BOEING

International Space Station Program

D684-10056-01
Revision G

Prime Contractor Software Standards and Procedures Specification

March 16, 1998

National Aeronautics and Space Administration
Johnson Space Center
Contract No. NAS 15-10000

REVISION AND HISTORY PAGE

REV.	DESCRIPTION	PUB. DATE
—	Initial Release	04/08/94
A	Revision A Post SDR – Update	10/18/94
	DCN 001 Incorporates ECP 157	05/23/98
B	Revision B Incorporates ECP 264 (SSCD 000264, EFF. 06/20/96)	09/09/96
C	Revision C (per CCR 000444)	04/17/98
D	Revision D per CCR 000550 (SSCD 000550, EFF. 03/10/97)	12/14/98
E	Revision E per CCR 000661 (SSCD 000661, EFF. 07/29/97)	12/15/98
F	Revision F per CCR 000772 (SSCD 000722, EFF. 03/06/98)	12/15/98
G	Revision G per CCR 000840 (SSCD 000840, EFF. 08/11/98)	12/15/98

INTERNATIONAL SPACE STATION PROGRAM

PRIME CONTRACTOR SOFTWARE STANDARDS AND PROCEDURES SPECIFICATION

MARCH 16, 1998

PREFACE

This Boeing document, D684-10056-01, Space Station Software Standards and Procedures Specification (SSPS), describes the Boeing standards and procedures to be used during software development for the United States (U.S.) Segments of the International Space Station (ISS) Program. Information provided herein is submitted in accordance with the guidelines of DOD-STD-2167A. Development of software by the Tier 1 Subcontractors will be in consonance with this specification.

The contents of this document are intended to be consistent with the tasks and products to be prepared by Program participants. The Space Station Software Standards and Procedures Specification may be implemented on new ISS contractual activities and may be implemented on existing contracts by an authorized contract change. This document is under the control of the Command and Data Handling (C&DH) Data Integration Team (DIT), and any changes shall be approved by the C&DH DIT Co-Chairmen.

KEY WORDS

1553 Message Content
Byte Swapping
Data Item Description
Data Structure
Data Type
Instrumentation Program and Command List
Legal Value
Multiplexer/Demultiplexer
Software Development Folder
Bus Program Unique Identifier
Conversion Program Unique Identifier
Device Program Unique Identifier
FW Controller Primitive Signal Data
Requirement Program Unique Identifier
Signal Program Unique Identifier
Standard In
Tier 1 Subcontractor
Units of Measure
HW Primitive Signal Data
SW Primitive Signal Data
Word Swapping

/s/ Marth Christensen	31 Mar 98	/s/ Stephen D. Hunter	3-31-98
Marth Christensen	Date	Stephen D. Hunter	Date
Boeing Co-Chairman		NASA Co-Chairman	
C&DH Data Integration IPT		C&DH Data Integration IPT	

CONCURRENCE

INTERNATIONAL SPACE STATION PROGRAM

PRIME CONTRACTOR SOFTWARE STANDARDS AND PROCEDURES SPECIFICATION

MARCH 16, 1998

Prepared By:	RICH ROBITAILLE	BOEING NORTH AMERICAN
	PRINT NAME	ORG
	/s/ Rich Robitaille	
	SIGNATURE	DATE
Checked By:	JIM PURCELL	BOEING
	PRINT NAME	ORG
	/s/ Jim Purcell	3-31-98
	SIGNATURE	DATE
Supervised By :	MARTH CHRISTENSEN	BOEING
	PRINT NAME	ORG
	/s/ Marth Christensen	31 Mar 98
	SIGNATURE	DATE
Supervised By :	STEPHEN D. HUNTER	NASA
	PRINT NAME	ORG
	/s/ Stephen D. Hunter	MARCH 31, 1998
	SIGNATURE	DATE
DQA	HOPE KILPATRICK	BOEING
	PRINT NAME	ORG
	/s/ Hope Kilpatrick	3/31/98
	SIGNATURE	DATE

INTERNATIONAL SPACE STATION ALPHA PROGRAM

PRIME CONTRACTOR SOFTWARE STANDARDS AND PROCEDURES SPECIFICATION

LIST OF CHANGES

JULY 29, 1994

All changes to paragraphs, tables, and figures in this document are shown below:

ENTRY DATE	CHANGE	PARAGRAPH NO
06-23-94	New document format per SSP 50010; Minor editorial changes	All
06-23-94	Change in facility name/concept	1.1
06-23-94	DOD-STD-2167 TO DOD-STD-2167A	1.2
06-23-94	Addition to Program Unique Requirement Identifier	3.3.1, 3.3.1.3
06-23-94	Correction (Reference to assembly)	3.3.1.1.2
06-23-94	Scope of section changed to signals	3.3.1.1.3.3
06-23-94	Reference to updated section; Removed reference to deleted figures	3.3.1.1.3.4
06-23-94	Rewrite of section	3.3.1.1.3.6
06-23-94	Addition of Program Unique Requirement Identifier	3.3.1.3
06-23-94	Additional DID tailoring	3.6.8
06-23-94	Acronym list change	4.0

ENTRY DATE	CHANGE	FIGURE NO
06-23-94	New figure numbers per SSP 50010	All
06-23-94	Correction (Added sensor and effector to special devices)	3.3.1.1.1-1 (Old - 3.3)
06-23-94	Correction (New examples)	3.3.1.1.2-1 (Old - 3.4)
06-23-94	Deleted figure	3.3.1.1.3.4-3 (Old - 3-11)
06-23-94	Deleted figure	3.3.1.1.3.4-4 (Old - 3-12)
06-23-94	New figure	3.3.1.1.3.6-1
06-23-94	New figure	3.3.1.1.3.6-2
06-23-94	New figure	3.3.1.1.3.6-3
06-23-94	New figure	3.3.1.3-1

ENTRY DATE	CHANGE	APPENDIX
06-23-94	New figure numbers per SSP 50010	All
06-23-94	Functional Element Name correction	A
06-23-94	Additions/Corrections	C
06-23-94	Title change; “Bussing” to “Bus” correction	D
06-23-94	Title change	E
06-23-94	Updated per latest from System Specification	H
06-23-94	Updated figure reference in title	K
06-23-94	Correction	M

MARCH 15, 1996

The entire document was modified to incorporate updates related to data integration, including modifications to all appendices.

DECEMBER 16, 1996

The entire document was modified to incorporate major updates to data integration, including modifications to all. The change desription for Revision A was reinstated. This revision incorporates PCM 444 (Notice 7). The summary of the changes are as follows:

1. Data Integration Guidelines: Added requirements to support IPs and PLs; clarified Requirement PUI and Legal Values; clarified development of SPUI, Command Instantiation and Data Provider rules; added rules for Telemetry and Bus Protocol; added a table to summarize the relationship of group types to content types defined in STD IN File 5.1; clarified Delta Delivery requirements; added requirements for Metrics Conversion; and added definition of Physical Bus PUIs.
2. Software Guidelines: Deleted reference to Adaptation Data.
3. Appendix B (System Values): Reinstated Value W.
4. Appendix C (Device PUIs): Added 250 devices; corrected other data.
5. Appendix D (Generic SPUI Device Code): Added eight new codes.
6. Appendix F (Units): Added 18 and changed one legal value; added Metric Conversion.
7. Appendix G (Telemetry CCSDS Header): New appendix.
8. Appendix H (1553 Mode Code Matrix): New appendix.
9. Appendix J (Data Type): Clarified definition of LSB and added seven new data types.
10. Appendix N (STD IN FMT): Added change management and change authorization fields to all files; corrected description of fields in all files; increased some field sizes; added new File 6.5; modified name of File 2.1; added effectivity fields to File 2.1, 2.2 , and 2.3; modified some Legal Values for Files 1.1, 1.2, 1.3, 2.2, 2.3, 3.4, 4.1, 5.1, 5.2, and 5.3; and added new metric conversion override fields to File 6.3.

11. Appendix O (FSW STD IN I/F Agreement): Revised MDM Image Creation File Extensions/Types; revised description for PPLs; added MPLM CSCIs and ASI Mate C File Extensions.
12. Appendix P (MDM/Chan Legal Values): Added Channel Configurations to LLA Card.
13. Appendix Q (Flt Activated/Deactivated Legal Values): Added legal values for some flights and updated Flight Assy Description.
14. Appendix R (Data Owners Legal Values): Added some owners, and updated Descriptions.
15. Appendix S (ISS Data Buses): Added Physical Data Bus PUIs; and added MPLM and RS485 Data Buses.
16. Appendix T (Command Template Format): Clarified definition of value; corrected USOS definition; added RSA Command Template; and added placeholder for IPs and P/L Templates.
17. Appendix U (LDPs): Added and changed LDPs.

MARCH 12, 1997

The document was modified to incorporate updates to data integration. This change incorporates PCM 550 (Notice 8) which is totally based on a set of approved C&DH Problem Reports submitted to the Avionics Software Control Panel (ASCP) on February 26, 1997. The summary of the changes and the related Problem Reports (PRs) are as follows:

PR 1283	Added Legal Value and Description to Appendix N Field 1.1-3 (HW Device Type). Added new column to Appendix S (Alert 9) to reflect Non C&DH Architecture buses
PR 1419	Changed Legal Value for Appendix N Field 2.2-6 (MDM Chan No.) SDO Card From ‘0-31’, To ‘0-15’
PR 1474	Added New System Code N to indicate Service Module Docking (SMD)
PR 1475	Appendix C Update: Added 13 Logical Devices PUIs (USDK01 through K08, UDPK01 through K05) Changed Description of PCS Devices to Indicate Receptacles on the 1553 Bus (USDL01 thru L20) Changed PG Ownership of select RPCMs Updated Command Instance Devices (CIP Device Type) Updated List to reflect PG1 & PG2 configuration Corrected PMCU/PVCU GRP (USPZ20/Z21 Device Type/MBF Domain)
PR 1476	Appendix F Update: Added new units: AMPD, DEGE, DEGE/S, REVE, REV/S, REVE/S Declared the new units to not require Metrics Corrected Metrics as defined in Alert 7

PR 1477	Appendix J Update: Added New Data Types: 8SF7, 12SF0, 12SF2, 12SF4, 12SF5, 12SF10, 12UF8, 12UF9, 12UF10, 12UF14, 12UF17, 16UF8
PR 1478	Appendix N: Clarified Description of N/A for certain fields by changing to read "N/A shall only...." Clarified Description of N/A for certain fields by changing to read "N/A in lieu of '@' shall only be used..... " Clarified Description of N/A for usage by specific Data types Deleted Statement "N/A can be used for all other type primitives" Added "Note: For Constants: Min Val=Max Val=Initial Val" Added Statement "MBF will store N/A in IPCL Database" Disallow value of zero for fields 1.2-17, 18 and 1.3-17, 18 for specific case. Corrected typographical error to STD IN Field 5.2-9
PR 1480	Appendix K (Delta Delivery Update) : Added new Legal Value A/C (ADD/CHG) in the Standard Input Change Management Field for each file. Changed Fields 2.2, 2.3, 5.2, 5.3, 5.4 from a Single Record Set (SR) to a Complete Record Set (CRS) Added File 6.5 to Table 3.7.1.2.5.2-1 Clarified the guidelines in paragraph 3.7.1.2.5.1 Updated Appendix K to reflect changes and updated guidelines
PR 1483	Added the legal value of BYTE to the following: Appendix N input file 5.1-3 and 5.1-5 Table 3.3.1.2.1.4-1 Relationship of Group Type to Content Type Clarified the legal value range of bit number for BYTE to become 0-7
PR 1484	Deleted requirement in Primitive Signals To Firmware Controller (paragraph 3.3.1.2.1.2.2G) Primitive Signals To MDM (paragraph 3.3.1.2.1.3.2G) that states, "Pass Thru Hardware Commands are not allowed" Changed requirement in Primitive Signals To MDM (paragraph 3.3.1.2.1.3.2G) to read: "Hardware effector commands as defined in STD Input File 1.1 (Appendix N) requiring software attributes will be identified with a 'HW' in Field 1.3-3 of the Software Primitive File"

PR 1558 Revised paragraph3.3.1.2.1.5 to update the rules for defining the Command Instantiated SPUI to be consistent with other SPUI rules

Expanded guidelines to point to Appendix B (Systems) and U (LDP)

Added reference to new Generic Codes "IM" and "MG"

Added words that MOD will be co-owner with SMC

Added new Legal Values to Appendix D

IM = ISS MOD Avionics Reconfiguration

MG=MOD Generated

JUNE 26, 1997

This change incorporates PCM 601 (Notice 9) which is totally based on a set of approved C&DH Problem Reports approved by the Avionics Software Control Panel. The summary of the changes and the related Problem Reports (PRs) are as follows:

PR No.	Title	Change
1482	CCSDS for Firmware controller	1. Modify Paragraph 3.3.1.2.1.4.3 (Command Templates) to • Clarify the rules if Command Templates are applicable to Firmware Controllers. • Removed statement "Each Command Template consists of …" because the statement was not accurate and the format is identified in Appendix T. 2. Modify Appendix N File 6.1-1 to add FCMD to Legal Value
1488 Mod A	Appendix S (Data Bus) Update for CDH Architecture	Define buses which follow CDH Arch rules utilizing Legal values defined in Appendix N Field 1.1-3 • RS485=RS485 Serial Bus • 1553F=Mil Std 1553 CDH Architecture Functional Bus • 1553N=Mil Std 1553 Non CDH Architecture Functional Bus • 1553P=Mil Std 1553 Physical Bus
1681	Add new field to explicitly define BC/RT	• Add new Field 2.1-10 (Device Bus Role) to SSPS Appendix N • Modify Field 2.1-6 (BPUI) description to SSPS Appendix N
1684	SSPS Appendix U (LDP) Update:	• Add applicable Logical DPUIs associated with the applicable LDPs to SSPS App U • Add new column and associated DPUIs for the Physical device associated with Logical DPUI • Add/Change LDPs

PR No.	Title	Change
1685	SSPS Appendix A (Element) Update	• Add “JC”: EM Inter-orbit Communication System(ICS) • Delete “CC”: Mobile Service Center • Add “CO”: Operations and Control Software (OCS)
1686 Mod A	SSPS Appendix C (Device) Update	• Add M1PD95 (CIP/2A) • Add P6TE01&P6TE02 (HWM/4A) • Chg CMRC13, CMRC23(SW-CB/6A); Add CMRC27,CRRC31 (SW-CB/6A); Deleted CRB (FW-LB/6A) • Add S0DP39, SODB40 (LDM/8A); S1DP41, S1DB42 (LDM/9A); P1DP25, P1DB269 (LDM/11A); P3DP27,P3DB28 (LDM/12A); S3DP43, S3DB44 (LDM/13A) • Changed Title for P3MU01 thru P3MU12 (FW-LB/12A); P3MU21, P3MU22 (HWF/FW-LB/12A) • Deleted CBB (4 entries) (FW-CB/UF-2); Added CBRC29 (SW-CB/UF-2) • Deleted S3CP04,S3CP05 (HWM/HWF/9A) and Replaced with S1CP04, S1CP05(HWM/HWF/9A) • Added HAPR64 thru HAPR69 (FW-LB/17A) • Changed Title for USDG00, USDG01(GRPM/2A) • Added CRRC3-(SW-LB/19A) • Deleted CDB (4 entries) (FW-CB/1J); Added CDRC32,CDRC33 (SW-LB) • Deleted Flight Date Column in its entirety • Added RFPP01, RSPP01 (Loads)
1687	SSPS Appendix J (Data Type) Update	• Add Data Type 9SMI • Add Data Types 15C, 40C, 44C • Add Data Types 2C,8C, 10C, 12C, 16C, 18C, 20C, 22C, 34C, 38C, 40C, 42C, 44C, 54C, 62C
1688	Update for RS485 Group Type	• Modify SSPS table to include WORD, DBL_WD, SPARES as valid content of RS485 group type • Modify SSPS Appendix N Field 5.1-4 Description for spare bytes in RS485 • Modify SOD Data Dictionary Field ST01070 Description for spare bytes in RS485
1689	Clarify STD IN Delta Rules	• Modify text to SSPS Sections 3.7.1.2.5.1 • Replace SSPS Table 3.7.1.2.5.2-1 in its entirety • Modify SSPS Appendix K to clarify delta rules • Modify SSPS Appendix N to include A/C as Legal Value for CM fields (inadvertently omitted from Notice 8)

PR No.	Title	Change
1704 ModA	SSPS Appendix F (Units)	• Change Metrics conversion of INH2O to MMHG to be 1.8683. • Add the following new units: Millirem Millirem/min Particle Particles/min rad(Radiation term) rad/min rem(Radiation term) Ampere Second per Radian Inch Pound Force per Microinch Pound Force per Microinch Microinch per Degree Celcius Microinch per Inch Pound Force Microinch per Pound Force Radian per Second per Newton Meter Volts per Radian per Second Amperes per Radian
1707	Forward/Inverse Guideline Clarification (Incl Std/Act)	• Modify text to SSPS Sections 3.3.1.5 and 3.3.4 • Modify SSPS Appendix N, File 3.3 Fields 3.3-8 and 3.3-9 Legal Values

SEPTEMBER 17, 1997

This change incorporates PCM 722 (Notice 10) which is totally based on a set of approved C&DH Problem Reports approved by the Avionics Software Control Panel. The summary of the changes and the related Problem Reports (PRs) are as follows:

PR No.	Title	Change
1486	Modification of Data by DIT	This change adds a new Section 3.7.1.5, entitled "Process Governing Data Modification by the Prime".
1487	Appendix Q (Flight) Update	a. Added new column labeled "Stage" b. Updated Flight Order and Legal values to align with Rev C Flight Schedule
1489	Appendix T(Cmd Templates) Update	a. USOS Template(Appendix T-1) Changed "RV" to "RV*" for: Type, APID, Pkt Seq Cnt, Coarse Time, Fine Time, LSM O/R, & Ck Sum Changed "RV" to "RV(1) for Time ID Changed Element ID from "1" to RV(1) b. RSA Template (Appendix T-2) Corrected Primary Header SPUI Changed Type from "@" to "RV*" in Deleted LSM Changed "PG" reference to "RSA" in STD IN FILE FOR VALUE Column c. Added ASI Template (Appendix T-5) d. Added CSA Template (Appendix T-6) e. Added Statement prior to USOS Table. "The value of USDG00CC0710K must be provided by each International Partner in the Command Template (CT; 6.1) file provided by the International Partner. For ESA, the values are 2 and 6; for ASI, the value is 7; for RSA, the value is 4; for CSA, the value is 5; and for NASDA, the value is 3."
1702	New field in the CP file for multical indicator value	a. Modify text to Section 3.3.4 b. Add new fields to Appendix N, File 3.4 Fields 3.4-6 and 3.4-7
1709	Add New Decade Pipe PUI	a. Modify Table 3.3.1.2.1.4-1 to reflect new group and group content b. Modify Paragraphs 3.3.1.2.1.4.4.2 and 3.3.1.2.1.4.4.3 to make Rate Group constructs mandantory for 1553B cyclic data acquisition/distribution C&DH decade bus transfers and establish requirement for decade pipe SPUIs. c. Add new Paragraphs 3.3.1.2.1.4.6, 6.1, 6.2, and 6.3 for 1553B Decade Pipes. d. Modify Appendix K for file 5.4 CRS composite key attributes to include bus Pipe SPUI. e. Modify Appendix N File 5.1 and 5.4 to include bus Pipe Group SPUIs.
1710	Spare Words/Spare Bits/Not Use	a. Add new Paragraphs 3.3.1.2.1.4.7, 4.7.1 and 4.7.2 to clarify guidelines for SPARES. b. Modify Appendix K for file 5.2-9 Legal Values and Field Description clarifications.

PR No.	Title	Change
1712	Correction to Appendix G (Telemetry CCSDS Header)	Modify Appendix G Tables for each telemetry format CCSDS Header content.
1912	PPL	a. Add new Sections: 3.3.7.1 and 3.7.2.3 b. Clarification for Appendix O, Table O-2
1961	SSPS Appendix U LDP Names/Devices	a. Correct LDP name to align with delivered State Conversion file (File3.1) b. CH_CDPS-3 Device Code should be S0FC07 instead of S0FC06 c. Add RWS_CEU_Active and Monitor Device Codes
2309	Add Special TLM DPUIs to Appendix C	a. Add new stage dependent Device PUIs for the Telemetry CCSDS Header groups b. USDG50 thru USDG65 (Flight Specific) c. USDG66 thru USDG76 (Reserved)
2310	Delta Cleanup and Validation of deleted records	a. Modify paragraph 3.7.1.2.5 b. Modify Appendix K
2311	SSPS Appendix J Update LSB Usage with Conversion Files and Definition Clarity	a. Add Data Type15SF0, 17SF0, 19SF0 b. Add Data Types 52C c. Clarify LSB usage with Conversion files
2312	Add System to RPUI	Add System “N” as defined in Appendix B to Table 3.3.1.1-2
2313	SSPS Appendix F Update	a. Delete Meters Cubic M3
2314	SSPS Appendix C Updates	a. Added 200 CIP Codes b. Deleted IADI01/I02 c. Changed ownership of ESDL01-L04, JSDL01-L04, RFDL01-L02, and USDL01-L21 from PCS to DIT d. Deleted PLRH02 e. Changed CBRC29,CDRC32-34, CMRC10, CMRC12-CMRC16,CMRC20, CMRC22-CMRC27 to LD(Logical Devices) and Modified name of CMRC11 and CMRC21 f. Changed Flight Effectivity to 1A FOR VOGU01 and VOGU02 g. Deleted Reserved codes for Group PUIs h. Changed Title of Appendix C to ‘LEGAL VALUES FOR DEVICE PUIs’ and added ‘DEVICE PUI” title to Elem, Sys, Assy columns i. Added New Device Codes for TLM CCSDS Groups: USDG50-USDG76 j. Changed Description of Logical MDMs P1DP25, P1DB26, P3DP27, P3DB28, S0DP39, S0DB40, S1DP41, S1DB42, S3DP43, S3DB44 k. Changed description for P3MU01 thru U04 l. Added MTTB22

PR No.	Title	Change
2316	SSPS Clarification	a. Appendix N, File 1.2. Clarified Field Description for 1.2-3 Clarified in 1.2-6,7 that initial value = max value = min value does not apply to Enumerated Constants. b. Appendix N, File 1.3. Clarified Field Description for 1.2-3 Clarified in 1.2-6,7 that initial value = max value = min value does not apply to Enumerated Constants. c. Appendix N, File 3.2 Corrected Typos In 3.2-4 Description changed 'maximum' to 'minimum' and 'high' to 'low' In 3.2-5 Description changed 'low' to 'high' d. Appendix N, File 5.2 Deleted reference to Command Template e. Appendix N, File 6.1 Corrected typo in 6.1-2 to 'FW" from 'FC'. f. Section 3.3.1.2.1.4.4.6, corrected to reference 3.3.1.2.1.4.5.2 from 3.3.1.2.1.4.6 (which does not exist). g. Section 3.3.1.2.1.4.5.2, Section referenced device RRDG01 which does not exist so it was deleted.
2317	Rules for Cmd Polling	AppN Field 5.2-5 a. Remove the reference "(for DMSG_CONS)" and "(for CMSG_CONS or MODECODE)" Reference SSPS FIGURE 3.3.1.2.1.4-1 a. Add DMSG_CON and DAx_Group under Software Command Template SPUIs b. Add CMSG_CON and CCSDS under SW Data Acquisition SPUIs
2318	Transaction Slot (Document First Slot)	a. Modify File 5.2-2 Legal Values and Field Description

PR No.	Title	Change
2319	HW Pass thru (HW with SW Attributes) Guidelines	a. 3.3.1.2.1.2.1 Primitive Signals From Firmware Controller Changed to state for IPs that 'Primitives that represent HW Measurements that are not provided in Appendix N, File 1.1 (HW Primitive File), shall be defined in Field 1.2-3 (FW Type of Signal) with any legal value other than "HW"' from 'defined in Field 1.2-3 (FW Type of Signal) with "HW"'. b. 3.3.1.2.1.2.1 Primitives From MDM or Processor Software Changed to state for IPs that 'Primitives that represent HW Measurements that are not provided in Appendix N, File 1.1 (HW Primitive File), shall be defined in Field 1.3-3 (SW Type of Signal) with any legal value other than "HW"' from 'defined in Field 1.3-3 (SW Type of Signal) with "HW"'. c. 3.7.1.2.5.1 General Delta Rules and Procedures Added Note to point to new section 3.7.1.2.5.3 for description of end item changes. d. Added new section 3.7.1.2.5.3 Delta Delivery Processing for Pass Throughs to describe the actions necessary to perform end item changes (which apply only to pass throughs) in the database. e. Appendix N, 1.2-3 Added new comment ''HW" shall only be used when the signal has a corresponding HW record delivered in a HW (1.1) file. To Legal Values Section. f. Appendix N, 1.3-3 Added new comment ''HW' shall only be used when the signal has a corresponding HW record delivered in a HW (1.1) file. To Legal Values Section.
2320	Single process frame for Cyclic Data Acquistion Pipe	a. Add SSPS Paragraph 3.3.1.2.1.4.1.1 b. Modify File 5.2-2 Legal Values and Field Description
2395	Add MOD ODRC Ground facility to SSPS Appendix A	a. Add MOD ODRC Ground facility b. Correct Description of IS to indicate "High-Level Italian Segment"
2428	SSPS Appendix R Update	a. Replace ROB by EVR b. Add MOD OPS Plan c. Add CNC d. Add RSM
2429	Clarify CVT Requirements	a. Modify Appendix N, File 6.4-2 Legal Values and Field Description
2505	SSPS Appendix S Update	a. Delete (RS BUS 7) for LB-GNC 1 and (RS BUS 8) for LB-GNC 2
2558	Multiplexing (i.e., CBM's, LCA's); over subscribing	a. Add SSPS Paragraphs 3.3.1.2.1.4.8, 4.8.1, and 4.8.2
2592	Update Appendix E	Update description for Legal PUI Code 'K' from Stimulus (Command) to Command/Stimulus and Command Parameters
2593	Change Max Legal Value of Box Car to 16	a. Modify SSPS Appendix N, File 5.2 and 5.4 Legal Values to include transaction slot number 16.
2594	Shared Data among Data Providers	a. Modify Para. 3.7.1.4 to add the Steps for Exchange

MARCH 16, 1998

This change incorporates PCM840 (Notice 11) which is totally based on a set of approved C&DH Problem Reports approved by the Avionics Software Control Panel. The summary of the changes and the related Problem Reports (PRs) are as follows:

PR No.	Title	Change
1481	SSPS App N & SOD App C Update - Delete legal value 'AD'	Appendix N Delete the legal value of 'AD' from input file 1.2-3 and 1.3-3
1680	Clarification of SSPS requirements for the 1553B Transmit/Receive indicator bit	a. Modify SSPS Paragraph 3.3.1.2.1.6.1 and 6.1.1, Tables 3.3.1.2.1.6.1.3.2-1 and -2. b. Modify SSPS Appendix H to add the Transmit/Receive bit indicator for Mode Codes. c. Modify SSPS Appendix N, File 5.2-5 Field Description.
2778 Rev A	Clarify Conversion Coeff Values of N/A and 0.0	Appendix N, File 3.4 descriptions of conversion coefficient value requirements.
3600 Mod A	SSPS/Appendix P update for Channel Configurations	a. Add LLAC8 Low Level Analog-Current Loop (Gain =2.5) b. Add LLAV8 Low Level Analog -Voltage Input (Gain = 2.5) c. Add HRDL to Appendix P d. Add Legal value of HRL to Fields 1.1-2 e. Add Legal value of HRDL to Field 1.1-3 f. Add legal values for HRDL to Fields 2.2-1 and 2.2-6
3602 Mod B	Update Appendix F	a. Add SLUG/FT3. b. Add M2/S4. c. Add additional line for LBF Conversion Type of Newtons. Corrected Metrics column to indicate N. d. For MJ, change Conversion Type from N/A to NONE. e. Correct Prefix Multiplier for IN to CM from: 1.0E+00 to: 1.0E+02. f. Correct FT to M A1 coefficient from: 3.408000E-01 to: 3.048000E-01 wherever it is used. g. Corrected LBF Conversion Type for LBF KiloNewtons to 1.0E-03. h. Corrected INH2O to MMHG and INHG to MMHG A1 conversion coefficients.

PR No.	Title	Change
3604 Mod A	SSPS/Appendix J Update	a. Change 12UF0 to 12UF8. b. Add 30C c. Add 58C d. Add 4C and 6C e. Deleted f. Add 32SF22, 32SF25 g. For enumeration Data Type, provide explicit reference to File 3.1 for providing State definition h. Added statement to clarify odd character types (i.e. 15C) Each character shall occupy one byte. For cases where the declared length of the primitive is an odd number n, n+1 characters will be transmitted in bus transactions with the value of the primitive occupying the first n bytes.
3627 Mod A	SW and Non-Signal Data Delivery Standards	a. Para. 3.7.2 - SET 1 - Source Files needed to rebuild all Load Image Files - SET 2 - FSW and related files required for the Integrated Flight Load b. Para.3.7.2.1 Update c. Table 3.7.2.1-1 Update d. Appendix O Update

PR No.	Title	Change
3629 Mod B	SSPS/Appendix C Update	a) Correct Device Types to indicate Loads (HWF): PG0 (3 DPUIs), PG1 (234 DPUIs), PG2 (54 DPUIs), CHC (8 DPUIs), ECT (1 DPUI), CNN (2 DPUIs) b) Correct Ownership of CNN Devices from 'N' to 'A' (14 DPUIs) c) Delete CNN Devices (4 DPUIs), correct name (2 DPUIs) d) Delete CAN Devices (5 DPUIs) e) Delete PG1 Devices (29 DPUIs) f) Change Ownership of GPS Antenna Assys (4 DPUIs) from GPS to PG1 g) Correct Device Type Typo for PG2 ECU BGA (2 DPUIs) h) Split PG3 AL EL DPA ELECTRICAL UNIT into 3 DPUIs and identified Device type as a FW-UBN (Firmware Controller on a non 1553 Bus) i) Correct Ownership of DIT Data Busses (2 DPUIs) j) Add DIT RS485 Bus Devices (3 DPUIs) k) Add DIT HRDL Bus Device (1 DPUI) l) Add DIT Orbiter Bus device (1 DPUI) m) Add DIT PCS Devices (4 DPUIs) n) Delete DIT PCS Devices (2 DPUIs) o) Modify DIT PCS Legal Names (6 DPUIs) p) (11/13/97) Change MBF Domain for PG1 Devices (10 DPUIs) q) Deleted r) Correct Flight Effectivity for PCS Devices (3 DPUIs) s) Correct Ownership of SSC Devices from 'H' to 'M' (2 DPUIs) t) Add new SSC Logical Device (1 DPUI) u) Correct Ownership and change Flt Effectivity of GPS Device from PG1 to GPS (1 DPUI) v) Add new SMC CIP Devices (38 DPUIs)/correct 39 DPUIs w) Delete P6PG15, P6PG16 (11/13/97) x) Added NASDA Devices (7 DPUIs) y) Additional ISPR Devices (10 DPUIs) z) Additional ASI Devices (2 DPUIs)
3757	Side Effects: Requirements Change	Para. 3.5.1.12 Use of side-effects should only be forbidden in functions where there is a sensitivity to the order of evlauation. Anytime a side-effect is used it should be documented in the code and in the appropriate SDF.
3758	Unconstrained Record Objects	Para.3.5.1.3 The declaration of record objects of discriminate record types always be constrained where a discriminate has a default value and that discriminate is used to bound the index constraint of a component subtype definition.
3759	Editorial changes to ISS code Standards	a. Para. 2.0: Added new references b. General update of Para. 3.5, and all parts of 3.5.1 except for those covered by PR 3757, 3758, 7020
3991	Incremental TRR/FQT & Delta FQT	Para. 3.6.1 Add tailoring to STP DID requiring an STP to describe itself as part of an Incremental TRR/Incremental FQT

PR No.	Title	Change
4034	Extend Limit of CPUIs in MBF and re-establish omitted requirement.	a. Modify paragraph 3.3.4.1 to explicitly identify '100' as the maximum number of multiple conversion per primitive PUI allowed. b. Modify SSPS Appendix N, File 3.4-2 and the corresponding SOD Data Dictionary Items (ST00510, ST00540, ST00690, ST00910) stating the new limit c. Re-establish omitted material from paragraph 3.3.3.4.1
4201	Recycling of SPUIs	Modify paragraph 3.7.1.2.4 to explicitly identify the guidelines for recycling Signal Program Unique Identifiers.
4202	Clarification of Pass thru Words	Modified para. 3.3.1.2.1.4.4
4204	SSPS Appendix A Update	a. "MC" for Interim Control Module (ICM) b. Correct description for ODRC, should be Operational Data Reduction Center
4206 Mod B	SSPS Appendix U Update	a. Update LDP: 1,14,15,28,29,33,95,96,97,98,99,100, 101,103,148,171 thru 195, 232,233 b. N/A identified for LDP: 34,102,104,196 thru 208 c. Lacking information identified with TBD: 13,26,27,30,31,65 thru 69, 107,167 thru 170, 211 d. Deleted DPUIs CMRC 15, 16, 25, 26, CBRC29, CDRC32, 33, 34, CRRC31 from Note. e. Reassign device codes JAKR31 thru JAKR40 to IP JEM ISPR LDPs (196 thru 206 minus 204). f. Deleted the device codes for the US JEM ISPR LDPs (171 thru 180)
4207	SSPS Add Legal Value ALL to Rate Group File	Appendix N a. Add Legal value of 'ALL' to fields 5.4-3 and 5.4-7 b. Align SOD Data dictionary Items ST02102 and ST02106 to IPCL changes c. Correct erroneous IPCL reference for ST02112
4226	Clarify Rate Group File Field Descriptions and Legal Values	Appendix N a. Change pipeline to decade pipe in , Fields 5.4-1,4,5,8,9,10,11,12 b. Change legal value to '128' for Field 5.4-8 (Boxcar Count) c. Change legal value to read "1-Boxcar Count (5.4-8) for Fields 5.4-9 and 5.4-11
4229 Mod A	Rules and Guidelines for Assigning Logical Vs Physical PUIS	a. Add new paragraph 3.3.1.2.1.4.10 which provides the rules and guidelines for assigning Logical Vs Physical SPUIs to devices for commands and data acquisition. b. Corrected additional 'template' references. c. Clarified redlines to distinguish type of PUI. d. Deleted statements "(applies to NCS") e. Added exception to A under Logical Usages for Data Acq and commands: "Except Application/Data unique to a Physical MDM

PR No.	Title	Change
4248	SSPS Standard Input Delta Requirements Update	a. Clarification of Fields required to be consistent in a CRS. - This includes changes to 3.7.1.2.5.1, Rules for Complete Record Sets, and to every CRS file in Appendix K b. Clarification of the DEL Change Management action for File 2.1 (Appendix N) c. Addition of Field 2.2-7 as a key filed for the MC File and Field 2.3-4 as a key field for the FC File - This includes changes to eliminate the DELDEV Change Management action (Section 3.7.1.2.5.1, Appendix K, and Appendix N) - Changes to establish FC as an SR File (Section 3.7.1.2.5.1, Table 3.7.1.2.5.2-1, and Appendix K) - Changes to establish the two new key fields (Table 3.7.1.2.5.2-1, Appendix, and Appendix N) d. Processing of File 6.4 (CD) - This includes changes to eliminate the CHG and DEL Change Management actions for this file and to define the file as a complete redelivery file (Section 3.7.1.2.5.1, Appendix K, and Appendix N)
4249 Mod A	SSPS Clarification of BULK and SPARE	Revise Para. 3.3.1.2.1.4.7 to clarify usage of 'SPARES' and add usage of "BULK" in messages and/or words.
4250	Sharing of Hardware Primitives	Add a new rule 'G' to Para. 3.3.1.2.1.1.1 (Primitive Signals from Hardware)
4251 Mod A	Command Requirements Update	Consolidate, clarify, and update all Command Template and Command Instantiation Requirements (Para. 3.3.1.2.1.5) under paragraph 3.3.1.2.1.4.3
4252	Guidelines for Engineering Names in IPCL files	Modify paragraph 3.3.1.2.1 to explicitly state guidelines in the establishment of SPUI Engineering Names in the IPCL Standard Input files and clarify the intent of such guidelines.
4254	Appendix R Update	a. Add Note (1) to denote applicability of MOD Ops name owners b. Change PG1 name to Boeing-Huntington Beach c. Change PG2 name to Boeing-Canoga Park d. Add S as a legal value for MOD
4255 Mod A	Appendix S Update	a. Change PG3 UB AL-1 Bus to RS-485 b. Add HRDL Buss c. Update SSPS/Field 1.1-1 and SOD ST00001 description to indicate that Bus PUIs will be provided by DIT based on the Device Type in Appendix C equaling HWM-DB or HWM-DBN. d. Correct Functionality of Buses for RS GNC Buses

PR No.	Title	Change
4256 Mod A	Rules for Multiple Uses of Signal	a. Modify SSPS Paragraph 3.3.1.2.1.4.4.3 for Data Acquisition to preclude duplicate assignments of primitive SPUIs to DAQ messages on 1553 control buses with the same source and destination. b. Modify SSPS Paragraph 3.3.1.2.1.4.4.4.2 for Telemetry Version to preclude duplicate assignments of primitive SPUIs within a given telemetry packet. NOTE: The requirement for not having multiple primitives in commands is documented in PR4251
4257	Addition of Device Type Legal Values for Usage of Device PUIs to SSPS Table 3.3.1.3-1	a. Describe Appendix C Fields including Device Type b. Add rule that only certain Device Types will be legal for Source and Destination Fields in Appendix N/Files 5.2 and 5.4 c. Add Device Types to Device Type Definition Table to match present usage of Appendix C Device Types d. Add new columns to Table 3.3.1.3-1 (Device Type Definition Table) to indicate applicablity of Appendix N Files that reference this table e. Update SSPS Appendix N Files 2.1,5.2, and 5.4 to remove present Device Type Legal Values with reference to Device Type Definition Table
4258	Allow Processing Frame of N/A for 1553 Functional Bus	Modify SSPS Appendix N, File 5.2-2
4259	Clarify RPUI Responsibility	Add clarification statement to Para. 3.7.1.4.11 (Data Provider responsibility for Requirements file
4260 Mod A	SSPS Clarification	a. Clarify and/or remove references to BCD in Appendix N Fields 1.2/1.3-6, 7, 9, 10, 11, 12, 17, 18. b. In Para. 3.3.1.2.1.4.2 (Message Word/Double Word Group Signal), clarify need to identify words if primitives are less than 16 bits in SSPS (D684-10056-01). (Note: deleted last sentence of redline as part of Mod A to this PR) c. Add the words, 'and associated data' after SPUI at the lead in paragraph for the rules in Paragraphs:3.3.1.2.1.1.2, 3.3.1.2.1.2.1, 3.3.1.2.1.3.1 (other paragraphs associated with commands are identified in PR 4251) d. Strike Hardware from the Legal Values field in the 5.1-4 file in Appendix N. e. App B needs an addition, (PYRO), to the functional description column for Q. f. In Paragraph 3.3.1.2.1.1.2 Rule D, change 'E' to 'X' for Excitation g. In Paragraphs 3.3.1.2.1.2.1/3.1 explicitly define that if Field 1.1-3 equals SEN then File 1.2/1.3 respectively is required. h. In Paragraphs 3.3.1.2.1.2.2/3.2 explicitly define that if Field 1.1-3 equals EFF then File 1.2/1.3 respectively is required.

PR No.	Title	Change
4261	Handling of Backup Messages	Add a new paragraph 3.3.1.2.1.4.6.1.1 (US MDM TO MDM PRIMARY AND BACKUP CYCLIC DATA ACQUISITION MESSAGES) following the Decade Pipe paragraph which provides guidelines for providing cyclic messages for File 5.2 (MT File) and File 5.4 (RG File)
4262	Update 5.3 Legal Values	Modify appendix N, File 5.3.6 legal values to include SMCC for RSA Service Module Central Computer.
7000 Mod A	Add Template Guidelines to SSPS	Add paragraph 3.3.1.2.1.4.10 through 3.3.1.2.1.4.10.3 to explicitly identify template guidelines.
7020	Pragma Supress	a. Update Para. 3.5.1.9.1 for Pragma supress b. Add new Appendix V

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1.0 SCOPE

1.1 IDENTIFICATION

The Space Station Prime Contractor Software Standards and Procedures Specification (SSPS), D684-10056-01, contains the standards and procedures to be used during the development of the following types of software and signal data either developed or acquired for the United States (U.S.) segments International Space Station (ISS) program (reference Figure 1.1-1):

- Flight software;
- Ground software, including Mission Build Facility (MBF) software;
- Ground Support Equipment (GSE) software and Test Support Equipment (TSE) software;
- Test software, including simulations; and
- Software Verification Facility (SVF) software.

Within this document, a subset of standards for the gathering of software/signal data is commonly known as Standard Input for the Prime's Mission Build Facility. The signal data is identified as Instrumentation Program and Command List (IP&CL), and is provided to the Prime via SDS VE-31. The primary purpose of gathered IP&CL data is to provide the Command and Control (C&C) Multiplexer/DeMultiplexer (MDM), International Partner (IP) interfaces, Shuttle interfaces, and Ground reconfiguration facilities with the data necessary for developing/ controlling the on-board and space/ground interfaces with the United States On-orbit Segment (USOS).

- US Software and Signal Data Standard Input.

This SSPS Standard Input also defines the signal data input standards (see section 3.7) for all National Aeronautics and Space Administration (NASA) provided data:

- Payload signal data from Payload Operations Integration Center (POIC) / Payload Software Integration and Verifications (PSIV), IPs signal data, Global Positioning System (GPS) and other Communications & Tracking (C&T) data, and other Government Furnished Equipment (GFE) Part 2 Interface Control Document (ICD) data.

This SSPS defines the standards for software image delivery (see section 3.7) for all NASA provided software:

- Payload MDM, International Partner MDMs, and GFE processor executable images.

This SSPS does not govern the following ISS software development:

- Software by the International Partners, including European Space Agency (ESA) Attached Pressurized Module (APM), Japanese Experiment Module (JEM), Russian Segment (RS), Italian Mini-Pressurized Logistics Module (MPLM), and Canadian Mobile Servicing System (MSS);
- Software contracted by NASA outside of the Prime contract, including the Mission Control Center (MCC), Test, Control and Monitor System (TCMS) at Kennedy Space Center (KSC), POIC, and training unique software developed at Johnson Space Center (JSC);
- Payload/User software; and
- GFE, including Timeliner Kernels, Portable Computer Systems (PCS), and Orbiter Interface Unit (OIU) software.

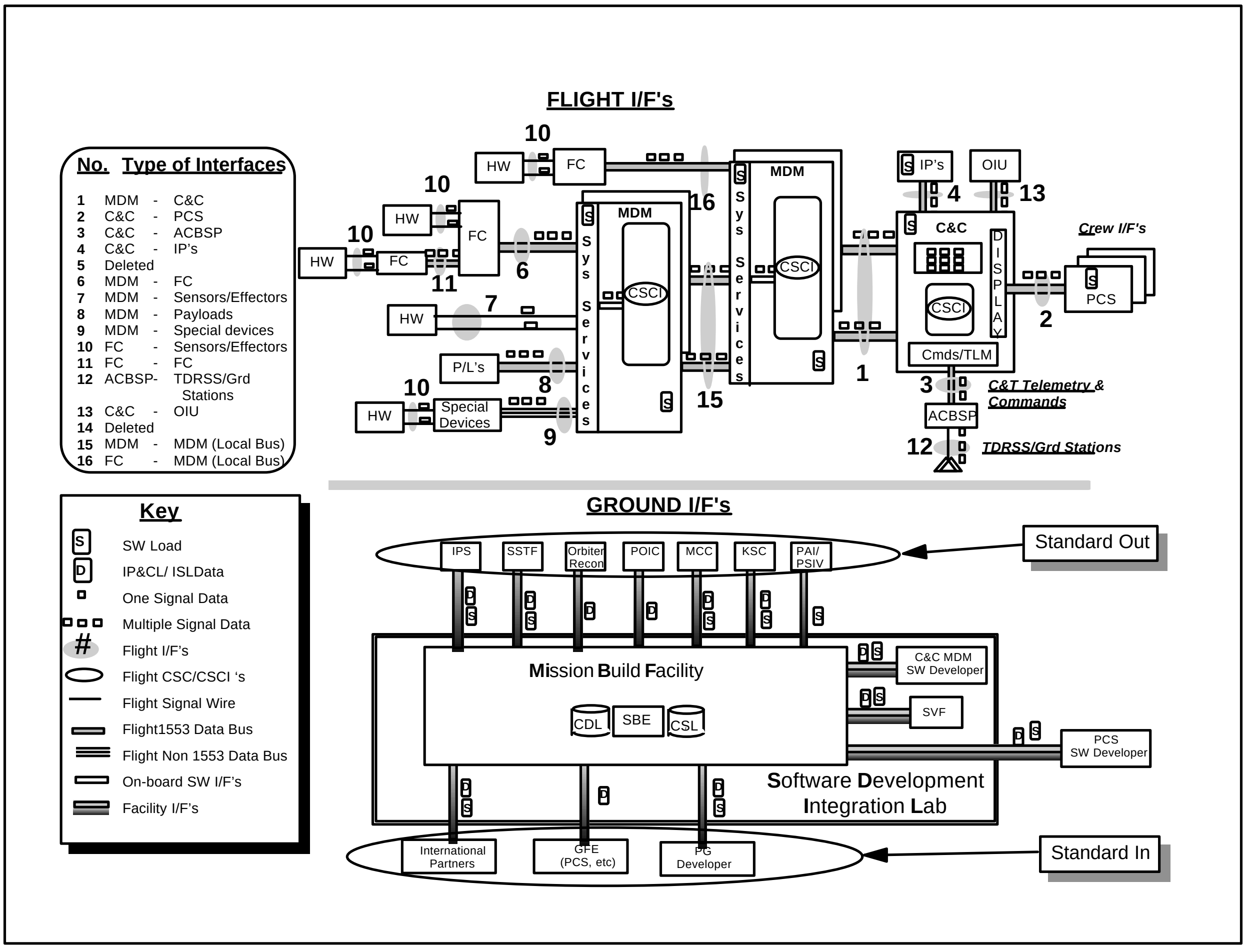


FIGURE 1.1-1 ISS FLIGHT & GROUND INTERFACES (SOFTWARE AND SIGNALS)

1.2 DOCUMENT OVERVIEW

This document provides the Tier 1 Subcontractors with the standards and procedures to be used in performing their software development. This SSPS complies with DOD-STD-2167. This SSPS also provides the document standards, including the tailored DOD-STD-2167 Data Item Descriptions (DIDs). All deviations from this document shall be documented in the Tier 1 Subcontractor's Software Development Plan (SDP). This document is maintained by the Command & Data Handling (C&DH) Integrated Product Team (IPT).

Section 3.0, Software Standards and Procedures, contains the following sections:

3.1 "Software Development Techniques and Methodologies", refers back to the descriptions in the Prime SDP.

3.2 "Software Development Folders (SDFs)", describes organization and contents.

3.3 "Design Standards", covers Program Unique Identifiers (PUIs), including requirements for 5 PUI types, Software Component Definition, Naming Conventions, Interface Conventions, Calibration, Computer Software Unit (CSU) Communication, CSCI Data Structure, and Configuration Management versioning.

3.4 "Non-Signal Data Coding Standard", describes the bit ordering conventions for storage and transmission of data items that are shared by onboard flight software.

3.5 "Software Coding Standards", imposes flight software development guidelines for Ada and non-Ada software.

3.6 "Document Standards", tailors ten DOD-STD-2167A Data Item Descriptions (DIDs) used by flight software developers. The section identifies specific "IS/WAS" tailoring of DIDs to be used in generating the ISS software documentation.

3.7 "Identification of Deliverables", describes standards for the delivery and naming of flight software, simulation, and data files.

Section 4.0, SVF Simulation Standards, defines standards for the development/delivery of simulations and is organized in three major subsections:

4.1 "Simulation Development Standards", addresses issues essential to all simulations such as organization and naming conventions. Additional sections include the use of user code blocks, read/write blocks, and simulation initialization.

4.2 "Simulation Architecture Standards", addresses issues related to simulation to simulation interfaces. Additional sections include Operational Readiness Date (ORD) and Stage build up switches and malfunction insertion standards.

4.3 "Simulation Delivery Standards", addresses issues related to simulation delivery such as file naming and file format.

Section 5.0 provides a list of acronyms and abbreviations used in this document.

In the event of a conflict between this document and higher level documents, the higher level documents take precedence. The same precedence applies at the Tier 1 Subcontractor level.

The appendices provide the following information:

Appendix A defines legal values for the “element” field (first 2 characters) in the Signal Program Unique Identifier (SPUI).

Appendix B defines legal values for the “functional system” field (3rd character) in the Signal Program Unique Identifier (SPUI).

Appendix C defines legal values for the “Subsystem/Assembly/CSCI” field (characters 4, 5, and 6) in the Signal Program Unique Identifier (SPUI).

Appendix D defines legal values for the “Hardware Device/CSC” field (characters 7 and 8) in the Signal Program Unique Identifier (SPUI).

Appendix E defines legal values for the “Signal Type” field (last or 13th character) in the Signal Program Unique Identifier (SPUI).

Appendix F defines legal values for units of measure applicable to signal data.

Appendices G and H were deleted from the SSPS.

Appendix I provides standard engineering constants.

Appendix J defines the standard data types to be used for signal data deliverables.

Appendices K, L, and M were deleted from the SSPS.

Appendix N provides the field by field definition of files delivered via the IP&CL DR VE-31.

Appendix O identifies all flight and simulation software to be delivered.

Appendix P defines legal values for the “MDM Card/Channel Configuration” field in Appendix N.

Appendix Q defines legal values for the data fields in Appendix N as “flight delivered” and “flight activated”.

Appendix R defines legal values for identifying “Data Bus” in Appendix N.

Appendix S defines assigned PUIs for identifying “ISS Data Buses” referenced by messages, devices, etc.

Appendix T defines the Command Template Format.

Appendix U defines legal values for the Logical Destination Processor (LDP).

Appendix V documents the exceptions to this specification. A "pointer" in the applicable section or Appendix directs the reader to this Appendix which documents the requirement's limited applicability.

2.0 REFERENCED DOCUMENTS

The following documents of the exact issue shown form a part of this document to the extent specified herein.

MILITARY STANDARDS

DOD-STD-2167A	Military Standard, Defense System Software Development, 29 February 1988
ANSI/MIL-STD-1815A	Reference Manual for Ada Programming Language, 1983
ANSI/ISO 9899	American National Standard for Programming Languages - C, 1990

BOEING

D684-10017-01, Rev A 8/11/95	Prime Contractor Software Development Plan

REFERENCE

SPC-91061-CMC	Ada Quality and Style: Guidelines for Professional Programmers, The Software Productivity Consortium, Inc., Herndon, VA., Version 02.01.01, December 1992
ISBN 0805306099	Software Components with Ada: Structures, Tools, and Subsystems, (The Benjamin/ Cummings Series in Ada and Software Engineering), Grady Booch, Benjamin/ Cummings Publishing Company, Inc., October 1990
UD/REF/A030-05333/001	Alsys Ada Software Development Environment for VAX.VMS to 80386 targets Application Developer's Guide, Version 5.5.1, Revision 001, Aonix, Inc., San Diego, CA

UD/UG/A030-05323/001	Alsys Ada Software Development Environment for VAX/VMS to 80386 targets User's Guide, Version 5.5.1, Revision 001, Aonix, Inc., San Diego, CA
ISBN 0521264820	Portability and Style in Ada, John Nissen, Cambridge University Press, June 1984
SSP 41154	Software Interface Control Document Part 1 United States On-Orbit Segment to United States Ground Segment Command and Telemetry

TIER 1 SUBCONTRACTOR

DR VE-31	Instrumentation Program and Command List

3.0 SOFTWARE STANDARDS AND PROCEDURES

This document contains instances of “shall”, “will”, “may”, “is”, and “could”, along with passive statements of relationships. The intended utilization of these words is to identify necessary relationships or configurations (using “shall”) as opposed to recommended relationships or configurations (using any other form of verb).

This document is not a requirements specification. Instead, the document serves a purpose more in the flavor of a standards specification. As such, this document does not contain qualification requirements. Qualification of the requirements contained in this document therefore belong in the document(s) which reference this document or provisions of this document.

Nevertheless, it is important to note that certain sections of this document are referenced by documents containing no qualification provisions (specifically related to IP&CL). Among others, these documents include the United States On-Orbit Segment Specification. In these cases, and in the context of IP&CL data, the necessity implied by use of “shall” continues to exist, and is enforced by tools which qualify the data as a step in entering the IP&CL inputs into a database.

3.1 SOFTWARE DEVELOPMENT TECHNIQUES AND METHODOLOGIES

The techniques and methodologies which shall be utilized by the Tier 1 Subcontractors during the software development process are documented in section 4.2.1 of the Prime Contractor SDP, D684-10017-01.

3.2 SOFTWARE DEVELOPMENT FOLDERS

A SDF is required for each Computer Software Configuration Item (CSCI). Each folder is created and maintained by the Software Design Engineer responsible for the CSCI and shall contain working and historical material relating to the CSCI. These folders shall:

A. Provide management with visibility of CSCI status;

B. Allow orderly transfer of responsibility of the CSCI to another engineer, if necessary; and

C. Provide a source of material for review and audit.

3.2.1 ORGANIZATION

Each SDF shall contain the following:

- Cover Sheet;
- Activity Log;
- Software Requirements;

- Interface Requirements;
- Software Design;
- Notes;
- Limitations and Restrictions;
- Sizing and Timing Estimates;
- Review Notes;
- Test Log;
- Problem Report and Change Log; and
- Source Code Log.

3.2.2 INDEX SOFTWARE DEVELOPMENT FOLDER

SDFs may be maintained at the CSCI level or at the lower Computer Software Component (CSC) or CSU levels of the software hierarchy. The IPT Leader shall determine the level at which the SDFs are maintained for the CSCI. If the SDF is maintained at the CSCI level, only one SDF is required. If multiple SDFs are maintained for a CSCI, an Index SDF shall be prepared for the CSCI.

The Index SDF shall document the CSCI-level information and shall also provide visibility to the level at which the SDFs are maintained. The Index SDF shall contain the following:

- Cover Sheet;
- Activity Log;
- Software Requirements;
- Interface Requirements;
- Hierarchy; and
- Notes;
- Limitations and Restrictions;
- Sizing and Timing Estimates.

Each section of the Index SDF shall be prepared consistently with the respective SDF section(s). The only additional information required in the Index SDF that is not contained in a typical SDF is a hierarchical software component breakdown identifying the CSCs or CSUs which have an associated SDF. Figure 3.2.2-1 is an example of a hierarchical software component breakdown. The chart or table may be tailored as long as the specified information is included.

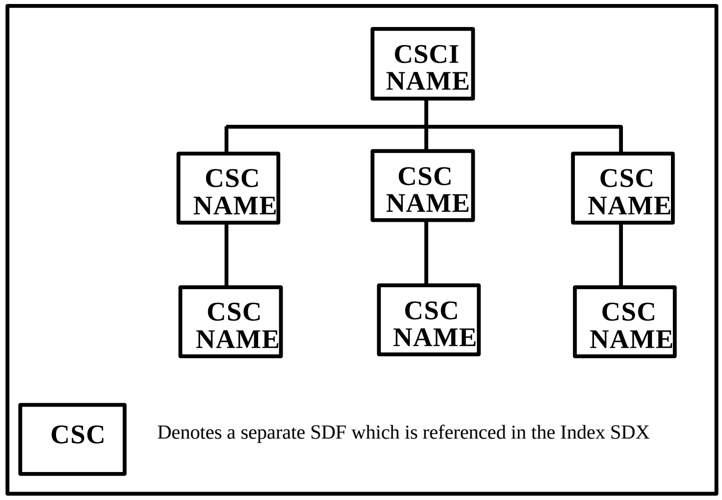


FIGURE 3.2.2-1 EXAMPLE OF HIERARCHICAL SOFTWARE COMPONENT BREAKDOWN

3.2.3 CONTENTS

The SDF shall contain or reference the items defined in the following subsections.

3.2.3.1 COVER SHEET

Each SDF shall contain a cover sheet that identifies the CSCI and CSCs or CSUs contained within, the responsible engineer, and a status summary of each component.

3.2.3.2 ACTIVITY LOG

A schedule identifying significant activities and events shall be maintained for the SDF defined components. The following identifies the type of activities and events to be included:

- Requirements (activity);
- SRS Peer Review (event);
- SSR (event);
- Preliminary Design (activity);
- Preliminary Design Peer Review (event);
- Preliminary Design Review (event);
- Detail Design (activity);
- Detail Design Peer Review (event);
- Critical Design Review (event);

- Unit Test Preparation (activity);
- Coding (activity);
- Peer Code Review (event);
- Unit Testing (activity);
- Unit Test Report Preparation (activity);
- CSC Integration Testing (activity); and
- Release Date(s).

3.2.3.3 SOFTWARE REQUIREMENTS

This section shall contain or reference the Software Requirements Specification (SRS) for the appropriate requirements. This section shall include reference paragraphs from the specification allocation to the software CI this SDF represents. Any assumptions, ambiguities, deferrals, or conflicts concerning the requirements and their impact on the design and development shall be documented.

3.2.3.4 INTERFACE REQUIREMENTS

This section shall contain a block diagram of the CSCI/CSC/CSU, as appropriate, and identify or contain the interface control documentation for each interface. Any assumptions, ambiguities, deferrals, or conflicts concerning the interfaces and their impact on the design and development shall be documented.

3.2.3.5 SOFTWARE DESIGN

This section shall contain the preliminary and detailed designs, including the Program Design Language (PDL) or other detailed design diagrams, which would normally be part of the Software Design Document (SDD) and contain a list of the functional capabilities addressed in the SDF and the associated design components. The functional capabilities are the testable functions performed.

3.2.3.6 NOTES

All applicable memos, trade studies, and other design information that apply to the SDF defined components shall be included in this section.

3.2.3.7 LIMITATIONS AND RESTRICTIONS

This section shall identify any limitations and restrictions that apply to the SDF products.

3.2.3.8 SIZING AND TIMING ESTIMATES

This section shall contain the sizing and timing estimates. The date and basis for each estimate shall be noted. The estimates shall be maintained in chronological order.

3.2.3.9 REVIEW NOTES

This section shall include all minutes, action items, and resolution from each review of the SDF products (including peer reviews and customer reviews). Each action item shall include a due date, responsible engineer(s), and closure dates. A defect list and summary of the number and type of defects shall be maintained for each peer review.

3.2.3.10 TEST LOG

This section shall contain or reference the unit and CSC test plan, test procedures, test cases, test results, and listings of any test drivers or special test code.

3.2.3.11 PROBLEM REPORT AND CHANGE LOG

This section shall log or reference all problem reports and change proposals which affect the SDF products. The following information shall be included in the Change Log and Problem Report:

- Problem or Change Identification;
- Description;
- Product(s) Affected;
- Date;
- Status;
- Estimated and Actual Completion Dates; and
- Version Identification.

3.2.3.12 SOURCE CODE LOG

This section shall contain or reference the source code listings for the SDF defined components.

3.3 DESIGN STANDARDS

Design standards will be used for the following items, and are described in subsequent subparagraphs:

- Program Unique Identifiers;

- Software Component Definition;
- Naming Conventions;
- Interface Description Conventions;
- Calibration Standards;
- CSU to CSU Communications;
- CSCI Data Structure and Access;
- Chart and Graphics Conventions; and
- Configuration Management.

3.3.1 PROGRAM UNIQUE IDENTIFIERS

There shall be five (5) basic types of Program Unique Identifiers (PUIs) for ISS software and data systems controlled by this document. Table 3.3.1-1 provides a short description of the PUIs and the paragraph by which the detail requirements are defined. The Prime’s MBF maintains a central controlled database for managing these PUIs.

NOTE - The five types of PUIs identified in Table 3.3.1-1 are not required for documenting non-flight interfaces at, or between, ground facilities. The ground facilities, at their option, may use any one of the five PUI identifiers for documenting their non-flight interfaces; however the MBF will not be responsible for tracking or providing a central repository for these PUIs.

TABLE 3.3.1-1 PROGRAM UNIQUE IDENTIFIERS CONTROLLED BY THE SSPS

Type of PUI	Paragraph/General Description	Usage
Requirement PUI (RPUI)	Paragraph 3.3.1.1: Seven(7) character fixed format identifiers assigned to uniquely identify each software requirement in the Part 1 Interface Control Documents (ICDs).	1) Part 1 SW ICD 2) Part 2 SW ICD
Signal PUI (SPUI)	Paragraph 3.3.1.2: Thirteen(13) character fixed format identifiers assigned to uniquely identify each and all ISS signals generated, or utilized by, the design elements defined in the Part 2 ICDs and IP&CL. The SPUI also will be used to identify RPCM channels in the Resource Management area of the VMDB.	1) Part 2 SW ICD 2) IP&CL 3) Resource Mgmt
Device PUI (DPUI)	Paragraph 3.3.1.3: Six(6) character fixed format identifiers assigned to uniquely identify Hardware Devices, Firmware Controllers, MDMs, and Special Software Devices (Logical and Groups) which will be the IP&CL source for all ISS signals. The DPUI also will be used to identify sources and loads in the Resource Management area of the VMDB.	1) IP&CL 2) Resource Mgmt
Bus PUI (BPUI)	Paragraph 3.3.1.4: Thirteen(13) character fixed format identifiers assigned to uniquely identify all the Data Buses utilized by the ISS MDMs and Firmware Controllers.	IP&CL
Conversion PUI (CPUI)	Paragraph 3.3.1.5: Thirteen(13) character fixed format identifiers assigned to uniquely identify all the State Conversion and Calibration Curve tables required to interpret ISS discrete signals (i.e. state conversion) and analog signals (i.e. calibration curves).	IP&CL

3.3.1.1 REQUIREMENT PROGRAM UNIQUE IDENTIFIER (RPUI)

A Requirement Program Unique Identifier (RPUI) is used to identify the software data requirements for the Part 1 Software Interface Control Document (ICD). Part 1 Software ICDs provide definition of the software interface requirements between CSCIs and the ISS Flight Elements. Each Part 1 SW ICD contains MDM CSCI Inputs/Outputs to ISS Flight Elements which include Firmware Controllers and other MDM CSCIs.

All Part 1 Software ICD data requirements identified with RPUIs shall conform to the following rules:

A. The RPUI shall be seven (7) characters in length as illustrated in Figure 3.3.1.1-1 and encoded as follows:

Field 1 Product Group

The first character represents the Part 1 SW ICD Data Provider per Legal Values defined in Table 3.3.1.1-1.

TABLE 3.3.1.1-1 LEGAL VALUES FOR PART 1 SW ICD DATA PROVIDER

Legal Value	Description
1	McDonnell Douglas
2	Rocketdyne
3	Boeing-Huntsville
C	Canada
E	European Space Agency
I	Italian Space Agency (ASI)
J	NASDA
N	NASA
P	Prime
R	Russia Space Agency

Field 2 Part 1 SW ICD Functional System

The second character represents the Part 1 SW ICD Functional System to which the Requirement Program Unique Identifiers belongs. The legal values are defined in Table 3.3.1.1-2.

TABLE 3.3.1.1-2 LEGAL VALUES FOR PART 1 SW ICD FUNCTIONAL SYSTEM

Legal Value	Description
B	Motility Systems
C	Communications and Tracking
D	Command and Data Handling
E	Life Support
F	Flight Crew Systems
G	Guidance, Navigation, and Control
H	Heaters
I	Generic Integrated Motor Controller Assy
J	Structural Motion
K	Accommodations and Support Systems
L	Element Unique System
M	Mated Interface Systems
N	Service Module Docking Systems
P	Electrical Power
R	Extra-vehicular Robotics
S	Structures
T	Thermal Control System
V	Station Management and Control
W	Propellant System
X	Extra-vehicular Activity
Y	Thruster Systems
Z	Payload

Field 3 Data Item Identifier

The third, fourth, fifth, sixth, and seventh characters represent a number assigned to the requirement. It should contain leading zeros right justified and should be unique within the Functional System to which it is assigned.

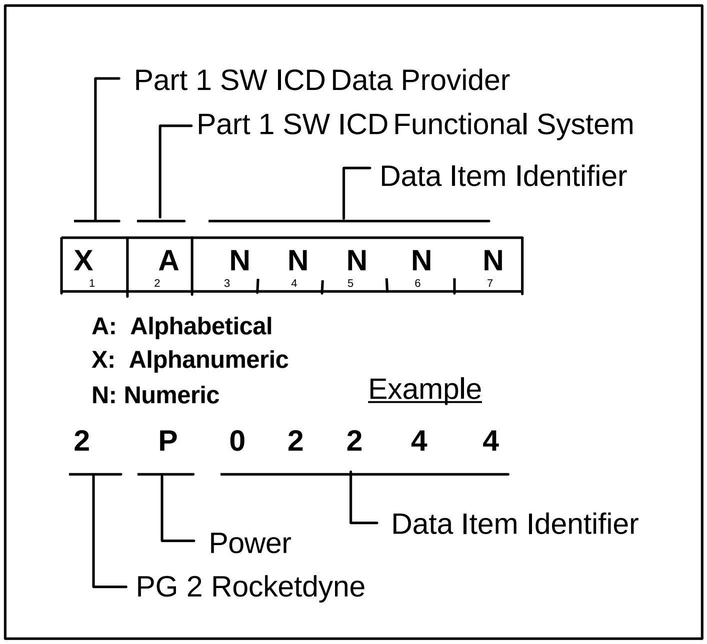
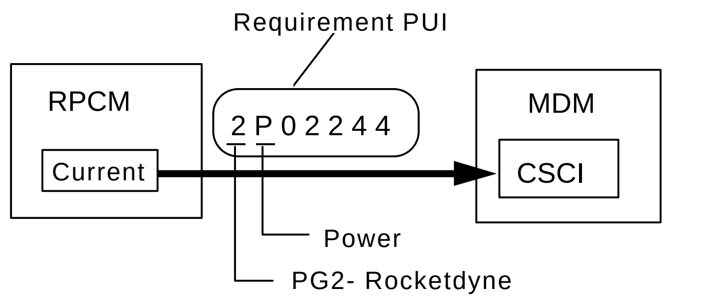


FIGURE 3.3.1.1-1 REQUIREMENT PROGRAM UNIQUE IDENTIFIER

B. All RPUIs shall be traceable to Part 2 Software ICD Signal Program Unique Identifiers (SPUI). Definitions of Signal Program Unique Identifiers are defined in paragraph 3.3.1.2.

C. The traceability relationship between the RPUI and SPUI shall be provided in File 4.1 of the IP&CL Standard Input as defined in paragraph 3.7.1 and Appendix N.

An example of a typical RPUI, and its associated Part 1 SW ICD data requirements, is shown in Figure 3.3.1.1-2.



RPUI	2P02244
Name	RPCM Input Current
Units	amps
Frequency	1 Hz
Limits/Range	0-125
Accuracy	+/_ 3.0 %
Precision	125/4096

FIGURE 3.3.1.1-2 EXAMPLE OF A REQUIREMENT AND ITS RPUI

3.3.1.2 SIGNAL PROGRAM UNIQUE IDENTIFIER (SPUI)

A Signal Program Unique Identifier (SPUI) is used to identify all ISS Signals. An ISS signal is defined as data needed or provided by the flight crew, ground crew, ISS hardware elements, ISS Firmware Controllers, ISS Portable Computer Systems, or ISS MDM/Processor application and system services software to monitor, control, or define its state. ISS signals are those control signals that traverse (in either direction) the wiring between sensor devices, effectors, and the onboard processors, which are used by ground or onboard operations for command and control of the station. Ancillary data about some signals, such as calibration information, are also part of the ISS signal domain, and therefore subject to SPUI definition. The following subparagraphs further define the five major categories of ISS signals (Hardware Primitives, Firmware Primitives, Software Primitives, Groups, and Command Instantiations). Appendix N defines the format and SPUI usage when delivering these signal types and their necessary ancillary information. Signals used only internally to a processor or device need not be identified with SPUIs, if they are never sent to, or received from, the onboard/ground command and control operations systems.

The following are example internal signals, only subject to SPUI definition if the MDM application developer creates software signals representing them for the telemetry link:

- MDM Input/Output backplane protocol;
- SX backplane protocol;
- IOCC command list used to drive backplanes;
- MDM Input/Output SRAM;
- SCSI port and debug interface;

- MDM utilities; and
- MDM hardware signals (e.g. SDO card voltage monitor, card BIT, etc.).

The domains of ISS Signal Data are illustrated in Figures 3.3.1.2-1 and 3.3.1.2-2, where the four major signal domains are identified with underlines. Figure 3.3.1.2-1 correlates the Tier 1 ISS onboard C&DH architecture (below the C&C MDM) with the four major signal categories. Figure 3.3.1.2-2 correlates the higher domains of Software and Groups with the Ground Link, International Partner, Payloads, and Crew interfaces. Note - Command Instantiations are shown as a part of the Group Signals' C&C MDM external interfaces because that is the limit of its domain, see paragraph 3.3.1.2.1.5.

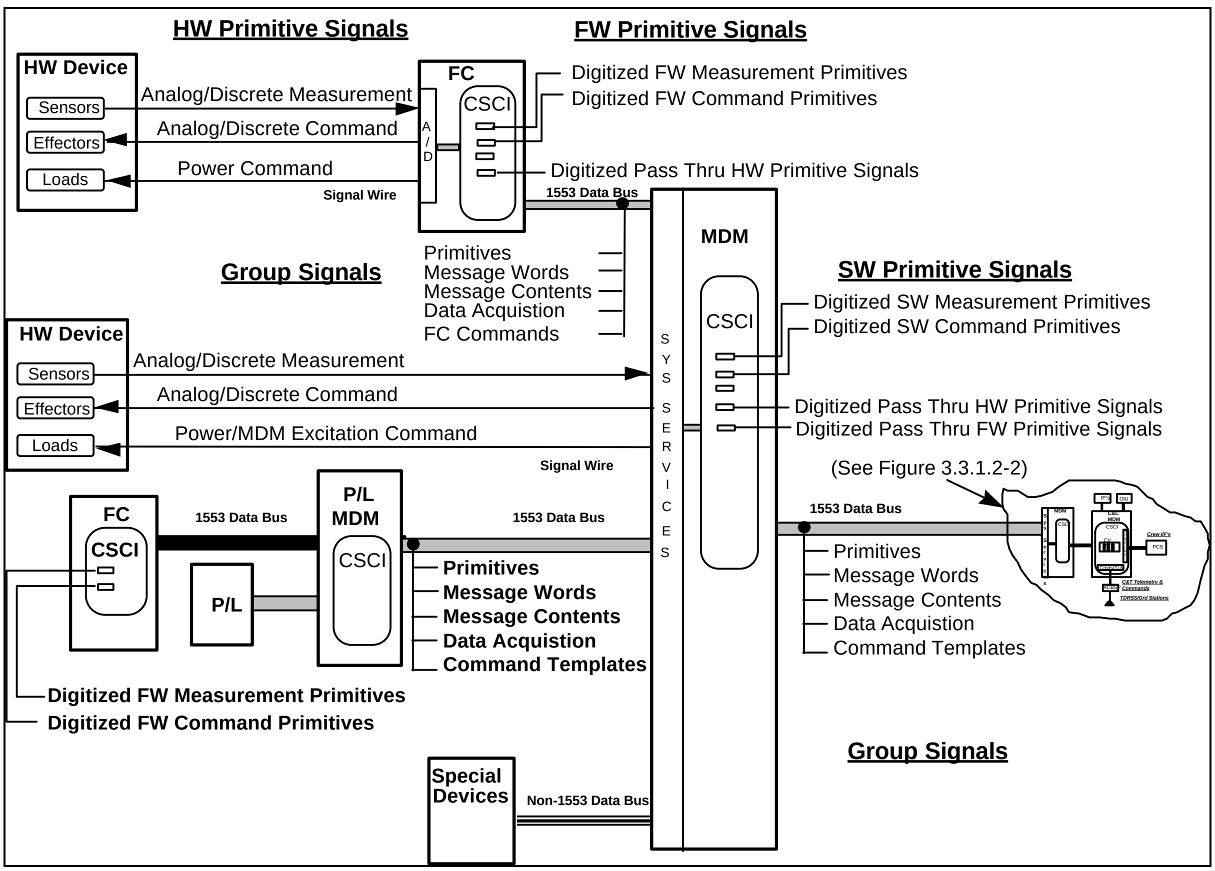


FIGURE 3.3.1.2-1 TIER 1 ISS SIGNAL DATA DOMAIN

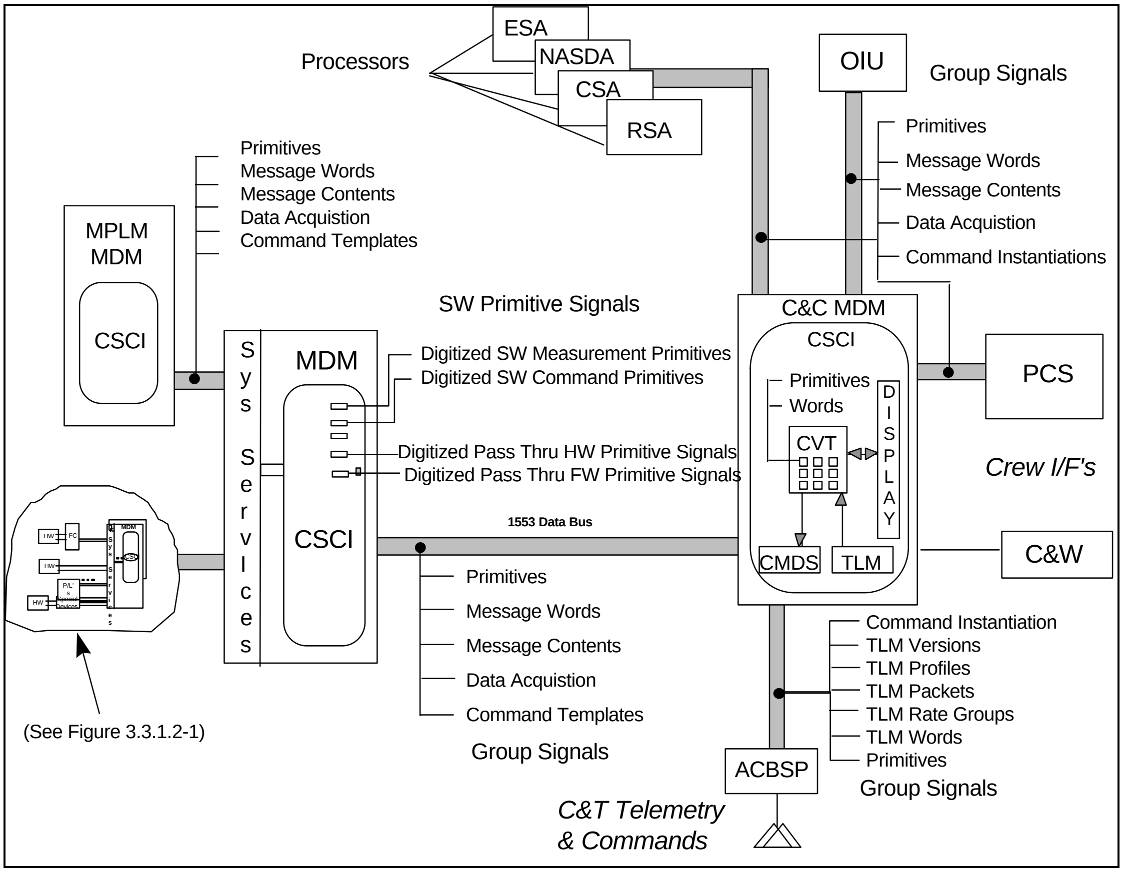


FIGURE 3.3.1.2-2 ISS COMMANDS, DATA ACQUISITION, DISPLAY, AND TELEMETRY DATA DOMAIN

3.3.1.2.1 RULES AND GUIDELINES FOR ISS SIGNAL DATA

The ISS Signal Data categories above are further delineated in the following sub-categories:

A. Hardware Primitive Signals (optional for IPs and P/Ls)

- Signals from Hardware (Analog/Discrete Measurements from Sensors)
- Signals to Hardware (Analog/Discrete Commands to Effectors, Excitation to Sensors, and Power to Loads)

B. Firmware Controller (FC) Primitive Signals (optional for IPs and P/Ls)

- Digitized Primitive Measurements derived by FC software
- Digitized Primitive Commands used by FC software
- Digitized Pass through Hardware Primitive Signals.

C. Software Primitive Signals

- Digitized Primitive Measurement derived by MDM/Processor software
- Digitized Command Primitives within Command Templates used by MDM/Processor software
- Digitized Pass through Hardware Primitive Signals (optional for IPs and P/Ls)
- Digitized Pass through Firmware Controller Primitive Signals (optional for IPs and P/Ls)
- Digitized Hardware Primitives (IPs and P/Ls only)

D. Group Signals

- Message Content
- Message Words
- Data Acquisition
- Command Templates
- Telemetry

E. Command Instantiations

All Signal data will be identified with a thirteen(13) character Signal Program Unique Identifier (SPUI) as illustrated in Figure 3.3.1.2.1-1. The encoding of the SPUI is as follows:

Field 1 Element

The first two characters represent the Functional (Flight) Element of the ISS. A set of legal values to encode this field is listed in Appendix A.

Field 2 Functional System

The third character represents the Functional System. A set of legal values to encode this field is listed in Appendix B.

Field 3 Subsystem/Assembly/CSCI

The fourth, fifth, and sixth characters represent the Subsystem/Assembly Instance/CSCI within the element/functional system. A set of legal values to encode this field is listed in Appendix C.

Field 4 Generic Device Code

The seventh and eighth characters represent the Generic Device Code for the generated or received signal. A set of legal values for the field is listed in Appendix D.

Field 5 Sequence Number

The ninth, tenth, eleventh, and twelfth characters represent the unique alphanumeric Sequence Number assigned at the discretion of the data provider. Numeric are preferred for the sequence number, but alphabetical characters are allowed.

Field 6 Signal Type

The thirteenth character represents the Signal Type. The signal type is defined based on the units of the signal function as defined in Appendix F. A set of legal values for the field is listed in Appendix E except for:

- a SPUI assigned to "Group", the character shall be "L"; and
- a SPUI assigned to Command Primitives/Parameters, Command Templates, and Command Instantiations, the character shall be "K".

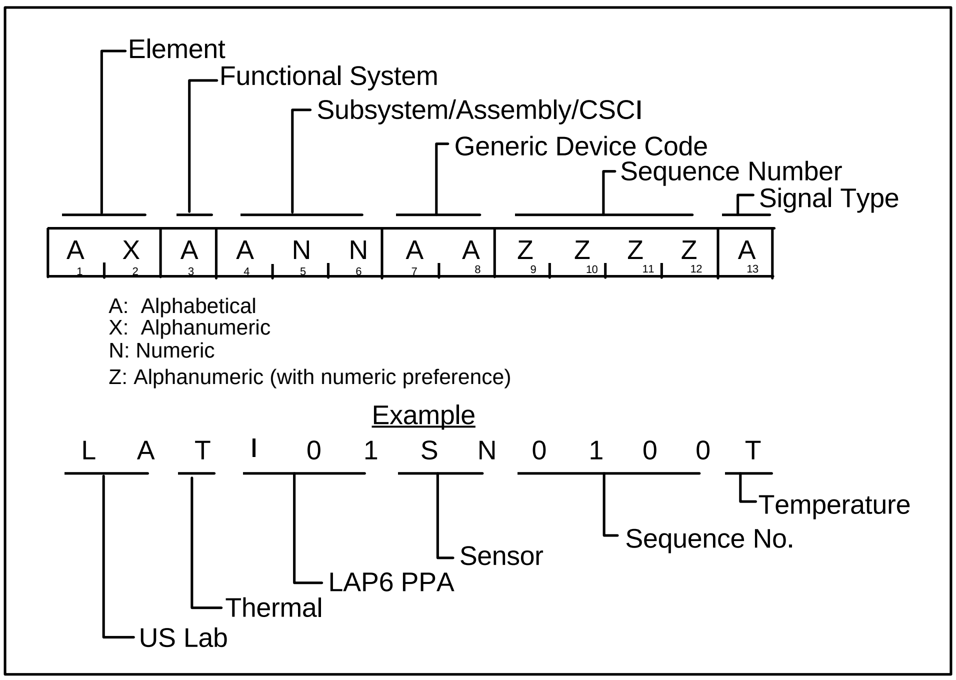


FIGURE 3.3.1.2.1-1 SIGNAL PUI FORMAT

Guidelines regarding the generation of Engineering Names for SPUIs are stated here for the purpose of avoiding the dilemma caused by cryptic names in the engineering name field of the Standard-In data.

Engineering names should be descriptive enough to provide a novice with a general intuitive sense of what the parameter represents functionally. If the primitive is a command word, then the name should contain an action word, e.g. On, Off, Set, Remove, etc. If the primitive is a measurement parameter, then the name should contain a noun (or nouns) that is related to the measurement such as ORU acronym (RPCM, CDRA, VOA, MDM, Node, LAB, HAB, etc.) perhaps combined with common Engineering units abbreviations (for current, I; for Volts, E; etc.). Group level SPUIs should reflect, to the degree possible, the functional content comprising that group. Where mixed content is present, a higher level association may be applicable. The choice is left to the discretion of the data provider with the caveat that every effort should be made to give an adequate measure of intelligence to the engineering name to assist the end user in distinguishing it from all other SPUIs.

This is not meant to make every engineering name unique, but to be sensitive to the situation where other users of the database are looking at dozens of names from potentially all the data providers and must distinguish between them with only the SPUI and the engineering name for reference.

All SPUIs and their associated ancillary data will be provided via the IP&CL Standard Input as defined in paragraph 3.7.1, Appendix N, and the subparagraphs below. The subparagraphs below, corresponding to the five (5) major signal data categories, provide “shalls” corresponding to signal definition, domain identification, rules for applying SPUIs, and examples. Complete rules and responsibilities for each Signal Data Provider are defined in paragraph 3.7.1.4, subparagraphs below will reference only generic Data Providers.

3.3.1.2.1.1 HARDWARE PRIMITIVE SIGNALS

Both of the subparagraphs below provides a definition, a figure illustrating the domain, the rules for applying SPUIs, and an example for Primitives From/To ISS Hardware.

The following paragraphs are optional to the International Partners and Payloads (e.g., Appendix N/File 1.1 is not a deliverable).

3.3.1.2.1.1.1 PRIMITIVE SIGNALS FROM HARDWARE

Primitive signals from hardware are defined as a measurement signal derived from a sensor or hardware device that responds to either the absolute value or change in a physical stimulus (heat, light, sound, magnetism, pressure, or particular motion) and produces a corresponding signal. A sensor can be an entire instrument or the part of it that measures a phenomenon. The Hardware Measurement Primitive Signal is routed either to a MDM or Firmware Controller (FC) for digitizing and further processing. SPUIs will be assigned to every signal associated with sensors or devices that are monitored by or connected to MDM card channels and FC hardware interfaces.

Figure 3.3.1.2.1.1.1-1 illustrates the assignment of SPUIs for Hardware Measurement Primitive Signals.

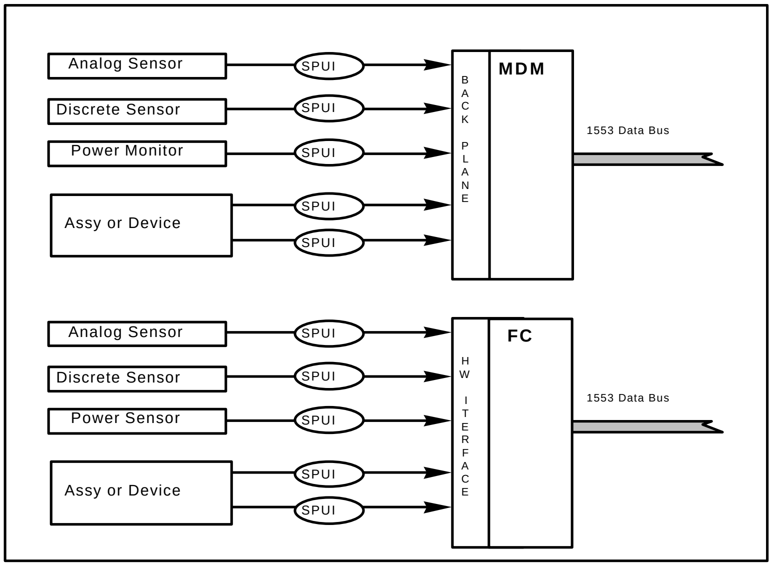


FIGURE 3.3.1.2.1.1.1-1 ASSIGNMENT OF SPUI FOR HARDWARE MEASUREMENT PRIMITIVE SIGNALS

SPUIs assigned to all Hardware Measurement Primitives shall conform to the following rules:

A. First 6 characters of the SPUI shall be defined per Appendix C and indicate the HW device generating the measurement signal (e.g. N1EI37, N1ER21, etc.).

B. Generic Device Code (Characters 7 and 8) of the SPUI shall be defined per Appendix D and indicate the generic type of source generating the measurements (e.g. FA, VL, etc.).

C. Sequence Code (Characters 9 through 12) of the SPUI is assigned at the discretion of the data provider (e.g. 0001, 0003, etc.).

D. Signal Type (Character 13) of the SPUI shall be defined per Appendix E and indicate the physical phenomenon the device or sensor is monitoring (e.g. T, J, etc.). For hardware primitive signals:

- a "K" (stimulus) will never be used as the signal type in the thirteenth character of the SPUIs; and
- a “J” is preferred for Hardware Discretes.

E. The Data Provider responsible for the device/sensor generating this Measurement Signal shall be designated as the "Functional System Data Provider" of the Hardware Measurement Primitive Signal and will provide the data via File 1.1 (HW Primitive File) defined in Appendix N.

F. The Data Provider responsible for the Hardware Devicewill be the only one authorized to modify or delete the Hardware Measurement Primitive signal once it has been baselined.

G. If the MDM/FC destination of a Hardware Measurement Signal changes as the results of relocation the following rules apply:

- The SPUI will only change if the Data Type for the firmware/software attributes change;
- If the Data Type changes the new SPUI will utilize the same six characters (i.e. DPUI) as the original SPUI;
- If the Data Type changes, and the owner of the firmware/software attributes changes, then the Hardware Measurement Signal Data Provider will provide the new SPUI along with the associated Calibration files if applicable (unless the following Two Wire RTD rule applies); and
- If the Hardware Measurement Signal is a 'Two Wire' Resistance Thermal Device (RTD), the data provider responsible for MDM channelization (i.e the integrator) will inherit the signal and will be responsible for the associated Calibration Files.

Examples of a Hardware Measurement Primitive SPUI are shown in Figure 3.3.1.2.1.1.1-2.

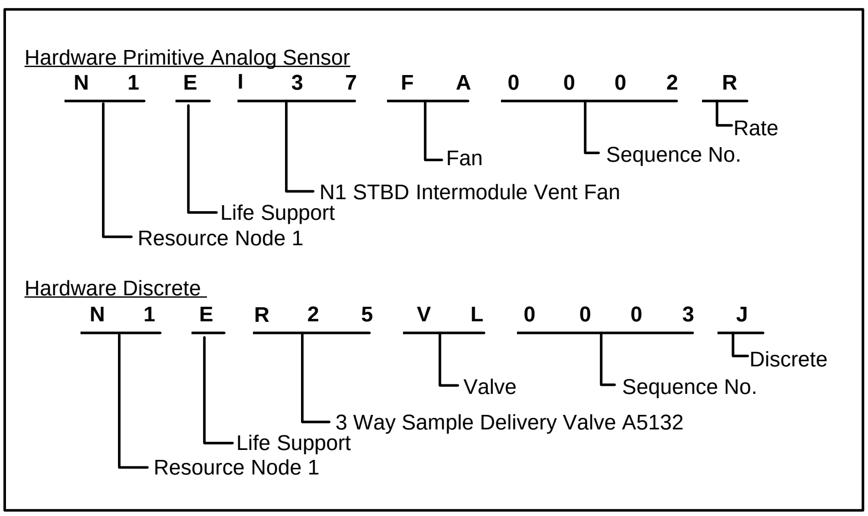


FIGURE 3.3.1.2.1.1.1-2 EXAMPLES OF HARDWARE MEASUREMENT PRIMITIVE SPUIS

3.3.1.2.1.1.2 PRIMITIVE SIGNALS TO HARDWARE

Primitive signals to hardware are defined as a primitive command signal generated from an MDM or Firmware Controller (FC) to a hardware device for the purpose of stimulating or initiating an action within the hardware device (e.g. solenoids, pumps, device power, sensor excitation, etc.).

SPUIs will be assigned to every signal associated with effectors connected to MDM card channels and effectors or loads connected to FC hardware interfaces.

Figure 3.3.1.2.1.1.2-1 illustrates the assignment of SPUIs for Hardware Command Primitive Signals.

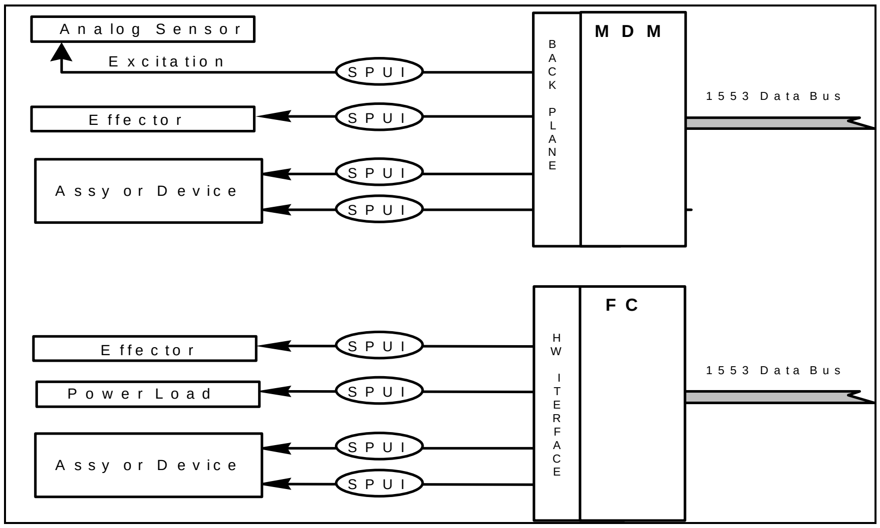


FIGURE 3.3.1.2.1.1.2-1 ASSIGNMENT OF SPUI FOR HARDWARE COMMAND PRIMITIVE SIGNALS

SPUIs and associated data assigned to Hardware Command Primitives shall conform to the following rules:

A. First 6 characters of the SPUI shall be defined per Appendix C and indicate the HW device receiving the command signal (e.g. N1EA02, N1ED02, N1PN01, etc.);

B. Generic Device Code (Characters 7 and 8) of the SPUI shall be defined per Appendix D and indicate the generic type of source receiving the commands (e.g. VL, SR, PW, etc.);

C. Sequence Code (Characters 9 through 12) of the SPUI is assigned at the discretion of the data provider (e.g. 0001, 0002, etc.);

D. Signal Type (Character 13) of the SPUI shall be as follows:

- "K" for Commands to Effectors
- "X" for Excitation to Sensors
- "K" for Power to Loads

E. The Data Provider responsible for the device receiving the command shall be designated as the "Functional System Data Provider" of this Hardware Command Primitive Signal and will provide the data via File 1.1 (HW Primitive File) defined in Appendix N; and

F. The Data Provider responsible for the Hardware Devicewill be the only one authorized to modify or delete the Hardware Command Primitive signal once it has been baseline.

Examples of a Hardware Command SPUI are shown in Figure 3.3.1.2.1.1.2-2.

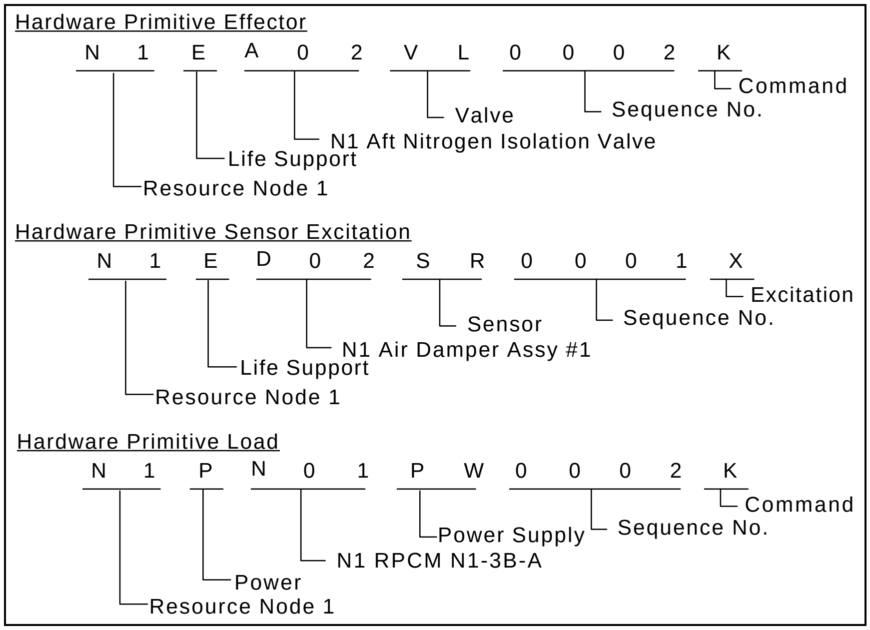


FIGURE 3.3.1.2.1.1.2-2 EXAMPLES OF HARDWARE COMMAND PRIMITIVE SPUIS

3.3.1.2.1.2 FIRMWARE CONTROLLER (FC) PRIMITIVE SIGNALS

Both subparagraphs below provide a definition, a figure illustrating the domain, the rules for applying SPUIs, and an example for Primitives From/To ISS Firmware Controllers and are optional to the International Partners and Payloads.

3.3.1.2.1.2.1 PRIMITIVE SIGNALS FROM FIRMWARE CONTROLLER

Primitive signals from a Firmware Controller are defined as a digitized measurement signal that originates in a Firmware Controller and is transferred via a Data Bus (1553, 442B, etc.) to the requesting Bus Controller. SPUIs will be assigned to every signal that is generated from a Firmware Controller.

Figure 3.3.1.2.1.2.1-1 illustrates the assignment of SPUIs for Firmware Controller Measurement Primitive SPUIs measurements.

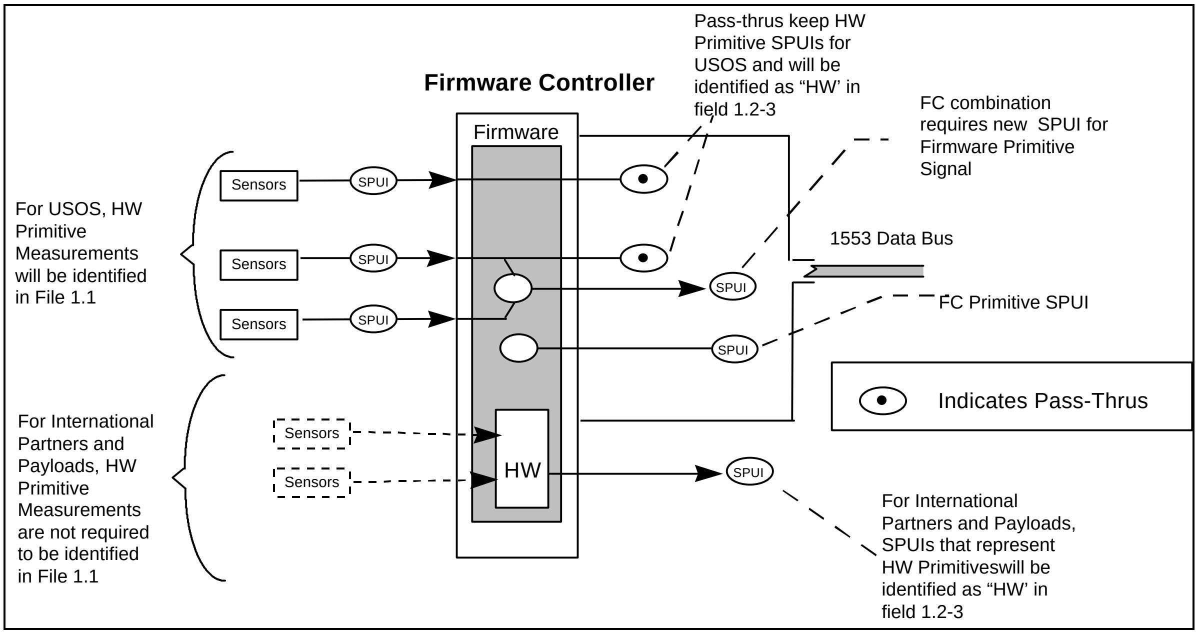


FIGURE 3.3.1.2.1.2.1-1 ASSIGNMENT OF SPUI FOR FIRMWARE CONTROLLER MEASUREMENT PRIMITIVE SIGNALS

SPUIs and associated data assigned to all Firmware Controller Measurement Primitives shall conform to the following rules:

A. First 6 characters of the SPUI shall be defined per Appendix C and indicate the FC device generating the measurement signal (e.g. S6PD11, N1ER21, etc.);

B. Generic Device Code (Characters 7 and 8) of the SPUI

- shall always be FC (as defined in Appendix D) for USOS; and
- for International Partners and Payloads, "FC" is preferred for Primitives generated within the Firmware Controller and "HW" for Primitives that represent HW Measurement Primitives;

C. Sequence Code (Characters 9 through 12) of the SPUI is assigned at the discretion of the data provider;

D. Signal Type (Character 13) of the SPUI shall be defined per Appendix E and indicate the physical phenomenon the device or sensor is monitoring (e.g. T, J, etc.). For Firmware Controller Measurement Primitives:

- "U" shall not be used if the primitive signal requires conversion coefficients. (Note, if temperature is being represented as counts, this field should be typed via the calibration units, not the counts);
- "J" is the preferred way for signals requiring state conversion (e.g., enumerated data type signal);

E. The Data Provider responsible for the Firmware Controller generating this Measurement Signal shall be designated as the "Functional System Data Provider" of the Firmware Controller Measurement and will provide the data via File 1.2 (FW Primitive File) defined in Appendix N;

F. The Data Provider responsible for the Firmware Controller will be the only one authorized to modify or delete the Firmware Controller Measurement Primitive signal once it has been baseline;

G. The SPUI of a Hardware Measurement Primitive signal shall not be changed if the signal passes through the Firmware Controller and exits on the 1553 bus and Field 1.2-3 (FW Type of Signal) will be defined in Appendix N as a "HW";

H. A new Firmware Controller Measurement Primitive signal shall be assigned if the Firmware Controller software combines two or more Hardware Measurement Primitive signals and generates a new signals;

I. For International Partners and Payloads, Primitives that represent HW Measurements that are not provided in Appendix N, File 1.1 (HW Primitive File), shall be defined in Field 1.2-3 (FW Type of Signal) with any legal value other than "HW";

J. For Primitives requiring Polynomial or Piecewise Conversions, the FW Data Type (Appendix N/Field 1.2-2) shall be used in the calculation of the Polynomial or Piecewise coefficients as defined in Appendix N / File 3.2 or 3.3. (e.g. If the data type is 12SI, then A0, A1, An will be based on 12 bits).

K. All HW Primitives defined in Appendix N/File 1.1 where Field 1.1-3 (HW Primitive Device Type) only equals 'SEN' shall have a corresponding FW primitive in File 1.2 with the same SPUI as the HW Primitive and Field 1.2-3 identified with a 'HW' only if the signal actually shows up on the bus going up from the Firmware Controller.

Examples of a Firmware Controller Measurement Primitive SPUI are shown in Figure 3.3.1.2.1.2.1-2.

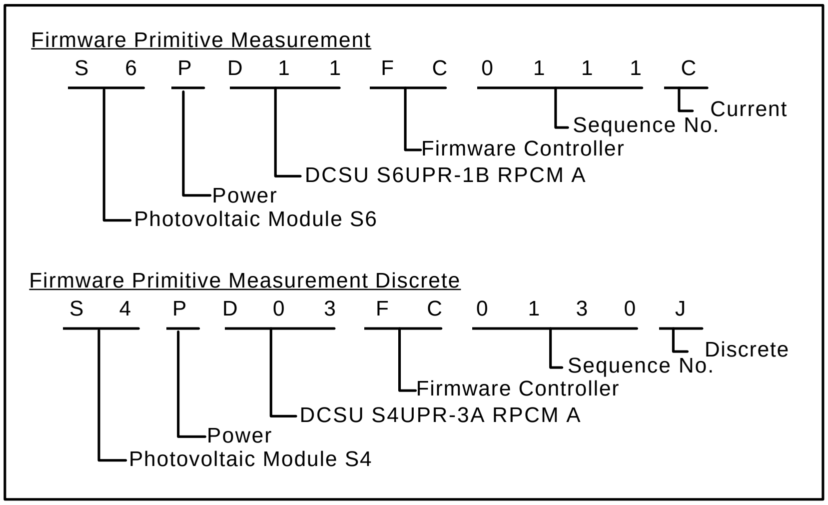


FIGURE 3.3.1.2.1.2.1-2 EXAMPLES OF FIRMWARE CONTROLLER MEASUREMENT PRIMITIVE SPUIS

3.3.1.2.1.2.2 PRIMITIVE SIGNALS TO FIRMWARE CONTROLLER

Primitive signals to a Firmware Controller are defined as digitized command signals that originate in a MDM or Processor and are transferred via a Data Bus to the designated Firmware Controller for the purpose of initiating an action within the Firmware Controller Device. There are two types of Firmware Controller command primitive signals - Command Structure and Non-CCSDS. Primitives associated with Command Structures are defined in Paragraph 3.3.1.2.1.4.3.1 and in Paragraph 3.3.1.2.1.4.3.3 for Non-CCSDS Firmware Commands.

Command signals will only be required per each unique type of Firmware Controller. If two or more identical Firmware Controllers exist on the ISS, only one set of commands are required to be generated. Generic command signals will be used to identify this set of signals. The purpose for generic command signals is to identify the existence of the command without identifying the specific firmware controller device receiving the command. There are many firmware controllers receiving the same command via the same bus or perhaps through different buses. Using a generic identifier allows for a single definition of the command to be used for each firmware controller receiving the command regardless of the firmware controller's location or the time slot of the command on the bus. SPUIs will be assigned to all signals that are generated for each unique type of a Firmware Controller.

Figure 3.3.1.2.1.2.2-1 illustrates the assignment of SPUIs for Firmware Controller Command Primitive SPUIs measurements.

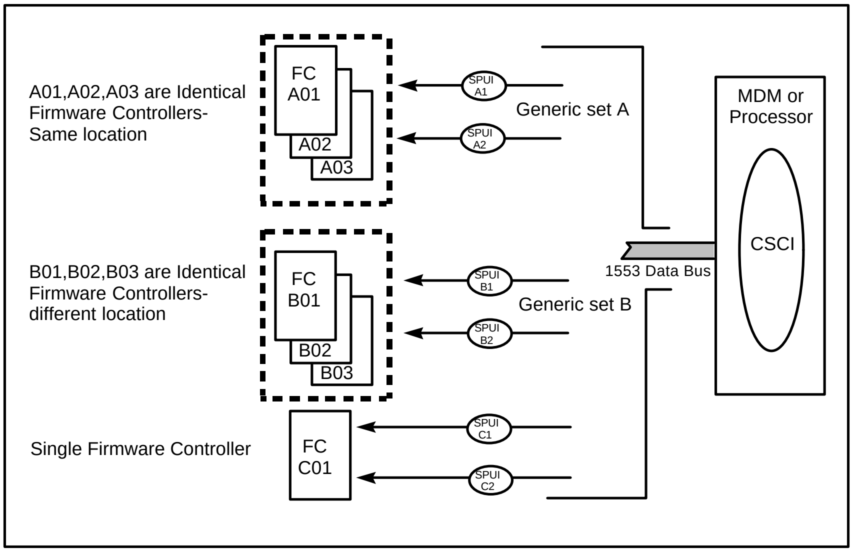


FIGURE 3.3.1.2.1.2.2-1 ASSIGNMENT OF SPUI FOR FIRMWARE CONTROLLER COMMAND PRIMITIVE SIGNALS

SPUIs and associated data assigned to Firmware Controller Command Primitives shall conform to the following rules:

A. First 6 characters of the SPUI shall be defined per Appendix C and indicates the FC device or FC generic device receiving the command signal (e.g. LAEA11, S6PZ28, USPZ31, etc.).

B. Generic Device Code (Characters 7 and 8) of the SPUI shall always be FC (as defined in Appendix D).

C. Sequence Code (Characters 9 through 12) of the SPUI is assigned at the discretion of the data provider.

D. For all Firmware Controller Command Primitives and Command Primitive Parameters, Signal Type (Character 13) of the SPUI shall be a "K".

E. The Data Provider responsible for the Firmware Controller receiving this Command Signal shall be designated as the "Functional System Data Provider" of the Firmware Controller Measurement and will provide the data via File 1.2 (FW Primitive File) defined in Appendix N.

F. The Data Provider responsible for the Firmware Controller will be the only one authorized to modify or delete the Firmware Controller Command Primitive signal once it has been baselined.

G. (DELETED).

H. If the primitive is part of a Command Structure as defined in Paragraph 3.3.1.2.1.4.3.1, then for all Command Primitives not associated with the CCSDS Primary/Secondary Header, the value for STD Input File 1.2-3 shall be 'PC', 'CD', or 'CO', as applicable.

Note: MOD requires all command specific primitives requiring instantiation to have a value of 'PC', 'CD', or 'CO' in File 1.2-3 and a value of 'IN' in File 6.1-3 because they are unable to assign instance values for software primitives that have a signal type of 'RV'.

Examples of a Firmware Controller Command Primitive SPUI are shown in Figure 3.3.1.2.1.2.2–2.

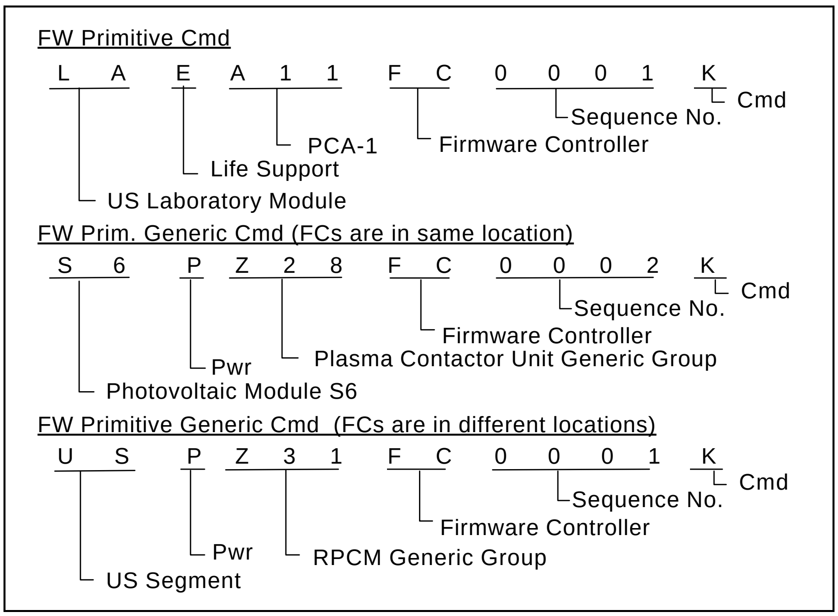


FIGURE 3.3.1.2.1.2.2-2 EXAMPLES OF FIRMWARE CONTROLLER COMMAND PRIMITIVE SPUIS

3.3.1.2.1.3 MDM OR PROCESSOR SOFTWARE PRIMITIVE SIGNALS

Both subparagraphs below provide a definition, a figure illustrating the domain, the rules for applying SPUIs, and an example for Primitives From/To ISS MDMs or Processors.

3.3.1.2.1.3.1 PRIMITIVE SIGNALS FROM MDM OR PROCESSOR SOFTWARE

Primitive signals from MDM or Processor Software are defined as digitized measurement signals that originate in an MDM or Processor CSCI and are transferred via a 1553 bus:

- to the requesting Bus Controller if the primitive is part of a Data Acquisition message, or

- by the Bus Controller if the primitive is part of a Broadcast or Mode Code message.

In the cases where software primitives are generated from a CSCI that exists in redundant MDMs or Processors (i.e. Primary or Backup), SPUIs will be required on the Primary Software Primitives and the Backup Software Primitive measurements. SPUIs will be assigned to all signals that are generated from MDM or Processor software. In the cases where there are two MDMs or Processors (e.g. NCS) which receive both Physical and Logical Command Structure Primitive signals, SPUIs will be assigned to every Command Structure Primitive signal per the rules and guidelines defined in Paragraph 3.3.1.2.1.4.10.

Figure 3.3.1.2.1.3.1-1 illustrates the assignment of SPUIs for these measurements.

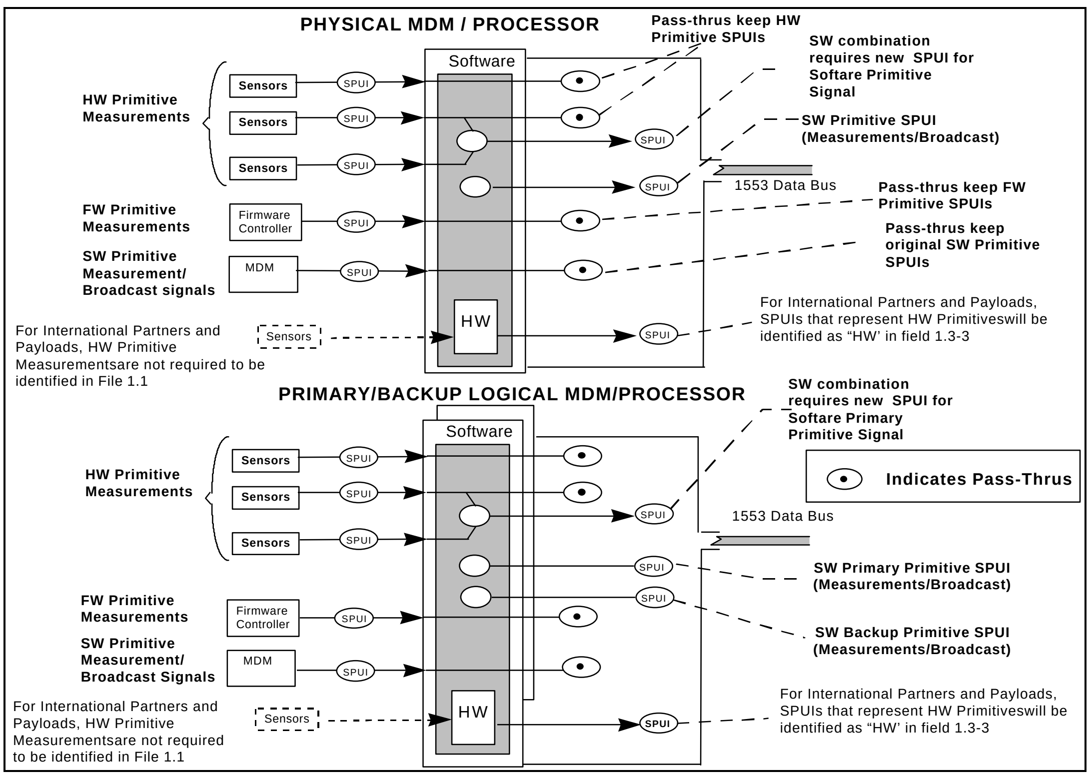


FIGURE 3.3.1.2.1.3.1-1 ASSIGNMENT OF SIGNAL PUI FOR MDM OR PROCESSOR SOFTWARE MEASUREMENT SIGNALS AND BROADCAST SIGNALS

SPUIs and associated data assigned to all MDM or Processor Software Measurement Primitives shall conform to the following rules:

A. First 6 characters of the SPUI shall be defined per Appendix C and Paragraph 3.3.1.2.1.4.10 and

- indicate the Physical MDM or Processor device generating the measurement signal (e.g. LAES19, etc.);

- indicate the Logical Primary MDM or Processor generating the measurement signal (e.g. P6PP34, etc.); or
- indicate the Logical Backup MDM or Processor generating the measurement signal (e.g. P6PB38, etc.).

B. Generic Device Code (Characters 7 and 8) of the SPUI:

- shall always be “MD” (as defined in Appendix D) for USOS); and
- for International Partners and Payloads, “SW” is preferred for Primitives generated within the Processor and “HW” for Primitives that represent HW Measurement Primitives;

C. Sequence Code (Characters 9 through 12) of the SPUI is assigned at the discretion of the data provider;

D. Signal Type (Character 13) of the SPUI shall be defined per Appendix E and indicate the physical phenomenon the primitive is monitoring (e.g. T, J, etc.) or providing in the case where the MDM or Processor is broadcasting, or issuing Mode codes (e.g. W for broadcast of time). For MDM or Processor Measurement, Broadcasts, or Mode Codes:

- "U" shall not be used if the primitive signal requires conversion coefficients. (Note, if temperature is being represented as counts, this field should be typed via the calibration units, not the counts);
- “J” is the preferred way for signals requiring state conversion;

E. The Data Provider responsible for the MDM or Processor CSCI generating this Measurement Signal shall be designated as the "Functional System Data Provider" of the Software Measurement, Broadcasts, or Mode Codes and will provide the data via File 1.3 (SW Primitive File) defined in Appendix N;

F. The Data Provider responsible for the MDM or Processor CSCI will be the only one authorized to modify or delete the Software Measurement Primitive signal once it has been baselined;

G. The SPUI of a Hardware Measurement Primitive Signal, a Firmware Measurement Primitive Signal, or a Software Measurement/Broadcast Primitive Signal shall not be changed if the signal passes through the MDM or Processor CSCI and exits on the 1553 bus, unless the data type of the signal is changed and Field 1.3-3 (SW Type of Signal) defined in Appendix N will be “HW”;

H. A new Software Measurement Primitive signal shall be assigned if the MDM or Processor software combines two or more Hardware Measurement Primitive signals and generates a new software signal. An example is shown in Figure 3.3.1.2.1.3.1-2;

I. For International Partners and Payloads, Primitives that represent HW Measurements that are not provided in Appendix N, File 1.1 (HW Primitive File), shall be defined in Field 1.3-3 (SW Type of Signal) with any legal value other than "HW";

J. For Primitives requiring Polynomial or Piecewise Conversions, the FW Data Type (Appendix N/Field 1.2-2) shall be used in the calculation of the Polynomial or Piecewise coefficients as defined in Appendix N / File 3.2 or 3.3. (e.g. If the data type is 12SI, then A0, A1, An will be based on 12 bits); and

K. All HW Primitives defined in Appendix N/File 1.1 where Field 1.1-3 (HW Primitive Device Type) only equals 'SEN' shall have a corresponding SW primitive in File 1.3 with the same SPUI as the HW Primitive and Field 1.3-3 identified with a 'HW'.

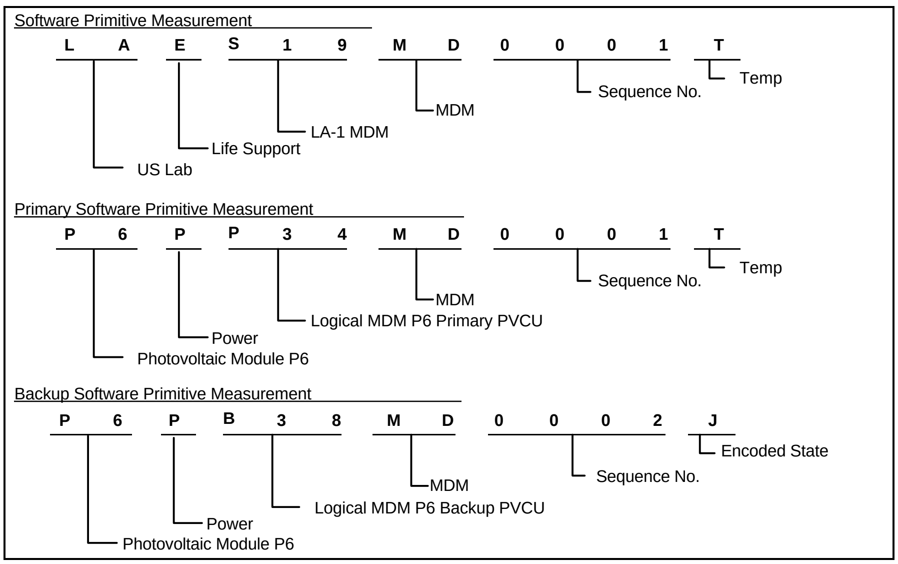


FIGURE 3.3.1.2.1.3.1-2 EXAMPLES OF SOFTWARE MEASUREMENT PRIMITIVE SPUIS

3.3.1.2.1.3.2 PRIMITIVE SIGNALS TO MDM OR PROCESSOR SOFTWARE

Primitive signals to MDM or Processor Software are defined as a digitized command signal that is part of a MDM or Processor Command Structure Signal and is transferred via a 1553 bus to the receiving MDM or Processor. A Command Structure Signal is defined in paragraph 3.3.1.2.1.4.3.1. In the cases where software primitives are transmitted to a CSCI that exists in redundant MDM or Processors (i.e. Primary or Backup Logical MDM or Processors), SPUIs will be required on the Primary Software Primitives and the Backup Software Primitive commands. Generic primitive commands will be used to capture the complete set of signals to identical CSCIs. The command structures will identify the relationship of the generic commands and the target MDM or Processor. SPUIs will be assigned to Primitive signals that are generated as part of a MDM or Processor Command Structure Signal. In the cases where there are two MDMs or Processors (e.g. NCS) which receive both Physical and Logical Command Structure Primitive signals, SPUIs will be assigned to every Command Structure Primitive signal per the rules and guidelines defined in Paragraph 3.3.1.2.1.4.10.

Figure 3.3.1.2.1.3.2-1 illustrates the assignment of SPUIs for these Command Structure Primitive Signals.

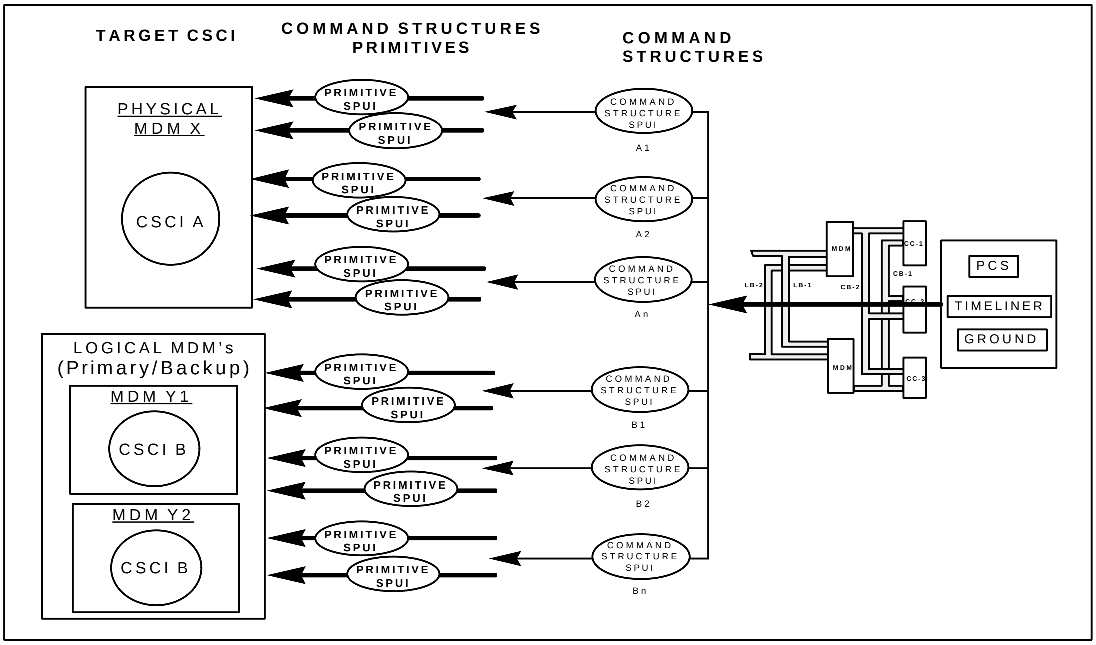


FIGURE 3.3.1.2.1.3.2-1 ASSIGNMENT OF MDM OR PROCESSOR COMMAND STRUCTURE PRIMITIVE SPUIS

SPUIs and associated data assigned to MDM or Processor Command Structure Primitives shall conform to the following rules:

A. First 6 characters of the SPUI shall be defined per Appendix C and Paragraph 3.3.1.2.1.4.10 and

- indicate the Physical MDM or Processor device receiving the command signal (e.g. LADS19, etc.);
- indicate the Logical Primary MDM or Processor receiving the command signal (e.g. S4DP31, etc.); or
- indicate the Logical Backup MDM or Processor receiving the command signal (e.g. S4DB35, etc.) or indicate the CSCI receiving a Generic Primitive Command (e.g. USPZ21);

B. Generic Device Code (Characters 7 and 8) of the SPUI shall be:

- "MD" (as defined in Appendix D) for USOS for all non CCSDS command primitives;

- for International Partners and Payloads non CCSDS command primitives, “SW” is preferred for Primitive commands to the Processor; and
- "CC" for all CCSDS and Legal Station Mode command primitives.

C. Sequence Code (Characters 9 through 12) of the SPUI is assigned at the discretion of the data provider;

D. Signal Type (Character 13) of the SPUI for all Command and Command parameter primitives shall be a "K" (see Appendix E);

E. The Data Provider responsible for the MDM or Processor CSCI receiving this Command Structure Primitive Command Signal shall be designated as the "Functional System Data Provider" of the Software Command Structure primitive and will provide the data via File 1.3 (SW Primitive File) defined in Appendix N;

F. The Data Provider responsible for the MDM or Processor CSCI is the only one authorized to modify or delete the Software Command Primitive signal once it has been baselined;

G. All HW Primitives defined in Appendix N/File 1.1 where Field 1.1-3 (HW Primitive Device Type) only equals 'EFF' shall have a corresponding SW primitive in File 1.3 with the same SPUI as the HW Primitive and Field 1.3-3 identified with a 'HW'; and

H. For all Command Structure Primitives not associated with the CCSDS Primary/Secondary Header, the value for STD Input File 1.3-3 shall be 'PC', 'CD', or 'CO', as applicable.

Note: MOD requires all command specific primitives requiring instantiation to have a value of 'PC', 'CD', or 'CO' in File 1.3-3 and a value of 'IN' in File 6.1-3 because they are unable to assign instance values for software primitives that have a signal type of 'RV'.

An example is shown in Figure 3.3.1.2.1.3.2-2.

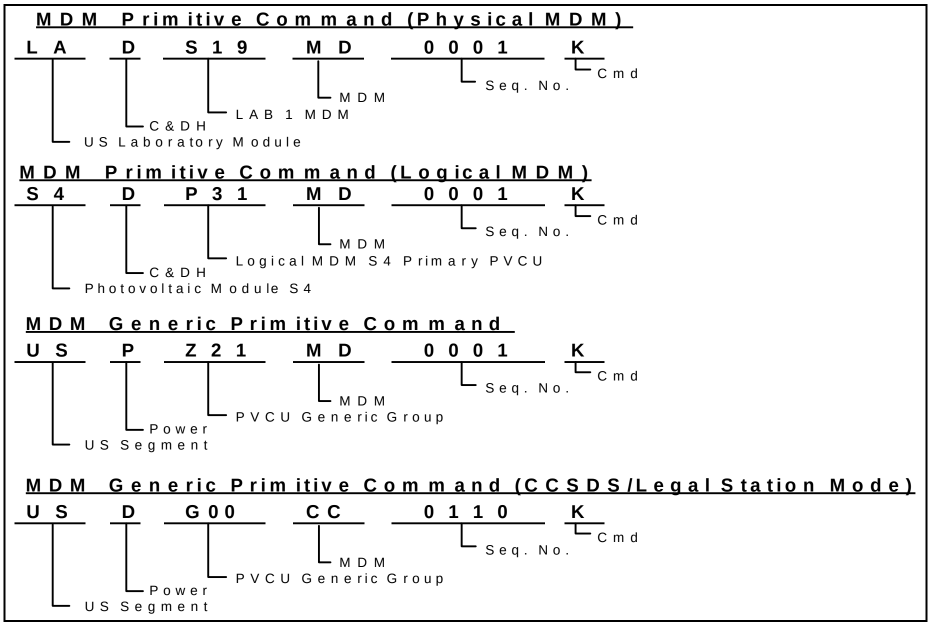


FIGURE 3.3.1.2.1.3.2-2 EXAMPLES OF MDM OR PROCESSOR COMMAND STRUCTURE PRIMITIVE SPUIS

3.3.1.2.1.4 GROUP SIGNALS

Group SPUIs and associated attributes shall be provided by File 5.1 of the IP&CL Standard Input as defined in Appendix N.

The concept of signal grouping is utilized throughout the signal data definition and capture discipline and is the identifying of instances of physical hierarchical containment structures for signals. These structures are given the name “groups”. They may consist of a grouping of signal information as it appears on a 1553B or non-1553 data bus, or a grouping of signal information as it appears within an air-to-ground telemetry transmission, or a grouping of signal information as it appears within a CCSDS header, etc. Group identifiers (SPUIs) are assigned as an abstract method of identifying these structures which are inherent in the designed C&DH signal management system.

These groups bear some significance on how signal data is managed within ground data systems for processing support and human presentation. They may or may not be utilized by the actual system being described.

There are several group attributes captured along with the group SPUI which describe the group and its structural content. There are two attributes that provide the group name and type, in addition to four more descriptive attributes; content SPUIs, content type, content offset, and word order. Appendix N, File 5.1, gives additional information for group attributes.

All group signals decompose into smaller groups and/or primitives (the most basic signal identifier). These defined group structures are described in the following sections with rules and guidelines for their related SPUI determination.

Figure 3.3.1.2.1.4-1 illustrates the types of Group Signals that will require SPUIs.

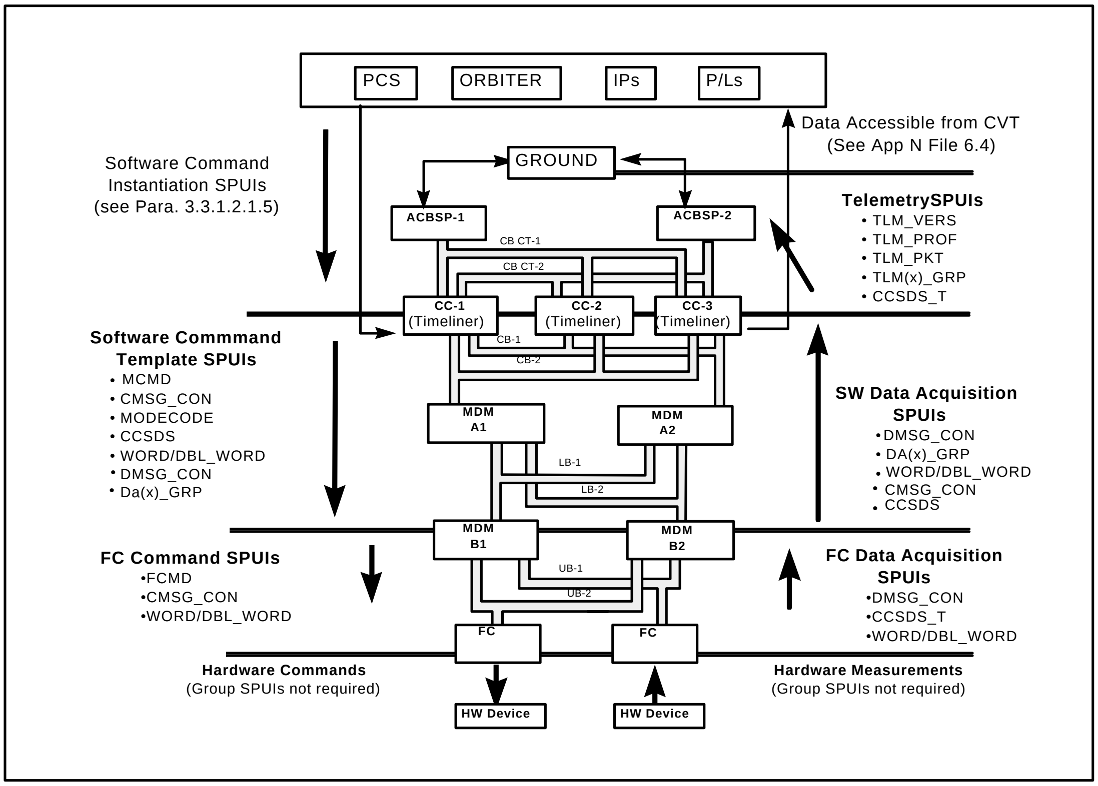


FIGURE 3.3.1.2.1.4-1 TYPES OF GROUP SIGNALS THAT WILL REQUIRE SPUIS

In File 5.1 of Appendix N, there are stringent constraints on the allowable content types for each group type. The relationships of the Group Type (field 5.1-3) and Content Type (field 5.1-5) shall be limited to those defined in Table 3.3.1.2.1.4-1.

TABLE 3.3.1.2.1.4-1 RELATIONSHIP OF GROUP TYPE TO CONTENT TYPE

Group Type \ Content Type	SIGNAL	N/A	DBL_WORD	WORD	DMSG_CON	CMSG_CON	CCSDS	CCSDS_T	TLM_PROF	TLM_PKT	TLM1_GRP	TLM2_GRP	TLM3_GRP	DA1_GRP	DA2_GRP	DA3_GRP	SPARES	BULK	BYTE
WORD	X																X		

	SIGNAL	N/A	DBL_WORD	WORD	DMSG CON	CMSG_CON	CCSDS	CCSDS_T	TLM_PROF	TLM_PKT	TLM1_GRP	TLM2_GRP	TLM3_GRP	DA1_GRP	DA2_GRP	DA3_GRP	SPARES	BULK	BYTE
BYTE	X																X		
DBL_WORD	X																X		
CMSG_CON	X		X	X			X										X	X	
DMSG_CON	X		X	X				X						X	X	X	X	X	
MCMD						X													
FCMD						X													
PIPE DCD					X														
CCSDS	X		X	X													X		
CCSDS_T	X		X	X													X		
TLM_VERS									X										
TLM_PROF								O		S	O	O	O						
TLM_PKT								X			X	X	X					X	
TLM1_GRP	X		X	X													X	X	
TLM2_GRP	X		X	X													X	X	
TLM3_GRP	X		X	X													X	X	
DA1_GRP	X		X	X													X	X	
DA2_GRP	X		X	X													X	X	
DA3_GRP	X		X	X													X	X	
MODECODE		X																	
RS485	X		X	X													X		X

Legend

X	Allowed
S	Allowed for S-band packets
O	Allowed for OIU packets

3.3.1.2.1.4.1 MESSAGE CONTENT GROUP SIGNAL

A Message Content Group Signal is defined as the grouping of up to thirty-two (32) sixteen (16) bit data words/primitives within any one 1553 message. The "Command Word" and "Status Word" is not considered an integral part of the 1553 Message Content Group Signal. SPUIs will be assigned to all unique 1553 Message Contents.

Figure 3.3.1.2.1.4.1-1 illustrates the assignment of SPUIs for Message Content Group Signals.

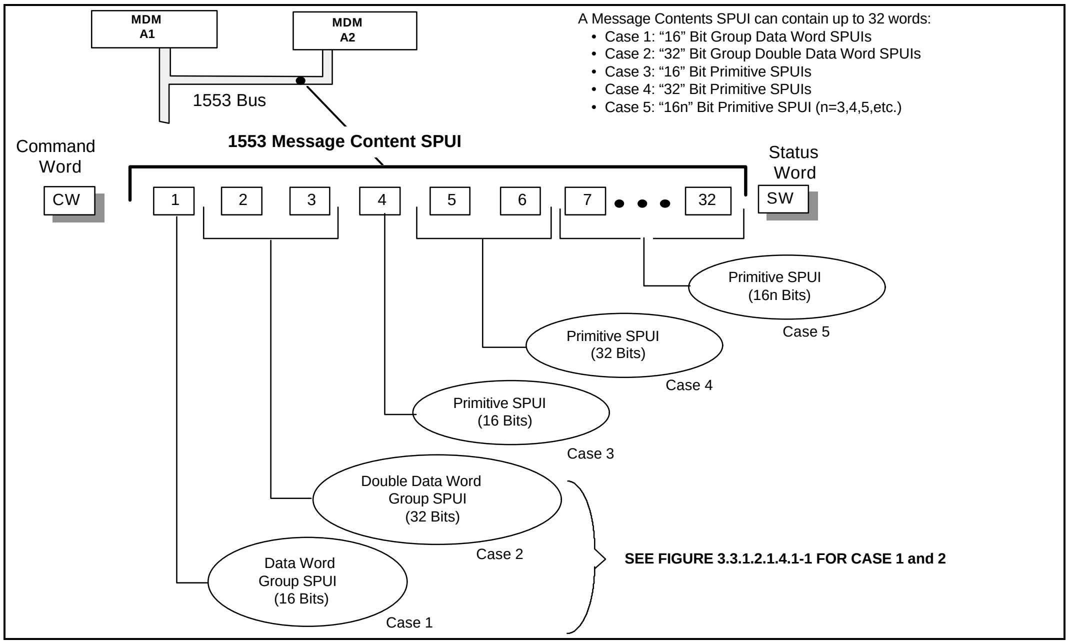


FIGURE 3.3.1.2.1.4.1-1 ASSIGNMENT OF SPUI FOR MESSAGE CONTENT GROUP SIGNALS

SPUIs assigned to all Unique Message Content Group Signals shall conform to the following rules:

A. First 6 characters of the SPUI shall be defined per Appendix C and indicate the Remote Terminal (RT) device, generic group device, or logical MDM device generating (source) or receiving (destination) the Message Content (e.g. USPZ21, etc.);

B. Except for International Partners, Generic Device Code (Characters 7 and 8) of the SPUI shall be:

- "FC" if device is a Firmware Controller; or
- "MD" if device is a MDM;

C. Sequence Code (Characters 9 through 12) of the SPUI is assigned at the discretion of the data provider (e.g. 0001, 0003, etc.);

D. Signal Type (Character 13) of the SPUI shall be "L" (see Appendix E);

E. The Remote Terminal (RT) device, generic group device, or logical MDM device generating (source) or receiving (destination) the Message Content Group Signal shall be designated as the "Functional System Data Provider";

F. The Data Provider will be the only one authorized to modify or delete the Message Content Group signal once it has been baselined;

G. The Message Content Group SPUI shall not change if the message contents of any given 1553 Message does not change as it moves from one 1553 message to another 1553 message;

H. The Group Type (Field 5.1-3) as defined in File 5.1 of Appendix N (Standard In) shall be:

- "CMSG_CON" if the message contents is a command signal or if the message contents is the data word in a mode code with data word; or
- "DMSG_CON" if the message content is a measurement or broadcast signal; or
- "MODECODE" if the message content is the null representation of any mode code command which does not include a data word.

Example of a Message Content Group SPUI is shown in Figure 3.3.1.2.1.4.1-2.

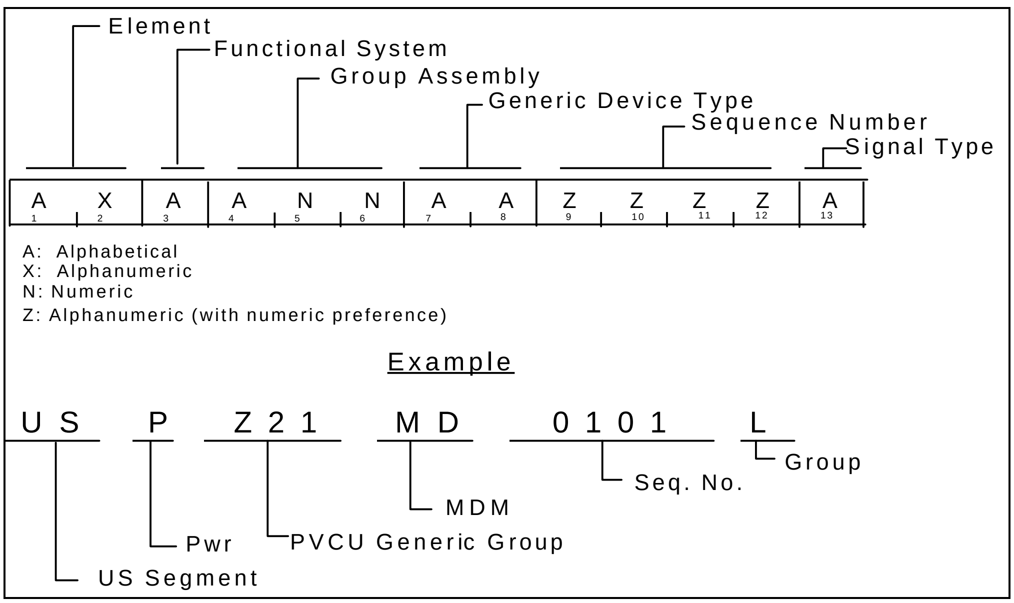


FIGURE 3.3.1.2.1.4.1-2 EXAMPLE OF A MESSAGE CONTENT GROUP SPUI

3.3.1.2.1.4.2 MESSAGE WORD/DOUBLE WORD GROUP SIGNAL

A 1553 Message Contents Group Signal is defined as a contiguous 16 bits (one word) or a contiguous 32 bits (one double-word). A 16-bit 1553 Message Contents Group Signal will contain between one and sixteen signal primitives, but must contain the full 16 bit word (e.g. Complete the word with spares or additional primitives). A 32-bit 1553 Message Contents Group Signal will contain between one and 32 signal primitives, but must contain the full 32 bit double word (e.g. Complete the double word with spares or additional primitives).

Figure 3.3.1.2.1.4.2-1 illustrates the assignment of SPUIs for Message Word Group Signals.

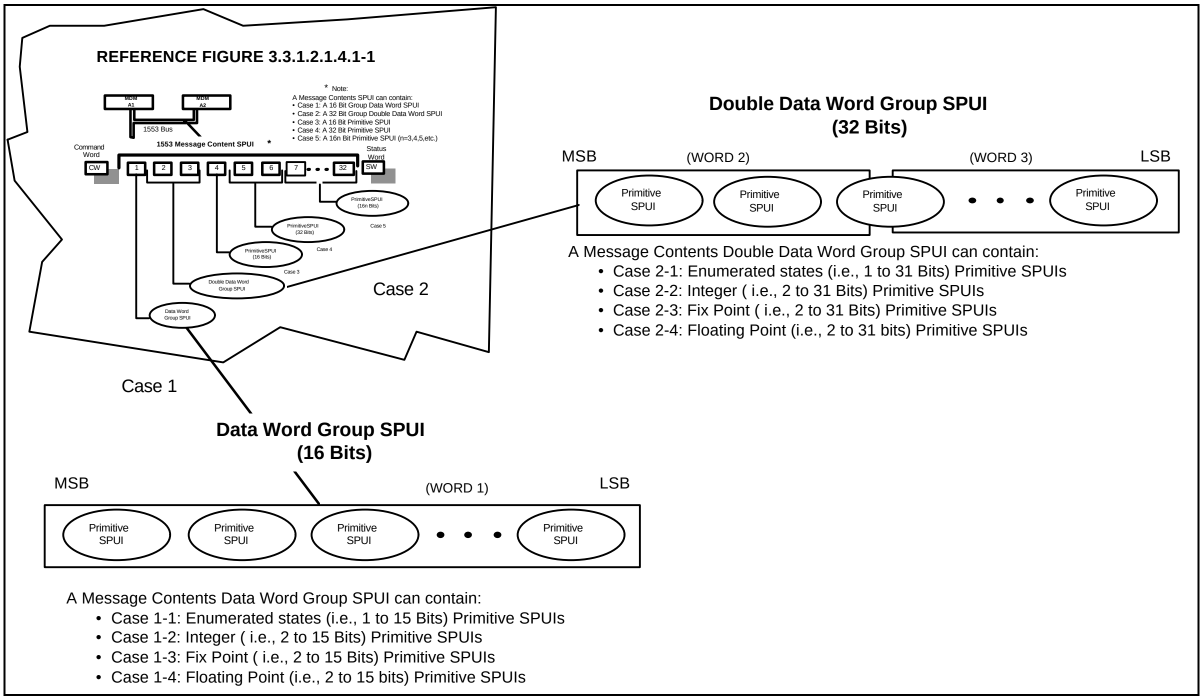


FIGURE 3.3.1.2.1.4.2-1 ASSIGNMENT OF SPUIS FOR MESSAGE WORD/DOUBLE WORD GROUP SIGNALS

SPUIs and associated data assigned to Message Word Group Signals shall conform to the following rules:

A. First 6 characters of the SPUI shall be defined per Appendix C and indicate the Remote Terminal (RT) device, generic group device, or logical MDM device generating (source) or receiving (destination) the Message Word (e.g. USPZ21, etc.);

B. Except for International Partners, Generic Device Code (Characters 7 and 8) of the SPUI shall be defined per Appendix D and indicate:

- "FC" if device is a Firmware Controller;
- "MD" if device is a MDM; or
- "CC" a CCSDS or Legal Station Mode word;

C. Sequence Code (Characters 9 through 12) of the SPUI is assigned at the discretion of the data provider (e.g. 0001,0003, etc.);

D. Signal Type (Character 13) of the SPUI shall be "L" as defined per Appendix E;

E. The Remote Terminal (RT) device, generic group device, or logical MDM device generating (source) or receiving (destination) the Message Word Group Signal shall be designated as the "Functional System Data Provider";

F. The Data Provider will be the only one authorized to modify or delete the Message Word Group signal once it has been baselined;

G. The Message Word Group SPUI shall not change if the message word contents of any given 1553 Message Content does not change as it moves from one 1553 message to another 1553 message;

H. The Group Type (Field 5.1-3) as defined in File 5.1 of Appendix N (Standard In) shall be "WORD" or “DBL WORD”;

I. A Message Word Group SPUI or Message Double-Word Group SPUI shall not be created if the word or double-word slot contains a single 16-bit or single 32-bit signal Primitive respectively.

J. A 16 bit word Message Content Group SPUI shall be assigned in all cases where the content SPUI(s) is a Primitive(s) less than 16 bits in length.

Example of a Message Word Group SPUI is shown in Figure 3.3.1.2.1.4.2-2.

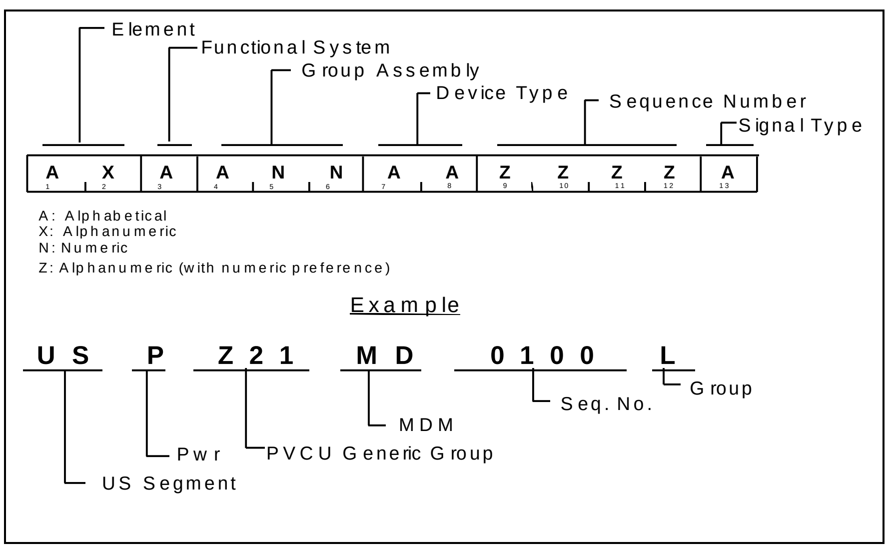


FIGURE 3.3.1.2.1.4.2-2 EXAMPLE OF A MESSAGE WORD GROUP SPUI

3.3.1.2.1.4.3 COMMANDS

Commands to software on board the ISS, can originate from a number of command sources on the ground and on board the Space Station. In order for these commands to be acted upon, or executed by software in a destination processor the command must be delivered to the destination processor. The destination processor can be any MDM, international processor, or in some cases, firmware controllers. Once a command reaches its destination the command is executed by application software unique to the command.

Three types of commands are utilized on board the ISS:

- Standard Commands;
- Data Load/File Transfer Commands; and
- Non CCSDS Firmware Commands.

Standard Commands are used to instruct or command a function at the destination of a command and consist of one or two CMSG_CON 1553 messages of which the first message always contains the CCSDS protocol.

Data Load/File Transfer commands are used to transfer data from the source to the destination and consists of up to 9 CMSG_CON messages of which the first message always contain the CCSDS protocol.

Non CCSDS Firmware Commands do not contain CCSDS headers and are used to transmit Firmware command primitives as defined in Paragraph 3.3.1.2.1.2.2 (Primitive signals to Firmware Controller) via 1553 CMSG_CONs.

All ISS-Standard Commands and Data Load/File Transfer Commands will be identified with a 'Command Structure' as defined in Para. 3.3.1.2.1.4.3.1. The Command Structure provides a shell for the types of commands that are available to be transmitted to a particular destination while the actual transmitted commands to the onboard system is identified as an 'Instantiated Command' as defined in Para. 3.3.1.2.1.4.3.2. The instantiated command provides the unique values for the parameters established by the Command Structure. In some cases, commands will be available as "Template Commands' which again is based on the Command Structure; however, the actual values for the parameters will be inserted at the command source.

Details of and requirements for application of the CCSDS Protocol for Standard and Data Load/File Transfer Commands are provide in SSP 41154 (ISS Space to Ground ICD). This section provides the rules and guidelines for providing IPCL data via the Standard Input Files (Appendix N) to the MBF for Standard, Data Load/File Transfer, and Non-Standard Commands.

3.3.1.2.1.4.3.1 COMMAND STRUCTURE

A Command Structure Signal is defined as a structure of digitized Command Primitive Signals that could originate from the ground, the PCS, or a MDM/Processor CSCI and is transmitted on a 1553 bus via the C&C MDM (NCS MDM in early configuration) to the target MDM/FC/Processor for the purpose of initiating an action within the target MDM/ FC/Processor CSCI. The purpose for MDM/FC/Processor Command Structure signals is to identify the existence of commands to each unique CSCI without identifying the specific physical MDM/FC/Processor receiving the command. Each Command Structure requires a Group SPUI defined in Appendix N/File 5.1 (Group File), values provided in Appendix N/File 6.1 (Command Structure Value File) and the content of the Command Structure is defined in Appendix T. Rules for defining Primitives associated with Command Structures are defined in Paragraph 3.3.1.2.1.3.2 (Primitive Signals To MDM Or Processor Software).

Figure 3.3.1.2.1.4.3.1-1 illustrates assignment of Group SPUIs to the contents of Command Structure Signals.

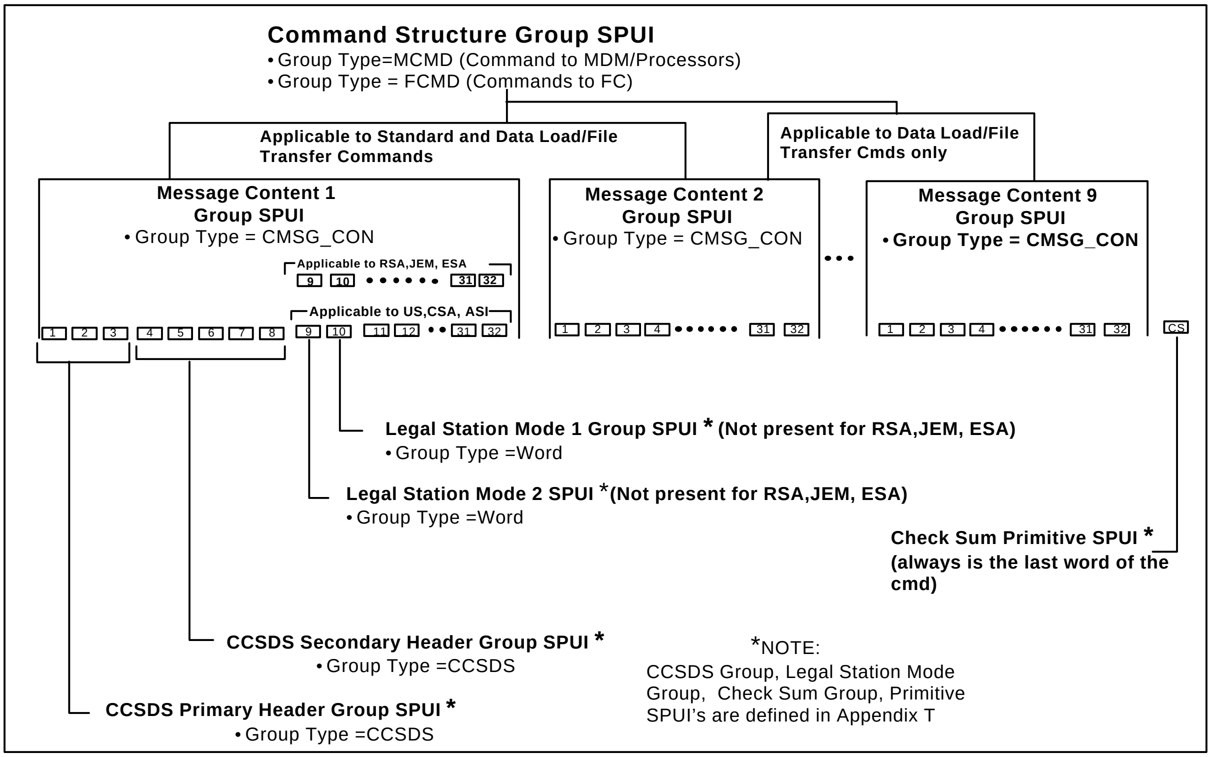


FIGURE 3.3.1.2.1.4.3.1-1 EXAMPLE FOR ASSIGNMENT OF GROUP AND PRIMITIVE SPUIS TO CONTENTS OF COMMAND STRUCTURE SIGNALS

SPUIs and associated data assigned to all Command Structure Group Signals shall conform to the following rules:

A. First 6 characters of the SPUI shall be defined per Appendix C and

- indicate the Physical MDM/FC/Processor device receiving the command template signal (e.g. LADS19, etc.); or
- indicate the Logical Primary MDM/FC/Processor receiving the command template signal (e.g. S4DP31, etc.); or
- indicate the Logical Backup MDM/FC/Processor receiving the command template signal (e.g. S4DB35, etc.).

B. Generic Device Code (Characters 7 and 8) of the SPUI shall be:

- “FC” (as defined in Appendix D) only if the Command Structure destination is a Firmware Controller (e.g., CheCs equipment);
- "MD" (as defined in Appendix D) for USOS;

- ‘SW’ is preferred for International Partners and Payloads;

C. Sequence Code (Characters 9 thru 12) of the SPUI is assigned at the discretion of the data provider.

D. Signal Type (Character 13) of the SPUI shall be a "L" as defined per Appendix E.

E. The MDM/FC/Processor CSCI receiving this Command Structure Signal shall be designated as the "Functional System Data Provider".

F. The Data Provider responsible for the MDM/FC/Processor CSCI will be the only one authorized to modify or delete the Command Structure signal once it has been baselined.

G. Command Structures shall conform to the formats as identified in Appendix T.

H. Command Structure values shall be submitted per File 6.1 of the IP&CL Standard Input as defined in Appendix N.

I. A command structure is intended to be unique for a CSCI. The same structure shall be utilized for all circumstances where the same command is being transmitted to multiple processors each with the same CSCI. The constraint is that a command structure must have a unique SPUI for each CSCI to which the command is being sent. If the CSCI is represented by a Logical Primary and Logical Backup Device PUI in Appendix C, then a command structure Group SPUI will be assigned only to the Logical Primary Device PUI.

J. All Command Structure Value Files (Appendix N/File 6.1) shall have a record(s) containing the Logical Data Path (LDP) value in field 6.1-3 regardless of the CCSDS Header format. The identification of all LDPs to which a command structure applies is identified in the Command Structure Value (6.1) file by means of multiple records with the same structure group PUI, the same primitive PUI, and different LDP values for Primitive USDG00CC0720K. This method shall be interpreted to mean that the command structure may be instantiated for any of the identified LDPs. The LDP values to be used are defined in Appendix U.

Note: If the value for a LDP is not identified in this file, an instantiated command will not be provided. File 6.1 is used by MOD to support their instantiation process. The LDP is used to determine which firmware controllers, MDMs, or processors require instantiated commands.

K. Command Structure SPUIs shall be defined in Appendix N/File 5.1 (Group File) where:

- Group Type = MCMD for Command Structures targeted to MDM/Processors; and
- Group Type = FCMD for Command Structures targeted to FCs.

L. Standard Commands will contain up to two CMSG_CONS.

M. Command Primitives or Word/Double Word crossing the1553 message boundary between the first CMSG_CONS and second CMSG_CONS is acceptable. In Appendix N/File 5.1 (Group File), the first entry of the second CMSG_CON will contain a word offset value (Field 5.1-6) which allows space for the overflow of the Command Primitive or Word/Double Word.

N. Data Load/File Transfer Commands will contain up to nine (9) CMSG_CONS where all words subsequent to Start Address: Most Significant Word up to the Check Sum will be considered to be "BULK" data as defined in Para. 3.3.1.2.1.4.7.

O. CMSG_CONS for all Standard and Data Load/File Transfer Commands shall be defined in Appendix N/File 5.2 (Message Transaction File) as noted below:

- Provided only on the final destination buses of the MDM/Processor/Firmware Controller receiving the Command except for:
  - PCS to NCS Interface;
  - PCS to CCS Interface; and
  - OIU to NCS Interface.
- For PCS to NCS Interface, PCS to CCS Interface, and OIU to NCS Interface only a generic set is required to define the existence of the required set of boxcars (i.e. command pipe) is required.

P. Command Primitive SPUIs:

- shall appear only once in a specific MCMD/FCMD; and
- can appear in more than one MCMD/FCMD.

An example of Command Structure SPUIs is shown in Figure 3.3.1.2.1.4.3.1-2.

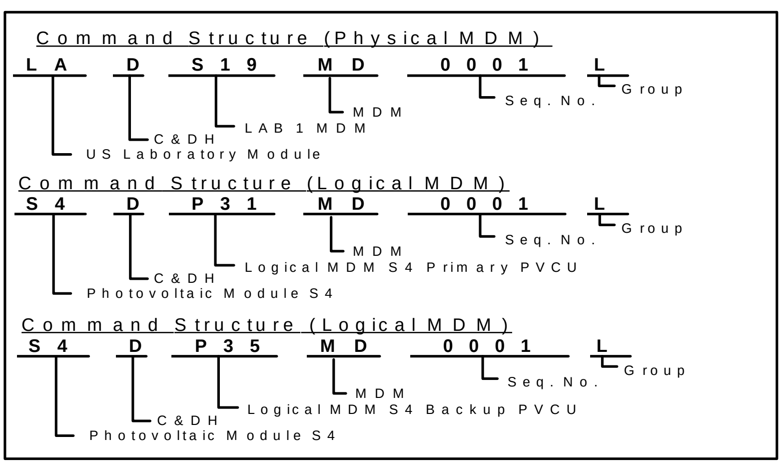


FIGURE 3.3.1.2.1.4.3.1-2 EXAMPLE OF A COMMAND STRUCTURE GROUP SPUI

3.3.1.2.1.4.3.2 COMMAND INSTANTIATION

Command Instantiation Signal is defined as the actual digitized command signals that originates from the ground, the PCS, or a MDM/Processor CSCI and is transmitted via a 1553 bus to the target MDM/Processor for the purpose of initiating an action within the target MDM/Processor CSCI. All Command Instantiation Signals are based on the Command Structure defined in paragraph 3.3.1.2.1.4.3.1 and provided by File 6.2/6.5 of the IP&CL Standard Input (Appendix N). SPUIs will be assigned to all Command Instantiation Signals.

Command Template is defined as a partially instantiated command. A command template is created by partially instantiating a Command Structure.

The rules and guidelines below are applicable for Command Instantiation and Command Templates.

The Station Management and Control Integrated Product Team (SMC IPT) and/or NASA MOD is responsible for Command Instantiation Commands and will use the data contents provided by the data providers of the command structure as the basis to create Command Instantiated SPUIs and associated data necessary for the on board software to accept the command.

Figure 3.3.1.2.1.4.3.2-1 illustrates that a Command Instantiation Signal is based on the Command Structure.

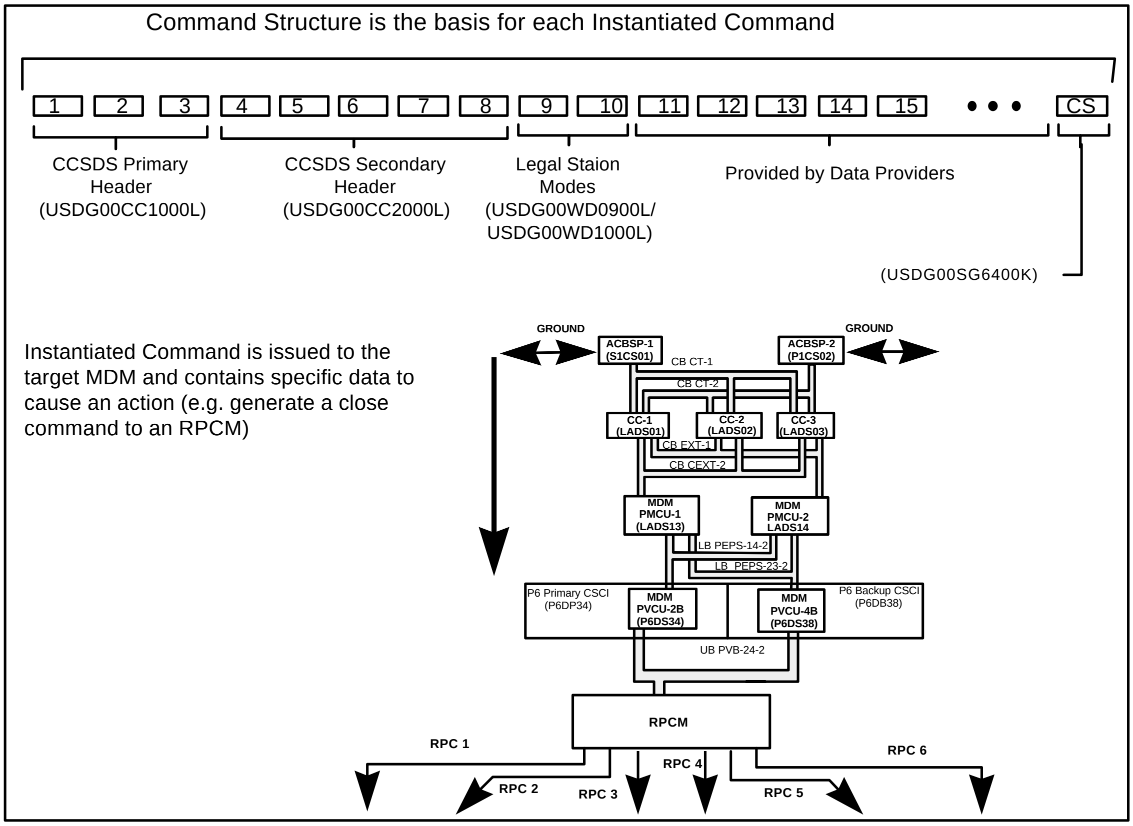


FIGURE 3.3.1.2.1.4.3.2-1 COMMAND INSTANTIATION SIGNALS ARE BASED ON COMMAND TEMPLATE STRUCTURES

SPUIs and associated data assigned to all Command Instantiation Signals shall conform to the following rules:

A. First 6 characters of the SPUI shall be defined per Appendix C where the Device Code equals CIP (Command Instantiated PUI) and:

- the first two characters indicate the element of the targeted Instantiated Command as defined in Appendix U; and
- the third character indicates the system as documented in Appendix B; and
- the fourth, fifth, and sixth characters indicate the Operations subsystem that will be using the command;

B. Generic Device Code (Characters 7 and 8) of the SPUI shall be "SM”, “IM”, or “MG” as defined in Appendix D;

C. Sequence Code (Characters 9 thru 12) of the SPUI is assigned at the discretion of the SMC/MOD team;

D. Signal Type (Character 13) of the SPUI shall be a "K" as defined per Appendix E;

E. The SMC Team and MOD shall be designated as the "Functional System Data Provider" of the Command Instantiation Signal;

F. The SMC Team and MOD will be the only ones authorized to modify or delete the Command Instantiation Signal once it has been processed;

G. Command Instantiated SPUIs shall be submitted per File 6.2 of the IP&CL Standard Input as defined in Appendix N;

H. Command Instantiated values shall be submitted per File 6.5 of the IP&CL Standard Input as defined in Appendix N;

Example of a Command Instantiated SPUI is shown in Figure 3.3.1.2.1.4.3.2-2.

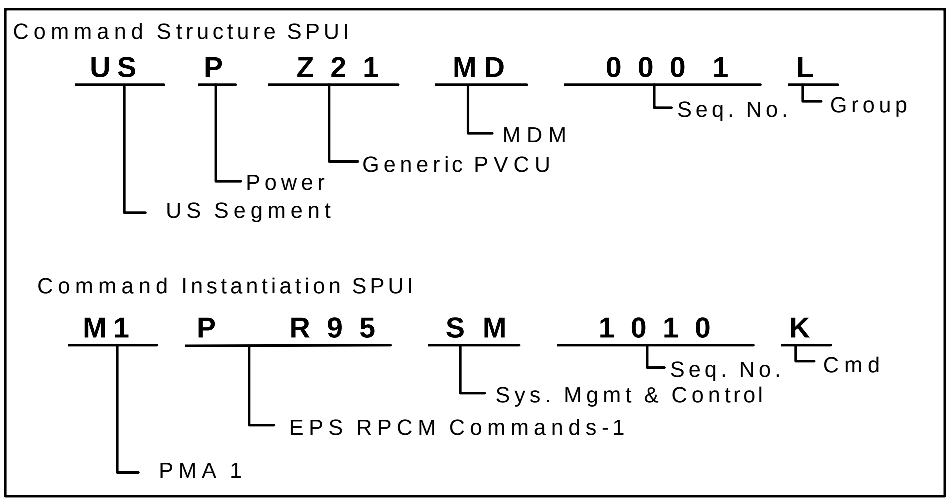


FIGURE 3.3.1.2.1.4.3.2-2 EXAMPLE OF A COMMAND INSTANTIATION SPUI

3.3.1.2.1.4.3.2.1 INSTANTIATED COMMAND CRITICALITY

Command Criticality is populated as a function of the hazardous nature of the action invoked, the method of invocation, and operational considerations for protection of those invocation methods. ISS commands are classified into four categories of criticality, as specified in Appendix N, File 6.2-5. Table 3.3.1.2.1.4.3.2.1-1 reflects the operational protection implications of each criticality level for both onboard and ground uplink invocation of ISS destined commands.

TABLE 3.3.1.2.1.4.3.2.1-1 COMMAND CRITICALITY IMPLICATIONS

Criticality/Ops Implication	Shuttle MCDS	Shuttle MCC	PCS	Station MCC
1. Arm/Fire, Hazardous	Hazardous (Item # + 88)	Safed	None	Fire - Safed Arm/Disarm - Safing not required
2. Not Arm/Fire, Hazardous	Hazardous (Item # + 88)	Safed	<Prompt> Are you Sure?	Safed
3. Requested protection, non-hazardous	Protected (Item # + 99)	Safed	<Prompt> Are you Sure?	Safed
4. No protection, non-hazardous	None	None	None	Safing not required

3.3.1.2.1.4.3.3 NON CCSDS FIRMWARE COMMANDS

A Non CCSDS Firmware Command Signal is defined as those 1553 messages associated with Firmware Controller Primitive signals (i.e CMSG_CONs) denoted in Paragraph 3.3.1.2.1.2.2 (Primitive signals to Firmware Controller). As noted in Paragraph 3.3.1.2.1.2.2, non-CCSDS Firmware Command signals are only required per each unique type of Firmware Controller. Based on this requirement, only one set of CMSG_CONS are required to be identified in Appendix N/File 5.1 (Group File) per Firmware Controller type.

SPUIs and associated data assigned to Firmware Controller CMSG_CONSs shall conform to the following rules:

A. First 6 characters of the SPUI shall be defined per Appendix C and indicates the FC device or FC generic device receiving the command signal (e.g. LAEA11, S6PZ28, USPZ31, etc.).

B. Generic Device Code (Characters 7 and 8) of the SPUI shall always be FC (as defined in Appendix D).

C. Sequence Code (Characters 9 through 12) of the SPUI is assigned at the discretion of the data provider.

D. Signal Type (Character 13) of the SPUI shall be a "L".

E. The Data Provider responsible for the Firmware Controller receiving this Command Signal shall be designated as the "Functional System Data Provider" of the Firmware Controller Measurement and will provide the data via File 5.1 (Group File) and File 5.2 (Message Transaction File) defined in Appendix N.

F. The Data Provider responsible for the Firmware Controller will be the only one authorized to modify or delete the Firmware Controller Command Primitive signal once it has been baselined.

3.3.1.2.1.4.4 DATA ACQUISITION

Data Acquisition is the process of lower level processors collecting monitored signal data and presenting it via 1553B protocols to the Tier 1 C&C MDMs for ISS systems availability (or such processor assuming the role of a C&C MDM). The C&C MDMs receive the accumulated signal data via sets of MDM-unique 1553B data acquisition messages which are Time Division Multiplexed (TDM) across the entire ISS bus architecture. Subordinate MDM bus tiers pass collected information up to the next higher tier for eventual presentation to the C&C MDMs. Non-MDM processors subordinate to the lowest level MDM processors in a bus path provide data acquisition messages to their bus-controlling MDM processor for transfer up the MDM hierarchy. These lower level, non-MDM processors are not sensitive to the 1553B bus timing architecture of the MDM-to-MDM buses and therefore are exempted from providing specific bus timing information in the definition of their role in the data acquisition process.

3.3.1.2.1.4.4.1 NON-MDM DATA ACQUISITION

Each 1553B data message in the set of Data Acquisition messages for non-MDM processors which contains monitored data shall be identified by a unique Data Message Content group SPUI. These SPUIs and data attributes shall conform to the following rules:

A. The Data Message Content Group SPUI assignment shall conform to the rules of Section 3.3.1.2.1.4.1 of this document.

B. The Data Message Content Group type shall be DMSG_CON which shall conform to the constructs for Message Groups and Message Word Groups set forth in Section 3.3.1.2.1.4.1 and 4.2 of this document.

C. Bus timing attributes of Standard Input file 5.2 (fields 5.2-2, 5.2-3, and 5.2-4) shall be N/A for these SPUIs.

D. Firmware Controller Data Acquisition sets of Data Message Content SPUIs shall be exempt from the requirement for Data Acquisition Rate Group assignments via file 5.1 and rate group boundary assignments via file 5.4.

E. The appropriate data definition (e.g., Primitive, word groups, etc.) will be provided by the ISS C&DH Data Integration Team if CCSDS Header information is present within these data acquisition sets.

F. Signals which are packed into a word for transmission from a Tier 3 device to a Tier 2 device should not have a new word PUI assigned at Tier 2 if the word is passed intact from Tier 2 to Tier 1 with the identical signal composition.

G. If there is good reason for repacking signals into new word definitions at the Tier 2 level and these words are not identical in signal composition to any Tier 3 words, then such repacked words require a new word PUI to be assigned.

H. Repacking and consequent new word PUI assignment at the Tier 2 level is not appropriate in cases where it is desired to ignore (or spare out) certain signals within a word, but the word structure remains otherwise unchanged.

3.3.1.2.1.4.4.2 MDM OR PROCESSOR DATA ACQUISITION

Data acquisition for MDM processors shall require that each message in the set of 1553B data messages containing their monitored data be identified by a unique Data Message Content group SPUI and specific rate grouping information be provided. These SPUIs and data attributes shall conform to the following rules:

A. The Data Message Content Group SPUI assignment shall conform to the rules of Section 3.3.1.2.1.4.1 of this document.

B. The Data Message Content Group type shall be DMSG_CON which shall conform to the constructs for Message Groups and Message Word Groups set forth in Section 3.3.1.2.1.4.1 and 4.2 of this document.

C. Bus timing information shall be provided per Standard Input file 5.2.

D. Rate group boundary information determined by C&DH design for each individual MDM data acquisition message set shall be provided via Standard Input file 5.4.

E. Data Acquisition Rate Group subgrouping constructs DAx_GRP shall be supplied as applicable.

F. The appropriate data definition (e.g., Primitive, word groups, etc.) will be provided by the ISS C&DH Data Integration Team if CCSDS Header information is present within these data acquisition sets.

G. Data acquisition messages which compose a complete contiguous set of status data for a given MDM device shall be identified by the assignment of a pipe PUI with a group type of PIPE_DCD per Section 3.3.1.2.1.4.6.1.

H. Signals which are packed into a word for transmission from a Tier 3 device to a Tier 2 device should not have a new word PUI assigned at Tier 2 if the word is passed intact from Tier 2 to Tier 1 with the identical signal composition.

I. If there is good reason for repacking signals into new word definitions at the Tier 2 level and these words are not identical in signal composition to any Tier 3 words, then such repacked words require a new word PUI to be assigned.

J. Repacking and consequent new word PUI assignment at the Tier 2 level is not appropriate in cases where it is desired to ignore (or spare out) certain signals within a word, but the word structure remains otherwise unchanged.

3.3.1.2.1.4.4.3 MDM OR PROCESSOR DATA ACQUISITION RATE GROUPS

A Data Acquisition Rate Group is a required subgrouping superimposed on a set of 1553B DMSG_CON message groups (the number of DMSG_CON message groups per set is a C&DH design decision for each MDM) identified as that set of MDM messages containing the C&C CVT-bound signal data. The purpose for the data acquisition rate groupings is to provide explicitly the information necessary for the C&C MDM to populate its CVT for ISS systems access to signal data. This information is provided by defining the data acquisition rate group SPUIs as the content signals of the appropriate DMSG_CON group SPUIs, and then defining the Word/Double_Word or Signal SPUIs as the content signals of the data acquisition rate group, DAx_GRP, group SPUIs.

SPUIs shall be assigned to all Data Acquisition Rate Group Signals in conformance to the following rules:

A. First 6 characters of the SPUI shall be defined per Appendix C and

- indicate the Logical Primary MDM from which the data content messages originate (e.g. S4DP31, etc.); or
- indicate the Logical Backup MDM from which the data content messages originate (e.g. S4DB35, etc.).

B. Except for International Partners, Generic Device Code (Characters 7 and 8) of the SPUI shall be "MD" as defined in Appendix D.

C. Sequence Code (Characters 9 thru 12) of the SPUI is assigned at the discretion of the data provider.

D. Signal Type (Character 13) of the SPUI shall be a "L" as defined per Appendix E.

E. The MDM CSCI generating the Data Message Content Group Signal associated with the Data Acquisition Rate Group SPUIs shall be designated as the "Functional System Data Provider".

F. The Data Provider responsible for the MDM CSCI will be the only one authorized to modify or delete the Data Acquisition Rate Group signal once it has been baselined.

G. Data Acquisition Rate Group rate values are established by the group type assignment in Standard Input file 5.1 to each rate group SPUI where:

- DA1_GRP indicates a rate assignment of 10 Hz
- DA2_GRP indicates a rate assignment of 1 Hz
- DA3_GRP indicates a rate assignment of 0.1 Hz

NOTE: CCSDS Headers (where present within data acquisition sets) are defined as part of the 10 Hz data and are not assigned a separate group identifier for rate group considerations. It is pass-thru information for ground systems usage and will be identified via the normal definition process of the data stream of which they are a part.

A. Data Acquisition Rate Group SPUIs shall be assigned as Content Signals to DMSG_CON groups with the content type of DAx_GRP, and Content Offset of the 1553B word number within the DMSG_CON where the rate group being defined begins (See Table 3.3.1.2.1.4-1).

B. Data Acquisition Rate Group SPUIs shall be defined in Standard Input file 5.1 with:

- Group Type of DA1_GRP, DA2_GRP, or DA3_GRP,
- Content Signal Type of WORD, DBL_WORD, SIGNAL, or a legal spares indicator
- Content PUI value with the word SPARES shall be acceptable (consistent with rules established for the use of spares elsewhere in the 5.1 file),
- Content Offset of the absolute word position within the specific rate grouping being identified, beginning with 1 and ending with the number of the last word within that group. This Content Offset applies individually to each rate group.

C. Rules governing the multiple uses of signal primitive PUIs for data acquisition:

These data acquisition rules apply to the inputs to CCS and NCS. Lower tier boxes may be excepted if the design and interface agreement allow multiple primitives in a message.

- A signal, regardless of its size, can appear once and only once between a source and destination for a given stage. (The Russian interface contains an exception.)
- Two logical sources cannot provide the same primitive to the same logical destination.

3.3.1.2.1.4.4.4 ISS S-BAND TELEMETRY

The general definition of telemetry is the process of collection, preparation, and transmission of digitized information from one point to another via an established communication medium. The ISS employs several technologies to accomplish this task, each requiring different conventions of description. The context of this document focuses on content, organizational definition and management of the ISS S-Band communications link information.

There are several telemetry sources and sinks which require content and/or organizational definition in terms of ISS signal conventions defined in this document. These include, but are not limited to, the following:

- ISS S-Band transmissions via the ACBSP to MCC-H
- ISS telemetry transmissions via SSSR to space sink

- ISS telemetry transmissions via OIU to Shuttle
- Contingency telemetry from SMCC via USOS to MCC-M via MCC-H
- Contingency telemetry from USOS via SMCC to MCC-H via MCC-M
- EVA Suit telemetry — preemptive packets in ISS S-Band to MCC-H
- PDGF telemetry — preemptive packets in ISS S-Band to MCC-H
- APM VTC/MMC telemetry — preemptive packets in ISS S-Band to ESOC via MCC-H

The conventions applied for telemetry content definition in the various source/sink instances are primarily determined by the transmission medium and protocol employed. The factors influencing conventions established in this document are the utilization of CCSDS packetizing protocol and/or MIL-STD-1553B bus protocol. The USOS utilizes these conventions to define telemetry organization and content for those sources/sinks requiring subsequent processing defined by formal interface controlling documentation. All ISS participants requiring USOS support in telemetry processing utilize these conventions where applicable.

Where pass-through support is provided by the USOS, the requirement to define telemetry organization exists, but that of defining telemetry content using these conventions is a matter of mutual agreement among ISS participants, which should also consider any USOS ground reconfiguration support requirements. The mechanization is supplied in this document and will be recognized by the USOS.

3.3.1.2.1.4.4.4.1 NORMAL S-BAND TELEMETRY DEFINITION

ISS S-Band Telemetry Definition is the process of packaging data acquired by the functioning Command and Control MDMs from lower-tier devices and making it available for transmission to various signal sinks. Routing varies with the sink and ISS configuration. Basic telemetry constructs vary with the targeted ISS functional coverage. In the ISS nominal telemetry sink and routing scheme, the C&C MDMs receive the accumulated signal data via sets of MDM-unique 1553B data acquisition messages, which are Time Division Multiplexed (TDM) across the entire ISS bus architecture (as well as acquiring the data from devices via direct connection, and by actually generating data). Data within the C&C MDMs which is available for telemetry selection is stored in a Current Value Table (CVT). Predefined Telemetry Format tables are utilized by the C&C MDM to build S-band telemetry packets. Packet content and content rate assignments are predicated on data acquisition availability and ISS functional status-reporting requirements. There is a predetermined set of telemetry packet types, each containing a unique CCSDS header and a set maximum number of words of data (Refer to Appendix H). The data contained in each packet is allocated to discrete rate groups (currently 10Hz, 1Hz and .1 Hz). Each rate group contains primitive signal data that is stored either in words, double words or individually depending on its bit size. Packets are combined by the C&C MDM into a processing frame transfer of telemetry data, which is transmitted every 100 milliseconds at high rate or less often at low rate.

The combination of all “potential” packets that, by design, could comprise a telemetry processing frame will constitute that particular Telemetry Processing Frame definition. Certain selectable options enable and or disable a preemptive packet priority scheme. This is a capability where runtime dynamics determine the “actual” set of packets selected for a given telemetry processing frame transfer for transmittal to the external sink. For formats without this option, the “potential” packet set equals the “actual” set. Finally, the combination of all telemetry processing frames that comprise the configuration for a full ISS C&DH major frame set of telemetry transfers will constitute a Telemetry Version definition, the highest level construct for ISS S-band telemetry signal management.

3.3.1.2.1.4.4.4.2 TELEMETRY VERSIONS

A Telemetry Version is defined as that total set of potential telemetry content which is collected and organized for transmittal within the largest basic processing increment. For the ISS, that increment is termed a major frame and is composed of 100 units called processing frames, each of equal construct. The C&DH has defined a fixed task scheduling environment based on a 10Hz processing frame from which the telemetry task receives its cyclic organization. Telemetry major frames and processing frames may be of a different time base than the C&DH processor task scheduling and I/O frames. Each specific telemetry version is defined to the program to enable interim and end-user consumption of the telemetry data. For identification and organization, each unique telemetry version is assigned a group PUI as the highest level group identifier, with subgroup and signal SPUI content assignments made as necessary to fully define its specific version construct and content.

The rule for assigning Telemetry Version group SPUIs is as follows:

A. First 6 characters of the SPUI shall be defined per Appendix C and indicate the Logical Primary MDM in which the telemetry version is constructed (e.g. S4DP31, etc.)

B. Device Code (Characters 7 and 8) of the SPUI shall be "TL" as defined in Appendix D.

C. Sequence Code (Characters 9 through 12) of the SPUI shall be assigned at the discretion of the telemetry version data provider.

D. Signal Type (Character 13) of the SPUI shall be a "L" as defined per Appendix E.

E. Telemetry Version Group SPUIs shall be initially established in Standard Input file 5.3 and further defined in file 5.1 with:

- Group type of TLM_VERS;
- Content Signal Type of TLM_PROF;
- Content Offset of the telemetry processing frame number, within the major frame set of telemetry transfers, for the specific TLM_PROF referenced; and
- Spares are not allowed as Content Signal Types.

F. Rules governing the multiple uses of signal primitives in definition of telemetry are:

- Primitive signals shall exist only once within a given S-band telemetry packet set (TLM_PKT group level); and
- Where the TLM_PKT group level does not exist (e.g., NCS-OIU), a primitive signal shall exist only once within a given telemetry version set (TLM_VERS group level).

3.3.1.2.1.4.4.4.3 TELEMETRY PROCESSING FRAMES

A Telemetry Processing Frame is defined as that total set of potential telemetry content which is collected and organized for transmittal within one telemetry transmission increment. ISS C&DH design defines 100 such transmissions within each C&DH telemetry major frame. For identification and organization, each unique telemetry processing frame of a given telemetry version is assigned a group PUI, with subgroup and signal SPUI content assignments made as necessary to establish telemetry construct definition.

Except for the NCS to OIU, the CCS to OIU, and the NCS to FGB data streams, the rule for assigning Telemetry Processing Frame group SPUIs is as follows:

A. First 6 characters of the SPUI shall be defined per Appendix C and indicate the Logical Primary MDM in which the telemetry processing frame is constructed (e.g. S4DP31, etc.)

B. Device Code (Characters 7 and 8) of the SPUI shall be "TL" as defined in Appendix D.

C. Sequence Code (Characters 9 through 12) of the SPUI shall be assigned at the discretion of the telemetry format data provider.

D. Signal Type (Character 13) of the SPUI shall be a "L" as defined per Appendix E.

E. Telemetry Processing Frame Group SPUIs shall be initially established in Standard Input file 5.3 and further defined in file 5.1 with:

- Group type of TLM_PROF;
- Content Signal Type of TLM_PKT; and
- Content Offset of the absolute word position, within the total telemetry processing frame, for the first word of the TLM_PKT group referenced.

For the cases of NCS to OIU, CCS to OIU, and NCS to FGB, there are 100 processing frames worth of data defined for the NCS to OIU and CCS to OIU conditions, and 10 processing frames worth of data defined for the NCS to FGB condition. In all cases, however, there is only one packet per processing frame defined. To avoid unnecessary definitions, the definition of a packet for these conditions is bypassed, and the processing frame is defined in terms of the packet components, rather than in terms of the packet. Therefore, the processing frame definition is provided in terms of components of CCSDS_T, TLM1_GRP, TLM2_GRP, and TLM3_GRP.

A. First 6 characters of the SPUI shall be defined per Appendix C and indicate the Logical Primary MDM in which the telemetry processing frame is constructed (e.g. S4DP31, etc.)

B. Device Code (Characters 7 and 8) of the SPUI shall be "TL" as defined in Appendix D.

C. Sequence Code (Characters 9 thru 12) of the SPUI shall be assigned at the discretion of the telemetry format data provider.

D. Signal Type (Character 13) of the SPUI shall be a "L" as defined per Appendix E.

E. Telemetry Processing Frame Group SPUIs shall be initially established in Standard Input file 5.1 with:

- Group type of TLM_PROF;
- Content Signal Type of CCSDS_T, TLM1_GRP, TLM2_GRP or TLM3_GRP; and
- Content Offset of the absolute word position, within the specific telemetry packet group, for the first word of the CCSDS_T or TLMx_GRP group referenced.

3.3.1.2.1.4.4.4.4 TELEMETRY PACKETS

A Telemetry Packet is defined as a CCSDS compliant construct of information with predefined content which has been assembled for transmission, one or more of which compose a telemetry processing frame transfer of information. For identification and organization, each unique telemetry packet of a given telemetry processing frame is assigned a group PUI, with subgroup and signal SPUI content assignments made as necessary to establish telemetry construct definition. The rule for assigning Telemetry Packet group SPUIs is as follows:

A. First 6 characters of the SPUI shall be defined per Appendix C and indicate the Logical Primary MDM in which the telemetry packet is constructed (e.g. S4DP31, etc.)

B. Device Code (Characters 7 and 8) of the SPUI shall be "TL" as defined in Appendix D.

C. Sequence Code (Characters 9 thru 12) of the SPUI shall be assigned at the discretion of the telemetry format data provider.

D. Signal Type (Character 13) of the SPUI shall be a "L" as defined per Appendix E.

E. Telemetry Packet Group SPUIs shall be initially established in Standard Input file 5.1 with:

- Group type of TLM_PKT;
- Content Signal Type of CCSDS_T, TLM1_GRP, TLM2_GRP or TLM3_GRP; and

- Content Offset of the absolute word position, within the specific telemetry packet group, for the first word of the CCSDS_T or TLMx_GRP group referenced.

3.3.1.2.1.4.4.4.5 TELEMETRY RATE GROUPS

A Telemetry Rate Group is defined as a contiguous set of words within a telemetry packet which have been assigned to contain information refreshed at a specified frequency. For identification and organization, each telemetry rate group of a given telemetry packet is assigned a group PUI, with subgroup and signal SPUI content assignments made as necessary to establish telemetry construct definition. The rule for assigning Telemetry Rate Group SPUIs is as follows:

A. First 6 characters of the SPUI shall be defined per Appendix C and indicate the Logical Primary MDM in which the associated telemetry packet is constructed (e.g. S4DP31, etc.)

B. Device Code (Characters 7 and 8) of the SPUI shall be "TL" as defined in Appendix D.

C. Sequence Code (Characters 9 thru 12) of the SPUI shall be assigned at the discretion of the telemetry format data provider.

D. Signal Type (Character 13) of the SPUI shall be a "L" as defined per Appendix E.

E. Telemetry Rate Group SPUIs shall be defined in Standard Input file 5.1 with:

  - Group type of TLM1_GRP, TLM2_GRP or TLM3_GRP
  - Content Signal Type of WORD, DBL_WORD or SIGNAL
  - Content Offset of the absolute word position, within the specific telemetry packet group, for the content signal type being referenced.

3.3.1.2.1.4.4.4.6 TELEMETRY CCSDS HEADERS

A Telemetry CCSDS Header Group is defined as that set of contiguous words within each telemetry packet necessary to establish the ISS adopted CCSDS packet protocol for telemetry transmissions. For identification and organization, each telemetry CCSDS header group of a given telemetry packet is assigned a group PUI, with subgroup and signal SPUI content assignments made as necessary to establish telemetry construct definition. The rule for assigning Telemetry CCSDS Header Group SPUIs is defined in section 3.3.1.2.1.4.5.2 of this document.

3.3.1.2.1.4.4.4.7 TELEMETRY WORD AND DOUBLE WORD GROUPS

The Telemetry Word and Double Word Groups that are contained in a full telemetry rate group of data are identified by unique group SPUIs. The telemetry content definition inherits these SPUIs, and their attributes, from the data acquisition bus messaging definition process necessary to make signals available for the telemetry definition process. Rules for establishing these are defined in the appropriate subsections of section 3.3.1.2, Signal Program Unique Identifier, of this document.

3.3.1.2.1.4.4.4.8 TELEMETRY SIGNALS

The Telemetry Signals that are full-length primitives, or contained in telemetry word and double word groups of data, are identified by unique signal SPUIs. The telemetry content definition inherits these SPUIs, and their attributes, from the established ISS primitive signal definition process. Rules for defining all primitive signal PUIs are in the appropriate subsections of section 3.3.1, Program Unique Identifiers, of this document.

3.3.1.2.1.4.5 ISS CONSULTATIVE CONSORTIUM FOR SPACE DATA SYSTEMS (CCSDS) PATH SERVICE APPLICATIONS

The ISS has adopted the industry standards per CCSDS 701.0-B-2 as their communications path servicing protocol along with ISS established application conventions. The following ISS path servicing functions are supported via these CCSDS protocols:

- Commanding;
- Health & Status Telemetry; and
- Onboard Communications.

CCSDS Path Servicing Protocols utilize a packet header concept adaptable to specific applications. The ISS has established a set of application conventions which provide the services unique to ISS needs, such as those stated in the prior paragraph. ISS signal management disciplines provide in this section a set of general guidelines for the identification of the associated CCSDS header components.

A CCSDS Header Group is defined as that set of contiguous 16-bit words within each CCSDS compliant packet necessary to establish the ISS adopted CCSDS packet protocol for path servicing. For identification and organization, each CCSDS header group of a given packet functionality is assigned group PUIs of a predetermined convention, with subgroup and signal SPUI content assignments made as necessary to establish complete packet header construct definition.

Additionally, USOS has defined a protocol consisting of two words supporting Legal Station Mode functionality. For telemetry applications these words are defined by convention to not be present. For USOS command applications, these words are defined by convention to be present, except that some commands which are valid in all modes are defined without the words. No assumptions or definitions are made regarding the conventions to be followed for International Partners.

Details of and requirements for application of the CCSDS Protocol are provided in SSP 41154 (ISS Space to Ground ICD). The rules for formulating those portions of the overall protocol which are governed by the Consultative Consortium for Space Data Systems for providing IPCL data are provided in the following subsections.

Appendix G and Appendix T contains definitions for the CCSDS headers discussed in this section. The definition is in the form of an iterative reduction of groups to words to primitives. The data provider is responsible for explicitly stipulating the following components provided in Appendix T to the messages defined by the data provider:

- the CCSDS primary header as content type CCSDS or CCSDS_T (as defined by Appendix G and Appendix T);
- the CCSDS secondary header as content type CCSDS or CCSDS_T (as defined by Appendix G and Appendix T);
- as appropriate, both LSM words as content type WORD; and
- as appropriate, the Checksum word as content type SIGNAL.

The rules for defining the remainder of the words and signals involved with the CCSDS protocol are stated in other portions of this document. The rules for defining the message structure are in terms of elements of group type CCSDS or CCSDS_T, WORD, and SIGNAL as stated in other portions of this document.

3.3.1.2.1.4.5.1 ISS COMMANDING HEADER GROUPS

The specific rules for assigning CCSDS Header SPUIs and associated data for the ISS Commanding path services are as follows:

A. First 6 characters of the SPUI shall be defined per Appendix C and indicate the reserved codes for the CCSDS group PUI identifiers specific to the ISS IP high level segment receiving the CCSDS packet command (e.g. USDG00, RRDG00, etc.);

B. Device Code (Characters 7 and 8) of the SPUI shall be "CC" as defined in Appendix D;

C. Sequence Code (Characters 9 through 12) of the SPUI shall be assigned at the discretion of the CCSDS header provider;

D. Signal Type (Character 13) of the SPUI shall be a "L" as defined per Appendix E;

E. CCSDS Header Group SPUIs shall be defined in Standard Input file 5.1 with:
   - Group Name assigned to this CCSDS header group SPUI;
   - Group Type shall be “CCSDS”;
   - Group/subgroup construct shall include CCSDS primary and secondary header groups;

- Content Signal Type of WORD, SIGNAL, or SPARES; and
- Content Offset of the absolute word position, within the specific functional packet group, for the item of the content signal type referenced.

For the ISS Commanding path service function, the conventions adopted for certain CCSDS secondary header words are uniquely defined and distinctly different from other path service functions. Refer to Appendix T for a further decomposition of the CCSDS subgrouping and PUI assignment conventions.

3.3.1.2.1.4.5.2 ISS HEALTH & STATUS TELEMETRY HEADER GROUPS

The specific rules for assigning CCSDS Header SPUIs and associated data for the ISS Health & Status Telemetry path services are as follows:

A. First 6 characters of the SPUI shall be defined per Appendix C and indicate the reserved codes for the CCSDS group PUI identifiers specific to the ISS IP high level segment generating the CCSDS packet (e.g. USDG01, etc.);

B. Device Code (Characters 7 and 8) of the SPUI shall be "CC" as defined in Appendix D;

C. Sequence Code (Characters 9 through 12) of the SPUI shall be assigned at the discretion of the telemetry CCSDS header provider;

D. Signal Type (Character 13) of the SPUI shall be a "L" as defined per Appendix E;

E. Telemetry CCSDS Header Group SPUIs shall be defined in Standard Input file 5.1 with:

- Group type of CCSDS_T;
- Primary/Secondary Header groups;
- Content Signal Type of WORD, DBL_WORD, or SIGNAL; and
- Content Offset of the absolute word position, within the specific telemetry packet group, for the item of the content signal type referenced.

For the ISS Health & Status Telemetry path service function, the conventions adopted for certain CCSDS secondary header words are uniquely defined and distinctly different from other path service functions. Refer to Appendix G for a further decomposition of the CCSDS subgrouping and PUI assignment conventions.

3.3.1.2.1.4.6 1553B BUS COMMUNICATION PIPES

Pipe is an ISS C&DH term used to describe information flow paths over a 1553B data bus path. In the stricter sense, it refers to the dedication of specific time division multiplexed slices of bus communication time to the transfer of a certain classification of information. In general, these pipes are a C&DH bus architecture design solution to the utilization of bus communication resources and, as such, are defined to the program independent of any signal data definition/collection disciplines. This bus scheme supports cyclic message occurrences at 0.1 Hz, 1 Hz, and 10 Hz frequencies synchronized to the C&C controlled major frame processing cycle composition, and is sometimes referred to as a “decade bus”.

There are 16 identified ISS C&DH 1553B pipes as listed below:

ISS C&DH Pipes

- Data Acquisition, i.e. RT-to-BC Status Data Transfer (MDM Status Poll);
- Broadcast Ancillary Data;
- Broadcast Time;
- Broadcast Sync w/data;
- Data Load;
- Data Dump;
- File Load;
- File Dump;
- BC-to-RT Status Data Transfer (Command Transfers);
- Standard Commands;
- Command Poll;
- Pt-to-Pt Mode Code w/data;
- Pt-to-Pt Mode Code w/o data;
- CCSDS Telemetry Transfer (SP-to-GD);
- Bulk Data Transfer (ASBSP I/F); and
- Firmware Controller Commands.

The term “decade pipe” is a term with a very explicit definition and speaks to information on a decade bus which conforms to the following criteria:

1. composed of transaction messages which contain only cyclic data;
2. transmitted on a fixed number of transaction slots (or boxcars); and
3. contain fixed rate group boundaries (independent of message boundaries) ordered with 10Hz first, then 1 Hz then 0.1Hz data.

3.3.1.2.1.4.6.1 1553B DECADE PIPE IDENTIFICATION

The decade pipes established by the C&DH software control concept for data acquisition and distribution are unique to ISS C&DH decade buses. Those buses for which this convention is mandatory are indicated as such in Appendix S of this document by an architecture type of 1553F. Decade pipe identification is required for cyclic data acquisition/distribution communications utilizing this scheme.

Of the 16 specific pipes identified in the ISS C&DH software control concept design, only “decade pipes” require signal identification by PUIs. The list below identifies that subset.

- Data Acquisition, i.e., RT-to-BC Status Data Transfer (MDM Status Poll); and
- Broadcast Ancillary Data.

Note: Telemetry transfers are not considered decade pipes

The figure below gives a pictorial representation of decade pipes. Those shown are representing data acquisition flow from lower tier MDMs to the C&C MDM.

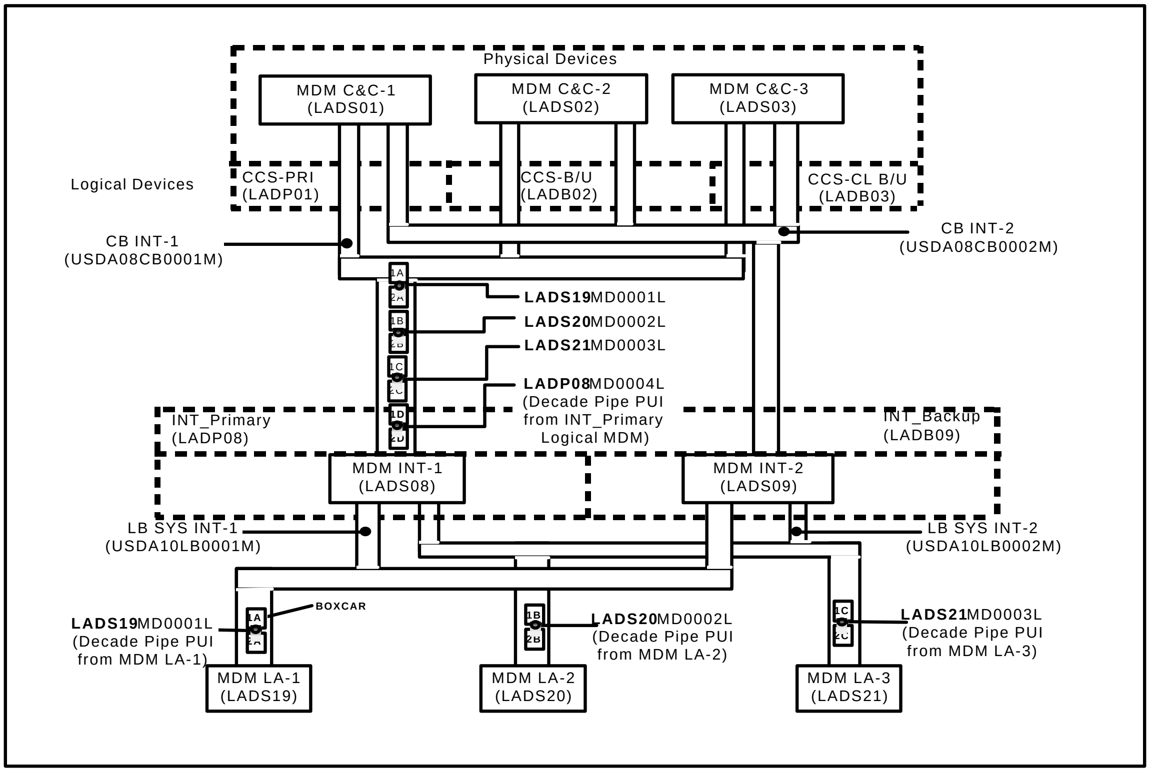


FIGURE 3.3.1.2.1.4.6.1-1 1553B DECADE BUS PIPE CONCEPT

All MDM or processors communicating on a C&DH decade bus employing data acquisition or distribution transfers under the decade pipe scheme shall identify each contiguous set of 1553B data messages making up that decade pipe by a unique Pipe Group SPUI.

These SPUIs and data attributes shall conform to the following rules:

A. First 6 characters of the SPUI shall be defined per Appendix C and

- indicate the Logical Primary MDM or processor from which the data content messages originate (e.g. S4DP31, etc.); or
- indicate the Logical Backup MDM or processor from which the data content messages originate (e.g. S4DB35, etc.).

Note: If no logical MDM exists, then the physical MDM or processor will be used.

B. Except for International Partners, Generic Device Code (Characters 7 and 8) of the SPUI shall be "MD" as defined in Appendix D;

C. Sequence Code (Characters 9 through 12) of the SPUI is assigned at the discretion of the data provider (e.g. 0001, 0003, etc.);

D. Signal Type (Character 13) of the SPUI shall be "L" (see Appendix E);

E. The MDM CSCI generating the Data Message Content Group Signal associated with the Data Acquisition/Distribution Rate Group SPUIs shall be designated as the "Functional System Data Provider";

F. The Data Provider responsible for the MDM CSCI will be the only one authorized to modify or delete the Pipe Group signal once it has been baselined;

G. The Pipe Group SPUI shall represent the data flow path of a contiguous set of messages (or instances of the same) spanning multiple 1553B buses as long as the total set of content group SPUIs remain unchanged;

H. The Group Type (Field 5.1-3) as defined in File 5.1 of Appendix N (Standard In) shall be "PIPE_DCD" if the message contents represents cyclic data acquisition/distribution transfers managed under the C&DH decade scheme;

I. Pipe Group SPUIs shall be defined in Standard Input file 5.1 per Appendix N with:

- Group Type of PIPE_DCD;
- Content Signal Type of DMSG_CON;
- Content Offset of N/A; and
- Word Order of N/A.

J. Pipe Group SPUIs shall be supplied in Standard Input file 5.4 per Appendix N. For the same set of decade DMSG_CON messages, there shall be one entry of the same Pipe Group SPUI (with the associated file 5.4 attributes) for each unique Physical Source/Destination Device pair within a given Logical Source/Destination Device pair.

Example of a Pipe Group SPUI is shown in Figure 3.3.1.2.1.4.6.1-2.

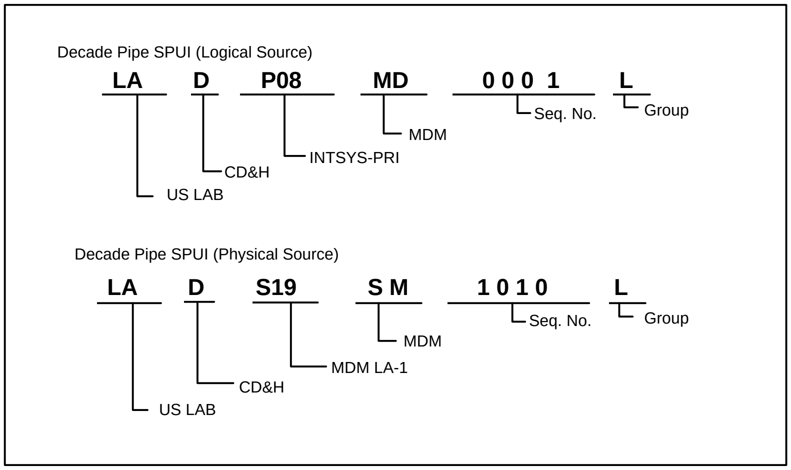


FIGURE 3.3.1.2.1.4.6.1-2 EXAMPLE OF A PIPE GROUP SPUI

3.3.1.2.1.4.6.1.1 US MDM TO MDM PRIMARY AND BACKUP CYCLIC DATA ACQUISITION MESSAGES

The scope of these guidelines is the US MDM to MDM Primary and Backup cyclic data acquisition messages. The intent is to limit the duplication of cyclic data acquisition messages provided in Appendix N/File 5.2 (MT File) and File 5.4 (RG File).

A. For the control buses, provide MT and RG records to place the Tier 2 Primary (to CCS Primary) data acquisition messages on the INT-1, EXT-1 and GN&C-1 buses only. Provide MT and RG records to place the Tier 3 pass-through primary and backup MDM data acquisition messages (to CCS Primary) on the INT-1, EXT-1 and GN&C-1 buses only.

B. For the control buses, provide MT and RG records to place the Tier 2 backup (to CCS Primary) data acquisition messages on the INT-2, EXT-2 and GN&C-2 buses only.

C. For the local buses, provide MT and RG records to place the Tier 3 Primary (to Tier 2 Primary) data acquisition messages on the default primary buses only.

D. For the local buses, provide MT and RG records to place the Tier 3 backup (to Tier 2 Primary) data acquisition messages on the default backup buses only.

E. For the RG file, provide records to list the default physical device only for the respective logical device, for the message source or destination and only for the buses listed above. For example put one record in for the GN&C primary decade pipe, on the GN&C-1 bus, physical CCS default primary MDM and physical GN&C default primary MDM.

3.3.1.2.1.4.6.2 1553B NON-DECADE BUSES

All processors with a 1553B connectivity which is not identified as a decade bus and, as such, is not required to conform to the decade pipe scheme for data acquisition or distribution transfers shall be exempt from the requirement for assigning Pipe Group SPUIs to those non-decade compliant transfers.

3.3.1.2.1.4.6.3 OTHER BUS PROTOCOL PIPES

All processors with a non-1553B connectivity which is, by definition, not a decade bus, shall be exempt from the requirement for assigning Pipe Group SPUIs for transfers across that non-1553B bus.

3.3.1.2.1.4.7 USAGE OF SPARES AND BULK

This section establishes guidelines and rules for the use of SPARE and BULK descriptors in word and message definitions. Impacts to both the GD file (as the primary impact) and to the MT file are defined.

'SPARE' and 'BULK' are legal values used in lieu of a SPUI for defining the Content Signal PUI (Standard-In Field 5.1-4). The acceptable relationships of Group Type To Content Type as related to 'SPARE' and 'BULK' as defined in Table 3.3.1.2.1.4.-1. are denoted in Table 3.3.1.2.1.4.7-1 below:

TABLE 3.3.1.2.1.4.7-1 APPLICABILITY OF SPARES AND BULK TO GROUP TYPE

	SPARE	BULK
WORD	X	
BYTE	X	
DBL_WORD	X	
CMSG_CON	X	X
DMSG_CON	X	X
CCSDS	X	
CCSDS_T	X	
TLM_PKT		X
TLM1_GRP	X	X
TLM2_GRP	X	X
TLM3_GRP	X	X
DA1_GRP	X	X
DA2_GRP	X	X
DA3_GRP	X	X
RS485	X	

3.3.1.2.1.4.7.1 SPARE USAGE

There are five separate applications during which a SPARE could be utilized, and there are four separate contexts for these applications.

- The five applications are:
  1) when SPARE bits are defined as a part of a WORD, DBL_WORD, BYTE, CCSDS and CCSDS_T;
  2) when SPARE word definitions exist in a boxcar prior to the natural length of a message. This includes SPARE word definitions which are allocated as a part of the message, but appear as the last words of the message;
  3) when SPARE word definitions exist as padding to the end of a boxcar. This includes SPARE word definitions which are allocated following the natural length of the message and in the same boxcar as the last word of the natural length of the message, thereby padding the message out to the full 32 words;
  4) when SPARE word definitions exist as the sole and exclusive contents of a boxcar. This occurs when the last word of the natural length of the message does not occur in the last boxcar allocated to the message's pipe. For example, when the pipe is three boxcars wide and the natural length of the message concludes in the second boxcar, this condition applies to the third boxcar of the pipe; and
  5) when SPARE word definitions exist in 1553 and RS 485 messages, telemetry groups, and data acquisition groups not associated with boxcars.
- The contexts are:
  1) commands;
  2) data acquisition in decade pipes;
  3) data acquisition in non-decade pipes; and
  4) telemetry.

A decade data acquisition pipe is defined to be communication between two MDMs for data acquisition (i.e., DMSG_CON).

The following rules shall be used to define spares:

A. SPARE bits in a WORD/DBL_WORD/BYTE must be provided when the bit has no utilization. Likewise, within the natural length of the data acquisition message, SPARE word definitions must be provided when the WORD has no utilization.

B. Following the natural length of the actual message, words remaining undefined in that portion of the DMSG_CON following the last word of the natural length of the actual message must be identified explicitly as SPARE word definitions (for non-decade pipes, the identification is optional). As an example, consider a 40-word communication. The second boxcar of the communication consists of eight words of the communication as the first eight words of the boxcar, followed by 24 words which are part of the boxcar but not part of the communication. These 24 words must be identified explicitly as padding, i.e., as SPARE words for a decade data acquisition pipe, and may optionally be specified as SPARE words for a non-decade data acquisition pipe. Identify the number of words in the boxcar as 32 words if the padding is specified, and as eight words if the padding is not specified.

C. It is possible that boxcars will follow the boxcar containing the last word of the actual communication. These boxcars must be explicitly identified for decade data acquisition pipes, and may optionally be specified for non-decade data acquisition pipes. Their contents, if and when defined, must consist exclusively of SPARE words. As an example, consider the 40-word actual communication discussed earlier. If this occurs in a pipe which is three boxcars wide, the third boxcar must (when specified) consist of a definition with 32 words of SPARE. For the same communication being placed into a pipe which is four boxcars wide, the last two boxcars must be specified as consisting of SPARE.

D. The data provider is required to provide explicit and unique definitions for all boxcars identified pursuant to the last paragraph above. The purpose for the explicit identification by the data provider is due to an assumption that the data provider will eventually modify the communication to take advantage of the spare space available in the boxcar. If the data provider explicitly defined the spare boxcars and defined the spare padding in the last used boxcar, the changes would occur only within the GD file and the MT file would not be affected; if the data provider used the DIT-defined default boxcar (or took the option of not defining the padding provided for the non-decade pipes), changes to the MT file would be probable as well as changes to the GD file.

E. Use SPARE to fill in the holes of telemetry formats.

F. SPARE bits and words may be used to suppress definition of "ground" or otherwise not useful data coming from a firmware controller. This is for the purpose of "killing" superfluous PUIs.

G. Use SPARE where data is perhaps defined for a different mode or later flight. Specifically, use SPARE for Backup data hole definition for the inactive and otherwise unuseful data left over from a Primary cyclic data stream.

3.3.1.2.1.4.7.2 BULK USAGE

The intended use of BULK is:

A. to allow definitions with both of the following properties:

- The use of SPARE does not apply. This occurs when the data is used, or when the data is not used but it cannot be guaranteed that the contents are constrained to be zero. When SPARE does apply, use of SPARE rather than BULK is preferred.

- Formatting serves no purpose. This occurs, for example, when the data is in a pipe intended exclusively for downlink and has no interpretation onboard. Conversely, when an application for the data does exist onboard, formatting is required and BULK is not appropriate.

B. to allow definitions when specific formatting cannot be determined. Formatting cannot be determined when the cyclic properties of the data do not correspond to the decade nature of the pipe containing the data, or alternatively when the data to be sent cannot be determined in advance (i.e., the selection is essentially arbitrary). This property applies even when the data does have application onboard the station. An example of this is suit data.

Any application in which the data is intended to be downlinked, with no application onboard the station, can and should be BULK. It is left as a matter of documentation of the format of the information to allow the information to be decomposed on the ground. Conversely, any application where the data can be utilized onboard the station does not allow the use of BULK.

Usage of 'BULK' in Appendix N, Field 5.1-4 shall conform to the following rules:

A. Use BULK for the contents of memory dump cyclic data or telemetry.

B. Use BULK for the contents of memory load commands.

C. BULK may be used for the contents of cyclic data messages that are not defineable.

Note: The reason for the MAY disclaimer is that there will be times that generic 16 bit unsigned integers will be used as placeholders (e.g., Payload Data). This could be done if there are messages which are not defineable but could perhaps be sorted out on the ground. Examples of this are:

- Video Tape Recorder data(which is not defineable because it is asynchronous); and
- VSU camera data to CCS (which is not defineable because the bits are reversed and ignorant of word boundaries).

  Note: The VSU camera data is repackaged and defined explicitly by the CCS CSCI.

D. Use BULK for the content of the PCS display data pipe. It is variable definition and depends on what displays are open.

3.3.1.2.1.4.8 MESSAGE MULTIPLEXING

This section provides guidelines for message multiplexing. Message multiplexing is generally defined for the purposes of this section to mean the definition of multiple options for messages being sent in the same processing frame, subframe, and transaction slot. In general, this will occur in two completely separate sets of circumstances:

- when a data acquisition message contains several options for interpretation, based on some condition generally also included in the data being transmitted as a part of the data stream; and
- in the case of multiple commands being capable of being sent during the same processing frame, subframe, and transaction slot.

In both cases, only one of the possible messages can actually be sent, but the selection (as far as the IP&CL is concerned) is ambiguous. We will not address the command situation in this section, since a different protocol is being used to represent commands in IP&CL.

The correct method of representing a multiplexing situation in IP&CL is to adhere to the following steps:

- in the GD file, define one unique DMSG_CON for each possible representation of the message.
- in the MT file, represent all DMSG_CONs possible to be transmitted in the same processing frame, subframe, and transaction slot with that duplicated information. This creates a Complete Record Set condition in the MT file, wherein the same Change Keys exist for multiple records, so that modifying one of the records requires that all the records be redelivered.

There are two examples which can be discussed to illustrate the use of this protocol.

3.3.1.2.1.4.8.1 MULTIPLEXING EXAMPLE: A SINGLE MESSAGE

Suppose a single data acquisition message has a parameter capable of assuming multiple data types or units. Such an example might be a message identifying the current value of a set point for a power supply. This message would have two parameters: one parameter would indicate the usage of the second parameter, and the second parameter would indicate either the voltage or the current setpoint, as indicated by the first parameter. To indicate a voltage setpoint, the data acquisition message would have the first parameter indicating that the second parameter is a voltage setpoint, and the second parameter would indicate the voltage.

Due to the difference in units, different parameters would need to be specified for the voltage and current parameters, thereby requiring individually defined message formats (i.e., separate DMSG_CON definitions in the GD file would be required). Separate DMSG_CON PUIs would be stipulated. In the MT file, each of these DMSG_CON PUIs would be allocated to the same processing frame, subframe, and transaction slot, thereby indicating that either message could be transmitted during that time period.

3.3.1.2.1.4.8.2 MULTIPLEXING EXAMPLE: MULTIPLE DATA ACQUISITION MESSAGES

A second example is similar, and applies specifically to CBM data messages. There are three CBM data acquisition message formats, one dealing with testing results, one dealing with bolts, and one dealing with latches. There are 21 possible messages (one test message, 16 bolt messages, or four latch messages) which could be transmitted. Twenty times per second, one of the 21 messages is transmitted (under normal circumstances, the 16 bolt messages and the 4 latch messages would be transmitted once each per second).

The correct definition is to provide three definitions in the GD file, each corresponding to one of the three possible forms in which the CBM could produce a message, and each having a PUI assigned. Each of these three message forms (i.e., each of these three PUIs) is then assigned to each of the 20 time slots allocated in the MT file. For historical reasons, the time slots are allocated as two separate 10 Hz time allocations, separated by four subframes in each processing frame. As a result, a minimal duplication occurs (each of the three PUIs appear only twice in the MT file).

3.3.1.2.1.4.9 POLLED COMMANDS

The specific rules for defining Polled Commands are as follows:

A. For Polled Commands, the Group Type (Field 5.1-3) as defined in File 5.1, Group Data Item File (GD), of Appendix N (Standard In), will be CMSG_CON; and

B. The Transfer Type (Field 5.2-5) as defined in File 5.2, Message Transaction (MT) file of Appendix N (Standard In) will have the legal value set to T (for transmit), with the message being sent from the Remote Terminal (RT) to the Bus Controller (BC).

3.3.1.2.1.4.10 RULES AND GUIDELINES FOR ASSIGNING LOGICAL VS PHYSICAL DEVICE PUIS

This section provides the rules and guidelines that shall be applied to assigning SPUIs to data acquisition software primitives and for use of command LDP endpoints with respect to the application of logical and physical distinction. Note that these rules were developed at the time we were developing the NCS IP&CL so they address NCS design feature not typical of other MDMs.

Appendix C contains two types of Device PUIs (DPUIs):

- Logical DPUIs (i.e. Device Type equals LDF or LDM) for nominal processing role, e.g. Primary, Backup and (for NCS) Secondary; and

- Physical DPUIs for particular physical MDM, e.g. N1-1, N1-2, Hardware devices (e.g. thermal sensors, fan speed, valve position, pressure devices) and Firmware controller devices (e.g. RPCM, IMCA).

Obviously, physical device PUIs correlate to physical devices. However, the reason for defining logical device PUIs on this program is because the logical design of the data acquisition pipes was done on a logical basis. Otherwise, there would have been significant impact to the software architecture if physical device PUIs were used for C&DH status primitive SPUIs. IP&CL has a capability for identifying where a different hardware device (perhaps using a different set of calibration coefficients) may be used after switching to a backup MDM (while still using the original HW SPUI).

3.3.1.2.1.4.10.1 DATA ACQUISTION, LOGICAL VS PHYSICAL

For Logical Usages:

A. SPUIs for status data from a PRIMARY MDM shall use the logical primary device PUIs:
   - Except where the status relates to a device uniquely connected under this physical MDM;
   - Except Application/Data unique to a Physical MDM; and/or
   - Includes Application and C&DH system software status.

B. SPUIs for status data from a BACKUP MDM shall use the logical backup device PUIs:
   - Except where the status relates to a device uniquely connected under this physical MDM;
   - Applies mainly to C&DH system software status, including BIT summary table; or
   - Can apply to application status where status from the backup MDM is relevant (e.g. redundant device status).

C. SPUIs for status data from a SECONDARY MDM (NCS only) shall use the logical secondary device ID:
   - Except where the status relates to a device uniquely connected under this physical MDM;
   - Applies mainly to C&DH status, including BIT summary; and
   - Can apply to application status where status from the secondary MDM is relevant (e.g. ACS moding status).

D. Software primitives for bus status for shared buses (primary and secondary have access to the same bus) shall use logical device PUIs.

E. Summary status, unrelated to the unique physical HW or FW devices shall use logical device PUIs.

For Physical Usages:

A. SPUIs for status data from a primary, backup or secondary MDM for software status related to HW or FW device uniquely connected to that physical MDM shall use the respective physical MDM device PUIs.

B. Software primitives for bus status for unique physical buses for that MDM shall use physical device PUIs.

3.3.1.2.1.4.10.2 NCS TELEMETRY, LOGICAL VS PHYSICAL

There shall be only one Telemetry format for assigning primitives to rate groups and slots.

When N1-2 goes down, and N1-1 becomes primary:

- None of the N1-2 DPUIs (M1DS48) will be valid;
- None of the secondary DPUIs (M1DB48) will be valid;
- Primary DPUIs (M1DP47) will be valid, and they will reflect primary functions which are now running in N1-1; and
- N1-1 physical DPUIs (M1DS47) will be valid.

3.3.1.2.1.4.10.3 COMMANDS, LOGICAL VS PHYSICAL

Commands shall use logical LDP end point when the corresponding status is logical and physical LDP end point when the corresponding status is physical. The LDP endpoint in the instantiated command will be used by the command source to determine the APID value in the command bit pattern. The LDP value in the command bit pattern is ignored by the software executing the command. APID values are different for logical and physical LDP end points.

For Logical Usages:

Commands for a primary MDM shall use logical primary LDP endpoint

- Except where the command relates to a device uniquely connected under this physical MDM;
- under this physical MDM;
- Except Application/Data unique to a Physical MDM; and
- Includes application and C&DH commands.

A. Commands for a backup MDM shall use logical backup LDP endpoint

- Except where the command relates to a device uniquely connected under this physical MDM;
- Applies mainly to C&DH commands, including state change commands; and
- Can apply to application commands where relevant.

B. Commands for a secondary MDM (NCS only) shall use logical secondary LDP endpoint

- Except where the command relates to a device uniquely connected under this physical MDM;
- Applies mainly to C&DH commands, including state change commands; and
- Can apply to application command where relevant.

For Physical Usages:

A. Commands for a primary, secondary or backup MDM related to a HW or FW device uniquely connected to that physical MDM shall use the respective physical MDM LDP endpoint.

B. MDMs which come up in Standby state will accept commands with APIDs of secondary (or backup) or the physical MDM device.

3.3.1.2.1.4.11 SPECIAL GENERIC TEMPLATES

To assure consistency of common signal data provided by more than one Data Provider, special generic templates are required to be developed. This section provides the requirements for development, use, and configuration of special generic templates.

The following sections describe the requirements for the following special generic templates:

- RPCM Generic Templates; and
- Common Command Generic Templates.

3.3.1.2.1.4.11.1 RPCM GENERIC TEMPLATES

RPCM Generic Templates consist of a set of files which will allow data providers to define their required IPCL data for RPCMs in a manner consistent with that provided by other data providers. All data providers are expected to follow this template format in delivering required RPCM data. Any exceptions to following this template format require prior approval by the DIT.

RPCM Generic Templates are generated by the DIT from files provided by Data Provider ‘PG2’. These source files are in the format of Appendix N of the SSPS and are provided as delta files. That is, PG2 only needs to provide delta updates to the existing template definition as design changes occur. The source files are of three basic types as follows:

- Instantiable RPCM Template Files - These files are files which are intended to be instantiated by each data provider responsible for providing RPCM IPCL data. Although in the format of Appendix N, these files have placeholders for the PUIs, bus information, data provider, and flights which allow each data provider to define the required data. The following required template source files are of this type:

  - Hardware Primitive File (File 1.1) - Provided by the DIT;
  - Firmware Primitive File (File 1.2);
  - Conversion Primitive File (File 3.4);
  - Requirement PUI File (File 4.1);
  - Group File (File 5.1); and
  - Message Transaction File (File 5.2.

- RPCM Reference Files - These are files which are not instantiated by each data provider. They are provided as a part of the RPCM Generic Template for reference purposes only. These files are in SSPS Appendix N format and are loaded into the MBF one time following submission by PG2. Files of this type are as follows:

  - State Conversion File (File 3.1); and
  - Polynomial Calibration File (File 3.2).

- RPCM Common Command Component Files - These files are a Group File (File 5.1), a Firmware File (File 1.2), a State Conversion File (File 3.1), a Conversion Primitive File (File 3.4), and a Requirement PUI (File 4.1) which provide the complete definition of the RPCM common command structures. These commands will all be associated with device PUI USPZ31.

The requirements for development, use, and configuration of RPCM Generic Templates are as follows:

A. Data Provider 'PG2' shall be responsible for:

- Providing delta updates to all RPCM Generic template files including RPCM Instantiable Template Files (with the exception of the HW file), RPCM Reference Files, and RPCM Common Command Component Files. In addition, a standard DD file should be a part of each delivery. This file should identify the associated files by type (i.e. RPCM Instantiable Template Files, RPCM Reference Files, or RPCM Common Command Component Files).~~MBF IPCL delivery of any changes to template 'common' files not to be instantiated by the other providers (i.e. PL files, PC files, files with USPZ31 data, etc.)~~

- Provided files should be delta updates to the existing RPCM template definitions and should be provided to Software Configuration Management.~~providing required RPCM Generic Template changes to the Prime Software Configuration group.~~
- RPCM template source file names shall conform to the following format:

  AARPBBBB.PG2

  - AA is the Appendix N Standard Input File Name
  - RP is for RPCM template
  - BBBB is the version number
    - For example, the first delivery shall be 0001, the next delivery shall be 0002, etc.
  - PG2 is the data provider
  - An example of the format – RPRP0001.PG2

~~B.~~

B. Data Provider 'DIT" shall be responsible for:

- Provision of updates to the Hardware Primitive Template File (File 1.1);
- Creation of the formal RPCM Generic Template files from inputs provided by PG2 and other sources. Templates shall be provided in Microsoft Excel format and will include the following items:~~maintenance of the RPCM Generic Template and 'Read Me' file~~
  - One file showing the entire RPCM data definition for pre-data reduction RPCMs;
  - One template file to be instantiated by RPCM providers for pre-data reduction RPCMs;
  - One file showing the entire RPCM data definition for post-data reduction RPCMs;
  - One template file to be instantiated by RPCM providers for post-data reduction RPCMs;
  - One file showing the entire RPCM command definition (USPZ31); and
  - 'Read Me' file explaining the file names and usages.
- Provision of~~providing~~ updated RPCM Generic Template and 'Read Me' file to SCM.

C. Prime Configuration Management shall be responsible for:

- Distribution of the RPCM Generic Template source files~~changes~~ to the DIT;
- Provision of the RPCM Reference Files and RPCM Common Command Template Component Files to MBF for loading into database;

- Host and Management of RPCM Generic Template files on a designated file server with a file directory path designated as '/MBF_Staging/DIT_Transfer/RPCM_TEMPLATES'; and
- Notification of new template updates when they occur.

3.3.1.2.1.4.11.2 COMMON COMMAND GENERIC TEMPLATES

Common Command Generic Templates consist of a set of files which will allow data providers to define their required IPCL data for Common Commands in a manner consistent with that provided by other data providers.

Common Command Generic Templates are generated by the DIT from files provided by Data Provider ‘PG0’. These source files are in the format of Appendix N of the SSPS and are provided as delta files. That is, PG0 only need provide delta updates to the existing template definition as design changes occur. The source files are of two basic types as follows:

- Common Command Reference Files: These files are provided for informational purposes only. These files are in SSPS Appendix N format and are loaded into the MBF one time following submission by PG0. Files of this type are as follows:
  - Software Primitive File (File 1.3);
  - State Conversion File (File 3.1); and
  - Conversion Primitive File (File 3.4).
- Instantiable Common Command Template Files: These files are files which are intended to be instantiated by each data provider responsible for providing Common Command IPCL data. Although in the format of Appendix N, these files have placeholders for the PUIs, bus information, data provider, and flights which allow each data provider to define the required data. The usage of these files is described in the Common Command Generic Template ‘Read Me’ file. The following required template source files are of this type:
  - Common Command Template File (File 6.1);
  - Group File (File 5.1); and
  - Message Transaction File (File 5.2)

The requirements for development, use, and configuration of Common Command Generic Templates are as follows:

A. Data Provider 'PG0' shall be responsible for:

- Provision and maintenance of the Common Command definitions up to the definition of CMSG_CONs and generic MT files to the Data Provider 'DIT';

- delivery to Data Provider 'DIT'; and
- Common Command template source file names shall conform to the following format:

  AACCBBBB.CNC

  - AA is the Appendix N Standard Input File Name;
  - CC is for Common Command template;
  - BBBB is the version number;
    - For example, the first delivery shall be 0001, the next delivery shall be 0002, etc.
  - CNC is the data provider; and
  - An example of the format – CPCC0001.CNC.

B. Data Provider 'DIT' shall be responsible for:

- Provision and maintenance of the Common Command Generic Templates based on Data Provider ‘PG0’ input;
- Provision and maintenance of the Common Command Generic Template 'Read Me' file; and
- delivery to the Prime Configuration Management group.

C. Prime Configuration Management shall be responsible for:

- Host and Management of files on a designated file server with a file directory path designated as '/MBF_Staging/DIT_Transfer/COMMON_COMMANDS'; and
- Notification of new template updates when they occur.

D. Data Providers shall provide Appendix N Standard Input Files for Common Commands per the Common Command Generic Template ‘Read Me’ file.

3.3.1.2.1.5 DELETED (SEE PARA. 3.3.1.2.1.4.3.2)

3.3.1.2.1.6 BUS PROTOCOLS

All ISS core 1553B and non-1553B bus messaging of signal data shall be defined utilizing signal PUI conventions established in this document. Those aspects of the 1553B and non-1553B standard requiring signal PUI identification are stated in the following sections.

3.3.1.2.1.6.1 1553B STANDARD

The MIL-STD-1553B Digital Time Division Command/Response Multiplex Data Bus with Notice 2 (the Standard) defines two types of information transfer formats: non-broadcast or "message formats" and broadcast or "broadcast message formats". Both information transfer formats are divided into data communication messages and communication management messages.

The Standard defines communication management messages that are identified by a specific message identification number in the message identification field. The Standard calls these mode commands (Refer to Appendix H). The standard defines mode codes as a means by which the bus controller can communicate with the multiplex bus related hardware, in order to assist in the management of information flow. Mode codes 0-8 (Appendix H) shall only be used for mode codes which do not require transfer of a data word. Mode codes 16-21 shall only be used for mode codes which require transfer of a single data word. Mode codes 9-15 are reserved for future use and shall not be used. No multiple data word transfer shall be implemented with any mode code. The mode codes are reserved for the specific functions as specified in Appendix H and shall not be used for any other purpose.

The Standard defines only three types of words: command word, status word, and data word. For signal identification of the ISS 1553B bus messaging, the command words and status words are not documented. Only the data words within messages are considered for ISS signal PUI applications (the single exception is the mode code without data command). Refer to section 3.3.1.2.1.4 GROUP SIGNALS and subsequent sections for details.

3.3.1.2.1.6.1.1 1553B MESSAGE FORMATS

The message formats are used only for communication between two terminals. The Standard defines six types for message formats. Three of these message types are for normal data communication, and three are for communication management.

For normal data communication, the BC issues commands to:

- BC-to-RT transmit - require an RT to transmit a message to the BC (RT-to-BC);
- BC-to-RT receive - originate a message to an RT (BC-to-RT); and
- BC-to-RT receive followed by BC-to-RT transmit - require one RT to transmit a message, while directing another RT to receive it (RT-to-RT).

For communication management, the BC issues mode commands to:

- BC-to-RT transmit - command one RT to perform the operation the mode indicates and to transmit its status word and a single data word (RT-to-BC with data word);

- BC-to-RT transmit - command one RT to transmit only its status word and perform the mode operation (RT-to-BC without data word); and
- BC-to-RT receive - command one RT to receive one data word, transmit its status word, and perform the mode operation (RT-to-BC with data word).

3.3.1.2.1.6.1.2 1553B BROADCAST MESSAGE FORMATS

The broadcast message formats allow either a BC or RT to transmit to all other terminals under the BC's direction. The Standard defines four broadcast messages. Two of these message types are for broadcast data communication, and two are for broadcast communication management.

For broadcast data communication, the BC issues commands to:

- BC to all RTs receive - originate a transmission from the BC to all RTs which have the ability to receive a broadcast message with data words; and
- single RT to all RTs receive followed by transmit - originate a transmission of two contiguous command words, a broadcast receive followed by an RT transmit with data command.

For broadcast communication management, the BC issues commands to:

- BC mode command to all RTs receive - originate a command to all broadcast RTs to receive the mode command and perform the required function; and
- BC mode command with data word to all RTs receive -originate a command to all broadcast RTs to receive the mode command with one data word and perform the required function.

3.3.1.2.1.6.1.3 1553B MESSAGING PROGRAM UNIQUE IDENTIFIERS

ISS bus messaging PUI identification for the 1553B protocol necessitates that existing ISS C&DH design terminologies be superimposed onto those terminologies unique to the 1553B disciplines. The ISS C&DH bus topology is one of a hierarchical design where the lower level tiers are not required to conform to the C&DH bus synchronization and timing conventions.

At the C&DH controlled tier levels, the design speaks to four basic flows of bus message traffic; system level commands, C&DH commands, C&DH data acquisition and C&DH bulk data transfer. While each of these utilize the 1553B bus protocol mechanism, the signal PUI disciplines speak most strongly to the C&DH design rather than to the 1553B mechanizations.

At the lower level non-C&DH tiers, the language takes on a stronger 1553B flavor. In addition, there are terminologies unique to the signal identification and management disciplines which must be recognized.

3.3.1.2.1.6.1.3.1 1553B MESSAGING AND C&DH DESIGN CONCEPTS

Table 3.3.1.2.1.6.1.3.1-1 correlates the 1553B Standard Message Types to the C&DH Implementation terms and gives the bus transaction type associated with each.

TABLE 3.3.1.2.1.6.1.3.1-1 MATRIX FOR 1553B-TO-C&DH TERMINOLOGIES

1553B Message Type	C&DH Implementation	Bus Transaction
	Non-C&DH 1553B	
Data Communication	Standard Commands Data/File Dump Cmd Data/File Load Cmd Data Acquisition Tlm (selected interfaces)	BC-to-RT receive BC-to-RT transmit BC-to-RT receive BC-to-RT transmit BC-to-RT receive
Communication Management	Pt-to-Pt Mode Cmd w/data Pt-to-Pt Mode Cmd w/o data	BC-to-RT receive BC-to-RT transmit
Broadcast Data Communication	Broadcast Time Broadcast Ancillary Data	BC to all RTs receive BC to all RTs receive
Broadcast Communication Management	Broadcast Mode Code w/data Broadcast Mode Code w/o data	BC to all RTs receive BC to all RTs receive
Bulk Data Transfer	ACBSP Telemetry I/F	BC to RT receive

Each of the C&DH implementation types require specific data field IP&CL inputs via the SSPS Appendix N file set.

3.3.1.2.1.6.1.3.2 1553B MESSAGING AND IP&CL INPUT REQUIREMENTS

Table 3.3.1.2.1.6.1.3.2-1 supplies a top-level indication of those things required to support each C&DH implementation of the 1553B message types. Blanks indicate that specific data values are required for that field. Item entries are the actual legal value literally expected to be supplied for that field (refer to App N for detailed legal value requirements).

TABLE 3.3.1.2.1.6.1.3.2-1 MATRIX FOR C&DH 1553B MESSAGE TRANSACTION FILE INPUTS

	SSPS Appendix N, File 5.2 IP&CL Required Fields												
C&DH Implementation	**5.2 -1**	**5.2 -2**	**5.2 -3**	**5.2 -4**	**5.2 -5**	**5.2 -6**	**5.2 -7**	**5.2 -8**	***5.2 -9**	**5.2 -10**	**5.2 -11**	**5.2 -12**	***5.2 -13**
Standard Commands					R	CMSG_ CON	BC DPUI	RT DPUI	1-32			OD	27,28
Data/File Dump					T	DMSG_ CON	RT DPUI	BC DPUI	1-32			OD	14-16
Data/File Load			6		R	CMSG_ CON	BC DPUI	RT DPUI	1-32			OD	15-23
Data Acquisition					T	DMSG_ CON	RT DPUI	BC DPUI	1-32				
Pt-to-Pt Mode Code with data (Sync)					(T/R)	CMSG_ CON	BC DPUI	RT DPUI	?			OD	0,31
Pt-to-Pt Mode Code w/o data					(T/R)	MODE CODE	BC DPUI	RT DPUI	0-31				0,31
Broadcast Time					B	DMSG_ CON	BC DPUI	RT DPUI	1-32				
Broadcast Ancillary Data					B	DMSG_ CON	BC DPUI	RT DPUI	1-32				
Broadcast Mode Code with data (Sync)					B	DMSG_ CON	BC DPUI	RT DPUI	17			OD	0,31
Broadcast Mode Code w/o data					B	MODE CODE	BC DPUI	RT DPUI	0-31				0,31
Bulk Data Transfer (ACBSP I/F)					R		BC DPUI	RT DPUI					
Telemetry (sel I/Fs)					R		BC DPUI	RT DPUI					

*Notes:
(1) the value range 1-32 indicates the number of words in the message
(2) the value range 0-31 or 17 indicates the actual mode code value in the message
(3) the value set 0,31 indicates the actual RT subaddress assigned for mode code reception
(4) non-Mode Code Broadcast messages have a T/R bit value of 0 (zero)
(5) all Mode Code message T/R bit values (1=T, 0=R) are defined in Appendix H by mode code value

TABLE 3.3.1.2.1.6.1.3.2-2 identifies those Message Transaction File (MT) fields which are required for non-C&DH 1553B bus tier messaging. As these buses are not required to operate under the C&DH synchronization scheme, the constructs associated with it are not applicable. This table reflects that by placing an “N/A” in the appropriate columns.

TABLE 3.3.1.2.1.6.1.3.2-2 MATRIX FOR NON-C&DH 1553B MESSAGE TRANSACTION FILE INPUTS

	SSPS Appendix N, File 5.2 IP&CL Required Fields												
Non-C&DH Implementation	**5.2 -1**	**5.2 -2**	**5.2 -3**	**5.2 -4**	**5.2 -5**	**5.2 -6**	**5.2 -7**	**5.2 -8**	***5.2 -9**	**5.2 -10**	**5.2 -11**	**5.2 -12**	***5.2 -13**

	SSPS Appendix N, File 5.2 IP&CL Required Fields												
Non-C&DH Implementation	**5.2 -1**	**5.2 -2**	**5.2 -3**	**5.2 -4**	**5.2 -5**	**5.2 -6**	**5.2 -7**	**5.2 -8**	***5.2 -9**	**5.2 -10**	**5.2 -11**	**5.2 -12**	***5.2 -13**
Commands		N/A	N/A	N/A	R	CMSG_ CON	BC DPUI	RT DPUI	1-32			OD	
Data/File Dump				NOT REQUIRED									
Data/File Load				NOT REQUIRED									
Data Acquisition		N/A	N/A	N/A	T	DMSG_ CON	RT DPUI	BC DPUI	1-32				
Pt-to-Pt Mode Code with data (Sync)				NOT REQUIRED									
Pt-to-Pt Mode Code w/o data		N/A	N/A	N/A	(T/R)	MODE CODE	BC DPUI	RT DPUI	0-31			OD	0,31
Broadcast Time				NOT REQUIRED									
Broadcast Ancillary Data				NOT REQUIRED									
Broadcast Mode Code with data (Sync)		N/A	N/A	N/A	B	DMSG_ CON	BC DPUI	RT DPUI	17			?	0,31
Broadcast Mode Code w/o data		N/A	N/A	N/A	B	MODE CODE	BC DPUI	RT DPUI	0-31			?	0,31
Bulk Data Transfer (ACBSP I/F)				NOT REQUIRED									
Telemetry (sel I/Fs)				NOT REQUIRED									

*Notes:
(1) the value range 1-32 indicates the number of words in the message
(2) the value range 0-31 or 17 indicates the actual mode code value in the message
(3) the value set 0,31 indicates the actual RT subaddress assigned for mode code reception
(4) Shaded areas not applicable
(5) All Mode Code message T/R bit values (1=T, 0=R) are defined in Appendix H by mode code value

Table 3.3.1.2.1.6.1.3.2-3 identifies other files in addition to the Message Transaction (MT) file required to support bus messaging related data for each C&DH 1553B bus transaction. The responsible provider is identified in relation to the bus message end points, which correlate to a firmware or software end item. The columns identifying the categories of data are referenced to the applicable IP&CL file designation, which is defined in Appendix N.

TABLE 3.3.1.2.1.6.1.3.2-3 MATRIX FOR ADDITIONAL C&DH 1553B MESSAGE FILE REQUIREMENTS

C&DH 1553B Bus Transaction	Group Type (5.1-3)	MT File (5.2) Required	TT File (5.3) Required	RG File (5.4) Required	Data Provider
Standard Command	MCMD FCMD CMSG_CON CCSDS (1)	YES	NO	NO	Destination
Standard Command (with Mode Code)	MCMD FCMD CMSG_CON CCSDS (1)	YES	NO	NO	Source
Data/File Dump	DMSG_CON	YES	NO	NO	Source
Data/File Load	MCMD CMSG_CON CCSDS (1)	YES	NO	NO	Destination
Data Acquisition	DMSG_CON WORD DBL_WORD DA1_GRP DA2_GRP DA3_GRP	YES	NO	YES	Source
Pt to Pt Mode Code with data word (Sync)	CMSG_CON WORD DBL_WORD	YES	NO	NO	Source
Pt to Pt Mode Code without data word	MODECODE	YES	NO	NO	Destination
Broadcast Time	DMSG_CON WORD DBL_WORD	YES	NO	NO	Source
Broadcast Ancillary Data	DMSG_CON WORD	YES	NO	YES	Source
Broadcast Mode Code w/data (Sync)	DMSG_CON WORD DBL_WORD CCSDS (1)	YES	NO	YES	Source
Broadcast Mode Code w/o data	MODECODE	YES	NO	NO	Destination
BC to RT Bulk Data Transfer (ACBSP Telemetry I/F)	TLM_VERS TLM_PROF TLM_PKT CCSDS_T TLM1_GRP TLM2_GRP TLM3_GRP	NO	YES	NO	SMC

3.3.1.2.1.6.1.3.2.1 MESSAGE DELIVERY REQUIREMENTS

A message is transmitted according to the legal message rate of Appendix N field 5.2-12. This rate defines the message rate relative to a 10 second major frame (i.e. a 10 Hz message is sent 10 times per second or 100 times per 10 second major frame, a 1 Hz message is sent 1 time per second or 10 times per 10 second major frame, a 0.1 Hz message is sent 0.1 time per second or 1 time per 10 second major frame, etc.).

For a specific true and actual message rate that coincides with a legal message rate (e.g. 10 Hz, 1 Hz, 0.1 Hz, 5 Hz), the message is transmitted in a regularly scheduled process frame, always occurring in the same subframe and transaction slot. For this reason, only one record for a unique message transaction (i.e. for a given bus (field 5.2-1), message PUI (field 5.2-6), source (field 5.2-7), and destination (field 5.2-8) shall be delivered per major frame per the following:

A. A message with 10 Hz in the message rate field shall have a processing frame of 0 to represent the first processing frame for the message transaction;

B. A message with 5 Hz in the message rate field shall have a processing frame of 0 or 1 to represent the first processing frame for the message transaction;

C. A message with 1 Hz in the message rate field shall have a processing frame value in the range of 0 through 9 to represent the first processing frame for the message transaction; and

D. A message with 0.1 Hz in the message rate field shall have a processing frame value in the range of 0 through 99 to represent the first processing frame for the message transaction.

There are cases where the specific true and actual message rate for a given message transaction does not coincide with a legal message rate but is a multiple of a legal message rate. In these situations, message transaction records representing multiples of the legal 10 Hz, 1 Hz, 0.1 Hz message rates are delivered. As such, it may be necessary to deliver more than one record to represent the set of records which serves as a basis for extrapolating all remaining records. For example, a true 20 Hz message transaction would be delivered in IPCL as two 10 Hz records. The only differences between the two records would be the subframe and possibly the transaction slot. But, given the two input records, a consumer of the data could extrapolate the data and arrive at 200 explicit message transactions within a major frame. As another example, a true 5 Hz message transaction on a 1553F bus (i.e. 5 Hz is not a legal message rate on a 1553F bus) would be delivered in IPCL as five 1 Hz messages. The differences between the five records would be the processing frame. But, given the five input records, a consumer of the data could extrapolate the data and arrive at 50 explicit message transactions. And, as a final example, a “twice a second (but not even sampling to call it 2 Hz)” message would be delivered in IPCL as two 1 Hz records. The differences between the two records would be the processing frame and possibly the subframe and/or transaction slot. But, given the two input records, a consumer of the data could extrapolate the data and arrive at 20 explicit message transactions within a major frame.

For these cases where more than one message transaction record (for a given bus (field 5.2-1), message PUI (field 5.2-6), source (field 5.2-7), and destination (field 5.2-8)) is needed to reflect a multiple of a given message rate, the records shall be delivered per major frame per the following:

A. A message with 10 Hz in the message rate field shall have a processing frame of 0;

B. A message with 5 Hz in the message rate field shall have a processing frame of 0 or 1;

C. A message with 1 Hz in the message rate field shall have a processing frame value in the range of 0 through 9; and

D. A message with 0.1 Hz in the message rate field have a processing frame value in the range of 0 through 99.

In summary, the quantity of records to be delivered shall be the number of records it takes to tell a complete story using no more records than is necessary (i.e. only the first record of a completely repetitive record set shall be delivered). The legal values for processing frame are discussed above based on the message rate value defined in field 5.2-12.

3.3.1.2.1.6.2 RS485 STANDARD

TBD

3.3.1.3 DEVICE PROGRAM UNIQUE IDENTIFIER (DPUI)

A Device Program Unique Identifier (DPUI) is used to identify Physical devices or Assemblies, generic devices, and Logical Devices that generate or receive ISS Signals. In addition, DPUI's are used to identify classes of the 1553 Data Bus and non-1553 Data Bus as defined in paragraph 3.3.1.4 and Appendix S.

All Device Program Unique Identifiers (DPUIs) are documented in Appendix C and includes:

- DPUI;
- Device/Controller Legal Name (N/A is acceptable for Hardware devices);
- Device/Controller Description;
- Device Type (Defined in Table 3.3.1.3-1);
- Data Provider responsible for Device;
- Flight Delivered (N/A is acceptable for 'CIP' Device types); and
- MBF Domain (Defined in Table 3.3.1.3-1).

Table 3.3.1.3-1 provides the definition for the different types of Device Types used on the ISS program, the applicable Fields that are referenced in Appendix N (Standard Input Files), and the MBF Domain used to store the data in the Mission Build Facility.

Note: Table 3.3.1.3-1 Legal Values for Appendix N Fields is part of the Software Configuration Management Validation Tool used to check all Standard Input Files delivered by the Data Providers

A DPUI shall conform to the following rules:

A. The DPUI shall be six (6) characters in length as illustrated in Figure 3.3.1.3-1 and encoded as follows:

Field 1 Element

The first two characters represent the Functional (Flight) Element of the ISS. A set of legal values to encode this field is listed in Appendix A.

Field 2 Functional System

The third character represents the Functional Subsystem or Payload. A set of legal values to encode this field is listed in Appendix B.

Field 3 Subsystem/Assembly/CSCI

The fourth, fifth, and sixth characters represent the Subsystem/Assembly/CSCI within the element/functional system. A set of legal values to encode this field is listed in C.

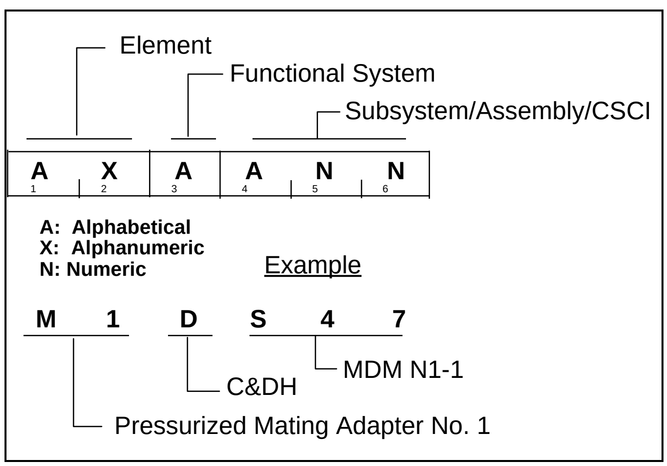


FIGURE 3.3.1.3-1 DEVICE PROGRAM UNIQUE IDENTIFIER

B. All Physical devices (i.e., Appendix C Device Type equals FW-xxx or SW-xxx) that are connected to a 1553 or non-1553 Data Bus and associated attributes shall be provided by File 2.1 of the IP&CL Standard Input as defined in paragraph 3.7.1.4.4, Table 3.3.1.3-1 and Appendix N.

C. All SPUIs defined in the Hardware Primitive File (Appendix N/File 1.1) shall be channelized by File 2.2 and 2.3 of the IP&CL Standard Input as defined in paragraph 3.7.1.4.5.6 and Appendix N.

D. Only the legal values defined in Table 3.3.1.3-1 shall be acceptable for Source (Fields 5.2-7, 5.4-2, 5.4-6) and Destination (Fields 5.2-8, 5.4-3, 5.4-7) in Appendix N Files.

TABLE 3.3.1.3-1 APPENDIX C DEVICE TYPE DEFINITIONS AND APPLICABLE APPENDIX N FIELDS

			Applicability of Legal Values For Appendix N Fields			
App C Device Type	**Description of Signals Generated or Received by the Device**	***MBF Domain**	**2.1.1**	**5.2-7 - 5.2-8**	**5.4-2 - 5.4.3**	**5.4-6 - 5.4-7**
CIP	Command Instantiation signals	N/A				
FW-CB	Firmware Controller signals on a Control Bus	FW	LEGAL	LEGAL		
FW-CBN	Firmware Controller signals on a Non-1553 Control Bus	FW	LEGAL	LEGAL		
FW-LB	Firmware Controller signals on a Local Bus	FW	LEGAL	LEGAL		
FW-LBN	Firmware Controller signals on a Non-1553 Local Bus	FW	LEGAL	LEGAL		
FW-UB	Firmware Controller signals on a User Bus	FW	LEGAL	LEGAL		
FW-UBN	Firmware Controller signals on a Non-1553 User Bus	FW	LEGAL	LEGAL		
GRPF	Generic signals associated with a Firmware Controller	FW				
GRPM	Generic signals associated with a MDM/Processor	SW				
HWF	Hardware signals channelized to a Firmware Controller	FW				
HWF/FW-CB	• Hardware signals channelized to a Firmware Controller and • Firmware Controller signals on a Control Bus	FW	LEGAL	LEGAL		
HWF/FW-LB	• Hardware signals channelized to a Firmware Controller and • Firmware Controller signals on a Local Bus	FW	LEGAL	LEGAL		
HWF/FW-UB	• Hardware signals channelized to a Firmware Controller and • Firmware Controller signals on a User Bus	FW	LEGAL	LEGAL		
HWF/FW-UBN	• Hardware signals channelized to a Firmware Controller • Firmware Controller signals on a non-1553 User Bus	FW	LEGAL	LEGAL		
HWM	Hardware signals channelized to a MDM	SW				
HWM-DB	1553 Data Bus channelized to a MDM	SW				
HWM-DBN	Non-1553 Data Bus channelized to a MDM	SW				
HWM/FW-CB	• Hardware signals channelized to a MDM and • Firmware Controller signals on a Control Bus	SW	LEGAL	LEGAL		
HWM/FW-LB	• Hardware signals channelized to a MDM and • Firmware Controller signals on a Local Bus	SW	LEGAL	LEGAL		
HWM/FW-UB	• Hardware signals channelized to a MDM and • Firmware Controller signals on a User Bus	SW	LEGAL	LEGAL		
HWM/FW-UBN	• Hardware signals channelized to a MDM and • Firmware Controller signals on a Non-1553 User Bus	SW	LEGAL	LEGAL		
HWM/HWF	• Hardware signals channelized to a MDM and • Hardware signals channelized Firmware Controller	SW				
HWM/HWF/FW-UB	• Hardware signals channelized to a MDM and • Hardware signals channelized to a Firmware Controller and • Firmware Controller signals on a 1553 User Bus	SW	LEGAL	LEGAL		

App C Device Type	Description of Signals Generated or Received by the Device	*MBF Domain	Applicability of Legal Values For Appendix N Fields: 2.1.1	5.2-7 - 5.2-8	5.4-2 - 5.4.3	5.4-6 - 5.4-7
HWM/HWF/ FW-LB	• Hardware signals channelized to a MDM and • Hardware signals channelized to a Firmware Controller and • Firmware Controller signals on a 1553 Local Bus	SW	LEGAL	LEGAL		
HWM/HWF/ FW-CB	• Hardware signals channelized to a MDM and • Hardware signals channelized to a Firmware Controller and • Firmware Controller signals on a 1553 User Bus	SW	LEGAL	LEGAL		
HWM/HWF/ FW-UBN	• Hardware signals channelized to a MDM and • Hardware signals channelized to a Firmware Controller and • Firmware Controller signals on a Non-1553 User Bus	SW	LEGAL	LEGAL		
HWM/SW-CB	• Hardware signals channelized to a MDM and • Software signals on a 1553 Control Bus	SW	LEGAL	LEGAL	LEGAL	LEGAL
HWM/SW-LB	• Hardware signals channelized to a MDM and • Software signals on a 1553 Local Bus	SW	LEGAL	LEGAL	LEGAL	LEGAL
HWM/HWF/ SW-UB	• Hardware signals channelized to a MDM and • Hardware signals channelized to a Firmware Controller and • Software signals on a 1553 User Bus	SW	LEGAL	LEGAL	LEGAL	LEGAL
HWM/HWF/ SW-LB	• Hardware signals channelized to a MDM and • Hardware signals channelized to a Firmware Controller and • Software signals on a 1553 Local Bus	SW	LEGAL	LEGAL	LEGAL	LEGAL
HWM/HWF/ SW-CB	• Hardware signals channelized to a MDM and • Hardware signals channelized to a Firmware Controller and • Software signals on a 1553 Local Bus	SW	LEGAL	LEGAL	LEGAL	LEGAL
LDF	Logical Firmware Controller signals	FW		LEGAL		
LDM	Logical MDM/Processor Device signals	SW		LEGAL		LEGAL
N/A	Not Applicable	N/A				
PCS-CB	Portable Computer Systems signals on a Control Bus	SW	LEGAL		LEGAL	LEGAL
SW-CB	CSCI signals in a MDM/Processor on a Control Bus	SW	LEGAL	LEGAL	LEGAL	LEGAL
SW-LB	CSCI signals in a MDM/Processor on a Local Bus	SW	LEGAL	LEGAL	LEGAL	LEGAL
SW-UB	CSCI signals in a MDM/Processor on a User Bus	SW	LEGAL	LEGAL	LEGAL	LEGAL

*Note: MBF Domain column is applicable to internal processing of Signal Data within the Mission Build Facility.

3.3.1.4 BUS PROGRAM UNIQUE IDENTIFIER (BPUI)

A Bus Program Unique Identifier (BPUI) is used to identify ISS Data Buses used to transmit ISS Signals.

For an ISS 1553 Data Bus, three unique BPUIs will be identified per data bus as noted below:

- BPUI that represents the functional data bus;
- BPUI that represents the physical twisted pair of wires referenced as the 'A' channel within the functional bus; and

- BPUI that represents the physical twisted pair of wires referenced as the 'B' channel within the functional bus.

For an ISS non-1553 Data Bus, only one BPUI will be identified per data bus.

All ISS Data Bus BPUIs are defined in Appendix S, and conform to the following rules:

A. The BPUI is thirteen (13) characters in length as illustrated in Figure 3.3.1.4-1 and encoded as follows:

Field 1 Element:

The first two characters reflect the High-Level Segment Code (US, RS, etc.) as defined in Appendix A.

Field 2 Functional System:

The third character represents the Functional System code which for all buses would always be "D" for C&DH.

Field 3 Data Bus Assembly Field:

The fourth, fifth, and sixth characters identify a bus instance and are in keeping with the general definition of a signal PUI, which is that this field always refers to the "assembly instance". For bus PUI generation this field specifically identifies a bus instance. Every instance code for all the US buses are made up of the letter "A", followed by two digits. All the Russian buses are made up of the letter "R", followed by two digits. All Japanese buses, are made up of the letter "J" followed by two digits.

Field 4 Data Bus Type:

The seventh and eighth characters are as follows:

- "CB" for Control Bus;
- "LB" for Local Bus; and
- "UB" for User Bus.

Field 5 Sequence Number:

The ninth character for a 1553 Data BUS shall be:

0	Functional 1553 Data Bus;
A	Physical 1553 Data Bus A; and
B	Physical 1553 Data Bus B.

The ninth character for a non-1553 Data Bus shall be:

1 Non-1553 Data Bus.

2 High Rate Data Link (HRDL)

The tenth, eleventh, and twelfth characters represent a three-digit number ranging from 000 - 999.

Field 6 Signal Type:

The thirteenth character is "M" to indicate Data Bus as defined in Appendix E.

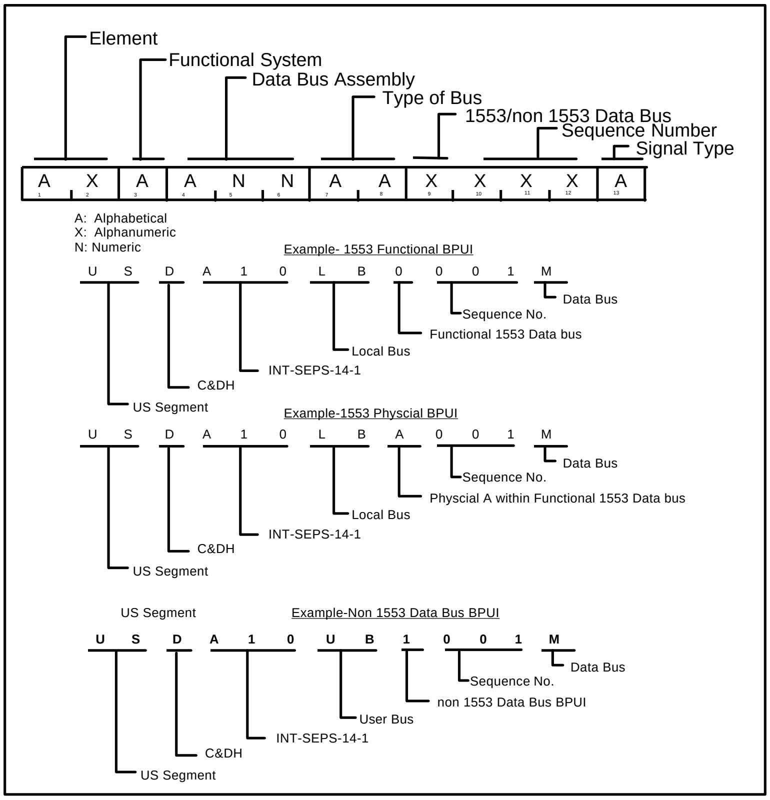


FIGURE 3.3.1.4-1 BUS PUI IDENTIFICATION

B. BPUIs and associated attributes shall be provided by the Prime (C&DH Data Integration Team) via File 1.1 of the IP&CL Standard Input as defined in Appendix N;

C. The 1553 functional/non data bus BPUI will be used in Appendix N, File 2.1-5 (Device file, Bus PUI field) and 5.2-1 (Message Transaction file, Bus PUI field);

D. The 1553 physical BPUI will be used in Appendix N, File 2.2-1 (MDM channelization file, Bus PUI) to indicate the physical 1553 channels within a Serial Parallel Digital (SPD) card where the Channel Configuration (Field 2.2-5) equals SPD1;

E. The non-1553 BPUI will be used in Appendix N, File 2.2-1 (MDM channelization file, Bus PUI) to indicate the non-1553 channels within a Serial Parallel Digital (SPD) card where the Channel Configuration (Field 2.2-5) equals SPD2.

F. The HRDL bus will be used in Appendix N, File 2.2-1 (MDM channelization file, Bus PUI) to indicate the HRDL card where the Channel Configuration (Field 2.2-5) equals HRDL

3.3.1.5 CONVERSION PROGRAM UNIQUE IDENTIFIER (CPUI)

A Conversion Program Unique Identifier (CPUI) is used to define calibration curves and state conversion tables referenced by applicable primitive signals. The CPUI is composed of six fields collectively defining some aspect of conversion ownership, functional system relationship and curve characteristics. The type of calibration curve and whether it is forward or inverse as well as relationships to specific environmental factors such as gains and bias settings are also reflected in the CPUI.

CPUIs assigned to all calibration curves and state conversion tables shall conform to the following rules:

A. CPUI shall be thirteen (13) characters in length as illustrated in Figure 3.3.1.5-1 and be encoded as follows:

Field 1 Element

The first two characters is always set to the High-Level Segment Code, for example, (U.S.) for US owned conversion. All conversions defined by the PG(s) and potentially NASA for GFE provided calibration data must use "US" as the element code. Each International Partner defining their conversions will use their respective High-Level Segment Code as defined in Appendix A.

Field 2 Functional System

The third character represents the functional system which this particular CPUI supports. The legal values are defined in Appendix B. If several systems need to use the same conversion data, then one of the systems will be declared the owner by the data provider and will be responsible for any change to the conversion data.

Field 3 Conversion Owner

The fourth character represents the Data Provider. The legal value list is defined in Appendix R.

Field 4 Conversion Type

The fifth character represents several conditions. It defines the type of conversion (Piecewise or Polynomial), whether they are actual or standard, if it is a forward or inverse, or a state conversion. The following Conversion Type Codes are defined:

- A = Actual Polynomial Forward Calibration Conversion Equation;
- B = Actual Polynomial Inverse Calibration Conversion Equation;
- C = Actual Piecewise Forward Calibration Conversion Equation Set;
- D = Actual Piecewise Inverse Calibration Conversion Equation Set;
- E = Standard Polynomial Forward Calibration Conversion Equation;
- F = Standard Polynomial Inverse Calibration Conversion Equation;
- G = Standard Piecewise Forward Calibration Conversion Equation Set;
- H = Standard Piecewise Inverse Calibration Conversion Equation Set; and
- Z = Encoded State Conversion.

Where: the terms Forward, Inverse, Standard, and Actual Calibration Conversions are as defined in this document, section 3.3.4, Conversion Standards.

Field 5 Conversion Family

The sixth, seventh, eighth, and ninth characters represents a four digit number which is left to the discretion of the PUI developer to signify the group of conversion curves to which this particular curve belongs. For example, it may be that all conversion PUIs that are associated with a particular type of temperature sensor are assigned to a curve family type of 1000. This 1000 four digit code has a significance to the developer with respect to all the other four digit codes assigned a meaning by the same developer, but is of no specific concern to anyone else. The only guidelines defined are that the Conversion Family Code be all digits, and four numeric characters long with a range of 0000 to 9999, and must be unique within the combined Field 2 and 3 code domains (i.e. a temperature family - assigned a Field 2 value of T, a Field 3 value of 1, and a Field 5 value of 1000, - will be unique among all other Field 2=T, Field 3=1 curve families).

Field 6 Conversion Criteria

The tenth, eleventh, twelfth, and thirteenth character represents certain environmental factors that reflect specific values assigned to the conversion. The effect of the factors is to produce a set of unique members to the "conversion family" defined by field 5 above. Whereas that family identification still applies, a further breakdown into a set of multiple conversions for that family is required. Factors such as bias and gain setting combination, scaling, or filtering, line length, hardware device configuration settings, ISS Mode sensitivities etc. are to be represented by a code which is associated with that condition. These codes must be defined via inputs from the PG(s), NASA, and IP(s). The initial legal value list is derived from the Channel Configuration table in Appendix P. In this list the legal values that are longer than four characters are to be truncated as follows: (The LLAC1 - LLAC7 are to be LAC1 - LAC7, and LLAV1 - LLAV7 are to be LAV1 - LAV7). For any Criteria Independent (one conversion per family) conversions, the Criteria Code legal value will be "INDP". This applies to Encoded State Conversion Tables as well.

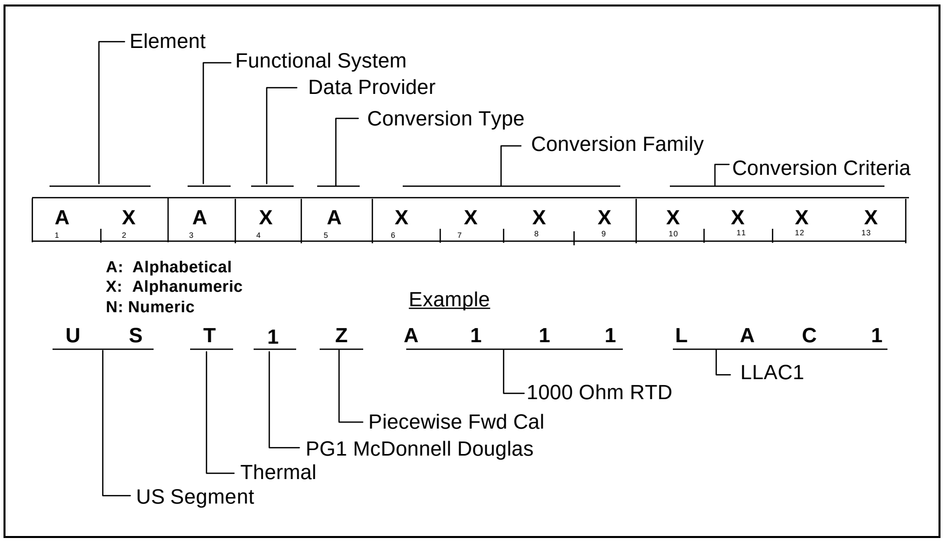


FIGURE 3.3.1.5-1 CONVERSION PUI DEFINITION

B. CPUIs and associated attributes shall be provided via the appropriate State Conversion File 3.1, Polynomial File 3.2, and Piecewise Linear File 3.3 of the IP&CL Standard Input as defined in paragraphs 3.3.4, 3.7.1.4.7, .8, .9 and Appendix N;

C. The relationship between the SPUIs, the CPUIs, and associated attributes shall be provided by File 3.4 of the IP&CL Standard Input as defined in paragraph 3.7.1.4.10 and Appendix N; and

D. If a Primitive Signal requires more than one conversion table, the SPUI of the signal used to determine which conversion should be used, shall be provided in file 4.2 of the IP&CL Standard Input as defined in paragraph 3.7.1.4.19 and Appendix N.

3.3.2 SOFTWARE COMPONENT DEFINITION

The CSCIs shall be modular in design. The modularity shall be chosen to maximize functional isolation and minimize interface complexity. A structured design approach shall be used to establish modularity. This approach shall create a hierarchical structure with components identified at multiple levels. Each level of the hierarchical structure is logically complete; the lower levels simply add more design detail. The hierarchical structure need not resemble the capability divisions contained in the SRS. However, every requirement contained in the SRS shall be satisfied by, and traceable to, one or more CSCs. The design may include features not directly traceable from requirements, but these features shall be derivable from the requirements.

3.3.3 NAMING CONVENTIONS

The following sections include standards for software component, interface, and data element naming.

3.3.3.1 FLIGHT SOFTWARE CODED NAMES

Flight Software Coded Names shall be compliant with the Reference Manual for Ada Programming Language, ANSI/MIL-STD-1815A, and the coding standards defined in section 3.5 of this document.

3.3.3.2 SOFTWARE COMPONENT NAMING

The following standards shall apply to software component naming:

A. CSCI(s) shall have a unique three character Configuration Item (CI) identifier to support Program Unique Interface Identifier naming conventions. Appendix C lists the ISS CSCIs and their associated identifiers.

B. CSCIs shall have a unique name to be used in naming the delivery directory containing the CSCI files. In addition, each file in a delivered CSCI directory will use a standard file extension. Section 3.7.2, Software and Non-Signal Data Delivery Standards, and the associated Tables in Appendix O list the standard CSCI directory names and the set of standard file extensions to be used for CSCI deliveries.

C. CSC names shall be as specified in the Tier 1 Subcontractor's SDPs and/or SSPS.

D. CSU names shall be as specified in the Tier 1 Subcontractor's SDPs and/or SSPS.

3.3.3.3 <DELETED - INTERFACE NAMING>

No standard names for interfaces.

3.3.3.4 DATA ELEMENT NAMING

This section contains the data element naming standards to be used by the Tier 1 Subcontractors in preparation of the following data element sections:

A. SRS section 3.4, CSCI Data Element Requirements;

B. SRS section 3.5, Adaptation Requirements; and

C. Software Product Specification (SPS) section 3.1, Software Design.

Data elements that are external to the CSCI, or internal to the CSCI but cross the Tier 1 Subcontractor boundaries shall follow the standards specified in this section. Specific rules for identifying the data elements are as follows:

- For each data element identified in section 3.4 of the SRS, the software coded name shall be traceable from interface requirements to design and from design to code in the SPS. The traceability from code to the assignment of Program Unique Signal Data Identifiers shall be documented in the SPS.

3.3.3.4.1 STANDARD UNITS OF MEASURE

Appendix F, Legal Values for Units of Measure, shall be used in describing the referenced data element.

The ISS Program has adopted a general policy of supporting the conversion of the English system units of measure into the appropriate metric counterpart. For ISS signal data, this support will involve supplying a mutually accepted set of conversion data for use where applicable. The conversion data will be provided in this document for program visibility and control.

The official program source for the ISS program concerning engineering units conversions of signal data shall be established in this document.

Appendix F shall be the ISS program source for:

- all legal signal data Native engineering units;
- all legal signal data Metric engineering units;
- the coefficients for each conversion using the following equation relationship: Metric Value = [A0 + A1(Native Value)] x Prefix Multiplier;
- a prefix multiplier for each conversion; and
- the conversions from Native units to Metric units only.

3.3.3.4.1.1 GENERAL GUIDELINES

The following paragraphs describe a set of guidelines for the disciplines supporting ISS signal data engineering units conversions.

Terminology for supported signal data engineering unit conventions:

- Native - that set of units chosen as the initial convention and established by the originating requirements for that signal; and
- Metric - that metric engineering unit convention requiring conversion from the native set.

ISS On-board data bus environments: Signal data will not appear on ISS on-board buses in the non-native forms.

Signal scaling data:

- conversion algorithms and coefficient data for transforming digitized signal data into engineering units representation will be supplied for Native engineering units only; and
- refer to section 3.3.1.5 for associated requirements.

Operations override capability:

- provision shall be made allowing standard input data to establish the selection from a predetermined set of metrics conversions for priority application to specified signal primitives;
- the set of predetermined metric conversion selections shall exist in Appendix F of this document;
- the override option shall not apply to signals whose native units are COUNTS; and
- the override option shall only be applied on a primitive-by-primitive basis.

Command parameters: all command parameter data for ISS standard commands will be supplied in Native engineering units only.

3.3.3.4.1.2 SCOPE OF METRIC UNIT APPLICATION

The application of Metric engineering unit conversions will oblige the end-user to assume certain associated risks.

All units conversions will be performed by “end-users” for any interface requiring such.

All signal attributes “related” to the signal value attribute will be the sole concern of the one performing the units conversion:

- the conversion process impact to related attributes is the risk inheritance of the one performing the conversion;

- the precision implied by the numerical conversion factor is to be considered as that precision necessary to establish a reasonable approximation of definitions or physical measurements; and
- resultant precision from an applied units conversion are the responsibility of the "end-user".

3.3.3.4.2 <DELETED - INCLUDES APPENDICES G & H> NOT USED

3.3.3.4.3 STANDARD ENGINEERING CONSTANTS

Appendix I, Standard Engineering Constants, shall used in describing the conversion factors or engineering constants for the referenced data element. In addition to the constant value, the coded name for the constant shall be specified.

Note: Appendix F along with paragraph 3.3.3.4.1 is used for Conversion of English Units to Metrics Units

3.3.3.4.4 STANDARD DATA TYPES

Appendix J, Legal Values for Firmware & Software Primitive Data Types, shall be used to specify the data types for each external data element identified in the SRS and SPS and Standard-IN IP&CL Data Delivery File Definition (Appendix N) Fields 1.2-3 and 1.3-3. Language or processor dependent data type conventions (e.g., enumeration, array, data structures, etc.) must be documented in the Tier 1 Subcontractor's SDP and/or SSPS.

3.3.3.4.5 STANDARD STATE CONVERSION LIST

The Standard State Conversion List necessary to document the values of the encoded signal states shall be delivered in the format required by the Standard-In IP&CL Data Delivery File Definition (Appendix N) Files 3.1 (State Conversion File) and 3.4 (Conversion Primitive File).

3.3.4 CONVERSION STANDARDS

Conversion is defined as the technique of translating the basic hardware signal output into engineering values usable for evaluation, control, or specific analysis. Sensors/Effectors react to or act upon their environment by producing an electrical signal indicative of a monitored quantity. This data is useful only if it can be related to a verifiable desired Engineering Unit.

The following definitions are given for terms specific to signal conversion disciplines stated in this document.

1. Forward Calibration Conversion: that set of data which describes the conversion of a digitized discrete count representation of a physical phenomenon into that set of engineering units associated with the phenomenon (i.e., ‘CNT’ to ‘Engineering Units’). The term “forward” is independent of the direction of information flow. It makes a statement solely in the context of converting from an interim data representation to a desired physical interpretation in engineering units.

2. Inverse Calibration Conversion: that set of data which describes the conversion of a physical phenomenon into a digitized discrete count representation of that phenomenon (i.e., ‘Engineering Units’ to ‘CNT’). The term “inverse” is independent of the direction of information flow. It makes a statement solely in the context of converting from a defined physical interpretation in engineering units to an interim data representation, usually expressed in discrete counts.

3. Standard Calibration Conversion: a conversion which “best fits” a sample of curves for transducers of the same type or class and is utilized for all transducers with those same characteristics. These may be industry “book” standards or ISS data provider generated standards developed via specific techniques established per the provider’s own requirements. Common system factors may be included in the final end-to-end calibration conversion data associated with multiple instruments.

4. Actual Calibration Conversion: a conversion obtained empirically from a controlled environment for a serialized instrument and is unique to that instrument. In special cases, certain “system factors” such as connectivity or sensor environment may establish unique results for transducers whose characteristics are described by a standard calibration conversion. If the introduction of those factors into standard conversion data produces a result uniquely used by a single instrument, the final end-to-end result should be represented as an actual calibration conversion.

5. Multiple Conversions: indicates that several state, polynomial, or piecewise conversions exist for a given digitized primitive signal.

6. Multiple Conversion SPUI Indicator: a primitive signal that is used to indicate the specific state, polynomial, or piecewise conversion to be used to interpret the given digitized primitive signal.

Forward and Inverse calibration conversion data shall be consistent sets. That is to say, for a given forward conversion, its associated inverse conversion shall produce results consistent with the variable relationships stated by the forward conversion, and vice versa.

The following rules and guidelines shall be adhered to when providing the conversion data for sensors and effectors:

A. Forward Conversion Coefficients shall be provided as part of the files specified in paragraph 3.7.1.4.8 (Polynomial) and paragraph 3.7.1.4.9 (Piecewise Linear). Figure

3.3.4-1 and Figure 3.3.4-2 illustrate examples of Polynomial and Piecewise Linear Coefficients.

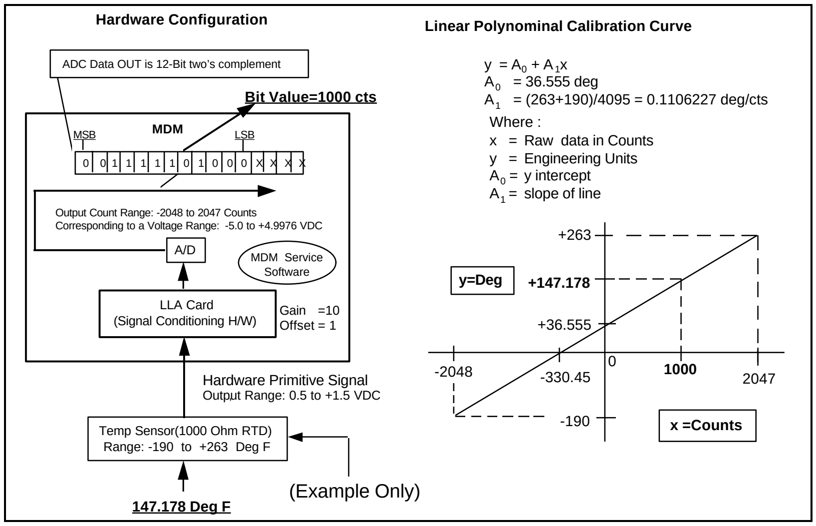


FIGURE 3.3.4-1 EXAMPLE OF LINEAR POLYNOMIAL CURVE

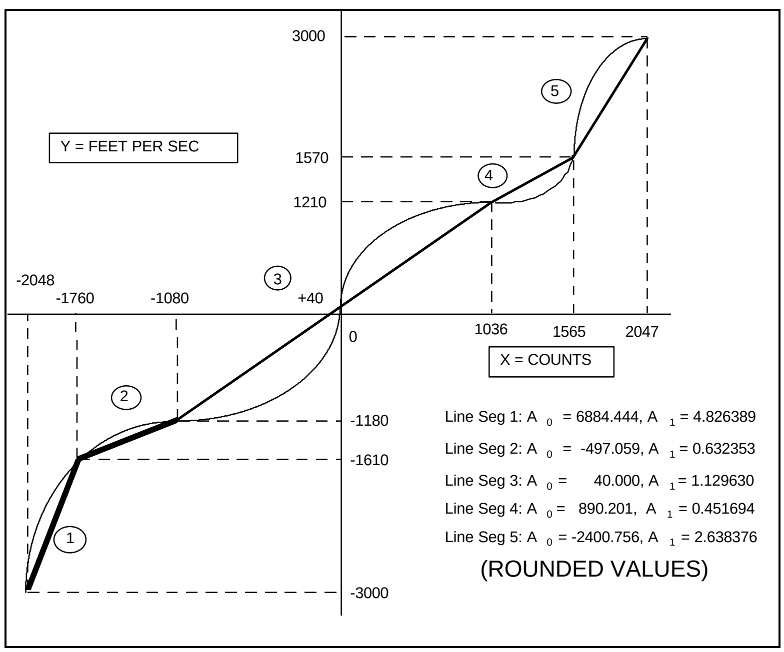


FIGURE 3.3.4-2 SAMPLE PIECEWISE LINEAR CURVE

B. Inverse Conversion-Coefficients shall be provided with each set of Forward Calibration coefficients in support of the program simulation facilities. Figure 3.3.4-3 illustrates inverse coefficients.

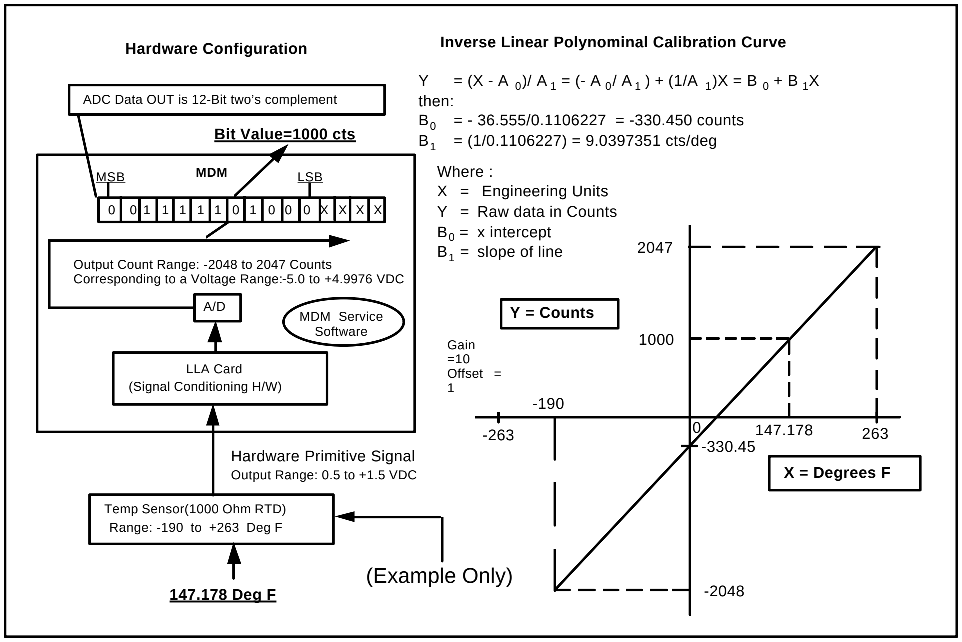


FIGURE 3.3.4-3 EXAMPLE OF INVERSE CONVERSION COEFFICIENTS

C. Once the conversion coefficients have been established for the sensor and effector, the units of measure will be standardized and used whenever that sensor/effector data is referenced.

D. Conversion Coefficients generated for use by the On-Board Software will also be used by the Ground Processing System.

E. On Board Software calculations (C&W limits, position of a valve, etc.) will be based on the conversion coefficients provided by the IP&CL.

3.3.4.1 MULTIPLE CONVERSIONS

A primitive signal may require more than one state, polynomial, or piecewise conversion data. An indicator is required to determine which conversion data should be used to interpret the primitive signal. This indicator will be a separate primitive signal or the primitive itself and will contain a value or a range of values to establish the required conversion data. The indicator is defined as a Multiple Conversion SPUI Indicator and will be provided in Field 3.4-3 of the Standard Input File defined in Appendix N. In addition, Fields 3.4-6 and 3.4-7 will contain the minimum and maximum value necessary to determine the required conversion data. Multiple Conversion types include:

- An enumerated digitized primitive requiring state conversion where the Multiple Conversion SPUI Indicator is the same SPUI as the enumerated digitized primitive and the range of enumerated values determines the correct conversion data to be used;

- An enumerated digitized primitive where the Multiple Conversion SPUI Indicator is a different SPUI as the digitized primitive and the range of values determines the correct conversion data; and
- A digitized primitive requiring Poly or Piecewise conversion where the Multiple Conversion SPUI Indicator is a different SPUI from the digitized primitive and the range of values determines the correct conversion data.

Multiple conversion CPUIs for the same primitive SPUI shall be limited to a combined maximum of one hundred (100) in number. This excludes inverse conversion CPUIs.

Multiple conversions shall not be utilized for Standard command primitives (i.e., commands utilizing CCSDS Headers) with the following exceptions:

- Command APIDs;
- NCS Heater RTD setpoint commands; and
- Internal Commands not issued from the C&C, PCS, Timeliner, or Payload MDM Processors.

3.3.5 INTERFACE DESCRIPTION CONVENTIONS

This section specifies the data interface conventions with respect to each CSCI.

3.3.5.1 EXTERNAL INTERFACES

The Tier I Subcontractors shall specify the external interfaces of a CSCI in the SRS.

3.3.5.2 INTERNAL INTERFACES

The Tier 1 Subcontractors shall specify the internal interfaces of a CSCI (i.e., inputs and outputs of CSCI capabilities) in accordance with the Tier 1 Subcontractor’s SDP and/or SSPS.

3.3.5.3 LOCAL DATA

The Tier I Subcontractors shall document the design of local data in the SDFs.

3.3.6 CSU-TO-CSU COMMUNICATION

Communication between CSUs within a CSCI shall be via arguments (preferred) or via data elements common to the components. The use of arguments reduces the interface complexity and provides better interface control and flexibility. However, for real-time software, execution time and memory size limitations may dictate use of common data elements.

3.3.7 CSCI DATA STRUCTURE AND ACCESS

The CSCI data shall be placed in separate areas of memory according to the following categories: adaptation data, constant data, and variable data. For the purposes of this section, adaptation data is defined as data subject to change by a pre-positioned load. The following standards shall apply:

A. Within adaptation data, the CSCI data will be structured to associate data that is functionally related;

B. Data internal to a CSC shall be associated together and shall not be accessed by other components; and

C. Data that must be logically treated as a set shall be protected from access by another component when the data set is being updated. Access protection shall be explicit (i.e., software techniques prevent access) or implicit (i.e., updating is logically separated from access in time). Explicit access protection is preferred.

3.3.7.1 ADAPTATION DATA OVERLAYS AND PRE-POSITIONED LOADS

USOS MDM based CSCIs include Adaptation Data Tables (ADTs) that contain configuration and control parameters that are used to initialize the CSCI. Time synchronization variables, command routing tables, upper and lower sensor limits, telemetry lists and data acquisition lists are examples of ADTs.

ADTs have three basic types:

1. tables that have a high probability for change between major releases of a CSCI (Telemetry lists, command routing tables, RT configuration tables and the time drift compensation control table are examples of the first type.);
2. tables that can not change without major impact to interfacing systems (Data scatter/gather tables that implement on-board data acquisition and distribution are examples of the second.); and
3. tables that can not change without a major change to their parent CSCI or the hardware that hosts their CSCI. (The I/O Card Configuration and checksum tables are examples of the third.).

Type-one ADTs are subject to the implementation, use and formatting rules defined in this section. The implementation, format and use of other ADT types is defined in the documentation delivered with each CSCI.

The type-one ADTs defined above are referred to in this section as Adaptation Data Overlays (ADOs). ADOs exist in on-board memory and are accessed during run-time by the CSCI. At least one version of an ADO is delivered with each CSCI load image when it is released for use on-board.

Additional versions of an ADO may be required to support the expected life-cycle of a CSCI release. ADO versions that are not included in a load image are pre-positioned 1) on the ground for uplink to CSCIs or 2) in on-board Mass-Storage Devices (MSDs) for transfer to other on-board systems. Adaptation Data Tables, that are pre-positioned to update ADOs, are called Pre-Positioned Loads (PPLs).

The difference between the terms ADO and PPL is the following:

- ADO is a design construct for the subset of adaptation data tables that are likely to be changed and need special consideration; and
- PPLs are load files which contain data for the overlays of default data in the ADO.

The format and use of ADOs and PPLs are defined below. See the SDP, D684-10017-01, Section 4.2.3.3 for additional information on the use and terminology of ADOs and PPLs.

The following sections are the program source for detailed definition of the structures, components, files, and documentation required to modify ADOs during on-orbit assembly and operations. They focus on the following topics:

- Adaptation Data Overlay Design Construct;
- Pre-Positioned Load File; and
- Documentation for Adaptation Data Overlays and Pre-Positioned Loads.

3.3.7.1.1 ADAPTATION DATA OVERLAY DESIGN CONSTRUCT

Adaptation Data Overlays are contiguous blocks of related parameters. They are preceded by a header that contains a Checksum Wildcard and Version ID. The Checksum Wildcard and Version ID are an integral part of the ADO table.

The preferred format for the ADO Checksum Wildcard/Version ID header is to have the Checksum Wildcard in the first word and the Version ID in the second word. An alternative format is to have the Version ID (8 bits), plus an ADO/PPL number (8 bits) in the first word, and the Checksum Wildcard in the second word. Allowable ADO header formats are shown in figure 3.3.7.1.1-1.

The preferred ADO format will be used for ADOs that are common across all MDMs. The alternate ADO format may be used for ADOs that are not common across all MDMs.

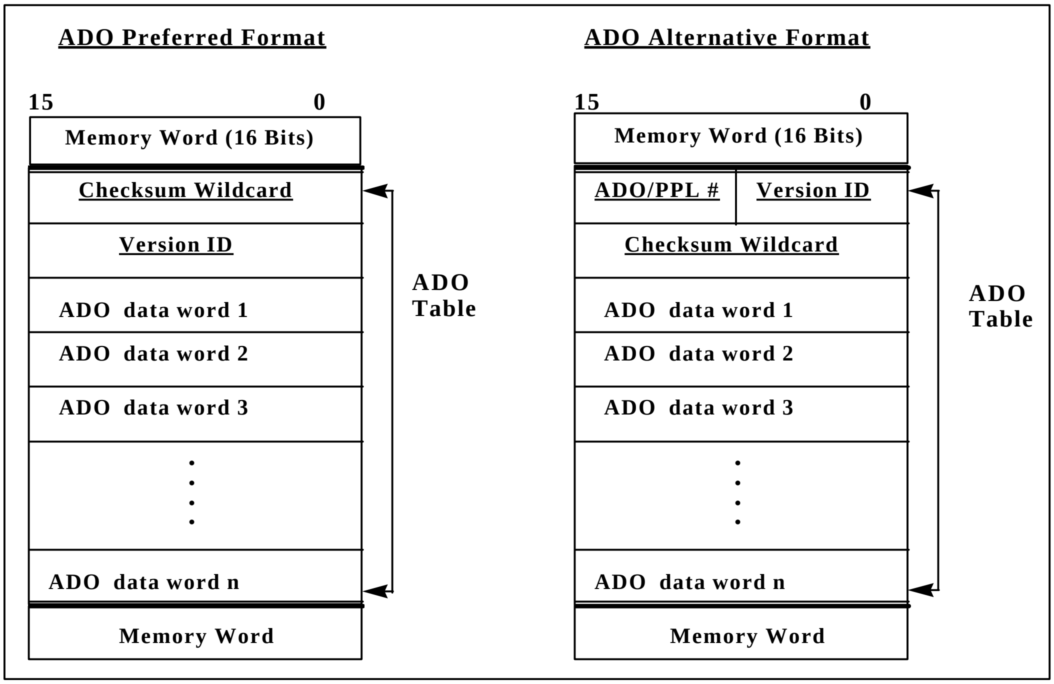


FIGURE 3.3.7.1.1-1 APPLICATION DATA OVERLAY CONSTRUCT FORMATS

3.3.7.1.1.1 RULES FOR THE ADO DESIGN CONSTRUCT

ADOs may contain configuration data, control parameters, address lists, and/or command lists. These values are "read-only" data to the flight Applications that use them. They can be modified via Data Load commands generated by Ground Control. For example, an ADO might be a telemetry list that contains pointers to data which will be included in a space-to-ground telemetry message. (See Figure 3.3.7.1.1.1-1, Ex. #1). During normal operations, the on-board software uses the values in the telemetry table as inputs to its telemetry functions. (See Figure 3.3.7.1.1.1-1, Ex. #2). If new telemetry is required, a new telemetry table is built, tested and uploaded. The uploaded telemetry list overlays the old list, and the telemetry function begins down-linking the new data.

The first two words of an ADO will contain a Checksum Wildcard and Version ID. The complete ADO, including Checksum Wildcard, Version ID, and Parameters, is a contiguous block of data.

The Checksum Wildcard is calculated so that the checksum of the ADO, including the Checksum Wildcard, Version ID and parameters, is equal to the checksum of the first ADO used by the CSCI.

The Version ID is either a 16-bit unsigned integer (preferred format) or an 8-bit unsigned integer (alternative format). The Version ID will change with each new ADO instance to uniquely define the ADO version contained in the PPL.

An ADO is updated in aggregate using one or more Data Load commands. ADOs are updated both in DRAM and non-volatile memory (EEPROM or CCS MSD) unless the CSCI Team will meet autonomous operations requirements with the original ADO(s) loaded in its non-volatile memory (i.e., the memory used to bootstrap the CSCI during power-up).

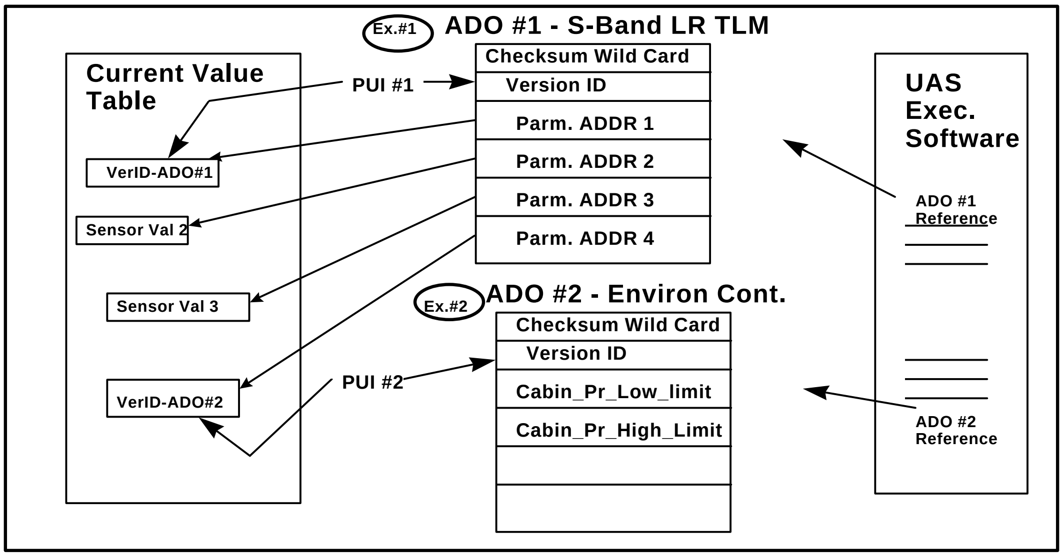


FIGURE 3.3.7.1.1.1-1 CSCI APPLICATION IMAGE WITH EXAMPLE ADOS

3.3.7.1.2 PRE-POSITIONED LOAD FILE

The PPL file is created by the CSCI developer when it becomes known that an ADO will require modification before the next major release of a CSCI. The need for ADO modification may be driven by steps in the station assembly sequence, or in response to real-time operations contingencies. The format of the PPL file includes the Load Image File header, the PPL instance data to overlay the ADO, and a checksum trailer word. See the Load Image File Format described in the Space to Ground ICD, SSP-41154, Section 3.5.1 and Figure 3.5.1.1-1.

3.3.7.1.3 DOCUMENTATION FOR ADOS AND PPLS

ADO and PPL documentation standards are specified to provide consistent documentation by all Program Groups (PGs). The documentation for ADOs and PPLs provided by the Flight Software (FSW) developers as input to the MBF will be made available to the FSW users without change by the MBF and will reflect the complete set of information received by the MBF from each CSCI.

3.3.7.1.3.1 ADO DESIGN DESCRIPTION

The ADO design description documentation will make use of standard CSCI documentation and will define the individual ADO engineering name, ADO unique number within the CSCI (same as VDF Item 4 specified below), and the ADO structure in terms of Parameter Engineering Names, Parameter locations - word number within the ADO, default parameter value, and engineering units. Typical documents include Software Product Specification, Database Design Document (DBDD) or Software Users Manual.

3.3.7.1.3.2 PPL VERSION DESCRIPTION FILE (VDF)

For each delivery of CSCI FSW which may include predefined PPLs, as well as each subsequent individual PPL file delivery, there will be included a corresponding Version Description Drawing (VDD) as described in Data Item Description DI-MCCR-80013A. In addition, each delivery will include a subset of the information contained in the standard VDD in an ASCII file, called a Version Description File (VDF). This VDF will be accessed electronically by the MBF in the process of identifying and tracing all the elements of the delivery. The required fields in the VDF are as specified in Table 3.7.2.1-1, in the SSPS, D684-10056-01.

The VDF will accompany each PPL's delivered Image and Source Files. It is intended to describe the final parameter values contained in each PPL File (Data Load Image File format), including the PPL load address, final parameter values, and other information needed to use the PPL file operationally. In addition, the following detailed information relative to each PPL parameter and its attributes will be provided. One VDF will be delivered for each instance of a PPL. For the delivery of an instance of a PPL that requires multiple PPLs because there are multiple load destinations, one VDF will be delivered.

VDF - General Information about each PPL and its CSCI will include:

- CSCI name and development organization;
- Contact within a CSCI's organization for PPL information;
- PPL general description and purpose for this instance;
- PPL engineering name and PPL number within the CSCI;
- Signal PUI for the PPL's version ID field;
- PPL version ID for this instance;
- Flight effectivity for PPL (for example: "2A-3A");
- CSCI FSW major release version(s) for which this instance is valid;
- PPL file names delivered to the MBF will use the file format defined in the SSPS, D684-10056-01, Section 3.7.2.1 and Appendix O;
- PPL Software Load Procedure Description - As a part of the VDF, the delivery of each PPL will include a Load Procedure Description (written from

the software development and test perspective), which will be used by MCC-H to 1) prepare for the load, 2) complete the load and 3) return to normal operations. The Load Procedure will specify the state required for all related systems during each load step and identify all constraints and cautions related to the load; and

- PPL Software Load Restrictions - As a part of the VDF, the delivery of each PPL will include the specification of any load restrictions, e.g., time of day, Station Mode, or other conditions specified to Mission Operations.

3.3.7.1.3.3 PPL DEVELOPMENT AND DELIVERY

PPL files will be developed by the CSCI development organization, tested and made available to the MBF Software CM Library as part of a CSCI Software Version Delivery or in response to a Change Request from MOD, asynchronous to planned FSW Version Deliveries.

The delivery of one or more PPLs for a CSCI to the CM Library will include:

- The PPL load image files;
- See the Load Image File Format described in the Space to Ground ICD, SSP-41154, Section 3.5.1 and Figure 3.5.1.1-1;
- The PPL data files and/or tool sets used to build the PPL Load Image Files;
- The MBF will use the data files and/or tool sets to verify that the building of the PPL File can be duplicated and defines a PPL Load Image File identical to the delivered product. This is the same as the requirement specified for the delivery of other FSW products (see Section 3.7.2);
- One Version Description File (see Section 3.7.2.1);
- The VDF will include the “PPL Software Load Procedures Description” and the “PPL Software Load Restrictions” for each PPL (see Section 3.3.7.1.3); and
- A reference in the VDF to the Version Description Document (VDD), for the major FSW Release, for which this set of PPLs is applicable (see DID, DI-MCCR-80013A).

3.3.8 CHART AND GRAPHICS CONVENTIONS

The Tier 1 Subcontractors shall follow their individual chart and graphics standards for the figures required in the requirements specifications and design standards and shall document these standards in the Tier 1 Subcontractor SDPs and/or SSPS.

3.3.9 CONFIGURATION MANAGEMENT (PROGRAM VERSION IDENTIFIERS)

All deliverable software and data components will be uniquely identified using the naming conventions specified in sections 3.7 of this document and the version identifiers specified in the respective development organization's Software Development Plan (SDP) and/or Configuration Management Handbook. In making this assignment of version numbers each development organization should give full consideration to the version number linkages between related parts of the delivered source code, data, object code, and executables.

Upon receipt and acceptance of software and/or data components at the Prime Mission Build Facility, these components will be assigned a Prime Program version identifier. A traceability mapping between these Program version identifiers and the development organization delivery version identifiers will be maintained by the Prime Configuration Management organization. This traceability will be used to provide reference to the development organization version identifiers should a particular component be referenced in a Problem Report or Program Change Memo.

3.4 NON-SIGNAL DATA CODING STANDARDS

In addition to the set of standard data types defined in section 3.3.3.4.4, the following data encoding standards shall be followed.

The standard bit order for data transmission from processing element on to the transmission media shall follow the MIL-STD-1553B's bit priority, as follows:

A. The most significant bit shall be transmitted first with the less significant bits following in descending order of value in the data word. The number of bits required to define a quantity shall be consistent with the resolution or accuracy required. In the event that multiple precision quantities (information accuracy or resolution requiring more than 16 bits) are transmitted, the most significant bits shall be transmitted first, followed by the word(s) containing the lesser significant bits in numerical descending order. Bit packing of multiple quantities in a single word is permitted; and

B. Bit numbering order for bits in the 16-bit words on the 1553 bus shall be bit 0 as the first data bit sent (first bit follows the sync bit), and bit 15 to be the last data bit sent. Figure 3-4-1 illustrates the bit transmission order and bit numbering conventions for the 1553 bus.

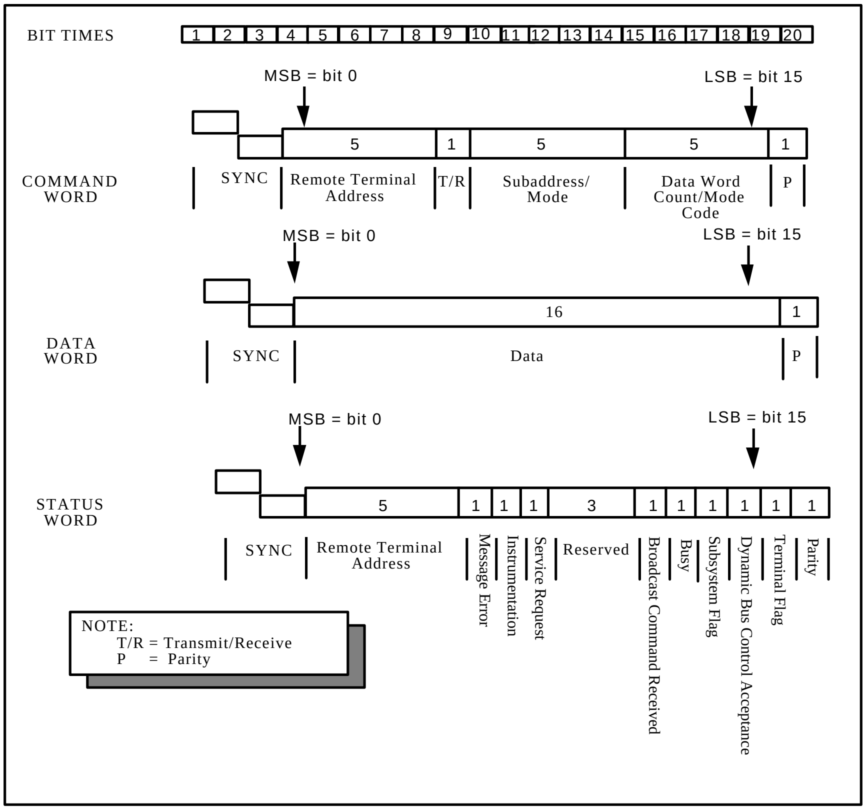


FIGURE 3.4-1 BIT ORDERING FOR 1553 BUS TRANSMISSION

C. Bit numbering order for bits in the 16-bit processor registers or memory words shall be bit 15 as the most significant bit, and bit 0 as the least significant bit. Figure 3-4-2 illustrates the bit position numbering convention for processor registers and memory contents.

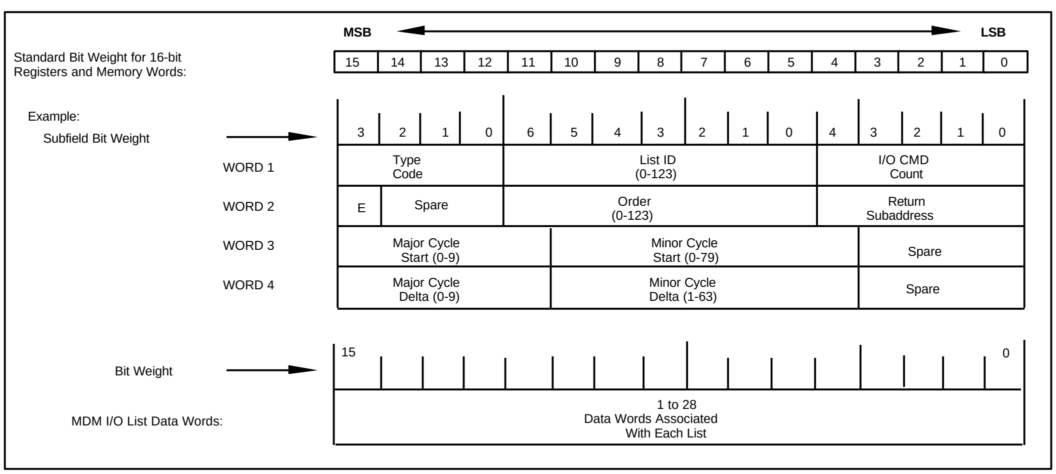


FIGURE 3.4-2 BIT POSITION NUMBERING CONVENTION FOR PROCESSOR REGISTER AND MEMORY WORD CONTENTS

D. When depicting register or memory word contents that contain multiple encoded subfields, the bit position denotation shall start with bit 0, from right to left, in ascending order;

E. The serial stream of bits as presented by the source of transmission to the destination shall be preserved by the communication and storage devices for each data path segment of the space-to-ground, end-to-end path;

F. The bit, byte, or word ordering conventions used in the processing and communication elements shall be documented in the Part 2 ICDs;

G. The 80x86 Intel hardware has a Little Endian processor architecture; that is, the least significant bytes are stored in lower addresses in memory. Figure 3.4-3 illustrates the data representation of integers and floating point numbers as stored in 80X86 memory; and

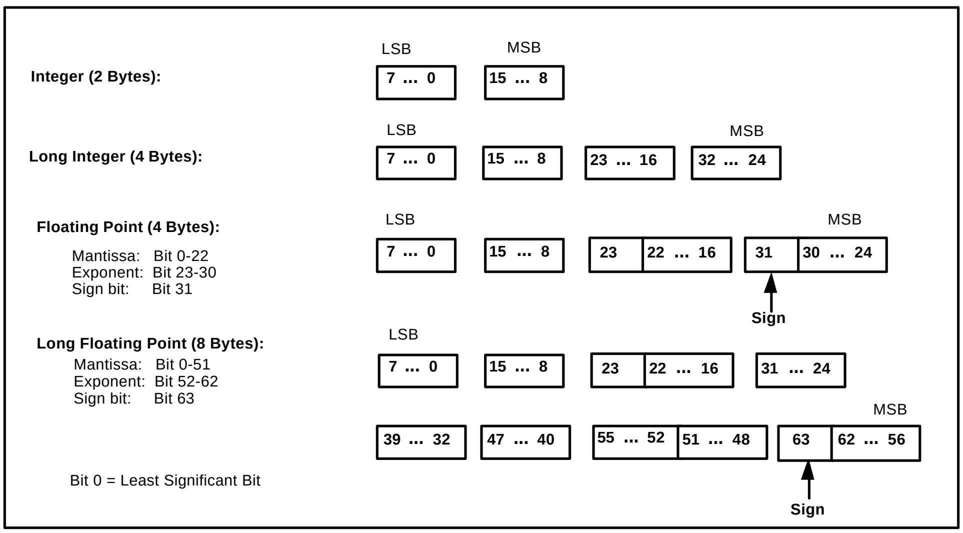


FIGURE 3.4-3 INTEGER AND FLOATING POINT DATA REPRESENTATION IN 80X86 MEMORY

H. When the transmission of data bits is done from a source device with Little Endian processor architecture, (e.g., Intel processor), to a destination device also with Little Endian processor architecture, the 1553 bus bit transmission priority as specified in paragraph 3.4-A can be waived to avoid excessive on-board processing, provided that the bit transmission ordering is agreed upon by all the parties involved in the interace definition and is documented explicitly in the ICD.

3.5 SOFTWARE CODING STANDARDS

This section describes the coding standards and guidelines for the ISS Program. These standards and guidelines apply to the Ada language (the primary programming language for the ISS program) and those non-Ada languages used on the ISS program.

Waiver/Deviation/Exceptions

Waivers, deviations or exceptions against any code standard shall be handled on a case by case basis and through the appropriate boards.

Any waiver, deviation or exception granted shall be documented within the appropriate SDF and comments shall be added to the code in the appropriate compilation units.

3.5.1 ADA STANDARDS

The following coding standards shall be applied to on-board flight software and safety critical ground support software written in Ada. These standards will also serve as guidelines for all non-safety critical ground support software, development tools provided by the Software Engineering Environment (SEE), simulation software, test software, and training support software written in Ada.

Each Tier 1 Subcontractor shall document any additional Ada standards applicable to their software development in the Tier 1 Subcontractor's SDP and/or SSPS.

Where applicable, references from the following are provided:

- Reference Manual for the Ada Programming Language (Ada RM), ANSI/MIL-STD-1815A;
- Alsys User's Guide (Alsys UG), UD/UG/A030-05323/001;
- Alsys Application Developer's Guide (Alsys ADG), UD/REF/A030-05333/001;
- Ada Quality and Style: Guidelines for Professional Programmers (Ada Q&S), SPC-91061-CMC; and/or
- Portability and Style in Ada (P&S in Ada), ISBN 0521264820.

Terms:

Some terms used in a number of the code standards require explanation and are provided here.

A. The term 'outermost declarative part' refers to the highest declarative region of a compilation unit. 'Outermost declarative part' does not refer to the declarative region of any nested unit, except for the task body of a 'permanent task'. For a subprogram, the 'outermost declarative part' deals with those objects declared within the declarative part of the subprogram body (Ada RM, Section 6.3). For a package, the 'outermost declarative part' deals with those objects declared within the package specification or the declarative part of the package body (Ada RM, Section 7.1). For a task, the 'outermost declarative part' deals with those objects specifically declared within the declarative part of the task body (Ada RM, Section 91.).

B. The term ‘permanent task’ defines those tasks dependent upon the main program (Ada RM , Section 9.1(1-4,13)). Refer to Ada RM, Section 9.1 for more information on task termination.

C. The term library package refers to the collective library unit package declaration and the library unit body package body (Ada RM, Section 10.1(2)).

<u>Heap Usage:</u>

One specific goal of a number of these code standards is to control, or better eliminate, the usage of heap during execution of flight software by restricting the use of various Ada constructs. The intent being to reduce the occurrence of flight software failures by eliminating, in these instances, the dynamic allocation of heap.

<u>Rationale:</u>

Both the explicit and implicit use of dynamic (heap) storage by Ada software during its execution poses a significant risk that software failures will occur.

The use of dynamic storage by Ada software can cause significant irregularities and nondeterminism in software execution time and can result in software failing to meet its performance requirements. This irregularity and nondeterminism in execution time depends upon the particular algorithms used to allocate, deallocate, and reclaim dynamic storage and the condition of that storage from its prior use. During allocation, searching for available heap storage is often required and the execution time can vary significantly depending on how many blocks of contiguous storage have to be checked before one is found that is large enough. Also, during reclamation, the execution time required to perform coalescing, compaction, or garbage collection can vary significantly depending on the algorithms used and the amount of data that has to be processed.

The use of dynamic storage can also result in a software failure caused by exceeding the limit of available heap storage and not being able to recover from Storage_Error.

Often, the algorithm used to manage the dynamic allocation and reclamation of heap storage causes fragmentation (proliferation of deallocated blocks that are too small to satisfy additional allocation requests) or leakage (storage that is lost during reclamation). Heap fragmentation and leakage often occur because deallocation is performed without compaction or garbage collection or because a variable size block allocation algorithm is used instead of a fixed size. In addition, heap fragmentation and leakage can often increase during the execution of an application program depending on the pervasiveness of the use of heap storage by the program and depending upon the sequence of allocations and reclamations. If heap fragmentation and/or leakage increases, it is likely to eventually cause the Ada exception Storage_Error to occur when a dynamic allocation cannot be performed that is required by the program. It is very difficult or impossible to recover from a Storage_Error without reloading and restarting the application program. This is because it is difficult to determine which specific Ada statement caused the Storage_Error exception and therefore to design the software to recover under all possible occurrences of this error. Regardless of this difficulty, a software failure due to Storage_Error should be considered unacceptable for Space Station operational software and therefore the risk of its occurrence should be reduced by restricting the use of dynamic storage.

Even if fragmentation or leakage do not occur, the use of dynamic storage by a program can result in Storage_Error if a program makes a request for more storage than is available at that particular point in time. Heap storage can be dynamically allocated and reclaimed within numerous Ada tasks which are executing concurrently within a program. If heap storage is used pervasively within numerous tasks and given that Ada tasks cannot be assumed to execute in a guaranteed order due to Ada's preemptive priority scheduling, it is very difficult to determine the worst case heap storage usage of a program and to size the heap such that the program will never request more heap storage than is available.

The Alsys Ada compiler used to develop Space Station flight software for the MDM utilizes a dynamic storage management algorithm that can result in fragmentation of heap storage. Fragmentation can occur because the heap storage manager normally allocates heap storage using variable size blocks and performs automatic deallocation without performing compaction or garbage collection.

The four features of the Ada language that are often found to use dynamic storage and, therefore, must be restricted in their use are: (1) catenation, (2) composite objects with non–static bounds, (3) access objects created via an allocator, and (4) dynamically created task objects. The use of dynamic (heap) storage will be restricted via programming standards either preventing the use of the above Ada features or by preventing the objects from ever being deallocated. Preventing deallocation ensures that fragmentation will not occur but permits allocation of dynamic (heap) storage.

3.5.1.1 ADA PROLOGUE COMMENTS

Every Ada package specification and body shall begin with a prologue. The prologue shall contain the following information at a minimum:

- creation date;
- modification history;
- programmer's name;
- CSC/project ID; and
- implementation dependencies.

3.5.1.2 WITH CLAUSE

A compilation unit shall only WITH a library unit where direct visibility to that library unit is required by the compilation unit.

3.5.1.3 UNCONSTRAINED RECORD OBJECTS

The declaration of a record object, whose type contains a discriminant part containing a default value, where the default value of that discriminant is used to bound an index constraint of a component subtype definition or to bound an index constraint of a component within a subcomponent in the record object, shall always be constrained. The declaration of an unconstrained object of a discriminated record type is permitted only if the discriminants have no impact on the size of the record object.

Reference Ada RM Sections 3.7.1 and 3.7.2, Appendix D.

Examples:

Example of record objects, whose type contains a discriminant, where the discriminant's value affects the size of the record object:

```
type Buffer_Size is range 0 .. 1000;
type Buffer_rec (Size : Buffer_Size := 200) is record
   Position : Buffer_Size := 0;
   Value : String (1..Size);
end record;

Message_A : Buffer;       -- unconstrained (implicit discriminant value)
Message_B : Buffer (300); -- constrained (explicit discriminant value)
```

Example of record type with discriminant where the discriminant's value does not affect the size of the record object:

```
declare
  type Days is range 1 .. 31;
  type Months is (Jan, Feb, Mar, Apr, May, Jun,
                  Jul, Aug, Sep, Oct, Nov, Dec);
  type Years is range 1800 .. 2000;
  type Date_rec (D : Days   := 1;
                 M : Months := Jan;
                 Y : Years  := 1800) is record
     Day   : Days   := D;
     Month : Months := M;
     Year  : Years  := Y;
   end record;

   Start_Date : Date_rec;                --unconstrained (implicit discriminant value)
   End_Date : Date_rec (1, Feb, 1998);--constrained (explicit discriminant value)
begin
   stuff;
end;
```

3.5.1.4 COMPOSITE OBJECTS OTHER THAN UNCONSTRAINED RECORD OBJECTS

The following shall only be declared in the ‘outermost declarative part’ of either a library package, a main subprogram, or a ‘permanent task’:

A. A constrained composite object with non-static bounds;

B. Any object of an unconstrained composite type whose discriminant values impact the size of the object; or

C. A composite object which has a statically known size greater than the stack parameter used in its corresponding compile command. (Note: Reference to the stack parameter is a specific Alsys Ada Compiler Compile command allocation parameter and may not be applicable to other compilers. Refer to Alsys UG, Section 4.2, pp39 & 48.)

These kind of objects shall not be used as an OUT parameter or as the return expression of a FUNCTION (Ada RM, Section 5.8).

These standards shall apply to any composite object having a component or a subcomponent that is a composite object with non-static bounds.

An object with non-static bounds is one whose size cannot be computed at compile time. Specifically regarding the Alsys Ada Compiler, such objects are of an unknown size; therefore, the object is tagged for Indirect Allocation by the compiler and will be dynamically allocated from the heap at run time (Ada ADG, Section 2.1).

Reference Ada RM, Sections 3.3(2), 3.6(2,3,5,6,11-13), 3.7, 3.7.1(11), 3.7.2(14), Appendix D.

Rationale:

Restricting declaration of such objects to the locations specified above does not keep heap allocation from occurring but restricts it to program elaboration and initialization, not allowing the allocation to occur during execution of the program.

3.5.1.5 ACCESS TYPES

An access object shall only be declared in the ‘outermost declarative part’ of either a library package, a main subprogram, or a ‘permanent task’.

Reference Ada RM, Sections 3.8 and 3.8.1.

Rationale:

Objects created by an Ada allocator are allocated in the heap. Deallocation can result in software failure due to heap fragmentation. Objects created using an access type declared in the ‘outermost declarative part’ of either a library package, a main subprogram, or a ‘permanent task’ will not be deallocated until the program is terminated and since they are allocated only once, the heap space requirements are deterministically bounded.

Reference Alsys ADG, Section 2.3.

3.5.1.6 CATENATION

Catenation, the basic operation defined for one-dimensional array types (See Ada RM 3.6.2), shall only be used:

A. Within the sequence of statements of a library package body; or

B. In the 'outermost declarative part' of a library package, main subprogram or permanent task.

Reference Ada RM, Sections 4.5.3, 7.1.

Rationale:

Catenation causes allocation and deallocation from the heap since it is a function returning a dynamically sized result.

Reference Alsys ADG, Section 2.3.

3.5.1.7 TASK SPECIFICATION

The following standards apply to dynamically created task objects:

A. Task types and task objects shall only be declared in the 'outermost declarative part' of either a library package or a main subprogram;

B. Arrays of task objects shall be statically constrained and shall only be declared in the 'outermost declarative part' of either a library package or a main subprogram;

C. An access type that designates task objects shall only be declared in the 'outermost declarative part' of either a library package or a main subprogram and shall have a static storage size specification;

D. Definition of unconstrained array subtypes whose components are task objects shall be prohibited; and

E. Definition of discriminant record subtypes that contains a component that is an array of task objects, where the number of task objects depends on the value of the discriminant, shall be prohibited.

Reference Ada RM, Sections 9.1, 9.2 and 9.4.

3.5.1.8 TASK EXECUTION

3.5.1.8.1 CIRCULAR TASK CALLS

Tasks shall not call their own entries, even by calling another task entry that (through one or more additional calls) can result in a call to an entry of the original calling task.

Reference Ada RM, Section 9.5 (21).

Rationale:

A software failure known as task deadlock will result if a task calls its own entries. This is unacceptable for ISS operational software. (Note that task deadlock due to circular task calls may occur with or without rendezvous actually occurring.) This standard should not be construed to mean that tasks should be either purely calling tasks or purely accepting tasks.

3.5.1.8.2 CALLABLE AND TERMINATED

The task attributes T'CALLABLE and T'TERMINATED shall not be used (where T is any task).

Reference Ada RM, Section 9.9 (1-3,5-7), Annex A (5,47); Ada Q&S, Section 6.2.2.

Rationale:

After the task attribute T'CALLABLE or T'TERMINATED returns a value indicating a task may be called, the situation could change immediately following the call. Therefore, the value returned for the attributes can be misleading. The task attributes T'CALLABLE or TTERMINATED cannot be used with any certainty and should not be used to avoid raising TASKING_ERROR. Use of the task attributes T'CALLABLE and T'TERMINATED may lead to an unsafe result.

3.5.1.8.3 ABORT

The ABORT statement shall not be used.

Reference Ada RM, Sections 9.10 and 11.5; and Ada Q&S, Sections 6.1.3 and 6.3.2.

3.5.1.8.4 SHARED VARIABLES

Shared variables shall be protected from being simultaneously accessed by both a reader and a writer. Multiple simultaneous writers or one or more writer in conjunction with one or more reader can lead to indeterminate results and errors. An Ada comment shall be included near the shared variables that indicates the method used to protect them from simultaneous access. Some of the preferred methods for protection of shared variables are:

- Use of a task such that a parameter-passing rendezvous is required to read or write the shared variables;
- Use of semaphores;
- Use of PRAGMA SHARED for scalar or access type variables, etc.; and
- Deterministic design which guarantees mutual exclusion.

Reference Ada RM, Section 9.11 (3-6), Annex B (12).

3.5.1.8.5 E'COUNT

The task entry attribute E'COUNT shall not be used (where E is any task entry name).

Reference Ada RM, Section 9.9 (6), Annex A (8).

3.5.1.9 EXCEPTION HANDLING

3.5.1.9.1 PRAGMA SUPPRESS

The PRAGMA SUPPRESS shall not be used. Compile command line (compiler invocation) switches that have the same effect as PRAGMA SUPPRESS shall not be used.

Reference Ada RM Section 11.7 and Ada Q&S Section 5.9.5.

Rationale:

The intent of limiting the use of runtime check suppression is to ensure that all software–detectable errors are at least detected and logged in order to help monitor the health of the software and/or to support error isolation, error correction, or error recovery.

PRAGMA SUPPRESS removes automatic runtime checks for the software–detectable errors specified in Section 11.7 of the Ada RM.

It is usually too costly to test all the possible combinations of paths through software and all the possible combinations of the ranges of input variables; therefore, testing cannot always guarantee that constraint, numeric, program, and storage errors will not occur during software execution.

The Ada language states that erroneous execution will result if error conditions occur where runtime checks have been omitted. The result of erroneous execution is deliberately left undefined in Ada. Reference Ada RM Section 11.7 (18).

See Appendix V for exceptions to this requirement.

3.5.1.9.2 PROPAGATION

If execution of a subprogram is abandoned due to the raising of an exception, the values returned by the subprogram shall not be relied upon, even if they are accessible.

Reference Ada RM, Section 6.2 (12,13).

Rationale:

If execution of a subprogram is abandoned as a result of an exception, the final value of an actual parameter of such a type can be either its value before the call or a value assigned to the formal parameter during the execution of the subprogram. If no actual parameter of an array or record type is accessible by more than one path, then the effect of a subprogram call (unless abandoned) is the same whether or not the implementation uses copying for parameter passing. If, however, there are multiple, access paths to such a parameter, then the value of the formal parameter is undefined after updating the actual other than by updating the formal. A program using such an undefined value is erroneous.

3.5.1.9.3 NESTED EXCEPTION HANDLERS

Nested exception handlers shall not be used.

3.5.1.10 <DELETED - ADDRESS COMPUTATIONS>

3.5.1.11 ADDRESS CLAUSES

Address clauses shall not be used to achieve overlays of objects or overlays of program units. Nor should a given interrupt be linked to more than one entry.

Reference Ada RM, Section 13.5 (8).

3.5.1.12 SIDE-EFFECTS

A side-effect is a change to any object that is not locally declared within a FUNCTION subprogram. This includes changes to non-local objects by subprograms and entries called from the FUNCTION if the changes persist after the FUNCTION returns.

Side-effects shall not be used where a sensitivity to the order of evaluation exists.

In all other cases, the use of side-effects should be avoided as they are difficult to understand and maintain. Additionally, the Ada language does not define the order functions are evaluated in when they occur in expressions or as actual parameters to subprograms. Therefore, a program that depends on the order in which side effects of functions occur is erroneous.

Where a side-effect is used it shall be commented where used within the code and documented within the appropriate SDF.

In examining the following example, the component of Matrix selected is sensitive to the order the evaluation of the indices is performed. Depending upon the order of the evaluation of the indices, the selected component of Matrix could either be (3, 1) or (3, 2).

Example:

```
declare
    type Stuff is . . .;
    Some_Stuff : Stuff;
    subtype Rows is Integer range 1 .. 3;
    subtype Cols is Integer range 1 .. 3;
    Row : Rows := 1;
    Matrix: array (Cols, Rows) of Stuff;
    function Col return Cols is
    begin
        Row := Row + 1;
        return 3;
    end;
begin
    Matrix(Col, Row) := Some_Stuff;
end;
```

Reference P&S in Ada, page 30; Ada Q&S, Section 4.1.3.

3.5.2 ADA GUIDELINES

Each Tier 1 Subcontractor shall document any Ada guidelines applicable to their development in the Tier 1 Subcontractor's SDP and shall be compliant with ANSI/MIL-STD-1815A.

3.5.3 NON-ADA STANDARDS AND GUIDELINES

Each Tier 1 Subcontractor shall document any C standards and guidelines applicable to their development in the Tier 1 Subcontractor's SDP and/or SSPS and shall be compliant with ANSI/ISO 9899.

There are no standards and guidelines applicable to all Tier 1 Subcontractors for languages that are non-Ada and non-C. Each Tier 1 Subcontractor shall document any non-Ada and non-C standards and guidelines applicable to their development in the Tier 1 Subcontractor's SDP and/or SSPS.

3.6 DOCUMENT STANDARDS

This section identifies the tailoring being applied to the DIDs (in DOD-STD-2167) which shall be used to develop the software documentation. Where tailoring is minor, specific changes are explained in detail; where the changes are more significant, complete revision of the DIDs or DID sections are supplied. In all cases, a rationale for the tailoring is provided. Tailored DIDs are designated by a “/T” suffix to the original DID number. Reference should be made to DOD-STD-2167 for the complete set of DIDs.

3.6.1 SOFTWARE TEST PLAN (DI-MCCR-80014A) TAILORING

Change Rationale

Section 4.0, Formal Qualification Test Identification, will be referenced to and contained in Section 4, Volume 1 of the Software Test Description.

Change 1

WAS:

10.1.3.1 Identification

This section shall be numbered 1.1 and shall contain the approved identification number, title, and abbreviation, if applicable, of the system to which the STP applies. It shall also identify the CSCIs to which this plan applies. If the STP applies to all CSCIs in the system this shall be stated. If it applies to selected CSCIs, the applicable CSCIs shall be named by title, abbreviation, and identifer.

IS:

10.1.3.1 Identification

This section shall be numbered 1.1 and shall contain the approved identification number, title, and abbreviation, if applicable, of the system to which the STP applies. It shall also identify the CSCIs to which this plan applies. If the STP applies to all CSCIs in the system this shall be stated. If it applies to selected CSCIs, the applicable CSCIs shall be named by title, abbreviation, and identifer. If the STP is part of an Incremental FQT process this shall be be stated.

Change 2

WAS:

10.1.6 Formal Qualification Test Identification

This section shall be numbered 4 and shall be divided into the following paragraphs and subparagraphs to identify each formal qualification test ...

IS:

10.1.6 Formal Qualification Test Identification

This section and the following paragraphs and subparagraphs shall be included in section 4, Volume 1 of the Software Test Description to identify each formal qualification test ...

Change 3

WAS:

10.1.6.1.5 Test schedule

This section shall be numbered 4.X.5 and shall contain or reference the test schedule for conducting the tests identified in paragraph 4.X.4.

IS:

10.1.6.1.5 Test schedule

This section shall be numbered 4.X.5 and shall contain or reference the test schedule for conducting the tests identified in paragraph 4.X.4. This paragraph shall also describe the incremental scheduling of FQT elements leading to FQT complete when an incremental process is being used.

3.6.2 SOFTWARE TEST DESCRIPTION (DI-MCCR-80015A)

Change Rationale

The Software Test Description will be implemented as a two volume document. Volume 1 will contain the information required by DI-MCCR-80015A with the inclusion of Section 4.0 from the Software Test Plan (DI-MCCR-80014A). Detailed test procedures information required by DI-MCCR-80015A for sections 3.0 and 4.0 will be referenced to and contained in Volume 2 of the Software Test Description. Volume 2 is included as part of the Software Test Report.

Change 1

WAS:

10.1.5.1.2.1 Hardware Preparation

... in a state of readiness.

IS:

10.1.5.1.2.1 Hardware Preparation

... in a state of readiness.

Note: The detailed step-by-step procedures for placing the test environment hardware in a state of readiness shall be referenced to and contained in Volume 2 of the Software Test Description.

<u>Change 2</u>

WAS:

10.1.5.1.2.2 Software Preparation

... more than one test case.

IS:

10.1.5.1.2.2 Software Preparation

... more than one test case.

Note: The detailed step-by-step procedures for placing the software in a state of readiness shall be referenced to and contained in Volume 2 of the Software Test Description.

<u>Change 3</u>

WAS:

10.1.6 Formal Qualification Test Descriptions

... CSCI identified in the Software Test Plan (STP).

IS:

10.1.6 (CSCI name) CSCI Formal Qualification Test Identification and Descriptions

... CSCI identified in the Software Test Description (STD).

<u>Change 4</u>

WAS:

10.1.6.1.1.6 (Test case name) Test Procedure

This subparagraph shall be numbered 4.X.Y.6 and shall define the test procedure for the test case. The test procedure ...

IS:

10.1.6.1.1.6 (Test case name) Test Procedure

This subparagraph shall be included in Volume 2 of the Software Test Description and shall define the test procedure for the test case. The test procedure ...

3.6.3 SOFTWARE TEST PROCEDURE DID TAILORING

Volume 2 of the Software Test Description will use DOD-STD-2167 DI-MCCR-80015A content requirements as a guideline. An example table of contents is detailed below:

- 1.0 Scope
  - 1.1 Identification
  - 1.2 Purpose
  - 1.3 Document Overview
  - 1.4 Introduction
- 2.0 Referenced Documents
  - 2.1 Specified Documents
  - 2.2 Information Documents
  - 2.3 Parent Documentation
- 3.0 (CSCI name) CSCI (Test name) Procedures
  - 3.1 Pre-test Procedures
    - 3.1.1 Hardware Preparation
    - 3.1.2 Software Preparation
  - 3.2 Test Procedures
    - 3.2.X (Formal test X name and number)
      - 3.2.X.Y (Test case Y name and number)

Note: The test case steps are contained in this section.

- 3.3 Data Reduction and Analysis
- 4.0 Notes
  - Abbreviations/Acronyms
- List of Figures
- List of Tables
- Appendices
  - Appendix A Naming Conventions for Test Cases
  - Appendix B Test Traceability Matrix
  - Appendix C Requirements Traceability Matrix

Appendix D Equipment List

Appendix E Software List

3.6.4 SOFTWARE DESIGN DOCUMENT (DI-MCCR-80012A) TAILORING

Change Rationale

The SDD is not required for delivery on the ISS program. This tailoring is included to provide clarification on what pieces of the SDD are to be provided in the SPS and SDFs. Section 3.1, CSCI Overview, and section 7.0, Requirements Traceability, will be referenced to and contained in section 3.1 of the Software Product Specification. Information for section 4 will be documented in the SDFs.

Change 1

WAS:

10.1.5.1 CSCI Overview

This section shall be numbered 3.1 and shall identify and describe the role of the CSCI within the system to which this SDD applies. The overview shall identify and state the purpose of each external interface of the CSCI. A system architecture diagram may be used to show the relationships between this CSCI and the other CIs in the system.

IS:

10.1.5.1 CSCI Overview

This section and the following paragraphs and subparagraphs shall be included in Section 3.1 of the Software Product Specification to describe the architecture overview of the CSCI.

Change 2

WAS:

10.1.5.2 CSCI Design Description

This section shall be numbered 3.2 and shall be divided into the following paragraphs and subparagraphs to provide a design description of each CSC of the CSCI.

IS:

10.1.5.2 CSCI Design Description

This contents of this paragraph and the following subparagraphs and section 4, Detailed Design, shall be included in the Software Development Folders (SDF) to describe the detailed design of each CSC and CSU of the CSCI.

Change 3

WAS:

10.1.9 Requirements Traceability

This section shall be numbered 7 and shall provide traceability ...

IS:

10.1.9 Requirements Traceability

This section shall be included in section 3.1 of the Software Product Specification and shall provide traceability...

3.6.5 SOFTWARE PRODUCT SPECIFICATION (DI-MCCR-80029A) TAILORING

Change Rationale

The Software Product Specification will contain the information required by DI-MCCR-80029A with the inclusion of Sections 3.1 and 7.0 from the Software Design Document (DI-MCCR-80012A).

Change 1

WAS:

10.1.5.1 Software Design

This paragraph shall be numbered 3.1 and shall contain, or reference the appendix or other document that contains, the Software Design Document (SDD).

IS:

10.1.5.1 Software Design

This paragraph shall be numbered 3.1 and shall contain Sections 3.1 and 7.0 of the Software Design Document as stated in DI-MCCR-80012A.

Change 2

WAS:

10.1.5.2 CSCI Source Code Listings

This paragraph shall be numbered 3.2 and shall contain, or reference the appendix that contains, the source code listings of the CSCI. This paragraph shall provide an index that cross-references each CSC and CSU to the location in the source code where they are found.

IS:

10.1.5.2 CSCI Source Code Listings

This paragraph shall be numbered 3.2 and shall contain a reference to the Version Description Document that identifies the source code listings of the CSCI. This paragraph shall provide an index that cross-references each CSC and CSU to the location in the source code where they are found.

Change 3

WAS:

10.1.7.2 Appendix B, Source Code Listings

This appendix shall contain the source code listings of the CSCI if they are not contained in paragraph 3.2.

10.1.7.3 Additional appendices

Any additional appendices shall start with Appendix C.

IS:

10.1.7.2 Additional appendices

Appendix B shall identify any unused source code. Annotations to the application source code listings shall be made. Unused functionality of the Ada Run-Time Environment (RTE) shall be identified. Any additional appendices shall start with Appendix C.

NOTE: The Prime will provide to the Tier 1 Subcontractors a correlation of the Ada structures to RTE functionality to facilitate the identification of the unused Ada RTE functionality.

3.6.6 SOFTWARE REPORTS

Software Reports will be developed using contractor format and shall include, at a minimum, metrics information as defined in Appendix B of the Software Development Plan.

3.6.7 SOFTWARE REQUIREMENTS SPECIFICATION (DI-MCCR-80025A) TAILORING

The Software Requirements Specification will be implemented in accordance with DOD-STD-2167 with specific tailoring as defined by the following changes to the SRS DID.

<u>Change 1</u>

WAS:

10.1.6.1 Qualification Methods. This paragraph...

c. Inspection. The visual examination of CSCI code, documentation, etc.

TABLE I. Example of a qualification cross-reference table.

...

* QUALIFICATION METHOD

A - ANALYSIS

D - DEMONSTRATION

I - INSPECTION

IS:

10.1.6.1 Qualification Methods. This paragraph...

c. Inspection. The visual examination of CSCI code, documentation, etc.

d. Test. The execution of software procedures and functions where observed output is compared with expected output.

TABLE I. Example of a qualification cross-reference table.

* QUALIFICATION METHOD

A - ANALYSIS

D - DEMONSTRATION

I - INSPECTION

T - TEST

<u>Change 2</u>

WAS:

10.1.6.2 Special qualification requirements.

This paragraph shall be numbered 4.2 and shall be divided into appropriate subparagraphs to specify special requirements associated with qualification of the CSCI. This paragraph shall identify and describe, if applicable, special tools, techniques (e.g., test formulas, algorithms), procedures, facilities, and acceptance limits. For each special test the following information shall be specified:

a. A project-unique identifier for the test

b. The paragraph number(s) of the capability requirement(s) to which the test applies

c. A description of the test, such as peak-load stress test for 24 hr. duration

d. The level of the test (CSU, CSC, CSCI, segment, or system level)

IS:

10.1.6.2 Special qualification requirements.

This paragraph shall be numbered 4.2 and shall be divided into appropriate subparagraphs to specify special requirements associated with qualification of the CSCI. This paragraph shall identify and describe, if applicable, special tools, techniques (e.g., test formulas, algorithms), procedures, facilities, and acceptance limits.

3.6.8 SOFTWARE DEVELOPMENT PLAN (DI-MCCR-80030A) TAILORING

<u>Change Rationale</u>

The Software Development Plan will be modified to include sections that are essential for ISS software development and management, including software metrics management, flight software builds, firmware management, support software, and ground software. In addition, subparagraphs within the Software Product Evaluations and Software Configuration Management sections will reference the SQPP volume of the Prime S&MA Plan and the Prime Configuration Management Handbook, respectively, to eliminate duplication of information pertinent to these functions.

<u>Change 1</u>

WAS:

10.2.1 Title Page. The title page shall ...

IS:

10.2.1 Title Page. The title page shall be in contractor format.

<u>Change 2</u>

WAS:

10.2.5.11 Problem/change report. This paragraph ...

IS:

10.2.5.11 Problem/change report. This paragraph ...

10.2.5.12 Software metrics management. This paragraph shall be numbered 3.12 and shall be divided into the following subparagraphs to identify and describe software metrics management.

10.2.5.12.1 Organization and resources. This subparagraph shall be numbered 3.12.1 and shall describe the organization and resources for software metrics collection and reporting.

10.2.5.12.2 Purpose and scope. This subparagraph shall be numbered 3.12.2 and shall state the goals of software metrics.

10.2.5.12.3 Software metric reporting methodology. This subparagraph shall be numbered 3.12.3 and shall identify the level and format for software metric reporting.

10.2.5.12.4 Software metrics. This subparagraph shall be numbered 3.12.4 and shall identify and describe each metric that is to be reported.

10.2.5.13 Flight software builds. This paragraph shall be numbered 3.13 and shall describe the flight software build process. This paragraph shall include the Prime and subcontractor responsibilities for activities related to the flight software build process.

10.2.5.14 Firmware management. This paragraph shall be numbered 3.14 and shall identify the classification of firmware and documentation required for firmware.

10.2.5.15 Shared MDM Integration Strategy. This paragraph shall be numbered 3.15 and shall describe the responsibilities and process for integration of shared MDMs.

Change 3

WAS:

10.2.6.3 Non-developmental software. This paragraph ...

IS:

10.2.6.3 Non-developmental software. This paragraph ...

10.2.6.4 Non-flight software. This paragraph shall be numbered 4.4 and shall describe the software used to support flight software integration and verification activities, training software, simulations, ground software and support equipment software. This paragraph shall include a description of the non-flight software life cycle, products, and certification process.

10.2.6.5 MDM services software. This paragraph shall be numbered 4.5 and shall describe the modified life cycle being used for development of MDM services software.

Change 4

WAS:

10.2.6.2.2 Software development files. This paragraph shall be numbered 4.2.2 and shall define the contractor's plans, including the responsible organizations(s), for the creation and maintenance of the software development files (SDFs). This subparagraph shall define...

IS:

10.2.6.2.2 Software development folders. This paragraph shall be numbered 4.2.2 and shall define the contractor's plans, including the responsible organizations(s), for the creation and maintenance of the software development folders (SDFs). This subparagraph shall define...

Change 5 (applies only to Tier 1 Subcontractor SDPs)

WAS:

10.2.11 Notes. This section shall be numbered 9 and shall contain any general information that aids in understanding this document. This section shall include an alphabetical listing of all acronyms, abbreviations, and their meanings as used in this document.

IS:

10.2.11 Notes. This section shall be numbered 9 and shall divided into the following paragraphs to contain exceptions to the Prime Contractor Software Development Plan and Prime Contractor Software Standards and Procedures Specification, identification of software items being "grandfathered" from the Space Station Freedom Program, and any general information that aids in understanding this document.

10.2.11.1 Exceptions to the Prime Contractor Software Development Plan. This paragraph shall be numbered 9.1 and shall identify all exceptions to the Prime Contractor Software Development Plan. This paragraph shall include the section number and a brief explanation for the exception (e.g., cost savings, "grandfather" clause, etc.). Interpretations and assumptions of the Prime Contractor Software Development Plan shall also be included.

10.2.11.2 Exceptions to the Prime Contractor Software Standards and Procedures Specification. This paragraph shall be numbered 9.2 and shall identify all exceptions to the Prime Contractor Software Standards and Procedures Specification. This paragraph shall include the section number and a brief explanation for the exception (e.g., cost savings, "grandfather" clause, etc.). Interpretations and assumptions of the Prime Contractor Software Standards and Procedures Specification shall also be included.

10.2.11.3 "Grandfathered" software from Space Station Freedom Program. This paragraph shall be numbered 9.3 and shall identify all software items (Computer Software Configuration Items and shared Computed Software Components) that are being "grandfathered" from the Space Station Freedom Program. (Shared Computer Software Components are those Computer Software Components produced by a Tier 1 Subcontractor other than the box developer and provided to another Tier 1 Subcontractor). This paragraph shall also identify the associated documentation and describe the life-cycle of the software items.

10.2.11.4 Acronyms and Glossary. This paragraph shall be numbered 9.4 and shall include an alphabetical listing of all acronyms, abbreviations, and their meanings as used in this document.

3.6.9 SOFTWARE STANDARDS AND PROCEDURES SPECIFICATION

If the Tier 1 Subcontractor deviates from the Prime Software Standards and Procedures Specification, the Tier 1 Subcontractor shall document the deviations in section 9.2 of the Tier 1 Subcontractor SDP. Deviations shall not be allowed for any of the information contained in the Prime SSPS Appendices or section 3.4.1, Program Unique Identifiers. If the Tier 1 Subcontractor chooses to develop a Software Standards and Procedures Specification, contractor document format may be used.

3.6.10 SOFTWARE TEST REPORT (DI-MCCR-80017A) TAILORING

Change Rationale

The Software Test Report will be modified to include the “as-run” Software Test Procedures resulting from conduct of the Formal Qualification Test.

Change 1

WAS:

10.1.9 Appendices. Appendices may be used to provide information published separately for convenience in document maintenance (e.g., charts, classified data). As applicable each appendix shall be referenced in the main body of the document where the data would normally have been provided. Appendices may be bound as separate documents for ease in handling. Appendices shall be lettered alphabetically, (A, B, etc.), and the paragraphs within each appendix be numbered as multiples of 10 (e.g., Appendix A, paragraph 10, 10.1, 10.2, 20, 20.1, 20.2, etc.). Pages within each appendix shall be numbered alpha-numerically as follows: Appendix A pages shall be numbered A-1, A-2, A-3, etc. Appendix B pages shall be numbered B-1, B-2, B-3, etc.

IS:

10.1.9 Appendices. Appendix A shall contain the Formal Qualification Test “as-run” Software Test Procedures and follow the format identified in either the Prime Software Standards and Procedures Specification or Tier 1 Subcontractor SDP. Additional appendices may be used to provide information published separately for convenience in document maintenance (e.g., charts, classified data). As applicable each appendix shall be referenced in the main body of the document where the data would normally have been provided. Appendices may be bound as separate documents for ease in handling.

Additonal appendices shall be lettered alphabetically starting at B, (B, C, etc.), and the paragraphs within each appendix be numbered as multiples of 10 (e.g., Appendix B, paragraph 10, 10.1, 10.2, 20, 20.1, 20.2, etc.). Pages within each appendix shall be numbered alpha-numerically as follows: Appendix B pages shall be numbered B-1, B-2, B-3, etc. Appendix C pages shall be numbered C-1, C-2, C-3, etc.

3.7 STANDARD INPUT IDENTIFICATION AND DELIVERY

All International Space Station signal data deliveries as well as software and non-signal data deliveries will conform to certain naming and delivery format standards as described in this section. These naming and delivery format standards will aid in uniform and accurate identification and processing of these deliveries at the Prime MBF.

Whenever possible, software CSCIs, IP&CL data files, and any other file delivery to the Prime shall be accomplished via electronic transfer using the PSCNI computer network. Electronic transfers, via File Transfer Protocol (FTP), shall be performed and validated by the PGs using the ISS MD5 Checksum Utility to ensure accurate transmittal. This utility resides on the MBF FTP server. Information to access this server is documented in the MD5 Checksum Utility Version Description Drawing (VDD), 684-10275. The FTP process and the compare shall be witnessed by PG Quality and documented in a record that will be available upon request to the Prime. In all cases the software transferred to the Prime shall be copied from the PGs Software Configuration Management.

If electronic transfer is not possible, there are two secondary methods for delivery of software and/or data to the Prime. The first is to use the 4mm Data Cartridge tape drive format. The tape shall be written using the standard UNIX tar command (Block size = 10240) format. The second is to use the DEC TZ-87 tape drive format. The tape shall be written using the VAX “Saveset” format. The target host for the delivered tape media is a VAX and the tape(s) must be in VAX native format. No file protection is to be used on the delivered software. With either secondary method the files must be listed by name and the listing will be included in the VDD with the delivery. Labels will be affixed to the media and, in the case of a software delivery, will include the CSCI name and any applicable problem report or other change number notation, as required. In the case of an IP&CL data delivery, tapes should be labeled with the following: “IP&CL Standard In”, “PG”, and “Date of Delivery”. All data deliveries will include the DDF file (See Section 3.7.1.3).

As a third priority method, software and/or data may be delivered to the Prime on 3.5 inch diskettes in either DOS or Macintosh formats. In the case of a software, such diskettes should be clearly marked with the CSCI name and any applicable problem report or other change number notation, as required. In the case of an IP&CL data delivery, the diskettes should be marked with the names of the data files delivered, at a minimum. If a compression tool was used to prepare the files, the files must be self extracting.

Any software/data transferred physically (tape or diskette) will be stamped and sealed by the PG/site QA. The delivery location shall be as listed in the contract. If an alternate form of media other than the above is required, or if the software to be delivered to the Prime cannot be in the above format, Prime Software Quality Assurance may waive these requirements on a case by case basis, in writing.

The remainder of this section describes standards for the naming and delivery of flight signal data Standard Input files and flight software and non-signal data Standard Input files.

3.7.1 SIGNAL DATA DELIVERY STANDARDS

All IP&CL Signal Data shall be provided by the designated IP&CL Data Providers via Standard Input Files. The IP&CL Data Provider is defined as the Organization (Prime Contractor, Product Groups, International Partners, or NASA) responsible for delivering the Signal Data. Types of files and rules for delivering the files are specified in Table 3.7.1.1-1 and paragraph. 3.7.1.3.

3.7.1.1 SIGNAL DATA STANDARD INPUT FILE DELIVERY

Each Signal Data Standard Input file shall be identified by DCYYMMDD.ZZZ where:

DC: File Data Contents two letter code per paragraph 3.7.1.2, Table 3.7.1.2-1;

YYMMDD: Date of Record for the IP&CL data delivery in ANSI standard format (2 character year, 2 character month, 2 character day); and

ZZZ: Data provider identifier as noted in Appendix R.

Examples for file naming:

HW950306.PG1;

FW950306.PG2;

SW961206.ESA; and

MC950306.PG3.

3.7.1.2 STANDARD INPUT SIGNAL DATA FILE STRUCTURE/FORMAT

The data provider shall deliver the IP&CL signal data files denoted in Table 3.7.1.2-1 which contain the fields per Appendix N, Standard-In IP&CL Data Delivery File Definition.

TABLE 3.7.1.2-1 STANDARD INPUT-IP&CL SIGNAL DATA FILES

No.	File Data Contents	File Name	Provider	Delivery Responsibility	Applicability (All except where noted)
	Primitives				

No.	File Data Contents	File Name	Provider	Delivery Responsibility	Applicability (All except where noted)
1.1	Hardware Primitive Signal Data File (HW)	HW YYMMDD	.zzz	3.7.1.4.1	Optional to IPs / PLs
1.2	Firmware Primitive Signal Data File (FW)	FW YYMMDD	.zzz	3.7.1.4.2	
1.3	Software Primitive Signal Data File (SW)	SW YYMMDD	.zzz	3.7.1.4.3	
	Device/Channel				
2.1	Device File (DF)	DF YYMMDD	.zzz	3.7.1.4.4	Optional to IPs / PLs
2.2	MDM Channel File (MC)	MC YYMMDD	.zzz	3.7.1.4.5	Optional to IPs / PLs
2.3	FC Channel File (FC)	FC YYMMDD	.zzz	3.7.1.4.6	Optional to IPs / PLs
	Conversion Data				
3.1	State Conversion File (SC)	SC YYMMDD	.zzz	3.7.1.4.7	
3.2	Polynomial Calibration File (PC)	PC YYMMDD	.zzz	3.7.1.4.8	
3.3	Piecewise Linear Calibration File (PL)	PL YYMMDD	.zzz	3.7.1.4.9	
3.4	Conversion Primitive File (CP)	CP YYMMDD	.zzz	3.7.1.4.10	
	Associated Data				
4-1	Requirement PUI File (RP)	RP YYMMDD	.zzz	3.7.1.4.11	
4-2	Traceability File (TR)	TR YYMMDD	.zzz	3.7.1.4.12	
	Bus Traffic				
5-1	Group Data Item File (GD)	GD YYMMDD	.zzz	3.7.1.4.13	
5-2	Message Transaction File (MT)	MT YYMMDD	.zzz	3.7.1.4.14	
5-3	Telemetry Transaction file (TT)	TT YYMMDD	.zzz	3.7.1.4.15	SMC Only
5-4	Rate Group File (RG)	RG YYMMDD	.zzz	3.7.1.4.16	
	Utilization				
6-1	Command Template Value File (CT)	CT YYMMDD	.zzz	3.7.1.4.17	
6-2	Command Instantiation File (CI)	CI YYMMDD	.zzz	3.7.1.4.18	SMC Only
6-3	Operations Parameter Definition File (OP)	OP YYMMDD	. zzz	3.7.1.4.19	SMC Only
6-4	CVT Definition file (CD)	CD YYMMDD	.zzz	3.7.1.4.20	C&C Only
6-5	Command Instantiation Value File (CV)	CV YYMMDD	.zzz	3.7.1.4.21	SMC Only

3.7.1.2.1 FILE STRUCTURE

The Data provider shall provide the data fields for each "row" of data in the delivered file as specified in Appendix N and per the format noted below:

A. Each data field in the submitted files shall be separated by a horizontal tab (ASCII nonprintable character 9). No tab delimiter shall be placed at the beginning or at the end of a record;

B. Each record (row) shall be ended with a Carriage Return or Line Feed;

C. A record shall contain all data fields in the same order specified in Appendix N;

D. For all fields, blank padding is not acceptable;

E. For all fields, including the "Remarks" field, blank fields are not allowed. Blank fields shall either contain an "@" or "N/A" as follows:

- If the content of a field CANNOT BE OBTAINED at this time, place the "@" symbol to indicate a missing value or null -- a hole that needs to be filled at a later date. (This symbol is not to be used to indicate any other meaning); and
- If the content of a field is not required for that record, place the symbol "N/A" for NOT APPLICABLE (e.g., the data is not missing, the data is supposed to be a Blank Space).

3.7.1.2.2 MANDATORY DATA

The data provider shall deliver, as a minimum, the fields denoted with a "(M)" in Appendix N. No "@'s" shall be entered in Mandatory fields. N/A's are allowed in the fields as indicated in the legal value column.

Note: N/A is acceptable in all applicable fields where the field length is less than 3 characters and/or for all field types (i.e., C, F, or I).

3.7.1.2.3 LEGAL VALUES

A. The Data provider shall provide legal values as denoted the in Legal Value Column of Appendix N and associated Appendices;

B. The data provider shall provide a value exactly as it appears in the Legal Value list (case sensitive, same numeric type, no blanks, etc.); and

C. Appendix N identifies field types of C, I, and F. These data types identify the format in which information is provided in the IP&CL.

The field type I represents integer data. If an integer is represented as a base literal the bases allowed are: base 2, 8, or 16 and the Ada base literal representation should be used. If a base 16, 8, or 2 base literal representation is used to represent an integer then all the related fields within the record shall use the same base literal (see Item D below).

The field type F represents floating point or fixed point data (the representations are identical). A floating point number is expressed in the format specified below. A fixed point number must be expressed as a floating point number with this field type.

SDDD.DDD[E+DD]

where

[] is the delimiter for the optional exponential representation, and is for illustration only, brackets are not meant to be included with input. If an exponential representation is being provided, include all structural components between the left square bracket ([) and the right square bracket (]). If an exponential representation is not being provided, do not include any of the characters between the angle brackets.

S is an optional sign character. If it is present, it consists of either a minus (-) or a plus (+) sign. If it is not present, it is considered to implicitly be a (+) sign.

+ is a required sign character. The character may be either the (-) sign or the (+) sign.

D is a decimal digit. There must be at least one decimal digit prior to the decimal point, and there must be at least one decimal digit following the decimal point. There may be as many decimal digits as are necessary for the accuracy of the value and as are consistent with the constraints of the number of bits representing the value. A limitation of the tool is to restrict the number of decimal characters following the decimal point to 16.

. is the decimal point. This is a required character.

E is the letter E (e is not allowed). This is a necessity for an exponential format floating point value. If this letter is not present, none of the remainder of the format is allowed.

The field type C represents the 7 bit ASCII printable characters which are a subset within the 8 bit ASCII code. A type C (character) field may be used to represent any data type specified in Appendix J. However, the fields of type C representing numeric values related to the parameter values of the parameter defined by the FW (1.2) or SW (1.3) record must be consistent with the data type found in Appendix J and specified in the fields 1.2-2 and 1.3-2. In addition, the contents of a type C field must comply with instructions in the “Legal Values”, “Field Description” and “Applicability Data Type” columns of Appendix N.

D. The data provider shall provide values in the formats specified in Appendix J and as noted below. The following standards shall be followed for representation of integer data types:

a) Integer values may be represented as base literal values. In the absence of base literal notation, the decimal base (base 10) shall be utilized for interpretation of the value; and

b) Based notation for integer values shall adopt the Ada base literal notation of base#value#. The base value shall be a decimal integer identifying the base, 2, 8, and 16 are the only base values allowed. The value shall be expressed in the base notation identified by the specified base, with specific constraints identified as follows:

- The notation appropriate to the binary base (base 2) shall be the numeric digits 0 (zero) and 1. An example of a correctly formatted binary value (in base notation) is 2#001#;
- The notation appropriate to the octal base (base 8) shall be the numeric digits 0 (zero) through 7. An example of a correctly formatted octal value (in base notation) is 8#377#;
- The notation appropriate to the hexadecimal base (base 16) shall be the numeric digits 0 (zero) through 9 followed by the alphabetic characters A through F. As a matter of convention, the alphabetic letters should be uppercase. An example of a correctly formatted hexadecimal value (in base notation) is 16#FACE#;
- By convention, base notation for addresses shall be hexadecimal (include leading zeros);
- The printed representation of any value other than a decimal value may not contain a sign character. If the value is to be signed, the expressed form shall embody the one's or two's complement conversion of the value to incorporate the negation of the value. For example, the based value 16#7FFF# is a positive value occupying sixteen bits in one's or two's complement notation. To negate this value, the correct form of the value (as negated) is 16#8001# in two's complement notation or 16#8000# in one's complement notation; and
- 0 (zero) and 1 shall be valid in any base without base notation (e.g., 16#1# and 1 are both legal representation of 1 in hexadecimal).

3.7.1.2.4 RETIREMENT OR RECYCLING OF PROGRAM UNIQUE IDENTIFIERS

A. Changes to Signal PUI Assembly codes shall require retirement of code and establishment of a new code.

B. All new Signal PUI Assembly codes shall require DIT approval prior to delivery.

C. Once a primitive signal PUI has been defined, it may not be deleted and then added again as a different signal having the same signal PUI. The only exception to this rule is to accommodate the correction of errors in the PUI data type (this is a Data Type Change - DTC) or the correction of HW Primitive Device Data Type errors. In all other cases, once a primitive PUI is deleted, it should not be reused and CHG should only be used to refine rather than redefine a PUI signal definition.

D. Once a group PUI has been defined, it may not be deleted and then added again as a totally different group having the same group PUI. The only exception to this rule is the use of the GROUP TYPE CHANGE (GTC) action to accommodate errors in the specification of a group type. With this exception, once a group PUI is deleted, it should not be reused and CHG should only be used to refine the contents of a group PUI.

3.7.1.2.5 DELTA DATA DELIVERY PROCESSES & RULES

This section defines the Standard-In IP&CL Delta Data Delivery and Change Management (CM) Processes and Rules necessary for the IP&CL Data Providers to deliver Delta's (Additions, Changes and Deletes) to previously delivered data which has been validated and loaded into the Mission Build Facility (MBF) Database.

3.7.1.2.5.1 GENERAL DELTA RULES AND PROCEDURES

Data Providers are expected to provide consistent information about Added, Changed, and Deleted records relative to the completion of their previous delivery cycle and interim deliveries of the Standard In IP&CL files. In addition, timely Problem Reports (PRs), including explicit instructions on CM actions, will be written and processed against previous data deliveries. This will help maintain and keep the PGs CM Process synchronized with CM for the MBF Database.

During a Standard In processing cycle the data for the Delta Delivery will be found in one of three sets: The Standard In Files, the MBF Data Base, and the PRs (Error Set).

Delta Change Management Actions, which will specify actions against the MBF Database, are as follows:

- ADD - The addition of records with “New” Composite Keys (CK) not previously loaded into the MBF DB.
- CHG - The change of attribute data fields of existing records in the MBF DB, except for the following fields:

  1) HW Primitive Device Data Type (1.1-2);
  2) FW or SW Primitive Data Type (1.2-2) or (1.3-2);
  3) FW or SW Primitive Type of Signal (1.2-3) or (1.3-3) from or to “HW” (pass-through);
  4) Group Type GD (5.1-3); and
  5) Composite Key (CK) fields.

  NOTE: CHG is not allowed as a CM field option for 6.4 CD. See App. K.
- A/C - The same as ADD or CHG except the Data Provider is not sure of the status of MBF Database.

  NOTE: If the key fields of the record do not exist in the database, the ADD logic will be used. If the key fields of the record exist in the database the CHG logic will be used.

- DEL - The deletion of existing data and/or the breaking of certain relationships between data items in the MBF DB.

  NOTE: DEL is not allowed as a CM field option for files 3.4 CP, 4.1 RP, 4.2 TR, 5.3 TT, 6.1 CT, 6.3 OP, 6.4 CD, and 6.5 CV. See App. K.

- DTC - The changing of a Primitive SPUI's Data Type. This is accomplished by delivering the record with the new Data Type in the 1.2-2 or 1.3-2 field and results in defining the old SPUI with the new data type;

  NOTE:
  (1) The DTC action involves redefining the SPUI under a completely different end item in the Mission Database. This breaks all links that are associated with attribute data. Thus, the associated data must be redelivered which includes CP, RP, TR, and OP records. Any other files that reference the changed SPUI should be reviewed and appropriate changes made. (Also see Note under paragraph J);

  (2) DTC may not be used for HW type changes (that is, changes in HW Device Data Type Field 1.2-2). Such changes must be accomplished by a DEL followed by an ADD. In these cases, any existing MC of FC channelization data will be lost and must be redelivered as an ADD;

- GTC - The changing of the Group Type for a Group Data Item SPUI. This is accomplished with the delivery of the record defining the Group Data Item SPUI with the new Group Type in the 5.1-3 field. (Also see Note under Par. J.)

- CHANGING KEY FIELDS - If it is desired to change Composite Key Fields, the record must be deleted (CM=DEL and the key fields must match what is in the MBF). (See Par. F.). A new replacement Single Record (SR) or Complete Record Set (CRS) is delivered with the appropriate Key Fields changed (and other fields changed as needed); then, the SR or CRS is added back to the MBF (CM=ADD). (See Par. G.).

  NOTE: In addition to the concepts of adding, deleting, changing, and data type changes, there is the concept of end item changes. However, end item changes are accomplished with DELs and ADDs which is discussed in detail in 3.7.1.2.5.3.

Following are the General Rules for Change Management and Delta Delivery of all Standard In Records. Detailed Procedures and Steps for each record type are found in the SSPS, Appendix K.

NOTE: Special consideration of the rules for change processing will be required for HW PUIs with a Device Data Type (field 1.2) of ANA or DIS, where the same HW PUI is used to define FW or SW attributes about the PUI. (See Section 3.7.1.2.5.2, Delta Delivery Processing For “Pass-Throughs”).

The rules will reference the three steps in the Mission Build Facility (MBF) Standard In Processing:

1) Validation - The Validation Program is the first step in the MBF Input Process. It validates each record with respect to legal values and other consistency checks with respect to the SSPS, Appendix N. The Validation Program is also run by some of the Product Groups (PGs) allowing them to validate their data before delivery;

2) Preprocessor - The Preprocessor Program begins verifying the change action requested with the data base, updating change records and sorting data for loading; and

3) Bulk Data Entry (BDE) is the final step in the Standard In Processing which completes the processing of records into the data base.

A. All additions, changes, and deletions to a file will be specified in the applicable 'Change Management' field for that file as defined in Appendix N.

NOTE: The CM field must be identical for all records within a Complete Record Set.

B. Authorization (e.g., Prime SW Problem Reports, other Prime change instruments, Data Provider change instrument, etc.) for the additions, changes, and deletions to a Standard In file will be provided in the applicable 'Authorization' field as defined in Appendix N.

NOTE: The authorization field must be identical for all records within a Complete Record Set.

C. In response to a PR written for errors found in the Validation Step, the PG will redeliver the record(s) with the errors corrected. In general, no change will be made in the Change Management (CM) field from the value it had in the original submission. A/C is allowed if the data provider is unsure of the status of the MBF Database.

D. In response to a PR written as a result of the Preprocessor Program or the BDE Program, the PG will redeliver the record(s) with the errors corrected, and a change will be made in the (CM) field in response to the type of errors found and specific directions in the PR. A/C is allowed if the data provider is unsure of the status of the MBF Database.

E. All records delivered (with the exception of delete actions as described later in this paragraph) must contain legal values for the Mandatory Fields and the other fields must contain legal values or “@”. This is the minimum required to pass the “Validation Program” and go on to MBF preprocessing and loading. The Validation Tool shall recognize all delete actions (DEL) and pass these records on to the preprocessor with only validation checks being performed on the Key Fields. This permits data submitted under previous versions of the SSPS rules and legal values to be deleted. The Key Fields provide the information needed to verify uniqueness in the MBF for add, change and delete actions (CM = ADD, CHG, A/C, DTC, GTC, DEL). (See Appendix N of the SSPS for identification of Key Fields and Mandatory Fields).

F. Key fields (indicated as "CK" in Appendix N of the SSPS) are a subset of the Mandatory (M) fields and must contain legal values that exactly match the values previously processed into the MBF to accomplish a Change (CHG, A/C, DTC, GTC) or a Delete (DEL) action.

G. CHANGING KEY FIELDS - If it is desired to change Composite Key Fields, the record must be deleted (CM=DEL) and key fields match what is in the MBF (See Par. F). A new replacement record is delivered with the appropriate Key Fields changed (and other fields changed as needed); then, the record is added back to the MBF (CM=ADD or A/C).

NOTE: Only the Changing of Key Fields should be handled using the CM=DEL record followed by the CM=ADD record. The Changing of Non-Key Fields should be accomplished with the CM=CHG process.

H. SINGLE RECORD (SR) FILES - Only a "Single Record" (SR) will be required in the designated file to completely define new data (ADD or A/C), make a change (CHG) to existing data, or to delete (DEL) existing data for the following files:

- HW (1.1), FW (1.2), SW (1.3);
- DF (2.1), MC (2.2), FC (2.3);
- CI (6.2), OP (6.3); and
- CD (6.4) - The CD file supplies data about the mapping of Signal PUIs to CVT addresses. As such, a complete CD file with ADD in the Change Management field (6.4-4) of each record should be supplied for each delivery. This data will completely replace all previously delivered CD data. Thus, the CD file does not conform to the normal Delta Delivery rules for an SR file.

NOTE: See also Section 3.7.1.2.5.2.

I. COMPLETE RECORD SET - A logical "Complete Record Set", containing one or more records, will be required to completely define new data (ADD) or to make a change (CHG) to existing data.

NOTE: The deletion of a CRS only requires one record of the CRS for the following files:

- SC (3.1), PC (3.2)*, PL (3.3), CP (3.4);
- RP (4.1), TR (4.2);

- GD (5.1), MT (5.2), TT (5.3), RG (5.4); and
- CT (6.1), CV (6.5).

* The PC (3.2) file will contain only one record for each Polynomial Calibration Conversion PUI defined. However, it is handled as a CRS type file consistent with the MBF processing of the other conversion files.

Rules for Complete Record Sets:

A. The records of the Complete Record Set must be a contiguous set within the Standard In file;

B. The CM field must be identical for all records within a Complete Record Set;

C. The Authorization Field must be identical for all records within a Complete Record Set;

D. The Key Fields of each record must be identical with the corresponding Key Fields of each record within the CRS;

E. In addition to the Key Fields, the CM Field, and the Authorization Field, the following fields:

- SC (3.1) file-field (3.1-2) - St. Conv. PUI Name;
- PL (3.3) file - field (3.3-2) - PL Conv. Name, field (3.3-3) - No. of Segments, field (3.3-4) - Min. Cal. Range, field (3.3-5) - Max. Cal. Range, field (3.3-6) - Conv. Units, field (3.3-12) - Fwd/Inverse PUI, and field (3.3-14) - Conversion Remarks; and
- GD (5.1) file - field (5.1-2) - Group Data Item name~~;~~ and field (5.1-3) - Group Type

must be identical with the corresponding fields of each record within the CRS.

For example, in the GD (5.1) file, the Group Data Item Name field (5.1-2) and the Group Type Field (5.1-3) must be the same for all records within the CRS, in addition to the Key Field, the CM Field, and the Authorization Field. So, if there is the need to change the content of a Word SPUI in the Group file (5.1), then all the records associated with defining that Word SPUI will need to be delivered. Each record will have the same Key Field - Group Data Item PUI (5.1-1), Group Data Item Name Field (5.1-2), Group Type Field (5.1-3), Group Change Management Field (5.1-8), and Group Authorization Field (5.1-9).

NOTE: See also Section 3.7.1.2.5.2.

J. Data Type Changes (DTC) for Primitive Files (1.2-2 and 1.3-2) and Group Type Changes (GTC) for the Group file (5.1-3) will require:

- the action to be specified in the 'Change Management' field of each file with 'DTC' in fields 1.2-21 and 1.3-21, and 'GTC' in 5.1-8; and
- the New Data Type to be defined in fields 1.2-2 and 1.3-2, and for the New Grp Type to be defined in field 5.1-3.

NOTE: The MBF processing of a “Data Type Change (DTC)” involves the Deletion of the PUI and its related data under the 'Old Data Type' and the re-definition of the PUI under the 'New Data Type'. This assures that the 'Old Attribute Data' will not be inadvertently assumed to be valid for use in support of the “New Data Type”. Thus, for any Data Type change, the data provider needs to redefine the attribute data for the PUI by delivering “ADD” or “A/C” records for the related files: CP (3.4), RP (4.1), TR (4.2) and OP (6.3). Change “CHG” records should be delivered as needed for the files: GD (5.1), CT (6.1), CD (6.4) and CV (6.5).

For “Group Type Changes (GTC)”, depending on the Group Type, related data should be delivered as appropriate for ADDs or CHGs to the following files: CT (6.1), CI (6.2), CV (6.5), MT (5.2), and TT (5.3).

3.7.1.2.5.2 DELTA DELIVERY FILE RELATIONSHIPS

To assist in the understanding of IP&CL files and the delivery of consistent, valid data; five PUIs have been identified as Primary Data Items:

(1) FW (1.2) and SW (1.3) Primitive PUIs;

(2) HW (1.1) Primitive PUIs;

(3) HW (1.1) Primitive Bus PUIs;

(4) GD (5.1) Group PUIs; and

(5) SC (3.1), PC (3.2), and PL (3.3) Conversion PUIs.

All other data items may be associated with one or more of these five Primary Data Items, as providing additional attributes relative to the Primary Data Item PUI (see Table 3.7.1.2.5.2-1). The Hardware Signal PUIs are divided into four columns according to the four Device Data Types (field 1.1-2): ANA, DIS, PWR, and SPD, labeled the BUS PUI. The file relationships indicated in the columns in this table are one of the inter-file relationships to be reviewed and checked whenever making any adds, changes or deletes of IP&CL Standard In records.

The key fields making up the Composite Key for each record are also shown in the second column of Table 3.7.1.2.5.2-1. The CK fields are Mandatory (M) and so marked in Appendix N. These CK fields allow the ADD, CHG, A/C, and DEL processes to uniquely identify the specific record’s data to be processed.

TABLE 3.7.1.2.5.2-1 STANDARD IN FILES WHICH PROVIDE ADDITIONAL ATTRIBUTES FOR PRIMARY DATA ITEMS

		Input Processing		**SPUIs**			**BUS PUIs**	**SPUIs**	**CPUIs**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Standard In File	Input Processing Logic	Standard In File Key Fields	FW and SW Primitives Data Type in App. J	HW Primitive Data Type ANA	HW Primitive Data Type DIS	HW Primitive Data Type PWR	HW Primitives Data Type SPD (1553 or RS-485)	GD Group Definitions	SC, PC, PL Conversion Definitions
HW (1.1)	SR	1.1-1		D	D	D	D		
FW (1.2)	SR	1.2-1	D	D (ptp)	D (ptp)				
SW (1.3)	SR	1.3-1	D	D (ptp)	D (ptp)				
DF (2.1)	SR	2.1-1, 2.1-5					R		
MC (2.2)	SR	2.2-1, 2.2-2, 2.2-3, 2.2-4, 2.2-6, 2.2-7		R	R		R		
FC (2.3)	SR	2.3-1, 2.3-2, 2.3-3, 2.3-4		R	R	R			
SC (3.1)	CRS	3.1-1							D
PC (3.2)	CRS	3.2-1							D
PL (3.3)	CRS	3.3-1							D
CP (3.4)	CRS	3.4-1	R	R					R
RP (4.1)	CRS	4.1-1	R	R	R	R	R	R	
TR (4.2)	CRS	4.2-1	R	R	R	R	R		
GD (5.1)	CRS	5.1-1						D	
MT (5.2)	CRS	5.2-1, 5.2-6, 5.2-7, 5.2-8					R	R	
TT (5.3)	CRS	5.3-1, 5.3-7						R	
RG (5.4)	CRS	5.4-1, 5.4-2, 5.4-3, 5.4-4, 5.4-5					R		
CT (6.1)	CRS	6.1-1	R					R	
CI (6.2)	SR	6.2-1,6.2-2						R	
OP (6.3)	SR	6.3-1	R			R			
CD (6.4)	SR	6.4-1	R			R			
CV (6.5)	CRS	6.5-1, 6.5-2	R					R	

This table shows which records participate in the definition of the Primary Data Items (the five 13 character PUIs) in the MBF and which records reference these definitions. Both the definition records and the reference records add attribute information to the database. The “Ds” and “Rs” are specified in the table as follows:

- “D” - Indicates which records initiate the “Definition” of one of the five 13-character PUIs.

- "R" - Indicates which records "Reference" one or more of the five 13-character PUIs and adds attribute data in addition to that already added in the definition.

This matrix thus allows one to see the effect of changes made to one of the five 13-character PUIs, by viewing the specific column in which the change occurred to determine which records may be changed because of their reference to the Primary Data Item change.

Column #1 - The Standard In File

Column #2 - SR or CRS processing of input records specified for the Standard In file on this row:

> NOTE: "SR" = "Single Record" - Only One Record in the designated file is needed to ADD a new record, or to CHG or DEL an existing record, in a Standard In IP&CL file (except for the CD file which must be supplied in its entirety with each delivery).
>
> "CRS" = "Complete Record Set" - A complete record set (one or more records with matching corresponding Key Fields, CM Fields, Authorization Fields, and Fields 3.1-2, 3.3-2, and 5.1-2) is needed in the designated file to completely define an ADD, or a CHANGE of an existing record, in a Standard In file. Only one record of a CRS is needed to DEL a CRS.

Column #3 - Key Fields for each record type. More than one combine to form a Composite Key

Column #4 - Shows the definition and references to the FW and SW Primitives (Signal PUIs) defined in the Standard In files.

Columns #5 & 6 - Show the definition and references to the HW Primitives (Signal PUIs) defined in the Standard In files with a Device Data Type (field 1.1-2) of ANA or DIS.

> HW PUIs may be defined as "Pass Through" PUIs (PTP): notation in Table 3.7.1.2.5.2-1, = Pass Through PUI - A Signal PUI defined by an HW record with a Device Data Type of ANA or DIS which is passed through to a Firmware Controller or MDM and thus has additional attributes defined by using the same SPUI in a FW or SW record. The FW or SW record information is stored with the original SPUI defined by the HW record under an MBF end item of ANA or DIS. See Section 3.7.1.2.5.2 Delta Delivery Processing for "Pass-Throughs".

Columns #7 & 8 - Show the definition and references to the HW Primitives with a Device Data Type of PWR and SPD. The SPD HW Primitives are defined by DIT.

Column #9 Shows the definition and references to the Signal PUI that defines a Group and is know as a Group PUI. The definition of the Group PUI is initiated by the GD (5.1) Standard In record.

Column #10 Shows the definition of the Conversion PUIs. The Conversion PUIs are defined by the Standard In records SC (3.1), PC (3.2), and PL (3.3). The CP (3.4) record establishes a relationship between a Signal PUI defined in FW (1.2) or SW (1.3) and a Conversion PUI.

In the table “D” is for Definition and identifies which records defines the Primary Data Item PUI.

In the table “R” is for Reference and identifies which records reference the Primary Data Item PUI.

3.7.1.2.5.3 DELTA DELIVERY PROCESSING FOR “PASS-THROUGHS”.

A pass-through (SW/FW attribute of a HW primitive) is signified when a SW/FW primitive has Type of Signal (field 1.2-3 or 1.3-3) = HW. Since a SW/FW attribute of a HW primitive has the same PUI as the HW primitive, one HW end item is created in the database. This HW end item not only contains the HW record, but also the SW/FW attribute.

A HW end item, which also contains the SW/FW attribute, can be created in one of two ways:

1. A HW record is delivered with CM = ADD and Data Type (field 1.1-2) = Analog (ANA) or Discrete (DIS), creating an Analog or Discrete end item, respectively.

2. A SW/FW primitive is delivered with CM = ADD and Type of Signal (field 1.2-3 or 1.3-3) = HW. The type of HW end item created by the SW/FW attribute depends on the SW/FW Data Type.

   a) SW/FW Data Type = SI (Signed Integer), UI (Unsigned Integer), SF (Signed Fixed Point), UF (Unsigned Fixed Point), DSI (Distended Signed Integer), or SMI (Signed Magnitude Integer) creates an Analog end item.

   b) SW/FW Data Type = 1E creates a Discrete end item.

Once the HW end item has been created in the database, the end item Data Type (Analog or Discrete) becomes the ruling factor in what other type of information the end item can contain:

1. State Conversion CP records are NOT allowed for SW/FW pass-throughs. Since the SW/FW attribute corresponds to a HW record, the HW record contains the state table through the High/Low State Code and Definition. Therefore, the database rejects all CP records for SW/FW attributes to HW primitives with a HW Device Type (field 1.1-2) of DIS.

2. Calibration Conversion CP records are ONLY allowed for Analog-type (SI, UI, SF, UF, DSI, or SMI) SW/FW attributes to HW primitives.

3. When a HW record is delivered first, creating a HW end item in the database, only SW/FW attributes with a compatible Data Type will get loaded into the database.

a) If end item Data Type = Analog, only SW/FW Data Type = Analog-type SW Data Type (SI, UI, SF, UF, DSI, or SMI) is allowed.

b) If end item Data Type = Discrete, only SW/FW Data Type = 1E is allowed.

4. When a SW/FW attribute to a HW primitive is delivered first, creating a HW end item (1E creates Discrete, Analog-type SW Data Types creates Analog), only HW records with the same Data Type as the end item Data Type will be loaded. (i.e. A SW pass-through with Data Type = 1E creates a Discrete end item in the database, so only a HW record with Data Type = Discrete will successfully load into the database, HW Data Type = Analog would fail.)

Since the database uses the HW Data Type (whether a HW record was delivered or the Data Type was assumed from the SW/FW Data Type) as the end item data type, certain changes to the SW/FW pass-throughs are different from regular SW/FW primitives:

1. Non-pass-through to Pass-through - To change a SW/FW non-pass-through to a pass-through (Type of Signal = HW), an end item data type change is needed since the end item must change from a SW/FW end item to a HW end item. In order to accomplish an end item data type change, the SW/FW end item must be deleted and the HW end item (from a HW or SW/FW pass-through record) must be added. So, a DEL record of the SW/FW non-pass-through will delete the SW/FW end item, and an ADD of the HW or SW/FW pass-through will create the new HW end item.

2. Pass-through to Non-pass-through - To change a SW/FW pass-through (Type of Signal = HW) to a non-pass-through an end item data type change is also needed to go from a HW end item to a SW/FW end item. In this case, the HW end item must first be deleted through the delivery of a DEL HW record. If a HW record was never delivered (the end item was created through the SW/FW pass-through) the DIT must manually delete the HW end item from the database. Once the HW end item has been deleted, through a DEL record or manual delete, the SW/FW non-pass-through record can then be delivered with an ADD.

3. Analog to Discrete (and vice-versa) - A change from end item data type Analog to end item data type Discrete, or from end item data type Discrete to end item data type Analog, can be achieved in different ways depending on if a HW record was ever delivered:

a) Deliver the HW record with DEL and then ADD in a different file to change the end item data type, and then submit the SW/FW attribute with an ADD and the correct Data Type to match the end item data type (i.e. end item data type = Discrete, SW/FW Data Type = 1E).

b) If only a SW/FW attribute to a HW primitive was delivered (no HW record) and the SW/FW Data Type is changing from Analog-type SW Data Type (SI, UI, SF, UF, DSI, or SMI) to 1E (or vice-versa) the end item data type also must change. Since no HW record was delivered, and a HW record facilitates the change of the end item data type, DIT must manually delete the HW end item from the database. Once the end item delete has been accomplished, the SW/FW record with the new Data Type can be delivered with an ADD.

The deletion of HW primitives and their SW/FW attributes also depends on the HW end item in the database:

1. A delete of the HW and SW/FW attribute can be accomplished through a DEL of the HW record. A HW delete record will delete the entire HW end item, which includes the HW data and the SW/FW attribute data.

2. To delete a SW/FW pass-through record when no HW record was ever delivered, the DIT must manually delete the HW end item from the database. If the SW/FW attribute record is delivered with a DEL, it will only delete the SW/FW data under the HW end item, it will NOT delete the end item.

3.7.1.3 IP&CL DATA DELIVERY FILE (DDF)

The Data Provider shall provide a Data Delivery File (DDF) along with the files delivered per paragraph 3.7.1.1. The format of the DDF is denoted in Table 3.7.1.3-1, Data Delivery File Information. This DDF will be accessed electronically by the MBF in the process of identifying and tracing all the elements of the delivery. The required fields in the VDF are as specified in Table 3.7.2.3-1, Data Delivery File Information.

TABLE 3.7.1.3-1 DATA DELIVERY FILE INFORMATION

Data Item	Description
/ID	Key to indicate the beginning of the delivery identification information.
Date	The delivery date for this set of data files (i.e. 12/06/95)
Provider Name	The data provider name (i.e. PG1, PG2, PG3, CNC, etc.)
/CI	Key to indicate the beginning of the change instrument information.
Change Instrument$_1$	The numeric identifier of the first Program level change instrument incorporated in this delivery.
Change Instrument Name$_1$	The name of the first Program level change instrument contained in the previous field.
Change Instrument$_{2...N}$	The numeric identifier of the next Program level change instrument incorporated in this delivery.
Change Instrument Name$_{2...N}$	The name of the next Program level change instrument contained in the previous field.
/CE	Key to indicate the beginning of the CSCI effectivity information.
CSCI Effectivity (Name)$_1$	The MDM CSCI delivery name of the first CSCI delivery to which this data delivery applies. This name should be chosen from the list of standard names in Appendix O, Table O-1.

Data Item	Description
CSCI Effectivity (Version)$_{1}$	The provider version of the MDM CSCI delivery named in the previous field.
CSCI Effectivity (Name)$_{2...N}$	The MDM CSCI delivery name of the next CSCI delivery to which this data delivery applies. This name should be chosen from the list of standard names in Appendix O, Table O-1.
CSCI Effectivity (Version)$_{2...N}$	The provider version of the MDM CSCI delivery named in the previous field.
/KD	Key to indicate the beginning of the known deficiency information.
Known Deficiency$_{1}$	A textural description of the first known discrepancy from the currently applicable SSPS standards.
Known Deficiency$_{2...N}$	A textural description of the next known discrepancy from the currently applicable SSPS standards.
/FN	Key to indicate the beginning of the file name and number of records information.
File Name$_{1}$	The name and extension of the first file which makes up this delivery as per section 3.7.1.2
Number of Records$_{1}$	The number of data records contained in the file identified in the previous field.
File Name$_{2...N}$	The name and extension of the next file which makes up this delivery as per section 3.7.1.2
Number of Records$_{2...N}$	The number of data records contained in the file identified in the previous field.
/REM	Key to indicate the beginning of the remarks information.
Remarks	Any remarks the data provider wishes to supply to assist in processing and/or interpreting the delivery

The Data provider shall provide the data fields for the DDF file per the format noted below:

A. Each record shall contain only ASCII characters and shall be ended with a Carriage Return or Line Feed.

Note: Records in the above table are indicated by a double line.

B. Records are of unspecified length with a maximum length of 256 ASCII characters. That is, they may be as large as required to contain the necessary information (subject to the 256 ASCII character maximum limitation).

C. A key field indicator shall be used to identify the beginning of each specific region of data within the file. These key field indicators are described in Table 3.7.1.3-1 and shall occupy a record by themselves.

D. Each data field within a record in the submitted file shall be separated by a horizontal tab (ASCII non printable character 9). No tab delimiter shall be placed at the beginning or at the end of a record.

E. For all fields, blank padding at the first or last of a field is not acceptable.

F. Every field shall contain a non-blank entry. Fields shall either contain an "@" or "N/A" to indicate that the corresponding data values are either unavailable or non-applicable as follows:

- If the content of a field CANNOT BE OBTAINED at this time, place the "@" symbol to indicate a missing value or null -- a hole that needs to be filled at a later date. (This symbol is not to be used to indicate any other meaning.)
- If the content of a field is not required for that record, place the symbol "N/A" for NOT APPLICABLE (e.g., if there are no Program level change instruments incorporated in this delivery, that record would contain a value of N/A).

G. Every effort shall be made by the provider to ensure compatibility with applicable SSPS requirements standards for each file delivered. The known deficiency records should be limited to describing records which meet SSPS standards, but may be deficient for other reasons. Note - Records with known deficiencies are subject to rejection during the MBF loading process.

An example of a typical DDF file follows: This information is for example purposes only and not representative of any particular data delivery.

```
/ID
12/06/95    PG1
/CI
PCM239      @
/CE
N/A   N/A
/KD
Records #21, 339, and 1201 thru 1212 in SW file reference primitives in PG3 FW file
which were rejected and are covered by PR#131.  The SW records meet applicable
standards, and upon correction of PR#131, the SW records will properly trace to PG3 FW
primitives.

/FN
HW 951206   1300
FW 951206   273
SW 951206   15000
/REM
We will be providing an additional delivery in 10 days.
```

3.7.1.4 RULES FOR DETERMINING DATA PROVIDER

This section provides the rules that shall be used to determine the data provider responsibility for delivering the Standard-In IP&CL Signal Data.

Figure 3.7.1.4-1 provides an overview of the relationship of signal devices/device codes as defined in paragraph 3.3.1.3 and the IP&CL Data Providers.

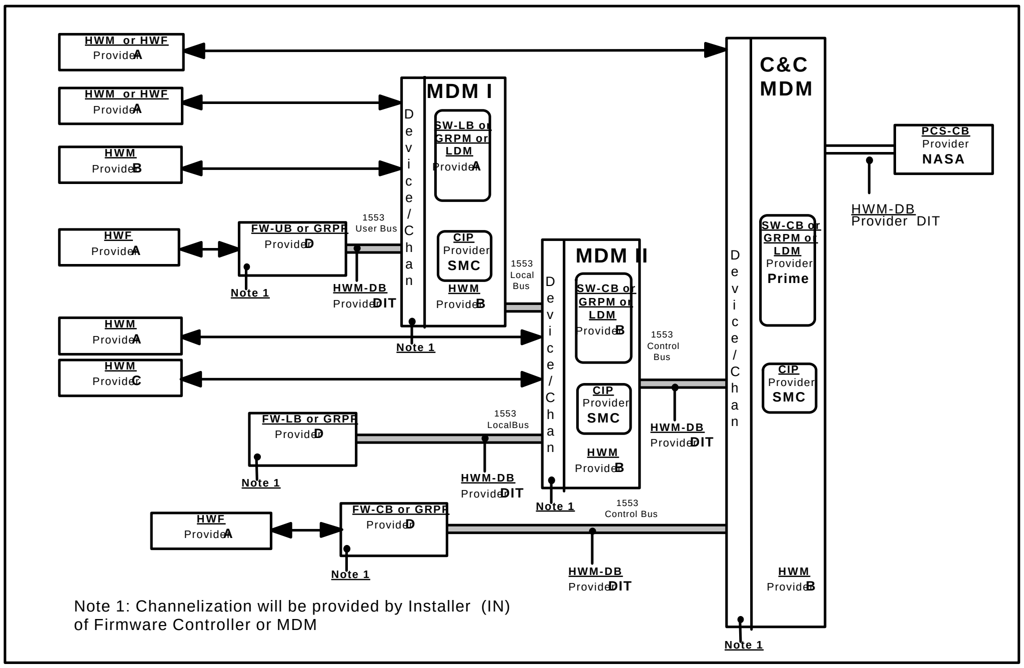


FIGURE 3.7.1.4-1 RELATIONSHIP BETWEEN SIGNAL DEVICES AND ISS IP&CL DATA PROVIDERS

Table 3.7.1.4-1 provides the relationship between the Device Types (reference paragraph 3.3.1.3) provided in Appendix C and responsibity for delivering the Standard Input IP&CL files defined in Appendix N.

TABLE 3.7.1.4-1 IP&CL STANDARD INPUT RESPONSIBILITY MATRIX.

STD IN Files	Primitives			Device/Chan			Conversion				Assoc.		Bus Traffic				Utilization				
	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	3.4	4.1	4.2	5.1	5.2	5.3	5.4	6.1	6.2	6.3	6.4	6.5
App C Device Type	Responsibility Matrix																				
HWM	X	-	SW	-	IN	-	X	X	X	X	-	-	-	-	-	-	-	-	S	0	S
HWM-DB	X	-	-	-	IN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HWM-DBN	X	-	-	-	IN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HWF	X	F	-	-	-	IN	-	-	-	-	-	-	-	-	-	-	-	-	S	0	S
FW-UB	-	X	-	X	-	-	X	X	X	X	X	-	X	X	-	-	-	-	S	0	S
FW-LB	-	X	-	X	-	-	X	X	X	X	X	-	X	X	-	X	-	-	S	0	S
FW-CB	-	X	-	X	-	-	X	X	X	X	X	-	X	X	-	X	-	-	S	0	S
FW-UBN	-	X	-	X	-	-	X	X	X	X	X	-	X	X	-	-	-	-	S	0	S
FW-LBN	-	X	-	X	-	-	X	X	X	X	X	-	X	X	-	X	-	-	S	0	S
FW-CBN	-	X	-	X	-	-	X	X	X	X	X	-	X	X	-	X	-	-	S	0	S
GRPF	-	X	-	-	-	-	X	-	-	X	X	-	X	X	-	X	-	-	-	-	-
LDF	-	X		-	-	-		-	-		X	-	X	X	-	X	-	-	S	0	S
SW-CB	-	-	X	X	-	-	X	-	-	X	X	-	X/S	X	S	X	X	-	S	0	S
SW-LB	-	-	X	X	-	-	X	-	-	X	X	-	X	X	-	X	X	-	S	0	S
SW-UB	-	-	X	X	-	-	X	-	-	X	X	-	X	X	-	X	X	-	S	0	S
GRPM	-	-	X	-	-	-	X	-	-	X	X	-	X	X	-	-	X	-	-	-	-
LDM	-	-	X	-	-	-	X	P	P	X	X	-	X	X	-	X	X	-	S	0	S
CIP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
PCS-CB	-	-	X	X	-	-	X	-	-	X	X	-	X	X	-	X	-	-	-	-	-

Paragraphs 3.7.1.4.1 thru 3.7.1.4.20 along with the following guidelines will be the basis for determining the Data provider responsibility for delivery of the IP&CL Standard Input files:

- An "X" in any one of the columns of Table 3.7.1.4-1 indicates the Data Provider denoted in Appendix C for that device will be responsible for delivery of the respective Standard Input file;
- An "IN" in any one of the columns of Table 3.7.1.4-1 indicates the Installer of the MDM or Firmware Controller Device will be responsible for delivery of the applicable 2.2 or 2.3 files for HWF or HWM respectively;
- A "SW" in any one of the columns of Table 3.7.1.4-1 indicates the Owner of the CSCI that controls the HWM device will be responsible for delivering the 1.3 file;
- A "F" in any one of the columns of Table 3.7.1.4-1 indicates the Owner of the FWSCI that controls the device will be responsible for delivering the 1.2 file;
- A "S" in any one of the columns of Table 3.7.1.4-1 indicates the Station Management and Control (SMC) team will be responsible for delivering the required Appendix C Device Code data for the respective Standard Input files;

- A “P” in any one of the columns of Table 3.7.1.4-1 indicates that the data is to be provided by the Data Provider denoted in appendix C for that device unless the relevant data was provided in a HW or FW file;
- An "0" in any one of the columns of Table 3.7.1.4-1 indicates the Command and Control (C&C) team will be responsible for delivering the required Appendix C Device Code data for the respective Standard Input files; and
- The Flight Delivered column of Appendix C will be used to determine the flight delivered effectivity for the associated signals in Standard Input file/field 1.1-10, 1.2-14, 1.3-14, and 2.1-4.

There are cases in the paragraphs below where two or more Data Providers are required to support delivery of a file. The statement, “Data required from other data providers will be delivered via Prime software Configuration Management”, is used to signify the need for shared data. The following provides the process to be used for shared data. (Reference Figure 3.7.1.4-2.)

Roles for the Exchange of Shared Data:

- DP1 -- Provider for the default format;
- DP2 -- Provider who fills in the necessary information; and
- CM -- Facilitates the exchange.

Steps for the Exchange of Shared Data:

- DP1 coordinates with DP2 for format and schedule;
- Prime C&DH Data Integration Team (DIT) provides support if required;
- DP1 sends to CM, notifies DP2;
- CM releases to DP2 via protected release area;
- DP2 gets the data, fills the requested fields;
- DP2 sends to CM and notifies DP1 of completion; and
- DP1 gets the data, incorporates and officially delivers.

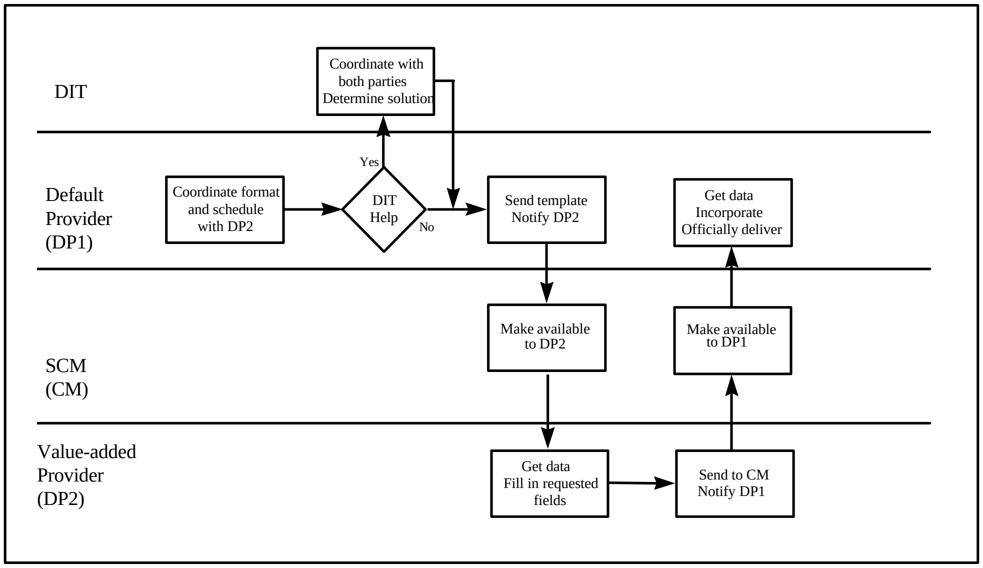


FIGURE 3.7.1.4-2 PROCESS FOR SHARED RESPONSIBILITY STANDARD INPUT FILES

3.7.1.4.1 HARDWARE PRIMITIVE FILE (HW)

Note: The HW Primitive File is optional for the International Partners and Payloads.

The Organization functionally responsible for the hardware generating the primitive measurement signals or receiving the primitive command signals shall define the Signal PUIs and provide the Hardware (HW) Primitive File 1.1. A list of the Hardware Data Providers is available in Appendix C. Definitions for Data Provider codes are available in Appendix R.

3.7.1.4.2 FIRMWARE CONTROLLER PRIMITIVE FILE (FW)

Note: The HW Primitive File is optional for the International Partners and Payloads.

The Organization functionally responsible for the Firmware Controller (FC) generating the primitive measurement signals or receiving the primitive command signals shall define the Signal PUIs and provide the Firmware (FW) Primitive File 1.2 including the Firmware Attributes for Pass Thru Hardware Primitives. A list of the Firmware Data Providers are available in Appendix C. Definitions for Data Provider codes are available in Appendix R.

3.7.1.4.3 SOFTWARE PRIMITIVE FILE (SW)

The Organization functionally responsible for the MDM or Processor CSCI generating the software primitive measurement signals or receiving the primitive command signals shall define the Signal PUIs and provide the Software (SW) Primitive File 1.3 including the Software Attributes for Pass Thru

Hardware Primitives. A list of the MDM or Processor CSCI Data Providers are available in Appendix C. Definitions for Data Provider codes are available in Appendix R.

3.7.1.4.4 DEVICE FILE (DF)

Note: The Device File is optional for the International Partners and Payloads.

The Organization as defined in Appendix C as Data Provider and where the Device Code equals FW-xx, FW-xxx, SW-xx, or PCS-CB shall conform to the following rules:

A. Except for RPCMs, the Organization functionally responsible for the FC or MDM provides the Device File 2.1 (DF); and

B. For RPCMs, the Organization responsible for the CSCI that is controlling the RPCM provides the Device File 2.1 (DF).

A list of the MDM/CSCI Data Providers are available in Appendix C. Definitions for Data Provider codes are available in Appendix R.

3.7.1.4.5 MDM CHANNEL FILE (MC)

Note: The MDM Channel File is optional for the International Partners and Payloads.

A. The Organization functionally responsible for installing the MDM shall provide the MDM Channel File 2.2 (MC).

B. Organizations with File 1.1 HW Primitive (Ref. Appendix N) data and channelized to a MDM installed by another contractor (shared MDMs) shall provide File 2.2 for these signals to the ISS Prime Software Configuration Management Group. The ISS Prime Software Configuration Management Group shall deliver the file to the appropriate contractor responsible for installing the MDM.

3.7.1.4.6 FIRMWARE CONTROLLER CHANNEL FILE (FC)

Note: The Firmware Controller Channel File will not be required to be delivered by the IPs.

A. The Organization functionally responsible for installing the Firmware Controller shall provide the Firmware Controller Channel File 2.3 (FC).

B. Organizations with File 1.1 HW Primitive (Ref. Appendix N) data and channelized to a FC installed by another contractor (Shared FCs) shall provide File 2.3 for these signals to the ISS Prime Software Configuration Management Group. The ISS Prime Software Configuration Management Group shall deliver the file to the appropriate contractor responsible for installing the FC.

3.7.1.4.7 STATE CONVERSION DATA FILE (SC)

The Organization responsible for providing the primitives requiring state conversion shall provide a State Conversion File 3.1 (SC). Calibration PUI naming rules are defined in paragraph. 3.3.1.5.

3.7.1.4.8 POLYNOMIAL CALIBRATION FILE (PC)

The Organization responsible for providing the primitives requiring polynomial coefficients shall provide a Polynomial Calibration File 3.2 (PC).

Data Providers of HW Primitives requiring Polynomial Coefficients that are processed by other Data Provider CSCIs shall provide a list to the ISS Prime Software Configuration Management Group that identifies the HW SPUI and the Data Type used to calculate the coefficients. The ISS Prime Software Configuration Management Group shall deliver the file to the appropriate contractor responsible for the CSCI.

Calibration PUI naming rules are defined in paragraph 3.3.1.5.

3.7.1.4.9 PIECEWISE LINEAR CALIBRATION FILE (PL)

The Organization responsible for providing the primitives requiring piecewise linear coefficients shall provide a Piecewise Linear Calibration File 3.3 (PL).

Data Providers of HW Primitives requiring Piece wise Linear Coefficients that are processed by other Data Provider CSCIs shall provide a list to the ISS Prime Software Configuration Management Group that identifies the HW SPUI and the Data Type used to calculate the coefficients. The ISS Prime Software Configuration Management Group shall deliver the file to the appropriate contractor responsible for the CSCI.

The calibration PUI rules defined in paragraph 3.3.1.5 should be applied for generating piecewise linear calibration curve unique identifiers.

3.7.1.4.10 CONVERSION PRIMITIVE FILE (CP)

The Organization responsible for providing the State Conversion File, Polynomial Calibration File, and Piecewise Linear Calibration file shall provide a Conversion Primitive File 3.4 (CP).

3.7.1.4.11 REQUIREMENT PUI FILE (RP)

The Organization responsible for providing the primitives via the Primitive files (1.1, 1.2, 1.3) or Group data via the Group Data file (5.1) that are controlled by the Software Part 1 and Part 2 ICDs shall provide a Requirement PUI File 4.1 (RP).

In the case where the Data Provider is responsible for the Hardware Primitives delivered in File 1.1 and a different Data Provider is responsible for the Firmware or Software Attributes delivered in file 1.2 or 1.3, the Data Provider responsible for the Firmware or Software Primitives shall provide a Requirement PUI File 4.1 (RP).

3.7.1.4.12 TRACEABILITY FILE (TR)

The organization responsible for providing the hardware primitives requiring the traceability relationship shall provide the Traceability File 4.2 (TR).

3.7.1.4.13 GROUP DATA ITEM FILE (GD)

The Organization functionally responsible for:

A. Firmware Controller/MDM CSCI generating or receiving signal data via 1553/non-1553 Data Buses shall provide the Group Data Item File 5.1 (GD) as denoted in Table 3.3.1.2.1.6.1.3.2-3. A list of the Firmware/MDM CSCI Data Providers are available in Appendix C. Definitions for Data Provider codes are available in Appendix R; and

B. Generation of the Telemetry Group PUIs shall be defined by the Station Management and Control (SMC) group and provided in the Group Data File 5.1 (GD).

3.7.1.4.14 MESSAGE TRANSACTION FILE (MT)

A. The Organization functionally responsible for the Firmware Controller/MDM CSCI generating or receiving 1553 messages shall provide the Message Transaction File 5.2 (MT) as denoted in Table 3.3.1.2.1.6.1.3.2-3;

B. Data required from other data providers will be delivered via Prime Software Configuration Management (SCM); and

C. The Organization functionally responsible for the Firmware Controller generating or receiving RS485 Signals shall provide the Message Transaction File 5.2 (MT) as denoted in Table 3.3.1.2.1.6.1.3.2-3.

A list of the Firmware/MDM CSCI Data Providers are available in Appendix C. Definitions for Data Provider codes are available in Appendix R/Short Legal names.

3.7.1.4.15 TELEMETRY TRANSACTION FILE (TT)

The Station Management and Control (SMC) group shall define and provide the Telemetry Transaction File 5.3 (TT) as denoted in Table 3.3.1.2.1.6.1.3.2-3.

3.7.1.4.16 RATE GROUP FILE (RG)

The Organization functionally responsible for defining the applicable DMSG_CONs in File 5.1/5.2 shall provide the Rate Group File 5.4 (RG).

3.7.1.4.17 COMMAND TEMPLATE FILE (CT)

The Organization functionally responsible for the MDM CSCI shall define the Command Template 6.1 (CT) File. A list of the Firmware/MDM CSCI Data Providers are available in Appendix C. Definitions for Data Provider codes are available in Appendix R.

3.7.1.4.18 COMMAND INSTANTIATION FILE (CI)

The Station Management and Control (SMC) group is responsible for generation of commands from the PCS/Ground and shall define the Command Instantiation File 6.2 (CI). A list of the Command Instantiation Devices are available in Appendix C.

3.7.1.4.19 OPERATIONS PARAMETER DEFINITION FILE (OP)

The Station Management and Control (SMC) group is responsible for providing "Operations Names" to Data Acquisition signals for purposes of display, telemetry, and Timeliner and shall define the Operations Parameter Definition File 6.3 (OP).

3.7.1.4.20 CVT DEFINITION FILE (CD)

The CVT Definition File 6.4 (CD) shall be provided by the Prime C&C development group. The file consists of a mapping of word PUIs, or primitive PUIs if a primitive completely fills more than one word, to the corresponding Node Control Software (NCS) or Command and Control Software (CCS) Current Value Table (CVT) memory address where that word or signal primitive is stored. The CVT will be used to construct tables for driving the access to and transmission of data for displays, procedures, and possibly other applications requiring CVT memory data.

3.7.1.4.21 COMMAND INSTANTIATION VALUE FILE (CV)

Station Management and Control (SMC) group defines the Command Instantiation Values for the Command Instantiation File (6.2). and shall define the Command Instantiation Value File 6.5 (CV).

3.7.1.5 PROCESS GOVERNING DATA MODIFICATION BY THE PRIME

This section provides the guidelines that will be used to determine when the Prime may modify data submitted by the respective Data Providers and the process for making such changes.

In general, all changes to data previously submitted by a Data Provider should be made by that Data Provider and resubmitted to the Prime as a delta update following the process and rules established in Section 3.7.1.2.5, Delta Delivery Processes and Rules, and conforming to the Standard Input File structure and naming described in Sections 3.7.1.1 and 3.7.1.2. However, in certain circumstances it may be required for reasons of time criticality or overall efficiency for the Prime to make changes to data on behalf of the original Data Provider. This section lays out the process for making such changes.

The need for the Prime to modify provider data may be established either by the Prime itself or by the Data Provider.

If the Prime determines the need to modify provider data, it will write a new Problem Report (PR) or update an existing PR describing the reason for the change and the nature of the change. If Standard Input change files are required, they will be developed by the Prime and referenced in the PR. If interactive database changes are required, these changes will be explicitly described in the Analysis section of the PR. This Problem Report and any associated Standard Input change files will be submitted to the original Data Provider for review and approval. This submission will normally be accomplished via an electronic mail notice and associated attachments.

The Data Provider will respond by either approving the PR and any change files or by disapproving these changes. If the PR and changes are approved, this fact will be noted on the PR and in the Remarks section of the Data Description (DD) file accompanying the change files. The PR will then be submitted to the appropriate Prime PR Board for disposition. If the PR is approved at that board, either the change files and associated DD file will be submitted to QA/CM for loading into the database or the identified changes will be accomplished interactively with the participation/observation of CM.

CM will keep a record of all such interactive changes stating the changes made and referencing the associated PR. If the data provider does not approve the requested change, then either the change will be modified and resubmitted for Data Provider approval or the changes will be dropped at that point.

It may also be that a Data Provider determines the need for Prime to modify data it has originally provided. Cases in which this may occur include data that can only be corrected via interactive database changes or data that is more efficiently changed by the Prime. In such cases, a Data Provider will either create a new PR or update an existing PR to indicate that a portion or all of the changes identified by that PR are requested to be made by the Prime. This information would normally appear in the Recommended Corrective Action section of the PR. This PR will then be processed in the normal fashion and dispositioned by the appropriate Prime PR Board.

If the PR is approved, Prime will either prepare Standard Input change files and an associated Data Description file to accomplish the change or will compile the information necessary to accomplish the change interactively. If files are created, these will be submitted for approval to the Data Provider as described in the paragraph above. Upon receipt of this approval, the Data Description file will be updated to note that this was a change made by Prime at the request of the Data Provider and the change files will be submitted to QA/CM for loading into the database.

If the change is to be accomplished interactively, the PR must explicitly state all changes to be accomplished. These will then be made by Prime with the participation/observation of CM. CM will keep a record of all such interactive changes stating the changes made and referencing the associated PR.

3.7.2 SOFTWARE AND NON-SIGNAL DATA DELIVERY STANDARDS

Each of the ISS Program entities responsible for flight software development including the Product Groups (PGs), the C&C IPT, the various GFE groups, i.e., Portable Computers Systems (PCS), and the International Partners (IPs) will deliver flight software products to the Mission Build Facility.

The PGs and the Prime C&C IPT shall deliver two set**s** of software files for each CSCI or CSC delivered**.** The two sets will be two distinct directories or archive files within the delivery. See Section 3.7.2.1.1. The two sets of delivered files are:

> SET-1 - Source Files and any tools Required to Recreate MDM Loadable Images, Pre-Positioned Loads (PPL), Adaptation Data Tables (ADT), and Memory Patch Files, within the MBF,
>
> SET-2 - Files Required for the FSW part of the Integrated Flight Load (IFL), made available in the MBF_Distribution product set. These files include MDM Loadable Images, PPLs, ADTs, Memory Patches, and Other Ancillary Data.

The first set of software files will be sufficient to recreate MDM loadable images, PPLs, Adaptation Data Loads and Memory Patches within the environment of the MBF.

The first set may be specified as a “save set” or “tar” file, or may include both, if applicable, within the distinct directory. (See Section 3.7, Standard Input Identification and Delivery.)

1. SET-1 - Files required, when applicable, to recreate MDM Loadable Images, PPLs, ADTs, and Memory Patches, within the MBF:

    a) Source Code - All source code files needed to compile a complete MDM Load Image or source code used in creating PPL Load Image files. If any of the FSW Load MDM Utility files have been changed by the CSCI development or CM organizations; they will be delivered as part of SET-1. The software build scripts will explicitly specify the appropriate modified files to use instead of the default CFE provided set.

        NOTE: The CFE provided MDM Utilities, Boot and Diagnostics files will be provided directly by PG1-Huntington Beach to Prime CM and the other PGs. These files will not be delivered by the other PGs to the MBF.

    b) Models - Any models required in the processing of source code and compiling the MDM Load Image.

    c) Data Files - Any data files needed to create the appropriate environment, create the MDM Load Image or create the PPL Load Image files.

d) Build Scripts - All scripts needed to support the environment, create the complete MDM Load Image and PPL Load Image files.

e) Executable Tools - Any tools, developed or modified by the software development or CM organizations, needed for creation of the MDM Load Image or other Load Image files. Compilers are not considered to be one of the tools in this case.

f) The FSW Load MDM Utilities - This file will be delivered if any of the Load Utilities have been changed by the CSCI development or CM organizations.

NOTE: The CFE provided MDM Utilities, Boot and Diagnostics files will be provided directly by PG1-Huntington Beach to Prime CM and the other PGs. These files will not be delivered by the other PGs to the MBF.

2. SET-2 - Files required, when applicable, for FSW Standard-Out, including MDM Loadable Images, PPLs, and Other Ancillary Data:

NOTE: This second set of software files will be packaged to be loaded into the flight MDM. This second set may be passed through the MBF unmodified, and made available in the SWCM-MBF_Distribution Release Directory. This second set of files will be made available to the MBF as a separate directory of individual files as produced by the CSCI provider.

a) The FSW Load MDM Application Image.

b) The FSW Load MDM I/O Configuration Image.

NOTE: A VDF file will be delivered with each SET 2 delivery. This VDF file will provide the required descriptive information for the set of MDM Application Image, I/O Configuration Image, and Application Checksum Table files.

c) Pre-Positioned Loads (PPLs) - These files are the PPL files using the Load Image File Format specified in Section 3.7.2.3.

NOTE: A VDD may be delivered with the delivery of PPLs relative to this FSW release, as determined by each CSCI. If a CSCI does not deliver a separate VDD for the PPLs, then the appropriate PPL information will be added to the overall CSCI VDD revised as required. A VDF will be delivered for each PPL set (one or more instances of a PPL) and will include descriptive information for the PPL files in the set. The PPL file set represents combinations of required instances (versions of a PPL) and memory targets, needed for this PPL, for this delivery. See Section 3.7.2.1.2. Zero or more PPLs may be delivered with a scheduled FSW release. However, some PPLs may be required to be delivered between FSW releases or may never need to be delivered.

d) Data/Memory Load Patches not covered by MDM Load Images and PPLs. These files are Adaptation Data (Non-PPL) Loads and Memory Patch Loads, and are loadable files using the Load Image File Format specified in Section 3.7.2.3.

NOTE: A VDD may be delivered with the delivery of Adaptation Data (Non-PPL) Loads and Memory Patch Loads relative to this FSW release, as determined by each CSCI. If a CSCI does not deliver a separate VDD for the ADTs and

Memory Patches, then the appropriate information will be added to the overall CSCI VDD revised as required. A VDF file will be delivered with the delivery of each Adaptation Data (Non-PPL) Load or Memory Patch Load File relative to this CSCI release, and will include the required descriptive information pertaining to each file. See Section 3.7.2.1.2.

e) Other Ancillary Files will be delivered, when applicable. The descriptions, file format, and file name are specified in the Standard Out Definition (SOD) Document (D684-10177-01). These files will include such items as:

   1) Application Process Identifiers Definitions (APID) files - These files consist of two spread sheets defined by C&C IPT and processed by DIT for inclusion in the IP&CL State Conversion Data. One file contains Core definitions including routing nodes, and the other contains Payload definitions including routing nodes. These files are specified in the SOD Document (D684-10177-01, paragraph 30.7.1.3.1).

   2) Emergency, Caution, Warning, and Advisory (ECWA) file - This file is provided by SMC IPT, and is the controlled reference for all of the ISS provider supplied attributes of the primitives contained in their Caution & Warning data acquisition words. This file is specified in the SOD Document (D684-10177-01, paragraph 30.7.1.3.2).

   3) MDM Buffer/Logs Descriptions - This item currently pertains to the Node 1 MDM CSCI (NCS) only. These files are provided by C&C IPT, and specify the structural definition for the MDM buffers and logs considered necessary for ground real time display support and non-real time data analysis support. These files are specified in the SOD Document (D684-10177-01, paragraph 30.7.1.3.4).

   4) Telemetry Versioning files - These files map telemetry components to Format Version IDs and Flights, and are provided by MOD. These files are specified in the SOD Document (D684-10177-01, paragraph 30.7.1.3.5).

   5) MDM Legal Addresses - This item currently pertains to the Node 1 MDM CSCI (NCS) only. This file defines lists of MDM addresses that can be used by an MDM analyst to access various parts of MDM memory for data dump. This file is specified in the SOD Document (D684-10177-01, paragraph 30.7.1.3.6).

   6) MDM Current Value Table (CVT) Maps - This file is required to provide a linkage between the MDM addresses and their respective data contents. The information is required by the USGS controller to build correct data dump commands, as well as interpret the resultant data dump telemetry. The details of this file have been defined to be specified in the SOD Document (D684-10177-01).

   7) Text file from “Symbols=Extensive” linker map of Ada names versus memory addresses - This file is required by the USGS controller to provide a linkage

between Ada names and MDM memory addresses. The details of this file have been defined to be specified in the SOD Document (D684-10177-01).

f) CCS Mass Storage Device (MSD) Load Files will be delivered, by the designated provider, to the MBF for each appropriate FSW release. These files will be defined using the Load Image File Format specified in Section 3.7.2.4. These files support the initialization and loading of the Flight CCS MSD, and subsequent uplinks to the MSD from the MCC-H as required. The files required are as follows:

   1) Operations Plans and Procedures (OPP) - MOD
      - Inventory Management Systems file
   2) PCS
      - PCS Display Data Transfer (DDT) files
   3) PG1 - GN&C
      - GNC MDM Load Images
      - GNC Controller Configuration Data Base (CCDB) images
   4) PG0 - CCS
      - CCS MDM Load Image
      - CCS PPL files
      - CCS Telemetry Control Tables
   5) Canada - CSA - MSS/RWS files. These files will be delivered to the MBF for each appropriate FSW release including the final release for uplink by the MCC-H to the CCS MSD.
      - Robotics Workstation (RWS) Load Image
      - Other RWS Images
      - Artificial Vision Unit (AVU) Load Image

All other ISS program participants including the various GFE groups, and the IPs shall deliver only loadable flight image products to the MBF as specified in their respective agreements. These files include:

1) FSW Load Application Image;
2) FSW Load I/O Configuration Image;
3) FSW Load Memory Patch; and
4) Adaptation Data Loads (Loads not using the Adaptation Data Overlay Design Construct). (See Section 3.3.7.1).

3.7.2.1 SOFTWARE AND NON-SIGNAL DATA STANDARD INPUT FILE DELIVERY

All software deliveries to the MBF will be according to established Program schedules.

Each of the software deliveries to the MBF from the IPs and GFE groups shall be as required in their respective agreements.

3.7.2.1.1 FLIGHT SOFTWARE FILE NAMES

The list of deliverable CSCIs and CSCs and their associated standard file names for each of the Product Groups and the Prime C&C IPT is given in Appendix O, Flight Software Standard Interface Agreement, Part 1, Table O-1, Standard CSCI and CSC Names. In providing these deliverables, the standard file name for a particular CSCI or CSC as referenced in Appendix O, Table O-1 will be used to identify the two sets of files corresponding to that CSCI or CSC. This is to be accomplished by structuring all of these files in two directories bearing the common CSCI or CSC name. These directories shall be specified as Save Sets (from the VAX environment with a .bck file extension) or as Tape Archive files (from the Sun/Unix environment with a .tar file extension.

File Name Format for Delivery to the MBF

In addition to the user supplier name, each of the files supplied with a CSCI delivery must be identified by a standard file extension. Standard file types and corresponding standard file extensions are itemized in Appendix O, Table O-2, Standard File Extensions and Types. These standard file extensions are meant to identify the contents or intended use of the provided files. Examples of such content or intended use include Ada source code bodies, Ada source code specifications, Alsys Ada Compiler command script for compilation, and Matrix-X Binary Data Model including all Superblocks. Every attempt has been made to provide a set of inclusive and appropriate file types and corresponding extensions in Table O-2. However, should a provider not find a standard extension corresponding to a delivered file, one should be uniquely assigned and that fact should be noted in the VDD documentation accompanying the delivery. An overall VDD is required for each CSCI delivery to provide the required descriptive information relative to SET-1 and SET-2 files, including the PPLs, the ADTs (Non-PPL Patches) and Memory Patch Loads. As interim deliveries (between FSW releases) are made for the PPLs and the Data/Memory Patch Loads, the VDD will be revised to accommodate the newly delivered files. Each CSCI may specify additional VDDs as required to facilitate the multiple versions and deliveries of PPLs, Adaptation Data Loads and Memory Patch Loads. See Section 3.7.2.1.2.

1. SET-1 File Names (see SET-1 definition in section 3.7.2) will be defined as specified above using Appendix O, Table O-2, Standard File Extensions and Types.
2. SET-2 File Names (see SET-2 definition in section 3.7.2) will be delivered as defined in this section, except for the file names for the Other Ancillary Files (Paragraph, 3.7.2, A, 2, f) which will be explicitly specified in the Standard Out Definition document, (D684-10177-01.

The general format for naming the FSW Load MDM Application Image and the FSW Load MDM I/O Configuration Image and related SET-2 files will use the following form:

CCCCCCCC---C.eee

where :

CCCCCCCC - is the file name as defined by the CSCI Development Organization and specified in the VDD, and

eee = :

.BIN for the Load Image File loadable by the MATE,

.LIF for the Load Image File loadable via the 1553 Bus,

.VDF for the Load Image File's Version Description File (VDF),

and for other files see the list of file extensions in Appendix O.

For PPL Load Image files:

DDDDDD_TTT_NNNN_X_Y_MMMMM.eee

where:

DDDDDD = the applicable CSCI Name. Six (6) is the max number of characters for deliverable Load Image File CSCIs as defined in Appendix O.

TTT = "PPL", the file type for Pre-Positioned Load (PPL),

NNNN = the ADO ID Number assigned within the CSCI associated with one ADO with a unique engineering name. There may be zero, one or more PPL instance/version files associated with this ADO ID Number. See paragraph 3.3.7.1.3.1.

X = the MDM target (s) for this file:

1= Primary, 2= Secondary, 3= Backup, and 4= All targets are included in this file.

Y = the MDM memory locations for this file:

E= EEPROM, D= DRAM, and A= All required memory locations are included in this file.

MMMMM = the PPL Version Number which matches the Version Number specified in the body of the PPL, and is incremented with each new instance of the PPL. (The Version Number field of 5 characters allows for a maximum 16 bit unsigned integer value of 65536).

eee = .LIF for the binary PPL file using the Load Image File Format (see section 3.7.2.3).

For PPL VDF files:

DDDDDD_TTT_NNNN.eee

where:

DDDDDD = the applicable CSCI Name (See Appendix O).

TTT = “PPL”, the file type for Pre-Positioned Load (PPL).

NNNN = the ADO ID Number, assigned within the CSCI, associated with one ADO with a unique engineering name. There may be zero, one or more PPL instance/version files associated with this ADO ID Number. See paragraph 3.3.7.1.3.1.

eee = .VDF for the Version Description File. The VDF will contain the descriptions, for each PPL File, for each combination of instance (PPL version) and target memory for this unique PPL within the CSCI.

For ADT and Memory Patch files:

DDDDDD_TTT_CCCC---C.eee

where:

DDDDDD = the applicable CSCI Name (See Appendix O).

TTT = “ADT”, the file type for an Adaptation Data Table (non-PPL type of adaptation data).

TTT = “PAT”, the file type for a Memory Patch Load.

CCCC---C = the CSCI Development Organization defined portion of the file name to uniquely identify the ADT Load or the Memory Patch Load.

eee = .LIF for the binary ADT or Memory Patch file using the Load Image File Format (see section 3.7.2.3), for each ADT or Memory Patch file.

eee = .VDF for the Version Description File. The VDF will contain the descriptions, for each ADT or Memory Patch file.

3.7.2.1.2 VERSION DESCRIPTION DRAWING (VDD) AND VERSION DESCRIPTION

FILE (VDF)

The software deliverables: a) CSCI or CSC FSW, b) PPLs, and c) ADTs or Memory Patch Loads, will be delivered with a corresponding Version Description Drawing (VDD) as described in Data Item Description DI-MCCR-80013A.

In addition, each supplier will provide a subset of the information contained in the standard VDD, as well as additional descriptive information, in one or more ASCII files(s) called a Version Description File (VDF). This VDF will be accessed electronically by the users of the output MBF Distribution IFL in the process of identifying and tracing all the elements of the delivery.

VDD documents and VDF files will be provided, as specified, for each FSW delivery and subsets of the delivery as follows:

Delivery Part	One VDD Required	VDFs Required
Complete FSW Delivery	CSCI VDD The sets of files should be described in separate appendices, for example: SET-1 files described in App. A SET-2 files described in App. B	SET-1 NO SET-2 YES A VDF for each MDM Load Image file
PPL Load Image files set for this CSCI release	Included in CSCI VDD All PPLs for this CSCI release CSCI VDD revised to reflect PPLs delivered between CSCI releases. It is the CSCIs option to define a separate VDD for PPLs	YES A VDF will be provided for each PPL type delivered. One VDF would cover one or more instances/versions of a PPL type.
Adaptation Data (Non-PPL) Loads and Memory Patch Loads	Included in CSCI VDD For all Adaptation Data and Memory Patch Loads delivered for this CSCI releasey CSCI VDD revised to reflect deliveries between CSCI releases It is the CSCIs option to define a separate VDD for Adaptation Data Loads and Memory Patch Loads.	YES A VDF will be provided for each Adaptation Data or Memory Patch Load file delivered.

The required fields in the VDF are as specified in Table 3.7.2.1-1, Version Description File Information, below.

TABLE 3.7.2.1-1 VERSION DESCRIPTION FILE INFORMATION

Data Item	Description
/ID	Key to indicate the beginning of the delivery identification information.
Date	The delivery date for this set of flight software files (i.e. 12/06/95).
Provider Name	The software provider name (i.e. PG1, PG2, PG3, CNC, etc.).

Data Item	Description
CSCI Name	The standard CSCI or CSC name used for this delivery (chosen from Appendix O, Table O-1.
Delivered Version	The PG provided version identifier for this delivery.
Part Number	The PG supplied part number for this delivery.
Stage Effectivity	The ISS Stage for which this CSCI is targeted (i.e. 2A).
Compiler Name	The compiler name used in compiling this CSCI.
Compiler Version	The compiler version used in compiling this CSCI.
Linker Name	The linker name used in binding and linking this CSCI.
Linker Version	The linker version used in binding and linking this CSCI.
/CI	Key to indicate the beginning of the change instrument information.
Change Instrument$_{1}$	The numeric identifier of the first Program level change instrument incorporated in this delivery.
Change Instrument Name$_{1}$	The name of the first Program level change instrument contained in the previous field.
Change Instrument$_{2...N}$	The numeric identifier of the next Program level change instrument incorporated in this delivery.
Change Instrument Name$_{2...N}$	The name of the next Program level change instrument contained in the previous field.
/KD	Key to indicate the beginning of the known deficiency information.
Known Deficiency$_{1}$	A textural description of the first known deficiency for this delivery.
Known Deficiency$_{2...N}$	A textural description of the next known deficiency for this delivery.
/FN_SET_2	Key to indicate the beginning of the file name and version information for SET 2 files - files required for the FSW Standard-Out, including MDM Loadable Images, PPLs and Other Ancillary FSW Data (See paragraph 3.7.2-A).
File Name$_{1}$	The name and extension of the first file which makes up the delivery. Standard file extensions chosen from Appendix O, Table O-2 must be used with PG supplied names for these files.
Provider Version$_{1}$	The internal PG version for the file identified in the previous field.
File Name$_{2...N}$	The name and extension of the next file which makes up the delivery. Standard file extensions chosen from Appendix O, Table O-2 should be used with PG supplied names for these files. If a new file extension is required it must be specified in the VDD and VDF.
Provider Version$_{2...N}$	The internal PG version for the file identified in the previous field.
/PPL	Key to indicate the beginning of PPL instance and target (Primary, Secondary, DRAM and EEPROM) specific information. The "/PPL" section will be repeated, as required, for each file (instance and target combination).

Data Item	Description
PPL Contact	Contact within a CSCI's organization for PPL information.
PPL Engineering Name	Descriptive Engineering Name of this PPL.
PPL Number	PPL Number for this PPL. Assigned by the CSCI for each PPL in the CSCI.
Signal PUI	Signal PUI associated with this PPL's Version ID field.
/PPL LOAD PROCEDURES	Key to indicate the beginning of the PPL Load Procedures Description.
PPL Load Procedures	PPL Load Procedures Description - This procedure description will be written from the FSW development and test perspective and will be used by the MCC-H to 1) prepare for the load, 2) complete the load, and 3) return to normal operations. The load procedure will specify the state required for all related systems during each load step and identify all constraints and cautions related to the load.
	Additional records, as needed, for the PPL Load Procedures Description .
/PPL LOAD RESTRICTIONS	Key to indicate the beginning of the PPL Load Restrictions.
PPL Load Restrictions	PPL Load Restrictions - The specification of any load restrictions, e.g. time of day, station mode, or other conditions specified to Mission Operations.
	Additional records, as needed, for the PPL Load Restrictions.
/PPL FILE	Key to indicate the beginning of PPL file specific information. This entire keyfield section is repeated for multiple versions of this PPL.
PPL File Name	PPL file name for this PPL instance (See Paragraph 3.7.2.1.1).
PPL Version ID	PPL Version ID number for this PPL instance.
Flight Effectivity	Flight effectivity for this instance of this PPL (for example: "2A-3A").
Purpose for this PPL Instance	A brief description of the purpose of this specific PPL instance.
/ADT	Key to indicate the beginning of ADT information.
ADT Contact	Contact within a CSCI's organization for ADT information.
ADT Engineering Name	Descriptive Engineering Name of this ADT.
/ADT LOAD PROCEDURES	Key to indicate the beginning of the ADT Load Procedures Description.
ADT Load Procedures	ADT Load Procedures Description - This procedure description will be written from the FSW development and test perspective and will be used by the MCC-H to 1) prepare for the load, 2) complete the load, and 3) return to normal operations. The load procedure will specify the state required for all related systems during each load step and identify all constraints and cautions related to the load.
	Additional records, as needed, for the ADT Load Procedures Description.

Data Item	Description
/ADT LOAD RESTRICTIONS	Key to indicate the beginning of the ADT Load Restrictions.
ADT Load Restrictions	ADT Load Restrictions - The specification of any load restrictions, e.g. time of day, station mode, or other conditions specified to Mission Operations.
	Additional records, as needed, for the ADT Load Restrictions.
/ADT FILE	Key to indicate the beginning of ADT file specific information. This entire keyfield section is repeated for multiple versions of this ADT.
ADT File Name	ADT file name for this ADT file (See Paragraph 3.7.2.1.1).
ADT Flight Effectivity	Flight effectivity for this instance of this ADT (for example: “2A-3A”).
Purpose for this ADT Instance	A brief description of the purpose of this specific ADT instance.
/PAT	Key to indicate the beginning of Memory Patch information.
PAT Contact	Contact within a CSCI’s organization for Memory Patch information.
PAT Engineering Name	Descriptive Engineering Name of this Memory Patch.
/PAT LOAD PROCEDURES	Key to indicate the beginning of the Patch Load Procedures Description.
Patch Load Procedures	Patch Load Procedures Description - This procedure description will be written from the FSW development and test perspective and will be used by the MCC-H to 1) prepare for the load, 2) complete the load, and 3) return to normal operations. The load procedure will specify the state required for all related systems during each load step and identify all constraints and cautions related to the load.
	Additional records, as needed, for the Patch Load Procedures Description.
/PAT LOAD RESTRICTIONS	Key to indicate the beginning of the Patch Load Restrictions.
Patch Load Restrictions	Patch Load Restrictions - The specification of any load restrictions, e.g. time of day, station mode, or other conditions specified to Mission Operations.
	Additional records, as needed, for the Patch Load Restrictions.
/PAT FILE	Key to indicate the beginning of Patch file specific information. This entire keyfield section is repeated for multiple versions of this Memory Patch.
PAT File Name	Patch file name for this Patch file (See Paragraph 3.7.2.1.1).
PAT Flight Effectivity	Flight effectivity for this instance of this Patch file (for example: “2A-3A”).
Purpose for this Patch file	A brief description of the purpose of this specific Memory Patch file.
/REM	Key to indicate the beginning of the remarks information.

Data Item	Description
Remarks	Any remarks the software provider wishes to supply to assist in processing and/or interpreting the delivery.
/ENDVDF	Key to indicate the end of the VDF file.

The Data provider shall provide the data fields for the VDF file per the format noted below:

A. Each record shall contain only ASCII characters and shall be ended with a Carriage Return or Line Feed. Records in the above table are indicated by a double line.

B. Records are of unspecified length with a maximum length of 256 ASCII characters. That is, they may be as large as required to contain the necessary information (subject to the 256 ASCII character maximum limitation).

C. A key field indicator shall be used to identify the beginning of each specific region of data within the file. These key field indicators shall occupy a record by themselves.

D. Each data field within a record in the submitted file shall be separated by a horizontal tab (ASCII non printable character 9). No tab delimiter shall be placed at the beginning or at the end of a record.

E. For all fields, blank padding at the first or last of a field is not acceptable.

F. Every field shall contain a non-blank entry. Fields shall either contain an "@" or "N/A" to indicate that the corresponding data values are either unavailable or non-applicable as follows:

- If the content of a field CANNOT BE OBTAINED at this time, place the "@" symbol to indicate a missing value or null -- a hole that needs to be filled at a later date. (This symbol is not to be used to indicate any other meaning.)
- If the content of a field is not required for that record, place the symbol "N/A" for NOT APPLICABLE (e.g., if there are no Program level change instruments incorporated in this delivery, that record would contain a value of N/A).
- For the PPLs, ADT Loads, and Memory Patch Loads, the /ID, /CI, /KD and /FN_SET-2 sections will be completed according to VDF format rules.

G. Every effort shall be made by the provider to ensure compatibility with applicable SSPS requirements standards for each file delivered. The known deficiency records should be limited to describing items which meet SSPS standards, but may be deficient for other reasons. Note - Files with known deficiencies are subject to rejection during the MBF loading process.

An example of a typical VDF file follows. This information is for example purposes only and not representative of any particular software delivery.

/ID

12/15/95 PG3 PCASIM 01 683-72505-01-8 5A Alsys @ Pharlap @

/CI

N/A N/A

/KD

This version is compatible with the BS102b and US102b versions of the Honeywell Boot/Utilities, rather than the current versions of these utilities.

/FN

PCASIM_USERADA_B.ADA 01

PCASIM_USERADA_S.ADA 01

STATUS.PIC 05

PCASIM_TARGET_CONFIG.CFG 04

/REM

Compiler and linker versions to be used will be supplied in 5 days.

/ENDVDF

End of example.

3.7.2.2 SOFTWARE BUILD SCRIPTS AND BUILD OPTIONS

With their software deliveries, every developer will provide build scripts which contain all compiler, binder, linker, and VAX operating system commands required to build a flight executable. Any required directory structures or supporting libraries required for the build process will be clearly specified in the VDD accompanying the software delivery. All required compiler/linker options will be specified in the delivered build scripts. Only one compiler option will be standardized across the Program. This is the Alsys Ada "Version_ID" binder option.

The “Version ID” option may be set by using the following standard string:

Version_ID => "CSCI Name"."Version No."

where

"CSCI Name" = the standard CSCI of CSC name for this deliverable

and

Version No. = a three digit code containing the PG supplied version number for this delivery.

As an example the first delivery of the PG3 Airlock Systems CSCI would use:

Version_ID => ALSYS1.001

3.7.2.3 THE LOAD IMAGE FILE FORMAT

Reserved.

4.0 SVF SIMULATION STANDARDS

These standards are identified as the Software Development and Integration Laboratory (SDIL) Integrated Product Team (IPT) Standards for PG, Prime Contractor, and, NASA MDM Application Test Environment (MATE) simulation developer's products that are used in support of horizontal ISS flight software verification in the Software Verification Facility (SVF). This document describes the mandatory standards that support integration of PG, Prime, NASA, and IP simulations targeted for SVF.

The mission of the SVF is to provide an environment and capabilities for the integration, test, verification, and validation of copies of Space Station flight software with multiple Space Station integrated avionics systems, either real or simulated. The SVF development will result in hardware, software, and procedural components that will be implemented in the verification facility. The SVF will have the capability to:

A. Accept copies of integrated flight software releases from the MBF and manage these releases as well as internal simulation software and SVF software for ground test, verification, and validation.

B. Verify and certify copies of integrated flight software releases for each stage.

C. Validate the copies of the integrated flight software releases.

D. Provides capabilities to conduct configuration management for SVF ground test software releases.

The SVF facility specifications can be found in the Prime Item Development Specification for the SVF, S684-10140.

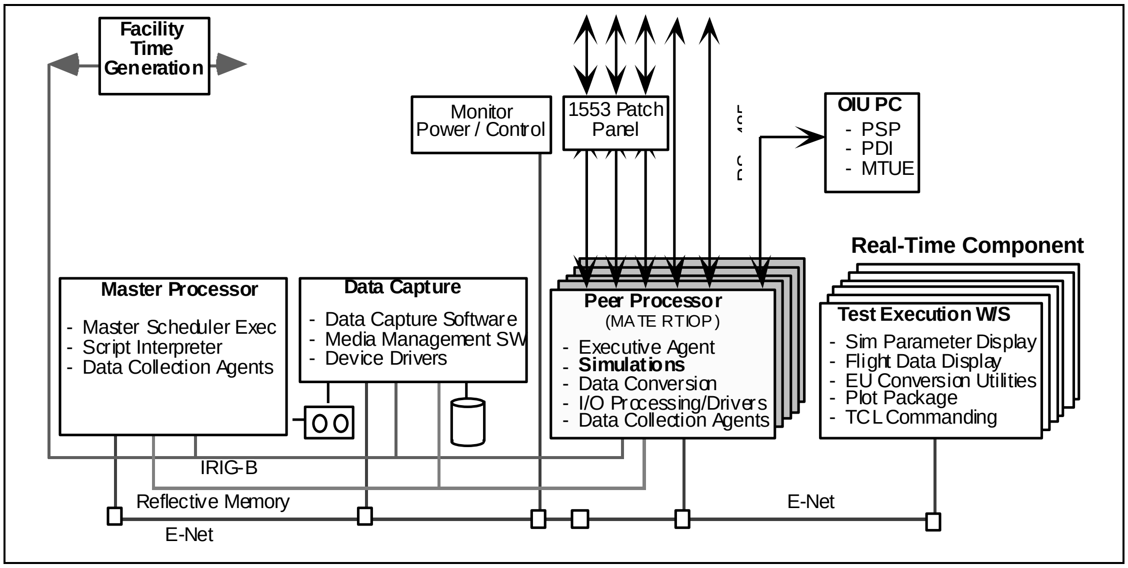


FIGURE 4.0-1 SVF REAL-TIME COMPONENT

Figure 4.0-1 shows the Real-Time Component of the SVF facility architecture. Simulations will execute on the MATE 3 Real-Time I/O Processors (RTIOP) connected in a distributed real-time architecture. Simulations, using the MATE services, communicate to MDM Flight Equivalent Units (FEUs) via 1553B, RS-422, & RS-485 buses. Simulations communicate to other simulations (either within the same RTIOP or across RTIOPs) via the I/O Processor and reflective memory.

Simulations delivered to SVF are allocated to one of the RTIOPs based on processor loading and bus configurations. A given set of RTIOP simulations must be integrated before being loaded onto the RTIOP. The integration process involves opening each simulation inside SystemBuild and AutoCoding them as a group. The SVF simulation integration process is the motivation for the standards contained within this section.

A goal of the SVF facility is to maximize reuse of flight software FQT and Integrated Flight Article (IFA) verification simulations. SVF personnel do not modify delivered simulations. Simulation development organizations are responsible for producing simulations capable of running in the SVF facility. The standards contained within this section are those standards which SVF deems critical to producing simulations capable of running in the SVF facility in an integrated fashion. Simulation developers may find it necessary to violate these standards for FQT or IFA verification simulations. When an FQT or IFA simulation is modified for delivery to SVF, these standards must be adhered to.

Typically standards are defined at three levels: mandatory, recommended, and suggested. This section contains only mandatory standards. The focus of this section is on issues that are critical to simulation reuse and integration at SVF. Recommended and suggested standards for simulation development should be covered by the development organization's Software Development Plan.

Rationale paragraphs are used to convey the reasoning for a standard. These paragraphs do not define standards. They are written in a less formal manner and give the reader insight into the portion of the SVF simulation integration process which is the motivation for the standard.

This section is organized in three major subsections: Simulation Development Standards, Simulation Architecture Standards, and Simulation Delivery Standards.

Simulation Development Standards, subsection 4.1, addresses issues essential to all simulations such as organization and naming conventions. Additional sections include the use of user code blocks, read/write blocks, and simulation initialization.

Simulation Architecture Standards, subsection 4.2, addresses architecture issues that are vital to simulation system integration. The simulation architecture standards define specifics such as how to report changing mass properties to the environment simulation or which side of the interface an RPCM model should reside. Additional sections include Operational Readiness Date (ORD) and Stage build up switches and malfunction insertion standards.

Simulation Delivery Standards, subsection 4.3, addresses issues related to simulation delivery such as file naming and file format.

4.1 SIMULATION DEVELOPMENT STANDARDS

This subsection defines the SVF simulation development standards. Simulation development standards should be followed regardless of the type of SVF simulation being developed. These standards are an integral part of the SVF simulation integration process.

The standards in this section are mandatory for all simulations delivered to SVF. This document does not cover recommended or suggested standards. The simulation developer is referred to their organization's Software Development Plan for general simulation development standards.

4.1.1 SIMULATION DEVELOPMENT USING MATRIXx

SVF simulations shall be developed using the MATRIXx SystemBuild toolset version 4.1 and subsequent releases as coordinated by SVF.

SVF expects that all simulations delivered for use at SVF will be in MATRIXx format. For simulations not developed in MATRIXx, a MATRIXx wrapper is expected. Simulations not developed in MATRIXx shall be developed in Ada.

[Rationale] The SVF/MATE 3 real-time scheduler is derived directly from the MATRIXx scheduler. The only way to integrate simulations into the scheduler is to have it AutoCoded with the MATRIXx scheduler. This means all simulations must be present inside SystemBuild when the AutoCode button is pressed.

4.1.2 SIMULATION DELIVERABLES

Simulations delivered to SVF shall be accompanied by the following support files.

- One MATRIXx SystemBuild Block Diagram File;
- User Code Block C Source Files;
- Simulation Initialization Files;
- Interactive Animation Files;
- I/O Configuration Files;
- TCL Script Files;
- Pre-Release Version of Associated Flight Software; and
- Documentation as specified in table 3.0-1 of the Prime Contractor Software Development Plan, number D684-10017-01 or a functional equivalent.

Section 4.3 describes standards for simulation delivery.

4.1.3 SIMULATION STRUCTURE

This subsection addresses standards for constructing simulations in SystemBuild. Issues include: naming conventions, model hierarchy, and use & restrictions of basic blocks. A simulation is equivalent to a delivered CSCI. Simulations become CSCs in the SVF simulation architecture, but this document will refer to simulations as deliverable CSCIs.

4.1.3.1 CSCI LEVEL

The CSCI level shall be the highest level SuperBlock. The CSCI level shall contain one SuperBlock for each top level CSC.

Simulation CSCIs shall not contain components of US flight software. Simulated US flight software stubs and drivers should be delivered in separate CSCIs.

[Rationale] The CSCI level is the top level which is delivered to SVF. It should be a container that hold CSCs. CSCIs and CSCI interfaces are listed in the SVF Simulation ICD.

4.1.3.2 CSC LEVEL

Each top level CSC shall have one SuperBlock. Timing attributes should be defined at the top level CSC or second level CSC.

[Rationale] Defining timing attributes at the first or second CSC level helps SVF integrate simulations. CSC interfaces are not specified in the SVF Simulation ICD.

4.1.3.3 ALLOWABLE RATES

Simulation scheduling interval shall be an integer multiple of 25 msec (40Hz).

The MATE 3 I/O drivers allow data communication at the following rates: 40 Hz, 10 Hz, 1 Hz, or 0.1 Hz.

4.1.3.4 TEXT BLOCKS

Text blocks shall be used to insert comments where simulation implementation may affect SVF's integration efforts.

A text block shall be inserted next to a replicated CSC SuperBlock to uniquely identify each instance. Changing the SuperBlock name is not an option because it would disable the SystemBuild replication mechanism.

Additional comment blocks shall be used in accordance with standard programming practices. SVF does not levy any additional standards for comment blocks. The simulation developer is referred to their organization's Software Development Plan.

4.1.3.5 PROLOGUE BLOCKS

Prologue blocks shall be located at the highest level of each simulation CSC and one at the CSCI level. Prologue blocks shall be constructed from text blocks and include the following fields as a minimum:

- SuperBlock Name;
- Abstract;
- Creator/Organization;
- Creation Date;
- Version Number;
- Change History;
- Implementation Dependencies; and
- List of Accompanying Files.

Figure 4.1.3-1, Prologue Example, shows an example of a prologue block.

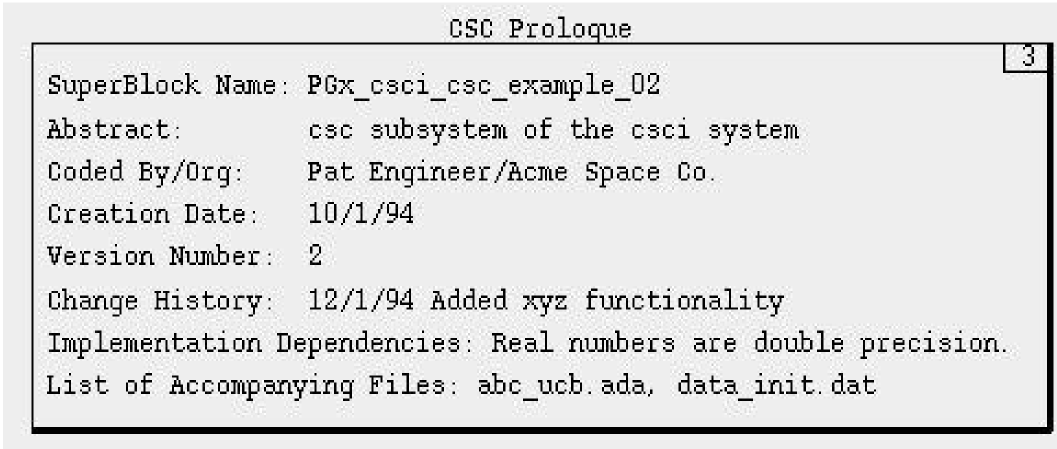


FIGURE 4.1.3-1 PROLOG EXAMPLE

SuperBlocks are used to logically group sections of a model into systems and subsystems. SuperBlocks can contain a functional model, a reusable utility, a reusable component, a CSU, a CSC or a CSCI. SuperBlocks can be nested inside of other SuperBlocks to build up more complex structures.

SVF does not intend to standardize the way developers build up their simulations, but SVF does have standards that must be followed in order for simulations from many developers to be integrated. The following subsections describe the SuperBlock standards that are critical to SVF's ability to integrate simulations.

4.1.3.6.1 SUPERBLOCK NAMING CONVENTIONS

Every SuperBlock or set of replicated SuperBlocks shall have a unique name. Unique name fields may be delimited with a "_". SuperBlock unique names shall not exceed 32 characters.

SystemBuild uses SuperBlock names as unique identifiers. Only one SuperBlock with a given name can exist within the bounds of a SystemBuild model. This satisfies two important replication issues: 1) Replication can be accomplished without multiple copies of the same SuperBlock; and 2) Updates to a replicated SuperBlock are automatically reflected through each instance of the replicated SuperBlock.

4.1.3.6.1.1 SUPERBLOCK PROGRAM UNIQUE NAMES

Non-Utility SuperBlock unique names shall consist of the following fields: Development Organization, CSCI Identifier, Component Descriptor, and a Revision Number. CSC and CSU fields are optional.

If SuperBlocks are replicated across CSCIs, they should be maintained separately. If a SuperBlock is used across many CSCIs, it should be classified as a utility and follow the convention described in Section 4.1.3.6.1.2.

Table 4.1.3-1 shows the SuperBlock unique name format. Field lengths may vary depending on SuperBlock location within a simulation. For example, a CSCI SuperBlock will not have CSC , CSU, or component fields.

TABLE 4.1.3-1 SUPERBLOCK UNIQUE NAME FORMAT

Character	Functional Description	Example Code	Example Description
1-3	Development Organization	PG1	Product Group 1
5-7	CSCI Identifier	GNC	GN&C CSCI
9-11*	CSC Identifier	CMG	Control Moment Gyro
13-15*	CSU Identifier		Not used
16-29	Component Descriptor	Inner_Gimbal	Inner Gimbal
31-32	Revision Designator	01	Version 01

* Optional fields

[Rationale] SystemBuild uses SuperBlock names for replication. When SVF combines two CSCIs in SystemBuild, name conflicts are handled by overwriting each other. For example, if two CSCIs have a SuperBlock called valve, when the two CSCIs are combined, the last CSCI will overwrite the first. In this case, unexpected results may occur.

4.1.3.6.1.2 UTILITY SUPERBLOCK UNIQUE NAMES

Utility SuperBlock Unique Names shall consist of the following fields: Development Organization and Component Descriptor. Version numbers are optional.

A utility is an algorithm or function that can be reused. Examples of utilities are a vector multiplied by a matrix, a matrix multiplied by a matrix, matrix inversion, and physical constants.

[Rationale] This is an exception to the standard defined in section 4.1.3.6.1.1. If Utilities were held to 4.1.3.6.1.1 then each CSCI would have a separate set of utilities. Developers should create and maintain one set of utilities for all CSCI they are producing.

Table 4.1.3-2 shows the utility SuperBlock Unique Name format.

TABLE 4.1.3-2 UTILITY SUPERBLOCK UNIQUE NAME FORMAT

Character	Functional Description	Example Code	Example Description
1-3	Development Organization	PG1	Product Group 1
5-29	Component Descriptor	vector_multiply	Vector Multiply
31-32*	Revision Designator	01	Version 1

* Optional Fields

Utilities from the ISS utilities library will be named UTIL_xxx. The ISS utility library is still under development. More instructions will be provided when the library is operational.

4.1.3.6.2 SUPERBLOCK NESTING AND COMPLEXITY

SVF does not levy any additional standards for nesting and complexity. SystemBuild imposes a complexity limit of 99 blocks per SuperBlock. The simulation developer is referred to their organization's Software Development Plan for nesting and complexity standards.

4.1.3.6.3 SUPERBLOCK TIMING ATTRIBUTES

Unique timing attributes shall be defined for first or second level CSCs. Lower level CSCs and CSUs should maintain the attributes of the parent CSC. Allowable execution rates for first and second level CSCs are defined in section 4.1.3.3.

4.1.3.7 VARIABLES

This section addresses standards for internal and external variables. The following subsections describe the variable standards that are critical to SVF's ability to integrate simulations.

4.1.3.7.1 EXTERNAL VARIABLE NAMING CONVENTIONS

External variables shall have a 32 character program unique name (e.g. PUI or Engineering Name). External is defined in terms of a CSCI. Any input or output going to or from a CSCI SuperBlock is an external variable. External variables are used for communication with other sims, flight software, test control, and/or data capture.

External variable program unique names shall map one-to-one to a Signal Program Unique Identifier (SPUI). Section 3.3.1.2 of this document defines the format for PUIs.

Simulations have three types of interfaces; flight software, simulations, & test control. Program Unique Identifiers for simulation-to-flight software interfaces are defined in the flight system ICD. Program Unique Identifiers for simulation-to-simulation and simulation-to-test control are defined in the SVF Simulation Interface Control Document, number D684-10092-1. The SVF unique simulation-to-simulation and simulation-to-test interfaces shall use "GV" as the valid field entry for the "ISS Functional Element" field.

[Rationale] The external variable names are used by automated tools to build channelization tables. The channelization tables connect sim-to-sim I/O, sim-to-FSW I/O, TCL-to-sim I/O, and sim-to-test data capture.

4.1.3.7.2 INTERNAL VARIABLE NAMING CONVENTIONS

SVF does not impose any additional standards on internal variable names. The simulation developer is referred to their organization's Software Development Plan.

4.1.3.7.3 PARAMETERIZED VARIABLES

Parameterized variables shall not be used in simulations delivered to SVF. Parameterized variables shall be replaced by hard-coded values or connected as external inputs.

[Rationale] Parameterized variables are specified by typing a "%variable_name" in the block form. The variable_name is given a value from within X-Math. Parameterization is very useful for design and development of a system or studying the effects of changing parameter values.

When a parameterized model is AutoCoded, the parameterized values are hard-coded. SVF should not be responsible for making sure the correct values are present at AutoCode time. Since the value is to be hard-coded anyway, it should be hard coded before coming to SVF.

If the parameterized value can change from test to test, then it should be an external input. The variable is then accessible from Test Control Language (TCL) scripts, or from the initialization mechanism. Other parameters, such as physical constants, should be put into utility SuperBlocks.

4.1.3.8 USER CODE BLOCKS

Sometimes user code blocks are the only way to implement a needed capability. SVF recognizes this and is working to reduce the problems with integrating simulations containing user code blocks.

4.1.3.8.1 C USER CODE BLOCKS

User Code Blocks shall be coded in C. The developer is referred to their organization's Software Development Plan for C coding standards.

[Rationale] The MATE has transitioned from Ada to C. Ada will not be supported with the 3.1C delivery.

4.1.3.8.2 USER CODE BLOCK NAMING CONVENTIONS

User Code Block C functions shall have a unique name. User Code Block (UCB) unique names shall comply with the SuperBlock naming convention in section 4.1.3.6.1. UCB filenames shall correspond to the C function name.

4.1.3.8.3 USER CODE BLOCK STRUCTURE

User Code Blocks shall be structured as self contained entities. A User Code Block shall accept inputs, process data, and supply outputs. User Code Blocks shall not be used to implement global data. Communication between two User Code Blocks is discouraged.

User Code Blocks shall not be used to call I/O drivers. The MATE 3 I/O drivers are not accessible from simulations.

[Rationale] The SVF version of the MATE 3 has a separate MIPS 4000 processor to perform I/O functions. Since these I/O drivers are on another processor, UCBs will not be able to communicate with them directly.

4.1.3.9 BYPASSING DATA POSTING MECHANISMS

Read/Write blocks, User Code Blocks, Triggered SuperBlocks, and Block Script blocks shall not bypass the data posting mechanism.

Figure 4.1.3-2 shows the normal MATRIXx data posting mechanism. Data between tasks are double buffered. The reason for double buffering is related to the use of Rate Monotonic Scheduling and the ability of a slower rate task to be preempted by a higher rate task. Double buffering provides data consistency, but adds data latency. With the double buffers, data output from a simulation is made available at the beginning of the next frame at which that simulation is scheduled to run. In Figure 4.1.3-2 the outputs from Task B at time T1 are not available to task A until T3.

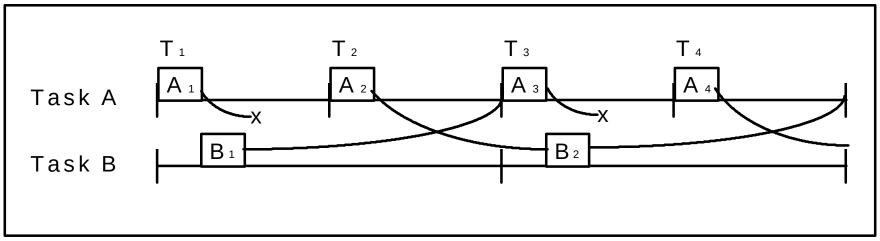


FIGURE 4.1.3-2 TIMING DIAGRAM WITH DOUBLE BUFFERS

SystemBuild provides mechanisms to circumvent the double buffers. These mechanisms allow data to be made available immediately to other tasks. Figure 4.1.3-3 shows a timing diagram using Read/Write blocks. On the surface, this may look like a simple solution. The problem is that Read/Write blocks do not guarantee data consistency. The only way to determine data consistency is to perform independent timing analysis. Task-rate modifications may provide a better solution.

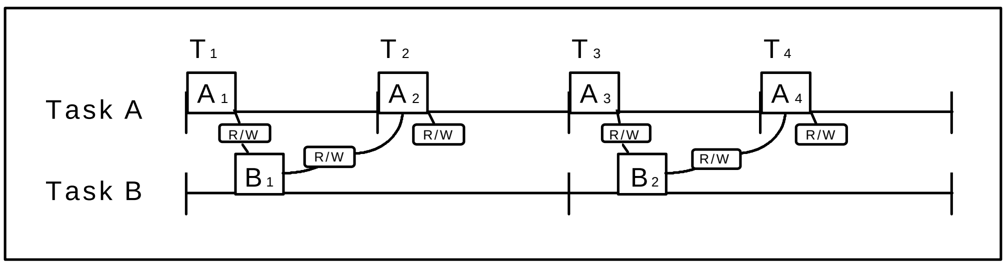


FIGURE 4.1.3-3 TIMING DIAGRAM WITH READ/WRITE BLOCKS

Figure 4.1.3-4 shows an example of what could happen if a simulation containing Read/Write blocks is delivered to SVF. Notice that SVF added an additional task, Task C, which changed the system timing characteristics. The RMS deadlines are still being satisfied. Figure 4.1.3-4 shows two important issues. First, Task B completion has been delayed. The outputs now match the double buffering case and nothing was gained. Second, task B was preempted during its execution. If Task B wrote a portion of its data to the read/write block, then was preempted, Task A will see an inconsistent set of data.

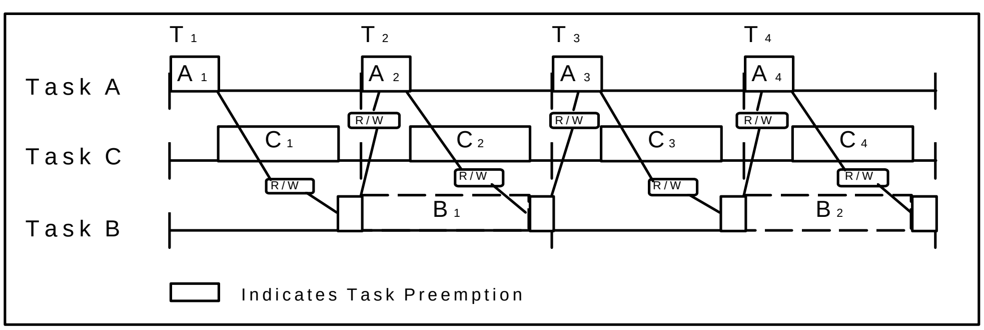


FIGURE 4.1.3-4 TIMING DIAGRAM WITH READ/WRITE BLOCKS AND TASK C

4.1.4 SIMULATION INITIALIZATION

Simulation initialization is a very important topic. One of the ground rules at SVF is that a simulation is developed for an entire ORD (containing several stage configurations). A simulation may be configured by input data for a particular stage.

4.1.4.1 INITIALIZATION THROUGH EXTERNAL INPUTS

Initialization shall be performed through external input lines. The MATE 3 will provide a capability to read initialization data from a file and supply the data to the simulation external input lines.

Two types of initialization can be performed through external inputs: control signals and data values. Control signals can be used to trigger first pass logic (see standard 4.1.4.2) or conditional blocks that implement different functionality. Data values can be read in at initialization and held constant for the entire test.

[Note] MATRIXx does not support a single read of an external input. External inputs are read every time. Simulations can choose to ignore subsequent inputs.

4.1.4.2 INITIALIZATION WITH FIRST PASS LOGIC

First pass logic shall be used for more extensive initialization. First pass logic can be used to trigger computations that only need to be performed once.

[Rationale] Initialization by data requires a large amount of information, and it must all be consistent. Sometimes it is better to calculate initialization from a small number of independent variables. First pass logic is available as an alternative to large amounts of initialization data.

4.1.4.3 INITIALIZATION FROM FSAVE FILES

Simulations shall not be initialized from FSAVE files. FSAVE files can be used during non-real-time execution, but serve no purpose during real-time.

[Rationale] The MATE 3 does not support initialization from FSAVE files. FSAVE files will probably be used for simulation acceptance test, but cannot be used for real-time tests.

4.1.4.4 INITIALIZATION FROM PARAMETERIZED VARIABLES

Simulations shall not be initialized from parameterized variables. Parameterized variables are hard-coded when the simulation is AutoCoded. SVF will not reAutoCode to change parameterized variable values, Nor can SVF ensure that these values will be "set" correctly at AutoCode time. Therefore, parameterized variables should not be used. For more information see section 4.1.3.7.3.

[Rationale] Parameterized variables are hard-coded at AutoCode time. The only way to change these values is to re-AutoCode. Variables that must change from test to test should be defined as external inputs.

4.1.5 INTERACTIVE ANIMATION ICONS

Interactive Animation Icons shall be removed from SuperBlocks prior to delivery to SVF.

4.1.6 TCL COMMAND FILES

SVF has a desire to reuse TCL script files from vertical test facilities wherever possible.

This section will be updated as the SVF design matures.

4.1.7 PERFORMANCE

Simulation performance shall be calculated in accordance with the Prime Contractor SDP, document number D684-10017-1, section 3.12.4 Software Metrics, paragraph F Computer resource utilization.

Execution time shall be reported in absolute time on a MATE 3 Simulation Processor not percent utilization of the MATE 3 Simulation Processor.

4.1.8 MAINTENANCE

SVF does not impose any maintenance related standards.

SVF is not responsible for simulation maintenance. All development, repairs, and certification of simulations is performed by the developing organization. Simulation developers are referred to their organization's Software Development Plan.

4.2 SIMULATION ARCHITECTURE STANDARDS

This subsection defines the simulation architecture standards. Simulation architecture standards define specific development standards regarding architectural related issues such as simulation reconfiguration, malfunction triggering, mass properties, and environment interactions. Simulation architecture standards are to be followed regardless of the type of simulation being developed for SVF. These standards are an integral part of the SVF simulation integration process and are mandatory for all simulations delivered to SVF.

4.2.1 SIMULATION RECONFIGURATION BASED ON TEST, STAGE & ORD BUILDUP

Each simulation CSCI delivered to SVF shall be capable of representing all of the ISS stage configurations for the applicable ORD. A simulation CSCI shall contain the entire functionality required for each stage within the ORD release. If subsequent ORD releases are planned, they shall completely replace the previous ORD release.

The simulation CSCI shall have the runtime capability to enable and disable functionality (e.g., connecting/disconnecting ORUs, adding/removing mass properties, and rechannelization) to allow for assembly operations testing, stage testing, and ORD testing.

The simulation CSCI shall control the represented configuration change with initialization flags or data entered through external input variables.

Standardized naming conventions for the simulation configuration change flags and data shall comply with external input unique name formats (see section 4.1.3.7.1).

[Rationale] Simulations will be compiled once per ORD. Hence, the simulations need a built-in mechanism to allow for stage testing and user defined testing to be performed. This mechanism will turn on and off functionality based on test, stage & ORD. Standard naming of flags allow for standardized control of all simulation elements. In fact, some stage configurations add or remove jumpers which must be accounted for in the ORD sim.

4.2.2 MALFUNCTION TRIGGERING

Simulation malfunctions shall be separated into two distinct types: a control signal and a data value.

Control signal type malfunctions shall be implemented with flag mechanisms which allow for the selection of one of two possible conditions or functionality's (either failure or nominal).

Control signal type malfunctions shall be implemented such that the current condition or functionality exists until the Boolean malfunction flag is toggled.

Data value malfunctions shall be implemented with discrete identifier mechanisms that allow nominal data values to be substituted by failure values.

Data value malfunctions shall be implemented such that the data values can be restored to nominal values.

Both types of malfunctions shall be implemented such that they can be triggered and reset via external input pins.

Standardized naming conventions for both types of malfunctions shall comply with external input unique name formats (see section 4.1.3.7.1).

4.2.3 MASS PROPERTIES

Dynamic motion of masses that are maneuverable shall be provided to the environment simulation on a cyclical basis. The environment simulation is included in the Guidance, Navigation & Control (GN&C) simulation CSCI.

Static mass properties shall not be provided to the environment simulation. Static mass properties are set by the environment simulation at initialization only.

Simulation mass properties that are derived from model state information shall not be provided to the environment simulation (as described in section 4.2.4).

4.2.4 STATE FEEDBACK TO ENVIRONMENT

Simulations shall provide model state feedback information to the environment simulation (see SVF simulation ICD for specific state models impacted). State information includes object position and velocity.

The environment simulation shall accept model state feedback information from other simulations to update the station configuration and mass properties.

4.2.5 ELECTRICAL POWER FLOW

Electrical power flow from DDCUs to RPCMs or from RPCMs to ORU power consumers shall be as follows: the power feeding element (DDCU or RPCM) provides a voltage available parameter in volts to the receiving element (RPCM or ORU power consumer).

Electrical power flow from RPCMs to DDCUs or from ORU power consumers to RPCMs shall be as follows: the receiving element (RPCM or ORU power consumer) provides a current used parameter in Amperes to the power feeding element (DDCU or RPCM).

All electrical power loads greater than 5 watts are modeled at the SVF.

4.2.6 FLUID FLOW

Fluid flow interactions between simulation CSCIs shall consist of the following three parameters: fluid flow rate parameter in lbm/hr, fluid temperature parameter in °F, and fluid pressure parameter in psia.

4.2.7 THERMAL HEAT TRANSFER

Heat transfer from Thermal Control System (TCS) components (i.e. coldplates and heat exchangers) to ORUs shall be as follows: TCS components provide and accept heat outlet temperature parameters in °F.

Heat transfer from DDCUs and MBSUs to TCS shall be as follows: the DDCUs and MBSUs provide a heat load parameter in Watts to the TCS component and accept heat absorbed in °F from the TCS component.

4.3 SIMULATION DELIVERY STANDARDS

This subsection defines the simulation delivery standards. Simulation delivery standards define specific file structures and naming conventions. These standards are an integral part of the SVF simulation integration process.

4.3.1 DELIVERABLE FILES

Each CSCI shall be delivered to SVF as one MATRIXx SystemBuild Block Diagram File. The SystemBuild Block Diagram file shall meet the following standards:

A. Interactive Animation Icons shall be removed from SuperBlocks prior to delivery;

B. Simulated US flight software components shall be delivered as separate SuperBlocks;

C. Parameterized variables shall be replaced by hard coded values; and

D. Block diagram files shall be saved in ASCII format.

Each simulation CSCI delivered to SVF shall include the files listed in Table 4.3.1-1.

TABLE 4.3.1-1 SVF SIMULATION DELIVERY PACKAGE

Item Name	Description
MATRIXx source	Simulation MATRIXx source file (per DIL, CFEL, GFEL)
Unique name to PUI map	Defines the mapping between unique engineering names (MATRIXx Pin labels) and Program Unique Identifiers.
C User Code Blocks*	User Code Block files in the C language.
Stubs & drivers	Stubs and drivers associated with the simulation. Delivered as MATRIXx source files.
Documentation	Documentation (as specified in table 3.0-1 of the Prime SDP)
Pre-release FSW	Pre-release version of associated flight software
IA screens	Interactive Animation screens
I/O Configuration file	I/O Configuration file (from MATE Hardware Connection Editor)
Sim IC sets	Set of Simulation Initial Condition files
TCL scripts	Set of TCL script files
Acceptance Test Documents	Test Procedures, Test Cases
Acceptance Test Results	Results from the acceptance test
1553 Channelization	Defines the Message/Command channel assignments such as User Bus RT and User Bus BC.
RS-485 Channelization	Defines number of channels and for each channel defines character size, baud rate, stop bits, parity, duplex, and handshaking.
HRDL Channelization	TBD
IOSU Channelization	Defines the Sensor/Effector IOSU card assignments and for each IOSU defines MDM target ID, CTID table, CSID table, and Configuration table.
1553B Boxcar Profiles	Defines which 1553B commands are sent at what time and to which RT & SA for the 10- second profile (for keep-alive and stub sims only).
Engineering Units Conversions	Defines the conversion of data in Engineering Units to compensated sensor data.
Inverse Calibration Curves	Defines the compensation to introduce bias, scaling, and non-linearity to compensated sensor data to give raw sensor values.
Data log spec	Specifies data to be logged (MATE 3).
Sim AutoCode Output	Simulation AutoCode C source files.

* Note: the MATE will transition from Ada to C with the MATE 3.1C release. Ada will not be supported in the MATE 3.1C release. All UCBs delivered in SVF will be coded in C.

Files extension naming shall comply with MBF standards.

4.3.2 FILE AND DIRECTORY NAMING STANDARDS

SVF file and directory naming shall comply with MBF standards.

4.3.3 DELIVERY CHECK LIST

TABLE 4.3.3-1 DELIVERY CHECK LIST

ITEM	Yes	No	N/A
Simulation Development Standards			
MATRIXx Used			
Delivered Simulation Support Files			
CSCI Top Level			
CSCs Second Level			
Allowable Execution Rate			
Text Block Comments Used			
Prologue Block Used			
SuperBlock Naming Conventions Followed			
SuperBlock Timing Attributes Defined			
External Variable Naming Conventions Followed			
Parameterized Variables Not Used			
User Code Block follows Ada Standards			
User Code Block Naming Conventions Followed			
User Code Block Structure Self Contained			
Posting Mechanism not Bypassed			
Initialization through External Inputs			
Initialization with First Pass Logic Used As Needed			
Initialization from FSAVE Files Not Used			
Initialization from Parameterized Variables Not Used			
Interactive Animation Icons Deleted			
TCL Command Files Used			
Performance Metrics Calculated			
Simulation Architecture Standards			
Simulation Reconfigurable For Test, Stage & ORD BU			
Malfunction Triggered Through TCL			
Mass Properties Optimized			
State Feedback to Environment Managed			
Electrical Power Flow Interface Correct			
Fluid Flow Interface Correct			
ORU Heat Rate Transfer Interface Correct			
Simulation Delivery Standards			
All Listed Files Delivered			
Files Formatted in ASCII			
Standard File Extensions Correct			
File and Directory Naming Standards Correct			

5.0 ACRONYMS

Ada Q&S	Ada Quality and Style: Guidelines for Professional Programers (SPC-91061-CMC)
Ada RM	Reference Manual for the Ada Programming Language (ANSI/MIL-STD-1815A-1983)
ADO	Adaptation Data Overlays
ADT	Adaptation Data Tables
AIT	Architecture and Integration Team
Alsys ADG	Alsys Application Developer's Guide (UD/REF/A030-05333/001)
Alsys UG	Alsys User's Guide (UD/UG/A030-05323/001)
APM	Attached Pressurized Module
ASCP	Avionics Software Control Panel
BDE	Bulk Data Entry
BPUI	Bus Program Unique Identifier
C&C	Command and Control
C&DH	Command and Data Handling
C&T	Communications & Tracking
CB	Control Bus
CCC	Consolidated Control Center
CCS	Command and Control Software
CCSDS	Consultative Committee for Space Date Systems
CF	Channel File
CI	Configuration Item
	Command Instantiations File
CK	Composite Keys
CP	Conversion Primitive File
CPUI	Conversion Program Unique Identifier
CRS	Complete Record Set
CSC	Computer Software Component
CSCI	Computer Software Configuration Item

CSU	Computer Software Unit
CT	Command Template File
CVT	CVT Definition File
DBDD	DataBase Design Document
DDCUs	DC-to-DC Converter Unit
DDF	Data Delivery File
DDS	Data Delivery Sheet
DF	Device File
DPUI	Device Program Unique Identifier
DID	Data Item Description
DIL	Delivery Items List
DPUI	Device Program Unique Identifier
DTC	Data Type Changes
ESA	European Space Agency
FC	Firmware Controller
	FC Channel File
FEU	Flight Equivalent Units
FQT	Formal Qualification Test
FTP	File Transfer Protocol
FW	Firmware
GD	Group Data Item File
GFE	Government Furnished Equipment
GN&C	Guidance, Navigation & Control
GPS	Global Positioning System
GSE	Ground Support Equipment
GTC	Group Type Changes
HW	Hardware

HWCI	Hardware Configuration Item
I/O	Input/Output
ICDs	Interface Control Documents
ID	Identifier
IFA	Integrated Flight Article
IP&CL	Instrumentation Program and Command List
IPs	International Partners
IPT	Integrated Product Team
ISS	International Space Station
JEM	Japanese Experiment Module
JSC	Johnson Space Center
KSC	Kennedy Space Center
LB	Local Bus
LDP	Logical Destination Processor
MATE	MDM Application Test Environment
MBF	Mission Build Facility
MC	MDM Channel File
MCC	Mission Control Center
MDM	Multiplexer/Demultiplexer
MPLM	Mini-Pressurized Logistics Module
MSS	Mobile Servicing System
NASA	National Aeronautics and Space Administration
NCS	Node Control Software
ODF	Operations Data File
OIU	Orbiter Interface Unit

ORD	Operational Readiness Date
ORU	Orbital Replacement Unit
P&S in Ada	Portability and Style in Ada (ISBN 0521264820)
PC	Polynomial Calibration File
PCS	Portable Computers Systems
PGs	Product Groups
PL	Piecewise Linear Calibration File
PDL	Program Design Language
POIC	Payload Operations Integration Center
PPL	Pre-Positioned Loads
PR	Problem Report
PSC	Portable Computer System
PSCNI	Program Support Communications Network Interface
PSIV	Payload Software Integration and Verification
PTP	Pass-Through PUIs
PUI	Program Unique Identifier
RMS	Root Mean Square
RP	Requirement PUI File
RPUI	Requirement Program Unique Identifier
RS	Russian Segment
RTE	Run-Time Environment
RTIOP	Real-Time I/O Processors
RV	Runtime Variables
SC	State Conversion File
SDD	Software Design Document
SDF	Software Development Folder
SDIL	Software Development and Integration Laboratory
SDP	Software Development Plan
SDS	Supplier Data Sheet

SPUI	Signal Program Unique Identifier
SEE	Software Engineering Environment
SMC	Station Management and Control
SPS	Software Product Specification
SR	Single Record
SRS	Software Requirements Specification
SSPS	Software Standards and Procedures Specification
SSVTF	Space Station Verification and Training Facility
SVF	Software Verification Facility
SW	Software
TBD	To Be Determined
TCL	Test Control Language
TCMS	Test, Control and Monitor System
TCS	Thermal Control System
TCMS	Test, Control and Monitor System
TD	Telemetry Definition File
TS	Telemetry Parameter Selection File
TSE	Test Support Equipment
UB	User Bus
UCB	User Code Block
US	United States
USOS	United States On-orbit Segment
VDD	Version Description Document
VDF	Version Description File
VMDB	Vehicle Master DataBase

APPENDIX A LEGAL ELEMENT FOR ENCODING SIGNAL PUIs

ISS Segment	**Legal PUI Code (Ch 1&2)**	**Element Description**
USOS Segment	*US*	*High-Level United States Segment*
	AL	Airlock
	FG	Centrifuge
	HA	US Habitation Module
	LA	US Laboratory Module
	M1	Pressurized Mating Adaptor-1
	M2	Pressurized Mating Adaptor-2
	M3	Pressurized Mating Adaptor-3
	MC	Interim Control Module (ICM)
	MT	Mobile Transporter/MBS
	N1	Resource Node-1
	N2	Resource Node-2
	P1	Integrated Truss Segment P1
	P3	Integrated Truss Segment P3
	P4	Photovoltaic Module P4
	P5	Truss Element - Short Spacer P5
	P6	Photovoltaic Module P6
	PL	Cupola
	S0	Integrated Truss Segment S0
	S1	Integrated Truss Segment S1
	S3	Integrated Truss Segment S3
	S4	Photovoltaic Module S4
	S5	Truss Element - Short Spacer S5
	S6	Photovoltaic Module S6
	UA	Attached Payload
	UE	Express Payload
	UF	Facility Payload
	UP	US Payload
	VO	Shuttle-Orbiter
	Z1	Integrated Truss Segment Z1
US Ground Segment	*GS*	*High-Level United States Ground Segment*
	GC	Mission Control Center
	GD	Operational Data Reduction Center
	GK	Kennedy Space Center
	GP	Payload Operations Integration Center
	GT	Space Station Training Facility
	GV	Software Verification Facility
Russian Segment	*RS*	*High-Level Russian Segment*
	R1	Research Module-1
	R2	Research Module-2
	R3	Research Module-3
	R4	Solar Power Platform-1

APPENDIX A LEGAL ELEMENT FOR ENCODING SIGNAL PUIs (CONTINUED)

ISS Segment	Legal PUI Code (Ch 1&2)	Element Description
	R5	Solar Power Platform-2
	R8	Progress-M1
	R9	Progress-M2
	RA	Russian American Converter Unit
	RB	FGB Baseband Signal Processor
	RD	Docking Compartment
	RF	Functional Energy Block(FGB)
	RL	Life Support Module
	RM	Docking and Stowage Module
	RO	FGB Omni Antenna
	RP	Photovoltaic Cell
	RR	Service Module
	RC	Motion Platform
	RT	Crew Transfer Vehicle-1
	RU	Universal Docking Module
	RV	Crew Transfer Vehicle-2 (Soyuz)
JEM Segment	*JS*	*High-Level Japanese Segment*
	JA	NASDA Payload
	JC	JEM Inter-orbit Communication System (ICS)
	JE	JEM-Experimental Logistics Module-ES
	JM	JEM-Pressurized Module
	JP	JEM-Experimental Logistics Module-PS
	JR	JEM-Remote Manipulator System
	JX	JEM-Exposed Facility
ESA Segment	*ES*	*High-Level European Segment*
	EM	Attached Pressurized Module
	EP	ESA Payload
Italian ASI Segment	*IS*	*High-Level Italian Segment*
	IM	ASI Mini-Pressurized Logistics Module
Canadian MSS Segment	*CS*	*High-Level Canadian Segment (MSS)*
	CB	MRS Base System
	CD	Special Purpose Dexterous Manipulator
	CG	Canadian Ground Support
	CM	MSS Control Equipment
	CO	Operations and Control Software (OCS)
	CR	Space Station Remote Manipulator System
	CV	Canadian Space Vision System
Vehicle Master Database Segment	*XS*	*Reserved for Vehicle Master Database (VMDB)*
	X1	Reserved - US Product Group 1 VDMB
	X2	Reserved - US Product Group 2 VDMB

APPENDIX A LEGAL ELEMENT FOR ENCODING SIGNAL PUIs (CONTINUED)

ISS Segment	Legal PUI Code (Ch 1&2)	Element Description
	X3	Reserved - US Product Group 3 VDMB
	XC	Reserved - Canada
	XH	Reserved - GFE-CHeCS
	XE	Reserved - European Space Agency
	XP	Reserved - GFE-Global Positioning System
	XI	Reserved - Italian Space Agency
	XN	Reserved - NASA
	XJ	Reserved - NASDA
	XU	Reserved - GFE-Orbiter Interface Unit
	XK	Reserved - GFE-Portable Computer System
	XR	Reserved - Russia Space Agency
	XM	Reserved - GFE-Space to Space Comm.
	XT	Reserved - Ecomm CMD & TLM
	XZ	Reserved - Payloads

* Reference VMDB Meeting dated 11/6/96

APPENDIX B LEGAL FUNCTIONAL SYSTEM VALUES FOR ENCODING SIGNAL/DEVICE PUIS

Legal PUI Code (Ch 3)	Functional System Description	Brief descriptive text qualifying specific code application.
B	Motility Systems (MS)	This includes aspects of any motion facilitating system such as the MT, exclusive of major structural mechanical motion systems in code "J", which provide spatial repositioning for the purpose of supporting other work activities defined in codes "R&X".
C	Communications and Tracking (CT)	This includes aspects of all disciplines necessary to establish orbit-to-ground, orbit-to-orbit, ISSA on-board, or EVA communications and tracking for operations support. This includes Audio, Video, S-Band, Ku-Band, UHF, and GPS Systems. This also includes non-core parallel systems providing an interface to the ISS core environment.
D	Command and Data Handling (CDH)	This includes aspects of all disciplines rqd to provision for ISSA cmd, monitor and Control., including all data and Communication bus protocols, processors, cmd/data pathing, crew I/F, Sys S/W, Time Mgmt., Cmd structure, file transfers, and telemetry/PCS/Auto-processing. This also includes non-core on-board computer systems and related disciplines which interface with the core C&DH system.
E	Life Support (LS)	This includes aspects of any system provisioning atmosphere Control/supply, atmosphere revital., fire detect/suppression., atmosphere temp./humid Control., and H2O/waste mgmt. within life supporting habitats.
F	Flight Crew Systems (FCS)	This includes aspects of all disciplines rqd for crew privacy, decals, food mgmt/storage/distribution, housekeeping, personal equip, CHeCs, mobility aids, stowage, lighting, tools, wardroom, Control. dwgs. and emergency provisions.
G	Guidance, Navigation, and Control (GNC)	This includes aspects of all disciplines required to determine navigation parameters, maintain attitude (non-propulsive), execute translation maneuvers, and control attitude (propulsive).
J	Structural Motion (SM)	This includes aspects of major structural mechanical motion systems such as the SARJ, TRRJ, and array/radiator positioning systems, i.e. SAW and BGA.
K	Accommodations and Support Systems (AS)	This includes aspects of systems designed to accommodate portable devices, itinerant units, or varying cargo content. Includes such things as PCS receptacles, CHeCs equip accommodations, ISPRs, R/R racks, ARIS microgravity support, vacuum and gas systems.
L	Element Unique System (EUS)	This includes items that are not able to be defined in unique functional systems such as orphan sensors and U.S. Lab vacuum systems.

APPENDIX B LEGAL FUNCTIONAL SYSTEM VALUES FOR ENCODING SIGNAL/DEVICE PUIS (CONTINUED)

Legal PUI Code (Ch 3)	Functional System Description	Brief descriptive text qualifying specific code application.
M	Mated Interface Systems (MIS)	This includes aspects of such interfaces as CBMs, hatches, APAS, etc. where environmental and/or functional integrity are established via mated surface integrity. This also includes non-core parallel systems providing an interface to the ISS core environment.
N	Service Module Docking (SMD)	This includes docking mechanisms for the Russian Service Module, distinguishable from Structures (S) by virtue of the specialized purpose of the mechanism.
P	Electrical Power (EP)	This includes aspects of collection/generation/storage/load management and distribution of electrical energy during ISSA on-orbit presence. This includes primary and secondary power utilization and conversion interfaces between varying power sources.
Q	Pyrotechnics (PYRO)	This includes aspects of arming/safing/inhibiting/firing/and status management of explosive devices utilized to separate structural attach points.
R	Extra-vehicular Robotics (EVR)	This includes aspects of EVA activities which deal with automated mechanical mass mgmt devices used to support assembly, payload, proximity, etc. operations. Includes related Control. sys. such as rot/trans hand cntlrs, PCS cmd functions and robotic W/S.
S	Structures (STRUC)	This includes aspects of all ISSA structures not covered by other systems such as Mated Interface Systems, Structural Motion, Motility Systems, or Extra-Vehicular Robotics. This would include the SDMS and any structural-specific monitoring.
T	Thermal Control System (TCS)	This includes aspects of all heat energy management systems which support controlled environments for equipment and/or human occupation or functionality. This includes EATC, PVATC, RS ATC, IATC, and PTC with associated interfacing systems.
V	Station Management and Control (SMC)	This includes aspects of on-board S/W support of Ground and Crew awareness/control of ISSA core systems in areas such as housekeeping, operational health, safety, and general station functionality management.
X	Extra-vehicular Activity (EVA)	This includes aspects of EVA ops such as the EMU, ORLAN, airlock, external stowage, tools, ORU handling, portable work platform, and translation aids and devices.
W	Propellant System (PS)	This includes aspects of any system provision to handle, store, or provide propellants including propellant storage, propellant pumping, and propellant units.
Y	Thruster Systems (TS)	This includes aspects of all thrusters and engine systems required for attitude control.

APPENDIX B LEGAL FUNCTIONAL SYSTEM VALUES FOR ENCODING SIGNAL/DEVICE PUIS (CONTINUED)

Legal PUI Code (Ch 3)	Functional System Description	Brief descriptive text qualifying specific code application.
Z	Payload (PL)	This includes all aspects of payloads which are unique to the payload and are utilized to assure payload mission success. Excludes ISSA core payload accommodations such as power, thermal, cmd/data handling, communication and structural attachments.

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY)

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
AL	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
AL	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
AL	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
AL	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
AL	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
AL	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
AL	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
AL	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
AL	D	S15	MDM AL	Airlock System MDM	HWF/SW-LB	3	7A	SW
AL	E	A06	N/A	AL EL High Pres O2 Sup Vlv	HWM	3	7A	SW
AL	E	A07	N/A	AL EL Low Pres O2 Sup Vlv	HWM	3	7A	SW
AL	E	A11	N/A	AL EL Low Pres N2 Supply Vlv	HWM	3	7A	SW
AL	E	A22	PCA-2	Pressure Control Assembly-2 AL	HWF/FW-LB	3	7A	FW
AL	E	A31	N/A	AL EL O2 Pressure Sensor-1	HWM	3	7A	SW
AL	E	A32	N/A	AL EL O2 Pressure Sensor-2	HWM	3	7A	SW
AL	E	A33	N/A	AL EL O2 Pressure Sensor-3	HWM	3	7A	SW
AL	E	A34	N/A	AL EL N2 Pressure Sensor-1	HWM	3	7A	SW
AL	E	A96	N/A	MOD ECL/ARS Instantiated Commands	CIP	S	N/A	N/A
AL	E	C21	N/A	AL PCA/PRESSURE CONTROL PANEL	HWF	3	7A	FW
AL	E	C22	N/A	ALUA PCA/VENT & RELIEF VALVE	HWF	3	7A	FW
AL	E	F20	N/A	AL X4 Fire Detection Assembly	HWM/HWF	3	7A	SW
AL	E	F21	N/A	AL X3 Fire Detection Assembly	HWM	3	7A	SW
AL	E	F96	N/A	MOD ECL/FDS Instantiated Commands	CIP	S	N/A	N/A
AL	E	P96	N/A	MOD ECL/ACS Instantiated Commands	CIP	S	N/A	N/A
AL	E	T04	EIB	AL CA Cabin Air Assembly EIB	HWM/HWF	3	7A	SW
AL	E	T09	N/A	AL CA Cabin Air WS ORU	HWM/HWF	3	7A	SW
AL	E	T14	N/A	AL CA Cabin Air HX Assy	HWM/HWF	3	7A	SW
AL	E	T19	N/A	AL CA Cabin Air Inlet ORU	HWM/HWF	3	7A	SW
AL	E	T24	N/A	AL CA CABIN AIR TEMP SENSOR	HWM	3	7A	SW
AL	E	T96	N/A	MOD ECL/THC Instantiated Commands	CIP	S	N/A	N/A
AL	E	W96	N/A	MOD ECLWRM Instantiated Commands	CIP	S	N/A	N/A
AL	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
AL	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
AL	G	X96	N/A	MCS Instantiated Commands	CIP	S	N/A	N/A
AL	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
AL	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
AL	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
AL	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
AL	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
AL	P	R65	RPCM ALFR-2A3B-A054	REMOTE POWER CONTROL MODULE AL1-2A3B-A054	FW-LB	3	7A	FW
AL	P	R66	RPCM ALFR-2A3B-A055	REMOTE POWER CONTROL MODULE AL1-2A3B-A055	FW-LB	3	7A	FW
AL	P	R67	RPCM ALFR-2A3B-A056	REMOTE POWER CONTROL MODULE AL1-2A3B-A056	FW-LB	3	7A	FW
AL	P	R68	RPCM ALFR-1A4A-A057	REMOTE POWER CONTROL MODULE AL1-1A4A-A057	FW-LB	3	7A	FW
AL	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
AL	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
AL	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
AL	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
AL	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
AL	T	T51	N/A	AL TCS MTL TEMP SENSOR	HWM	3	7A	SW
AL	T	T52	N/A	AL TCS LTL TEMP SENSOR	HWM	3	7A	SW
AL	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
AL	X	D01	N/A	AL EL DPA ELECTRICAL UNIT 1	HWF/FW-UBN	3	7A	FW
AL	X	D02	N/A	AL CL UMB I/F PNL-1	HWM	3	7A	SW
AL	X	D03	N/A	AL EL DPA ELECTRICAL UNIT 2	FW-UBN	3	7A	FW
AL	X	D04	N/A	AL EL DPA ELECTRICAL UNIT 3	FW-UBN	3	7A	FW
AL	X	E01	N/A	AL AA EMU SERIAL PORT	HWM	3	7A	SW
AL	X	S01	N/A	AL AA Battery Charger Assy	HWM	3	7A	SW
AL	X	S02	N/A	AL AA Power Supply Assy	HWM	3	7A	SW
AL	X	S03	N/A	AL CL UIA CABIN PRESSURE SENSOR	HWM	3	7A	SW
AL	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
CM	R	C10	CEU-1-MECBF	MSS Control Electronics Unit-1/Master Embedded Control Board Firmware	LDM	A	6A	SW
CM	R	C11	CEU-1	MSS Control Electronics Unit-1	HWF/SW-CB	A	6A	SW
CM	R	C12	CEU-1-WHS	MSS Control Electronics Unit-1/Workstation Host Software	LDM	A	6A	SW
CM	R	C13	RWS_CEU_ACTIVE_OCS	Robotic Work Station Control Electronics Unit/Active OCS	LDM	C	6A	SW
CM	R	C13	RWS_CEU_ACTIVE_OCS	Robotic Work Station Control Electronics Unit/Active OCS	LDM	C	6A	SW
CM	R	C14	CEU-1-VGS	MSS Control Electronics Unit-1/Video Graphic Software	LDM	A	6A	SW
CM	R	C20	CEU-2-MECBF	MSS Control Electronics Unit-2/Master Embedded Control Board Firmware	LDM	A	6A	SW
CM	R	C21	CEU-2	MSS Control Electronics Unit-2	HWF/SW-CB	A	6A	SW
CM	R	C22	CEU-2-WHS	MSS Control Electronics Unit-2/Workstation Host Software	LDM	A	6A	SW
CM	R	C23	RWS_CEU_LAB_MONITOR_OCS	Robotic Work Station Control Electronics Unit/Lab Monitor OCS	LDM	C	6A	SW
CM	R	C23	RWS_CEU_LAB_MONITOR_OCS	Robotic Work Station Control Electronics Unit/Lab Monitor OCS	LDM	C	6A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
CM	R	C24	CEU-2-VGS	MSS Control Electronics Unit-2/Video Graphic Software	LDM	A	6A	SW
CM	R	C27	RWS_CEU_CUPOLA_MONITOR OCS	Robotic Work Station Control Electronics Unit/Cupola Monitor OCS	LDM	C	6A	SW
CM	R	C27	RWS_CEU_CUPOLA_MONITOR OCS	Robotic Work Station Control Electronics Unit/Cupola Monitor OCS	LDM	C	6A	SW
CM	R	H11	D&CP-1-THC	THC on D&CP-1	LDM	A	6A	SW
CM	R	H12	D&CP-1-RHC	RHC on D&CP-1	LDM	A	6A	SW
CM	R	H21	D&CP-2-THC	THC on D&CP-2	LDM	A	6A	SW
CM	R	H22	D&CP-2-RHC	RHC on D&CP-2	LDM	A	6A	SW
CM	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
CM	R	P10	D&CP-1	Display & Control Panel for CEU-1	LDM	A	6A	SW
CM	R	P20	D&CP-2	Display & Control Panel for CEU-2	LDM	A	6A	SW
CR	R	C30	SSMS_BDU	SSRMS Backup Drive Unit	LDM	C	19A	SW
CV	R	V10	AVU-1	Artificial Vision Unit-1	LDM	C	6A	SW
CV	R	V20	AVU-2	Artificial Vision Unit-2	LDM	C	6A	SW
EM	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
EM	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
EM	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
EM	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
EM	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
EM	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
EM	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
EM	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
EM	E	A96	N/A	MOD ECL/ARS Instantiated Commands	CIP	S	N/A	N/A
EM	E	F96	N/A	MOD ECL/FDS Instantiated Commands	CIP	S	N/A	N/A
EM	E	P96	N/A	MOD ECL/ACS Instantiated Commands	CIP	S	N/A	N/A
EM	E	T96	N/A	MOD ECL/THC Instantiated Commands	CIP	S	N/A	N/A
EM	E	V96	N/A	MOD ECLVS Instantiated Commands	CIP	S	N/A	N/A
EM	E	W96	N/A	MOD ECLWRM Instantiated Commands	CIP	S	N/A	N/A
EM	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
EM	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
EM	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
EM	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
EM	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
EM	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
EM	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
EM	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
EM	P	C96	N/A	MOD EPS/DC/DC Converter Instantiated commands	CIP	S	N/A	N/A
EM	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
EM	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
EM	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
EM	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
EM	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
EM	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
EM	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
EM	Z	R01	APM ISPR-1	APM International Standard Payload Rack-1	FW-LB	E	1E	FW
EM	Z	R02	APM ISPR-2	APM International Standard Payload Rack-2	FW-LB	E	1E	FW
EM	Z	R03	APM ISPR-3	APM International Standard Payload Rack-3	FW-LB	E	1E	FW
EM	Z	R04	APM ISPR-4	APM International Standard Payload Rack-4	FW-LB	E	1E	FW
EM	Z	R05	APM ISPR-5	APM International Standard Payload Rack-5	FW-LB	E	1E	FW
EM	Z	R06	APM ISPR-6	APM International Standard Payload Rack-6	FW-LB	E	1E	FW
EM	Z	R07	APM ISPR-7	APM International Standard Payload Rack-7	FW-LB	E	1E	FW
EM	Z	R08	APM ISPR-8	APM International Standard Payload Rack-8	FW-LB	E	1E	FW
EM	Z	R09	APM ISPR-9	APM International Standard Payload Rack-9	FW-LB	E	1E	FW
EM	Z	R10	APM ISPR-10	APM International Standard Payload Rack-10	FW-LB	E	1E	FW
ES	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
ES	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
ES	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
ES	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
ES	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
ES	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
ES	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
ES	D		MMC	Mission Management Computer	FW-CB	E	1E	FW
ES	D		PLCU	Payload Control Unit	FW-CB	E	1E	FW
ES	D		DMC	Data Management Computer	FW-CB	E	1E	FW
ES	D		VTC-1	Vital Telecommand/Telemetry Computer-1	FW-CB	E	1E	FW
ES	D		VTC-2	Vital Telecommand/Telemetry Computer-2	FW-CB	E	1E	FW
ES	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
ES	D	E01	LB CHECS-APM	CHeCs-ESA Local Data Bus	HWM-DB	D	8A	SW
ES	D	E02	ESA PL BUS	ESA PL Local Data Bus	HWM-DB	D	1E	SW
ES	D	E03	LB PL-APM	PL-APM Local data Bus	HWM-DB	D	1E	SW
ES	D	L01	PCR APM CB INT-1	Portable Computer Receptacle APM CB INT-1	PCR-CB	D	1E	SW
ES	D	L02	PCR APM CB INT-2	Portable Computer Receptacle APM CB INT-2	PCR-CB	D	1E	SW
ES	D	L03	PCR PL APM1 LB PL-APM	Portable Computer Receptacle PL APM1 LB PL-APM	PCR-LB	D	1E	SW
ES	D	L04	PCR PL APM2 LB PL-APM	Portable Computer Receptacle PL APM2 LB PL-APM	PCR-LB	D	1E	SW
ES	E	A96	N/A	MOD ECL/ARS Instantiated Commands	CIP	S	N/A	N/A
ES	E	F96	N/A	MOD ECL/FDS Instantiated Commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	DPUI Sys	DPUI Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
ES	E	P96	N/A	MOD ECL/ACS Instantiated Commands	CIP	S	N/A	N/A
ES	E	T96	N/A	MOD ECL/THC Instantiated Commands	CIP	S	N/A	N/A
ES	E	V96	N/A	MOD ECLVS Instantiated Commands	CIP	S	N/A	N/A
ES	E	W96	N/A	MOD ECLWRM Instantiated Commands	CIP	S	N/A	N/A
ES	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
ES	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
ES	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
ES	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
ES	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
ES	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
ES	P	C96	N/A	MOD EPS/DC/DC Converter Instantiated commands	CIP	S	N/A	N/A
ES	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
ES	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
ES	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
ES	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
ES	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
ES	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
ES	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
FG	C	X96	N/A	MOD COM& Tracking Instantiated commands	CIP	S	N/A	N/A
FG	D	D96	N/A	MOD CDHInstantiated commands	CIP	S	N/A	N/A
FG	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
FG	F	C96	N/A	MOD CHC Instantiated Commands	CIP	S	N/A	N/A
FG	G	X96	N/A	MCS Instantiated Commands	CIP	S	N/A	N/A
FG	M	X96	N/A	MOD SNM Instantiated Commands	CIP	S	N/A	N/A
FG	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
FG	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
FG	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
FG	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
HA	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
HA	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
HA	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
HA	C	P14	VCSA Port-14	Video Camera Support Assembly Port-14	HWM/HWF	1	16A	FW
HA	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
HA	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
HA	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
HA	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
HA	D	C02	C&W Pnl Hab	Caution & Warning Panel Hab	HWM	1	16A	SW
HA	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
HA	D	S16	MDM HA-1	Hab Systems-1 MDM	SW-LB	3	16A	SW
HA	D	S17	MDM HA-2	Hab Systems-2 MDM	SW-LB	3	16A	SW
HA	D	S18	MDM HA-3	Hab Systems-3 MDM	SW-LB	3	16A	SW
HA	E		HA WP	HA Water PumpWP	FW-UB	3	16A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
HA	E		HA O2 GEN	HA O2 GeneratorEN	FW-UB	3	16A	FW
HA	E	A04	N/A	HAF3 O2 ISO VLV	HWM	3	17A	SW
HA	E	A23	PCA-3	PRESSURE CONTROL ASSY-3 HAB	FW-LB	3	16A	FW
HA	E	A96	N/A	MOD ECL/ARS Instantiated Commands	CIP	S	N/A	N/A
HA	E	C31	N/A	HAB PCA/PRESSURE CONTROL PANEL	HWF	3	16A	FW
HA	E	C32	N/A	HAB PCA/VENT & RELIEF VALVE	HWF	3	16A	FW
HA	E	F25	N/A	HAX2 FIRE DETECTION ASSY	HWM	3	16A	SW
HA	E	F26	N/A	HAX3 FIRE DETECTION ASSY	HWM	3	16A	SW
HA	E	F27	N/A	HAF3 FIRE DETECTION ASSY	HWM	3	17A	SW
HA	E	F28	N/A	HAF4 FIRE DETECTION ASSY	HWM	3	17A	SW
HA	E	F29	N/A	HAF5 FIRE DETECTION ASSY	HWM	3	17A	SW
HA	E	F30	N/A	HAF6 FIRE DETECTION ASSY	HWM	3	17A	SW
HA	E	F31	N/A	HAC5 FIRE DETECTION ASSY	HWM	3	17A	SW
HA	E	F32	N/A	HAS1 FIRE DETECTION ASSY (RESERVED)	HWM	3	17A	SW
HA	E	F33	N/A	HAS2 FIRE DETECTION ASSY (RESERVED)	HWM	3	17A	SW
HA	E	F34	N/A	HAS3 FIRE DETECTION ASSY (RESERVED)	HWM	3	17A	SW
HA	E	F35	N/A	HAF1 FIRE DETECTION ASSY (RESERVED)	HWM	3	16A	SW
HA	E	F36	N/A	HAF1 FIRE DETECTION ASSY (RESERVED)	HWM	3	16A	SW
HA	E	F96	N/A	MOD ECL/FDS Instantiated Commands	CIP	S	N/A	N/A
HA	E	I05	N/A	HAB AFT INTERMODULE VENT VLV	HWM	3	16A	SW
HA	E	I06	N/A	HAB AFT INTERMODULE VENT VLV	HWM	3	16A	SW
HA	E	I07	N/A	HAB FWD INTERMODULE VENT VLV	HWM	3	16A	SW
HA	E	I08	N/A	HAB FWD INTERMODULE VENT VLV	HWM	3	16A	SW
HA	E	I39	N/A	HAB AFT INTERMODULE VENT FAN	HWM	3	16A	SW
HA	E	I40	N/A	HAB AFT INTERMODULE VENT FAN	HWM	3	16A	SW
HA	E	I41	N/A	HAB FWD INTERMODULE VENT FAN	HWM	3	16A	SW
HA	E	M21	N/A	HAB MCA/MASS SPECTROMETER ANALYZER	HWF	3	17A	FW
HA	E	M22	N/A	HAB MCA/DATA & CONTROL ASSY	HWF	3	17A	FW
HA	E	M23	N/A	HAB MCA/SAMPLE DIST ASSY	HWF	3	17A	FW
HA	E	M24	N/A	HAB MCA/SERIES PUMP ASSY	HWF	3	17A	FW
HA	E	M25	N/A	HAB MCA/GAS VERIFICATION ASSY	HWF	3	17A	FW
HA	E	M26	N/A	HAB MCA/LOW VOLT POWER SUPPLY	HWF	3	17A	FW
HA	E	P96	N/A	MOD ECL/ACS Instantiated Commands	CIP	S	N/A	N/A
HA	E	R02	N/A	HAF6 CO2 REMOVAL ASSY	HWM	3	17A	SW
HA	E	R04	N/A	HAF6 TRACE CONT CNTL SUBASSY	HWM	3	17A	SW
HA	E	R09	N/A	HAF6 2W ARS DIST VLV A5029	HWM	3	16A	SW
HA	E	R10	N/A	HAF6 2W ARS DIST VLV	HWM	3	16A	SW
HA	E	R11	N/A	HAF6 2W ARS DIST VLV	HWM	3	16A	SW
HA	E	R13	MCA-2	Major Constituent Analyzer Assy-2 Hab	FW-LB	3	16A	FW
HA	E	R21	N/A	HA 3W SAMPLE DEL VLV A5141	HWM	3	16A	SW
HA	E	R22	N/A	HA 3W SAMPLE DEL VLV A5142	HWM	3	16A	SW
HA	E	R23	N/A	HA 3W SAMPLE DEL VLV A5143	HWM	3	16A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	DPUI Sys	DPUI Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
HA	E	R35	N/A	HAF6 ARS DIST PRES TRANS	HWM	3	16A	SW
HA	E	R43	CDRA-2P	Carbon Dioxide Removal Assy-2 Pump Hab	FW-UB	3	16A	FW
HA	E	R44	CDRA-2B	Carbon Dioxide Removal Assy-2 Blower Hab	FW-UB	3	16A	FW
HA	E	S96	N/A	MOD ECL/WM Instantiated Commands	CIP	S	N/A	N/A
HA	E	T03	N/A	HAP6 CABIN AIR ASSY EIB	HWM	3	16A	SW
HA	E	T08	N/A	HAP6 CABIN AIR WS ORU	HWM	3	16A	SW
HA	E	T13	N/A	HAP6 CABIN AIR HX ASSY	HWM	3	16A	SW
HA	E	T22	N/A	HAP6 CABIN AIR INLET ORU	HWM	3	16A	SW
HA	E	T25	N/A	HAX3 CABIN AIR TEMP SENSOR	HWM	3	16A	SW
HA	E	T65	N/A	HAF3 AVIONICS AIR ASSY	HWM	3	17A	SW
HA	E	T66	N/A	HAF4 AVIONICS AIR ASSY	HWM	3	17A	SW
HA	E	T67	N/A	HAF5 AVIONICS AIR ASSY	HWM	3	17A	SW
HA	E	T68	N/A	HAF6 AVIONICS AIR ASSY	HWM	3	17A	SW
HA	E	T69	N/A	HAC5 AVIONICS AIR ASSY	HWM	3	17A	SW
HA	E	T70	N/A	HAS1 AVIONICS AIR ASSY (RESERVED)	HWM	3	17A	SW
HA	E	T71	N/A	HAS2 AVIONICS AIR ASSY (RESERVED)	HWM	3	17A	SW
HA	E	T72	N/A	HAS3 AVIONICS AIR ASSY (RESERVED)	HWM	3	17A	SW
HA	E	T73	N/A	HAF1 AVIONICS AIR ASSY (RESERVED)	HWM	3	16A	SW
HA	E	T74	N/A	HAF1 AVIONICS AIR ASSY (RESERVED)	HWM	3	16A	SW
HA	E	T96	N/A	MOD ECL/THC Instantiated Commands	CIP	S	N/A	N/A
HA	E	W51	HA WPA	HAF3 WATER PROCESSOR ASSY	FW-UB	3	17A	FW
HA	E	W61	HA UPA	HAF4 URINE PROCESSOR ASSY	FW-UB	3	17A	FW
HA	E	W96	N/A	MOD ECLWRM Instantiated Commands	CIP	S	N/A	N/A
HA	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
HA	F	C32	INCB	CHeCS Incubator-HAB	FW-LB	H	17A	FW
HA	F	C34	MEC	CHeCS Medical Equipment Computer	HWF/FW-LB	H	6A	FW
HA	F	C36	SPCPH	CHeCS Spectrophotometer	FW-LB	H	17A	FW
HA	F	C60	VOA	CHeCS Volatile Organic Analyzer	HWF/FW-LB	H	6A	FW
HA	F	C70	DEFIB	CHeCs Defibrillator	HWF/FW-LB	H	6A	FW
HA	F	C72	BPECG	CHeCS Blood Pressure and Electrocardiograph Monitor	FW-LB	H	17A	FW
HA	F	C96	N/A	MOD CHC Instantiated Commands	CIP	S	N/A	N/A
HA	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
HA	M	C13	CBM-HANAD-P	Common Berthing Mechanism HANAD Primary	FW-LB	3	16A	FW
HA	M	C33	CBM-HANAD-S	Common Berthing Mechanism HANAD Secondary	FW-LB	3	16A	FW
HA	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
HA	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
HA	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
HA	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
HA	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
HA	P	C23	DDCU HANAD-2A	DC to DC Converter Unit HANAD-2A	FW-LB	2	16A	FW
HA	P	C24	DDCU HAZEN-4A	DC to DC Converter Unit HAZEN-4A	FW-LB	2	16A	FW
HA	P	C96	N/A	MOD EPS/DC/DC Converter Instantiated commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
HA	P	E50	N/A	HAC4 MAINT. SWITCH ASSY	HWM	3	17A	SW
HA	P	E51	N/A	HAC5 MAINT. SWITCH ASSY	HWM	3	17A	SW
HA	P	E52	N/A	HAS1 MAINT. SWITCH ASSY	HWM	3	17A	SW
HA	P	E53	N/A	HAS2 MAINT. SWITCH ASSY	HWM	3	17A	SW
HA	P	E54	N/A	HAS3 MAINT. SWITCH ASSY	HWM	3	17A	SW
HA	P	E55	N/A	HAS5 MAINT. SWITCH ASSY	HWM	3	17A	SW
HA	P	E56	N/A	HAS6 MAINT. SWITCH ASSY	HWM	3	16A	SW
HA	P	E57	N/A	HAF1 MAINT. SWITCH ASSY	HWM	3	16A	SW
HA	P	E58	N/A	HAF3 MAINT. SWITCH ASSY	HWM	3	17A	SW
HA	P	E59	N/A	HAF4 MAINT. SWITCH ASSY	HWM	3	17A	SW
HA	P	E60	N/A	HAF5 MAINT. SWITCH ASSY	HWM	3	17A	SW
HA	P	E61	N/A	HAF6 MAINT. SWITCH ASSY	HWM	3	16A	SW
HA	P	E62	N/A	HAP1 MAINT. SWITCH ASSY	HWM	3	17A	SW
HA	P	E63	N/A	HAP3 MAINT. SWITCH ASSY	HWM	3	17A	SW
HA	P	E64	N/A	HAP4 MAINT. SWITCH ASSY	HWM	3	17A	SW
HA	P	E65	N/A	HAP5 MAINT. SWITCH ASSY	HWM	3	17A	SW
HA	P	E66	N/A	HAP6 MAINT. SWITCH ASSY	HWM	3	16A	SW
HA	P	E70	N/A	HAB FWD MAINT. SWITCH ASSY	HWM	3	16A	SW
HA	P	E71	N/A	HAB AFT MAINT. SWITCH ASSY	HWM	3	16A	SW
HA	P	E72	N/A	HAB AFT MAINT. SWITCH ASSY	HWM	3	16A	SW
HA	P	E73	N/A	HAB AFT MAINT. SWITCH ASSY	HWM	3	16A	SW
HA	P	E74	N/A	HAB AFT MAINT. SWITCH ASSY	HWM	3	16A	SW
HA	P	E75	N/A	HAB AFT MAINT. SWITCH ASSY	HWM	3	16A	SW
HA	P	R64	RPCM HAP3-4A-A	REMOTE POWER CONTROL MODULE HAP3-4A-A	FW-LB	3	17A	FW
HA	P	R65	RPCM HAP3-4A-B	REMOTE POWER CONTROL MODULE HAP3-4A-B	FW-LB	3	17A	FW
HA	P	R66	RPCM HAP4-4A-A	REMOTE POWER CONTROL MODULE HAP4-4A-A	FW-LB	3	17A	FW
HA	P	R67	RPCM HAS1-2A-A	REMOTE POWER CONTROL MODULE HAS1-2A-A	FW-LB	3	17A	FW
HA	P	R68	RPCM HAS2-2A-A	REMOTE POWER CONTROL MODULE HAS2-2A-A	FW-LB	3	17A	FW
HA	P	R69	RPCM HAS3-2A-A	REMOTE POWER CONTROL MODULE HAS3-2A-A	FW-LB	3	17A	FW
HA	P	R70	RPCM HAC4-4A-A	REMOTE POWER CONTROL MODULE HAC4-4A-A	FW-LB	2	17A	FW
HA	P	R71	RPCM HAC5-4A-A	REMOTE POWER CONTROL MODULE HAC5-4A-A	FW-LB	2	17A	FW
HA	P	R72	RPCM HAF1-2A-A	REMOTE POWER CONTROL MODULE HAF1-2A-A	FW-LB	2	16A	FW
HA	P	R73	RPCM HAF4-4A-A	REMOTE POWER CONTROL MODULE HAF4-4A-A	FW-LB	2	17A	FW
HA	P	R74	RPCM HAS6-4A-A	REMOTE POWER CONTROL MODULE HAS6-4A-4	FW-LB	3	16A	FW
HA	P	R75	RPCM HAF6-4A-A	REMOTE POWER CONTROL MODULE HAF6-4A-A	FW-LB	3	16A	FW
HA	P	R76	RPCM HANAD-2A-A	REMOTE POWER CONTROL MODULE HANAD-2A-A	FW-LB	2	16A	FW
HA	P	R77	RPCM HANAD-2A-B	REMOTE POWER CONTROL MODULE HANAD-2A-B	FW-LB	2	16A	FW
HA	P	R78	RPCM HANAD-2A-C	REMOTE POWER CONTROL MODULE HANAD-2A-C	FW-LB	2	16A	FW
HA	P	R79	RPCM HANAD-2A-D	REMOTE POWER CONTROL MODULE HANAD-2A-D	FW-LB	3	16A	FW
HA	P	R80	RPCM HANAD-2A-E	REMOTE POWER CONTROL MODULE HANAD-2A-E	FW-LB	3	16A	FW
HA	P	R81	RPCM HANAD-2A-F	REMOTE POWER CONTROL MODULE HANAD-2A-F	FW-LB	3	16A	FW
HA	P	R82	RPCM HANAD-2A-G	REMOTE POWER CONTROL MODULE HANAD-2A-G	FW-LB	3	16A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
HA	P	R83	RPCM HANAD-2A-H	REMOTE POWER CONTROL MODULE HANAD-2A-H	FW-LB	3	16A	FW
HA	P	R84	RPCM HAP5-4A-A	REMOTE POWER CONTROL MODULE HAP5-4A-A	FW-LB	2	17A	FW
HA	P	R85	RPCM HAP6-2A-A	REMOTE POWER CONTROL MODULE HAP6-2A-A	FW-LB	3	16A	FW
HA	P	R86	RPCM HAZEN-4A-A	REMOTE POWER CONTROL MODULE HAZEN-4A-A	FW-LB	2	16A	FW
HA	P	R87	RPCM HAZEN-4A-B	REMOTE POWER CONTROL MODULE HAZEN-4A-B	FW-LB	2	16A	FW
HA	P	R88	RPCM HAZEN-4A-C	REMOTE POWER CONTROL MODULE HAZEN-4A-C	FW-LB	2	16A	FW
HA	P	R89	RPCM HAZEN-4A-D	REMOTE POWER CONTROL MODULE HAZEN-4A-D	FW-LB	3	16A	FW
HA	P	R90	RPCM HAZEN-4A-E	REMOTE POWER CONTROL MODULE HAZEN-4A-E	FW-LB	3	16A	FW
HA	P	R91	RPCM HAZEN-4A-F	REMOTE POWER CONTROL MODULE HAZEN-4A-F	FW-LB	3	16A	FW
HA	P	R92	RPCM HAZEN-4A-G	REMOTE POWER CONTROL MODULE HAZEN-4A-G	FW-LB	3	16A	FW
HA	P	R93	RPCM HAZEN-4A-H	REMOTE POWER CONTROL MODULE HAZEN-4A-H	FW-LB	3	16A	FW
HA	P	R94	RPCM HAZEN-4A-I	REMOTE POWER CONTROL MODULE HAZEN-4A-I	FW-LB	3	16A	FW
HA	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
HA	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
HA	R	D03	PDGF Hab	Power Data Grapple Fixture Hab	HWF	1	16A	FW
HA	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
HA	S	W03	N/A	HAP1 WINDOW ASSY	HWM	3	16A	SW
HA	S	W04	N/A	HAC3 WINDOW ASSY	HWM	3	16A	SW
HA	T	B04	N/A	HAB2 LTL CTB 3W MIX VLV	HWM	3	16A	SW
HA	T	B05	N/A	HAB2 MTL CTB 3W MIX VLV	HWM	3	16A	SW
HA	T	B06	N/A	HAB2 RHX CTB 3W MIX VLV	HWM	3	16A	SW
HA	T	E35	HX Hab MT-A	Water/Ammonia Heat Exchanger Hab ITCS Moderate Temperature Loop to EATCS Loop A	HWM/HWF	1	16A	FW
HA	T	E36	HX Hab LT-B	Water/Ammonia Heat Exchanger Hab ITCS Low Temperature Loop to EATCS Loop B	HWM/HWF	1	16A	FW
HA	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
HA	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
HA	T	I03	HAP6 PPA	HAP6 PUMP PACKAGE ASSY	HWM	3	16A	SW
HA	T	I04	HAS6 PPA	HAS6 PUMP PACKAGE ASSY (SCAR)	HWM	3	16A	SW
HA	T	I22	PPA HAP6	HAP6 Internal Thermal Pump Package Assy	FW-LB	3	16A	FW
HA	T	I23	PPA HAS6	HAS6 Internal Thermal Pump Package Assy (SCAR)	FW-LB	3	16A	FW
HA	T	L05	N/A	HAP6 SYS FLOW CNTRL ASSY	HWM	3	16A	SW
HA	T	L06	N/A	HAS6 SYS FLOW CNTRL ASSY	HWM	3	16A	SW
HA	T	N21	N/A	HAP6 NITROGEN I/F ASSY	HWM	3	16A	SW
HA	T	N22	N/A	HAS6 NITROGEN I/F ASSY	HWM	3	16A	SW
HA	T	R40	N/A	HAB AFT RACK FLOW CNTRL ASSY	HWM	3	16A	SW
HA	T	R41	N/A	HAB AFT RACK FLOW CNTRL ASSY	HWM	3	16A	SW
HA	T	T61	N/A	HAC4 TEMP SENSOR	HWM	3	17A	SW
HA	T	T62	N/A	HAC5 TEMP SENSOR	HWM	3	17A	SW
HA	T	T63	N/A	HAS1 TEMP SENSOR	HWM	3	17A	SW
HA	T	T64	N/A	HAS2 TEMP SENSOR	HWM	3	17A	SW
HA	T	T65	N/A	HAS3 TEMP SENSOR	HWM	3	17A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
HA	T	T66	N/A	HAS5 TEMP SENSOR	HWM	3	17A	SW
HA	T	T67	N/A	HAS6 TEMP SENSOR	HWM	3	16A	SW
HA	T	T68	N/A	HAF1 TEMP SENSOR	HWM	3	16A	SW
HA	T	T69	N/A	HAF3 TEMP SENSOR	HWM	3	17A	SW
HA	T	T70	N/A	HAF4 TEMP SENSOR	HWM	3	17A	SW
HA	T	T71	N/A	HAF5 TEMP SENSOR	HWM	3	17A	SW
HA	T	T72	N/A	HAF6 TEMP SENSOR	HWM	3	16A	SW
HA	T	T73	N/A	HAP1 TEMP SENSOR	HWM	3	17A	SW
HA	T	T74	N/A	HAP3 TEMP SENSOR	HWM	3	17A	SW
HA	T	T75	N/A	HAP4 TEMP SENSOR	HWM	3	17A	SW
HA	T	T76	N/A	HAP5 TEMP SENSOR	HWM	3	17A	SW
HA	T	T77	N/A	HAP6 TEMP SENSOR	HWM	3	16A	SW
HA	T	T80	N/A	HAB AFT TEMP SENSOR	HWM	3	16A	SW
HA	T	T81	N/A	HAB AFT TEMP SENSOR	HWM	3	16A	SW
HA	T	T82	N/A	HAB AFT TEMP SENSOR	HWM	3	16A	SW
HA	T	T83	N/A	HAB AFT TEMP SENSOR	HWM	3	16A	SW
HA	T	T84	N/A	HAB FWD TEMP SENSOR	HWM	3	16A	SW
HA	T	T90	N/A	HA EXT TEMP SENSOR	HWM	3	16A	SW
HA	T	T91	N/A	HA EXT TEMP SENSOR	HWM	3	16A	SW
HA	T	T92	N/A	HA EXT TEMP SENSOR	HWM	3	16A	SW
HA	T	T93	N/A	HA EXT TEMP SENSOR	HWM	3	16A	SW
HA	T	T94	N/A	HA EXT TEMP SENSOR	HWM	3	16A	SW
HA	T	X03	N/A	HAB Loop Crossover Assy	HWM	3	16A	SW
HA	T	X04	N/A	HAB Loop Crossover Assy	HWM	3	16A	SW
HA	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
HA	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
IM	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
IM	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
IM	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
IM	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
IM	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
IM	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
IM	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
IM	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
IM	D	I01	MPLM UB	MPLM User Data Bus-1553	HWM-DB	D	6A	SW
IM	D	I02	MPLM RS485	MPLM User Data Bus-RS485	HWM-DB	D	6A	SW
IM	D	M01	MDM LM-1	Mini-Pressurized Logistics Module-1 MDM	SW-LB	I	6A	SW
IM	E	A01	PPRA#1	Positive Pressure Relief Assy #1	HWF/FW-UBN	I	6A	FW
IM	E	A02	PPRA#2	Positive Pressure Relief Assy #2	HWF/FW-UBN	I	6A	FW
IM	E	A03	PPRA#3	Positive Pressure Relief Assy #3	HWF/FW-UBN	I	6A	FW
IM	E	A96	N/A	MOD ECL/ARS Instantiated Commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
IM	E	D01	DA#1	Depressurization Assy #1	HWM/HWF/FW-UBN	I	6A	SW
IM	E	D02	DA#2	Depressurization Assy #2	HWM/HWF/FW-UBN	I	6A	SW
IM	E	F01	CFA	Cabin Fan Assy	HWM	I	6A	SW
IM	E	F96	N/A	MOD ECL/FDS Instantiated Commands	CIP	S	N/A	N/A
IM	E	I01	ISOV#1	Inter Module Vent. Shut-off Valve #1	HWF/FW-UBN	I	6A	FW
IM	E	I02	ISOV#2	Inter Module Vent. Shut-off Valve #2	HWF/FW-UBN	I	6A	FW
IM	E	P01	PT#1	Pressure Trasducer #1	HWM	I	6A	SW
IM	E	P02	PT#2	Pressure Trasducer #2	HWM	I	6A	SW
IM	E	P03	PT#3	Pressure Trasducer #3	HWM	I	6A	SW
IM	E	P96	N/A	MOD ECL/ACS Instantiated Commands	CIP	S	N/A	N/A
IM	E	S01	DSD	Duct Smoke Detector	HWM	I	6A	SW
IM	E	S96	N/A	MOD ECL/WM Instantiated Commands	CIP	S	N/A	N/A
IM	E	T01	ATS	Air Temperature Sensor	HWM	I	6A	SW
IM	E	T96	N/A	MOD ECL/THC Instantiated Commands	CIP	S	N/A	N/A
IM	E	V01	SSOV	Sampling line Shut-off Valve	HWF/FW-UBN	I	6A	FW
IM	E	V96	N/A	MOD ECLVS Instantiated Commands	CIP	S	N/A	N/A
IM	E	W96	N/A	MOD ECLWRM Instantiated Commands	CIP	S	N/A	N/A
IM	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
IM	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
IM	M	J01	JUMPER#1	1553 Local Bus A Jumper	HWF	I	6A	FW
IM	M	J02	JUMPER#2	1553 Local Bus B Jumper	HWF	I	6A	FW
IM	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
IM	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
IM	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
IM	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
IM	P	H01	HCU	Heater Control Unit	HWM	I	6A	SW
IM	P	P01	PDB	Power Distribution Box	HWM/HWF/FW-UBN	I	6A	SW
IM	P	P02	GLA	General Lighting Assembly	HWF	I	6A	FW
IM	P	P03	ELPS	Emergency Lighting Power Supply	HWF	I	6A	FW
IM	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
IM	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
IM	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
IM	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
IM	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
IM	T	W01	WMV	Water modulating Valve	HWM/FW-UBN	I	6A	SW
IM	T	W02	WOV	Water On/Off Valve	HWM/FW-UBN	I	6A	SW
IM	T	W03	WPP	Water Pump Package	HWM/FW-UBN	I	6A	SW
IM	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
IM	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
IM	Z	R01	R/F RACK#1	Refrigerator/Freezer Rack #1	FW-UB	I	6A	FW
IM	Z	R02	R/F RACK#2	Refrigerator/Freezer Rack #2	FW-UB	I	6A	FW
IM	Z	R03	R/F RACK#3	Refrigerator/Freezer Rack #3	FW-UB	I	6A	FW
IM	Z	R04	R/F RACK#4	Refrigerator/Freezer Rack #4	FW-UB	I	6A	FW
IM	Z	R05	R/F RACK#5	Refrigerator/Freezer Rack #5	FW-UB	I	6A	FW
JA	K	R31	ISPR_JEM_A1	JEM International Standard Payload Rack-A1	FW-LB	Z	1J	FW
JA	K	R32	ISPR_JEM_A2	JEM International Standard Payload Rack-A2	FW-LB	Z	1J	FW
JA	K	R33	ISPR_JEM_A3	JEM International Standard Payload Rack-A3	FW-LB	Z	1J	FW
JA	K	R34	ISPR_JEM_A4	JEM International Standard Payload Rack-A4	FW-LB	Z	1J	FW
JA	K	R35	ISPR_JEM_A5	JEM International Standard Payload Rack-A5	FW-LB	Z	1J	FW
JA	K	R36	ISPR_JEM_F1	JEM International Standard Payload Rack-F1	FW-LB	Z	1J	FW
JA	K	R37	ISPR_JEM_F2	JEM International Standard Payload Rack-F2	FW-LB	Z	1J	FW
JA	K	R38	ISPR_JEM_F3	JEM International Standard Payload Rack-F3	FW-LB	Z	1J	FW
JA	K	R39	ISPR_JEM_F5	JEM International Standard Payload Rack-F5	FW-LB	Z	1J	FW
JA	K	R40	ISPR_JEM_F6	JEM International Standard Payload Rack-F6	FW-LB	Z	1J	FW
JA	M	C14	CBM-JP	Common Berthing Mechanism JEM Primary	FW-CB	3	1J	FW
JA	M	C34	CBM-JS	Common Berthing Mechanism JEM Secondary	FW-CB	3	1J	FW
JM	F	C96	N/A	MOD CHC Instantiated Commands	CIP	S	N/A	N/A
JR	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
JR	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
JR	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
JR	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
JR	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
JR	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
JR	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
JR	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
JR	E	X96	N/A	MOD ECL Instantiated commands	CIP	S	N/A	N/A
JR	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
JR	G	C96	N/A	MOD MCS/CMG Instantiated Commands	CIP	S	N/A	N/A
JR	G	G96	N/A	MOD MCS/GPS Instantiated Commands	CIP	S	N/A	N/A
JR	G	R96	N/A	MOD MCS/GN&C/P Instantiated Commands	CIP	S	N/A	N/A
JR	G	T96	N/A	MOD MCSRGA (Theta Dot) Instantiated Commands	CIP	S	N/A	N/A
JR	G	U96	N/A	MOD MCS/GN&C MDM Instantiated Commands	CIP	S	N/A	N/A
JR	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
JR	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
JR	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
JR	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
JR	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
JR	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
JR	R	C00	JEM RMS	JEM Remote Manipulator System	SW-CB	J	1J	SW
JR	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
JR	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
JR	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
JR	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
JR	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
JS	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
JS	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
JS	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
JS	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
JS	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
JS	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
JS	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
JS	D	C00	Logical JCP - PRI	Logical Primary JEM Control Processor	LDM	J	1J	SW
JS	D	C01	JCP-A	JEM Control Processor-A	SW-CB	J	1J	SW
JS	D	C02	JCP-B	JEM Control Processor-B	SW-CB	J	1J	SW
JM	D	C03	DIU-III-A	Data Interface Unit III-A	FW-CB	J	1J	FW
JM	D	C04	DIU-III-B	Data Interface Unit III-B	FW-CB	J	1J	FW
JS	D	C10	Logical JCP - B/U	Logical Backup JEM Control Processor	LDM	J	1J	SW
JS	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
JS	D	J01	NASDA PL BUS E	NASDA PL BUS E Local Data Bus	HWM-DB	D	1J	SW
JS	D	J02	LB CHECS-JEM	CHeCs-JEM Local Data Bus	HWM-DB	D	5A	SW
JS	D	J03	LB PL-JEM	PL-JEM Local Data Bus	HWM-DB	D	1J	SW
JS	D	L01	PCR JEM CB EXT-1	Portable Computer Receptacle JEM CB EXT-1	PCR-CB	D	1J	SW
JS	D	L02	PCR JEM CB EXT-2	Portable Computer Receptacle JEM CB EXT-2	PCR-CB	D	1J	SW
JS	D	L03	PCR PL JEM LB PL-JEM	Portable Computer Receptacle PL JEM LB PL-JEM	PCR-LB	D	1J	SW
JS	D	L04	PCR NASDA NASDA PL BUS E	Portable Computer Receptacle NASDA NASDA PL BUS E	PCR-LB	D	1J	SW
JS	E	A96	N/A	MOD ECL/ARS Instantiated Commands	CIP	S	N/A	N/A
JS	E	F96	N/A	MOD ECL/FDS Instantiated Commands	CIP	S	N/A	N/A
JS	E	P96	N/A	MOD ECL/ACS Instantiated Commands	CIP	S	N/A	N/A
JS	E	T96	N/A	MOD ECL/THC Instantiated Commands	CIP	S	N/A	N/A
JS	E	V96	N/A	MOD ECLVS Instantiated Commands	CIP	S	N/A	N/A
JS	E	W96	N/A	MOD ECLWRM Instantiated Commands	CIP	S	N/A	N/A
JS	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
JS	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
JS	G	X96	N/A	MCS Instantiated Commands	CIP	S	N/A	N/A
JS	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
JS	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
JS	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
JS	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
JS	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
JS	P	C96	N/A	MOD EPS/DC/DC Converter Instantiated commands	CIP	S	N/A	N/A
JS	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
JS	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
JS	R	D02	PDGF JEM	Power Data Grapple Fixture JEM	HWF	1	1J	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
JS	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
JS	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
JS	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
JS	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
JS	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
LA	C	A01	IAC-1	Internal Audio Controller-1	HWF/FW-CB	3	5A	FW
LA	C	A02	IAC-2	Internal Audio Controller-2	HWF/FW-CB	3	5A	FW
LA	C	A95	N/A	LA Comm/Audio commands	CIP	S	5A	N/A
LA	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
LA	C	C01	SCU-1	Video Sync and Control Unit-1	HWF/FW-CB	3	5A	FW
LA	C	C02	SCU-2	Video Sync and Control Unit-2	HWF/FW-CB	3	5A	FW
LA	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
LA	C	K01	HRFM	Ku-Band SGS High Rate Frame Mux	HWF/FW-CB	1	6A	FW
LA	C	K02	HRM	Ku-Band SGS High Rate Modem	HWF/FW-CB	1	6A	FW
LA	C	K06	VBSP	Ku-Band SGS Video Baseband Signal Processor	HWF/FW-CB	1	5A	FW
LA	C	K95	N/A	LA Comm/Ku-Band commands	CIP	S	5A	N/A
LA	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
LA	C	P13	VCSA Port-13	Video Camera Support Assembly Port-13	HWF	1	5A	FW
LA	C	S95	N/A	LA Comm/S-Band commands	CIP	S	5A	N/A
LA	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
LA	C	U03	LOGICAL SSSR	Logical UHF Terminals-(SSSR)	LDM	M	6A	FW
LA	C	U04	SSSR-2	UHF Terminals-2 (SSSR-2)	FW-CB	M	6A	FW
LA	C	U05	SSSR-1	UHF Terminals-1 (SSSR-1)	FW-CB	M	6A	FW
LA	C	U95	N/A	LA Comm/UHF commands	CIP	S	5A	N/A
LA	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
LA	C	V01	VSU-1	Video Switching Unit-1	HWF/FW-CB	3	5A	FW
LA	C	V02	VSU-2	Video Switching Unit-2	HWF/FW-CB	3	5A	FW
LA	C	V03	VSU-3	Video Switching Unit-3	HWF/FW-CB	3	5A	FW
LA	C	V21	VTR-1	Video Tape Recorder-1	HWF/FW-CBN	3	6A	FW
LA	C	V22	VTR-2	Video Tape Recorder-2	HWF/FW-CBN	3	6A	FW
LA	C	V95	N/A	LA Comm/Video commands	CIP	S	5A	N/A
LA	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
LA	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
LA	D	B02	CCS-B/U	Logical MDM CCS Backup	LDM	0	5A	SW
LA	D	B03	CCS-CL B/U	Logical MDM CCS Cool Backup	LDM	0	5A	SW
LA	D	B07	GNC-B/U	Logical MDM GNC Backup	LDM	1	5A	SW
LA	D	B09	INTSYS-B/U	Logical MDM Backup INTSYS	LDM	3	5A	SW
LA	D	B11	PL-B/U	Logical MDM Backup Payload	LDM	3	6A	SW
LA	D	B14	PMCU-B/U	Logical MDM Backup PMCU	LDM	2	5A	SW
LA	D	C01	C&W Pnl Lab	Caution & Warning Panel Lab	HWM	1	5A	SW
LA	D	D95	N/A	LA C&DH commands	CIP	S	5A	N/A
LA	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
LA	D	P01	CCS-PRI	Logical MDM CCS Primary	LDM	0	5A	SW
LA	D	P06	GNC-PRI	Logical MDM GNC Primary	LDM	1	5A	SW
LA	D	P08	INTSYS-PRI	Logical MDM Primary INTSYS	LDM	3	5A	SW
LA	D	P10	PL-PRI	Logical MDM Primary Payload	LDM	3	5A	SW
LA	D	P13	PMCU-PRI	Logical MDM Primary PMCU	LDM	2	5A	SW
LA	D	S01	MDM C&C-1	Command and Control Processor-1 MDM	HWM/HWF/SW-CB	0	5A	SW
LA	D	S02	MDM C&C-2	Command and Control Processor-2 MDM	HWM/HWF/SW-CB	0	5A	SW
LA	D	S03	MDM C&C-3	Command and Control Processor-3 MDM	HWM/HWF/SW-CB	0	5A	SW
LA	D	S06	ESSMDM GNC-1	Enhanced Space Station Multiplexer/Demultiplexer GN&C-1	HWF/SW-CB	1	5A	SW
LA	D	S07	ESSMDM GNC-2	Enhanced Space Station Multiplexer/Demultiplexer GN&C-2	HWF/SW-CB	1	5A	SW
LA	D	S08	MDM INT-1	Internal Systems Processor-1 MDM	HWM/HWF /SW-CB	3	5A	SW
LA	D	S09	MDM INT-2	Internal Systems Processor-2 MDM	HWM/HWF /SW-CB	3	5A	SW
LA	D	S10	MDM PL-1	Payload Executive Processor-1 MDM	HWM/HWF /SW-CB	3	5A	SW
LA	D	S11	MDM PL-2	Payload Executive Processor-2 MDM	HWM/HWF /SW-CB	3	6A	SW
LA	D	S13	MDM PMCU-1	Power Management Control Unit-1 MDM	HWM/HWF/SW-CB	2	5A	SW
LA	D	S14	MDM PMCU-2	Power Management Control Unit-2 MDM	HWM/HWF/SW-CB	2	5A	SW
LA	D	S19	MDM LA-1	Lab Systems-1 MDM	HWF/SW-LB	3	5A	SW
LA	D	S20	MDM LA-2	Lab Systems-2 MDM	HWF/SW-LB	3	5A	SW
LA	D	S21	MDM LA-3	Lab Systems-3 MDM	HWF/SW-LB	3	5A	SW
LA	D	Z01	PEHG-1	Payload Ethernet Hub Gateway-1	HWF/FW-LB	1	5A	FW
LA	D	Z02	PEHG-2	Payload Ethernet Hub Gateway-2	HWF/FW-LB	1	5A	FW
LA	D	Z03	APS-1	Automated Payload Switch-1	HWF/FW-LB	1	5A	FW
LA	D	Z04	APS-2	Automated Payload Switch-2	HWF/FW-LB	1	5A	FW
LA	E	A01	LA1 NIV	Lab1 Nitrogen Iso Valve A3006	HWM/HWF	3	5A	SW
LA	E	A03	LA2 OIV	LAP2 Oxygen Iso Valve	HWM	3	5A	SW
LA	E	A21	PCA-1	PRESSURE CONTROL ASSY-1 LAB	HWF/FW-LB	3	5A	FW
LA	E	A95	N/A	LA ECLSS/ARS Commands	CIP	S	5A	N/A
LA	E	A96	N/A	MOD ECL/ARS Instantiated Commands	CIP	S	N/A	N/A
LA	E	C11	N/A	LAB PCA/PRESSURE CONTROL PANEL	HWF	3	5A	FW
LA	E	C12	N/A	LAB PCA/VENT & RELIEF VALVE	HWF	3	5A	FW
LA	E	C95	N/A	LA ECLSS/ACS Commands	CIP	S	5A	N/A
LA	E	F01	N/A	LAX2 FIRE DETECTION ASSY	HWM/HWF	3	5A	SW
LA	E	F02	N/A	LAX3 FIRE DETECTION ASSY	HWM/HWF	3	5A	SW
LA	E	F03	N/A	LAF3 FIRE DETECTION ASSY	HWM	3	6A	SW
LA	E	F04	N/A	LAC1 FIRE DETECTION ASSY	HWM	3	UF-1	SW
LA	E	F05	N/A	LAC2 FIRE DETECTION ASSY	HWM	3	UF-1	SW
LA	E	F06	N/A	LAC3 FIRE DETECTION ASSY	HWM	3	UF-1	SW
LA	E	F07	N/A	LAC4 FIRE DETECTION ASSY	HWM	3	UF-1	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
LA	E	F08	N/A	LAC5 FIRE DETECTION ASSY	HWM	3	UF-1	SW
LA	E	F09	N/A	LAS1 FIRE DETECTION ASSY	HWM	3	UF-1	SW
LA	E	F10	N/A	LAS2 FIRE DETECTION ASSY	HWM	3	UF-1	SW
LA	E	F11	N/A	LAS3 FIRE DETECTION ASSY	HWM	3	UF-1	SW
LA	E	F12	N/A	LAS4 FIRE DETECTION ASSY	HWM	3	UF-1	SW
LA	E	F13	N/A	LAP1 FIRE DETECTION ASSY	HWM	3	UF-1	SW
LA	E	F14	N/A	LAP2 FIRE DETECTION ASSY	HWM	3	UF-1	SW
LA	E	F15	N/A	LAP4 FIRE DETECTION ASSY	HWM	3	UF-1	SW
LA	E	F16	N/A	LAF6 FIRE DETECTION ASSY	HWM/HWF	3	6A	SW
LA	E	F17	N/A	LAF4 FIRE DETECTION ASSY	HWM	3	6A	SW
LA	E	F95	N/A	LA ECLSS/FDS Commands	CIP	S	5A	N/A
LA	E	F96	N/A	MOD ECL/FDS Instantiated Commands	CIP	S	N/A	N/A
LA	E	I01	N/A	LAB1 Intermodule Vent Valve A1019	HWM/HWF	3	5A	SW
LA	E	I02	N/A	LAB1 Intermodule Vent Valve A1020	HWM/HWF	3	5A	SW
LA	E	I03	N/A	LAB2 Intermodule Vent Valve A1017	HWM/HWF	3	5A	SW
LA	E	I04	N/A	LAB2 Intermodule Vent Valve A1018	HWM/HWF	3	5A	SW
LA	E	I32	N/A	LAB1 Intermodule Vent Fan A1032	HWM/HWF	3	5A	SW
LA	E	I33	N/A	LAB2 Intermodule Vent Fan A1013	HWM/HWF	3	5A	SW
LA	E	I34	N/A	LAB1 Intermodule Vent Fan	HWM/HWF	3	5A	SW
LA	E	M11	N/A	LAB MCA/MASS SPECTROMETER ANALYZER	HWF	3	6A	FW
LA	E	M12	N/A	LAB MCA/DATA & CONTROL ASSY	HWF	3	6A	FW
LA	E	M13	N/A	LAB MCA/SAMPLE/DIST ASSY	HWF	3	6A	FW
LA	E	M14	N/A	LAB MCA/SERIES PUMP ASSY	HWF	3	6A	FW
LA	E	M15	N/A	LAB MCA/GAS VERIFICATION ASSY	HWF	3	6A	FW
LA	E	M16	N/A	LAB MCA/LOW VOLT POWER SUPPLY	HWF	3	6A	FW
LA	E	P01	N/A	LAF3 ECLSS Payload Instrumentation	HWM	3	UF-1	SW
LA	E	P02	N/A	LAC1 ECLSS Payload Instrumentation	HWM	3	UF-1	SW
LA	E	P03	N/A	LAC2 ECLSS Payload Instrumentation	HWM	3	UF-1	SW
LA	E	P04	N/A	LAC3 ECLSS Payload Instrumentation	HWM	3	UF-1	SW
LA	E	P05	N/A	LAC4 ECLSS Payload Instrumentation	HWM	3	UF-1	SW
LA	E	P06	N/A	LAC5 ECLSS Payload Instrumentation	HWM	3	UF-1	SW
LA	E	P07	N/A	LAS1 ECLSS Payload Instrumentation	HWM	3	UF-1	SW
LA	E	P08	N/A	LAS2 ECLSS Payload Instrumentation	HWM	3	UF-1	SW
LA	E	P09	N/A	LAS3 ECLSS Payload Instrumentation	HWM	3	UF-1	SW
LA	E	P10	N/A	LAS4 ECLSS Payload Instrumentation	HWM	3	UF-1	SW
LA	E	P11	N/A	LAP1 ECLSS Payload Instrumentation	HWM	3	UF-1	SW
LA	E	P12	N/A	LAP2 ECLSS Payload Instrumentation	HWM	3	UF-1	SW
LA	E	P13	N/A	LAP4 ECLSS PAYLOAD INSTRUMENTATION	HWM	3	UF-1	SW
LA	E	P96	N/A	MOD ECL/ACS Instantiated Commands	CIP	S	N/A	N/A
LA	E	R01	N/A	LAF6 CO2 Removal Assy	HWM/HWF	3	6A	SW
LA	E	R03	N/A	LAF6 Trace Cont Cntl Subassy	HWM/HWF	3	6A	SW
LA	E	R05	N/A	LAB2 3W ARS Distribution Valve A5200	HWM	3	5A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
LA	E	R06	N/A	LAB2 2W ARS Distribution Valve A5201	HWM	3	5A	SW
LA	E	R07	LAF6 2W ARS Distribution Valve A5007	LAF6 2W ARS Distribution Valve A5007	HWM	3	6A	SW
LA	E	R08	LAF6 2W ARS Distribution Valve A5011	LAF6 2W ARS Distribution Valve A5011	HWM	3	6A	SW
LA	E	R12	MCA-1	Major Constituent Analyzer Assy-1 LAB	HWF/FW-LB	3	6A	FW
LA	E	R16	N/A	LAB1 3W Sample Delivery Valve A5112	HWM	3	5A	SW
LA	E	R17	N/A	LAB1 3W Sample Delivery Valve A5111	HWM	3	5A	SW
LA	E	R18	N/A	LAB1 3W Sample Delivery Valve A5113	HWM	3	5A	SW
LA	E	R19	N/A	LAB1 3W Sample Delivery Valve A5114	HWM	3	5A	SW
LA	E	R20	LAF6 3W Sample Delivery Valve A5023	LAF6 3W Sample Delivery Valve A5023	HWM	3	6A	SW
LA	E	R34	LAF6 ARS Distribution Pressure Transducer MT5000	LAF6 ARS Distribution Pressure Transducer MT5000	HWM	3	6A	SW
LA	E	R41	CDRA-1P	Carbon Dioxide Removal Assy-1 Pump Lab	FW-UB	3	6A	FW
LA	E	R42	CDRA-1B	Carbon Dioxide Removal Assy-1 Blower Lab	FW-UB	3	6A	FW
LA	E	S95	N/A	LA ECLSS/WM Commands	CIP	S	5A	N/A
LA	E	S96	N/A	MOD ECL/WM Instantiated Commands	CIP	S	N/A	N/A
LA	E	T01	N/A	LAP6 Cabin Air Assy Electrical Interface Box	HWM/HWF	3	5A	SW
LA	E	T02	N/A	LAS6 Cabin Air Assy Electrical Interface Box	HWM/HWF	3	5A	SW
LA	E	T06	N/A	LAP6 Cabin Air WS ORU	HWM/HWF	3	5A	SW
LA	E	T07	N/A	LAS6 Cabin Air WS ORU	HWM/HWF	3	5A	SW
LA	E	T11	N/A	LAP6 Cabin Air Heat Exchanger Assy	HWM	3	5A	SW
LA	E	T12	N/A	LAS6 Cabin Air Heat Exchanger Assy	HWM	3	5A	SW
LA	E	T16	N/A	LAP6 Cabin Air Inlet ORU	HWM	3	5A	SW
LA	E	T17	N/A	LAS6 Cabin Air Inlet ORU	HWM	3	5A	SW
LA	E	T23	N/A	LAX3 Cabin Air Temp SENSOR	HWM	3	5A	SW
LA	E	T27	N/A	LAX2 Cabin Air Temp SENSOR	HWM	3	5A	SW
LA	E	T60	N/A	LAF6 Avionics Air Assy	HWM	3	6A	SW
LA	E	T61	N/A	LAP2 Avionics Air Assy	HWM	3	UF-1	SW
LA	E	T62	N/A	LAF4 Avionics Air Assy	HWM	3	6A	SW
LA	E	T95	N/A	LA ECLSS/TCH Commands	CIP	S	5A	N/A
LA	E	T96	N/A	MOD ECL/THC Instantiated Commands	CIP	S	N/A	N/A
LA	E	V95	N/A	LA ECLSS/VS Commands	CIP	S	5A	N/A
LA	E	V96	N/A	MOD ECLVS Instantiated Commands	CIP	S	N/A	N/A
LA	E	W01	N/A	LAB1 Vent Valve Assy A7010	HWM	3	5A	SW
LA	E	W02	N/A	LAB1 Vent Valve Assy A7011	HWM	3	5A	SW
LA	E	W03	N/A	LAB1 Vent Valve Assy A7018	HWM	3	5A	SW
LA	E	W04	N/A	LAB1 Vent Valve Assy A7019	HWM	3	5A	SW
LA	E	W05	N/A	LAFX Overboard Water Vent A7015	HWM	3	5A	SW
LA	E	W06	N/A	LAFX Overboard Water Vent A7017	HWM	3	5A	SW
LA	E	W07	N/A	LAF5 Cond Storage Tank MT7007	HWM	3	5A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
LA	E	W08	N/A	LAF5 Cond Storage Tank MT7008	HWM	3	5A	SW
LA	E	W10	N/A	LAF4 Fuel Cell Water Storage	HWM	3	17A	SW
LA	E	W95	N/A	LA ECLSS/WRM Commands	CIP	S	5A	N/A
LA	E	W96	N/A	MOD ECLWRM Instantiated Commands	CIP	S	N/A	N/A
LA	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
LA	F	C96	N/A	MOD CHC Instantiated Commands	CIP	S	N/A	N/A
LA	G	C95	N/A	LA GN&C/CMG Commands	CIP	S	5A	N/A
LA	G	C96	N/A	MOD MCS/CMG Instantiated commands	CIP	S	N/A	N/A
LA	G	G01	GPS-1	Global Positioning System Receiver/Processor-1	FW-LB	P	5A	FW
LA	G	G02	GPS-2	Global Positioning System Receiver/Processor-2	FW-LB	P	5A	FW
LA	G	G95	N/A	LA GN&C/GPS Commands	CIP	S	5A	N/A
LA	G	G96	N/A	MOD MCS/GPS Instantiated commands	CIP	S	N/A	N/A
LA	G	N96	N/A	MOD MCS NCS/CCS Instantiated commands	CIP	S	N/A	N/A
LA	G	R95	N/A	LA GN&C/P Commands	CIP	S	5A	N/A
LA	G	R96	N/A	MOD MCS/GN&C/P Instantiated commands	CIP	S	N/A	N/A
LA	G	T95	N/A	LA GN&C/RGA(Theta Dot) Commands	CIP	S	5A	N/A
LA	G	U95	N/A	LA GN&C/MDM Commands	CIP	S	5A	N/A
LA	G	U96	N/A	MOD MCS/GN&C MDM Instantiated commands	CIP	S	N/A	N/A
LA	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
LA	K	R01	ISPR-LAC1	International Standard Payload Rack LAC1	FW-LB	3	6A	FW
LA	K	R02	ISPR-LAC2	International Standard Payload Rack LAC2	FW-LB	3	6A	FW
LA	K	R03	ISPR-LAC3	International Standard Payload Rack LAC3	FW-LB	3	6A	FW
LA	K	R04	ISPR-LAC4	International Standard Payload Rack LAC4	FW-LB	3	6A	FW
LA	K	R05	ISPR-LAC5	International Standard Payload Rack LAC5	FW-LB	3	6A	FW
LA	K	R06	ISPR-LAP1	International Standard Payload Rack LAP1	FW-LB	3	6A	FW
LA	K	R07	ISPR-LAP2	International Standard Payload Rack LAP2	FW-LB	3	6A	FW
LA	K	R08	ISPR-LAF3	International Standard Payload Rack LAF3	FW-LB	3	6A	FW
LA	K	R09	ISPR-LAP4	International Standard Payload Rack LAP4	FW-LB	3	6A	FW
LA	K	R10	ISPR-LAS1	International Standard Payload Rack LAS1	FW-LB	3	6A	FW
LA	K	R11	ISPR-LAS2	International Standard Payload Rack LAS2	FW-LB	3	6A	FW
LA	K	R12	ISPR-LAS3	International Standard Payload Rack LAS3	FW-LB	3	6A	FW
LA	K	R13	ISPR-LAS4	International Standard Payload Rack LAS4	FW-LB	3	6A	FW
LA	L	V01	LAB2 Load Cntrl Assy A8001	LAB2 Load Cntrl Assy A8001	HWF/FW-UB	3	5A	FW
LA	L	V02	N/A	LAB2 Cold-Cathode Transducer MT8002	HWM	3	5A	SW
LA	L	V03	N/A	LAB2 Cold-Cathode TransducerMT8003	HWM	3	5A	SW
LA	L	V04	N/A	LAB2 Pirani Gauge Transducer MT8006	HWM	3	5A	SW
LA	L	V05	N/A	LAB2 Pirani Gauge Transducer MT8009	HWM	3	5A	SW
LA	L	V06	N/A	LAB2 Positive Pressure Transducer MT8007	HWM	3	5A	SW
LA	L	V07	N/A	LAB2 Positive Pressure Transducer MT8008	HWM	3	5A	SW
LA	L	V08	N/A	"LAX2 1.0"" Internal Vacuum Exhaust System Valve Assy A8004"	HWM	3	5A	SW
LA	L	V09	N/A	"LAX2 1.0"" Internal Vacuum Exhaust System Valve Assy A8007"	HWM	3	5A	SW
LA	L	V10	N/A	"LAX2 1.0"" Internal Vacuum Exhaust System Valve Assy A8008"	HWM	3	5A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
LA	L	V11	N/A	"LAX2 1.0"" Internal Vacuum Exhaust System Valve Assy A8010"	HWM	3	5A	SW
LA	L	V12	N/A	"LAX3 1.0"" Internal Vacuum Exhaust System Valve Assy A8015"	HWM	3	5A	SW
LA	L	V13	N/A	"LAX3 1.0"" Internal Vacuum Exhaust System Valve Assy A8050"	HWM	3	5A	SW
LA	L	V14	N/A	"LAX3 1.0"" Internal Vacuum Exhaust System Valve Assy A8019"	HWM	3	5A	SW
LA	L	V15	N/A	"LAX3 1.0"" Internal Vacuum Exhaust System Valve Assy A8017"	HWM	3	5A	SW
LA	L	V16	N/A	"LAX4 1.0"" Internal Vacuum Exhaust System Valve Assy A8021"	HWM	3	5A	SW
LA	L	V17	N/A	"LAX4 1.0"" Internal Vacuum Exhaust System Valve Assy A8023"	HWM	3	5A	SW
LA	L	V18	N/A	"LAX4 1.0"" Internal Vacuum Exhaust System Valve Assy A8025"	HWM	3	5A	SW
LA	L	V19	N/A	"LAX4 1.0"" Internal Vacuum Exhaust System Valve Assy A8027"	HWM	3	5A	SW
LA	L	V20	N/A	"LAX4 1.0"" Internal Vacuum Exhaust System Valve Assy A8029"	HWM	3	5A	SW
LA	L	V21	N/A	"LAB2 2.5"" Internal Valve Assy A8033"	HWM	3	5A	SW
LA	L	V22	N/A	"LAB2 2.5"" Internal Valve Assy A8030"	HWM	3	5A	SW
LA	M	C07	CBM-LAFWD-P	Common Berthing Mechanism LAFWD Primary	FW-LB	3	5A	FW
LA	M	C27	CBM-LAFWD-S	Common Berthing Mechanism LAFWD Secondary	FW-LB	3	5A	FW
LA	M	C95	N/A	LA Structures & Mechanics/CBM commands	CIP	S	5A	N/A
LA	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
LA	M	L10	LCA Latch IMCA-1	Lab Cradle Assembly Latch Integrated Controller Motor-1	FW-CB	1	6A	FW
LA	M	L20	LCA Latch IMCA-2	Lab Cradle Assembly Latch Integrated Controller Motor-2	FW-CB	1	6A	FW
LA	M	L95	N/A	LA Structures & Mechanics/LCA commands	CIP	S	5A	N/A
LA	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
LA	M	P95	N/A	LA Structures & Mechanics/PAS commands	CIP	S	5A	N/A
LA	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
LA	M	S95	N/A	LA Structures & Mechanics/SSAS commands	CIP	S	5A	N/A
LA	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
LA	M	U95	N/A	LA Structures & Mechanics/ULCAS commands	CIP	S	5A	N/A
LA	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
LA	P	A95	N/A	LA EPS/Battery commands	CIP	S	5A	N/A
LA	P	B95	N/A	LA EPS/Battery chg/dschg commands	CIP	S	5A	N/A
LA	P	C09	DDCU LAC6-2A	DC to DC Converter Unit LAC6-2A	HWF/FW-LB	2	5A	FW
LA	P	C10	DDCU LAC6-3B	DC to DC Converter Unit LAC6-3B	HWF/FW-LB	2	5A	FW
LA	P	C11	DDCU LAAFT-2B	DC to DC Converter Unit LAAFT-2B	HWF/FW-LB	2	5A	FW
LA	P	C12	DDCU LAFWD-1B	DC to DC Converter Unit LAFWD-1B	HWF/FW-LB	2	5A	FW
LA	P	C13	DDCU LAP3-1A	DC to DC Converter Unit LAP3-1A	HWF/FW-LB	2	5A	FW
LA	P	C14	DDCU LAP3-4A	DC to DC Converter Unit LAP3-4A	HWF/FW-LB	2	5A	FW
LA	P	C95	N/A	LA EPS/DC/DC Converter commands	CIP	S	5A	N/A
LA	P	C96	N/A	MOD EPS/DC/DC Converter Instantiated commands	CIP	S	N/A	N/A
LA	P	D95	N/A	LA EPS/DC switching commands	CIP	S	5A	N/A
LA	P	E01	N/A	LAS6 Maintenance Switch Assy	HWM	3	5A	SW
LA	P	E02	N/A	LAP6 Maintenance Switch Assy	HWM	3	5A	SW
LA	P	E03	N/A	LAC1 Maintenance Switch Assy	HWM	3	UF-1	SW
LA	P	E04	N/A	LAC2 Maintenance Switch Assy	HWM	3	UF-1	SW
LA	P	E05	N/A	LAC3 Maintenance Switch Assy	HWM	3	UF-1	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
LA	P	E06	N/A	LAC4 Maintenance Switch Assy	HWM	3	UF-1	SW
LA	P	E07	N/A	LAC5 Maintenance Switch Assy	HWM	3	UF-1	SW
LA	P	E08	N/A	LAC6 Maintenance Switch Assy	HWM	3	6A	SW
LA	P	E09	N/A	LAF1 Maintenance Switch Assy	HWM	3	5A	SW
LA	P	E10	N/A	LAF2 Maintenance Switch Assy	HWM	3	6A	SW
LA	P	E11	N/A	LAF3 Maintenance Switch Assy	HWM	3	6A	SW
LA	P	E12	N/A	LAF4 Maintenance Switch Assy	HWM	3	6A	SW
LA	P	E13	N/A	LAF5 Maintenance Switch Assy	HWM	3	5A	SW
LA	P	E14	N/A	LAF6 Maintenance Switch Assy	HWM	3	6A	SW
LA	P	E15	N/A	LAP1 Maintenance Switch Assy	HWM	3	UF-1	SW
LA	P	E16	N/A	LAP2 Maintenance Switch Assy	HWM	3	UF-1	SW
LA	P	E17	N/A	LAP3 Maintenance Switch Assy	HWM	3	6A	SW
LA	P	E18	N/A	LAP4 Maintenance Switch Assy	HWM	3	UF-1	SW
LA	P	E19	N/A	LAP5 Maintenance Switch Assy	HWM	3	6A	SW
LA	P	E21	N/A	LAS1 Maintenance Switch Assy	HWM	3	UF-1	SW
LA	P	E22	N/A	LAS2 Maintenance Switch Assy	HWM	3	UF-1	SW
LA	P	E23	N/A	LAS3 Maintenance Switch Assy	HWM	3	UF-1	SW
LA	P	E24	N/A	LAS4 Maintenance Switch Assy	HWM	3	UF-1	SW
LA	P	E25	N/A	LAS5 Maintenance Switch Assy	HWM	3	6A	SW
LA	P	E39	N/A	LAB1 Maintenance Switch Assy	HWM	3	5A	SW
LA	P	E40	N/A	LAB2 Maintenance Switch Assy	HWM	3	5A	SW
LA	P	E41	N/A	LAX1 Maintenance Switch Assy	HWM	3	5A	SW
LA	P	E42	N/A	LAX2 Maintenance Switch Assy	HWM	3	5A	SW
LA	P	E43	N/A	LAX3 Maintenance Switch Assy	HWM	3	5A	SW
LA	P	E44	N/A	LAX4 Maintenance Switch Assy	HWM	3	5A	SW
LA	P	G95	N/A	LA EPS/ECU Beta Gimbals commands	CIP	S	5A	N/A
LA	P	L95	N/A	LA EPS/Plasma Contactor commands	CIP	S	5A	N/A
LA	P	M95	N/A	LA EPS/Main Bus Switch commands	CIP	S	5A	N/A
LA	P	P95	N/A	LA EPS/Pump & Flow Control commands	CIP	S	5A	N/A
LA	P	R01	RPCM LAFWD-1B-A01	Remote Power Control Module LAFWD-1B-A01	HWF/FW-LB	2	5A	FW
LA	P	R02	RPCM LAFWD-1B-A02	Remote Power Control Module LAFWD-1B-A02	FW-LB	3	5A	FW
LA	P	R03	RPCM LAFWD-1B-A11	Remote Power Control Module LAFWD-1B-A11	HWF/FW-LB	2	5A	FW
LA	P	R04	RPCM LAFWD-1B-A12	Remote Power Control Module LAFWD-1B-A12	FW-LB	3	5A	FW
LA	P	R05	RPCM LAFWD-1B-A05	Remote Power Control Module LAFWD-1B-A05	FW-LB	3	5A	FW
LA	P	R06	RPCM LAFWD-1B-A06	Remote Power Control Module LAFWD-1B-A06	FW-LB	3	5A	FW
LA	P	R07	RPCM LAFWD-1B-A07	Remote Power Control Module LAFWD-1B-A07	FW-LB	3	5A	FW
LA	P	R08	RPCM LAFWD-1B-A08	Remote Power Control Module LAFWD-1B-A08	FW-LB	3	5A	FW
LA	P	R13	RPCM LAAFT-2B-A13	Remote Power Control Module LAAFT-2B-A13	HWF/FW-LB	2	5A	FW
LA	P	R14	RPCM LAAFT-2B-A14	Remote Power Control Module LAAFT-2B-A14	FW-LB	3	5A	FW
LA	P	R15	RPCM LAAFT-2B-A23	Remote Power Control Module LAAFT-2B-A23	FW-LB	3	5A	FW
LA	P	R16	RPCM LAAFT-2B-A24	Remote Power Control Module LAAFT-2B-A24	HWF/FW-LB	2	5A	FW
LA	P	R17	RPCM LAAFT-2B-A17	Remote Power Control Module LAAFT-2B-A17	FW-LB	3	5A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
LA	P	R18	RPCM LAAFT-2B-A18	Remote Power Control Module LAAFT-2B-A18	FW-LB	3	5A	FW
LA	P	R19	RPCM LAAFT-2B-A19	Remote Power Control Module LAAFT-2B-A19	FW-LB	3	5A	FW
LA	P	R20	RPCM LAAFT-2B-A20	Remote Power Control Module LAAFT-2B-A20	FW-LB	3	5A	FW
LA	P	R25	RPCM LAC6-2A3B-A25	Remote Power Control Module LAC6-2A3B-A25	HWF/FW-LB	2	6A	FW
LA	P	R26	RPCM LAC6-2A3B-A26	Remote Power Control Module LAC6-2A3B-A26	HWF/FW-LB	2	6A	FW
LA	P	R27	RPCM LAC6-2A3B-A27	Remote Power Control Module LAC6-2A3B-A27	FW-LB	3	6A	FW
LA	P	R28	RPCM LAC6-2A3B-A28	Remote Power Control Module LAC6-2A3B-A28	FW-LB	3	6A	FW
LA	P	R29	RPCM LAC6-2A3B-A29	Remote Power Control Module LAC6-2A3B-A29	HWF/FW-LB	2	6A	FW
LA	P	R30	RPCM LAC6-2A3B-A30	Remote Power Control Module LAC6-2A3B-A30	FW-LB	3	6A	FW
LA	P	R31	RPCM LAC6-2A3B-A31	Remote Power Control Module LAC6-2A3B-A31	HWF/FW-LB	2	6A	FW
LA	P	R32	RPCM LAP3-1A4A-A32	Remote Power Control Module LAP3-1A4A-A32	HWF/FW-LB	2	6A	FW
LA	P	R33	RPCM LAP3-1A4A-A33	Remote Power Control Module LAP3-1A4A-A33	HWF/FW-LB	2	6A	FW
LA	P	R34	RPCM LAP3-1A4A-A34	Remote Power Control Module LAP3-1A4A-A34	HWF/FW-LB	2	6A	FW
LA	P	R35	RPCM LAP3-1A4A-A35	Remote Power Control Module LAP3-1A4A-A35	FW-LB	3	6A	FW
LA	P	R36	RPCM LAP3-1A4A-A36	Remote Power Control Module LAP3-1A4A-A36	FW-LB	3	6A	FW
LA	P	R37	RPCM LAP3-1A4A-A37	Remote Power Control Module LAP3-1A4A-A37	FW-LB	3	6A	FW
LA	P	R38	RPCM LAP3-1A4A-A38	Remote Power Control Module LAP3-1A4A-A38	HWF/FW-LB	2	6A	FW
LA	P	R52	RPCM LAF6-2B-A54	Remote Power Control Module LAF6-2B-A54	FW-LB	3	6A	FW
LA	P	R53	RPCM LAF1-1B-A53	Remote Power Control Module LAF1-1B-A53	FW-LB	3	5A	FW
LA	P	R54	RPCM LAS6-2B-A52	Remote Power Control Module LAS6-2B-A52	FW-LB	3	5A	FW
LA	P	R56	RPCM LAP6-1B-A56	Remote Power Control Module LAP6-1B-A56	FW-LB	3	5A	FW
LA	P	R57	RPCM LAF5-2B-A57	Remote Power Control Module LAF5-2B-A57	FW-LB	3	5A	FW
LA	P	R58	RPCM LAF2-2B-A58	Remote Power Control Module LAF2-2B-A58	HWF/FW-LB	2	6A	FW
LA	P	R59	RPCM LAF4-2B-A59	Remote Power Control Module LAF4-2B-A59	HWF/FW-LB	2	6A	FW
LA	P	R60	RPCM LAP5-1A4A-A60	Remote Power Control Module LAP5-1A4A-A60	HWF/FW-LB	2	6A	FW
LA	P	R61	RPCM LAS5-2A3B-A61	Remote Power Control Module LAS5-2A3B-A61	HWF/FW-LB	2	6A	FW
LA	P	R95	N/A	LA EPS RPCM commands -1	CIP	S	5A	N/A
LA	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	5A	N/A
LA	P	S95	N/A	LA EPS/Solar Shunt commands	CIP	S	5A	N/A
LA	P	T95	N/A	LA EPS/Radiator commands	CIP	S	5A	N/A
LA	P	W95	N/A	LA EPS/ECU Solar Array commands	CIP	S	5A	N/A
LA	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
LA	R	D01	PDGF Lab	Power Data Grapple Fixture Lab	HWF	1	5A	FW
LA	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
LA	S	W01	N/A	CUUA Window Assy	HWM	3	10A	SW
LA	S	W02	N/A	LAF3 Window Assy	HWM	3	5A	SW
LA	T	B01	N/A	LAB2 CTB 3W MIX VLV	HWM/HWF	3	5A	SW
LA	T	B02	N/A	LAB2 MTL CTB 3W MIX VLV	HWM/HWF	3	5A	SW
LA	T	B03	N/A	LAB2 RHX CTB 3W MIX VLV	HWM/HWF	3	5A	SW
LA	T	C01	N/A	LAAX TCS MTL CTB INLET TEMP SENSOR	HWM	3	5A	SW
LA	T	C02	N/A	LAAX TCS MTL CTB OUTLET TEMP SENSOR	HWM	3	5A	SW
LA	T	C03	N/A	LAAX TCS LTL CTB INLET TEMP SENSOR	HWM	3	5A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
LA	T	C04	N/A	LAAX TCS LTL CTB OUTLET TEMP SENSOR	HWM	3	5A	SW
LA	T	E25	Isln V Hab MT-A Byp	Isolation Valve Hab EATCS Moderate Temperature Loop Bypass to Loop A	HWM	1	5A	SW
LA	T	E26	Isln V Hab LT-B Byp	Isolation Valve Hab EATCS Low Temperature Loop Bypass to Loop B	HWM	1	5A	SW
LA	T	E27	HX Lab LT-A	Water/Ammonia Heat Exchanger Lab ITCS Low Temperature Loop to EATCS Loop A	HWM/HWF	1	5A	SW
LA	T	E28	HX Lab MT-B	Water/Ammonia Heat Exchanger Lab ITCS Moderate Temperature Loop to EATCS Loop B	HWM/HWF	1	5A	SW
LA	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
LA	T	F27	N/A	LAAX TCS LTL AMMONIA/WATER HX GROUP	HWM	3	5A	SW
LA	T	F28	N/A	LAAX TCS MTL AMMONIA/WATER HX GROUP	HWM	3	5A	SW
LA	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
LA	T	I01	N/A	LAP6 Pump Package Assy	HWM/HWF	3	5A	SW
LA	T	I02	N/A	LAS6 Pump Package Assy	HWM/HWF	3	5A	SW
LA	T	I20	PPA LAP6	Internal Thermal Pump Package Assy LAP6	FW-LB	3	5A	FW
LA	T	I21	PPA LAS6	Internal Thermal Pump Package Assy LAS6	FW-LB	3	5A	FW
LA	T	L01	N/A	LAP6 Sys Flow Control Assy	HWM	3	5A	SW
LA	T	L02	N/A	LAS6 Sys Flow Control Assy	HWM	3	5A	SW
LA	T	M01	N/A	LAB2 TCS LTL MIXING VALVE TEMP SENSOR	HWM	3	5A	SW
LA	T	M02	N/A	LAB2 TCS MTL MIXING VALVE TEMP SENSOR	HWM	3	5A	SW
LA	T	M03	N/A	LAB2 TCS RHX MIXING VALVE TEMP SENSOR	HWM/HWF	3	5A	SW
LA	T	N01	N/A	LAP6 Nitrogen Interface Assy	HWM/HWF	3	5A	SW
LA	T	N02	N/A	LAS6 Nitrogen Interface Assy	HWM/HWF	3	5A	SW
LA	T	R01	N/A	LAX2 Rack Flow Control Assy A9011	HWM/HWF	3	5A	SW
LA	T	R02	N/A	LAX2 Rack Flow Control Assy A9012	HWM/HWF	3	5A	SW
LA	T	R03	N/A	LAX2 Rack Flow Control Assy A9013	HWM/HWF	3	5A	SW
LA	T	R04	N/A	LAX2 Rack Flow Control Assy A9014	HWM/HWF	3	5A	SW
LA	T	R05	N/A	LAX3 Rack Flow Control Assy A9015	HWM/HWF	3	5A	SW
LA	T	R06	N/A	LAX3 Rack Flow Control Assy A9016	HWM/HWF	3	5A	SW
LA	T	R07	N/A	LAX3 Rack Flow Control Assy A9017	HWM/HWF	3	5A	SW
LA	T	R08	N/A	LAX3 Rack Flow Control Assy A9018	HWM/HWF	3	5A	SW
LA	T	R09	N/A	LAX4 Rack Flow Control Assy A9019	HWM/HWF	3	5A	SW
LA	T	R10	N/A	LAX4 Rack Flow Control Assy A9020	HWM/HWF	3	5A	SW
LA	T	R11	N/A	LAX4 Rack Flow Control Assy A9021	HWM/HWF	3	5A	SW
LA	T	R12	N/A	LAX4 Rack Flow Control Assy A9022	HWM/HWF	3	5A	SW
LA	T	R13	N/A	LAX4 Rack Flow Control Assy A9023	HWM/HWF	3	5A	SW
LA	T	R21	N/A	LAB2 Rack Flow Control Assy A9045	HWM/HWF	3	5A	SW
LA	T	R31	N/A	LAB2 Rack Flow Control Assy A9046	HWM/HWF	3	5A	SW
LA	T	T01	N/A	LAB1 Temperature Sensor MT9008	HWM	3	5A	SW
LA	T	T02	N/A	LAB2 Temperature Sensor MT9007	HWM	3	5A	SW
LA	T	T03	N/A	LAC6 Temperature Sensor MT9009	HWM	3	6A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
LA	T	T04	N/A	LAF1 Temperature Sensor MT9010	HWM	3	5A	SW
LA	T	T05	N/A	LAS5 Temperature Sensor MT9018	HWM	3	6A	SW
LA	T	T06	N/A	LAF6 Temperature Sensor MT9015	HWM	3	6A	SW
LA	T	T07	N/A	LAP6 Temperature Sensor MT9017	HWM	3	5A	SW
LA	T	T08	N/A	LAS6 Temperature Sensor MT9019	HWM	3	5A	SW
LA	T	T09	N/A	LAF5 Temperature Sensor MT9014	HWM	3	5A	SW
LA	T	T10	N/A	LAP5 Temperature Sensor MT9016	HWM	3	6A	SW
LA	T	T11	N/A	LAF4 Temperature Sensor MT9013	HWM	3	6A	SW
LA	T	T12	N/A	LAF2 Temperature Sensor MT9011	HWM	3	6A	SW
LA	T	T13	N/A	LAP3 Temperature Sensor	HWM	3	6A	SW
LA	T	T14	N/A	LAP1 Temperature Sensor	HWM	3	6A	SW
LA	T	X01	N/A	LAB2 Loop Crossover Assy A9025	HWM	3	5A	SW
LA	T	X02	N/A	LAB2 Loop Crossover Assy A9025	HWM	3	5A	SW
LA	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
LA	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
LA	Z	P95	N/A	LA Plans & Procedures commands	CIP	S	5A	N/A
M1	B	M95	N/A	MOD MSS Instantiated Instantiated commands	CIP	S	5A	N/A
M1	C	A95	N/A	MOD Comm/Audio Instantiated commands	CIP	S	5A	N/A
M1	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
M1	C	C95	N/A	M1 MOD Comm/ECOMM Instantiated commands	CIP	S	3A	N/A
M1	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
M1	C	K95	N/A	MOD Comm/Ku-Band Instantiated commands	CIP	S	5A	N/A
M1	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
M1	C	S95	N/A	M1 MOD Comm/S-Band Instantiated commands	CIP	S	3A	N/A
M1	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
M1	C	U95	N/A	MOD Comm/UHF Instantiated commands	CIP	S	5A	N/A
M1	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
M1	C	V95	N/A	MOD Comm/Video Instantiated commands	CIP	S	5A	N/A
M1	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
M1	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
M1	D	B48	NCS SCND	Logical MDM NCS Secondary	LDM	0	2A	SW
M1	D	D95	N/A	M1 MOD C&DH Instantiated commands	CIP	S	2A	N/A
M1	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
M1	D	P47	NCS PRI	Logical MDM NCS Primary	LDM	0	2A	SW
M1	D	S47	SSMDM N1-1	Space Station Multiplexer/Demultiplexer Node 1-1	HWM/HWF/SW-LB	1	2A	SW
M1	D	S48	SSMDM N1-2	Space Station Multiplexer/Demultiplexer Node 1-2	HWM/HWF/SW-LB	1	2A	SW
M1	E	A95	N/A	MOD ECLSS/ARS Instantiated Commands	CIP	S	5A	N/A
M1	E	F95	N/A	M1 MOD ECLSS/FDS Instantiated Commands	CIP	S	2A	N/A
M1	E	P95	N/A	M1 MOD ECLSS/ACS Instantiated Commands	CIP	S	2A	N/A
M1	E	S95	N/A	MOD ECLSS/WM Instantiated Commands	CIP	S	5A	N/A
M1	E	T95	N/A	MOD ECLSS/THC Instantiated Commands	CIP	S	5A	N/A
M1	E	V95	N/A	MOD ECLSS/VS Instantiated Commands	CIP	S	5A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
M1	E	W95	N/A	MOD ECLSS/WRM Instantiated Commands	CIP	S	5A	N/A
M1	E	X96	N/A	MOD ECL Instantiated commands	CIP	S	N/A	N/A
M1	F	C95	N/A	MOD CHeCS Instantiated commands	CIP	S	8A	N/A
M1	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
M1	G	C95	N/A	MOD GN&C/CMG Instantiated Commands	CIP	S	5A	N/A
M1	G	G95	N/A	MOD GN&C/GPS Instantiated Commands	CIP	S	5A	N/A
M1	G	R95	N/A	MOD GN&C/P Instantiated Commands	CIP	S	5A	N/A
M1	G	T95	N/A	MOD GN&C/RGA(Theta Dot) Instantiated Commands	CIP	S	5A	N/A
M1	G	U95	N/A	M1 MOD GN&C/MDM Instantiated Commands	CIP	S	2A	N/A
M1	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
M1	J	P95	N/A	MOD SM/Port SARJ Instantiated Commands	CIP	S	5A	N/A
M1	J	S95	N/A	MOD SM/Starboard SARJ Instantiated Commands	CIP	S	5A	N/A
M1	K	R95	N/A	MOD IP Instantiated commands	CIP	S	5A	N/A
M1	M	C95	N/A	M1 MOD Structures & Mechanics/CBM Instantiated Commands	CIP	S	2A	N/A
M1	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
M1	M	L95	N/A	MOD Structures & Mechanics/LCA Instantiated Commands	CIP	S	5A	N/A
M1	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
M1	M	P95	N/A	MOD Structures & Mechanics/PAS Instantiated Commands	CIP	S	5A	N/A
M1	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
M1	M	S95	N/A	MOD Structures & Mechanics/SSAS Instantiated Commands	CIP	S	5A	N/A
M1	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
M1	M	U95	N/A	MOD Structures & Mechanics/ULCAS Instantiated Commands	CIP	S	5A	N/A
M1	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
M1	M	X96	N/A	MOD SNM Instantiated Commands	CIP	S	N/A	N/A
M1	P	A95	N/A	MOD EPS/Battery Instantiated commands	CIP	S	N/A	N/A
M1	P	B95	N/A	MOD EPS/Battery charge/discharge Instantiated commands	CIP	S	N/A	N/A
M1	P	C95	N/A	MOD EPS/DC/DC Converter Instantiated commands	CIP	S	N/A	N/A
M1	P	D95	N/A	M1 MOD EPS/DC Switching Instantiated commands	CIP	S	2A	N/A
M1	P	D96	N/A	MOD EPS/DC switching Instantiated commands	CIP	S	N/A	N/A
M1	P	G95	N/A	MOD EPS/ECU Beta Gimbals Instantiated commands	CIP	S	N/A	N/A
M1	P	L95	N/A	MOD EPS/Plasma Contactor Instantiated commands	CIP	S	N/A	N/A
M1	P	M95	N/A	MOD EPS/Main Bus Switch Instantiated commands	CIP	S	N/A	N/A
M1	P	P95	N/A	MOD EPS/Pump & Flow Control Instantiated commands	CIP	S	N/A	N/A
M1	P	R95	N/A	M1 MOD EPS RPCM Instantiated commands -1	CIP	S	2A	N/A
M1	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
M1	P	R96	N/A	M1 MOD EPS RPCM Instantiated commands -2	CIP	S	2A	N/A
M1	P	S95	N/A	MOD EPS/Solar Shunt Instantiated commands	CIP	S	5A	N/A
M1	P	T95	N/A	MOD EPS/Radiator Instantiated commands	CIP	S	5A	N/A
M1	P	W95	N/A	MOD EPS/ECU Solar Array Instantiated commands	CIP	S	5A	N/A
M1	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
M1	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
M1	T	E95	N/A	MOD Thermal Active Instantiated Commands	CIP	S	5A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
M1	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
M1	T	H95	N/A	M1 MOD Thermal Passive Heater Instantiated Commands	CIP	S	2A	N/A
M1	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
M1	T	R61	Rdtr SSMDM N1-1	Radiator for Space Station Multiplexer/Demultiplexer N1-1	HWM/HWF	1	2A	SW
M1	T	R62	Rdtr SSMDM N1-2	Radiator for Space Station Multiplexer/Demultiplexer N1-2	HWM/HWF	1	2A	SW
M1	T	S01	Press Shl PMA1	Pressure Shell Pressurized Mating Adapter#1	HWM/HWF	1	2A	SW
M1	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
M1	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
M1	Z	P95	N/A	MOD Plans & Procedures Instantiated commands	CIP	S	5A	N/A
M2	G	M01	ACS M Ind PMA 2	Attitude Control System Moding Indicator Pressurized Mating Adapter #2	HWM	1	2A	SW
M2	M	A02	Psiv APAS PMA2	Passive Adrogynous Peripheral Assy Sys Pressurized Mating Adapter#2	HWM	1	2A	SW
M2	T	S02	Press Shl PMA2	Pressure Shell Pressurized Mating Adapter#2	HWM/HWF	1	2A	SW
M3	G	M02	ACS M Ind PMA 3	Attitude Control System Moding Indicator Pressurized Mating Adapter #3	HWM	1	3A	SW
M3	M	A03	Psiv APAS PMA3	Passive Adrogynous Peripheral Assy Sys Pressurized Mating Adapter#3	HWM	1	3A	SW
M3	T	S03	Press Shl PMA3	Pressure Shell Pressurized Mating Adapter#3	HWM/HWF	1	3A	SW
MT	B	M01	MT UMA-1	Mobile Transporter Active Umbilical Mechanism Assembly-1	HWF/FW-LB	1	8A	FW
MT	B	M02	MT UMA-2	Mobile Transporter Active Umbilical Mechanism Assembly-2	HWF/FW-LB	1	8A	FW
MT	B	M03	LDU Dr-1	Linear Drive Unit Drive String -1	HWF/FW-LB	1	8A	FW
MT	B	M04	LDU Dr-2	Linear Drive Unit Drive String -2	HWF/FW-LB	1	8A	FW
MT	B	M05	LTU-1	Load Transfer Unit-1	HWF/FW-LB	1	8A	FW
MT	B	M06	LTU-2	Load Transfer Unit-2	HWF/FW-LB	1	8A	FW
MT	B	M07	LTU-3	Load Transfer Unit-3	HWF/FW-LB	1	8A	FW
MT	B	M08	LTU-4	Load Transfer Unit-4	HWF/FW-LB	1	8A	FW
MT	B	M09	MT UMA-1 IMCA-1	Mobile Transporter Umbilical Mechanism Assembly-1 Integrated Controller Motor-1	HWF/FW-LB	1	8A	FW
MT	B	M10	MT UMA-1 IMCA-2	Mobile Transporter Umbilical Mechanism Assembly-1 Integrated Controller Motor-2	HWF/FW-LB	1	8A	FW
MT	B	M11	MT UMA-2 IMCA-1	Mobile Transporter Umbilical Mechanism Assembly-2 Integrated Controller Motor-1	HWF/FW-LB	1	8A	FW
MT	B	M12	MT UMA-2 IMCA-2	Mobile Transporter Umbilical Mechanism Assembly-2 Integrated Controller Motor-2	HWF/FW-LB	1	8A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	DPUI Sys	DPUI Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
MT	B	M13	LDU Dr-1 Enga IMCA	Linear Drive Unit Drive String -1 Engage Integrated Controller Motor	HWF/FW-LB	1	8A	FW
MT	B	M14	LDU Dr-2 Enga IMCA	Linear Drive Unit Drive String -2 Engage Integrated Controller Motor	HWF/FW-LB	1	8A	FW
MT	B	M15	LDU Dr-1 Xlt IMCA	Linear Drive Unit Drive String -1 Translate Integrated Controller Motor	HWF/FW-LB	1	8A	FW
MT	B	M16	LDU Dr-2 Xlt IMCA	Linear Drive Unit Drive String -2 Translate Integrated Controller Motor	HWF/FW-LB	1	8A	FW
MT	B	M17	LTU-1 IMCA-1	Load Transfer Unit-1 Integrated Controller Motor-1	HWF/FW-LB	1	8A	FW
MT	B	M18	LTU-1 IMCA-2	Load Transfer Unit-1 Integrated Controller Motor-2	HWF/FW-LB	1	8A	FW
MT	B	M19	LTU-2 IMCA-1	Load Transfer Unit-2 Integrated Controller Motor-1	HWF/FW-LB	1	8A	FW
MT	B	M20	LTU-2 IMCA-2	Load Transfer Unit-2 Integrated Controller Motor-2	HWF/FW-LB	1	8A	FW
MT	B	M21	LTU-3 IMCA-1	Load Transfer Unit-3 Integrated Controller Motor-1	HWF/FW-LB	1	8A	FW
MT	B	M22	LTU-3 IMCA-2	Load Transfer Unit-3 Integrated Controller Motor-2	HWF/FW-LB	1	8A	FW
MT	B	M23	LTU-4 IMCA-1	Load Transfer Unit-4 Integrated Controller Motor-1	HWF/FW-LB	1	8A	FW
MT	B	M24	LTU-4 IMCA-2	Load Transfer Unit-4 Integrated Controller Motor-2	HWF/FW-LB	1	8A	FW
MT	B	M27	IUA-1	Interface Umbilical Assembly-1	HWF	1	8A	FW
MT	B	M28	IUA-2	Interface Umbilical Assembly-2	HWF	1	8A	FW
MT	B	M29	RSU-1	Roller Suspension Unit No. 1	HWF	1	8A	FW
MT	B	M30	RSU-2	Roller Suspension Unit No. 2	HWF	1	8A	FW
MT	D	M01	Ampl ORU-1	Amplifier Orbital Replacement Unit-1	HWF	1	8A	FW
MT	D	M02	Ampl ORU-2	Amplifier Orbital Replacement Unit-2	HWF	1	8A	FW
MT	P	Q01	RPCM MT 3A	Remote Power Controller Module MT Power Channel 3A	HWF/FW-LB	1	8A	FW
MT	P	Q02	RPCM MT 4B	Remote Power Controller Module MT Power Channel 4B	HWF/FW-LB	1	8A	FW
MT	T	B20	LDU Back Plane	Linear Drive Unit Back Plane	HWF	1	8A	FW
MT	T	B21	RPCM Brkt	Remote Power Controller Module Bracket	HWF	1	8A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
MT	T	B22	LDU Wheel Bogie	Linear Drive Unit Wheel Bogie	HWF	1	8A	FW
N1	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
N1	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
N1	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
N1	C	P12	VCSA Port-12	Video Camera Support Assembly Port-12	HWF	1	2A	FW
N1	C	S05	EComm N1	EComm Command & Telemetry	HWF/SW-UB	T	2A	SW
N1	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
N1	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
N1	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
N1	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
N1	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
N1	E	A96	N/A	MOD ECL/ARS Instantiated Commands	CIP	S	N/A	N/A
N1	E	D01	N/A	N1UA AIR DAMPER ASSY #2	HWM	3	2A	SW
N1	E	D02	N/A	N1UA AIR DAMPER ASSY #1	HWM	3	2A	SW
N1	E	F18	N/A	N1 NAD Fire Detection Assy	HWM	3	2A	SW
N1	E	F19	N/A	N1 ZEN Fire Detection Assy	HWM	3	2A	SW
N1	E	F96	N/A	MOD ECL/FDS Instantiated Commands	CIP	S	N/A	N/A
N1	E	I11	N/A	N1 Fwd Intermodule Vent Vlv (Supply)	HWM	3	2A	SW
N1	E	I12	N/A	N1 Fwd Intermodule Vent Vlv (Return)	HWM	3	2A	SW
N1	E	I13	N/A	N1 Aft Intermodule Vent Vlv (Supply)	HWM	3	2A	SW
N1	E	I14	N/A	N1 Aft Intermodule Vent Vlv (Return)	HWM	3	2A	SW
N1	E	I15	N/A	N1 NAD Intermodule Vent Vlv (Supply)	HWM	3	2A	SW
N1	E	I16	N/A	N1 NAD Intermodule Vent Vlv (Return)	HWM	3	2A	SW
N1	E	I17	N/A	N1 Port Intermodule Vent Vlv	HWM	3	2A	SW
N1	E	I18	N/A	N1 STBD Intermodule Vent Vlv (Supply)	HWM	3	2A	SW
N1	E	I19	N/A	N1 STBD Intermodule Vent Vlv (Return)	HWM	3	2A	SW
N1	E	I35	N/A	N1 AFT Intermodule Vent Fan	HWM	3	2A	SW
N1	E	I36	N/A	N1 Port Intermodule Vent Fan	HWM	3	2A	SW
N1	E	I37	N/A	N1 STBD Intermodule Vent Fan	HWM	3	2A	SW
N1	E	P96	N/A	MOD ECL/ACS Instantiated Commands	CIP	S	N/A	N/A
N1	E	R25	N/A	N1UA 3W Sample Delivery Vlv A5132	HWM	3	2A	SW
N1	E	R26	N/A	N1UA 3W Sample Delivery Vlv A5133	HWM	3	2A	SW
N1	E	R27	N/A	N1UA 3W Sample Delivery Vlv A5134	HWM	3	2A	SW
N1	E	R28	N/A	N1UA 3W Sample Delivery Vlv A5135	HWM	3	2A	SW
N1	E	R35	Abs Press Xdcr N1	Absolute Pressure Transducer Node 1	HWM	1	2A	SW
N1	E	T18	N1UA Cabin Air Inlet ORU	N1UA Cabin Air Inlet ORU	HWM	3	2A	SW
N1	E	T96	N/A	MOD ECL/THC Instantiated Commands	CIP	S	N/A	N/A
N1	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
N1	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
N1	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
N1	M	C01	CBM-N1FWD-P	Common Berthing Mechanism N1FWD Primary	FW-CB	3	2A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	DPUI Sys	DPUI Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
N1	M	C02	CBM-N1NAD-P	Common Berthing Mechanism N1NAD Primary	FW-UB	3	2A	FW
N1	M	C03	CBM-N1PRT-P	Common Berthing Mechanism N1PRT Primary	FW-UB	3	2A	FW
N1	M	C04	CBM-N1STB-P	Common Berthing Mechanism N1STB Primary	FW-UB	3	2A	FW
N1	M	C05	CBM-N1ZEN-P	Common Berthing Mechanism N1ZEN Primary	FW-UB	3	2A	FW
N1	M	C21	CBM-N1FWD-S	Common Berthing Mechanism N1FWD Secondary	FW-CB	3	2A	FW
N1	M	C22	CBM-N1NAD-S	Common Berthing Mechanism N1NAD Secondary	FW-UB	3	2A	FW
N1	M	C23	CBM-N1PRT-S	Common Berthing Mechanism N1PRT Secondary	FW-UB	3	2A	FW
N1	M	C24	CBM-N1STB-S	Common Berthing Mechanism N1STB Secondary	FW-UB	3	2A	FW
N1	M	C25	CBM-N1ZEN-S	Common Berthing Mechanism N1ZEN Secondary	FW-UB	3	2A	FW
N1	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
N1	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
N1	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
N1	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
N1	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
N1	P	B01	Emer Egress Bat Chg N1-1	Emergency Egress Battery Charger Node 1-1	HWF	1	2A	FW
N1	P	B02	Emer Egress Bat Chg N1-2	Emergency Egress Battery Charger Node 1-2	HWF	1	2A	FW
N1	P	B09	Emer Egress Bat Chg N1-3	Emergency Egress Battery Charger Node 1-3	HWF	1	2A	FW
N1	P	L10	GLA N1-1	General Luminaire Assembly Node 1-1	HWF	1	2A	FW
N1	P	L11	GLA N1-2	General Luminaire Assembly Node 1-2	HWF	1	2A	FW
N1	P	L12	GLA N1-3	General Luminaire Assembly Node 1-3	HWF	1	2A	FW
N1	P	L13	GLA N1-4	General Luminaire Assembly Node 1-4	HWF	1	2A	FW
N1	P	L14	GLA N1-5	General Luminaire Assembly Node 1-5	HWF	1	2A	FW
N1	P	L15	GLA N1-6	General Luminaire Assembly Node 1-6	HWF	1	2A	FW
N1	P	L16	GLA N1-7	General Luminaire Assembly Node 1-7	HWF	1	2A	FW
N1	P	L17	GLA N1-8	General Luminaire Assembly Node 1-8	HWF	1	2A	FW
N1	P	L18	CETA Lum N1-1	Crew and Equipment Translation Aid Luminaire Node 1-1	HWF	1	2A	FW
N1	P	L19	CETA Lum N1-2	Crew and Equipment Translation Aid Luminaire Node 1-2	HWF	1	2A	FW
N1	P	N01	RPCM N1-3B-A	Node 1 Power Channel 3B Remote Power Controller Module A	FW-LB	0	2A	FW
N1	P	N02	RPCM N1-3B-B	Node 1 Power Channel 3B Remote Power Controller Module B	FW-LB	0	2A	FW
N1	P	N03	RPCM N1-3B-C	Node 1 Power Channel 3B Remote Power Controller Module C	FW-LB	0	2A	FW
N1	P	N05	RPCM N1-4B-A	Node 1 Power Channel 4B Remote Power Controller Module A	FW-LB	0	2A	FW
N1	P	N06	RPCM N1-4B-B	Node 1 Power Channel 4B Remote Power Controller Module B	FW-LB	0	2A	FW
N1	P	N07	RPCM N1-4B-C	Node 1 Power Channel 4B Remote Power Controller Module C	FW-LB	0	2A	FW
N1	P	N09	RPCM N1-RS1-A	Node 1 Power Channel RS1 Remote Power Controller Module A	FW-UB	0	2A	FW
N1	P	N10	RPCM N1-RS1-B	Node 1 Power Channel RS1 Remote Power Controller Module B	FW-UB	0	2A	FW
N1	P	N11	RPCM N1-RS1-C	Node 1 Power Channel RS1 Remote Power Controller Module C	FW-UB	0	2A	FW
N1	P	N13	RPCM N1-RS2-A	Node 1 Power Channel RS2 Remote Power Controller Module A	FW-UB	0	2A	FW
N1	P	N14	RPCM N1-RS2-B	Node 1 Power Channel RS2 Remote Power Controller Module B	FW-UB	0	2A	FW
N1	P	N15	RPCM N1-RS2-C	Node 1 Power Channel RS2 Remote Power Controller Module C	FW-UB	0	2A	FW
N1	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
N1	P	U31	Util Rail N1 RS1	Utility Rail Node 1 Power Channel RS1	HWF	1	2A	FW
N1	P	U32	Util Rail N1 RS2	Utility Rail Node 1 Power Channel RS2	HWF	1	2A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
N1	P	U33	Util Rail N1 3B	Utility Rail Node 1 Power Channel 3B	HWF	1	2A	FW
N1	P	U34	Util Rail N1 4B	Utility Rail Node 1 Power Channel 4B	HWF	1	2A	FW
N1	P	X03	UOP N1-1	Utility Outlet Panel Node1-1	HWF	1	2A	FW
N1	P	X04	UOP N1-2	Utility Outlet Panel Node1-2	HWF	1	2A	FW
N1	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
N1	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
N1	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
N1	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
N1	T	P60	N/A	N1 FWD SHELL HEATERS (PRI)	HWM	3	2A	SW
N1	T	P61	N/A	N1 AFT SHELL HEATERS (PRI)	HWM	3	2A	SW
N1	T	P62	N/A	N1 RDL SHELL HEATERS (PRI)	HWM	3	2A	SW
N1	T	P63	N/A	N1 FWD SHELL HEATERS (SEC)	HWM	3	2A	SW
N1	T	P64	N/A	N1 AFT SHELL HEATERS (SEC)	HWM	3	2A	SW
N1	T	P65	N/A	N1 RDL SHELL HEATERS (SEC)	HWM	3	2A	SW
N1	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
N1	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
N2	C	A03	ABC N2-1	Audio Bus Coupler Node 2-1	HWF	3	10A	FW
N2	C	A04	ABC N2-2	Audio Bus Coupler Node 2-2	HWF	3	10A	FW
N2	C	A05	ATU N2	Audio Terminal Unit Node 2	HWF	3	10A	FW
N2	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
N2	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
N2	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
N2	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
N2	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
N2	C	V04	VSU-4	Video Switching Unit-4	FW-CB	3	10A	FW
N2	C	V41	CVIU N2-1	Common Video Interface Unit Node 2 No. 1	HWF	3	10A	FW
N2	C	V42	CVIU N2-2	Common Video Interface Unit Node 2 No. 2	HWF	3	10A	FW
N2	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
N2	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
N2	D	B24	N2SYS SCND	N2 SYS SECONDARY	LDM	3	10A	SW
N2	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
N2	D	P23	N2SYS PRI	N2 SYS PRIMARY	LDM	3	10A	SW
N2	D	S23	MDM N2-1	Node 2 Systems -1 MDM	HWM/SW-LB	3	10A	SW
N2	D	S24	MDM N2-2	Node 2 Systems -2 MDM	HWM/SW-LB	3	10A	SW
N2	E	A41	N/A	N2UA CABIN PRESSURE SENSOR	HWM	3	10A	SW
N2	E	A96	N/A	MOD ECL/ARS Instantiated Commands	CIP	S	N/A	N/A
N2	E	D03	N/A	N2UA AIR DAMPER ASSY	HWM	3	10A	SW
N2	E	F23	N2 AFT FDA	N2 AFT Fire Detection Assy	HWM	3	10A	SW
N2	E	F24	N2 FWD FDA	N2 FWD Fire Detection Assy	HWM	3	10A	SW
N2	E	F96	N/A	MOD ECL/FDS Instantiated Commands	CIP	S	N/A	N/A
N2	E	I20	N/A	N2B1 INTERMODULE VENT VLV	HWM	3	10A	SW
N2	E	I21	N/A	N2B1 INTERMODULE VENT VLV	HWM	3	10A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
N2	E	I22	N/A	N2B2 INTERMODULE VENT VLV	HWM	3	10A	SW
N2	E	I23	N/A	N2B2 INTERMODULE VENT VLV	HWM	3	10A	SW
N2	E	I24	N/A	N2ND INTERMODULE VENT VLV	HWM	3	10A	SW
N2	E	I25	N/A	N2ND INTERMODULE VENT VLV	HWM	3	10A	SW
N2	E	I26	N/A	N2PT INTERMODULE VENT VLV	HWM	3	10A	SW
N2	E	I27	N/A	N2PT INTERMODULE VENT VLV	HWM	3	10A	SW
N2	E	I28	N/A	N2ST INTERMODULE VENT VLV	HWM	3	10A	SW
N2	E	I29	N/A	N2ST INTERMODULE VENT VLV	HWM	3	10A	SW
N2	E	I30	N/A	N2ZE INTERMODULE VENT VLV	HWM	3	10A	SW
N2	E	I31	N/A	N2ZE INTERMODULE VENT VLV	HWM	3	10A	SW
N2	E	I38	N/A	N2B1 INTERMODULE VENT FAN	HWM	3	10A	SW
N2	E	P96	N/A	MOD ECL/ACS Instantiated Commands	CIP	S	N/A	N/A
N2	E	R30	N/A	N2UA 3W SAMPLE DEL VLV A5102	HWM	3	10A	SW
N2	E	R31	N/A	N2UA 3W SAMPLE DEL VLV A5103	HWM	3	10A	SW
N2	E	R32	N/A	N2UA 3W SAMPLE DEL VLV A5101	HWM	3	10A	SW
N2	E	R33	N/A	N2UA 3W SAMPLE DEL VLV A5104	HWM	3	10A	SW
N2	E	T05	N/A	N2UA CABIN AIR ASSY EIB	HWM	3	10A	SW
N2	E	T10	N/A	N2UA CABIN AIR WS ORU	HWM	3	10A	SW
N2	E	T15	N/A	N2UA CABIN AIR HX ASSY	HWM	3	10A	SW
N2	E	T20	N/A	N2UA Cabin Air Inlet ORU	HWM	3	10A	SW
N2	E	T21	N/A	N2UA CABIN AIR INLET ORU	HWM	3	10A	SW
N2	E	T96	N/A	MOD ECL/THC Instantiated Commands	CIP	S	N/A	N/A
N2	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
N2	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
N2	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
N2	M	C08	CBM-N2FWD-P	Common Berthing Mechanism N2FWD Primary	FW-LB	3	10A	FW
N2	M	C09	CBM-N2NAD-P	Common Berthing Mechanism N2NAD Primary	FW-LB	3	10A	FW
N2	M	C10	CBM-N2PRT-P	Common Berthing Mechanism N2PRT Primary	FW-LB	3	10A	FW
N2	M	C11	CBM-N2STB-P	Common Berthing Mechanism N2STB Primary	FW-LB	3	10A	FW
N2	M	C12	CBM-N2ZEN-P	Common Berthing Mechanism N2ZEN Primary	FW-LB	3	10A	FW
N2	M	C28	CBM-N2FWD-S	Common Berthing Mechanism N2FWD Secondary	FW-LB	3	10A	FW
N2	M	C29	CBM-N2NAD-S	Common Berthing Mechanism N2NAD Secondary	FW-LB	3	10A	FW
N2	M	C30	CBM-N2PRT-S	Common Berthing Mechanism N2PRT Secondary	FW-LB	3	10A	FW
N2	M	C31	CBM-N2STB-S	Common Berthing Mechanism N2STB Secondary	FW-LB	3	10A	FW
N2	M	C32	CBM-N2ZEN-S	Common Berthing Mechanism N2ZEN Secondary	FW-LB	3	10A	FW
N2	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
N2	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
N2	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
N2	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
N2	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
N2	P	C15	DDCU N2STB-1B	DC to DC Converter Unit N2STB-1B	FW-LB	2	10A	FW
N2	P	C16	DDCU N2STB-4A	DC to DC Converter Unit N2STB-4A	FW-LB	2	10A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	DPUI Sys	DPUI Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
N2	P	C17	DDCU N2ZEN-2B	DC to DC Converter Unit N2ZEN-2B	FW-LB	2	10A	FW
N2	P	C18	DDCU N2ZEN-3A	DC to DC Converter Unit N2ZEN-3A	FW-LB	2	10A	FW
N2	P	C19	DDCU N2NAD-1B	DC to DC Converter Unit N2NAD-1B	FW-LB	2	10A	FW
N2	P	C20	DDCU N2NAD-4B	DC to DC Converter Unit N2NAD-4B	FW-LB	2	10A	FW
N2	P	C21	DDCU N2PRT-2A	DC to DC Converter Unit N2PRT-2A	FW-LB	2	10A	FW
N2	P	C22	DDCU N2PRT-3A	DC to DC Converter Unit N2PRT-3A	FW-LB	2	10A	FW
N2	P	C96	N/A	MOD EPS/DC/DC Converter Instantiated commands	CIP	S	N/A	N/A
N2	P	N17	RPCM N2 Nad 1A4A-A	Remote Power Controller Module Node 2 Rack Nadir Power Channel 1A4A-A	FW-LB	3	10A	FW
N2	P	N18	RPCM N2 Nad 1A4A-B	Remote Power Controller Module Node 2 Rack Nadir Power Channel 1A4A-B	FW-LB	3	10A	FW
N2	P	N19	RPCM N2 Nad 1A4A-C	Remote Power Controller Module Node 2 Rack Nadir Power Channel 1A4A-C	FW-LB	3	10A	FW
N2	P	N20	RPCM N2 Nad 1A4A-D	Remote Power Controller Module Node 2 Rack Nadir Power Channel 1A4A-D	FW-LB	3	10A	FW
N2	P	N21	RPCM N2 Nad 1B4B-A	Remote Power Controller Module Node 2 Rack Nadir Power Channel 1B4B-A	FW-LB	2	10A	FW
N2	P	N22	RPCM N2 Nad 1B4B-B	Remote Power Controller Module Node 2 Rack Nadir Power Channel 1B4B-B	FW-LB	3	10A	FW
N2	P	N25	RPCM N2 Prt 2A3A-A	Remote Power Controller Module Node 2 Rack Port Power Channel 2A3A-A	FW-LB	2	10A	FW
N2	P	N26	RPCM N2 Prt 2A3A-B	Remote Power Controller Module Node 2 Rack Port Power Channel 2A3A-B	FW-LB	3	10A	FW
N2	P	N27	RPCM N2 Prt 2A3A-C	Remote Power Controller Module Node 2 Rack Port Power Channel 2A3A-C	FW-LB	2	10A	FW
N2	P	N29	RPCM N2 Stbd 1B4A-A	Remote Power Controller Module Node 2 Rack Starboard Power Channel 1B4A-A	FW-LB	3	10A	FW
N2	P	N30	RPCM N2 Stbd 1B4A-B	Remote Power Controller Module Node 2 Rack Starboard Power Channel 1B4A-B	FW-LB	2	10A	FW
N2	P	N33	RPCM N2 Zen 2A3B-A	Remote Power Controller Module Node 2 Rack Zenith Power Channel 2A3B-A	FW-LB	3	10A	FW
N2	P	N34	RPCM N2 Zen 2A3B-B	Remote Power Controller Module Node 2 Rack Zenith Power Channel 2A3B-B	FW-LB	3	10A	FW
N2	P	N35	RPCM N2 Zen 2A3B-C	Remote Power Controller Module Node 2 Rack Zenith Power Channel 2A3B-C	FW-LB	3	10A	FW
N2	P	N36	RPCM N2 Zen 2A3B-D	Remote Power Controller Module Node 2 Rack Zenith Power Channel 2A3B-D	FW-LB	3	10A	FW
N2	P	N37	RPCM N2 Zen 2B3A-A	Remote Power Controller Module Node 2 Rack Zenith Power Channel 2B3A-A	FW-LB	3	10A	FW
N2	P	N38	RPCM N2 Zen 2B3A-B	Remote Power Controller Module Node 2 Rack Zenith Power Channel 2B3A-B	FW-LB	2	10A	FW
N2	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
N2	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
N2	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
N2	T	B07	N/A	N2 LTL CTB 3W MIX VLV	HWM	3	10A	SW
N2	T	B09	N/A	N2 LTL CTB 3W MIX VLV	HWM	3	10A	SW
N2	T	C05	N/A	N2UA TCS LTL CTB INLET TEMP SENSOR	HWM	3	10A	SW
N2	T	C06	N/A	N2UA TCS LTL CTB OUTLET TEMP SENSOR	HWM	3	10A	SW
N2	T	C07	N/A	JEM TCS MTL CTB INLET TEMP SENSOR	HWM	3	10A	SW
N2	T	C08	N/A	JEM TCS MTL CTB OUTLET TEMP SENSOR	HWM	3	10A	SW
N2	T	C09	N/A	APM TCS LTL CTB INLET TEMP SENSOR	HWM	3	10A	SW
N2	T	C10	N/A	APM TCS LTL CTB OUTLET TEMP SENSOR	HWM	3	10A	SW
N2	T	C11	N/A	N2UA TCS MTL CTB INLET TEMP SENSOR	HWM	3	10A	SW
N2	T	C12	N/A	N2UA TCS MTL CTB OUTLET TEMP SENSOR	HWM	3	10A	SW
N2	T	C13	N/A	JEM TCS LTL CTB INLET TEMP SENSOR	HWM	3	10A	SW
N2	T	C14	N/A	JEM TCS LTL CTB OUTLET TEMP SENSOR	HWM	3	10A	SW
N2	T	C15	N/A	APM TCS MTL CTB INLET TEMP SENSOR	HWM	3	10A	SW
N2	T	C16	N/A	APM TCS MTL CTB OUTLET TEMP SENSOR	HWM	3	10A	SW
N2	T	E29	HX N2 MT-A	Ammonia/Water Heat Exchanger Node 2 ITCS Moderate Temperature Loop to EATCS Loop A	HWF	1	10A	SW
N2	T	E30	HX N2 LT-B	Ammonia/Water Heat Exchanger Node 2 ITCS Low Temperature Loop to EATCS Loop B	HWM/HWF	1	10A	SW
N2	T	E31	HX JEM LT-A	Ammonia/Water Heat Exchanger JEM ITCS Low Temperature Loop to EATCS Loop A	HWM/HWF	1	10A	SW
N2	T	E32	HX JEM MT-B	Ammonia/Water Heat Exchanger JEM ITCS Moderate Temperature Loop to EATCS Loop B	HWM/HWF	1	10A	SW
N2	T	E33	HX APM MT-A	Ammonia/Water Heat Exchanger APM ITCS Moderate Temperature Loop to EATCS Loop A	HWM/HWF	1	10A	SW
N2	T	E34	HX APM LT-B	Ammonia/Water Heat Exchanger APM ITCS Low Temperature Loop to EATCS Loop B	HWM/HWF	1	10A	SW
N2	T	E71	RTD N2 LT-1	Temperature Sensor Node 2 Low Temperature Loop No. 1	HWM	1	10A	SW
N2	T	E72	RTD N2 LT-2	Temperature Sensor Node 2 Low Temperature Loop No. 2	HWM	1	10A	SW
N2	T	E73	RTD N2 MT	Temperature Sensor Node 2 Moderate Temperature Loop	HWM	1	10A	SW
N2	T	E74	Ext LT Wtr Line Out N2	External Low Temperature Water Line Outlet to Node 2 Heat Exchanger	HWM/HWF	1	10A	SW
N2	T	E75	Ext LT Wtr Line Inl N2	External Low Temperature Water Line Inlet to Node 2 Heat Exchanger	HWM/HWF	1	10A	SW
N2	T	E76	Ext LT Wtr Line Out APM	External Low Temperature Water Line Outlet to Attached Payload Module Heat Exchanger	HWM/HWF	1	10A	SW
N2	T	E77	Ext LT Wtr Line Inl APM	External Low Temperature Water Line Inlet to Attached Payload Module Heat Exchanger	HWM/HWF	1	10A	SW
N2	T	E78	Ext LT Wtr Line Out JEM	External Low Temperature Water Line Outlet to Japanese Experiment Module Heat Exchanger	HWM/HWF	1	10A	SW
N2	T	E79	Ext LT Wtr Line Inl JEM	External Low Temperature Water Line Inlet to Japanese Experiment Module Heat Exchanger	HWM/HWF	1	10A	SW
N2	T	E80	Ext MT Wtr Line Out N2	External Moderate Temperature Water Line Outlet to Node 2 Heat Exchanger	HWM/HWF	1	10A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
N2	T	E81	Ext MT Wtr Line Inl N2	External Moderate Temperature Water Line Inlet to Node 2 Heat Exchanger	HWM/HWF	1	10A	SW
N2	T	E82	Ext MT Wtr Line Out APM	External Moderate Temperature Water Line Outlet to Attached Payload Module Heat Exchanger	HWM/HWF	1	10A	SW
N2	T	E83	Ext MT Wtr Line Inl APM	External Moderate Temperature Water Line Inlet to Attached Payload Module Heat Exchanger	HWM/HWF	1	10A	SW
N2	T	E84	Ext MT Wtr Line Out JEM	External Moderate Temperature Water Line Outlet to Japanese Experiment Module Heat Exchanger	HWM/HWF	1	10A	SW
N2	T	E85	Ext MT Wtr Line Inl JEM	External Moderate Temperature Water Line Inlet to Japanese Experiment Module Heat Exchanger	HWM/HWF	1	10A	SW
N2	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
N2	T	F29	N/A	N2UA TCS MTL AMMONIA/WATER HX GROUP	HWM	3	10A	SW
N2	T	F30	N/A	N2UA TCS LTL AMMONIA/WATER HX GROUP	HWM	3	10A	SW
N2	T	F31	N/A	JEM TCS LTL AMMONIA/WATER HX GROUP	HWM	3	10A	SW
N2	T	F32	N/A	JEM TCS MTL AMMONIA/WATER HX GROUP	HWM	3	10A	SW
N2	T	F33	N/A	APM TCS MTL AMMONIA/WATER HX GROUP	HWM	3	10A	SW
N2	T	F34	N/A	APM TCS LTL AMMONIA/WATER HX GROUP	HWM	3	10A	SW
N2	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
N2	T	I25	PPA N2-1	Internal Thermal Pump Package Assy N2-1	FW-LB	3	10A	FW
N2	T	I26	PPA N2-2	Internal Thermal Pump Package Assy N2-2	FW-LB	3	10A	FW
N2	T	N11	N/A	N2UA NITROGEN I/F ASSY	HWM	3	10A	SW
N2	T	N12	N/A	N2UA NITROGEN I/F ASSY	HWM	3	10A	SW
N2	T	P40	N/A	N2 FWD SHELL HEATERS (PRI)	HWM	3	10A	SW
N2	T	P41	N/A	N2 AFT SHELL HEATERS (PRI)	HWM	3	10A	SW
N2	T	P42	N/A	N2 RADIAL SHELL HEATERS (PRI)	HWM	3	10A	SW
N2	T	P43	N/A	N2 FWD SHELL HEATERS (SEC)	HWM	3	10A	SW
N2	T	P44	N/A	N2 AFT SHELL HEATERS (SEC)	HWM	3	10A	SW
N2	T	P45	N/A	N2 RADIAL SHELL HEATERS (SEC)	HWM	3	10A	SW
N2	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
N2	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
P1	B	P06	MSC Util Port-6	Mobile Servicing Center Utility Port-6	HWF	1	11A	FW
P1	B	P07	MSC Util Port-7	Mobile Servicing Center Utility Port-7	HWF	1	11A	FW
P1	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
P1	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
P1	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
P1	C	P06	VCSA Port-6	Video Camera Support Assembly Port-6	HWF	1	11A	FW
P1	C	P07	VCSA Port-7	Video Camera Support Assembly Port-7	HWF	1	11A	FW
P1	C	P08	VCSA Port-8	Video Camera Support Assembly Port-8	HWF	1	11A	FW
P1	C	P09	VCSA Port-9	Video Camera Support Assembly Port-9	HWF	1	11A	FW
P1	C	S03	ACBSP P1	ACS Baseband Signal Processor P1	HWF/FW-CB	1	3A	FW
P1	C	S13	ACRFG P1	S-Band Radio Frequency Group P1	HWF/FW-CB	1	3A	FW
P1	C	S22	XPDR P1	Standard TDRSS Transponder P1	HWF/FW-CB	1	4A	FW
P1	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
P1	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
P1	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
P1	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
P1	D	B26	P1-B/U	Logical MDM P1 Monitor	LDM	1	11A	SW
P1	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
P1	D	P25	P1-PRI	Logical MDM P1 Control	LDM	1	11A	SW
P1	D	S25	SSMDM P1-1	Space Station Multiplexer/Demultiplexer P1-1	HWM/HWF/SW-LB	1	11A	SW
P1	D	S26	SSMDM P1-2	Space Station Multiplexer/Demultiplexer P1-2	HWM/HWF/SW-LB	1	11A	SW
P1	D	S29	SSMDM PTR	Space Station Multiplexer/Demultiplexer Port Thermal Radiator	HWM/HWF/SW-LB	1	11A	SW
P1	E	X96	N/A	MOD ECL Instantiated commands	CIP	S	N/A	N/A
P1	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
P1	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
P1	J	T01	RJMC P1-1	Rotary Joint Motor Controller P1-1	HWM/HWF/FW-UBN	1	11A	SW
P1	J	T03	RJMC P1-2	Rotary Joint Motor Controller P1-2	HWM/HWF/FW-UBN	1	11A	SW
P1	J	T11	DLA P1-1	TRRJ Drive Lock Assembly P1-1	HWM/HWF	1	11A	SW
P1	J	T12	DLA P1-2	TRRJ Drive Lock Assembly P1-2	HWM/HWF	1	11A	SW
P1	J	T14	BRG P1	TRRJ Bearing Assembly	HWM	1	11A	SW
P1	J	T16	FHRC P1	TRRJ Flexible Hose Rotary Coupler P1	HWM	1	11A	SW
P1	J	T18	PDTA P1	TRRJ Power Data Transfer Assembly P1	HWM	1	11A	SW
P1	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
P1	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
P1	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
P1	M	S22	Cap Ltch P1-P3	Segment to Segment Attachment System Capture Latch Assembly P1 to P3 (Subassemblies)	HWM/HWF/FW-LB	1	11A	SW
P1	M	S23	BBC P1-P3-1	Bolt Bus Controller P1 to P3-1	HWF/FW-LB	1	11A	FW
P1	M	S24	BBC P1-P3-2	Bolt Bus Controller P1 to P3-2	HWF/FW-LB	1	11A	FW
P1	M	S25	MBA P1-P3-1	Motorized Bolt Assembly P1 to P3-1	HWM/HWF	1	11A	SW
P1	M	S26	MBA P1-P3-2	Motorized Bolt Assembly P1 to P3-2	HWM/HWF	1	11A	SW
P1	M	S27	MBA P1-P3-3	Motorized Bolt Assembly P1 to P3-3	HWM/HWF	1	11A	SW
P1	M	S28	MBA P1-P3-4	Motorized Bolt Assembly P1 to P3-4	HWM/HWF	1	11A	SW
P1	M	S35	Cap Ltch P1-P3 IMCA-1	Capture Latch Assembly P1 to P3 Integrated Motor Controller Assembly-1	HWF/FW-LB	1	11A	FW
P1	M	S36	Cap Ltch P1-P3 IMCA-2	Capture Latch Assembly P1 to P3 Integrated Motor Controller Assembly-2	HWF/FW-LB	1	11A	FW
P1	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
P1	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
P1	P	C28	DDCU P1-3A	DC to DC Converter Unit P1-3A	FW-LB	2	11A	FW
P1	P	C96	N/A	MOD EPS/DC/DC Converter Instantiated commands	CIP	S	N/A	N/A
P1	P	Q47	RPCM P1 1A-A	Remote Power Controller Module P1 Power Channel 1A-A	FW-UB	1	11A	FW
P1	P	Q48	RPCM P1 1A-B	Remote Power Controller Module P1 Power Channel 1A-B	FW-UB	1	11A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
P1	P	Q51	RPCM P1 4B-E	Remote Power Controller Module P1 Power Channel 4B-E	FW-UB	1	11A	FW
P1	P	Q52	RPCM P1 4B-F	Remote Power Controller Module P1 Power Channel 4B-F	FW-UB	1	11A	FW
P1	P	Q53	RPCM P1 4B-G	Remote Power Controller Module P1 Power Channel 4B-G	FW-UB	1	11A	FW
P1	P	Q55	RPCM P1 2B-A	Remote Power Controller Module P1 Power Channel 2B-A	FW-UB	1	11A	FW
P1	P	Q56	RPCM P1 2B-B	Remote Power Controller Module P1 Power Channel 2B-B	FW-UB	1	11A	FW
P1	P	Q57	RPCM P1 2B-C	Remote Power Controller Module P1 Power Channel 2B-C	FW-UB	1	11A	FW
P1	P	Q58	RPCM P1 2B-D	Remote Power Controller Module P1 Power Channel 2B-D	FW-UB	1	11A	FW
P1	P	Q59	RPCM P1 3A-E	Remote Power Controller Module P1 Power Channel 3A-E	FW-UB	1	11A	FW
P1	P	Q60	RPCM P1 3A-F	Remote Power Controller Module P1 Power Channel 3A-F	FW-UB	1	11A	FW
P1	P	Q61	RPCM P1 3A-G	Remote Power Controller Module P1 Power Channel 3A-G	FW-UB	1	11A	FW
P1	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
P1	P	U17	Util Rail P1 1A4B	Utility Rail S1/P1 P1 Power Channel 1A4B	HWM/HWF	1	11A	SW
P1	P	U18	Util Rail P1 2B3A	Utility Rail S1/P1 P1 Power Channel 2B3A	HWM/HWF	1	11A	SW
P1	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
P1	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
P1	T	E02	PM-B	Pump-ORU Module EATCS Loop B	HWM/HWF/FW-UB	1	11A	SW
P1	T	E04	NTA-B	Nitrogen-ORU Tank EATCS Loop B	HWM/HWF	1	11A	SW
P1	T	E06	ATA-B	Ammonia-ORU Tank EATCS Loop B	HWM/HWF	1	11A	SW
P1	T	E13	RBVM P1-1-1	Radiator Beam Valve Module P1 Radiator No. 1 Valve Module No. 1	HWM/HWF/FW-UB	1	11A	SW
P1	T	E14	RBVM P1-1-2	Radiator Beam Valve Module P1 Radiator No. 1 Valve Module No. 2	HWM/HWF/FW-UB	1	11A	SW
P1	T	E15	RBVM P1-2-1	Radiator Beam Valve Module P1 Radiator No. 2 Valve Module No. 1	HWM/HWF/FW-UB	1	11A	SW
P1	T	E16	RBVM P1-2-2	Radiator Beam Valve Module P1 Radiator No. 2 Valve Module No. 2	HWM/HWF/FW-UB	1	11A	SW
P1	T	E17	RBVM P1-3-1	Radiator Beam Valve Module P1 Radiator No. 3 Valve Module No. 1	HWM/HWF/FW-UB	1	11A	SW
P1	T	E18	RBVM P1-3-2	Radiator Beam Valve Module P1 Radiator No. 3 Valve Module No. 2	HWM/HWF/FW-UB	1	11A	SW
P1	T	E22	Rdtr P1-1	Radiator P1-1	HWM/HWF/FW-UB	1	11A	SW
P1	T	E23	Rdtr P1-2	Radiator P1-2	HWM/HWF/FW-UB	1	11A	SW
P1	T	E24	Rdtr P1-3	Radiator P1-3	HWM/HWF/FW-UB	1	11A	SW
P1	T	E46	DDCU Coldplate P1 3A	DC to DC Converter Unit Coldplate Loop B P13A	HWM/HWF	1	11A	SW
P1	T	E48	PM-B PCVP	Pump-ORU Module EATCS Loop B Pump and Control Valve Package	HWM/HWF/FW-UB	1	11A	FW
P1	T	E59	RBVM P1-1-1 IMCA	Radiator Beam Valve Module P1-1-1 Integrated Controller Motor	FW-UB	1	11A	FW
P1	T	E60	RBVM P1-1-2 IMCA	Radiator Beam Valve Module P1-1-2 Integrated Controller Motor	FW-UB	1	11A	FW
P1	T	E61	RBVM P1-2-1 IMCA	Radiator Beam Valve Module P1-2-1 Integrated Controller Motor	FW-UB	1	11A	FW
P1	T	E62	RBVM P1-2-2 IMCA	Radiator Beam Valve Module P1-2-2 Integrated Controller Motor	FW-UB	1	11A	FW
P1	T	E63	RBVM P1-3-1 IMCA	Radiator Beam Valve Module P1-3-1 Integrated Controller Motor	FW-UB	1	11A	FW
P1	T	E64	RBVM P1-3-2 IMCA	Radiator Beam Valve Module P1-3-2 Integrated Controller Motor	FW-UB	1	11A	FW
P1	T	E65	Rdtr P1-1 IMCA	Radiator ORU P1-1 Integrated Controller Motor	FW-UB	1	11A	FW
P1	T	E66	Rdtr P1-2 IMCA	Radiator ORU P1-2 Integrated Controller Motor	FW-UB	1	11A	FW
P1	T	E67	Rdtr P1-3 IMCA	Radiator ORU P1-3 Integrated Controller Motor	FW-UB	1	11A	FW
P1	T	E69	Rdtr Bm P1	Radiator Beam P1	HWM/HWF	1	11A	SW
P1	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
P1	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
P1	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
P1	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
P3	B	P08	MSC Util Port-8	Mobile Servicing Center Utility Port-8	HWF	1	12A	FW
P3	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
P3	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
P3	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
P3	C	P10	VCSA Port-10	Video Camera Support Assembly Port-10	HWF	1	12A	FW
P3	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
P3	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
P3	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
P3	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
P3	D	B28	P3-B/U	Logical MDM P3 Monitor	LDM	1	12A	SW
P3	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
P3	D	P27	P3-PRI	Logical MDM P3 Control	LDM	1	12A	SW
P3	D	S27	SSMDM P3-1	Space Station Multiplexer/Demultiplexer P3-1	HWM/HWF/SW-LB	1	12A	SW
P3	D	S28	SSMDM P3-2	Space Station Multiplexer/Demultiplexer P3-2	HWM/HWF/SW-LB	1	12A	SW
P3	E	X96	N/A	MOD ECL Instantiated commands	CIP	S	N/A	N/A
P3	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
P3	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
P3	J	S01	RJMC P3-1	SARJ Rotary Joint Motor Controller P3-1	HWM/HWF/FW-UBN	1	12A	SW
P3	J	S02	RJMC P3-2	SARJ Rotary Joint Motor Controller P3-2	HWM/HWF/FW-UBN	1	12A	SW
P3	J	S07	DLA P3-1	SARJ Drive Lock Assembly P3-1	HWM	1	12A	SW
P3	J	S08	DLA P3-2	SARJ Drive Lock Assembly P3-2	HWM	1	12A	SW
P3	J	S15	Inbd Brg P3	SARJ Inboard Bearing Assembly P3	HWM	1	12A	SW
P3	J	S17	Outbd Brg P3	SARJ Outboard Bearing Assembly P3	HWM	1	12A	SW
P3	J	S19	Trndl P3-1	SARJ Trundle P3-1	HWM	1	12A	SW
P3	J	S20	Trndl P3-2	SARJ Trundle P3-2	HWM	1	12A	SW
P3	J	S21	Trndl P3-3	SARJ Trundle P3-3	HWM	1	12A	SW
P3	J	S22	Trndl P3-4	SARJ Trundle P3-4	HWM	1	12A	SW
P3	J	S23	Trndl P3-5	SARJ Trundle P3-5	HWM	1	12A	SW
P3	J	S24	Trndl P3-6	SARJ Trundle P3-6	HWM	1	12A	SW
P3	J	S25	Trndl P3-7	SARJ Trundle P3-7	HWM	1	12A	SW
P3	J	S26	Trndl P3-8	SARJ Trundle P3-8	HWM	1	12A	SW
P3	J	S27	Trndl P3-9	SARJ Trundle P3-9	HWM	1	12A	SW
P3	J	S28	Trndl P3-10	SARJ Trundle P3-10	HWM	1	12A	SW
P3	J	S29	Trndl P3-11	SARJ Trundle P3-11	HWM	1	12A	SW
P3	J	S30	Trndl P3-12	SARJ Trundle P3-12	HWM	1	12A	SW
P3	J	S67	UTA P3	SARJ Utility Transfer Assembly P3	HWM	1	12A	SW
P3	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
P3	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
P3	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	DPUI Sys	DPUI Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
P3	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
P3	M	U01	UCCAS-1 Cap Ltch	Unpressurized Cargo Carrier Attach System-1 Capture Latch Assembly	HWM/HWF/FW-LB	1	12A	SW
P3	M	U02	UCCAS-2 Cap Ltch	Unpressurized Cargo Carrier Attach System-2 Capture Latch Assembly	HWM/HWF/FW-LB	1	12A	SW
P3	M	U03	UCCAS-1 UMA	Unpressurized Cargo Carrier Attach System-1 Umbilical Mechanism Assembly	HWM/HWF/FW-LB	1	12A	SW
P3	M	U04	UCCAS-2 UMA	Unpressurized Cargo Carrier Attach System-2 Umbilical Mechanism Assembly	HWM/HWF/FW-LB	1	12A	SW
P3	M	U05	UCCAS-1 Cap Ltch IMCA-1	Unpressurized Carrier Attach System-1 Capture Latch Assembly Integrated Motor Controller Assembly-1	HWF/FW-LB	1	12A	FW
P3	M	U06	UCCAS-1 Cap Ltch IMCA-2	Unpressurized Carrier Attach System-1 Capture Latch Assembly Integrated Motor Controller Assembly-2	HWF/FW-LB	1	12A	FW
P3	M	U07	UCCAS-2 Cap Ltch IMCA-1	Unpressurized Carrier Attach System-2 Capture Latch Assembly Integrated Motor Controller Assembly-1	HWF/FW-LB	1	12A	FW
P3	M	U08	UCCAS-2 Cap Ltch IMCA-2	Unpressurized Carrier Attach System-2 Capture Latch Assembly Integrated Motor Controller Assembly-2	HWF/FW-LB	1	12A	FW
P3	M	U09	UCCAS-1 UMA IMCA-1	Unpressurized Carrier Attach System-1 Umbilical Mating Adapter Integrated Motor Controller Assembly-1	HWF/FW-LB	1	12A	FW
P3	M	U10	UCCAS-1 UMA IMCA-2	Unpressurized Carrier Attach System-1 Umbilical Mating Adapter Integrated Motor Controller Assembly-2	HWF/FW-LB	1	12A	FW
P3	M	U11	UCCAS-2 UMA IMCA-1	Unpressurized Carrier Attach System-2 Umbilical Mating Adapter Integrated Motor Controller Assembly-1	HWF/FW-LB	1	12A	FW
P3	M	U12	UCCAS-2 UMA IMCA-2	Unpressurized Carrier Attach System-2 Umbilical Mating Adapter Integrated Motor Controller Assembly-2	HWF/FW-LB	1	12A	FW
P3	M	U21	UCCAS-1	Unpressurized Carrier Attach System-1 Utility Port	HWF/FW-LB	1	12A	FW
P3	M	U22	UCCAS-2	Unpressurized Carrier Attach System-2 Utility Port	HWF/FW-LB	1	12A	FW
P3	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
P3	P	L44	CETA Lum P3-1	Crew Equipment Translation Aid Luminaire P3-1	HWF	1	12A	FW
P3	P	Q63	RPCM P3 1A-A	Remote Power Controller Module P3 Power Channel 1A-A	FW-UB	1	12A	FW
P3	P	Q65	RPCM P3 4B-C	Remote Power Controller Module P3 Power Channel 4B-C	FW-UB	1	12A	FW
P3	P	Q67	RPCM P3 4B-E	Remote Power Controller Module P3 Power Channel 4B-E	FW-UB	1	12A	FW
P3	P	Q68	RPCM P3 4B-F	Remote Power Controller Module P3 Power Channel 4B-F	FW-UB	1	12A	FW
P3	P	Q69	RPCM P3 2B-A	Remote Power Controller Module P3 Power Channel 2B-A	FW-UB	1	12A	FW
P3	P	Q71	RPCM P3 3A-C	Remote Power Controller Module P3 Power Channel 3A-C	FW-UB	1	12A	FW
P3	P	Q73	RPCM P3 3A-E	Remote Power Controller Module P3 Power Channel 3A-E	FW-UB	1	12A	FW
P3	P	Q74	RPCM P3 3A-F	Remote Power Controller Module P3 Power Channel 3A-F	FW-UB	1	12A	FW
P3	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
P3	P	U19	Util Rail P3 1A4B	Utility Rail S3/P3 P3 Power Channel 1A4B	HWM/HWF	1	12A	SW
P3	P	U20	Util Rail P3 2B3A	Utility Rail S3/P3 P3 Power Channel 2B3A	HWM/HWF	1	12A	SW
P3	P	U96	N/A	MOD EPS/Port SARJ Instantiated commands	CIP	S	N/A	N/A
P3	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
P3	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
P3	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
P3	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
P3	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
P3	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
P4	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
P4	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
P4	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
P4	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
P4	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
P4	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
P4	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
P4	D	B37	P4 PVCU-B/U	Logical MDM P4 Backup PVCU	LDM	2	12A	SW
P4	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
P4	D	P33	P4 PVCU-PRI	Logical MDM P4 Primary PVCU	LDM	2	12A	SW
P4	D	S33	MDM PVCU-2A	Photovoltaic Control Unit-2A MDM	SW-LB	2	12A	SW
P4	D	S37	MDM PVCU-4A	Photovoltaic Control Unit-4A MDM	SW-LB	2	12A	SW
P4	E	X96	N/A	MOD ECL Instantiated commands	CIP	S	N/A	N/A
P4	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
P4	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
P4	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
P4	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
P4	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
P4	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
P4	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
P4	M	X96	N/A	MOD MCS Instantiated commands	CIP	S	N/A	N/A
P4	P	A01	BCDU P4UPR-4A3	Battery Charge/Discharge Unit P4UPR-4A3	FW-UB	2	2J/A	FW
P4	P	A03	DDCU P4UPR-4A	DC to DC Converter Unit P4UPR-4A	FW-UB	2	12A	FW
P4	P	A04	BCDU P4UPR-4A2	Battery Charge/Discharge Unit P4UPR-4A2	FW-UB	2	12A	FW
P4	P	A05	BCDU P4UPR-4A1	Battery Charge/Discharge Unit P4UPR-4A1	FW-UB	2	12A	FW
P4	P	A06	BATT P4UPR-4A3-1	Battery P4UPR-4A3-1	HWF	2	2J/A	FW
P4	P	A08	BATT P4UPR-4A2-1	Battery P4UPR-4A2-1	HWF	2	12A	FW
P4	P	A09	BATT P4UPR-4A1-1	Battery P4UPR-4A1-1	HWF	2	12A	FW
P4	P	A10	BATT P4UPR-4A3-2	Battery P4UPR-4A3-2	HWF	2	2J/A	FW
P4	P	A12	BATT P4UPR-4A2-2	Battery P4UPR-4A2-2	HWF	2	12A	FW
P4	P	A13	BATT P4UPR-4A1-2	Battery P4UPR-4A1-2	HWF	2	12A	FW
P4	P	A14	BATT P4LWR-2A3-2	Battery P4LWR-2A3-2	HWF	2	2J/A	FW
P4	P	A16	BATT P4LWR-2A2-2	Battery P4LWR-2A2-2	HWF	2	12A	FW
P4	P	A17	BATT P4LWR-2A1-2	Battery P4LWR-2A1-2	HWF	2	12A	FW
P4	P	A18	BATT P4LWR-2A3-1	Battery P4LWR-2A3-1	HWF	2	2J/A	FW
P4	P	A20	BATT P4LWR-2A2-1	Battery P4LWR-2A2-1	HWF	2	12A	FW
P4	P	A21	BATT P4LWR-2A1-1	Battery P4LWR-2A1-1	HWF	2	12A	FW
P4	P	A22	BCDU P4LWR-2A3	Battery Charge/Discharge Unit P4LWR-2A3	FW-UB	2	2J/A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	DPUI Sys	DPUI Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
P4	P	A23	DDCU P4LWR-2A	DC to DC Converter Unit P4LWR-2A	FW-UB	2	12A	FW
P4	P	A25	BCDU P4LWR-2A2	Battery Charge/Discharge Unit P4LWR-2A2	FW-UB	2	12A	FW
P4	P	A26	BCDU P4LWR-2A1	Battery Charge/Discharge Unit P4LWR-2A1	FW-UB	2	12A	FW
P4	P	A96	N/A	MOD EPS/Battery Instantiated commands	CIP	S	N/A	N/A
P4	P	B03	ECU BGA P4LWR-2A/4A	Electronics Control Unit Beta Gimbal Assembly P4LWR-2A/4A	FW-UB	2	12A	FW
P4	P	B04	ECU BGA P4UPR-2A/4A	Electronics Control Unit Beta Gimbal Assembly P4UPR-2A/4A	FW-UB	2	12A	FW
P4	P	B09	ECU ORU P4LWR-2A/4A	Electronics Control Unit Orbital Replacement Unit P4LWR-2A/4A	HWF	2	12A	FW
P4	P	B10	ECU ORU P4UPR-2A/4A	Electronics Control Unit Orbital Replacement Unit P4upr-2A/4A	HWF	2	12A	FW
P4	P	B11	BMRRM P4LWR-2A	"Beta Gimbal Bearing, Motor, & Roll Ring Module P4LWR-2A"	HWF	2	12A	FW
P4	P	B12	BMRRM P4UPR-4A	"Beta Gimbal Bearing, Motor, & Roll Ring Module P4UPR-4A"	HWF	2	12A	FW
P4	P	B96	N/A	MOD EPS/Battery chg/dschg Instantiated commands	CIP	S	N/A	N/A
P4	P	C96	N/A	MOD EPS/DC/DC Converter Instantiated commands	CIP	S	N/A	N/A
P4	P	D05	DCSU P4LWR-2A RPCM A	DC Switching Unit P4LWR-2A RPCM A TYPE I	FW-UB	2	12A	FW
P4	P	D06	DCSU P4LWR-2A RPCM B	DC Switching Unit P4LWR-2A RPCM B TYPE IV	FW-UB	2	12A	FW
P4	P	D07	DCSU P4UPR-4A RPCM A	DC Switching Unit P4UPR-4A RPCM A TYPE I	FW-UB	2	12A	FW
P4	P	D08	DCSU P4UPR-4A RPCM B	DC Switching Unit P4UPR-4A RPCM B TYPE IV	FW-UB	2	12A	FW
P4	P	D19	DCSU P4LWR-2A SCA	DC Switching Unit Switchgear Cntlr Assy P4LWR-2A	FW-UB	2	12A	FW
P4	P	D20	DCSU P4UPR-4A SCA	DC Switching Unit Switchgear Cntlr Assy P4UPR-4A	FW-UB	2	12A	FW
P4	P	D96	N/A	MOD EPS/DC switching Instantiated commands	CIP	S	N/A	N/A
P4	P	G11	BGA P4LWR-2A/4A	Beta Gimbal Assy P4LWR-2A/4A	HWF	2	12A	FW
P4	P	G12	BGA P4UPR-2A/4A	Beta Gimbal Assy P4UPR-2A/4A	HWF	2	12A	FW
P4	P	G96	N/A	MOD EPS/ECU Beta Gimbals Instantiated commands	CIP	S	N/A	N/A
P4	P	P96	N/A	MOD EPS/Pump & Flow Control Instantiated commands	CIP	S	N/A	N/A
P4	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
P4	P	S03	SSU P4LWR-2A	Sequential Shunt Unit P4LWR-2A	FW-UB	2	12A	FW
P4	P	S04	SSU P4UPR-4A	Sequential Shunt Unit P4UPR-4A	FW-UB	2	12A	FW
P4	P	S96	N/A	MOD EPS/Solar Shunt Converter Instantiated commands	CIP	S	N/A	N/A
P4	P	T96	N/A	MOD EPS/Radiator Instantiated commands	CIP	S	N/A	N/A
P4	P	U96	N/A	MOD EPS/Port SARJ Instantiated commands	CIP	S	N/A	N/A
P4	P	W03	ECU P4LWR-2A/4A SAW	Electronics Cntrl Unit Solar Array Wing P4LWR-2A/4A	FW-UB	2	12A	FW
P4	P	W04	ECU P4UPR-2A/4A SAW	Electronics Cntrl Unit Solar Array Wing P4UPR-2A/4A	FW-UB	2	12A	FW
P4	P	W12	SAW P4LWR-2A/4A LBB MDA	Solar Array Wing P4LWR-2A/4A LBB MDA	HWF	2	12A	FW
P4	P	W13	SAW P4UPR-2A/4A LBB MDA	Solar Array Wing P4UPR-2A/4A LBB MDA	HWF	2	12A	FW
P4	P	W20	SAW P4LWR-2A/4A RBB MDA	Solar Array Wing P4LWR-2A/4A RBB MDA	HWF	2	12A	FW
P4	P	W21	SAW P4UPR-2A/4A RBB MDA	Solar Array Wing P4UPR-2A/4A RBB MDA	HWF	2	12A	FW
P4	P	W28	SAW P4LWR-2A/4A Mast MDA	Solar Array Wing P4LWR-2A/4A Mast MDA	HWF	2	12A	FW
P4	P	W29	SAW P4UPR-2A/4A Mast MDA	Solar Array Wing P4UPR-2A/4A Mast MDA	HWF	2	12A	FW
P4	P	W96	N/A	MOD EPS/ECU Solar Array Instantiated commands	CIP	S	N/A	N/A
P4	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
P4	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
P4	T	A11	PFCS P4UPR-4A	Pump Flow Control Subassy P4UPR-4A	FW-UB	2	12A	FW
P4	T	A15	PFCS P4LWR-2A	Pump Flow Control Subassy P4LWR-2A	FW-UB	2	12A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
P4	T	A27	PVR P4LWR-2A	Photovoltaic Radiator P4LWR-2A	FW-UB	2	12A	FW
P4	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
P4	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
P4	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
P4	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
P6	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
P6	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
P6	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
P6	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
P6	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
P6	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
P6	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
P6	D	B38	P6 PVCU-B/U	Logical MDM P6 Backup PVCU	LDM	2	4A	SW
P6	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
P6	D	P34	P6 PVCU-PRI	Logical MDM P6 Primary PVCU	LDM	2	4A	SW
P6	D	S34	MDM PVCU-2B	Photovoltaic Control Unit-2B MDM	HWF/SW-LB	2	4A	SW
P6	D	S38	MDM PVCU-4B	Photovoltaic Control Unit-4B MDM	HWF/SW-LB	2	4A	SW
P6	E	X96	N/A	MOD ECL Instantiated commands	CIP	S	N/A	N/A
P6	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
P6	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
P6	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
P6	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
P6	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
P6	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
P6	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
P6	P	A01	BCDU P6UPR-2B3	Battery Charge/Discharge Unit P6UPR-2B3	FW-UB	2	UF-1	FW
P6	P	A03	DDCU P6UPR-2B	DC to DC Converter Unit P6UPR-2B	FW-UB	2	4A	FW
P6	P	A04	BCDU P6UPR-2B2	Battery Charge/Discharge Unit P6UPR-2B2	FW-UB	2	4A	FW
P6	P	A05	BCDU P6UPR-2B1	Battery Charge/Discharge Unit P6UPR-2B1	FW-UB	2	4A	FW
P6	P	A06	BATT P6UPR-2B3-1	Battery P6UPR-2B3-1	HWF	2	UF-1	FW
P6	P	A08	BATT P6UPR-2B2-1	Battery P6UPR-2B2-1	HWF	2	4A	FW
P6	P	A09	BATT P6UPR-2B1-1	Battery P6UPR-2B1-1	HWF	2	4A	FW
P6	P	A10	BATT P6UPR-2B3-2	Battery P6UPR-2B3-2	HWF	2	UF-1	FW
P6	P	A12	BATT P6UPR-2B2-2	Battery P6UPR-2B2-2	HWF	2	4A	FW
P6	P	A13	BATT P6UPR-2B1-2	Battery P6UPR-2B1-2	HWF	2	4A	FW
P6	P	A14	BATT P6LWR-4B3-2	Battery P6LWR-4B3-2	HWF	2	UF-1	FW
P6	P	A16	BATT P6LWR-4B2-2	Battery P6LWR-4B2-2	HWF	2	4A	FW
P6	P	A17	BATT P6LWR-4B1-2	Battery P6LWR-4B1-2	HWF	2	4A	FW
P6	P	A18	BATT P6LWR-4B3-1	Battery P6LWR-4B3-1	HWF	2	UF-1	FW
P6	P	A20	BATT P6LWR-4B2-1	Battery P6LWR-4B2-1	HWF	2	4A	FW
P6	P	A21	BATT P6LWR-4B1-1	Battery P6LWR-4B1-1	HWF	2	4A	FW
P6	P	A22	BCDU P6LWR-4B3	Battery Charge/Discharge Unit P6LWR-4B3	FW-UB	2	UF-1	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
P6	P	A23	DDCU P6LWR-4B	DC to DC Converter Unit P6LWR-4B	HWF/FW-UB	2	4A	FW
P6	P	A25	BCDU P6LWR-4B2	Battery Charge/Discharge Unit P6LWR-4B2	FW-UB	2	4A	FW
P6	P	A26	BCDU P6LWR-4B1	Battery Charge/Discharge Unit P6LWR-4B1	FW-UB	2	4A	FW
P6	P	A95	N/A	P6 MOD EPS/Battery Instantiated commands	CIP	S	4A	N/A
P6	P	A96	N/A	MOD EPS/Battery Instantiated commands	CIP	S	N/A	N/A
P6	P	B07	ECU BGA P6LWR-2B/4B	Electronics Control Unit Beta Gimbal Assembly P6LWR-2B/4B	FW-UB	2	4A	FW
P6	P	B08	ECU BGA P6UPR-2B/4B	Electronics Control Unit Beta Gimbal Assembly P6UPR-2B/4B	FW-UB	2	4A	FW
P6	P	B09	ECU ORU P6LWR-2B/4B	Electronic Control Unit Orbital Replacement Unit P6LWR-2B/4B	HWF	2	4A	FW
P6	P	B10	ECU ORU P6UPR-2B/4B	Electronic Control Unit Orbital Replacement Unit P6UPR-2B/4B	HWF	2	4A	FW
P6	P	B15	BMRRM P6LWR-4B	"Beta Gimbal Bearing, Motor, & Roll Ring Module P6LWR-4B"	HWF	2	4A	FW
P6	P	B16	BMRRM P6UPR-2B	"Beta Gimbal Bearing, Motor, & Roll Ring Module P6UPR-2B"	HWF	2	4A	FW
P6	P	B95	N/A	P6 MOD EPS/Battery chg/dschg Instantiated commands	CIP	S	4A	N/A
P6	P	B96	N/A	MOD EPS/Battery chg/dschg Instantiated commands	CIP	S	N/A	N/A
P6	P	C95	N/A	P6 MOD EPS/DC/DC Converter Instantiated commands	CIP	S	4A	N/A
P6	P	C96	N/A	MOD EPS/DC/DC Converter Instantiated commands	CIP	S	N/A	N/A
P6	P	D13	DCSU P6LWR-4B RPCM A	DC Switching Unit P6LWR-4B RPCM A TYPE I	HWF/FW-UB	2	4A	FW
P6	P	D14	DCSU P6LWR-4B RPCM B	DC Switching Unit P6LWR-4B RPCM B TYPE IV	HWF/FW-UB	2	4A	FW
P6	P	D15	DCSU P6UPR-2B RPCM A	DC Switching Unit P6UPR-2B RPCM A TYPE I	HWF/FW-UB	2	4A	FW
P6	P	D16	DCSU P6UPR-2B RPCM B	DC Switching Unit P6UPR-2B RPCM B TYPE IV	HWF/FW-UB	2	4A	FW
P6	P	D23	DCSU P6LWR-4B SCA	DC Switching Unit Switchgear Cntlr Assy P6LWR-4B	HWF/FW-UB	2	4A	FW
P6	P	D24	DCSU P6UPR-2B SCA	DC Switching Unit Switchgear Cntlr Assy P6UPR-2B	HWF/FW-UB	2	4A	FW
P6	P	D95	N/A	P6 MOD EPS/DC switching Instantiated commands	CIP	S	4A	N/A
P6	P	D96	N/A	MOD EPS/DC switching Instantiated commands	CIP	S	N/A	N/A
P6	P	G95	N/A	P6 MOD EPS/ECU Beta Gimbals Instantiated commands	CIP	S	4A	N/A
P6	P	G96	N/A	MOD EPS/ECU Beta Gimbals Instantiated commands	CIP	S	N/A	N/A
P6	P	L95	N/A	P6 MOD EPS/Plasma Contactor Instantiated commands	CIP	S	3A	N/A
P6	P	M95	N/A	P6 MOD EPS/Main Bus Switch Instantiated commands	CIP	S	4A	N/A
P6	P	P95	N/A	P6 MOD EPS/Pump & Flow Control Instantiated commands	CIP	S	4A	N/A
P6	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
P6	P	S07	SSU P6LWR-4B	Sequential Shunt Unit P6LWR-4B	FW-UB	2	4A	FW
P6	P	S08	SSU P6UPR-2B	Sequential Shunt Unit P6UPR-2B	FW-UB	2	4A	FW
P6	P	S96	N/A	MOD EPS/Solar Shunt Converter Instantiated commands	CIP	S	N/A	N/A
P6	P	T96	N/A	MOD EPS/Radiator Instantiated commands	CIP	S	N/A	N/A
P6	P	W07	ECU P6LWR-2B/4B SAW	Electronics Cntrl Unit Solar Array Wing P6LWR-2B/4B	FW-UB	2	4A	FW
P6	P	W08	ECU P6UPR-2B/4B SAW	Electronics Cntrl Unit Solar Array Wing P6UPR-2B/4B	FW-UB	2	4A	FW
P6	P	W16	SAW P6LWR-2B/4B LBB MDA	Solar Array Wing P6LWR-2B/4B LBB MDA	HWF	2	4A	FW
P6	P	W17	SAW P6UPR-2B/4B LBB MDA	Solar Array Wing P6UPR-2B/4B LBB MDA	HWF	2	4A	FW
P6	P	W24	SAW P6LWR-2B/4B RBB MDA	Solar Array Wing P6LWR-2B/4B RBB MDA	HWF	2	4A	FW
P6	P	W25	SAW P6UPR-2B/4B RBB MDA	Solar Array Wing P6UPR-2B/4B RBB MDA	HWF	2	4A	FW
P6	P	W32	SAW P6LWR-2B/4B Mast MDA	Solar Array Wing P6LWR-2B/4B Mast MDA	HWF	2	4A	FW
P6	P	W33	SAW P6UPR-2B/4B Mast MDA	Solar Array Wing P6UPR-2B/4B Mast MDA	HWF	2	4A	FW
P6	P	W96	N/A	MOD EPS/ECU Solar Array Instantiated commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
P6	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
P6	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
P6	T	A09	TCSLH	EEATCS Line Heater	HWM/HWF	2	4A	SW
P6	T	A10	EEATCS NOPH A-1	EEATCS Non-Op Heater A-1	HWF	2	3A	FW
P6	T	A11	PFCS P6UPR-2B	Pump Flow Control Subassy P6UPR-2B	HWF/FW-UB	2	4A	FW
P6	T	A12	EEATCS NOPH B-1	EEATCS Non-Op Heater B-1	HWF	2	3A	FW
P6	T	A15	PFCS P6LWR-4B	Pump Flow Control Subassy P6LWR-4B	HWF/FW-UB	2	4A	FW
P6	T	A27	PVR P6LWR-4B	Photovoltaic Radiator P6LWR-4B	HWF/FW-UB	2	4A	FW
P6	T	E01	RTD P6 Loop A	Temperature Sensor P6 Loop A	HWM	2	4a	SW
P6	T	E02	RTD P6 Loop B	Temperature Sensor P6 Loop B	HWM	2	4a	SW
P6	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
P6	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
P6	T	P09	PFCS P6SPA-2B	Pump Flow Control Subassy P6SPA-2B	HWF/FW-UB	2	4A	FW
P6	T	P10	PFCS P6SPA-4B	Pump Flow Control Subassy P6SPA -4B	HWF/FW-UB	2	4A	FW
P6	T	T05	PVR P6SPA-2B	Photovoltaic Radiator P6SPA-2B	HWF/FW-UB	2	4A	FW
P6	T	T06	PVR P6SPA-4B	Photovoltaic Radiator P6SPA-4B	HWF/FW-UB	2	4A	FW
P6	T	X95	N/A	MOD TCS Instantiated Commands	CIP	S	N/A	N/A
P6	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
P6	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
PL	C	A10	ATU Cu	Audio Terminal Unit Cupola	HWF	3	10A	FW
PL	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
PL	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
PL	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
PL	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
PL	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
PL	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
PL	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
PL	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
PL	E	X96	N/A	MOD ECL Instantiated commands	CIP	S	N/A	N/A
PL	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
PL	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
PL	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
PL	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
PL	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
PL	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
PL	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
PL	P	X01	UOP Cu-1	Utility Outlet Panel Cupola-1	HWF	1	10A	FW
PL	P	X02	UOP Cu-2	Utility Outlet Panel Cupola-2	HWF	1	10A	FW
PL	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
PL	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
PL	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
PL	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
PL	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
PL	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
RF	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
RF	C	C00	Logical MDM-C	FGB Communications and Tracking Logical MDM	LDM	R	1A	SW
RF	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
RF	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
RF	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
RF	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
RF	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
RF	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
RF	D	C00	Logical MDM-D	FGB C&DH Logical MDM	LDM	R	1A	SW
RF	D	C01	FGB MDM1	FGB MDM - 1	SW-UB	R	1A	SW
RF	D	C02	FGB MDM2	FGB MDM - 2	SW-UB	R	1A	SW
RF	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
RF	D	L01	PCR FGB CB GNC-1 (RS-7)	Portable Computer Receptacle FGB CB GNC-1	PCR-CB	D	1A	SW
RF	D	L02	PCR FGB CB GNC-2 (RS-8)	Portable Computer Receptacle FGB CB GNC-2	PCR-CB	D	1A	SW
RF	D	M00	Logical MU-D	C&DH Logical Matching Unit	LDM	R	1A	SW
RF	D	M01	MU Channel 1	Matching Unit Channel 1	SW-UB	R	1A	SW
RF	D	M02	MU Channel 2	Matching Unit Channel 2	SW-UB	R	1A	SW
RF	D	M03	MU Channel 3	Matching Unit Channel 3	SW-UB	R	1A	SW
RF	E	A96	N/A	MOD ECL/ARS Instantiated Commands	CIP	S	N/A	N/A
RF	E	C00	Logical MDM-E	FGB Life Support Logical MDM	LDM	R	1A	SW
RF	E	F96	N/A	MOD ECL/FDS Instantiated Commands	CIP	S	N/A	N/A
RF	E	P96	N/A	MOD ECL/ACS Instantiated Commands	CIP	S	N/A	N/A
RF	E	S96	N/A	MOD ECL/WM Instantiated Commands	CIP	S	N/A	N/A
RF	E	T96	N/A	MOD ECL/THC Instantiated Commands	CIP	S	N/A	N/A
RF	E	W96	N/A	MOD ECLWRM Instantiated Commands	CIP	S	N/A	N/A
RF	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
RF	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
RF	G	C00	Logical MDM-G	FGB GNC Logical MDM	LDM	R	1A	SW
RF	G	R96	N/A	MOD MCS/GN&C/P Instantiated Commands	CIP	S	N/A	N/A
RF	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
RF	J	C00	Logical MDM-J	FGB Structural Motion Logical MDM	LDM	R	1A	SW
RF	M	C00	Logical MDM-M	FGB Mated Interface Systems Logical MDM	LDM	R	1A	SW
RF	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
RF	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
RF	M	M00	Logical MU-M	Mated Interface Systems Logical Matching Unit	LDM	R	1A	SW
RF	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
RF	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
RF	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
RF	P	C00	Logical MDM-P	FGB Electrical Power Logical MDM	LDM	R	1A	SW
RF	P	P01	FGB SEC PWR	FGB Secondary Power (PMA1-A/PMA1-B)	HWF	D	3A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
RF	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
RF	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
RF	T	C00	MDM FGB-T	FGB Thermal Control System Logical MDM	LDM	R	1A	SW
RF	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
RF	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
RF	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
RF	W	C00	Logical MDM-W	FGB Propellant System Logical MDM	LDM	R	1A	SW
RF	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
RF	Y	C00	FGB MDM_Y	FGB Thruster Systems Logical MDM	LDM	R	1A	SW
RR	C	C00	Logical CC-C	Communications and Tracking Logical Central Computer	LDM	R	1R	SW
RR	C	T00	Logical TC-C	Communication and Tracking Logical Terminal Computer	LDM	R	1R	SW
RR	C	X96	N/A	MOD COM & Tracking Instantiated commands	CIP	S	N/A	N/A
RR	D	C00	Logical CC-D	C&DH Logical Central Computer	LDM	R	1R	SW
RR	D	C01	CC-1	Russian Segment Central Computer 1	SW-CB	R	1R	SW
RR	D	C02	CC-2	Russian Segment Central Computer 2	SW-CB	R	1R	SW
RR	D	C03	CC-3	Russian Segment Central Computer 3	SW-CB	R	1R	SW
RR	D	D96	N/A	MOD CDHInstantiated commands	CIP	S	N/A	N/A
RR	D	L00	PCS-RL	Portable Computer System - Russian Logical Laptop	PCS-CB	R	1R	SW
RR	D	L01	PCR SM CB GNC-1 (RS-7)	Portable Computer Receptacle Service Module CB GNC-1	PCR-CB	D	1R	SW
RR	D	L02	PCR SM CB GNC-2 (RS-8)	Portable Computer Receptacle Service Module CB GNC-2	PCR-CB	D	1R	SW
RR	D	P00	CPC0	Logical CPC	LDM	R	1R	SW
RR	D	P01	CPC-1	Central Post Computer - 1	SW-LB	R	1R	SW
RR	D	P02	CPC-2	Central Post Computer - 2	SW-LB	R	1R	SW
RR	D	T00	Logical TC-D	C&DH Logical Terminal Computer	LDM	R	1R	SW
RR	D	T01	TC1 GN&C/P	Service Module Terminal Computer-1	SW-LB	R	1R	SW
RR	D	T02	TC2 GN&C/P	Service Module Terminal Computer-2	SW-LB	R	1R	SW
RR	D	T03	TC3 GN&C/P	Service Module Terminal Computer-3	SW-LB	R	1R	SW
RR	E	C00	Logical CC-E	Life Support Logical Central Computer	LDM	R	1R	SW
RR	E	T00	Logical TC-E	Life Support Logical Terminal Computer	LDM	R	1R	SW
RR	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
RR	F	C96	N/A	MOD CHC Instantiated Commands	CIP	S	N/A	N/A
RR	G	C00	Logical CC-G	GN&C Logical Central Computer	LDM	R	1R	SW
RR	G	C96	N/A	MOD MCS/CMG Instantiated commands	CIP	S	N/A	N/A
RR	G	G96	N/A	MOD MCS/GPS Instantiated commands	CIP	S	N/A	N/A
RR	G	N96	N/A	MOD MCS NCS/CCS Instantiated commands	CIP	S	N/A	N/A
RR	G	R96	N/A	MOD MCS/GN&C/P Instantiated commands	CIP	S	N/A	N/A
RR	G	T00	Logical TC-G	GN&C Logical Terminal Computer	LDM	R	1R	SW
RR	G	T96	N/A	MOD MCS/RGA (Theta Dot) Instantiated commands	CIP	S	N/A	N/A
RR	G	U96	N/A	MOD MCS/GN&C MDM Instantiated commands	CIP	S	N/A	N/A
RR	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
RR	J	C00	Logical CC-J	Logical Central Computer	LDM	R	1R	SW
RR	J	T00	Logical TC-J	Logical Terminal Computer	LDM	R	1R	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
RR	M	C00	Logical CC-M	Logical Central Computer	LDM	R	1R	SW
RR	M	T00	Logical TC-M	Logical Terminal Computer	LDM	R	1R	SW
RR	M	X96	N/A	SNM Instantiated Commands	CIP	S	N/A	N/A
RR	N	C00	Logical CC-N	Logical Central Cpomputer	LDM	R	1R	SW
RR	N	T00	Logical TC-N	Logical Terminal Computer	LDM	R	1R	SW
RR	P	C00	Logical CC-P	Power Logical Central Computer	LDM	R	1R	SW
RR	P	T00	Logical TC-P	Power Logical Terminal Computer	LDM	R	1R	SW
RR	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
RR	Q	C00	Logical CC-Q	Logical Central Computer	LDM	R	1R	SW
RR	Q	T00	Logical TC-Q	Logical Terminal Computer	LDM	R	1R	SW
RR	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
RR	S	C00	Logical CC-S	Logical Central Computer	LDM	R	1R	SW
RR	S	T00	Logical TC-S	Logical Terminal Computer	LDM	R	1R	SW
RR	T	C00	Logical CC-T	Logical Central Computer	LDM	R	1R	SW
RR	T	T00	Logical TC-T	Logical Terminal Computer	LDM	R	1R	SW
RR	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
RR	V	C00	Logical CC-V	Logiacl Central Computer	LDM	R	1R	SW
RR	V	T00	Logical TC-V	Logical Terminal Computer	LDM	R	1R	SW
RR	W	C00	Logical CC-W	Propellant System Logical Central Computer	LDM	R	1R	SW
RR	W	T00	Logical TC-W	Propellant System Logical Terminal Computer	LDM	R	1R	SW
RR	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
RR	Y	C00	Logical CC-Y	Thruster System Logical Central Computer	LDM	R	1R	SW
RR	Y	T00	Logical TC-Y	Thruster System Logical Terminal Computer	LDM	R	1R	SW
RS	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
RS	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
RS	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
RS	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
RS	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
RS	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
RS	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
RS	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
RS	D	R01	LB RS	Russian Local Data Bus	HWM-DB	D	1R	SW
RS	E	A96	N/A	MOD ECL/ARS Instantiated Commands	CIP	S	N/A	N/A
RS	E	F96	N/A	MOD ECL/FDS Instantiated Commands	CIP	S	N/A	N/A
RS	E	P96	N/A	MOD ECL/ACS Instantiated Commands	CIP	S	N/A	N/A
RS	E	S96	N/A	MOD ECL/WM Instantiated Commands	CIP	S	N/A	N/A
RS	E	T96	N/A	MOD ECL/THC Instantiated Commands	CIP	S	N/A	N/A
RS	E	V96	N/A	MOD ECLVS Instantiated Commands	CIP	S	N/A	N/A
RS	E	W96	N/A	MOD ECLWRM Instantiated Commands	CIP	S	N/A	N/A
RS	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
RS	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
RS	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
RS	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
RS	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
RS	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
RS	M	R96	N/A	MOD MCS/GN&C/P Instantiated Commands	CIP	S	N/A	N/A
RS	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
RS	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
RS	P	P01	UDM PWR	UDM Power (PMA1-C/PMA1-D)	HWF	D	3A	FW
RS	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
RS	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
RS	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
RS	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
RS	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
RS	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
S0	B	P04	MSC Util Port-4	Mobile Servicing Center Utility Port-4	HWF	1	8A	FW
S0	B	P05	MSC Util Port-5	Mobile Servicing Center Utility Port-5	HWF	1	8A	FW
S0	B	T01	TUS-1 IMCA-1	Trailing Umbilical System-1 Integrated Motor Controller Assembly-1	HWF/FW-LB	1	8A	FW
S0	B	T02	TUS-1 IMCA-2	Trailing Umbilical System-1 Integrated Motor Controller Assembly-2	HWF/FW-LB	1	8A	FW
S0	B	T03	TUS-2 IMCA-1	Trailing Umbilical System-2 Integrated Motor Controller Assembly-1	HWF/FW-LB	1	8A	FW
S0	B	T04	TUS-2 IMCA-2	Trailing Umbilical System-2 Integrated Motor Controller Assembly-2	HWF/FW-LB	1	8A	FW
S0	B	T05	TUS-1	Trailing Umbilical System-1	HWM/HWF/FW-LB	1	8A	SW
S0	B	T06	TUS-2	Trailing Umbilical System-2	HWM/HWF/FW-LB	1	8A	SW
S0	B	T07	TUS-1 VSC	Trailing Umbilical System-1 Video Signal Converter	HWM /HWF	1	8A	SW
S0	B	T08	TUS-2 VSC	Trailing Umbilical System-2 Video Signal Converter	HWM /HWF	1	8A	SW
S0	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
S0	C	C11	VSW-1	External Video Switch-1	HWM/HWF/FW-CB	1	8A	SW
S0	C	C12	VSW-2	External Video Switch-2	HWM/HWF/FW-CB	1	8A	SW
S0	C	C13	VSW-3	External Video Switch-3	HWM/HWF/FW-CB	1	8A	SW
S0	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
S0	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
S0	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
S0	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
S0	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
S0	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
S0	D	B05	EXT-B/U	Logical MDM EXT Backup	LDM	1	8A	SW
S0	D	B40	S0-B/U	Logical MDM S0 Monitor	LDM	1	8A	SW
S0	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
S0	D	P04	EXT-PRI	Logical MDM EXT Primary	LDM	1	8A	SW
S0	D	P39	S0-PRI	Logical MDM S0 Control	LDM	1	8A	SW
S0	D	S04	ESSMDM EXT-1	Enhanced Space Station Multiplexer/Demultiplexer External-1	HWM/HWF/SW-CB	1	8A	SW
S0	D	S05	ESSMDM EXT-2	Enhanced Space Station Multiplexer/Demultiplexer External-2	HWM/HWF/SW-CB	1	8A	SW
S0	D	S39	SSMDM S0-1	Space Station Multiplexer/Demultiplexer S0-1	HWM/HWF/SW-CB	1	8A	SW
S0	D	S40	SSMDM S0-2	Space Station Multiplexer/Demultiplexer S0-2	HWM/HWF/SW-CB	1	8A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
S0	E	X96	N/A	MOD ECL Instantiated commands	CIP	S	N/A	N/A
S0	F	C05	CPDS EV-1	CHeCS Charged Particle Directional Spectrometer EV-1 S0	HWF/FW-LB	H	8A	FW
S0	F	C06	CPDS EV-2	CHeCS Charged Particle Directional Spectrometer EV-2 S0	HWF/FW-LB	H	8A	FW
S0	F	C07	CPDS EV-3	CHeCS Charged Particle Directional Spectrometer EV-3 S0	HWF/FW-LB	H	8A	FW
S0	F	C09	CPDS-EV	Charged Particle Directional Spectrometer-Extravehicular	HWF	1	8A	FW
S0	F	C96	N/A	MOD CHC Instantiated Commands	CIP	S	N/A	N/A
S0	G	G03	GPS AA-1	Global Positioning System Antenna Assembly-1	HWM	1	8A	SW
S0	G	G04	GPS AA-2	Global Positioning System Antenna Assembly-2	HWM	1	8A	SW
S0	G	G05	GPS AA-3	Global Positioning System Antenna Assembly-3	HWM	1	8A	SW
S0	G	G06	GPS AA-4	Global Positioning System Antenna Assembly-4	HWM	1	8A	SW
S0	G	G96	N/A	MOD MCS/GPS Instantiated Commands	CIP	S	N/A	N/A
S0	G	R01	RGA-1	Rate Gyro Assembly-1	HWF/FW-LB	1	8A	FW
S0	G	R02	RGA-2	Rate Gyro Assembly-2	HWF/FW-LB	1	8A	FW
S0	G	T96	N/A	MOD MCS RGA (Theta Dot) Instantiated Commands	CIP	S	N/A	N/A
S0	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
S0	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
S0	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
S0	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
S0	M	S01	Cap Ltch S0-S1	Segment to Segment Attachment System Capture Latch Assembly S0 to S1 (Subassemblies)	HWM/HWF/FW-LB	1	8A	SW
S0	M	S02	BBC S0-S1-1	Bolt Bus Controller S0 to S1-1	HWM/HWF/FW-LB	1	8A	SW
S0	M	S03	BBC S0-S1-2	Bolt Bus Controller S0 to S1-2	HWM/HWF/FW-LB	1	8A	SW
S0	M	S04	MBA S0-S1-1	Motorized Bolt Assembly S0 to S1-1	HWM/HWF	1	8A	SW
S0	M	S05	MBA S0-S1-2	Motorized Bolt Assembly S0 to S1-2	HWM/HWF	1	8A	SW
S0	M	S06	MBA S0-S1-3	Motorized Bolt Assembly S0 to S1-3	HWM/HWF	1	8A	SW
S0	M	S07	MBA S0-S1-4	Motorized Bolt Assembly S0 to S1-4	HWM/HWF	1	8A	SW
S0	M	S08	Cap Ltch S0-P1	Segment to Segment Attachment System Capture Latch Assembly S0 to P1 (Subassemblies)	HWM/HWF/FW-LB	1	8A	SW
S0	M	S09	BBC S0-P1-1	Bolt Bus Controller S0 to P1-1	HWM/HWF/FW-LB	1	8A	SW
S0	M	S10	BBC S0-P1-2	Bolt Bus Controller S0 to P1-2	HWM/HWF/FW-LB	1	8A	SW
S0	M	S11	MBA S0-P1-1	Motorized Bolt Assembly S0 to P1-1	HWM/HWF	1	8A	SW
S0	M	S12	MBA S0-P1-2	Motorized Bolt Assembly S0 to P1-2	HWM/HWF	1	8A	SW
S0	M	S13	MBA S0-P1-3	Motorized Bolt Assembly S0 to P1-3	HWM/HWF	1	8A	SW
S0	M	S14	MBA S0-P1-4	Motorized Bolt Assembly S0 to P1-4	HWM/HWF	1	8A	SW
S0	M	S29	Cap Ltch S0-S1 IMCA-1	Capture Latch Assembly S0 to S1 Integrated Motor Controller Assembly-1	HWF/FW-LB	1	8A	FW
S0	M	S30	Cap Ltch S0-S1 IMCA-2	Capture Latch Assembly S0 to S1 Integrated Motor Controller Assembly-2	HWF/FW-LB	1	8A	FW
S0	M	S31	Cap Ltch S0-P1 IMCA-1	Capture Latch Assembly S0 to P1 Integrated Motor Controller Assembly-1	HWF/FW-LB	1	8A	FW
S0	M	S32	Cap Ltch S0-P1 IMCA-2	Capture Latch Assembly S0 to P1 Integrated Motor Controller Assembly-2	HWF/FW-LB	1	8A	FW
S0	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
S0	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
S0	M	X96	N/A	MOD SNM Instantiated Commands	CIP	S	N/A	N/A
S0	P	C29	DDCU S0-2B	DC to DC Converter Unit S0-2B	HWF/FW-LB	2	8A	FW
S0	P	C30	DDCU S0-1A	DC to DC Converter Unit S0-1A	HWF/FW-LB	2	8A	FW
S0	P	C31	DDCU S0-3B	DC to DC Converter Unit S0-3B	HWF/FW-LB	2	8A	FW
S0	P	C32	DDCU S0-4B	DC to DC Converter Unit S0-4B	HWF/FW-LB	2	8A	FW
S0	P	C96	N/A	MOD EPS/DC/DC Converter Instantiated commands	CIP	S	N/A	N/A
S0	P	L18	CETA Lum N1-1 (S0 Stowed)	Crew Equipment Translation Aid Luminaire Node 1-1 (S0 Stowed)	HWF	1	8A	FW
S0	P	L19	CETA Lum N1-2 (S0 Stowed)	Crew Equipment Translation Aid Luminaire Node 1-2 (S0 Stowed)	HWF	1	8A	FW
S0	P	L22	CETA Lum Lab	Crew and Equipment Translation Aid Luminaire Lab	HWF	1	8A	FW
S0	P	M01	MBSU S0-1A/1B	Main Bus Switching Unit S0-1A/1B	HWF/FW-LB	2	8A	FW
S0	P	M02	MBSU S0-2A/2B	Main Bus Switching Unit S0-2A/2B	HWF/FW-LB	2	8A	FW
S0	P	M03	MBSU S0-3A/3B	Main Bus Switching Unit S0-3A/3B	HWF/FW-LB	2	8A	FW
S0	P	M04	MBSU S0-4A/4B	Main Bus Switching Unit S0-4A/4B	HWF/FW-LB	2	8A	FW
S0	P	M96	N/A	MOD EPS/Main Bus Switch Instantiated commands	CIP	S	N/A	N/A
S0	P	Q03	RPCM S0 1A-A	Remote Power Controller Module S0 Power Channel 1A-A	FW-UB	1	8A	FW
S0	P	Q04	RPCM S0 1A-B	Remote Power Controller Module S0 Power Channel 1A-B	FW-UB	1	8A	FW
S0	P	Q05	RPCM S0 1A-C	Remote Power Controller Module S0 Power Channel 1A-C	FW-CB	1	8A	FW
S0	P	Q06	RPCM S0 1A-D	Remote Power Controller Module S0 Power Channel 1A-D	FW-UB	1	8A	FW
S0	P	Q07	RPCM S0 1A-E	Remote Power Controller Module S0 Power Channel 1A-E	FW-UB	1	8A	FW
S0	P	Q09	RPCM S0 2B-A	Remote Power Controller Module S0 Power Channel 2B-A	FW-UB	1	8A	FW
S0	P	Q10	RPCM S0 2B-B	Remote Power Controller Module S0 Power Channel 2B-B	FW-UB	1	8A	FW
S0	P	Q11	RPCM S0 2B-C	Remote Power Controller Module S0 Power Channel 2B-C	FW-CB	1	8A	FW
S0	P	Q12	RPCM S0 2B-D	Remote Power Controller Module S0 Power Channel 2B-D	FW-UB	1	8A	FW
S0	P	Q13	RPCM S0 2B-E	Remote Power Controller Module S0 Power Channel 2B-E	FW-UB	1	8A	FW
S0	P	Q15	RPCM S0 3A-A	Remote Power Controller Module S0 Power Channel 3A-A	FW-UB	1	8A	FW
S0	P	Q16	RPCM S0 3A-B	Remote Power Controller Module S0 Power Channel 3A-B	FW-UB	1	8A	FW
S0	P	Q17	RPCM S0 3A-C	Remote Power Controller Module S0 Power Channel 3A-C	FW-UB	1	8A	FW
S0	P	Q18	RPCM S0 3A-D	Remote Power Controller Module S0 Power Channel 3A-D	FW-UB	1	8A	FW
S0	P	Q19	RPCM S0 3A-E	Remote Power Controller Module S0 Power Channel 3A-E	FW-UB	1	8A	FW
S0	P	Q20	RPCM S0 3A-F	Remote Power Controller Module S0 Power Channel 3A-F	FW-UB	1	8A	FW
S0	P	Q23	RPCM S0 4B-A	Remote Power Controller Module S0 Power Channel 4B-A	FW-UB	1	8A	FW
S0	P	Q24	RPCM S0 4B-B	Remote Power Controller Module S0 Power Channel 4B-B	FW-UB	1	8A	FW
S0	P	Q25	RPCM S0 4B-C	Remote Power Controller Module S0 Power Channel 4B-C	FW-UB	1	8A	FW
S0	P	Q26	RPCM S0 4B-D	Remote Power Controller Module S0 Power Channel 4B-D	FW-UB	1	8A	FW
S0	P	Q27	RPCM S0 4B-E	Remote Power Controller Module S0 Power Channel 4B-E	FW-UB	1	8A	FW
S0	P	Q28	RPCM S0 4B-F	Remote Power Controller Module S0 Power Channel 4B-F	FW-UB	1	8A	FW
S0	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
S0	P	U05	Util Rail S0 1A	Utility Rail S0 Power Channel 1A	HWM/HWF	1	8A	SW
S0	P	U06	Util Rail S0 2B	Utility Rail S0 Power Channel 2B	HWM/HWF	1	8A	SW
S0	P	U07	Util Rail S0 3A	Utility Rail S0 Power Channel 3A	HWM/HWF	1	8A	SW
S0	P	U08	Util Rail S0 4B	Utility Rail S0 Power Channel 4B	HWM/HWF	1	8A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
S0	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
S0	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
S0	S	D01	SC-1	Accelerometer and Strain Gage Signal Conditioner Unit-1	HWM/HWF/FW-UBN	1	8A	SW
S0	S	D02	SC-2	Accelerometer and Strain Gage Signal Conditioner Unit-2	HWM/HWF/FW-UBN	1	8A	SW
S0	T	E37	MBSU Coldplate 1A1B	Main Bus Switching Unit Coldplate EATCS Loop A 1A1B	HWM/HWF	1	8A	SW
S0	T	E38	MBSU Coldplate 2A2B	Main Bus Switching Unit Coldplate EATCS Loop B 2A2B	HWM/HWF	1	8A	SW
S0	T	E39	MBSU Coldplate 3A3B	Main Bus Switching Unit Coldplate EATCS Loop B 3A3B	HWM/HWF	1	8A	SW
S0	T	E40	MBSU Coldplate 4A4B	Main Bus Switching Unit Coldplate EATCS Loop A 4A4B	HWM/HWF	1	8A	SW
S0	T	E41	DDCU Coldplate S0 1A	DC TO DC Converter Unit Coldplate Loop A S0 1A	HWM/HWF	1	8A	SW
S0	T	E42	DDCU Coldplate S0 2B	DC TO DC Converter Unit Coldplate Loop B S0 2B	HWM/HWF	1	8A	SW
S0	T	E43	DDCU Coldplate S0 3B	DC TO DC Converter Unit Coldplate Loop B S0 3B	HWM/HWF	1	8A	SW
S0	T	E44	DDCU Coldplate S0 4A	DC TO DC Converter Unit Coldplate Loop A S0 4A	HWM/HWF	1	8A	SW
S0	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
S0	T	H01	HPRS	Heat Pipe Radiator System	HWM	1	8A	SW
S0	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
S0	T	U01	Fl Umb-A	Fluid Umbilical Ammonia Laboratory Forward Loop A	HWM	1	8A	SW
S0	T	U02	Fl Umb-B	Fluid Umbilical Ammonia Laboratory Forward Loop B	HWM	1	8A	SW
S0	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
S0	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
S1	B	P02	MSC Util Port-2	Mobile Servicing Center Utility Port-2	HWF	1	9A	FW
S1	B	P03	MSC Util Port-3	Mobile Servicing Center Utility Port-3	HWF	1	9A	FW
S1	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
S1	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
S1	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
S1	C	P02	VCSA Port-2	Video Camera Support Assembly Port-2	HWF	1	9A	FW
S1	C	P03	VCSA Port-3	Video Camera Support Assembly Port-3	HWF	1	9A	FW
S1	C	P04	VCSA Port-4	Video Camera Support Assembly Port-4	HWF	1	9A	FW
S1	C	P05	VCSA Port-5	Video Camera Support Assembly Port-5	HWF	1	9A	FW
S1	C	S04	ACBSP S1	ACS Baseband Signal Processor S1	HWM/HWF/FW-CB	1	9A	SW
S1	C	S14	ACRFG S1	Radio Frequency Group S1	HWM/HWF/FW-CB	1	9A	SW
S1	C	S23	XPDR S1	Standard TDRSS Transponder S1	HWF/FW-CB	1	9A	FW
S1	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
S1	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
S1	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
S1	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
S1	D	B42	S1-B/U	Logical MDM S1 Monitor	LDM	1	9A	SW
S1	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
S1	D	P41	S1-PRI	Logical MDM S1 Control	LDM	1	9A	SW
S1	D	S41	SSMDM S1-1	Space Station Multiplexer/Demultiplexer S1-1	HWM/HWF/SW-LB	1	9A	SW
S1	D	S42	SSMDM S1-2	Space Station Multiplexer/Demultiplexer S1-2	HWM/HWF/SW-LB	1	9A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
S1	D	S45	SSMDM STR	Space Station Multiplexer/Demultiplexer Starboard Thermal Radiator	HWM/HWF/SW-LB	1	9A	SW
S1	E	X96	N/A	MOD ECL Instantiated commands	CIP	S	N/A	N/A
S1	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
S1	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
S1	J	T02	RJMC S1-1	Rotary Joint Motor Controller S1-1	HWM/HWF/FW-UBN	1	9A	SW
S1	J	T04	RJMC S1-2	Rotary Joint Motor Controller S1-2	HWM/HWF/FW-UBN	1	9A	SW
S1	J	T09	DLA S1-1	TRRJ Drive Lock Assembly S1-1	HWM/HWF	1	9A	SW
S1	J	T10	DLA S1-2	TRRJ Drive Lock Assembly S1-2	HWM/HWF	1	9A	SW
S1	J	T13	Brg S1	TRRJ Bearing Assembly S1	HWM	1	9A	SW
S1	J	T15	FHRC S1	TRRJ Flexible Hose Rotary Coupler S1	HWM	1	9A	SW
S1	J	T17	PDTA S1	TRRJ Power Data Transfer Assembly S1	HWM	1	9A	SW
S1	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
S1	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
S1	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
S1	M	S15	Cap Ltch S1-S3	Segment to Segment Attachment System Capture Latch Assembly S1 to S3 (Subassemblies)	HWM/HWF/FW-LB	1	9A	SW
S1	M	S16	BBC S1-S3-1	Bolt Bus Controller S1 to S3-1	HWF/FW-LB	1	9A	FW
S1	M	S17	BBC S1-S3-2	Bolt Bus Controller S1 to S3-2	HWF/FW-LB	1	9A	FW
S1	M	S18	MBA S1-S3-1	Motorized Bolt Assembly S1 to S3-1	HWM/HWF	1	9A	SW
S1	M	S19	MBA S1-S3-2	Motorized Bolt Assembly S1 to S3-2	HWM/HWF	1	9A	SW
S1	M	S20	MBA S1-S3-3	Motorized Bolt Assembly S1 to S3-3	HWM/HWF	1	9A	SW
S1	M	S21	MBA S1-S3-4	Motorized Bolt Assembly S1 to S3-4	HWM/HWF	1	9A	SW
S1	M	S33	Cap Ltch S1-S3 IMCA-1	Capture Latch Assembly S1 to S3 Integrated Controller Motor-1	HWF/FW-LB	1	9A	FW
S1	M	S34	Cap Ltch S1-S3 IMCA-2	Capture Latch Assembly S1 to S3 Integrated Controller Motor-2	HWF/FW-LB	1	9A	FW
S1	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
S1	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
S1	P	C25	DDCU S1-4B	DC to DC Converter Unit S1-4B	HWF/FW-LB	2	9A	FW
S1	P	C96	N/A	MOD EPS/DC/DC Converter Instantiated commands	CIP	S	N/A	N/A
S1	P	L29	CETA Lum S1-2	Crew and Equipment Translation Aid Luminaire S1-2	HWF	1	9A	FW
S1	P	L30	CETA Lum S1-1	Crew and Equipment Translation Aid Luminaire S1-1	HWF	1	9A	FW
S1	P	Q31	RPCM S1 1A-A	Remote Power Controller Module S1 Power Channel 1A-A	FW-UB	1	9A	FW
S1	P	Q32	RPCM S1 1A-B	Remote Power Controller Module S1 Power Channel 1A-B	FW-UB	1	9A	FW
S1	P	Q33	RPCM S1 1A-C	Remote Power Controller Module S1 Power Channel 1A-C	FW-UB	1	9A	FW
S1	P	Q34	RPCM S1 1A-D	Remote Power Controller Module S1 Power Channel 1A-D	FW-UB	1	9A	FW
S1	P	Q35	RPCM S1 4B-E	Remote Power Controller Module S1 Power Channel 4B-E	FW-UB	1	9A	FW
S1	P	Q36	RPCM S1 4B-F	Remote Power Controller Module S1 Power Channel 4B-F	FW-UB	1	9A	FW
S1	P	Q37	RPCM S1 4B-G	Remote Power Controller Module S1 Power Channel 4B-G	FW-UB	1	9A	FW
S1	P	Q39	RPCM S1 2B-A	Remote Power Controller Module S1 Power Channel 2B-A	FW-UB	1	9A	FW
S1	P	Q40	RPCM S1 2B-B	Remote Power Controller Module S1 Power Channel 2B-B	FW-UB	1	9A	FW
S1	P	Q43	RPCM S1 3A-E	Remote Power Controller Module S1 Power Channel 3A-E	FW-UB	1	9A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
S1	P	Q44	RPCM S1 3A-F	Remote Power Controller Module S1 Power Channel 3A-F	FW-UB	1	9A	FW
S1	P	Q45	RPCM S1 3A-G	Remote Power Controller Module S1 Power Channel 3A-G	FW-UB	1	9A	FW
S1	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
S1	P	U09	Util Rail S1 1A4B	Utility Rail S1/P1 S1 Power Channel 1A4B	HWM/HWF/HWF	1	9A	SW
S1	P	U10	Util Rail S1 2B3A	Utility Rail S1/P1 S1 Power Channel 2B3A	HWM/HWF/HWF	1	9A	SW
S1	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
S1	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
S1	T	E01	PM-A	Pump-ORU Module EATCS Loop A	HWM/HWF/FW-UB	1	9A	SW
S1	T	E03	NTA-A	Nitrogen-ORU Tank EATCS Loop A	HWM/HWF	1	9A	SW
S1	T	E05	ATA-A	Ammonia-ORU Tank EATCS Loop A	HWM/HWF	1	9A	SW
S1	T	E07	RBVM S1-1-1	Radiator Beam Valve Module S1 Radiator No. 1 Valve Module No. 1	HWM/HWF/FW-UB	1	9A	SW
S1	T	E08	RBVM S1-1-2	Radiator Beam Valve Module S1 Radiator No. 1 Valve Module No. 2	HWM/HWF/FW-UB	1	9A	SW
S1	T	E09	RBVM S1-2-1	Radiator Beam Valve Module S1 Radiator No. 2 Valve Module No. 1	HWM/HWF/FW-UB	1	9A	SW
S1	T	E10	RBVM S1-2-2	Radiator Beam Valve Module S1 Radiator No. 2 Valve Module No. 2	HWM/HWF/FW-UB	1	9A	SW
S1	T	E11	RBVM S1-3-1	Radiator Beam Valve Module S1 Radiator No. 3 Valve Module No. 1	HWM/HWF/FW-UB	1	9A	SW
S1	T	E12	RBVM S1-3-2	Radiator Beam Valve Module S1 Radiator No. 3 Valve Module No. 2	HWM/HWF/FW-UB	1	9A	SW
S1	T	E19	Rdtr S1-1	Radiator S1-1	HWM/HWF/FW-UB	1	9A	SW
S1	T	E20	Rdtr S1-2	Radiator S1-2	HWM/HWF/FW-UB	1	9A	SW
S1	T	E21	Rdtr S1-3	Radiator S1-3	HWM/HWF/FW-UB	1	9A	SW
S1	T	E45	DDCU Coldplate S1 4B	DC to DC Converter Unit Coldplate Loop A S1 4B	HWM/HWF	1	9A	SW
S1	T	E47	PM-A PCVP	Pump-ORU Module EATCS Loop A Pump and Control Valve Package	HWM/HWF/FW-UB	1	9A	SW
S1	T	E49	Radr Bm S1	Radiator Beam S1	HWM/HWF	1	9A	SW
S1	T	E50	RBVM S1-1-1 IMCA	Radiator Beam Valve Module S1-1-1 Integrated Controller Motor	FW-UB	1	9A	FW
S1	T	E51	RBVM S1-1-2 IMCA	Radiator Beam Valve Module S1-1-2 Integrated Controller Motor	FW-UB	1	9A	FW
S1	T	E52	RBVM S1-2-1 IMCA	Radiator Beam Valve Module S1-2-1 Integrated Controller Motor	FW-UB	1	9A	FW
S1	T	E53	RBVM S1-2-2 IMCA	Radiator Beam Valve Module S1-2-2 Integrated Controller Motor	FW-UB	1	9A	FW
S1	T	E54	RBVM S1-3-1 IMCA	Radiator Beam Valve Module S1-3-1 Integrated Controller Motor	FW-UB	1	9A	FW
S1	T	E55	RBVM S1-3-2 IMCA	Radiator Beam Valve Module S1-3-2 Integrated Controller Motor	FW-UB	1	9A	FW
S1	T	E56	Rdtr S1-1 IMCA	Radiator ORU S1-1 Integrated Controller Motor	FW-UB	1	9A	FW
S1	T	E57	Rdtr S1-2 IMCA	Radiator ORU S1-2 Integrated Controller Motor	FW-UB	1	9A	FW
S1	T	E58	Rdtr S1-3 IMCA	Radiator ORU S1-3 Integrated Controller Motor	FW-UB	1	9A	FW
S1	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
S1	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
S1	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
S1	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
S3	B	P01	MSC Util Port-1	Mobile Servicing Center Utility Port-1	HWF	1	13A	FW
S3	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
S3	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
S3	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
S3	C	P01	VCSA Port-1	Video Camera Support Assembly Port-1	HWF	1	13A	FW
S3	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
S3	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
S3	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
S3	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
S3	D	B44	S3-B/U	Logical MDM S3 Monitor	LDM	1	13A	SW
S3	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
S3	D	P43	S3-PRI	Logical MDM S3 Control	LDM	1	13A	SW
S3	D	S43	SSMDM S3-1	Space Station Multiplexer/Demultiplexer S3-1	HWM/HWF/SW-LB	1	13A	SW
S3	D	S44	SSMDM S3-2	Space Station Multiplexer/Demultiplexer S3-2	HWM/HWF/SW-LB	1	13A	SW
S3	E	X96	N/A	MOD ECL Instantiated commands	CIP	S	N/A	N/A
S3	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
S3	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
S3	J	S03	RJMC S3-1	SARJ Rotary Joint Motor Controller S3-1	HWM/HWF/FW-UBN	1	13A	SW
S3	J	S04	RJMC S3-2	SARJ Rotary Joint Motor Controller S3-2	HWM/HWF/FW-UBN	1	13A	SW
S3	J	S09	DLA S3-1	SARJ Drive Lock Assembly S3-1	HWM	1	13A	SW
S3	J	S10	DLA S3-2	SARJ Drive Lock Assembly S3-2	HWM	1	13A	SW
S3	J	S16	Inbd Brg S3	SARJ Inboard Bearing Assembly S3	HWM	1	13A	SW
S3	J	S18	Outbd Brg S3	SARJ Outboard Bearing Assembly S3	HWM	1	13A	SW
S3	J	S31	Trndl S3-1	SARJ Trundle S3-1	HWM	1	13A	SW
S3	J	S32	Trndl S3-2	SARJ Trundle S3-2	HWM	1	13A	SW
S3	J	S33	Trndl S3-3	SARJ Trundle S3-3	HWM	1	13A	SW
S3	J	S34	Trndl S3-4	SARJ Trundle S3-4	HWM	1	13A	SW
S3	J	S35	Trndl S3-5	SARJ Trundle S3-5	HWM	1	13A	SW
S3	J	S36	Trndl S3-6	SARJ Trundle S3-6	HWM	1	13A	SW
S3	J	S37	Trndl S3-7	SARJ Trundle S3-7	HWM	1	13A	SW
S3	J	S38	Trndl S3-8	SARJ Trundle S3-8	HWM	1	13A	SW
S3	J	S39	Trndl S3-9	SARJ Trundle S3-9	HWM	1	13A	SW
S3	J	S40	Trndl S3-10	SARJ Trundle S3-10	HWM	1	13A	SW
S3	J	S41	Trndl S3-11	SARJ Trundle S3-11	HWM	1	13A	SW
S3	J	S42	Trndl S3-12	SARJ Trundle S3-12	HWM	1	13A	SW
S3	J	S68	UTA S3	SARJ Utility Transfer Assembly S3	HWM	1	13A	SW
S3	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
S3	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
S3	M	P01	PAS-1 Cap Ltch	Payload Attach System-1 Capture Latch Assembly	HWF/FW-LB	1	13A	FW
S3	M	P02	PAS-2 Cap Ltch	Payload Attach System-2 Capture Latch Assembly	HWF/FW-LB	1	13A	FW
S3	M	P03	PAS-3 Cap Ltch	Payload Attach System-3 Capture Latch Assembly	HWF/FW-LB	1	13A	FW
S3	M	P04	PAS-4 Cap Ltch	Payload Attach System-4 Capture Latch Assembly	HWF/FW-LB	1	13A	FW
S3	M	P05	PAS-1 UMA	Payload Attach System-1 Umbilical Mechanism Assembly	HWF/FW-LB	1	13A	FW
S3	M	P06	PAS-2 UMA	Payload Attach System-2 Umbilical Mechanism Assembly	HWF/FW-LB	1	13A	FW
S3	M	P07	PAS-3 UMA	Payload Attach System-31 Umbilical Mechanism Assembly	HWF/FW-LB	1	13A	FW
S3	M	P08	PAS-4 UMA	Payload Attach System-4 Umbilical Mechanism Assembly	HWF/FW-LB	1	13A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
S3	M	P11	PAS-1	Payload Attach System No. 1 Utility Port	HWF/FW-LB	1	13A	FW
S3	M	P12	PAS-2	Payload Attach System No. 2 Utility Port	HWF/FW-LB	1	13A	FW
S3	M	P13	PAS-3	Payload Attach System No. 3 Utility Port	HWF/FW-LB	1	13A	FW
S3	M	P14	PAS-4	Payload Attach System No. 4 Utility Port	HWF/FW-LB	1	13A	FW
S3	M	P21	PAS-1 Cap Ltch IMCA	Payload Attach System No. 1 Capture Latch Integrated Controller Motor	HWF/FW-UB	1	13A	FW
S3	M	P22	PAS-2 Cap Ltch IMCA	Payload Attach System No. 2 Capture Latch Integrated Controller Motor	HWF/FW-UB	1	13A	FW
S3	M	P23	PAS-3 Cap Ltch IMCA	Payload Attach System No. 3 Capture Latch Integrated Controller Motor	HWF/FW-UB	1	13A	FW
S3	M	P24	PAS-4 Cap Ltch IMCA	Payload Attach System No. 4 Capture Latch Integrated Controller Motor	HWF/FW-UB	1	13A	FW
S3	M	P25	PAS-1 UMA IMCA	Payload Attach System No. 1 Umbilical Mechanism Assembly Integrated Controller Motor	HWF/FW-UB	1	13A	FW
S3	M	P26	PAS-2 UMA IMCA	Payload Attach System No. 2 Umbilical Mechanism Assembly Integrated Controller Motor	HWF/FW-UB	1	13A	FW
S3	M	P27	PAS-3 UMA IMCA	Payload Attach System No. 3 Umbilical Mechanism Assembly Integrated Controller Motor	HWF/FW-UB	1	13A	FW
S3	M	P28	PAS-4 UMA IMCA	Payload Attach System No. 4 Umbilical Mechanism Assembly Integrated Controller Motor	HWF/FW-UB	1	13A	FW
S3	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
S3	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
S3	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
S3	P	L46	CETA Lum S3-1	Crew and Equipment Translation Aid Luminaire S3-1	HWF	1	13A	FW
S3	P	Q75	RPCM S3 1A-A	Romote Power Controller Module S3 Power Channel 1A-A	FW-UB	1	13A	FW
S3	P	Q77	RPCM S3 4B-C	Romote Power Controller Module S3 Power Channel 4B-C	FW-UB	1	13A	FW
S3	P	Q79	RPCM S3 4B-E	Romote Power Controller Module S3 Power Channel 4B-E	FW-UB	1	13A	FW
S3	P	Q80	RPCM S3 4B-F	Romote Power Controller Module S3 Power Channel 4B-F	FW-UB	1	13A	FW
S3	P	Q81	RPCM S3 2B-A	Romote Power Controller Module S3 Power Channel 2B-A	FW-UB	1	13A	FW
S3	P	Q83	RPCM S3 3A-C	Romote Power Controller Module S3 Power Channel 3A-C	FW-UB	1	13A	FW
S3	P	Q85	RPCM S3 3A-E	Romote Power Controller Module S3 Power Channel 3A-E	FW-UB	1	13A	FW
S3	P	Q86	RPCM S3 3A-F	Romote Power Controller Module S3 Power Channel 3A-F	FW-UB	1	13A	FW
S3	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
S3	P	U21	Util Rail S3 1A4B	Utility Rail S3/P3 S3 Power Channel 1A4B	HWM/HWF	1	13A	SW
S3	P	U22	Util Rail S3 2B3A	Utility Rail S3/P3 S3 Power Channel 2B3A	HWM/HWF	1	13A	SW
S3	P	V96	N/A	MOD EPS/Starboard SARJ Instantiated commands	CIP	S	N/A	N/A
S3	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
S3	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
S3	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
S3	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
S3	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
S3	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
S4	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
S4	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
S4	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
S4	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
S4	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
S4	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
S4	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
S4	D	B35	S4 PVCU-B/U	Logical MDM S4 Backup PVCU	LDM	2	13A	SW
S4	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
S4	D	P31	S4 PVCU-PRI	Logical MDM S4 Primary PVCU	LDM	2	13A	SW
S4	D	S31	MDM PVCU-1A	Photovoltaic Control Unit-1A MDM	SW-LB	2	13A	SW
S4	D	S35	MDM PVCU-3A	Photovoltaic Control Unit-3A MDM	SW-LB	2	13A	SW
S4	E	X96	N/A	MOD ECL Instantiated commands	CIP	S	N/A	N/A
S4	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
S4	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
S4	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
S4	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
S4	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
S4	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
S4	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
S4	P	A01	BCDU S4UPR-3A3	Battery Charge/Discharge Unit S4UPR-3A3	FW-UB	2	2J/A	FW
S4	P	A03	DDCU S4UPR-3A	DC to DC Converter Unit S4UPR-3A	FW-UB	2	13A	FW
S4	P	A04	BCDU S4UPR-3A2	Battery Charge/Discharge Unit S4UPR-3A2	FW-UB	2	13A	FW
S4	P	A05	BCDU S4UPR-3A1	Battery Charge/Discharge Unit S4UPR-3A1	FW-UB	2	13A	FW
S4	P	A06	BATT S4UPR-3A3-1	Battery S4UPR-3A3-1	HWF	2	2J/A	FW
S4	P	A08	BATT S4UPR-3A2-1	Battery S4UPR-3A2-1	HWF	2	13A	FW
S4	P	A09	BATT S4UPR-3A1-1	Battery S4UPR-3A1-1	HWF	2	13A	FW
S4	P	A10	BATT S4UPR-3A3-2	Battery S4UPR-3A3-2	HWF	2	2J/A	FW
S4	P	A12	BATT S4UPR-3A2-2	Battery S4UPR-3A2-2	HWF	2	13A	FW
S4	P	A13	BATT S4UPR-3A1-2	Battery S4UPR-3A1-2	HWF	2	13A	FW
S4	P	A14	BATT S4LWR-1A3-2	Battery S4LWR-1A3-2	HWF	2	2J/A	FW
S4	P	A16	BATT S4LWR-1A2-2	Battery S4LWR-1A2-2	HWF	2	13A	FW
S4	P	A17	BATT S4LWR-1A1-2	Battery S4LWR-1A1-2	HWF	2	13A	FW
S4	P	A18	BATT S4LWR-1A3-1	Battery S4LWR-1A3-1	HWF	2	2J/A	FW
S4	P	A20	BATT S4LWR-1A2-1	Battery S4LWR-1A2-1	HWF	2	13A	FW
S4	P	A21	BATT S4LWR-1A1-1	Battery S4LWR-1A1-1	HWF	2	13A	FW
S4	P	A22	BCDU S4LWR-1A3	Battery Charge/Discharge Unit S4LWR-1A3	FW-UB	2	2J/A	FW
S4	P	A23	DDCU S4LWR-1A	DC to DC Converter Unit S4LWR-1A	FW-UB	2	13A	FW
S4	P	A25	BCDU S4LWR-1A2	Battery Charge/Discharge Unit S4LWR-1A2	FW-UB	2	13A	FW
S4	P	A26	BCDU S4LWR-1A1	Battery Charge/Discharge Unit S4LWR-1A1	FW-UB	2	13A	FW
S4	P	A96	N/A	MOD EPS/Battery Instantiated commands	CIP	S	N/A	N/A
S4	P	B01	ECU BGA S4LWR-1A/3A	Electronics Control Unit Beta Gimbal Assembly S4LWR-1A/3A	HWF	2	13A	FW
S4	P	B02	ECU BGA S4UPR-1A/3A	Electronics Control Unit Beta Gimbal Assembly S4UPR-1A/3A	HWF	2	13A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
S4	P	B09	BMRRM S4LWR-1A	"Beta Gimbal Bearing, Motor, & Roll Ring Module S4LWR-1A "	HWF	2	13A	FW
S4	P	B10	BMRRM S4UPR-3A	"Beta Gimbal Bearing, Motor, & Roll Ring Module S4UPR-3A"	HWF	2	13A	FW
S4	P	B11	ECU ORU S4LWR-2A/4A	Electronics Control Unit Orbital Replacement Unit S4LWR-2A/4A	HWF	2	13A	FW
S4	P	B12	ECU ORU S4UPR-2A/4A	Electronics Control Unit Orbital Replacement Unit S4UPR-2A/4A	HWF	2	13A	FW
S4	P	B96	N/A	MOD EPS/Battery chg/dschg Instantiated commands	CIP	S	N/A	N/A
S4	P	C96	N/A	MOD EPS/DC/DC Converter Instantiated commands	CIP	S	N/A	N/A
S4	P	D01	DCSU S4LWR-1A RPCM A	DC Switching Unit S4LWR-1A RPCM A TYPE I	FW-UB	2	13A	FW
S4	P	D02	DCSU S4LWR-1A RPCM B	DC Switching Unit S4LWR-1A RPCM B TYPE IV	FW-UB	2	13A	FW
S4	P	D03	DCSU S4UPR-3A RPCM A	DC Switching Unit S4UPR-3A RPCM A TYPE I	FW-UB	2	13A	FW
S4	P	D04	DCSU S4UPR-3A RPCM B	DC Switching Unit S4UPR-3A RPCM B TYPE IV	FW-UB	2	13A	FW
S4	P	D17	DCSU S4LWR-1A SCA	DC Switching Unit Switchgear Cntlr Assy S4LWR-1A	FW-UB	2	13A	FW
S4	P	D18	DCSU S4UPR-3A SCA	DC Switching Unit Switchgear Cntlr Assy S4UPR-3A	FW-UB	2	13A	FW
S4	P	D96	N/A	MOD EPS/DC switching Instantiated commands	CIP	S	N/A	N/A
S4	P	G09	BGA S4LWR-1A/3A	Beta Gimbal Assy S4LWR-1A/3A	HWF	2	13A	FW
S4	P	G10	BGA S4UPR-1A/3A	Beta Gimbal Assy S4UPR-1A/3A	HWF	2	13A	FW
S4	P	G96	N/A	MOD EPS/ECU Beta Gimbals Instantiated commands	CIP	S	N/A	N/A
S4	P	P96	N/A	MOD EPS/Pump & Flow Control Instantiated commands	CIP	S	N/A	N/A
S4	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
S4	P	S01	SSU S4LWR-1A	Sequential Shunt Unit S4LWR-1A	FW-UB	2	13A	FW
S4	P	S02	SSU S4UPR-3A	Sequential Shunt Unit S4UPR-3A	FW-UB	2	13A	FW
S4	P	S96	N/A	MOD EPS/Solar Shunt Converter Instantiated commands	CIP	S	N/A	N/A
S4	P	T96	N/A	MOD EPS/Radiator Instantiated commands	CIP	S	N/A	N/A
S4	P	V96	N/A	MOD EPS/Starboard SARJ Instantiated commands	CIP	S	N/A	N/A
S4	P	W01	ECU S4LWR-1A/3A SAW	Electronics Cntrl Unit Solar Array Wing S4LWR-1A/3A	FW-UB	2	13A	FW
S4	P	W02	ECU S4UPR-1A/3A SAW	Electronics Cntrl Unit Solar Array Wing S4UPR-1A/3A	FW-UB	2	13A	FW
S4	P	W10	SAW S4LWR-1A/3A LBB MDA	Solar Array Wing S4LWR-1A/3A LBB MDA	HWF	2	13A	FW
S4	P	W11	SAW S4UPR-1A/3A LBB MDA	Solar Array Wing S4UPR-1A/3A LBB MDA	HWF	2	13A	FW
S4	P	W18	SAW S4LWR-1A/3A RBB MDA	Solar Array Wing S4LWR-1A/3A RBB MDA	HWF	2	13A	FW
S4	P	W19	SAW S4UPR-1A/3A RBB MDA	Solar Array Wing S4UPR-1A/3A RBB MDA	HWF	2	13A	FW
S4	P	W26	SAW S4LWR-1A/3A Mast MDA	Solar Array Wing S4LWR-1A/3A Mast MDA	HWF	2	13A	FW
S4	P	W27	SAW S4UPR-1A/3A Mast MDA	Solar Array Wing S4UPR-1A/3A Mast MDA	HWF	2	13A	FW
S4	P	W96	N/A	MOD EPS/ECU Solar Array Instantiated commands	CIP	S	N/A	N/A
S4	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
S4	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
S4	T	A11	PFCS S4UPR-3A	Pump Flow Control Subassy S4UPR-3A	FW-UB	2	13A	FW
S4	T	A15	PFCS S4LWR-1A	Pump Flow Control Subassy S4LWR-1A	FW-UB	2	13A	FW
S4	T	A27	PVR S4LWR-1A	Photovoltaic Radiator S4LWR-1A	FW-UB	2	13A	FW
S4	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
S4	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
S4	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
S4	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
S5	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
S5	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
S5	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
S5	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
S5	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
S5	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
S5	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
S5	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
S5	E	X96	N/A	MOD ECL Instantiated commands	CIP	S	N/A	N/A
S5	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
S5	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
S5	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
S5	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
S5	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
S5	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
S5	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
S5	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
S5	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
S5	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
S5	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
S5	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
S5	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
S6	C	X96	N/A	MOD COM & Tracking Instantiated commands	CIP	S	N/A	N/A
S6	D	B36	S6 PVCU-B/U	Logical MDM S6 Backup PVCU	LDM	2	15A	SW
S6	D	D96	N/A	MOD CDHInstantiated commands	CIP	S	N/A	N/A
S6	D	P32	S6 PVCU-PRI	Logical MDM S6 Primary PVCU	LDM	2	15A	SW
S6	D	S32	MDM PVCU-1B	Photovoltaic Control Unit-1B MDM	SW-LB	2	15A	SW
S6	D	S36	MDM PVCU-3B	Photovoltaic Control Unit-3B MDM	SW-LB	2	15A	SW
S6	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
S6	F	C96	N/A	MOD CHC Instantiated Commands	CIP	S	N/A	N/A
S6	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
S6	M	X96	N/A	SNM Instantiated Commands	CIP	S	N/A	N/A
S6	P	A01	BCDU S6UPR-1B3	Battery Charge/Discharge Unit S6UPR-1B3	FW-UB	2	17A	FW
S6	P	A03	DDCU S6UPR-1B	DC to DC Converter Unit S6UPR-1B	FW-UB	2	15A	FW
S6	P	A04	BCDU S6UPR-1B2	Battery Charge/Discharge Unit S6UPR-1B2	FW-UB	2	15A	FW
S6	P	A05	BCDU S6UPR-1B1	Battery Charge/Discharge Unit S6UPR-1B1	FW-UB	2	15A	FW
S6	P	A06	BATT S6UPR-1B3-1	Battery S6UPR-1B3-1	HWF	2	17A	FW
S6	P	A08	BATT S6UPR-1B2-1	Battery S6UPR-1B2-1	HWF	2	15A	FW
S6	P	A09	BATT S6UPR-1B1-1	Battery S6UPR-1B1-1	HWF	2	15A	FW
S6	P	A10	BATT S6UPR-1B3-2	Battery S6UPR-1B3-2	HWF	2	17A	FW
S6	P	A12	BATT S6UPR-1B2-2	Battery S6UPR-1B2-2	HWF	2	15A	FW
S6	P	A13	BATT S6UPR-1B1-2	Battery S6UPR-1B1-2	HWF	2	15A	FW
S6	P	A14	BATT S6LWR-3B3-2	Battery S6LWR-3B3-2	HWF	2	17A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	DPUI Sys	DPUI Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
S6	P	A16	BATT S6LWR-3B2-2	Battery S6LWR-3B2-2	HWF	2	15A	FW
S6	P	A17	BATT S6LWR-3B1-2	Battery S6LWR-3B1-2	HWF	2	15A	FW
S6	P	A18	BATT S6LWR-3B3-1	Battery S6LWR-3B3-1	HWF	2	17A	FW
S6	P	A20	BATT S6LWR-3B2-1	Battery S6LWR-3B2-1	HWF	2	15A	FW
S6	P	A21	BATT S6LWR-3B1-1	Battery S6LWR-3B1-1	HWF	2	15A	FW
S6	P	A22	BCDU S6LWR-3B3	Battery Charge/Discharge Unit S6LWR-3B3	FW-UB	2	17A	FW
S6	P	A23	DDCU S6LWR-3B	DC to DC Converter Unit S6LWR-3B	FW-UB	2	15A	FW
S6	P	A25	BCDU S6LWR-3B2	Battery Charge/Discharge Unit S6LWR-3B2	FW-UB	2	15A	FW
S6	P	A26	BCDU S6LWR-3B1	Battery Charge/Discharge Unit S6LWR-3B1	FW-UB	2	15A	FW
S6	P	B05	ECU BGA S6LWR-1B/3B	Electronics Control Unit Beta Gimbal Assembly S6LWR-3B/1B	HWF	2	15A	FW
S6	P	B06	ECU BGA S6UPR-1B/3B	Electronics Control Unit Beta Gimbal Assembly S6UPR-3B/1B	HWF	2	15A	FW
S6	P	B09	ECU ORU S6LWR-2A/4A	Electronics Control Unit Orbital Replacement Unit S6LWR-2A/4A	HWF	2	15A	FW
S6	P	B11	ECU ORU S6UPR-2A/4A	Electronics Control Unit Orbital Replacement Unit S6UPR-2A/4A	HWF	2	15A	FW
S6	P	B13	BMRRM S6LWR-3B	"Beta Gimbal Bearing, Motor, & Roll Ring Module S6LWR-3B"	HWF	2	15A	FW
S6	P	B14	BMRRM S6UPR-1B	"Beta Gimbal Bearing, Motor, & Roll Ring Module S6UPR-1B"	HWF	2	15A	FW
S6	P	D09	DCSU S6LWR-3B RPCM A	DC Switching Unit S6LWR-3B RPCM A TYPE I	FW-UB	2	15A	FW
S6	P	D10	DCSU S6LWR-3B RPCM B	DC Switching Unit S6LWR-3B RPCM B TYPE IV	FW-UB	2	15A	FW
S6	P	D11	DCSU S6UPR-1B RPCM A	DC Switching Unit S6UPR-1B RPCM A TYPE I	FW-UB	2	15A	FW
S6	P	D12	DCSU S6UPR-1B RPCM B	DC Switching Unit S6UPR-1B RPCM B TYPE IV	FW-UB	2	15A	FW
S6	P	D21	DCSU S6LWR-3B SCA	DC Switching Unit Switchgear Cntlr Assy S6LWR-3B	FW-UB	2	15A	FW
S6	P	D22	DCSU S6UPR-1B SCA	DC Switching Unit Switchgear Cntlr Assy S6UPR-1B	FW-UB	2	15A	FW
S6	P	G13	BGA S6LWR-1B/3B	Beta Gimbal Assy S6LWR-1B/3B	HWF	2	15A	FW
S6	P	G14	BGA S6UPR-1B/3B	Beta Gimbal Assy S6UPR-1B/3B	HWF	2	15A	FW
S6	P	S05	SSU S6LWR-3B	Sequential Shunt Unit S6LWR-3B	FW-UB	2	15A	FW
S6	P	S06	SSU S6UPR-1B	Sequential Shunt Unit S6UPR-1B	FW-UB	2	15A	FW
S6	P	W05	ECU S6LWR-1B/3B SAW	Electronics Cntrl Unit Solar Array Wing S6LWR-1B/3B	FW-UB	2	15A	FW
S6	P	W06	ECU S6UPR-1B/3B SAW	Electronics Cntrl Unit Solar Array Wing S6UPR-1B/3B	FW-UB	2	15A	FW
S6	P	W14	SAW S6LWR-1B/3B LBB MDA	Solar Array Wing S6LWR-1B/3B LBB MDA	HWF	2	15A	FW
S6	P	W15	SAW S6UPR-1B/3B LBB MDA	Solar Array Wing S6UPR-1B/3B LBB MDA	HWF	2	15A	FW
S6	P	W22	SAW S6LWR-1B/3B RBB MDA	Solar Array Wing S6LWR-1B/3B RBB MDA	HWF	2	15A	FW
S6	P	W23	SAW S6UPR-1B/3B RBB MDA	Solar Array Wing S6UPR-1B/3B RBB MDA	HWF	2	15A	FW
S6	P	W30	SAW S6LWR-1B/3B Mast MDA	Solar Array Wing S6LWR-1B/3B Mast MDA	HWF	2	15A	FW
S6	P	W31	SAW S6UPR-1B/3B Mast MDA	Solar Array Wing S6UPR-1B/3B Mast MDA	HWF	2	15A	FW
S6	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
S6	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
S6	T	A11	PFCS S6UPR-1B	Pump Flow Control Subassy S6UPR-1B	FW-UB	2	15A	FW
S6	T	A15	PFCS S6LWR-3B	Pump Flow Control Subassy S6LWR-3B	FW-UB	2	15A	FW
S6	T	A27	PVR S6LWR-3B	Photovoltaic Radiator S6LWR-3B	FW-UB	2	15A	FW
S6	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
S6	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
UF	D	M10	MFU1_CDH	MELFI Flight Unit 1 Command and Data Handling Unit	FW-LB	N	UF-2	FW
UF	D	M20	MFU2_CDH	MELFI Flight Unit 2 Command and Data Handling Unit	FW-LB	N	UF-2	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
UF	D	M30	MFU3_CDH	MELFI Flight Unit 3 Command and Data Handling Unit	FW-LB	P	UF-6	FW
UF	D	M40	MFU4_CDH	MELFI Flight Unit 4 Command and Data Handling Unit	FW-LB	P	UF-6	FW
UF	L	M15	MFU1_BSS	MELFI Flight Unit 1 Brayton Cooling Assembly	HWM	N	UF-2	SW
UF	L	M25	MFU2_BSS	MELFI Flight Unit 2 Brayton Cooling Assembly	HWM	N	UF-2	SW
UF	L	M35	MFU3_BSS	MELFI Flight Unit 3 Brayton Cooling Assembly	HWM	P	UF-6	SW
UF	L	M45	MFU4_BSS	MELFI Flight Unit 4 Brayton Cooling Assembly	HWM	P	UF-6	SW
UF	P	C01	TR CRYO-1 Power	TR CRYO-1 Power	LDF	P	UF-6	FW
UF	P	C02	TR CRYO-2 Power	TR CRYO-2 Power	LDF	P	19A	FW
UF	P	M16	MFU1_POW	MELFI Flight Unit 1 Power Distribution Unit	HWM	N	UF-2	SW
UF	P	M17	MFU1_MDU	MELFI Flight Unit 1 Motor Drive Unit	HWM	N	UF-2	SW
UF	P	M26	MFU2_POW	MELFI Flight Unit 2 Power Distribution Unit	HWM	N	UF-2	SW
UF	P	M27	MFU2_MDU	MELFI Flight Unit 2 Motor Drive Unit	HWM	N	UF-2	SW
UF	P	M36	MFU3_POW	MELFI Flight Unit 3 Power Distribution Unit	HWM	P	UF-6	SW
UF	P	M37	MFU3_MDU	MELFI Flight Unit 3 Motor Drive Unit	HWM	P	UF-6	SW
UF	P	M46	MFU4_POW	MELFI Flight Unit 4 Power Distribution Unit	HWM	P	UF-6	SW
UF	P	M47	MFU4_MDU	MELFI Flight Unit 4 Motor Drive Unit	HWM	P	UF-6	SW
UF	T	C01	TR CRYCO-1 Coolong Water	TR CRYCO-1 Coolong Water	LDF	P	UF-6	FW
UF	T	C02	TR CRYCO-2 Coolong Water	TR CRYCO-2 Coolong Water	LDF	P	19A	FW
UF	T	M11	MFU1_DE1	MELFI Flight Unit 1 Dewar 1 / Nitrogen valve 1	HWM	N	UF-2	SW
UF	T	M12	MFU1_DE2	MELFI Flight Unit 1 Dewar 2 / Nitrogen valve 2	HWM	N	UF-2	SW
UF	T	M13	MFU1_DE3	MELFI Flight Unit 1 Dewar 3 / Nitrogen valve 3	HWM	N	UF-2	SW
UF	T	M14	MFU1_DE4	MELFI Flight Unit 1 Dewar 4 / Nitrogen valve 4	HWM	N	UF-2	SW
UF	T	M18	MFU1_BPV	MELFI Flight Unit 1 Nitrogen By-pass Valve	HWM	N	UF-2	SW
UF	T	M19	MFU1_WVA	MELFI Flight Unit 1 Water loop valve	HWM	N	UF-2	SW
UF	T	M21	MFU2_DE1	MELFI Flight Unit 2 Dewar 1 / Nitrogen valve 1	HWM	N	UF-2	SW
UF	T	M22	MFU2_DE2	MELFI Flight Unit 2 Dewar 2 / Nitrogen valve 2	HWM	N	UF-2	SW
UF	T	M23	MFU2_DE3	MELFI Flight Unit 2 Dewar 3 / Nitrogen valve 3	HWM	N	UF-2	SW
UF	T	M24	MFU2_DE4	MELFI Flight Unit 2 Dewar 4 / Nitrogen valve 4	HWM	N	UF-2	SW
UF	T	M28	MFU2_BPV	MELFI Flight Unit 2 Nitrogen By-pass Valve	HWM	N	UF-2	SW
UF	T	M29	MFU2_WVA	MELFI Flight Unit 2 Water loop valve	HWM	N	UF-2	SW
UF	T	M31	MFU3_DE1	MELFI Flight Unit 3 Dewar 1 / Nitrogen valve 1	HWM	P	UF-6	SW
UF	T	M32	MFU3_DE2	MELFI Flight Unit 3 Dewar 2 / Nitrogen valve 2	HWM	P	UF-6	SW
UF	T	M33	MFU3_DE3	MELFI Flight Unit 3 Dewar 3 / Nitrogen valve 3	HWM	P	UF-6	SW
UF	T	M34	MFU3_DE4	MELFI Flight Unit 3 Dewar 4 / Nitrogen valve 4	HWM	P	UF-6	SW
UF	T	M38	MFU3_BPV	MELFI Flight Unit 3 Nitrogen By-pass Valve	HWM	P	UF-6	SW
UF	T	M39	MFU3_WVA	MELFI Flight Unit 3 Water loop valve	HWM	P	UF-6	SW
UF	T	M41	MFU4_DE1	MELFI Flight Unit 4 Dewar 1 / Nitrogen valve 1	HWM	P	UF-6	SW
UF	T	M42	MFU4_DE2	MELFI Flight Unit 4 Dewar 2 / Nitrogen valve 2	HWM	P	UF-6	SW
UF	T	M43	MFU4_DE3	MELFI Flight Unit 4 Dewar 3 / Nitrogen valve 3	HWM	P	UF-6	SW
UF	T	M44	MFU4_DE4	MELFI Flight Unit 4 Dewar 4 / Nitrogen valve 4	HWM	P	UF-6	SW
UF	T	M48	MFU4_BPV	MELFI Flight Unit 4 Nitrogen By-pass Valve	HWM	P	UF-6	SW
UF	T	M49	MFU4_WVA	MELFI Flight Unit 4 Water loop valve	HWM	P	UF-6	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	DPUI Sys	DPUI Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
UF	Z	C01	Transportation CYRO Unit 1	Transportation CYRO Unit 1	FW-LB	P	UF-6	FW
UF	Z	C02	Transportation CYRO Unit 2	Transportation CYRO Unit 2	FW-LB	P	19A	FW
UP	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
UP	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
UP	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
UP	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
UP	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
UP	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
UP	C	X96	N/A	MOD Com & Tracking Instantiated commands	CIP	S	N/A	N/A
UP	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
UP	D	K01	PCS/P-1	Payload Portable Computer System Logical Device 1	LDM	K	6A	SW
UP	D	K02	PCS/P-2	Payload Portable Computer System Logical Device 2	LDM	K	6A	SW
UP	D	K03	PCS/P-3	Payload Portable Computer System Logical Device 3	LDM	K	6A	SW
UP	D	K04	PCS/P-4	Payload Portable Computer System Logical Device 4	LDM	K	6A	SW
UP	D	K05	PCS/P-5	Payload Portable Computer System Logical Device 5	LDM	K	6A	SW
UP	E	A96	N/A	MOD ECL/ARS Instantiated Commands	CIP	S	N/A	N/A
UP	E	F96	N/A	MOD ECL/FDS Instantiated Commands	CIP	S	N/A	N/A
UP	E	P96	N/A	MOD ECL/ACS Instantiated Commands	CIP	S	N/A	N/A
UP	E	S96	N/A	MOD ECL/WM Instantiated Commands	CIP	S	N/A	N/A
UP	E	T96	N/A	MOD ECL/THC Instantiated Commands	CIP	S	N/A	N/A
UP	E	V96	N/A	MOD ECLVS Instantiated Commands	CIP	S	N/A	N/A
UP	E	W96	N/A	MOD ECLWRM Instantiated Commands	CIP	S	N/A	N/A
UP	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
UP	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
UP	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
UP	M	C96	N/A	MOD SNM/CBM Instantiated Commands	CIP	S	N/A	N/A
UP	M	L96	N/A	MOD SNM/LCA Instantiated Commands	CIP	S	N/A	N/A
UP	M	P96	N/A	MOD SNM/PAS Instantiated Commands	CIP	S	N/A	N/A
UP	M	S96	N/A	MOD SNM/SSAS Instantiated Commands	CIP	S	N/A	N/A
UP	M	U96	N/A	MOD SNM/ULCAS Instantiated Commands	CIP	S	N/A	N/A
UP	P	R96	N/A	MOD EPS/RPCM Instantiated commands	CIP	S	N/A	N/A
UP	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
UP	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
UP	T	E96	N/A	MOD TCS/Active Instantiated commands	CIP	S	N/A	N/A
UP	T	H96	N/A	MOD TCS/Heaters Instantiated commands	CIP	S	N/A	N/A
UP	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
UP	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
US	C	A96	N/A	MOD CNT/Audio Instantiated commands	CIP	S	N/A	N/A
US	C	C96	N/A	MOD CNT/ECOMM Instantiated commands	CIP	S	N/A	N/A
US	C	G40	ACBSP GRP	ACBSP pseudo command device	GRPF	1	3A	FW
US	C	G41	XPDR GRP	XPDR pseudo command device	GRPF	1	3A	FW
US	C	G42	ACFRG GRP	ACRFG pseudo command device	GRPF	1	4A	FW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
US	C	G43	EVSW GRP	EVSW Commands for Group PUIs	GRPF	1	8A	FW
US	C	K96	N/A	MOD CNT/Ku-Band Instantiated commands	CIP	S	N/A	N/A
US	C	S96	N/A	MOD CNT/S-Band Instantiated commands	CIP	S	N/A	N/A
US	C	U96	N/A	MOD CNT/UHF Instantiated commands	CIP	S	N/A	N/A
US	C	V96	N/A	MOD CNT/Video Instantiated commands	CIP	S	N/A	N/A
US	C	X95	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
US	C	X96	N/A	MOD Com and Tracking Instantiated commands	CIP	S	N/A	N/A
US	D	A01	LB CHECS	CHeCS Local Data Bus	HWM-DB	D	5A	SW
US	D	A02	CB CT	Comm & Track Control Data Bus	HWM-DB	D	4A	SW
US	D	A03	CB EXT	External Control Data Bus	HWM-DB	D	5A	SW
US	D	A04	LB SEPS-HAB	Habitat Secondary Electrical Power Sys Local Data Bus	HWM-DB	D	5A	SW
US	D	A05	LB SEPS-N2	Node 2 Secondary Electrical Power Sys Local Data Bus	HWM-DB	D	5A	SW
US	D	A06	LB SYS-S	Secondary Electrical Power Sys Local Data Bus	HWM-DB	D	8A	SW
US	D	A07	CB GNC	GN&C Control Data Bus	HWM-DB	D	2A	SW
US	D	A08	CB INT	Internal Control Data Bus	HWM-DB	D	5A	SW
US	D	A09	HC LB	HC Local Data Bus	HWM-DB	D	6A	SW
US	D	A10	LB SYS-LAB	SYS-LAB Local Data Bus	HWM-DB	D	2A	SW
US	D	A11	LB SYS-HAB	SYS-HAB Local Data Bus	HWM-DB	D	6A	SW
US	D	A12	BCU LB	BCU Local Data Bus	HWM-DB	D	6A	SW
US	D	A13	MSS LB	MSS Local Data Bus	HWM-DB	D	8A	SW
US	D	A14	MSS BUD LB	MSS BUD Local Data Bus	HWM-DB	D	6A	SW
US	D	A15	MSS PDGF LB	MSS PDGF Local Data Bus	HWM-DB	D	6A	SW
US	D	A16	LB MT	MT Local Data Bus	HWM-DB	D	8A	SW
US	D	A17	LB EPS-HAB	EPS-HAB Local Data Bus	HWM-DB	D	6A	SW
US	D	A18	LB EPS-CAM	EPS-CAM Local Data Bus	HWM-DB	D	5A	SW
US	D	A19	LB PL	PL Local Data Bus	HWM-DB	D	5A	SW
US	D	A20	LB PMCU	PMCU Local Data Bus	HWM-DB	D	8A	SW
US	D	A21	UB AL	AL User Data Bus	HWM-DB	D	7A	SW
US	D	A22	UB HA	HA User Data Bus	HWM-DB	D	16A	SW
US	D	A23	UB LA	LA User Data Bus	HWM-DB	D	5A	SW
US	D	A24	UB PVA-13	PVA User Data Bus	HWM-DB	D	13A	SW
US	D	A25	UB PVB-13	PVB User Data Bus	HWM-DB	D	15A	SW
US	D	A26	UB PTR	PTR User Data Bus	HWM-DB	D	11A	SW
US	D	A27	UB PVA-24	PVA User Data Bus	HWM-DB	D	12A	SW
US	D	A28	UB PVB-24	PVB User Data Bus	HWM-DB	D	4A	SW
US	D	A29	UB STR	STR User Data Bus	HWM-DB	D	9A	SW
US	D	A30	UB ORB-N1	ORB-N1 User Data Bus	HWM-DB	D	2A	SW
US	D	A31	CB CT-BIA	Comm & Track-BIA Control Data Bus	HWM-DB	D	5A	SW
US	D	A32	LB SYS-P	SYS-P Local Data Bus	HWM-DB	D	8A	SW
US	D	A33	LB MECH-S	MECH-S Local Data Bus	HWM-DB	D	8A	SW
US	D	A34	LB MECH-P	MECH-P Local Data Bus	HWM-DB	D	8A	SW
US	D	A35	LB EPS-N2	EPS-N2 Local Data Bus	HWM-DB	D	5A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
US	D	A36	LB SYS-N2	SYS-N2 Local Data Bus	HWM-DB	D	10A	SW
US	D	A37	LB ORB-HAB	ORB-HAB Local Data Bus	HWM-DB	D	16A	SW
US	D	A38	LB ORB-N2	ORB-N2 Local Data Bus	HWM-DB	D	5A	SW
US	D	A39	UB EPS-N1	EPS-N1 User Data Bus	HWM-DB	D	2A	SW
US	D	A40	UB SEPS-S0	SEPS-SO User Data Bus	HWM-DB	D	8A	SW
US	D	A41	UB SEPS-S1	SEPS-S1 User Data Bus	HWM-DB	D	9A	SW
US	D	A42	UB SEPS-P1	SEPS-P1 User Data Bus	HWM-DB	D	11A	SW
US	D	A43	UB SEPS-S3	SEPS-S3 User Data Bus	HWM-DB	D	13A	SW
US	D	A44	UB SEPS-P3	SEPS-P3 User Data Bus	HWM-DB	D	12A	SW
US	D	A45	LB GNC	GNC Local Data Bus	HWM-DB	D	5A	SW
US	D	A50	SDMS RS-485	Structural Dynamic Measurement System-RS-485 Data Bus	HWM-DBN	D	8A	SW
US	D	A51	RJMC RS-485	Rotary Joint Motor Controller RS-485 Data Bus	HWM-DBN	D	9A	SW
US	D	A52	VTR RS-485	Video Tape Recorder RS-485 Data Bus	HWM-DBN	D	5A	SW
US	D	A53	EMU RS-485	Extravehicular Mobility Unit RS-485 Data Bus	HWM-DBN	D	5A	SW
US	D	A54	APS HRDL	Automatic Payload Switch High Rate Data Link	HWM-DBN	D	5A	SW
US	D	A55	INT ORB	Internal Orbiter Bus	HWM-DBN	D	5A	SW
US	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
US	D	G00	CMD GRP	Command Group PUI Identifier	GRPM	D	2A	SW
US	D	G01	TLM GRP	Telemetry Group PUI Identifier	GRPM	D	2A	SW
US	D	G02	TIME GRP	Time Broadcast & Set Time Commands PUI Identifier	GRPM	D	2A	SW
US	D	G11	CC GRP	Command & Control Group PUI Identifier	GRPM	0	5A	SW
US	D	G12	COM CMD GRP	Common Command Group PUI Identifier	GRPM	0	2A	SW
US	D	G40	APS PCD	APS Psuedo Cmd. Device	GRPF	1	5A	FW
US	D	G41	PEHG PCD	PEHG Psuedo Cmd. Device	GRPF	1	5A	FW
US	D	G42	ESSMDM EXT PCD	Space Station Multiplexer/Demultiplexer External Psuedo Command Device	GRPM	1	8A	SW
US	D	G43	SSMDM S0 PCD	Space Station Multiplexer/Demultiplexer S0 Psuedo Command Device	GRPM	1	8A	SW
US	D	G44	SSMDM S1 PCD	Space Station Multiplexer/Demultiplexer S1 Psuedo Command Device	GRPM	1	9A	SW
US	D	G45	SSMDM STR/PTR PCD	Space Station Multiplexer/Demultiplexer STR/PTR Psuedo Command Device	GRPM	1	9A	SW
US	D	G46	SSMDM S3 PCD	Space Station Multiplexer/Demultiplexer S3 Psuedo Command Device	GRPM	1	13A	SW
US	D	G47	SSMDM P1 PCD	Space Station Multiplexer/Demultiplexer P1 Psuedo Command Device	GRPM	1	11A	SW
US	D	G48	SSMDM P3 PCD	Space Station Multiplexer/Demultiplexer P3 Psuedo Command Device	GRPM	1	12A	SW
US	D	G50	CCSDS TLM GRP 3A	Telemetry Device Code for 3A	GRPM	D	3A	SW
US	D	G51	CCSDS TLM GRP 5A	Telemetry Device Code for 5A	GRPM	D	5A	SW
US	D	G52	CCSDS TLM GRP 6A	Telemetry Device Code for 6A	GRPM	D	6A	SW
US	D	G53	CCSDS TLM GRP 7A	Telemetry Device Code for 7A	GRPM	D	7A	SW
US	D	G54	CCSDS TLM GRP 8A	Telemetry Device Code for 8A	GRPM	D	8A	SW
US	D	G55	CCSDS TLM GRP 9A	Telemetry Device Code for 9A	GRPM	D	9A	SW
US	D	G56	CCSDS TLM GRP 10A	Telemetry Device Code for 10A	GRPM	D	10A	SW
US	D	G57	CCSDS TLM GRP 11A	Telemetry Device Code for 11A	GRPM	D	11A	SW
US	D	G58	CCSDS TLM GRP 12A	Telemetry Device Code for 12A	GRPM	D	12A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI								
Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
US	D	G59	CCSDS TLM GRP 13A	Telemetry Device Code for 13A	GRPM	D	13A	SW
US	D	G60	CCSDS TLM GRP 14A	Telemetry Device Code for 14A	GRPM	D	14A	SW
US	D	G61	CCSDS TLM GRP 15A	Telemetry Device Code for 15A	GRPM	D	15A	SW
US	D	G62	CCSDS TLM GRP 16A	Telemetry Device Code for 16A	GRPM	D	16A	SW
US	D	G63	CCSDS TLM GRP 17A	Telemetry Device Code for 17A	GRPM	D	17A	SW
US	D	G64	CCSDS TLM GRP 18A	Telemetry Device Code for 18A	GRPM	D	18A	SW
US	D	G65	CCSDS TLM GRP 19A	Telemetry Device Code for 19A	GRPM	D	19A	SW
US	D	G66	CCSDS TLM GRP RESERVE 1	Telemetry Device Code RESERVE 1	GRPM	D	3A	SW
US	D	G67	CCSDS TLM GRP RESERVE 2	Telemetry Device Code RESERVE 2	GRPM	D	4A	SW
US	D	G68	CCSDS TLM GRP RESERVE 3	Telemetry Device Code RESERVE 3	GRPM	D	5A	SW
US	D	G69	CCSDS TLM GRP RESERVE 4	Telemetry Device Code RESERVE 4	GRPM	D	6A	SW
US	D	G70	CCSDS TLM GRP RESERVE 5	Telemetry Device Code RESERVE 5	GRPM	D	7A	SW
US	D	G71	CCSDS TLM GRP RESERVE 6	Telemetry Device Code RESERVE 6	GRPM	D	8A	SW
US	D	G72	CCSDS TLM GRP RESERVE 7	Telemetry Device Code RESERVE 7	GRPM	D	9A	SW
US	D	G73	CCSDS TLM GRP RESERVE 8	Telemetry Device Code RESERVE 8	GRPM	D	10A	SW
US	D	G74	CCSDS TLM GRP RESERVE 9	Telemetry Device Code RESERVE 9	GRPM	D	11A	SW
US	D	G75	CCSDS TLM GRP RESERVE 10	Telemetry Device Code RESERVE 10	GRPM	D	12A	SW
US	D	G76	CCSDS TLM GRP RESERVE 11	Telemetry Device Code RESERVE 11	GRPM	D	13A	SW
US	D	K01	PCS/C-1	Portable Computer System Logical Device 1	LDM	K	2A	SW
US	D	K02	PCS/C-2	Portable Computer System Logical Device 2	LDM	K	2A	SW
US	D	K03	PCS/C-3	Portable Computer System Logical Device 3	LDM	K	2A	SW
US	D	K04	PCS/C-4	Portable Computer System Logical Device 4	LDM	K	5A	SW
US	D	K05	PCS/C-5	Portable Computer System Logical Device 5	LDM	K	5A	SW
US	D	K06	PCS/C-6	Portable Computer System Logical Device 6	LDM	K	5A	SW
US	D	K07	PCS/C-7	Portable Computer System Logical Device 7	LDM	K	5A	SW
US	D	K08	PCS/C-8	Portable Computer System Logical Device 8	LDM	K	5A	SW
US	D	L01	PCR ORB UB ORB-N1-1	Portable Computer Receptacle ORB UB ORB-N1-1	PCR-UB	D	2A	SW
US	D	L02	PCR ORB UB ORB-N1-2	Portable Computer Receptacle ORB UB ORB-N1-2	PCR-UB	D	2A	SW
US	D	L03	PCR ORB LB ORB-N2-1	Portable Computer Receptacle ORB LB ORB-N2-1	PCR-LB	D	10A	SW
US	D	L04	PCR ORB LB ORB-N2-2	Portable Computer Receptacle ORB LB ORB-N2-2	PCR-LB	D	10A	SW
US	D	L05	PCR ORB LB ORB-HAB-1	Portable Computer Receptacle ORB LB ORB-HAB-1	PCR-LB	D	16A	SW
US	D	L06	PCR ORB LB ORB-HAB-2	Portable Computer Receptacle ORB LB ORB-HAB-2	PCR-LB	D	16A	SW
US	D	L07	PCR-1 USL CB INT-1	Portable Computer Receptacle-1 USL CB INT-1	PCR-CB	D	5A	SW
US	D	L08	PCR-5 USL CB INT-1	Portable Computer Receptacle-5 USL CB INT-1	PCR-CB	D	5A	SW
US	D	L09	PCR-2 USL CB INT-2	Portable Computer Receptacle-2 USL CB INT-2	PCR-CB	D	5A	SW
US	D	L10	PCR-6 USL CB INT-2	Portable Computer Receptacle-6 USL CB INT-2	PCR-CB	D	5A	SW
US	D	L11	PCR MSS USL Rk CB EXT-1	Portable Computer Receptacle MSS USL Rack CB EXT-1	PCR-CB	D	5A	SW
US	D	L12	PCR-1 PL LB PL-1	Portable Computer Receptacle-1 PL LB PL-1	PCR-LB	D	5A	SW
US	D	L13	PCR-2 PL LB PL-2	Portable Computer Receptacle-2 PL LB PL-2	PCR-LB	D	5A	SW
US	D	L14	PCR AL1 CB CT-4	Portable Computer Receptacle AL1 CB CT-4	PCR-CB	D	7A	SW
US	D	L15	PCR AL2 CB CT-4	Portable Computer Receptacle AL2 CB CT-4	PCR-CB	D	7A	SW
US	D	L16	PCR Core Cu CB INT-2	Portable Computer Receptacle Core Cupola CB INT-2	PCR-CB	D	10A	SW

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	Sys	Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
US	D	L17	PCR MSS Cu CB INT-2	Portable Computer Receptacle MSS Cupola CB INT-2	PCR-CB	D	10A	SW
US	D	L18	PCR MSS Cu Rk CB EXT-2	Portable Computer Receptacle MSS Cupola Rack CB EXT-2	PCR-CB	D	10A	SW
US	D	L19	PCR CAM1 CB CT-4	Portable Computer Receptacle CAM1 CB CT-4	PCR-CB	D	14A	SW
US	D	L20	PCR CAM2 CB CT-BIA-23	Portable Computer Receptacle CAM2 CB-BIA-23	PCR-CB	D	14A	SW
US	D	L23	PCR HAX1-2 CB CT-4	Portable Computer Receptacle HAX1-2 CB CT-4	PCR-CB	D	16A	SW
US	D	L24	PCR HAX4-4 CB CT-BIA-23	Portable Computer Receptacle HAX4-4 CB-BIA-23	PCR-CB	D	16A	SW
US	D	L25	PCR HAS4 CB CT-4	Portable Computer Receptacle HAS4 CB CT-4	PCR-CB	D	16A	SW
US	D	L26	PCR HAX4-4 CB CT-BIA-23	Portable Computer Receptacle HAX4-4 CB-BIA-23	PCR-CB	D	16A	SW
US	D	L27	PCR HAX4-4 CB CT-BIA-23	Portable Computer Receptacle HAX4-4 CB-BIA-23	PCR-CB	D	16A	SW
US	D	L28	PCR HAX4-4 CB CT-BIA-23	Portable Computer Receptacle HAX4-4 CB-BIA-23	PCR-CB	D	16A	SW
US	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
US	F	C08	CPDS IV	CHeCS Charged Particle Directional Spectrometer IV	HWF/FW-LB	H	6A	FW
US	F	C40	TEPC	CHeCS Tissue Equivalent Proportional Counter	HWF/FW-LB	H	6A	FW
US	F	C96	N/A	MOD CHC Instatiated Commands	CIP	S	N/A	N/A
US	F	C96	N/A	MOD CHC Instantiated commands	CIP	S	N/A	N/A
US	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
US	G	Z40	CMG PCD GRP	CMG pseudo command device	GRPF	1	3A	FW
US	G	Z41	RGA PCD	RGA Psuedo Cmd. Device	GRPF	1	8A	FW
US	G	Z42	GPS PCD	GPS Psuedo Cmd. Device	GRPF	P	5A	FW
US	J	G40	RJMC PCD	Rotary Joint Motor Controller Psuedo Command Device	GRPF	1	9A	FW
US	M	G40	IMCA PCD Grp	Integrated Motor Controller Assembly Psuedo Command Device	GRPF	1	8A	FW
US	M	G41	BBC PCD Grp	Bolt Bus Controller Psuedo Command Device	GRPF	1	8A	FW
US	M	X96	N/A	MOD SNM Instantiated Commands	CIP	S	N/A	N/A
US	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
US	P	Z20	PMCU GRP	PMCU Commands for Group PUI’s	GRPM	2	5A	SW
US	P	Z21	PVCU GRP	PVCU Commands for Group PUIs	GRPM	2	4A	SW
US	P	Z22	BCDU GRP	BCDU Commands for Group PUIs	GRPF	2	4A	FW
US	P	Z23	DCSU SCA GRP	DCSU SCA Commands for Group PUIs	GRPF	2	4A	FW
US	P	Z24	DDCU GRP	DDCU Commands for Group PUIs	GRPF	2	4A	FW
US	P	Z25	ECU BGA GRP	ECU BGA Commands for Group PUIs	GRPF	2	4A	FW
US	P	Z26	ECU SAW GRP	ECU SAW Commands for Group PUIs	GRPF	2	4A	FW
US	P	Z27	MBSU SCA GRP	MBSU SCA Commands for Group PUIs	GRPF	2	8A	FW
US	P	Z28	PCU GRP	PCU Commands for Group PUIs	GRPF	2	3A	FW
US	P	Z29	PFCS GRP	PFCS Commands for Group PUIs	GRPF	2	4A	FW
US	P	Z30	SSU GRP	SSU Commands for Group PUIs	GRPF	2	4A	FW
US	P	Z31	RPCM GRP	RPCM Commands for Group PUIs	GRPF	2	2A	FW
US	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
US	S	G40	SCU PCD Grp	Accelerometer and Strain Gage Signal Conditioner Unit Psuedo Command Device	GRPF	1	8A	FW
US	T	G01	PM PCVP PCD	Pump-ORU Module EATCS Pump and Control Valve Package Psuedo Command Device	GRPF	1	9A	FW
US	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A

APPENDIX C LEGAL VALUES FOR DEVICE PUIS (SORTED BY ELEM, SYS, ASSY) - CONTINUED

DPUI Elem	DPUI Sys	DPUI Assy	Device/Controller Legal Name	Device/Controller Description	Device Type (Ref Table 3.3.1.3-1)	Data Provider	Flt Del.	MBF Domain
US	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A
VO	G	U01	OIU-1	Orbiter Interface Unit-1	HWM/SW-CB	U	1A	SW
VO	G	U02	OIU-2	Orbiter Interface Unit-2	HWM/SW-CB	U	1A	SW
Z1	C	K04	SGTRC	Ku-Band SGS Transmitter/Receiver Controller	HWF/FW-CB	1	3A	FW
Z1	C	K05	SGTRC ANT	Ku-Band SGS Transmitter/Receiver Controller Antenna	HWF	1	3A	FW
Z1	C	X96	N/A	MOD COM& Tracking Instantiated commands	CIP	S	N/A	N/A
Z1	D	D96	N/A	MOD CDH Instantiated commands	CIP	S	N/A	N/A
Z1	E	X96	N/A	MOD ECL Instantiated Commands	CIP	S	N/A	N/A
Z1	F	C96	N/A	MOD CHC Instantiated Commands	CIP	S	N/A	N/A
Z1	G	C01	CMG-1	Control Moment Gyro 1	HWF	1	3A	FW
Z1	G	C02	CMG-1 CNTRL	Control Moment Gyro 1 Firmware Controller	FW-LB	1	3A	FW
Z1	G	C03	CMG-2	Control Moment Gyro 2	HWF	1	3A	FW
Z1	G	C04	CMG-2 CNTRL	Control Moment Gyro 2 Firmware Controller	FW-LB	1	3A	FW
Z1	G	C05	CMG-3	Control Moment Gyro 3	HWF	1	3A	FW
Z1	G	C06	CMG-3 CNTRL	Control Moment Gyro 3 Firmware Controller	FW-LB	1	3A	FW
Z1	G	C07	CMG-4	Control Moment Gyro 4	HWF	1	3A	FW
Z1	G	C08	CMG-4 CNTRL	Control Moment Gyro 4 Firmware Controller	FW-LB	1	3A	FW
Z1	G	X96	N/A	MOD MCS Instantiated Commands	CIP	S	N/A	N/A
Z1	L	P01	PCU Z1-3B	Plasma Contactor Unit Z1-3B	HWF/FW-UB	2	3A	FW
Z1	L	P02	PCU Z1-4B	Plasma Contactor Unit Z1-4B	HWF/FW-UB	2	3A	FW
Z1	M	X96	N/A	SNM Instantiated Commands	CIP	S	N/A	N/A
Z1	P	C33	DDCU Z1-3B	DC to DC Converter Unit Z1-3B	HWF/FW-UB	2	3A	FW
Z1	P	C34	DDCU Z1-4B	DC to DC Converter Unit Z1-4B	HWF/FW-UB	2	3A	FW
Z1	P	D25	RPCM Z1-4B-A	Remote Power Control Module Z1-4B-A	FW-UB	0	3A	FW
Z1	P	D26	RPCM Z1-4B-B	Remote Power Control Module Z1-4B-B	FW-UB	0	3A	FW
Z1	P	D27	RPCM Z1-3B-A	Remote Power Control Module Z1-3B-A	FW-UB	0	3A	FW
Z1	P	D28	RPCM Z1-3B-B	Remote Power Control Module Z1-3B-B	FW-UB	0	3A	FW
Z1	P	U23	Util Rail Z1 3B	Utility Rail Z1 Power Channel 3B	HWF	1	3A	FW
Z1	P	U24	Util Rail Z1 4B	Utility Rail Z1 Power Channel 4B	HWF	1	3A	FW
Z1	P	X96	N/A	MOD EPS Instantiated commands	CIP	S	N/A	N/A
Z1	R	M96	N/A	MOD EVR Instantiated commands	CIP	S	N/A	N/A
Z1	T	X96	N/A	MOD TCS Instantiated commands	CIP	S	N/A	N/A
Z1	X	X96	N/A	MOD EVA Instantiated commands	CIP	S	N/A	N/A

APPENDIX D LEGAL GENERIC DEVICE CODE VALUES FOR ENCODING SIGNAL PUIS

Legal PUI Code (Ch7,8)	Description
AF	After Cooler
AM	Accumulator
AN	Antenna
AS	Array String
AT	Audio Terminal Unit
AU	Audio I/F Unit
BB	Blanket Box
BC	Bussing Connector
BD	Bed
BG	Beta Gimbal Assembly
BI	Remote Bus Isolator
BL	Blower
BP	Baseplate
BR	Bar Code Reader
BT	Battery
CB	Control Bus
CC	CCSDS
CM	Camera
CN	Controller
CO	Power Conditioning Unit
CP	Coldplate
CT	Central Computer
CU	Coupler
CV	Converter
CW	Crew Wireless Unit
DR	Drive Unit
FA	Fan
FC	Firmware Controller
FD	Flame Detector
FM	Flow Meter
FT	Filter
HT	Heater

APPENDIX D LEGAL GENERIC DEVICE CODE VALUES FOR ENCODING SIGNAL PUIS (CONTINUED)

Legal PUI Code (Ch7,8)	Description
HW	Hardware (International Partners Only)
HX	Heat Exchanger
IE	Integrated Equipment Assembly
IM	ISS MOD Avionics Reconfiguration
IP	Interface Panel
IU	Interface Unit
LB	Local Bus
LD	Light Emitting Diode
LT	Latch
LP	Lamp
MC	Magnetic Damping Control Unit
MD	Multiplexer/Demultiplexer
ME	Matching Unit
MG	MOD GENERATED
MI	Mode Indicator
MM	Motor Drive Assembly Mast
MO	Modem
MS	Mass Spectometer
MT	Motor
MU	Mass Storage Unit
MX	Multiplexer
OV	Oven
PB	Powered Bolt
PC	Control Post Computer
PD	Power distribution Unit
PE	Precooler
PO	Processor
PT	Port
PP	Peltier Pulser
PU	Pump
PW	Power Supply
QD	Quick Disconnect
RC	Recorder

APPENDIX D LEGAL GENERIC DEVICE CODE VALUES FOR ENCODING SIGNAL PUIS (CONTINUED)

Legal PUI Code (Ch7,8)	Description
RD	Radiator
RG	Regulator
RK	Refrigerator/Freezer Rack
RT	Remote Terminal
SC	Signal Conditioning Unit
SK	Smoke Detector
SM	Station Management & Control
SP	Signal Processor
SQ	Squib Unit
SR	Sensor
SU	Switch Unit
SW	Software (International Partners Only)
TC	Terminal Computer
TH	Thruster
TK	Tank
TL	Telemetry
UB	User Bus
UM	Umbilical
VE	Vent
VL	Valve
VM	Video Monitor
WS	Air/Water Separator
XP	Transponder
XR	Transmitter/Receiver

APPENDIX E LEGAL SIGNAL TYPE VALUES FOR ENCODING SIGNAL PUIS

Legal PUI Code (Ch 13)	Description
A	Acceleration
B	Phase Electrical/Electromagnetic Field/Light/Intensity
C	Current
D	Vibration
E	Electrical Power
F	Frequency
G	Force/Strain/Stress/Angular Momentum/Mass
H	Position/Attitude/Distance/Deflection/Area
I	(Unused)
J	Logic Status/Discrete Event/Enumeration
K	Command/Stimulus and Command Parameters
L	Group
M	Data Bus
N	Radiation/Contamination/Toxicity
O	(Unused)
P	Pressure
Q	Quantity/Humidity/Volume
R	Rate/Flow
S	(Unused)
T	Temperature
U	Undefined/Non Dimensional/Null
V	Voltage
W	Time/Day/Year
X	Excitation
Y	Acoustics
Z	(Unused)

APPENDIX F LEGAL VALUES FOR UNITS OF MEASURE

This field is an alphabetic abbreviation used in conjunction with data range low or high to denote common usage engineering units. The Signal Type defined in this table shall be used in conjunction with the associated unit. The Units Conversion will be used by the Users to convert from the Native Units to the Metric Units utilizing the general expression: Metric Value = [A0 + A1(Native Value)] x Prefix Multiplier.

The metric Conversion Type column will identify a set of values for each of four types of conversion options:

A. SMALL - A metric conversion for a small native units range;

B. LARGE - A metric conversion for a large native units range;

C. OVRD_ONLY - A variable number of selectable override metric units conversions available only via override requirements; and

D. NONE - A native unit for which no conversion is applicable.

The value in the Range Criteria column will indicate that native units maximum value at which the conversion selection is to default to the Large conversion type, unless an override specification has been provided against that primitive for which a conversion is being made. The override selection takes priority. The value "N/A" is present when a range criteria value does not exist for a given conversion.

All entries in the Metric Units column shall have an entry in the Legal Values (Native Units) column to establish it as a legal units. The remaining columns for that entry shall be those required to establish a unitary conversion set for that unit and the Conversion Type shall be "NONE".

Description of Unit Name (80C)	Legal Values (Native Units) (30C)	Signal Type PUI Code (Ch13) (1C)	Metric Units (30C)	Units A0 Coefficient (14F)	Units A1 Coefficient (14F)	Prefix Multiplier (14F)	Range Criteria (14F)	Conver-sion Type (30C)
1.5 Seconds	1.5S	W	N/A	N/A	N/A	N/A	N/A	NONE
1/1024 cycles	1/1024C	F	N/A	N/A	N/A	N/A	N/A	NONE
1/16 chip	1/16CHIP	U	N/A	N/A	N/A	N/A	N/A	NONE
1/16 Microseconds	1/16US	W	N/A	N/A	N/A	N/A	N/A	NONE
1/256 cycles	1/256C	F	N/A	N/A	N/A	N/A	N/A	NONE
1/256 seconds	1/256S	W	N/A	N/A	N/A	N/A	N/A	NONE
1/4 Auxiliary Measurement Units	1/4AMU	B	N/A	N/A	N/A	N/A	N/A	NONE

APPENDIX F LEGAL VALUES FOR UNITS OF MEASURE (Continued)

Description of Unit Name (80C)	Legal Values (Native Units) (30C)	Signal Type PUI Code (Ch13) (1C)	Metric Units (30C)	Units A0 Coefficient (14F)	Units A1 Coefficient (14F)	Prefix Multiplier (14F)	Range Criteria (14F)	Conver-sion Type (30C)
Absorption Units	ABU	Q	N/A	N/A	N/A	N/A	N/A	NONE
Ampere	AMP	C	N/A	N/A	N/A	N/A	N/A	NONE
Ampere Hours	AMP-HR	E	COULOMB	0.0E+00	3.600000E+03	1.0E+00	N/A	SMALL
Amperes dc	AMPD	C	N/A	N/A	N/A	N/A	N/A	NONE
Amperes per Count	AMP/CNT	C	N/A	N/A	N/A	N/A	N/A	NONE
Amperes per Degree	AMPS/DEG	C	N/A	N/A	N/A	N/A	N/A	NONE
Ampere Second per Radian	AMP-SEC/RAD	R	N/A	N/A	N/A	N/A	N/A	NONE
Amperes per Radian	AMP/RAD	C	N/A	N/A	N/A	N/A	N/A	NONE
Arc Minute	ARCMIN	H	RAD	0.0E+00	2.908882E-04	1.0E+00	N/A	SMALL
Arc Second	ARCS	H	RAD	0.0E+00	4.848137E-06	1.0E+00	N/A	SMALL
Astronomical Units	AU	H	N/A	N/A	N/A	N/A	N/A	NONE
Atomic Number	AN	Q	N/A	N/A	N/A	N/A	N/A	NONE
Aux Measurement Unit	AMU	B	N/A	N/A	N/A	N/A	N/A	NONE
Beats per Minute	BTS/MIN	R	N/A	N/A	N/A	N/A	N/A	NONE
Bits per Second	BPS	R	N/A	N/A	N/A	N/A	N/A	NONE
Breaths per Minute	BTHS/MIN	R	N/A	N/A	N/A	N/A	N/A	NONE
British Thermal Unit Per Square foot per Second	B/F/S	R	KW/M2/S	0.0E+00	1.135653E+04	1.0E-03	N/A	SMALL
Byte	BYTE	J	N/A	N/A	N/A	N/A	N/A	NONE
Centimeter	CM	H	N/A	N/A	N/A	N/A	N/A	NONE
Centimeters/Sec	CM/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Coulomb	COULOMB	E	N/A	N/A	N/A	N/A	N/A	NONE
Coulomb per Kilogram	COULOMB/KG	R	N/A	N/A	N/A	N/A	N/A	NONE
Count	CNT(1)	U	N/A	N/A	N/A	N/A	N/A	NONE
Count down time	CDT	W	N/A	N/A	N/A	N/A	N/A	NONE
Cubic Feet	FT3	Q	M3	0.0E+00	2.831685E-02	1.0E+00	N/A	SMALL
Cubic Feet per Minute	CFM	R	M3/S	0.0E+00	4.719474E-04	1.0E+00	N/A	SMALL
Cubic Feet per Minute	CFM	R	KL/S	0.0E+00	4.719474E-01	1.0E-03	N/A	OVRD_ONLY
Cubic Meter per Second	M3/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Cubic Meters	M3	Q	N/A	N/A	N/A	N/A	N/A	NONE
Cubic Millimeters	MM3	Q	N/A	N/A	N/A	N/A	N/A	NONE

APPENDIX F LEGAL VALUES FOR UNITS OF MEASURE (Continued)

Description of Unit Name (80C)	Legal Values (Native Units) (30C)	Signal Type PUI Code (Ch13) (1C)	Metric Units (30C)	Units A0 Coefficient (14F)	Units A1 Coefficient (14F)	Prefix Multiplier (14F)	Range Criteria (14F)	Conver-sion Type (30C)
Cycle	C	F	N/A	N/A	N/A	N/A	N/A	NONE
Day	D	W	N/A	N/A	N/A	N/A	N/A	NONE
Days	DAY	W	N/A	N/A	N/A	N/A	N/A	NONE
Days per Hour	D/H	R	N/A	N/A	N/A	N/A	N/A	NONE
Days per Hour Per Minute Per Second	D/H/M/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Decibel	DB	E	N/A	N/A	N/A	N/A	N/A	NONE
Decibel referred to one milliwatt	DBM	E	N/A	N/A	N/A	N/A	N/A	NONE
Degree	DEG	H	RAD	0.0E+00	1.745329E-02	1.0E+00	N/A	SMALL
Degree Celius per Hour	DEGC/HR	R	N/A	N/A	N/A	N/A	N/A	NONE
Degree Celius per Minute	DEGC/MIN	R	N/A	N/A	N/A	N/A	N/A	NONE
Degree Celsius	DEGC	T	N/A	N/A	N/A	N/A	N/A	NONE
Degree Celsius minus 20	DEGC-20	T	N/A	N/A	N/A	N/A	N/A	NONE
Degree Elec	DEGE	H	N/A	N/A	N/A	N/A	N/A	NONE
Degree Fahrenheit	DEGF	T	DEGC	-1.777778E+01	5.555556E-01	1.0E+00	N/A	SMALL
Degree Fahrenheit per Hour	DEGF/HR	R	DEGC/HR	-1.777778E+01	5.555556E-01	1.0E+00	N/A	SMALL
Degree Fahrenheit per Minute	DEGF/MIN	R	DEGC/MIN	-1.777778E+01	5.555556E-01	1.0E+00	N/A	SMALL
Degree Kelvin	DEGK	T	N/A	N/A	N/A	N/A	N/A	NONE
Degree per Degree Fahrenheit	DEG/ DEGF	R	N/A	N/A	N/A	N/A	N/A	NONE
Degree per Degree Per Degree	DEG/DEG2	R	RAD/RAD2	0.0E+00	5.729579E+01	1.0E+00	N/A	SMALL
Degree per Hour	DEG/HR	R	RAD/HR	0.0E+00	1.745329E-02	1.0E+00	N/A	SMALL
Degree per Hour per Gravity	DEG/HR/G	R	N/A	N/A	N/A	N/A	N/A	NONE
Degree per Sec Elec	DEGE/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Degree per Second	DEG/S	R	RAD/S	0.0E+00	1.745329E-02	1.0E+00	N/A	SMALL
Degree per Second Squared	DEG/S2	R	RAD/S2	0.0E+00	1.745329E-02	1.0E+00	N/A	SMALL
Degree Rankin	DEGR	T	K	0.0E+00	5.555556E-01	1.0E+00	N/A	SMALL
Degrees Squared	DEG2	R	RAD2	0.0E+00	3.046173E-04	1.0E+00	N/A	SMALL
Degrees Squared per Seconds Cubed	DEG2/S3	R	RAD2/S3	0.0E+00	3.046173E-04	1.0E+00	N/A	SMALL
Discrete/Event	EVENT	J	N/A	N/A	N/A	N/A	N/A	NONE
Feet	FT	H	M	0.0E+00	3.048000E-01	1.0E+00	5000	SMALL

APPENDIX F LEGAL VALUES FOR UNITS OF MEASURE (Continued)

Description of Unit Name (80C)	Legal Values (Native Units) (30C)	Signal Type PUI Code (Ch13) (1C)	Metric Units (30C)	Units A0 Coefficient (14F)	Units A1 Coefficient (14F)	Prefix Multiplier (14F)	Range Criteria (14F)	Conversion Type (30C)
Feet	FT	H	KM	0.0E+00	3.048000E-01	1.0E-03	N/A	LARGE
Feet	FT	H	CM	0.0E+00	3.048000E-01	1.0E+02	N/A	OVRD_ ONLY
Feet per Second	FT/S	R	M/S	0.0E+00	3.048000E-01	1.0E+00	N/A	SMALL
Feet per Second Squared	FT/S2	A	M/S2	0.0E+00	3.048000E-01	1.0E+00	N/A	SMALL
Feet Squared	FT2	H	M2	0.0E+00	9.290304E-02	1.0E+00	N/A	SMALL
Foot Candles	FT/CAND	B	LX	0.0E+00	1.076391E+01	1.0E+00	N/A	SMALL
Foot Pound	FT-LB	G	N-M	0.0E+00	1.355818E+00	1.0E+00	N/A	SMALL
Foot Pound Seconds	FT-LB-S	G	N-M-S	0.0E+00	1.355818E+00	1.0E+00	N/A	SMALL
Foot Pound Seconds per RPM	FT-LB-S/RPM	G	N-M-S/RAD/S	0.0E+00	1.294710E+01	1.0E+00	N/A	SMALL
Frames per Second	F/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Gallon	GAL	Q	L	0.0E+00	3.785412E+00	1.0E+00	N/A	SMALL
Gallon	GAL	Q	M3	0.0E+00	3.785412E-03	1.0E+00	N/A	OVRD_ ONLY
Gallons per Minute	GAL/MIN	R	M3/S	0.0E+00	6.309020E-05	1.0E+00	N/A	OVRD_ ONLY
Gallons per Minute	GAL/MIN	R	L/S/MIN	0.0E+00	6.309020E-02	1.0E+00	N/A	SMALL
Gram	GM	G	N/A	N/A	N/A	N/A	N/A	NONE
Grams per Deciliter	G/DL	Q	N/A	N/A	N/A	N/A	N/A	NONE
Gravity	G	G	M/S2	0.0E+00	9.806650E+00	1.0E+00	N/A	SMALL
Gravity Peak to Peak	GP-P	G	M/S2P-P	0.0E+00	9.806650E+00	1.0E+00	N/A	SMALL
Greenwich Mean Time	GMT	W	N/A	N/A	N/A	N/A	N/A	NONE
Henrys	HEN	E	N/A	N/A	N/A	N/A	N/A	NONE
Hertz	HZ	F	N/A	N/A	N/A	N/A	N/A	NONE
Hour	HR	W	N/A	N/A	N/A	N/A	N/A	NONE
Hours per Radian per Minute	HR/RAD/MIN	R	N/A	N/A	N/A	N/A	N/A	NONE
Hours per RPM	HR/RPM	R	HR/RAD/MIN	0.0E+00	1.591549E-01	1.0E+00	N/A	SMALL
Inch lb per radian	IN-LB/RAD	R	N-M/RAD	0.0E+00	1.129848E-01	1.0E+00	N/A	SMALL
Inch lb per radian per second	IN-LB/RAD/S	R	N-M/RAD/S	0.0E+00	1.129848E-01	1.0E+00	N/A	SMALL
Inch lb radians per second	IN-LB-RAD/S	R	N-M-RAD/S	0.0E+00	1.129848E-01	1.0E+00	N/A	SMALL
Inch Pounds	IN-LB	G	N-M	0.0E+00	1.129848E-01	1.0E+00	N/A	SMALL

APPENDIX F LEGAL VALUES FOR UNITS OF MEASURE (Continued)

Description of Unit Name (80C)	Legal Values (Native Units) (30C)	Signal Type PUI Code (Ch13) (1C)	Metric Units (30C)	Units A0 Coefficient (14F)	Units A1 Coefficient (14F)	Prefix Multiplier (14F)	Range Criteria (14F)	Conver-sion Type (30C)
Inch Pound Force per Microinch	IN-LBF/UIN	G	N/A	N/A	N/A	N/A	N/A	NONE
Inches	IN	H	M	0.0E+00	2.540000E-02	1.0E+00	N/A	SMALL
Inches	IN	H	CM	0.0E+00	2.540000E-02	1.00E+02	N/A	OVRD_ ONLY
Inches of Mercury Column	INHG	P	MMHG	0.0E+00	2.540000E+01	1.0E+00	N/A	SMALL
Inches of Mercury Column	INHG	P	KPA	0.0E+00	3.38638E+03	1.0E-03	N/A	OVRD_ ONLY
Inches of Water Column	INH2O	P	MMHG	0.0E+00	1.868320E+00	1.0E+00	N/A	SMALL
Inches of Water Column	INH2O	P	KPA	0.0E+00	2.490889E+02	1.0E-03	N/A	OVRD_ ONLY
Inches per Second	IN/S	R	M/S	0.0E+00	2.540000E-02	1.0E+00	N/A	SMALL
Integer	INTEGR	U	N/A	N/A	N/A	N/A	N/A	NONE
Intensity	INTENS	B	N/A	N/A	N/A	N/A	N/A	NONE
International Units per Liter	IU/L	Q	N/A	N/A	N/A	N/A	N/A	NONE
Interval Time	INTRVL	W	N/A	N/A	N/A	N/A	N/A	NONE
Inverse Volts	IV	V	N/A	N/A	N/A	N/A	N/A	NONE
Kelvin	K	T	N/A	N/A	N/A	N/A	N/A	NONE
Kilo-Newton	KN	G	N/A	N/A	N/A	N/A	N/A	NONE
Kilobits per Second	KB/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Kilofeet	KFT	H	KM	0.0E+00	3.048000E-01	1.0E+00	N/A	SMALL
Kilofeet per Second	KFT/S	R	KM/S	0.0E+00	3.048000E-01	1.0E+00	N/A	SMALL
Kilogallon	KGAL	Q	KL	0.0E+00	3.785412E+00	1.0E+00	N/A	SMALL
Kilogram	KG	G	N/A	N/A	N/A	N/A	N/A	NONE
Kilogram Meters Squared	KG-M2	G	N/A	N/A	N/A	N/A	N/A	NONE
Kilogram second	KGS	G	N/A	N/A	N/A	N/A	N/A	NONE
Kilograms Force per Centimeter Squared	KGF/CM2	P	N/A	N/A	N/A	N/A	N/A	NONE
Kilograms per Cubic Meter	KG/CM	G	N/A	N/A	N/A	N/A	N/A	NONE
Kilograms per hour	KG/HR	R	N/A	N/A	N/A	N/A	N/A	NONE
Kilograms per Second	KG/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Kilograms per Square Meter	KG/M2	R	N/A	N/A	N/A	N/A	N/A	NONE
Kiloliter	KL	Q	N/A	N/A	N/A	N/A	N/A	NONE
Kilometer	KM	H	N/A	N/A	N/A	N/A	N/A	NONE

APPENDIX F LEGAL VALUES FOR UNITS OF MEASURE (Continued)

Description of Unit Name (80C)	Legal Values (Native Units) (30C)	Signal Type PUI Code (Ch13) (1C)	Metric Units (30C)	Units A0 Coefficient (14F)	Units A1 Coefficient (14F)	Prefix Multiplier (14F)	Range Criteria (14F)	Conver-sion Type (30C)
Kilometer per Second	KM/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Kilometer per Meter per Second Squared	KM/M/S2	A	N/A	N/A	N/A	N/A	N/A	NONE
Kilometer-Meter per Second Squared	KM-M/S2	A	N/A	N/A	N/A	N/A	N/A	NONE
Kilopascal Absolute	KPAA	P	N/A	N/A	N/A	N/A	N/A	NONE
Kilopascal Absolute per Minute	KPAA/MIN	R	N/A	N/A	N/A	N/A	N/A	NONE
Kilopascal Absolute per Second	KPAA/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Kilopascal per Minute	KPA/MIN	R	N/A	N/A	N/A	N/A	N/A	NONE
Kilopascals	KPA	P	N/A	N/A	N/A	N/A	N/A	NONE
Kilopascals Absolute per Hour	KPAA/HR	R	N/A	N/A	N/A	N/A	N/A	NONE
Kilopascals Differential	KPA DIFF	P	N/A	N/A	N/A	N/A	N/A	NONE
Kilopascals Gauge	KPA GAUGE	P	N/A	N/A	N/A	N/A	N/A	NONE
Kilopound Force	KLBF	G	N	0.0E+00	4.448222E+00	1.0E+03	N/A	SMALL
Kilorevolution per Minute	KR/M	R	RAD/S	0.0E+00	1.047189E-01	1.0E+03	N/A	SMALL
Kilowatt Hours per Meter Squared per Second	KW/M2/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Kilowatts	KW	E	N/A	N/A	N/A	N/A	N/A	NONE
Kilowatts per Meter Square	KW/M2	B	N/A	N/A	N/A	N/A	N/A	NONE
Knot	KT	H	M/S	0.0E+00	5.144444E-01	1.0E+00	N/A	SMALL
Knots per Second	KT/S	R	M/S/S	0.0E+00	5.144444E-01	1.0E+00	N/A	SMALL
Liter	L	Q	N/A	N/A	N/A	N/A	N/A	NONE
Liter per second per Minute	L/S/MIN	R	N/A	N/A	N/A	N/A	N/A	NONE
Liters per Second	L/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Lux	LX	B	N/A	N/A	N/A	N/A	N/A	NONE
Mach	MACH	R	N/A	N/A	N/A	N/A	N/A	NONE
Magnitude Intensity	MAGINT	B	N/A	N/A	N/A	N/A	N/A	NONE
Mega Bits per Second	MB/S	R	N/A	N/A	N/A	N/A	N/A	NONE

APPENDIX F LEGAL VALUES FOR UNITS OF MEASURE (Continued)

Description of Unit Name (80C)	Legal Values (Native Units) (30C)	Signal Type PUI Code (Ch13) (1C)	Metric Units (30C)	Units A0 Coefficient (14F)	Units A1 Coefficient (14F)	Prefix Multiplier (14F)	Range Criteria (14F)	Conver-sion Type (30C)
Megafeet	MFT	H	MEGAM	0.0E+00	3.048000E-01	1.0E+00	N/A	SMALL
MegaMeter	MEGAM	H	N/A	N/A	N/A	N/A	N/A	NONE
Meter	M	H	N/A	N/A	N/A	N/A	N/A	NONE
Meter per Second	M/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Meter per Second Squared Peak to Peak	M/S2P-P	G	N/A	N/A	N/A	N/A	N/A	NONE
Meter per Second per Second	M/S/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Meter per second Squared	M/S2	A	N/A	N/A	N/A	N/A	N/A	NONE
Meters Squared	M2	H	N/A	N/A	N/A	N/A	N/A	NONE
Meters Squared per Second Squared	M2/S2	R	N/A	N/A	N/A	N/A	N/A	NONE
(Meters per Second per Second) Squared	M2/S4	A	N/A	N/A	N/A	N/A	N/A	N/A
Meters to the Fourth per Second Squared	M4/S2	H	N/A	N/A	N/A	N/A	N/A	NONE
Microinch per Degree Celcius	UIN/DEGC	R	N/A	N/A	N/A	N/A	N/A	NONE
Microinch per Inch	UIN/IN	R	UM/M	0.0E+00	1.0E+00	1.0E+00	N/A	SMALL
Microinch per Inch Pound Force	UIN/IN-LBF	G	N/A	N/A	N/A	N/A	N/A	NONE
Microinch per Pound Force	UIN/LBF	G	N/A	N/A	N/A	N/A	N/A	NONE
Microamp	UAMP	C	N/A	N/A	N/A	N/A	N/A	NONE
Microgram	UGM	G	N/A	N/A	N/A	N/A	N/A	NONE
Microgram per Cubic Meter	UGM/M3	Q	N/A	N/A	N/A	N/A	N/A	NONE
Microgram per Milliliter	UG/ML	Q	N/A	N/A	N/A	N/A	N/A	NONE
Microgram per Minutes	UGM/M	R	N/A	N/A	N/A	N/A	N/A	NONE
Microgravity	UG	G	N/A	N/A	N/A	N/A	N/A	NONE
Microgravity/per Gravity	UG/G	G	N/A	N/A	N/A	N/A	N/A	NONE
Microinch	UIN	H	UM	0.0E+00	2.540000E-02	1.0E+00	N/A	SMALL
Microinch per Deg C	UIN/DEGC	H	UM/DEGC	0.0E+00	2.540000E-02	1.0E+00	N/A	SMALL
Micrometer	UM	H	N/A	N/A	N/A	N/A	N/A	NONE
MicroMeter per Meter	UM/M	R	N/A	N/A	N/A	N/A	N/A	NONE

APPENDIX F LEGAL VALUES FOR UNITS OF MEASURE (Continued)

Description of Unit Name (80C)	Legal Values (Native Units) (30C)	Signal Type PUI Code (Ch13) (1C)	Metric Units (30C)	Units A0 Coefficient (14F)	Units A1 Coefficient (14F)	Prefix Multiplier (14F)	Range Criteria (14F)	Conver-sion Type (30C)
MicroMeter per Degree Celius	UM/DEGC	H	N/A	N/A	N/A	N/A	N/A	NONE
Micro-Mhos per Centimeter	UMHOS/CM	E	N/A	N/A	N/A	N/A	N/A	NONE
Microsecond	US	W	N/A	N/A	N/A	N/A	N/A	NONE
MicroTorr	MICROTOR R	P	MMHG	0.0E+00	1.000000E+00	1.0E-06	N/A	SMALL
Microwatts per Square Centimeter	UW/CM2	B	N/A	N/A	N/A	N/A	N/A	NONE
Mile	MI	H	KM	0.0E+00	1.609344E+03	1.0E-03	N/A	SMALL
Mile	MI	H	M	0.0E+00	1.609344E+03	1.0E+00	N/A	OVRD_O NLY
Mile per Second	MI/S	R	KM/S	0.0E+00	1.609344E+03	1.0E-03	N/A	SMALL
Mile per Second	MI/S	R	M/S	0.0E+00	1.609344E+03	1.0E+00	N/A	OVRD_O NLY
Milli Roentgen per Minute	MRTGN/MN	R	N/A	N/A	N/A	N/A	N/A	NONE
Milliampere	MAMP	C	N/A	N/A	N/A	N/A	N/A	NONE
Milligram	MGM	G	N/A	N/A	N/A	N/A	N/A	NONE
Milligram per Cubic Meter	MGM/M3	Q	N/A	N/A	N/A	N/A	N/A	NONE
Milligravity	MILLIGEE	G	MM/S2	0.0E+00	9.806650E+00	1.0E+00	N/A	SMALL
Millijoule	MJ	Q	N/A	N/A	N/A	N/A	N/A	NONE
Milliliter	ML	Q	N/A	N/A	N/A	N/A	N/A	NONE
Milliliters per Hour	ML/HR	R	N/A	N/A	N/A	N/A	N/A	NONE
Millimeter	MM	H	N/A	N/A	N/A	N/A	N/A	NONE
Millimeter per Second per Second	MM/S2	A	N/A	N/A	N/A	N/A	N/A	NONE
Millimeter of Mercury Absolute	MMHGA	P	N/A	N/A	N/A	N/A	N/A	NONE
Millimeter of Mercury Absolute per Hour	MMHGA/HR	R	N/A	N/A	N/A	N/A	N/A	NONE
Millimeter of Mercury Absolute per Minute	MMHGA/MIN	R	N/A	N/A	N/A	N/A	N/A	NONE
Millimeter of Mercury Absolute per Second	MMHGA/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Millimeters of Mercury	MMHG	P	N/A	N/A	N/A	N/A	N/A	NONE
Millimeters of Mercury Differential	MMHG DIFF	P	N/A	N/A	N/A	N/A	N/A	NONE

APPENDIX F LEGAL VALUES FOR UNITS OF MEASURE (Continued)

Description of Unit Name (80C)	Legal Values (Native Units) (30C)	Signal Type PUI Code (Ch13) (1C)	Metric Units (30C)	Units A0 Coefficient (14F)	Units A1 Coefficient (14F)	Prefix Multiplier (14F)	Range Criteria (14F)	Conver-sion Type (30C)
Millimeters of Mercury Gauge	MMHG GAUGE	P	N/A	N/A	N/A	N/A	N/A	NONE
Millimeters of Mercury per Minute	MMHG/MIN	R	N/A	N/A	N/A	N/A	N/A	NONE
Millimeters Squared	MM2	H	N/A	N/A	N/A	N/A	N/A	NONE
Millimoles per Liter	MMOL/L	Q	N/A	N/A	N/A	N/A	N/A	NONE
Milliradian per Second	MRAD/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Millirem	MREM	N	N/A	N/A	N/A	N/A	N/A	NONE
Millirem/min	MREM/M	R	N/A	N/A	N/A	N/A	N/A	NONE
Millisecond	MS	W	N/A	N/A	N/A	N/A	N/A	NONE
MilliTorr	MILLITORR	P	MMHG	0.0E+00	1.0E+01	1.0E-03	N/A	SMALL
Millivolts	MV	V	N/A	N/A	N/A	N/A	N/A	NONE
Millivolts Alternating Current	MVAC	V	N/A	N/A	N/A	N/A	N/A	NONE
Millivolts Direct Current	MVDC	V	N/A	N/A	N/A	N/A	N/A	NONE
Milliwatts	MW	E	N/A	N/A	N/A	N/A	N/A	NONE
Milliwatts per Square Centimeter	MW/CM2	B	N/A	N/A	N/A	N/A	N/A	NONE
Minute	MIN	W	N/A	N/A	N/A	N/A	N/A	NONE
Mission Elapsed Time in Hours,Minutes,Seconds	MET	W	N/A	N/A	N/A	N/A	N/A	NONE
Month of Year	MONTH	W	N/A	N/A	N/A	N/A	N/A	NONE
Multiple of 4096 Second	4096S	W	N/A	N/A	N/A	N/A	N/A	NONE
Nanometers	NMTR	H	N/A	N/A	N/A	N/A	N/A	NONE
Nautical Mile per Foot per Second Square	NM/FT/S2	A	KM/M/S2	0.0E+00	6.076115E+03	1.0E-03	N/A	SMALL
Nautical Mile-Foot per Second Square	NM-FT/S2	A	KM-M/S2	0.0E+00	5.644896E+02	1.0E-03	N/A	SMALL
Nautical Miles	NM	H	KM	0.0E+00	1.852000E+03	1.0E-03	N/A	SMALL
Nautical Miles	NM	H	M	0.0E+00	1.852000E+03	1.0E+00	N/A	OVRD_ONLY
Nephelometry Turbidity Units	NTU	B	N/A	N/A	N/A	N/A	N/A	NONE
Newton Meter	N-M	G	N/A	N/A	N/A	N/A	N/A	NONE

APPENDIX F LEGAL VALUES FOR UNITS OF MEASURE (Continued)

Description of Unit Name (80C)	Legal Values (Native Units) (30C)	Signal Type PUI Code (Ch13) (1C)	Metric Units (30C)	Units A0 Coefficient (14F)	Units A1 Coefficient (14F)	Prefix Multiplier (14F)	Range Criteria (14F)	Conver-sion Type (30C)
Newton Meter per Radian	N-M/RAD	R	N/A	N/A	N/A	N/A	N/A	NONE
Newton Meter per Radian per second	N-M/RAD/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Newton Meter Seconds	N-M-S	G	N/A	N/A	N/A	N/A	N/A	NONE
Newton Meter Seconds per Radian per Second	N-M-S/RAD/S	G	N/A	N/A	N/A	N/A	N/A	NONE
Newtons	N	G	N/A	N/A	N/A	N/A	N/A	NONE
Non-Dimensional	ND	U	N/A	N/A	N/A	N/A	N/A	NONE
Null	NULL	U	N/A	N/A	N/A	N/A	N/A	NONE
Ohms	OHM	E	N/A	N/A	N/A	N/A	N/A	NONE
Once per Second	1/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Once per Second Square	1/S2	R	N/A	N/A	N/A	N/A	N/A	NONE
One over Feet	1/FT	H	1/M	0.0E+00	3.280840E+00	1.0E+00	N/A	SMALL
One over Meter	1/M	H	N/A	N/A	N/A	N/A	N/A	NONE
One over Volts DC	1/VDC	V	N/A	N/A	N/A	N/A	N/A	NONE
Particle	PT	O	N/A	N/A	N/A	N/A	N/A	NONE
Particles/min	PT/M	R	N/A	N/A	N/A	N/A	N/A	NONE
Parts per Billion	PPB	Q	N/A	N/A	N/A	N/A	N/A	NONE
Parts per Million	PPM	Q	N/A	N/A	N/A	N/A	N/A	NONE
Pascal	PA	P	N/A	N/A	N/A	N/A	N/A	NONE
Percent	PCT	Q	N/A	N/A	N/A	N/A	N/A	NONE
Percent Obscuration per Foot	PCTOB/FT	R	PCTOB/M	0.0E+00	3.280840E+00	1.0E+00	N/A	SMALL
Percent Obscuration per Meter	PCTOB/M	R	N/A	N/A	N/A	N/A	N/A	NONE
Pound Force	LBF	G	N	0.0E+00	4.448222E+00	1.0E+00	N/A	SMALL
Pound Force	LBF	G	KN	0.0E+00	4.448222E+00	1.0E-03	N/A	OVRD ONLY
Pound Force per Foot per Second	LBF/FT/S	R	N/M/S	0.0E+00	1.459390E+01	1.0E+00	N/A	SMALL
Pound Force per Microinch	LBF/UIN	G	N/A	N/A	N/A	N/A	N/A	NONE
Pound Force per Square Foot	LBF/FT2	G	PA	0.0E+00	4.788026E+01	1.0E+00	N/A	SMALL
Pound Mass	LBM	G	KG	0.0E+00	4.535924E-01	1.0E+00	N/A	SMALL

APPENDIX F LEGAL VALUES FOR UNITS OF MEASURE (Continued)

Description of Unit Name (80C)	Legal Values (Native Units) (30C)	Signal Type PUI Code (Ch13) (1C)	Metric Units (30C)	Units A0 Coefficient (14F)	Units A1 Coefficient (14F)	Prefix Multiplier (14F)	Range Criteria (14F)	Conver-sion Type (30C)
Pound Mass per Cubic Foot	LBM/FT3	G	KG/CM	0.0E+00	1.601846E+01	1.0E+00	N/A	SMALL
Pound Mass per Hour	LBM/HR	R	KG/HR	0.0E+00	4.535924E-01	1.0E+00	N/A	SMALL
Pound per Hour	LB/HR	R	KG/HR	0.0E+00	4.535924E-01	1.0E+00	N/A	SMALL
Pound Mass per Second	LBM/S	R	KG/S	0.0E+00	4.535924E-01	1.0E+00	N/A	SMALL
Pound Force per Square Inch	PSI	P	MMHG	0.0E+00	5.171492E+01	1.0E+00	N/A	SMALL
Pound Force per Square Inch	PSI	P	KPA	0.0E+00	6.894757E+03	1.0E-03	N/A	OVRD_O NLY
Pound Force per Square Inch Absolute	PSIA	P	MMHGA	0.0E+00	5.171492E+01	1.0E+00	N/A	SMALL
Pound Force per Square Inch Absolute	PSIA	P	KPAA	0.0E+00	6.894757E+03	1.0E-03	N/A	OVRD_O NLY
Pound Force per Square Inch Absolute per Hour	PSIA/HR	R	MMHGA/HR	0.0E+00	5.171492E+01	1.0E+00	N/A	SMALL
Pound Force per Square Inch Absolute per Hour	PSIA/HR	R	KPAA/HR	0.0E+00	6.894757E+03	1.0E-03	N/A	OVRD_O NLY
Pound Force per Square Inch Absolute per Minute	PSIA/MIN	R	MMHGA/MIN	0.0E+00	5.171492E+01	1.0E+00	N/A	SMALL
Pound Force per Square Inch Absolute per Minute	PSIA/MIN	R	KPAA/MIN	0.0E+00	6.894757E+03	1.0E-03	N/A	OVRD_O NLY
Pound Force per Square Inch Absolute per Second	PSIA/S	R	MMHGA/S	0.0E+00	5.171492E+01	1.0E+00	N/A	SMALL
Pound Force per Square Inch Absolute per Second	PSIA/S	R	KPAA/S	0.0E+00	6.894757E+03	1.0E-03	N/A	OVRD_O NLY
Pound Force per Square Inch Differential	PSID	P	MMHG DIFF	0.0E+00	5.171492E+01	1.0E+00	N/A	SMALL
Pound Force per Square Inch Differential	PSID	P	KPA DIFF	0.0E+00	6.894757E+03	1.0E-03	N/A	OVRD_O NLY
Pound Force per Square Inch Gauge	PSIG	P	MMHG GAUGE	0.0E+00	5.171492E+01	1.0E+00	N/A	SMALL
Pound Force per Square Inch Gauge	PSIG	P	KPA GAUGE	0.0E+00	6.894757E+03	1.0E-03	N/A	OVRD_O NLY

APPENDIX F LEGAL VALUES FOR UNITS OF MEASURE (Continued)

Description of Unit Name (80C)	Legal Values (Native Units) (30C)	Signal Type PUI Code (Ch13) (1C)	Metric Units (30C)	Units A0 Coefficient (14F)	Units A1 Coefficient (14F)	Prefix Multiplier (14F)	Range Criteria (14F)	Conver-sion Type (30C)
Pound Force per Square Inch per Minute	PSI/MIN	R	MMHG/MIN	0.0E+00	5.171492E+01	1.0E+00	N/A	SMALL
Pound Force per Square Inch per Minute	PSI/MIN	R	KPA/MIN	0.0E+00	6.894757E+03	1.0E-03	N/A	OVRD_ONLY
Pound Seconds	LB-SEC	G	KGS	0.0E+00	4.535924E-01	1.0E+00	N/A	SMALL
Pounds	LBS	G	KG	0.0E+00	4.535924E-01	1.0E+00	N/A	SMALL
Pulse	P	R	N/A	N/A	N/A	N/A	N/A	NONE
Pulses per Second	PPS	R	N/A	N/A	N/A	N/A	N/A	NONE
rad (Radiation term)	RADS	N	N/A	N/A	N/A	N/A	N/A	NONE
rad/min	RADS/M	R	N/A	N/A	N/A	N/A	N/A	NONE
Radian	RAD	H	N/A	N/A	N/A	N/A	N/A	NONE
Radian per Hour	RAD/HR	R	N/A	N/A	N/A	N/A	N/A	NONE
Radian per Radian per Radian	RAD/RAD/RAD	R	N/A	N/A	N/A	N/A	N/A	NONE
Radian per Second	RAD/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Radian per Second per G	RAD/S/G	R	N/A	N/A	N/A	N/A	N/A	NONE
Radian per Second per Newton Meter	RAD/S/N-M	R	N/A	N/A	N/A	N/A	N/A	NONE
Radian per Second per Radian per Second	R/S/R/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Radian per second per Second	RAD/S/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Radian per Second per Watt	RAD/S/W	R	N/A	N/A	N/A	N/A	N/A	NONE
Radian per Second Squared	RAD/S2	R	N/A	N/A	N/A	N/A	N/A	NONE
Radian Squared	RAD2	R	N/A	N/A	N/A	N/A	N/A	NONE
Radian Squared per Second Cubed	RAD2/S3	R	N/A	N/A	N/A	N/A	N/A	NONE
Radian Squared per Second Squared	RAD2/S2	R	N/A	N/A	N/A	N/A	N/A	NONE
Radians per Count	RAD/CNT	H	N/A	N/A	N/A	N/A	N/A	NONE
Radians Squared per Second	RAD2/S	R	N/A	N/A	N/A	N/A	N/A	NONE
rem (Radiation term)	REM	N	N/A	N/A	N/A	N/A	N/A	NONE
Revolution	REV	F	RAD	0.0E+00	6.283185E+00	1.0E+00	N/A	SMALL

APPENDIX F LEGAL VALUES FOR UNITS OF MEASURE (Continued)

Description of Unit Name (80C)	Legal Values (Native Units) (30C)	Signal Type PUI Code (Ch13) (1C)	Metric Units (30C)	Units A0 Coefficient (14F)	Units A1 Coefficient (14F)	Prefix Multiplier (14F)	Range Criteria (14F)	Conver-sion Type (30C)
Revolution per Minute	RPM	R	RAD/S	0.0E+00	1.047198E-01	1.0E+00	N/A	SMALL
Revolutions Elec	REVE	F	N/A	N/A	N/A	N/A	N/A	NONE
Revolutions per minute per second	RPM/S	R	RAD/S/S	0.0E+00	1.047198E-01	1.0E+00	N/A	SMALL
Revolutions per minute per Watt	RPM/W	R	RAD/S/W	0.0E+00	1.047198E-01	1.0E+00	N/A	SMALL
Rev per Sec	REV/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Rev per Sec Elec	REVE/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Roentgen	RTGN	R	COULOMB/KG	0.0E+00	2.58000E-04	1.0E+00	N/A	SMALL
Roentgen Equivalent Man	REM	N	SV	0.0E+00	1.000000E-02	1.0E+00	N/A	SMALL
Second	S	W	N/A	N/A	N/A	N/A	N/A	NONE
Second per Foot	S/FT	R	S/M	0.0E+00	3.280840E+00	1.0E+00	N/A	SMALL
Second per Meter	S/M	R	N/A	N/A	N/A	N/A	N/A	NONE
Second per Radian	S/RAD	R	N/A	N/A	N/A	N/A	N/A	NONE
Second per Second	S/S	A	N/A	N/A	N/A	N/A	N/A	NONE
Second per Second Squared	S/S2	R	N/A	N/A	N/A	N/A	N/A	NONE
Second Square per Foot	S2/FT	R	S2/M	0.0E+00	3.280840E+00	1.0E+00	N/A	SMALL
Second Square per Meter	S2/M	R	N/A	N/A	N/A	N/A	N/A	NONE
Seconds and Milliseconds	S/MS	W	N/A	N/A	N/A	N/A	N/A	NONE
Sievert	SV	N	N/A	N/A	N/A	N/A	N/A	NONE
Slug	SLUG	G	KG	0.0E+00	1.459390E+01	1.0E+00	N/A	SMALL
Slug/Foot Cubed	SLUG/FT3	G	KG/M3	0.0E+00	5.153788E+02	1.0E+00	N/A	SMALL
Slug Foot Squared	SLUG/FT2	G	KG-M2	0.0E+00	1.355818E+00	1.0E+00	N/A	SMALL
Slug per Second	SLUG/S	R	KG/S	0.0E+00	1.459390E+01	1.0E+00	N/A	SMALL
Slugs per Foot Squared	SLUG/FT2	R	KG/M2	0.0E+00	1.570875E+02	1.0E+00	N/A	SMALL
Square Root of Meters	SQM	H	N/A	N/A	N/A	N/A	N/A	NONE
Standard Cubic Feet per Minute	SCFM	R	M3/S	0.0E+00	4.719474E-04	1.0E+00	N/A	SMALL
Torr (mm Hg, 0°C)	TORR	P	MMHG	0.0E+00	1.0E+00	1.0E+00	N/A	SMALL
Torr (mm Hg, 0°C)	TORR	P	PA	0.0E+00	1.333224E+02	1.0E+00	N/A	OVRD_ONLY
Volts Alternating Current	VAC	V	N/A	N/A	N/A	N/A	N/A	NONE

APPENDIX F LEGAL VALUES FOR UNITS OF MEASURE (Continued)

Description of Unit Name (80C)	Legal Values (Native Units) (30C)	Signal Type PUI Code (Ch13) (1C)	Metric Units (30C)	Units A0 Coefficient (14F)	Units A1 Coefficient (14F)	Prefix Multiplier (14F)	Range Criteria (14F)	Conver-sion Type (30C)
Volts Direct Current	VDC	V	N/A	N/A	N/A	N/A	N/A	NONE
Volts Peak to Peak	VP-P	R	N/A	N/A	N/A	N/A	N/A	NONE
Volts per Count	V/CNT	V	N/A	N/A	N/A	N/A	N/A	NONE
Volts per Cubic Foot per Minute	V/CFM	R	V/M3/MIN	0.0E+00	3.531467E+01	1.0E+00	N/A	SMALL
Volts per Cubic Meter per Minute	V/M3/MIN	R	N/A	N/A	N/A	N/A	N/A	NONE
Volts per Radian per Second	V/RAD/S	R	N/A	N/A	N/A	N/A	N/A	NONE
Volts per Second	VPS	R	N/A	N/A	N/A	N/A	N/A	NONE
Volts RMS	VRMS	V	N/A	N/A	N/A	N/A	N/A	NONE
WattHour	WHR	Q	N/A	N/A	N/A	N/A	N/A	NONE
Watts	W	E	N/A	N/A	N/A	N/A	N/A	NONE
Week Number	WEEKS	W	N/A	N/A	N/A	N/A	N/A	NONE
Year	YR	W	N/A	N/A	N/A	N/A	N/A	NONE

(1) CNT use for counters is discouraged but allowed. ND is the preferred usage for counters.

APPENDIX G TELEMETRY CCSDS HEADER

This appendix identifies information related to the definition and interpretation of telemetry data streams. The information in this appendix serves two purposes: first, it identifies the information required to be a component portion of the telemetry data stream definitions in the Standard Input; and second, it provides information to the recipient of the telemetry data streams which will allow the recipient to determine the format and definition of the telemetry data stream immediately being considered.

There is one table applicable to each telemetry packet length. The values which constitute the CCSDS header definition unique for a given telemetry packet type are specified as constants in the table and in the IP&CL, and Runtime Variables (RV) which serve to identify primitives for which values must be supplied at the time of generation of the specific packet contents at runtime.

For the definition of the telemetry data stream, the boldfaced elements in the following tables identify the values to be placed into the Content PUI and Content Type fields (5.1-4 and 5.1-5, respectively) in the Group Data (GD; 5.1) file definition of the telemetry data streams to represent the CCSDS header position and content as a part of the data stream definition. The PUIs are defined by the Data Integration Team (DIT) and are available for reference by the developer of the data stream definition.

The recipient of the data stream on the ground must be capable of determining, based on bit patterns and the information available in this appendix and the Standard Output files, the identity of a specific packet and have sufficient information to otherwise determine the format and identity of the parameters in the remainder of the packet.

The gray areas identify information which does not have a meaning. For example, to talk about a primitive type for a record representing a WORD structure is not a meaningful discussion. The gray areas are intended to highlight areas which can be safely ignored.

APPENDIX G TELEMETRY CCSDS HEADER (Continued)

TABLE G-1 TELEMETRY CCSDS HEADER - NCS ESSENTIAL PACKET

SW Engineering Title	Word Position/ Bit Offset	Signal PUI	Content Type	SW Type of Signal	SW Initial Value	Data Provider
CCSDS Primary Header	N/A	USDG01CC3000L	CCSDS_T			DIT
Primary Header	WORD 1	USDG01CC0100L	WORD			DIT
Version Number	0	USDG01CC0110U	SIGNAL	CO	0	DIT
Type	3	USDG01CC0120J	SIGNAL	CO	0	DIT
Secondary Header Flag	4	USDG01CC0130J	SIGNAL	CO	1	DIT
APID	5	USDG01CC0140J	SIGNAL	RV	N/A	DIT
Primary Header	WORD 2	USDG01CC0200L	WORD			DIT
Sequence Flags	0	USDG01CC0210J	SIGNAL	CO	2#11#	DIT
Packet Sequence Count	2	USDG01CC0220U	SIGNAL	RV	0	DIT
Packet Length	WORD 3	USDG01CC0300Q	SIGNAL	CO	737	N/A
CCSDS Secondary Header	N/A	USDG01CC2000L	CCSDS_T			DIT
Course Time	WORD 4/5	USDG01CC0400W	SIGNAL	RV	N/A	DIT
Secondary Header	WORD 6	USDG01CC0601L	WORD			DIT
Fine Time	0	USDG01CC0610W	SIGNAL	RV	N/A	DIT
Time ID	8	USDG01CC0620J	SIGNAL	RV	1	DIT
Checkword Indication	10	USDG01CC0630J	SIGNAL	CO	0	DIT
ZOE Indicator Flag	11	USDG01CC0640J	SIGNAL	RV	0	DIT
Telemetry Packet Type	12	USDG01CC0651J	SIGNAL	CO	2#0100#	DIT
Secondary Header	WORD 7	USDG01CC0700L	WORD			DIT
Element ID	0	USDG01CC0710J	SIGNAL	CO	1	DIT
Packet Data Type	5	USDG01CC0712J	SIGNAL	CO	1	DIT
Version Identifier	6	USDG01CC0720J	SIGNAL	RV	N/A	DIT
Format ID	10	USDG01CC0730J	SIGNAL	CO	1	DIT
Secondary Header	WORD 8	USDG01CC0800L	WORD			DIT
Spare	0	SPARE				DIT
Processing Frame ID	9	USDG01CC0810U	SIGNAL	RV	0	DIT

APPENDIX G TELEMETRY CCSDS HEADER (Continued)

TABLE G-2 TELEMETRY CCSDS HEADER - CCS ESSENTIAL PACKET

SW Engineering Title	Word Position/ Bit Offset	Signal PUI	Content Type	SW Type of Signal	SW Initial Value	Data Provider
CCSDS Primary Header	N/A	USDG01CC3001L	CCSDS_T			DIT
Primary Header	WORD 1	USDG01CC0100L	WORD			DIT
Version Number	0	USDG01CC0110U	SIGNAL	CO	0	DIT
Type	3	USDG01CC0120J	SIGNAL	CO	0	DIT
Secondary Header Flag	4	USDG01CC0130J	SIGNAL	CO	1	DIT
APID	5	USDG01CC0140J	SIGNAL	RV	N/A	DIT
Primary Header	WORD 2	USDG01CC0200L	WORD			DIT
Sequence Flags	0	USDG01CC0210J	SIGNAL	CO	2#11#	DIT
Packet Sequence Count	2	USDG01CC0220U	SIGNAL	RV	N/A	DIT
Packet Length	WORD 3	USDG01CC0301Q	SIGNAL	CO	779	N/A
CCSDS Secondary Header	N/A	USDG01CC2001L	CCSDS_T			DIT
Course Time	WORD 4/5	USDG01CC0400W	SIGNAL	RV	N/A	DIT
Secondary Header	WORD 6	USDG01CC0601L	WORD			DIT
Fine Time	0	USDG01CC0610W	SIGNAL	RV	N/A	DIT
Time ID	8	USDG01CC0620J	SIGNAL	RV	1	DIT
Checkword Indication	10	USDG01CC0630J	SIGNAL	CO	0	DIT
ZOE Indicator Flag	11	USDG01CC0640J	SIGNAL	RV	0	DIT
Telemetry Packet Type	12	USDG01CC0651J	SIGNAL	CO	2#0100#	DIT
Secondary Header	WORD 7	USDG01CC0700L	WORD			DIT
Element ID	0	USDG01CC0710J	SIGNAL	CO	1	DIT
Packet Data Type	5	USDG01CC0712J	SIGNAL	CO	1	DIT
Version Identifier	6	USDG01CC0720J	SIGNAL	RV	N/A	DIT
Format ID	10	USDG01CC0730J	SIGNAL	CO	1	DIT
Secondary Header	WORD 8	USDG01CC0800L	WORD			DIT
Spare	0	SPARE				DIT
Processing Frame ID	9	USDG01CC0810U	SIGNAL	RV	0	DIT

APPENDIX G TELEMETRY CCSDS HEADER (Continued)

TABLE G-3 TELEMETRY CCSDS HEADER - HOUSEKEEPING I PACKET

SW Engineering Title	Word Position/ Bit Offset	Signal PUI	Content Type	SW Type of Signal	SW Initial Value	Data Provider
CCSDS Primary Header	N/A	USDG01CC3002L	CCSDS_T			DIT
Primary Header	WORD 1	USDG01CC0100L	WORD			DIT
Version Number	0	USDG01CC0110U	SIGNAL	CO	0	DIT
Type	3	USDG01CC0120J	SIGNAL	CO	0	DIT
Secondary Header Flag	4	USDG01CC0130J	SIGNAL	CO	1	DIT
APID	5	USDG01CC0140J	SIGNAL	RV	N/A	DIT
Primary Header	WORD 2	USDG01CC0200L	WORD			DIT
Sequence Flags	0	USDG01CC0210J	SIGNAL	CO	2#11#	DIT
Packet Sequence Count	2	USDG01CC0220U	SIGNAL	RV	N/A	DIT
Packet Length	WORD 3	USDG01CC0302Q	SIGNAL	CO	569	N/A
CCSDS Secondary Header	N/A	USDG01CC2002L	CCSDS_T			DIT
Course Time	WORD 4/5	USDG01CC0400W	SIGNAL	RV	N/A	DIT
Secondary Header	WORD 6	USDG01CC0601L	WORD			DIT
Fine Time	0	USDG01CC0610W	SIGNAL	RV	N/A	DIT
Time ID	8	USDG01CC0620J	SIGNAL	RV	1	DIT
Checkword Indication	10	USDG01CC0630J	SIGNAL	CO	0	DIT
ZOE Indicator Flag	11	USDG01CC0640J	SIGNAL	RV	0	DIT
Telemetry Packet Type	12	USDG01CC0651J	SIGNAL	CO	2#0100#	DIT
Secondary Header	WORD 7	USDG01CC0701L	WORD			DIT
Element ID	0	USDG01CC0710J	SIGNAL	CO	1	DIT
Packet Data Type	5	USDG01CC0712J	SIGNAL	CO	1	DIT
Version Identifier	6	USDG01CC0720J	SIGNAL	RV	N/A	DIT
Format ID	10	USDG01CC0731J	SIGNAL	CO	2#000010#	DIT
Secondary Header	WORD 8	USDG01CC0800L	WORD			DIT
Spare	0	SPARE				DIT
Processing Frame ID	9	USDG01CC0810U	SIGNAL	RV	0	DIT

APPENDIX G TELEMETRY CCSDS HEADER (Continued)

TABLE G-4 TELEMETRY CCSDS HEADER - HOUSEKEEPING II PACKET

SW Engineering Title	Word Position/ Bit Offset	Signal PUI	Content Type	SW Type of Signal	SW Initial Value	Data Provider
CCSDS Primary Header	N/A	USDG01CC3003L	CCSDS_T			DIT
Primary Header	WORD 1	USDG01CC0100L	WORD			DIT
Version Number	0	USDG01CC0110U	SIGNAL	CO	0	DIT
Type	3	USDG01CC0120J	SIGNAL	CO	0	DIT
Secondary Header Flag	4	USDG01CC0130J	SIGNAL	CO	1	DIT
APID	5	USDG01CC0140J	SIGNAL	RV	N/A	DIT
Primary Header	WORD 2	USDG01CC0200L	WORD			DIT
Sequence Flags	0	USDG01CC0210J	SIGNAL	CO	2#11#	DIT
Packet Sequence Count	2	USDG01CC0220U	SIGNAL	RV	N/A	DIT
Packet Length	WORD 3	USDG01CC0304Q	SIGNAL	CO	185	N/A
CCSDS Secondary Header	N/A	USDG01CC2003L	CCSDS_T			DIT
Course Time	WORD 4/5	USDG01CC0400W	SIGNAL	RV	N/A	DIT
Secondary Header	WORD 6	USDG01CC0601L	WORD			DIT
Fine Time	0	USDG01CC0610W	SIGNAL	RV	N/A	DIT
Time ID	8	USDG01CC0620J	SIGNAL	RV	1	DIT
Checkword Indication	10	USDG01CC0630J	SIGNAL	CO	0	DIT
ZOE Indicator Flag	11	USDG01CC0640J	SIGNAL	RV	O	DIT
Telemetry Packet Type	12	USDG01CC0651J	SIGNAL	CO	2#0100#	DIT
Secondary Header	WORD 7	USDG01CC0702L	WORD			DIT
Element ID	0	USDG01CC0710J	SIGNAL	CO	1	DIT
Packet Data Type	5	USDG01CC0712J	SIGNAL	CO	1	DIT
Version Identifier	6	USDG01CC0720J	SIGNAL	RV	N/A	DIT
Format ID	10	USDG01CC0732J	SIGNAL	CO	2#000011#	DIT
Secondary Header	WORD 8	USDG01CC0800L	WORD			DIT
Spare	0	SPARE				DIT
Processing Frame ID	9	USDG01CC0810U	SIGNAL	RV	0	DIT

APPENDIX G TELEMETRY CCSDS HEADER (Continued)

TABLE G-5 TELEMETRY CCSDS HEADER - COMMAND RESPONSE PACKET

SW Engineering Title	Word Position/ Bit Offset	Signal PUI	Content Type	SW Type of Signal	SW Initial Value	Data Provider
CCSDS Primary Header	N/A	USDG01CC3006L	CCSDS_T			DIT
Primary Header	WORD 1	USDG01CC0100L	WORD			DIT
Version Number	0	USDG01CC0110U	SIGNAL	CO	0	DIT
Type	3	USDG01CC0120J	SIGNAL	CO	0	DIT
Secondary Header Flag	4	USDG01CC0130J	SIGNAL	CO	1	DIT
APID	5	USDG01CC0140J	SIGNAL	RV	N/A	DIT
Primary Header	WORD 2	USDG01CC0200L	WORD			DIT
Sequence Flags	0	USDG01CC0210J	SIGNAL	CO	2#11#	DIT
Packet Sequence Count	2	USDG01CC0220U	SIGNAL	RV	N/A	DIT
Packet Length	WORD 3	USDG01CC0304Q	SIGNAL	CO	185	N/A
CCSDS Secondary Header	N/A	USDG01CC2006L	CCSDS_T			DIT
Course Time	WORD 4/5	USDG01CC0400W	SIGNAL	RV	N/A	DIT
Secondary Header	WORD 6	USDG01CC0602L	WORD			DIT
Fine Time	0	USDG01CC0610W	SIGNAL	RV	N/A	DIT
Time ID	8	USDG01CC0620J	SIGNAL	RV	1	DIT
Checkword Indication	10	USDG01CC0630J	SIGNAL	CO	0	DIT
ZOE Indicator Flag	11	USDG01CC0640J	SIGNAL	RV	0	DIT
Telemetry Packet Type	12	USDG01CC0651J	SIGNAL	CO	2#0100#	DIT
Secondary Header	WORD 7	USDG01CC0703L	WORD			DIT
Element ID	0	USDG01CC0710J	SIGNAL	CO	1	DIT
Packet Data Type	5	USDG01CC0712J	SIGNAL	CO	1	DIT
Version Identifier	6	USDG01CC0720J	SIGNAL	RV	N/A	DIT
Format ID	10	USDG01CC0733J	SIGNAL	CO	2#000101#	DIT
Secondary Header	WORD 8	USDG01CC0800L	WORD			DIT
Spare	0	SPARE				DIT
Processing Frame ID	9	USDG01CC0810U	SIGNAL	RV	0	DIT

APPENDIX G TELEMETRY CCSDS HEADER (Continued)

TABLE G-6 TELEMETRY CCSDS HEADER - NORMAL DATA DUMP PACKET

SW Engineering Title	Word Position/ Bit Offset	Signal PUI	Content Type	SW Type of Signal	SW Initial Value	Data Provider
CCSDS Primary Header	N/A	USDG01CC3004L	CCSDS_T			DIT
Primary Header	WORD 1	USDG01CC0100L	WORD			DIT
Version Number	0	USDG01CC0110U	SIGNAL	CO	0	DIT
Type	3	USDG01CC0120J	SIGNAL	CO	0	DIT
Secondary Header Flag	4	USDG01CC0130J	SIGNAL	CO	1	DIT
APID	5	USDG01CC0140J	SIGNAL	RV	N/A	DIT
Primary Header	WORD 2	USDG01CC0200L	WORD			DIT
Sequence Flags	0	USDG01CC0210J	SIGNAL	CO	2#11#	DIT
Packet Sequence Count	2	USDG01CC0220U	SIGNAL	RV	N/A	DIT
Packet Length	WORD 3	USDG01CC0304Q	SIGNAL	CO	185	N/A
CCSDS Secondary Header	N/A	USDG01CC2004L	CCSDS_T			DIT
Course Time	WORD 4/5	USDG01CC0400W	SIGNAL	RV	N/A	DIT
Secondary Header	WORD 6	USDG01CC0600L	WORD			DIT
Fine Time	0	USDG01CC0610W	SIGNAL	RV	N/A	DIT
Time ID	8	USDG01CC0620J	SIGNAL	RV	1	DIT
Checkword Indication	10	USDG01CC0630J	SIGNAL	CO	0	DIT
Spare	11	SPARE				DIT
Telemetry Packet Type	12	USDG01CC0650J	SIGNAL	CO	1	DIT
Secondary Header	WORD 7	USDG01CC0704L	WORD			DIT
Element ID	0	USDG01CC0710J	SIGNAL	CO	1	DIT
Packet Data Type	5	USDG01CC0712J	SIGNAL	CO	1	DIT
Version Identifier	6	USDG01CC0720J	SIGNAL	RV	N/A	DIT
Format ID	10	USDG01CC0734J	SIGNAL	CO	2#000111#	DIT
Secondary Header	WORD 8	USDG01CC0800L	WORD			DIT
Spare	0	SPARE				DIT
Processing Frame ID	9	USDG01CC0810U	SIGNAL	RV	N/A	DIT

APPENDIX G TELEMETRY CCSDS HEADER (Continued)

TABLE G-7 TELEMETRY CCSDS HEADER - EXTENDED DATA DUMP PACKET

SW Engineering Title	Word Position/ Bit Offset	Signal PUI	Content Type	SW Type of Signal	SW Initial Value	Data Provider
CCSDS Primary Header	N/A	USDG01CC3005L	CCSDS_T			DIT
Primary Header	WORD 1	USDG01CC0100L	WORD			DIT
Version Number	0	USDG01CC0110U	SIGNAL	CO	0	DIT
Type	3	USDG01CC0120J	SIGNAL	CO	0	DIT
Secondary Header Flag	4	USDG01CC0130J	SIGNAL	CO	1	DIT
APID	5	USDG01CC0140J	SIGNAL	RV	N/A	DIT
Primary Header	WORD 2	USDG01CC0200L	WORD			DIT
Sequence Flags	0	USDG01CC0210J	SIGNAL	CO	2#11#	DIT
Packet Sequence Count	2	USDG01CC0220U	SIGNAL	RV	N/A	DIT
Packet Length	WORD 3	USDG01CC0303Q	SIGNAL	CO	761	N/A
CCSDS Secondary Header	N/A	USDG01CC2005L	CCSDS_T			DIT
Course Time	WORD 4/5	USDG01CC0400W	SIGNAL	RV	N/A	DIT
Secondary Header	WORD 6	USDG01CC0600L	WORD			DIT
Fine Time	0	USDG01CC0610W	SIGNAL	RV	N/A	DIT
Time ID	8	USDG01CC0620J	SIGNAL	RV	1	DIT
Checkword Indication	10	USDG01CC0630J	SIGNAL	CO	0	DIT
Spare	11	SPARE				DIT
Telemetry Packet Type	12	USDG01CC0650J	SIGNAL	CO	1	DIT
Secondary Header	WORD 7	USDG01CC0705L	WORD			DIT
Element ID	0	USDG01CC0710J	SIGNAL	CO	1	DIT
Packet Data Type	5	USDG01CC0712J	SIGNAL	CO	1	DIT
Version Identifier	6	USDG01CC0720J	SIGNAL	RV	N/A	DIT
Format ID	10	USDG01CC0735J	SIGNAL	CO	2#001000#	DIT
Secondary Header	WORD 8	USDG01CC0800L	WORD			DIT
Spare	0	SPARE				DIT
Processing Frame ID	9	USDG01CC0810U	SIGNAL	RV	N/A	DIT

APPENDIX G TELEMETRY CCSDS HEADER (Continued)

TABLE G-8 TELEMETRY CCSDS HEADER - NCS TO OIU PACKET

SW Engineering Title	Word Position/ Bit Offset	Signal PUI	Content Type	SW Type of Signal	SW Initial Value	Data Provider
CCSDS Primary Header	N/A	USDG01CC3007L	CCSDS_T			DIT
Primary Header	WORD 1	USDG01CC0100L	WORD			DIT
Version Number	0	USDG01CC0110U	SIGNAL	CO	0	DIT
Type	3	USDG01CC0120J	SIGNAL	CO	0	DIT
Secondary Header Flag	4	USDG01CC0130J	SIGNAL	CO	1	DIT
APID	5	USDG01CC0140J	SIGNAL	RV	N/A	DIT
Primary Header	WORD 2	USDG01CC0200L	WORD			DIT
Sequence Flags	0	USDG01CC0210J	SIGNAL	CO	2#11#	DIT
Packet Sequence Count	2	USDG01CC0220U	SIGNAL	RV	N/A	DIT
Packet Length	WORD 3	USDG01CC0305Q	SIGNAL	CO	185	N/A
CCSDS Secondary Header	N/A	USDG01CC2007L	CCSDS_T			DIT
Course Time	WORD 4/5	USDG01CC0400W	SIGNAL	RV	N/A	DIT
Secondary Header	WORD 6	USDG01CC0603L	WORD			DIT
Fine Time	0	USDG01CC0610W	SIGNAL	RV	N/A	DIT
Time ID	8	USDG01CC0620J	SIGNAL	RV	1	DIT
Checkword Indication	10	USDG01CC0630J	SIGNAL	CO	0	DIT
Spare	11	SPARE				DIT
Telemetry Packet Type	12	USDG01CC0651J	SIGNAL	CO	2#0100#	DIT
Secondary Header	WORD 7	USDG01CC0706L	WORD			DIT
Element ID	0	USDG01CC0710J	SIGNAL	CO	1	DIT
Packet Data Type	5	USDG01CC0712J	SIGNAL	CO	1	DIT
Version Identifier	6	USDG01CC0720J	SIGNAL	RV	N/A	DIT
Format ID	10	USDG01CC0736J	SIGNAL	CO	2#001101#	DIT
Secondary Header	WORD 8	USDG01CC0800L	WORD			DIT
Spare	0	SPARE				DIT
Processing Frame ID	9	USDG01CC0810U	SIGNAL	RV	N/A	DIT

APPENDIX G TELEMETRY CCSDS HEADER (Continued)

TABLE G-9 TELEMETRY CCSDS HEADER - NCS TO FGB PACKET

SW Engineering Title	Word Position/ Bit Offset	Signal PUI	Content Type	SW Type of Signal	SW Initial Value	Data Provider
CCSDS Primary Header	N/A	USDG01CC3009L	CCSDS_T			DIT
Primary Header	WORD 1	USDG01CC0100L	WORD			DIT
Version Number	0	USDG01CC0110U	SIGNAL	CO	0	DIT
Type	3	USDG01CC0120J	SIGNAL	CO	0	DIT
Secondary Header Flag	4	USDG01CC0130J	SIGNAL	CO	1	DIT
APID	5	USDG01CC0140J	SIGNAL	RV	N/A	DIT
Primary Header	WORD 2	USDG01CC0200L	WORD			DIT
Sequence Flags	0	USDG01CC0210J	SIGNAL	CO	2#11#	DIT
Packet Sequence Count	2	USDG01CC0220U	SIGNAL	RV	N/A	DIT
Packet Length	WORD 3	USDG01CC0304Q	SIGNAL	CO	185	DIT
CCSDS Secondary Header	N/A	USDG01CC2009L	CCSDS_T			DIT
Course Time	WORD 4/5	USDG01CC0400W	SIGNAL	RV	N/A	DIT
Secondary Header	WORD 6	USDG01CC0603L	WORD			DIT
Fine Time	0	USDG01CC0610W	SIGNAL	RV	N/A	DIT
Time ID	8	USDG01CC0620J	SIGNAL	RV	1	DIT
Checkword Indication	10	USDG01CC0630J	SIGNAL	CO	0	DIT
Spare	11	SPARE				DIT
Telemetry Packet Type	12	USDG01CC0651J	SIGNAL	CO	2#0100#	DIT
Secondary Header	WORD 7	USDG01CC0708L	WORD			DIT
Element ID	0	USDG01CC0710J	SIGNAL	CO	1	DIT
Packet Data Type	5	USDG01CC0712J	SIGNAL	CO	1	DIT
Version Identifier	6	USDG01CC0720J	SIGNAL	RV	N/A	DIT
Format ID	10	USDG01CC0738J	SIGNAL	CO	2#010010#	DIT
Secondary Header	WORD 8	USDG01CC0800L	WORD			DIT
Spare	0	SPARE				DIT
Processing Frame ID	9	USDG01CC0810U	SIGNAL	RV	N/A	DIT

APPENDIX H 1553B MODE CODE COMMAND REQUIREMENTS MATRIX

This material is intended to provide assistance and guidance in the instantiation of Mode Code commands. This material duplicates information defined elsewhere, and is not provided here as a definition. The accuracy of this appendix is subject to modification of this information in the authority document.

Note:
* Depends on protocol with RTS beneath BC

(Shaded areas invalid for ISS)

Mode Code	Name	1553B T/R BIT	OPER I/F	MDM BC HW	MDM BC UAS	MDM RT HW	RT MDM UAS	MDM UTIL	MATE (BC)	MATE (RT)	OPER INVOC
0	Dynamic Bus Control	1=T	no	no	no	no	no	no	no	no	
1	Sync w/o Data Word	1=T	no	yes	no	yes	no	no	yes	yes	
2	Transmit Status Word	1=T	yes	yes	yes	yes	no	no	yes	yes	yes
3	Initiate Self Test	1=T	yes	yes	yes	yes	no	no	yes	yes	yes
4	Transmitter Shutdown (SD)	1=T	yes	yes	yes	yes	no	no	yes	yes	yes
5	Override Transmit SD	1=T	yes	yes	yes	yes	no	no	yes	yes	yes
6	Inhibit Terminal Flag	1=T	no	no	no	no	no	no	no	no	
7	Override Inhibit Term	1=T	no	no	no	no	no	no	no	no	
8	Reset Remote Term	1=T	yes	yes	yes	yes	no	no	yes	yes	yes
16	Transmit Vector Word	1=T	no	yes	yes*	yes	no	no	yes	yes	
17	Sync w/ Data Word	0=R	no	yes	yes	yes	yes	no	yes	yes	
18	Transmit Last Command	1=T	yes	yes	yes	yes	no	no	yes	yes	yes
19	Transmit BIT Word	1=T	yes	yes	yes	yes	no	no	yes	yes	yes
20	Select Transmitter SD	0=R	no	no	no	no	no	no	no	no	
21	Override Sltd Trans SD	0=R	no	no	no	no	no	no	no	no	

APPENDIX I STANDARD ENGINEERING CONSTANTS

Description	Constant Value	Eng Unit	Data Type
Radian to Degree Conversion Factor	5.72957795131E+01	Deg/Rad	Double Precision Floating
Earth Gravity Acceleration Constant(G)	3.21740490000E+01	Ft/Sec**2	Double Precision Floating
Feet to Nautical Miles Conversion Factor	1.64578840000E-04	Nmi/Ft	Single Precision Floating
Degree to Radian Conversion Factor	1.74532930000E-02	Rad/Deg	Double Precision Floating
Earth Gravitational Constant	1.40764487566E+16	Ft**3/Sec**2	Double Precision Floating
Ratio of Circumference to Diameter (Pi)	3.14159265358E+00	No Unit	Double Precision Floating
X Comp of Unit Vector in Direction of Earth's Axis	2.83228440000E-03	No Unit	Double Precision Floating
Y Comp of Unit Vector in Direction of Earth's Axis	-5.02799600000E-05	No Unit	Single Precision Floating
Z Comp of Unit Vector in Direction of Earth's Axis	9.99995984100E-01	No Unit	Double Precision Floating
Earth's Rotational Rate	7.29211514545E-05	Rad/Sec	Double Precision Floating
Earth Rotational Radius	2.09257414698E+07	Ft	Double Precision Floating
Mass-To-Weight Conversion	3.21740490000E+01	Lb/Slug	Double Precision Floating
Earth's Ellipticity Constant	3.35232986900E-03	No Unit	Double Precision Floating
Nautical Mile to Feet Conversion	6.07611550000E+03	Ft/Nmi	Double Precision Floating

APPENDIX J STANDARDIZED DATA TYPES

This appendix characterizes the types of data which will be referenced by the Standard IP&CL Input fields defined in Appendix N. For each data type, a description and the required legal values are defined.

This appendix characterizes the types of data which will be referenced by the Standard IP&CL input fields defined in Appendix N. For each data type, a description and the required legal values are defined.

TYPE LEGAL CODE	DESCRIPTION LEGAL VALUES
Signed Integer Code: SI	A numeric value containing a sign bit but containing no fractional parts. The value shall be in Two's Complement. Note that a floating point value with a fractional part of zero may be converted to an integer without loss of precision, but is not an integer. In its printed representation, only the characters 0 through 9 are allowed (in particular, a decimal point is not allowed). The number preceding the code indicates the number of bits in the field For this data type, the value of the LSB guides interpretation of the value. When the LSB is 1 and the units of the primitive is CNT, a conversion definition is allowed but not required. If no conversion definition is provided, the integer value of the bit pattern is the engineering unit of measure. If a conversion definition is provided, the integer value of the bit pattern is provided to the conversion function defined by the conversion definition, with the resulting units of measure identified by the conversion definition. If the value of the LSB is any value other than 1, no conversion is allowed, and the value of the LSB is the linear scaling factor to be applied to the integer value of the bit pattern to achieve the indicated engineering unit of measure. LEGAL VALUES: 2SI, 8SI, 9SI, 12SI, 16SI, 24SI, 32SI
Unsigned Integer Code: UI	Integer value not containing a sign bit - the numbers prior to the code indicate the number of bits in the field. For this data type, the value of the LSB guides interpretation of the value. When the LSB is 1 and the units of the primitive is CNT, a conversion definition is allowed but not required. If no conversion definition is provided, the integer value of the bit pattern is the engineering unit of measure. If a conversion definition is provided, the integer value of the bit pattern is provided to the conversion function defined by the conversion definition, with the resulting units of measure identified by the conversion definition. If the value of the LSB is any value other than 1, no conversion is allowed, and the value of the LSB is the linear scaling factor to be applied to the integer value of the bit pattern to achieve the indicated engineering unit of measure. LEGAL VALUES: 1UI, 2UI, 3UI, 4UI, 5UI, 6UI, 7UI, 8UI, 9UI,10UI, 11UI, 12UI, 13UI, 14UI, 15UI, 16UI, 32UI

APPENDIX J STANDARDIZED DATA TYPES (Continued)

TYPE LEGAL CODE	DESCRIPTION LEGAL VALUES
Signed Fixed Point	A numeric value containing a fractional part, expressed in terms of a mantissa with an implied binary point position determined by the computational use of the supplied LSB value. The value shall be in Two's Complement. The value does not contain an exponent. The bits representing the fractional part of the value occupy the least significant bits in the internal representation. The position of the implied binary point expressed as a part of the complete data type definition is a convention no longer given significance; however the characters will be required and be compatible with the supplied LSB. Note: Prior convention stated that the value was internally represented as a signed integer value, but with a binary point in a specific location - the number prior to the code identified the number of bits occupied by the field, the number following the code identified the number of bits representing the fractional part of the value. This convention is still utilized in the IP&CL data collection disciplines. However, the internal processing usage of the data type to determine integer and fractional components of a fixed point data value has been superseded by the computational use of the LSB value.
Code: SF	LEGAL VALUES: 8SF0, 8SF1, 8SF2, 8SF3, 8SF5, 8SF7, 12SF0, 12SF2, 12SF4, 12SF5, 12SF10, 15SF0, 16SF3, 16SF0, 16SF2, 16SF4, 16SF5, 16SF6, 16SF7, 16SF8, 16SF9, 16SF10, 16SF11, 16SF12, 16SF13, 16SF14, 16SF15, 16SF20, 17SF0, 18SF14, 19SF0, 32SF3, 32SF14, 32SF15, 32SF16, 32SF18, 32SF20, 32SF22, 32SF25, 32SF28, 32SF31
Unsigned Fixed Point	A numeric value containing a fractional part, expressed in terms of a mantissa with an implied binary point position determined by the computational use of the supplied LSB value. The value does not contain an exponent. The bits representing the fractional part of the value occupy the least significant bits in the internal representation. The position of the implied binary point expressed as a part of the complete data type definition is a convention no longer given significance; however the characters will be required and be compatible with the supplied LSB. Note: Prior convention stated that the value was internally represented as a unsigned integer value, but with a binary point in a specific location - the number prior to the code identified the number of bits occupied by the field, the number following the code identified the number of bits representing the fractional part of the value. This convention is still utilized in the IP&CL data collection disciplines. However, the internal processing usage of the data type to determine integer and fractional components of a fixed point data value has been superseded by the computational use of the LSB value.
Code: UF	LEGAL VALUES: 4UF0, 5UF1, 8UF0, 8UF1, 8UF8, 12UF8, 12UF9, 12UF10, 12UF14, 12UF17, 16UF0, 16UF2, 16UF3, 16UF5, 16UF6, 16UF7, 16UF8, 16UF9, 16UF10, 16UF11, 16UF12, 16UF13, 16UF14, 16UF15, 16UF19, 16UF20, 20UF20, 32UF1, 32UF16,

APPENDIX J STANDARDIZED DATA TYPES (Continued)

TYPE LEGAL CODE	DESCRIPTION LEGAL VALUES
Floating Point Code: F	Floating point number - A real number represented by a three-field binary format as required by IEEE standard 754 for floating point numerics. The number's significant digits are in a mantissa field (which is normalized to an implied leading bit value of one), the exponent field (which is biased with a value according to the real format chosen, 127 for 32F type and 1023 for 64F type) locates the binary point within the significant digits (and therefore determines the number's magnitude), and the sign field indicates whether the number is positive or negative. Negative numbers differ from positive numbers only in their sign bits. LEGAL VALUES: 32F, 64F
Enumerated Code: E	A series of names, each of which consists exclusively of the characters A-Z, a-z, and 0-9, with the addition of the underscore character, and each of which has an associated explicitly identified internal representation. The exact names and their respective internal representations must be specified externally to the field - the numbers indicate the number of bits in the field. Each numeral within the same enumerated data type has a specific, unique printed representation, and a specific, unique binary representation. The method of specifying the legal values for an enumerated data type is defined in Appendix N/File 3.1 (State Conversion File). LEGAL VALUES: 1E, 2E, 3E, 4E, 5E, 6E, 7E, 8E, 9E, 10E, 11E, 12E, 13E, 14E, 15E, 16E, 32E
Distended Signed Integer Code: DSI	Occupies memory in units of one word (16 bits) or two words (32 bits). The value shall be in Two's Complement. The sign bit for the value is contained in the MSB of the field, and the absolute value is contained in the least significant bits of the field. The number of bits in the field is defined to the left of the data type code, and the number of bits of magnitude are defined to the right of the data type code. All bits between the sign bit and the most significant bit of the magnitude shall be undefined, and no assumptions shall be made regarding the value(s) of the bit(s). For this data type, the value of the LSB guides interpretation of the value. When the LSB is 1 and the units of the primitive is CNT, a conversion definition is allowed but not required. If no conversion definition is provided, the integer value of the bit pattern is the engineering unit of measure. If a conversion definition is provided, the integer value of the bit pattern is provided to the conversion function defined by the conversion definition, with the resulting units of measure identified by the conversion definition. If the value of the LSB is any value other than 1, no conversion is allowed, and the value of the LSB is the linear scaling factor to be applied to the integer value of the bit pattern to achieve the indicated engineering unit of measure. LEGAL VALUES: 16DSI12, 32DSI12

APPENDIX J STANDARDIZED DATA TYPES (Continued)

TYPE LEGAL CODE	DESCRIPTION LEGAL VALUES
Binary Coded Decimal Code: BCD	A representation of a numeric value in which each consecutive 4 bits contains a binary encoding of a digit. Used only for unsigned integer values. By definition, BCD values are base 10. The convention for the order of progression of decimal digit significance (Least significant digit to Most significant digit) within the total numeric decimal number follows that established for the order of progression for the binary word nibbles (i.e. least four significant bits equals nibble #1, the next four least significant bits equals nibble #2, etc. to the highest four significant bits for nibble #4 of a 16-bit word). This is sometimes referred to as “packed BCD.” The convention for the order of progression of the binary bit weights (LSB to MSB) within the representation of each digit of the numeric decimal value is the same as the convention established for the order of progression of the binary bit weights (LSB to MSB) of the entire binary word containing the BDC value. LEGAL VALUES: 1BCD, 2BCD, 3BCD, 4BCD
Signed Magnitude Integer Code: SMI	A form of signed integer value in which the sign bit is combined with an unsigned integer value. The sign bit resides in the MSB of the field, with all less significant bits in the field capable of containing the (unsigned integer) value. The number of bits in the field is represented by the number appearing prior to the data type code. As an example, the value -5 is represented as a sign bit of one (indicating negative) combined with the unsigned integer value 5. Also, the range of values of an object of type 16SMI is +/-32767. Note that there are two representations for zero, and that there are as many values greater than zero as there are less than zero. For this data type, the value of the LSB guides interpretation of the value. When the LSB is 1 and the units of the primitive is CNT, a conversion definition is allowed but not required. If no conversion definition is provided, the integer value of the bit pattern is the engineering unit of measure. If a conversion definition is provided, the integer value of the bit pattern is provided to the conversion function defined by the conversion definition, with the resulting units of measure identified by the conversion definition. If the value of the LSB is any value other than 1, no conversion is allowed, and the value of the LSB is the linear scaling factor to be applied to the integer value of the bit pattern to achieve the indicated engineering unit of measure. LEGAL VALUES: 9SMI, 16SMI

APPENDIX J STANDARDIZED DATA TYPES (Continued)

TYPE LEGAL CODE	DESCRIPTION LEGAL VALUES
Character	A series of one or more ASCII characters consisting of any character in the 7-bit ASCII encoding standard, intended to be used for transfer of arbitrary data values - the numbers indicate the number of bytes in the field. Each character shall occupy one byte. For cases where the declared length of the primitive is an odd number n, n+1 characters will be transmitted in bus transactions with the value of the primitive occupying the first n bytes.
Code: C	LEGAL VALUES: 2C, 4C, 6C, 8C, 10C, 12C, 15C, 16C, 18C, 20C, 22C, 30C, 32C, 34C, 38C, 40C, 42C, 44C, 52C, 54C, 58C, 62C, 80C, 100C, 104C

APPENDIX K DELTA DELIVERY DETAILED PROCEDURES FOR EACH IP&CL STANDARD IN FILE

This Appendix provides the detailed procedures necessary to implement the Delta Delivery requirements established in paragraph 3.7.1.2.5

Note:

- All @ signs must be replaced by valid data for a 100% delivery;
- SR = Only a single record is required; and
- CRS = A logically complete set of one or more records is required.

NOTE: A/C can be used if the Data Provider is not sure of the status of MBF Database when conditionally wanting to make an ADD or CHG in the Database.

Standard In File	Key Fields (CK)	CM = ADD or A/C* (All)	CM = CHG or A/C*(All) CM = DTC (1.2, 1.3) CM = GTC (5.1)	CM = DEL (Not All)
1.1 HW (SR)	1.1-1	Deliver new unique SPUI in field 1.1-1 and legal values in the (M) fields. If other fields are unknown an @ may be used. If a HW SPUI has been previously defined by a FW or SW record specifying Type of Signal (field 1.2-3 or 1.3-3) as “HW”, then the addition of the HW record attributes will require a CM action of CHG.	Deliver previously defined SPUI in field 1.1-1. Device Data Type field 1.1-2 shall not be changed except by deleting (DEL) the old record and adding (ADD) the new record. Modify other attribute fields as required.	Deliver previously defined SPUI and Data Type in fields 1.1-1 and 1.1-2 respectively. Put legal values in the (M) fields. If other fields are unknown an @ may be used.

APPENDIX K DELTA DELIVERY DETAILED PROCEDURES FOR EACH IP&CL STANDARD IN FILE (Continued)

Standard In File	Key Fields (CK)	CM = ADD or A/C* (All)	CM = CHG or A/C*(All) CM = DTC (1.2, 1.3) CM = GTC (5.1)	CM = DEL (Not All)
1.2 FW (SR)	1.2-1	Deliver new unique SPUI in field 1.2-1 and legal values in the (M) fields. If other fields are unknown an @ may be used.	Deliver previously defined SPUI in field 1.2-1 and data type in field 1.2-2. Modify other attribute fields as required. If using Data Type Change (DTC) and the Type of Signal (field 1.2-3) is NOT "HW" then deliver the old SPUI in 1.2-1 and the new data type in 1.2-2. If the Type of Signal (field 1.2-3) is "HW", and the Data Type (field 1.2-2) is to be changed within the set (SI, UI, SF, UF, DSI, SMI), it must be changed with a CM action of CHG, as with any other attribute fields for the PUI, rather than as a DTC.	Deliver previously defined SPUI, Data Type and Type of Signal in fields 1.2-1, 1.2-2 and 1.2-3 respectively. Put legal values in the (M) fields. If other fields are unknown an @ may be used.
1.3 SW (SR)	1.3-1	Deliver new unique SPUI in field 1.3-1 and legal values in the (M) fields. If other fields are unknown an @ may be used.	Deliver previously defined SPUI in field 1.3-1 and data type in field 1.3-2. Modify other attribute fields as required. If using Data Type Change (DTC) and the Type of Signal (field 1.2-3) is NOT "HW" then deliver the old SPUI in 1.3-1 and the new data type in 1.3-2. If the Type of Signal (field 1.3-3) is "HW", and the Data Type 9field 1.3-2) is to be changed within the set (SI, UI, SF, UF, DSI, SMI), it must be changed with a CM action of CHG, as with any other attribute fields for the PUI, rather than as a DTC.	Deliver previously defined SPUI, Data Type and Type of Signal in fields 1.3-1,1.3-2 and 1.3-3 respectively. Put legal values in the (M) fields. If other fields are unknown an @ may be used.

APPENDIX K DELTA DELIVERY DETAILED PROCEDURES FOR EACH IP&CL STANDARD IN FILE (Continued)

Standard In File	Key Fields (CK)	CM = ADD or A/C* (All)	CM = CHG or A/C*(All) CM = DTC (1.2, 1.3) CM = GTC (5.1)	CM = DEL (Not All)
2.1 DF (SR)	2.1-1 and 2.1-5	Deliver a new unique combination of 2.1-1 & 2.1-5, fields. Put legal values in the (M) fields. If other fields are unknown an @ may be used.	Deliver a match of the previously defined combination of 2.1-1 & 2.1-5. Modify other "non-key (CK)" attribute fields as required.	Deliver a match of the previously defined combination of 2.1-1 & 2.1-5. Put legal values in the (M) fields. The DEL removes the link between the Device PUI and the BUS PUI.
2.2 MC (SR)	2.2-1 2.2-2 2.2-3 2.2-4 2.2-6 and 2.2-7	Deliver new unique combination of 2.2-1, 2.2-2, 2.2-3, 2.2-4, 2.2-6 & 2.2-7 Put legal values in the (M) fields. If other fields are unknown an @ may be used.	Deliver a match of the previously defined combination of 2.2-1, 2.2-2, 2.2-3, 2.2-4, 2.2-6 & 2.2-7 Modify other "non-key (CK)" attribute fields as required.	Deliver One Record matching the previously defined combination of 2.2-1, 2.2-2, 2.2-3, 2.2-4, 2.2-6, & 2.2-7. The DEL action removes the channelization record at the channelization end item.
2.3 FC (SR)	2.3-1 2.3-2 2.3-3 and 2.3-4	Deliver new unique combination of 2.3-1, 2.3-2 2.3-3 & 2.3-4 Put legal values in the (M) fields. If other fields are unknown an @ may be used	Deliver a match of the previously defined combination of fields 2.3-1, 2.3-2 2.3-3 & 2.3-4. Modify other "non-key (CK)" attribute fields as required.	Deliver One Record of a Complete Record Set matching the previously defined combination of 2.3-1, 2.3-2, 2.3-3. & 2.3-4 The DEL removes the link between the HW SPUI and the FC Device PUI & RPCM Chan. No.

APPENDIX K DELTA DELIVERY DETAILED PROCEDURES FOR EACH IP&CL STANDARD IN FILE (Continued)

Standard In File	Key Fields (CK)	CM = ADD or A/C* (All)	CM = CHG or A/C*(All) CM = DTC (1.2, 1.3) CM = GTC (5.1)	CM = DEL (Not All)
3.1 SC (CRS)	3.1-1	Deliver a new unique 3.1-1, as a Complete Record Set. NOTE: All records in the CRS must have identical corresponding fields for the Key Field (3.1-1), the State Conv. PUI Name (3.1-2), the CM Field (3.1-5) and the Authorization Field (3.1-6).	Deliver a CRS with a match of the previously defined 3.1-1 as a Complete Record Set. Modify other attribute fields as required. NOTE: All records in the CRS must have identical corresponding fields for the Key Field (3.1-1), the State Conv. PUI Name (3.1-2), the CM Field (3.1-5) and the Authorization Field (3.1-6).	Deliver One Record of a Complete Record Set matching the previously defined State Conv. PUI, field 3.1-1 and with CM=DEL. This complete State Conversion definition and PUI will be deleted.
3.2 PC (CRS)	3.2-1	Deliver a new unique 3.2-1 to define the Poly Conv. See NOTE in next column. NOTE: The PC (3.2) file will contain only one record for each Polynomial Calibration Conversion PUI defined. However, it is handled as a CRS type file consistent with the MBF processing of the other conversion files.	Deliver previously defined Conversion PUI in field 3.2-1. Modify other attribute fields as required. When changing “forward” Conversion PUI attributes, also change “inverse” Conversion PUI attributes to maintain consistency. NOTE: The PC (3.2) file will contain only one record for each Polynomial Calibration Conversion PUI defined. However, it is handled as a CRS type file consistent with the MBF processing of the other conversion files.	Deliver One Record matching the previously defined Poly Conv. PUI, field 3.2-1 and with CM=DEL. This complete Poly Conversion definition and PUI will be deleted. See NOTE in previous column.

APPENDIX K DELTA DELIVERY DETAILED PROCEDURES FOR EACH IP&CL STANDARD IN FILE (Continued)

Standard In File	Key Fields (CK)	CM = ADD or A/C* (All)	CM = CHG or A/C*(All) CM = DTC (1.2, 1.3) CM = GTC (5.1)	CM = DEL (Not All)
3.3 PL (CRS)	3.3-1	Deliver a new unique 3.3-1, as a Complete Record Set. NOTE: All records in the CRS must have identical corresponding fields for the Key Field (3.3-1), the PL Conv. PUI Name (3.3-2), the No. of Segments (3.3-3), the Min. Cal. Range (3.3-5), the Max. Cal. Range (3.3-6), the Conv. Units (3.3-7), the Fwd/Inverse PUI (3.3-12), the Conv. Remarks (3.3-14),the CM Field (3.3-15) and the Authorization Field (3.3-16).	Deliver a CRS with a match of the previously defined field 3.3-1 as a Complete Record Set. Modify other attribute fields as required. NOTE: All records in the CRS must have identical corresponding fields for the Key Field (3.3-1), the PL Conv. PUI Name (3.3-2), the No. of Segments (3.3-3), the Min. Cal. Range (3.3-5), the Max. Cal. Range (3.3-6), the Conv. Units (3.3-7), the Fwd/Inverse PUI (3.3-12), the Conv. Remarks (3.3-14),the CM Field (3.3-15) and the Authorization Field (3.3-16).	Deliver One Record of a Complete Record Set matching the previously defined PL Conv. PUI, field 3.3-1 and with CM=DEL. This complete PL Conversion definition and PUI will be deleted.

APPENDIX K DELTA DELIVERY DETAILED PROCEDURES FOR EACH IP&CL STANDARD IN FILE (Continued)

Standard In File	**Key Fields (CK)**	**CM = ADD or A/C* (All)**	**CM = CHG or A/C*(All) CM = DTC (1.2, 1.3) CM = GTC (5.1)**	**CM = DEL (Not All)**
3.4 CP (CRS)	3.4-1	Deliver a new (i.e., no previous conversion PUI has been specified for this SPUI) record or CRS for Multi-conversions. NOTE: All records in the CRS must have identical corresponding fields for the Key Field (3.4-1), the CM Field (3.4-4) and the Authorization Field (3.4-5).	Deliver a match of the previously defined field 3.4-1 as a Complete Record Set. Modify other attribute fields as required. NOTE: All records in the CRS must have identical corresponding fields for the Key Field (3.4-1), the CM Field (3.4-4) and the Authorization Field (3.4-5).	DEL not allowed. (This data is deleted when the SPUI is deleted.) For a multi-cal set to delete one of the cal Options, deliver the new CRS with the deleted cal removed and specify CM=CHG.
4.1 RP (CRS)	4.1-1	Deliver a new CRS (i.e., no previous “Requirement PUI” has been specified for this SPUI). NOTE: All records in the CRS must have identical corresponding fields for the Key Field (4.1-1), the CM Field (4.1-3) and the Authorization Field (4.1-4).	Deliver a match of the previously defined 4.1-1 as a Complete Record Set. Modify other attribute fields as required. NOTE: All records in the CRS must have identical corresponding fields for the Key Field (4.1-1), the CM Field (4.1-3) and the Authorization Field (4.1-4).	DEL not allowed. (This data is deleted when the SPUI is deleted.)

APPENDIX K DELTA DELIVERY DETAILED PROCEDURES FOR EACH IP&CL STANDARD IN FILE (Continued)

Standard In File	Key Fields (CK)	CM = ADD or A/C* (All)	CM = CHG or A/C*(All) CM = DTC (1.2, 1.3) CM = GTC (5.1)	CM = DEL (Not All)
4.2 TR (CRS)	4.2-1	Deliver a new CRS (i.e., no previous "Traceable SPUI" has been specified). NOTE: All records in the CRS must have identical corresponding fields for the Key Field (4.2-1), the CM Field (4.1-4) and the Authorization Field (4.1-5).	Deliver a match of the previously defined field 4.2-1 as a Complete Record Set. Modify other attribute fields as required. NOTE: All records in the CRS must have identical corresponding fields for the Key Field (4.2-1), the CM Field (4.1-4) and the Authorization Field (4.1-5).	DEL not allowed. (This data is deleted when the SPUI is deleted.)
5.1 GD (CRS)	5.1-1	Deliver a new unique 5.1-1, with the CRS to define the Group. NOTE: All records in the CRS must have identical corresponding fields for the Key Field (5.1-1), the Group Data Item Name Field (5.1-2), the Group Type Field (5.1-3), the CM Field (5.1-8) and the Authorization Field (5.1-9).	Deliver a match of the previously defined field 5.1-1 as a Complete Record Set. If using Group Type Change (GTC) then deliver the old SPUI 5.1-1 and the new Grp Type in field 5.1-3. NOTE: All records in the CRS must have identical corresponding fields for the Key Field (5.1-1), the Group Data Item Name Field (5.1-2), the Group Type Field (5.1-3), the CM Field (5.1-8) and the Authorization Field (5.1-9).	Deliver One Record of a CRS with a match of the Grp Data Item PUI, field 5.1-1 to be deleted. The DEL will delete the Grp Data Item PUI and remove the links with all of its contents. For a DEL of a MCMD Grp PUI, the related data from the CT, CI & CV files will also be deleted.

APPENDIX K DELTA DELIVERY DETAILED PROCEDURES FOR EACH IP&CL STANDARD IN FILE (Continued)

Standard In File	**Key Fields (CK)**	**CM = ADD or A/C* (All)**	**CM = CHG or A/C*(All) CM = DTC (1.2, 1.3) CM = GTC (5.1)**	**CM = DEL (Not All)**
5.2 MT (CRS)	5.2-1 and 5.2-6 5.2-7 & 5.2-8	Deliver a new unique combination of 5.2-1 and 5.2-6, 5.2-7, & 5.2-8 as a Complete Record Set. NOTE: All records in the CRS must have identical corresponding fields for the four Key Fields (5.2-1, 5.2-6, 5.2-7, & 5.2-8), the CM Field (5.2-14) and the Authorization Field (5.2-15).	Deliver a match of the previously defined combination of 5.2-1, 5.2-6, 5.2-7, & 5.2-8 as a Complete Record Set. Modify other “non-key (CK)” attribute fields as required. NOTE: All records in the CRS must have identical corresponding fields for the four Key Fields (5.2-1, 5.2-6, 5.2-7, & 5.2-8), the CM Field (5.2-14) and the Authorization Field (5.2-15). See App. N, File 5.2 for legal values in fields.	Deliver One Record of a Complete Record Set matching the previously defined combination of 5.2-1, 5.2-6, 5.2-7, & 5.2-8. This will delete the Complete Record Set and the relationship of 5.2-1 and the other key fields, effectively deleting the message identified in field 5.2-6 from the bus.
5.3 TT (CRS)	5.3-1 and 5.3-7	Deliver a new unique combination of 5.3-1 and 5.3-7. NOTE: All records in the CRS must have identical corresponding fields for the two Key Fields (5.3-1 & 5.3-7), the CM Field (5.3-8) and the Authorization Field (5.3-9).	Deliver a match of the previously defined combination of 5.3-1 & 5.3-7 as a Complete Record Set Modify “non-key (CK)” attribute fields as required. NOTE: All records in the CRS must have identical corresponding fields for the two Key Fields (5.3-1 & 5.3-7), the CM Field (5.3-8) and the Authorization Field (5.3-9).	DEL not allowed. This data CRS is deleted when the Telemetry Version PUI (5.3-7) is deleted. To delete Process Frame PUIs from the Telemetry Version PUI CRS omit appropriate records from the CRS. Deliver the new CRS with the records removed and specify CM=CHG.

APPENDIX K DELTA DELIVERY DETAILED PROCEDURES FOR EACH IP&CL STANDARD IN FILE (Continued)

Standard In File	Key Fields (CK)	CM = ADD or A/C* (All)	CM = CHG or A/C*(All) CM = DTC (1.2, 1.3) CM = GTC (5.1)	CM = DEL (Not All)
5.4 RG (CRS)	5.4-1 5.4-2 5.4-3 5.4-4 5.4-5 5.4-15	Deliver a new CRS with a unique combination of key fields 5.4-1, 5.4-2, 5.4-3, 5.4-4, 5.4-5 and 5.4-15. NOTE: All records in the CRS must have identical corresponding fields for the six Key Fields (5.4-1, 5.4-2, 5.4-3, 5.4-4, 5.4-5, & 5.4-15), the CM Field (5.4-13) and the Authorization Field (5.4-14).	Deliver a match of the previously defined combination of 5.4-1, 5.4-2, 5.4-3, 5.4-4, 5.4-5 and 5.4-15 as a Complete Record Set. Modify “non-key (CK)” attribute fields as required. NOTE: All records in the CRS must have identical corresponding fields for the six Key Fields (5.4-1, 5.4-2, 5.4-3, 5.4-4, 5.4-5, & 5.4-15), the CM Field (5.4-13) and the Authorization Field (5.4-14).	Deliver one record with a match of the previously defined combination 5.4-1, 5.4-2, 5.4-3, 5.4-4, 5.4-5 and 5.4-15. This will delete the relationship of 5.4-1 and the other key fields effectively deleting the specified data pipe between the devices indicated in fields 5.4-2 and 5.4-3 that was defined by the CRS.
6.1 CT (CRS)	6.1-1	Deliver a new CRS (i.e., no previous SPUIs and Values have been specified). NOTE: All records in the CRS must have identical corresponding fields for the Key Field (6.1-1), the CM Field (6.1-4) and the Authorization Field (6.1-5).	Deliver a match of the previously defined 6.1-1 as a Complete Record Set. Modify other “non-key (CK)” attribute fields as required. NOTE: All records in the CRS must have identical corresponding fields for the Key Field (6.1-1), the CM Field (6.1-4) and the Authorization Field (6.1-5).	DEL not allowed. (This data is deleted when the Cmd Temp Grp SPUI is deleted.)

APPENDIX K DELTA DELIVERY DETAILED PROCEDURES FOR EACH IP&CL STANDARD IN FILE (Continued)

Standard In File	Key Fields (CK)	CM = ADD or A/C* (All)	CM = CHG or A/C*(All) CM = DTC (1.2, 1.3) CM = GTC (5.1)	CM = DEL (Not All)
6.2 CI (SR)	6.2-1 and 6.2-2	Deliver a new unique combination of 6.2-1 and 6.2-2.	Deliver a match of the previously defined combination of 6.2-1 and 6.2-2. Modify "non-key (CK)" attribute fields as required.	Deliver a match of the previously defined combination of 6.2-1 and 6.2-2. This deletes the Cmd Instance PUI and the relationship of 6.2-1 and 6.2-2.
6.3 OP (SR)	6.3-1	Deliver a new 6.3-1 (i.e., no previous Ops. Name specified).	Deliver a match of the previously defined 6.3-1. Modify attribute fields as required.	DEL not allowed. (This data is deleted when the SPUI is deleted.)
6.4 CD (SR)	6.4-1	Deliver a complete new 6.4-1.	CHG not allowed. A complete CD file must be submitted with each delivery. Values in this file will completely replace values provided in the previous CD file delivery.	DEL not allowed. A complete CD file must be submitted with each delivery. Values in this file will completely replace values provided in the previous CD file delivery.
6.5 CV (CRS)	6.5-1 and 6.5-2	Deliver a CRS with a unique combination of 6.5-1 and 6.5-2 previously defined in 6.2. NOTE: All records in the CRS must have identical corresponding fields for the two Key Fields (6.5-1 & 6.5-2), the CM Field (6.5-5) and the Authorization Field (6.5-6).	Deliver a match of the previously defined combination of 6.5-1 and 6.5-2 as a Complete Record Set. Add or delete records from the CRS and modify attribute fields as required. NOTE: All records in the CRS must have identical corresponding fields for the two Key Fields (6.5-1 & 6.5-2), the CM Field (6.5-5) and the Authorization Field (6.5-6).	DEL not allowed. (This data is deleted when the Cmd Instance PUI (6.2) or Cmd Temp Grp SPUI (5.1) is deleted.)

APPENDIX L <DELETED>

APPENDIX M <DELETED>

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION

FILE 1 PRIMITIVES

FILE 1.1 HARDWARE PRIMITIVE SIGNAL DATA (HW)

This file contains the attributes for :

- Signals generated/received by a Hardware Device where the Device PUI is documented in Appendix C with a Device Type of HWM or HWF; and
- Bus PUIs (BPUIs) defined in Appendix S, the Device PUI (first 6 characters of the BPUI) is documented in Appendix C with a Device Type of HWM-DB and the records are submitted by the DIT.

All attributes necessary to process this data thru the firmware and/or software will be identified in the Firmware (File 1.2) or Software (File 1.3) Primitive File.

Note:

(M): Defines Field as 'Mandatory' per paragraph 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description	Applicability to Field 1.1-2 Legal Values
1.1-1 (M) (CK)	HW Signal PUI	13	C	Paragraph 3.3.1.2.1.1 and Appendix A thru E	ISSA Signal Program Unique Identifier for Hardware signals. Field used for Part 2 ICDs For HW Signal PUIs which are generated from a device defined in App C where the Device Type equals HWM-DB or HWM-DBN, then the Data Provider in Field 1.1-5 shall be DIT.	ALL

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description	Applicability to Field 1.1-2 Legal Values
1.1-2 (M)	HW Primitive Device Data Type	3	C	ANA, DIS, SPD, PWR, HRL	Unique code representing the type of processing required by a MDM or FC. a) HW signals generated or received by a MDM/FC ANA = Analog DIS = Discrete (b) Data Bus controlled by a MDM SPD = Serial Parallel Digital HRL = High Rate Data Link Note: All Bus PUIs are provided by the C&DH DIT via file 1.1. Data Bus Primitives are defined in Appendix S. c) HW load signals that are generated by a FC PWR=Power Command	N/A
1.1-3 (M)	HW Primitive Device Type	5	C	EFF EXC SEN RS485 1553F 1553N 1553P LOAD HRDL	Unique code representing the MDM channel type or FC that originated or received the signal. <u>MDM/FC</u> EFF = Effector SEN = Sensor <u>FC Only</u> LOAD=Power Cmd to Load <u>MDM Only</u> EXC = Excitation from MDM RS485 = RS485 Serial Bus 1553F=Mil Std 1553CDH Architecture Functional Bus 1553N=Mil Std 1553 Non CDH Architecture Functional Bus 1553P=Mil Std 1553 Physical Bus HRDL = High Rate Data Link Bus Note: The HRDL Bus Primitive is only provided for channelization of Bus in File 2.2. No Appendix Data traveling on this bus will be provided.	<u>ANA</u> EFF SEN EXC <u>DIS</u> EFF SEN <u>SPD</u> RS485 1553F 1553P <u>PWR</u> LOAD <u>HRL</u> HRDL

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description	Applicability to Field 1.1-2 Legal Values
1.1-4 (M)	HW Engineering Title	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code	Meaningful description of the signal.	ALL
1.1-5 (M)	HW Data Provider	3	C	Appendix R-Legal Value (3 Char.)	Data Provider responsible for delivering this HW primitive signal data record as defined in SSPS paragraph 3.7.1.4.1	ALL
1.1-6	HW Low State Definition	30	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	Definition of signals low state (i.e. " OFF") N/A shall only be used if HW primitive is not a DIS or PWR.	DIS PWR
1.1-7	HW Low State Code	1	I	0,1 Mutually exclusive from field 1.1-9 or N/A	Numeric code used to represent signals low state. N/A shall be only used if HW primitive is not a DIS or PWR.	DIS PWR
1.1-8	HW High State Definition	30	C	7 Bit ASCII Printable Characters or N/A	Definition of signals high state (i.e. " ON") N/A shall only be used if HW primitive is not a DIS or PWR.	DIS PWR
1.1-9	HW High State Code	1	I	0,1 Mutually exclusive from field 1.1-7 or N/A	Numeric code used to represent signals high state. N/A shall only be used if HW primitive is not a DIS or PWR.	DIS PWR
1.1-10 (M)	HW Flight Delivered	5	C	Appendix Q	The assembly flight on which this signal goes to orbit.	ALL
1.1-11	HW Flight Activated	5	C	Appendix Q	The assembly flight on which this signal is available to be activated on orbit.	ALL

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description	Applicability to Field 1.1-2 Legal Values
1.1-12	HW Description	250	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	Supplier Discretionary Field. N/A in lieu of '@' shall only be used if no remarks are required.	ALL
1.1-13 (M)	HW Change Mgmt	10	C	ADD CHG DEL A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph3.7.1.2.5: ADD = New record CHG = attribute change DEL = Delete SPUI A/C = Add or Change	ALL
1.1-14	HW Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of '@' shall only be used if no remarks are required.	ALL

FILE 1.2 FIRMWARE PRIMITIVE SIGNAL DATA (FW)

This file contains:

- The attributes for Signals-generated/received by a Firmware Controller where the Device PUI is documented in Appendix C with a Device Type of FW-UB, FW-LB, FW-CB, FW-UBN, FW-LBN, FW-CBN, GRPF, or LDF
- The software attributes for Pass thru Primitives defined in File 1.1 and Field 1.2-3 equals 'HW'; and
- For IPs and Payloads only, the attributes for primitives that are not defined in File 1.1, where the Generic Device Code of the SPUI (8th and 9th character) is equal to HW, and Field 1.2-3 equals 'HW'.

Note:

(M): Defines Field as 'Mandatory' per paragraph 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Length	Field Type	Legal Values	Field Description	Applicability to Field 1.2-2 Legal Values
1.2-1 (M) (CK)	HW/FW Signal PUI	13	C	Paragraph 3.3.1.2.1.1, 3.3.1.2.1.2, and Appendix A thru E	ISS Signal Program Unique Identifier for Firmware Primitive signals and Existing Hardware Signals defined in HW Primitive File. Field used for Part 2 ICDs.	ALL
1.2-2 (M)	FW Data Type	7	C	Appendix J	Unique code representing the digitized data type of the signal. Field used for Part 2 ICDs	N/A
1.2-3 (M)	FW Type of Signal	2	C	CD, PC, RV, CO, HW, DE	Provides general description of signal. CD=Command Parameter PC=Command Parameter RV=Run Time Variable CO=Constant HW=Hardware Passthrough DE=Data Acquisition Element	ALL ‘HW’ shall only be used when the signal has a corresponding HW record delivered in a HW (1.1) file.
1.2-4 (M)	FW Engineering Title	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code	Meaningful description of the signal. Field used for Part 2 ICDs	ALL
1.2-5 (M)	FW Data Provider	3	C	Appendix R-Legal Value (3 Char.)	Data Provider for delivering this FW/HW primitive signal data. record as defined in SSPS paragraph 3.7.1.4.2	ALL

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Length	Field Type	Legal Values	Field Description	Applicability to Field 1.2-2 Legal Values
1.2-6	FW Minimum Value	32	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A. The field type shall be consistent with the data type identified in 1.2-2 and follows the rule defined in paragraph 3.7.1.2.3C	Lowest value of the data contained in this signal in the units defined in field 1.2-8. N/A shall be the only legal value for Enumeration and Character Primitives. N/A shall not be used for any other data type. For Numeric Constants (i.e. not Enumerated Constants): Minimum Value = Maximum Value = Initial Value Field used for Part 2 ICDs	All but Enumeration (E) and Character (C)
1.2-7	FW Maximum Value	32	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A. The field type shall be consistent with the data type identified in 1.2-2 and follows the rule defined in paragraph 3.7.1.2.3C.	Highest value of the data contained in this signal in the units defined in field 1.2-8. N/A shall be the only legal value for Enumeration and Character Primitives. N/A shall not be used for any other data type. For Numeric Constants (i.e. not Enumerated Constants): Minimum Value = Maximum Value = Initial Value Field used for Part 2 ICDs	All but Enumeration (E) and Character (C)
1.2-8	FW Units	30	C	Appendix F or N/A	Units of the transmitted signal N/A shall only be used for Enumeration. Field used for Part 2 ICDs	All but Enumeration (E)

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Length	Field Type	Legal Values	Field Description	Applicability to Field 1.2-2 Legal Values
1.2-9	FW Positive Accuracy	14	C	7 bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	The amount by which the reported value may exceed the actual measurement. N/A shall be the only legal value for Enumeration and Character Primitives. N/A can be used for all other type primitives and MBF will store N/A in IPCL Database. Field used for Part 2 ICDs	All but Enumeration (E) and Character (C).
1.2-10	FW Negative Accuracy	14	C	7 bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	The amount by which the reported value may exceed the actual measurement. N/A shall be the only legal value for Enumeration and Character Primitives. N/A can be used for all other type primitives and MBF will store N/A in IPCL Database. Field used for Part 2 ICDs.	All but Enumeration (E) and Character (C).
1.2-11	FW Accuracy Units	30	C	PCT CONST N/A	The identification of method for application of the accuracy values. PCT = the accuracy is a percentage of the reading where the value expressed in fields 1.2-9 and 1.2-10 is in percent (%) CONST = the accuracy is a constant value where the value expressed in fields 1.2-9 and 1.2-10 is in the units defined in 1.2-8 N/A shall be the only legal value for Enumeration and Character Primitives. N/A can be used for all other type primitives. MBF shall store N/A in IPCL Database. Field used for Part 2 ICDs	All but Enumeration (E) and Character (C).

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	**Field Name**	**Field Length**	**Field Type**	**Legal Values**	**Field Description**	**Applicability to Field 1.2-2 Legal Values**
1.2-12	FW Resolution	32	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A. The field type shall be consistent with the data type identified in 1.2-2 and follows the rule defined in paragraph 3.7.1.2.3C.	The minimum detectable change in value of the signal in units defined by field 1.2-8, as supplied by the subsystem. N/A shall be the only legal value for Enumeration and Character Primitives. N/A can be used for all other type primitives and MBF will store N/A in IPCL Database. Not related to the minimum change the transport medium is capable of representing. Field used for Part 2 ICDs.	All but Enumeration (E) and Character (C).
1.2-13	FW Computation Rate	14	C	Floating Pt No. OD EV N/A	The rate value in Hz at which this signal is updated within the firmware. OD=On Demand EV=Event Driven N/A shall only be used when field 1.2-3 is ‘CO’ and MBF will store N/A in IPCL Database. Field used for Part 2 ICDs.	ALL
1.2-14 (M)	FW Flight Delivered	5	C	Appendix Q	The assembly flight on which this signal goes to orbit.	ALL
1.2-15	FW Flight Activated	5	C	Appendix Q	The assembly flight on which this signal is available to be activated on orbit.	ALL

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Length	Field Type	Legal Values	Field Description	Applicability to Field 1.2-2 Legal Values
1.2-16	FW Initial Value	32	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A. The field type shall be consistent with the data type identified in 1.2-2 and follows the rule defined in paragraph 3.7.1.2.3C.	The expected state of a FW primitive signal when a device is first turned on and has completed its initialization. DATA ACQUISTION: the initial value is limited (for enumerated data types) to the integer representation of an enumeral. COMMAND PRIMITIVES: it is the constant value supplied by the data provider when the signal type is a constant (i.e., CO), whether it is enumerated or analog. Or a value for a Runtime Variable N/A: can be used for all primitives and MBF will store N/A in IPCL Database. Note: For Constants: Min Val=Max Val=Initial Value and in this case N/A is not allowed.	Enumerated (E) for Data Acquisition ALL for Command Primitives where Field 1.2-3 = CO (Constant) or RV (Runtime Variable) except for Character (C)
1.2-17	FW LSB Value	32	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A. The field type shall be consistent with the data type identified in 1.2-2 and follows the rule defined in paragraph 3.7.1.2.3C.	The value of the least significant bit of the signal in units defined in field 1.2-8. No conversion data shall be provided in File 3.2 or 3.3 unless the value in this field is 1. "1" shall be used if the units are counts in field 1.2-8. The LSB shall not have a value of zero. N/A shall be the only legal value for Enumeration, Character, Binary Coded Decimal, and Floating Point Primitives. Field used for Part 2 ICDs.	All but Enumeration (E), Character (C), Binary Coded Decimal (BCD), and Floating Point (F).

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Length	Field Type	Legal Values	Field Description	Applicability to Field 1.2-2 Legal Values
1.2-18	FW MSB Value	32	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A. The field type shall be consistent with the data type identified in 1.2-2 and follows the rule defined in paragraph 3.7.1.2.3C.	The value of the most significant bit of the signal, in units defined in field 1.2-8. N/A shall only be the only legal value used for Enumeration, Character, Binary Coded Decimal and Floating Point Primitives. The MSB shall not have a value of zero. Field used for Part 2 ICDs	All but Enumeration (E), Character (C), Binary Coded Decimal (BCD) and Floating Point (F).
1.2-19	FW ICD Remarks	250	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A.	Supplier Discretionary Field. Data provided in this field will be documented in ICD. N/A in lieu of '@' shall only be used if not ICD remark is required. Field used for Part 2 ICDs	ALL
1.2-20	FW Description	250	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	Supplier Discretionary Field. N/A in lieu of '@' shall only be used if no description is required.	ALL

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Length	Field Type	Legal Values	Field Description	Applicability to Field 1.2-2 Legal Values
1.2-21 (M)	FW Change Mgmt	10	C	ADD CHG DEL DTC A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = Attribute value changes other than Data Type Change to record DEL = Delete SPUI DTC = Data Type Change (Field 1.2-2) with or without other attribute changes A/C = Add or Change	ALL
1.2-22	FW Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of ‘@’ shall only be used if no authorization is required.	ALL

FILE 1.3 SOFTWARE PRIMITIVE SIGNAL DATA FILE (SW)

This file contains:

- The attributes for Signals-generated/received by a MDM CSCI where the Device PUI is documented in Appendix C with a Device Type of SW-UB, SW-LB, SW-CB, GRPM, LDM or PCS-CB;
- The software attributes for Pass thru Primitives defined in File 1.1 and Field 1.2-3 equals 'HW'; and
- For IPs and Payloads only, the attributes for primitives that are not defined in File 1.1, where the Generic Device Code of the SPUI (8th and 9th character) is equal to HW, and Field 1.2-3 equals 'HW'.

Note:

(M): Defines Field as 'Mandatory' per paragraph 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description	Applicability to Field 1.3-2 Legal Values
1.3-1 (M) (CK)	HW/SW Signal PUI	13	C	Paragraph 3.3.1.2.1.1, paragraph 3.3.1.2.1.3, and Appendix A thru E	ISS~~A~~ Signal Program Unique Identifier for Software Primitive signals and existing Hardware Signals defined in HW Primitive File. Field used for Part 2 ICDs	ALL
1.3-2 (M)	SW Data Type	7	C	Appendix J	Unique code representing the digitized data type of the signal. Field used for Part 2 ICDs	N/A
1.3-3 (M)	SW Type of Signal	2	C	CD, PC, RV, CO, HW, DE	Provides general description of signal CD=Command Parameter PC=Command Parameter RV=Run Time Variable CO=Constant HW=Hardware Passthrough DE=Data Acquistion Element	ALL 'HW' shall only be used when the signal has a corresponding HW record delivered in a HW (1.1) file.
1.3-4 (M)	SW Engineering Title	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code	Meaningful description of the signal. Field used for Part 2 ICDs	ALL
1.3-5 (M)	SW Data Provider	3	C	Appendix R-Legal Value (3 Char.)	Data Provider for delivering this SW/HW primitive signal data~~.~~ record as defined in SSPS paragraph 3.7.1.4.3.	ALL

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description	Applicability to Field 1.3-2 Legal Values
1.3-6	SW Minimum Value	32	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A. The field type shall be consistent with the data type identified in 1.3-2 and follows the rule defined in paragraph 3.7.1.2.3C.	Lowest value of the data contained in this signal in the units defined in field 1.3-8. N/A shall be the only legal value for Enumeration and Character Primitives. N/A shall not be used for any other data. For Numeric Constants (i.e. not Enumerated Constants): Minimum Value= Maximum Value= Initial Value Field used for Part 2 ICDs.	All but Enumeration (E) and Character (C).
1.3-7	SW Maximum Value	32	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A. The field type shall be consistent with the data type identified in 1.3-2 and follows the rule defined in paragraph 3.7.1.2.3C.	Highest value of the data contained in this signal in the units defined in field 1.3-8. N/A shall be the only legal value for Enumeration and Character Primitives. N/A shall not be used for any other data. For Numeric Constants (i.e. not Enumerated Constants): Minimum Value= Maximum Value= Initial Value Field used for Part 2 ICDs.	All but Enumeration (E) and Character (C).
1.3-8	SW Units	30	C	Appendix F or N/A	Units of the transmitted signal. N/A shall only be used for Enumeration. Field used for Part 2 ICDs.	All but Enumeration (E).

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description	Applicability to Field 1.3-2 Legal Values
1.3-9	SW Positive Accuracy	14	C	7 bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	The amount by which the reported value may exceed the actual measurement. N/A shall be the only legal value for Enumeration and Character Primitives. N/A can be used for all other type primitives and MBF will store N/A in IPCL Database. Field used for Part 2 ICDs	All but Enumeration (E) and Character (C).
1.3-10	SW Negative Accuracy	14	C	7 bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	The amount by which the reported value may exceed the actual measurement. N/A shall be the only legal value for Enumeration and Character Primitives. N/A can be used for all other type primitives and MBF will store N/A in IPCL Database. Field used for Part 2 ICDs	All but Enumeration (E) and Character (C).
1.3-11	SW Accuracy Units	30	C	PCT CONST N/A	The identification of method for application of the accuracy values. PCT = the accuracy is a percentage of the reading where the value expressed in fields 1.3-9 and 1.3-10 is in percent (%) CONST = the accuracy is a constant value where the value expressed in fields 1.3-9 and 1.3-10 is in the units defined in 1.3-8 N/A shall be the only legal value for Enumeration and Character Primitives. N/A can be used for all other type primitives and MBF will store N/A in IPCL Database. Field used for Part 2 ICDs	All but Enumeration (E) and Character (C).

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description	Applicability to Field 1.3-2 Legal Values
1.3-12	SW Resolution	32	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A The field type shall be consistent with the data type identified in 1.3-2 and follows the rule defined in paragraph 3.7.1.2.3C.	The minimum detectable change in value of the signal in units defined by field 1.3-8, as supplied by the subsystem. N/A shall be the only legal value for Enumeration and Character Primitives. N/A can be used for all other type primitives. MBF will store N/A in IPCL Database. Not related to the minimum change the transport medium is capable of representing. Field used for Part 2 ICDs	All but Enumeration (E) and Character (C).
1.3-13	SW Computation Rate	14	C	Floating Pt No. OD EV N/A	The rate value in Hz at which this signal is updated within the software. OD=On Demand EV=Event Driven N/A shall only be used when Field 1.3-3 is 'CO' and MB will store N/A in IPCL Database. Field used for Part 2 ICDs	ALL
1.3-14 (M)	SW Flight Delivered	5	C	Appendix Q	The assembly flight on which this signal goes to orbit.	ALL
1.3-15	SW Flight Activated	5	C	Appendix Q	The assembly flight on which this signal is available to be activated on orbit. Field used for Part 2 ICDs	ALL

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description	Applicability to Field 1.3-2 Legal Values
1.3-16	SW Initial Value	32	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A. The field type shall be consistent with the data type identified in 1.3-2 and follows the rule defined in paragraph 3.7.1.2.3C.	The expected state of a SW primitive signal when a device is first turned on and has completed its initialization. DATA ACQUISTION: the initial value is limited (for enumerated data types) to the integer representation of an enumeral. COMMAND PRIMITIVES: it is the constant value supplied by the data provider when the signal type is a constant (i.e., CO), whether it is enumerated or analog. or a value for a Runtime Variable N/A: can be used for all primitives and MBF will store N/A in IPCL Database. Note: For Constants: Min Val=Max Val=Initial Value and in this case N/A is not allowed.	Enumerated (E) for Data Acquisition ALL for Command Primitives where Field 1.3-3 = CO (Constant) or RV (Runtime Variable) except for Character (C)
1.3-17	SW LSB Value	32	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A. The field type shall be consistent with the data type identified in 1.3-2 and follows the rule defined in paragraph 3.7.1.2.3C.	The value of the least significant bit of the signal in units defined in field 1.3-8. No conversion data shall be provided in File 3.2 or 3.3 unless the value in this field is 1. “1” shall be used if the units are counts in field 1.3-8. The LSB shall not have a value of zero. N/A shall be the only legal value for Enumeration, Character, Binary Coded Decimal and Floating Point Primitives. Field used for Part 2 ICDs	All but Enumeration (E), Character (C), Binary Coded Decimal (BCD), and Floating Point (F).

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description	Applicability to Field 1.3-2 Legal Values
1.3-18	SW MSB Value	32	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A. The field type shall be consistent with the data type identified in 1.2-2 and follows the rule defined in paragraph 3.7.1.2.3C.	The value of the most significant bit of the signal, in units defined in field 1.3-8. N/A shall be the only legal value for Enumeration, Character, Binary Coded Decimal and Floating Point Primitives. The MSB shall not have a value of zero. Field used for Part 2 ICDs	All but Enumeration (E), Character (C), Binary Coded Decimal (BCD) and Floating Point (F).
1.3-19	SW ICD Remarks	250	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	Supplier Discretionary Field. Data provided in this field will be documented in ICD. N/A in lieu of '@' shall only be used if no ICD remark is required. Field used for Part 2 ICDs	ALL
1.3-20	SW Description	250	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code	Supplier Discretionary Field. N/A in lieu of '@' shall only be used if no description is required.	ALL
1.3-21 (M)	SW Change Mgmt	10	C	ADD CHG DEL DTC A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = Attribute value changes other than Data Type Change to record DEL = Delete SPUI DTC = Data Type Change(Field 1.3-2) with or without other attribute changes A/C = Add or Change	ALL

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description	Applicability to Field 1.3-2 Legal Values
1.3-22	SW Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of '@' shall only be used if no authorization is required.	ALL

FILE 2 DEVICE/CHANNELS

FILE 2.1 DEVICE (DF)

This file contains the attributes for all the 1553 remote terminal and non 1553 firmware controller devices connected to control buses, local buses, and user buses as documented in Table 3.3.1.3-1.

Note:

(M): Defines Field as 'Mandatory' per paragraph 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
2.1-1 (M) (CK)	Device PUI	6	C	Appendix C where applicable Device Types are identified in Table3.3.1.3-1.	6 Char Device PUI to identify the device per SSPS paragraph 3.3.1.3
2.1-2 (M)	Device Name	30	C	Appendix C/Legal Name	The Legal name of the device
2.1-3 (M)	Device Provider	3	C	Appendix R - Legal value column (e.g. 3 character code)	Data Provider responsible for delivering this Device record as defined in SSPS paragraph 3.7.1.4.4
2.1-4	Device Flight Delivered	5	C	Appendix Q	The assembly flight on which this device goes to orbit.
2.1-5 (M) (CK)	Bus PUI	13	C	Functional 1553 or non 1553 Bus PUI as defined in Appendix S	The Bus PUI to which the Device is physically attached.
2.1-6	RT/BC Address	2	I	0 thru 31 N/A	The address of the RT/BC on the Bus PUI identified in 2.1-5 or N/A shall only be used for non 1553 Firmware Controllers

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
2.1-7	Device Flight Deactivated	5	C	Appendix Q or N/A	The assembly flight on which this device is no longer available or N/A for when device is always active. MBF will store N/A in IPCL Database.
2.1-8 (M)	Device Change Mgmt	10	C	ADD CHG DEL A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = Attribute change DEL = Remove the DPUI (2.1-1) from the Bus (2.1-5) A/C = Add or Change
2.1-9	Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of '@' shall only be used if no authorization is required.
2.1-10	Device Bus Role	2	C	RT (A) BC (B) N/A	Indicator depicting the role assigned to a specific device on a specific bus. (A) if a device functions as a Remote Terminal (RT) only and never assumes a bus controller role, the input field value shall be "RT". (B) if the device functions as a Bus Controller (BC), the input field value shall be "BC". When the device can also function as a remote terminal, the assigned RT address shall be defined in Field 2.1-6. N/A shall only be used for non 1553 devices.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

FILE 2.2 MDM CHANNEL (MC)

The following file contains the attributes for defining the channelization of Hardware Primitive signals connected to the backplane of the MDM defined in File 2.1 and includes effectors, sensors, excitation, RS485 data buses, and 1553 and non 1553 data buses.

Rules for defining Data Provider are provided in paragraph 3.7.1.5

Note:

(M): Defines Field as 'Mandatory' per paragraph 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
2.2-1 (M) (CK)	HW Signal PUI	13	C	EFF (A) EXC (A) SEN (A) BPUI (B) BPUI (C) BPUI (D)	ISSA Signal Program Unique Identifier from Hardware Primitive Signal Data File 1.1-1 where field 1.1-3 equals: (A) EFF,EXC,SEN (B) 1553P (Provided by DIT in File 1.1 and identified as a Physical data bus in Appendix S) (C) RS485 (Provided by DIT in File 1.1 and identified as a non 1553 data bus in Appendix S) (D) HRDL (Provided by DIT in File 1.1 and identified as a non 1553 data bus in Appendix S)
2.2-2 (M) (CK)	MDM Device PUI	6	C	Appendix C Must be in the RT Device File, field 2.1-1.	Device PUI for the MDM originating or receiving the HW Signal as defined in 2.2-1.
2.2-3 (M) (CK)	MDM Card Type	4	C	Appendix P	Type of card within the Device for the signal defined in 2.2-1 if the signal is processed by backplane of MDM.
2.2-4 (M) (CK)	MDM Card Slot No.	2	I	0 thru 15	Slot location in MDM, where card defined in 2.2-3 is positioned.
2.2-5	MDM Channel Configuration	6	C	Appendix P	MDM Card channel configuration for the card defined in 2.2-4.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
2.2-6 (M) (CK)	MDM Channel No.	2	I	0-15 (A) 0-31 (B) 0-31 (C) 0-31 (D) 0-15 (E) 1 (F) 2 (G) 3 (H) 4 (I) 1 or 2 (J) 0-15 (K) 1 or 2 (L)	MDM Channel Number for the Signal PUI defined in 2.2-1. For a SPUI defined as (A) in Field 2.2-1 and MDM Card Type (2.2-3) equal to: (A) AIO (B) DIO (C) HLA (D) LLA (E) SDO For a BPUI defined as (B) or (C) or (D) in Field 2.2-1 and MDM Chan. Config. (2.2-5) equal to: (F) SPD1 Phys. Chan 1A (G) SPD1 Phys. Chan 1B (H) SPD1 Phys. Chan 2A (I) SPD1 Phys. Chan 2B (J) SPD2 (K) SPD3 (L) HRDL
2.2-7 (M) (CK)	MDM Channelization Flight Delivered	5	C	Appendix Q	The assembly flight on which this channelization is available
2.2-8	MDM Channelization Flight Deactivated	5	C	Appendix Q or N/A	The assembly flight on which this channelization is no longer required or N/A for when channelization is always active. MBF will store N/A in IPCL Database.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

2.2-9 (M)	MDM Channelization Change Mgmt	10	C	ADD CHG DEL A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = Attribute change DEL = Delete the record A/C = Add or Change
2.2-10	Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of '@' shall only be used if no authorization is required.

FILE 2.3 FIRMWARE CONTROLLER CHANNEL FILE (FC)

The following file contains the attributes for defining the HW primitive signals connected to the backplane of a Firmware Controller defined in File 2.1 and includes effectors, sensors, and loads. For RPCMs, the channel is also specified for those signals defined as loads in Field 1.1-3 of the Hardware Primitive file.

Rules for defining Data Provider are provided in paragraph 3.7.1.5

Note:

(M): Defines Field as 'Mandatory' per paragraph 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
2.3-1 (M) (CK)	HW Signal PUI	13	C	Appendix A thru E	ISSA Signal Program Unique Identifier from Hardware Primitive File 1.1-1 originating or received by a FC.
2.3-2 (M) (CK)	FC Device PUI	6	C	Appendix C Must be in the RT Device File, field 2.1-1.	Device PUI for the FC originating or receiving the HW Signal as defined in 2.3-1.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
2.3-3 (M) (CK)	RPCM Channel No.	2	I	1 thru 18 (A) 0 (B)	Only applies to RPCMs: (A) RPCM Channel Number for the RPCM FW Signal PUI defined in 2.2-1. (B) '0' shall be used if the Firmware Controller is not a RPCM.
2.3-4 (M) (CK)	FC Channelization Flight Delivered	5	C	Appendix Q	The assembly flight on which this channelization is available
2.3-5	FC Channelization Flight Deactivated	5	C	Appendix Q or N/A	The assembly flight on which this channelization is no longer required or N/A for when channelization is always active. MBF will store N/A in IPCL Database.
2.3-6 (M)	FC Channelization Change Mgmt	10	C	ADD CHG DEL A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = attribute change DEL = Delete the record A/C = Add or Change
2.3-7	Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of '@' shall only be used if no authorization is required.

FILE 3 CONVERSION DATA

FILE 3.1 STATE CONVERSION (SC)

This file contains the attributes necessary to define "enumerated states" associated with applicable Firmware (File 1.2) and Software Primitives (File 1.3). The applicable Firmware and Software Primitives are defined in the Conversion Primitive File (File 3.4).

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

In this file each line (record) defines one state in a specified file. If a device has three states it will take three lines.

EXAMPLES:

US1TZ0001INDP<tab>Heater Switch States<tab>Heater Switch On<tab>1<tab>ADD<tab> N/A<CR/LF>

US1TZ0001INDP<tab>Heater Switch States<tab>Heater Switch Off<tab>0<tab>ADD<tab> N/A<CR/LF>

Note:

(M): Defines Field as 'Mandatory' per Para, 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
3.1-1 (M) (CK)	State Conversion PUI	13	C	Per paragraph 3.3.1.5	The unique pointer into the state conversion file for a specific set of state code to state definition equivalents. File 3.4 provides the relationship between this CPUI and the Primitive SPUIs defined in Files 1.2 and 1.3. Field used for Part 2 ICDs
3.1-2 (M)	State Conversion PUI Name	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code	Human user information. Short descriptive name for the conversion set. Field used for Part 2 ICDs
3.1-3 (M)	State Definition	60	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code	A description of the state identified by field 3.1-4. Field used for Part 2 ICDs
3.1-4 (M)	State Code	11	I	-2147483648 thru 4294967295	A integer representation of the value output by the primitive. Field used for Part 2 ICDs

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
3.1-5 (M)	State Conversion Change Mgmt	10	C	ADD CHG DEL A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = attribute change DEL = Delete the CPUI A/C = Add or Change
3.1-6	Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of '@' shall only be used if no authorization is required.

FILE 3.2 POLYNOMIAL CALIBRATION (PC)

This file contains the attributes necessary to define the forward and inverse polynomial calibration coefficients (up to fifth order) for applicable Hardware (for Firmware or Software pass throughs only), Firmware, and Software primitives defined in files 1.2 and 1.3 respectively. The applicable Hardware, Firmware and Software Primitives are defined in the Conversion Primitive File (File 3.4). Rules are provided in paragraph 3.3.4.

Note:
(M): Defines Field as 'Mandatory' per Para, 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
3.2-1 (M) (CK)	Polynomial Conversion PUI	13	C	Per paragraph 3.3.1.5	The unique CPUI for a specific set of conversion attributes. File 3.4 provides the relationship between this CPUI and the Primitive SPUIs defined in Files 1.1, 1.2, and 1.3.
3.2-2 (M)	Polynomial Conversion Name	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code	Human user information. Short descriptive name for the conversion set.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
3.2-3 (M)	Curve Degree	1	I	1 to 5	Integer value defining the degree of polynomial curve fit of conversion. File access support. The Polynomial Conversion is defined by the equation: $Y = A_0 + \sum A_i * X^i$ where i = 1 to Curve Degree. $A_0, \ldots A_i$ are the coefficients of the independent variable.
3.2-4 (M)	Polynomial Minimum Calibration Range	14	F	Per paragraph 3.3.4	Floating Point Value of the minimum legal value supported by this calibration (EU for Fwd/RAW data units for Inv). Used in determining offscale low data values.
3.2-5	Polynomial Maximum Calibration Range	14	F	Per paragraph 3.3.4	Floating Point Value of the maximum legal value supported by this calibration (EU for Fwd/RAW data units for Inv.). Used in determining offscale high data values.
3.2-6	Polynomial Conversion Units	30	C	Appendix F	Standard Units of Measure for the Range entries (EU for Fwd/RAW for Inv).
3.2-7 (M)	A_0 Coefficient	14	F	Floating point number as defined in paragraph 3.7.1.2.3C.	Single precision, floating point number for A_0 coef value in polynomial.
3.2-8 (M)	A_1 Coefficient	14	F	Floating point number as defined in paragraph 3.7.1.2.3C	Single precision, floating point number for A_1 coef value in polynomial. If the Curve Degree >=1 and the first degree term is null, set A_1 = 0.0.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
3.2-9	A_2 Coefficient	14	F	Floating point number as defined in paragraph 3.7.1.2.3C or N/A.	Single precision, floating point number for A_2 coef value in polynomial. N/A shall only be used if A_2 is not required as indicated by Curve Degree < 2. If the Curve Degree >=2 and the second degree term is null, set A_2 = 0.0.
3.2-10	A_3 Coefficient	14	F	Floating point number as defined in paragraph 3.7.1.2.3C or N/A.	Single precision, floating point number for A_3 coef value in polynomia. N/A shall only be used if A_3 is not required as indicated by Curve Degree < 3. If the Curve Degree >=3 and the third degree term is null, set A_3 = 0.0.
3.2-11	A_4 Coefficient	14	F	Floating point number as defined in paragraph 3.7.1.2.3C or N/A.	Single precision, floating point number for A_4 coef value in polynomial. N/A shall only be used if A_4 is not required as indicated by Curve Degree < 4. If the Curve Degree >=4 and the fourth degree term is null, set A_4 = 0.0.
3.2-12	A_5 Coefficient	14	F	Floating point number as defined in paragraph 3.7.1.2.3C or N/A	Single precision, floating point number for A_5 coef value in polynomial. N/A shall only be used if A_5 is not required as indicated by Curve Degree < 5. If the Curve Degree =5 and the fifth degree term is null, set A_5 = 0.0.
3.2-13	FORWARD / INVERSE Conversion-X-reference PUI (poly or piecewise)	13	C	Per paragraph 3.3.1.5	The unique CPUI for a specific set of counterpart Forward or Inverse equation attributes. Conversion data access for processing support and/or revision action.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
3.2-14	Polynomial Conversion Version	3	I	Three-digit numeric number	Unique numeric number identifying this specific version of the calibration curve (distinguishes updated curve data to ground processes). Traceability of specific file entry version back to the data source
3.2-15	Polynomial Conversion Remarks	250	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	Any long description that the definer of the set might want to associate with the calibration set. N/A shall only be used if remarks are not required.
3.2-16 (M)	Polynomial Conversion Change Mgmt	10	C	ADD CHG DEL A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = attribute change DEL = Delete the CPUI A/C = Add or Change
3.2-17	Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of '@' shall only be used if no authorization is required.

FILE 3.3 PIECEWISE LINEAR CALIBRATION (PL)

This file contains the attributes necessary to define forward and inverse piecewise calibration coefficients (up to 30 segments) for applicable Hardware, Firmware, and Software primitives defined in files 1.1, 1.2, 1.3 respectively. applicable Hardware, Firmware, and Software primitives defined in files 1.1, 1.2, 1.3 respectively. The applicable Hardware, Firmware and Software Primitives are defined in the Conversion Primitive File (File 3.4). Rules are provided in paragraph 3.3.4.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Note:

(M): Defines Field as 'Mandatory' per Para, 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
3.3-1 (M) (CK)	Piecewise Linear Conversion PUI	13	C	Per paragraph 3.3.1.5	The unique CPUI for a specific set of conversion attributes. File 3.4 provides the relationship between this CPUI and the Primitive SPUIs defined in Files 1.1, 1.2, 1.3
3.3-2	Piecewise Linear Conversion Name	80	C	7 Bit Printable Characters subset within the 8 Bit ASCII Code	Human user information short descriptive name of what the calibration set is used for.
3.3-3 (M)	Number of Piecewise Segments	2	I	1 to 30	Integer value defining the number of linear line segments constituting this total calibration. Used as index into the file structure for line segment conversion coeff and related field access.
3.3 (M)	Piecewise Linear Minimum Calibration Range	14	F	Any legal floating point value	Floating Point Value of the minimum legal value supported by this calibration (EU for Fwd/RAW data units for Inv). Used in determining offscale low data values
3.3-5 (M)	Piecewise Linear Maximum Calibration Range	14	F	Any legal floating point value	Floating Point Value of the maximum legal value supported by this calibration. (EU for Fwd/RAW data units for Inv). Used in determining offscale high data values.
3.3-6 (M)	Piecewise Linear Conversion Units	30	C	Appendix F	Standard Units of Measure for the Range entries.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
3.3-7	Piecewise Segment Number	2	I	1 to 30	The number of the segment represented by the High/Low endpoint values and A0/A1 coefficients contained in this record. (Fields 3.2-8,9,10,11.)
3.3-8	Segment Low End Point	14	F	Any legal floating point value Value representation shall be in the same data type that the conversion is to be from (i.e., Counts if converting to EU or EU if converting to Counts). High/Low End Points of adjacent segments are common. For positive slope conversions the value for the Low End Point of the first segment of a set of segments shall be the point pair to 3.3-4. For negative slope conversions the value for the Low End Point of the first segment of a set of segments shall be the point pair to 3.3-5.	Data point used in selecting this linear line segment of the set required. Used as determinate as to which line segment equation to apply.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
3.3-9	Segment High End Point	14	F	Any legal floating point value Value representation shall be in the same data type that the conversion is to be from (i.e., Counts if converting to EU or EU if converting to Counts). For positive slope conversions the value for the Low End Point of the first segment of a set of segments shall be the point pair to 3.3-5. For negative slope conversions the value for the Low End Point of the first segment of a set of segments shall be the point pair to 3.3-4.	Data point used in selecting this linear line segment of the set required. (RAW or EU.) Used as determinate as to which line segment equation to apply.
3.3-10	Segment A_0 Coefficient	14	F	Per paragraph 3.3.4	Single precision, floating point number for A_0 coef value for this linear line segment.
3.3-11	Segment A_1 Coefficient	14	F	Per paragraph 3.3.4	Single precision, floating point number for A_1 coef value for this linear line segment.
3.3-12	FORWARD / INVERSE Conversion X-reference PUI (poly or piecewise)	13	C	Per paragraph 3.3.4	The unique PUI for a specific set of counterpart Forward or Inverse equation attributes.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
3.3-13	Piecewise Linear Conversion Version	3	I	Three-digit numeric number	Unique numeric number identifying this specific version of the calibration curve (distinguishes updated curve data to ground processes).
3.3-14	Piecewise Linear Conversion Remarks	250	C	7 Bit ASCII Printable Characters subset within the 8Bit ASCII Code or N/A	Any long description that the definer of the calibration set might want to associate with the calibration set. N/A in lieu of '@' shall only be used if remarks are not required.
3.3-15 (M)	Piecewise Linear Conversion Change Mgmt	10	C	ADD CHG DEL A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = attribute change DEL = Delete the CPUI A/C = Add or Change
3.3-16	Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of '@' shall only be used if no authorization is required.

FILE 3.4 CONVERSION PRIMITIVE FILE (CP)

The following file defines the Primitive Signal PUIs (SPUI) provided in File 1.2 (FW) and File 1.3 (SW) requiring Conversion PUIs (CPUI) and, if required, a Primitive SPUI and associated min/max value to indicate that multiple conversions are required as defined in Paragraph 3.3.4.1.

Note:
(M): Defines Field as 'Mandatory' per Para, 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
3.4-1 (M) (CK)	Signal PUI	13	C	SPUI Defined in Field 1.2-1 or 1.3-1 and requires a CPUI: SC (A) PC (B) PL (B)	ISS Signal Program Unique Identifier for signals requiring a SC File 3.1, PC File 3.2, or PL File 3.3 A) For SPUIs requiring a State CPUI, Field 1.2-2 (FW Data Type) or 1.3-2 (SW Data Type) shall be an Enumerated data type (i.e.xE) and Field 1.2-3 (FW Type of Signal) or 1.3-3 (SW Type of Signal) is NOT equal to ‘HW’. B) For SPUIs requiring a polynomial or piecewise CPUI, Field 1.2-2 (FW Data Type) or 1.3-2 (SW Data Type) shall NOT be an Enumerated data type (i.e.xE) and Field 1.2-8 (FW Units) or 1.3-8 (SW Units) shall be equal to ‘CNT’ and Field 1.2-17 (LSB) equals 1.
3.4-2 (M)	Conversion PUI	13	C	State CPUI defined in Field 3.1-1 Forward* CPUI defined in 3.2-1 Forward* CPUI defined in Field 3.3-1	The unique state conversion, Forward polynomial, or Forward piecewise CPUI for a specific set of conversion attributes. The maximum total combined State Conversion and Forward CPUIs per primitive SPUI is limited to one hundred (100) per SSPS Para 3.3.4.1 *Note: A Forward CPUI is defined in Paragraph 3.3.4 (Item 1).

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
3.4-3	Multiple Conversion Indicator SPUI	13	C	SPUI Defined in Field 1.2-1 or 1.3-1 per Para. 3.3.4.1 or N/A	Presence of a SPUI in this field defines the related Signal PUI for those Primitive Signals requiring multiple conversions. This related signal, in conjunction with the min/max value defined in Field's 3.4-6 and 3.4-7 is used to determine which Conversion PUI is required to process the data. N/A shall only be used if a Multi-Cal indicator is not required and MBF will store N/A in IPCL Database.
3.4-4 (M)	Conversion Change Mgmt	10	C	ADD CHG A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = attribute change A/C = Add or Change
3.4-5	Conversion Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of '@' shall only be used if no authorization is required.
3.4-6	Multiple Conversion Indicator Min Value	32	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code per Para. 3.3.4.1 or N/A. The field type shall be consistent with the data type identified in Field 1.2-2 or 1.3-2 and follows the rule defined in paragraph 3.7.1.2.3C.	Indicates the minimum value of the Multiple Conversion Indicator PUI defined in Field 3.4-3 for application of CPUI defined in Field 3.4-2 N/A shall only be used if a Multi-Conv indicator is not required and MBF will store N/A in IPCL Database.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
3.4-7	Multiple Conversion Indicator Max Value	32	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code per Para. 3.3.4.1 or N/A. The field type shall be consistent with the data type identified in Field 1.2-2 or 1.3-2 and follows the rule defined in paragraph 3.7.1.2.3C.	Indicates the maximum value of the Multiple Conversion Indicator PUI defined in Field 3.4-3 for application of CPUI defined in Field 3.4-2. N/A shall only be used if a Multi-Conv indicator is not required and MBF will store N/A in IPCL Database.

FILE 4 ASSOCIATED DATA

FILE 4.1 REQUIREMENT PUI FILE (RP)

This file contains the attributes necessary to define the Part 1 Software ICD Requirement PUI relationship to the Part 2 Software ICD Signal PUI. Rules for the Requirement PUI are provided in paragraph 3.3.1.1.

Note:
(M): Defines Field as 'Mandatory' per Para, 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
4.1-1 (M) (CK)	Signal PUI	13	C	Appendix A thru E	The identifier for a Signal PUI defined in the HW, FW, SW Primitive Signal (1.1,1.2,1.3) or Group (5.1) Data File requiring a Requirement PUI. Field used for Part 2 ICDs

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
4.1-2 (M)	Requirement PUI	7	C	paragraph 3.3.1.1	The 7 character PUI associated with Part #1 ICD Interface Requirement. This PUI identifies an ICD Requirement and links it to the Signal PUI above. Field Controlled by Part 1 ICD.
4.1-3 (M)	Requirement Change Mgmt	10	C	ADD CHG A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = attribute change A/C = Add or Change
4.1-4	Requirement Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of ‘@’ shall only be used if no authorization is required.

FILE 4.2 TRACEABILITY FILE (TR)

This file contains the attributes necessary to define the relationship between two Primitives that are channelized to a Primary/Backup MDM.

Note:

(M): Defines Field as 'Mandatory' per paragraph 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
4.2-1 (M) (CK)	Signal PUI	13	C	Appendix A thru E	The identifier for a Signal PUI defined in the HW, FW, SW Primitive Signal (1.1,1.2,1.3) or Group (5.1) Data File requiring Traceability.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

4.2-2 (M)	Traceable Signal PUI	13	C	Appendix A thru E	The identifier for a Signal PUI defined in the HW, FW, SW Primitive Signal (1.1,1.2,1.3) or Group (5.1) Data File related to Signal PUI as denoted in Field 4.2-3.
4.2-3 (M)	Relationship Type	10	C	BDSPUI	Provides the type of relationship between the Signal PUI (4.2-1) and the Traceable Signal PUI(4.2-2). BDSPUI = Backup Device Signal PUI
4.2-4 (M)	Traceability Change Mgmt	10	C	ADD CHG A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = attribute change A/C = Add or Change
4.2-5	Traceability Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of '@' shall only be used if no authorization is required.

FILE 5 BUS TRAFFIC

FILE 5.1 GROUP DATA ITEM FILE (GD)

This file contains the attributes necessary to define packaging (i.e., groups) of signals for purposes of defining words containing primitives, double words containing primitives (one of the primitives is greater than 16 bits), 1553 message contents, command templates, firmware controller generic commands, CCSDS contents, data acquisition contents, and telemetry contents. Rules for Group Signals are provided in paragraph 3.3.1.2.1.4.

Note:

(M): Defines Field as 'Mandatory' per Para, 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
5.1-1 (M) (CK)	Group Data Item PUI	13	C	Paragraph 3.3.1.2.1.4 and Appendix A thru E	The SPUI for a data item which contains the Content PUI listed in field 5.1-4.
5.1-2 (M)	Group Data Item Name	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code	The name for a data item which contains the Content PUI listed in field 5.1-4.
5.1-3 (M)	Group Type	8	C	WORD DBL_WORD CMSG_CON DMSG_CON MODECODE MCMD FCMD PIPE_DCD CCSDS CCSDS_T TLM_VERS TLM_PROF TLM_PKT DA1_GRP DA2_GRP DA3_GRP TLM1_GRP TLM2_GRP TLM3_GRP RS485 BYTE	The specific grouping-type that is being documented: many signals to one signal, 16 bits into a word, up to 32 words into a message, and other groupings as required: WORD = 16 Bit Word DBL_WORD = Double Word (32 bits) CMSG_CON = Command 1553 Msg Content DMSG_CON = Acquisition Data 1553 Msg Content MODECODE=1553 Mode Code Message which contains no words. MCMD = MDM Generic Cmd Template FCMD = FC Generic Cmd Template PIPE_DCD = Decade Pipe CCSDS = Command CCSDS Header Group CCSDS_T = Telemetry CCSDS Header Group TLM_VERS = Telemetry Version Group TLM_PROF = Telemetry Process Frame Group TLM_PKT = Telemetry Packet Group DA1_GRP = 10.0 Hz Data Acq Group DA2_GRP = 1.0 Hz Data Acq Group DA3_GRP = 0.1 Hz Data Acq Group TLM1_GRP = 10.0 Hz Telemetry Group TLM2_GRP = 1.0 Hz Telemetry Group TLM3_GRP = 0.1 Hz Telemetry Group RS485 = RS485 Data Bus Group BYTE = 8 Bit Byte
5.1-4 (M)	Content Signal PUI	13	C	The 13 character Signal PUI from the Firmware or Software Primitive Signal Data files or other Group Data Item PUIs listed in this file. SPARE BULK N/A	The SPUI identification of a data item contained in the group identified by the Group Data Item PUI in field 5.1-1. SPARE: See Para. 3.3.1.2.1.4.7.1. BULK: See Para. 3.3.1.2.1.4.7.2. N/A shall only be used when Group Type = MODECODE

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
5.1-5 (M)	Content Type	8	C	SIGNAL WORD DBL_WORD CMSG_CON DMSG_CON CCSDS CCSDS_T TLM_PROF TLM_PKT DA1_GRP DA2_GRP DA3_GRP TLM1_GRP TLM2_GRP TLM3_GRP, 1S thru 32S 1S thru 999S 1B thru 32B 88B 386B BYTE N/A	Defines the content type for the Signal PUI provided in Field 5.1-4 SIGNAL references an SPUI from Primitive File (1.1, 1.2, or 1.3) All other legal value descriptions are provided in 5.1-3 1S thru 15S: Shall be used to identify spare bits where-group type (Field 5.1-3) is WORD or DBL_WORD 1S thru 7S: Shall be used to identify spare bits where group type (Field 5.1-3) is BYTE 1S thru 32S: Shall be used to identify spare words where group type (Field 5.1-3) is TLM1_GRP, TLM2_GRP, TLM3_GRP, DA1_GRP, DA2_GRP, DA3_GRP, CMSG_CON, DMSG_CON 1S thru 999S: Shall be used to identify spare bytes where group type (Field 5.1-3) is RS485 1B thru 32B, 88B, 386B,: Shall be used to specify number of dump or command load words when Field 5.1-4 contains the reserved word BULK N/A shall only be used when Field 5.1-3 (Group Type) =MODECODE

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
5.1-6 (M)	Content Offset	3	I	0 through 15 (A) 0 through 31 (B) 1 through 32 (C) 1 through 873 (D) 1 to 9 (E) N/A (F) 1 through 999 (G) 0 through 7 (H)	Identifies the offset of the Content SPUI from the start of the item defined as noted below. For Group Type (5.1-3) equal to: (A) WORD,Offset is a bit offset beginning with zero as the MSB of the word, and identifying the position of the MSB of the field being described in this record. (B) DBL_WORD, Offset is a bit offset beginning with zero as the MSB of the double word, and identifying the position of the MSB of the field being described in this record. (C) CMSG_CON, DMSG_CON, CCSDS, CCSDS_T, DA1_GRP, DA2_GRP, or DA3_GRP, Offset is a word number, beginning with word 1 and with a maximum of word 32. (D) TLM1_GRP, TLM2_GRP, TLM3_GRP, TLM_PKT or TLM_PROF, Offset is a word number, beginning with word 1 and with a maximum value of 873 words. (E) MCMD or FCMD, Offset identifies the relative position of the message within the command. The first message of the command is message 1. (F) N/A shall only be used when Group Type =PIPE_DCD, MODECODE or TLM_VERS (G) RS485, Offset is a byte number, beginning with byte 1 and with a maximum of byte 999. (H) BYTE Offset is bit number within an 8 bit byte.
5.1-7 (M)	Word Order	5	C	1553, INTEL, or N/A	Identifies the sequence of words on the data bus. The Most Significant Word (MSW) and the Least Significant Word (LSW) are transmitted either in the word order defined by MIL-STD-1553B or in the reverse word order, typified by the protocol of the bus interface on Intel-based processors (MDMs). Applies only when the value in 5.1-5 is DBL_WORD, or 5.1-5 is SIGNAL and the signal is a data type comprised of a multiple of 16 bits. All other instances where 5.1-5 is SIGNAL or is other than DBL_WORD, the value of 5.1-7 shall only be N/A. 1553 = the MSW is transmitted first INTEL = the LSW is transmitted first~~.~~

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
5.1-8 (M)	Group Change Mgmt	10	C	ADD CHG DEL GTC A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = group content change other than Group Type Change to record DEL = Delete Group SPUI GTC = Group Type Change (Field 1.2-3) with or without other attribute changes A/C = Add or Change
5.1-9	Group Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of '@' shall only be used if no authorization is required.

FILE 5.2 MESSAGE TRANSACTION FILE (MT)

This file contains the attributes necessary to specify the transmission of a 1553 message or words on a RS485 bus on a given bus. In addition, this file provides process frame, subframe, and transaction slot for scheduled data acquisition messages (DMSG_CONS) and subframe and transaction slot for messages associated with Command Templates (MCMD). Rules for the MT file Signals are provided in paragraph 3.3.1.2.1.6.

Note:
(M): Defines Field as 'Mandatory' per Para, 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
5.2-1 (M) (CK)	Bus PUI	13	C	Functional 1553 or non 1553 Bus PUI as defined in Appendix S.	The 1553 Bus PUI to which this transaction is assigned or RS485 Bus for which the RS485 Group is assigned Field used for Part 2 ICDs

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
5.2-2	Process Frame	2	I	0-99 (per Paragraph 3.3.1.2.1.6.1.3.2.1) or N/A	For scheduling this message, this specifies the Process Frame number when this message will be transmitted according to Paragraph 3.3.1.2.1.6.1.3.2.1. N/A shall only be used when file transactions are not required (e.g. RS485 or no 1553 boxcars), or where the software design is such that the process frame is indeterminate on a static basis. Field used for Part 2 ICDs.
5.2-3	Subframe	1	I	0-7 or N/A	Specifies the subframe in which this message is transmitted within the processing frame identified in 5.2-2. N/A shall only be used when file transactions are not required (e.g. RS485 or no 1553 boxcars). Field used for Part 2 ICDs.
5.2-4	Transaction Slot	2	I	1-16 or N/A	Identifies the transaction slot within the subframe identified in 5.2-3. The intent of this field is to identify the transaction slot in which the design allocates the message. It is recognized that the message could appear in other transaction slots within the subframe identified in field 5.2-3 in accordance with the system control protocols for the International Space Station. N/A shall only be used when file transactions are not required (e.g. RS485 or no 1553 boxcars). Field used for Part 2 ICDs

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
5.2-5 (M)	Transfer Type	1	C	B, T, R or N/A	Per MIL-STD-1553B Standard. Value unique to message type as defined in SSPS Tables 3.3.1.2.1.6.1.3.2-1 & 2. Specifies the action of the RT. If field 5.2-13 (Subaddress) equals 0 or 31, then field 5.2-9 (Word Count/Mode Code) is a mode code value. The correct Transfer Type setting is defined by MIL-STD-1553B for mode code values and is included in SSPS Appendix H as a reference. For all other 1553 messages (i.e. non-mode codes), T = RT is to transmit message to BC R = RT is to receive message from BC B = Broadcast and the contents of field 5.2-8 shall be "ALL" N/A shall only be used when the Bus PUI defined in Field 5.2-1 is a RS485. Field used for Part 2 ICDs.
5.2-6 (M) (CK)	Message Content Group Data Item PUI	13	C	Paragraph 3.3.1.2.1.4.1	Identification of the message being transferred by this transaction, using a specified Group Data Item PUI of Type=CMSG_CON or Type=DMSG_CON or Type=MODECODE (1553 Message with No Data Word) Type=RS485 Field used for Part 2 ICDs
5.2-7 (M) (CK)	Immediate Source PUI	6	C	The Device PUI from Appendix C based on the Device Types defined in Table 3.3.1.3-1.	The DPUI of the Logical Device (or Physical Device if no logical device exists) which is the source of the transaction or message/ words. Field used for Part 2 ICDs
5.2-8 (M) (CK)	Immediate Destination PUI	6	C	The Device PUI from Appendix C based on the Device Types defined in Table 3.3.1.3-1 or ALL	The DPUI of the Logical Device (or Physical Device if no logical device exists) that is the destination of the transaction or message/ words. ALL is legal only when field 5.2-5 = "B". Field used for Part 2 ICDs.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
5.2-9	Word Count/ Mode Code	2	C	1 - 32 (A) 1 - 32 (B) 1 - 32 (C) 1 - 32 (D) 0 - 31 (E) N/A (F)	(A) If Field 5.2-13 equals 1 thru 30 and the pipe is a command pipe, the value is the natural length-of the communication. (B) If Field 5.2-13 equals 1 thru 30 and the pipe is a decade data acquisition pipe, the value must be 32. (C) If Field 5.2-13 equals 1 thru 30 and the pipe is a non-decade data acquisition pipe and the boxcar is padded with spares, the value must be 32. (D) If Field 5.2-13 equals 1 thru 30 and the pipe is a non-decade data acquisition pipe and the boxcar is not padded with spares, the value is the number of word of the communication occupying the boxcar. (E) If field 5.2-13 equals 0 or 31, the value identifies Mode Code as defined in App H being sent to RT (F) N/A shall only be used if field 5.1-3 equals RS485 Field used for Part 2 ICDs
5.2-10 (M)	Message Flight Delivered	5	C	Appendix Q	The assembly flight on which this message is available to be activated on orbit. Field used for Part 2 ICDs.
5.2-11	Message Flight Deactivated	5	C	Appendix Q or N/A	The assembly flight on which this message is no longer active (or N/A when message never deactivated). MBF will store N/A in IPCL Database. Field used for Part 2 ICDs
5.2-12	Message Rate	4	C	0.1, 1.0, 10.0 (A) 0.1, 1.0, 5.0, 10.0 (B) OD (C)	Rate at which this message is sent (Hz) (A) Applies to all C&DH Architecture 1553 Messages (B) Applies to messages not defined by C&DH Architecture and Fields 5.2-3, 5.2-4, 5.2-4 equals N/A (C) OD=On Demand (i.e., not regularly scheduled)

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
5.2-13	Sub Address	2	I	1-30 (A) 0 or 31 (B) N/A (C)	Indicates buffer to be used. (A) Subaddress for No. of Words defined in Field 5.2-9 (B) Subaddress for Mode Code defined in Field 5.2-9 (C) N/A shall only be used for RS485 messages/words and Fields 5.2-3, 5.2-4, 5.2-4 Field used for Part 2 ICDs
5.2-14 (M)	Message Change Mgmt	10	C	ADD CHG DEL A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = Attribute change DEL = Delete the record A/C = Add or Change
5.2-15	Message Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of '@' shall only be used if no authorization is required.

FILE 5.3 TELEMETRY TRANSACTION FILE (TT)

This file contains the attributes necessary to specify the downlink of a process frame. A telemetry stream (telemetry version) is made up of 100 different process frames, which are executed repeatedly in the same sequence. A high-rate S-band telemetry definition occurs in 10 seconds (or 100 milliseconds per processing frame), while a low-rate S-band telemetry definition occurs in between 60 seconds and 150 seconds (which represents between .6 seconds and 1.5 seconds per processing frame). This file will be provided by the SMC team.

Note:

(M): Defines Field as 'Mandatory' per Para, 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
5.3-1 (M) (CK)	Process Frame PUI	13	C	See PUI Naming Rules in the SSPS	Identification of the message being transferred by this transaction, using a specified Group Data Item. PUI of Type = TLM_PROF
5.3-2 (M)	Process Frame Sequence Number	2	I	Positive Integer (0-99)	Specifies the Process Frame sequence number indicating when this message will be transmitted.
5.3-3	Processing Frame Word Count	4	I	1 - 9999	Number of words being transmitted in this processing frame, including CCSDS and data words.
5.3-4 (M)	Telemetry Format Version Flight Delivered	5	C	Appendix Q	The assembly flight on which this message is available to be activated on orbit.
5.3-5	Telemetry Format Version Flight Deactivated	5	C	Appendix Q or N/A	The assembly flight on which this message is no longer active (or N/A when message never deactivated) MBF will store N/A in IPCL Database
5.3-6	Telemetry Format	4	C	HIGH LOW OIU FGB UHF SMCC	Identifies whether this format applies to a high-rate a low-rate S-band telemetry definition or a Shuttle Telemetry. HIGH = High-rate S-band LOW = Low-rate S-band OIU = USOS to Shuttle Telemetry FGB = USOS to Russian Telemetry UHF = USOS to Telemetry routed thru UHF SMCC = Service Module Central Computer
5.3-7 (M) (CK)	Telemetry Version PUI	13	C	See PUI Naming Rules in the SSPS	Identifies the Telemetry Version PUI of which this Process Frame is a part. The Telemetry Version PUI is defined in file 5.1 with a group data item type of TLM_VERS.
5.3-8 (M)	Telemetry Format Change Mgmt	10	C	ADD CHG A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = attribute change A/C = Add or Change
5.3-9	Telemetry Format Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed N/A in lieu of '@' shall only be used if no authorization is required.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

FILE 5.4 RATE GROUP FILE (RG)

This file contains the attributes necessary to define rate groups and "pipe" and is only applicable to DMSG_CONs for Data Buses that adhere to the C&DH Data Acquisition Software Architecture, referred to as the “decade” scheme. A pipe is defined for the purposes of this description as a communications path between two MDMs or processors. In general, a pipe will be capable of being forwarded to another MDM, thereby creating a "pass-through" pipe from the point of view of one MDM; in other words, the pipe is being passed through the MDM from one bus to another without modification. The purpose of this file is not to identify the pass-through pipes (directly); rather, this file identifies pipes and their associated rate group information.

Note:

(M): Defines Field as 'Mandatory' per Para, 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
5.4-1 (M) (CK)	BUS PUI	13	C	Functional 1553 Bus PUI as defined in Appendix S	The Bus PUI on which the decade pipe is being transmitted.
5.4-2 (M) (CK)	Physical Source Device PUI	6	C	The Device PUI from Appendix C based on the Device Types defined in Table 3.3.1.3-1.	The Physical source of the transmission.
5.4-3 (M) (CK)	Physical Destination Device PUI	6	C	The Device PUI from Appendix C based on the Device Types defined in Table 3.3.1.3-1 or ALL	The Physical destination of the transmission. ALL should be used if the Decade Pipe defined in Field 5.4-15 represents Broadcast DMSG_CONs in File 5.2.
5.4-4 (M) (CK)	Subframe Number	1	I	0-7	Identifies the subframe for the first boxcar in the decade pipe.
5.4-5 (M) (CK)	Transaction Slot	2	I	1-16	Identifies the message (transaction) within the subframe constituting the first boxcar of the decade pipe.
5.4-6	Logical Source Device PUI	6	C	The Device PUI from Appendix C based on the Device Types defined in Table 3.3.1.3-1. (A) LDM (B) Field 5.4-2	(A) The DPUI for the logical source of the transmission. (B) If there is no logical source, the DPUI for the physical source identified in Field 5.4-2 shall be used.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
5.4-7	Logical Destination Device PUI	6	C	The Device PUI from Appendix C based on the Device Types defined in Table 3.3.1.3-1. (A) LDM (B) Field 5.4-3 (C) ALL	(A) The DPUI for the logical destination of the transmission. (B) If there is no logical destination, the DPUI for the physical destination identified in Field 5.4-3 shall be used. (C) ALL should be used if the Decade Pipe defined in Field 5.4-15 represents Broadcast DMSG_CONs in File 5.2.
5.4-8	Boxcar Count	3	I	1 to 128	The number of boxcars in the decade pipe. The total number of boxcars in a processing frame must not exceed 128.
5.4-9	Offset to First 1Hz Boxcar	2	I	1 to Boxcar Count (5.4-8) or N/A	Identifies the first boxcar in the decade pipe which contains 1Hz items. N/A shall only be used if there are no 1Hz items in this decade pipe.
5.4-10	Offset to First 1Hz Word	2	I	1-32 or N/A	Identifies the first word in the boxcar identified by 5.4-9 which is at 1Hz. N/A shall only be used if there are no 1Hz items in this decade pipe.
5.4-11	Offset to First 0.1Hz Boxcar	2	I	1 to Boxcar Count (5.4-8) or N/A	Identifies the first boxcar in the decade pipe which contains 0.1Hz items. N/A shall only be used if there are no 0.1Hz items in this decade pipe.
5.4-12	Offset to First 0.1Hz Word	2	I	1-32 or N/A	Identifies the first word in the boxcar identified by 5.4-11 which is at 0.1Hz. N/A shall only be used if there are no 0.1Hz items in this decade pipe.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
5.4-13 (M)	Rate Group Change Mgmt	10	C	ADD CHG DEL A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = Attribute change DEL = Delete the record A/C = Add or Change
5.4-14	Rate Group Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed N/A in lieu of '@' shall only be used if no authorization is required.
5.4-15 (M) (CK)	Pipe Group PUI	13	C	Defined in File 5.1 where field 5.1-3, Group Type, is PIPE_DCD and conforms to Paragraph 3.3.1.2.1.4 and Paragraph 3.3.1.2.1.4.6.1	Data Acquisition or Data Distribution decade Pipe Group PUI for C&DH decade bus transfers.

FILE 6 UTILIZATION

FILE 6.1 COMMAND STRUCTURE VALUE FILE (CT)

This file contains the attributes necessary to provide specific values for the MCMD or FCMD Command Structure SPUIs defined in File 5.1 (Group File). Rules and guidelines for defining command structures are provided in paragraph 3.3.1.2.1.4.3.1 and Appendix T.

Note 1: Paragraph 3.3.1.2.1.4.3, Rule J, states that all the values for USDG00CC0720K (LDP) must be provided in this file for all Command Structures. This requirement is applicable to all Data Providers including International Partners.

Note 2:
(M): Defines Field as 'Mandatory' per Para, 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
6.1-1 (M) (CK)	Command Structure Group Data Item PUI	13	C	Appendix A thru E	The PUI for a group data item which is identified in field 5.1-3 as a group type MCMD or FCMD.
6.1-2 (M)	Signal PUI	13	C	Appendix A thru E	Signal PUI as defined in the FW or SW Primitive File. Primitives identified as ‘CO’ in Field 1.2-3 of FW file or Field 1.3-3 of SW file are not legal entries for this field.
6.1-3 (M)	Command Structure Parameter Value	32	C	IN or a value of the same data type of the Primitive Signal PUI defined in Field 6.1-2	Supplied Values will be a • numerical value for this Command Structure as provided by the PG(s); • a Run Time Variable value, or • the literal “IN” for Instantiation.
6.1-4 (M)	Command Structure Change Mgmt	10	C	ADD CHG A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record; CHG = attribute change; or A/C = Add or Change.
6.1-5	Command Structure Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of ‘@’ shall only be used if no authorization is required.

FILE 6.2 COMMAND INSTANTIATION FILE (CI)

This file and file 6.5 together contains the attributes necessary to define instantiation of command structures defined in File 6.1. This file is provided by the SMC/MOD Team. Rules for instantiation of command structures are provided in paragraph 3.3.1.2.1.4.3.2.

Note:
(M): Defines Field as 'Mandatory' per paragraph 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
6.2-1 (M) (CK)	Command Instance PUI	13	C	Appendix A thru E	The identifier for the instantiated command.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
6.2-2 (M) (CK)	Command Structure Group Data Item PUI	13	C	Appendix A thru E	As identified in 6.1-1.
6.2-3 (M)	Operations Name	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code	The name for instantiated command name defined in field 6.2-1.
6.2-4	Ops Data Provider	3	C	Appendix R	Data Provider for Ops Nomenclature
6.2-5	Command Criticality	2	C	1, 2, 3, 4	Criticality of Command 1 = Arm/Fire, Hazardous 2 = Not Arm/Fire, Hazardous 3 = Requested protection, non-hazardous 4 = No protection, non-hazardous
6.2-6 (M)	Command Instance Change Mgmt	10	C	ADD CHG DEL A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = attribute change DEL = Delete the record A/C = Add or Change
6.2-7	Command Instance Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of '@' shall only be used if no authorization is required.

FILE 6.3 OPERATIONS PARAMETER DEFINITION FILE (OP)

This file contains the attributes necessary to define the operations name and criticality/hazard of all parameters resident in the NCS or CCS CVT that could be telemetered to the ground, displayed by the crew, or used by Timeliner. This file is provided by the SMC Team.

Note:

(M): Defines Field as 'Mandatory' per Para, 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
6.3-1 (M) (CK)	Signal PUI	13	C	As defined in Primitive File	Signal Required to be telemetered.
6.3-2 (M)	Operations Name	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code	The name for the signal PUI defined in field 6.3-1.
6.3-3	Ops Data Provider	3	C	Appendix R	Data Provider for Ops Nomenclature
6.3-4	Parameter Criticality	2	C	1, 2, 3	Criticality of Parameter 1= Safety Critical 2= Ops Critical 3= None
6.3-5	Metrics Conversion Action	6	C	OVRD NATIVE NORMAL N/A	OVRD - Pre-empt all other metric conversions for this primitive with the 6.3-6 input units NATIVE - Cancel all metrics conversions for this primitive and use the native units as defined in Field 1.2-8 or 1.3-8 as appropriate NORMAL - Ignore override options and default to the normal metric conversion for the units of this primitive N/A shall only be used if - Metric units conversion is not valid for this primitive signal
6.3-6	Operations Units Override	30	C	SSPS App F or N/A.	Operations override unit selection for this primitive where Field 1.2-8 or 1.3-8 is not equal to CNT (Counts). N/A shall only be used when Field 6.3-5 is not ‘OVRD’ of Field 1.2-8 or 1.3-8 equals CNT (Counts).
6.3-7 (M)	Operations Parameter Change Mgmt	10	C	ADD CHG A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = attribute change A/C = Add or Change
6.3-8	Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of ‘@’ shall only be used if no authorization is required.

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

FILE 6.4 CVT DEFINITION FILE (CD)

This file contains the attributes necessary to define the content and format of the Current Value Table (CVT). The CVT is defined either in terms of bus messages which are destined for the C&C MDM or in terms of (software or hardware) primitives originating with the C&C MDM.

Note:
(M): Defines Field as 'Mandatory' per Para, 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
6.4-1 (M) (CK)	CVT Content PUI	13	C	A 13-character Group Data SPUI which identifies a group item with a type of WORD, DBL_WORD, or a 13-character primitive SPUI if this item is 16 bits or larger in size	SPUI for a group item of type WORD, DBL_WORD or the SPUI for a 16 bit or larger primitive item to be included in the CVT
6.4-2 (M)	CVT Address	12	C	0 through 16#00FFFFFF#	The CVT absolute memory address in base notated hexadecimal defining the position of the word/double word identified in field 6.4-1 or the position within in the CVT of the start of the signal primitive identified in field 6.4-1.
6.4-3 (M)	CVT Word Order	5	C	1553, INTEL, or N/A	For those data items larger than 16 bits (one word) in size, this field identifies the sequence of words as stored in the CVT memory. 1553 indicates that the Most Significant Word is stored first in memory. INTEL indicates that the Least Significant Word is stored first in memory. N/A shall only be used to indicate that this data item is 16 bits or less in size.
6.4-4 (M)	CVT Change Mgmt	10	C	ADD	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
6.4-5	Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A	A field to record PR# and other change authorization information as needed. N/A in lieu of '@' shall only be used if no authorization is required.

FILE 6.5 COMMAND INSTANTIATION VALUE FILE (CV)

This file and file 6.2 together contain the attributes necessary to define the values for instantiated commands defined in File 6.2. This file is provided by the SMC/MOD Team. Rules for instantiation of command structures are provided in paragraph 3.3.1.2.1.4.3.2.

Note:

(M): Defines Field as 'Mandatory' per Para, 3.7.1.2.2
(CK): Defines Field as 'Composite Key' per paragraph 3.7.1.2.5.2

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
6.5-1 (M) (CK)	Command Instance PUI	13	C	Appendix A thru E	The identifier for the instantiated command.
6.5-2 (M) (CK)	Command Structure Group Data Item PUI	13	C	Appendix A thru E	As identified in 6.1-1.
6.5-3 (M)	Signal PUI	13	C	Signal PUI as defined in the FC or SW Primitive File.	Same as signal defined in Field 6.1-2.
6.5-4 (M)	Command Instance Parameter Value	32	C	Value must be same as data type of signal defined in 6.1-2.	Values will be provided by the SMC Team.
6.5-5 (M)	Command Instance Value Change Mgmt	10	C	ADD CHG A/C	Provides configuration management information to support Delta processing of this file as defined in SSPS paragraph 3.7.1.2.5: ADD = New record CHG = attribute change A/C = Add or Change

APPENDIX N STANDARD-IN IP&CL DATA DELIVERY FILE DEFINITION (Continued)

Field No.	Field Name	Field Lgth	Field Type	Legal Values	Field Description
6.5-6	Command Instance Value Authorization	80	C	7 Bit ASCII Printable Characters subset within the 8 Bit ASCII Code or N/A.	A field to record PR# and other change authorization information as needed. N/A in lieu of ‘@’ shall only be used if no authorization is required.

APPENDIX O FLIGHT SOFTWARE STANDARD INPUT INTERFACE AGREEMENT, PART 1

TABLE O-1 STANDARD CSCI AND CSC NAMES

CSCI/CSC Name	Function	Cat.	Type	FSW Delivery with VDF	Category / Language	Launch Sequence
PG1 CSCIs						
PCVP	Pump and Control Valve Package FC CSCI	FW	FWCI		Flight	9A
GNC	Guidance, Navigation, and Control CSCI	SW	CSCI	YES	Flight	5A
GNC_S	GN&C Test Driver Simulation CSCI	SW	CSCI		Simulation	n/a
ADACOMPS	ALSYS Ada Compiler CSCI (Compilation System, Ada RTE, and Ada Tool Set)	SW	CSCI		Ground / COTS	n/a
ADA_P	ALSYS Ada Probe CSCI	SW	CSC		Ground/COTS	n/a
ADA_PI	ALSYS Ada Probe/ICE CSCI (optional for MATE systems only)	SW	CSCI		Ground / COTS	n/a
PHAR	Pharlap Toolset CSCI	SW	CSCI		Ground / COTS	n/a
HI-SDCS	MATE-3 Simulation Development and Control Services CSCI	SW	CSCI		STE	n/a
HI-IOS	MATE-3 I/O Services CSCI	SW	CSCI		STE	n/a
HI-IOU	MATE-3 I/O Utilities CSCI	SW	CSCI		STE	n/a
HI-TG	MATE-3 Table Generator CSCI	SW	CSCI		STE	n/a
HI-US	Standard MDM Utilities CSCs	SW	CSC		Flight	2-15A
HI-UE	Enhanced MDM Utilities CSCs	SW	CSC		Flight	5-8A
HI-BS	SSMDM Boot & Diagnostics Firmware CSCI	FW	FWCI		Flight	2-15A
HI-BE	Enhanced SSMDM Boot & Diagnostics Firmware CSCI	FW	FWCI		Flight	5-8A
HI-SPD	Serial Parallel Digital 1553 FW	FW	FWCI		Flight	2-15A
HI-HRDL	High Rate Data Link Firmware CSCI	FW	FWCI		Flight	5-8A
HI-SIOS	Simulation I/O Services Firmware CSCI	FW	FWCI		Ground	n/a
HI-TAS	SSMDM Test Application Software CSCI	SW	CSCI		STE	n/a
HI-ETAS	ESSMDM Test Application Software CSCI	SW	CSCI		STE	n/a
PEHG	Payload Ethernet Hub/Gateway Firmware CSCI	FW	FWCI		Flight	5A
STR/PTR	STR/PTR MDM CSCI	SW	CSCI	YES	Flight	9A
EXT	External MDM CSCI	SW	CSCI	YES	Flight	8A
S3/P3	S3/P3 MDM CSCI	SW	CSCI	YES	Flight	12A
S0	S0 MDM CSCI	SW	CSCI	YES	Flight	8A
S1/P1	S1/P1 MDM CSCI	SW	CSCI	YES	Flight	9A
ZEXTS	External Simulation CSCI	SW	MATE		Simulation	n/a
ZSDMSS	SDMS Simulation CSCI	SW	MATE		Simulation	n/a
ZETCSS	ETCS Simulation CSCI	SW	MATE		Simulation	n/a
ZSARJS	SARJ Simulation CSCI	SW	MATE		Simulation	n/a
LBC	Local Bus Controller CSCI	SW	CSCI		Ground/Test	n/a
SES	Sensor/Effector Simulator CSCI	SW	CSCI		Ground/Test	n/a

APPENDIX O FLIGHT SOFTWARE STANDARD INPUT INTERFACE AGREEMENT, PART 1 (Continued)

CSCI/CSC Name	Function	Cat.	Type	FSW Delivery with VDF	Category / Language	Launch Sequence
PG1 CSCIs						
ISC	IACO Simulation Components CSCI	SW	CSCI		Ground/Test	n/a
MBF	Mission Build Facility CSCI	SW	CSCI		Ground	n/a
ACBSP	S-Band Baseband Signal Processor FC CSCI	FW	FWCI		Flight	7A
ACRFG	S-Band RF Group FC CSCI	FW	FWCI		Flight	7A
XPDR	Standard TDRSS Transponder FC CSCI	FW	FWCI		Flight	7A
HRFM	High Rate Frame Multiplexer FC CSCI	FW	FWCI		Flight	4A
HRM	High Rate Modem FC CSCI	FW	FWCI		Flight	4A
SGTRC	Ku-Band Transmitter/Receiver Controller FC CSCI	FW	FWCI		Flight	7A
VBSP	KU-Band Video Baseband Signal Processor FC CSCI	FW	FWCI		Flight	2A
EVSW	External Video Switch FC CSCI	FW	FWCI		Flight	8A
VTS	Video Test Set CSCI	SW	CSC		Ground	n/a
KUBTS	Ku-Band Test Set CSCI	SW	CSC		Ground	n/a
SBTS	S-Band Test Set CSCI	SW	CSC		Ground	n/a
IMCA	Integrated Motor Controller Actuator FC	FW	FWCI		Flight	8A
CMG	Control Moment Gyro Firmware	FW	FWCI		Flight	8A
RGA	Rate Gyro Assembly Firmware	FW	FWCI		Flight	8A
ZLPS	SVF LPS Simulation	SW	CSCI		Ground	n/a
FSE	Flight Software Environment	SW	CSCI		Ground	n/a
TDC	Test Data Capture	SW	CSCI		Ground	n/a
RTPC	Real Time Process Control Support Services	SW	CSCI		Ground	n/a
RTD	Real Time Display Support Services	SW	CSCI		Ground	n/a
PP	Post Processing Support Services	SW	CSCI		Ground	n/a
SS&S	Session Setup & Staging Support Services	SW	CSCI		Ground	n/a
BSS	Basic Support Services	SW	CSCI		Ground	n/a

CSCI/CSC Name	Function	Cat.	Type	FSW Delivery with VDF	Category / Language	Launch Sequence
PG2 CSCIs						
PVCA	Photovoltaic Controller Application (Installed in 2 PVCU MDMs each on 4 PV Modules -- P4, P6, S4, S6)	SW	CSCI	YES	Flight/Ada	4A, 12A, 13A, 15A
PMCA	Power Management & Control Application (Installed in 2 PMCU MDMs in US LAB)	SW	CSCI	YES	Flight/Ada	5A
PVCASIM	PVCA SVF Simulation	SW	MATE		Simulation/C	n/a

APPENDIX O FLIGHT SOFTWARE STANDARD INPUT INTERFACE AGREEMENT, PART 1 (Continued)

CSCI/CSC Name	Function	Cat.	Type	FSW Delivery with VDF	Category / Language	Launch Sequence
PMCASIM	PMCA SVF Simulation	SW	MATE		Simulation/C	n/a

CSCI/CSC Name	Function	Cat.	Type	FSW Delivery with VDF	Category / Language	Launch Sequence
PG3 CSCIs						
ALSYS1	Airlock Systems 1	SW	CSCI		Flight/Ada	7A
ALSYS1SIM	Airlock Systems 1 Simulation	SW	MATE		Simulation /Ada	7A
AIUA	Audio Interface Unit Audio FC	FW	FWCI		Flight	5A
AIUC	Audio Interface Unit Command FC	FW	FWCI		Flight	5A
AMP	Audio Management Processor FC	FW	FWCI		Flight	5A
ATU	Audio Terminal Unit FC	FW	FWCI		Flight	5A
BMP	Bus Management Processor FC	FW	FWCI		Flight	5A
IAS	C&C Internal Audio Subsystem CSC	SW	CSC		Flight/Ada	5A
IASS	C&C Internal Audio Subsystem Simulation CSC	SW	CSC		Simulation/ Ada	5A
IVC	C&C Video Distribution Subsystem CSC	SW	CSC		Flight/Ada	5A
IVCS	C&C Video Distribution Subsystem Simulation CSC	SW	CSC		Simulation /Ada	5A
CBM	Common Berthing Mechanism CSC	SW	CSC		Flight/Ada	1A, 5A
CBMS	Common Berthing Mechanism Simulation CSC	SW	CSC		Simulation /Ada	1A, 5A
CBMBC	Common Berthing Mechanism Bolt Controller FC	FW	FWCI		Flight	2A, 5A, 10A, 15A
CBMMLC	Common Berthing Mechanisms Master/Latch Controller FC	FW	FWCI		Flight	2A, 5A, 10A, 15A
FE1012_SW	FE1012 - Command and Data Handling Test Set	SW	CSCI		GSE/TSE	5A
FE1053_SW	FE1053 - Support Equipment Controller	SW	CSCI		GSE/TSE	5A
HSYS1	HAB Systems 1	SW	CSCI	YES	Flight/Ada	15A
HSYS1SIM	HAB Systems 1 Simulation	SW	MATE		Simulation /Ada	15A
HSYS2	HAB Systems 2	SW	CSCI	YES	Flight/Ada	15A
HSYS2SIM	HAB Systems 2 Simulation	SW	MATE		Simulation /Ada	15A
HSYS3	HAB Systems 3	SW	CSCI	YES	Flight/Ada	15A
HSYS3SIM	HAB Systems 3 Simulation	SW	MATE		Simulation /Ada	15A
INTSYS	Internal Systems	SW	CSCI	YES	Flight/Ada	5A, 10A, 15A

APPENDIX O FLIGHT SOFTWARE STANDARD INPUT INTERFACE AGREEMENT, PART 1 (Continued)

CSCI/CSC Name	Function	Cat.	Type	FSW Delivery with VDF	Category / Language	Launch Sequence
PG3 CSCIs						
INTSYSSIM	Internal Systems Simulation	SW	MATE -3		Simulation /Ada	5A, 10A, 15A
LSYS1	LAB Systems 1	SW	CSCI	YES	Flight/Ada	5A
LSYS1SIM	LAB Systems 1 Simulation	SW	MATE		Simulation /Ada	5A
LSYS2	LAB Systems 2	SW	CSCI	YES	Flight/Ada	5A
LSYS2SIM	LAB Systems 2 Simulation	SW	MATE		Simulation /Ada	5A
LSYS3	LAB Systems 3	SW	CSCI	YES	Flight/Ada	5A
LSYS3SIM	LAB Systems 3 Simulation	SW	MATE		Simulation /Ada	5A
MCA	Major Constituent Analyzer FC	FW	FWCI		Flight	6A
N2SYS1	Node 2 Systems 1	SW	CSCI	YES	Flight/Ada	10A
N2SYS1SIM	Node 2 Systems 1 Simulation	SW	MATE		Simulation /Ada	10A
N2SYS2	Node 2 Systems 2	SW	CSCI	YES	Flight/Ada	10A
N2SYS2SIM	Node 2 Systems 2 Simulation	SW	MATE		Simulation /Ada	10A
PEP	Payload Executive Processor	SW	CSCI	YES	Flight/Ada	5A
PEPSIM	Payload Executive Processor Simulation	SW	MATE		Simulation /Ada	5A
PCA	Pressure Control Assembly FC	FW	FWCI		Flight	5A, 7A, 15A
PCASIM	Pressure Control Assembly Simulation	SW	AG		Simulation /Ada	5A, 7A, 15A
WP	Water Processor FC	FW	FWCI		Flight	16A
WPSIM	Water Processor Simulation	SW	AG		Simulation /Ada	16A
PPMC	Pump Package Motor Controller FC	FW	FWCI		Flight	5A, 6A, 16A
SCU	Sync and Control Unit FC	FW	FWCI		Flight	5A
TP	Tone Processor FC	FW	FWCI		Flight	5A
UPA	Urine Processor Assembly FC	FW	FWCI		Flight	13A

CSCI/CSC Name	Function	Cat.	Type	FSW Delivery with VDF	Category / Language	Launch Sequence
C&C CSCIs						
NCS	Node 1 Control Software	SW	CSCI	YES	Flight	2A
NES	Node 1 Environmental Simulation	SW	CSCI		Simulation /Ada	2A

APPENDIX O FLIGHT SOFTWARE STANDARD INPUT INTERFACE AGREEMENT, PART 1 (Continued)

CSCI/CSC Name	Function	Cat.	Type	FSW Delivery with VDF	Category / Language	Launch Sequence
CCS	Command and Control Software	SW	CSCI	YES	Flight	5A,10A,1J, 1E,15A
CES	Command and Control Environmental Simulation	SW	CSCI		Simulation /Ada	5A,10A,1J, 1E,15A

CSCI/CSC Name	Function	Cat.	Type	FSW Delivery with VDF	Category / Language	Launch Sequence
MMC	MPLM MDM	SW	CSCI	YES	Flight	6A
MPLMSIM	MPLM Simulation Models	SW	CSCI		Simulation	6A

APPENDIX O FLIGHT SOFTWARE STANDARD INPUT INTERFACE AGREEMENT, PART 1 (Continued)

TABLE O-2 STANDARD FILE EXTENSIONS AND TYPES

Standard File Extension	File Description or Intended Use
Ada File Extensions/Types	
_S.ADA	Ada Specification File (ASCII source)
_B.ADA	Ada Body File (ASCII source)
.ADA	Ada Separates and Mains (ASCII source)
.INC	Include File
.INV	Alsys Ada Compiler command file to build the Ada Program Library
.ADL	An Ada Program Library file (Compiled Ada source file)
.INF	Ada Program Library Information File
.ADD	Ada Library Family File (Directory of Libraries in the Family)
.LIB	Common directory containing all Ada Program Library related files
.LIS	Compiler log file
.BLD, .COM	Alsys Ada Compilation/Binder command file
.OBJ, .O86	Object file produced by the binder (.086 = Phar Lap 386 Assembler Object File)
.RSP	Linker response file produced by the binder (used as input to linker prompts)
.ABS	Absolute file produced by the binder
.CUI	AdaProbe and error traceback information produced by the binder
_B.MAP	Binder map file (Contains information from the bind process - _B added manually)
.LNK	Phar Lap linker command file
.ASM	Input Assembler file for the Phar Lap Linker
.LST	Linker Output Listing File
.ERR	Linker Error Listing File
.X	The executable program produced by the Phar Lap linker, and is loadable via Ada Probe
.PBX	EEPROM Loadable image file
.SYM	ASCII File List of Symbols and Addresses
.LOG	Log File
.MAC	Macro file
.TXT	ASCII Text file
.MAP	The map file produced by the Phar Lap linker
.105	Copy of Driver_101.X File
.cfg	Matrix X Configuration File
.dat	Matrix X Configuration File
.exe	Executable for MIPS
.mads	Display Page
.nobj	Object File for MIPS
.pmp	Matrix X PMP File
.rtf	Matrix X.RTF File

APPENDIX O FLIGHT SOFTWARE STANDARD INPUT INTERFACE AGREEMENT, PART 1 (Continued)

Standard File Extension	File Description or Intended Use
MDM Image Creation File Extensions/Types	
.BIN	Load Image file - loadable by the MATE
.LIF	Load Image file - loadable via the 1553 Bus. File uses Load Image File Format Header (See Section 3.7.2.3), and checksum as the last word.
.FEU	FEU Loadable Image (Application Image with Header and Checksum)
.CFG	MDM Loadable I/O Configuration File
.CTB	I/O Configuration Table (ASCII Source for Configuration File)
.LIF	Pre-positioned Load-File**.** File uses Load Image File Format Header (See Section 3.7.2.3), and checksum as the last word. NOTE: PPL source files and tool set files will use file extensions as defined in this Appendix, and file names as defined by the CSCI Development and CM organizations.
.BTD	MDM Boot/Diagnostics Loadable Image
.HDR	Header File
.MBS	MDM Image Build Script (Flight Version)
.FBS	MDM Image Build Script (FEU Version)
.CBS	MDM Configuration File Build Script

Standard File Extension	File Description or Intended Use
C File Extensions/Types	
.a	Library
.c	C Source Files (ASCII source)
.h	C Header files (ASCII source)
.mak	C Makefile (compile/link script)
.obj	C Object File
.exe	Executable File
.ini_c	Initialization File
.rules	Header File for Make
.sh	Shell File
.tcl_c	Test Control Language File
.txt	Database File

Standard File Extension	File Description or Intended Use
MATE File Extensions/Types	
.DAT	Binary Version of the Model (including Matrix-X top Level Superblocks)
.ASC	ASCII Version of the Model
.RTF	Real Time File
_S.ADA	Generated Ada Source Code (specs)
_B.ADA	Generated Ada Source Code (bodies)
.ADA	Ada Separates and Mains (ASCII source)
_US.ADA	User Code Blocks (specs)
_UB.ADA	User Code Blocks (bodies)

APPENDIX O FLIGHT SOFTWARE STANDARD INPUT INTERFACE AGREEMENT, PART 1 (Continued)

Standard File Extension	File Description or Intended Use
MATE File Extensions/Types	
.INV	Alsys Ada Compiler command file to build the Ada Program Library
.ADL	An Alsys Ada Program Library file (Compiled Ada source file)
.INF	Alsys Ada Program Library Information File
.ADD	Alsys Ada Library Family File (Directory of Libraries in the Family)
.LIB, .ALB	Common directory containing all Ada Program Library related files (.LIB=Alsys, .ALB=DDCI)
.LIS	Compiler Log File
.BLD	Alsys Ada Compilation/Binder command file
.OBJ, .O86	Object file produced by the binder
.RSP	Alsys Linker response file produced by the binder (used as input to linker prompts)
.ABS	Alsys Absolute file produced by the binder
.CUI	AdaProbe and error traceback information produced by the binder
_B.MAP	Alsys Binder map file (Contains information from the bind process - _B added manually)
.LNK	Linker command file
.LST	Linker Output Listing File
.ERR	Linker Error Listing File
.X, .ABS	The executable program image file (.X = Alsys, .ABS = DDCI)
.MAP	The map file produced by the Phar Lap linker
.MP1	Map File produced by the Intel Linker
.MP2	Map File produced by the Intel Linker
.DIR	MS DOS Directory File
.TPL	Template File
.DAC	Compiled (binary) Template File
sa_.ADA	MATE Library Files Linked with other Ada Source Files
.PIC	MATE Interactive Animation Picture File
.CFG	MATE Interactive Animation Configuration Files
.MIF	MATE Interface Files
.DAT	1553 Bus Files
.CST	Csid Table
.CTT	Ctid Table
.HFT	HRDL Fiber Table
.IST	IOSU SCSI Table
.IBT	IRIG B Table
.LDT	Logged Data Table
.MST	MSU SCSI Table
.RWT	Remote Workstation Table
.SBT	Serial Bus Table
.SDT	Simulation Definition Table
.FDT	File Description Table
.SST	SCSI System Table
.SCT	System Configuration Table
.TDT	Test Data Table
.TST	Test Suite Table
.TRT	Terminal Server Table

APPENDIX O FLIGHT SOFTWARE STANDARD INPUT INTERFACE AGREEMENT, PART 1 (Continued)

Standard File Extension	File Description or Intended Use
MATE File Extensions/Types	
_INIT.DAT	Initialization Files
.SCR	TCL Scripts
.ICAL	Inverse Calibration Curves
.SES	TCL Session File
.SOG	Compiled ICON Files
.SCN	MATE Scenario File

Standard File Extension	File Description or Intended Use
ASI MATE C File Extensions/Types	
TBD *	
TBD *	
TBD *	

APPENDIX P LEGAL VALUES FOR MDM CARD/CHANNEL CONFIGURATION

MDM Card (Bold) / Channel Configuration Name	Legal Values
Analog Input/Output Circuit Card Assy	**AIO**
Analog Output	AIO1
Analog Voltage Input (50 mV, Gain = 100)	AIO2
Analog Voltage Input (500 mV, Gain = 10)	AIO3
Analog Voltage Input (5.0 V, Gain = 1)	AIO4
Discrete Input/Output Circuit Card Assy	**DIO**
Discrete Input-Active Source	DIO1
Discrete Input-Passive Source	DIO2
Discrete Output-External Power(User Supplied)	DIO3
Discrete Output-Internal Power(MDM Supplied)	DIO4
High Level Analog Input Circuit Card Assy	**HLA**
High Level Analog-Active Current Loop	HLA1
High Level Analog-Passive Current Loop	HLA2
High Level Analog-Voltage Input	HLA3
High Level Analog-Voltage Source (15V)	HLA4
Low Level Analog Input Circuit Card Assy	**LLA**
Low Level Analog-Current Loop (Gain = 1)	LLAC1
Low Level Analog-Current Loop (Gain = 10)	LLAC2
Low Level Analog-Current Loop (Gain = 25)	LLAC3
Low Level Analog-Current Loop (Gain = 100)	LLAC4
Low Level Analog-Current Loop Exp Scale(Gain =10,Offset = 0.5V)	LLAC5
Low Level Analog-Current Loop Exp Scale (Gain =10,Offset = 1.0V)	LLAC6
Low Level Analog-Current Loop Exp Scale (Gain =10,Offset = 1.5V)	LLAC7
Low Level Analog-Current Loop (Gain =2.5)	LLAC8
Low Level Analog - 4 Wire - Current loop Excitation	LLA4C
Low Level Analog - 4 Wire - Voltage Input (Gain = 1)	LLA41
Low Level Analog - 4 Wire - Voltage Input (Gain = 25)	LLA42
Low Level Analog - 4 Wire - Voltage Input (Gain = 100)	LLA43
Low Level Analog - 4 Wire - Exp Scale (Gain = 10, Offset = 0.0V)	LLA44
Low Level Analog - 4 Wire - Exp Scale (Gain = 10, Offset = 0.5V)	LLA45
Low Level Analog - 4 Wire - Exp Scale (Gain = 10, Offset = 1.0V)	LLA46
Low Level Analog - 4 Wire - Exp Scale (Gain = 10, Offset = 1.5V)	LLA47
Low Level Analog-Voltage Input (Gain =1)	LLAV1
Low Level Analog-Voltage Input (Gain =10)	LLAV2
Low Level Analog-Voltage Input (Gain =25)	LLAV3
Low Level Analog-Voltage Input (Gain = 100)	LLAV4
Low Level Analog-Voltage Input Exp Scale (Gain =10,Offset = 0.5V)	LLAV5
Low Level Analog-Voltage Input Exp Scale (Gain =10,Offset = 1.0V)	LLAV6
Low Level Analog-Voltage Input Exp Scale (Gain =10,Offset = 1.5V)	LLAV7
Low Level Analog-Voltage Input (Gain =2.5)	LLAV8

APPENDIX P LEGAL VALUES FOR MDM CARD/CHANNEL CONFIGURATION (Continued)

MDM Card (Bold) / Channel Configuration Name	Legal Values
Solonoid Driver Output Circuit Card Assy	**SDO**
Solonoid Driver Output	SDO
High Rate Data Link Card Assy	**HRDL**
High Rate Data Link	HRDL
Serial Parallel Digital 1553 Circuit Card Assy	**SPD**
MIL-STD-1553B	SPD1
RS-485/449 Serial	SPD2
RS-485/449 Parallel	SPD3
Input/Output Control Unit Circuit Card Assy	**IOCU**

APPENDIX Q ISS FLIGHT/STAGE MANIFEST USE IN MBF

This table has three purposes:

- provides the Legal Values for Flight Delivered, Flight Activated and Flight Deactivated fields;
- defines ISS assembly *Stages** which are used to define the *Scope*** of the data extracted from the MBF IPCL Database and placed in the Standard Out Reports; and
- provides a Naming Alias which can be used in data processing directory and/or file naming applications where any special characters may impact processing.

* Stage CCUs are a point in time in the ISS Assembly sequence where all flights before and inclusive of that flight reside in that Stage CCU (e.g.stages are cumulative). As an example, Stage CCU 3A would be the ISS configuration at the completion of Flight 3A in 1/99 and would include all flights up to that point in time. When Standard Out is produced in the MBF for Stage 3A, the **Scope of the data included in the reports is all data for Flights 1A/R, 2A, 1R, 2A.1, and 3A.

Flight Legal Value	Stage CCU	Launch Date	Flight Assembly Description	Naming Alias
		(Ref. Only Based on SSP 50017, Rev. C, 5/15/97) Note: Launch dates shown with * are still under evaluation		
1A/R or 1A	2A	6/98	Functional Cargo Block (FGB)	1A
2A	2A	7/98	Node 1, (1Stowage Rack), PMA-1, PMA-2,	2A
1R	2A.1	12/98	Service Module	1R
2A.1	2A.1	12/98	Logistics-Reserved	2A1
3A	3A	1/99	Z1 truss, PMA-3, S-Band Equipment, EVAS, CMGs, Ku-band	3A
2R	4A	1/99	Soyuz	2R
4A	4A	3/99	P6, PV Array(4 Battery Sets)/EATCS radiators (2), S-band (1st string)	4A
5A	5A	5/99	U.S. Lab (5 Lab sys racks)	5A
6A	6A	6/99	6 Lab sys racks, 1 Storage rack, MPLM-1 (1 Express rack), UHF Antenna, SSRMS	6A
7A	7A	8/99	Airlock, Crewlock, High Pressure Gas /3O_2, 1N_2	7A
7A.1	7A.1	10/99	Logistics-Reserved	7A1
4R	UF-1	12/99	Docking Compartment 1 (DC)	4R

APPENDIX Q ISS FLIGHT/STAGE MANIFEST USE IN MBF (Continued)

Flight Legal Value	Stage CCU	Launch Date	Flight Assembly Description	Naming Alias
		(Ref. Only Based on SSP 50017, Rev. C, 5/15/97) Note: Launch dates shown with * are still under evaluation		
UF-1	UF-1	1/00	MPLM, ISPRs, 2 Storage racks, 2 PV battery sets (Spacelab Pallet)	UF1
8A	8A	2/00	S0, MT, Umbilicals, A/L Spur, GPS	8A
UF-2	UF-2	3/00	MPLM, ISPRs, 3 Stowage racks, MBS	UF2
9A	9A	6/00	S1(3 rads), TCS, CETA Cart A(1), S-Band (2nd string)	9A
9A.1	9A.1	7/00	Science Power Platform(SPP) with 4 solar arrays, European Robotic Arm (ERA)	9A1
11A	11A	10/00	P1(3 rads), TCS, CETA Cart B, UHF	11A
12A	12A	2/00	P3, P4, PV array (4 battery sets), 2 ULCAS	12A
3R	13A	12/00	Universal Docking Module (UDM)	3R
5R	13A	12/00	Docking Compartment -2 (DC2)	5R
13A	13A	3/01	S3/S4, PV array (4 battery sets), 4 PAS	13A
10A	10A	4/01	Node 2 (4 DDCU racks), Nitrogen Tank Assy (NTA)	10A
1J/A	UF-3	5/01	JEM ELM PS (5 JEM Sys, 3 ISPR, 1 Storage rack), P5, Spacelab Pallet-1, OSE, O_2 High Pressure Gas	1JA
1J	UF-3	8/01	JEM PM (4 JEM racks), JEM RMS	1J
UF-3	UF-3	9/01	MPLM (ISPRs)	UF3
UF-4	UF-4	1/02	SLP (Ammonia & TCS Tank Assy , O_2 High Pressure Gas, SPDM), Express Pallet-1, Alpha Magnetic Spectrometer (AMS)	UF4
2J/A	14A	2/02	JEM EF, ELM-ES, 4PV Battery sets	2JA
9R.1	14A	2/02	Docking & Stowage Module-1	9R1
9R.2	14A	5/02	Docking & Stowage Module-2	9R2
14A	14A	5/02	Cupola & Port Rails (on SLP), 4 SPP Solar Arrays	14A
UF-5	UF-5	6/02	MPLM (ISPRs), Express Pallet	UF5
2E	16A	*	MPLM (Sys Stowage &7 ISPR Racks), JEM Small Fine Arm, S5	2E
8R	16A	*	Research Module #1 (RM-1)	8R
16A	16A	*	U.S. Hab	16A
10R	17A	*	Research Module #2 (RM-2)	10R

APPENDIX Q ISS FLIGHT/STAGE MANIFEST USE IN MBF (Continued)

Flight Legal Value	Stage CCU	Launch Date	Flight Assembly Description	Naming Alias
		(Ref. Only Based on SSP 50017, Rev. C, 5/15/97) Note: Launch dates shown with * are still under evaluation		
17A	17A	*	MPLM (Hab O/F)-2 w/rachs, PV batteries, O_2 High Pressure Gas	17A
11R	18A	*	Lift Support Module-1 (LSM1)	11R
12R	18A	*	Life Support Module-2 (LSM2)	12R
18A	18A	*	Crew Return Vehicle 1 (CRV1)	18A
19A	19A	*	MPLM (O/F)	19A
15A	15A	*	S6	15A
UF-6	UF-6	*	MPLM (ISPRs), Attached Payloads	UF6
UF-7	UF-7	*	Centrifuge	UF7
1E		*	Columbus Orbital Facility	1E

APPENDIX R LEGAL VALUES FOR DATA OWNERS/PROVIDERS

Legal Value	Short Legal Value	Description Note (1) Legal Names are applicable to MOD operations only and applies to Appendix N/Files 6.2 and 6.3
CAN	C	Canada
CCS	0	C&C Boeing Prime Dev. - CCS
CDH	N/A	MOD Cmd and Data Handling (1)
CHC	H	GFE - CHeCS
CNC	0	C&C Boe. Prime Dev. - NCS
CNN	A	Canada/NASA
CNT	N/A	MOD Comm & Track (1)
DIT	D	Data Integ. Team
ECL	N/A	MOD Life Support (1)
EPS	N/A	MOD Power System (1)
ESA	E	European Space Agency
EVA	N/A	MOD Extra Vehicular Activity (1)
GPS	P	GFE - Global Positioning Sys.
ITL	I	Italian Space Agency (ASI)
MCS	N/A	MOD Motion Control System (1)
MOD	S	MOD IMARS
NAS	N	NASA
NDA	J	NASDA
OIU	U	GFE - Orbiter Interface Unit
OST	N/A	MOD Timeliner and Onboard Short Term Planning (OSTP) (1)
PCS	K	GFE - Portable Computer Sys.
PG1	1	Boeing-Huntington Beach
PG2	2	Boeing-Canoga Park
PG3	3	Boeing - Huntsville
EVR	N/A	MOD Robotics (1)
RSA	R	Russia Space Agency
RSM	R	Russia Space Agency - SM
SMC	S	Station Mgmt & Control
SNM	N/A	MOD Structures & Mechanisms (1)
SSC	M	GFE - Space to Space Comm.
TCS	N/A	MOD Thermal Control System (1)
ECT	T	Ecomm CMD & TLM
PL_	Z	Payloads (_To Be Supplied by Payload User)

APPENDIX S ISS DATA BUSES AND ASSIGNED PUIS

NOTE: DIT will provide Appendix N File 1.1 for Data Bus PUIs

DATA BUS PUI	DATA BUS NAME	DATA BUS TYPE	ARCH TYPE (Ref. App N Field 1.2-3)
IMDI01UB0001M	Functional MPLM UB	1553 UB-Functional	1553N
IMDI01UBA001M	Physical Channel A of the MPLM UB	1553 UB-Physical	1553P
IMDI01UBB001M	Physical Channel B of the MPLM UB	1553 UB-Physical	1553P
IMDI02UB1002M	MPLM RS-485	Non 1553 Data Bus	RS485
JSDJ01LB0001M	NASDA PL BUS E	1553 LB-Functional	1553F
JSDJ01LBA001M	LB NASDA PL BUS E PHYSICAL A	1553 LB-Physical	1553P
JSDJ01LBB001M	LB NASDA PL BUS E PHYSICAL B	1553 LB-Physical	1553P
JSDJ02LB0001M	LB CHECS-JEM	1553 LB-Functional	1553F
JSDJ02LBA001M	LB CHECS-JEM PHYSICAL A	1553 LB-Physical	1553P
JSDJ02LBB001M	LB CHECS-JEM PHYSICAL B	1553 LB-Physical	1553P
JSDJ03LB0001M	LB PL-JEM	1553 LB-Functional	1553F
JSDJ03LBA001M	LB PL-JEM PHYSICAL A	1553 LB-Physical	1553P
JSDJ03LBB001M	LB PL-JEM PHYSICAL B	1553 LB-Physical	1553P
ESDE01LB0001M	LB CHECS-APM	1553 LB-Functional	1553F
ESDE01LBA001M	LB CHECS-APM PHYSICAL A	1553 LB-Physical	1553P
ESDE01LBB001M	LB CHECS-APM PHYSICAL B	1553 LB-Physical	1553P
ESDE02LB0001M	ESA PL BUS	1553 LB-Functional	1553F
ESDE02LBA001M	LB ESA PL BUS PHYSICAL A	1553 LB-Physical	1553P
ESDE02LBB001M	LB ESA PL BUS PHYSICAL B	1553 LB-Physical	1553P
ESDE03LB0001M	LB PL-APM	1553 LB-Functional	1553F
ESDE03LBA001M	LB PL-APM PHYSICAL A	1553 LB-Physical	1553P
ESDE03LBB001M	LB PL-APM PHYSICAL B	1553 LB-Physical	1553P
RSDR01LB0001M	LB RS-1 (RS BUS 1)	1553 LB-Non Functional	1553N
RSDR01LBA001M	LB RS-1 (RS BUS 1) PHYSICAL A	1553 LB-Physical	1553P
RSDR01LBB001M	LB RS-1 (RS BUS 1) PHYSICAL B	1553 LB-Physical	1553P
RSDR01LB0002M	LB RS-2 (RS BUS 2)	1553 LB-Non Functional	1553N
RSDR01LBA002M	LB RS-2 (RS BUS 2) PHYSICAL A	1553 LB-Physical	1553P
RSDR01LBB002M	LB RS-2 (RS BUS 2) PHYSICAL B	1553 LB-Physical	1553P
RSDR01LB0003M	LB RS-3 (RS BUS 3)	1553 LB-Non Functional	1553N
RSDR01LBA003M	LB RS-3 (RS BUS 3) PHYSICAL A	1553 LB-Physical	1553P
RSDR01LBB003M	LB RS-3 (RS BUS 3) PHYSICAL B	1553 LB-Physical	1553P
RSDR01LB0004M	LB RS-4 (RS BUS 4)	1553 LB-Non Functional	1553N
RSDR01LBA004M	LB RS-4 (RS BUS 4) PHYSICAL A	1553 LB-Physical	1553P
RSDR01LBB004M	LB RS-4 (RS BUS 4) PHYSICAL B	1553 LB-Physical	1553P
USDA01LB0001M	LB CHECS-HAB	1553 LB-Functional	1553F
USDA01LBA001M	LB CHECS-HAB PHYSICAL A	1553 LB-Physical	1553P
USDA01LBB001M	LB CHECS-HAB PHYSICAL B	1553 LB-Physical	1553P
USDA01LB0002M	LB CHECS-SM	1553 LB-Functional	1553F
USDA01LBA002M	LB CHECS-SM PHYSICAL A	1553 LB-Physical	1553P
USDA01LBB002M	LB CHECS-SM PHYSICAL B	1553 LB-Physical	1553P

APPENDIX S ISS DATA BUSES AND ASSIGNED PUIs (Continued)

DATA BUS PUI	DATA BUS NAME	DATA BUS TYPE	ARCH TYPE (Ref. App N Field 1.2-3)
USDA02CB0001M	CB CT- 1	1553 CB-Functional	1553F
USDA02CBA001M	CB CT- 1 PHYSICAL A	1553 CB-Physical	1553P
USDA02CBB001M	CB CT- 1 PHYSICAL B	1553 CB-Physical	1553P
USDA02CB0002M	CB CT- 2	1553 CB-Functional	1553F
USDA02CBA002M	CB CT- 2 PHYSICAL A	1553 CB-Physical	1553P
USDA02CBB002M	CB CT- 2 PHYSICAL B	1553 CB-Physical	1553P
USDA02CB0003M	CB CT- 3	1553 CB-Functional	1553F
USDA02CBA003M	CB CT- 3 PHYSICAL A	1553 CB-Physical	1553P
USDA02CBB003M	CB CT- 3 PHYSICAL B	1553 CB- Physical	1553P
USDA02CB0004M	CB CT- 4	1553 CB-Functional	1553F
USDA02CBA004M	CB CT- 4 PHYSICAL A	1553 CB-Physical	1553P
USDA02CBB004M	CB CT- 4 PHYSICAL B	1553 CB-Physical	1553P
USDA03CB0001M	CB EXT-1	1553 CB-Functional	1553F
USDA03CBA001M	CB EXT-1 PHYSICAL A	1553 CB-Physical	1553P
USDA03CBB001M	CB EXT-1 PHYSICAL B	1553 CB-Physical	1553P
USDA03CB0002M	CB EXT-2	1553 CB-Functional	1553F
USDA03CBA002M	CB EXT-2 PHYSICAL A	1553 CB-Physical	1553P
USDA03CBB002M	CB EXT-2 PHYSICAL B	1553 CB-Physical	1553P
USDA04LB0001M	LB SEPS-HAB-14	1553 LB-Functional	1553F
USDA04LBA001M	LB SEPS-HAB-14 PHYSICAL A	1553 LB-Physical	1553P
USDA04LBB001M	LB SEPS-HAB-14 PHYSICAL B	1553 LB-Physical	1553P
USDA04LB0002M	LB SEPS-HAB-23	1553 LB-Functional	1553F
USDA04LBA002M	LB SEPS-HAB-23 PHYSICAL A	1553 LB- Physical	1553P
USDA04LBB002M	LB SEPS-HAB-23 PHYSICAL B	1553 LB- Physical	1553P
USDA05LB0001M	LB SEPS-N2-14	1553 LB-Functional	1553F
USDA05LBA001M	LB SEPS-N2-14 PHYSICAL A	1553 LB-Physical	1553P
USDA05LBB001M	LB SEPS-N2-14 PHYSICAL B	1553 LB-Physical	1553P
USDA05LB0002M	LB SEPS-N2-23	1553 LB-Functional	1553F
USDA05LBA002M	LB SEPS-N2-23 PHYSICAL A	1553 LB-Physical	1553P
USDA05LBB002M	LB SEPS-N2-23 PHYSICAL B	1553 LB-Physical	1553P
USDA06LB0001M	LB SYS-S-1	1553 LB-Functional	1553F
USDA06LBA001M	LB SYS-S-1 PHYSICAL A	1553 LB-Physical	1553P
USDA06LBB001M	LB SYS-S-1 PHYSICAL B	1553 LB-Physical	1553P
USDA06LB0002M	LB SYS-S-2	1553 LB-Functional	1553F
USDA06LBA002M	LB SYS-S-2 PHYSICAL A	1553 LB-Physical	1553P
USDA06LBB002M	LB SYS-S-2 PHYSICAL B	1553 LB-Physical	1553P
USDA07CB0001M	CB GNC-1 (RS BUS 7)	1553 CB-Functional	1553F
USDA07CBA001M	CB GNC-1 (RS BUS 7) PHYSICAL A	1553 CB-Physical	1553P
USDA07CBB001M	CB GNC-1 (RS BUS 7) PHYSICAL B	1553 CB-Physical	1553P
USDA07CB0002M	CB GNC-2 (RS BUS 8)	1553 CB-Functional	1553F
USDA07CBA002M	CB GNC-2 (RS BUS 8) PHYSICAL A	1553 CB-Physical	1553P
USDA07CBB002M	CB GNC-2 (RS BUS 8) PHYSICAL B	1553 CB-Physical	1553P
USDA08CB0001M	CB INT-1	1553 CB-Functional	1553F
USDA08CBA001M	CB INT-1 PHYSICAL A	1553 CB-Physical	1553P

APPENDIX S ISS DATA BUSES AND ASSIGNED PUIs (Continued)

DATA BUS PUI	DATA BUS NAME	DATA BUS TYPE	ARCH TYPE (Ref. App N Field 1.2-3)
USDA08CBB001M	CB INT-1 PHYSICAL B	1553 CB-Physical	1553P
USDA08CB0002M	CB INT-2	1553 CB-Functional	1553F
USDA08CBA002M	CB INT-2 PHYSICAL A	1553 CB-Physical	1553P
USDA08CBB002M	CB INT-2 PHYSICAL B	1553 CB-Physical	1553P
USDA09LB0001M	HC LB 1	1553 LB-Functional	1553F
USDA09LBA001M	LB HC LB 1 PHYSICAL A	1553 LB-Physical	1553P
USDA09LBB001M	LB HC LB 1 PHYSICAL B	1553 LB-Physica	1553P
USDA09LB0002M	HC LB 2	1553 LB-Functional	1553F
USDA09LBA002M	LB HC LB 2 PHYSICAL A	1553 LB-Physical	1553P
USDA09LBB002M	LB HC LB 2 PHYSICAL B	1553 LB-Physical	1553P
USDA10LB0001M	LB SYS-LAB-1	1553 LB-Functional	1553F
USDA10LBA001M	LB SYS-LAB-1 PHYSICAL A	1553 LB-Physical	1553P
USDA10LBB001M	LB SYS-LAB-1 PHYSICAL B	1553 LB-Physical	1553P
USDA10LB0002M	LB SYS-LAB-2	1553 LB-Functional	1553F
USDA10LBA002M	LB SYS-LAB-2 PHYSICAL A	1553 LB-Physical	1553P
USDA10LBB002M	LB SYS-LAB-2 PHYSICAL B	1553 LB-Physical	1553P
USDA11LB0001M	LB SYS-HAB-1	1553 LB-Functional	1553F
USDA11LBA001M	LB SYS-HAB-1 PHYSICAL A	1553 LB-Physical	1553P
USDA11LBB001M	LB SYS-HAB-1 PHYSICAL B	1553 LB-Physical	1553P
USDA11LB0002M	LB SYS-HAB-2	1553 LB-Functional	1553F
USDA11LBA002M	LB SYS-HAB-2 PHYSICAL A	1553 LB-Physical	1553P
USDA11LBB002M	LB SYS-HAB-2 PHYSICAL B	1553 LB-Physical	1553P
USDA12LB0001M	BCU LB 1	1553 LB-Functional	1553F
USDA12LBA001M	LB BCU LB 1 PHYSICAL A	1553 LB-Physical	1553P
USDA12LBB001M	LB BCU LB 1 PHYSICAL B	1553 LB-Physical	1553P
USDA12LB0002M	BCU LB 2	1553 LB-Functional	1553F
USDA12LBA002M	LB BCU LB 2 PHYSICAL A	1553 LB-Physical	1553P
USDA12LBB002M	LB BCU LB 2 PHYSICAL B	1553 LB-Physical	1553P
USDA13LB0001M	MSS LB	1553 LB-Functional	1553F
USDA13LBA001M	LB MSS LB PHYSICAL A	1553 LB-Physical	1553P
USDA13LBB001M	LB MSS LB PHYSICAL B	1553 LB-Physical	1553P
USDA14LB0001M	MSS BUD LB	1553 LB-Functional	1553F
USDA14LBA001M	LB MSS BUD LB PHYSICAL A	1553 LB-Physical	1553P
USDA14LBB001M	LB MSS BUD LB PHYSICAL B	1553 LB-Physical	1553P
USDA15LB0001M	MSS PDGF LB	1553 LB-Functional	1553F
USDA15LBA001M	LB MSS PDGF LB PHYSICAL A	1553 LB-Physical	1553P
USDA15LBB001M	LB MSS PDGF LB PHYSICAL B	1553 LB-Physical	1553P
USDA16LB0001M	LB MT-1	1553 LB-Functional	1553F
USDA16LBA001M	LB MT-1 PHYSICAL A	1553 LB-Physical	1553P
USDA16LBB001M	LB MT-1 PHYSICAL B	1553 LB-Physical	1553P
USDA17LB0001M	LB EPS-HAB-14	1553 LB-Functional	1553F
USDA17LBA001M	LB EPS-HAB-14 PHYSICAL A	1553 LB-Physical	1553P
USDA17LBB001M	LB EPS-HAB-14 PHYSICAL B	1553 LB-Physical	1553P
USDA17LB0002M	LB EPS-HAB-23	1553 LB-Functional	1553F

APPENDIX S ISS DATA BUSES AND ASSIGNED PUIs (Continued)

DATA BUS PUI	DATA BUS NAME	DATA BUS TYPE	ARCH TYPE (Ref. App N Field 1.2-3)
USDA17LBA002M	LB EPS-HAB-23 PHYSICAL A	1553 LB-Physical	1553P
USDA17LBB002M	LB EPS-HAB-23 PHYSICAL B	1553 LB-Physical	1553P
USDA18LB0001M	LB EPS-CAM-14	1553 LB-Functional	1553F
USDA18LBA001M	LB EPS-CAM-14 PHYSICAL A	1553 LB-Physical	1553P
USDA18LBB001M	LB EPS-CAM-14 PHYSICAL B	1553 LB-Physical	1553P
USDA18LB0002M	LB EPS-CAM-23	1553 LB-Functional	1553F
USDA18LBA002M	LB EPS-CAM-23 PHYSICAL A	1553 LB-Physical	1553P
USDA18LBB002M	LB EPS-CAM-23 PHYSICAL B	1553 LB-Physical	1553P
USDA19LB0001M	LB PL-1	1553 LB-Functional	1553F
USDA19LBA001M	LB PL-1 PHYSICAL A	1553 LB-Physical	1553P
USDA19LBB001M	LB PL-1 PHYSICAL B	1553 LB-Physical	1553P
USDA19LB0002M	LB PL-2	1553 LB-Functional	1553F
USDA19LBA002M	LB PL-2 PHYSICAL A	1553 LB-Physical	1553P
USDA19LBB002M	LB PL-2 PHYSICAL B	1553 LB-Physical	1553P
USDA19LB0003M	LB PL-3	1553 LB-Functional	1553F
USDA19LBA003M	LB PL-3 PHYSICAL A	1553 LB-Physical	1553P
USDA19LBB003M	LB PL-3 PHYSICAL B	1553 LB-Physical	1553P
USDA19LB0004M	LB PL-4	1553 LB-Functional	1553F
USDA19LBA004M	LB PL-4 PHYSICAL A	1553 LB-Physical	1553P
USDA19LBB004M	LB PL-4 PHYSICAL B	1553 LB-Physical	1553P
USDA20LB0001M	LB PMCU-1	1553 LB-Functional	1553F
USDA20LBA001M	LB PMCU-1 PHYSICAL A	1553 LB-Physical	1553P
USDA20LBB001M	LB PMCU-1 PHYSICAL B	1553 LB-Physical	1553P
USDA20LB0002M	LB PMCU-2	1553 LB-Functional	1553F
USDA20LBA002M	LB PMCU-2 PHYSICAL A	1553 LB-Physical	1553P
USDA20LBB002M	LB PMCU-2 PHYSICAL B	1553 LB-Physical	1553P
USDA20LB0003M	LB PMCU-3	1553 LB-Functional	1553F
USDA20LBA003M	LB PMCU-3 PHYSICAL A	1553 LB-Physical	1553P
USDA20LBB003M	LB PMCU-3 PHYSICAL B	1553 LB-Physical	1553P
USDA20LB0004M	LB PMCU-4	1553 LB-Functional	1553F
USDA20LBA004M	LB PMCU-4 PHYSICAL A	1553 LB-Physical	1553P
USDA20LBB004M	LB PMCU-4 PHYSICAL B	1553 LB-Physical	1553P
USDA21UB1001M	UB AL-1 RS-485	Non 1553 Data Bus	RS485
USDA22UB0001M	UB HA-3	1553 UB-Functional	1553N
USDA22UBA001M	UB HA-3 PHYSICAL A	1553 UB-Physical	1553P
USDA22UBB001M	UB HA-3 PHYSICAL B	1553 UB-Physical	1553P
USDA23UB0001M	UB LA-3	1553 UB-Functional	1553N
USDA23UBA001M	UB LA-3 PHYSICAL A	1553 UB-Physical	1553P
USDA23UBB001M	UB LA-3 PHYSICAL B	1553 UB-Physical	1553P
USDA24UB0001M	UB PVA-13-1	1553 UB-Functional	1553N
USDA24UBA001M	UB PVA-13-1 PHYSICAL A	1553 UB-Physical	1553P
USDA24UBB001M	UB PVA-13-1 PHYSICAL B	1553 UB-Physical	1553P
USDA24UB0002M	UB PVA-13-2	1553 UB-Functional	1553N
USDA24UBA002M	UB PVA-13-2 PHYSICAL A	1553 UB-Physical	1553P

APPENDIX S ISS DATA BUSES AND ASSIGNED PUIs (Continued)

DATA BUS PUI	DATA BUS NAME	DATA BUS TYPE	ARCH TYPE (Ref. App N Field 1.2-3)
USDA24UBB002M	UB PVA-13-2 PHYSICAL B	1553 UB-Physical	1553P
USDA25UB0001M	UB PVB-13-1	1553 UB-Functional	1553N
USDA25UBA001M	UB PVB-13-1 PHYSICAL A	1553 UB-Physical	1553P
USDA25UBB001M	UB PVB-13-1 PHYSICAL B	1553 UB-Physical	1553P
USDA25UB0002M	UB PVB-13-2	1553 UB-Functional	1553N
USDA25UBA002M	UB PVB-13-2 PHYSICAL A	1553 UB-Physical	1553P
USDA25UBB002M	UB PVB-13-2 PHYSICAL B	1553 UB-Physical	1553P
USDA26UB0001M	UB PTR	1553 UB-Functional	1553N
USDA26UBA001M	UB PTR PHYSICAL A	1553 UB-Physical	1553P
USDA26UBB001M	UB PTR PHYSICAL B	1553 UB-Physical	1553P
USDA27UB0001M	UB PVA-24-1	1553 UB-Functional	1553N
USDA27UBA001M	UB PVA-24-1 PHYSICAL A	1553 UB-Physical	1553P
USDA27UBB001M	UB PVA-24-1 PHYSICAL B	1553 UB-Physical	1553P
USDA27UB0002M	UB PVA-24-2	1553 UB-Functional	1553N
USDA27UBA002M	UB PVA-24-2 PHYSICAL A	1553 UB-Physical	1553P
USDA27UBB002M	UB PVA-24-2 PHYSICAL B	1553 UB-Physical	1553P
USDA28UB0001M	UB PVB-24-1	1553 UB-Functional	1553N
USDA28UBA001M	UB PVB-24-1 PHYSICAL A	1553 UB-Physical	1553P
USDA28UBB001M	UB PVB-24-1 PHYSICAL B	1553 UB-Physical	1553P
USDA28UB0002M	UB PVB-24-2	1553 UB-Functional	1553N
USDA28UBA002M	UB PVB-24-2 PHYSICAL A	1553 UB-Physical	1553P
USDA28UBB002M	UB PVB-24-2 PHYSICAL B	1553 UB-Physical	1553P
USDA29UB0001M	UB STR	1553 UB-Functional	1553N
USDA29UBA001M	UB STR PHYSICAL A	1553 UB-Physical	1553P
USDA29UBB001M	UB STR PHYSICAL B	1553 UB-Physical	1553P
USDA30UB0001M	UB ORB-N1-1 (RS BUS 13)	1553 UB-Functional	1553F
USDA30UBA001M	UB ORB-N1-1 (RS BUS 13) PHYSICAL A	1553 UB-Physical	1553P
USDA30UBB001M	UB ORB-N1-1 (RS BUS 13) PHYSICAL B	1553 UB-Physical	1553P
USDA30UB0002M	UB ORB-N1-2 (RS BUS 18)	1553 UB-Functional	1553F
USDA30UBA002M	UB ORB-N1-2 (RS BUS 18) PHYSICAL A	1553 UB-Physical	1553P
USDA30UBB002M	UB ORB-N1-2 (RS BUS 18) PHYSICAL B	1553 UB-Physical	1553P
USDA31CB0001M	CB CT-BIA-23	1553 CB-Functional	1553F
USDA31CBA001M	CB CT-BIA-23 PHYSICAL A	1553 CB-Physical	1553P
USDA31CBB001M	CB CT-BIA-23 PHYSICAL B	1553 CB-Physical	1553P
USDA32LB0001M	LB SYS-P-1	1553 LB-Functional	1553F
USDA32LBA001M	LB SYS-P-1 PHYSICAL A	1553 LB-Physical	1553P
USDA32LBB001M	LB SYS-P-1 PHYSICAL B	1553 LB-Physical	1553P
USDA32LB0002M	LB SYS-P-2	1553 LB-Functional	1553F
USDA32LBA002M	LB SYS-P-2 PHYSICAL A	1553 LB-Physical	1553P
USDA32LBB002M	LB SYS-P-2 PHYSICAL B	1553 LB-Physical	1553P
USDA33LB0001M	LB MECH-S-1	1553 LB-Functional	1553F
USDA33LBA001M	LB MECH-S-1 PHYSICAL A	1553 LB-Physical	1553P
USDA33LBB001M	LB MECH-S-1 PHYSICAL B	1553 LB-Physical	1553P
USDA33LB0002M	LB MECH-S-2	1553 LB-Functional	1553F

APPENDIX S ISS DATA BUSES AND ASSIGNED PUIs (Continued)

DATA BUS PUI	DATA BUS NAME	DATA BUS TYPE	ARCH TYPE (Ref. App N Field 1.2-3)
USDA33LBA002M	LB MECH-S-2 PHYSICAL A	1553 LB-Physical	1553P
USDA33LBB002M	LB MECH-S-2 PHYSICAL B	1553 LB-Physical	1553P
USDA34LB0001M	LB MECH-P-1	1553 LB-Functional	1553F
USDA34LBA001M	LB MECH-P-1 PHYSICAL A	1553 LB-Physical	1553P
USDA34LBB001M	LB MECH-P-1 PHYSICAL B	1553 LB-Physical	1553P
USDA34LB0002M	LB MECH-P-2	1553 LB-Functional	1553F
USDA34LBA002M	LB MECH-P-2 PHYSICAL A	1553 LB-Physical	1553P
USDA34LBB002M	LB MECH-P-2 PHYSICAL B	1553 LB-Physical	1553P
USDA36LB0001M	LB SYS-N2-1	1553 LB-Functional	1553F
USDA36LBA001M	LB SYS-N2-1 PHYSICAL A	1553 LB-Physical	1553P
USDA36LBB001M	LB SYS-N2-1 PHYSICAL B	1553 LB-Physical	1553P
USDA36LB0002M	LB SYS-N2-2	1553 LB-Functional	1553F
USDA36LBA002M	LB SYS-N2-2 PHYSICAL A	1553 LB-Physical	1553P
USDA36LBB002M	LB SYS-N2-2 PHYSICAL B	1553 LB-Physical	1553P
USDA35LB0001M	LB EPS-N2-14	1553 LB-Functional	1553F
USDA35LBA001M	LB EPS-N2-14 PHYSICAL A	1553 LB-Physical	1553P
USDA35LBB001M	LB EPS-N2-14 PHYSICAL B	1553 LB-Physical	1553P
USDA35LB0002M	LB EPS-N2-23	1553 LB-Functional	1553F
USDA35LBA002M	LB EPS-N2-23 PHYSICAL A	1553 LB-Physical	1553P
USDA35LBB002M	LB EPS-N2-23 PHYSICAL B	1553 LB-Physical	1553P
USDA37LB0001M	LB ORB-HAB-1	1553 LB-Functional	1553F
USDA37LBA001M	LB ORB-HAB-1 PHYSICAL A	1553 LB-Physical	1553P
USDA37LBB001M	LB ORB-HAB-1 PHYSICAL B	1553 LB-Physical	1553P
USDA37LB0002M	LB ORB-HAB-2	1553 LB-Functional	1553F
USDA37LBA002M	LB ORB-HAB-2 PHYSICAL A	1553 LB-Physical	1553P
USDA37LBB002M	LB ORB-HAB-2 PHYSICAL B	1553 LB-Physical	1553P
USDA38LB0001M	LB ORB-N2-1	1553 LB-Functional	1553F
USDA38LBA001M	LB ORB-N2-1 PHYSICAL A	1553 LB-Physical	1553P
USDA38LBB001M	LB ORB-N2-1 PHYSICAL B	1553 LB-Physical	1553P
USDA38LB0002M	LB ORB-N2-2	1553 LB-Functional	1553F
USDA38LBA002M	LB ORB-N2-2 PHYSICAL A	1553 LB-Physical	1553P
USDA38LBB002M	LB ORB-N2-2 PHYSICAL B	1553 LB-Physical	1553P
USDA39UB0001M	UB EPS-N1-14	1553 UB-Functional	1553F
USDA39UBA001M	UB EPS-N1-14 PHYSICAL A	1553 UB-Physical	1553P
USDA39UBB001M	UB EPS-N1-14 PHYSICAL B	1553 UB-Physical	1553P
USDA39UB0002M	UB EPS-N1-23	1553 UB-Functional	1553F
USDA39UBA002M	UB EPS-N1-23 PHYSICAL A	1553 UB-Physical	1553P
USDA39UBB002M	UB EPS-N1-23 PHYSICAL B	1553 UB-Physical	1553P
USDA45LB0001M	LB GNC-1	1553 LB-Functional	1553N
USDA45LBA001M	LB GNC-1 PHYSICAL A	1553 LB-Physical	1553P
USDA45LBB001M	LB GNC-1 PHYSICAL B	1553 LB-Physical	1553P
USDA45LB0002M	LB GNC-2	1553 LB-Functional	1553N
USDA45LBA002M	LB GNC-2 PHYSICAL A	1553 LB-Physical	1553P
USDA45LBB002M	LB GNC-2 PHYSICAL B	1553 LB-Physical	1553P

APPENDIX S ISS DATA BUSES AND ASSIGNED PUIs (Continued)

DATA BUS PUI	DATA BUS NAME	DATA BUS TYPE	ARCH TYPE (Ref. App N Field 1.2-3)
USDA45LB0003M	LB GNC-3	1553 LB-Functional	1553N
USDA45LBA003M	LB GNC-3 PHYSICAL A	1553 LB-Physical	1553P
USDA45LBB003M	LB GNC-3 PHYSICAL B	1553 LB-Physical	1553P
USDA45LB0004M	LB GNC-4	1553 LB-Functional	1553N
USDA45LBA004M	LB GNC-4 PHYSICAL A	1553 LB-Physical	1553P
USDA45LBB004M	LB GNC-4 PHYSICAL B	1553 LB-Physical	1553P
USDA40UB0001M	UB SEPS-S0-14	1553 UB-Functional	1553N
USDA40UBA001M	UB SEPS-S0-14 PHYSICAL A	1553 UB-Physical	1553P
USDA40UBB001M	UB SEPS-S0-14 PHYSICAL B	1553 UB-Physical	1553P
USDA40UB0002M	UB SEPS-S0-23	1553 UB-Functional	1553N
USDA40UBA002M	UB SEPS-S0-23 PHYSICAL A	1553 UB-Physical	1553P
USDA40UBB002M	UB SEPS-S0-23 PHYSICAL B	1553 UB-Physical	1553P
USDA41UB0001M	UB SEPS-S1-14	1553 UB-Functional	1553N
USDA41UBA001M	UB SEPS-S1-14 PHYSICAL A	1553 UB-Physical	1553P
USDA41UBB001M	UB SEPS-S1-14 PHYSICAL B	1553 UB-Physical	1553P
USDA41UB0002M	UB SEPS-S1-23	1553 UB-Functional	1553N
USDA41UBA002M	UB SEPS-S1-23 PHYSICAL A	1553 UB-Physical	1553P
USDA41UBB002M	UB SEPS-S1-23 PHYSICAL B	1553 UB-Physical	1553P
USDA42UB0001M	UB SEPS-P1-14	1553 UB-Functional	1553N
USDA42UBA001M	UB SEPS-P1-14 PHYSICAL A	1553 UB-Physical	1553P
USDA42UBB001M	UB SEPS-P1-14 PHYSICAL B	1553 UB-Physical	1553P
USDA42UB0002M	UB SEPS-P1-23	1553 UB-Functional	1553N
USDA42UBA002M	UB SEPS-P1-23 PHYSICAL A	1553 UB-Physical	1553P
USDA42UBB002M	UB SEPS-P1-23 PHYSICAL B	1553 UB-Physical	1553P
USDA43UB0001M	UB SEPS-S3-14	1553 UB-Functional	1553N
USDA43UBA001M	UB SEPS-S3-14 PHYSICAL A	1553 UB-Physical	1553P
USDA43UBB001M	UB SEPS-S3-14 PHYSICAL B	1553 UB-Physical	1553P
USDA43UB0002M	UB SEPS-S3-23	1553 UB-Functional	1553N
USDA43UBA002M	UB SEPS-S3-23 PHYSICAL A	1553 UB-Physical	1553P
USDA43UBB002M	UB SEPS-S3-23 PHYSICAL B	1553 UB-Physical	1553P
USDA44UB0002M	UB SEPS-P3-23	1553 UB-Functional	1553N
USDA44UBA002M	UB SEPS-P3-23 PHYSICAL A	1553 UB-Physical	1553P
USDA44UBB002M	UB SEPS-P3-23 PHYSICAL B	1553 UB-Physical	1553P
USDA44UB0001M	UB SEPS-P3-14	1553 UB-Functional	1553N
USDA44UBA001M	UB SEPS-P3-14 PHYSICAL A	1553 UB-Physical	1553P
USDA44UBB001M	UB SEPS-P3-14 PHYSICAL B	1553 UB-Physical	1553P
USDA50UB1001M	SC-1 RS-485	Non 1553 Data Bus	RS485
USDA50UB1002M	SC-2 RS-485	Non 1553 Data Bus	RS485
USDA51UB1001M	RJMC S1-1 RS-485	Non 1553 Data Bus	RS485
USDA51UB1002M	RJMC S1-2 RS-485	Non 1553 Data Bus	RS485
USDA51UB1003M	RJMC P1-1 RS-485	Non 1553 Data Bus	RS485
USDA51UB1004M	RJMC P1-2 RS-485	Non 1553 Data Bus	RS485
USDA51UB1005M	RJMC S3-1 RS-485	Non 1553 Data Bus	RS485
USDA51UB1006M	RJMC S3-2 RS-485	Non 1553 Data Bus	RS485

APPENDIX S ISS DATA BUSES AND ASSIGNED PUIs (Continued)

DATA BUS PUI	DATA BUS NAME	DATA BUS TYPE	ARCH TYPE (Ref. App N Field 1.2-3)
USDA51UB1007M	RJMC P3-1 RS-485	Non 1553 Data Bus	RS485
USDA51UB1008M	RJMC P3-2 RS-485	Non 1553 Data Bus	RS485
USDA52CB1001M	CB USL VTR 1 Mode RS485	Non 1553 Data Bus	RS485
USDA52CB1002M	CB USL VTR 1 Tx/Rx RS485	Non 1553 Data Bus	RS485
USDA52CB1003M	CB USL VTR 2 Mode RS485	Non 1553 Data Bus	RS485
USDA52CB1004M	CB USL VTR 2 Tx/Rx RS485	Non 1553 Data Bus	RS485
USDA52CB1005M	CB Hab VTR 3 Mode RS485	Non 1553 Data Bus	RS485
USDA52CB1006M	CB Hab VTR 3 Tx/Rx RS485	Non 1553 Data Bus	RS485
USDA52CB1007M	CB Hab VTR 4 Mode RS485	Non 1553 Data Bus	RS485
USDA52CB1008M	CB Hab VTR 4 Tx/Rx RS485	Non 1553 Data Bus	RS485
USDA53CB1001M	CB EMU RS485	Non 1553 Data Bus	RS485
USDA54CB2001M	APS-1 Rx HRDL	HRDL	HRDL
USDA54CB2002M	APS-1 Tx HRDL	HRDL	HRDL
USDA54CB2003M	APS-2 Rx HRDL	HRDL	HRDL
USDA54CB2004M	APS-2 Tx HRDL	HRDL	HRDL
USDA55UB0001M	Internal Orbiter Bus	1553 UB Functional	1553N

APPENDIX T COMMAND STRUCTURE FORMAT

The following guidelines are provided to interpret the Command Structure Tables.

A. In the column labeled "VALUE (Decimal)", the following convention is used:

1. The value @ is used to identify that the primitive must have a value in the Command Structure Value (CT; 6.1) file which is consistent with the type of the primitive. As a result, this primitive does not appear in the Command Instantiation Value (CV; 6.5) file.
2. The value IN is used to identify that the primitive must appear in the Command Structure Value (CT; 6.1) file with a value of IN in field 6.1-3. As a result, this primitive appears in the Command Instantiation Value (CV; 6.5) file with a value appropriate to the type of the primitive.
3. The value RV identifies a value either established at runtime or a value established during command instance definition which is capable of being over-written at runtime. A value in parentheses following the RV identifies an initial value for the primitive established by DIT in the SW file. An asterisk following the RV identifies that no initial value is specified. The primitive is capable of having a value assigned in the Command Structure Value (CT; 6.1) file, the Command Instantiation Value (CV; 6.5) file, or as a default, the Software Primitive (SW; 1.3) file.
4. The value N/A is used to identify that the item does not refer to a primitive, and does not appear in the Command Structure Value (CT; 6.1) file or the Command Instantiation Value (CV; 6.5) file.
5. Any other value identifies that the primitive is a constant having that value, and does not appear in the Command Structure Value (CT; 6.1) file or the Command Command Instantiation Value (CV; 6.5) file.

B. In the column labeled “STD IN FILE FOR VALUE”, the following convention is used:

1. The value N/A is used to identify that there is no value assignment is required to occur. When the value of the column labeled “VALUE (Decimal)” is N/A, the definition of a value is inappropriate because there is no primitive involved. When the value of the column labeled “VALUE (Decimal)” is one of the varieties of RV, a value may (at the option of the data provider) be supplied in the Command Structure Value (CT; 6.1) file or in the Command Instantiation Value (CV; 6.5) file.
2. The value “1.3-16/DIT” identifies that the value is established by DIT in the Initial Value field (field 1.3-16) of the primitive declaration in the Software Signal Primitive (SW; 1.3) file.
3. The value “6.1-3/PG” identifies that the value is required to be provided by the provider of the CT entry for the command. If the value in the column labeled “VALUE (Decimal)” is the value IN, the data provider is required to provide the value IN for the value of the primitive in field 6.1-3. If the value in the column labeled

APPENDIX T COMMAND TEMPLATE FORMAT (Continued)

"VALUE (Decimal)" is @, the data provider is required to provide a value consistent with the type of the primitive for the value of the primitive in field 6.1-3.

C. The following items must be provided by each International Partner in the Command Structure Value (CT; 6.1) file:

1. The value of USDG00CC0710K:
   - For ESA, the values are 2 and 6;
   - For ASI, the value is 7;
   - For RSA, the value is 4;
   - For CSA, the value is 5; and
   - For NASDA, the value is 3.

2. For RSA, NASDA, and ESA, the value of USDG00CC0720K (LDP) per Appendix U must be provided as by Paragraph 3.3.1.2.1.4.3.1, Rule J even though this primitive is not included in Word 7 of their CCSDS Secondary Header.

APPENDIX T COMMAND TEMPLATE FORMAT (Continued)

TABLE T-1 USOS SEGMENT

TABLE T-1 USOS SEGMENT					
TITLE	**WORD/ OFFSET**	**SIGNAL PUI**	**CONTENT TYPE**	**VALUE (Decimal)**	**STD IN FILE FOR VALUE**
CCSDS Primary Header	**N/A**	**US D G00 CC 3000L**	**CCSDS**	**N/A**	**N/A**
Primary Header **-**	Word 1	US D G00 CC 0100L	WORD	N/A	N/A
Version No.	0	US D G00 CC 0110K	SIGNAL	0	1.3-16/DIT
Type	3	US D G00 CC 0120K	SIGNAL	RV*	N/A
Secondary Header Flag	4	US D G00 CC 0130K	SIGNAL	1	1.3-16
APID	5	US D G00 CC 0140K	SIGNAL	RV*	N/A
Primary Header **-**	WORD 2	US D G00 CC 0200L	WORD	N/A	N/A
Sequence Flags	0	US D G00 CC 0210K	SIGNAL	@	6.1-3/PG
Packet Sequence Count	2	US D G00 CC 0220K	SIGNAL	RV*	N/A
Packet Length **-**	WORD 3	US D G00 CC 0300K	SIGNAL	@	6.1-3/PG
CCSDS Secondary Header	**N/A**	**US D G00 CC 2000L**	**CCSDS**	**N/A**	**N/A**
Coarse Time **-**	WORD 4/5	US D G00 CC 0400K	SIGNAL	RV*	N/A
Secondary Header **-**	WORD 6	US D G00 CC 0600L	WORD	N/A	N/A
Fine Time	0	US D G00 CC 0610K	SIGNAL	RV*	N/A
Time ID	8	US D G00 CC 0620K	SIGNAL	RV(1)	N/A
Checkword Indication	10	US D G00 CC 0630K	SIGNAL	1	1.3-16/DIT
Spare	11	SPARE			
Packet Type	12	US D G00 CC 0650K	SIGNAL	@	6.1-3PG
Secondary Header **-**	WORD 7	US D G00 CC 0700L	WORD	N/A	N/A
Element ID	0	US D G00 CC 0710K	SIGNAL	RV(1)	1.3-16/DIT
Packet Data Type	5	US D G00 CC 0712K	SIGNAL	@	6.1-3/PG
Spare	6	SPARE			
Logical Data Path	8	US D G00 CC 0720K	SIGNAL	@	6.1-3/PG
Secondary Header **-**	Word 8	US D G00 CC 0800L	WORD	N/A	N/A
Packet ID/Command ID	0	US D G00 CC 0810K	SIGNAL	@	6.1-3/PG
CMD QUEUE	7	US D G00 CC 0812K	SIGNAL	@	6.1-3/PG
Function Code	8	US D G00 CC 0820K	SIGNAL	@	6.1-3/PG
Legal Station Mode Word 1	Word 9	US D G00 CC 0900L	WORD	N/A	N/A
Spare	0	SPARE			
Std Mode, Untended State	9	US D G00 CC 0910K	SIGNAL	IN	6.1-3/PG
Microgravity Mode, Untend.	10	US D G00 CC 0911K	SIGNAL	IN	6.1-3/PG
Reboost Mode, Untend.	11	US D G00 CC 0912K	SIGNAL	IN	6.1-3/PG
Proximity Ops Mode, Untend.	12	US D G00 CC 0913K	SIGNAL	IN	6.1-3/PG
External Ops Mode, Untend.	13	US D G00 CC 0914K	SIGNAL	IN	6.1-3/PG
Survival Mode, Untend.	14	US D G00 CC 0915K	SIGNAL	IN	6.1-3/PG
ASCR Mode, Untend.	15	US D G00 CC 0916K	SIGNAL	IN	6.1-3/PG
Legal Station Mode Word 2 **-**	Word 10	US D G00 CC 1000L	WORD	N/A	N/A
LSM Override Code	0	US D G000 CC 1001K	SIGNAL	RV*	N/A
Spare	8	SPARE			
Std Mode, Habitable State	9	US D G00 CC 1010K	SIGNAL	IN	6.1-3/PG
Microgravity Mode, Hab.	10	US D G00 CC 1011K	SIGNAL	IN	6.1-3/PG
Reboost Mode, Hab.	11	US D G00 CC 1012K	SIGNAL	IN	6.1-3/PG

APPENDIX T COMMAND TEMPLATE FORMAT (Continued)

TABLE T-1 USOS SEGMENT					
TITLE	**WORD/ OFFSET**	**SIGNAL PUI**	**CONTENT TYPE**	**VALUE (Decimal)**	**STD IN FILE FOR VALUE**
Proximity Ops Mode, Hab.	12	US D G00 CC 1013K	SIGNAL	IN	6.1-3/PG
External Ops Mode, Hab.	13	US D G00 CC 1014K	SIGNAL	IN	6.1-3/PG
Survival Mode, Hab.	14	US D G00 CC 1015K	SIGNAL	IN	6.1-3/PG
ASCR Mode, Hab.	15	US D G00 CC 1016K	SIGNAL	IN	6.1-3/PG
@	Word 11	@	@	Remaining Words except Chk Sum will be defined by PG.	
@	@	@	@		
@	@	@	@		
@	Word (n-1)	@	@	“Fill Words” will not be in Structure	
Check Sum	Word (n)	US D G00 CC 6400K	Signal	RV*	N/A

APPENDIX T COMMAND TEMPLATE FORMAT (Continued)

TABLE T-2 RSA SEGMENT

TITLE	WORD/ OFF-SET	SIGNAL PUI	CONTENT TYPE	VALUE (Decimal)	STD IN FILE FOR VALUE
CCSDS Primary Header	**N/A**	**US D G00 CC 3000L**	**CCSDS**	**N/A**	**N/A**
Primary Header -	Word 1	US D G00 CC 0100L	WORD	N/A	N/A
Version No.	0	US D G00 CC 0110K	SIGNAL	0	1.3-16/DIT
Type	3	US D G00 CC 0120K	SIGNAL	RV*	1.3-16/DIT
Secondary Header Flag	4	US D G00 CC 0130K	SIGNAL	1	1.3-16
APID	5	US D G00 CC 0140K	SIGNAL	RV*	N/A
Primary Header -	WORD 2	US D G00 CC 0200L	WORD	N/A	N/A
Sequence Flags	0	US D G00 CC 0210K	SIGNAL	@	6.1-3/RSA
Packet Sequence Count	2	US D G00 CC 0220K	SIGNAL	RV*	N/A
Packet Length -	WORD 3	US D G00 CC 0300K	SIGNAL	@	6.1-3/RSA
CCSDS Secondary Header	**N/A**	**US D G00 CC C002L**	**CCSDS**	**N/A**	**N/A**
Coarse Time -	WORD 4/5	US D G00 CC 0400K	SIGNAL	RV*	N/A
Secondary Header -	WORD 6	US D G00 CC 0600L	WORD	N/A	N/A
Fine Time	0	US D G00 CC 0610K	SIGNAL	RV*	N/A
Time ID	8	US D G00 CC 0620K	SIGNAL	RV(1)	N/A
Checkword Indication	10	US D G00 CC 0630K	SIGNAL	1	1.3-16/DIT
Spare	11	SPARE			
Packet Type	12	US D G00 CC 0650K	SIGNAL	@	6.1-3/RSA
Secondary Header -	WORD 7	RF D C00 CC C001L	WORD	N/A	N/A
Spare	0	SPARE			
Element ID	1	US D G00 CC 0710K	SIGNAL	RV(1)	N/A
Packet Id Field 0	5	RF D C00 CC 0001K	SIGNAL	@	6.1-3/RSA
Packet Id Field 1	10	RF D C00 CC 0002K	SIGNAL	@	6.1-3/RSA
Packet Id Field 2	WORD 8	RF D C00 CC 0003K	SIGNAL	@	6.1-3/RSA
@	Word 9	@	@	Remaining Words except Chk Sum will be defined by RSA.	
@	@	@	@		
@	@	@	@		
@	Word (n-1)	@	@	"Fill Words" will not be in Structure	
Check Sum	Word (n)	US D G00 CC 6400K	Signal	RV*	N/A

APPENDIX T COMMAND TEMPLATE FORMAT (Continued)

TABLE T-3 JEM SEGMENT

TITLE	WORD/ OFF-SET	SIGNAL PUI	CONTENT TYPE	VALUE (Decimal)	STD IN FILE FOR VALUE
CCSDS Primary Header	**N/A**	**US D G00 CC 3000L**	**CCSDS**	**N/A**	**N/A**
Primary Header **-**	Word 1	US D G00 CC 0100L	WORD	N/A	N/A
Version No.	0	US D G00 CC 0110K	SIGNAL	0	1.3-16/DIT
Type	3	US D G00 CC 0120K	SIGNAL	RV*	6.1-3/NASDA
Secondary Header Flag	4	US D G00 CC 0130K	SIGNAL	1	1.3-16
APID	5	US D G00 CC 0140K	SIGNAL	RV*	N/A
Primary Header **-**	WORD 2	US D G00 CC 0200L	WORD	N/A	N/A
Sequence Flags	0	US D G00 CC 0210K	SIGNAL	@	6.1-3/NASDA
Packet Sequence Count	2	US D G00 CC 0220K	SIGNAL	RV*	N/A
Packet Length **-**	WORD 3	US D G00 CC 0300K	SIGNAL	@	6.1-3/NASDA
CCSDS Secondary Header(NASDA)	**N/A**	**TBD**	**CCSDS**	**N/A**	**N/A**
Coarse Time **-**	WORD 4/5	US D G00 CC 0400K	SIGNAL	RV*	N/A
Secondary Header **-**	WORD 6	US D G00 CC 0600L	WORD	N/A	N/A
Fine Time	0	US D G00 CC 0610K	SIGNAL	RV*	N/A
Time ID	8	US D G00 CC 0620K	SIGNAL	RV(1)	N/A
Checkword Indication	10	US D G00 CC 0630K	SIGNAL	1	1.3-16/DIT
Spare	11	SPARE			
Packet Type	12	US D G00 CC 0650K	SIGNAL	@	6.1-3/NASDA
Secondary Header **-**	WORD 7	TBD	WORD	N/A	N/A
Spare	0	SPARE			
Element ID	1	US D G00 CC 0710K	SIGNAL	RV(1)	6.1-3/NASDA
Command Flag 1	5	TBD	SIGNAL	@	6.1-3/NASDA
Command Flag 2	6	TBD	SIGNAL	@	6.1-3/NASDA
Spare	7	SPARE			
APID EXT.	8	TBD	SIGNAL	@	6.1-3/NASDA
Command Code	WORD 8	TBD	SIGNAL	@	6.1-3/NASDA
@	Word 9	@	@	Remaining Words except Chk Sum will be defined by NASDA.	
@	@	@	@		
@	@	@	@		
@	Word (n-1)	@	@	"Fill Words" will not be in Structure	
Check Sum	Word (n)	US D G00 CC 6400K	Signal	RV*	N/A

APPENDIX T COMMAND TEMPLATE FORMAT (Continued)

TABLE T-4 ESA SEGMENT TBD

TITLE	WORD/ OFF-SET	SIGNAL PUI	CONTENT TYPE	VALUE (Decimal)	STD IN FILE FOR VALUE

APPENDIX T COMMAND TEMPLATE FORMAT (Continued)

TABLE T-5 ASI SEGMENT

TITLE	WORD/ OFFSET	SIGNAL PUI	CONTENT TYPE	VALUE (Decimal)	STD IN FILE FOR VALUE
CCSDS Primary Header	**N/A**	**US D G00 CC 3000L**	**CCSDS**	**N/A**	**N/A**
Primary Header -	Word 1	US D G00 CC 0100L	WORD	N/A	N/A
Version No.	0	US D G00 CC 0110K	SIGNAL	0	1.3-16/DIT
Type	3	US D G00 CC 0120K	SIGNAL	RV*	N/A
Secondary Header Flag	4	US D G00 CC 0130K	SIGNAL	1	1.3-16
APID	5	US D G00 CC 0140K	SIGNAL	RV*	N/A
Primary Header -	WORD 2	US D G00 CC 0200L	WORD	N/A	N/A
Sequence Flags	0	US D G00 CC 0210K	SIGNAL	@	6.1-3/ASI
Packet Sequence Count	2	US D G00 CC 0220K	SIGNAL	RV*	N/A
Packet Length -	WORD 3	US D G00 CC 0300K	SIGNAL	@	6.1-3/ASI
CCSDS Secondary Header	**N/A**	**US D G00 CC 2000L**	**CCSDS**	**N/A**	**N/A**
Coarse Time -	WORD 4/5	US D G00 CC 0400K	SIGNAL	RV*	N/A
Secondary Header -	WORD 6	US D G00 CC 0600L	WORD	N/A	N/A
Fine Time	0	US D G00 CC 0610K	SIGNAL	RV	N/A
Time ID	8	US D G00 CC 0620K	SIGNAL	RV(1)	N/A
Checkword Indication	10	US D G00 CC 0630K	SIGNAL	1	1.3-16/DIT
Spare	11	SPARE			
Packet Type	12	US D G00 CC 0650K	SIGNAL	@	6.1-3PG
Secondary Header -	WORD 7	US D G00 CC 0700L	WORD	N/A	N/A
Element ID	0	US D G00 CC 0710K	SIGNAL	RV(1)	1.3-16/DIT
Packet Data Type	5	US D G00 CC 0712K	SIGNAL	@	6.1-3/ASI
Spare	6	SPARE			
Logical Data Path	8	US D G00 CC 0720K	SIGNAL	@	6.1-3/ASI
Secondary Header -	Word 8	US D G00 CC 0800L	WORD	N/A	N/A
Packet ID/Command ID	0	US D G00 CC 0810K	SIGNAL	@	6.1-3/ASI
CMD QUEUE	7	US D G00 CC 0812K	SIGNAL	@	6.1-3/ASI
Function Code	8	US D G00 CC 0820K	SIGNAL	@	6.1-3/ASI
Legal Station Mode Word 1	Word 9	US D G00 CC 0900L	WORD	N/A	N/A
Spare	0	SPARE			
Std Mode, Untended State	9	US D G00 CC 0910K	SIGNAL	IN	6.1-3/ASI
Microgravity Mode, Untend.	10	US D G00 CC 0911K	SIGNAL	IN	6.1-3/ASI
Reboost Mode, Untend.	11	US D G00 CC 0912K	SIGNAL	IN	6.1-3/ASI
Proximity Ops Mode, Untend.	12	US D G00 CC 0913K	SIGNAL	IN	6.1-3/ASI
External Ops Mode, Untend.	13	US D G00 CC 0914K	SIGNAL	IN	6.1-3/ASI
Survival Mode, Untend.	14	US D G00 CC 0915K	SIGNAL	IN	6.1-3/ASI
ASCR Mode, Untend.	15	US D G00 CC 0916K	SIGNAL	IN	6.1-3/ASI
Legal Station Mode Word 2 -	Word 10	US D G00 CC 1000L	WORD	N/A	N/A
LSM Override Code	0	US D G000 CC 1001K	SIGNAL	RV*	N/A
Spare	8	SPARE			
Std Mode, Habitable State	9	US D G00 CC 1010K	SIGNAL	IN	6.1-3/ASI
Microgravity Mode, Hab.	10	US D G00 CC 1011K	SIGNAL	IN	6.1-3/ASI
Reboost Mode, Hab.	11	US D G00 CC 1012K	SIGNAL	IN	6.1-3/ASI

APPENDIX T COMMAND TEMPLATE FORMAT (Continued)

TABLE T-5 ASI SEGMENT

TITLE	WORD/ OFFSET	SIGNAL PUI	CONTENT TYPE	VALUE (Decimal)	STD IN FILE FOR VALUE
Proximity Ops Mode, Hab.	12	US D G00 CC 1013K	SIGNAL	IN	6.1-3/ASI
External Ops Mode, Hab.	13	US D G00 CC 1014K	SIGNAL	IN	6.1-3/ASI
Survival Mode, Hab.	14	US D G00 CC 1015K	SIGNAL	IN	6.1-3/ASI
ASCR Mode, Hab.	15	US D G00 CC 1016K	SIGNAL	IN	6.1-3/ASI
@	Word 11	@	@	Remaining Words except Chk Sum will be defined by PG.	
@	@	@	@		
@	@	@	@		
@	Word (n-1)	@	@	"Fill Words" will not be in Structure	
Check Sum	Word (n)	US D G00 CC 6400K	Signal	RV*	N/A

APPENDIX T COMMAND TEMPLATE FORMAT (Continued)

TABLE T-6 CSA SEGMENT

TABLE T-6 CSA SEGMENT

TITLE	WORD/ OFFSET	SIGNAL PUI	CONTENT TYPE	VALUE (Decimal)	STD IN FILE FOR VALUE
CCSDS Primary Header	**N/A**	**US D G00 CC 3000L**	**CCSDS**	**N/A**	**N/A**
Primary Header -	Word 1	US D G00 CC 0100L	WORD	N/A	N/A
Version No.	0	US D G00 CC 0110K	SIGNAL	0	1.3-16/DIT
Type	3	US D G00 CC 0120K	SIGNAL	RV*	N/A
Secondary Header Flag	4	US D G00 CC 0130K	SIGNAL	1	1.3-16
APID	5	US D G00 CC 0140K	SIGNAL	RV*	N/A
Primary Header -	WORD 2	US D G00 CC 0200L	WORD	N/A	N/A
Sequence Flags	0	US D G00 CC 0210K	SIGNAL	@	6.1-3/CSA
Packet Sequence Count	2	US D G00 CC 0220K	SIGNAL	RV*	N/A
Packet Length -	WORD 3	US D G00 CC 0300K	SIGNAL	@	6.1-3/CSA
CCSDS Secondary Header	**N/A**	**US D G00 CC 2000L**	**CCSDS**	**N/A**	**N/A**
Coarse Time -	WORD 4/5	US D G00 CC 0400K	SIGNAL	RV*	N/A
Secondary Header -	WORD 6	US D G00 CC 0600L	WORD	N/A	N/A
Fine Time	0	US D G00 CC 0610K	SIGNAL	RV	N/A
Time ID	8	US D G00 CC 0620K	SIGNAL	RV(1)	N/A
Checkword Indication	10	US D G00 CC 0630K	SIGNAL	1	1.3-16/DIT
Spare	11	SPARE			
Packet Type	12	US D G00 CC 0650K	SIGNAL	@	6.1-3PG
Secondary Header -	WORD 7	US D G00 CC 0700L	WORD	N/A	N/A
Element ID	0	US D G00 CC 0710K	SIGNAL	RV(1)	1.3-16/DIT
Packet Data Type	5	US D G00 CC 0712K	SIGNAL	@	6.1-3/CSA
Spare	6	SPARE			
Logical Data Path	8	US D G00 CC 0720K	SIGNAL	@	6.1-3/CSA
Secondary Header -	Word 8	US D G00 CC 0800L	WORD	N/A	N/A
Packet ID/Command ID	0	US D G00 CC 0810K	SIGNAL	@	6.1-3/CSA
CMD QUEUE	7	US D G00 CC 0812K	SIGNAL	@	6.1-3/CSA
Function Code	8	US D G00 CC 0820K	SIGNAL	@	6.1-3/CSA
Legal Station Mode Word 1 -	Word 9	US D G00 CC 0900L	WORD	N/A	N/A
Spare	0	SPARE			
Std Mode, Untended State	9	US D G00 CC 0910K	SIGNAL	IN	6.1-3/CSA
Microgravity Mode, Untend.	10	US D G00 CC 0911K	SIGNAL	IN	6.1-3/CSA
Reboost Mode, Untend.	11	US D G00 CC 0912K	SIGNAL	IN	6.1-3/CSA
Proximity Ops Mode, Untend.	12	US D G00 CC 0913K	SIGNAL	IN	6.1-3/CSA
External Ops Mode, Untend.	13	US D G00 CC 0914K	SIGNAL	IN	6.1-3/CSA
Survival Mode, Untend.	14	US D G00 CC 0915K	SIGNAL	IN	6.1-3/CSA
ASCR Mode, Untend.	15	US D G00 CC 0916K	SIGNAL	IN	6.1-3/CSA
Legal Station Mode Word 2 -	Word 10	US D G00 CC 1000L	WORD	N/A	N/A
LSM Override Code	0	US D G000 CC 1001K	SIGNAL	RV*	N/A
Spare	8	SPARE			
Std Mode, Habitable State	9	US D G00 CC 1010K	SIGNAL	IN	6.1-3/CSA
Microgravity Mode, Hab.	10	US D G00 CC 1011K	SIGNAL	IN	6.1-3/CSA

APPENDIX T COMMAND TEMPLATE FORMAT (Continued)

TABLE T-6 CSA SEGMENT					
TITLE	**WORD/ OFFSET**	**SIGNAL PUI**	**CONTENT TYPE**	**VALUE (Decimal)**	**STD IN FILE FOR VALUE**
Reboost Mode, Hab.	11	US D G00 CC 1012K	SIGNAL	IN	6.1-3/CSA
Proximity Ops Mode, Hab.	12	US D G00 CC 1013K	SIGNAL	IN	6.1-3/CSA
External Ops Mode, Hab.	13	US D G00 CC 1014K	SIGNAL	IN	6.1-3/CSA
Survival Mode, Hab.	14	US D G00 CC 1015K	SIGNAL	IN	6.1-3/CSA
ASCR Mode, Hab.	15	US D G00 CC 1016K	SIGNAL	IN	6.1-3/CSA
@	Word 11	@	@	Remaining Words except Chk Sum will be defined by PG.	
@	@	@	@		
@	@	@	@		
@	Word (n-1)	@	@	"Fill Words" will not be in Structure	
Check Sum	Word (n)	US D G00 CC 6400K	Signal	RV*	N/A

APPENDIX T COMMAND TEMPLATE FORMAT (Continued)

TABLE T-7 US PAYLOADS SEGMENT TBD

TITLE	WORD/ OFFSET	SIGNAL PUI	CONTENT TYPE	VALUE (Decimal)	STD IN FILE FOR VALUE

APPENDIX U LEGAL VALUES FOR LOGICAL DESTINATION PROCESSOR (LDP)

Core LDPs			
NAME	**LDP**	**Logical DPUI**	**Physical DPUIs**
Reserved as a core LDP	0	N/A	N/A
CPC-2 as a core LDP	1	RRDP00	RRDP01, P02
PCS/C-1 as a core LDP	2	USDK01	RFDL01,RFDL02, USDL01 thru USDL24
PCS/C-2 as a core LDP	3	USDK02	RFDL01,RFDL02, USDL01 thru USDL24
PCS/C-3 as a core LDP	4	USDK03	RFDL01,RFDL02, USDL01 thru USDL24
PCS/C-4 as a core LDP	5	USDK04	RFDL01,RFDL02, USDL01 thru USDL24
PCS/C-5 as a core LDP	6	USDK05	RFDL01,RFDL02, USDL01 thru USDL24
PCS/C-6 as a core LDP	7	USDK06	RFDL01,RFDL02, USDL01 thru USDL24
PCS/C-7 as a core LDP	8	USDK07	RFDL01,RFDL02, USDL01 thru USDL24
PCS/C-8 as a core LDP	9	USDK08	RFDL01,RFDL02, USDL01 thru USDL24
C&C_HOT as a core LDP	10	LADP01	LADS01,LADS02,LADS03
C&C_WARM as a core LDP	11	LADB02	LADS01,LADS02,LADS03
C&C_COLD as a core LDP	12	LADB03	LADS01,LADS02,LADS03
Cargo_Veh_Com as a core LDP	13	TBD	TBD
CC_SM as a core LDP	14	RRDC00	RRDC01,C02,C03
CPC-1 as a core LDP	15	RRDP00	RRDP01,P02
MU_FGB as a core LDP	16	RFDM00	RFDM01, RFDM02, RFDM03
Reserved for C&C SW Designers (MCC-Houston) as a core LDP	17	N/A	N/A
Reserved for C&C SW Designers (MCC-Moscow) as a core LDP	18	N/A	N/A
Reserved for C&C SW Designers (OIU) as a core LDP	19	N/A	N/A
N1_Primary as a core LDP	20	M1DP47	M1DS47,M1DS48
N1_Secondary as a core LDP	21	M1DB48	M1DS47,M1DS48
GNC_Pri as a core LDP	22	LADP06	LADS06,LADS07
GNC_Back as a core LDP	23	LADB07	LADS06,LADS07
FGB_Pri as a core LDP	24	RFDC00	RFDC01,RFDC02
FGB_Back as a core LDP	25	N/A	N/A
TC_LSM as a core LDP	26	TBD	TBD
SPP as a core LDP	27	TBD	TBD
APS-1 as a core LDP	28	LADZ03	LADZ03
APS-2 as a core LDP	29	LADZ04	LADZ04
TC_SPP as a core LDP	30	TBD	TBD
TC_UDM as a core LDP	31	TBD	TBD

APPENDIX U LEGAL VALUES FOR LOGICAL DATA PATH (LDP) (Continued)

Core LDPs			
NAME	**LDP**	**Logical DPUI**	**Physical DPUIs**
JCP_Pri as a core LDP	33	JSDC00	JSDC01,JSDC02
JCP_Back as a core LDP	34	JSDC10	JSDC01,JSDC02
EXT_Pri as a core LDP	35	S0DP04	S0DS04,S0DS05
EXT_Back as a core LDP	36	S0DB05	S0DS04,S0DS05
STR_ as a core LDP	37	S1DS45	S1DS45
PTR_ as a core LDP	38	P1DS29	P1DS29
P1_Control as a core LDP	39	P1DP25	P1DS25,P1DS26
P1_Monitor as a core LDP	40	P1DB26	P1DS25,P1DS26
S1_Control as a core LDP	41	S1DP41	S1DS41,S1DS42
S1_Monitor as a core LDP	42	S1DB42	S1DS41,S1DS42
S0_Loop A as a core LDP	43	S0DP39	S0DS39,S0DS40
S0_Loop B as a core LDP	44	S0DS40	S0DS39,S0DS40
JEM Exp. PL #1 as a core LDP	45	TBD	TBD
JEM Exp. PL #2 as a core LDP	46	TBD	TBD
JEM Exp. PL #3 as a core LDP	47	TBD	TBD
JEM Exp. PL #4 as a core LDP	48	TBD	TBD
PMCU_Pri as a core LDP	49	LADP13	LADS13,LADS14
PMCU_Back as a core LDP	50	LADB14	LADS13,LADS14
PVCU_S4_Pri as a core LDP	51	S4DP31	S4DS31,S4DS35
PVCU_S4_Bk as a core LDP	52	S4DB35	S4DS31,S4DS35
PVCU_S6_Pri as a core LDP	53	S6DP32	S6DS32,S6DS36
PVCU_S6_Bk as a core LDP	54	S6DB36	S6DS32,S6DS36
PVCU_P4_Pri as a core LDP	55	P4DP33	P4DS33,P4DS37
PVCU_P4_Bk as a core LDP	56	P4DB37	P4DS33,P4DS37
PVCU_P6_Pri as a core LDP	57	P6DP34	P6DS34,P6DS38
PVCU_P6_Bk as a core LDP	58	P6DB38	P6DS34,P6DS38
S3_Control as a core LDP	59	S3DP43	S3DS43,S3DS44
S3_Monitor as a core LDP	60	S3DB44	S3DS43,S3DS44
P3_Control as a core LDP	61	P3DP27	P3DS27,P3DS28
P3_Monitor as a core LDP	62	P3DB28	P3DS27,P3DS28
JEM Exp. PL #5 as a core LDP	63	TBD	TBD
JEM Exp. PL #6 as a core LDP	64	TBD	TBD
MMC_MTL as a core LDP	65	TBD	TBD
MMC_Recon as a core LDP	66	TBD	TBD
VTC-Master as a core LDP	67	TBD	TBD
VTC-Com2 as a core LDP	68	TBD	TBD
VTC-Com1 as a core LDP	69	TBD	TBD
JEM Exp. PL #7 as a core LDP	70	TBD	TBD
JEM Exp. PL #8 as a core LDP	71	TBD	TBD
INT_Primary as a core LDP	72	LADP08	LADS08,LADS09
INT_Backup as a core LDP	73	LADB09	LADS08,LADS09
LAB-1 as a core LDP	74	LADS19	LADS19
LAB-2 as a core LDP	75	LADS20	LADS20
LAB-3 as a core LDP	76	LADS21	LADS21
HAB-1 as a core LDP	77	HADS16	HADS16

APPENDIX U LEGAL VALUES FOR LOGICAL DATA PATH (LDP) (Continued)

Core LDPs			
NAME	LDP	Logical DPUI	Physical DPUIs
HAB-2 as a core LDP	78	HADS17	HADS17
HAB-3 as a core LDP	79	HADS18	HADS18
Airlock as a core LDP	80	ALDS15	ALDS15
CH_Dfib as a core LDP	81	HAFC70	HAFC70
CH_MEC as a core LDP	82	HAFC34	HAFC34
CH_IV _CPDS as a core LDP	83	USFC08	USFC08
CH_TEPC as a core LDP	84	USFC40	USFC40
CH_CPDS-1 as a core LDP	85	S0FC05	S0FC05
CH_CPDS-2 as a core LDP	86	S0FC06	S0FC06
CH_CPDS-3 as a core LDP	87	S0FC07	S0FC07
CH_BPM as a core LDP	88	HAFC72	HAFC72
CH_VOA as a core LDP	89	HAFC60	HAFC60
CH_Spec as a core LDP	90	HAFC36	HAFC36
CH_Inc as a core LDP	91	HAFC32	HAFC32
N1-1 as a core LDP	92	M1DS47	M1DS47
N1-2 as a core LDP	93	M1DS48	M1DS48
MPLM as a core LDP	94	IMDM01	IMDM01
RFR(ESA-80)_1 as a core LDP	95	IMZR01	IMZR01
RFR(ESA-80)_2 as a core LDP	96	IMZR02	IMZR02
RFR(ESA-80)_3 as a core LDP	97	IMZR03	IMZR03
RFR(ESA-80)_4 as a core LDP	98	IMZR04	IMZR04
RWS_CEU_Lab_Monitor as a core LDP	99	See Note 1 Column A	CMRC11
RWS_CEU_Cupola_Monitor as a core LDP	100	See Note 1 Column B	CMRC21
JEM_PDH as a core LDP	101	TBD	TBD
JEM_ICS as a core LDP	102	TBD	TBD
JEM_RMS as a core LDP	103	JRRC00	JRRC00
JEM_JWS as a core LDP	104	N/A	N/A
PL_Pri as a core LDP	105	LADP10	LADS10,LADS11
PL_Back as a core LDP	106	LADB11	LADS10,LADS11
PCS_Generic as a core LDP	107	N/A	N/A
JEM Exp. PL #9 as a core LDP	108	TBD	TBD
JEM Exp. PL #10 as a core LDP	109	TBD	TBD
JEM Exp. PL #11 as a core LDP	110	TBD	TBD
JEM Exp. PL #12 as a core LDP	111	TBD	TBD
ISPR_APM_SUP1 as a core LDP	112	TBD	TBD
ISPR_APM_SUP2 as a core LDP	113	TBD	TBD
ISPR_APM_SUP3 as a core LDP	114	TBD	TBD
ISPR_APM_SUP4 as a core LDP	115	TBD	TBD
APM_PCS_1 as a core LDP	116	TBD	TBD
APM_PCS_2 as a core LDP	117	TBD	TBD
APM_PCS_3 as a core LDP	118	TBD	TBD
PLCU_AP as a core LDP	119	TBD	TBD
APM_MMU as a core LDP	120	TBD	TBD

APPENDIX U LEGAL VALUES FOR LOGICAL DATA PATH (LDP) (Continued)

Core LDPs			
NAME	LDP	Logical DPUI	Physical DPUIs
N2_Primary as a core LDP	142	N2DP23	N2DS23,N2DS24
N2_Secondary as a core LDP	143	N2DB24	N2DS23,N2DS24
P1_RPCM-A as a core LDP	144	P1DP25	P1DS25,P1DS26
P1_RPCM-B as a core LDP	145	P1DP25	P1DS25,P1DS26
P3_RPCM-A as a core LDP	146	P3DP27	P3DS27.P3DS28
P3_RPCM-B as a core LDP	147	P3DP27	P3DS27.P3DS28
RWS_CEU_Active as a core LDP	148	See Note 1 Column C	CMRC11, CMRC21
S0_RPCM-A as a core LDP	149	S0DP39	S0DS39,S0DS40
S0_RPCM-B as a core LDP	150	S0DP39	S0DS39,S0DS40
S1_RPCM-A as a core LDP	151	S1DP41	S1DS41,S1DS42
S1_RPCM-B as a core LDP	152	S1DP41	S1DS41,S1DS42
S3_RPCM-A as a core LDP	153	S3DP43	S3DS43,S3DS44
S3_RPCM-B as a core LDP	154	S3DP43	S3DS43,S3DS44
L1 as a core LDP	155	TBD	TBD
L2 as a core LDP	156	TBD	TBD
L3 as a core LDP	157	TBD	TBD

Payload LDPs			
NAME	LDP	Logical DPUI	Physical DPUIs
ISPR-CAM-1 as a payload LDP	167	TBD	TBD
ISPR-CAM-2 as a payload LDP	168	TBD	TBD
ISPR-CAM-3 as a payload LDP	169	TBD	TBD
ISPR-Centrifuge as a payload LDP	170	TBD	TBD
JEM ICS Stored Cmds as a payload LDP	171	TBD	TBD
ISPR-LAF3 as a payload LDP	181	LAKR08	LAKR08
ISPR-S3_1 as a payload LDP	182	S3MP11	S3MP11
ISPR-S3_2 as a payload LDP	183	S3MP12	S3MP12
ISPR-S3_3 as a payload LDP	184	S3MP13	S3MP13
ISPR-S3_4 as a payload LDP	185	S3MP14	S3MP14
ISPR_APM_01 as a payload LDP	186	EMZR01	EMZR01
ISPR_APM_02 as a payload LDP	187	EMZR02	EMZR02
ISPR_APM_A1 as a payload LDP	188	EMZR03	EMZR03
ISPR_APM_A2 as a payload LDP	189	EMZR04	EMZR04
ISPR_APM_A3 as a payload LDP	190	EMZR05	EMZR05
ISPR_APM_A4 as a payload LDP	191	EMZR06	EMZR06
ISPR_APM_F1 as a payload LDP	192	EMZR07	EMZR07
ISPR_APM_F2 as a payload LDP	193	EMZR08	EMZR08
ISPR_APM_F3 as a payload LDP	194	EMZR09	EMZR09
ISPR_APM_F4 as a payload LDP	195	EMZR10	EMZR10
ISPR_JEM_A1 as a payload LDP	196	JAKR31	JAKR31
ISPR_JEM_A2 as a payload LDP	197	JAKR32	JAKR32
ISPR_JEM_A3 as a payload LDP	198	JAKR33	JAKR33
ISPR_JEM_A4 as a payload LDP	199	JAKR34	JAKR34

APPENDIX U LEGAL VALUES FOR LOGICAL DATA PATH (LDP) (Continued)

Payload LDPs			
NAME	**LDP**	**Logical DPUI**	**Physical DPUIs**
ISPR_JEM_A5 as a payload LDP	200	JAKR35	JAKR35
ISPR_JEM_F1 as a payload LDP	201	JAKR36	JAKR36
ISPR_JEM_F2 as a payload LDP	202	JAKR37	JAKR37
ISPR_JEM_F3 as a payload LDP	203	JAKR38	JAKR38
ISPR_JEM_F4 as a payload LDP	204	TBD	TBD
ISPR_JEM_F5 as a payload LDP	205	JAKR39	JAKR39
ISPR_JEM_F6 as a payload LDP	206	JAKR40	JAKR40
ISPR_P3_ULC_1 as a payload LDP	207	TBD	TBD
ISPR_P3_ULC_2 as a payload LDP	208	TBD	TBD
PCS/P-5 as a payload LDP	209	UPDK05	RFDL01,RFDL02, USDL01 thru USDL24
PLCU as a payload LDP	211	TBD	TBD
APS-1 as a payload LDP	232	LADZ03	LADZ03
APS-2 as a payload LDP	233	LADZ04	LADZ04
PCS/P-1 as a payload LDP	234	UPDK01	RFDL01,RFDL02, USDL01 thru USDL24
PCS/P-2 as a payload LDP	235	UPDK02	RFDL01,RFDL02, USDL01 thru USDL24
PCS/P-3 as a payload LDP	236	UPDK03	RFDL01,RFDL02, USDL01 thru USDL24
PCS/P-4 as a payload LDP	237	UPDK04	RFDL01,RFDL02, USDL01 thru USDL24
MMC_MTL as a payload LDP	239	LADB11	LADS10,LADS11
ISPR-LAC1 as a payload LDP	241	LAKR01	LAKR01
ISPR-LAC2 as a payload LDP	242	LAKR02	LAKR02
ISPR-LAC3 as a payload LDP	243	LAKR03	LAKR03
ISPR-LAC4 as a payload LDP	244	LAKR04	LAKR04
ISPR-LAC5 as a payload LDP	245	LAKR05	LAKR05
ISPR-LAS1 as a payload LDP	246	LAKR10	LAKR10
ISPR-LAS2 as a payload LDP	247	LAKR11	LAKR11
ISPR-LAS3 as a payload LDP	248	LAKR12	LAKR12
ISPR-LAS4 as a payload LDP	249	LAKR13	LAKR13
ISPR-LAP1 as a payload LDP	250	LAKR06	LAKR06
ISPR-LAP2 as a payload LDP	251	LAKR07	LAKR07
ISPR-LAP3 as a payload LDP	252	LAKR08	LAKR08
ISPR-LAP4 as a payload LDP	253	LAKR09	LAKR09
PEHG-1 as a payload LDP	254	LADZ01	LADZ01
PEHG-2 as a payload LDP	255	LADZ02	LADZ02

APPENDIX U LEGAL VALUES FOR LOGICAL DATA PATH (LDP) (Continued)

(1) Note: The following MSS Logical Device PUIs are applicable to LDPs 99, 100, 148:

Column A	Column B	Column C
LDP=99	LDP=100	LDP=148
(RWS_CEU_Lab)	(RWS_CEU_Cupola)	(RWS_CEU_Active)
CMRC11	CMRC21	CMRC13
CMRC10	CMRC20	CRRC30
CMRC12	CMRC22	CVRV10
CMRC14	CMRC24	CVRV20
CMRC23	CMRC27	
CMRH11	CMRH21	
CMRH12	CMRH22	
CMRP10	CMRP20	

APPENDIX V APPROVED REQUIREMENT EXCEPTIONS

V.1 SCOPE

This appendix specifies the requirement's Limited Applicability for this specification's Section 3.0, 4.0 requirements, and Appendicies. Corresponding paragraph numbers for which no limited applicabilities exist will not be included in this appendix.

V.2 APPENDIX STRUCTURE

Sections are organized by ascending paragraph number. For example. paragraphs comprised of 3.2.1.X paragraph numbers always appear in front of 3.2.2.X number paragraphs. Paragraph numbering corresponds to the affected specifications main body paragraph but with the leading **V** character matching the designator of the appendix.

V.3 REQUIREMENTS

V.3.5.1.9.1 PRAGMA SUPPRESS

<u>MDM Utilities</u>

The MDM Utilities, that is, the Enhanced MDM Utilities and the Standard MDM Utilities, shall be allowed to use PRAGMA SUPPRESS or the corresponding Alsys Compiler compile switch(s) to turn off access checking for those access objects (Ada objects whose type is of type access) used to access word only addressable MDM memory.

Rationale:

A disconnect between the MDM and the Alsys Compiler resulted in the need for Ada run-time checks to be turned off in specific instances. The design of MDM memory (SDRAM, registers, etc.) requires certain of this memory is word only addressable. Objects of type access are used to point to data structures in memory, including word only addressable memory, such as a SPUD card. When word only addressable memory is accessed with an object of type access, sometimes the compiler will have put in a test (TESTB) to determine if the access object is a null pointer. The compiler puts in the TESTB instruction when it cannot determine if the access object has been allocated memory prior to its first use. The TESTB instruction is a byte test with the intent of generating a page fault if the access object is a null pointer. The problem arises when the TESTB instruction is performed on word only addressable memory. When TESTB is performed on word only addressable memory an Intel CPU bus exception is raised. The Intel CPU bus exception in turn raises a non-Maskable Interrupt (NMI). The result of a NMI being raised can cause the program to crash, the box to hang or an exception signal being set back to the program by the NMI exception handler. What will not be returned to the program is an Ada exception.

APPENDIX V APPROVED REQUIREMENT EXCEPTIONS (CONTINUED)

It should be noted that the TESTB instruction is redundant. If the access object is a null pointer, any read or write operation using that access object will raise a page fault for the same cases the TESTB instruction raises the page fault. There is no loss of safety by suppressing access checks.