

# HIRDLS

## HIGH RESOLUTION DYNAMICS LIMB SOUNDER



Originator: Douglas M. Woodard

Date: 2000-02-04

---

Subject / Title: **CSS to PSS Interface Control Document (ICD)**

---

Contents / Description / Summary:

Information included herein is controlled under the International Traffic in Arms Regulations (ITAR) by the U.S. Department of State. Transfer of this information to a foreign person or foreign entity requires an export license issued by the U.S. State Department or an ITAR exemption to the license requirement prior to the export or transfer.

---

Keywords: CSS, PSS, Interface

---

Purpose (20 characters maximum): Interface definition

---

---

**Oxford University**  
**Atmospheric, Oceanic & Planetary Physics**  
**Parks Road**  
**OXFORD OX1 3PU**  
**United Kingdom**

**Lockheed Martin Missiles & Space**  
**Advanced Technology Center**  
**3251 Hanover Street**  
**Palo Alto, California 94304-1187**  
**United States of America**

**EOS**

[Intentionally Blank]

**CSS to PSS Interface Control Document (ICD)**

Approved by:

---

John G. Whitney, HIRDLS Program System Engineer Date

---

Raymond L. von Savoye, HIRDLS Instrument System Engineer Date

---

Brenda J. Costanzo, CSS Responsible Product Engineer Date

---

Stan Jaroslawski, PSS Responsible Engineer Date

---

Nigel Morris, HIRDLS UK Program Manager Date

[Intentionally Blank]

## Log of Changes

Rev.	Date	Section	Change Description
draft	97-05-19		Initial draft
draft	97-05-28		Changed font size
draft	98-05-22		Incorporated TC-BLL-048A dated 24 November, 1997 and all relevant comments to date.
draft	98-07-14	3.2	Figure 3.2-1: grounding and shielding connections corrected
		3.4	Table 3.4-1: internal shields removed, I <sub>max</sub> changed to 5 A, power wires changed to 20 AWG.
		3.7	Deleted PCU output shorting requirement.
		4	Table 4-1: load currents updated; Note 3 revised.
		5	Reference to TC-UCB-009 deleted.
		6	Added acronym list.
Initial	98-08-18		Initial release.
A draft	00-01-27	2.1	Added explicit revisions to all documents in AD list.
		2.2	Added to Information Documents list: SP-HIR-034 SP-HIR-036 SP-HIR-218
		3.1	Deleted meaningless word “complex” from text.
		3.2	Figure 3.2-1: Deleted 2x CSS_COM_GND wires.
		3.3	Corrections to Table 3.3-1: Cable designation “U22” changed to “U21”. Changed Plug at PCU end of cable from “MS27468T11F98P” to “MS27467T11F98P”. Changed Plug at CCU end of cable from “MS2746T11F98S” to “MS27467T11F98S” Additions to Table 3.3-1: Added “MIL-C-38999” to descriptions. Added note that MS27505 is not in PPL-21. Added column for Ball Connector Designation.
		3.4	Table 3.4-1: Deleted 2x CSS_COM_GND wires; pins E and F are now spares; changed I <sub>max</sub> on power and return lines from 5 A to 9 A.
		3.6.1	Primary-to-chassis isolation changed from 1 MΩ to 2 MΩ. Primary-to-secondary power isolation requirement in CSS changed from 1 MΩ and 1 nF to 2 MΩ and 1 μF.
		3.6.2.1	Deleted reference to non-existent “figure 3”.
		3.6.2.2	Deleted reference to non-existent “figure 3”; revised text for clarity.
		4	Table 4-1: Changed voltage limits from 27→31 to 24→35; changed I <sub>max</sub> from 5 A to 9 A; changed Note 3 to read “transient fault conditions”.
A	00-02-04		Rev. A released per draft of 00-01-27, with minor editorial corrections; ITAR notice added.

[Intentionally Blank]

## TABLE OF CONTENTS

<b>1</b>	<b>SCOPE .....</b>	<b>1</b>
<b>2</b>	<b>DOCUMENT REFERENCES .....</b>	<b>1</b>
2.1	Applicable Documents .....	1
2.2	Information Documents.....	1
<b>3</b>	<b>INTERFACE REQUIREMENTS .....</b>	<b>2</b>
3.1	Interface Configuration.....	2
3.2	Interface Schematic.....	2
3.3	Connector Definition.....	3
3.4	Cable Configuration and Connector Pinout Definition .....	4
3.5	[deleted] .....	5
3.6	Returns and Grounding.....	5
3.6.1	Primary Power Return.....	5
3.6.2	Secondary Power and Signal Return .....	5
3.6.2.1	Power Section Chassis Ground.....	5
3.6.2.2	CMU Sensor Chassis Ground .....	5
3.6.3	CCU Signal Point Ground Chassis Connection.....	5
3.7	Interface Fault Tolerance .....	5
<b>4</b>	<b>POWER SUPPLY AND LOAD CHARACTERISTICS .....</b>	<b>6</b>
<b>5</b>	<b>INTERFACE FUNCTIONAL DEFINITIONS .....</b>	<b>6</b>
<b>6</b>	<b>ABBREVIATIONS &amp; ACRONYMS .....</b>	<b>7</b>

[Intentionally Blank]



## 1 SCOPE

Interface Control Documents (ICDs) in the SP-HIR-2XX series define, as applicable, the specific design implementations of the electrical, functional, mechanical, conductive thermal, and optical interfaces between specified HIRDLS Subsystems or, in a few special cases, between units within the same subsystem.

This ICD defines the specific design implementation of the interfaces between the Cooler Subsystem (CSS) and the Power Subsystem (PSS). The interfaces between these two subsystems are limited to the Electrical interfaces between the Cooler Control Unit (CCU) and the Power Converter Unit (PCU).

## 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 ICD and any Applicable Document, this ICD shall take precedence.

SP-HIR-013U	Instrument Technical Specification (ITS)	00-02-22
SP-HIR-169G	HIRDLS Power Distribution, Switching and Grounding	00-02-02
SP-HIR-200G	Internal Interface Control Document (IICD) (System Section)	97-12-01
ANSI/TIA/EIA 422-B-1994	Electrical Characteristics of Balanced Voltage Digital Interface Circuits	
GSFC 422-11-12-01, Rev. A, Change 3	General Interface Requirements Document (GIRD) for EOS Common Spacecraft/Instruments	96-11-20
GSFC 424-28-21-06, Rev. A	Unique Instrument Interface Document for HIRDLS (UIID)	98-04-24

### 2.2 Information Documents

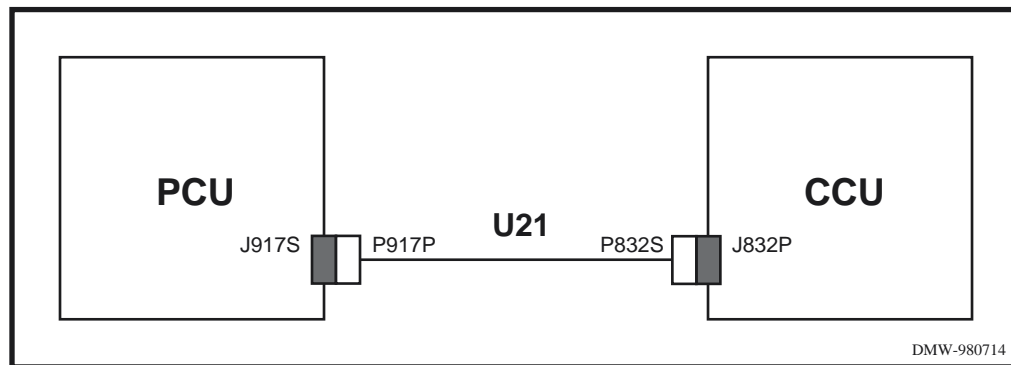
The documents listed below are for information only and are explicitly not, by reference, part of this ICD.

SP-HIR-034	Cooler Subsystem Specification Document	Current Revision
SP-HIR-036	Power Subsystem Specification Document	Current Revision
SP-HIR-103	Command and Telemetry Handbook (C&TH)	Current Revision
SP-HIR-218	STH to CSS Interface Control Document	Current Revision

### 3 INTERFACE REQUIREMENTS

#### 3.1 Interface Configuration

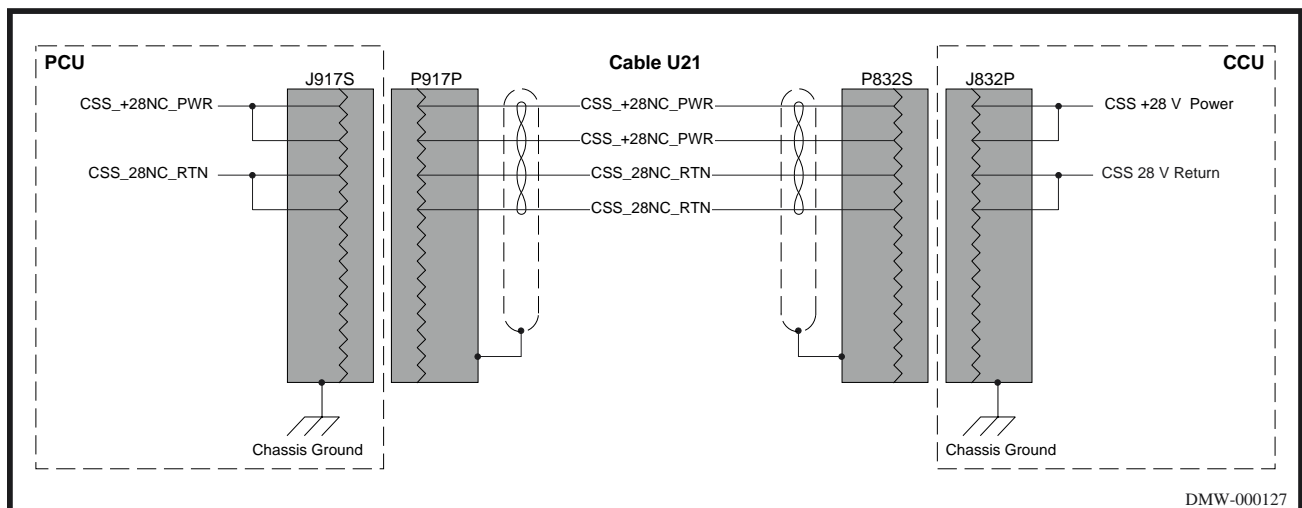
This electrical interface includes one cable in the Main Instrument Harness. The interface carries only DC power from the PCU to the CCU. The cable/connector configuration is illustrated in Figure 3.1-1.



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

#### 3.2 Interface Schematic

A conceptual schematic of Cable U21 and its interfaces with the PCU and CCU is shown in Figure 3.2-1. For conductor and pinout details, refer to Table 3.4-1.



**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 CSS-PSS interface are defined in Table 3.3-1. The cable designation is U21. The cable has a single connector at the PCU end and a single connector at the CCU end.

U21	HIRDLS Connector Designation	Ball Connector Designation	GSFC PPL Type	Description
Receptacle on PCU	J917S	—	MS27468T11F98S	MIL-C-38999 6 contact Round Female contacts
Plug at PCU end of cable	P917P	—	MS27467T11F98P	MIL-C-38999 6 contact Round Male contacts
Receptacle on CCU	J832P	J10P	MS27505E11F98P (not in PPL-21)	MIL-C-38999 6 contact Round Male contacts
Plug at CCU end of cable	P832S	—	MS27467T11F98S	MIL-C-38999 6 contact Round Female contacts

**Table 3.3-1 CSS-PSS interface Connectors**

### 3.4 Cable Configuration and Connector Pinout Definition

The cable configuration and connector pinout definitions for Cable U21 (PCU to CCU Power) are listed in Table 3.4-1.

<b>P917P</b>	<b>β Cable U21à</b>						<b>P832S</b>	
<b>J917S</b>	<b>β Box-Mounted Receptaclesà</b>						<b>J832P</b>	
<b>PCU</b>							<b>CCU</b>	
PIN	SIGNAL NAME	TYPE	V <sub>max</sub> V	I <sub>max</sub> A	Group	WIRE TYPE	PIN	FUNCTION
A	CSS_+28NC_PWR	Power	36	9	T4-1A	**	A	Noisy Bus Power
B	CSS_+28NC_PWR	Power	36	9	T4-1B	**	B	Noisy Bus Power
C	CSS_28NC_RTN	Return	0	9	T4-1C	**	C	Noisy Bus Power Return
D	CSS_28NC_RTN	Return	0	9	T4-1D	**	D	Noisy Bus Power Return
E	Spare						E	
F	Spare						F	
Shell	U21_CHASS_GND						Shell	Overall Shield to Chassis
*	M22759/33-22-9							
**	M22759/33-20-9							

**Table 3.4-1 Cable U21 Connectors J917S and P917P Pinout**

### **3.5 [deleted]**

## **3.6 Returns and Grounding**

### **3.6.1 Primary Power Return**

Isolation between the primary, noisy bus, power or return lines and the CCU chassis shall be greater than  $2\text{ M}\Omega$ . Isolation between primary (noisy bus) and secondary (CCU generated power) grounds shall be greater than  $2\text{ M}\Omega$ , with a capacitance between grounds of less than  $1\text{ }\mu\text{F}$ .

### **3.6.2 Secondary Power and Signal Return**

CSS secondary power (CCU generated power) consists to two returns. The Power Section chassis ground and the CMU Sensor chassis ground

#### **3.6.2.1 Power Section Chassis Ground**

The Power Section of the CCU is connected to the CCU power supply chassis at one point only. When the Power Section secondary power ground connection is removed, the isolation between the secondary power and the instrument structure shall be greater than  $1\text{ M}\Omega$  with a capacitance of less than  $1\text{ }\mu\text{F}$ .

#### **3.6.2.2 CMU Sensor Chassis Ground**

The CSS Compressor and Displacer assemblies contain capacitive position sensors. The sensors are powered by an independent power supply contained in the CCU. This independent supply has a chassis ground connection through the sensors and the compressor and displacer mechanical components. When the CMU Sensor secondary power ground connection is removed, the isolation between this secondary power circuit and the Instrument structure shall be greater than  $1\text{ M}\Omega$  with a capacitance of less than  $1\text{ }\mu\text{F}$ .

### **3.6.3 CCU Signal Point Ground Chassis Connection**

See SP-HIR-218, STH to CSS ICD.

## **3.7 Interface Fault Tolerance**

See SP-HIR-034, Cooler Subsystem Specification Document.

#### 4 POWER SUPPLY AND LOAD CHARACTERISTICS

The PCU shall supply electrical power directly to the CCU. 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.

	CSS_+28NC_PWR	See Note
<b>Voltage limits at PCU end of cable</b>	High +35.0 V Low +24.0 V	1
<b>Nominal DC load current</b>	2.3 A	2
<b>Maximum DC load current</b>	9 A	3
<b>Maximum resistance of cable + connector pins</b>	300 mΩ	

Notes:

1. At specified nominal DC load current
2. When CSS in OPERATIONAL State; bus voltage at low limit
3. CCU converter current limit; transient fault conditions

**Table 4-1 Voltage Limits and Load Characteristics**

#### 5 INTERFACE FUNCTIONAL DEFINITIONS

The PCU supplies switched DC power to the Cooler Control Unit (CCU). 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 CCU power switching functions are transmitted to the CCU directly from the IPU. Refer to SP-HIR-103 Command & Telemetry Handbook (C&TH) for power switching command details.

## 6 ABBREVIATIONS & ACRONYMS

AWG	American Wire Gauge
C&TH	Command and Telemetry Handbook
CCU	Cooler Control Unit
CMU	Cooler Mechanical Unit
CSS	Cooler SubSystem
GIRD	General Interface Requirements Document
ICD	Interface Control Document
IICD	Internal Interface Control Document
IPS	Instrument Processor Subsystem
IPU	Instrument Processor Unit
ITS	Instrument Technical Specification
PCU	Power Converter Unit
PPL	Preferred Parts List
PSS	Power Supply Subsystem
SSP	Secondary Star Point
TBD	To Be Determined
TBV	To Be Verified
UIID	Unique Instrument Interface Document