IRN NO: 57001–0001	**ISS PAYLOAD OFFICE IRN/PIRN/EXCEPTION FORM**	(Page 1 of 26) DATE PREPARED: 03–25–02
Doc. No., Rev. & Title: SSP 57001 Pressurized Payloads Hardware Interface Control Document Template		PIRN NO: 57001–NA–0025A, 57001–NA–0029A, 57001–NA–0030, 57001–NA–0037, 57001–NA–0040, 57001–NA–0042A
(P)IRN TITLE: **Incorporate PTR Approved PIRNs into SSP 57001 – Rev C as IRN 57001–0001**		
ORIGINATOR: Name: Mike Horkachuck Agency: NASA Phone: (281) 226–4229 Fax: (281) 226–6133	PIRN Type: *Check One* ❑ Standard PIRN ❑ Exception	*For Payload Office Use Only* ❑ Exceedance ❑ Deviation ❑ Waiver
UTILIZATION CHANGE ENGINEER.: Name: Tom Gallagher Agency: Boeing/TBE Phone: (281) 226–4074	SSCN/CR: SSCN 005962A	RELATED PIRN NO.: N/A
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PARAGRAPHS, FIGURES, TABLES AFFECTED (For PIRN use only)		
Page Paragraph(s) Figure(s) Table(s) See Continuation sheet		

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IRN NO: 57001–0001	**ISS PAYLOAD OFFICE IRN/PIRN/EXCEPTION FORM CONTINUED**	PAGE NO. 2 of 26 DATE PREPARED: 03–25–02
Doc. No., Rev. & Title: SSP 57001 Pressurized Payloads Hardware Interface Control Document Template		PIRN/EXCEPTION NO:

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Incorporate PTR Approved PIRNs into SSP 57001 – Rev C as IRN 57001–0001

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axv	Table of Contents				X	
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axviii	Table of Contents – Tables				X	
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3–15a		3.1.2–6			X	
3–17	3.2.1.1			X		
3–26		3.2.1.3–2		X		
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3–28		3.2.1.3–5, 3.2.1.3–6		X		
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3–68a	3.4.1.1.3		3.4.1.1.3–1		X	
3–71	3.5.1.1			X		
3–76	3.5.1.4		3.5.1.4–1			X
3–80	3.6.1, 3.6.1.1		3.6.1.1–1	X		
3–84	3.6.1.2		3.6.1.2–1	X		
3–88	3.7			X		
3–90a		3.7–3			X	

Pressurized Payloads Hardware Interface Control Document Template

International Space Station Program

November 1, 2000

Revision C

Incorporates IRN0001

TYPE 1 – APPROVED BY NASA

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National Aeronautics and Space Administration
International Space Station Program
Johnson Space Center
Houston, Texas
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REV.	DESCRIPTION	PUB. DATE
–	DRAFT Preliminary Release per DR PA07	09/15/97
	INITIAL RELEASE (Referenced per SSCD 000802, EFF. 10/14/97)	02/18/98
A	REVISION A (Referenced per SSCD 001823, EFF. 04/28/99)	07/09/99
B	REVISION B (Referenced per SSCD 002534, EFF. 08/02/99)	12/08/99
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	IRN 0001 (Release per SSCD 005962A, Eff. 12/05/01)	04/16/02

ERU: /s/ M. Hehn 04/16/02

SSCBD	ENTRY DATE	CHANGE	PARAGRAPH(S)
			FIGURE(S)
		57001–NA–0019A	3.2.5.2–1, 3.2.5.2–2, 3.2.5.2–3
			TABLE(S)
003164E	01–NOV–00	57001–NA–0020	3.5.1.3–1
			PARAGRAPH(S)
		57001–NA–0021G	3.5.1.2
			TABLE(S)
			3.5.1.2–1
			3.5.1.2–2
			ADDENDA
			Appendix A
			PARAGRAPH(S)
		57001–NA–0022	3.5.1.2
			TABLE(S)
			3.5.1.2–3
			FIGURE(S)
			3.5.1.2–3
		57001–NA–0023	**PARAGRAPH(S)**
			2.1,
			3.8.1
		57001–NA–0028	**PARAGRAPH(S)**
			3.8.2
			PARAGRAPH(S)
005962A	05–DEC–01	57001–NA–0025A	3.6.1, 3.6.1.1., 3.6.1.2
			TABLE(S)
			3.6.1.1–1, 3.6.1.2–1
			PARAGRAPH(S)
		57000–NA–0029A	3.7
			FIGURE(S)
			3.7–3
			PARAGRAPH(S)
		57000–NA–0030	3.1.2, 3.2.1.1, 3.5.1.1
			FIGURE(S)
			3.1.2–1, 3.1.2–6
			PARAGRAPH(S)
		57000–NA–0037	3.5.1.4
			TABLE(S)
			3.5.1.4–1

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57000–NA–0040	3.4.1.1.1, 3.4.1.1.2, 3.4.1.1.3	IRN 0001
	TABLE(S)	
	3.4.1.1.1–1, 3.4.1.1.2–1, 3.4.1.1.3–1	
	FIGURE(S)	
57000–NA–0042	3.2.1.3–2, 3.2.1.3–3, 3.2.1.3–4, 3.2.1.3–5, 3.2.1.3–6	

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TABLE OF CONTENTS (Continued)

TABLES

TABLES (Continued)

FIGURES

FIGURES (Continued)

3.1.2 CONNECTOR INTERFACES

The physical interface of the integrated rack to ISS system services is at the Utility Interface Panel (UIP). The UIP location is shown in Figure 3.1.2–1. The ISS system services connector layout at the UIP is shown in Figures 3.1.2–2 through 3.1.2–6. The ISS system services connectors are defined in Table 3.1.2–1. IRN 0001

IRN 0001

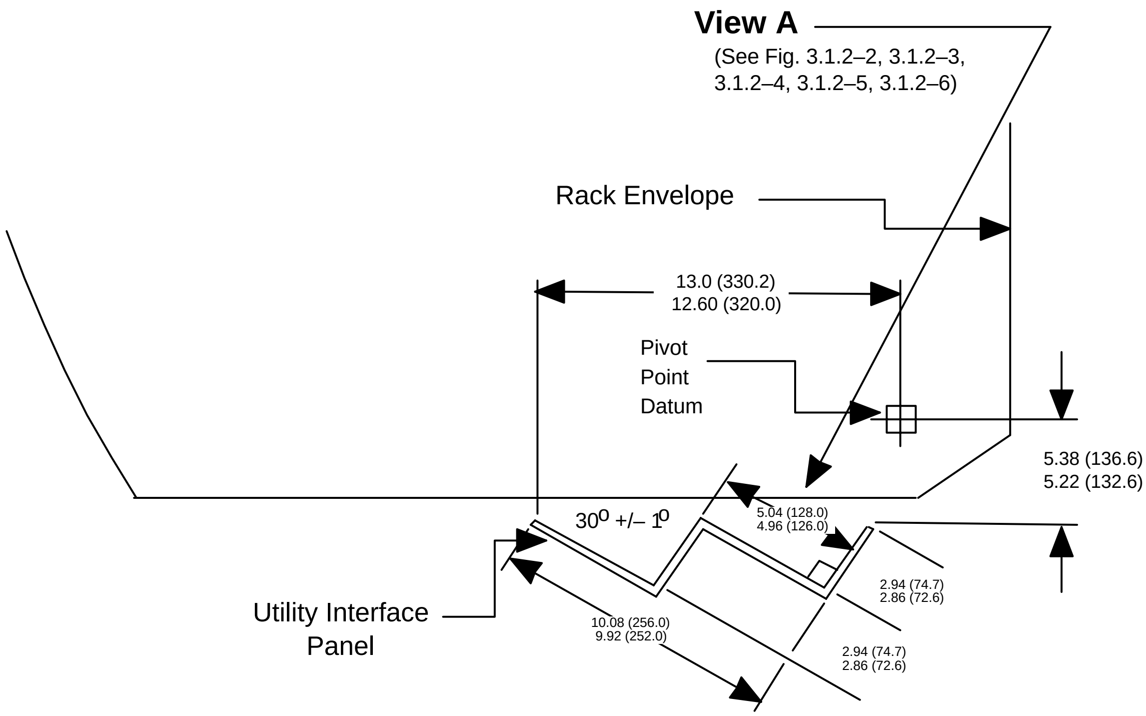


FIGURE 3.1.2–1 UIP LOCATION AND DIMENSIONS

IRN 0001

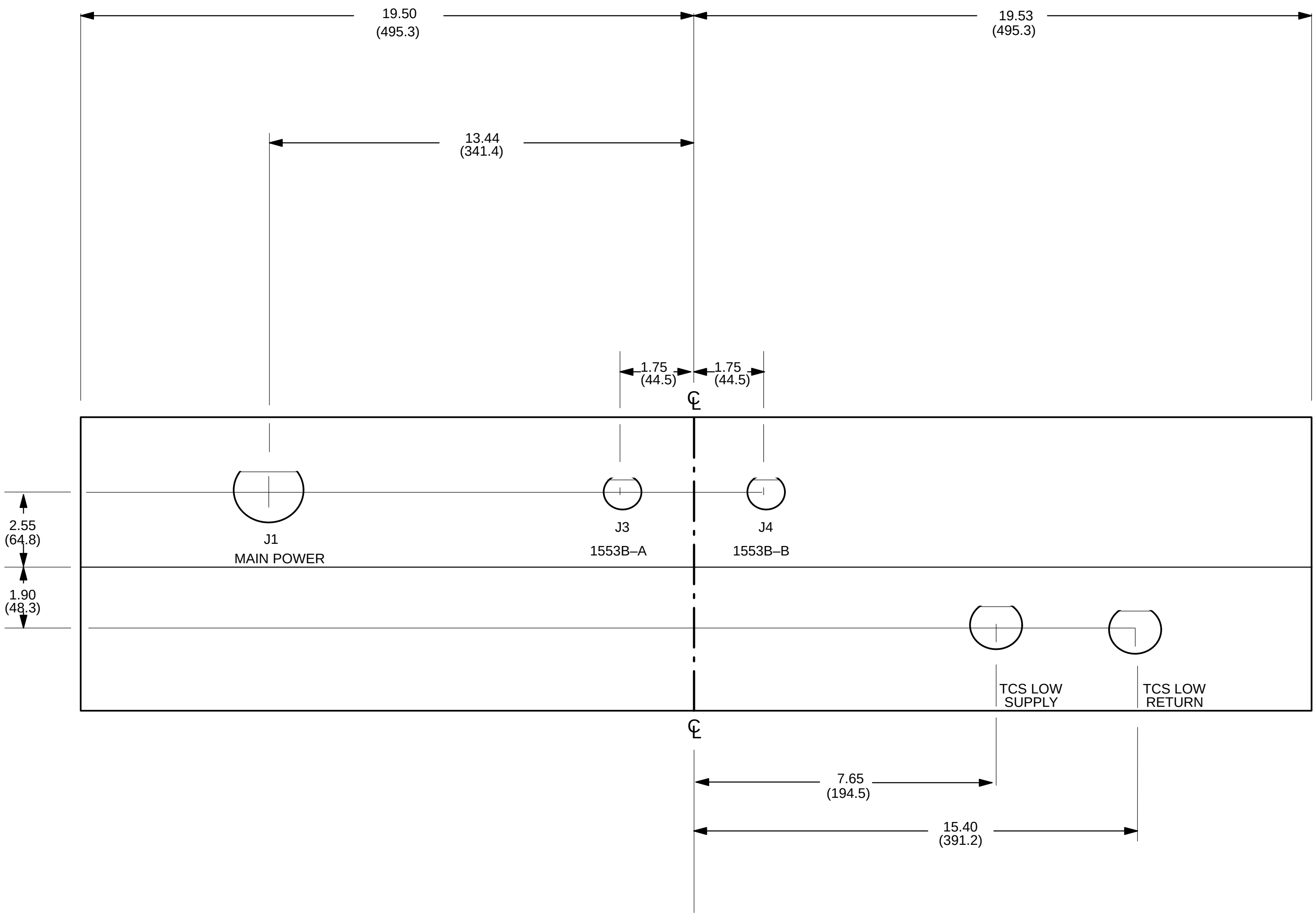


FIGURE 3.1.2–6 MPLM SPECIFIC CONNECTOR LOCATIONS

3.2 ELECTRICAL POWER INTERFACES

3.2.1 CONNECTORS

3.2.1.1 UTILITY INTERFACE PANEL

The Integrated rack electrical power connectors, J1 and J2, interfaces at the UIP are defined in Figures 3.1.2–1 through 3.1.2–6. The J1 and J2 part numbers are defined in Table 3.1.2–1 and the pin assignments are defined in Figure 3.2.1.1–1. IRN 0001

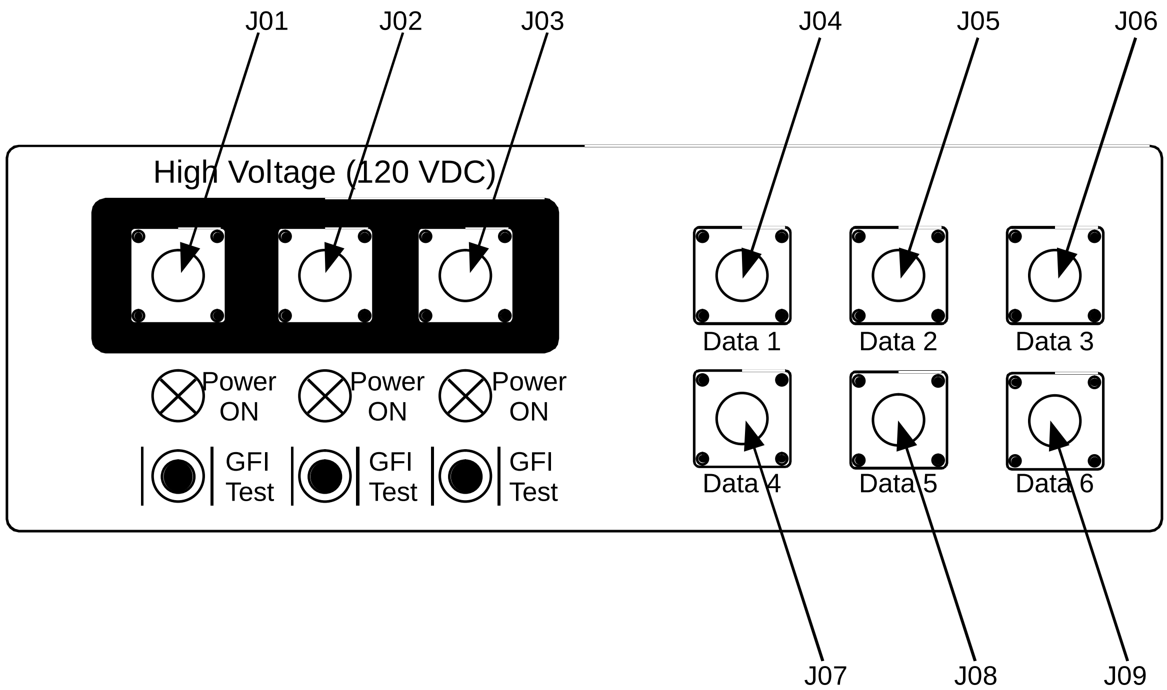


FIGURE 3.2.1.3–1 SUP PANEL LAYOUT

APM NATC00T15N97SN	SUP	Experiment NATC06G15N97PN
CHECS DATA A HI	A	
CHECS DATA A LO	B	
NOT AVAILABLE FOR USE	C	
NOT CONNECTED	D	
NOT CONNECTED	E	
NOT CONNECTED	F	
CHASSIS GROUND	G	
CHECS DATA B HI	H	
CHECS DATA B LO	J	
NOT CONNECTED	K	
POWER RETURN	L	
120 V POWER	M	

IRN 0001

FIGURE 3.2.1.3–2 SUP–1/SUP–4 CONNECTOR J01 PIN ASSIGNMENTS

APM NATC00T15N97SN	SUP	Experiment NATC06G15N97PN
ISS C&C BUS 1 A HI	A	
ISS C&C BUS 1 A LO	B	
NOT AVAILABLE FOR USE	C	
NOT CONNECTED	D	
NOT CONNECTED	E	
NOT CONNECTED	F	
CHASSIS GROUND	G	
ISS C&C BUS 1 B HI	H	
ISS C&C BUS 1 B LO	J	
NOT CONNECTED	K	
POWER RETURN	L	
120 V POWER	M	

IRN 0001

FIGURE 3.2.1.3–3 SUP–2 CONNECTOR J01 PIN ASSIGNMENTS

APM NATC00T15N97SN	SUP	Experiment NATC06G15N97PN
ISS C&C BUS 2 A HI	A	
ISS C&C BUS 2 A LO	B	
NOT AVAILABLE FOR USE	C	
NOT CONNECTED	D	
NOT CONNECTED	E	
NOT CONNECTED	F	
CHASSIS GROUND	G	
ISS C&C BUS 2 B HI	H	
ISS C&C BUS 2 B LO	J	
NOT CONNECTED	K	
POWER RETURN	L	
120 V POWER	M	

IRN 0001

FIGURE 3.2.1.3–4 SUP–3 CONNECTOR J01 PIN ASSIGNMENTS

APM NATC00T15N97SN	SUP	Experiment NATC06G15N97PN
NOT CONNECTED	A	
NOT CONNECTED	B	
NOT AVAILABLE FOR USE	C	
NOT CONNECTED	D	
NOT CONNECTED	E	
NOT CONNECTED	F	
CHASSIS GROUND	G	
NOT CONNECTED	H	
NOT CONNECTED	J	
NOT CONNECTED	K	
POWER RETURN	L	
120 V POWER	M	

IRN 0001

FIGURE 3.2.1.3–5 SUP–1/SUP–4 CONNECTOR J02 PIN ASSIGNMENTS

APM NATC00T15N97SN	SUP	Experiment NATC06G15N97PN
ISS P/L BUS A HI	A	
ISS P/L BUS A LO	B	
NOT AVAILABLE FOR USE	C	
NOT CONNECTED	D	
NOT CONNECTED	E	
NOT CONNECTED	F	
CHASSIS GROUND	G	
ISS P/L BUS B HI	H	
ISS P/L BUS B LO	J	
NOT CONNECTED	K	
POWER RETURN	L	
120 V POWER	M	

IRN 0001

FIGURE 3.2.1.3–6 SUP–2/SUP–3 CONNECTOR J02 PIN ASSIGNMENTS

3.4.1 NTSC FIBER OPTIC VIDEO

3.4.1.1 PULSE FREQUENCY MODULATION NTSC FIBER OPTIC VIDEO CHARACTERISTICS

The pulse frequency modulation (PFM) fiber optical video interface consists of one video channel into the rack, one video channel out of the rack, and one synchronization and control channel. The video hardwired addresses are allocated in Table 3.4.2.1–1.

3.4.1.1.1 OPTICAL PFM NTSC VIDEO SIGNAL TRANSMIT POWER LEVELS (USL) IRN 0001

The minimum average transmit power level for optical PFM NTSC video signals to a rack, measured at ambient temperature, at each signal interface provided for ISPR is shown in Table 3.4.1.1.1–1.

TABLE 3.4.1.1.1–1 OPTICAL PFM NTSC VIDEO SIGNAL TRANSMIT POWER

Signal	USL Output
	Optical Power (dB)
LAP–1	–22.2
ISPR (Non LAP–1 Location)	–19.1

3.4.1.1.2 OPTICAL PFM NTSC SYNC AND CONTROL SIGNAL TRANSMIT POWER LEVELS (USL)

The minimum average transmit power level for optical PFM NTSC sync and control signals to a rack, measured at ambient temperature, at each interface provided for ISPR is shown in Table 3.4.1.1.2–1.

TABLE 3.4.1.1.2–1 OPTICAL PFM NTSC SYNC AND CONTROL SIGNAL TRANSMIT POWER

Signal	USL Output
	Optical Power (dB)
LAP–1	–22.2
LAB1P4	–21.4
ISPR (Non LAP–1 or P4 Location)	–19.1

Note: Use of the Sync is only required if a payload wants to display its video on board split screen.

3.4.1.1.3 APM OPTICAL PFM NTSC VIDEO POWER LEVELS

IRN 0001

The APM transmits optical PFM NTSC video and sync and control signals to the ISPR at the minimum optical power levels shown in Table 3.4.1.1.3–1 (APM Side–Output), Video Interface APM Optical Power Levels.

TABLE 3.4.1.1.3–1 VIDEO INTERFACE APM OPTICAL POWER LEVELS

Signal Name	APM Output
	Optical Power Levels (dBm)
APM VIDEO	–20.0
APM SYNC	–20.0

Note: Optical Power Levels are dBm average 50% duty cycle, measured at ambient temperature.

3.4.1.2 PFM NTSC OPTICAL CONNECTOR

The integrated rack PFM NTSC video optical connector, J16, pin assignments are shown in Figure 3.4.1.2–1. The location of the video optical connector, J16, interface at the UIP is defined in Figures 3.1.2–1, 3.1.2–2, and 3.1.2–5. The video optical connector is defined in Table 3.1.2–1.

TABLE 3.4.2.1–1 VIDEO HARDWIRED ADDRESSES

APM ISPR		JEM ISPR		US–LAB ISPR		CAM ISPR	
Location	Video Hardwired Address	Location	Video Hardwired Address	Location	Video Hardwired Address	Location	Video Hardwired Address
F1	210	F1	91	LAC1	179	O1	(TBD #3)
F2	211	F2	92	LAC2	180	O2	(TBD #3)
F3	212	F3	93	LAC3	181	F1	(TBD #3)
F4	213	F5	94	LAC4	182	F2	(TBD #3)
A1	214	F6	95	LAC5	183	F3	(TBD #3)
A2	215	A1	96	LAS1	184	F4	(TBD #3)
A3	216	A2	97	LAS2	185	A1	(TBD #3)
A4	217	A3	98	LAS3	186	A2	(TBD #3)
O1	218	A4	99	LAS4	187	A3	(TBD #3)
O2	219	A5	100	LAF3	188	A4	(TBD #3)
NOTES: 1. Decimal values to be mapped in 8 bit presentation, bit 0 = LSB. See Figures 3.4.1.2–1 and 3.4.2.1–1. 2. Jumpering address line to ground = logic 0.				LAP1	189		
				LAP2	190		
				LAP4	191		

3.5 THERMAL CONTROL INTERFACE REQUIREMENTS

3.5.1 INTERNAL THERMAL CONTROL SYSTEM (ITCS) INTERFACE REQUIREMENTS

3.5.1.1 CONNECTOR

The location of the ITCS Moderate Temperature Loop (MTL) and Low Temperature Loop (LTL) interfaces at the UIP are defined in Figures 3.1.2–1 through 3.1.2–6. The MTL and LTL connectors are defined in Table 3.1.2–1. IRN 0001

3.5.1.2 ITCS COOLANT FLOW RATE AND PRESSURE DROP

The integrated rack can request to be supplied a specific flow rate within the ranges specified in Table 3.5.1.2–1. Multiple flow rate settings can be accommodated provided the control system time constant requirements are met and the flow rate setting changes are properly coordinated with the Module Integrator. Each payload location utilizing a module–provided valve has an off or “zero–flow” capability. During nominal operations a payload should receive ITCS coolant from the interface at the requested rate plus or minus the system control capability. The maximum pressure drop across an integrated rack in each module for the MTL and the LTL is defined in Table 3.5.1.2–2. The coolant flow rate required by the integrated rack and the corresponding pressure drop across the rack is defined in Figure 3.5.1.2–3.

3.5.1.3 COOLANT SUPPLY TEMPERATURE

The ITCS coolant loop supply temperatures in each module are defined in Table 3.5.1.3–1.

TABLE 3.5.1.3–1 ITCS COOLANT SUPPLY TEMPERATURES

Loop/Lab	USL °F (°C)	APM °F (°C)	JEM ° F (°C)	MPLM [1] °F (°C)	CAM °F (°C)
MTL	61 – 65 (16 – 18.3)	61 – 68 (16 – 20)	61 – 73.4 (16 – 23)		61 – 65 (16 – 18.3)
LTL	38 – 42 (3.3 – 5.6)		34 – 50 (1.1 – 10)	38 – 45 (3.3 – 7.2)	38 – 43 (3.3 – 6.1)

1. After a period of stagnant water conditions, MPLM TCS start up will result in actively cooled payloads receiving low temperature coolant at a maximum temperature of 140 °F (60 °C) for no more than 10 seconds, a maximum of 113 °F (45 °C) for no more than 500 seconds, and a maximum of 55 °F (12.8 °C) for no more than 650 seconds. During these conditions the actively cooled payload will be switched off. After the start up phase, each payload shall receive low temperature coolant from the MPLM at 38 to 45 °F (3.3 to 7.2 °C) during operations on station and 35 to 47 °F (1.7 to 8.3 °C) during operations in the orbiter.

3.5.1.4 DELETE IRN 0001

3.5.1.5 SIMULTANEOUS COOLING

3.5.1.5.1 USL AND CAM SIMULTANEOUS COOLING

The moderate temperature loop and low temperature loop may not be connected to each other. However, payload racks in the USL and CAM can be simultaneously supplied with both low temperature and moderate temperature coolant, provided the following stipulations for each of the implementation methods listed below are satisfied by the payloads:

TABLE 3.5.1.9–1 AIR HEAT LOAD

Ambient Temperature	Max Heat Load	Rack Load
15.5 °C (60 °F)	68 W	
49 °C (120 °F)	140 W	

Note:
Supply the total amount of heat that the integrated rack will remove from the ISS cabin in Table 3.5.1.9–1.

3.6 VACUUM SYSTEM REQUIREMENTS

3.6.1 VACUUM EXHAUST SYSTEM (VES)/WASTE GAS SYSTEM (WGS)

The Vacuum Exhaust System/Waste Gas System (VES/WGS) is capable of reaching a pressure at the ISPR interface of 1 x 10^{-3} torr (.13 Pa) in less than two hours for a single payload/facility volume of 100 liter at an initial pressure of 14.7 psia (101 kPa); dry air at 70 °F (21 °C) assuming zero leakage and out/off gasing and infinite conductivity between payload/facility volume and the rack interface. The ISPR locations in the USL, JEM, and APM providing VES/WGS capabilities are illustrated in Figures 3.6.1–1, 3.6.1–2 and 3.6.1–3. The locations of the VES/WGS interfaces at the UIP are defined in Figures 3.1.2–1 through 3.1.2–5 (WASTE GAS SYSTEM). The VES/WGS connector is defined in Table 3.1.2–1. IRN 0001 IRN 0001

3.6.1.1 EXHAUST GASES

IRN 0001

A list of acceptable exhaust gases for each module with verified compatibility to the wetted materials of the VES/WGS is documented in Appendix D of SSP 57000. The proposed Rack vent gases are identified in Table 3.6.1.1–1.

TABLE 3.6.1.1–1 RACK VENT GASES

Constituent	Mass (kg)	Temperature °C	Total Pressure (kPa)	Concentration

Note:
The rack integrator will define each gas to be vented through the VES and its associated characteristics in Table 3.6.1.1–1 for each venting event. Contingency events must also be addressed. When the pressures and/or durations exceed those specified in Section 3.6.3 of SSP 57025 for the VES in the USL, the rack integrator must clearly specify those durations in the PIA Addendum. IRN 0001

3.6.1.2 INCOMPATIBLE GASES

A list of exhaust gases for each module that are incompatible with the wetted materials of the VES/WGS are documented in Appendix D of SSP 57000. The integrated rack will provide containment, storage, and transport hardware for gases that are incompatible with the vacuum exhaust system or external environment per Section 3.6 of SSP 57000. The gases utilized by the integrated rack known to be incompatible with the wetted materials of the VES/WGS, or that fail to meet the requirements of Section 3.6.1.5 of SSP 57000, are identified in Table 3.6.1.2–1. These gases will not be vented to the ISS VES/WGS. IRN 0001 IRN 0001

TABLE 3.6.1.2–1 INCOMPATIBLE GASES IRN 0001

Gas	Mass (kg)	Temperature °C	Reason for Incompatibility	Containment Method

Note:
The rack integrator will provide the reason that the gases have been deemed incompatible (i.e., incompatible with the wetted materials, adhesion requirements, etc.). The rack integrator will provide an overview of the method by which the incompatible gas is stored during the transportation and on–orbit phases. IRN 0001

3.6.2 VACUUM RESOURCE SYSTEM (VRS)/VACUUM VENT SYSTEM (VVS)

The Vacuum Resource System/Vacuum Vent System (VRS/VVS) in the USL and JEM has the capability to maintain a single payload facility volume at 0.13 Pa when the total gas load, including leakage and out/offgassing does not exceed 1.0 x 10–3 mbar–liter/sec assuming infinite conductance between payload facility volume and the ISPR interface. The VRS/VVS in the APM has the capability to maintain a single payload facility volume at 0.17 Pa when the total gas load, including leakage and out/offgassing does not exceed 1.0 x 10–3 mbar–liter/sec assuming infinite conductance between payload facility volume and the ISPR interface. The location of the VRS/VVS interfaces at the UIP are defined in Figures 3.1.2–1 through 3.1.2–5. The VRS/VVS connector is defined in Table 3.1.2–1. The ISPR locations which provide VRS/VVS capabilities are identified in Figures 3.6.2–1, 3.6.2–2 , and 3.6.2–3.

3.6.2.1 ACCEPTABLE GASES

A list of acceptable gases with verified compatibility to the VRS will be documented in Table 3.6.1.5–1 of SSP 57000. A list of the Rack VRS gases is provide in Table 3.6.2.1–1.

TABLE 3.6.2.1–1 RACK VRS GASES

Constituent	Mass (kg)

3.7 PRESSURIZED GASES INTERFACE REQUIREMENTS

The ISS provides gaseous nitrogen (GN_2), argon (Ar), helium (He), and carbon dioxide (CO_2) to the integrated rack. GN_2 is provided in the USL, APM, CAM, and JEM modules. Ar and He are provided only at the JEM Materials Science Rack locations. CO_2 is provided only at the JEM Life Science Rack locations. The locations of the Materials Science and Life Science racks within the JEM are depicted in Figure 3.7–1. The CAM provides gaseous nitrogen at the locations shown in Figure 3.7–3. IRN 0001 IRN 0001

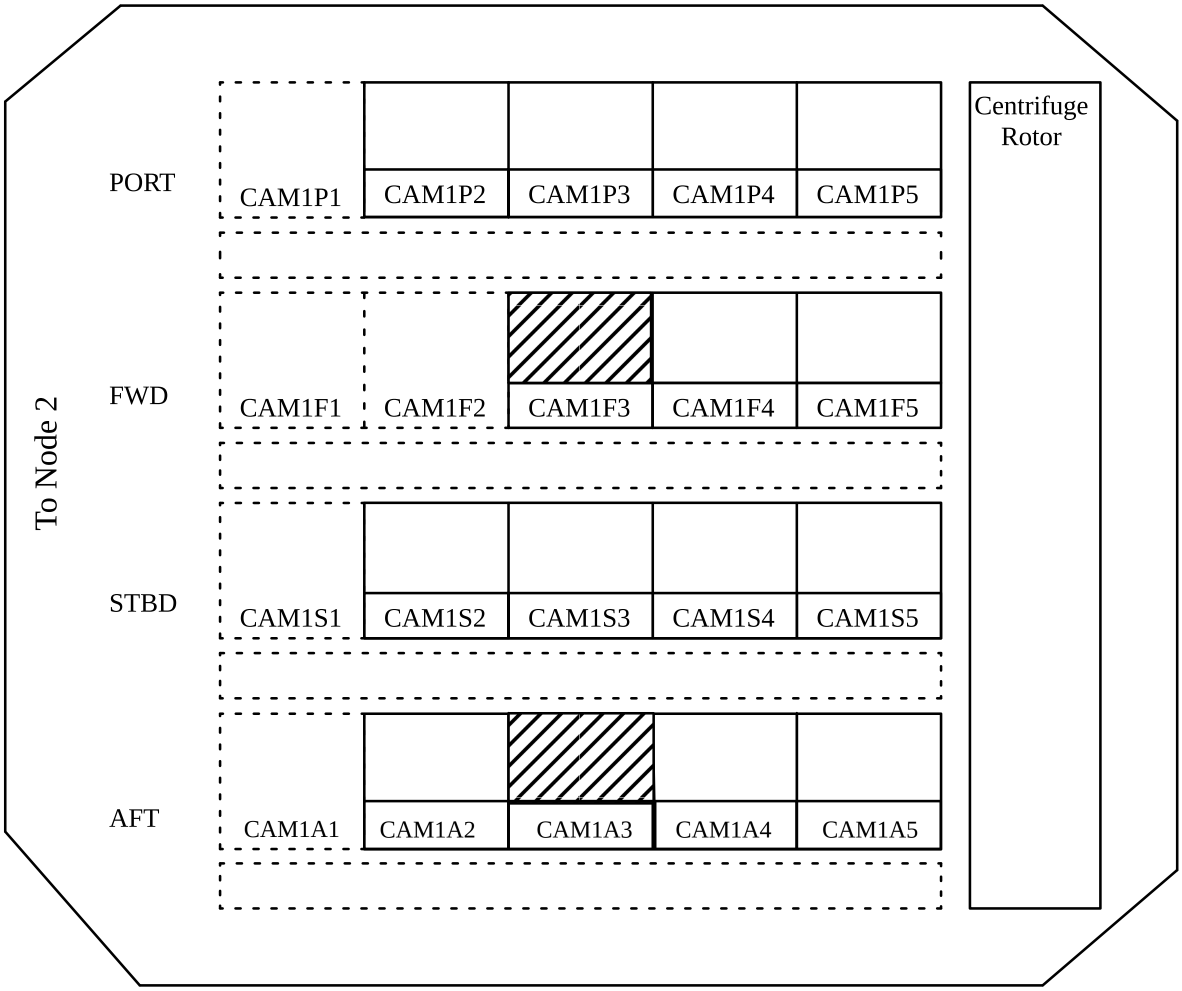
The location of the pressurized gases interfaces at the UIP are defined in Figures 3.1.2–1 through 3.1.2–5. The pressurized gases connectors are defined in Table 3.1.2–1.

The physical and chemical properties of the provided gases are per SSP 30573, Space Station Program Fluid Procurement and Use Control Specification.

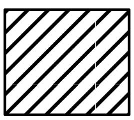
A schematic of the Rack pressurized system is provided in Figure 3.7–2.

Notes:
Provide a schematic of the integrated rack pressurized gas system. Identify the major components of the system, such as shut off valve, relief valves, pressure regulators, tanks, etc. The symbols used for the schematic should adhere to JSC 10506, Mission Operations Directorate Drafting Standards.

IRN 0001



Note: Dotted line is closeout panel, not ISPR



Denotes locations with gaseous nitrogen capability

FIGURE 3.7–3 CAM GASEOUS NITROGEN RACK LOCATIONS