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(P)IRN TITLE:

Incorporate PTR Approved PIRNs into SSP 57000 – Rev E to support CoFRs

ORIGINATOR:	PIRN Type: *Check One*	*For Payload Office Use Only*
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UTILIZATION CHANGE ENGINEER.:	SSCN/CR:	RELATED PIRN NO.:
Name: Tom Gallagher Agency: Boeing/TBE Phone: (281) 226–4074	SSCN 005717	N/A

Agency Tracking No.:	SYSTEM/ELEMENT AFFECTED:

REASON FOR CHANGE: (INCLUDE APPLICABLE ICAP NUMBER)

SSCD #005717

PARAGRAPHS, FIGURES, TABLES AFFECTED (For PIRN use only)

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Note: See referenced SSCD for approved signatures.

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(P)IRN TITLE: **Incorporate PTR Approved PIRNs into SSP 57000 – Rev E to support CoFRs**

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Pressurized Payloads Interface Requirements Document

International Space Station Program

November 1, 2000

Revision E

Incorporates IRN 0001
Incorporates IRN 0004
Incorporates IRN 0003
Incorporates IRN 0005

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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D	Revision D (Reference per SSCD 002533, EFF. 08/02/99). Revision D incorporates the following PIRNs: 57000–NA–0132D, 57000–NA–0139B, 57000–NA–0140A, 57000–NA–141, 57000–NA–0143A, 57000–NA–0146A, 57000–NA–0147A, 57000–NA–149, 57000–NA–0150C, 57000–NA–0152A, 57000–NA–0153, 57000–NA–154, 57000–NA–0155, 57000–NA–0156A, 57000–NA–0157A, 57000–NA–0158, 57000–NA–0159, 57000–NA–0160, 57000–NA–0162A, 57000–NA–0163A, 57000–NA–164B, 57000–NA–0165A, 57000–NA–0166B, 57000–NA–0167, 57000–NA–0168B, 57000–NA–0170, 57000–NA–0174A, 57000–NA–0177A	11–16–99
E	Revision E (Reference per SSCD 003132, Rev. F, EFF. 02–21–01). Revision E incorporates the following PIRNs: 57000–NA–0151H, 57000–NA–0161C, 57000–NA–0179, 57000–NA–0180, 57000–NA–0181C, 57000–NA–0182, 57000–NA–0183A, 57000–NA–0184A, 57000–NA–0185A, 57000–NA–0189, 57000–NA–0190B, 57000–NA–0191A, 57000–NA–0192, 57000–NA–0193B, 57000–NA–0194, 57000–NA–0195E, 57000–NA–0196, 57000–NA–0202, 57000–ES–0001A, 57000–ND–0003C	4–18–01
–	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
–	IRN 0003 per SSCD 003664 R1, EFF. 06/07/02	08–29–02
–	IRN 0005 per SSCD 005717, EFF. 07/29/02	11–25–02

ERU: /s/ M. Hehn 11–25–02

SSCBD	ENTRY DATE	CHANGE	PARAGRAPH(S)	
003664R1	07–JUN–02	57000–NA–0110H	3.1.2, 3.1.2.1, 3.1.2.2, 3.1.2.3, 3.1.2.4, 3.1.2.5, 4.3.1.2, 4.3.1.2.1, 4.3.1.2.2, 4.3.1.2.3, 4.3.1.2.4, 4.3.1.2.5, Appendix B **TABLE(S)** 3.1.2.2–1, 3.1.2.2–2, 3.1.2.5–1 **FIGURE(S)** 3.1.2.2–1, 3.1.2.2–2, 3.1.2.5–1	IRN 0003
			PARAGRAPH(S)	
005717	29–JUL–02	57000–NA–0200B	2.0, 2.1, 2.2	IRN 0005
			PARAGRAPH(S)	
		57000–NA–0201	3.3.5.1.3, 4.3.3.5.1.3, Appendix A	
			PARAGRAPH(S)	
		57000–NA–0209C	3.10.2.1.2, 4.3.10.2.1.2	
			PARAGRAPH(S)	
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			PARAGRAPH(S)	
		57000–NA–0227A	4.3.12.9.1.3, 4.3.12.9.1.3.1, 4.3.12..9.1.3.2, 4.3.12.9.1.3.3, 4.3.12.9.1.3.4, 4.3.12.9.1.3.5, 4.3.12.9.1.4, 4.3.12.9.1.4.1, 4.3.12.9.1.4.2, 4.3.12.9.12.4.3, 4.3.12.9.1.4.4, 4.3.12.9.1.4.5,	
			PARAGRAPH(S)	
		57000–NA–0228	4.3.2.4.10, 4.3.3.4.1.4, 4.3.7.1.5, 4.3.7.2.5, 4.3.7.3.5, Appendix A	
			PARAGRAPH(S)	
		57000–NA–0229	3.3.5.1.4	
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			PARAGRAPH(S)	
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2.0 DOCUMENTATION

The following documents include specifications, models, standards, guidelines, handbooks, and other special publications. Specific date and revision number of documents under control of the Space Station Control Board can be found in SSP 50257, Program Control Document Index or SSP 50258, Prime Control Document Index. IRN 0005

The documents in this paragraph form a part of this specification to the extent specified herein. In the event of a conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

2.1 APPLICABLE DOCUMENTS

DOCUMENT NO.	TITLE	
CCSDS 301.0–B–2	CCSDS Time Code Format	IRN 0005
CCSDS 701.0-B-2	Advanced Orbiting Systems, Network and Data Links: Architectural Specification, Blue Book	
220G07455	Upper Structure Assembly	IRN 0004
220G07470	MSFC Base Assembly	
220G07475	SSPF Base Assembly	
220G07500	Rack Shipping Containers	
683-50243-4	Rack, Equipment, U.S. Standard–Assy	IRN 0005
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	
JSC 27337	Project Technical Requirements for the PCS	IRN 0005

DOCUMENT NO.	TITLE	
MA2–95–048	Thermal Limits for Intravehicular Activity	IRN 0005
MA2–97–093	Crew Mating/Demating of Powered Connectors	
MIL–HDBK–1553	Digital Time Division Command/Response Multiplex Data Bus Handbook	
MIL–STD–462	EMI Characteristics, Measurement of	IRN 0005
MIL–STD–1553B	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	IRN 0005
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	IRN 0005
NTC Report No. 7	Video Facility Testing Technical Performance Objectives (NTC)	
NSTS/ISS 13830	Payload Safety Review and Data Submittal Requirements For Payloads Using the Space Shuttle and International Space Station	
NSTS 1700.7 ISS Addendum	Safety Policy and Requirements for Payloads Using the International Space Station	
NSTS/ISS 18798	Interpretations of NSTS/ISS Payload Safety Requirements	
SDD32100397	Decal, Fire Hole	IRN 0005
SED33108703	Desk Top Plate Assy, Inflight Computere	
SED39126010	Assembly, DC Power Supply PGSC 486	
SEG33107631	Bracket Assy, Multi–Use	
SN–C–0005	NSTS Contamination Control Requirements Manual	
SSP 30233	Space Station Requirements for Material and Processes	
SSP 30237	Space Station Requirements for Electromagnetic Emission and Susceptibility Requirements	
SSP 30238	Space Station Electromagnetic Techniques	
SSP 30240	Space Station Grounding Requirements	
SSP 30242	Space Station Cable/Wire Design and Control Requirements for Electromagnetic Compatibility	

DOCUMENT NO.	TITLE	
SSP 30243	Space Station Requirements for Electromagnetic Compatibility	
SSP 30245	Space Station Electrical Bonding Requirements	IRN 0005
SSP 30257:004	Space Station Program Intravehicular Activity Restraints and Mobility Aids Standard ICD	
SSP 30262:013	Smoke Detector Assembly Standard ICD	
SSP 30312	Electrical, Electronic, and Electromechanical (EEE) and Mechanical Parts Management and Implementation Plan For Space Station Program	IRN 0005
SSP 30426	External Contamination Control Requirements	
SSP 30482 (V1)	Electric Power Specifications and Standards, Vol. 1: EPS Performance Specifications	IRN 0005
SSP 30512	Ionizing Radiation Design Environment	
SSP 30573	SSP Fluid Procurement and Use Control Specification	IRN 0005
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 IRN 0005
SSP 41175-02	Software ICD Part 1 Station Management and Control to ISS Book 2 General Interface Software Interfaces Requirement	IRN 0005
SSP 50005	International Space Station Flight Crew Integration Standard (NASA-STD-3000/T) Document	IRN 0005
SSP 50184	High Rate Data Link Physical Media, Physical Signaling & Protocol Specifications	IRN 0005
SSP 50313	Display and Graphical Commonality Standard	IRN 0005
SSP 52005	ISS Payload Flight Equipment and Guidelines For Safety Critical Structures	

DOCUMENT NO.	TITLE	
SSP 52050	Software Interface Control Document Part 1, International Standard Payload Rack to International Space Station.	IRN 0005
SSP 57001	Pressurized Payload Hardware ICD	
SSP 57002	Pressurized Payload Software ICD	IRN 0005
SSQ 21635	Connectors and Accessories, Electrical, Rectangular, Rack and Panel	
SSQ 21654	Cable, Single Fiber, Multitude, Space Quality, General Specification for Document	
SSQ 21655	Cable, Electrical, MIL-STD-1553 DataBus, Space Quality, General	IRN 0005
TM 102179	Selection of Wires and Circuit Protective Devices for STS Orbiter Vehicle Payload Electrical Circuits	
TM–9A–038	Protection of Payload Electrical Power Circuits	

2.2 REFERENCE DOCUMENTS

ANSI S1.4	Specification for Sound Level Meters Amendment S1.4A–1985 ASA 37 R(1994)	IRN 0005
ANSI S1.11	Specification for Octave–Band and Fractional–Octave–Band Analog and Digital Filters; ASA 65–1986 R(1993)	
ANSI S12.12–1992	Engineering Method for the Determination of Sound Power Levels of Noise Sources Using Sound Intensity ASSA 104	
ANSI S12.23	Method for the Designation of Sound Power Emitted by Machinery and Equipment	
ANSI S12.23 1996	Method for the Designation of Sound Power Emitted by Machinery and Equipment	
ANSI S12.31	Precision Methods for Determination of Sound Power Levels of Broad–Band Noise Sources in Reverberation Rooms	
ANSI S12.32	Precision Methods for the Determination of Sound Power Levels of Discrete–Frequency and Narrow–Band Noise Sources in Reverberation Rooms	
ANSI S12.33	Engineering Methods for the Determination of Sound Power Levels of Noise Sources in a Special Reverberation Test Room	
ANSI S12.34	Engineering Methods for the Determination Sound Power Levels of Noise Sources for Essentially Free–Field Conditions Over a Reflecting Plane	

ANSI–S12.35	Precision Methods for the Determination of Sound Power Levels of Noise Sources in Anechoic and Hemi–Anechoic Rooms	IRN 0005
ANSI–S12.36	Survey Methods for the Determination of Sound Power Levels of Noise Sources	
ANSI X3.255	Fibre Distributed Data Interface (FDDI) – Abstract Test Suite for FDDI Physical Medium Dependent Conformance Testing (PMD ATS)	
ASTM E380–86	Standard Practice for Use of the International System of Units (SI) (modernized Metric System)	
ICD–A–21378	SSP DEAP TO ISSP HAS/CHEK GSE Interfaces	
ICD–A–21379	ISS Payload/GSE Ground Operations Envelope ICD	
MIL–STD–461	Electromagnetic Emission and Susceptibility Requirements for Control of Electromagnetic Interference	IRN 0005
MSFC–STD–531	High Voltage Design Criteria	
NHB 8060.1	Flammability, Odor, Offgassing, and Compatibility Requirements and Test Procedures for Materials in Environments that Support Combustion	
NSTS 21000–IDD–MDK	Middeck Payloads Interface Definition Document for Middeck Accommodations	
SAIC–TN–9550	Ionizing Radiation Dose Estimates for International Space Station Alpha using the CADrays 3–D Mass Model	
SSP 41000	System Specification for the International Space Station	
SSP 50007	Space Station Inventory Management System Label Specification	
SSP 50014	International Space Station Utility Coding Specification	
SSP 50053	ASI Flight Hardware to Launch and Landing Site ICD	
SSP 50257	Program Control Document Index	IRN 0005
SSP 50258	Prime Control Document Index	
SSP 50467	ISS Stowage Accommodations Handbook: Pressurized Volume	

3.3.4.2.2 CCSDS SEGMENTED TIME

Segmented time code will be sent to the integrated rack by a broadcast message on the Payload MIL–STD–1553B. Segmented time code formats is specified in paragraph 2.4, CCSDS Calendar Segmented Time Code (CCS), of CCSDS 301.0–B–2.

The broadcast time will be received at subaddress #29 on each Payload MIL–STD–1553B bus. The broadcast time signal will be updated once a second and is accurate to ±2.5 ms with respect to the Space Station Global Positioning System (GPS) receiver.

3.3.5 MIL-STD-1553B LOW RATE DATA LINK (LRDL)

Each integrated rack shall implement a single MIL–STD–1553B Remote Terminal (RT) to the payload unique MIL–STD–1553B bus in accordance with paragraph 3.2, MIL–STD–1553B Interface, of SSP 52050.

3.3.5.1 MIL-STD-1553B PROTOCOL

3.3.5.1.1 STANDARD MESSAGES

Integrated racks shall develop standard message for the Payload MIL–STD–1553B in accordance with paragraph 3.2.3.3, Standard Messages of SSP 52050.

3.3.5.1.2 COMMANDING

Integrated racks shall receive and process commands from the Payload MDM that originate from the Ground, Timeliner, Payload MDM and Portable Computer System (PCS) in accordance with paragraph 3.2.3.4, Commanding of SSP 52050.

3.3.5.1.3 HEALTH AND STATUS DATA

A. Integrated racks shall develop health and status data in accordance with paragraph 3.2.3.5, Health and Status of SSP 52050. The health and status data shall be documented in accordance with the data field format defined in Table A–5, Health and Status ISS Processed Data Packets, of SSP 57002. The definition of health and status data is provided in the Glossary of Terms, Appendix B of this document. IRN 0005

B. Integrated racks shall respond to their respective payload MDM polls for health and status data with updated data at a 1 Hz or 0.1 Hz rate. IRN 0005

C. Payloads interfacing with the MPLM shall set the Busy Bit to logic “1” in the event its H&S data packet is not available for transfer to the MPLM MDM. IRN 0005

D. Payloads interfacing with the MPLM shall zero fill the unused words in the H&S data packets when the size of the H&S data packet is less than a multiple of 32 words. IRN 0005

E. Payloads interfacing with the MPLM shall update H&S data a time such that the Frame Count (received in Broadcast sync with Data) modulo 10 equals any one of the following values: 2, 3, 4, 7, 8, or 9.

Note: The MPLM will collect 96 words of H&S data from the Minus Eighty Degree Laboratory Freezer for the ISS (MELFI), and will collect 32 words of data from the +4/–26 Degree Refrigerator Freezer and from the Laboratory Support Equipment Transportation Rack Freezer.

3.3.5.1.4 SAFETY DATA

A. Safety data is the set of payload generated C&W related parameters that are required to be available in the CCS MDM for S–band downlink, display to the crew on a core PCS, or monitored for C&W events. Determination of the safety–related parameters that are required is the responsibility of the PD/PI. An example of safety–related data is a current or temperature sensor parameter which is being monitored for a situation that could lead to fire or overheating. Safety data shall be included in the H&S data CCSDS packets provided by ISPR RTs.

B. Integrated racks shall provide as safety data the standard rack caution and warning status words in accordance with paragraph 3.2.3.5, Health and Status Data, of SSP 52050.

3.3.5.1.4.1 CAUTION AND WARNING IRN 0005

For the purpose of Caution and Warning (C&W) classifications, the sensors are the integrated racks means of detecting events that were deemed necessary by the PSRP during the Phased Safety Reviews. The sensors used to produce Caution and Warning Events are determined by the payload developer, advisories may be set if the payload developer identifies a situation that meets the classification of an advisory.

3.3.5.1.4.1.1 CLASS 1 – EMERGENCY

All of the defined ISS Emergency conditions are reported by the ISS systems or the rack smoke detector, integrated racks and equipment will not report an Emergency condition.

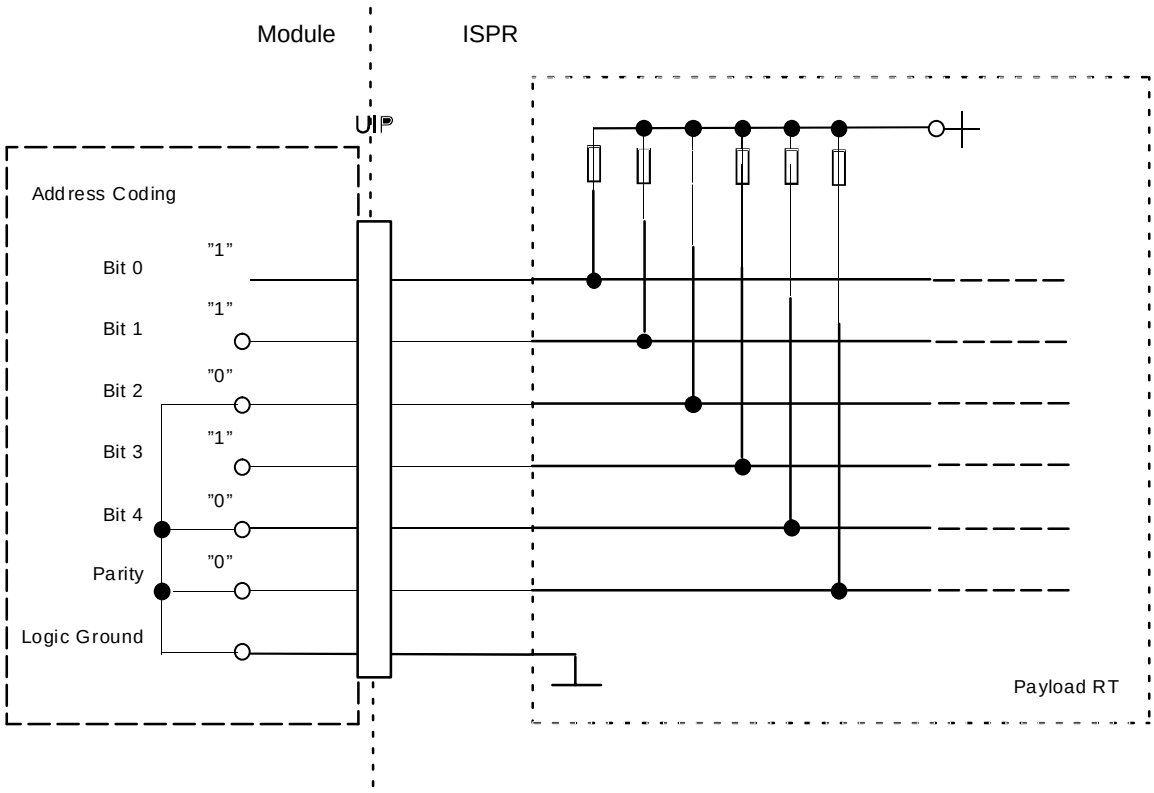
(1) The emergency condition rapid cabin depressurization will be detected by the ISS module sensors.

(2) The emergency condition of toxic atmosphere is set as a scar.

(3) Payload Fire emergency's can only be declared as a confirmed fire event by the ISS rack smoke detector or equivalent, which can detect 96% of the smoke detector failures.

When an emergency event is detected, the format of the data will identify the event type (fire, toxic atmosphere, depressurization)

Emergency conditions require all onboard crew to respond immediately.



Note: Example RT Address = 11 in decimal representation.
All address and parity lines have pull up resistors so that "0" on those lines is achieved by connecting the lines to common secondary return. The parity is odd. Bit 0 is LSB.

FIGURE 3.3.5.2.1.4–1 REMOTE TERMINAL HARDWIRED ADDRESS CODING (EXAMPLE)

3.3.5.2.2 LRDL SIGNAL CHARACTERISTICS

Integrated racks which require connectivity to the payload local MIL-STD-1553B bus shall meet the electrical characteristics in accordance with MIL-STD-1553B.

The integrated rack MIL–STD–1553B terminal characteristics shall be in accordance with paragraph 4.5.2, Terminal Characteristics of MIL–STD–1553B.

3.3.5.2.3 LRDL CABLING

A. The integrated rack MIL–STD–1553B internal wiring characteristics shall be according to SSQ 21655, Cable, Electrical, MIL–STD–1553B Data Bus, Space Quality, General Specifications for 75 Ohm or equivalent. IRN 0005

B. The integrated rack MIL–STD–1553B internal wiring stub length shall not exceed 12 feet, (3.65 meters), when measured from the internal MIL–STD–1553B Remote Terminal to the ISPR Utility Interface Panel. IRN 0005

3.10 FIRE PROTECTION INTERFACE REQUIREMENTS

3.10.1 FIRE PREVENTION

Integrated racks shall meet the fire prevention requirements specified in NSTS 1700.7, ISS Addendum, paragraph 220.10a.

3.10.2 PAYLOAD MONITORING AND DETECTION REQUIREMENTS

Note: The ISS monitors and detects fire events within payloads containing potential fire sources by using a station approved rack smoke detector. For payload volumes that contain a potential fire source but do not exchange air with the rack smoke detector because there is no forced air circulation, or for metabolic or science isolation purposes, parameter monitoring can be used as an alternative. Use of parameter monitoring will be presented to and approved by the PSRP during the phased safety reviews. Volumes containing no potential fire sources do not require detection capabilities. Small aisle mounted equipment (laptop computers, etc.) may not require detection capabilities. Safety monitoring and detection requirements are specified in NSTS 1700.7, ISS Addendum, paragraph 220.10b.

3.10.2.1 SMOKE DETECTION

3.10.2.1.1 SMOKE DETECTOR

A. Integrated racks that contain potential fire source and have forced air circulation shall use a smoke detector that meets the requirements specified in 683–10007 and SSP 30262:013.

B. Integrated racks requiring a smoke detector shall provide a smoke detector interface at the J43 connection with interface characteristics meeting the requirements specified in paragraph 3.3.10.

3.10.2.1.2 FORCED AIR CIRCULATION INDICATION

Integrated racks requiring a smoke detector shall provide a signal and data indicating the presence of airflow in the velocity range of 3 to 36.6 meters per minute (10 to 120 feet per minute) for the Area Smoke Detector (Allied Signal [Honeywell] P/N 2351520–2–1 or 2119818–3–1) or 18.3 to 603.5 meters per minute (60 to 1980 feet per minute) for the Duct Smoke Detector (Allied Signal [Honeywell] P/N 2351510–2–1 or 22119814–3–1) when the smoke detector is in use.

IRN 0005

3.10.2.1.3 FIRE DETECTION INDICATOR

A. Integrated racks requiring a smoke detector shall provide a red Fire Detection Indicator LED in an easily visible location on the front of the rack that is powered by the ISS when the smoke detector senses smoke.

D. Analysis of electrical circuit schematics shall be performed to show overcurrent protection exists at all points in the payload electrical architecture system where power is distributed to lower level (wire size not protected by upstream circuit protection device) feeder and branch lines. The analysis shall be considered successful when results show overcurrent protection exists at each point in the payload electrical architecture system where power is distributed to lower level (wire size) feeder and branch lines.

E. Analysis of electrical circuit schematics shall be performed to show current limiting overcurrent protection exists for all internal loads drawing power from an interface B power feed(s). The analysis shall be considered successful when results show current limiting overcurrent protection exists in the distribution paths to all load devices connected to an interface B power feed(s).

4.3.2.2.6.2 EPCE RPC INTERFACE REQUIREMENTS

NVR

4.3.2.2.6.2.1 RPC TRIP COORDINATION

NVR

4.3.2.2.6.2.1.1 PAYLOAD TRIP RATINGS

The integrated rack or EPCE Trip Ratings shall be verified by analysis. IRN 0005

An analysis shall be performed for the integrated rack connected to Interface B. The analysis will compare the current rating and trip characteristics of the circuit protection device in the integrated rack to the current rating and trip characteristics of the upstream RPC.

The verification shall be considered successful when analysis shows that the circuit protection device in the integrated rack will trip before the upstream RPC.

4.3.2.2.6.2.1.2 DELETED

4.3.2.2.7 EPCE COMPLEX LOAD IMPEDANCES

NVR

verified by analysis or test to the degree necessary to ensure no permanent damaging effects and no hazardous conditions due to destructive corona will exist in its operating environment. The operating environment is defined as normal pressurized atmosphere as specified in Table 3.9.4–1 or depressurized module if the payload is still powered. The fault clearing and protection voltage defined in Paragraph 3.2.1.3.3. is not considered the equipment voltage. If the equipment (with voltages greater than 190 volts) may be powered during depressurization, the verification shall be by test.

4.3.2.4.9 LIGHTNING

The Lightning requirement shall be verified by analysis.

The analysis shall be considered successful when the data shows that the integrated rack and EPCE is compatible with the requirements specified in paragraph 3.2.4.9. Note: The analysis data should be based on end item qualification design data and analysis data of the integrated rack or EPCE.

4.3.2.4.10 EMI SUSCEPTIBILITY FOR SAFETY-CRITICAL CIRCUITS

Test and analysis shall verify safety critical circuits. The analysis shall be considered successful when the results show the requirements of SSP 30243, paragraph 3.2.3 are met. IRN 0005

4.3.2.5 SAFETY REQUIREMENTS

NVR

4.3.2.5.1 PAYLOAD ELECTRICAL SAFETY

NVR

4.3.2.5.1.1 MATING/DEMATING OF POWERED CONNECTORS

Verification that the equipment connected to Interface B or Interface C meets the loss of power safety requirements specified in NSTS 1700.7, ISS Addendum shall be performed and submitted to the PSRP in accordance with NSTS 13830. Verification shall be considered successful when hazard reports and safety data presented to the PSRP during the phased safety reviews are approved.

4.3.2.6.2.1 MPLM UIP CONNECTORS AND PIN ASSIGNMENTS

A. NVR. Physical mating verification requirements are specified in paragraph 4.3.1.1.6.1.

B. Verification of appropriate pin assignment shall be by inspection. The inspection shall be an inspection of payload drawings to verify that the P1 pinouts match the corresponding J1 pinouts. The verification shall be considered successful when the inspection shows that the P1 connector pinout is appropriate.

C. Verification of the P1 connector with the requirements of SSQ 21635 shall be by inspection. The inspection shall consist of an inspection of the drawings to identify that the SSQ 21635 requirement is identified on the drawing for the P1 connectors.

4.3.2.6.2.1.1 DELETED

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4.3.2.6.2.2 COMPATIBILITY WITH RPC SOFT START/STOP IN MPLM

Compatibility with RPC Soft Start/Stop in MPLM shall be verified by test.

Verification of compatibility with RPC soft start/stop performance characteristics shall be performed by test when the initial supply of power is provided to the equipment connected to the RPC(s). Input power to the integrated rack shall be delivered through a PRCU or equivalent. The integrated rack connected to interface C shall be operated with multiple load combinations at levels ranging from 0% to 100% of the rated load current.

The verification shall be considered successful when test shows the integrated rack can initialize operation and is compatible with the RPC soft start/stop characteristics shown in Figure 3.2.6.2.2–1, as specified in paragraph 3.2.6.2.2.

4.3.2.6.2.3 MPLM SURGE CURRENT

Surge Current shall be verified by test and analysis. Input power to the integrated rack should be representative of the ISS power environment. Verification of compatibility with Surge Current

Test shall be considered successful when the PRCU correctly receives the CCSDS secondary header.

4.3.3.4.1.2 CCSDS DATA FIELD

Verification of the CCSDS data field shall be by test.

The test shall consist of a data transmission with the PRCU and inspection of the transmitted data against the SSP 52050 formats.

Test shall be considered successful when the PRCU correctly receives the CCSDS data field.

4.3.3.4.1.3 CCSDS DATA BITSTREAM

Verification of the CCSDS bitstream shall be by test.

The test shall consist of a transmission of a known set of bits and an inspection of the received data with the transmitted data.

Test shall be considered successful when the PRCU correctly receives the CCSDS bitstream.

4.3.3.4.1.4 CCSDS APPLICATION PROCESS IDENTIFICATION FIELD

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NVR

4.3.3.4.2 CCSDS TIME CODES

NVR

4.3.3.4.2.1 CCSDS UNSEGMENTED TIME

Verification of the CCSDS unsegmented time shall be by test.

The test shall consist of a data transmission with the PRCU and inspection of the transmitted data against the SSP 52050 formats.

Verification shall be to test the integrated rack with the PRCU, for correct test CCSDS unsegmented time.

A. The payload health and status data shall be tested during checkout with the Payload Rack Checkout Unit (PRCU), the Suitcase Test Environment for Payloads (STEP) or equivalent. The payload health and status data shall be transmitted into the PRCU, the STEP, or equivalent and logged. Subsequent inspection of the logged data shall verify that it exists as defined in the unique payload software ICD. The test shall be considered successful when the PRCU, STEP, or equivalent correctly receives the health and status data in the unique payload software ICD, and in a format that complies with Table 3.2.3.5–1, Health and Status Packet Format, of SSP 52050. IRN 0005 IRN 0005

B. The payload health and status data shall be tested during checkout with the PRCU, the STEP or equivalent. The payload health and status data shall be transmitted into the PRCU, the STEP, or equivalent and logged. The test shall be considered successful when the PRCU, STEP, or equivalent correctly receives the health and status data at the rate defined in the unique payload software ICD, and in a format that complies with Table 3.2.3.5–1, Health and Status Packet Format, of SSP 52050.

C. The payload health and status data shall be tested during checkout with an MPLM MDM flight equivalent unit (FEU) hosted on an MDM Applications Test Environment (MATE) III or equivalent. The payload health and status data shall be transmitted into the MATE III or equivalent and logged. The test shall be considered when the MATE III or equivalent correctly receives the health and status data as it is defined in the unique payload software ICD, and in a format that complies with Table 3.2.3.5–1, Health and Status Packet Format, of SSP 52050.

D. The payload health and status data shall be tested during checkout with an MPLM MDM FEU hosted on an MATE III or equivalent. The payload health and status data shall be transmitted into the MATE III or equivalent and logged. The test shall be considered successful when the MATE III or equivalent correctly receives the health and status data as it is defined in the unique payload software ICD, and in a format that complies with Table 3.2.3.5–1, Health and Status Packet Format, of SSP 52050.

E. The payload health and status data shall be tested during checkout with an MPLM MDM FEU hosted on an MATE III or equivalent. The payload health and status data shall be transmitted into the MATE III or equivalent and logged. The test shall be considered successful when the MATE III or equivalent correctly receives the health and status data as it is defined in the unique payload software ICD, and in a format that complies with Table 3.2.3.5–1, Health and Status Packet Format, of SSP 52050.

4.3.3.5.1.4 SAFETY DATA

Verification of the safety data shall be by test.

The test shall consist of a transmission of a Class 2, Class 3, and Class 4 Caution and Warning message and an inspection of the received data against the format of paragraph 3.2.3.5, Health

and Status Data, of SSP 52050 and Table A–1, Telemetry Parameter Definition, and Table A–5, Health and Status ISS Processed Data Packets, of SSP 57002.

Test shall be considered successful when the PRCU correctly receives the safety data.

4.3.3.5.1.4.1 CAUTION AND WARNING

NVR

4.3.3.5.1.4.1.1 CLASS 1 – EMERGENCY

NVR

4.3.3.5.1.4.1.2 CLASS 2 – WARNING

Verification that the integrated rack formats the C&W word for the listed warning events shall be by analysis and test.

Analysis of the payload safety hazard reports and payload safety review data shall identify the types of events identified as warnings that are being monitored.

4.3.3.5.2.2 LRDL SIGNAL CHARACTERISTICS

Verification of the MIL–STD–1553B bus A and bus B shall be by test.

The test shall consist of the measurement of the LRDL signal characteristics with the RT Validation Test Set.

Verification shall be to test the integrated rack's Payload Bus Remote Terminal with RT Validation Test Set, for correct test of the MIL–STD–1553B signal characteristics according to paragraph 4.5.2, Terminal Characteristics of MIL–STD–1553B with a MIL–STD–1553B bus analyzer as specified in MIL–HDBK–1553 Handbook, Notice 1, Appendix A, RT Validation Test Plan.

4.3.3.5.2.3 LRDL CABLING

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A. Verification shall be by inspection of the integrated rack LRDL cable. The inspection shall show the LRDL cable meets the requirements of SSQ 21655, Cable, Electrical, MIL–STD–1553B Data Bus, Space Quality, General Specifications for 75 Ohm or Equivalent.

B. Verification shall be by inspection that the integrated rack internal wiring stub length does not exceed 12 feet, (3.65 meters).

4.3.3.5.2.4 MULTI–BUS ISOLATION

If an integrated rack's Payload Bus RT utilizes multiple ISS Payload MIL–STD–1553B data buses, verification of the isolation between the various ISS Payload MIL–STD–1553B data buses shall be by test.

The test shall consist of the measurement of the signal isolation between the multiple ISS Payload MIL–STD–1553B data buses of the integrated rack's Payload Bus Remote Terminal in a RT validation test as defined in MIL–HDBK–1553, Notice 1, Appendix A, RT Validation Test Plan.

Verification shall be considered successful when the measurement of the signal isolation between the integrated rack's Payload Bus Remote Terminal's multiple ISS Payload MIL–STD–1553B data buses is no less than 58 dB.

4.3.3.6 MEDIUM RATE DATA LINK (MRDL)

NVR

4.3.7.1.4 NITROGEN LEAKAGE

Verification of integrated rack nitrogen leakage shall be by test. The verification shall be considered successful when the test results show that the sum of all potential leakage sources from the standoff UIP panel connection to the point to nitrogen flow control in the integrated rack does not exceed the allowable leakage rate.

4.3.7.1.5 NITROGEN PHYSICAL INTERFACE

IRN 0005

NVR. Physical mating verification requirements are specified in section 4.3.1.1.6.1.

4.3.7.2 ARGON INTERFACE VERIFICATION REQUIREMENTS

4.3.7.2.1 ARGON INTERFACE CONTROL

Verification of argon flow control shall be by test. The verification shall be considered successful when the test results confirm that the integrated rack can turn on and off the flow of argon and can control the flow to not exceed the maximum allowable argon flow rate when connected to argon supplied at the maximum and minimum of the specified pressure range.

4.3.7.2.2 ARGON INTERFACE MDP

The MDP of integrated rack volumes connected to the Argon system shall be verified by the test and analysis guidelines identified in SSP 52005, paragraph 5.1.3. The verification shall be considered successful if the test results show the integrated rack passes the proof-pressure test.

4.3.7.2.3 ARGON INTERFACE TEMPERATURE

Verification that the integrated rack argon system is compatible with the argon interface temperature range shall be by test or analysis or both. Verification shall be considered successful when review of the argon system components, including component qualification data packs, or test results, show that the integrated rack argon system is compatible with the argon temperature range specified.

4.3.7.2.4 ARGON LEAKAGE

Verification of integrated rack argon leakage shall be by test. Verification shall be considered successful when the test results show that the sum of all potential leakage sources from the standoff UIP panel connection to the point to argon flow control in the integrated rack does not exceed the allowable leakage rate.

4.3.7.2.5 ARGON PHYSICAL INTERFACE

IRN 0005

NVR. Physical mating verification requirements are specified in section 4.3.1.1.6.1.

4.3.7.3 CARBON DIOXIDE INTERFACE VERIFICATION REQUIREMENTS

4.3.7.3.1 CARBON DIOXIDE INTERFACE CONTROL

Verification of carbon dioxide flow control shall be by test. The verification shall be considered successful when the test results confirm that the integrated rack can turn on and off the flow of carbon dioxide and can control the flow to not exceed the maximum allowable carbon dioxide flow rate when connected to carbon dioxide supplied at the maximum and minimum of the specified pressure range.

4.3.7.3.2 CARBON DIOXIDE INTERFACE PRESSURE

The MDP of integrated rack volumes connected to the Carbon Dioxide system shall be verified by the test and analysis guidelines identified in SSP 52005, paragraph 5.1.3. The verification shall be considered successful if the test results show the integrated rack passes the proof-pressure test.

4.3.7.3.3 CARBON DIOXIDE INTERFACE TEMPERATURE

Verification that the integrated rack carbon dioxide system is compatible with the carbon dioxide interface temperature range shall be by test or analysis or both. The verification shall be considered successful when review of carbon dioxide system components, including qualification data packs, test results, show that the integrated rack carbon dioxide system is compatible with the carbon dioxide temperature range specified.

4.3.7.3.4 CARBON DIOXIDE LEAKAGE

Verification of integrated rack carbon dioxide leakage shall be by test. The verification shall be considered successful when the test results show that the sum of all potential leakage sources from the standoff UIP panel connection to the point to carbon dioxide flow control in the integrated rack does not exceed the allowable leakage rate.

4.3.7.3.5 CARBON DIOXIDE PHYSICAL INTERFACE

IRN 0005

NVR. Physical mating verification requirements are specified in section 4.3.1.1.6.1.

4.3.10 FIRE PROTECTION INTERFACE VERIFICATION REQUIREMENTS

4.3.10.1 FIRE PREVENTION

Verification that integrated racks meet the fire prevention requirements specified in NSTS 1700.7 ISS Addendum shall be performed and submitted to the PSRP in accordance with NSTS 13830. Verification shall be considered successful when hazard reports and safety data presented to the PSRP during the phased safety reviews are approved.

4.3.10.2 PAYLOAD MONITORING AND DETECTION REQUIREMENTS

NVR

4.3.10.2.1 SMOKE DETECTION

4.3.10.2.1.1 SMOKE DETECTOR

A. Verification that integrated racks requiring smoke detection use a smoke detector that meets the requirements specified in 683–10007 and SSP 30262:013 shall be by inspection. Verification shall be considered successful when the inspection shows the end item spec and interface control document of the smoke detector used meets the requirements specified in 683–10007 and SSP 30262:013 respectively. Integrated racks using the ISS provided smoke detector shall be considered in compliance with this requirement.

B. Verification that integrated racks requiring a smoke detector provide a smoke detector interface at the J43 connection shall be by inspection and demonstration. The inspection shall consist of reviewing schematics/drawings to verify they show wiring to the J43 connector. The verification shall be considered successful when the inspection shows wiring from smoke detector to the J43 connector. The demonstration shall be conducted to show the connector mates with the ISS equivalent connector. The verification shall be considered successful when the demonstration shows the connector mates with the ISS equivalent connector.

4.3.10.2.1.2 FORCED AIR CIRCULATION INDICATION

Verification that integrated racks provide a signal or data indicating the presence of airflow to the smoke detector when the smoke detector is in use shall be by test. Verification shall be considered successful when the test shows signal strength meets the interface characteristics in paragraph 3.3.10. IRN 0005 IRN 0005

maximum requirements) are provided, and the design of the controls is such that no single failure, event, or environment can eliminate more than one control.

C. The exposure condition exceeds both the threshold for shock and the threshold of the let–go current profile (catastrophic hazardous events) as defined in Table 3.2.5.4.–1, and three independent controls are provided, and the design of the controls is such that no combination of two failures, events or environments can eliminate more than two controls.

D. If two dependent controls are provided, the physiological effect that a crew member experiences as a result of the combinations of the highest internal voltage applied to or generated within the equipment and the frequency and wave form associated with a worst case credible failure is below the threshold of the let–go current profile as defined in Table 3.2.5.4.–1.

E. If the analysis fails to clearly define the exposure condition that a crew member might experience, three independent hazard controls are provided and the design of the controls is such that no combination of two failures, events or environments can eliminate more than two controls.

4.3.12.9.1.1 MISMATCHED

The design of electrical connectors to preclude inadvertent reversal of connections shall be verification by analysis, inspection and demonstration. The verification shall be considered successful only when all of the integrated rack electrical connectors, and wire harnesses requiring crew access to mate/demate during on–orbit operations are demonstrated to meet the requirements.

4.3.12.9.1.2 DELETED

4.3.12.9.1.3 DELETED

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4.3.12.9.1.3.1 DELETED

4.3.12.9.1.3.2 DELETED

4.3.12.9.1.3.3 DELETED

4.3.12.9.1.3.4 DELETED

4.3.12.9.1.3.5 DELETED

4.3.12.9.1.4 OVERLOAD PROTECTION

NVR

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4.3.12.9.1.4.1 DEVICE ACCESSIBILITY

Verification that an overload protective device will not be accessible without opening a door or cover (except operating handles or buttons of a circuit breaker, the cap of an extractor-type fuse holder, and similar parts may project outside the enclosure) shall be by hardware inspection. Verification shall be considered successful when hardware inspection shows a door or cover must be opened to access the overload protective device.

4.3.12.9.1.4.2 EXTRACTOR – TYPE FUSE HOLDER

Verification that the arrangement of the extractor–type fuse holder operates such that the fuse is extracted when the cap is removed shall be by demonstration. Verification shall be considered successful when demonstrations show the fuse is extracted when the removable cap assembly is removed.

4.3.12.9.1.4.3 OVERLOAD PROTECTION LOCATION

Verification that overload protection (fuses and circuit breakers) intended to be manually replaced or physically reset on–orbit are located where they can be seen and replaced or reset without removing other components shall be by hardware inspection. Verification shall be considered successfull when hardware inspection results show that overload protection devices are directly visible and accessible without removal of other components.

4.3.12.9.1.4.4 OVERLOAD PROTECTION IDENTIFICATION

Verification that each overload protection (fuse or circuit breaker), intended to be manually replaced or physically reset on–orbit, shall be readily identified or keyed (mechanically or color coded) for its rated value shall be by hardware inspection. Verification shall be considered successful when hardware inspection results show the rated identification for each overload protection is in place.

4.3.12.9.1.4.5 AUTOMATIC RESTART PROTECTION

Verification shall be by demonstration. The demonstration shall first induce an “Overload Initiated Shutdown” as defined in SSP 57000 Paragraph 3.2.2.6.1.1 and then observe system response to assure that Automatic Restart does not occur unless the Protection Switch/Control is explicitly operated to enable restarting. The verification of Automatic Restart Protection shall be considered successful when it shows that automatic restart cannot occur following an overload–initiated shutdown without explicit operation of the protection switch/control to enable restarting.

4.3.12.9.2 SHARP EDGES AND CORNERS PROTECTION

Verification that the hardware meets the sharp edges and corners requirements specified in NSTS 1700.7, ISS Addendum 222.1 shall be performed and submitted to the PSRP in accordance with NSTS 13830. Verification shall be considered successful when the hazard reports and safety data presented to the PSRP during the phased safety reviews are approved.

APPENDIX A ABBREVIATIONS AND ACRONYMS

AC	Alternating Current
AIT	Analysis and Integration Team
APM	Attached Pressurized Module
APS	Automated Payload Switch
ANCP	Acoustics Noise Control Plan
ARIS	Active Rack Isolation System
ASI	Italian Space Agency
BPDU	Bitstream Protocol Data Unit
C	Centigrade
cc	cubic centimeters
cm	Centimeter
C&DH	Command & Data Handling
CCSDS	Consultative Committee for Space Data Systems
C&T	Communications & Tracking
C&W	Caution and Warning
CAM	Centrifuge Accommodations Module
COF	Columbus Orbiting Facility
COTS	Commercial Off The Shelf
CSMA/CD	Carrier Sense Multiple Access with Collision Detection
CVIU	Common Video Interface Unit
DEAP	Dryden Early Access Platform
dB	deciBel
dBs	deciBels

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dBA	Acoustic Decibel Level
dBm	deciBels Referenced to One Milliwatt
dc	Direct Current
EEE	Electrical, Electronic, and Electromechanical
ELM-PS	Experiment Logistics Module – Pressurized Section
EMC CS–01, 02	Electromagnetic Compatibility; Conducted Susceptibility –01 (CS–01), (CS–01), Conducted Susceptibility –02 (CS–02)
EMI	Electromagnetic Interference
EPCE	Electrical Power Consuming Equipment
EPS	Electrical Power System
ESA	European Space Agency
ESD	Electrostatic Discharge
F	Fahrenheit
FHP	First Header Pointer
FSS	Fluid System Servicer
GFCI	Ground Fault Circuit Interrupter
GSE	Ground Support Equipment?
HRDL	High Rate Data Link
HRFM	High Rate Frame Multiplexer
hr	hour
Hz	Hertz
ICD	Interface Control Document
IDD	Interface Design Document
IEC	International Electro Technical Commission
IEEE	Institute of Electrical and Electronic Engineers
IRD	Interface Requirements Document

IRE	Institute of Radio Engineers
ISO	International Standards Organization
ISPR	International Standard Payload Rack
ISS	International Space Station
ISSP	International Space Station Program
ITCS	Internal Thermal Control System
IVA	Intravehicular Activity
JEM	Japanese Experiment Module
kg	kilograms
kHz	kiloHertz
kPa	kiloPascal
KSC	Kennedy Space Center
kW	kiloWatt
LAN	Local Area Network
lbm	pounds mass
LED	Light Emitting Diode
LISN	Line Impedance Simulation Network
LLC	Logical Layer Control
LRDL	Low Rate Data Link
mA	milliAmperes
MATE III	Multiplexer/Demultiplexer Applications Test Environment
Mbps	MegaBytes per second
MDM	Multiplexer–Demultiplexer
MDP	Maximum Design Pressure
MIL–STD	Military Standard

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MPICB	Multilateral Payload Implementation Control Board
MPLM	Mini Pressurized Logistics Module
MRB	Microgravity Rack Barrier
MRDL	Medium Rate Data Link (Ethernet)
MSFC	Marshall Space Flight Center
N	Newton
NASA	National Aeronautics and Space Administration
NASDA	National Space Development Agency of Japan
NRZI	Non Return to Zero Invent
NSTS	National Space Transportation System
NTSC	National Television Systems Committee
NVR	No Verification Required
ODS	Orbiter Docking System
ORU	Orbital Replacement Unit
PCM	Program Cost Management
PCS	Portable Computer System
PFE	Portable Fire Extinguisher
PFM	Pulse Frequency Modulation
PG	Product Group
PIA	Payload Interface Agreement
PIDS	Prime Item Development Specification
PIO	Program Integration Office
PIRN	Preliminary/Proposed Interface Revision Notice
PP	Pressurized Payloads
PRCU	Payload Rack Checkout Unit

psia	pounds per square inch absolute
PSRP	Payload Safety Review Panel
PUI	Program Unique Identifier
PUL	Portable Utility Light
QD	Quick Disconnect
R/FR	Refrigerator/Freezer
Rev	Revision
RHA	Rack Handling Adapter
RID	Rack Insertion Device
RMA	Restraint Mobility Aids
RPC	Remote Power Controller
RPCM	Remote Power Control Mechanism
RPCS	Remote Power Controllers
RSC	Rack Shipping Container
RT	Remote Terminal
RUP	Rack Utility Panels
scc	Standard Cubic Centimeter
sec	second
SEE	Single Event Effect
SI	International System of Units
SLPM	Standard Liter Per Minute
SMAC	Spacecraft Maximum Allowable Concentrations
SPL	Sound Pressure Level
SPOE	Standard Payload Outfitting Equipment
SSCM	Space Station Change Memo

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SSP	Space Station/Shuttle Program
SSPF	Space Station Processing Facility
SSQ	Space Station Qualified
TBC	To Be Confirmed
TBD	To Be Determined
TBE	Teledyne Brown Engineering
TBS	To Be Supplied
TBV	To be Verified
TCS	Thermal Control System
TM	Technical Memo
UIP	Utility Interface Panel
UOP	Utility Outlet Panel
USL	United States Laboratory
USOS	United States On–orbit Segment
VC–S	Visibly Clean – Sensitive
VES	Vacuum Exhaust System
VES/WGS	Vacuum Exhaust System and/or Waste Gas System
VRS	Vacuum Resource System
WG	Waste Gas
WGS	Waste Gas System

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E.2 TO BE RESOLVED ITEMS

TABLE E–2 TO BE RESOLVED ITEMS

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No.	Description	Document Section	Responsible	Due Date	
1	NASDA to evaluate the defined AC/DC magnetic field impact to the JEM system	3.2.4.6 3.2.4.7	NASDA JEM	9/1/00	
					IRN 0005
3	ESA does not agree with the relaxation of the NTSC Video Performance Characteristics defined in Table 3.4.1.1–1. ESA requires that Payloads meet the “RECOMMENDED” values in Table 3.4.1.1–1 to be compatible with the APM video system.	3.4.1.1–1	ESA NASA OZ3	9/1/00	
4	NASDA believes that the rack pressure drop must remain a constant 5.8 ± 0.2 psid (40 ± 1.2 kPa) for all flow rates. Requirement will require additional coordination between NASA and NASDA.	3.5.1.3	NASDA JEM NASA OZ3	9/1/00	IRN 0005