IRN NO: **57000–0004**	**ISS PAYLOAD OFFICE IRN/PIRN/EXCEPTION FORM**	(Page 1 of 51) DATE PREPARED: 2–1–02

Doc. No., Rev. & Title:	SSP 57000 Revision E Pressurized Payloads Interface Requirements Document	PIRN NO: 57000–NA–211B, 57000–NA–0215, 57000–NA–0216, 57000–NA–0218, 57000–NA–0219, 57000–NA–0231, 57000–NA–0233D, 57000–NA–0234, 57000–NA–0250A, 57000–NA–0251C

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Agency: NASA	❑ Exception	❑ Deviation
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UTILIZATION CHANGE ENGINEER.:	SSCN/CR:	RELATED PIRN NO.:
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Agency Tracking No.:	SYSTEM/ELEMENT AFFECTED:

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(B)					
(C)					
(D)					
(E)					

Note: See referenced SSCD for approved signatures.

IRN NO: 57000–0004	**ISS PAYLOAD OFFICE IRN/PIRN/EXCEPTION FORM CONTINUED**	PAGE NO. 2 of 51 DATE PREPARED: 2–1–02

Doc. No., Rev. & Title: SSP 57000 Revision E Pressurized Payloads Interface Requirements Document

PIRN/EXCEPTION NO:

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3–66	3.3.8.1.E			X		
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3–97			3.9.4–2			X
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3–119			3.12.3.4–1, 3.12.3.4–2	X		
4–7	4.3.1.1.7.B			X		
4–21	4.3.2.2.9					X
4–21	4.3.2.2.12				X	

Pressurized Payloads Interface Requirements Document

International Space Station Program

November 1, 2000

Revision E

Incorporates IRN 0001
Incorporates IRN 0004

Type 1 – APPROVED BY NASA

NASDA 宇宙開発事業団

esa european space agency

National Aeronautics and Space Administration
International Space Station Program
Johnson Space Center
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REV.	DESCRIPTION	PUB. DATE
–	Initial Release per DR PA06	07–25–97
A	Revision A (Reference per SSCD 000887, EFF. 11/12/97). Revision A incorporates the following PIRNs: 57000–NA–0008B, 57000–NA–0011B, 57000–NA–0018A, 57000–NA–0019B, 57000–NA–0021A, 57000–NA–0027A, 57000–NA–0028A, 57000–NA–0030A, 57000–NA–0032, 57000–NA–0033, 57000–NA–0034A, 57000–NA–0035, 57000–NA–0036, 57000–NA–0038A, 57000–NA–0040A, 57000–NA–0044A	02–18–98
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C	Revision C (Reference per SSCD 001822, EFF. 4/28/99). Revision C incorporates the following PIRNs: 57000–NA–0109B, 57000–NA–0111A, 57000–NA–0112A, 57000–NA–0113, 57000–NA–114D, 57000–NA–0115A, 57000–NA–0116C, 57000–NA–0117A, 57000–NA–0119B, 57000–NA–0120, 57000–NA–0121B, 57000–NA–122D, 57000–NA–0123A, 57000–NA–0126C, 57000–NA–0127B, 57000–NA–0128A, 57000–NA–0129A, 57000–NA–0130, 57000–NA–0131A, 57000–NA–0133A, 57000–NA–0135H, 57000–NA–136C, 57000–NA–0137	07–08–99

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–	IRN 0001 incorporates the following: SSCD 003970 incorporates PIRN 57000–NA–0205A SSCD 004176 incorporates PIRNS 57000–NA–0198A, 57000–NA–0203, 57000–NA–0208, 57000–NA–0222, 57000–NA–0235A	11–20–01
–	IRN 0004 per SSCD 005833, EFF. 11/06/01	02–26–02

ERU: /s/ M. Hehn 02–26–02

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003970	24–APR–01	57000–NA–0205A	3.12.3.3.1.C, 4.3.12.3.3.1.C	IRN 0001
			TABLE(S)	
			3.12.3.3.1–2	
			PARAGRAPH(S)	
004176	24–APR–01	57000–NA–0198A	3.2.2.3	
		57000–NA–0203	1.1, 2.1, 3.3.1, 3.3.4.1.1.1, 3.3.4.1.1.2, 3.3.4.1.2, 3.3.4.1.3, 3.3.4.1.4, 3.3.4.2, 3.3.4.2.1, 3.3.4.2.2, 3.3.6.1.1, Appendix A	
			TABLE(S)	
		57000–NA–0208	3.12.3.3.2–1	
			PARAGRAPH(S)	
		57000–NA–0222	3.2.5.1.1	
		57000–NA–0235A	3.2.5.2, 3.3.10.1, 4.3.2.5.2, 4.3.3.10.1,	
			TABLE(S)	
			3.2.5.2–1	
005833	01–FEB–02	57000–NA–0211B	3.12.3.4–1	IRN 0004
			PARAGRAPH(S)	
		57000–NA–0215	3.4.1.4	
		57000–NA–0216	2.1, 3.1.3	
		57000–NA–0218	4.3.1.1.7.B	
		57000–NA–0219	3.3.5.1.9	
		57000–NA–0231	3.1.1.1.C, 2.1	
		57000–NA–0233D	3.2.2.9, 4.3.2.2.9	
		57000–NA–0234	3.3.8.1.E, 3.3.9.2.2.A	
			FIGURE(S)	
			3.3.8.1–1	
			PARAGRAPH(S)	
		57000–NA–0250A	3.2.2.9, 4.3.2.2.9	
		57000–NA–0251C	3.1.2.4	
			TABLE(S)	
			3.9.4–1, 3.9.4–2	
			FIGURE(S)	
			3.9.4–2, 3.9.4–3, 3.9.4–4	

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TABLES

FIGURES

FIGURES (Continued)

IRN 0004

DOCUMENT NO.	TITLE
220G07455	Upper Structure Assembly
220G07470	MSFC Base Assembly
220G07475	SSPF Base Assembly
220G07500	Rack Shipping Containers
683-50243-4	ED for Refrigerator/Freezer Rack Structure
683–10007	Fire Detection Assembly
683–17103	Fluid System Servicer (FSS) Interface Definition Drawings
D684–10056–01	International Space Station Program, Prime Contractor Software Standards and Procedures Specification
EIA–RS–170	Electrical Performance Standards for Television Studio Facilities
EIA/TIA 250	Electrical Performance for Television Relay Facility
FED–STD–595	Federal Standard Colors Used in Government Procurement
ISO/IEC 8802-3	Carrier Sense Multiple Access With Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications
JSC 27199	End Item Specification for the International Space Station Portable Utility Light
JSC 27260	Decal Process Document and Catalog
MIL–HDBK–1553	Digital Time Division Command/Response Multiplex Data Bus Handbook
MIL–STD–1189	Standard Department of Defense Bar Code Symbology
MIL–STD–1522	Standard General Requirements for Safe Design and Operation of Pressurized Missile and Space Systems
MIL–STD–1553	Digital Time Division Command/Response Multiplex Data Bus
MIL-STD-1686	Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices) Document
MIL-STD-1777	Internet Protocol
MSFC–SPEC–250	Protective Finishes for Space Vehicle Structures and Associated Flight Equipment, General Specification for Document
MSFC–STD–275	Marking of Electrical Ground Support Equipment, Front Panels, and Rack Title Plates
MSFC–STD–531	High Voltage Design Criteria

DOCUMENT NO.	TITLE	
SSP 30575	Interior and Exterior Operational Location Coding System	
SSP 41000	System Specification for the International Space Station	
SSP 41002	International Standard Payload Rack to NASA/NASDA Modules Interface Control Document	
SSP 41017	Rack to Multi–Purpose Logistics Module Interface Control Document (ICD) Part 1 and Part 2	IRN 0001
SSP 41155	Refrigerator/Freezer Rack to MPLM ICD	
SSP 41172	Qualification and Acceptance Environmental Test Requirements	
SSP 41175-02	Software ICD Part 1 Station Management and Control to ISS Book 2 General Interface Software Interfaces Requirement	
SSP 41175–08	Software ICD Part 1 SMC to ISS Book 8 Payload Multiplexer/ Demultiplexer Interface	
SSP 50005	International Space Station Flight Crew Integration Standard (NASA-STD-3000/T) Document	
SSP 50007	Space Station Inventory Management System Label Specification	
SSP 50008	International Space Station Interior Color Scheme	
SSP 50014	International Space Station Utility Coding Specification	
SSP 50184	High Rate Data Link Physical Media, Physical Signaling & Protocol Specifications	
SSP 50200–8	Station Program Implementation Plan Vol. VIII, Increment Execution Preparation	
SSP 50313	Display and Graphical Commonality Standard	
SSP 50467	ISS Cargo Stowage Technical Manual: Pressurized Volume	IRN 0004
SSP 52005	ISS Payload Flight Equipment and Guidelines For Safety Critical Structures	
SSP 52050	Software Interface Control Document Part 1, International Standard Payload Rack to International Space Station.	
SSP 52051	Payload Interface Definition Document (IDD) Baseline – SSP 52051 – User Electric Power Specifications and Standards.	
SSP 57001	Pressurized Payload Hardware ICD	
SSP 57002	Pressurized Payload Software ICD	
SSP 57005	Active Rack Isolation System to Payload ICD	
SSQ 21635	Connectors and Accessories, Electrical, Rectangular, Rack and Panel	

3.0 PAYLOAD INTERFACE REQUIREMENTS AND GUIDANCE

The requirements contained in this section will be complied with in order to certify a payload for integration into the applicable ISS modules. This section is divided by the following disciplines: Structural and Mechanical, Electrical, Command and Data Handling, Audio/Video, Thermal Control, Vacuum Exhaust and Vacuum Resource, Gases, Payload Support Services, Environment, Fire Protection, Material and Parts, Human Factors. Unless otherwise specified as USL, JEM, APM, MPLM, or CAM, a requirement applies to all modules.

3.1 STRUCTURAL/MECHANICAL, AND MICROGRAVITY AND STOWAGE INTERFACE REQUIREMENTS

3.1.1 STRUCTURAL/MECHANICAL

3.1.1.1 GSE INTERFACES

A. Integrated racks shall interface to the KSC GSE Rack Insertion Device in accordance with SSP 41017 Part 1, paragraph 3.2.1.1.2 Static Envelope, 3.2.1.4.3 Interface Loads, and SSP 41017 Part 2, paragraph 3.3.2 Upper Attachment Interfaces and 3.3.3 Ground Handling Attachment Interfaces.

B. Integrated racks shall interface to Rack Shipping Containers in accordance with the Teledyne Brown Engineering (TBE) as-built drawing 220G07500.

C. Integrated racks shall interface to Rack Handling Adapters (RHA) in accordance with the following TBE as-built drawings: 220G07455 Upper Structure Assembly, 220G07470 MSFC Base Assembly, and 220G07475 SSPF Base Assembly. IRN 0004

D. Integrated racks shall be limited to ground transportation accelerations of 80% of flight accelerations defined by SSP 41017 Part 1, paragraph 3.2.1.4.2.

3.1.1.2 MPLM INTERFACES

A. Integrated racks shall interface to the MPLM structural attach points in accordance with SSP 41017 Part 2, paragraph 3.1.1.

B. Integrated racks shall maintain positive margins of safety for MPLM depress rates of 890 Pa/second (7.75 psi/minute) and repress rates of 800 Pa/second (6.96 psi/minute).

C. Deleted.

D. Deleted.

3.1.2.2 VIBRATORY REQUIREMENTS

A. Integrated racks shall limit vibroacoustic disturbances to Table **(TBD #3)**.

B. During microgravity isolation, integrated ARIS racks shall meet the vibroacoustic disturbance requirements in accordance with the SSP **(TBD #4)** ARIS IDD, to avoid bumping.

3.1.2.3 TRANSIENT REQUIREMENTS

A. Integrated racks shall meet the **(TBD #5)** transient disturbance requirement.

B. During microgravity isolation, integrated ARIS racks shall meet the transient disturbance requirements in accordance with the SSP **(TBD #6)** ARIS IDD.

3.1.2.4 MICROGRAVITY ENVIRONMENT

Refer to the Pressurized Payload Accommodation Handbook (PAH), SSP 57020 for microgravity environment data. IRN 0004

3.1.2.5 ARIS INTERFACES

3.1.3 STOWAGE

Stowage interface information is provided in SSP 50467, Cargo Stowage Technical Manual: Pressurized Volume. IRN 0004

3.2 ELECTRICAL INTERFACE REQUIREMENTS

3.2.1 ELECTRICAL POWER CHARACTERISTICS

Electrical power characteristics are specified in this section for two interfaces, Interfaces B and C, as depicted in Figure 3.2.1–1, Electrical Power System Interface Locations. Integrated racks, payload associated hardware and payload hardware connected to Utility Outlet Panels (UOPs) in the USL, JEM, and CAM or the Standard Utility Panels (SUP) in the APM are required to be compatible with the prescribed characteristics of the Electrical Power System (EPS). For purposes of this specification, compatibility is defined as operating without producing an unsafe condition or one that could result in damage to ISS equipment or payload hardware.

3.2.2.7.2 INTERFACE C

The load impedance presented by the EPCE to Interface C shall not exceed the bounds defined by Figure 3.2.2.7.2–1 for input over the frequency range of 50 Hz to 100kHz. The magnitude component of the EPCE input impedance should not be less than the minimum defined in Figure 3.2.2.7.2–1. At frequencies where the magnitude component of the EPCE input impedance is less than the defined minimum, the phase component of the input impedance shall not exceed the bounds defined in this Figure.

3.2.2.8 LARGE SIGNAL STABILITY

The integrated rack connected to Interface B and the EPCE connected to Interface C shall maintain stability with the ISS EPS interface by damping a transient response to 10 percent of the maximum response amplitude within 1.0 millisecond (ms), and remaining below 10 percent thereafter under the following conditions:

1. The rise time/fall time (between 10 and 90 percent of the amplitude) of the input voltage pulse is less than 10 microseconds (s).

2. The voltage pulse is to be varied from 100 to 150 μs in duration.

Note: Figure 3.2.2.8–1 is used to clarify the above requirement.

3.2.2.9 DELETED

IRN 0004

3.2.2.10 ELECTRICAL LOAD-STAND ALONE STABILITY

The Integrated Rack connected to Interface B and EPCE (or Integrated rack in MPLM) connected to Interface C shall provide local stability by meeting the following conducted susceptibility requirements defined in Paragraph 3.2.4.4:

A. Paragraph 3.2.2.1 of SSP 30237 (CS01)

B. Paragraph 3.2.2.2 of SSP 30237 (CS02)

C. Paragraph 3.2.2.3 of SSP 30237 (CS06)

3.2.2.11 ELECTRICAL LOAD INDUCTANCE

(TBD #3)

3.2.2.12 MAXIMUM LOAD STEP SIZE

IRN 0004

For 6 kW and 12 kW racks, step changes in power demand by the integrated rack connected to Interface B shall not exceed 3 kilowatts on a single power feed.

(1) Advisories are set primarily for ground monitoring purposes (advantageous due to limited comm. coverage and data recording).

(2) Data item that most likely will not exist permanently in Telemetry List but should be time tagged and logged for failure isolation, trending, sustaining engineering, etc.

3.3.5.1.5 SERVICE REQUESTS

Integrated racks shall develop service requests shall be in accordance with paragraph 3.2.3.7, Service Requests of SSP 52050. The service requests data format, shall be developed in accordance with Table 3.2.3.7–1, Service Requests, of SSP 52050.

3.3.5.1.6 ANCILLARY DATA

Information regarding ancillary data that can be made available to payloads is contained in paragraph 3.2.3.8, Ancillary Data, of SSP 52050.

3.3.5.1.7 FILE TRANSFER

Integrated racks requiring file transfer shall develop its file transfer in accordance with paragraph 3.2.3.9, File Transfer, of SSP 52050.

3.3.5.1.8 LOW RATE TELEMETRY

Integrated racks requiring low rate telemetry shall develop low rate telemetry (i.e. science data) in accordance with paragraph 3.2.3.10, Low Rate Telemetry of SSP 52050.

3.3.5.1.9 DEFINED MODE CODES

Integrated racks MIL–STD–1553B mode codes are defined in paragraph 3.2.3.2.1.5, Data Word Count/Mode Code in SSP 52050. The MPLM does not support the Initiate Self–Test or Transmit BIT Word mode codes referenced in that paragraph and listed in Table 3.2.3.2.1.5–1 of SSP 52050.

IRN 0004

3.3.5.1.10 IMPLEMENTED MODE CODES

Integrated racks shall implement MIL–STD–1553B mode codes in accordance with paragraph 3.2.3.2.1.5, Data Word Count/Mode Code, and Table 3.2.3.2.1.5–1, Mode Codes of SSP 52050.

3.3.7.6 HRDL CONNECTORS AND FIBER

A. Integrated rack connector P7 mating requirement to the UIP connector J7 is specified in paragraph 3.1.1.6.1, E.

B. Integrated rack connector P7 shall meet the pin out interfaces of the UIP J7 connector as specified in SSP 57001, paragraph 3.3.4.1.

C. Integrated rack HRDL connector P7 shall meet the requirements of SSQ 21635 or equivalent.

D. Integrated rack HRDL fiber shall meet the requirements of SSQ 21654 or equivalent.

3.3.7.7 DELETED

3.3.8 PERSONAL COMPUTERS

There are three types of personal computers available for payload operations: the Payload Laptop, Portable Computer System (PCS), and the Station Support Computer (SSC).

3.3.8.1 PAYLOAD LAPTOP

The Payload Laptop is a rack unique laptop which is provided by the Payload Developer (PD). The primary purpose of the Payload Laptop is to provide rack and experiment control and display. Requirements for the Payload Laptop are detailed below.

A. Payload racks which require a laptop shall utilize an IBM 760XD (model 9546U9E) laptop per JSC 27337, Project Technical Requirements Specification for the PCS.

B. Payload Laptops shall utilize a Windows NT 4.0 software load supporting the following standard services (Computer Browser, Internet Info Server 4.0, TCP/IP Printing, NetBIOS Interface, Network Monitor & Tools, RPC Config, Server, Transaction Server, Workstation) with TCP/IP Protocol suite.

C. Payload Laptop displays shall be in accordance with SSP 50313, Display and Graphical Commonality Standard.

D. Each rack shall be limited to one Payload Laptop computer.

E. The Payload Laptop shall interface to the rack via a front panel connection utilizing the connectors as specified in Table 3.3.8.1–1 and pin outs per SSP 57001, Figures 3.3.6–1 through 3.3.6–5. IRN 0004

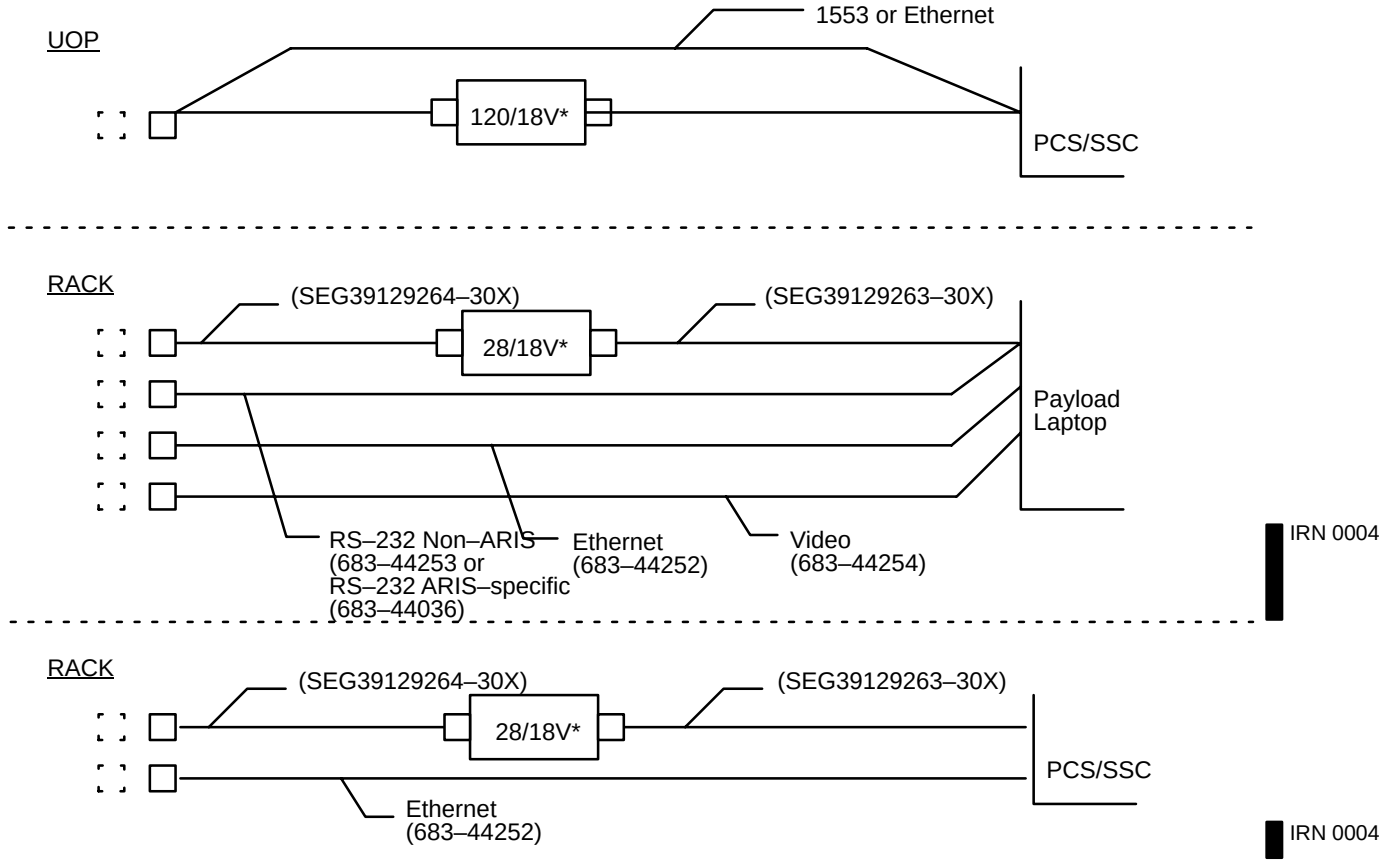
F. Data / power cables shall be per design specified in drawings shown in Figure 3.3.8.1–1.

G. A 28V power converter, shown in Figure 3.3.8.1–1, shall be per design specified in drawing SED39126010–305.

H. The Payload Laptop shall be attached to the rack seat track via the multi–use bracket, SEG33107631–301 and PGSC desk, Shuttle P/N SED33108703–302 or equivalent.

TABLE 3.3.8.1–1 RACK CONNECTOR PART NUMBERS

Power	MS3474L14–12S
RS–232	MS27468T15F35SA
Ethernet	MS27468T11F35S
Video	BJ76



*16–20V

FIGURE 3.3.8.1–1 DATA/POWER CABLE DESIGN

3.3.8.2 PCS

The PCS is a complement level laptop which is a shared ISS resource. The purpose of the PCS is to provide 1553 connectivity to the C&C and Payload MDMs. PCS has the following displays available for use by the crew: vehicle displays, complement level payload displays, and if requested, payload unique displays. All of these run under the Solaris operating system. The IBM 760XD laptop hardware also provides Ethernet, RS–232 and RS–422 interfaces. The PCS is only connected to the payload 1553 bus for payload command and control. However, the PCS hardware and Solaris OS is available as a shared resource for direct connection to a payload rack. Ethernet, RS–422/232 user display and interface control software must be provided by the payload developers. All payload developed software for use on PCS must be delivered to the PSIV for integration into a payload complement load.

A. All payload software to be used on PCS shall adhere to the PCS Interface Definition Document (IDD), SSP 52052.

B. PCS displays shall be in accordance with SSP 50313, Display and Graphical Commonanilty Standard. (not unique to PCS)

C. Each integrated rack shall be limited to one shared PCS. The PCS is not dedicated to a rack; memory and hard drive availability for payload displays and software must be negotiated with the Payload Software Control Panel.

3.3.8.2.1 PCS TO UOP INTERFACE

A. The PCS interface to payloads is through the MIL–STD–1553B (PLMDM) port or SSMB (Ethernet) port of a UOP in accordance with paragraph 3.2.1.2 of SSP 57001.

B. A 120V power converter and data / power cables are utilized as shown in Figure 3.3.8.1–1.

3.3.8.2.2 760XD LAPTOP TO RACK INTERFACE

A. The integrated rack shall interface with the 760XD via a front panel connection utilizing the connectors as specified in Table 3.3.8.1–1 and pin outs per SSP 57001, Figures 3.3.6–1 through 3.3.6–5. IRN 0004

B. Data / power cables shall be per design specified in drawings shown in Figure 3.3.8.1–1.

C. A 28V power converter, shown in Figure 3.3.8.1–1, shall be per design specified in drawing SED39126010–305.

D. The 760XD shall be attached to the rack seat track via the multi–use bracket, SEG33107631–301 and PGSC desk, Shuttle P/N SED33108703–302.

3.4.1.4 NTSC ELECTRICAL CONNECTOR/PIN ASSIGNMENTS

A. Integrated rack connector P77 mating requirements to the ISPR UIP connector J77 are specified in paragraph 3.1.1.6.1, K.

B. The integrated rack electrical video system P77 connector shall meet the pin out interfaces of the UIP J77 connector as specified in SSP 57001, paragraph 3.4.2.1. IRN 0004

C. The integrated rack electrical video system P77 connector shall meet the requirements of SSQ 21635 or equivalent. IRN 0004

3.4.2 U.S. ELEMENT AUDIO INTERFACE REQUIREMENTS

There are no direct audio interfaces from a payload to any ISS equipment. Audible Caution and Warning enunciation is through the Standard safety caution and warning status words.

3.5 THERMAL CONTROL INTERFACE REQUIREMENTS

3.5.1 INTERNAL THERMAL CONTROL SYSTEM (ITCS) INTERFACE REQUIREMENTS

3.5.1.1 PHYSICAL INTERFACE

A. Integrated rack connectors for moderate temperature water cooling supply and return mating requirements to the utility interface panel connectors are specified in paragraph 3.1.1.6.1, items L and M.

B. Integrated rack connectors for low temperature water cooling supply and return mating requirements to the utility interface panel connectors are specified in paragraph 3.1.1.6.1, items N and O.

3.5.1.2 ITCS FLUID USE AND CHARGING

A. ITCS Fluid Use

Coolant contained int he integrated rack that interfaces with ITCS collant shall satisfy the cleanliness and materials requirements specified in paragraph 3.11.2.

B. Integrated Rack Charging

Payloads shall be delivered on–orbit charged with coolant as specified in paragraph 3.11.2 and during transport, integrated racks that are not actively serviced by the MPLM Thermal Control

TABLE 3.9.4–1 ENVIRONMENTAL CONDITIONS

Environmental Condition	Value	
Atmospheric Conditions on ISS		
Pressure Extremes	0 to 104.8 kPa (0 to 15.2 psia)	
Normal operating pressure	See Figure 3.9.4–1	
Oxygen partial pressure	See Figure 3.9.4–1	
Nitrogen partial pressure	See Figure 3.9.4–1	
Dewpoint	4.4 to 15.6 °C (40 to 60 °F) ref. figure 3.9.1.3–1	
Percent relative humidity	25 to 75% ref. figure 3.9.1.3–1	
Carbon dioxide partial pressure during normal operations with 6 crewmembers plus animals	24-hr average exposure 5.3 mm Hg Peak exposure 7.6 mm Hg	
Carbon dioxide partial pressure during crew changeout with 11 crewmembers plus animals	24-hr average exposure 7.6 mm Hg Peak exposure 10 mm Hg	
Cabin air temperature in USL, JEM, APM, and CAM	17 to 28 °C (63 to 82 °F)	
Cabin air temperature in Node 1	17 to 31 °C (63 to 87 °F)	
Air velocity (Nominal)	0.051 to 0.203 m/s (10 to 40 ft/min)	
Airborne microbes	Less than 1000 CFU/m3	
Atmosphere particulate level	Average less than 100,000 particles/ft3 for particles less than 0.5 microns in size	
MPLM Air Temperatures	**Passive Flights**	**Active Flights**
Pre-Launch	15 to 24°C (59 to 75.2°F)	14 to 30 °C (57.2 to 86 °F)
Launch/Ascent	14 to 24°C (57.2 to 75.2°F)	20 to 30 °C (68 to 86 °F)
On-orbit (Cargo Bay + Deployment)	24 to 44°C (75.2 to 111.2°F)	16 to 46 °C (60.8 to 114.8 °F)
On-orbit (On-Station)	23 to 45°C (73.4 to 113°F)	16 to 43 °C (60.8 to 109.4 °F)
On-orbit (Retrieval + Cargo Bay)	17 to 44°C (62.6 to 111.2°F)	11 to 45 °C (51.8 to 113 °F)
Descent/Landing	13 to 43°C (55.4 to 109.4 °F)	10 to 42 °C (50 to 107.6 °F)
Post-Landing	13 to 43°C (55.4 to 109.4 °F)	10 to 42 °C (50 to 107.6 °F)
Ferry Flight	15.5 to 30°C (59.9 to 86 °F)	15.5 to 30 °C (59.9 to 86 °F)
MPLM Maximum Dewpoint Temperatures		
Pre-Launch	13.8°C (56.8°F)	12.5°C (54.5°F)
Launch/Ascent	13.8°C (56.8°F)	12.5°C (54.5°F)
On-orbit (Cargo Bay + Deployment)	13.8°C (56.8°F)	12.5°C (54.5°F)
On-orbit (On-Station)	15.5°C (60°F)	15.5°C (60°F)
On-orbit (Retrieval + Cargo Bay)	10°C (50°F)	10°C (50°F)
Descent/Landing	10°C (50°F)	10°C (50°F)
Post-Landing	10°C (50°F)	10°C (50°F)
Ferry Flight	15.5°C (60°F)	15.5°C (60°F)
Thermal Conditions		
USL module wall temperature	13 °C to 43 °C (55 °F to 109 °F)	
JEM module wall temperature	13 °C to 45 °C (55 °F to 113 °F) **(TBR #7)**	
APM module wall temperature	13 °C to 43 °C (55 °F to 109 °F) **(TBR #8)**	
CAM module wall temperature	13 °C to 43 °C (55 °F to 109 °F) **(TBR #9)**	
Other integrated payload racks	Front surface less than 37 °C (98.6 °F)	
General Illumination	108 Lux (10 fc) measured 30 inches from the floor in the center of the aisle	

IRN 0004

TABLE 3.9.4–2 DELETED

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FIGURE 3.9.4–2 DELETED

FIGURE 3.9.4–3 DELETED

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FIGURE 3.9.4–4 DELETED

TABLE 3.12.3.4–1 SURFACE INTERIOR COLORS AND PAINTS

HARDWARE DESCRIPTION	COLOR	FINISH	PAINT SPECIFICATION PER FED–STD–595
Equipment Rack Utility Panel Recess	White	Semigloss	27925
Equipment Rack Utility Panel Text Characters	Black	Lusterless	37038
ISPR Utility Panel Recess	White	Semigloss	27925
ISPR Utility Panel Recess Text Characters	Black	Lusterless	37038
Functional Unit Utility Panel Recess (as applicable)	White	Semigloss	27925
Functional Unit Utility Panel Recess Text Characters	Black	Lusterless	37038
Rack Front Aisle Extensions	Off-White	Semigloss	27722
Overhead Rack Face Plates	Off-White	Semigloss	27722
Port Rack Face Plates	Off-White	Semigloss	27722
Starboard Rack Face Plates	Off-White	Semigloss	27722
Deck Rack Face Plates	Off-White	Semigloss	27722
Overhead Rack Utility Panel Closeouts	Off-White	Semigloss	27722
Port Rack Utility Panel Closeouts	Off-White	Semigloss	27722
Starboard Rack Utility Panel Closeouts	Off-White	Semigloss	27722
Deck Rack Utility Panel Closeouts	Off-White	Semigloss	27722
Stowage Trays	Off-White	Semigloss	27722
Stowage Tray Handle Straps (any location)	Natural/Off White Material	Semigloss	none
Common Seat Track	Nickel Plate	Semigloss	none
Glovebox (Aluminum or Plastic)	Medium Gray	Gloss	16329 or 16373
Glovebox (Aluminum)	White	Gloss	17925
Glovebox (Aluminum or Plastic)	Off-White	Gloss	17722
Glovebox (Aluminum)	Tan	Gloss	10475
EXPRESS Program Rack Utility Panels	Off–White	Gloss	17875

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TABLE 3.12.3.4–2 PAYLOAD REQUIRED ILLUMINATION LEVELS

Type of Task	Required Lux (Foot-Candles)*
Medium payload operations (not performed in the aisle) (e.g., payload change-out and maintenance)	325 (30)
Fine payload operations (e.g., instrument repair)	1075 (100)
Medium glovebox operations (e.g., general operations, experiment set-up)	975 (90)
Fine glovebox operations (e.g., detailed operations, protein crystal growth, surgery/dissection, spot illumination)	1450 (135)

* As measured at the task site

4.3.1.1.7 ON ORBIT PAYLOAD PROTRUSIONS

A. An inspection shall be performed to determine that on–orbit protrusions do not extend laterally across the edges of the rack or pass between racks. The inspection shall be of the hardware or the as built drawings. The verification shall be considered successful when the inspection shows that no on–orbit protrusions extends extend laterally across the edges of the rack or pass between racks.

B. Verification that the integrated rack hardware does not preclude the attachment of RMA to the seat track shall be by demonstration or analysis. The demonstration shall be on the flight hardware or a flight like equivalent. The verification shall be considered successful when the demonstration shows that integrated rack hardware does not prevent attachment of RMA on the seat track for each discrete operational configuration of the rack. IRN 0004 IRN 0004

The analysis will consist of an assessment of each discrete operational configuration of the integrated rack based upon the as–built hardware drawings. The verification shall be considered successful when the analysis shows that the integrated rack hardware does not prevent attachment of RMA on the seat track for each discrete operational configuration.

4.3.1.1.7.1 ON–ORBIT PERMANENT PROTRUSIONS

An inspection of the integrated rack shall be conducted to determine that there are no permanent protrusions. The inspection shall be of the hardware or the as built drawings. The verification shall be considered successful when the inspection shows that there are no permanent protrusions.

4.3.1.1.7.2 ON–ORBIT SEMI–PERMANENT PROTRUSIONS

A. An inspection of the integrated rack shall be conducted to determine SIR and ISIS drawer handles remain within the envelope shown in Figure 3.1.1.7.2–1. The inspection shall be of the hardware or the as built drawings. The verification shall be considered successful when the inspection shows that all SIR and ISIS drawer handles remain within the envelope shown in Figure 3.1.1.7.2–1.

B. Verification of the other on–orbit semi–permanent protrusions, including knobs, switches, guards, quick–disconnect fittings, etc., of the integrated rack shall be performed by inspection. The inspection shall be of the as built drawings or hardware. Verification shall be considered successful when the inspection shows that all on–orbit semi–permanent protrusions including knobs, switches, guards, quick–disconnect fittings, etc., are limited to a total of 500 square inches within the envelope shown in Figure 3.1.1.7.2.2

C. Verification that the on–orbit semi–permanent protrusions are removable with hand operations and/or standard IVA tools shall be performed by demonstration. The demonstration shall be performed on the hardware. The verification shall be considered successful when the on–orbit semi–permanent protrusion can be removed with hand operations and/or standard IVA tools.

4.3.2.2.9 DELETED

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4.3.2.2.10 ELECTRICAL LOAD-STAND ALONE STABILITY

Verification of local stability requirements is defined in paragraph 4.3.2.4.4.

The verification shall be considered successful when analysis of test data for the requirements identified in the following paragraphs are met:

A. Paragraph 3.2.2.1 of SSP 30237 (CS01)

B. Paragraph 3.2.2.2 of SSP 30237 (CS02)

C. Paragraph 3.2.2.3 of SSP 30237 (CS06)

4.3.2.2.11 ELECTRICAL LOAD INDUCTANCE

(TBD #9)

4.3.2.2.12 MAXIMUM LOAD STEP SIZE

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Maximum load step size shall be verified by test.

Verification shall be by test for loads will operate from feeds rated for more than 25 amperes or 3 kilowatts. The test shall simulate all operational modes and related transitions for each power feed. The maximum change in power demand must be determined for each transition that is possible under normal operating conditions, and that can occur in less than 1 millisecond (measured between the 10 and 90 percent of transition points). In all cases, the power levels measured will be the average over any 10 millisecond, or greater, time interval. The test shall be considered successful if the test results show that a change in power does not exceed 3 kilowatts.

4.3.2.3 ELECTRICAL POWER CONSUMER CONSTRAINTS

NVR