

# HIRDLS



## HIGH RESOLUTION DYNAMICS LIMB SOUNDER

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**SP-HIR-239**  
**GSS to PSS Interface Control Document (ICD)**

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## Change Log

Rev.	Date	Section	Change Description
	98-04-28	All	Initial Release
A	99-02-22	2.1	Added SP-HIR-169 to Applicable Documents list.
		4.	Table 4-1: Updated load currents per JGW memo of 98-12-04; changed supply names to match those in Table 3.4-1; Revised column headings; Revised Note 3. Revised Note 6.
		5.	Deleted reference to TC-UCB-009 (now obsolete).
B	00-06-02	Sig Page	Updated to current program responsibilities
		2.1	Provided release dates for “Applicable Documents”
		3.2	Figure 3.2-1 Updated PCU returns and grounds
		4.1	Table 4-1: Based on Jaroslowski memo dated 00-03-09 Added line for Voltage limits at GEU Updated PCU voltage limits Updated cable resistance (based on notes from von Savoye) Removed TBD on supply output resistance Changed Note 4 to read “at BOL”. Added text to identify supply output resistance expected at end of life. Deleted original note 6 (added no unique information) Added note 6 to indicate frequency
C	01-04-23	Sig. Page	Changed GSS RE to Dr. O. Oduleye
		2.1	Removed SP-HIR-200G, GIRD and UIID from referenced documents. None are referenced in this ICD. Moved SP-HIR-237 from 2.2 to 2.1. ICD is now specifically referenced in this document.
		2.2	Removed C&TH from referenced documents
		4.1	Renumbered paragraph to reflect addition of In Rush current requirements. Added text to define conditions for measuring maximum and minimum voltage from PCU. (CR206)
		4.2	Added Table 4-2 defining switching transients for GSS. (CR206)
		5.	Changed reference from C&TH to SP-HIR-267, GSS-IPS ICD. (CR206)
	01-06-11	3.2	Figure 3.2-1. Modified figure to reflect naming convention of star point and grounding studs external to PCU box. (RE comments to CR206)

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## 1 SCOPE

This Interface Control Document (ICD) defines the Electrical interface between the Gyro Subsystem (GSS) and the Power Supply Subsystem (PSS).

## 2 DOCUMENT REFERENCES

### 2.1 Applicable Documents

The documents listed below are a part of this ICD to the extent specified herein. In the case of a conflict between the contents of this document and any Applicable or Referenced document, this document shall take precedence.

SP-HIR-169G	HIRDLS Power Dist., Switching & Grounding	00-02-01
GSFC 424-12-21-13	Instrument Technical Specification (ITS)	February 2000
SP-HIR-237	GSS to IPS Interface Control Document	Current Revision

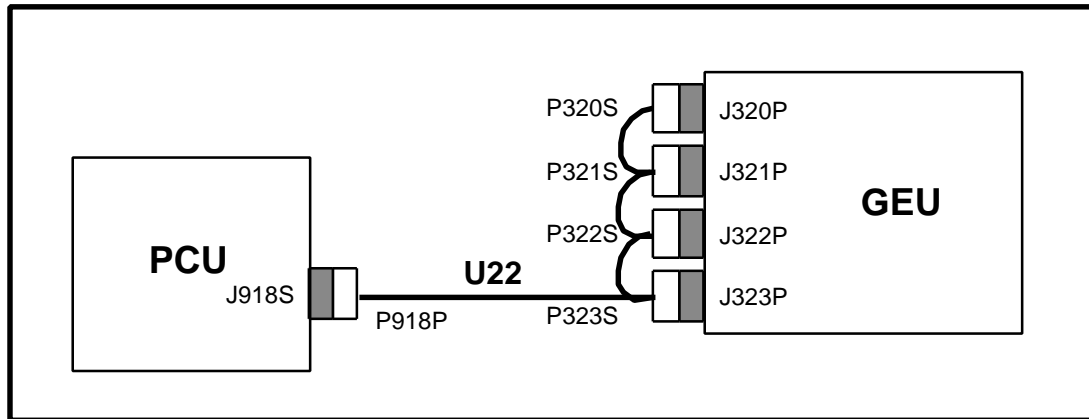
### 2.2 Information Documents

SP-HIR-033	Gyro Subsystem Specification Document	Current Revision
SP-HIR-036	Power Subsystem Specification Document	Current Revision

### 3 INTERFACE REQUIREMENTS

#### 3.1 Interface Configuration

This electrical interface includes one “complex” cable in the Main Instrument Harness. The interface carries only DC power supplies from the PCU to the GEU. The cable/connector configuration is illustrated in Fig. 3.1-1.

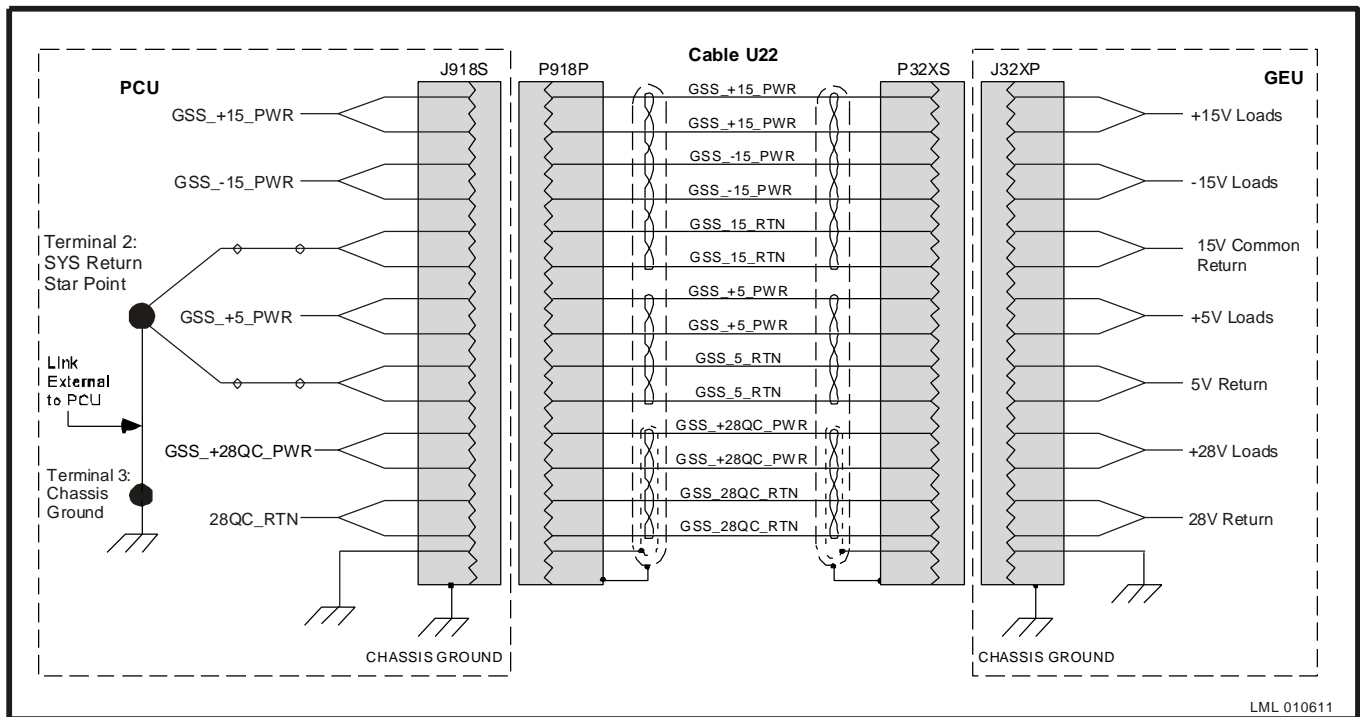


Note:

The harness from the PCU is shown routed to P/J323, but it may be routed to P/J320 instead if this is more convenient.

**Figure 3.1-1 PCU to GEU Interface Configuration**

## 3.2 Interface Schematic



### Notes:

1. Cable comprises:
  - Unshielded twisted hex group
  - Unshielded twisted quad group
  - Shielded twisted quad group
  - Overall cable shield grounded to shell at each end
2. Wires between connectors on GEU will be "daisy-chained"

**Figure 3.2-1 PCU-to-GEU Power Interface**

### 3.3 Connector Definition

Box-mounted or bracket-mounted connectors are referred to as “receptacles” and shall have the letter “J” preceding the connector designation. Cable-mounted connectors shall be referred to as “plugs” and shall have the letter “P” preceding the connector number.

The suffix letter “P” at the end of the connector designation indicates a male (pin) type. The suffix letter “S” at the end of the connector designation indicates a female (socket) type.

The connectors used for the GSS-PSS interface are defined in Table 3.3-1. The cable designation is U22. The cable has a single connector at the PCU end and four identical connectors at the GEU end, wired in parallel, pin to pin.

Jack No.	Location	PPL-21 Type	Pins	Plug No.	PPL-21 Type
J918S	PCU	311P409-3S-B12	25	P918P	311P409-3P-B12
J320P	Gyro #0	311P409-2P-B12	15	P320S	311P409-2S-B12
J321P	Gyro #1	311P409-2P-B12	15	P321S	311P409-2S-B12
J322P	Gyro #2	311P409-2P-B12	15	P322S	311P409-2S-B12
J323P	Gyro #3	311P409-2P-B12	15	P323S	311P409-2S-B12

**Table 3.3-1 GSS-PSS interface Connectors (Cable U22)**

### 3.4 Cable Configuration and Connector Pinout Definition

The cable configuration and connector pinout definitions for Cable U22 (PCU to GEU Power) are listed in Table 3.4-1.

P918P		← Cable U22 →					P320S <sup>1</sup>	
							P321S	
							P322S	
							P323S	
J918S		← Box-Mounted Receptacles →					J320P	
							J321P	
							J322P	
							J323P	
PCU							GEU	
PIN	SIGNAL NAME	TYPE	V <sub>max</sub>	I <sub>max</sub>	Group <sup>2</sup>	WIRE	PIN	FUNCTION
			V	A		TYPE		
1	Chassis							
2	GSS_+15_PWR	Power	16	0.6	T6-1a	*	1	GSS +15 Volt Power
3	GSS_+15_PWR	Power	16	0.6	T6-1b	*	2	GSS +15 Volt Power
4	GSS_15_RTN	Pwr Rtn		0.2	T6-1c	*	3	GSS 15 Volt Pwr Return
5	spare							
6	spare							
7	GSS_+5_PWR	Power	5.5	0.8	T4-1a	*	4	GSS +5 Volt Power
8	GSS_5_RTN	Pwr Rtn		0.8	T4-1b	*	5	GSS 5 Volt Return
9	spare							
10	spare							
11	GSS_28QC_RTN	Pwr Rtn		0.9	T4S-2a	*	6	GSS 28 Volt Pwr Return
12	GSS_28QC_RTN	Pwr Rtn		0.9	T4S-2b	*	7	GSS 28 Volt Pwr Return
13	Chassis/T4S-shield						8	chassis/T4S-shield
14	GSS_-15_PWR	Power	16	0.5	T6-1d	*	9	GSS -15 Volt Power
15	GSS_-15_PWR	Power	16	0.5	T6-1e	*	10	GSS -15 Volt Power
16	GSS_15_RTN	Pwr Rtn		0.2	T6-1f	*	11	GSS 15 Volt Pwr Return
17	spare							
18	spare							
19	GSS_+5_PWR	Power	5.5	0.8	T4-1c	*	12	GSS +5 Volt Power
20	GSS_5_RTN	Pwr Rtn		0.8	T4-1d	*	13	GSS 5 Volt Return
21	spare							
22	spare							
23	spare							
24	GSS_+28QC_PWR	Power	29	0.9	T4S-2c	*	14	GSS +28 Volt Power
25	GSS_+28QC_PWR	Power	29	0.9	T4S-2d	*	15	GSS +28 Volt Power
	GSS_CHASS_GND							U22 Overall Cable Shield to Chassis
*	M22759/33-24-9							

**Table 3.4-1 Cable U22 Connectors J918S and P918P Pinout**

Notes:

1. All four power connectors on GEU linked pin-pin per above table

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2.  $T_{n-m}$  = harness wire is part of twisted group of  $n$  wires, group  $m$

### **3.5 [Deleted]**

### **3.6 Returns and Grounding**

Within the GSS, the 5V returns shall be connected to each other, the 15V returns shall be connected to each other and the 28V returns shall be connected to each other. Each of these three common returns shall be isolated from each other, except that the 5V and 15V returns only may be connected to each other via resistors of  $>100\ \Omega$  each. Each of the three common returns shall be isolated from chassis ground within the GSS.

The 28V (primary) power and return lines shall, within the GSS, be isolated from signal and chassis grounds, and from the 5V and 15V (secondary) return lines, by a resistance of not less than  $10\ M\Omega$ .

The three common returns shall be separately routed to the PCU. Within the PCU the returns shall be connected as specified in SP-HIR-169.

### **3.7 Interface Fault Tolerance**

The GSS shall not be damaged by sustained voltages below the minimum as indicated in paragraph 4. or by the unannounced removal of power. The PCU shall not be damaged by the shorting of any power line at this interface to ground.

## 4 POWER

### 4.1 Power Supply and Load Characteristics

The PCU shall supply electrical power directly to the GSS. The characteristics of the supplies at each end of the cable are specified in Table 4-1. In this context, "DC" means for time periods longer than 5 s. Maximum voltages to the GSS shall apply with only the GSS powered (EEA & TEU are off) as controlled by the PCU. Minimum voltages to the GSS shall apply with the TEU, EEA and GSS powered.

	<b>GSS_+5</b>	<b>GSS_+15</b>	<b>GSS_-15</b>	<b>GSS_+28QC</b>
Voltage limits at PCU end of cable (1)	+5.17 +5.27	+15.00 +15.30	-15.15 -15.45	+24.00 +35.00
Voltage limits at GEU end of cable (1)	+5.07 +5.27	+14.94 +15.30	-15.10 -15.45	+23.92 +35.00
Continuous DC load current (mA) (2)	984	442	402	33
Maximum DC load current (mA) (3)	984	562	522	860
Maximum resistance of cable + connector pins	100 mΩ	310 mΩ	100 mΩ	100 mΩ
Maximum PCU supply output resistance (4)	100 mΩ	100 mΩ	100 mΩ	
PCU-induced spikes at PCU end of cable (6)	<150 mV peak	<150 mV peak	<150 mV peak	
PCU-induced ripple at PCU end of cable (5)	<20 mV peak	<20 mV peak	<20 mV peak	

**Table 4-1 PCU to GEU Power Characteristics**

Notes:

1. At specified maximum DC load current
2. When GSS in Operational State
3. Increase in GSS\_+28QC current for 1 hour during GMU warmup; increase in GSS\_±15 currents for 1 minute during gyro spin-up.
4. At Beginning of Life. At EOL: 200 mΩ
5. Over a bandwidth of 0-5 MHz
6. At the switching frequency

## 4.2 Inrush Current

The PCU shall perform to all requirements when connected to the GSS having the capability of sinking inrush currents as defined in Table 4-2.

Table 4-2. GSS Switching Transients.

Switching Action	Line Monitored	Quiescent Current Before (mA)	Spike (mA)	Rise Time	Duration	Quiescent Current After (mA)
GSS ON	+5 V		1000.0	3.5 $\mu$ s	19 $\mu$ s	150
GSS ON	+15V			6 ms		200
GSS ON	-15V		27.8	7.6 ms	106 ms	34.6
GSS ON	+28 V			40 ms		900
CH1 ON (0,2,3 ON, Motors On)	+5V	340	1900.0	5 $\mu$ s	70 $\mu$ s	440
CH1 ON (0,2,3 ON, Motors On)	+15V	580	2780.0	3 $\mu$ s	30 $\mu$ s	720
CH1 ON (0,2,3 ON, Motors On)	-15V	412	2800.0	5 $\mu$ s	44 $\mu$ s	560



## **5 INTERFACE FUNCTIONAL DEFINITIONS**

The PCU supplies switched DC power to the Gyro Subsystem (GSS). The switching details are shown in SP-HIR-169. The control signals to operate the power switching functions are transmitted to the PCU directly from the IPU. Additional internal GSS power switching functions (for Gyro channel selection) are transmitted to the GEU directly from the IPU. Refer to SP-HIR-237, GSS to IPS ICD .