

# Reference Data

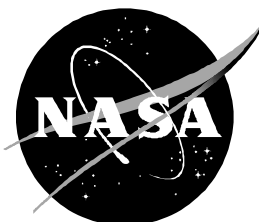
**Mission Operations Directorate  
Operations Division**

**Generic, Rev E  
July 8, 1999**

**NOTE**  
For STS-99 and subsequent flights

National Aeronautics and  
Space Administration

Lyndon B. Johnson Space Center  
Houston, Texas



REFERENCE DATA

GENERIC, Rev E (July 8, 1999)

## PCN-4 (Nov 19, 2001) Sheet 1 of 1

List of Implemented Change Requests (482s):

REF-964

REF-977

**NOTE**  
For STS-109 and subsequent flights

Incorporate the following:

1. Replace vii thru x
2. Replace A1-5 & A1-6, A1-9 thru A1-16, A1-23 & A1-24, B1-5 & B1-6, B1-9 thru B1-16, B1-23 & B1-24

Prepared by: \_\_\_\_\_  
Book Manager

Approved by: \_\_\_\_\_  
Manager, Shuttle Procedures Management (USA)

Accepted by: \_\_\_\_\_  
FDF Subsystem Manager (NASA)

Encl: 28 pages

**Verify this is the correct version for the pending operation (training, simulation or flight).**  
Electronic copies of FDF books are available. URL: <http://fltproc.jsc.nasa.gov/dfd>

***File this PCN immediately behind the front cover as a permanent record***

MISSION OPERATIONS DIRECTORATE

**REFERENCE DATA**

GENERIC, REVISION E  
July 8, 1999

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REF/ALL/GEN E

Incorporates the following:		
482#:	REF-900	MULTI-1448A
	REF-902	MULTI-1451
	REF-905	MULTI-1452

AREAS OF TECHNICAL RESPONSIBILITY

Book Manager	DO35/H. Scott	281-483-0670
Asst. Book Manager	DO35/L. Hansen	281-483-6030
GMEMs	DF22/R. Walton	281-483-6809

## NOTES

### 1. EPDC

The EPDC table includes CRITICAL equipment lost if a bus or sub bus is lost. Listed is hardware, switches, and instrumentation grouped under subheadings of (a) CRITICAL FUNCTIONS/EQUIPMENT LOST; (b) CRITICAL REDUNDANCY LOST; (c) INSTRUMENTATION/OTHER; and (d) OMS/RCS AFFECTED. For a complete listing of equipment lost, see BUS LOSS SSRs (MAL, EPS).

### 2. MDM

The MDM table includes a highly selective listing of input and output GPC parameters alerting the crew of I/O parameter (or contact) losses with element bypass failures of a specific MDM. Also included is a set of CRT displays which can be used to identify the loss of a specific OI DSC. The following I/O functions/displays have been excluded from the MDM tables:

Functions/displays lost during ascent (SRB, MPS, OMS crossfeed, ET/orbiter SEP cameras)

ET umbilical door and vent door functions

Loss of redundancy in the multi-redundant SM alert and C/W 'Backup C/W Alarm'

Loss of OMS-kit associated display functions

(Cont next page)

In the input and output columns, coded notation indicates the following:

A\* or B\* indicates dual redundancy – a two (A&B) contact (path) parameter. This is a convention for this publication. The actual designation of the contact could be numerical; i.e., 1 or 2 as examples.

BCE	GPC INPUT
B	FWD DAP AXES – A*

If MDM FF1 is lost: FF1 FWD DAP AXES A\* contact is lost. The dual redundant contact is indicated by B\* on another MDM as shown below.

B	FWD DAP AXES – B*
---	-------------------

FWD DAP AXES B\* contact is lost when MDM FF2 is lost.

1\*, 2\*, 3\*, or 4\* indicates triple or quad redundancy – a 3 or 4 contact (path) parameter.

BCE	GPC INPUT
B	AFT RHC – 1*

If MDM FF1 is lost: Similar to A\*(B\*) in previous example. Contact 1 lost but redundant contacts 2 & 3 or 2,3, & 4 are still available on other MDMs.

### 3. FAULT MESSAGES

With fault annunciation during ascent and entry, the crew should go directly to the appropriate PKT C/L contingency procedure. If on orbit and no PKT C/L procedure exists, the crew should go to the MAL book.

(Cont next page)

The 'MESSAGE' column of the Fault Messages notes the exact message annunciated on the display, and it can be driven by any of the 'CAUSES' stated. Only causes and fault messages resulting in flight situations requiring immediate response have PKT contingency procedures. For locating the specific procedure in the PKT, the appropriate system tab is lifted, exposing a complete array of contingency procedure titles on the ladder format. These ladder titles are at times more generic than the annunciated fault messages and/or the 'CAUSE' column drivers; in this case, the comment column is used to identify the PKT procedure.

#### 4. C/W

The C/W and FDA table provides annunciation limits for the hardwired primary C/W and software backup C/W and Fault Detection and Annunciation (FDA). These tables are followed by SM TABLE MAINTENANCE and HARDWARE C/W procedures used for the manipulation (changing) of C/W parameters and annunciation limits if required. The C/W and FDA table provides a comprehensive alphabetical listing of limit-sensed parameters which can result in a Class 2 or 3 alarm, and also information which can be used by the crew to alter limits in order to eliminate nuisance alarms.

The table columns are organized as follows. The parameter name is consistent with the appropriate CRT display as much as possible. Footnotes attached to the parameter name indicate OPS and Major Mode (MM) availability and which Major Function (GNC or SM) of the Flight System (PASS, BFS, or both) is doing the limit sensing. All parameters are sensed by both PASS and BFS SM Major Functions unless otherwise specified. The C/W CH column gives the hardwired parameter number, matching the numbers on the status matrix panel R13. The H/W C/W columns present the low and high Primary C/W (hardwired) limits in volts DC (VDC). In the few cases where hardwired limits are not backed up by identical

(Cont next page)

software limits, the value in engineering units (EU) is printed below or to the side of the value in VDC in parentheses. The Software ID column gives the Parameter ID number to be used when altering parameter fault detection via Table Maintenance, PASS SM SPEC 60. Software IDs for BFS SM limits are also given, although at the present time there is no BFS equivalent to the Table Maintenance SPEC. GNC limit-sensed parameters cannot be changed except by memory read/write, and I-LOAD identification numbers are provided for them. The SPEC column provides the system-level SPEC or DISP number on which the parameter appears. The SM ALERT columns contain the low and high SM (Class 3) Alert limits in EU. The Backup C/W columns contain the low and high Backup C/W (Class 2) software limits in EU. The last column identifies precondition characteristics where applicable, and where possible it describes the circumstances which generate the bilevel change of state and subsequent alarm. In addition, there are a few notes describing unusual cases.

#### 5. GPC Memory Data Locations

This section contains GPC Memory (GMEM) data used to access particular parameters with the orbiter GPCs.



REFERENCE DATA

**LIST OF EFFECTIVE PAGES**

GENERIC 10/15/87  
 REV E 07/08/99  
 PCN-1 01/20/00  
 PCN-2 03/17/00  
 PCN-3 12/12/00  
 PCN-4 11/19/01

Sign Off . . . . *	ALL/GEN E	A1-19 . . . . .	ALL/GEN E
ii . . . . . *	ALL/GEN E	A1-20 . . . . .	MEDS/GEN E,1
iii . . . . . *	ALL/GEN E	A1-21 . . . . .	MEDS/GEN E
iv . . . . . *	ALL/GEN E	A1-22 . . . . .	ALL/GEN E
v . . . . . *	ALL/GEN E	A1-23 . . . . .	ALL/GEN E
vi . . . . . *	ALL/GEN E	A1-24 . . . . .	MEDS/GEN E,4
vii . . . . . *	ALL/GEN E,4	A1-25 . . . . .	MEDS/GEN E,3
viii . . . . . *	ALL/GEN E,4	A1-26 . . . . .	MEDS/GEN E,3
ix . . . . . *	ALL/GEN E,4	A1-27 . . . . .	MEDS/GEN E,3
x . . . . . *	ALL/GEN E,4	A1-28 . . . . .	MEDS/GEN E,3
xi . . . . .	ALL/GEN E,1	B1-3 . . . . .	ALL/GEN E
xii . . . . .	ALL/GEN E	B1-4 . . . . .	NOM/GEN E
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A1-18 . . . . .	MEDS/GEN E,1	B1-22 . . . . .	ALL/GEN E

\* - Omit from flight book

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B1-25 .....	NOM/GEN E,3	A3-8 .....	MEDS/GEN E
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EPDC

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**EPDC**

EPDC

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1-2

REF/ALL/GEN E



The following decal scheme is used onboard the orbiter to identify the phase-related, nominal position of all circuit breakers:

cb COLOR CODE (Nominal Position)

- RED – OPEN ALL PHASES
- GREEN – OPEN ON-ORBIT
- YELLOW – OPEN ASCENT
- ORANGE – OPEN ORBIT AND ENTRY
- BLACK – CLOSED ALL PHASES

MNA

CRITICAL FUNCTIONS/EQUIP LOST

Functions or equipment lost during ASC/ENT which would require manual action be taken by crew

CRITICAL REDUNDANCY LOST

Loss of function or equipment with automatic redundancy. No action required by crew, but loss could be serious

INSTRUMENTATION/OTHER

A “catch-all” column containing items which do not belong in other categories

OMS/RCS AFFECTED

Loss of control of OMS/RCS systems (vlvs, sws, etc). Some OMS/RCS systems considered critical are listed in column 1

**MEDS**

A1-3

REF/ALL/GEN E

MNA

**CRITICAL EQUIPMENT LOST – MNA/AC1**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED	
<b>MNA</b>	<b>DA1</b>		Cryo O2/H2 Tk 1/3 Htrs A		
	<b>FPC1</b>	IDP 1 MDU CRT 1 L HUD MMU 1	LG Hyd Sys 1 Dpy (Pyros & NLG Hyd Sys 2 Dpy remain) NWS Hyd Sys 1	MCIU PDI Redundancy F RCS A Htrs	
	<b>FLC1</b>	F1 Manf Jets Bay 3 Agent Discharge			F RCS He P A (CL & GPC)
	<b>FMC1</b>	H2O Loop 1 Pump A	L Probe Mtr 1 Dpy Dsc 1	-Y S TRK SYS 1	F RCS Tk Isol 3/4/5 Manf Isol 1
	<b>AC1 multi</b>	FC1 Pumps Freon Pump 1A,2B H2O Loop 1 Pump A Av Bay Fan 1A,3B	L Probe Mtr 1 IMU Fan A PLBD Blkhd Lat,Stbd Dr Mtr Redun ET Door C/L,L Lat Mtr Redun L Dr Closure Mtr Redun Rad Port/Stbd Lat,Dpy/Sto Mtr Redun Ark/Tnl Fan A <sup>a</sup>	-Y S TRK SYS 1 Door Mtr Humidity Sep A RCS/OMS Prplt Qty RMS MRL Redun WCS Fan/Sep 1 PRLA Drive Mtr Sys 1 EDO WCS Urine Fan and Sep 1 EDO WCS Commode Fan 1	L,R OMS Tk Isol A L OMS Xfeed A L,R RCS Tk Isol 3/4/5 A Xfeed 3/4/5 Manf Isol 2 F RCS Tk Isol 3/4/5 Manf Isol 1
	<b>ΦA</b>	Blr Cntrl 1B Pwr CO2 Removal Sys Cntrl 1	FCL 1 Cntrl B Rad Byp vlv Mtr H2O Loop 2 Byp Cntrl C ME Ch A R ME Ch B	H2O Loop 2 Instr RMS Shldr Brace Rel Cabin Temp Cntrl Sys 2 FC1 pH Snsr 1Φ of: WCS Fan/Sep 1 EDO WCS Urine Fan and Sep 1 (All functions lost) EDO WCS Commode Fan 1	

<sup>a</sup>Docking missions only

**MEDS**

<b>M N A</b>	<b>FPC1</b>				
	<b>AC1 multi</b>				
	<b>ΦB</b>	Av Bay 2 Sig Condr	FCL 2 Cntr B Rad Byp vlv Mtr C ME Ch A R ME Ch B	RCS/OMS Prplt Qty Cabin Air Sig Condr Fwd Timers Hyd 1 Qty Snsr 1Φ of: WCS Fan/Sep 1 EDO WCS Urine Fan and Sep 1 (All functions lost) EDO WCS Commode Fan 1	
	<b>ΦC</b>	TACAN 1 (if Gould) Blr Cntr 3A Pwr	C ME Ch A R ME Ch B	1Φ of: WCS Fan/Sep 1 EDO WCS Urine Fan and Sep 1 (All functions lost) EDO WCS Commode Fan 1	
	<b>ML86B</b>	CO2 Removal Sys Cntr 1	Ku-Bd Jett Redun	WCS Fan Sep 1 Mtr Relay EDO WCS Controller and Compactor MNA Pwr	
	<b>APC4</b>	ATVC Ch 2 SSME/SRB Isol Cap	APU Cntr Pwr 1A,3B 1 GBx GN2 Repress vlv	APU Fu Tk vlv 3B ind 3 Turbine Speed ind	
	<b>APC1</b>	L OMS Pri TVC R OMS Sec TVC	APU GG/Fu Htrs 1A,3B	RCS/OMS Htrs L Pod A R Pod B Xfeed Lines A APU GG Inj H2O Htrs 1A,3B	L,R RCS He P A (CL & GPC) L,R OMS He P/vap Isol A (GPC OP) L,R OMS Eng vlv 1 Pos (=0) L Manf 5 Jets L RCS He P B (man OP)

(Cont next page)

A1-5

**MEDS**  
REF/MEDS/GEN E,4

**CRITICAL EQUIPMENT LOST – MNA/AC1 (Cont)**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED	
<b>M N A</b>	<b>APC4</b>				
	<b>ALC1</b>	Blr Cntrl 1B,3A Pwr FES Cntrl Pri B Top L Noz Htr A NH3 Cntrl Pri A (GPC) Auto sw-over C Me He Isol A Top/Hi Load Duct Htrs A	FES H2O Fdln A(B) Htrs 1(2) APU Fu/Tk vlv 1A,3B L,R OMS Ign Path APU GG/Fu Htrs 1A,3B Hyd Brake Isol vlv 1 Cntl (tb-OP)	Hyd MPS/TVC Isol vlv 1 Cntl (tb-CL) L,R RCS Manf 2 Jet Htrs APU Lube Oil Htrs 1A,3B OMS Qty Gaging Hyd Circ Pump 1,3 MNA Pwr RCS/OMS Htrs Xfd Lines A	L,R RCS He P A (CL & GPC) L Manf 5 jets L OMS Eng P vlv Pos L RCS He P B (man OP) L,R OMS He P/Vap Isol A (GPC OP)
	<b>AMC1</b>		LG Extend Isol vlv (tb-OP) NWS Hyd Sys 1	*****GPC***** ET Door C/L,L Lat Mtr Redun ET Door L Dr Closure Mtr Redun	
	<b>O14</b>	TACAN 1 (if Collins) RA 1 MLS 1 AA 1 ADTA 1 Bay 3 Agent Discharge L ME Status Lts NWS 1	Atm O2 Sys 1 Xovr vlv Atm P N2 Sys 1 Sply & Reg In sws FCL 1,2 Rad Flow Cntrl B O2/N2 Cntrl 1 Rad Isol Auto Contr	PPO2 Snsr A L Ovrhd Cnsl Flood Fwd Mission Timer IMU Fan Snsr Smoke Det: L,R Flt Dk Av Bay 2A,3B  -Z S TRK ACA 1 MNA Pwr O2/N2 Cntrl Sys 1 Aft Event Timer Cabin Vent Isol/Vent sws	

(Cont next page)

**MEDS**

<b>M N A</b>	<b>O14 &amp; A8</b>			RMS Pri Pwr	F1 Manf RJDs (if sw OFF)
	<b>R14</b>	MDU MFD 2 PLT 1 ADC 1A/2A UHF Pwr Amp MS ATU/CCU	GCIL Pwr Redun ACCU Data Word Redun	OS SU	
	<b>A6 &amp; A14</b>			F RCS Jet 1 Htrs PRLA Drive Mtr Sys 1	
	<b>MPC1</b>	O2 Sys 1 Sply sw (tb-CL) Top/Hi Load Duct Htrs A	FC H2O Ln and Rlf Htrs A Docking Sys Pwr Sys 1 OIU 1 Pwr Redun	FC1 H2,O2 Flow Xdcrs FC3 Redun Reac Vlv Close (via pnl C3) RMS Pri Pwr Vest Dep Vlv Sys 1 Vent Vent Isol	
	<b>MMC1 MMC3</b>		PLBD C/L,Blkhd Lat,Stbd Dr Mtr Redun Rad Port/Stbd Sto/Dpy Mtr Redun	RMS Redun MRL	

A1-7

**MEDS**  
REF/MEDS/GEN E,3

**MNB**

**MNB**

**CRITICAL EQUIPMENT LOST – MNB/AC2**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED	
<b>M N B</b>	<b>DA2</b>		Cryo O2/H2 Tk 2/3/4 Htrs B Cryo O2/H2 Tk 2/3/4 Htrs A (if in AUTO)		
	<b>FPC2</b>	IDP 2 MDU CRT 2 MMU 2 GPS 2	NLG Hyd Sys 2 Dpy capability NWS Hyd Sys 2 LG B/U Rel Sys 2	F RCS B Htrs LMG/NLG UP and DN tb	
	<b>FLC2</b>	F2 Manf Jets S-Bd String 1 Bay 1 Agent Discharge cap	PL Intrg 1 PSP 1 LMG,NLG B/U Rel Sys 2	LMG/NLG UP and DN tb	F RCS He P B (CL & GPC) A (man OP)
	<b>FMC2</b>	H2O Loop 1 Pump B	L,R Probes Mtrs 2 Dpy Dsc 2	-Y S Trk Sys 2 -Z S Trk Sys 1	F RCS Manf Isol 2 & TM
	<b>AC2 multi</b>	FC2 Pumps Av Bay Fan 1B,2A Freon Pump 1B H2O Loop 1 Pump 1B	Cabin Fan B L,R Probe Mtrs 2 IMU Fan B PLBD C/L,Blkhd Lat,Port/Stbd Dr Mtr Redun ET Door C/L,L,R Lat Mtr Redun R Dr Closure Mtr Redun Ku-Bd Sto/Dpy Redun Rad Port/Stbd Lat Redun Ark/Tnl Fan B <sup>a</sup>	RMS MPM, MRL Redun Cabin Temp Cntrl Sys 1 Humidity Sep B PRLA Drive Mtr Sys 2 WCS Fan/Sep 2 -Y S Trk Sys 2 Door Mtr -Z S Trk Sys 1 Door Mtr L,R Seat AC2 Pwr EDO WCS Urine Fan and Sep 2 EDO WCS Commode Fan 2	L,R OMS Xfeed B RCS Tk Isol 3/4/5 B Manf Isol 1 F RCS Manf Isol 2

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<sup>a</sup>Docking missions only

<b>M N B</b>	<b>FPC2</b>			
	<b>AC2 multi</b>			
	<b>ΦA</b>	Blr Cntrl 1A Pwr	L ME Ch A C ME Ch B LG Prox Snsr 2	LMG & NLG UP & DN tb FC 2 pH Snsr Cabin Temp Cntrl Sys 1 1Φ of: WCS Fan/Sep 2 EDO WCS Urine Fan and Sep 2 (All functions lost) EDO WCS Commode Fan 2
	<b>ΦB</b>	Av Bay 3 Sig Condr	FCL 1 Cntrl A Rad Byp Vlv Mtr A L ME Ch A C ME Ch B	Freon S/C AC2 Pwr Hyd 2 Qty Snsr 1Φ of: WCS Fan/Sep 2 EDO WCS Urine Fan and Sep 2 (All functions lost) EDO WCS Commode Fan 2
	<b>ΦC</b>	TACAN 2 (if Gould) Blr Cntrl 2B Pwr	L ME Ch A C ME Ch B FCL 1,2 Rad Isol Vlv Mtr A	1Φ of: WCS Fan/Sep 2 EDO WCS Urine Fan and Sep 2 (All functions lost) EDO WCS Commode Fan 2
	<b>ML86B</b>		RMS Jet Redun	WCS Sep Fan 2 Mtr Relay EDO WCS Controller and Compactor MNB Pwr L,R Seat AC2 Pwr

(Cont next page)

**CRITICAL EQUIPMENT LOST – MNB/AC2 (Cont)**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED	
<b>M N B</b>	<b>APC5</b>	RGA 2 ATVC Ch 3 SSME/SRB Isol Cap	APU Cntr Pwr 1B,2A 2 GBx GN2 Repress vlv	APU 1 Turbine Speed ind Fu Tk vlv 1B ind Freon Loop 1 Cldplate Flow Xdcr	
	<b>APC2</b>	L OMS Sec TVC ATVC Ch 4 SSME/SRB Isol Cap ASA Ch 4 Isol Cap	APU GG/Fu Htrs 1B,2A	APU GG Inj H2O Htr 1B Aft PL MNB Bus Pwr Htrs L Pod B RCS/OMS Htrs R Pod A, Xfeed Lines B	L OMS He P/Vap Isol B (GPC OP) R OMS He P/Vap Isol A,B (man OP) R Manf 5 Jets L,R RCS He P A (man OP) R RCS He P B (CL & GPC) L OMS Eng vlv 2 Pos (=0)
	<b>ALC2</b>	Blr Cntr 2B,1A Pwr Sec Flash Evap Cntr Top L Noz Htr B R Noz Htr A Top/Hi Load Duct Htrs B L ME He Isol A	FES H2O Fdln Htrs 2 (except mid 2) APU/Fu vlv/Tk 1B,2A L OMS Ignition Path APU GG/Fu Htrs 1B,2A Hyd Brake Isol vlv 2 Cntl (tb-OP) NWS Hyd Sys 2 NLG Hyd Sys 2 Dpy capability	APU Lube Oil Htrs 1B,2A L,R RCS Manf 1 Jet Htrs OMS Qty Gaging for L Burn NH3 Cntr B Sec – man sel Hyd Circ Pump 1 & 2 MNB Pwr Hyd MPS/TVC Isol vlv 2 Cntl (tb-CL) RCS/OMS Htrs Xfd Lines B	L OMS He P/Vap Isol B (GPC OP) L,R RCS He P A (man OP) R Manf 5 Jets R RCS He P B (CL & GPC)
	<b>AMC2</b>			*****GPC***** ET Door C/L,L,R Lat Mtr Redun ET Door R Dr Closure Mtr Redun	

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**MEDS**



<b>M N B</b>	<b>O15</b>	TACAN 2 (if Collins) RA 2 MLS 2 AA 2 ADTA 2 Bay 1 Agent Discharge Cap C,R ME Status lts NWS 2 GPS 2 Pre Amps (Up/Lwr)	FCL 1,2 Rad Flow Cntrl A Atm O2 Sys 2 Xovr Vlv Atm P N2 Sys 2 Sply & Reg In sws Drag Chute PLT Arm	PPO2 Snsr B,C Fwd Event Timer L Seat/Ctr Cnsl Flood R Ovhd Cnsl Flood Av Bay Smoke Det 1B,3A -Y S Trk ACA 1,2,3 MNB Pwr dP/dT Snsr O2/N2 Cntrl Sys 2 Cabin Relief A sw Docking Sys Pwr Sys 2 Redun	
	<b>O15 &amp; A8</b>			RMS B/U Pwr	F2 Manf RJDs (if sw OFF)
	<b>R14</b>	Ku-A System (Comm & Radar) MDU CDR 2 MFD 1 ADC 1B/2B VPU			
	<b>A6 &amp; A14</b>			F RCS Jet 2,3 Htrs PRLA Drive Mtr Sys 2	
	<b>MPC2</b>	O2 Sys 2 Sply sw (tb-CL) Top/Hi Load Duct Htrs B Ku-A System (Comm & Radar) OIU 2	Docking Sys Pwr Sys 2 OIU 1 Pwr Redun	FC1 Redun Reac Vlv Close (via pnl C3) FC2 H2,O2 Flow Xdcrs RMS B/U Pwr Vest Dep Vlv Sys 2 Vent Vent Isol	
	<b>MMC2 MMC4</b>		PLBD C/L,Blkhd Lat,Port/Stbd Dr Mtr Redun	RMS Redun MPM,MRL	

# MEDS

A1-11

REF/MEDS/GEN E,4

**MNC**

## MNC

### CRITICAL EQUIPMENT LOST – MNC/AC3

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED	
<b>M N C</b>	<b>DA3</b>		Cryo O2/H2 Tk 1 Htrs B 2,4 Htrs A Cryo O2/H2 Tk 1 Htrs A (if in AUTO)	PRIPL Bus MNC Pwr	
	<b>FPC3</b>	IDP 3,4 MDU CRT 3/4 R HUD	LG B/U Rel Sys 1	NLG UP tb, RMG UP & DN tb PDI Redun Ku-Bd Sys (Comm & Radar)	
	<b>FLC3</b>	F4 Manf Jets S-Bd String 2 Bay 2 Agent Discharge Cap	PL Intrg 2 PSP 2 RMG,NLG B/U Rel Sys 1	NWS Fail It RMG UP & DN tb NLG UP tb	F RCS He P B (man OP) F5 Manf Jets F RCS Manf Isol 5 & TM (Jets Lost)
	<b>FMC3</b>		R Probe Mtr 1 Dpy Dsc 1	-Z S Trk Sys 2	F RCS Tk Isol 1/2 Manf Isol 3/4 4 TM
	<b>AC3 multi</b>	FC3 Pumps Freon Pump 2A Av Bay Fans 2B,3A H2O Loop 2 Pmp Man ON	Cabin Fan A R Probe Mtr 1 IMU Fan C PLBD C/L,Blkhd Lat,Port Dr Mtr Redun ET Door C/L,R Lat Mtr Redun ET Door L,R Dr Closure Mtr Redun Rad Port/Stbd Lat,Dpy/Sto Mtr Redun	RMS MPM,MRL Redun L Seat AC3 Pwr IMU Fan S/C Hum Sep S/C -Z S Trk Sys 2 Door Mtr	L,R OMS Tk Isol B R OMS Xfeed A L,R RCS Tk Isol 1/2 F RCS Tk Isol 1/2 L,R RCS Xfeed 1/2 F,L,R RCS Manf Isol 3/4

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# MEDS

A1-12

REF/MEDS/GEN E,4

<b>M N C</b>	<b>FPC3</b>				
	<b>AC3 multi</b>				
	<b>ΦA</b>	Blr Cntrl 2A Pwr COAS CO2 Removal Sys Cntrl 2	L ME Ch B R ME Ch A LG Prox Snsr 1	NLG UP tb RMG UP & DN tb H2O Loop 1 Instr Byp Cntrl Hum Sep S/C FC 3 pH Snsr	
	<b>ΦB</b>	Av Bay 1 Sig Condr	FCL 2 Cntrl A Rad Byp vlv Mtr R ME Ch A L ME Ch B	Freon S/C AC3 Pwr Hyd 3 Qty Snsr	
	<b>ΦC</b>	TACAN 3 (if Gould) Blr Cntrl 3B Pwr	L ME Ch B R ME Ch A FCL 1,2 Rad Isol Vlv Mtr B		
	<b>ML86B</b>	CO2 Removal Sys Cntrl 2	RMS Jett Redun Ku-Bd Jett Redun	L,R Seat AC3 Pwr	
	<b>APC6</b>	ATVC Ch 1 SSME/SRB Isol cap	APU Cntrl Pwr 2B,3A 3 GBx GN2 Repress vlv	APU 2 Turbine Speed ind Fu Tk vlv 2B ind Freon Loop 2 Cldplate Flow Xdcr	
<b>APC3</b>	R OMS Pri TVC	APU GG/Fu Htrs 2B,3A Fu Tk vlv 2B	APU GG Inj H2O Htrs 3A RCS/OMS Htrs L,R Pod B Aft PL MNC Bus Pwr	L OMS He P/Vap Isol A,B (man OP) R OMS He P/Vap Isol B (GPC OP) R RCS He P B (man OP) R OMS Eng vlv 2 Pos (=0) L RCS He P B (CL & GPC) L,R RCS Manf Isol 5	

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**CRITICAL EQUIPMENT LOST – MNC/AC3 (Cont)**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED	
<b>M N C</b>	<b>APC6</b>				
	<b>ALC3</b>	Blr Cntrl 2A,3B Pwr R ME He Isol A Flash Evap Cntrl Pri A Top R Noz Htr B	FES H2O Fdln B Htrs 1 (ex mid 2) APU Fu/Tk vlv 2B,3A GG/Fu Htrs 2B,3A R OMS Ignition Path Hyd Brake Isol vlv 3 Cntl (tb-OP)	OMS Qty Gaging for R Brn APU Lube Oil Htrs 2B,3A Hyd Circ Pmp 2,3 MNC Pwr L,R RCS Manf 3/4/5 Jet Htrs Hyd MPS/TVC Isol vlv 3 Cntl (tb-CL) NH3 Cntrl B Pri Sec auto sw-over A Sec – man sel	R OMS He P/Vap Isol B (GPC OP) L RCS He P B (CL & GPC) R OMS Eng P viv Pos RCS He P B (man OP) L,R RCS Manf Isol 5
	<b>AMC3</b>			*****GPC***** ET Door C/L,R Lat Mtr Redun ET Door C/L,L,R Dr Closure Mtr Redun (GPC Cntl)	
	<b>O16</b>	TACAN 3 (if Collins) MLS 3 ADTA 3,4 Bay 2 Agent Disch cap Atm P Cntrl O2 Emer sw	Drag Chute CDR Arm	Smoke Det: Cabin Av Bay 1A,2B R Seat/Ctr Cnsl Flood Cabin Relief B sw OMS/RCS Qty Meter (pnl O3) ACA 2,3 MNC Pwr Aft Mission Timer Docking Sys Pwr Sys 2 Redun	
	<b>O16 RJD</b>				F4 Manf RJDs (if F3 & F4/5 sw OFF)
	<b>A6 &amp; A14</b>			F RCS Jet 4/5 Htrs	

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**MEDS**

<b>M N C</b>	<b>R14</b>	MDU CDR 1 PLT 2 AFD 1	GCIL Pwr Redun	Audio Center 2 Ku-A Sig Proc (Comm) PS ATU/CCU	
	<b>MPC3</b>	RGA 3	FC H2O Ln & Rlf Htrs B Docking Sys Pwr Redun	FC2 Redun Reac Vlv Close (via pnl C3) FC3 H2,O2 Flow Xdcrs	
	<b>MMC2 MMC4</b>		PLBD C/L,Blkhd Lat,Port Dr Mtr Redun Rad Port/Stbd Sto/Dpy Mtr Redun	RMS MPM,MRL Redun	

A1-15

**MEDS**  
REF/MEDS/GEN E,4

**CNTL**

## CNTL

### CRITICAL EQUIPMENT LOST – CONTROL BUS AB

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED
<b>CNTL AB1</b>	IDP 1 MDU CRT 1 MMU 1 COMSEC 1 FES Pri B GPC cap C ME Shutdown pb Top/Hi Load Duct Htrs A Blr Cntrl 1B Pwr L Pnl Trim Body Flap	L Probe Mtr 1 FC H2O Ln & Rif Htrs A L OMS Ignition Path APU GG/Fu Htrs 1A,3B Fu Tk Vlv 1A Cntrl Pwr 1A 1 GBx GN2 Repress Vlv PLBD C/L,Blkhd Lt,Stbd Dr Mtr Redun Rad Port/Stbd Lat,Sto/Dpy Mtr Redun LG B/U Rel Sys 2 NLG Hyd Sys 2 Dpy capability NWS Hyd Sys 2	APU GG Inj H2O Htrs 1A,2A Lube Oil Htrs 1A FES H2O Fdln Htrs B 1 RCS/OMS Htrs L Pod A F RCS A L,R RCS Manf 2 Jet Htrs Hyd Circ Pmp 1,3 MNA Pwr RMS MRL Redun APU 1 GG Bed T ind (APU running) APU 1 GBx P ind (APU running) NWS Fail indication PRLA Drive Mtr Sys 1 -Y S Trk Sys 1 Door Mtr  *****man sw cap***** Atm P Cntrl O2 Sys 1 Sply FC1 STOP & Reac Vlvs FC3 Redun Reac Vlv Close (via pnl C3) Cryo O2/H2 Manf Vlv Tk 1 L ADI Att Ref Set cap Hyd Brake Isol Vlv 1 MPS/TVC Isol 1 ET Door C/L,L,R Lat Mtr Redun ET Door L Dr Closure Mtr Redun	F1 Manf RJDs (if sw OFF) L RCS Manf Isol 2 F RCS Manf Isol 1  *****man CL cap***** L,R RCS Xfeed 3/4/5 A OMS Tk Isol A Xfeed A F,L RCS He P A  *****man OP & CL cap***** L RCS Tk Isol 3/4/5 A F RCS Tk Isol 3/4/5 R OMS He P Isol A Vap Isol 1,2

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<b>CNTL AB1</b> (Cont)			*****man ON cap***** NH3 Cntrl A Sec - Man Sel Cryo O2/H2 Tk 1 Htr B 3 Htr A	
<b>CNTL AB2</b>	L HUD MMU 2 Blr Cntrl 1B Pwr F1 Manf Jets Top/Hi Load Duct Htrs A FES Cntrl Pri B ON H2O Loop 1 A (ON) ATVC Ch 2 SSME Isol cap CDR sws Green Dot Top L Noz Htr B	L Probe Mtr APU GG/Fu Htrs 1A L OMS Ignition Path APU Fu Tk Vlv 2B PLBD C/L,Blkhd Lat Mtr Redun Rad Port/Stbd Lat, Sto/Dpy Mtr Redun	Hyd Circ Pmp 1 MNA Pwr FES H2O Fldn Htrs 1A RCS/OMS Htrs L Pod A F RCS A APU GG Inj H2O Tk Htrs A  *****man sw cap***** Cryo O2/H2 Tk 1 Htr B Tk 3 Htr A Manf Vlv Tk 1 FC1 STOP, Reac Vlvs L ADI Att Ref Set cap Atm P Cntrl O2 Sys 1 Sply Hyd MPS/TVC Isol 1 ET Door C/L,L,R Lat Mtr Redun ET Door R Dr Closure Mtr Redun LG Extend Isol Vlv -Y S Trk Sys 1 Door Mtr Close cap  *****man ON cap***** NH3 Cntrl B Sec - Man Sel	*****man sw cap***** L Manf 5 RJDs (if sw OFF) R RCS Manf Isol 2  *****man CL cap***** L,R RCS Xfeed 3/4/5 L,R OMS Tk Isol A Xfeed A F RCS Tk Isol 3/4/5 (and man GPC CL ovrdr) R RCS He P A  *****man OP & CL cap***** R RCS Tk Isol 3/4/5 A  **man OP,CL, & GPC cap** L,F RCS He P A

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**MEDS**

A1-17

REF/ALL/GEN E,1

**CRITICAL EQUIPMENT LOST – CONTROL BUS AB (Cont)**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED
<b>CNTL AB3</b>	COMSEC 2 Blr Cntrl 1A,3A Pwr Top/Hi Load Duct Htrs A Auto PLBD Ops H2O Loop 1 Pump A CDRs BFS Engage GPCs 1,2,4 – No Engage MPS Dump Seq Start sw	L Probe Mtr 1 Dpy Dsc 1 APU GG/Fu Pmp Htrs 1B Tk Fu Ln Htrs 1A,3B Cntrl Pwr 3B Fu Tk Vlv 3B PLBD C/L,Blkhd Lat,Stbd Dr Mtr Redun Rad Port/Stbd Lat,Sto/Dpy Mtr Redun LG Hyd Sys 1 Dpy (Pyros and NLG Hyd Sys 2 Dpy remain) NWS Hyd Sys 1	Hyd Circ Pmp 1 MNB Pwr APU GG Inj H2O Htrs 3B Lube Oil Htrs 1B 3 Turbine Speed ind RMS MRL Redun RCS/OMS Htrs Xfeed Ln A All Pnl C3 Man Mode pbs (18) –Y S Trk Sys 1 Door Mtr  *****GPC***** ET Door C/L Lat Mtr Redun L Dr Closure Mtr Redun (GPC Cntl)	F RCS Tk Isol 3/4/5 Manf Isol 1  **man OP,CL, & GPC cap** R RCS He P A



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**CRITICAL EQUIPMENT LOST – CONTROL BUS BC**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED
<b>CNTL BC1</b>	R HUD RGA 2 S-Bd String 1 Top L Noz Htr A L Pnl Trim L Body Flap Top/Hi Load Duct Htrs B Blr Cntrl 2B Pwr Drag Chute CDR Dpy Fire 2 Jett Fire 2  GPS 2 C ME Shutdown pb	PSP 1 PL Intrg 1 F,L,R Manf 5 Jets L,R Probe Mtrs 2 APU GG/Fu Htrs 2A,1B FC H2O Ln & Rlf Htrs B APU Cntrl Pwr 1B Fu Tk Vlv 1B PLBD C/L,Blkhd Lat,Port Dr Mtr Redun Rad Port/Stbd Lat,Sto/Dpy Mtr Redun Ku-Bd Sto/Dpy Mtr Redun LG B/U Rel Sys 2 NLG Hyd Sys 2 Dpy capability NWS Hyd Sys 2	APU Lube Oil Htrs 2A GG Inj H2O Htrs 1B,2B 1 Turbine Speed ind Hyd Circ Pmp 1,2 MNB Pwr RCS/OMS Htrs L Pod B R Pod A F RCS B RMS MPM,MRL Redun L,R RCS Manf 1 Jet Htrs PDI Redun PRLA Drive Mtr Sys 2 -Y S Trk Sys 2 Door Mtr Close cap -Z S Trk Sys 1 Door Mtr  *****man sw cap***** Hyd Brake Isol Vlv 2 MPS/TVC Isol 2 Cryo O2/H2 Manf Vlv Tk 2 Tk 2,4 Htrs Atm P Cntl O2 Sys 2 Sply FC1 Redun Reac Vlv Close (via pnl C3) FC2 STOP, Reac Vlvs R ADI Att Ref Set cap	F2 Manf RJDs (if sw OFF) L RCS Manf Isol 1 F RCS Manf Isol 2  *****man CL cap***** L OMS Tk Isol B L,R OMS Xfeed B F,R RCS He P B  *****man OP & CL cap***** L,R OMS He P/Vap Isol B L RCS Tk Isol 3/4/5 B

**MEDS**

<b>CNTL BC2</b>	IDP 2 MDU CRT 2 S-Bd String 2 Blr Cntrl 2B Pwr R Pnl Trim R Body Flap F2 Manf Jets PLT sws Green Dot ASA Ch 4 Isol cap Top/Hi Load Duct Htrs B L ME Shutdown pb H2O Loop 1 B (ON) Drag Chute CDR Dpy Fire 1 Jett Fire 1	PSP 2 PL Intrg 2 F,L,R Manf 5 Jets L,R Probe Mtrs 2 APU GG/Fu Htrs 2A Cntrl Pwr 2A Fu Tk Vlv 2B 2 GBx GN2 Repress Vlv PLBD Blkhd Lat,Stbd Dr Mtr Redun Rad Port/Stbd Lat,Stbd Sto/Dpy Mtr Redun Ku-Bd Sto/Dpy Mtr Redun LG B/U Rel Sys 2 NLG Hyd Sys Dpy capability NWS Hyd Sys 2	Freon Loop 1 Cldplate Flow Xdcr Hyd Circ Pmp 2 MNB Pwr RCS/OMS Htrs L Pod B R Pod A F RCS B APU GG Inj H2O Tk Htrs B APU 2 GG Bed T ind (APU running) APU 2 GBx P ind (APU running) FES H2O Fdln A Htrs 2 PDI Redun RMS MPM,MRL Redun NH3 Cntrl B Pri NH3 Cntrl B Sec Auto switchover Cryo O2/H2 Tk 2/4 Htrs A All Pnl A6 Man Mode pbs (18) PRLA Drive Mtr Sys 2 -Y S Trk Sys 2 Door Mtr -Z S Trk Sys 1 Door Mtr Close cap  *****man sw cap***** Hyd MPS/TVC Isol 2 Atm P Cntl O2 Sys 2 Sply Cryo O2/H2 Manf Vlv Tk 2 Sec FES Cntrl (if GPC) FC2 STOP, Reac Vlvs R ADI Att Ref Set cap	R RCS Manf Isol 1  *****man CL cap***** L OMS Tk Isol B L,R OMS Xfeed B  *****man OP & CL cap***** R RCS Tk Isol 3/4/5 B  **man OP,CL, & GPC cap** F,R RCS He P B
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**CRITICAL EQUIPMENT LOST – CONTROL BUS BC (Cont)**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED
<b>CNTL BC3</b>	H2O Loop 1 Pump B Blr Cntrl 1A,2A Pwr ATVC Ch 3/4 SSME Isol cap R ME Shutdown pb Top R Noz Htr A MPS Dump Seq Start sw Sec FES Cntrl (if sw ON) Top/Hi Load Duct Htrs B Auto PLBD Ops	L,R Probe Mtrs 2 Dpy Dsc 2 APU Fu Tk Vlv 3B PLBD C/L,Blkhd Lat,Port/Stbd Dr Mtr Redun Rad Port/Stbd Lat,Dpy Mtr Redun LG B/U Rel Sys 1	APU GG/Lube/Tk Htrs 2B Tk Htrs 1B,2A RMS Redun RCS/OMS Htrs Xfeed Ln B All Pnl C3 Man Mode pbs (18) Smoke Det Circ Test NH3 Cntrl A Pri NH3 Cntrl A Sec Auto switchover -Y S Trk Sys 2 Door Mtr -Z S Trk Sys 1 Door Mtr  *****man ON cap***** Cryo O2/H2 Tk 2,4 Htr B  *****GPC***** ET Door C/L,L,R Lat Mtr Redun ET Door R Dr Closure Mtr Redun (GPC Cntl)	F4/5 Manf RJDs (if sw OFF) F RCS Manf Isol 2

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A1-23

**MEDS**  
REF/ALL/GEN E

**CRITICAL EQUIPMENT LOST – CONTROL BUS CA**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED
<b>CNTL CA1</b>	IDP 3 MDU CRT 3 RGA 3 Blr Cntrl 3B Pwr Top R Noz Htr B Evap Duct Htrs C Hi Load Duct Htrs C GPCs 3,5 No Engage cap PLTs BFS Engage cap FES Pri A GPC cap ATVC Ch 1 SSME Isol cap H2O Loop 2 GPC cap Drag Chute PLT Dpy Fire 2 Jett Fire 2	R Probe Mtr 1 APU GG/Fu Htrs 3A,2B R OMS Ignition Path APU Fu Tk Vlv 1B PLBD C/L,Blkhd Lat Mtr Redun Rad Stbd Lat,Port Sto/Dpy Mtr Redun Ku-Bd Sto/Dpy Mtr Redun NWS Hyd Sys 1 LG Hyd Sys 1 Dpy (Pyros & NLG Hyd Sys 2 remain)	Freon Loop 2 Cldplate Flow Xdcr APU Lube Oil Htrs 3A RMS MRL Redun FES H2O Fdin Htrs B2 Hyd Circ Pmp 2,3 MNC Pwr RCS/OMS Htrs R Pod B L,R RCS Manf 3 Jet Htrs -Z S Trk Sys 2 Door Mtr  *****man sw cap***** FC2 Redun Reac Vlv Close (via pnl C3) FC3 STOP, Reac Vlvs A ADI Att Ref Set cap Hyd Brake Isol Vlv 3 MPS/TVC Isol 3 ET Door C/L,L,R Lat Mtr Redun ET Door L Dr Closure Mtr Redun  *****man ON cap***** Cryo O2/H2 Tk 1 Htr A Tk 3 Htr B NH3 Cntrl B Sec – Man Sel	F3 Manf RJDs (if sw OFF) F,L RCS Manf Isol 3 R RCS Manf Isol 3/4  *****man OP & CL cap***** F RCS Tk Isol 1/2 L OMS He P/Vap Isol A  *****man CL cap***** L,R RCS Tk Isol 1/2 Xfeed 1/2 R OMS Tk Isol B L RCS He P B L,F RCS Manf Isol 5

**MEDS**

<b>CNTL CA2</b>	IDP 4 MDU CRT 4 Blr Cntrl 3B Pwr R Pnl Trim Body Flap F3 Manf Jets L ME Shutdown pb FES Cntrl Pri A if sw ON Drag Chute PLT Dpy Fire 1 Jett Fire 1	R Probe Mtr APU GG/Fu Htrs 3A R OMS Ignition Path APU Cntrl Pwr 2B Fu Tk Vlv 2A PLBD C/L,Blkhd Lat, Port Dr Mtr Redun Rad Port Lat,Port Sto/Dpy Mtr Redun Ku-Bd Sto/Dpy Mtr Redun LG B/U Rel Sys 1	APU GG Inj H2O Htr 3A 2 Turbine Speed ind Cryo O2/H2 Tk Htrs 1A,3B Hyd Circ Pmp 3 MNC Pwr RCS/OMS Htrs R Pod B L,R RCS Manf 4 Jet Htrs RMS MPM Redun A ADI Sel (three) Att Ref Set All Pnl A6 Man Mode pb (18) Hyd MPS/TVC Isol 3 -Z S Trk Sys 2 Door Mtr Close cap  *****man sw cap***** FC3 STOP, Reac Vlvs Hyd MPS/TVC Isol 3 ET Dr C/L,L,R Lat Mtr Redun R Dr Closure Mtr Redun  *****man ON cap***** NH3 Cntrl A Sec – Man Sel	L,F RCS Manf Isol 4  ***man CL & GPC CL cap*** F RCS Tk Isol 1,2  *****man CL cap sw***** L,R RCS Tk Isol 1/2 Xfeed 1/2 R OMS Tk Isol B  **man OP, CL, & GPC cap** L RCS He P B  *****man OP & CL cap***** L,R,F RCS Manf Isol 5
<b>CNTL CA3</b>	F4 Manf Jets Blr Cntrl 2A,3A Pwr Auto PLBD Ops R ME Shutdown pb	R Probe Mtr 1 Dpy Dsc 1 APU GG/Fu Pmp Htrs 3B Tk Fu Ln Htrs 3A,3B Cntrl Pwr 3A Fu Tk Vlv 3A 3 GBx GN2 Repress Vlv PLBD C/L,Blkhd Lat,Port Dr Mtr Redun Rad Port/Stbd Lat,Sto/Dpy Mtr Redun	APU Lube Oil Htrs 3B L,R RCS Manf 5 Jet Htrs Hyd Circ Pmp 3 MNA Pwr Cryo O2/H2 Tk 2,4 Htrs B RMS Redun -Z S Trk Sys 2 Door Mtr  *****GPC***** ET Door C/L,R Lat Mtr Redun ET Door L,R Dr Closure Mtr Redun (GPC Cntl)	F RCS Tk Isol 1/2 Manf Isol 3/4  *****man OP & CL cap***** R RCS Manf Isol 5

**MEDS**

# ESS

## CRITICAL EQUIPMENT LOST – ESS BUSES

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED	
E S S  1 B C	DA1	APU Fu Tk Vlv 1A	FC1/MNA & MNA Bus Tie tb		
	MPC1	FC1 Cntrl (FC1 Pumps)	*****switches lost***** Cryo O2/H2 Manf Vlv Tk 1 FC1 Reac Vlvs (and tb)		
	FP & LC1		*****switches lost***** Inv Pwr 1 (tb lost)		
	FD	FC1 Cntrl (FC1 Pumps)	OIU 1 Pwr Redun	TACAN 1 Auto Self-Test  *****switches lost***** Inv Pwr 1, Inv/AC Bus 1 Cryo O2/H2 Tk 2,4 Htrs (test,reset) GPC 1,4 HALT,TERM cap	
	O13 & R14	CDRs ATU/CCU All C/W annun lts (F7)	C/W Sys A Pwr Sply: Pnl lts/Functions (R13) Pri C/W Limit Sensing Smoke Detn A Siren Cryo O2(H2) Tk 1,2 Htrs AUTO	Cryo O2/H2 Tk 2 Qty Xdcr AC1 Bus Snsr L Glrshld Flood Docking Sys Pwr Sys 1 Redun	
	ML86B		Cryo O2(H2) Tk 3,4 Htrs AUTO	Cryo O2/H2 Tk 4 Qty Xdcr	
	APC4			APU Fu Tk Vlv 1A ind	

# MEDS



<b>E S S 2 C A</b>	<b>DA2</b>		APU Fu Tk Vlv 2A	FC2/MNB & MNB Bus Tie tb	
	<b>MPC2</b>	FC2 Cntr (FC2 Pumps)		*****switches lost***** Cryo O2/H2 Manf Vlv Tk 2 FC2 Reac Vlvs (and tb)	
	<b>FP &amp; LC2</b>			*****switches lost***** Inv Pwr 2 (tb lost)	
	<b>FD</b>	FC2 Cntr (FC2 Pumps) OIU 2	OIU 1 Pwr Redun	TACAN 2 Auto Self-Test  *****switches lost***** Inv Pwr 2, Inv/AC Bus 2 Cryo O2 Tk 1 Htrs (test,reset) GPC 2,5 HALT,TERM cap	
	<b>O13 &amp; R14</b>	PLTs ATU/CCU Audio Center 1	ACCU Data Word Redun C/W Sys B Pwr Sply: B/U C/W Alarm annun It - on (cannot be reset) Sleep Sta Hdst Tones Smoke Detn B Siren Cryo O2(H2) Tk 1,2 Htrs AUTO	Cryo O2/H2 Tk 1 Qty Xdcr AC2 Bus Snsr R Glrshld Flood Docking Sys Pwr Sys 2 Redun	
<b>APC5</b>			APU Fu Tk Vlv 2A ind		

**CRITICAL EQUIPMENT LOST – ESS BUSES (Cont)**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED
<b>ESS 3 A B</b>	<b>DA3</b>		APU Fu Tk Vlv 3A	FC3/MNC & MNC Bus Tie tb MNC/PRI PL tbs
	<b>MPC3</b>	FC3 Cntrl (FC3 Pumps)		*****switches lost***** FC3 Reac Vlvs (and tb)
	<b>FP &amp; LC3</b>			*****switches lost***** Inv Pwr 3 (tb lost)
	<b>FD</b>	FC3 Cntrl (FC3 Pumps) BFS Engage cap (Do not engage BFS)		TACAN 3 Auto Self-Test  *****switches lost***** Inv Pwr 3, Inv/AC Bus 3 Cryo O2 Tk 3 Htrs (test,reset) GPC 3 HALT,TERM cap
	<b>O13</b>	CAM Status Matrix	Cryo O2(H2) Tk 3,4 Htrs AUTO	AC3 Bus Snsr
	<b>ML86B</b>			Cryo O2/H2 Tk 3 Qty Xdcr
	<b>APC6</b>			APU Fu Tk Vlv 3A ind

The following decal scheme is used onboard the orbiter to identify the phase-related, nominal position of all circuit breakers:

cb COLOR CODE (Nominal Position)

- RED – OPEN ALL PHASES
- GREEN – OPEN ON-ORBIT
- YELLOW – OPEN ASCENT
- ORANGE – OPEN ORBIT AND ENTRY
- BLACK – CLOSED ALL PHASES

MNA

CRITICAL FUNCTIONS/EQUIP LOST

Functions or equipment lost during ASC/ENT which would require manual action be taken by crew

CRITICAL REDUNDANCY LOST

Loss of function or equipment with automatic redundancy. No action required by crew, but loss could be serious

INSTRUMENTATION/OTHER

A “catch-all” column containing items which do not belong in other categories

OMS/RCS AFFECTED

Loss of control of OMS/RCS systems (vlvs, sws, etc). Some OMS/RCS systems considered critical are listed in column 1

**NOM**

B1-3

REF/ALL/GEN E

MNA

CRITICAL EQUIPMENT LOST – MNA/AC1

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED	
DA1		Cryo O2/H2 Tk 1/3 Htrs A			
MNA	FPC1	DEU/CRT 1 L HUD MMU 1	LG Hyd Sys 1 Dpy (Pyros & NLG Hyd Sys 2 Dpy remain) NWS Hyd Sys 1	MCIU PDI Redundancy F RCS A Htrs	
	FLC1	F1 Manf Jets Bay 3 Agent Discharge			F RCS He P A (CL & GPC)
	FMC1	H2O Loop 1 Pump A	L Probe Mtr 1 Dpy Dsc 1	-Y S TRK SYS 1	F RCS Tk Isol 3/4/5 Manf Isol 1
	AC1 multi	FC1 Pumps Freon Pump 1A,2B H2O Loop 1 Pump A Av Bay Fan 1A,3B	L Probe Mtr 1 IMU Fan A PLBD Bikh Lat, Stbd Dr Mtr Redun ET Door C/L, L Lat Mtr Redun L Dr Closure Mtr Redun Rad Port/Stbd Lat, Dpy/Sto Mtr Redun Arlk/Tnl Fan A <sup>a</sup>	-Y S TRK SYS 1 Door Mtr Humidity Sep A RCS/OMS Prplt Qty RMS MRL Redun WCS Fan/Sep 1 PRLA Drive Mtr Sys 1 EDO WCS Urine Fan and Sep 1 EDO WCS Commode Fan 1	L,R OMS Tk Isol A L OMS Xfeed A L,R RCS Tk Isol 3/4/5 A Xfeed 3/4/5 Manf Isol 2 F RCS Tk Isol 3/4/5 Manf Isol 1
	ΦA	Blr Cntrl 1B Pwr CO2 Removal Sys Cntrl 1	FCL 1 Cntrl B Rad Byp vlv Mtr H2O Loop 2 Byp Cntrl C ME Ch A R ME Ch B	H2O Loop 2 Instr RMS Shldr Brace Rel Cabin Temp Cntrl Sys 2 FC1 pH Snsr 1Φ of: WCS Fan/Sep 1 EDO WCS Urine Fan and Sep 1 (All functions lost) EDO WCS Commode Fan 1	

<sup>a</sup>Docking missions only

<b>M N A</b>	<b>FPC1</b>				
	<b>AC1 mult</b>				
	<b>ΦB</b>	Av Bay 2 Sig Condr	FCL 2 Cntr B Rad Byp vlv Mtr C ME Ch A R ME Ch B	RCS/OMS Prplt Qty Cabin Air Sig Condr Fwd Timers Hyd 1 Qty Snsr 1Φ of: WCS Fan/Sep 1 EDO WCS Urine Fan and Sep 1 (All functions lost) EDO WCS Commode Fan 1	
	<b>ΦC</b>	TACAN 1 (if Gould) Blr Cntr 3A Pwr	C ME Ch A R ME Ch B	1Φ of: WCS Fan/Sep 1 EDO WCS Urine Fan and Sep 1 (All functions lost) EDO WCS Commode Fan 1	
	<b>ML86B</b>	CO2 Removal Sys Cntr 1	Ku-Bd Jett Redun	WCS Fan Sep 1 Mtr Relay EDO WCS Controller and Compactor MNA Pwr	
	<b>APC4</b>	ATVC Ch 2 SSME/SRB Isol Cap	APU Cntr Pwr 1A,3B 1 GBx GN2 Repress vlv	APU Fu Tk vlv 3B ind 3 Turbine Speed ind	
	<b>APC1</b>	L OMS Pri TVC R OMS Sec TVC	APU GG/Fu Htrs 1A,3B	RCS/OMS Htrs L Pod A R Pod B Xfeed Lines A APU GG Inj H2O Htrs 1A,3B	L,R RCS He P A (CL & GPC) L,R OMS He P/vap Isol A (GPC OP) L,R OMS Eng vlv 1 Pos (=0) L Manf 5 Jets L RCS He P B (man OP)

(Cont next page)

B1-5

**NOM**  
REF/NOM/GEN E,4

**CRITICAL EQUIPMENT LOST – MNA/AC1 (Cont)**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED	
<b>M N A</b>	<b>APC4</b>				
	<b>ALC1</b>	Blr Cntrl 1B,3A Pwr FES Cntrl Pri B Top L Noz Htr A NH3 Cntrl Pri A (GPC) Auto sw-over C Me He Isol A Top/Hi Load Duct Htrs A	FES H2O Fdln A(B) Htrs 1(2) APU Fu/Tk vlv 1A,3B L,R OMS Ign Path APU GG/Fu Htrs 1A,3B Hyd Brake Isol vlv 1 Cntl (tb-OP)	Hyd MPS/TVC Isol vlv 1 Cntl (tb-CL) L,R RCS Manf 2 Jet Htrs APU Lube Oil Htrs 1A,3B OMS Qty Gaging Hyd Circ Pump 1,3 MNA Pwr RCS/OMS Htrs Xfd Lines A	L,R RCS He P A (CL & GPC) L Manf 5 jets L OMS Eng P vlv Pos L RCS He P B (man OP) L,R OMS He P/Vap Isol A (GPC OP)
	<b>AMC1</b>		LG Extend Isol vlv (tb-OP) NWS Hyd Sys 1	*****GPC***** ET Door C/L,L Lat Mtr Redun ET Door L Dr Closure Mtr Redun	
	<b>O14</b>	TACAN 1 (if Collins) RA 1 MLS 1 AA 1 ADTA 1 Bay 3 Agent Discharge L Instr Pwr L ME Status Lts SPI	Atm O2 Sys 1 Xovr vlv Atm P N2 Sys 1 Sply & Reg In sws FCL 1,2 Rad Flow Cntrl B O2/N2 Cntrl 1 NWS 1 Rad Isol Auto Contr	PPO2 Snsr A L Ovrhd Cnsl Flood Fwd Mission Timer IMU Fan Snsr Smoke Det: L,R Flt Dk Av Bay 2A,3B -Z S TRK ACA 1 MNA Pwr O2/N2 Cntrl Sys 1 Aft Event Timer Cabin Vent Isol/Vent sws	

(Cont next page)

**NOM**

<b>M N A</b>	<b>O14 &amp; A8</b>			RMS Pri Pwr	F1 Manf RJDs (if sw OFF)
	<b>R14</b>	UHF Pwr Amp MS ATU/CCU	GCIL Pwr Redun ACCU Data Word Redun	OS SU	
	<b>MPC1</b>	O2 Sys 1 Sply sw (tb-CL) Top/Hi Load Duct Htrs A	FC H2O Ln and Rif Htrs A Docking Sys Pwr Sys 1 OIU 1 Pwr Redun	FC1 H2,O2 Flow Xdcrs FC3 Redun Reac Vlv Close (via pnl C3) RMS Pri Pwr Vest Dep Vlv Sys 1 Vent Vent Isol	
	<b>MMC1 MMC3</b>		PLBD C/L,Blkhd Lat,Stbd Dr Mtr Redun Rad Port/Stbd Sto/Dpy Mtr Redun	RMS Redun MRL	

B1-7

**NOM**  
REF/NOM/GEN E,3

**MNB**

**MNB**

**CRITICAL EQUIPMENT LOST – MNB/AC2**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED	
<b>MNB</b>	<b>DA2</b>		Cryo O2/H2 Tk 2/3/4 Htrs B Cryo O2/H2 Tk 2/3/4 Htrs A (if in AUTO)		
	<b>FPC2</b>	DEU/CRT 2 MMU 2	NLG Hyd Sys 2 Dpy capability NWS Hyd Sys 2 LG B/U Rel Sys 2	F RCS B Htrs LMG/NLG UP and DN tb	
	<b>FLC2</b>	F2 Manf Jets S-Bd String 1 Bay 1 Agent Discharge cap	PL Intrg 1 PSP 1 LMG,NLG B/U Rel Sys 2	LMG/NLG UP and DN tb	F RCS He P B (CL & GPC) A (man OP)
	<b>FMC2</b>	H2O Loop 1 Pump B	L,R Probes Mtrs 2 Dpy Dsc 2	-Y S Trk Sys 2 -Z S Trk Sys 1	F RCS Manf Isol 2 & TM
	<b>AC2 multi</b>	FC2 Pumps Av Bay Fan 1B,2A Freon Pump 1B H2O Loop 1 Pump 1B	Cabin Fan B L,R Probe Mtrs 2 IMU Fan B PLBD C/L,Blkhd Lat,Port/Stbd Dr Mtr Redun ET Door C/L,L,R Lat Mtr Redun R Dr Closure Mtr Redun Ku-Bd Sto/Dpy Redun Rad Port/Stbd Lat Redun Ark/Tnl Fan B <sup>a</sup>	RMS MPM, MRL Redun Cabin Temp Cntr Sys 1 Humidity Sep B PRLA Drive Mtr Sys 2 WCS Fan/Sep 2 -Y S Trk Sys 2 Door Mtr -Z S Trk Sys 1 Door Mtr L,R Seat AC2 Pwr EDO WCS Urine Fan and Sep 2 EDO WCS Commode Fan 2	L,R OMS Xfeed B RCS Tk Isol 3/4/5 B Manf Isol 1 F RCS Manf Isol 2

<sup>a</sup>Docking missions only



<b>M N B</b>	<b>FPC2</b>			
	<b>AC2 multi</b>			
	<b>ΦA</b>	Blr Cntrl 1A Pwr	L ME Ch A C ME Ch B LG Prox Snsr 2	LMG & NLG UP & DN tb FC 2 pH Snsr Cabin Temp Cntrl Sys 1 1Φ of: WCS Fan/Sep 2 EDO WCS Urine Fan and Sep 2 (All functions lost) EDO WCS Commode Fan 2
	<b>ΦB</b>	Av Bay 3 Sig Condr	FCL 1 Cntrl A Rad Byp Vlv Mtr A L ME Ch A C ME Ch B	Freon S/C AC2 Pwr Hyd 2 Qty Snsr 1Φ of: WCS Fan/Sep 2 EDO WCS Urine Fan and Sep 2 (All functions lost) EDO WCS Commode Fan 2
	<b>ΦC</b>	TACAN 2 (if Gould) Blr Cntrl 2B Pwr	L ME Ch A C ME Ch B FCL 1,2 Rad Isol Vlv Mtr A	1Φ of: WCS Fan/Sep 2 EDO WCS Urine Fan and Sep 2 (All functions lost) EDO WCS Commode Fan 2
	<b>ML86B</b>		RMS Jet Redun	WCS Sep Fan 2 Mtr Relay EDO WCS Controller and Compactor MNB Pwr L,R Seat AC2 Pwr

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B1-9

**NOM**  
REF/NOM/GEN E,4

**CRITICAL EQUIPMENT LOST – MNB/AC2 (Cont)**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED	
<b>M N B</b>	<b>APC5</b>	RGA 2 ATVC Ch 3 SSME/SRB Isol Cap	APU Cntrl Pwr 1B,2A 2 GBx GN2 Repress vlv	APU 1 Turbine Speed ind Fu Tk vlv 1B ind Freon Loop 1 Cldplate Flow Xdcr	
	<b>APC2</b>	L OMS Sec TVC ATVC Ch 4 SSME/SRB Isol Cap ASA Ch 4 Isol Cap	APU GG/Fu Htrs 1B,2A	APU GG Inj H2O Htr 1B Aft PL MNB Bus Pwr Htrs L Pod B RCS/OMS Htrs R Pod A, Xfeed Lines B	L OMS He P/Vap Isol B (GPC OP) R OMS He P/Vap Isol A,B (man OP) R Manf 5 Jets L,R RCS He P A (man OP) R RCS He P B (CL & GPC) L OMS Eng vlv 2 Pos (=0)
	<b>ALC2</b>	Blr Cntrl 2B,1A Pwr Sec Flash Evap Cntrl Top L Noz Htr B R Noz Htr A Top/Hi Load Duct Htrs B L ME He Isol A	FES H2O Fdln Htrs 2 (except mid 2) APU/Fu vlv/Tk 1B,2A L OMS Ignition Path APU GG/Fu Htrs 1B,2A Hyd Brake Isol vlv 2 Cntl (tb-OP) NWS Hyd Sys 2 NLG Hyd Sys 2 Dpy capability	APU Lube Oil Htrs 1B,2A L,R RCS Manf 1 Jet Htrs OMS Qty Gaging for L Burn NH3 Cntrl B Sec – man sel Hyd Circ Pump 1 & 2 MNB Pwr Hyd MPS/TVC Isol vlv 2 Cntl (tb-CL) RCS/OMS Htrs Xfd Lines B	L OMS He P/Vap Isol B (GPC OP) L,R RCS He P A (man OP) R Manf 5 Jets R RCS He P B (CL & GPC)
	<b>AMC2</b>			*****GPC***** ET Door C/L,L,R Lat Mtr Redun ET Door R Dr Closure Mtr Redun	

(Cont next page)

<b>M N B</b>	<b>O15</b>	TACAN 2 (if Collins) RA 2 MLS 2 AA 2 ADTA 2 Bay 1 Agent Discharge Cap R Inst Pwr C,R ME Status lts NWS 2	FCL 1,2 Rad Flow Cntr A Atm O2 Sys 2 Xovr Vlv Atm P N2 Sys 2 Sply & Reg In sws NWS 2 Drag Chute PLT Arm	PPO2 Snsr B,C Fwd Event Timer L Seat/Ctr Cnsl Flood R Ovhd Cnsl Flood Av Bay Smoke Det 1B,3A -Y S Trk ACA 1,2,3 MNB Pwr dP/dT Snsr O2/N2 Cntr Sys 2 Cabin Relief A sw Docking Sys Pwr Sys 2 Redun	
	<b>O15 &amp; A8</b>			RMS B/U Pwr	F2 Manf RJDs (if sw OFF)
	<b>R14</b>	Ku-A System (Comm & Radar) VPU			
	<b>A6 &amp; A14</b>			F RCS Jet 2,3 Htrs PRLA Drive Mtr Sys 2	
	<b>MPC2</b>	O2 Sys 2 Sply sw (tb-CL) Top/Hi Load Duct Htrs B Ku-A System (Comm & Radar) OIU 2	Docking Sys Pwr Sys 2 OIU 1 Pwr Redun	FC1 Redun Reac Vlv Close (via pnl C3) FC2 H2,O2 Flow Xdcrs RMS B/U Pwr Vest Dep Vlv Sys 2 Vent Vent Isol	
	<b>MMC2 MMC4</b>		PLBD C/L,Blkhd Lat,Port/Stbd Dr Mtr Redun	RMS Redun MPM,MRL	

B1-11

**MNC**

**NOM**  
REF/NOM/GEN E,4

## MNC

### CRITICAL EQUIPMENT LOST – MNC/AC3

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED	
<b>M N C</b>	<b>DA3</b>		Cryo O2/H2 Tk 1 Htrs B 2,4 Htrs A Cryo O2/H2 Tk 1 Htrs A (if in AUTO)	PRIPL Bus MNC Pwr	
	<b>FPC3</b>	DEU/CRT 3/4 R HUD GPS 2	LG B/U Rel Sys 1	NLG UP tb, RMG UP & DN tb PDI Redun Ku-Bd Sys (Comm & Radar)	
	<b>FLC3</b>	F4 Manf Jets S-Bd String 2 Bay 2 Agent Discharge cap	PL Intrg 2 PSP 2 RMG,NLG B/U Rel Sys 1	NWS Fail It RMG UP & DN tb NLG UP tb	F RCS He P B (man OP) F5 Manf Jets F RCS Manf Isol 5 & TM (Jets Lost)
	<b>FMC3</b>		R Probe Mtr 1 Dpy Dsc 1	-Z S Trk Sys 2	F RCS Tk Isol 1/2 Manf Isol 3/4 4 TM
	<b>AC3 multi</b>	FC3 Pumps Freon Pump 2A Av Bay Fans 2B,3A H2O Loop 2 Pmp Man ON	Cabin Fan A R Probe Mtr 1 IMU Fan C PLBD C/L,Blkhd Lat,Port Dr Mtr Redun ET Door C/L,R Lat Mtr Redun ET Door L,R Dr Closure Mtr Redun Rad Port/Stbd Lat, Dpy/Sto Mtr Redun	RMS MPM,MRL Redun L Seat AC3 Pwr IMU Fan S/C Hum Sep S/C -Z S Trk Sys 2 Door Mtr	L,R OMS Tk Isol B R OMS Xfeed A L,R RCS Tk Isol 1/2 F RCS Tk Isol 1/2 L,R RCS Xfeed 1/2 F,L,R RCS Manf Isol 3/4

(Cont next page)

# NOM

B1-12

REF/NOM/GEN E,4

<b>MNC</b>	<b>FPC3</b>				
	<b>AC3 multi</b>				
	<b>ΦA</b>	Blr Cntrl 2A Pwr COAS CO2 Removal Sys Cntrl 2	L ME Ch B R ME Ch A LG Prox Snsr 1	NLG UP tb RMG UP & DN tb H2O Loop 1 Instr Byp Cntrl Hum Sep S/C FC 3 pH Snsr	
	<b>ΦB</b>	Av Bay 1 Sig Condr	FCL 2 Cntrl A Rad Byp vlv Mtr R ME Ch A L ME Ch B	Freon S/C AC3 Pwr Hyd 3 Qty Snsr	
	<b>ΦC</b>	TACAN 3 (if Gould) Blr Cntrl 3B Pwr	L ME Ch B R ME Ch A FCL 1,2 Rad Isol Vlv Mtr B		
	<b>ML86B</b>	CO2 Removal Sys Cntrl 2	RMS Jett Redun Ku-Bd Jett Redun	L,R Seat AC3 Pwr	
	<b>APC6</b>	ATVC Ch 1 SSME/SRB Isol cap	APU Cntrl Pwr 2B,3A 3 GBx GN2 Repress vlv	APU 2 Turbine Speed ind Fu Tk vlv 2B ind Freon Loop 2 Cldplate Flow Xdcr	
<b>APC3</b>	R OMS Pri TVC	APU GG/Fu Htrs 2B,3A Fu Tk vlv 2B	APU GG Inj H2O Htrs 3A RCS/OMS Htrs L,R Pod B Aft PL MNC Bus Pwr	L OMS He P/Vap Isol A,B (man OP) R OMS He P/Vap Isol B (GPC OP) R RCS He P B (man OP) R OMS Eng vlv 2 Pos (=0) L RCS He P B (CL & GPC) L,R RCS Manf Isol 5	

(Cont next page)

**CRITICAL EQUIPMENT LOST – MNC/AC3 (Cont)**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED	
<b>M N C</b>	<b>APC6</b>				
	<b>ALC3</b>	Blr Cntrl 2A,3B Pwr R ME He Isol A Flash Evap Cntrl Pri A Top R Noz Htr B	FES H2O Fdln B Htrs 1 (ex mid 2) APU Fu/Tk vlv 2B,3A GG/Fu Htrs 2B,3A R OMS Ignition Path Hyd Brake Isol vlv 3 Cntl (tb-OP)	OMS Qty Gaging for R Brn APU Lube Oil Htrs 2B,3A Hyd Circ Pmp 2,3 MNC Pwr L,R RCS Manf 3/4/5 Jet Htrs Hyd MPS/TVC Isol vlv 3 Cntl (tb-CL) NH3 Cntrl B Pri Sec auto sw-over A Sec – man sel	R OMS He P/Vap Isol B (GPC OP) L RCS He P B (CL & GPC) R OMS Eng P vlv Pos RCS He P B (man OP) L,R RCS Manf Isol 5
	<b>AMC3</b>			*****GPC***** ET Door C/L,R Lat Mtr Redun ET Door C/L,L,R Dr Closure Mtr Redun (GPC Cntl)	
	<b>O16</b>	TACAN 3 (if Collins) MLS 3 ADTA 3,4 Bay 2 Agent Disch cap Atm P Cntrl O2 Emer sw	Drag Chute CDR Arm	Smoke Det: Cabin Av Bay 1A,2B R Seat/Ctr Cnsl Flood Cabin Relief B sw OMS/RCS Qty Meter (pnl O3) ACA 2,3 MNC Pwr Aft Mission Timer Docking Sys Pwr Sys 2 Redun	
	<b>O16 RJD</b>				F4 Manf RJDs (if F3 & F4/5 sw OFF)
	<b>A6 &amp; A14</b>			F RCS Jet 4/5 Htrs	

(Cont next page)

<b>M N C</b>	<b>R14</b>		GCIL Pwr Redun	Audio Center 2 Ku-A Sig Proc (Comm) PS ATU/CCU	
	<b>MPC3</b>	RGA 3	FC H2O Ln & Rlf Htrs B Docking Sys Pwr Redun	FC2 Redun Reac Vlv Close (via pnl C3) FC3 H2,O2 Flow Xdcrs	
	<b>MMC2 MMC4</b>		PLBD C/L,Blkhd Lat,Port Dr Mtr Redun Rad Port/Stbd Sto/Dpy Mtr Redun	RMS MPM,MRL Redun	

B1-15

**NOM**  
REF/NOM/GEN E,4

**CNTL**

## CNTL

### CRITICAL EQUIPMENT LOST – CONTROL BUS AB

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED
<b>CNTL AB1</b>	DEU/CRT 1 MMU 1 COMSEC 1 FES Pri B GPC cap C ME Shutdown pb Top/Hi Load Duct Htrs A Blr Cntrl 1B Pwr L Pnl Trim Body Flap	L Probe Mtr 1 FC H2O Ln & Rlf Htrs A L OMS Ignition Path APU GG/Fu Htrs 1A,3B Fu Tk Vlv 1A Cntrl Pwr 1A 1 GBx GN2 Repress Vlv PLBD C/L,Blkhd Lat,Stbd Dr Mtr Redun Rad Port/Stbd Lat,Sto/Dpy Mtr Redun LG B/U Rel Sys 2 NLG Hyd Sys 2 Dpy capability NWS Hyd Sys 2	APU GG Inj H2O Htrs 1A,2A Lube Oil Htrs 1A FES H2O Fdln Htrs B 1 RCS/OMS Htrs L Pod A F RCS A L,R RCS Manf 2 Jet Htrs Hyd Circ Pmp 1,3 MNA Pwr RMS MRL Redun APU 1 Fu Qty Display (= H2O Qty) APU 1 GG Bed T ind (APU running) APU 1 GBx P ind (APU running) NWS Fail indication PRLA Drive Mtr Sys 1 -Y S Trk Sys 1 Door Mtr  ***** man sw cap***** Atm P Cntrl O2 Sys 1 Sply FC1 STOP & Reac Vlvs FC3 Redun Reac Vlv Close (via pnl C3) Cryo O2/H2 Manf Vlv Tk 1 L ADI Att Ref Set cap Hyd Brake Isol Vlv 1 MPS/TVC Isol 1 ET Door C/L,L,R Lat Mtr Redun ET Door L Dr Closure Mtr Redun	F1 Manf RJDs (if sw OFF) L RCS Manf Isol 2 F RCS Manf Isol 1  ***** man CL cap***** L,R RCS Xfeed 3/4/5 A OMS Tk Isol A Xfeed A F,L RCS He P A  ***** man OP & CL cap***** L RCS Tk Isol 3/4/5 A F RCS Tk Isol 3/4/5 R OMS He P Isol A Vap Isol 1,2

**NOM**



<b>CNTL AB1</b> (Cont)			*****man ON cap***** NH3 Cntrl A Sec – Man Sel Cryo O2/H2 Tk 1 Htr B 3 Htr A	
<b>CNTL AB2</b>	L HUD MMU 2 Blr Cntrl 1B Pwr F1 Manf Jets Top/Hi Load Duct Htrs A FES Cntrl Pri B ON H2O Loop 1 A (ON) ATVC Ch 2 SSME Isol cap CDR sws Green Dot Top L Noz Htr B	L Probe Mtr 1 APU GG/Fu Htrs 1A L OMS Ignition Path APU Fu Tk Vlv 2B PLBD C/L,Blkhd Lat Mtr Redun Rad Port/Stbd Lat,Sto/Dpy Mtr Redun	Hyd Circ Pmp 1 MNA Pwr FES H2O Fldn Htrs 1A RCS/OMS Htrs L Pod A F RCS A APU GG Inj H2O Tk Htrs A  *****man sw cap***** Cryo O2/H2 Tk 1 Htr B Tk 3 Htr A Manf Vlv Tk 1 FC1 STOP, Reac Vlvs L ADI Att Ref Set cap Atm P Cntrl O2 Sys 1 Sply Hyd MPS/TVC Isol 1 ET Door C/L,L,R Lat Mtr Redun ET Door R Dr Closure Mtr Redun LG Extend Isol Vlv -Y S Trk Sys 1 Door Mtr Close cap  *****man ON cap***** NH3 Cntrl B Sec – Man Sel	*****man sw cap***** L Manf 5 RJDs (if sw OFF) R RCS Manf Isol 2  *****man CL cap***** L,R RCS Xfeed 3/4/5 L,R OMS Tk Isol A Xfeed A F RCS Tk Isol 3/4/5 (and man GPC CL ovrdr) R RCS He P A  *****man OP & CL cap***** R RCS Tk Isol 3/4/5 A  **man OP,CL, & GPC cap** L,F RCS He P A

(Cont next page)

**CRITICAL EQUIPMENT LOST – CONTROL BUS AB (Cont)**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED
<b>CNTL AB3</b>	COMSEC 2 Blr Cntrl 1A,3A Pwr Top/Hi Load Duct Htrs A Auto PLBD Ops H2O Loop 1 Pump A CDRs BFS Engage GPCs 1,2,4 – No Engage MPS Dump Seq Start sw	L Probe Mtr 1 Dpy Dsc 1 APU GG/Fu Pmp Htrs 1B Tk Fu Ln Htrs 1A,3B Cntrl Pwr 3B Fu Tk Vlv 3B PLBD C/L,Blkhd Lat,Stbd Dr Mtr Redun Rad Port/Stbd Lat,Sto/Dpy Mtr Redun LG Hyd Sys 1 Dpy (Pyros and NLG Hyd Sys 2 Dpy remain) NWS Hyd Sys 1	Hyd Circ Pmp 1 MNB Pwr APU GG Inj H2O Htrs 3B Lube Oil Htrs 1B 3 Turbine Speed ind RMS MRL Redun RCS/OMS Htrs Xfeed Ln A All Pnl C3 Man Mode pbs (18) -Y S Trk Sys 1 Door Mtr  ***** GPC***** ET Door C/L Lat Mtr Redun ET Door L Dr Closure Mtr Redun (GPC Cntl)	F RCS Tk Isol 3/4/5 Manf Isol 1  **man OP,CL, & GPC cap** R RCS He P A

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B1-19

**NOM**  
REF/ALL/GEN E

**CRITICAL EQUIPMENT LOST – CONTROL BUS BC**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED
<b>CNTL BC1</b>	R HUD RGA 2 S-Bd String 1 Top L Noz Htr A L Pnl Trim L Body Flap Top/Hi Load Duct Htrs B Blr Cntrl 2B Pwr Drag Chute CDR Dpy Fire 2 Jett Fire 2 GPS 2 C ME Shutdown pb	PSP 1 PL Intrg 1 F,L,R Manf 5 Jets L,R Probe Mtrs 2 APU GG/Fu Htrs 2A,1B FC H2O Ln & Rlf Htrs B APU Cntrl Pwr 1B Fu Tk Vlv 1B PLBD C/L,Blkhd Lat,Port Dr Mtr Redun Rad Port/Stbd Lat,Sto/Dpy Mtr Redun Ku-Bd Sto/Dpy Mtr Redun LG B/U Rel Sys 2 NLG Hyd Sys 2 Dpy capability NWS Hyd Sys 2	APU Lube Oil Htrs 2A GG Inj H2O Htrs 1B,2B 1 Turbine Speed ind Hyd Circ Pmp 1,2 MNB Pwr RCS/OMS Htrs L Pod B R Pod A F RCS B RMS MPM,MRL Redun L,R RCS Manf 1 Jet Htrs PDI Redun PRLA Drive Mtr Sys 2 -Y S Trk Sys 2 Door Mtr Close cap -Z S Trk Sys 1 Door Mtr *****man sw cap***** Hyd Brake Isol Vlv 2 MPS/TVC Isol 2 Cryo O2/H2 Manf Vlv Tk 2 Tk 2,4 Htrs Atm P Cntl O2 Sys 2 Sply FC1 Redun Reac Vlv Close (via pnl C3) FC2 STOP, Reac Vlvs R ADI Att Ref Set cap	F2 Manf RJDs (if sw OFF) L RCS Manf Isol 1 F RCS Manf Isol 2 *****man CL cap***** L OMS Tk Isol B L,R OMS Xfeed B F,R RCS He P B *****man OP & CL cap***** L,R OMS He P/Vap Isol B L RCS Tk Isol 3/4/5 B

**NOM**

<p><b>CNTL BC2</b></p>	<p>DEU/CRT 2 S-Bd String 2 Blr Cntrl 2B Pwr R Pnl Trim R Body Flap F2 Manf Jets PLT sws Green Dot ASA Ch 4 Isol cap Top/Hi Load Duct Htrs B L ME Shutdown pb H2O Loop 1 B (ON) Drag Chute CDR Dpy Fire 1 Jett Fire 1</p>	<p>PSP 2 PL Intrg 2 F,L,R Manf 5 Jets L,R Probe Mtrs 2 APU GG/Fu Htrs 2A Cntrl Pwr 2A Fu Tk Vlv 2B 2 GBx GN2 Repress Vlv PLBD Bikhd Lat,Stbd Dr Mtr Redun Rad Port/Stbd Lat,Stbd Sto/Dpy Mtr Redun Ku-Bd Sto/Dpy Mtr Redun LG B/U Rel Sys 2 NLG Hyd Sys Dpy capability NWS Hyd Sys 2</p>	<p>Freon Loop 1 Cldplate Flow Xdcr Hyd Circ Pmp 2 MNB Pwr RCS/OMS Htrs L Pod B R Pod A F RCS B APU GG Inj H2O Tk Htrs B 2 Fu Qty (reads H2O) APU 2 GG Bed T ind (APU running) APU 2 GBx P ind (APU running) FES H2O Fdln A Htrs 2 PDI Redun RMS MPM,MRL Redun NH3 Cntrl B Pri NH3 Cntrl B Sec Auto switchover Cryo O2/H2 Tk 2/4 Htrs A All Pnl A6 Man Mode pbs (18) PRLA Drive Mtr Sys 2 -Y S Trk Sys 2 Door Mtr -Z S Trk Sys 1 Door Mtr Close cap  *****man sw cap***** Hyd MPS/TVC Isol 2 Atm P Cntl O2 Sys 2 Sply Cryo O2/H2 Manf Vlv Tk 2 Sec FES Cntrl (if GPC) FC2 STOP, Reac Vlvs R ADI Att Ref Set cap</p>	<p>R RCS Manf Isol 1  *****man CL cap***** L OMS Tk Isol B L,R OMS Xfeed B  *****man OP &amp; CL cap***** R RCS Tk Isol 3/4/5 B  **man OP,CL, &amp; GPC cap** F,R RCS He P B</p>
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**CRITICAL EQUIPMENT LOST – CONTROL BUS BC (Cont)**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED
<b>CNTL BC3</b>	H2O Loop 1 Pump B Blr Cntrl 1A,2A Pwr ATVC Ch 3/4 SSME Isol cap R ME Shutdown pb Top R Noz Htr A MPS Dump Seq Start sw Sec FES Cntrl (if sw ON) Top/Hi Load Duct Htrs B Auto PLBD Ops	L,R Probe Mtrs 2 Dpy Dsc 2 APU Fu Tk Vlv 3B PLBD C/L,Blkhd Lat,Port/Stbd Dr Mtr Redun Rad Port/Stbd Lat,Dpy Mtr Redun LG B/U Rel Sys 1	Hyd Circ Pmp 2 MNC Pwr APU GG/Lube/Tk Htrs 2B Tk Htrs 1B,2A RMS Redun RCS/OMS Htrs Xfeed Ln B All Pnl C3 Man Mode pbs (18) Smoke Det Circ Test NH3 Cntrl A Pri NH3 Cntrl A Sec Auto sw-over -Y S Trk Sys 2 Door Mtr -Z S Trk Sys 1 Door Mtr  *****man ON cap***** Cryo O2/H2 Tk 2,4 Htr B  *****GPC***** ET Door C/L,L,R Lat Mtr Redun ET Door R Dr Closure Mtr Redun (GPC Cntl)	F4/5 Manf RJDs (if sw OFF) F RCS Manf Isol 2

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B1-23

**NOM**  
REF/ALL/GEN E

**CRITICAL EQUIPMENT LOST – CONTROL BUS CA**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED
<b>CNTL CA1</b>	DEU/CRT 3 RGA 3 Blr Cntrl 3B Pwr Top R Noz Htr B Evap Duct Htrs C Hi Load Duct Htrs C GPCs 3,5 No Engage cap PLTs BFS Engage cap FES Pri A GPC cap ATVC Ch 1 SSME Isol cap H2O Loop 2 GPC cap Drag Chute PLT Dpy Fire 2 Jett Fire 2	R Probe Mtr 1 APU GG/Fu Htrs 3A,2B R OMS Ignition Path APU Fu Tk Vlv 1B PLBD C/L,Blkhd Lat Mtr Redun Rad Stbd Lat,Port Sto/Dpy Mtr Redun Ku-Bd Sto/Dpy Mtr Redun NWS Hyd Sys 1 LG Hyd Sys 1 Dpy (Pyros & NLG Hyd Sys 2 remain)	Freon Loop 2 Cldplate Flow Xdcr APU Lube Oil Htrs 3A RMS MRL Redun FES H2O Fdln Htrs B2 Hyd Circ Pmp 2,3 MNC Pwr RCS/OMS Htrs R Pod B L,R RCS Manf 3 Jet Htrs -Z S Trk Sys 2 Door Mtr  *****man sw cap***** FC2 Redun Reac Vlv Close (via pnl C3) FC3 STOP, Reac Vlvs A ADI Att Ref Set cap Hyd Brake Isol Vlv 3 MPS/TVC Isol 3 ET Door C/L,L,R Lat Mtr Redun ET Door L Dr Closure Mtr Redun  *****man ON cap***** Cryo O2/H2 Tk 1 Htr A Tk 3 Htr B NH3 Cntrl B Sec – Man Sel	F3 Manf RJDs (if sw OFF) F,L RCS Manf Isol 3 R RCS Manf Isol 3/4  *****man OP & CL cap***** F RCS Tk Isol 1/2 L OMS He P/Vap Isol A  *****man CL cap***** L,R RCS Tk Isol 1/2 Xfeed 1/2 R OMS Tk Isol B L RCS He P B L,F RCS Manf Isol 5



<b>CNTL CA2</b>	DEU/CRT 4 Blr Cntr 3B Pwr R Pnl Trim Body Flap F3 Manf Jets L ME Shutdown pb FES Cntr Pri A if sw ON Drag Chute PLT Dpy Fire 1 Jett Fire 1 GPS 2	R Probe Mtr 1 APU GG/Fu Htrs 3A R OMS Ignition Path APU Cntr Pwr 2B Fu Tk Vlv 2A PLBD C/L,Blkhd Lat,Port Dr Mtr Redun Rad Port Lat, Port Sto/Dpy Mtr Redun Ku-Bd Sto/Dpy Mtr Redun LG B/U Rel Sys 1	APU GG Inj H2O Htr 3A 2 Turbine Speed ind Cryo O2/H2 Tk Htrs 1A,3B Hyd Circ Pmp 3 MNC Pwr RCS/OMS Htrs R Pod B L,R RCS Manf 4 Jet Htrs RMS MPM Redun A ADI Sel (three) Att Ref Set All Pnl A6 Man Mode pb (18) Hyd MPS/TVC Isol 3 -Z S Trk Sys 2 Door Mtr Close cap *****man sw cap***** FC3 STOP, Reac Vlvs Hyd MPS/TVC Isol 3 ET Dr C/L, L,R Lat Mtr Redun R Dr Closure Mtr Redun *****man ON cap***** NH3 Cntr A Sec – Man Sel	L,F RCS Manf Isol 4 ***man CL & GPC CL cap*** F RCS Tk Isol 1,2 *****man CL cap sw***** L,R RCS Tk Isol 1/2 Xfeed 1/2 R OMS Tk Isol B **man OP, CL, & GPC cap** L RCS He P B *****man OP & CL cap***** L,R,F RCS Manf Isol 5
<b>CNTL CA3</b>	F4 Manf Jets Blr Cntr 2A,3A Pwr Auto PLBD Ops R ME Shutdown pb	R Probe Mtr 1 Dpy Dsc 1 APU GG/Fu Pmp Htrs 3B Tk Fu Ln Htrs 3A,3B Cntr Pwr 3A Fu Tk Vlv 3A 3 GBx GN2 Repress Vlv PLBD C/L,Blkhd Lat,Port Dr Mtr Redun Rad Port/Stbd Lat,Sto/Dpy Mtr Redun	APU Lube Oil Htrs 3B 3 Fu Qty (reads H2O) L,R RCS Manf 5 Jet Htrs Hyd Circ Pmp 3 MNA Pwr Cryo O2/H2 Tk 2,4 Htrs B RMS Redun -Z S Trk Sys 2 Door Mtr *****GPC***** ET Door C/L,R Lat Mtr Redun ET Door L,R Dr Closure Mtr Redun (GPC Cntl)	F RCS Tk Isol 1/2 Manf Isol 3/4 *****man OP & CL cap***** R RCS Manf Isol 5

**NOM**

# ESS

## CRITICAL EQUIPMENT LOST – CONTROL ESS BUSES

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED	
<b>DA1</b>		APU Fu Tk Vlv 1A	FC1/MNA & MNA Bus Tie tb		
<b>E S S  1 B C</b>	<b>MPC1</b>	FC1 Cntr (FC1 Pumps)	*****switches lost***** Cryo O2/H2 Manf Vlv Tk 1 FC1 Reac Vlvs (and tb)		
	<b>FP &amp; LC1</b>		*****switches lost***** Inv Pwr 1 (tb lost)		
	<b>FD</b>	FC1 Cntr (FC1 Pumps)	OIU 1 Pwr Redun	TACAN 1 Auto Self-Test  *****switches lost***** Inv Pwr 1, Inv/AC Bus 1 Cryo O2/H2 Tk 2,4 Htrs (test,reset) GPC 1,4 HALT,TERM cap	
	<b>O13 &amp; R14</b>	CDRs ATU/CCU All C/W annun lts (F7)	C/W Sys A Pwr Sply: Pnl lts/Functions (R13) Pri C/W Limit Sensing Smoke Detn A Siren Cryo O2(H2) Tk 1,2 Htrs AUTO	Cryo O2/H2 Tk 2 Qty Xdcr AC1 Bus Snsr L Glrshld Flood Docking Sys Pwr Sys 1 Redun	
	<b>ML86B</b>		Cryo O2(H2) Tk 3,4 Htrs AUTO	Cryo O2/H2 Tk 4 Qty Xdcr	
	<b>APC4</b>			APU Fu Tk Vlv 1A ind	

<b>E S S 2 C A</b>	<b>DA2</b>		APU Fu Tk Vlv 2A	FC2/MNB & MNB Bus Tie tb	
	<b>MPC2</b>	FC2 Cntr (FC2 Pumps)		*****switches lost***** Cryo O2/H2 Manf Vlv Tk 2 FC2 Reac Vlvs (and tb)	
	<b>FP &amp; LC2</b>			*****switches lost***** Inv Pwr 2 (tb lost)	
	<b>FD</b>	FC2 Cntr (FC2 Pumps) OIU 2	OIU 1 Pwr Redun	TACAN 2 Auto Self-Test  *****switches lost***** Inv Pwr 2, Inv/AC Bus 2 Cryo O2 Tk 1 Htrs (test,reset) GPC 2,5 HALT,TERM cap	
	<b>O13 &amp; R14</b>	PLTs ATU/CCU Audio Center 1	ACCU Data Word Redun C/W Sys B Pwr Sply: B/U C/W Alarm annun It - on (cannot be reset) Sleep Sta Hdst Tones Smoke Detn B Siren Cryo O2(H2) Tk 1,2 Htrs AUTO	Cryo O2/H2 Tk 1 Qty Xdcr AC2 Bus Snsr R Glrshld Flood Docking Sys Pwr Sys 2 Redun	
	<b>APC5</b>			APU Fu Tk Vlv 2A ind	

**CRITICAL EQUIPMENT LOST – CONTROL ESS BUSES (Cont)**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/OTHER	OMS/RCS AFFECTED
<b>ESS 3 A B</b>	<b>DA3</b>		APU Fu Tk Vlv 3A	FC3/MNC & MNC Bus Tie tb MNC/PRI PL tbs
	<b>MPC3</b>	FC3 Cntrl (FC3 Pumps)		*****switches lost***** FC3 Reac Vlvs (and tb)
	<b>FP &amp; LC3</b>			*****switches lost***** Inv Pwr 3 (tb lost)
	<b>FD</b>	FC3 Cntrl (FC3 Pumps) BFS Engage cap (Do not engage BFS)		TACAN 3 Auto Self-Test  *****switches lost***** Inv Pwr 3, Inv/AC Bus 3 Cryo O2 Tk 3 Htrs (test,reset) GPC 3 HALT,TERM cap
	<b>O13</b>	CAM Status Matrix	Cryo O2(H2) Tk 3,4 Htrs AUTO	AC3 Bus Snsr
	<b>ML86B</b>			Cryo O2/H2 Tk 3 Qty Xdcr
	<b>APC6</b>			APU Fu Tk Vlv 3A ind

MDM

MDM FF1 .....	2-2
FA1 .....	2-3
FF2 .....	2-4
FA2 .....	2-5
FF3 .....	2-6
FA3 .....	2-7
FF4 .....	2-8
FA4 .....	2-9
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PL2 .....	2-11
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NOTES .....	2-12
DISP 78 SM SYS SUMM 1 (PASS) .....	2-13
(BFS) .....	2-14
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19 GNC SYS SUMM 2 .....	2-18
MDM/DCU LOSS .....	2-20
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MEDS QUICK REFERENCE .....	2-24

**MDM**

**MEDS**

MDM

FF1				
BCE	GPC INPUT		BCE	GPC INPUT
A	F RCS Ts & Ps MANF 1 P BFS QTY IMU 1 STATUS PNL F6 DISP SWs (eight)		ADTA IMU MLS MTU NSP STKR TAC	ADTA 1 IMU 1 MLS 1 MTU ACCUM 1 NSP 1 -Z S TRK RADAR ALT 1 TACAN 1
			GPC OUTPUT	
B	AA 1 F RCS MANF 1 JET RM L ADS DEPLOY DISC - A* RMG NO WOW - 1* CNTLRs/PBIs/SWs: AFT DAP CNTL - 3* RHC - 1* SENSE - 1* THC - 1* C ME S/D PB (S/D INOP)  FCS CH 1 ORIDE - 2* 3 ORIDE - 2* 4 ORIDE - 3* ENTRY MODE - 1* FWD DAP AXES - A* CNTL - 1* THC - 1* LATT REF BDY FLP - A* FCS MODE - 1* PNL TRIM - A* RHC - 1* TRIM INH - A* TRIM - A* RUD PEDAL - 1* SBTC - 1* MAN - 1* MSTR RCS XFEED - 1* SEP, ET, & SRB - 1* NWS POS FDBK A - 1*		AA TEST ADTA 1 TEST F RCS He PRESS VLV A MANF 1 JETS  IMU 1 L OMS GMBL PRI SEL MLS 1 TEST MTU UPDATE - 1* NWS 1 RADAR ALT 1 TEST TACAN 1 -Z S TRK DISPLAYS: C/W: L RCS (LK/TK P) FWD DAP LIGHTS L FCS MODE LIGHTS: BDY FLP AUTO P & R/Y AUTO SPD BRK AUTO RCS COMMAND LIGHTS - A* FWD,L,R RCS OXID QTY FWD,L RCS LOWEST QTY SPI: ELEVON POS SPD BRK POS CMD RUD POS OFF FLAG	

\*In INPUT & OUTPUT columns, A(B) indicates dual redundancy; 1(2,3,4) indicates triple or quad redundancy

# MEDS

A2-2

REF/MEDS/GEN E,1

FA1	
BCE	GPC INPUT
C	L,R OMS Ps RCS MANF 1 P L RCS Ts and Ps PASS QTY
D	FCS CH 1 FDBK BYP IND HYD 1 P - 1* 2 P - 2* L OMS GMBL PRI FDBK ARM - B* ARM/PRESS - B* L RCS MANF 5 JET RM VLV STATUS L,R RCS MANF 1 JET RM RGA 1
GPC OUTPUT	
	BDY FLP - 1* FCS CH 1 CMD HYD BRAKE ISOL VLV 1 OP CMD MPS/TVC ISOL VLV 1 CMD LG EXTEND ISOL VLV OP CMD L OMS CNTL VLV 1 - B* GMBL PRI He P/VAP ISOL VLV A PURGE VLV 1 L RCS MANF 5 JETs L,R RCS MANF 1 JET He PRESS VLV A TK ISOL VLV 1/2 CL OP - A* R OMS CNTL VLV 1 - B* RGA 1 - TEST

FF2/FA2

\*In INPUT and OUTPUT columns, A(B) indicates dual redundancy; 1(2,3,4) indicates triple or quad redundancy

**MEDS**

A2-3

REF/ALL/GEN E

FF2/FA2

FF2				
BCE	GPC INPUT		BCE	GPC INPUT
A	F RCS MANF 2 P IMU 2 STATUS PNL F8 DISP SWs (eight)		ADTA GPS IMU MLS MTU TAC	ADTA 2 GPS 2 IMU 2 MLS 2 MTU ACCUM 2 RADAR ALT 2 TACAN 2
GPC OUTPUT				
B	AA 2 F RCS MANF 2 JET RM R ADS DEPLOY DISC - A* NLG NO WOW - B* LMG NO WOW - 1* RMG NO WOW - 2*  CNTLRs/PBIs/SWs: AFT SENSE - 2* RHC (PITCH, YAW) - 2* THC - 2* C ME S/D PB (S/D INOP) FCS CH 1 ORIDE - 1* 2 ORIDE - 1* 3 ORIDE - 3* ENTRY MODE - 2* FWD DAP AXES - B* CNTL - 2* THC - 2* L BDY FLP - B* FCS MODE - 2* ME S/D PB (S/D INOP) PNL TRIM - B* RHC - 2* TRIM INH - B* TRIM - B* RUD PED - 2* SBTC - 2* MAN - 2* R ATT REF FCS MODE - 1* RHC - 1* RUD PEDAL - 1* SBTC - 1* MAN - 1* MSTR RCS XFEED - 2* NWS POS FDBK B - 2*		AA 2 TEST ADTA 2 TEST F RCS MANF 2 JETS GPS 2 IMU 2 L OMS GMBL SEC SEL MLS 2 TEST MTU UPDATE - 2* NWS 1 RADAR ALT 2 TEST TACAN 2 DISPLAYS: L FCS MODE LIGHTS: BDY FLP MAN P and R/Y CSS SPD BRK MAN SPI: AILERON POS BDY FLP POS	

\*In INPUT and OUTPUT columns, A(B) indicates dual redundancy; 1(2,3,4) indicates triple or quad redundancy

# MEDS

A2-4

REF/MEDS/GEN E,1



<b>FA2</b>		
BCE	GPC INPUT	
C	L,R OMS Ps RCS MANF 3 P R RCS Ts and Ps PASS QTY	
D	FCS CH 2 FDBK BYP IND	
	HYD 1 P	- 2*
	2 P	- 1*
	L OMS GMBL SEC FDBK	
	L,R RCS MANF 3 JET RM	
	RGA 2	
	R OMS ARM	- B*
	ARM/PRESS	- B*
	RCS MANF 5 VLV (JET RM)	
-	HYD 3P	- 3*
GPC OUTPUT		
	BDY FLP	- 2*
	FCS CH 2 CMD	
	HYD BRAKE ISOL VLV 2 OP CMD	
	MPS/TVC ISOL VLV 2 CMD	
	L OMS CNTL VLV 2	- B*
	GMBL SEC	
	He P/VAP ISOL VLV B	
	PURGE VLV 2	
	R RCS MANF 5 JETS	
	L,R RCS MANF 3 JETS	
	He PRESS VLV B	
	TK ISOL VLV 3/4/5 A	
	R OMS CNTL VLV 2	- B*
	RGA 2 - TEST	

FF3/FA3

\*In INPUT and OUTPUT columns, A(B) indicates dual redundancy; 1(2,3,4) indicates triple or quad redundancy

**MEDS**

A2-5

REF/ALL/GEN E

FF3/FA3

FF3			
BCE	GPC INPUT	BCE	GPC INPUT
A	F RCS Ts and Ps MANF 4 P BFS QTY IMU 3 STATUS PNL A6 DISP SWs (three)	ADTA IMU 3 MLS 3 MTU NSP STKR TAC	ADTA 3 IMU 3 MLS 3 MTU ACCUM 3 NSP 2 -Y S TRK RNDZ RADAR** TACAN 3
			GPC OUTPUT
B	AA 3 F RCS MANF 4 JET RM 5 JET RM VLV STATUS L ADS DEPLOY DISC - B* NLG NO WOW - A* LMG NO WOW - 2* RMG NO WOW - 3*  CNTLRs/PBIs/SWs: AFT ATT REF DAPAXES - A* CNTL - 1* RHC - 3* SENSE - 3* THC - 3* FCS CH 1 ORIDE - 3* 2 ORIDE - 2* 4 ORIDE - 2* ENTRY MODE - 3* FWD DAP CNTL - 3* THC - 3* L FCS MODE - 3* ME S/D PB (S/D INOP) RHC - 3* RUD PEDAL - 3* SBTC - 3* MAN - 3* R BDY FLP - A* FCS MODE - 2* ME S/D PB (S/D INOP) PNL TRIM - A* RHC - 2* TRIM INH - A* TRIM - A* RUD PEDAL - 2* SBTC - 2* MAN - 2* MSTR RCS XFEED - 3* SEP, ET, and SRB - 3*	AA 3 TEST ADTA 3 TEST F RCS He PRESS VLV B MANF 4 JETS 5 JETS  IMU 3 MLS 3 TEST MTU UPDATE - 3* R OMS GMBL SEC SEL -Y S TRK NWS 2 TACAN 3 DISPLAYS: AFT DAP LIGHTS C/W: ADTA FCS CH SAT FWD RCS (LK/TK P) R RCS (LK/TK P) IMU L OMS ENG L RHC OMS TVC RCS JET RGA/AA R OMS ENG R RHC FWD,L,R RCS FU QTY R RCS LOWEST QTY - B* RCS CMD LTS - B* R FCS MODE LIGHTS: BDY FLP AUTO P and R/Y AUTO SPD BRK AUTO	

\*In INPUT and OUTPUT columns, A(B) indicates dual redundancy; 1(2,3,4) indicates triple or quad redundancy  
 \*\*No BCE msg associated w/loss of RNDZ RADAR

**MEDS**

MDM

MDM FF1 .....	2-2
FA1 .....	2-3
FF2 .....	2-4
FA2 .....	2-5
FF3 .....	2-6
FA3 .....	2-7
FF4 .....	2-8
FA4 .....	2-9
PL1 .....	2-10
PL2 .....	2-11
OI DSC LOSS .....	2-12
NOTES .....	2-12
DISP 78 SM SYS SUMM 1 (PASS) .....	2-13
(BFS) .....	2-14
DISP 79 SM SYS SUMM 2 (PASS) .....	2-15
(BFS) .....	2-16
DISP 89 PRPLT THERMAL .....	2-17
DISP 19 GNC SYS SUMM 2 .....	2-18
MDM/DCU LOSS .....	2-20
DISP 167 DOCKING STATUS .....	2-20

**MDM**

**NOM**

B2-1

REF/NOM/GEN E

MDM

FF1				
BCE	GPC INPUT		BCE	GPC INPUT
A	F RCS Ts & Ps MANF 1 P BFS QTY IMU 1 STATUS PNL F6 DISP SWs (eight)		ADTA IMU MLS MTU NSP STKR TAC	ADTA 1 IMU 1 MLS 1 MTU ACCUM 1 NSP 1 -Z S TRK TACAN 1 RADAR ALT 1
			GPC OUTPUT	
B	AA 1 F RCS MANF 1 JET RM L ADS DEPLOY DISC - A* RMG NO WOW - 1*  CNTLRs/PBIs/SWs: AFT DAP CNTL - 3* RHC - 1* SENSE - 1* THC - 1* C ME S/D PB (S/D INOP) FCS CH 1 ORIDE - 2* 3 ORIDE - 2* 4 ORIDE - 3* ENTRY MODE - 1* FWD DAP AXES - A* CNTL - 1* THC - 1* LATT REF BDY FLP - A* FCS MODE - 1* PNL TRIM - A* RHC - 1* TRIM INH - A* TRIM - A* RUD PEDAL - 1* SBTC - 1* MAN - 1* MSTR RCS XFEED - 1* SEP, ET & SRB - 1* NWS POS FDBK A - 1*		AA TEST ADTA 1 TEST F RCS He PRESS VLV A MANF 1 JETS  IMU 1 L OMS GMBL PRI SEL MLS 1 TEST MTU UPDATE - 1* NWS 1 RADAR ALT 1 TEST TACAN 1 -Z S TRK  DISPLAYS: C/W: L RCS (LK/TK P) FWD DAP LIGHTS L FCS MODE LIGHTS: BDY FLP AUTO P & R/Y AUTO SPD BRK AUTO RCS COMMAND LIGHTS - A* FWD,L,R RCS OXID QTY FWD,L RCS LOWEST QTY SPI: ELEVON POS SPD BRK POS CMD RUD POS OFF FLAG	

\*In INPUT & OUTPUT columns, A(B) indicates dual redundancy; (1,2,3,4) indicates triple or quad redundancy

**NOM**

B2-2

REF/NOM/GEN E

FA1	
BCE	GPC INPUT
C	L,R OMS Ps RCS MANF 1 P L RCS Ts and Ps PASS QTY
D	FCS CH 1 FDBK BYP IND HYD 1 P - 1* 2 P - 2* L OMS GMBL PRI FDBK ARM - B* ARM/PRESS - B* L RCS MANF 5 JET RM VLV STATUS L,R RCS MANF 1 JET RM RGA 1
GPC OUTPUT	
	BDY FLP - 1* FCS CH 1 CMD HYD BRAKE ISOL VLV 1 OP CMD MPS/TVC ISOL VLV 1 CMD LG EXTEND ISOL VLV OP CMD L OMS CNTL VLV 1 - B* GMBL PRI He P/VAP ISOL VLV A PURGE VLV 1 L RCS MANF 5 JETs L,R RCS MANF 1 JET He PRESS VLV A TK ISOL VLV 1/2 CL OP - A* R OMS CNTL VLV 1 - B* RGA 1 - TEST

FF2/FA2

\*In INPUT & OUTPUT columns, A(B) indicates dual redundancy; (1,2,3,4) indicates triple or quad redundancy

**NOM**

B2-3

REF/ALL/GEN E

FF2/FA2

FF2				
BCE	GPC INPUT		BCE	GPC INPUT
A	F RCS MANF 2 P IMU 2 STATUS PNL F8 DISP SWs (eight)		ADTA GPS IMU MLS MTU TAC	ADTA 2 GPS 2 IMU 2 MLS 2 MTU ACCUM 2 TACAN 2 RADAR ALT 2
			GPC OUTPUT	
B	AA 2 F RCS MANF 2 JET RM R ADS DEPLOY DISC - A* NLG NO WOW - B* LMG NO WOW - 1* RMG NO WOW - 2*  CNTLRs/PBIs/SWs: AFT SENSE - 2* RHC (PITCH, YAW) - 2* THC - 2* C ME S/D PB (S/D INOP) FCS CH 1 ORIDE - 1* 2 ORIDE - 1* 3 ORIDE - 3* ENTRY MODE - 2* FWD DAP AXES - B* CNTL - 2* THC - 2* L BDY FLP - B* FCS MODE - 2* ME S/D PB (S/D INOP) PNL TRIM - B* RHC - 2* TRIM INH - B* TRIM - B* RUD PED - 2* SBTC - 2* MAN - 2* R ATT REF FCS MODE - 1* RHC - 1* RUD PEDAL - 1* SBTC - 1* MAN - 1* MSTR RCS XFEED - 2* NWS POS FDBK B - 2*		AA 2 TEST ADTA 2 TEST F RCS MANF 2 JETS GPS 2 IMU 2 L OMS GMBL SEC SEL MLS 2 TEST MTU UPDATE - 2* NWS 1 RADAR ALT 2 TEST TACAN 2  DISPLAYS: L FCS MODE LIGHTS: BDY FLP MAN P and R/Y CSS SPD BRK MAN SPI: AILERON POS BDY FLP POS	

\*In INPUT & OUTPUT columns, A(B) indicates dual redundancy; (1,2,3,4) indicates triple or quad redundancy

**NOM**

B2-4

REF/NOM/GEN E

FA2		
BCE	GPC INPUT	
C	L,R OMS Ps RCS MANF 3 P R RCS Ts and Ps PASS QTY	
D	FCS CH 2 FDBK BYP IND	
	HYD 1 P	- 2*
	2 P	- 1*
	L OMS GMBL SEC FDBK	
	L,R RCS MANF 3 JET RM	
	RGA 2	
	R OMS ARM	- B*
	ARM/PRESS	- B*
	RCS MANF 5 VLV (JET RM)	
-	HYD 3P	- 3*
GPC OUTPUT		
	BDY FLP	- 2*
	FCS CH 2 CMD	
	HYD BRAKE ISOL VLV 2 OP CMD	
	MPS/TVC ISOL VLV 2 CMD	
	L OMS CNTL VLV 2	- B*
	GMBL SEC	
	He P/VAP ISOL VLV B	
	PURGE VLV 2	
	R RCS MANF 5 JETS	
	L,R RCS MANF 3 JETS	
	He PRESS VLV B	
	TK ISOL VLV 3/4/5 A	
	R OMS CNTL VLV 2	- B*
	RGA 2 - TEST	

FF3/FA3

\*In INPUT & OUTPUT columns, A(B) indicates dual redundancy; (1,2,3,4) indicates triple or quad redundancy

**NOM**

B2-5

REF/ALL/GEN E

FF3/FA3

FF3			
BCE	GPC INPUT	BCE	GPC INPUT
A	F RCS Ts and Ps MANF 4 P BFS QTY IMU 3 STATUS PNL A6 DISP SWs (three)	ADTA IMU MLS MTU NSP STKR TAC	ADTA 3 IMU 3 MLS 3 MTU ACCUM 3 NSP 2 -Y S TRK TACAN 3 RNDZ RADAR
			GPC OUTPUT
B	AA 3 F RCS MANF 4 JET RM 5 JET RM VLV STATUS L ADS DEPLOY DISC - B* NLG NO WOW - A* LMG NO WOW - 2* RMG NO WOW - 3*  CNTLRs/PBIs/SWs: AFT ATT REF DAPAXES - A* CNTL - 1* RHC - 3* SENSE - 3* THC - 3* FCS CH 1 ORIDE - 3* 2 ORIDE - 2* 4 ORIDE - 2* ENTRY MODE - 3* FWD DAP CNTL - 3* THC - 3* L FCS MODE - 3* ME S/D PB (S/D INOP) RHC - 3* RUD PEDAL - 3* SBTC - 3* MAN - 3* R BDY FLP - A* FCS MODE - 2* ME S/D PB (S/D INOP) PNL TRIM - A* RHC - 2* TRIM INH - A* TRIM - A* RUD PEDAL - 2* SBTC - 2* MAN - 2* MSTR RCS XFEED - 3* SEP, ET and SRB - 3*	AA 3 TEST ADTA 3 TEST F RCS He PRESS VLV B MANF 4 JETS 5 JETS  IMU 3 MLS 3 TEST MTU UPDATE - 3* R OMS GMBL SEC SEL TACAN 3 -Y S TRK NWS 2  DISPLAYS: AFT DAP LIGHTS C/W: ADTA FCS CH SAT FWD RCS (LK/TK P) R RCS (LK/TK P) IMU L OMS ENG L RHC OMS TVC RCS JET RGA/AA R OMS ENG R RHC FWD,L,R RCS FU QTY R RCS LOWEST QTY - B* RCS CMD LTS - B* R FCS MODE LIGHTS: BDY FLP AUTO P and R/Y AUTO SPD BRK AUTO	

\*In INPUT & OUTPUT columns, A(B) indicates dual redundancy; (1,2,3,4) indicates triple or quad redundancy

**NOM**

B2-6

REF/NOM/GEN E



FA3	
BCE	GPC INPUT
C	L OMS Ps BALL VLVs AFT QTY Pc (FDI) L,R RCS MANF 2 P L RCS BFS QTY
D	FCS CH 3 FDBK BYP IND HYD 2 P - 3* 3 P - 1* L OMS ARM - A* ARM/PRESS - A* N2 P VLV POS IND L,R RCS MANF 2 JET RM VLV STATUS R OMS GMBL SEC FDBK RGA 3
GPC OUTPUT	
	BDY FLP - 3* FCS CH 3 CMD HYD BRAKE ISOL VLV 3 OP CMD HYD MPS/TVC ISOL VLV 3 CMD L OMS CNTL VLV 2 - A* L,R RCS MANF 2 JETS TK ISOL VLV 1/2 CL OP - B* XFEED VLV 1/2 CL OP - A* 3/4/5 CL OP - A* R OMS CNTL VLV 1 - A* GMBL SEC He P/VAP ISOL VLV A PURGE VLV 1 RGA 3 TEST

FF4/FA4

\*In INPUT and OUTPUT columns, A or B indicates dual redundancy; 1, 2, 3, or 4 indicates triple or quad redundancy

<b>FF4</b>				
BCE	GPC INPUT		BCE	GPC INPUT
A	F RCS MANF 3 P		ADTA	ADTA 4
				GPC OUTPUT
B	AA 4 F RCS MANF 3 JET RM R ADS DEPLOY DISC - B* LMG NO WOW - 3*  CNTLRs/PBIs/SWs: AFT DAP AXES - B* CNTL - 2* RHC (ROLL) - 2* FCS CH 2 ORIDE - 3* 3 ORIDE - 1* 4 ORIDE - 1* ENTRY MODE - 4* R BDY FLP - B* FCS MODE - 3* ME S/D PB (S/D INOP) PNL TRIM - B* RHC - 3* TRIM INH - B* TRIM - B* RUD PEDAL - 3* SBTC - 3* MAN - 3* SEP, ET and SRB - 2* NWS POS FDBK C - 3*			AA 4 TEST ADTA 4 TEST F RCS MANF 3 JETS R OMS GMBL PRI SEL NWS 2  DISPLAYS: R FCS MODE LIGHTS: BDY FLP MAN P and R/Y CSS SPD BRK MAN NWS FAIL LIGHT (POSN ERROR)

\*In INPUT and OUTPUT columns, A or B indicates dual redundancy; 1, 2, 3, or 4 indicates triple or quad redundancy

**FF4/FA4**

<b>FA4</b>	
BCE	GPC INPUT
C	R OMS Ps BALL VLVs Pc (FDI) L, R RCS MANF 4 P R RCS BFS QTY
D	FCS CH 4 FDBK BYP IND HYD 1 P - 3* 3 P - 2* L,R RCS MANF 4 JET RM R OMS GMBL PRI FDBK ARM - A* ARM/PRESS - A* RGA 4
GPC OUTPUT	
	FCS CH 4 CMD HYD MPS/TVC ISOL VLV 3 CMD L OMS CNTL VLV 1 - A* L,R RCS MANF 4 JETS TK ISOL VLV 3/4/5 B - B* XFEED VLV 1/2 CL OP - B* 3/4/5 CL OP - B* R OMS CNTL VLV 2 - A* GMBL PRI He P/VAP ISOL B PURGE VLV 2 RGA 4 – TEST

\*In INPUT & OUTPUT columns, A or B indicates dual redundancy; 1, 2, 3, or 4 indicates triple or quad redundancy

**PL1/PL2**

PL1/PL2

PL1		
BCE	GPC INPUT	
PL	PLBD CTRLLINE LATs	- A (13-16 B)*
	DOOR SW	- 2,3*
	L AFT BHD RDY TO LAT	- 1,2*
	LAT	- A*
	L FWD BHD RDY TO LAT	- 1,2*
	LAT	- A*
	L OP/CL	- B*
	R AFT BHD RDY TO LAT	- 1*
	LAT	- B*
	R FWD BHD RDY TO LAT	- 1*
	LAT	- A*
	R OP/CL	- A*
KU	KU-A COMM	
GPC OUTPUT		
	FLASH EVAP CNTLR PRI B	
	FREON PUMP LOOP 2 B	
	FCL 1 RAD ISO VLV	
	FC 1 PURGE VLV	
	2 PURGE VLV	
	GCIL DECODER A	
	H2O LOOP 1 PMP A	
	B	
	HYD SYS 1 CIRC PMP	- A*
	2 CIRC PMP	- A*
	3 CIRC PMP	- A*
	NH3 BLR CNTLR PRI A	
	OPS RCDR 1	
	PLBD AC ENA 1,3,4	
	CTRLINE LATs	- A*
	L BHD FWD & AFT BHD LATs	- A*
	L OP/CL	- B*
	R BHD FWD & AFT BHD LATs	- A*
	R OP/CL	- A*
	PL RCDR	
	S-BD FM ANT SW ELECT 1	
	PM ANT SW ELECT 1	
	PSP 1	
	KU-A COMM/RDR	
	DISPLAYS:	
	ABORT LIGHT	- A*
	PL BAY DOORS tb	- A*
	IF FLOWN:	
	APCU1 OUTPUT VOLTS HI RES	
	LO	
	CONV A TEMPS	- B*
	OUTPUT CURRENT	- B*
	TRIP STATUS	

\*In INPUT & OUTPUT columns, A or B indicates dual redundancy; 1, 2, 3, or 4 indicates triple or quad redundancy

PL2		
BCE	GPC INPUT	
PL	FC PURGE SEQ START	
	PLBD CTRLLINE LATs	- B (13-16 A)*
	DOOR SW	- 1,4*
	L AFT BHD RDY TO LAT	- 3*
	LAT	- B*
	L FWD BHD RDY TO LAT	- 3*
	LAT	- B*
	L OP/CL	- A*
	R AFT BHD RDY TO LAT	- 2,3*
	LAT	- A*
	R FWD BHD RDY TO LAT	- 2,3*
	LAT	- B*
	R OP/CL	- B*
GPC OUTPUT		
	CCTV UPLINK COMMAND	
	FLASH EVAP CNTLR PRI A	
	SEC	
	FREON PUMP LOOP 1 B	
	FCL 2 RAD ISO VLV	
	FC O2/H2 PURGE HTR	
	3 PURGE VLV	
	GCIL DECODER B	
	H2O LOOP 2 PMP	
	HYD SYS 1 CIRC PMP	- B*
	2 CIRC PMP	- B*
	3 CIRC PMP	- B*
	NH3 BLR CNTLR PRI A	
	B	
	OPS RCDR 2	
	PLBD AC ENA 2,5,6	
	CTRLINE LATs	- B*
	L BHD FWD & AFT BHD LATs	- B*
	L OP/CL	- A*
	R BHD FWD & AFT BHD LATs	- B*
	R OP/CL	- B*
	S-BD FM ANT SW ELECT 2	
	PM ANT SW ELECT 2	
	PSP 2	
	DISPLAYS:	
	ABORT LIGHT	- B*
	APU FUEL QTY	
	H2O QTY	
	L & R BFC LIGHT	
	PL BAY DOORS tb	- B*
	IF FLOWN:	
	APCU1 OUTPUT VOLTS HI RES	
	LO	
	CONV A TEMPS	- B*
	OUTPUT CURRENT	- B*
	TRIP STATUS	

\* In INPUT & OUTPUT columns, A or B indicates dual redundancy; 1, 2, 3, or 4 indicates triple or quad redundancy

OIDSC  
LOSS

## OI DSC LOSS

### NOTES

1. Loss of signal conditioning will usually (but not always) cause display of an off-scale low value for that parameter. 'L's will be displayed adjacent to this value. The following displays are to be used as road maps to determine if a grouping of displayed off-scale low measurements is the result of the failure of an OI DSC.
2. The pwr controls for the OI DSCs are as follows:

DSC OF 1/4	O14:B cb MNA OI SIG CONDR OF 1/4 A
	O15:B cb MNB OI SIG CONDR OF 1/4 B
DSC OF 2/3	O15:B cb MNB OI SIG CONDR OF 2/3 A
	O16:B cb MNC OI SIG CONDR OF 2/3 B
DSC OM 1/2	O14:B cb MNA OI SIG CONDR OM 1/2 A
	O15:B cb MNB OI SIG CONDR OM 1/2 B
DSC OL 1/2	O17:C SIG CONDR OL 1/2
DSC OR 1/2	O17:C SIG CONDR OR 1/2
DSC OA 1/2/3	O17:D SIG CONDR OA 1/2/3
DSC OM 3	O15:B cb MNB OI SIG CONDR OM 3 A
	O16:B cb MNC OI SIG CONDR OM 3 B

OI DSC  
LOSS

1
2
3
4
5

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1

1	XXXX / XXX / 078	SM	SYS	SUMM	1	XX	X	DDD / HH : MM : SS
2								DDD / HH : MM : SS
3	SMOKE	1 / A	2 / B	DC	VOLTS	1 / A	2 / B	3 / C
4	CABIN	OF1		FC		OM1	OM2	OM2
5	L / R	FD	OF3	OF2	MAIN	OM2	OM2	OM1
6	AV BAY	1	OF2	OF3	ESS	OM2	OM2	OM1
7		2	OF1	OF3		A	B	C
8		3	OF1	OF2	CNTL	1	OF1	OF2
9						2	OF1	OF2
10						3	OF1	OF2
1	PRESS	OF2						OF3
2	dP / dT - EQ	OF3	± X . XXXS	A C				OF3
3	O2 CONC	XX . XS		VOLT	Φ A	OF1	OF2	OF3
4	PP02	OF1	OF2		Φ B	OF1	OF2	OF3
5	FAN Δ P	OF1			Φ C	OF1	OF2	OF3
6	HX OUT T	OF1		AMPS	Φ A	XX . XS	XX . XS	XX . XS
7	O2 FLOW	OF1	OF2		Φ B	XX . XS	XX . XS	XX . XS
8	N2 FLOW	OF1	OF2		Φ C	XX . XS	XX . XS	XX . XS
9	IMU FAN	AXS	BXS	CXS	FUEL CELL			
10	Δ V	FC1	FC2	FC3	AMPS	OM1	OM1	OM1
1	SS1	XXXS	XXXS	XXXS	REAC VLV	XXS	XXS	XXS
2	SS2	XXXS	XXXS	XXXS	STACK T	OM1	OM2	OM2
3	SS3	XXXS	XXXS	XXXS	EXIT T	OM1	OM2	OM2
4	TOTAL	AMPS	XXXXS		COOL P	OM1	OM2	OM2
5		KW	XXS		PUMP	XXS	XXS	XXS
6								(XX)

P  
A  
S  
S

'L' suggests loss of Dedicated Signal Conditioner

	1										2										3										4										5																																																	
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0																																								
1	XXXX/XXX/078										SM										SYS										SUMM										1										XX X										DDD/HH:MM:SS																													
2																																																			BFS										DDD/HH:MM:SS																													
3	SMOKE										1/A										2/B										DC VOLTS										1/A										2/B										3/C																													
4	CABIN										OF1																				FC										OM1										OM2										OM2																													
5	L/R FD										OF3										OF2										MAIN										OM2										OM2										OM1																													
6	AV BAY										1										OF2										OF3										CNTL										AB										OF1										OF1										OF1									
7											2										OF1										OF3										BC										OF2										OF2										OF2																			
8											3										OF1										OF2										CA										OF3										OF3										OF3																			
9	CABIN																														ESS										OM2										OM2										OM1																													
10	PRESS										OF2																				AC										VOLT										ΦA										OF1										OF2										OF3									
11	dP/dT										OF3																				ΦB										OF1										OF2										OF3																													
12	BU/EQ										OF2(3)										OF2(3)										ΦC										OF1										OF2										OF3																													
13	PPO2										OF1										OF2										AMPS										ΦA										XX.XS										XX.XS										XX.XS																			
14	FAN ΔP										OF1																				ΦB										XX.XS										XX.XS										XX.XS																													
15	HX OUT T										OF1																				ΦC										XX.XS										XX.XS										XX.XS																													
16	O2 FLOW										OF1										OF2										pH										XXS										XXS										XXS																													
17	N2 FLOW										OF1										OF2										AMPS										OM1										OM1										OM1																													
18	IMU FAN ΔP										X.XXS										FUEL CELL										REAC VLV										XXS										XXS										XXS																													
19	ΔV										FC1										FC2										FC3										STACK T										OM1										OM2										OM2																			
20	SS1										XXXS										XXXS										XXXS										EXIT T										OM1										OM2										OM2																			
1	SS2										XXXS										XXXS										XXXS										COOL P										OM1										OM2										OM2																			
2	SS3										XXXS										XXXS										XXXS										PUMP										XXS										XXS										XXS																			
3	TOTAL										AMPS										XXXS																																								(XX)																													
4											KW										XXS																																																																					
5																																																																																										
6																																																																																										

BFS



1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1

1  
2  
3  
4  
5  
6  
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5  
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```

XXXX / XXX / 079          SM  SYS  SUMM  2  XX  X  DDD / HH : MM : SS
                               DDD / HH : MM : SS

   CRYO  TK      1          2          3          4          5          MANF1  MANF2
H2 PRESS  XXXS  XXXS  XXXS  XXXS  XXXS  OM1  OM2
O2 PRESS  XXXXS XXXXS XXXXS XXXXS XXXXS OM1  OM2
HTR T1     OM1  OM1  OM1  OM2  OF2
      T2     OM2  OM2  OF3  OF3  OF3

-----
   APU      1          2          3          HYD      1          2          3
TEMP EGT   OA1  OA2  OA3  PRESS  OA2  OA1  OA3
B / U EGT  OA2  OA3  OA1  RSVR  T  OA1  OA2  OA3
OIL IN     OA1  OA2  OA3              P  OA1  OA2  OA3
      OUT   OA2  OA3  OA1              QTY  OA1  OA2  OA3
SPEED %    OA1  OA2  OA3              W / B
FUEL QTY   XXXS  XXXS  XXXS  H2O QTY XXXS  XXXS  XXXS
PMP LK P   OM3  OM3  OM3  BYP  VLV XXXS  XXXS  XXXS
OIL OUT P  OA1  OA2  OA3

      THERM CNTL      1          2
AV BAY      1          2          3  H2O PUMP P  OF2  OF3
TEMP        OF2  OF3  OF1  FREON FLOW  OF2  OF3
FAN ΔP      X.XXS X.XXS X.XXS  EVAP  OUT T  OA2  OA3

                               (XX)
  
```

**P  
A  
S  
S**

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1

```

1      XXXX / XXX / 079      SM SYS SUMM 2      XX X DDD / HH : MM : SS
2      BFS DDD / HH : MM : SS
3      CRYO TK      1      2      3      4      5      MANF1 MANF2
4      H2 PRESS      XXXS      XXXS      XXXS      XXXS      XXXS      OM1      OM2
5      O2 PRESS      XXXXS      XXXXS      XXXXS      XXXXS      XXXXS      OM1      OM2
6      HTR T1      OM1      OM1      OM1      OM2      OF2
7      T2      OM2      OM2      OF3      OF3      OF3
8      -----
9      APU      1      2      3      HYD      1      2      3
10     TEMP EGT      0A1      0A2      0A3      PRESS      0A2      0A1      0A3
11     B/U EGT      0A2      0A3      0A1      ACUM P      OM3      OM2      OM2
12     OIL IN      0A1      0A2      0A3      RSVR T      0A1      0A2      0A3
13     OUT      0A2      0A3      0A1
14     GG BED      XXXS      XXXS      XXXS      QTY      0A1      0A2      0A3
15     INJ      0A1      0A2      0A3
16     SPEED %      0A1      0A2      0A3      W/B
17     FUEL QTY      XXXS      XXXS      XXXS      H2O QTY      XXXS      XXXS      XXXS
18     PMP LK P      OM3      OM3      OM3      BYP VLV      XXXS      XXXS      XXXS
19     OIL OUT P      0A1      0A2      0A3
20     FU TK VLV
1      A T      OM3      OM3      OM3      THERM CNTL      1      2
2      B T      OM1      OM1      OM1      H2O PUMP P      OF2      OF3
3      AV BAY      1      2      3      FREON FLOW      OF2      OF3
4      TEMP      OF2      OF3      OF1      EVAP OUT T      0A2      0A3
5      FAN ΔP      X.XXS      X.XXS      X.XXS      (XX)
6

```

B  
F  
S

	1									2									3									4									5																																
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1	XXXX / XXX / 089									PRPLT									THERMAL									XX X									DDD / HH : MM : SS																																
2	POD									L R																											DDD / HH : MM : SS																																
3	OMS TK									OX OL2 OR2																																																											
4										FU OL1 OR1									OMS CRSFD									L R C																																									
5	ENG I / F									OX OL1 OR1									XFD									OX OA1 OA2 OA3																																									
6										FU OL2 OR2									GMBL LN									OA1 OA2																																									
7										OX VLV OL1 OR1									DRN									OX OA3 OA3																																									
8										FU INJ OL1 OR1																																																											
9																																																																					
10	WEB KEEL									1 OL2 OR2																											FU OX																																
11										2 OL2 OR2									BLD AFT FUS									OA3 OA3																																									
12	Y									OB OL2 OR2																		PL BAY									OM1 OM2																																
13										UP OL1 OR1																		OX QD									OF3																																
14	OX DRN PNL									1 OL1 OR1																																																											
15										2 OL1 OR1									FWD RCS									FU OX																																									
16	ENG COVER									OM1 OM2									LINE									T1 OF2 OF4																																									
17										SERV PNL OL2 OR2																		T2 OF4 OF2																																									
18	GSE SERV PNL									OL2 OR2																																																											
19	TEST HE / OX									1 OL1 OR1									AFT RCS									L R																																									
20										2 OL2 OR2									MANF 1									OX OL1 OR1																																									
1																			DRN PNL									1 OL2 OR2																																									
2																												2 OL2 OR2																																									
3																			VERN PNL									1 OL2 OR2																																									
4																												2 OL2 OR2																																									
5																																																																					
6																																														( X X )																							

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1

1	XXXX / XXX / 019										GNC SYS SUMM 2										XX X DDD / HH : MM : SS									
2																					BFS DDD / HH : MM : SS									
3	OMS AFT QTY					L R					OMS					L R														
4	OXID XX.XS					XX.XS					TK P					HE OL2 OR2														
5	FU XX.XS					XX.XS										OXID OA2/OL2 OA1/OR2														
6	FU INJ T					OL1 OR1										FU OL1 OR1														
7						JET ISOL					N2 TK P					OL1 OR1														
8	RCS					OXID FU					FAIL VLV					REG P					OL1 OR1									
9	FWD					HEP OF4 OF2										P VLV					XXS XXS									
10						TKP OF2 OF4										ENG IN P														
11						QTY OF2(4) OF2(3,4)										OXID OL1 OR1														
12	MANF					1P OF4 OF4					XXX XXS					FU OL2 OR2														
13						2P OF4 OF4					XXX XXS					VLV 1 XXXS XXXS														
14						3P OF2 OF2					XXX XXS					2 XXXS XXXS														
15						4P OF2 OF2					XXX XXS																			
16						5					XXX XXS					OXID FU					JET ISOL									
17	AFT					HEP OL2 OL1										HEP OR2 OR1														
18	L					TKP OL1 OA1/OL2										R TKP OR1 OA2/OR2														
19						QTY OL1(2) OL1(2)										QTY OR1(2) OR1(2)														
20	MANF					1P OL1 OL1					XXX XXS					1P OR1 OA1/OR1					XXX XXS									
1						2P OL1 OL1					XXX XXS					2P OR1 OA2/OR1					XXX XXS									
2						3P OL2 OA2/OL2					XXX XXS					3P OR2 OA2/OR2					XXX XXS									
3						4P OL2 OA1/OL2					XXX XXS					4P OR2 OR2					XXX XXS									
4						5					XXX XXS					5					XXX XXS									
5																					(XX)									
6																														

Note: [shaded] indicates parameters are driven and displayed on the BFS displays only

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**MDM/DCU/  
DSC LOSS**

	1								2								3								4								5																	
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
1	XXXX / XXX / 167																																																	
2	DOCKING STATUS XX X DDD / HH : MM : SS																																																	
3	DDD / HH : MM : SS																																																	
3	CONTACT	OF 3 <sub>1</sub>	CNTL	PNL	PWR	OA <sub>32</sub> /OA <sub>22</sub> /OA <sub>22</sub>	CNTL	CMD	PWR	OA <sub>31</sub>																																								
4	CAPTURE	OA 1 <sub>1</sub>	HTR / DCU	PWR	OA <sub>22</sub> /OA <sub>22</sub> /OA <sub>32</sub>	RING	DR	BUS	OF <sub>31</sub> /OA <sub>31</sub>																																									
5	DAMPING	OF 3 <sub>1</sub>	APDS	PWR	OA <sub>32</sub> /OA <sub>32</sub> /OA <sub>32</sub>	HKS	DR	BUS	OA <sub>31</sub> /OA <sub>31</sub>																																									
6	RNG ALGN	OF 3 <sub>1</sub>	APDS	CIRC	PROT	OA <sub>11</sub>	DAMPER	BUS	OA <sub>31</sub> /OA <sub>31</sub>																																									
7											FIXER										BUS										OA <sub>31</sub> /OA <sub>11</sub>																			
8	RING	POS	OA 2 <sub>2</sub> /	OA 2 <sub>2</sub> /	OA 2 <sub>2</sub>	PMA	2 / 3	OP	/	CL																																								
9	DRV	CMD	OA 1 <sub>1</sub>			HK 1	CMD	OF 1	OF 2 /	OF 1	OF 2																																							
10	FIXERS	OA 1 <sub>1</sub>			IND	OF 1	OF 2 /	OF 1	OF 2																																									
11	CLUTCH	OA 1 <sub>3</sub> /	OA 2 <sub>4</sub>			HK 2	CMD	OF 1	OF 2 /	OF 1	OF 2																																							
12	PETAL	POS	1	2	3	IND	OF 1	OF 2 /	OF 1	OF 2																																								
13	RING	OF 1 <sub>2</sub>	OF 2 <sub>2</sub>	OF 2 <sub>2</sub>																																														
14	BASE	OF 2 <sub>2</sub>	OF 2 <sub>2</sub>	OF 1 <sub>2</sub>																																														
15	UNDOCK	CMPLT	OA 1 <sub>2</sub>			1 / 3 / 5	OA 1 <sub>3</sub>	7 /	9 / 11	OA 1 <sub>3</sub>																																								
16	RDY TO	HOOK	OA 1 <sub>2</sub>			2 / 4 / 6	OA 2 <sub>4</sub>	8 /	10 / 12	OA 2 <sub>4</sub>																																								
17	HK 1	DRV	CMD	OA 1 <sub>1</sub>			ODS			INDIV			HK		CL		ODS			CONN																														
18	POS	OF 1 <sub>1</sub>			1	3	5	7	9	11	X 3	OA 2 <sub>4</sub>																																						
19	IND	OA 1 <sub>2</sub> /	OA 1 <sub>2</sub>			OA 1 <sub>3</sub>	OA 1 <sub>3</sub>	OA 1 <sub>3</sub>	OA 1 <sub>3</sub>	OA 1 <sub>3</sub>	OA 1 <sub>3</sub>	X 4	OA 1 <sub>3</sub>																																					
20	HK 2	DRV	CMD	OA 1 <sub>1</sub>			2			4			6		8		10		12																															
21	POS	OF 1 <sub>1</sub>			OA 2 <sub>4</sub>	OA 2 <sub>4</sub>	OA 2 <sub>4</sub>	OA 2 <sub>4</sub>	OA 2 <sub>4</sub>	OA 2 <sub>4</sub>	OA 2 <sub>4</sub>																																							
22	IND	OA 2 <sub>2</sub> /	OA 2 <sub>2</sub>																																															
23	CAP	LAT	CMD	OA 1 <sub>1</sub>			PYRO LOGIC PWR										OA 3 <sub>2</sub> /										OA 3 <sub>2</sub> /										OA 3 <sub>2</sub>													
24	IND	OA 2 <sub>2</sub> /	OA 2 <sub>2</sub>			PYRO CIRC PROT										OA 1 <sub>1</sub> /										OA 1 <sub>1</sub>																								
25	MAN	REL	OA 2 <sub>2</sub>			PYRO MNA 40 / 6 AMP										OA 1 /										OA 1																								
26	( X X )																																																	

NOTE: Subscript numbers indicate Data Collection Unit or DSC channelization: Subscript 1 for DCU 1, subscript 2 for DCU 2, subscript 3 for DSC OA1, and subscript 4 for DSC OA2. Parameters without a subscript are not processed by a DCU or DSC

## ADC DATA LOSS (MEDS only)

### ADC 1A,1B DATA LOSS

DATA PARAMETER		MSID	CH
SPI	Aileron Position	V72H5131C	2
	Body Flap Position	V72H5130C	1
	Left Inboard Elevon Position	V72H5110C	3
	Left Outboard Elevon Position	V72H5112C	4
	Right Inboard Elevon Position	V72H5120C	5
	Right Outboard Elevon Position	V72H5122C	6
	Rudder Position	V72H5100C	8
	Speed Brake Command Position	V72H5106C	10
	Speed Brake Position	V72H5105C	7
	Valid Flag (not currently used)	V72X8283C	9
OMS	Left Chamber Pressure	V43P4649C	26
	Left He Tank Pressure	V43P4121C	24
	Left N2 Tank Pressure	V43P4547C	25
	Right Chamber Pressure	V43P5649C	30
	Right He Tank Pressure	V43P5121C	28
	Right N2 Tank Pressure	V43P5547C	29
MPS	Center Engine Chamber Pressure	V72P0040C	11
	Center Engine He Regulator Pressure	V41P1154A	21
	Center Engine He Tank Pressure	V41P1150C	20
	Left Engine He Regulator Pressure	V41P1254A	16
	Left Engine He Tank Pressure	V41P1250C	15
	Left Engine Chamber Pressure	V72P0041C	12
	Right Engine Chamber Pressure	V72P0042C	13
	Right Engine He Regulator Pressure	V41P1354A	23
	Right Engine He Tank Pressure	V41P1350C	22
	LO2 Engine Manifold Pressure	V41P1533C	19
	LH2 Engine Manifold Pressure	V41P1433C	14
	PNEU He Tank Pressure	V41P1600A	17
	PNEU He Regulator Pressure	V41P1605A	18

ADC 2A,2B  
DATA LOSS

# MEDS

### ADC 2A,2B DATA LOSS

**ADC 2A,2B  
DATA LOSS**

	DATA PARAMETER	MSID	CH
APU	1 Fuel Pressure	V46P0100A	7
	2 Fuel Pressure	V46P0200A	12
	3 Fuel Pressure	V46P0300A	17
	1 Fuel Quantity	V72Q6001V	1
	2 Fuel Quantity	V72Q6002V	3
	3 Fuel Quantity	V72Q6003V	6
	1 H2O Pressure	V72Q6040V	2
	2 H2O Pressure	V72Q6042V	4
	3 H2O Pressure	V72Q6044V	5
	1 Oil Temperature	V46T0150A	8
	2 Oil Temperature	V46T0250A	13
	3 Oil Temperature	V46T0350A	18
Hydraulic	Subsystem 1 Pressure	V58P0114C	10
	Subsystem 2 Pressure	V58P0214C	15
	Subsystem 3 Pressure	V58P0314C	20
	Subsystem 1 Quantity	V58Q0102A	11
	Subsystem 2 Quantity	V58Q0202A	16
	Subsystem 3 Quantity	V58Q0302A	21

**MEDS**



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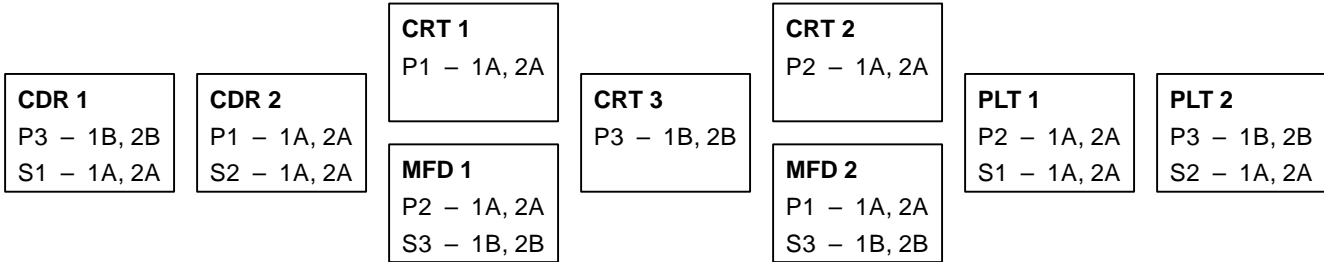
2-23

**MEDS  
QREF**

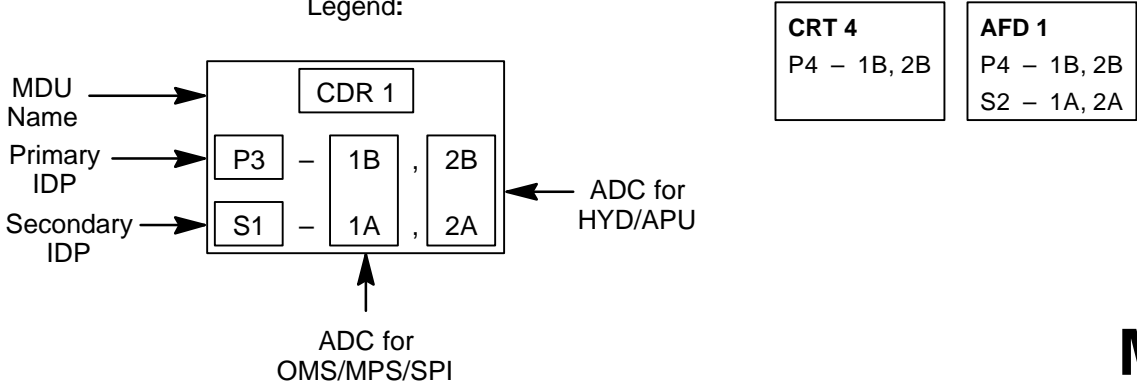
**MEDS**  
REF/MEDS/GEN E,1

**MEDS  
QREF**

**MEDS QUICK REFERENCE**



**Legend:**



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FAULT MESSAGES

3-1

REF/ALL/GEN E

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**FAULT  
MSG**

## FAULT MSG

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
S67 AC AMPS	1(2,3)	S2,4	• AC AMPS ↑	• ANY PHASE
S67 AC OVLD	1(2,3)	S2,4	• AC OVLD ↓	
SM1 AC OVLD 1(2,3)		SM		
S67 AC VOLTS	1(2,3)	S2,4	• AC VOLTS ↑↓	• ANY PHASE
SM1 AC VOLTS 1(2,3)		SM		
AERO DRIVE		G8	• SURFACE CMD/POS MISCOMPARE (I-LOAD)	• NO MAL • THRESHOLDS: ELEV = 5.8° RUD = 5.5° S/B = 10.9°
177 A/L H2O LCG	P1(2)	S2,4	• EXT A/L LCG SPLY P ↑↓	• EXT AIRLOCK ONLY
LN	T1(2)	S2,4	• EXT A/L H2O SPLY T ZN1(2) ↑↓ • EXT A/L LCG2 SPLY T ZN1(2) ↑↓ • EXT A/L QD PNL T ZN2 ↑↓	• EXT AIRLOCK ONLY • QD PNL T ZN2 IS ACTUALLY O2 SPLY LN T ZN2
XFER	P	S2,4	• EXT A/L H2O XFER P ↑↓	• EXT AIRLOCK ONLY
177 A/L STRUC	T	S2,4	• EXT A/L UPR BKHD T ↑↓ • EXT A/L LWR BKHD T ↑↓ • EXT A/L AFT STRUC T ↑↓	• EXT AIRLOCK ONLY
177 A/L-VEST	DP	S2,4	• AIRLOCK-VEST ΔP ↑↓	• EXTERNAL AIRLOCK ONLY
ANTENNA		S2,4	• QUAD ANT FAIL ↓	• MSG ONLY DURING AOS – CORRECTIVE ACTION BY MCC

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
S67 APC/ALC                      A(B,C)	S2,4		<ul style="list-style-type: none"> <li>• AFT PCA V ↓</li> </ul>	
SM2 APU 1(2,3)		SM	<ul style="list-style-type: none"> <li>• FU QTY ↓ APU OIL OUT T ↑↓</li> </ul>	
			<ul style="list-style-type: none"> <li>• PUMP LK PRESS ↑</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
			<ul style="list-style-type: none"> <li>• APU OIL OUT P ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>• APU SPEED % &gt; 40</li> </ul>
APU 1(2,3) COOL DOWN		SM	<ul style="list-style-type: none"> <li>• INJECTOR COOL COMPLETE</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
S88 APU FU LN                      1(2,3)	S2,4		<ul style="list-style-type: none"> <li>• APU FEED LN T ↑↓</li> <li>• APU PMP IN T ↑↓</li> <li>• APU TEST LN T1(T2) ↑↓</li> <li>• APU PUMP DRN LN T1(T2) ↑↓</li> </ul>	
S88 APU FU PMP                      1(2,3)	S2,4		<ul style="list-style-type: none"> <li>• APU PUMP OUT T ↑↓</li> <li>• APU PUMP BYP LN T ↑↓</li> <li>• GG SPLY LN T ↑↓</li> </ul>	

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3-4

REF/ALL/GEN E

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MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
S86 APU FUEL	1(2,3)	S2,4		<ul style="list-style-type: none"> <li>• APU FUEL QTY ↓</li> <li>• APU FUEL TK P ↑↓</li> </ul>
S86 APU GBX P	1(2,3)	S2,4		<ul style="list-style-type: none"> <li>• GBX P ↓</li> <li>• OIL OUT P ↑↓</li> </ul>
T	1(2,3)	S2,4		<ul style="list-style-type: none"> <li>• OIL OUT T ↑↓</li> <li>• GBX BRG T ↑</li> </ul>
S88 APU H2O T	1(2,3)	S2,4		<ul style="list-style-type: none"> <li>• APU H2O LN INT T ↑↓</li> </ul>
SM2 APU SPD HI 1(2,3)			SM	<ul style="list-style-type: none"> <li>• TURBINE OVERSPEED</li> </ul> <ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
SM2 APU SPD LO 1(2,3)			SM	<ul style="list-style-type: none"> <li>• TURBINE UNDERSPEED</li> </ul> <ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
S86 APU TEMP	1(2,3)	S2,4		<ul style="list-style-type: none"> <li>• BACKUP EGT ↑</li> </ul>
SM2 APU TEMP			SM	<ul style="list-style-type: none"> <li>• OIL TEMP ↑↓</li> </ul>
S88 APU TK T	1(2,3)	S2,4		<ul style="list-style-type: none"> <li>• APU TK SURF T ↓</li> <li>• APU TK SKIN T ↑↓</li> </ul>
S66 AV BAY 1(2,3)	FAN	S2,4		<ul style="list-style-type: none"> <li>• AV BAY 1(2,3) FAN ΔP ↑↓</li> </ul>
SM2 AV BAY FAN			SM	
S66 AV BAY 1(2,3)	TEMP	S2,4		<ul style="list-style-type: none"> <li>• AV BAY 1(2,3) FAN AIR OUT T ↑</li> </ul>
SM2 AV BAY TEMP			SM	
BCE BYP	FLEX	S2,4		<ul style="list-style-type: none"> <li>• BCE BYPASS ON FLEX/FLEX PAIR</li> </ul>
BCE BYP	KU	S2,4		<ul style="list-style-type: none"> <li>• PL 1 KU COMM/RADAR S10 FAIL</li> </ul> <ul style="list-style-type: none"> <li>• RADAR: GPC MODE NOT VALID UNLESS TRACKING, AUTO-TRACK MODE IS VALID</li> <li>• NO MAL</li> </ul>
BCE BYP	MCIU	S2,4		<ul style="list-style-type: none"> <li>• GPC DETECTED I/O LOSS WITH MCIU</li> </ul>

**B**

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
S62 BCE BYP	OA	S2,4		• OA1, OA2, OR OA3 MDM OR MDM CARD FAIL	
	OFA	S2,4		• OF1 OR OF2 MDM OR MDM CARD FAIL	
	OFB	S2,4		• OF3 OR OF4 MDM OR MDM CARD FAIL	
	PDI	S2,4		• PDI INTERFACE TO SM GPC FAIL	• MSG OCCURS AT SM OPS TRANSITION IF PDI POWER OFF
	PL	S2,4		• PDI SSC OR EXC INTERFACE TO PCMMU FAIL	• MSG OCCURS AT SM OPS TRANSITION IF PDI POWER OFF OR IF SPACELAB AND SSC OR EXC POWER OFF
	PSP 1(2)	S2,4		• PSP 1(2) TO PL 1(2) MDM SERIAL I/O FAIL	
BCE BYP	PL1(2)	S2,4		• BCE BYPASS ON PL BUSES	
BCE BYP	SCA	S2,4		• BCE BYPASS ON SCA	• NO MAL
BCE STRG 1	A	G1,2,3,6,8	G0,1,2,3,6	• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 1 AND HAVE BYPASSED THAT ELEMENT	• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE
	ADTA	G1,3,6,8	G0,1,3,6		
	B	G1,2,3,6,8	G0,1,3,6		
	C	G1,2,3,6,8	G0,1,3,6		



MESSAGE	OPS AVAIL		CAUSE	COMMENTS			
	PASS	BFS					
BCE STRG 1 (Cont)	D	G1,2,3,6,8	G0,1,3,6	<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 1 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> </ul>		
	IMU	G1,2,3,6,8	G0,1,3,6				
	GPS	G1,2,3,6,8	G0,1,3,6				
	MLS	G1,3,6,8					
	MTU	G1,2,3,6,8,0	G0,1,3,6				
	NSP	G1,2,3,6,8,0	G0,1,3,6				
	STKR	G2,3,8					
	TAC	G1,3,6,8	G0,1,3,6			<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 1 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> <li>• RADAR ALTIMETER DATA LOST</li> </ul>
	PASS		G0,1,3,6			<ul style="list-style-type: none"> <li>• BFS FAIL TO TRACK STRING 1</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• I/O RESET MAY RESTORE PASS/BFS COMM</li> </ul>
BCE STRG 2	A	G1,2,3,6,8	G0,1,3,6	<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 2 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> </ul>		
	ADTA	G1,3,6,8	G0,1,3,6				

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
BCE STRG 2 (Cont)	B	G1,2,3,6,8	G0,1,3,6	<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 2 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> </ul>
	C	G1,2,3,6,8	G0,1,3,6		
	D	G1,2,3,6,8	G0,1,3,6		
	IMU	G1,2,3,6,8	G0,1,3,6		
	GPS	G1,2,3,6,8	G0,1,3,6		
	MLS	G1,3,6,8			
	MTU	G1,2,3,6,8,0	G0,1,3,6		
	TAC	G1,3,6,8	G0,1,3,6		
PASS		G0,1,3,6	<ul style="list-style-type: none"> <li>• BFS FAIL TO TRACK STRING 2</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• I/O RESET MAY RESTORE PASS/BFS COMM</li> </ul>	
BCE STRG 3	A	G1,2,3,6,8	G0,1,3,6	<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 3 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> </ul>
	ADTA	G1,3,6,8	G0,1,3,6		

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
BCE STRG 3 (Cont)	B	G1,2,3, 6,8	G0,1,3, 6	<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 3 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> </ul>
	C	G1,2,3, 6,8	G0,1,3, 6		
	D	G1,2,3, 6,8	G0,1,3, 6		
	IMU	G1,2,3, 6,8	G0,1,3, 6		
	GPS	G1,2,3, 6,8	G0,1,3, 6		
	MLS	G1,3,6, 8			
	MTU	G1,2,3, 6,8, 0	G0,1,3, 6		
	NSP	G1,2,3, 6,8, 0	G0,1,3, 6		
	STKR	G2,3,8			
	PASS		G0,1,3, 6	<ul style="list-style-type: none"> <li>• BFS FAIL TO TRACK STRING 3</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• I/O RESET MAY RESTORE PASS/BFS COMM</li> </ul>

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
BCE STRG 4	A	G1,2,3,6,8	G0,1,3,6	<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 4 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGED MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> </ul>
	ADTA	G1,3,6,8	G0,1,3,6		
	B	G1,2,3,6,8	G0,1,3,6		
	C	G1,2,3,6,8	G0,1,3,6		
	D	G1,2,3,6,8	G0,1,3,6		
	PASS		G0,1,3,6	<ul style="list-style-type: none"> <li>• BFS FAIL TO TRACK STRING 4</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• I/O RESET MAY RESTORE PASS/BFS COMM</li> </ul>
BDY FLP SW	L(R)	G3,6		<ul style="list-style-type: none"> <li>• BODY FLAP DN(UP) SW DISAGREE</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• DEFAULT TO NO OUTPUT</li> </ul>
BODY FLAP	CYCL	G1,3,6		<ul style="list-style-type: none"> <li>• BODY FLAP LIMIT CYCLING BUT USABLE</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
	FAIL	G1,3,6		<ul style="list-style-type: none"> <li>• BODY FLAP STALLED OR RUNAWAY</li> </ul>	
	HOLD	G1,3,6		<ul style="list-style-type: none"> <li>• BODY FLAP ONE CH FAILED BUT USABLE</li> </ul>	
SM0 BRAKE P 1/3  2/3			G0,1,3,6	<ul style="list-style-type: none"> <li>• PRESSURE &gt;180 PSI IN BRAKES DRIVEN BY HYDRAULIC SYSTEM 1/3</li> </ul>	
			G0,1,3,6	<ul style="list-style-type: none"> <li>• PRESSURE &gt;180 PSI IN BRAKES DRIVEN BY HYDRAULIC SYSTEM 2/3</li> </ul>	

MESSAGE	OPS AVAIL		CAUSE	COMMENTS			
	PASS	BFS					
BCE STRG 1 (Cont)	D	G1,2,3,6,8	G0,1,3,6	<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 1 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> </ul>		
	IMU	G1,2,3,6,8	G0,1,3,6				
	MLS	G1,3,6,8					
	MTU	G1,2,3,6,8,0	G0,1,3,6				
	NSP	G1,2,3,6,8,0	G0,1,3,6				
	STKR	G2,3,8					
	TAC	G1,3,6,8	G0,1,3,6			<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 1 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> <li>• RADAR ALTIMETER DATA ALSO LOST</li> </ul>
	PASS		G0,1,3,6			<ul style="list-style-type: none"> <li>• BFS FAIL TO TRACK STRING 1</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• I/O RESET MAY RESTORE PASS/BFS COMM</li> </ul>
BCE STRG 2	A	G1,2,3,6,8	G0,1,3,6	<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 2 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> </ul>		
	ADTA	G1,3,6,8	G0,1,3,6				

MESSAGE	OPS AVAIL		CAUSE	COMMENTS			
	PASS	BFS					
BCE STRG 2 (Cont)	B	G1,2,3,6,8	G0,1,3,6	<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 2 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> </ul>		
	C	G1,2,3,6,8	G0,1,3,6				
	D	G1,2,3,6,8	G0,1,3,6				
	IMU	G1,2,3,6,8	G0,1,3,6				
	GPS	G1,2,3,6,8	G0,1,3,6				
	MLS	G1,3,6,8					
	MTU	G1,2,3,6,8,0	G0,1,3,6				
	TAC	G1,3,6,8	G0,1,3,6			<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 2 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> <li>• RADAR ALTIMETER DATA LOST</li> </ul>
	PASS		G0,1,3,6			<ul style="list-style-type: none"> <li>• BFS FAIL TO TRACK STRING 2</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• I/O RESET MAY RESTORE PASS/BFS COMM</li> </ul>
BCE STRG 3	A	G1,2,3,6,8	G0,1,3,6	<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 3 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> </ul>		
	ADTA	G1,3,6,8	G0,1,3,6				

**NOM**

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
BCE STRG 3 (Cont)	B	G1,2,3, 6,8	G0,1,3, 6	<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 3 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> </ul>
	C	G1,2,3, 6,8	G0,1,3, 6		
	D	G1,2,3, 6,8	G0,1,3, 6		
	IMU	G1,2,3, 6,8	G0,1,3, 6		
	MLS	G1,3,6, 8			
	MTU	G1,2,3, 6,8, 0	G0,1,3, 6		
	NSP	G1,2,3, 6,8, 0	G0,1,3, 6		
	STKR	G2,3,8			
	TAC	G1,3,6, 8	G0,1,3, 6		
	PASS		G0,1,3, 6	<ul style="list-style-type: none"> <li>• BFS FAIL TO TRACK STRING 3</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• I/O RESET MAY RESTORE PASS/BFS COMM</li> </ul>

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
BCE STRG 4	A	G1,2,3,6,8	G0,1,3,6	<ul style="list-style-type: none"> <li>• ALL GPCs DETECTED PROBLEM RECEIVING DATA FROM INDICATED BCE ELEMENT OF STRING 4 AND HAVE BYPASSED THAT ELEMENT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS PRE-ENGAGED MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> </ul>
	ADTA	G1,3,6,8	G0,1,3,6		
	B	G1,2,3,6,8	G0,1,3,6		
	C	G1,2,3,6,8	G0,1,3,6		
	D	G1,2,3,6,8	G0,1,3,6		
	PASS		G0,1,3,6	<ul style="list-style-type: none"> <li>• BFS FAIL TO TRACK STRING 4</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• I/O RESET MAY RESTORE PASS/BFS COMM</li> </ul>
BDY FLP SW	L(R)	G3,6		<ul style="list-style-type: none"> <li>• BODY FLAP DN(UP) SW DISAGREE</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• DEFAULT TO NO OUTPUT</li> </ul>
BODY FLAP	CYCL	G1,3,6		<ul style="list-style-type: none"> <li>• BODY FLAP LIMIT CYCLING BUT USABLE</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
	FAIL	G1,3,6		<ul style="list-style-type: none"> <li>• BODY FLAP STALLED OR RUNAWAY</li> </ul>	
	HOLD	G1,3,6		<ul style="list-style-type: none"> <li>• BODY FLAP ONE CH FAILED BUT USABLE</li> </ul>	
SM0 BRAKE P 1/3  2/3			G0,1,3,6	<ul style="list-style-type: none"> <li>• PRESSURE &gt;180 PSI IN BRAKES DRIVEN BY HYDRAULIC SYSTEM 1/3</li> </ul>	
			G0,1,3,6	<ul style="list-style-type: none"> <li>• PRESSURE &gt;180 PSI IN BRAKES DRIVEN BY HYDRAULIC SYSTEM 2/3</li> </ul>	



MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
S66 CAB AIRLK	PRES	S2,4	• AIRLOCK P ↑↓	• ΔP AIRLOCK TO AMB (PL)
S66 CAB HX OUT	TEMP	S2,4	• CAB HX OUT T	• NO MAL (NO LIMITS)
S66 CAB H2O N2	P1(2)	S2,4	• H2O TK N2 P ↓	
S66 CAB N2 FLO	1(2)	S2,4	• N2 FLOW ↑	
SM1 CABIN N2		SM		
S66 CAB N2 QTY	1(2)	S2,4	• N2 SPLY QTY ↓	
S66 CAB N2 REG	P1(2)	S2,4	• N2 REG P ↑↓	
S66 CAB O2 EMR	SPLY	S2,4	• EMER O2 QTY AND REG P	• EMER O2 MSG ONLY WHEN EMER O2 TK MANIFESTED
S66CAB O2 FLO	1(2)	S2,4	• O2 FLOW ↑	
SM1 CABIN O2		SM		
S66 CAB O2 REG	P 1(2)	S2,4	• O2 REG P ↑	
S66 CAB POCO2		S2,4	• POCO2 ↑	
S78 CABIN	DP/DT	S2,4	• CABIN PRESS RATE OF CHANGE ↓	
S66 CABIN	FAN	S2,4	• CABIN FAN ΔP ↑↓	
SM1 CABIN FAN		SM		
S66 CABIN	PRES	S2,4	• CAB P ↓↑	
SM1 CABIN PRES		SM		
S66 CABIN	TEMP	S2,4	• CAB T ↑	
S78 CABIN O2	CONC	S2,4	• O2 CONC ↑	• NO MAL
S66 CABIN PPO2	A(B,C)	S2,4	• PPO2 ↑↓	• NO MAL
SM1 CABIN PPO2		SM		
SM1 CABN DP/DT	BU	SM	• S/W CAB P RATE OF CHANGE COMP ↓	• NOT IN PRELAUNCH OPS 0

**C**

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
S78 CABN DP/DT SM1 CABN DP/DT EQ	EQ	S2,4	• EQ CABIN PRESS RATE OF CHANGE ↓	
		SM		
S60 CHECKPT FAIL		S2,4	• SM CHECKPOINT FAILED ON WRITE OR RESTORE DUE TO AN I/O FAILURE BETWEEN THE GPC AND MMU, OR MMU WAS OFF/BUSY	• ATTEMPT RECOVERY USING MMU MALS
CIRC PUMP		S2,4	• CIRC PUMP FAILS TO TURN OFF	• INHIBITS CONTINUATION OF PUMP CYCLING SEQ
S87 CIRC PMP P	1(2,3)	S2,4	• CIRC PUMP P ↑↓	
S67 CNTL BUS RPC	V	S2,4	• DC CNTL VOLT ↓	
		S2,4	• DC CNTL BUS RPC = OFF	
CM BUF BSY	CRT1(2,3,4)	S2,4	• DEU IPL REQUEST WHEN THE SM COMMON BUFFER IS CURRENTLY BUSY	• NO MAL • WAIT FOR CONTENDING OPERATION TO COMPLETE, THEN RETRY THE SM DEU IPL
SM1 CNTL/ESS V		SM	• DC VOLT CNTL ↓ • DC VOLT ESS ↓	
S66 CO2 RL SYS	MALF	S2,4	• EDO CO2 CNTLR 1(2) MALFUNCTION	• (OV102 ONLY) MALFUNCTION SIGNAL DURATION IS 6 SEC; RESULTING SPEC 66 '↓' WILL ONLY APPEAR FOR 6 SEC (PNL MO51F CONTROLLER FAIL LIGHT WILL REMAIN LATCHED)
S66 CO2 RL SYS	PCO2	S2,4	• EDO CO2 RCRS CO2 PARTIAL PRESS ↑	• OV102 ONLY
	VACP	S2,4		• (OV102 ONLY) CURRENTLY NO FDA ANNUNCIATION
	FAN	S2,4		

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
S76 COMM CAM	TEMP	S2,4		• TV CAMERA OVERTEMP – YES ↓	• CAM TEMP MSG VALID ONLY WHEN CCTV IN SYNC MODE
PA1	TEMP	S2,4		• PWR AMP 1 TEMP ↑	
PA2	TEMP	S2,4		• PWR AMP 2 TEMP ↑	
S76 COMSEC 1	BITE	S2,4		• COMSEC XMIT AND/OR RCV FAILED	
S76 COMSEC 2	BITE	S2,4		• COMSEC XMIT AND/OR RCV FAILED	
CRT BITE	1(2,3,4)	ALL	ALL	• A BITE ERROR DETECTED IN INDICATED DEU	
SM2 CRYO H2 MANF			SM	• MANF P ↓	
PRES			SM	• TK CNTL P ↑↓	
SM2 CRYO O2 HTR			SM	• TK HTR T ↑	
MANF			SM	• MANF P ↓	
PRES			SM	• TK CNTL P ↑↓	
DAP DNMODE	RHC	G1,2,3,6,8		• RHC MOVEMENT BEYOND DETENT THRESHOLD WHILE DAP IN AUTO • DURING OPS 3 AND OPS 6, EFFECTIVE ABOVE MACH 2.0	• NO MAL • IF ENTRY/GRTLS DAP, RESELECT AUTO IF CSS NOT DESIRED • IF TRANS DAP, RESELECT AUTO AND RE-INITIATE MANEUVER IF DESIRED • IF ORBIT DAP, DAP AS REQD
DAP RECONF		G2,8		• DESELECTION OF ONE OR MORE VERNIER JETS	• NO MAL • IF USING PRI RCS, MSG INDICATES FAILURE OF VERN JET W/O DOWNMODING • IF USING VERN RCS, OR UPON TRANS FROM PRI TO VERN RCS, DAP WILL DOWNMODE TO FREE DRIFT

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
SM1 DC VOLT FC 1(2,3)		SM	<ul style="list-style-type: none"> <li>• FC VOLT ↑↓</li> </ul>	
S69 DELTA AMPS 1(2,3)	S2,4		<ul style="list-style-type: none"> <li>• FC ΔAMPS ↑↓</li> </ul>	
> 3 DEU	ALL		<ul style="list-style-type: none"> <li>• TOO MANY DEUs IN COMMON SET</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
DISPLAY SW	A	G2,8	<ul style="list-style-type: none"> <li>• AFT ADI ERROR/RATE SW</li> <li>• AFT ADI ATT SEL SW</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• MAY BE TRIGGERED BY COMM FAULT OR I/O RESET</li> <li>• MOVE APPROPRIATE SW TO GREEN DOT DEFAULT POS</li> <li>• AIR DATA/RADAR ALT SW NOT READ IN OPS 1,2 OR 8 FOR PASS</li> </ul>
	L	G1,2,3,6,8	<ul style="list-style-type: none"> <li>• LH ADI ERROR/RATE SW</li> <li>• LH ADI ATT SEL SW</li> <li>• LH AIR DATA SW</li> <li>• LH HSI MODE/SOURCE/TRAN SW</li> <li>• LH RADAR ALT SW</li> </ul>	
	R	G1,2,3,6,8	<ul style="list-style-type: none"> <li>• RH ADI ERROR/RATE SW</li> <li>• RH ADI ATT SEL SW</li> <li>• RH AIR DATA SW</li> <li>• RH HSI MODE/SOURCE/TRAN SW</li> <li>• RH RADAR ALT SW</li> </ul>	
DK XMTR 1(2,3,4)		ALL	<ul style="list-style-type: none"> <li>• BFS DK TRANSMITTER FAILED HIGH ON A PASS CONTROLLED CRT</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• BFS WILL DOWNMODE AFFECTED DK BUS – NO COMMAND/LISTEN CAPABILITY ON THAT BUS</li> <li>• ASSIGN BFS TO AFFECTED CRT TO RECOVER BFS COMMAND/LISTEN CAPABILITY</li> <li>• BFS IS STILL ENGAGEABLE WITH FULL CAPABILITY</li> </ul>
S67 ESS BUS V 1BC(2CA,3AB)	S2,4		<ul style="list-style-type: none"> <li>• DC VOLT ESS ↓</li> </ul>	

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
ET SEP	AUTO	G6		• ET SEP MODE SW FAIL	• NO MAL • SW DEFAULTS TO AUTO IN G6
	INH	G1,6	G1,6	• AUTO SEP INH G1 = BODY RATES & FDLN DISC VLVS G6 = BODY RATES, $\alpha$ AND $\beta$	• NO MAL • USE CUE CARDS FOR DISC VLVS
	MAN	G1		• ET SEP SW FAIL (RM)	• NO MAL • USE SPEC 51 OVERRIDE
S77 EVA-MMU T	PORT STBD	S2,4		• MMU/FSS TEMP OUT OF LIMITS	
S88 EVAP FDLN	TA(B)	S2,4		• FDLN FWD,MID,AFT, TOPPING,ACCUM LINE A(B) AND HI LOAD LINE A(B) T $\uparrow\downarrow$	• FES FEEDLINE TEMPS
S88 EVAP HI LD	TEMP	S2,4		• FES HI LOAD NOZ AND DUCT T $\uparrow\downarrow$	• HI LOAD IB/OB DUCT T AND NOZ T
S88 EVAP OUT T	1(2)	S2,4		• OUT T $\uparrow\downarrow$	
SM2 EVAP OUT T			SM		
S88 EVAP TOP	TEMP	S2,4		• FES TOPPING NOZ AND DUCT T $\downarrow\uparrow$	• TOPPING EVAP L(R) FWD(AFT) DUCT T AND L(R) NOZ T
177 EXT A/L	PRES	S2,4		• EXT AIRLOCK P $\uparrow\downarrow$	• EXTERNAL AIRLOCK ONLY
F RCS	JET		G1,3,6	• F JET MANF 1(2,3,4) FAIL ON/OFF	• NO FAIL LK DETECTION IN BFS
	DJET	G1,2,3, 6,8		• F DOWN JET 1(2,3,4) FAIL ON/OFF/LK	• FAIL OFF DETECTION NOT PERFORMED IN MM101 & 102 FOR PASS
	FJET	G1,2,3, 6,8		• F FWD JET 1(2,3) FAIL ON/OFF/LK	
	LJET	G1,2,3, 6,8		• F LEFT JET 1(3,5) FAIL ON/OFF/LK	

**F**

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
F RCS (Cont)	RJET	G1,2,3, 6,8		• F RIGHT JET 2(4,5) FAIL ON/OFF/LK	• FAIL OFF DETECTION NOT PERFORMED IN MM101 & 102 FOR PASS
	UJET	G1,2,3, 6,8		• F UP JET 1(2,3) FAIL ON/OFF/LK	
	He P	G2,8	G1,3,6	• F He (FU OR OX) TK P 2 LOW	• PKT C/L – RCS LEAK ISOL
	LEAK	G2,3,8	G1,3,6	• PROP/He LEAK	• OX/FU Δ QTY > 9.5%
	PVT	G2,3,8		• LOSS OF P OR T DATA FOR RCS QTY CALC	• NO MAL • QTY CALC SUSPENDED
	TK P	G2,8	G1,3,6	• FWD RCS (FU OR OX) TK ULL PRESS HI/LOW	• QTY CALC SUSPENDED
S69 FC AMPS SM1 FC AMPS 1(2,3)	1(2,3)	S2,4		• FC AMPS ↑ ↓	
			SM		
S69 FC COOL P SM1 FC COOL P 1(2,3)	1(2,3)	S2,4		• FC COOL P ↑ ↓	
			SM		
S69 FC DELTA V SM1 FC DELTA V 1(2,3)	1(2,3)	S2,4		• FC SUBSTACK ΔV > 150 MV	
			SM		
S69 FC EXIT T SM1 FC EXIT T 1(2,3)	1(2,3)	S2,4		• FC EXIT T ↑ ↓	
			SM		
S69 FC H2 FLOW	1(2,3)	S2,4		• FC H2 FLOW ↑	
S69 FC H2 PUMP	1(2,3)	S2,4		• FC H2 PUMP STATUS ↑ ↓	

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
S69 FC H2O ALT PRI RLF HTR LINE NOZ	1(2,3)	S2,4		• FC ALT H2O LN T ↑↓	• BOTH HTRS OFF OR BOTH HTRS INDICATING AUTO WILL ANNUNCIATE ALARM
	1(2,3)	S2,4		• FC H2O LN T ↑↓	
	1(2,3)	S2,4		• FC H2O RLF VLV T ↑↓	
		S2,4		• FC H2O RLF HTR STATUS A,B ↑↓	
		S2,4		• FC H2O RLF LN T ↑↓	
		S2,4		• FC H2O RLF NOZ T A(B) ↑↓	
S69 FC O2 FLOW	1(2,3)	S2,4		• FC O2 FLOW ↑	
S69 FC PH	1(2,3)	S2,4		• FC PH – PH ↓	• PH > BILEVEL
SM1 FC PH 1(2,3)			SM	• FC PH HIGH	
S69 FC PRG LN	H2	S2,4		• FC H2 PURGE LN T 1(2) ↑	
	O2	S2,4		• FC O2 PURGE LN T ↑	
S69 FC PUMP	1(2,3)	S2,4		• FC COOL PUMP ΔP ↓	
SM1 FC PUMP 1(2,3)			SM		
FC PURGE	1(2,3)	S2,4		• FAILS FLOW CHECK AT PURGES AT END OF PURGE	• USE MAN FC PURGE PROC
	SEQ	S2,4		• LOSS OF PWR TO PURGE LN HTRS AFTER AUTO SEQ INIT OR LOSS OF SWITCH FUNCTION	• USE MAN FC PURGE PROC • SEQ FAIL FLAG TERMINATES AUTO PURGE SEQ
	TEMP	S2,4		• FC PURGE LINE TEMP TOO LOW TO PERFORM AUTO PURGE	• TERMINATES AUTO PURGE • USE MAN FC PURGE PROC
S69 FC REAC	1(2,3)	S2,4		• FC REAC ↓	• FC REAC VLV – CL
SM1 FC REAC 1(2,3)			SM		
S69 FC READY	1(2,3)	S2,4		• FC READY ↓	

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
S69 FC STACK T	1(2,3)	S2,4		• FC STACK T ↑↓	
SM1 FC STACK T	1(2,3)		SM		
S69 FC VOLTS	1(2,3)	S2,4		• FC VOLT ↑↓	
FCS CH	1(2,3,4)	G1	G1	• SRB CHANNEL BYPASS	• NO MAL • ROCK & TILT ACT A(B,C,D) CH FAIL
		G1,3,6	G1,6	• MPS CHANNEL BYPASS	• NO MAL • MPS ENG PITCH(YAW) CH FAIL
		G1,3,6	G1,3,6	• AERO CHANNEL BYPASS	• NO MAL • ELEV (RUD,S/B) ACT CH FAIL
FCS SAT	POS	G3,6	G3,6	• L/R IB/OB ELEVON POSITION SATURATION	• NO MAL • ELEVON SAT (>+12 OR <-15 DEG)
	MOM	G3,6	G3,6	• L/R IB/OB PRI DELTA PRESS	• NO MAL • IN RTLS EXPECT HINGE MOM > 2400 PSI (80% SYS MAX)
S67 FPC/FLC	1(2,3)	S2,4		• FWD PCA V ↓	
S88 FREON FLOW	1(2)	S2,4		• FLOW ↓	• FCL ICH FLOW
SM2 FREON FLOW			SM		
S88 FREON QTY	1(2)	S2,4		• ACCUM QTY ↓	• FREON LOOP ACCUM QTY
S88 FREON RAD	T1(2)	S2,4		• CNTL OUT T 1(2) ↓	• RAD CONTROLLER OUT TEMP
S88 FRN AFT CP	1(2)	S2,4		• AFT CP FREON FLOW ↓	• AFT CP FLOW
S88 FRN PL HX	1(2)	S2,4		• PL HX FREON FLOW ↓	• PL HX FLOW
S86 FU TK VLV	1(2,3)	S2,4		• APU FUEL TANK VLV TEMP ↑↓	
SM2 FU TK VLV APU			SM		



MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
S76 GCIL	FAIL	S2,4		• GCIL CONFIG FAILED TO PNL	
S86 GG/FU PMP	1(2,3)	S2,4		• APU GG BED T ↑↓	
GPC	BITE	ALL	ALL	• S/W FORCED CLOSED PROCESS DUE TO GPC H/W (S/W) FAULT	• IN PASS
				• BFS RESTART INDICATION	• IN BFS
	CONF	ALL		• NBAT TGT GPCs NOT IN RUN OR NOT SPECIFIED	• NO MAL
					• PROCEDURAL ERROR OR SWITCH ERROR
	SUM 1	ALL		• INDICATED GPC HAS FAILED	
		2	ALL		
3		ALL			
4		ALL			
	5	ALL	• GPC 5 HAS FAILED	• NO MAL	
GPC PWR			ALL	• PWR TRANSITIONS TO BFS GPC	• NO MAL • BFS WILL DISENGAGE • S/W DOES AUTO RESTART
G55 GPS FAIL	1(2,3)	G1,2,3,6,8		• INDICATED GPS HAS FAILED	• NO BFS MSG • NO MAL
G55 GPS QA	1(2,3)	G1,2,3,6,8		• INDICATED GPS HAS FAILED • QA 1(2,3,4) CHECK	• NO BFS MSG • NO MAL
S68 H2 CNTL P	1(2,3,4,5)	S2,4		• CNTL P ↑↓	
HTR T	1(2,3,4,5)	S2,4		• HTR T ↑	

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
S68 H2 MANF TK P	PRES	S2,4		• MANF P ↓	
	VLV	S2,4		• MANF VLV = CL	
	1(2,3,4,5)	S2,4		• TK P ↑↓	
168 H2 CNTL P HTR T TK P	6(7,8,9)	S2,4		• CNTL P ↑↓	
	6(7,8,9)	S2,4		• HTR T ↑	
	6(7,8,9)	S2,4		• TK P ↑↓	
S69 H2O LN PH		S2,4		• H2O LINE PH ↓	• PH > 9 BILEVEL
S88 H2O LOOP 1(2)	FLOW	S2,4		• ICH FLOW ↓	• ACTIVE LOOP ONLY
	QTY	S2,4		• ACCUM QTY ↓↑	
	TEMP	S2,4		• PUMP OUT T ↑↓ • CAB HX IN T ↓ • ICH OUT T ↓	• H2O LOOP TEMPS
S88 H2O PUMP P SM2 H2O PUMP P	1(2)	S2,4		• P 1(2) ↑↓ OR ΔP 1(2) ↑↓	• ΔP HIGH ONLY FOR INACTIVE LOOP • ΔP HIGH OR LOW FOR ACTIVE LOOP
			SM		
HIGH G		G3,6		• HIGH G	• NO MAL
S66 HUMID SEP	A(B)	S2,4		• HUM SEP SPEED ↓	
SM2 HYD ACUM P 1(2,3)			SM	• ACCUM P ↓	
S86 HYD PRESS SM2 HYD PRESS	1(2,3)	S2,4		• HYD SYS SPLY P ↑↓	• NO MAL
			SM		
SM2 HYD QTY 1(2,3)			SM	• RSVR QTY ↑↓	
S86 HYD RSVR Q	1(2,3)	S2,4		• RSVR QTY ↑↓	
S86 HYD RSVR T SM2 HYD RSVR T 1(2,3)	1(2,3)	S2,4		• RSVR T ↑	
			SM		

**MEDS**

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
S76 GCIL	FAIL	S2,4		• GCIL CONFIG FAILED TO PNL	
S86 GG/FU PMP	1(2,3)	S2,4		• APU GG BED T ↑↓	
GPC	BITE	ALL	ALL	• S/W FORCED CLOSED PROCESS DUE TO GPC H/W (S/W) FAULT	• IN PASS
				• BFS RESTART INDICATION	• IN BFS
	CONF	ALL		• NBAT TGT GPCs NOT IN RUN OR NOT SPECIFIED	• NO MAL
					• PROCEDURAL ERROR OR SWITCH ERROR
	SUM 1	ALL		• INDICATED GPC HAS FAILED	
		2	ALL		
3		ALL			
4		ALL			
5		ALL			• GPC 5 HAS FAILED
GPC PWR			ALL	• PWR TRANSITIONS TO BFS GPC	• NO MAL • BFS WILL DISENGAGE • S/W DOES AUTO RESTART
G55 GPS FAIL*	2	G1,2,3,6,8		• GPS 2 HAS FAILED	• NO BFS MSG
QA*	2	G1,2,3,6,8		• GPS 2 HAS FAILED QA 1(2,3) CHECK	• NO BFS MSG
S68 H2 CNTL P	1(2,3,4,5)	S2,4		• CNTL P ↑↓	
HTR T	1(2,3,4,5)	S2,4		• HTR T ↑	

\* Applies to OI-27 single string GPS flights only

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
S68 H2 MANF TK P	PRES	S2,4		• MANF P ↓	
	VLV	S2,4		• MANF VLV = CL	
	1(2,3,4,5)	S2,4		• TK P ↑↓	
168 H2 CNTL P HTR T TK P	6(7,8,9)	S2,4		• CNTL P ↑↓	
	6(7,8,9)	S2,4		• HTR T ↑	
	6(7,8,9)	S2,4		• TK P ↑↓	
S69 H2O LN PH		S2,4		• H2O LINE PH ↓	• PH > 9 BILEVEL
S88 H2O LOOP 1(2)	FLOW	S2,4		• ICH FLOW ↓	• ACTIVE LOOP ONLY
	QTY	S2,4		• ACCUM QTY ↓↑	
	TEMP	S2,4		• PUMP OUT T ↑↓ • CAB HX IN T ↓ • ICH OUT T ↓	• H2O LOOP TEMPS
S88 H2O PUMP P SM2 H2O PUMP P	1(2)	S2,4		• P 1(2) ↑↓ OR ΔP 1(2) ↑↓	• ΔP HIGH ONLY FOR INACTIVE LOOP • ΔP HIGH OR LOW FOR ACTIVE LOOP
			SM		
HIGH G		G3,6		• HIGH G	• NO MAL
S66 HUMID SEP	A(B)	S2,4		• HUM SEP SPEED ↓	
SM2 HYD ACUM P 1(2,3)			SM	• ACCUM P ↓	
S86 HYD PRESS SM2 HYD PRESS	1(2,3)	S2,4		• HYD SYS SPLY P ↑↓	• NO MAL
			SM		
SM2 HYD QTY 1(2,3)			SM	• RSVR QTY ↑↓	
S86 HYD RSVR Q	1(2,3)	S2,4		• RSVR QTY ↑↓	
S86 HYD RSVR T SM2 HYD RSVR T 1(2,3)	1(2,3)	S2,4		• RSVR T ↓↑	
			SM		

**NOM**

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
SM2 ILLEGAL ENTRY	ALL	ALL	<ul style="list-style-type: none"> <li>ILLEGAL KYBD ENTRY WITH RESPECT TO OPS SELECT/TRANSITION, DATA LOAD, INITIALIZATION, MEM RECONFIG, GPC ASSIGN, KYBD SYNTAX, FREEZE DRY LOAD, ETC</li> </ul>	<ul style="list-style-type: none"> <li>NO MAL</li> <li>IF APPROPRIATE, KYBD INPUT SHOULD BE REENTERED</li> </ul>	
S66 IMU FAN	DP	S2,4	<ul style="list-style-type: none"> <li>IMU FAN <math>\Delta P</math> <math>\uparrow\downarrow</math></li> </ul>		
SM1 CABIN IMU		SM			
S66 IMU FN SPD	A(B,C)	S2,4	<ul style="list-style-type: none"> <li>IMU FAN SPEED <math>\downarrow</math></li> </ul>		
I/O ERROR	CRT1	ALL	ALL	<ul style="list-style-type: none"> <li>ERROR IN DEU 1(2,3,4) MSG (I/O OR CHECKSUM)</li> </ul>	
	CRT2	ALL	ALL		
	CRT3	ALL	ALL		
	CRT4	ALL	ALL		
	D/L	ALL		<ul style="list-style-type: none"> <li>I/O ERROR ON DOWNLIST INTERFACE WITH PCMMU</li> </ul>	
	FA1	G1,2,3,6,8	G0,1,3,6	<ul style="list-style-type: none"> <li>INPUT/OUTPUT ERROR ON INDICATED UNIT HAS BEEN DETECTED</li> </ul>	<ul style="list-style-type: none"> <li>BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE</li> </ul>
	FA2	G1,2,3,6,8	G0,1,3,6		
	FA3	G1,2,3,6,8	G0,1,3,6		
	FA4	G1,2,3,6,8	G0,1,3,6		

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
I/O ERROR (Cont)	FF1	G1,2,3, 6,8	G0,1,3, 6	• INPUT/OUTPUT ERROR ON INDICATED UNIT HAS BEEN DETECTED	• BFS PRE-ENGAGE MUST BE IN SYNC WITH (TRACKING) PASS TO ANNUNCIATE
	FF2	G1,2,3, 6,8	G0,1,3, 6		
	FF3	G1,2,3, 6,8	G0,1,3, 6		
	FF4	G1,2,3, 6,8	G0,1,3, 6		
	FLEX	S2,4	G0,1,3, 6	• I/O ERROR FLEX/FLEX PAIR	
	MMU 1(2)	ALL		• CHECK SUM ERROR OR I/O ERROR ON MMU TRANSACTION, OR GPC-GPC OL FAILURE • TFL FORMAT NOT FOUND IN BUFFER FOLLOWING RETRIEVAL FROM MMU • I/O ERROR DURING DEU 1(2,3,4) LOAD	• MAY OCCUR WHILE EXPANDING REDUNDANT SET AS NEW GPC TAKES COMMAND OF MMU
	PCM	S2,4	SM	• I/O ERROR ON PCMMU	
	PL1	S2,4	SM	• I/O ERROR ON PL BUS 1/2	
	PL2	S2,4	SM		
IMU BITE/T	1(2,3)	G1,2,3, 6,8		• IMU 1,2,3 TEMP SAFE OR IMU BITE	• NO MAL • BITE PARAMETERS CAN BE MASKED VIA SPEC 21 • BFS USES ONLY IMU GOOD BIT • DAP DOWNMODES TO FREE FOR BITE IN SINGLE IMU CASE (OPS 2,8 ONLY)

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
ITEM RJCT PSP		S2,4		• PCP CC CMD REJECTED DUE TO PSP CMD DATA TRANSMISSION IN PROGRESS	• NO MAL
S76 KU-GMBL A	TEMP	S2,4		• KU GMBL A TEMP ↑	
GMBL B	TEMP	S2,4		• KU GMBL B TEMP ↑	
GYRO	TEMP	S2,4		• KU GYRO TEMP ↑	
XMTR	TEMP	S2,4		• KU XMTR TEMP ↑	
L OMS	GMBL	G1,2,3	G1,3	• PITCH (YAW) CMD/FEEDBACK Δ2° FOR 3.8 SEC	• NO MAL
	PC	G1,2,3,6	G1,3,6	• ENG CHAMBER PRESS LOW	
	QTY	G1,2,3,6,8		• ENG FU OR OX TK LEVEL LOW	
	TEMP		G1,3	• ENG FU INJ T HI	
	TK P	G2,8	G1,3	• FU OR OX TK ULLAGE P HI/LOW	
			G1,3,6	• He OR N2 TK P LOW • N2 REG P HI/LOW	
	VLV	G2		• He P/VAP ISOL VLV MISMATCH	
S89 L OMS	TEMP	S2,4		• ENG FU INJ T HI/LOW	• NO MAL

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
S89 L RCS	JET		G1,3,6	• LEFT JET MANF 1(2,3,4) FAIL ON/OFF	• NO FAIL LK DETECTION IN BFS
	AJET	G1,2,3,6,8		• L AFT JET 1(3) FAIL ON/OFF/LK	• FAIL OFF DETECTION NOT PERFORMED IN MM101 & 102 FOR PASS
	DJET	G1,2,3,6,8		• L DOWN JET 2(3,4,5) FAIL ON/OFF/LK	
	LJET	G1,2,3,6,8		• L LEFT JET 1(2,3,4,5) FAIL ON/OFF/LK	
	UJET	G1,2,3,6,8		• L UP JET 1(2,4) FAIL ON/OFF/LK	
	He P	G2,8	G1,3,6	• L RCS AFT He (FU OR OX) TK PRESS – 2 LOW	• PKT C/L – RCS LEAK ISOL
	LEAK	G2,3,8	G1,3,6	• PROP/He LEAK	• OX/FU ΔQTY > 9.5%
	PVT	G2,3,8		• LOSS OF P OR T DATA FOR RCS QTY CALC	• NO MAL • QTY CALC SUSPENDED
	TK P	G2,8	G1,2,3,6	• L RCS AFT (FU OR OX) TK ULL PRESS HI/LOW	
XFEED	G1,3,6		• L RCS PROP TANK LOW PRESS	• FAILURE ON LEFT SIDE, AUTO XFEED FROM RIGHT	
S67 MAIN BUS V	A(B,C)	S2,4		• MN VOLTS ↑↓	
SM1 MAIN BUS V A(B,C)			SM		



MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
SM1 MDM OUTPUT	FF1 2 3 4 — FA1 2 3 4 — PL1 2	ALL		<ul style="list-style-type: none"> <li>• MDM RETURN WORD FAILURE (ON MDM OUTPUT)</li> </ul>
ME SHDN SW	C(L,R)	G1,6		<ul style="list-style-type: none"> <li>• SW CONTACT DISAGREE</li> <li>• NO MAL</li> <li>• SHUTDOWN FUNCTION OF SWITCH NO LONGER WORKS</li> </ul>
S67 MPC	1(2,3)	S2,4		<ul style="list-style-type: none"> <li>• MID PCA AMPS ↓</li> </ul>
MPS CMD	C(L,R)	G1,6	G1,6	<ul style="list-style-type: none"> <li>• MPS C(L,R) CMD PATH FAIL</li> <li>• NO MAL</li> <li>• REF A/E SYS CUE CARDS</li> <li>• BFS DOES NOT SUPPORT CMD PATH FAIL ANNUNCIATION PRE-ENGAGED</li> </ul>

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MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
MPS DATA C(L,R)	G1,6	G1,6	• DATA PATH FAIL	• NO MAL • REF AESP CUE CARDS
MPS ELEC C(L,R)	G1,6	G1,6	• ELECTRONIC LOCKUP MODE FAIL	• NO MAL • REF AESP CUE CARDS
MPS H2 OUT P C(L,R)		G1,6	• PREMATURE SSME SHUTDOWN • MPS GH2 OUT P ↓	• NO MAL • REF AESP CUE CARDS
MPS HYD C(L,R)	G1,6	G1,6	• HYD LOCKUP MODE FAIL	• NO MAL • REF AESP CUE CARDS
MPS He P C(L,R)		G1,6	• MPS He TK P HI/LOW • HI LEAK RATE dP/dT	• NO MAL • REF AESP, ASC PKT
		G1,3,6	• INDICATED REG P HI/LOW	• NO MAL • REF AESP, ASC PKT, ENT PKT
MPS LH2/O2 MANF ULL		G1,6	• MPS LH2 ENG MANF P HI • MPS LOX ENG MANF P HI	• NO MAL • REF AESP CUE CARDS
		G1,6	• ET ULL P HI/LO	
MPS O2 OUT T C(L,R)		G1,6	• PREMATURE SSME SHUTDOWN • MPS GO2 OUT T ↓	• NO MAL • REF AESP CUE CARDS
MPS PNEU ACUM REG TK		G1,6	• MPS PNEU ACUM PRESS LOW	• NO MAL • REF AESP CUE CARDS
		G1,3,6	• MPS PNEU REG PRESS HI/LOW	• NO MAL • REF AESP, ASC PKT, ENT PKT
		G1,6	• MPS PNEU TANK PRESS LOW	• NO MAL • REF AESP CUE CARDS

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
NAV EDIT		G2	<ul style="list-style-type: none"> <li>• RNDZ NAV EDIT</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>	
			G3,6	<ul style="list-style-type: none"> <li>• DRAG H, ADTA, OR TACAN NAV EDIT</li> </ul>	<ul style="list-style-type: none"> <li>• BFS DOES NOT SUPPORT MLS</li> <li>• NO MAL</li> </ul>
	ALT	G3,6	<ul style="list-style-type: none"> <li>• ADTA ALT DATA NOT PROCESSING &lt; M2.5</li> <li>• DRAG H DATA NOT PROCESSING 85.2K FT &lt; H &lt; 140K FT</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• MLS NAV EDIT MESSAGE (MLSNV) SEEN ONLY ON HUD</li> </ul>	
	GPS	G1,2,3,6,8	<ul style="list-style-type: none"> <li>• SELECTED GPS STATE VECTOR EXCEEDED THRESHOLD</li> <li>• NO GPS VECTOR SELECTED &lt; 140 K FT</li> </ul>		
			G1,3,6	<ul style="list-style-type: none"> <li>• SELECTED GPS STATE VECTOR EXCEEDED THRESHOLD</li> </ul>	
NO UPDATE	GPS	G1,2,3,6,8	<ul style="list-style-type: none"> <li>• NO GPS UPDATE TO SF</li> </ul>	<ul style="list-style-type: none"> <li>• NO BFS MSG</li> <li>• NO MAL</li> </ul>	
S76 NSP 1	BITE	S2,4	<ul style="list-style-type: none"> <li>• NSP A/G 1 OR 2 XMIT AND/OR RCV VOICE MUX FAILED</li> </ul>		
S76 NSP 2	BITE	S2,4	<ul style="list-style-type: none"> <li>• NSP A/G 1 OR 2 XMIT AND/OR RCV VOICE MUX FAILED</li> </ul>		
S68 O2 CNTL P	1(2,3,4,5)	S2,4	<ul style="list-style-type: none"> <li>• CNTL P ↑↓</li> </ul>		
HTR T	1(2,3,4,5)	S2,4	<ul style="list-style-type: none"> <li>• HTR T ↑</li> </ul>		
TRP	1(2,3,4,5)	S2,4	<ul style="list-style-type: none"> <li>• HTR CUR SNSR = TRIP</li> </ul>		
MANF	PRES	S2,4	<ul style="list-style-type: none"> <li>• MANF P ↓</li> </ul>		
	VLV	S2,4	<ul style="list-style-type: none"> <li>• MANF VLV = CL</li> </ul>		
TK P	1(2,3,4,5)	S2,4	<ul style="list-style-type: none"> <li>• TK P ↑↓</li> </ul>		

**MEDS**  
REF/MEDS/GEN E

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
168 O2 CNTL P	6(7,8,9)	S2,4		• CNTL P ↑↓	
HTR T	6(7,8,9)	S2,4		• HTR T ↑	
TRP	6(7,8,9)	S2,4		• HTR CUR SNSR = TRIP	
TK P	6(7,8,9)	S2,4		• TK P ↑↓	
OFF/BUSY MMU	1(2)	ALL		• AN MMU TRANSACTION IS REQUESTED WHEN THE MMU IS OFF/BUSY, FAILED OFF, OR SELECTED FOR IPL	

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A3-30

**MEDS**  
REF/ALL/GEN E

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
MPS DATA C(L,R)	G1,6	G1,6	• DATA PATH FAIL	• NO MAL • REF AESP CUE CARDS
MPS ELEC C(L,R)	G1,6	G1,6	• ELECTRONIC LOCKUP MODE FAIL	• NO MAL • REF AESP CUE CARDS
MPS H2 OUT P C(L,R)		G1,6	• PREMATURE SSME SHUTDOWN • MPS GH2 OUT P ↓	• NO MAL • REF AESP CUE CARDS
MPS HYD C(L,R)	G1,6	G1,6	• HYD LOCKUP MODE FAIL	• NO MAL • REF AESP CUE CARDS
MPS He P C(L,R)		G1,6	• MPS He TK P HI/LOW • HI LEAK RATE dP/dT	• NO MAL • REF AESP, ASC PKT
		G1,3,6	• INDICATED REG P HI/LOW	• NO MAL • REF AESP, ASC PKT, ENT PKT
MPS LH2/O2 MANF ULL		G1,6	• MPS LH2 ENG MANF P HI • MPS LOX ENG MANF P HI	• NO MAL • REF AESP CUE CARDS
		G1,6	• ET ULL P HI/LO	
MPS O2 OUT T C(L,R)		G1,6	• PREMATURE SSME SHUTDOWN • MPS GO2 OUT T ↓	• NO MAL • REF AESP CUE CARDS
MPS PNEU ACUM REG TK		G1,6	• MPS PNEU ACUM PRESS LOW	• NO MAL • REF AESP CUE CARDS
		G1,3,6	• MPS PNEU REG PRESS HI/LOW	• NO MAL • REF AESP, ASC PKT, ENT PKT
		G1,6	• MPS PNEU TANK PRESS LOW	• NO MAL • REF AESP CUE CARDS

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
NAV EDIT		G2	• RNDZ NAV EDIT	• NO MAL	
			G3,6	• DRAG H, ADTA, OR TACAN NAV EDIT	• BFS DOES NOT SUPPORT MLS • NO MAL
	ALT	G3,6		• ADTA ALT DATA NOT PROCESSING < M2.5 • DRAG H DATA NOT PROCESSING 85.2K FT < H < 140K FT	• NO MAL • MLS NAV EDIT MESSAGE (MLSNV) SEEN ONLY ON HUD
	*GPS	G1,2,3,6,8	G1,3,6	• GPS 2 STATE VECTOR EXCEEDS RATIO THRESHOLD	
	TAC	G3,6		• TACAN DATA NOT PROCESSING < 140K FT	• NO MAL
NO UPDATE	*GPS	G1,2,3,6,8		• NO GPS UPDATE TO SF	• NO BFS MSG
S76 NSP 1	BITE	S2,4		• NSP A/G 1 OR 2 XMIT AND/OR RCV VOICE MUX FAILED	
S76 NSP 2	BITE	S2,4		• NSP A/G 1 OR 2 XMIT AND/OR RCV VOICE MUX FAILED	
S68 O2 CNTL P	1(2,3,4,5)	S2,4		• CNTL P ↑↓	
HTR T	1(2,3,4,5)	S2,4		• HTR T ↑	
TRP	1(2,3,4,5)	S2,4		• HTR CUR SNSR = TRIP	
MANF	PRES	S2,4		• MANF P ↓	
	VLV	S2,4		• MANF VLV = CL	
TK P	1(2,3,4,5)	S2,4		• TK P ↑↓	

\* Applies to OI-27 single string GPS flights only



MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
168 O2 CNTL P	6(7,8,9)	S2,4		• CNTL P ↑↓	
HTR T	6(7,8,9)	S2,4		• HTR T ↑	
TRP	6(7,8,9)	S2,4		• HTR CUR SNSR = TRIP	
TK P	6(7,8,9)	S2,4		• TK P ↑↓	
OFF/BUSY MMU	1(2)	ALL		• AN MMU TRANSACTION IS REQUESTED WHEN THE MMU IS OFF/BUSY, FAILED OFF, OR SELECTED FOR IPL	

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B3-30

**NOM**  
REF/ALL/GEN E

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
G23 OMS/RCS	QTY	G2		<ul style="list-style-type: none"> <li>• L(R) OMS TO RCS PROP TRANSFER EXCEEDS LIMIT</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
OTT ST IN		G3,6	G3,6	<ul style="list-style-type: none"> <li>• INDICATED E/W LVL LESS THAN LVL REQD FOR OVHD APPROACH</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• MSG TERMINATES &lt; 45 NM FROM LDG OR E/W LVL AGAIN MATCHES PROFILE</li> </ul>
S76 PA1 OUTPUT	LOW	S2,4		<ul style="list-style-type: none"> <li>• PWR AMP OUTPUT ↓</li> </ul>	
S76 PA2 OUTPUT	LOW	S2,4		<ul style="list-style-type: none"> <li>• PWR AMP OUTPUT ↓</li> </ul>	
168 PALLET H2 PRES TK P O2 HTR PRES TK P T V			S3,6	<ul style="list-style-type: none"> <li>• H2 TK 6 (7,8,9) CNTL P ↑↓</li> </ul>	
			S3,6	<ul style="list-style-type: none"> <li>• H2 TK 6 (7,8,9) TK P ↑↓</li> </ul>	
			S3,6	<ul style="list-style-type: none"> <li>• O2 TK 6 (7,8,9) HTR T ↑</li> </ul>	
			S3,6	<ul style="list-style-type: none"> <li>• O2 TK 6 (7,8,9) CNTL P ↑↓</li> </ul>	
			S3,6	<ul style="list-style-type: none"> <li>• O2 TK 6 (7,8,9) TK P ↑↓</li> </ul>	
			S2,4	<ul style="list-style-type: none"> <li>• PALLET T ↑↓</li> </ul>	
		A	S2,4	<ul style="list-style-type: none"> <li>• PALLET V A ↓</li> </ul>	
		B	S2,4	<ul style="list-style-type: none"> <li>• PALLET V B ↓</li> </ul>	
PBD CONFIG		S2,4		<ul style="list-style-type: none"> <li>• PLBD OUT-OF-SEQUENCE CONFIG</li> </ul>	<ul style="list-style-type: none"> <li>• CAUSES TERMINATION OF AUTO SEQUENCE</li> </ul>
S63 PBD CONFIG			SM		
PBD CONFIG		S2,4		<ul style="list-style-type: none"> <li>• PLBD AUTO SEQ FAIL</li> </ul>	<ul style="list-style-type: none"> <li>• CAUSES TERMINATION OF AUTO SEQUENCE</li> </ul>
S63 PBD CONFIG			SM		

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
S62 PDI DECOM FAIL	S2,4		<ul style="list-style-type: none"> <li>• DECOM 1 FMT ↑</li> <li>• DECOM 2 FMT ↑</li> <li>• DECOM 3 FMT ↑</li> <li>• DECOM 4 FMT ↑</li> </ul>	<ul style="list-style-type: none"> <li>• MSG OCCURS IF DECOM FDA ENA AND PL TLM FAIL OR PDI DECOM FAILS</li> <li>• MSG ALSO OCCURS IF PL DEPLOYED, PI FAIL, OR PSP FAIL</li> </ul>
S96 PDRS ABE	COMM	S2,4	<ul style="list-style-type: none"> <li>• ABE/MCIU MISCOMPARE</li> </ul>	
	SY SP EP WP WY WR	S2,4	<ul style="list-style-type: none"> <li>• SPA PWR (COMMUTATOR, MDA) FAIL</li> <li>• TACH/PHASE LOCK LOOP FAIL</li> </ul>	<ul style="list-style-type: none"> <li>• AUTO BRAKES APPLIED</li> </ul>
S96 PDRS CKCRT	D	S2,4	<ul style="list-style-type: none"> <li>• D&amp;C COMM FAIL</li> </ul>	<ul style="list-style-type: none"> <li>• AUTO BRAKES APPLIED</li> </ul>
	SY SP EP WP WY WR	S2,4	<ul style="list-style-type: none"> <li>• TACH/ENCODER DATA FAIL</li> <li>• JOINT ENCODER FAIL</li> </ul>	<ul style="list-style-type: none"> <li>• DNMODE TO IDLE IF IN AUTO MODE</li> </ul>
	EE	S2,4	<ul style="list-style-type: none"> <li>• EE CMDS ↓, EE FLAG ↓, EEEU FAIL ↓</li> </ul>	
	T CK	S2,4	<ul style="list-style-type: none"> <li>• MCIU TEMP MONITOR CIRCUIT FAIL</li> </ul>	
	FS	S2,4	<ul style="list-style-type: none"> <li>• MCIU EXTERNAL FRAME SYNC BITE OR BITE VERIFICATION FAILURE</li> </ul>	
	HC	S2,4	<ul style="list-style-type: none"> <li>• RHC (THC) HARDOVER (ANY AXIS)</li> <li>• MCIU HC ↓ (MULTIPLEXER MISMATCH)</li> </ul>	<ul style="list-style-type: none"> <li>• S/W DOWNMODE TO IDLE IF IN MANUAL (TEST)</li> </ul>

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
S96 PDRS CNTL	SY SP EP WP WY WR	S2,4		<ul style="list-style-type: none"> <li>• CONSISTENCY CK – JOINT RUNAWAY</li> <li>• TACH DATA FAIL</li> </ul>	<ul style="list-style-type: none"> <li>• AUTO BRAKES APPLIED</li> </ul>
PDRS CNTL	POR	S2,4		<ul style="list-style-type: none"> <li>• TRAJECTORY TRACKING ERROR DETECTION EXCEEDENCE</li> </ul>	<ul style="list-style-type: none"> <li>• AUTO BRAKES APPLIED</li> </ul>
PDRS DERIG		S2,4		<ul style="list-style-type: none"> <li>• UNCOMMANDED DERIGIDIZE</li> </ul>	<ul style="list-style-type: none"> <li>• POSSIBLE EE STRUCT FAIL</li> </ul>
S94 PDRS GPC		S2,4		<ul style="list-style-type: none"> <li>• MCIU–DETECTED GPC COMM FAIL</li> </ul>	<ul style="list-style-type: none"> <li>• MCIU SAFING COMMANDED</li> <li>• S/W DNMODE TO 'SUSPEND'</li> </ul>
S96 PDRS MCIU	MADC	S2,4		<ul style="list-style-type: none"> <li>• MADC REF VOLT TEST FAIL</li> </ul>	<ul style="list-style-type: none"> <li>• AUTO BRAKES APPLIED</li> </ul>
	MCPC	S2,4		<ul style="list-style-type: none"> <li>• MCPC REF VOLT TEST FAIL</li> </ul>	<ul style="list-style-type: none"> <li>• AUTO BRAKES APPLIED</li> </ul>
	ICF	S2,4		<ul style="list-style-type: none"> <li>• ICF FAIL</li> </ul>	<ul style="list-style-type: none"> <li>• AUTO BRAKES APPLIED (MAY NOT BE IND)</li> </ul>
PDRS RCH	SY SP EP WP WY WR	S2,4		<ul style="list-style-type: none"> <li>• JOINT EXCEEDS POS OR NEG RCH LIMIT</li> </ul>	<ul style="list-style-type: none"> <li>• APPROX 2° PRIOR TO S/W STOP</li> <li>• APPROX 4° PRIOR TO HARDSTOP</li> </ul>
PDRS REL		S2,4		<ul style="list-style-type: none"> <li>• UNCOMMANDED P/L RELEASE</li> </ul>	<ul style="list-style-type: none"> <li>• POSSIBLE EE STRUCT FAIL</li> </ul>
PDRS SING	SY	S2,4		<ul style="list-style-type: none"> <li>• SY/WY WITHIN 3 FT OF COALIGNMENT</li> </ul>	<ul style="list-style-type: none"> <li>• LOSE ±Y DEG OF FREEDOM AT SINGULARITY</li> </ul>
	EP	S2,4		<ul style="list-style-type: none"> <li>• EP &gt; -7.6°</li> </ul>	<ul style="list-style-type: none"> <li>• LOSE -X DEG OF FREEDOM AT SINGULARITY</li> </ul>
	WY	S2,4		<ul style="list-style-type: none"> <li>• WY WITHIN ±15° OF ±90° SING</li> </ul>	<ul style="list-style-type: none"> <li>• LOSE ROLL DEG OF FREEDOM AT SINGULARITY</li> </ul>

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
S96 PDRS SLIP	SY SP EP WP WY WR ALL	S2,4		<ul style="list-style-type: none"> <li>• JOINT SLIPPAGE WITH THE BRAKES ON AND NOT IN DIRECT MODE</li> </ul>	<ul style="list-style-type: none"> <li>• SLIPPAGE GREATER THAN 0.5° PER JOINT OR SUM OF 2.0° FOR ALL JOINTS</li> </ul>
PDRS TEMP	PORT STBD	S2,4		<ul style="list-style-type: none"> <li>• JOINT/EE TEMP OUT OF LIMITS</li> </ul>	
PDRS TEST	BRK C/W NMI FS LOSS	S2,4		<ul style="list-style-type: none"> <li>• MCIU BITE VERIFICATION TEST FAILURE</li> </ul>	
S96 PDRS TEST	SPA	S2,4		<ul style="list-style-type: none"> <li>• SPA BITE VERIFICATION TEST FAILURE</li> </ul>	
S94 PDRS WR R		S2,4		<ul style="list-style-type: none"> <li>• PDRS WRIST ROLL RANGE CHECK FAILURE</li> </ul>	
206 PL CL2			SM	<ul style="list-style-type: none"> <li>• AV FAN ΔP ↑↓</li> <li>• H2O PUMPS ΔP STAT ↓</li> </ul>	<ul style="list-style-type: none"> <li>• SEE A/E SYS (SPACELAB MODULE CONFIGURATION ONLY )</li> </ul>
PL CL3			SM	<ul style="list-style-type: none"> <li>• AUX BUS A/B U/V ↓</li> <li>• SS INV IN AMPS ↑</li> <li>• SS TEMP ↑</li> <li>• EXP INV IN AMPS ↑</li> <li>• EXP TEMP ↑</li> <li>• SS AC ΦA(B,C) V ↑↓</li> <li>• MAIN BUS V</li> </ul>	<ul style="list-style-type: none"> <li>• SEE ASCENT/ENTRY SYSTEMS PROCEDURES</li> </ul>

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
PNL TRIM	L(R)	G3,6		• LH(RH) +/- P/R/Y TRIM SW DISAGREE	• NO MAL
PROBES		G3,6		• EITHER ADTA PROBE NOT DEPLOYED DURING 1 < M < 2.5	• NO MAL
S89 PRPLT THRM	OMS	S2,4		• OX(FU) LN STRUCT T HI/LOW	
	POD	S2,4		• PROP AND STRUCT T HI/LOW	
	RCS	S2,4		• FWD AND L/R RCS STRUCT T HI/LOW	
R OMS	GMBL	G1,2,3	G1,3	• PITCH (YAW) CMD/FEEDBACK $\Delta 2^\circ$ FOR 3.8 SEC	• NO MAL
	PC	G1,2,3,6	G1,3,6	• ENG CHAMBER PRESS LOW	
	QTY	G1,2,3,6,8		• FU OR OX TK LEVEL LOW	
	TEMP		G1,3	• ENG FU INJ T HI	
	TK P	G2,8	G1,3	• FU OR OX TK ULLAGE P HI/LOW	
			G1,3,6	• He OR N2 TK P LOW • N2 REG P HI/LOW	
	VLV	G2		• OMS R POD He/P VAP ISOL VLV MISMATCH	
S89 R OMS	TEMP	S2,4		• ENG FU INJ T HI/LOW	• NO MAL

**R**

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
R RCS	JET		G1,3,6	<ul style="list-style-type: none"> <li>• RIGHT JET MANF 1(2,3,4) FAIL ON/OFF</li> </ul>	<ul style="list-style-type: none"> <li>• NO FAIL LK DETECTION IN BFS</li> </ul>
	AJET	G1,2,3,6,8		<ul style="list-style-type: none"> <li>• R AFT JET 1(3) FAIL ON/OFF/LK</li> </ul>	<ul style="list-style-type: none"> <li>• FAILED OFF DETECTION NOT PERFORMED IN MM101 &amp; 102 FOR PASS</li> </ul>
	DJET	G1,2,3,6,8		<ul style="list-style-type: none"> <li>• R DOWN JET 2(3,4,5) FAIL ON/OFF/LK</li> </ul>	
	RJET	G1,2,3,6,8		<ul style="list-style-type: none"> <li>• R RIGHT JET 1(2,3,4,5) FAIL ON/OFF/LK</li> </ul>	
	UJET	G1,2,3,6,8		<ul style="list-style-type: none"> <li>• R UP JET 1(2,4) FAIL ON/OFF/LK</li> </ul>	
	He P	G2,8	G1,3,6	<ul style="list-style-type: none"> <li>• R RCS AFT He (FU OR OX) TK PRESS – 2 LOW</li> </ul>	
	LEAK	G2,3,8	G1,3,6	<ul style="list-style-type: none"> <li>• PROP/He LEAK</li> </ul>	<ul style="list-style-type: none"> <li>• OX/FU ΔQTY &gt; 9.5%</li> </ul>
	PVT	G2,3,8		<ul style="list-style-type: none"> <li>• LOSS OF P OR T DATA FOR RCS QTY CALC</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• QTY CALC SUSPENDED</li> </ul>
	TK P	G2,8	G1,3,6	<ul style="list-style-type: none"> <li>• R RCS AFT (FU OR OX) TK ULL PRESS HI/LOW</li> </ul>	
	XFEED	G1,3,6		<ul style="list-style-type: none"> <li>• R RCS PROP TANK LOW PRESS</li> </ul>	<ul style="list-style-type: none"> <li>• FAILURE ON RIGHT SIDE, AUTO XFEED FROM LEFT</li> </ul>
G23 RCS SYSTEM	F(L,R)	G2,8		<ul style="list-style-type: none"> <li>• F(L,R) RCS FU OR OX TK TEMP</li> </ul>	
		G2,8		<ul style="list-style-type: none"> <li>• F(L,R) RCS FU OR OX TK OUT PRESS</li> </ul>	
RCS PWR	FAIL	G1,2,3,6,8		<ul style="list-style-type: none"> <li>• LOSS OF VLV LOGIC PWR TO MANF ISOL VLVs</li> </ul>	<ul style="list-style-type: none"> <li>• OMS/RCS VLVs WITH tb – bp STUCK IN CURRENT POSITION</li> </ul>



MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
RHC	A	G2,8	<ul style="list-style-type: none"> <li>CHANNEL FAIL</li> <li>R(P,Y) DISAGREE</li> </ul>	<ul style="list-style-type: none"> <li>NO MAL</li> <li>FAIL = SM ALERT</li> <li>RHC LOST FOR DISAGREE</li> </ul>
	L	G1,2,3,6,8	<ul style="list-style-type: none"> <li>CHANNEL FAIL</li> <li>R(P,Y) DISAGREE</li> </ul>	
	R	G1,2,3,6,8	<ul style="list-style-type: none"> <li>CHANNEL FAIL</li> <li>R(P,Y) DISAGREE</li> </ul>	
G51 RL MODE SW		G3,6	<ul style="list-style-type: none"> <li>ENTRY ROLL MODE SW FAIL</li> </ul>	<ul style="list-style-type: none"> <li>NO MAL</li> </ul>
RM DLMA	ADTA	G3,6	<ul style="list-style-type: none"> <li>DELAYED ADTA DILEMMA FLAG</li> </ul>	<ul style="list-style-type: none"> <li>NO MAL</li> <li>DES/SEL AVAILABLE</li> <li>CONDITION NOT RESET UNTIL DATA GOOD FLAG RETURNS TO VALID</li> </ul>
	GPS	G1,2,3,6,8	<ul style="list-style-type: none"> <li>Q4 DILEMMA GPS 1/2/3</li> </ul>	<ul style="list-style-type: none"> <li>NO BFS MSG</li> <li>NO MAL</li> <li>DES/SEL AVAILABLE</li> </ul>
	IMU	G1,2,3,6,8	<ul style="list-style-type: none"> <li>DILEMMA</li> </ul>	<ul style="list-style-type: none"> <li>NO MAL</li> <li>DES/SEL AVAILABLE</li> </ul>
	MLS	G3,6	<ul style="list-style-type: none"> <li>EL, RNG, OR AZ DISAGREE</li> </ul>	<ul style="list-style-type: none"> <li>NO MAL</li> <li>DES/SEL AVAILABLE OPS 8 ONLY</li> <li>PWR-OFF/CHANGE CHANNEL</li> <li>NO CRT DATA OPS 3: HSI MAY IDENTIFY BAD UNIT</li> </ul>
	PRL	G1,3,6	<ul style="list-style-type: none"> <li>HYD SYS 1(2,3) DISAGREE</li> </ul>	<ul style="list-style-type: none"> <li>NO MAL</li> <li>ASC PKT, ENT PKT – HYD P LOW</li> <li>ORB PKT – HYD ACCUM (RSVR) P LOW</li> </ul>
	MANF	G1,2,3,6,8	<ul style="list-style-type: none"> <li>RCS MANF DILEMMA FLAG. MANF VLV STATUS SET 'CLOSE'</li> </ul>	

**MEDS**

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
RM FAIL	ACC	G1,3,6		• FAIL	• NO MAL • DES/SEL AVAILABLE
	ADTA	G3,6	G3,6	• FAIL	• NO MAL • DES/SEL AVAILABLE
	IMU	G1,2,3 6,8	G1,3,6	• FAIL • COMM FAULT CAUSES BFS RM FAIL	• NO MAL • DES/SEL AVAILABLE
	MLS	G3,6		• FAIL	• NO MAL • DES/SEL AVAILABLE OPS 8 ONLY • NO CRT DATA OPS 3
	RGA	G1,3,6		• FAIL	• NO MAL • DES/SEL AVAILABLE
	TAC	G3,6		• FAIL	• NO MAL • DES/SEL AVAILABLE
	XFER		G1,3,6	• BFS NOT RECEIVE STATE VECTOR OR REFSMAT	• NO MAL
G33 RNDZ RADAR		G2		• KU-BAND BREAKS TRACK WITH RADAR TARGET (GPC ANT STEERING MODE ONLY)	• NO MAL
ROLL REF		G3	G3	• REF ROLL STATUS FAIL	• NO MAL
S86 RSVR/ACC P	1(2,3)	S2,4		• RSVR P ↓ • ACCUM P ↓	
SBTC/THC	A	G2,8		• AFT THC POS/NEG X/Y/Z OUTPUT A/B/C FAIL • AFT THC POS/NEG X/Y/Z OUTPUT DISAGREE	• NO MAL
	L	G3,6		• L SBTC CMD A(B,C) FAIL • L SBTC CMD A(B,C) DISAGREE	

**MEDS**

REF/ALL/GEN E

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
RHC	A	G2,8	<ul style="list-style-type: none"> <li>• CHANNEL FAIL</li> <li>• R(P,Y) DISAGREE</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• FAIL = SM ALERT</li> <li>• RHC LOST FOR DISAGREE</li> </ul>
	L	G1,2,3,6,8	<ul style="list-style-type: none"> <li>• CHANNEL FAIL</li> <li>• R(P,Y) DISAGREE</li> </ul>	
	R	G1,2,3,6,8	<ul style="list-style-type: none"> <li>• CHANNEL FAIL</li> <li>• R(P,Y) DISAGREE</li> </ul>	
G51 RL MODE SW		G3,6	<ul style="list-style-type: none"> <li>• ENTRY ROLL MODE SW FAIL</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
RM DLMA	ADTA	G3,6	<ul style="list-style-type: none"> <li>• DELAYED ADTA DILEMMA FLAG</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• DES/SEL AVAILABLE</li> <li>• CONDITION NOT RESET UNTIL DATA GOOD FLAG RETURNS TO VALID</li> </ul>
	IMU	G1,2,3,6,8	<ul style="list-style-type: none"> <li>• DILEMMA</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• DES/SEL AVAILABLE</li> </ul>
	MLS	G3,6	<ul style="list-style-type: none"> <li>• EL, RNG, OR AZ DISAGREE</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• DES/SEL AVAILABLE OPS 8 ONLY</li> <li>• PWR-OFF/CHANGE CHANNEL</li> <li>• NO CRT DATA OPS 3: HSI MAY IDENTIFY BAD UNIT</li> </ul>
	TAC	G3,6	<ul style="list-style-type: none"> <li>• DILEMMA</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• DES/SEL AVAILABLE</li> </ul>
	PRL	G1,3,6	<ul style="list-style-type: none"> <li>• HYD SYS 1(2,3) DISAGREE</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• ASC PKT, ENT PKT – HYD P LOW</li> <li>• ORB PKT – HYD ACCUM (RSVR) P LOW</li> </ul>
	MANF	G1,2,3,6,8	<ul style="list-style-type: none"> <li>• RCS MANF DILEMMA FLAG. MANF VLV STATUS SET 'CLOSE'</li> </ul>	

**NOM**

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
RM FAIL	ACC	G1,3,6		• FAIL	• NO MAL • DES/SEL AVAILABLE
	ADTA	G3,6	G3,6	• FAIL	• NO MAL • DES/SEL AVAILABLE
	IMU	G1,2,3 6,8	G1,3,6	• FAIL • COMM FAULT CAUSES BFS RM FAIL	• NO MAL • DES/SEL AVAILABLE
	MLS	G3,6		• FAIL	• NO MAL • DES/SEL AVAILABLE OPS 8 ONLY • NO CRT DATA OPS 3
	RGA	G1,3,6		• FAIL	• NO MAL • DES/SEL AVAILABLE
	TAC	G3,6		• FAIL	• NO MAL • DES/SEL AVAILABLE
	XFER		G1,3,6	• BFS NOT RECEIVE STATE VECTOR OR REFSMAT	• NO MAL
G33 RNDZ RADAR		G2		• KU-BAND BREAKS TRACK WITH RADAR TARGET (GPC ANT STEERING MODE ONLY)	• NO MAL
ROLL REF		G3	G3	• REF ROLL STATUS FAIL	• NO MAL
S86 RSVR/ACC P		1(2,3)	S2,4	• RSVR P ↓ • ACCUM P ↓	
SBTC/THC	A	G2,8		• AFT THC POS/NEG X/Y/Z OUTPUT A/B/C FAIL • AFT THC POS/NEG X/Y/Z OUTPUT DISAGREE	• NO MAL
	L	G3,6		• L SBTC CMD A(B,C) FAIL • L SBTC CMD A(B,C) DISAGREE	

**NOM**

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
SBTC/THC	L	G2,3,8	<ul style="list-style-type: none"> <li>• FWD THC POS/NEG X/Y/Z OUTPUT A/B/C FAIL</li> <li>• FWD THC POS/NEG X/Y/Z OUTPUT DISAGREE</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
	R	G3,6	<ul style="list-style-type: none"> <li>• R SBTC CMD A(B,C) FAIL</li> <li>• R SBTC CMD A(B,C) DISAGREE</li> </ul>	
SEL AUTO		G2	<ul style="list-style-type: none"> <li>• UNIV PTG MNVR T-30 &amp; NOT AUTO</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
SENSE SW		G2	<ul style="list-style-type: none"> <li>• AFT SENSE SW DEFAULT</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• DEFAULT POS IS '-Z'</li> </ul>
212 SL LINK ERR		S2,4	ANY OF THE FOLLOWING MDM SERIAL I/O LINK ERROR CONDITIONS OCCURRED FOR SSC OR EXC: <ul style="list-style-type: none"> <li>NO SL RESP ↓</li> <li>GPC NO MATCH ↓↓</li> <li>SL LENGTH ↓↓</li> <li>AR NO MATCH ↓↓</li> <li>SR NO MATCH ↓↓</li> <li>MSG REJECT (ITEM OR GNC) ↓↓</li> <li>MSG LINK BUSY ↓↓</li> <li>MSG LINK DSBL ↓↓</li> </ul>	<ul style="list-style-type: none"> <li>• SL MAL, <u>CDMS</u>, MDM/MTU/PCMMU</li> </ul>
212 SL LINK TERM		S2,4	MDM SERIAL I/O LINK TO SPACELAB TERMINATED. CAUSED BY ANY OF THE FOLLOWING FOR SSC OR EXC: <ul style="list-style-type: none"> <li>NOP IND ↓</li> <li>COMM ↓</li> <li>LINK INTRPT ↓</li> </ul>	<ul style="list-style-type: none"> <li>• SL MAL, <u>CDMS</u>, MDM/MTU/PCMMU</li> </ul>
SM1 SMOKE ALRM		SM	<ul style="list-style-type: none"> <li>• ANY SMOKE CONC ↑</li> </ul>	

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
SM1 SMOKE BAY	1A	S2,4		• AV BAY 1 SENSOR A CONC ↑	• NO MAL
	1B	S2,4		• AV BAY 1 SENSOR B CONC ↑	
	2A	S2,4		• AV BAY 2 SENSOR A CONC ↑	
	2B	S2,4		• AV BAY 2 SENSOR B CONC ↑	
	3A	S2,4		• AV BAY 3 SENSOR A CONC ↑	
	3B	S2,4		• AV BAY 3 SENSOR B CONC ↑	
SM1 SMOKE CAB	LFD	S2,4		• LEFT FLT DECK SMOKE CONC ↑	• NO MAL
	RFD	S2,4		• RIGHT FLT DECK SMOKE CONC ↑	
	HX	S2,4		• RETURN AIR CAB HX SMOKE CONC ↑	
SPD BRK		G3,6		• SPEED BRAKE POSITION > 20% FROM AUTO SCHEDULE DURING 0.95 < M < 9.8	• NO MAL
S66 SPLY H2O	PRES	S2,4		• SUPPLY H2O IN P ↓↑	
	QTY	S2,4		• SUPPLY QTY TK A(B,C,D) ↓ C(D) ↑	
	TEMP	S2,4		• SPLY DUMP LINE T ↑↓ • SPLY NOZ T A(B) ↑	
SSME FAIL	C(L,R)	G1,6	G1,6	• PREMATURE ME SHUTDOWN	• IN MM101, MSG ANNUNCIATED BY BFS ONLY
SSME REPOS FAIL		G3	G3	• MORE THAN ONE MPS/TVC ISOL VLV FAILED TO INDICATE OPEN • LESS THAN TWO APU/HYD SYSTEMS INDICATED GOOD	• NO MAL • SSME REPOSITIONING FOR DRAG CHUTE DEPLOY IS NOT COMPLETE • MM304 AND 3.5 < MACH < 8

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
SUMWORD ICC	1(2,3,4,5)	ALL		<ul style="list-style-type: none"> <li>SUMWORD MISCOMPARE IN DATA FROM INDICATED GPC</li> </ul>
SW TO MEP		G3,6	G3	<ul style="list-style-type: none"> <li>MEP ALERT</li> <li>NO MAL</li> </ul>
TFL LOAD FAIL		S2,4	ALL	<ul style="list-style-type: none"> <li>READ COMPARE ERROR</li> <li>UNSUCCESSFUL LOAD</li> <li>NO MAL</li> <li>MAY BE RESULT OF GROUND UPLINK</li> </ul>
TGT ΔT		G2		<ul style="list-style-type: none"> <li>REQUESTED TRANSFER TIME CAUSED SINGULARITY IN TARGETING ALGORITHM</li> </ul>
TGT EL ANG		G2		<ul style="list-style-type: none"> <li>EXCEEDED MAX NUMBER OF ITERATIONS ON TPI TIG FOR GIVEN ELEVATION ANGLE</li> <li>NO MAL</li> </ul>
TGT ITER		G2		<ul style="list-style-type: none"> <li>LAMBERT TGT TRANSFER ANGLE NEAR SINGULARITY POINT</li> <li>PARABOLIC TRANSFER</li> <li>MAX NUMBER OF ITERATIONS</li> </ul>
S87 THERMAL	HYD	S2,4		<ul style="list-style-type: none"> <li>HX OUT T ↓</li> </ul>
S87 THERMAL CNTL	1(2,3)	S2,4		<ul style="list-style-type: none"> <li>LN T ELEV RD/SPBK/BDY FLP ↑↓</li> <li>HYD CIRC PUMP NOT MAINTAINING HYD THERMAL ENVIR</li> </ul>
SM0 THRM APU			SM	<ul style="list-style-type: none"> <li>GG BED ↓, APU INJ T ↓</li> <li>ASC/ENT PKT – THERM HTR</li> </ul>
APU			SM	<ul style="list-style-type: none"> <li>APU FU FEED LN T ↑↓, PUMP IN T ↑↓, PUMP OUT T ↑↓, FU TEST LN T ↑↓, FU SERVICE LN T ↑↓, PUMP DRN LN T ↑↓, PUMP BYP LN T ↑↓, GGVM SPLY LN T ↑↓, H2O LN INJ ↑↓</li> </ul>
EVAP			<sup>a</sup>	<ul style="list-style-type: none"> <li>FES NOZ, DUCT OR FDLN T ↑↓</li> <li>ONLY SELECTED DUCTS AND FDLN Ts ARE SENSED FOR STATUS</li> </ul>

<sup>a</sup>MM104 to 106, ORB OPS 0, MM301 to 303

T

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
SM0 THRM FRN (Cont)		SM	<ul style="list-style-type: none"> <li>• ACCUM QTY ↓</li> <li>• RAD OUT T ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>• NO ASC/ENT PKT</li> </ul>
H2O		a	<ul style="list-style-type: none"> <li>• H2O SPLY IN P ↑↓</li> </ul>	
HYD		a	<ul style="list-style-type: none"> <li>• H2O BLR T ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• ASC/ENT PKT – THERM HTR</li> </ul>
PRPLT		a	<ul style="list-style-type: none"> <li>• OMS FU/OX BLD/DRAIN LN T</li> <li>• OMS POD RCS HOUSING</li> <li>• OMS RCS STRUCT T</li> <li>• OX ENG IN OR ENG FU FDLN T</li> </ul>	
TIME	MTU	ALL	<ul style="list-style-type: none"> <li>• AUTOMATIC TIME SOURCE CHANGE</li> </ul>	
	STONE	ALL	<ul style="list-style-type: none"> <li>• TIME MGT TIME TONE</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
TIRE PRESS		G3,6	<ul style="list-style-type: none"> <li>• NOSE GEAR/MLG TIRE PRESS ↓</li> </ul>	
S66 VAC VNT NZ	TEMP	S2,4	<ul style="list-style-type: none"> <li>• VACUUM VENT NOZ T</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL (NO LIMITS)</li> </ul>
SM2 W/B QTY 1(2,3)		SM	<ul style="list-style-type: none"> <li>• HYD SYS H2O BOILER FLUID QTY 40%</li> </ul>	
S66 WASTE H2O	PRES	S2,4	<ul style="list-style-type: none"> <li>• WASTE LIQ P ↑↓</li> </ul>	
	QTY	S2,4	<ul style="list-style-type: none"> <li>• WASTE QTY ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL FOR QTY HIGH</li> </ul>
	TEMP	S2,4	<ul style="list-style-type: none"> <li>• WASTE NOZ T ↑↓</li> <li>• DUMPLINE T ↑↓</li> </ul>	
S86 WSB P	1(2,3)	S2,4	<ul style="list-style-type: none"> <li>• REG P ↑↓</li> <li>• N2 P ↓</li> </ul>	
Q	1(2,3)	S2,4	<ul style="list-style-type: none"> <li>• H2O QTY ↓</li> </ul>	
T	1(2,3)	S2,4	<ul style="list-style-type: none"> <li>• TK T ↓</li> <li>• BLR T ↑↓</li> </ul>	

<sup>a</sup>MM104 to 106, ORB OPS 0, MM301 to 303



## MEDS FAULT MESSAGES

MEDS messages will appear in all PASS/BFS OPS on all MDUs that are operating in DPS mode and controlled by the detecting ID. If no MDUs are in DPS mode MEDS message will appear on an MDU display, if it is being commanded by that MDU, in the following hierarchy for its corresponding IDP:

IDP1		IDP2		IDP3		IDP4	
Rank	MDU	Rank	MDU	Rank	MDU	Rank	MDU
1	CRT1	1	CRT2	1	CRT3	1	CRT4
2	CDR1	2	PLT2	2	PLT2	2	AFD1
3	CDR2	3	PLT1	3	MFD2		
4	MFD2	4	MFD1	4	MFD1		
5	PLT1	5	CDR2	5	CDR1		
		6	AFD1				

## MEDS FAULTS

MESSAGE	CAUSE	COMMENTS <sup>a</sup>
BITE FAIL ADC1A (1B,2A,2B)	<ul style="list-style-type: none"> <li>• ADC BITE ERROR</li> <li>• ADC PWR ON SELF-TEST</li> </ul>	<ul style="list-style-type: none"> <li>• MEDS I/O ERROR XXXXX</li> </ul>
MDU AFD(1) MDU CDR1(2) MDU CRT1(2,3,4) MDU MFD1(2) MDU PLT1(2)	<ul style="list-style-type: none"> <li>• MDU BITE ERROR</li> <li>• MDU PWR ON SELF-TEST ERROR</li> </ul>	<ul style="list-style-type: none"> <li>• MEDS I/O ERROR XXXX</li> <li>• PORT CHANGE XXXX</li> </ul>
IDP1(2,3,4)	<ul style="list-style-type: none"> <li>• IDP BITE ERROR</li> <li>• IDP H/W or S/W HALT</li> <li>• IDP PWR ON SELF-TEST ERROR</li> </ul>	<ul style="list-style-type: none"> <li>• I/O ERROR CRTX</li> <li>• PORT CHANGE XXXX</li> <li>• CRT BITE XXXX</li> </ul>
CHECKSUM FAIL IDP1(2,3,4)	<ul style="list-style-type: none"> <li>• CHECKSUM ERROR AT PWR ON SELF-TEST</li> <li>• FAIL OF A LIMITED PORTION OF EEPROM</li> </ul>	
MEDS I/O ERROR FAIL ADC1A(1B,2A,2B)	<ul style="list-style-type: none"> <li>• COM ERROR ON 1553B DATA BUS (between IDP and ADC)</li> <li>• ADC PWR LOSS or FAILURE</li> <li>• ADC H/W or S/W FAILURE</li> </ul>	
MDU AFD1 MDU CRT1(2,3,4) MDU CDR1(2,3) MDU MFD1(2) MDU PLT1(2)	<ul style="list-style-type: none"> <li>• MDU PWR LOSS or FAILURE</li> <li>• MDU H/W or S/W FAILURE</li> <li>• MDU S/W LOAD FAIL</li> <li>• COMM ERROR ON 1553 DATA BUS</li> </ul>	<ul style="list-style-type: none"> <li>• PORT CHANGE XXXX</li> </ul>
MDU IS AUTONOMOUS	<ul style="list-style-type: none"> <li>• LOSS OF MDU INTERFACE VIA PRIMARY AND SECONDARY PORTS</li> </ul>	<ul style="list-style-type: none"> <li>• MESSAGE APPEARS IN CENTER OF MDU</li> <li>• MEDS I/O ERROR XXXX</li> </ul>
MDU OVERTEMP MDU AFD1 MDU CDR1(2) MDU CRT1(2,3,4) MDU MFD1(2) MDU PLT1(2)	<ul style="list-style-type: none"> <li>• MDU TEMP SENSOR FAILURE</li> <li>• INSUFFICIENT COOLING</li> </ul>	

<sup>a</sup>All messages listed in comments column are possible and may not be annunciated

MESSAGE	CAUSE	COMMENTS <sup>a</sup>
OPERATOR REQUEST FAIL MDU AFD1 MDU CDR1(2) MDU CRT1(2,3,4) MDU MFD1(2) MDU PLT1(2)	<ul style="list-style-type: none"> <li>• IDP or MDU MEMORY LOAD ERROR</li> <li>• MDU MEMORY DUMP READ ERROR</li> <li>• MASS STORAGE UNIT (MSU) FILE PATCHING ERRORS</li> <li>• MASS STORAGE UNIT (MSU) or 1553B OPERATOR REQUEST ERROR</li> </ul>	
PORT CHANGE MDU AFD1 MDU CDR1(2,3) MDU CRT1(2,3,4) MDU MFD1(2) MDU PLT1(2)	<ul style="list-style-type: none"> <li>• IN AUTO AND PERFORMED PORT SELECTION</li> <li>• MDU PRI/SEC PORT MODE ERROR</li> <li>• IDP/MDU 1553 BUS ERROR</li> <li>• IDP FAILURE</li> </ul>	<ul style="list-style-type: none"> <li>• AUTOMATIC MDU PORT CHANGE WILL CAUSE ANNUNCIATION OF MESSAGE</li> </ul>
PROCESSOR FAIL    ADC1A(2A,1B,2B)	<ul style="list-style-type: none"> <li>• INTERNAL ADC PROCESSOR ERROR</li> </ul>	
MDU AFD(1) MDU CDR1(2) MDU CRT1(2,3,4) MDU MFD1(2) MDU PLT1(2)	<ul style="list-style-type: none"> <li>• INTERNAL MDU PROCESSOR ERROR</li> </ul>	<ul style="list-style-type: none"> <li>• PORT CHANGE XXXX</li> </ul>
SOFTWARE FAIL        IDP1(2,3,4)	<ul style="list-style-type: none"> <li>• IDP S/W HALT</li> </ul>	<ul style="list-style-type: none"> <li>• I/O ERROR CRTX</li> </ul>

<sup>a</sup>All messages listed in comments column are possible and may not be annunciated

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CAUTION & WARNING

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C/W

## C/W POWER SUPPLY FAILURE

PRIMARY C/W light ON plus:

### SYS A PWR SPLY

All F7 annun lts ON except  
BACKUP C/W lt

Loss of:

C/W status pnl lts and  
function (R13U)  
Smoke detection  
Siren test CKT A  
C/W memory read  
Lower bulbs Master Alarm  
light except for lamp test  
Primary C/W limit sensing  
ACCU Bypass tones to  
MIDDK SU

### SYS B PWR SPLY

BACKUP C/W light ON  
(no reset)

Loss of:

Smoke detection  
Siren test CKT B  
Upper bulbs Master  
Alarm light except for  
lamp test  
Sleep station headset  
tones

C/W

C/W LIGHT PANEL

O <sub>2</sub> PRESS	H <sub>2</sub> PRESS	FUEL CELL REAC (R)	FUEL CELL STACK TEMP	FUEL CELL PUMP
CABIN ATM (R)	O <sub>2</sub> HEATER TEMP	MAIN BUS (R) UNDERVOLT	AC VOLTAGE	AC OVERLOAD
FREON LOOP	AV BAY/ CABIN AIR	IMU	FWD RCS (R)	RCS JET
H <sub>2</sub> O LOOP	RGA/ACCEL	AIR DATA (R)	LEFT RCS (R)	RIGHT RCS (R)
———	LEFT RHC (R)	RIGHT/AFT RHC (R)	LEFT OMS (R)	RIGHT OMS (R)
PAYLOAD WARNING (R)	GPC	FCS (R) SATURATION	OMS KIT	OMS TVC (R)
PAYLOAD CAUTION	PRIMARY C/W	FCS CHANNEL	MPS (R)	———
BACKUP C/W ALARM (R)	APU TEMP	APU OVERSPEED	APU UNDERSPEED	HYD PRESS

(34V73A7A2)

**C/W & FDA TABLE**

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
AC AMPS 1 $\Phi$ A <sup>a</sup>				0761540	67		10.0			
$\Phi$ B <sup>a</sup>				0761541	67		10.0			
$\Phi$ C <sup>a</sup>				0761542	67		10.0			
2 $\Phi$ A <sup>a</sup>				0761640	67		10.0			
$\Phi$ B <sup>a</sup>				0761641	67		10.0			
$\Phi$ C <sup>a</sup>				0761642	67		10.0			
3 $\Phi$ A <sup>a</sup>				0761740	67		10.0			
$\Phi$ B <sup>a</sup>				0761741	67		10.0			
$\Phi$ C <sup>a</sup>				0761742	67		10.0			
OVL1 1	63		5.00	0761506	67			1		• > 14.5 AMPS FOR 10-20 SEC (BL)
2	73		5.00	0761606	67			1		
3	83		5.00	0761706	67			1		
V 1 $\Phi$ A	33		5.00	0761500	67			108.0	123.0	• PRI C/W AC OV-UV (BL)
$\Phi$ B	33		5.00	0761501	67			108.0	123.0	
$\Phi$ C	33		5.00	0761502	67			108.0	123.0	
2 $\Phi$ A	43		5.00	0761600	67			108.0	123.0	• PRI C/W AC OV-UV (BL)
$\Phi$ B	43		5.00	0761601	67			108.0	123.0	
$\Phi$ C	43		5.00	0761602	67			108.0	123.0	
3 $\Phi$ A	53		5.00	0761700	67			108.0	123.0	• PRI C/W AC OV-UV (BL)
$\Phi$ B	53		5.00	0761701	67			108.0	123.0	
$\Phi$ C	53		5.00	0761702	67			108.0	123.0	
ADTA	91		2.50							• NAV SENSOR FAIL (BL)

<sup>a</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
AFT RCS DRN PNL 1 L <sup>a</sup>				0422304	89	49.0	125.0			
R <sup>a</sup>				0423304	89	49.0	125.0			
2 L <sup>b</sup>				0422305	89	49.0	125.0			
R <sup>b</sup>				0423305	89	49.0	125.0			
MANF 1 OX L <sup>b</sup>				0422204	89	50.0	140.0			
R <sup>b</sup>				0423204	89	50.0	140.0			
VERN PNL 1 L <sup>a</sup> (PASS)				0434701	89	45.0	140.0			
(BFS)						45.0	150.0			
R <sup>a</sup> (PASS)				0435701	89	45.0	140.0			
(BFS)						45.0	150.0			
2 L <sup>a</sup>				0434711	89	45.0	140.0			
R <sup>a</sup>				0435711	89	45.0	140.0			
A/L-VEST ΔP <sup>b</sup>				0640127	177	—	—			
APU B/U EGT 1 <sup>c</sup>				0460140	86				1160.0	
2 <sup>c</sup>				0460240	86				1160.0	
3 <sup>c</sup>				0460340	86				1160.0	
FUEL FEED LN T 1				0460104	88	45.0	120.0			
2				0460204	88	45.0	120.0			
3				0460304	88	45.0	120.0			
H2O LN INJ T 1				0460501	88	40.0	110.0			
2				0460502	88	40.0	190.0			
3				0460503	88	40.0	110.0			
PUMP BYP LN T 1				0460128	88	60.0	200.0			
2				0460228	88	60.0	200.0			
3				0460328	88	60.0	200.0			

<sup>a</sup>PASS OPS S2,4; BFS MM 104-106, 301-303, OPS 0

<sup>b</sup>External airlock only

<sup>c</sup>PASS only



PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
APU FUEL PUMP DRN LN T1 1				0460186	88	43.0	95.0			
2				0460286	88	43.0	95.0			
3				0460386	88	43.0	95.0			
T2 1				0460170	88	43.0	140.0			
2				0460270	88	48.0	195.0			
3				0460370	88	43.0	140.0			
INT 1				0460108	88	45.0	125.0			
2				0460208	88	45.0	125.0			
3				0460308	88	45.0	125.0			
LK P 1 <sup>a</sup>				0460190			25.0			
2 <sup>a</sup>				0460290			25.0			
3 <sup>a</sup>				0460390			25.0			
OUT T 1				0460112	88	50.0	210.0			
2				0460212	88	50.0	210.0			
3				0460312	88	50.0	210.0			
T 1				0460192	86		200.0			
2				0460292	86		200.0			
3				0460392	86		200.0			
QTY 1 (PASS)				0726001	86	50.0				
(BFS)						20.0				
2 (PASS)				0726002	86	50.0				
(BFS)						20.0				
3 (PASS)				0726003	86	50.0				
(BFS)						20.0				
TEST LN T1 1				0460183	88	45.0	110.0			
2				0460283	88	45.0	110.0			
3				0460383	88	45.0	110.0			

<sup>a</sup>BFS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
APU FUEL TEST LN T2 1				0460184	88	45.0	150.0			
2				0460284	88	45.0	150.0			
3				0460384	88	45.0	150.0			
TK HTR T 1 <sup>a</sup>				0460130	88	45.0	140.0			
2 <sup>a</sup>				0460230	88	45.0	140.0			
3 <sup>a</sup>				0460330	88	45.0	140.0			
P 1 <sup>a</sup>				0460100	86	100.0	350.0			
2 <sup>a</sup>				0460200	86	100.0	350.0			
3 <sup>a</sup>				0460300	86	100.0	350.0			
SURF T 1 <sup>a</sup>				0460102	88	45.0				
2 <sup>a</sup>				0460202	88	45.0				
3 <sup>a</sup>				0460302	88	45.0				
VLV A T 1				0461175	86	45.0	140.0			
2				0461275	86	45.0	140.0			
3				0461375	86	45.0	140.0			
B T 1				0461173	86	45.0	140.0			
2				0461273	86	45.0	140.0			
3				0461373	86	45.0	140.0			
GBX BRG T 1 <sup>a</sup>				0460161	86		400.0			
2 <sup>a</sup>				0460261	86		400.0			
3 <sup>a</sup>				0460361	86		400.0			
N2 P 1 <sup>a</sup>				0460151	86	3.0				
2 <sup>a</sup>				0460251	86	3.0				
3 <sup>a</sup>				0460351	86	3.0				

<sup>a</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
APU GG BED T 1 (PASS)				0460122	86	100.0				<ul style="list-style-type: none"> <li>• ① GG/FU PMP HTRS – OFF OR APU CNTLR PWR – ON (P)</li> <li>• ② GG/FU PMP HTRS A OR B–ON AND APU PWR–OFF (P)</li> <li>• SEE ①</li> <li>• SEE ②</li> <li>• SEE ①</li> <li>• SEE ②</li> </ul>
(PASS)						100.0	475.0			
(BFS)						258.0				
2 (PASS)				0460222	86	100.0				
(PASS)						100.0	475.0			
(BFS)						258.0				
3 (PASS)				0460322	86	100.0				
(PASS)						100.0	475.0			
(BFS)						258.0				
GGVM HTSK T 1				0461172	86		200.0			
2				0461272	86		200.0			
3				0461372	86		200.0			
SPLY LN T 1 (PASS)				0461171	88		200.0			
(BFS)							180.0			
2 (PASS)				0461271	88		200.0			
(BFS)							180.0			
3 (PASS)				0461371	88		200.0			
(BFS)							180.0			
INJ 1 <sup>a</sup>				0460174		258.0				
2 <sup>a</sup>				0460274		258.0				
3 <sup>a</sup>				0460374		258.0				

<sup>a</sup>BFS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
APU OIL OUT P 1 (PASS)				0460153	86	25.0	150.0			<ul style="list-style-type: none"> <li>• APU 1 ON (P)</li> <li>• APU 1 OFF (P)</li> <li>• APU 2 ON (P)</li> <li>• APU 2 OFF (P)</li> <li>• APU 3 ON (P)</li> <li>• APU 3 OFF (P)</li> <li>• &gt; 129% (BL)</li> <li>• APU 1 ON AND NOT IN HIGH SPD MODE (P)</li> <li>• APU 1 ON AND IN HIGH SPD MODE (P)</li> </ul>
(PASS)					86	OSL	150.0			
(BFS)						25.0	150.0			
2 (PASS)				0460253	86	25.0	150.0			
(PASS)					86	OSL	150.0			
(BFS)						25.0	150.0			
3 (PASS)				0460353	86	25.0	150.0			
(PASS)					86	OSL	150.0			
(BFS)						25.0	150.0			
T 1				0460154	86	40.0	305.0			
2				0460254	86	40.0	305.0			
3				0460354	86	40.0	305.0			
RTN T 1 (PASS)	38		2.90	0460150	86				290.0	
(BFS)								45.0	290.0	
2 (PASS)	48		2.90	0460250	86				290.0	
(BFS)								45.0	290.0	
3 (PASS)	58		2.90	0460350	86				290.0	
(BFS)								45.0	290.0	
OVERSPEED 1	68		5.00							
2	78		5.00							
3	88		5.00							
SPEED % 1 (PASS)				0460135	86	40.0				
(BFS)							112.0	80.0	122.0	
								80.0	122.0	

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
APU SPEED % 2 (PASS) (BFS)				0460235	86	40.0	112.0	80.0	122.0	<ul style="list-style-type: none"> <li>• APU 2 ON &amp; NOT IN HIGH SPD MODE (P)</li> <li>• APU 2 ON &amp; IN HIGH SPD MODE (P)</li> </ul>
3 (PASS) (BFS)				0460335	86	40.0	112.0	80.0	122.0	
TEMP EGT 1 <sup>a</sup>	8		4.20	0460142						<ul style="list-style-type: none"> <li>• APU 3 ON &amp; NOT IN HIGH SPD MODE (P)</li> <li>• APU 3 ON &amp; IN HIGH SPD MODE (P)</li> </ul>
2 <sup>a</sup>	18		4.20	0460242						
3 <sup>a</sup>	28		4.20	0460342						
UNDERSPEED 1	98		5.00							<ul style="list-style-type: none"> <li>• &lt; 80% (BL)</li> </ul>
2	108		5.00							
3	118		5.00							
AV BAY FAN ΔP 1				0612642	66	2.5	4.3			
2				0612647	66	2.5	4.3			
3				0612658	66	2.5	4.3			
3 <sup>b</sup>				0612658	66	4.5	7.8			
TEMP 1	84		4.25	0612645	66				130.0	
2	94		4.25	0612650	66				130.0	
3	104		4.25	0612661	66				130.0	

<sup>a</sup>H/W C/W channels are inhibited

<sup>b</sup>Upgraded AV Bay Fan

C

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
BRAKE PRESSURE LH OB 2A <sup>a</sup> 4A <sup>a</sup> IB 3A <sup>a</sup> 1A <sup>a</sup> RH OB 2A <sup>a</sup> 4A <sup>a</sup> IB 3A <sup>a</sup> 1A <sup>a</sup>				0510722 0510724 0510726 0510728 0510742 0510744 0510746 0510748			180 180 180 180 180 180 180			<ul style="list-style-type: none"> <li>• INHIBITED AFTER LANDING GEAR UPLOCK DISCRETES ARE OFF (0) (V51X0100X, 0200X) (P)</li> </ul>
CABIN AIRLOCK P <sup>b</sup> dP/dT <sup>b</sup> dP/dT EQ EMER O2 QTY <sup>b</sup> REG P <sup>b</sup>				0640101 0612401 0924935 0920305 0612166	66 78 78 66 66	13.8  -0.12 -0.12	15.7    			<ul style="list-style-type: none"> <li>• HIGH C/W DEFAULT VALUE 4.40 V (7.04 inches H2O) AND LOW C/W DEFAULT VALUE 1.75 V (2.80 inches H2O)</li> </ul>
FAN ΔP	74	2.60	4.25	0612556	66			4.2	6.8	
HX OUT T <sup>b</sup>	114		5.00	0612635	66					
H2O TK N2 P 1 <sup>b</sup>				0612307	66	13.0				
2 <sup>b</sup>				0612311	66	13.0				
N2 FLOW 1	54		4.90	0612553	66				4.9	
2	64		4.90	0612554	66				4.9	

<sup>a</sup>BFS only  
<sup>b</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
CABIN N2 QTY 1 <sup>a</sup> 2 <sup>a</sup>				0920315 0920318	66 66	100.0 100.0				<ul style="list-style-type: none"> <li>THIS VALUE IS TMBUd AT OPS 2 DEPENDING ON THE NUMBER OF TANKS FLOWN, LL = 150 (200) FOR 3(4) N2 TANKS/SYS</li> <li>LOW C/W DEFAULT VALUE 3.45 V AND HIGH C/W DEFAULT VALUE 3.80 V</li> </ul>
REG P 1 <sup>a</sup> 2 <sup>a</sup>				0612310 0612410	66 66	150.0 150.0	260.0 260.0			
O2 CONC <sup>a</sup>				0922104	78		25.9			
FLOW 1	14		4.90	0612105	66				4.9	
2	24		4.90	0612205	66				4.9	
REG P 1 <sup>a</sup> 2 <sup>a</sup>				0612115 0612215	66 66		145.0 145.0			
P (PASS) (OV102, OV105) (OV103) (BFS)	4	3.45 3.45	3.85 <sup>b</sup> 3.80 <sup>b</sup>	0612405	66	7.5		13.8 13.8	15.2 15.35	
PPCO2 <sup>a</sup>				0612540	66		7.6			

<sup>a</sup>PASS only

<sup>b</sup>CABIN P H/W C/W high limit set prelaunch (Crew Pre-Ingress sw Reconfiguration) to: (OV102) = 3.85 V/15.36 psia; (OV103) = 3.85 V/15.40 psia; (OV105) = 3.85 V/15.35 psia. Post Insertion, crew resets limits to those shown above

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
CABIN PPO2										
A (PASS) (BFS) (BFS)	34	2.70	3.60	0612511	66	1.9		2.7 2.7 2.4	3.6 3.6 3.6	<ul style="list-style-type: none"> <li>• LOW C/W DEFAULT VALUE 2.70 V (2.7 psia)</li> <li>• POST-LANDING BFS TRANSITION TO OPS 0 (P)</li> </ul>
B (PASS) (BFS) (BFS)	44	2.70	3.60	0612513	66	1.9		2.7 2.7 2.4	3.6 3.6 3.6	
C <sup>a</sup>				0612515	66					<ul style="list-style-type: none"> <li>• POST-LANDING BFS TRANSITION TO OPS 0 (P)</li> </ul>
T <sup>a</sup>				0612552	66		90.0			
CCTV CAM OVER-TEMP <sup>a</sup>				0740847	76	1				<ul style="list-style-type: none"> <li>• CCTV CAMERA OUT OF TEMP (BL)</li> </ul>
CO2 CNTLR 1 <sup>a,b</sup>				0612900	66	1				<ul style="list-style-type: none"> <li>• CNTLR MALFUNCTION (BL)</li> <li>• CNTLR MALFUNCTION (BL)</li> </ul>
2 <sup>a,b</sup>				0612910	66	1				
FILTER ΔP <sup>a,b</sup>				0612923	66					
PPCO <sub>2</sub> <sup>a,b</sup>				0612921	66		7.6			
VAC PRESS <sup>a,b</sup>				0612922	66					
COMSEC 1 BITE				0745003	76	0				<ul style="list-style-type: none"> <li>• NSP 1 RCV ENCRYPTED</li> <li>• NSP 2 RCV ENCRYPTED</li> </ul>
2 BITE				0745004	76	0				

<sup>a</sup>PASS only  
<sup>b</sup>OV102 only



PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
CABIN N2 QTY 1 <sup>a</sup> 2 <sup>a</sup>				0920315 0920318	66 66	100.0 100.0				<ul style="list-style-type: none"> <li>THIS VALUE IS TMBUd AT OPS 2 DEPENDING ON THE NUMBER OF TANKS FLOWN, LL = 150 (200) FOR 3(4) N2 TANKS/SYS</li> <li>LOW C/W DEFAULT VALUE 3.45 V AND HIGH C/W DEFAULT VALUE 3.80 V</li> </ul>
REG P 1 <sup>a</sup> 2 <sup>a</sup>				0612310 0612410	66 66	150.0 150.0	260.0 260.0			
O2 CONC <sup>a</sup>				0922104	78		25.9			
FLOW 1	14		4.90	0612105	66				4.9	
2	24		4.90	0612205	66				4.9	
REG P 1 <sup>a</sup> 2 <sup>a</sup>				0612115 0612215	66 66		145.0 145.0			
P (PASS) (OV104) (BFS)	4	3.45	3.90 <sup>b</sup>	0612405	66	7.5		13.8	15.2	
								13.8	15.35	
PPCO2 <sup>a</sup>				0612540	66		7.6			

<sup>a</sup>PASS only

<sup>b</sup>CABIN P H/W C/W high limit set prelaunch (Crew Pre-Ingress sw Reconfiguration) to: (OV104) = 3.90 V/15.53 psia. Post Insertion, crew resets limits to those shown above

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
CABIN PPO2										
A (PASS) (BFS) (BFS)	34	2.70	3.60	0612511	66	1.9		2.7 2.7 2.4	3.6 3.6 3.6	<ul style="list-style-type: none"> <li>• LOW C/W DEFAULT VALUE 2.70 V (2.7 psia)</li> <li>• POST-LANDING BFS TRANSITION TO OPS 0 (P)</li> </ul>
B (PASS) (BFS) (BFS)	44	2.70	3.60	0612513	66	1.9		2.7 2.7 2.4	3.6 3.6 3.6	
C <sup>a</sup>				0612515	66					<ul style="list-style-type: none"> <li>• POST-LANDING BFS TRANSITION TO OPS 0 (P)</li> </ul>
T <sup>a</sup>				0612552	66		90.0			
CCTV CAM OVER-TEMP <sup>a</sup>				0740847	76	1				<ul style="list-style-type: none"> <li>• CCTV CAMERA OUT OF TEMP (BL)</li> </ul>
COMSEC 1 BITE				0745003	76	0				<ul style="list-style-type: none"> <li>• NSP 1 RCV ENCRYPTED</li> <li>• NSP 2 RCV ENCRYPTED</li> </ul>
2 BITE				0745004	76	0				

<sup>a</sup>PASS only

B4-12

4 |  
REF/ALL/GEN E,3

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
CRYO H2 CNTL P TK 1	50	0.25	4.65	0452110	68			153.0	293.8	
2	60	0.25	4.65	0452210	68			153.0	293.8	
3	70	0.25	4.65	0452310	68			153.0	293.8	
4 <sup>a</sup>	80	0.25	4.65	0452410	68			153.0	293.8	
5 <sup>b</sup>	90 <sup>c</sup>	0.25	4.65 <sup>c</sup>	0452510	68			153.0	293.8	
6 (PASS) (BFS OPS 3,6)				0454110	168			153.0	293.8	
7 (PASS) (BFS OPS 3,6)				0454210	168			153.0	293.8	
8 (PASS) (BFS OPS 3,6)				0454310	168			153.0	293.8	
9 (PASS) (BFS OPS 3,6)				0454410	168			153.0	293.8	
HTR T TK 1 <sup>d</sup>				0452107	68		210.0			
2 <sup>d</sup>				0452207	68		210.0			
3 <sup>d</sup>				0452307	68		210.0			
4 <sup>d</sup>				0452407	68		210.0			
5 <sup>d</sup>				0452507	68		210.0			
6 <sup>d</sup>				0454107	168		210.0			
7 <sup>d</sup>				0454207	168		210.0			
8 <sup>d</sup>				0454307	168		210.0			
9 <sup>d</sup>				0454407	168		210.0			
MANF P TK 1 (PASS) (BFS)				0452140	68	150.0		189.8		
2 (PASS) (BFS)				0452145	68	150.0		189.8		

<sup>a</sup>PASS only

<sup>b</sup>OV102 only

<sup>a</sup>TK 4/5 if 5 tanks on OV102

<sup>b</sup>Not applicable for OV102

<sup>c</sup>TK 5 H/W C/W on OV105 only

<sup>d</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
VLV TK 1 <sup>d</sup> 2 <sup>d</sup>				0452141 0452146	68 68	0 0				• VALVE CLOSED (BL)
CRYO H2 TK P TK 1 <sup>a</sup>				0452100	68	165.0 189.8	283.0 283.0			<ul style="list-style-type: none"> <li>• HTRS NOT IN AUTO (P)<sup>b</sup></li> <li>• A OR B HEATER IN AUTO (P)<sup>b</sup></li> </ul>
2 <sup>a</sup>				0452200	68	165.0 189.8	283.0 283.0			
3 <sup>a</sup>				0452300	68	165.0 189.8	283.0 283.0			
4 <sup>a</sup>				0452400	68	165.0 189.8	283.0 283.0			
5 <sup>a</sup>				0452500	68	165.0 189.8	283.0 283.0			
6 (PASS) (BFS OPS 3,6)				0454100	168	165.0 189.8 165.0	283.0 283.0 OSH			
7 (PASS) (BFS OPS 3,6)				0454200	168	165.0 189.8 165.0	283.0 283.0 OSH			
8 (PASS) (BFS OPS 3,6)				0454300	168	165.0 189.8 165.0	283.0 283.0 OSH			
9 (PASS) (BFS OPS 3,6)				0454400	168	165.0 189.8 165.0	283.0 283.0 OSH			

<sup>a</sup>PASS only

<sup>b</sup>All tanks have the same preconditioning

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
CRYO O2 CNTL P TK 1	0	0.25	4.70	0451110	68			540.0	985.0	● EXCESSIVE HTR CURRENT (BL)
2	10	0.25	4.70	0451210	68			540.0	985.0	
3	20	0.25	4.70	0451310	68			540.0	985.0	
4 <sup>a</sup>	30	0.25	4.70	0451410	68			540.0	985.0	
5 <sup>b</sup>	40 <sup>c</sup>	0.25	4.70 <sup>c</sup>	0451510	68			540.0	985.0	
6 (PASS) (BFS OPS 3,6)				0453110	168			540.0	985.0	
7 (PASS) (BFS OPS 3,6)				0453210	168			540.0	985.0	
8 (PASS) (BFS OPS 3,6)				0453310	168			540.0	985.0	
9 (PASS) (BFS OPS 3,6)				0453410	168			540.0	985.0	
HTR CUR SNSR 1A 1 <sup>d</sup>				0451185	68	1				
2 <sup>d</sup>				0451285	68	1				
3 <sup>d</sup>				0451385	68	1				
4 <sup>d</sup>				0451485	68	1				
5 <sup>b,d</sup>				0451585	68	1				
6 <sup>d</sup>				0453185	168	1				
7 <sup>d</sup>				0453285	168	1				
8 <sup>d</sup>				0453385	168	1				
9 <sup>d</sup>				0453485	168	1				

<sup>a</sup>TK 4/5 if five tanks on OV102  
<sup>b</sup>Not applicable for OV102  
<sup>c</sup>TK 5 H/W C/W on OV105 only  
<sup>d</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
CRYO O2 HTR CUR SNSR 1B	1 <sup>a</sup>			0451187	68	1				• EXCESSIVE HTR CURRENT (BL)
	2 <sup>a</sup>			0451287	68	1				
	3 <sup>a</sup>			0451387	68	1				
	4 <sup>a,b</sup>			0451487	68	1				
	5 <sup>a,c</sup>			0451587	68	1				
	6 <sup>a</sup>			0453187	168	1				
	7 <sup>a</sup>			0453287	168	1				
	8 <sup>a</sup>			0453387	168	1				
	9 <sup>a</sup>			0453487	168	1				
	2A	1 <sup>a</sup>			0451186	68	1			• EXCESSIVE HTR CURRENT (BL)
		2 <sup>a</sup>			0451286	68	1			
		3 <sup>a</sup>			0451386	68	1			
		4 <sup>a</sup>			0451486	68	1			
		5 <sup>a,c</sup>			0451586	68	1			
		6 <sup>a</sup>			0453186	168	1			
		7 <sup>a</sup>			0453286	168	1			
		8 <sup>a</sup>			0453386	168	1			
		9 <sup>a</sup>			0453486	168	1			
	2B	1 <sup>a</sup>			0451188	68	1			• EXCESSIVE HTR CURRENT (BL)
		2 <sup>a</sup>			0451288	68	1			
		3 <sup>a</sup>			0451388	68	1			
		4 <sup>a,b</sup>			0451488	68	1			
		5 <sup>a,c</sup>			0451588	68	1			
		6 <sup>a</sup>			0453188	168	1			
		7 <sup>a</sup>			0453288	168	1			
		8 <sup>a</sup>			0453388	168	1			
		9 <sup>a</sup>			0453488	168	1			

<sup>a</sup>PASS only

<sup>b</sup>If five cryo tanks are installed on OV102, these indicate status for Tank 5 (SNSR 1A, 2A)

<sup>c</sup>Not applicable for OV102

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
CRYO O2 HTR T 1 TK 1	1		4.30	0451107	68				349.0	
2	21		4.30	0451207	68				349.0	
3	41		4.30	0451307	68				349.0	
4	61		4.30	0451407	68				349.0	
5	81 <sup>a</sup>		4.30 <sup>a</sup>	0451507	68				349.0	
6 (PASS) (BFS OPS 3,6)				0453107	168			OSL	OSH	
7 (PASS) (BFS OPS 3,6)				0453207	168			OSL	OSH	
8 (PASS) (BFS OPS 3,6)				0453307	168			OSL	OSH	
9 (PASS) (BFS OPS 3,6)				0453407	168			OSL	OSH	
T 2 TK 1	11		4.30	0451109	68				349.0	
2	31		4.30	0451209	68				349.0	
3	51		4.30	0451309	68				349.0	
4	71		4.30	0451409	68				349.0	
5	b		b	0451509	68				349.0	
6 (PASS) (BFS OPS 3,6)				0453109	168	OSL	OSH		349.0	
7 (PASS) (BFS OPS 3,6)				0453209	168	OSL	OSH		349.0	
8 (PASS) (BFS OPS 3,6)				0453309	168	OSL	OSH		349.0	
9 (PASS) (BFS OPS 3,6)				0453409	168	OSL	OSH		349.0	
MANF P 1 (PASS) (BFS)				0451140	68	200.0				
2 (PASS) (BFS)				0451145	68	740.0				
						200.0				
						740.0				

<sup>a</sup>TK 5 H/W C/W on OV105 only

<sup>b</sup>Mission and configuration dependent

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
CRYO O2 MANF VLV 1 <sup>a</sup>				0451141	68	0				• VALVE CLOSED (BL)
2 <sup>a</sup>				0451146	68	0				
TK P TK 1 <sup>a</sup>				0451100	68	575.0	960.0			• HTRS NOT IN AUTO (P) <sup>b</sup> • A OR B HTR IN AUTO (P) <sup>b</sup>
2 <sup>a</sup>				0451200	68	575.0	960.0			
3 <sup>a</sup>				0451300	68	575.0	960.0			
4 <sup>a</sup>				0451400	68	575.0	960.0			
5 <sup>a</sup>				0451500	68	575.0	960.0			
6 (PASS)				0453100	168	740.0	960.0			• TK 5 HTR NOT IN AUTO (P) <sup>c</sup> • TK 5 HTR IN AUTO (P) <sup>c</sup> • HTRS NOT IN AUTO (P) <sup>b</sup> • A OR B HTR IN AUTO (P) <sup>b</sup>
(BFS OPS 3,6)						575.0	960.0			
7 (PASS)				0453200	168	740.0	960.0			
(BFS OPS 3,6)						OSL	OSH			
8 (PASS)				0453300	168	575.0	960.0			
(BFS OPS 3,6)						740.0	960.0			
9 (PASS)				0453400	168	575.0	960.0			
(BFS OPS 3,6)						OSL	OSH			
						740.0	960.0			
						OSL	OSH			

<sup>a</sup>PASS only

<sup>b</sup>All tanks have the same preconditioning except for OV102 TK 5 as shown

<sup>c</sup>This note for OV102 only



PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
DC AMPS MID PCA 1 <sup>a</sup>				0763085	67	1.0				<ul style="list-style-type: none"> <li>• MID MCA 1 OP STAT 1 ACTIVE (P)</li> <li>• MID MCA 2 OP STAT 1 ACTIVE (P)</li> <li>• MID MCA 2 OP STAT 3 ACTIVE (P)</li> <li>• RPC OFF (BL)</li> </ul>
2 <sup>a</sup>				0763086	67	1.0				
3 <sup>a</sup>				0763087	67	1.0				
RPC CNTL MNA AB1/CA1 <sup>a</sup>				0760124	67	0				
AB2/CA2 <sup>a</sup>				0760125	67	0				
AB3/CA3 <sup>a</sup>				0760126	67	0				
MNB AB1/BC1 <sup>a</sup>				0760224	67	0				
AB2/BC2 <sup>a</sup>				0760225	67	0				
AB3/BC3 <sup>a</sup>				0760226	67	0				
MNC BC1/CA1 <sup>a</sup>				0760324	67	0				
BC2/CA2 <sup>a</sup>				0760325	67	0				
BC3/CA3 <sup>a</sup>				0760326	67	0				
VOLT AFT PCA 4 <sup>a</sup>				0763091	67	26.2				
5 <sup>a</sup>				0763092	67	26.2				
6 <sup>a</sup>				0763093	67	26.2				
CNTL AB 1				0760120	67	24.5				
2				0760121	67	24.5				
3				0760122	67	24.5				
BC 1				0760220	67	24.5				
2				0760221	67	24.5				
3				0760222	67	24.5				
CA 1				0760320	67	24.5				
2				0760321	67	24.5				
3				0760322	67	24.5				

<sup>a</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
DC VOLT ESS 1BC				0760130	67	25.0				
2CA				0760230	67	25.0				
3AB				0760330	67	25.0				
FWD PCA 1 <sup>a</sup>				0763071	67	26.2				
2 <sup>a</sup>				0763072	67	26.2				
3 <sup>a</sup>				0763073	67	26.2				

<sup>a</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
DC VOLT MAIN A	3	3.30		0760100	67	27.0	32.0	26.4		
B	13	3.30		0760200	67	27.0	32.0	26.4		
C	23	3.30		0760300	67	27.0	32.0	26.4		
ELEV HINGE MOM (GNC) <sup>a</sup>				V97U6814C					80.0	
POS SAT HI (GNC) <sup>a</sup>				V97U6856C					12.0	
LO				V97U6857C				-15.0		
EMER dP/dT BU <sup>b</sup>				0980004		-0.12				
EVAP FDLN T ACCUM A <sup>c</sup>				0631892	88	50.0	140.0			
B <sup>c</sup>				0631894	88	50.0	140.0			
AFT A <sup>d</sup>				0631876	88	50.0	140.0			
B <sup>d</sup>				0631877	88	50.0	140.0			
FWD A <sup>d</sup>				0631870	88	50.0	140.0			
B <sup>d</sup>				0631871	88	50.0	140.0			
HI LOAD A <sup>c</sup>				0631895	88	50.0	OSH			
B <sup>c</sup>				0631896	88	50.0	OSH			
MID 1 A <sup>d</sup>				0631872	88	50.0	140.0			
B <sup>d</sup>				0631873	88	50.0	140.0			
MID 2 A <sup>d</sup>				0631874	88	50.0	140.0			
B <sup>d</sup>				0631875	88	50.0	140.0			
TOPPING A <sup>c</sup>				0631891	88	50.0	140.0			
B <sup>c</sup>				0631893	88	50.0	140.0			

<sup>a</sup>PASS OPS G3,6; BFS OPS 3,6

<sup>b</sup>BFS only

<sup>c</sup>PASS only

<sup>d</sup>PASS OPS S2,4; BFS MM104-106, 301-303, OPS 0

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PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
EVAP TEMP HI LOAD INBD DUCT (PASS)				0631820	88	150.0	375.0			<ul style="list-style-type: none"> <li>• ANY HI LOAD DUCT HTR ON (24 MIN DELAY) (P)</li> <li>• ALL HI LOAD DUCT HTRS OFF (P)</li> <li>• NO PRECOND IN BFS</li> </ul>
(PASS)					88		375.0			
(BFS) <sup>a</sup>						150.0	375.0			
OUTBD DUCT (PASS)				0631821	88	150.0	330.0			
(PASS)					88		330.0			
(BFS) <sup>a</sup>						150.0	330.0			
NOZ (PASS)				0631890	88	100.0	350.0			
(PASS)					88		350.0			
(BFS) <sup>a</sup>						100.0	350.0			
TOPPING AFT <sup>b</sup>				0631802	88	100.0	330.0			
FWD <sup>b</sup>				0631801	88	100.0	330.0			
L DUCT <sup>c</sup>				0631800	88	50.0	245.0			
NOZ <sup>b</sup>				0631878	88	40.0	245.0			
R DUCT <sup>c</sup>				0631810	88	50.0	245.0			
NOZ <sup>b</sup>				0631879	88	40.0	245.0			

<sup>a</sup>BFS only; MM104–106, 301–303, OPS 0

<sup>b</sup>PASS OPS S2,4; BFS MM104–106, 301–303, OPS 0

<sup>c</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
EXT A/L										
H2O LINE PRESS LCG SPLY				0640170	177	—	—			
P1 <sup>a</sup>				0640171	177	—	—			
P2 <sup>a</sup>				0640173	177	—	—			
H2O XFER P <sup>a</sup>										
INT TEMP UPR BKHD T <sup>a</sup>				0640135	177	40	113			
LWR BKHD T <sup>a</sup>				0640136	177	40	113			
EXT TEMP AFT STRUC T <sup>a</sup>				0640137	177	40	113			
H2O LINE T H2O SPLY T ZN1 <sup>a</sup>				0640181	177	42	130			
ZN2 <sup>a</sup>				0640184	177	42	130			
LCG2 SPLY T ZN1 <sup>a</sup>				0640182	177	50	130			
ZN2 <sup>a</sup>				0640185	177	—	—			
QD PNL T <sup>a</sup>				0640183	177	42	—			
PRESS <sup>a</sup>				0640126	177	13.8	15.7			

<sup>a</sup>External airlock only; PASS only

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PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
FC ΔAMPS 1 <sup>a</sup>				0922142	69	-500 <sup>b</sup>	+500 <sup>b</sup>			
2 <sup>a</sup>				0922143	69	-500 <sup>b</sup>	+500 <sup>b</sup>			
3 <sup>a</sup>				0922144	69	-500 <sup>b</sup>	+500 <sup>b</sup>			
1				0450100	69	27.5	32.5			
2				0450200	69	27.5	32.5			
3				0450300	69	27.5	32.5			
1 ΔV SS 1				0450102	69		150.0			
2				0450103	69		150.0			
3				0450104	69		150.0			
2 ΔV SS 1				0450202	69		150.0			
2				0450203	69		150.0			
3				0450204	69		150.0			
3 ΔV SS 1				0450302	69		150.0			
2				0450303	69		150.0			
3				0450304	69		150.0			
AMPS 1 (PASS) (BFS)				0450101	69	54.0	360.0			
2 (PASS) (BFS)				0450201	69	54.0	360.0			
3 (PASS) (BFS)				0450301	69	54.0	360.0			
COOL P 1				0450147	69	50.0	75.0			
2				0450247	69	50.0	75.0			
3				0450347	69	50.0	75.0			

<sup>a</sup>PASS only

<sup>b</sup>TMBU value. Limit will be changed appropriately if needed

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
FC COOL PUMP 1	92	4.80		0450143	69			0		● PUMP OFF OR ΔP < 2 PSI (BL)
2	102	4.80		0450243	69			0		
3	112	4.80		0450343	69			0		
EXIT T 1				0450130	69	131.0	164.0			● HIGH PH (BL)
2				0450230	69	131.0	164.0			
3				0450330	69	131.0	164.0			
FLOW H2 1 <sup>a</sup>				0450170	69		1.6			
2 <sup>a</sup>				0450270	69		1.6			
3 <sup>a</sup>				0450370	69		1.6			
O2 1 <sup>a</sup>				0450160	69		11.1			
2 <sup>a</sup>				0450260	69		11.1			
3 <sup>a</sup>				0450360	69		11.1			
H2 PUMP STATUS 1 <sup>a</sup>				0450114	69	0.2	0.8			
2 <sup>a</sup>				0450214	69	0.2	0.8			
3 <sup>a</sup>				0450314	69	0.2	0.8			
H2O ALT LN T 1 <sup>a</sup>				0450182	69	60.0	185.0			
2 <sup>a</sup>				0450282	69	60.0	185.0			
3 <sup>a</sup>				0450382	69	60.0	185.0			
LINE PH <sup>a</sup>				0450462	69	1				
LN T 1 <sup>a</sup>				0450181	69	60.0	185.0			
2 <sup>a</sup>				0450281	69	60.0	185.0			
3 <sup>a</sup>				0450381	69	60.0	185.0			

<sup>a</sup>PASS only



PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
FC H2O RLF HTRS A-AUTO	2			0450445	69	0				<ul style="list-style-type: none"> <li>• H2O RLF HTRS B-AUTO = OFF (P)</li> <li>• H2O RLF HTRS B-AUTO = ON (P)</li>   <li>• HIGH PH (BL)</li>   <li>• VALVE CLOSED (BL)</li>   <li>• VALVE CLOSED (BL)</li>   <li>• (BL)</li> <li>• (BL)</li> <li>• (BL)</li> </ul>
LINE T <sup>a</sup>				0450450	69	60.0	185.0			
NOZ T A <sup>a</sup>				0450455	69	150.0	425.0			
B <sup>a</sup>				0450456	69	150.0	425.0			
VLV T 1 <sup>a</sup>				0450412	69	60.0	185.0			
2 <sup>a</sup>				0450422	69	60.0	185.0			
3 <sup>a</sup>				0450432	69	60.0	185.0			
PH 1				0450410	69	1				
2				0450420	69	1				
3				0450430	69	1				
PURGE LN H2 T1 <sup>a</sup>				0450699	69		380.0			
T2 <sup>a</sup>				0450700	69		380.0			
O2 T <sup>a</sup>				0450600	69		380.0			
REAC H2 1	12	4.80		0452150	69			0		
2	32	4.80		0452155	69			0		
3	52	4.80		0452160	69			0		
O2 1	2	4.80		0451150	69			0		
2	22	4.80		0451155	69			0		
3	42	4.80		0451160	69			0		
READY 1 <sup>a</sup>				0450105	69	0				
2 <sup>a</sup>				0450205	69	0				
3 <sup>a</sup>				0450305	69	0				

<sup>a</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
FC STACK T 1 (PASS)	62	3.30	4.25	0450120	69	180.0	212.0	172.5	243.7	<ul style="list-style-type: none"> <li>• ≤ 3.5 KW OUTPUT (P)</li> <li>• 3.5&lt; KW&lt; 7.5 OUTPUT (P)</li> <li>• ≥ 7.5 KW OUTPUT (P)</li> </ul>
(BFS)						212.0	172.5	243.7		
(PASS)						190.0	222.0			
(BFS)	72	3.30	4.25	0450220	69	180.0	212.0	172.5	243.7	<ul style="list-style-type: none"> <li>• ≤ 3.5 KW OUTPUT (P)</li> <li>• 3.5&lt; KW&lt; 7.5 OUTPUT (P)</li> <li>• ≥ 7.5 KW OUTPUT (P)</li> </ul>
(PASS)						190.0	222.0			
(BFS)						198.0	238.0			
(PASS)	82	3.30	4.25	0450320	69	180.0	212.0	172.5	243.7	<ul style="list-style-type: none"> <li>• ≤ 3.5 KW OUTPUT (P)</li> <li>• 3.5&lt;KW&lt;7.5 OUTPUT (P)</li> <li>• ≥ 7.5 KW OUTPUT (P)</li> </ul>
(BFS)						190.0	222.0			
(PASS)						198.0	238.0			
(BFS)	111		2.50							<ul style="list-style-type: none"> <li>• (BL)</li> </ul>
FCS CH BYPASS										
SATURATION	101		2.50							<ul style="list-style-type: none"> <li>• (BL)</li> </ul>
FREON LOOP ACCUM QTY 1				0631130	88	12.0				
2				0631330	88	12.0				

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)	
		LOW	HIGH			LOW	HIGH	LOW	HIGH		
FREON LOOP AFT CP FLOW 1 <sup>a</sup>				0631105	88	200.0					
2 <sup>a</sup>				0631305	88	200.0					
EVAP OUT T 1 (PASS)	107	.35	1.9 <sup>b</sup>	0631207	88			32.0	65.0	<ul style="list-style-type: none"> <li>• HIGH C/W DEFAULT VALUE 1.90 V (64.8 °F)</li> <li>• ASCENT</li> <li>• POST OMS 1 (TMBU), ENTRY</li> <li>• HIGH C/W DEFAULT VALUE 1.90 V (64.8 °F)</li> <li>• ASCENT</li> <li>• POST OMS 1 (TMBU), ENTRY</li> </ul>	
(BFS)								32.0	115.0		
2 (PASS)	117	.35	1.9 <sup>b</sup>	0631407	88			32.0	65.0		
(BFS)								32.0	115.0		
FREON FLOW 1 (PASS)	106	0.80		0631100	88	1950.0		1200.0		<ul style="list-style-type: none"> <li>• LOW C/W DEFAULT VALUE 1.00 V (1287 lb/hr)</li> <li>• FLOW PROP VLV – INTERCHANGER (P)</li> <li>• FLOW PROP VLV – PL HX</li> <li>• NO PRECOND IN BFS</li> </ul>	
(PASS)					88	1300.0					
(BFS)								1200.0			
FREON FLOW 2 (PASS)	116	0.80		0631300	88	1950.0		1200.0		<ul style="list-style-type: none"> <li>• LOW C/W DEFAULT VALUE 1.00 V (1287 lb/hr)</li> <li>• FLOW PROP VLV – INTERCHANGER (P)</li> <li>• FLOW PROP VLV – PL HX</li> <li>• NO PRECOND IN BFS</li> </ul>	
(PASS)					88	1300.0					
(BFS)								1200.0			

<sup>a</sup>PASS only

<sup>b</sup>EVAP OUT T H/W C/W high limits set to 4.3 V (115.2°F) Prelaunch at crew pre-ingress sw reconfig and set back to 1.90 V (64.8°F) Post Insertion

H

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
FREON LOOP PL HX FLOW 1 <sup>a</sup>				0631103	88	OSL				<ul style="list-style-type: none"> <li>• ① FLOW PROP VLV – 1(2) INTERCHANGER (P)</li> <li>• ② FLOW PROP VLV – 1(2) PAYLOAD (P)</li> <li>• SEE ①</li> <li>• SEE ②</li>   <li>• COMM CONTROL IS REVERTED TO PNL (BL)</li> <li>• (BL)</li> <li>• (BL)</li> <li>• (BL)</li> <li>• (BL)</li> <li>• (BL)</li> </ul>
2 <sup>a</sup>				0631303	88	OSL				
RAD OUT T 1 (PASS) (BFS)				0631208	88	32.0				
2 (PASS) (BFS)				0631408	88	32.0	129.0			
FWD RCS LINE T1 FU <sup>a</sup>				0421306	89	46.0	105.0			
OX <sup>a</sup>				0421206	89	46.0	105.0			
T2 FU <sup>a</sup>				0421308	89	46.0	105.0			
OX <sup>a</sup>				0421208	89	46.0	105.0			
GCIL CONFIG <sup>a</sup>				0745052	76	0				
GPC 1	5		2.50							
2	15		2.50							
3	25		2.50							
4	35		2.50							
5	45		2.50							
H2O LOOP ACCUM QTY 1 <sup>a</sup>				0612610	88	20.0	80.0			
2 <sup>a</sup>				0612710	88	20.0	80.0			

<sup>a</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
H2O LOOP CAB HX IN T 1 <sup>a</sup> 2 <sup>a</sup>				0612663 0612665	88 88	34.0 34.0				<ul style="list-style-type: none"> <li>• LOOP 1 PUMP SW – ON, OR SW – GPC AND EITHER 'PUMP ON' CMD ISSUED (P)</li> <li>• LOOP 1 PUMP SW – OFF (P)</li> <li>• LOOP 1 PUMP SW – GPC AND NEITHER 'PUMP ON' CMD PRESENT (P)</li> <li>• LOOP 2 PUMP SW – ON, OR SW – GPC AND 'PUMP ON' CMD ISSUED (P)</li> <li>• LOOP 2 PUMP SW – OFF, OR SW – GPC AND 'PUMP ON' CMD NOT PRESENT (P)</li> </ul>
ICH FLOW 1 <sup>a</sup>				0612742	88	550.0				
2 <sup>a</sup>				0612722	88	550.0				
ICH OUT T 1 <sup>a</sup> 2 <sup>a</sup>				0612744 0612724	88 88	35.0 35.0				

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
H2O LOOP PUMP OUT P 1 (PASS)	105	0.65	2.65	0612600	88	50.0	75.0	19.5	79.5	<ul style="list-style-type: none"> <li>● LOOP 1 PUMP SW – ON, OR SW – GPC AND EITHER 'PUMP ON' CMD ISSUED (P)</li> <li>● LOOP 1 PUMP SW – OFF (P)</li> <li>● LOOP 1 PUMP SW – GPC AND NEITHER 'PUMP ON' CMD PRESENT (P)</li> <li>● NO PRECOND IN BFS</li> <li>● LOOP 2 PUMP SW – ON OR SW – GPC AND 'PUMP ON' CMD ISSUED (P)</li> <li>● LOOP 2 PUMP SW – OFF, OR SW – GPC AND 'PUMP ON' CMD NOT PRESENT (P)</li> <li>● NO PRECOND IN BFS</li> </ul>
(PASS)					88	20.0				
(PASS)					88	20.0				
(BFS)								19.5	79.5	
2 (PASS)	115	1.50	2.70	0612700	88	50.0	75.0	45.0	81.0	
(PASS)					88	20.0				
(BFS)								45.0	81.0	

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
H2O LOOP PUMP OUT Δ P 1 <sup>a</sup>				0612605	88	33.0	46.0			<ul style="list-style-type: none"> <li>• LOOP 1 PUMP SW – ON, OR SW – GPC AND EITHER 'PUMP ON' CMD ISSUED (P)</li> <li>• LOOP 1 PUMP SW – OFF (P)</li> <li>• LOOP 1 PUMP SW – GPC AND NEITHER 'PUMP ON' CMD PRESENT (P)</li> <li>• LOOP 2 PUMP SW – ON OR SW – GPC AND 'PUMP ON' CMD ISSUED (P)</li> <li>• LOOP 2 PUMP SW – OFF OR SW – GPC AND 'PUMP ON' CMD NOT PRESENT (P)</li> </ul>
Δ P 2 <sup>a</sup>				0612705	88	33.0	46.0			
T 1 <sup>a</sup>				0612640	88	45.0	90.0			
T 2 <sup>a</sup>				0612740	88	45.0	90.0			
SUPPLY DUMP LN T <sup>a</sup>				0620418	66	45.0	125.0			

<sup>a</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
H2O SUPPLY NOZ T A <sup>a</sup>				0620440	66		250.0			<ul style="list-style-type: none"> <li>• ① SEP X – ON OR OTHER SEP – NOT ON (P); SEP X SPD NOT NORMAL (BL)</li> <li>• ② SEP X – NOT ON (P); SEP X SPD NORMAL (BL)</li> <li>• SEE ①</li> <li>• SEE ②</li> </ul>
B <sup>a</sup>				0620439	66		250.0			
PRESS <sup>b</sup>				0620430	66	10.0	40.0			
QTY A <sup>a</sup>				0620410	66	25.0				
B <sup>a</sup>				0620420	66	10.0				
C <sup>a</sup>				0620548	66	45.0	99.0			
D <sup>a</sup>				0620544	66					
WASTE DUMP LN T <sup>a</sup>				0620578	66	45.0	125.0			
NOZ T A <sup>a</sup>				0620520	66		250.0			
B <sup>a</sup>				0620519	66		250.0			
PRESS <sup>a</sup>				0620500	66	13.0	22.0			
QTY 1 <sup>a</sup>				0620540	66		99.0			
VAC VT NOZ T <sup>a</sup>				0620551	66					
HUMID SEP A <sup>a</sup>				0612557	66	0				
						1				
B <sup>a</sup>				0612558	66	0				
						1				
HYD ACCUM P 1				0580167	86	1930.0				
2				0580267	86	1930.0				
3				0580367	86	1930.0				

<sup>a</sup>PASS only

<sup>b</sup>PASS OPS S2,4; BFS MM 104–106, 301–303, OPS 0



PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)	
		LOW	HIGH			LOW	HIGH	LOW	HIGH		
HYD B/U P 1	99	3.00		0580115	86			2400.0		<ul style="list-style-type: none"> <li>• PUMP 1 ON (P)</li> <li>• PUMP 1 OFF (P)</li> <li>• PUMP 2 ON (P)</li> <li>• PUMP 2 OFF (P)</li> <li>• PUMP 3 ON (P)</li> <li>• PUMP 3 OFF (P)</li> </ul>	
2	109	3.00		0580215	86			2400.0			
3	119	3.00		0580315	86			2400.0			
CIRC PMP P 1 <sup>a</sup>				0580137	87	100.0					
2 <sup>a</sup>				0580237	87	100.0	100.0				
3 <sup>a</sup>				0580337	87	100.0	100.0				
HX OUT T 1 <sup>a</sup>				0580120	87	0.0					
2 <sup>a</sup>				0580220	87	0.0					
3 <sup>a</sup>				0580320	87	0.0					
RSVR P 1 <sup>a</sup>				0580131	86	42.0					
2 <sup>a</sup>				0580231	86	42.0					
3 <sup>a</sup>				0580331	86	42.0					
QTY 1				0580102	86	40.0	95.0				
2				0580202	86	40.0	95.0				
3				0580302	86	40.0	95.0				
T 1				0580101	86	10.0	230.0				
2				0580201	86	10.0	230.0				
3				0580301	86	10.0	230.0				
IMU	103		2.50								• (BL)

<sup>a</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)	
		LOW	HIGH			LOW	HIGH	LOW	HIGH		
IMU FAN A (PASS)				0612860	66	0				<ul style="list-style-type: none"> <li>• ① FAN X – ON OR ALL OTHER FANS – NOT ON (P); FAN X SPD NOT NORMAL (BL)</li> <li>• ② FAN X – NOT ON (P); FAN X SPD NORMAL</li> <li>• SEE ①</li> <li>• SEE ②</li> <li>• SEE ①</li> <li>• SEE ②</li> </ul>	
(PASS)					66	1					
B (PASS)				0612861	66	0					
(PASS)					66	1					
C (PASS)				0612862	66	0					
(PASS)					66	1					
ΔP				0612869	66	3.7	4.95				
KU-BAND GMBL T A <sup>a</sup>				0742965	76		150.0				
B <sup>a</sup>				0742969	76		166.0				
GYRO T <sup>a</sup>				0742967	76		155.0				
XMTR T <sup>a</sup>				0742497	76		171.0				
LEFT RHC	100		2.50								• (BL)
LINE TEMPS BDYFLP FUS 1 <sup>a</sup>				0580184	87	-10.0	250.0				
2 <sup>a</sup>				0580269	87						
3 <sup>a</sup>				0580369	87						
PDU 1 <sup>a</sup>				0580169	87						
2 <sup>a</sup>				0580288	87	-15.0	250.0				
3 <sup>a</sup>				0580388	87	-15.0	250.0				

<sup>a</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
LINE TEMPS ELEVON LIB 1 <sup>a</sup>				0580157	87		250.0			
2 <sup>a</sup>				0580257	87	-10.0	250.0			
3 <sup>a</sup>				0580833	87		250.0			
LOB 1 <sup>a</sup>				0580193	87	-10.0	250.0			
2 <sup>a</sup>				0580883	87		250.0			
3 <sup>a</sup>				0580394	87	-10.0	250.0			
RIB 1 <sup>a</sup>				0580159	87		250.0			
2 <sup>a</sup>				0580933	87		250.0			
3 <sup>a</sup>				0580359	87	-10.0	250.0			
ROB 1 <sup>a</sup>				0580194	87	-10.0	250.0			
2 <sup>a</sup>				0580294	87	-10.0	250.0			
3 <sup>a</sup>				0580983	87		250.0			
L BRAKE FUS 2 <sup>a</sup>				0580292	87					
3 <sup>a</sup>				0580392	87					
WHL 2 <sup>a</sup>				0580841	87					
3 <sup>a</sup>				0580842	87					
LMG UPLK <sup>a</sup>				0580125	87					
NLG MFUS 1 <sup>a</sup>				0580127	87					
2 <sup>a</sup>				0581143	87					
UPLK <sup>a</sup>				0580126	87					
R BRAKE FUS 1 <sup>a</sup>				0580192	87					
2 <sup>a</sup>				0580296	87					
3 <sup>a</sup>				0580393	87					

<sup>a</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
LINE TEMPS R BRAKE WHL 1 <sup>a</sup> 2 <sup>a</sup> 3 <sup>a</sup>				0580846 0580293 0580845	87 87 87					<ul style="list-style-type: none"> <li>• ENABLED IF LG ARM SWITCH HAS NOT BEEN ACTIVATED</li> </ul>
RD/SB FUS 1 <sup>a</sup> 2 <sup>a</sup> 3 <sup>a</sup>				0580198 0580284 0580384	87 87 87	-10.0 -10.0	250.0 250.0			
PDU 1 <sup>a</sup> 2 <sup>a</sup> 3 <sup>a</sup>				0581006 0580298 0580398	87 87 87	-15.0 -15.0 -15.0	250.0 250.0 250.0			
RMG FUS <sup>a</sup> UPLK <sup>a</sup>				0580129 0580128	87 87					
MLG LH INBD TIRE PRESS 1 <sup>b</sup> 2 <sup>b</sup>				051P057 1		50 50				
OTBD TIRE PRESS 1 <sup>b</sup> 2 <sup>b</sup>				051P057 3		50 50				
RH INBD TIRE PRESS 1 <sup>b</sup> 2 <sup>b</sup>				051P057 0		50 50				
OTBD TIRE PRESS 1 <sup>b</sup> 2 <sup>b</sup>				051P057 2 051P047 1 051P047 3 051P047 0 051P047 2		50 50 50 50 50 50 50 50				

<sup>a</sup>PASS only

<sup>b</sup>BFS only; OPS 3,6

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
MMU-FSS TEMP/FSS L TOGGLE VLV - PORT				0660752	77	-13.0	154.0			
MMU-FSS TEMP/FSS R TOGGLE VLV - PORT				0660753	77	-13.0	154.0			
MMU-FSS TEMP/MMU L TOGGLE VLV - PORT				0660754	77	-33.0	123.0			
MMU-FSS TEMP/MMU R TOGGLE VLV - PORT				0660755	77	-33.0	123.0			
MMU-FSS TEMP/MMU L GN2 TK BAR - PORT				0660756	77		150.0			
MMU-FSS TEMP/MMU CNTL ELECT - PORT				0660757	77	-13.0	148.0			
MMU-FSS TEMP/MMU R GN2 TK BAR - PORT				0660758	77		150.0			
MMU-FSS TEMP/FSS L TOGGLE VLV - STBD				0660762	77	-13.0	154.0			
MMU-FSS TEMP/FSS R TOGGLE VLV - STBD				0660763	77	-13.0	154.0			
MMU-FSS TEMP/MMU L TOGGLE VLV - STBD				0660764	77	-33.0	123.0			
MMU-FSS TEMP/MMU R TOGGLE VLV - STBD				0660765	77	-33.0	123.0			
MMU-FSS TEMP/MMU L GN2 TK BAR - STBD				0660766	77		150.0			
MMU-FSS TEMP/MMU CNTL ELECT - STBD				0660767	77	-13.0	148.0			
MMU-FSS TEMP/MMU R GN2 TK BAR - STBD				0660768	77		150.0			

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
MPS ET ULL P LH2 HI (GNC) <sup>a</sup>				V97U6783C			48.9 46.0			<ul style="list-style-type: none"> <li>• BLOCK II SSME CLUSTER (P)</li> <li>• NON-BLOCK II SSME CLUSTER (P)</li> </ul>
LO				V97U6784C		28.0				
LO2 HI (GNC) <sup>a</sup>				V97U6785C			29.0			
LO				V97U6786C		0.0				
H <sub>2</sub> OUT P C				V97U9601C		1050				
L				V97U9602C		1050				
R				V97U9603C		1050				
He dP/dt (GNC) <sup>a</sup>				V99U6943C			20.0			
REG P (GNC) <sup>b</sup>				V96U8499C		679.0	810.0			
C <sup>c</sup>	39	3.40 (680)	4.05 (810)							
L <sup>c</sup>	49	3.40 (680)	4.05 (810)							
R <sup>c</sup>	59	3.40 (680)	4.05 (810)							
TK P (GNC) <sup>a</sup>				V97U6826C				1150.0		
C	9	1.15 (1150)								
L	19	1.15 (1150)								
R	29	1.15 (1150)								

<sup>a</sup>BFS only; OPS 1,6

<sup>b</sup>BFS only; OPS 1,3,6

<sup>c</sup>Reg A only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
MPS MANF P LH2	79		3.25	V97U6828C						<ul style="list-style-type: none"> <li>• ENABLED IF LG ARM SWITCH HAS NOT BEEN ACTIVATED</li> </ul>
HI (GNC) <sup>a</sup>	69		(65.0)					65.0		
LO2			4.15	V97U6831C					249.0	
HI (GNC) <sup>a</sup>			(249.0)							
O2 OUT T C				V97U9605C		125				
L				V97U9606C		125				
R				V97U9607C		125				
PNEU P ACUM (GNC) <sup>a</sup>				V97U7680C		700				
REG (GNC) <sup>b</sup>				V97U6778C		700				
TK (GNC) <sup>a</sup>				V97U6777C			810			
				V97U6775C		3800				
NLG LH TIRE PRESS 1 <sup>c</sup>				051P0370		50				
2 <sup>c</sup>				051P0372		50				
RH TIRE PRESS 1 <sup>c</sup>				051P0371		50				
2 <sup>c</sup>				051P0373		50				
NSP 1 BITE <sup>d</sup>				0745184	76	1				
2 BITE <sup>d</sup>				0745185	76	1				
OMS CRSFD BLD AFT FUS FU <sup>e,f</sup>				0436238	89	50.0	110.0			
OX <sup>e,f</sup>				0436239	89	50.0	110.0			
PL BAY FU <sup>e,f</sup>				0436234	89	45.0	100.0			
OX <sup>e,f</sup>				0436235	89	45.0	100.0			
OX QD <sup>d,f</sup>				0436230	89	25.0	140.0			

<sup>a</sup>BFS only; OPS 1,6

<sup>b</sup>BFS only; OPS 1,3,6

<sup>c</sup>BFS only; OPS 3,6

<sup>d</sup>PASS only

<sup>e</sup>PASS OPS S2,4; BFS MM104–106, 301–303, OPS 0

<sup>f</sup>OMS CRSFD high point bleedlines removed from all vehicles

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
OMS CRSFD DRN OX L <sup>a</sup>				0436236	89	50.0	100.0			<ul style="list-style-type: none"> <li>• (BL)</li> <li>• (BL)</li> <li>• PASS IS IN VOLTS; BFS IS IN PERCENT</li> <li>• HIGH C/W DEFAULT VALUE: 3.55 (284.0)</li> </ul>
R <sup>a</sup>				0436237	89	50.0	110.0			
GMBL LN L <sup>b</sup>				0436218	89	50.0	100.0			
R <sup>b</sup>				0436219	89	50.0	90.0			
XFD OX C <sup>b</sup>				0436242	89	50.0	100.0			
L <sup>b</sup>				0436243	89	50.0	90.0			
R <sup>b</sup>				0436244	89	50.0	90.0			
ENG L	27		2.50							
R	57		2.50							
N2 REG P HI (GNC) <sup>c</sup>				V97U6847C			434.0			
LO				V97U6848C		299.0				
TK P (GNC) <sup>c</sup>				V97U6846C		1200.0				
Pc (GNC) <sup>c</sup> (PASS)				V97U4208C				2.5		
(BFS)				V99U6942C				80.0		
RCS QTY (GNC) <sup>d</sup>				V97U9826C			10,000			
TK P FU/OX HI (GNC) (PASS)				V97U6852C				284.0		
HI (BFS)				V97U9869C				288.0		
LO (BFS)				V97U6853C				234.0		
FU										
L	17	2.90	3.60							
		(232.0)	(288.0)							
R	47	2.90	3.60							
		(232.0)	(288.0)							

<sup>a</sup>PASS OPS S2,4; BFS MM104-106, 301-303, OPS 0

<sup>b</sup>PASS only

<sup>c</sup>PASS only; OPS G2,8; BFS 1,3,6

<sup>d</sup>PASS OPS G2



PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
OMS TK P He (GNC)				V97U6840C		1500.0				<ul style="list-style-type: none"> <li>• HIGH C/W DEFAULT VALUE: 3.55 (284.0)</li> <li style="text-align: center;">3.55 (284.0)</li> <li>• (BL)</li> <li>• PA1 ON &amp; TDRS/STDN HI (P)</li> <li>• PA ON &amp; TDRS/STDN HI (P)</li> </ul>
OX										
L	7	2.90 (232.0)	3.60 (288.0)							
R	37	2.90 (232.0)	3.60 (288.0)							
TVC	67		2.50							
PA1 OUTPUT LOW <sup>a</sup>				0744512	76	60				
PA2 OUTPUT LOW <sup>a</sup>				0744513	76	60				
PA1 TEMP <sup>a</sup>				0744514	76		230			
PA2 TEMP <sup>a</sup>				0744515	76		230			
PALLET T STBD A <sup>a</sup>				0450902	168	-45	130			
B <sup>a</sup>				0450903	168	-45	130			
PORT A <sup>a</sup>				0450904	168	-45	130			
B <sup>a</sup>				0450905	168	-45	130			
VOLTS PPC1 MNA <sup>a</sup>				0454452	168	26				
PPC2 MNB <sup>a</sup>				0454453	168	26				

<sup>a</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
PDI DECOM INPUT 1 <sup>a</sup>				0920106	62		0.00			<ul style="list-style-type: none"> <li>• ① IF SPEC 62 DECOM X FDA ENA &amp; IF ANY LOSS OF DATA STREAM LOCK X DETECTED (MASTER FRAME LOCK, WORD LOCK, OR BIT LOCK) (P)</li> <li>• ② IF SPEC 62 DECOM X FDA NOT ENA OR IF DATA STREAM LOCK X DETECTED (MASTER FRAME LOCK, WORD LOCK, AND BIT LOCK) (P)</li> <li>• SEE ①</li> <li>• SEE ②</li> <li>• SEE ①</li> <li>• SEE ②</li> <li>• SEE ①</li> <li>• SEE ②</li> </ul> <p>NOTE: SLIPPAGE GREATER THAN 0.5° PER JOINT OR SUM OF 2.0° FOR ALL JOINTS</p>
				0920106	62	0.00	6.00			
2 <sup>a</sup>				0920107	62	0.00	0.00			
3 <sup>a</sup>				0920108	62	0.00	0.00			
4 <sup>a</sup>				0920109	62	0.00	0.00			
PDRS JOINT SLIP TOLERANCE VALUE	SY			0986951			0.5			
	SP			0986952			0.5			
	EP			0986953			0.5			
	WP			0986954			0.5			
	WY			0986955			0.5			
	WR			0986956			0.5			
	TOTAL			0986957			2.0			

<sup>a</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
PDRS PORT ABE 1(2) S HI				0966800			106.0			NOTE: PDRS LIMITS ARE MANAGED THROUGH THE CONSTANTS PORTION OF SM 60 TABLE MAINTENANCE
LO				0966817		1.0				
3 EP HI				0966801			106.0			
LO				0966818		1.0				
4(5) WP HI				0966802			106.0			
LO				0966819		1.0				
6 WR HI				0966803			106.0			
LO				0966820		1.0				
7 EE HI				0966804			144.0			
LO				0966821		1.0				
LED 1 SY HI				0966790			172.0			
LO				0966808		1.0				
2 SP HI				0966791			172.0			
LO				0966809		1.0				
3 EP HI				0966792			172.0			
LO				0966810		1.0				
4 WP HI				0966793			172.0			
LO				0966811		1.0				
5 WY HI				0966794			172.0			
LO				0966812		1.0				
6 WR HI				0966795			172.0			
LO				0966813		1.0				
7 EE HI				0966796			172.0			
LO				0966814		1.0				

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
POD ENG COVER L <sup>a</sup>				0434720	89	45.0				
R <sup>a</sup>				0435720	89	45.0				
I/F FU L <sup>b</sup>				0434642	89	45.0	110.0			
R <sup>b</sup>				0435642	89	45.0	110.0			
INJ L <sup>a</sup>				0434643	89	36.0	260.0			
R <sup>a</sup>				0435643	89	36.0	260.0			
OX L <sup>b</sup>				0434216	89	45.0	110.0			
R <sup>b</sup>				0435216	89	45.0	110.0			
VLV L <sup>a</sup>				0434641	89	40.0	122.0			
R <sup>a</sup>				0435641	89	40.0	122.0			
SERV PNL L <sup>b</sup>				0434707	89	45.0	140.0			
R <sup>b</sup>				0435707	89	45.0	140.0			
GSE SERV PNL L <sup>a</sup>				0434706	89	45.0	120.0			
R <sup>a</sup>				0435706	89	45.0	120.0			
OMS TK FU L <sup>a</sup>				0434315	89	45.0	95.0			
R <sup>a</sup>				0435315	89	45.0	95.0			
OX L <sup>a</sup>				0434215	89	45.0	95.0			
R <sup>a</sup>				0435215	89	45.0	95.0			
OX DRN PNL 1 L <sup>b</sup>				0434704	89	45.0	110.0			
R <sup>b</sup>				0435704	89	45.0	110.0			
2 L <sup>b</sup>				0434705	89	45.0	110.0			
R <sup>b</sup>				0435705	89	45.0	110.0			

<sup>a</sup>PASS only

<sup>b</sup>PASS OPS S2,4: BFS MM104-106, 301-303, OPS 0

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
POD TEST He/OX 1 L <sup>a</sup>				0434708	89	35.0	125.0			
R <sup>a</sup>				0435708	89	35.0	125.0			
2 L <sup>a</sup>				0434718	89	35.0	125.0			
R <sup>a</sup>				0435718	89	35.0	125.0			
WEB KEEL 1 L <sup>a</sup>				0434700	89	45.0	100.0			
R <sup>a</sup>				0435700	89	45.0	100.0			
2 L <sup>a</sup>				0434710	89	45.0	100.0			
R <sup>a</sup>				0435710	89	45.0	100.0			
Y OB L <sup>a</sup>				0434702	89	45.0	120.0			
R <sup>a</sup>				0435702	89	45.0	120.0			
UP L <sup>a</sup>				0434703	89	45.0	120.0			
R <sup>a</sup>				0435703	89	45.0	120.0			
RCS He TK P FU/OX (GNC)				V97U6864C		500.0				
JET	96		2.50							• (BL)
LEAK (GNC) <sup>b</sup>				V97U9807C					9.5	
LEAK/TK P F	26		2.50							• LEAK ALERT OR TANK
L	56		2.50							ULLAGE PRESSURE
R	86		2.50							(PARAMETERS 6,16/36, 46)
TK OUT P FU/OX HI (GNC)				V97U6870C			300.0			
LO				V97U6871C		220.0				
TK P FU/OX HI (GNC)				V97U6876C					312.0	
LO				V97U6877C				200.0		

<sup>a</sup>PASS only

<sup>b</sup>PASS OPS G2,3,8: BFS OPS 1,3,6

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
RCS TK P FU F	16	2.50 (200.0)	3.90 (312.0)							
L	46	2.50 (200.0)	3.90 (312.0)							
R	76	2.50 (200.0)	3.90 (312.0)							
OX F	6	2.50 (200.0)	3.90 (312.0)							
L	36	2.50 (200.0)	3.90 (312.0)							
R	66	2.50 (200.0)	3.90 (312.0)							
TK T FU/OX HI FWD (GNC) AFT LO				V97U6873C V97U8756C V97U6874C		50.0	90.0 100.0			
RGA/AA	93		2.50							• (BL)
RIGHT/AFT RHC	110		2.50							• (BL)
S-BAND ANT QUAD <sup>a</sup>				0921049		1				• VERIFICATION FAIL (BL) • GPC MODE ONLY (P)
SMOKE CONCEN LEFT FD				0620590					2	
RIGHT FD				0620591					2	
CABIN				0620595					2	
1A				0620618					2	
1B				0620619					2	
2A				0620608					2	
2B				0620609					2	
3A				0620628					2	
3B				0620629					2	

<sup>a</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
SPACELAB: (BFS ONLY) AV FAN ΔP				9021515				0.044 0.17 <sup>a</sup>	0.074 0.28 <sup>a</sup>	<ul style="list-style-type: none"> <li>• FAN IN LOW SPEED</li> <li>• FAN IN HI SPEED</li> </ul>
BUS AUX A/B UV MAIN				9011004		0				
H2O LOOP ΔP STAT				9011201		24	31.8			
INVERTER EXP A IN				9041106				0		
TEMP				9011121			40			
SS A IN				9011138			122			
TEMP				9011101			40			
SS BUS VOLTS ΦA				9011118			122			
ΦB				9011301		110	124			
ΦC				9011302		110	124			
				9011303		110	124			
W/B BLR T A 1 (PASS)				0580162	86	40.0	185.0			<ul style="list-style-type: none"> <li>• ① W/B X CNTLR HTR – A ON PLUS 2 MIN DELAY (P)</li> <li>• ② W/B X CNTLR HTR – A OFF (P)</li> </ul>
(PASS)					86	OSL	OSH			
(BFS) <sup>b</sup>										
B 1 (PASS)				0580163	86	40.0	185.0			<ul style="list-style-type: none"> <li>• ③ W/B X CNTLR HTR – B ON PLUS 2 MIN DELAY (P)</li> <li>• ④ W/B X CNTLR HTR – B OFF (P)</li> </ul>
(PASS)					86	OSL	OSH			

<sup>a</sup>Limits will be TMBUd pre-launch if fans configured to HI speed

<sup>b</sup>BFS only; MM104–106, 301–303, OPS 0

**W**

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
W/B BLR T A 2 (PASS)				0580262	86	40.0	185.0			<ul style="list-style-type: none"> <li>• ① W/B X CNTLR HTR – A ON PLUS 2 MIN DELAY (P)</li> <li>• ② W/B X CNTLR HTR – A OFF (P)</li> </ul>
(PASS)					86	OSL	OSH			
(BFS) <sup>a</sup>										<ul style="list-style-type: none"> <li>• ③ W/B X CNTLR HTR – B ON PLUS 2 MIN DELAY (P)</li> <li>• ④ W/B X CNTLR HTR – B OFF (P)</li> <li>• SEE ①</li> <li>• SEE ②</li> <li>• SEE ③</li> <li>• SEE ④</li> </ul>
B 2 (PASS)				0580263	86	40.0	185.0			
(PASS)					86	OSL	OSH			
T A 3 (PASS)				0580362	86	40.0	185.0			
(PASS)					86	OSL	OSH			
(BFS) <sup>a</sup>										
B 3 (PASS)				0580363	86	40.0	185.0			
(PASS)					86	OSL	OSH			

<sup>a</sup>BFS only; MM104-106, 301-303, OPS 0



PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
W/B H2O QTY 1 (PASS)				0726040	86	60.0				<ul style="list-style-type: none"> <li>• ① BLR CNTLR/HTR SW – A OR B (P)</li> <li>• ② BLR CNTLR/HTR SW – OFF (P)</li> <li>• SEE ①</li> <li>• SEE ②</li> <li>• SEE ①</li> <li>• SEE ②</li> </ul>
(PASS)						OSL	OSH			
(BFS)						40.0				
2 (PASS)				0726042	86	60.0				
(PASS)						OSL	OSH			
(BFS)						40.0				
3 (PASS)				0726044	86	60.0				
(PASS)						OSL	OSH			
(BFS)						40.0				
N2 P 1 <sup>a</sup>				0580147	86	1800.0				
2 <sup>a</sup>				0580247	86	1800.0				
3 <sup>a</sup>				0580347	86	1800.0				
REG P 1 <sup>a</sup>				0580104	86	20.0	33.0			
2 <sup>a</sup>				0580204	86	20.0	33.0			
3 <sup>a</sup>				0580304	86	20.0	33.0			

<sup>a</sup>PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		B/U C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
W/B TANK T A 1 <sup>a</sup>				0580161	86	40.0	110.0			<ul style="list-style-type: none"> <li>• ① W/B X CNTLR A ON PLUS 5 MIN DELAY (P)</li> <li>• ② W/B X CNTLR A OFF (P)</li> <li>• SEE ①</li> <li>• SEE ②</li> <li>• SEE ①</li> <li>• SEE ②</li> </ul>
2 <sup>a</sup>				0580261	86	OSL	OSH			
3 <sup>a</sup>				0580361	86	OSL	OSH			
B 1 <sup>a</sup>				0580164	86	40.0	110.0			
2 <sup>a</sup>				0580264	86	OSL	OSH			
3 <sup>a</sup>				0580364	86	OSL	OSH			

<sup>a</sup>PASS only

### HARDWARE C/W TABLE

C/W CH	PARAMETER NAME	C/W CH	PARAMETER NAME	C/W CH	PARAMETER NAME	C/W CH	PARAMETER NAME	C/W CH	PARAMETER NAME
0	CRYO O2 P TK1	25	GPC 3	50	CRYO H2 P TK1	*75		100	L RHC
1	CRYO O2 HTR 1 TK1	26	RCS LEAK/TK P - F	51	CRYO O2 HTR 2 TK3	76	RCS TK P FU - R	101	FCS SATURATION
2	FC1 REAC O2	27	OMS ENG - L	52	FC3 REAC H2	*77		102	FC2 COOL PUMP
3	DC VOLT MAIN A	28	APU 3 EGT	53	AC3 VOLT (φA,B,C)	78	APU 2 OVERSPEED	103	IMU
4	CAB PRESS	29	MPS HE TK P - R	54	CAB N2 FLOW 1	79	MPS MANF P LH2	104	AV BAY 3 TEMP
5	GPC 1	30	CRYO O2 P TK4/5	*55		80	CRYO H2 P TK4/5	105	H2O LOOP 1 PUMP OUT P
6	RCS TK P OX - F	31	CRYO O2 HTR 2 TK2	56	RCS LEAK/TK P - L	†81	CRYO O2 HTR 1 TK5	106	FREON LOOP 1 FREON FLOW
7	OMS TK P OX - L	32	FC2 REAC H2	57	OMS ENG - R	82	FC3 STACK T	107	FREON LOOP 1 EVAP OUT T
8	APU 1 EGT	33	AC1 VOLT (φA,B,C)	58	APU 3 OIL T	83	AC3 OVLD	108	APU 2 UNDERSPEED
9	MPS HE TK P - C	34	CAB PPO2 A	59	MPS HE REG P - R	84	AV BAY 1 TEMP	109	HYD 2 P
10	CRYO O2 P TK2	35	GPC 4	60	CRYO H2 P TK2	*85		110	R/AFT RHC
11	CRYO O2 HTR 2 TK1	36	RCS TK P OX - L	61	CRYO O2 HTR 1 TK4	86	RCS LEAK/TK P - R	111	FCS CH BYPASS
12	FC1 REAC H2	37	OMS TK P OX - R	62	FC1 STACK T	*87		112	FC3 COOL PUMP
13	DC VOLT MAIN B	38	APU 1 OIL T	63	AC1 OVLD	88	APU 3 OVERSPEED	*113	
14	CAB O2 FLOW 1	39	MPS HE REG P - C	64	CAB N2 FLOW 2	*89		114	CAB HX OUT T
15	GPC 2	†40	CRYO O2 P TK5	*65		†90	CRYO H2 P TK5	115	H2O LOOP 2 PUMP OUT P
16	RCS TK P FU - F	41	CRYO O2 HTR 1 TK3	66	RCS TK P OX - R	91	ADTA	116	FREON LOOP 2 FREON FLOW
17	OMS TK P FU - L	42	FC3 REAC O2	67	OMS TVC	92	FC1 COOL PUMP	117	FREON LOOP 2 EVAP OUT T
18	APU 2 EGT	43	AC2 VOLT (φA,B,C)	68	APU 1 OVERSPEED	93	RGA/AA	118	APU 3 UNDERSPEED
19	MPS HE TK P - L	44	CAB PPO2 B	69	MPS MANF P L O2	94	AV BAY 2 TEMP	119	HYD 3 P
20	CRYO O2 P TK3	45	GPC 5	70	CRYO H2 P TK3	95	PL WARNING		
21	CRYO O2 HTR 1 TK2	46	RCS TK P FU - L	71	CRYO O2 HTR 2 TK4	96	RCS JET		
22	FC2 REAC O2	47	OMS TK P FU - R	72	FC2 STACK T	97	PL CAUTION		
23	DC VOLT MAIN C	48	APU 2 OIL T	73	AC2 OVLD	98	APU 1 UNDERSPEED		
24	CAB O2 FLOW 2	49	MPS HE REG P - L	74	CAB FAN ΔP	99	HYD 1 P		

\* Channel not used  
 † Not applicable for OV102

### PRIMARY TO BACKUP C/W ANALOG PARAMETER CALIBRATION

①	②	③	④	⑤a	⑤b	⑤c	⑤d	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯
0.00 TO 5.00	-417 TO 468	-76.7 TO 298.1	-3.1 TO 496.8	0.11 TO 19.91	0.00 TO 20.00	0.05 TO 19.85	0.10 TO 19.92	0 TO 8	0 TO 40	0 TO 100	0 TO 150	0 TO 300	8 TO 1520	24.9 TO 129.9	45 TO 145	145 TO 305	515 TO 1015	732 TO 2684
0.00	-417	-76.7	-3.1	0.11	0.00	-0.02	0.00	0.00	0.0	0	0.0	0	8	24.9	45	145.0	515	732
0.05	-408	-72.9	1.9	0.30	0.20	0.18	0.20	0.08	0.4	1	1.5	3	23	25.9	46	146.6	520	763
0.10	-399	-69.2	6.9	0.50	0.40	0.38	0.40	0.16	0.8	2	3.0	6	38	27.0	47	148.2	525	793
0.15	-390	-65.4	11.9	0.70	0.60	0.58	0.60	0.24	1.2	3	4.5	9	53	28.0	48	149.8	530	823
0.20	-381	-61.7	16.9	0.90	0.80	0.78	0.80	0.32	1.6	4	6.0	12	68	29.1	49	151.4	535	853
0.25	-373	-57.9	21.9	1.10	1.00	0.98	1.00	0.40	2.0	5	7.5	15	84	30.1	50	153.0	540	882
0.30	-364	-54.2	26.9	1.29	1.20	1.18	1.20	0.48	2.4	6	9.0	18	99	31.2	51	154.6	545	912
0.35	-355	-50.4	31.9	1.49	1.40	1.38	1.40	0.56	2.8	7	10.5	21	114	32.2	52	156.2	550	940
0.40	-346	-46.7	36.9	1.69	1.60	1.58	1.60	0.64	3.2	8	12.0	24	129	33.3	53	157.8	555	969
0.45	-337	-42.9	41.9	1.89	1.80	1.78	1.80	0.72	3.6	9	13.5	27	144	34.3	54	159.4	560	997
0.50	-328	-39.2	46.9	2.09	2.00	1.97	2.00	0.80	4.0	10	15.0	30	159	35.4	55	161.0	565	1025

① C/W LIMIT VOLTS  
O2 PP  
GN2 FLOW  
CAB O2 FLOW  
X1000 = MPS  
He TK P

② O2 TK HTR T

③ FCP STK T

④ APU LUBE  
OIL T

⑤ CABIN P  
a OV102  
b OV103  
c OV104  
d OV105

⑥ CAB FAN ΔP

⑦ MAIN BUS VOLTS  
X10 = OMS  
TK ULL P  
X10 = RCS  
TK ULL P  
X100 = HYD  
SYS P

0.55	-320	-35.4	51.9	2.28	2.20	2.17	2.19	0.88	4.4	11	16.5	33	174	36.4	56	162.6	570	1052
0.60	-311	-31.7	56.9	2.48	2.40	2.37	2.39	0.96	4.8	12	18.0	36	189	37.5	57	164.2	575	1080
0.65	-302	-27.9	61.9	2.68	2.60	2.57	2.59	1.04	5.2	13	19.5	39	205	38.5	58	165.8	580	1107
0.70	-293	-24.2	66.9	2.88	2.80	2.77	2.79	1.12	5.6	14	21.0	42	220	39.6	59	167.4	585	1133
0.75	-284	-20.4	71.9	3.08	3.00	2.97	2.99	1.20	6.0	15	22.5	45	235	40.6	60	169.0	590	1160
0.80	-275	-16.7	76.9	3.27	3.20	3.17	3.19	1.28	6.4	16	24.0	48	250	41.7	61	170.6	595	1186
0.85	-266	-12.9	81.9	3.47	3.40	3.37	3.39	1.36	6.8	17	25.5	51	265	42.7	62	172.2	600	1212
0.90	-258	-9.2	86.9	3.67	3.60	3.57	3.59	1.44	7.2	18	27.0	54	280	43.8	63	173.8	605	1237
0.95	-249	-5.5	91.9	3.87	3.80	3.77	3.79	1.52	7.6	19	28.5	57	295	44.8	64	175.4	610	1263
1.00	-240	-1.7	96.8	4.07	4.00	3.97	3.99	1.60	8.0	20	30.0	60	310	45.9	65	177.0	615	1287
1.05	-231	2.0	101.8	4.26	4.20	4.17	4.19	1.68	8.4	21	31.5	63	325	46.9	66	178.6	620	1312
1.10	-222	5.8	106.8	4.46	4.40	4.37	4.39	1.76	8.8	22	33.0	66	341	48.0	67	180.2	625	1337
1.15	-213	9.5	111.8	4.66	4.60	4.57	4.59	1.84	9.2	23	34.5	69	356	49.0	68	181.8	630	1361
1.20	-205	13.3	116.8	4.86	4.80	4.77	4.79	1.92	9.6	24	36.0	72	371	50.1	69	183.4	635	1385
1.25	-196	17.0	121.8	5.06	5.00	4.97	4.99	2.00	10.0	25	37.5	75	386	51.1	70	185.0	640	1408
1.30	-187	20.8	126.8	5.25	5.20	5.17	5.19	2.08	10.4	26	39.0	78	401	52.2	71	186.6	645	1432
1.35	-178	24.5	131.8	5.45	5.40	5.36	5.38	2.16	10.8	27	40.5	81	416	53.2	72	188.2	650	1455
1.40	-169	28.3	136.8	5.65	5.60	5.56	5.58	2.24	11.2	28	42.0	84	431	54.3	73	189.8	655	1478
1.45	-160	32.0	141.8	5.85	5.80	5.76	5.78	2.32	11.6	29	43.5	87	446	55.3	74	191.4	660	1501
1.50	-152	35.8	146.8	6.05	6.00	5.96	5.98	2.40	12.0	30	45.0	90	462	56.4	75	193.0	665	1523

⑧ MPS LH2 MANF P  
X10 = MPS  
He REG P

⑨ H2O LP PUMP P

⑩ MPS LO2  
MANF P

⑪ APU EGT

⑫ FCL EVAP OUT T

⑬ AV BAY T  
CAB HX AIR OUT T

⑭ CRYO H2  
PRESS

⑮ CRYO O2  
PRESS

⑯ FCL FLOW

①	②	③	④	⑤a	⑤b	⑤c	⑤d	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯
0.00 TO 5.00	-417 TO 468	-76.7 TO 298.1	-3.1 TO 496.8	0.11 TO 19.91	0.00 TO 20.00	0.05 TO 19.85	0.10 TO 19.92	0 TO 8	0 TO 40	0 TO 100	0 TO 150	0 TO 300	8 TO 1520	24.9 TO 129.9	45 TO 145	145 TO 305	515 TO 1015	732 TO 2684
1.55	-143	39.5	151.8	6.24	6.20	6.16	6.18	2.48	12.4	31	46.5	93	477	57.4	76	194.6	670	1545
1.60	-134	43.3	156.8	6.44	6.40	6.36	6.38	2.56	12.8	32	48.0	96	492	58.5	77	196.2	675	1567
1.65	-125	47.0	161.8	6.64	6.60	6.56	6.58	2.64	13.2	33	49.5	99	507	59.5	78	197.8	680	1589
1.70	-116	50.8	166.8	6.84	6.80	6.76	6.78	2.72	13.6	34	51.0	102	522	60.6	79	199.4	685	1610
1.75	-107	54.5	171.8	7.04	7.00	6.96	6.98	2.80	14.0	35	52.5	105	537	61.6	80	201.0	690	1631
1.80	-98	58.3	176.8	7.24	7.20	7.16	7.18	2.88	14.4	36	54.0	108	552	62.7	81	202.6	695	1652
1.85	-90	62.0	181.8	7.43	7.40	7.36	7.38	2.96	14.8	37	55.5	111	567	63.7	82	204.2	700	1673
1.90	-81	65.7	186.8	7.63	7.60	7.56	7.58	3.04	15.2	38	57.0	114	582	64.8	83	205.8	705	1694
1.95	-72	69.5	191.8	7.83	7.80	7.76	7.78	3.12	15.6	39	58.5	117	598	65.8	84	207.4	710	1714
2.00	-63	73.2	196.8	8.03	8.00	7.96	7.98	3.20	16.0	40	60.0	120	613	66.9	85	209.0	715	1734
2.05	-54	77.0	201.8	8.23	8.20	8.16	8.18	3.28	16.4	41	61.5	123	628	67.9	86	210.6	720	1754
2.10	-45	80.7	206.8	8.42	8.40	8.36	8.38	3.36	16.8	42	63.0	126	643	69.0	87	212.2	725	1774
2.15	-37	84.5	211.8	8.62	8.60	8.55	8.58	3.44	17.2	43	64.5	129	658	70.0	88	213.8	730	1794
2.20	-28	88.2	216.8	8.82	8.80	8.75	8.77	3.52	17.6	44	66.0	132	673	71.1	89	215.4	735	1813
2.25	-19	92.0	221.8	9.02	9.00	8.95	8.97	3.60	18.0	45	67.5	135	688	72.1	90	217.0	740	1832
2.30	-10	95.7	226.8	9.22	9.20	9.15	9.17	3.68	18.4	46	69.0	138	703	73.2	91	218.6	745	1851
2.35	-1	99.5	231.8	9.41	9.40	9.35	9.37	3.76	18.8	47	70.5	141	719	74.2	92	220.2	750	1870
2.40	8	103.2	236.8	9.61	9.60	9.55	9.57	3.84	19.2	48	72.0	144	734	75.3	93	221.8	755	1889
2.45	16	107.0	241.8	9.81	9.80	9.75	9.77	3.92	19.6	49	73.5	147	749	76.3	94	223.4	760	1907
2.50	25	110.7	246.8	10.01	10.00	9.95	9.97	4.00	20.0	50	75.0	150	764	77.4	95	225.0	765	1925

- ① C/W LIMIT VOLTS  
O2 PP  
GN2 FLOW  
CAB O2 FLOW  
X1000 = MPS  
He TK P
- ② O2 TK HTR T
- ③ FCP STK T
- ④ APU LUBE OIL T
- ⑤ CABIN P  
a OV102  
b OV103  
c OV104  
d OV105
- ⑥ CAB FAN ΔP
- ⑦ MAIN BUS VOLTS  
X10 = OMS  
TK ULL P  
X10 = RCS  
TK ULL P  
X100 = HYD  
SYS P

2.55	34	114.5	251.8	10.21	10.20	10.15	10.17	4.08	20.4	51	76.5	153	779	78.4	96	226.6	770	1943
2.60	43	118.2	256.8	10.40	10.40	10.35	10.37	4.16	20.8	52	78.0	156	794	79.5	97	228.2	775	1961
2.65	52	122.0	261.8	10.60	10.60	10.55	10.57	4.24	21.2	53	79.5	159	809	80.5	98	229.8	780	1979
2.70	61	125.7	266.8	10.80	10.80	10.75	10.77	4.32	21.6	54	81.0	162	824	81.6	99	231.4	785	1997
2.75	70	129.4	271.8	11.00	11.00	10.95	10.97	4.40	22.0	55	82.5	165	840	82.6	100	233.0	790	2014
2.80	78	133.2	276.8	11.20	11.20	11.15	11.17	4.48	22.4	56	84.0	168	855	83.7	101	234.6	795	2031
2.85	87	136.9	281.8	11.39	11.40	11.35	11.37	4.56	22.8	57	85.5	171	870	84.7	102	236.2	800	2048
2.90	96	140.7	286.8	11.59	11.60	11.55	11.57	4.64	23.2	58	87.0	174	885	85.8	103	237.8	805	2065
2.95	105	144.4	291.8	11.79	11.80	11.75	11.77	4.72	23.6	59	88.5	177	900	86.8	104	239.4	810	2082
3.00	114	148.2	296.8	11.99	12.00	11.94	11.97	4.80	24.0	60	90.0	180	915	87.9	105	241.0	815	2099
3.05	123	151.9	301.8	12.19	12.20	12.14	12.16	4.88	24.4	61	91.5	183	930	88.9	106	242.6	820	2115
3.10	131	155.7	306.8	12.38	12.40	12.34	12.36	4.96	24.8	62	93.0	186	945	90.0	107	244.2	825	2132
3.15	140	159.4	311.8	12.58	12.60	12.54	12.56	5.04	25.2	63	94.5	189	960	91.0	108	245.8	830	2148
3.20	149	163.2	316.8	12.78	12.80	12.74	12.76	5.12	25.6	64	96.0	192	976	92.1	109	247.4	835	2164
3.25	158	166.9	321.8	12.98	13.00	12.94	12.96	5.20	26.0	65	97.5	195	991	93.1	110	249.0	840	2180
3.30	167	170.7	326.8	13.18	13.20	13.14	13.16	5.28	26.4	66	99.0	198	1006	94.2	111	250.6	845	2196
3.35	176	174.4	331.8	13.38	13.40	13.34	13.36	5.36	26.8	67	100.5	201	1021	95.2	112	252.2	850	2212
3.40	185	178.2	336.8	13.57	13.60	13.54	13.56	5.44	27.2	68	102.0	204	1036	96.3	113	253.8	855	2227
3.45	193	181.9	341.8	13.77	13.80	13.74	13.76	5.52	27.6	69	103.5	207	1051	97.3	114	255.4	860	2243
3.50	202	185.7	346.8	13.97	14.00	13.94	13.96	5.60	28.0	70	105.0	210	1066	98.4	115	257.0	865	2258
3.55	211	189.4	351.8	14.17	14.20	14.14	14.16	5.68	28.4	71	106.5	213	1081	99.4	116	258.6	870	2273
3.60	220	193.2	356.8	14.37	14.40	14.34	14.36	5.76	28.8	72	108.0	216	1097	100.5	117	260.2	875	2289

- (8) MPS LH2 MANF P X10 = MPS He REG P     
 (9) H2O LP PUMP P     
 (10) MPS LO2 MANF P     
 (11) APU EGT     
 (12) FCL EVAP OUT T     
 (13) AV BAY T CAB HX AIR OUT T  
 (14) CRYO H2 PRESS     
 (15) CRYO O2 PRESS     
 (16) FCL FLOW

①	②	③	④	⑤a	⑤b	⑤c	⑤d	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯
0.00 TO 5.00	-417 TO 468	-76.7 TO 298.1	-3.1 TO 496.8	0.11 TO 19.91	0.00 TO 20.00	0.05 TO 19.85	0.10 TO 19.92	0 TO 8	0 TO 40	0 TO 100	0 TO 150	0 TO 300	8 TO 1520	24.9 TO 129.9	45 TO 145	145 TO 305	515 TO 1015	732 TO 2684
3.65	229	196.9	361.8	14.56	14.60	14.54	14.56	5.84	29.2	73	109.5	219	1112	101.5	118	261.8	880	2304
3.70	238	200.6	366.8	14.76	14.80	14.74	14.76	5.92	29.6	74	111.0	222	1127	102.6	119	263.4	885	2319
3.75	246	204.4	371.8	14.96	15.00	14.94	14.96	6.00	30.0	75	112.5	225	1142	103.6	120	265.0	890	2334
3.80	255	208.1	376.8	15.16	15.20	15.14	15.16	6.08	30.4	76	114.0	228	1157	104.7	121	266.6	895	2348
3.85	264	211.9	381.8	15.36	15.40	15.33	15.35	6.16	30.8	77	115.5	231	1172	105.7	122	268.2	900	2363
3.90	273	215.6	386.8	15.55	15.60	15.53	15.55	6.24	31.2	78	117.0	234	1187	106.8	123	269.8	905	2378
3.95	282	219.4	391.8	15.75	15.80	15.73	15.75	6.32	31.6	79	118.5	237	1202	107.8	124	271.4	910	2392
4.00	291	223.1	396.8	15.95	16.00	15.93	15.95	6.40	32.0	80	120.0	240	1217	108.9	125	273.0	915	2407
4.05	299	226.9	401.8	16.15	16.20	16.13	16.15	6.48	32.4	81	121.5	243	1233	109.9	126	274.6	920	2421
4.10	308	230.6	406.8	16.35	16.40	16.33	16.35	6.56	32.8	82	123.0	246	1248	111.0	127	276.2	925	2435
4.15	317	234.4	411.8	16.54	16.60	16.53	16.55	6.64	33.2	83	124.5	249	1263	112.0	128	277.8	930	2450
4.20	326	238.1	416.8	16.74	16.80	16.73	16.75	6.72	33.6	84	126.0	252	1278	113.1	129	279.4	935	2464
4.25	335	241.9	421.8	16.94	17.00	16.93	16.95	6.80	34.0	85	127.5	255	1293	114.1	130	281.0	940	2478
4.30	344	245.6	426.8	17.14	17.20	17.13	17.15	6.88	34.4	86	129.0	258	1308	115.2	131	282.6	945	2492
4.35	353	249.4	431.8	17.34	17.40	17.33	17.35	6.96	34.8	87	130.5	261	1323	116.2	132	284.2	950	2506
4.40	361	253.1	436.8	17.53	17.60	17.53	17.55	7.04	35.2	88	132.0	264	1338	117.3	133	285.8	955	2520
4.45	370	256.9	441.8	17.73	17.80	17.73	17.75	7.12	35.6	89	133.5	267	1354	118.3	134	287.4	960	2534
4.50	379	260.6	446.8	17.93	18.00	17.93	17.95	7.20	36.0	90	135.0	270	1369	119.4	135	289.0	965	2548

① C/W LIMIT VOLTS  
O2 PP  
GN2 FLOW  
CAB O2 FLOW  
X1000 = MPS  
He TK P

② O2 TK HTR T

③ FCP STK T

④ APU LUBE  
OIL T

⑤ CABIN P  
<sup>a</sup>OV102  
<sup>b</sup>OV103  
<sup>c</sup>OV104  
<sup>d</sup>OV105

⑥ CAB FAN ΔP

⑦ MAIN BUS VOLTS  
X10 = OMS  
TK ULL P  
X10 = RCS  
TK ULL P  
X100 = HYD  
SYS P



4.55	388	264.4	451.8	18.13	18.20	18.13	18.07	7.28	66.4	91	136.5	273	1384	120.4	136	290.6	970	2561
4.60	397	268.1	456.8	18.33	18.40	18.33	18.27	7.36	36.8	92	138.0	276	1399	121.5	137	292.2	975	2575
4.65	406	271.8	461.8	18.52	18.60	18.53	18.47	7.44	37.2	93	139.5	279	1414	122.5	138	293.8	980	2589
4.70	414	275.6	466.8	18.72	18.80	18.72	18.67	7.52	37.6	94	141.0	282	1429	123.6	139	295.4	985	2602
4.75	423	279.3	471.8	18.92	19.00	18.92	18.87	7.60	38.0	95	142.5	285	1444	124.6	140	297.0	990	2616
4.80	432	283.1	476.8	19.12	19.20	19.12	19.06	7.68	38.4	96	144.0	288	1459	125.7	141	298.6	995	2630
4.85	441	286.8	481.8	19.32	19.40	19.32	19.26	7.76	38.8	97	145.5	291	1475	126.7	142	300.2	1000	2643
4.90	450	290.6	486.8	19.51	19.60	19.52	19.46	7.84	39.2	98	147.0	294	1490	127.8	143	301.8	1005	2657
4.95	459	294.3	491.8	19.71	19.80	19.72	19.66	7.92	39.6	99	148.5	297	1505	128.8	144	303.4	1010	2670
5.00	468	298.1	496.8	19.91	20.00	19.92	19.86	8.00	40.0	100	150.0	300	1520	129.9	145	305.0	1015	2684

- (8) MPS LH2 MANF P  
 X10 = MPS  
 He REG P
- (9) H2O LP PUMP P
- (10) MPS LO2  
 MANF P
- (11) APU EGT
- (12) FCL EVAP OUT T
- (13) AV BAY T  
 CAB HX AIR OUT T
- (14) CRYO H2  
 PRESS
- (15) CRYO O2  
 PRESS
- (16) FCL FLOW

### FDA LIMIT CHANGE

SM 60 SM TABLE MAINT

- CRT
1. PARAM ID – ITEM 1 +\_ \_ \_ \_ \_ EXEC
  2. ✓Update of ID
  3. LIMITS – ITEM XX ± \_ \_ \_ \_ \_ EXEC
  4. ✓Update of LIMIT
  5. Notify MCC of CHANGED LIMIT(s)

### FDA NOISE FILTER CHANGE

SM 60 SM TABLE MAINT

- CRT
1. PARAM ID – ITEM 1 +\_ \_ \_ \_ \_ EXEC
  2. ✓Update of ID
  3. FILTER – ITEM 8(13) +\_ \_ EXEC
  4. ✓Update of FILTER

### FDA PARAM ANNUN INHIBIT

SM 60 SM TABLE MAINT

- CRT
1. PARAM ID – ITEM 1 +\_ \_ \_ \_ \_ EXEC
  2. ✓Update of ID
  3. INH – ITEM 10(15) EXEC
  4. ✓Update of INH
  5. Notify MCC of INHIBITED PARAMETER

## FDA PARAM ANNUN ENABLE

SM 60 SM TABLE MAINT

- CRT
1. PARAM ID – ITEM 1 + \_\_\_\_\_ EXEC
  2. ✓Update of ID
  3. ENA – ITEM 9(14) EXEC
  4. ✓Update of ENA

## CONSTANT VALUE CHANGE

SM 60 SM TABLE MAINT

- CRT
1. CONSTANT ID – ITEM 16 + \_\_\_\_\_ EXEC
  2. ✓Update of ID
  3. VALUE – ITEM 17 + \_\_\_\_\_ EXEC
  4. ✓Update of CONSTANT VALUE

## FDA ANNUN INHIBIT

SM 60 SM TABLE MAINT

- CRT
1. FDA INH – ITEM 20 EXEC
  2. ✓Update of INH
  3. Notify MCC that FDA INHIBITED

## FDA ANNUN ENABLE

SM 60 SM TABLE MAINT

- CRT
1. FDA ENA – ITEM 19 EXEC
  2. ✓Update of ENA

## C/W MEMORY READ/CLEAR

1. C/W Memory Read & Clear – Pnl F7 Annunciator
  - C3     ✓C/W MODE – NORM  
          MEM – READ, hold
  - F7     ✓C/W annunciator lts (parameters out of limits  
          since C/W memory clear) – on
  - C3     C/W MEM – CLEAR
  - F7     ✓C/W annunciator lts – off
  
2. C/W Memory Read & Clear – Pnl R13 Status
  - R13U   C/W MEM – READ, hold  
          ✓STATUS lts (parameters out of limits since  
          C/W memory clear) – on
  - C3     C/W MEM – CLEAR  
          ✓STATUS lts – off
  
3. C/W Memory Clear
  - C3  
(R13U)   C/W MEM – CLEAR

## C/W PARAMETER INHIBIT/ENABLE

1. C/W Parameter Inhibit  
R13U C/W PARAM SEL tw – desired parameter number (XXX)  
PARAM – INH  
PARAM STATUS – INH, hold  
STATUS It (selected parameter) – on  
PARAM SEL tw – 120 or greater
2. C/W Parameter Enable  
C/W PARAM SEL tw – desired parameter number (XXX)  
PARAM – ENA  
PARAM STATUS – INH, hold  
STATUS It (selected parameter) – off  
PARAM SEL tw – 120 or greater

## C/W PARAMETER LIMIT READ/CHANGE

1. C/W Parameter Limit Read  
R13U C/W PARAM SEL tw – desired parameter number (XXX)  
LIMIT SET LIMIT – desired limit (UPPER or LOWER)  
LIMIT SET FUNC – READ, hold  
STATUS Its – read value (X.XX volts)  
PARAM SEL tw – 120 or greater
2. C/W Parameter Limit Change  
C/W PARAM SEL tw – desired param number (XXX)  
LIMIT SET VALUE tw – desired value (X.XX volts)  
LIMIT SET LIMIT – desired limit (UPPER or LOWER)  
LIMIT SET FUNC – SET, then READ, hold  
STATUS Its – read value (X.XX volts)  
PARAM SEL tw – 120 or greater

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GPC READ/WRITE PADS

5-1

REF/ALL/GEN E

**GPC  
R/W**

# GPC R/W

GPC READ/WRITE	PASS	MAJOR FUNCTION	<input type="checkbox"/> GNC	<input type="checkbox"/> SM	<input type="checkbox"/> PL	OPS ___ ___ ___																		
OBJECTIVE:																								
<div style="border: 1px solid black; display: inline-block; padding: 2px;">0: GPC MEMORY</div> <input type="checkbox"/> DATA 20 <input type="checkbox"/> BIT SET 22 <input type="checkbox"/> CODE 21 <input type="checkbox"/> BIT RST 23 26 ENG UNITS ___ ___ ___ <input type="checkbox"/> HEX 27																								
ADD ID		INITIAL ACTUAL		DESIRED		FINAL ACTUAL																		
28	<table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>							<table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>						29	<table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>					<table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td></tr></table>				
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REMARKS:																								



GPC READ/WRITE	BFS	MAJOR FUNCTION	<input type="checkbox"/> GNC	<input type="checkbox"/> SM	OPS ___ ___ ___
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OBJECTIVE:

<input type="checkbox"/> DATA 1		<input type="checkbox"/> BIT SET 3	
<input type="checkbox"/> CODE 2		<input type="checkbox"/> BIT RST 4	
7 ENG UNITS ___ ___ ___		<input type="checkbox"/> HEX 8	

0: GPC MEMORY

ADD ID	INITIAL ACTUAL	DESIRED	FINAL ACTUAL
9		10	
11		12	
13		14	
15		16	
17		18	
19		20	

SEQ ID 5       WRITE 6

REMARKS:

GPC READ/WRITE	PASS	MAJOR FUNCTION	<input type="checkbox"/> GNC	<input type="checkbox"/> SM	<input type="checkbox"/> PL	OPS ___ ___ ___																									
OBJECTIVE:																															
<input type="checkbox"/> DATA 20 <input type="checkbox"/> BIT SET 22 <input type="checkbox"/> CODE 21 <input type="checkbox"/> BIT RST 23 26 ENG UNITS ___ ___ ___ <input type="checkbox"/> HEX 27 <div style="border: 1px solid black; display: inline-block; padding: 2px; margin: 5px 0;">0: GPC MEMORY</div>																															
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GPC READ/WRITE	BFS	MAJOR FUNCTION	<input type="checkbox"/> GNC	<input type="checkbox"/> SM	OPS ___ ___ ___
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OBJECTIVE:

DATA 1       BIT SET 3  
 CODE 2       BIT RST 4  
 7 ENG UNITS \_\_\_ \_\_\_ \_\_\_       HEX 8

0: GPC MEMORY

	ADD ID	INITIAL ACTUAL	DESIRED	FINAL ACTUAL																		
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SEQ ID 5       WRITE 6

REMARKS:

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5-6

REF/ALL/GEN E

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NAV STARS

**NAV  
STARS**

6-1

REF/ALL/GEN E

## NAV STAR REFERENCE TABLE

- ① Nav Star Mean of 1950 RA/DEC coordinates and magnitude data are provided for use with the onboard star charts. The names of the stars 61–110 have been omitted from the star charts for clarity.
- ② The current RA and DEC of the orbiter's +X axis can be determined from the IMU M50 angles on SPEC 21. The Z angle is equal to the RA and the –Y angle is equal to the DEC. (Ref SPEC 21 description in the DPS Dictionary.)
- ③ Mean of 1950 Pitch and Yaw angles are included to support two axis manual maneuvers for COAS IMU alignments. By placing either the CDRs or aft ADI in the inertial reference frame and using either the +X or –Z sense respectively, a manual maneuver can be flown to the given inertial Pitch and Yaw angles to center the star in either the +X or –Z COAS. These data emulate the technique of using the old Starball RELMAT.

Please note that no formal procedures exist to support this maneuver technique for COAS star acquisition.

## NAV STAR REFERENCE TABLE

Star ID	Name	*** MEAN OF 1950 ***				
		RA	Dec	Pitch	Yaw	MAG
11	SIRIUS	101	-17	122	70	-1
12	CANOPUS	96	-53	94	37	-1
13	RIGEL	78	-8	35	75	0
14	VEGA	279	39	281	310	0
15	HADAR	210	-60	116	346	1
16	ACHERNAR	24	-57	60	13	0
17	ACRUX	186	-63	117	357	1
18	CAPELLA	78	46	281	43	0
19	SPICA	201	-11	168	340	1
20	ARCTURUS	213	19	203	329	0
21	PROCYON	114	5	193	65	0
22	ALTAIR	297	9	341	298	1
23	BETELGEUSE	88	7	284	82	0
24	BELLATRIX	81	6	326	79	2
25	REGULUS	151	12	194	28	1
26	FOMALHAUT	344	-30	31	346	1
27	DENEK	310	45	303	327	1
28	AL NA'IR	331	-47	51	341	2
29	ALKAID	206	50	233	343	2
30	ANTARES	247	-26	129	305	1
31	CASTOR	113	32	238	51	2
32	ALDEBARAN	68	16	322	63	1
33	PEACOCK	305	-57	69	334	2
34	MIAPLACIDUS	138	-70	106	14	2
35	NUNKI	283	-26	66	299	2
36	KAUS AUSTRALIS	275	-34	82	305	2
37	ALPHERATZ	1	29	331	1	2
38	NAVI	13	60	299	7	2
39	ALHENA	99	16	243	71	2
40	MIRFAK	50	50	299	30	2
41	DENEKOLA	177	15	195	3	2
42	ALPHECCA	233	27	220	314	2
43	RASALHAGUE	263	13	242	284	2
44	MERAK	165	57	238	8	2
45	POLARIS	27	89	271	0	2
46	PHECDA	178	54	234	1	2
47	GIENAH	183	-17	163	357	3
48	ZUBENESCHEMALI	229	-9	166	312	3
49	KOCHAB	223	74	258	349	2
50	AVIOR	125	-59	109	25	2
51	ATRIA	251	-69	97	340	2
52	HAMAL	31	23	333	28	2
53	MENKENT	211	-36	140	335	2
54	DIPHDA	10	-18	19	10	2
55	ALPHARD	141	-8	169	38	2
56	AL SUHAIL	137	-43	128	30	2
57	ACAMAR	44	-41	50	32	3
58	DENEK ALGEDI	326	-16	19	328	3
59	SCHEAT	345	28	331	347	2
60	ENIF	325	10	348	326	2

## NAV STAR REFERENCE TABLE

Star ID	Name	*** MEAN OF 1950 ***				
		RA	Dec	Pitch	Yaw	MAG
61	ALNILAM	83	-1	11	83	2
62	EL NATH	81	29	286	60	2
63	NAOS	120	-40	121	41	2
64	SAIPH	86	-10	70	80	2
65	ALIOTH	193	56	237	353	2
66	MENKALINAN	89	45	271	45	2
67	ETA CENTAURI	218	-42	131	333	2
68	REGOR	122	-47	116	35	2
69	ALGOL	46	41	309	33	2
70	MUHLIFAIN	190	-49	131	354	2
71	ZETA CENTAURI	208	-47	129	341	3
72	ALUDRA	111	-29	122	55	2
73	ACRAB	241	-20	144	305	3
74	THETA CARINAE	160	-64	115	8	3
75	ZETA OPHIUCHI	249	-10	153	294	3
76	EPSILON CENTAURI	204	-53	124	346	2
77	ALGENIB	3	15	345	3	3
78	GAMMA LUPI	233	-41	125	323	3
79	MARKAB	346	15	345	346	2
80	EPSILON PERSEI	59	40	302	41	3
81	PHACT	84	-34	82	56	3
82	SABIK	257	-16	129	290	2
83	THETA AURIGAE	89	37	271	53	3
84	ALPHA ARAE	262	-50	97	320	3
85	KAPPA VELORUM	140	-55	118	22	2
86	ALDERAMIN	319	62	292	342	2
87	ZOZCA	168	21	201	11	3
88	ZETA CAN. MAJ.	95	-30	98	60	3
89	ARNEB	83	-18	68	71	3
90	ZETA PERSEI	58	32	311	46	3
91	ALPHIRK	322	70	286	348	3
92	MIRACH	17	35	323	14	2
93	ICEN	199	-36	142	344	3
94	COR CAROLI	193	39	219	350	3
95	BETA GRUIS	340	-47	49	346	2
96	DELTA CYGNI	296	45	294	320	3
97	ALMACH	30	42	314	22	2
98	ZUBENELGENUBI	222	-16	159	320	3
99	GAMMA GRUIS	328	-38	42	335	3
100	GAMMA TRI. AUS.	229	-68	105	344	3
101	IZAR	221	27	214	325	3
102	ELTAMIN	269	51	269	322	2
103	ARICH	190	-1	179	350	3
104	ZETA AQUILAE	286	14	318	291	3
105	EPSILON CYGNI	311	34	314	321	2
106	ANKAA	6	-43	43	4	2
107	RHO PUPPIS	121	-24	139	51	3
108	BETA TRIANGULI	32	35	321	26	3
109	PI SAGITTARII	287	-21	53	297	3
110	ZETA HERCULIS	250	32	241	307	3



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**PGM  
NOTES**

## PROGRAM NOTES

The notes in this section apply to PASS only unless otherwise indicated. Information in parentheses following each note indicates the applicable Software Discrepancy Report (DR XXXXX), BFS Discrepancy (BXXXXX), or Software Change Request (CR XXXXX). If no reference is given, the note describes an 'as is' peculiarity of the Data Processing System

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CRT DISPLAYS

GPC MEMORY

1. Mass Memory Pre-position Failure. When a mass memory pre-position failure occurs, SPEC 0 does not appear on the DEU where OPS request was made. During TAL abort (G1 to G3), if OPS 0 page is not displayed within 12 sec, a mass memory pre-position failure can be assumed. For other transitions, a 70-sec wait is required. An 'I/O ERROR MMU' message may appear on the Fault Summary Page (FSP) and CRT message lines when failure occurs (DR 25372)
  
2. Stale NBAT Data. If the MC # displayed (item 1) is the currently active MC, DEU selections (items 12,13,14,15) will not reflect any CRT reassignments that have occurred due to MF change or GPC/CRT entry  
  
 If G3 NBAT is not updated in OPS G1, the active G1 bus assignment is carried over at OPS G1 to G3 transition as the G3 bus assignment. After G1 to G3 transition, string/bus assignments displayed are stale data from the MC3 NBAT previously displayed in OPS G1. Selecting item 1+3 on SPEC 0 after transition to OPS G3 will update the display with the current G3 NBAT (DR 37506)
  
3. Engineering Units Conversion Processing. Processing of read/write information continues in the software even if GPC MEM SPEC is removed via RESUME. If improper engineering units conversion is requested, GPC errors may occur if SPEC is RESUMEd without first doing ITEM 27 EXEC to clear the read/conversion function
  
4. G-MEM Item Initialization. ADD ID and DESIRED columns are blanked at OPS transitions or fresh callup of SPEC 0, but not if SPEC 0 is active on another DEU or is underlying a DISP when it is called. A DEU equivalent G-MEM in the latter situation could produce an erroneous write to GPC memory. Reinitialization via item 20 should always be performed prior to DEU equivalent G-MEM writes
  
5. Read/Write and Memory Dump. When GPC MEMORY SPEC is called, READ/WRITE and MEMORY DUMP sections are initialized to DATA, HEX, and all other fields blank. If GPC MEMORY is being viewed as an OPS display and on another DEU driven by the same GPC or RS, GPC MEMORY SPEC is requested, both displays will be initialized to the default item



selections previously described. In configurations where GPC MEMORY SPEC is available as the OPS display, view it as the OPS display by resuming any other SPEC or display on DEU when reinitialization is not desired. Request SPEC 0 when reinitialization is desired (DR 37516)

#### DPS UTILITY

1. MMU Assignments. User selection of MMU assignments on DPS UTILITY SPEC from another GPC can interfere with proper operation of PL9 MM Utility (DR 37420)

#### TIME

1. Sign Convention for Item Entries. The sign of lowest non-zero item entry value determines the sign for entire field. Since S/W cannot interpret negative zero, the user should enter desired sign immediately preceding first non-zero entry (+ or -) or not use zero as the first digit in a series of entries to the items (DR 37504)
2. GMT Update on GPC Time. If GMT update is issued from either a redundant set GPC or nonredundant set GPC while on GPC time, there is a possibility that the redundant set GPC could perceive different time than nonredundant set GPC. This could lead to a common set fail-to-sync of nonredundant set GPC
3. MTU Effects on GMT Updates. When Greenwich mean time (GMT) update (item 32) is executed, there is an interval of up to 2 min before the update takes effect, as indicated by GMT  $\Delta$  blanking on the display. The length of delay is a function of the master timing unit (MTU) hardware, which can be updated only at a whole minute. During the interval, while waiting for the update to take effect, some user actions such as keyboard inputs may cause unexpected results (e.g., a FAIL-TO-SYNC)

For GMT updates > 15 msec:

No user actions or keyboard inputs should be attempted until the update takes effect. This type of update will force reinitialization

For GMT updates < or = 15 msec:

Do not perform the following actions until the update takes effect:

- Addition of a GPC to the CS
- OPS transition request or mode recall
- I/O RESET
- I/O terminate switch change
- Accumulator select (DR 29284/DR 40620)

4. MTU Updates with FC Strings not in RS. If an MTU update or accumulator sync is performed with flight critical strings 1, 2, or 3 split between redundant set and nonredundant set GPCs, it is possible to have two computers issuing an MTU update. Effects on the MTU are unpredictable

#### XXXX MNVR YYYY

1. Bad OMS Engine ID. If a bad engine ID is uplinked as part of a target load, the maneuver display will default to RCS +X thrusters in OPS 3 and to an indeterminable selection in OPS 1. Proper engine ID uplink or crew item number entry will correct this problem (DR38163U)
2. Targeting. If targeting is active in MM105 or 302 when PRO to MM106 or 303 occurs, target parameters will be displayed on the Coast MM display when they should be blank. In addition, for MM302 and 303 cases, the I-LOAD entry interface attitude will be overwritten by the targeting attitude and ADI error needles will reflect this new attitude. Manual entry of the entry interface attitude would resolve this last problem. In general, avoid any major mode transition except 301 to 302 while targeting is still computing burn numbers (DR 36015)

If transition to 301 from 303 occurs just after a state vector update (whole or delta) has been performed, target data entry rejection and CRT timer anomalies may be observed for several seconds while a targeting module finishes execution. When the module completes, item number entry will return to normal and the CRT timer will return to crew control (DR 36479)

In MM202, the rendezvous guidance option chosen by ORBIT TARGETING spec is displayed in text. Discrete (1) is set and 'LAMBERT' is displayed for this option. Discrete can be reset (0) by ground uplinking or crew retargeting to external  $\Delta V$  (via this or the ORBIT TARGETING display) and 'EXT  $\Delta V$ ' will be displayed

3. Use of BOTH to Clear OMS Down Arrows. If an engine indicates failure (down arrow) during a burn, subsequent to the burn the arrow cannot be cleared by selecting the BOTH item number. The down arrow will be automatically cleared by OMS RM at TIG-15 sec for a subsequent OMS burn regardless of engine selection (DR 55314)
4. Stale OMS Trim Angle Data. During maneuver operations in MM104 thru 106, 202, and 301 thru 303, OMS trim angles remain static during and after a burn until the next item entry or display recall. Perform an item entry or display recall to update OMS trim angles, repeating for each DEU (DR 39371)
5. Timer Countdown Terminated Unconditionally on MM301 Init or MNVR Target Item Update. Any CRT timer countdown initiated by the crew or software will be terminated upon entry to MM301 or upon update of a MNVR target item by keyboard or uplink. The crew may reinitiate countdown using items 22 (LOAD) and 23 (TIMER) (DR 37591)
6. Guidance Convergence Indications. Subsequent to execution of LOAD item number, only positive indication of guidance being unable to converge on a solution will be the display of zeroes for BURN ATT (blank or non-zero when converged) and TGT HA and HP (non-zero when converged) (DR 37573)
7. Item Entries During RCS BURN. During RCS maneuver, entries from the keyboard will be accepted by software. This is the case whether the maneuver was initially planned +4X or whether both OMS engines have failed during maneuver. If any target-set-related entry, except propellant to be depleted (i.e., trims, engine select, TIG, or targets), is made during maneuver, target solution values (i.e., TGO, VGOs, burn attitude, etc.) are blanked and a flashing LOAD appears.

The same applies for any such target entry prior to burn enable. Do not make target item entries (except for propellant to be depleted) during RCS maneuver. If an entry is inadvertently made, a new LOAD will be required to reestablish guidance solution. The TIG for LOAD must be in the future. Also, the

THETA target must be adjusted if TIG is changed (in OPS 3 only) or an REI miss will result (DR 37564)

8. Unsupported AOA/ATO Requests in MM105 after OMS 2. If AOA or ATO abort is requested in MM105 following OMS 2 burn completion:
  - a. The AOA/ATO targeting function is not scheduled so MNVR target items are not automatically updated
  - b. When crew manually enters desired MNVR target (item 10–17), followed by LOAD item, ATO targeting is correct; however, AOA targeting is incorrect (it should be done in MM301)
  - c. For AOA, subsequent transition to MM106 causes MNVR title to be unreadable in MM106 (DR 45739)
9. No Flashing 'LOAD' for BFS on Major Mode Transitions. After transitioning from MM104 to MM105, MM104 to MM301, or MM106 to MM301, 'LOAD' will flash on the PASS maneuver display but not on the BFS maneuver display. Additionally, 'LOAD' will not flash for BFS OPS 0 to OPS 3 transition, but will flash on the PASS maneuver display after OPS 2 to OPS 3 transition. The flashing 'LOAD' does not appear for BFS since there are no valid target data to be loaded. It will appear when an uplink or keyboard entry of target data is performed  
  
For both PASS and BFS, 'LOAD' must be flashing before item 18 (PRPLT) on the maneuver display can be entered with a non-zero value. Because of the flashing 'LOAD' difference between PASS and BFS, a non-zero item 18 could be entered on a PASS keyboard and displayed on the PASS maneuver display while being rejected by BFS without an ILLEGAL ENTRY message (DR 108559/B20611, 45749)
10. No Burn Attitude for Yaw Near  $\pm 90^\circ$ . If PEG 4 or PEG 7 target solution results in a desired preburn yaw attitude near  $\pm 90^\circ$ , the desired BURN ATT will not be displayed on the MNVR display. This is a display problem only; guidance will still function normally and ADI error needles are still valid (DR 37585)
11. Attitude Maneuver to Unknown Attitude. If auto maneuver is in progress in OPS 2 and item 22 (LOAD) is entered, a new burn attitude will be computed and displayed; the vehicle, however, will continue to maneuver to the old burn attitude. Mode the DAP to any manual mode and back to auto to avoid confusion regarding the attitude to which the vehicle is maneuvering. The crew could

also reexecute item 27 with DAP in auto (once burn attitude values are displayed) to begin the new maneuver (DR 48348)

12. TFF/REI Blanking. Maneuver display parameters TFF and REI are not computed for perigee altitudes above 55 nm (I-load) on any LOAD situation in OPS 3. These parameters are blanked on the display when this occurs and therefore, REI/TIG adjust (as called for in ASCENT C/L) is not possible. These parameters may therefore not be computed for AOAs with large MECO underspeeds (DR 37573)
13. Actuator Deselection. If both primary and secondary actuators are deselected, P and Y gimbal angles for that engine show a static display of the last valid gimbal data prior to OFF execution (item 32/33). Transition to OPS 3 in this case may result in erroneous gimbal data being displayed. Manually reselecting either primary or secondary gimbals will reinstate dynamic data (DR 37123)
14. Gimbal Drive Check. The GMBL CK item can be executed during an OMS burn and will cause check to be performed, overriding OMS TVC flight control commands (DR 37561)
15. Abnormal OMS Termination/Keyboard Lockout. Multiple failures during an OMS maneuver may lead to control problems and subsequent guidance divergence requiring manual OMS cutoff. Proper crew response is to terminate OMS thrust with the ARM PRESS switch. Absence of OMS cutoff commands (in software) causes keyboard lockout

If TGO stops counting down, the auto system probably will not achieve cutoff and proper crew response is a manual OMS cutoff

The chance of a keyboard lockout in this situation should be recognized and, if it results, the procedure for manual setting of cutoff commands should be used

In the case of a keyboard lockout, release is effected by OPS XXX PRO to the next OPS (MM104–105, 302–303). Note that MM105–106 terminates OMS burn capability in OPS 1 since MM106–105 is not permitted

## OVERRIDE

1. Possible Contingency Dump Lockout for Second Dump Request Pre-MECO. In an abort situation which causes automatic Pre-MECO OMS dump (MM103), if an additional OMS dump is requested during the OMS engine purge process, the dump does not occur, and subsequent requests for contingency OMS dumping are not honored. The same contingency dump lockout can also occur in MM103 when requesting another crew-initiated contingency dump during purge process of a previous contingency dump. Therefore, contingency dumping should only be requested prior to completion of the original OMS dump or after OMS purge completion (DR 55217)
2. OMS Propellant Dump Termination Via Arm/Press Switches. If OMS ARM/PRESS switches are turned OFF during a contingency dump (MM102, 103, 601, 602), OMS RM will fail vote the OMS engines. Attempts to reactivate dump will also fail. Terminate dump sequence using item 8 rather than ARM/PRESS switches. MM104, MM201, or MM301 PRO allows OMS engines to fire again (DR 55306)
3. RCS Dump Status May Change to Inhibit in MM304 or 602. In MM304 or 602, when dump start initiation conditions are met, user may see forward and/or aft RCS DUMP STATUS (items 13 and 15) change from 'ENA' to 'INH'. This occurs if dump duration (I-LOAD or crew entry) is a negative number  
  
Negative dump duration allows dump to remain enabled but not started. The crew may then start dump during TAL or RTLS by entering only one item entry (entering a positive dump duration) instead of two items (dump duration and dump enable) (DR 101386)
4. ET SEP Switch Default. In OPS 1, if ET SEP switch defaults to 'MANUAL,' ET SEP AUTO (item 38) is used to override the function back to AUTO. In OPS 6, default is to 'AUTO', so item 38 is not needed

## UNIV PTG

1. Current and Required Attitudes. Displayed ATT MON pitch angles will be incorrect for yaw angles near 270°. If the displayed current or required attitude angles are needed in this case, indicated pitch up should be a pitch down of same magnitude (DR 58926)

2. Enable RNDZ NAV Before Target Tracking. Execution of the target tracking option (item 19) with TGT ID (item 8) = 1 when rendezvous navigation is not enabled will cause divide by zero GPC errors. RNDZ NAV (item 1, REL NAV display) must be enabled each time GNC OPS 2 is entered, before attempting to track another orbiting object (DR 53101)
3. Disable Target Tracking Before OPS Transition. Target tracking of another orbiting vehicle should be stopped via item 21 before executing OPS transition or mode recall, or the target state vector may be lost (DR 58374)

#### GNC SYS SUMM 1

1. GNC SYS SUMM 1. When an FCS channel switch is moved between AUTO and OVERRIDE positions, a momentary down arrow may appear on GNC SYS SUMM 1 for that channel. This occurs because switch is of the break-before-make variety causing momentary loss of power to ASA during switch movement  
  
Although RHC LRU fault annunciation is possible in OPS 1, the RHC LRU status fields are blanked in OPS 1 preventing display of RHC failure, dilemma, or comm-fault status (DR 104639)

#### IMU ALIGN

1. IMU Operate Mode Indication. It is possible for the IMU LRU to be in operate mode (as indicated by OPER asterisk) but for the software to still be in an IMU STBY state. ACC and ANG data for that IMU will be indicating zeroes in this situation. Problem can be corrected by executing the OPER item number for that IMU (No DR)
2. Unexpected ILLEGAL ENTRY when Selecting IMU Alignment. If Bite Test 4 MDM initialization read is bypassed at OPS 2 or 3 transition, the output discrete that indicates IMU is 'In Operate' is set to zero. Any IMU to IMU alignment entry (item 16) with an IMU whose 'In Operate' output discrete is zero fails with an ILLEGAL ENTRY. If this occurs, select item 4, 5, or 6 (OPERATE) to set 'In Operate' output discrete for the reference IMU and repeat alignment (DR 100520)

#### S TRK/COAS CNTL

1. COAS ACCEPT Without Mark. Current software makes no check to ensure a COAS mark has been taken as a condition for processing ACCEPT item selection. Therefore, erroneous data could go into the star table. This might only be apparent to the

crew after second (valid) star is sighted and ANG DIF shows a significant error from the expected angular separation. If ACCEPT command is inadvertently entered without a mark, complete current processing by entering second ACCEPT command, reinitialize by entering a star table clear (item 20), and then perform the normal sight mode procedure (DR 35151)

2. COAS Operation from AFT Station in OPS 3. Marks from the aft station are not detected by flight software in OPS 3 because switch processing does not occur in OPS 3 for the aft station. COAS operations should only be performed at the forward station during OPS 3 (DR 35151)

### RCS

1. Incorrect OMS/RCS Quantity Display. If OMS to RCS quantity gauging has been enabled via item 5 or 6, and then interconnect is switched to other OMS pod (L or R), crew should select OFF (item 7) prior to selecting the new OMS pod via item 5 or 6. If this is not done, the quantity display for the newly interconnected OMS pod will initialize with the last quantity displayed for the previously interconnected pod (DR 46500)

### RM ORBIT

1. AFT THC Data Display. Physical orientation (rotated 90 degrees clockwise) of AFT THC causes crew commands to be displayed as follows:

THC CMD	TX	TY	TZ
PUSH	+		
PULL	-		
DOWN		+	
UP		-	
STBD			+
PORT			-

### REL NAV

1. Noise in  $\Delta V$ . Flight data has shown that  $\Delta V_X$ ,  $\Delta V_Y$ , and  $\Delta V_Z$  accumulated velocities are extremely noisy and should not be used as an indication of orbiter  $\Delta V$ . Use either R-dot or count THC pulses



### VERT SIT 1

1. Alpha-Recovery/NZ-Hold Transition. Subphase transition from alpha-recovery to NZ-hold in MM602 requires one of the following conditions; either A or B:
  - A.  $NZ > 1.8G$  (I-load)
  - B. For intact abort only:
    - ALPHA  $> 45^\circ$  (I-load) in guidance cycle, and
    - ALPHA  $< 45^\circ$  in subsequent cycle

Furthermore, the pitch error needle on ADI displays:

- Alpha error during alpha-recovery subphase, and
- NZ error during NZ-hold subphase

Normally, Case A takes place and transition to NZ-hold subphase occurs automatically. Case B is normally forced by CSS takeover

The crew should monitor VERT SIT 1 during MM602 and wait for display of an overbright NZ which appears when guidance transitions to NZ-hold phase (either case A or B). Pitch axis of the ADI error needle will display NZ error in NZ-hold subphase. The crew may then null NZ error manually (BO7339A/DR 46515)

### HORIZ SIT

1. OVHD to STRT Toggle in MM101. Item 6 cannot be used to toggle back to OVHD once STRT has been selected in MM101. The desired landing site can then be reselected (item 41), which will reset OVHD (DR 42650)

### FCS/DED DIS C/O

1. Run ADT Prior to SEC ACT CK. The SURF DR (ADT) test should be run prior to SEC CK because SURF DR leaves surfaces far enough from hardstops to ensure valid SEC ACT CK (DR 35572)
2. ADT Fault Annunciation. An 'AERO DRIVE' fault message and associated down arrow are generated when SEC ACT CK (channel 1) is run. This is expected and can be cleared by MSG RESET on the MCDS keyboard (DR 46503)
3. Actuator Bypass Down Arrows. Actuator bypass down arrows will not appear as expected if more than two channels are bypassed before resetting. Bypassed channels should be reset before bypassing next channel (DR 44250)

### SWITCH/SURF

1. FCS Channel Switch Comm Fault Status. In OPS 8 (only), comm faulted FCS channel switch contacts are not removed from contact selection filtering as they should be. If FF 1, 2, or 3 failures or 'BCE STRG 1 (2,3) B' bypasses occur, switch status should be closely monitored via SPEC and ground downlist to ensure erroneous OVERRIDE commands do not occur (DR 30526)

### CONTROLLERS

1. AFT THC Data Display. Physical orientation (rotated 90° clockwise) of the AFT THC causes crew commands to be displayed as follows:

THC CMD	TX	TY	TZ
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PULL	-		
DOWN		+	
UP		-	
STBD			+
PORT			-

2. RHC Contact Deselection. When RM automatically deselects an RHC channel, it places a down arrow by the axis that experienced the failure but not by the other two axes on that channel. An asterisk will appear under the 'DES' column for that channel to indicate all axes on that channel have been deselected

**MEDS**

REF/ALL/GEN E

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## HORIZ SIT

1. OVHD to STRT Toggle in MM101. Item 6 cannot be used to toggle back to OVHD once STRT has been selected in MM101. The desired landing site can then be reselected (item 41), which will reset OVHD (DR 42650)
2. Possible Display of Invalid Bearing Data. Due to timing between RM, SOP, and display software modules, it is possible for TACAN bearing data flagged as 'invalid' by TACAN SOP to be displayed if TACAN is alternately achieving and breaking lock at about 1 Hz. An intermittent 'M' on the display will usually occur in this situation (DR 37577)
3. Repetitive TACAN Self-Test. If a dilemma exists between two TACAN units and self-test is unable to resolve the dilemma, there is a possibility that software could get into a loop which would continue to command self-test every 8 sec. Deselecting one of the units or moding units to T/R will be required to clear up the problem (DR 37693/45703)

**NOM**

### FCS/DED DIS C/O

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### CONTROLLERS

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**NOM**

## ANTENNA

1. S-band Antenna Selection. When using the ANTENNA S-BAND PM rotary switch (panel C3), allow at least 2 sec at each intermediate position

## PL BAY DOORS

1. PL Bay Door Auto Open Sequence (PASS). PLBD auto sequences continuously monitor the state of all door and latch microswitches and should automatically halt whenever any one of the door configuration checks fails. PASS AUTO OPEN sequence fails to recognize the combination DOOR NOT CLOSED plus READY TO LATCH as a condition for sequence stop. PASS AUTO CLOSE sequence and both BFS sequences function properly
2. PL Bay Door Talkback. When BFS is taken to RUN, the payload bay door position indicator on panel R13 is initialized to barberpole, regardless of the true state of the doors. To show the true state, call BFS SM SPEC 63 (B08246)
3. BFS PL Bay Door Operation. PLBD operations cause unique handling of SPECS and displays in BFS. BFS operates as follows:
  4. RESUME, MF switch, display, and SPEC requests operate per normal interaction of structures requirements when a PLBD OPEN or CLOSE sequence is not in progress
  5. RESUME, MF switch, display, and SPEC requests operate per normal interaction of structures requirements as long as there is more than one CRT with PLBD SPEC active
  6. If only one CRT has PLBD SPEC active, RESUME of PLBD SPEC is illegal if either:
    - PLBD SW BYPASS (item 14) is not selected and the PLBD CONTROL switch is not in STOP position, or
    - PLBD SW BYPASS (item 14) is selected and the STOP item (item 16) is not selected
  7. Change of MF is allowed while a PLBD OPEN or CLOSE sequence is in progress and the sequence will continue
  8. PLBD OPEN or CLOSE sequence will continue if SPEC or display is called on top of the PLBD SPEC

9. SPEC may overlay PLBD SPEC, but if an OPEN or CLOSE sequence is in progress and that CRT is the only CRT with PLBD SPEC active, resume will return to PLBD SPEC (B03926)

#### SM TABLE MAINT

1. SPEC/TMBU Interlock. Table maintenance block update (TMBU) via uplink and SPEC 60 are interlocked such that (a) TMBU loads are rejected if SPEC 60 is active and (b) if TMBU is in progress and SPEC 60 is called, all items will be 'ILLEGAL ENTRIES' (DR 37572)
2. Limits for Discrete Parameters with Multiple Limit Sets. The out-of-limit state for a discrete parameter will be a +0, +1, or +2 entered in item 2. The +2 state causes FDA to be bypassed. If the +2 state is entered for a discrete parameter with only one limit set, an 'ILLEGAL ENTRY' message will result

#### PCMMU/PL COMM

1. Item Entry Characteristics. If OPS transition is initiated while item 3 (SEL ID), 4 (LOAD) format load is in progress, the load will fail. If this occurs, reinitiate load via items 3, 4 (DR 37584)
2. Erroneous Format Load Indications. PCMMU and PDI formats loaded on G9 GPC (prelaunch) are not reflected on SM-driven SPEC 62. Power-cycling the PCMMU or PDI erases stored formats, but not SPEC 62 indications. SPEC 62 displayed formats are blanked after SM GPC is re-IPLed on orbit even though loads are not changed (No DR)
3. SM2 PDI Fault Message Interpretation. When PDI is powered in SM2, but a payload data stream is not being DECOMed, PDI fault annunciation may occur without PDI failure. Annunciations caused by payloads which are not in configuration for PDI data processing (deployed payloads, those for which lock has been lost, etc.) do not necessarily indicate PDI failure (DR 55302)

#### BFS MEMORY

1. DESIRED Field Not Blanking. Old data in DESIRED column of the READ/WRITE section will not blank when new addresses are entered into ADD ID columns. Always reselect mode (item 1 thru 4, or 7, or 8) to clear DESIRED column prior to entering new addresses

BFS HORIZ SIT

1. BFS Horizontal Situation Display Predictors Incorrect. During BFS MM304, if roll angle of 90° or more is performed below 200K feet, the 20-, 40-, and 60-sec predictors of the horizontal situation display will indicate a turn in the opposite direction. The crew should ignore HSD predictors when roll angle is greater than or equal to 90° (DR B08297)

DPS  
(GEN)

## DPS (GENERAL)

### INITIAL PROGRAM LOADS (GPC and DEU)

DPS  
(GEN)

1. Invalid DEU IPL Requests. A DEU IPL request using PASS is valid only in SM, PL9, or post-IPL OPS 0 and SM OPS 2/4. Requests made at any other time will result in unpredictable problems with that DEU. If a "CM BUF BSY CRTX" fault message is annunciated, wait until the SM common buffer is no longer in use before attempting another DEU IPL request. If an invalid IPL request is made, deassign DEU and perform DEU re-IPL to recover DEU (DR 33643)
2. SM OPS 2/4 DEU IPL Failure Due to SM Common Buffer Busy. SM common buffer is utilized during DEU IPL and also by other processes running concurrently; buffer may be in use when DEU IPL is requested in SM 2/4. If buffer is in use, a 'CM BUF BSY CRTX' fault message will be annunciated by SM GPC, and the DEU IPL attempt will fail. The 'X' in 'CRTX' portion of fault message represents the number of CRT/DEU being IPLed. Operations which contend for the SM common buffer are: TFL loads, SM checkpoint/restore, orbiter mass memory read/write SPEC operations, and crew text uplinks (TUMMS). Should a 'CM BUF BSY CRTX' message be annunciated, wait for contending operation to complete before retrying DEU IPL (No DR)
3. DEU Loaded by BFS. A DEU that has been IPLed by BFS does not have the critical format background displays loaded into DEU to be usable to PASS. DEU must be re-IPLed by PASS (DR 37542)

### GPC/CRT MANAGEMENT

1. Potential FTS at New GPC Startup. During ICC initialization of new GPC into a common set, the following DPS-related actions could cause resulting ICC data to be overlaid by initialization ICC data. This could lead to an FTS at common set formation or later at redundant set formation
  2. Reassign GSE polling (ground initiated)
  3. Downlist GPC switch
  4. FC/PL string moding
  5. DEU major function switch change
  6. GPC/CRT key, BFC CRT select switch, BFS CRT display switch
  7. OPS transitions
  8. OPS mode recall



9. Redundant set to OPS 0
10. Moding another GPC from STBY to RUN or RUN to STBY

The above actions should not be performed during time span approximately 10 sec before moding GPC to RUN until 10 sec after placing mode switch to RUN or until output tb goes gray (DRs 42433, 46617, 30138a)

11. DEU Control Loss with BFC CRT SEL Switch to OFF. For a BFC CRT SEL switch change which requires PASS to resume control of a DEU, that DEU will not be picked up by PASS if the previous PASS commander is unable to assume command. On another PASS DEU, reassign dropped DEU to an active PASS GPC to regain DEU control (DR 37512)
12. RS Split and BFS Standalone. A 2 on 2 PASS redundant set split normally causes BFS to track the lower pair. However, if prior to the split, BFS experienced an I/O error due to BFS MIA receiver problem on a forward bus associated with lower pair, BFS will track higher pair. Upon execution of BFS I/O reset, BFS will attempt to reinitialize tracking on lowest pair. BFS will then downmode string with the faulty forward bus (MIA) and go standalone for lack of two strings to track. During PASS 2 on 2 set split, if BFS is tracking higher pair, do not attempt I/O reset to BFS until PASS restringing is complete (DR 101898/B28531)
13. CRT Assignment Guidelines
  14. Prior to CRT reassignment, deassignment, major function change or power off, 'RESUME' CRT to release any SPEC so one of two allowable SPECS (per major function) will not be allocated to that CRT
  15. Use PASS CS keyboard (not BFS or F-T-S keyboard). Note that BFS will DK listen to GPC/CRT keyboard entries
  16. To move CRT from F-T-S GPC to CS GPC, deassign CRT with F-T-S keyboard, then reassign on PASS CS keyboard
  17. Always ensure new GPC is available (running in CS) and new CRTs MF switch matches new GPCs MF (PL if OPS 0 GPC) prior to 'GPC/CRT XX EXEC'
  18. Request for more than three CRTs to be assigned to common set will result in the fault message '> 3 DEU' in all OPS. There is no restriction on number of CRTs that can be assigned to BFS

19. The BFS CRT switch can only be used to assign a CRT to BFS (preengage) if the IPL source switch on panel O6 is in the 'OFF' position
20. If new NBAT reassigns a CRT which is assigned to BFS via the BFC CRT switch, the new assignment will not be made until the BFC CRT switch turned off. At that time, the previous PASS commander will momentarily take that CRT until the new NBAT assignment is invoked. (If this switch is left 'ON', PASS cannot see the new NBAT assignment) (No DR)

#### OPS AND MAJOR MODE TRANSITIONS

1. OPS Transition Restrictions. To ensure a successful OPS transition, numerous DPS-related actions should be avoided throughout duration of OPS transition. Perform no switch or keyboard action at all during OPS transitions (DR 15620)
2. OPS Transition with SPEC Request in Progress. If a currently active SPEC is requested on another DEU simultaneously with an OPS transition request, it is possible the OPS transition will fail. Therefore, if OPS transition is desired following a request to bring up SPEC on second DEU, wait several seconds for the underlying SPEC control segment to get canceled before keying in OPS XXX PRO (DR 52779)
3. Annunciation of FTS During OPS Transition. Computer annunciation matrix (CAM) lights and software fail votes are cleared as part of any OPS transition involving memory reconfiguration in a redundant set. If an FTS occurs, both message and CAM light annunciation will be generated but CAM lights (and associated down arrow for GPC STATUS on GNC SYS SUMM 1 and GPC/BUS STATUS displays) will subsequently be cleared after overlay (successful or unsuccessful) (DRs 55300, 100788)
4. OPS Transition After MMU Powerup. Failure to allow MMU to complete its initialization may result in retention of the old OPS configuration and an 'OFF/BUSY MMU' message (if other MMU is unavailable). Delay at least 34 sec before trying OPS transition after MMU powerup (DR 33749)
5. CRT Assignments During OPS Transition. Prior to OPS XXX PRO, use GPC/CRT key to add/delete any desired CRTs (NBAT can only redistribute currently commanded CRTs). Ensure new NBAT is not requesting more than three PASS CRTs (No DR)

## KEYBOARD/DISPLAY MANAGEMENT

1. PASS/BFS Item Entry Monitoring. PASS and BFS keyboard item handling cannot be guaranteed to be identical. BFS may accept item entries illegal in PASS or may reject item entries legal in PASS. (BFS does not annunciate 'ILLEGAL ENTRY' when it rejects an item entered via DK listen.) The crew should monitor the BFS display to determine BFS response to each DK listen item entry (DR B03973)
2. System SPEC Availability. System SPECs are available under only one major function at a time. If a system SPEC is being viewed and the major function switch on that DEU is changed without first doing RESUME, then the SPEC cannot be requested again under the new major function switch setting. Therefore, perform RESUME before changing major function switch on DEU (DR 25396)
3. NBAT Updates and Stale Data. DEU assignment changes made via the MF switch, GPC/CRT entry, BFC/CRT DISPLAY switch, or BFC/CRT SEL switch do not update NBAT (items 12–15 on SPEC 0). Be aware that NBAT will reflect stale data. During OPS transition from G1 to G3, the active G1 NBAT shall be used by software to determine the G3 bus assignment table, but only if G3 NBAT has not been changed during OPS 1. If G3 NBAT is not updated in OPS 1, the active G1 bus assignment at the time of G1 to G3 transition is carried over to G3 as the active bus assignment, and G3 NBAT is updated accordingly. If, however, G3 NBAT is updated in OPS 1 (items 2 thru 19), the new G3 NBAT will be invoked at the time of G1 to G3 transition. The G3 NBAT was called up but not changed in OPS 1. For current G3 bus assignments, reselect ITEM 1+3 on SPEC 0 (CR 89592, DR 37506)
4. Consecutive I/O Resets. An I/O reset takes a minimum of 8 sec to complete. If subsequent I/O resets are requested before the first one is complete, an illegal entry error message will be issued. Therefore, consecutive I/O resets should be at least 10 sec apart (DR 31435)

5. Moving Switches to GPC Position. Multiposition cockpit switches in the GPC position store hardware commands in FSW output buffers and issue these commands via MDMs. The independent 'hardware' manual switch positions mode hardware without FSW having visibility into the mode change. Switching back to the GPC position after manual moding reconfigures the hardware back to the last FSW commanded position because FSW commands are not changed to reflect the 'hardware' command. Before returning any switch to GPC position, evaluate desirability of producing a moding change to that hardware device. If moding is undesirable, verify with ground the software output command status to that device (DR 46513)
6. Simultaneous System SPEC Inputs. Most item entry data on system SPECs (GPC MEMORY, TIME, and DPS UTILITY) are ICCed between common set computers. If simultaneous item entries are made on system SPECs in different major functions, interference in the ICC messages between GPCs may result. If this occurs, item entries from one SPEC will be ICCed properly but those from the other SPEC will be filtered out and lost. Avoid simultaneous inputs from different common set GPCs of system SPEC item data (DR 37427)
7. RESUME of SPEC on Failed DEU. If a SPEC is active on a DEU that fails, capability to RESUME that SPEC by normal means is lost. SPEC may be called on another DEU; however the failed DEU SPEC is charged to the active MF as one of two SPECs that are allowed to be active at one time. SPEC may be canceled by doing an OPS transition or by uplink of DEU equivalent RESUME to the failed DEU if CRT has not been deassigned since failure (DR 37503)
8. I/O RESET with Failed MTU. After entering I/O RESET in a PASS with failed MTU, a message may appear on a BFS CRT indicating that BFS has downmoded a string(s). To reinstate that string(s) for BFS, do BFS I/O RESET after PASS I/O RESET processing complete (approximately 10 sec) (DR 35211)

ASCENT/  
ABORT

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## ASCENT/ABORT

### ASCENT (GENERAL)

ASCENT/  
ABORT

1. Erroneous Command Path Failure Annunciation (PASS and BFS). GPC and MEC time base oscillators are not synchronized. When GPCs send a command to the controller, an acknowledgement which is present in the MEC engine vehicle data table (VDT) for only one 40–msec cycle is read by the GPCs. Because of the asynchronous operation, it is possible that an occasional VDT frame will be omitted. If the missed frame is one which contained command acknowledgement, failure is annunciated on the display message line, and the SSME amber light illuminated even though the engine received the command

Message line annunciation may not occur if subsequent command processed within 1.92 sec. The amber light will be extinguished on next good cycle of command accepted data. If command path failure occurs, crew will see a CRT message and SSME status amber light. If amber light extinguishes, then crew could assume command path failure was erroneous due to this DR condition. If failure is an engine throttling command, engine chamber pressure can be monitored for failure confirmation (DRs 37594, 106180/B22567)

2. RHC Status Not Displayed. Although RHC LRU fault annunciation is possible in OPS 1, RHC LRU status fields on the GNC SYS SUMM 1 display are blanked in OPS 1 preventing display of RHC failure, dilemma, or commfault status (DR 104639)
3. Incorrect SSME Limit Control Commands Issued. When engine failure occurs, software inhibits limit shutdown control capability on remaining two engines automatically. If SSME LIMIT SHUT DN switch changed from INHIBIT to AUTO position after engine has shut down or had DATA PATH FAIL, incorrect limit control commands will be issued and limits enabled. If switch taken to INHIBIT and it is desired to have limits inhibited, do not return switch to AUTO once it has been moved to inhibited position (DR 37678)
4. Inappropriate Upmode to Auto After Fast Sep. With implementation of single–engine auto contingency abort capability, flight control system will mode to AUTO after FAST SEP. Downmode to manual can only occur after ZERO\_THRUST event and when RHC is out–of–detent. When RHC is returned to detent, FCS will mode to AUTO. This discrepancy adversely

affects the three-engine-out RTLS contingency abort yellow procedure

5. Unexpected Roll Maneuver in MM103. If engine failure occurs in MM102 on missions that are inertially targeted or have high inclination with significant yaw steering, the PASS TAL droop logic may be activated in MM103. Droop logic modifies PEG thrust attitude in pitch to keep vehicle from drooping below minimum safe altitude. This causes PASS to command roll of up to 12° from heads down prior to aborting RTLS. Since BFS does not have this capability, there will be a difference between ADI attitude error needles and attitude error on the BFS Ascent TRAJ display. If 'DROOP' is overbright on the TRAJ display, be aware of possible attitude error difference. Once RTLS is declared, both PASS and BFS will command a heads-down attitude. Thus, the vehicle will roll back to wings level at a rate of 1 to 2°/sec. If BFS is engaged prior to declaring RTLS, the vehicle will also roll back to wings level (DR 105356)

RTLS (also see ABORT OMS Dumps)

1. CSS Alpha Recovery/NZ Hold Transition in OPS 6. In MM602, transition from alpha-recovery to Nz-hold subphase occurs when either  $N_z > 1.8G$  (I-LOAD) or  $\alpha > 45^\circ$  for a guidance cycle and less than  $45^\circ$  in subsequent cycle. If the second condition occurs prematurely for BFS or PASS in CSS, erroneous pitch errors will be displayed on the ADI. Guidance will command an  $\alpha > 50^\circ$  to attempt to achieve target  $N_z$ . When CSS during alpha recovery and guidance prematurely modes to the Nz-hold phase, the crew should ignore pitch errors and fly  $\alpha = 50^\circ$  until  $N_z = 1.8G$ . Guidance can then be used to fly the Nz-hold phase (DR 46515/B07339A)
2. RTLS Delayed Guidance Convergence. During second stage, the crew monitors the status of guidance convergence by the condition of the ADI error needles and PASS and BFS time to MECO (TMECO). When guidance is unconverged for five consecutive cycles (10 sec), the ADI error needles will stow. When guidance is converged for five consecutive cycles (10 sec), the error needles will unstow. At RTLS initialization, the ADI error needles are initialized unstowed and will be visible to the crew. Problems with guidance usually result in unreasonable or dynamic TMECO, while a good guidance solution will be stable and agree well in PASS and BFS

During RTLS second stage, the RTLS PPA solution is indicated by the GUID parameter on the RTLS TRAJ display. The GUID

parameter will indicate 'INIT' during RTLS guidance initialization, 'INHB' if PPA solution is not converged, and a countdown value when a good solution will be computed. At PPA, the GUID parameter will indicate 'PPA'. Note that the PPA solution is a function of guidance convergence. When guidance is unconverged the PPA solution will indicate 'INHB'. However, it is common to have guidance converged without a PPA solution

If SSME fails early in first stage, delays in guidance convergence and a PPA solution may be seen when RTLS is selected in second stage. The ground and crew may notice any of the following scenarios:

3. Guidance goes unconverged at RTLS selection. This may last approximately 30 sec
4. Guidance goes unconverged after initial RTLS guidance convergence. This may last approximately 14 sec
5. Delay in a PPA solution at RTLS selection. This may last approximately 45 sec
6. Guidance convergence and a good PPA solution occur at different times in PASS and BFS. Differences of approximately 30 sec may be seen

The crew should be aware of these possible delays in guidance convergence and cross-check PASS and BFS guidance with the RTLS Unconverged Guidance Table. If significant differences from this table occur, then the crew should check with MCC or take over manually in a no-comm situation. It is important to remember that the RTLS fuel dissipation attitude is a function of velocity and altitude rate at engine out or SRB SEP. It should be good regardless of the status of the RTLS guidance parameters

Even though PASS and BFS may get solutions at different times, the final solution should be the same. An exception to this is if PASS or BFS have not been notified of the engine out. Delays in engine out recognition by GPC can significantly impact RTLS guidance performance (DR 105441, B27583/105429, 46520+)

#### ABORT OMS DUMPS (GENERAL)

1. OMS Propellant Dump Termination via ARM/PRESS Switches. If the OMS ARM/PRESS switches are turned off during a contingency dump (MM102, 103, 601, 602), OMS RM will fail vote the OMS engines. Attempts to reactivate dump will also fail. The (contingency) dump sequence should be terminated by item 8 on SPEC 51, not the ARM/PRESS switches. If RM has failed the



OMS engines because of the switch taken to OFF, a PRO to MM104, MM201, or MM301 will allow OMS engines to be fired again (DR 55306)

2. Possible 2nd OMS Pre-MECO Dump Lockout. In an abort situation which causes automatic pre-MECO OMS dump (MM103), if an additional OMS dump is requested during the OMS engine purge process, the dump does not occur, and subsequent requests for contingency OMS dumping are not honored. The same contingency dump lockout can also occur in MM103 when requesting another crew-initiated contingency dump during purge process of a previous contingency dump. Therefore, contingency dumping should only be requested prior to completion of the original OMS dump or after OMS purge completion (DR 55217)
3. Abort OMS Dumps Inhibited Upon BFS Engagement. During any abort, if PASS fails prior to commanding the OMS engines ON, BFS goes standalone and is engaged after it sets its OMS ignition event, then the automatic OMS dump will be inhibited. If this scenario occurs, the crew should start OMS dump manually via the BFS override display (DR 108524/B22592)

#### MM104/MM105

1. OMS Target Guidance Convergence. In OPS 1 and 3, the only positive indication of guidance convergence after performing a target LOAD (ITEM 22 EXEC) is a nonzero target HA/HP. Time for guidance convergence is generally proportional to how far in the future TIG is. When a target LOAD is performed in PASS, guidance computation cannot be interrupted until convergence except by doing an OPS transition. (Note that this would not help in OPS 1 because, once moded out of OPS 1, return to OPS 1 is not possible.) This means that, if targets are wrong, loading them could tie up PASS for an indefinite period of time. Ensure OMS targets are correct before loading to preclude being locked out of PASS (DR 37573)
2. OMS 1 Attitude Errors Induced by MPS Dump. MPS dump started at OMS 1 ignition results in burn attitude errors because of the change in total body thrust vector. Guidance commands vehicle attitude based on sensed acceleration and operated correctly. Expect up to 6° of transient error at ignition and about 1° of pitch and yaw error after stabilization during auto (DAP) OMS 1 burn. For a manual (CSS) OMS 1 burn, centering needles throughout burn will result in small burn residuals and minimal fuel wasting (DR 101774)

3. Engine Response to the ARM/PRESS Switch (in all MMs). OMS engine ARM/PRESS switch in the OFF position commands OMS cutoff. However, if this switch is moved from OFF to ARM or ARM/PRESS before OMS FDI detects a failure, engine attempts to return to steady state thrust conditions, possibly causing engine damage. If switch is inadvertently moved to OFF position during an OMS burn, no attempt should be made to recycle switch immediately back to ARM or ARM/PRESS. If it is recycled to ARM or ARM/PRESS, switch should be taken to OFF immediately to minimize the chance of engine damage (DR 37555)

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**ON-ORBIT  
(OPS 2)**

ON-ORBIT (OPS 2)

1. OPS 2 OMS Burn ADI Guidance Error Requirement. In OPS 2, ADI attitude error needles are not referenced to the PEG guidance solution unless AUTO MNVR is executed on the MM202 MANEUVER display. Before executing an MM202 OMS/RCS burn, perform AUTO MNVR (item 27) to reference ADI error needles to the guidance computed thrust solution (DR 46512)
2. Universal Pointing Pitch Angles at Yaw = 270°. For yaw angles of  $270 \pm 0.3^\circ$  on the UNIVERSAL POINTING display, current and required pitch angles are very nearly the negative of the correct angles. These are display parameters only. Reverse the sign of the indicated pitch parameters on the UNIVERSAL POINTING display for yaw angles of  $270 \pm 0.3^\circ$  (DR 58926)
3. Improper COAS Operation. Current software makes no check to ensure a COAS mark has been taken as a condition for processing an ACCEPT item selection. Therefore, erroneous data could go into the star table. This might only be apparent to the crew after a second (valid) star is sighted and the ANG DIF shows significant error from expected angular separation. If an ACCEPT command is inadvertently entered without a mark, complete current processing by entering second ACCEPT command, reinitialize by entering a star table clear (item 20), and then perform the normal sight mode procedure (DR 35151)
4. Multiple Commands via a PSP. Item entries for commands to a payload via PSP should be entered one at a time. When multiple commands are entered simultaneously, all commands except the first one will be rejected (No DR)
5. ADI Freeze at 90°/270° Yaw. Anytime the ADI YAW angle command is within  $1.7^\circ$  of  $90^\circ$  or  $270^\circ$ , the PITCH and ROLL axes of the ADI are frozen because of the indeterminate nature of PITCH and ROLL at high YAW angles. For example, if an ADI is in INRTL mode with YAW near zero, but vehicle attitude is such that in LVLH mode YAW would be  $90^\circ$ , the ball will freeze in the last PITCH and ROLL INRTL attitude if the ADI select switch is taken to LVLH. YAW will, however, read the correct attitude. Yawing the vehicle more than  $1.7^\circ$  away from  $90^\circ$  LVLH will unfreeze the ADI in this situation as will returning to INRTL mode (No DR)

6. VRCS Failure. If one or more vernier RCS jets fail with ORBIT DAP in VERN mode, the jet fire outputs to all vernier jet drivers are inhibited. However, DAP continues to compute required jet commands. The VERN PBI stays on and RCS command lights on F6 continue to reflect DAP or RHC command activity (No DR)

DEORBIT/  
ENTRY

## DEORBIT/ENTRY (OPS 3/6)

### OPS 3/6 (GENERAL)

1. COAS Operation in OPS 3. In OPS 3, COAS switch processing does not occur for the aft station, so that marks from the aft station are not detected by flight software. In OPS 3, perform COAS operations from the forward station (DR 35151)

### DEORBIT BURNS

1. Erroneous Attitude Displays for Yaw Near  $\pm 90^\circ$ . If a burn solution results in a yaw attitude near  $\pm 90^\circ$ , burn attitudes (R,P,Y) on the PASS Maneuver display are blanked and remain blanked during cyclic guidance. Additionally, if burn attitudes are displayed and yaw enters the  $\pm 90^\circ$  region, the crew will see stale burn attitudes during cyclic guidance. The burn solution and ADI error needle readings are still good, and guidance will function as normal. In this scenario, the crew should use standard procedures to maneuver to attitude via the auto maneuver capability or by nulling the ADI error needles. Once the burn attitude is achieved, the ADI REF option can be used for attitude reference during the burn (DR 37585)

Pitch and roll axes of the ADI will freeze up if the ADI yaw angle is within  $1.7^\circ$  of  $90^\circ$ . This is due to the indeterminate nature of pitch and roll at high yaw angles. For example, if an ADI is in INRTL mode with YAW near zero, but vehicle attitude is such that in LVLH mode YAW would be  $90^\circ$ , the ball will freeze in the last PITCH and ROLL INRTL attitude if the ADI select switch is taken to LVLH. YAW will, however, read the correct attitude. Yawing the vehicle more than  $1.7^\circ$  away from  $90^\circ$  LVLH will unfreeze the ADI in this situation as will returning to INRTL mode (DR 106915)

2. Yaw Error Needle Sensitivity During Deorbit Burns. During OPS 3 deorbit burns with fuel wasting, the ADI yaw error needle will appear sensitive, especially when time-to-go (TTG) is small. Typically, the yaw error needle will diverge or jump suddenly near a TGO of 6 sec. In this scenario, the crew should not attempt to follow the yaw error needle near cutoff (DR 37559)

DEORBIT/  
ENTRY

3. Pitch Error Needle Sensitivity During RCS Burns. During +X RCS maneuvers (OPS 1, 2, or 3) the ADI pitch error needle becomes very sensitive as time-to-go (TGO) gets small. Error needle jumps of several degrees can occur as TGO approaches 6 sec. In this scenario, the crew should not attempt to follow the pitch error needle near cutoff, since a divergent situation can be created (DR 37562)

#### ENTRY

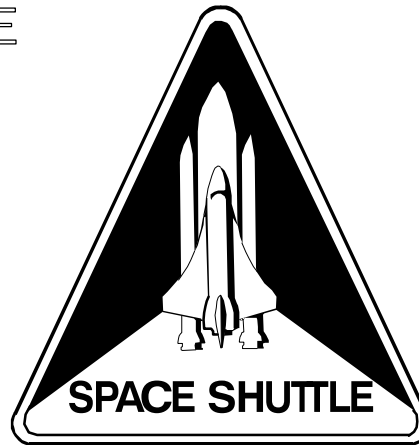
1. HAC Radius Position Uninitialized in MM304. HAC is displayed with its center located on the extended runway centerline on SPEC 50 during MM304. This is due to the HAC radius not being calculated until TAEM, after which the displayed HAC position is correct (DR 50085)
2. BFS Horizontal Situation Display Predictors Incorrect. During BFS MM304, if a roll angle of 90° or more is performed below 200K ft, the 20-, 40-, and 60-sec predictors of the horizontal situation display will indicate a turn in the opposite direction. The crew should ignore the HSD predictors when the roll angle is greater than or equal to 90° (DR B08297)

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Space Shuttle Program  
FLIGHT DATA FILE

JSC-48041  
GENERIC, REV E



**REFERENCE  
DATA**

**STS  
ALL**

Flight Cover (trim bottom to expose tabs)