00000000 0000000W
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. For parameter 0: 0 = power off drive motors, 1 = power on drive motors. This command is for the PFM only. It is a noop for the EM and the command counter will increment but no action will be taken.

Cmd No	Mnemonic	Subsystem	Class	Type
60	HIR_TSS_REBOOT	TSS	Operational	Flight

Description

Soft reboot of the TSS control processor (software reset)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111100 ********
00000000 00000000 00000001 00101001 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This instruction will abort any operation in progress. The scanner will NOT be safed if this command is used. This command may be used during either TSW boot or application execution.

Cmd No	Mnemonic	Subsystem	Class	Type
66	HIR_TSS_SAFE	TSS	Operational	Flight

Description

Abort and erase the current scanner table, and move the mirror as fast as possible to the safe positi

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000010 ********
00000000 00000000 00000001 00110001 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Note that if the azimuth motor has been disabled with the HIR_TSS_MOTOR command, the mirror will not move in azimuth. This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
65	HIR_TSS_START	TSS	Operational	Flight

Description

Forces an immediate execution of the scanner table

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000001 ********
00000000 00000000 00000000 11110000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is only intended for ground testing, and will be handled automatically for regular operations.This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
59	HIR_TSS_WATCHDOG	TSS	Operational	Flight

Description

Turns the system watchdog or scanner strobe watchdog on or off.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (even) or enable (odd) system or scanner strobe watchdog.	2	A	0 to 3

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111011 ********
00000000 00000010 11100000 11101000 00000000 00000000 00000000 000000AA
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This TSW application code command turns on or off either of two watchdog timers according to the following values: 0 = disable system watchdog, 1 = enable system watchdog, 2 = disable scanner strobe watchdog or 3 = enable scanner strobe watchdog.

Cmd No	Mnemonic	Subsystem	Class	Type
87	HIR_TSU_BOOT	TSU	Operational	Flight

Description

Boot the TSW from the specified location from TSU boot state.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	TSU RAM location for boot	24	R	0 to 16777215

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010111 ********
00000000 00000001 10000001 00100000 00000000 RRRRRRRR RRRRRRRR RRRRRRRR
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is only valid during the TSW boot sequence. During normal operation, the command will generate an error.

Cmd No	Mnemonic	Subsystem	Class	Type
91	HIR_TSU_DOWNLOAD	TSU	Operational	Flight

Description

Download a TSS memory dump packet while in TSS boot state.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Memory location to start dump (32-bit boundary).	32	A	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011011 ********
00000000 00000010 10000001 01100000 AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Send a download packet to the IPU from the TEU SUROM software only.

Cmd No	Mnemonic	Subsystem	Class	Type
90	HIR_TSU_REBOOT	TSU	Operational	Flight

Description

Soft reboot of the TSS control processor while in boot state (software reset).

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011010 ********
00000000 00000000 00000000 01100000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This instruction will abort any operation in progress. The scanner will NOT be safed if this command is used. This command may be used during either TSW boot or application execution.

Cmd No	Mnemonic	Subsystem	Class	Type
101	HIR_UPL_DATA	UPL	Operational	Flight

Description

Upload data to IPU RAM

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	15

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Block number.	16	B	1 to 40330
1	Number of 32-bit words to upload	4	N	1 to 13
2	Data word 1 for upload (zero padded).	32	A	0 to 4294967295
3	Data word 2 for upload (zero padded).	32	C	0 to 4294967295
4	Data word 3 for upload (zero padded).	32	D	0 to 4294967295
5	Data word 4 for upload (zero padded).	32	E	0 to 4294967295
6	Data word 5 for upload (zero padded).	32	F	0 to 4294967295
7	Data word 6 for upload (zero padded).	32	G	0 to 4294967295
8	Data word 7 for upload (zero padded).	32	H	0 to 4294967295
9	Data word 8 for upload (zero padded).	32	J	0 to 4294967295
10	Data word 9 for upload (zero padded).	32	K	0 to 4294967295
11	Data word 10 for upload (zero padded).	32	M	0 to 4294967295
12	Data word 11 for upload (zero padded).	32	P	0 to 4294967295
13	Data word 12 for upload (zero padded).	32	R	0 to 4294967295
14	Data word 13 for upload (zero padded).	32	T	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100101 ********
BBBBBBBB BBBBBBBB 00000000 0000NNNN AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
```

Comments

This command must be preceded by the HIR_UPL_HEADER command. The block number must begin with 1 and be sequential.

Cmd No	Mnemonic	Subsystem	Class	Type
100	HIR_UPL_HEADER	UPL	Operational	Flight

Description

Header to upload IPU RAM

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Subsystem identifier (0x1000 = IPU Test Area, 0x2000 = SAIL task data block, 0x2100 = SAIL task code block and 0x8000 = TEU startup)	16	S	0 to 65535
1	Start address for RAM upload	24	A	0 to 2097148
2	Number of HIR_UPL_DATA commands to follow. If number of blocks = 0, abort the upload.	16	N	0 to 40330
3	XOR checksum for the entire upload	32	C	0 to 4294967295
4	Length in 32-bit words	32	L	0 to 4294967295
5	If 0, data to follow; if 1, calculate checksum based on start address and length and compare with uploaded checksum (no data follows this command). The result of the comparison is given by subtelemetry point IPU_UPL_CHKSUMOK = 1 if comparison successful, = 0 if comparison failed. For SAIL uploads, if this parameter is 1 it is ignored.	1	F	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100100 ********
00000000 00000000 SSSSSSSS SSSSSSSS 00000000 AAAAAAAA AAAAAAAA AAAAAAAA
00000000 00000000 NNNNNNNN NNNNNNNN CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 0000000F
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede a group of HIR_UPL_DATA commands. The address is relative to the beginning of the appropriate memory space and must be on a 4 byte boundary.

HIRDLS Commands

(Sort by Subsystem)

Cmd No	Mnemonic	Subsystem	Class	Type
6	HIR_BIP_DUMPADDR	BIP	Boot Hold	Flight

Description

Change current dump address of IPU dump

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	0 means fixed dump, 1 means cyclic dump	1	R	0 to 1
1	Address offset is byte address for location in RAM if 0 or Dword address in EEPROM if 1	1	L	0 to 1
2	IPU address to start dump	24	A	0 to 2097148

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000110 ********
0000000R 0000000L 00000000 AAAAAAAA AAAAAAAA AAAAAAAA 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Start dump at specified location in RAM or EEPROM.

Cmd No	Mnemonic	Subsystem	Class	Type
103	HIR_BIP_EEWRITE	BIP	Boot Hold	CRITICAL

Description

Setup to copy a section from IPU RAM into permanent EEPROM (critical command)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
1	RAM address offset of image start	24	R	0 to 2097148
2	Length in 32-bit Dwords for copy	24	L	0 to 393216
3	EEPROM address offset to load image	24	E	0 to 1048572
4	Flags	32	F	0 to 4294967295
5	XOR Checksum of entire area to be copied	32	C	0 to 4294967295
0	EEPROM section location (0 - 15)	4	S	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100111 ********
00000000 0000SSSS 00000000 RRRRRRRR RRRRRRRR RRRRRRRR 00000000 LLLLLLLL
LLLLLLLL LLLLLLLL 00000000 EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF
FFFFFFFF FFFFFFFF CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For more detailed notes see latest release of SP_HIR_103 Vol1

Cmd No	Mnemonic	Subsystem	Class	Type
7	HIR_BIP_JMP	BIP	Boot Hold	CRITICAL

Description

Boot IPU from the specified RAM address

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	IPU RAM address to warm reboot	32	J	0 to 2097148

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000111 ********
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For more detailed notes see latest release of SP_HIR_103 Vol1

Cmd No	Mnemonic	Subsystem	Class	Type
18	HIR_BIP_EEREPAIR	BIP	Boot Hold	CRITICAL

Description

Fix a EEPROM index error or clear all EEPROM data.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Action to be performed (0x0000=abort, 0x5555=EEPROM scrub, 0x7777=load MBIC start/end addresses, 0x8888=correct failed index block, 0xAAAA=set safety override word, 0xBBBB=perform IPU autoboot check, 0xFFFF=erase all EEPROM [stage 1], 0xEEEE=erase all EEPROM [stage 3]. All other values invalid and will be rejected	16	A	0 to 65535
1	Parameter (see SW-LOC-502)	32	P	0 to 65535
2	MBICA start address (32-bit word offset, 2^19 - 2, last byte not usable)	19	E	0 to 524286
3	MBICA end address (32-bit word offset, 2^19 - 2, last byte not usable))	19	F	0 to 524286
4	MBICB start address (32-bit word offset, 2^19 - 2, last byte not usable))	19	G	0 to 524286
5	MBICB end address (32-bit word offset, 2^19 - 2, last byte not usable))	19	H	0 to 524286

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010010 ********
AAAAAAAA AAAAAAAA PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP 00000000 00000EEE
EEEEEEEE EEEEEEEE 00000000 00000FFF FFFFFFFF FFFFFFFF 00000000 00000GGG
GGGGGGGG GGGGGGGG 00000000 00000HHH HHHHHHHH HHHHHHHH 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For more detailed notes see latest release of SW-LOC-502.

Cmd No	Mnemonic	Subsystem	Class	Type
5	HIR_BIP_BOOT	BIP	Boot Hold	Flight

Description

Boot IPU from the specified RAM address

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000101 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Jump to the loaded RAM address and boot if the program checksums match using the address and checsum from the latest HIR_BIP_HEADER or HIR_BIP_EEREAD command.

Cmd No	Mnemonic	Subsystem	Class	Type
4	HIR_BIP_EEREAD	BIP	Boot Hold	Flight

Description

Copy a section of EEPROM into IPU RAM

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	EEPROM section location (0 to 15)	4	S	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000100 ********
00000000 0000SSSS 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Read a section of EEPROM into RAM.

Cmd No	Mnemonic	Subsystem	Class	Type
3	HIR_BIP_REBOOT	BIP	Boot Hold	Flight

Description

Performs a cold reboot of the IPU processor.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000011 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will cause all operations (including 1553) to halt for the duration of the IPU boot.Additional commands may be required to return the IPU to an operational state.This command is valid only during any of the boot hold states.Note that if the EEPROM was being programmed, the EEPROM contents may be corruptedif this command is used.

Cmd No	Mnemonic	Subsystem	Class	Type
2	HIR_BIP_EXECUTE	BIP	Booting	Flight

Description

Abort IPU countdown and execute the application immediately

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000010 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is valid only during the countdown state.

Cmd No	Mnemonic	Subsystem	Class	Type
96	HIR_BIP_HEADER	BIP	Boot Hold	Flight

Description

Header to upload IPU RAM in IPU boot state only.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Subsystem identifier (0x0000 = IPU startup).	16	S	0 to 0
1	Start address for RAM upload	24	A	0 to 2097148
2	Number of HIR_BIP_DATA commands (blocks) to follow. If number of blocks = 0 and flags word below is also zero, abort the upload.	16	N	0 to 40330
3	XOR checksum for the entire upload	32	C	0 to 4294967295
4	Length in 32-bit words	32	L	0 to 4294967295
5	If 0, data to follow; if 1, calculate checksum based on start address and length and place in telemetry point ISU_CMPCSUM.	1	F	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100000 ********
00000000 00000000 SSSSSSSS SSSSSSSS 00000000 AAAAAAAA AAAAAAAA AAAAAAAA
00000000 00000000 NNNNNNNN NNNNNNNN CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 0000000F
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede a group of HIR_BIP_DATA commands. The address is relative to the beginning of the appropriate memory space and must be on a 4 byte boundary.

Cmd No	Mnemonic	Subsystem	Class	Type
1	HIR_BIP_HOLD	BIP	Booting	Flight

Description

Abort IPU countdown to running state and hold the IPU in the idle boot hold state

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00000001 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If this command is used, the program will NOT be loaded from EEPROM into RAM. This must be done manually if required. This command will transition the IPU into the idle boot hold state.The IPU remains in this state until a HIR_IPU_BOOT or HIR_IPU_REBOOT command is received.This command is only valid during the countdown state.

Cmd No	Mnemonic	Subsystem	Class	Type
98	HIR_BIP_JMPCOMMIT	BIP	Boot Hold	CRITICAL

Description

Boot IPU from the specified RAM address

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100010 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Jump to the specified RAM address (ignoring checksums) once the commit command has been sent.

Cmd No	Mnemonic	Subsystem	Class	Type
104	HIR_BIP_EECOMMIT	BIP	Boot Hold	CRITICAL

Description

Perform RAM to EEPROM transfer or other EEPROM action.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Perform RAM to EEPROM transfer or other EEPROM action - Action to be performed: 5=write EEPROM segment, 6=erase EEPROM segment, 8=copy index block 1 to 2, 9=copy index block 2 to 1, 16=EEPROM scrub, 17=erase all EEPROM [stage 2], 19=erase all EEPROM [final stage].	5	E	0 to 19

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101000 ********
00000000 000EEEEE 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Perform RAM to EEPROM transfer or other EEPROM action.

Cmd No	Mnemonic	Subsystem	Class	Type
97	HIR_BIP_DATA	BIP	Boot Hold	Flight

Description

Upload data to IPU RAM for IPU boot state only

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	15

Command Parameters

No	Parameter	Bit Size	Symbol	Range
3	Data word 2 for upload (zero padded).	32	C	0 to 4294967295
4	Data word 3 for upload (zero padded).	32	D	0 to 4294967295
5	Data word 4 for upload (zero padded).	32	E	0 to 4294967295
6	Data word 5 for upload (zero padded).	32	F	0 to 4294967295
7	Data word 6 for upload (zero padded).	32	G	0 to 4294967295
8	Data word 7 for upload (zero padded).	32	H	0 to 4294967295
9	Data word 8 for upload (zero padded).	32	J	0 to 4294967295
10	Data word 9 for upload (zero padded).	32	K	0 to 4294967295
11	Data word 10 for upload (zero padded).	32	M	0 to 4294967295
12	Data word 11 for upload (zero padded).	32	P	0 to 4294967295
13	Data word 12 for upload (zero padded).	32	R	0 to 4294967295
14	Data word 13 for upload (zero padded).	32	T	0 to 4294967295
0	Block number.	16	B	1 to 40330
1	Number of 32-bit words to upload	4	N	1 to 13
2	Data word 1 for upload (zero padded).	32	A	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100001 ********
BBBBBBBB BBBBBBBB 00000000 0000NNNN AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
```

Comments

This command must be preceded by the HIR_BIP_HEADER command. The block number must begin with 1 and be sequential.

Cmd No	Mnemonic	Subsystem	Class	Type
17	HIR_BIP_EEWIPE	BIP	Boot Hold	CRITICAL

Description

Erase a EEPROM section

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	EEPROM section to erase (0 - 15)	4	E	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010001 ********
00000000 0000EEEE 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For more detailed notes see latest release of SP_HIR_103 Vol1

Cmd No	Mnemonic	Subsystem	Class	Type
86	HIR_CSS_PIDCOEFFS	CSS	Operational	Flight

Description

Proportional, Integral and Derivative coefficients for use by CSS SW.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Proportional Coefficient	16	P	0 to 65535
1	Integral Coefficient	16	I	0 to 65535
2	Derivative Coefficient	16	D	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010110 ********
PPPPPPPP PPPPPPPP IIIIIIII IIIIIIII DDDDDDDD DDDDDDDD 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

None

Cmd No	Mnemonic	Subsystem	Class	Type
11	HIR_CSS_LOCK	CSS	Operational	CRITICAL

Description

Short or open CSS motor windings

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Compressor(0), Displacer(1).	1	S	0 to 1
1	Cage(0), Prim_Uncage(1), Sec_Uncage(2).	2	F	0 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001011 ********
00000000 0000000S 00000000 000000FF 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The cooler cannot be operated until the motor windings have been uncaged.

Cmd No	Mnemonic	Subsystem	Class	Type
8	HIR_CSS_SETTING	CSS	Operational	Flight

Description

Set cooler mode, and target temperature or manual settings

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Mode word (see notes)	8	M	0 to 255
1	Temperature in 0.1 K units in mode 0	16	T	0 to 3000
2	Compressor stroke level in 0.1% units	16	C	0 to 1000
3	Displacer stroke level in 0.1% units	16	D	0 to 1000

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001000 ********
00000000 MMMMMMMM TTTTTTTT TTTTTTTT CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

In thermostatic mode, the values for the stroke levels define the maximum levels. In manual mode, the temperature is ignored. For the mode word, the following bit definitions apply: Bit 0 - Electronics Only (0), Control (1),Bit 1 - Manual mode off (0), on (1)Bit 2 - Thermostatic mode off (0), on (1),Bit 3 - Warm-up mode off (0), on (1),Bit 4 - Vibration cancellation mode (eliminated/not used), Bit 5 - Diode select, diode 0 or 1. Bit 7 - Over Stroke Disable Mode, 0=O/S on, 1=O/S off.

Cmd No	Mnemonic	Subsystem	Class	Type
9	HIR_CSS_FREQ	CSS	Operational	Flight

Description

Set cooler frequency and angles

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
1	Displacer phase angle in 0.1 deg units	16	A	0 to 3599
0	Operating frequency in 0.1 Hz units	16	F	306 to 400

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001001 ********
FFFFFFFF FFFFFFFF AAAAAAAA AAAAAAAA 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Default value for P0: 325 = 32.5 HzDefault value for P1: 550 = 55 deg.

Cmd No	Mnemonic	Subsystem	Class	Type
10	HIR_CSS_CNVRTR	CSS	Operational	CRITICAL

Description

Select primary or secondary converters

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Primary cnvrtrs (0) or secondary cnvrtrs (1)	1	P	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001010 ********
00000000 0000000P 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Default state for P0: 0 = primary converters selected

Cmd No	Mnemonic	Subsystem	Class	Type
13	HIR_GSS_CONTROL	GSS	Operational	Flight

Description

Set attributes for selected gyro

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Gyro channel	3	G	0 to 7
1	Function code	2	F	0 to 3
2	Operation code	5	P	0 to 31

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001101 ********
00000000 00000GGG 00000000 000000FF 00000000 000PPPPP 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Maps directly on to IPU-to-GSS Control Word. See C&THB, Vol. 1, Section 2.3.4.3.2.

Cmd No	Mnemonic	Subsystem	Class	Type
12	HIR_GSS_BSELECT	GSS	Operational	Flight

Description

Select GSS B-side.

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001100 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command issues an IPU discrete pulse to the GSS to switch to GSS side B. The GSS automatically powers on to the GSS A side independent of the IPU.

Cmd No	Mnemonic	Subsystem	Class	Type
16	HIR_IPU_FAULTCLR	IPU	Operational	Flight

Description

Clear all fault condition flags which have been set in the telemetry

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010000 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For any fault, a flag bit will be set in the telemetry stream which will persist until cleared by this command. This command will also protect HIR_IPU_FAULTOFF, HIR_SVA_MOVEPROT, HIR_SSH_MOVEPROT and HIR_SSH_HEATERPROT if they are currently unprotected by their corresponding unprotect commands.

Cmd No	Mnemonic	Subsystem	Class	Type
54	HIR_TLM_HKACTIVATE	IPU	Operational	Flight

Description

Activate a new housekeeping telemetry table

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Table number	2	H	0 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110110 ********
00000000 000000HH 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Activate a housekeeping telemetry table: 0 = default; 1 = operational; 2 = uploaded

Cmd No	Mnemonic	Subsystem	Class	Type
53	HIR_TLM_HKFMT	IPU	Operational	Flight

Description

Upload data to housekeeping telemetry table

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	15

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Address 32-bit offset (0 = start of table)	16	A	0 to 65535
1	Number of 32-bit words to upload	4	N	1 to 13
2	Data word 1 for upload (zero padded).	32	B	0 to 4294967295
3	Data word 2 for upload (zero padded).	32	C	0 to 4294967295
4	Data word 3 for upload (zero padded).	32	D	0 to 4294967295
5	Data word 4 for upload (zero padded).	32	E	0 to 4294967295
6	Data word 5 for upload (zero padded).	32	F	0 to 4294967295
7	Data word 6 for upload (zero padded).	32	G	0 to 4294967295
8	Data word 7 for upload (zero padded).	32	H	0 to 4294967295
9	Data word 8 for upload (zero padded).	32	J	0 to 4294967295
10	Data word 9 for upload (zero padded).	32	K	0 to 4294967295
11	Data word 10 for upload (zero padded).	32	M	0 to 4294967295
12	Data word 11 for upload (zero padded).	32	P	0 to 4294967295
13	Data word 12 for upload (zero padded).	32	R	0 to 4294967295
14	Data word 13 for upload (zero padded).	32	T	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110101 ********
AAAAAAAA AAAAAAAA 00000000 0000NNNN BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
```

Comments

This command must be preceded by the HIR_TLM_HKHEAD command.

Cmd No	Mnemonic	Subsystem	Class	Type
56	HIR_TLM_OFFSETS	IPU	Operational	Flight

Description

Set telemetry offsets for encoder and wobble sensor data

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Item Number: 0 = Elevation; 1 = Azimuth; 2 = WOBX; 3 = WOBY	2	A	0 to 3
1	Value	20	B	0 to 1048575

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111000 ********
00000000 00000000 00000000 000000AA 00000000 0000BBBB BBBBBBBB BBBBBBBB
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command sets the telemetry offsets for encoder and wobble sensor data telemetry output. The Value parameter is the number in the unsigned telemetry output which corresponds to zero of the signed data item.

Cmd No	Mnemonic	Subsystem	Class	Type
107	HIR_IPU_FAULTOFF	IPU	Operational	CRITICAL

Description

Enable or disable autonomous management of selected fault condition

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Fault condition number	5	F	0 to 31
1	Disable (0) or enable (1) fault handling	1	H	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101011 ********
00000000 000FFFFF 00000000 0000000H 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must be preceded by a HIR_IPU_CRFAULT command. Disabling an action will still detect and mark faults,and will set a flag for another fault action task (VxWorks or SAIL) to take over.

Cmd No	Mnemonic	Subsystem	Class	Type
50	HIR_TLM_SCIFMT	IPU	Operational	Flight

Description

Select the contents of the science packet

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	16

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Timestamp block enable	1	B	0 to 1
1	Radiance block enable	1	C	0 to 1
2	Primary Elevation Encoder block enable. 0=disabled, 1= Var only, 2= El2 only, 3= Both Var and El2	2	D	0 to 3
3	Secondary Elevation Encoder block enable. 0=disabled, 1= Var only, 2= El2 only, 3= Both Var and El2	2	E	0 to 3
4	Azimuth Encoder block enable. 0=disabled, 1= Primary only, 2= Secondary only, 3= Both Primary and Secondary	2	F	0 to 3
5	Gyro 0 block enable	1	G	0 to 1
6	Gyro 1 block enable	1	H	0 to 1
7	Gyro 2 block enable	1	J	0 to 1
8	Gyro 3 block enable	1	K	0 to 1
9	Science housekeeping block enable	1	N	0 to 1
10	Diagnostic block enable	1	P	0 to 1
11	Telemetry Test Pattern select	3	R	0 to 7
12	Radiance Data Sample Rate	3	S	1 to 6
13	Radiance Channel Select	21	T	0 to 2097151
14	Primary Elevation Encoder Var Readhead Data Souce. 1= readhead 1 only, 2= readhead 2 only, 3= average of readheads 1 and 2. If the primary variable elevation encoder block is not enabled, this parameter has no effect.	2	U	1 to 3
15	Secondary Elevation Encoder Var Readhead Data Source. 1= readhead 1 only, 2= readhead 2 only, 3= average of readheads 1 and 2. If the secondary variable elevation encoder block is not enabled, this parameter has no effect.	2	W	1 to 3

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110010 ********
00000000 00000000 00000000 0000000B 00000000 0000000C 00000000 000000DD
00000000 000000EE 00000000 000000FF 00000000 0000000G 00000000 0000000H
00000000 0000000J 00000000 0000000K 00000000 0000000N 00000000 0000000P
00000000 00000RRR 00000000 00000SSS 00000000 000TTTTT TTTTTTTT TTTTTTTT
00000000 000000UU 00000000 000000WW 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For each of the block enables, 0 = block not included, and 1 = block included in order shown above. For normal operations, the telemetry test pattern select must be 0. Non-zero values will

produce telemetry test patterns without any science data.The radiance data sample rate is described in the C&THB, Vol. 3. The radiance data channel select will enable each channel with a high bit in this field. The LSB of the select field will enable channel 1, and the MSB will enable channel 21. If the total amount of data requested exceeds the packet size, data will be truncated. See C&THB, Vol. 3 for the format of the science and diagnostic packet formats.

Cmd No	Mnemonic	Subsystem	Class	Type
108	HIR_IPU_FAULTVAL	IPU	Operational	CRITICAL

Description

Change a value for the autonomous fault management of a selected fault condition

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Fault condition number	5	F	0 to 31
1	Value to be changed	10	V	0 to 1023
2	New value	32	N	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101100 ********
00000000 000FFFFF 000000VV VVVVVVVV NNNNNNNN NNNNNNNN NNNNNNNN NNNNNNNN
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must be preceded by a HIR_IPU_CRFAULT command.

Cmd No	Mnemonic	Subsystem	Class	Type
51	HIR_TLM_DIAGFMT	IPU	Operational	Flight

Description

Select diagnostic items for diagnostic package

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	5

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Diagnostic item ID	5	D	0 to 15
1	Enable (1) or disable (0) diagnostic item	1	E	0 to 1
2	Length of diagnostic item in 16-bit words	9	L	0 to 392
3	Start address	22	A	0 to 4194300
4	Fixed dump (0) or cyclic dump (1)	1	F	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110011 ********
00000000 000DDDDD 00000000 0000000E 0000000L LLLLLLLL 00000000 00000000
00000000 00AAAAAA AAAAAAAA AAAAAAAA 00000000 0000000F 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The first two parameters of this command allow a diagnostic item (one of 16 defined) to be enabled or disabled for inclusion in the diagnostic block. If the diagnostic item is a memory dump, the remaining 3 parameters are used to specify the length of the diagnostic item, the address from which to start the memory dump and the choice of a fixed dump or a cyclic (rolling) dump.

Cmd No	Mnemonic	Subsystem	Class	Type
109	HIR_TLM_HKHEAD	IPU	Operational	CRITICAL

Description

Header to upload housekeeping telemetry table

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Housekeeping Identifier	10	I	0 to 1023
1	Number of telemetry format table entries	10	N	1 to 1023
2	Size in words of housekeeping block	10	S	1 to 256
3	32-bit checksum of all data words in upload	32	C	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101101 ********
000000II IIIIIIII 000000NN NNNNNNNN 000000SS SSSSSSSS CCCCCCCC CCCCCCCC
CCCCCCCC CCCCCCCC 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede the HIR_TLM_HKFMT command.The uploaded table cannot be used until the checksum matches the uploaded table.See C&TH section 4 for additional information.

Cmd No	Mnemonic	Subsystem	Class	Type
15	HIR_IPU_CHOPFREQ	IPU	Operational	Flight

Description

Set a chopper reference frequency prescaler

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Prescaler Value	12	P	3003 to 3255

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001111 ********
00000000 0000PPPP PPPPPPPP 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The chopper reference signal is a 500 Hz +/- 20 Hz programmable square wave. It's period is set by loading the prescaler register. Values between 3003 (0BBB) and 3255 (0CB7) will yield frequencies between 520.14 Hz and 479.88 Hz respectively. A prescaler value of 3124 (0C34) will yield a chopper frequency of 500 Hz. Conversion equations: Frequency (Hz) = 1/((prescaler + 1) *0.00000064). Prescaler = 1/(frequency * .00000064)-1. Default value: 3124 (0C34) 500.00 Hz.

Cmd No	Mnemonic	Subsystem	Class	Type
93	HIR_IPU_QLFLAG	IPU	Operational	Flight

Description

Quick look flag in science packet header for use in EOCC

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Quick Look Flag	1	F	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011101 ********
00000000 0000000F 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Quick look flag value (0 = don't process as quick look data, 1 = process as quick look data).

Cmd No	Mnemonic	Subsystem	Class	Type
88	HIR_IPU_SETTIME	IPU	Operational	Flight

Description

Set 51-bit HIRDLS clock.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Control code: 1 = Set Low Time; 2 = Set High Time; 3 = Set Low and High Time.	2	C	1 to 3
1	High Time value (19 MSBs)	32	H	0 to 524287
2	Low Time value (32 LSBs)	32	L	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011000 ********
00000000 00000000 00000000 000000CC HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

A HIRDLS Time Word is 64 bits long and consists of a 32 bit hardware counter (PTIM3) and a 19 bit software maintained counter. One LSB of HIRDLS Time is 2.03252 microseconds. This command sets one or both parts of the Time Word. If only one part is to be set the command ignores the value uploaded for the other part. If the IPU is powered down the Time Word setting is lost and resets to zero on subsequent power-up. IMPORTANT NOTE: if the HIRDLS Time Word is changed by this command, all TIMED macros will be deleted. This command should not be executed more than once in any 2 second period or else the time code in science and engineering packets may be incorrect for the next 2 seconds. It is possible to have duplicate HIRDLS time stamps.

Cmd No	Mnemonic	Subsystem	Class	Type
85	HIR_IPU_TSSRESET	IPU	Operational	Flight

Description

Hard reset of the TSS control processor (external reset)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010101 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This instruction will abort any operation in progress. The scanner will NOT be safed if this command is used.This command may be used during either TSW boot or application execution.

Cmd No	Mnemonic	Subsystem	Class	Type
106	HIR_IPU_CRFAULT	IPU	Operational	CRITICAL

Description

Enable changes to fault management system

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101010 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede an HIR_IPU_FAULTOFF or an HIR_IPU_FAULTVAL command.

Cmd No	Mnemonic	Subsystem	Class	Type
14	HIR_IPU_REBOOT	IPU	Operational	Flight

Description

Performs a cold reboot of the IPU processor.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00001110 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will cause all operations (including 1553) to halt for the duration of the IPU boot.Additional commands may be required to return the IPU to an operational state.

Cmd No	Mnemonic	Subsystem	Class	Type
105	HIR_IPU_FAULTSEL	IPU	Operational	CRITICAL

Description

Select a primary or redundant unit of a subsystem or device (not IPU processor)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Action Code	5	N	0 to 31
1	Action Parameter	1	S	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01101001 ********
00000000 000NNNNN 00000000 0000000S 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If the unit is a switchable powered device (such as the TSS), this flag will apply after the unit is powered down, then back up.If the unit is a redundant mechanism (such as the sunshield), the flag will apply after the current movement has completed.

Cmd No	Mnemonic	Subsystem	Class	Type
55	HIR_TLM_CSC	IPU	Operational	Flight

Description

Controls telemetry reporting for CSC's

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	CSC ID: MACRO(0), FAULT(1)	4	C	0 to 15
1	Function Code	32	F	0 to 4294967295
2	Telemetry Item	32	T	0 to 4294967295
3	Secondary Function Code	32	S	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110111 ********
00000000 0000CCCC 00000000 00000000 FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT SSSSSSSS SSSSSSSS SSSSSSSS SSSSSSSS
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is used to give a finer degree of control over how each CSC chooses to report telemetry. Refer to SW-LOC-113 for more detail on the usage of this command.

Cmd No	Mnemonic	Subsystem	Class	Type
21	HIR_MAC_EXE	MACRO	Operational	Flight

Description

Execute selected macro immediately

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Macro Number	7	M	0 to 127

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010101 ********
00000000 0MMMMMMM 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The contents of the selected macro will be added to the command queue.

Cmd No	Mnemonic	Subsystem	Class	Type
20	HIR_MAC_UPLOAD	MACRO	Operational	Flight

Description

Upload data for a macro

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	15

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Address offset in block (0 = block start)	16	A	0 to 65535
1	Number of 32-bit words to upload	4	L	1 to 13
2	Data word 1 for upload (zero padded)	32	B	0 to 4294967295
3	Data word 2 for upload (zero padded)	32	C	0 to 4294967295
4	Data word 3 for upload (zero padded)	32	D	0 to 4294967295
5	Data word 4 for upload (zero padded)	32	E	0 to 4294967295
6	Data word 5 for upload (zero padded)	32	F	0 to 4294967295
7	Data word 6 for upload (zero padded)	32	G	0 to 4294967295
8	Data word 7 for upload (zero padded)	32	H	0 to 4294967295
9	Data word 8 for upload (zero padded)	32	J	0 to 4294967295
10	Data word 9 for upload (zero padded)	32	K	0 to 4294967295
11	Data word 10 for upload (zero padded)	32	M	0 to 4294967295
12	Data word 11 for upload (zero padded)	32	P	0 to 4294967295
13	Data word 12 for upload (zero padded)	32	R	0 to 4294967295
14	Data word 13 for upload (zero padded)	32	T	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010100 ********
AAAAAAAA AAAAAAAA 00000000 0000LLLL BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
```

Comments

This command must be preceded by the HIR_MAC_ASSIGN command. Addresses in the H-32 format are relative to 0, which is the start of the selected macro. The format within the upload data is as follows: 16 32-bit words representing a 1553 command, followed by 1 32-bit word representing the delay factor in command ticks relative to the previous command in the macro. One command tick = 4*CR (where CR is time of one chopper rotation, nominal 12ms). (The minimum time between MACRO commands is 4 CR's). A group of HIR_MAC_UPLOAD commands is assembled into a macro and verified by the HIR_MAC_ACTIVATE command.

Cmd No	Mnemonic	Subsystem	Class	Type
19	HIR_MAC_ASSIGN	MACRO	Operational	Flight

Description

Assign a macro to a macro number

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Macro Number	7	M	0 to 127
1	Total number of 32-bit words in macro. If this parameter is not a multiple of 17, (16 words for each command, plus 1 for the delay) the command will be rejected.	16	N	0 to 65535
2	32-bit XOR checksum of the macro to be uploaded	32	C	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010011 ********
00000000 0MMMMMMM NNNNNNNN NNNNNNNN CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede a number of HIR_MAC_UPLOAD commands.

Cmd No	Mnemonic	Subsystem	Class	Type
23	HIR_MAC_ERASE	MACRO	Operational	Flight

Description

Erase a macro (set to no-operation if executed)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Macro Number	7	M	0 to 127

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010111 ********
00000000 0MMMMMMM 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will affect all future execution of the macro, including any timed requests which have not been executed. Executing an erased macro will generate a command error.

Cmd No	Mnemonic	Subsystem	Class	Type
89	HIR_MAC_ACTIVATE	MACRO	Operational	Flight

Description

Activate the previously uploaded macro

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011001 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command, which must be preceded by a series of HIR_MAC_UPLOAD commands, signals when the upload is complete. When the HIR_MAC_ACTIVATE command is received, the checksum which has been uploaded in the HIR_MAC_ASSIGN command is verified and the macro marked as ready for execution if the checksums match. If the checksums do not match, the HIR_MAC_ACTIVATE command fails (as reflected in the MAC_CMD_ERR telemetry point) and the uploaded commands are deleted for the macro for which the checksums did not match.

Cmd No	Mnemonic	Subsystem	Class	Type
22	HIR_MAC_TIMED	MACRO	Operational	Flight

Description

Add or delete a timed macro

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Delete (0) or add (1) a timed macro	1	A	0 to 1
1	Macro Number	7	N	0 to 127
2	Macro High Time of execution	32	M	0 to 4294967295
3	Macro Low Time of execution	32	L	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00010110 ********
00000000 0000000A 00000000 0NNNNNNN MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Only one macro may be executed at an specified HIRDLS time. Adding a macro at a already used time will replace the existing macro. A timed macro will only be deleted if the time and macro number match the original add request.If a HIR_IPU_SETTIME command is issued, all timed macro entries will be deleted.

Cmd No	Mnemonic	Subsystem	Class	Type
24	HIR_OPH_CONTROL	OPH	Operational	Flight

Description

Control operational heaters for specified zone

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Heater zone	4	Z	0 to 6
1	Power level value. 255= 100% power.For zones 1-6 this is a pulse width of (5.12E-6 seconds) * 0xB7 = .937 msecs	8	P	0 to 255
2	Heater On Pulse delay from start of half chopper cycle (5.12 usecs per bit). Zones 1-6 only	8	D	0 to 255

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011000 ********
00000000 0000ZZZZ 00000000 DDDDDDDD 00000000 00000000 00000000 PPPPPPPP
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The in-flight calibrator is heater zone 0. This command is intended for use by SAIL but can be sent from the ground for manual heater control (Constant Power settings only). A SAIL Task will normally be used to control operational heaters.

Cmd No	Mnemonic	Subsystem	Class	Type
26	HIR_PSS_DISCRETE	PSS	Operational	Flight

Description

Send a discrete pulse to the PSS

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Discrete Channel (see notes)	3	D	1 to 6

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011010 ********
00000000 00000DDD 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Starting at the next chopper revolution, and ending at the following chopper revolution,the IPU software will activate one of the 6 PSS relay discrete pulses. Param #0 = 1 will connect PCU Internal Supply A to QBA and Supply B to QBB. Param #0 = 2 will connect PCU Internal Supply B to QBA and Supply A to QBB. Param #0 = 3 thro' 6 are not used.

Cmd No	Mnemonic	Subsystem	Class	Type
25	HIR_PSS_SWITCH	PSS	Operational	Flight

Description

Send a function code and action to PSS

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	PSS Function Code (see notes)	16	C	0 to 63
1	PSS Action (see notes)	16	A	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011001 ********
CCCCCCCC CCCCCCCC AAAAAAAA AAAAAAAA 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If P0 = 0, the value of P1 will be passed directly to the PSS as an Individual Relay Command (IRC). If P0 >0 an IPU Power Switching Macro (PSM) will be executed. A PSM contains a sequence of IRCs. See the HIR_MAC_EXE command for additional information.

Cmd No	Mnemonic	Subsystem	Class	Type
38	HIR_SAI_CONTROL	SAIL	Operational	Flight

Description

Enable or disable SAIL control of a specified subsystem

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) control by SAIL	1	C	0 to 1
1	Control item (see notes)	3	N	0 to 5

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100110 ********
00000000 0000000C 00000000 00000NNN 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The item is one of: SSH (0), scanner (1), blackbody heaters (2), HWA (3), CSS (4) and SVA (5). Note that these items are enabled by default, but may be autonomously disabled by fault management actions. A disable of scanner (1) disables all TSS commands from SAIL. A disable of blackbody (2) disables only zone 0 of command HIR_OPH_CONTROL (cmd # 24).

Cmd No	Mnemonic	Subsystem	Class	Type
29	HIR_SAI_CREATE	SAIL	Operational	Flight

Description

Create a SAIL task using specified code and data sections with a given purpose code

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	4

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15
1	SAIL code block start	10	C	0 to 1023
2	SAIL data block start	10	D	0 to 1023
3	User-defined purpose identifier	16	P	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011101 ********
00000000 0000TTTT 000000CC CCCCCCCC 000000DD DDDDDDDD PPPPPPPP PPPPPPPP
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected under any of the following conditions: SAIL processor not running, task number in use, code or data area assigned to another task, code or data area is not the start of a series,code or data area not uploaded, or purpose does not match identifier in code block.

Cmd No	Mnemonic	Subsystem	Class	Type
30	HIR_SAI_KILL	SAIL	Operational	Flight

Description

Kill a SAIL task, code and data areas remain allocated

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011110 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if the SAIL processor is not running or the task number is not in use.

Cmd No	Mnemonic	Subsystem	Class	Type
31	HIR_SAI_SUSPEND	SAIL	Operational	Flight

Description

Suspends indefinitely a given SAIL task at the next SAIL frame

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011111 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if the SAIL processor is not running or the task number is not in use.

Cmd No	Mnemonic	Subsystem	Class	Type
32	HIR_SAI_RESUME	SAIL	Operational	Flight

Description

Resumes a given SAIL task at the next SAIL frame.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100000 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if the SAIL processor is not running or the task number is not in use.

Cmd No	Mnemonic	Subsystem	Class	Type
35	HIR_SAI_ERASE	SAIL	Operational	Flight

Description

Erase a SAIL code or data segment

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Start block of segment to be erased	10	S	0 to 1023

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100011 ********
000000SS SSSSSSSS 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if any of the following conditions are true: the SAIL processor is not running, the block number is not the start of a code or data segment, the block is not allocated,or the block is currently in use by one of the tasks (running or suspended).

Cmd No	Mnemonic	Subsystem	Class	Type
36	HIR_SAI_SETPARAM	SAIL	Operational	Flight

Description

Loads value into specified SAIL task parameter slot

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15
1	SAIL parameter number	4	S	0 to 15
2	Binary encoded data (zero padded)	32	D	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100100 ********
00000000 0000TTTT 00000000 0000SSSS DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command intended primarily to allow SAIL task parameters to be changed by stored (time-tag) commands or RTSs. It is a particular implementation of the HIR_SAI_SHARED command.

Cmd No	Mnemonic	Subsystem	Class	Type
34	HIR_SAI_FLAGCLR	SAIL	Operational	Flight

Description

Clear flags (slot #15) for specified SAIL task

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100010 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command clears the status flags in parameter #15 of the selected SAIL task. It is a particular implementation of the HIR_SAI_SHARED command. Intended for use by FOT on HIRDLS request.

Cmd No	Mnemonic	Subsystem	Class	Type
37	HIR_SAI_COMMAND	SAIL	Operational	Flight

Description

Disable or enable the use of a command by SAIL

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) command by SAIL	1	C	0 to 1
1	Command number	7	N	1 to 127

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100101 ********
00000000 0000000C 00000000 0NNNNNNN 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if the specified command can never be used by SAIL.

Cmd No	Mnemonic	Subsystem	Class	Type
33	HIR_SAI_PARAMCLR	SAIL	Operational	Flight

Description

Clear parameters 0-7 OR 8-15 for specified SAIL task.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL task number	4	T	0 to 15
1	SAIL parameter group	1	U	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100001 ********
00000000 0000TTTT 00000000 0000000U 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command clears selected parameters for a specified SAIL task. Param#1=0 selects slots 0-7. Param#1=1 selects slots 8-15. This is a particular implementation of the HIR_SAI_SHARED command.

Cmd No	Mnemonic	Subsystem	Class	Type
27	HIR_SAI_START	SAIL	Operational	Flight

Description

Starts SAIL processor with specified amount of additional shared memory

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Number of 512-byte blocks for shared area	9	B	0 to 126

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011011 ********
0000000B BBBBBBBB 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If the SAIL processor is already running, this command will be rejected.Note that the maximum shared memory is limited to 64K (1K preallocated, 63K maximum additional memory)

Cmd No	Mnemonic	Subsystem	Class	Type
28	HIR_SAI_STOP	SAIL	Operational	Flight

Description

Kills all active SAIL tasks, deallocates SAIL memory, and halts the SAIL processor

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Kill code to stop SAIL	16	C	57005 to 57005

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00011100 ********
CCCCCCCC CCCCCCCC 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

If the SAIL processor is not running, this command will be rejected. If the kill (hex) code is not DEAD, the command will be rejected.

Cmd No	Mnemonic	Subsystem	Class	Type
52	HIR_SAI_SHARED	SAIL	Operational	Flight

Description

Modify contents of SAIL shared memory

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	16

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	SAIL shared memory location (32-bit entry)	14	L	0 to 16383
1	Type of upload (0 = int, 1 = float)	1	T	0 to 1
2	Number of 32-bit values to be loaded	4	N	1 to 13
3	Data word 1 for upload (zero padded)	32	A	0 to 4294967295
4	Data word 2 for upload (zero padded)	32	B	0 to 4294967295
5	Data word 3 for upload (zero padded)	32	C	0 to 4294967295
6	Data word 4 for upload (zero padded)	32	D	0 to 4294967295
7	Data word 5 for upload (zero padded)	32	E	0 to 4294967295
8	Data word 6 for upload (zero padded)	32	F	0 to 4294967295
9	Data word 7 for upload (zero padded)	32	G	0 to 4294967295
10	Data word 8 for upload (zero padded)	32	H	0 to 4294967295
11	Data word 9 for upload (zero padded)	32	J	0 to 4294967295
12	word 10 for upload (zero padded)	32	K	0 to 4294967295
13	Data word 11 for upload (zero padded)	32	M	0 to 4294967295
14	Data word 12 for upload (zero padded)	32	P	0 to 4294967295
15	Data word 13 for upload (zero padded)	32	R	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110100 ********
00LLLLLL LLLLLLLL 0000000T 0000NNNN AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE
FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG
HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ
KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR
```

Comments

Note that the contents will be committed immediately after the command is received.

Cmd No	Mnemonic	Subsystem	Class	Type
40	HIR_TLM_FIR	SPU	Operational	Flight

Description

Load FIR Filter Coefficient table or Decimation Coefficients

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	16

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Opcode: 0 = START; 1 = DATA; 2 = ACTIVATE; 3 = DEMOD	2	A	0 to 3
1	Opcode = 1, Number of first FIR coeff within this command; Opcode = 2, RDSR table (1,2,3 or 6)	6	B	0 to 31
2	Opcode = 1, Number of coeffs within this command.	4	C	1 to 12
3	Opcode = 0, 32-bit XOR checksum of FIR filter table; Opcode = 2, 8-bit table ID#, special cases: 1) For ID=0, disable FIR for that RDSR (return result code S_FIRTBL_DISABLE); 2) For RDSR=1, ID=1; RDSR=2, ID=2; RDSR=3, ID=3; RDSR=6, ID=4 Load default FIR table (return result code S_FIRTBL_DEFAULT, Illegal combinations of default table ID and RDSR returns F_FIRID_MISMATCH); Opcode = 3, 8-bit table ID#, special case: 1) 1 means set default DEMOD coef table (return result code S_DEMODTBL_DEF).	32	D	0 to 4294967295
4	Opcode = 1 or 3, 32-bit signed	32	M	-2147483647 to 2
5	Opcode = 1 or 3, 32-bit signed	32	N	-2147483647 to 2
6	Opcode = 1 or 3, 32-bit signed	32	P	-2147483647 to 2
7	Opcode = 1, 32-bit signed	32	R	-2147483647 to 2
8	Opcode = 1, 32-bit signed	32	S	-2147483647 to 2
9	Opcode = 1, 32-bit signed	32	T	-2147483647 to 2
10	Opcode = 1, 32-bit signed	32	U	-2147483647 to 2
11	Opcode = 1, 32-bit signed	32	V	-2147483647 to 2
12	Opcode = 1, 32-bit signed	32	W	-2147483647 to 2
13	Opcode = 1, 32-bit signed	32	X	-2147483647 to 2
14	Opcode = 1, 32-bit signed	32	Y	-2147483647 to 2
15	Opcode = 1, 32-bit signed	32	Z	-2147483647 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101000 ********
00000000 000000AA 00BBBBBB 0000CCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM NNNNNNNN NNNNNNNN NNNNNNNN NNNNNNNN
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR
SSSSSSSS SSSSSSSS SSSSSSSS SSSSSSSS TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
UUUUUUUU UUUUUUUU UUUUUUUU UUUUUUUU VVVVVVVV VVVVVVVV VVVVVVVV VVVVVVVV
WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX
YYYYYYYY YYYYYYYY YYYYYYYY YYYYYYYY ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ
```

Comments

A FIR table upload consists of a START command followed by DATA commands, followed by an ACTIVATE command. For OPCODE = START, param D is the 32-bit XOR checksum of the table

to be loaded. For OPCODE = DATA, param B is the number of the first FIR Coeff contained within this command, param C is the number of coeffs contained within this command, and params M-Z are 32-bit signed integers representing the desired coeff values *10^9. For OPCODE = ACTIVATE, param B selects the RDSR table to load, where 1 = RDSR1, 2 = RDSR2, 3 = RDSR3 and 6 = RDSR6, and parm D is the 8-bit table ID. If an error or inconsistency occurs, the new table is not activated and an error is returned. OPCODE = DEMOD is a special stand-alone command to load the demodulation coeffs: param M = D1, param N = D2, and param P = D3, where these are 32-bit signed integers representing the desired coeff values *10^9. Refer to TC-UCB-005C.

Cmd No	Mnemonic	Subsystem	Class	Type
41	HIR_SPU_ZERO	SPU	Operational	Flight

Description

Change one of the detector data zero offset values

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Detector number	5	D	0 to 21
1	New zero offset value	16	V	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101001 ********
00000000 000DDDDD VVVVVVVV VVVVVVVV 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Adds a numerical offset (value = param #1) to the signal count of the detector specified by param #0. Special case: If detector 0 selected, set all detector offsets to value specified by Parm #1. Default offsets are 2000 for all detectors.

Cmd No	Mnemonic	Subsystem	Class	Type
42	HIR_SPU_CLOCKSEL	SPU	Operational	Flight

Description

Select clock sources to be used by the RAD6000 for system tick and the SPU for data collection

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	System tick source select	1	T	0 to 1
1	Chopper rotation pulse source select	2	R	0 to 2
2	Chopper sync pulse source select	2	S	0 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101010 ********
00000000 0000000T 00000000 0000RRSS 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For parameter 0 (Tick Source): 0 = internal RAD6000 clock *1 = Chopper Rotation pulseFor parameter 1 (CR sync pulse source): 0 = internal rotation pulse *1 = Chopper Rotation pulse 2 = External rotation pulseFor parameter 2 Chopping sync source): 0 = internal sync *1 = Chopper sync 2 = External sync* indicates default state after IProc booting has completed

Cmd No	Mnemonic	Subsystem	Class	Type
39	HIR_SPU_TIMING	SPU	Operational	Flight

Description

Change timing delay of detector readouts

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	3

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Opcode (see notes)	3	C	0 to 4
1	Item number (see notes)	5	N	0 to 21
2	Value in 160 ns units	16	V	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00100111 ********
00000000 00000CCC 00000000 000NNNNN VVVVVVVV VVVVVVVV 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

For parameter 0: 0= Set detector delay, 1= Set blade open offset, 2= Set blade closed offset,3= Set housekeeping delay, 4= Set SPU filter delay.For parameter 1: Items for detector delay are 1 through 21.Items for blade edges are 0 through 5.Items for housekeeping delay and SPU filter delay are 0 (only one value).

Cmd No	Mnemonic	Subsystem	Class	Type
46	HIR_SSH_DOORUNPROT	SSH	Operational	Flight

Description

Disable or enable flag to close, latch, or unlatch the sunshield door

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101110 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede a HIR_SSH_HEATERPROT command, or a HIR_SSH_MOVEPROT command which is attempting to close the door past the safe angle.

Cmd No	Mnemonic	Subsystem	Class	Type
45	HIR_SSH_SAFEANGLE	SSH	Operational	Flight

Description

Set safe angle parameter for sunshield door

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Safe angle parameter	16	A	0 to 65535

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101101 ********
AAAAAAAA AAAAAAAA 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The units of the safe angle position are counts of the SSH door potentiometer as seen in telemetry. Default value for P0 is 36500 for the EM and 46500 for the PFM [equivalent to the 60-degree open position]

Cmd No	Mnemonic	Subsystem	Class	Type
47	HIR_SSH_HEATERPROT	SSH	Operational	Flight

Description

Activate the HRM heater to latch or unlatch the sunshield door

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Maximum number of seconds	9	S	0 to 511

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101111 ********
0000000S SSSSSSSS 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if not preceded by an enable HIR_SSH_DOORUNPROT command. The heater will turn off once another heater command is received (overriding the currently executing command) or the time-out has expired or an overheating condition is detected by the fault management software. If the time-out is specified as zero, the heater will be turned off immediately if already on.

Cmd No	Mnemonic	Subsystem	Class	Type
95	HIR_SSH_MOVEPROT	SSH	Operational	Flight

Description

Close the sunshield door at a specified rate outside the safe angle range.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Number of steps	12	N	0 to 2400

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011111 ********
0000NNNN NNNNNNNN 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will move the door for a total of N steps in the closed direction at a fixed rate of approximately 28 steps per second. One step is 0.1 degrees. The door will not be moved (the command will be rejected) unless this command was immediately preceded by the HIR_SSH_DOORUNPROT command. Note that this command does not examine any of the microswitches

Cmd No	Mnemonic	Subsystem	Class	Type
44	HIR_SSH_SAFE	SSH	Operational	Flight

Description

Safe the sunshield door as quickly as possible

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101100 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

The door will be moved to the position specifed by the HIR_SSH_SAFEANGLE command. If another HIR_SSH_MOVE command is executing, it will be aborted immediately. This command will only move the door toward the closed position and will be ignored if the door is already within the safe range.

Cmd No	Mnemonic	Subsystem	Class	Type
43	HIR_SSH_MOVE	SSH	Operational	Flight

Description

Move the sunshield door at a specifed rate

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Direction (0 = close, 1 = open)	1	D	0 to 1
1	Number of steps to move door	12	N	0 to 2400

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00101011 ********
00000000 0000000D 0000NNNN NNNNNNNN 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will move the door for a total of N steps in direction D at a fixed rate of approximately 28 steps per second. One step is 0.1 degrees. The door will not be closed past the angle specified in the HIR_SSH_SAFEANGLE command. Commands in the 'Open' direction are not restricted. If one of these commands is executing, additional HIR_SSH_MOVE commands will be ignored, except a command with a zero number of steps, which will abort the currently executing command. Note that this command does not examine any of the 'limit' microswitches.

Cmd No	Mnemonic	Subsystem	Class	Type
48	HIR_SVA_UNPROT	SVA	Operational	Flight

Description

Must precede HIR_SVA_MOVEPROT.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110000 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede an HIR_SVA_MOVEPROT command.

Cmd No	Mnemonic	Subsystem	Class	Type
49	HIR_SVA_MOVEPROT	SVA	Operational	Flight

Description

Open or close the space view aperture door.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	2

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Close (0) or open (1) the SVA	1	M	0 to 1
1	Number of seconds	5	S	0 to 31

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00110001 ********
00000000 0000000M 00000000 000SSSSS 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command will be rejected if not preceded by an HIR_SVA_UNPROT command. The motor will be engaged for the specified number of seconds. The microswitches are ignored. If another command is received during the timeout period it will be ignored, unless the number of seconds is set to zero, in which case the current command will be aborted.

Cmd No	Mnemonic	Subsystem	Class	Type
61	HIR_TSS_ENCINIT	TSS	Operational	Flight

Description

Home both elevation and azimuth encoders with new parameters

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	5

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Azimuth motor torque (Nm scaled by 2E-8)	32	M	-2147483647 to 2
1	Elevation equilibrium angle (deg. scaled by 2E-8)	32	A	-2147483647 to 2
2	Open-loop traversal time (sec. scaled 5E-5)	32	L	0 to 2147483647
3	Torque ramp-up time (sec. scaled 5E-5)	32	R	0 to 2147483647
4	Delta time for EEA restart (sec. scaled 5E-5)	32	T	0 to 2147483647

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111101 ********
00000000 00000101 10000000 11101010 MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM
AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
74	HIR_TSS_EEARESET	TSS	Operational	Flight

Description

Restarts the active EEA side

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01001010 ********
00000000 00000000 00000001 01110010 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
75	HIR_TSS_CHOPSEL	TSS	Operational	Flight

Description

Configures the chopper drive motor windings

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Chopper winding and driver control configuration param.	3	W	0 to 4

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01001011 ********
00000000 00000001 10000001 10110010 00000000 00000000 00000000 00000WWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.For parameter 0: (0) disconnect windings A and B, (1) connect winding A to driver (2) connect winding B to driver, (3) set chopper to high current mode and (4) remove high current from chopper.

Cmd No	Mnemonic	Subsystem	Class	Type
76	HIR_TSS_CHOPENA	TSS	Operational	Flight

Description

Enable (power up) or disable (power down) the chopper drive motor

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) chopper drive motor.	1	E	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01001100 ********
00000000 00000001 10000001 11110010 00000000 00000000 00000000 0000000E
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. There is a 10 second delay after receipt of a disable command before an enable command will be acted upon (it will be accepted but not acted upon).

Cmd No	Mnemonic	Subsystem	Class	Type
80	HIR_TSS_CSCENC	TSS	Operational	Flight

Description

Enable or disable TSW encoder initialization CSC

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) CSC.	1	E	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010000 ********
00000000 00000001 10000000 01101010 00000000 00000000 00000000 0000000E
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. This CSC can not be enabled at the same time that the scan mirror contol CSC is enabled. The encoder initialization should be enabled and allowed to disable itself before the scan mirror control CSC is enabled.

Cmd No	Mnemonic	Subsystem	Class	Type
84	HIR_TSS_CSCSSS	TSS	Operational	Flight

Description

Enable or disable TSW sub-subsystem support CSC

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (even) or Enable (odd) various diagnostic and fault management functions excluding parameters 8 and 9.	4	E	0 to 13

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010100 ********
00000000 00000001 10000000 01110110 00000000 00000000 00000000 0000EEEE
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. This CSC is not enabled as the other CSCs but individual actions are turned on and off in this CSC by this command. The parameter values perform the following actions: 0= disable memory dump, 1= enable memory dump, 2= disable chopper power fault management, 3= enable chopper power fault management, 4= disable EEA fault management, 5= enable EEA fault management, 6= disable TSW telemetry test pattern, 7= enable default TSW telemetry test pattern, 8= enable diagnostic telemetry test pattern, 9= noop, 10= disable measured current FM, 11= enable measured current FM, 12= disable commanded current FM, 13= enable commanded current FM. For noop, the TSW command accept counter will increment.

Cmd No	Mnemonic	Subsystem	Class	Type
68	HIR_TSS_AZELDATPOS	TSS	Operational	Flight

Description

Provides offset values to be used for zero position output when the scan mirror is in its datum positi

SAIL	1553 Location	1553 Word Count	Parameter Count
Enabled	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Primary Elevation 1 Offset	32	A	-2147483647 to 2
1	Primary Elevation 2 Offset	32	B	-2147483647 to 2
2	Primary Azimuth Offset	32	C	-2147483647 to 2
3	Secondary Elevation 1 Offset	32	X	-2147483647 to 2
4	Secondary Elevation 2 Offset	32	Y	-2147483647 to 2
5	Secondary Azimuth Offset	32	Z	-2147483647 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000100 ********
00000000 00000110 10000001 01110000 AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX YYYYYYYY YYYYYYYY YYYYYYYY YYYYYYYY
ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

None

Cmd No	Mnemonic	Subsystem	Class	Type
62	HIR_TSS_EINITTBL	TSS	Operational	Flight

Description

Upload entries to TSW scan mirror table for use during encoder initialization.

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	7

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Number of entries (0 = clear from P1)	1	N	0 to 1
1	Starting location in TSW control list	7	E	0 to 127
2	Delta time for movement (5E-5 sec)	32	T	0 to 2147483647
3	Elevation shaft angle (2E-8 deg)	32	P	-2147483647 to 2
4	Elevation shaft rate (2E-8 deg/sec)	32	Q	-2147483647 to 2
5	Azimuth shaft angle (2E-8 deg)	32	V	-2147483647 to 2
6	Azimuth shaft rate (2E-8 deg/sec)	32	W	-2147483647 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111110 ********
00000000 00000111 10000000 10101010 00000000 00000000 00000000 0000000N
00000000 00000000 00000000 0EEEEEEE TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP QQQQQQQQ QQQQQQQQ QQQQQQQQ QQQQQQQQ
VVVVVVVV VVVVVVVV VVVVVVVV VVVVVVVV WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command may be used through the 1553, but it is intended for use internally between the IPU and the TSW to transmit the SAIL generated control list. Usually, multiple entries would be sent instead of a single entry. This is a TSW application command and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
81	HIR_TSS_CSCSCN	TSS	Operational	Flight

Description

Enable or disable TSW scan mirror control CSC

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (0) or enable (1) CSC.	1	E	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010001 ********
00000000 00000001 10000000 01110000 00000000 00000000 00000000 0000000E
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. This CSC can not be enabled at the same time that the encoder initialization CSC is enabled.

Cmd No	Mnemonic	Subsystem	Class	Type
59	HIR_TSS_WATCHDOG	TSS	Operational	Flight

Description

Turns the system watchdog or scanner strobe watchdog on or off.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Disable (even) or enable (odd) system or scanner strobe watchdog.	2	A	0 to 3

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111011 ********
00000000 00000010 11100000 11101000 00000000 00000000 00000000 000000AA
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This TSW application code command turns on or off either of two watchdog timers according to the following values: 0 = disable system watchdog, 1 = enable system watchdog, 2 = disable scanner strobe watchdog or 3 = enable scanner strobe watchdog.

Cmd No	Mnemonic	Subsystem	Class	Type
67	HIR_TSS_FREQINFO	TSS	Operational	Flight

Description

Passes the information about the chopper rate to the TEU software

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Prescaler value	12	P	3003 to 3255

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000011 ********
00000000 00000001 10000001 01101000 00000000 00000000 0000PPPP PPPPPPPP
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is used to provide information to the TEU software and does not control any hardware functions. This definition is identical to that in the command HIR_IPU_CHOPFREQ. Both HIR_TSS_FREQINFO and HIR_IPU_CHOPFREQ must be sent together to set both the IPU and TEU to the same time base. The chopper reference signal is a 500Hz +/- 20Hz programmable square wave. It's period is set by loading the prescaler register. Values between 3003 (0BBB) and 3255 (0CB7) will yield frequencies between 520.14 Hz and 479.88 Hz respectively. A prescaler value of 3124 (0C34) will yield a chopper frequency of 500Hz. Conversion equations: Frequency (Hz) = 1/((prescaler + 1) *0.00000064). Prescaler = 1/(frequency * .00000064)-1. Default value: 3124 (0C34) 500.00 Hz.

Cmd No	Mnemonic	Subsystem	Class	Type
66	HIR_TSS_SAFE	TSS	Operational	Flight

Description

Abort and erase the current scanner table, and move the mirror as fast as possible to the safe positi

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000010 ********
00000000 00000000 00000001 00110001 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Note that if the azimuth motor has been disabled with the HIR_TSS_MOTOR command, the mirror will not move in azimuth. This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
65	HIR_TSS_START	TSS	Operational	Flight

Description

Forces an immediate execution of the scanner table

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000001 ********
00000000 00000000 00000000 11110000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is only intended for ground testing, and will be handled automatically for regular operations.This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
64	HIR_TSS_CNTLTABLE	TSS	Operational	Flight

Description

Upload entries to TSW scan mirror table

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	7

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Number of entries (0 = clear from P1)	1	N	0 to 1
1	Starting location in TSW control list	7	E	0 to 127
2	Delta time for movement (5E-5 sec)	32	T	0 to 2147483647
3	Elevation shaft angle (2E-8 deg)	32	P	-2147483647 to 2
4	Elevation shaft rate (2E-8 deg/sec)	32	Q	-2147483647 to 2
5	Azimuth shaft angle (2E-8 deg)	32	V	-2147483647 to 2
6	Azimuth shaft rate (2E-8 deg/sec)	32	W	-2147483647 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000000 ********
00000000 00000111 10000000 10110000 00000000 00000000 00000000 0000000N
00000000 00000000 00000000 0EEEEEEE TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP QQQQQQQQ QQQQQQQQ QQQQQQQQ QQQQQQQQ
VVVVVVVV VVVVVVVV VVVVVVVV VVVVVVVV WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command may be used through the 1553, but it is intended for use internally between the IPU andthe TSW to transmit the SAIL generated control list. Usually, multiple entries would be sent instead of the single entry. This is a TSW application command, and will not be recognized during TSW boot.

Cmd No	Mnemonic	Subsystem	Class	Type
63	HIR_TSS_ENCSEL	TSS	Operational	Flight

Description

Selects which of the encoders (2 read heads for elevation and one for azimuth on both the primary

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Control encoder / readhead selection	4	W	1 to 7

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111111 ********
00000000 00000001 10000010 00110010 00000000 00000000 00000000 0000WWWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command and will not be recognized during TSW boot. Choices for the control encoders are: (1) elevation read head 1, (2) elevation read head 2, (3) average of elevation read heads 1 & 2, (4) elevation control on primary EEA, (5) elevation control on secondary EEA, (6) azimuth control on primary EEA 2, (7) azimuth control secondary EEA.

Cmd No	Mnemonic	Subsystem	Class	Type
60	HIR_TSS_REBOOT	TSS	Operational	Flight

Description

Soft reboot of the TSS control processor (software reset)

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111100 ********
00000000 00000000 00000001 00101001 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This instruction will abort any operation in progress. The scanner will NOT be safed if this command is used. This command may be used during either TSW boot or application execution.

Cmd No	Mnemonic	Subsystem	Class	Type
71	HIR_TSS_DRSETUP	TSS	Operational	Flight

Description

Elevation and azimuth drive motor configuration

SAIL	1553 Location	1553 Word Count	Parameter Count
Disabled	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	See notes above	4	M	1 to 12

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01000111 ********
00000000 00000001 10000000 10110010 00000000 00000000 00000000 0000MMMM
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.For parameter 0: (12) Azimuth motor short (EM only, PFM noop), (11) Azimuth open short (EM only, PFM noop), (10) Azimuth connect to drive (9) Azimuth disconnect from drive, (8) Elevation 2 motor short, (7) Elevation 2 open short, (6) Elevation 2 connect to drive, (5) Elevation 2 disconnect from drive, (4) Elevation 1 motor short, (3) Elevation 1 open short, (2) Elevation 1 connect to drive, (1) Elevation 1 disconnect from drive. For PFM noop, the TSW command accept counter will increment.

Cmd No	Mnemonic	Subsystem	Class	Type
73	HIR_TSS_EEASELECT	TSS	Operational	Flight

Description

Select (power up) or deselect (power down) the primary and/or secondary encoder set

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	See notes below	3	S	1 to 6

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01001001 ********
00000000 00000001 10000001 00110010 00000000 00000000 00000000 00000SSS
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot.For parameter 0: (1) select primary EEA, (2) deselect primary EEA, (3) select secondary EEA, (4) deselect secondary EEA, (5) test angle (both EEAs selected), (6) remove test angle (both).

Cmd No	Mnemonic	Subsystem	Class	Type
94	HIR_TSS_MTRPWR	TSS	Operational	Flight

Description

Turns on or off the scan/chopper motor power converter.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Drive motor power configuration parameter.	1	W	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011110 ********
00000000 00000001 10000010 01110010 00000000 00000000 00000000 0000000W
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This is a TSW application command, and will not be recognized during TSW boot. For parameter 0: 0 = power off drive motors, 1 = power on drive motors. This command is for the PFM only. It is a noop for the EM and the command counter will increment but no action will be taken.

Cmd No	Mnemonic	Subsystem	Class	Type
58	HIR_TSS_CLOCKSEL	TSS	Operational	Flight

Description

Select if the TSS is to use internal or external clock for the system tick and 83 Hz sync

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Internal Test (0), Chopper Test (1), Nominal Flight (2)	2	C	0 to 2

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 00111010 ********
00000000 00000001 11100000 10101000 00000000 00000000 00000000 000000CC
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Mode 0 = Internal Test, Mode 1 = Chopper Test, and Mode 2 = Nominal flight mode (default on boot). This command adjusts the source of timing signals for three items: Scanner Strobe Interrupt, Chopper Ref Signal and Chopper Rotation Signal. (SS, ChRef and CR respectively.) SS source : (0) internal, (1) chopper blade edges, (2) external (IPU). ChRef source : (0) internal (PFM only), (1) internal (PFM only), (2) external (IPU, only source for EM). CR source: (0) internal, (1) Chopper, (2) Chopper.

Cmd No	Mnemonic	Subsystem	Class	Type
92	HIR_IPU_TSUSECTION	TSU	Operational	Flight

Description

Changes the EEPROM section that the IPU will use when the TSU requests a program load.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Auto boot section	16	S	0 to 65535
1	Override Flags	16	V	0 to 65535
2	MBIC A Start	32	W	0 to 524286
3	MBIC A End	32	X	0 to 524286
4	MBIC B Start	32	Y	0 to 524286
5	MBIC B End	32	Z	0 to 524286

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011100 ********
SSSSSSSS SSSSSSSS VVVVVVVV VVVVVVVV WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW
XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX YYYYYYYY YYYYYYYY YYYYYYYY YYYYYYYY
ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Values of 0 to 15 will load the TEU with the image located in this section of the EEPROM and send the boot command to the TEU if the load is successful. A value of 16 will load the TEU with the image located in the first section of IPU EEPROM marked as autobootable for the TEU and send the boot command to the TEU if the load is successful. A value of 100 - 115 will load the TEU with the image located in this IPU EEPROM section but not send the TEU boot command. A value of 116 will load the TEU with the image located in the first section of the IPU EEPROM marked as autobootable for the TEU but will not send the TEU boot command. For any other values, no load of the TEU from IPU EEPROM nor boot will occur.

Cmd No	Mnemonic	Subsystem	Class	Type
91	HIR_TSU_DOWNLOAD	TSU	Operational	Flight

Description

Download a TSS memory dump packet while in TSS boot state.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Memory location to start dump (32-bit boundary).	32	A	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011011 ********
00000000 00000010 10000001 01100000 AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

Send a download packet to the IPU from the TEU SUROM software only.

Cmd No	Mnemonic	Subsystem	Class	Type
90	HIR_TSU_REBOOT	TSU	Operational	Flight

Description

Soft reboot of the TSS control processor while in boot state (software reset).

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	0

Command Parameters

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01011010 ********
00000000 00000000 00000000 01100000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This instruction will abort any operation in progress. The scanner will NOT be safed if this command is used. This command may be used during either TSW boot or application execution.

Cmd No	Mnemonic	Subsystem	Class	Type
87	HIR_TSU_BOOT	TSU	Operational	Flight

Description

Boot the TSW from the specified location from TSU boot state.

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	1

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	TSU RAM location for boot	24	R	0 to 16777215

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01010111 ********
00000000 00000001 10000001 00100000 00000000 RRRRRRRR RRRRRRRR RRRRRRRR
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command is only valid during the TSW boot sequence. During normal operation, the command will generate an error.

Cmd No	Mnemonic	Subsystem	Class	Type
100	HIR_UPL_HEADER	UPL	Operational	Flight

Description

Header to upload IPU RAM

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	6

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Subsystem identifier (0x1000 = IPU Test Area, 0x2000 = SAIL task data block, 0x2100 = SAIL task code block and 0x8000 = TEU startup)	16	S	0 to 65535
1	Start address for RAM upload	24	A	0 to 2097148
2	Number of HIR_UPL_DATA commands to follow. If number of blocks = 0, abort the upload.	16	N	0 to 40330
3	XOR checksum for the entire upload	32	C	0 to 4294967295
4	Length in 32-bit words	32	L	0 to 4294967295
5	If 0, data to follow; if 1, calculate checksum based on start address and length and compare with uploaded checksum (no data follows this command). The result of the comparison is given by subtelemetry point IPU_UPL_CHKSUMOK = 1 if comparison successful, = 0 if comparison failed. For SAIL uploads, if this parameter is 1 it is ignored.	1	F	0 to 1

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100100 ********
00000000 00000000 SSSSSSSS SSSSSSSS 00000000 AAAAAAAA AAAAAAAA AAAAAAAA
00000000 00000000 NNNNNNNN NNNNNNNN CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 0000000F
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

Comments

This command must precede a group of HIR_UPL_DATA commands. The address is relative to the beginning of the appropriate memory space and must be on a 4 byte boundary.

Cmd No	Mnemonic	Subsystem	Class	Type
101	HIR_UPL_DATA	UPL	Operational	Flight

Description

Upload data to IPU RAM

SAIL	1553 Location	1553 Word Count	Parameter Count
Never	Receive Subaddress 5	32	15

Command Parameters

No	Parameter	Bit Size	Symbol	Range
0	Block number.	16	B	1 to 40330
1	Number of 32-bit words to upload	4	N	1 to 13
2	Data word 1 for upload (zero padded).	32	A	0 to 4294967295
3	Data word 2 for upload (zero padded).	32	C	0 to 4294967295
4	Data word 3 for upload (zero padded).	32	D	0 to 4294967295
5	Data word 4 for upload (zero padded).	32	E	0 to 4294967295
6	Data word 5 for upload (zero padded).	32	F	0 to 4294967295
7	Data word 6 for upload (zero padded).	32	G	0 to 4294967295
8	Data word 7 for upload (zero padded).	32	H	0 to 4294967295
9	Data word 8 for upload (zero padded).	32	J	0 to 4294967295
10	Data word 9 for upload (zero padded).	32	K	0 to 4294967295
11	Data word 10 for upload (zero padded).	32	M	0 to 4294967295
12	Data word 11 for upload (zero padded).	32	P	0 to 4294967295
13	Data word 12 for upload (zero padded).	32	R	0 to 4294967295
14	Data word 13 for upload (zero padded).	32	T	0 to 4294967295

1553 Bit Pattern

```
00011110 01000000 11000000 00000000 00000000 00111001 01100101 ********
BBBBBBBB BBBBBBBB 00000000 0000NNNN AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
```

Comments

This command must be preceded by the HIR_UPL_HEADER command. The block number must begin with 1 and be sequential.

HIRDLS Telemetry

(Sort by ID)

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
0	SIG_DAT_01	Radiance channel 1 (GROUND USE ONLY)	No	No	No	No	1	16	2
1	SIG_DAT_02	Radiance channel 2 (GROUND USE ONLY)	No	No	No	No	1	16	2
2	SIG_DAT_03	Radiance channel 3 (GROUND USE ONLY)	No	No	No	No	1	16	2
3	SIG_DAT_04	Radiance channel 4 (GROUND USE ONLY)	No	No	No	No	1	16	2
4	SIG_DAT_05	Radiance channel 5 (GROUND USE ONLY)	No	No	No	No	1	16	2
5	SIG_DAT_06	Radiance channel 6 (GROUND USE ONLY)	No	No	No	No	1	16	2
6	SIG_DAT_07	Radiance channel 7 (GROUND USE ONLY)	No	No	No	No	1	16	2
7	SIG_DAT_08	Radiance channel 8 (GROUND USE ONLY)	No	No	No	No	1	16	2
8	SIG_DAT_09	Radiance channel 9 (GROUND USE ONLY)	No	No	No	No	1	16	2
9	SIG_DAT_10	Radiance channel 10 (GROUND USE ONLY)	No	No	No	No	1	16	2
10	SIG_DAT_11	Radiance channel 11 (GROUND USE ONLY)	No	No	No	No	1	16	2
11	SIG_DAT_12	Radiance channel 12 (GROUND USE ONLY)	No	No	No	No	1	16	2
12	SIG_DAT_13	Radiance channel 13 (GROUND USE ONLY)	No	No	No	No	1	16	2
13	SIG_DAT_14	Radiance channel 14 (GROUND USE ONLY)	No	No	No	No	1	16	2
14	SIG_DAT_15	Radiance channel 15 (GROUND USE ONLY)	No	No	No	No	1	16	2
15	SIG_DAT_16	Radiance channel 16 (GROUND USE ONLY)	No	No	No	No	1	16	2
16	SIG_DAT_17	Radiance channel 17 (GROUND USE ONLY)	No	No	No	No	1	16	2
17	SIG_DAT_18	Radiance channel 18 (GROUND USE ONLY)	No	No	No	No	1	16	2
18	SIG_DAT_19	Radiance channel 19 (GROUND USE ONLY)	No	No	No	No	1	16	2
19	SIG_DAT_20	Radiance channel 20 (GROUND USE ONLY)	No	No	No	No	1	16	2
20	SIG_DAT_21	Radiance channel 21 (GROUND USE ONLY)	No	No	No	No	1	16	2
29	STH_TMP_01	Structure temp 01, EDAQ AD590 Row 2 Col 5	Yes	Yes	Yes	No	64	16	8
30	STH_TMP_02	Structure temp 02, EDAQ AD590 Row 2 Col 6	Yes	Yes	Yes	No	64	16	8
31	STH_TMP_03	Structure temp 03, EDAQ AD590 Row 7 Col 3	Yes	Yes	Yes	No	64	16	8
32	STH_TMP_04	Structure temp 04, EDAQ AD590 Row 6 Col 7	Yes	Yes	Yes	No	64	16	8
37	CCU_BOX_TMP	CCU box temp, EDAQ AD590 Row 4 Col 7	Yes	Yes	Yes	Yes	64	16	8
38	GEU_BOX_TMP	GEU box temp, EDAQ AD590 Row 4 Col 0	Yes	Yes	Yes	Yes	64	16	8

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
39	PCU_BOX_TMP	PCU box temp, EDAQ AD590 Row 1 Col 1	Yes	Yes	Yes	Yes	64	16	8
40	EEA_BOX_TMP	EEA box temp, EDAQ AD590 Row 4 Col 1	Yes	Yes	Yes	Yes	64	16	8
41	WSE_BOX_TMP	WSE box temp, EDAQ AD590 Row 0 Col 3	Yes	Yes	Yes	Yes	64	16	8
42	CSS_RAD_TMP1	Cooler Radiator temp 1, EDAQ AD590 Row 3 Col 5	Yes	Yes	Yes	Yes	64	16	8
43	CSS_RAD_TMP2	Cooler Radiator temp 2, EDAQ AD590 Row 4 Col 6	Yes	Yes	Yes	No	64	16	8
44	COMP_HEAD_TMP	Compressor head temp, EDAQ AD590 Row 5 Col 5	Yes	Yes	Yes	Yes	64	16	8
45	DISPL1_TMP	Displacer 1 body temp, EDAQ AD590 Row 6 Col 6	Yes	Yes	Yes	Yes	64	16	8
46	DISPL2_TMP	Displacer 2 body temp, EDAQ AD590 Row 5 Col 5	Yes	Yes	Yes	Yes	64	16	8
47	SUNSEN1_TMP	Sun sensor 1 (temperature), EDAQ	Yes	Yes	Yes	Yes	64	16	9
48	SUNSEN2_TMP	Sun sensor 2 (temperature), EDAQ	Yes	Yes	Yes	Yes	64	16	9
49	SUNSEN3_TMP	Sun sensor 3 (temperature), EDAQ	Yes	Yes	Yes	Yes	64	16	9
50	DOOR_POT	Door angle sensor, EDAQ	Yes	Yes	Yes	Yes	64	16	9
51	DOOR_SAF_ANG	Door Safe Angle setting	Yes	Yes	Yes	Yes	64	16	1
52	SSH_HWA_TMP	Hot Wax Actuator temp, EDAQ	Yes	Yes	Yes	Yes	64	16	9
53	SSH_DORMOT_TMP	SSH drive motor temp, EDAQ	Yes	Yes	Yes	Yes	64	16	9
54	SSH_APL_TMP	SSH aperture plate temp, EDAQ AD590 Row 7 Col 7	Yes	Yes	Yes	No	64	16	8
55	SSH_PZSURF_TMP	SSH +Z surface temp, EDAQ AD590 Row 4 Col 5	Yes	Yes	Yes	No	64	16	8
56	SSH_NZSURF_TMP	SSH -Z surface temp, EDAQ ADC590 Row 6 Col 2	Yes	Yes	Yes	No	64	16	8
57	SSH_STAT	Sunshield switch status	Yes	Yes	Yes	Yes	64	16	1
58	SVA_STAT	SVA switch status	Yes	Yes	Yes	Yes	64	16	1
59	SVA_DORMOT_TMP	SVA drive motor temp, EDAQ	Yes	Yes	Yes	Yes	64	16	9
60	SVA_MTGPLT_TMP	SVA mounting plate tmp, EDAQ ADC590 Row 7 Col 0	Yes	Yes	Yes	Yes	64	16	8
61	GYR0_TMP	Gyro 0 temperature	Yes	Yes	Yes	Yes	64	16	0
62	GYR1_TMP	Gyro 1 temperature	Yes	Yes	Yes	Yes	64	16	0
63	GYR2_TMP	Gyro 2 temperature	Yes	Yes	Yes	Yes	64	16	0
64	GYR3_TMP	Gyro 3 temperature	Yes	Yes	Yes	Yes	64	16	0
65	GYR0_BD_TMP	Gyro 0 board temp	Yes	Yes	Yes	No	64	16	0
66	GYR1_BD_TMP	Gyro 1 board temp	Yes	Yes	Yes	No	64	16	0
67	GYR2_BD_TMP	Gyro 2 board temp	Yes	Yes	Yes	No	64	16	0
68	GYR3_BD_TMP	Gyro 3 board temp	Yes	Yes	Yes	No	64	16	0

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
69	GYR0_ADAT	Gyro 0 angle data (GROUND USE ONLY)	No	No	No	No	1	16	2
70	GYR1_ADAT	Gyro 1 angle data (GROUND USE ONLY)	No	No	No	No	1	16	2
71	GYR2_ADAT	Gyro 2 angle data (GROUND USE ONLY)	No	No	No	No	1	16	2
72	GYR3_ADAT	Gyro 3 angle data (GROUND USE ONLY)	No	No	No	No	1	16	2
77	GYR0_CAPL	Gyro 0 cap loop output	Yes	Yes	Yes	No	64	16	0
78	GYR1_CAPL	Gyro 1 cap loop output	Yes	Yes	Yes	No	64	16	0
79	GYR2_CAPL	Gyro 2 cap loop output	Yes	Yes	Yes	No	64	16	0
80	GYR3_CAPL	Gyro 3 cap loop output	Yes	Yes	Yes	No	64	16	0
81	GYR0_MOT_V	Gyro 0 motor volts	Yes	Yes	Yes	Yes	64	16	0
82	GYR1_MOT_V	Gyro 1 motor volts	Yes	Yes	Yes	Yes	64	16	0
83	GYR2_MOT_V	Gyro 2 motor volts	Yes	Yes	Yes	Yes	64	16	0
84	GYR3_MOT_V	Gyro 3 motor volts	Yes	Yes	Yes	Yes	64	16	0
85	GYR0_MOT_I	Gyro 0 motor current	Yes	Yes	Yes	Yes	64	16	0
86	GYR1_MOT_I	Gyro 1 motor current	Yes	Yes	Yes	Yes	64	16	0
87	GYR2_MOT_I	Gyro 2 motor current	Yes	Yes	Yes	Yes	64	16	0
88	GYR3_MOT_I	Gyro 3 motor current	Yes	Yes	Yes	Yes	64	16	0
89	GYR0_STAT	Gyro 0 status word	Yes	Yes	Yes	Yes	64	16	0
90	GYR1_STAT	Gyro 1 status word	Yes	Yes	Yes	Yes	64	16	0
91	GYR2_STAT	Gyro 2 status word	Yes	Yes	Yes	Yes	64	16	0
92	GYR3_STAT	Gyro 3 status word	Yes	Yes	Yes	Yes	64	16	0
93	GYR0_P15V	Gyro 0 +15 volts	Yes	Yes	Yes	Yes	64	16	0
94	GYR1_P15V	Gyro 1 +15 volts	Yes	Yes	Yes	Yes	64	16	0
95	GYR2_P15V	Gyro 2 +15 volts	Yes	Yes	Yes	Yes	64	16	0
96	GYR3_P15V	Gyro 3 +15 volts	Yes	Yes	Yes	Yes	64	16	0
97	GYR0_N15V	Gyro 0 -15 volts	Yes	Yes	Yes	Yes	64	16	0
98	GYR1_N15V	Gyro 1 -15 volts	Yes	Yes	Yes	Yes	64	16	0
99	GYR2_N15V	Gyro 2 -15 volts	Yes	Yes	Yes	Yes	64	16	0
100	GYR3_N15V	Gyro 3 -15 volts	Yes	Yes	Yes	Yes	64	16	0
101	SCI_ELVARP_POS	Elevation Primary variable-readhead position (GROUND USE ONLY)	No	No	No	No	1	32	2
102	SCI_EL2P_POS	Elevation Primary readhead 2 position (GROUND USE ONLY)	No	No	No	No	1	32	2

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
103	SCI_AZP_POS	Azimuth Primary readhead position (GROUND USE ONLY)	No	No	No	No	1	32	2
133	SM_TMP1	Scan mirror temp.1, EDAQ AD590 Row 2 Col 4	Yes	Yes	Yes	Yes	64	16	8
134	SM_TMP2	Scan mirror temp.2, EDAQ AD590 Row 2 Col 3	Yes	Yes	Yes	No	64	16	8
135	SM_TMP3	Scan mirror temp 3, EDAQ Derived PRT 0	Yes	Yes	Yes	No	64	16	6
138	AZ_HSG_TMP_1	Azimuth housing temp 1, EDAQ AD590 Row 2 Col 2	Yes	Yes	Yes	No	64	16	8
139	M1_TMP1	Pri (M1) mir temp. 1, EDAQ AD590 Row 0 Col 2	Yes	Yes	Yes	No	64	16	8
140	M1_TMP2	Pri (M1) mir temp. 2, EDAQ AD590 Row 7 Col 1	Yes	Yes	Yes	No	64	16	8
141	LNS1_WF_TMP1	Lens 1-WF temp. 1, EDAQ AD590 Row 5 Col 0	Yes	Yes	Yes	Yes	64	16	8
142	LNS1_WF_TMP2	Lens 1-WF temp. 2, EDAQ AD590 Row 6 Col 1	Yes	Yes	Yes	No	64	16	8
143	LNS1_WF_TMP3	Lens 1-WF temp. 3, EDAQ Derived PRT 5	Yes	Yes	Yes	No	64	16	6
144	LNS2_TMP1	Lens 2 temp. 1, EDAQ AD590 Row 5 Col 1	Yes	Yes	Yes	Yes	64	16	8
145	LNS2_TMP2	Lens 2 temp. 2, EDAQ AD590 Row 6 Col 0	Yes	Yes	Yes	No	64	16	8
146	LNS2_TMP3	Lens 2 temp. 3, EDAQ Derived PRT 6	Yes	Yes	Yes	No	64	16	6
147	CHOP_MOT_TMP	Chopper motor temp, EDAQ AD590 Row 5 Col 3	Yes	Yes	Yes	Yes	64	16	8
148	CHOP_HSG_TMP2	Field Stop #1 temp, EDAQ AD590 Row 3 Col 4	Yes	Yes	Yes	No	64	16	8
149	CHOP_HSG_TMP3	Chopper blade shroud temp, EDAQ Derived PRT 2	Yes	Yes	Yes	No	64	16	6
150	CALMIR_TMP1	Cal. Mirror temp #1, EDAQ ADC590 Row 0 Col 1	Yes	Yes	Yes	Yes	64	16	8
151	CALMIR_TMP2	Cal. Mirror temp #2, EDAQ ADC590 Row 1 Col 2	Yes	Yes	Yes	No	64	16	8
152	CALMIR_TMP3	Cal. Mirror temp #3, EDAQ Derived PRT 4	Yes	Yes	Yes	No	64	16	6
153	M2_TMP1	Sec. (M2) mir temp #1, EDAQ ADC590 Row 6 Col 4	Yes	Yes	Yes	Yes	64	16	8
154	M2_TMP2	Sec. (M2) mir temp #2, EDAQ Derived PRT 7	Yes	Yes	Yes	No	64	16	6
155	SMA_MTRING_TMP	SMA mount ring temp, EDAQ 56	Yes	Yes	Yes	Yes	64	16	8
156	LNSASSY_TMP1	OBA lens assy temp #1, EDAQ 33	Yes	Yes	Yes	No	64	16	8
157	LNSASSY_TMP2	OBA lens assy temp #2, EDAQ 44	Yes	Yes	Yes	No	64	16	8
158	SPVU_BAF_TMP	OBA Sp. View baffle tmp, EDAQ 36	Yes	Yes	Yes	No	64	16	8
159	OBA_PLT_TMP	OBA aperture plate temp, EDAQ 10	Yes	Yes	Yes	No	64	16	8
160	GMU_MNT_TMP	GMU Mount temp., EDAQ 43	Yes	Yes	Yes	No	64	16	8
161	GMU_HSG_TMP	GMU Housing temp., EDAQ 54	Yes	Yes	Yes	No	64	16	8
162	TSW_CSCI_BLD_ID	Telescope S/W Bld Versn ID	Yes	No	Yes	Yes	64	16	1
163	FPA_TMP_A	Focal Plane temperature A, SPU	Yes	Yes	Yes	Yes	8	16	13

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
164	FPA_TMP_B	Focal Plane temperature B,SPU	Yes	Yes	Yes	Yes	8	16	13
165	IFCBB_FRPL_TMP	IFCBB front plate temp, EDAQ	Yes	Yes	Yes	Yes	64	16	9
166	IFC_REF_TMP	IFC ref. resistor temp	Yes	Yes	Yes	Yes	64	8	12
167	IFCBB_TMP1	IFC BB temp. #1	Yes	Yes	Yes	Yes	64	16	12
168	IFCBB_TMP2	IFC BB temp. #2	Yes	Yes	Yes	Yes	64	16	12
169	IFCBB_TMP3	IFC BB temp. #3	Yes	Yes	Yes	Yes	64	16	12
170	IFC_PSV_P28	IFC +28V rail volts	Yes	Yes	Yes	No	64	8	12
171	IFC_PSV_P15	IFC +15V rail volts	Yes	Yes	Yes	Yes	64	8	12
172	IFC_PSV_N15	IFC -15V rail volts	Yes	Yes	Yes	Yes	64	8	12
173	IFC_PSV_P5	IFC +5V rail volts	Yes	Yes	Yes	Yes	64	8	12
206	SAILTASK_00_P15	SAIL Tsk 00 param 15 !	Yes	Yes	Yes	Yes	64	32	0
207	SAILTASK_01_P15	SAIL Tsk 01 param 15 !	Yes	Yes	Yes	Yes	64	32	0
208	SAILTASK_02_P15	SAIL Tsk 02 param 15 !	Yes	Yes	Yes	Yes	64	32	0
209	SAILTASK_03_P15	SAIL Tsk 03 param 15 !	Yes	Yes	Yes	Yes	64	32	0
210	SAILTASK_04_P15	SAIL Tsk 04 param 15 !	Yes	Yes	Yes	Yes	64	32	0
211	SAILTASK_05_P15	SAIL Tsk 05 param 15 !	Yes	Yes	Yes	Yes	64	32	0
212	SAILTASK_06_P15	SAIL Tsk 06 param 15 !	Yes	Yes	Yes	Yes	64	32	0
213	SAILTASK_07_P15	SAIL Tsk 07 param 15 !	Yes	Yes	Yes	Yes	64	32	0
214	SAILTASK_08_P15	SAIL Tsk 08 param 15 !	Yes	No	Yes	Yes	64	32	0
215	SAILTASK_09_P15	SAIL Tsk 09 param 15 !	Yes	No	Yes	Yes	64	32	0
216	SAILTASK_10_P15	SAIL Tsk 10 param 15 !	Yes	No	Yes	Yes	64	32	0
217	SAILTASK_11_P15	SAIL Tsk 11 param 15 !	Yes	No	Yes	Yes	64	32	0
218	SAILTASK_12_P15	SAIL Tsk 12 param 15 !	Yes	No	Yes	Yes	64	32	0
219	SAILTASK_13_P15	SAIL Tsk 13 param 15 !	Yes	No	Yes	Yes	64	32	0
220	SAILTASK_14_P15	SAIL Tsk 14 param 15 !	Yes	No	Yes	Yes	64	32	0
221	SAILTASK_15_P15	SAIL Tsk 15 param 15 !	Yes	No	Yes	Yes	64	32	0
234	SAIL_PROC_STAT	SAIL Processor Status Code	Yes	Yes	Yes	Yes	64	8	0
235	SAILTASK_00_STAT	SAIL Task 00 Status Code	Yes	Yes	Yes	Yes	64	8	0
236	SAILTASK_01_STAT	SAIL Task 01 Status Code	Yes	Yes	Yes	Yes	64	8	0
237	SAILTASK_02_STAT	SAIL Task 02 Status Code	Yes	Yes	Yes	Yes	64	8	0

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
238	SAILTASK_03_STAT	SAIL Task 03 Status Code	Yes	Yes	Yes	Yes	64	8	0
239	SAILTASK_04_STAT	SAIL Task 04 Status Code	Yes	Yes	Yes	Yes	64	8	0
240	SAILTASK_05_STAT	SAIL Task 05 Status Code	Yes	Yes	Yes	Yes	64	8	0
241	SAILTASK_06_STAT	SAIL Task 06 Status Code	Yes	Yes	Yes	Yes	64	8	0
242	SAILTASK_07_STAT	SAIL Task 07 Status Code	Yes	Yes	Yes	Yes	64	8	0
243	SAILTASK_08_STAT	SAIL Task 08 Status Code	Yes	Yes	Yes	Yes	64	8	0
244	SAILTASK_09_STAT	SAIL Task 09 Status Code	Yes	Yes	Yes	Yes	64	8	0
245	SAILTASK_10_STAT	SAIL Task 10 Status Code	Yes	Yes	Yes	Yes	64	8	0
246	SAILTASK_11_STAT	SAIL Task 11 Status Code	Yes	Yes	Yes	Yes	64	8	0
247	SAILTASK_12_STAT	SAIL Task 12 Status Code	Yes	Yes	Yes	Yes	64	8	0
248	SAILTASK_13_STAT	SAIL Task 13 Status Code	Yes	Yes	Yes	Yes	64	8	0
249	SAILTASK_14_STAT	SAIL Task 14 Status Code	Yes	Yes	Yes	Yes	64	8	0
250	SAILTASK_15_STAT	SAIL Task 15 Status Code	Yes	Yes	Yes	Yes	64	8	0
251	HIRDLS_CLK_LSB	HIRDLS clock LSBYTES (GROUND USE ONLY)	No	No	No	No	1	16	2
252	TMARK_CLK	Time Mark clock word (GROUND USE ONLY)	No	No	No	No	64	16	2
253	TMARK_DATA	Time mark data word (GROUND USE ONLY)	No	No	No	No	64	16	2
254	SCCMDS_RCVCT	S/C cmds: received count	Yes	Yes	Yes	Yes	64	16	1
255	SCCMDS_REJCT	S/C cmds: rejected count	Yes	Yes	Yes	Yes	64	16	1
256	SCCMD_LAST_RC	Last S/C cmd: result code	Yes	Yes	Yes	Yes	64	16	1
257	SCCMD_LAST_CN	Last S/C cmd: cmd nmbr	Yes	Yes	Yes	Yes	64	8	1
258	SCCMD_LAST_PC	Last S/C cmd: pkt seq cnt	Yes	Yes	Yes	No	64	16	1
259	SAILCMDS_RCVCT	SAIL cmds: received count	Yes	Yes	Yes	Yes	64	16	1
260	SAILCMDS_REJCT	SAIL cmds: rejected count	Yes	Yes	Yes	Yes	64	16	1
261	SAILCMD_LAST_RC	Last SAIL cmd: result code	Yes	Yes	Yes	Yes	64	16	1
262	SAILCMD_LAST_CN	Last SAIL cmd: cmd nmbr	Yes	Yes	Yes	Yes	64	8	1
263	MACMDS_RCVCT	Macro cmds: receivd count	Yes	Yes	Yes	Yes	64	16	1
264	MACMDS_REJCT	Macro cmds: rejected count	Yes	Yes	Yes	Yes	64	16	1
265	MACMD_LAST_RC	Last Macro cmd: reslt code	Yes	Yes	Yes	Yes	64	16	1
266	MACMD_LAST_CN	Last Macro cmd: cmd nmbr	Yes	Yes	Yes	Yes	64	8	1
267	FRAMECNT	Minor frame count (GROUND USE ONLY)	No	No	No	No	8	32	2

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
268	HK_FORMAT_ID	Houskeeping format ID (GROUND USE ONLY)	No	No	No	No	64	16	2
269	SPU_CH_01_ZERO	Channel 1 Zero Offset	Yes	Yes	Yes	No	64	16	1
270	SPU_CH_02_ZERO	Channel 2 Zero Offset	Yes	No	Yes	No	64	16	1
271	SPU_CH_03_ZERO	Channel 3 Zero Offset	Yes	No	Yes	No	64	16	1
272	SPU_CH_04_ZERO	Channel 4 Zero Offset	Yes	No	Yes	No	64	16	1
273	SPU_CH_05_ZERO	Channel 5 Zero Offset	Yes	No	Yes	No	64	16	1
274	SPU_CH_06_ZERO	Channel 6 Zero Offset	Yes	No	Yes	No	64	16	1
275	SPU_CH_07_ZERO	Channel 7 Zero Offset	Yes	No	Yes	No	64	16	1
276	SPU_CH_08_ZERO	Channel 8 Zero Offset	Yes	No	Yes	No	64	16	1
277	SPU_CH_09_ZERO	Channel 9 Zero Offset	Yes	No	Yes	No	64	16	1
278	SPU_CH_10_ZERO	Channel 10 Zero Offset	Yes	No	Yes	No	64	16	1
279	SPU_CH_11_ZERO	Channel 11 Zero Offset	Yes	No	Yes	No	64	16	1
280	SPU_CH_12_ZERO	Channel 12 Zero Offset	Yes	No	Yes	No	64	16	1
281	SPU_CH_13_ZERO	Channel 13 Zero Offset	Yes	No	Yes	No	64	16	1
282	SPU_CH_14_ZERO	Channel 14 Zero Offset	Yes	No	Yes	No	64	16	1
283	SPU_CH_15_ZERO	Channel 15 Zero Offset	Yes	No	Yes	No	64	16	1
284	SPU_CH_16_ZERO	Channel 16 Zero Offset	Yes	No	Yes	No	64	16	1
285	SPU_CH_17_ZERO	Channel 17 Zero Offset	Yes	No	Yes	No	64	16	1
286	SPU_CH_18_ZERO	Channel 18 Zero Offset	Yes	No	Yes	No	64	16	1
287	SPU_CH_19_ZERO	Channel 19 Zero Offset	Yes	No	Yes	No	64	16	1
288	SPU_CH_20_ZERO	Channel 20 Zero Offset	Yes	No	Yes	No	64	16	1
289	SPU_CH_21_ZERO	Channel 21 Zero Offset	Yes	No	Yes	No	64	16	1
290	SPU_P5V_A	SPU +5VA supply volts (analog)	Yes	Yes	Yes	Yes	64	16	13
291	SPU_N5V_A	SPU -5VA supply volts (analog)	Yes	Yes	Yes	Yes	64	16	13
292	SPU_P5V_DA	SPU +5VA supply volts (digital)	Yes	Yes	Yes	Yes	64	16	13
293	SPU_P12V_A	SPU +12VA supply volts	Yes	Yes	Yes	Yes	64	16	13
294	SPU_N12V_A	SPU -12VA supply volts	Yes	Yes	Yes	Yes	64	16	13
295	SPU_P5V_B	SPU +5VB supply volts (analog)	Yes	Yes	Yes	Yes	64	16	13
296	SPU_N5V_B	SPU -5VB supply volts (analog)	Yes	Yes	Yes	Yes	64	16	13
297	SPU_P5V_DB	SPU +5VB supply volts (digital)	Yes	Yes	Yes	Yes	64	16	13

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
298	SPU_P12V_B	SPU +12VB supply volts	Yes	Yes	Yes	Yes	64	16	13
299	SPU_N12V_B	SPU -12VB supply volts	Yes	Yes	Yes	Yes	64	16	13
300	IPU_P3P3V	Wkg IPU +3.3V supply volts, EDAQ	Yes	Yes	Yes	Yes	64	16	9
301	IPU_P5V	Wkg IPU +5V supply volts, EDAQ	Yes	Yes	Yes	Yes	64	16	9
302	IPU_P15V	Wkg IPU +15V supply volts, EDAQ	Yes	Yes	Yes	Yes	64	16	9
303	IPU_N15V	Wkg IPU -15V supply volts, EDAQ	Yes	Yes	Yes	Yes	64	16	9
304	IPU_P3P3_DDC_TMP	Wkg IPU +3.3V DDC temp, EDAQ	Yes	Yes	Yes	No	64	16	9
305	IPU_P5V_DDC_TMP	Wkg IPU +5V DDC temp, EDAQ	Yes	Yes	Yes	No	64	16	9
306	ISU_LIO_STAT	IPU SUROM LIO RAD6K Test Status (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
307	ISU_1ST_MEM_SEG	IPU SUROM First Good Mem Segment (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
308	ISU_EDAC1ERR_CNT	IPU SUROM EDAC Single Error Count (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
309	ISU_EDAC2ERR_CNT	IPU SUROM EDAC Double Error Count (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
310	ISU_EE_ERR_CNT	IPU SUROM EDAC EEPROM Err Cnt (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
311	ISU_RAM_FAIL	IPU SUROM RAM Readback Fail (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
312	ISU_EE_ERR_STAT	IPU SUROM EEPROM Error Status (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
313	ISU_1ST_1553_SEG	IPU SUROM First Good 1553 Segment (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
314	ISU_1553_READERR	IPU SUROM 1553 Read Failures (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
315	ISU_CMD_RCVD_CN	IPU SUROM Command Rceiv'd Count (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
316	ISU_CMD_REJ_CNT	IPU SUROM Command Reject'd Count (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
317	ISU_CMD_NUMBER	IPU SUROM Command Number (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
318	ISU_CMD_RES_CODE	IPU SUROM Command Result Code (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
320	ISU_COUNTDOWN	Countdown parameter (seconds remaining until automatic application load and execute, 0=expired/aborted)	No	No	No	No	8	16	3
321	ISU_STATE	IPU SUROM Startup State (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
322	ISU_ROM_BUILD_ID	IPU SUROM ROM Build Version ID (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
325	IPU_CSCI_BLD_ID	IPU S/W Build Version ID	Yes	Yes	Yes	Yes	64	16	1
327	CSS_OP_STAT	Cooler operating status	Yes	Yes	Yes	Yes	64	8	14
328	CSS_DDCAG_STAT	Cooler DDC & caging status discretes (Read by IPU)	Yes	Yes	Yes	Yes	64	8	14
329	CSS_ERROR	Cooler error flags	Yes	Yes	Yes	Yes	64	8	14
330	CSS_TOTAL_I	Cooler tot mean currt	Yes	Yes	Yes	Yes	64	8	14
331	CRYOTIP_SETP	Cryo tip temp set point	Yes	Yes	Yes	Yes	64	16	14

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
332	CRYOTIP_TMP_D0	Cryo tip temperature 0	Yes	Yes	Yes	Yes	64	16	14
333	CRYOTIP_TMP_D1	Cryo tip temperature 1	Yes	Yes	Yes	Yes	64	16	14
334	CSS_FREQ_DMD	Cooler frequency (dmd'd)	Yes	Yes	Yes	Yes	64	16	14
335	CSS_FREQ_ACT	Cooler frequency (actual)	Yes	Yes	Yes	Yes	64	16	14
336	CSS_PH_DMD	Comp/Disp phase (dmd'd)	Yes	Yes	Yes	Yes	64	16	14
337	CSS_PH_ACT	Comp/Disp phase (actual)	Yes	Yes	Yes	Yes	64	16	14
338	COMP_AMP_DMD	Compressor ampl (dmd'd)	Yes	Yes	Yes	Yes	64	16	14
339	COMP_AMP_ACT	Compressor ampl (actual)	Yes	Yes	Yes	Yes	64	16	14
340	DISP_AMP_DMD	Displacer ampl (dmd'd)	Yes	Yes	Yes	Yes	64	16	14
341	DISP_AMP_ACT	Displacer ampl (actual)	Yes	Yes	Yes	Yes	64	16	14
342	CSS_MSG_NUMBER	CSS-IPS data msg number	Yes	Yes	Yes	Yes	64	8	14
343	CSS_CSCI_BLD_ID	Cooler F/W Build Version ID	Yes	Yes	Yes	No	64	16	14
344	QA_I	Quiet Bus A input currt, from PSS	Yes	Yes	Yes	Yes	64	16	11
345	QB_I	Quiet Bus B input currt, from PSS	Yes	Yes	Yes	Yes	64	16	11
346	PSS_SPU_5VA	SPU +5V DDC A volts	Yes	Yes	Yes	Yes	64	16	11
347	PSS_SPU_5VB	SPU +5V DDC B volts	Yes	Yes	Yes	Yes	64	16	11
348	PSS_SPU_P15VA	SPU +15V DDC A volts	Yes	Yes	Yes	Yes	64	16	11
349	PSS_SPU_P15VB	SPU +15V DDC B volts	Yes	Yes	Yes	Yes	64	16	11
350	PSS_SPU_N15VA	SPU -15V DDC A volts	Yes	Yes	Yes	Yes	64	16	11
351	PSS_SPU_N15VB	SPU -15V DDC B volts	Yes	Yes	Yes	Yes	64	16	11
352	PSS_PCU_5VC	PCU Internal +5 Volts	Yes	Yes	Yes	Yes	64	16	11
353	PSS_PCU_P15VC	PCU Internal +15 Volts	Yes	Yes	Yes	Yes	64	16	11
354	PSS_PCU_N15VC	PCU Internal -15 Volts	Yes	Yes	Yes	Yes	64	16	11
355	PSS_REG_28VA	REG +28V DDC A volts	Yes	Yes	Yes	Yes	64	16	11
356	PSS_REG_28VB	REG +28V DDC B volts	Yes	Yes	Yes	Yes	64	16	11
357	PSS_SYS_5VA	SYS +5V DDC A volts	Yes	Yes	Yes	Yes	64	16	11
358	PSS_SYS_5VB	SYS +5V DDC B volts	Yes	Yes	Yes	Yes	64	16	11
359	PSS_SYS_P15VA	SYS +15V DDC A volts	Yes	Yes	Yes	Yes	64	16	11
360	PSS_SYS_P15VB	SYS +15V DDC B volts	Yes	Yes	Yes	Yes	64	16	11
361	PSS_SYS_N15VA	SYS -15V DDC A volts	Yes	Yes	Yes	Yes	64	16	11

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
362	PSS_SYS_N15VB	SYS -15V DDC B volts	Yes	Yes	Yes	Yes	64	16	11
363	PSS_STAT_00	PSS relay status word 0	Yes	Yes	Yes	No	64	16	15
364	PSS_STAT_01	PSS relay status word 1	Yes	Yes	Yes	No	64	16	15
365	PSS_STAT_02	PSS relay status word 2	Yes	Yes	Yes	No	64	16	15
366	PSS_STAT_03	PSS relay status word 3	Yes	Yes	Yes	No	64	16	15
367	PSS_STAT_04	PSS relay status word 4	Yes	Yes	Yes	No	64	16	15
368	PSS_STAT_05	PSS relay status word 5	Yes	Yes	Yes	No	64	16	15
369	PSS_STAT_06	PSS relay status word 6	Yes	Yes	Yes	No	64	16	15
370	PSS_STAT_07	PSS relay status word 7	Yes	Yes	Yes	No	64	16	15
371	PSS_SPU_5VA_TMP	SPU +5VA DDC temp	Yes	Yes	Yes	No	64	16	11
372	PSS_SPU_5VB_TMP	SPU +5VB DDC temp	Yes	Yes	Yes	No	64	16	11
373	PSS_SPU_15VA_TMP	SPU15VA DDC temp	Yes	Yes	Yes	No	64	16	11
374	PSS_SPU_15VB_TMP	SPU15VB DDC temp	Yes	Yes	Yes	No	64	16	11
375	PSS_REG_28VA_TMP	REG +28VA DDC temp	Yes	Yes	Yes	No	64	16	11
376	PSS_REG_28VB_TMP	REG +28VB DDC temp	Yes	Yes	Yes	No	64	16	11
377	PSS_SYS_5VA_TMP	SYS +5VA DDC temp	Yes	Yes	Yes	No	64	16	11
378	PSS_SYS_5VB_TMP	SYS +5VB DDC temp	Yes	Yes	Yes	No	64	16	11
379	PSS_SYS_P15VATMP	SYS +15VA DDC temp	Yes	Yes	Yes	No	64	16	11
380	PSS_SYS_P15VBTMP	SYS +15VB DDC temp	Yes	Yes	Yes	No	64	16	11
381	PSS_SYS_N15VATMP	SYS -15VA DDC temp	Yes	Yes	Yes	No	64	16	11
382	PSS_SYS_N15VBTMP	SYS -15VB DDC temp	Yes	Yes	Yes	No	64	16	11
383	PSS_PCU_15VA_TMP	PCU (Intnl) 15VA DDC temp	Yes	Yes	Yes	No	64	16	11
384	PSS_PCU_15VB_TMP	PCU (Intnl) 15VB DDC temp	Yes	Yes	Yes	No	64	16	11
385	PSS_QAFILT_TMP	PCU QBA Inrush Filter temp	Yes	Yes	Yes	No	64	16	11
386	PSS_QBFILT_TMP	PCU QBB Inrush Filter temp	Yes	Yes	Yes	No	64	16	11
387	IPU_STAT_0	IPU Status Word 0	Yes	Yes	Yes	Yes	8	16	1
388	IPU_ERR_0	IPU Error Flags 0	Yes	Yes	Yes	Yes	64	16	1
389	CMD_ERR_0	Command Error Flags	Yes	Yes	Yes	Yes	64	16	1
390	IPU_ERR_1	IPU Error Flags 1	Yes	Yes	Yes	Yes	64	16	1
391	IPU_ERR_2	IPU Error Flags 2	Yes	Yes	Yes	Yes	64	16	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
392	SUBTMI_BUILD_ID	Subtmi file version	Yes	Yes	Yes	Yes	64	8	0
393	IPU_BUILD_DATE	MSbyte year-1900, LSbyte day of year	Yes	No	Yes	No	64	16	0
394	IPU_BUILD_TIME	Minute of day	Yes	No	Yes	No	64	16	0
395	EXEC_OVERRUN_CN	CR-executive task overrun count	Yes	Yes	Yes	Yes	64	16	1
396	IPU_FLT_STAT_1	IPU fault status word 1	Yes	Yes	Yes	Yes	64	16	0
397	IPU_FLT_STAT_0	IPU Fault Managmt. Status	Yes	Yes	Yes	Yes	64	16	0
398	QHSS_1_RV_STAT	QHSS 1 Receive Status Word TSS HS	No	No	Yes	No	64	16	1
399	QHSS_2_RV_STAT	QHSS 2 Receive Status Word TSS LS	Yes	Yes	Yes	No	64	16	1
400	QHSS_3_RV_STAT	QHSS 3 Receive Status Word SPU	Yes	Yes	Yes	No	64	16	1
401	QHSS_1_TX_STAT	QHSS 1 Transmit Status Word TSS CMD	Yes	Yes	Yes	No	64	16	1
402	IPU_STAT_1	IPU Status Word 1	Yes	Yes	Yes	Yes	8	16	1
403	FIR1_TBL_ID	FIR coeffts table ID (1/CR rate)	Yes	Yes	Yes	Yes	64	8	1
404	FIR2_TBL_ID	FIR coeffts table ID (2/CR rate)	Yes	Yes	Yes	Yes	64	8	1
405	FIR3_TBL_ID	FIR coeffts table ID (3/CR rate)	Yes	Yes	Yes	Yes	64	8	1
406	FIR6_TBL_ID	FIR coeffts table ID (6/CR rate)	Yes	Yes	Yes	Yes	64	8	1
407	PRF_CR_TOTAL	1, Execution Profile, Max Execution time, 1 LS Bit = 50 usecs	Yes	Yes	Yes	No	64	8	1
408	PRF_1553	2	Yes	No	Yes	No	64	8	1
409	PRF_QHSS_SPU	3	Yes	No	Yes	No	64	8	1
410	PRF_QHSS_TEU	4	Yes	No	Yes	No	64	8	1
411	PRF_HIRDLSTIME	5	Yes	No	Yes	No	64	8	1
412	PRF_SWAP_DIAG	6	Yes	No	Yes	No	64	8	1
413	PRF_UP_HKTBL	7	Yes	No	Yes	No	64	8	1
414	PRF_UP_SCITBL	8	Yes	No	Yes	No	64	8	1
415	PRF_UP_SCIFMT	9	Yes	No	Yes	No	64	8	1
416	PRF_CLR_CMD	10	Yes	No	Yes	No	64	8	1
417	PRF_EXE_TLM	11	Yes	No	Yes	No	64	8	1
418	PRF_SSH_TLM	12	Yes	No	Yes	No	64	8	1
419	PRF_SVA_TLM	13	Yes	No	Yes	No	64	8	1
420	PRF_CMD_TLM	14	Yes	No	Yes	No	64	8	1
421	PRF_IOBIC_TLM	15	Yes	No	Yes	No	64	8	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
422	PRF_SPU_TLM	16	Yes	No	Yes	No	64	8	1
423	PRF_TSS_TLM	17	Yes	No	Yes	No	64	8	1
424	PRF_TG_TLM	18	Yes	No	Yes	No	64	8	1
425	PRF_SCIFMT_TLM	19	Yes	No	Yes	No	64	8	1
426	PRF_SCIPRO_TLM	20	Yes	No	Yes	No	64	8	1
427	PRF_CSS_TLM	21	Yes	No	Yes	No	64	8	1
428	PRF_UPDATE_MAC	22	Yes	No	Yes	No	64	8	1
429	PRF_EXE_SCCMD	23	Yes	No	Yes	No	64	8	1
430	PRF_EXE_SAICMD	24	Yes	No	Yes	No	64	8	1
431	PRF_EXE_MACCMD	25	Yes	No	Yes	No	64	8	1
432	PRF_CNTRL_PSS	26	Yes	No	Yes	No	64	8	1
433	PRF_CNTRL_EDAQ	27	Yes	No	Yes	No	64	8	1
434	PRF_CNTRL_CSS	28	Yes	No	Yes	No	64	8	1
435	PRF_CNTRL_IFC	29	Yes	No	Yes	No	64	8	1
436	PRF_DECIM_SCI	30	Yes	No	Yes	No	64	8	1
437	PRF_FIR_SCI	31	Yes	No	Yes	No	64	8	1
439	PRF_FMT_HKBLOCK	33	Yes	No	Yes	No	64	8	1
440	PRF_MAKE_SCIPKT	34	Yes	No	Yes	No	64	8	1
441	PRF_MAKE_ENGPKT	35	Yes	No	Yes	No	64	8	1
442	PRF_INVALID	Execution Profile Max Execution time, 1 LS Bit = 50 usecs	Yes	No	Yes	No	64	8	1
443	PRF_CNTRL_SSH	Execution Profile Max Execution time, 1 LS Bit = 50 usecs	Yes	No	Yes	No	64	8	1
444	PRF_CNTRL_GSS	Execution Profile Max Execution time, 1 LS Bit = 50 usecs	Yes	No	Yes	No	64	8	1
445	IPU_ERR_3	IPU ERROR Status Word 3	Yes	Yes	Yes	Yes	64	16	1
446	IFC_HCW	IFC Heater Control Word value	Yes	Yes	Yes	Yes	64	8	1
447	IPU_CSS_TLM_CNT	Number of TLM Packets sent by IPU from the CSS	Yes	Yes	Yes	No	64	8	1
451	TSS_RD_TEUSYNC	IPU read TEU DMA buffer sync, state counter	Yes	No	Yes	No	64	8	1
455	TSS_WR_TEUSYNC	IPU write TEU DMA buffer sync, state counter	Yes	No	Yes	No	64	8	1
456	IPU_CSS_CMD_CNT	Number of CMD Packets recieved by IPU from the CSS	Yes	Yes	Yes	No	64	8	1
457	TSU_DUMP_NWORDS	Number of words in TSU Ram Dump	No	No	Yes	No	64	16	0
458	CHOP_FREQ	Chopper frequency setting	Yes	Yes	Yes	Yes	64	16	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
459	BEU_BOX_TMP	BEU box EDAQ AD590 Row 4 Col 2	Yes	Yes	Yes	Yes	64	16	8
460	BEU_MNT_TMP	BEU box mount EDAQ AD590 Row 1 Col 4	Yes	Yes	Yes	No	64	16	8
461	SPU_BOX_TMP	SPU box EDAQ AD590 Row 2 Col 7	Yes	Yes	Yes	Yes	64	16	8
462	IPU_BOX_TMP	IPU box EDAQ AD590 Row 7 Col 4	Yes	Yes	Yes	Yes	64	16	8
463	TEU_BOX_TMP	TEU box EDAQ AD590 Row 7 Col 6	Yes	Yes	Yes	Yes	64	16	8
464	TEU_MNT_TMP	TEU box mount EDAQ AD590 Row 3 Col 7	Yes	Yes	Yes	No	64	16	8
465	EEA_MNT_TMP	EEA box mount EDAQ AD590 Row 3 Col 0	Yes	Yes	Yes	No	64	16	8
466	ELMOT1_TMP1	Elev motor 1 temp 1, EDAQ AD590 Row 2 Col 1	Yes	Yes	Yes	No	64	16	8
468	ELMOT2_TMP1	Elev motor 2 temp 1, EDAQ AD590 Row 2 Col 0	Yes	Yes	Yes	No	64	16	8
470	M1_TMP3	Pri (M1) mir temp. 3, EDAQ Derived PRT 1	Yes	Yes	Yes	No	64	16	6
471	SPVUMIR_TMP1	Space View Mirror temp #1 EDAQ AD590 Row 0 Col 4	Yes	Yes	Yes	Yes	64	16	8
472	SPVUMIR_TMP2	Space View Mirror temp #2 EDAQ AD590 Row 1 Col 3	Yes	Yes	Yes	No	64	16	8
473	SPVUMIR_TMP3	Space View Mirror temp #3 EDAQ Derived PRT 3	Yes	Yes	Yes	No	64	16	6
483	SAIL_SHM_256	SAIL shared memory [256]	Yes	Yes	Yes	Yes	64	32	0
484	SAIL_SHM_257	SAIL shared memory [257]	Yes	Yes	Yes	Yes	64	32	0
485	SAIL_SHM_258	SAIL shared memory [258]	Yes	Yes	Yes	Yes	64	32	0
486	SAIL_SHM_259	SAIL shared memory [259]	Yes	Yes	Yes	Yes	64	32	0
487	SAIL_SHM_260	SAIL shared memory [260]	Yes	Yes	Yes	Yes	64	32	0
488	SAIL_SHM_261	SAIL shared memory [261]	Yes	Yes	Yes	Yes	64	32	0
489	SAIL_SHM_262	SAIL shared memory [262]	Yes	Yes	Yes	Yes	64	32	0
490	SAIL_SHM_263	SAIL shared memory [263]	Yes	Yes	Yes	Yes	64	32	0
491	SAIL_ENGWORD_00	SAIL-generated Eng. Word 0	No	No	Yes	Yes	64	32	0
492	SAIL_ENGWORD_01	SAIL-generated Eng. Word 1	No	No	Yes	Yes	64	32	0
493	SAIL_ENGWORD_02	SAIL-generated Eng. Word 2	No	No	Yes	Yes	64	32	0
494	SAIL_ENGWORD_03	SAIL-generated Eng. Word 3	No	No	Yes	Yes	64	32	0
495	SAIL_ENGWORD_04	SAIL-generated Eng. Word 4	No	No	Yes	Yes	64	32	0
496	SAIL_ENGWORD_05	SAIL-generated Eng. Word 5	No	No	Yes	Yes	64	32	0
497	SAIL_ENGWORD_06	SAIL-generated Eng. Word 6	No	No	Yes	Yes	64	32	0
498	SAIL_ENGWORD_07	SAIL-generated Eng. Word 7	No	No	Yes	Yes	64	32	0
500	OBA_TMP_00	OBA +X Isolator Temp (top) EDAQ, AD590 Row 0 Col 0	Yes	Yes	Yes	No	64	16	8

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
501	OBA_TMP_01	OBA +Y Isolator Temp (top) EDAQ, AD590 Row 1 Col 6	Yes	Yes	Yes	No	64	16	8
502	OBA_TMP_02	OBA -Y Isolator Temp (top) EDAQ, AD590 Row 6 Col 3	Yes	Yes	Yes	No	64	16	8
503	OBA_TMP_03	OBA external leg beam temp, +Y EDAQ, AD590 Row 0 Col 7	Yes	Yes	Yes	No	64	16	8
504	OBA_TMP_04	OBA external leg beam temp, -Y EDAQ, AD590 Row 1 Col 5	Yes	Yes	Yes	No	64	16	8
505	OBA_TMP_05	OBA truss Temp, top, centre, +X EDAQ, AD590 Row 0 Col 5	Yes	Yes	Yes	No	64	16	8
506	OBA_TMP_06	OBA truss Temp, top, +X, +Y EDAQ, AD590 Row 5 Col 7	Yes	Yes	Yes	No	64	16	8
507	OBA_TMP_07	OBA truss Temp, top, +X, -Y EDAQ, AD590 Row 1 Col 7	Yes	Yes	Yes	No	64	16	8
508	OBA_TMP_08	OBA centre tube, +Z EDAQ, AD590 Row 6 Col 5	Yes	Yes	Yes	No	64	16	8
509	OBA_TMP_09	OBA centre tube, -Z EDAQ, AD590 Row 7 Col 2	Yes	Yes	Yes	No	64	16	8
512	CMD_DB_BUILD_ID	Command Database Build Version ID	Yes	Yes	Yes	Yes	64	8	1
513	TLM_DB_BUILD_ID	Telemetry Database Build Version ID	Yes	Yes	Yes	Yes	64	8	1
516	TSW_EL1P_POS	Raw Primary elevation 1 position	Yes	Yes	Yes	No	64	32	1
517	TSW_EL2P_POS	Raw Primary elevation 2 position	Yes	Yes	Yes	No	64	32	1
518	TSW_AZP_POS	Raw Primary azimuth position	Yes	Yes	Yes	No	64	32	1
519	TSW_EL1S_POS	Raw Secondary elevation 1 position	Yes	Yes	Yes	No	64	32	1
520	TSW_EL2S_POS	Raw Secondary elevation 2 position	Yes	Yes	Yes	No	64	32	1
521	TSW_AZS_POS	RAW Secondary azimuth encoder position	Yes	Yes	Yes	No	64	32	1
522	TSW_ENCP_STAT	EEA primary channel set status	Yes	Yes	Yes	Yes	64	16	1
523	TSW_ENCS_STAT	EEA secondary channel set status	Yes	Yes	Yes	Yes	64	16	1
524	TSW_PRIIF_STAT	Primary EEA/TEU channel I/F status	Yes	Yes	Yes	Yes	64	16	1
525	TSW_SECIF_STAT	Secondary EEA/TEU channel I/F stat	Yes	Yes	Yes	Yes	64	16	1
528	TSW_HWCNFG	TSS hardware configuration @@ TSS_HW_CFIG	Yes	Yes	Yes	Yes	64	16	1
529	TSW_CLOCK_SEL	TSS synchronization source	Yes	Yes	Yes	Yes	64	16	1
532	TSW_WBDAT1	Wobble sensor data @@WOBB_SENS1	Yes	Yes	Yes	Yes	8	16	1
533	TSW_WBDAT2	Wobble sensor data @@ WOBB_SENS2	Yes	Yes	Yes	Yes	8	16	1
534	TSW_SCON_STAT	Signal conditioning module status @@TEU_SIGCON_STAT	Yes	No	Yes	No	64	16	1
535	TSW_CSC_STAT	TSW CSC enable/disable status @@TEU_TSW_STAT	Yes	Yes	Yes	Yes	64	16	1
537	TSW_CMDA_CNT	Command accept count	Yes	Yes	Yes	Yes	64	16	1
538	TSW_CMDR_CNT	Command reject count	Yes	Yes	Yes	Yes	64	16	1
539	TSW_CMDA_SIG	Accepted command signature	Yes	Yes	Yes	Yes	64	16	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
540	TSW_CMDR_SIG	Rejected command signature in high byte, reject reason in low byte	Yes	Yes	Yes	Yes	64	16	1
542	TSW_CTL_INDEX	Scan mirror cntrl list crrnt index	Yes	Yes	Yes	Yes	64	16	1
543	TSW_SM_EI_STAT	Scan mirror control CSC status	Yes	Yes	Yes	Yes	64	16	1
544	TSW_EL1MTRDRVC	Commanded torque in elevation 1	Yes	Yes	Yes	No	64	16	1
545	TSW_EL2MTRDRVC	Commanded torque in elevation 2	Yes	Yes	Yes	No	64	16	1
546	TSW_AZMTRDRVCM	Commanded torque in azimuth	Yes	Yes	Yes	No	64	16	1
547	TSW_AZ_MTR_I	Azimuth drive motor current @@AZMOTR_CRRT	Yes	Yes	Yes	Yes	64	16	1
548	TSW_EL1_MTR_I	Elevation 1 motor current @@ELMOTR1_CRRT 105	Yes	Yes	Yes	Yes	64	16	1
549	TSW_EL2_MTR_I	Elevation 2 motor current @@ELMOTR2_CRRT	Yes	Yes	Yes	Yes	64	16	1
550	TSW_CHOP_MTR_I	Chopper motor current @@CHOPMOT_CRRT 112	Yes	Yes	Yes	Yes	64	16	1
551	TSW_P15VSUP	Positive 15V supply 1 @@TEU_P9V	Yes	Yes	Yes	Yes	64	16	1
553	TSW_P5VSUP	Positive 5V supply 1 @@TEU_P5V	Yes	Yes	Yes	Yes	64	16	1
554	TSW_P5VREF1	Positive 5V reference 1 @@TEU_ADC0_REF	Yes	Yes	Yes	Yes	64	16	1
555	TSW_P5VREF2	Positive 5V reference 2 @@TEU_ADC1_REF	Yes	Yes	Yes	Yes	64	16	1
557	TSW_N15VSUP	Negative 15V supply @@ TEU_N9V	Yes	Yes	Yes	Yes	64	16	1
562	TSW_PIFCTLRG	DIO primary I/F cntrl register	Yes	Yes	Yes	Yes	64	16	1
563	TSW_SIFCTLRG	DIO secondary I/F cntrl register	Yes	Yes	Yes	Yes	64	16	1
564	TSW_MTRCTRG	DIO scan mirror motor control reg	Yes	No	Yes	No	64	16	1
567	TSU_LIOTRES	TEU SUROM - LIO test results	Yes	No	Yes	Yes	64	16	1
568	TSU_SBERR_CNT	TEU SUROM - EDAC single bit error cum count	Yes	No	Yes	No	64	16	1
569	TSU_DBERR_CNT	TEU SUROM - EDAC double bit error cum count	Yes	No	Yes	No	64	16	1
570	TSU_RBERR_CNT	TEU SUROM - Read back fail count	Yes	No	Yes	No	64	16	1
571	TSU_GOOD_RAM	TEU SUROM - Start address of "good" RAM	Yes	No	Yes	Yes	64	16	1
572	TSU_CACPT_CNT	TEU SUROM - Command accept count	Yes	No	Yes	Yes	64	16	1
573	TSU_CREJ_CNT	TEU SUROM - Command reject count	Yes	No	Yes	Yes	64	16	1
574	TSU_REJ_SIG	TEU SUROM - Reject command signature	Yes	No	Yes	Yes	64	16	1
575	TSU_REJREAS	TEU SUROM - Command reject reason	Yes	No	Yes	Yes	64	16	1
576	TSU_NEXT_BLK	TEU SUROM - Next expected block number for Program Image upload	Yes	No	Yes	Yes	64	16	1
577	TSU_TOTAL_BLKS	TEU SUROM - Program Image upload total expected block num	Yes	No	Yes	Yes	64	16	1
578	TSU_UP_CKSUM	TEU SUROM - Expected checksum of total Program Image	Yes	No	Yes	Yes	64	32	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
579	TSU_CMP_CKSUM	TEU SUROM - Computed checksum of total Program Image	Yes	No	Yes	Yes	64	32	1
580	TSU_FLAG_BITS	TEU SUROM - Watchdog frame	Yes	No	Yes	Yes	64	16	1
581	TSU_DUMP_ADDR	TEU SUROM - RAM dump address	Yes	No	Yes	No	64	32	0
582	TSU_BUILD_ID	TEU SUROM - S/W Bld Versn ID	Yes	No	Yes	No	64	16	1
583	HK_SIGDAT02	Filtered Radiance data channel 2, For inclusion in ENG data	No	No	Yes	Yes	64	16	0
584	HK_SIGDAT04	Filtered Radiance data channel 4, For inclusion in ENG data	No	No	Yes	Yes	64	16	0
585	HK_ELVARP_POS	Filtered Primary El Var data sample	No	No	Yes	Yes	64	32	0
586	HK_EL2P_POS	Filtered Primary Elevation 2 data sample	No	No	Yes	Yes	64	32	0
587	HK_AZP_POS	Filtered Primary Azimuth data sample	No	No	Yes	Yes	64	32	0
588	HIRDLS_TIME_LSW	Bits 0-31 of HIRDLS time	Yes	No	Yes	Yes	64	32	0
589	HIRDLS_TIME_MSW	Bits 32-63 of HIRDLS time	Yes	No	Yes	Yes	64	32	0
590	ISU_CURRENT_BLK	IPU SUROM - Current block number for Program Image	No	No	No	No	8	16	3
591	ISU_TOTAL_BLKS	IPU SUROM - Program Image upload total expected block num	No	No	No	No	8	16	3
592	ISU_UP_CKSUM	IPU SUROM - 32 bit expected checksum of total Program Image	No	No	No	No	8	32	3
593	ISU_CMP_CKSUM	IPU SUROM - 32 bit Computed checksum of total Program Image	No	No	No	No	8	32	3
606	TSW_TOT_MAX	Max total time in last 64 CRs, 4 microsec/count	Yes	Yes	Yes	No	64	8	1
618	TSW_CRIT_MAX	Max critical time in last 64 CRs, 4 usec/count	Yes	Yes	Yes	No	64	8	1
619	SPU_CH_01_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 1 sample	Yes	No	Yes	No	64	16	1
620	SPU_CH_02_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 2 sample	Yes	No	Yes	No	64	16	1
621	SPU_CH_03_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 3 sample	Yes	No	Yes	No	64	16	1
622	SPU_CH_04_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 4 sample	Yes	No	Yes	No	64	16	1
623	SPU_CH_05_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 5 sample	Yes	No	Yes	No	64	16	1
624	SPU_CH_06_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 6 sample	Yes	No	Yes	No	64	16	1
625	SPU_CH_07_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 7 sample	Yes	No	Yes	No	64	16	1
626	SPU_CH_08_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 8 sample	Yes	No	Yes	No	64	16	1
627	SPU_CH_09_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 9 sample	Yes	No	Yes	No	64	16	1
628	SPU_CH_10_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 10 sample	Yes	No	Yes	No	64	16	1
629	SPU_CH_11_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 11 sample	Yes	No	Yes	No	64	16	1
630	SPU_CH_12_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 12 sample	Yes	No	Yes	No	64	16	1
631	SPU_CH_13_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 13 sample	Yes	No	Yes	No	64	16	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
632	SPU_CH_14_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 14 sample	Yes	No	Yes	No	64	16	1
633	SPU_CH_15_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 15 sample	Yes	No	Yes	No	64	16	1
634	SPU_CH_16_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 16 sample	Yes	No	Yes	No	64	16	1
635	SPU_CH_17_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 17 sample	Yes	No	Yes	No	64	16	1
636	SPU_CH_18_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 18 sample	Yes	No	Yes	No	64	16	1
637	SPU_CH_19_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 19 sample	Yes	No	Yes	No	64	16	1
638	SPU_CH_20_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 20 sample	Yes	No	Yes	No	64	16	1
639	SPU_CH_21_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 21 sample	Yes	No	Yes	No	64	16	1
640	SPU_HK_PHASE	Delay (in 160 nsec ticks) for Radiance Data HouseKeeping sample	Yes	No	Yes	No	64	16	1
641	SPU_BLADE_0_OPEN	Delay (in 160 nsec ticks) for Chopper Blade Open 0 delay	Yes	No	Yes	No	64	16	1
642	SPU_BLADE_1_OPEN	Delay (in 160 nsec ticks) for Chopper Blade Open 1 delay	Yes	No	Yes	No	64	16	1
643	SPU_BLADE_2_OPEN	Delay (in 160 nsec ticks) for Chopper Blade Open 2 delay	Yes	No	Yes	No	64	16	1
644	SPU_BLADE_3_OPEN	Delay (in 160 nsec ticks) for Chopper Blade Open 3 delay	Yes	No	Yes	No	64	16	1
645	SPU_BLADE_4_OPEN	Delay (in 160 nsec ticks) for Chopper Blade Open 4 delay	Yes	No	Yes	No	64	16	1
646	SPU_BLADE_5_OPEN	Delay (in 160 nsec ticks) for Chopper Blade Open 5 delay	Yes	No	Yes	No	64	16	1
647	SPU_BLADE_0_CLSD	Delay (in 160 nsec ticks) for Chopper Blade Closed 0 delay	Yes	No	Yes	No	64	16	1
648	SPU_BLADE_1_CLSD	Delay (in 160 nsec ticks) for Chopper Blade Closed 1 delay	Yes	No	Yes	No	64	16	1
649	SPU_BLADE_2_CLSD	Delay (in 160 nsec ticks) for Chopper Blade Closed 2 delay	Yes	No	Yes	No	64	16	1
650	SPU_BLADE_3_CLSD	Delay (in 160 nsec ticks) for Chopper Blade Closed 3 delay	Yes	No	Yes	No	64	16	1
651	SPU_BLADE_4_CLSD	Delay (in 160 nsec ticks) for Chopper Blade Closed 4 delay	Yes	No	Yes	No	64	16	1
652	SPU_BLADE_5_CLSD	Delay (in 160 nsec ticks) for Chopper Blade Closed 5 delay	Yes	No	Yes	No	64	16	1
653	SPU_GLOBAL_DELA	Delay (in 160 nsec ticks) for Global Filter Delay	Yes	No	Yes	No	64	16	1
654	TSS_RESET_TIME	Hirdls Time at Last TSS Reset	Yes	No	Yes	No	64	32	1
655	TSW_FREQ	Chopper pre-scalar value used for scan mirror control time tick	Yes	Yes	Yes	Yes	64	16	1
656	CMDRES_DB_BLD_ID	Command Results Database Build Version ID	Yes	Yes	Yes	No	64	8	0
657	TSW_EXEC_OVERRU	TSW Executive overrun counter	Yes	Yes	Yes	Yes	64	8	0
658	ISU_SEQUENCE_CNT	IPU SUROM packet sequence count	No	No	No	No	8	16	3
659	GSS_SIO_BUSY_CNT	Count of IPU GSS(SIO) telemetry overruns	Yes	Yes	Yes	No	64	8	0
660	IPU_ERR_4	IPU Error status	Yes	Yes	Yes	Yes	64	16	1
661	IPU_STAT_2	IPU status word #2	Yes	Yes	Yes	Yes	8	16	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
662	ISU_JMP_ADDRESS	IPU SUROM jump address	No	No	No	No	8	32	3
663	ISU_EE_OFFSET	IPU SUROM EEPROM address offset	No	No	No	No	8	32	3
664	ISU_EE_LOOP_END	IPU SUROM EEPROM end address	No	No	No	No	8	32	3
665	ISU_OVERRIDE_FLG	IPU SUROM override status	No	No	No	No	8	16	3
666	ISU_ACTION_CODE	IPU SUROM program action code	No	No	No	No	8	16	3
667	TSW_SCBD_TMP	Signal Conditioning Board Temperature	Yes	Yes	Yes	No	64	16	0
668	ISU_SPARE	Spare channel for test purposes	No	No	No	No	8	16	3
670	PSS_PCU_5VA	PCU Internal +5 Volts - A side	Yes	Yes	Yes	Yes	64	16	0
671	PSS_PCU_5VB	PCU Internal +5 Volts - B side	Yes	Yes	Yes	Yes	64	16	0
672	GYR0_HTR_W	Gyro 0 heater watts (mean)	Yes	Yes	Yes	Yes	64	16	0
673	GYR1_HTR_W	Gyro 1 heater watts (mean)	Yes	Yes	Yes	Yes	64	16	0
674	GYR2_HTR_W	Gyro 2 heater watts (mean)	Yes	Yes	Yes	Yes	64	16	0
675	GYR3_HTR_W	Gyro 3 heater watts (mean)	Yes	Yes	Yes	Yes	64	16	0
676	SC_ATT_QUAT_1	S/C Ancillary data item: Attitude Quaternion 1	Yes	Yes	Yes	No	64	32	5
677	SC_ATT_QUAT_2	S/C Ancillary data item: Attitude Quaternion 2	Yes	Yes	Yes	No	64	32	5
678	SC_ATT_QUAT_3	S/C Ancillary data item: Attitude Quaternion 3	Yes	Yes	Yes	No	64	32	5
679	SC_ATT_QUAT_4	S/C Ancillary data item: Attitude Quaternion 4	Yes	Yes	Yes	No	64	32	5
680	SC_DESC_NODE	S/C Ancillary data item: Time to Descending Node	Yes	Yes	Yes	No	64	16	5
681	SC_EUL_ANG_PITCH	S/C Ancillary data item: Pitchl Euler Angle	Yes	Yes	Yes	No	64	16	5
682	SC_EUL_ANG_ROLL	S/C Ancillary data item: Roll Euler Angle	Yes	Yes	Yes	No	64	16	5
683	SC_EUL_ANG_YAW	S/C Ancillary data item: Yaw Euler Angle	Yes	Yes	Yes	No	64	16	5
684	SC_GYRO_STAT	S/C Ancillary data item: S/C Gyro (IRU) status word	Yes	Yes	Yes	No	64	16	5
685	SC_MOON_VECT_X	S/C Ancillary data item: Moon Vector - X	Yes	Yes	Yes	No	64	16	5
686	SC_MOON_VECT_Y	S/C Ancillary data item: Moon Vector - Y	Yes	Yes	Yes	No	64	16	5
687	SC_MOON_VECT_Z	S/C Ancillary data item: Moon Vector - Z	Yes	Yes	Yes	No	64	16	5
688	SC_NAV_MODE	S/C Ancillary data item: S/C Mode (pointing) status	Yes	Yes	Yes	No	64	16	5
689	SC_OBL_ANG_AFT	S/C Ancillary data item: Oblateness Angle (aft)	Yes	Yes	Yes	No	64	16	5
690	SC_OBL_ANG_R	S/C Ancillary data item: Oblateness angle (aft) rate	Yes	Yes	Yes	No	64	16	5
691	SC_PITCH_RATE	S/C Ancillary data item: Pitch Rate	Yes	Yes	Yes	No	64	16	5
692	SC_POS_X	S/C Ancillary data item: Spacecraft Position - X	Yes	Yes	Yes	No	64	32	5

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
693	SC_POS_Y	S/C Ancillary data item: Spacecraft Position - Y	Yes	Yes	Yes	No	64	32	5
694	SC_POS_Z	S/C Ancillary data item: Spacecraft Position - Z	Yes	Yes	Yes	No	64	32	5
695	SC_ROLL_RATE	S/C Ancillary data item: Roll Rate	Yes	Yes	Yes	No	64	16	5
696	SC_SUN_VECT_X	S/C Ancillary data item: Sun Vector - X	Yes	Yes	Yes	No	64	16	5
697	SC_SUN_VECT_Y	S/C Ancillary data item: Sun Vector - Y	Yes	Yes	Yes	No	64	16	5
698	SC_SUN_VECT_Z	S/C Ancillary data item: Sun Vector - Z	Yes	Yes	Yes	No	64	16	5
699	SC_TIM_STAMP_LSW	S/C Ancillary data item: HIRDLS Time Stamp (least significant 32 bits)	Yes	Yes	Yes	No	64	32	5
700	SC_TIM_STAMP_MS	S/C Ancillary data item: HIRDLS Time Stamp (most significant 32 bits)	Yes	Yes	Yes	No	64	32	5
701	SC_VELY_X	S/C Ancillary data item: Spacecraft Velocity - X	Yes	Yes	Yes	No	64	32	5
702	SC_VELY_Y	S/C Ancillary data item: Spacecraft Velocity - Y	Yes	Yes	Yes	No	64	32	5
703	SC_VELY_Z	S/C Ancillary data item: Spacecraft Velocity - Z	Yes	Yes	Yes	No	64	32	5
704	SC_YAW_RATE	S/C Ancillary data item: Yaw Rate	Yes	Yes	Yes	No	64	16	5
705	OPH_ZONE1_DELAY	OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse	Yes	No	Yes	No	64	16	1
706	OPH_ZONE2_DELAY	OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse	Yes	No	Yes	No	64	16	1
707	OPH_ZONE3_DELAY	OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse	Yes	No	Yes	No	64	16	1
708	OPH_ZONE4_DELAY	OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse	Yes	No	Yes	No	64	16	1
709	OPH_ZONE5_DELAY	OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse	Yes	No	Yes	No	64	16	1
710	OPH_ZONE6_DELAY	OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse	Yes	No	Yes	No	64	16	1
711	OPH_ZONE1_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	Yes	Yes	Yes	Yes	64	16	1
712	OPH_ZONE2_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	Yes	Yes	Yes	Yes	64	16	1
713	OPH_ZONE3_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	Yes	Yes	Yes	Yes	64	16	1
714	OPH_ZONE4_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	Yes	Yes	Yes	Yes	64	16	1
715	OPH_ZONE5_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	Yes	Yes	Yes	No	64	16	1
716	OPH_ZONE6_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	Yes	Yes	Yes	No	64	16	1
720	CSS_STACK_STAT	Stack monitoring word. High byte is the position of the return stack, low byte is the position of the parameter stack.	Yes	Yes	Yes	Yes	64	16	0
721	E_PRT_AMP_OFF	PRT Amplifier Offset	Yes	Yes	Yes	No	64	16	10
722	E_PRT_0_P	PRT 0 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
723	E_PRT_1_P	PRT 1 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
724	E_PRT_2_P	PRT 2 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
725	E_PRT_3_P	PRT 3 positive reading, EDAQ	Yes	No	Yes	No	64	16	7

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
726	E_PRT_4_P	PRT 4 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
727	E_PRT_5_P	PRT 5 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
728	E_PRT_6_P	PRT 6 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
729	E_PRT_7_P	PRT 7 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
730	E_REF_379_OHM	379 ohm REFERENCE, EDAQ	Yes	Yes	Yes	No	64	16	10
731	E_REF_619_OHM	379 ohm REFERENCE, EDAQ	Yes	Yes	Yes	No	64	16	10
732	E_PRT_0_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
733	E_PRT_1_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
734	E_PRT_2_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
735	E_PRT_3_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
736	E_PRT_4_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
737	E_PRT_5_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
738	E_PRT_6_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
739	E_PRT_7_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
740	E_REF_234_UAMP	193 microamp reference , EDAQ	Yes	Yes	Yes	No	64	16	10
741	E_AD590_AMP_OFF	AD590 Amplifier Offset, EDAQ	Yes	Yes	Yes	No	64	16	10
742	SSH_DOOR_TMP	SSH Door Temp, EDAQ AD590 Row 0, col 6	Yes	Yes	Yes	No	64	16	8
743	E_REF_352_UAMP	352 microamp reference, EDAQ	Yes	Yes	Yes	No	64	16	10
744	SPU_MNT_TMP	SPU Mounting Temp, EDAQ AD590 Row 5, col 2	Yes	Yes	Yes	No	64	16	8
745	E_PSS_GND_O	PSS Ground Offset, EDAQ	Yes	Yes	Yes	No	64	16	10
746	E_ADC_OFFSET	ADC Offset, EDAQ	Yes	Yes	Yes	No	64	16	10
747	E_REF_7P664_V	8.066 Volt Reference, EDAQ	Yes	Yes	Yes	No	64	16	10
748	SPARE_00D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
749	PSS_SPU_P15VATMP	Temperature of +15V SPU PS A	Yes	Yes	Yes	No	64	16	5
750	PSS_SPU_P15VBTMP	Temperature of +15V SPU PS B	Yes	Yes	Yes	No	64	16	5
751	PSS_SPU_N15VATMP	Temperature of -15V SPU PS A	Yes	Yes	Yes	No	64	16	5
752	PSS_SPU_N15VBTMP	Temperature of -15V SPU PS B	Yes	Yes	Yes	No	64	16	5
753	PSS_QAP_RLY_TMP	+28QA primary N/L relay coil temperature	Yes	Yes	Yes	No	64	16	5
754	PSS_QBP_RLY_TMP	+28QB redundant N/L relay coil temperature	Yes	Yes	Yes	No	64	16	5
755	PSS_QAR_RLY_TMP	+28QB primary N/L relay coil temperature	Yes	Yes	Yes	No	64	16	5

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
756	PSS_QBR_RLY_TMP	+28QB redundant N/L relay coil temperature	Yes	Yes	Yes	No	64	16	5
757	SPARE_09D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
758	SPARE_10D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
759	SPARE_11D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
760	SPARE_12D	Spare Tlm Channel	Yes	Yes	Yes	No	64	32	0
763	SPARE_15D	Spare Tlm Channel	Yes	Yes	Yes	No	64	32	0
764	SPARE_01D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
765	SPARE_02D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
766	SPARE_03D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
767	SPARE_04D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
768	SPARE_05D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
769	SPARE_06D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
770	SPARE_07D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
771	SPARE_08D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
772	SPARE_13D	Spare Tlm Channel	Yes	Yes	Yes	No	64	32	0
773	SPARE_14D	Spare Tlm Channel	Yes	Yes	Yes	No	64	32	0
774	ISU_RAM_ADDRESS	Address in RAM	No	No	No	No	8	32	3
775	ISU_RAM_SIZE	Size of the RAM	No	No	No	No	8	32	3
776	ISU_MBICA_START	Start address for the MBIC side A	No	No	No	No	8	32	3
777	ISU_MBICA_END	End address for the MBIC side A	No	No	No	No	8	32	3
778	ISU_MBICB_START	Start address for the MBIC side B	No	No	No	No	8	32	3
779	ISU_MBICB_END	End address for the MBIC side B	No	No	No	No	8	32	3
780	ISU_MBIC_ERROR	MBIC error with MBICA alive = 0x8000, MBICB alive = 0x4000	No	No	No	No	8	16	3
781	ISU_SECT	Which EEPROM section info follows, 0-15 >16 means stale info	No	No	No	No	8	16	3
782	ISU_SECT_FLAGS	EEPROM section flags word	No	No	No	No	8	32	3
783	ISU_SECT_CHKSUM	EEPROM section checksum word	No	No	No	No	8	32	3
784	ISU_SECT_START	EEPROM section start address	No	No	No	No	8	32	3
785	ISU_SECT_LENGTH	EEPROM section length in 32 bit words	No	No	No	No	8	32	3
786	SCI_ELVARS_POS	Elevation Secondary variable-readhead position (GROUND USE ONLY)	No	No	No	No	64	32	2
787	SCI_EL2S_POS	Elevation Secondary readhead 2 position (GROUND USE ONLY)	No	No	No	No	64	32	2

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
788	SCI_AZS_POS	Azimuth Secondary readhead position (GROUND USE ONLY)	No	No	No	No	64	32	2
789	HK_ELVARS_POS	Filtered Secondary El Var data sample	No	No	Yes	Yes	64	32	0
790	HK_EL2S_POS	Filtered Secondary Elevation 2 data sample	No	No	Yes	Yes	64	32	0
791	HK_AZS_POS	Filtered Secondary Azimuth data sample	No	No	Yes	Yes	64	32	0
792	TSW_EL1P_OFFSET	Encoder offset value (32 bits) for Elevation 1 Primary	Yes	No	Yes	No	64	32	0
793	TSW_EL2P_OFFSET	Encoder offset value (32 bits) for Elevation 2 Primary	Yes	No	Yes	No	64	32	0
794	TSW_AZP_OFFSET	Encoder offset value (32 bits) for Azimuth Primary	Yes	No	Yes	No	64	32	0
795	TSW_EL1S_OFFSET	Encoder offset value (32 bits) for Elevation 1 Secondary	Yes	No	Yes	No	64	32	0
796	TSW_EL2S_OFFSET	Encoder offset value (32 bits) for Elevation 2 Secondary	Yes	No	Yes	No	64	32	0
797	TSW_AZS_OFFSET	Encoder offset value (32 bits) for Azimuth Secondary	Yes	No	Yes	No	64	32	0
798	TSW_EEACNFG	EEA configuration word	Yes	Yes	Yes	Yes	64	16	1
799	TSW_HK_PKT_CNT	TSW HK Packet Counter	Yes	Yes	Yes	Yes	64	16	1
800	TSW_SCI_PKT_CNT	TSW SCI Packet Counter	Yes	No	Yes	Yes	64	16	1
801	TSW_TLM_ID	TSS telemetry ID (51)	Yes	No	Yes	No	64	16	1
802	TSS_TLM_PKT_CNT	Packet count, on TSS on tlm Channel	Yes	Yes	Yes	Yes	64	8	1
803	TSS_TLM_LEN_CNT	Packet Length Error count, on TSS on tlm Channel	Yes	No	Yes	No	64	8	1
804	TSS_TLM_NOPKT_C	No Packet count, on TSS on tlm Channel	Yes	Yes	Yes	Yes	64	8	1
806	TSB_DIAG_CHKSM_C	Ckecksum Error count, on TSU DIAG block	Yes	No	Yes	Yes	64	16	1
807	TSB_HK_CHKSM_CN	Ckecksum Error count, on TSU HK block	Yes	No	Yes	Yes	64	16	1
808	TSU_HK_PKT_CNT	TEU SUROM - HK packet counter	Yes	No	Yes	Yes	64	16	1
809	TSU_DIAG_PKT_CNT	TEU SUROM - DIAG packet counter	Yes	No	Yes	Yes	64	16	1
810	TSU_TLM_ID	TEU SUROM - telemetry ID (20 for HK only, 19 for HK plus Diag)	Yes	No	Yes	No	64	16	1
811	SAIL_ERR_LTASK	which SAIL task had the last error	Yes	Yes	Yes	Yes	64	8	1
812	SAIL_ERR_LTYP	SAIL last error type	Yes	Yes	Yes	Yes	64	8	1
813	SAIL_ERR_LLOC	SAIL last error location	Yes	Yes	Yes	Yes	64	16	1
814	SAIL_ERR_CTASK	which SAIL task had the current error	Yes	Yes	Yes	Yes	64	8	1
815	SAIL_ERR_CTYP	SAIL current error type	Yes	Yes	Yes	Yes	64	8	1
816	SAIL_ERR_CLOC	SAIL current error location	Yes	Yes	Yes	Yes	64	16	1
817	TLM_DIAG_STAT	Diagnostic format status word	Yes	Yes	Yes	Yes	64	16	1
818	TSW_EL1P_INDEX	Elevation 1 Primary index value	Yes	Yes	Yes	No	64	16	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
819	TSW_EL2P_INDEX	Elevation 2 Primary index va	Yes	Yes	Yes	No	64	16	1
820	TSW_AZP_INDEX	Azimuth Primary index val	Yes	Yes	Yes	No	64	16	1
821	TSW_EL1S_INDEX	Elevation 1 Secondary index value	Yes	Yes	Yes	No	64	16	1
822	TSW_EL2S_INDEX	Elevation 2 Secondary index value	Yes	Yes	Yes	No	64	16	1
823	TSW_AZS_INDEX	Azimuth Secondary index value	Yes	Yes	Yes	No	64	16	1
824	TSS_APP_CHKSM_C	TSS App code telemetry packet checksum error count	Yes	Yes	Yes	No	64	8	1
825	TSW_TABLEN	Number of lines in the current table	Yes	Yes	Yes	Yes	64	16	1
826	TSB_BOOT_STAT_1	Combined IPU states for the TSB (see subtmi)	Yes	No	Yes	Yes	64	16	1
827	TSB_BOOT_STAT_2	Combined IPU load info for the TSB (see subtmi)	Yes	No	Yes	Yes	64	16	1
828	TSB_BOOT_STAT_3	Combined IPU cmd and index info for the TSB (see subtmi)	Yes	No	Yes	Yes	64	16	1
829	TSB_BOOT_STAT_4	Combined IPU MBIC and override info for the TSB (see subtmi)	Yes	No	Yes	Yes	64	32	1
830	TSB_EE_TABLE	Subcommed EEPROM table entry (subcom index TSB_EE_TBL_INDEX)	Yes	No	Yes	No	64	32	1
831	TSB_ADDR_OFF	IPU address offset for the TSB	Yes	No	Yes	No	64	32	1
832	ISU_SECT_BOOT	EEPROM section boot address	No	No	No	No	64	32	3
833	ISU_FLAG_BITS		No	No	No	No	64	16	3
834	SAIL_SHM_264	SAIL shared memory [264]	Yes	Yes	Yes	Yes	64	32	1
835	SAIL_SHM_265	SAIL shared memory [265]	Yes	Yes	Yes	Yes	64	32	1
836	SAIL_SHM_266	SAIL shared memory [266]	Yes	Yes	Yes	Yes	64	32	1
837	SAIL_SHM_267	SAIL shared memory [267]	Yes	Yes	Yes	Yes	64	32	1
838	SAIL_SHM_268	SAIL shared memory [268]	Yes	Yes	Yes	Yes	64	32	1
839	SAIL_SHM_269	SAIL shared memory [269]	Yes	Yes	Yes	Yes	64	32	1
840	SAIL_SHM_270	SAIL shared memory [270]	Yes	Yes	Yes	Yes	64	32	1
841	SAIL_SHM_271	SAIL shared memory [271]	Yes	Yes	Yes	Yes	64	32	1
842	PRF_SAIL_EXEC	SAIL executive execution profile	Yes	No	Yes	No	64	8	5
843	PRF_SAIL_TLM	SAIL executive telemetry execution profile	Yes	No	Yes	No	64	8	5
844	EDAC_DBL_ERR_C	RAM double bit error counter	Yes	Yes	Yes	No	64	8	5
845	EDAC_SGL_ERR_C	RAM single bit error counter	Yes	Yes	Yes	No	64	8	5
848	IPU_ERR_5	IPU status word 5	Yes	Yes	Yes	Yes	64	16	5
849	DISPL1_OTSP	CSS displacer 1 over-temperature set point	Yes	Yes	Yes	Yes	64	16	5
850	GYR0_OTSP	GYRO 0 over-temp set point	Yes	Yes	Yes	Yes	64	16	5

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
851	GYR1_OTSP	GYRO 1 over-temp set point	Yes	Yes	Yes	Yes	64	16	5
852	GYR2_OTSP	GYRO 2 over-temp set point	Yes	Yes	Yes	Yes	64	16	5
853	GYR3_OTSP	GYRO 3 over-temp set point	Yes	Yes	Yes	Yes	64	16	5
854	SSH_DORMOT_OTSP	Sunshield door motor over-temperature set point	Yes	Yes	Yes	Yes	64	16	5
855	SSH_HWA_OTSP	Hot Wax Actuator over-temperature set point	Yes	Yes	Yes	Yes	64	16	5
856	SVA_DORMOT_OTSP	SVA door motor over-temperature set point	Yes	Yes	Yes	Yes	64	16	5
857	CHOP_MOT_OTSP	Chopper motor over-temperature set point	Yes	Yes	Yes	Yes	64	16	5
858	DISPL2_OTSP	CSS displacer 2 over-temperature set point	Yes	Yes	Yes	Yes	64	16	5
859	COMP_HEAD_OTSP	CSS compressor head over-temperature set point	Yes	Yes	Yes	Yes	64	16	5
860	SCI_ELVARP_STAT	Elevation Primary VAR status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)	No	No	No	No	64	8	5
861	SCI_EL2P_STAT	Elevation Primary readhead 2 status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)	No	No	No	No	64	8	5
862	SCI_AZP_STAT	Azimuth Primary readhead status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)	No	No	No	No	64	8	5
863	SCI_ELVARS_STAT	Elevation Secondary VAR status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)	No	No	No	No	64	8	5
864	SCI_EL2S_STAT	Elevation Secondary readhead 2 status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)	No	No	No	No	64	8	5
865	SCI_AZS_STAT	Azimuth Secondary readhead status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)	No	No	No	No	64	8	5
866	IPU_ALIVE	TMON keep-alive and eng tlm sub-com counter	Yes	Yes	Yes	Yes	64	16	1
867	TSW_FAULT_STAT	Fault status information for TSW	Yes	Yes	Yes	Yes	64	16	1
868	TSW_MEM_SCRUB	Single bit error count	Yes	Yes	Yes	No	64	16	1
869	TSW_SCI_AZPO_CMD	TSW commanded Az position	Yes	Yes	Yes	Yes	64	16	1
870	TSW_SCI_ELPO_CMD	TSW commanded El position	Yes	Yes	Yes	Yes	64	16	1
872	TSW_MIN_SSTIME	Min number of microsec between successive SS within a MAF	Yes	Yes	Yes	No	64	16	1
873	TSW_MAX_SSTIME	Max number of microsec between successive SS within a MAF	Yes	Yes	Yes	No	64	16	1
874	TSW_DUMP_ADDR	Dump address	No	No	Yes	No	64	32	1
875	TSW_CR_SYNC_STAT	Chopper rotation sync status	Yes	Yes	Yes	Yes	64	16	1
876	CSS_PACKED_PID	Packed CSS P, I and D coefficients	Yes	Yes	Yes	Yes	64	16	1
877	MACRO_STAT	Status for macro CSC	Yes	Yes	Yes	Yes	64	32	1
878	MACRO_PARM	Macro command parameters	Yes	Yes	Yes	Yes	64	32	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
879	SCI_HKTBL_ERR	Error flags for science HK table	Yes	Yes	Yes	No	64	16	1
880	ENG_HKTBL_ERR	Error flags for engineering HK table	Yes	No	Yes	No	64	16	1
882	PRF_CR2CR_MAX	Max time between chopper rotation interrupts (for IPU) in micro-sec	Yes	Yes	Yes	No	64	16	1
883	PRF_CR2CR_MIN	Min time between chopper rotation interrupts (for IPU) in micro-sec	Yes	Yes	Yes	No	64	16	1
884	ISU_EXCEPTION	Address causing exception (if nonzero, should be normally be zero)	No	No	No	No	64	16	3
885	SPU_PHASE_ERR_C	SPU phase error counters	Yes	Yes	Yes	Yes	64	16	1
886	TSS_DMA_ERR_C	DMA Parity , Framing, HW Programming and phase error counters	Yes	Yes	Yes	No	64	16	1
887	PRF_FAULTMON	Execution Profile for Fault management, 1 LSB = 50 usec	Yes	No	Yes	No	64	8	1
888	PRF_MACRO_TLM	Execution Profile for Macro system, 1 LSB = 50 usec	Yes	No	Yes	No	64	8	1
889	PRF_EXEC_DELAY	Execution delay from system tick pulse to start of executive, 1 LSB = 10 usec	Yes	Yes	Yes	No	64	8	1
890	AZ_HSG_TMP_2	Azimuth housing temp 2, EDAQ AD590 Row 1 Col 0	Yes	Yes	Yes	Yes	64	16	8
891	AD590_ROW3_COL2	Spare temp, EDAQ AD590 Row 3 Col 2	No	No	Yes	No	64	16	8
892	TSW_CTL_ERR_AZ	SM AZ control error (meas - cmd) (0.01 urad/count)	Yes	Yes	Yes	Yes	64	16	1
893	TSW_CTL_ERR_EL	SM EL control error (meas - cmd) (0.01 urad/count)	Yes	Yes	Yes	Yes	64	16	1
894	TSW_EXCEPTION	Exception status for TEU flight software	Yes	Yes	Yes	No	64	32	1
895	IPU_EXCEPTION	Exception status for IPU flight software	Yes	Yes	Yes	No	64	32	1
896	IPU_FAULT_AVG	Running average (temperature) for over temperature faults	No	No	No	No	64	16	1
898	SAILCMST_0_15	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
899	SAILCMST_16_31	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
900	SAILCMST_32_47	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
901	SAILCMST_48_63	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
902	SAILCMST_64_79	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
903	SAILCMST_80_95	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
904	SAILCMST_96_111	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
905	SAILCMST_112_127	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
906	TSW_EL1C_POS	Copy of TSW_EL1X_POS data based on which EEA (primary or secondary) is selected for control	No	No	No	No	64	32	1
907	TSW_EL2C_POS	Copy of TSW_EL2X_POS data based on which EEA (primary or secondary) is selected for control	No	No	No	No	64	32	1
908	TSW_AZC_POS	Copy of TSW_AZX_POS data based on which EEA (primary or secondary) is selected for control	No	No	No	No	64	32	1
909	TLM_TSS_AZOFFSET	Azimuth telemetry offset; value in telemetry which corresponds to zero	Yes	Yes	Yes	No	64	32	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
910	TLM_TSS_ELOFFSET	Elevation telemetry offset; value in telemetry which corresponds to zero	Yes	Yes	Yes	No	64	32	1
911	TLM_TSS_WXOFFSET	WobX telemetry offset; value in telemetry which corresponds to zero	Yes	No	Yes	No	64	32	1
912	TLM_TSS_WYOFFSET	WobY telemetry offset; value in telemetry which corresponds to zero	Yes	No	Yes	No	64	32	1
913	TLM_ACTIVE_SCIHK	Identifies active science HK format table	No	No	Yes	Yes	64	16	1
914	TSW_DMA_R_ERR_C	Counters for 4 errors	Yes	Yes	Yes	No	64	16	1
915	TSW_QHSS_ERR_C	Counters for 4 errors	Yes	Yes	Yes	No	64	16	1
916	HIRDLS_CLK_LSW	HIRDLS time Least Significant Word (GROUND USE ONLY)	No	No	No	No	64	32	1
917	HIRDLS_CLK_MSW	HIRDLS time Most Significant Word (GROUND USE ONLY)	No	No	No	No	64	32	1
918	EXEC_STACK_MRGN	Number of bytes left on the Executive stack before overrunning stack end, 0xffff if Executive task name missing	Yes	Yes	Yes	No	64	16	1
919	SAIL_STACK_MRGN	Number of bytes left on the SAIL stack before overrunning stack end, 0xffff if SAIL task name missing	Yes	Yes	Yes	No	64	16	1
920	EDAQ_LIST_ERR_C	Count of EDAQ list refresh errors	Yes	No	Yes	No	64	16	1
921	EDAQ_LIST_STAT	Status of which lists have errors	Yes	No	Yes	No	64	16	1
922	EDAQ_LIST_ERR_W	Value of last list/word which had error	Yes	No	Yes	No	64	16	1
923	SCI_FMT_BLK_ENA	Science format block enabled status	No	No	Yes	Yes	64	16	1
924	RAD_CHAN_ENA	Science format radiance channel enabled status (bit 0=chan 1, ..., bit 20=chan 21)	No	No	Yes	Yes	64	32	1
925	EDAQ_CR_PHASE	CR within MiF at which gather 0 convert 1	Yes	No	Yes	No	64	8	1
926	MACRO_EXECUTING	Number of the currently executing macro, or 255 if no macro currently executing	Yes	Yes	Yes	No	64	8	1
927	RAD_DEMOD_TBL_I	Demodulation table ID (default = 0)	Yes	Yes	Yes	Yes	64	8	1
928	PCU_SUBSTAT_0	PCU subsystem status word 0	No	No	Yes	Yes	64	16	1
929	PCU_SUBSTAT_1	PCU subsystem status word 1	No	No	Yes	Yes	64	16	1
930	PCU_SUBSTAT_2	PCU subsystem status word 2	No	No	Yes	Yes	64	16	1
931	TP_IPU_TEMP_A	Passive Temp Ch0 (GROUND USE ONLY)	No	No	No	No	64	16	2
932	TP_PCU_TEMP_A	Passive Temp Ch1 (GROUND USE ONLY)	No	No	No	No	64	16	2
933	TP_CMPRSR_TMP_A	Passive Temp Ch2 (GROUND USE ONLY)	No	No	No	No	64	16	2
934	TP_CCU_TEMP_A	Passive Temp Ch3 (GROUND USE ONLY)	No	No	No	No	64	16	2
935	TP_TEU_TEMP_A	Passive Temp Ch4 (GROUND USE ONLY)	No	No	No	No	64	16	2
936	TP_SMA_MNT_TMP_	Passive Temp Ch5 (GROUND USE ONLY)	No	No	No	No	64	16	2
937	TP_IFC_BB_TMP_A	Passive Temp Ch6 (GROUND USE ONLY)	No	No	No	No	64	16	2
938	TP_BEU_TEMP_A	Passive Temp Ch7 (GROUND USE ONLY)	No	No	No	No	64	16	2

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
939	TP_IPU_TEMP_B	Passive Temp Ch8 (GROUND USE ONLY)	No	No	No	No	64	16	2
940	TP_PCU_TEMP_B	Passive Temp Ch9 (GROUND USE ONLY)	No	No	No	No	64	16	2
941	TP_CMPRSR_TMP_B	Passive Temp Ch10 (GROUND USE ONLY)	No	No	No	No	64	16	2
942	TP_CCU_TEMP_B	Passive Temp Ch11 (GROUND USE ONLY)	No	No	No	No	64	16	2
943	TP_TEU_TEMP_B	Passive Temp Ch12 (GROUND USE ONLY)	No	No	No	No	64	16	2
944	TP_SMA_MNT_TMP_	Passive Temp Ch13 (GROUND USE ONLY)	No	No	No	No	64	16	2
945	TP_IFC_BB_TMP_B	Passive Temp Ch14 (GROUND USE ONLY)	No	No	No	No	64	16	2
946	TP_BEU_TEMP_B	Passive Temp Ch15 (GROUND USE ONLY)	No	No	No	No	64	16	2

HIRDLS Telemetry

(Sort by Mnemonic)

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
891	AD590_ROW3_COL2	Spare temp, EDAQ AD590 Row 3 Col 2	No	No	Yes	No	64	16	8
138	AZ_HSG_TMP_1	Azimuth housing temp 1, EDAQ AD590 Row 2 Col 2	Yes	Yes	Yes	No	64	16	8
890	AZ_HSG_TMP_2	Azimuth housing temp 2, EDAQ AD590 Row 1 Col 0	Yes	Yes	Yes	Yes	64	16	8
459	BEU_BOX_TMP	BEU box EDAQ AD590 Row 4 Col 2	Yes	Yes	Yes	Yes	64	16	8
460	BEU_MNT_TMP	BEU box mount EDAQ AD590 Row 1 Col 4	Yes	Yes	Yes	No	64	16	8
150	CALMIR_TMP1	Cal. Mirror temp #1, EDAQ ADC590 Row 0 Col 1	Yes	Yes	Yes	Yes	64	16	8
151	CALMIR_TMP2	Cal. Mirror temp #2, EDAQ ADC590 Row 1 Col 2	Yes	Yes	Yes	No	64	16	8
152	CALMIR_TMP3	Cal. Mirror temp #3, EDAQ Derived PRT 4	Yes	Yes	Yes	No	64	16	6
37	CCU_BOX_TMP	CCU box temp, EDAQ AD590 Row 4 Col 7	Yes	Yes	Yes	Yes	64	16	8
458	CHOP_FREQ	Chopper frequency setting	Yes	Yes	Yes	Yes	64	16	1
148	CHOP_HSG_TMP2	Field Stop #1 temp, EDAQ AD590 Row 3 Col 4	Yes	Yes	Yes	No	64	16	8
149	CHOP_HSG_TMP3	Chopper blade shroud temp, EDAQ Derived PRT 2	Yes	Yes	Yes	No	64	16	6
857	CHOP_MOT_OTSP	Chopper motor over-temperature set point	Yes	Yes	Yes	Yes	64	16	5
147	CHOP_MOT_TMP	Chopper motor temp, EDAQ AD590 Row 5 Col 3	Yes	Yes	Yes	Yes	64	16	8
512	CMD_DB_BUILD_ID	Command Database Build Version ID	Yes	Yes	Yes	Yes	64	8	1
389	CMD_ERR_0	Command Error Flags	Yes	Yes	Yes	Yes	64	16	1
656	CMDRES_DB_BLD_ID	Command Results Database Build Version ID	Yes	Yes	Yes	No	64	8	0
339	COMP_AMP_ACT	Compressor ampl (actual)	Yes	Yes	Yes	Yes	64	16	14
338	COMP_AMP_DMD	Compressor ampl (dmd'd)	Yes	Yes	Yes	Yes	64	16	14
859	COMP_HEAD_OTSP	CSS compressor head over-temperature set point	Yes	Yes	Yes	Yes	64	16	5
44	COMP_HEAD_TMP	Compressor head temp, EDAQ AD590 Row 5 Col 5	Yes	Yes	Yes	Yes	64	16	8
331	CRYOTIP_SETP	Cryo tip temp set point	Yes	Yes	Yes	Yes	64	16	14
332	CRYOTIP_TMP_D0	Cryo tip temperature 0	Yes	Yes	Yes	Yes	64	16	14
333	CRYOTIP_TMP_D1	Cryo tip temperature 1	Yes	Yes	Yes	Yes	64	16	14
343	CSS_CSCI_BLD_ID	Cooler F/W Build Version ID	Yes	Yes	Yes	No	64	16	14
328	CSS_DDCAG_STAT	Cooler DDC & caging status discretes (Read by IPU)	Yes	Yes	Yes	Yes	64	8	14
329	CSS_ERROR	Cooler error flags	Yes	Yes	Yes	Yes	64	8	14

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
335	CSS_FREQ_ACT	Cooler frequency (actual)	Yes	Yes	Yes	Yes	64	16	14
334	CSS_FREQ_DMD	Cooler frequency (dmd'd)	Yes	Yes	Yes	Yes	64	16	14
342	CSS_MSG_NUMBER	CSS-IPS data msg number	Yes	Yes	Yes	Yes	64	8	14
327	CSS_OP_STAT	Cooler operating status	Yes	Yes	Yes	Yes	64	8	14
876	CSS_PACKED_PID	Packed CSS P, I and D coefficients	Yes	Yes	Yes	Yes	64	16	1
337	CSS_PH_ACT	Comp/Disp phase (actual)	Yes	Yes	Yes	Yes	64	16	14
336	CSS_PH_DMD	Comp/Disp phase (dmd'd)	Yes	Yes	Yes	Yes	64	16	14
42	CSS_RAD_TMP1	Cooler Radiator temp 1, EDAQ AD590 Row 3 Col 5	Yes	Yes	Yes	Yes	64	16	8
43	CSS_RAD_TMP2	Cooler Radiator temp 2, EDAQ AD590 Row 4 Col 6	Yes	Yes	Yes	No	64	16	8
720	CSS_STACK_STAT	Stack monitoring word. High byte is the position of the return stack, low byte is the position of the parameter stack.	Yes	Yes	Yes	Yes	64	16	0
330	CSS_TOTAL_I	Cooler tot mean currt	Yes	Yes	Yes	Yes	64	8	14
341	DISP_AMP_ACT	Displacer ampl (actual)	Yes	Yes	Yes	Yes	64	16	14
340	DISP_AMP_DMD	Displacer ampl (dmd'd)	Yes	Yes	Yes	Yes	64	16	14
849	DISPL1_OTSP	CSS displacer 1 over-temperature set point	Yes	Yes	Yes	Yes	64	16	5
45	DISPL1_TMP	Displacer 1 body temp, EDAQ AD590 Row 6 Col 6	Yes	Yes	Yes	Yes	64	16	8
858	DISPL2_OTSP	CSS displacer 2 over-temperature set point	Yes	Yes	Yes	Yes	64	16	5
46	DISPL2_TMP	Displacer 2 body temp, EDAQ AD590 Row 5 Col 5	Yes	Yes	Yes	Yes	64	16	8
50	DOOR_POT	Door angle sensor, EDAQ	Yes	Yes	Yes	Yes	64	16	9
51	DOOR_SAF_ANG	Door Safe Angle setting	Yes	Yes	Yes	Yes	64	16	1
741	E_AD590_AMP_OFF	AD590 Amplifier Offset, EDAQ	Yes	Yes	Yes	No	64	16	10
746	E_ADC_OFFSET	ADC Offset, EDAQ	Yes	Yes	Yes	No	64	16	10
732	E_PRT_0_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
722	E_PRT_0_P	PRT 0 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
733	E_PRT_1_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
723	E_PRT_1_P	PRT 1 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
734	E_PRT_2_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
724	E_PRT_2_P	PRT 2 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
735	E_PRT_3_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
725	E_PRT_3_P	PRT 3 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
736	E_PRT_4_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
726	E_PRT_4_P	PRT 4 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
737	E_PRT_5_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
727	E_PRT_5_P	PRT 5 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
738	E_PRT_6_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
728	E_PRT_6_P	PRT 6 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
739	E_PRT_7_N	PRT 0 negative reading, EDAQ	Yes	No	Yes	No	64	16	7
729	E_PRT_7_P	PRT 7 positive reading, EDAQ	Yes	No	Yes	No	64	16	7
721	E_PRT_AMP_OFF	PRT Amplifier Offset	Yes	Yes	Yes	No	64	16	10
745	E_PSS_GND_O	PSS Ground Offset, EDAQ	Yes	Yes	Yes	No	64	16	10
740	E_REF_234_UAMP	193 microamp reference , EDAQ	Yes	Yes	Yes	No	64	16	10
743	E_REF_352_UAMP	352 microamp reference, EDAQ	Yes	Yes	Yes	No	64	16	10
730	E_REF_379_OHM	379 ohm REFERENCE, EDAQ	Yes	Yes	Yes	No	64	16	10
731	E_REF_619_OHM	379 ohm REFERENCE, EDAQ	Yes	Yes	Yes	No	64	16	10
747	E_REF_7P664_V	8.066 Volt Reference, EDAQ	Yes	Yes	Yes	No	64	16	10
844	EDAC_DBL_ERR_C	RAM double bit error counter	Yes	Yes	Yes	No	64	8	5
845	EDAC_SGL_ERR_C	RAM single bit error counter	Yes	Yes	Yes	No	64	8	5
925	EDAQ_CR_PHASE	CR within MiF at which gather 0 convert 1	Yes	No	Yes	No	64	8	1
920	EDAQ_LIST_ERR_C	Count of EDAQ list refresh errors	Yes	No	Yes	No	64	16	1
922	EDAQ_LIST_ERR_W	Value of last list/word which had error	Yes	No	Yes	No	64	16	1
921	EDAQ_LIST_STAT	Status of which lists have errors	Yes	No	Yes	No	64	16	1
40	EEA_BOX_TMP	EEA box temp, EDAQ AD590 Row 4 Col 1	Yes	Yes	Yes	Yes	64	16	8
465	EEA_MNT_TMP	EEA box mount EDAQ AD590 Row 3 Col 0	Yes	Yes	Yes	No	64	16	8
466	ELMOT1_TMP1	Elev motor 1 temp 1, EDAQ AD590 Row 2 Col 1	Yes	Yes	Yes	No	64	16	8
468	ELMOT2_TMP1	Elev motor 2 temp 1, EDAQ AD590 Row 2 Col 0	Yes	Yes	Yes	No	64	16	8
880	ENG_HKTBL_ERR	Error flags for engineering HK table	Yes	No	Yes	No	64	16	1
395	EXEC_OVERRUN_CN	CR-executive task overrun count	Yes	Yes	Yes	Yes	64	16	1
918	EXEC_STACK_MRGN	Number of bytes left on the Executive stack before overrunning stack end, 0xffff if Executive task name missing	Yes	Yes	Yes	No	64	16	1
403	FIR1_TBL_ID	FIR coeffts table ID (1/CR rate)	Yes	Yes	Yes	Yes	64	8	1
404	FIR2_TBL_ID	FIR coeffts table ID (2/CR rate)	Yes	Yes	Yes	Yes	64	8	1
405	FIR3_TBL_ID	FIR coeffts table ID (3/CR rate)	Yes	Yes	Yes	Yes	64	8	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
406	FIR6_TBL_ID	FIR coeffts table ID (6/CR rate)	Yes	Yes	Yes	Yes	64	8	1
163	FPA_TMP_A	Focal Plane temperature A, SPU	Yes	Yes	Yes	Yes	8	16	13
164	FPA_TMP_B	Focal Plane temperature B,SPU	Yes	Yes	Yes	Yes	8	16	13
267	FRAMECNT	Minor frame count (GROUND USE ONLY)	No	No	No	No	8	32	2
38	GEU_BOX_TMP	GEU box temp, EDAQ AD590 Row 4 Col 0	Yes	Yes	Yes	Yes	64	16	8
161	GMU_HSG_TMP	GMU Housing temp., EDAQ 54	Yes	Yes	Yes	No	64	16	8
160	GMU_MNT_TMP	GMU Mount temp., EDAQ 43	Yes	Yes	Yes	No	64	16	8
659	GSS_SIO_BUSY_CNT	Count of IPU GSS(SIO) telemetry overruns	Yes	Yes	Yes	No	64	8	0
69	GYR0_ADAT	Gyro 0 angle data (GROUND USE ONLY)	No	No	No	No	1	16	2
65	GYR0_BD_TMP	Gyro 0 board temp	Yes	Yes	Yes	No	64	16	0
77	GYR0_CAPL	Gyro 0 cap loop output	Yes	Yes	Yes	No	64	16	0
672	GYR0_HTR_W	Gyro 0 heater watts (mean)	Yes	Yes	Yes	Yes	64	16	0
85	GYR0_MOT_I	Gyro 0 motor current	Yes	Yes	Yes	Yes	64	16	0
81	GYR0_MOT_V	Gyro 0 motor volts	Yes	Yes	Yes	Yes	64	16	0
97	GYR0_N15V	Gyro 0 -15 volts	Yes	Yes	Yes	Yes	64	16	0
850	GYR0_OTSP	GYRO 0 over-temp set point	Yes	Yes	Yes	Yes	64	16	5
93	GYR0_P15V	Gyro 0 +15 volts	Yes	Yes	Yes	Yes	64	16	0
89	GYR0_STAT	Gyro 0 status word	Yes	Yes	Yes	Yes	64	16	0
61	GYR0_TMP	Gyro 0 temperature	Yes	Yes	Yes	Yes	64	16	0
70	GYR1_ADAT	Gyro 1 angle data (GROUND USE ONLY)	No	No	No	No	1	16	2
66	GYR1_BD_TMP	Gyro 1 board temp	Yes	Yes	Yes	No	64	16	0
78	GYR1_CAPL	Gyro 1 cap loop output	Yes	Yes	Yes	No	64	16	0
673	GYR1_HTR_W	Gyro 1 heater watts (mean)	Yes	Yes	Yes	Yes	64	16	0
86	GYR1_MOT_I	Gyro 1 motor current	Yes	Yes	Yes	Yes	64	16	0
82	GYR1_MOT_V	Gyro 1 motor volts	Yes	Yes	Yes	Yes	64	16	0
98	GYR1_N15V	Gyro 1 -15 volts	Yes	Yes	Yes	Yes	64	16	0
851	GYR1_OTSP	GYRO 1 over-temp set point	Yes	Yes	Yes	Yes	64	16	5
94	GYR1_P15V	Gyro 1 +15 volts	Yes	Yes	Yes	Yes	64	16	0
90	GYR1_STAT	Gyro 1 status word	Yes	Yes	Yes	Yes	64	16	0
62	GYR1_TMP	Gyro 1 temperature	Yes	Yes	Yes	Yes	64	16	0

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
71	GYR2_ADAT	Gyro 2 angle data (GROUND USE ONLY)	No	No	No	No	1	16	2
67	GYR2_BD_TMP	Gyro 2 board temp	Yes	Yes	Yes	No	64	16	0
79	GYR2_CAPL	Gyro 2 cap loop output	Yes	Yes	Yes	No	64	16	0
674	GYR2_HTR_W	Gyro 2 heater watts (mean)	Yes	Yes	Yes	Yes	64	16	0
87	GYR2_MOT_I	Gyro 2 motor current	Yes	Yes	Yes	Yes	64	16	0
83	GYR2_MOT_V	Gyro 2 motor volts	Yes	Yes	Yes	Yes	64	16	0
99	GYR2_N15V	Gyro 2 -15 volts	Yes	Yes	Yes	Yes	64	16	0
852	GYR2_OTSP	GYRO 2 over-temp set point	Yes	Yes	Yes	Yes	64	16	5
95	GYR2_P15V	Gyro 2 +15 volts	Yes	Yes	Yes	Yes	64	16	0
91	GYR2_STAT	Gyro 2 status word	Yes	Yes	Yes	Yes	64	16	0
63	GYR2_TMP	Gyro 2 temperature	Yes	Yes	Yes	Yes	64	16	0
72	GYR3_ADAT	Gyro 3 angle data (GROUND USE ONLY)	No	No	No	No	1	16	2
68	GYR3_BD_TMP	Gyro 3 board temp	Yes	Yes	Yes	No	64	16	0
80	GYR3_CAPL	Gyro 3 cap loop output	Yes	Yes	Yes	No	64	16	0
675	GYR3_HTR_W	Gyro 3 heater watts (mean)	Yes	Yes	Yes	Yes	64	16	0
88	GYR3_MOT_I	Gyro 3 motor current	Yes	Yes	Yes	Yes	64	16	0
84	GYR3_MOT_V	Gyro 3 motor volts	Yes	Yes	Yes	Yes	64	16	0
100	GYR3_N15V	Gyro 3 -15 volts	Yes	Yes	Yes	Yes	64	16	0
853	GYR3_OTSP	GYRO 3 over-temp set point	Yes	Yes	Yes	Yes	64	16	5
96	GYR3_P15V	Gyro 3 +15 volts	Yes	Yes	Yes	Yes	64	16	0
92	GYR3_STAT	Gyro 3 status word	Yes	Yes	Yes	Yes	64	16	0
64	GYR3_TMP	Gyro 3 temperature	Yes	Yes	Yes	Yes	64	16	0
251	HIRDLS_CLK_LSB	HIRDLS clock LSBYTES (GROUND USE ONLY)	No	No	No	No	1	16	2
916	HIRDLS_CLK_LSW	HIRDLS time Least Significant Word (GROUND USE ONLY)	No	No	No	No	64	32	1
917	HIRDLS_CLK_MSW	HIRDLS time Most Significant Word (GROUND USE ONLY)	No	No	No	No	64	32	1
588	HIRDLS_TIME_LSW	Bits 0-31 of HIRDLS time	Yes	No	Yes	Yes	64	32	0
589	HIRDLS_TIME_MSW	Bits 32-63 of HIRDLS time	Yes	No	Yes	Yes	64	32	0
587	HK_AZP_POS	Filtered Primary Azimuth data sample	No	No	Yes	Yes	64	32	0
791	HK_AZS_POS	Filtered Secondary Azimuth data sample	No	No	Yes	Yes	64	32	0
586	HK_EL2P_POS	Filtered Primary Elevation 2 data sample	No	No	Yes	Yes	64	32	0

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
790	HK_EL2S_POS	Filtered Secondary Elevation 2 data sample	No	No	Yes	Yes	64	32	0
585	HK_ELVARP_POS	Filtered Primary El Var data sample	No	No	Yes	Yes	64	32	0
789	HK_ELVARS_POS	Filtered Secondary El Var data sample	No	No	Yes	Yes	64	32	0
268	HK_FORMAT_ID	Houskeeping format ID (GROUND USE ONLY)	No	No	No	No	64	16	2
583	HK_SIGDAT02	Filtered Radiance data channel 2, For inclusion in ENG data	No	No	Yes	Yes	64	16	0
584	HK_SIGDAT04	Filtered Radiance data channel 4, For inclusion in ENG data	No	No	Yes	Yes	64	16	0
446	IFC_HCW	IFC Heater Control Word value	Yes	Yes	Yes	Yes	64	8	1
172	IFC_PSV_N15	IFC -15V rail volts	Yes	Yes	Yes	Yes	64	8	12
171	IFC_PSV_P15	IFC +15V rail volts	Yes	Yes	Yes	Yes	64	8	12
170	IFC_PSV_P28	IFC +28V rail volts	Yes	Yes	Yes	No	64	8	12
173	IFC_PSV_P5	IFC +5V rail volts	Yes	Yes	Yes	Yes	64	8	12
166	IFC_REF_TMP	IFC ref. resistor temp	Yes	Yes	Yes	Yes	64	8	12
165	IFCBB_FRPL_TMP	IFCBB front plate temp, EDAQ	Yes	Yes	Yes	Yes	64	16	9
167	IFCBB_TMP1	IFC BB temp. #1	Yes	Yes	Yes	Yes	64	16	12
168	IFCBB_TMP2	IFC BB temp. #2	Yes	Yes	Yes	Yes	64	16	12
169	IFCBB_TMP3	IFC BB temp. #3	Yes	Yes	Yes	Yes	64	16	12
866	IPU_ALIVE	TMON keep-alive and eng tlm sub-com counter	Yes	Yes	Yes	Yes	64	16	1
462	IPU_BOX_TMP	IPU box EDAQ AD590 Row 7 Col 4	Yes	Yes	Yes	Yes	64	16	8
393	IPU_BUILD_DATE	MSbyte year-1900, LSbyte day of year	Yes	No	Yes	No	64	16	0
394	IPU_BUILD_TIME	Minute of day	Yes	No	Yes	No	64	16	0
325	IPU_CSCI_BLD_ID	IPU S/W Build Version ID	Yes	Yes	Yes	Yes	64	16	1
456	IPU_CSS_CMD_CNT	Number of CMD Packets recieved by IPU from the CSS	Yes	Yes	Yes	No	64	8	1
447	IPU_CSS_TLM_CNT	Number of TLM Packets sent by IPU from the CSS	Yes	Yes	Yes	No	64	8	1
388	IPU_ERR_0	IPU Error Flags 0	Yes	Yes	Yes	Yes	64	16	1
390	IPU_ERR_1	IPU Error Flags 1	Yes	Yes	Yes	Yes	64	16	1
391	IPU_ERR_2	IPU Error Flags 2	Yes	Yes	Yes	Yes	64	16	1
445	IPU_ERR_3	IPU ERROR Status Word 3	Yes	Yes	Yes	Yes	64	16	1
660	IPU_ERR_4	IPU Error status	Yes	Yes	Yes	Yes	64	16	1
848	IPU_ERR_5	IPU status word 5	Yes	Yes	Yes	Yes	64	16	5
895	IPU_EXCEPTION	Exception status for IPU flight software	Yes	Yes	Yes	No	64	32	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
896	IPU_FAULT_AVG	Running average (temperature) for over temperature faults	No	No	No	No	64	16	1
397	IPU_FLT_STAT_0	IPU Fault Managmt. Status	Yes	Yes	Yes	Yes	64	16	0
396	IPU_FLT_STAT_1	IPU fault status word 1	Yes	Yes	Yes	Yes	64	16	0
303	IPU_N15V	Wkg IPU -15V supply volts, EDAQ	Yes	Yes	Yes	Yes	64	16	9
302	IPU_P15V	Wkg IPU +15V supply volts, EDAQ	Yes	Yes	Yes	Yes	64	16	9
304	IPU_P3P3_DDC_TMP	Wkg IPU +3.3V DDC temp, EDAQ	Yes	Yes	Yes	No	64	16	9
300	IPU_P3P3V	Wkg IPU +3.3V supply volts, EDAQ	Yes	Yes	Yes	Yes	64	16	9
301	IPU_P5V	Wkg IPU +5V supply volts, EDAQ	Yes	Yes	Yes	Yes	64	16	9
305	IPU_P5V_DDC_TMP	Wkg IPU +5V DDC temp, EDAQ	Yes	Yes	Yes	No	64	16	9
387	IPU_STAT_0	IPU Status Word 0	Yes	Yes	Yes	Yes	8	16	1
402	IPU_STAT_1	IPU Status Word 1	Yes	Yes	Yes	Yes	8	16	1
661	IPU_STAT_2	IPU status word #2	Yes	Yes	Yes	Yes	8	16	1
314	ISU_1553_READERR	IPU SUROM 1553 Read Failures (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
313	ISU_1ST_1553_SEG	IPU SUROM First Good 1553 Segment (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
307	ISU_1ST_MEM_SEG	IPU SUROM First Good Mem Segment (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
666	ISU_ACTION_CODE	IPU SUROM program action code	No	No	No	No	8	16	3
317	ISU_CMD_NUMBER	IPU SUROM Command Number (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
315	ISU_CMD_RCVD_CN	IPU SUROM Command Rceiv'd Count (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
316	ISU_CMD_REJ_CNT	IPU SUROM Command Reject'd Count (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
318	ISU_CMD_RES_CODE	IPU SUROM Command Result Code (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
593	ISU_CMP_CKSUM	IPU SUROM - 32 bit Computed checksum of total Program Image	No	No	No	No	8	32	3
320	ISU_COUNTDOWN	Countdown parameter (seconds remaining until automatic application load and execute, 0=expired/aborted)	No	No	No	No	8	16	3
590	ISU_CURRENT_BLK	IPU SUROM - Current block number for Program Image	No	No	No	No	8	16	3
308	ISU_EDAC1ERR_CNT	IPU SUROM EDAC Single Error Count (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
309	ISU_EDAC2ERR_CNT	IPU SUROM EDAC Double Error Count (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
310	ISU_EE_ERR_CNT	IPU SUROM EDAC EEPROM Err Cnt (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
312	ISU_EE_ERR_STAT	IPU SUROM EEPROM Error Status (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
664	ISU_EE_LOOP_END	IPU SUROM EEPROM end address	No	No	No	No	8	32	3
663	ISU_EE_OFFSET	IPU SUROM EEPROM address offset	No	No	No	No	8	32	3
884	ISU_EXCEPTION	Address causing exception (if nonzero, should be normally be zero)	No	No	No	No	64	16	3

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
833	ISU_FLAG_BITS		No	No	No	No	64	16	3
662	ISU_JMP_ADDRESS	IPU SUROM jump address	No	No	No	No	8	32	3
306	ISU_LIO_STAT	IPU SUROM LIO RAD6K Test Status (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
780	ISU_MBIC_ERROR	MBIC error with MBICA alive = 0x8000, MBICB alive = 0x4000	No	No	No	No	8	16	3
777	ISU_MBICA_END	End address for the MBIC side A	No	No	No	No	8	32	3
776	ISU_MBICA_START	Start address for the MBIC side A	No	No	No	No	8	32	3
779	ISU_MBICB_END	End address for the MBIC side B	No	No	No	No	8	32	3
778	ISU_MBICB_START	Start address for the MBIC side B	No	No	No	No	8	32	3
665	ISU_OVERRIDE_FLG	IPU SUROM override status	No	No	No	No	8	16	3
774	ISU_RAM_ADDRESS	Address in RAM	No	No	No	No	8	32	3
311	ISU_RAM_FAIL	IPU SUROM RAM Readback Fail (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
775	ISU_RAM_SIZE	Size of the RAM	No	No	No	No	8	32	3
322	ISU_ROM_BUILD_ID	IPU SUROM ROM Build Version ID (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
781	ISU_SECT	Which EEPROM section info follows, 0-15 >16 means stale info	No	No	No	No	8	16	3
832	ISU_SECT_BOOT	EEPROM section boot address	No	No	No	No	64	32	3
783	ISU_SECT_CHKSUM	EEPROM section checksum word	No	No	No	No	8	32	3
782	ISU_SECT_FLAGS	EEPROM section flags word	No	No	No	No	8	32	3
785	ISU_SECT_LENGTH	EEPROM section length in 32 bit words	No	No	No	No	8	32	3
784	ISU_SECT_START	EEPROM section start address	No	No	No	No	8	32	3
658	ISU_SEQUENCE_CNT	IPU SUROM packet sequence count	No	No	No	No	8	16	3
668	ISU_SPARE	Spare channel for test purposes	No	No	No	No	8	16	3
321	ISU_STATE	IPU SUROM Startup State (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	3
591	ISU_TOTAL_BLKS	IPU SUROM - Program Image upload total expected block num	No	No	No	No	8	16	3
592	ISU_UP_CKSUM	IPU SUROM - 32 bit expected checksum of total Program Image	No	No	No	No	8	32	3
141	LNS1_WF_TMP1	Lens 1-WF temp. 1, EDAQ AD590 Row 5 Col 0	Yes	Yes	Yes	Yes	64	16	8
142	LNS1_WF_TMP2	Lens 1-WF temp. 2, EDAQ AD590 Row 6 Col 1	Yes	Yes	Yes	No	64	16	8
143	LNS1_WF_TMP3	Lens 1-WF temp. 3, EDAQ Derived PRT 5	Yes	Yes	Yes	No	64	16	6
144	LNS2_TMP1	Lens 2 temp. 1, EDAQ AD590 Row 5 Col 1	Yes	Yes	Yes	Yes	64	16	8
145	LNS2_TMP2	Lens 2 temp. 2, EDAQ AD590 Row 6 Col 0	Yes	Yes	Yes	No	64	16	8
146	LNS2_TMP3	Lens 2 temp. 3, EDAQ Derived PRT 6	Yes	Yes	Yes	No	64	16	6

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
156	LNSASSY_TMP1	OBA lens assy temp #1, EDAQ 33	Yes	Yes	Yes	No	64	16	8
157	LNSASSY_TMP2	OBA lens assy temp #2, EDAQ 44	Yes	Yes	Yes	No	64	16	8
139	M1_TMP1	Pri (M1) mir temp. 1, EDAQ AD590 Row 0 Col 2	Yes	Yes	Yes	No	64	16	8
140	M1_TMP2	Pri (M1) mir temp. 2, EDAQ AD590 Row 7 Col 1	Yes	Yes	Yes	No	64	16	8
470	M1_TMP3	Pri (M1) mir temp. 3, EDAQ Derived PRT 1	Yes	Yes	Yes	No	64	16	6
153	M2_TMP1	Sec. (M2) mir temp #1, EDAQ ADC590 Row 6 Col 4	Yes	Yes	Yes	Yes	64	16	8
154	M2_TMP2	Sec. (M2) mir temp #2, EDAQ Derived PRT 7	Yes	Yes	Yes	No	64	16	6
266	MACMD_LAST_CN	Last Macro cmd: cmd nmbr	Yes	Yes	Yes	Yes	64	8	1
265	MACMD_LAST_RC	Last Macro cmd: reslt code	Yes	Yes	Yes	Yes	64	16	1
263	MACMDS_RCVCT	Macro cmds: receivd count	Yes	Yes	Yes	Yes	64	16	1
264	MACMDS_REJCT	Macro cmds: rejected count	Yes	Yes	Yes	Yes	64	16	1
926	MACRO_EXECUTING	Number of the currently executing macro, or 255 if no macro currently executing	Yes	Yes	Yes	No	64	8	1
878	MACRO_PARM	Macro command parameters	Yes	Yes	Yes	Yes	64	32	1
877	MACRO_STAT	Status for macro CSC	Yes	Yes	Yes	Yes	64	32	1
159	OBA_PLT_TMP	OBA aperture plate temp, EDAQ 10	Yes	Yes	Yes	No	64	16	8
500	OBA_TMP_00	OBA +X Isolator Temp (top) EDAQ, AD590 Row 0 Col 0	Yes	Yes	Yes	No	64	16	8
501	OBA_TMP_01	OBA +Y Isolator Temp (top) EDAQ, AD590 Row 1 Col 6	Yes	Yes	Yes	No	64	16	8
502	OBA_TMP_02	OBA -Y Isolator Temp (top) EDAQ, AD590 Row 6 Col 3	Yes	Yes	Yes	No	64	16	8
503	OBA_TMP_03	OBA external leg beam temp, +Y EDAQ, AD590 Row 0 Col 7	Yes	Yes	Yes	No	64	16	8
504	OBA_TMP_04	OBA external leg beam temp, -Y EDAQ, AD590 Row 1 Col 5	Yes	Yes	Yes	No	64	16	8
505	OBA_TMP_05	OBA truss Temp, top, centre, +X EDAQ, AD590 Row 0 Col 5	Yes	Yes	Yes	No	64	16	8
506	OBA_TMP_06	OBA truss Temp, top, +X, +Y EDAQ, AD590 Row 5 Col 7	Yes	Yes	Yes	No	64	16	8
507	OBA_TMP_07	OBA truss Temp, top, +X, -Y EDAQ, AD590 Row 1 Col 7	Yes	Yes	Yes	No	64	16	8
508	OBA_TMP_08	OBA centre tube, +Z EDAQ, AD590 Row 6 Col 5	Yes	Yes	Yes	No	64	16	8
509	OBA_TMP_09	OBA centre tube, -Z EDAQ, AD590 Row 7 Col 2	Yes	Yes	Yes	No	64	16	8
705	OPH_ZONE1_DELAY	OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse	Yes	No	Yes	No	64	16	1
711	OPH_ZONE1_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	Yes	Yes	Yes	Yes	64	16	1
706	OPH_ZONE2_DELAY	OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse	Yes	No	Yes	No	64	16	1
712	OPH_ZONE2_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	Yes	Yes	Yes	Yes	64	16	1
707	OPH_ZONE3_DELAY	OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse	Yes	No	Yes	No	64	16	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
713	OPH_ZONE3_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	Yes	Yes	Yes	Yes	64	16	1
708	OPH_ZONE4_DELAY	OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse	Yes	No	Yes	No	64	16	1
714	OPH_ZONE4_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	Yes	Yes	Yes	Yes	64	16	1
709	OPH_ZONE5_DELAY	OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse	Yes	No	Yes	No	64	16	1
715	OPH_ZONE5_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	Yes	Yes	Yes	No	64	16	1
710	OPH_ZONE6_DELAY	OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse	Yes	No	Yes	No	64	16	1
716	OPH_ZONE6_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	Yes	Yes	Yes	No	64	16	1
39	PCU_BOX_TMP	PCU box temp, EDAQ AD590 Row 1 Col 1	Yes	Yes	Yes	Yes	64	16	8
928	PCU_SUBSTAT_0	PCU subsystem status word 0	No	No	Yes	Yes	64	16	1
929	PCU_SUBSTAT_1	PCU subsystem status word 1	No	No	Yes	Yes	64	16	1
930	PCU_SUBSTAT_2	PCU subsystem status word 2	No	No	Yes	Yes	64	16	1
408	PRF_1553	2	Yes	No	Yes	No	64	8	1
416	PRF_CLR_CMD	10	Yes	No	Yes	No	64	8	1
420	PRF_CMD_TLM	14	Yes	No	Yes	No	64	8	1
434	PRF_CNTRL_CSS	28	Yes	No	Yes	No	64	8	1
433	PRF_CNTRL_EDAQ	27	Yes	No	Yes	No	64	8	1
444	PRF_CNTRL_GSS	Execution Profile Max Execution time, 1 LS Bit = 50 usecs	Yes	No	Yes	No	64	8	1
435	PRF_CNTRL_IFC	29	Yes	No	Yes	No	64	8	1
432	PRF_CNTRL_PSS	26	Yes	No	Yes	No	64	8	1
443	PRF_CNTRL_SSH	Execution Profile Max Execution time, 1 LS Bit = 50 usecs	Yes	No	Yes	No	64	8	1
407	PRF_CR_TOTAL	1, Execution Profile, Max Execution time, 1 LS Bit = 50 usecs	Yes	Yes	Yes	No	64	8	1
882	PRF_CR2CR_MAX	Max time between chopper rotation interrupts (for IPU) in micro-sec	Yes	Yes	Yes	No	64	16	1
883	PRF_CR2CR_MIN	Min time between chopper rotation interrupts (for IPU) in micro-sec	Yes	Yes	Yes	No	64	16	1
427	PRF_CSS_TLM	21	Yes	No	Yes	No	64	8	1
436	PRF_DECIM_SCI	30	Yes	No	Yes	No	64	8	1
431	PRF_EXE_MACCMD	25	Yes	No	Yes	No	64	8	1
430	PRF_EXE_SAICMD	24	Yes	No	Yes	No	64	8	1
429	PRF_EXE_SCCMD	23	Yes	No	Yes	No	64	8	1
417	PRF_EXE_TLM	11	Yes	No	Yes	No	64	8	1
889	PRF_EXEC_DELAY	Execution delay from system tick pulse to start of executive, 1 LSB = 10 usec	Yes	Yes	Yes	No	64	8	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
887	PRF_FAULTMON	Execution Profile for Fault management, 1 LSB = 50 usec	Yes	No	Yes	No	64	8	1
437	PRF_FIR_SCI	31	Yes	No	Yes	No	64	8	1
439	PRF_FMT_HKBLOCK	33	Yes	No	Yes	No	64	8	1
411	PRF_HIRDLSTIME	5	Yes	No	Yes	No	64	8	1
442	PRF_INVALID	Execution Profile Max Execution time, 1 LS Bit = 50 usecs	Yes	No	Yes	No	64	8	1
421	PRF_IOBIC_TLM	15	Yes	No	Yes	No	64	8	1
888	PRF_MACRO_TLM	Execution Profile for Macro system, 1 LSB = 50 usec	Yes	No	Yes	No	64	8	1
441	PRF_MAKE_ENGPKT	35	Yes	No	Yes	No	64	8	1
440	PRF_MAKE_SCIPKT	34	Yes	No	Yes	No	64	8	1
409	PRF_QHSS_SPU	3	Yes	No	Yes	No	64	8	1
410	PRF_QHSS_TEU	4	Yes	No	Yes	No	64	8	1
842	PRF_SAIL_EXEC	SAIL executive execution profile	Yes	No	Yes	No	64	8	5
843	PRF_SAIL_TLM	SAIL executive telemetry execution profile	Yes	No	Yes	No	64	8	5
425	PRF_SCIFMT_TLM	19	Yes	No	Yes	No	64	8	1
426	PRF_SCIPRO_TLM	20	Yes	No	Yes	No	64	8	1
422	PRF_SPU_TLM	16	Yes	No	Yes	No	64	8	1
418	PRF_SSH_TLM	12	Yes	No	Yes	No	64	8	1
419	PRF_SVA_TLM	13	Yes	No	Yes	No	64	8	1
412	PRF_SWAP_DIAG	6	Yes	No	Yes	No	64	8	1
424	PRF_TG_TLM	18	Yes	No	Yes	No	64	8	1
423	PRF_TSS_TLM	17	Yes	No	Yes	No	64	8	1
413	PRF_UP_HKTBL	7	Yes	No	Yes	No	64	8	1
415	PRF_UP_SCIFMT	9	Yes	No	Yes	No	64	8	1
414	PRF_UP_SCITBL	8	Yes	No	Yes	No	64	8	1
428	PRF_UPDATE_MAC	22	Yes	No	Yes	No	64	8	1
383	PSS_PCU_15VA_TMP	PCU (Intnl) 15VA DDC temp	Yes	Yes	Yes	No	64	16	11
384	PSS_PCU_15VB_TMP	PCU (Intnl) 15VB DDC temp	Yes	Yes	Yes	No	64	16	11
670	PSS_PCU_5VA	PCU Internal +5 Volts - A side	Yes	Yes	Yes	Yes	64	16	0
671	PSS_PCU_5VB	PCU Internal +5 Volts - B side	Yes	Yes	Yes	Yes	64	16	0
352	PSS_PCU_5VC	PCU Internal +5 Volts	Yes	Yes	Yes	Yes	64	16	11

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
354	PSS_PCU_N15VC	PCU Internal -15 Volts	Yes	Yes	Yes	Yes	64	16	11
353	PSS_PCU_P15VC	PCU Internal +15 Volts	Yes	Yes	Yes	Yes	64	16	11
385	PSS_QAFILT_TMP	PCU QBA Inrush Filter temp	Yes	Yes	Yes	No	64	16	11
753	PSS_QAP_RLY_TMP	+28QA primary N/L relay coil temperature	Yes	Yes	Yes	No	64	16	5
755	PSS_QAR_RLY_TMP	+28QB primary N/L relay coil temperature	Yes	Yes	Yes	No	64	16	5
386	PSS_QBFILT_TMP	PCU QBB Inrush Filter temp	Yes	Yes	Yes	No	64	16	11
754	PSS_QBP_RLY_TMP	+28QB redundant N/L relay coil temperature	Yes	Yes	Yes	No	64	16	5
756	PSS_QBR_RLY_TMP	+28QB redundant N/L relay coil temperature	Yes	Yes	Yes	No	64	16	5
355	PSS_REG_28VA	REG +28V DDC A volts	Yes	Yes	Yes	Yes	64	16	11
375	PSS_REG_28VA_TMP	REG +28VA DDC temp	Yes	Yes	Yes	No	64	16	11
356	PSS_REG_28VB	REG +28V DDC B volts	Yes	Yes	Yes	Yes	64	16	11
376	PSS_REG_28VB_TMP	REG +28VB DDC temp	Yes	Yes	Yes	No	64	16	11
373	PSS_SPU_15VA_TMP	SPU15VA DDC temp	Yes	Yes	Yes	No	64	16	11
374	PSS_SPU_15VB_TMP	SPU15VB DDC temp	Yes	Yes	Yes	No	64	16	11
346	PSS_SPU_5VA	SPU +5V DDC A volts	Yes	Yes	Yes	Yes	64	16	11
371	PSS_SPU_5VA_TMP	SPU +5VA DDC temp	Yes	Yes	Yes	No	64	16	11
347	PSS_SPU_5VB	SPU +5V DDC B volts	Yes	Yes	Yes	Yes	64	16	11
372	PSS_SPU_5VB_TMP	SPU +5VB DDC temp	Yes	Yes	Yes	No	64	16	11
350	PSS_SPU_N15VA	SPU -15V DDC A volts	Yes	Yes	Yes	Yes	64	16	11
751	PSS_SPU_N15VATMP	Temperature of -15V SPU PS A	Yes	Yes	Yes	No	64	16	5
351	PSS_SPU_N15VB	SPU -15V DDC B volts	Yes	Yes	Yes	Yes	64	16	11
752	PSS_SPU_N15VBTMP	Temperature of -15V SPU PS B	Yes	Yes	Yes	No	64	16	5
348	PSS_SPU_P15VA	SPU +15V DDC A volts	Yes	Yes	Yes	Yes	64	16	11
749	PSS_SPU_P15VATMP	Temperature of +15V SPU PS A	Yes	Yes	Yes	No	64	16	5
349	PSS_SPU_P15VB	SPU +15V DDC B volts	Yes	Yes	Yes	Yes	64	16	11
750	PSS_SPU_P15VBTMP	Temperature of +15V SPU PS B	Yes	Yes	Yes	No	64	16	5
363	PSS_STAT_00	PSS relay status word 0	Yes	Yes	Yes	No	64	16	15
364	PSS_STAT_01	PSS relay status word 1	Yes	Yes	Yes	No	64	16	15
365	PSS_STAT_02	PSS relay status word 2	Yes	Yes	Yes	No	64	16	15
366	PSS_STAT_03	PSS relay status word 3	Yes	Yes	Yes	No	64	16	15

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
367	PSS_STAT_04	PSS relay status word 4	Yes	Yes	Yes	No	64	16	15
368	PSS_STAT_05	PSS relay status word 5	Yes	Yes	Yes	No	64	16	15
369	PSS_STAT_06	PSS relay status word 6	Yes	Yes	Yes	No	64	16	15
370	PSS_STAT_07	PSS relay status word 7	Yes	Yes	Yes	No	64	16	15
357	PSS_SYS_5VA	SYS +5V DDC A volts	Yes	Yes	Yes	Yes	64	16	11
377	PSS_SYS_5VA_TMP	SYS +5VA DDC temp	Yes	Yes	Yes	No	64	16	11
358	PSS_SYS_5VB	SYS +5V DDC B volts	Yes	Yes	Yes	Yes	64	16	11
378	PSS_SYS_5VB_TMP	SYS +5VB DDC temp	Yes	Yes	Yes	No	64	16	11
361	PSS_SYS_N15VA	SYS -15V DDC A volts	Yes	Yes	Yes	Yes	64	16	11
381	PSS_SYS_N15VATMP	SYS -15VA DDC temp	Yes	Yes	Yes	No	64	16	11
362	PSS_SYS_N15VB	SYS -15V DDC B volts	Yes	Yes	Yes	Yes	64	16	11
382	PSS_SYS_N15VBTMP	SYS -15VB DDC temp	Yes	Yes	Yes	No	64	16	11
359	PSS_SYS_P15VA	SYS +15V DDC A volts	Yes	Yes	Yes	Yes	64	16	11
379	PSS_SYS_P15VATMP	SYS +15VA DDC temp	Yes	Yes	Yes	No	64	16	11
360	PSS_SYS_P15VB	SYS +15V DDC B volts	Yes	Yes	Yes	Yes	64	16	11
380	PSS_SYS_P15VBTMP	SYS +15VB DDC temp	Yes	Yes	Yes	No	64	16	11
344	QA_I	Quiet Bus A input currt, from PSS	Yes	Yes	Yes	Yes	64	16	11
345	QB_I	Quiet Bus B input currt, from PSS	Yes	Yes	Yes	Yes	64	16	11
398	QHSS_1_RV_STAT	QHSS 1 Receive Status Word TSS HS	No	No	Yes	No	64	16	1
401	QHSS_1_TX_STAT	QHSS 1 Transmit Status Word TSS CMD	Yes	Yes	Yes	No	64	16	1
399	QHSS_2_RV_STAT	QHSS 2 Receive Status Word TSS LS	Yes	Yes	Yes	No	64	16	1
400	QHSS_3_RV_STAT	QHSS 3 Receive Status Word SPU	Yes	Yes	Yes	No	64	16	1
924	RAD_CHAN_ENA	Science format radiance channel enabled status (bit 0=chan 1, ..., bit 20=chan 21)	No	No	Yes	Yes	64	32	1
927	RAD_DEMOD_TBL_I	Demodulation table ID (default = 0)	Yes	Yes	Yes	Yes	64	8	1
491	SAIL_ENGWORD_00	SAIL-generated Eng. Word 0	No	No	Yes	Yes	64	32	0
492	SAIL_ENGWORD_01	SAIL-generated Eng. Word 1	No	No	Yes	Yes	64	32	0
493	SAIL_ENGWORD_02	SAIL-generated Eng. Word 2	No	No	Yes	Yes	64	32	0
494	SAIL_ENGWORD_03	SAIL-generated Eng. Word 3	No	No	Yes	Yes	64	32	0
495	SAIL_ENGWORD_04	SAIL-generated Eng. Word 4	No	No	Yes	Yes	64	32	0
496	SAIL_ENGWORD_05	SAIL-generated Eng. Word 5	No	No	Yes	Yes	64	32	0

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
497	SAIL_ENGWORD_06	SAIL-generated Eng. Word 6	No	No	Yes	Yes	64	32	0
498	SAIL_ENGWORD_07	SAIL-generated Eng. Word 7	No	No	Yes	Yes	64	32	0
816	SAIL_ERR_CLOC	SAIL current error location	Yes	Yes	Yes	Yes	64	16	1
814	SAIL_ERR_CTASK	which SAIL task had the current error	Yes	Yes	Yes	Yes	64	8	1
815	SAIL_ERR_CTYP	SAIL current error type	Yes	Yes	Yes	Yes	64	8	1
813	SAIL_ERR_LLOC	SAIL last error location	Yes	Yes	Yes	Yes	64	16	1
811	SAIL_ERR_LTASK	which SAIL task had the last error	Yes	Yes	Yes	Yes	64	8	1
812	SAIL_ERR_LTYP	SAIL last error type	Yes	Yes	Yes	Yes	64	8	1
234	SAIL_PROC_STAT	SAIL Processor Status Code	Yes	Yes	Yes	Yes	64	8	0
483	SAIL_SHM_256	SAIL shared memory [256]	Yes	Yes	Yes	Yes	64	32	0
484	SAIL_SHM_257	SAIL shared memory [257]	Yes	Yes	Yes	Yes	64	32	0
485	SAIL_SHM_258	SAIL shared memory [258]	Yes	Yes	Yes	Yes	64	32	0
486	SAIL_SHM_259	SAIL shared memory [259]	Yes	Yes	Yes	Yes	64	32	0
487	SAIL_SHM_260	SAIL shared memory [260]	Yes	Yes	Yes	Yes	64	32	0
488	SAIL_SHM_261	SAIL shared memory [261]	Yes	Yes	Yes	Yes	64	32	0
489	SAIL_SHM_262	SAIL shared memory [262]	Yes	Yes	Yes	Yes	64	32	0
490	SAIL_SHM_263	SAIL shared memory [263]	Yes	Yes	Yes	Yes	64	32	0
834	SAIL_SHM_264	SAIL shared memory [264]	Yes	Yes	Yes	Yes	64	32	1
835	SAIL_SHM_265	SAIL shared memory [265]	Yes	Yes	Yes	Yes	64	32	1
836	SAIL_SHM_266	SAIL shared memory [266]	Yes	Yes	Yes	Yes	64	32	1
837	SAIL_SHM_267	SAIL shared memory [267]	Yes	Yes	Yes	Yes	64	32	1
838	SAIL_SHM_268	SAIL shared memory [268]	Yes	Yes	Yes	Yes	64	32	1
839	SAIL_SHM_269	SAIL shared memory [269]	Yes	Yes	Yes	Yes	64	32	1
840	SAIL_SHM_270	SAIL shared memory [270]	Yes	Yes	Yes	Yes	64	32	1
841	SAIL_SHM_271	SAIL shared memory [271]	Yes	Yes	Yes	Yes	64	32	1
919	SAIL_STACK_MRGN	Number of bytes left on the SAIL stack before overrunning stack end, 0xffff if SAIL task name missing	Yes	Yes	Yes	No	64	16	1
262	SAILCMD_LAST_CN	Last SAIL cmd: cmd nmbr	Yes	Yes	Yes	Yes	64	8	1
261	SAILCMD_LAST_RC	Last SAIL cmd: result code	Yes	Yes	Yes	Yes	64	16	1
259	SAILCMDS_RCVCT	SAIL cmds: received count	Yes	Yes	Yes	Yes	64	16	1
260	SAILCMDS_REJCT	SAIL cmds: rejected count	Yes	Yes	Yes	Yes	64	16	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
898	SAILCMST_0_15	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
905	SAILCMST_112_127	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
899	SAILCMST_16_31	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
900	SAILCMST_32_47	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
901	SAILCMST_48_63	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
902	SAILCMST_64_79	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
903	SAILCMST_80_95	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
904	SAILCMST_96_111	SAIL enabled status of each command	Yes	No	Yes	Yes	64	16	1
206	SAILTASK_00_P15	SAIL Tsk 00 param 15 !	Yes	Yes	Yes	Yes	64	32	0
235	SAILTASK_00_STAT	SAIL Task 00 Status Code	Yes	Yes	Yes	Yes	64	8	0
207	SAILTASK_01_P15	SAIL Tsk 01 param 15 !	Yes	Yes	Yes	Yes	64	32	0
236	SAILTASK_01_STAT	SAIL Task 01 Status Code	Yes	Yes	Yes	Yes	64	8	0
208	SAILTASK_02_P15	SAIL Tsk 02 param 15 !	Yes	Yes	Yes	Yes	64	32	0
237	SAILTASK_02_STAT	SAIL Task 02 Status Code	Yes	Yes	Yes	Yes	64	8	0
209	SAILTASK_03_P15	SAIL Tsk 03 param 15 !	Yes	Yes	Yes	Yes	64	32	0
238	SAILTASK_03_STAT	SAIL Task 03 Status Code	Yes	Yes	Yes	Yes	64	8	0
210	SAILTASK_04_P15	SAIL Tsk 04 param 15 !	Yes	Yes	Yes	Yes	64	32	0
239	SAILTASK_04_STAT	SAIL Task 04 Status Code	Yes	Yes	Yes	Yes	64	8	0
211	SAILTASK_05_P15	SAIL Tsk 05 param 15 !	Yes	Yes	Yes	Yes	64	32	0
240	SAILTASK_05_STAT	SAIL Task 05 Status Code	Yes	Yes	Yes	Yes	64	8	0
212	SAILTASK_06_P15	SAIL Tsk 06 param 15 !	Yes	Yes	Yes	Yes	64	32	0
241	SAILTASK_06_STAT	SAIL Task 06 Status Code	Yes	Yes	Yes	Yes	64	8	0
213	SAILTASK_07_P15	SAIL Tsk 07 param 15 !	Yes	Yes	Yes	Yes	64	32	0
242	SAILTASK_07_STAT	SAIL Task 07 Status Code	Yes	Yes	Yes	Yes	64	8	0
214	SAILTASK_08_P15	SAIL Tsk 08 param 15 !	Yes	No	Yes	Yes	64	32	0
243	SAILTASK_08_STAT	SAIL Task 08 Status Code	Yes	Yes	Yes	Yes	64	8	0
215	SAILTASK_09_P15	SAIL Tsk 09 param 15 !	Yes	No	Yes	Yes	64	32	0
244	SAILTASK_09_STAT	SAIL Task 09 Status Code	Yes	Yes	Yes	Yes	64	8	0
216	SAILTASK_10_P15	SAIL Tsk 10 param 15 !	Yes	No	Yes	Yes	64	32	0
245	SAILTASK_10_STAT	SAIL Task 10 Status Code	Yes	Yes	Yes	Yes	64	8	0

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
217	SAILTASK_11_P15	SAIL Tsk 11 param 15 !	Yes	No	Yes	Yes	64	32	0
246	SAILTASK_11_STAT	SAIL Task 11 Status Code	Yes	Yes	Yes	Yes	64	8	0
218	SAILTASK_12_P15	SAIL Tsk 12 param 15 !	Yes	No	Yes	Yes	64	32	0
247	SAILTASK_12_STAT	SAIL Task 12 Status Code	Yes	Yes	Yes	Yes	64	8	0
219	SAILTASK_13_P15	SAIL Tsk 13 param 15 !	Yes	No	Yes	Yes	64	32	0
248	SAILTASK_13_STAT	SAIL Task 13 Status Code	Yes	Yes	Yes	Yes	64	8	0
220	SAILTASK_14_P15	SAIL Tsk 14 param 15 !	Yes	No	Yes	Yes	64	32	0
249	SAILTASK_14_STAT	SAIL Task 14 Status Code	Yes	Yes	Yes	Yes	64	8	0
221	SAILTASK_15_P15	SAIL Tsk 15 param 15 !	Yes	No	Yes	Yes	64	32	0
250	SAILTASK_15_STAT	SAIL Task 15 Status Code	Yes	Yes	Yes	Yes	64	8	0
676	SC_ATT_QUAT_1	S/C Ancillary data item: Attitude Quaternion 1	Yes	Yes	Yes	No	64	32	5
677	SC_ATT_QUAT_2	S/C Ancillary data item: Attitude Quaternion 2	Yes	Yes	Yes	No	64	32	5
678	SC_ATT_QUAT_3	S/C Ancillary data item: Attitude Quaternion 3	Yes	Yes	Yes	No	64	32	5
679	SC_ATT_QUAT_4	S/C Ancillary data item: Attitude Quaternion 4	Yes	Yes	Yes	No	64	32	5
680	SC_DESC_NODE	S/C Ancillary data item: Time to Descending Node	Yes	Yes	Yes	No	64	16	5
681	SC_EUL_ANG_PITCH	S/C Ancillary data item: Pitchl Euler Angle	Yes	Yes	Yes	No	64	16	5
682	SC_EUL_ANG_ROLL	S/C Ancillary data item: Roll Euler Angle	Yes	Yes	Yes	No	64	16	5
683	SC_EUL_ANG_YAW	S/C Ancillary data item: Yaw Euler Angle	Yes	Yes	Yes	No	64	16	5
684	SC_GYRO_STAT	S/C Ancillary data item: S/C Gyro (IRU) status word	Yes	Yes	Yes	No	64	16	5
685	SC_MOON_VECT_X	S/C Ancillary data item: Moon Vector - X	Yes	Yes	Yes	No	64	16	5
686	SC_MOON_VECT_Y	S/C Ancillary data item: Moon Vector - Y	Yes	Yes	Yes	No	64	16	5
687	SC_MOON_VECT_Z	S/C Ancillary data item: Moon Vector - Z	Yes	Yes	Yes	No	64	16	5
688	SC_NAV_MODE	S/C Ancillary data item: S/C Mode (pointing) status	Yes	Yes	Yes	No	64	16	5
689	SC_OBL_ANG_AFT	S/C Ancillary data item: Oblateness Angle (aft)	Yes	Yes	Yes	No	64	16	5
690	SC_OBL_ANG_R	S/C Ancillary data item: Oblateness angle (aft) rate	Yes	Yes	Yes	No	64	16	5
691	SC_PITCH_RATE	S/C Ancillary data item: Pitch Rate	Yes	Yes	Yes	No	64	16	5
692	SC_POS_X	S/C Ancillary data item: Spacecraft Position - X	Yes	Yes	Yes	No	64	32	5
693	SC_POS_Y	S/C Ancillary data item: Spacecraft Position - Y	Yes	Yes	Yes	No	64	32	5
694	SC_POS_Z	S/C Ancillary data item: Spacecraft Position - Z	Yes	Yes	Yes	No	64	32	5
695	SC_ROLL_RATE	S/C Ancillary data item: Roll Rate	Yes	Yes	Yes	No	64	16	5

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
696	SC_SUN_VECT_X	S/C Ancillary data item: Sun Vector - X	Yes	Yes	Yes	No	64	16	5
697	SC_SUN_VECT_Y	S/C Ancillary data item: Sun Vector - Y	Yes	Yes	Yes	No	64	16	5
698	SC_SUN_VECT_Z	S/C Ancillary data item: Sun Vector - Z	Yes	Yes	Yes	No	64	16	5
699	SC_TIM_STAMP_LSW	S/C Ancillary data item: HIRDLS Time Stamp (least significant 32 bits)	Yes	Yes	Yes	No	64	32	5
700	SC_TIM_STAMP_MS	S/C Ancillary data item: HIRDLS Time Stamp (most significant 32 bits)	Yes	Yes	Yes	No	64	32	5
701	SC_VELY_X	S/C Ancillary data item: Spacecraft Velocity - X	Yes	Yes	Yes	No	64	32	5
702	SC_VELY_Y	S/C Ancillary data item: Spacecraft Velocity - Y	Yes	Yes	Yes	No	64	32	5
703	SC_VELY_Z	S/C Ancillary data item: Spacecraft Velocity - Z	Yes	Yes	Yes	No	64	32	5
704	SC_YAW_RATE	S/C Ancillary data item: Yaw Rate	Yes	Yes	Yes	No	64	16	5
257	SCCMD_LAST_CN	Last S/C cmd: cmd nmbr	Yes	Yes	Yes	Yes	64	8	1
258	SCCMD_LAST_PC	Last S/C cmd: pkt seq cnt	Yes	Yes	Yes	No	64	16	1
256	SCCMD_LAST_RC	Last S/C cmd: result code	Yes	Yes	Yes	Yes	64	16	1
254	SCCMDS_RCVCT	S/C cmds: received count	Yes	Yes	Yes	Yes	64	16	1
255	SCCMDS_REJCT	S/C cmds: rejected count	Yes	Yes	Yes	Yes	64	16	1
103	SCI_AZP_POS	Azimuth Primary readhead position (GROUND USE ONLY)	No	No	No	No	1	32	2
862	SCI_AZP_STAT	Azimuth Primary readhead status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)	No	No	No	No	64	8	5
788	SCI_AZS_POS	Azimuth Secondary readhead position (GROUND USE ONLY)	No	No	No	No	64	32	2
865	SCI_AZS_STAT	Azimuth Secondary readhead status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)	No	No	No	No	64	8	5
102	SCI_EL2P_POS	Elevation Primary readhead 2 position (GROUND USE ONLY)	No	No	No	No	1	32	2
861	SCI_EL2P_STAT	Elevation Primary readhead 2 status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)	No	No	No	No	64	8	5
787	SCI_EL2S_POS	Elevation Secondary readhead 2 position (GROUND USE ONLY)	No	No	No	No	64	32	2
864	SCI_EL2S_STAT	Elevation Secondary readhead 2 status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)	No	No	No	No	64	8	5
101	SCI_ELVARP_POS	Elevation Primary variable-readhead position (GROUND USE ONLY)	No	No	No	No	1	32	2
860	SCI_ELVARP_STAT	Elevation Primary VAR status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)	No	No	No	No	64	8	5
786	SCI_ELVARS_POS	Elevation Secondary variable-readhead position (GROUND USE ONLY)	No	No	No	No	64	32	2
863	SCI_ELVARS_STAT	Elevation Secondary VAR status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)	No	No	No	No	64	8	5
923	SCI_FMT_BLK_ENA	Science format block enabled status	No	No	Yes	Yes	64	16	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
879	SCI_HKTBL_ERR	Error flags for science HK table	Yes	Yes	Yes	No	64	16	1
0	SIG_DAT_01	Radiance channel 1 (GROUND USE ONLY)	No	No	No	No	1	16	2
1	SIG_DAT_02	Radiance channel 2 (GROUND USE ONLY)	No	No	No	No	1	16	2
2	SIG_DAT_03	Radiance channel 3 (GROUND USE ONLY)	No	No	No	No	1	16	2
3	SIG_DAT_04	Radiance channel 4 (GROUND USE ONLY)	No	No	No	No	1	16	2
4	SIG_DAT_05	Radiance channel 5 (GROUND USE ONLY)	No	No	No	No	1	16	2
5	SIG_DAT_06	Radiance channel 6 (GROUND USE ONLY)	No	No	No	No	1	16	2
6	SIG_DAT_07	Radiance channel 7 (GROUND USE ONLY)	No	No	No	No	1	16	2
7	SIG_DAT_08	Radiance channel 8 (GROUND USE ONLY)	No	No	No	No	1	16	2
8	SIG_DAT_09	Radiance channel 9 (GROUND USE ONLY)	No	No	No	No	1	16	2
9	SIG_DAT_10	Radiance channel 10 (GROUND USE ONLY)	No	No	No	No	1	16	2
10	SIG_DAT_11	Radiance channel 11 (GROUND USE ONLY)	No	No	No	No	1	16	2
11	SIG_DAT_12	Radiance channel 12 (GROUND USE ONLY)	No	No	No	No	1	16	2
12	SIG_DAT_13	Radiance channel 13 (GROUND USE ONLY)	No	No	No	No	1	16	2
13	SIG_DAT_14	Radiance channel 14 (GROUND USE ONLY)	No	No	No	No	1	16	2
14	SIG_DAT_15	Radiance channel 15 (GROUND USE ONLY)	No	No	No	No	1	16	2
15	SIG_DAT_16	Radiance channel 16 (GROUND USE ONLY)	No	No	No	No	1	16	2
16	SIG_DAT_17	Radiance channel 17 (GROUND USE ONLY)	No	No	No	No	1	16	2
17	SIG_DAT_18	Radiance channel 18 (GROUND USE ONLY)	No	No	No	No	1	16	2
18	SIG_DAT_19	Radiance channel 19 (GROUND USE ONLY)	No	No	No	No	1	16	2
19	SIG_DAT_20	Radiance channel 20 (GROUND USE ONLY)	No	No	No	No	1	16	2
20	SIG_DAT_21	Radiance channel 21 (GROUND USE ONLY)	No	No	No	No	1	16	2
133	SM_TMP1	Scan mirror temp.1, EDAQ AD590 Row 2 Col 4	Yes	Yes	Yes	Yes	64	16	8
134	SM_TMP2	Scan mirror temp.2, EDAQ AD590 Row 2 Col 3	Yes	Yes	Yes	No	64	16	8
135	SM_TMP3	Scan mirror temp 3, EDAQ Derived PRT 0	Yes	Yes	Yes	No	64	16	6
155	SMA_MTRING_TMP	SMA mount ring temp, EDAQ 56	Yes	Yes	Yes	Yes	64	16	8
748	SPARE_00D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
764	SPARE_01D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
765	SPARE_02D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
766	SPARE_03D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
767	SPARE_04D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
768	SPARE_05D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
769	SPARE_06D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
770	SPARE_07D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
771	SPARE_08D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
757	SPARE_09D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
758	SPARE_10D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
759	SPARE_11D	Spare Tlm Channel	Yes	Yes	Yes	No	64	16	0
760	SPARE_12D	Spare Tlm Channel	Yes	Yes	Yes	No	64	32	0
772	SPARE_13D	Spare Tlm Channel	Yes	Yes	Yes	No	64	32	0
773	SPARE_14D	Spare Tlm Channel	Yes	Yes	Yes	No	64	32	0
763	SPARE_15D	Spare Tlm Channel	Yes	Yes	Yes	No	64	32	0
647	SPU_BLADE_0_CLSD	Delay (in 160 nsec ticks) for Chopper Blade Closed 0 delay	Yes	No	Yes	No	64	16	1
641	SPU_BLADE_0_OPEN	Delay (in 160 nsec ticks) for Chopper Blade Open 0 delay	Yes	No	Yes	No	64	16	1
648	SPU_BLADE_1_CLSD	Delay (in 160 nsec ticks) for Chopper Blade Closed 1 delay	Yes	No	Yes	No	64	16	1
642	SPU_BLADE_1_OPEN	Delay (in 160 nsec ticks) for Chopper Blade Open 1 delay	Yes	No	Yes	No	64	16	1
649	SPU_BLADE_2_CLSD	Delay (in 160 nsec ticks) for Chopper Blade Closed 2 delay	Yes	No	Yes	No	64	16	1
643	SPU_BLADE_2_OPEN	Delay (in 160 nsec ticks) for Chopper Blade Open 2 delay	Yes	No	Yes	No	64	16	1
650	SPU_BLADE_3_CLSD	Delay (in 160 nsec ticks) for Chopper Blade Closed 3 delay	Yes	No	Yes	No	64	16	1
644	SPU_BLADE_3_OPEN	Delay (in 160 nsec ticks) for Chopper Blade Open 3 delay	Yes	No	Yes	No	64	16	1
651	SPU_BLADE_4_CLSD	Delay (in 160 nsec ticks) for Chopper Blade Closed 4 delay	Yes	No	Yes	No	64	16	1
645	SPU_BLADE_4_OPEN	Delay (in 160 nsec ticks) for Chopper Blade Open 4 delay	Yes	No	Yes	No	64	16	1
652	SPU_BLADE_5_CLSD	Delay (in 160 nsec ticks) for Chopper Blade Closed 5 delay	Yes	No	Yes	No	64	16	1
646	SPU_BLADE_5_OPEN	Delay (in 160 nsec ticks) for Chopper Blade Open 5 delay	Yes	No	Yes	No	64	16	1
461	SPU_BOX_TMP	SPU box EDAQ AD590 Row 2 Col 7	Yes	Yes	Yes	Yes	64	16	8
619	SPU_CH_01_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 1 sample	Yes	No	Yes	No	64	16	1
269	SPU_CH_01_ZERO	Channel 1 Zero Offset	Yes	Yes	Yes	No	64	16	1
620	SPU_CH_02_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 2 sample	Yes	No	Yes	No	64	16	1
270	SPU_CH_02_ZERO	Channel 2 Zero Offset	Yes	No	Yes	No	64	16	1
621	SPU_CH_03_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 3 sample	Yes	No	Yes	No	64	16	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
271	SPU_CH_03_ZERO	Channel 3 Zero Offset	Yes	No	Yes	No	64	16	1
622	SPU_CH_04_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 4 sample	Yes	No	Yes	No	64	16	1
272	SPU_CH_04_ZERO	Channel 4 Zero Offset	Yes	No	Yes	No	64	16	1
623	SPU_CH_05_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 5 sample	Yes	No	Yes	No	64	16	1
273	SPU_CH_05_ZERO	Channel 5 Zero Offset	Yes	No	Yes	No	64	16	1
624	SPU_CH_06_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 6 sample	Yes	No	Yes	No	64	16	1
274	SPU_CH_06_ZERO	Channel 6 Zero Offset	Yes	No	Yes	No	64	16	1
625	SPU_CH_07_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 7 sample	Yes	No	Yes	No	64	16	1
275	SPU_CH_07_ZERO	Channel 7 Zero Offset	Yes	No	Yes	No	64	16	1
626	SPU_CH_08_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 8 sample	Yes	No	Yes	No	64	16	1
276	SPU_CH_08_ZERO	Channel 8 Zero Offset	Yes	No	Yes	No	64	16	1
627	SPU_CH_09_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 9 sample	Yes	No	Yes	No	64	16	1
277	SPU_CH_09_ZERO	Channel 9 Zero Offset	Yes	No	Yes	No	64	16	1
628	SPU_CH_10_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 10 sample	Yes	No	Yes	No	64	16	1
278	SPU_CH_10_ZERO	Channel 10 Zero Offset	Yes	No	Yes	No	64	16	1
629	SPU_CH_11_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 11 sample	Yes	No	Yes	No	64	16	1
279	SPU_CH_11_ZERO	Channel 11 Zero Offset	Yes	No	Yes	No	64	16	1
630	SPU_CH_12_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 12 sample	Yes	No	Yes	No	64	16	1
280	SPU_CH_12_ZERO	Channel 12 Zero Offset	Yes	No	Yes	No	64	16	1
631	SPU_CH_13_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 13 sample	Yes	No	Yes	No	64	16	1
281	SPU_CH_13_ZERO	Channel 13 Zero Offset	Yes	No	Yes	No	64	16	1
632	SPU_CH_14_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 14 sample	Yes	No	Yes	No	64	16	1
282	SPU_CH_14_ZERO	Channel 14 Zero Offset	Yes	No	Yes	No	64	16	1
633	SPU_CH_15_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 15 sample	Yes	No	Yes	No	64	16	1
283	SPU_CH_15_ZERO	Channel 15 Zero Offset	Yes	No	Yes	No	64	16	1
634	SPU_CH_16_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 16 sample	Yes	No	Yes	No	64	16	1
284	SPU_CH_16_ZERO	Channel 16 Zero Offset	Yes	No	Yes	No	64	16	1
635	SPU_CH_17_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 17 sample	Yes	No	Yes	No	64	16	1
285	SPU_CH_17_ZERO	Channel 17 Zero Offset	Yes	No	Yes	No	64	16	1
636	SPU_CH_18_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 18 sample	Yes	No	Yes	No	64	16	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
286	SPU_CH_18_ZERO	Channel 18 Zero Offset	Yes	No	Yes	No	64	16	1
637	SPU_CH_19_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 19 sample	Yes	No	Yes	No	64	16	1
287	SPU_CH_19_ZERO	Channel 19 Zero Offset	Yes	No	Yes	No	64	16	1
638	SPU_CH_20_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 20 sample	Yes	No	Yes	No	64	16	1
288	SPU_CH_20_ZERO	Channel 20 Zero Offset	Yes	No	Yes	No	64	16	1
639	SPU_CH_21_PHASE	Delay (in 160 nsec ticks) for Radiance Data Channel 21 sample	Yes	No	Yes	No	64	16	1
289	SPU_CH_21_ZERO	Channel 21 Zero Offset	Yes	No	Yes	No	64	16	1
653	SPU_GLOBAL_DELA	Delay (in 160 nsec ticks) for Global Filter Delay	Yes	No	Yes	No	64	16	1
640	SPU_HK_PHASE	Delay (in 160 nsec ticks) for Radiance Data HouseKeeping sample	Yes	No	Yes	No	64	16	1
744	SPU_MNT_TMP	SPU Mounting Temp, EDAQ AD590 Row 5, col 2	Yes	Yes	Yes	No	64	16	8
294	SPU_N12V_A	SPU -12VA supply volts	Yes	Yes	Yes	Yes	64	16	13
299	SPU_N12V_B	SPU -12VB supply volts	Yes	Yes	Yes	Yes	64	16	13
291	SPU_N5V_A	SPU -5VA supply volts (analog)	Yes	Yes	Yes	Yes	64	16	13
296	SPU_N5V_B	SPU -5VB supply volts (analog)	Yes	Yes	Yes	Yes	64	16	13
293	SPU_P12V_A	SPU +12VA supply volts	Yes	Yes	Yes	Yes	64	16	13
298	SPU_P12V_B	SPU +12VB supply volts	Yes	Yes	Yes	Yes	64	16	13
290	SPU_P5V_A	SPU +5VA supply volts (analog)	Yes	Yes	Yes	Yes	64	16	13
295	SPU_P5V_B	SPU +5VB supply volts (analog)	Yes	Yes	Yes	Yes	64	16	13
292	SPU_P5V_DA	SPU +5VA supply volts (digital)	Yes	Yes	Yes	Yes	64	16	13
297	SPU_P5V_DB	SPU +5VB supply volts (digital)	Yes	Yes	Yes	Yes	64	16	13
885	SPU_PHASE_ERR_C	SPU phase error counters	Yes	Yes	Yes	Yes	64	16	1
158	SPVU_BAF_TMP	OBA Sp. View baffle tmp, EDAQ 36	Yes	Yes	Yes	No	64	16	8
471	SPVUMIR_TMP1	Space View Mirror temp #1 EDAQ AD590 Row 0 Col 4	Yes	Yes	Yes	Yes	64	16	8
472	SPVUMIR_TMP2	Space View Mirror temp #2 EDAQ AD590 Row 1 Col 3	Yes	Yes	Yes	No	64	16	8
473	SPVUMIR_TMP3	Space View Mirror temp #3 EDAQ Derived PRT 3	Yes	Yes	Yes	No	64	16	6
54	SSH_APL_TMP	SSH aperture plate temp, EDAQ AD590 Row 7 Col 7	Yes	Yes	Yes	No	64	16	8
742	SSH_DOOR_TMP	SSH Door Temp, EDAQ AD590 Row 0, col 6	Yes	Yes	Yes	No	64	16	8
854	SSH_DORMOT_OTSP	Sunshield door motor over-temperature set point	Yes	Yes	Yes	Yes	64	16	5
53	SSH_DORMOT_TMP	SSH drive motor temp, EDAQ	Yes	Yes	Yes	Yes	64	16	9
855	SSH_HWA_OTSP	Hot Wax Actuator over-temperature set point	Yes	Yes	Yes	Yes	64	16	5

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
52	SSH_HWA_TMP	Hot Wax Actuator temp, EDAQ	Yes	Yes	Yes	Yes	64	16	9
56	SSH_NZSURF_TMP	SSH -Z surface temp, EDAQ ADC590 Row 6 Col 2	Yes	Yes	Yes	No	64	16	8
55	SSH_PZSURF_TMP	SSH +Z surface temp, EDAQ AD590 Row 4 Col 5	Yes	Yes	Yes	No	64	16	8
57	SSH_STAT	Sunshield switch status	Yes	Yes	Yes	Yes	64	16	1
29	STH_TMP_01	Structure temp 01, EDAQ AD590 Row 2 Col 5	Yes	Yes	Yes	No	64	16	8
30	STH_TMP_02	Structure temp 02, EDAQ AD590 Row 2 Col 6	Yes	Yes	Yes	No	64	16	8
31	STH_TMP_03	Structure temp 03, EDAQ AD590 Row 7 Col 3	Yes	Yes	Yes	No	64	16	8
32	STH_TMP_04	Structure temp 04, EDAQ AD590 Row 6 Col 7	Yes	Yes	Yes	No	64	16	8
392	SUBTMI_BUILD_ID	Subtmi file version	Yes	Yes	Yes	Yes	64	8	0
47	SUNSEN1_TMP	Sun sensor 1 (temperature), EDAQ	Yes	Yes	Yes	Yes	64	16	9
48	SUNSEN2_TMP	Sun sensor 2 (temperature), EDAQ	Yes	Yes	Yes	Yes	64	16	9
49	SUNSEN3_TMP	Sun sensor 3 (temperature), EDAQ	Yes	Yes	Yes	Yes	64	16	9
856	SVA_DORMOT_OTSP	SVA door motor over-temperature set point	Yes	Yes	Yes	Yes	64	16	5
59	SVA_DORMOT_TMP	SVA drive motor temp, EDAQ	Yes	Yes	Yes	Yes	64	16	9
60	SVA_MTGPLT_TMP	SVA mounting plate tmp, EDAQ ADC590 Row 7 Col 0	Yes	Yes	Yes	Yes	64	16	8
58	SVA_STAT	SVA switch status	Yes	Yes	Yes	Yes	64	16	1
463	TEU_BOX_TMP	TEU box EDAQ AD590 Row 7 Col 6	Yes	Yes	Yes	Yes	64	16	8
464	TEU_MNT_TMP	TEU box mount EDAQ AD590 Row 3 Col 7	Yes	Yes	Yes	No	64	16	8
913	TLM_ACTIVE_SCIHK	Identifies active science HK format table	No	No	Yes	Yes	64	16	1
513	TLM_DB_BUILD_ID	Telemetry Database Build Version ID	Yes	Yes	Yes	Yes	64	8	1
817	TLM_DIAG_STAT	Diagnostic format status word	Yes	Yes	Yes	Yes	64	16	1
909	TLM_TSS_AZOFFSET	Azimuth telemetry offset; value in telemetry which corresponds to zero	Yes	Yes	Yes	No	64	32	1
910	TLM_TSS_ELOFFSET	Elevation telemetry offset; value in telemetry which corresponds to zero	Yes	Yes	Yes	No	64	32	1
911	TLM_TSS_WXOFFSET	WobX telemetry offset; value in telemetry which corresponds to zero	Yes	No	Yes	No	64	32	1
912	TLM_TSS_WYOFFSET	WobY telemetry offset; value in telemetry which corresponds to zero	Yes	No	Yes	No	64	32	1
252	TMARK_CLK	Time Mark clock word (GROUND USE ONLY)	No	No	No	No	64	16	2
253	TMARK_DATA	Time mark data word (GROUND USE ONLY)	No	No	No	No	64	16	2
938	TP_BEU_TEMP_A	Passive Temp Ch7 (GROUND USE ONLY)	No	No	No	No	64	16	2
946	TP_BEU_TEMP_B	Passive Temp Ch15 (GROUND USE ONLY)	No	No	No	No	64	16	2
934	TP_CCU_TEMP_A	Passive Temp Ch3 (GROUND USE ONLY)	No	No	No	No	64	16	2

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
942	TP_CCU_TEMP_B	Passive Temp Ch11 (GROUND USE ONLY)	No	No	No	No	64	16	2
933	TP_CMPRSR_TMP_A	Passive Temp Ch2 (GROUND USE ONLY)	No	No	No	No	64	16	2
941	TP_CMPRSR_TMP_B	Passive Temp Ch10 (GROUND USE ONLY)	No	No	No	No	64	16	2
937	TP_IFC_BB_TMP_A	Passive Temp Ch6 (GROUND USE ONLY)	No	No	No	No	64	16	2
945	TP_IFC_BB_TMP_B	Passive Temp Ch14 (GROUND USE ONLY)	No	No	No	No	64	16	2
931	TP_IPU_TEMP_A	Passive Temp Ch0 (GROUND USE ONLY)	No	No	No	No	64	16	2
939	TP_IPU_TEMP_B	Passive Temp Ch8 (GROUND USE ONLY)	No	No	No	No	64	16	2
932	TP_PCU_TEMP_A	Passive Temp Ch1 (GROUND USE ONLY)	No	No	No	No	64	16	2
940	TP_PCU_TEMP_B	Passive Temp Ch9 (GROUND USE ONLY)	No	No	No	No	64	16	2
936	TP_SMA_MNT_TMP_	Passive Temp Ch5 (GROUND USE ONLY)	No	No	No	No	64	16	2
944	TP_SMA_MNT_TMP_	Passive Temp Ch13 (GROUND USE ONLY)	No	No	No	No	64	16	2
935	TP_TEU_TEMP_A	Passive Temp Ch4 (GROUND USE ONLY)	No	No	No	No	64	16	2
943	TP_TEU_TEMP_B	Passive Temp Ch12 (GROUND USE ONLY)	No	No	No	No	64	16	2
831	TSB_ADDR_OFF	IPU address offset for the TSB	Yes	No	Yes	No	64	32	1
826	TSB_BOOT_STAT_1	Combined IPU states for the TSB (see subtmi)	Yes	No	Yes	Yes	64	16	1
827	TSB_BOOT_STAT_2	Combined IPU load info for the TSB (see subtmi)	Yes	No	Yes	Yes	64	16	1
828	TSB_BOOT_STAT_3	Combined IPU cmd and index info for the TSB (see subtmi)	Yes	No	Yes	Yes	64	16	1
829	TSB_BOOT_STAT_4	Combined IPU MBIC and override info for the TSB (see subtmi)	Yes	No	Yes	Yes	64	32	1
806	TSB_DIAG_CHKSM_C	Ckecksum Error count, on TSU DIAG block	Yes	No	Yes	Yes	64	16	1
830	TSB_EE_TABLE	Subcommed EEPROM table entry (subcom index TSB_EE_TBL_INDEX)	Yes	No	Yes	No	64	32	1
807	TSB_HK_CHKSM_CN	Ckecksum Error count, on TSU HK block	Yes	No	Yes	Yes	64	16	1
824	TSS_APP_CHKSM_C	TSS App code telemetry packet checksum error count	Yes	Yes	Yes	No	64	8	1
886	TSS_DMA_ERR_C	DMA Parity , Framing, HW Programming and phase error counters	Yes	Yes	Yes	No	64	16	1
451	TSS_RD_TEUSYNC	IPU read TEU DMA buffer sync, state counter	Yes	No	Yes	No	64	8	1
654	TSS_RESET_TIME	Hirdls Time at Last TSS Reset	Yes	No	Yes	No	64	32	1
803	TSS_TLM_LEN_CNT	Packet Length Error count, on TSS on tlm Channel	Yes	No	Yes	No	64	8	1
804	TSS_TLM_NOPKT_C	No Packet count, on TSS on tlm Channel	Yes	Yes	Yes	Yes	64	8	1
802	TSS_TLM_PKT_CNT	Packet count, on TSS on tlm Channel	Yes	Yes	Yes	Yes	64	8	1
455	TSS_WR_TEUSYNC	IPU write TEU DMA buffer sync, state counter	Yes	No	Yes	No	64	8	1
582	TSU_BUILD_ID	TEU SUROM - S/W Bld Versn ID	Yes	No	Yes	No	64	16	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
572	TSU_CACPT_CNT	TEU SUROM - Command accept count	Yes	No	Yes	Yes	64	16	1
579	TSU_CMP_CKSUM	TEU SUROM - Computed checksum of total Program Image	Yes	No	Yes	Yes	64	32	1
573	TSU_CREJ_CNT	TEU SUROM - Command reject count	Yes	No	Yes	Yes	64	16	1
569	TSU_DBERR_CNT	TEU SUROM - EDAC double bit error cum count	Yes	No	Yes	No	64	16	1
809	TSU_DIAG_PKT_CNT	TEU SUROM - DIAG packet counter	Yes	No	Yes	Yes	64	16	1
581	TSU_DUMP_ADDR	TEU SUROM - RAM dump address	Yes	No	Yes	No	64	32	0
457	TSU_DUMP_NWORDS	Number of words in TSU Ram Dump	No	No	Yes	No	64	16	0
580	TSU_FLAG_BITS	TEU SUROM - Watchdog frame	Yes	No	Yes	Yes	64	16	1
571	TSU_GOOD_RAM	TEU SUROM - Start address of "good" RAM	Yes	No	Yes	Yes	64	16	1
808	TSU_HK_PKT_CNT	TEU SUROM - HK packet counter	Yes	No	Yes	Yes	64	16	1
567	TSU_LIOTRES	TEU SUROM - LIO test results	Yes	No	Yes	Yes	64	16	1
576	TSU_NEXT_BLK	TEU SUROM - Next expected block number for Program Image upload	Yes	No	Yes	Yes	64	16	1
570	TSU_RBERR_CNT	TEU SUROM - Read back fail count	Yes	No	Yes	No	64	16	1
574	TSU_REJ_SIG	TEU SUROM - Reject command signature	Yes	No	Yes	Yes	64	16	1
575	TSU_REJREAS	TEU SUROM - Command reject reason	Yes	No	Yes	Yes	64	16	1
568	TSU_SBERR_CNT	TEU SUROM - EDAC single bit error cum count	Yes	No	Yes	No	64	16	1
810	TSU_TLM_ID	TEU SUROM - telemetry ID (20 for HK only, 19 for HK plus Diag)	Yes	No	Yes	No	64	16	1
577	TSU_TOTAL_BLKS	TEU SUROM - Program Image upload total expected block num	Yes	No	Yes	Yes	64	16	1
578	TSU_UP_CKSUM	TEU SUROM - Expected checksum of total Program Image	Yes	No	Yes	Yes	64	32	1
547	TSW_AZ_MTR_I	Azimuth drive motor current @@AZMOTR_CRRT	Yes	Yes	Yes	Yes	64	16	1
908	TSW_AZC_POS	Copy of TSW_AZX_POS data based on which EEA (primary or secondary) is selected for control	No	No	No	No	64	32	1
546	TSW_AZMTRDRVCM	Commanded torque in azimuth	Yes	Yes	Yes	No	64	16	1
820	TSW_AZP_INDEX	Azimuth Primary index val	Yes	Yes	Yes	No	64	16	1
794	TSW_AZP_OFFSET	Encoder offset value (32 bits) for Azimuth Primary	Yes	No	Yes	No	64	32	0
518	TSW_AZP_POS	Raw Primary azimuth position	Yes	Yes	Yes	No	64	32	1
823	TSW_AZS_INDEX	Azimuth Secondary index value	Yes	Yes	Yes	No	64	16	1
797	TSW_AZS_OFFSET	Encoder offset value (32 bits) for Azimuth Secondary	Yes	No	Yes	No	64	32	0
521	TSW_AZS_POS	RAW Secondary azimuth encoder position	Yes	Yes	Yes	No	64	32	1
550	TSW_CHOP_MTR_I	Chopper motor current @@CHOPMOT_CRRT 112	Yes	Yes	Yes	Yes	64	16	1
529	TSW_CLOCK_SEL	TSS synchronization source	Yes	Yes	Yes	Yes	64	16	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
537	TSW_CMDA_CNT	Command accept count	Yes	Yes	Yes	Yes	64	16	1
539	TSW_CMDA_SIG	Accepted command signature	Yes	Yes	Yes	Yes	64	16	1
538	TSW_CMDR_CNT	Command reject count	Yes	Yes	Yes	Yes	64	16	1
540	TSW_CMDR_SIG	Rejected command signature in high byte, reject reason in low byte	Yes	Yes	Yes	Yes	64	16	1
875	TSW_CR_SYNC_STAT	Chopper rotation sync status	Yes	Yes	Yes	Yes	64	16	1
618	TSW_CRIT_MAX	Max critical time in last 64 CRs, 4 usec/count	Yes	Yes	Yes	No	64	8	1
535	TSW_CSC_STAT	TSW CSC enable/disable status @@TEU_TSW_STAT	Yes	Yes	Yes	Yes	64	16	1
162	TSW_CSCI_BLD_ID	Telescope S/W Bld Versn ID	Yes	No	Yes	Yes	64	16	1
892	TSW_CTL_ERR_AZ	SM AZ control error (meas - cmd) (0.01 urad/count)	Yes	Yes	Yes	Yes	64	16	1
893	TSW_CTL_ERR_EL	SM EL control error (meas - cmd) (0.01 urad/count)	Yes	Yes	Yes	Yes	64	16	1
542	TSW_CTL_INDEX	Scan mirror cntrl list crrnt index	Yes	Yes	Yes	Yes	64	16	1
914	TSW_DMA_R_ERR_C	Counters for 4 errors	Yes	Yes	Yes	No	64	16	1
874	TSW_DUMP_ADDR	Dump address	No	No	Yes	No	64	32	1
798	TSW_EEACNFG	EEA configuration word	Yes	Yes	Yes	Yes	64	16	1
548	TSW_EL1_MTR_I	Elevation 1 motor current @@ELMOTR1_CRRT 105	Yes	Yes	Yes	Yes	64	16	1
906	TSW_EL1C_POS	Copy of TSW_EL1X_POS data based on which EEA (primary or secondary) is selected for control	No	No	No	No	64	32	1
544	TSW_EL1MTRDRVC	Commanded torque in elevation 1	Yes	Yes	Yes	No	64	16	1
818	TSW_EL1P_INDEX	Elevation 1 Primary index value	Yes	Yes	Yes	No	64	16	1
792	TSW_EL1P_OFFSET	Encoder offset value (32 bits) for Elevation 1 Primary	Yes	No	Yes	No	64	32	0
516	TSW_EL1P_POS	Raw Primary elevation 1 position	Yes	Yes	Yes	No	64	32	1
821	TSW_EL1S_INDEX	Elevation 1 Secondary index value	Yes	Yes	Yes	No	64	16	1
795	TSW_EL1S_OFFSET	Encoder offset value (32 bits) for Elevation 1 Secondary	Yes	No	Yes	No	64	32	0
519	TSW_EL1S_POS	Raw Secondary elevation 1 position	Yes	Yes	Yes	No	64	32	1
549	TSW_EL2_MTR_I	Elevation 2 motor current @@ELMOTR2_CRRT	Yes	Yes	Yes	Yes	64	16	1
907	TSW_EL2C_POS	Copy of TSW_EL2X_POS data based on which EEA (primary or secondary) is selected for control	No	No	No	No	64	32	1
545	TSW_EL2MTRDRVC	Commanded torque in elevation 2	Yes	Yes	Yes	No	64	16	1
819	TSW_EL2P_INDEX	Elevation 2 Primary index va	Yes	Yes	Yes	No	64	16	1
793	TSW_EL2P_OFFSET	Encoder offset value (32 bits) for Elevation 2 Primary	Yes	No	Yes	No	64	32	0
517	TSW_EL2P_POS	Raw Primary elevation 2 position	Yes	Yes	Yes	No	64	32	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
822	TSW_EL2S_INDEX	Elevation 2 Secondary index value	Yes	Yes	Yes	No	64	16	1
796	TSW_EL2S_OFFSET	Encoder offset value (32 bits) for Elevation 2 Secondary	Yes	No	Yes	No	64	32	0
520	TSW_EL2S_POS	Raw Secondary elevation 2 position	Yes	Yes	Yes	No	64	32	1
522	TSW_ENCP_STAT	EEA primary channel set status	Yes	Yes	Yes	Yes	64	16	1
523	TSW_ENCS_STAT	EEA secondary channel set status	Yes	Yes	Yes	Yes	64	16	1
894	TSW_EXCEPTION	Exception status for TEU flight software	Yes	Yes	Yes	No	64	32	1
657	TSW_EXEC_OVERRU	TSW Executive overrun counter	Yes	Yes	Yes	Yes	64	8	0
867	TSW_FAULT_STAT	Fault status information for TSW	Yes	Yes	Yes	Yes	64	16	1
655	TSW_FREQ	Chopper pre-scalar value used for scan mirror control time tick	Yes	Yes	Yes	Yes	64	16	1
799	TSW_HK_PKT_CNT	TSW HK Packet Counter	Yes	Yes	Yes	Yes	64	16	1
528	TSW_HWCNFG	TSS hardware configuration @@ TSS_HW_CFIG	Yes	Yes	Yes	Yes	64	16	1
873	TSW_MAX_SSTIME	Max number of microsec between successive SS within a MAF	Yes	Yes	Yes	No	64	16	1
868	TSW_MEM_SCRUB	Single bit error count	Yes	Yes	Yes	No	64	16	1
872	TSW_MIN_SSTIME	Min number of microsec between successive SS within a MAF	Yes	Yes	Yes	No	64	16	1
564	TSW_MTRCTRG	DIO scan mirror motor control reg	Yes	No	Yes	No	64	16	1
557	TSW_N15VSUP	Negative 15V supply @@ TEU_N9V	Yes	Yes	Yes	Yes	64	16	1
551	TSW_P15VSUP	Positive 15V supply 1 @@TEU_P9V	Yes	Yes	Yes	Yes	64	16	1
554	TSW_P5VREF1	Positive 5V reference 1 @@TEU_ADC0_REF	Yes	Yes	Yes	Yes	64	16	1
555	TSW_P5VREF2	Positive 5V reference 2 @@TEU_ADC1_REF	Yes	Yes	Yes	Yes	64	16	1
553	TSW_P5VSUP	Positive 5V supply 1 @@TEU_P5V	Yes	Yes	Yes	Yes	64	16	1
562	TSW_PIFCTLRG	DIO primary I/F cntrl register	Yes	Yes	Yes	Yes	64	16	1
524	TSW_PRIIF_STAT	Primary EEA/TEU channel I/F status	Yes	Yes	Yes	Yes	64	16	1
915	TSW_QHSS_ERR_C	Counters for 4 errors	Yes	Yes	Yes	No	64	16	1
667	TSW_SCBD_TMP	Signal Conditioning Board Temperature	Yes	Yes	Yes	No	64	16	0
869	TSW_SCI_AZPO_CMD	TSW commanded Az position	Yes	Yes	Yes	Yes	64	16	1
870	TSW_SCI_ELPO_CMD	TSW commanded El position	Yes	Yes	Yes	Yes	64	16	1
800	TSW_SCI_PKT_CNT	TSW SCI Packet Counter	Yes	No	Yes	Yes	64	16	1
534	TSW_SCON_STAT	Signal conditioning module status @@TEU_SIGCON_STAT	Yes	No	Yes	No	64	16	1
525	TSW_SECIF_STAT	Secondary EEA/TEU channel I/F stat	Yes	Yes	Yes	Yes	64	16	1
563	TSW_SIFCTLRG	DIO secondary I/F cntrl register	Yes	Yes	Yes	Yes	64	16	1

ID	Mnemonic	Description	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
543	TSW_SM_EI_STAT	Scan mirror control CSC status	Yes	Yes	Yes	Yes	64	16	1
825	TSW_TABLEN	Number of lines in the current table	Yes	Yes	Yes	Yes	64	16	1
801	TSW_TLM_ID	TSS telemetry ID (51)	Yes	No	Yes	No	64	16	1
606	TSW_TOT_MAX	Max total time in last 64 CRs, 4 microsec/count	Yes	Yes	Yes	No	64	8	1
532	TSW_WBDAT1	Wobble sensor data @@WOBB_SENS1	Yes	Yes	Yes	Yes	8	16	1
533	TSW_WBDAT2	Wobble sensor data @@ WOBB_SENS2	Yes	Yes	Yes	Yes	8	16	1
41	WSE_BOX_TMP	WSE box temp, EDAQ AD590 Row 0 Col 3	Yes	Yes	Yes	Yes	64	16	8

HIRDLS Obsolete Telemetry

(Sort by ID)

ID	Mnemonic	Comments	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
21	ORB_DAT_00	S/C Ancillary data item #0 (OBSOLETE)	No	No	No	No	64	16	4
22	ORB_DAT_01	S/C Ancillary data item #1 (OBSOLETE)	No	No	No	No	64	16	4
23	ORB_DAT_02	S/C Ancillary data item #2 (OBSOLETE)	No	No	No	No	64	16	4
24	ORB_DAT_03	S/C Ancillary data item #3 (OBSOLETE)	No	No	No	No	64	16	4
25	ORB_DAT_04	S/C Ancillary data item #4 (OBSOLETE)	No	No	No	No	64	16	4
26	ORB_DAT_05	S/C Ancillary data item #5 (OBSOLETE)	No	No	No	No	64	16	4
27	ORB_DAT_06	S/C Ancillary data item #6 (OBSOLETE)	No	No	No	No	64	16	4
28	ORB_DAT_07	S/C Ancillary data item #7 (OBSOLETE)	No	No	No	No	64	16	4
33	STH_TMP_05	OBSOLETE Structure temp 05 EDAQ AD590 Row 3 Col 0	No	No	No	No	64	16	4
34	STH_TMP_06	OBSOLETE Structure temp 06 EDAQ AD590 Row 3 Col 7	No	No	No	No	64	16	4
35	STH_TMP_07	OBSOLETE Structure temp 07 EDAQ AD590 Row 5 Col 2	No	No	No	No	64	16	4
36	STH_TMP_08	OBSOLETE Structure temp 08 EDAQ AD590 Row 1 Col 4	No	No	No	No	64	16	4
73	GYR0_MAGDAT	OBSOLETE Gyro 0 mgnetomtr data	No	No	No	No	64	16	4
74	GYR1_MAGDAT	OBSOLETE Gyro 1 mgnetomtr data	No	No	No	No	64	16	4
75	GYR2_MAGDAT	OBSOLETE Gyro 2 mgnetomtr data	No	No	No	No	64	16	4
76	GYR3_MAGDAT	OBSOLETE Gyro 3 mgnetomtr data	No	No	No	No	64	16	4
104	EEA_STATUS	@@ OBSOLETE , maps to 522-525	No	No	No	No	64	16	4
105	ELMOTR1_CRRT	@@ OBSOLETE new name TSW_EL1MTRCUR	No	No	No	No	8	16	4
106	ELMOTR2_CRRT	@@ OBSOLETE new name TSW_EL2MTRCUR	No	No	No	No	8	16	4
107	AZMOTR_CRRT	@@ OBSOLETE new name TSW_AZMTRCUR	No	No	No	No	8	16	4
108	WOBB_SENS1	@@ OBSOLETE new name TSW_WBDAT1	No	No	No	No	8	16	4
109	WOBB_SENS2	@@ OBSOLETE new name TSW_WBDAT2	No	No	No	No	8	16	4
110	ACCEL_PITCH	@@ OBSOLETE (GROUND USE ONLY)	No	No	No	No	64	16	4

ID	Mnemonic	Comments	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
111	ACCEL_ROLL	@@ OBSOLETE (GROUND USE ONLY)	No	No	No	No	64	16	4
112	CHOP_MOT_I	@@ OBSOLETE new name TSW_CHOPMCSENS	No	No	No	No	64	16	4
113	TEU_TSW_ST	@@ OBSOLETE new name TSW_CSCSTATUS	No	No	No	No	64	16	4
114	TEU_STATUS	@@ OBSOLETE new name TSW_TCMFLST	No	No	No	No	64	8	4
115	TSS_HW_CFIG	@@ OBSOLETE new name TSW_HWCNFG	No	No	No	No	64	16	4
116	TEU_SIGCON_STAT	@@ OBSOLETE new name TSW_SCONSTAT	No	No	No	No	64	16	4
117	SCAN_MOT_STAT	@@ OBSOLETE new name TSW_SMDMST	No	No	No	No	64	16	4
118	TEU_ADC0_REF	@@ OBSOLETE new name TSW_P5VREF1	No	No	No	No	64	16	4
119	TEU_ADC1_REF	@@ OBSOLETE new name TSW_P5VREF2	No	No	No	No	64	16	4
120	TEU_ADC2_REF	@@ OBSOLETE	No	No	No	No	64	16	4
121	TEU_ADC3_REF	@@ OBSOLETE	No	No	No	No	64	16	4
122	TEU_ADC0_ZER	@@ OBSOLETE new name TSW_P0VREF1	No	No	No	No	64	16	4
123	TEU_ADC1_ZER	@@ OBSOLETE new name TSW_P0VREF2	No	No	No	No	64	16	4
124	TEU_ADC2_ZER	@@ OBSOLETE new name TSW_P0VREF3	No	No	No	No	64	16	4
125	TEU_ADC3_ZER	@@ OBSOLETE new name TSW_P0VREF4	No	No	No	No	64	16	4
126	TEU_P5V	@@ OBSOLETE new name TSW_P5VSUP1	No	No	No	No	64	16	4
127	TEU_P9V	@@ OBSOLETE	No	No	No	No	64	16	4
128	TEU_N9V	@@ OBSOLETE	No	No	No	No	64	16	4
129	ACCEL00_TMP	@@ OBSOLETE	No	No	No	No	64	16	4
130	ACCEL01_TMP	@@ OBSOLETE	No	No	No	No	64	16	4
131	ACCEL02_TMP	@@ OBSOLETE	No	No	No	No	64	16	4
132	ACCEL03_TMP	@@ OBSOLETE	No	No	No	No	64	16	4
136	ELMOT1TMP	OBSOLETE Elev motor 1 temp EDAQ need mapping	No	No	No	No	64	16	4
137	ELMOT2TMP	OBSOLETE Elev motor 2 temp EDAQ need mapping	No	No	No	No	64	16	4
174	SAILTASK_00_LO	SAIL Tsk 00 params 00-07 !	No	No	No	No	8	16	4

ID	Mnemonic	Comments	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
175	SAILTASK_00_HI	SAIL Tsk 00 params 08-15 !	No	No	No	No	8	16	4
176	SAILTASK_01_LO	SAIL Tsk 01 params 00-07 !	No	No	No	No	8	16	4
177	SAILTASK_01_HI	SAIL Tsk 01 params 08-15 !	No	No	No	No	8	16	4
178	SAILTASK_02_LO	SAIL Tsk 02 params 00-07 !	No	No	No	No	8	16	4
179	SAILTASK_02_HI	SAIL Tsk 02 params 08-15 !	No	No	No	No	8	16	4
180	SAILTASK_03_LO	SAIL Tsk 03 params 00-07 !	No	No	No	No	8	16	4
181	SAILTASK_03_HI	SAIL Tsk 03 params 08-15 !	No	No	No	No	8	16	4
182	SAILTASK_04_LO	SAIL Tsk 04 params 00-07 !	No	No	No	No	8	16	4
183	SAILTASK_04_HI	SAIL Tsk 04 params 08-15 !	No	No	No	No	8	16	4
184	SAILTASK_05_LO	SAIL Tsk 05 params 00-07 !	No	No	No	No	8	16	4
185	SAILTASK_05_HI	SAIL Tsk 05 params 08-15 !	No	No	No	No	8	16	4
186	SAILTASK_06_LO	SAIL Tsk 06 params 00-07 !	No	No	No	No	8	16	4
187	SAILTASK_06_HI	SAIL Tsk 06 params 08-15 !	No	No	No	No	8	16	4
188	SAILTASK_07_LO	SAIL Tsk 07 params 00-07 !	No	No	No	No	8	16	4
189	SAILTASK_07_HI	SAIL Tsk 07 params 08-15 !	No	No	No	No	8	16	4
190	SAILTASK_08_LO	SAIL Tsk 08 params 00-07 !	No	No	No	No	8	16	4
191	SAILTASK_08_HI	SAIL Tsk 08 params 08-15 !	No	No	No	No	8	16	4
192	SAILTASK_09_LO	SAIL Tsk 09 params 00-07 !	No	No	No	No	8	16	4
193	SAILTASK_09_HI	SAIL Tsk 09 params 08-15 !	No	No	No	No	8	16	4
194	SAILTASK_10_LO	SAIL Tsk 10 params 00-07 !	No	No	No	No	8	16	4
195	SAILTASK_10_HI	SAIL Tsk 10 params 08-15 !	No	No	No	No	8	16	4
196	SAILTASK_11_LO	SAIL Tsk 11 params 00-07 !	No	No	No	No	8	16	4
197	SAILTASK_11_HI	SAIL Tsk 11 params 08-15 !	No	No	No	No	8	16	4
198	SAILTASK_12_LO	SAIL Tsk 12 params 00-07 !	No	No	No	No	8	16	4
199	SAILTASK_12_HI	SAIL Tsk 12 params 08-15 !	No	No	No	No	8	16	4

ID	Mnemonic	Comments	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
200	SAILTASK_13_LO	SAIL Tsk 13 params 00-07 !	No	No	No	No	8	16	4
201	SAILTASK_13_HI	SAIL Tsk 13 params 08-15 !	No	No	No	No	8	16	4
202	SAILTASK_14_LO	SAIL Tsk 14 params 00-07 !	No	No	No	No	8	16	4
203	SAILTASK_14_HI	SAIL Tsk 14 params 08-15 !	No	No	No	No	8	16	4
204	SAILTASK_15_LO	SAIL Tsk 15 params 00-07 !	No	No	No	No	8	16	4
205	SAILTASK_15_HI	SAIL Tsk 15 params 08-15 !	No	No	No	No	8	16	4
222	SAIL_SHM_504	(OBSOLETE) SAIL shared memory [504]	No	No	No	No	64	32	4
223	SAIL_SHM_505	(OBSOLETE) SAIL shared memory [505]	No	No	No	No	64	32	4
224	SAIL_SHM_506	(OBSOLETE) SAIL shared memory [506]	No	No	No	No	64	32	4
225	SAIL_SHM_507	(OBSOLETE) SAIL shared memory [507]	No	No	No	No	64	32	4
226	SAIL_SHM_508	(OBSOLETE) SAIL shared memory [508]	No	No	No	No	64	32	4
227	SAIL_SHM_509	(OBSOLETE) SAIL shared memory [509]	No	No	No	No	64	32	4
228	SAIL_SHM_510	(OBSOLETE) SAIL shared memory [510]	No	No	No	No	64	32	4
229	SAIL_SHM_511	(OBSOLETE) SAIL shared memory [511]	No	No	No	No	64	32	4
230	SAILCMDST_0_31	Cmd SAIL Attributes Status	No	No	No	No	64	32	4
231	SAILCMDST_32_63	Cmd SAIL Attributes Status	No	No	No	No	64	32	4
232	SAILCMDST_64_95	Cmd SAIL Attributes Status	No	No	No	No	64	32	4
233	SAILCMDST_96_127	Cmd SAIL Attributes Status	No	No	No	No	64	32	4
319	ISU_FRAME_CNT	OBSOLETE, IPU SUROM Telemetry Frame Count (GROUND/SUROM USE ONLY)	No	No	No	No	8	16	4
323	CMD_CSCI_BLD_ID	OBSOLETE new name CMD_DB_BUILD_ID	No	No	No	No	64	16	4
324	TLM_CSCI_BLD_ID	OBSOLETE new name TLM_DB_BUILD_ID	No	No	No	No	64	16	4
326	SAIL_CSCI_BLD_ID	SAIL S/W Build Version ID	Yes	Yes	Yes	Yes	64	16	4
438	PRF_HKPATTERN	32	Yes	No	Yes	No	64	8	4
448	TSS_LS_BUSY_C	Busy error count on TSS on Low Rate tlm Channel	No	No	No	No	64	8	4
449	TSS_LS_NOPKT_C	No Packet count, on TSS on Low Rate tlm Channel	No	No	No	No	64	8	4

ID	Mnemonic	Comments	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
450	TSS_LS_SUMERR_C	Checksum error count, on TSS on Low Rate tlm Channel	No	No	No	No	64	8	4
452	TSS_HS_BUSY_C	Busy error count on TSS on High Rate tlm Channel	No	No	No	No	64	8	4
453	TSS_HS_NOPKT_C	No Packet count, on TSS on High Rate tlm Channel	No	No	No	No	64	8	4
454	TSS_HS_SUMERR_C	Checksum error count, on TSS on High Rate tlm Channel	No	No	No	No	64	8	4
467	ELMOT1_TMP2	(OBSOLETE) Elev motor 1 temp 2, EDAQ	No	No	No	No	64	16	4
469	ELMOT2_TMP2	(OBSOLETE) Elev motor 2 temp 2, EDAQ	No	No	No	No	64	16	4
474	AD590MTX_LOREF	(OBSOLETE) EDAQ	No	No	No	No	64	16	4
475	AD590MTX_HIREF	(OBSOLETE) EDAQ	No	No	No	No	64	16	4
476	PRT76_8_REF	(OBSOLETE) EDAQ	No	No	No	No	64	16	4
477	PRT100_REF	(OBSOLETE) EDAQ	No	No	No	No	64	16	4
478	PRT123_REF	(OBSOLETE) EDAQ	No	No	No	No	64	16	4
479	IPU_ADC_REFV	(OBSOLETE) EDAQ	No	No	No	No	64	16	4
480	TLM_PATT_ID	OBSOLETE	No	No	No	No	8	8	4
481	CMD_DBASE_ID	@@ OBSOLETE, new name CMD_DB_BUILD_ID	No	No	No	No	64	16	4
482	TLM_DBASE_ID	@@ OBSOLETE, new name TLM_DB_BUILD_ID	No	No	No	No	64	16	4
499	AD590MTX_ZREF	(OBSOLETE)	No	No	No	No	64	16	4
510	TEU_P15V	(OBSOLETE) renamed TSW_P15VSUP1	No	No	No	No	64	16	4
511	TEU_N15V	(OBSOLETE) renamed TSW_N15VSUP	No	No	No	No	64	16	4
514	TSW_HS_PKT_CNT	Roll over cntr (High rate channel)	No	No	No	No	64	16	4
515	TSW_HS_TLMID	Normal hi rate TLM ID (51 decimal)	No	No	No	No	64	16	4
526	TSW_LS_PKT_CNT	Roll over cntr (low rate channel)	No	No	No	No	64	16	4
527	TSW_LS_TLMID	Lo rate tlm ID (50 decimal)	No	No	No	No	64	16	4
530	TSW_EICTLINDX	(OBSOLETE) Encoder init control list index	No	No	No	No	64	16	4
531	TSW_EIC_STAT_OBS	(Obsolete)Encoder Initialization CSC status	No	No	No	No	64	16	4
536	TSW_SMDMST	(OBSOLETE) Never implemented and no additional information to place here	No	No	No	No	64	16	4

ID	Mnemonic	Comments	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
541	TSW_TCMFL_STAT	Task completion/failure status	No	No	No	No	64	16	4
552	TSW_P15VSUP2	(OBSOLETE) EM only and never connected into TSS telemetry	No	No	No	No	64	16	4
556	TSW_P5VSUP2	(OBSOLETE) EM only and never connected into TSS telemetry	No	No	No	No	64	16	4
558	TSW_P0VREF1	(OBSOLETE) EM only and never connected into TSS telemetry	No	No	No	No	64	16	4
559	TSW_P0VREF2	(OBSOLETE) EM only and never connected into TSS telemetry	No	No	No	No	64	16	4
560	TSW_P0VREF3	(OBSOLETE) EM only and never connected into TSS telemetry	No	No	No	No	64	16	4
561	TSW_P0VREF4	(OBSOLETE) EM only and never connected into TSS telemetry	No	No	No	No	64	16	4
565	TSU_HS_PKT_CN	TEU SUROM - High Speed packet counter	No	No	No	No	64	16	4
566	TSU_HS_TLM_ID	TEU SUROM - High Speed telemetry ID (20 decimal)	No	No	No	No	64	16	4
594	TSW_PRF_TOT_M0	TEU processor msec 0 total execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
595	TSW_PRF_TOT_M1	TEU processor msec 1 total execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
596	TSW_PRF_TOT_M2	TEU processor msec 2 total execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
597	TSW_PRF_TOT_M3	TEU processor msec 3 total execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
598	TSW_PRF_TOT_M4	TEU processor msec 4 total execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
599	TSW_PRF_TOT_M5	TEU processor msec 5 total execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
600	TSW_PRF_TOT_M6	TEU processor msec 6 total execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
601	TSW_PRF_TOT_M7	TEU processor msec 7 total execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
602	TSW_PRF_TOT_M8	TEU processor msec 8 total execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
603	TSW_PRF_TOT_M9	TEU processor msec 9 total execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
604	TSW_PRF_TOT_M10	TEU processor msec 10 total execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
605	TSW_PRF_TOT_M11	TEU processor msec 11 total execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
607	TSW_PRF_CRIT_M0	TEU processor msec 0 critical execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
608	TSW_PRF_CRIT_M1	TEU processor msec 1 critical execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
609	TSW_PRF_CRIT_M2	TEU processor msec 2 critical execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
610	TSW_PRF_CRIT_M3	TEU processor msec 3 critical execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4

ID	Mnemonic	Comments	Science HK Def	Science HK Opr	Science HK All	Eng Stream	Period CRs	Bits Per Word	Map
611	TSW_PRF_CRIT_M4	TEU processor msec 4 critical execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
612	TSW_PRF_CRIT_M5	TEU processor msec 5 critical execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
613	TSW_PRF_CRIT_M6	TEU processor msec 6 critical execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
614	TSW_PRF_CRIT_M8	TEU processor msec 8 critical execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
615	TSW_PRF_CRIT_M9	TEU processor msec 9 critical execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
616	TSW_PRF_CRIT_M10	TEU processor msec 10 critical execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
617	TSW_PRF_CRIT_M11	TEU processor msec 11 critical execution time , max value, (TBD) 4 usecs per count	No	No	Yes	No	64	8	4
669	TSW_PRF_CRIT_M7	TEU processor msec 7 critical execution time , max value, (TBD) 4 usecs per count	Yes	No	Yes	No	64	8	4
717	CSS_P_COEFF	Are contained as subtelemetry points (at full resolution) in CSS_PACKED_PID	No	No	No	No	64	16	4
718	CSS_I_COEFF	Are contained as subtelemetry points (at full resolution) in CSS_PACKED_PID	No	No	No	No	64	16	4
719	CSS_D_COEFF	Are contained as subtelemetry points (at full resolution) in CSS_PACKED_PID	No	No	No	No	64	16	4
761	TSW_HSSCMDQ2OVF	QHSS channel 2 status (IPU - TEU)	Yes	Yes	Yes	No	64	16	4
762	TSW_HWCNFG2	TSS hardware configuration 2	No	No	No	No	64	16	4
805	TSS_TLM_CHKSM_C	Ckecksum Error count, on TSS on tlm Channel	No	No	No	No	64	8	4
846	CR_TICK_TIME_LO	HIRDLS ticks in a chopper rotation (Low water mark) cleared by IPU_FAULTCLR	Yes	Yes	Yes	No	64	16	4
847	CR_TICK_TIME_HI	HIRDLS ticks in a chopper rotation (High water mark) cleared by IPU_FAULTCLR	Yes	Yes	Yes	No	64	16	4
871	TSW_CR_DBL_CNT	Number of times a CR event is detected twice within a single SS (diagnostic only)	No	No	No	No	64	8	4
881	HKTBL_ERR	Or of SCI_HKTBL_ERR and ENG_HKTBL_ERR for eng tlm	No	No	No	No	64	16	4
897	SAIL_CNTL_STATUS	Status of the HIR_SAI_CONTROL command	No	No	No	No	64	16	4

HIRDLS Engineering Telemetry

(Sort by ID)

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
37	CCU_BOX_TMP	CCU box temp, EDAQ AD590 Row 4 Col 7	8	8	32	HD1
38	GEU_BOX_TMP	GEU box temp, EDAQ AD590 Row 4 Col 0	8	8	32	HD1
39	PCU_BOX_TMP	PCU box temp, EDAQ AD590 Row 1 Col 1	8	8	32	HD1
40	EEA_BOX_TMP	EEA box temp, EDAQ AD590 Row 4 Col 1	8	8	32	HD1
41	WSE_BOX_TMP	WSE box temp, EDAQ AD590 Row 0 Col 3	8	8	32	HD1
42	CSS_RAD_TMP1	Cooler Radiator temp 1, EDAQ AD590 Row 3 Col 5	8	8	32	HD1
44	COMP_HEAD_TMP	Compressor head temp, EDAQ AD590 Row 5 Col 5	8	8	32	HD1
45	DISPL1_TMP	Displacer 1 body temp, EDAQ AD590 Row 6 Col 6	8	8	32	HD1
46	DISPL2_TMP	Displacer 2 body temp, EDAQ AD590 Row 5 Col 5	8	8	32	HD1
47	SUNSEN1_TMP	Sun sensor 1 (temperature), EDAQ	8	8	32	HA1
48	SUNSEN2_TMP	Sun sensor 2 (temperature), EDAQ	8	8	32	HA1
49	SUNSEN3_TMP	Sun sensor 3 (temperature), EDAQ	8	8	32	HA1
50	DOOR_POT	Door angle sensor, EDAQ	16	0	4	HA2
51	DOOR_SAF_ANG	Door Safe Angle setting	16	0	8	HA2
52	SSH_HWA_TMP	Hot Wax Actuator temp, EDAQ	8	8	8	HD2
53	SSH_DORMOT_TMP	SSH drive motor temp, EDAQ	8	8	32	HD2
57	SSH_STAT	Sunshield switch status	16	0	4	
58	SVA_STAT	SVA switch status	8	0	8	
59	SVA_DORMOT_TMP	SVA drive motor temp, EDAQ	8	8	32	HD1
60	SVA_MTGPLT_TMP	SVA mounting plate tmp, EDAQ ADC590 Row 7 Col 0	8	8	32	HD1
61	GYR0_TMP	Gyro 0 temperature	8	2	32	HG8
62	GYR1_TMP	Gyro 1 temperature	8	2	32	HG8
63	GYR2_TMP	Gyro 2 temperature	8	2	32	HG8

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
64	GYR3_TMP	Gyro 3 temperature	8	2	32	HG8
81	GYR0_MOT_V	Gyro 0 motor volts	8	2	32	HG5
82	GYR1_MOT_V	Gyro 1 motor volts	8	2	32	HG5
83	GYR2_MOT_V	Gyro 2 motor volts	8	2	32	HG5
84	GYR3_MOT_V	Gyro 3 motor volts	8	2	32	HG5
85	GYR0_MOT_I	Gyro 0 motor current	8	2	32	HG4
86	GYR1_MOT_I	Gyro 1 motor current	8	2	32	HG4
87	GYR2_MOT_I	Gyro 2 motor current	8	2	32	HG4
88	GYR3_MOT_I	Gyro 3 motor current	8	2	32	HG4
89	GYR0_STAT	Gyro 0 status word	16	0	4	
90	GYR1_STAT	Gyro 1 status word	16	0	4	
91	GYR2_STAT	Gyro 2 status word	16	0	4	
92	GYR3_STAT	Gyro 3 status word	16	0	4	
93	GYR0_P15V	Gyro 0 +15 volts	8	2	32	HG6
94	GYR1_P15V	Gyro 1 +15 volts	8	2	32	HG6
95	GYR2_P15V	Gyro 2 +15 volts	8	2	32	HG6
96	GYR3_P15V	Gyro 3 +15 volts	8	2	32	HG6
97	GYR0_N15V	Gyro 0 -15 volts	8	2	32	HG7
98	GYR1_N15V	Gyro 1 -15 volts	8	2	32	HG7
99	GYR2_N15V	Gyro 2 -15 volts	8	2	32	HG7
100	GYR3_N15V	Gyro 3 -15 volts	8	2	32	HG7
133	SM_TMP1	Scan mirror temp.1, EDAQ AD590 Row 2 Col 4	8	8	32	HD1
141	LNS1_WF_TMP1	Lens 1-WF temp. 1, EDAQ AD590 Row 5 Col 0	8	8	32	HD1
144	LNS2_TMP1	Lens 2 temp. 1, EDAQ AD590 Row 5 Col 1	8	8	32	HD1
147	CHOP_MOT_TMP	Chopper motor temp, EDAQ AD590 Row 5 Col 3	8	8	32	HD1

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
150	CALMIR_TMP1	Cal. Mirror temp #1, EDAQ ADC590 Row 0 Col 1	8	8	32	HD1
153	M2_TMP1	Sec. (M2) mir temp #1, EDAQ ADC590 Row 6 Col 4	8	8	32	HD1
155	SMA_MTRING_TMP	SMA mount ring temp, EDAQ 56	8	8	32	HD1
162	TSW_CSCI_BLD_ID	Telescope S/W Bld Versn ID	16	0	32	
163	FPA_TMP_A	Focal Plane temperature A, SPU	16	0	32	HE1
164	FPA_TMP_B	Focal Plane temperature B,SPU	16	0	32	HE2
165	IFCBB_FRPL_TMP	IFCBB front plate temp, EDAQ	8	8	32	HD1
166	IFC_REF_TMP	IFC ref. resistor temp	8	0	32	HJ4
167	IFCBB_TMP1	IFC BB temp. #1	8	8	32	HK1
168	IFCBB_TMP2	IFC BB temp. #2	8	8	32	HK2
169	IFCBB_TMP3	IFC BB temp. #3	8	8	32	HK3
171	IFC_PSV_P15	IFC +15V rail volts	8	2	32	HJ1
172	IFC_PSV_N15	IFC -15V rail volts	8	2	32	HJ2
173	IFC_PSV_P5	IFC +5V rail volts	8	2	32	HJ3
206	SAILTASK_00_P15	SAIL Tsk 00 param 15 !	32	0	32	
207	SAILTASK_01_P15	SAIL Tsk 01 param 15 !	32	0	32	
208	SAILTASK_02_P15	SAIL Tsk 02 param 15 !	32	0	32	
209	SAILTASK_03_P15	SAIL Tsk 03 param 15 !	32	0	32	
210	SAILTASK_04_P15	SAIL Tsk 04 param 15 !	32	0	32	
211	SAILTASK_05_P15	SAIL Tsk 05 param 15 !	32	0	32	
212	SAILTASK_06_P15	SAIL Tsk 06 param 15 !	32	0	32	
213	SAILTASK_07_P15	SAIL Tsk 07 param 15 !	32	0	32	
214	SAILTASK_08_P15	SAIL Tsk 08 param 15 !	32	0	32	
215	SAILTASK_09_P15	SAIL Tsk 09 param 15 !	32	0	32	
216	SAILTASK_10_P15	SAIL Tsk 10 param 15 !	32	0	32	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
217	SAILTASK_11_P15	SAIL Tsk 11 param 15 !	32	0	32	
218	SAILTASK_12_P15	SAIL Tsk 12 param 15 !	32	0	32	
219	SAILTASK_13_P15	SAIL Tsk 13 param 15 !	32	0	32	
220	SAILTASK_14_P15	SAIL Tsk 14 param 15 !	32	0	32	
221	SAILTASK_15_P15	SAIL Tsk 15 param 15 !	32	0	32	
234	SAIL_PROC_STAT	SAIL Processor Status Code	8	0	4	
235	SAILTASK_00_STA	SAIL Task 00 Status Code	8	0	8	
236	SAILTASK_01_STA	SAIL Task 01 Status Code	8	0	8	
237	SAILTASK_02_STA	SAIL Task 02 Status Code	8	0	8	
238	SAILTASK_03_STA	SAIL Task 03 Status Code	8	0	8	
239	SAILTASK_04_STA	SAIL Task 04 Status Code	8	0	8	
240	SAILTASK_05_STA	SAIL Task 05 Status Code	8	0	8	
241	SAILTASK_06_STA	SAIL Task 06 Status Code	8	0	8	
242	SAILTASK_07_STA	SAIL Task 07 Status Code	8	0	8	
243	SAILTASK_08_STA	SAIL Task 08 Status Code	8	0	8	
244	SAILTASK_09_STA	SAIL Task 09 Status Code	8	0	8	
245	SAILTASK_10_STA	SAIL Task 10 Status Code	8	0	8	
246	SAILTASK_11_STA	SAIL Task 11 Status Code	8	0	8	
247	SAILTASK_12_STA	SAIL Task 12 Status Code	8	0	8	
248	SAILTASK_13_STA	SAIL Task 13 Status Code	8	0	8	
249	SAILTASK_14_STA	SAIL Task 14 Status Code	8	0	8	
250	SAILTASK_15_STA	SAIL Task 15 Status Code	8	0	8	
254	SCCMDS_RCVCT	S/C cmds: received count	8	0	4	
255	SCCMDS_REJCT	S/C cmds: rejected count	8	0	4	
256	SCCMD_LAST_RC	Last S/C cmd: result code	16	0	4	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
257	SCCMD_LAST_CN	Last S/C cmd: cmd nmbr	8	0	4	
259	SAILCMDS_RCVCT	SAIL cmds: received count	8	0	16	
260	SAILCMDS_REJCT	SAIL cmds: rejected count	8	0	16	
261	SAILCMD_LAST_RC	Last SAIL cmd: result code	16	0	16	
262	SAILCMD_LAST_CN	Last SAIL cmd: cmd nmbr	8	0	16	
263	MACMDS_RCVCT	Macro cmds: receivd count	8	0	16	
264	MACMDS_REJCT	Macro cmds: rejected count	8	0	16	
265	MACMD_LAST_RC	Last Macro cmd: reslt code	16	0	16	
266	MACMD_LAST_CN	Last Macro cmd: cmd nmbr	8	0	16	
290	SPU_P5V_A	SPU +5VA supply volts (analog)	8	8	32	HU7
291	SPU_N5V_A	SPU -5VA supply volts (analog)	8	8	32	HU3
292	SPU_P5V_DA	SPU +5VA supply volts (digital)	8	8	32	HU9
293	SPU_P12V_A	SPU +12VA supply volts	8	8	32	HU5
294	SPU_N12V_A	SPU -12VA supply volts	8	8	32	HU1
295	SPU_P5V_B	SPU +5VB supply volts (analog)	8	8	32	HU8
296	SPU_N5V_B	SPU -5VB supply volts (analog)	8	8	32	HU4
297	SPU_P5V_DB	SPU +5VB supply volts (digital)	8	8	32	HUA
298	SPU_P12V_B	SPU +12VB supply volts	8	8	32	HU6
299	SPU_N12V_B	SPU -12VB supply volts	8	8	32	HU2
300	IPU_P3P3V	Wkg IPU +3.3V supply volts, EDAQ	8	8	32	HP1
301	IPU_P5V	Wkg IPU +5V supply volts, EDAQ	8	8	32	HP2
302	IPU_P15V	Wkg IPU +15V supply volts, EDAQ	8	8	32	HP3
303	IPU_N15V	Wkg IPU -15V supply volts, EDAQ	8	8	32	HP3
325	IPU_CSCI_BLD_ID	IPU S/W Build Version ID	16	0	32	
327	CSS_OP_STAT	Cooler operating status	8	0	4	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
328	CSS_DDCAG_STAT	Cooler DDC & caging status discretes (Read by IPU)	8	0	8	
329	CSS_ERROR	Cooler error flags	8	0	4	
330	CSS_TOTAL_I	Cooler tot mean currt	8	0	8	HC1
331	CRYOTIP_SETP	Cryo tip temp set point	16	0	8	HC2
332	CRYOTIP_TMP_D0	Cryo tip temperature 0	16	0	32	HC2
333	CRYOTIP_TMP_D1	Cryo tip temperature 1	16	0	32	HC2
334	CSS_FREQ_DMD	Cooler frequency (dmd'd)	16	0	8	HC5
335	CSS_FREQ_ACT	Cooler frequency (actual)	16	0	32	HC5
336	CSS_PH_DMD	Comp/Disp phase (dmd'd)	16	0	8	HC3
337	CSS_PH_ACT	Comp/Disp phase (actual)	16	0	32	HC3
338	COMP_AMP_DMD	Compressor ampl (dmd'd)	16	0	8	HC4
339	COMP_AMP_ACT	Compressor ampl (actual)	16	0	32	HC4
340	DISP_AMP_DMD	Displacer ampl (dmd'd)	16	0	8	HC4
341	DISP_AMP_ACT	Displacer ampl (actual)	16	0	32	HC4
342	CSS_MSG_NUMBER	CSS-IPS data msg number	8	0	4	
344	QA_I	Quiet Bus A input currt, from PSS	16	0	4	HSG
345	QB_I	Quiet Bus B input currt, from PSS	16	0	4	HSH
346	PSS_SPU_5VA	SPU +5V DDC A volts	16	0	8	HS3
347	PSS_SPU_5VB	SPU +5V DDC B volts	16	0	8	HS4
348	PSS_SPU_P15VA	SPU +15V DDC A volts	16	0	8	HS7
349	PSS_SPU_P15VB	SPU +15V DDC B volts	16	0	8	HS8
350	PSS_SPU_N15VA	SPU -15V DDC A volts	16	0	8	HS5
351	PSS_SPU_N15VB	SPU -15V DDC B volts	16	0	8	HS6
352	PSS_PCU_5VC	PCU Internal +5 Volts	16	0	16	HR3
353	PSS_PCU_P15VC	PCU Internal +15 Volts	16	0	16	HR5

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
354	PSS_PCU_N15VC	PCU Internal -15 Volts	16	0	16	HR4
355	PSS_REG_28VA	REG +28V DDC A volts	16	0	8	HS1
356	PSS_REG_28VB	REG +28V DDC B volts	16	0	8	HS2
357	PSS_SYS_5VA	SYS +5V DDC A volts	16	0	8	HS9
358	PSS_SYS_5VB	SYS +5V DDC B volts	16	0	8	HSA
359	PSS_SYS_P15VA	SYS +15V DDC A volts	16	0	8	HSD
360	PSS_SYS_P15VB	SYS +15V DDC B volts	16	0	8	HSE
361	PSS_SYS_N15VA	SYS -15V DDC A volts	16	0	8	HSB
362	PSS_SYS_N15VB	SYS -15V DDC B volts	16	0	8	HSC
387	IPU_STAT_0	IPU Status Word 0	16	0	4	
388	IPU_ERR_0	IPU Error Flags 0	16	0	4	
389	CMD_ERR_0	Command Error Flags	16	0	4	
390	IPU_ERR_1	IPU Error Flags 1	16	0	4	
391	IPU_ERR_2	IPU Error Flags 2	16	0	4	
392	SUBTMI_BUILD_ID	Subtmi file version	16	0	32	
395	EXEC_OVERRUN_CN	CR-executive task overrun count	8	0	32	
396	IPU_FLT_STAT_1	IPU fault status word 1	16	0	4	
397	IPU_FLT_STAT_0	IPU Fault Managmt. Status	16	0	4	
402	IPU_STAT_1	IPU Status Word 1	16	0	4	
403	FIR1_TBL_ID	FIR coeffts table ID (1/CR rate)	8	0	32	
404	FIR2_TBL_ID	FIR coeffts table ID (2/CR rate)	8	0	32	
405	FIR3_TBL_ID	FIR coeffts table ID (3/CR rate)	8	0	32	
406	FIR6_TBL_ID	FIR coeffts table ID (6/CR rate)	8	0	32	
445	IPU_ERR_3	IPU ERROR Status Word 3	16	0	4	
446	IFC_HCW	IFC Heater Control Word value	8	0	4	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
458	CHOP_FREQ	Chopper frequency setting	16	0	16	HM0
459	BEU_BOX_TMP	BEU box EDAQ AD590 Row 4 Col 2	8	8	32	HD1
461	SPU_BOX_TMP	SPU box EDAQ AD590 Row 2 Col 7	8	8	32	HD1
462	IPU_BOX_TMP	IPU box EDAQ AD590 Row 7 Col 4	8	8	32	HD1
463	TEU_BOX_TMP	TEU box EDAQ AD590 Row 7 Col 6	8	8	32	HD1
471	SPVUMIR_TMP1	Space View Mirror temp #1 EDAQ AD590 Row 0 Col 4	8	8	32	HD1
483	SAIL_SHM_256	SAIL shared memory [256]	32	0	32	
484	SAIL_SHM_257	SAIL shared memory [257]	32	0	32	
485	SAIL_SHM_258	SAIL shared memory [258]	32	0	32	
486	SAIL_SHM_259	SAIL shared memory [259]	32	0	32	
487	SAIL_SHM_260	SAIL shared memory [260]	32	0	32	
488	SAIL_SHM_261	SAIL shared memory [261]	32	0	32	
489	SAIL_SHM_262	SAIL shared memory [262]	32	0	32	
490	SAIL_SHM_263	SAIL shared memory [263]	32	0	32	
491	SAIL_ENGWORD_00	SAIL-generated Eng. Word 0	32	0	4	
492	SAIL_ENGWORD_01	SAIL-generated Eng. Word 1	32	0	4	
493	SAIL_ENGWORD_02	SAIL-generated Eng. Word 2	32	0	4	
494	SAIL_ENGWORD_03	SAIL-generated Eng. Word 3	32	0	4	
495	SAIL_ENGWORD_04	SAIL-generated Eng. Word 4	32	0	4	
496	SAIL_ENGWORD_05	SAIL-generated Eng. Word 5	32	0	4	
497	SAIL_ENGWORD_06	SAIL-generated Eng. Word 6	32	0	4	
498	SAIL_ENGWORD_07	SAIL-generated Eng. Word 7	32	0	4	
512	CMD_DB_BUILD_ID	Command Database Build Version ID	16	0	32	
513	TLM_DB_BUILD_ID	Telemetry Database Build Version ID	16	0	32	
522	TSW_ENCP_STAT	EEA primary channel set status	16	0	8	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
523	TSW_ENCS_STAT	EEA secondary channel set status	16	0	8	
524	TSW_PRIIF_STAT	Primary EEA/TEU channel I/F status	16	0	16	
525	TSW_SECIF_STAT	Secondary EEA/TEU channel I/F stat	16	0	16	
528	TSW_HWCNFG	TSS hardware configuration @@ TSS_HW_CFIG	16	0	8	
529	TSW_CLOCK_SEL	TSS synchronization source	8	0	8	
532	TSW_WBDAT1	Wobble sensor data @@WOBB_SENS1	16	0	4	HW6
533	TSW_WBDAT2	Wobble sensor data @@ WOBB_SENS2	16	0	4	HW6
535	TSW_CSC_STAT	TSW CSC enable/disable status @@TEU_TSW_STAT	16	0	8	
537	TSW_CMDA_CNT	Command accept count	8	0	4	
538	TSW_CMDR_CNT	Command reject count	8	0	4	
539	TSW_CMDA_SIG	Accepted command signature	16	0	4	
540	TSW_CMDR_SIG	Rejected command signature in high byte, reject reason in low byte	16	0	4	
542	TSW_CTL_INDEX	Scan mirror cntrl list crrnt index	8	0	4	
543	TSW_SM_EI_STAT	Scan mirror control CSC status	16	0	8	
547	TSW_AZ_MTR_I	Azimuth drive motor current @@AZMOTR_CRRT	8	8	4	HW4
548	TSW_EL1_MTR_I	Elevation 1 motor current @@ELMOTR1_CRRT 105	8	8	4	HW5
549	TSW_EL2_MTR_I	Elevation 2 motor current @@ELMOTR2_CRRT	8	8	4	HW5
550	TSW_CHOP_MTR_I	Chopper motor current @@CHOPMOT_CRRT 112	16	0	4	HWC
551	TSW_P15VSUP	Positive 15V supply 1 @@TEU_P9V	8	8	32	HW3
553	TSW_P5VSUP	Positive 5V supply 1 @@TEU_P5V	8	8	32	HW2
554	TSW_P5VREF1	Positive 5V reference 1 @@TEU_ADC0_REF	8	8	32	HW2
555	TSW_P5VREF2	Positive 5V reference 2 @@TEU_ADC1_REF	8	8	32	HW2
557	TSW_N15VSUP	Negative 15V supply @@ TEU_N9V	8	8	32	HW3
562	TSW_PIFCTLRG	DIO primary I/F cntrl register	16	0	32	
563	TSW_SIFCTLRG	DIO secondary I/F cntrl register	16	0	32	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
567	TSU_LIOTRES	TEU SUROM - LIO test results	16	0	32	
571	TSU_GOOD_RAM	TEU SUROM - Start address of "good" RAM	8	0	32	
572	TSU_CACPT_CNT	TEU SUROM - Command accept count	8	0	4	
573	TSU_CREJ_CNT	TEU SUROM - Command reject count	8	0	4	
574	TSU_REJ_SIG	TEU SUROM - Reject command signature	8	0	4	
575	TSU_REJREAS	TEU SUROM - Command reject reason	16	0	4	
576	TSU_NEXT_BLK	TEU SUROM - Next expected block number for Program Image upload	16	0	8	
577	TSU_TOTAL_BLKS	TEU SUROM - Program Image upload total expected block num	16	0	16	
578	TSU_UP_CKSUM	TEU SUROM - Expected checksum of total Program Image	32	0	32	
579	TSU_CMP_CKSUM	TEU SUROM - Computed checksum of total Program Image	32	0	32	
580	TSU_FLAG_BITS	TEU SUROM - Watchdog frame	16	0	32	
583	HK_SIGDAT02	Filtered Radiance data channel 2, For inclusion in ENG data	16	0	32	
584	HK_SIGDAT04	Filtered Radiance data channel 4, For inclusion in ENG data	16	0	32	
585	HK_ELVARP_POS	Filtered Primary El Var data sample	16	4	4	
586	HK_EL2P_POS	Filtered Primary Elevation 2 data sample	16	4	4	
587	HK_AZP_POS	Filtered Primary Azimuth data sample	16	4	4	
588	HIRDLS_TIME_LSW	Bits 0-31 of HIRDLS time	32	0	32	
589	HIRDLS_TIME_MSW	Bits 32-63 of HIRDLS time	32	0	32	
655	TSW_FREQ	Chopper pre-scalar value used for scan mirror control time tick	16	0	16	HW9
657	TSW_EXEC_OVERRU	TSW Executive overrun counter	8	0	32	
660	IPU_ERR_4	IPU Error status	16	0	4	
661	IPU_STAT_2	IPU status word #2	16	0	4	
670	PSS_PCU_5VA	PCU Internal +5 Volts - A side	16	0	16	HR1
671	PSS_PCU_5VB	PCU Internal +5 Volts - B side	16	0	16	HR2
672	GYR0_HTR_W	Gyro 0 heater watts (mean)	8	2	32	HG3

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
673	GYR1_HTR_W	Gyro 1 heater watts (mean)	8	2	32	HG3
674	GYR2_HTR_W	Gyro 2 heater watts (mean)	8	2	32	HG3
675	GYR3_HTR_W	Gyro 3 heater watts (mean)	8	2	32	HG3
711	OPH_ZONE1_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	8	0	32	
712	OPH_ZONE2_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	8	0	32	
713	OPH_ZONE3_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	8	0	32	
714	OPH_ZONE4_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	8	0	32	
720	CSS_STACK_STAT	Stack monitoring word. High byte is the position of the return stack, low byte is the position of the parameter stack.	16	0	32	
789	HK_ELVARS_POS	Filtered Secondary El Var data sample	16	4	4	
790	HK_EL2S_POS	Filtered Secondary Elevation 2 data sample	16	4	4	
791	HK_AZS_POS	Filtered Secondary Azimuth data sample	16	4	4	
798	TSW_EEACNFG	EEA configuration word	16	0	8	
799	TSW_HK_PKT_CNT	TSW HK Packet Counter	8	0	4	
800	TSW_SCI_PKT_CNT	TSW SCI Packet Counter	8	0	32	
802	TSS_TLM_PKT_CNT	Packet count, on TSS on tlm Channel	8	0	32	
804	TSS_TLM_NOPKT_C	No Packet count, on TSS on tlm Channel	8	0	32	
806	TSB_DIAG_CHKSM_	Ckecksum Error count, on TSU DIAG block	8	0	32	
807	TSB_HK_CHKSM_CN	Ckecksum Error count, on TSU HK block	8	0	32	
808	TSU_HK_PKT_CNT	TEU SUROM - HK packet counter	8	0	4	
809	TSU_DIAG_PKT_CN	TEU SUROM - DIAG packet counter	8	0	4	
811	SAIL_ERR_LTASK	which SAIL task had the last error	8	0	32	
812	SAIL_ERR_LTYP	SAIL last error type	8	0	32	
813	SAIL_ERR_LLOC	SAIL last error location	16	0	32	
814	SAIL_ERR_CTASK	which SAIL task had the current error	8	0	32	
815	SAIL_ERR_CTYP	SAIL current error type	8	0	32	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
816	SAIL_ERR_CLOC	SAIL current error location	16	0	32	
817	TLM_DIAG_STAT	Diagnostic format status word	16	0	16	
825	TSW_TABLEN	Number of lines in the current table	8	0	32	
826	TSB_BOOT_STAT_1	Combined IPU states for the TSB (see subtmi)	16	0	4	
827	TSB_BOOT_STAT_2	Combined IPU load info for the TSB (see subtmi)	16	0	4	
828	TSB_BOOT_STAT_3	Combined IPU cmd and index info for the TSB (see subtmi)	16	0	4	
829	TSB_BOOT_STAT_4	Combined IPU MBIC and override info for the TSB (see subtmi)	32	0	16	
834	SAIL_SHM_264	SAIL shared memory [264]	32	0	32	
835	SAIL_SHM_265	SAIL shared memory [265]	32	0	32	
836	SAIL_SHM_266	SAIL shared memory [266]	32	0	32	
837	SAIL_SHM_267	SAIL shared memory [267]	32	0	32	
838	SAIL_SHM_268	SAIL shared memory [268]	32	0	32	
839	SAIL_SHM_269	SAIL shared memory [269]	32	0	32	
840	SAIL_SHM_270	SAIL shared memory [270]	32	0	32	
841	SAIL_SHM_271	SAIL shared memory [271]	32	0	32	
848	IPU_ERR_5	IPU status word 5	16	0	4	
849	DISPL1_OTSP	CSS displacer 1 over-temperature set point	8	8	32	HD1
850	GYR0_OTSP	GYRO 0 over-temp set point	8	2	32	HG8
851	GYR1_OTSP	GYRO 1 over-temp set point	8	2	32	HG8
852	GYR2_OTSP	GYRO 2 over-temp set point	8	2	32	HG8
853	GYR3_OTSP	GYRO 3 over-temp set point	8	2	32	HG8
854	SSH_DORMOT_OTSP	Sunshield door motor over-temperature set point	8	8	32	HD2
855	SSH_HWA_OTSP	Hot Wax Actuator over-temperature set point	8	8	32	HD2
856	SVA_DORMOT_OTSP	SVA door motor over-temperature set point	8	8	32	HD1
857	CHOP_MOT_OTSP	Chopper motor over-temperature set point	8	8	32	HD1

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
858	DISPL2_OTSP	CSS displacer 2 over-temperature set point	8	8	32	HD1
859	COMP_HEAD_OTSP	CSS compressor head over-temperature set point	8	8	32	HD1
866	IPU_ALIVE	TMON keep-alive and eng tlm sub-com counter	16	0	4	
867	TSW_FAULT_STAT	Fault status information for TSW	16	0	8	
869	TSW_SCI_AZPO_CM	TSW commanded Az position	16	0	4	HW8
870	TSW_SCI_ELPO_CM	TSW commanded El position	16	0	4	HW7
875	TSW_CR_SYNC_STA	Chopper rotation sync status	16	0	32	
876	CSS_PACKED_PID	Packed CSS P, I and D coefficients	16	0	32	
877	MACRO_STAT	Status for macro CSC	32	0	4	
878	MACRO_PARM	Macro command parameters	32	0	4	
885	SPU_PHASE_ERR_C	SPU phase error counters	16	0	16	
890	AZ_HSG_TMP_2	Azimuth housing temp 2, EDAQ AD590 Row 1 Col 0	8	8	32	HD1
892	TSW_CTL_ERR_AZ	SM AZ control error (meas - cmd) (0.01 urad/count)	16	0	4	HWB
893	TSW_CTL_ERR_EL	SM EL control error (meas - cmd) (0.01 urad/count)	16	0	4	HWB
898	SAILCMST_0_15	SAIL enabled status of each command	16	0	32	
899	SAILCMST_16_31	SAIL enabled status of each command	16	0	32	
900	SAILCMST_32_47	SAIL enabled status of each command	16	0	32	
901	SAILCMST_48_63	SAIL enabled status of each command	16	0	32	
902	SAILCMST_64_79	SAIL enabled status of each command	16	0	32	
903	SAILCMST_80_95	SAIL enabled status of each command	16	0	32	
904	SAILCMST_96_111	SAIL enabled status of each command	16	0	32	
905	SAILCMST_112_12	SAIL enabled status of each command	16	0	32	
913	TLM_ACTIVE_SCIH	Identifies active science HK format table	16	0	16	
923	SCI_FMT_BLK_ENA	Science format block enabled status	16	0	16	
924	RAD_CHAN_ENA	Science format radiance channel enabled status (bit 0=chan 1, ..., bit 20=chan 21)	32	0	16	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
927	RAD_DEMOD_TBL_I	Demodulation table ID (default = 0)	8	0	32	
928	PCU_SUBSTAT_0	PCU subsystem status word 0	16	0	4	
929	PCU_SUBSTAT_1	PCU subsystem status word 1	16	0	4	
930	PCU_SUBSTAT_2	PCU subsystem status word 2	16	0	4	

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(Sort by Mnemonic)

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
890	AZ_HSG_TMP_2	Azimuth housing temp 2, EDAQ AD590 Row 1 Col 0	8	8	32	HD1
459	BEU_BOX_TMP	BEU box EDAQ AD590 Row 4 Col 2	8	8	32	HD1
150	CALMIR_TMP1	Cal. Mirror temp #1, EDAQ ADC590 Row 0 Col 1	8	8	32	HD1
37	CCU_BOX_TMP	CCU box temp, EDAQ AD590 Row 4 Col 7	8	8	32	HD1
458	CHOP_FREQ	Chopper frequency setting	16	0	16	HM0
857	CHOP_MOT_OTSP	Chopper motor over-temperature set point	8	8	32	HD1
147	CHOP_MOT_TMP	Chopper motor temp, EDAQ AD590 Row 5 Col 3	8	8	32	HD1
512	CMD_DB_BUILD_ID	Command Database Build Version ID	16	0	32	
389	CMD_ERR_0	Command Error Flags	16	0	4	
339	COMP_AMP_ACT	Compressor ampl (actual)	16	0	32	HC4
338	COMP_AMP_DMD	Compressor ampl (dmd'd)	16	0	8	HC4
859	COMP_HEAD_OTSP	CSS compressor head over-temperature set point	8	8	32	HD1
44	COMP_HEAD_TMP	Compressor head temp, EDAQ AD590 Row 5 Col 5	8	8	32	HD1
331	CRYOTIP_SETP	Cryo tip temp set point	16	0	8	HC2
332	CRYOTIP_TMP_D0	Cryo tip temperature 0	16	0	32	HC2
333	CRYOTIP_TMP_D1	Cryo tip temperature 1	16	0	32	HC2
328	CSS_DDCAG_STAT	Cooler DDC & caging status discretes (Read by IPU)	8	0	8	
329	CSS_ERROR	Cooler error flags	8	0	4	
335	CSS_FREQ_ACT	Cooler frequency (actual)	16	0	32	HC5
334	CSS_FREQ_DMD	Cooler frequency (dmd'd)	16	0	8	HC5
342	CSS_MSG_NUMBER	CSS-IPS data msg number	8	0	4	
327	CSS_OP_STAT	Cooler operating status	8	0	4	
876	CSS_PACKED_PID	Packed CSS P, I and D coefficients	16	0	32	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
337	CSS_PH_ACT	Comp/Disp phase (actual)	16	0	32	HC3
336	CSS_PH_DMD	Comp/Disp phase (dmd'd)	16	0	8	HC3
42	CSS_RAD_TMP1	Cooler Radiator temp 1, EDAQ AD590 Row 3 Col 5	8	8	32	HD1
720	CSS_STACK_STAT	Stack monitoring word. High byte is the position of the return stack, low byte is the position of the parameter stack.	16	0	32	
330	CSS_TOTAL_I	Cooler tot mean currt	8	0	8	HC1
341	DISP_AMP_ACT	Displacer ampl (actual)	16	0	32	HC4
340	DISP_AMP_DMD	Displacer ampl (dmd'd)	16	0	8	HC4
849	DISPL1_OTSP	CSS displacer 1 over-temperature set point	8	8	32	HD1
45	DISPL1_TMP	Displacer 1 body temp, EDAQ AD590 Row 6 Col 6	8	8	32	HD1
858	DISPL2_OTSP	CSS displacer 2 over-temperature set point	8	8	32	HD1
46	DISPL2_TMP	Displacer 2 body temp, EDAQ AD590 Row 5 Col 5	8	8	32	HD1
50	DOOR_POT	Door angle sensor, EDAQ	16	0	4	HA2
51	DOOR_SAF_ANG	Door Safe Angle setting	16	0	8	HA2
40	EEA_BOX_TMP	EEA box temp, EDAQ AD590 Row 4 Col 1	8	8	32	HD1
395	EXEC_OVERRUN_CN	CR-executive task overrun count	8	0	32	
403	FIR1_TBL_ID	FIR coeffts table ID (1/CR rate)	8	0	32	
404	FIR2_TBL_ID	FIR coeffts table ID (2/CR rate)	8	0	32	
405	FIR3_TBL_ID	FIR coeffts table ID (3/CR rate)	8	0	32	
406	FIR6_TBL_ID	FIR coeffts table ID (6/CR rate)	8	0	32	
163	FPA_TMP_A	Focal Plane temperature A, SPU	16	0	32	HE1
164	FPA_TMP_B	Focal Plane temperature B,SPU	16	0	32	HE2
38	GEU_BOX_TMP	GEU box temp, EDAQ AD590 Row 4 Col 0	8	8	32	HD1
672	GYR0_HTR_W	Gyro 0 heater watts (mean)	8	2	32	HG3
85	GYR0_MOT_I	Gyro 0 motor current	8	2	32	HG4
81	GYR0_MOT_V	Gyro 0 motor volts	8	2	32	HG5

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
97	GYR0_N15V	Gyro 0 -15 volts	8	2	32	HG7
850	GYR0_OTSP	GYRO 0 over-temp set point	8	2	32	HG8
93	GYR0_P15V	Gyro 0 +15 volts	8	2	32	HG6
89	GYR0_STAT	Gyro 0 status word	16	0	4	
61	GYR0_TMP	Gyro 0 temperature	8	2	32	HG8
673	GYR1_HTR_W	Gyro 1 heater watts (mean)	8	2	32	HG3
86	GYR1_MOT_I	Gyro 1 motor current	8	2	32	HG4
82	GYR1_MOT_V	Gyro 1 motor volts	8	2	32	HG5
98	GYR1_N15V	Gyro 1 -15 volts	8	2	32	HG7
851	GYR1_OTSP	GYRO 1 over-temp set point	8	2	32	HG8
94	GYR1_P15V	Gyro 1 +15 volts	8	2	32	HG6
90	GYR1_STAT	Gyro 1 status word	16	0	4	
62	GYR1_TMP	Gyro 1 temperature	8	2	32	HG8
674	GYR2_HTR_W	Gyro 2 heater watts (mean)	8	2	32	HG3
87	GYR2_MOT_I	Gyro 2 motor current	8	2	32	HG4
83	GYR2_MOT_V	Gyro 2 motor volts	8	2	32	HG5
99	GYR2_N15V	Gyro 2 -15 volts	8	2	32	HG7
852	GYR2_OTSP	GYRO 2 over-temp set point	8	2	32	HG8
95	GYR2_P15V	Gyro 2 +15 volts	8	2	32	HG6
91	GYR2_STAT	Gyro 2 status word	16	0	4	
63	GYR2_TMP	Gyro 2 temperature	8	2	32	HG8
675	GYR3_HTR_W	Gyro 3 heater watts (mean)	8	2	32	HG3
88	GYR3_MOT_I	Gyro 3 motor current	8	2	32	HG4
84	GYR3_MOT_V	Gyro 3 motor volts	8	2	32	HG5
100	GYR3_N15V	Gyro 3 -15 volts	8	2	32	HG7

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
853	GYR3_OTSP	GYRO 3 over-temp set point	8	2	32	HG8
96	GYR3_P15V	Gyro 3 +15 volts	8	2	32	HG6
92	GYR3_STAT	Gyro 3 status word	16	0	4	
64	GYR3_TMP	Gyro 3 temperature	8	2	32	HG8
588	HIRDLS_TIME_LSW	Bits 0-31 of HIRDLS time	32	0	32	
589	HIRDLS_TIME_MSW	Bits 32-63 of HIRDLS time	32	0	32	
587	HK_AZP_POS	Filtered Primary Azimuth data sample	16	4	4	
791	HK_AZS_POS	Filtered Secondary Azimuth data sample	16	4	4	
586	HK_EL2P_POS	Filtered Primary Elevation 2 data sample	16	4	4	
790	HK_EL2S_POS	Filtered Secondary Elevation 2 data sample	16	4	4	
585	HK_ELVARP_POS	Filtered Primary El Var data sample	16	4	4	
789	HK_ELVARS_POS	Filtered Secondary El Var data sample	16	4	4	
583	HK_SIGDAT02	Filtered Radiance data channel 2, For inclusion in ENG data	16	0	32	
584	HK_SIGDAT04	Filtered Radiance data channel 4, For inclusion in ENG data	16	0	32	
446	IFC_HCW	IFC Heater Control Word value	8	0	4	
172	IFC_PSV_N15	IFC -15V rail volts	8	2	32	HJ2
171	IFC_PSV_P15	IFC +15V rail volts	8	2	32	HJ1
173	IFC_PSV_P5	IFC +5V rail volts	8	2	32	HJ3
166	IFC_REF_TMP	IFC ref. resistor temp	8	0	32	HJ4
165	IFCBB_FRPL_TMP	IFCBB front plate temp, EDAQ	8	8	32	HD1
167	IFCBB_TMP1	IFC BB temp. #1	8	8	32	HK1
168	IFCBB_TMP2	IFC BB temp. #2	8	8	32	HK2
169	IFCBB_TMP3	IFC BB temp. #3	8	8	32	HK3
866	IPU_ALIVE	TMON keep-alive and eng tlm sub-com counter	16	0	4	
462	IPU_BOX_TMP	IPU box EDAQ AD590 Row 7 Col 4	8	8	32	HD1

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
325	IPU_CSCI_BLD_ID	IPU S/W Build Version ID	16	0	32	
388	IPU_ERR_0	IPU Error Flags 0	16	0	4	
390	IPU_ERR_1	IPU Error Flags 1	16	0	4	
391	IPU_ERR_2	IPU Error Flags 2	16	0	4	
445	IPU_ERR_3	IPU ERROR Status Word 3	16	0	4	
660	IPU_ERR_4	IPU Error status	16	0	4	
848	IPU_ERR_5	IPU status word 5	16	0	4	
397	IPU_FLT_STAT_0	IPU Fault Managmt. Status	16	0	4	
396	IPU_FLT_STAT_1	IPU fault status word 1	16	0	4	
303	IPU_N15V	Wkg IPU -15V supply volts, EDAQ	8	8	32	HP3
302	IPU_P15V	Wkg IPU +15V supply volts, EDAQ	8	8	32	HP3
300	IPU_P3P3V	Wkg IPU +3.3V supply volts, EDAQ	8	8	32	HP1
301	IPU_P5V	Wkg IPU +5V supply volts, EDAQ	8	8	32	HP2
387	IPU_STAT_0	IPU Status Word 0	16	0	4	
402	IPU_STAT_1	IPU Status Word 1	16	0	4	
661	IPU_STAT_2	IPU status word #2	16	0	4	
141	LNS1_WF_TMP1	Lens 1-WF temp. 1, EDAQ AD590 Row 5 Col 0	8	8	32	HD1
144	LNS2_TMP1	Lens 2 temp. 1, EDAQ AD590 Row 5 Col 1	8	8	32	HD1
153	M2_TMP1	Sec. (M2) mir temp #1, EDAQ ADC590 Row 6 Col 4	8	8	32	HD1
266	MACMD_LAST_CN	Last Macro cmd: cmd nmbr	8	0	16	
265	MACMD_LAST_RC	Last Macro cmd: reslt code	16	0	16	
263	MACMDS_RCVCT	Macro cmds: receivd count	8	0	16	
264	MACMDS_REJCT	Macro cmds: rejected count	8	0	16	
878	MACRO_PARM	Macro command parameters	32	0	4	
877	MACRO_STAT	Status for macro CSC	32	0	4	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
711	OPH_ZONE1_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	8	0	32	
712	OPH_ZONE2_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	8	0	32	
713	OPH_ZONE3_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	8	0	32	
714	OPH_ZONE4_WIDTH	OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units	8	0	32	
39	PCU_BOX_TMP	PCU box temp, EDAQ AD590 Row 1 Col 1	8	8	32	HD1
928	PCU_SUBSTAT_0	PCU subsystem status word 0	16	0	4	
929	PCU_SUBSTAT_1	PCU subsystem status word 1	16	0	4	
930	PCU_SUBSTAT_2	PCU subsystem status word 2	16	0	4	
670	PSS_PCU_5VA	PCU Internal +5 Volts - A side	16	0	16	HR1
671	PSS_PCU_5VB	PCU Internal +5 Volts - B side	16	0	16	HR2
352	PSS_PCU_5VC	PCU Internal +5 Volts	16	0	16	HR3
354	PSS_PCU_N15VC	PCU Internal -15 Volts	16	0	16	HR4
353	PSS_PCU_P15VC	PCU Internal +15 Volts	16	0	16	HR5
355	PSS_REG_28VA	REG +28V DDC A volts	16	0	8	HS1
356	PSS_REG_28VB	REG +28V DDC B volts	16	0	8	HS2
346	PSS_SPU_5VA	SPU +5V DDC A volts	16	0	8	HS3
347	PSS_SPU_5VB	SPU +5V DDC B volts	16	0	8	HS4
350	PSS_SPU_N15VA	SPU -15V DDC A volts	16	0	8	HS5
351	PSS_SPU_N15VB	SPU -15V DDC B volts	16	0	8	HS6
348	PSS_SPU_P15VA	SPU +15V DDC A volts	16	0	8	HS7
349	PSS_SPU_P15VB	SPU +15V DDC B volts	16	0	8	HS8
357	PSS_SYS_5VA	SYS +5V DDC A volts	16	0	8	HS9
358	PSS_SYS_5VB	SYS +5V DDC B volts	16	0	8	HSA
361	PSS_SYS_N15VA	SYS -15V DDC A volts	16	0	8	HSB
362	PSS_SYS_N15VB	SYS -15V DDC B volts	16	0	8	HSC

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
359	PSS_SYS_P15VA	SYS +15V DDC A volts	16	0	8	HSD
360	PSS_SYS_P15VB	SYS +15V DDC B volts	16	0	8	HSE
344	QA_I	Quiet Bus A input currt, from PSS	16	0	4	HSG
345	QB_I	Quiet Bus B input currt, from PSS	16	0	4	HSH
924	RAD_CHAN_ENA	Science format radiance channel enabled status (bit 0=chan 1, ..., bit 20=chan 21)	32	0	16	
927	RAD_DEMOD_TBL_I	Demodulation table ID (default = 0)	8	0	32	
491	SAIL_ENGWORD_00	SAIL-generated Eng. Word 0	32	0	4	
492	SAIL_ENGWORD_01	SAIL-generated Eng. Word 1	32	0	4	
493	SAIL_ENGWORD_02	SAIL-generated Eng. Word 2	32	0	4	
494	SAIL_ENGWORD_03	SAIL-generated Eng. Word 3	32	0	4	
495	SAIL_ENGWORD_04	SAIL-generated Eng. Word 4	32	0	4	
496	SAIL_ENGWORD_05	SAIL-generated Eng. Word 5	32	0	4	
497	SAIL_ENGWORD_06	SAIL-generated Eng. Word 6	32	0	4	
498	SAIL_ENGWORD_07	SAIL-generated Eng. Word 7	32	0	4	
816	SAIL_ERR_CLOC	SAIL current error location	16	0	32	
814	SAIL_ERR_CTASK	which SAIL task had the current error	8	0	32	
815	SAIL_ERR_CTYP	SAIL current error type	8	0	32	
813	SAIL_ERR_LLOC	SAIL last error location	16	0	32	
811	SAIL_ERR_LTASK	which SAIL task had the last error	8	0	32	
812	SAIL_ERR_LTYP	SAIL last error type	8	0	32	
234	SAIL_PROC_STAT	SAIL Processor Status Code	8	0	4	
483	SAIL_SHM_256	SAIL shared memory [256]	32	0	32	
484	SAIL_SHM_257	SAIL shared memory [257]	32	0	32	
485	SAIL_SHM_258	SAIL shared memory [258]	32	0	32	
486	SAIL_SHM_259	SAIL shared memory [259]	32	0	32	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
487	SAIL_SHM_260	SAIL shared memory [260]	32	0	32	
488	SAIL_SHM_261	SAIL shared memory [261]	32	0	32	
489	SAIL_SHM_262	SAIL shared memory [262]	32	0	32	
490	SAIL_SHM_263	SAIL shared memory [263]	32	0	32	
834	SAIL_SHM_264	SAIL shared memory [264]	32	0	32	
835	SAIL_SHM_265	SAIL shared memory [265]	32	0	32	
836	SAIL_SHM_266	SAIL shared memory [266]	32	0	32	
837	SAIL_SHM_267	SAIL shared memory [267]	32	0	32	
838	SAIL_SHM_268	SAIL shared memory [268]	32	0	32	
839	SAIL_SHM_269	SAIL shared memory [269]	32	0	32	
840	SAIL_SHM_270	SAIL shared memory [270]	32	0	32	
841	SAIL_SHM_271	SAIL shared memory [271]	32	0	32	
262	SAILCMD_LAST_CN	Last SAIL cmd: cmd nmbr	8	0	16	
261	SAILCMD_LAST_RC	Last SAIL cmd: result code	16	0	16	
259	SAILCMDS_RCVCT	SAIL cmds: received count	8	0	16	
260	SAILCMDS_REJCT	SAIL cmds: rejected count	8	0	16	
898	SAILCMST_0_15	SAIL enabled status of each command	16	0	32	
905	SAILCMST_112_12	SAIL enabled status of each command	16	0	32	
899	SAILCMST_16_31	SAIL enabled status of each command	16	0	32	
900	SAILCMST_32_47	SAIL enabled status of each command	16	0	32	
901	SAILCMST_48_63	SAIL enabled status of each command	16	0	32	
902	SAILCMST_64_79	SAIL enabled status of each command	16	0	32	
903	SAILCMST_80_95	SAIL enabled status of each command	16	0	32	
904	SAILCMST_96_111	SAIL enabled status of each command	16	0	32	
206	SAILTASK_00_P15	SAIL Tsk 00 param 15 !	32	0	32	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
235	SAILTASK_00_STA	SAIL Task 00 Status Code	8	0	8	
207	SAILTASK_01_P15	SAIL Tsk 01 param 15 !	32	0	32	
236	SAILTASK_01_STA	SAIL Task 01 Status Code	8	0	8	
208	SAILTASK_02_P15	SAIL Tsk 02 param 15 !	32	0	32	
237	SAILTASK_02_STA	SAIL Task 02 Status Code	8	0	8	
209	SAILTASK_03_P15	SAIL Tsk 03 param 15 !	32	0	32	
238	SAILTASK_03_STA	SAIL Task 03 Status Code	8	0	8	
210	SAILTASK_04_P15	SAIL Tsk 04 param 15 !	32	0	32	
239	SAILTASK_04_STA	SAIL Task 04 Status Code	8	0	8	
211	SAILTASK_05_P15	SAIL Tsk 05 param 15 !	32	0	32	
240	SAILTASK_05_STA	SAIL Task 05 Status Code	8	0	8	
212	SAILTASK_06_P15	SAIL Tsk 06 param 15 !	32	0	32	
241	SAILTASK_06_STA	SAIL Task 06 Status Code	8	0	8	
213	SAILTASK_07_P15	SAIL Tsk 07 param 15 !	32	0	32	
242	SAILTASK_07_STA	SAIL Task 07 Status Code	8	0	8	
214	SAILTASK_08_P15	SAIL Tsk 08 param 15 !	32	0	32	
243	SAILTASK_08_STA	SAIL Task 08 Status Code	8	0	8	
215	SAILTASK_09_P15	SAIL Tsk 09 param 15 !	32	0	32	
244	SAILTASK_09_STA	SAIL Task 09 Status Code	8	0	8	
216	SAILTASK_10_P15	SAIL Tsk 10 param 15 !	32	0	32	
245	SAILTASK_10_STA	SAIL Task 10 Status Code	8	0	8	
217	SAILTASK_11_P15	SAIL Tsk 11 param 15 !	32	0	32	
246	SAILTASK_11_STA	SAIL Task 11 Status Code	8	0	8	
218	SAILTASK_12_P15	SAIL Tsk 12 param 15 !	32	0	32	
247	SAILTASK_12_STA	SAIL Task 12 Status Code	8	0	8	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
219	SAILTASK_13_P15	SAIL Tsk 13 param 15 !	32	0	32	
248	SAILTASK_13_STA	SAIL Task 13 Status Code	8	0	8	
220	SAILTASK_14_P15	SAIL Tsk 14 param 15 !	32	0	32	
249	SAILTASK_14_STA	SAIL Task 14 Status Code	8	0	8	
221	SAILTASK_15_P15	SAIL Tsk 15 param 15 !	32	0	32	
250	SAILTASK_15_STA	SAIL Task 15 Status Code	8	0	8	
257	SCCMD_LAST_CN	Last S/C cmd: cmd nmbr	8	0	4	
256	SCCMD_LAST_RC	Last S/C cmd: result code	16	0	4	
254	SCCMDS_RCVCT	S/C cmds: received count	8	0	4	
255	SCCMDS_REJCT	S/C cmds: rejected count	8	0	4	
923	SCI_FMT_BLK_ENA	Science format block enabled status	16	0	16	
133	SM_TMP1	Scan mirror temp.1, EDAQ AD590 Row 2 Col 4	8	8	32	HD1
155	SMA_MTRING_TMP	SMA mount ring temp, EDAQ 56	8	8	32	HD1
461	SPU_BOX_TMP	SPU box EDAQ AD590 Row 2 Col 7	8	8	32	HD1
294	SPU_N12V_A	SPU -12VA supply volts	8	8	32	HU1
299	SPU_N12V_B	SPU -12VB supply volts	8	8	32	HU2
291	SPU_N5V_A	SPU -5VA supply volts (analog)	8	8	32	HU3
296	SPU_N5V_B	SPU -5VB supply volts (analog)	8	8	32	HU4
293	SPU_P12V_A	SPU +12VA supply volts	8	8	32	HU5
298	SPU_P12V_B	SPU +12VB supply volts	8	8	32	HU6
290	SPU_P5V_A	SPU +5VA supply volts (analog)	8	8	32	HU7
295	SPU_P5V_B	SPU +5VB supply volts (analog)	8	8	32	HU8
292	SPU_P5V_DA	SPU +5VA supply volts (digital)	8	8	32	HU9
297	SPU_P5V_DB	SPU +5VB supply volts (digital)	8	8	32	HUA
885	SPU_PHASE_ERR_C	SPU phase error counters	16	0	16	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
471	SPVUMIR_TMP1	Space View Mirror temp #1 EDAQ AD590 Row 0 Col 4	8	8	32	HD1
854	SSH_DORMOT_OTSP	Sunshield door motor over-temperature set point	8	8	32	HD2
53	SSH_DORMOT_TMP	SSH drive motor temp, EDAQ	8	8	32	HD2
855	SSH_HWA_OTSP	Hot Wax Actuator over-temperature set point	8	8	32	HD2
52	SSH_HWA_TMP	Hot Wax Actuator temp, EDAQ	8	8	8	HD2
57	SSH_STAT	Sunshield switch status	16	0	4	
392	SUBTMI_BUILD_ID	Subtmi file version	16	0	32	
47	SUNSEN1_TMP	Sun sensor 1 (temperature), EDAQ	8	8	32	HA1
48	SUNSEN2_TMP	Sun sensor 2 (temperature), EDAQ	8	8	32	HA1
49	SUNSEN3_TMP	Sun sensor 3 (temperature), EDAQ	8	8	32	HA1
856	SVA_DORMOT_OTSP	SVA door motor over-temperature set point	8	8	32	HD1
59	SVA_DORMOT_TMP	SVA drive motor temp, EDAQ	8	8	32	HD1
60	SVA_MTGPLT_TMP	SVA mounting plate tmp, EDAQ ADC590 Row 7 Col 0	8	8	32	HD1
58	SVA_STAT	SVA switch status	8	0	8	
463	TEU_BOX_TMP	TEU box EDAQ AD590 Row 7 Col 6	8	8	32	HD1
913	TLM_ACTIVE_SCIH	Identifies active science HK format table	16	0	16	
513	TLM_DB_BUILD_ID	Telemetry Database Build Version ID	16	0	32	
817	TLM_DIAG_STAT	Diagnostic format status word	16	0	16	
826	TSB_BOOT_STAT_1	Combined IPU states for the TSB (see subtmi)	16	0	4	
827	TSB_BOOT_STAT_2	Combined IPU load info for the TSB (see subtmi)	16	0	4	
828	TSB_BOOT_STAT_3	Combined IPU cmd and index info for the TSB (see subtmi)	16	0	4	
829	TSB_BOOT_STAT_4	Combined IPU MBIC and override info for the TSB (see subtmi)	32	0	16	
806	TSB_DIAG_CHKSM_	Ckecksum Error count, on TSU DIAG block	8	0	32	
807	TSB_HK_CHKSM_CN	Ckecksum Error count, on TSU HK block	8	0	32	
804	TSS_TLM_NOPKT_C	No Packet count, on TSS on tlm Channel	8	0	32	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
802	TSS_TLM_PKT_CNT	Packet count, on TSS on tlm Channel	8	0	32	
572	TSU_CACPT_CNT	TEU SUROM - Command accept count	8	0	4	
579	TSU_CMP_CKSUM	TEU SUROM - Computed checksum of total Program Image	32	0	32	
573	TSU_CREJ_CNT	TEU SUROM - Command reject count	8	0	4	
809	TSU_DIAG_PKT_CN	TEU SUROM - DIAG packet counter	8	0	4	
580	TSU_FLAG_BITS	TEU SUROM - Watchdog frame	16	0	32	
571	TSU_GOOD_RAM	TEU SUROM - Start address of "good" RAM	8	0	32	
808	TSU_HK_PKT_CNT	TEU SUROM - HK packet counter	8	0	4	
567	TSU_LIOTRES	TEU SUROM - LIO test results	16	0	32	
576	TSU_NEXT_BLK	TEU SUROM - Next expected block number for Program Image upload	16	0	8	
574	TSU_REJ_SIG	TEU SUROM - Reject command signature	8	0	4	
575	TSU_REJREAS	TEU SUROM - Command reject reason	16	0	4	
577	TSU_TOTAL_BLKS	TEU SUROM - Program Image upload total expected block num	16	0	16	
578	TSU_UP_CKSUM	TEU SUROM - Expected checksum of total Program Image	32	0	32	
547	TSW_AZ_MTR_I	Azimuth drive motor current @@AZMOTR_CRRT	8	8	4	HW4
550	TSW_CHOP_MTR_I	Chopper motor current @@CHOPMOT_CRRT 112	16	0	4	HWC
529	TSW_CLOCK_SEL	TSS synchronization source	8	0	8	
537	TSW_CMDA_CNT	Command accept count	8	0	4	
539	TSW_CMDA_SIG	Accepted command signature	16	0	4	
538	TSW_CMDR_CNT	Command reject count	8	0	4	
540	TSW_CMDR_SIG	Rejected command signature in high byte, reject reason in low byte	16	0	4	
875	TSW_CR_SYNC_STA	Chopper rotation sync status	16	0	32	
535	TSW_CSC_STAT	TSW CSC enable/disable status @@TEU_TSW_STAT	16	0	8	
162	TSW_CSCI_BLD_ID	Telescope S/W Bld Versn ID	16	0	32	
892	TSW_CTL_ERR_AZ	SM AZ control error (meas - cmd) (0.01 urad/count)	16	0	4	HWB

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
893	TSW_CTL_ERR_EL	SM EL control error (meas - cmd) (0.01 urad/count)	16	0	4	HWB
542	TSW_CTL_INDEX	Scan mirror cntrl list crrnt index	8	0	4	
798	TSW_EEACNFG	EEA configuration word	16	0	8	
548	TSW_EL1_MTR_I	Elevation 1 motor current @@ELMOTR1_CRRT 105	8	8	4	HW5
549	TSW_EL2_MTR_I	Elevation 2 motor current @@ELMOTR2_CRRT	8	8	4	HW5
522	TSW_ENCP_STAT	EEA primary channel set status	16	0	8	
523	TSW_ENCS_STAT	EEA secondary channel set status	16	0	8	
657	TSW_EXEC_OVERRU	TSW Executive overrun counter	8	0	32	
867	TSW_FAULT_STAT	Fault status information for TSW	16	0	8	
655	TSW_FREQ	Chopper pre-scalar value used for scan mirror control time tick	16	0	16	HW9
799	TSW_HK_PKT_CNT	TSW HK Packet Counter	8	0	4	
528	TSW_HWCNFG	TSS hardware configuration @@ TSS_HW_CFIG	16	0	8	
557	TSW_N15VSUP	Negative 15V supply @@ TEU_N9V	8	8	32	HW3
551	TSW_P15VSUP	Positive 15V supply 1 @@TEU_P9V	8	8	32	HW3
554	TSW_P5VREF1	Positive 5V reference 1 @@TEU_ADC0_REF	8	8	32	HW2
555	TSW_P5VREF2	Positive 5V reference 2 @@TEU_ADC1_REF	8	8	32	HW2
553	TSW_P5VSUP	Positive 5V supply 1 @@TEU_P5V	8	8	32	HW2
562	TSW_PIFCTLRG	DIO primary I/F cntrl register	16	0	32	
524	TSW_PRIIF_STAT	Primary EEA/TEU channel I/F status	16	0	16	
869	TSW_SCI_AZPO_CM	TSW commanded Az position	16	0	4	HW8
870	TSW_SCI_ELPO_CM	TSW commanded El position	16	0	4	HW7
800	TSW_SCI_PKT_CNT	TSW SCI Packet Counter	8	0	32	
525	TSW_SECIF_STAT	Secondary EEA/TEU channel I/F stat	16	0	16	
563	TSW_SIFCTLRG	DIO secondary I/F cntrl register	16	0	32	
543	TSW_SM_EI_STAT	Scan mirror control CSC status	16	0	8	

ID	Mnemonic	Description	Size [bits]	Shift [bits]	Period [sec]	Conv Alg
825	TSW_TABLEN	Number of lines in the current table	8	0	32	
532	TSW_WBDAT1	Wobble sensor data @@WOBB_SENS1	16	0	4	HW6
533	TSW_WBDAT2	Wobble sensor data @@ WOBB_SENS2	16	0	4	HW6
41	WSE_BOX_TMP	WSE box temp, EDAQ AD590 Row 0 Col 3	8	8	32	HD1

!---------- Command Number = 1 ----------
BIP
HIR_BIP_HOLD
Abort IPU countdown to running state and hold the IPU in the idle boot hold state
Booting
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 00000001 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
If this command is used, the program will NOT be loaded from EEPROM into RAM. This must be done manually if required. This command will transition the IPU into the idle boot hold state.The IPU remains in this state until a HIR_IPU_BOOT or HIR_IPU_REBOOT command is received.This command is only valid during the countdown state.
!---------- Command Number = 2 ----------
BIP
HIR_BIP_EXECUTE
Abort IPU countdown and execute the application immediately
Booting
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 00000010 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command is valid only during the countdown state.
!---------- Command Number = 3 ----------
BIP
HIR_BIP_REBOOT
Performs a cold reboot of the IPU processor.
Boot Hold
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 00000011 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command will cause all operations (including 1553) to halt for the duration of the IPU boot.Additional commands may be required to return the IPU to an operational state.This command is valid only during any of the boot hold states.Note that if the EEPROM was being programmed, the EEPROM contents may be corruptedif this command is used.
!---------- Command Number = 4 ----------

```
BIP
HIR_BIP_EEREAD
Copy a section of EEPROM into IPU RAM
Boot Hold
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00000100 ********
00000000 0000SSSS 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
Read a section of EEPROM into RAM.
EEPROM section location (0 to 15)
4
0 15
S
!---------- Command Number = 5 ----------
BIP
HIR_BIP_BOOT
Boot IPU from the specified RAM address
Boot Hold
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 00000101 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
Jump to the loaded RAM address and boot if the program checksums match using
the address and checsum from the latest HIR_BIP_HEADER or HIR_BIP_EEREAD
command.
!---------- Command Number = 6 ----------
BIP
HIR_BIP_DUMPADDR
Change current dump address of IPU dump
Boot Hold
Flight
3
512
00011110 01000000 11000000 00000000 00000000 00111001 00000110 ********
0000000R 0000000L 00000000 AAAAAAAA AAAAAAAA AAAAAAAA 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
Start dump at specified location in RAM or EEPROM.
0 means fixed dump, 1 means cyclic dump
1
0 1
R
Address offset is byte address for location in RAM if 0 or Dword address in
```

```
EEPROM if 1
1
0 1
L
IPU address to start dump
24
0 2097148
A
!---------- Command Number = 7 ----------
BIP
HIR_BIP_JMP
Boot IPU from the specified RAM address
Boot Hold
CRITICAL
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00000111 ********
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
For more detailed notes see latest release of SP_HIR_103 Vol1
IPU RAM address to warm reboot
32
0 2097148
J
!---------- Command Number = 8 ----------
CSS
HIR_CSS_SETTING
Set cooler mode, and target temperature or manual settings
Operational
Flight
4
512
00011110 01000000 11000000 00000000 00000000 00111001 00001000 ********
00000000 MMMMMMMM TTTTTTTT TTTTTTTT CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
In thermostatic mode, the values for the stroke levels define the maximum
levels.  In manual mode, the temperature is ignored. For the mode word, the
following bit definitions apply: Bit 0 - Electronics Only (0), Control (1),Bit
1 - Manual mode off (0), on (1)Bit 2 - Thermostatic mode off (0), on (1),Bit 3
- Warm-up mode off (0), on (1),Bit 4 - Vibration cancellation mode
(eliminated/not used), Bit 5 - Diode select, diode 0 or 1.  Bit 7 - Over
Stroke Disable Mode, 0=O/S on, 1=O/S off.
Mode word (see notes)
8
0 255
M
Temperature in 0.1 K units in mode 0
16
0 3000
T
Compressor stroke level in 0.1% units
16
0 1000
C
```

```
Displacer stroke level in 0.1% units
16
0 1000
D
!---------- Command Number = 9 ----------
CSS
HIR_CSS_FREQ
Set cooler frequency and angles
Operational
Flight
2
512
00011110 01000000 11000000 00000000 00000000 00111001 00001001 ********
FFFFFFFF FFFFFFFF AAAAAAAA AAAAAAAA 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
Default value for P0:  325 = 32.5 HzDefault value for P1:  550 = 55 deg.
Operating frequency in 0.1 Hz units
16
306 400
F
Displacer phase angle in 0.1 deg units
16
0 3599
A
!---------- Command Number = 10 ----------
CSS
HIR_CSS_CNVRTR
Select primary or secondary converters
Operational
CRITICAL
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00001010 ********
00000000 0000000P 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
Default state for P0: 0 = primary converters selected
Primary cnvrtrs (0) or secondary cnvrtrs (1)
1
0 1
P
!---------- Command Number = 11 ----------
CSS
HIR_CSS_LOCK
Short or open CSS motor windings
Operational
CRITICAL
2
512
00011110 01000000 11000000 00000000 00000000 00111001 00001011 ********
00000000 0000000S 00000000 000000FF 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

```
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
The cooler cannot be operated until the motor windings have been uncaged.
Compressor(0), Displacer(1).
1
0 1
S
Cage(0), Prim_Uncage(1), Sec_Uncage(2).
2
0 2
F
!---------- Command Number = 12 ----------
GSS
HIR_GSS_BSELECT
Select GSS B-side.
Operational
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 00001100 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Enabled
32
This command issues an IPU discrete pulse to the GSS to switch to GSS side B.
The GSS automatically powers on to the GSS A side independent of the IPU.
!---------- Command Number = 13 ----------
GSS
HIR_GSS_CONTROL
Set attributes for selected gyro
Operational
Flight
3
512
00011110 01000000 11000000 00000000 00000000 00111001 00001101 ********
00000000 00000GGG 00000000 000000FF 00000000 000PPPPP 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Enabled
32
Maps directly on to IPU-to-GSS Control Word.  See C&THB, Vol. 1, Section
2.3.4.3.2.
Gyro channel
3
0 7
G
Function code
2
0 3
F
Operation code
5
0 31
P
!---------- Command Number = 14 ----------
IPU
```

HIR_IPU_REBOOT
Performs a cold reboot of the IPU processor.
Operational
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 00001110 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command will cause all operations (including 1553) to halt for the duration of the IPU boot.Additional commands may be required to return the IPU to an operational state.
!---------- Command Number = 15 ----------
IPU
HIR_IPU_CHOPFREQ
Set a chopper reference frequency prescaler
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00001111 ********
00000000 0000PPPP PPPPPPPP 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
The chopper reference signal is a 500 Hz +/- 20 Hz programmable square wave. It's period is set by loading the prescaler register. Values between 3003 (0BBB) and 3255 (0CB7) will yield frequencies between 520.14 Hz and 479.88 Hz respectively. A prescaler value of 3124 (0C34) will yield a chopper frequency of 500 Hz. Conversion equations: Frequency (Hz) = 1/((prescaler + 1) *0.00000064). Prescaler = 1/(frequency * .00000064)-1. Default value: 3124 (0C34) 500.00 Hz.
Prescaler Value
12
3003 3255
P
!---------- Command Number = 16 ----------
IPU
HIR_IPU_FAULTCLR
Clear all fault condition flags which have been set in the telemetry
Operational
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 00010000 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
For any fault, a flag bit will be set in the telemetry stream which will

```
persist until cleared by this command.  This command will also protect
HIR_IPU_FAULTOFF, HIR_SVA_MOVEPROT, HIR_SSH_MOVEPROT and HIR_SSH_HEATERPROT if
they are currently unprotected by their corresponding unprotect commands.
!---------- Command Number = 17 ----------
BIP
HIR_BIP_EEWIPE
Erase a EEPROM section
Boot Hold
CRITICAL
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00010001 ********
00000000 0000EEEE 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
For more detailed notes see latest release of SP_HIR_103 Vol1
EEPROM section to erase (0 - 15)
4
0 15
E
!---------- Command Number = 18 ----------
BIP
HIR_BIP_EEREPAIR
Fix a EEPROM index error or clear all EEPROM data.
Boot Hold
CRITICAL
6
512
00011110 01000000 11000000 00000000 00000000 00111001 00010010 ********
AAAAAAAA AAAAAAAA PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP 00000000 00000EEE
EEEEEEEE EEEEEEEE 00000000 00000FFF FFFFFFFF FFFFFFFF 00000000 00000GGG
GGGGGGGG GGGGGGGG 00000000 00000HHH HHHHHHHH HHHHHHHH 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
For more detailed notes see latest release of SW-LOC-502.
Action to be performed (0x0000=abort, 0x5555=EEPROM scrub, 0x7777=load MBIC
start/end addresses, 0x8888=correct failed index block, 0xAAAA=set safety
override word, 0xBBBB=perform IPU autoboot check, 0xFFFF=erase all EEPROM
[stage 1], 0xEEEE=erase all EEPROM [stage 3].  All other values invalid and
will be rejected
16
0 65535
A
Parameter (see SW-LOC-502)
32
0 65535
P
MBICA start address (32-bit word offset, 2^19 - 2, last byte not usable)
19
0 524286
E
MBICA end address (32-bit word offset, 2^19 - 2, last byte not usable))
19
0 524286
F
MBICB start address (32-bit word offset, 2^19 - 2, last byte not usable))
19
0 524286
```

G
MBICB end address (32-bit word offset, 2^19 - 2, last byte not usable))
19
0 524286
H
!---------- Command Number = 19 ----------
MACRO
HIR_MAC_ASSIGN
Assign a macro to a macro number
Operational
Flight
3
512
00011110 01000000 11000000 00000000 00000000 00111001 00010011 ********
00000000 0MMMMMMM NNNNNNNN NNNNNNNN CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command must precede a number of HIR_MAC_UPLOAD commands.
Macro Number
7
0 127
M
Total number of 32-bit words in macro. If this parameter is not a multiple of 17, (16 words for each command, plus 1 for the delay) the command will be rejected.
16
0 65535
N
32-bit XOR checksum of the macro to be uploaded
32
0 4294967295
C
!---------- Command Number = 20 ----------
MACRO
HIR_MAC_UPLOAD
Upload data for a macro
Operational
Flight
15
512
00011110 01000000 11000000 00000000 00000000 00111001 00010100 ********
AAAAAAAA AAAAAAAA 00000000 0000LLLL BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
Receive Subaddress 5
Never
32
This command must be preceded by the HIR_MAC_ASSIGN command. Addresses in the H-32 format are relative to 0, which is the start of the selected macro. The format within the upload data is as follows: 16 32-bit words representing a 1553 command, followed by 1 32-bit word representing the delay factor in command ticks relative to the previous command in the macro. One command tick = 4*CR (where CR is time of one chopper rotation, nominal 12ms). (The minimum time between MACRO commands is 4 CR's). A group of HIR_MAC_UPLOAD commands is assembled into a macro and verified by the HIR_MAC_ACTIVATE command.
Address offset in block (0 = block start)
16
0 65535
A

```
Number of 32-bit words to upload
4
1 13
L
Data word 1 for upload (zero padded)
32
0 4294967295
B
Data word 2 for upload (zero padded)
32
0 4294967295
C
Data word 3 for upload (zero padded)
32
0 4294967295
D
Data word 4 for upload (zero padded)
32
0 4294967295
E
Data word 5 for upload (zero padded)
32
0 4294967295
F
Data word 6 for upload (zero padded)
32
0 4294967295
G
Data word 7 for upload (zero padded)
32
0 4294967295
H
Data word 8 for upload (zero padded)
32
0 4294967295
J
Data word 9 for upload (zero padded)
32
0 4294967295
K
Data word 10 for upload (zero padded)
32
0 4294967295
M
Data word 11 for upload (zero padded)
32
0 4294967295
P
Data word 12 for upload (zero padded)
32
0 4294967295
R
Data word 13 for upload (zero padded)
32
0 4294967295
T
!---------- Command Number = 21 ----------
MACRO
HIR_MAC_EXE
Execute selected macro immediately
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00010101 ********
00000000 0MMMMMMM 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Enabled
32
The contents of the selected macro will be added to the command queue.
Macro Number
7
0 127
M
!---------- Command Number = 22 ----------
MACRO
HIR_MAC_TIMED
Add or delete a timed macro
Operational
Flight
4
512
00011110 01000000 11000000 00000000 00000000 00111001 00010110 ********
00000000 0000000A 00000000 0NNNNNNN MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Enabled
32
Only one macro may be executed at an specified HIRDLS time. Adding a macro at a already used time will replace the existing macro. A timed macro will only be deleted if the time and macro number match the original add request.If a HIR_IPU_SETTIME command is issued, all timed macro entries will be deleted.
Delete (0) or add (1) a timed macro
1
0 1
A
Macro Number
7
0 127
N
Macro High Time of execution
32
0 4294967295
M
Macro Low Time of execution
32
0 4294967295
L
!---------- Command Number = 23 ----------
MACRO
HIR_MAC_ERASE
Erase a macro (set to no-operation if executed)
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00010111 ********
00000000 0MMMMMMM 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command will affect all future execution of the macro, including any timed requests which have not been executed. Executing an erased macro will

generate a command error.
Macro Number
7
0 127
M
!---------- Command Number = 24 ----------
OPH
HIR_OPH_CONTROL
Control operational heaters for specified zone
Operational
Flight
3
512
00011110 01000000 11000000 00000000 00000000 00111001 00011000 ********
00000000 0000ZZZZ 00000000 DDDDDDDD 00000000 00000000 00000000 PPPPPPPP
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Enabled
32
The in-flight calibrator is heater zone 0. This command is intended for use by SAIL but can be sent from the ground for manual heater control (Constant Power settings only). A SAIL Task will normally be used to control operational heaters.
Heater zone
4
0 6
Z
Power level value. 255= 100% power.For zones 1-6 this is a pulse width of (5.12E-6 seconds) * 0xB7 = .937 msecs
8
0 255
P
Heater On Pulse delay from start of half chopper cycle (5.12 usecs per bit). Zones 1-6 only
8
0 255
D
!---------- Command Number = 25 ----------
PSS
HIR_PSS_SWITCH
Send a function code and action to PSS
Operational
Flight
2
512
00011110 01000000 11000000 00000000 00000000 00111001 00011001 ********
CCCCCCCC CCCCCCCC AAAAAAAA AAAAAAAA 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
If P0 = 0, the value of P1 will be passed directly to the PSS as an Individual Relay Command (IRC). If P0 >0 an IPU Power Switching Macro (PSM) will be executed. A PSM contains a sequence of IRCs. See the HIR_MAC_EXE command for additional information.
PSS Function Code (see notes)
16
0 63
C
PSS Action (see notes)

16
0 65535
A
!---------- Command Number = 26 ----------
PSS
HIR_PSS_DISCRETE
Send a discrete pulse to the PSS
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00011010 ********
00000000 00000DDD 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
Starting at the next chopper revolution, and ending at the following chopper revolution,the IPU software will activate one of the 6 PSS relay discrete pulses. Param #0 = 1 will connect PCU Internal Supply A to QBA and Supply B to QBB. Param #0 = 2 will connect PCU Internal Supply B to QBA and Supply A to QBB. Param #0 = 3 thro' 6 are not used.
Discrete Channel (see notes)
3
1 6
D
!---------- Command Number = 27 ----------
SAIL
HIR_SAI_START
Starts SAIL processor with specified amount of additional shared memory
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00011011 ********
0000000B BBBBBBBB 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
If the SAIL processor is already running, this command will be rejected.Note that the maximum shared memory is limited to 64K (1K preallocated, 63K maximum additional memory)
Number of 512-byte blocks for shared area
9
0 126
B
!---------- Command Number = 28 ----------
SAIL
HIR_SAI_STOP
Kills all active SAIL tasks, deallocates SAIL memory, and halts the SAIL processor
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00011100 ********
CCCCCCCC CCCCCCCC 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000

00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
If the SAIL processor is not running, this command will be rejected. If the kill (hex) code is not DEAD, the command will be rejected.
Kill code to stop SAIL
16
57005 57005
C
!---------- Command Number = 29 ----------
SAIL
HIR_SAI_CREATE
Create a SAIL task using specified code and data sections with a given purpose code
Operational
Flight
4
512
00011110 01000000 11000000 00000000 00000000 00111001 00011101 ********
00000000 0000TTTT 000000CC CCCCCCCC 000000DD DDDDDDDD PPPPPPPP PPPPPPPP
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command will be rejected under any of the following conditions: SAIL processor not running, task number in use, code or data area assigned to another task, code or data area is not the start of a series,code or data area not uploaded, or purpose does not match identifier in code block.
SAIL task number
4
0 15
T
SAIL code block start
10
0 1023
C
SAIL data block start
10
0 1023
D
User-defined purpose identifier
16
0 65535
P
!---------- Command Number = 30 ----------
SAIL
HIR_SAI_KILL
Kill a SAIL task, code and data areas remain allocated
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00011110 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5

Never
32
This command will be rejected if the SAIL processor is not running or the task number is not in use.
SAIL task number
4
0 15
T
!---------- Command Number = 31 ----------
SAIL
HIR_SAI_SUSPEND
Suspends indefinitely a given SAIL task at the next SAIL frame
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00011111 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command will be rejected if the SAIL processor is not running or the task number is not in use.
SAIL task number
4
0 15
T
!---------- Command Number = 32 ----------
SAIL
HIR_SAI_RESUME
Resumes a given SAIL task at the next SAIL frame.
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00100000 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command will be rejected if the SAIL processor is not running or the task number is not in use.
SAIL task number
4
0 15
T
!---------- Command Number = 33 ----------
SAIL
HIR_SAI_PARAMCLR
Clear parameters 0-7 OR 8-15 for specified SAIL task.
Operational
Flight
2
512
00011110 01000000 11000000 00000000 00000000 00111001 00100001 ********
00000000 0000TTTT 00000000 0000000U 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000

```
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```
Receive Subaddress 5
Never
32
This command clears selected parameters for a specified SAIL task. Param#1=0 selects slots 0-7. Param#1=1 selects slots 8-15. This is a particular implementation of the HIR_SAI_SHARED command.
SAIL task number
4
0 15
T
SAIL parameter group
1
0 1
U
!---------- Command Number = 34 ----------
SAIL
HIR_SAI_FLAGCLR
Clear flags (slot #15) for specified SAIL task
Operational
Flight
1
512
```
00011110 01000000 11000000 00000000 00000000 00111001 00100010 ********
00000000 0000TTTT 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```
Receive Subaddress 5
Never
32
This command clears the status flags in parameter #15 of the selected SAIL task. It is a particular implementation of the HIR_SAI_SHARED command.
Intended for use by FOT on HIRDLS request.
SAIL task number
4
0 15
T
!---------- Command Number = 35 ----------
SAIL
HIR_SAI_ERASE
Erase a SAIL code or data segment
Operational
Flight
1
512
```
00011110 01000000 11000000 00000000 00000000 00111001 00100011 ********
000000SS SSSSSSSS 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```
Receive Subaddress 5
Never
32
This command will be rejected if any of the following conditions are true: the SAIL processor is not running, the block number is not the start of a code or data segment, the block is not allocated,or the block is currently in use by one of the tasks (running or suspended).
Start block of segment to be erased
10
0 1023

```
S
!---------- Command Number = 36 ----------
SAIL
HIR_SAI_SETPARAM
Loads value into specified SAIL task parameter slot
Operational
Flight
3
512
00011110 01000000 11000000 00000000 00000000 00111001 00100100 ********
00000000 0000TTTT 00000000 0000SSSS DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Enabled
32
This command intended primarily to allow SAIL task parameters to be changed by
stored (time-tag) commands or RTSs.  It is a particular implementation of the
HIR_SAI_SHARED command.
SAIL task number
4
0 15
T
SAIL parameter number
4
0 15
S
Binary encoded data (zero padded)
32
0 4294967295
D
!---------- Command Number = 37 ----------
SAIL
HIR_SAI_COMMAND
Disable or enable the use of a command by SAIL
Operational
Flight
2
512
00011110 01000000 11000000 00000000 00000000 00111001 00100101 ********
00000000 0000000C 00000000 0NNNNNNN 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command will be rejected if the specified command can never be used by
SAIL.
Disable (0) or enable (1) command by SAIL
1
0 1
C
Command number
7
1 127
N
!---------- Command Number = 38 ----------
SAIL
HIR_SAI_CONTROL
Enable or disable SAIL control of a specified subsystem
Operational
Flight
```

2
512
00011110 01000000 11000000 00000000 00000000 00111001 00100110 ********
00000000 0000000C 00000000 00000NNN 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
The item is one of: SSH (0), scanner (1), blackbody heaters (2), HWA (3), CSS (4) and SVA (5). Note that these items are enabled by default, but may be autonomously disabled by fault management actions. A disable of scanner (1) disables all TSS commands from SAIL. A disable of blackbody (2) disables only zone 0 of command HIR_OPH_CONTROL (cmd # 24).
Disable (0) or enable (1) control by SAIL
1
0 1
C
Control item (see notes)
3
0 5
N
!---------- Command Number = 39 ----------
SPU
HIR_SPU_TIMING
Change timing delay of detector readouts
Operational
Flight
3
512
00011110 01000000 11000000 00000000 00000000 00111001 00100111 ********
00000000 00000CCC 00000000 000NNNNN VVVVVVVV VVVVVVVV 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
For parameter 0: 0= Set detector delay, 1= Set blade open offset, 2= Set blade closed offset,3= Set housekeeping delay, 4= Set SPU filter delay.For parameter 1: Items for detector delay are 1 through 21.Items for blade edges are 0 through 5.Items for housekeeping delay and SPU filter delay are 0 (only one value).
Opcode (see notes)
3
0 4
C
Item number (see notes)
5
0 21
N
Value in 160 ns units
16
0 65535
V
!---------- Command Number = 40 ----------
SPU
HIR_TLM_FIR
Load FIR Filter Coefficient table or Decimation Coefficients
Operational
Flight
16
512

00011110 01000000 11000000 00000000 00000000 00111001 00101000 ********
00000000 000000AA 00BBBBBB 0000CCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM NNNNNNNN NNNNNNNN NNNNNNNN NNNNNNNN
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR
SSSSSSSS SSSSSSSS SSSSSSSS SSSSSSSS TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
UUUUUUUU UUUUUUUU UUUUUUUU UUUUUUUU VVVVVVVV VVVVVVVV VVVVVVVV VVVVVVVV
WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX
YYYYYYYY YYYYYYYY YYYYYYYY YYYYYYYY ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ
Receive Subaddress 5
Never
32
A FIR table upload consists of a START command followed by DATA commands, followed by an ACTIVATE command. For OPCODE = START, param D is the 32-bit XOR checksum of the table to be loaded. For OPCODE = DATA, param B is the number of the first FIR Coeff contained within this command, param C is the number of coeffs contained within this command, and params M-Z are 32-bit signed integers representing the desired coeff values *10^9. For OPCODE = ACTIVATE, param B selects the RDSR table to load, where 1 = RDSR1, 2 = RDSR2, 3 = RDSR3 and 6 = RDSR6, and parm D is the 8-bit table ID. If an error or inconsistency occurs, the new table is not activated and an error is returned. OPCODE = DEMOD is a special stand-alone command to load the demodulation coeffs: param M = D1, param N = D2, and param P = D3, where these are 32-bit signed integers representing the desired coeff values *10^9. Refer to TC-UCB-005C.
Opcode: 0 = START; 1 = DATA; 2 = ACTIVATE; 3 = DEMOD
2
0 3
A
Opcode = 1, Number of first FIR coeff within this command; Opcode = 2, RDSR table (1,2,3 or 6)
6
0 31
B
Opcode = 1, Number of coeffs within this command.
4
1 12
C
Opcode = 0, 32-bit XOR checksum of FIR filter table; Opcode = 2, 8-bit table ID#, special cases: 1) For ID=0, disable FIR for that RDSR (return result code S_FIRTBL_DISABLE); 2) For RDSR=1, ID=1; RDSR=2, ID=2; RDSR=3, ID=3; RDSR=6, ID=4 Load default FIR table (return result code S_FIRTBL_DEFAULT, Illegal combinations of default table ID and RDSR returns F_FIRID_MISMATCH); Opcode = 3, 8-bit table ID#, special case: 1) 1 means set default DEMOD coef table (return result code S_DEMODTBL_DEF).
32
0 4294967295
D
Opcode = 1 or 3, 32-bit signed
32
-2147483647 2147483647
M
Opcode = 1 or 3, 32-bit signed
32
-2147483647 2147483647
N
Opcode = 1 or 3, 32-bit signed
32
-2147483647 2147483647
P
Opcode = 1, 32-bit signed
32
-2147483647 2147483647
R
Opcode = 1, 32-bit signed
32
-2147483647 2147483647
S
Opcode = 1, 32-bit signed
32
-2147483647 2147483647

```
T
Opcode = 1, 32-bit signed
32
-2147483647 2147483647
U
Opcode = 1, 32-bit signed
32
-2147483647 2147483647
V
Opcode = 1, 32-bit signed
32
-2147483647 2147483647
W
Opcode = 1, 32-bit signed
32
-2147483647 2147483647
X
Opcode = 1, 32-bit signed
32
-2147483647 2147483647
Y
Opcode = 1, 32-bit signed
32
-2147483647 2147483647
Z
!---------- Command Number = 41 ----------
SPU
HIR_SPU_ZERO
Change one of the detector data zero offset values
Operational
Flight
2
512
00011110 01000000 11000000 00000000 00000000 00111001 00101001 ********
00000000 000DDDDD VVVVVVVV VVVVVVVV 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
Adds a numerical offset (value = param #1) to the signal count of the detector
specified by param #0.  Special case:  If detector 0 selected, set all
detector offsets to value specified by Parm #1.  Default offsets are 2000 for
all detectors.
Detector number
5
0 21
D
New zero offset value
16
0 65535
V
!---------- Command Number = 42 ----------
SPU
HIR_SPU_CLOCKSEL
Select clock sources to be used by the RAD6000 for system tick and the SPU for
data collection
Operational
Flight
3
512
00011110 01000000 11000000 00000000 00000000 00111001 00101010 ********
00000000 0000000T 00000000 0000RRSS 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
For parameter 0 (Tick Source): 0 = internal RAD6000 clock *1 = Chopper Rotation pulseFor parameter 1 (CR sync pulse source): 0 = internal rotation pulse *1 = Chopper Rotation pulse 2 = External rotation pulseFor parameter 2 Chopping sync source): 0 = internal sync *1 = Chopper sync 2 = External sync* indicates default state after IProc booting has completed
System tick source select
1
0 1
T
Chopper rotation pulse source select
2
0 2
R
Chopper sync pulse source select
2
0 2
S
!---------- Command Number = 43 ----------
SSH
HIR_SSH_MOVE
Move the sunshield door at a specifed rate
Operational
Flight
2
512
00011110 01000000 11000000 00000000 00000000 00111001 00101011 ********
00000000 0000000D 0000NNNN NNNNNNNN 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Enabled
32
This command will move the door for a total of N steps in direction D at a fixed rate of approximately 28 steps per second. One step is 0.1 degrees. The door will not be closed past the angle specified in the HIR_SSH_SAFEANGLE command. Commands in the 'Open' direction are not restricted. If one of these commands is executing, additional HIR_SSH_MOVE commands will be ignored, except a command with a zero number of steps, which will abort the currently executing command. Note that this command does not examine any of the 'limit' microswitches.
Direction (0 = close, 1 = open)
1
0 1
D
Number of steps to move door
12
0 2400
N
!---------- Command Number = 44 ----------
SSH
HIR_SSH_SAFE
Safe the sunshield door as quickly as possible
Operational
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 00101100 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000

```
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```
Receive Subaddress 5
Enabled
32
The door will be moved to the position specifed by the HIR_SSH_SAFEANGLE command. If another HIR_SSH_MOVE command is executing, it will be aborted immediately. This command will only move the door toward the closed position and will be ignored if the door is already within the safe range.
!---------- Command Number = 45 ----------
SSH
HIR_SSH_SAFEANGLE
Set safe angle parameter for sunshield door
Operational
Flight
1
512
```
00011110 01000000 11000000 00000000 00000000 00111001 00101101 ********
AAAAAAAA AAAAAAAA 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```
Receive Subaddress 5
Never
32
The units of the safe angle position are counts of the SSH door potentiometer as seen in telemetry. Default value for P0 is 36500 for the EM and 46500 for the PFM [equivalent to the 60-degree open position]
Safe angle parameter
16
0 65535
A
!---------- Command Number = 46 ----------
SSH
HIR_SSH_DOORUNPROT
Disable or enable flag to close, latch, or unlatch the sunshield door
Operational
Flight
0
512
```
00011110 01000000 11000000 00000000 00000000 00111001 00101110 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```
Receive Subaddress 5
Disabled
32
This command must precede a HIR_SSH_HEATERPROT command, or a HIR_SSH_MOVEPROT command which is attempting to close the door past the safe angle.
!---------- Command Number = 47 ----------
SSH
HIR_SSH_HEATERPROT
Activate the HRM heater to latch or unlatch the sunshield door
Operational
Flight
1
512
```
00011110 01000000 11000000 00000000 00000000 00111001 00101111 ********
0000000S SSSSSSSS 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
This command will be rejected if not preceded by an enable HIR_SSH_DOORUNPROT command. The heater will turn off once another heater command is received (overriding the currently executing command) or the time-out has expired or an overheating condition is detected by the fault management software. If the time-out is specified as zero, the heater will be turned off immediately if already on.
Maximum number of seconds
9
0 511
S
!---------- Command Number = 48 ----------
SVA
HIR_SVA_UNPROT
Must precede HIR_SVA_MOVEPROT.
Operational
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 00110000 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
This command must precede an HIR_SVA_MOVEPROT command.
!---------- Command Number = 49 ----------
SVA
HIR_SVA_MOVEPROT
Open or close the space view aperture door.
Operational
Flight
2
512
00011110 01000000 11000000 00000000 00000000 00111001 00110001 ********
00000000 0000000M 00000000 000SSSSS 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
This command will be rejected if not preceded by an HIR_SVA_UNPROT command. The motor will be engaged for the specified number of seconds. The microswitches are ignored. If another command is received during the timeout period it will be ignored, unless the number of seconds is set to zero, in which case the current command will be aborted.
Close (0) or open (1) the SVA
1
0 1
M
Number of seconds
5
0 31
S
!---------- Command Number = 50 ----------

IPU
HIR_TLM_SCIFMT
Select the contents of the science packet
Operational
Flight
16
512
00011110 01000000 11000000 00000000 00000000 00111001 00110010 ********
00000000 00000000 00000000 0000000B 00000000 0000000C 00000000 000000DD
00000000 000000EE 00000000 000000FF 00000000 0000000G 00000000 0000000H
00000000 0000000J 00000000 0000000K 00000000 0000000N 00000000 0000000P
00000000 00000RRR 00000000 00000SSS 00000000 000TTTTT TTTTTTTT TTTTTTTT
00000000 000000UU 00000000 000000WW 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
For each of the block enables, 0 = block not included, and 1 = block included in order shown above. For normal operations, the telemetry test pattern select must be 0. Non-zero values will produce telemetry test patterns without any science data.The radiance data sample rate is described in the C&THB, Vol. 3. The radiance data channel select will enable each channel with a high bit in this field. The LSB of the select field will enable channel 1, and the MSB will enable channel 21. If the total amount of data requested exceeds the packet size, data will be truncated. See C&THB, Vol. 3 for the format of the science and diagnostic packet formats.
Timestamp block enable
1
0 1
B
Radiance block enable
1
0 1
C
Primary Elevation Encoder block enable. 0=disabled, 1= Var only, 2= El2 only, 3= Both Var and El2
2
0 3
D
Secondary Elevation Encoder block enable. 0=disabled, 1= Var only, 2= El2 only, 3= Both Var and El2
2
0 3
E
Azimuth Encoder block enable. 0=disabled, 1= Primary only, 2= Secondary only, 3= Both Primary and Secondary
2
0 3
F
Gyro 0 block enable
1
0 1
G
Gyro 1 block enable
1
0 1
H
Gyro 2 block enable
1
0 1
J
Gyro 3 block enable
1
0 1
K
Science housekeeping block enable
1
0 1
N

Diagnostic block enable
1
0 1
P
Telemetry Test Pattern select
3
0 7
R
Radiance Data Sample Rate
3
1 6
S
Radiance Channel Select
21
0 2097151
T
Primary Elevation Encoder Var Readhead Data Souce. 1= readhead 1 only, 2= readhead 2 only, 3= average of readheads 1 and 2. If the primary variable elevation encoder block is not enabled, this parameter has no effect.
2
1 3
U
Secondary Elevation Encoder Var Readhead Data Source. 1= readhead 1 only, 2= readhead 2 only, 3= average of readheads 1 and 2. If the secondary variable elevation encoder block is not enabled, this parameter has no effect.
2
1 3
W
!---------- Command Number = 51 ----------
IPU
HIR_TLM_DIAGFMT
Select diagnostic items for diagnostic package
Operational
Flight
5
512
00011110 01000000 11000000 00000000 00000000 00111001 00110011 ********
00000000 000DDDDD 00000000 0000000E 0000000L LLLLLLLL 00000000 00000000
00000000 00AAAAAA AAAAAAAA AAAAAAAA 00000000 0000000F 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
The first two parameters of this command allow a diagnostic item (one of 16 defined) to be enabled or disabled for inclusion in the diagnostic block. If the diagnostic item is a memory dump, the remaining 3 parameters are used to specify the length of the diagnostic item, the address from which to start the memory dump and the choice of a fixed dump or a cyclic (rolling) dump.
Diagnostic item ID
5
0 15
D
Enable (1) or disable (0) diagnostic item
1
0 1
E
Length of diagnostic item in 16-bit words
9
0 392
L
Start address
22
0 4194300
A
Fixed dump (0) or cyclic dump (1)
1

```
0 1
F
!---------- Command Number = 52 ----------
SAIL
HIR_SAI_SHARED
Modify contents of SAIL shared memory
Operational
Flight
16
512
00011110 01000000 11000000 00000000 00000000 00111001 00110100 ********
00LLLLLL LLLLLLLL 0000000T 0000NNNN AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE
FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG
HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ
KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR
Receive Subaddress 5
Never
32
Note that the contents will be committed immediately after the command is
received.
SAIL shared memory location (32-bit entry)
14
0 16383
L
Type of upload (0 = int, 1 = float)
1
0 1
T
Number of 32-bit values to be loaded
4
1 13
N
Data word 1 for upload (zero padded)
32
0 4294967295
A
Data word 2 for upload (zero padded)
32
0 4294967295
B
Data word 3 for upload (zero padded)
32
0 4294967295
C
Data word 4 for upload (zero padded)
32
0 4294967295
D
Data word 5 for upload (zero padded)
32
0 4294967295
E
Data word 6 for upload (zero padded)
32
0 4294967295
F
Data word 7 for upload (zero padded)
32
0 4294967295
G
Data word 8 for upload (zero padded)
32
0 4294967295
H
Data word 9 for upload (zero padded)
32
0 4294967295
```

```
J
 word 10 for upload (zero padded)
32
0 4294967295
K
Data word 11 for upload (zero padded)
32
0 4294967295
M
Data word 12 for upload (zero padded)
32
0 4294967295
P
Data word 13 for upload (zero padded)
32
0 4294967295
R
!---------- Command Number = 53 ----------
IPU
HIR_TLM_HKFMT
Upload data to housekeeping telemetry table
Operational
Flight
15
512
00011110 01000000 11000000 00000000 00000000 00111001 00110101 ********
AAAAAAAA AAAAAAAA 00000000 0000NNNN BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
Receive Subaddress 5
Never
32
This command must be preceded by the HIR_TLM_HKHEAD command.
Address 32-bit offset (0 = start of table)
16
0 65535
A
Number of 32-bit words to upload
4
1 13
N
Data word 1 for upload (zero padded).
32
0 4294967295
B
Data word 2 for upload (zero padded).
32
0 4294967295
C
Data word 3 for upload (zero padded).
32
0 4294967295
D
Data word 4 for upload (zero padded).
32
0 4294967295
E
Data word 5 for upload (zero padded).
32
0 4294967295
F
Data word 6 for upload (zero padded).
32
0 4294967295
G
Data word 7 for upload (zero padded).
```

```
32
0 4294967295
H
Data word 8 for upload (zero padded).
32
0 4294967295
J
Data word 9 for upload (zero padded).
32
0 4294967295
K
Data word 10 for upload (zero padded).
32
0 4294967295
M
Data word 11 for upload (zero padded).
32
0 4294967295
P
Data word 12 for upload (zero padded).
32
0 4294967295
R
Data word 13 for upload (zero padded).
32
0 4294967295
T
!---------- Command Number = 54 ----------
IPU
HIR_TLM_HKACTIVATE
Activate a new housekeeping telemetry table
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00110110 ********
00000000 000000HH 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
Activate a housekeeping telemetry table: 0 = default; 1 = operational; 2 =
uploaded
Table number
2
0 2
H
!---------- Command Number = 55 ----------
IPU
HIR_TLM_CSC
Controls telemetry reporting for CSC's
Operational
Flight
4
512
00011110 01000000 11000000 00000000 00000000 00111001 00110111 ********
00000000 0000CCCC 00000000 00000000 FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT SSSSSSSS SSSSSSSS SSSSSSSS SSSSSSSS
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
```

32
This command is used to give a finer degree of control over how each CSC chooses to report telemetry. Refer to SW-LOC-113 for more detail on the usage of this command.
CSC ID: MACRO(0), FAULT(1)
4
0 15
C
Function Code
32
0 4294967295
F
Telemetry Item
32
0 4294967295
T
Secondary Function Code
32
0 4294967295
S
!---------- Command Number = 56 ----------
IPU
HIR_TLM_OFFSETS
Set telemetry offsets for encoder and wobble sensor data
Operational
Flight
2
512
00011110 01000000 11000000 00000000 00000000 00111001 00111000 ********
00000000 00000000 00000000 000000AA 00000000 0000BBBB BBBBBBBB BBBBBBBB
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command sets the telemetry offsets for encoder and wobble sensor data telemetry output. The Value parameter is the number in the unsigned telemetry output which corresponds to zero of the signed data item.
Item Number: 0 = Elevation; 1 = Azimuth; 2 = WOBX; 3 = WOBY
2
0 3
A
Value
20
0 1048575
B
!---------- Command Number = 58 ----------
TSS
HIR_TSS_CLOCKSEL
Select if the TSS is to use internal or external clock for the system tick and 83 Hz sync
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00111010 ********
00000000 00000001 11100000 10101000 00000000 00000000 00000000 000000CC
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32

Mode 0 = Internal Test, Mode 1 = Chopper Test, and Mode 2 = Nominal flight mode (default on boot). This command adjusts the source of timing signals for three items: Scanner Strobe Interrupt, Chopper Ref Signal and Chopper Rotation Signal. (SS, ChRef and CR respectively.) SS source : (0) internal, (1) chopper blade edges, (2) external (IPU). ChRef source : (0) internal (PFM only), (1) internal (PFM only), (2) external (IPU, only source for EM). CR source: (0) internal, (1) Chopper, (2) Chopper.
Internal Test (0), Chopper Test (1), Nominal Flight (2)
2
0 2
C
!---------- Command Number = 59 ----------
TSS
HIR_TSS_WATCHDOG
Turns the system watchdog or scanner strobe watchdog on or off.
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00111011 ********
00000000 00000010 11100000 11101000 00000000 00000000 00000000 000000AA
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This TSW application code command turns on or off either of two watchdog timers according to the following values: 0 = disable system watchdog, 1 = enable system watchdog, 2 = disable scanner strobe watchdog or 3 = enable scanner strobe watchdog.
Disable (even) or enable (odd) system or scanner strobe watchdog.
2
0 3
A
!---------- Command Number = 60 ----------
TSS
HIR_TSS_REBOOT
Soft reboot of the TSS control processor (software reset)
Operational
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 00111100 ********
00000000 00000000 00000001 00101001 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This instruction will abort any operation in progress. The scanner will NOT be safed if this command is used. This command may be used during either TSW boot or application execution.
!---------- Command Number = 61 ----------
TSS
HIR_TSS_ENCINIT
Home both elevation and azimuth encoders with new parameters
Operational
Flight
5
512
00011110 01000000 11000000 00000000 00000000 00111001 00111101 ********
00000000 00000101 10000000 11101010 MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM

```
AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```
Receive Subaddress 5
Disabled
32
This is a TSW application command, and will not be recognized during TSW boot.
Azimuth motor torque (Nm scaled by 2E-8)
32
-2147483647 2147483647
M
Elevation equilibrium angle (deg. scaled by 2E-8)
32
-2147483647 2147483647
A
Open-loop traversal time (sec. scaled 5E-5)
32
0 2147483647
L
Torque ramp-up time (sec. scaled 5E-5)
32
0 2147483647
R
Delta time for EEA restart (sec. scaled 5E-5)
32
0 2147483647
T
!---------- Command Number = 62 ----------
TSS
HIR_TSS_EINITTBL
Upload entries to TSW scan mirror table for use during encoder initialization.
Operational
Flight
7
512
```
00011110 01000000 11000000 00000000 00000000 00111001 00111110 ********
00000000 00000111 10000000 10101010 00000000 00000000 00000000 0000000N
00000000 00000000 00000000 0EEEEEEE TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP QQQQQQQQ QQQQQQQQ QQQQQQQQ QQQQQQQQ
VVVVVVVV VVVVVVVV VVVVVVVV VVVVVVVV WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```
Receive Subaddress 5
Disabled
32
This command may be used through the 1553, but it is intended for use internally between the IPU and the TSW to transmit the SAIL generated control list. Usually, multiple entries would be sent instead of a single entry.
This is a TSW application command and will not be recognized during TSW boot.
Number of entries (0 = clear from P1)
1
0 1
N
Starting location in TSW control list
7
0 127
E
Delta time for movement (5E-5 sec)
32
0 2147483647
T
Elevation shaft angle (2E-8 deg)
32
-2147483647 2147483647
P
Elevation shaft rate (2E-8 deg/sec)

32
-2147483647 2147483647
Q
Azimuth shaft angle (2E-8 deg)
32
-2147483647 2147483647
V
Azimuth shaft rate (2E-8 deg/sec)
32
-2147483647 2147483647
W
!---------- Command Number = 63 ----------
TSS
HIR_TSS_ENCSEL
Selects which of the encoders (2 read heads for elevation and one for azimuth on both the primary and secondary sides) to use for scan mirror control. Only one choice for elevation and one for azimuth can be in effect at any given time.
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 00111111 ********
00000000 00000001 10000010 00110010 00000000 00000000 00000000 0000WWWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This is a TSW application command and will not be recognized during TSW boot. Choices for the control encoders are: (1) elevation read head 1, (2) elevation read head 2, (3) average of elevation read heads 1 & 2, (4) elevation control on primary EEA, (5) elevation control on secondary EEA, (6) azimuth control on primary EEA 2, (7) azimuth control secondary EEA.
Control encoder / readhead selection
4
1 7
W
!---------- Command Number = 64 ----------
TSS
HIR_TSS_CNTLTABLE
Upload entries to TSW scan mirror table
Operational
Flight
7
512
00011110 01000000 11000000 00000000 00000000 00111001 01000000 ********
00000000 00000111 10000000 10110000 00000000 00000000 00000000 0000000N
00000000 00000000 00000000 0EEEEEEE TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP QQQQQQQQ QQQQQQQQ QQQQQQQQ QQQQQQQQ
VVVVVVVV VVVVVVVV VVVVVVVV VVVVVVVV WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
This command may be used through the 1553, but it is intended for use internally between the IPU andthe TSW to transmit the SAIL generated control list. Usually, multiple entries would be sent instead of the single entry. This is a TSW application command, and will not be recognized during TSW boot.
Number of entries (0 = clear from P1)
1
0 1
N
Starting location in TSW control list

7
0 127
E
Delta time for movement (5E-5 sec)
32
0 2147483647
T
Elevation shaft angle (2E-8 deg)
32
-2147483647 2147483647
P
Elevation shaft rate (2E-8 deg/sec)
32
-2147483647 2147483647
Q
Azimuth shaft angle (2E-8 deg)
32
-2147483647 2147483647
V
Azimuth shaft rate (2E-8 deg/sec)
32
-2147483647 2147483647
W
!---------- Command Number = 65 ----------
TSS
HIR_TSS_START
Forces an immediate execution of the scanner table
Operational
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 01000001 ********
00000000 00000000 00000000 11110000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
This command is only intended for ground testing, and will be handled
automatically for regular operations.This is a TSW application command, and
will not be recognized during TSW boot.
!---------- Command Number = 66 ----------
TSS
HIR_TSS_SAFE
Abort and erase the current scanner table, and move the mirror as fast as
possible to the safe position
Operational
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 01000010 ********
00000000 00000000 00000001 00110001 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
Note that if the azimuth motor has been disabled with the HIR_TSS_MOTOR
command, the mirror will not move in azimuth. This is a TSW application
command, and will not be recognized during TSW boot.
!---------- Command Number = 67 ----------
TSS

HIR_TSS_FREQINFO
Passes the information about the chopper rate to the TEU software
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 01000011 ********
00000000 00000001 10000001 01101000 00000000 00000000 0000PPPP PPPPPPPP
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
This command is used to provide information to the TEU software and does not control any hardware functions. This definition is identical to that in the command HIR_IPU_CHOPFREQ. Both HIR_TSS_FREQINFO and HIR_IPU_CHOPFREQ must be sent together to set both the IPU and TEU to the same time base. The chopper reference signal is a 500Hz +/- 20Hz programmable square wave. It's period is set by loading the prescaler register. Values between 3003 (0BBB) and 3255 (0CB7) will yield frequencies between 520.14 Hz and 479.88 Hz respectively. A prescaler value of 3124 (0C34) will yield a chopper frequency of 500Hz. Conversion equations: Frequency (Hz) = 1/((prescaler + 1) *0.00000064). Prescaler = 1/(frequency * .00000064)-1. Default value: 3124 (0C34) 500.00 Hz.
Prescaler value
12
3003 3255
P
!---------- Command Number = 68 ----------
TSS
HIR_TSS_AZELDATPOS
Provides offset values to be used for zero position output when the scan mirror is in its datum position.
Operational
Flight
6
512
00011110 01000000 11000000 00000000 00000000 00111001 01000100 ********
00000000 00000110 10000001 01110000 AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX YYYYYYYY YYYYYYYY YYYYYYYY YYYYYYYY
ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Enabled
32
None
Primary Elevation 1 Offset
32
-2147483647 2147483647
A
Primary Elevation 2 Offset
32
-2147483647 2147483647
B
Primary Azimuth Offset
32
-2147483647 2147483647
C
Secondary Elevation 1 Offset
32
-2147483647 2147483647
X
Secondary Elevation 2 Offset

```
32
-2147483647 2147483647
Y
Secondary Azimuth Offset
32
-2147483647 2147483647
Z
!---------- Command Number = 71 ----------
TSS
HIR_TSS_DRSETUP
Elevation and azimuth drive motor configuration
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 01000111 ********
00000000 00000001 10000000 10110010 00000000 00000000 00000000 0000MMMM
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
This is a TSW application command, and will not be recognized during TSW
boot.For parameter 0: (12) Azimuth motor short (EM only, PFM noop), (11)
Azimuth open short (EM only, PFM noop), (10) Azimuth connect to drive (9)
Azimuth disconnect from drive, (8) Elevation 2 motor short, (7) Elevation 2
open short, (6) Elevation 2 connect to drive, (5) Elevation 2 disconnect from
drive, (4) Elevation 1 motor short, (3) Elevation 1 open short, (2) Elevation
1 connect to drive, (1) Elevation 1 disconnect from drive.  For PFM noop, the
TSW command accept counter will increment.
See notes above
4
1 12
M
!---------- Command Number = 73 ----------
TSS
HIR_TSS_EEASELECT
Select (power up) or deselect (power down) the primary and/or secondary
encoder set
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 01001001 ********
00000000 00000001 10000001 00110010 00000000 00000000 00000000 00000SSS
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This is a TSW application command, and will not be recognized during TSW
boot.For parameter 0: (1) select primary EEA, (2) deselect primary EEA,  (3)
select secondary EEA, (4) deselect secondary EEA, (5) test angle (both EEAs
selected), (6) remove test angle (both).
See notes below
3
1 6
S
!---------- Command Number = 74 ----------
TSS
HIR_TSS_EEARESET
Restarts the active EEA side
```

Operational
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 01001010 ********
00000000 00000000 00000001 01110010 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This is a TSW application command, and will not be recognized during TSW boot.
!---------- Command Number = 75 ----------
TSS
HIR_TSS_CHOPSEL
Configures the chopper drive motor windings
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 01001011 ********
00000000 00000001 10000001 10110010 00000000 00000000 00000000 00000WWW
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This is a TSW application command, and will not be recognized during TSW
boot.For parameter 0: (0) disconnect windings A and B, (1) connect winding A
to driver (2) connect winding B to driver, (3) set chopper to high current
mode and (4) remove high current from chopper.
Chopper winding and driver control configuration param.
3
0 4
W
!---------- Command Number = 76 ----------
TSS
HIR_TSS_CHOPENA
Enable (power up) or disable (power down) the chopper drive motor
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 01001100 ********
00000000 00000001 10000001 11110010 00000000 00000000 00000000 0000000E
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This is a TSW application command, and will not be recognized during TSW boot.
There is a 10 second delay after receipt of a disable command before an enable
command will be acted upon (it will be accepted but not acted upon).
Disable (0) or enable (1) chopper drive motor.
1
0 1
E
!---------- Command Number = 80 ----------

```
TSS
HIR_TSS_CSCENC
Enable or disable TSW encoder initialization CSC
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 01010000 ********
00000000 00000001 10000000 01101010 00000000 00000000 00000000 0000000E
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
This is a TSW application command, and will not be recognized during TSW boot.
This CSC can not be enabled at the same time that the scan mirror contol CSC
is enabled. The encoder initialization should be enabled and allowed to
disable itself before the scan mirror control CSC is enabled.
Disable (0) or enable (1) CSC.
1
0 1
E
!---------- Command Number = 81 ----------
TSS
HIR_TSS_CSCSCN
Enable or disable TSW scan mirror control CSC
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 01010001 ********
00000000 00000001 10000000 01110000 00000000 00000000 00000000 0000000E
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
This is a TSW application command, and will not be recognized during TSW boot.
This CSC can not be enabled at the same time that the encoder initialization
CSC is enabled.
Disable (0) or enable (1) CSC.
1
0 1
E
!---------- Command Number = 84 ----------
TSS
HIR_TSS_CSCSSS
Enable or disable TSW sub-subsystem support CSC
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 01010100 ********
00000000 00000001 10000000 01110110 00000000 00000000 00000000 0000EEEE
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
```

32
This is a TSW application command, and will not be recognized during TSW boot. This CSC is not enabled as the other CSCs but individual actions are turned on and off in this CSC by this command. The parameter values perform the following actions: 0= disable memory dump, 1= enable memory dump, 2= disable chopper power fault management, 3= enable chopper power fault management, 4= disable EEA fault management, 5= enable EEA fault management, 6= disable TSW telemetry test pattern, 7= enable default TSW telemetry test pattern, 8= enable diagnostic telemetry test pattern, 9= noop, 10= disable measured current FM, 11= enable measured current FM, 12= disable commanded current FM, 13= enable commanded current FM. For noop, the TSW command accept counter will increment.
Disable (even) or Enable (odd) various diagnostic and fault management functions excluding parameters 8 and 9.
4
0 13
E
!---------- Command Number = 85 ----------
IPU
HIR_IPU_TSSRESET
Hard reset of the TSS control processor (external reset)
Operational
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 01010101 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This instruction will abort any operation in progress. The scanner will NOT be safed if this command is used.This command may be used during either TSW boot or application execution.
!---------- Command Number = 86 ----------
CSS
HIR_CSS_PIDCOEFFS
Proportional, Integral and Derivative coefficients for use by CSS SW.
Operational
Flight
3
512
00011110 01000000 11000000 00000000 00000000 00111001 01010110 ********
PPPPPPPP PPPPPPPP IIIIIIII IIIIIIII DDDDDDDD DDDDDDDD 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
None
Proportional Coefficient
16
0 65535
P
Integral Coefficient
16
0 65535
I
Derivative Coefficient
16
0 65535

```
D
!---------- Command Number = 87 ----------
TSU
HIR_TSU_BOOT
Boot the TSW from the specified location from TSU boot state.
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 01010111 ********
00000000 00000001 10000001 00100000 00000000 RRRRRRRR RRRRRRRR RRRRRRRR
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command is only valid during the TSW boot sequence.  During normal
operation, the command will generate an error.
TSU RAM location for boot
24
0 16777215
R
!---------- Command Number = 88 ----------
IPU
HIR_IPU_SETTIME
Set 51-bit HIRDLS clock.
Operational
Flight
3
512
00011110 01000000 11000000 00000000 00000000 00111001 01011000 ********
00000000 00000000 00000000 000000CC HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
A HIRDLS Time Word is 64 bits long and consists of a 32 bit hardware counter
(PTIM3) and a 19 bit software maintained counter. One LSB of HIRDLS Time is
2.03252 microseconds.  This command sets one or both parts of the Time Word.
If only one part is to be set the command ignores the value uploaded for the
other part. If the IPU is powered down the Time Word setting is lost and
resets to zero on subsequent power-up.  IMPORTANT NOTE: if the HIRDLS Time
Word is changed by this command, all TIMED macros will be deleted.  This
command should not be executed more than once in any 2 second period or else
the time code in science and engineering packets may be incorrect for the next
2 seconds.  It is possible to have duplicate HIRDLS time stamps.
Control code: 1 = Set Low Time; 2 = Set High Time; 3 = Set Low and High Time.
2
1 3
C
High Time value (19 MSBs)
32
0 524287
H
Low Time value (32 LSBs)
32
0 4294967295
L
!---------- Command Number = 89 ----------
MACRO
HIR_MAC_ACTIVATE
```

Activate the previously uploaded macro
Operational
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 01011001 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command, which must be preceded by a series of HIR_MAC_UPLOAD commands, signals when the upload is complete. When the HIR_MAC_ACTIVATE command is received, the checksum which has been uploaded in the HIR_MAC_ASSIGN command is verified and the macro marked as ready for execution if the checksums match. If the checksums do not match, the HIR_MAC_ACTIVATE command fails (as reflected in the MAC_CMD_ERR telemetry point) and the uploaded commands are deleted for the macro for which the checksums did not match.
!---------- Command Number = 90 ----------
TSU
HIR_TSU_REBOOT
Soft reboot of the TSS control processor while in boot state (software reset).
Operational
Flight
0
512
00011110 01000000 11000000 00000000 00000000 00111001 01011010 ********
00000000 00000000 00000000 01100000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This instruction will abort any operation in progress. The scanner will NOT be safed if this command is used. This command may be used during either TSW boot or application execution.
!---------- Command Number = 91 ----------
TSU
HIR_TSU_DOWNLOAD
Download a TSS memory dump packet while in TSS boot state.
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 01011011 ********
00000000 00000010 10000001 01100000 AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
Send a download packet to the IPU from the TEU SUROM software only.
Memory location to start dump (32-bit boundary).
32
0 4294967295
A
!---------- Command Number = 92 ----------

TSU
HIR_IPU_TSUSECTION
Changes the EEPROM section that the IPU will use when the TSU requests a program load.
Operational
Flight
6
512
00011110 01000000 11000000 00000000 00000000 00111001 01011100 ********
SSSSSSSS SSSSSSSS VVVVVVVV VVVVVVVV WWWWWWWW WWWWWWWW WWWWWWWW WWWWWWWW
XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX YYYYYYYY YYYYYYYY YYYYYYYY YYYYYYYY
ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ ZZZZZZZZ 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
Values of 0 to 15 will load the TEU with the image located in this section of the EEPROM and send the boot command to the TEU if the load is successful. A value of 16 will load the TEU with the image located in the first section of IPU EEPROM marked as autobootable for the TEU and send the boot command to the TEU if the load is successful. A value of 100 - 115 will load the TEU with the image located in this IPU EEPROM section but not send the TEU boot command. A value of 116 will load the TEU with the image located in the first section of the IPU EEPROM marked as autobootable for the TEU but will not send the TEU boot command. For any other values, no load of the TEU from IPU EEPROM nor boot will occur.
Auto boot section
16
0 65535
S
Override Flags
16
0 65535
V
MBIC A Start
32
0 524286
W
MBIC A End
32
0 524286
X
MBIC B Start
32
0 524286
Y
MBIC B End
32
0 524286
Z
!---------- Command Number = 93 ----------
IPU
HIR_IPU_QLFLAG
Quick look flag in science packet header for use in EOCC
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 01011101 ********
00000000 0000000F 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5

Enabled
32
Quick look flag value (0 = don't process as quick look data, 1 = process as quick look data).
Quick Look Flag
1
0 1
F
!---------- Command Number = 94 ----------
TSS
HIR_TSS_MTRPWR
Turns on or off the scan/chopper motor power converter.
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 01011110 ********
00000000 00000001 10000010 01110010 00000000 00000000 00000000 0000000W
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This is a TSW application command, and will not be recognized during TSW boot. For parameter 0: 0 = power off drive motors, 1 = power on drive motors. This command is for the PFM only. It is a noop for the EM and the command counter will increment but no action will be taken.
Drive motor power configuration parameter.
1
0 1
W
!---------- Command Number = 95 ----------
SSH
HIR_SSH_MOVEPROT
Close the sunshield door at a specified rate outside the safe angle range.
Operational
Flight
1
512
00011110 01000000 11000000 00000000 00000000 00111001 01011111 ********
0000NNNN NNNNNNNN 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Disabled
32
This command will move the door for a total of N steps in the closed direction at a fixed rate of approximately 28 steps per second. One step is 0.1 degrees. The door will not be moved (the command will be rejected) unless this command was immediately preceded by the HIR_SSH_DOORUNPROT command. Note that this command does not examine any of the microswitches
Number of steps
12
0 2400
N
!---------- Command Number = 96 ----------
BIP
HIR_BIP_HEADER
Header to upload IPU RAM in IPU boot state only.
Boot Hold
Flight
6

512
00011110 01000000 11000000 00000000 00000000 00111001 01100000 ********
00000000 00000000 SSSSSSSS SSSSSSSS 00000000 AAAAAAAA AAAAAAAA AAAAAAAA
00000000 00000000 NNNNNNNN NNNNNNNN CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 0000000F
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command must precede a group of HIR_BIP_DATA commands. The address is relative to the beginning of the appropriate memory space and must be on a 4 byte boundary.
Subsystem identifier (0x0000 = IPU startup).
16
0 0
S
Start address for RAM upload
24
0 2097148
A
Number of HIR_BIP_DATA commands (blocks) to follow. If number of blocks = 0 and flags word below is also zero, abort the upload.
16
0 40330
N
XOR checksum for the entire upload
32
0 4294967295
C
Length in 32-bit words
32
0 4294967295
L
If 0, data to follow; if 1, calculate checksum based on start address and length and place in telemetry point ISU_CMPCSUM.
1
0 1
F
!---------- Command Number = 97 ----------
BIP
HIR_BIP_DATA
Upload data to IPU RAM for IPU boot state only
Boot Hold
Flight
15
512
00011110 01000000 11000000 00000000 00000000 00111001 01100001 ********
BBBBBBBB BBBBBBBB 00000000 0000NNNN AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP
RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
Receive Subaddress 5
Never
32
This command must be preceded by the HIR_BIP_HEADER command. The block number must begin with 1 and be sequential.
Block number.
16
1 40330
B
Number of 32-bit words to upload
4
1 13
N

```
Data word 1 for upload (zero padded).
32
0 4294967295
A
Data word 2 for upload (zero padded).
32
0 4294967295
C
Data word 3 for upload (zero padded).
32
0 4294967295
D
Data word 4 for upload (zero padded).
32
0 4294967295
E
Data word 5 for upload (zero padded).
32
0 4294967295
F
Data word 6 for upload (zero padded).
32
0 4294967295
G
Data word 7 for upload (zero padded).
32
0 4294967295
H
Data word 8 for upload (zero padded).
32
0 4294967295
J
Data word 9 for upload (zero padded).
32
0 4294967295
K
Data word 10 for upload (zero padded).
32
0 4294967295
M
Data word 11 for upload (zero padded).
32
0 4294967295
P
Data word 12 for upload (zero padded).
32
0 4294967295
R
Data word 13 for upload (zero padded).
32
0 4294967295
T
!---------- Command Number = 98 ----------
BIP
HIR_BIP_JMPCOMMIT
Boot IPU from the specified RAM address
Boot Hold
CRITICAL
0
512
00011110 01000000 11000000 00000000 00000000 00111001 01100010 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
```

32
Jump to the specified RAM address (ignoring checksums) once the commit command has been sent.
!---------- Command Number = 100 ----------
UPL
HIR_UPL_HEADER
Header to upload IPU RAM
Operational
Flight
6
512
00011110 01000000 11000000 00000000 00000000 00111001 01100100 ********
00000000 00000000 SSSSSSSS SSSSSSSS 00000000 AAAAAAAA AAAAAAAA AAAAAAAA
00000000 00000000 NNNNNNNN NNNNNNNN CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC
LLLLLLLL LLLLLLLL LLLLLLLL LLLLLLLL 00000000 00000000 00000000 0000000F
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command must precede a group of HIR_UPL_DATA commands. The address is relative to the beginning of the appropriate memory space and must be on a 4 byte boundary.
Subsystem identifier (0x1000 = IPU Test Area, 0x2000 = SAIL task data block, 0x2100 = SAIL task code block and 0x8000 = TEU startup)
16
0 65535
S
Start address for RAM upload
24
0 2097148
A
Number of HIR_UPL_DATA commands to follow. If number of blocks = 0, abort the upload.
16
0 40330
N
XOR checksum for the entire upload
32
0 4294967295
C
Length in 32-bit words
32
0 4294967295
L
If 0, data to follow; if 1, calculate checksum based on start address and length and compare with uploaded checksum (no data follows this command). The result of the comparison is given by subtelemetry point IPU_UPL_CHKSUMOK = 1 if comparison successful, = 0 if comparison failed. For SAIL uploads, if this parameter is 1 it is ignored.
1
0 1
F
!---------- Command Number = 101 ----------
UPL
HIR_UPL_DATA
Upload data to IPU RAM
Operational
Flight
15
512
00011110 01000000 11000000 00000000 00000000 00111001 01100101 ********
BBBBBBBB BBBBBBBB 00000000 0000NNNN AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA
CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC DDDDDDDD DDDDDDDD DDDDDDDD DDDDDDDD
EEEEEEEE EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
GGGGGGGG GGGGGGGG GGGGGGGG GGGGGGGG HHHHHHHH HHHHHHHH HHHHHHHH HHHHHHHH
JJJJJJJJ JJJJJJJJ JJJJJJJJ JJJJJJJJ KKKKKKKK KKKKKKKK KKKKKKKK KKKKKKKK
MMMMMMMM MMMMMMMM MMMMMMMM MMMMMMMM PPPPPPPP PPPPPPPP PPPPPPPP PPPPPPPP

RRRRRRRR RRRRRRRR RRRRRRRR RRRRRRRR TTTTTTTT TTTTTTTT TTTTTTTT TTTTTTTT
Receive Subaddress 5
Never
32
This command must be preceded by the HIR_UPL_HEADER command. The block number must begin with 1 and be sequential.
Block number.
16
1 40330
B
Number of 32-bit words to upload
4
1 13
N
Data word 1 for upload (zero padded).
32
0 4294967295
A
Data word 2 for upload (zero padded).
32
0 4294967295
C
Data word 3 for upload (zero padded).
32
0 4294967295
D
Data word 4 for upload (zero padded).
32
0 4294967295
E
Data word 5 for upload (zero padded).
32
0 4294967295
F
Data word 6 for upload (zero padded).
32
0 4294967295
G
Data word 7 for upload (zero padded).
32
0 4294967295
H
Data word 8 for upload (zero padded).
32
0 4294967295
J
Data word 9 for upload (zero padded).
32
0 4294967295
K
Data word 10 for upload (zero padded).
32
0 4294967295
M
Data word 11 for upload (zero padded).
32
0 4294967295
P
Data word 12 for upload (zero padded).
32
0 4294967295
R
Data word 13 for upload (zero padded).
32
0 4294967295
T
!---------- Command Number = 103 ----------
BIP
HIR_BIP_EEWRITE
Setup to copy a section from IPU RAM into permanent EEPROM (critical command)

```
Boot Hold
CRITICAL
6
512
00011110 01000000 11000000 00000000 00000000 00111001 01100111 ********
00000000 0000SSSS 00000000 RRRRRRRR RRRRRRRR RRRRRRRR 00000000 LLLLLLLL
LLLLLLLL LLLLLLLL 00000000 EEEEEEEE EEEEEEEE EEEEEEEE FFFFFFFF FFFFFFFF
FFFFFFFF FFFFFFFF CCCCCCCC CCCCCCCC CCCCCCCC CCCCCCCC 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
For more detailed notes see latest release of SP_HIR_103 Vol1
EEPROM section location (0 - 15)
4
0 15
S
RAM address offset of image start
24
0 2097148
R
Length in 32-bit Dwords for copy
24
0 393216
L
EEPROM address offset to load image
24
0 1048572
E
Flags
32
0 4294967295
F
XOR Checksum of entire area to be copied
32
0 4294967295
C
!---------- Command Number = 104 ----------
BIP
HIR_BIP_EECOMMIT
Perform RAM to EEPROM transfer or other EEPROM action.
Boot Hold
CRITICAL
1
512
00011110 01000000 11000000 00000000 00000000 00111001 01101000 ********
00000000 000EEEEE 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
Perform RAM to EEPROM transfer or other EEPROM action.
Perform RAM to EEPROM transfer or other EEPROM action - Action to be
performed: 5=write EEPROM segment, 6=erase EEPROM segment, 8=copy index block
1 to 2, 9=copy index block 2 to 1, 16=EEPROM scrub, 17=erase all EEPROM [stage
2], 19=erase all EEPROM [final stage].
5
0 19
E
!---------- Command Number = 105 ----------
IPU
HIR_IPU_FAULTSEL
```

Select a primary or redundant unit of a subsystem or device (not IPU processor)
Operational
CRITICAL
2
512
00011110 01000000 11000000 00000000 00000000 00111001 01101001 ********
00000000 000NNNNN 00000000 0000000S 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
If the unit is a switchable powered device (such as the TSS), this flag will apply after the unit is powered down, then back up.If the unit is a redundant mechanism (such as the sunshield), the flag will apply after the current movement has completed.
Action Code
5
0 31
N
Action Parameter
1
0 1
S
!---------- Command Number = 106 ----------
IPU
HIR_IPU_CRFAULT
Enable changes to fault management system
Operational
CRITICAL
0
512
00011110 01000000 11000000 00000000 00000000 00111001 01101010 ********
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command must precede an HIR_IPU_FAULTOFF or an HIR_IPU_FAULTVAL command.
!---------- Command Number = 107 ----------
IPU
HIR_IPU_FAULTOFF
Enable or disable autonomous management of selected fault condition
Operational
CRITICAL
2
512
00011110 01000000 11000000 00000000 00000000 00111001 01101011 ********
00000000 000FFFFF 00000000 0000000H 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command must be preceded by a HIR_IPU_CRFAULT command. Disabling an action will still detect and mark faults,and will set a flag for another fault

```
action task (VxWorks or SAIL) to take over.
Fault condition number
5
0 31
F
Disable (0) or enable (1) fault handling
1
0 1
H
!---------- Command Number = 108 ----------
IPU
HIR_IPU_FAULTVAL
Change a value for the autonomous fault management of a selected fault
condition
Operational
CRITICAL
3
512
00011110 01000000 11000000 00000000 00000000 00111001 01101100 ********
00000000 000FFFFF 000000VV VVVVVVVV NNNNNNNN NNNNNNNN NNNNNNNN NNNNNNNN
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command must be preceded by a HIR_IPU_CRFAULT command.
Fault condition number
5
0 31
F
Value to be changed
10
0 1023
V
New value
32
0 4294967295
N
!---------- Command Number = 109 ----------
IPU
HIR_TLM_HKHEAD
Header to upload housekeeping telemetry table
Operational
CRITICAL
4
512
00011110 01000000 11000000 00000000 00000000 00111001 01101101 ********
000000II IIIIIIII 000000NN NNNNNNNN 000000SS SSSSSSSS CCCCCCCC CCCCCCCC
CCCCCCCC CCCCCCCC 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
Receive Subaddress 5
Never
32
This command must precede the HIR_TLM_HKFMT command.The uploaded table cannot
be used until the checksum matches the uploaded table.See C&TH section 4 for
additional information.
Housekeeping Identifier
10
0 1023
I
Number of telemetry format table entries
10
```

```
1 1023
N
Size in words of housekeeping block
10
1 256
S
32-bit checksum of all data words in upload
32
0 4294967295
C
!EOF 103 2002-06-20 v6.15
```

```
# $Id$
#
# HIRDLS Telemetry Information File: v6.15
# Version Date: 2002-06-20 11:00:00
#
# Generated from: Telemetry Table version 035
#                 Database version 016
#
# Column 1    :   Mnemonic
# Column 2    :   Unique ID
# Column 3    :   Length in bits
# Column 4-6  :   Currently not used
# Column 7    :   0= need mapping
#                 1= implemented
#                 2= ground use only no mapping required
#                 3= SUROM only
#                 4= obsolete
#                 5= have mapping, not implemented
#                 6= Derived EDAQ PRT
#                 7= Raw EDAQ PRT
#                 8= EDAQ AD590
#                 9= EDAQ
#                10= EDAQ REF
#                11= PSS_ANALOG
#                12= IFC
#                13= SPU HK
#                14= CSS HK
#                15= PSS STATUS
#
SIG_DAT_01           0     16   0  0  0  2  # Radiance channel  1  (GROUND USE ONLY)
SIG_DAT_02           1     16   0  0  0  2  # Radiance channel  2  (GROUND USE ONLY)
SIG_DAT_03           2     16   0  0  0  2  # Radiance channel  3  (GROUND USE ONLY)
SIG_DAT_04           3     16   0  0  0  2  # Radiance channel  4  (GROUND USE ONLY)
SIG_DAT_05           4     16   0  0  0  2  # Radiance channel  5  (GROUND USE ONLY)
SIG_DAT_06           5     16   0  0  0  2  # Radiance channel  6  (GROUND USE ONLY)
SIG_DAT_07           6     16   0  0  0  2  # Radiance channel  7  (GROUND USE ONLY)
SIG_DAT_08           7     16   0  0  0  2  # Radiance channel  8  (GROUND USE ONLY)
SIG_DAT_09           8     16   0  0  0  2  # Radiance channel  9  (GROUND USE ONLY)
SIG_DAT_10           9     16   0  0  0  2  # Radiance channel 10  (GROUND USE ONLY)
SIG_DAT_11           10    16   0  0  0  2  # Radiance channel 11  (GROUND USE ONLY)
SIG_DAT_12           11    16   0  0  0  2  # Radiance channel 12  (GROUND USE ONLY)
SIG_DAT_13           12    16   0  0  0  2  # Radiance channel 13  (GROUND USE ONLY)
SIG_DAT_14           13    16   0  0  0  2  # Radiance channel 14  (GROUND USE ONLY)
SIG_DAT_15           14    16   0  0  0  2  # Radiance channel 15  (GROUND USE ONLY)
SIG_DAT_16           15    16   0  0  0  2  # Radiance channel 16  (GROUND USE ONLY)
SIG_DAT_17           16    16   0  0  0  2  # Radiance channel 17  (GROUND USE ONLY)
SIG_DAT_18           17    16   0  0  0  2  # Radiance channel 18  (GROUND USE ONLY)
SIG_DAT_19           18    16   0  0  0  2  # Radiance channel 19  (GROUND USE ONLY)
SIG_DAT_20           19    16   0  0  0  2  # Radiance channel 20  (GROUND USE ONLY)
SIG_DAT_21           20    16   0  0  0  2  # Radiance channel 21  (GROUND USE ONLY)
STH_TMP_01           29    16   0  0  0  8  # Structure temp 01, EDAQ AD590 Row 2 Col 5
STH_TMP_02           30    16   0  0  0  8  # Structure temp 02, EDAQ AD590 Row 2 Col 6
```

```
STH_TMP_03            31    16   0  0  0  8  # Structure temp 03, EDAQ AD590 Row 7 Col 3
STH_TMP_04            32    16   0  0  0  8  # Structure temp 04, EDAQ AD590 Row 6 Col 7
CCU_BOX_TMP           37    16   0  0  0  8  # CCU box temp, EDAQ AD590 Row 4 Col 7
GEU_BOX_TMP           38    16   0  0  0  8  # GEU box temp, EDAQ AD590 Row 4 Col 0
PCU_BOX_TMP           39    16   0  0  0  8  # PCU box temp, EDAQ AD590 Row 1 Col 1
EEA_BOX_TMP           40    16   0  0  0  8  # EEA box temp, EDAQ AD590 Row 4 Col 1
WSE_BOX_TMP           41    16   0  0  0  8  # WSE box temp, EDAQ AD590 Row 0 Col 3
CSS_RAD_TMP1          42    16   0  0  0  8  # Cooler Radiator temp 1, EDAQ AD590 Row 3 Col 5
CSS_RAD_TMP2          43    16   0  0  0  8  # Cooler Radiator temp 2, EDAQ AD590 Row 4 Col 6
COMP_HEAD_TMP         44    16   0  0  0  8  # Compressor head temp, EDAQ AD590 Row 5 Col 5
DISPL1_TMP            45    16   0  0  0  8  # Displacer 1 body temp, EDAQ AD590 Row 6 Col 6
DISPL2_TMP            46    16   0  0  0  8  # Displacer 2 body temp, EDAQ AD590 Row 5 Col 5
SUNSEN1_TMP           47    16   0  0  0  9  # Sun sensor 1 (temperature), EDAQ
SUNSEN2_TMP           48    16   0  0  0  9  # Sun sensor 2 (temperature), EDAQ
SUNSEN3_TMP           49    16   0  0  0  9  # Sun sensor 3 (temperature), EDAQ
DOOR_POT              50    16   0  0  0  9  # Door angle sensor, EDAQ
DOOR_SAF_ANG          51    16   0  0  0  1  # Door Safe Angle setting
SSH_HWA_TMP           52    16   0  0  0  9  # Hot Wax Actuator temp, EDAQ
SSH_DORMOT_TMP        53    16   0  0  0  9  # SSH drive motor temp, EDAQ
SSH_APL_TMP           54    16   0  0  0  8  # SSH aperture plate temp, EDAQ AD590 Row 7 Col 7
SSH_PZSURF_TMP        55    16   0  0  0  8  # SSH +Z surface temp, EDAQ AD590 Row 4 Col 5
SSH_NZSURF_TMP        56    16   0  0  0  8  # SSH -Z surface temp, EDAQ ADC590 Row 6 Col 2
SSH_STAT              57    16   0  0  0  1  # Sunshield switch status
SVA_STAT              58    16   0  0  0  1  # SVA switch status
SVA_DORMOT_TMP        59    16   0  0  0  9  # SVA drive motor temp, EDAQ
SVA_MTGPLT_TMP        60    16   0  0  0  8  # SVA mounting plate tmp, EDAQ ADC590 Row 7 Col 0
GYR0_TMP              61    16   0  0  0  0  # Gyro 0 temperature
GYR1_TMP              62    16   0  0  0  0  # Gyro 1 temperature
GYR2_TMP              63    16   0  0  0  0  # Gyro 2 temperature
GYR3_TMP              64    16   0  0  0  0  # Gyro 3 temperature
GYR0_BD_TMP           65    16   0  0  0  0  # Gyro 0 board temp
GYR1_BD_TMP           66    16   0  0  0  0  # Gyro 1 board temp
GYR2_BD_TMP           67    16   0  0  0  0  # Gyro 2 board temp
GYR3_BD_TMP           68    16   0  0  0  0  # Gyro 3 board temp
GYR0_ADAT             69    16   0  0  0  2  # Gyro 0 angle data (GROUND USE ONLY)
GYR1_ADAT             70    16   0  0  0  2  # Gyro 1 angle data (GROUND USE ONLY)
GYR2_ADAT             71    16   0  0  0  2  # Gyro 2 angle data (GROUND USE ONLY)
GYR3_ADAT             72    16   0  0  0  2  # Gyro 3 angle data (GROUND USE ONLY)
GYR0_CAPL             77    16   0  0  0  0  # Gyro 0 cap loop output
GYR1_CAPL             78    16   0  0  0  0  # Gyro 1 cap loop output
GYR2_CAPL             79    16   0  0  0  0  # Gyro 2 cap loop output
GYR3_CAPL             80    16   0  0  0  0  # Gyro 3 cap loop output
GYR0_MOT_V            81    16   0  0  0  0  # Gyro 0 motor volts
GYR1_MOT_V            82    16   0  0  0  0  # Gyro 1 motor volts
GYR2_MOT_V            83    16   0  0  0  0  # Gyro 2 motor volts
GYR3_MOT_V            84    16   0  0  0  0  # Gyro 3 motor volts
GYR0_MOT_I            85    16   0  0  0  0  # Gyro 0 motor current
GYR1_MOT_I            86    16   0  0  0  0  # Gyro 1 motor current
GYR2_MOT_I            87    16   0  0  0  0  # Gyro 2 motor current
GYR3_MOT_I            88    16   0  0  0  0  # Gyro 3 motor current
GYR0_STAT             89    16   0  0  0  0  # Gyro 0 status word
GYR1_STAT             90    16   0  0  0  0  # Gyro 1 status word
```

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GYR2_STAT            91    16   0  0  0  0  # Gyro 2 status word
GYR3_STAT            92    16   0  0  0  0  # Gyro 3 status word
GYR0_P15V            93    16   0  0  0  0  # Gyro 0 +15 volts
GYR1_P15V            94    16   0  0  0  0  # Gyro 1 +15 volts
GYR2_P15V            95    16   0  0  0  0  # Gyro 2 +15 volts
GYR3_P15V            96    16   0  0  0  0  # Gyro 3 +15 volts
GYR0_N15V            97    16   0  0  0  0  # Gyro 0 -15 volts
GYR1_N15V            98    16   0  0  0  0  # Gyro 1 -15 volts
GYR2_N15V            99    16   0  0  0  0  # Gyro 2 -15 volts
GYR3_N15V            100   16   0  0  0  0  # Gyro 3 -15 volts
SCI_ELVARP_POS       101   32   0  0  0  2  # Elevation Primary variable-readhead position (GROUND USE ONLY)
SCI_EL2P_POS         102   32   0  0  0  2  # Elevation Primary readhead 2 position (GROUND USE ONLY)
SCI_AZP_POS          103   32   0  0  0  2  # Azimuth Primary readhead position  (GROUND USE ONLY)
SM_TMP1              133   16   0  0  0  8  # Scan mirror temp.1, EDAQ AD590 Row 2 Col 4
SM_TMP2              134   16   0  0  0  8  # Scan mirror temp.2, EDAQ AD590 Row 2 Col 3
SM_TMP3              135   16   0  0  0  6  # Scan mirror temp 3, EDAQ Derived PRT 0
AZ_HSG_TMP_1         138   16   0  0  0  8  # Azimuth housing temp 1, EDAQ AD590 Row 2 Col 2
M1_TMP1              139   16   0  0  0  8  # Pri (M1) mir temp. 1, EDAQ AD590 Row 0 Col 2
M1_TMP2              140   16   0  0  0  8  # Pri (M1) mir temp. 2, EDAQ AD590 Row 7 Col 1
LNS1_WF_TMP1         141   16   0  0  0  8  # Lens 1-WF temp. 1, EDAQ AD590 Row 5 Col 0
LNS1_WF_TMP2         142   16   0  0  0  8  # Lens 1-WF temp. 2, EDAQ AD590 Row 6 Col 1
LNS1_WF_TMP3         143   16   0  0  0  6  # Lens 1-WF temp. 3, EDAQ Derived PRT 5
LNS2_TMP1            144   16   0  0  0  8  # Lens 2 temp. 1, EDAQ AD590 Row 5 Col 1
LNS2_TMP2            145   16   0  0  0  8  # Lens 2 temp. 2, EDAQ AD590 Row 6 Col 0
LNS2_TMP3            146   16   0  0  0  6  # Lens 2 temp. 3, EDAQ Derived PRT 6
CHOP_MOT_TMP         147   16   0  0  0  8  # Chopper motor temp, EDAQ AD590 Row 5 Col 3
CHOP_HSG_TMP2        148   16   0  0  0  8  # Field Stop #1 temp, EDAQ AD590 Row 3 Col 4
CHOP_HSG_TMP3        149   16   0  0  0  6  # Chopper blade shroud temp, EDAQ Derived PRT 2
CALMIR_TMP1          150   16   0  0  0  8  # Cal. Mirror temp  #1, EDAQ ADC590 Row 0 Col 1
CALMIR_TMP2          151   16   0  0  0  8  # Cal. Mirror temp  #2, EDAQ ADC590 Row 1 Col 2
CALMIR_TMP3          152   16   0  0  0  6  # Cal. Mirror temp  #3, EDAQ Derived PRT 4
M2_TMP1              153   16   0  0  0  8  # Sec. (M2) mir temp #1, EDAQ ADC590 Row 6 Col 4
M2_TMP2              154   16   0  0  0  6  # Sec. (M2) mir temp #2, EDAQ Derived PRT 7
SMA_MTRING_TMP       155   16   0  0  0  8  # SMA mount ring temp, EDAQ 56
LNSASSY_TMP1         156   16   0  0  0  8  # OBA lens assy temp #1, EDAQ 33
LNSASSY_TMP2         157   16   0  0  0  8  # OBA lens assy temp #2, EDAQ 44
SPVU_BAF_TMP         158   16   0  0  0  8  # OBA Sp. View baffle tmp, EDAQ 36
OBA_PLT_TMP          159   16   0  0  0  8  # OBA aperture plate temp, EDAQ 10
GMU_MNT_TMP          160   16   0  0  0  8  # GMU Mount temp., EDAQ 43
GMU_HSG_TMP          161   16   0  0  0  8  # GMU Housing temp., EDAQ 54
TSW_CSCI_BLD_ID      162   16   0  0  0  1  # Telescope S/W Bld Versn ID
FPA_TMP_A            163   16   0  0  0  13 # Focal Plane temperature A, SPU
FPA_TMP_B            164   16   0  0  0  13 # Focal Plane temperature B,SPU
IFCBB_FRPL_TMP       165   16   0  0  0  9  # IFCBB front plate temp, EDAQ
IFC_REF_TMP          166   8    0  0  0  12 # IFC ref. resistor temp
IFCBB_TMP1           167   16   0  0  0  12 # IFC BB temp. #1
IFCBB_TMP2           168   16   0  0  0  12 # IFC BB temp. #2
IFCBB_TMP3           169   16   0  0  0  12 # IFC BB temp. #3
IFC_PSV_P28          170   8    0  0  0  12 # IFC +28V rail volts
IFC_PSV_P15          171   8    0  0  0  12 # IFC +15V rail volts
IFC_PSV_N15          172   8    0  0  0  12 # IFC -15V rail volts
IFC_PSV_P5           173   8    0  0  0  12 # IFC +5V rail volts
```

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SAILTASK_00_P15        206   32   0  0  0  0  # SAIL Tsk 00 param 15  !
SAILTASK_01_P15        207   32   0  0  0  0  # SAIL Tsk 01 param 15  !
SAILTASK_02_P15        208   32   0  0  0  0  # SAIL Tsk 02 param 15  !
SAILTASK_03_P15        209   32   0  0  0  0  # SAIL Tsk 03 param 15  !
SAILTASK_04_P15        210   32   0  0  0  0  # SAIL Tsk 04 param 15  !
SAILTASK_05_P15        211   32   0  0  0  0  # SAIL Tsk 05 param 15  !
SAILTASK_06_P15        212   32   0  0  0  0  # SAIL Tsk 06 param 15  !
SAILTASK_07_P15        213   32   0  0  0  0  # SAIL Tsk 07 param 15  !
SAILTASK_08_P15        214   32   0  0  0  0  # SAIL Tsk 08 param 15  !
SAILTASK_09_P15        215   32   0  0  0  0  # SAIL Tsk 09 param 15  !
SAILTASK_10_P15        216   32   0  0  0  0  # SAIL Tsk 10 param 15  !
SAILTASK_11_P15        217   32   0  0  0  0  # SAIL Tsk 11 param 15  !
SAILTASK_12_P15        218   32   0  0  0  0  # SAIL Tsk 12 param 15  !
SAILTASK_13_P15        219   32   0  0  0  0  # SAIL Tsk 13 param 15  !
SAILTASK_14_P15        220   32   0  0  0  0  # SAIL Tsk 14 param 15  !
SAILTASK_15_P15        221   32   0  0  0  0  # SAIL Tsk 15 param 15  !
SAIL_PROC_STAT         234   8    0  0  0  0  # SAIL Processor Status Code
SAILTASK_00_STAT       235   8    0  0  0  0  # SAIL Task  00 Status Code
SAILTASK_01_STAT       236   8    0  0  0  0  # SAIL Task  01 Status Code
SAILTASK_02_STAT       237   8    0  0  0  0  # SAIL Task  02 Status Code
SAILTASK_03_STAT       238   8    0  0  0  0  # SAIL Task  03 Status Code
SAILTASK_04_STAT       239   8    0  0  0  0  # SAIL Task  04 Status Code
SAILTASK_05_STAT       240   8    0  0  0  0  # SAIL Task  05 Status Code
SAILTASK_06_STAT       241   8    0  0  0  0  # SAIL Task  06 Status Code
SAILTASK_07_STAT       242   8    0  0  0  0  # SAIL Task  07 Status Code
SAILTASK_08_STAT       243   8    0  0  0  0  # SAIL Task  08 Status Code
SAILTASK_09_STAT       244   8    0  0  0  0  # SAIL Task  09 Status Code
SAILTASK_10_STAT       245   8    0  0  0  0  # SAIL Task  10 Status Code
SAILTASK_11_STAT       246   8    0  0  0  0  # SAIL Task  11 Status Code
SAILTASK_12_STAT       247   8    0  0  0  0  # SAIL Task  12 Status Code
SAILTASK_13_STAT       248   8    0  0  0  0  # SAIL Task  13 Status Code
SAILTASK_14_STAT       249   8    0  0  0  0  # SAIL Task  14 Status Code
SAILTASK_15_STAT       250   8    0  0  0  0  # SAIL Task  15 Status Code
HIRDLS_CLK_LSB         251   16   0  0  0  2  # HIRDLS clock LSBYTES (GROUND USE ONLY)
TMARK_CLK              252   16   0  0  0  2  # Time Mark clock word (GROUND USE ONLY)
TMARK_DATA             253   16   0  0  0  2  # Time mark data word (GROUND USE ONLY)
SCCMDS_RCVCT           254   16   0  0  0  1  # S/C cmds: received count
SCCMDS_REJCT           255   16   0  0  0  1  # S/C cmds: rejected count
SCCMD_LAST_RC          256   16   0  0  0  1  # Last S/C cmd: result code
SCCMD_LAST_CN          257   8    0  0  0  1  # Last S/C cmd: cmd nmbr
SCCMD_LAST_PC          258   16   0  0  0  1  # Last S/C cmd: pkt seq cnt
SAILCMDS_RCVCT         259   16   0  0  0  1  # SAIL cmds: received count
SAILCMDS_REJCT         260   16   0  0  0  1  # SAIL cmds: rejected count
SAILCMD_LAST_RC        261   16   0  0  0  1  # Last SAIL cmd: result code
SAILCMD_LAST_CN        262   8    0  0  0  1  # Last SAIL cmd: cmd nmbr
MACMDS_RCVCT           263   16   0  0  0  1  # Macro cmds: receivd count
MACMDS_REJCT           264   16   0  0  0  1  # Macro cmds: rejected count
MACMD_LAST_RC          265   16   0  0  0  1  # Last Macro cmd: reslt code
MACMD_LAST_CN          266   8    0  0  0  1  # Last Macro cmd: cmd nmbr
FRAMECNT               267   32   0  0  0  2  # Minor frame count (GROUND USE ONLY)
HK_FORMAT_ID           268   16   0  0  0  2  # Houskeeping format ID (GROUND USE ONLY)
SPU_CH_01_ZERO         269   16   0  0  0  1  # Channel  1 Zero Offset
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SPU_CH_02_ZERO        270   16   0  0  0  1  # Channel  2 Zero Offset
SPU_CH_03_ZERO        271   16   0  0  0  1  # Channel  3 Zero Offset
SPU_CH_04_ZERO        272   16   0  0  0  1  # Channel  4 Zero Offset
SPU_CH_05_ZERO        273   16   0  0  0  1  # Channel  5 Zero Offset
SPU_CH_06_ZERO        274   16   0  0  0  1  # Channel  6 Zero Offset
SPU_CH_07_ZERO        275   16   0  0  0  1  # Channel  7 Zero Offset
SPU_CH_08_ZERO        276   16   0  0  0  1  # Channel  8 Zero Offset
SPU_CH_09_ZERO        277   16   0  0  0  1  # Channel  9 Zero Offset
SPU_CH_10_ZERO        278   16   0  0  0  1  # Channel 10 Zero Offset
SPU_CH_11_ZERO        279   16   0  0  0  1  # Channel 11 Zero Offset
SPU_CH_12_ZERO        280   16   0  0  0  1  # Channel 12 Zero Offset
SPU_CH_13_ZERO        281   16   0  0  0  1  # Channel 13 Zero Offset
SPU_CH_14_ZERO        282   16   0  0  0  1  # Channel 14  Zero Offset
SPU_CH_15_ZERO        283   16   0  0  0  1  # Channel 15 Zero Offset
SPU_CH_16_ZERO        284   16   0  0  0  1  # Channel 16 Zero Offset
SPU_CH_17_ZERO        285   16   0  0  0  1  # Channel 17 Zero Offset
SPU_CH_18_ZERO        286   16   0  0  0  1  # Channel 18 Zero Offset
SPU_CH_19_ZERO        287   16   0  0  0  1  # Channel 19 Zero Offset
SPU_CH_20_ZERO        288   16   0  0  0  1  # Channel 20 Zero Offset
SPU_CH_21_ZERO        289   16   0  0  0  1  # Channel 21 Zero Offset
SPU_P5V_A             290   16   0  0  0  13 # SPU +5VA supply volts (analog)
SPU_N5V_A             291   16   0  0  0  13 # SPU -5VA supply volts (analog)
SPU_P5V_DA            292   16   0  0  0  13 # SPU +5VA supply volts (digital)
SPU_P12V_A            293   16   0  0  0  13 # SPU +12VA supply volts
SPU_N12V_A            294   16   0  0  0  13 # SPU -12VA supply volts
SPU_P5V_B             295   16   0  0  0  13 # SPU +5VB supply volts (analog)
SPU_N5V_B             296   16   0  0  0  13 # SPU -5VB supply volts (analog)
SPU_P5V_DB            297   16   0  0  0  13 # SPU +5VB supply volts (digital)
SPU_P12V_B            298   16   0  0  0  13 # SPU +12VB supply volts
SPU_N12V_B            299   16   0  0  0  13 # SPU -12VB supply volts
IPU_P3P3V             300   16   0  0  0  9  # Wkg IPU +3.3V supply volts, EDAQ
IPU_P5V               301   16   0  0  0  9  # Wkg IPU +5V supply volts, EDAQ
IPU_P15V              302   16   0  0  0  9  # Wkg IPU +15V supply volts, EDAQ
IPU_N15V              303   16   0  0  0  9  # Wkg IPU -15V supply volts, EDAQ
IPU_P3P3_DDC_TMP      304   16   0  0  0  9  # Wkg IPU +3.3V DDC temp, EDAQ
IPU_P5V_DDC_TMP       305   16   0  0  0  9  # Wkg IPU +5V DDC temp, EDAQ
ISU_LIO_STAT          306   16   0  0  0  3  # IPU SUROM LIO RAD6K Test Status  (GROUND/SUROM USE ONLY)
ISU_1ST_MEM_SEG       307   16   0  0  0  3  # IPU SUROM First Good Mem Segment (GROUND/SUROM USE ONLY)
ISU_EDAC1ERR_CNT      308   16   0  0  0  3  # IPU SUROM EDAC Single Error Count (GROUND/SUROM USE ONLY)
ISU_EDAC2ERR_CNT      309   16   0  0  0  3  # IPU SUROM EDAC Double Error Count (GROUND/SUROM USE ONLY)
ISU_EE_ERR_CNT        310   16   0  0  0  3  # IPU SUROM EDAC EEPROM Err Cnt (GROUND/SUROM USE ONLY)
ISU_RAM_FAIL          311   16   0  0  0  3  # IPU SUROM RAM Readback Fail (GROUND/SUROM USE ONLY)
ISU_EE_ERR_STAT       312   16   0  0  0  3  # IPU SUROM EEPROM Error Status (GROUND/SUROM USE ONLY)
ISU_1ST_1553_SEG      313   16   0  0  0  3  # IPU SUROM First Good 1553 Segment (GROUND/SUROM USE ONLY)
ISU_1553_READERR      314   16   0  0  0  3  # IPU SUROM 1553 Read Failures (GROUND/SUROM USE ONLY)
ISU_CMD_RCVD_CNT      315   16   0  0  0  3  # IPU SUROM Command Rceiv'd Count (GROUND/SUROM USE ONLY)
ISU_CMD_REJ_CNT       316   16   0  0  0  3  # IPU SUROM Command Reject'd Count (GROUND/SUROM USE ONLY)
ISU_CMD_NUMBER        317   16   0  0  0  3  # IPU SUROM  Command Number (GROUND/SUROM USE ONLY)
ISU_CMD_RES_CODE      318   16   0  0  0  3  # IPU SUROM Command Result Code (GROUND/SUROM USE ONLY)
ISU_COUNTDOWN         320   16   0  0  0  3  # Countdown parameter (seconds remaining until automatic application load
and execute, 0=expired/aborted)
ISU_STATE             321   16   0  0  0  3  # IPU SUROM Startup State (GROUND/SUROM USE ONLY)
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ISU_ROM_BUILD_ID	322	16	0	0	0	3	# IPU SUROM ROM Build Version ID (GROUND/SUROM USE ONLY)
IPU_CSCI_BLD_ID	325	16	0	0	0	1	# IPU S/W Build Version ID
CSS_OP_STAT	327	8	0	0	0	14	# Cooler operating status
CSS_DDCAG_STAT	328	8	0	0	0	14	# Cooler DDC & caging status discretes (Read by IPU)
CSS_ERROR	329	8	0	0	0	14	# Cooler error flags
CSS_TOTAL_I	330	8	0	0	0	14	# Cooler tot mean currt
CRYOTIP_SETP	331	16	0	0	0	14	# Cryo tip temp set point
CRYOTIP_TMP_D0	332	16	0	0	0	14	# Cryo tip temperature 0
CRYOTIP_TMP_D1	333	16	0	0	0	14	# Cryo tip temperature 1
CSS_FREQ_DMD	334	16	0	0	0	14	# Cooler frequency (dmd'd)
CSS_FREQ_ACT	335	16	0	0	0	14	# Cooler frequency (actual)
CSS_PH_DMD	336	16	0	0	0	14	# Comp/Disp phase (dmd'd)
CSS_PH_ACT	337	16	0	0	0	14	# Comp/Disp phase (actual)
COMP_AMP_DMD	338	16	0	0	0	14	# Compressor ampl (dmd'd)
COMP_AMP_ACT	339	16	0	0	0	14	# Compressor ampl (actual)
DISP_AMP_DMD	340	16	0	0	0	14	# Displacer ampl (dmd'd)
DISP_AMP_ACT	341	16	0	0	0	14	# Displacer ampl (actual)
CSS_MSG_NUMBER	342	8	0	0	0	14	# CSS-IPS data msg number
CSS_CSCI_BLD_ID	343	16	0	0	0	14	# Cooler F/W Build Version ID
QA_I	344	16	0	0	0	11	# Quiet Bus A input currt, from PSS
QB_I	345	16	0	0	0	11	# Quiet Bus B input currt, from PSS
PSS_SPU_5VA	346	16	0	0	0	11	# SPU +5V DDC A volts
PSS_SPU_5VB	347	16	0	0	0	11	# SPU +5V DDC B volts
PSS_SPU_P15VA	348	16	0	0	0	11	# SPU +15V DDC A volts
PSS_SPU_P15VB	349	16	0	0	0	11	# SPU +15V DDC B volts
PSS_SPU_N15VA	350	16	0	0	0	11	# SPU -15V DDC A volts
PSS_SPU_N15VB	351	16	0	0	0	11	# SPU -15V DDC B volts
PSS_PCU_5VC	352	16	0	0	0	11	# PCU Internal +5 Volts
PSS_PCU_P15VC	353	16	0	0	0	11	# PCU Internal +15 Volts
PSS_PCU_N15VC	354	16	0	0	0	11	# PCU Internal -15 Volts
PSS_REG_28VA	355	16	0	0	0	11	# REG +28V DDC A volts
PSS_REG_28VB	356	16	0	0	0	11	# REG +28V DDC B volts
PSS_SYS_5VA	357	16	0	0	0	11	# SYS +5V DDC A volts
PSS_SYS_5VB	358	16	0	0	0	11	# SYS +5V DDC B volts
PSS_SYS_P15VA	359	16	0	0	0	11	# SYS +15V DDC A volts
PSS_SYS_P15VB	360	16	0	0	0	11	# SYS +15V DDC B volts
PSS_SYS_N15VA	361	16	0	0	0	11	# SYS -15V DDC A volts
PSS_SYS_N15VB	362	16	0	0	0	11	# SYS -15V DDC B volts
PSS_STAT_00	363	16	0	0	0	15	# PSS relay status word 0
PSS_STAT_01	364	16	0	0	0	15	# PSS relay status word 1
PSS_STAT_02	365	16	0	0	0	15	# PSS relay status word 2
PSS_STAT_03	366	16	0	0	0	15	# PSS relay status word 3
PSS_STAT_04	367	16	0	0	0	15	# PSS relay status word 4
PSS_STAT_05	368	16	0	0	0	15	# PSS relay status word 5
PSS_STAT_06	369	16	0	0	0	15	# PSS relay status word 6
PSS_STAT_07	370	16	0	0	0	15	# PSS relay status word 7
PSS_SPU_5VA_TMP	371	16	0	0	0	11	# SPU +5VA DDC temp
PSS_SPU_5VB_TMP	372	16	0	0	0	11	# SPU +5VB DDC temp
PSS_SPU_15VA_TMP	373	16	0	0	0	11	# SPU15VA DDC temp
PSS_SPU_15VB_TMP	374	16	0	0	0	11	# SPU15VB DDC temp
PSS_REG_28VA_TMP	375	16	0	0	0	11	# REG +28VA DDC temp
PSS_REG_28VB_TMP	376	16	0	0	0	11	# REG +28VB DDC temp

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PSS_SYS_5VA_TMP       377   16   0  0  0  11 # SYS +5VA DDC temp
PSS_SYS_5VB_TMP       378   16   0  0  0  11 # SYS +5VB DDC temp
PSS_SYS_P15VATMP      379   16   0  0  0  11 # SYS +15VA DDC temp
PSS_SYS_P15VBTMP      380   16   0  0  0  11 # SYS +15VB DDC temp
PSS_SYS_N15VATMP      381   16   0  0  0  11 # SYS -15VA DDC temp
PSS_SYS_N15VBTMP      382   16   0  0  0  11 # SYS -15VB DDC temp
PSS_PCU_15VA_TMP      383   16   0  0  0  11 # PCU  (Intnl) 15VA DDC temp
PSS_PCU_15VB_TMP      384   16   0  0  0  11 # PCU  (Intnl) 15VB DDC temp
PSS_QAFILT_TMP        385   16   0  0  0  11 # PCU QBA Inrush Filter  temp
PSS_QBFILT_TMP        386   16   0  0  0  11 # PCU QBB Inrush Filter  temp
IPU_STAT_0            387   16   0  0  0  1  # IPU Status Word 0
IPU_ERR_0             388   16   0  0  0  1  # IPU Error Flags 0
CMD_ERR_0             389   16   0  0  0  1  # Command Error Flags
IPU_ERR_1             390   16   0  0  0  1  # IPU Error Flags 1
IPU_ERR_2             391   16   0  0  0  1  # IPU Error Flags 2
SUBTMI_BUILD_ID       392   8    0  0  0  0  # Subtmi file version
IPU_BUILD_DATE        393   16   0  0  0  0  # MSbyte year-1900, LSbyte day of year
IPU_BUILD_TIME        394   16   0  0  0  0  # Minute of day
EXEC_OVERRUN_CNT      395   16   0  0  0  1  # CR-executive task overrun count
IPU_FLT_STAT_1        396   16   0  0  0  0  # IPU fault status word 1
IPU_FLT_STAT_0        397   16   0  0  0  0  # IPU Fault Managmt. Status
QHSS_1_RV_STAT        398   16   0  0  0  1  # QHSS 1 Receive Status Word TSS HS
QHSS_2_RV_STAT        399   16   0  0  0  1  # QHSS 2 Receive Status Word TSS LS
QHSS_3_RV_STAT        400   16   0  0  0  1  # QHSS 3 Receive Status Word SPU
QHSS_1_TX_STAT        401   16   0  0  0  1  # QHSS 1 Transmit Status Word TSS CMD
IPU_STAT_1            402   16   0  0  0  1  # IPU Status Word 1
FIR1_TBL_ID           403   8    0  0  0  1  # FIR coeffts table ID (1/CR rate)
FIR2_TBL_ID           404   8    0  0  0  1  # FIR coeffts table ID (2/CR rate)
FIR3_TBL_ID           405   8    0  0  0  1  # FIR coeffts table ID (3/CR rate)
FIR6_TBL_ID           406   8    0  0  0  1  # FIR coeffts table ID (6/CR rate)
PRF_CR_TOTAL          407   8    0  0  0  1  # 1, Execution Profile, Max Execution time, 1 LS Bit = 50 usecs
PRF_1553              408   8    0  0  0  1  # 2
PRF_QHSS_SPU          409   8    0  0  0  1  # 3
PRF_QHSS_TEU          410   8    0  0  0  1  # 4
PRF_HIRDLSTIME        411   8    0  0  0  1  # 5
PRF_SWAP_DIAG         412   8    0  0  0  1  # 6
PRF_UP_HKTBL          413   8    0  0  0  1  # 7
PRF_UP_SCITBL         414   8    0  0  0  1  # 8
PRF_UP_SCIFMT         415   8    0  0  0  1  # 9
PRF_CLR_CMD           416   8    0  0  0  1  # 10
PRF_EXE_TLM           417   8    0  0  0  1  # 11
PRF_SSH_TLM           418   8    0  0  0  1  # 12
PRF_SVA_TLM           419   8    0  0  0  1  # 13
PRF_CMD_TLM           420   8    0  0  0  1  # 14
PRF_IOBIC_TLM         421   8    0  0  0  1  # 15
PRF_SPU_TLM           422   8    0  0  0  1  # 16
PRF_TSS_TLM           423   8    0  0  0  1  # 17
PRF_TG_TLM            424   8    0  0  0  1  # 18
PRF_SCIFMT_TLM        425   8    0  0  0  1  # 19
PRF_SCIPRO_TLM        426   8    0  0  0  1  # 20
PRF_CSS_TLM           427   8    0  0  0  1  # 21
PRF_UPDATE_MAC        428   8    0  0  0  1  # 22
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PRF_EXE_SCCMD         429   8    0  0  0  1  # 23
PRF_EXE_SAICMD        430   8    0  0  0  1  # 24
PRF_EXE_MACCMD        431   8    0  0  0  1  # 25
PRF_CNTRL_PSS         432   8    0  0  0  1  # 26
PRF_CNTRL_EDAQ        433   8    0  0  0  1  # 27
PRF_CNTRL_CSS         434   8    0  0  0  1  # 28
PRF_CNTRL_IFC         435   8    0  0  0  1  # 29
PRF_DECIM_SCI         436   8    0  0  0  1  # 30
PRF_FIR_SCI           437   8    0  0  0  1  # 31
PRF_FMT_HKBLOCK       439   8    0  0  0  1  # 33
PRF_MAKE_SCIPKT       440   8    0  0  0  1  # 34
PRF_MAKE_ENGPKT       441   8    0  0  0  1  # 35
PRF_INVALID           442   8    0  0  0  1  # Execution Profile Max Execution time, 1 LS Bit = 50 usecs
PRF_CNTRL_SSH         443   8    0  0  0  1  # Execution Profile Max Execution time, 1 LS Bit = 50 usecs
PRF_CNTRL_GSS         444   8    0  0  0  1  # Execution Profile Max Execution time, 1 LS Bit = 50 usecs
IPU_ERR_3             445   16   0  0  0  1  # IPU ERROR Status Word 3
IFC_HCW               446   8    0  0  0  1  # IFC Heater Control Word value
IPU_CSS_TLM_CNT       447   8    0  0  0  1  # Number of TLM Packets sent by IPU from the CSS
TSS_RD_TEUSYNC        451   8    0  0  0  1  # IPU read TEU DMA buffer sync, state counter
TSS_WR_TEUSYNC        455   8    0  0  0  1  # IPU write TEU DMA buffer sync, state counter
IPU_CSS_CMD_CNT       456   8    0  0  0  1  # Number of CMD Packets recieved by IPU from the CSS
TSU_DUMP_NWORDS       457   16   0  0  0  0  # Number of words in TSU Ram Dump
CHOP_FREQ             458   16   0  0  0  1  # Chopper frequency setting
BEU_BOX_TMP           459   16   0  0  0  8  # BEU box  EDAQ AD590 Row 4 Col 2
BEU_MNT_TMP           460   16   0  0  0  8  # BEU box  mount EDAQ AD590 Row 1 Col 4
SPU_BOX_TMP           461   16   0  0  0  8  # SPU box EDAQ AD590 Row 2 Col 7
IPU_BOX_TMP           462   16   0  0  0  8  # IPU box EDAQ AD590 Row 7 Col 4
TEU_BOX_TMP           463   16   0  0  0  8  # TEU box EDAQ AD590 Row 7 Col 6
TEU_MNT_TMP           464   16   0  0  0  8  # TEU box mount EDAQ AD590 Row 3 Col 7
EEA_MNT_TMP           465   16   0  0  0  8  # EEA box mount EDAQ AD590 Row 3 Col 0
ELMOT1_TMP1           466   16   0  0  0  8  # Elev motor 1 temp 1, EDAQ AD590 Row 2 Col 1
ELMOT2_TMP1           468   16   0  0  0  8  # Elev motor 2 temp 1, EDAQ AD590 Row 2 Col 0
M1_TMP3               470   16   0  0  0  6  # Pri (M1) mir temp. 3, EDAQ Derived PRT 1
SPVUMIR_TMP1          471   16   0  0  0  8  # Space View Mirror temp #1 EDAQ AD590 Row 0 Col 4
SPVUMIR_TMP2          472   16   0  0  0  8  # Space View Mirror temp #2 EDAQ AD590 Row 1 Col 3
SPVUMIR_TMP3          473   16   0  0  0  6  # Space View Mirror temp #3 EDAQ Derived PRT 3
SAIL_SHM_256          483   32   0  0  0  0  # SAIL shared memory [256]
SAIL_SHM_257          484   32   0  0  0  0  # SAIL shared memory [257]
SAIL_SHM_258          485   32   0  0  0  0  # SAIL shared memory [258]
SAIL_SHM_259          486   32   0  0  0  0  # SAIL shared memory [259]
SAIL_SHM_260          487   32   0  0  0  0  # SAIL shared memory [260]
SAIL_SHM_261          488   32   0  0  0  0  # SAIL shared memory [261]
SAIL_SHM_262          489   32   0  0  0  0  # SAIL shared memory [262]
SAIL_SHM_263          490   32   0  0  0  0  # SAIL shared memory [263]
SAIL_ENGWORD_00       491   32   0  0  0  0  # SAIL-generated  Eng. Word 0
SAIL_ENGWORD_01       492   32   0  0  0  0  # SAIL-generated  Eng. Word 1
SAIL_ENGWORD_02       493   32   0  0  0  0  # SAIL-generated  Eng. Word 2
SAIL_ENGWORD_03       494   32   0  0  0  0  # SAIL-generated  Eng. Word 3
SAIL_ENGWORD_04       495   32   0  0  0  0  # SAIL-generated  Eng. Word 4
SAIL_ENGWORD_05       496   32   0  0  0  0  # SAIL-generated  Eng. Word 5
SAIL_ENGWORD_06       497   32   0  0  0  0  # SAIL-generated  Eng. Word 6
SAIL_ENGWORD_07       498   32   0  0  0  0  # SAIL-generated  Eng. Word 7
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OBA_TMP_00            500   16   0  0  0  8  # OBA +X Isolator Temp (top) EDAQ, AD590 Row 0 Col 0
OBA_TMP_01            501   16   0  0  0  8  # OBA +Y Isolator Temp (top) EDAQ, AD590 Row 1 Col 6
OBA_TMP_02            502   16   0  0  0  8  # OBA -Y Isolator Temp (top)  EDAQ, AD590 Row 6 Col 3
OBA_TMP_03            503   16   0  0  0  8  # OBA external leg beam temp, +Y  EDAQ, AD590 Row 0 Col 7
OBA_TMP_04            504   16   0  0  0  8  # OBA external leg beam temp, -Y EDAQ, AD590 Row 1 Col 5
OBA_TMP_05            505   16   0  0  0  8  # OBA truss Temp, top, centre, +X  EDAQ, AD590 Row 0 Col 5
OBA_TMP_06            506   16   0  0  0  8  # OBA truss Temp, top, +X, +Y  EDAQ, AD590 Row 5 Col 7
OBA_TMP_07            507   16   0  0  0  8  # OBA truss Temp, top, +X, -Y EDAQ, AD590 Row 1 Col 7
OBA_TMP_08            508   16   0  0  0  8  # OBA centre tube, +Z  EDAQ, AD590 Row 6 Col 5
OBA_TMP_09            509   16   0  0  0  8  # OBA centre tube, -Z EDAQ, AD590 Row 7 Col 2
CMD_DB_BUILD_ID       512   8    0  0  0  1  # Command Database Build Version ID
TLM_DB_BUILD_ID       513   8    0  0  0  1  # Telemetry Database Build Version ID
TSW_EL1P_POS          516   32   0  0  0  1  # Raw Primary elevation 1 position
TSW_EL2P_POS          517   32   0  0  0  1  # Raw Primary elevation 2 position
TSW_AZP_POS           518   32   0  0  0  1  # Raw Primary azimuth position
TSW_EL1S_POS          519   32   0  0  0  1  # Raw Secondary elevation 1 position
TSW_EL2S_POS          520   32   0  0  0  1  # Raw Secondary elevation 2 position
TSW_AZS_POS           521   32   0  0  0  1  # RAW Secondary azimuth encoder position
TSW_ENCP_STAT         522   16   0  0  0  1  # EEA primary channel set status
TSW_ENCS_STAT         523   16   0  0  0  1  # EEA secondary channel set status
TSW_PRIIF_STAT        524   16   0  0  0  1  # Primary EEA/TEU channel I/F status
TSW_SECIF_STAT        525   16   0  0  0  1  # Secondary EEA/TEU channel I/F stat
TSW_HWCNFG            528   16   0  0  0  1  # TSS hardware configuration @@ TSS_HW_CFIG
TSW_CLOCK_SEL         529   16   0  0  0  1  # TSS synchronization source
TSW_WBDAT1            532   16   0  0  0  1  # Wobble sensor data @@WOBB_SENS1
TSW_WBDAT2            533   16   0  0  0  1  # Wobble sensor data @@ WOBB_SENS2
TSW_SCON_STAT         534   16   0  0  0  1  # Signal conditioning module status @@TEU_SIGCON_STAT
TSW_CSC_STAT          535   16   0  0  0  1  # TSW CSC enable/disable status @@TEU_TSW_STAT
TSW_CMDA_CNT          537   16   0  0  0  1  # Command accept count
TSW_CMDR_CNT          538   16   0  0  0  1  # Command reject count
TSW_CMDA_SIG          539   16   0  0  0  1  # Accepted command signature
TSW_CMDR_SIG          540   16   0  0  0  1  # Rejected command signature in high byte, reject reason in low byte
TSW_CTL_INDEX         542   16   0  0  0  1  # Scan mirror cntrl list crrnt index
TSW_SM_EI_STAT        543   16   0  0  0  1  # Scan mirror control CSC status
TSW_EL1MTRDRVCMD      544   16   0  0  0  1  # Commanded torque in elevation 1
TSW_EL2MTRDRVCMD      545   16   0  0  0  1  # Commanded torque in elevation 2
TSW_AZMTRDRVCMD       546   16   0  0  0  1  # Commanded torque in azimuth
TSW_AZ_MTR_I          547   16   0  0  0  1  # Azimuth drive motor current @@AZMOTR_CRRT
TSW_EL1_MTR_I         548   16   0  0  0  1  # Elevation 1 motor current @@ELMOTR1_CRRT 105
TSW_EL2_MTR_I         549   16   0  0  0  1  # Elevation 2 motor current @@ELMOTR2_CRRT
TSW_CHOP_MTR_I        550   16   0  0  0  1  # Chopper motor current @@CHOPMOT_CRRT 112
TSW_P15VSUP           551   16   0  0  0  1  # Positive 15V supply 1 @@TEU_P9V
TSW_P5VSUP            553   16   0  0  0  1  # Positive 5V supply 1 @@TEU_P5V
TSW_P5VREF1           554   16   0  0  0  1  # Positive 5V reference 1 @@TEU_ADC0_REF
TSW_P5VREF2           555   16   0  0  0  1  # Positive 5V reference 2 @@TEU_ADC1_REF
TSW_N15VSUP           557   16   0  0  0  1  # Negative 15V supply @@ TEU_N9V
TSW_PIFCTLRG          562   16   0  0  0  1  # DIO primary I/F cntrl register
TSW_SIFCTLRG          563   16   0  0  0  1  # DIO secondary I/F cntrl register
TSW_MTRCTRG           564   16   0  0  0  1  # DIO scan mirror motor control reg
TSU_LIOTRES           567   16   0  0  0  1  # TEU SUROM - LIO test results
TSU_SBERR_CNT         568   16   0  0  0  1  # TEU SUROM - EDAC single bit error cum count
TSU_DBERR_CNT         569   16   0  0  0  1  # TEU SUROM - EDAC double bit error cum count
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TSU_RBERR_CNT	570	16	0	0	0	1	# TEU SUROM - Read back fail count
TSU_GOOD_RAM	571	16	0	0	0	1	# TEU SUROM - Start address of "good" RAM
TSU_CACPT_CNT	572	16	0	0	0	1	# TEU SUROM - Command accept count
TSU_CREJ_CNT	573	16	0	0	0	1	# TEU SUROM - Command reject count
TSU_REJ_SIG	574	16	0	0	0	1	# TEU SUROM - Reject command signature
TSU_REJREAS	575	16	0	0	0	1	# TEU SUROM - Command reject reason
TSU_NEXT_BLK	576	16	0	0	0	1	# TEU SUROM - Next expected block number for Program Image upload
TSU_TOTAL_BLKS	577	16	0	0	0	1	# TEU SUROM - Program Image upload total expected block num
TSU_UP_CKSUM	578	32	0	0	0	1	# TEU SUROM - Expected checksum of total Program Image
TSU_CMP_CKSUM	579	32	0	0	0	1	# TEU SUROM - Computed checksum of total Program Image
TSU_FLAG_BITS	580	16	0	0	0	1	# TEU SUROM - Watchdog frame
TSU_DUMP_ADDR	581	32	0	0	0	0	# TEU SUROM - RAM dump address
TSU_BUILD_ID	582	16	0	0	0	1	# TEU SUROM - S/W Bld Versn ID
HK_SIGDAT02	583	16	0	0	0	0	# Filtered Radiance data channel 2, For inclusion in ENG data
HK_SIGDAT04	584	16	0	0	0	0	# Filtered Radiance data channel 4, For inclusion in ENG data
HK_ELVARP_POS	585	32	0	0	0	0	# Filtered Primary El Var data sample
HK_EL2P_POS	586	32	0	0	0	0	# Filtered Primary Elevation 2 data sample
HK_AZP_POS	587	32	0	0	0	0	# Filtered Primary Azimuth data sample
HIRDLS_TIME_LSW	588	32	0	0	0	0	# Bits 0-31 of HIRDLS time
HIRDLS_TIME_MSW	589	32	0	0	0	0	# Bits 32-63 of HIRDLS time
ISU_CURRENT_BLK	590	16	0	0	0	3	# IPU SUROM - Current block number for Program Image
ISU_TOTAL_BLKS	591	16	0	0	0	3	# IPU SUROM - Program Image upload total expected block num
ISU_UP_CKSUM	592	32	0	0	0	3	# IPU SUROM - 32 bit expected checksum of total Program Image
ISU_CMP_CKSUM	593	32	0	0	0	3	# IPU SUROM - 32 bit Computed checksum of total Program Image
TSW_TOT_MAX	606	8	0	0	0	1	# Max total time in last 64 CRs, 4 microsec/count
TSW_CRIT_MAX	618	8	0	0	0	1	# Max critical time in last 64 CRs, 4 usec/count
SPU_CH_01_PHASE	619	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 1 sample
SPU_CH_02_PHASE	620	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 2 sample
SPU_CH_03_PHASE	621	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 3 sample
SPU_CH_04_PHASE	622	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 4 sample
SPU_CH_05_PHASE	623	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 5 sample
SPU_CH_06_PHASE	624	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 6 sample
SPU_CH_07_PHASE	625	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 7 sample
SPU_CH_08_PHASE	626	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 8 sample
SPU_CH_09_PHASE	627	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 9 sample
SPU_CH_10_PHASE	628	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 10 sample
SPU_CH_11_PHASE	629	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 11 sample
SPU_CH_12_PHASE	630	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 12 sample
SPU_CH_13_PHASE	631	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 13 sample
SPU_CH_14_PHASE	632	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 14 sample
SPU_CH_15_PHASE	633	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 15 sample
SPU_CH_16_PHASE	634	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 16 sample
SPU_CH_17_PHASE	635	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 17 sample
SPU_CH_18_PHASE	636	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 18 sample
SPU_CH_19_PHASE	637	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 19 sample
SPU_CH_20_PHASE	638	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 20 sample
SPU_CH_21_PHASE	639	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data Channel 21 sample
SPU_HK_PHASE	640	16	0	0	0	1	# Delay (in 160 nsec ticks) for Radiance Data HouseKeeping sample
SPU_BLADE_0_OPEN	641	16	0	0	0	1	# Delay (in 160 nsec ticks) for Chopper Blade Open 0 delay
SPU_BLADE_1_OPEN	642	16	0	0	0	1	# Delay (in 160 nsec ticks) for Chopper Blade Open 1 delay
SPU_BLADE_2_OPEN	643	16	0	0	0	1	# Delay (in 160 nsec ticks) for Chopper Blade Open 2 delay
SPU_BLADE_3_OPEN	644	16	0	0	0	1	# Delay (in 160 nsec ticks) for Chopper Blade Open 3 delay

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SPU_BLADE_4_OPEN      645   16   0  0  0  1  # Delay (in 160 nsec ticks) for Chopper Blade Open 4 delay
SPU_BLADE_5_OPEN      646   16   0  0  0  1  # Delay (in 160 nsec ticks) for Chopper Blade Open 5 delay
SPU_BLADE_0_CLSD      647   16   0  0  0  1  # Delay (in 160 nsec ticks) for Chopper Blade Closed 0 delay
SPU_BLADE_1_CLSD      648   16   0  0  0  1  # Delay (in 160 nsec ticks) for Chopper Blade Closed 1 delay
SPU_BLADE_2_CLSD      649   16   0  0  0  1  # Delay (in 160 nsec ticks) for Chopper Blade Closed 2 delay
SPU_BLADE_3_CLSD      650   16   0  0  0  1  # Delay (in 160 nsec ticks) for Chopper Blade Closed 3 delay
SPU_BLADE_4_CLSD      651   16   0  0  0  1  # Delay (in 160 nsec ticks) for Chopper Blade Closed 4 delay
SPU_BLADE_5_CLSD      652   16   0  0  0  1  # Delay (in 160 nsec ticks) for Chopper Blade Closed 5 delay
SPU_GLOBAL_DELAY      653   16   0  0  0  1  # Delay (in 160 nsec ticks) for Global Filter Delay
TSS_RESET_TIME        654   32   0  0  0  1  # Hirdls Time at Last TSS Reset
TSW_FREQ              655   16   0  0  0  1  # Chopper pre-scalar value used for scan mirror control time tick
CMDRES_DB_BLD_ID      656   8    0  0  0  0  # Command Results Database Build Version ID
TSW_EXEC_OVERRUN      657   8    0  0  0  0  # TSW Executive overrun counter
ISU_SEQUENCE_CNT      658   16   0  0  0  3  # IPU SUROM packet sequence count
GSS_SIO_BUSY_CNT      659   8    0  0  0  0  # Count of IPU GSS(SIO) telemetry overruns
IPU_ERR_4             660   16   0  0  0  1  # IPU Error status
IPU_STAT_2            661   16   0  0  0  1  # IPU status word #2
ISU_JMP_ADDRESS       662   32   0  0  0  3  # IPU SUROM jump address
ISU_EE_OFFSET         663   32   0  0  0  3  # IPU SUROM EEPROM address offset
ISU_EE_LOOP_END       664   32   0  0  0  3  # IPU SUROM EEPROM end address
ISU_OVERRIDE_FLG      665   16   0  0  0  3  # IPU SUROM override status
ISU_ACTION_CODE       666   16   0  0  0  3  # IPU SUROM program action code
TSW_SCBD_TMP          667   16   0  0  0  0  # Signal Conditioning Board Temperature
ISU_SPARE             668   16   0  0  0  3  # Spare channel for test purposes
PSS_PCU_5VA           670   16   0  0  0  0  # PCU Internal +5 Volts - A side
PSS_PCU_5VB           671   16   0  0  0  0  # PCU Internal +5 Volts - B side
GYR0_HTR_W            672   16   0  0  0  0  # Gyro 0 heater watts (mean)
GYR1_HTR_W            673   16   0  0  0  0  # Gyro 1 heater watts (mean)
GYR2_HTR_W            674   16   0  0  0  0  # Gyro 2 heater watts (mean)
GYR3_HTR_W            675   16   0  0  0  0  # Gyro 3 heater watts (mean)
SC_ATT_QUAT_1         676   32   0  0  0  5  # S/C Ancillary data item: Attitude Quaternion 1
SC_ATT_QUAT_2         677   32   0  0  0  5  # S/C Ancillary data item: Attitude Quaternion 2
SC_ATT_QUAT_3         678   32   0  0  0  5  # S/C Ancillary data item: Attitude Quaternion 3
SC_ATT_QUAT_4         679   32   0  0  0  5  # S/C Ancillary data item: Attitude Quaternion 4
SC_DESC_NODE          680   16   0  0  0  5  # S/C Ancillary data item: Time to  Descending Node
SC_EUL_ANG_PITCH      681   16   0  0  0  5  # S/C Ancillary data item: Pitchl Euler Angle
SC_EUL_ANG_ROLL       682   16   0  0  0  5  # S/C Ancillary data item: Roll Euler Angle
SC_EUL_ANG_YAW        683   16   0  0  0  5  # S/C Ancillary data item: Yaw Euler Angle
SC_GYRO_STAT          684   16   0  0  0  5  # S/C Ancillary data item: S/C Gyro (IRU) status word
SC_MOON_VECT_X        685   16   0  0  0  5  # S/C Ancillary data item: Moon Vector - X
SC_MOON_VECT_Y        686   16   0  0  0  5  # S/C Ancillary data item: Moon Vector - Y
SC_MOON_VECT_Z        687   16   0  0  0  5  # S/C Ancillary data item: Moon Vector - Z
SC_NAV_MODE           688   16   0  0  0  5  # S/C Ancillary data item: S/C Mode (pointing) status
SC_OBL_ANG_AFT        689   16   0  0  0  5  # S/C Ancillary data item: Oblateness Angle (aft)
SC_OBL_ANG_R          690   16   0  0  0  5  # S/C Ancillary data item: Oblateness angle (aft) rate
SC_PITCH_RATE         691   16   0  0  0  5  # S/C Ancillary data item: Pitch Rate
SC_POS_X              692   32   0  0  0  5  # S/C Ancillary data item: Spacecraft Position - X
SC_POS_Y              693   32   0  0  0  5  # S/C Ancillary data item: Spacecraft Position - Y
SC_POS_Z              694   32   0  0  0  5  # S/C Ancillary data item: Spacecraft Position - Z
SC_ROLL_RATE          695   16   0  0  0  5  # S/C Ancillary data item: Roll Rate
SC_SUN_VECT_X         696   16   0  0  0  5  # S/C Ancillary data item: Sun Vector - X
SC_SUN_VECT_Y         697   16   0  0  0  5  # S/C Ancillary data item: Sun Vector - Y
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SC_SUN_VECT_Z          698   16   0  0  0  5  # S/C Ancillary data item: Sun Vector - Z
SC_TIM_STAMP_LSW       699   32   0  0  0  5  # S/C Ancillary data item: HIRDLS Time Stamp (least significant 32 bits)
SC_TIM_STAMP_MSW       700   32   0  0  0  5  # S/C Ancillary data item: HIRDLS Time Stamp (most significant 32 bits)
SC_VELY_X              701   32   0  0  0  5  # S/C Ancillary data item: Spacecraft Velocity - X
SC_VELY_Y              702   32   0  0  0  5  # S/C Ancillary data item: Spacecraft Velocity - Y
SC_VELY_Z              703   32   0  0  0  5  # S/C Ancillary data item: Spacecraft Velocity - Z
SC_YAW_RATE            704   16   0  0  0  5  # S/C Ancillary data item: Yaw Rate
OPH_ZONE1_DELAY        705   16   0  0  0  1  # OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR
pulse
OPH_ZONE2_DELAY        706   16   0  0  0  1  # OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR
pulse
OPH_ZONE3_DELAY        707   16   0  0  0  1  # OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR
pulse
OPH_ZONE4_DELAY        708   16   0  0  0  1  # OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR
pulse
OPH_ZONE5_DELAY        709   16   0  0  0  1  # OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR
pulse
OPH_ZONE6_DELAY        710   16   0  0  0  1  # OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR
pulse
OPH_ZONE1_WIDTH        711   16   0  0  0  1  # OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec  units
OPH_ZONE2_WIDTH        712   16   0  0  0  1  # OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units
OPH_ZONE3_WIDTH        713   16   0  0  0  1  # OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units
OPH_ZONE4_WIDTH        714   16   0  0  0  1  # OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units
OPH_ZONE5_WIDTH        715   16   0  0  0  1  # OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units
OPH_ZONE6_WIDTH        716   16   0  0  0  1  # OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units
CSS_STACK_STAT         720   16   0  0  0  0  # Stack monitoring word.  High byte is the position of the return  stack,
low byte is the position of the parameter stack.
E_PRT_AMP_OFF          721   16   0  0  0  10 # PRT Amplifier Offset
E_PRT_0_P              722   16   0  0  0  7  # PRT 0 positive reading, EDAQ
E_PRT_1_P              723   16   0  0  0  7  # PRT 1 positive reading, EDAQ
E_PRT_2_P              724   16   0  0  0  7  # PRT 2 positive reading, EDAQ
E_PRT_3_P              725   16   0  0  0  7  # PRT 3 positive reading, EDAQ
E_PRT_4_P              726   16   0  0  0  7  # PRT 4 positive reading, EDAQ
E_PRT_5_P              727   16   0  0  0  7  # PRT 5 positive reading, EDAQ
E_PRT_6_P              728   16   0  0  0  7  # PRT 6 positive reading, EDAQ
E_PRT_7_P              729   16   0  0  0  7  # PRT 7 positive reading, EDAQ
E_REF_379_OHM          730   16   0  0  0  10 # 379 ohm REFERENCE, EDAQ
E_REF_619_OHM          731   16   0  0  0  10 # 379 ohm REFERENCE, EDAQ
E_PRT_0_N              732   16   0  0  0  7  # PRT 0 negative reading, EDAQ
E_PRT_1_N              733   16   0  0  0  7  # PRT 0 negative reading, EDAQ
E_PRT_2_N              734   16   0  0  0  7  # PRT 0 negative reading, EDAQ
E_PRT_3_N              735   16   0  0  0  7  # PRT 0 negative reading, EDAQ
E_PRT_4_N              736   16   0  0  0  7  # PRT 0 negative reading, EDAQ
E_PRT_5_N              737   16   0  0  0  7  # PRT 0 negative reading, EDAQ
E_PRT_6_N              738   16   0  0  0  7  # PRT 0 negative reading, EDAQ
E_PRT_7_N              739   16   0  0  0  7  # PRT 0 negative reading, EDAQ
E_REF_234_UAMP         740   16   0  0  0  10 # 193 microamp reference , EDAQ
E_AD590_AMP_OFF        741   16   0  0  0  10 # AD590 Amplifier Offset, EDAQ
SSH_DOOR_TMP           742   16   0  0  0  8  # SSH Door Temp, EDAQ AD590 Row 0, col 6
E_REF_352_UAMP         743   16   0  0  0  10 # 352 microamp reference, EDAQ
SPU_MNT_TMP            744   16   0  0  0  8  # SPU Mounting Temp, EDAQ AD590 Row 5, col 2
E_PSS_GND_O            745   16   0  0  0  10 # PSS Ground Offset, EDAQ
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E_ADC_OFFSET          746   16   0  0  0  10 # ADC Offset, EDAQ
E_REF_7P664_V         747   16   0  0  0  10 # 8.066 Volt Reference, EDAQ
SPARE_00D             748   16   0  0  0  0  # Spare Tlm Channel
PSS_SPU_P15VATMP      749   16   0  0  0  5  # Temperature of +15V SPU PS A
PSS_SPU_P15VBTMP      750   16   0  0  0  5  # Temperature of +15V SPU PS B
PSS_SPU_N15VATMP      751   16   0  0  0  5  # Temperature of -15V SPU PS A
PSS_SPU_N15VBTMP      752   16   0  0  0  5  # Temperature of -15V SPU PS B
PSS_QAP_RLY_TMP       753   16   0  0  0  5  # +28QA primary N/L relay coil temperature
PSS_QBP_RLY_TMP       754   16   0  0  0  5  # +28QB redundant N/L relay coil temperature
PSS_QAR_RLY_TMP       755   16   0  0  0  5  # +28QB primary N/L relay coil temperature
PSS_QBR_RLY_TMP       756   16   0  0  0  5  # +28QB redundant N/L relay coil temperature
SPARE_09D             757   16   0  0  0  0  # Spare Tlm Channel
SPARE_10D             758   16   0  0  0  0  # Spare Tlm Channel
SPARE_11D             759   16   0  0  0  0  # Spare Tlm Channel
SPARE_12D             760   32   0  0  0  0  # Spare Tlm Channel
SPARE_15D             763   32   0  0  0  0  # Spare Tlm Channel
SPARE_01D             764   16   0  0  0  0  # Spare Tlm Channel
SPARE_02D             765   16   0  0  0  0  # Spare Tlm Channel
SPARE_03D             766   16   0  0  0  0  # Spare Tlm Channel
SPARE_04D             767   16   0  0  0  0  # Spare Tlm Channel
SPARE_05D             768   16   0  0  0  0  # Spare Tlm Channel
SPARE_06D             769   16   0  0  0  0  # Spare Tlm Channel
SPARE_07D             770   16   0  0  0  0  # Spare Tlm Channel
SPARE_08D             771   16   0  0  0  0  # Spare Tlm Channel
SPARE_13D             772   32   0  0  0  0  # Spare Tlm Channel
SPARE_14D             773   32   0  0  0  0  # Spare Tlm Channel
ISU_RAM_ADDRESS       774   32   0  0  0  3  # Address in RAM
ISU_RAM_SIZE          775   32   0  0  0  3  # Size of the RAM
ISU_MBICA_START       776   32   0  0  0  3  # Start address for the MBIC side A
ISU_MBICA_END         777   32   0  0  0  3  # End address for the MBIC side A
ISU_MBICB_START       778   32   0  0  0  3  # Start address for the MBIC side B
ISU_MBICB_END         779   32   0  0  0  3  # End address for the MBIC side B
ISU_MBIC_ERROR        780   16   0  0  0  3  # MBIC error with MBICA alive = 0x8000, MBICB alive = 0x4000
ISU_SECT              781   16   0  0  0  3  # Which EEPROM section info follows, 0-15 >16 means stale info
ISU_SECT_FLAGS        782   32   0  0  0  3  # EEPROM section flags word
ISU_SECT_CHKSUM       783   32   0  0  0  3  # EEPROM section checksum word
ISU_SECT_START        784   32   0  0  0  3  # EEPROM section start address
ISU_SECT_LENGTH       785   32   0  0  0  3  # EEPROM section length in 32 bit words
SCI_ELVARS_POS        786   32   0  0  0  2  # Elevation Secondary variable-readhead position (GROUND USE ONLY)
SCI_EL2S_POS          787   32   0  0  0  2  # Elevation Secondary readhead 2 position (GROUND USE ONLY)
SCI_AZS_POS           788   32   0  0  0  2  # Azimuth Secondary readhead position (GROUND USE ONLY)
HK_ELVARS_POS         789   32   0  0  0  0  # Filtered Secondary El Var data sample
HK_EL2S_POS           790   32   0  0  0  0  # Filtered Secondary Elevation 2 data sample
HK_AZS_POS            791   32   0  0  0  0  # Filtered Secondary Azimuth data sample
TSW_EL1P_OFFSET       792   32   0  0  0  0  # Encoder offset value (32 bits) for Elevation 1 Primary
TSW_EL2P_OFFSET       793   32   0  0  0  0  # Encoder offset value (32 bits) for Elevation 2 Primary
TSW_AZP_OFFSET        794   32   0  0  0  0  # Encoder offset value (32 bits) for Azimuth Primary
TSW_EL1S_OFFSET       795   32   0  0  0  0  # Encoder offset value (32 bits) for Elevation 1 Secondary
TSW_EL2S_OFFSET       796   32   0  0  0  0  # Encoder offset value (32 bits) for Elevation 2 Secondary
TSW_AZS_OFFSET        797   32   0  0  0  0  # Encoder offset value (32 bits) for Azimuth Secondary
TSW_EEACNFG           798   16   0  0  0  1  # EEA configuration word
TSW_HK_PKT_CNT        799   16   0  0  0  1  # TSW HK Packet Counter
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TSW_SCI_PKT_CNT       800   16   0  0  0  1  # TSW SCI Packet Counter
TSW_TLM_ID            801   16   0  0  0  1  # TSS telemetry ID (51)
TSS_TLM_PKT_CNT       802   8    0  0  0  1  # Packet count, on TSS on tlm Channel
TSS_TLM_LEN_CNT       803   8    0  0  0  1  # Packet Length Error count, on TSS on tlm Channel
TSS_TLM_NOPKT_C       804   8    0  0  0  1  # No Packet count, on TSS on tlm Channel
TSB_DIAG_CHKSM_C      806   16   0  0  0  1  # Ckecksum Error count, on TSU DIAG block
TSB_HK_CHKSM_CNT      807   16   0  0  0  1  # Ckecksum Error count, on TSU HK block
TSU_HK_PKT_CNT        808   16   0  0  0  1  # TEU SUROM - HK packet counter
TSU_DIAG_PKT_CNT      809   16   0  0  0  1  # TEU SUROM - DIAG packet counter
TSU_TLM_ID            810   16   0  0  0  1  # TEU SUROM - telemetry ID (20 for HK only, 19 for HK plus Diag)
SAIL_ERR_LTASK        811   8    0  0  0  1  # which SAIL task had the last error
SAIL_ERR_LTYP         812   8    0  0  0  1  # SAIL last error type
SAIL_ERR_LLOC         813   16   0  0  0  1  # SAIL last error location
SAIL_ERR_CTASK        814   8    0  0  0  1  # which SAIL task had the current error
SAIL_ERR_CTYP         815   8    0  0  0  1  # SAIL current error type
SAIL_ERR_CLOC         816   16   0  0  0  1  # SAIL current error location
TLM_DIAG_STAT         817   16   0  0  0  1  # Diagnostic format status word
TSW_EL1P_INDEX        818   16   0  0  0  1  # Elevation 1 Primary index value
TSW_EL2P_INDEX        819   16   0  0  0  1  # Elevation 2 Primary index va
TSW_AZP_INDEX         820   16   0  0  0  1  # Azimuth Primary index val
TSW_EL1S_INDEX        821   16   0  0  0  1  # Elevation 1 Secondary index value
TSW_EL2S_INDEX        822   16   0  0  0  1  # Elevation 2 Secondary index value
TSW_AZS_INDEX         823   16   0  0  0  1  # Azimuth Secondary index value
TSS_APP_CHKSM_C       824   8    0  0  0  1  # TSS App code telemetry packet checksum error count
TSW_TABLEN            825   16   0  0  0  1  # Number of lines in the current table
TSB_BOOT_STAT_1       826   16   0  0  0  1  # Combined IPU states for the TSB (see subtmi)
TSB_BOOT_STAT_2       827   16   0  0  0  1  # Combined IPU load info for the TSB (see subtmi)
TSB_BOOT_STAT_3       828   16   0  0  0  1  # Combined IPU cmd and index info for the TSB (see subtmi)
TSB_BOOT_STAT_4       829   32   0  0  0  1  # Combined IPU MBIC and override info for the TSB (see subtmi)
TSB_EE_TABLE          830   32   0  0  0  1  # Subcommed EEPROM table entry (subcom index TSB_EE_TBL_INDEX)
TSB_ADDR_OFF          831   32   0  0  0  1  # IPU address offset for the TSB
ISU_SECT_BOOT         832   32   0  0  0  3  # EEPROM section boot address
ISU_FLAG_BITS         833   16   0  0  0  3  #
SAIL_SHM_264          834   32   0  0  0  1  # SAIL shared memory [264]
SAIL_SHM_265          835   32   0  0  0  1  # SAIL shared memory [265]
SAIL_SHM_266          836   32   0  0  0  1  # SAIL shared memory [266]
SAIL_SHM_267          837   32   0  0  0  1  # SAIL shared memory [267]
SAIL_SHM_268          838   32   0  0  0  1  # SAIL shared memory [268]
SAIL_SHM_269          839   32   0  0  0  1  # SAIL shared memory [269]
SAIL_SHM_270          840   32   0  0  0  1  # SAIL shared memory [270]
SAIL_SHM_271          841   32   0  0  0  1  # SAIL shared memory [271]
PRF_SAIL_EXEC         842   8    0  0  0  5  # SAIL executive execution profile
PRF_SAIL_TLM          843   8    0  0  0  5  # SAIL executive telemetry execution profile
EDAC_DBL_ERR_C        844   8    0  0  0  5  # RAM double bit error counter
EDAC_SGL_ERR_C        845   8    0  0  0  5  # RAM single bit error counter
IPU_ERR_5             848   16   0  0  0  5  # IPU status word 5
DISPL1_OTSP           849   16   0  0  0  5  # CSS displacer 1 over-temperature set point
GYR0_OTSP             850   16   0  0  0  5  # GYRO 0 over-temp set point
GYR1_OTSP             851   16   0  0  0  5  # GYRO 1 over-temp set point
GYR2_OTSP             852   16   0  0  0  5  # GYRO 2 over-temp set point
GYR3_OTSP             853   16   0  0  0  5  # GYRO 3 over-temp set point
SSH_DORMOT_OTSP       854   16   0  0  0  5  # Sunshield door motor over-temperature set point
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SSH_HWA_OTSP          855   16   0  0  0  5  # Hot Wax Actuator over-temperature set point
SVA_DORMOT_OTSP       856   16   0  0  0  5  # SVA door motor over-temperature set point
CHOP_MOT_OTSP         857   16   0  0  0  5  # Chopper motor over-temperature set point
DISPL2_OTSP           858   16   0  0  0  5  # CSS displacer 2 over-temperature set point
COMP_HEAD_OTSP        859   16   0  0  0  5  # CSS compressor head over-temperature set point
SCI_ELVARP_STAT       860   8    0  0  0  5  # Elevation Primary VAR status - for mapping of Encoder Science Block 4 bit
status (GROUND USE ONLY)
SCI_EL2P_STAT         861   8    0  0  0  5  # Elevation Primary readhead 2 status - for mapping of Encoder Science
Block 4 bit status (GROUND USE ONLY)
SCI_AZP_STAT          862   8    0  0  0  5  # Azimuth Primary readhead status - for mapping of Encoder Science Block 4
bit status (GROUND USE ONLY)
SCI_ELVARS_STAT       863   8    0  0  0  5  # Elevation Secondary VAR status - for mapping of Encoder Science Block 4
bit status (GROUND USE ONLY)
SCI_EL2S_STAT         864   8    0  0  0  5  # Elevation Secondary readhead 2 status - for mapping of Encoder Science
Block 4 bit status (GROUND USE ONLY)
SCI_AZS_STAT          865   8    0  0  0  5  # Azimuth Secondary readhead status - for mapping of Encoder Science Block
4 bit status (GROUND USE ONLY)
IPU_ALIVE             866   16   0  0  0  1  # TMON keep-alive and eng tlm sub-com counter
TSW_FAULT_STAT        867   16   0  0  0  1  # Fault status information for TSW
TSW_MEM_SCRUB         868   16   0  0  0  1  # Single bit error count
TSW_SCI_AZPO_CMD      869   16   0  0  0  1  # TSW commanded Az position
TSW_SCI_ELPO_CMD      870   16   0  0  0  1  # TSW commanded El position
TSW_MIN_SSTIME        872   16   0  0  0  1  # Min number of microsec between successive SS within a MAF
TSW_MAX_SSTIME        873   16   0  0  0  1  # Max number of microsec between successive SS within a MAF
TSW_DUMP_ADDR         874   32   0  0  0  1  # Dump address
TSW_CR_SYNC_STAT      875   16   0  0  0  1  # Chopper rotation sync status
CSS_PACKED_PID        876   16   0  0  0  1  # Packed CSS P, I and D coefficients
MACRO_STAT            877   32   0  0  0  1  # Status for macro CSC
MACRO_PARM            878   32   0  0  0  1  # Macro command parameters
SCI_HKTBL_ERR         879   16   0  0  0  1  # Error flags for science HK table
ENG_HKTBL_ERR         880   16   0  0  0  1  # Error flags for engineering HK table
PRF_CR2CR_MAX         882   16   0  0  0  1  # Max time between chopper rotation interrupts (for IPU) in micro-sec
PRF_CR2CR_MIN         883   16   0  0  0  1  # Min time between chopper rotation interrupts (for IPU) in micro-sec
ISU_EXCEPTION         884   16   0  0  0  3  # Address causing exception (if nonzero, should be normally be zero)
SPU_PHASE_ERR_C       885   16   0  0  0  1  # SPU phase error counters
TSS_DMA_ERR_C         886   16   0  0  0  1  # DMA Parity , Framing, HW Programming and phase error counters
PRF_FAULTMON          887   8    0  0  0  1  # Execution Profile for Fault management, 1 LSB = 50 usec
PRF_MACRO_TLM         888   8    0  0  0  1  # Execution Profile for Macro system, 1 LSB = 50 usec
PRF_EXEC_DELAY        889   8    0  0  0  1  # Execution delay from system tick pulse to start of executive, 1 LSB = 10
usec
AZ_HSG_TMP_2          890   16   0  0  0  8  # Azimuth housing temp 2, EDAQ AD590 Row 1 Col 0
AD590_ROW3_COL2       891   16   0  0  0  8  # Spare temp, EDAQ AD590 Row 3 Col 2
TSW_CTL_ERR_AZ        892   16   0  0  0  1  # SM AZ control error (meas - cmd) (0.01 urad/count)
TSW_CTL_ERR_EL        893   16   0  0  0  1  # SM EL control error (meas - cmd) (0.01 urad/count)
TSW_EXCEPTION         894   32   0  0  0  1  # Exception status for TEU flight software
IPU_EXCEPTION         895   32   0  0  0  1  # Exception status for IPU flight software
IPU_FAULT_AVG         896   16   0  0  0  1  # Running average (temperature) for over temperature faults
SAILCMST_0_15         898   16   0  0  0  1  # SAIL enabled status of each command
SAILCMST_16_31        899   16   0  0  0  1  # SAIL enabled status of each command
SAILCMST_32_47        900   16   0  0  0  1  # SAIL enabled status of each command
SAILCMST_48_63        901   16   0  0  0  1  # SAIL enabled status of each command
SAILCMST_64_79        902   16   0  0  0  1  # SAIL enabled status of each command
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SAILCMST_80_95        903   16   0  0  0  1  # SAIL enabled status of each command
SAILCMST_96_111       904   16   0  0  0  1  # SAIL enabled status of each command
SAILCMST_112_127      905   16   0  0  0  1  # SAIL enabled status of each command
TSW_EL1C_POS          906   32   0  0  0  1  # Copy of TSW_EL1X_POS data based on which EEA (primary or secondary) is
selected for control
TSW_EL2C_POS          907   32   0  0  0  1  # Copy of TSW_EL2X_POS data based on which EEA (primary or secondary) is
selected for control
TSW_AZC_POS           908   32   0  0  0  1  # Copy of TSW_AZX_POS data based on which EEA (primary or secondary) is
selected for control
TLM_TSS_AZOFFSET      909   32   0  0  0  1  # Azimuth telemetry offset; value in telemetry which corresponds to zero
TLM_TSS_ELOFFSET      910   32   0  0  0  1  # Elevation telemetry offset; value in telemetry which corresponds to zero
TLM_TSS_WXOFFSET      911   32   0  0  0  1  # WobX telemetry offset; value in telemetry which corresponds to zero
TLM_TSS_WYOFFSET      912   32   0  0  0  1  # WobY telemetry offset; value in telemetry which corresponds to zero
TLM_ACTIVE_SCIHK      913   16   0  0  0  1  # Identifies active science HK format table
TSW_DMA_R_ERR_C       914   16   0  0  0  1  # Counters for 4 errors
TSW_QHSS_ERR_C        915   16   0  0  0  1  # Counters for 4 errors
HIRDLS_CLK_LSW        916   32   0  0  0  1  # HIRDLS time Least Significant Word (GROUND USE ONLY)
HIRDLS_CLK_MSW        917   32   0  0  0  1  # HIRDLS time Most Significant Word (GROUND USE ONLY)
EXEC_STACK_MRGN       918   16   0  0  0  1  # Number of bytes left on the Executive stack before overrunning stack end,
0xffff if Executive task name missing
SAIL_STACK_MRGN       919   16   0  0  0  1  # Number of bytes left on the SAIL stack before overrunning stack end,
0xffff if SAIL task name missing
EDAQ_LIST_ERR_C       920   16   0  0  0  1  # Count of EDAQ list refresh errors
EDAQ_LIST_STAT        921   16   0  0  0  1  # Status of which lists have errors
EDAQ_LIST_ERR_W       922   16   0  0  0  1  # Value of last list/word which had error
SCI_FMT_BLK_ENA       923   16   0  0  0  1  # Science format block enabled status
RAD_CHAN_ENA          924   32   0  0  0  1  # Science format radiance channel enabled status (bit 0=chan 1, ..., bit
20=chan 21)
EDAQ_CR_PHASE         925   8    0  0  0  1  # CR within MiF at which gather 0 convert 1
MACRO_EXECUTING       926   8    0  0  0  1  # Number of the currently executing macro, or 255 if no macro currently
executing
RAD_DEMOD_TBL_ID      927   8    0  0  0  1  # Demodulation table ID (default = 0)
PCU_SUBSTAT_0         928   16   0  0  0  1  # PCU subsystem status word 0
PCU_SUBSTAT_1         929   16   0  0  0  1  # PCU subsystem status word 1
PCU_SUBSTAT_2         930   16   0  0  0  1  # PCU subsystem status word 2
TP_IPU_TEMP_A         931   16   0  0  0  2  # Passive Temp Ch0 (GROUND USE ONLY)
TP_PCU_TEMP_A         932   16   0  0  0  2  # Passive Temp Ch1 (GROUND USE ONLY)
TP_CMPRSR_TMP_A       933   16   0  0  0  2  # Passive Temp Ch2 (GROUND USE ONLY)
TP_CCU_TEMP_A         934   16   0  0  0  2  # Passive Temp Ch3 (GROUND USE ONLY)
TP_TEU_TEMP_A         935   16   0  0  0  2  # Passive Temp Ch4 (GROUND USE ONLY)
TP_SMA_MNT_TMP_A      936   16   0  0  0  2  # Passive Temp Ch5 (GROUND USE ONLY)
TP_IFC_BB_TMP_A       937   16   0  0  0  2  # Passive Temp Ch6 (GROUND USE ONLY)
TP_BEU_TEMP_A         938   16   0  0  0  2  # Passive Temp Ch7 (GROUND USE ONLY)
TP_IPU_TEMP_B         939   16   0  0  0  2  # Passive Temp Ch8 (GROUND USE ONLY)
TP_PCU_TEMP_B         940   16   0  0  0  2  # Passive Temp Ch9 (GROUND USE ONLY)
TP_CMPRSR_TMP_B       941   16   0  0  0  2  # Passive Temp Ch10 (GROUND USE ONLY)
TP_CCU_TEMP_B         942   16   0  0  0  2  # Passive Temp Ch11 (GROUND USE ONLY)
TP_TEU_TEMP_B         943   16   0  0  0  2  # Passive Temp Ch12 (GROUND USE ONLY)
TP_SMA_MNT_TMP_B      944   16   0  0  0  2  # Passive Temp Ch13 (GROUND USE ONLY)
TP_IFC_BB_TMP_B       945   16   0  0  0  2  # Passive Temp Ch14 (GROUND USE ONLY)
TP_BEU_TEMP_B         946   16   0  0  0  2  # Passive Temp Ch15 (GROUND USE ONLY)
HIR_CCU_BOX_TMP       1061  8    0  0  0  8  # CCU box temp, EDAQ AD590 Row 4 Col 7
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HIR_GEU_BOX_TMP       1062  8    0  0  0  8  # GEU box temp, EDAQ AD590 Row 4 Col 0
HIR_PCU_BOX_TMP       1063  8    0  0  0  8  # PCU box temp, EDAQ AD590 Row 1 Col 1
HIR_EEA_BOX_TMP       1064  8    0  0  0  8  # EEA box temp, EDAQ AD590 Row 4 Col 1
HIR_WSE_BOX_TMP       1065  8    0  0  0  8  # WSE box temp, EDAQ AD590 Row 0 Col 3
HIR_CSS_RAD_TMP1      1066  8    0  0  0  8  # Cooler Radiator temp 1, EDAQ AD590 Row 3 Col 5
HIR_COMP_HEAD_TMP     1068  8    0  0  0  8  # Compressor head temp, EDAQ AD590 Row 5 Col 5
HIR_DISPL1_TMP        1069  8    0  0  0  8  # Displacer 1 body temp, EDAQ AD590 Row 6 Col 6
HIR_DISPL2_TMP        1070  8    0  0  0  8  # Displacer 2 body temp, EDAQ AD590 Row 5 Col 5
HIR_SUNSEN1_TMP       1071  8    0  0  0  9  # Sun sensor 1 (temperature), EDAQ
HIR_SUNSEN2_TMP       1072  8    0  0  0  9  # Sun sensor 2 (temperature), EDAQ
HIR_SUNSEN3_TMP       1073  8    0  0  0  9  # Sun sensor 3 (temperature), EDAQ
HIR_DOOR_POT          1074  16   0  0  0  9  # Door angle sensor, EDAQ
HIR_DOOR_SAF_ANG      1075  16   0  0  0  1  # Door Safe Angle setting
HIR_SSH_HWA_TMP       1076  8    0  0  0  9  # Hot Wax Actuator temp, EDAQ
HIR_SSH_DORMOT_TMP    1077  8    0  0  0  9  # SSH drive motor temp, EDAQ
HIR_SSH_STAT          1081  16   0  0  0  1  # Sunshield switch status
HIR_SVA_STAT          1082  8    0  0  0  1  # SVA switch status
HIR_SVA_DORMOT_TMP    1083  8    0  0  0  9  # SVA drive motor temp, EDAQ
HIR_SVA_MTGPLT_TMP    1084  8    0  0  0  8  # SVA mounting plate tmp, EDAQ ADC590 Row 7 Col 0
HIR_GYR0_TMP          1085  8    0  0  0  0  # Gyro 0 temperature
HIR_GYR1_TMP          1086  8    0  0  0  0  # Gyro 1 temperature
HIR_GYR2_TMP          1087  8    0  0  0  0  # Gyro 2 temperature
HIR_GYR3_TMP          1088  8    0  0  0  0  # Gyro 3 temperature
HIR_GYR0_MOT_V        1105  8    0  0  0  0  # Gyro 0 motor volts
HIR_GYR1_MOT_V        1106  8    0  0  0  0  # Gyro 1 motor volts
HIR_GYR2_MOT_V        1107  8    0  0  0  0  # Gyro 2 motor volts
HIR_GYR3_MOT_V        1108  8    0  0  0  0  # Gyro 3 motor volts
HIR_GYR0_MOT_I        1109  8    0  0  0  0  # Gyro 0 motor current
HIR_GYR1_MOT_I        1110  8    0  0  0  0  # Gyro 1 motor current
HIR_GYR2_MOT_I        1111  8    0  0  0  0  # Gyro 2 motor current
HIR_GYR3_MOT_I        1112  8    0  0  0  0  # Gyro 3 motor current
HIR_GYR0_STAT         1113  16   0  0  0  0  # Gyro 0 status word
HIR_GYR1_STAT         1114  16   0  0  0  0  # Gyro 1 status word
HIR_GYR2_STAT         1115  16   0  0  0  0  # Gyro 2 status word
HIR_GYR3_STAT         1116  16   0  0  0  0  # Gyro 3 status word
HIR_GYR0_P15V         1117  8    0  0  0  0  # Gyro 0 +15 volts
HIR_GYR1_P15V         1118  8    0  0  0  0  # Gyro 1 +15 volts
HIR_GYR2_P15V         1119  8    0  0  0  0  # Gyro 2 +15 volts
HIR_GYR3_P15V         1120  8    0  0  0  0  # Gyro 3 +15 volts
HIR_GYR0_N15V         1121  8    0  0  0  0  # Gyro 0 -15 volts
HIR_GYR1_N15V         1122  8    0  0  0  0  # Gyro 1 -15 volts
HIR_GYR2_N15V         1123  8    0  0  0  0  # Gyro 2 -15 volts
HIR_GYR3_N15V         1124  8    0  0  0  0  # Gyro 3 -15 volts
HIR_SM_TMP1           1157  8    0  0  0  8  # Scan mirror temp.1, EDAQ AD590 Row 2 Col 4
HIR_LNS1_WF_TMP1      1165  8    0  0  0  8  # Lens 1-WF temp. 1, EDAQ AD590 Row 5 Col 0
HIR_LNS2_TMP1         1168  8    0  0  0  8  # Lens 2 temp. 1, EDAQ AD590 Row 5 Col 1
HIR_CHOP_MOT_TMP      1171  8    0  0  0  8  # Chopper motor temp, EDAQ AD590 Row 5 Col 3
HIR_CALMIR_TMP1       1174  8    0  0  0  8  # Cal. Mirror temp  #1, EDAQ ADC590 Row 0 Col 1
HIR_M2_TMP1           1177  8    0  0  0  8  # Sec. (M2) mir temp #1, EDAQ ADC590 Row 6 Col 4
HIR_SMA_MTRING_TMP    1179  8    0  0  0  8  # SMA mount ring temp, EDAQ 56
HIR_TSW_CSCI_BLD_ID   1186  16   0  0  0  1  # Telescope S/W Bld Versn ID
HIR_FPA_TMP_A         1187  16   0  0  0  13 # Focal Plane temperature A, SPU
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HIR_FPA_TMP_B         1188  16   0  0  0  13 # Focal Plane temperature B,SPU
HIR_IFCBB_FRPL_TMP    1189  8    0  0  0  9  # IFCBB front plate temp, EDAQ
HIR_IFC_REF_TMP       1190  8    0  0  0  12 # IFC ref. resistor temp
HIR_IFCBB_TMP1        1191  8    0  0  0  12 # IFC BB temp. #1
HIR_IFCBB_TMP2        1192  8    0  0  0  12 # IFC BB temp. #2
HIR_IFCBB_TMP3        1193  8    0  0  0  12 # IFC BB temp. #3
HIR_IFC_PSV_P15       1195  8    0  0  0  12 # IFC +15V rail volts
HIR_IFC_PSV_N15       1196  8    0  0  0  12 # IFC -15V rail volts
HIR_IFC_PSV_P5        1197  8    0  0  0  12 # IFC +5V rail volts
HIR_SAILTASK_00_P15   1230  32   0  0  0  0  # SAIL Tsk 00 param 15  !
HIR_SAILTASK_01_P15   1231  32   0  0  0  0  # SAIL Tsk 01 param 15  !
HIR_SAILTASK_02_P15   1232  32   0  0  0  0  # SAIL Tsk 02 param 15  !
HIR_SAILTASK_03_P15   1233  32   0  0  0  0  # SAIL Tsk 03 param 15  !
HIR_SAILTASK_04_P15   1234  32   0  0  0  0  # SAIL Tsk 04 param 15  !
HIR_SAILTASK_05_P15   1235  32   0  0  0  0  # SAIL Tsk 05 param 15  !
HIR_SAILTASK_06_P15   1236  32   0  0  0  0  # SAIL Tsk 06 param 15  !
HIR_SAILTASK_07_P15   1237  32   0  0  0  0  # SAIL Tsk 07 param 15  !
HIR_SAILTASK_08_P15   1238  32   0  0  0  0  # SAIL Tsk 08 param 15  !
HIR_SAILTASK_09_P15   1239  32   0  0  0  0  # SAIL Tsk 09 param 15  !
HIR_SAILTASK_10_P15   1240  32   0  0  0  0  # SAIL Tsk 10 param 15  !
HIR_SAILTASK_11_P15   1241  32   0  0  0  0  # SAIL Tsk 11 param 15  !
HIR_SAILTASK_12_P15   1242  32   0  0  0  0  # SAIL Tsk 12 param 15  !
HIR_SAILTASK_13_P15   1243  32   0  0  0  0  # SAIL Tsk 13 param 15  !
HIR_SAILTASK_14_P15   1244  32   0  0  0  0  # SAIL Tsk 14 param 15  !
HIR_SAILTASK_15_P15   1245  32   0  0  0  0  # SAIL Tsk 15 param 15  !
HIR_SAIL_PROC_STAT    1258  8    0  0  0  0  # SAIL Processor Status Code
HIR_SAILTASK_00_STAT  1259  8    0  0  0  0  # SAIL Task  00 Status Code
HIR_SAILTASK_01_STAT  1260  8    0  0  0  0  # SAIL Task  01 Status Code
HIR_SAILTASK_02_STAT  1261  8    0  0  0  0  # SAIL Task  02 Status Code
HIR_SAILTASK_03_STAT  1262  8    0  0  0  0  # SAIL Task  03 Status Code
HIR_SAILTASK_04_STAT  1263  8    0  0  0  0  # SAIL Task  04 Status Code
HIR_SAILTASK_05_STAT  1264  8    0  0  0  0  # SAIL Task  05 Status Code
HIR_SAILTASK_06_STAT  1265  8    0  0  0  0  # SAIL Task  06 Status Code
HIR_SAILTASK_07_STAT  1266  8    0  0  0  0  # SAIL Task  07 Status Code
HIR_SAILTASK_08_STAT  1267  8    0  0  0  0  # SAIL Task  08 Status Code
HIR_SAILTASK_09_STAT  1268  8    0  0  0  0  # SAIL Task  09 Status Code
HIR_SAILTASK_10_STAT  1269  8    0  0  0  0  # SAIL Task  10 Status Code
HIR_SAILTASK_11_STAT  1270  8    0  0  0  0  # SAIL Task  11 Status Code
HIR_SAILTASK_12_STAT  1271  8    0  0  0  0  # SAIL Task  12 Status Code
HIR_SAILTASK_13_STAT  1272  8    0  0  0  0  # SAIL Task  13 Status Code
HIR_SAILTASK_14_STAT  1273  8    0  0  0  0  # SAIL Task  14 Status Code
HIR_SAILTASK_15_STAT  1274  8    0  0  0  0  # SAIL Task  15 Status Code
HIR_SCCMDS_RCVCT      1278  8    0  0  0  1  # S/C cmds: received count
HIR_SCCMDS_REJCT      1279  8    0  0  0  1  # S/C cmds: rejected count
HIR_SCCMD_LAST_RC     1280  16   0  0  0  1  # Last S/C cmd: result code
HIR_SCCMD_LAST_CN     1281  8    0  0  0  1  # Last S/C cmd: cmd nmbr
HIR_SAILCMDS_RCVCT    1283  8    0  0  0  1  # SAIL cmds: received count
HIR_SAILCMDS_REJCT    1284  8    0  0  0  1  # SAIL cmds: rejected count
HIR_SAILCMD_LAST_RC   1285  16   0  0  0  1  # Last SAIL cmd: result code
HIR_SAILCMD_LAST_CN   1286  8    0  0  0  1  # Last SAIL cmd: cmd nmbr
HIR_MACMDS_RCVCT      1287  8    0  0  0  1  # Macro cmds: receivd count
HIR_MACMDS_REJCT      1288  8    0  0  0  1  # Macro cmds: rejected count
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HIR_MACMD_LAST_RC     1289  16   0  0  0  1  # Last Macro cmd: reslt code
HIR_MACMD_LAST_CN     1290  8    0  0  0  1  # Last Macro cmd: cmd nmbr
HIR_SPU_P5V_A         1314  8    0  0  0  13 # SPU +5VA supply volts (analog)
HIR_SPU_N5V_A         1315  8    0  0  0  13 # SPU -5VA supply volts (analog)
HIR_SPU_P5V_DA        1316  8    0  0  0  13 # SPU +5VA supply volts (digital)
HIR_SPU_P12V_A        1317  8    0  0  0  13 # SPU +12VA supply volts
HIR_SPU_N12V_A        1318  8    0  0  0  13 # SPU -12VA supply volts
HIR_SPU_P5V_B         1319  8    0  0  0  13 # SPU +5VB supply volts (analog)
HIR_SPU_N5V_B         1320  8    0  0  0  13 # SPU -5VB supply volts (analog)
HIR_SPU_P5V_DB        1321  8    0  0  0  13 # SPU +5VB supply volts (digital)
HIR_SPU_P12V_B        1322  8    0  0  0  13 # SPU +12VB supply volts
HIR_SPU_N12V_B        1323  8    0  0  0  13 # SPU -12VB supply volts
HIR_IPU_P3P3V         1324  8    0  0  0  9  # Wkg IPU +3.3V supply volts, EDAQ
HIR_IPU_P5V           1325  8    0  0  0  9  # Wkg IPU +5V supply volts, EDAQ
HIR_IPU_P15V          1326  8    0  0  0  9  # Wkg IPU +15V supply volts, EDAQ
HIR_IPU_N15V          1327  8    0  0  0  9  # Wkg IPU -15V supply volts, EDAQ
HIR_IPU_CSCI_BLD_ID   1349  16   0  0  0  1  # IPU S/W Build Version ID
HIR_CSS_OP_STAT       1351  8    0  0  0  14 # Cooler operating status
HIR_CSS_DDCAG_STAT    1352  8    0  0  0  14 # Cooler DDC & caging status discretes (Read by IPU)
HIR_CSS_ERROR         1353  8    0  0  0  14 # Cooler error flags
HIR_CSS_TOTAL_I       1354  8    0  0  0  14 # Cooler tot mean currt
HIR_CRYOTIP_SETP      1355  16   0  0  0  14 # Cryo tip temp set point
HIR_CRYOTIP_TMP_D0    1356  16   0  0  0  14 # Cryo tip temperature 0
HIR_CRYOTIP_TMP_D1    1357  16   0  0  0  14 # Cryo tip temperature 1
HIR_CSS_FREQ_DMD      1358  16   0  0  0  14 # Cooler frequency (dmd'd)
HIR_CSS_FREQ_ACT      1359  16   0  0  0  14 # Cooler frequency (actual)
HIR_CSS_PH_DMD        1360  16   0  0  0  14 # Comp/Disp phase (dmd'd)
HIR_CSS_PH_ACT        1361  16   0  0  0  14 # Comp/Disp phase (actual)
HIR_COMP_AMP_DMD      1362  16   0  0  0  14 # Compressor ampl (dmd'd)
HIR_COMP_AMP_ACT      1363  16   0  0  0  14 # Compressor ampl (actual)
HIR_DISP_AMP_DMD      1364  16   0  0  0  14 # Displacer ampl (dmd'd)
HIR_DISP_AMP_ACT      1365  16   0  0  0  14 # Displacer ampl (actual)
HIR_CSS_MSG_NUMBER    1366  8    0  0  0  14 # CSS-IPS data msg number
HIR_QA_I              1368  16   0  0  0  11 # Quiet Bus A input currt, from PSS
HIR_QB_I              1369  16   0  0  0  11 # Quiet Bus B input currt, from PSS
HIR_PSS_SPU_5VA       1370  16   0  0  0  11 # SPU +5V DDC A volts
HIR_PSS_SPU_5VB       1371  16   0  0  0  11 # SPU +5V DDC B volts
HIR_PSS_SPU_P15VA     1372  16   0  0  0  11 # SPU +15V DDC A volts
HIR_PSS_SPU_P15VB     1373  16   0  0  0  11 # SPU +15V DDC B volts
HIR_PSS_SPU_N15VA     1374  16   0  0  0  11 # SPU -15V DDC A volts
HIR_PSS_SPU_N15VB     1375  16   0  0  0  11 # SPU -15V DDC B volts
HIR_PSS_PCU_5VC       1376  16   0  0  0  11 # PCU Internal +5 Volts
HIR_PSS_PCU_P15VC     1377  16   0  0  0  11 # PCU Internal +15 Volts
HIR_PSS_PCU_N15VC     1378  16   0  0  0  11 # PCU Internal -15 Volts
HIR_PSS_REG_28VA      1379  16   0  0  0  11 # REG +28V DDC A volts
HIR_PSS_REG_28VB      1380  16   0  0  0  11 # REG +28V DDC B volts
HIR_PSS_SYS_5VA       1381  16   0  0  0  11 # SYS +5V DDC A volts
HIR_PSS_SYS_5VB       1382  16   0  0  0  11 # SYS +5V DDC B volts
HIR_PSS_SYS_P15VA     1383  16   0  0  0  11 # SYS +15V DDC A volts
HIR_PSS_SYS_P15VB     1384  16   0  0  0  11 # SYS +15V DDC B volts
HIR_PSS_SYS_N15VA     1385  16   0  0  0  11 # SYS -15V DDC A volts
HIR_PSS_SYS_N15VB     1386  16   0  0  0  11 # SYS -15V DDC B volts
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HIR_IPU_STAT_0        1411  16   0  0  0  1  # IPU Status Word 0
HIR_IPU_ERR_0         1412  16   0  0  0  1  # IPU Error Flags 0
HIR_CMD_ERR_0         1413  16   0  0  0  1  # Command Error Flags
HIR_IPU_ERR_1         1414  16   0  0  0  1  # IPU Error Flags 1
HIR_IPU_ERR_2         1415  16   0  0  0  1  # IPU Error Flags 2
HIR_SUBTMI_BUILD_ID   1416  16   0  0  0  0  # Subtmi file version
HIR_EXEC_OVERRUN_CNT  1419  8    0  0  0  1  # CR-executive task overrun count
HIR_IPU_FLT_STAT_1    1420  16   0  0  0  0  # IPU fault status word 1
HIR_IPU_FLT_STAT_0    1421  16   0  0  0  0  # IPU Fault Managmt. Status
HIR_IPU_STAT_1        1426  16   0  0  0  1  # IPU Status Word 1
HIR_FIR1_TBL_ID       1427  8    0  0  0  1  # FIR coeffts table ID (1/CR rate)
HIR_FIR2_TBL_ID       1428  8    0  0  0  1  # FIR coeffts table ID (2/CR rate)
HIR_FIR3_TBL_ID       1429  8    0  0  0  1  # FIR coeffts table ID (3/CR rate)
HIR_FIR6_TBL_ID       1430  8    0  0  0  1  # FIR coeffts table ID (6/CR rate)
HIR_IPU_ERR_3         1469  16   0  0  0  1  # IPU ERROR Status Word 3
HIR_IFC_HCW           1470  8    0  0  0  1  # IFC Heater Control Word value
HIR_CHOP_FREQ         1482  16   0  0  0  1  # Chopper frequency setting
HIR_BEU_BOX_TMP       1483  8    0  0  0  8  # BEU box  EDAQ AD590 Row 4 Col 2
HIR_SPU_BOX_TMP       1485  8    0  0  0  8  # SPU box EDAQ AD590 Row 2 Col 7
HIR_IPU_BOX_TMP       1486  8    0  0  0  8  # IPU box EDAQ AD590 Row 7 Col 4
HIR_TEU_BOX_TMP       1487  8    0  0  0  8  # TEU box EDAQ AD590 Row 7 Col 6
HIR_SPVUMIR_TMP1      1495  8    0  0  0  8  # Space View Mirror temp #1 EDAQ AD590 Row 0 Col 4
HIR_SAIL_SHM_256      1507  32   0  0  0  0  # SAIL shared memory [256]
HIR_SAIL_SHM_257      1508  32   0  0  0  0  # SAIL shared memory [257]
HIR_SAIL_SHM_258      1509  32   0  0  0  0  # SAIL shared memory [258]
HIR_SAIL_SHM_259      1510  32   0  0  0  0  # SAIL shared memory [259]
HIR_SAIL_SHM_260      1511  32   0  0  0  0  # SAIL shared memory [260]
HIR_SAIL_SHM_261      1512  32   0  0  0  0  # SAIL shared memory [261]
HIR_SAIL_SHM_262      1513  32   0  0  0  0  # SAIL shared memory [262]
HIR_SAIL_SHM_263      1514  32   0  0  0  0  # SAIL shared memory [263]
HIR_SAIL_ENGWORD_00   1515  32   0  0  0  0  # SAIL-generated  Eng. Word 0
HIR_SAIL_ENGWORD_01   1516  32   0  0  0  0  # SAIL-generated  Eng. Word 1
HIR_SAIL_ENGWORD_02   1517  32   0  0  0  0  # SAIL-generated  Eng. Word 2
HIR_SAIL_ENGWORD_03   1518  32   0  0  0  0  # SAIL-generated  Eng. Word 3
HIR_SAIL_ENGWORD_04   1519  32   0  0  0  0  # SAIL-generated  Eng. Word 4
HIR_SAIL_ENGWORD_05   1520  32   0  0  0  0  # SAIL-generated  Eng. Word 5
HIR_SAIL_ENGWORD_06   1521  32   0  0  0  0  # SAIL-generated  Eng. Word 6
HIR_SAIL_ENGWORD_07   1522  32   0  0  0  0  # SAIL-generated  Eng. Word 7
HIR_CMD_DB_BUILD_ID   1536  16   0  0  0  1  # Command Database Build Version ID
HIR_TLM_DB_BUILD_ID   1537  16   0  0  0  1  # Telemetry Database Build Version ID
HIR_TSW_ENCP_STAT     1546  16   0  0  0  1  # EEA primary channel set status
HIR_TSW_ENCS_STAT     1547  16   0  0  0  1  # EEA secondary channel set status
HIR_TSW_PRIIF_STAT    1548  16   0  0  0  1  # Primary EEA/TEU channel I/F status
HIR_TSW_SECIF_STAT    1549  16   0  0  0  1  # Secondary EEA/TEU channel I/F stat
HIR_TSW_HWCNFG        1552  16   0  0  0  1  # TSS hardware configuration @@ TSS_HW_CFIG
HIR_TSW_CLOCK_SEL     1553  8    0  0  0  1  # TSS synchronization source
HIR_TSW_WBDAT1        1556  16   0  0  0  1  # Wobble sensor data @@WOBB_SENS1
HIR_TSW_WBDAT2        1557  16   0  0  0  1  # Wobble sensor data @@ WOBB_SENS2
HIR_TSW_CSC_STAT      1559  16   0  0  0  1  # TSW CSC enable/disable status @@TEU_TSW_STAT
HIR_TSW_CMDA_CNT      1561  8    0  0  0  1  # Command accept count
HIR_TSW_CMDR_CNT      1562  8    0  0  0  1  # Command reject count
HIR_TSW_CMDA_SIG      1563  16   0  0  0  1  # Accepted command signature
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HIR_TSW_CMDR_SIG      1564  16   0  0  0  1  # Rejected command signature in high byte, reject reason in low byte
HIR_TSW_CTL_INDEX     1566  8    0  0  0  1  # Scan mirror cntrl list crrnt index
HIR_TSW_SM_EI_STAT    1567  16   0  0  0  1  # Scan mirror control CSC status
HIR_TSW_AZ_MTR_I      1571  8    0  0  0  1  # Azimuth drive motor current @@AZMOTR_CRRT
HIR_TSW_EL1_MTR_I     1572  8    0  0  0  1  # Elevation 1 motor current @@ELMOTR1_CRRT 105
HIR_TSW_EL2_MTR_I     1573  8    0  0  0  1  # Elevation 2 motor current @@ELMOTR2_CRRT
HIR_TSW_CHOP_MTR_I    1574  16   0  0  0  1  # Chopper motor current @@CHOPMOT_CRRT 112
HIR_TSW_P15VSUP       1575  8    0  0  0  1  # Positive 15V supply 1 @@TEU_P9V
HIR_TSW_P5VSUP        1577  8    0  0  0  1  # Positive 5V supply 1 @@TEU_P5V
HIR_TSW_P5VREF1       1578  8    0  0  0  1  # Positive 5V reference 1 @@TEU_ADC0_REF
HIR_TSW_P5VREF2       1579  8    0  0  0  1  # Positive 5V reference 2 @@TEU_ADC1_REF
HIR_TSW_N15VSUP       1581  8    0  0  0  1  # Negative 15V supply @@ TEU_N9V
HIR_TSW_PIFCTLRG      1586  16   0  0  0  1  # DIO primary I/F cntrl register
HIR_TSW_SIFCTLRG      1587  16   0  0  0  1  # DIO secondary I/F cntrl register
HIR_TSU_LIOTRES       1591  16   0  0  0  1  # TEU SUROM - LIO test results
HIR_TSU_GOOD_RAM      1595  8    0  0  0  1  # TEU SUROM - Start address of "good" RAM
HIR_TSU_CACPT_CNT     1596  8    0  0  0  1  # TEU SUROM - Command accept count
HIR_TSU_CREJ_CNT      1597  8    0  0  0  1  # TEU SUROM - Command reject count
HIR_TSU_REJ_SIG       1598  8    0  0  0  1  # TEU SUROM - Reject command signature
HIR_TSU_REJREAS       1599  16   0  0  0  1  # TEU SUROM - Command reject reason
HIR_TSU_NEXT_BLK      1600  16   0  0  0  1  # TEU SUROM - Next expected block number for Program Image upload
HIR_TSU_TOTAL_BLKS    1601  16   0  0  0  1  # TEU SUROM - Program Image upload total expected block num
HIR_TSU_UP_CKSUM      1602  32   0  0  0  1  # TEU SUROM - Expected checksum of total Program Image
HIR_TSU_CMP_CKSUM     1603  32   0  0  0  1  # TEU SUROM - Computed checksum of total Program Image
HIR_TSU_FLAG_BITS     1604  16   0  0  0  1  # TEU SUROM - Watchdog frame
HIR_HK_SIGDAT02       1607  16   0  0  0  0  # Filtered Radiance data channel 2, For inclusion in ENG data
HIR_HK_SIGDAT04       1608  16   0  0  0  0  # Filtered Radiance data channel 4, For inclusion in ENG data
HIR_HK_ELVARP_POS     1609  16   0  0  0  0  # Filtered Primary El Var data sample
HIR_HK_EL2P_POS       1610  16   0  0  0  0  # Filtered Primary Elevation 2 data sample
HIR_HK_AZP_POS        1611  16   0  0  0  0  # Filtered Primary Azimuth data sample
HIR_HIRDLS_TIME_LSW   1612  32   0  0  0  0  # Bits 0-31  of HIRDLS time
HIR_HIRDLS_TIME_MSW   1613  32   0  0  0  0  # Bits 32-63 of HIRDLS time
HIR_TSW_FREQ          1679  16   0  0  0  1  # Chopper pre-scalar value used for scan mirror control time tick
HIR_TSW_EXEC_OVERRUN  1681  8    0  0  0  0  # TSW Executive overrun counter
HIR_IPU_ERR_4         1684  16   0  0  0  1  # IPU Error status
HIR_IPU_STAT_2        1685  16   0  0  0  1  # IPU status word #2
HIR_PSS_PCU_5VA       1694  16   0  0  0  0  # PCU Internal +5 Volts - A side
HIR_PSS_PCU_5VB       1695  16   0  0  0  0  # PCU Internal +5 Volts - B side
HIR_GYR0_HTR_W        1696  8    0  0  0  0  # Gyro 0 heater watts (mean)
HIR_GYR1_HTR_W        1697  8    0  0  0  0  # Gyro 1 heater watts (mean)
HIR_GYR2_HTR_W        1698  8    0  0  0  0  # Gyro 2 heater watts (mean)
HIR_GYR3_HTR_W        1699  8    0  0  0  0  # Gyro 3 heater watts (mean)
HIR_OPH_ZONE1_WIDTH   1735  8    0  0  0  1  # OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec  units
HIR_OPH_ZONE2_WIDTH   1736  8    0  0  0  1  # OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units
HIR_OPH_ZONE3_WIDTH   1737  8    0  0  0  1  # OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units
HIR_OPH_ZONE4_WIDTH   1738  8    0  0  0  1  # OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units
HIR_CSS_STACK_STAT    1744  16   0  0  0  0  # Stack monitoring word.  High byte is the position of the return  stack,
low byte is the position of the parameter stack.
HIR_HK_ELVARS_POS     1813  16   0  0  0  0  # Filtered Secondary El Var data sample
HIR_HK_EL2S_POS       1814  16   0  0  0  0  # Filtered Secondary Elevation 2 data sample
HIR_HK_AZS_POS        1815  16   0  0  0  0  # Filtered Secondary Azimuth data sample
HIR_TSW_EEACNFG       1822  16   0  0  0  1  # EEA configuration word
```

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HIR_TSW_HK_PKT_CNT    1823  8    0  0  0  1  # TSW HK Packet Counter
HIR_TSW_SCI_PKT_CNT   1824  8    0  0  0  1  # TSW SCI Packet Counter
HIR_TSS_TLM_PKT_CNT   1826  8    0  0  0  1  # Packet count, on TSS on tlm Channel
HIR_TSS_TLM_NOPKT_C   1828  8    0  0  0  1  # No Packet count, on TSS on tlm Channel
HIR_TSB_DIAG_CHKSM_C  1830  8    0  0  0  1  # Ckecksum Error count, on TSU DIAG block
HIR_TSB_HK_CHKSM_CNT  1831  8    0  0  0  1  # Ckecksum Error count, on TSU HK block
HIR_TSU_HK_PKT_CNT    1832  8    0  0  0  1  # TEU SUROM - HK packet counter
HIR_TSU_DIAG_PKT_CNT  1833  8    0  0  0  1  # TEU SUROM - DIAG packet counter
HIR_SAIL_ERR_LTASK    1835  8    0  0  0  1  # which SAIL task had the last error
HIR_SAIL_ERR_LTYP     1836  8    0  0  0  1  # SAIL last error type
HIR_SAIL_ERR_LLOC     1837  16   0  0  0  1  # SAIL last error location
HIR_SAIL_ERR_CTASK    1838  8    0  0  0  1  # which SAIL task had the current error
HIR_SAIL_ERR_CTYP     1839  8    0  0  0  1  # SAIL current error type
HIR_SAIL_ERR_CLOC     1840  16   0  0  0  1  # SAIL current error location
HIR_TLM_DIAG_STAT     1841  16   0  0  0  1  # Diagnostic format status word
HIR_TSW_TABLEN        1849  8    0  0  0  1  # Number of lines in the current table
HIR_TSB_BOOT_STAT_1   1850  16   0  0  0  1  # Combined IPU states for the TSB (see subtmi)
HIR_TSB_BOOT_STAT_2   1851  16   0  0  0  1  # Combined IPU load info for the TSB (see subtmi)
HIR_TSB_BOOT_STAT_3   1852  16   0  0  0  1  # Combined IPU cmd and index info for the TSB (see subtmi)
HIR_TSB_BOOT_STAT_4   1853  32   0  0  0  1  # Combined IPU MBIC and override info for the TSB (see subtmi)
HIR_SAIL_SHM_264      1858  32   0  0  0  1  # SAIL shared memory [264]
HIR_SAIL_SHM_265      1859  32   0  0  0  1  # SAIL shared memory [265]
HIR_SAIL_SHM_266      1860  32   0  0  0  1  # SAIL shared memory [266]
HIR_SAIL_SHM_267      1861  32   0  0  0  1  # SAIL shared memory [267]
HIR_SAIL_SHM_268      1862  32   0  0  0  1  # SAIL shared memory [268]
HIR_SAIL_SHM_269      1863  32   0  0  0  1  # SAIL shared memory [269]
HIR_SAIL_SHM_270      1864  32   0  0  0  1  # SAIL shared memory [270]
HIR_SAIL_SHM_271      1865  32   0  0  0  1  # SAIL shared memory [271]
HIR_IPU_ERR_5         1872  16   0  0  0  5  # IPU status word 5
HIR_DISPL1_OTSP       1873  8    0  0  0  5  # CSS displacer 1 over-temperature set point
HIR_GYR0_OTSP         1874  8    0  0  0  5  # GYRO 0 over-temp set point
HIR_GYR1_OTSP         1875  8    0  0  0  5  # GYRO 1 over-temp set point
HIR_GYR2_OTSP         1876  8    0  0  0  5  # GYRO 2 over-temp set point
HIR_GYR3_OTSP         1877  8    0  0  0  5  # GYRO 3 over-temp set point
HIR_SSH_DORMOT_OTSP   1878  8    0  0  0  5  # Sunshield door motor over-temperature set point
HIR_SSH_HWA_OTSP      1879  8    0  0  0  5  # Hot Wax Actuator over-temperature set point
HIR_SVA_DORMOT_OTSP   1880  8    0  0  0  5  # SVA door motor over-temperature set point
HIR_CHOP_MOT_OTSP     1881  8    0  0  0  5  # Chopper motor over-temperature set point
HIR_DISPL2_OTSP       1882  8    0  0  0  5  # CSS displacer 2 over-temperature set point
HIR_COMP_HEAD_OTSP    1883  8    0  0  0  5  # CSS compressor head over-temperature set point
HIR_IPU_ALIVE         1890  16   0  0  0  1  # TMON keep-alive and eng tlm sub-com counter
HIR_TSW_FAULT_STAT    1891  16   0  0  0  1  # Fault status information for TSW
HIR_TSW_SCI_AZPO_CMD  1893  16   0  0  0  1  # TSW commanded Az position
HIR_TSW_SCI_ELPO_CMD  1894  16   0  0  0  1  # TSW commanded El position
HIR_TSW_CR_SYNC_STAT  1899  16   0  0  0  1  # Chopper rotation sync status
HIR_CSS_PACKED_PID    1900  16   0  0  0  1  # Packed CSS P, I and D coefficients
HIR_MACRO_STAT        1901  32   0  0  0  1  # Status for macro CSC
HIR_MACRO_PARM        1902  32   0  0  0  1  # Macro command parameters
HIR_SPU_PHASE_ERR_C   1909  16   0  0  0  1  # SPU phase error counters
HIR_AZ_HSG_TMP_2      1914  8    0  0  0  8  # Azimuth housing temp 2, EDAQ AD590 Row 1 Col 0
HIR_TSW_CTL_ERR_AZ    1916  16   0  0  0  1  # SM AZ control error (meas - cmd) (0.01 urad/count)
HIR_TSW_CTL_ERR_EL    1917  16   0  0  0  1  # SM EL control error (meas - cmd) (0.01 urad/count)
```

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HIR_SAILCMST_0_15     1922  16   0  0  0  1  # SAIL enabled status of each command
HIR_SAILCMST_16_31    1923  16   0  0  0  1  # SAIL enabled status of each command
HIR_SAILCMST_32_47    1924  16   0  0  0  1  # SAIL enabled status of each command
HIR_SAILCMST_48_63    1925  16   0  0  0  1  # SAIL enabled status of each command
HIR_SAILCMST_64_79    1926  16   0  0  0  1  # SAIL enabled status of each command
HIR_SAILCMST_80_95    1927  16   0  0  0  1  # SAIL enabled status of each command
HIR_SAILCMST_96_111   1928  16   0  0  0  1  # SAIL enabled status of each command
HIR_SAILCMST_112_127  1929  16   0  0  0  1  # SAIL enabled status of each command
HIR_TLM_ACTIVE_SCIHK  1937  16   0  0  0  1  # Identifies active science HK format table
HIR_SCI_FMT_BLK_ENA   1947  16   0  0  0  1  # Science format block enabled status
HIR_RAD_CHAN_ENA      1948  32   0  0  0  1  # Science format radiance channel enabled status (bit 0=chan 1, ..., bit
20=chan 21)
HIR_RAD_DEMOD_TBL_ID  1951  8    0  0  0  1  # Demodulation table ID (default = 0)
HIR_PCU_SUBSTAT_0     1952  16   0  0  0  1  # PCU subsystem status word 0
HIR_PCU_SUBSTAT_1     1953  16   0  0  0  1  # PCU subsystem status word 1
HIR_PCU_SUBSTAT_2     1954  16   0  0  0  1  # PCU subsystem status word 2
HIR_ISU_LIO_STAT      1330  16   0  0  0  3  # IPU SUROM LIO RAD6K Test Status  (GROUND/SUROM USE ONLY)
HIR_ISU_1ST_MEM_SEG   1331  16   0  0  0  3  # IPU SUROM First Good Mem Segment (GROUND/SUROM USE ONLY)
HIR_ISU_EDAC1ERR_CNT  1332  16   0  0  0  3  # IPU SUROM EDAC Single Error Count (GROUND/SUROM USE ONLY)
HIR_ISU_EDAC2ERR_CNT  1333  16   0  0  0  3  # IPU SUROM EDAC Double Error Count (GROUND/SUROM USE ONLY)
HIR_ISU_EE_ERR_CNT    1334  16   0  0  0  3  # IPU SUROM EDAC EEPROM Err Cnt (GROUND/SUROM USE ONLY)
HIR_ISU_RAM_FAIL      1335  16   0  0  0  3  # IPU SUROM RAM Readback Fail (GROUND/SUROM USE ONLY)
HIR_ISU_EE_ERR_STAT   1336  16   0  0  0  3  # IPU SUROM EEPROM Error Status (GROUND/SUROM USE ONLY)
HIR_ISU_1ST_1553_SEG  1337  16   0  0  0  3  # IPU SUROM First Good 1553 Segment (GROUND/SUROM USE ONLY)
HIR_ISU_1553_READERR  1338  16   0  0  0  3  # IPU SUROM 1553 Read Failures (GROUND/SUROM USE ONLY)
HIR_ISU_CMD_RCVD_CNT  1339  16   0  0  0  3  # IPU SUROM Command Rceiv'd Count (GROUND/SUROM USE ONLY)
HIR_ISU_CMD_REJ_CNT   1340  16   0  0  0  3  # IPU SUROM Command Reject'd Count (GROUND/SUROM USE ONLY)
HIR_ISU_CMD_NUMBER    1341  16   0  0  0  3  # IPU SUROM  Command Number (GROUND/SUROM USE ONLY)
HIR_ISU_CMD_RES_CODE  1342  16   0  0  0  3  # IPU SUROM Command Result Code (GROUND/SUROM USE ONLY)
HIR_ISU_COUNTDOWN     1344  16   0  0  0  3  # Countdown parameter (seconds remaining until automatic application load
and execute, 0=expired/aborted)
HIR_ISU_STATE         1345  16   0  0  0  3  # IPU SUROM Startup State (GROUND/SUROM USE ONLY)
HIR_ISU_ROM_BUILD_ID  1346  16   0  0  0  3  # IPU SUROM ROM Build Version ID (GROUND/SUROM USE ONLY)
HIR_ISU_CURRENT_BLK   1614  16   0  0  0  3  # IPU SUROM - Current block number for Program Image
HIR_ISU_TOTAL_BLKS    1615  16   0  0  0  3  # IPU SUROM - Program Image upload total expected block num
HIR_ISU_UP_CKSUM      1616  32   0  0  0  3  # IPU SUROM - 32 bit expected checksum of total Program Image
HIR_ISU_CMP_CKSUM     1617  32   0  0  0  3  # IPU SUROM - 32 bit Computed checksum of total Program Image
HIR_ISU_SEQUENCE_CNT  1682  16   0  0  0  3  # IPU SUROM packet sequence count
HIR_ISU_JMP_ADDRESS   1686  32   0  0  0  3  # IPU SUROM jump address
HIR_ISU_EE_OFFSET     1687  32   0  0  0  3  # IPU SUROM EEPROM address offset
HIR_ISU_EE_LOOP_END   1688  32   0  0  0  3  # IPU SUROM EEPROM end address
HIR_ISU_OVERRIDE_FLG  1689  16   0  0  0  3  # IPU SUROM override status
HIR_ISU_ACTION_CODE   1690  16   0  0  0  3  # IPU SUROM program action code
HIR_ISU_SPARE         1692  16   0  0  0  3  # Spare channel for test purposes
HIR_ISU_RAM_ADDRESS   1798  32   0  0  0  3  # Address in RAM
HIR_ISU_RAM_SIZE      1799  32   0  0  0  3  # Size of the RAM
HIR_ISU_MBICA_START   1800  32   0  0  0  3  # Start address for the MBIC side A
HIR_ISU_MBICA_END     1801  32   0  0  0  3  # End address for the MBIC side A
HIR_ISU_MBICB_START   1802  32   0  0  0  3  # Start address for the MBIC side B
HIR_ISU_MBICB_END     1803  32   0  0  0  3  # End address for the MBIC side B
HIR_ISU_MBIC_ERROR    1804  16   0  0  0  3  # MBIC error with MBICA alive = 0x8000, MBICB alive = 0x4000
HIR_ISU_SECT          1805  16   0  0  0  3  # Which EEPROM section info follows, 0-15 >16 means stale info
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HIR_ISU_SECT_FLAGS    1806  32   0  0  0  3  # EEPROM section flags word
HIR_ISU_SECT_CHKSUM   1807  32   0  0  0  3  # EEPROM section checksum word
HIR_ISU_SECT_START    1808  32   0  0  0  3  # EEPROM section start address
HIR_ISU_SECT_LENGTH   1809  32   0  0  0  3  # EEPROM section length in 32 bit words
HIR_ISU_SECT_BOOT     1856  32   0  0  0  3  # EEPROM section boot address
HIR_ISU_FLAG_BITS     1857  16   0  0  0  3  #
HIR_ISU_EXCEPTION     1908  16   0  0  0  3  # Address causing exception (if nonzero, should be normally be zero)
# Obsolete Telemetry Words
ORB_DAT_00            21    16   0  0  0  4  # S/C Ancillary data item #0 (OBSOLETE)
ORB_DAT_01            22    16   0  0  0  4  # S/C Ancillary data item #1 (OBSOLETE)
ORB_DAT_02            23    16   0  0  0  4  # S/C Ancillary data item #2 (OBSOLETE)
ORB_DAT_03            24    16   0  0  0  4  # S/C Ancillary data item #3 (OBSOLETE)
ORB_DAT_04            25    16   0  0  0  4  # S/C Ancillary data item #4 (OBSOLETE)
ORB_DAT_05            26    16   0  0  0  4  # S/C Ancillary data item #5 (OBSOLETE)
ORB_DAT_06            27    16   0  0  0  4  # S/C Ancillary data item #6 (OBSOLETE)
ORB_DAT_07            28    16   0  0  0  4  # S/C Ancillary data item #7 (OBSOLETE)
STH_TMP_05            33    16   0  0  0  4  # OBSOLETE Structure temp 05  EDAQ AD590 Row 3 Col 0
STH_TMP_06            34    16   0  0  0  4  # OBSOLETE Structure temp 06  EDAQ AD590 Row 3 Col 7
STH_TMP_07            35    16   0  0  0  4  # OBSOLETE Structure temp 07  EDAQ AD590 Row 5 Col 2
STH_TMP_08            36    16   0  0  0  4  # OBSOLETE Structure temp 08  EDAQ AD590 Row 1 Col 4
GYR0_MAGDAT           73    16   0  0  0  4  # OBSOLETE Gyro 0 mgnetomtr data
GYR1_MAGDAT           74    16   0  0  0  4  # OBSOLETE Gyro 1 mgnetomtr data
GYR2_MAGDAT           75    16   0  0  0  4  # OBSOLETE Gyro 2 mgnetomtr data
GYR3_MAGDAT           76    16   0  0  0  4  # OBSOLETE Gyro 3 mgnetomtr data
EEA_STATUS            104   16   0  0  0  4  # @@ OBSOLETE  , maps to 522-525
ELMOTR1_CRRT          105   16   0  0  0  4  # @@ OBSOLETE new name TSW_EL1MTRCUR
ELMOTR2_CRRT          106   16   0  0  0  4  # @@ OBSOLETE new name TSW_EL2MTRCUR
AZMOTR_CRRT           107   16   0  0  0  4  # @@ OBSOLETE new name TSW_AZMTRCUR
WOBB_SENS1            108   16   0  0  0  4  # @@ OBSOLETE new name TSW_WBDAT1
WOBB_SENS2            109   16   0  0  0  4  # @@ OBSOLETE new name TSW_WBDAT2
ACCEL_PITCH           110   16   0  0  0  4  # @@ OBSOLETE ( GROUND USE ONLY)
ACCEL_ROLL            111   16   0  0  0  4  # @@ OBSOLETE ( GROUND USE ONLY)
CHOP_MOT_I            112   16   0  0  0  4  # @@ OBSOLETE new name TSW_CHOPMCSENS
TEU_TSW_ST            113   16   0  0  0  4  # @@ OBSOLETE new name TSW_CSCSTATUS
TEU_STATUS            114   8    0  0  0  4  # @@ OBSOLETE new name TSW_TCMFLST
TSS_HW_CFIG           115   16   0  0  0  4  # @@ OBSOLETE new name TSW_HWCNFG
TEU_SIGCON_STAT       116   16   0  0  0  4  # @@ OBSOLETE new name TSW_SCONSTAT
SCAN_MOT_STAT         117   16   0  0  0  4  # @@ OBSOLETE new name TSW_SMDMST
TEU_ADC0_REF          118   16   0  0  0  4  # @@ OBSOLETE new name TSW_P5VREF1
TEU_ADC1_REF          119   16   0  0  0  4  # @@ OBSOLETE new name TSW_P5VREF2
TEU_ADC2_REF          120   16   0  0  0  4  # @@ OBSOLETE
TEU_ADC3_REF          121   16   0  0  0  4  # @@ OBSOLETE
TEU_ADC0_ZER          122   16   0  0  0  4  # @@ OBSOLETE new name TSW_P0VREF1
TEU_ADC1_ZER          123   16   0  0  0  4  # @@ OBSOLETE new name TSW_P0VREF2
TEU_ADC2_ZER          124   16   0  0  0  4  # @@ OBSOLETE new name TSW_P0VREF3
TEU_ADC3_ZER          125   16   0  0  0  4  # @@ OBSOLETE new name TSW_P0VREF4
TEU_P5V               126   16   0  0  0  4  # @@ OBSOLETE new name TSW_P5VSUP1
TEU_P9V               127   16   0  0  0  4  # @@ OBSOLETE
TEU_N9V               128   16   0  0  0  4  # @@ OBSOLETE
ACCEL00_TMP           129   16   0  0  0  4  # @@ OBSOLETE
ACCEL01_TMP           130   16   0  0  0  4  # @@ OBSOLETE
ACCEL02_TMP           131   16   0  0  0  4  # @@ OBSOLETE
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ACCEL03_TMP	132	16	0	0	0	4	# @@ OBSOLETE
ELMOT1TMP	136	16	0	0	0	4	# OBSOLETE Elev motor 1 temp EDAQ need mapping
ELMOT2TMP	137	16	0	0	0	4	# OBSOLETE Elev motor 2 temp EDAQ need mapping
SAILTASK_00_LO	174	16	0	0	0	4	# SAIL Tsk 00 params 00-07 !
SAILTASK_00_HI	175	16	0	0	0	4	# SAIL Tsk 00 params 08-15 !
SAILTASK_01_LO	176	16	0	0	0	4	# SAIL Tsk 01 params 00-07 !
SAILTASK_01_HI	177	16	0	0	0	4	# SAIL Tsk 01 params 08-15 !
SAILTASK_02_LO	178	16	0	0	0	4	# SAIL Tsk 02 params 00-07 !
SAILTASK_02_HI	179	16	0	0	0	4	# SAIL Tsk 02 params 08-15 !
SAILTASK_03_LO	180	16	0	0	0	4	# SAIL Tsk 03 params 00-07 !
SAILTASK_03_HI	181	16	0	0	0	4	# SAIL Tsk 03 params 08-15 !
SAILTASK_04_LO	182	16	0	0	0	4	# SAIL Tsk 04 params 00-07 !
SAILTASK_04_HI	183	16	0	0	0	4	# SAIL Tsk 04 params 08-15 !
SAILTASK_05_LO	184	16	0	0	0	4	# SAIL Tsk 05 params 00-07 !
SAILTASK_05_HI	185	16	0	0	0	4	# SAIL Tsk 05 params 08-15 !
SAILTASK_06_LO	186	16	0	0	0	4	# SAIL Tsk 06 params 00-07 !
SAILTASK_06_HI	187	16	0	0	0	4	# SAIL Tsk 06 params 08-15 !
SAILTASK_07_LO	188	16	0	0	0	4	# SAIL Tsk 07 params 00-07 !
SAILTASK_07_HI	189	16	0	0	0	4	# SAIL Tsk 07 params 08-15 !
SAILTASK_08_LO	190	16	0	0	0	4	# SAIL Tsk 08 params 00-07 !
SAILTASK_08_HI	191	16	0	0	0	4	# SAIL Tsk 08 params 08-15 !
SAILTASK_09_LO	192	16	0	0	0	4	# SAIL Tsk 09 params 00-07 !
SAILTASK_09_HI	193	16	0	0	0	4	# SAIL Tsk 09 params 08-15 !
SAILTASK_10_LO	194	16	0	0	0	4	# SAIL Tsk 10 params 00-07 !
SAILTASK_10_HI	195	16	0	0	0	4	# SAIL Tsk 10 params 08-15 !
SAILTASK_11_LO	196	16	0	0	0	4	# SAIL Tsk 11 params 00-07 !
SAILTASK_11_HI	197	16	0	0	0	4	# SAIL Tsk 11 params 08-15 !
SAILTASK_12_LO	198	16	0	0	0	4	# SAIL Tsk 12 params 00-07 !
SAILTASK_12_HI	199	16	0	0	0	4	# SAIL Tsk 12 params 08-15 !
SAILTASK_13_LO	200	16	0	0	0	4	# SAIL Tsk 13 params 00-07 !
SAILTASK_13_HI	201	16	0	0	0	4	# SAIL Tsk 13 params 08-15 !
SAILTASK_14_LO	202	16	0	0	0	4	# SAIL Tsk 14 params 00-07 !
SAILTASK_14_HI	203	16	0	0	0	4	# SAIL Tsk 14 params 08-15 !
SAILTASK_15_LO	204	16	0	0	0	4	# SAIL Tsk 15 params 00-07 !
SAILTASK_15_HI	205	16	0	0	0	4	# SAIL Tsk 15 params 08-15 !
SAIL_SHM_504	222	32	0	0	0	4	# (OBSOLETE) SAIL shared memory [504]
SAIL_SHM_505	223	32	0	0	0	4	# (OBSOLETE) SAIL shared memory [505]
SAIL_SHM_506	224	32	0	0	0	4	# (OBSOLETE) SAIL shared memory [506]
SAIL_SHM_507	225	32	0	0	0	4	# (OBSOLETE) SAIL shared memory [507]
SAIL_SHM_508	226	32	0	0	0	4	# (OBSOLETE) SAIL shared memory [508]
SAIL_SHM_509	227	32	0	0	0	4	# (OBSOLETE) SAIL shared memory [509]
SAIL_SHM_510	228	32	0	0	0	4	# (OBSOLETE) SAIL shared memory [510]
SAIL_SHM_511	229	32	0	0	0	4	# (OBSOLETE) SAIL shared memory [511]
SAILCMDST_0_31	230	32	0	0	0	4	# Cmd SAIL Attributes Status
SAILCMDST_32_63	231	32	0	0	0	4	# Cmd SAIL Attributes Status
SAILCMDST_64_95	232	32	0	0	0	4	# Cmd SAIL Attributes Status
SAILCMDST_96_127	233	32	0	0	0	4	# Cmd SAIL Attributes Status
ISU_FRAME_CNT	319	16	0	0	0	4	# OBSOLETE, IPU SUROM Telemetry Frame Count (GROUND/SUROM USE ONLY)
CMD_CSCI_BLD_ID	323	16	0	0	0	4	# OBSOLETE new name CMD_DB_BUILD_ID
TLM_CSCI_BLD_ID	324	16	0	0	0	4	# OBSOLETE new name TLM_DB_BUILD_ID
SAIL_CSCI_BLD_ID	326	16	0	0	0	4	# SAIL S/W Build Version ID
PRF_HKPATTERN	438	8	0	0	0	4	# 32

```
TSS_LS_BUSY_C          448   8    0  0  0  4  # Busy error count on TSS on Low Rate tlm Channel
TSS_LS_NOPKT_C         449   8    0  0  0  4  # No Packet count, on TSS on Low Rate tlm Channel
TSS_LS_SUMERR_C        450   8    0  0  0  4  # Checksum error count, on TSS on Low Rate tlm Channel
TSS_HS_BUSY_C          452   8    0  0  0  4  # Busy error count on TSS on High Rate tlm Channel
TSS_HS_NOPKT_C         453   8    0  0  0  4  # No Packet count, on TSS on High Rate tlm Channel
TSS_HS_SUMERR_C        454   8    0  0  0  4  # Checksum error count, on TSS on High Rate tlm Channel
ELMOT1_TMP2            467   16   0  0  0  4  # (OBSOLETE) Elev motor 1 temp 2, EDAQ
ELMOT2_TMP2            469   16   0  0  0  4  # (OBSOLETE) Elev motor 2 temp 2, EDAQ
AD590MTX_LOREF         474   16   0  0  0  4  # (OBSOLETE) EDAQ
AD590MTX_HIREF         475   16   0  0  0  4  # (OBSOLETE) EDAQ
PRT76_8_REF            476   16   0  0  0  4  # (OBSOLETE) EDAQ
PRT100_REF             477   16   0  0  0  4  # (OBSOLETE) EDAQ
PRT123_REF             478   16   0  0  0  4  # (OBSOLETE) EDAQ
IPU_ADC_REFV           479   16   0  0  0  4  # (OBSOLETE) EDAQ
TLM_PATT_ID            480   8    0  0  0  4  # OBSOLETE
CMD_DBASE_ID           481   16   0  0  0  4  # @@ OBSOLETE, new name CMD_DB_BUILD_ID
TLM_DBASE_ID           482   16   0  0  0  4  # @@ OBSOLETE, new name TLM_DB_BUILD_ID
AD590MTX_ZREF          499   16   0  0  0  4  # (OBSOLETE)
TEU_P15V               510   16   0  0  0  4  # (OBSOLETE) renamed TSW_P15VSUP1
TEU_N15V               511   16   0  0  0  4  # (OBSOLETE) renamed TSW_N15VSUP
TSW_HS_PKT_CNT         514   16   0  0  0  4  # Roll over cntr (High rate channel)
TSW_HS_TLMID           515   16   0  0  0  4  # Normal hi rate TLM ID (51 decimal)
TSW_LS_PKT_CNT         526   16   0  0  0  4  # Roll over cntr (low rate channel)
TSW_LS_TLMID           527   16   0  0  0  4  # Lo rate tlm ID (50 decimal)
TSW_EICTLINDX          530   16   0  0  0  4  # (OBSOLETE) Encoder init control list index
TSW_EIC_STAT_OBS       531   16   0  0  0  4  # (Obsolete)Encoder Initialization CSC status
TSW_SMDMST             536   16   0  0  0  4  # (OBSOLETE) Never implemented and no additional information to place here
TSW_TCMFL_STAT         541   16   0  0  0  4  # Task completion/failure status
TSW_P15VSUP2           552   16   0  0  0  4  # (OBSOLETE) EM only and never connected into TSS telemetry
TSW_P5VSUP2            556   16   0  0  0  4  # (OBSOLETE) EM only and never connected into TSS telemetry
TSW_P0VREF1            558   16   0  0  0  4  # (OBSOLETE) EM only and never connected into TSS telemetry
TSW_P0VREF2            559   16   0  0  0  4  # (OBSOLETE) EM only and never connected into TSS telemetry
TSW_P0VREF3            560   16   0  0  0  4  # (OBSOLETE) EM only and never connected into TSS telemetry
TSW_P0VREF4            561   16   0  0  0  4  # (OBSOLETE) EM only and never connected into TSS telemetry
TSU_HS_PKT_CN          565   16   0  0  0  4  # TEU SUROM - High Speed packet counter
TSU_HS_TLM_ID          566   16   0  0  0  4  # TEU SUROM - High Speed telemetry ID (20 decimal)
TSW_PRF_TOT_M0         594   8    0  0  0  4  # TEU processor msec 0 total execution time , max value, (TBD) 4 usecs per
count
TSW_PRF_TOT_M1         595   8    0  0  0  4  # TEU processor msec 1 total execution time , max value, (TBD) 4 usecs per
count
TSW_PRF_TOT_M2         596   8    0  0  0  4  # TEU processor msec 2 total execution time , max value, (TBD) 4 usecs per
count
TSW_PRF_TOT_M3         597   8    0  0  0  4  # TEU processor msec 3 total execution time , max value, (TBD) 4 usecs per
count
TSW_PRF_TOT_M4         598   8    0  0  0  4  # TEU processor msec 4 total execution time , max value, (TBD) 4 usecs per
count
TSW_PRF_TOT_M5         599   8    0  0  0  4  # TEU processor msec 5 total execution time , max value, (TBD) 4 usecs per
count
TSW_PRF_TOT_M6         600   8    0  0  0  4  # TEU processor msec 6 total execution time , max value, (TBD) 4 usecs per
count
TSW_PRF_TOT_M7         601   8    0  0  0  4  # TEU processor msec 7 total execution time , max value, (TBD) 4 usecs per
count
```

```
TSW_PRF_TOT_M8        602   8    0  0  0  4  # TEU processor msec 8 total execution time , max value, (TBD) 4 usecs per
count
TSW_PRF_TOT_M9        603   8    0  0  0  4  # TEU processor msec 9 total execution time , max value, (TBD) 4 usecs per
count
TSW_PRF_TOT_M10       604   8    0  0  0  4  # TEU processor msec 10 total execution time , max value, (TBD) 4 usecs per
count
TSW_PRF_TOT_M11       605   8    0  0  0  4  # TEU processor msec 11 total execution time , max value, (TBD) 4 usecs per
count
TSW_PRF_CRIT_M0       607   8    0  0  0  4  # TEU processor msec 0 critical execution time , max value, (TBD) 4 usecs
per count
TSW_PRF_CRIT_M1       608   8    0  0  0  4  # TEU processor msec 1 critical execution time , max value, (TBD) 4 usecs
per count
TSW_PRF_CRIT_M2       609   8    0  0  0  4  # TEU processor msec 2 critical execution time , max value, (TBD) 4 usecs
per count
TSW_PRF_CRIT_M3       610   8    0  0  0  4  # TEU processor msec 3 critical execution time , max value, (TBD) 4 usecs
per count
TSW_PRF_CRIT_M4       611   8    0  0  0  4  # TEU processor msec 4 critical execution time , max value, (TBD) 4 usecs
per count
TSW_PRF_CRIT_M5       612   8    0  0  0  4  # TEU processor msec 5 critical execution time , max value, (TBD) 4 usecs
per count
TSW_PRF_CRIT_M6       613   8    0  0  0  4  # TEU processor msec 6 critical execution time , max value, (TBD) 4 usecs
per count
TSW_PRF_CRIT_M8       614   8    0  0  0  4  # TEU processor msec 8 critical execution time , max value, (TBD) 4 usecs
per count
TSW_PRF_CRIT_M9       615   8    0  0  0  4  # TEU processor msec 9 critical execution time , max value, (TBD) 4 usecs
per count
TSW_PRF_CRIT_M10      616   8    0  0  0  4  # TEU processor msec 10 critical execution time , max value, (TBD) 4 usecs
per count
TSW_PRF_CRIT_M11      617   8    0  0  0  4  # TEU processor msec 11 critical execution time , max value, (TBD) 4 usecs
per count
TSW_PRF_CRIT_M7       669   8    0  0  0  4  # TEU processor msec 7 critical execution time , max value, (TBD) 4 usecs
per count
CSS_P_COEFF           717   16   0  0  0  4  # Are contained as subtelemetry points (at full resolution) in
CSS_PACKED_PID
CSS_I_COEFF           718   16   0  0  0  4  # Are contained as subtelemetry points (at full resolution) in
CSS_PACKED_PID
CSS_D_COEFF           719   16   0  0  0  4  # Are contained as subtelemetry points (at full resolution) in
CSS_PACKED_PID
TSW_HSSCMDQ2OVFL      761   16   0  0  0  4  # QHSS channel 2 status (IPU - TEU)
TSW_HWCNFG2           762   16   0  0  0  4  # TSS hardware configuration 2
TSS_TLM_CHKSM_C       805   8    0  0  0  4  # Ckecksum Error count, on TSS on tlm Channel
CR_TICK_TIME_LO       846   16   0  0  0  4  # HIRDLS ticks in a chopper rotation (Low water mark) cleared by
IPU_FAULTCLR
CR_TICK_TIME_HI       847   16   0  0  0  4  # HIRDLS ticks in a chopper rotation (High water mark) cleared by
IPU_FAULTCLR
TSW_CR_DBL_CNT        871   8    0  0  0  4  # Number of times a CR event is detected twice within a single SS
(diagnostic only)
HKTBL_ERR             881   16   0  0  0  4  # Or of SCI_HKTBL_ERR and ENG_HKTBL_ERR for eng tlm
SAIL_CNTL_STATUS      897   16   0  0  0  4  # Status of the HIR_SAI_CONTROL command
```

```
# $Id$
#
# HIRDLS Sub-Telemetry Information File: v6.15
# Version Date: 2002-06-20 11:00:00
#
# Generated from: Telemetry Table version 035
#                 Database version 016
#
CMD_MINOR_REV         CMD_DB_BUILD_ID       0   5  # cmd minor rev num (0 to 31)
CMD_MAJOR_REV         CMD_DB_BUILD_ID       5   3  # cmd major rev num (0 to 7)
BIP_CMD_ERR           CMD_ERR_0             0   1  # 1 means an error occured while executing a BIP command.
UPL_CMD_ERR           CMD_ERR_0             1   1  # 1 means an error occured while executing a UPL command.
CSS_CMD_ERR           CMD_ERR_0             2   1  # 1 means an error occured while executing a CSS command.
GSS_CMD_ERR           CMD_ERR_0             3   1  # 1 means an error occured while executing a GSS command.
IPU_CMD_ERR           CMD_ERR_0             4   1  # 1 means an error occured while executing a IPU command.
MAC_CMD_ERR           CMD_ERR_0             5   1  # 1 means an error occured while executing a MAC command.
OPH_CMD_ERR           CMD_ERR_0             6   1  # 1 means an error occured while executing a OPH command
PSS_CMD_ERR           CMD_ERR_0             7   1  # 1 means an error occured while executing a PSS command.
SAIL_CMD_ERR          CMD_ERR_0             8   1  # 1 means an error occured while executing a SAIL command.
SPU_CMD_ERR           CMD_ERR_0             9   1  # 1 means an error occured while executing a SPU command.
SSH_CMD_ERR           CMD_ERR_0             10  1  # 1 means an error occured while executing a SSH command.
SVA_CMD_ERR           CMD_ERR_0             11  1  # 1 means an error occured while executing a SVA command.
TSS_CMD_ERR           CMD_ERR_0             12  1  # 1 means an error occured while executing a TSS command.
GSE_CMD_ERR           CMD_ERR_0             13  1  # 1 means an error occured while executing a GSE command.
CMD_ERR               CMD_ERR_0             14  1  # 1 means a low level error occured processing a cmd within the
command handler.
CMDRES_MINOR_REV      CMDRES_DB_BLD_ID      0   5  # Command result code DB minor rev num (0 to 31)
CMDRES_MAJOR_REV      CMDRES_DB_BLD_ID      5   3  # Command result code DB major rev num (0 to 7)
CSS_SPLY_PRI_OFF      CSS_DDCAG_STAT        0   1  # Primary   Convertor Selection Status (1= Not Selected, 0= Selected)
CSS_SPLY_RED_OFF      CSS_DDCAG_STAT        1   1  # Redundant Convertor Selection Status (1= Not Selected, 0= Selected)
CSS_C1_UNCAGED        CSS_DDCAG_STAT        2   1  # Compressor 1 caging status ( 0= caged, 1= uncaged)
CSS_C2_UNCAGED        CSS_DDCAG_STAT        3   1  # Compressor 2 caging status ( 0= caged, 1= uncaged)
CSS_D1_UNCAGED        CSS_DDCAG_STAT        4   1  # Displacer  1 caging status ( 0= caged, 1= uncaged)
CSS_D2_UNCAGED        CSS_DDCAG_STAT        5   1  # Displacer  2 caging status ( 0= caged, 1= uncaged)
CSS_IBF_FLAG          CSS_DDCAG_STAT        6   1  # 1 means IPU CSS serial control/tlm interface is enabled
CSS_OBF_FLAG          CSS_DDCAG_STAT        7   1  # 1 means IPU CSS serial tlm is available.
CSS_OSTROKE_ERR       CSS_ERROR             0   1  # 1= Overstroke Error
CSS_RESET_ERR         CSS_ERROR             1   1  # 1= Just been reset, (Watchdog timeout or just powered on)
CSS_CMD_XMIT_ERR      CSS_ERROR             2   1  # 1= Last Command Transmission error
CSS_CMD_STATE_ER      CSS_ERROR             3   1  # 1= Last Command Illegal State error
CSS_CMD_PARM_ERR      CSS_ERROR             4   1  # 1= Last Command illegal parameter error
CSS_CMD_TEMP_ERR      CSS_ERROR             5   1  # 1= Overtemp error in warm-up state
CSS_CMU_CNTRL         CSS_OP_STAT           0   1  # 0= Electronics Only, 1= Control
CSS_MANUAL            CSS_OP_STAT           1   1  # 0= off, 1= Manual Mode
CSS_THERMOSTATIC      CSS_OP_STAT           2   1  # 0= off, 1= Thermostatic Mode
CSS_WARMUP            CSS_OP_STAT           3   1  # 0= off, 1= Warmup Mode
CSS_OS_OVERIDE        CSS_OP_STAT           4   1  # 0 = normal, 1 = override
CSS_DIODE_SELECT      CSS_OP_STAT           5   1  # 0= diode 0 selected , 1= diode 1 selected
CSS_PACKED_PCOEF      CSS_PACKED_PID        0   8  # CSS P (proportional) coefficient (LS 8 bits)
CSS_PACKED_ICOEF      CSS_PACKED_PID        8   4  # CSS I (integral) coefficient (LS 6 bits)
CSS_PACKED_DCOEF      CSS_PACKED_PID        12  4  # CSS D (differential) coefficient (LS 4 bits)
G0_ADAT               GYR0_ADAT             0   10 # GSS 11 Bit Angle Data Without Status Info
```

```
G0_BDTMP            GYR0_BD_TMP         0   10 # GSS 10 Bit HK Data Without Status Info
G0_CAPL             GYR0_CAPL           0   10 # GSS 10 Bit HK Data Without Status Info
GYS0_MOTOR_ON       GYR0_STAT           0   1  # GYRO 0 Status, Motor status, 1 means ON, 0 means OFF
GYS0_MOTOR_SPEED    GYR0_STAT           1   3  # GYRO 0 Status, 3 bits Motor Speed Code
GYS0_TEMP_INHIB     GYR0_STAT           4   1  # GYRO 0 Status, Temperature Inhib, 1 means INHIB, 0 means ENAB
GYS0_PWR_MODE       GYR0_STAT           5   1  # GYRO 0 Status, Power Mode, 1 means HIGH PWR, 0 means NORMAL PWR
GYS0_IN_SYNC        GYR0_STAT           6   1  # GYRO 0 Status, Sync Status, 1 means IN SYNC, 0 means NOT IN SYNC
GYS0_OVRC_ENAB      GYR0_STAT           7   1  # GYRO 0 Status, Moter overcurrent trip, 1 means ENAB, 0 means INHIB
GYS0_ENC_RANGE      GYR0_STAT           8   1  # GYRO 0 Status, Encoder Range, 1 means FINE, 0 means COARSE
GYS0_AB_SIDE        GYR0_STAT           9   1  # This bit has no meaning for GYR0
GYS0_HEATER_OFF     GYR0_STAT           10  1  # GYRO 0 Status, Heater Status, 1=off, 0=on
GYS0_CHAN_ID        GYR0_STAT           13  3  # GYRO 3 Status, 3 bit GYRO Channel Address
G1_ADAT             GYR1_ADAT           0   10 # GSS 11 Bit Angle Data Without Status Info
G1_BDTMP            GYR1_BD_TMP         0   10 # GSS 10 Bit HK Data Without Status Info
G1_CAPL             GYR1_CAPL           0   10 # GSS 10 Bit HK Data Without Status Info
GYS1_MOTOR_ON       GYR1_STAT           0   1  # GYRO 1 Status, Motor status, 1 means ON, 0 means OFF
GYS1_MOTOR_SPEED    GYR1_STAT           1   3  # GYRO 1 Status, 3 bits Motor Speed Code
GYS1_TEMP_INHIB     GYR1_STAT           4   1  # GYRO 1 Status, Temperature Inhib, 1 means INHIB, 0 means ENAB
GYS1_PWR_MODE       GYR1_STAT           5   1  # GYRO 1 Status, Power Mode, 1 means HIGH PWR, 0 means NORMAL PWR
GYS1_IN_SYNC        GYR1_STAT           6   1  # GYRO 1 Status, Sync Status, 1 means IN SYNC, 0 means NOT IN SYNC
GYS1_OVRC_ENAB      GYR1_STAT           7   1  # GYRO 1 Status, Moter overcurrent trip, 1 means ENAB, 0 means INHIB
GYS1_ENC_RANGE      GYR1_STAT           8   1  # GYRO 1 Status, Encoder Range, 1 means FINE, 0 means COARSE
GYS1_AB_SIDE        GYR1_STAT           9   1  # For GYR1, 1 = A-side on (all 4 gyros)
GYS1_HEATER_OFF     GYR1_STAT           10  1  # GYRO 1 Status, Heater Status, 1=off, 0=on
GYS1_CHAN_ID        GYR1_STAT           13  3  # GYRO 1 Status, 3 bit GYRO Channel Address
G2_ADAT             GYR2_ADAT           0   10 # GSS 11 Bit Angle Data Without Status Info
G2_BDTMP            GYR2_BD_TMP         0   10 # GSS 10 Bit HK Data Without Status Info
G2_CAPL             GYR2_CAPL           0   10 # GSS 10 Bit HK Data Without Status Info
GYS2_MOTOR_ON       GYR2_STAT           0   1  # GYRO 2 Status, Motor status, 1 means ON, 0 means OFF
GYS2_MOTOR_SPEED    GYR2_STAT           1   3  # GYRO 2 Status, 3 bits Motor Speed Code
GYS2_TEMP_INHIB     GYR2_STAT           4   1  # GYRO 2 Status, Temperature Inhib, 1 means INHIB, 0 means ENAB
GYS2_PWR_MODE       GYR2_STAT           5   1  # GYRO 2 Status, Power Mode, 1 means HIGH PWR, 0 means NORMAL PWR
GYS2_IN_SYNC        GYR2_STAT           6   1  # GYRO 2 Status, Sync Status, 1 means IN SYNC, 0 means NOT IN SYNC
GYS2_OVRC_ENAB      GYR2_STAT           7   1  # GYRO 2 Status, Moter overcurrent trip, 1 means ENAB, 0 means INHIB
GYS2_ENC_RANGE      GYR2_STAT           8   1  # GYRO 2 Status, Encoder Range, 1 means FINE, 0 means COARSE
GYS2_AB_SIDE        GYR2_STAT           9   1  # For GYR2, 1 = B-side on (all 4 gyros)
GYS2_HEATER_OFF     GYR2_STAT           10  1  # GYRO 2 Status, Heater Status, 1=off, 0=on
GYS2_CHAN_ID        GYR2_STAT           13  3  # GYRO 2 Status, 3 bit GYRO Channel Address
G3_ADAT             GYR3_ADAT           0   10 # GSS 11 Bit Angle Data Without Status Info
G3_BDTMP            GYR3_BD_TMP         0   10 # GSS 10 Bit HK Data Without Status Info
G3_CAPL             GYR3_CAPL           0   10 # GSS 10 Bit HK Data Without Status Info
GYS3_MOTOR_ON       GYR3_STAT           0   1  # GYRO 3 Status, Motor status, 1 means ON, 0 means OFF
GYS3_MOTOR_SPEED    GYR3_STAT           1   3  # GYRO 3 Status, 3 bits Motor Speed Code
GYS3_TEMP_INHIB     GYR3_STAT           4   1  # GYRO 3 Status, Temperature Inhib, 1 means INHIB, 0 means ENAB
GYS3_PWR_MODE       GYR3_STAT           5   1  # GYRO 3 Status, Power Mode, 1 means HIGH PWR, 0 means NORMAL PWR
GYS3_IN_SYNC        GYR3_STAT           6   1  # GYRO 3 Status, Sync Status, 1 means IN SYNC, 0 means NOT IN SYNC
GYS3_OVRC_ENAB      GYR3_STAT           7   1  # GYRO 3 Status, Moter overcurrent trip, 1 means ENAB, 0 means INHIB
GYS3_ENC_RANGE      GYR3_STAT           8   1  # GYRO 3 Status, Encoder Range, 1 means FINE, 0 means COARSE
GYS3_AB_SIDE        GYR3_STAT           9   1  # This bit has no meaning for GYR3
GYS3_HEATER_OFF     GYR3_STAT           10  1  # GYRO 3 Status, Heater Status, 1=off, 0=on
GYS3_CHAN_ID        GYR3_STAT           13  3  # GYRO 3 Status, 3 bit GYRO Channel Address
ECHO_PKT_SEQ_CTR    IPU_ALIVE           0   5  # Echo of packet sequence counter
```

```
TURN_OFF_HIRDLS       IPU_ALIVE            5   3  # If = 111, spacecraft to power off HIRDLS
IPU_ALIVE_SPARES      IPU_ALIVE            8   8  # Spares
IPU_SIDE              IPU_CSCI_BLD_ID      0   1  # IPU Subsystem status 0 means A side is active, 1 means B side is
active
IPU_KERNEL_TYPE       IPU_CSCI_BLD_ID      1   1  # TBD - 0 means IPU code loaded after vxworks kernel, 1 means IPU
code loaded as part of vxWorks kernel
IPU_ALPHA_BUILD       IPU_CSCI_BLD_ID      2   1  # 0= IPU code is released, 1= IPU code is under development
IPU_BUILD_NUM         IPU_CSCI_BLD_ID      3   7  # Build Number, release number is CPU_TYPE.REVISION.BUILD_NUM
IPU_REVISION          IPU_CSCI_BLD_ID      10  3  # Revision number
IPU_CPU_TYPE          IPU_CSCI_BLD_ID      13  3  # 0 is unused, 1 means an INTEL PC, 2 means the EM PSA-32, 3 is the
PFM PSA-32, 4,5,6,7 are unused
IOBIC_TG_ERR          IPU_ERR_0            0   1  # 1 means the Timing Generator Board didn't respond during
initialization.
IOBIC_SIO_ERR         IPU_ERR_0            1   1  # 1 means the Serial I/O Interface Board didn't respond during
initialization.
IOBIC_EDAQ_ERR        IPU_ERR_0            2   1  # 1 means the EDAQ Interface Board didn't respond during
initialization.
TSS_TLM_QHSS_ERR      IPU_ERR_0            3   1  # 1 means the TSS Tlm QHSS Channel encountered an error.
CHOP_SYNC_ERR         IPU_ERR_0            4   1  # Chopper Sync failed for SPU.  Fallback to internal chopper ref
TSS_CMD_QHSS_ERR      IPU_ERR_0            5   1  # Spare IPU Error Bit
SPU_QHSS_ERR          IPU_ERR_0            6   1  # 1 means the SPU data receive encountered an error.
EXEC_OVERRUN_ERR      IPU_ERR_0            7   1  # 1 means the IPU Executive did not finish within a chopper rotation.
SPU_DATA_ERR          IPU_ERR_0            8   2  # 1 means the SPU did not send data last cr.  2 means it did not
finish sending data.
TSS_TLM_NOPKT_ER      IPU_ERR_0            10  1  # 1 means the IPU did not receive TSS data packet
TSS_TLM_LEN_ERR       IPU_ERR_0            11  1  # 1 means the TSS recieved a Tlm packet but there was an incorrect
packet length specified
TSS_TLM_SUMA_ERR      IPU_ERR_0            12  1  # 1 means a TSW App code packet checksum error occurred
TSB_TLM_SUMH_ERR      IPU_ERR_0            13  1  # 1 means a TSU packet HK block checksum error occurred
TSB_TLM_SUMD_ERR      IPU_ERR_0            14  1  # 1 means a TSU packet Diag block checksum error occurred
TSS_DBL_PKT_ERR       IPU_ERR_0            15  1  # IPU received 2 packets from TEU in 1 CR (reset by faultclr)
SPU_CR_PHASE_ERR      IPU_ERR_1            0   1  # 1 means the chopper rotation counter was not constant within a
given cr
SPU_CR_DROP_ERR       IPU_ERR_1            1   1  # 1 means 1 or more cr SPU radiance data packets was not received by
the qhss
SPU_CC_PHASE_ERR      IPU_ERR_1            2   1  # 1 means the value for one or more chopper cycles was not correct
SPU_POWER_PILEUP      IPU_ERR_1            3   1  # 1 means the SPU received a power select command while still
processing previous command
SPU_RESET_PILEUP      IPU_ERR_1            4   1  # 1 means the SPU received a reset command while still processing
previous command
PSS_ERR               IPU_ERR_1            5   6  # See following 6 entries.
PSS_IRC_OVFL_ERR      IPU_ERR_1            5   1  # 1 means the PSS received more than 1 IRC per 4 CR's
PSS_IF_BUSY_ERR       IPU_ERR_1            6   1  # 1 means the PSS Interface was busy unexpectedly.
PSS_PILEUP_ERR        IPU_ERR_1            7   1  # 1 means the PSS Interface received a command while latching a relay
PSS_FUNC_ERR          IPU_ERR_1            8   1  # 1 means the PSS Switch routing encountered an invalid Function-
Action code combination
PSS_MAC_ERR           IPU_ERR_1            9   1  # 1 means the PSS Switch routine received an error status from the
Macro SS while executing a PSM
PSS_EXE_ERR           IPU_ERR_1            10  1  # 1 means the PSS encountered an execution error while executing an
IRC
IFC_ERR               IPU_ERR_1            11  2  # See following 2 entries
IFC_IF_BUSY           IPU_ERR_1            11  1  # 1 means the IFC interface was busy unexpectedly
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IFC_TLM_ERR           IPU_ERR_1             12  1  # 1 means the IFC encountered an error while gathering TLM
MBIC_A_ERR            IPU_ERR_1             13  1  # 1 means the A MBIC didn't respond during initialization
MBIC_B_ERR            IPU_ERR_1             14  1  # 1 means the B MBIC didn't respond during initialization
EDAQ_BUSY_ERR         IPU_ERR_1             15  1  # 1 means the EDAQ Telemetry Converter was unexpectedly busy.
EDAQ_ADC_FLT_ERR      IPU_ERR_2             0   1  # 1 means the ADC is in a latch up state.  Telemetry will not be
reported for 425 ms
PSS_CMD_ECHO_ERR      IPU_ERR_2             1   1  # 1 means the was a miscompare on PSS a control word
DOOR_SAF_ANG_ERR      IPU_ERR_2             2   1  # 1 means the sunshield tried to move past the safe angle without a
critical enable command
S1553_BISTPOLLED      IPU_ERR_2             3   1  # 1 means the S/C polled for BIST word via 1553 TMC19.
SCIPKT_LOSS           IPU_ERR_2             4   1  # 1 means science packet loss has occured.
ENGPKT_LOSS           IPU_ERR_2             5   1  # 1 means engineering packet loss has occured.
SSH_HWA_TIMEOUT       IPU_ERR_2             6   1  # 1 means the HWA timed out. 0, means its fine
SPU_FAULT_A           IPU_ERR_2             7   1  # SPU fault status bit Read from TG DIO port, 1= Fault condition on
TLM side A
SPU_FAULT_B           IPU_ERR_2             8   1  # SPU fault status bit Read from TG DIO port, 1= Fault condition on
TLM side B
CSS_CHKSUM_ERR        IPU_ERR_2             9   1  # 1 means checksum failure on TLM transfer from CSS
SC_SOFT_RESET         IPU_ERR_2             10  1  # 1 means a soft reset command was received on 1553 (RSA27) Reset
action TBD.
SC_HARD_RESET         IPU_ERR_2             11  1  # 1 means a hard reset command was received on 1553 (RSA27) Reset
action TBD.
SC_INVLD_RESET        IPU_ERR_2             12  1  # 1 means was received on 1553 (RSA27) but ignored.
S1553_ITF_TST         IPU_ERR_2             13  1  # 1 means 1553 Summit status register 9 TF (Terminal Flag) bit was
set by IPU for test purposes
S1553_BIST_CMDED      IPU_ERR_2             14  1  # 1 means 1553 Summit was commanded by S/C via RMC3 to perform a
Built-in Self Test.
S1553_REINIT          IPU_ERR_2             15  1  # 1 means the Summit was idle (perhaps because of a BIST) was
reinitialized.
IPU_UPL_SEQ_ERR       IPU_ERR_3             0   1  # 1 means an improper sequence of IPU Upload Commands was received,
including block number out of sequence
IPU_UPL_SYS_ERR       IPU_ERR_3             1   1  # 1 means an invalid IPU Upload Subsystem ID
IPU_UPL_PROC_ERR      IPU_ERR_3             2   1  # 1 means an IPU Upload Processing Error occured
IPU_UPL_ABORTED       IPU_ERR_3             3   1  # 1 means an IPU Upload was aborted by a HIR_UPL_HEADER command with
numblocks= 0 and IPU_UPL_INPROG subtmi True
SSH_DORMOT_OT_ER      IPU_ERR_3             4   1  # SSH door motor over temperature fault
SSH_HWA_OT_ERR        IPU_ERR_3             5   1  # HWA over temperature fault
TSS_ID_ERR            IPU_ERR_3             6   1  # 1 means an App Hk or Sci invalid block ID
TSB_ID_ERR            IPU_ERR_3             7   1  # 1 means an TSU Hk or Diag invalid block ID
TSS_HK_BSEQ_ERR       IPU_ERR_3             8   1  # 1 means an App HK block counter out of sequence
TSS_SCI_BSEQ_ERR      IPU_ERR_3             9   1  # 1 means an App Sci block counter out of sequence
TSU_HK_BSEQ_ERR       IPU_ERR_3             10  1  # 1 means an TSU HK block counter out of sequence
TSU_DIAG_BSEQ_ER      IPU_ERR_3             11  1  # 1 means an TSU DIAG block counter out of sequence
TSS_TLM_TOUT_ERR      IPU_ERR_3             12  1  # 1 means a timeout occured waiting for TSS TLM - resync occurred
TSS_DMA_PSEQ_ERR      IPU_ERR_3             13  1  # 1 means the TLM DMA packet counter was out of sequence
TSS_HSS_CMDQ_ERR      IPU_ERR_3             14  1  # 1 means timeout occured waitng for TSS HSS CMD queue to be empty.
TSS not powered or not functioning
GSS_SIO_BUSY_ERR      IPU_ERR_3             15  1  # 1 means the SIO GSS interface cycle was not finished in time for
the next CR cycle.
GSS_HK_SYNC_ERR       IPU_ERR_4             0   1  # 1 means the GSS HK Tlm words' RTC bits do not match those
requested.
GSS_ST_SYNC_ERR       IPU_ERR_4             1   1  # 1 means the GSS STATUS Tlm words' RTC bits do not match those
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requested.
EDAQ_LIST_ERR         IPU_ERR_4             2   1  # 1 means the EDAQ Telemetry Converter encountered an error in a
Telemetry List.
AMBI_TG_ERR           IPU_ERR_4             3   1  # 1 means an AMBI error occured while setting up the TG board
AMBI_SIO_ERR          IPU_ERR_4             4   1  # 1 means an AMBI error occured while setting up the SIO board
AMBI_EDAQ_ERR         IPU_ERR_4             5   1  # 1 means an AMBI error occured while setting up the EDAQ board
AMBI_MBIC_A_ERR       IPU_ERR_4             6   1  # 1 means an AMBI error occured while setting up the MBIC_A on the
MSA board
AMBI_MBIC_B_ERR       IPU_ERR_4             7   1  # 1 means an AMBI error occured while setting up the MBIC_B on the
MSA board
AMBI_ERR              IPU_ERR_4             8   1  # 1 means an AMBI error occured while setting up AMBI Bus
CR_TICK_WDOG_ERR      IPU_ERR_4             9   1  # 1 means a loss of system tick interrupt has caused the system tick
source to fallback to TG internal or decrementer
CSS_LATCH_ERR         IPU_ERR_4             10  1  # 1 means the CSS was commanded to latch while running or commanded
to run while latched
SVA_DORMOT_OT_ER      IPU_ERR_4             11  1  # SVA door motor over temperature fault
CHOP_MOT_OT_ERR       IPU_ERR_4             12  1  # Chopper motor over temperature fault
DISPL1_OT_ERR         IPU_ERR_4             13  1  # Displacer 1 over temperature fault
DISPL2_OT_ERR         IPU_ERR_4             14  1  # Displacer 2 over temperature fault
COMP_HEAD_OT_ERR      IPU_ERR_4             15  1  # Compressor head over temperature fault
GYR0_OT_ERR           IPU_ERR_5             0   1  # GYRO 0 over-temperature fault, 1=occurred
GYR1_OT_ERR           IPU_ERR_5             1   1  # GYRO 1 over-temperature fault, 1=occurred
GYR2_OT_ERR           IPU_ERR_5             2   1  # GYRO 2 over-temperature fault, 1=occurred
GYR3_OT_ERR           IPU_ERR_5             3   1  # GYRO 3 over-temperature fault, 1=occurred
IPU_CHKSUM_ERR        IPU_ERR_5             4   1  # 1 means IPU image checksum failed
IPU_SGL_BIT_ERR       IPU_ERR_5             5   1  # 1 means IPU single bit RAM error occurred
IPU_DBL_BIT_ERR       IPU_ERR_5             6   1  # 1 means IPU double bit RAM error occurred
TEU_CHKSUM_ERR        IPU_ERR_5             7   1  # 1 means TEU image checksum failed
TEU_SGL_BIT_ERR       IPU_ERR_5             8   1  # 1 means TEU single bit RAM error occurred
TEU_DBL_BIT_ERR       IPU_ERR_5             9   1  # 1 means TEU double bit RAM error occurred
CSS_CAGE_IL_ERR       IPU_ERR_5             10  1  # 0=no interlock occurred, 1=interlock occurred
CSS_PWR_IL_ERR        IPU_ERR_5             11  1  # 0=no interlock occurred, 1=interlock occurred
SC_TIMEOUT10_ERR      IPU_ERR_5             12  1  # 1 = a loss of SC communications for 10 seconds occurred
SC_TIMEOUT1_ERR       IPU_ERR_5             13  1  # 1 = a loss of SC communications for 1 second occurred
SCIFMT_TBL_ERR        IPU_ERR_5             14  1  # Error in science format table
PCI_RESET_ERR         IPU_ERR_5             15  1  # 1 = PCI reset fault occured
IPU_EXCEPT_ADDR       IPU_EXCEPTION         0   19 # Address of last exception/4
IPU_EXCEPT_ENA        IPU_EXCEPTION         19  1  # Exception skip disabled if high
IPU_EXCEPT_CNT        IPU_EXCEPTION         20  8  # Number of exceptions since last clear
IPU_EXCEPT_TYPE       IPU_EXCEPTION         28  3  # Type of last exception (2=MCI, 3=DSI, 4=ISI, 6=AI, 7=PI, 0=FPU)
IPU_EXCEPT_OCCR       IPU_EXCEPTION         31  1  # Exception occurred if high
EDAQ_PIO_PAR_CK       IPU_FLT_STAT_0        0   1  # 0 means Edaq IOBIC PIO Parity checking is disabled, 1 is enabled
PSS_IRC_OVFL_FM       IPU_FLT_STAT_0        1   1  # 0 means Fault Management for this error is off, 1 on
PSS_IF_BUSY_FM        IPU_FLT_STAT_0        2   1  # 0 means Fault Management for this error is off, 1 on
PSS_PILEUP_FM         IPU_FLT_STAT_0        3   1  # 0 means Fault Management for this error is off, 1 on
SSH_DORMOT_OT_FM      IPU_FLT_STAT_0        4   1  # 0 means Fault Management for this error is off, 1 on
WATCHDOG_FM           IPU_FLT_STAT_0        5   1  # 0 means Fault Management for this error is off, 1 on
PSS_EXE_ERR_FM        IPU_FLT_STAT_0        6   1  # 0 means Fault Management for this error is off, 1 on
EDAQ_BUSY_FM          IPU_FLT_STAT_0        7   1  # 0 means Fault Management for this error is off, 1 on
EDAQ_ADC_FLT_FM       IPU_FLT_STAT_0        8   1  # 0 means Fault Management for this error is off, 1 on
DOOR_SAF_ANG_FM       IPU_FLT_STAT_0        9   1  # 1 means the SSH will check the Potentiometer, 0 means it won't
SVA_DORMOT_OT_FM      IPU_FLT_STAT_0        10  1  # SVA door motor OT fault management: 0=off, 1=on
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CHOP_MOT_OT_FM        IPU_FLT_STAT_0        11  1  # 0 means Fault Management for this error is off, 1 on
TICK_WATCHDOG_FM      IPU_FLT_STAT_0        12  1  # 0 = off, 1 = on
CSS_LATCH_FM          IPU_FLT_STAT_0        13  1  # 0 means Fault Management for this error is off, 1 on
DISPL1_OT_FM          IPU_FLT_STAT_0        14  1  # Displacer 1 over temperature fault mgt: 0=off, 1=on
DISPL2_OT_FM          IPU_FLT_STAT_0        15  1  # Displacer 2 over temperature fault mgt: 0=off, 1=on
SSH_HWA_OT_FM         IPU_FLT_STAT_1        0   1  # HWA over temperature fault mgt: 0=off, 1=on
COMP_HEAD_OT_FM       IPU_FLT_STAT_1        1   1  # Compressor head over temperature fault mgt: 0=off, 1=on
GYR0_OT_FM            IPU_FLT_STAT_1        2   1  # GYRO 0 over-temperature fault mgt: 0=off, 1=on
GYR1_OT_FM            IPU_FLT_STAT_1        3   1  # GYRO 1 over-temperature fault mgt: 0=off, 1=on
GYR2_OT_FM            IPU_FLT_STAT_1        4   1  # GYRO 2 over-temperature fault mgt: 0=off, 1=on
GYR3_OT_FM            IPU_FLT_STAT_1        5   1  # GYRO 3 over-temperature fault mgt: 0=off, 1=on
CSS_CAGE_IL_FM        IPU_FLT_STAT_1        6   1  # CSS cage interlock FM bit, 0=no FM, 1=FM (cmd blocked)
CSS_PWR_IL_FM         IPU_FLT_STAT_1        7   1  # CSS power interlock FM bit, 0=no FM, 1=FM (cmd blocked)
CHOP_SYNC_FM          IPU_FLT_STAT_1        8   1  # Chopper Sync fault management:  0 = off, 1 = on
SC_TIMEOUT_FM         IPU_FLT_STAT_1        9   1  # SC communications fault management: 0 = off; 1 = on
SSH_OT_IL_FM          IPU_FLT_STAT_1        10  1  # SSH interlock response to SSH_DORMOT_OT_ER: 0 = disabled, 1 =
enabled
PCI_RESET_FM          IPU_FLT_STAT_1        11  1  # 1 = fault management for detection and correction PCI in reset is
enabled
EDAQ_FILTER_FM        IPU_FLT_STAT_1        12  1  # Enable/disable EDAQ analog filter
SPARE_STAT1_BT13      IPU_FLT_STAT_1        13  1  # Spare
SPARE_STAT1_BT14      IPU_FLT_STAT_1        14  1  # Spare
MEMSCRUB_FM           IPU_FLT_STAT_1        15  1  # Memory scrub fault management: 0 = disabled; 1 = enabled
TICK_SOURCE           IPU_STAT_0            0   1  # 0 means the decrementer, 1 means the TimingGenerator.
CR_INT_SOURCE         IPU_STAT_0            1   2  # 0 means internal rotation sync, 1 means CR sync, 2 means external
CR sync
CHOP_SYNC_SOURCE      IPU_STAT_0            3   2  # 0 means internal chopper ref, 1 means chopper ref, 2 means external
chopper ref
IPU_UPL_INPROG        IPU_STAT_0            5   1  # 1 means IPU Upload is in progress, valid header received
IPU_UPL_COMPLETE      IPU_STAT_0            6   1  # 1 means IPU Upload header plus all expected blocks were received
IPU_UPL_CHKSUMOK      IPU_STAT_0            7   1  # 1 means IPU Upload completed and checksum matched
TSS_TLM_STATE         IPU_STAT_0            8   2  # 0 means no TSS tlm, 1= SU HK Tlm, 2= SU DIAG and HK, 3= APP Tlm
TSS_DMA_PSEQ_OK       IPU_STAT_0            10  1  # 0 means an the TLM DMA packet counter was out of sequence
CMD_UNPROT            IPU_STAT_0            11  1  # 1 means an unprotect command has been sent and it's corresponding
command has not
TSB_CHKSUM_MATCH      IPU_STAT_0            12  1  # 1 means that the TSS telemetered expected and actual upload
checksum match.
TSB_UPLOAD_DONE       IPU_STAT_0            13  1  # 1 means that the TSS has received it's upload (i.e. the TSS
telemeterd next expected block equals the total expected blocks +1)
TSS_CMDRJCT_NZ        IPU_STAT_0            14  1  # 1 means TSS telemetered Command Reject Count is not zero
PSS_DISC_STATE        IPU_STAT_0            15  1  # 1 means the a PSS discrete is energized
SCIPKT_Q_SZ           IPU_STAT_1            0   5  # the current number of buffered science packets
RDSR                  IPU_STAT_1            5   3  # the value is the current RDSR, 6,3,2 or 1
TLM_PATTERN           IPU_STAT_1            8   3  # 0 means normal pattern, 1 means Fixed HK, 2 means Fixed Sci, 3
means Simulated Data with decimation disabled, 4 means Simulated Data with decimation enabled, 5 means Simulated Data
with decimation and 32 tap filter enabled. 6 and 7 are TBD
TSS_TLM_SUMOK         IPU_STAT_1            11  1  # 1 means Checksum    OK for current TSS Tlm Packet
TSB_TLM_SUMOK         IPU_STAT_1            12  1  # 1 means Checksum(s) OK for current TSU Tlm Packet
TSS_SYNC_STATE        IPU_STAT_1            13  2  # 0 means IPU waiting for DMA address from TEU , 1 means IPU received
DMA buffer addresses from TEU, IPU sending DMA address to TEU, 2 means IPU-TEU DMA buffers are in sync expect nominal
communications
GSS_SIO_BUSY          IPU_STAT_1            15  1  # 1 means the SIO GSS interface cycle was not finished in time for
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the next CR cycle.
TIME_GIRD_HD_ERR      IPU_STAT_2            0   1  # 1 = an error occurred in the last received GIRD Header timecode
EDAQ_LIST_BAD         IPU_STAT_2            1   1  # 1 means the EDAQ Telemetry Converter encountered an error in a
Telemetry List. This Flag is cleared once per MIF
EDAQ_BUSY             IPU_STAT_2            2   1  # 1 means the EDAQ Telemetry Converter was unexpectedly busy. This
Flag is cleared once per MIF
SAIL_CNTL_SSH         IPU_STAT_2            3   1  # SAIL control allowed for SSH: 0=no, 1=yes
SAIL_CNTL_SMA         IPU_STAT_2            4   1  # SAIL control allowed for SMA: 0=no, 1=yes
SAIL_CNTL_BB          IPU_STAT_2            5   1  # SAIL control allowed for BlackBody: 0=no, 1=yes
SAIL_CNTL_HWA         IPU_STAT_2            6   1  # SAIL control allowed for HWA: 0=no, 1=yes
ANCILLARY_TMATCH      IPU_STAT_2            7   1  # 1 = ancillary 1 and ancillary 2 time codes and checksums match
SAIL_CNTL_CSS         IPU_STAT_2            8   1  # SAIL control allowed for CSS: 0=no, 1=yes
SAIL_CNTL_SVA         IPU_STAT_2            9   1  # SAIL control allowed for SVA: 0=no, 1=yes
PRHS                  IPU_STAT_2            10  2  # Primary read head select (0=test value, 1=RH1 data, 2=RH2 data, 3=
average of both read heads)
SRHS                  IPU_STAT_2            12  2  # Secondary read head select (0=test value, 1=RH1 data, 2=RH2 data,
3= average of both read heads)
DIAG_ITEM_TRUNC       IPU_STAT_2            14  1  # 1 means at least one requested diag was truncated (i.e. requested
size not met)
DIAG_ITEM_DROP        IPU_STAT_2            15  1  # 1 means at least one requested diag was not included in diag block
ISU_CMD_RES_NUM       ISU_CMD_RES_CODE      0   6  # Cmd Result code. Command result number
ISU_CMD_PARM_NUM      ISU_CMD_RES_CODE      6   5  # Cmd Result code. Parameter in error
ISU_CMD_SUBSYS        ISU_CMD_RES_CODE      11  4  # Cmd Result code. Constant value of 2 for SUROM
ISU_CMD_OK            ISU_CMD_RES_CODE      15  1  # Cmd Result code. 1 means last command OK, 0 means last command
rejected
ISU_EE_AUTO_OK        ISU_EE_ERR_STAT       0   1  # 1 means Autoboot image is valid
ISU_EE_AUTO_ERR       ISU_EE_ERR_STAT       1   3  # Specific Autoboot error which occured
ISU_EE_RETRY          ISU_EE_ERR_STAT       4   1  # Retry on EE prom read or write
ISU_EE_BADCOPY        ISU_EE_ERR_STAT       5   1  #
ISU_EE_OVERRIDE       ISU_EE_ERR_STAT       6   1  #
ISU_EE_TSWITCH        ISU_EE_ERR_STAT       7   1  #
ISU_EE_T1CHKSUM       ISU_EE_ERR_STAT       8   1  #
ISU_EE_T2CHKSUM       ISU_EE_ERR_STAT       9   1  #
ISU_EE_T1FAIL         ISU_EE_ERR_STAT       10  1  #
ISU_EE_T2FAIL         ISU_EE_ERR_STAT       11  1  #
ISU_EE_WRITE_ERR      ISU_EE_ERR_STAT       12  1  #
ISU_EE_READ_ERR       ISU_EE_ERR_STAT       13  1  #
ISU_EE_NEEDSCRUB      ISU_EE_ERR_STAT       14  1  #
ISU_EE_ERROR          ISU_EE_ERR_STAT       15  1  # 1 means an EEPROM error occured, see bits 0-14 for details
ISU_WDT_EXPIRED       ISU_FLAG_BITS         0   1  # 1=Watchdog Expired
ISU_EXCEPT_ERR        ISU_FLAG_BITS         4   1  # 1=Processor exception occurred
ISU_ERR_INJECT        ISU_FLAG_BITS         8   1  # 1=Error injection enabled
ISU_EEDUMP_ON         ISU_FLAG_BITS         11  1  # 1=EEPROM Dump On
ISU_EE_SECT           ISU_FLAG_BITS         12  4  # EEPROM Section used for EEPROM work
ISU_MBICPID12_ER      ISU_MBIC_ERROR        0   1  # I_MBIC_AMBI_PID12_CONFIG ERROR
ISU_MBIC_PUP_ERR      ISU_MBIC_ERROR        9   1  # I_MBIC_POWERUP ERROR
ISU_MBIC_PDWNERR      ISU_MBIC_ERROR        10  1  # I_MBIC_POWERDOWN ERROR
ISU_MBIC_CNF_ERR      ISU_MBIC_ERROR        11  1  # I_MBIC_CONFIGURE ERROR
ISU_MBIC_RNG_ERR      ISU_MBIC_ERROR        12  1  # I_MBIC_RANGE ERROR
ISU_MBIC_A_DEAD       ISU_MBIC_ERROR        14  1  # I_MBIC_A_DEAD ERROR
ISU_MBIC_B_DEAD       ISU_MBIC_ERROR        15  1  # I_MBIC_B_DEAD ERROR
ISU_CPU_SIDE          ISU_ROM_BUILD_ID      0   1  # 0 = SIDE, A 1= SIDE B, Read from LIO PID
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ISU_ALPHA_BUILD       ISU_ROM_BUILD_ID      2   1  # 1= ALPHA TEST BUILD, 0= CODE FREEZE/RELEASE
ISU_BUILD_NUM         ISU_ROM_BUILD_ID      3   7  # BUILD NUMBER             0-99
ISU_MINOR_REV         ISU_ROM_BUILD_ID      10  3  # MINOR_REVISION NUMBER    1-7
ISU_MAJOR_REV         ISU_ROM_BUILD_ID      13  3  # MAJOR_REVISION NUMBER    1-7
ISU_EETBL_SECT        ISU_SECT              0   4  # EEPROM index table section info being downloaded
ISU_EETBL             ISU_SECT              4   2  # EEPROM index table being downloaded (1 or 2), 0 for decoded table
ISU_EETBL_ACTIVE      ISU_SECT              6   2  # Active EEPROM index table (1 or 2, 0 if no good tables)
MACROCMD_RES_NUM      MACMD_LAST_RC         0   6  # Cmd Result code. Command result number Display Mnemonic
MACROCMD_PARMNUM      MACMD_LAST_RC         6   5  # Cmd Result code. Parameter in error
MACROCMD_SUBSYS       MACMD_LAST_RC         11  4  # Subsystem to which the command is to be routed
MACROCMD_OK           MACMD_LAST_RC         15  1  # Cmd Result code. 1 means last command OK, 0 means last command
reject
MAC_CMD_PNUM          MACRO_STAT            0   5  # Current parameter for current command
MAC_CMD_NUM           MACRO_STAT            5   8  # Current command number for current macro
MAC_NUM_CMDS          MACRO_STAT            13  6  # Number of commands in current macro
MAC_STATE             MACRO_STAT            19  3  # 0=unused, 1=uploading, 2=ready, 3=executing, 4=pended
MAC_NUM               MACRO_STAT            22  8  # Current macro number
MAC_CSC_STATE         MACRO_STAT            30  2  # 0=idle, 1=uploading, 2=executing
PCU_SYS5CNVA_ON       PCU_SUBSTAT_0         0   1  # = PSS_SYSCNV_P5_A
PCU_SYS5CNVB_ON       PCU_SUBSTAT_0         1   1  # = PSS_SYSCNV_P5_B
PCU_SYS15CNVA_ON      PCU_SUBSTAT_0         2   1  # = PSS_SYSCNV_P15_A & PSS_SYSCNV_N15_A
PCU_SYS15CNVB_ON      PCU_SUBSTAT_0         3   1  # = PSS_SYSCNV_P15_B & PSS_SYSCNV_N15_B
PCU_REG28CNVA_ON      PCU_SUBSTAT_0         4   1  # = PSS_SYSCNV_28R_A
PCU_REG28CNVB_ON      PCU_SUBSTAT_0         5   1  # = PSS_SYSCNV_28R_B
PCU_SPUCNVA_ON        PCU_SUBSTAT_0         6   1  # = PSS_SPU_CNVTRS_A
PCU_SPUCNVB_ON        PCU_SUBSTAT_0         7   1  # = PSS_SPU_CNVTRS_B
PCU_PCUCNVA_ON        PCU_SUBSTAT_0         8   1  # = PSS_PCU_CNVTRS_A
PCU_PCUCNVB_ON        PCU_SUBSTAT_0         9   1  # = PSS_PCU_CNVTRS_B
PCU_QBUS_INPUT        PCU_SUBSTAT_0         10  1  # = PSS_QB_PWR & (PSS_QA_PWR ^ PSS_QB_PWR)
PCU_QBUS2QC_RLYA      PCU_SUBSTAT_0         11  1  # = (PSS_QA_PWR & PSS_QA_28C_RLYA) | (PSS_QB_PWR & PSS_QB_28C_RLYA)
PCU_QBUS2QC_RLYB      PCU_SUBSTAT_0         12  1  # = (PSS_QA_PWR & PSS_QA_28C_RLYB) | (PSS_QB_PWR & PSS_QB_28C_RLYB)
PCU_QC_ON             PCU_SUBSTAT_0         13  1  # = PSS_QC_PWR & (PSS_QC_PWR ^ PSS_28C_LOWVOLTS)
PCU_NA_INPUT          PCU_SUBSTAT_0         14  1  # = !(PSS_NBA_RLYA & PSS_NBA_RLYB)
PCU_NB_INPUT          PCU_SUBSTAT_0         15  1  # = !(PSS_NBB_RLYA & PSS_NBB_RLYB)
PCU_IPUA28R_RLYA      PCU_SUBSTAT_1         0   1  # = PSS_IPUA_28R_PWR & (PSS_SYSCNV_28R_A & PSS_IPUA_28RRLYA)
PCU_IPUA28R_RLYB      PCU_SUBSTAT_1         1   1  # = PSS_IPUA_28R_PWR & (PSS_SYSCNV_28R_B & PSS_IPUA_28RRLYB)
PCU_IPUB28R_RLYA      PCU_SUBSTAT_1         2   1  # = PSS_IPUB_28R_PWR & (PSS_SYSCNV_28R_A & PSS_IPUB_28RRLYA)
PCU_IPUB28R_RLYB      PCU_SUBSTAT_1         3   1  # = PSS_IPUB_28R_PWR & (PSS_SYSCNV_28R_B & PSS_IPUB_28RRLYB)
PCU_TEUA28C_RLYA      PCU_SUBSTAT_1         4   1  # = PSS_TEUA_28C_PWR & (PSS_QC_PWR & PSS_TEUA_28CRLYA)
PCU_TEUA28C_RLYB      PCU_SUBSTAT_1         5   1  # = PSS_TEUA_28C_PWR & (PSS_QC_PWR & PSS_TEUA_28CRLYB)
PCU_TEUB28C_RLYA      PCU_SUBSTAT_1         6   1  # = PSS_TEUB_28C_PWR & (PSS_QC_PWR & PSS_TEUB_28CRLYA)
PCU_TEUB28C_RLYB      PCU_SUBSTAT_1         7   1  # = PSS_TEUB_28C_PWR & (PSS_QC_PWR & PSS_TEUB_28CRLYB)
PCU_GSS28C_RLYA       PCU_SUBSTAT_1         8   1  # = PSS_GSS_28C_PWR & (PSS_QC_PWR & PSS_GSS_28CRLYA)
PCU_GSS28C_RLYB       PCU_SUBSTAT_1         9   1  # = PSS_GSS_28C_PWR & (PSS_QC_PWR & PSS_GSS_28CRLYB)
PCU_SPU5_RLYA         PCU_SUBSTAT_1         10  1  # = PSS_SPUA_P5_RLY
PCU_SPU15_RLYA        PCU_SUBSTAT_1         11  1  # = PSS_SPUA_P15_RLY & PSS_SPUA_N15_RLY
PCU_SPU5_RLYB         PCU_SUBSTAT_1         12  1  # = PSS_SPUB_P5_RLY
PCU_SPU15_RLYB        PCU_SUBSTAT_1         13  1  # = PSS_SPUB_P15_RLY & PSS_SPUB_N15_RLY
PCU_CSS_RLYA          PCU_SUBSTAT_1         14  1  # = PSS_NB_PWR & (((PSS_NBA_RLYA ^ PSS_NBA_RLYB) & PSS_NBA_RLYA) |
((PSS_NBB_RLYA ^ PSS_NBB_RLYB) & PSS_NBB_RLYA))
PCU_CSS_RLYB          PCU_SUBSTAT_1         15  1  # = PSS_NB_PWR & (((PSS_NBA_RLYA ^ PSS_NBA_RLYB) & PSS_NBA_RLYB) |
((PSS_NBB_RLYA ^ PSS_NBB_RLYB) & PSS_NBB_RLYB))
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PCU_TEUA5_RLYA        PCU_SUBSTAT_2         0   1  # = PSS_TEUA_P5_PWR & (PSS_SYSCNV_P5_A & PSS_TEUA_P5RLYA)
PCU_TEUA5_RLYB        PCU_SUBSTAT_2         1   1  # = PSS_TEUA_P5_PWR & (PSS_SYSCNV_P5_B & PSS_TEUA_P5RLYB)
PCU_TEUB5_RLYA        PCU_SUBSTAT_2         2   1  # = PSS_TEUB_P5_PWR & (PSS_SYSCNV_P5_A & PSS_TEUB_P5RLYA)
PCU_TEUB5_RLYB        PCU_SUBSTAT_2         3   1  # = PSS_TEUB_P5_PWR & (PSS_SYSCNV_P5_B & PSS_TEUB_P5RLYB)
PCU_GSS5_RLYA         PCU_SUBSTAT_2         4   1  # = PSS_GSS_P5_PWR & (PSS_SYSCNV_P5_A & PSS_GSS_P5RLYA)
PCU_GSS5_RLYB         PCU_SUBSTAT_2         5   1  # = PSS_GSS_P5_PWR & (PSS_SYSCNV_P5_B & PSS_GSS_P5RLYB)
PCU_EEA5_RLYA         PCU_SUBSTAT_2         6   1  # = PSS_EEA_P5_PWR & (PSS_SYSCNV_P5_A & PSS_EEA_P5RLYA)
PCU_EEA5_RLYB         PCU_SUBSTAT_2         7   1  # = PSS_EEA_P5_PWR & (PSS_SYSCNV_P5_B & PSS_EEA_P5RLYB)
PCU_TEUA15_RLYA       PCU_SUBSTAT_2         8   1  # = (PSS_TEUA_P15_PWR & PSS_TEUA_N15_PWR) & ((PSS_SYSCNV_P15_A &
PSS_SYSCNV_N15_A) & PSS_TEUA_15VRLYA)
PCU_TEUA15_RLYB       PCU_SUBSTAT_2         9   1  # = (PSS_TEUA_P15_PWR & PSS_TEUA_N15_PWR) & ((PSS_SYSCNV_P15_B &
PSS_SYSCNV_N15_B) & PSS_TEUA_15VRLYB)
PCU_TEUB15_RLYA       PCU_SUBSTAT_2         10  1  # = (PSS_TEUB_P15_PWR & PSS_TEUB_N15_PWR) & ((PSS_SYSCNV_P15_A &
PSS_SYSCNV_N15_A) & PSS_TEUB_15VRLYA)
PCU_TEUB15_RLYB       PCU_SUBSTAT_2         11  1  # = (PSS_TEUB_P15_PWR & PSS_TEUB_N15_PWR) & ((PSS_SYSCNV_P15_B &
PSS_SYSCNV_N15_B) & PSS_TEUB_15VRLYB)
PCU_GSS15_RLYA        PCU_SUBSTAT_2         12  1  # = (PSS_GSS_P15_PWR & PSS_GSS_N15_PWR) & ((PSS_SYSCNV_P15_A &
PSS_SYSCNV_N15_A) & PSS_GSS_15VRLYA)
PCU_GSS15_RLYB        PCU_SUBSTAT_2         13  1  # = (PSS_GSS_P15_PWR & PSS_GSS_N15_PWR) & ((PSS_SYSCNV_P15_B &
PSS_SYSCNV_N15_B) & PSS_GSS_15VRLYB)
PCU_EEA15_RLYA        PCU_SUBSTAT_2         14  1  # = (PSS_EEA_P15_PWR & PSS_EEA_N15_PWR) & ((PSS_SYSCNV_P15_A &
PSS_SYSCNV_N15_A) & PSS_EEA_15VRLYA)
PCU_EEA15_RLYB        PCU_SUBSTAT_2         15  1  # = (PSS_EEA_P15_PWR & PSS_EEA_N15_PWR) & ((PSS_SYSCNV_P15_B &
PSS_SYSCNV_N15_B) & PSS_EEA_15VRLYB)
PSS_IPUA_28RRLYB      PSS_STAT_00           0   1  # A_IPU +28REG supply redt. relay OFF/ON
PSS_IPUA_28RRLYA      PSS_STAT_00           1   1  # A_IPU +28REG supply prim. relay OFF/ON
PSS_IPUA_28R_PWR      PSS_STAT_00           2   1  # +28REG supply to A_IPU OFF/ON
PSS_IPUB_28RRLYB      PSS_STAT_00           3   1  # B_IPU +28REG supply redt. relay OFF/ON
PSS_IPUB_28RRLYA      PSS_STAT_00           4   1  # B_IPU +28REG supply prim. relay OFF/ON
PSS_IPUB_28R_PWR      PSS_STAT_00           5   1  # +28REG supply to B_IPU OFF/ON
PSS_SPUA_P5_RLY       PSS_STAT_00           9   1  # +5A power to SPU OFF/ON
PSS_SPUA_P15_RLY      PSS_STAT_00           10  1  # +15A power to SPU OFF/ON
PSS_SPUA_N15_RLY      PSS_STAT_00           11  1  # -15A power to SPU OFF/ON
PSS_SYSCNV_P5_A       PSS_STAT_00           12  1  # +5V SYS Converter A input OFF/ON
PSS_SYSCNV_P5_B       PSS_STAT_00           13  1  # +5V SYS Converter B input OFF/ON
PSS_SYSCNV_28R_A      PSS_STAT_00           14  1  # +28REG Converter A input OFF/ON
PSS_SYSCNV_28R_B      PSS_STAT_00           15  1  # +28REG Converter B input OFF/ON
PSS_TEUA_P5RLYB       PSS_STAT_01           0   1  # A_TEU +5V supply redt. relay OFF/ON
PSS_TEUA_P5RLYA       PSS_STAT_01           1   1  # A_TEU +5V supply prim. relay OFF/ON
PSS_TEUA_P5_PWR       PSS_STAT_01           2   1  # +5V supply to A_TEU OFF/ON
PSS_TEUA_15VRLYB      PSS_STAT_01           3   1  # A_TEU +/-15V supply redt. relay OFF/ON
PSS_TEUA_15VRLYA      PSS_STAT_01           4   1  # A_TEU +/-15V supply prim. relay OFF/ON
PSS_TEUA_P15_PWR      PSS_STAT_01           5   1  # +15V supply to A_TEU OFF/ON
PSS_TEUA_N15_PWR      PSS_STAT_01           6   1  # -15V supply to A_TEU OFF/ON
PSS_SYSCNV_P15_A      PSS_STAT_01           12  1  # +15V SYS Converter A input OFF/ON
PSS_SYSCNV_P15_B      PSS_STAT_01           13  1  # +15V SYS Converter B input OFF/ON
PSS_SYSCNV_N15_A      PSS_STAT_01           14  1  # -15V SYS Converter A input OFF/ON
PSS_SYSCNV_N15_B      PSS_STAT_01           15  1  # -15V SYS Converter B input OFF/ON
PSS_GSS_P5RLYB        PSS_STAT_02           0   1  # GSS +5V supply redt. relay OFF/ON
PSS_GSS_P5RLYA        PSS_STAT_02           1   1  # GSS +5V supply prim. relay OFF/ON
PSS_GSS_P5_PWR        PSS_STAT_02           2   1  # +5V supply to GSS OFF/ON
PSS_GSS_15VRLYB       PSS_STAT_02           3   1  # GSS +/-15V supply redt. relay OFF/ON
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PSS_GSS_15VRLYA       PSS_STAT_02           4   1  # GSS +/-15V supply prim. relay OFF/ON
PSS_GSS_P15_PWR       PSS_STAT_02           5   1  # +15V supply to GSS OFF/ON
PSS_GSS_N15_PWR       PSS_STAT_02           6   1  # -15V supply to GSS OFF/ON
PSS_SPUB_P5_RLY       PSS_STAT_02           9   1  # +5B power to SPU OFF/ON
PSS_SPUB_P15_RLY      PSS_STAT_02           10  1  # +15B power to SPU OFF/ON
PSS_SPUB_N15_RLY      PSS_STAT_02           11  1  # -15B power to SPU OFF/ON
PSS_PCU_CNVTRS_A      PSS_STAT_02           12  1  # PCU Internal Converter A OFF/ON
PSS_PCU_CNVTRS_B      PSS_STAT_02           13  1  # PCU Internal Converter B OFF/ON
PSS_SPU_CNVTRS_A      PSS_STAT_02           14  1  # SPU A Converters OFF/ON
PSS_SPU_CNVTRS_B      PSS_STAT_02           15  1  # SPU B Converters OFF/ON
PSS_NBA_RLYB          PSS_STAT_03           0   1  # +28NA redt. relay OFF/ON
PSS_NBA_RLYA          PSS_STAT_03           1   1  # +28NA prim. relay OFF/ON
PSS_NB_PWR            PSS_STAT_03           2   1  # +28NC supply to CSS OFF/ON
PSS_NBB_RLYB          PSS_STAT_03           5   1  # +28NB redt. relay OFF/ON
PSS_NBB_RLYA          PSS_STAT_03           6   1  # +28NB prim. relay OFF/ON
PSS_TEUB_P5RLYB       PSS_STAT_04           0   1  # B_TEU +5 redt. relay OFF/ON
PSS_TEUB_P5RLYA       PSS_STAT_04           1   1  # B_TEU +5 prim. relay OFF/ON
PSS_TEUB_P5_PWR       PSS_STAT_04           2   1  # +5V supply to B_TEU OFF/ON
PSS_TEUB_15VRLYB      PSS_STAT_04           3   1  # B_TEU +/-15V redt. relay OFF/ON
PSS_TEUB_15VRLYA      PSS_STAT_04           4   1  # B_TEU +/-15V prim. relay OFF/ON
PSS_TEUB_P15_PWR      PSS_STAT_04           5   1  # +15V supply to B_TEU OFF/ON
PSS_TEUB_N15_PWR      PSS_STAT_04           6   1  # -15V supply to B_TEU OFF/ON
PSS_EEA_P5RLYB        PSS_STAT_05           0   1  # EEA +5 redt. relay OFF/ON
PSS_EEA_P5RLYA        PSS_STAT_05           1   1  # EEA +5 prim. relay OFF/ON
PSS_EEA_P5_PWR        PSS_STAT_05           2   1  # +5V supply to EEA OFF/ON
PSS_EEA_15VRLYB       PSS_STAT_05           3   1  # EEA +/-15V redt. relay OFF/ON
PSS_EEA_15VRLYA       PSS_STAT_05           4   1  # EEA +/-15V prim. relay OFF/ON
PSS_EEA_P15_PWR       PSS_STAT_05           5   1  # +15V supply to EEA OFF/ON
PSS_EEA_N15_PWR       PSS_STAT_05           6   1  # -15V supply to EEA OFF/ON
PSS_TEUA_28CRLYB      PSS_STAT_06           0   1  # A_TEU +28QC supply redt. relay OFF/ON
PSS_TEUA_28CRLYA      PSS_STAT_06           1   1  # A_TEU +28QC supply prim. relay OFF/ON
PSS_TEUA_28C_PWR      PSS_STAT_06           2   1  # +28QC supply to A_TEU OFF/ON
PSS_TEUB_28CRLYB      PSS_STAT_06           3   1  # B_TEU +28QC supply redt. relay OFF/ON
PSS_TEUB_28CRLYA      PSS_STAT_06           4   1  # B_TEU +28QC supply prim. relay OFF/ON
PSS_TEUB_28C_PWR      PSS_STAT_06           5   1  # +28QC supply to B_TEU OFF/ON
PSS_GSS_28CRLYB       PSS_STAT_06           12  1  # GSS +28QC supply redt. relay OFF/ON
PSS_GSS_28CRLYA       PSS_STAT_06           13  1  # GSS +28QC supply prim. relay OFF/ON
PSS_GSS_28C_PWR       PSS_STAT_06           14  1  # +28QC supply to GSS OFF/ON
PSS_28C_LOWVOLTS      PSS_STAT_06           15  1  # +28QC internal bus below 20V
PSS_QA_28C_RLYA       PSS_STAT_07           0   1  # +28QA (Prim) N/L relay OFF/ON
PSS_QA_28C_RLYB       PSS_STAT_07           1   1  # +28QA (Redt) N/L relay OFF/ON
PSS_QA_PWR            PSS_STAT_07           2   1  # +28QA S/C input power OFF/ON
PSS_QB_28C_RLYA       PSS_STAT_07           3   1  # +28QB (Prim) N/L relay OFF/ON
PSS_QB_28C_RLYB       PSS_STAT_07           4   1  # +28QB (Redt) N/L relay OFF/ON
PSS_QB_PWR            PSS_STAT_07           5   1  # +28QB S/C input power OFF/ON
PSS_QC_PWR            PSS_STAT_07           6   1  # +28QC internal bus OFF/ON
Q1R_UNUSED            QHSS_1_RV_STAT        0   1  # See QHSS specification
Q1R_PCI_PROG_ERR      QHSS_1_RV_STAT        1   1  # See QHSS specification
Q1R_HSS_PROG_ERR      QHSS_1_RV_STAT        2   1  # See QHSS specification
Q1R_CMD_OVERRUN       QHSS_1_RV_STAT        3   1  # See QHSS specification
Q1R_PARITY_ERR        QHSS_1_RV_STAT        4   1  # See QHSS specification
Q1R_FRAMING_ERR       QHSS_1_RV_STAT        5   1  # See QHSS specification
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Q1R_PCI_IN_RESET      QHSS_1_RV_STAT        6   1  # See QHSS specification
Q1R_PCI_NO_DEV        QHSS_1_RV_STAT        7   1  # See QHSS specification
Q1R_PCI_TGT_ABRT      QHSS_1_RV_STAT        8   1  # See QHSS specification
Q1R_PCI_PROTOCOL      QHSS_1_RV_STAT        9   1  # See QHSS specification
Q1R_PCI_RDY_PAR       QHSS_1_RV_STAT        10  1  # See QHSS specification
Q1R_PCI_PERR          QHSS_1_RV_STAT        11  1  # See QHSS specification
Q1R_DMA_ABORTED       QHSS_1_RV_STAT        12  1  # See QHSS specification
Q1R_DMA_COMPLETE      QHSS_1_RV_STAT        13  1  # See QHSS specification
Q1R_CMDQ_NOT_MT       QHSS_1_RV_STAT        14  1  # See QHSS specification
Q1R_DATAQ_NOT_MT      QHSS_1_RV_STAT        15  1  # See QHSS specification TSS HS Channel
Q1T_UNUSED            QHSS_1_TX_STAT        0   1  # See QHSS specification
Q1T_HSS_PROG_ERR      QHSS_1_TX_STAT        1   1  # See QHSS specification
Q1T_PCI_IN_RESET      QHSS_1_TX_STAT        2   1  # See QHSS specification
Q1T_PCI_NO_DEV        QHSS_1_TX_STAT        3   1  # See QHSS specification
Q1T_PCI_TGT_ABRT      QHSS_1_TX_STAT        4   1  # See QHSS specification
Q1T_PCI_PROTOCOL      QHSS_1_TX_STAT        5   1  # See QHSS specification
Q1T_PCI_RDY_PERR      QHSS_1_TX_STAT        6   1  # See QHSS specification
Q1T_PCI_DAT_PERR      QHSS_1_TX_STAT        7   1  # See QHSS specification
Q1T_DMA_ABORTED       QHSS_1_TX_STAT        8   1  # See QHSS specification
Q1T_DMA_COMPLETE      QHSS_1_TX_STAT        9   1  # See QHSS specification
Q1T_CMDQ_NFULL        QHSS_1_TX_STAT        10  1  # See QHSS specification
Q1T_CMDQ_FULL         QHSS_1_TX_STAT        11  1  # See QHSS specification
Q1T_CMDQ_EMPTY        QHSS_1_TX_STAT        12  1  # See QHSS specification
Q1T_DATAQ_NFULL       QHSS_1_TX_STAT        13  1  # See QHSS specification
Q1T_DATAQ_FULL        QHSS_1_TX_STAT        14  1  # See QHSS specification
Q1T_DATAQ_EMPTY       QHSS_1_TX_STAT        15  1  # See QHSS specification TSS Cmd Channel
Q2R_UNUSED            QHSS_2_RV_STAT        0   1  # See QHSS specification
Q2R_PCI_PROG_ERR      QHSS_2_RV_STAT        1   1  # See QHSS specification
Q2R_HSS_PROG_ERR      QHSS_2_RV_STAT        2   1  # See QHSS specification
Q2R_CMDQ_OVERRUN      QHSS_2_RV_STAT        3   1  # See QHSS specification
Q2R_PARITY_ERR        QHSS_2_RV_STAT        4   1  # See QHSS specification
Q2R_FRAMING_ERR       QHSS_2_RV_STAT        5   1  # See QHSS specification
Q2R_PCI_IN_RESET      QHSS_2_RV_STAT        6   1  # See QHSS specification
Q2R_PCI_NO_DEV        QHSS_2_RV_STAT        7   1  # See QHSS specification
Q2R_PCI_TGT_ABRT      QHSS_2_RV_STAT        8   1  # See QHSS specification
Q2R_PCI_PROTOCOL      QHSS_2_RV_STAT        9   1  # See QHSS specification
Q2R_PCI_RDY_PAR       QHSS_2_RV_STAT        10  1  # See QHSS specification
Q2R_PCI_PERR          QHSS_2_RV_STAT        11  1  # See QHSS specification
Q2R_DMA_ABORTED       QHSS_2_RV_STAT        12  1  # See QHSS specification
Q2R_DMA_COMPLETE      QHSS_2_RV_STAT        13  1  # See QHSS specification
Q2R_CMDQ_NOT_MT       QHSS_2_RV_STAT        14  1  # See QHSS specification
Q2R_DATAQ_NOT_MT      QHSS_2_RV_STAT        15  1  # See QHSS specification TSS LS Channel
Q3R_UNUSED            QHSS_3_RV_STAT        0   1  # See QHSS specification
Q3R_PCI_PROG_ERR      QHSS_3_RV_STAT        1   1  # See QHSS specification
Q3R_HSS_PROG_ERR      QHSS_3_RV_STAT        2   1  # See QHSS specification
Q3R_CMD_OVERRUN       QHSS_3_RV_STAT        3   1  # See QHSS specification
Q3R_PARITY_ERR        QHSS_3_RV_STAT        4   1  # See QHSS specification
Q3R_FRAMING_ERR       QHSS_3_RV_STAT        5   1  # See QHSS specification
Q3R_PCI_IN_RESET      QHSS_3_RV_STAT        6   1  # See QHSS specification
Q3R_PCI_NO_DEV        QHSS_3_RV_STAT        7   1  # See QHSS specification
Q3R_PCI_TGT_ABRT      QHSS_3_RV_STAT        8   1  # See QHSS specification
Q3R_PCI_PROTOCOL      QHSS_3_RV_STAT        9   1  # See QHSS specification
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Q3R_PCI_RDY_PAR       QHSS_3_RV_STAT        10  1  # See QHSS specification
Q3R_PCI_PERR          QHSS_3_RV_STAT        11  1  # See QHSS specification
Q3R_DMA_ABORTED       QHSS_3_RV_STAT        12  1  # See QHSS specification
Q3R_DMA_COMPLETE      QHSS_3_RV_STAT        13  1  # See QHSS specification
Q3R_CMDQ_NOT_MT       QHSS_3_RV_STAT        14  1  # See QHSS specification
Q3R_DATAQ_NOT_MT      QHSS_3_RV_STAT        15  1  # See QHSS specification SPU Channel
SAILCMD_RES_NUM       SAILCMD_LAST_RC       0   6  # Cmd Result code. Command result number Display Mnemonic
SAILCMD_PARM_NUM      SAILCMD_LAST_RC       6   5  # Cmd Result code. Parameter in error
SAILCMD_SUBSYS        SAILCMD_LAST_RC       11  4  # Subsystem to which the command is to be routed
SAILCMD_OK            SAILCMD_LAST_RC       15  1  # Cmd Result code. 1 means last command OK, 0 means last command
reject
SAILTSTATUS_00        SAILTASK_00_STAT      0   4  # SAIL Task 00 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_00         SAILTASK_00_STAT      4   4  # SAIL Task 00 number of times it has run since the last reset
SAILTSTATUS_01        SAILTASK_01_STAT      0   4  # SAIL Task 01 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_01         SAILTASK_01_STAT      4   4  # SAIL Task 01 number of times it has run since the last reset
SAILTSTATUS_02        SAILTASK_02_STAT      0   4  # SAIL Task 02 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_02         SAILTASK_02_STAT      4   4  # SAIL Task 02 number of times it has run since the last reset
SAILTSTATUS_03        SAILTASK_03_STAT      0   4  # SAIL Task 03 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_03         SAILTASK_03_STAT      4   4  # SAIL Task 03 number of times it has run since the last reset
SAILTSTATUS_04        SAILTASK_04_STAT      0   4  # SAIL Task 04 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_04         SAILTASK_04_STAT      4   4  # SAIL Task 04 number of times it has run since the last reset
SAILTSTATUS_05        SAILTASK_05_STAT      0   4  # SAIL Task 05 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_05         SAILTASK_05_STAT      4   4  # SAIL Task 05 number of times it has run since the last reset
SAILTSTATUS_06        SAILTASK_06_STAT      0   4  # SAIL Task 06 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_06         SAILTASK_06_STAT      4   4  # SAIL Task 06 number of times it has run since the last reset
SAILTSTATUS_07        SAILTASK_07_STAT      0   4  # SAIL Task 07 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_07         SAILTASK_07_STAT      4   4  # SAIL Task 07 number of times it has run since the last reset
SAILTSTATUS_08        SAILTASK_08_STAT      0   4  # SAIL Task 08 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_08         SAILTASK_08_STAT      4   4  # SAIL Task 08 number of times it has run since the last reset
SAILTSTATUS_09        SAILTASK_09_STAT      0   4  # SAIL Task 09 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_09         SAILTASK_09_STAT      4   4  # SAIL Task 09 number of times it has run since the last reset
SAILTSTATUS_10        SAILTASK_10_STAT      0   4  # SAIL Task 10 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_10         SAILTASK_10_STAT      4   4  # SAIL Task 10 number of times it has run since the last reset
SAILTSTATUS_11        SAILTASK_11_STAT      0   4  # SAIL Task 11 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_11         SAILTASK_11_STAT      4   4  # SAIL Task 11 number of times it has run since the last reset
SAILTSTATUS_12        SAILTASK_12_STAT      0   4  # SAIL Task 12 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_12         SAILTASK_12_STAT      4   4  # SAIL Task 12 number of times it has run since the last reset
SAILTSTATUS_13        SAILTASK_13_STAT      0   4  # SAIL Task 13 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
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SAILTSKRAN_13          SAILTASK_13_STAT      4   4  # SAIL Task 13 number of times it has run since the last reset
SAILTSTATUS_14         SAILTASK_14_STAT      0   4  # SAIL Task 14 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_14          SAILTASK_14_STAT      4   4  # SAIL Task 14 number of times it has run since the last reset
SAILTSTATUS_15         SAILTASK_15_STAT      0   4  # SAIL Task 15 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
SAILTSKRAN_15          SAILTASK_15_STAT      4   4  # SAIL Task 15 number of times it has run since the last reset
SCCMD_RES_NUM          SCCMD_LAST_RC         0   6  # Command result number
SCCMD_PARM_NUM         SCCMD_LAST_RC         6   5  # Parameter in error
SCCMD_SUBSYS           SCCMD_LAST_RC         11  4  # Subsystem to which the command is to be routed
SCCMD_OK               SCCMD_LAST_RC         15  1  # Success code:  1 = last command OK; 0 = last command rejected
TLM_TIME_BLK_ENA       SCI_FMT_BLK_ENA       0   1  # Time block enable
TLM_RAD_BLK_ENA        SCI_FMT_BLK_ENA       1   1  # Radiance data block enable
TLM_ELVP_BLK_ENA       SCI_FMT_BLK_ENA       2   1  # Primary variable elevation block enable
TLM_EL2P_BLK_ENA       SCI_FMT_BLK_ENA       3   1  # Primary elevation 2 block enable
TLM_AZP_BLK_ENA        SCI_FMT_BLK_ENA       4   1  # Primary azimuth block enable
TLM_GYR0_BLK_ENA       SCI_FMT_BLK_ENA       5   1  # Gyro 0 block enable
TLM_GYR1_BLK_ENA       SCI_FMT_BLK_ENA       6   1  # Gyro 1 block enable
TLM_GYR2_BLK_ENA       SCI_FMT_BLK_ENA       7   1  # Gyro 2 block enable
TLM_GYR3_BLK_ENA       SCI_FMT_BLK_ENA       8   1  # Gyro 3 block enable
TLM_ELVS_BLK_ENA       SCI_FMT_BLK_ENA       9   1  # Secondary variable elevation block enable
TLM_EL2S_BLK_ENA       SCI_FMT_BLK_ENA       10  1  # Secondary elevation 2 block enable
TLM_HK_BLK_ENA         SCI_FMT_BLK_ENA       11  1  # Science housekeeping block enable
TLM_DIAG_BLK_ENA       SCI_FMT_BLK_ENA       12  1  # Diagnostic block enable
TLM_AZS_BLK_ENA        SCI_FMT_BLK_ENA       13  1  # Secondary azimuth block enable
SPARE_00_BIT0          SPARE_00D             0   1  # Spare
SPARE_00_BIT1          SPARE_00D             1   1  # Spare
SPARE_00_BIT2          SPARE_00D             2   1  # Spare
SPARE_00_BIT3          SPARE_00D             3   1  # Spare
SPARE_00_BIT4          SPARE_00D             4   1  # Spare
SPARE_00_BIT5          SPARE_00D             5   1  # Spare
SPARE_00_BIT6          SPARE_00D             6   1  # Spare
SPARE_00_BIT7          SPARE_00D             7   1  # Spare
SPARE_00_BIT8          SPARE_00D             8   1  # Spare
SPARE_00_BIT9          SPARE_00D             9   1  # Spare
SPARE_00_BIT10         SPARE_00D             10  1  # Spare
SPARE_00_BIT11         SPARE_00D             11  1  # Spare
SPARE_00_BIT12         SPARE_00D             12  1  # Spare
SPARE_00_BIT13         SPARE_00D             13  1  # Spare
SPARE_00_BIT14         SPARE_00D             14  1  # Spare
SPARE_00_BIT15         SPARE_00D             15  1  # Spare
SPU_CRPHASE_ER_C       SPU_PHASE_ERR_C       0   4  # Error count
SPU_CRDROP_ER_C        SPU_PHASE_ERR_C       4   4  # Error count
SPU_CCPHASE_ER_C       SPU_PHASE_ERR_C       8   4  # Error count
SPU_DATA_ER_C          SPU_PHASE_ERR_C       12  4  # Error count
SSH_DR_CLOSED          SSH_STAT              0   1  # Sun Shield Door CLOSED, 1= CLOSED
SSH_DR_NCLOSED         SSH_STAT              1   1  # Sun Shield Door CLOSED, 0= CLOSED
SSH_DR_OPEN            SSH_STAT              2   1  # Sun Shield Door OPEN, 1= OPEN
SSH_DR_NOPEN           SSH_STAT              3   1  # Sun Shield Door OPEN, 0= OPEN
SSH_DR_LATCHDIS        SSH_STAT              4   1  # Sun Shield Latch disengaged, 1= disenaged
SSH_DR_LATCHNDIS       SSH_STAT              5   1  # Sun Shield Latch not disengaged, 0= disenaged
SSH_DR_LATCHENG        SSH_STAT              6   1  # Sun Shield Latch engaged, 1= enaged
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SSH_DR_LATCHNENG      SSH_STAT              7   1  # Sun Shield Latch not engaged, 0= enaged
SSH_DOOR_STATE        SSH_STAT              8   3  # Sun Shield Door State, NOT_MOVING=0, 1=MOVING_OPEN, 2=
MOVING_CLOSED, 3=MOVING_CRITICAL, 4=, =SAFING(set by IPU SSH control software)
SSH_MOTOR_CONFIG      SSH_STAT              11  1  # SSH Drive Motor configuration, DISABLED =0, ENABLED =1 (Bit 0 of
configuration register)
SSH_DRIVE_DIR         SSH_STAT              12  1  # Sun Shield Door Motor Direction Open =1, Close =0   (Bit 1 of
configuration register)
SSH_HWA_CONFIG        SSH_STAT              14  1  # HWA Configuration, 0 = OFF, 1 = ON, value of DIO bit
SSH_HWA_STATE         SSH_STAT              15  1  # HWA Control State, 0 = OFF, 1 = ON
SUBTLM_MINOR_REV      SUBTMI_BUILD_ID       0   5  # subtmi minor rev num (0 to 31)
SUBTLM_MAJOR_REV      SUBTMI_BUILD_ID       5   3  # subtmi major rev num (0 to 7)
SVA_DR_CLOSED         SVA_STAT              0   1  # Space View Aperature Closed, 1= closed
SVA_DR_NCLOSED        SVA_STAT              1   1  # Space View Aperature Not Closed, 0= closed
SVA_DR_OPEN           SVA_STAT              2   1  # Space View Aperature open, 1= open
SVA_DR_NOPEN          SVA_STAT              3   1  # Space View Aperature Not open, 0= open
SVA_DOOR_STATE        SVA_STAT              4   2  # SVA State, 0 = NOT_MOVING, 1 = OPENING, 2 = CLOSING
SVA_MOTOR_CONFIG      SVA_STAT              6   2  # SVA Drive Motor Configuration, 0= DISABLED, 1 = DRIVE CLOSED, 2
DRIVE OPEN (bits 0-1 of configuration register)
SPARE_STAT_BIT8       SVA_STAT              8   1  # Spare
SPARE_STAT_BIT9       SVA_STAT              9   1  # Spare
SPARE_STAT_BIT10      SVA_STAT              10  1  # Spare
SPARE_STAT_BIT11      SVA_STAT              11  1  # Spare
SPARE_STAT_BIT12      SVA_STAT              12  1  # Spare
SPARE_STAT_BIT13      SVA_STAT              13  1  # Spare
SPARE_STAT_BIT14      SVA_STAT              14  1  # Spare
SPARE_STAT_BIT15      SVA_STAT              15  1  # Spare
TLM_SCI_HK_ID         TLM_ACTIVE_SCIHK      0   10 # Science housekeeping table ID
TLM_SCI_HK_ACTIV      TLM_ACTIVE_SCIHK      12  2  # Active table (0=default, 1=operational, 2=uploaded)
TLM_MINOR_REV         TLM_DB_BUILD_ID       0   5  # tmi minor rev num (0 to 31)
TLM_MAJOR_REV         TLM_DB_BUILD_ID       5   3  # tmi major rev num (0 to 7)
DIAG_STSKPRM_ENA      TLM_DIAG_STAT         0   1  # SAIL task parameter item (0=disabled, 1=enabled)
DIAG_IRAMDMP_ENA      TLM_DIAG_STAT         1   1  # IPU RAM memory dump item (0=disabled, 1=enabled)
DIAG_EPRMDMP_ENA      TLM_DIAG_STAT         2   1  # IPU EEPROM memory dump (SUROM only) item (0=disabled, 1=enabled)
DIAG_TRAMDMP_ENA      TLM_DIAG_STAT         3   1  # TEU RAM memory dump item (0=disabled, 1=enabled)
DIAG_SRAMDMP_ENA      TLM_DIAG_STAT         4   1  # SAIL RAM memory dump item (0=disabled, 1=enabled)
DIAG_SBLKDMP_ENA      TLM_DIAG_STAT         5   1  # SAIL block memory dump item (0=disabled, 1=enabled)
DIAG_TSSCNTL_ENA      TLM_DIAG_STAT         6   1  # TSS control item (0= disabled, 1=enabled)
DIAG_TSSJITR_ENA      TLM_DIAG_STAT         7   1  # TSS jitter item (0=disabled, 1=enabled)
DIAG_HWREGS_ENA       TLM_DIAG_STAT         9   1  # HW Register dump item
DIAG_RAWSPU_ENA       TLM_DIAG_STAT         10  1  # Raw SPU data dump item
DIAG_CMDSMRY_ENA      TLM_DIAG_STAT         11  1  # Command summary item (0=disabled, 1=enabled)
DIAG_STSKINF_ENA      TLM_DIAG_STAT         12  1  # SAIL task information item (0=disabled, 1=enabled)
DIAG_SMEMINF_ENA      TLM_DIAG_STAT         13  1  # SAIL memory information item (0=disabled, 1=enabled)
DIAG_TEXTMSG_ENA      TLM_DIAG_STAT         14  1  # Text message item (0=disabled, 1=enabled)
TSB_STATE             TSB_BOOT_STAT_1       0   3  # 0=Reset, 1=InfoOnly, 2=InfoOnlyErrs, 3=Checking, 4=Loading, 5=
Booting, 6=PostBoot
TSB_IPU_ERROR         TSB_BOOT_STAT_1       3   4  # 0=NoError, 1=TSUError, 2=NoEEPROM, 3=NoAutoboot, 4=SectEmpty, 5=
BadAddress, 6=EETableFail, 7=EEChecksumFail, 8=Timeout, 9=UserAbort, 10=AbnormalExit, 11=AcceptAndReject, 12=SyncError,
13=ChecksumError, 14=EEReadError, 15=Internal
TSB_EEPROM_ON         TSB_BOOT_STAT_1       7   1  # EEPROM Power State, 0= Power on, 1=Power off
TSB_IPU_ERR_CNT       TSB_BOOT_STAT_1       8   4  # Number TSB IPU errors
TSB_SECT              TSB_BOOT_STAT_1       12  4  # Actual EEPROM section used for TSU Boot
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TSB_LAST_BLK          TSB_BOOT_STAT_2       0   10 # Last Block loaded to the TSU
TSB_SUB_STATE1        TSB_BOOT_STAT_2       10  3  # Bits 30 thru 28 of TSB_ADDR_OFF
TSB_SUB_STATE2        TSB_BOOT_STAT_2       13  1  # Bit 8 of TSB_ADDR_OFF
TSB_SUB_STATE3        TSB_BOOT_STAT_2       14  2  # Bits 5 thru 4 of TSB_ADDR_OFF
TSB_EE_TBL_INDEX      TSB_BOOT_STAT_3       0   7  # Subcom Index of EE Table Array in Word TSB_EE_TABLE
TSB_EE_BOOT_SRC       TSB_BOOT_STAT_3       7   5  # HIR_IPU_TSUSECTION command Parameter 0
TSB_EE_MBIC_ADDR      TSB_BOOT_STAT_4       0   19 # Subcom MBIC Address in Word TSB_BOOT_STAT_4
TSB_EE_BOOT_FLAG      TSB_BOOT_STAT_4       19  2  #
TSB_EE_MBIC_SUB       TSB_BOOT_STAT_4       21  2  # Subcom Index of MBIC Address in Word TSB_BOOT_STAT_4, 0=MBIC A
Start, 1=MBIC A End, 2=MBIC B Start, 3=MBIC B End
TSB_EE_OVERIDE        TSB_BOOT_STAT_4       23  9  # HIR_IPU_TSUSECTION command Parameter 1
TSS_DMA_PARITY_C      TSS_DMA_ERR_C         0   4  # DMA Parity error counter
TSS_DMA_FRAME_C       TSS_DMA_ERR_C         4   4  # DMA Framing error counter
TSS_DMA_PROG_C        TSS_DMA_ERR_C         8   4  # DMA HW cmd programming error counter
TSS_DMA_PHASE_C       TSS_DMA_ERR_C         12  4  # DMA in progress error counter
TSU_CPU_SIDE          TSU_BUILD_ID          0   1  # 0=SIDE A, 1=SIDE B, Read from LIO PID
TSU_ALPHA_BUILD       TSU_BUILD_ID          2   1  # 1=ALPHA TEST BUILD, 0=CODE FREEZE/RELEASE
TSU_BUILD_NUM         TSU_BUILD_ID          3   7  # BUILD NUMBER              0-99
TSU_MINOR_REV         TSU_BUILD_ID          10  3  # MINOR_REVISION NUMBER     1-7
TSU_MAJOR_REV         TSU_BUILD_ID          13  3  # MAJOR_REVISION NUMBER     1-7
TSU_WDT_EXPIRED       TSU_FLAG_BITS         0   1  # 1=Watchdog Expired
TSU_EXCEPTION         TSU_FLAG_BITS         4   1  # 1=Processor exception occurred
TSU_ERR_INJECT        TSU_FLAG_BITS         8   1  # 1=Error injection enabled
TSW_CMDACC_SIG        TSW_CMDA_SIG          8   8  # Command signature
TSW_CMDREJ_REAS       TSW_CMDR_SIG          0   8  # Command reject reason
TSW_CMDREJ_SIG        TSW_CMDR_SIG          8   8  # Command reject signature
TSW_CR_SS_INDEX       TSW_CR_SYNC_STAT      0   4  # Value of Scanner Strobe index internal to TEU when CR detected
TSW_CR_SS_SYNC        TSW_CR_SYNC_STAT      4   4  # Number Times SS index reset to sync SS to CR
TSW_CR_SS_OUTSYN      TSW_CR_SYNC_STAT      8   4  # Number Times CR interval incorrect once sync SS to CR
TSW_CR_START_CNT      TSW_CR_SYNC_STAT      12  2  # Number of Times chopper tried to start
TSW_EINIT_STAT        TSW_CSC_STAT          0   1  # Encoder Init CSC status, 0 = disabled, 1 = enabled
TSW_SMC_STAT          TSW_CSC_STAT          1   1  # Scan Mirror Control CSC status, 0 = disabled, 1 = enabled
TSW_HWCMD_STAT        TSW_CSC_STAT          2   1  # Hardware Command Handling CSC status, 0 = disabled, 1 = enabled
TSW_DACQ_STAT         TSW_CSC_STAT          3   1  # Data Acquisition CSC status, 0 = disabled, 1 = enabled
TSW_SS_STAT           TSW_CSC_STAT          4   1  # Subsystem Support CSC status, 0 = disabled, 1 = enabled
TSW_CHOP_FM_STAT      TSW_CSC_STAT          5   1  # Chopper fault management, 0= disabled, 1= enabled
TSW_EEA_FM_STAT       TSW_CSC_STAT          6   1  # EEA fault management, 0= disabled, 1= enabled
TSW_TLM_TST_STAT      TSW_CSC_STAT          7   1  # Default telemetry test pattern, 0=off, 1=on (test data output)
TSW_WD_STAT           TSW_CSC_STAT          8   1  # Watchdog Timer, 0=disabled, 1=enabled
TSW_SSWD_STAT         TSW_CSC_STAT          9   1  # Scanner strobe watchdog status, 0 = disabled, 1 = enabled
TSW_TLM_DIAGSTAT      TSW_CSC_STAT          10  1  # Diagnostic telemetry test pattern, 0=off, 1=on (test data output)
TSW_AZM_FM_STAT       TSW_CSC_STAT          11  1  # Measured current azimuth fault management, 0=disabled, 1=enabled
TSW_AZC_FM_STAT       TSW_CSC_STAT          12  1  # Commanded current azimuth fault management, 0=disabled, 1=enabled
TSW_CPU_SIDE          TSW_CSCI_BLD_ID       0   1  # 0 means A side, 1 means B side
TSW_ALPHA_BUILD       TSW_CSCI_BLD_ID       2   1  # 0= TEU code is released, 1= TEU code is under development
TSW_BUILD_NUM         TSW_CSCI_BLD_ID       3   7  # Build Number, release number is CPU_TYPE.REVISION.BUILD_NUM
TSW_REVISION          TSW_CSCI_BLD_ID       10  3  # Revision number
TSW_CPU_TYPE          TSW_CSCI_BLD_ID       13  3  # 0 is unused, 1 means an INTEL PC, 2 means the EM PSA-32, 3 is the
PFM PSA-32 4,5,6,7 are unused
TSW_PARITY_ERR        TSW_DMA_R_ERR_C       0   4  # Parity erors detected since reboot (v4.82 and later only)
TSW_FRAMING_ERR       TSW_DMA_R_ERR_C       4   4  # Framing errors detected since reboot (v4.82 and later only)
TSW_PROGRAM_ERR       TSW_DMA_R_ERR_C       8   4  # QHSS programming errors detected since reboot (v4.82 and later
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only)
TSW_DMA_NC_ERR        TSW_DMA_R_ERR_C       12  4  # DMA-not-complete errors detected since reboot (v4.82 and later
only)
TSW_CNTRL_AZ          TSW_EEACNFG           0   2  # Control encoder for azimuth, 00=none, 01=primary, 10=secondary, 11=
forbidden
TSW_SPARE_ECNFG1      TSW_EEACNFG           2   1  # Spare
TSW_TEST_ANGLE        TSW_EEACNFG           3   1  # Test angle mode off (0) or on (1)
TSW_CNTRL_EL          TSW_EEACNFG           4   2  # Control encoder for elevation, 00=none, 01=primary, 10=secondary,
11=forbidden
TSW_CNTRL_RH          TSW_EEACNFG           8   2  # Control read head, 00=forbidden, 01=EL RH1, 10=EL RH2, 11=Ave 1&2
TSW_SPARE_ECNFG2      TSW_EEACNFG           10  6  # Spare
TSW_EXCEPT_ADDR       TSW_EXCEPTION         0   19 # Address of last exception/4
TSW_EXCEPT_ENA        TSW_EXCEPTION         19  1  # Exception skip disabled if high
TSW_EXCEPT_CNT        TSW_EXCEPTION         20  8  # Number of exceptions since last clear
TSW_EXCEPT_TYPE       TSW_EXCEPTION         28  3  # Type of last exception (0=FPU, 2=MCI, 3=OSI, 4=ISI, 6=AI, 7=PI)
TSW_EXCEPT_OCCR       TSW_EXCEPTION         31  1  # Exception occurred if high
TSW_CHOP_FAULT        TSW_FAULT_STAT        0   1  # Chopper fault occurred, nominal = 0 /over power = 1
TSW_PEEA_FAULT        TSW_FAULT_STAT        1   2  # Primary EEA fault occurred, nominal = 0 /fault type = 1 or 2
TSW_SEEA_FAULT        TSW_FAULT_STAT        3   2  # Secondary EEA fault occurred, nominal = 0 /fault type = 1 or 2
TSW_CLOCK_FAULT       TSW_FAULT_STAT        5   1  # Lost Scanner Strobe, fall back to internal clock mode
TSW_CHSUM_FAULT       TSW_FAULT_STAT        6   1  # Memory Scrub detected program checksum error
TSW_SYNC_FAULT1       TSW_FAULT_STAT        7   1  # Chopper Rotation Signal Not detected in expected Scanner Strobe
TSW_SYNC_FAULT2       TSW_FAULT_STAT        8   1  # Average SS cycle time doesn’t match Chopper Freq Info in TEU
TSW_SYNC_FAULT3       TSW_FAULT_STAT        9   1  # Jitter in SS cycle time exceeds limits
TSW_SYNC_FAULT4       TSW_FAULT_STAT        10  1  # Interval between Chopper Rotation Signal detection NOT 12 SS events
TSW_SYNC_FAULT5       TSW_FAULT_STAT        11  1  # Fault4 detected at least once in last 5 sec
TSW_AZM_FAULT_1       TSW_FAULT_STAT        12  1  # Az meas current exceeds limit 1, FM is cmd words set to 0
TSW_AZM_FAULT_2       TSW_FAULT_STAT        13  1  # Az meas current exceeds limit 2, FM is mtr pwr disabled
TSW_AZC_FAULT         TSW_FAULT_STAT        14  1  # Az cmd current exceeds limit, FM is mtr pwr disabled
TSW_MTR_PWR           TSW_HWCNFG            0   1  # Motor power status, 0 = disabled, 1 = enabled
TSW_AZ_UNSHORTED      TSW_HWCNFG            1   1  # Coil short status, 0 = shorted, 1 = unshorted
TSW_AZ_CONNECT        TSW_HWCNFG            2   1  # Coil connected status, 0 = disconnected, 1 = connected
TSW_EL1_UNSHORTD      TSW_HWCNFG            3   1  # Coil short status, 0 = shorted, 1 = unshorted
TSW_EL1_CONNECT       TSW_HWCNFG            4   1  # Coil connected status, 0 = disconnected, 1 = connected
TSW_EL2_UNSHORTD      TSW_HWCNFG            5   1  # Coil short status, 0 = shorted, 1 = unshorted
TSW_EL2_CONNECT       TSW_HWCNFG            6   1  # Coil connected status, 0 = disconnected, 1 = connected
TSW_ACTIVE_EEA        TSW_HWCNFG            7   2  # EEA side powered on: 00=none, 01=primary, 10=secondary, 11=both
TSW_SPARE_HCNFG0      TSW_HWCNFG            9   2  # Spare
TSW_CHOPPER_CNT       TSW_HWCNFG            11  2  # Chopper connection status: 00=disconnected, 01=A connected, 10=B
connected, 11=both connected
TSW_CHOPPER_ENA       TSW_HWCNFG            13  1  # 0 = disabled, 1 = enabled
TSW_CHOPPER_SYNC      TSW_HWCNFG            14  1  # Chopper in-sync flag, 0 = false, 1 = true
TSW_CHOPPER_HCM       TSW_HWCNFG            15  1  # High current mode flag, 0 = off, 1 = on
TSW_KEEPALIV_ERR      TSW_QHSS_ERR_C        0   4  # Keep-alive-NOT-detected error count since reboot (v4.82 and later
only)
TSW_CMDQOVRF_ERR      TSW_QHSS_ERR_C        4   4  # QHSS command queue overflow error count since reboot (v4.82 and
later only)
TSW_DMA_ERR           TSW_QHSS_ERR_C        8   4  # Transmit-DMA-NOT-complete error count since reboot (v4.82 and later
only)
TSW_SMCTL_STAT        TSW_SM_EI_STAT        0   8  # Scan mirror control status bits
TSW_SCAN_START        TSW_SM_EI_STAT        0   1  # Scan Start Received, 0 = false, 1 = true (Cleared next SS)
TSW_SCAN_ACTIVE       TSW_SM_EI_STAT        1   1  # Scan Active - under closed loop control, 0 = false, 1 = true
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TSW_SAFE_NOW          TSW_SM_EI_STAT        2   1  # Safing Mirror (12 sec process), 0 = false, 1 = true
TSW_AZPOS_CONST       TSW_SM_EI_STAT        3   1  # AzPosConstant (archaic), 0 = false, 1 = true
TSW_SAFE_WAIT         TSW_SM_EI_STAT        4   1  # Waiting to Safe (30 sec time-out), 0 = false, 1 = true
TSW_SM_EI_SPARE       TSW_SM_EI_STAT        5   3  # Spare
TSW_EIC_STAT          TSW_SM_EI_STAT        8   8  # Encoder initialization control status bits
TSW_AZP_INIT          TSW_SM_EI_STAT        8   1  # Primary Azimuth encoder initialized, 0 = false, 1 = true
TSW_EL2P_INIT         TSW_SM_EI_STAT        9   1  # Primary Elevation 2 encoder initialized, 0 = false, 1 = true
TSW_EL1P_INIT         TSW_SM_EI_STAT        10  1  # Primary Elevation 1 encoder initialized, 0 = false, 1 = true
TSW_EI_OLOOP          TSW_SM_EI_STAT        11  1  # Open loop EI active, 0 = false, 1 = true
TSW_AZS_INIT          TSW_SM_EI_STAT        12  1  # Secondary Azimuth encoder initialized, 0 = false, 1 = true
TSW_EL2S_INIT         TSW_SM_EI_STAT        13  1  # Secondary Elevation 2 encoder initialized, 0 = false, 1 = true
TSW_EL1S_INIT         TSW_SM_EI_STAT        14  1  # Secondary Elevation 1 encoder initialized, 0 = false, 1 = true
TSW_EI_CLOOP          TSW_SM_EI_STAT        15  1  # Closed loop EI active, 0 = false, 1 = true
HIR_CMD_MINOR_REV     HIR_CMD_DB_BUILD_ID   0   5  # cmd minor rev num (0 to 31)
HIR_CMD_MAJOR_REV     HIR_CMD_DB_BUILD_ID   5   3  # cmd major rev num (0 to 7)
HIR_BIP_CMD_ERR       HIR_CMD_ERR_0         0   1  # 1 means an error occured while executing a BIP command.
HIR_UPL_CMD_ERR       HIR_CMD_ERR_0         1   1  # 1 means an error occured while executing a UPL command.
HIR_CSS_CMD_ERR       HIR_CMD_ERR_0         2   1  # 1 means an error occured while executing a CSS command.
HIR_GSS_CMD_ERR       HIR_CMD_ERR_0         3   1  # 1 means an error occured while executing a GSS command.
HIR_IPU_CMD_ERR       HIR_CMD_ERR_0         4   1  # 1 means an error occured while executing a IPU command.
HIR_MAC_CMD_ERR       HIR_CMD_ERR_0         5   1  # 1 means an error occured while executing a MAC command.
HIR_OPH_CMD_ERR       HIR_CMD_ERR_0         6   1  # 1 means an error occured while executing a OPH command
HIR_PSS_CMD_ERR       HIR_CMD_ERR_0         7   1  # 1 means an error occured while executing a PSS command.
HIR_SAIL_CMD_ERR      HIR_CMD_ERR_0         8   1  # 1 means an error occured while executing a SAIL command.
HIR_SPU_CMD_ERR       HIR_CMD_ERR_0         9   1  # 1 means an error occured while executing a SPU command.
HIR_SSH_CMD_ERR       HIR_CMD_ERR_0         10  1  # 1 means an error occured while executing a SSH command.
HIR_SVA_CMD_ERR       HIR_CMD_ERR_0         11  1  # 1 means an error occured while executing a SVA command.
HIR_TSS_CMD_ERR       HIR_CMD_ERR_0         12  1  # 1 means an error occured while executing a TSS command.
HIR_GSE_CMD_ERR       HIR_CMD_ERR_0         13  1  # 1 means an error occured while executing a GSE command.
HIR_CMD_ERR           HIR_CMD_ERR_0         14  1  # 1 means a low level error occured processing a cmd within the
command handler.
HIR_CSS_SPLY_PRI_OFF  HIR_CSS_DDCAG_STAT    0   1  # Primary   Convertor Selection Status (1= Not Selected, 0= Selected)
HIR_CSS_SPLY_RED_OFF  HIR_CSS_DDCAG_STAT    1   1  # Redundant Convertor Selection Status (1= Not Selected, 0= Selected)
HIR_CSS_C1_UNCAGED    HIR_CSS_DDCAG_STAT    2   1  # Compressor 1 caging status ( 0= caged, 1= uncaged)
HIR_CSS_C2_UNCAGED    HIR_CSS_DDCAG_STAT    3   1  # Compressor 2 caging status ( 0= caged, 1= uncaged)
HIR_CSS_D1_UNCAGED    HIR_CSS_DDCAG_STAT    4   1  # Displacer  1 caging status ( 0= caged, 1= uncaged)
HIR_CSS_D2_UNCAGED    HIR_CSS_DDCAG_STAT    5   1  # Displacer  2 caging status ( 0= caged, 1= uncaged)
HIR_CSS_IBF_FLAG      HIR_CSS_DDCAG_STAT    6   1  # 1 means IPU CSS serial control/tlm interface is enabled
HIR_CSS_OBF_FLAG      HIR_CSS_DDCAG_STAT    7   1  # 1 means IPU CSS serial tlm is available.
HIR_CSS_OSTROKE_ERR   HIR_CSS_ERROR         0   1  # 1= Overstroke Error
HIR_CSS_RESET_ERR     HIR_CSS_ERROR         1   1  # 1= Just been reset, (Watchdog timeout or just powered on)
HIR_CSS_CMD_XMIT_ERR  HIR_CSS_ERROR         2   1  # 1= Last Command Transmission error
HIR_CSS_CMD_STATE_ER  HIR_CSS_ERROR         3   1  # 1= Last Command Illegal State error
HIR_CSS_CMD_PARM_ERR  HIR_CSS_ERROR         4   1  # 1= Last Command illegal parameter error
HIR_CSS_CMD_TEMP_ERR  HIR_CSS_ERROR         5   1  # 1= Overtemp error in warm-up state
HIR_CSS_CMU_CNTRL     HIR_CSS_OP_STAT       0   1  # 0= Electronics Only, 1= Control
HIR_CSS_MANUAL        HIR_CSS_OP_STAT       1   1  # 0= off, 1= Manual Mode
HIR_CSS_THERMOSTATIC  HIR_CSS_OP_STAT       2   1  # 0= off, 1= Thermostatic Mode
HIR_CSS_WARMUP        HIR_CSS_OP_STAT       3   1  # 0= off, 1= Warmup Mode
HIR_CSS_OS_OVERIDE    HIR_CSS_OP_STAT       4   1  # 0 = normal, 1 = override
HIR_CSS_DIODE_SELECT  HIR_CSS_OP_STAT       5   1  # 0= diode 0 selected , 1= diode 1 selected
HIR_CSS_PACKED_PCOEF  HIR_CSS_PACKED_PID    0   8  # CSS P (proportional) coefficient (LS 8 bits)
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HIR_CSS_PACKED_ICOEF  HIR_CSS_PACKED_PID    8   4  # CSS I (integral) coefficient (LS 6 bits)
HIR_CSS_PACKED_DCOEF  HIR_CSS_PACKED_PID    12  4  # CSS D (differential) coefficient (LS 4 bits)
HIR_GYS0_MOTOR_ON     HIR_GYR0_STAT         0   1  # GYRO 0 Status, Motor status, 1 means ON, 0 means OFF
HIR_GYS0_MOTOR_SPEED  HIR_GYR0_STAT         1   3  # GYRO 0 Status, 3 bits Motor Speed Code
HIR_GYS0_TEMP_INHIB   HIR_GYR0_STAT         4   1  # GYRO 0 Status, Temperature Inhib, 1 means INHIB, 0 means ENAB
HIR_GYS0_PWR_MODE     HIR_GYR0_STAT         5   1  # GYRO 0 Status, Power Mode, 1 means HIGH PWR, 0 means NORMAL PWR
HIR_GYS0_IN_SYNC      HIR_GYR0_STAT         6   1  # GYRO 0 Status, Sync Status, 1 means IN SYNC, 0 means NOT IN SYNC
HIR_GYS0_OVRC_ENAB    HIR_GYR0_STAT         7   1  # GYRO 0 Status, Moter overcurrent trip, 1 means ENAB, 0 means INHIB
HIR_GYS0_ENC_RANGE    HIR_GYR0_STAT         8   1  # GYRO 0 Status, Encoder Range, 1 means FINE, 0 means COARSE
HIR_GYS0_AB_SIDE      HIR_GYR0_STAT         9   1  # This bit has no meaning for GYR0
HIR_GYS0_HEATER_OFF   HIR_GYR0_STAT         10  1  # GYRO 0 Status, Heater Status, 1=off, 0=on
HIR_GYS0_CHAN_ID      HIR_GYR0_STAT         13  3  # GYRO 3 Status, 3 bit GYRO Channel Address
HIR_GYS1_MOTOR_ON     HIR_GYR1_STAT         0   1  # GYRO 1 Status, Motor status, 1 means ON, 0 means OFF
HIR_GYS1_MOTOR_SPEED  HIR_GYR1_STAT         1   3  # GYRO 1 Status, 3 bits Motor Speed Code
HIR_GYS1_TEMP_INHIB   HIR_GYR1_STAT         4   1  # GYRO 1 Status, Temperature Inhib, 1 means INHIB, 0 means ENAB
HIR_GYS1_PWR_MODE     HIR_GYR1_STAT         5   1  # GYRO 1 Status, Power Mode, 1 means HIGH PWR, 0 means NORMAL PWR
HIR_GYS1_IN_SYNC      HIR_GYR1_STAT         6   1  # GYRO 1 Status, Sync Status, 1 means IN SYNC, 0 means NOT IN SYNC
HIR_GYS1_OVRC_ENAB    HIR_GYR1_STAT         7   1  # GYRO 1 Status, Moter overcurrent trip, 1 means ENAB, 0 means INHIB
HIR_GYS1_ENC_RANGE    HIR_GYR1_STAT         8   1  # GYRO 1 Status, Encoder Range, 1 means FINE, 0 means COARSE
HIR_GYS1_AB_SIDE      HIR_GYR1_STAT         9   1  # For GYR1, 1 = A-side on (all 4 gyros)
HIR_GYS1_HEATER_OFF   HIR_GYR1_STAT         10  1  # GYRO 1 Status, Heater Status, 1=off, 0=on
HIR_GYS1_CHAN_ID      HIR_GYR1_STAT         13  3  # GYRO 1 Status, 3 bit GYRO Channel Address
HIR_GYS2_MOTOR_ON     HIR_GYR2_STAT         0   1  # GYRO 2 Status, Motor status, 1 means ON, 0 means OFF
HIR_GYS2_MOTOR_SPEED  HIR_GYR2_STAT         1   3  # GYRO 2 Status, 3 bits Motor Speed Code
HIR_GYS2_TEMP_INHIB   HIR_GYR2_STAT         4   1  # GYRO 2 Status, Temperature Inhib, 1 means INHIB, 0 means ENAB
HIR_GYS2_PWR_MODE     HIR_GYR2_STAT         5   1  # GYRO 2 Status, Power Mode, 1 means HIGH PWR, 0 means NORMAL PWR
HIR_GYS2_IN_SYNC      HIR_GYR2_STAT         6   1  # GYRO 2 Status, Sync Status, 1 means IN SYNC, 0 means NOT IN SYNC
HIR_GYS2_OVRC_ENAB    HIR_GYR2_STAT         7   1  # GYRO 2 Status, Moter overcurrent trip, 1 means ENAB, 0 means INHIB
HIR_GYS2_ENC_RANGE    HIR_GYR2_STAT         8   1  # GYRO 2 Status, Encoder Range, 1 means FINE, 0 means COARSE
HIR_GYS2_AB_SIDE      HIR_GYR2_STAT         9   1  # For GYR2, 1 = B-side on (all 4 gyros)
HIR_GYS2_HEATER_OFF   HIR_GYR2_STAT         10  1  # GYRO 2 Status, Heater Status, 1=off, 0=on
HIR_GYS2_CHAN_ID      HIR_GYR2_STAT         13  3  # GYRO 2 Status, 3 bit GYRO Channel Address
HIR_GYS3_MOTOR_ON     HIR_GYR3_STAT         0   1  # GYRO 3 Status, Motor status, 1 means ON, 0 means OFF
HIR_GYS3_MOTOR_SPEED  HIR_GYR3_STAT         1   3  # GYRO 3 Status, 3 bits Motor Speed Code
HIR_GYS3_TEMP_INHIB   HIR_GYR3_STAT         4   1  # GYRO 3 Status, Temperature Inhib, 1 means INHIB, 0 means ENAB
HIR_GYS3_PWR_MODE     HIR_GYR3_STAT         5   1  # GYRO 3 Status, Power Mode, 1 means HIGH PWR, 0 means NORMAL PWR
HIR_GYS3_IN_SYNC      HIR_GYR3_STAT         6   1  # GYRO 3 Status, Sync Status, 1 means IN SYNC, 0 means NOT IN SYNC
HIR_GYS3_OVRC_ENAB    HIR_GYR3_STAT         7   1  # GYRO 3 Status, Moter overcurrent trip, 1 means ENAB, 0 means INHIB
HIR_GYS3_ENC_RANGE    HIR_GYR3_STAT         8   1  # GYRO 3 Status, Encoder Range, 1 means FINE, 0 means COARSE
HIR_GYS3_AB_SIDE      HIR_GYR3_STAT         9   1  # This bit has no meaning for GYR3
HIR_GYS3_HEATER_OFF   HIR_GYR3_STAT         10  1  # GYRO 3 Status, Heater Status, 1=off, 0=on
HIR_GYS3_CHAN_ID      HIR_GYR3_STAT         13  3  # GYRO 3 Status, 3 bit GYRO Channel Address
HIR_ECHO_PKT_SEQ_CTR  HIR_IPU_ALIVE         0   5  # Echo of packet sequence counter
HIR_TURN_OFF_HIRDLS   HIR_IPU_ALIVE         5   3  # If = 111, spacecraft to power off HIRDLS
HIR_IPU_ALIVE_SPARES  HIR_IPU_ALIVE         8   8  # Spares
HIR_IPU_SIDE          HIR_IPU_CSCI_BLD_ID   0   1  # IPU Subsystem status 0 means A side is active, 1 means B side is
active
HIR_IPU_KERNEL_TYPE   HIR_IPU_CSCI_BLD_ID   1   1  # TBD - 0 means IPU code loaded after vxworks kernel, 1 means IPU
code loaded as part of vxWorks kernel
HIR_IPU_ALPHA_BUILD   HIR_IPU_CSCI_BLD_ID   2   1  # 0= IPU code is released, 1= IPU code is under development
HIR_IPU_BUILD_NUM     HIR_IPU_CSCI_BLD_ID   3   7  # Build Number, release number is CPU_TYPE.REVISION.BUILD_NUM
HIR_IPU_REVISION      HIR_IPU_CSCI_BLD_ID   10  3  # Revision number
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HIR_IPU_CPU_TYPE      HIR_IPU_CSCI_BLD_ID   13  3  # 0 is unused, 1 means an INTEL PC, 2 means the EM PSA-32, 3 is the
PFM PSA-32, 4,5,6,7 are unused
HIR_IOBIC_TG_ERR      HIR_IPU_ERR_0         0   1  # 1 means the Timing Generator Board didn't respond during
initialization.
HIR_IOBIC_SIO_ERR     HIR_IPU_ERR_0         1   1  # 1 means the Serial I/O Interface Board didn't respond during
initialization.
HIR_IOBIC_EDAQ_ERR    HIR_IPU_ERR_0         2   1  # 1 means the EDAQ Interface Board didn't respond during
initialization.
HIR_TSS_TLM_QHSS_ERR  HIR_IPU_ERR_0         3   1  # 1 means the TSS Tlm QHSS Channel encountered an error.
HIR_CHOP_SYNC_ERR     HIR_IPU_ERR_0         4   1  # Chopper Sync failed for SPU.  Fallback to internal chopper ref
HIR_TSS_CMD_QHSS_ERR  HIR_IPU_ERR_0         5   1  # Spare IPU Error Bit
HIR_SPU_QHSS_ERR      HIR_IPU_ERR_0         6   1  # 1 means the SPU data receive encountered an error.
HIR_EXEC_OVERRUN_ERR  HIR_IPU_ERR_0         7   1  # 1 means the IPU Executive did not finish within a chopper rotation.
HIR_SPU_DATA_ERR      HIR_IPU_ERR_0         8   2  # 1 means the SPU did not send data last cr.  2 means it did not
finish sending data.
HIR_TSS_TLM_NOPKT_ER  HIR_IPU_ERR_0         10  1  # 1 means the IPU did not receive TSS data packet
HIR_TSS_TLM_LEN_ERR   HIR_IPU_ERR_0         11  1  # 1 means the TSS recieved a Tlm packet but there was an incorrect
packet length specified
HIR_TSS_TLM_SUMA_ERR  HIR_IPU_ERR_0         12  1  # 1 means a TSW App code packet checksum error occurred
HIR_TSB_TLM_SUMH_ERR  HIR_IPU_ERR_0         13  1  # 1 means a TSU packet HK block checksum error occurred
HIR_TSB_TLM_SUMD_ERR  HIR_IPU_ERR_0         14  1  # 1 means a TSU packet Diag block checksum error occurred
HIR_TSS_DBL_PKT_ERR   HIR_IPU_ERR_0         15  1  # IPU received 2 packets from TEU in 1 CR (reset by faultclr)
HIR_SPU_CR_PHASE_ERR  HIR_IPU_ERR_1         0   1  # 1 means the chopper rotation counter was not constant within a
given cr
HIR_SPU_CR_DROP_ERR   HIR_IPU_ERR_1         1   1  # 1 means 1 or more cr SPU radiance data packets was not received by
the qhss
HIR_SPU_CC_PHASE_ERR  HIR_IPU_ERR_1         2   1  # 1 means the value for one or more chopper cycles was not correct
HIR_SPU_POWER_PILEUP  HIR_IPU_ERR_1         3   1  # 1 means the SPU received a power select command while still
processing previous command
HIR_SPU_RESET_PILEUP  HIR_IPU_ERR_1         4   1  # 1 means the SPU received a reset command while still processing
previous command
HIR_PSS_ERR           HIR_IPU_ERR_1         5   6  # See following 6 entries.
HIR_PSS_IRC_OVFL_ERR  HIR_IPU_ERR_1         5   1  # 1 means the PSS received more than 1 IRC per 4 CR's
HIR_PSS_IF_BUSY_ERR   HIR_IPU_ERR_1         6   1  # 1 means the PSS Interface was busy unexpectedly.
HIR_PSS_PILEUP_ERR    HIR_IPU_ERR_1         7   1  # 1 means the PSS Interface received a command while latching a relay
HIR_PSS_FUNC_ERR      HIR_IPU_ERR_1         8   1  # 1 means the PSS Switch routing encountered an invalid Function-
Action code combination
HIR_PSS_MAC_ERR       HIR_IPU_ERR_1         9   1  # 1 means the PSS Switch routine received an error status from the
Macro SS while executing a PSM
HIR_PSS_EXE_ERR       HIR_IPU_ERR_1         10  1  # 1 means the PSS encountered an execution error while executing an
IRC
HIR_IFC_ERR           HIR_IPU_ERR_1         11  2  # See following 2 entries
HIR_IFC_IF_BUSY       HIR_IPU_ERR_1         11  1  # 1 means the IFC interface was busy unexpectedly
HIR_IFC_TLM_ERR       HIR_IPU_ERR_1         12  1  # 1 means the IFC encountered an error while gathering TLM
HIR_MBIC_A_ERR        HIR_IPU_ERR_1         13  1  # 1 means the A MBIC didn't respond during initialization
HIR_MBIC_B_ERR        HIR_IPU_ERR_1         14  1  # 1 means the B MBIC didn't respond during initialization
HIR_EDAQ_BUSY_ERR     HIR_IPU_ERR_1         15  1  # 1 means the EDAQ Telemetry Converter was unexpectedly busy.
HIR_EDAQ_ADC_FLT_ERR  HIR_IPU_ERR_2         0   1  # 1 means the ADC is in a latch up state.  Telemetry will not be
reported for 425 ms
HIR_PSS_CMD_ECHO_ERR  HIR_IPU_ERR_2         1   1  # 1 means the was a miscompare on PSS a control word
HIR_DOOR_SAF_ANG_ERR  HIR_IPU_ERR_2         2   1  # 1 means the sunshield tried to move past the safe angle without a
critical enable command
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HIR_S1553_BISTPOLLED  HIR_IPU_ERR_2         3   1  # 1 means the S/C polled for BIST word via 1553 TMC19.
HIR_SCIPKT_LOSS       HIR_IPU_ERR_2         4   1  # 1 means science packet loss has occured.
HIR_ENGPKT_LOSS       HIR_IPU_ERR_2         5   1  # 1 means engineering packet loss has occured.
HIR_SSH_HWA_TIMEOUT   HIR_IPU_ERR_2         6   1  # 1 means the HWA timed out. 0, means its fine
HIR_SPU_FAULT_A       HIR_IPU_ERR_2         7   1  # SPU fault status bit Read from TG DIO port, 1= Fault condition on
TLM side A
HIR_SPU_FAULT_B       HIR_IPU_ERR_2         8   1  # SPU fault status bit Read from TG DIO port, 1= Fault condition on
TLM side B
HIR_CSS_CHKSUM_ERR    HIR_IPU_ERR_2         9   1  # 1 means checksum failure on TLM transfer from CSS
HIR_SC_SOFT_RESET     HIR_IPU_ERR_2         10  1  # 1 means a soft reset command was received on 1553 (RSA27) Reset
action TBD.
HIR_SC_HARD_RESET     HIR_IPU_ERR_2         11  1  # 1 means a hard reset command was received on 1553 (RSA27) Reset
action TBD.
HIR_SC_INVLD_RESET    HIR_IPU_ERR_2         12  1  # 1 means was received on 1553 (RSA27) but ignored.
HIR_S1553_ITF_TST     HIR_IPU_ERR_2         13  1  # 1 means 1553 Summit status register 9 TF (Terminal Flag) bit was
set by IPU for test purposes
HIR_S1553_BIST_CMDED  HIR_IPU_ERR_2         14  1  # 1 means 1553 Summit was commanded by S/C via RMC3 to perform a
Built-in Self Test.
HIR_S1553_REINIT      HIR_IPU_ERR_2         15  1  # 1 means the Summit was idle (perhaps because of a BIST) was
reinitialized.
HIR_IPU_UPL_SEQ_ERR   HIR_IPU_ERR_3         0   1  # 1 means an improper sequence of IPU Upload Commands was received,
including block number out of sequence
HIR_IPU_UPL_SYS_ERR   HIR_IPU_ERR_3         1   1  # 1 means an invalid IPU Upload Subsystem ID
HIR_IPU_UPL_PROC_ERR  HIR_IPU_ERR_3         2   1  # 1 means an IPU Upload Processing Error occured
HIR_IPU_UPL_ABORTED   HIR_IPU_ERR_3         3   1  # 1 means an IPU Upload was aborted by a HIR_UPL_HEADER command with
numblocks= 0 and IPU_UPL_INPROG subtmi True
HIR_SSH_DORMOT_OT_ER  HIR_IPU_ERR_3         4   1  # SSH door motor over temperature fault
HIR_SSH_HWA_OT_ERR    HIR_IPU_ERR_3         5   1  # HWA over temperature fault
HIR_TSS_ID_ERR        HIR_IPU_ERR_3         6   1  # 1 means an App Hk or Sci invalid block ID
HIR_TSB_ID_ERR        HIR_IPU_ERR_3         7   1  # 1 means an TSU Hk or Diag invalid block ID
HIR_TSS_HK_BSEQ_ERR   HIR_IPU_ERR_3         8   1  # 1 means an App HK block counter out of sequence
HIR_TSS_SCI_BSEQ_ERR  HIR_IPU_ERR_3         9   1  # 1 means an App Sci block counter out of sequence
HIR_TSU_HK_BSEQ_ERR   HIR_IPU_ERR_3         10  1  # 1 means an TSU HK block counter out of sequence
HIR_TSU_DIAG_BSEQ_ER  HIR_IPU_ERR_3         11  1  # 1 means an TSU DIAG block counter out of sequence
HIR_TSS_TLM_TOUT_ERR  HIR_IPU_ERR_3         12  1  # 1 means a timeout occured waiting for TSS TLM - resync occurred
HIR_TSS_DMA_PSEQ_ERR  HIR_IPU_ERR_3         13  1  # 1 means the TLM DMA packet counter was out of sequence
HIR_TSS_HSS_CMDQ_ERR  HIR_IPU_ERR_3         14  1  # 1 means timeout occured waitng for TSS HSS CMD queue to be empty.
TSS not powered or not functioning
HIR_GSS_SIO_BUSY_ERR  HIR_IPU_ERR_3         15  1  # 1 means the SIO GSS interface cycle was not finished in time for
the next CR cycle.
HIR_GSS_HK_SYNC_ERR   HIR_IPU_ERR_4         0   1  # 1 means the GSS HK Tlm words' RTC bits do not match those
requested.
HIR_GSS_ST_SYNC_ERR   HIR_IPU_ERR_4         1   1  # 1 means the GSS STATUS Tlm words' RTC bits do not match those
requested.
HIR_EDAQ_LIST_ERR     HIR_IPU_ERR_4         2   1  # 1 means the EDAQ Telemetry Converter encountered an error in a
Telemetry List.
HIR_AMBI_TG_ERR       HIR_IPU_ERR_4         3   1  # 1 means an AMBI error occured while setting up the TG board
HIR_AMBI_SIO_ERR      HIR_IPU_ERR_4         4   1  # 1 means an AMBI error occured while setting up the SIO board
HIR_AMBI_EDAQ_ERR     HIR_IPU_ERR_4         5   1  # 1 means an AMBI error occured while setting up the EDAQ board
HIR_AMBI_MBIC_A_ERR   HIR_IPU_ERR_4         6   1  # 1 means an AMBI error occured while setting up the MBIC_A on the
MSA board
HIR_AMBI_MBIC_B_ERR   HIR_IPU_ERR_4         7   1  # 1 means an AMBI error occured while setting up the MBIC_B on the
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MSA board
HIR_AMBI_ERR          HIR_IPU_ERR_4         8   1  # 1 means an AMBI error occured while setting up AMBI Bus
HIR_CR_TICK_WDOG_ERR  HIR_IPU_ERR_4         9   1  # 1 means a loss of system tick interrupt has caused the system tick
source to fallback to TG internal or decrementer
HIR_CSS_LATCH_ERR     HIR_IPU_ERR_4         10  1  # 1 means the CSS was commanded to latch while running or commanded
to run while latched
HIR_SVA_DORMOT_OT_ER  HIR_IPU_ERR_4         11  1  # SVA door motor over temperature fault
HIR_CHOP_MOT_OT_ERR   HIR_IPU_ERR_4         12  1  # Chopper motor over temperature fault
HIR_DISPL1_OT_ERR     HIR_IPU_ERR_4         13  1  # Displacer 1 over temperature fault
HIR_DISPL2_OT_ERR     HIR_IPU_ERR_4         14  1  # Displacer 2 over temperature fault
HIR_COMP_HEAD_OT_ERR  HIR_IPU_ERR_4         15  1  # Compressor head over temperature fault
HIR_GYR0_OT_ERR       HIR_IPU_ERR_5         0   1  # GYRO 0 over-temperature fault, 1=occurred
HIR_GYR1_OT_ERR       HIR_IPU_ERR_5         1   1  # GYRO 1 over-temperature fault, 1=occurred
HIR_GYR2_OT_ERR       HIR_IPU_ERR_5         2   1  # GYRO 2 over-temperature fault, 1=occurred
HIR_GYR3_OT_ERR       HIR_IPU_ERR_5         3   1  # GYRO 3 over-temperature fault, 1=occurred
HIR_IPU_CHKSUM_ERR    HIR_IPU_ERR_5         4   1  # 1 means IPU image checksum failed
HIR_IPU_SGL_BIT_ERR   HIR_IPU_ERR_5         5   1  # 1 means IPU single bit RAM error occurred
HIR_IPU_DBL_BIT_ERR   HIR_IPU_ERR_5         6   1  # 1 means IPU double bit RAM error occurred
HIR_TEU_CHKSUM_ERR    HIR_IPU_ERR_5         7   1  # 1 means TEU image checksum failed
HIR_TEU_SGL_BIT_ERR   HIR_IPU_ERR_5         8   1  # 1 means TEU single bit RAM error occurred
HIR_TEU_DBL_BIT_ERR   HIR_IPU_ERR_5         9   1  # 1 means TEU double bit RAM error occurred
HIR_CSS_CAGE_IL_ERR   HIR_IPU_ERR_5         10  1  # 0=no interlock occurred, 1=interlock occurred
HIR_CSS_PWR_IL_ERR    HIR_IPU_ERR_5         11  1  # 0=no interlock occurred, 1=interlock occurred
HIR_SC_TIMEOUT10_ERR  HIR_IPU_ERR_5         12  1  # 1 = a loss of SC communications for 10 seconds occurred
HIR_SC_TIMEOUT1_ERR   HIR_IPU_ERR_5         13  1  # 1 = a loss of SC communications for 1 second occurred
HIR_SCIFMT_TBL_ERR    HIR_IPU_ERR_5         14  1  # Error in science format table
HIR_PCI_RESET_ERR     HIR_IPU_ERR_5         15  1  # 1 = PCI reset fault occured
HIR_EDAQ_PIO_PAR_CK   HIR_IPU_FLT_STAT_0    0   1  # 0 means Edaq IOBIC PIO Parity checking is disabled, 1 is enabled
HIR_PSS_IRC_OVFL_FM   HIR_IPU_FLT_STAT_0    1   1  # 0 means Fault Management for this error is off, 1 on
HIR_PSS_IF_BUSY_FM    HIR_IPU_FLT_STAT_0    2   1  # 0 means Fault Management for this error is off, 1 on
HIR_PSS_PILEUP_FM     HIR_IPU_FLT_STAT_0    3   1  # 0 means Fault Management for this error is off, 1 on
HIR_SSH_DORMOT_OT_FM  HIR_IPU_FLT_STAT_0    4   1  # 0 means Fault Management for this error is off, 1 on
HIR_WATCHDOG_FM       HIR_IPU_FLT_STAT_0    5   1  # 0 means Fault Management for this error is off, 1 on
HIR_PSS_EXE_ERR_FM    HIR_IPU_FLT_STAT_0    6   1  # 0 means Fault Management for this error is off, 1 on
HIR_EDAQ_BUSY_FM      HIR_IPU_FLT_STAT_0    7   1  # 0 means Fault Management for this error is off, 1 on
HIR_EDAQ_ADC_FLT_FM   HIR_IPU_FLT_STAT_0    8   1  # 0 means Fault Management for this error is off, 1 on
HIR_DOOR_SAF_ANG_FM   HIR_IPU_FLT_STAT_0    9   1  # 1 means the SSH will check the Potentiometer, 0 means it won't
HIR_SVA_DORMOT_OT_FM  HIR_IPU_FLT_STAT_0    10  1  # SVA door motor OT fault management: 0=off, 1=on
HIR_CHOP_MOT_OT_FM    HIR_IPU_FLT_STAT_0    11  1  # 0 means Fault Management for this error is off, 1 on
HIR_TICK_WATCHDOG_FM  HIR_IPU_FLT_STAT_0    12  1  # 0 = off, 1 = on
HIR_CSS_LATCH_FM      HIR_IPU_FLT_STAT_0    13  1  # 0 means Fault Management for this error is off, 1 on
HIR_DISPL1_OT_FM      HIR_IPU_FLT_STAT_0    14  1  # Displacer 1 over temperature fault mgt: 0=off, 1=on
HIR_DISPL2_OT_FM      HIR_IPU_FLT_STAT_0    15  1  # Displacer 2 over temperature fault mgt: 0=off, 1=on
HIR_SSH_HWA_OT_FM     HIR_IPU_FLT_STAT_1    0   1  # HWA over temperature fault mgt: 0=off, 1=on
HIR_COMP_HEAD_OT_FM   HIR_IPU_FLT_STAT_1    1   1  # Compressor head over temperature fault mgt: 0=off, 1=on
HIR_GYR0_OT_FM        HIR_IPU_FLT_STAT_1    2   1  # GYRO 0 over-temperature fault mgt: 0=off, 1=on
HIR_GYR1_OT_FM        HIR_IPU_FLT_STAT_1    3   1  # GYRO 1 over-temperature fault mgt: 0=off, 1=on
HIR_GYR2_OT_FM        HIR_IPU_FLT_STAT_1    4   1  # GYRO 2 over-temperature fault mgt: 0=off, 1=on
HIR_GYR3_OT_FM        HIR_IPU_FLT_STAT_1    5   1  # GYRO 3 over-temperature fault mgt: 0=off, 1=on
HIR_CSS_CAGE_IL_FM    HIR_IPU_FLT_STAT_1    6   1  # CSS cage interlock FM bit, 0=no FM, 1=FM (cmd blocked)
HIR_CSS_PWR_IL_FM     HIR_IPU_FLT_STAT_1    7   1  # CSS power interlock FM bit, 0=no FM, 1=FM (cmd blocked)
HIR_CHOP_SYNC_FM      HIR_IPU_FLT_STAT_1    8   1  # Chopper Sync fault management:  0 = off, 1 = on
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HIR_SC_TIMEOUT_FM     HIR_IPU_FLT_STAT_1    9   1  # SC communications fault management: 0 = off; 1 = on
HIR_SSH_OT_IL_FM      HIR_IPU_FLT_STAT_1    10  1  # SSH interlock response to SSH_DORMOT_OT_ER: 0 = disabled, 1 =
enabled
HIR_PCI_RESET_FM      HIR_IPU_FLT_STAT_1    11  1  # 1 = fault management for detection and correction PCI in reset is
enabled
HIR_EDAQ_FILTER_FM    HIR_IPU_FLT_STAT_1    12  1  # Enable/disable EDAQ analog filter
HIR_SPARE_STAT1_BT13  HIR_IPU_FLT_STAT_1    13  1  # Spare
HIR_SPARE_STAT1_BT14  HIR_IPU_FLT_STAT_1    14  1  # Spare
HIR_MEMSCRUB_FM       HIR_IPU_FLT_STAT_1    15  1  # Memory scrub fault management: 0 = disabled; 1 = enabled
HIR_TICK_SOURCE       HIR_IPU_STAT_0        0   1  # 0 means the decrementer, 1 means the TimingGenerator.
HIR_CR_INT_SOURCE     HIR_IPU_STAT_0        1   2  # 0 means internal rotation sync, 1 means CR sync, 2 means external
CR sync
HIR_CHOP_SYNC_SOURCE  HIR_IPU_STAT_0        3   2  # 0 means internal chopper ref, 1 means chopper ref, 2 means external
chopper ref
HIR_IPU_UPL_INPROG    HIR_IPU_STAT_0        5   1  # 1 means IPU Upload is in progress, valid header received
HIR_IPU_UPL_COMPLETE  HIR_IPU_STAT_0        6   1  # 1 means IPU Upload header plus all expected blocks were received
HIR_IPU_UPL_CHKSUMOK  HIR_IPU_STAT_0        7   1  # 1 means IPU Upload completed and checksum matched
HIR_TSS_TLM_STATE     HIR_IPU_STAT_0        8   2  # 0 means no TSS tlm, 1= SU HK Tlm, 2= SU DIAG and HK, 3= APP Tlm
HIR_TSS_DMA_PSEQ_OK   HIR_IPU_STAT_0        10  1  # 0 means an the TLM DMA packet counter was out of sequence
HIR_CMD_UNPROT        HIR_IPU_STAT_0        11  1  # 1 means an unprotect command has been sent and it's corresponding
command has not
HIR_TSB_CHKSUM_MATCH  HIR_IPU_STAT_0        12  1  # 1 means that the TSS telemetered expected and actual upload
checksum match.
HIR_TSB_UPLOAD_DONE   HIR_IPU_STAT_0        13  1  # 1 means that the TSS has received it's upload (i.e. the TSS
telemeterd next expected block equals the total expected blocks +1)
HIR_TSS_CMDRJCT_NZ    HIR_IPU_STAT_0        14  1  # 1 means TSS telemetered Command Reject Count is not zero
HIR_PSS_DISC_STATE    HIR_IPU_STAT_0        15  1  # 1 means the a PSS discrete is energized
HIR_SCIPKT_Q_SZ       HIR_IPU_STAT_1        0   5  # the current number of buffered science packets
HIR_RDSR              HIR_IPU_STAT_1        5   3  # the value is the current RDSR, 6,3,2 or 1
HIR_TLM_PATTERN       HIR_IPU_STAT_1        8   3  # 0 means normal pattern, 1 means Fixed HK, 2 means Fixed Sci, 3
means Simulated Data with decimation disabled, 4 means Simulated Data with decimation enabled, 5 means Simulated Data
with decimation and 32 tap filter enabled. 6 and 7 are TBD
HIR_TSS_TLM_SUMOK     HIR_IPU_STAT_1        11  1  # 1 means Checksum    OK for current TSS Tlm Packet
HIR_TSB_TLM_SUMOK     HIR_IPU_STAT_1        12  1  # 1 means Checksum(s) OK for current TSU Tlm Packet
HIR_TSS_SYNC_STATE    HIR_IPU_STAT_1        13  2  # 0 means IPU waiting for DMA address from TEU , 1 means IPU received
DMA buffer addresses from TEU, IPU sending DMA address to TEU, 2 means IPU-TEU DMA buffers are in sync expect nominal
communications
HIR_GSS_SIO_BUSY      HIR_IPU_STAT_1        15  1  # 1 means the SIO GSS interface cycle was not finished in time for
the next CR cycle.
HIR_TIME_GIRD_HD_ERR  HIR_IPU_STAT_2        0   1  # 1 = an error occurred in the last received GIRD Header timecode
HIR_EDAQ_LIST_BAD     HIR_IPU_STAT_2        1   1  # 1 means the EDAQ Telemetry Converter encountered an error in a
Telemetry List. This Flag is cleared once per MIF
HIR_EDAQ_BUSY         HIR_IPU_STAT_2        2   1  # 1 means the EDAQ Telemetry Converter was unexpectedly busy. This
Flag is cleared once per MIF
HIR_SAIL_CNTL_SSH     HIR_IPU_STAT_2        3   1  # SAIL control allowed for SSH: 0=no, 1=yes
HIR_SAIL_CNTL_SMA     HIR_IPU_STAT_2        4   1  # SAIL control allowed for SMA: 0=no, 1=yes
HIR_SAIL_CNTL_BB      HIR_IPU_STAT_2        5   1  # SAIL control allowed for BlackBody: 0=no, 1=yes
HIR_SAIL_CNTL_HWA     HIR_IPU_STAT_2        6   1  # SAIL control allowed for HWA: 0=no, 1=yes
HIR_ANCILLARY_TMATCH  HIR_IPU_STAT_2        7   1  # 1 = ancillary 1 and ancillary 2 time codes and checksums match
HIR_SAIL_CNTL_CSS     HIR_IPU_STAT_2        8   1  # SAIL control allowed for CSS: 0=no, 1=yes
HIR_SAIL_CNTL_SVA     HIR_IPU_STAT_2        9   1  # SAIL control allowed for SVA: 0=no, 1=yes
HIR_PRHS              HIR_IPU_STAT_2        10  2  # Primary read head select (0=test value, 1=RH1 data, 2=RH2 data, 3=
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average of both read heads)
HIR_SRHS               HIR_IPU_STAT_2        12  2  # Secondary read head select (0=test value, 1=RH1 data, 2=RH2 data,
3= average of both read heads)
HIR_DIAG_ITEM_TRUNC    HIR_IPU_STAT_2        14  1  # 1 means at least one requested diag was truncated (i.e. requested
size not met)
HIR_DIAG_ITEM_DROP     HIR_IPU_STAT_2        15  1  # 1 means at least one requested diag was not included in diag block
HIR_MACROCMD_RES_NUM   HIR_MACMD_LAST_RC     0   6  # Cmd Result code. Command result number Display Mnemonic
HIR_MACROCMD_PARMNUM   HIR_MACMD_LAST_RC     6   5  # Cmd Result code. Parameter in error
HIR_MACROCMD_SUBSYS    HIR_MACMD_LAST_RC     11  4  # Subsystem to which the command is to be routed
HIR_MACROCMD_OK        HIR_MACMD_LAST_RC     15  1  # Cmd Result code. 1 means last command OK, 0 means last command
reject
HIR_MAC_CMD_PNUM       HIR_MACRO_STAT        0   5  # Current parameter for current command
HIR_MAC_CMD_NUM        HIR_MACRO_STAT        5   8  # Current command number for current macro
HIR_MAC_NUM_CMDS       HIR_MACRO_STAT        13  6  # Number of commands in current macro
HIR_MAC_STATE          HIR_MACRO_STAT        19  3  # 0=unused, 1=uploading, 2=ready, 3=executing, 4=pended
HIR_MAC_NUM            HIR_MACRO_STAT        22  8  # Current macro number
HIR_MAC_CSC_STATE      HIR_MACRO_STAT        30  2  # 0=idle, 1=uploading, 2=executing
HIR_PCU_SYS5CNVA_ON    HIR_PCU_SUBSTAT_0     0   1  # = PSS_SYSCNV_P5_A
HIR_PCU_SYS5CNVB_ON    HIR_PCU_SUBSTAT_0     1   1  # = PSS_SYSCNV_P5_B
HIR_PCU_SYS15CNVA_ON   HIR_PCU_SUBSTAT_0     2   1  # = PSS_SYSCNV_P15_A & PSS_SYSCNV_N15_A
HIR_PCU_SYS15CNVB_ON   HIR_PCU_SUBSTAT_0     3   1  # = PSS_SYSCNV_P15_B & PSS_SYSCNV_N15_B
HIR_PCU_REG28CNVA_ON   HIR_PCU_SUBSTAT_0     4   1  # = PSS_SYSCNV_28R_A
HIR_PCU_REG28CNVB_ON   HIR_PCU_SUBSTAT_0     5   1  # = PSS_SYSCNV_28R_B
HIR_PCU_SPUCNVA_ON     HIR_PCU_SUBSTAT_0     6   1  # = PSS_SPU_CNVTRS_A
HIR_PCU_SPUCNVB_ON     HIR_PCU_SUBSTAT_0     7   1  # = PSS_SPU_CNVTRS_B
HIR_PCU_PCUCNVA_ON     HIR_PCU_SUBSTAT_0     8   1  # = PSS_PCU_CNVTRS_A
HIR_PCU_PCUCNVB_ON     HIR_PCU_SUBSTAT_0     9   1  # = PSS_PCU_CNVTRS_B
HIR_PCU_QBUS_INPUT     HIR_PCU_SUBSTAT_0     10  1  # = PSS_QB_PWR & (PSS_QA_PWR ^ PSS_QB_PWR)
HIR_PCU_QBUS2QC_RLYA   HIR_PCU_SUBSTAT_0     11  1  # = (PSS_QA_PWR & PSS_QA_28C_RLYA) | (PSS_QB_PWR & PSS_QB_28C_RLYA)
HIR_PCU_QBUS2QC_RLYB   HIR_PCU_SUBSTAT_0     12  1  # = (PSS_QA_PWR & PSS_QA_28C_RLYB) | (PSS_QB_PWR & PSS_QB_28C_RLYB)
HIR_PCU_QC_ON          HIR_PCU_SUBSTAT_0     13  1  # = PSS_QC_PWR & (PSS_QC_PWR ^ PSS_28C_LOWVOLTS)
HIR_PCU_NA_INPUT       HIR_PCU_SUBSTAT_0     14  1  # = !(PSS_NBA_RLYA & PSS_NBA_RLYB)
HIR_PCU_NB_INPUT       HIR_PCU_SUBSTAT_0     15  1  # = !(PSS_NBB_RLYA & PSS_NBB_RLYB)
HIR_PCU_IPUA28R_RLYA   HIR_PCU_SUBSTAT_1     0   1  # = PSS_IPUA_28R_PWR & (PSS_SYSCNV_28R_A & PSS_IPUA_28RRLYA)
HIR_PCU_IPUA28R_RLYB   HIR_PCU_SUBSTAT_1     1   1  # = PSS_IPUA_28R_PWR & (PSS_SYSCNV_28R_B & PSS_IPUA_28RRLYB)
HIR_PCU_IPUB28R_RLYA   HIR_PCU_SUBSTAT_1     2   1  # = PSS_IPUB_28R_PWR & (PSS_SYSCNV_28R_A & PSS_IPUB_28RRLYA)
HIR_PCU_IPUB28R_RLYB   HIR_PCU_SUBSTAT_1     3   1  # = PSS_IPUB_28R_PWR & (PSS_SYSCNV_28R_B & PSS_IPUB_28RRLYB)
HIR_PCU_TEUA28C_RLYA   HIR_PCU_SUBSTAT_1     4   1  # = PSS_TEUA_28C_PWR & (PSS_QC_PWR & PSS_TEUA_28CRLYA)
HIR_PCU_TEUA28C_RLYB   HIR_PCU_SUBSTAT_1     5   1  # = PSS_TEUA_28C_PWR & (PSS_QC_PWR & PSS_TEUA_28CRLYB)
HIR_PCU_TEUB28C_RLYA   HIR_PCU_SUBSTAT_1     6   1  # = PSS_TEUB_28C_PWR & (PSS_QC_PWR & PSS_TEUB_28CRLYA)
HIR_PCU_TEUB28C_RLYB   HIR_PCU_SUBSTAT_1     7   1  # = PSS_TEUB_28C_PWR & (PSS_QC_PWR & PSS_TEUB_28CRLYB)
HIR_PCU_GSS28C_RLYA    HIR_PCU_SUBSTAT_1     8   1  # = PSS_GSS_28C_PWR & (PSS_QC_PWR & PSS_GSS_28CRLYA)
HIR_PCU_GSS28C_RLYB    HIR_PCU_SUBSTAT_1     9   1  # = PSS_GSS_28C_PWR & (PSS_QC_PWR & PSS_GSS_28CRLYB)
HIR_PCU_SPU5_RLYA      HIR_PCU_SUBSTAT_1     10  1  # = PSS_SPUA_P5_RLY
HIR_PCU_SPU15_RLYA     HIR_PCU_SUBSTAT_1     11  1  # = PSS_SPUA_P15_RLY & PSS_SPUA_N15_RLY
HIR_PCU_SPU5_RLYB      HIR_PCU_SUBSTAT_1     12  1  # = PSS_SPUB_P5_RLY
HIR_PCU_SPU15_RLYB     HIR_PCU_SUBSTAT_1     13  1  # = PSS_SPUB_P15_RLY & PSS_SPUB_N15_RLY
HIR_PCU_CSS_RLYA       HIR_PCU_SUBSTAT_1     14  1  # = PSS_NB_PWR & (((PSS_NBA_RLYA ^ PSS_NBA_RLYB) & PSS_NBA_RLYA) |
((PSS_NBB_RLYA ^ PSS_NBB_RLYB) & PSS_NBB_RLYA))
HIR_PCU_CSS_RLYB       HIR_PCU_SUBSTAT_1     15  1  # = PSS_NB_PWR & (((PSS_NBA_RLYA ^ PSS_NBA_RLYB) & PSS_NBA_RLYB) |
((PSS_NBB_RLYA ^ PSS_NBB_RLYB) & PSS_NBB_RLYB))
HIR_PCU_TEUA5_RLYA     HIR_PCU_SUBSTAT_2     0   1  # = PSS_TEUA_P5_PWR & (PSS_SYSCNV_P5_A & PSS_TEUA_P5RLYA)
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HIR_PCU_TEUA5_RLYB    HIR_PCU_SUBSTAT_2     1   1  # = PSS_TEUA_P5_PWR & (PSS_SYSCNV_P5_B & PSS_TEUA_P5RLYB)
HIR_PCU_TEUB5_RLYA    HIR_PCU_SUBSTAT_2     2   1  # = PSS_TEUB_P5_PWR & (PSS_SYSCNV_P5_A & PSS_TEUB_P5RLYA)
HIR_PCU_TEUB5_RLYB    HIR_PCU_SUBSTAT_2     3   1  # = PSS_TEUB_P5_PWR & (PSS_SYSCNV_P5_B & PSS_TEUB_P5RLYB)
HIR_PCU_GSS5_RLYA     HIR_PCU_SUBSTAT_2     4   1  # = PSS_GSS_P5_PWR & (PSS_SYSCNV_P5_A & PSS_GSS_P5RLYA)
HIR_PCU_GSS5_RLYB     HIR_PCU_SUBSTAT_2     5   1  # = PSS_GSS_P5_PWR & (PSS_SYSCNV_P5_B & PSS_GSS_P5RLYB)
HIR_PCU_EEA5_RLYA     HIR_PCU_SUBSTAT_2     6   1  # = PSS_EEA_P5_PWR & (PSS_SYSCNV_P5_A & PSS_EEA_P5RLYA)
HIR_PCU_EEA5_RLYB     HIR_PCU_SUBSTAT_2     7   1  # = PSS_EEA_P5_PWR & (PSS_SYSCNV_P5_B & PSS_EEA_P5RLYB)
HIR_PCU_TEUA15_RLYA   HIR_PCU_SUBSTAT_2     8   1  # = (PSS_TEUA_P15_PWR & PSS_TEUA_N15_PWR) & ((PSS_SYSCNV_P15_A &
PSS_SYSCNV_N15_A) & PSS_TEUA_15VRLYA)
HIR_PCU_TEUA15_RLYB   HIR_PCU_SUBSTAT_2     9   1  # = (PSS_TEUA_P15_PWR & PSS_TEUA_N15_PWR) & ((PSS_SYSCNV_P15_B &
PSS_SYSCNV_N15_B) & PSS_TEUA_15VRLYB)
HIR_PCU_TEUB15_RLYA   HIR_PCU_SUBSTAT_2     10  1  # = (PSS_TEUB_P15_PWR & PSS_TEUB_N15_PWR) & ((PSS_SYSCNV_P15_A &
PSS_SYSCNV_N15_A) & PSS_TEUB_15VRLYA)
HIR_PCU_TEUB15_RLYB   HIR_PCU_SUBSTAT_2     11  1  # = (PSS_TEUB_P15_PWR & PSS_TEUB_N15_PWR) & ((PSS_SYSCNV_P15_B &
PSS_SYSCNV_N15_B) & PSS_TEUB_15VRLYB)
HIR_PCU_GSS15_RLYA    HIR_PCU_SUBSTAT_2     12  1  # = (PSS_GSS_P15_PWR & PSS_GSS_N15_PWR) & ((PSS_SYSCNV_P15_A &
PSS_SYSCNV_N15_A) & PSS_GSS_15VRLYA)
HIR_PCU_GSS15_RLYB    HIR_PCU_SUBSTAT_2     13  1  # = (PSS_GSS_P15_PWR & PSS_GSS_N15_PWR) & ((PSS_SYSCNV_P15_B &
PSS_SYSCNV_N15_B) & PSS_GSS_15VRLYB)
HIR_PCU_EEA15_RLYA    HIR_PCU_SUBSTAT_2     14  1  # = (PSS_EEA_P15_PWR & PSS_EEA_N15_PWR) & ((PSS_SYSCNV_P15_A &
PSS_SYSCNV_N15_A) & PSS_EEA_15VRLYA)
HIR_PCU_EEA15_RLYB    HIR_PCU_SUBSTAT_2     15  1  # = (PSS_EEA_P15_PWR & PSS_EEA_N15_PWR) & ((PSS_SYSCNV_P15_B &
PSS_SYSCNV_N15_B) & PSS_EEA_15VRLYB)
HIR_SAILCMD_RES_NUM   HIR_SAILCMD_LAST_RC   0   6  # Cmd Result code. Command result number Display Mnemonic
HIR_SAILCMD_PARM_NUM  HIR_SAILCMD_LAST_RC   6   5  # Cmd Result code. Parameter in error
HIR_SAILCMD_SUBSYS    HIR_SAILCMD_LAST_RC   11  4  # Subsystem to which the command is to be routed
HIR_SAILCMD_OK        HIR_SAILCMD_LAST_RC   15  1  # Cmd Result code. 1 means last command OK, 0 means last command
reject
HIR_SAILTSTATUS_00    HIR_SAILTASK_00_STAT  0   4  # SAIL Task 00 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_00     HIR_SAILTASK_00_STAT  4   4  # SAIL Task 00 number of times it has run since the last reset
HIR_SAILTSTATUS_01    HIR_SAILTASK_01_STAT  0   4  # SAIL Task 01 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_01     HIR_SAILTASK_01_STAT  4   4  # SAIL Task 01 number of times it has run since the last reset
HIR_SAILTSTATUS_02    HIR_SAILTASK_02_STAT  0   4  # SAIL Task 02 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_02     HIR_SAILTASK_02_STAT  4   4  # SAIL Task 02 number of times it has run since the last reset
HIR_SAILTSTATUS_03    HIR_SAILTASK_03_STAT  0   4  # SAIL Task 03 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_03     HIR_SAILTASK_03_STAT  4   4  # SAIL Task 03 number of times it has run since the last reset
HIR_SAILTSTATUS_04    HIR_SAILTASK_04_STAT  0   4  # SAIL Task 04 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_04     HIR_SAILTASK_04_STAT  4   4  # SAIL Task 04 number of times it has run since the last reset
HIR_SAILTSTATUS_05    HIR_SAILTASK_05_STAT  0   4  # SAIL Task 05 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_05     HIR_SAILTASK_05_STAT  4   4  # SAIL Task 05 number of times it has run since the last reset
HIR_SAILTSTATUS_06    HIR_SAILTASK_06_STAT  0   4  # SAIL Task 06 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_06     HIR_SAILTASK_06_STAT  4   4  # SAIL Task 06 number of times it has run since the last reset
HIR_SAILTSTATUS_07    HIR_SAILTASK_07_STAT  0   4  # SAIL Task 07 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_07     HIR_SAILTASK_07_STAT  4   4  # SAIL Task 07 number of times it has run since the last reset
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HIR_SAILTSTATUS_08    HIR_SAILTASK_08_STAT  0   4  # SAIL Task 08 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_08     HIR_SAILTASK_08_STAT  4   4  # SAIL Task 08 number of times it has run since the last reset
HIR_SAILTSTATUS_09    HIR_SAILTASK_09_STAT  0   4  # SAIL Task 09 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_09     HIR_SAILTASK_09_STAT  4   4  # SAIL Task 09 number of times it has run since the last reset
HIR_SAILTSTATUS_10    HIR_SAILTASK_10_STAT  0   4  # SAIL Task 10 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_10     HIR_SAILTASK_10_STAT  4   4  # SAIL Task 10 number of times it has run since the last reset
HIR_SAILTSTATUS_11    HIR_SAILTASK_11_STAT  0   4  # SAIL Task 11 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_11     HIR_SAILTASK_11_STAT  4   4  # SAIL Task 11 number of times it has run since the last reset
HIR_SAILTSTATUS_12    HIR_SAILTASK_12_STAT  0   4  # SAIL Task 12 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_12     HIR_SAILTASK_12_STAT  4   4  # SAIL Task 12 number of times it has run since the last reset
HIR_SAILTSTATUS_13    HIR_SAILTASK_13_STAT  0   4  # SAIL Task 13 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_13     HIR_SAILTASK_13_STAT  4   4  # SAIL Task 13 number of times it has run since the last reset
HIR_SAILTSTATUS_14    HIR_SAILTASK_14_STAT  0   4  # SAIL Task 14 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_14     HIR_SAILTASK_14_STAT  4   4  # SAIL Task 14 number of times it has run since the last reset
HIR_SAILTSTATUS_15    HIR_SAILTASK_15_STAT  0   4  # SAIL Task 15 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=
Wait
HIR_SAILTSKRAN_15     HIR_SAILTASK_15_STAT  4   4  # SAIL Task 15 number of times it has run since the last reset
HIR_SCCMD_RES_NUM     HIR_SCCMD_LAST_RC     0   6  # Command result number
HIR_SCCMD_PARM_NUM    HIR_SCCMD_LAST_RC     6   5  # Parameter in error
HIR_SCCMD_SUBSYS      HIR_SCCMD_LAST_RC     11  4  # Subsystem to which the command is to be routed
HIR_SCCMD_OK          HIR_SCCMD_LAST_RC     15  1  # Success code:  1 = last command OK; 0 = last command rejected
HIR_TLM_TIME_BLK_ENA  HIR_SCI_FMT_BLK_ENA   0   1  # Time block enable
HIR_TLM_RAD_BLK_ENA   HIR_SCI_FMT_BLK_ENA   1   1  # Radiance data block enable
HIR_TLM_ELVP_BLK_ENA  HIR_SCI_FMT_BLK_ENA   2   1  # Primary variable elevation block enable
HIR_TLM_EL2P_BLK_ENA  HIR_SCI_FMT_BLK_ENA   3   1  # Primary elevation 2 block enable
HIR_TLM_AZP_BLK_ENA   HIR_SCI_FMT_BLK_ENA   4   1  # Primary azimuth block enable
HIR_TLM_GYR0_BLK_ENA  HIR_SCI_FMT_BLK_ENA   5   1  # Gyro 0 block enable
HIR_TLM_GYR1_BLK_ENA  HIR_SCI_FMT_BLK_ENA   6   1  # Gyro 1 block enable
HIR_TLM_GYR2_BLK_ENA  HIR_SCI_FMT_BLK_ENA   7   1  # Gyro 2 block enable
HIR_TLM_GYR3_BLK_ENA  HIR_SCI_FMT_BLK_ENA   8   1  # Gyro 3 block enable
HIR_TLM_ELVS_BLK_ENA  HIR_SCI_FMT_BLK_ENA   9   1  # Secondary variable elevation block enable
HIR_TLM_EL2S_BLK_ENA  HIR_SCI_FMT_BLK_ENA   10  1  # Secondary elevation 2 block enable
HIR_TLM_HK_BLK_ENA    HIR_SCI_FMT_BLK_ENA   11  1  # Science housekeeping block enable
HIR_TLM_DIAG_BLK_ENA  HIR_SCI_FMT_BLK_ENA   12  1  # Diagnostic block enable
HIR_TLM_AZS_BLK_ENA   HIR_SCI_FMT_BLK_ENA   13  1  # Secondary azimuth block enable
HIR_SPU_CRPHASE_ER_C  HIR_SPU_PHASE_ERR_C   0   4  # Error count
HIR_SPU_CRDROP_ER_C   HIR_SPU_PHASE_ERR_C   4   4  # Error count
HIR_SPU_CCPHASE_ER_C  HIR_SPU_PHASE_ERR_C   8   4  # Error count
HIR_SPU_DATA_ER_C     HIR_SPU_PHASE_ERR_C   12  4  # Error count
HIR_SSH_DR_CLOSED     HIR_SSH_STAT          0   1  # Sun Shield Door CLOSED, 1= CLOSED
HIR_SSH_DR_NCLOSED    HIR_SSH_STAT          1   1  # Sun Shield Door CLOSED, 0= CLOSED
HIR_SSH_DR_OPEN       HIR_SSH_STAT          2   1  # Sun Shield Door OPEN, 1= OPEN
HIR_SSH_DR_NOPEN      HIR_SSH_STAT          3   1  # Sun Shield Door OPEN, 0= OPEN
HIR_SSH_DR_LATCHDIS   HIR_SSH_STAT          4   1  # Sun Shield Latch disengaged, 1= disenaged
HIR_SSH_DR_LATCHNDIS  HIR_SSH_STAT          5   1  # Sun Shield Latch not disengaged, 0= disenaged
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HIR_SSH_DR_LATCHENG   HIR_SSH_STAT          6   1  # Sun Shield Latch engaged, 1= enaged
HIR_SSH_DR_LATCHNENG  HIR_SSH_STAT          7   1  # Sun Shield Latch not engaged, 0= enaged
HIR_SSH_DOOR_STATE    HIR_SSH_STAT          8   3  # Sun Shield Door State, NOT_MOVING=0, 1=MOVING_OPEN, 2=
MOVING_CLOSED, 3=MOVING_CRITICAL, 4=, =SAFING(set by IPU SSH control software)
HIR_SSH_MOTOR_CONFIG  HIR_SSH_STAT          11  1  # SSH Drive Motor configuration, DISABLED =0, ENABLED =1 (Bit 0 of
configuration register)
HIR_SSH_DRIVE_DIR     HIR_SSH_STAT          12  1  # Sun Shield Door Motor Direction Open =1, Close =0   (Bit 1 of
configuration register)
HIR_SSH_HWA_CONFIG    HIR_SSH_STAT          14  1  # HWA Configuration, 0 = OFF, 1 = ON, value of DIO bit
HIR_SSH_HWA_STATE     HIR_SSH_STAT          15  1  # HWA Control State, 0 = OFF, 1 = ON
HIR_SUBTLM_MINOR_REV  HIR_SUBTMI_BUILD_ID   0   5  # subtmi minor rev num (0 to 31)
HIR_SUBTLM_MAJOR_REV  HIR_SUBTMI_BUILD_ID   5   3  # subtmi major rev num (0 to 7)
HIR_SVA_DR_CLOSED     HIR_SVA_STAT          0   1  # Space View Aperature Closed, 1= closed
HIR_SVA_DR_NCLOSED    HIR_SVA_STAT          1   1  # Space View Aperature Not Closed, 0= closed
HIR_SVA_DR_OPEN       HIR_SVA_STAT          2   1  # Space View Aperature open, 1= open
HIR_SVA_DR_NOPEN      HIR_SVA_STAT          3   1  # Space View Aperature Not open, 0= open
HIR_SVA_DOOR_STATE    HIR_SVA_STAT          4   2  # SVA State, 0 = NOT_MOVING, 1 = OPENING, 2 = CLOSING
HIR_SVA_MOTOR_CONFIG  HIR_SVA_STAT          6   2  # SVA Drive Motor Configuration, 0= DISABLED, 1 = DRIVE CLOSED, 2
DRIVE OPEN (bits 0-1 of configuration register)
HIR_SPARE_STAT_BIT8   HIR_SVA_STAT          8   1  # Spare
HIR_SPARE_STAT_BIT9   HIR_SVA_STAT          9   1  # Spare
HIR_SPARE_STAT_BIT10  HIR_SVA_STAT          10  1  # Spare
HIR_SPARE_STAT_BIT11  HIR_SVA_STAT          11  1  # Spare
HIR_SPARE_STAT_BIT12  HIR_SVA_STAT          12  1  # Spare
HIR_SPARE_STAT_BIT13  HIR_SVA_STAT          13  1  # Spare
HIR_SPARE_STAT_BIT14  HIR_SVA_STAT          14  1  # Spare
HIR_SPARE_STAT_BIT15  HIR_SVA_STAT          15  1  # Spare
HIR_TLM_SCI_HK_ID     HIR_TLM_ACTIVE_SCIHK  0   10 # Science housekeeping table ID
HIR_TLM_SCI_HK_ACTIV  HIR_TLM_ACTIVE_SCIHK  12  2  # Active table (0=default, 1=operational, 2=uploaded)
HIR_TLM_MINOR_REV     HIR_TLM_DB_BUILD_ID   0   5  # tmi minor rev num (0 to 31)
HIR_TLM_MAJOR_REV     HIR_TLM_DB_BUILD_ID   5   3  # tmi major rev num (0 to 7)
HIR_DIAG_STSKPRM_ENA  HIR_TLM_DIAG_STAT     0   1  # SAIL task parameter item (0=disabled, 1=enabled)
HIR_DIAG_IRAMDMP_ENA  HIR_TLM_DIAG_STAT     1   1  # IPU RAM memory dump item (0=disabled, 1=enabled)
HIR_DIAG_EPRMDMP_ENA  HIR_TLM_DIAG_STAT     2   1  # IPU EEPROM memory dump (SUROM only) item (0=disabled, 1=enabled)
HIR_DIAG_TRAMDMP_ENA  HIR_TLM_DIAG_STAT     3   1  # TEU RAM memory dump item (0=disabled, 1=enabled)
HIR_DIAG_SRAMDMP_ENA  HIR_TLM_DIAG_STAT     4   1  # SAIL RAM memory dump item (0=disabled, 1=enabled)
HIR_DIAG_SBLKDMP_ENA  HIR_TLM_DIAG_STAT     5   1  # SAIL block memory dump item (0=disabled, 1=enabled)
HIR_DIAG_TSSCNTL_ENA  HIR_TLM_DIAG_STAT     6   1  # TSS control item (0= disabled, 1=enabled)
HIR_DIAG_TSSJITR_ENA  HIR_TLM_DIAG_STAT     7   1  # TSS jitter item (0=disabled, 1=enabled)
HIR_DIAG_HWREGS_ENA   HIR_TLM_DIAG_STAT     9   1  # HW Register dump item
HIR_DIAG_RAWSPU_ENA   HIR_TLM_DIAG_STAT     10  1  # Raw SPU data dump item
HIR_DIAG_CMDSMRY_ENA  HIR_TLM_DIAG_STAT     11  1  # Command summary item (0=disabled, 1=enabled)
HIR_DIAG_STSKINF_ENA  HIR_TLM_DIAG_STAT     12  1  # SAIL task information item (0=disabled, 1=enabled)
HIR_DIAG_SMEMINF_ENA  HIR_TLM_DIAG_STAT     13  1  # SAIL memory information item (0=disabled, 1=enabled)
HIR_DIAG_TEXTMSG_ENA  HIR_TLM_DIAG_STAT     14  1  # Text message item (0=disabled, 1=enabled)
HIR_TSB_STATE         HIR_TSB_BOOT_STAT_1   0   3  # 0=Reset, 1=InfoOnly, 2=InfoOnlyErrs, 3=Checking, 4=Loading, 5=
Booting, 6=PostBoot
HIR_TSB_IPU_ERROR     HIR_TSB_BOOT_STAT_1   3   4  # 0=NoError, 1=TSUError, 2=NoEEPROM, 3=NoAutoboot, 4=SectEmpty, 5=
BadAddress, 6=EETableFail, 7=EEChecksumFail, 8=Timeout, 9=UserAbort, 10=AbnormalExit, 11=AcceptAndReject, 12=SyncError,
13=ChecksumError, 14=EEReadError, 15=Internal
HIR_TSB_EEPROM_ON     HIR_TSB_BOOT_STAT_1   7   1  # EEPROM Power State, 0= Power on, 1=Power off
HIR_TSB_IPU_ERR_CNT   HIR_TSB_BOOT_STAT_1   8   4  # Number TSB IPU errors
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HIR_TSB_SECT          HIR_TSB_BOOT_STAT_1   12  4  # Actual EEPROM section used for TSU Boot
HIR_TSB_LAST_BLK      HIR_TSB_BOOT_STAT_2   0   10 # Last Block loaded to the TSU
HIR_TSB_SUB_STATE1    HIR_TSB_BOOT_STAT_2   10  3  # Bits 30 thru 28 of TSB_ADDR_OFF
HIR_TSB_SUB_STATE2    HIR_TSB_BOOT_STAT_2   13  1  # Bit 8 of TSB_ADDR_OFF
HIR_TSB_SUB_STATE3    HIR_TSB_BOOT_STAT_2   14  2  # Bits 5 thru 4 of TSB_ADDR_OFF
HIR_TSB_EE_TBL_INDEX  HIR_TSB_BOOT_STAT_3   0   7  # Subcom Index of EE Table Array in Word TSB_EE_TABLE
HIR_TSB_EE_BOOT_SRC   HIR_TSB_BOOT_STAT_3   7   5  # HIR_IPU_TSUSECTION command Parameter 0
HIR_TSB_EE_MBIC_ADDR  HIR_TSB_BOOT_STAT_4   0   19 # Subcom MBIC Address in Word TSB_BOOT_STAT_4
HIR_TSB_EE_BOOT_FLAG  HIR_TSB_BOOT_STAT_4   19  2  #
HIR_TSB_EE_MBIC_SUB   HIR_TSB_BOOT_STAT_4   21  2  # Subcom Index of MBIC Address in Word TSB_BOOT_STAT_4, 0=MBIC A
Start, 1=MBIC A End, 2=MBIC B Start, 3=MBIC B End
HIR_TSB_EE_OVERIDE    HIR_TSB_BOOT_STAT_4   23  9  # HIR_IPU_TSUSECTION command Parameter 1
HIR_TSU_WDT_EXPIRED   HIR_TSU_FLAG_BITS     0   1  # 1=Watchdog Expired
HIR_TSU_EXCEPTION     HIR_TSU_FLAG_BITS     4   1  # 1=Processor exception occurred
HIR_TSU_ERR_INJECT    HIR_TSU_FLAG_BITS     8   1  # 1=Error injection enabled
HIR_TSW_CMDACC_SIG    HIR_TSW_CMDA_SIG      8   8  # Command signature
HIR_TSW_CMDREJ_REAS   HIR_TSW_CMDR_SIG      0   8  # Command reject reason
HIR_TSW_CMDREJ_SIG    HIR_TSW_CMDR_SIG      8   8  # Command reject signature
HIR_TSW_CR_SS_INDEX   HIR_TSW_CR_SYNC_STAT  0   4  # Value of Scanner Strobe index internal to TEU when CR detected
HIR_TSW_CR_SS_SYNC    HIR_TSW_CR_SYNC_STAT  4   4  # Number Times SS index reset to sync SS to CR
HIR_TSW_CR_SS_OUTSYN  HIR_TSW_CR_SYNC_STAT  8   4  # Number Times CR interval incorrect once sync SS to CR
HIR_TSW_CR_START_CNT  HIR_TSW_CR_SYNC_STAT  12  2  # Number of Times chopper tried to start
HIR_TSW_EINIT_STAT    HIR_TSW_CSC_STAT      0   1  # Encoder Init CSC status, 0 = disabled, 1 = enabled
HIR_TSW_SMC_STAT      HIR_TSW_CSC_STAT      1   1  # Scan Mirror Control CSC status, 0 = disabled, 1 = enabled
HIR_TSW_HWCMD_STAT    HIR_TSW_CSC_STAT      2   1  # Hardware Command Handling CSC status, 0 = disabled, 1 = enabled
HIR_TSW_DACQ_STAT     HIR_TSW_CSC_STAT      3   1  # Data Acquisition CSC status, 0 = disabled, 1 = enabled
HIR_TSW_SS_STAT       HIR_TSW_CSC_STAT      4   1  # Subsystem Support CSC status, 0 = disabled, 1 = enabled
HIR_TSW_CHOP_FM_STAT  HIR_TSW_CSC_STAT      5   1  # Chopper fault management, 0= disabled, 1= enabled
HIR_TSW_EEA_FM_STAT   HIR_TSW_CSC_STAT      6   1  # EEA fault management, 0= disabled, 1= enabled
HIR_TSW_TLM_TST_STAT  HIR_TSW_CSC_STAT      7   1  # Default telemetry test pattern, 0=off, 1=on (test data output)
HIR_TSW_WD_STAT       HIR_TSW_CSC_STAT      8   1  # Watchdog Timer, 0=disabled, 1=enabled
HIR_TSW_SSWD_STAT     HIR_TSW_CSC_STAT      9   1  # Scanner strobe watchdog status, 0 = disabled, 1 = enabled
HIR_TSW_TLM_DIAGSTAT  HIR_TSW_CSC_STAT      10  1  # Diagnostic telemetry test pattern, 0=off, 1=on (test data output)
HIR_TSW_AZM_FM_STAT   HIR_TSW_CSC_STAT      11  1  # Measured current azimuth fault management, 0=disabled, 1=enabled
HIR_TSW_AZC_FM_STAT   HIR_TSW_CSC_STAT      12  1  # Commanded current azimuth fault management, 0=disabled, 1=enabled
HIR_TSW_CPU_SIDE      HIR_TSW_CSCI_BLD_ID   0   1  # 0 means A side, 1 means B side
HIR_TSW_ALPHA_BUILD   HIR_TSW_CSCI_BLD_ID   2   1  # 0= TEU code is released, 1= TEU code is under development
HIR_TSW_BUILD_NUM     HIR_TSW_CSCI_BLD_ID   3   7  # Build Number, release number is CPU_TYPE.REVISION.BUILD_NUM
HIR_TSW_REVISION      HIR_TSW_CSCI_BLD_ID   10  3  # Revision number
HIR_TSW_CPU_TYPE      HIR_TSW_CSCI_BLD_ID   13  3  # 0 is unused, 1 means an INTEL PC, 2 means the EM PSA-32, 3 is the
PFM PSA-32 4,5,6,7 are unused
HIR_TSW_CNTRL_AZ      HIR_TSW_EEACNFG       0   2  # Control encoder for azimuth, 00=none, 01=primary, 10=secondary, 11=
forbidden
HIR_TSW_SPARE_ECNFG1  HIR_TSW_EEACNFG       2   1  # Spare
HIR_TSW_TEST_ANGLE    HIR_TSW_EEACNFG       3   1  # Test angle mode off (0) or on (1)
HIR_TSW_CNTRL_EL      HIR_TSW_EEACNFG       4   2  # Control encoder for elevation, 00=none, 01=primary, 10=secondary,
11=forbidden
HIR_TSW_CNTRL_RH      HIR_TSW_EEACNFG       8   2  # Control read head, 00=forbidden, 01=EL RH1, 10=EL RH2, 11=Ave 1&2
HIR_TSW_SPARE_ECNFG2  HIR_TSW_EEACNFG       10  6  # Spare
HIR_TSW_CHOP_FAULT    HIR_TSW_FAULT_STAT    0   1  # Chopper fault occurred, nominal = 0 /over power = 1
HIR_TSW_PEEA_FAULT    HIR_TSW_FAULT_STAT    1   2  # Primary EEA fault occurred, nominal = 0 /fault type = 1 or 2
HIR_TSW_SEEA_FAULT    HIR_TSW_FAULT_STAT    3   2  # Secondary EEA fault occurred, nominal = 0 /fault type = 1 or 2
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HIR_TSW_CLOCK_FAULT   HIR_TSW_FAULT_STAT    5   1  # Lost Scanner Strobe, fall back to internal clock mode
HIR_TSW_CHSUM_FAULT   HIR_TSW_FAULT_STAT    6   1  # Memory Scrub detected program checksum error
HIR_TSW_SYNC_FAULT1   HIR_TSW_FAULT_STAT    7   1  # Chopper Rotation Signal Not detected in expected Scanner Strobe
HIR_TSW_SYNC_FAULT2   HIR_TSW_FAULT_STAT    8   1  # Average SS cycle time doesn’t match Chopper Freq Info in TEU
HIR_TSW_SYNC_FAULT3   HIR_TSW_FAULT_STAT    9   1  # Jitter in SS cycle time exceeds limits
HIR_TSW_SYNC_FAULT4   HIR_TSW_FAULT_STAT    10  1  # Interval between Chopper Rotation Signal detection NOT 12 SS events
HIR_TSW_SYNC_FAULT5   HIR_TSW_FAULT_STAT    11  1  # Fault4 detected at least once in last 5 sec
HIR_TSW_AZM_FAULT_1   HIR_TSW_FAULT_STAT    12  1  # Az meas current exceeds limit 1, FM is cmd words set to 0
HIR_TSW_AZM_FAULT_2   HIR_TSW_FAULT_STAT    13  1  # Az meas current exceeds limit 2, FM is mtr pwr disabled
HIR_TSW_AZC_FAULT     HIR_TSW_FAULT_STAT    14  1  # Az cmd current exceeds limit, FM is mtr pwr disabled
HIR_TSW_MTR_PWR       HIR_TSW_HWCNFG        0   1  # Motor power status, 0 = disabled, 1 = enabled
HIR_TSW_AZ_UNSHORTED  HIR_TSW_HWCNFG        1   1  # Coil short status, 0 = shorted, 1 = unshorted
HIR_TSW_AZ_CONNECT    HIR_TSW_HWCNFG        2   1  # Coil connected status, 0 = disconnected, 1 = connected
HIR_TSW_EL1_UNSHORTD  HIR_TSW_HWCNFG        3   1  # Coil short status, 0 = shorted, 1 = unshorted
HIR_TSW_EL1_CONNECT   HIR_TSW_HWCNFG        4   1  # Coil connected status, 0 = disconnected, 1 = connected
HIR_TSW_EL2_UNSHORTD  HIR_TSW_HWCNFG        5   1  # Coil short status, 0 = shorted, 1 = unshorted
HIR_TSW_EL2_CONNECT   HIR_TSW_HWCNFG        6   1  # Coil connected status, 0 = disconnected, 1 = connected
HIR_TSW_ACTIVE_EEA    HIR_TSW_HWCNFG        7   2  # EEA side powered on: 00=none, 01=primary, 10=secondary, 11=both
HIR_TSW_SPARE_HCNFG0  HIR_TSW_HWCNFG        9   2  # Spare
HIR_TSW_CHOPPER_CNT   HIR_TSW_HWCNFG        11  2  # Chopper connection status: 00=disconnected, 01=A connected, 10=B
connected, 11=both connected
HIR_TSW_CHOPPER_ENA   HIR_TSW_HWCNFG        13  1  # 0 = disabled, 1 = enabled
HIR_TSW_CHOPPER_SYNC  HIR_TSW_HWCNFG        14  1  # Chopper in-sync flag, 0 = false, 1 = true
HIR_TSW_CHOPPER_HCM   HIR_TSW_HWCNFG        15  1  # High current mode flag, 0 = off, 1 = on
HIR_TSW_SMCTL_STAT    HIR_TSW_SM_EI_STAT    0   8  # Scan mirror control status bits
HIR_TSW_SCAN_START    HIR_TSW_SM_EI_STAT    0   1  # Scan Start Received, 0 = false, 1 = true (Cleared next SS)
HIR_TSW_SCAN_ACTIVE   HIR_TSW_SM_EI_STAT    1   1  # Scan Active - under closed loop control, 0 = false, 1 = true
HIR_TSW_SAFE_NOW      HIR_TSW_SM_EI_STAT    2   1  # Safing Mirror (12 sec process), 0 = false, 1 = true
HIR_TSW_AZPOS_CONST   HIR_TSW_SM_EI_STAT    3   1  # AzPosConstant (archaic), 0 = false, 1 = true
HIR_TSW_SAFE_WAIT     HIR_TSW_SM_EI_STAT    4   1  # Waiting to Safe (30 sec time-out), 0 = false, 1 = true
HIR_TSW_SM_EI_SPARE   HIR_TSW_SM_EI_STAT    5   3  # Spare
HIR_TSW_EIC_STAT      HIR_TSW_SM_EI_STAT    8   8  # Encoder initialization control status bits
HIR_TSW_AZP_INIT      HIR_TSW_SM_EI_STAT    8   1  # Primary Azimuth encoder initialized, 0 = false, 1 = true
HIR_TSW_EL2P_INIT     HIR_TSW_SM_EI_STAT    9   1  # Primary Elevation 2 encoder initialized, 0 = false, 1 = true
HIR_TSW_EL1P_INIT     HIR_TSW_SM_EI_STAT    10  1  # Primary Elevation 1 encoder initialized, 0 = false, 1 = true
HIR_TSW_EI_OLOOP      HIR_TSW_SM_EI_STAT    11  1  # Open loop EI active, 0 = false, 1 = true
HIR_TSW_AZS_INIT      HIR_TSW_SM_EI_STAT    12  1  # Secondary Azimuth encoder initialized, 0 = false, 1 = true
HIR_TSW_EL2S_INIT     HIR_TSW_SM_EI_STAT    13  1  # Secondary Elevation 2 encoder initialized, 0 = false, 1 = true
HIR_TSW_EL1S_INIT     HIR_TSW_SM_EI_STAT    14  1  # Secondary Elevation 1 encoder initialized, 0 = false, 1 = true
HIR_TSW_EI_CLOOP      HIR_TSW_SM_EI_STAT    15  1  # Closed loop EI active, 0 = false, 1 = true
HIR_ISU_CMD_RES_NUM   HIR_ISU_CMD_RES_CODE  0   6  # Cmd Result code. Command result number
HIR_ISU_CMD_PARM_NUM  HIR_ISU_CMD_RES_CODE  6   5  # Cmd Result code. Parameter in error
HIR_ISU_CMD_SUBSYS    HIR_ISU_CMD_RES_CODE  11  4  # Cmd Result code. Constant value of 2 for SUROM
HIR_ISU_CMD_OK        HIR_ISU_CMD_RES_CODE  15  1  # Cmd Result code. 1 means last command OK, 0 means last command
rejected
HIR_ISU_EE_AUTO_OK    HIR_ISU_EE_ERR_STAT   0   1  # 1 means Autoboot image is valid
HIR_ISU_EE_AUTO_ERR   HIR_ISU_EE_ERR_STAT   1   3  # Specific Autoboot error which occured
HIR_ISU_EE_RETRY      HIR_ISU_EE_ERR_STAT   4   1  # Retry on EE prom read or write
HIR_ISU_EE_BADCOPY    HIR_ISU_EE_ERR_STAT   5   1  #
HIR_ISU_EE_OVERRIDE   HIR_ISU_EE_ERR_STAT   6   1  #
HIR_ISU_EE_TSWITCH    HIR_ISU_EE_ERR_STAT   7   1  #
HIR_ISU_EE_T1CHKSUM   HIR_ISU_EE_ERR_STAT   8   1  #
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HIR_ISU_EE_T2CHKSUM   HIR_ISU_EE_ERR_STAT   9   1  #
HIR_ISU_EE_T1FAIL     HIR_ISU_EE_ERR_STAT   10  1  #
HIR_ISU_EE_T2FAIL     HIR_ISU_EE_ERR_STAT   11  1  #
HIR_ISU_EE_WRITE_ERR  HIR_ISU_EE_ERR_STAT   12  1  #
HIR_ISU_EE_READ_ERR   HIR_ISU_EE_ERR_STAT   13  1  #
HIR_ISU_EE_NEEDSCRUB  HIR_ISU_EE_ERR_STAT   14  1  #
HIR_ISU_EE_ERROR      HIR_ISU_EE_ERR_STAT   15  1  # 1 means an EEPROM error occured, see bits 0-14 for details
HIR_ISU_WDT_EXPIRED   HIR_ISU_FLAG_BITS     0   1  # 1=Watchdog Expired
HIR_ISU_EXCEPT_ERR    HIR_ISU_FLAG_BITS     4   1  # 1=Processor exception occurred
HIR_ISU_ERR_INJECT    HIR_ISU_FLAG_BITS     8   1  # 1=Error injection enabled
HIR_ISU_EEDUMP_ON     HIR_ISU_FLAG_BITS     11  1  # 1=EEPROM Dump On
HIR_ISU_EE_SECT       HIR_ISU_FLAG_BITS     12  4  # EEPROM Section used for EEPROM work
HIR_ISU_MBICPID12_ER  HIR_ISU_MBIC_ERROR    0   1  # I_MBIC_AMBI_PID12_CONFIG ERROR
HIR_ISU_MBIC_PUP_ERR  HIR_ISU_MBIC_ERROR    9   1  # I_MBIC_POWERUP ERROR
HIR_ISU_MBIC_PDWNERR  HIR_ISU_MBIC_ERROR    10  1  # I_MBIC_POWERDOWN ERROR
HIR_ISU_MBIC_CNF_ERR  HIR_ISU_MBIC_ERROR    11  1  # I_MBIC_CONFIGURE ERROR
HIR_ISU_MBIC_RNG_ERR  HIR_ISU_MBIC_ERROR    12  1  # I_MBIC_RANGE ERROR
HIR_ISU_MBIC_A_DEAD   HIR_ISU_MBIC_ERROR    14  1  # I_MBIC_A_DEAD ERROR
HIR_ISU_MBIC_B_DEAD   HIR_ISU_MBIC_ERROR    15  1  # I_MBIC_B_DEAD ERROR
HIR_ISU_CPU_SIDE      HIR_ISU_ROM_BUILD_ID  0   1  # 0 = SIDE, A 1= SIDE B, Read from LIO PID
HIR_ISU_ALPHA_BUILD   HIR_ISU_ROM_BUILD_ID  2   1  # 1= ALPHA TEST BUILD, 0= CODE FREEZE/RELEASE
HIR_ISU_BUILD_NUM     HIR_ISU_ROM_BUILD_ID  3   7  # BUILD NUMBER             0-99
HIR_ISU_MINOR_REV     HIR_ISU_ROM_BUILD_ID  10  3  # MINOR_REVISION NUMBER    1-7
HIR_ISU_MAJOR_REV     HIR_ISU_ROM_BUILD_ID  13  3  # MAJOR_REVISION NUMBER    1-7
HIR_ISU_EETBL_SECT    HIR_ISU_SECT          0   4  # EEPROM index table section info being downloaded
HIR_ISU_EETBL         HIR_ISU_SECT          4   2  # EEPROM index table being downloaded (1 or 2), 0 for decoded table
HIR_ISU_EETBL_ACTIVE  HIR_ISU_SECT          6   2  # Active EEPROM index table (1 or 2, 0 if no good tables)
```

```
# $Id$
#
# HIRDLS Science Houskeeping File: v6.15
# Version Date: 2002-06-20 11:00:00
#
# Generated from: Telemetry table Version  035
#                 Database Version 016
#
START_OF_TABLE: hirdls_sci_def_v6_15
#32 bit entries

START_COMPLEX: 32
       SAILTASK_00_P15     , 0
       SAILTASK_01_P15     , 1
       SAILTASK_02_P15     , 2
       SAILTASK_03_P15     , 3
       SAILTASK_04_P15     , 4
       SAILTASK_05_P15     , 5
       SAILTASK_06_P15     , 6
       SAILTASK_07_P15     , 7
END_COMPLEX:

START_COMPLEX: 32
       SAILTASK_08_P15     , 0
       SAILTASK_09_P15     , 1
       SAILTASK_10_P15     , 2
       SAILTASK_11_P15     , 3
       SAILTASK_12_P15     , 4
       SAILTASK_13_P15     , 5
       SAILTASK_14_P15     , 6
       SAILTASK_15_P15     , 7
END_COMPLEX:

START_COMPLEX: 32
       SAIL_SHM_256        , 0
       SAIL_SHM_257        , 1
       SAIL_SHM_258        , 2
       SAIL_SHM_259        , 3
       SAIL_SHM_260        , 4
       SAIL_SHM_261        , 5
       SAIL_SHM_262        , 6
       SAIL_SHM_263        , 7
END_COMPLEX:

START_COMPLEX: 32
       TSW_EL1P_POS        , 0
       TSW_EL2P_POS        , 1
       TSW_AZP_POS         , 2
       TSW_EL1S_POS        , 3
       TSW_EL2S_POS        , 4
       TSW_AZS_POS         , 5
       TSU_UP_CKSUM        , 6
       TSU_CMP_CKSUM       , 7
END_COMPLEX:

START_COMPLEX: 32
       TSU_DUMP_ADDR       , 0
       HIRDLS_TIME_LSW     , 1
       HIRDLS_TIME_MSW     , 2
       TSS_RESET_TIME      , 3
       SC_ATT_QUAT_1       , 4
       SC_ATT_QUAT_2       , 5
       SC_ATT_QUAT_3       , 6
       SC_ATT_QUAT_4       , 7
END_COMPLEX:

START_COMPLEX: 32
       SC_POS_X            , 0
       SC_POS_Y            , 1
       SC_POS_Z            , 2
```

```
        SC_TIM_STAMP_LSW    , 3
        SC_TIM_STAMP_MSW    , 4
        SC_VELY_X           , 5
        SC_VELY_Y           , 6
        SC_VELY_Z           , 7
END_COMPLEX:

START_COMPLEX: 32
        SPARE_12D           , 0
        SPARE_15D           , 1
        SPARE_13D           , 2
        SPARE_14D           , 3
        TSW_EL1P_OFFSET     , 4
        TSW_EL2P_OFFSET     , 5
        TSW_AZP_OFFSET      , 6
        TSW_EL1S_OFFSET     , 7
END_COMPLEX:

START_COMPLEX: 32
        TSW_EL2S_OFFSET     , 0
        TSW_AZS_OFFSET      , 1
        TSB_BOOT_STAT_4     , 2
        TSB_EE_TABLE        , 3
        TSB_ADDR_OFF        , 4
        SAIL_SHM_264        , 5
        SAIL_SHM_265        , 6
        SAIL_SHM_266        , 7
END_COMPLEX:

START_COMPLEX: 32
        SAIL_SHM_267        , 0
        SAIL_SHM_268        , 1
        SAIL_SHM_269        , 2
        SAIL_SHM_270        , 3
        SAIL_SHM_271        , 4
        MACRO_STAT          , 5
        MACRO_PARM          , 6
        TSW_EXCEPTION       , 7
END_COMPLEX:

START_COMPLEX: 32
        IPU_EXCEPTION       , 0
        TLM_TSS_AZOFFSET    , 1
        TLM_TSS_ELOFFSET    , 2
        TLM_TSS_WXOFFSET    , 3
        TLM_TSS_WYOFFSET    , 4
END_COMPLEX:
#16 bit entries (1/minor frame)
FPA_TMP_A
FPA_TMP_B
IPU_STAT_0
IPU_STAT_1
TSW_WBDAT1
TSW_WBDAT2
IPU_STAT_2
# Start of 16 bit subcommutated/complex entry sections

START_COMPLEX: 16
        STH_TMP_01          , 0
        STH_TMP_02          , 1
        STH_TMP_03          , 2
        STH_TMP_04          , 3
        CCU_BOX_TMP         , 4
        GEU_BOX_TMP         , 5
        PCU_BOX_TMP         , 6
        EEA_BOX_TMP         , 7
END_COMPLEX:

START_COMPLEX: 16
        WSE_BOX_TMP         , 0
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        CSS_RAD_TMP1         , 1
        CSS_RAD_TMP2         , 2
        COMP_HEAD_TMP        , 3
        DISPL1_TMP           , 4
        DISPL2_TMP           , 5
        SUNSEN1_TMP          , 6
        SUNSEN2_TMP          , 7
END_COMPLEX:

START_COMPLEX: 16
        SUNSEN3_TMP          , 0
        DOOR_POT             , 1
        DOOR_SAF_ANG         , 2
        SSH_HWA_TMP          , 3
        SSH_DORMOT_TMP       , 4
        SSH_APL_TMP          , 5
        SSH_PZSURF_TMP       , 6
        SSH_NZSURF_TMP       , 7
END_COMPLEX:

START_COMPLEX: 16
        SSH_STAT             , 0
        SVA_STAT             , 1
        SVA_DORMOT_TMP       , 2
        SVA_MTGPLT_TMP       , 3
        GYR0_TMP             , 4
        GYR1_TMP             , 5
        GYR2_TMP             , 6
        GYR3_TMP             , 7
END_COMPLEX:

START_COMPLEX: 16
        GYR0_BD_TMP          , 0
        GYR1_BD_TMP          , 1
        GYR2_BD_TMP          , 2
        GYR3_BD_TMP          , 3
        GYR0_CAPL            , 4
        GYR1_CAPL            , 5
        GYR2_CAPL            , 6
        GYR3_CAPL            , 7
END_COMPLEX:

START_COMPLEX: 16
        GYR0_MOT_V           , 0
        GYR1_MOT_V           , 1
        GYR2_MOT_V           , 2
        GYR3_MOT_V           , 3
        GYR0_MOT_I           , 4
        GYR1_MOT_I           , 5
        GYR2_MOT_I           , 6
        GYR3_MOT_I           , 7
END_COMPLEX:

START_COMPLEX: 16
        GYR0_STAT            , 0
        GYR1_STAT            , 1
        GYR2_STAT            , 2
        GYR3_STAT            , 3
        GYR0_P15V            , 4
        GYR1_P15V            , 5
        GYR2_P15V            , 6
        GYR3_P15V            , 7
END_COMPLEX:

START_COMPLEX: 16
        GYR0_N15V            , 0
        GYR1_N15V            , 1
        GYR2_N15V            , 2
        GYR3_N15V            , 3
        SM_TMP1              , 4
```

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        SM_TMP2              , 5
        SM_TMP3              , 6
        AZ_HSG_TMP_1         , 7
END_COMPLEX:

START_COMPLEX: 16
        M1_TMP1              , 0
        M1_TMP2              , 1
        LNS1_WF_TMP1         , 2
        LNS1_WF_TMP2         , 3
        LNS1_WF_TMP3         , 4
        LNS2_TMP1            , 5
        LNS2_TMP2            , 6
        LNS2_TMP3            , 7
END_COMPLEX:

START_COMPLEX: 16
        CHOP_MOT_TMP         , 0
        CHOP_HSG_TMP2        , 1
        CHOP_HSG_TMP3        , 2
        CALMIR_TMP1          , 3
        CALMIR_TMP2          , 4
        CALMIR_TMP3          , 5
        M2_TMP1              , 6
        M2_TMP2              , 7
END_COMPLEX:

START_COMPLEX: 16
        SMA_MTRING_TMP       , 0
        LNSASSY_TMP1         , 1
        LNSASSY_TMP2         , 2
        SPVU_BAF_TMP         , 3
        OBA_PLT_TMP          , 4
        GMU_MNT_TMP          , 5
        GMU_HSG_TMP          , 6
        TSW_CSCI_BLD_ID      , 7
END_COMPLEX:

START_COMPLEX: 16
        IFCBB_FRPL_TMP       , 0
        IFCBB_TMP1           , 1
        IFCBB_TMP2           , 2
        IFCBB_TMP3           , 3
        SCCMDS_RCVCT         , 4
        SCCMDS_REJCT         , 5
        SCCMD_LAST_RC        , 6
        SCCMD_LAST_PC        , 7
END_COMPLEX:

START_COMPLEX: 16
        SAILCMDS_RCVCT       , 0
        SAILCMDS_REJCT       , 1
        SAILCMD_LAST_RC      , 2
        MACMDS_RCVCT         , 3
        MACMDS_REJCT         , 4
        MACMD_LAST_RC        , 5
        SPU_CH_01_ZERO       , 6
        SPU_CH_02_ZERO       , 7
END_COMPLEX:

START_COMPLEX: 16
        SPU_CH_03_ZERO       , 0
        SPU_CH_04_ZERO       , 1
        SPU_CH_05_ZERO       , 2
        SPU_CH_06_ZERO       , 3
        SPU_CH_07_ZERO       , 4
        SPU_CH_08_ZERO       , 5
        SPU_CH_09_ZERO       , 6
        SPU_CH_10_ZERO       , 7
END_COMPLEX:
```

```
START_COMPLEX: 16
       SPU_CH_11_ZERO       , 0
       SPU_CH_12_ZERO       , 1
       SPU_CH_13_ZERO       , 2
       SPU_CH_14_ZERO       , 3
       SPU_CH_15_ZERO       , 4
       SPU_CH_16_ZERO       , 5
       SPU_CH_17_ZERO       , 6
       SPU_CH_18_ZERO       , 7
END_COMPLEX:

START_COMPLEX: 16
       SPU_CH_19_ZERO       , 0
       SPU_CH_20_ZERO       , 1
       SPU_CH_21_ZERO       , 2
       SPU_P5V_A            , 3
       SPU_N5V_A            , 4
       SPU_P5V_DA           , 5
       SPU_P12V_A           , 6
       SPU_N12V_A           , 7
END_COMPLEX:

START_COMPLEX: 16
       SPU_P5V_B            , 0
       SPU_N5V_B            , 1
       SPU_P5V_DB           , 2
       SPU_P12V_B           , 3
       SPU_N12V_B           , 4
       IPU_P3P3V            , 5
       IPU_P5V              , 6
       IPU_P15V             , 7
END_COMPLEX:

START_COMPLEX: 16
       IPU_N15V             , 0
       IPU_P3P3_DDC_TMP     , 1
       IPU_P5V_DDC_TMP      , 2
       IPU_CSCI_BLD_ID      , 3
       CRYOTIP_SETP         , 4
       CRYOTIP_TMP_D0       , 5
       CRYOTIP_TMP_D1       , 6
       CSS_FREQ_DMD         , 7
END_COMPLEX:

START_COMPLEX: 16
       CSS_FREQ_ACT         , 0
       CSS_PH_DMD           , 1
       CSS_PH_ACT           , 2
       COMP_AMP_DMD         , 3
       COMP_AMP_ACT         , 4
       DISP_AMP_DMD         , 5
       DISP_AMP_ACT         , 6
       CSS_CSCI_BLD_ID      , 7
END_COMPLEX:

START_COMPLEX: 16
       QA_I                 , 0
       QB_I                 , 1
       PSS_SPU_5VA          , 2
       PSS_SPU_5VB          , 3
       PSS_SPU_P15VA        , 4
       PSS_SPU_P15VB        , 5
       PSS_SPU_N15VA        , 6
       PSS_SPU_N15VB        , 7
END_COMPLEX:

START_COMPLEX: 16
       PSS_PCU_5VC          , 0
       PSS_PCU_P15VC        , 1
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        PSS_PCU_N15VC        , 2
        PSS_REG_28VA         , 3
        PSS_REG_28VB         , 4
        PSS_SYS_5VA          , 5
        PSS_SYS_5VB          , 6
        PSS_SYS_P15VA        , 7
END_COMPLEX:

START_COMPLEX: 16
        PSS_SYS_P15VB        , 0
        PSS_SYS_N15VA        , 1
        PSS_SYS_N15VB        , 2
        PSS_STAT_00          , 3
        PSS_STAT_01          , 4
        PSS_STAT_02          , 5
        PSS_STAT_03          , 6
        PSS_STAT_04          , 7
END_COMPLEX:

START_COMPLEX: 16
        PSS_STAT_05          , 0
        PSS_STAT_06          , 1
        PSS_STAT_07          , 2
        PSS_SPU_5VA_TMP      , 3
        PSS_SPU_5VB_TMP      , 4
        PSS_SPU_15VA_TMP     , 5
        PSS_SPU_15VB_TMP     , 6
        PSS_REG_28VA_TMP     , 7
END_COMPLEX:

START_COMPLEX: 16
        PSS_REG_28VB_TMP     , 0
        PSS_SYS_5VA_TMP      , 1
        PSS_SYS_5VB_TMP      , 2
        PSS_SYS_P15VATMP     , 3
        PSS_SYS_P15VBTMP     , 4
        PSS_SYS_N15VATMP     , 5
        PSS_SYS_N15VBTMP     , 6
        PSS_PCU_15VA_TMP     , 7
END_COMPLEX:

START_COMPLEX: 16
        PSS_PCU_15VB_TMP     , 0
        PSS_QAFILT_TMP       , 1
        PSS_QBFILT_TMP       , 2
        IPU_ERR_0            , 3
        CMD_ERR_0            , 4
        IPU_ERR_1            , 5
        IPU_ERR_2            , 6
        IPU_BUILD_DATE       , 7
END_COMPLEX:

START_COMPLEX: 16
        IPU_BUILD_TIME       , 0
        EXEC_OVERRUN_CNT     , 1
        IPU_FLT_STAT_1       , 2
        IPU_FLT_STAT_0       , 3
        QHSS_2_RV_STAT       , 4
        QHSS_3_RV_STAT       , 5
        QHSS_1_TX_STAT       , 6
        IPU_ERR_3            , 7
END_COMPLEX:

START_COMPLEX: 16
        CHOP_FREQ            , 0
        BEU_BOX_TMP          , 1
        BEU_MNT_TMP          , 2
        SPU_BOX_TMP          , 3
        IPU_BOX_TMP          , 4
        TEU_BOX_TMP          , 5
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        TEU_MNT_TMP          , 6
        EEA_MNT_TMP          , 7
END_COMPLEX:

START_COMPLEX: 16
        ELMOT1_TMP1          , 0
        ELMOT2_TMP1          , 1
        M1_TMP3              , 2
        SPVUMIR_TMP1         , 3
        SPVUMIR_TMP2         , 4
        SPVUMIR_TMP3         , 5
        OBA_TMP_00           , 6
        OBA_TMP_01           , 7
END_COMPLEX:

START_COMPLEX: 16
        OBA_TMP_02           , 0
        OBA_TMP_03           , 1
        OBA_TMP_04           , 2
        OBA_TMP_05           , 3
        OBA_TMP_06           , 4
        OBA_TMP_07           , 5
        OBA_TMP_08           , 6
        OBA_TMP_09           , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_ENCP_STAT        , 0
        TSW_ENCS_STAT        , 1
        TSW_PRIIF_STAT       , 2
        TSW_SECIF_STAT       , 3
        TSW_HWCNFG           , 4
        TSW_CLOCK_SEL        , 5
        TSW_SCON_STAT        , 6
        TSW_CSC_STAT         , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_CMDA_CNT         , 0
        TSW_CMDR_CNT         , 1
        TSW_CMDA_SIG         , 2
        TSW_CMDR_SIG         , 3
        TSW_CTL_INDEX        , 4
        TSW_SM_EI_STAT       , 5
        TSW_EL1MTRDRVCMD     , 6
        TSW_EL2MTRDRVCMD     , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_AZMTRDRVCMD      , 0
        TSW_AZ_MTR_I         , 1
        TSW_EL1_MTR_I        , 2
        TSW_EL2_MTR_I        , 3
        TSW_CHOP_MTR_I       , 4
        TSW_P15VSUP          , 5
        TSW_P5VSUP           , 6
        TSW_P5VREF1          , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_P5VREF2          , 0
        TSW_N15VSUP          , 1
        TSW_PIFCTLRG         , 2
        TSW_SIFCTLRG         , 3
        TSW_MTRCTRG          , 4
        TSU_LIOTRES          , 5
        TSU_SBERR_CNT        , 6
        TSU_DBERR_CNT        , 7
END_COMPLEX:
```

```
START_COMPLEX: 16
        TSU_RBERR_CNT        , 0
        TSU_GOOD_RAM         , 1
        TSU_CACPT_CNT        , 2
        TSU_CREJ_CNT         , 3
        TSU_REJ_SIG          , 4
        TSU_REJREAS          , 5
        TSU_NEXT_BLK         , 6
        TSU_TOTAL_BLKS       , 7
END_COMPLEX:

START_COMPLEX: 16
        TSU_FLAG_BITS        , 0
        TSU_BUILD_ID         , 1
        SPU_CH_01_PHASE      , 2
        SPU_CH_02_PHASE      , 3
        SPU_CH_03_PHASE      , 4
        SPU_CH_04_PHASE      , 5
        SPU_CH_05_PHASE      , 6
        SPU_CH_06_PHASE      , 7
END_COMPLEX:

START_COMPLEX: 16
        SPU_CH_07_PHASE      , 0
        SPU_CH_08_PHASE      , 1
        SPU_CH_09_PHASE      , 2
        SPU_CH_10_PHASE      , 3
        SPU_CH_11_PHASE      , 4
        SPU_CH_12_PHASE      , 5
        SPU_CH_13_PHASE      , 6
        SPU_CH_14_PHASE      , 7
END_COMPLEX:

START_COMPLEX: 16
        SPU_CH_15_PHASE      , 0
        SPU_CH_16_PHASE      , 1
        SPU_CH_17_PHASE      , 2
        SPU_CH_18_PHASE      , 3
        SPU_CH_19_PHASE      , 4
        SPU_CH_20_PHASE      , 5
        SPU_CH_21_PHASE      , 6
        SPU_HK_PHASE         , 7
END_COMPLEX:

START_COMPLEX: 16
        SPU_BLADE_0_OPEN     , 0
        SPU_BLADE_1_OPEN     , 1
        SPU_BLADE_2_OPEN     , 2
        SPU_BLADE_3_OPEN     , 3
        SPU_BLADE_4_OPEN     , 4
        SPU_BLADE_5_OPEN     , 5
        SPU_BLADE_0_CLSD     , 6
        SPU_BLADE_1_CLSD     , 7
END_COMPLEX:

START_COMPLEX: 16
        SPU_BLADE_2_CLSD     , 0
        SPU_BLADE_3_CLSD     , 1
        SPU_BLADE_4_CLSD     , 2
        SPU_BLADE_5_CLSD     , 3
        SPU_GLOBAL_DELAY     , 4
        TSW_FREQ             , 5
        IPU_ERR_4            , 6
        TSW_SCBD_TMP         , 7
END_COMPLEX:

START_COMPLEX: 16
        PSS_PCU_5VA          , 0
        PSS_PCU_5VB          , 1
        GYR0_HTR_W           , 2
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        GYR1_HTR_W          , 3
        GYR2_HTR_W          , 4
        GYR3_HTR_W          , 5
        SC_DESC_NODE        , 6
        SC_EUL_ANG_PITCH    , 7
END_COMPLEX:

START_COMPLEX: 16
        SC_EUL_ANG_ROLL     , 0
        SC_EUL_ANG_YAW      , 1
        SC_GYRO_STAT        , 2
        SC_MOON_VECT_X      , 3
        SC_MOON_VECT_Y      , 4
        SC_MOON_VECT_Z      , 5
        SC_NAV_MODE         , 6
        SC_OBL_ANG_AFT      , 7
END_COMPLEX:

START_COMPLEX: 16
        SC_OBL_ANG_R        , 0
        SC_PITCH_RATE       , 1
        SC_ROLL_RATE        , 2
        SC_SUN_VECT_X       , 3
        SC_SUN_VECT_Y       , 4
        SC_SUN_VECT_Z       , 5
        SC_YAW_RATE         , 6
        OPH_ZONE1_DELAY     , 7
END_COMPLEX:

START_COMPLEX: 16
        OPH_ZONE2_DELAY     , 0
        OPH_ZONE3_DELAY     , 1
        OPH_ZONE4_DELAY     , 2
        OPH_ZONE5_DELAY     , 3
        OPH_ZONE6_DELAY     , 4
        OPH_ZONE1_WIDTH     , 5
        OPH_ZONE2_WIDTH     , 6
        OPH_ZONE3_WIDTH     , 7
END_COMPLEX:

START_COMPLEX: 16
        OPH_ZONE4_WIDTH     , 0
        OPH_ZONE5_WIDTH     , 1
        OPH_ZONE6_WIDTH     , 2
        CSS_STACK_STAT      , 3
        E_PRT_AMP_OFF       , 4
        E_PRT_0_P           , 5
        E_PRT_1_P           , 6
        E_PRT_2_P           , 7
END_COMPLEX:

START_COMPLEX: 16
        E_PRT_3_P           , 0
        E_PRT_4_P           , 1
        E_PRT_5_P           , 2
        E_PRT_6_P           , 3
        E_PRT_7_P           , 4
        E_REF_379_OHM       , 5
        E_REF_619_OHM       , 6
        E_PRT_0_N           , 7
END_COMPLEX:

START_COMPLEX: 16
        E_PRT_1_N           , 0
        E_PRT_2_N           , 1
        E_PRT_3_N           , 2
        E_PRT_4_N           , 3
        E_PRT_5_N           , 4
        E_PRT_6_N           , 5
        E_PRT_7_N           , 6
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        E_REF_234_UAMP      , 7
END_COMPLEX:

START_COMPLEX: 16
        E_AD590_AMP_OFF     , 0
        SSH_DOOR_TMP        , 1
        E_REF_352_UAMP      , 2
        SPU_MNT_TMP         , 3
        E_PSS_GND_O         , 4
        E_ADC_OFFSET        , 5
        E_REF_7P664_V       , 6
        SPARE_00D           , 7
END_COMPLEX:

START_COMPLEX: 16
        PSS_SPU_P15VATMP    , 0
        PSS_SPU_P15VBTMP    , 1
        PSS_SPU_N15VATMP    , 2
        PSS_SPU_N15VBTMP    , 3
        PSS_QAP_RLY_TMP     , 4
        PSS_QBP_RLY_TMP     , 5
        PSS_QAR_RLY_TMP     , 6
        PSS_QBR_RLY_TMP     , 7
END_COMPLEX:

START_COMPLEX: 16
        SPARE_09D           , 0
        SPARE_10D           , 1
        SPARE_11D           , 2
        SPARE_01D           , 3
        SPARE_02D           , 4
        SPARE_03D           , 5
        SPARE_04D           , 6
        SPARE_05D           , 7
END_COMPLEX:

START_COMPLEX: 16
        SPARE_06D           , 0
        SPARE_07D           , 1
        SPARE_08D           , 2
        TSW_EEACNFG         , 3
        TSW_HK_PKT_CNT      , 4
        TSW_SCI_PKT_CNT     , 5
        TSW_TLM_ID          , 6
        TSB_DIAG_CHKSM_C    , 7
END_COMPLEX:

START_COMPLEX: 16
        TSB_HK_CHKSM_CNT    , 0
        TSU_HK_PKT_CNT      , 1
        TSU_DIAG_PKT_CNT    , 2
        TSU_TLM_ID          , 3
        SAIL_ERR_LLOC       , 4
        SAIL_ERR_CLOC       , 5
        TLM_DIAG_STAT       , 6
        TSW_EL1P_INDEX      , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_EL2P_INDEX      , 0
        TSW_AZP_INDEX       , 1
        TSW_EL1S_INDEX      , 2
        TSW_EL2S_INDEX      , 3
        TSW_AZS_INDEX       , 4
        TSW_TABLEN          , 5
        TSB_BOOT_STAT_1     , 6
        TSB_BOOT_STAT_2     , 7
END_COMPLEX:

START_COMPLEX: 16
```

```
        TSB_BOOT_STAT_3      , 0
        IPU_ERR_5            , 1
        DISPL1_OTSP          , 2
        GYR0_OTSP            , 3
        GYR1_OTSP            , 4
        GYR2_OTSP            , 5
        GYR3_OTSP            , 6
        SSH_DORMOT_OTSP      , 7
END_COMPLEX:

START_COMPLEX: 16
        SSH_HWA_OTSP         , 0
        SVA_DORMOT_OTSP      , 1
        CHOP_MOT_OTSP        , 2
        DISPL2_OTSP          , 3
        COMP_HEAD_OTSP       , 4
        IPU_ALIVE            , 5
        TSW_FAULT_STAT       , 6
        TSW_MEM_SCRUB        , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_SCI_AZPO_CMD     , 0
        TSW_SCI_ELPO_CMD     , 1
        TSW_MIN_SSTIME       , 2
        TSW_MAX_SSTIME       , 3
        TSW_CR_SYNC_STAT     , 4
        CSS_PACKED_PID       , 5
        SCI_HKTBL_ERR        , 6
        ENG_HKTBL_ERR        , 7
END_COMPLEX:

START_COMPLEX: 16
        PRF_CR2CR_MAX        , 0
        PRF_CR2CR_MIN        , 1
        SPU_PHASE_ERR_C      , 2
        TSS_DMA_ERR_C        , 3
        AZ_HSG_TMP_2         , 4
        TSW_CTL_ERR_AZ       , 5
        TSW_CTL_ERR_EL       , 6
        SAILCMST_0_15        , 7
END_COMPLEX:

START_COMPLEX: 16
        SAILCMST_16_31       , 0
        SAILCMST_32_47       , 1
        SAILCMST_48_63       , 2
        SAILCMST_64_79       , 3
        SAILCMST_80_95       , 4
        SAILCMST_96_111      , 5
        SAILCMST_112_127     , 6
        TSW_DMA_R_ERR_C      , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_QHSS_ERR_C       , 0
        EXEC_STACK_MRGN      , 1
        SAIL_STACK_MRGN      , 2
        EDAQ_LIST_ERR_C      , 3
        EDAQ_LIST_STAT       , 4
        EDAQ_LIST_ERR_W      , 5
END_COMPLEX:
# Start of 8 bit subcommutated/complex entry sections

START_COMPLEX: 16
        IFC_REF_TMP          , 0   , 0
        IFC_PSV_P28          , 0   , 8
        IFC_PSV_P15          , 1   , 0
        IFC_PSV_N15          , 1   , 8
        IFC_PSV_P5           , 2   , 0
```

```
        SAIL_PROC_STAT      , 2   , 8
        SAILTASK_00_STAT    , 3   , 0
        SAILTASK_01_STAT    , 3   , 8
        SAILTASK_02_STAT    , 4   , 0
        SAILTASK_03_STAT    , 4   , 8
        SAILTASK_04_STAT    , 5   , 0
        SAILTASK_05_STAT    , 5   , 8
        SAILTASK_06_STAT    , 6   , 0
        SAILTASK_07_STAT    , 6   , 8
        SAILTASK_08_STAT    , 7   , 0
        SAILTASK_09_STAT    , 7   , 8
END_COMPLEX:

START_COMPLEX: 16
        SAILTASK_10_STAT    , 0   , 0
        SAILTASK_11_STAT    , 0   , 8
        SAILTASK_12_STAT    , 1   , 0
        SAILTASK_13_STAT    , 1   , 8
        SAILTASK_14_STAT    , 2   , 0
        SAILTASK_15_STAT    , 2   , 8
        SCCMD_LAST_CN       , 3   , 0
        SAILCMD_LAST_CN     , 3   , 8
        MACMD_LAST_CN       , 4   , 0
        CSS_OP_STAT         , 4   , 8
        CSS_DDCAG_STAT      , 5   , 0
        CSS_ERROR           , 5   , 8
        CSS_TOTAL_I         , 6   , 0
        CSS_MSG_NUMBER      , 6   , 8
        SUBTMI_BUILD_ID     , 7   , 0
        FIR1_TBL_ID         , 7   , 8
END_COMPLEX:

START_COMPLEX: 16
        FIR2_TBL_ID         , 0   , 0
        FIR3_TBL_ID         , 0   , 8
        FIR6_TBL_ID         , 1   , 0
        PRF_CR_TOTAL        , 1   , 8
        PRF_1553            , 2   , 0
        PRF_QHSS_SPU        , 2   , 8
        PRF_QHSS_TEU        , 3   , 0
        PRF_HIRDLSTIME      , 3   , 8
        PRF_SWAP_DIAG       , 4   , 0
        PRF_UP_HKTBL        , 4   , 8
        PRF_UP_SCITBL       , 5   , 0
        PRF_UP_SCIFMT       , 5   , 8
        PRF_CLR_CMD         , 6   , 0
        PRF_EXE_TLM         , 6   , 8
        PRF_SSH_TLM         , 7   , 0
        PRF_SVA_TLM         , 7   , 8
END_COMPLEX:

START_COMPLEX: 16
        PRF_CMD_TLM         , 0   , 0
        PRF_IOBIC_TLM       , 0   , 8
        PRF_SPU_TLM         , 1   , 0
        PRF_TSS_TLM         , 1   , 8
        PRF_TG_TLM          , 2   , 0
        PRF_SCIFMT_TLM      , 2   , 8
        PRF_SCIPRO_TLM      , 3   , 0
        PRF_CSS_TLM         , 3   , 8
        PRF_UPDATE_MAC      , 4   , 0
        PRF_EXE_SCCMD       , 4   , 8
        PRF_EXE_SAICMD      , 5   , 0
        PRF_EXE_MACCMD      , 5   , 8
        PRF_CNTRL_PSS       , 6   , 0
        PRF_CNTRL_EDAQ      , 6   , 8
        PRF_CNTRL_CSS       , 7   , 0
        PRF_CNTRL_IFC       , 7   , 8
END_COMPLEX:
```

```
START_COMPLEX: 16
       PRF_DECIM_SCI        , 0   , 0
       PRF_FIR_SCI          , 0   , 8
       PRF_FMT_HKBLOCK      , 1   , 0
       PRF_MAKE_SCIPKT      , 1   , 8
       PRF_MAKE_ENGPKT      , 2   , 0
       PRF_INVALID          , 2   , 8
       PRF_CNTRL_SSH        , 3   , 0
       PRF_CNTRL_GSS        , 3   , 8
       IFC_HCW              , 4   , 0
       IPU_CSS_TLM_CNT      , 4   , 8
       TSS_RD_TEUSYNC       , 5   , 0
       TSS_WR_TEUSYNC       , 5   , 8
       IPU_CSS_CMD_CNT      , 6   , 0
       CMD_DB_BUILD_ID      , 6   , 8
       TLM_DB_BUILD_ID      , 7   , 0
       TSW_TOT_MAX          , 7   , 8
END_COMPLEX:

START_COMPLEX: 16
       TSW_CRIT_MAX         , 0   , 0
       CMDRES_DB_BLD_ID     , 0   , 8
       TSW_EXEC_OVERRUN     , 1   , 0
       GSS_SIO_BUSY_CNT     , 1   , 8
       TSS_TLM_PKT_CNT      , 2   , 0
       TSS_TLM_LEN_CNT      , 2   , 8
       TSS_TLM_NOPKT_C      , 3   , 0
       SAIL_ERR_LTASK       , 3   , 8
       SAIL_ERR_LTYP        , 4   , 0
       SAIL_ERR_CTASK       , 4   , 8
       SAIL_ERR_CTYP        , 5   , 0
       TSS_APP_CHKSM_C      , 5   , 8
       PRF_SAIL_EXEC        , 6   , 0
       PRF_SAIL_TLM         , 6   , 8
       EDAC_DBL_ERR_C       , 7   , 0
       EDAC_SGL_ERR_C       , 7   , 8
END_COMPLEX:

START_COMPLEX: 16
       PRF_FAULTMON         , 0   , 0
       PRF_MACRO_TLM        , 0   , 8
       PRF_EXEC_DELAY       , 1   , 0
       EDAQ_CR_PHASE        , 1   , 8
       MACRO_EXECUTING      , 2   , 0
       RAD_DEMOD_TBL_ID     , 2   , 8
END_COMPLEX:
END_OF_TABLE:
```

```
# $Id$
#
# HIRDLS Science Houskeeping File: v6.15
# Version Date: 2002-06-20 11:00:00
#
# Generated from: Telemetry table Version  035
#                 Database Version 016
#
START_OF_TABLE: hirdls_sci_opr_v6_15
#32 bit entries

START_COMPLEX: 32
       SAILTASK_00_P15     , 0
       SAILTASK_01_P15     , 1
       SAILTASK_02_P15     , 2
       SAILTASK_03_P15     , 3
       SAILTASK_04_P15     , 4
       SAILTASK_05_P15     , 5
       SAILTASK_06_P15     , 6
       SAILTASK_07_P15     , 7
END_COMPLEX:

START_COMPLEX: 32
       SAIL_SHM_256        , 0
       SAIL_SHM_257        , 1
       SAIL_SHM_258        , 2
       SAIL_SHM_259        , 3
       SAIL_SHM_260        , 4
       SAIL_SHM_261        , 5
       SAIL_SHM_262        , 6
       SAIL_SHM_263        , 7
END_COMPLEX:

START_COMPLEX: 32
       TSW_EL1P_POS        , 0
       TSW_EL2P_POS        , 1
       TSW_AZP_POS         , 2
       TSW_EL1S_POS        , 3
       TSW_EL2S_POS        , 4
       TSW_AZS_POS         , 5
       SC_ATT_QUAT_1       , 6
       SC_ATT_QUAT_2       , 7
END_COMPLEX:

START_COMPLEX: 32
       SC_ATT_QUAT_3       , 0
       SC_ATT_QUAT_4       , 1
       SC_POS_X            , 2
       SC_POS_Y            , 3
       SC_POS_Z            , 4
       SC_TIM_STAMP_LSW    , 5
       SC_TIM_STAMP_MSW    , 6
       SC_VELY_X           , 7
END_COMPLEX:

START_COMPLEX: 32
       SC_VELY_Y           , 0
       SC_VELY_Z           , 1
       SPARE_12D           , 2
       SPARE_15D           , 3
       SPARE_13D           , 4
       SPARE_14D           , 5
       SAIL_SHM_264        , 6
       SAIL_SHM_265        , 7
END_COMPLEX:

START_COMPLEX: 32
       SAIL_SHM_266        , 0
       SAIL_SHM_267        , 1
       SAIL_SHM_268        , 2
```

```
       SAIL_SHM_269        , 3
       SAIL_SHM_270        , 4
       SAIL_SHM_271        , 5
       MACRO_STAT          , 6
       MACRO_PARM          , 7
END_COMPLEX:

START_COMPLEX: 32
       TSW_EXCEPTION       , 0
       IPU_EXCEPTION       , 1
       TLM_TSS_AZOFFSET    , 2
       TLM_TSS_ELOFFSET    , 3
END_COMPLEX:
#16 bit entries (1/minor frame)
FPA_TMP_A
FPA_TMP_B
IPU_STAT_0
IPU_STAT_1
TSW_WBDAT1
TSW_WBDAT2
IPU_STAT_2
# Start of 16 bit subcommutated/complex entry sections

START_COMPLEX: 16
       STH_TMP_01          , 0
       STH_TMP_02          , 1
       STH_TMP_03          , 2
       STH_TMP_04          , 3
       CCU_BOX_TMP         , 4
       GEU_BOX_TMP         , 5
       PCU_BOX_TMP         , 6
       EEA_BOX_TMP         , 7
END_COMPLEX:

START_COMPLEX: 16
       WSE_BOX_TMP         , 0
       CSS_RAD_TMP1        , 1
       CSS_RAD_TMP2        , 2
       COMP_HEAD_TMP       , 3
       DISPL1_TMP          , 4
       DISPL2_TMP          , 5
       SUNSEN1_TMP         , 6
       SUNSEN2_TMP         , 7
END_COMPLEX:

START_COMPLEX: 16
       SUNSEN3_TMP         , 0
       DOOR_POT            , 1
       DOOR_SAF_ANG        , 2
       SSH_HWA_TMP         , 3
       SSH_DORMOT_TMP      , 4
       SSH_APL_TMP         , 5
       SSH_PZSURF_TMP      , 6
       SSH_NZSURF_TMP      , 7
END_COMPLEX:

START_COMPLEX: 16
       SSH_STAT            , 0
       SVA_STAT            , 1
       SVA_DORMOT_TMP      , 2
       SVA_MTGPLT_TMP      , 3
       GYR0_TMP            , 4
       GYR1_TMP            , 5
       GYR2_TMP            , 6
       GYR3_TMP            , 7
END_COMPLEX:

START_COMPLEX: 16
       GYR0_BD_TMP         , 0
       GYR1_BD_TMP         , 1
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```
        GYR2_BD_TMP          , 2
        GYR3_BD_TMP          , 3
        GYR0_CAPL            , 4
        GYR1_CAPL            , 5
        GYR2_CAPL            , 6
        GYR3_CAPL            , 7
END_COMPLEX:

START_COMPLEX: 16
        GYR0_MOT_V           , 0
        GYR1_MOT_V           , 1
        GYR2_MOT_V           , 2
        GYR3_MOT_V           , 3
        GYR0_MOT_I           , 4
        GYR1_MOT_I           , 5
        GYR2_MOT_I           , 6
        GYR3_MOT_I           , 7
END_COMPLEX:

START_COMPLEX: 16
        GYR0_STAT            , 0
        GYR1_STAT            , 1
        GYR2_STAT            , 2
        GYR3_STAT            , 3
        GYR0_P15V            , 4
        GYR1_P15V            , 5
        GYR2_P15V            , 6
        GYR3_P15V            , 7
END_COMPLEX:

START_COMPLEX: 16
        GYR0_N15V            , 0
        GYR1_N15V            , 1
        GYR2_N15V            , 2
        GYR3_N15V            , 3
        SM_TMP1              , 4
        SM_TMP2              , 5
        SM_TMP3              , 6
        AZ_HSG_TMP_1         , 7
END_COMPLEX:

START_COMPLEX: 16
        M1_TMP1              , 0
        M1_TMP2              , 1
        LNS1_WF_TMP1         , 2
        LNS1_WF_TMP2         , 3
        LNS1_WF_TMP3         , 4
        LNS2_TMP1            , 5
        LNS2_TMP2            , 6
        LNS2_TMP3            , 7
END_COMPLEX:

START_COMPLEX: 16
        CHOP_MOT_TMP         , 0
        CHOP_HSG_TMP2        , 1
        CHOP_HSG_TMP3        , 2
        CALMIR_TMP1          , 3
        CALMIR_TMP2          , 4
        CALMIR_TMP3          , 5
        M2_TMP1              , 6
        M2_TMP2              , 7
END_COMPLEX:

START_COMPLEX: 16
        SMA_MTRING_TMP       , 0
        LNSASSY_TMP1         , 1
        LNSASSY_TMP2         , 2
        SPVU_BAF_TMP         , 3
        OBA_PLT_TMP          , 4
        GMU_MNT_TMP          , 5
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        GMU_HSG_TMP          , 6
        IFCBB_FRPL_TMP       , 7
END_COMPLEX:

START_COMPLEX: 16
        IFCBB_TMP1           , 0
        IFCBB_TMP2           , 1
        IFCBB_TMP3           , 2
        SCCMDS_RCVCT         , 3
        SCCMDS_REJCT         , 4
        SCCMD_LAST_RC        , 5
        SCCMD_LAST_PC        , 6
        SAILCMDS_RCVCT       , 7
END_COMPLEX:

START_COMPLEX: 16
        SAILCMDS_REJCT       , 0
        SAILCMD_LAST_RC      , 1
        MACMDS_RCVCT         , 2
        MACMDS_REJCT         , 3
        MACMD_LAST_RC        , 4
        SPU_CH_01_ZERO       , 5
        SPU_P5V_A            , 6
        SPU_N5V_A            , 7
END_COMPLEX:

START_COMPLEX: 16
        SPU_P5V_DA           , 0
        SPU_P12V_A           , 1
        SPU_N12V_A           , 2
        SPU_P5V_B            , 3
        SPU_N5V_B            , 4
        SPU_P5V_DB           , 5
        SPU_P12V_B           , 6
        SPU_N12V_B           , 7
END_COMPLEX:

START_COMPLEX: 16
        IPU_P3P3V            , 0
        IPU_P5V              , 1
        IPU_P15V             , 2
        IPU_N15V             , 3
        IPU_P3P3_DDC_TMP     , 4
        IPU_P5V_DDC_TMP      , 5
        IPU_CSCI_BLD_ID      , 6
        CRYOTIP_SETP         , 7
END_COMPLEX:

START_COMPLEX: 16
        CRYOTIP_TMP_D0       , 0
        CRYOTIP_TMP_D1       , 1
        CSS_FREQ_DMD         , 2
        CSS_FREQ_ACT         , 3
        CSS_PH_DMD           , 4
        CSS_PH_ACT           , 5
        COMP_AMP_DMD         , 6
        COMP_AMP_ACT         , 7
END_COMPLEX:

START_COMPLEX: 16
        DISP_AMP_DMD         , 0
        DISP_AMP_ACT         , 1
        CSS_CSCI_BLD_ID      , 2
        QA_I                 , 3
        QB_I                 , 4
        PSS_SPU_5VA          , 5
        PSS_SPU_5VB          , 6
        PSS_SPU_P15VA        , 7
END_COMPLEX:
```

```
START_COMPLEX: 16
       PSS_SPU_P15VB        , 0
       PSS_SPU_N15VA        , 1
       PSS_SPU_N15VB        , 2
       PSS_PCU_5VC          , 3
       PSS_PCU_P15VC        , 4
       PSS_PCU_N15VC        , 5
       PSS_REG_28VA         , 6
       PSS_REG_28VB         , 7
END_COMPLEX:

START_COMPLEX: 16
       PSS_SYS_5VA          , 0
       PSS_SYS_5VB          , 1
       PSS_SYS_P15VA        , 2
       PSS_SYS_P15VB        , 3
       PSS_SYS_N15VA        , 4
       PSS_SYS_N15VB        , 5
       PSS_STAT_00          , 6
       PSS_STAT_01          , 7
END_COMPLEX:

START_COMPLEX: 16
       PSS_STAT_02          , 0
       PSS_STAT_03          , 1
       PSS_STAT_04          , 2
       PSS_STAT_05          , 3
       PSS_STAT_06          , 4
       PSS_STAT_07          , 5
       PSS_SPU_5VA_TMP      , 6
       PSS_SPU_5VB_TMP      , 7
END_COMPLEX:

START_COMPLEX: 16
       PSS_SPU_15VA_TMP     , 0
       PSS_SPU_15VB_TMP     , 1
       PSS_REG_28VA_TMP     , 2
       PSS_REG_28VB_TMP     , 3
       PSS_SYS_5VA_TMP      , 4
       PSS_SYS_5VB_TMP      , 5
       PSS_SYS_P15VATMP     , 6
       PSS_SYS_P15VBTMP     , 7
END_COMPLEX:

START_COMPLEX: 16
       PSS_SYS_N15VATMP     , 0
       PSS_SYS_N15VBTMP     , 1
       PSS_PCU_15VA_TMP     , 2
       PSS_PCU_15VB_TMP     , 3
       PSS_QAFILT_TMP       , 4
       PSS_QBFILT_TMP       , 5
       IPU_ERR_0            , 6
       CMD_ERR_0            , 7
END_COMPLEX:

START_COMPLEX: 16
       IPU_ERR_1            , 0
       IPU_ERR_2            , 1
       EXEC_OVERRUN_CNT     , 2
       IPU_FLT_STAT_1       , 3
       IPU_FLT_STAT_0       , 4
       QHSS_2_RV_STAT       , 5
       QHSS_3_RV_STAT       , 6
       QHSS_1_TX_STAT       , 7
END_COMPLEX:

START_COMPLEX: 16
       IPU_ERR_3            , 0
       CHOP_FREQ            , 1
       BEU_BOX_TMP          , 2
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```
        BEU_MNT_TMP          , 3
        SPU_BOX_TMP          , 4
        IPU_BOX_TMP          , 5
        TEU_BOX_TMP          , 6
        TEU_MNT_TMP          , 7
END_COMPLEX:

START_COMPLEX: 16
        EEA_MNT_TMP          , 0
        ELMOT1_TMP1          , 1
        ELMOT2_TMP1          , 2
        M1_TMP3              , 3
        SPVUMIR_TMP1         , 4
        SPVUMIR_TMP2         , 5
        SPVUMIR_TMP3         , 6
        OBA_TMP_00           , 7
END_COMPLEX:

START_COMPLEX: 16
        OBA_TMP_01           , 0
        OBA_TMP_02           , 1
        OBA_TMP_03           , 2
        OBA_TMP_04           , 3
        OBA_TMP_05           , 4
        OBA_TMP_06           , 5
        OBA_TMP_07           , 6
        OBA_TMP_08           , 7
END_COMPLEX:

START_COMPLEX: 16
        OBA_TMP_09           , 0
        TSW_ENCP_STAT        , 1
        TSW_ENCS_STAT        , 2
        TSW_PRIIF_STAT       , 3
        TSW_SECIF_STAT       , 4
        TSW_HWCNFG           , 5
        TSW_CLOCK_SEL        , 6
        TSW_CSC_STAT         , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_CMDA_CNT         , 0
        TSW_CMDR_CNT         , 1
        TSW_CMDA_SIG         , 2
        TSW_CMDR_SIG         , 3
        TSW_CTL_INDEX        , 4
        TSW_SM_EI_STAT       , 5
        TSW_EL1MTRDRVCMD     , 6
        TSW_EL2MTRDRVCMD     , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_AZMTRDRVCMD      , 0
        TSW_AZ_MTR_I         , 1
        TSW_EL1_MTR_I        , 2
        TSW_EL2_MTR_I        , 3
        TSW_CHOP_MTR_I       , 4
        TSW_P15VSUP          , 5
        TSW_P5VSUP           , 6
        TSW_P5VREF1          , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_P5VREF2          , 0
        TSW_N15VSUP          , 1
        TSW_PIFCTLRG         , 2
        TSW_SIFCTLRG         , 3
        TSW_FREQ             , 4
        IPU_ERR_4            , 5
        TSW_SCBD_TMP         , 6
```

```
        PSS_PCU_5VA          , 7
END_COMPLEX:

START_COMPLEX: 16
        PSS_PCU_5VB          , 0
        GYR0_HTR_W           , 1
        GYR1_HTR_W           , 2
        GYR2_HTR_W           , 3
        GYR3_HTR_W           , 4
        SC_DESC_NODE         , 5
        SC_EUL_ANG_PITCH     , 6
        SC_EUL_ANG_ROLL      , 7
END_COMPLEX:

START_COMPLEX: 16
        SC_EUL_ANG_YAW       , 0
        SC_GYRO_STAT         , 1
        SC_MOON_VECT_X       , 2
        SC_MOON_VECT_Y       , 3
        SC_MOON_VECT_Z       , 4
        SC_NAV_MODE          , 5
        SC_OBL_ANG_AFT       , 6
        SC_OBL_ANG_R         , 7
END_COMPLEX:

START_COMPLEX: 16
        SC_PITCH_RATE        , 0
        SC_ROLL_RATE         , 1
        SC_SUN_VECT_X        , 2
        SC_SUN_VECT_Y        , 3
        SC_SUN_VECT_Z        , 4
        SC_YAW_RATE          , 5
        OPH_ZONE1_WIDTH      , 6
        OPH_ZONE2_WIDTH      , 7
END_COMPLEX:

START_COMPLEX: 16
        OPH_ZONE3_WIDTH      , 0
        OPH_ZONE4_WIDTH      , 1
        OPH_ZONE5_WIDTH      , 2
        OPH_ZONE6_WIDTH      , 3
        CSS_STACK_STAT       , 4
        E_PRT_AMP_OFF        , 5
        E_REF_379_OHM        , 6
        E_REF_619_OHM        , 7
END_COMPLEX:

START_COMPLEX: 16
        E_REF_234_UAMP       , 0
        E_AD590_AMP_OFF      , 1
        SSH_DOOR_TMP         , 2
        E_REF_352_UAMP       , 3
        SPU_MNT_TMP          , 4
        E_PSS_GND_O          , 5
        E_ADC_OFFSET         , 6
        E_REF_7P664_V        , 7
END_COMPLEX:

START_COMPLEX: 16
        SPARE_00D            , 0
        PSS_SPU_P15VATMP     , 1
        PSS_SPU_P15VBTMP     , 2
        PSS_SPU_N15VATMP     , 3
        PSS_SPU_N15VBTMP     , 4
        PSS_QAP_RLY_TMP      , 5
        PSS_QBP_RLY_TMP      , 6
        PSS_QAR_RLY_TMP      , 7
END_COMPLEX:

START_COMPLEX: 16
```

```
        PSS_QBR_RLY_TMP      , 0
        SPARE_09D            , 1
        SPARE_10D            , 2
        SPARE_11D            , 3
        SPARE_01D            , 4
        SPARE_02D            , 5
        SPARE_03D            , 6
        SPARE_04D            , 7
END_COMPLEX:

START_COMPLEX: 16
        SPARE_05D            , 0
        SPARE_06D            , 1
        SPARE_07D            , 2
        SPARE_08D            , 3
        TSW_EEACNFG          , 4
        TSW_HK_PKT_CNT       , 5
        SAIL_ERR_LLOC        , 6
        SAIL_ERR_CLOC        , 7
END_COMPLEX:

START_COMPLEX: 16
        TLM_DIAG_STAT        , 0
        TSW_EL1P_INDEX       , 1
        TSW_EL2P_INDEX       , 2
        TSW_AZP_INDEX        , 3
        TSW_EL1S_INDEX       , 4
        TSW_EL2S_INDEX       , 5
        TSW_AZS_INDEX        , 6
        TSW_TABLEN           , 7
END_COMPLEX:

START_COMPLEX: 16
        IPU_ERR_5            , 0
        DISPL1_OTSP          , 1
        GYR0_OTSP            , 2
        GYR1_OTSP            , 3
        GYR2_OTSP            , 4
        GYR3_OTSP            , 5
        SSH_DORMOT_OTSP      , 6
        SSH_HWA_OTSP         , 7
END_COMPLEX:

START_COMPLEX: 16
        SVA_DORMOT_OTSP      , 0
        CHOP_MOT_OTSP        , 1
        DISPL2_OTSP          , 2
        COMP_HEAD_OTSP       , 3
        IPU_ALIVE            , 4
        TSW_FAULT_STAT       , 5
        TSW_MEM_SCRUB        , 6
        TSW_SCI_AZPO_CMD     , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_SCI_ELPO_CMD     , 0
        TSW_MIN_SSTIME       , 1
        TSW_MAX_SSTIME       , 2
        TSW_CR_SYNC_STAT     , 3
        CSS_PACKED_PID       , 4
        SCI_HKTBL_ERR        , 5
        PRF_CR2CR_MAX        , 6
        PRF_CR2CR_MIN        , 7
END_COMPLEX:

START_COMPLEX: 16
        SPU_PHASE_ERR_C      , 0
        TSS_DMA_ERR_C        , 1
        AZ_HSG_TMP_2         , 2
        TSW_CTL_ERR_AZ       , 3
```

```
        TSW_CTL_ERR_EL      , 4
        TSW_DMA_R_ERR_C     , 5
        TSW_QHSS_ERR_C      , 6
        EXEC_STACK_MRGN     , 7
END_COMPLEX:

START_COMPLEX: 16
        SAIL_STACK_MRGN     , 0
END_COMPLEX:
# Start of 8 bit subcommutated/complex entry sections

START_COMPLEX: 16
        IFC_REF_TMP         , 0   , 0
        IFC_PSV_P28         , 0   , 8
        IFC_PSV_P15         , 1   , 0
        IFC_PSV_N15         , 1   , 8
        IFC_PSV_P5          , 2   , 0
        SAIL_PROC_STAT      , 2   , 8
        SAILTASK_00_STAT    , 3   , 0
        SAILTASK_01_STAT    , 3   , 8
        SAILTASK_02_STAT    , 4   , 0
        SAILTASK_03_STAT    , 4   , 8
        SAILTASK_04_STAT    , 5   , 0
        SAILTASK_05_STAT    , 5   , 8
        SAILTASK_06_STAT    , 6   , 0
        SAILTASK_07_STAT    , 6   , 8
        SAILTASK_08_STAT    , 7   , 0
        SAILTASK_09_STAT    , 7   , 8
END_COMPLEX:

START_COMPLEX: 16
        SAILTASK_10_STAT    , 0   , 0
        SAILTASK_11_STAT    , 0   , 8
        SAILTASK_12_STAT    , 1   , 0
        SAILTASK_13_STAT    , 1   , 8
        SAILTASK_14_STAT    , 2   , 0
        SAILTASK_15_STAT    , 2   , 8
        SCCMD_LAST_CN       , 3   , 0
        SAILCMD_LAST_CN     , 3   , 8
        MACMD_LAST_CN       , 4   , 0
        CSS_OP_STAT         , 4   , 8
        CSS_DDCAG_STAT      , 5   , 0
        CSS_ERROR           , 5   , 8
        CSS_TOTAL_I         , 6   , 0
        CSS_MSG_NUMBER      , 6   , 8
        SUBTMI_BUILD_ID     , 7   , 0
        FIR1_TBL_ID         , 7   , 8
END_COMPLEX:

START_COMPLEX: 16
        FIR2_TBL_ID         , 0   , 0
        FIR3_TBL_ID         , 0   , 8
        FIR6_TBL_ID         , 1   , 0
        PRF_CR_TOTAL        , 1   , 8
        IFC_HCW             , 2   , 0
        IPU_CSS_TLM_CNT     , 2   , 8
        IPU_CSS_CMD_CNT     , 3   , 0
        CMD_DB_BUILD_ID     , 3   , 8
        TLM_DB_BUILD_ID     , 4   , 0
        TSW_TOT_MAX         , 4   , 8
        TSW_CRIT_MAX        , 5   , 0
        CMDRES_DB_BLD_ID    , 5   , 8
        TSW_EXEC_OVERRUN    , 6   , 0
        GSS_SIO_BUSY_CNT    , 6   , 8
        TSS_TLM_PKT_CNT     , 7   , 0
        TSS_TLM_NOPKT_C     , 7   , 8
END_COMPLEX:

START_COMPLEX: 16
        SAIL_ERR_LTASK      , 0   , 0
```

```
        SAIL_ERR_LTYP        , 0   , 8
        SAIL_ERR_CTASK       , 1   , 0
        SAIL_ERR_CTYP        , 1   , 8
        TSS_APP_CHKSM_C      , 2   , 0
        EDAC_DBL_ERR_C       , 2   , 8
        EDAC_SGL_ERR_C       , 3   , 0
        PRF_EXEC_DELAY       , 3   , 8
        MACRO_EXECUTING      , 4   , 0
        RAD_DEMOD_TBL_ID     , 4   , 8
END_COMPLEX:
END_OF_TABLE:
```

```
# $Id$
#
# HIRDLS Science Houskeeping File: v6.15
# Version Date: 2002-06-20 11:00:00
#
# Generated from: Telemetry table Version  035
#                 Database Version 016
#
START_OF_TABLE: hirdls_sci_all_v6_15
#32 bit entries

START_COMPLEX: 32
       SAILTASK_00_P15     , 0
       SAILTASK_01_P15     , 1
       SAILTASK_02_P15     , 2
       SAILTASK_03_P15     , 3
       SAILTASK_04_P15     , 4
       SAILTASK_05_P15     , 5
       SAILTASK_06_P15     , 6
       SAILTASK_07_P15     , 7
END_COMPLEX:

START_COMPLEX: 32
       SAILTASK_08_P15     , 0
       SAILTASK_09_P15     , 1
       SAILTASK_10_P15     , 2
       SAILTASK_11_P15     , 3
       SAILTASK_12_P15     , 4
       SAILTASK_13_P15     , 5
       SAILTASK_14_P15     , 6
       SAILTASK_15_P15     , 7
END_COMPLEX:

START_COMPLEX: 32
       SAIL_SHM_256        , 0
       SAIL_SHM_257        , 1
       SAIL_SHM_258        , 2
       SAIL_SHM_259        , 3
       SAIL_SHM_260        , 4
       SAIL_SHM_261        , 5
       SAIL_SHM_262        , 6
       SAIL_SHM_263        , 7
END_COMPLEX:

START_COMPLEX: 32
       SAIL_ENGWORD_00     , 0
       SAIL_ENGWORD_01     , 1
       SAIL_ENGWORD_02     , 2
       SAIL_ENGWORD_03     , 3
       SAIL_ENGWORD_04     , 4
       SAIL_ENGWORD_05     , 5
       SAIL_ENGWORD_06     , 6
       SAIL_ENGWORD_07     , 7
END_COMPLEX:

START_COMPLEX: 32
       TSW_EL1P_POS        , 0
       TSW_EL2P_POS        , 1
       TSW_AZP_POS         , 2
       TSW_EL1S_POS        , 3
       TSW_EL2S_POS        , 4
       TSW_AZS_POS         , 5
       TSU_UP_CKSUM        , 6
       TSU_CMP_CKSUM       , 7
END_COMPLEX:

START_COMPLEX: 32
       TSU_DUMP_ADDR       , 0
       HK_ELVARP_POS       , 1
       HK_EL2P_POS         , 2
```

```
        HK_AZP_POS          , 3
        HIRDLS_TIME_LSW     , 4
        HIRDLS_TIME_MSW     , 5
        TSS_RESET_TIME      , 6
        SC_ATT_QUAT_1       , 7
END_COMPLEX:

START_COMPLEX: 32
        SC_ATT_QUAT_2       , 0
        SC_ATT_QUAT_3       , 1
        SC_ATT_QUAT_4       , 2
        SC_POS_X            , 3
        SC_POS_Y            , 4
        SC_POS_Z            , 5
        SC_TIM_STAMP_LSW    , 6
        SC_TIM_STAMP_MSW    , 7
END_COMPLEX:

START_COMPLEX: 32
        SC_VELY_X           , 0
        SC_VELY_Y           , 1
        SC_VELY_Z           , 2
        SPARE_12D           , 3
        SPARE_15D           , 4
        SPARE_13D           , 5
        SPARE_14D           , 6
        HK_ELVARS_POS       , 7
END_COMPLEX:

START_COMPLEX: 32
        HK_EL2S_POS         , 0
        HK_AZS_POS          , 1
        TSW_EL1P_OFFSET     , 2
        TSW_EL2P_OFFSET     , 3
        TSW_AZP_OFFSET      , 4
        TSW_EL1S_OFFSET     , 5
        TSW_EL2S_OFFSET     , 6
        TSW_AZS_OFFSET      , 7
END_COMPLEX:

START_COMPLEX: 32
        TSB_BOOT_STAT_4     , 0
        TSB_EE_TABLE        , 1
        TSB_ADDR_OFF        , 2
        SAIL_SHM_264        , 3
        SAIL_SHM_265        , 4
        SAIL_SHM_266        , 5
        SAIL_SHM_267        , 6
        SAIL_SHM_268        , 7
END_COMPLEX:

START_COMPLEX: 32
        SAIL_SHM_269        , 0
        SAIL_SHM_270        , 1
        SAIL_SHM_271        , 2
        TSW_DUMP_ADDR       , 3
        MACRO_STAT          , 4
        MACRO_PARM          , 5
        TSW_EXCEPTION       , 6
        IPU_EXCEPTION       , 7
END_COMPLEX:

START_COMPLEX: 32
        TLM_TSS_AZOFFSET    , 0
        TLM_TSS_ELOFFSET    , 1
        TLM_TSS_WXOFFSET    , 2
        TLM_TSS_WYOFFSET    , 3
        RAD_CHAN_ENA        , 4
END_COMPLEX:
#16 bit entries (1/minor frame)
```

```
FPA_TMP_A
FPA_TMP_B
IPU_STAT_0
IPU_STAT_1
TSW_WBDAT1
TSW_WBDAT2
IPU_STAT_2
# Start of 16 bit subcommutated/complex entry sections

START_COMPLEX: 16
       STH_TMP_01          , 0
       STH_TMP_02          , 1
       STH_TMP_03          , 2
       STH_TMP_04          , 3
       CCU_BOX_TMP         , 4
       GEU_BOX_TMP         , 5
       PCU_BOX_TMP         , 6
       EEA_BOX_TMP         , 7
END_COMPLEX:

START_COMPLEX: 16
       WSE_BOX_TMP         , 0
       CSS_RAD_TMP1        , 1
       CSS_RAD_TMP2        , 2
       COMP_HEAD_TMP       , 3
       DISPL1_TMP          , 4
       DISPL2_TMP          , 5
       SUNSEN1_TMP         , 6
       SUNSEN2_TMP         , 7
END_COMPLEX:

START_COMPLEX: 16
       SUNSEN3_TMP         , 0
       DOOR_POT            , 1
       DOOR_SAF_ANG        , 2
       SSH_HWA_TMP         , 3
       SSH_DORMOT_TMP      , 4
       SSH_APL_TMP         , 5
       SSH_PZSURF_TMP      , 6
       SSH_NZSURF_TMP      , 7
END_COMPLEX:

START_COMPLEX: 16
       SSH_STAT            , 0
       SVA_STAT            , 1
       SVA_DORMOT_TMP      , 2
       SVA_MTGPLT_TMP      , 3
       GYR0_TMP            , 4
       GYR1_TMP            , 5
       GYR2_TMP            , 6
       GYR3_TMP            , 7
END_COMPLEX:

START_COMPLEX: 16
       GYR0_BD_TMP         , 0
       GYR1_BD_TMP         , 1
       GYR2_BD_TMP         , 2
       GYR3_BD_TMP         , 3
       GYR0_CAPL           , 4
       GYR1_CAPL           , 5
       GYR2_CAPL           , 6
       GYR3_CAPL           , 7
END_COMPLEX:

START_COMPLEX: 16
       GYR0_MOT_V          , 0
       GYR1_MOT_V          , 1
       GYR2_MOT_V          , 2
       GYR3_MOT_V          , 3
       GYR0_MOT_I          , 4
```

```
        GYR1_MOT_I          , 5
        GYR2_MOT_I          , 6
        GYR3_MOT_I          , 7
END_COMPLEX:

START_COMPLEX: 16
        GYR0_STAT           , 0
        GYR1_STAT           , 1
        GYR2_STAT           , 2
        GYR3_STAT           , 3
        GYR0_P15V           , 4
        GYR1_P15V           , 5
        GYR2_P15V           , 6
        GYR3_P15V           , 7
END_COMPLEX:

START_COMPLEX: 16
        GYR0_N15V           , 0
        GYR1_N15V           , 1
        GYR2_N15V           , 2
        GYR3_N15V           , 3
        SM_TMP1             , 4
        SM_TMP2             , 5
        SM_TMP3             , 6
        AZ_HSG_TMP_1        , 7
END_COMPLEX:

START_COMPLEX: 16
        M1_TMP1             , 0
        M1_TMP2             , 1
        LNS1_WF_TMP1        , 2
        LNS1_WF_TMP2        , 3
        LNS1_WF_TMP3        , 4
        LNS2_TMP1           , 5
        LNS2_TMP2           , 6
        LNS2_TMP3           , 7
END_COMPLEX:

START_COMPLEX: 16
        CHOP_MOT_TMP        , 0
        CHOP_HSG_TMP2       , 1
        CHOP_HSG_TMP3       , 2
        CALMIR_TMP1         , 3
        CALMIR_TMP2         , 4
        CALMIR_TMP3         , 5
        M2_TMP1             , 6
        M2_TMP2             , 7
END_COMPLEX:

START_COMPLEX: 16
        SMA_MTRING_TMP      , 0
        LNSASSY_TMP1        , 1
        LNSASSY_TMP2        , 2
        SPVU_BAF_TMP        , 3
        OBA_PLT_TMP         , 4
        GMU_MNT_TMP         , 5
        GMU_HSG_TMP         , 6
        TSW_CSCI_BLD_ID     , 7
END_COMPLEX:

START_COMPLEX: 16
        IFCBB_FRPL_TMP      , 0
        IFCBB_TMP1          , 1
        IFCBB_TMP2          , 2
        IFCBB_TMP3          , 3
        SCCMDS_RCVCT        , 4
        SCCMDS_REJCT        , 5
        SCCMD_LAST_RC       , 6
        SCCMD_LAST_PC       , 7
END_COMPLEX:
```

```
START_COMPLEX: 16
       SAILCMDS_RCVCT       , 0
       SAILCMDS_REJCT       , 1
       SAILCMD_LAST_RC      , 2
       MACMDS_RCVCT         , 3
       MACMDS_REJCT         , 4
       MACMD_LAST_RC        , 5
       SPU_CH_01_ZERO       , 6
       SPU_CH_02_ZERO       , 7
END_COMPLEX:

START_COMPLEX: 16
       SPU_CH_03_ZERO       , 0
       SPU_CH_04_ZERO       , 1
       SPU_CH_05_ZERO       , 2
       SPU_CH_06_ZERO       , 3
       SPU_CH_07_ZERO       , 4
       SPU_CH_08_ZERO       , 5
       SPU_CH_09_ZERO       , 6
       SPU_CH_10_ZERO       , 7
END_COMPLEX:

START_COMPLEX: 16
       SPU_CH_11_ZERO       , 0
       SPU_CH_12_ZERO       , 1
       SPU_CH_13_ZERO       , 2
       SPU_CH_14_ZERO       , 3
       SPU_CH_15_ZERO       , 4
       SPU_CH_16_ZERO       , 5
       SPU_CH_17_ZERO       , 6
       SPU_CH_18_ZERO       , 7
END_COMPLEX:

START_COMPLEX: 16
       SPU_CH_19_ZERO       , 0
       SPU_CH_20_ZERO       , 1
       SPU_CH_21_ZERO       , 2
       SPU_P5V_A            , 3
       SPU_N5V_A            , 4
       SPU_P5V_DA           , 5
       SPU_P12V_A           , 6
       SPU_N12V_A           , 7
END_COMPLEX:

START_COMPLEX: 16
       SPU_P5V_B            , 0
       SPU_N5V_B            , 1
       SPU_P5V_DB           , 2
       SPU_P12V_B           , 3
       SPU_N12V_B           , 4
       IPU_P3P3V            , 5
       IPU_P5V              , 6
       IPU_P15V             , 7
END_COMPLEX:

START_COMPLEX: 16
       IPU_N15V             , 0
       IPU_P3P3_DDC_TMP     , 1
       IPU_P5V_DDC_TMP      , 2
       IPU_CSCI_BLD_ID      , 3
       CRYOTIP_SETP         , 4
       CRYOTIP_TMP_D0       , 5
       CRYOTIP_TMP_D1       , 6
       CSS_FREQ_DMD         , 7
END_COMPLEX:

START_COMPLEX: 16
       CSS_FREQ_ACT         , 0
       CSS_PH_DMD           , 1
```

```
        CSS_PH_ACT          , 2
        COMP_AMP_DMD        , 3
        COMP_AMP_ACT        , 4
        DISP_AMP_DMD        , 5
        DISP_AMP_ACT        , 6
        CSS_CSCI_BLD_ID     , 7
END_COMPLEX:

START_COMPLEX: 16
        QA_I                , 0
        QB_I                , 1
        PSS_SPU_5VA         , 2
        PSS_SPU_5VB         , 3
        PSS_SPU_P15VA       , 4
        PSS_SPU_P15VB       , 5
        PSS_SPU_N15VA       , 6
        PSS_SPU_N15VB       , 7
END_COMPLEX:

START_COMPLEX: 16
        PSS_PCU_5VC         , 0
        PSS_PCU_P15VC       , 1
        PSS_PCU_N15VC       , 2
        PSS_REG_28VA        , 3
        PSS_REG_28VB        , 4
        PSS_SYS_5VA         , 5
        PSS_SYS_5VB         , 6
        PSS_SYS_P15VA       , 7
END_COMPLEX:

START_COMPLEX: 16
        PSS_SYS_P15VB       , 0
        PSS_SYS_N15VA       , 1
        PSS_SYS_N15VB       , 2
        PSS_STAT_00         , 3
        PSS_STAT_01         , 4
        PSS_STAT_02         , 5
        PSS_STAT_03         , 6
        PSS_STAT_04         , 7
END_COMPLEX:

START_COMPLEX: 16
        PSS_STAT_05         , 0
        PSS_STAT_06         , 1
        PSS_STAT_07         , 2
        PSS_SPU_5VA_TMP     , 3
        PSS_SPU_5VB_TMP     , 4
        PSS_SPU_15VA_TMP    , 5
        PSS_SPU_15VB_TMP    , 6
        PSS_REG_28VA_TMP    , 7
END_COMPLEX:

START_COMPLEX: 16
        PSS_REG_28VB_TMP    , 0
        PSS_SYS_5VA_TMP     , 1
        PSS_SYS_5VB_TMP     , 2
        PSS_SYS_P15VATMP    , 3
        PSS_SYS_P15VBTMP    , 4
        PSS_SYS_N15VATMP    , 5
        PSS_SYS_N15VBTMP    , 6
        PSS_PCU_15VA_TMP    , 7
END_COMPLEX:

START_COMPLEX: 16
        PSS_PCU_15VB_TMP    , 0
        PSS_QAFILT_TMP      , 1
        PSS_QBFILT_TMP      , 2
        IPU_ERR_0           , 3
        CMD_ERR_0           , 4
        IPU_ERR_1           , 5
```

```
        IPU_ERR_2            , 6
        IPU_BUILD_DATE       , 7
END_COMPLEX:

START_COMPLEX: 16
        IPU_BUILD_TIME       , 0
        EXEC_OVERRUN_CNT     , 1
        IPU_FLT_STAT_1       , 2
        IPU_FLT_STAT_0       , 3
        QHSS_1_RV_STAT       , 4
        QHSS_2_RV_STAT       , 5
        QHSS_3_RV_STAT       , 6
        QHSS_1_TX_STAT       , 7
END_COMPLEX:

START_COMPLEX: 16
        IPU_ERR_3            , 0
        TSU_DUMP_NWORDS      , 1
        CHOP_FREQ            , 2
        BEU_BOX_TMP          , 3
        BEU_MNT_TMP          , 4
        SPU_BOX_TMP          , 5
        IPU_BOX_TMP          , 6
        TEU_BOX_TMP          , 7
END_COMPLEX:

START_COMPLEX: 16
        TEU_MNT_TMP          , 0
        EEA_MNT_TMP          , 1
        ELMOT1_TMP1          , 2
        ELMOT2_TMP1          , 3
        M1_TMP3              , 4
        SPVUMIR_TMP1         , 5
        SPVUMIR_TMP2         , 6
        SPVUMIR_TMP3         , 7
END_COMPLEX:

START_COMPLEX: 16
        OBA_TMP_00           , 0
        OBA_TMP_01           , 1
        OBA_TMP_02           , 2
        OBA_TMP_03           , 3
        OBA_TMP_04           , 4
        OBA_TMP_05           , 5
        OBA_TMP_06           , 6
        OBA_TMP_07           , 7
END_COMPLEX:

START_COMPLEX: 16
        OBA_TMP_08           , 0
        OBA_TMP_09           , 1
        TSW_ENCP_STAT        , 2
        TSW_ENCS_STAT        , 3
        TSW_PRIIF_STAT       , 4
        TSW_SECIF_STAT       , 5
        TSW_HWCNFG           , 6
        TSW_CLOCK_SEL        , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_SCON_STAT        , 0
        TSW_CSC_STAT         , 1
        TSW_CMDA_CNT         , 2
        TSW_CMDR_CNT         , 3
        TSW_CMDA_SIG         , 4
        TSW_CMDR_SIG         , 5
        TSW_CTL_INDEX        , 6
        TSW_SM_EI_STAT       , 7
END_COMPLEX:
```

```
START_COMPLEX: 16
        TSW_EL1MTRDRVCMD     , 0
        TSW_EL2MTRDRVCMD     , 1
        TSW_AZMTRDRVCMD      , 2
        TSW_AZ_MTR_I         , 3
        TSW_EL1_MTR_I        , 4
        TSW_EL2_MTR_I        , 5
        TSW_CHOP_MTR_I       , 6
        TSW_P15VSUP          , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_P5VSUP           , 0
        TSW_P5VREF1          , 1
        TSW_P5VREF2          , 2
        TSW_N15VSUP          , 3
        TSW_PIFCTLRG         , 4
        TSW_SIFCTLRG         , 5
        TSW_MTRCTRG          , 6
        TSU_LIOTRES          , 7
END_COMPLEX:

START_COMPLEX: 16
        TSU_SBERR_CNT        , 0
        TSU_DBERR_CNT        , 1
        TSU_RBERR_CNT        , 2
        TSU_GOOD_RAM         , 3
        TSU_CACPT_CNT        , 4
        TSU_CREJ_CNT         , 5
        TSU_REJ_SIG          , 6
        TSU_REJREAS          , 7
END_COMPLEX:

START_COMPLEX: 16
        TSU_NEXT_BLK         , 0
        TSU_TOTAL_BLKS       , 1
        TSU_FLAG_BITS        , 2
        TSU_BUILD_ID         , 3
        HK_SIGDAT02          , 4
        HK_SIGDAT04          , 5
        SPU_CH_01_PHASE      , 6
        SPU_CH_02_PHASE      , 7
END_COMPLEX:

START_COMPLEX: 16
        SPU_CH_03_PHASE      , 0
        SPU_CH_04_PHASE      , 1
        SPU_CH_05_PHASE      , 2
        SPU_CH_06_PHASE      , 3
        SPU_CH_07_PHASE      , 4
        SPU_CH_08_PHASE      , 5
        SPU_CH_09_PHASE      , 6
        SPU_CH_10_PHASE      , 7
END_COMPLEX:

START_COMPLEX: 16
        SPU_CH_11_PHASE      , 0
        SPU_CH_12_PHASE      , 1
        SPU_CH_13_PHASE      , 2
        SPU_CH_14_PHASE      , 3
        SPU_CH_15_PHASE      , 4
        SPU_CH_16_PHASE      , 5
        SPU_CH_17_PHASE      , 6
        SPU_CH_18_PHASE      , 7
END_COMPLEX:

START_COMPLEX: 16
        SPU_CH_19_PHASE      , 0
        SPU_CH_20_PHASE      , 1
        SPU_CH_21_PHASE      , 2
```

```
        SPU_HK_PHASE         , 3
        SPU_BLADE_0_OPEN     , 4
        SPU_BLADE_1_OPEN     , 5
        SPU_BLADE_2_OPEN     , 6
        SPU_BLADE_3_OPEN     , 7
END_COMPLEX:

START_COMPLEX: 16
        SPU_BLADE_4_OPEN     , 0
        SPU_BLADE_5_OPEN     , 1
        SPU_BLADE_0_CLSD     , 2
        SPU_BLADE_1_CLSD     , 3
        SPU_BLADE_2_CLSD     , 4
        SPU_BLADE_3_CLSD     , 5
        SPU_BLADE_4_CLSD     , 6
        SPU_BLADE_5_CLSD     , 7
END_COMPLEX:

START_COMPLEX: 16
        SPU_GLOBAL_DELAY     , 0
        TSW_FREQ             , 1
        IPU_ERR_4            , 2
        TSW_SCBD_TMP         , 3
        PSS_PCU_5VA          , 4
        PSS_PCU_5VB          , 5
        GYR0_HTR_W           , 6
        GYR1_HTR_W           , 7
END_COMPLEX:

START_COMPLEX: 16
        GYR2_HTR_W           , 0
        GYR3_HTR_W           , 1
        SC_DESC_NODE         , 2
        SC_EUL_ANG_PITCH     , 3
        SC_EUL_ANG_ROLL      , 4
        SC_EUL_ANG_YAW       , 5
        SC_GYRO_STAT         , 6
        SC_MOON_VECT_X       , 7
END_COMPLEX:

START_COMPLEX: 16
        SC_MOON_VECT_Y       , 0
        SC_MOON_VECT_Z       , 1
        SC_NAV_MODE          , 2
        SC_OBL_ANG_AFT       , 3
        SC_OBL_ANG_R         , 4
        SC_PITCH_RATE        , 5
        SC_ROLL_RATE         , 6
        SC_SUN_VECT_X        , 7
END_COMPLEX:

START_COMPLEX: 16
        SC_SUN_VECT_Y        , 0
        SC_SUN_VECT_Z        , 1
        SC_YAW_RATE          , 2
        OPH_ZONE1_DELAY      , 3
        OPH_ZONE2_DELAY      , 4
        OPH_ZONE3_DELAY      , 5
        OPH_ZONE4_DELAY      , 6
        OPH_ZONE5_DELAY      , 7
END_COMPLEX:

START_COMPLEX: 16
        OPH_ZONE6_DELAY      , 0
        OPH_ZONE1_WIDTH      , 1
        OPH_ZONE2_WIDTH      , 2
        OPH_ZONE3_WIDTH      , 3
        OPH_ZONE4_WIDTH      , 4
        OPH_ZONE5_WIDTH      , 5
        OPH_ZONE6_WIDTH      , 6
```

```
        CSS_STACK_STAT      , 7
END_COMPLEX:

START_COMPLEX: 16
        E_PRT_AMP_OFF       , 0
        E_PRT_0_P           , 1
        E_PRT_1_P           , 2
        E_PRT_2_P           , 3
        E_PRT_3_P           , 4
        E_PRT_4_P           , 5
        E_PRT_5_P           , 6
        E_PRT_6_P           , 7
END_COMPLEX:

START_COMPLEX: 16
        E_PRT_7_P           , 0
        E_REF_379_OHM       , 1
        E_REF_619_OHM       , 2
        E_PRT_0_N           , 3
        E_PRT_1_N           , 4
        E_PRT_2_N           , 5
        E_PRT_3_N           , 6
        E_PRT_4_N           , 7
END_COMPLEX:

START_COMPLEX: 16
        E_PRT_5_N           , 0
        E_PRT_6_N           , 1
        E_PRT_7_N           , 2
        E_REF_234_UAMP      , 3
        E_AD590_AMP_OFF     , 4
        SSH_DOOR_TMP        , 5
        E_REF_352_UAMP      , 6
        SPU_MNT_TMP         , 7
END_COMPLEX:

START_COMPLEX: 16
        E_PSS_GND_O         , 0
        E_ADC_OFFSET        , 1
        E_REF_7P664_V       , 2
        SPARE_00D           , 3
        PSS_SPU_P15VATMP    , 4
        PSS_SPU_P15VBTMP    , 5
        PSS_SPU_N15VATMP    , 6
        PSS_SPU_N15VBTMP    , 7
END_COMPLEX:

START_COMPLEX: 16
        PSS_QAP_RLY_TMP     , 0
        PSS_QBP_RLY_TMP     , 1
        PSS_QAR_RLY_TMP     , 2
        PSS_QBR_RLY_TMP     , 3
        SPARE_09D           , 4
        SPARE_10D           , 5
        SPARE_11D           , 6
        SPARE_01D           , 7
END_COMPLEX:

START_COMPLEX: 16
        SPARE_02D           , 0
        SPARE_03D           , 1
        SPARE_04D           , 2
        SPARE_05D           , 3
        SPARE_06D           , 4
        SPARE_07D           , 5
        SPARE_08D           , 6
        TSW_EEACNFG         , 7
END_COMPLEX:

START_COMPLEX: 16
```

```
        TSW_HK_PKT_CNT       , 0
        TSW_SCI_PKT_CNT      , 1
        TSW_TLM_ID           , 2
        TSB_DIAG_CHKSM_C     , 3
        TSB_HK_CHKSM_CNT     , 4
        TSU_HK_PKT_CNT       , 5
        TSU_DIAG_PKT_CNT     , 6
        TSU_TLM_ID           , 7
END_COMPLEX:

START_COMPLEX: 16
        SAIL_ERR_LLOC        , 0
        SAIL_ERR_CLOC        , 1
        TLM_DIAG_STAT        , 2
        TSW_EL1P_INDEX       , 3
        TSW_EL2P_INDEX       , 4
        TSW_AZP_INDEX        , 5
        TSW_EL1S_INDEX       , 6
        TSW_EL2S_INDEX       , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_AZS_INDEX        , 0
        TSW_TABLEN           , 1
        TSB_BOOT_STAT_1      , 2
        TSB_BOOT_STAT_2      , 3
        TSB_BOOT_STAT_3      , 4
        IPU_ERR_5            , 5
        DISPL1_OTSP          , 6
        GYR0_OTSP            , 7
END_COMPLEX:

START_COMPLEX: 16
        GYR1_OTSP            , 0
        GYR2_OTSP            , 1
        GYR3_OTSP            , 2
        SSH_DORMOT_OTSP      , 3
        SSH_HWA_OTSP         , 4
        SVA_DORMOT_OTSP      , 5
        CHOP_MOT_OTSP        , 6
        DISPL2_OTSP          , 7
END_COMPLEX:

START_COMPLEX: 16
        COMP_HEAD_OTSP       , 0
        IPU_ALIVE            , 1
        TSW_FAULT_STAT       , 2
        TSW_MEM_SCRUB        , 3
        TSW_SCI_AZPO_CMD     , 4
        TSW_SCI_ELPO_CMD     , 5
        TSW_MIN_SSTIME       , 6
        TSW_MAX_SSTIME       , 7
END_COMPLEX:

START_COMPLEX: 16
        TSW_CR_SYNC_STAT     , 0
        CSS_PACKED_PID       , 1
        SCI_HKTBL_ERR        , 2
        ENG_HKTBL_ERR        , 3
        PRF_CR2CR_MAX        , 4
        PRF_CR2CR_MIN        , 5
        SPU_PHASE_ERR_C      , 6
        TSS_DMA_ERR_C        , 7
END_COMPLEX:

START_COMPLEX: 16
        AZ_HSG_TMP_2         , 0
        AD590_ROW3_COL2      , 1
        TSW_CTL_ERR_AZ       , 2
        TSW_CTL_ERR_EL       , 3
```

```
        SAILCMST_0_15        , 4
        SAILCMST_16_31       , 5
        SAILCMST_32_47       , 6
        SAILCMST_48_63       , 7
END_COMPLEX:

START_COMPLEX: 16
        SAILCMST_64_79       , 0
        SAILCMST_80_95       , 1
        SAILCMST_96_111      , 2
        SAILCMST_112_127     , 3
        TLM_ACTIVE_SCIHK     , 4
        TSW_DMA_R_ERR_C      , 5
        TSW_QHSS_ERR_C       , 6
        EXEC_STACK_MRGN      , 7
END_COMPLEX:

START_COMPLEX: 16
        SAIL_STACK_MRGN      , 0
        EDAQ_LIST_ERR_C      , 1
        EDAQ_LIST_STAT       , 2
        EDAQ_LIST_ERR_W      , 3
        SCI_FMT_BLK_ENA      , 4
        PCU_SUBSTAT_0        , 5
        PCU_SUBSTAT_1        , 6
        PCU_SUBSTAT_2        , 7
END_COMPLEX:
# Start of 8 bit subcommutated/complex entry sections

START_COMPLEX: 16
        IFC_REF_TMP          , 0   , 0
        IFC_PSV_P28          , 0   , 8
        IFC_PSV_P15          , 1   , 0
        IFC_PSV_N15          , 1   , 8
        IFC_PSV_P5           , 2   , 0
        SAIL_PROC_STAT       , 2   , 8
        SAILTASK_00_STAT     , 3   , 0
        SAILTASK_01_STAT     , 3   , 8
        SAILTASK_02_STAT     , 4   , 0
        SAILTASK_03_STAT     , 4   , 8
        SAILTASK_04_STAT     , 5   , 0
        SAILTASK_05_STAT     , 5   , 8
        SAILTASK_06_STAT     , 6   , 0
        SAILTASK_07_STAT     , 6   , 8
        SAILTASK_08_STAT     , 7   , 0
        SAILTASK_09_STAT     , 7   , 8
END_COMPLEX:

START_COMPLEX: 16
        SAILTASK_10_STAT     , 0   , 0
        SAILTASK_11_STAT     , 0   , 8
        SAILTASK_12_STAT     , 1   , 0
        SAILTASK_13_STAT     , 1   , 8
        SAILTASK_14_STAT     , 2   , 0
        SAILTASK_15_STAT     , 2   , 8
        SCCMD_LAST_CN        , 3   , 0
        SAILCMD_LAST_CN      , 3   , 8
        MACMD_LAST_CN        , 4   , 0
        CSS_OP_STAT          , 4   , 8
        CSS_DDCAG_STAT       , 5   , 0
        CSS_ERROR            , 5   , 8
        CSS_TOTAL_I          , 6   , 0
        CSS_MSG_NUMBER       , 6   , 8
        SUBTMI_BUILD_ID      , 7   , 0
        FIR1_TBL_ID          , 7   , 8
END_COMPLEX:

START_COMPLEX: 16
        FIR2_TBL_ID          , 0   , 0
        FIR3_TBL_ID          , 0   , 8
```

```
        FIR6_TBL_ID          , 1   , 0
        PRF_CR_TOTAL         , 1   , 8
        PRF_1553             , 2   , 0
        PRF_QHSS_SPU         , 2   , 8
        PRF_QHSS_TEU         , 3   , 0
        PRF_HIRDLSTIME       , 3   , 8
        PRF_SWAP_DIAG        , 4   , 0
        PRF_UP_HKTBL         , 4   , 8
        PRF_UP_SCITBL        , 5   , 0
        PRF_UP_SCIFMT        , 5   , 8
        PRF_CLR_CMD          , 6   , 0
        PRF_EXE_TLM          , 6   , 8
        PRF_SSH_TLM          , 7   , 0
        PRF_SVA_TLM          , 7   , 8
END_COMPLEX:

START_COMPLEX: 16
        PRF_CMD_TLM          , 0   , 0
        PRF_IOBIC_TLM        , 0   , 8
        PRF_SPU_TLM          , 1   , 0
        PRF_TSS_TLM          , 1   , 8
        PRF_TG_TLM           , 2   , 0
        PRF_SCIFMT_TLM       , 2   , 8
        PRF_SCIPRO_TLM       , 3   , 0
        PRF_CSS_TLM          , 3   , 8
        PRF_UPDATE_MAC       , 4   , 0
        PRF_EXE_SCCMD        , 4   , 8
        PRF_EXE_SAICMD       , 5   , 0
        PRF_EXE_MACCMD       , 5   , 8
        PRF_CNTRL_PSS        , 6   , 0
        PRF_CNTRL_EDAQ       , 6   , 8
        PRF_CNTRL_CSS        , 7   , 0
        PRF_CNTRL_IFC        , 7   , 8
END_COMPLEX:

START_COMPLEX: 16
        PRF_DECIM_SCI        , 0   , 0
        PRF_FIR_SCI          , 0   , 8
        PRF_FMT_HKBLOCK      , 1   , 0
        PRF_MAKE_SCIPKT      , 1   , 8
        PRF_MAKE_ENGPKT      , 2   , 0
        PRF_INVALID          , 2   , 8
        PRF_CNTRL_SSH        , 3   , 0
        PRF_CNTRL_GSS        , 3   , 8
        IFC_HCW              , 4   , 0
        IPU_CSS_TLM_CNT      , 4   , 8
        TSS_RD_TEUSYNC       , 5   , 0
        TSS_WR_TEUSYNC       , 5   , 8
        IPU_CSS_CMD_CNT      , 6   , 0
        CMD_DB_BUILD_ID      , 6   , 8
        TLM_DB_BUILD_ID      , 7   , 0
        TSW_TOT_MAX          , 7   , 8
END_COMPLEX:

START_COMPLEX: 16
        TSW_CRIT_MAX         , 0   , 0
        CMDRES_DB_BLD_ID     , 0   , 8
        TSW_EXEC_OVERRUN     , 1   , 0
        GSS_SIO_BUSY_CNT     , 1   , 8
        TSS_TLM_PKT_CNT      , 2   , 0
        TSS_TLM_LEN_CNT      , 2   , 8
        TSS_TLM_NOPKT_C      , 3   , 0
        SAIL_ERR_LTASK       , 3   , 8
        SAIL_ERR_LTYP        , 4   , 0
        SAIL_ERR_CTASK       , 4   , 8
        SAIL_ERR_CTYP        , 5   , 0
        TSS_APP_CHKSM_C      , 5   , 8
        PRF_SAIL_EXEC        , 6   , 0
        PRF_SAIL_TLM         , 6   , 8
        EDAC_DBL_ERR_C       , 7   , 0
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       EDAC_SGL_ERR_C      , 7   , 8
END_COMPLEX:

START_COMPLEX: 16
       PRF_FAULTMON        , 0   , 0
       PRF_MACRO_TLM       , 0   , 8
       PRF_EXEC_DELAY      , 1   , 0
       EDAQ_CR_PHASE       , 1   , 8
       MACRO_EXECUTING     , 2   , 0
       RAD_DEMOD_TBL_ID    , 2   , 8
END_COMPLEX:
END_OF_TABLE:
```

```
# $Id$
#
# HIRDLS Engineering Houskeeping File: v6.15
# Version Date: 2002-06-20 11:00:00
#
# Generated from: Telemetry table Version  035
#                 Database Version 016
#
START_OF_TABLE: hirdls_eng_v6_15

# 16 bit entries
START_LENGTH: 16

HIR_IPU_ALIVE,           0x1f, 0, 0

# 32 bit entries
START_LENGTH: 32

HIR_MACRO_PARM,          0x1f, 0, 0
HIR_MACRO_STAT,          0x1f, 0, 0
HIR_SAIL_ENGWORD_00,     0x1f, 0, 0
HIR_SAIL_ENGWORD_01,     0x1f, 0, 0
HIR_SAIL_ENGWORD_02,     0x1f, 0, 0
HIR_SAIL_ENGWORD_03,     0x1f, 0, 0
HIR_SAIL_ENGWORD_04,     0x1f, 0, 0
HIR_SAIL_ENGWORD_05,     0x1f, 0, 0
HIR_SAIL_ENGWORD_06,     0x1f, 0, 0
HIR_SAIL_ENGWORD_07,     0x1f, 0, 0

START_COMPLEX: 32
   HIR_RAD_CHAN_ENA,     0, 0, 0
   HIR_TSB_BOOT_STAT_4,  1, 0, 0
   HIR_HIRDLS_TIME_LSW,  2, 0, 0
   HIR_SAIL_SHM_256,     3, 0, 0
   HIR_RAD_CHAN_ENA,     4, 0, 0
   HIR_TSB_BOOT_STAT_4,  5, 0, 0
   HIR_HIRDLS_TIME_MSW,  6, 0, 0
   HIR_SAIL_SHM_257,     7, 0, 0
END_COMPLEX:

START_COMPLEX: 32
   HIR_SAIL_SHM_258,     0, 0, 0
   HIR_SAIL_SHM_259,     1, 0, 0
   HIR_SAIL_SHM_260,     2, 0, 0
   HIR_SAIL_SHM_261,     3, 0, 0
   HIR_SAIL_SHM_262,     4, 0, 0
   HIR_SAIL_SHM_263,     5, 0, 0
   HIR_SAIL_SHM_264,     6, 0, 0
   HIR_SAIL_SHM_265,     7, 0, 0
END_COMPLEX:

START_COMPLEX: 32
   HIR_SAIL_SHM_266,     0, 0, 0
   HIR_SAIL_SHM_267,     1, 0, 0
   HIR_SAIL_SHM_268,     2, 0, 0
   HIR_SAIL_SHM_269,     3, 0, 0
   HIR_SAIL_SHM_270,     4, 0, 0
   HIR_SAIL_SHM_271,     5, 0, 0
   HIR_SAILTASK_00_P15,  6, 0, 0
   HIR_SAILTASK_01_P15,  7, 0, 0
END_COMPLEX:

START_COMPLEX: 32
   HIR_SAILTASK_02_P15,  0, 0, 0
   HIR_SAILTASK_03_P15,  1, 0, 0
   HIR_SAILTASK_04_P15,  2, 0, 0
   HIR_SAILTASK_05_P15,  3, 0, 0
   HIR_SAILTASK_06_P15,  4, 0, 0
   HIR_SAILTASK_07_P15,  5, 0, 0
   HIR_SAILTASK_08_P15,  6, 0, 0
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   HIR_SAILTASK_09_P15,  7, 0, 0
END_COMPLEX:

START_COMPLEX: 32
   HIR_SAILTASK_10_P15,  0, 0, 0
   HIR_SAILTASK_11_P15,  1, 0, 0
   HIR_SAILTASK_12_P15,  2, 0, 0
   HIR_SAILTASK_13_P15,  3, 0, 0
   HIR_SAILTASK_14_P15,  4, 0, 0
   HIR_SAILTASK_15_P15,  5, 0, 0
   HIR_TSU_CMP_CKSUM,    6, 0, 0
   HIR_TSU_UP_CKSUM,     7, 0, 0
END_COMPLEX:

# 16 bit entries
START_LENGTH: 16

HIR_CMD_ERR_0,           0x1f, 0, 0
HIR_DOOR_POT,            0x1f, 0, 0
HIR_GYR0_STAT,           0x1f, 0, 0
HIR_GYR1_STAT,           0x1f, 0, 0
HIR_GYR2_STAT,           0x1f, 0, 0
HIR_GYR3_STAT,           0x1f, 0, 0
HIR_HK_AZP_POS,          0x1f, 0, 4
HIR_HK_AZS_POS,          0x1f, 0, 4
HIR_HK_EL2P_POS,         0x1f, 0, 4
HIR_HK_EL2S_POS,         0x1f, 0, 4
HIR_HK_ELVARP_POS,       0x1f, 0, 4
HIR_HK_ELVARS_POS,       0x1f, 0, 4
HIR_IPU_ERR_0,           0x1f, 0, 0
HIR_IPU_ERR_1,           0x1f, 0, 0
HIR_IPU_ERR_2,           0x1f, 0, 0
HIR_IPU_ERR_3,           0x1f, 0, 0
HIR_IPU_ERR_4,           0x1f, 0, 0
HIR_IPU_ERR_5,           0x1f, 0, 0
HIR_IPU_FLT_STAT_0,      0x1f, 0, 0
HIR_IPU_FLT_STAT_1,      0x1f, 0, 0
HIR_IPU_STAT_0,          0x1f, 0, 0
HIR_IPU_STAT_1,          0x1f, 0, 0
HIR_IPU_STAT_2,          0x1f, 0, 0
HIR_PCU_SUBSTAT_0,       0x1f, 0, 0
HIR_PCU_SUBSTAT_1,       0x1f, 0, 0
HIR_PCU_SUBSTAT_2,       0x1f, 0, 0
HIR_QA_I,                0x1f, 0, 0
HIR_QB_I,                0x1f, 0, 0
HIR_SCCMD_LAST_RC,       0x1f, 0, 0
HIR_SSH_STAT,            0x1f, 0, 0
HIR_TSB_BOOT_STAT_1,     0x1f, 0, 0
HIR_TSB_BOOT_STAT_2,     0x1f, 0, 0
HIR_TSB_BOOT_STAT_3,     0x1f, 0, 0
HIR_TSU_REJREAS,         0x1f, 0, 0
HIR_TSW_CHOP_MTR_I,      0x1f, 0, 0
HIR_TSW_CMDA_SIG,        0x1f, 0, 0
HIR_TSW_CMDR_SIG,        0x1f, 0, 0
HIR_TSW_CTL_ERR_AZ,      0x1f, 0, 0
HIR_TSW_CTL_ERR_EL,      0x1f, 0, 0
HIR_TSW_SCI_AZPO_CMD,    0x1f, 0, 0
HIR_TSW_SCI_ELPO_CMD,    0x1f, 0, 0
HIR_TSW_WBDAT1,          0x1f, 0, 0
HIR_TSW_WBDAT2,          0x1f, 0, 0

START_COMPLEX: 16
   HIR_COMP_AMP_DMD,     0, 0, 0
   HIR_CRYOTIP_SETP,     1, 0, 0
   HIR_COMP_AMP_DMD,     2, 0, 0
   HIR_CRYOTIP_SETP,     3, 0, 0
   HIR_COMP_AMP_DMD,     4, 0, 0
   HIR_CRYOTIP_SETP,     5, 0, 0
   HIR_COMP_AMP_DMD,     6, 0, 0
   HIR_CRYOTIP_SETP,     7, 0, 0
```

```
END_COMPLEX:

START_COMPLEX: 16
   HIR_CSS_FREQ_DMD,      0, 0, 0
   HIR_CSS_PH_DMD,        1, 0, 0
   HIR_CSS_FREQ_DMD,      2, 0, 0
   HIR_CSS_PH_DMD,        3, 0, 0
   HIR_CSS_FREQ_DMD,      4, 0, 0
   HIR_CSS_PH_DMD,        5, 0, 0
   HIR_CSS_FREQ_DMD,      6, 0, 0
   HIR_CSS_PH_DMD,        7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_DISP_AMP_DMD,      0, 0, 0
   HIR_DOOR_SAF_ANG,      1, 0, 0
   HIR_DISP_AMP_DMD,      2, 0, 0
   HIR_DOOR_SAF_ANG,      3, 0, 0
   HIR_DISP_AMP_DMD,      4, 0, 0
   HIR_DOOR_SAF_ANG,      5, 0, 0
   HIR_DISP_AMP_DMD,      6, 0, 0
   HIR_DOOR_SAF_ANG,      7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_PSS_REG_28VA,      0, 0, 0
   HIR_PSS_REG_28VB,      1, 0, 0
   HIR_PSS_REG_28VA,      2, 0, 0
   HIR_PSS_REG_28VB,      3, 0, 0
   HIR_PSS_REG_28VA,      4, 0, 0
   HIR_PSS_REG_28VB,      5, 0, 0
   HIR_PSS_REG_28VA,      6, 0, 0
   HIR_PSS_REG_28VB,      7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_PSS_SPU_5VA,       0, 0, 0
   HIR_PSS_SPU_5VB,       1, 0, 0
   HIR_PSS_SPU_5VA,       2, 0, 0
   HIR_PSS_SPU_5VB,       3, 0, 0
   HIR_PSS_SPU_5VA,       4, 0, 0
   HIR_PSS_SPU_5VB,       5, 0, 0
   HIR_PSS_SPU_5VA,       6, 0, 0
   HIR_PSS_SPU_5VB,       7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_PSS_SPU_N15VA,     0, 0, 0
   HIR_PSS_SPU_N15VB,     1, 0, 0
   HIR_PSS_SPU_N15VA,     2, 0, 0
   HIR_PSS_SPU_N15VB,     3, 0, 0
   HIR_PSS_SPU_N15VA,     4, 0, 0
   HIR_PSS_SPU_N15VB,     5, 0, 0
   HIR_PSS_SPU_N15VA,     6, 0, 0
   HIR_PSS_SPU_N15VB,     7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_PSS_SPU_P15VA,     0, 0, 0
   HIR_PSS_SPU_P15VB,     1, 0, 0
   HIR_PSS_SPU_P15VA,     2, 0, 0
   HIR_PSS_SPU_P15VB,     3, 0, 0
   HIR_PSS_SPU_P15VA,     4, 0, 0
   HIR_PSS_SPU_P15VB,     5, 0, 0
   HIR_PSS_SPU_P15VA,     6, 0, 0
   HIR_PSS_SPU_P15VB,     7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_PSS_SYS_5VA,       0, 0, 0
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   HIR_PSS_SYS_5VB,       1, 0, 0
   HIR_PSS_SYS_5VA,       2, 0, 0
   HIR_PSS_SYS_5VB,       3, 0, 0
   HIR_PSS_SYS_5VA,       4, 0, 0
   HIR_PSS_SYS_5VB,       5, 0, 0
   HIR_PSS_SYS_5VA,       6, 0, 0
   HIR_PSS_SYS_5VB,       7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_PSS_SYS_N15VA,     0, 0, 0
   HIR_PSS_SYS_N15VB,     1, 0, 0
   HIR_PSS_SYS_N15VA,     2, 0, 0
   HIR_PSS_SYS_N15VB,     3, 0, 0
   HIR_PSS_SYS_N15VA,     4, 0, 0
   HIR_PSS_SYS_N15VB,     5, 0, 0
   HIR_PSS_SYS_N15VA,     6, 0, 0
   HIR_PSS_SYS_N15VB,     7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_PSS_SYS_P15VA,     0, 0, 0
   HIR_PSS_SYS_P15VB,     1, 0, 0
   HIR_PSS_SYS_P15VA,     2, 0, 0
   HIR_PSS_SYS_P15VB,     3, 0, 0
   HIR_PSS_SYS_P15VA,     4, 0, 0
   HIR_PSS_SYS_P15VB,     5, 0, 0
   HIR_PSS_SYS_P15VA,     6, 0, 0
   HIR_PSS_SYS_P15VB,     7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_TSU_NEXT_BLK,      0, 0, 0
   HIR_TSW_CSC_STAT,      1, 0, 0
   HIR_TSU_NEXT_BLK,      2, 0, 0
   HIR_TSW_CSC_STAT,      3, 0, 0
   HIR_TSU_NEXT_BLK,      4, 0, 0
   HIR_TSW_CSC_STAT,      5, 0, 0
   HIR_TSU_NEXT_BLK,      6, 0, 0
   HIR_TSW_CSC_STAT,      7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_TSW_EEACNFG,       0, 0, 0
   HIR_TSW_ENCP_STAT,     1, 0, 0
   HIR_TSW_EEACNFG,       2, 0, 0
   HIR_TSW_ENCP_STAT,     3, 0, 0
   HIR_TSW_EEACNFG,       4, 0, 0
   HIR_TSW_ENCP_STAT,     5, 0, 0
   HIR_TSW_EEACNFG,       6, 0, 0
   HIR_TSW_ENCP_STAT,     7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_TSW_ENCS_STAT,     0, 0, 0
   HIR_TSW_FAULT_STAT,    1, 0, 0
   HIR_TSW_ENCS_STAT,     2, 0, 0
   HIR_TSW_FAULT_STAT,    3, 0, 0
   HIR_TSW_ENCS_STAT,     4, 0, 0
   HIR_TSW_FAULT_STAT,    5, 0, 0
   HIR_TSW_ENCS_STAT,     6, 0, 0
   HIR_TSW_FAULT_STAT,    7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_TSW_HWCNFG,        0, 0, 0
   HIR_TSW_SM_EI_STAT,    1, 0, 0
   HIR_TSW_HWCNFG,        2, 0, 0
   HIR_TSW_SM_EI_STAT,    3, 0, 0
   HIR_TSW_HWCNFG,        4, 0, 0
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   HIR_TSW_SM_EI_STAT,    5, 0, 0
   HIR_TSW_HWCNFG,        6, 0, 0
   HIR_TSW_SM_EI_STAT,    7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_CHOP_FREQ,         0, 0, 0
   HIR_MACMD_LAST_RC,     1, 0, 0
   HIR_PSS_PCU_5VA,       2, 0, 0
   HIR_PSS_PCU_5VB,       3, 0, 0
   HIR_CHOP_FREQ,         4, 0, 0
   HIR_MACMD_LAST_RC,     5, 0, 0
   HIR_PSS_PCU_5VA,       6, 0, 0
   HIR_PSS_PCU_5VB,       7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_PSS_PCU_5VC,       0, 0, 0
   HIR_PSS_PCU_N15VC,     1, 0, 0
   HIR_PSS_PCU_P15VC,     2, 0, 0
   HIR_SAILCMD_LAST_RC,   3, 0, 0
   HIR_PSS_PCU_5VC,       4, 0, 0
   HIR_PSS_PCU_N15VC,     5, 0, 0
   HIR_PSS_PCU_P15VC,     6, 0, 0
   HIR_SAILCMD_LAST_RC,   7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_SCI_FMT_BLK_ENA,   0, 0, 0
   HIR_SPU_PHASE_ERR_C,   1, 0, 0
   HIR_TLM_ACTIVE_SCIHK,  2, 0, 0
   HIR_TLM_DIAG_STAT,     3, 0, 0
   HIR_SCI_FMT_BLK_ENA,   4, 0, 0
   HIR_SPU_PHASE_ERR_C,   5, 0, 0
   HIR_TLM_ACTIVE_SCIHK,  6, 0, 0
   HIR_TLM_DIAG_STAT,     7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_TSU_TOTAL_BLKS,    0, 0, 0
   HIR_TSW_FREQ,          1, 0, 0
   HIR_TSW_PRIIF_STAT,    2, 0, 0
   HIR_TSW_SECIF_STAT,    3, 0, 0
   HIR_TSU_TOTAL_BLKS,    4, 0, 0
   HIR_TSW_FREQ,          5, 0, 0
   HIR_TSW_PRIIF_STAT,    6, 0, 0
   HIR_TSW_SECIF_STAT,    7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_CMD_DB_BUILD_ID,   0, 0, 0
   HIR_COMP_AMP_ACT,      1, 0, 0
   HIR_CRYOTIP_TMP_D0,    2, 0, 0
   HIR_CRYOTIP_TMP_D1,    3, 0, 0
   HIR_CSS_FREQ_ACT,      4, 0, 0
   HIR_CSS_PACKED_PID,    5, 0, 0
   HIR_CSS_PH_ACT,        6, 0, 0
   HIR_CSS_STACK_STAT,    7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_DISP_AMP_ACT,      0, 0, 0
   HIR_FPA_TMP_A,         1, 0, 0
   HIR_FPA_TMP_B,         2, 0, 0
   HIR_HK_SIGDAT02,       3, 0, 0
   HIR_HK_SIGDAT04,       4, 0, 0
   HIR_IPU_CSCI_BLD_ID,   5, 0, 0
   HIR_SAIL_ERR_CLOC,     6, 0, 0
   HIR_SAIL_ERR_LLOC,     7, 0, 0
END_COMPLEX:
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START_COMPLEX: 16
   HIR_SAILCMST_0_15,     0, 0, 0
   HIR_SAILCMST_112_127, 1, 0, 0
   HIR_SAILCMST_16_31,    2, 0, 0
   HIR_SAILCMST_32_47,    3, 0, 0
   HIR_SAILCMST_48_63,    4, 0, 0
   HIR_SAILCMST_64_79,    5, 0, 0
   HIR_SAILCMST_80_95,    6, 0, 0
   HIR_SAILCMST_96_111,   7, 0, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_SUBTMI_BUILD_ID,   0, 0, 0
   HIR_TLM_DB_BUILD_ID,   1, 0, 0
   HIR_TSU_FLAG_BITS,     2, 0, 0
   HIR_TSU_LIOTRES,       3, 0, 0
   HIR_TSW_CR_SYNC_STAT, 4, 0, 0
   HIR_TSW_CSCI_BLD_ID,   5, 0, 0
   HIR_TSW_PIFCTLRG,      6, 0, 0
   HIR_TSW_SIFCTLRG,      7, 0, 0
END_COMPLEX:

# 8 bit entries
START_LENGTH: 8

START_COMPLEX: 16
   HIR_CSS_ERROR,         0x1f, 0, 0
   HIR_CSS_MSG_NUMBER,    0x1f, 8, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_CSS_OP_STAT,       0x1f, 0, 0
   HIR_IFC_HCW,           0x1f, 8, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_SAIL_PROC_STAT,    0x1f, 0, 0
   HIR_SCCMD_LAST_CN,     0x1f, 8, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_SCCMDS_RCVCT,      0x1f, 0, 0
   HIR_SCCMDS_REJCT,      0x1f, 8, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_TSU_CACPT_CNT,     0x1f, 0, 0
   HIR_TSU_CREJ_CNT,      0x1f, 8, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_TSU_DIAG_PKT_CNT, 0x1f, 0, 0
   HIR_TSU_HK_PKT_CNT,    0x1f, 8, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_TSU_REJ_SIG,       0x1f, 0, 0
   HIR_TSW_AZ_MTR_I,      0x1f, 8, 8
END_COMPLEX:

START_COMPLEX: 16
   HIR_TSW_CMDA_CNT,      0x1f, 0, 0
   HIR_TSW_CMDR_CNT,      0x1f, 8, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_TSW_CTL_INDEX,     0x1f, 0, 0
   HIR_TSW_EL1_MTR_I,     0x1f, 8, 8
END_COMPLEX:
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START_COMPLEX: 16
   HIR_TSW_EL2_MTR_I,     0x1f, 0, 8
   HIR_TSW_HK_PKT_CNT,    0x1f, 8, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_CSS_DDCAG_STAT,    0, 0, 0
   HIR_CSS_TOTAL_I,       0, 8, 0
   HIR_SAILTASK_00_STAT, 1, 0, 0
   HIR_SAILTASK_01_STAT, 1, 8, 0
   HIR_CSS_DDCAG_STAT,    2, 0, 0
   HIR_CSS_TOTAL_I,       2, 8, 0
   HIR_SAILTASK_00_STAT, 3, 0, 0
   HIR_SAILTASK_01_STAT, 3, 8, 0
   HIR_CSS_DDCAG_STAT,    4, 0, 0
   HIR_CSS_TOTAL_I,       4, 8, 0
   HIR_SAILTASK_00_STAT, 5, 0, 0
   HIR_SAILTASK_01_STAT, 5, 8, 0
   HIR_CSS_DDCAG_STAT,    6, 0, 0
   HIR_CSS_TOTAL_I,       6, 8, 0
   HIR_SAILTASK_00_STAT, 7, 0, 0
   HIR_SAILTASK_01_STAT, 7, 8, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_SAILTASK_02_STAT, 0, 0, 0
   HIR_SAILTASK_03_STAT, 0, 8, 0
   HIR_SAILTASK_04_STAT, 1, 0, 0
   HIR_SAILTASK_05_STAT, 1, 8, 0
   HIR_SAILTASK_02_STAT, 2, 0, 0
   HIR_SAILTASK_03_STAT, 2, 8, 0
   HIR_SAILTASK_04_STAT, 3, 0, 0
   HIR_SAILTASK_05_STAT, 3, 8, 0
   HIR_SAILTASK_02_STAT, 4, 0, 0
   HIR_SAILTASK_03_STAT, 4, 8, 0
   HIR_SAILTASK_04_STAT, 5, 0, 0
   HIR_SAILTASK_05_STAT, 5, 8, 0
   HIR_SAILTASK_02_STAT, 6, 0, 0
   HIR_SAILTASK_03_STAT, 6, 8, 0
   HIR_SAILTASK_04_STAT, 7, 0, 0
   HIR_SAILTASK_05_STAT, 7, 8, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_SAILTASK_06_STAT, 0, 0, 0
   HIR_SAILTASK_07_STAT, 0, 8, 0
   HIR_SAILTASK_08_STAT, 1, 0, 0
   HIR_SAILTASK_09_STAT, 1, 8, 0
   HIR_SAILTASK_06_STAT, 2, 0, 0
   HIR_SAILTASK_07_STAT, 2, 8, 0
   HIR_SAILTASK_08_STAT, 3, 0, 0
   HIR_SAILTASK_09_STAT, 3, 8, 0
   HIR_SAILTASK_06_STAT, 4, 0, 0
   HIR_SAILTASK_07_STAT, 4, 8, 0
   HIR_SAILTASK_08_STAT, 5, 0, 0
   HIR_SAILTASK_09_STAT, 5, 8, 0
   HIR_SAILTASK_06_STAT, 6, 0, 0
   HIR_SAILTASK_07_STAT, 6, 8, 0
   HIR_SAILTASK_08_STAT, 7, 0, 0
   HIR_SAILTASK_09_STAT, 7, 8, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_SAILTASK_10_STAT, 0, 0, 0
   HIR_SAILTASK_11_STAT, 0, 8, 0
   HIR_SAILTASK_12_STAT, 1, 0, 0
   HIR_SAILTASK_13_STAT, 1, 8, 0
   HIR_SAILTASK_10_STAT, 2, 0, 0
   HIR_SAILTASK_11_STAT, 2, 8, 0
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   HIR_SAILTASK_12_STAT, 3, 0, 0
   HIR_SAILTASK_13_STAT, 3, 8, 0
   HIR_SAILTASK_10_STAT, 4, 0, 0
   HIR_SAILTASK_11_STAT, 4, 8, 0
   HIR_SAILTASK_12_STAT, 5, 0, 0
   HIR_SAILTASK_13_STAT, 5, 8, 0
   HIR_SAILTASK_10_STAT, 6, 0, 0
   HIR_SAILTASK_11_STAT, 6, 8, 0
   HIR_SAILTASK_12_STAT, 7, 0, 0
   HIR_SAILTASK_13_STAT, 7, 8, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_SAILTASK_14_STAT, 0, 0, 0
   HIR_SAILTASK_15_STAT, 0, 8, 0
   HIR_SSH_HWA_TMP,      1, 0, 8
   HIR_SVA_STAT,         1, 8, 0
   HIR_SAILTASK_14_STAT, 2, 0, 0
   HIR_SAILTASK_15_STAT, 2, 8, 0
   HIR_SSH_HWA_TMP,      3, 0, 8
   HIR_SVA_STAT,         3, 8, 0
   HIR_SAILTASK_14_STAT, 4, 0, 0
   HIR_SAILTASK_15_STAT, 4, 8, 0
   HIR_SSH_HWA_TMP,      5, 0, 8
   HIR_SVA_STAT,         5, 8, 0
   HIR_SAILTASK_14_STAT, 6, 0, 0
   HIR_SAILTASK_15_STAT, 6, 8, 0
   HIR_SSH_HWA_TMP,      7, 0, 8
   HIR_SVA_STAT,         7, 8, 0
END_COMPLEX:

START_COMPLEX: 16
   HIR_TSW_CLOCK_SEL,    0, 0, 0
   HIR_AZ_HSG_TMP_2,     0, 8, 8
   HIR_CHOP_MOT_OTSP,    1, 0, 8
   HIR_CSS_RAD_TMP1,     1, 8, 8
   HIR_TSW_CLOCK_SEL,    2, 0, 0
   HIR_BEU_BOX_TMP,      2, 8, 8
   HIR_CHOP_MOT_TMP,     3, 0, 8
   HIR_DISPL1_OTSP,      3, 8, 8
   HIR_TSW_CLOCK_SEL,    4, 0, 0
   HIR_CALMIR_TMP1,      4, 8, 8
   HIR_COMP_HEAD_OTSP,   5, 0, 8
   HIR_DISPL1_TMP,       5, 8, 8
   HIR_TSW_CLOCK_SEL,    6, 0, 0
   HIR_CCU_BOX_TMP,      6, 8, 8
   HIR_COMP_HEAD_TMP,    7, 0, 8
   HIR_DISPL2_OTSP,      7, 8, 8
END_COMPLEX:

START_COMPLEX: 16
   HIR_MACMD_LAST_CN,    0, 0, 0
   HIR_MACMDS_RCVCT,     0, 8, 0
   HIR_MACMDS_REJCT,     1, 0, 0
   HIR_SAILCMD_LAST_CN,  1, 8, 0
   HIR_SAILCMDS_RCVCT,   2, 0, 0
   HIR_SAILCMDS_REJCT,   2, 8, 0
   HIR_DISPL2_TMP,       3, 0, 8
   HIR_EXEC_OVERRUN_CNT, 3, 8, 0
   HIR_MACMD_LAST_CN,    4, 0, 0
   HIR_MACMDS_RCVCT,     4, 8, 0
   HIR_MACMDS_REJCT,     5, 0, 0
   HIR_SAILCMD_LAST_CN,  5, 8, 0
   HIR_SAILCMDS_RCVCT,   6, 0, 0
   HIR_SAILCMDS_REJCT,   6, 8, 0
   HIR_EEA_BOX_TMP,      7, 0, 8
   HIR_FIR1_TBL_ID,      7, 8, 0
END_COMPLEX:

START_COMPLEX: 16
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   HIR_FIR2_TBL_ID,       0, 0, 0
   HIR_FIR3_TBL_ID,       0, 8, 0
   HIR_FIR6_TBL_ID,       1, 0, 0
   HIR_GEU_BOX_TMP,       1, 8, 8
   HIR_GYR0_HTR_W,        2, 0, 2
   HIR_GYR0_MOT_I,        2, 8, 2
   HIR_GYR0_MOT_V,        3, 0, 2
   HIR_GYR0_N15V,         3, 8, 2
   HIR_GYR0_OTSP,         4, 0, 2
   HIR_GYR0_P15V,         4, 8, 2
   HIR_GYR0_TMP,          5, 0, 2
   HIR_GYR1_HTR_W,        5, 8, 2
   HIR_GYR1_MOT_I,        6, 0, 2
   HIR_GYR1_MOT_V,        6, 8, 2
   HIR_GYR1_N15V,         7, 0, 2
   HIR_GYR1_OTSP,         7, 8, 2
END_COMPLEX:

START_COMPLEX: 16
   HIR_GYR1_P15V,         0, 0, 2
   HIR_GYR1_TMP,          0, 8, 2
   HIR_GYR2_HTR_W,        1, 0, 2
   HIR_GYR2_MOT_I,        1, 8, 2
   HIR_GYR2_MOT_V,        2, 0, 2
   HIR_GYR2_N15V,         2, 8, 2
   HIR_GYR2_OTSP,         3, 0, 2
   HIR_GYR2_P15V,         3, 8, 2
   HIR_GYR2_TMP,          4, 0, 2
   HIR_GYR3_HTR_W,        4, 8, 2
   HIR_GYR3_MOT_I,        5, 0, 2
   HIR_GYR3_MOT_V,        5, 8, 2
   HIR_GYR3_N15V,         6, 0, 2
   HIR_GYR3_OTSP,         6, 8, 2
   HIR_GYR3_P15V,         7, 0, 2
   HIR_GYR3_TMP,          7, 8, 2
END_COMPLEX:

START_COMPLEX: 16
   HIR_IFC_PSV_N15,       0, 0, 2
   HIR_IFC_PSV_P15,       0, 8, 2
   HIR_IFC_PSV_P5,        1, 0, 2
   HIR_IFC_REF_TMP,       1, 8, 0
   HIR_IFCBB_FRPL_TMP,    2, 0, 8
   HIR_IFCBB_TMP1,        2, 8, 8
   HIR_IFCBB_TMP2,        3, 0, 8
   HIR_IFCBB_TMP3,        3, 8, 8
   HIR_IPU_BOX_TMP,       4, 0, 8
   HIR_IPU_N15V,          4, 8, 8
   HIR_IPU_P15V,          5, 0, 8
   HIR_IPU_P3P3V,         5, 8, 8
   HIR_IPU_P5V,           6, 0, 8
   HIR_LNS1_WF_TMP1,      6, 8, 8
   HIR_LNS2_TMP1,         7, 0, 8
   HIR_M2_TMP1,           7, 8, 8
END_COMPLEX:

START_COMPLEX: 16
   HIR_OPH_ZONE1_WIDTH,   0, 0, 0
   HIR_OPH_ZONE2_WIDTH,   0, 8, 0
   HIR_OPH_ZONE3_WIDTH,   1, 0, 0
   HIR_OPH_ZONE4_WIDTH,   1, 8, 0
   HIR_PCU_BOX_TMP,       2, 0, 8
   HIR_RAD_DEMOD_TBL_ID,  2, 8, 0
   HIR_SAIL_ERR_CTASK,    3, 0, 0
   HIR_SAIL_ERR_CTYP,     3, 8, 0
   HIR_SAIL_ERR_LTASK,    4, 0, 0
   HIR_SAIL_ERR_LTYP,     4, 8, 0
   HIR_SM_TMP1,           5, 0, 8
   HIR_SMA_MTRING_TMP,    5, 8, 8
   HIR_SPU_BOX_TMP,       6, 0, 8
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   HIR_SPU_N12V_A,        6, 8, 8
   HIR_SPU_N12V_B,        7, 0, 8
   HIR_SPU_N5V_A,         7, 8, 8
END_COMPLEX:

START_COMPLEX: 16
   HIR_SPU_N5V_B,         0, 0, 8
   HIR_SPU_P12V_A,        0, 8, 8
   HIR_SPU_P12V_B,        1, 0, 8
   HIR_SPU_P5V_A,         1, 8, 8
   HIR_SPU_P5V_B,         2, 0, 8
   HIR_SPU_P5V_DA,        2, 8, 8
   HIR_SPU_P5V_DB,        3, 0, 8
   HIR_SPVUMIR_TMP1,      3, 8, 8
   HIR_SSH_DORMOT_OTSP,   4, 0, 8
   HIR_SSH_DORMOT_TMP,    4, 8, 8
   HIR_SSH_HWA_OTSP,      5, 0, 8
   HIR_SUNSEN1_TMP,       5, 8, 8
   HIR_SUNSEN2_TMP,       6, 0, 8
   HIR_SUNSEN3_TMP,       6, 8, 8
   HIR_SVA_DORMOT_OTSP,   7, 0, 8
   HIR_SVA_DORMOT_TMP,    7, 8, 8
END_COMPLEX:

START_COMPLEX: 16
   HIR_SVA_MTGPLT_TMP,    0, 0, 8
   HIR_TEU_BOX_TMP,       0, 8, 8
   HIR_TSB_DIAG_CHKSM_C,  1, 0, 0
   HIR_TSB_HK_CHKSM_CNT,  1, 8, 0
   HIR_TSS_TLM_NOPKT_C,   2, 0, 0
   HIR_TSS_TLM_PKT_CNT,   2, 8, 0
   HIR_TSU_GOOD_RAM,      3, 0, 0
   HIR_TSW_EXEC_OVERRUN,  3, 8, 0
   HIR_TSW_N15VSUP,       4, 0, 8
   HIR_TSW_P15VSUP,       4, 8, 8
   HIR_TSW_P5VREF1,       5, 0, 8
   HIR_TSW_P5VREF2,       5, 8, 8
   HIR_TSW_P5VSUP,        6, 0, 8
   HIR_TSW_SCI_PKT_CNT,   6, 8, 0
   HIR_TSW_TABLEN,        7, 0, 0
   HIR_WSE_BOX_TMP,       7, 8, 8
END_COMPLEX:

END_OF_TABLE:
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Telemetry Summary for ASCII Files Version 6.15
DMW 2002-07-19

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
AD590_ROW3_COL2		Spare temp, EDAQ AD590 Row 3 Col 2			0	0	0	64	16	FALSE	FALSE	TRUE
AMBI_EDAQ_ERR	IPU_ERR_4	1 means an AMBI error occured while setting up the EDAQ board	5	1								
AMBI_ERR	IPU_ERR_4	1 means an AMBI error occured while setting up AMBI Bus	8	1								
AMBI_MBIC_A_ERR	IPU_ERR_4	1 means an AMBI error occured while setting up the MBIC_A on the MSA board	6	1								
AMBI_MBIC_B_ERR	IPU_ERR_4	1 means an AMBI error occured while setting up the MBIC_B on the MSA board	7	1								
AMBI_SIO_ERR	IPU_ERR_4	1 means an AMBI error occured while setting up the SIO board	4	1								
AMBI_TG_ERR	IPU_ERR_4	1 means an AMBI error occured while setting up the TG board	3	1								
ANCILLARY_TMATCH	IPU_STAT_2	1 = ancillary 1 and ancillary 2 time codes and checksums match	7	1								
AZ_HSG_TMP_1		Azimuth housing temp 1, EDAQ AD590 Row 2 Col 2					0	64	16	TRUE	TRUE	TRUE
AZ_HSG_TMP_2		Azimuth housing temp 2, EDAQ AD590 Row 1 Col 0			32	8	8	64	16	TRUE	TRUE	TRUE
BEU_BOX_TMP		BEU box EDAQ AD590 Row 4 Col 2			32	8	8	64	16	TRUE	TRUE	TRUE
BEU_MNT_TMP		BEU box mount EDAQ AD590 Row 1 Col 4					0	64	16	TRUE	TRUE	TRUE
BIP_CMD_ERR	CMD_ERR_0	1 means an error occured while executing a BIP command.	0	1								
CALMIR_TMP1		Cal. Mirror temp #1, EDAQ ADC590 Row 0 Col 1			32	8	8	64	16	TRUE	TRUE	TRUE
CALMIR_TMP2		Cal. Mirror temp #2, EDAQ ADC590 Row 1 Col 2					0	64	16	TRUE	TRUE	TRUE
CALMIR_TMP3		Cal. Mirror temp #3, EDAQ Derived PRT 4					0	64	16	TRUE	TRUE	TRUE
CCU_BOX_TMP		CCU box temp, EDAQ AD590 Row 4 Col 7			32	8	8	64	16	TRUE	TRUE	TRUE
CHOP_FREQ		Chopper frequency setting			16	16	0	64	16	TRUE	TRUE	TRUE
CHOP_HSG_TMP2		Field Stop #1 temp, EDAQ AD590 Row 3 Col 4					0	64	16	TRUE	TRUE	TRUE
CHOP_HSG_TMP3		Chopper blade shroud temp, EDAQ Derived PRT 2					0	64	16	TRUE	TRUE	TRUE
CHOP_MOT_OT_ERR	IPU_ERR_4	Chopper motor over temperature fault	12	1								
CHOP_MOT_OT_FM	IPU_FLT_STAT_0	0 means Fault Management for this error is off, 1 on	11	1								
CHOP_MOT_OTSP		Chopper motor over-temperature set point			32	8	8	64	16	TRUE	TRUE	TRUE
CHOP_MOT_TMP		Chopper motor temp, EDAQ AD590 Row 5 Col 3			32	8	8	64	16	TRUE	TRUE	TRUE
CHOP_SYNC_ERR	IPU_ERR_0	Chopper Sync failed for SPU. Fallback to internal chopper ref	4	1								
CHOP_SYNC_FM	IPU_FLT_STAT_1	Chopper Sync fault management: 0 = off, 1 = on	8	1								
CHOP_SYNC_SOURCE	IPU_STAT_0	0 means internal chopper ref, 1 means chopper ref, 2 means external chopper ref	3	2								
CMD_DB_BUILD_ID		Command Database Build Version ID			32	16	0	64	8	TRUE	TRUE	TRUE
CMD_ERR	CMD_ERR_0	1 means a low level error occured processing a cmd within the command handler.	14	1								
CMD_ERR_0		Command Error Flags			4	16	0	64	16	TRUE	TRUE	TRUE
CMD_MAJOR_REV	CMD_DB_BUILD_ID	cmd major rev num (0 to 7)	5	3								
CMD_MINOR_REV	CMD_DB_BUILD_ID	cmd minor rev num (0 to 31)	0	5								
CMD_UNPROT	IPU_STAT_0	not	11	1								
CMDRES_DB_BLD_ID		Command Results Database Build Version ID					0	64	8	TRUE	TRUE	TRUE
CMDRES_MAJOR_REV	CMDRES_DB_BLD_ID	Command result code DB major rev num (0 to 7)	5	3								
CMDRES_MINOR_REV	CMDRES_DB_BLD_ID	Command result code DB minor rev num (0 to 31)	0	5								
COMP_AMP_ACT		Compressor ampl (actual)			32	16	0	64	16	TRUE	TRUE	TRUE
COMP_AMP_DMD		Compressor ampl (dmd'd)			8	16	0	64	16	TRUE	TRUE	TRUE
COMP_HEAD_OT_ERR	IPU_ERR_4	Compressor head over temperature fault	15	1								
COMP_HEAD_OT_FM	IPU_FLT_STAT_1	Compressor head over temperature fault mgt: 0=off, 1=on	1	1								
COMP_HEAD_OTSP		CSS compressor head over-temperature set point			32	8	8	64	16	TRUE	TRUE	TRUE
COMP_HEAD_TMP		Compressor head temp, EDAQ AD590 Row 5 Col 5			32	8	8	64	16	TRUE	TRUE	TRUE
CR_INT_SOURCE	IPU_STAT_0	0 means internal rotation sync, 1 means CR sync, 2 means external CR sync	1	2								
CR_TICK_WDOG_ERR	IPU_ERR_4	1 means a loss of system tick interrupt has caused the system tick source to fallback to TG internal or decrementer	9	1								
CRYOTIP_SETP		Cryo tip temp set point			8	16	0	64	16	TRUE	TRUE	TRUE
CRYOTIP_TMP_D0		Cryo tip temperature 0			32	16	0	64	16	TRUE	TRUE	TRUE
CRYOTIP_TMP_D1		Cryo tip temperature 1			32	16	0	64	16	TRUE	TRUE	TRUE
CSS_C1_UNCAGED	CSS_DDCAG_STAT	Compressor 1 caging status (0= caged, 1= uncaged)	2	1								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
CSS_C2_UNCAGED	CSS_DDCAG_STAT	Compressor 2 caging status (0= caged, 1= uncaged)	3	1								
CSS_CAGE_IL_ERR	IPU_ERR_5	0=no interlock occurred, 1=interlock occurred	10	1								
CSS_CAGE_IL_FM	IPU_FLT_STAT_1	CSS cage interlock FM bit, 0=no FM, 1=FM (cmd blocked)	6	1								
CSS_CHKSUM_ERR	IPU_ERR_2	1 means checksum failure on TLM transfer from CSS	9	1								
CSS_CMD_ERR	CMD_ERR_0	1 means an error occured while executing a CSS command.	2	1								
CSS_CMD_PARM_ERR	CSS_ERROR	1= Last Command illegal parameter error	4	1								
CSS_CMD_STATE_ER	CSS_ERROR	1= Last Command Illegal State error	3	1								
CSS_CMD_TEMP_ERR	CSS_ERROR	1= Overtemp error in warm-up state	5	1								
CSS_CMD_XMIT_ERR	CSS_ERROR	1= Last Command Transmission error	2	1								
CSS_CMU_CNTRL	CSS_OP_STAT	0= Electronics Only, 1= Control	0	1								
CSS_CSCI_BLD_ID		Cooler F/W Build Version ID					0	64	16	TRUE	TRUE	TRUE
CSS_D1_UNCAGED	CSS_DDCAG_STAT	Displacer 1 caging status (0= caged, 1= uncaged)	4	1								
CSS_D2_UNCAGED	CSS_DDCAG_STAT	Displacer 2 caging status (0= caged, 1= uncaged)	5	1								
CSS_DDCAG_STAT		Cooler DDC & caging status discretes (Read by IPU)			8	8	0	64	8	TRUE	TRUE	TRUE
CSS_DIODE_SELECT	CSS_OP_STAT	0= diode 0 selected , 1= diode 1 selected	5	1								
CSS_ERROR		Cooler error flags			4	8	0	64	8	TRUE	TRUE	TRUE
CSS_FREQ_ACT		Cooler frequency (actual)			32	16	0	64	16	TRUE	TRUE	TRUE
CSS_FREQ_DMD		Cooler frequency (dmd'd)			8	16	0	64	16	TRUE	TRUE	TRUE
CSS_IBF_FLAG	CSS_DDCAG_STAT	1 means IPU CSS serial control/tlm interface is enabled	6	1								
CSS_LATCH_ERR	IPU_ERR_4	latched	10	1								
CSS_LATCH_FM	IPU_FLT_STAT_0	0 means Fault Management for this error is off, 1 on	13	1								
CSS_MANUAL	CSS_OP_STAT	0= off, 1= Manual Mode	1	1								
CSS_MSG_NUMBER		CSS-IPS data msg number			4	8	0	64	8	TRUE	TRUE	TRUE
CSS_OBF_FLAG	CSS_DDCAG_STAT	1 means IPU CSS serial tlm is available.	7	1								
CSS_OP_STAT		Cooler operating status			4	8	0	64	8	TRUE	TRUE	TRUE
CSS_OS_OVERIDE	CSS_OP_STAT	0 = normal, 1 = override	4	1								
CSS_OSTROKE_ERR	CSS_ERROR	1= Overstroke Error	0	1								
CSS_PACKED_DCOEF	CSS_PACKED_PID	CSS D (differential) coefficient (LS 4 bits)	12	4								
CSS_PACKED_ICOEF	CSS_PACKED_PID	CSS I (integral) coefficient (LS 6 bits)	8	4								
CSS_PACKED_PCOEF	CSS_PACKED_PID	CSS P (proportional) coefficient (LS 8 bits)	0	8								
CSS_PACKED_PID		Packed CSS P, I and D coefficients			32	16	0	64	16	TRUE	TRUE	TRUE
CSS_PH_ACT		Comp/Disp phase (actual)			32	16	0	64	16	TRUE	TRUE	TRUE
CSS_PH_DMD		Comp/Disp phase (dmd'd)			8	16	0	64	16	TRUE	TRUE	TRUE
CSS_PWR_IL_ERR	IPU_ERR_5	0=no interlock occurred, 1=interlock occurred	11	1								
CSS_PWR_IL_FM	IPU_FLT_STAT_1	CSS power interlock FM bit, 0=no FM, 1=FM (cmd blocked)	7	1								
CSS_RAD_TMP1		Cooler Radiator temp 1, EDAQ AD590 Row 3 Col 5			32	8	8	64	16	TRUE	TRUE	TRUE
CSS_RAD_TMP2		Cooler Radiator temp 2, EDAQ AD590 Row 4 Col 6					0	64	16	TRUE	TRUE	TRUE
CSS_RESET_ERR	CSS_ERROR	1= Just been reset, (Watchdog timeout or just powered on)	1	1								
CSS_SPLY_PRI_OFF	CSS_DDCAG_STAT	Primary Convertor Selection Status (1= Not Selected, 0= Selected)	0	1								
CSS_SPLY_RED_OFF	CSS_DDCAG_STAT	Redundant Convertor Selection Status (1= Not Selected, 0= Selected)	1	1								
CSS_STACK_STAT		Stack monitoring word. High byte is the position of the return stack, low byte is the position of the parameter stack.			32	16	0	64	16	TRUE	TRUE	TRUE
CSS_THERMOSTATIC	CSS_OP_STAT	0= off, 1= Thermostatic Mode	2	1								
CSS_TOTAL_I		Cooler tot mean currt			8	8	0	64	8	TRUE	TRUE	TRUE
CSS_WARMUP	CSS_OP_STAT	0= off, 1= Warmup Mode	3	1								
DIAG_CMDSMRY_ENA	TLM_DIAG_STAT	Command summary item (0=disabled, 1=enabled)	11	1								
DIAG_EPRMDMP_ENA	TLM_DIAG_STAT	IPU EEPROM memory dump (SUROM only) item (0=disabled, 1=enabled)	2	1								
DIAG_HWREGS_ENA	TLM_DIAG_STAT	HW Register dump item	9	1								
DIAG_IRAMDMP_ENA	TLM_DIAG_STAT	IPU RAM memory dump item (0=disabled, 1=enabled)	1	1								
DIAG_ITEM_DROP	IPU_STAT_2	1 means at least one requested diag was not included in diag block	15	1								
DIAG_ITEM_TRUNC	IPU_STAT_2	1 means at least one requested diag was truncated (i.e. requested size not met)	14	1								
DIAG_RAWSPU_ENA	TLM_DIAG_STAT	Raw SPU data dump item	10	1								
DIAG_SBLKDMP_ENA	TLM_DIAG_STAT	SAIL block memory dump item (0=disabled, 1=enabled)	5	1								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
DIAG_SMEMINF_ENA	TLM_DIAG_STAT	SAIL memory information item (0=disabled, 1=enabled)	13	1								
DIAG_SRAMDMP_ENA	TLM_DIAG_STAT	SAIL RAM memory dump item (0=disabled, 1=enabled)	4	1								
DIAG_STSKINF_ENA	TLM_DIAG_STAT	SAIL task information item (0=disabled, 1=enabled)	12	1								
DIAG_STSKPRM_ENA	TLM_DIAG_STAT	SAIL task parameter item (0=disabled, 1=enabled)	0	1								
DIAG_TEXTMSG_ENA	TLM_DIAG_STAT	Text message item (0=disabled, 1=enabled)	14	1								
DIAG_TRAMDMP_ENA	TLM_DIAG_STAT	TEU RAM memory dump item (0=disabled, 1=enabled)	3	1								
DIAG_TSSCNTL_ENA	TLM_DIAG_STAT	TSS control item (0= disabled, 1=enabled)	6	1								
DIAG_TSSJITR_ENA	TLM_DIAG_STAT	TSS jitter item (0=disabled, 1=enabled)	7	1								
DISP_AMP_ACT		Displacer ampl (actual)			32	16	0	64	16	TRUE	TRUE	TRUE
DISP_AMP_DMD		Displacer ampl (dmd'd)			8	16	0	64	16	TRUE	TRUE	TRUE
DISPL1_OT_ERR	IPU_ERR_4	Displacer 1 over temperature fault	13	1								
DISPL1_OT_FM	IPU_FLT_STAT_0	Displacer 1 over temperature fault mgt: 0=off, 1=on	14	1								
DISPL1_OTSP		CSS displacer 1 over-temperature set point			32	8	8	64	16	TRUE	TRUE	TRUE
DISPL1_TMP		Displacer 1 body temp, EDAQ AD590 Row 6 Col 6			32	8	8	64	16	TRUE	TRUE	TRUE
DISPL2_OT_ERR	IPU_ERR_4	Displacer 2 over temperature fault	14	1								
DISPL2_OT_FM	IPU_FLT_STAT_0	Displacer 2 over temperature fault mgt: 0=off, 1=on	15	1								
DISPL2_OTSP		CSS displacer 2 over-temperature set point			32	8	8	64	16	TRUE	TRUE	TRUE
DISPL2_TMP		Displacer 2 body temp, EDAQ AD590 Row 5 Col 5			32	8	8	64	16	TRUE	TRUE	TRUE
DOOR_POT		Door angle sensor, EDAQ			4	16	0	64	16	TRUE	TRUE	TRUE
DOOR_SAF_ANG		Door Safe Angle setting			8	16	0	64	16	TRUE	TRUE	TRUE
DOOR_SAF_ANG_ERR	IPU_ERR_2	command	2	1								
DOOR_SAF_ANG_FM	IPU_FLT_STAT_0	1 means the SSH will check the Potentiometer, 0 means it won't	9	1								
E_AD590_AMP_OFF		AD590 Amplifier Offset, EDAQ					0	64	16	TRUE	TRUE	TRUE
E_ADC_OFFSET		ADC Offset, EDAQ					0	64	16	TRUE	TRUE	TRUE
E_PRT_0_N		PRT 0 negative reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_0_P		PRT 0 positive reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_1_N		PRT 0 negative reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_1_P		PRT 1 positive reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_2_N		PRT 0 negative reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_2_P		PRT 2 positive reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_3_N		PRT 0 negative reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_3_P		PRT 3 positive reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_4_N		PRT 0 negative reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_4_P		PRT 4 positive reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_5_N		PRT 0 negative reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_5_P		PRT 5 positive reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_6_N		PRT 0 negative reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_6_P		PRT 6 positive reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_7_N		PRT 0 negative reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_7_P		PRT 7 positive reading, EDAQ					0	64	16	TRUE	FALSE	TRUE
E_PRT_AMP_OFF		PRT Amplifier Offset					0	64	16	TRUE	TRUE	TRUE
E_PSS_GND_O		PSS Ground Offset, EDAQ					0	64	16	TRUE	TRUE	TRUE
E_REF_234_UAMP		193 microamp reference , EDAQ					0	64	16	TRUE	TRUE	TRUE
E_REF_352_UAMP		352 microamp reference, EDAQ					0	64	16	TRUE	TRUE	TRUE
E_REF_379_OHM		379 ohm REFERENCE, EDAQ					0	64	16	TRUE	TRUE	TRUE
E_REF_619_OHM		379 ohm REFERENCE, EDAQ					0	64	16	TRUE	TRUE	TRUE
E_REF_7P664_V		8.066 Volt Reference, EDAQ					0	64	16	TRUE	TRUE	TRUE
ECHO_PKT_SEQ_CTR	IPU_ALIVE	Echo of packet sequence counter	0	5								
EDAC_DBL_ERR_C		RAM double bit error counter					0	64	8	TRUE	TRUE	TRUE
EDAC_SGL_ERR_C		RAM single bit error counter					0	64	8	TRUE	TRUE	TRUE
EDAQ_ADC_FLT_ERR	IPU_ERR_2	1 means the ADC is in a latch up state. Telemetry will not be reported for 425 ms	0	1								
EDAQ_ADC_FLT_FM	IPU_FLT_STAT_0	0 means Fault Management for this error is off, 1 on	8	1								
EDAQ_BUSY	IPU_STAT_2	once per MIF	2	1								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
EDAQ_BUSY_ERR	IPU_ERR_1	1 means the EDAQ Telemetry Converter was unexpectedly busy.	15	1								
EDAQ_BUSY_FM	IPU_FLT_STAT_0	0 means Fault Management for this error is off, 1 on	7	1								
EDAQ_CR_PHASE		CR within MiF at which gather 0 convert 1			0	0	0	64	8	TRUE	FALSE	TRUE
EDAQ_FILTER_FM	IPU_FLT_STAT_1	Enable/disable EDAQ analog filter	12	1								
EDAQ_LIST_BAD	IPU_STAT_2	1 means the EDAQ Telemetry Converter encountered an error in a Telemetry List. This Flag is cleared once per MIF	1	1								
EDAQ_LIST_ERR	IPU_ERR_4	1 means the EDAQ Telemetry Converter encountered an error in a Telemetry List.	2	1								
EDAQ_LIST_ERR_C		Count of EDAQ list refresh errors			0	0	0	64	16	TRUE	FALSE	TRUE
EDAQ_LIST_ERR_W		Value of last list/word which had error			0	0	0	64	16	TRUE	FALSE	TRUE
EDAQ_LIST_STAT		Status of which lists have errors			0	0	0	64	16	TRUE	FALSE	TRUE
EDAQ_PIO_PAR_CK	IPU_FLT_STAT_0	0 means Edaq IOBIC PIO Parity checking is disabled, 1 is enabled	0	1								
EEA_BOX_TMP		EEA box temp, EDAQ AD590 Row 4 Col 1			32	8	8	64	16	TRUE	TRUE	TRUE
EEA_MNT_TMP		EEA box mount EDAQ AD590 Row 3 Col 0					0	64	16	TRUE	TRUE	TRUE
ELMOT1_TMP1		Elev motor 1 temp 1, EDAQ AD590 Row 2 Col 1					0	64	16	TRUE	TRUE	TRUE
ELMOT2_TMP1		Elev motor 2 temp 1, EDAQ AD590 Row 2 Col 0					0	64	16	TRUE	TRUE	TRUE
ENG_HKTBL_ERR		Error flags for engineering HK table					0	64	16	TRUE	FALSE	TRUE
ENGPKT_LOSS	IPU_ERR_2	1 means engineering packet loss has occured.	5	1								
EXEC_OVERRUN_CNT		CR-executive task overrun count			32	8	0	64	16	TRUE	TRUE	TRUE
EXEC_OVERRUN_ERR	IPU_ERR_0	1 means the IPU Executive did not finish within a chopper rotation.	7	1								
EXEC_STACK_MRGN		Number of bytes left on the Executive stack before overrunning stack end, 0xffff if Executive task name missing			0	0	0	64	16	TRUE	TRUE	TRUE
FIR1_TBL_ID		FIR coeffts table ID (1/CR rate)			32	8	0	64	8	TRUE	TRUE	TRUE
FIR2_TBL_ID		FIR coeffts table ID (2/CR rate)			32	8	0	64	8	TRUE	TRUE	TRUE
FIR3_TBL_ID		FIR coeffts table ID (3/CR rate)			32	8	0	64	8	TRUE	TRUE	TRUE
FIR6_TBL_ID		FIR coeffts table ID (6/CR rate)			32	8	0	64	8	TRUE	TRUE	TRUE
FPA_TMP_A		Focal Plane temperature A, SPU			32	16	0	8	16	TRUE	TRUE	TRUE
FPA_TMP_B		Focal Plane temperature B,SPU			32	16	0	8	16	TRUE	TRUE	TRUE
FRAMECNT		Minor frame count (GROUND USE ONLY)					0	8	32	FALSE	FALSE	FALSE
G0_ADAT	GYR0_ADAT	GSS 11 Bit Angle Data Without Status Info	0	10								
G0_BDTMP	GYR0_BD_TMP	GSS 10 Bit HK Data Without Status Info	0	10								
G0_CAPL	GYR0_CAPL	GSS 10 Bit HK Data Without Status Info	0	10								
G1_ADAT	GYR1_ADAT	GSS 11 Bit Angle Data Without Status Info	0	10								
G1_BDTMP	GYR1_BD_TMP	GSS 10 Bit HK Data Without Status Info	0	10								
G1_CAPL	GYR1_CAPL	GSS 10 Bit HK Data Without Status Info	0	10								
G2_ADAT	GYR2_ADAT	GSS 11 Bit Angle Data Without Status Info	0	10								
G2_BDTMP	GYR2_BD_TMP	GSS 10 Bit HK Data Without Status Info	0	10								
G2_CAPL	GYR2_CAPL	GSS 10 Bit HK Data Without Status Info	0	10								
G3_ADAT	GYR3_ADAT	GSS 11 Bit Angle Data Without Status Info	0	10								
G3_BDTMP	GYR3_BD_TMP	GSS 10 Bit HK Data Without Status Info	0	10								
G3_CAPL	GYR3_CAPL	GSS 10 Bit HK Data Without Status Info	0	10								
GEU_BOX_TMP		GEU box temp, EDAQ AD590 Row 4 Col 0			32	8	8	64	16	TRUE	TRUE	TRUE
GMU_HSG_TMP		GMU Housing temp., EDAQ 54					0	64	16	TRUE	TRUE	TRUE
GMU_MNT_TMP		GMU Mount temp., EDAQ 43					0	64	16	TRUE	TRUE	TRUE
GSE_CMD_ERR	CMD_ERR_0	1 means an error occured while executing a GSE command.	13	1								
GSS_CMD_ERR	CMD_ERR_0	1 means an error occured while executing a GSS command.	3	1								
GSS_HK_SYNC_ERR	IPU_ERR_4	1 means the GSS HK Tlm words' RTC bits do not match those requested.	0	1								
GSS_SIO_BUSY	IPU_STAT_1	1 means the SIO GSS interface cycle was not finished in time for the next CR cycle.	15	1								
GSS_SIO_BUSY_CNT		Count of IPU GSS(SIO) telemetry overruns					0	64	8	TRUE	TRUE	TRUE
GSS_SIO_BUSY_ERR	IPU_ERR_3	1 means the SIO GSS interface cycle was not finished in time for the next CR cycle.	15	1								
GSS_ST_SYNC_ERR	IPU_ERR_4	1 means the GSS STATUS Tlm words' RTC bits do not match those requested.	1	1								
GYR0_ADAT		Gyro 0 angle data (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
GYR0_BD_TMP		Gyro 0 board temp					0	64	16	TRUE	TRUE	TRUE
GYR0_CAPL		Gyro 0 cap loop output					0	64	16	TRUE	TRUE	TRUE

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
GYR0_HTR_W		Gyro 0 heater watts (mean)			32	8	2	64	16	TRUE	TRUE	TRUE
GYR0_MOT_I		Gyro 0 motor current			32	8	2	64	16	TRUE	TRUE	TRUE
GYR0_MOT_V		Gyro 0 motor volts			32	8	2	64	16	TRUE	TRUE	TRUE
GYR0_N15V		Gyro 0 -15 volts			32	8	2	64	16	TRUE	TRUE	TRUE
GYR0_OT_ERR	IPU_ERR_5	GYRO 0 over-temperature fault, 1=occurred	0	1								
GYR0_OT_FM	IPU_FLT_STAT_1	GYRO 0 over-temperature fault mgt: 0=off, 1=on	2	1								
GYR0_OTSP		GYRO 0 over-temp set point			32	8	2	64	16	TRUE	TRUE	TRUE
GYR0_P15V		Gyro 0 +15 volts			32	8	2	64	16	TRUE	TRUE	TRUE
GYR0_STAT		Gyro 0 status word			4	16	0	64	16	TRUE	TRUE	TRUE
GYR0_TMP		Gyro 0 temperature			32	8	2	64	16	TRUE	TRUE	TRUE
GYR1_ADAT		Gyro 1 angle data (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
GYR1_BD_TMP		Gyro 1 board temp					0	64	16	TRUE	TRUE	TRUE
GYR1_CAPL		Gyro 1 cap loop output					0	64	16	TRUE	TRUE	TRUE
GYR1_HTR_W		Gyro 1 heater watts (mean)			32	8	2	64	16	TRUE	TRUE	TRUE
GYR1_MOT_I		Gyro 1 motor current			32	8	2	64	16	TRUE	TRUE	TRUE
GYR1_MOT_V		Gyro 1 motor volts			32	8	2	64	16	TRUE	TRUE	TRUE
GYR1_N15V		Gyro 1 -15 volts			32	8	2	64	16	TRUE	TRUE	TRUE
GYR1_OT_ERR	IPU_ERR_5	GYRO 1 over-temperature fault, 1=occurred	1	1								
GYR1_OT_FM	IPU_FLT_STAT_1	GYRO 1 over-temperature fault mgt: 0=off, 1=on	3	1								
GYR1_OTSP		GYRO 1 over-temp set point			32	8	2	64	16	TRUE	TRUE	TRUE
GYR1_P15V		Gyro 1 +15 volts			32	8	2	64	16	TRUE	TRUE	TRUE
GYR1_STAT		Gyro 1 status word			4	16	0	64	16	TRUE	TRUE	TRUE
GYR1_TMP		Gyro 1 temperature			32	8	2	64	16	TRUE	TRUE	TRUE
GYR2_ADAT		Gyro 2 angle data (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
GYR2_BD_TMP		Gyro 2 board temp					0	64	16	TRUE	TRUE	TRUE
GYR2_CAPL		Gyro 2 cap loop output					0	64	16	TRUE	TRUE	TRUE
GYR2_HTR_W		Gyro 2 heater watts (mean)			32	8	2	64	16	TRUE	TRUE	TRUE
GYR2_MOT_I		Gyro 2 motor current			32	8	2	64	16	TRUE	TRUE	TRUE
GYR2_MOT_V		Gyro 2 motor volts			32	8	2	64	16	TRUE	TRUE	TRUE
GYR2_N15V		Gyro 2 -15 volts			32	8	2	64	16	TRUE	TRUE	TRUE
GYR2_OT_ERR	IPU_ERR_5	GYRO 2 over-temperature fault, 1=occurred	2	1								
GYR2_OT_FM	IPU_FLT_STAT_1	GYRO 2 over-temperature fault mgt: 0=off, 1=on	4	1								
GYR2_OTSP		GYRO 2 over-temp set point			32	8	2	64	16	TRUE	TRUE	TRUE
GYR2_P15V		Gyro 2 +15 volts			32	8	2	64	16	TRUE	TRUE	TRUE
GYR2_STAT		Gyro 2 status word			4	16	0	64	16	TRUE	TRUE	TRUE
GYR2_TMP		Gyro 2 temperature			32	8	2	64	16	TRUE	TRUE	TRUE
GYR3_ADAT		Gyro 3 angle data (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
GYR3_BD_TMP		Gyro 3 board temp					0	64	16	TRUE	TRUE	TRUE
GYR3_CAPL		Gyro 3 cap loop output					0	64	16	TRUE	TRUE	TRUE
GYR3_HTR_W		Gyro 3 heater watts (mean)			32	8	2	64	16	TRUE	TRUE	TRUE
GYR3_MOT_I		Gyro 3 motor current			32	8	2	64	16	TRUE	TRUE	TRUE
GYR3_MOT_V		Gyro 3 motor volts			32	8	2	64	16	TRUE	TRUE	TRUE
GYR3_N15V		Gyro 3 -15 volts			32	8	2	64	16	TRUE	TRUE	TRUE
GYR3_OT_ERR	IPU_ERR_5	GYRO 3 over-temperature fault, 1=occurred	3	1								
GYR3_OT_FM	IPU_FLT_STAT_1	GYRO 3 over-temperature fault mgt: 0=off, 1=on	5	1								
GYR3_OTSP		GYRO 3 over-temp set point			32	8	2	64	16	TRUE	TRUE	TRUE
GYR3_P15V		Gyro 3 +15 volts			32	8	2	64	16	TRUE	TRUE	TRUE
GYR3_STAT		Gyro 3 status word			4	16	0	64	16	TRUE	TRUE	TRUE
GYR3_TMP		Gyro 3 temperature			32	8	2	64	16	TRUE	TRUE	TRUE
GYS0_AB_SIDE	GYR0_STAT	This bit has no meaning for GYR0	9	1								
GYS0_CHAN_ID	GYR0_STAT	GYRO 3 Status, 3 bit GYRO Channel Address	13	3								
GYS0_ENC_RANGE	GYR0_STAT	GYRO 0 Status, Encoder Range, 1 means FINE, 0 means COARSE	8	1								
GYS0_HEATER_OFF	GYR0_STAT	GYRO 0 Status, Heater Status, 1=off, 0=on	10	1								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
GYS0_IN_SYNC	GYR0_STAT	GYRO 0 Status, Sync Status, 1 means IN SYNC, 0 means NOT IN SYNC	6	1								
GYS0_MOTOR_ON	GYR0_STAT	GYRO 0 Status, Motor status, 1 means ON, 0 means OFF	0	1								
GYS0_MOTOR_SPEED	GYR0_STAT	GYRO 0 Status, 3 bits Motor Speed Code	1	3								
GYS0_OVRC_ENAB	GYR0_STAT	GYRO 0 Status, Moter overcurrent trip, 1 means ENAB, 0 means INHIB	7	1								
GYS0_PWR_MODE	GYR0_STAT	GYRO 0 Status, Power Mode, 1 means HIGH PWR, 0 means NORMAL PWR	5	1								
GYS0_TEMP_INHIB	GYR0_STAT	GYRO 0 Status, Temperature Inhib, 1 means INHIB, 0 means ENAB	4	1								
GYS1_AB_SIDE	GYR1_STAT	For GYR1, 1 = A-side on (all 4 gyros)	9	1								
GYS1_CHAN_ID	GYR1_STAT	GYRO 1 Status, 3 bit GYRO Channel Address	13	3								
GYS1_ENC_RANGE	GYR1_STAT	GYRO 1 Status, Encoder Range, 1 means FINE, 0 means COARSE	8	1								
GYS1_HEATER_OFF	GYR1_STAT	GYRO 1 Status, Heater Status, 1=off, 0=on	10	1								
GYS1_IN_SYNC	GYR1_STAT	GYRO 1 Status, Sync Status, 1 means IN SYNC, 0 means NOT IN SYNC	6	1								
GYS1_MOTOR_ON	GYR1_STAT	GYRO 1 Status, Motor status, 1 means ON, 0 means OFF	0	1								
GYS1_MOTOR_SPEED	GYR1_STAT	GYRO 1 Status, 3 bits Motor Speed Code	1	3								
GYS1_OVRC_ENAB	GYR1_STAT	GYRO 1 Status, Moter overcurrent trip, 1 means ENAB, 0 means INHIB	7	1								
GYS1_PWR_MODE	GYR1_STAT	GYRO 1 Status, Power Mode, 1 means HIGH PWR, 0 means NORMAL PWR	5	1								
GYS1_TEMP_INHIB	GYR1_STAT	GYRO 1 Status, Temperature Inhib, 1 means INHIB, 0 means ENAB	4	1								
GYS2_AB_SIDE	GYR2_STAT	For GYR2, 1 = B-side on (all 4 gyros)	9	1								
GYS2_CHAN_ID	GYR2_STAT	GYRO 2 Status, 3 bit GYRO Channel Address	13	3								
GYS2_ENC_RANGE	GYR2_STAT	GYRO 2 Status, Encoder Range, 1 means FINE, 0 means COARSE	8	1								
GYS2_HEATER_OFF	GYR2_STAT	GYRO 2 Status, Heater Status, 1=off, 0=on	10	1								
GYS2_IN_SYNC	GYR2_STAT	GYRO 2 Status, Sync Status, 1 means IN SYNC, 0 means NOT IN SYNC	6	1								
GYS2_MOTOR_ON	GYR2_STAT	GYRO 2 Status, Motor status, 1 means ON, 0 means OFF	0	1								
GYS2_MOTOR_SPEED	GYR2_STAT	GYRO 2 Status, 3 bits Motor Speed Code	1	3								
GYS2_OVRC_ENAB	GYR2_STAT	GYRO 2 Status, Moter overcurrent trip, 1 means ENAB, 0 means INHIB	7	1								
GYS2_PWR_MODE	GYR2_STAT	GYRO 2 Status, Power Mode, 1 means HIGH PWR, 0 means NORMAL PWR	5	1								
GYS2_TEMP_INHIB	GYR2_STAT	GYRO 2 Status, Temperature Inhib, 1 means INHIB, 0 means ENAB	4	1								
GYS3_AB_SIDE	GYR3_STAT	This bit has no meaning for GYR3	9	1								
GYS3_CHAN_ID	GYR3_STAT	GYRO 3 Status, 3 bit GYRO Channel Address	13	3								
GYS3_ENC_RANGE	GYR3_STAT	GYRO 3 Status, Encoder Range, 1 means FINE, 0 means COARSE	8	1								
GYS3_HEATER_OFF	GYR3_STAT	GYRO 3 Status, Heater Status, 1=off, 0=on	10	1								
GYS3_IN_SYNC	GYR3_STAT	GYRO 3 Status, Sync Status, 1 means IN SYNC, 0 means NOT IN SYNC	6	1								
GYS3_MOTOR_ON	GYR3_STAT	GYRO 3 Status, Motor status, 1 means ON, 0 means OFF	0	1								
GYS3_MOTOR_SPEED	GYR3_STAT	GYRO 3 Status, 3 bits Motor Speed Code	1	3								
GYS3_OVRC_ENAB	GYR3_STAT	GYRO 3 Status, Moter overcurrent trip, 1 means ENAB, 0 means INHIB	7	1								
GYS3_PWR_MODE	GYR3_STAT	GYRO 3 Status, Power Mode, 1 means HIGH PWR, 0 means NORMAL PWR	5	1								
GYS3_TEMP_INHIB	GYR3_STAT	GYRO 3 Status, Temperature Inhib, 1 means INHIB, 0 means ENAB	4	1								
HIRDLS_CLK_LSB		HIRDLS clock LSBYTES (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
HIRDLS_CLK_LSW		HIRDLS time Least Significant Word (GROUND USE ONLY)			0	0	0	64	32	FALSE	FALSE	FALSE
HIRDLS_CLK_MSW		HIRDLS time Most Significant Word (GROUND USE ONLY)			0	0	0	64	32	FALSE	FALSE	FALSE
HIRDLS_TIME_LSW		Bits 0-31 of HIRDLS time			32	32	0	64	32	TRUE	FALSE	TRUE
HIRDLS_TIME_MSW		Bits 32-63 of HIRDLS time			32	32	0	64	32	TRUE	FALSE	TRUE
HK_AZP_POS		Filtered Primary Azimuth data sample			4	16	4	64	32	FALSE	FALSE	TRUE
HK_AZS_POS		Filtered Secondary Azimuth data sample			4	16	4	64	32	FALSE	FALSE	TRUE
HK_EL2P_POS		Filtered Primary Elevation 2 data sample			4	16	4	64	32	FALSE	FALSE	TRUE
HK_EL2S_POS		Filtered Secondary Elevation 2 data sample			4	16	4	64	32	FALSE	FALSE	TRUE
HK_ELVARP_POS		Filtered Primary El Var data sample			4	16	4	64	32	FALSE	FALSE	TRUE
HK_ELVARS_POS		Filtered Secondary El Var data sample			4	16	4	64	32	FALSE	FALSE	TRUE
HK_FORMAT_ID		Houskeeping format ID (GROUND USE ONLY)					0	64	16	FALSE	FALSE	FALSE
HK_SIGDAT02		Filtered Radiance data channel 2, For inclusion in ENG data			32	16	0	64	16	FALSE	FALSE	TRUE
HK_SIGDAT04		Filtered Radiance data channel 4, For inclusion in ENG data			32	16	0	64	16	FALSE	FALSE	TRUE
IFC_ERR	IPU_ERR_1	See following 2 entries	11	2								
IFC_HCW		IFC Heater Control Word value			4	8	0	64	8	TRUE	TRUE	TRUE
IFC_IF_BUSY	IPU_ERR_1	1 means the IFC interface was busy unexpectedly	11	1								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
IFC_PSV_N15		IFC -15V rail volts			32	8	2	64	8	TRUE	TRUE	TRUE
IFC_PSV_P15		IFC +15V rail volts			32	8	2	64	8	TRUE	TRUE	TRUE
IFC_PSV_P28		IFC +28V rail volts					0	64	8	TRUE	TRUE	TRUE
IFC_PSV_P5		IFC +5V rail volts			32	8	2	64	8	TRUE	TRUE	TRUE
IFC_REF_TMP		IFC ref. resistor temp			32	8	0	64	8	TRUE	TRUE	TRUE
IFC_TLM_ERR	IPU_ERR_1	1 means the IFC encountered an error while gathering TLM	12	1								
IFCBB_FRPL_TMP		IFCBB front plate temp, EDAQ			32	8	8	64	16	TRUE	TRUE	TRUE
IFCBB_TMP1		IFC BB temp. #1			32	8	8	64	16	TRUE	TRUE	TRUE
IFCBB_TMP2		IFC BB temp. #2			32	8	8	64	16	TRUE	TRUE	TRUE
IFCBB_TMP3		IFC BB temp. #3			32	8	8	64	16	TRUE	TRUE	TRUE
IOBIC_EDAQ_ERR	IPU_ERR_0	1 means the EDAQ Interface Board didn't respond during initialization.	2	1								
IOBIC_SIO_ERR	IPU_ERR_0	1 means the Serial I/O Interface Board didn't respond during initialization.	1	1								
IOBIC_TG_ERR	IPU_ERR_0	1 means the Timing Generator Board didn't respond during initialization.	0	1								
IPU_ALIVE		TMON keep-alive and eng tlm sub-com counter			4	16	0	64	16	TRUE	TRUE	TRUE
IPU_ALIVE_SPARES	IPU_ALIVE	Spares	8	8								
IPU_ALPHA_BUILD	IPU_CSCI_BLD_ID	0= IPU code is released, 1= IPU code is under development	2	1								
IPU_BOX_TMP		IPU box EDAQ AD590 Row 7 Col 4			32	8	8	64	16	TRUE	TRUE	TRUE
IPU_BUILD_DATE		MSbyte year-1900, LSbyte day of year					0	64	16	TRUE	FALSE	TRUE
IPU_BUILD_NUM	IPU_CSCI_BLD_ID	Build Number, release number is CPU_TYPE.REVISION.BUILD_NUM	3	7								
IPU_BUILD_TIME		Minute of day					0	64	16	TRUE	FALSE	TRUE
IPU_CHKSUM_ERR	IPU_ERR_5	1 means IPU image checksum failed	4	1								
IPU_CMD_ERR	CMD_ERR_0	1 means an error occured while executing a IPU command.	4	1								
IPU_CPU_TYPE	IPU_CSCI_BLD_ID	0 is unused, 1 means an INTEL PC, 2 means the EM PSA-32, 3 is the PFM PSA-32, 4,5,6,7 are unused	13	3								
IPU_CSCI_BLD_ID		IPU S/W Build Version ID			32	16	0	64	16	TRUE	TRUE	TRUE
IPU_CSS_CMD_CNT		Number of CMD Packets recieved by IPU from the CSS					0	64	8	TRUE	TRUE	TRUE
IPU_CSS_TLM_CNT		Number of TLM Packets sent by IPU from the CSS					0	64	8	TRUE	TRUE	TRUE
IPU_DBL_BIT_ERR	IPU_ERR_5	1 means IPU double bit RAM error occurred	6	1								
IPU_ERR_0		IPU Error Flags 0			4	16	0	64	16	TRUE	TRUE	TRUE
IPU_ERR_1		IPU Error Flags 1			4	16	0	64	16	TRUE	TRUE	TRUE
IPU_ERR_2		IPU Error Flags 2			4	16	0	64	16	TRUE	TRUE	TRUE
IPU_ERR_3		IPU ERROR Status Word 3			4	16	0	64	16	TRUE	TRUE	TRUE
IPU_ERR_4		IPU Error status			4	16	0	64	16	TRUE	TRUE	TRUE
IPU_ERR_5		IPU status word 5			4	16	0	64	16	TRUE	TRUE	TRUE
IPU_EXCEPT_ADDR	IPU_EXCEPTION	Address of last exception/4	0	19								
IPU_EXCEPT_CNT	IPU_EXCEPTION	Number of exceptions since last clear	20	8								
IPU_EXCEPT_ENA	IPU_EXCEPTION	Exception skip disabled if high	19	1								
IPU_EXCEPT_OCCR	IPU_EXCEPTION	Exception occurred if high	31	1								
IPU_EXCEPT_TYPE	IPU_EXCEPTION	Type of last exception (2=MCI, 3=DSI, 4=ISI, 6=AI, 7=PI, 0=FPU)	28	3								
IPU_EXCEPTION		Exception status for IPU flight software			0	0	0	64	32	TRUE	TRUE	TRUE
IPU_FAULT_AVG		Running average (temperature) for over temperature faults			0	0	0	64	16	FALSE	FALSE	FALSE
IPU_FLT_STAT_0		IPU Fault Managmt. Status			4	16	0	64	16	TRUE	TRUE	TRUE
IPU_FLT_STAT_1		IPU fault status word 1			4	16	0	64	16	TRUE	TRUE	TRUE
IPU_KERNEL_TYPE	IPU_CSCI_BLD_ID	TBD - 0 means IPU code loaded after vxworks kernel, 1 means IPU code loaded as part of vxWorks kernel	1	1								
IPU_N15V		Wkg IPU -15V supply volts, EDAQ			32	8	8	64	16	TRUE	TRUE	TRUE
IPU_P15V		Wkg IPU +15V supply volts, EDAQ			32	8	8	64	16	TRUE	TRUE	TRUE
IPU_P3P3_DDC_TMP		Wkg IPU +3.3V DDC temp, EDAQ					0	64	16	TRUE	TRUE	TRUE
IPU_P3P3V		Wkg IPU +3.3V supply volts, EDAQ			32	8	8	64	16	TRUE	TRUE	TRUE
IPU_P5V		Wkg IPU +5V supply volts, EDAQ			32	8	8	64	16	TRUE	TRUE	TRUE
IPU_P5V_DDC_TMP		Wkg IPU +5V DDC temp, EDAQ					0	64	16	TRUE	TRUE	TRUE
IPU_REVISION	IPU_CSCI_BLD_ID	Revision number	10	3								
IPU_SGL_BIT_ERR	IPU_ERR_5	1 means IPU single bit RAM error occurred	5	1								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
IPU_SIDE	IPU_CSCI_BLD_ID	IPU Subsystem status 0 means A side is active, 1 means B side is active	0	1								
IPU_STAT_0		IPU Status Word 0			4	16	0	8	16	TRUE	TRUE	TRUE
IPU_STAT_1		IPU Status Word 1			4	16	0	8	16	TRUE	TRUE	TRUE
IPU_STAT_2		IPU status word #2			4	16	0	8	16	TRUE	TRUE	TRUE
IPU_UPL_ABORTED	IPU_ERR_3	1 means an IPU Upload was aborted by a HIR_UPL_HEADER command with numblocks= 0 and IPU_UPL_INPROG subtmi True	3	1								
IPU_UPL_CHKSUMOK	IPU_STAT_0	1 means IPU Upload completed and checksum matched	7	1								
IPU_UPL_COMPLETE	IPU_STAT_0	1 means IPU Upload header plus all expected blocks were receivec	6	1								
IPU_UPL_INPROG	IPU_STAT_0	1 means IPU Upload is in progress, valid header received	5	1								
IPU_UPL_PROC_ERR	IPU_ERR_3	1 means an IPU Upload Processing Error occured	2	1								
IPU_UPL_SEQ_ERR	IPU_ERR_3	1 means an improper sequence of IPU Upload Commands was received, including block number out of sequence	0	1								
IPU_UPL_SYS_ERR	IPU_ERR_3	1 means an invalid IPU Upload Subsystem ID	1	1								
ISU_1553_READERR		IPU SUROM 1553 Read Failures (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_1ST_1553_SEG		IPU SUROM First Good 1553 Segment (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_1ST_MEM_SEG		IPU SUROM First Good Mem Segment (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_ACTION_CODE		IPU SUROM program action code					0	8	16	FALSE	FALSE	FALSE
ISU_ALPHA_BUILD	ISU_ROM_BUILD_ID	1= ALPHA TEST BUILD, 0= CODE FREEZE/RELEASE	2	1								
ISU_BUILD_NUM	ISU_ROM_BUILD_ID	BUILD NUMBER 0-99	3	7								
ISU_CMD_NUMBER		IPU SUROM Command Number (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_CMD_OK	ISU_CMD_RES_CODE	Cmd Result code. 1 means last command OK, 0 means last command rejected	15	1								
ISU_CMD_PARM_NUM	ISU_CMD_RES_CODE	Cmd Result code. Parameter in error	6	5								
ISU_CMD_RCVD_CNT		IPU SUROM Command Rceiv'd Count (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_CMD_REJ_CNT		IPU SUROM Command Reject'd Count (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_CMD_RES_CODE		IPU SUROM Command Result Code (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_CMD_RES_NUM	ISU_CMD_RES_CODE	Cmd Result code. Command result number	0	6								
ISU_CMD_SUBSYS	ISU_CMD_RES_CODE	Cmd Result code. Constant value of 2 for SUROM	11	4								
ISU_CMP_CKSUM		IPU SUROM - 32 bit Computed checksum of total Program Image					0	8	32	FALSE	FALSE	FALSE
ISU_COUNTDOWN		Countdown parameter (seconds remaining until automatic application load and execute, 0=expired/aborted)					0	8	16	FALSE	FALSE	FALSE
ISU_CPU_SIDE	ISU_ROM_BUILD_ID	0 = SIDE, A 1= SIDE B, Read from LIO PID	0	1								
ISU_CURRENT_BLK		IPU SUROM - Current block number for Program Image					0	8	16	FALSE	FALSE	FALSE
ISU_EDAC1ERR_CNT		IPU SUROM EDAC Single Error Count (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_EDAC2ERR_CNT		IPU SUROM EDAC Double Error Count (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_EE_AUTO_ERR	ISU_EE_ERR_STAT	Specific Autoboot error which occured	1	3								
ISU_EE_AUTO_OK	ISU_EE_ERR_STAT	1 means Autoboot image is valid	0	1								
ISU_EE_BADCOPY	ISU_EE_ERR_STAT	ISU EE bad copy	5	1								
ISU_EE_ERR_CNT		IPU SUROM EDAC EEPROM Err Cnt (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_EE_ERR_STAT		IPU SUROM EEPROM Error Status (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_EE_ERROR	ISU_EE_ERR_STAT	1 means an EEPROM error occured, see bits 0-14 for details	15	1								
ISU_EE_LOOP_END		IPU SUROM EEPROM end address					0	8	32	FALSE	FALSE	FALSE
ISU_EE_NEEDSCRUB	ISU_EE_ERR_STAT	ISU EE needs scrub	14	1								
ISU_EE_OFFSET		IPU SUROM EEPROM address offset					0	8	32	FALSE	FALSE	FALSE
ISU_EE_OVERRIDE	ISU_EE_ERR_STAT	ISU EE override	6	1								
ISU_EE_READ_ERR	ISU_EE_ERR_STAT	ISU EE read error	13	1								
ISU_EE_RETRY	ISU_EE_ERR_STAT	Retry on EE prom read or write	4	1								
ISU_EE_SECT	ISU_FLAG_BITS	EEPROM Section used for EEPROM work	12	4								
ISU_EE_T1CHKSUM	ISU_EE_ERR_STAT	ISU EE T1 checksum	8	1								
ISU_EE_T1FAIL	ISU_EE_ERR_STAT	ISU EE T1 fail	10	1								
ISU_EE_T2CHKSUM	ISU_EE_ERR_STAT	ISU EE T2 checksum	9	1								
ISU_EE_T2FAIL	ISU_EE_ERR_STAT	ISU EE T2 fail	11	1								
ISU_EE_TSWITCH	ISU_EE_ERR_STAT	ISU EE T switch	7	1								
ISU_EE_WRITE_ERR	ISU_EE_ERR_STAT	ISU EE write error	12	1								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
ISU_EEDUMP_ON	ISU_FLAG_BITS	1=EEPROM Dump On	11	1								
ISU_EETBL	ISU_SECT	EEPROM index table being downloaded (1 or 2), 0 for decoded table	4	2								
ISU_EETBL_ACTIVE	ISU_SECT	Active EEPROM index table (1 or 2, 0 if no good tables)	6	2								
ISU_EETBL_SECT	ISU_SECT	EEPROM index table section info being downloaded	0	4								
ISU_ERR_INJECT	ISU_FLAG_BITS	1=Error injection enabled	8	1								
ISU_EXCEPT_ERR	ISU_FLAG_BITS	1=Processor exception occurred	4	1								
ISU_EXCEPTION		Address causing exception (if nonzero, should be normally be zero)					0	64	16	FALSE	FALSE	FALSE
ISU_FLAG_BITS							0	64	16	FALSE	FALSE	FALSE
ISU_JMP_ADDRESS		IPU SUROM jump address					0	8	32	FALSE	FALSE	FALSE
ISU_LIO_STAT		IPU SUROM LIO RAD6K Test Status (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_MAJOR_REV	ISU_ROM_BUILD_ID	MAJOR_REVISION NUMBER 1-7	13	3								
ISU_MBIC_A_DEAD	ISU_MBIC_ERROR	I_MBIC_A_DEAD ERROR	14	1								
ISU_MBIC_B_DEAD	ISU_MBIC_ERROR	I_MBIC_B_DEAD ERROR	15	1								
ISU_MBIC_CNF_ERR	ISU_MBIC_ERROR	I_MBIC_CONFIGURE ERROR	11	1								
ISU_MBIC_ERROR		MBIC error with MBICA alive = 0x8000, MBICB alive = 0x4000					0	8	16	FALSE	FALSE	FALSE
ISU_MBIC_PDWNERR	ISU_MBIC_ERROR	I_MBIC_POWERDOWN ERROR	10	1								
ISU_MBIC_PUP_ERR	ISU_MBIC_ERROR	I_MBIC_POWERUP ERROR	9	1								
ISU_MBIC_RNG_ERR	ISU_MBIC_ERROR	I_MBIC_RANGE ERROR	12	1								
ISU_MBICA_END		End address for the MBIC side A					0	8	32	FALSE	FALSE	FALSE
ISU_MBICA_START		Start address for the MBIC side A					0	8	32	FALSE	FALSE	FALSE
ISU_MBICB_END		End address for the MBIC side B					0	8	32	FALSE	FALSE	FALSE
ISU_MBICB_START		Start address for the MBIC side B					0	8	32	FALSE	FALSE	FALSE
ISU_MBICPID12_ER	ISU_MBIC_ERROR	I_MBIC_AMBI_PID12_CONFIG ERROR	0	1								
ISU_MINOR_REV	ISU_ROM_BUILD_ID	MINOR_REVISION NUMBER 1-7	10	3								
ISU_OVERRIDE_FLG		IPU SUROM override status					0	8	16	FALSE	FALSE	FALSE
ISU_RAM_ADDRESS		Address in RAM					0	8	32	FALSE	FALSE	FALSE
ISU_RAM_FAIL		IPU SUROM RAM Readback Fail (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_RAM_SIZE		Size of the RAM					0	8	32	FALSE	FALSE	FALSE
ISU_ROM_BUILD_ID		IPU SUROM ROM Build Version ID (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_SECT		Which EEPROM section info follows, 0-15 >16 means stale info					0	8	16	FALSE	FALSE	FALSE
ISU_SECT_BOOT		EEPROM section boot address					0	64	32	FALSE	FALSE	FALSE
ISU_SECT_CHKSUM		EEPROM section checksum word					0	8	32	FALSE	FALSE	FALSE
ISU_SECT_FLAGS		EEPROM section flags word					0	8	32	FALSE	FALSE	FALSE
ISU_SECT_LENGTH		EEPROM section length in 32 bit words					0	8	32	FALSE	FALSE	FALSE
ISU_SECT_START		EEPROM section start address					0	8	32	FALSE	FALSE	FALSE
ISU_SEQUENCE_CNT		IPU SUROM packet sequence count					0	8	16	FALSE	FALSE	FALSE
ISU_SPARE		Spare channel for test purposes					0	8	16	FALSE	FALSE	FALSE
ISU_STATE		IPU SUROM Startup State (GROUND/SUROM USE ONLY)					0	8	16	FALSE	FALSE	FALSE
ISU_TOTAL_BLKS		IPU SUROM - Program Image upload total expected block num					0	8	16	FALSE	FALSE	FALSE
ISU_UP_CKSUM		IPU SUROM - 32 bit expected checksum of total Program Image					0	8	32	FALSE	FALSE	FALSE
ISU_WDT_EXPIRED	ISU_FLAG_BITS	1=Watchdog Expired	0	1								
LNS1_WF_TMP1		Lens 1-WF temp. 1, EDAQ AD590 Row 5 Col 0			32	8	8	64	16	TRUE	TRUE	TRUE
LNS1_WF_TMP2		Lens 1-WF temp. 2, EDAQ AD590 Row 6 Col 1					0	64	16	TRUE	TRUE	TRUE
LNS1_WF_TMP3		Lens 1-WF temp. 3, EDAQ Derived PRT 5					0	64	16	TRUE	TRUE	TRUE
LNS2_TMP1		Lens 2 temp. 1, EDAQ AD590 Row 5 Col 1			32	8	8	64	16	TRUE	TRUE	TRUE
LNS2_TMP2		Lens 2 temp. 2, EDAQ AD590 Row 6 Col 0					0	64	16	TRUE	TRUE	TRUE
LNS2_TMP3		Lens 2 temp. 3, EDAQ Derived PRT 6					0	64	16	TRUE	TRUE	TRUE
LNSASSY_TMP1		OBA lens assy temp #1, EDAQ 33					0	64	16	TRUE	TRUE	TRUE
LNSASSY_TMP2		OBA lens assy temp #2, EDAQ 44					0	64	16	TRUE	TRUE	TRUE
M1_TMP1		Pri (M1) mir temp. 1, EDAQ AD590 Row 0 Col 2					0	64	16	TRUE	TRUE	TRUE
M1_TMP2		Pri (M1) mir temp. 2, EDAQ AD590 Row 7 Col 1					0	64	16	TRUE	TRUE	TRUE
M1_TMP3		Pri (M1) mir temp. 3, EDAQ Derived PRT 1					0	64	16	TRUE	TRUE	TRUE
M2_TMP1		Sec. (M2) mir temp #1, EDAQ ADC590 Row 6 Col 4			32	8	8	64	16	TRUE	TRUE	TRUE

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
M2_TMP2		Sec. (M2) mir temp #2, EDAQ Derived PRT 7					0	64	16	TRUE	TRUE	TRUE
MAC_CMD_ERR	CMD_ERR_0	1 means an error occured while executing a MAC command.	5	1								
MAC_CMD_NUM	MACRO_STAT	Current command number for current macro	5	8								
MAC_CMD_PNUM	MACRO_STAT	Current parameter for current command	0	5								
MAC_CSC_STATE	MACRO_STAT	0=idle, 1=uploading, 2=executing	30	2								
MAC_NUM	MACRO_STAT	Current macro number	22	8								
MAC_NUM_CMDS	MACRO_STAT	Number of commands in current macro	13	6								
MAC_STATE	MACRO_STAT	0=unused, 1=uploading, 2=ready, 3=executing, 4=pended	19	3								
MACMD_LAST_CN		Last Macro cmd: cmd nmbr			16	8	0	64	8	TRUE	TRUE	TRUE
MACMD_LAST_RC		Last Macro cmd: reslt code			16	16	0	64	16	TRUE	TRUE	TRUE
MACMDS_RCVCT		Macro cmds: receivd count			16	8	0	64	16	TRUE	TRUE	TRUE
MACMDS_REJCT		Macro cmds: rejected count			16	8	0	64	16	TRUE	TRUE	TRUE
MACRO_EXECUTING		Number of the currently executing macro, or 255 if no macro currently executing			0	0	0	64	8	TRUE	TRUE	TRUE
MACRO_PARM		Macro command parameters			4	32	0	64	32	TRUE	TRUE	TRUE
MACRO_STAT		Status for macro CSC			4	32	0	64	32	TRUE	TRUE	TRUE
MACROCMD_OK	MACMD_LAST_RC	Cmd Result code. 1 means last command OK, 0 means last command reject	15	1								
MACROCMD_PARMNUM	MACMD_LAST_RC	Cmd Result code. Parameter in error	6	5								
MACROCMD_RES_NUM	MACMD_LAST_RC	Cmd Result code. Command result number Display Mnemonic	0	6								
MACROCMD_SUBSYS	MACMD_LAST_RC	Subsystem to which the command is to be routed	11	4								
MBIC_A_ERR	IPU_ERR_1	1 means the A MBIC didn't respond during initialization	13	1								
MBIC_B_ERR	IPU_ERR_1	1 means the B MBIC didn't respond during initialization	14	1								
MEMSCRUB_FM	IPU_FLT_STAT_1	Memory scrub fault management: 0 = disabled; 1 = enabled	15	1								
OBA_PLT_TMP		OBA aperture plate temp, EDAQ 10					0	64	16	TRUE	TRUE	TRUE
OBA_TMP_00		OBA +X Isolator Temp (top) EDAQ, AD590 Row 0 Col 0					0	64	16	TRUE	TRUE	TRUE
OBA_TMP_01		OBA +Y Isolator Temp (top) EDAQ, AD590 Row 1 Col 6					0	64	16	TRUE	TRUE	TRUE
OBA_TMP_02		OBA -Y Isolator Temp (top) EDAQ, AD590 Row 6 Col 3					0	64	16	TRUE	TRUE	TRUE
OBA_TMP_03		OBA external leg beam temp, +Y EDAQ, AD590 Row 0 Col 7					0	64	16	TRUE	TRUE	TRUE
OBA_TMP_04		OBA external leg beam temp, -Y EDAQ, AD590 Row 1 Col 5					0	64	16	TRUE	TRUE	TRUE
OBA_TMP_05		OBA truss Temp, top, centre, +X EDAQ, AD590 Row 0 Col 5					0	64	16	TRUE	TRUE	TRUE
OBA_TMP_06		OBA truss Temp, top, +X, +Y EDAQ, AD590 Row 5 Col 7					0	64	16	TRUE	TRUE	TRUE
OBA_TMP_07		OBA truss Temp, top, +X, -Y EDAQ, AD590 Row 1 Col 7					0	64	16	TRUE	TRUE	TRUE
OBA_TMP_08		OBA centre tube, +Z EDAQ, AD590 Row 6 Col 5					0	64	16	TRUE	TRUE	TRUE
OBA_TMP_09		OBA centre tube, -Z EDAQ, AD590 Row 7 Col 2					0	64	16	TRUE	TRUE	TRUE
OPH_CMD_ERR	CMD_ERR_0	1 means an error occured while executing a OPH command	6	1								
OPH_ZONE1_DELAY		OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse					0	64	16	TRUE	FALSE	TRUE
OPH_ZONE1_WIDTH		OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units			32	8	0	64	16	TRUE	TRUE	TRUE
OPH_ZONE2_DELAY		OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse					0	64	16	TRUE	FALSE	TRUE
OPH_ZONE2_WIDTH		OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units			32	8	0	64	16	TRUE	TRUE	TRUE
OPH_ZONE3_DELAY		OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse					0	64	16	TRUE	FALSE	TRUE
OPH_ZONE3_WIDTH		OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units			32	8	0	64	16	TRUE	TRUE	TRUE
OPH_ZONE4_DELAY		OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse					0	64	16	TRUE	FALSE	TRUE
OPH_ZONE4_WIDTH		OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units			32	8	0	64	16	TRUE	TRUE	TRUE
OPH_ZONE5_DELAY		OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse					0	64	16	TRUE	FALSE	TRUE
OPH_ZONE5_WIDTH		OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units					0	64	16	TRUE	TRUE	TRUE
OPH_ZONE6_DELAY		OPH HEATER ZONE DELAY. heater on pulse delay in 5.12 usec units from CR pulse					0	64	16	TRUE	FALSE	TRUE
OPH_ZONE6_WIDTH		OPH HEATER ZONE PULSE WIDTH. heater on pulse width in 5.12 usec units					0	64	16	TRUE	TRUE	TRUE
PCI_RESET_ERR	IPU_ERR_5	1 = PCI reset fault occured	15	1								
PCI_RESET_FM	IPU_FLT_STAT_1	1 = fault management for detection and correction PCI in reset is enabled	11	1								
PCU_BOX_TMP		PCU box temp, EDAQ AD590 Row 1 Col 1			32	8	8	64	16	TRUE	TRUE	TRUE
PCU_CSS_RLYA	PCU_SUBSTAT_1	= PSS_NB_PWR & (((PSS_NBA_RLYA ^ PSS_NBA_RLYB) & PSS_NBA_RLYA) | ((PSS_NBB_RLYA ^ PSS_NBB_RLYB) & PSS_NBB_RLYA))	14	1								
PCU_CSS_RLYB	PCU_SUBSTAT_1	= PSS_NB_PWR & (((PSS_NBA_RLYA ^ PSS_NBA_RLYB) & PSS_NBA_RLYB) | ((PSS_NBB_RLYA ^ PSS_NBB_RLYB) & PSS_NBB_RLYB))	15	1								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
PCU_EEA15_RLYA	PCU_SUBSTAT_2	= (PSS_EEA_P15_PWR & PSS_EEA_N15_PWR) & ((PSS_SYSCNV_P15_A & PSS_SYSCNV_N15_A) & PSS_EEA_15VRLYA)	14	1								
PCU_EEA15_RLYB	PCU_SUBSTAT_2	= (PSS_EEA_P15_PWR & PSS_EEA_N15_PWR) & ((PSS_SYSCNV_P15_B & PSS_SYSCNV_N15_B) & PSS_EEA_15VRLYB)	15	1								
PCU_EEA5_RLYA	PCU_SUBSTAT_2	= PSS_EEA_P5_PWR & (PSS_SYSCNV_P5_A & PSS_EEA_P5RLYA)	6	1								
PCU_EEA5_RLYB	PCU_SUBSTAT_2	= PSS_EEA_P5_PWR & (PSS_SYSCNV_P5_B & PSS_EEA_P5RLYB)	7	1								
PCU_GSS15_RLYA	PCU_SUBSTAT_2	= (PSS_GSS_P15_PWR & PSS_GSS_N15_PWR) & ((PSS_SYSCNV_P15_A & PSS_SYSCNV_N15_A) & PSS_GSS_15VRLYA)	12	1								
PCU_GSS15_RLYB	PCU_SUBSTAT_2	= (PSS_GSS_P15_PWR & PSS_GSS_N15_PWR) & ((PSS_SYSCNV_P15_B & PSS_SYSCNV_N15_B) & PSS_GSS_15VRLYB)	13	1								
PCU_GSS28C_RLYA	PCU_SUBSTAT_1	= PSS_GSS_28C_PWR & (PSS_QC_PWR & PSS_GSS_28CRLYA)	8	1								
PCU_GSS28C_RLYB	PCU_SUBSTAT_1	= PSS_GSS_28C_PWR & (PSS_QC_PWR & PSS_GSS_28CRLYB)	9	1								
PCU_GSS5_RLYA	PCU_SUBSTAT_2	= PSS_GSS_P5_PWR & (PSS_SYSCNV_P5_A & PSS_GSS_P5RLYA)	4	1								
PCU_GSS5_RLYB	PCU_SUBSTAT_2	= PSS_GSS_P5_PWR & (PSS_SYSCNV_P5_B & PSS_GSS_P5RLYB)	5	1								
PCU_IPUA28R_RLYA	PCU_SUBSTAT_1	= PSS_IPUA_28R_PWR & (PSS_SYSCNV_28R_A & PSS_IPUA_28RRLYA)	0	1								
PCU_IPUA28R_RLYB	PCU_SUBSTAT_1	= PSS_IPUA_28R_PWR & (PSS_SYSCNV_28R_B & PSS_IPUA_28RRLYB)	1	1								
PCU_IPUB28R_RLYA	PCU_SUBSTAT_1	= PSS_IPUB_28R_PWR & (PSS_SYSCNV_28R_A & PSS_IPUB_28RRLYA)	2	1								
PCU_IPUB28R_RLYB	PCU_SUBSTAT_1	= PSS_IPUB_28R_PWR & (PSS_SYSCNV_28R_B & PSS_IPUB_28RRLYB)	3	1								
PCU_NA_INPUT	PCU_SUBSTAT_0	= !(PSS_NBA_RLYA & PSS_NBA_RLYB)	14	1								
PCU_NB_INPUT	PCU_SUBSTAT_0	= !(PSS_NBB_RLYA & PSS_NBB_RLYB)	15	1								
PCU_PCUCNVA_ON	PCU_SUBSTAT_0	= PSS_PCU_CNVTRS_A	8	1								
PCU_PCUCNVB_ON	PCU_SUBSTAT_0	= PSS_PCU_CNVTRS_B	9	1								
PCU_QBUS_INPUT	PCU_SUBSTAT_0	= PSS_QB_PWR & (PSS_QA_PWR ^ PSS_QB_PWR)	10	1								
PCU_QBUS2QC_RLYA	PCU_SUBSTAT_0	= (PSS_QA_PWR & PSS_QA_28C_RLYA) | (PSS_QB_PWR & PSS_QB_28C_RLYA)	11	1								
PCU_QBUS2QC_RLYB	PCU_SUBSTAT_0	= (PSS_QA_PWR & PSS_QA_28C_RLYB) | (PSS_QB_PWR & PSS_QB_28C_RLYB)	12	1								
PCU_QC_ON	PCU_SUBSTAT_0	= PSS_QC_PWR & (PSS_QC_PWR ^ PSS_28C_LOWVOLTS)	13	1								
PCU_REG28CNVA_ON	PCU_SUBSTAT_0	= PSS_SYSCNV_28R_A	4	1								
PCU_REG28CNVB_ON	PCU_SUBSTAT_0	= PSS_SYSCNV_28R_B	5	1								
PCU_SPU15_RLYA	PCU_SUBSTAT_1	= PSS_SPUA_P15_RLY & PSS_SPUA_N15_RLY	11	1								
PCU_SPU15_RLYB	PCU_SUBSTAT_1	= PSS_SPUB_P15_RLY & PSS_SPUB_N15_RLY	13	1								
PCU_SPU5_RLYA	PCU_SUBSTAT_1	= PSS_SPUA_P5_RLY	10	1								
PCU_SPU5_RLYB	PCU_SUBSTAT_1	= PSS_SPUB_P5_RLY	12	1								
PCU_SPUCNVA_ON	PCU_SUBSTAT_0	= PSS_SPU_CNVTRS_A	6	1								
PCU_SPUCNVB_ON	PCU_SUBSTAT_0	= PSS_SPU_CNVTRS_B	7	1								
PCU_SUBSTAT_0		PCU subsystem status word 0			4	16	0	64	16	FALSE	FALSE	TRUE
PCU_SUBSTAT_1		PCU subsystem status word 1			4	16	0	64	16	FALSE	FALSE	TRUE
PCU_SUBSTAT_2		PCU subsystem status word 2			4	16	0	64	16	FALSE	FALSE	TRUE
PCU_SYS15CNVA_ON	PCU_SUBSTAT_0	= PSS_SYSCNV_P15_A & PSS_SYSCNV_N15_A	2	1								
PCU_SYS15CNVB_ON	PCU_SUBSTAT_0	= PSS_SYSCNV_P15_B & PSS_SYSCNV_N15_B	3	1								
PCU_SYS5CNVA_ON	PCU_SUBSTAT_0	= PSS_SYSCNV_P5_A	0	1								
PCU_SYS5CNVB_ON	PCU_SUBSTAT_0	= PSS_SYSCNV_P5_B	1	1								
PCU_TEUA15_RLYA	PCU_SUBSTAT_2	= (PSS_TEUA_P15_PWR & PSS_TEUA_N15_PWR) & ((PSS_SYSCNV_P15_A & PSS_SYSCNV_N15_A) & PSS_TEUA_15VRLYA)	8	1								
PCU_TEUA15_RLYB	PCU_SUBSTAT_2	= (PSS_TEUA_P15_PWR & PSS_TEUA_N15_PWR) & ((PSS_SYSCNV_P15_B & PSS_SYSCNV_N15_B) & PSS_TEUA_15VRLYB)	9	1								
PCU_TEUA28C_RLYA	PCU_SUBSTAT_1	= PSS_TEUA_28C_PWR & (PSS_QC_PWR & PSS_TEUA_28CRLYA)	4	1								
PCU_TEUA28C_RLYB	PCU_SUBSTAT_1	= PSS_TEUA_28C_PWR & (PSS_QC_PWR & PSS_TEUA_28CRLYB)	5	1								
PCU_TEUA5_RLYA	PCU_SUBSTAT_2	= PSS_TEUA_P5_PWR & (PSS_SYSCNV_P5_A & PSS_TEUA_P5RLYA)	0	1								
PCU_TEUA5_RLYB	PCU_SUBSTAT_2	= PSS_TEUA_P5_PWR & (PSS_SYSCNV_P5_B & PSS_TEUA_P5RLYB)	1	1								
PCU_TEUB15_RLYA	PCU_SUBSTAT_2	= (PSS_TEUB_P15_PWR & PSS_TEUB_N15_PWR) & ((PSS_SYSCNV_P15_A & PSS_SYSCNV_N15_A) & PSS_TEUB_15VRLYA)	10	1								
PCU_TEUB15_RLYB	PCU_SUBSTAT_2	= (PSS_TEUB_P15_PWR & PSS_TEUB_N15_PWR) & ((PSS_SYSCNV_P15_B & PSS_SYSCNV_N15_B) & PSS_TEUB_15VRLYB)	11	1								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
PCU_TEUB28C_RLYA	PCU_SUBSTAT_1	= PSS_TEUB_28C_PWR & (PSS_QC_PWR & PSS_TEUB_28CRLYA)	6	1								
PCU_TEUB28C_RLYB	PCU_SUBSTAT_1	= PSS_TEUB_28C_PWR & (PSS_QC_PWR & PSS_TEUB_28CRLYB)	7	1								
PCU_TEUB5_RLYA	PCU_SUBSTAT_2	= PSS_TEUB_P5_PWR & (PSS_SYSCNV_P5_A & PSS_TEUB_P5RLYA)	2	1								
PCU_TEUB5_RLYB	PCU_SUBSTAT_2	= PSS_TEUB_P5_PWR & (PSS_SYSCNV_P5_B & PSS_TEUB_P5RLYB)	3	1								
PRF_1553		2					0	64	8	TRUE	FALSE	TRUE
PRF_CLR_CMD		10					0	64	8	TRUE	FALSE	TRUE
PRF_CMD_TLM		14					0	64	8	TRUE	FALSE	TRUE
PRF_CNTRL_CSS		28					0	64	8	TRUE	FALSE	TRUE
PRF_CNTRL_EDAQ		27					0	64	8	TRUE	FALSE	TRUE
PRF_CNTRL_GSS		Execution Profile Max Execution time, 1 LS Bit = 50 usecs					0	64	8	TRUE	FALSE	TRUE
PRF_CNTRL_IFC		29					0	64	8	TRUE	FALSE	TRUE
PRF_CNTRL_PSS		26					0	64	8	TRUE	FALSE	TRUE
PRF_CNTRL_SSH		Execution Profile Max Execution time, 1 LS Bit = 50 usecs					0	64	8	TRUE	FALSE	TRUE
PRF_CR_TOTAL		1, Execution Profile, Max Execution time, 1 LS Bit = 50 usecs					0	64	8	TRUE	TRUE	TRUE
PRF_CR2CR_MAX		Max time between chopper rotation interrupts (for IPU) in micro-sec					0	64	16	TRUE	TRUE	TRUE
PRF_CR2CR_MIN		Min time between chopper rotation interrupts (for IPU) in micro-sec					0	64	16	TRUE	TRUE	TRUE
PRF_CSS_TLM		21					0	64	8	TRUE	FALSE	TRUE
PRF_DECIM_SCI		30					0	64	8	TRUE	FALSE	TRUE
PRF_EXE_MACCMD		25					0	64	8	TRUE	FALSE	TRUE
PRF_EXE_SAICMD		24					0	64	8	TRUE	FALSE	TRUE
PRF_EXE_SCCMD		23					0	64	8	TRUE	FALSE	TRUE
PRF_EXE_TLM		11					0	64	8	TRUE	FALSE	TRUE
PRF_EXEC_DELAY		Execution delay from system tick pulse to start of executive, 1 LSB = 10 usec			0	0	0	64	8	TRUE	TRUE	TRUE
PRF_FAULTMON		Execution Profile for Fault management, 1 LSB = 50 usec			0	0	0	64	8	TRUE	FALSE	TRUE
PRF_FIR_SCI		31					0	64	8	TRUE	FALSE	TRUE
PRF_FMT_HKBLOCK		33					0	64	8	TRUE	FALSE	TRUE
PRF_HIRDLSTIME		5					0	64	8	TRUE	FALSE	TRUE
PRF_INVALID		Execution Profile Max Execution time, 1 LS Bit = 50 usecs					0	64	8	TRUE	FALSE	TRUE
PRF_IOBIC_TLM		15					0	64	8	TRUE	FALSE	TRUE
PRF_MACRO_TLM		Execution Profile for Macro system, 1 LSB = 50 usec			0	0	0	64	8	TRUE	FALSE	TRUE
PRF_MAKE_ENGPKT		35					0	64	8	TRUE	FALSE	TRUE
PRF_MAKE_SCIPKT		34					0	64	8	TRUE	FALSE	TRUE
PRF_QHSS_SPU		3					0	64	8	TRUE	FALSE	TRUE
PRF_QHSS_TEU		4					0	64	8	TRUE	FALSE	TRUE
PRF_SAIL_EXEC		SAIL executive execution profile					0	64	8	TRUE	FALSE	TRUE
PRF_SAIL_TLM		SAIL executive telemetry execution profile					0	64	8	TRUE	FALSE	TRUE
PRF_SCIFMT_TLM		19					0	64	8	TRUE	FALSE	TRUE
PRF_SCIPRO_TLM		20					0	64	8	TRUE	FALSE	TRUE
PRF_SPU_TLM		16					0	64	8	TRUE	FALSE	TRUE
PRF_SSH_TLM		12					0	64	8	TRUE	FALSE	TRUE
PRF_SVA_TLM		13					0	64	8	TRUE	FALSE	TRUE
PRF_SWAP_DIAG		6					0	64	8	TRUE	FALSE	TRUE
PRF_TG_TLM		18					0	64	8	TRUE	FALSE	TRUE
PRF_TSS_TLM		17					0	64	8	TRUE	FALSE	TRUE
PRF_UP_HKTBL		7					0	64	8	TRUE	FALSE	TRUE
PRF_UP_SCIFMT		9					0	64	8	TRUE	FALSE	TRUE
PRF_UP_SCITBL		8					0	64	8	TRUE	FALSE	TRUE
PRF_UPDATE_MAC		22					0	64	8	TRUE	FALSE	TRUE
PRHS	IPU_STAT_2	read heads)	10	2								
PSS_28C_LOWVOLTS	PSS_STAT_06	+28QC internal bus below 20V	15	1								
PSS_CMD_ECHO_ERR	IPU_ERR_2	1 means the was a miscompare on PSS a control word	1	1								
PSS_CMD_ERR	CMD_ERR_0	1 means an error occured while executing a PSS command.	7	1								
PSS_DISC_STATE	IPU_STAT_0	1 means the a PSS discrete is energized	15	1								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
PSS_EEA_15VRLYA	PSS_STAT_05	EEA +/-15V prim. relay OFF/ON	4	1								
PSS_EEA_15VRLYB	PSS_STAT_05	EEA +/-15V redt. relay OFF/ON	3	1								
PSS_EEA_N15_PWR	PSS_STAT_05	-15V supply to EEA OFF/ON	6	1								
PSS_EEA_P15_PWR	PSS_STAT_05	+15V supply to EEA OFF/ON	5	1								
PSS_EEA_P5_PWR	PSS_STAT_05	+5V supply to EEA OFF/ON	2	1								
PSS_EEA_P5RLYA	PSS_STAT_05	EEA +5 prim. relay OFF/ON	1	1								
PSS_EEA_P5RLYB	PSS_STAT_05	EEA +5 redt. relay OFF/ON	0	1								
PSS_ERR	IPU_ERR_1	See following 6 entries.	5	6								
PSS_EXE_ERR	IPU_ERR_1	1 means the PSS encountered an execution error while executing an IRC	10	1								
PSS_EXE_ERR_FM	IPU_FLT_STAT_0	0 means Fault Management for this error is off, 1 on	6	1								
PSS_FUNC_ERR	IPU_ERR_1	combination	8	1								
PSS_GSS_15VRLYA	PSS_STAT_02	GSS +/-15V supply prim. relay OFF/ON	4	1								
PSS_GSS_15VRLYB	PSS_STAT_02	GSS +/-15V supply redt. relay OFF/ON	3	1								
PSS_GSS_28C_PWR	PSS_STAT_06	+28QC supply to GSS OFF/ON	14	1								
PSS_GSS_28CRLYA	PSS_STAT_06	GSS +28QC supply prim. relay OFF/ON	13	1								
PSS_GSS_28CRLYB	PSS_STAT_06	GSS +28QC supply redt. relay OFF/ON	12	1								
PSS_GSS_N15_PWR	PSS_STAT_02	-15V supply to GSS OFF/ON	6	1								
PSS_GSS_P15_PWR	PSS_STAT_02	+15V supply to GSS OFF/ON	5	1								
PSS_GSS_P5_PWR	PSS_STAT_02	+5V supply to GSS OFF/ON	2	1								
PSS_GSS_P5RLYA	PSS_STAT_02	GSS +5V supply prim. relay OFF/ON	1	1								
PSS_GSS_P5RLYB	PSS_STAT_02	GSS +5V supply redt. relay OFF/ON	0	1								
PSS_IF_BUSY_ERR	IPU_ERR_1	1 means the PSS Interface was busy unexpectedly.	6	1								
PSS_IF_BUSY_FM	IPU_FLT_STAT_0	0 means Fault Management for this error is off, 1 on	2	1								
PSS_IPUA_28R_PWR	PSS_STAT_00	+28REG supply to A_IPU OFF/ON	2	1								
PSS_IPUA_28RRLYA	PSS_STAT_00	A_IPU +28REG supply prim. relay OFF/ON	1	1								
PSS_IPUA_28RRLYB	PSS_STAT_00	A_IPU +28REG supply redt. relay OFF/ON	0	1								
PSS_IPUB_28R_PWR	PSS_STAT_00	+28REG supply to B_IPU OFF/ON	5	1								
PSS_IPUB_28RRLYA	PSS_STAT_00	B_IPU +28REG supply prim. relay OFF/ON	4	1								
PSS_IPUB_28RRLYB	PSS_STAT_00	B_IPU +28REG supply redt. relay OFF/ON	3	1								
PSS_IRC_OVFL_ERR	IPU_ERR_1	1 means the PSS received more than 1 IRC per 4 CR's	5	1								
PSS_IRC_OVFL_FM	IPU_FLT_STAT_0	0 means Fault Management for this error is off, 1 on	1	1								
PSS_MAC_ERR	IPU_ERR_1	executing a PSM	9	1								
PSS_NB_PWR	PSS_STAT_03	+28NC supply to CSS OFF/ON	2	1								
PSS_NBA_RLYA	PSS_STAT_03	+28NA prim. relay OFF/ON	1	1								
PSS_NBA_RLYB	PSS_STAT_03	+28NA redt. relay OFF/ON	0	1								
PSS_NBB_RLYA	PSS_STAT_03	+28NB prim. relay OFF/ON	6	1								
PSS_NBB_RLYB	PSS_STAT_03	+28NB redt. relay OFF/ON	5	1								
PSS_PCU_15VA_TMP		PCU (Intnl) 15VA DDC temp					0	64	16	TRUE	TRUE	TRUE
PSS_PCU_15VB_TMP		PCU (Intnl) 15VB DDC temp					0	64	16	TRUE	TRUE	TRUE
PSS_PCU_5VA		PCU Internal +5 Volts - A side			16	16	0	64	16	TRUE	TRUE	TRUE
PSS_PCU_5VB		PCU Internal +5 Volts - B side			16	16	0	64	16	TRUE	TRUE	TRUE
PSS_PCU_5VC		PCU Internal +5 Volts			16	16	0	64	16	TRUE	TRUE	TRUE
PSS_PCU_CNVTRS_A	PSS_STAT_02	PCU Internal Converter A OFF/ON	12	1								
PSS_PCU_CNVTRS_B	PSS_STAT_02	PCU Internal Converter B OFF/ON	13	1								
PSS_PCU_N15VC		PCU Internal -15 Volts			16	16	0	64	16	TRUE	TRUE	TRUE
PSS_PCU_P15VC		PCU Internal +15 Volts			16	16	0	64	16	TRUE	TRUE	TRUE
PSS_PILEUP_ERR	IPU_ERR_1	1 means the PSS Interface received a command while latching a relay	7	1								
PSS_PILEUP_FM	IPU_FLT_STAT_0	0 means Fault Management for this error is off, 1 on	3	1								
PSS_QA_28C_RLYA	PSS_STAT_07	+28QA (Prim) N/L relay OFF/ON	0	1								
PSS_QA_28C_RLYB	PSS_STAT_07	+28QA (Redt) N/L relay OFF/ON	1	1								
PSS_QA_PWR	PSS_STAT_07	+28QA S/C input power OFF/ON	2	1								
PSS_QAFILT_TMP		PCU QBA Inrush Filter temp					0	64	16	TRUE	TRUE	TRUE
PSS_QAP_RLY_TMP		+28QA primary N/L relay coil temperature					0	64	16	TRUE	TRUE	TRUE

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
PSS_QAR_RLY_TMP		+28QB primary N/L relay coil temperature					0	64	16	TRUE	TRUE	TRUE
PSS_QB_28C_RLYA	PSS_STAT_07	+28QB (Prim) N/L relay OFF/ON	3	1								
PSS_QB_28C_RLYB	PSS_STAT_07	+28QB (Redt) N/L relay OFF/ON	4	1								
PSS_QB_PWR	PSS_STAT_07	+28QB S/C input power OFF/ON	5	1								
PSS_QBFILT_TMP		PCU QBB Inrush Filter temp					0	64	16	TRUE	TRUE	TRUE
PSS_QBP_RLY_TMP		+28QB redundant N/L relay coil temperature					0	64	16	TRUE	TRUE	TRUE
PSS_QBR_RLY_TMP		+28QB redundant N/L relay coil temperature					0	64	16	TRUE	TRUE	TRUE
PSS_QC_PWR	PSS_STAT_07	+28QC internal bus OFF/ON	6	1								
PSS_REG_28VA		REG +28V DDC A volts			8	16	0	64	16	TRUE	TRUE	TRUE
PSS_REG_28VA_TMP		REG +28VA DDC temp					0	64	16	TRUE	TRUE	TRUE
PSS_REG_28VB		REG +28V DDC B volts			8	16	0	64	16	TRUE	TRUE	TRUE
PSS_REG_28VB_TMP		REG +28VB DDC temp					0	64	16	TRUE	TRUE	TRUE
PSS_SPU_15VA_TMP		SPU15VA DDC temp					0	64	16	TRUE	TRUE	TRUE
PSS_SPU_15VB_TMP		SPU15VB DDC temp					0	64	16	TRUE	TRUE	TRUE
PSS_SPU_5VA		SPU +5V DDC A volts			8	16	0	64	16	TRUE	TRUE	TRUE
PSS_SPU_5VA_TMP		SPU +5VA DDC temp					0	64	16	TRUE	TRUE	TRUE
PSS_SPU_5VB		SPU +5V DDC B volts			8	16	0	64	16	TRUE	TRUE	TRUE
PSS_SPU_5VB_TMP		SPU +5VB DDC temp					0	64	16	TRUE	TRUE	TRUE
PSS_SPU_CNVTRS_A	PSS_STAT_02	SPU A Converters OFF/ON	14	1								
PSS_SPU_CNVTRS_B	PSS_STAT_02	SPU B Converters OFF/ON	15	1								
PSS_SPU_N15VA		SPU -15V DDC A volts			8	16	0	64	16	TRUE	TRUE	TRUE
PSS_SPU_N15VATMP		Temperature of -15V SPU PS A					0	64	16	TRUE	TRUE	TRUE
PSS_SPU_N15VB		SPU -15V DDC B volts			8	16	0	64	16	TRUE	TRUE	TRUE
PSS_SPU_N15VBTMP		Temperature of -15V SPU PS B					0	64	16	TRUE	TRUE	TRUE
PSS_SPU_P15VA		SPU +15V DDC A volts			8	16	0	64	16	TRUE	TRUE	TRUE
PSS_SPU_P15VATMP		Temperature of +15V SPU PS A					0	64	16	TRUE	TRUE	TRUE
PSS_SPU_P15VB		SPU +15V DDC B volts			8	16	0	64	16	TRUE	TRUE	TRUE
PSS_SPU_P15VBTMP		Temperature of +15V SPU PS B					0	64	16	TRUE	TRUE	TRUE
PSS_SPUA_N15_RLY	PSS_STAT_00	-15A power to SPU OFF/ON	11	1								
PSS_SPUA_P15_RLY	PSS_STAT_00	+15A power to SPU OFF/ON	10	1								
PSS_SPUA_P5_RLY	PSS_STAT_00	+5A power to SPU OFF/ON	9	1								
PSS_SPUB_N15_RLY	PSS_STAT_02	-15B power to SPU OFF/ON	11	1								
PSS_SPUB_P15_RLY	PSS_STAT_02	+15B power to SPU OFF/ON	10	1								
PSS_SPUB_P5_RLY	PSS_STAT_02	+5B power to SPU OFF/ON	9	1								
PSS_STAT_00		PSS relay status word 0			4	16	0	64	16	TRUE	TRUE	TRUE
PSS_STAT_01		PSS relay status word 1			4	16	0	64	16	TRUE	TRUE	TRUE
PSS_STAT_02		PSS relay status word 2			4	16	0	64	16	TRUE	TRUE	TRUE
PSS_STAT_03		PSS relay status word 3			4	16	0	64	16	TRUE	TRUE	TRUE
PSS_STAT_04		PSS relay status word 4			4	16	0	64	16	TRUE	TRUE	TRUE
PSS_STAT_05		PSS relay status word 5			4	16	0	64	16	TRUE	TRUE	TRUE
PSS_STAT_06		PSS relay status word 6			4	16	0	64	16	TRUE	TRUE	TRUE
PSS_STAT_07		PSS relay status word 7			4	16	0	64	16	TRUE	TRUE	TRUE
PSS_SYS_5VA		SYS +5V DDC A volts			8	16	0	64	16	TRUE	TRUE	TRUE
PSS_SYS_5VA_TMP		SYS +5VA DDC temp					0	64	16	TRUE	TRUE	TRUE
PSS_SYS_5VB		SYS +5V DDC B volts			8	16	0	64	16	TRUE	TRUE	TRUE
PSS_SYS_5VB_TMP		SYS +5VB DDC temp					0	64	16	TRUE	TRUE	TRUE
PSS_SYS_N15VA		SYS -15V DDC A volts			8	16	0	64	16	TRUE	TRUE	TRUE
PSS_SYS_N15VATMP		SYS -15VA DDC temp					0	64	16	TRUE	TRUE	TRUE
PSS_SYS_N15VB		SYS -15V DDC B volts			8	16	0	64	16	TRUE	TRUE	TRUE
PSS_SYS_N15VBTMP		SYS -15VB DDC temp					0	64	16	TRUE	TRUE	TRUE
PSS_SYS_P15VA		SYS +15V DDC A volts			8	16	0	64	16	TRUE	TRUE	TRUE
PSS_SYS_P15VATMP		SYS +15VA DDC temp					0	64	16	TRUE	TRUE	TRUE
PSS_SYS_P15VB		SYS +15V DDC B volts			8	16	0	64	16	TRUE	TRUE	TRUE

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
PSS_SYS_P15VBTMP		SYS +15VB DDC temp					0	64	16	TRUE	TRUE	TRUE
PSS_SYSCNV_28R_A	PSS_STAT_00	+28REG Converter A input OFF/ON	14	1								
PSS_SYSCNV_28R_B	PSS_STAT_00	+28REG Converter B input OFF/ON	15	1								
PSS_SYSCNV_N15_A	PSS_STAT_01	-15V SYS Converter A input OFF/ON	14	1								
PSS_SYSCNV_N15_B	PSS_STAT_01	-15V SYS Converter B input OFF/ON	15	1								
PSS_SYSCNV_P15_A	PSS_STAT_01	+15V SYS Converter A input OFF/ON	12	1								
PSS_SYSCNV_P15_B	PSS_STAT_01	+15V SYS Converter B input OFF/ON	13	1								
PSS_SYSCNV_P5_A	PSS_STAT_00	+5V SYS Converter A input OFF/ON	12	1								
PSS_SYSCNV_P5_B	PSS_STAT_00	+5V SYS Converter B input OFF/ON	13	1								
PSS_TEUA_15VRLYA	PSS_STAT_01	A_TEU +/-15V supply prim. relay OFF/ON	4	1								
PSS_TEUA_15VRLYB	PSS_STAT_01	A_TEU +/-15V supply redt. relay OFF/ON	3	1								
PSS_TEUA_28C_PWR	PSS_STAT_06	+28QC supply to A_TEU OFF/ON	2	1								
PSS_TEUA_28CRLYA	PSS_STAT_06	A_TEU +28QC supply prim. relay OFF/ON	1	1								
PSS_TEUA_28CRLYB	PSS_STAT_06	A_TEU +28QC supply redt. relay OFF/ON	0	1								
PSS_TEUA_N15_PWR	PSS_STAT_01	-15V supply to A_TEU OFF/ON	6	1								
PSS_TEUA_P15_PWR	PSS_STAT_01	+15V supply to A_TEU OFF/ON	5	1								
PSS_TEUA_P5_PWR	PSS_STAT_01	+5V supply to A_TEU OFF/ON	2	1								
PSS_TEUA_P5RLYA	PSS_STAT_01	A_TEU +5V supply prim. relay OFF/ON	1	1								
PSS_TEUA_P5RLYB	PSS_STAT_01	A_TEU +5V supply redt. relay OFF/ON	0	1								
PSS_TEUB_15VRLYA	PSS_STAT_04	B_TEU +/-15V prim. relay OFF/ON	4	1								
PSS_TEUB_15VRLYB	PSS_STAT_04	B_TEU +/-15V redt. relay OFF/ON	3	1								
PSS_TEUB_28C_PWR	PSS_STAT_06	+28QC supply to B_TEU OFF/ON	5	1								
PSS_TEUB_28CRLYA	PSS_STAT_06	B_TEU +28QC supply prim. relay OFF/ON	4	1								
PSS_TEUB_28CRLYB	PSS_STAT_06	B_TEU +28QC supply redt. relay OFF/ON	3	1								
PSS_TEUB_N15_PWR	PSS_STAT_04	-15V supply to B_TEU OFF/ON	6	1								
PSS_TEUB_P15_PWR	PSS_STAT_04	+15V supply to B_TEU OFF/ON	5	1								
PSS_TEUB_P5_PWR	PSS_STAT_04	+5V supply to B_TEU OFF/ON	2	1								
PSS_TEUB_P5RLYA	PSS_STAT_04	B_TEU +5 prim. relay OFF/ON	1	1								
PSS_TEUB_P5RLYB	PSS_STAT_04	B_TEU +5 redt. relay OFF/ON	0	1								
Q1R_CMD_OVERRUN	QHSS_1_RV_STAT	See QHSS specification	3	1								
Q1R_CMDQ_NOT_MT	QHSS_1_RV_STAT	See QHSS specification	14	1								
Q1R_DATAQ_NOT_MT	QHSS_1_RV_STAT	See QHSS specification TSS HS Channel	15	1								
Q1R_DMA_ABORTED	QHSS_1_RV_STAT	See QHSS specification	12	1								
Q1R_DMA_COMPLETE	QHSS_1_RV_STAT	See QHSS specification	13	1								
Q1R_FRAMING_ERR	QHSS_1_RV_STAT	See QHSS specification	5	1								
Q1R_HSS_PROG_ERR	QHSS_1_RV_STAT	See QHSS specification	2	1								
Q1R_PARITY_ERR	QHSS_1_RV_STAT	See QHSS specification	4	1								
Q1R_PCI_IN_RESET	QHSS_1_RV_STAT	See QHSS specification	6	1								
Q1R_PCI_NO_DEV	QHSS_1_RV_STAT	See QHSS specification	7	1								
Q1R_PCI_PERR	QHSS_1_RV_STAT	See QHSS specification	11	1								
Q1R_PCI_PROG_ERR	QHSS_1_RV_STAT	See QHSS specification	1	1								
Q1R_PCI_PROTOCOL	QHSS_1_RV_STAT	See QHSS specification	9	1								
Q1R_PCI_RDY_PAR	QHSS_1_RV_STAT	See QHSS specification	10	1								
Q1R_PCI_TGT_ABRT	QHSS_1_RV_STAT	See QHSS specification	8	1								
Q1R_UNUSED	QHSS_1_RV_STAT	See QHSS specification	0	1								
Q1T_CMDQ_EMPTY	QHSS_1_TX_STAT	See QHSS specification	12	1								
Q1T_CMDQ_FULL	QHSS_1_TX_STAT	See QHSS specification	11	1								
Q1T_CMDQ_NFULL	QHSS_1_TX_STAT	See QHSS specification	10	1								
Q1T_DATAQ_EMPTY	QHSS_1_TX_STAT	See QHSS specification TSS Cmd Channel	15	1								
Q1T_DATAQ_FULL	QHSS_1_TX_STAT	See QHSS specification	14	1								
Q1T_DATAQ_NFULL	QHSS_1_TX_STAT	See QHSS specification	13	1								
Q1T_DMA_ABORTED	QHSS_1_TX_STAT	See QHSS specification	8	1								
Q1T_DMA_COMPLETE	QHSS_1_TX_STAT	See QHSS specification	9	1								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
Q1T_HSS_PROG_ERR	QHSS_1_TX_STAT	See QHSS specification	1	1								
Q1T_PCI_DAT_PERR	QHSS_1_TX_STAT	See QHSS specification	7	1								
Q1T_PCI_IN_RESET	QHSS_1_TX_STAT	See QHSS specification	2	1								
Q1T_PCI_NO_DEV	QHSS_1_TX_STAT	See QHSS specification	3	1								
Q1T_PCI_PROTOCOL	QHSS_1_TX_STAT	See QHSS specification	5	1								
Q1T_PCI_RDY_PERR	QHSS_1_TX_STAT	See QHSS specification	6	1								
Q1T_PCI_TGT_ABRT	QHSS_1_TX_STAT	See QHSS specification	4	1								
Q1T_UNUSED	QHSS_1_TX_STAT	See QHSS specification	0	1								
Q2R_CMDQ_NOT_MT	QHSS_2_RV_STAT	See QHSS specification	14	1								
Q2R_CMDQ_OVERRUN	QHSS_2_RV_STAT	See QHSS specification	3	1								
Q2R_DATAQ_NOT_MT	QHSS_2_RV_STAT	See QHSS specification TSS LS Channel	15	1								
Q2R_DMA_ABORTED	QHSS_2_RV_STAT	See QHSS specification	12	1								
Q2R_DMA_COMPLETE	QHSS_2_RV_STAT	See QHSS specification	13	1								
Q2R_FRAMING_ERR	QHSS_2_RV_STAT	See QHSS specification	5	1								
Q2R_HSS_PROG_ERR	QHSS_2_RV_STAT	See QHSS specification	2	1								
Q2R_PARITY_ERR	QHSS_2_RV_STAT	See QHSS specification	4	1								
Q2R_PCI_IN_RESET	QHSS_2_RV_STAT	See QHSS specification	6	1								
Q2R_PCI_NO_DEV	QHSS_2_RV_STAT	See QHSS specification	7	1								
Q2R_PCI_PERR	QHSS_2_RV_STAT	See QHSS specification	11	1								
Q2R_PCI_PROG_ERR	QHSS_2_RV_STAT	See QHSS specification	1	1								
Q2R_PCI_PROTOCOL	QHSS_2_RV_STAT	See QHSS specification	9	1								
Q2R_PCI_RDY_PAR	QHSS_2_RV_STAT	See QHSS specification	10	1								
Q2R_PCI_TGT_ABRT	QHSS_2_RV_STAT	See QHSS specification	8	1								
Q2R_UNUSED	QHSS_2_RV_STAT	See QHSS specification	0	1								
Q3R_CMD_OVERRUN	QHSS_3_RV_STAT	See QHSS specification	3	1								
Q3R_CMDQ_NOT_MT	QHSS_3_RV_STAT	See QHSS specification	14	1								
Q3R_DATAQ_NOT_MT	QHSS_3_RV_STAT	See QHSS specification SPU Channel	15	1								
Q3R_DMA_ABORTED	QHSS_3_RV_STAT	See QHSS specification	12	1								
Q3R_DMA_COMPLETE	QHSS_3_RV_STAT	See QHSS specification	13	1								
Q3R_FRAMING_ERR	QHSS_3_RV_STAT	See QHSS specification	5	1								
Q3R_HSS_PROG_ERR	QHSS_3_RV_STAT	See QHSS specification	2	1								
Q3R_PARITY_ERR	QHSS_3_RV_STAT	See QHSS specification	4	1								
Q3R_PCI_IN_RESET	QHSS_3_RV_STAT	See QHSS specification	6	1								
Q3R_PCI_NO_DEV	QHSS_3_RV_STAT	See QHSS specification	7	1								
Q3R_PCI_PERR	QHSS_3_RV_STAT	See QHSS specification	11	1								
Q3R_PCI_PROG_ERR	QHSS_3_RV_STAT	See QHSS specification	1	1								
Q3R_PCI_PROTOCOL	QHSS_3_RV_STAT	See QHSS specification	9	1								
Q3R_PCI_RDY_PAR	QHSS_3_RV_STAT	See QHSS specification	10	1								
Q3R_PCI_TGT_ABRT	QHSS_3_RV_STAT	See QHSS specification	8	1								
Q3R_UNUSED	QHSS_3_RV_STAT	See QHSS specification	0	1								
QA_I		Quiet Bus A input currt, from PSS			4	16	0	64	16	TRUE	TRUE	TRUE
QB_I		Quiet Bus B input currt, from PSS			4	16	0	64	16	TRUE	TRUE	TRUE
QHSS_1_RV_STAT		QHSS 1 Receive Status Word TSS HS					0	64	16	FALSE	FALSE	TRUE
QHSS_1_TX_STAT		QHSS 1 Transmit Status Word TSS CMD					0	64	16	TRUE	TRUE	TRUE
QHSS_2_RV_STAT		QHSS 2 Receive Status Word TSS LS					0	64	16	TRUE	TRUE	TRUE
QHSS_3_RV_STAT		QHSS 3 Receive Status Word SPU					0	64	16	TRUE	TRUE	TRUE
RAD_CHAN_ENA		Science format radiance channel enabled status (bit 0=chan 1, ..., bit 20=chan 21)			16	32	0	64	32	FALSE	FALSE	TRUE
RAD_DEMOD_TBL_ID		Demodulation table ID (default = 0)			32	8	0	64	8	TRUE	TRUE	TRUE
RDSR	IPU_STAT_1	the value is the current RDSR, 6,3,2 or 1	5	3								
S1553_BIST_CMDED	IPU_ERR_2	Test.	14	1								
S1553_BISTPOLLED	IPU_ERR_2	1 means the S/C polled for BIST word via 1553 TMC19.	3	1								
S1553_ITF_TST	IPU_ERR_2	purposes	13	1								
S1553_REINIT	IPU_ERR_2	1 means the Summit was idle (perhaps because of a BIST) was reinitialized.	15	1								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
SAIL_CMD_ERR	CMD_ERR_0	1 means an error occured while executing a SAIL command.	8	1								
SAIL_CNTL_BB	IPU_STAT_2	SAIL control allowed for BlackBody: 0=no, 1=yes	5	1								
SAIL_CNTL_CSS	IPU_STAT_2	SAIL control allowed for CSS: 0=no, 1=yes	8	1								
SAIL_CNTL_HWA	IPU_STAT_2	SAIL control allowed for HWA: 0=no, 1=yes	6	1								
SAIL_CNTL_SMA	IPU_STAT_2	SAIL control allowed for SMA: 0=no, 1=yes	4	1								
SAIL_CNTL_SSH	IPU_STAT_2	SAIL control allowed for SSH: 0=no, 1=yes	3	1								
SAIL_CNTL_SVA	IPU_STAT_2	SAIL control allowed for SVA: 0=no, 1=yes	9	1								
SAIL_ENGWORD_00		SAIL-generated Eng. Word 0			4	32	0	64	32	FALSE	FALSE	TRUE
SAIL_ENGWORD_01		SAIL-generated Eng. Word 1			4	32	0	64	32	FALSE	FALSE	TRUE
SAIL_ENGWORD_02		SAIL-generated Eng. Word 2			4	32	0	64	32	FALSE	FALSE	TRUE
SAIL_ENGWORD_03		SAIL-generated Eng. Word 3			4	32	0	64	32	FALSE	FALSE	TRUE
SAIL_ENGWORD_04		SAIL-generated Eng. Word 4			4	32	0	64	32	FALSE	FALSE	TRUE
SAIL_ENGWORD_05		SAIL-generated Eng. Word 5			4	32	0	64	32	FALSE	FALSE	TRUE
SAIL_ENGWORD_06		SAIL-generated Eng. Word 6			4	32	0	64	32	FALSE	FALSE	TRUE
SAIL_ENGWORD_07		SAIL-generated Eng. Word 7			4	32	0	64	32	FALSE	FALSE	TRUE
SAIL_ERR_CLOC		SAIL current error location			32	16	0	64	16	TRUE	TRUE	TRUE
SAIL_ERR_CTASK		which SAIL task had the current error			32	8	0	64	8	TRUE	TRUE	TRUE
SAIL_ERR_CTYP		SAIL current error type			32	8	0	64	8	TRUE	TRUE	TRUE
SAIL_ERR_LLOC		SAIL last error location			32	16	0	64	16	TRUE	TRUE	TRUE
SAIL_ERR_LTASK		which SAIL task had the last error			32	8	0	64	8	TRUE	TRUE	TRUE
SAIL_ERR_LTYP		SAIL last error type			32	8	0	64	8	TRUE	TRUE	TRUE
SAIL_PROC_STAT		SAIL Processor Status Code			4	8	0	64	8	TRUE	TRUE	TRUE
SAIL_SHM_256		SAIL shared memory [256]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_257		SAIL shared memory [257]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_258		SAIL shared memory [258]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_259		SAIL shared memory [259]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_260		SAIL shared memory [260]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_261		SAIL shared memory [261]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_262		SAIL shared memory [262]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_263		SAIL shared memory [263]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_264		SAIL shared memory [264]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_265		SAIL shared memory [265]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_266		SAIL shared memory [266]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_267		SAIL shared memory [267]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_268		SAIL shared memory [268]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_269		SAIL shared memory [269]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_270		SAIL shared memory [270]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_SHM_271		SAIL shared memory [271]			32	32	0	64	32	TRUE	TRUE	TRUE
SAIL_STACK_MRGN		Number of bytes left on the SAIL stack before overrunning stack end, 0xffff if SAIL task name missing			0	0	0	64	16	TRUE	TRUE	TRUE
SAILCMD_LAST_CN		Last SAIL cmd: cmd nmbr			16	8	0	64	8	TRUE	TRUE	TRUE
SAILCMD_LAST_RC		Last SAIL cmd: result code			16	16	0	64	16	TRUE	TRUE	TRUE
SAILCMD_OK	SAILCMD_LAST_RC	Cmd Result code. 1 means last command OK, 0 means last command reject	15	1								
SAILCMD_PARM_NUM	SAILCMD_LAST_RC	Cmd Result code. Parameter in error	6	5								
SAILCMD_RES_NUM	SAILCMD_LAST_RC	Cmd Result code. Command result number Display Mnemonic	0	6								
SAILCMD_SUBSYS	SAILCMD_LAST_RC	Subsystem to which the command is to be routed	11	4								
SAILCMDS_RCVCT		SAIL cmds: received count			16	8	0	64	16	TRUE	TRUE	TRUE
SAILCMDS_REJCT		SAIL cmds: rejected count			16	8	0	64	16	TRUE	TRUE	TRUE
SAILCMST_0_15		SAIL enabled status of each command			32	16	0	64	16	TRUE	FALSE	TRUE
SAILCMST_112_127		SAIL enabled status of each command			32	16	0	64	16	TRUE	FALSE	TRUE
SAILCMST_16_31		SAIL enabled status of each command			32	16	0	64	16	TRUE	FALSE	TRUE
SAILCMST_32_47		SAIL enabled status of each command			32	16	0	64	16	TRUE	FALSE	TRUE
SAILCMST_48_63		SAIL enabled status of each command			32	16	0	64	16	TRUE	FALSE	TRUE

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
SAILCMST_64_79		SAIL enabled status of each command			32	16	0	64	16	TRUE	FALSE	TRUE
SAILCMST_80_95		SAIL enabled status of each command			32	16	0	64	16	TRUE	FALSE	TRUE
SAILCMST_96_111		SAIL enabled status of each command			32	16	0	64	16	TRUE	FALSE	TRUE
SAILTASK_00_P15		SAIL Tsk 00 param 15 !			32	32	0	64	32	TRUE	TRUE	TRUE
SAILTASK_00_STAT		SAIL Task 00 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_01_P15		SAIL Tsk 01 param 15 !			32	32	0	64	32	TRUE	TRUE	TRUE
SAILTASK_01_STAT		SAIL Task 01 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_02_P15		SAIL Tsk 02 param 15 !			32	32	0	64	32	TRUE	TRUE	TRUE
SAILTASK_02_STAT		SAIL Task 02 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_03_P15		SAIL Tsk 03 param 15 !			32	32	0	64	32	TRUE	TRUE	TRUE
SAILTASK_03_STAT		SAIL Task 03 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_04_P15		SAIL Tsk 04 param 15 !			32	32	0	64	32	TRUE	TRUE	TRUE
SAILTASK_04_STAT		SAIL Task 04 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_05_P15		SAIL Tsk 05 param 15 !			32	32	0	64	32	TRUE	TRUE	TRUE
SAILTASK_05_STAT		SAIL Task 05 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_06_P15		SAIL Tsk 06 param 15 !			32	32	0	64	32	TRUE	TRUE	TRUE
SAILTASK_06_STAT		SAIL Task 06 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_07_P15		SAIL Tsk 07 param 15 !			32	32	0	64	32	TRUE	TRUE	TRUE
SAILTASK_07_STAT		SAIL Task 07 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_08_P15		SAIL Tsk 08 param 15 !			32	32	0	64	32	TRUE	FALSE	TRUE
SAILTASK_08_STAT		SAIL Task 08 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_09_P15		SAIL Tsk 09 param 15 !			32	32	0	64	32	TRUE	FALSE	TRUE
SAILTASK_09_STAT		SAIL Task 09 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_10_P15		SAIL Tsk 10 param 15 !			32	32	0	64	32	TRUE	FALSE	TRUE
SAILTASK_10_STAT		SAIL Task 10 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_11_P15		SAIL Tsk 11 param 15 !			32	32	0	64	32	TRUE	FALSE	TRUE
SAILTASK_11_STAT		SAIL Task 11 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_12_P15		SAIL Tsk 12 param 15 !			32	32	0	64	32	TRUE	FALSE	TRUE
SAILTASK_12_STAT		SAIL Task 12 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_13_P15		SAIL Tsk 13 param 15 !			32	32	0	64	32	TRUE	FALSE	TRUE
SAILTASK_13_STAT		SAIL Task 13 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_14_P15		SAIL Tsk 14 param 15 !			32	32	0	64	32	TRUE	FALSE	TRUE
SAILTASK_14_STAT		SAIL Task 14 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTASK_15_P15		SAIL Tsk 15 param 15 !			32	32	0	64	32	TRUE	FALSE	TRUE
SAILTASK_15_STAT		SAIL Task 15 Status Code			8	8	0	64	8	TRUE	TRUE	TRUE
SAILTSKRAN_00	SAILTASK_00_STAT	SAIL Task 00 number of times it has run since the last reset	4	4								
SAILTSKRAN_01	SAILTASK_01_STAT	SAIL Task 01 number of times it has run since the last reset	4	4								
SAILTSKRAN_02	SAILTASK_02_STAT	SAIL Task 02 number of times it has run since the last reset	4	4								
SAILTSKRAN_03	SAILTASK_03_STAT	SAIL Task 03 number of times it has run since the last reset	4	4								
SAILTSKRAN_04	SAILTASK_04_STAT	SAIL Task 04 number of times it has run since the last reset	4	4								
SAILTSKRAN_05	SAILTASK_05_STAT	SAIL Task 05 number of times it has run since the last reset	4	4								
SAILTSKRAN_06	SAILTASK_06_STAT	SAIL Task 06 number of times it has run since the last reset	4	4								
SAILTSKRAN_07	SAILTASK_07_STAT	SAIL Task 07 number of times it has run since the last reset	4	4								
SAILTSKRAN_08	SAILTASK_08_STAT	SAIL Task 08 number of times it has run since the last reset	4	4								
SAILTSKRAN_09	SAILTASK_09_STAT	SAIL Task 09 number of times it has run since the last reset	4	4								
SAILTSKRAN_10	SAILTASK_10_STAT	SAIL Task 10 number of times it has run since the last reset	4	4								
SAILTSKRAN_11	SAILTASK_11_STAT	SAIL Task 11 number of times it has run since the last reset	4	4								
SAILTSKRAN_12	SAILTASK_12_STAT	SAIL Task 12 number of times it has run since the last reset	4	4								
SAILTSKRAN_13	SAILTASK_13_STAT	SAIL Task 13 number of times it has run since the last reset	4	4								
SAILTSKRAN_14	SAILTASK_14_STAT	SAIL Task 14 number of times it has run since the last reset	4	4								
SAILTSKRAN_15	SAILTASK_15_STAT	SAIL Task 15 number of times it has run since the last reset	4	4								
SAILTSTATUS_00	SAILTASK_00_STAT	SAIL Task 00 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SAILTSTATUS_01	SAILTASK_01_STAT	SAIL Task 01 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
SAILTSTATUS_02	SAILTASK_02_STAT	SAIL Task 02 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SAILTSTATUS_03	SAILTASK_03_STAT	SAIL Task 03 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SAILTSTATUS_04	SAILTASK_04_STAT	SAIL Task 04 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SAILTSTATUS_05	SAILTASK_05_STAT	SAIL Task 05 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SAILTSTATUS_06	SAILTASK_06_STAT	SAIL Task 06 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SAILTSTATUS_07	SAILTASK_07_STAT	SAIL Task 07 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SAILTSTATUS_08	SAILTASK_08_STAT	SAIL Task 08 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SAILTSTATUS_09	SAILTASK_09_STAT	SAIL Task 09 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SAILTSTATUS_10	SAILTASK_10_STAT	SAIL Task 10 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SAILTSTATUS_11	SAILTASK_11_STAT	SAIL Task 11 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SAILTSTATUS_12	SAILTASK_12_STAT	SAIL Task 12 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SAILTSTATUS_13	SAILTASK_13_STAT	SAIL Task 13 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SAILTSTATUS_14	SAILTASK_14_STAT	SAIL Task 14 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SAILTSTATUS_15	SAILTASK_15_STAT	SAIL Task 15 Status 0=Halted, 1=Ready, 2=Running, 3=Suspended, 4=Wait	0	4								
SC_ATT_QUAT_1		S/C Ancillary data item: Attitude Quaternion 1					0	64	32	TRUE	TRUE	TRUE
SC_ATT_QUAT_2		S/C Ancillary data item: Attitude Quaternion 2					0	64	32	TRUE	TRUE	TRUE
SC_ATT_QUAT_3		S/C Ancillary data item: Attitude Quaternion 3					0	64	32	TRUE	TRUE	TRUE
SC_ATT_QUAT_4		S/C Ancillary data item: Attitude Quaternion 4					0	64	32	TRUE	TRUE	TRUE
SC_DESC_NODE		S/C Ancillary data item: Time to Descending Node					0	64	16	TRUE	TRUE	TRUE
SC_EUL_ANG_PITCH		S/C Ancillary data item: Pitchl Euler Angle					0	64	16	TRUE	TRUE	TRUE
SC_EUL_ANG_ROLL		S/C Ancillary data item: Roll Euler Angle					0	64	16	TRUE	TRUE	TRUE
SC_EUL_ANG_YAW		S/C Ancillary data item: Yaw Euler Angle					0	64	16	TRUE	TRUE	TRUE
SC_GYRO_STAT		S/C Ancillary data item: S/C Gyro (IRU) status word					0	64	16	TRUE	TRUE	TRUE
SC_HARD_RESET	IPU_ERR_2	1 means a hard reset command was received on 1553 (RSA27) Reset action TBD.	11	1								
SC_INVLD_RESET	IPU_ERR_2	1 means was received on 1553 (RSA27) but ignored.	12	1								
SC_MOON_VECT_X		S/C Ancillary data item: Moon Vector - X					0	64	16	TRUE	TRUE	TRUE
SC_MOON_VECT_Y		S/C Ancillary data item: Moon Vector - Y					0	64	16	TRUE	TRUE	TRUE
SC_MOON_VECT_Z		S/C Ancillary data item: Moon Vector - Z					0	64	16	TRUE	TRUE	TRUE
SC_NAV_MODE		S/C Ancillary data item: S/C Mode (pointing) status					0	64	16	TRUE	TRUE	TRUE
SC_OBL_ANG_AFT		S/C Ancillary data item: Oblateness Angle (aft)					0	64	16	TRUE	TRUE	TRUE
SC_OBL_ANG_R		S/C Ancillary data item: Oblateness angle (aft) rate					0	64	16	TRUE	TRUE	TRUE
SC_PITCH_RATE		S/C Ancillary data item: Pitch Rate					0	64	16	TRUE	TRUE	TRUE
SC_POS_X		S/C Ancillary data item: Spacecraft Position - X					0	64	32	TRUE	TRUE	TRUE
SC_POS_Y		S/C Ancillary data item: Spacecraft Position - Y					0	64	32	TRUE	TRUE	TRUE
SC_POS_Z		S/C Ancillary data item: Spacecraft Position - Z					0	64	32	TRUE	TRUE	TRUE
SC_ROLL_RATE		S/C Ancillary data item: Roll Rate					0	64	16	TRUE	TRUE	TRUE
SC_SOFT_RESET	IPU_ERR_2	1 means a soft reset command was received on 1553 (RSA27) Reset action TBD.	10	1								
SC_SUN_VECT_X		S/C Ancillary data item: Sun Vector - X					0	64	16	TRUE	TRUE	TRUE
SC_SUN_VECT_Y		S/C Ancillary data item: Sun Vector - Y					0	64	16	TRUE	TRUE	TRUE
SC_SUN_VECT_Z		S/C Ancillary data item: Sun Vector - Z					0	64	16	TRUE	TRUE	TRUE
SC_TIM_STAMP_LSW		S/C Ancillary data item: HIRDLS Time Stamp (least significant 32 bits)					0	64	32	TRUE	TRUE	TRUE
SC_TIM_STAMP_MSW		S/C Ancillary data item: HIRDLS Time Stamp (most significant 32 bits)					0	64	32	TRUE	TRUE	TRUE
SC_TIMEOUT_FM	IPU_FLT_STAT_1	SC communications fault management: 0 = off; 1 = on	9	1								
SC_TIMEOUT1_ERR	IPU_ERR_5	1 = a loss of SC communications for 1 second occurred	13	1								
SC_TIMEOUT10_ERR	IPU_ERR_5	1 = a loss of SC communications for 10 seconds occurred	12	1								
SC_VELY_X		S/C Ancillary data item: Spacecraft Velocity - X					0	64	32	TRUE	TRUE	TRUE
SC_VELY_Y		S/C Ancillary data item: Spacecraft Velocity - Y					0	64	32	TRUE	TRUE	TRUE
SC_VELY_Z		S/C Ancillary data item: Spacecraft Velocity - Z					0	64	32	TRUE	TRUE	TRUE
SC_YAW_RATE		S/C Ancillary data item: Yaw Rate					0	64	16	TRUE	TRUE	TRUE
SCCMD_LAST_CN		Last S/C cmd: cmd nmbr			4	8	0	64	8	TRUE	TRUE	TRUE
SCCMD_LAST_PC		Last S/C cmd: pkt seq cnt					0	64	16	TRUE	TRUE	TRUE
SCCMD_LAST_RC		Last S/C cmd: result code			4	16	0	64	16	TRUE	TRUE	TRUE
SCCMD_OK	SCCMD_LAST_RC	Success code: 1 = last command OK; 0 = last command rejected	15	1								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
SCCMD_PARM_NUM	SCCMD_LAST_RC	Parameter in error	6	5								
SCCMD_RES_NUM	SCCMD_LAST_RC	Command result number	0	6								
SCCMD_SUBSYS	SCCMD_LAST_RC	Subsystem to which the command is to be routed	11	4								
SCCMDS_RCVCT		S/C cmds: received count			4	8	0	64	16	TRUE	TRUE	TRUE
SCCMDS_REJCT		S/C cmds: rejected count			4	8	0	64	16	TRUE	TRUE	TRUE
SCI_AZP_POS		Azimuth Primary readhead position (GROUND USE ONLY)					0	1	32	FALSE	FALSE	FALSE
SCI_AZP_STAT		Azimuth Primary readhead status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)					0	64	8	FALSE	FALSE	FALSE
SCI_AZS_POS		Azimuth Secondary readhead position (GROUND USE ONLY)					0	64	32	FALSE	FALSE	FALSE
SCI_AZS_STAT		Azimuth Secondary readhead status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)					0	64	8	FALSE	FALSE	FALSE
SCI_EL2P_POS		Elevation Primary readhead 2 position (GROUND USE ONLY)					0	1	32	FALSE	FALSE	FALSE
SCI_EL2P_STAT		Elevation Primary readhead 2 status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)					0	64	8	FALSE	FALSE	FALSE
SCI_EL2S_POS		Elevation Secondary readhead 2 position (GROUND USE ONLY)					0	64	32	FALSE	FALSE	FALSE
SCI_EL2S_STAT		Elevation Secondary readhead 2 status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)					0	64	8	FALSE	FALSE	FALSE
SCI_ELVARP_POS		Elevation Primary variable-readhead position (GROUND USE ONLY)					0	1	32	FALSE	FALSE	FALSE
SCI_ELVARP_STAT		Elevation Primary VAR status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)					0	64	8	FALSE	FALSE	FALSE
SCI_ELVARS_POS		Elevation Secondary variable-readhead position (GROUND USE ONLY)					0	64	32	FALSE	FALSE	FALSE
SCI_ELVARS_STAT		Elevation Secondary VAR status - for mapping of Encoder Science Block 4 bit status (GROUND USE ONLY)					0	64	8	FALSE	FALSE	FALSE
SCI_FMT_BLK_ENA		Science format block enabled status			16	16	0	64	16	FALSE	FALSE	TRUE
SCI_HKTBL_ERR		Error flags for science HK table					0	64	16	TRUE	TRUE	TRUE
SCIFMT_TBL_ERR	IPU_ERR_5	Error in science format table	14	1								
SCIPKT_LOSS	IPU_ERR_2	1 means science packet loss has occured.	4	1								
SCIPKT_Q_SZ	IPU_STAT_1	the current number of buffered science packets	0	5								
SIG_DAT_01		Radiance channel 1 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_02		Radiance channel 2 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_03		Radiance channel 3 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_04		Radiance channel 4 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_05		Radiance channel 5 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_06		Radiance channel 6 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_07		Radiance channel 7 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_08		Radiance channel 8 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_09		Radiance channel 9 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_10		Radiance channel 10 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_11		Radiance channel 11 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_12		Radiance channel 12 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_13		Radiance channel 13 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_14		Radiance channel 14 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_15		Radiance channel 15 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_16		Radiance channel 16 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_17		Radiance channel 17 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_18		Radiance channel 18 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_19		Radiance channel 19 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_20		Radiance channel 20 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SIG_DAT_21		Radiance channel 21 (GROUND USE ONLY)					0	1	16	FALSE	FALSE	FALSE
SM_TMP1		Scan mirror temp.1, EDAQ AD590 Row 2 Col 4			32	8	8	64	16	TRUE	TRUE	TRUE
SM_TMP2		Scan mirror temp.2, EDAQ AD590 Row 2 Col 3					0	64	16	TRUE	TRUE	TRUE
SM_TMP3		Scan mirror temp 3, EDAQ Derived PRT 0					0	64	16	TRUE	TRUE	TRUE
SMA_MTRING_TMP		SMA mount ring temp, EDAQ 56			32	8	8	64	16	TRUE	TRUE	TRUE

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
SPARE_00_BIT0	SPARE_00D	Spare	0	1								
SPARE_00_BIT1	SPARE_00D	Spare	1	1								
SPARE_00_BIT10	SPARE_00D	Spare	10	1								
SPARE_00_BIT11	SPARE_00D	Spare	11	1								
SPARE_00_BIT12	SPARE_00D	Spare	12	1								
SPARE_00_BIT13	SPARE_00D	Spare	13	1								
SPARE_00_BIT14	SPARE_00D	Spare	14	1								
SPARE_00_BIT15	SPARE_00D	Spare	15	1								
SPARE_00_BIT2	SPARE_00D	Spare	2	1								
SPARE_00_BIT3	SPARE_00D	Spare	3	1								
SPARE_00_BIT4	SPARE_00D	Spare	4	1								
SPARE_00_BIT5	SPARE_00D	Spare	5	1								
SPARE_00_BIT6	SPARE_00D	Spare	6	1								
SPARE_00_BIT7	SPARE_00D	Spare	7	1								
SPARE_00_BIT8	SPARE_00D	Spare	8	1								
SPARE_00_BIT9	SPARE_00D	Spare	9	1								
SPARE_00D		Spare Tlm Channel					0	64	16	TRUE	TRUE	TRUE
SPARE_01D		Spare Tlm Channel					0	64	16	TRUE	TRUE	TRUE
SPARE_02D		Spare Tlm Channel					0	64	16	TRUE	TRUE	TRUE
SPARE_03D		Spare Tlm Channel					0	64	16	TRUE	TRUE	TRUE
SPARE_04D		Spare Tlm Channel					0	64	16	TRUE	TRUE	TRUE
SPARE_05D		Spare Tlm Channel					0	64	16	TRUE	TRUE	TRUE
SPARE_06D		Spare Tlm Channel					0	64	16	TRUE	TRUE	TRUE
SPARE_07D		Spare Tlm Channel					0	64	16	TRUE	TRUE	TRUE
SPARE_08D		Spare Tlm Channel					0	64	16	TRUE	TRUE	TRUE
SPARE_09D		Spare Tlm Channel					0	64	16	TRUE	TRUE	TRUE
SPARE_10D		Spare Tlm Channel					0	64	16	TRUE	TRUE	TRUE
SPARE_11D		Spare Tlm Channel					0	64	16	TRUE	TRUE	TRUE
SPARE_12D		Spare Tlm Channel					0	64	32	TRUE	TRUE	TRUE
SPARE_13D		Spare Tlm Channel					0	64	32	TRUE	TRUE	TRUE
SPARE_14D		Spare Tlm Channel					0	64	32	TRUE	TRUE	TRUE
SPARE_15D		Spare Tlm Channel					0	64	32	TRUE	TRUE	TRUE
SPARE_STAT_BIT10	SVA_STAT	Spare	10	1								
SPARE_STAT_BIT11	SVA_STAT	Spare	11	1								
SPARE_STAT_BIT12	SVA_STAT	Spare	12	1								
SPARE_STAT_BIT13	SVA_STAT	Spare	13	1								
SPARE_STAT_BIT14	SVA_STAT	Spare	14	1								
SPARE_STAT_BIT15	SVA_STAT	Spare	15	1								
SPARE_STAT_BIT8	SVA_STAT	Spare	8	1								
SPARE_STAT_BIT9	SVA_STAT	Spare	9	1								
SPARE_STAT1_BT13	IPU_FLT_STAT_1	Spare	13	1								
SPARE_STAT1_BT14	IPU_FLT_STAT_1	Spare	14	1								
SPU_BLADE_0_CLSD		Delay (in 160 nsec ticks) for Chopper Blade Closed 0 delay					0	64	16	TRUE	FALSE	TRUE
SPU_BLADE_0_OPEN		Delay (in 160 nsec ticks) for Chopper Blade Open 0 delay					0	64	16	TRUE	FALSE	TRUE
SPU_BLADE_1_CLSD		Delay (in 160 nsec ticks) for Chopper Blade Closed 1 delay					0	64	16	TRUE	FALSE	TRUE
SPU_BLADE_1_OPEN		Delay (in 160 nsec ticks) for Chopper Blade Open 1 delay					0	64	16	TRUE	FALSE	TRUE
SPU_BLADE_2_CLSD		Delay (in 160 nsec ticks) for Chopper Blade Closed 2 delay					0	64	16	TRUE	FALSE	TRUE
SPU_BLADE_2_OPEN		Delay (in 160 nsec ticks) for Chopper Blade Open 2 delay					0	64	16	TRUE	FALSE	TRUE
SPU_BLADE_3_CLSD		Delay (in 160 nsec ticks) for Chopper Blade Closed 3 delay					0	64	16	TRUE	FALSE	TRUE
SPU_BLADE_3_OPEN		Delay (in 160 nsec ticks) for Chopper Blade Open 3 delay					0	64	16	TRUE	FALSE	TRUE
SPU_BLADE_4_CLSD		Delay (in 160 nsec ticks) for Chopper Blade Closed 4 delay					0	64	16	TRUE	FALSE	TRUE
SPU_BLADE_4_OPEN		Delay (in 160 nsec ticks) for Chopper Blade Open 4 delay					0	64	16	TRUE	FALSE	TRUE
SPU_BLADE_5_CLSD		Delay (in 160 nsec ticks) for Chopper Blade Closed 5 delay					0	64	16	TRUE	FALSE	TRUE

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
SPU_BLADE_5_OPEN		Delay (in 160 nsec ticks) for Chopper Blade Open 5 delay					0	64	16	TRUE	FALSE	TRUE
SPU_BOX_TMP		SPU box EDAQ AD590 Row 2 Col 7			32	8	8	64	16	TRUE	TRUE	TRUE
SPU_CC_PHASE_ERR	IPU_ERR_1	1 means the value for one or more chopper cycles was not correct	2	1								
SPU_CCPHASE_ER_C	SPU_PHASE_ERR_C	Error count	8	4								
SPU_CH_01_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 1 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_01_ZERO		Channel 1 Zero Offset					0	64	16	TRUE	TRUE	TRUE
SPU_CH_02_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 2 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_02_ZERO		Channel 2 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_03_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 3 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_03_ZERO		Channel 3 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_04_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 4 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_04_ZERO		Channel 4 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_05_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 5 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_05_ZERO		Channel 5 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_06_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 6 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_06_ZERO		Channel 6 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_07_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 7 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_07_ZERO		Channel 7 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_08_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 8 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_08_ZERO		Channel 8 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_09_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 9 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_09_ZERO		Channel 9 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_10_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 10 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_10_ZERO		Channel 10 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_11_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 11 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_11_ZERO		Channel 11 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_12_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 12 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_12_ZERO		Channel 12 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_13_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 13 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_13_ZERO		Channel 13 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_14_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 14 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_14_ZERO		Channel 14 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_15_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 15 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_15_ZERO		Channel 15 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_16_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 16 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_16_ZERO		Channel 16 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_17_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 17 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_17_ZERO		Channel 17 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_18_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 18 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_18_ZERO		Channel 18 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_19_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 19 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_19_ZERO		Channel 19 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_20_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 20 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_20_ZERO		Channel 20 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CH_21_PHASE		Delay (in 160 nsec ticks) for Radiance Data Channel 21 sample					0	64	16	TRUE	FALSE	TRUE
SPU_CH_21_ZERO		Channel 21 Zero Offset					0	64	16	TRUE	FALSE	TRUE
SPU_CMD_ERR	CMD_ERR_0	1 means an error occured while executing a SPU command.	9	1								
SPU_CR_DROP_ERR	IPU_ERR_1	1 means 1 or more cr SPU radiance data packets was not received by the qhss	1	1								
SPU_CR_PHASE_ERR	IPU_ERR_1	1 means the chopper rotation counter was not constant within a given cr	0	1								
SPU_CRDROP_ER_C	SPU_PHASE_ERR_C	Error count	4	4								
SPU_CRPHASE_ER_C	SPU_PHASE_ERR_C	Error count	0	4								
SPU_DATA_ER_C	SPU_PHASE_ERR_C	Error count	12	4								
SPU_DATA_ERR	IPU_ERR_0	1 means the SPU did not send data last cr. 2 means it did not finish sending data.	8	2								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
SPU_FAULT_A	IPU_ERR_2	SPU fault status bit Read from TG DIO port, 1= Fault condition on TLM side A	7	1								
SPU_FAULT_B	IPU_ERR_2	SPU fault status bit Read from TG DIO port, 1= Fault condition on TLM side B	8	1								
SPU_GLOBAL_DELAY		Delay (in 160 nsec ticks) for Global Filter Delay					0	64	16	TRUE	FALSE	TRUE
SPU_HK_PHASE		Delay (in 160 nsec ticks) for Radiance Data HouseKeeping sample					0	64	16	TRUE	FALSE	TRUE
SPU_MNT_TMP		SPU Mounting Temp, EDAQ AD590 Row 5, col 2					0	64	16	TRUE	TRUE	TRUE
SPU_N12V_A		SPU -12VA supply volts			32	8	8	64	16	TRUE	TRUE	TRUE
SPU_N12V_B		SPU -12VB supply volts			32	8	8	64	16	TRUE	TRUE	TRUE
SPU_N5V_A		SPU -5VA supply volts (analog)			32	8	8	64	16	TRUE	TRUE	TRUE
SPU_N5V_B		SPU -5VB supply volts (analog)			32	8	8	64	16	TRUE	TRUE	TRUE
SPU_P12V_A		SPU +12VA supply volts			32	8	8	64	16	TRUE	TRUE	TRUE
SPU_P12V_B		SPU +12VB supply volts			32	8	8	64	16	TRUE	TRUE	TRUE
SPU_P5V_A		SPU +5VA supply volts (analog)			32	8	8	64	16	TRUE	TRUE	TRUE
SPU_P5V_B		SPU +5VB supply volts (analog)			32	8	8	64	16	TRUE	TRUE	TRUE
SPU_P5V_DA		SPU +5VA supply volts (digital)			32	8	8	64	16	TRUE	TRUE	TRUE
SPU_P5V_DB		SPU +5VB supply volts (digital)			32	8	8	64	16	TRUE	TRUE	TRUE
SPU_PHASE_ERR_C		SPU phase error counters			16	16	0	64	16	TRUE	TRUE	TRUE
SPU_POWER_PILEUP	IPU_ERR_1	command	3	1								
SPU_QHSS_ERR	IPU_ERR_0	1 means the SPU data receive encountered an error.	6	1								
SPU_RESET_PILEUP	IPU_ERR_1	1 means the SPU received a reset command while still processing previous command	4	1								
SPVU_BAF_TMP		OBA Sp. View baffle tmp, EDAQ 36					0	64	16	TRUE	TRUE	TRUE
SPVUMIR_TMP1		Space View Mirror temp #1 EDAQ AD590 Row 0 Col 4			32	8	8	64	16	TRUE	TRUE	TRUE
SPVUMIR_TMP2		Space View Mirror temp #2 EDAQ AD590 Row 1 Col 3					0	64	16	TRUE	TRUE	TRUE
SPVUMIR_TMP3		Space View Mirror temp #3 EDAQ Derived PRT 3					0	64	16	TRUE	TRUE	TRUE
SRHS	IPU_STAT_2	Secondary read head select (0=test value, 1=RH1 data, 2=RH2 data, 3= average of both read heads)	12	2								
SSH_APL_TMP		SSH aperture plate temp, EDAQ AD590 Row 7 Col 7					0	64	16	TRUE	TRUE	TRUE
SSH_CMD_ERR	CMD_ERR_0	1 means an error occured while executing a SSH command.	10	1								
SSH_DOOR_STATE	SSH_STAT	Sun Shield Door State, NOT_MOVING=0, 1=MOVING_OPEN, 2=MOVING_CLOSED, 3=MOVING_CRITICAL, 4=, =SAFING(set by IPU SSH control software)	8	3								
SSH_DOOR_TMP		SSH Door Temp, EDAQ AD590 Row 0, col 6					0	64	16	TRUE	TRUE	TRUE
SSH_DORMOT_OT_ER	IPU_ERR_3	SSH door motor over temperature fault	4	1								
SSH_DORMOT_OT_FM	IPU_FLT_STAT_0	0 means Fault Management for this error is off, 1 on	4	1								
SSH_DORMOT_OTSP		Sunshield door motor over-temperature set point			32	8	8	64	16	TRUE	TRUE	TRUE
SSH_DORMOT_TMP		SSH drive motor temp, EDAQ			32	8	8	64	16	TRUE	TRUE	TRUE
SSH_DR_CLOSED	SSH_STAT	Sun Shield Door CLOSED, 1= CLOSED	0	1								
SSH_DR_LATCHDIS	SSH_STAT	Sun Shield Latch disengaged, 1= disenaged	4	1								
SSH_DR_LATCHENG	SSH_STAT	Sun Shield Latch engaged, 1= enaged	6	1								
SSH_DR_LATCHNDIS	SSH_STAT	Sun Shield Latch not disengaged, 0= disenaged	5	1								
SSH_DR_LATCHNENG	SSH_STAT	Sun Shield Latch not engaged, 0= enaged	7	1								
SSH_DR_NCLOSED	SSH_STAT	Sun Shield Door CLOSED, 0= CLOSED	1	1								
SSH_DR_NOPEN	SSH_STAT	Sun Shield Door OPEN, 0= OPEN	3	1								
SSH_DR_OPEN	SSH_STAT	Sun Shield Door OPEN, 1= OPEN	2	1								
SSH_DRIVE_DIR	SSH_STAT	Sun Shield Door Motor Direction Open =1, Close =0 (Bit 1 of configuration register)	12	1								
SSH_HWA_CONFIG	SSH_STAT	HWA Configuration, 0 = OFF, 1 = ON, value of DIO bit	14	1								
SSH_HWA_OT_ERR	IPU_ERR_3	HWA over temperature fault	5	1								
SSH_HWA_OT_FM	IPU_FLT_STAT_1	HWA over temperature fault mgt: 0=off, 1=on	0	1								
SSH_HWA_OTSP		Hot Wax Actuator over-temperature set point			32	8	8	64	16	TRUE	TRUE	TRUE
SSH_HWA_STATE	SSH_STAT	HWA Control State, 0 = OFF, 1 = ON	15	1								
SSH_HWA_TIMEOUT	IPU_ERR_2	1 means the HWA timed out. 0, means its fine	6	1								
SSH_HWA_TMP		Hot Wax Actuator temp, EDAQ			8	8	8	64	16	TRUE	TRUE	TRUE
SSH_MOTOR_CONFIG	SSH_STAT	register)	11	1								
SSH_NZSURF_TMP		SSH -Z surface temp, EDAQ ADC590 Row 6 Col 2					0	64	16	TRUE	TRUE	TRUE
SSH_OT_IL_FM	IPU_FLT_STAT_1	SSH interlock response to SSH_DORMOT_OT_ER: 0 = disabled, 1 = enabled	10	1								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
SSH_PZSURF_TMP		SSH +Z surface temp, EDAQ AD590 Row 4 Col 5					0	64	16	TRUE	TRUE	TRUE
SSH_STAT		Sunshield switch status			4	16	0	64	16	TRUE	TRUE	TRUE
STH_TMP_01		Structure temp 01, EDAQ AD590 Row 2 Col 5					0	64	16	TRUE	TRUE	TRUE
STH_TMP_02		Structure temp 02, EDAQ AD590 Row 2 Col 6					0	64	16	TRUE	TRUE	TRUE
STH_TMP_03		Structure temp 03, EDAQ AD590 Row 7 Col 3					0	64	16	TRUE	TRUE	TRUE
STH_TMP_04		Structure temp 04, EDAQ AD590 Row 6 Col 7					0	64	16	TRUE	TRUE	TRUE
SUBTLM_MAJOR_REV	SUBTMI_BUILD_ID	subtmi major rev num (0 to 7)	5	3								
SUBTLM_MINOR_REV	SUBTMI_BUILD_ID	subtmi minor rev num (0 to 31)	0	5								
SUBTMI_BUILD_ID		Subtmi file version			32	16	0	64	8	TRUE	TRUE	TRUE
SUNSEN1_TMP		Sun sensor 1 (temperature), EDAQ			32	8	8	64	16	TRUE	TRUE	TRUE
SUNSEN2_TMP		Sun sensor 2 (temperature), EDAQ			32	8	8	64	16	TRUE	TRUE	TRUE
SUNSEN3_TMP		Sun sensor 3 (temperature), EDAQ			32	8	8	64	16	TRUE	TRUE	TRUE
SVA_CMD_ERR	CMD_ERR_0	1 means an error occured while executing a SVA command.	11	1								
SVA_DOOR_STATE	SVA_STAT	SVA State, 0 = NOT_MOVING, 1 = OPENING, 2 = CLOSING	4	2								
SVA_DORMOT_OT_ER	IPU_ERR_4	SVA door motor over temperature fault	11	1								
SVA_DORMOT_OT_FM	IPU_FLT_STAT_0	SVA door motor OT fault management: 0=off, 1=on	10	1								
SVA_DORMOT_OTSP		SVA door motor over-temperature set point			32	8	8	64	16	TRUE	TRUE	TRUE
SVA_DORMOT_TMP		SVA drive motor temp, EDAQ			32	8	8	64	16	TRUE	TRUE	TRUE
SVA_DR_CLOSED	SVA_STAT	Space View Aperature Closed, 1= closed	0	1								
SVA_DR_NCLOSED	SVA_STAT	Space View Aperature Not Closed, 0= closed	1	1								
SVA_DR_NOPEN	SVA_STAT	Space View Aperature Not open, 0= open	3	1								
SVA_DR_OPEN	SVA_STAT	Space View Aperature open, 1= open	2	1								
SVA_MOTOR_CONFIG	SVA_STAT	SVA Drive Motor Configuration, 0= DISABLED, 1 = DRIVE CLOSED, 2 DRIVE OPEN (bits 0-1 of configuration register)	6	2								
SVA_MTGPLT_TMP		SVA mounting plate tmp, EDAQ ADC590 Row 7 Col 0			32	8	8	64	16	TRUE	TRUE	TRUE
SVA_STAT		SVA switch status			8	8	0	64	16	TRUE	TRUE	TRUE
TEU_BOX_TMP		TEU box EDAQ AD590 Row 7 Col 6			32	8	8	64	16	TRUE	TRUE	TRUE
TEU_CHKSUM_ERR	IPU_ERR_5	1 means TEU image checksum failed	7	1								
TEU_DBL_BIT_ERR	IPU_ERR_5	1 means TEU double bit RAM error occurred	9	1								
TEU_MNT_TMP		TEU box mount EDAQ AD590 Row 3 Col 7					0	64	16	TRUE	TRUE	TRUE
TEU_SGL_BIT_ERR	IPU_ERR_5	1 means TEU single bit RAM error occurred	8	1								
TICK_SOURCE	IPU_STAT_0	0 means the decrementer, 1 means the TimingGenerator.	0	1								
TICK_WATCHDOG_FM	IPU_FLT_STAT_0	0 = off, 1 = on	12	1								
TIME_GIRD_HD_ERR	IPU_STAT_2	1 = an error occurred in the last received GIRD Header timecode	0	1								
TLM_ACTIVE_SCIHK		Identifies active science HK format table			16	16	0	64	16	FALSE	FALSE	TRUE
TLM_AZP_BLK_ENA	SCI_FMT_BLK_ENA	Primary azimuth block enable	4	1								
TLM_AZS_BLK_ENA	SCI_FMT_BLK_ENA	Secondary azimuth block enable	13	1								
TLM_DB_BUILD_ID		Telemetry Database Build Version ID			32	16	0	64	8	TRUE	TRUE	TRUE
TLM_DIAG_BLK_ENA	SCI_FMT_BLK_ENA	Diagnostic block enable	12	1								
TLM_DIAG_STAT		Diagnostic format status word			16	16	0	64	16	TRUE	TRUE	TRUE
TLM_EL2P_BLK_ENA	SCI_FMT_BLK_ENA	Primary elevation 2 block enable	3	1								
TLM_EL2S_BLK_ENA	SCI_FMT_BLK_ENA	Secondary elevation 2 block enable	10	1								
TLM_ELVP_BLK_ENA	SCI_FMT_BLK_ENA	Primary variable elevation block enable	2	1								
TLM_ELVS_BLK_ENA	SCI_FMT_BLK_ENA	Secondary variable elevation block enable	9	1								
TLM_GYR0_BLK_ENA	SCI_FMT_BLK_ENA	Gyro 0 block enable	5	1								
TLM_GYR1_BLK_ENA	SCI_FMT_BLK_ENA	Gyro 1 block enable	6	1								
TLM_GYR2_BLK_ENA	SCI_FMT_BLK_ENA	Gyro 2 block enable	7	1								
TLM_GYR3_BLK_ENA	SCI_FMT_BLK_ENA	Gyro 3 block enable	8	1								
TLM_HK_BLK_ENA	SCI_FMT_BLK_ENA	Science housekeeping block enable	11	1								
TLM_MAJOR_REV	TLM_DB_BUILD_ID	tmi major rev num (0 to 7)	5	3								
TLM_MINOR_REV	TLM_DB_BUILD_ID	tmi minor rev num (0 to 31)	0	5								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
TLM_PATTERN	IPU_STAT_1	0 means normal pattern, 1 means Fixed HK, 2 means Fixed Sci, 3 means Simulated Data with decimation disabled, 4 means Simulated Data with decimation enabled, 5 means Simulated Data with decimation and 32 tap filter enabled. 6 and 7 are TBD	8	3								
TLM_RAD_BLK_ENA	SCI_FMT_BLK_ENA	Radiance data block enable	1	1								
TLM_SCI_HK_ACTIV	TLM_ACTIVE_SCIHK	Active table (0=default, 1=operational, 2=uploaded)	12	2								
TLM_SCI_HK_ID	TLM_ACTIVE_SCIHK	Science housekeeping table ID	0	10								
TLM_TIME_BLK_ENA	SCI_FMT_BLK_ENA	Time block enable	0	1								
TLM_TSS_AZOFFSET		Azimuth telemetry offset; value in telemetry which corresponds to zero			0	0	0	64	32	TRUE	TRUE	TRUE
TLM_TSS_ELOFFSET		Elevation telemetry offset; value in telemetry which corresponds to zero			0	0	0	64	32	TRUE	TRUE	TRUE
TLM_TSS_WXOFFSET		WobX telemetry offset; value in telemetry which corresponds to zero			0	0	0	64	32	TRUE	FALSE	TRUE
TLM_TSS_WYOFFSET		WobY telemetry offset; value in telemetry which corresponds to zero			0	0	0	64	32	TRUE	FALSE	TRUE
TMARK_CLK		Time Mark clock word (GROUND USE ONLY)					0	64	16	FALSE	FALSE	FALSE
TMARK_DATA		Time mark data word (GROUND USE ONLY)					0	64	16	FALSE	FALSE	FALSE
TP_BEU_TEMP_A		Passive Temp Ch7 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_BEU_TEMP_B		Passive Temp Ch15 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_CCU_TEMP_A		Passive Temp Ch3 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_CCU_TEMP_B		Passive Temp Ch11 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_CMPRSR_TMP_A		Passive Temp Ch2 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_CMPRSR_TMP_B		Passive Temp Ch10 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_IFC_BB_TMP_A		Passive Temp Ch6 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_IFC_BB_TMP_B		Passive Temp Ch14 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_IPU_TEMP_A		Passive Temp Ch0 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_IPU_TEMP_B		Passive Temp Ch8 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_PCU_TEMP_A		Passive Temp Ch1 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_PCU_TEMP_B		Passive Temp Ch9 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_SMA_MNT_TMP_A		Passive Temp Ch5 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_SMA_MNT_TMP_B		Passive Temp Ch13 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_TEU_TEMP_A		Passive Temp Ch4 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TP_TEU_TEMP_B		Passive Temp Ch12 (GROUND USE ONLY)			0	0	0	64	16	FALSE	FALSE	FALSE
TSB_ADDR_OFF		IPU address offset for the TSB					0	64	32	TRUE	FALSE	TRUE
TSB_BOOT_STAT_1		Combined IPU states for the TSB (see subtmi)			4	16	0	64	16	TRUE	FALSE	TRUE
TSB_BOOT_STAT_2		Combined IPU load info for the TSB (see subtmi)			4	16	0	64	16	TRUE	FALSE	TRUE
TSB_BOOT_STAT_3		Combined IPU cmd and index info for the TSB (see subtmi)			4	16	0	64	16	TRUE	FALSE	TRUE
TSB_BOOT_STAT_4		Combined IPU MBIC and override info for the TSB (see subtmi)			16	32	0	64	32	TRUE	FALSE	TRUE
TSB_CHKSUM_MATCH	IPU_STAT_0	1 means that the TSS telemetered expected and actual upload checksum match.	12	1								
TSB_DIAG_CHKSM_C		Ckecksum Error count, on TSU DIAG block			32	8	0	64	16	TRUE	FALSE	TRUE
TSB_EE_BOOT_FLAG	TSB_BOOT_STAT_4	ISU EE boot flag	19	2								
TSB_EE_BOOT_SRC	TSB_BOOT_STAT_3	HIR_IPU_TSUSECTION command Parameter 0	7	5								
TSB_EE_MBIC_ADDR	TSB_BOOT_STAT_4	Subcom MBIC Address in Word TSB_BOOT_STAT_4	0	19								
TSB_EE_MBIC_SUB	TSB_BOOT_STAT_4	Subcom Index of MBIC Address in Word TSB_BOOT_STAT_4, 0=MBIC A Start, 1=MBIC A End, 2=MBIC B Start, 3=MBIC B End	21	2								
TSB_EE_OVERIDE	TSB_BOOT_STAT_4	HIR_IPU_TSUSECTION command Parameter 1	23	9								
TSB_EE_TABLE		Subcommed EEPROM table entry (subcom index TSB_EE_TBL_INDEX)					0	64	32	TRUE	FALSE	TRUE
TSB_EE_TBL_INDEX	TSB_BOOT_STAT_3	Subcom Index of EE Table Array in Word TSB_EE_TABLE	0	7								
TSB_EEPROM_ON	TSB_BOOT_STAT_1	EEPROM Power State, 0= Power on, 1=Power off	7	1								
TSB_HK_CHKSM_CNT		Ckecksum Error count, on TSU HK block			32	8	0	64	16	TRUE	FALSE	TRUE
TSB_ID_ERR	IPU_ERR_3	1 means an TSU Hk or Diag invalid block ID	7	1								
TSB_IPU_ERR_CNT	TSB_BOOT_STAT_1	Number TSB IPU errors	8	4								
TSB_IPU_ERROR	TSB_BOOT_STAT_1	5=BadAddress, 6=EETableFail, 7=EEChecksumFail, 8=Timeout, 9=UserAbort, 10=AbnormalExit, 11=AcceptAndReject, 12=SyncError, 13=ChecksumError, 14=EEReadError, 15=Internal	3	4								
TSB_LAST_BLK	TSB_BOOT_STAT_2	Last Block loaded to the TSU	0	10								
TSB_SECT	TSB_BOOT_STAT_1	Actual EEPROM section used for TSU Boot	12	4								

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
TSB_STATE	TSB_BOOT_STAT_1	0=Reset, 1=InfoOnly, 2=InfoOnlyErrs, 3=Checking, 4=Loading, 5=Booting, 6=PostBoot	0	3								
TSB_SUB_STATE1	TSB_BOOT_STAT_2	Bits 30 thru 28 of TSB_ADDR_OFF	10	3								
TSB_SUB_STATE2	TSB_BOOT_STAT_2	Bit 8 of TSB_ADDR_OFF	13	1								
TSB_SUB_STATE3	TSB_BOOT_STAT_2	Bits 5 thru 4 of TSB_ADDR_OFF	14	2								
TSB_TLM_SUMD_ERR	IPU_ERR_0	1 means a TSU packet Diag block checksum error occurred	14	1								
TSB_TLM_SUMH_ERR	IPU_ERR_0	1 means a TSU packet HK block checksum error occurred	13	1								
TSB_TLM_SUMOK	IPU_STAT_1	1 means Checksum(s) OK for current TSU Tlm Packet	12	1								
TSB_UPLOAD_DONE	IPU_STAT_0	1 means that the TSS has received it's upload (i.e. the TSS telemeterd next expected block equals the total expected blocks +1)	13	1								
TSS_APP_CHKSM_C		TSS App code telemetry packet checksum error count					0	64	8	TRUE	TRUE	TRUE
TSS_CMD_ERR	CMD_ERR_0	1 means an error occured while executing a TSS command.	12	1								
TSS_CMD_QHSS_ERR	IPU_ERR_0	Spare IPU Error Bit	5	1								
TSS_CMDRJCT_NZ	IPU_STAT_0	1 means TSS telemetered Command Reject Count is not zero	14	1								
TSS_DBL_PKT_ERR	IPU_ERR_0	IPU received 2 packets from TEU in 1 CR (reset by faultclr)	15	1								
TSS_DMA_ERR_C		DMA Parity , Framing, HW Programming and phase error counters			0	0	0	64	16	TRUE	TRUE	TRUE
TSS_DMA_FRAME_C	TSS_DMA_ERR_C	DMA Framing error counter	4	4								
TSS_DMA_PARITY_C	TSS_DMA_ERR_C	DMA Parity error counter	0	4								
TSS_DMA_PHASE_C	TSS_DMA_ERR_C	DMA in progress error counter	12	4								
TSS_DMA_PROG_C	TSS_DMA_ERR_C	DMA HW cmd programming error counter	8	4								
TSS_DMA_PSEQ_ERR	IPU_ERR_3	1 means the TLM DMA packet counter was out of sequence	13	1								
TSS_DMA_PSEQ_OK	IPU_STAT_0	0 means an the TLM DMA packet counter was out of sequence	10	1								
TSS_HK_BSEQ_ERR	IPU_ERR_3	1 means an App HK block counter out of sequence	8	1								
TSS_HSS_CMDQ_ERR	IPU_ERR_3	1 means timeout occured waitng for TSS HSS CMD queue to be empty. TSS not powered or not functioning	14	1								
TSS_ID_ERR	IPU_ERR_3	1 means an App Hk or Sci invalid block ID	6	1								
TSS_RD_TEUSYNC		IPU read TEU DMA buffer sync, state counter					0	64	8	TRUE	FALSE	TRUE
TSS_RESET_TIME		Hirdls Time at Last TSS Reset					0	64	32	TRUE	FALSE	TRUE
TSS_SCI_BSEQ_ERR	IPU_ERR_3	1 means an App Sci block counter out of sequence	9	1								
TSS_SYNC_STATE	IPU_STAT_1	0 means IPU waiting for DMA address from TEU , 1 means IPU received DMA buffer addresses from TEU, IPU sending DMA address to TEU, 2 means IPU-TEU DMA buffers are in sync expect nominal communications	13	2								
TSS_TLM_LEN_CNT		Packet Length Error count, on TSS on tlm Channel					0	64	8	TRUE	FALSE	TRUE
TSS_TLM_LEN_ERR	IPU_ERR_0	specified	11	1								
TSS_TLM_NOPKT_C		No Packet count, on TSS on tlm Channel			32	8	0	64	8	TRUE	TRUE	TRUE
TSS_TLM_NOPKT_ER	IPU_ERR_0	1 means the IPU did not receive TSS data packet	10	1								
TSS_TLM_PKT_CNT		Packet count, on TSS on tlm Channel			32	8	0	64	8	TRUE	TRUE	TRUE
TSS_TLM_QHSS_ERR	IPU_ERR_0	1 means the TSS Tlm QHSS Channel encountered an error.	3	1								
TSS_TLM_STATE	IPU_STAT_0	0 means no TSS tlm, 1= SU HK Tlm, 2= SU DIAG and HK, 3= APP Tlm	8	2								
TSS_TLM_SUMA_ERR	IPU_ERR_0	1 means a TSW App code packet checksum error occurred	12	1								
TSS_TLM_SUMOK	IPU_STAT_1	1 means Checksum OK for current TSS Tlm Packet	11	1								
TSS_TLM_TOUT_ERR	IPU_ERR_3	1 means a timeout occured waiting for TSS TLM - resync occurred	12	1								
TSS_WR_TEUSYNC		IPU write TEU DMA buffer sync, state counter					0	64	8	TRUE	FALSE	TRUE
TSU_ALPHA_BUILD	TSU_BUILD_ID	1=ALPHA TEST BUILD, 0=CODE FREEZE/RELEASE	2	1								
TSU_BUILD_ID		TEU SUROM - S/W Bld Versn ID					0	64	16	TRUE	FALSE	TRUE
TSU_BUILD_NUM	TSU_BUILD_ID	BUILD NUMBER 0-99	3	7								
TSU_CACPT_CNT		TEU SUROM - Command accept count			4	8	0	64	16	TRUE	FALSE	TRUE
TSU_CMP_CKSUM		TEU SUROM - Computed checksum of total Program Image			32	32	0	64	32	TRUE	FALSE	TRUE
TSU_CPU_SIDE	TSU_BUILD_ID	0=SIDE A, 1=SIDE B, Read from LIO PID	0	1								
TSU_CREJ_CNT		TEU SUROM - Command reject count			4	8	0	64	16	TRUE	FALSE	TRUE
TSU_DBERR_CNT		TEU SUROM - EDAC double bit error cum count					0	64	16	TRUE	FALSE	TRUE
TSU_DIAG_BSEQ_ER	IPU_ERR_3	1 means an TSU DIAG block counter out of sequence	11	1								
TSU_DIAG_PKT_CNT		TEU SUROM - DIAG packet counter			4	8	0	64	16	TRUE	FALSE	TRUE
TSU_DUMP_ADDR		TEU SUROM - RAM dump address			32	32	0	64	32	TRUE	FALSE	TRUE

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
TSU_DUMP_NWORDS		Number of words in TSU Ram Dump					0	64	16	FALSE	FALSE	TRUE
TSU_ERR_INJECT	TSU_FLAG_BITS	1=Error injection enabled	8	1								
TSU_EXCEPTION	TSU_FLAG_BITS	1=Processor exception occurred	4	1								
TSU_FLAG_BITS		TEU SUROM - Watchdog frame			32	16	0	64	16	TRUE	FALSE	TRUE
TSU_GOOD_RAM		TEU SUROM - Start address of "good" RAM			32	8	0	64	16	TRUE	FALSE	TRUE
TSU_HK_BSEQ_ERR	IPU_ERR_3	1 means an TSU HK block counter out of sequence	10	1								
TSU_HK_PKT_CNT		TEU SUROM - HK packet counter			4	8	0	64	16	TRUE	FALSE	TRUE
TSU_LIOTRES		TEU SUROM - LIO test results			32	16	0	64	16	TRUE	FALSE	TRUE
TSU_MAJOR_REV	TSU_BUILD_ID	MAJOR_REVISION NUMBER 1-7	13	3								
TSU_MINOR_REV	TSU_BUILD_ID	MINOR_REVISION NUMBER 1-7	10	3								
TSU_NEXT_BLK		TEU SUROM - Next expected block number for Program Image upload			8	16	0	64	16	TRUE	FALSE	TRUE
TSU_RBERR_CNT		TEU SUROM - Read back fail count					0	64	16	TRUE	FALSE	TRUE
TSU_REJ_SIG		TEU SUROM - Reject command signature			4	8	0	64	16	TRUE	FALSE	TRUE
TSU_REJREAS		TEU SUROM - Command reject reason			4	16	0	64	16	TRUE	FALSE	TRUE
TSU_SBERR_CNT		TEU SUROM - EDAC single bit error cum count					0	64	16	TRUE	FALSE	TRUE
TSU_TLM_ID		TEU SUROM - telemetry ID (20 for HK only, 19 for HK plus Diag)					0	64	16	TRUE	FALSE	TRUE
TSU_TOTAL_BLKS		TEU SUROM - Program Image upload total expected block num			16	16	0	64	16	TRUE	FALSE	TRUE
TSU_UP_CKSUM		TEU SUROM - Expected checksum of total Program Image			32	32	0	64	32	TRUE	FALSE	TRUE
TSU_WDT_EXPIRED	TSU_FLAG_BITS	1=Watchdog Expired	0	1								
TSW_ACTIVE_EEA	TSW_HWCNFG	EEA side powered on: 00=none, 01=primary, 10=secondary, 11=both	7	2								
TSW_ALPHA_BUILD	TSW_CSCI_BLD_ID	0= TEU code is released, 1= TEU code is under development	2	1								
TSW_AZ_CONNECT	TSW_HWCNFG	Coil connected status, 0 = disconnected, 1 = connected	2	1								
TSW_AZ_MTR_I		Azimuth drive motor current @@AZMOTR_CRRT			4	8	8	64	16	TRUE	TRUE	TRUE
TSW_AZ_UNSHORTED	TSW_HWCNFG	Coil short status, 0 = shorted, 1 = unshorted	1	1								
TSW_AZC_FAULT	TSW_FAULT_STAT	Az cmd current exceeds limit, FM is mtr pwr disabled	14	1								
TSW_AZC_FM_STAT	TSW_CSC_STAT	Commanded current azimuth fault management, 0=disabled, 1=enabled	12	1								
TSW_AZC_POS		for control			0	0	0	64	32	FALSE	FALSE	FALSE
TSW_AZM_FAULT_1	TSW_FAULT_STAT	Az meas current exceeds limit 1, FM is cmd words set to 0	12	1								
TSW_AZM_FAULT_2	TSW_FAULT_STAT	Az meas current exceeds limit 2, FM is mtr pwr disabled	13	1								
TSW_AZM_FM_STAT	TSW_CSC_STAT	Measured current azimuth fault management, 0=disabled, 1=enabled	11	1								
TSW_AZMTRDRVCMD		Commanded torque in azimuth					0	64	16	TRUE	TRUE	TRUE
TSW_AZP_INDEX		Azimuth Primary index val					0	64	16	TRUE	TRUE	TRUE
TSW_AZP_INIT	TSW_SM_EI_STAT	Primary Azimuth encoder initialized, 0 = false, 1 = true	8	1								
TSW_AZP_OFFSET		Encoder offset value (32 bits) for Azimuth Primary					0	64	32	TRUE	FALSE	TRUE
TSW_AZP_POS		Raw Primary azimuth position			8	32	0	64	32	TRUE	TRUE	TRUE
TSW_AZPOS_CONST	TSW_SM_EI_STAT	AzPosConstant (archaic), 0 = false, 1 = true	3	1								
TSW_AZS_INDEX		Azimuth Secondary index value					0	64	16	TRUE	TRUE	TRUE
TSW_AZS_INIT	TSW_SM_EI_STAT	Secondary Azimuth encoder initialized, 0 = false, 1 = true	12	1								
TSW_AZS_OFFSET		Encoder offset value (32 bits) for Azimuth Secondary					0	64	32	TRUE	FALSE	TRUE
TSW_AZS_POS		RAW Secondary azimuth encoder position			8	32	0	64	32	TRUE	TRUE	TRUE
TSW_BUILD_NUM	TSW_CSCI_BLD_ID	Build Number, release number is CPU_TYPE.REVISION.BUILD_NUM	3	7								
TSW_CHOP_FAULT	TSW_FAULT_STAT	Chopper fault occurred, nominal = 0 /over power = 1	0	1								
TSW_CHOP_FM_STAT	TSW_CSC_STAT	Chopper fault management, 0= disabled, 1= enabled	5	1								
TSW_CHOP_MTR_I		Chopper motor current @@CHOPMOT_CRRT 112			4	16	0	64	16	TRUE	TRUE	TRUE
TSW_CHOPPER_CNT	TSW_HWCNFG	Chopper connection status: 00=disconnected, 01=A connected, 10=B connected, 11=both connected	11	2								
TSW_CHOPPER_ENA	TSW_HWCNFG	0 = disabled, 1 = enabled	13	1								
TSW_CHOPPER_HCM	TSW_HWCNFG	High current mode flag, 0 = off, 1 = on	15	1								
TSW_CHOPPER_SYNC	TSW_HWCNFG	Chopper in-sync flag, 0 = false, 1 = true	14	1								
TSW_CHSUM_FAULT	TSW_FAULT_STAT	Memory Scrub detected program checksum error	6	1								
TSW_CLOCK_FAULT	TSW_FAULT_STAT	Lost Scanner Strobe, fall back to internal clock mode	5	1								
TSW_CLOCK_SEL		TSS synchronization source			8	8	0	64	16	TRUE	TRUE	TRUE
TSW_CMDA_CNT		Command accept count			4	8	0	64	16	TRUE	TRUE	TRUE

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
TSW_CMDA_SIG		Accepted command signature			4	16	0	64	16	TRUE	TRUE	TRUE
TSW_CMDACC_SIG	TSW_CMDA_SIG	Command signature	8	8								
TSW_CMDQOVRF_ERR	TSW_QHSS_ERR_C	QHSS command queue overflow error count since reboot (v4.82 and later only)	4	4								
TSW_CMDR_CNT		Command reject count			4	8	0	64	16	TRUE	TRUE	TRUE
TSW_CMDR_SIG		Rejected command signature in high byte, reject reason in low byte			4	16	0	64	16	TRUE	TRUE	TRUE
TSW_CMDREJ_REAS	TSW_CMDR_SIG	Command reject reason	0	8								
TSW_CMDREJ_SIG	TSW_CMDR_SIG	Command reject signature	8	8								
TSW_CNTRL_AZ	TSW_EEACNFG	Control encoder for azimuth, 00=none, 01=primary, 10=secondary, 11=forbidden	0	2								
TSW_CNTRL_EL	TSW_EEACNFG	Control encoder for elevation, 00=none, 01=primary, 10=secondary, 11=forbidden	4	2								
TSW_CNTRL_RH	TSW_EEACNFG	Control read head, 00=forbidden, 01=EL RH1, 10=EL RH2, 11=Ave 1&2	8	2								
TSW_CPU_SIDE	TSW_CSCI_BLD_ID	0 means A side, 1 means B side	0	1								
TSW_CPU_TYPE	TSW_CSCI_BLD_ID	0 is unused, 1 means an INTEL PC, 2 means the EM PSA-32, 3 is the PFM PSA-32 4,5,6,7 are unused	13	3								
TSW_CR_SS_INDEX	TSW_CR_SYNC_STAT	Value of Scanner Strobe index internal to TEU when CR detected	0	4								
TSW_CR_SS_OUTSYN	TSW_CR_SYNC_STAT	Number Times CR interval incorrect once sync SS to CR	8	4								
TSW_CR_SS_SYNC	TSW_CR_SYNC_STAT	Number Times SS index reset to sync SS to CR	4	4								
TSW_CR_START_CNT	TSW_CR_SYNC_STAT	Number of Times chopper tried to start	12	2								
TSW_CR_SYNC_STAT		Chopper rotation sync status			32	16	0	64	16	TRUE	TRUE	TRUE
TSW_CRIT_MAX		Max critical time in last 64 CRs, 4 usec/count					0	64	8	TRUE	TRUE	TRUE
TSW_CSC_STAT		TSW CSC enable/disable status @@TEU_TSW_STAT			8	16	0	64	16	TRUE	TRUE	TRUE
TSW_CSCI_BLD_ID		Telescope S/W Bld Versn ID			32	16	0	64	16	TRUE	FALSE	TRUE
TSW_CTL_ERR_AZ		SM AZ control error (meas - cmd) (0.01 urad/count)			4	16	0	64	16	TRUE	TRUE	TRUE
TSW_CTL_ERR_EL		SM EL control error (meas - cmd) (0.01 urad/count)			4	16	0	64	16	TRUE	TRUE	TRUE
TSW_CTL_INDEX		Scan mirror cntrl list crrnt index			4	8	0	64	16	TRUE	TRUE	TRUE
TSW_DACQ_STAT	TSW_CSC_STAT	Data Acquisition CSC status, 0 = disabled, 1 = enabled	3	1								
TSW_DMA_ERR	TSW_QHSS_ERR_C	Transmit-DMA-NOT-complete error count since reboot (v4.82 and later only)	8	4								
TSW_DMA_NC_ERR	TSW_DMA_R_ERR_C	DMA-not-complete errors detected since reboot (v4.82 and later only)	12	4								
TSW_DMA_R_ERR_C		Counters for 4 errors			0	0	0	64	16	TRUE	TRUE	TRUE
TSW_DUMP_ADDR		Dump address			16	32	0	64	32	FALSE	FALSE	TRUE
TSW_EEA_FM_STAT	TSW_CSC_STAT	EEA fault management, 0= disabled, 1= enabled	6	1								
TSW_EEACNFG		EEA configuration word			8	16	0	64	16	TRUE	TRUE	TRUE
TSW_EI_CLOOP	TSW_SM_EI_STAT	Closed loop EI active, 0 = false, 1 = true	15	1								
TSW_EI_OLOOP	TSW_SM_EI_STAT	Open loop EI active, 0 = false, 1 = true	11	1								
TSW_EIC_STAT	TSW_SM_EI_STAT	Encoder initialization control status bits	8	8								
TSW_EINIT_STAT	TSW_CSC_STAT	Encoder Init CSC status, 0 = disabled, 1 = enabled	0	1								
TSW_EL1_CONNECT	TSW_HWCNFG	Coil connected status, 0 = disconnected, 1 = connected	4	1								
TSW_EL1_MTR_I		Elevation 1 motor current @@ELMOTR1_CRRT 105			4	8	8	64	16	TRUE	TRUE	TRUE
TSW_EL1_UNSHORTD	TSW_HWCNFG	Coil short status, 0 = shorted, 1 = unshorted	3	1								
TSW_EL1C_POS		selected for control			0	0	0	64	32	FALSE	FALSE	FALSE
TSW_EL1MTRDRVCMD		Commanded torque in elevation 1					0	64	16	TRUE	TRUE	TRUE
TSW_EL1P_INDEX		Elevation 1 Primary index value					0	64	16	TRUE	TRUE	TRUE
TSW_EL1P_INIT	TSW_SM_EI_STAT	Primary Elevation 1 encoder initialized, 0 = false, 1 = true	10	1								
TSW_EL1P_OFFSET		Encoder offset value (32 bits) for Elevation 1 Primary					0	64	32	TRUE	FALSE	TRUE
TSW_EL1P_POS		Raw Primary elevation 1 position			8	32	0	64	32	TRUE	TRUE	TRUE
TSW_EL1S_INDEX		Elevation 1 Secondary index value					0	64	16	TRUE	TRUE	TRUE
TSW_EL1S_INIT	TSW_SM_EI_STAT	Secondary Elevation 1 encoder initialized, 0 = false, 1 = true	14	1								
TSW_EL1S_OFFSET		Encoder offset value (32 bits) for Elevation 1 Secondary					0	64	32	TRUE	FALSE	TRUE
TSW_EL1S_POS		Raw Secondary elevation 1 position			8	32	0	64	32	TRUE	TRUE	TRUE
TSW_EL2_CONNECT	TSW_HWCNFG	Coil connected status, 0 = disconnected, 1 = connected	6	1								
TSW_EL2_MTR_I		Elevation 2 motor current @@ELMOTR2_CRRT			4	8	8	64	16	TRUE	TRUE	TRUE
TSW_EL2_UNSHORTD	TSW_HWCNFG	Coil short status, 0 = shorted, 1 = unshorted	5	1								
TSW_EL2C_POS		selected for control			0	0	0	64	32	FALSE	FALSE	FALSE
TSW_EL2MTRDRVCMD		Commanded torque in elevation 2					0	64	16	TRUE	TRUE	TRUE

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
TSW_EL2P_INDEX		Elevation 2 Primary index va					0	64	16	TRUE	TRUE	TRUE
TSW_EL2P_INIT	TSW_SM_EI_STAT	Primary Elevation 2 encoder initialized, 0 = false, 1 = true	9	1								
TSW_EL2P_OFFSET		Encoder offset value (32 bits) for Elevation 2 Primary					0	64	32	TRUE	FALSE	TRUE
TSW_EL2P_POS		Raw Primary elevation 2 position			8	32	0	64	32	TRUE	TRUE	TRUE
TSW_EL2S_INDEX		Elevation 2 Secondary index value					0	64	16	TRUE	TRUE	TRUE
TSW_EL2S_INIT	TSW_SM_EI_STAT	Secondary Elevation 2 encoder initialized, 0 = false, 1 = true	13	1								
TSW_EL2S_OFFSET		Encoder offset value (32 bits) for Elevation 2 Secondary					0	64	32	TRUE	FALSE	TRUE
TSW_EL2S_POS		Raw Secondary elevation 2 position			8	32	0	64	32	TRUE	TRUE	TRUE
TSW_ENCP_STAT		EEA primary channel set status			8	16	0	64	16	TRUE	TRUE	TRUE
TSW_ENCS_STAT		EEA secondary channel set status			8	16	0	64	16	TRUE	TRUE	TRUE
TSW_EXCEPT_ADDR	TSW_EXCEPTION	Address of last exception/4	0	19								
TSW_EXCEPT_CNT	TSW_EXCEPTION	Number of exceptions since last clear	20	8								
TSW_EXCEPT_ENA	TSW_EXCEPTION	Exception skip disabled if high	19	1								
TSW_EXCEPT_OCCR	TSW_EXCEPTION	Exception occurred if high	31	1								
TSW_EXCEPT_TYPE	TSW_EXCEPTION	Type of last exception (0=FPU, 2=MCI, 3=OSI, 4=ISI, 6=AI, 7=PI)	28	3								
TSW_EXCEPTION		Exception status for TEU flight software			0	0	0	64	32	TRUE	TRUE	TRUE
TSW_EXEC_OVERRUN		TSW Executive overrun counter			32	8	0	64	8	TRUE	TRUE	TRUE
TSW_FAULT_STAT		Fault status information for TSW			8	16	0	64	16	TRUE	TRUE	TRUE
TSW_FRAMING_ERR	TSW_DMA_R_ERR_C	Framing errors detected since reboot (v4.82 and later only)	4	4								
TSW_FREQ		Chopper pre-scalar value used for scan mirror control time tick			16	16	0	64	16	TRUE	TRUE	TRUE
TSW_HK_PKT_CNT		TSW HK Packet Counter			4	8	0	64	16	TRUE	TRUE	TRUE
TSW_HWCMD_STAT	TSW_CSC_STAT	Hardware Command Handling CSC status, 0 = disabled, 1 = enabled	2	1								
TSW_HWCNFG		TSS hardware configuration @@ TSS_HW_CFIG			8	16	0	64	16	TRUE	TRUE	TRUE
TSW_KEEPALIV_ERR	TSW_QHSS_ERR_C	Keep-alive-NOT-detected error count since reboot (v4.82 and later only)	0	4								
TSW_MAX_SSTIME		Max number of microsec between successive SS within a MAF					0	64	16	TRUE	TRUE	TRUE
TSW_MEM_SCRUB		Single bit error count					0	64	16	TRUE	TRUE	TRUE
TSW_MIN_SSTIME		Min number of microsec between successive SS within a MAF					0	64	16	TRUE	TRUE	TRUE
TSW_MTR_PWR	TSW_HWCNFG	Motor power status, 0 = disabled, 1 = enabled	0	1								
TSW_MTRCTRG		DIO scan mirror motor control reg					0	64	16	TRUE	FALSE	TRUE
TSW_N15VSUP		Negative 15V supply @@ TEU_N9V			32	8	8	64	16	TRUE	TRUE	TRUE
TSW_P15VSUP		Positive 15V supply 1 @@TEU_P9V			32	8	8	64	16	TRUE	TRUE	TRUE
TSW_P5VREF1		Positive 5V reference 1 @@TEU_ADC0_REF			32	8	8	64	16	TRUE	TRUE	TRUE
TSW_P5VREF2		Positive 5V reference 2 @@TEU_ADC1_REF			32	8	8	64	16	TRUE	TRUE	TRUE
TSW_P5VSUP		Positive 5V supply 1 @@TEU_P5V			32	8	8	64	16	TRUE	TRUE	TRUE
TSW_PARITY_ERR	TSW_DMA_R_ERR_C	Parity erors detected since reboot (v4.82 and later only)	0	4								
TSW_PEEA_FAULT	TSW_FAULT_STAT	Primary EEA fault occurred, nominal = 0 /fault type = 1 or 2	1	2								
TSW_PIFCTLRG		DIO primary I/F cntrl register			32	16	0	64	16	TRUE	TRUE	TRUE
TSW_PRIIF_STAT		Primary EEA/TEU channel I/F status			16	16	0	64	16	TRUE	TRUE	TRUE
TSW_PROGRAM_ERR	TSW_DMA_R_ERR_C	QHSS programming errors detected since reboot (v4.82 and later only)	8	4								
TSW_QHSS_ERR_C		Counters for 4 errors			0	0	0	64	16	TRUE	TRUE	TRUE
TSW_REVISION	TSW_CSCI_BLD_ID	Revision number	10	3								
TSW_SAFE_NOW	TSW_SM_EI_STAT	Safing Mirror (12 sec process), 0 = false, 1 = true	2	1								
TSW_SAFE_WAIT	TSW_SM_EI_STAT	Waiting to Safe (30 sec time-out), 0 = false, 1 = true	4	1								
TSW_SCAN_ACTIVE	TSW_SM_EI_STAT	Scan Active - under closed loop control, 0 = false, 1 = true	1	1								
TSW_SCAN_START	TSW_SM_EI_STAT	Scan Start Received, 0 = false, 1 = true (Cleared next SS)	0	1								
TSW_SCBD_TMP		Signal Conditioning Board Temperature					0	64	16	TRUE	TRUE	TRUE
TSW_SCI_AZPO_CMD		TSW commanded Az position			4	16	0	64	16	TRUE	TRUE	TRUE
TSW_SCI_ELPO_CMD		TSW commanded El position			4	16	0	64	16	TRUE	TRUE	TRUE
TSW_SCI_PKT_CNT		TSW SCI Packet Counter			32	8	0	64	16	TRUE	FALSE	TRUE
TSW_SCON_STAT		Signal conditioning module status @@TEU_SIGCON_STAT					0	64	16	TRUE	FALSE	TRUE
TSW_SECIF_STAT		Secondary EEA/TEU channel I/F stat			16	16	0	64	16	TRUE	TRUE	TRUE
TSW_SEEA_FAULT	TSW_FAULT_STAT	Secondary EEA fault occurred, nominal = 0 /fault type = 1 or 2	3	2								
TSW_SIFCTLRG		DIO secondary I/F cntrl register			32	16	0	64	16	TRUE	TRUE	TRUE

Mnemonic	Parent	Description	Subtmi		Engineering Telemetry			Science Telemetry				
			Position (bits)	Size (bits)	Period (s)	Size (bits)	Shift (bits)	Period (CR)	Size (bits)	Def	Opr	All
TSW_SM_EI_SPARE	TSW_SM_EI_STAT	Spare	5	3								
TSW_SM_EI_STAT		Scan mirror control CSC status			8	16	0	64	16	TRUE	TRUE	TRUE
TSW_SMC_STAT	TSW_CSC_STAT	Scan Mirror Control CSC status, 0 = disabled, 1 = enabled	1	1								
TSW_SMCTL_STAT	TSW_SM_EI_STAT	Scan mirror control status bits	0	8								
TSW_SPARE_ECNFG1	TSW_EEACNFG	Spare	2	1								
TSW_SPARE_ECNFG2	TSW_EEACNFG	Spare	10	6								
TSW_SPARE_HCNFG0	TSW_HWCNFG	Spare	9	2								
TSW_SS_STAT	TSW_CSC_STAT	Subsystem Support CSC status, 0 = disabled, 1 = enabled	4	1								
TSW_SSWD_STAT	TSW_CSC_STAT	Scanner strobe watchdog status, 0 = disabled, 1 = enabled	9	1								
TSW_SYNC_FAULT1	TSW_FAULT_STAT	Chopper Rotation Signal Not detected in expected Scanner Strobe	7	1								
TSW_SYNC_FAULT2	TSW_FAULT_STAT	Average SS cycle time does not match Chopper Freq Info in TEU	8	1								
TSW_SYNC_FAULT3	TSW_FAULT_STAT	Jitter in SS cycle time exceeds limits	9	1								
TSW_SYNC_FAULT4	TSW_FAULT_STAT	Interval between Chopper Rotation Signal detection NOT 12 SS events	10	1								
TSW_SYNC_FAULT5	TSW_FAULT_STAT	Fault4 detected at least once in last 5 sec	11	1								
TSW_TABLEN		Number of lines in the current table			32	8	0	64	16	TRUE	TRUE	TRUE
TSW_TEST_ANGLE	TSW_EEACNFG	Test angle mode off (0) or on (1)	3	1								
TSW_TLM_DIAGSTAT	TSW_CSC_STAT	Diagnostic telemetry test pattern, 0=off, 1=on (test data output)	10	1								
TSW_TLM_ID		TSS telemetry ID (51)					0	64	16	TRUE	FALSE	TRUE
TSW_TLM_TST_STAT	TSW_CSC_STAT	Default telemetry test pattern, 0=off, 1=on (test data output)	7	1								
TSW_TOT_MAX		Max total time in last 64 CRs, 4 microsec/count					0	64	8	TRUE	TRUE	TRUE
TSW_WBDAT1		Wobble sensor data @@WOBB_SENS1			4	16	0	8	16	TRUE	TRUE	TRUE
TSW_WBDAT2		Wobble sensor data @@ WOBB_SENS2			4	16	0	8	16	TRUE	TRUE	TRUE
TSW_WD_STAT	TSW_CSC_STAT	Watchdog Timer, 0=disabled, 1=enabled	8	1								
TURN_OFF_HIRDLS	IPU_ALIVE	If = 111, spacecraft to power off HIRDLS	5	3								
UPL_CMD_ERR	CMD_ERR_0	1 means an error occured while executing a UPL command.	1	1								
WATCHDOG_FM	IPU_FLT_STAT_0	0 means Fault Management for this error is off, 1 on	5	1								
WSE_BOX_TMP		WSE box temp, EDAQ AD590 Row 0 Col 3			32	8	8	64	16	TRUE	TRUE	TRUE

SP-HIR-103
(Second Draft)
VOLUME III

HIRDLS

HIGH RESOLUTION DYNAMICS LIMB SOUNDER

Originator: J. G. Whitney
(with inputs from LMMS)

SECOND DRAFT

Date: 18 Aug 99

Subject / Title **COMMAND & TELEMETRY HANDBOOK (C&TH) - Vol. III**
(HIRDLS Command and Telemetry Packet Formats, Protocols &Timing)

Contents / Description / Summary:

This document (3 volumes) includes descriptions of all aspects of the HIRDLS Instrument command, control, telemetry, activation and autonomous health & safety and fault management.

Two major related operational computer files are the "HIRDLS Command Database" and the "HIRDLS Telemetry Database". Other operational files include HIRDLS "STOL Procedure" files and "HIRDLS Microload" files. These files are frequently referred to in Volume I of this document, and are described in Volume II.

Operational aspects of this document are intended to apply primarily post-launch. Pre-launch command and telemetry usage will be basically the same, except where indicated herein, and allowing for any operational constraints and requirements given in the HIRDLS-S/C Integration & Test documentation, which shall take precedence over the C&TH in the event of conflict.

RELEASED WITH CMD DB v.4.0 AND TLM DB v.4.1

Summary of Volumes

VOLUME I HIRDLS Operation, Commanding, Verification & Telemetry
VOLUME II Compendium of HIRDLS Command & Telemetry Files & Databases
VOLUME III Command & Telemetry Packet Formats, Data Blocks, Protocols &Timing

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Change/Release History (Vol. III)

***** R = release; C = changes since previous release

Event *	Date	Version	Section/Table	Change / Comment
R	98-11-13	1st draft	Vol. III	1st uncontrolled draft available to LMMS for review
C			various	Changes not listed here
R		2nd draft	Vol. III	This draft released at same time as first formal release of Vol. I, version 4.0 of Cmd Databas files, version 4.1 of Tlm Databas files

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1 OVERVIEW

Unless stated otherwise, the command and telemetry packet and data format definitions given in the GIRD are applicable to HIRDLS.

All command packets will have essentially the same format.

The HIRDLS Instrument generates two distinct telemetry data streams, the Science Data stream and the Engineering Data stream. Each data stream comprises data packets which are presented to the 1553 Instrument-S/C interface, and - if 'ready' - are transferred in response to polling signals generated by the S/C. Each polling event results in the transmission of a single data packet, so that the polling rate must be not less than the maximum packet generation rate for each Stream. In general some S/C polling events will therefore receive a null response.

Both the Engineering Data and the Science Data stream packets are structured, each part ("field") having attributes as described in Sections 3 and 4 respectively. See Vol. I, Section 1.4 for a general description of the Engineering telemetry definitions and timing attributes.

The HIRDLS-specific attributes (i.e. those not completely defined by the GIRD) applicable to the 1553 interface with the S/C are not addressed in this C&TH. They are described in "Interface Control Document for [HIRDLS /EOS-CHEM]", TRW document # D26477. The following sections of that document are relevant:

6.5.5.4 Instrument RT address assignment

6.5.5.5 Instrument RT sub-address assignment

6.5.5.11 Illegal command monitoring

6.5.6.1 [Some additional applicable APID values listed here]

6.5.6.6 HIRDLS 1553B Messages

6.5.8.6 Engineering data transfer

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6.5.9.5 Science data transfer cycle

6.5.9.6 Science data sampling rate, data transfer cycle and time gap

6.5.9.7 [Additional] science data formats

6.5.10 Ancillary data transfer

2 COMMAND PACKET FORMATS

2.1 General

Command packet attributes which are not specific to the HIRDLS Instrument, or which are not defined or controlled by the HIRDLS Project, will not be described in this document. Such attributes are expected to conform to the GIRD requirements, but may be the subject of deviation agreements. In this section the terms used and the packet structure being described are as illustrated in Section 6.5 of the GIRD.

HIRDLS commands and "microloads" (memory loads) will use the same command packet structure.

Each command packet will contain one command only, and consecutive packets will be separated by a time interval of at least 13 ms.

2.2 Primary Header (HIRDLS-specific fields)

The Packet ID field includes the Application Process ID (APID) number; the value"1600" (decimal) has been assigned to all HIRDLS command packets except the "Soft Reset" command. The latter is assigned an APID of 1601: on receiving this command from the ground, the S/C will strip off the CCSDS header and send the stripped command to the Instrument as a single (16 bit) word.

2.3 Data Zone

The Secondary Header (bits 1 through 7) contains the Command Function Code. This is the command ID number shown for each command in Vol. I of this C&TH and in the Command List (see Vol. II of this C&TH). The Instrument Data Field bit pattern will also be as shown in the Command List

3 ENGINEERING DATA PACKET FORMATS

3.1 Summary of Engineering Data Packet Attributes

3.1.1 Packet Rate

HIRDLS Engineering Data packets are generated at a constant rate - one packet every 4 seconds. Unlike the Science Data packet rate, the Engineering Data packet rate is not related to the Chopping frequency.

3.1.2 Packet Type & Structure

There will be two types of Engineering Data packet, referred to herein as the Start-up packet and the Normal packet. The Start-up packet is generated while the Instrument Processor (IProc) is booting up. On successful completion of boot-up, Normal packets will thereafter be generated. Both types of packet will contain three fields - a GIRD-defined (CCSDS) header field, a HIRDLS header field and a Data field. Each field comprises well-defined data blocks as described below.

3.1.3 Contents & Usage

HIRDLS Engineering Data packets contain a subset of the Science Data. No information is included in the Engineering Data which is not also in the Science Data. The purpose of the Engineering Data stream is to provide a convenient way to make housekeeping and health data available in near-real time (NRT) both on the S/C and on ground for use by the FOT and Instrument teams.

3.2 Normal Engineering Data Packet

This section defines the HIRDLS Normal Engineering Data Packet, i.e. after the IProc has booted-up and the Telemetry Formatter CSC has been activated. Fig. 3.2-1 illustrates the structure of the Normal Engineering packet:-

3.2.1 Later

3.3 Start-up Engineering Data Packet

The Start-up packet is generated while the Instrument Processor (IProc) is booting up. Fig. 3.3-1 illustrates the structure of the Start-up Engineering packet:-

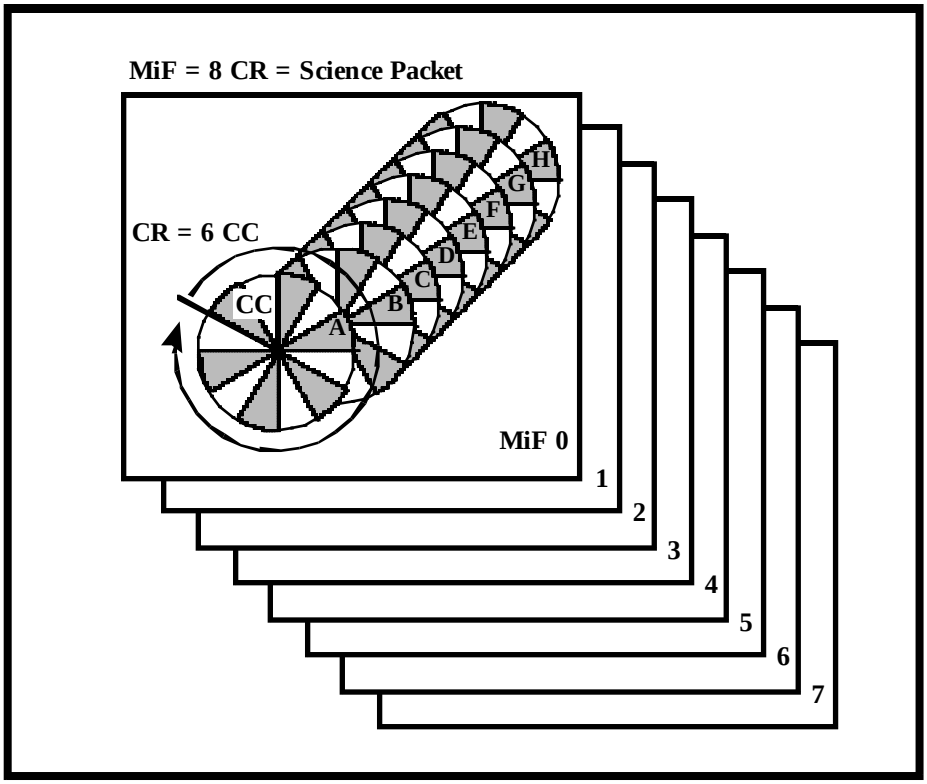
3.3.1 Later

4 SCIENCE DATA PACKET FORMATS

4.0 Science Telemetry Frame Rates & Timing Definitions

The timing of all HIRDLS command, data sampling and science telemetry functions is related to the HIRDLS chopper frequency and phase. Fig. 4.0-1 depicts a cycle of eight Chopper Revolutions, which occupy the period corresponding to a single Science packet (one Minor Frame). A set of eight Science packets occupies the period corresponding to a Major Frame. Within a Major Frame some data are commutated at a MiF rate, and these are decommutated by reference to the "MiF subcomm" counter (see Section 4.3.3).

Fig. 4.0-1 Relation Between Science Data Timing and Chopper Revolutions



The terminology and definitions shown in Table 4.0-1 describe time periods and frequencies by which the HIRDLS Science telemetry is organized.

Table 4.0-1 Science Telemetry Frame Rates & Timing Definitions

NAME	NOMINAL PERIOD	NOMINAL FREQUENCY	RANGE (Hz) **	DESCRIPTION
Chopper **C**ycle (**CC**)	2 ms	500 Hz	480 - 520	Corresponds to 1 chopper tooth + gap = 1 cycle of detector signal waveform.
Chopper **R**evolution (**CR**)	12 ms	83.3 Hz	80.00 - 86.67	6 Chopper Cycles; primary telemetry sample rate; sync pulse will be generated by Chopper once per revolution.
Minor **F**rame (**MiF**)	96 ms	10.8 Hz	10.000 - 10.833	8 Chopper Revolutions; 1 Science data packet is generated every Minor Frame.
Major **F**rame (**MaF**)	768 ms	1.3 Hz	1.250 - 1.354	8 Minor Frames

** programmable

4.1 Summary of Science Data Packet Attributes

4.1.1 Packet Rate

HIRDLS Science Data packets are generated at a nominal rate of approximately 10.4 per second. The exact rate is given by (**fc** ÷ 48), where **fc** is the HIRDLS Chopping frequency: nominally 500 Hz. However, **fc** is programmable between 480 and 520 Hz; therefore the Science Data packet rate will vary accordingly. It is emphasised, however, that **fc** will probably not be changed after launch, and that if this is necessary the change will be properly co-ordinated with the FOT.

An important aspect of the above is that - since the HIRDLS Science Data rate (i.e. bit rate) is nominally fixed at 65 kbits/s, the packet size will vary according to the selected Chopping frequency and therefore the packet rate. See Section 4.3.2 below (APID selection).

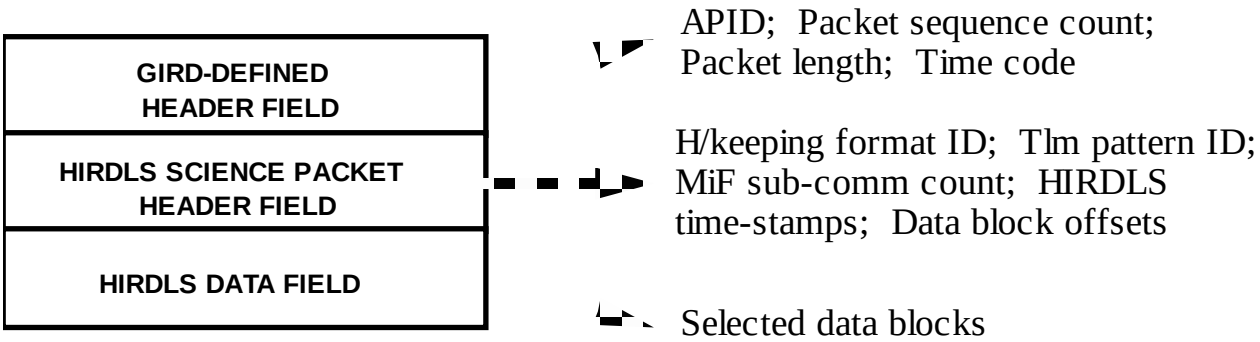
4.1.2 Packet Type & Structure

There will be two types of Science Data packet, referred to herein as the Start-up packet and the Normal packet. The Start-up packet is generated while the Instrument Processor (IProc) is booting up. Thereafter, normal packets will be generated. Both types of packet will contain three fields - a GIRD-defined (CCSDS) header field, a HIRDLS header field and a Data field. Each field comprises well-defined data blocks as described below.

4.2 Normal Science Data Packet

This section defines the HIRDLS Normal Science Data Packet, i.e. after the IProc has booted-up and the Telemetry Formatter CSC has been activated. Fig. 4.2-1 illustrates the structure of the Normal Science packet:-

Fig. 4.2-1 Normal Science Packet Structure



4.2.1 General Description of Normal Science Data Packet

A Normal Science Data Packet consists of the GIRD-defined Primary and Secondary Headers, a Science Packet Header, Science Data Blocks, a Diagnostic Data Segment, and a Checksum. The Science Packet size is basically fixed (adjustable only by changes to the S/C Telemetry Bus Scheduler - see Section 4.2.2). Each data block is fixed in length, with the following caveats:

- Data Blocks may be omitted
- Radiance data channel selection and sample rate may be changed on command
- Science Housekeeping Data may be changed on command
- Diagnostic Data (if selected) uses the remaining unallocated space in the Science Packet

If more data is requested (by ground command) than can fit, the data blocks are either not included or they are truncated. The checksum is always included. It is the responsibility of the flight operations team to ensure that the amount of data requested does not exceed the packet size. For details on how to select the required format option, see Section 5 below.

4.2.2 GIRD-defined Header Field

The CCSDS primary and secondary headers are defined in GIRD Section 6.5. An offset of 8 bits is required to align the remaining data on 16 bit word boundaries used by the 1553 communications protocol. The detailed bit-filling of the GIRD primary and secondary headers and the bit-fill required for the 1553 are shown in Figure 4.2.2-1.

Fig. 4.2.2-1 GIRD Header with Word Alignment Fill

	<---------- Bit Position ---------->															
Word	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	0	0	0	1	Application Process ID (APID)										
1	1	1	Packet Sequence Count													
2	Packet Length															
3	0	0	0	0	0	0	QL	0	1	0	1	0	1	1	1	0
4	0	S/C Leap Seconds							S/C Coarse Time bits 31-24							
5		S/C Coarse Time bits 23-16							S/C Coarse Time bits 15-8							
6		S/C Coarse Time bits 7-0							S/C Fine Time bits 15-8							
7		S/C Fine Time bits 7-0							Spare (Word Alignment Fill)							

The **Application Process ID (APID)** has an implied packet size which must match the S/C Telemetry Bus Scheduler's expected size. As explained in Section 4.1.1 above, the packet size will need to be adjusted to allow for the whole commandable range of Chopping frequencies. Therefore, a unique APID must be assigned to each packet size.

A block of APID values in the range 1600 to 1663 has been allocated to HIRDLS. These are listed in Table 4.2.2-1. The values shown in bold are currently assigned for use.

Table 4.2.2-1 HIRDLS APID Definitions

APID	MNEMONIC	PACKET SIZE		DESCRIPTION
		BYTES	BITS	
1600	**CMD**	**64**	**512**	**Command Packet**
1601	**SOFT_RESET**	**10**	**80**	**Soft_Reset**
1602	**TIME_CODE**	**16**	**128**	**Broadcast Time Code**
1603	**ANCILLARY**	**64**	**512**	**Broadcast Ancillary Data Set**
1604	ENG_512A	64	512	Normal Engineering Data Packet (1 Per Sec)
1605	ENG_512B	64	512	Normal Engineering Data Packet (1 Per Sec)
1606	ENG_512C	64	512	Normal Engineering Data Packet (1 Per Sec)
1607	ENG_512D	64	512	Normal Engineering Data Packet (1 Per Sec)
1608	ENG_1024	128	1024	Normal Engineering Data Packet (1 Per 2 Sec)
1609	ENG_1024	128	1024	Normal Engineering Data Packet (1 Per 2 Sec)
1610	ENG_1024	128	1024	Normal Engineering Data Packet (1 Per 2 Sec)
1611	ENG_1024	128	1024	Normal Engineering Data Packet (1 Per 2 Sec)
1612	ENG_1536A	192	1536	Normal Engineering Data Packet (1 Per 3 Sec)
1613	ENG_1536B	192	1536	Normal Engineering Data Packet (1 Per 3 Sec)

1614	ENG_1536C	192	1536	Normal Engineering Data Packet (1 Per 3 Sec)
1615	ENG_1536D	192	1536	Normal Engineering Data Packet (1 Per 3 Sec)
1616	**ENG_2048**	**256**	**2048**	**Normal Engineering Data Packet (1 Per 4 Sec)**
1617	ENG_2048	256	2048	Normal Engineering Data Packet (1 Per 4 Sec)
1618	ENG_2048	256	2048	Normal Engineering Data Packet (1 Per 4 Sec)
1619	ENG_2048	256	2048	Normal Engineering Data Packet (1 Per 4 Sec)
1620 - 1629				Spare
1630	**BOOT_ENG**	**TBD**	**TBD**	**Start-up Engineering Data Packet (1 Per 4 Sec)**
1631	**BOOT_SCI**	**750**	**6000**	**Start-up Science Data Packet**
1632	SCI_6000	750	6000	Normal Science Data Packet: Chopper @ 520.00 - 521.39 Hz
1633	SCI_6016	752	6016	Normal Science Data Packet: Chopper @ 518.62 - 520.00 Hz
1634	SCI_6032	754	6032	Normal Science Data Packet: Chopper @ 517.24 - 518.61 Hz
1635	SCI_6048	756	6048	Normal Science Data Packet: Chopper @ 515.87 - 517.24 Hz
1636	SCI_6064	758	6064	Normal Science Data Packet: Chopper @ 514.51 - 515.87 Hz
1637	SCI_6080	760	6080	Normal Science Data Packet: Chopper @ 513.16 - 514.51 Hz
1638	SCI_6096	762	6096	Normal Science Data Packet: Chopper @ 511.81 - 513.15 Hz
1639	SCI_6112	764	6112	Normal Science Data Packet: Chopper @ 510.47 - 511.81 Hz
1640	SCI_6128	766	6128	Normal Science Data Packet: Chopper @ 509.14 - 510.47 Hz
1641	SCI_6144	768	6144	Normal Science Data Packet: Chopper @ 507.81 - 509.13 Hz
1642	SCI_6160	770	6160	Normal Science Data Packet: Chopper @ 506.49 - 507.81 Hz
1643	SCI_6176	772	6176	Normal Science Data Packet: Chopper @ 505.18 - 506.49 Hz
1644	SCI_6192	774	6192	Normal Science Data Packet: Chopper @ 503.88 - 505.18 Hz
1645	SCI_6208	776	6208	Normal Science Data Packet: Chopper @ 502.58 - 503.87 Hz
1646	SCI_6224	778	6224	Normal Science Data Packet: Chopper @ 501.29 - 502.57 Hz
1647	**SCI_6240**	**780**	**6240**	Normal Science Data Packet: Chopper @ 500.00 - 501.28 Hz
1648	SCI_6256	782	6256	Normal Science Data Packet: Chopper @ 498.72 - 500.00 Hz
1649	SCI_6272	784	6272	Normal Science Data Packet: Chopper @ 497.45 - 498.72 Hz
1650	SCI_6288	786	6288	Normal Science Data Packet: Chopper @ 496.18 - 497.45 Hz
1651	SCI_6304	788	6304	Normal Science Data Packet: Chopper @ 494.92 - 496.18 Hz
1652	SCI_6320	790	6320	Normal Science Data Packet: Chopper @ 493.67 - 494.92 Hz
1653	SCI_6336	792	6336	Normal Science Data Packet: Chopper @ 492.42 - 493.67 Hz
1654	SCI_6352	794	6352	Normal Science Data Packet: Chopper @ 491.18 - 492.42 Hz
1655	SCI_6368	796	6368	Normal Science Data Packet: Chopper @ 489.95 - 491.18 Hz
1656	SCI_6384	798	6384	Normal Science Data Packet: Chopper @ 488.72 - 489.95 Hz
1657	SCI_6400	800	6400	Normal Science Data Packet: Chopper @ 487.50 - 488.72 Hz
1658	SCI_6416	802	6416	Normal Science Data Packet: Chopper @ 486.28 - 487.50 Hz
1659	SCI_6432	804	6432	Normal Science Data Packet: Chopper @ 485.07 - 486.28 Hz
1660	SCI_6448	806	6448	Normal Science Data Packet: Chopper @ 483.87 - 485.07 Hz

1661	SCI_6464	808	6464	Normal Science Data Packet: Chopper @ 482.67 - 483.87 Hz
1662	SCI_6480	810	6480	Normal Science Data Packet: Chopper @ 481.48 - 482.67 Hz
1663	SCI_6496	812	6496	Normal Science Data Packet: Chopper @ 480.30 - 481.48 Hz

The **Packet Sequence Count** is incremented once for each packet sent, and can have the value zero **only** for the first packet after power up. Each time the counter reaches the value 16383 it will roll back to the value 1.

The **Packet Length** is the size of the packet in bytes (octets). The packet must be an even number of bytes (see GIRD Fig. 6-4 or Section 5.2.1.3 of CCSDS 203.0-B-1, the "Blue Book")

QL is the Quick Look Flag. The default is 0 (quicklook data disabled). Setting the flag to 1 indicates to the ground data processing system that the Science data packet is to be processed for "quick look" purposes.

The **S/C Leap Seconds, S/C Coarse Time** and **S/C Fine Time** are defined in GIRD section 6.5.7.2.1 (Time Code Format).

Spare (Word Alignment Fill) is actually the **first** data word and serves to align the data to a 16 bit word boundary.

4.2.3 HIRDLS Science Packet Header Field

The contents of the science packet are defined by the Science Packet Header. The science packet is flexible in that various data items may be included or not, and the rate for the radiance data may be controlled by command. This flexibility means that the packet size is variable and must be managed by the Instrument Flight Operations Team generating the observing plan for any given time. The contents of the Science Packet Header are shown in Table 4.2.3-1.

Table 4.2.3-1 Science Packet Header Field

	<---------- Bit Position ---------->															
Word	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
8	Housekeeping Format Identifier										Tlm Pattern ID			MiF Subcomm		
9	HIRDLS Timestamp at Beginning of MiF (Bits 63-48)															
10	HIRDLS Timestamp at Beginning of MiF (Bits 47-32)															
11	HIRDLS Timestamp at Beginning of MiF (Bits 31-16)															
12	HIRDLS Timestamp at Beginning of MiF (Bits 15-0)															
13	HIRDLS Timestamp Block Offset								Radiance Data Block Offset							
14	Elevation Encoder 1 Block Offset								Elevation Encoder 2 Block Offset							
15	Azimuth Encoder Block Offset								Housekeeping Block Offset							
16	Gyro 0 Data Block Offset								Gyro 1 Data Block Offset							
17	Gyro 2 Data Block Offset								Gyro 3 Data Block Offset							
18	Accelerometer Pitch Data Block Offset *								Accelerometer Roll Data Block Offset *							
19	Diagnostic Segment Offset								Checksum Offset							

* No longer used but retained in header to preserve format definition

32-bit Minor Frame Counter (FRAMECNT) missing from above table

The **Housekeeping Format Identifier** (** HK_FORMAT_ID) identifies to the ground data processing system which Housekeeping Format Table is being used for encoding, and must therefore be used for decoding.

The Telemetry Pattern ID (** TLM_PATT_ID) indicates whether the Science ttelemetry stream contains normal data (ID = 0) or one of a number of test patterns for for pre-launch testing purposes. These bits will normally be set to zero.

The **MiF Subcomm** is a counter which increments each Minor Frame - see Section 4.0 above. MiF 0 is the first MiF of a Major Frame, and the MiF subcomm counter increments to 7 before resetting to zero at the start of the next MaF.

The **HIRDLS Timestamp** is the full 64-bit value of the HIRDLS internally generated time at the beginning of the first Science Packet MiF (MiF #0). The exact time used is the Chopper Revolution strobe at the beginning of the first Chopper Revolution of a MiF, corresponding to Chopper tooth 'A' in Fig 4.0-1. The HIRDLS Timestamp has an LSB value of 50.4561 micro-seconds. See also Section 4.2.4.1 - Timestamp Block.

The **Offsets** denote the start location of each data block within the Science packet. The block starts at Word N, where N = offset x 2. All data blocks begin on an even word boundary. A value 255 indicates that the block is disabled.

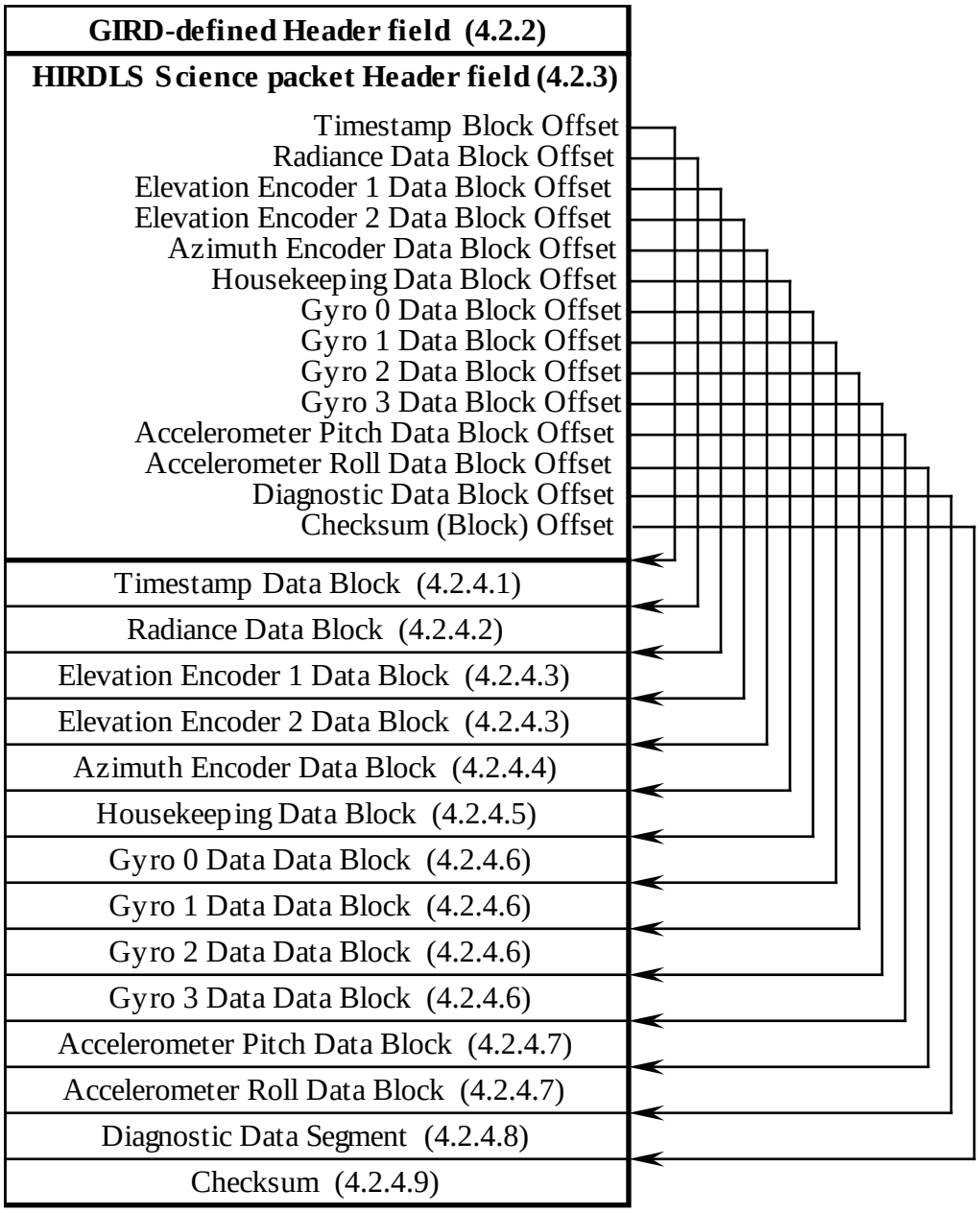
The **Minor Frame Count** (** FRAMECNT) .....

Note: ** asterisks indicate that this Header function has been assigned a Telemetry Mnemonic.

4.2.4 Science Packet Data Blocks

The HIRDLS Data Field (Fig. 4.2-1) consists of various possible combinations of the data blocks listed in Fig. 4.2.4-1. Some of the data blocks are optional and may be disabled when not required. This will usually be done to make more space for the Diagnostic data. Blocks which are enabled will always occur in the relative sequence shown in Fig. 4.2.4-1, and will always have the same format within the block. Block selection is controlled by the Telemetry Format Table, which is configured by means of the command HIR_TLM_SCIFMT.

Fig. 4.2.4-1 Organisation of HIRDLS Science Data Packet



* No longer used but retained in header to preserve format definition

4.2.4.1 Timestamp Block

This consists of eight 16-bit words corresponding to each of the eight Chopper Revolutions within a MiF (Science packet). Word #0 is a copy of the 16 LSBs of the 64-bit HIRDLS Timestamp which appears in the HIRDLS Header Field as described above. The remaining seven words correspond to

the start of each successive Chopper revolution within the period corresponding to the Science packet, as illustrated in Table 4.2.4.1-1.

Table 4.2.4.1-1 Timestamp Data Block Format

	<---------- Bit Position ---------->															
Word	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	16 LSBits of HIRDLS Timestamp at Start of 1st Chopper Rev of MiF **															
1	16 LSBits of HIRDLS Timestamp at Start of 2ndChopper Rev of MiF															
2	16 LSBits of HIRDLS Timestamp at Start of 3rd Chopper Rev of MiF															
3	16 LSBits of HIRDLS Timestamp at Start of 4th Chopper Rev of MiF															
4	16 LSBits of HIRDLS Timestamp at Start of 5th Chopper Rev of MiF															
5	16 LSBits of HIRDLS Timestamp at Start of 6th Chopper Rev of MiF															
6	16 LSBits of HIRDLS Timestamp at Start of 7th Chopper Rev of MiF															
7	16 LSBits of HIRDLS Timestamp at Start of 8th Chopper Rev of MiF															

** same as 16 LSBs of Timestamp in HIRDLS Header field

4.2.4.2 Radiance Data Block

The normal length of this block corresponds to the selection of all 21 science channels at the normal telemetry rate of one sample per Chopper Revolution. Specific alternative selections may be made, as listed in Table 4.2.4.2-1. For details on how to select the required format option, see Section 4.4 below.

Table 4.2.4.2-1 Radiance Channel Sampling Options

Sub-Mode Code	No. of Channels Sampled	Samples/sec (nominal)	Bits per Science pkt	Words per Science pkt
(Default)	All 21	1 per Chopper Rev (nom 83.3 Hz)	2688	168
SP1	Any 10	2 per Chopper Rev (nom 167 Hz)	2560	160
SP2	Any 7	3 per Chopper Rev (nom 250 Hz)	2688	168
SP3	Any 3	6 per Chopper Rev (nom 500 Hz)	2304	144

4.2.4.3 Elevation Encoder Blocks

Later

4.2.4.4 Azimuth Encoder Block

Later

4.2.4.5 Housekeeping Block

Later

4.2.4.6 Gyro Data Blocks

The four Gyro Data blocks have the same format, shown in Table 4.2.4.6-1. The asterisk * represents the Gyro channel number (0, 1, 2 or 3). Each channel has its own data block.

Table 4.2.4.6-1 Gyro Data Block Format

	<---------- Bit Position ---------->															
Word	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	GYR*ADAT word corresponding to 1st Chopper Rev of MiF															
1	GYR*ADAT word corresponding to 2ndChopper Rev of MiF															
2	GYR*ADAT word corresponding to 3rd Chopper Rev of MiF															
3	GYR*ADAT word corresponding to 4th Chopper Rev of MiF															
4	GYR*ADAT word corresponding to 5th Chopper Rev of MiF															
5	GYR*ADAT word corresponding to 6th Chopper Rev of MiF															
6	GYR*ADAT word corresponding to 7th Chopper Rev of MiF															
7	GYR*ADAT word corresponding to 8th Chopper Rev of MiF															

4.2.4.7 Diagnostic Data Segment

Please refer to Section 4.4 THERE ISN'T A SECTION 4.4 !!

4.2.4.8 Checksum

The Science Packet Checksum is the longitudinal parity of all previous words in the Science Packet as defined by the following pseudo code:

```
Checksum_result = 0
For  Word_count = 0 to Checksum_word - 1
        Checksum_result = Checksum_result XOR Word[Word_count]
Next Word_count
Word[Checksum_word] = Checksum_result
```

4.2.4.9 Filler Zeroes

In general the Checksum will be followed by as many zeroes as are required to bring the total number of bits in the packet up to the number specified in Table 4.2.2-1 for the given APID.

4.3 Start-up Science Data Packet

The Start-up packet is generated while the Instrument Processor (IProc) is booting up. Fig. 4.2-1 illustrates the structure of the Normal Science packet; the Start-up packet has the same basic structure, but all of the blocks in the Data field are void except for Housekeeping (256 bits), Diagnostics (5344 bits) and the Checksum (16 bits). Including the headers and 64 zero-filler bits the total number of bits in the Start-up packet is 6000.

The Start-up packet rate is 10 per sec, giving a total bit rate of 60 kbits/sec. **Should be 65 kbits/sec**

4.3.1 Start-up Packet Headers

Table 4.3.1-1 shows the format for the Start-up Packet GIRD Header.

Fig. 4.3.1-1 Start-up GIRD Header with Word Alignment Fill

	<---------- **Bit Position** ---------->															
Word	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	0	0	0	1	Application Process ID (APID = 1631)										
1	1	1	Packet Sequence Count													
2	Packet Length = 750															
3	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	0
4	0	null							null							
5		null							null							
6		null							null							
7		null							null							

Table 4.3.1-2 shows the format for the Packet header field which replaces the HIRDLS Normal Science Packet Header during booting.

Table 4.3.1-2 Start-up Packet HIRDLS-Header Field

	<---------- Bit Position ---------->															
Word	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
8	Housekeeping Format Identifier = 0										Pattern ID = 0			MiF Subcomm		
9	null															
10	null															
11	null															
12	null															
13	255 (data block disabled)								255 (data block disabled)							
14	255 (data block disabled)								255 (data block disabled)							
15	255 (data block disabled)								Housekeeping Block Offset = 10							
16	255 (data block disabled)								255 (data block disabled)							
17	255 (data block disabled)								255 (data block disabled)							
18	255 (data block disabled)								255 (data block disabled)							
19	Diagnostic Segment Offset = 18								Checksum Offset = 185							

4.3.2 Start-up Packet Housekeeping Data Block

The Start-up Housekeeping data items are described in the C&TH, Vol. I, Section 2.7.5.3 (also shown in the Telemetry List in Vol. II). They immediately follow the header as words 20 through 35. Two items are described here:

4.3.2.1 Word 34 - SU_STARTUP_STATE

This item has the following values and meanings:-

0 = countdown
1 = boot hold - idle (waiting for command)
2 = boot hold - uploading (upload in progress)
3 = boot hold - EEPROM ready to program
4 = boot hold - EEPROM programming (**power must not be shut off until completion**)
5 = auto-booting - starting Telemetry CSC from verified copy in EEPROM
6 = booting - starting Telemetry CSC from manual user boot command
7 = resetting - user commanded reset in progress

4.3.2.2 Word 35 - SU_ ROM_BUILD_ID

This item is a unique SUROM code release/build identifier having the following format:

Bits 15 - 12 (MSB):	Major Version Number
Bits 11 - 8:	Minor Version Number
Bits 7 - 0 (LSB):	Build Serial Number

4.3.3 Start-up Packet Diagnostic Data Segment

Please refer to Section 4.4

4.3.4 Start-up Packet Checksum

The Start-up Science packet checksum is similar to the Normal packet checksum, i.e. it is the longitudinal parity of all (370) previous words in the Start-up Science packet as defined by the following pseudo code:

```
Checksum_result = 0
For  Word_count = 0 to 369
        Checksum_result = Checksum_result XOR Word[Word_count]
Next Word_count
Word[370] = Checksum_result
```

4.3.5 Start-up Packet Filler Zeroes

The Checksum will be followed by 64 zeroes, required to bring the total number of bits in the packet up to the number specified in Table 4.2.2-1 for the Start-up packet APID.

5 DIAGNOSTICS AND DATA PACKET FORMATTING

5.1 Diagnostic Data Handling

5.1.1 General Description

Diagnostic data are handled slightly differently from most other data in that the diagnostic data block length is a Major Frame, equivalent to 8 Science packets. These diagnostic data blocks are called Diagnostic Data Packages, and they are divided up for transmission into Diagnostic Data Segments, one of which is inserted into each Science packet. Thus a set of 8 Science packets, beginning at Minor Frame #0, contains the 8 Diagnostic Data Segments which make up a complete Diagnostic Data Package.

As described above, each Science packet Header includes an offset pointer to the start of the Diagnostic Data Segment, and further offset pointers are included within the Diagnostic Data Package itself to allow the whole Package to be unravelled on the ground.

Diagnostic data will either wholly or partially replace zero fillers in a Science packet. If more space is required within the fixed length of the Science packets, one or more Science data blocks will be inhibited by command. The choice of which diagnostic data to transmit is controlled by the command HIR_FMT_DIAGFMT. The preceding remarks apply to the Normal Science packets; the Start-up Science packet diagnostic segments are pre-defined and fixed - see Section 5.1.7.

5.1.2 Diagnostic Data Options

Table 5.1.2-1 lists the available diagnostic data items, any or all of which can be selected subject to the availability of free space within the Normal Science packet.

Table 5.1.2-1 Available Diagnostic Data Items

ID #	**ITEM**	**SIZE** (BYTES)
	Diagnostic dump header	
	Diagnostic dump elements	
	Subsystem specific	
	Memory dump: IPU RAM	
	Memory dump: IPU EEPROM	
	Memory dump: TEU RAM	
	SAIL shared memory	
	SAIL task memory	
	Elevation 1 encoder (high rate)	
	Elevation 2 encoder (high rate)	
	Azimuth encoder (high rate)	
	HIRDLS timestamp (high rate)	

	Wobble sensor A (high rate)	
	Wobble sensor B (high rate)	
	High speed A-D 1	
	High speed A-D 2	

5.1.3 Diagnostic Data Package Header

The contents of a diagnostic data package is described by the Diagnostic Data Package Header. The rate for the encoder and time tick data may be controlled. The Header contents indicate which diagnostic items are included, and the boundary between each item within the overall Package format. Table 5.1.3-1 shows the format for the Header.

Table 5.1.3-1 Diagnostic Data Package Header

	<---------- Bit Position ---------->																
Word	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**Note**
D0	HIRDLS Timestamp at Beginning of MaF, Bits 63-48																a
D1	HIRDLS Timestamp at Beginning of MaF, Bits 47-32																a
D2	HIRDLS Timestamp at Beginning of MaF, Bits 31-16																a
D3	HIRDLS Timestamp at Beginning of MaF, Bits 15-0																a
D4	Subsystem Specific Data Item A Offset																b
D5	Subsystem Specific Data Item B Offset																
D6	IPU RAM Memory Dump Item Offset																
D7	IPU EEPROM Memory Dump Item Offset																
D8	TEU RAM Memory Dump Item Offset																
D9	SAIL TASK Memory Dump Item Offset																
D10	SAIL SHARED Memory Dump Item Offset																
D11	Elevation 1 Encoder (High Rate) Item Offset																
D12	Elevation 2 Encoder (High Rate) Item Offset																
D13	Azimuth Encoder (High Rate) Item Offset																
D14	HIRDLS Timestamp (High Rate) Item Offset																
D15	Wobble Sensor A (High Rate) Item Offset																
D16	Wobble Sensor B (High Rate) Item Offset																
D17	High Speed A/D Data Item A Offset																
D18	High Speed A/D Data Item B Offset																

Notes

a) Automatically inserted whenever Diagnostic Segment selected by command HIR_TLM_SCIFMT

b)

5.1.4 Diagnostic Data Item Descriptions

5.1.4.1 Subsystem-specific Items

Placeholder: FIR filter coefficients; 21 chan x 6 coeffs x 64 bits = 8064 bits.

5.1.4.2 Memory Dumps

Placeholder: FIR filter coefficients; 21 chan x 6 coeffs x 64 bits = 8064 bits.

5.1.4.3 SAIL Diagnostics

5.1.5.1 Elevation Encoder Diagnostics

5.1.4.5 Azimuth Encoder Diagnostics

5.1.4.6 Timestamp Diagnostics

5.1.4.7 Wobble Sensor Diagnostics

5.1.4.8 High Speed A-D Diagnostics

5.1.5 Diagnostic Data Packaging

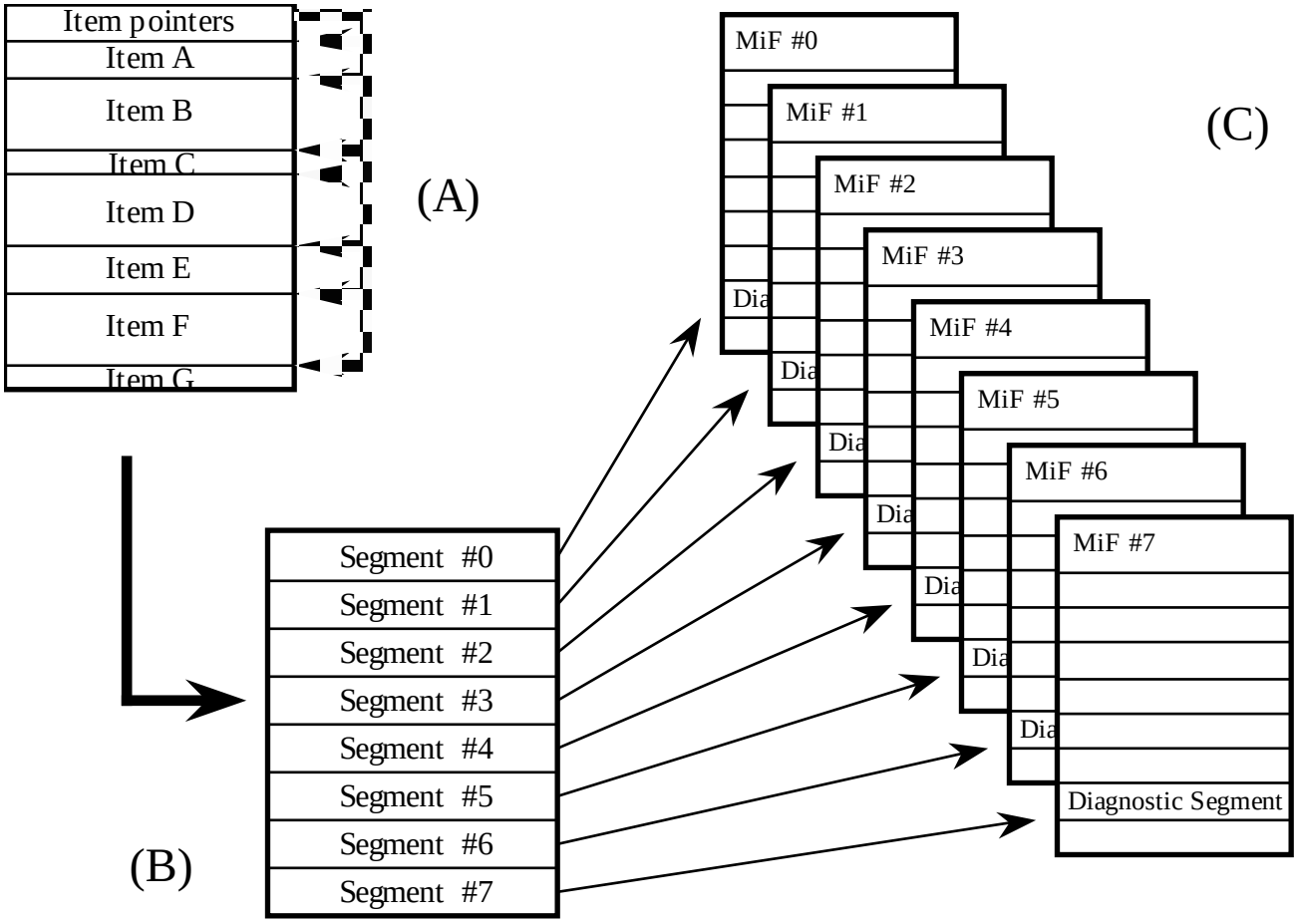
Fig. 5.1.5-1 illustrates how the Diagnostic Data Package is split up into 8 segments for insertion into Science Data packets..

(A) shows the complete Diagnostic Package compiled from the concatenation of the selected diagnostic data items. In this example 7 items have been selected, although it would typically be less. The Package represents one Major Frame of data.

(B) shows the Package split into 8 Segments and (C) shows the Segments inserted into each of the 8 Science packets corresponding to the next Major Frame. Timing information will be preserved since the Package includes the Timestamp at the start of the Frame in which the data were acquired.

Unravelling a Diagnostic data Package on the ground is essentially the reverse process.

Fig. 5.1.5-1 Packetising of Diagnostic Data



5.1.6 Start-up Diagnostic Package

5.1.6.1 Package Contents

The Start-up Diagnostic Data Package basically conforms to the above description, except that it has a fixed, pre-determined format. There are no commandable options. Table 5.1.7.1-1 depicts the contents of the Start-up Diagnostic Package Header.

Table 5.1.6.1-1 Start-up Diagnostic Package Header

	<---------- Bit Position ---------->															
Word	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
D0	null															
D1	null															
D2	null															
D3	null															
D4	Command Echo Item Offset = 28															
D5	255															
D6	IPU RAM Dump Item Offset = 889															
D7	IPU EEPROM Dump Item Offset = 1462															
D8	255															
D9	255															
D10	255															
D11	255															
D12	255															
D13	255															
D14	255															
D15	255															
D16	255															
D17	255															
D18	255															
D19	255															
D20	255															

The number of diagnostic items is TBD. The above table has been truncated to finish at D20 for consistency with the DPH described in Section 5.1.3. The following tables are the original LMMS tables which begin with D28. **To be resolved later**.

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
D28	Diagnostic Item ID: Subsystem Specific =0					Length of Diagnostic Item (in words)= 861										
D29	0 (IPU)			0 (unused)				0								
D30	Number of Commands received in Previous Science MaF															
D31 to D62	512 bit Command Echo for First Command Received															
D63	Command Error Status for First Command															
D64 to D95	512 bit Command Echo for Second Command Received															
D96	Command Error Status for Second Command															
...	...															
D856 to D887	512 bit Command Echo for 26th Command Received															
D888	Command Error Status for 26th Command															
D889	Diagnostic Item ID: IPU RAM= 2					Length of Diagnostic Item (in words) = 603										
D890	0								IPU RAM Start Address Bits 23-16							
D891	IPU RAM Start Address Bits 15-8								IPU RAM Start Address Bits 7-0							
D892 to D1461	IPU RAM Memdump Data															
D1462	Diagnostic Type: IPU EEPROM= 3					Length of Diagnostic Item (in words) = 1203										
D1463	0								IPU EEPROM Start Address Bits 23-16							
D1464	IPU EEPROM Start Address Bits 15-8								IPU EEPROM Start Address Bits 7-0							
D1465 to D2664	IPU EEPROM Memdump Data															
D2265 to D2671	0 (Fill)															

5.1.6.2 Assignment of Package Contents to Diagnostic Segments

The Start-up Diagnostic Package is packetised for transmission into 8 segments as described above. In each packet the Diagnostic Segment comprises 334 words (#36 through #369) immediately following the last of the Housekeeping words (Section 4.3.2.2).

Table 5.1.6.2-1 lists the assignment of the Package words to Segment words.

Fig. 5.1.6.2-1 Packetising of Diagnostic Data

MiF (Diagnostic Segment)	Diagnostic Package Words
0	D0 to D333
1	D334 to D667
2	D668 to D1001
3	D1002 to D1335
4	D1336 to D1669
5	D1670 to D2003
6	D2004 to D2337
7	D2338 to D2671

5.2 Description & Verification of Telemetry Formatting Commands

5.2.0 Verification of Telemetry Formatting Commands

These commands will be sent infrequently and will normally be verified either by initiating a suitable memory dump or by inspection of the resulting telemetry data. In some cases limited status verification is possible, as described below. Verification of the remaining telemetry formatting commands is not further addressed in this document.

5.2.1 Summary of Telemetry Formatting Commands

CMD ID#	MNEMONIC	No OF PARAMS	FUNCTION
50	HIR_TLM_SCIFMT	16	Select the contents of the science packet
51	HIR_TLM_DIAGFMT	14	Select diagnostic items for diagnostic package
52	HIR_TLM_DUMPADDR	2	Select a new dump address for a diagnostic dump
109	HIR_TLM_HKHEAD	4	Header to upload housekeeping telemetry table
53	HIR_TLM_HKFMT	3	Upload data to housekeeping telemetry table
54	HIR_TLM_HKACTIVATE	1	Activate a new housekeeping telemetry format

5.2.2 Description of HIR_TLM_SCIFMT Command

This command is used to select the contents of the Normal Science Packet (as opposed to the Start-up Science Packet). It will normally be issued as a ground command. The command requires 18 parameters as shown below:

CMD ID#: 50	**MNEMONIC:** HIR_TLM_SCIFMT		
FUNCTION:	Select the contents of the science packet		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	APID for science packet		**RANGE:** 1600 to 1663
PARAMETER #:1	Timestamp block enable		**RANGE:** 0 to 1
PARAMETER #:2	Radiance block enable		**RANGE:** 0 to 1
PARAMETER #:3	Elevation Motor 1 block enable		**RANGE:** 0 to 1
PARAMETER #:4	Elevation Motor 2 block enable		**RANGE:** 0 to 1
PARAMETER #:5	Azimuth Motor block enable		**RANGE:** 0 to 1
PARAMETER #:6	Gyro 1 block enable		**RANGE:** 0 to 1
PARAMETER #:7	Gyro 2 block enable		**RANGE:** 0 to 1
PARAMETER #:8	Gyro 3 block enable		**RANGE:** 0 to 1
PARAMETER #:9	Gyro 4 block enable		**RANGE:** 0 to 1
PARAMETER #:10	Science housekeeping block enable		**RANGE:** 0 to 1
PARAMETER #:11	Diagnostic Segment block enable		**RANGE:** 0 to 1
PARAMETER #:12	Telemetry Test Pattern select		**RANGE:** 0 to 7
PARAMETER #:13	Radiance Data Sample Rate		**RANGE:** 0 to 7
PARAMETER #:14	Radiance Channel Select		**RANGE:** 0 to 2097151
PARAMETER #:15	Length in 16-bit words for science packet		**RANGE:** 21 to 512
VERIFICATION:			
NOTES:	The 'APID' is defined in the C&THB, Vol. III Table 4.2.2-1. It is used to define the number of bits in the science data packet. For each of the block enables, 0 = block not included, and 1 = block included in order shown above. For normal operations, the telemetry test pattern select must be 0. Non-zero values will produce telemetry test patterns without any science data.The radiance data sample rate is described in the C&THB, Vol. III. The radiance data channel select will enable each channel with a high bit in this mask.The LSB of the select will enable channel 1, and the MSB will enable channel 21.If the total amount of data will exceed the APID limit, data loss will occur. See C&THB, Vol. III for the format of the science and diagnostic packet formats.		

Notes

Param #12: Telemetry Test Pattern select: this must be set to zero for normal Science data. Other values for this parameter may be used as follows:

= 1 means Fixed HK

= 2 means Fixed Sci

= 3 means Simulated Data with decimation disabled

= 4 means Simulated Data with decimation enabled

= 5 means Simulated Data with decimation and 32 tap filter enabled.

Param #13: Radiance Data Sample Rate: this must be set to zero for normal Science data. Other values for this parameter may be used as follows:

= 1 means Fixed HK

5.2.3 Summary Descriptions of remaining HIR_TLM_ Commands

CMD ID#: 51	**MNEMONIC:** HIR_TLM_DIAGFMT		
FUNCTION:	Select diagnostic items for diagnostic package		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Number of diagonstic items enabled	**RANGE:** 0 to 13	
PARAMETER #:1	Diagnostic item 1 (see notes)	**RANGE:** Any	
PARAMETER #:2	Diagnostic item 2 (see notes)	**RANGE:** Any	
PARAMETER #:3	Diagnostic item 3 (see notes)	**RANGE:** Any	
PARAMETER #:4	Diagnostic item 4 (see notes)	**RANGE:** Any	
PARAMETER #:5	Diagnostic item 5 (see notes)	**RANGE:** Any	
PARAMETER #:6	Diagnostic item 6 (see notes)	**RANGE:** Any	
PARAMETER #:7	Diagnostic item 7 (see notes)	**RANGE:** Any	
PARAMETER #:8	Diagnostic item 8 (see notes)	**RANGE:** Any	
PARAMETER #:9	Diagnostic item 9 (see notes)	**RANGE:** Any	
PARAMETER #:10	Diagnostic item 10 (see notes)	**RANGE:** Any	
PARAMETER #:11	Diagnostic item 11 (see notes)	**RANGE:** Any	
PARAMETER #:12	Diagnostic item 12 (see notes)	**RANGE:** Any	
PARAMETER #:13	Diagnostic item 13 (see notes)	**RANGE:** Any	
VERIFICATION:			
NOTES:	For each 32 bit item, bits 31-27 are the diagnostic type (numbered 0 to 22), bits 26-24 are diagnostic parameter 0, bits 23-16 are diagnostic parameter 1, bits 15-8 are diagnostic parameter 2,and bits 7-0 are diagnostic parameter 3. The types and corresponding parameters are defined in the C&THB, Vol. III. All unused elements should be set to zero.Items are listed in the order which they will appear in the diagnostic data package.		

CMD ID#: 52	**MNEMONIC:** HIR_TLM_DUMPADDR		
FUNCTION:	Select a new dump address for a diagnostic dump		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Dump item to change	**RANGE:** 2 to 6	
PARAMETER #:1	New address	**RANGE:** 0 to 16777215	
VERIFICATION:			
NOTES:	The dump item is the ID number as described in the telemetry section of this document underdiagnostic package header definition. The address must be in a valid range for the type of dump.		

CMD ID#: 109	**MNEMONIC:** HIR_TLM_HKHEAD		
FUNCTION:	Header to upload housekeeping telemetry table		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** CRITICAL	**SAIL:** Never
PARAMETER #:0	Housekeeping Identifier	**RANGE:** 0 to 1023	
PARAMETER #:1	Number of telemetry format table entries	**RANGE:** 1 to 1023	
PARAMETER #:2	Size in words of housekeeping block	**RANGE:** 1 to 256	
PARAMETER #:3	32-bit checksum of all data words in upload	**RANGE:** Any	
VERIFICATION:			
NOTES:	This command must preceed the HIR_TLM_HKFMT command.The uploaded table cannot be used until the checksum matches the uploaded table.See C&TH section 4 for additional information.		

CMD ID#: 53	**MNEMONIC:** HIR_TLM_HKFMT		
FUNCTION:	Upload data to housekeeping telemetry table		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Address 32-bit offset (0 = start of table)	**RANGE:** 0 to 65535	
PARAMETER #:1	Number of 32-bit words to upload	**RANGE:** 1 to 13	
PARAMETER #:2	H-32 encoded data	**RANGE:** Any	
VERIFICATION:			
NOTES:	This command must be preceded by the HIR_TLM_HKHEAD command.		

CMD ID#: 54	**MNEMONIC:** HIR_TLM_HKACTIVATE		
FUNCTION:	Activate a new housekeeping telemetry format		
C, T, S ATTRIBUTES:	**CLASS:** Operational	**TYPE:** Flight	**SAIL:** Never
PARAMETER #:0	Housekeeping table activate	**RANGE:** 0 to 1	
VERIFICATION:			
NOTES:	If the activate housekeeping parameter is 0, the default housekeeping table is activated.If the housekeeping activate parameter is 1, activate the loaded housekeeping table.		

In order to enable diagnostic data to be inserted into the Science packets, the "Diagnostic Segment Enable" parameter in command HIR_TLM_SCIFMT must be set to "1".

The command HIR_TLM_DIAGFMT includes a 32-bit parameter specific to each Diagnostic Item. This parameter is made up as follows:

Bit #	**No. of bits**	**Name**	**Description**
31-27	5	Diagnostic Item id	Value corresponds to Item id # shown in Table 5.1.2-1 above
26-24	3	Diagnostic sub-param #0	
23-16	8	Diagnostic sub-param #1	
15-8	8	Diagnostic sub-param #2	
7-0	8	Diagnostic sub-param #3	