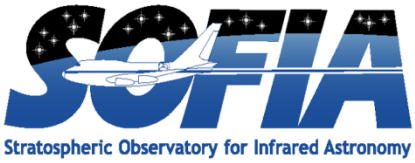

Interface Control Document
Principal Investigator Patch Panel to
Principal Investigator Equipment Rack(s)
MCCS_SI_05

SOF-AR-ICD-SE03-2029

Date: August 1, 2018
Revision: E

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Interface Control Document
Principal Investigator Patch Panel to
Principal Investigator Equipment Racks
MCCS_SI_05

PREPARED BY:

Stefan Rosner '00'07- 16:37:32 2018.08.16 SETI INSTITUTE	16 August 2018
SETI Institute / Stefan Rosner / SOFIA SI Development Engineer	Date

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NASA / Matt Enga / SOFIA Systems Integration Lead	Date

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NASA / Jeanette Le / SOFIA Program Chief Engineer	Date

REVISIONS

REV	DATE	DESCRIPTION	APPROVAL
-	2/8/2010	This version includes the consolidation of MCCS_SI_02 and MCCS_SI_03 ICDs into one. The addition of 230 VAC 50 Hz UPS source power, panel reference designators, and context diagram. Functions of bulkhead connectors on the PI Patch Panel (MCCS & SI side), including cable destination at the SI patch panels on the Telescope Assembly, have been updated to reflect the current PI Patch Panel and MCCS configuration. Audio interface section has been removed as MADS will no longer be accessed via the PI Patch Panel. Power/grounding diagram, reference documents, and table/figure numbers have been updated.	PMB_20100208
A	02/21/2012	This version reflects incorporation of CCRs PRG-CCR-096 and PRG-CCR-102: PRG-CCR-096: deletes unused video coaxial cables described in Table 2 & 21 - PI Patch Panel-MCCS Side (U401) Connector Identification. Replaces 75 ohm coaxial BNC connectors with additional Fiber and Copper Ethernet connectors, J30-J51, J133, J134. Section for *Analog Video Interface* removed. Changed Function for J52, J53 and J54 of Table 2 & 21, and inserted new Table 8 to define the pinout for J52, and the lead times associated with various sensor excitation voltages. In Table 2, updates power connectors J1-J3, which require upgraded wire gauges to address SOF-DRs 305 & 306 and segment 3 design changes. Sections 3.2.1.2 – 3.2.1.4 added to define power allocations to Cryogen Cooler Compressors, Vacuum Pump System, and Nasmyth Blower. In section 3.2.1.1, upgraded power specs, and added note about 28VDC on UPS. In Table 21, updates cable specifications for J0-J3 to reflect actual / planned wire gauges and types. PRG-CCR-102: Updates to Figure 7 graphic as well as connectors, function, wire types and backshell P/Ns in Tables 3 and 22 to identify U400 J128 ~ J131 as being available for any AC power transmission application up to 2 KVA and 230 VAC (i.e., not limited to 115 VAC 60 Hz), and to define U400 J132 as a new power transmission interface up to 3.5 KVA and 230 VAC (i.e., not limited to 230 VAC 50 Hz). Updates to para. 3.1.2, 3.2.2, 3.2.2.3 to clarify the usage of J128 ~ J131 and J132. Updates to para. 3.2.1.5, 3.2.2, and 3.4 to clarify that grounding straps are to be provided by SOFIA Program (USRA) and not by SI developer.	PMB_20120221
B	04/10/2012	This version reflects incorporation of CCR PRG-CCR-108: Updates to Table 3 and Table 22 to reflect J60 ~ J69 microwave coax cable upgrades approved by Platform PCB via SOF CCR-651 on 3/29/2012 and to clarify SI mating connector P/N. Updates to para. 3.2.1.1, Power Interface, to reflect slight relaxations in power quality specifications for frequency stability and Total Harmonic Distortion (THD) of 230 VAC 50 Hz UPS power available from U401 J0, and to clarify UPS backup capabilities of 28 VDC interface.	PMB_20120410
B.1	5/7/2012	This is a minor iteration release, reflecting incorporation of CCR PRG-CCR-110: Updates to J132 entries in Table 3 to correct the bulkhead connector U400 J132 P/N (pin contacts), and the mating SI cable plug P132 (socket contacts), to match the U400 J128 ~ J131 lines.	PMB_20120507

REV	DATE	DESCRIPTION	APPROVAL
C	11/4/2013	This is a minor update, reflecting incorporation of CCR PRG-CCR-141. Para. 3.1.3 added to describe the PI Patch Panel Safety Guard Installation (per SOF CCR-938). Updated confirmed FS locations for PI Patch Panel in Figure 1 and Table 1. Corrected CB ratings in Para. 3.2.1.1. Figure 8, PI Patch Panel Safety Guard (added). Reference document APP-DF-ICD-SE03-2006 ICD Global Electrical, SI Power and Grounding Approach A&B marked as draft in Para. 2.3. FS & LBL added in Para. 5 "ACRONYMS". Para. 3.2.1.5, Figure 8 became Figure 9. SE03-2015 added in Para. 3.1 and 3.1.3	PMB_20131104
D	3/9/2016	Updates per OCCB-CCR-0581 (JIRA Key # SOF-3362). See CCR for detailed FROM: / TO: changes. Note: this and other Level 2 ICDs and specifications have been pushed down from PMB to OCCB control per PMB-approved PRG-CCR-181, SE01-068 Rev. K. Updated signature pages to reflect changes in program staffing, as well as direction from Chief Engineers office that Prepared By signatures for ICDs should include a representative from both sides of the defined interface. Redacted references to "SI Cooling Lines" and "SI Water" in Figure 3, consistent with removal of these lines and interfaces from CLA per OCCB-CCR-0572 (JIRA Key # SOF-3347). Added Table 7b, Cryocooler Power, in Section 3.2.1. Updated Table 2 (U401) with a new row defining DOZ9091 (Cryocooler Power Connector). Updated Figure 6 to reflect relocation of J3 connector and addition of CRYO COOLER PWR connector on U401. Added reference to OP03-2000 (SI Dev. HDBK) to Sections 2.3 and 3.1. Added reference to SE03-036 (TA_SI_01) to Section 3.1.3. Errata correction of the Emergency Power Disconnect (EPD) signal logic description in Table 7a, Table 13 and Section 3.2.1.1 (logic was reversed) and deleted duplicative / conflictive statement in Section 3.2.2.3 [resolves OCCB-DR-856 (JIRA Key # SOF-3327) and OCCB-DR-857 (JIRA Key # SOF-3328), except for associated impacts to Power Draw Test Fixture EGSE]. Clarify that the SI power allocations defined in Section 3.2.1.1 for U401 J0, J1 and J2 represent verifiable worst-case steady-state power draw values for the SI (and that SIs should not plan to operate within overload conditions for any significant duration beyond start-up transients). Updated information within VPS Power Section 3.2.1.3 and Cryocooler Power Section 3.2.1.4. Relaxed ground path resistance spec. in Section 3.2.1.5 (sub-allocation of 100 mΩ Class H Shock Hazard grounding spec.) from 10 mΩ to 20 mΩ [resolves PR (JIRA Key # SOF-1966), and dovetails with relaxation of corresponding SI requirement in SE01-2028A ParID 3.5.4.2 per OCCB-CCR-0454 (JIRA Key # SOF-3118)]. Updated Table 21 with a new for the CRYO COOLER PWR connector. Added note to Section 3.2.2.2 re: possible use of J75 through J79 TSP interfaces for low-power multi-phase power transmission (e.g., Cryocooler cold head rotary valve power). Added note to Section 3.2.2.3 re: possible use of U400 / U402(A) J128 ~ J132 interfaces for DC power transmission. Added footnote to Tables 2 and 3 for mating plug P/Ns for J0, J1, J2, J3 and J132 to indicate that MS3456 plug may be substituted for (preferred) MS3459 plug with self-locking coupling nut [retires OCCB-WAV-0079 (JIRA Key # SOF-3472)].	OCCB
E	8/1/2018	Per OCCB-CCR-1465: Figure 6 updated: (Connector J52, J53 removed and new connector J135-J138 added). Table 2. PI Patch Panel - MCCS Side (U401) updated: (Connector J52, J53 removed and new connector J135-J138 added. J54 connector PN & mating PN updated and reference designator deleted). Section 3.2.1.7 Data/Sensors "content" & Table 8	OCCB

REV	DATE	DESCRIPTION	APPROVAL
		deleted. Table 7b renamed Table 8. Table 18 was Power Connector J129 Now is Power Connector J130. Table 21. Cable selection-MCCS side updated: (Connector J52, J53 removed and new connector J135-J138 added. J54 name or function & Cable PN deleted).	

Interface Control Document
Principal Investigator Patch Panel
to Principal Investigator Equipment Rack(s)
MCCS_SI_05

Table of Contents

List of Figures

List of Tables

Interface Control Document
Principal Investigator Patch Panel
to Principal Investigator Equipment Rack(s)
MCCS_SI_05

1. SCOPE

This document describes the physical and electrical interface between the Principal Investigator (PI) equipment in the PI Rack(s) and the "MCCS" (Mission Controls and Communications System) side of the PI Patch Panel (U401) at which MCCS services (electrical power, network, video, etc.) are provided. It also describes the physical and electrical interface between the Principal Investigator (PI) equipment in the PI Rack(s) and the "SI" side of the PI Patch Panel (U400) is utilized for connections to PI hardware mounted on the Telescope Assembly. This ICD includes the consolidation of ICD MCCS_SI_02 (PI Patch Panel to MCCS Interface) and ICD MCCS_SI_03 (PI Patch Panel to SI Interface). A supplementary ICD, MCCS_SI_04, describes the network services and the SOFIA Command Language (SCL), which provides the software interface between PI computers, and the MCCS. The scope of this ICD reflects the known implementation of the Fully Operational Capable (FOC) configuration as identified by the SOFIA program. There exists a future expansion capability to the PI patch panels, including connections such as additional 230 VAC feeds, video, thermocouple monitoring and voltage monitoring of the PI racks should those capabilities be required.

Purpose

The purpose of this Interface Control Document is to provide the data necessary for PI teams to design the physical and electrical connectivity between PI Rack equipment, MCCS, and all PI hardware mounted on the Telescope Assembly (i.e., Counterweight Rack and SI per se).

2. APPLICABLE DOCUMENTS

The data referenced in this ICD represents the latest version at the time of issuance of this ICD, unless otherwise stated, and forms a part of these requirements to the extent specified herein.

2.1. Order of Precedence

In the event of a conflict between the text of this ICD and the referenced cited herein, the text of this ICD takes precedence. Nothing in this ICD, however, supersedes contractual requirements unless a specific exemption has been obtained. As appropriate, reference is made to other project documentation for use as guidance in developing the content of this ICD and as such forms a basis for requirements to the extent specified herein.

2.2. Required Documents

USRA-DAL-1093-00	Environmental Requirements for the SOFIA Observatory (PD96165006-000)

2.3. Other Related Documents

APP-DF-ICD-SE03-2006	ICD Global_Electrical, SI Power and Grounding Approach A & B (draft)
APP-DF-ICD-SE03-2038	ICD Global Power Budget
APP-DF-ICD-SE03-2011	ICD MCCS_Network Subsystem, MCCS Network Subsystem Interface Control Document

SOF-DF-PD-PD-2009	SOFIA Lexicon
SCI-AR-PLA-PM21-2000	Science Project System Safety and Mission Assurance Plan
SOF-DA-ICD-SE03-036	ICD TA_SI_01, Cable Load Alleviator Device / Science Instrument Cable Interface
SOF-DA-ICD-SE03-052	ICD MCCS_SI_04, Interface Control Document for the SOFIA System MCCS / Science Instrument Interface
SOF-AR-ICD-SE03-2015	ICD SI_AS_01, Interface Control Document for the Principal Investigator Equipment/Rack to Aircraft System
SCI-AR-HBK-OP03-2000	SOFIA Science Instrument Developers' Handbook

3. INTERFACE REQUIREMENTS

3.1. Physical

The observatory provides for installation and operation of up to three PI equipment racks containing electronic equipment used to gather and process scientific data. This PI equipment will interface with the PI Patch Panel from which the PI is able to access and communicate with the MCCS and with the PI hardware mounted on the Telescope Assembly. The physical structure of the PI Patch Panel is designed such that one panel face allows connectivity to the MCCS and the other with the PI hardware mounted on the Telescope Assembly. Figure 1 shows the location of the PI Patch Panel in relation to the PI racks. Table 1 lists panel names and reference designators.

Refer to SOF-AR-ICD-SE03-2015 (SI_AS_01) for definition of the FS locations of the PI racks. To support cable layout and design, additional information re: the locations and dimensions of the PI and SI patch panels on the main deck and the TA may be found in SCI-AR-HBK-OP03-2000, SI Developers' Handbook, Appendix C, Rack & Patch Panel Distances.

Connectors on the PI Patch Panel are arranged to provide easy access for connection of cable assemblies. The connectors are grouped by type (e.g. power, signal, etc.), and are labeled with a connector reference designator. Figure 2 depicts the PI Patch Panel in an isometric view with the location of ground studs shown.

Each connector on the PI Patch Panel will have a spacing of at least one inch from any other connector on the panel for at least 270°. There will be at least two inch spacing for 360° between connectors of differing signal types.

Figures 3 and 4 are block diagrams that show the systems that interface at the PI Patch Panel.
Figure 5 depicts the connector naming convention used for the part numbers in Table 2 and 3.

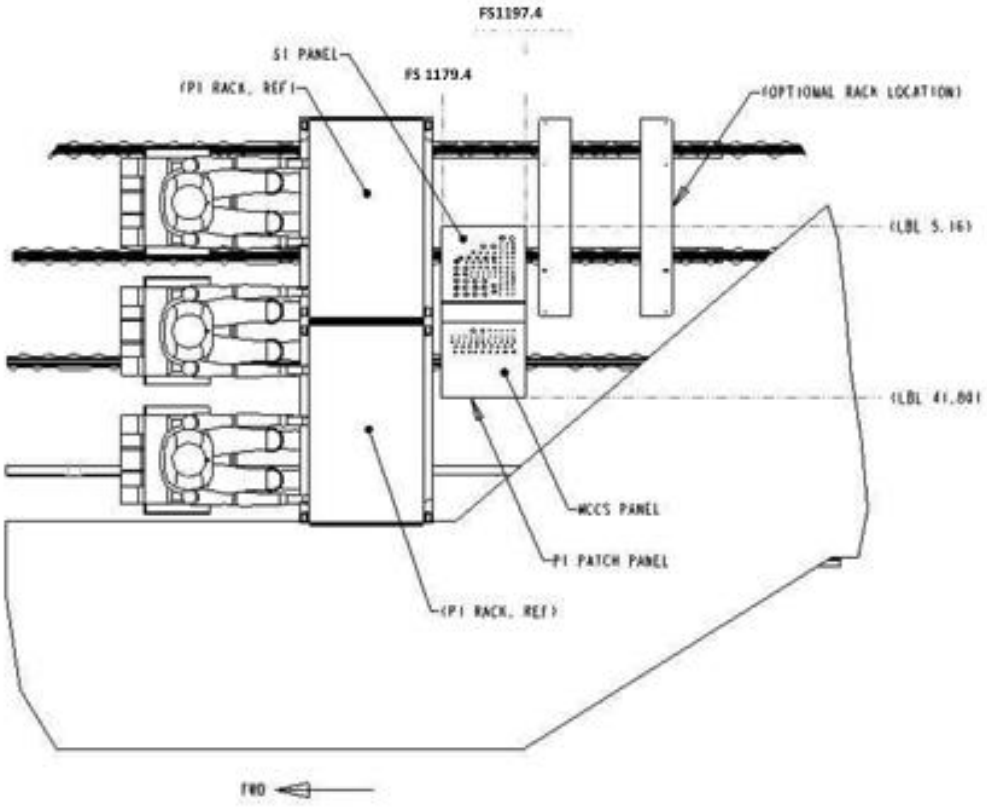

Figure 1. PI Patch Panel Location

Table 1. Panel Names and Reference Designators

Panel	Location	Designator
PI Patch Panel – SI Side	FS 1179.4 LBL 5.16 (Fig.1)	U400
PI Patch Panel – MCCS Side	FS 1179.4 LBL 41.8 (Fig.1)	U401
SI Patch Panel – Power	TA – Right Side [1]	U402
SI Patch Panel – Signal	TA – Left Side [2]	U403

[1] ICD SE03-036 (TA_SI_01), Fig.13-A, 13-B
[2] ICD SE03-036 (TA_SI_01), Fig.14-A, 14-B

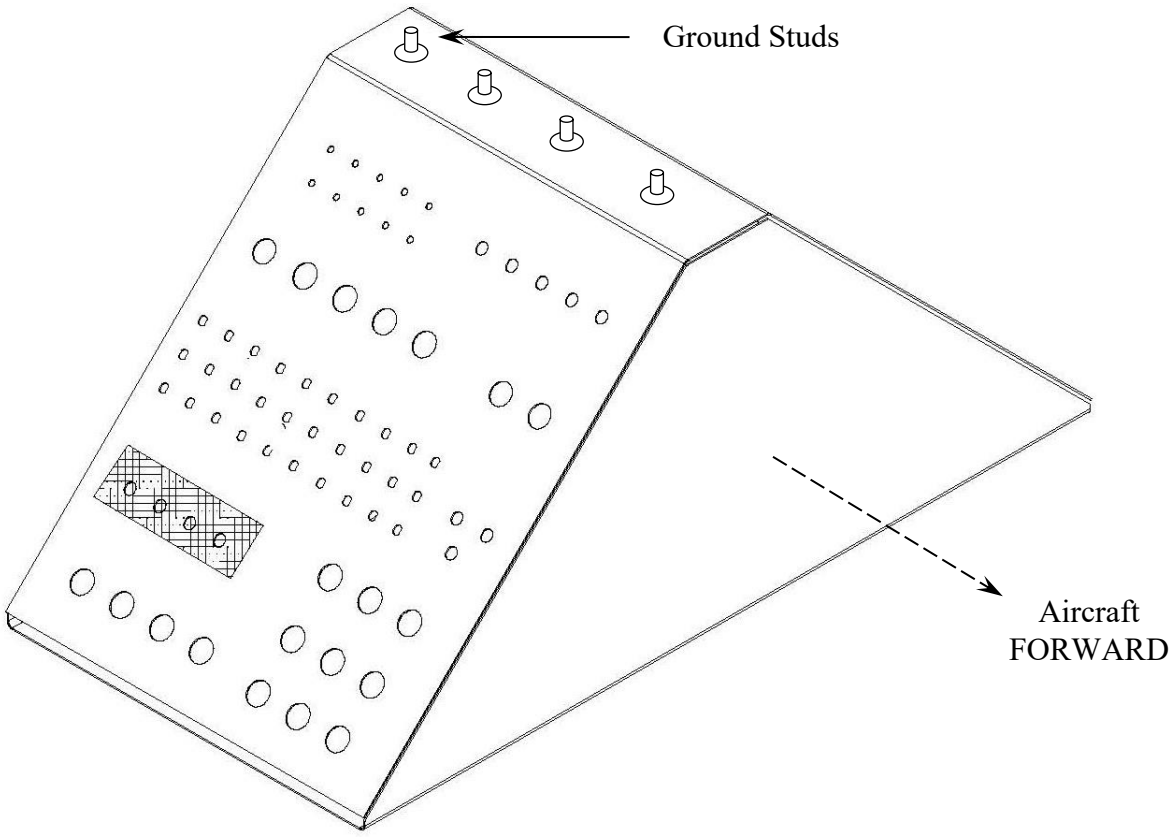

Figure 2. PI Patch Panel - Isometric View of SI Side (U400)

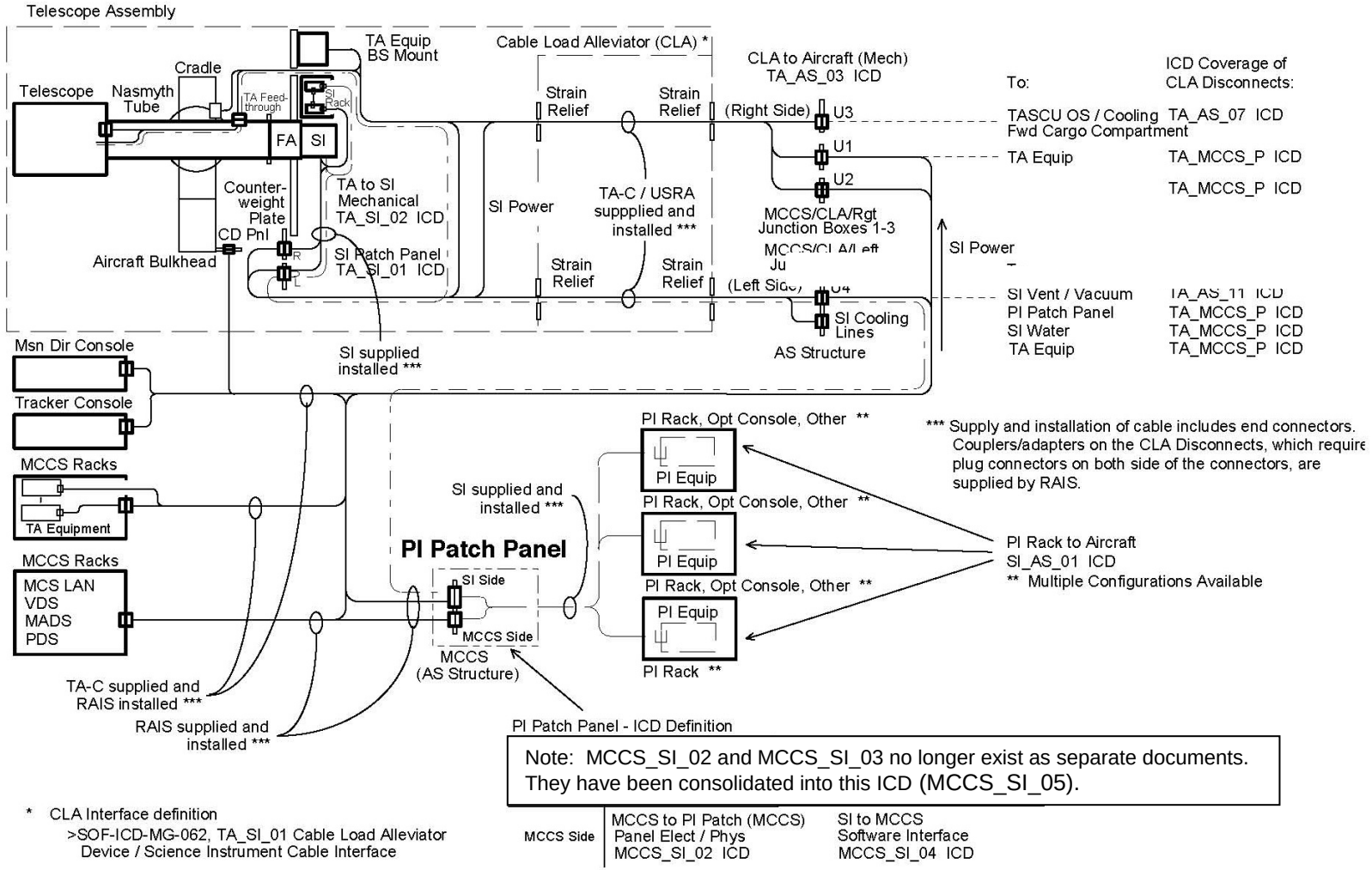

Figure 3. Electrical Block Diagram - For Reference Only

Science Instrument Electrical Interface Context Diagram

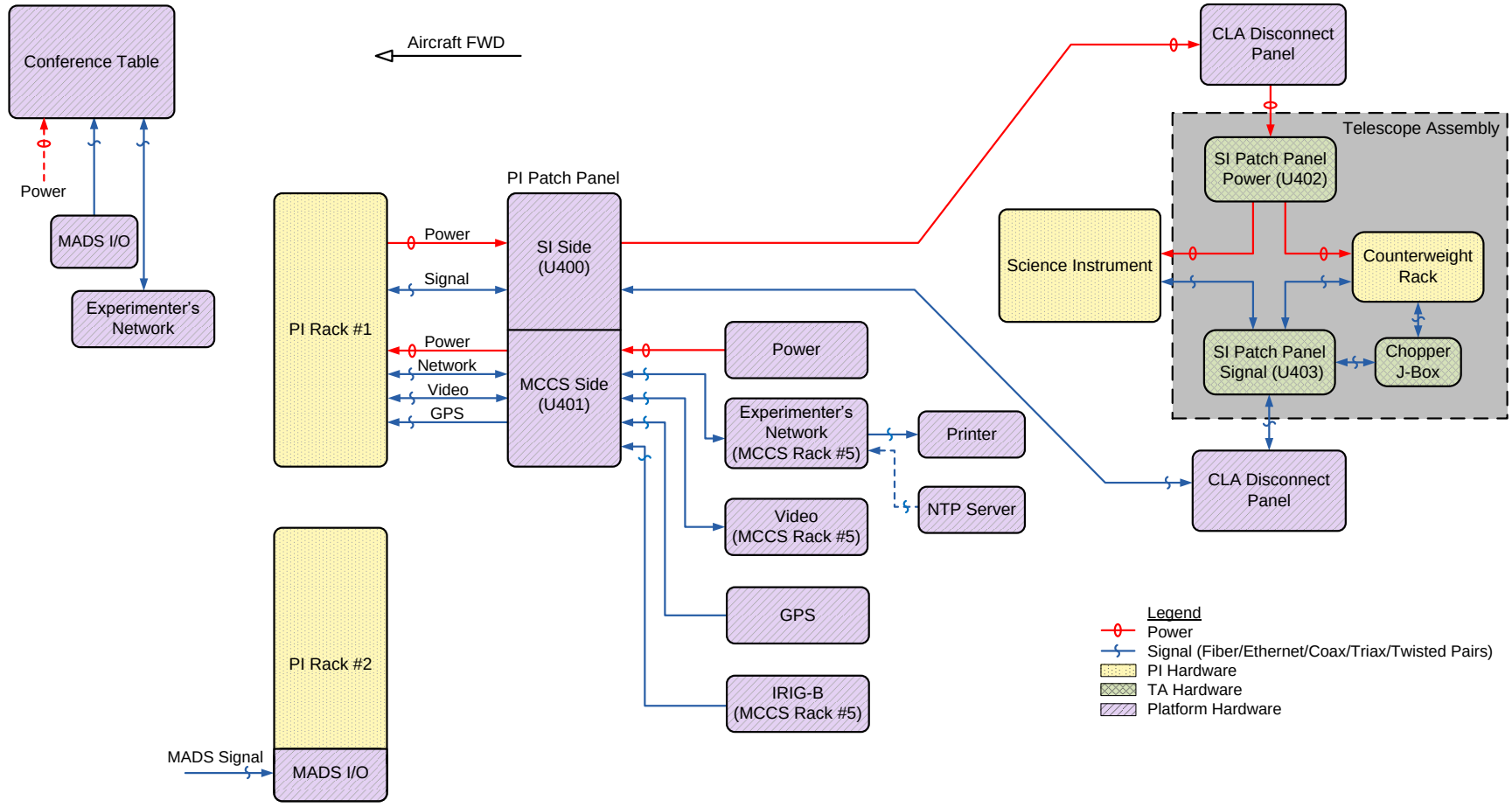

Figure 4. Science Instrument Electrical Interface - Context Diagram

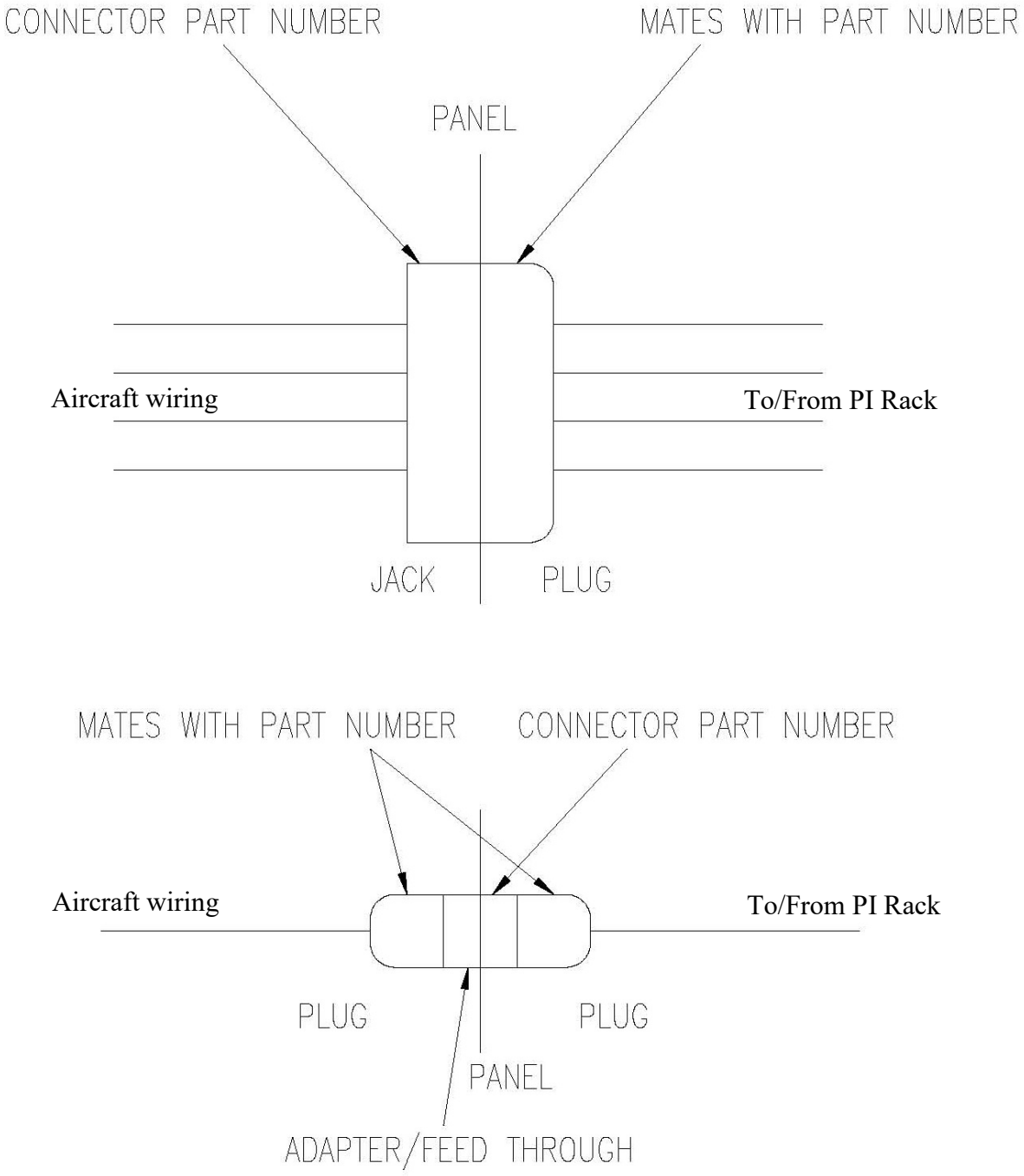

Figure 5. Connector Naming Convention

3.1.2. PI Patch Panel-MCCS Side

PI equipment housed in the PI racks(s) may be interfaced to the MCCS through the PI Patch Panel-MCCS Side (U401). Jumper cable assemblies to make these connections will be provided by the PI. Figure 6 depicts an enlarged view of the layout of the MCCS side of the PI Patch Panel.

Table 2 identifies each bulkhead connector located on panel U401 by a reference designator, bulkhead connector part number, generic name for functionality, destination for cables connected to the back side of the PI Patch Panel, and mating connector part number (for the SI-provided jumpers) as part of the physical interface control. SI cables shall utilize connectors (or equivalents) as documented in Table 2.

Power connectors J0 through J3, and CRYO COOLER PWR are each uniquely keyed to prevent misconnection.

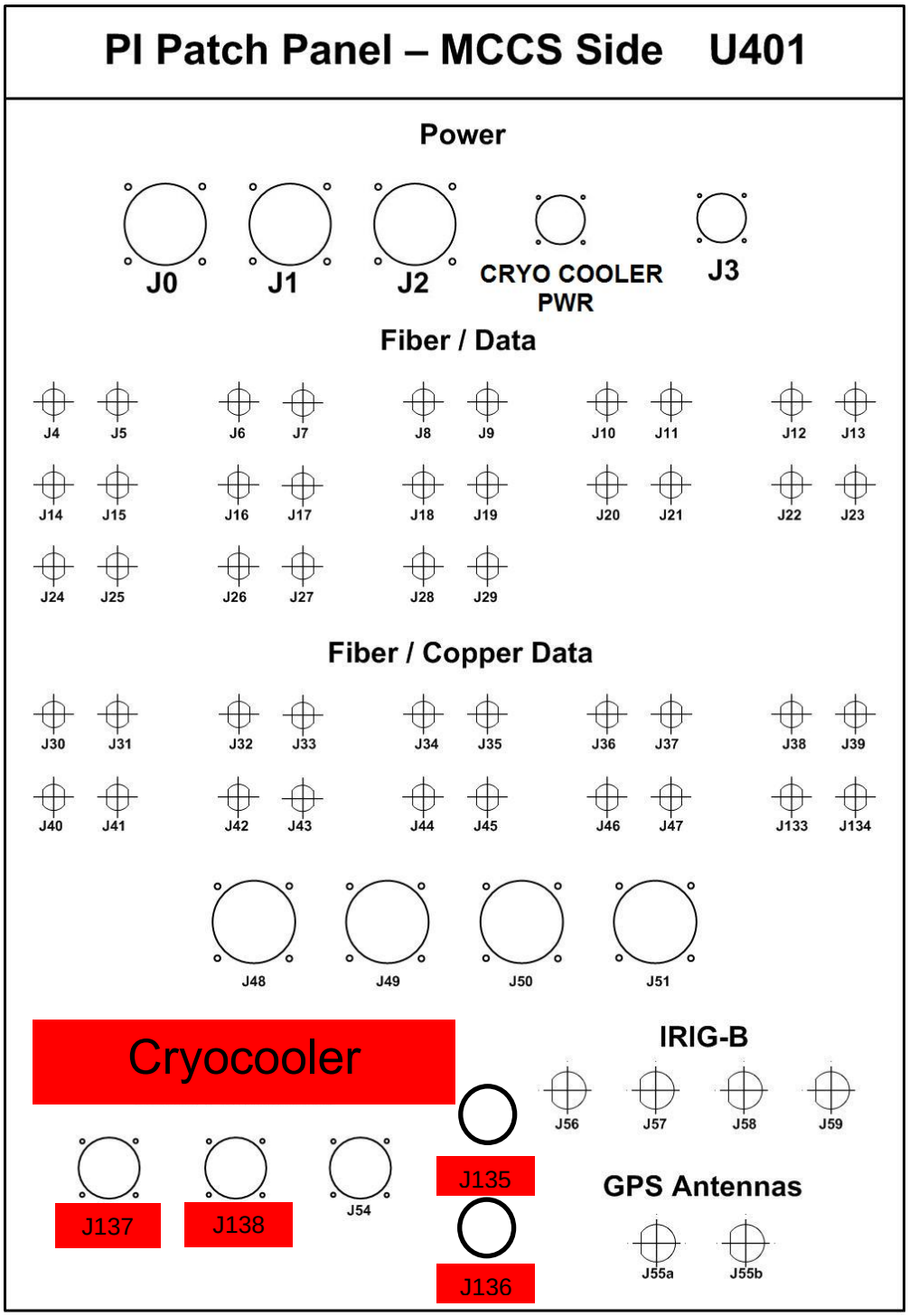

Figure 6. PI Patch Panel connector layout for MCCS Interface

Table 2. PI Patch Panel-MCCS Side (U401) Connector Identification

Reference Designator	Bulkhead Connector ID	Bulkhead Connector P/N	Function	Mating Part Number
DOZ9088	J0	MS3450W22-2SX	UPS 230 VAC 50 Hz (from MCCS PDS)	MS3459W22-2PX [3]
DOZ9089	J1	MS3450W28-6SY	FC 115 VAC 60 Hz (from MCCS PDS)	MS3459W28-6PY [3]
DOZ9090	J2	MS3450W28-6SW	UPS 115 VAC 60 Hz (from MCCS PDS)	MS3459W28-6PW [3]
DOZ9080	J3	MS3450W16-9S	28 VDC (from MCCS PDS) / Emergency Disconnect	MS3459W16-9P [3]
DOZ9091	CRYO COOLER PWR	MS3450W22-22S	Cryocooler System Power – 3-phase 115 VAC 60 Hz	MS3459W22-22P [3]
DOZ9298	J4	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 1[1,2]	M83522/16-DNX
DOZ9297	J5	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 1[1,2]	M83522/16-DNX
DOZ9303	J6	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 2[1,2]	M83522/16-DNX
DOZ9299	J7	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 2[1,2]	M83522/16-DNX
DOZ9282	J8	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 3[1,2]	M83522/16-DNX
DOZ9281	J9	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 3[1,2]	M83522/16-DNX
DOZ9284	J10	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 4[1,2]	M83522/16-DNX
DOZ9283	J11	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 4[1,2]	M83522/16-DNX
DOZ9290	J12	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 5[1,2]	M83522/16-DNX
DOZ9289	J13	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 5[1,2]	M83522/16-DNX
DOZ9292	J14	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 6[1,2]	M83522/16-DNX
DOZ9291	J15	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 6[1,2]	M83522/16-DNX
DOZ9294	J16	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 7[1,2]	M83522/16-DNX
DOZ9293	J17	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 7[1,2]	M83522/16-DNX
DOZ9296	J18	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 8[1,2]	M83522/16-DNX
DOZ9295	J19	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 8[1,2]	M83522/16-DNX
DOZ9317	J20	M83522/17-NY	VDS (100/1000BASE-FX/SX Fiber) Transmit 1[1,2]	M83522/16-DNX
DOZ9316	J21	M83522/17-NY	VDS (100/1000BASE-FX/SX Fiber) Receive 1[1,2]	M83522/16-DNX
DOZ9319	J22	M83522/17-NY	VDS (100/1000BASE-FX/SX Fiber) Transmit 2[1,2]	M83522/16-DNX
DOZ9318	J23	M83522/17-NY	VDS (100/1000BASE-FX/SX Fiber) Receive 2[1,2]	M83522/16-DNX
DOZ9321	J24	M83522/17-NY	VDS (100/1000BASE-FX/SX Fiber)Transmit 3[1,2]	M83522/16-DNX
DOZ9320	J25	M83522/17-NY	VDS (100/1000BASE-FX/SX Fiber) Receive 3[1,2]	M83522/16-DNX
DOZ9110	J26	M83522/17-NY	MADS PI FCD ATM(OC-3) Transmit	M83522/16-DNX
DOZ9109	J27	M83522/17-NY	MADS PI FCD ATM(OC-3) Receive	M83522/16-DNX
DOZ9112	J28	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 9[1,2]	M83522/16-DNX
DOZ9111	J29	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 9[1,2]	M83522/16-DNX
DOZ9560	J30	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 10[1,2]	M83522/16-DNX
DOZ9562	J31	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 10[1,2]	M83522/16-DNX
DOZ9564	J32	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 11[1,2]	M83522/16-DNX
DOZ9566	J33	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 11[1,2]	M83522/16-DNX

Reference Designator	Bulkhead Connector ID	Bulkhead Connector P/N	Function	Mating Part Number
DOZ9417	J34	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 12[1,2]	M83522/16-DNX
DOZ9419	J35	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 12[1,2]	M83522/16-DNX
DOZ9421	J36	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 13[1,2]	M83522/16-DNX
DOZ9772	J37	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 13[1,2]	M83522/16-DNX
DOZ9774	J38	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 14[1,2]	M83522/16-DNX
DOZ9776	J39	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 14[1,2]	M83522/16-DNX
DOZ9778	J40	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 15[1,2]	M83522/16-DNX
DOZ9780	J41	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 15[1,2]	M83522/16-DNX
DOZ9567	J42	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 16[1,2]	M83522/16-DNX
DOZ9569	J43	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 16[1,2]	M83522/16-DNX
DOZ9571	J44	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 17[1,2]	M83522/16-DNX
DOZ9573	J45	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 17[1,2]	M83522/16-DNX
DOZ9575	J46	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 18[1,2]	M83522/16-DNX
DOZ9577	J47	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 18[1,2]	M83522/16-DNX
N/A	J48	RJF2PEM1B	RJ-45 Gigabit Copper Ethernet 1	Amphenol RJF6B
N/A	J49	RJF2PEM1B	RJ-45 Gigabit Copper Ethernet 2	Amphenol RJF6B
N/A	J50	RJF2PEM1B	RJ-45 Gigabit Copper Ethernet 3	Amphenol RJF6B
N/A	J51	RJF2PEM1B	RJ-45 Gigabit Copper Ethernet 4	Amphenol RJF6B
N/A	J54	D38999/20FC98SN	Not Used	D38999/26FC98PN
DOZ9385	J55a	BJ28 (Trompeter)	GPS Antenna 1	50Ω BNC
DOZ9386	J55b	BJ28 (Trompeter)	GPS Antenna 2	50Ω BNC
DOZ9374	J56	BJ28 (Trompeter)	IRIG-B #1	50Ω BNC
DOZ9376	J57	BJ28 (Trompeter)	IRIG-B #2	50Ω BNC
DOZ9378	J58	BJ28 (Trompeter)	IRIG-B #3	50Ω BNC
DOZ9380	J59	BJ28 (Trompeter)	IRIG-B #4	50Ω BNC
N/A	J133	M83522/17-NY	100/1000BASE-FX/SX Fiber / Transmit 19[1,2]	M83522/16-DNX
N/A	J134	M83522/17-NY	100/1000BASE-FX/SX Fiber / Receive 19[1,2]	M83522/16-DNX
N/A	J135		Cryocooler interface to MDCP. Ref: SE03-2066 (CRYO_SI_02)	
N/A	J136		Cryocooler interface to SI. Ref: SE03-2066 (CRYO_SI_02)	
N/A	J137		Cryocooler interface to SI. Ref: SE03-2066 (CRYO_SI_02)	
N/A	J138		Cryocooler interface to MDCP. Ref: SE03-2066 (CRYO_SI_02)	

Notes:

[1] To/From MCCS Forward Rack 5.

[2] All fiber optic jumper cables must be multimode (62.5 μm core, 125 μm cladding) with ST type connectors.

[3] MS3456 plug may be substituted for specified (preferred) MS3459 plug for this application.

3.1.3. PI Patch Panel- SI Side

PI equipment housed in the PI racks may be interfaced to the SI assembly and Counterweight Rack at the TA through the PI Patch Panel-SI Side (U400). Jumper cable assemblies to make these connections will be provided by the PI. Figure 7 depicts an enlarged view of the layout of the SI side of the PI Patch Panel.

Cables on the other side of the U400 bulkhead connectors route to two other panels on the Telescope Assembly, the SI Patch Panel-Power (U402 and U402A) and the SI Patch Panel-Signal (U403). Additional SI-provided jumper cables from panels U402 and U403 complete the wiring to the Science Instrument itself, the Counterweight Rack and the TA Chopper J-Box, as needed.

Table 3 identifies each bulkhead connector located on panel U400 by a reference designator, bulkhead connector part number, generic name for functionality, destination for cables connected to the back side of the PI Patch Panel, and mating connector part number (for the SI-provided jumpers) as part of the physical interface control. SI cables shall utilize connectors (or equivalents) as documented in Table 3.

Power connectors J128 through J132 are each uniquely keyed to prevent misconnection. J128 through J131 may be used for any power transmission applications up to 2 KVA and up to 230 VAC. The J132 line is sized with larger conductor wire and connector contacts for power transmission applications up to 3.5 KVA and up to 230 VAC. It is anticipated that SI use of the J132 line will generally be limited to SI cabling downstream of the 115 VAC 60 Hz FC (unprotected) 3.5 KVA power interface from U401 J1 that needs to be routed to SI equipment in the CWR and/or the SI assembly itself.

For further information regarding the U402, U402A and U403 patch panels, and the cable / wire types routed through the CLA, please refer to SOF-DA-ICD-SE03-036 (TA_SI_01).

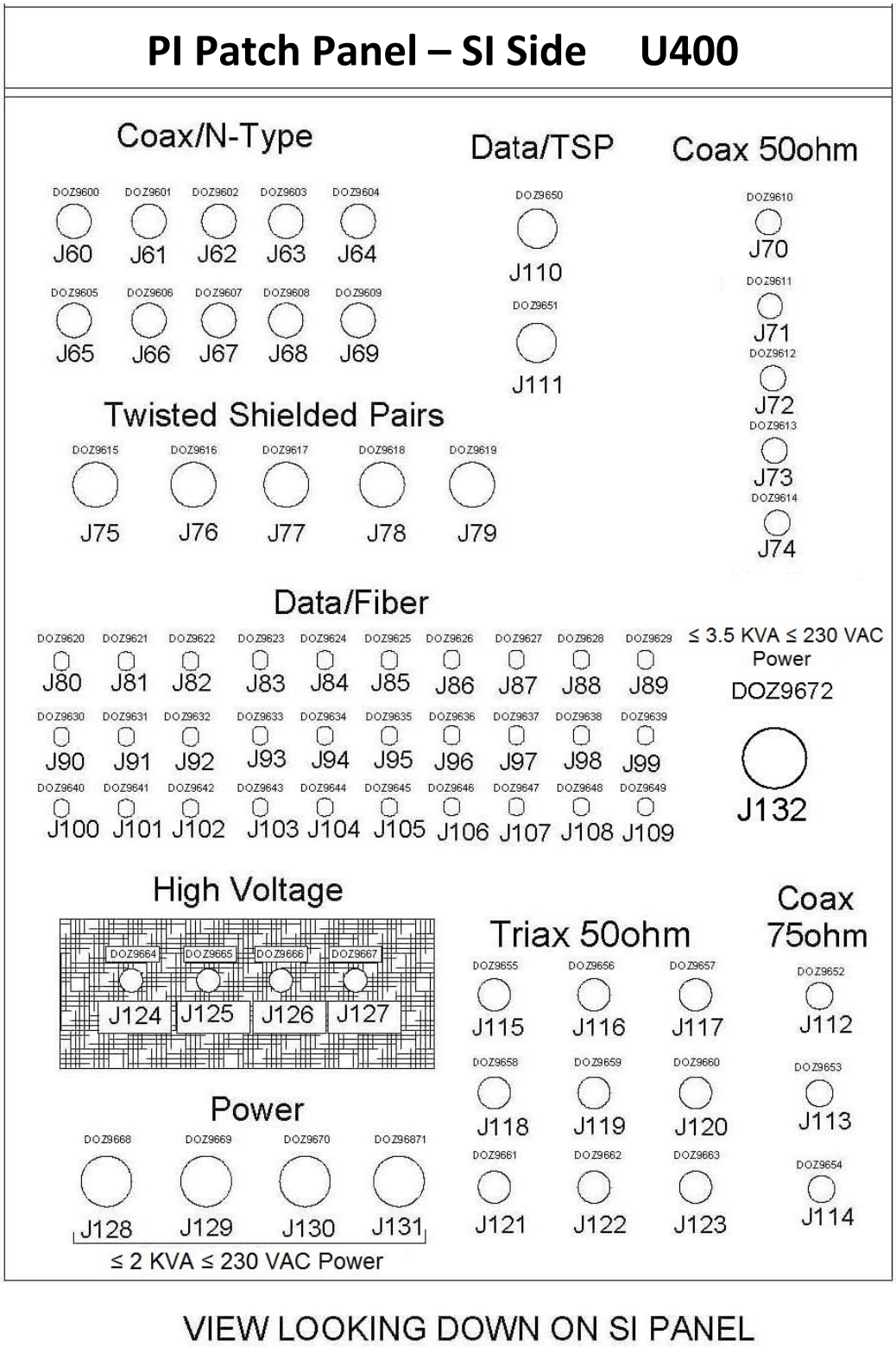

Figure 7. PI Patch Panel-SI Side

Table 3. PI Patch Panel-SI Side (U400) Connector Identification

Reference Designator	Bulkhead Connector ID	Bulkhead Connector P/N	General Purpose Function	Cable Destination	Mating P/N[1]
DOZ9600	J60	34N-50-0-51 (Huber-Suhner)	0UQ01Q01720.0-T/V W. L. Gore & Associates, 18 GHz, 50-ohm Coax (N-connector)[4]	U403 – J60	Precision N-Type Male, 18 GHz, 50Ω
DOZ9601	J61	34N-50-0-51 (Huber-Suhner)	0UQ01Q01720.0-T/V W. L. Gore & Associates, 18 GHz, 50-ohm Coax (N-connector)[4]	U403 – J61	Precision N-Type Male, 18 GHz, 50Ω
DOZ9602	J62	34N-50-0-51 (Huber-Suhner)	0UQ01Q01720.0-T/V W. L. Gore & Associates, 18 GHz, 50-ohm Coax (N-connector)[4]	U403 – J62	Precision N-Type Male, 18 GHz, 50Ω
DOZ9603	J63	34N-50-0-51 (Huber-Suhner)	0UQ01Q01720.0-T/V W. L. Gore & Associates, 18 GHz, 50-ohm Coax (N-connector)[4]	U403 – J63	Precision N-Type Male, 18 GHz, 50Ω
DOZ9604	J64	34N-50-0-51 (Huber-Suhner)	0UQ01Q01720.0-T/V W. L. Gore & Associates, 18 GHz, 50-ohm Coax (N-connector)[4]	U403 – J64	Precision N-Type Male, 18 GHz, 50Ω
DOZ9605	J65	34N-50-0-51 (Huber-Suhner)	0UQ01Q01720.0-T/V W. L. Gore & Associates, 18 GHz, 50-ohm Coax (N-connector)[4]	U403 – J65	Precision N-Type Male, 18 GHz, 50Ω
DOZ9606	J66	34N-50-0-51 (Huber-Suhner)	0UQ01Q01720.0-T/V W. L. Gore & Associates, 18 GHz, 50-ohm Coax (N-connector)[4]	U403 – J66	Precision N-Type Male, 18 GHz, 50Ω
DOZ9607	J67	34N-50-0-51 (Huber-Suhner)	0UQ01Q01720.0-T/V W. L. Gore & Associates, 18 GHz, 50-ohm Coax (N-connector)[4]	U403 – J67	Precision N-Type Male, 18 GHz, 50Ω
DOZ9608	J68	34N-50-0-51 (Huber-Suhner)	0UQ01Q01720.0-T/V W. L. Gore & Associates, 18 GHz, 50-ohm Coax (N-connector)[4]	U403 – J68	Precision N-Type Male, 18 GHz, 50Ω
DOZ9609	J69	34N-50-0-51 (Huber-Suhner)	0UQ01Q01720.0-T/V W. L. Gore & Associates, 18 GHz, 50-ohm Coax (N-connector)[4]	U403 – J69	Precision N-Type Male, 18 GHz, 50Ω
DOZ9610	J70	BJ28 (Trompeter)	50-ohm Coax (BNC-connector)	U403 – J70	BNC 50Ω
DOZ9611	J71	BJ28 (Trompeter)	50-ohm Coax (BNC-connector)	U403 – J71	BNC 50Ω
DOZ9612	J72	BJ28 (Trompeter)	50-ohm Coax (BNC-connector)	U403 – J72	BNC 50Ω
DOZ9613	J73	BJ28 (Trompeter)	50-ohm Coax (BNC-connector)	U403 – J73	BNC 50Ω

Reference Designator	Bulkhead Connector ID	Bulkhead Connector P/N	General Purpose Function	Cable Destination	Mating P/N[1]
DOZ9614	J74	BJ28 (Trompeter)	50-ohm Coax (BNC-connector)	U403 – J74	BNC 50Ω
DOZ9615	J75	M83723/72W2041N	AWG 20 Twisted-Shielded Pair (MS connector)	U403 – J75	M83723/75W2041N
DOZ9616	J76	M83723/72W20416	AWG 20 Twisted-Shielded Pair (MS connector)	U403 – J76	M83723/75W20416
DOZ9617	J77	M83723/72W20417	AWG 20 Twisted-Shielded Pair (MS connector)	U403 – J77	M83723/75W20417
DOZ9618	J78	M83723/72W20418	AWG 20 Twisted-Shielded Pair (MS connector)	U403 – J78	M83723/75W20418
DOZ9619	J79	M83723/72W20419	AWG 20 Twisted-Shielded Pairs (MS connector)	U403 – J79	M83723/75W20419
DOZ9620	J80	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J80	M83522/16-DNX
DOZ9621	J81	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J81	M83522/16-DNX
DOZ9622	J82	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J82	M83522/16-DNX
DOZ9623	J83	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J83	M83522/16-DNX
DOZ9624	J84	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J84	M83522/16-DNX
DOZ9625	J85	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J85	M83522/16-DNX
DOZ9626	J86	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J86	M83522/16-DNX
DOZ9627	J87	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J87	M83522/16-DNX
DOZ9628	J88	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J88	M83522/16-DNX
DOZ9629	J89	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J89	M83522/16-DNX
DOZ9630	J90	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J90	M83522/16-DNX
DOZ9631	J91	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J91	M83522/16-DNX
DOZ9632	J92	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J92	M83522/16-DNX
DOZ9633	J93	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J93	M83522/16-DNX
DOZ9634	J94	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J94	M83522/16-DNX
DOZ9635	J95	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J95	M83522/16-DNX
DOZ9636	J96	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J96	M83522/16-DNX
DOZ9637	J97	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J97	M83522/16-DNX
DOZ9638	J98	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J98	M83522/16-DNX
DOZ9639	J99	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J99	M83522/16-DNX
DOZ9640	J100	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J100	M83522/16-DNX
DOZ9641	J101	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J101	M83522/16-DNX
DOZ9642	J102	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J102	M83522/16-DNX
DOZ9643	J103	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J103	M83522/16-DNX

Reference Designator	Bulkhead Connector ID	Bulkhead Connector P/N	General Purpose Function	Cable Destination	Mating P/N[1]
DOZ9644	J104	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J104	M83522/16-DNX
DOZ9645	J105	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J105	M83522/16-DNX
DOZ9646	J106	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J106	M83522/16-DNX
DOZ9647	J107	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J107	M83522/16-DNX
DOZ9648	J108	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J108	M83522/16-DNX
DOZ9649	J109	M83522/17-NY	62.5 µm/multimode Fiber (ST connector)[3]	U403 – J109	M83522/16-DNX
DOZ9650	J110	M83723/72W1624N	RS422 Twisted-Shielded Pairs (MS connector)	U403 – J110	M83723/75W1624N
DOZ9651	J111	M83723/72W16246	RS422 Twisted-Shielded Pairs (MS connector)	U403 – J111	M83723/75W16246
DOZ9652	J112	UBJ28 (Trompeter)	75-ohm Coax (BNC connector)	U403 – J112	BNC 75Ω
DOZ9653	J113	UBJ28 (Trompeter)	75-ohm Coax (BNC connector)	U403 – J113	BNC 75Ω
DOZ9654	J114	UBJ28 (Trompeter)	75-ohm Coax (BNC connector)	U403 – J114	BNC 75Ω
DOZ9655	J115	BJ73 (Trompeter)	50-ohm Triax	U403 – J115	PL75C-306 (Trompeter)
DOZ9656	J116	BJ73 (Trompeter)	50-ohm Triax	U403 – J116	PL75C-306 (Trompeter)
DOZ9657	J117	BJ73 (Trompeter)	50-ohm Triax	U403 – J117	PL75C-306 (Trompeter)
DOZ9658	J118	BJ73 (Trompeter)	50-ohm Triax	U403 – J118	PL75C-306 (Trompeter)
DOZ9659	J119	BJ73 (Trompeter)	50-ohm Triax	U403 – J119	PL75C-306 (Trompeter)
DOZ9660	J120	BJ73 (Trompeter)	50-ohm Triax	U403 – J120	PL75C-306(Trompeter)
DOZ9661	J121	BJ73 (Trompeter)	50-ohm Triax	U403 – J121	PL75C-306 (Trompeter)
DOZ9662	J122	BJ73 (Trompeter)	50-ohm Triax	U403 – J122	PL75C-306 (Trompeter)
DOZ9663	J123	BJ73 (Trompeter)	50-ohm Triax	U403 – J123	PL75C-306 (Trompeter)
DOZ9664	J124	167-9096 (Reynolds Industries)	High-voltage cable[5]	U402 – J124	167-4535 (Reynolds Industries)
DOZ9665	J125	167-9096 (Reynolds Industries)	High-voltage cable[5]	U402 – J125	167-4535 (Reynolds Industries)
DOZ9666	J126	167-9096 (Reynolds Industries)	High-voltage cable[5]	U402 – J126	167-4535 (Reynolds Industries)
DOZ9667	J127	167-9096 (Reynolds Industries)	High-voltage cable[5]	U402 – J127	167-4535 (Reynolds Industries)
DOZ9668	J128	M83723/72W1404N	2 KVA max. power, 230 VAC max. voltage Transmission (AWG 12 TSP)[2]	U402 – J128	M83723/75W1404N
DOZ9669	J129	M83723/72W14046	2 KVA max. power, 230 VAC max. voltage Transmission (AWG 12 TSP)[2]	U402 – J129	M83723/75W14046
DOZ9670	J130	M83723/72W14047	2 KVA max. power, 230 VAC max. voltage Transmission (AWG 12 TSP)[2]	U402 – J130	M83723/75W14047
DOZ9671	J131	M83723/72W14048	2 KVA max. power, 230 VAC max. voltage Transmission (AWG 12 TSP)[2]	U402 – J131	M83723/75W14048

Reference Designator	Bulkhead Connector ID	Bulkhead Connector P/N	General Purpose Function	Cable Destination	Mating P/N[1]
DOZ9672	J132	MS3450W20-19P	3.5 KVA max. power, 230 VAC max. voltage Transmission (AWG 8 TSP)[2]	U402 – J132	MS3459W20-19S [6]

NOTES:

[1] Connector part number used for aircraft wiring behind the panel. Equivalent connectors shall be used for SI-provided jumper cables that connect to the front side of this panel. See Section 6.2 for additional information about cables and backshells.

[2] PI Rack power is obtained from the MCCS side of the PI Patch Panel (U401) and distributed to the SI Patch Panel-Power (U402) on the TA via these connectors. Refer to Section 3.2.1.1 for the maximum rated power draw for each of the AC sources at U401. Refer to Section 3.2.2.3 for information about the 2-wire AC power distribution scheme and safety ground requirements.

[3] All fiber optic jumper cables must be multimode (62.5 μm core, 125 μm cladding) with ST type connectors.

[4] Connector and shield isolated from mounting interface on connector panel with Huber-Suhner P/N 77-Z-0-0-4.

[5] HV connectors are rated for 15 kVDC and mounted on isolated panel. Maximum allowed operating voltage is 10 kVDC.

[6] MS3456 plug may be substituted for specified (preferred) MS3459 plug for this application.

3.1.4. PI Patch Panel Safety Guard

The PI Patch Panel Safety Guard (an aluminum guard structure) has been fabricated to address the safety concern regarding personnel falling into, and possibly damaging, the PI Patch Panel and related electrical connections. The fabricated guard attaches to the seat track, allows access to all connections while installed and includes quick release pins allow for easy removal without tools.

The PI Patch Panel Safety Guard has no structure between the PI Rack and the PI Patch Panel, and it is unlikely to interfere with PI rack equipment, particularly as PI rack protrusions in the lower aft rack bays cannot interfere with the PI Patch Panel "doghouse" itself.

Refer to SOF-AR-ICD-SE03-2015 (SI_AS_01) for definition of the FS locations of the PI racks.

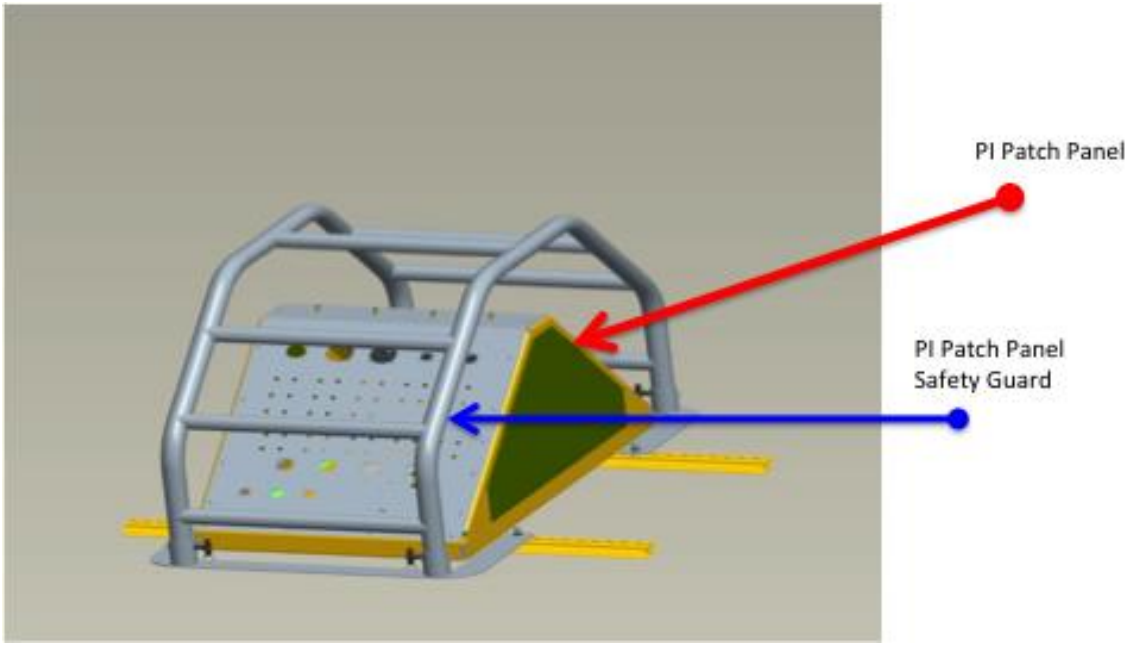

Figure 8. PI Patch Panel Safety Guard

3.2. Electrical

3.2.1 PI Patch Panel-MCCS Side

The PI Patch Panel-MCCS side (U401) provides electrical power (UPS, Frequency Converter and 28 VDC) and access to the Experimenter Network Switch, the Video Distribution System, GPS antenna and IRIG-B timing signals. Electrical specifications and connector pin-outs are provided in this section. Refer to Tables 4 through 8 for signal names and pin assignments.

Note: The signal name "NC" is No Connection.

Table 4. 50 Hz Power Connector J0

Pin	Signal Name	Electrical Characteristic
A	230 VAC 50 Hz (UPS)	TSP Shield floated* For rating see Section 3.2.1.1
B	230 VAC 50 Hz Return (UPS)	
C	NC	

*Shield grounded at MCCS PDS OPP.

Table 5. 60 Hz Power Connector J1

Pin	Signal Name	Electrical Characteristic
A	115 VAC 60 Hz (FC)	TSP Shield floated* For rating see Section 3.2.1.1
B	115 VAC 60 Hz Return (FC)	
C	NC	

*Shield grounded at MCCS PDS OPP.

Table 6. 60 Hz Power Connector J2

Pin	Signal Name	Electrical Characteristics
A	115 VAC 60 Hz (UPS)	TPS Shield floated* For rating see Section 3.2.1.1
B	115 VAC 60 Hz Return (UPS)	
C	NC	

*Shield grounded at MCCS PDS OPP.

Table 7. 28 VDC Power and Emergency Power Shutdown Connector J3

Pin	Signal Name	Electrical Characteristic
A	28 VDC	I = 3 A max (budget)
C	Ground	DC Return
B	Emergency Power Shutdown	EPD Event Declared = Open Circuit Nominal Observatory Power Operation = 28 VDC
D	Emergency Power Shutdown Return	

Table 8. Cryocooler System Power Connector (CRYOCOOLER PWR)

Pin	Signal Name	Electrical Characteristics
A	Phase A 115 VAC 60 Hz	See Section 3.2.1.4
B	Phase B 115 VAC 60 Hz	
C	Phase C 115 VAC 60 Hz	
D	Neutral	

3.2.1.1 Power Interface

Single phase 115 VAC 60 Hz power for the PI equipment racks is supplied from a Frequency Converter (J1) and an Uninterruptible Power Supply (J2). Single-phase 230 VAC 50 Hz power for the PI equipment is supplied from another Uninterruptible Power Supply (J0). Circuit breakers installed in the MCCS Power Distribution Subsystem (PDS) Observatory Power Panel (OPP) provide wire protection for the power feeds.

Single-phase 230 VAC 50 Hz power is provided on J0 from MCCS UPS C located in the forward cargo compartment. UPS power will continue to supply steady state AC power to sensitive loads in the event of a power failure. All power, including UPS power, is cut-off when EPD (Emergency Power Disconnect) is declared. The characteristics of the 230 VAC 50 Hz UPS are as follows:

- UPS power available to PI/SI 1 KVA (maximum)
- Voltage stability ±3% of 230 VAC
- Frequency stability ±1.5% of 50 Hz
- Total Harmonic Distortion 6% max.
- UPS back-up time (100% load) 8 minutes (minimum)
- Overload KVA/time[6,7] 1.25 KVA/10 min

The worst-case steady-state SI electrical power drawn from J0 shall not exceed the 1 KVA limit above. See Table 4 for 230 V 50 Hz UPS power connector pin-outs.

Single-phase 115 VAC 60 Hz power is provided on J1 from MCCS FC 5 located in the forward cargo compartment. FC power is shared between the PI equipment racks and the Science Instrument (SI) as budgeted by the SI team. FC power is subject to all outages experienced on the observatory. Characteristics of FC power are as follows:

- FC power available to PI/SI 3.5 KVA (maximum)
- Voltage stability ±3% of 115 VAC
- Frequency stability ±1% of 60 Hz
- Total Harmonic Distortion 1.5% typ., 5% max.
- Overload KVA/time[8] 4.375 KVA / 5 minutes

[6] While UPS has three-phase input power
[7] Circuit breakers will not trip at overload power levels
[8] While UPS has three-phase input power

The worst-case steady-state SI electrical power drawn from J1 shall not exceed the 3.5 KVA limit above. See Table 5 for 115 V, 60 Hz, FC power connector pin-out.

Single-phase 115 VAC 60 Hz power is provided on J2 from MCCS UPS D located in the forward cargo compartment. UPS power will continue to supply steady state AC power to sensitive loads in the event of a power failure. UPS D is used for battery backup to the PI Patch Panel. UPS power is provided and shared between all PI/SI equipment racks, and the SI as budgeted by the SI team. Characteristics of this UPS power are as follows:

- UPS power available to PI/SI 2 KVA (maximum)
- Voltage stability ±3% of 115 VAC
- Frequency stability ±1% of 60 Hz
- Total Harmonic Distortion 5% max.
- UPS back-up time (100% load) 8 minutes (minimum)
- Overload KVA/time [9,10] 2.4 KVA / 10 minutes

The worst-case steady-state SI electrical power drawn from J2 shall not exceed the 2 KVA limit above. See Table 6 for 115 V, 60 Hz, UPS power connector pin-out.

Both the UPS and non-UPS 60 Hz and 50 Hz power have circuit breaker protection. The 2 UPS units have 25-ampere limiting breakers while the Frequency Converter has a 35-ampere limiting breaker. (Refer to MS25244 for circuit breaker specifications.) The FC and UPS breakers provide observatory power wire protection and are not intended as circuit protection devices for electrical/electronic equipment in the PI/SI racks and console. Only the FC power may notice power transients when switching back and forth from ground to ship power.

28 VDC is provided at connector J3 from aircraft transformer-rectifiers (TR) and 28 VDC Bus 4, which is backed up by a 28VDC UPS battery in case that power bus drops off (unless it is caused by a decompression event). This connector also provides the pins for an Emergency Power Disconnect (EPD) shutdown discrete. This discrete control signal is provided by the SOFIA observatory for use by PI/SI equipment in shutting down power output from any PI/SI-supplied UPS, and its use is mandatory if an SI UPS is present. Whenever the 28 VDC EPD signal is removed, an EPD event has been declared and all SI-provided UPS shall shutdown by ensuring that the UPS inverter circuits are no longer energized by input power or the UPS battery pack(s).

28 VDC power is limited to 5 amperes by a circuit breaker at the MCCS PDS OPP to protect the wiring. However, SI electrical power at 28 VDC drawn from J3 shall be limited to 85 watts, or 3 amperes, maximum, to balance the overall power budget. Refer to Table 7 for 28 VDC power and emergency power shutdown connector pin-out.

The UPS back-up time at the SI interface (100% load, including MADS components and ECS Controller Bus loads powered by 28 VDC Bus 4) will be 8 minutes (minimum).

> Note: The UPS line is useful for loads that need to be turned on prior to switchover to engine generators and stay on through the switchover. If there is a sudden power or voltage drop in engine generator output, the UPS remains steady whereas the FC output voltage will dip (if the 3-phase FC input voltage strays outside the voltage regulation limits for the FC). Both FC and UPS (115 VAC and 230 VAC) will shut off immediately in the event of cabin decompression or EPD actuation. The 28 VDC power fed to J3 will also shut down in the event of an EPD or cabin decompression event. There are a number of possible scenarios that could invoke the use of the EPD, including MCCS/TA/SI equipment electrical fire, sudden loss of 2 or more engine generators, etc. For a complete treatment of emergency scenarios that may invoke the EPD refer to SOFIA Ops Engineering.

[9] While UPS has three-phase input power
[10] Circuit breakers will not trip at overload power levels

3.2.1.2 Power Allocation for Nasmyth Blower

The Nasmyth Blower is allocated 0.5 KVA, 115VAC 60Hz single phase power from FC4, per the Global Power Budget ICD (APP-DF-ICD-SE03-2038). Its location is TBD. 12 AWG wire has been routed to the area just forward of the TA on the left hand side to potentially power the unit in the surrounding area.

3.2.1.3 Power Allocation for Vacuum Pump System

The Vacuum Pump System (VPS) is allocated 3 KVA, 115 VAC 60 Hz single phase power from FC 4, per the Global Power Budget ICD (APP-DF-ICD-SE03-2038). The VPS is located on the left hand side of the aircraft just forward of the TA pit, and adjacent to the Cavity Door Seal Control Panel. 12 AWG wire from the OPP has been routed via a cable bundle to interface connectors on the VPS pallet (upstream of the VPS Control Box).

3.2.1.4 Power Allocation for Cryocooler System

The Cryocooler System is allocated 20 KVA, 3-phase, 115 VAC 400 Hz power from Observatory Bus 4, per the Global Power Budget ICD (APP-DF-ICD-SE03-2038). 4 AWG power cabling from the OPP is routed to the Cryocooler Power Frequency Converter Rack (part of the MCCS PDS) located in the upper deck aft section near the WVM. Based on the specified efficiency of these Cryocooler Frequency Converters, there is approximately 17.8 KVA of 3-phase, 115 VAC 60 Hz power available to operate the Cryocooler System.

For the initial phase of Cryocooler System development, a single gimbal-mounted He compressor and associated controller enclosure was mounted just aft of the PI Patch Panel (roughly in the location where a pallet for a 3rd PI rack may be installed). To support this installation, power cabling is routed to the CRYO COOLER PWR connector (DOZ9091) installed on panel U401. The Cryocooler System power wiring from the OPP is documented in drawing SOF-40611.

A Phase 2 Cryocooler System is envisioned, with two (2) He compressors capable of driving two distinct cold heads. The location for these two compressors is TBD, and a new power interface from the existing Cryocooler Power Frequency Converter Rack in the upper deck aft section will be needed.

3.2.1.5 Power and Grounding

The AC power distribution sources at the PI-Patch Panel-MCCS Side (U401 J0-J2) are described in this ICD. This power distribution is provided as 2-wire without safety ground. The PI Rack(s) must be grounded for safety to one of the four #10-32 ground studs provided on top of the PI Patch Panel as depicted in Figure 2. These ground straps shall be provided by the SOFIA program (USRA). Additional AC power distribution from the PI Rack(s) through the PI Patch Panel-SI Side (U400) to TA-mounted SI hardware is also via a 2-wire arrangement without ground (J128-J132). Figure 9 depicts a typical AC power distribution and safety grounding arrangement. The resistance from the PI Rack to aircraft ground shall be no greater than 20 mΩ (0.020 ohms). Refer to APP-DF-ICD-SE03-2006 (draft), Global Electrical, for the overall grounding approach from the SI to the aircraft system ground.

If no equipment in the PI racks uses a particular type of 115 VAC or 230 VAC power, that power may be patched directly to the SI side of the PI patch panel to provide power distribution at the SI patch panel on the TA.

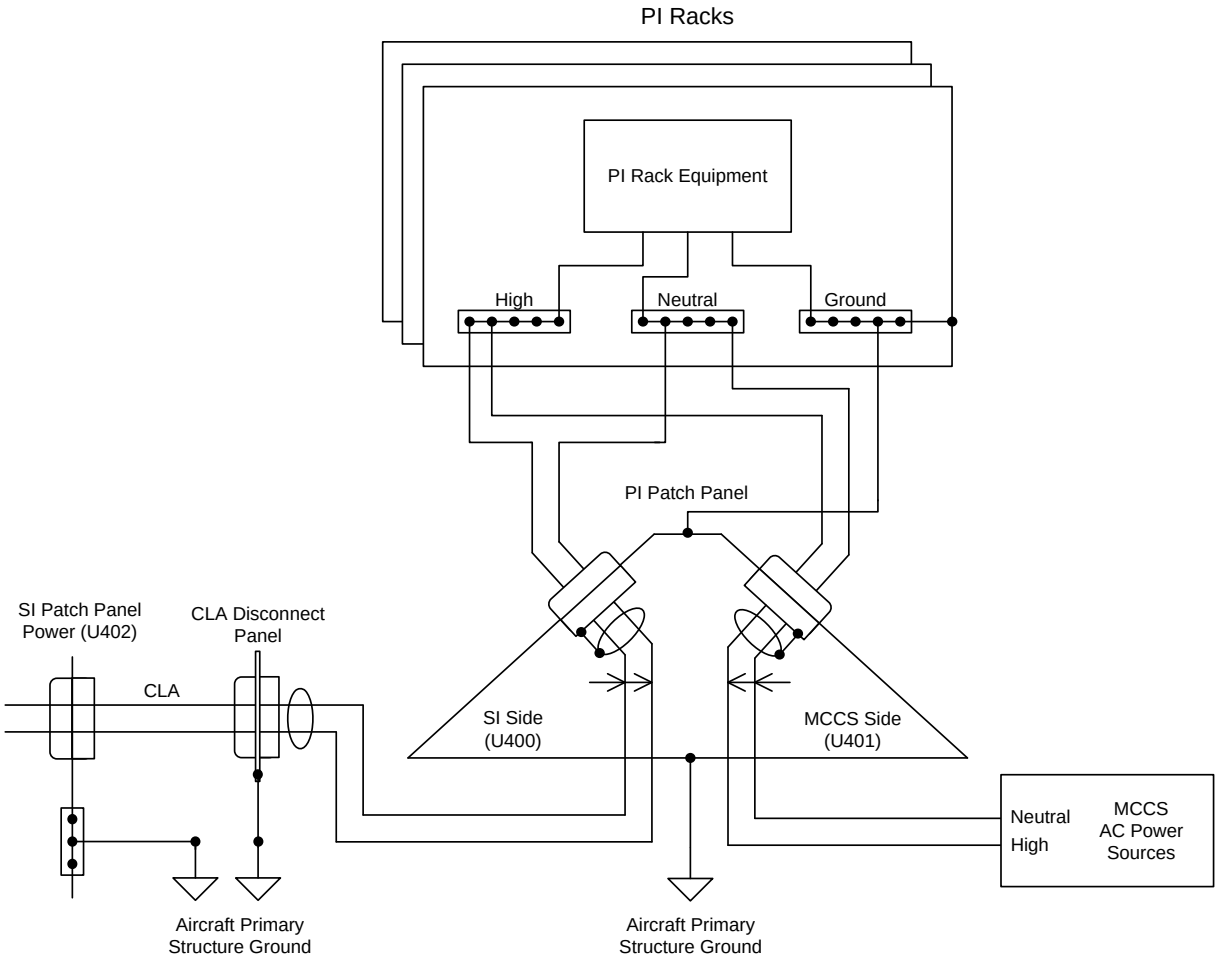

Figure 9. Typical AC Power and Ground Wiring

3.2.1.6 Network Interface

MCCS Fast Ethernet and Gigabit Ethernet LAN access is provided via connectors on the PI Patch Panel to allow equipment in the PI racks to gain access to the MCCS Experimenter Network Switch and the Video Network Switch. Fiber optic ST type connectors are used on the PI Patch Panel for all connections. All PI computers shall interface to the MCCS using the fixed IP addressing scheme detailed in APP-DF-ICD-SE03-2011, MCCS_Network Subsystem ICD.

The MCCS Network Switches are Ethernet-based and support both 100BASE-FX (Fast Ethernet, 1300nm wavelength) and 1000BASE-SX (Gigabit Ethernet, 850nm wavelength) standards. Any of the fiber optic connections (J4-J47 and J133, J134) may be patched to either the Experimenter or Video/Guest Network Switches using the MCCS Forward Rack 5 Patch Panel. On the PI Patch Panel there are twenty-three pair of fiber connections (J4-J47 and J133, J134) to either Fast Ethernet ports or to Gigabit Ethernet ports. These LAN connection points are used for science equipment in the PI racks or they can be patched over to the SI portion of the PI Patch Panel for network access at the SI.

Three pair of Fast Ethernet fiber optic connections from the MCCS Video Network at J20-J25 provide multicast access to the Video Distribution streams such as TA images from the WFI (Wide Field Imager), FFI (Fine Field Imager), and FPI (Focal Plane Imager). Four copper RJ-45 Gigabit ethernet connections are also available to patch into the MCCS Network and are located on the PI Patch Panel - J48-J51.

3.2.1.7 Data / Sensors

Data/Sensors interface to SI not implemented.

3.2.1.8 GPS Antenna and IRIG-B Interfaces

Two GPS antenna ports are provided at J55a and J55b. Both signals are derived from a common antenna via an active splitter. Both coaxial lines are DC blocked, and the PI-supplied GPS receiver does not need to provide excitation voltage for the GPS preamp.

IRIG-B timing signals from MCCS are provided at J56-J59. This signal is derived from an MCCS GPS receiver, and it is identical to the timing signals sent to the Telescope Assembly.

3.2.2. PI Patch Panel-SI Side

The SI Side of the PI Patch Panel (U400) provides cable runs to panels on the TA for power and signals. Connections to this panel can be made via SI-provided jumper cables from the PI Rack(s) or directly from the MCCS Side of the PI Patch Panel (U401). Electrical specifications for the various signal types are described, and connector pin-out tables are provided in this section. Refer to Tables 9 through 20 for signal names and pin assignments where applicable.

Shielding of the general purpose signal (J75-J79) and communications (J110-J111) twisted shielded pair (TSP) cables is provided on a per pair basis and pinned through designated contacts in the connector. Termination of the overall shield for these cables is to an EMI backshell on both ends of the cable. See notes Section 6.2 for EMI backshell part numbers.

Shielding of the AWG 12 power twisted pair cables (J128-J131) and the AWG 8 power twisted pair cable (J132) is terminated to the strain relief backshell screw. See Section 6.2 for the strain relief backshell part numbers.

Separate safety ground straps for the 2-wire AC power distribution system shall be employed at the PI Patch Panel and at the TA. Ground studs are provided at the top of the PI Patch Panel for this purpose.

Note: The signal name "NC" is No Connection.

Table 9. Signal Connector J75

Pin	Signal Name	Electrical Characteristic
1	Pair 1 +	TSP
2	Pair 1 -	TSP
3	Pair 1 Shield	
4	Pair 2 +	TSP
5	Pair 2 -	TSP
6	Pair 2 Shield	
7	Pair 3 +	TSP
8	Pair 3 -	TSP
9	Pair 3 Shield	
10	Pair 4 +	TSP
11	Pair 4 -	TSP
12	Pair 4 Shield	
13	Pair 5 +	TSP
14	Pair 5 -	TSP
15	Pair 5 Shield	
16	Pair 6 +	TSP
17	Pair 6 -	TSP
18	Pair 6 Shield	
19	Pair 7 +	TSP
20	Pair 7 -	TSP
21	Pair 7 Shield	
22	Pair 8 +	TSP
23	Pair 8 -	TSP
24	Pair 8 Shield	
25	Pair 9 +	TSP
26	Pair 9 -	TSP
27	Pair 9 Shield	
28	Pair 10 +	TSP
29	Pair 10 -	TSP
30	Pair 10 Shield	
31	NC	
32	NC	
33	NC	
34	NC	
35	NC	
36	NC	
37	NC	
38	NC	
39	NC	
40	NC	
41	NC	

Note: Overall shield terminated at EMI backshell on both ends of the cable. Individual cables are all AWG 20 twisted shielded pairs.

Table 10. Signal Connector J76

Pin	Signal Name	Electrical Characteristic
1	Pair 1 +	TSP
2	Pair 1 -	TSP
3	Pair 1 Shield	
4	Pair 2 +	TSP
5	Pair 2 -	TSP
6	Pair 2 Shield	
7	Pair 3 +	TSP
8	Pair 3 -	TSP
9	Pair 3 Shield	
10	Pair 4 +	TSP
11	Pair 4 -	TSP
12	Pair 4 Shield	
13	Pair 5 +	TSP
14	Pair 5 -	TSP
15	Pair 5 Shield	
16	Pair 6 +	TSP
17	Pair 6 -	TSP
18	Pair 6 Shield	
19	Pair 7 +	TSP
20	Pair 7 -	TSP
21	Pair 7 Shield	
22	Pair 8 +	TSP
23	Pair 8 -	TSP
24	Pair 8 Shield	
25	Pair 9 +	TSP
26	Pair 9 -	TSP
27	Pair 9 Shield	
28	Pair 10 +	TSP
29	Pair 10 -	TSP
30	Pair 10 Shield	
31	NC	
32	NC	
33	NC	
34	NC	
35	NC	
36	NC	
37	NC	
38	NC	
39	NC	
40	NC	
41	NC	

Note: Overall shield terminated at EMI backshell on both ends of the cable. Individual cables are all AWG 20 twisted shielded pairs.

Table 11. Signal Connector J77

Pin	Signal Name	Electrical Characteristic
1	Pair 1 +	TSP
2	Pair 1 -	TSP
3	Pair 1 Shield	
4	Pair 2 +	TSP
5	Pair 2 -	TSP
6	Pair 2 Shield	
7	Pair 3 +	TSP
8	Pair 3 -	TSP
9	Pair 3 Shield	
10	Pair 4 +	TSP
11	Pair 4 -	TSP
12	Pair 4 Shield	
13	Pair 5 +	TSP
14	Pair 5 -	TSP
15	Pair 5 Shield	
16	Pair 6 +	TSP
17	Pair 6 -	TSP
18	Pair 6 Shield	
19	Pair 7 +	TSP
20	Pair 7 -	TSP
21	Pair 7 Shield	
22	Pair 8 +	TSP
23	Pair 8 -	TSP
24	Pair 8 Shield	
25	Pair 9 +	TSP
26	Pair 9 -	TSP
27	Pair 9 Shield	
28	Pair 10 +	TSP
29	Pair 10 -	TSP
30	Pair 10 Shield	
31	NC	
32	NC	
33	NC	
34	NC	
35	NC	
36	NC	
37	NC	
38	NC	
39	NC	
40	NC	
41	NC	

Note: Overall shield terminated at EMI backshell on both ends of the cable. Individual cables are all AWG 20 twisted shielded pairs.

Table 12. Signal Connector J78

Pin	Signal Name	Electrical Characteristic
1	Pair 1 +	TSP
2	Pair 1 -	TSP
3	Pair 1 Shield	
4	Pair 2 +	TSP
5	Pair 2 -	TSP
6	Pair 2 Shield	
7	Pair 3 +	TSP
8	Pair 3 -	TSP
9	Pair 3 Shield	
10	Pair 4 +	TSP
11	Pair 4 -	TSP
12	Pair 4 Shield	
13	Pair 5 +	TSP
14	Pair 5 -	TSP
15	Pair 5 Shield	
16	Pair 6 +	TSP
17	Pair 6 -	TSP
18	Pair 6 Shield	
19	Pair 7 +	TSP
20	Pair 7 -	TSP
21	Pair 7 Shield	
22	Pair 8 +	TSP
23	Pair 8 -	TSP
24	Pair 8 Shield	
25	Pair 9 +	TSP
26	Pair 9 -	TSP
27	Pair 9 Shield	
28	Pair 10 +	TSP
29	Pair 10 -	TSP
30	Pair 10 Shield	
31	NC	
32	NC	
33	NC	
34	NC	
35	NC	
36	NC	
37	NC	
38	NC	
39	NC	
40	NC	
41	NC	

Note: Overall shield terminated at EMI backshell on both ends of the cable. Individual cables are all AWG 20 twisted shielded pairs.

Table 13. Signal Connector J79

Pin	Signal Name	Electrical Characteristic
1	Pair 1 +	TSP
2	Pair 1 -	TSP
3	Pair 1 Shield	
4	Pair 2 +	TSP
5	Pair 2 -	TSP
6	Pair 2 Shield	
7	Pair 3 +	TSP
8	Pair 3 -	TSP
9	Pair 3 Shield	
10	Pair 4 +	TSP
11	Pair 4 -	TSP
12	Pair 4 Shield	
13	Pair 5 +	TSP
14	Pair 5 -	TSP
15	Pair 5 Shield	
16	Pair 6 +	TSP
17	Pair 6 -	TSP
18	Pair 6 Shield	
19	Pair 7 +	TSP
20	Pair 7 -	TSP
21	Pair 7 Shield	
22	Pair 8 +	TSP
23	Pair 8 -	TSP
24	Pair 8 Shield	
25	Pair 9 +	TSP
26	Pair 9 -	TSP
27	Pair 9 Shield	
28	Pair 10 Emergency Power Shutdown	EPD Event Declared = open circuit, Nominal Observatory Power Operation = 28VDC
29	Pair 10 Emergency Power Shutdown Return	
30	Pair 10 Shield	
31	NC	
32	NC	
33	NC	
34	NC	
35	NC	
36	NC	
37	NC	
38	NC	
39	NC	
40	NC	
41	NC	

Notes: Overall shield terminated at EMI backshell on both ends of the cable. Individual cables are all AWG 20 twisted shielded pairs. Pair #10 is the Emergency Power Disconnect (EPD) provision. See Sections 3.2.1.1 and 3.2.2.3, and Table 7a for further information.

Table 14. Communications Connector J110

Pin	Signal Name	Electrical Characteristic
1	Line #1	TSP
2	Line #2	TSP
3	Shield, pins 1 and 2	
4	Line #3	TSP
5	Line #4	TSP
6	Shield, pins 4 and 5	
7	Line #5	TSP
8	Line #6	TSP
9	Shield, pins 7 and 8	
10	Line #7	TSP
11	Line #8	TSP
12	Shield, pins 10 and 11	
13	NC	
14	NC	
15	NC	
16	NC	
17	NC	
18	NC	
19	NC	
20	NC	
21	NC	
22	NC	
23	NC	
24	NC	

Note: Overall shield terminated at EMI backshell on both ends of the cable. The twisted shielded pairs in this cable are intended for use as the balanced circuits for RS-422 communication. Individual cables are all AWG 20 twisted shielded pairs.

Table 15. Communications Connector J111

Pin	Signal Name	Electrical Characteristic
1	Line #1	TSP
2	Line #2	TSP
3	Shield, pins 1 and 2	
4	Line #3	TSP
5	Line #4	TSP
6	Shield, pins 4 and 5	
7	Line #5	TSP
8	Line #6	TSP
9	Shield, pins 7 and 8	
10	Line #7	TSP
11	Line #8	TSP
12	Shield, pins 10 and 11	
13	NC	
14	NC	
15	NC	
16	NC	
17	NC	
18	NC	

Pin	Signal Name	Electrical Characteristic
19	NC	
20	NC	
21	NC	
22	NC	
23	NC	
24	NC	

Note: Overall shield terminated at EMI backshell on both ends of the cable. The twisted shielded pairs in this cable are intended for use as the balanced circuits for RS-422 communication. Individual cables are all AWG 20 twisted shielded pairs.

Table 16. Power Connector J128

Pin	Signal Name	Electrical Characteristic
1	SI Power, 2 KVA max. power, 230 VAC max. voltage	TSP AWG 12, Shield ground to connector (jack)
2	SI Power Return, 2 KVA max. power, 230 VAC max. voltage	TSP AWG 12
3	NC	
4	NC	

Note: Overall shield is terminated to backshell at this panel, and left floating at the CLA end.

Table 17. Power Connector J129

Pin	Signal Name	Electrical Characteristic
1	SI Power, 2 KVA max. power, 230 VAC max. voltage	TSP AWG 12, Shield ground to connector (jack)
2	SI Power Return, 2 KVA max. power, 230 VAC max. voltage	TSP AWG 12
3	NC	
4	NC	

Note: Overall shield is terminated to backshell at this panel, and left floating at the CLA end.

Table 18. Power Connector J130

Pin	Signal Name	Electrical Characteristic
1	SI Power, 2 KVA max. power, 230 VAC max. voltage	TSP AWG 12, Shield ground to connector (jack)
2	SI Power Return, 2 KVA max. power, 230 VAC max. voltage	TSP AWG 12
3	NC	
4	NC	

Note: Overall shield is terminated to backshell at this panel, and left floating at the CLA end.

Table 19. Power Connector J131

Pin	Signal Name	Electrical Characteristic
1	SI Power, 2 KVA max. power, 230 VAC max. voltage	TSP AWG 12, Shield ground to connector (jack)
2	SI Power Return, 2 KVA max. power, 230 VAC max. voltage	TSP AWG 12
3	NC	
4	NC	

Note: Overall shield is terminated to backshell at this panel, and left floating at the CLA end.

Table 20. Power Connector J132

Pin	Signal Name	Electrical Characteristic
A	SI Power, 3.5 KVA max. power, 230 VAC max. voltage	TSP AWG 8, Shield ground to connector (jack)
B	SI Power Return, 3.5 KVA max. power, 230 VAC max. voltage	TSP AWG 8
C	NC	

Note: Overall shield is terminated to backshell at this panel, and left floating at the CLA end.

3.2.2.1 Communications Lines

Two channels of RS-422 communications with twisted shielded pairs are provided at the PI Patch Panel-SI Side (U400) on connectors J110 and J111.

All of these SI cable connections interface straight through, pin-to-pin, connector to connector, from the PI Patch Panel-SI Side (U400) through the CLA Disconnect Panel to the SI Patch Panel-Signal (U403) on the TA. Identical connector IDs are used at each end of the circuits.

3.2.2.2 Signal Lines

Signal lines on the SI portion of the PI Patch Panel include ten N-type coax connectors, five 50-ohm BNC coax connectors, three 75-ohm coax connectors, five connectors with twisted pairs, nine 50-ohm Triaxial connectors, and thirty fiber optic ST style connectors.

All of these SI cable connections interface straight through, pin-to-pin, connector to connector, from the PI Patch Panel-SI Side (U400) through the CLA Disconnect Panel to the SI Patch Panel-Signal (U403) on the TA. Identical connector IDs are used at each end of the circuits.

Though these interfaces are primarily intended as signaling interfaces, the U400 / U403 J75 through J79 Twisted Shielded Pair (TSP) interfaces may be used for low-power, single- or 3-phase power transmission applications, pending circuit analysis indicating appropriate current limiting / overcurrent protection for the AWG #20 TSP wire type.

As an example, four pairs from the J75 interface have been used by the upGREAT SI to transmit 230 VAC, 3-phase power (20 to 50 mA per phase) from inverters in a PI rack to closed-cycle cryocooler cold head(s) integrated into the upGREAT cryostat(s) of the GREAT SI assembly on the TA.

Refer to Section 3.2.2.3 for information about the use of the EPD (Emergency Power Disconnect) signal that is dedicated for use on twisted pair #10 on J79.

3.2.2.3 Power Lines and Grounding

Four 2 KVA (J128-J131) and one 3.5 KVA (J132) 2-wire AC power distribution lines run from the PI Patch Panel-SI Side (U400) to the SI Patch Panel-Power (U402 and U402A) on the right side of the TA. The lines are to be used to route power that is obtained from the PI Patch Panel-MCCS Side (U401) as detailed in Section 3.2.1.

Though it is anticipated that the J128 through J132 interfaces will be used primarily for AC power transmission, they could potentially be used for DC power transmission applications, within the safe operating constraints of the wire type and connector contacts.

A 28 VDC Emergency Power Disconnect (EPD) signal is provided by the Observatory for use in shutting down all SI-provided Uninterruptible Power Supplies (UPS) in the PI Rack(s), Counterweight Rack or inside the SI itself, as described in Section 3.2.1.1. This signal originates on J3 of the PI Patch Panel-MCCS side (U401) and it shall be carried through J79 of the PI Patch Panel-SI Side (U400) as needed to disable any TA-mounted UPS as shown in Table 13.

There are four special purpose connectors and cables (U400 J124-J127) suitable for the transmission of HV voltages from the PI Rack to the SI Patch Panel-Power (U402) on the right side of the TA. These HV connectors are mounted on insulated panels at both ends of the circuits. Refer to Tables 4 and 20 for appropriate HV plugs and cables to be used for SI-provided jumper cables. These connectors and cables are rated for 15 kVDC, and shall be used with voltages no greater than 10 kVDC.

Grounding requirements are covered in earlier Section 3.2.1.5.

All of these SI cable connections interface straight through, pin-to-pin, and connector-to-connector, from the PI Patch Panel-SI Side (U400) through the CLA Disconnect Panel to the SI Patch Panel-Power (U402) on the TA. Identical connector IDs are used at each end of the circuits.

3.3. Environmental

All SI-to-observatory interface connectors shall adhere to environmental specifications for use in the Observatory as listed in USRA-DAL-1093-00.

Connector groupings and spacing on the PI patch panel have been designed to minimize the effects of EMI/EMC.

3.4. Safety

USRA-provided safety ground straps shall be employed to ground the PI Rack(s) to the studs provided on the top of the PI Patch Panel as described in Section 3.2.1.5. AC power distribution schemes inside the PI Rack(s) shall provide a safety ground to each chassis as depicted in Figure 9.

4. QUALITY ASSURANCE PROVISIONS

Quality Assurance will verify SI compliance with this ICD in accordance with SCI-AR-PLA-PM21-2000, Science Project System Safety and Mission Assurance Plan.

5. ACRONYMS

AC	Alternating Current
ARC	Ames Research Center
AWG	American Wire Gauge
CLA	Cable Load Alleviator
DC	Direct Current
DFRC	Dryden Flight Research Center
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EPD	Emergency Power Disconnect
FC	Frequency Converter
FFI	Fine Field Imager
FPI	Focal Plane Imager
FWD	Forward
FS	Fuselage Station
HV	High Voltage
GPS	Global Positioning System
ICD	Interface Control Document
ID	Identification
IRIG	Inter-range Instrumentation Group
LAN	Local Area Network
LBL	Left Butt Line
MADS	Mission Audio Distribution System
MCCS	Mission Controls and Communications System
MDCP	Main Deck Control Panel
NC	No Connection
NTP	Network Time Protocol
NTSC	National Television Standards Committee

OPP	Observatory Power Panel
PDS	Power Distribution System
PI	Private Investigator
RAIS	Raytheon Company Aircraft Integration Systems
RGB	Red Green Blue
SI	Science Instrument
TA	Telescope Assembly
TBD	To Be Determined
TBR	To Be Reviewed
TSP	Twisted Shielded Pair
UPS	Uninterruptible Power Supply
VDS	Video Distribution System
WFI	Wide Field Imager
4CTS	Four Conductor Twisted Shielded

6. NOTES

6.1. Cable Selection-MCCS Side

Table 21 shows the cabling for the MCCS side of the PI Patch Panel. This table correlates with Table 2 by bulkhead connector identification. These same cable part numbers are recommended for use by the PI for connection to the connectors specified in this document; however, it is not a requirement that they must be used.

Table 21. Cable Selection-MCCS Side

Bulkhead Connector ID	Name or Function	Cable Part Number
J0	UPS 230 VAC 50 Hz (from MCCS PDS)	M22759/34-8-9
J1	FC 115 VAC 60 Hz (from MCCS PDS)	M22759/34-6-9 or M22759/34-4-9
J2	UPS 115 VAC 60 Hz (from MCCS PDS)	M22759/34-6-9
J3	28 VDC (from MCCS PDS) / Emergency Disconnect	M22759/34-12-9 M22759/34-20-9 or M22759/34-16-9
CRYO COOLER PWR	3-phase 115 VAC 60 Hz power for Cryocooler System	
J4	100/1000BASE-FX/SX Fiber / Transmit 1	Brand-Rex M85045/16-01
J5	100/1000BASE-FX/SX Fiber / Receive 1	Brand-Rex M85045/16-01
J6	100/1000BASE-FX/SX Fiber / Transmit 2	Brand-Rex M85045/16-01
J7	100/1000BASE-FX/SX Fiber / Receive 2	Brand-Rex M85045/16-01
J8	100/1000BASE-FX/SX Fiber / Transmit 3	Brand-Rex M85045/16-01
J9	100/1000BASE-FX/SX Fiber / Receive 3	Brand-Rex M85045/16-01
J10	100/1000BASE-FX/SX Fiber / Transmit 4	Brand-Rex M85045/16-01
J11	100/1000BASE-FX/SX Fiber / Receive 4	Brand-Rex M85045/16-01
J12	100/1000BASE-FX/SX Fiber / Transmit 5	Brand-Rex M85045/16-01
J13	100/1000BASE-FX/SX Fiber / Receive 5	Brand-Rex M85045/16-01
J14	100/1000BASE-FX/SX Fiber / Transmit 6	Brand-Rex M85045/16-01
J15	100/1000BASE-FX/SX Fiber / Receive 6	Brand-Rex M85045/16-01
J16	100/1000BASE-FX/SX Fiber / Transmit 7	Brand-Rex M85045/16-01
J17	100/1000BASE-FX/SX Fiber / Receive 7	Brand-Rex M85045/16-01
J18	100/1000BASE-FX/SX Fiber / Transmit 8	Brand-Rex M85045/16-01
J19	100/1000BASE-FX/SX Fiber / Receive 8	Brand-Rex M85045/16-01
J20	VDS (100/1000BASE-FX/SX Fiber) Transmit 1	Brand-Rex M85045/16-01
J21	VDS (100/1000BASE-FX/SX Fiber) Receive 1	Brand-Rex M85045/16-01

Bulkhead Connector ID	Name or Function	Cable Part Number
J22	VDS (100/1000BASE-FX/SX Fiber) Transmit 2	Brand-Rex M85045/16-01
J23	VDS (100/1000BASE-FX/SX Fiber) Receive 2	Brand-Rex M85045/16-01
J24	VDS (100/1000BASE-FX/SX Fiber) Transmit 3	Brand-Rex M85045/16-01
J25	VDS (100/1000BASE-FX/SX Fiber) Receive 3	Brand-Rex M85045/16-01
J26	MADS PI Rack FCD TX	Brand-Rex M85045/16-01
J27	MADS PI Rack FCD RX	Brand-Rex M85045/16-01
J28	100/1000BASE-FX/SX Fiber / Transmit 9	Brand-Rex M85045/16-01
J29	100/1000BASE-FX/SX Fiber / Receive 9	Brand-Rex M85045/16-01
J30	100/1000BASE-FX/SX Fiber / Transmit 10	Brand-Rex M85045/16-01
J31	100/1000BASE-FX/SX Fiber / Receive 10	Brand-Rex M85045/16-01
J32	100/1000BASE-FX/SX Fiber / Transmit 11	Brand-Rex M85045/16-01
J33	100/1000BASE-FX/SX Fiber / Receive 11	Brand-Rex M85045/16-01
J34	100/1000BASE-FX/SX Fiber / Transmit 12	Brand-Rex M85045/16-01
J35	100/1000BASE-FX/SX Fiber / Receive 12	Brand-Rex M85045/16-01
J36	100/1000BASE-FX/SX Fiber / Transmit 13	Brand-Rex M85045/16-01
J37	100/1000BASE-FX/SX Fiber / Receive 13	Brand-Rex M85045/16-01
J38	100/1000BASE-FX/SX Fiber / Transmit 14	Brand-Rex M85045/16-01
J39	100/1000BASE-FX/SX Fiber / Receive 14	Brand-Rex M85045/16-01
J40	100/1000BASE-FX/SX Fiber / Transmit 15	Brand-Rex M85045/16-01
J41	100/1000BASE-FX/SX Fiber / Receive 15	Brand-Rex M85045/16-01
J42	100/1000BASE-FX/SX Fiber / Transmit 16	Brand-Rex M85045/16-01
J43	100/1000BASE-FX/SX Fiber / Receive 16	Brand-Rex M85045/16-01
J44	100/1000BASE-FX/SX Fiber / Transmit 17	Brand-Rex M85045/16-01
J45	100/1000BASE-FX/SX Fiber / Receive 17	Brand-Rex M85045/16-01
J46	100/1000BASE-FX/SX Fiber / Transmit 18	Brand-Rex M85045/16-01
J47	100/1000BASE-FX/SX Fiber / Receive 18	Brand-Rex M85045/16-01
J48	RJ-45 Gigabit Copper Ethernet 1	Raychem CEC-RWC-21064
J49	RJ-45 Gigabit Copper Ethernet 2	Raychem CEC-RWC-21064
J50	RJ-45 Gigabit Copper Ethernet 3	Raychem CEC-RWC-21064
J51	RJ-45 Gigabit Copper Ethernet 4	Raychem CEC-RWC-21064
J54	Not Used	
J55a	GPS Antenna 1	Times Microwave AFC-240-UF-FR
J55b	GPS Antenna 2	Times Microwave AFC-240-UF-FR
J56	IRIG-B #1	Times Microwave AFC-240-UF-FR
J57	IRIG-B #2	Times Microwave AFC-240-UF-FR
J58	IRIG-B #3	Times Microwave AFC-240-UF-FR
J59	IRIG-B #4	Times Microwave AFC-240-UF-FR
J133	100/1000BASE-FX/SX Fiber / Transmit 18	Brand-Rex M85045/16-01
J134	100/1000BASE-FX/SX Fiber / Receive 18	Brand-Rex M85045/16-01
J135	Cryocooler interface to MDCP. Ref: SE03-2066 (CRYO_SI_02)	
J136	Cryocooler interface to SI. Ref: SE03-2066 (CRYO_SI_02)	
J137	Cryocooler interface to SI. Ref: SE03-2066 (CRYO_SI_02)	
J138	Cryocooler interface to MDCP. Ref: SE03-2066 (CRYO_SI_02)	

6.2. Cable and Backshell Selection-SI Side

Table 22 shows the cables and backshells (if any) used on aircraft wiring connected to the SI side of the PI Patch Panel (U400). These same cable/backshell part numbers are recommended for use by PI cables between the PI Rack and U400; however, it is not a requirement that they must be used.

Table 22. Cable and Backshell Selection - SI Side

Bulkhead Connector ID	Function	Cable Part Number	Backshell P/N
J60	50-ohm Coax (N-connector)	0UQ01Q01720.0-T/V * W. L. Gore & Associates	N/A
J61	50-ohm Coax (N-connector)	0UQ01Q01720.0-T/V * W. L. Gore & Associates	N/A
J62	50-ohm Coax (N-connector)	0UQ01Q01720.0-T/V * W. L. Gore & Associates	N/A
J63	50-ohm Coax (N-connector)	0UQ01Q01720.0-T/V * W. L. Gore & Associates	N/A
J64	50-ohm Coax (N-connector)	0UQ01Q01720.0-T/V * W. L. Gore & Associates	N/A
J65	50-ohm Coax (N-connector)	0UQ01Q01720.0-T/V * W. L. Gore & Associates	N/A
J66	50-ohm Coax (N-connector)	0UQ01Q01720.0-T/V * W. L. Gore & Associates	N/A
J67	50-ohm Coax (N-connector)	0UQ01Q01720.0-T/V * W. L. Gore & Associates	N/A
J68	50-ohm Coax (N-connector)	0UQ01Q01720.0-T/V * W. L. Gore & Associates	N/A
J69	50-ohm Coax (N-connector)	0UQ01Q01720.0-T/V * W. L. Gore & Associates	N/A
J70	50-ohm Coax (BNC-connector)	Times Microwave AFC-240-UF	N/A
J71	50-ohm Coax (BNC-connector)	Times Microwave AFC-240-UF	N/A
J72	50-ohm Coax (BNC-connector)	Times Microwave AFC-240-UF	N/A
J73	50-ohm Coax (BNC-connector)	Times Microwave AFC-240-UF	N/A
J74	50-ohm Coax (BNC-connector)	Times Microwave AFC-240-UF	N/A
J75	Twisted-Shielded Pairs	Vermillion Inc. 20SB10X22-25	M85049/ 25-33W
J76	Twisted-Shielded Pairs	Vermillion Inc. 20SB10X22-25	M85049/ 25-33W
J77	Twisted-Shielded Pairs	Vermillion Inc. 20SB10X22-25	M85049/ 25-33W
J78	Twisted-Shielded Pairs	Vermillion Inc. 20SB10X22-25	M85049/ 25-33W
J79	Twisted-Shielded Pairs	Vermillion Inc. 20SB10X22-25	M85049/ 25-33W
J80	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J81	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J82	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J83	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J84	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J85	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J86	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J87	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J88	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J89	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J90	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J91	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J92	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J93	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A

Bulkhead Connector ID	Function	Cable Part Number	Backshell P/N
J94	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J95	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J96	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J97	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J98	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J99	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J100	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J101	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J102	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J103	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J104	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J105	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J106	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J107	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J108	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J109	62.5 µm/multimode Fiber	Brand-Rex M85045/16-01	N/A
J110	RS422 Twisted-Shielded Pairs	Vermillion Inc. 20SB4X22-25	M85049/ 25-22W
J111	RS422 Twisted-Shielded Pairs	Vermillion Inc. 20SB4X22-25	M85049/ 25-22W
J112	75-ohm Coax (BNC connector)	Times Microwave LMR-240-75	N/A
J113	75-ohm Coax (BNC connector)	Times Microwave LMR-240-75	N/A
J114	75-ohm Coax (BNC connector)	Times Microwave LMR-240-75	N/A
J115	50-ohm Triax	Electronic Cable Specialists 322001	N/A
J116	50-ohm Triax	Electronic Cable Specialists 322001	N/A
J117	50-ohm Triax	Electronic Cable Specialists 322001	N/A
J118	50-ohm Triax	Electronic Cable Specialists 322001	N/A
J119	50-ohm Triax	Electronic Cable Specialists 322001	N/A
J120	50-ohm Triax	Electronic Cable Specialists 322001	N/A
J121	50-ohm Triax	Electronic Cable Specialists 322001	N/A
J122	50-ohm Triax	Electronic Cable Specialists 322001	N/A
J123	50-ohm Triax	Electronic Cable Specialists 322001	N/A
J124	High-voltage cable	Reynolds Industries 178-6053	N/A
J125	High-voltage cable	Reynolds Industries 178-6053	N/A
J126	High-voltage cable	Reynolds Industries 178-6053	N/A
J127	High-voltage cable	Reynolds Industries 178-6053	N/A
J128	SI Power, 2 KVA max. power, 230 VAC max. voltage Transmission	Interstate Wire (distributor) M22759/34-12-9	M85049/ 52S14W
J129	SI Power, 2 KVA max. power, 230 VAC max. voltage Transmission	Interstate Wire (distributor) M22759/34-12-9	M85049/ 52S14W
J130	SI Power, 2 KVA max. power, 230 VAC max. voltage Transmission	Interstate Wire (distributor) M22759/34-12-9	M85049/ 52S14W
J131	SI Power, 2 KVA max. power, 230 VAC max. voltage Transmission	Interstate Wire (distributor) M22759/34-12-9	M85049/ 52S14W
J132	SI Power, 3.5 KVA max. power, 230 VAC max. voltage Transmission	Interstate Wire (distributor) M22759/34-8-9	M85049/ 52S20W

* Cable assemblies must be custom ordered to specified length, where 720.0 represents cable length in inches to the nearest tenth inch, and -T/V specifies a thermal vacuum application