

**FLIGHT DATA FILE**

# Reference Data

**Mission Operations Directorate  
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**Generic, Rev A  
January 10, 1990**

**NASA**

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REFERENCE DATA

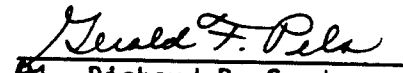
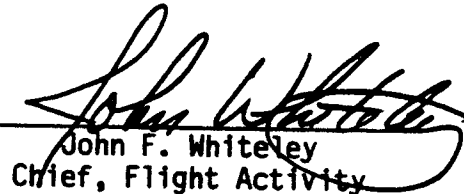
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In the input and output columns, coded notation indicates the following:

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	STR TRK -Y DOOR - A*

If MDM FF1 is lost:  
FF1 STR TRK -Y DOOR A\* contact is lost. The dual redundant contact is indicated by B\* on another MDM as shown below.

B	STR TRK -Y DOOR - B*
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MDM FF3:

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.

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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  
Cont next page

hardwired limits are not backed up by identical software limits, the value in engineering units (EU) is printed below 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 S/W 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.

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

EPDC

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

CRITICAL FUNCTIONS/EQUIP LOST

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

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			
MN A	FPC1	DEU/CRT 1 L HUD MMU 1	LG Hyd Deploy (Pyros remain)	MCIU PDI Redundancy F RCS A Htrs	
	FLC1	NWS F1 Manf Jets Bay 3 Agent Discharge WOW Relay (Brakes Enabled Early)			F RCS He P A (CL & GPC)
	FMC1	H2O Loop 1 Pump A	L Probe Mtr 1 Dply Dsc 1	-Y Star Tracker Sys 1	F RCS Tk Isol 3/4/5 Manf 1 Isol
	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 Lat,Blkhd,R Dr Mtr Redun ET Door CL,L Lat Mtr Redun L Dr Closure Mtr Redun Rad Port,Stbd Lat Dpy/Sto Mtr Redun	-Y STRK Door Mtr 1 Humidity Sep A RCS/OMS Prplt Qty RMS MRL Redun WCS Fan/Sep 1 PRLA Drive Mtr Sys 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	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	
	ΦB	Av Bay 2 Sig Condr	FCL 2 Cntrl 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	
	ΦC	Tacan 1 Blr Cntrl 3A Pwr	C ME Ch A R ME Ch B		



MN A	APCA	ATVC Ch 2 SSME/SRB Isol Cap			
	APC1	L OMS Pri TVC R OMS Sec TVC	L Manf 5 Jets 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) OMS He P/Vap Isol A (GPC) Eng vlv 1 Pos (= 0) L RCS He P B (OP)
	ALC1	Blr Cntrlr 1B,3A Pwr NWS FES Cntrlr Pri B LG Hyd Isol 1 vlv - Cntrl (tb ind-OP) Top L Noz Htr A NH3 Cntrlr Pri A (GPC) Auto sw-over C Me He Isol A Top/Hi Load Duct Htrs A	L Manf 5 Jets FES H2O Fdin A(B) Htrs 1(2) APU Fu/Tk vlv 1A,3B L,R OMS Ign Path APU GG/Fu Htrs 1A,3B	Hyd MPS/TVC Isol 1 sw L,R RCS Manf 2 Jet Htrs APU Lube Oil Htrs 1A,3B OMS Qty Gaging Hyd Circ Pump 1,3 MNA Pwr	L,R RCS He P A (CL & GPC) L OMS Eng P vlv Pos L RCS He P B (OP) L,R OMS He P/Vap ISOL A (GPC)
	AMC1		ET Door C/L L Lat Mtr Redun L Dr Closure Mtr Redun		
	014	RA 1 MLS 1 AA 1 ADTA 1 NWS Bay 3 Agent Discharge L Instr Pwr L ME Status Lts SPI	Atm O2 Sys 1 Xovr vlv P N2 Sys 1 Sply & Reg In L Probe Dply Dsc 1 FCL 1,2 Rad Flow Cntrlr B O2/N2 Cntrlr 1	PPO2 Snsr A L Ovrhd Cnsl Flood Fwd Mission Timer IMU Fan Snsr Smoke Det: L,R Flt Dk Av Bay 2A,3B -Z Star Tracker ACA 1 MNA Pwr O2/N2 Cntrlr Sys 1 Aft Event Timer Cabin Vent Isol/Vent sws	
	014 & A8				
	R15	UHF Xmit MS ATU	GCIL Cntrlr A	RMS Pri Pwr OS SMU	F1 Manf R/Ds (if sw OFF)
	A6 & A14				
	MPC1	O2 Sys 1 Sply sw (tb-CL) Top/Hi Load Duct Htrs A	FC H2O Ln & Rlf Htrs A	F RCS Jet 1 Htrs FC1 H2,O2 Flow Xdcrs RMS Pri Pwr RMS Redun MRL	
	MMC1 MMC3				

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REF/ALL/GEN A

MNB

MNB

CRITICAL EQUIPMENT LOST - MNB/AC2

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/ OTHER	OMS/RCS AFFECTED	
DA2		Cryo O2/H2 Tk 2/3/4 Htrs B Cryo O2/H2 Tk 2/3/4 Htrs A (if in AUTO)			
MN B	FPC2	DEU/CRT 2 MMU 2		F RCS B Htrs	
	FLC2	F2 Manf Jets S-Bd String 1 Bay 1 Agent Discharge cap WOW Relay (Brakes enabled early)	PL INTRG 1 PSP 1	LMG UP tb, NLG UP & DN tb	F RCS He P B (CL & GPC) A (OP)
	FMC2	H2O Loop 1 Pump B	L,R Probes Mtrs 2 Dply Dscr 2	-Y Star Tracker Sys 2 -Z Star Tracker Sys 1	F RCS Manf Isol 2
	AC2 multi	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 Lat, Blkhd, L/R Dr Mtr Redun ET Door CL L,R Lat Mtr Redun R Dr Closure Mtr Redun Bad Port. Stbd Lat Redun	RMS MPM, MRL Redun Cabin Temp Cntrl Sys 1 Humidity Sep B PRLA Drive Mtr Sys 2 WCS Fan/Sep 2 -Y STRK Door Mtr 2 -Z STRK Door Mtr 1 L,R Seat AC2 Pwr	L,R OMS Xfeed B L,R RCS Tk Isol 3/4/5 B Manf Isol 1 F RCS Manf Isol 2
	φA	Blr Cntrl 1A Pwr LG Prox Snsr 2	L ME Ch A C ME Ch B	LMG & NLG UP & DN tb FC 2 pH Snsr Cabin Temp Cntrl Sys 1	
	φB	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	
	φC	Tacan 2 Blr Cntrl 2B Pwr	L ME Ch A C ME Ch B		
	MLB6B		RMS Jet Redun	L,R Seat AC2 Pwr	

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MN B	APCS	RGA 2 ATVC Ch 3 SSME/SRB Isol Cap			
	APC2	L OMS Sec TVC ATVC Ch 4 SSME/SRB Isol Cap ASA Ch 4 Isol Cap	APU GG/Fu Htrs 1B,2A R Manf 5 Jets	APU GG Inj H2O Htr 1B Aft PL MNB Bus Pwr RCS/OMS Htrs R Pod A, Xfeed Lines B	L OMS He P/Vap Isol B (GPC) R OMS He P/Vap Isol A,B (OP) L,R RCS He P A (OP) R RCS He P B (CL & GPC) L OMS Eng vlv 2 Pos (=0)
	ALC2	Blr Cntrl 2B,1A Pwr Sec Flash Evap Cntrl Top L Noz Htr B R Noz Htr A LG Hyd Isol 2 vlv - Cntl (tb ind - OP) 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 R Manf 5 Jets APU GG/Fu Htrs 1B,2A	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 2 sw	L OMS He P/Vap Isol B (CL & GPC) L,R RCS He P A (OP) R RCS He P B (CL & GPC)
	AMC2		ET Door C/L L,R Lat Mtr Redun R Dr Closure Mtr Redun		
	O15	RA 2 MLS 2 AA 2 ADTA 2 Bay 1 Agent Disch Cap R Inst Pwr C,R ME Status Lts	FCL 1,2 Rad Flow Cntrl A Atm O2 Sys 2 Xovr vlv Atm P N2 Sys 2 Sply & Reg In sw	PPO2 Snsr B,C Fwd Event Timer L Seat/Ctr Cnsl Flood R Ovhd Cnsl Flood Av Bay Smoke Det 1B,3A -Y Star Tracker ACA 1,2,3 MNB Pwr dP/dT Snsr O2/N2 Cntrl Sys 2 Cabin Relief A sw	
	O15&A8			RMS BU Pwr	F2 Manf RJDs (if sw-OFF)
	R15	KU-A System (Comm & Radar)			
	A6&A14			F RCS Jet 2,3 Htrs	
	MPC2	O2 Sys 2 Sply sw (tb-CL) Top/Hi Load Duct Htrs B KU-A System (Comm & Radar)		FC2 H2,O2 Flow Xdcrs RMS BU Pwr	
	MMC2 MMC4			RMS Redun MPM,MRL	

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REF/ALL/GEN A

MNC

MNC

**CRITICAL EQUIPMENT LOST - MNC/AC3**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/ OTHER	OMS/RCS AFFECTED	
DA3		Cryo O2/H2 Tk 1 Htrs B 2,4 Htrs A Cryo O2/H2 Tk 1 Htrs A (if in AUTO)	PR IPL Bus MNC Pwr		
MNC	FPC3	DEU/CRT 3/4 R HUD	PDI Redun K-Bd Sys (Comm & Radar)		
	FLC3	F4/F5 Manf Jets S-Bd String 2 Bay 2 Agent Disch cap WOW Relay (Brakes enabled early)	PL INTRG 2 PSP 2	F RCS He P B (OP) Manf Isol 5 & TM (Jets Lost)	
	FMC3		R Probe Mtr 1 Dply Dsc 1	F RCS Tk Isol 1/2 Manf Isol 3/4 4 TM	
	AC3 multi	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 Lat, Blkhd, L Dr Mtr Redun ET Door C/L,R Lat Mtr Redun 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 STRK Door Mtr 2	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
	ΦA	Blr Cntrl 2A Pwr LG Prox Snsr 1 COAS	L ME Ch B R ME Ch A	NLG UP tb RMG UP & DN tb H2O Loop 1 Instr Byp Cntrl Hum Sep S/C FC 3 pH Snsr	
	ΦB	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	
	ΦC	Tacan 3 Blr Cntrl 3B Pwr	L ME Ch B R ME Ch A		
	ML86B		RMS Jett Redun	L,R Seat AC3 Pwr	

MNC	APC6	ATVC Ch 1 SSME/SRB Isol CAD		Freon Loops 1,2 Cldplate Flow Xdcrs	
	APC3	R OMS Pri TVC	APU GG/Fu Htrs 2B,3A	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 (OP) R OMS He P/Vap Isol B (GPC) R RCS He P B (OP) R OMS Eng vlv 2 Pos (=0) L RCS He P B (CL & GPC) L,R RCS Manf Isol 5
	ALC3	Blr Cntlr 2A,3B Pwr R ME He Isol A Flash Evap Cntlr Pri A Top R Noz Htr B	FES H2O Fdln B Htrs 1 (ex mid 2) APU Fu/Tk vlv 2B,3A APU GG/Fu Htrs 2B,3A R OMS Ignition Path	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 LG Hyd Isol 3 vlv & tb Hyd MPS/TVC Isol 3 sw NH3 Cntlr B Pri Sec auto sw-over NH3 Cntlr A Sec - man sel	R OMS He P/Vap Isol B (CL & GPC) L RCS He P B sw (CL & GPC) R OMS Eng P vlv Pos R RCS He P B sw (OP) L,R RCS Manf Isol 5
	AMC3		ET Door CL, R Lat Mtr Redun L,R Dr Closure Mtr Redun		
	O16	MLS 3 ADTA 3,4 Bay 2 Agent Disch cap Atm P Cntlr O2 Emer sw		Smoke Det: Cabin Av Bay 1A,2B R Seat/Ctr Cnsl Flood Cabin Relief B sw OMS/RCS Qty Gaging ACA 2,3 MNC Pwr Aft Mission Timer	
	O16RJD				F4 Manf RJDs (if F3 & F4/S sw OFF)
	A6 & A14			F RCS Jet 4/5 Htrs Audio Center 2 Ku-A Sig Proc (Comm)	
	R15		GCIL Cntlr B		
	MPC3	RGA 3	FC H2O Ln & Rlf Htrs B	FC3 H2, O2 Flow Xdcrs RMS MPM, MRL Redun	
	MMC2 MMC4				

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REF/ALL/GEN A

CNTL

**CNTL**

**CRITICAL EQUIPMENT LOST - CONTROL BUS AB**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/ OTHER	OMS/RCS AFFECTED
CNTL AB1	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 LRHC Trim Body Flap	L Probe Mtr 1 FC H2O Ln & Rif Htrs A L OMS Ignition Path APU GG/Fu Htrs 1A,3B	APU Lube Oil Htrs 1A FES H2O FdIn 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 APU 1 Fu Qty (= H2O Qty) NWS Fail Indication Atm P Cntrl O2 Sys 1 Sply *****man sw cap***** FC1 STOP & Reac vlvs Cryo O2/H2 Manf vlv Tk 1 L ADI Att Ref Set cap LG Hyd Isol 1 Hyd MPS/TVC Isol 1 *****man ON cap***** NH3 Cntrl A sec-man sel Cryo O2/H2 Tk 1 Htr B 3 Htr A	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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<p>CNTL AB2</p>	<p>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 CME Shutdown pb</p>	<p>L Probe Mtr 1 APU GG/Fu Htrs 1A,3B L OMS Ignition Path</p>	<p>Hyd Circ Pmp 1 MNA Pwr FES H2O Fidn Htrs 1A RCS/OMS Htrs L Pod A F RCS A APU GG Inj H2O HTRS 1A  *****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  *****man ON cap***** NH3 Cntrl B sec-man sel</p>	<p>*****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 ovrd) R RCS He P A  ****man OP &amp; CL cap*** R RCS Tk Isol 3/4/5 A  *man OP,CL, &amp; GPC cap* L,F RCS He P A</p>
<p>CNTL AB3</p>	<p>COMSEC 2 NWS 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</p>	<p>LG Hyd Deploy (Pyros remain) L Probe Mtr 1 Dply Dsc 1 APU GG/Fu Pmp Htrs 1B Tk Fu Ln Htrs 1A,3B</p>	<p>Hyd Circ Pmp 1 MNB Pwr APU GG Inj H2O Htrs 3B Lube Oil Htrs 1B RMS MRL Redun RCS/OMS Htrs Xfeed Ln A All Pnl C3 Man Mode pbs (18)</p>	<p>F RCS Tk Isol 3/4/5 Manf Isol 1  *man OP,CL, &amp; GPC cap* R RCS He P A</p>

**CRITICAL EQUIPMENT LOST - CONTROL BUS BC**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/ OTHER	OMS/RCS AFFECTED
CNTL BC1	R HUD RGA 2 S-Bd String 1 Top L Noz Htr A L RHC Trim Body Flap Top/Hi Load Duct Htrs B Blr Cntrl 2B Pwr	PSP 1 PL INTGR 1 F,L,R Manf 5 Jets L,R Probe Mtrs 2 APU GG/Fu Htrs 2A,1B FC H2O Ln & Rif Htrs B	APU Lube Oil Htrs 2A 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  *****man sw cap***** LG Hyd Isol 2 Hyd MPS/TVC Isol 2 Cryo O2/H2 Manf vlv Tk 2 Tk 2,4 Htrs Atm P Cntl O2 Sys 2 Sply 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

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<b>CNTL BC2</b>	DEU/CRT 2 S-Bd String 2 Blr Cntrl 2B Pwr R RHC 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)	PSP 2 PL INTRG 2 F,L,R Manf 5 Jets L,R Probe Mtrs 2 APU GG/Fu Htrs 2A,1B	Hyd Circ Pmp 2 MNB Pwr RCS/OMS Htrs L Pod B R Pod A F RCS B APU GG Inj H2O Htrs 1B,2B APU 2 Fu Qty (reads H2O) FES H2O Fdln A Htrs 2 PDI Redun RMS MPM,MRL Redun NH3 Cntrl B Pri Sec auto sw-over Cryo O2/H2 Tk 2/4 Htrs A All Pnl A6 Man Mode pbs(18)  *****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
<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 Dply Dsc 2	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 Sec auto sw-over  *****man ON cap***** Cryo O2/H2 Tk 2,4 Htr B	F4/5 Manf RJDs (if sw OFF) F RCS Manf Isol 2

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**CRITICAL EQUIPMENT LOST - CONTROL BUS CA**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/ OTHER	OMS/RCS AFFECTED
CNTL CA1	DEU/CRT 3 RGA 3 NWS Blr Cntrl 3B Pwr Top R Noz Htr B Top Evap Duct Htrs B 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	LG Hyd Deploy (Pyros remain) R Probe Mtr 1 APU GG/Fu Htrs 3A,2B R OMS Ignition Path	Freon Loops 1,2 Coldplt Flw Xdcrs APU Lube Oil Htrs 3A RMS MRL Redun FES H2O Fdlin Htrs B2 Hyd Circ Pmp 2,3 MNC Pwr RCS/OMS Htrs R Pod B L,R RCS Manf 3 Jet Htrs  *****man sw cap***** FC3 STOP, Reac vlvs A ADI Att Ref Set cap LG Hyd Isol 3 Hyd MPS/TVC Isol 3  *****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

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<b>CNTL CA2</b>	DEU/CRT 4 Blr Cntrl 3B Pwr R RHC Trim Body Flap F3 Manf Jets L ME Shutdown pb FES Cntrl Pri A if sw ON	R Probe Mtr 1 APU GG/Fu Htrs 3A,2B R OMS Ignition Path	APU GG Inj H2O Htr 3A,2B 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  *****man sw cap***** FC3 STOP, Reac vlvs  *****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>	NWS F4 Manf Jets Blr Cntrl 2A,3A Pwr Auto PLBD OPS R ME Shutdown pb	LG Hyd Deploy (Pyros remain) R Probe Mtr 1 Dply Dsc 1 APU GG/Fu Pmp Htrs 3B Tk Fu Ln Htrs 3A,3B	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	F RCS Tk Isol 1/2 Manf Isol 3/4  ***man OP & CL cap*** R RCS Manf Isol 5

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**ESS**

**CRITICAL EQUIPMENT LOST - ESS BUSES**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/ OTHER	OMS/RCS AFFECTED	
ESS 1BC	DA1				
	MPC1	FC1 Cntrl (FC1 Pumps)		FC1/MNA & MNA Bus Tie tb *****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)		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 & R15	CDRs ATU & Hdst All CW Annun Its (F7)	CW Sys A Pwr Sply: Pni Its/functions (R13) Pri CW 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 Girshld Flood	
	ML86B		Cryo O2(H2) Tk 3,4 Htrs AUTO	Cryo O2/H2 Tk 4 Qty Xdcr	

**CRITICAL EQUIPMENT LOST - ESS BUSES**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/ OTHER	OMS/RCS AFFECTED
ESS 2CA	DA2		FC2/MNB & MNB Bus Tie tb	
	MPC2	FC2 Cntrl (FC2 Pumps)	*****switches lost***** Cryo O2/H2 Manf vlv Tk 2 FC2 Reac vlvs (and tb)	
	FP & LC2		*****switches lost***** Inv Pwr 2 (tb lost)	
	FD	FC2 Cntrl (FC2 Pumps)	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	
	O13 & R15	PLTs ATU & Hdst Audio Center 1	CW Sys B Pwr Sply: B/U CW alarm annun lt - 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 Girshld Flood

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**CRITICAL EQUIPMENT LOST - ESS BUSES**

BUS LOST	CRITICAL FUNCTIONS/ EQUIPMENT LOST	CRITICAL REDUNDANCY LOST	INSTRUMENTATION/ OTHER	OMS/RCS AFFECTED	
2 2 ESS 3AB	DA3		FC3/MNC & MNC Bus Tie tb MNC/PRI PL tbs		
	MPC3	FC3 Cntlr (FC3 Pumps)	*****switches lost***** FC3 Reac vlvs (and tb)		
	FP & LC3		*****switches lost***** Inv Pwr 3 (tb lost)		
	FD	FC3 Cntlr (FC3 Pumps) BFS Engage cap		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	
	O13	CAM Status Matrix	Cryo O2(H2) Tk 3,4 Htrs AUTO	AC3 Bus Snsr	
	ML86B			Cryo O2/H2 Tk 3 Qty Xdcr	

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MDM

FF1/FA1

FF1				
BCE	GPC INPUT		BCE	GPC INPUT
A	FRCS OX He P TKT & P(QTY) - A* MANF 1 P		ADTA	ADTA 1
	IMU 1 STATUS		IMU	IMU 1
	PNL F6 DISP SWs (eight)		MLS	MLS 1
			MTU	MTU ACCUM 1
			NSP	NSP 1
			STKR	-Z S TRK
			TAC	TACAN 1
				RADAR ALT 1
B	AA 1		GPC OUTPUT	
	FRCS MANF 1 JET RM		AA TEST	
	JETs (OPS 1 & 6)		ADTA 1 TEST	
	L ADS DEPLOY DISC - A*		FRCS He PRESS VLV A	
			MANF 1 JETS	
	CNTLRs/PBIs/SWs:		IMU 1	
	AFT DAP CNTL - 3*		L OMS GMBL-PRI SEL	
	RHC - 1*		MLS 1 TEST	
	SENSE - 1*		MTU UPDATE - 1*	
	THC - 1*		NWS ENA (GPC/DIRECT MODES)	
	FCS CH 1 ORIDE - 2*		RADAR ALT 1 TEST	
	3 ORIDE - 2*		TACAN 1	
	4 ORIDE - 3*		-Z S TRK	
	ENTRY MODE - 1*		DISPLAYS:	
	FWD DAP AXES - A*		CW: L RCS (LK/TK P)	
	CNTL - 1*		FWD DAP LIGHTS	
	THC - 1*		L FCS MODE LIGHTS	
	L ATT REF		BDY FLP AUTO	
	BDY FLP - A*		P & RY AUTO	
	FCS MODE - 1*		SPD BRK AUTO	
	PNL TRIM - A*		RCS COMMAND LIGHTS - A*	
	RHC - 1*		FWD, L, R RCS OXID QTY	
	TRIM INH - A*		FWD, L RCS LOWEST QTY	
	TRIM - A*		SPI: ELEVON POS	
	RUD PEDAL - 1*		SPD BRK POS	
	SBTC - 1*		CMD	
	MAN - 1*		RUD POS	
	MSTR RCS XFEED - 1*		OFF FLAG	
	SEP, ET & SRB - 1*			
	NWS POS FDBK - 1*			

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

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FA1	
BCE	GPC INPUT
C	LOMS T & P L RCS He P T & P (QTY) L, R RCS MANF 1 P ROMS OX TK P
D	FCS CH 1 FDBK FCS CH 1 BYB IND HYD 1 P - 1* 2 P - 2* LOMS GMBL PRI ARM - B* ARM/PRESS - B* L RCS MANF 5 JET RM VLV STATUS L, R RCS MANF 1 JET RM JETS (OPS 1 & 6) RGA 1
GPC OUTPUT	
	BDY FLP - 1* FCS CH 1 CMD LG HYD ISOL VLV 1 LOMS 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 or B indicates dual redundancy;  
1, 2, 3, or 4 indicates triple or quad redundancy

FF2/FA2

FF2				
BCE	GPC INPUT		BCE	GPC INPUT
A	F RCS HE TK T & P MANF 2 P IMU 2 STATUS PNL F8 DISP SWs (eight)	-B*	ADTA IMU MLS MTU TAC	ADTA 2 IMU 2 MLS 2 MTU ACCUM 2 TACAN 2 RADAR ALT 2
B	AA 2 F RCS MANF 2 JET RM JETs (OPS 1 & 6) L ADS DEPLOY DISC		GPC OUTPUT	
	CNTLrs/PBIs/SWs: AFT SENSE -2* RHC (PITCH, YAW) -2* THC -2* 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* 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 STATUS -2* NWS POS FDBK -2*		AA 2 TEST ADTA 2 TEST F RCS MANF 2 JETs IMU 2 LOMS GMBL SEC SEL MLS 2 TEST MTU UPDATE -2* NWS (GPC MODE ONLY) RADAR ALT 2 TEST TACAN 2  DISPLAYS: L FCS MODE LIGHTS: BDY FLP MAN P & R/Y CSS SPD BRK MAN SPI: AILERON POS BDY FLP POS	

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

FA2		
BCE	GPC INPUT	
C	L, R RCS MANF 3 P ROMS AFT QTYS T & P RCS T & P (QTY) LOMS OX TK P	
D	FCS CH 2 FDBK BYP IND HYD 1 P 2 P LOMS GMBL SEC L,R RCS MANF 3 JET RM JETs (OPS 1 & 6) RGA 2 ROMS ARM ARM/PRESS RCS MANF 5 VLV (JET RM)	-2* -1*      -B* -B*
-	HYD 3P	-3*
GPC OUTPUT		
	BDY FLP FCS CH 2 CMD LG HYD ISOL VLV 2 LOMS CNTL VLV 2 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 ROMS CNTL VLV 2 RGA 2 - TEST	-2*   -B*         -B*

FF3/FA3

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

FF3/FA3

FF3			
BCE	GPC INPUT	BCE	GPC INPUT
A	F RCS TK T & P (QTY) - 8* MANF 4 P 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 STR TRK TACAN 3 RNDZ RADAR
B	AA 3 F RCS MANF 4 JET RM JETs (OPS 1 & 6) 5 JET RM VLV STATUS R ADS DEPLOY DISC - A*  CNTLRs/PBIs/SWs: AFT ATT REF DAP AXES - 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* RHC - 3* RUD PEDAL - 3* SBTC - 3* MAN - 3* R BDY FLP - A* FCS MODE - 2* PNL TRIM - A* RHC - 2* TRIM INH - A* TRIM - A* RUD PEDAL - 2* SBTC - 2* MAN - 2* MSTR RCS XFEED - 3* SEP ET & SRB - 3* NWS STATUS - 3*		GPC OUTPUT 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* ROMS GMBL SEC SEL TACAN 3 -Y STR TRK  DISPLAYS: AFT DAP LIGHTS CW: ADTA FCS CH SAT FWD RCS (LK/TK P) R RCS (LK/TK P) IMU LOMS ENG RHC OMS TVC RCS JET RGA/AA R OMS ENG RHC FWD, L,R RCS FU QTY R RCS LOWEST QTY - B* RCS CMD LTS - B* R FCS MODE LIGHTS BDY FLP AUTO P & R/Y AUTO SPD BRK AUTO

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

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FA3	
BCE	GPC INPUT
C	L OMS ENG VLVs FU INLET P He TK P PC (FDI) L, R RCS MANF 2 P L RCS T & P (BFS QTY) - B* L OMS AFT QTYS
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 JETs (OPS 1 & 6) R OMS GMBL SEC RGA 3
GPC OUTPUT	
	BDY FLP - 3* FCS CH 3 CMD LG HYD ISOL VLV 3 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 & OUTPUT columns, A or B indicates dual redundancy;  
 1, 2, 3, or 4 indicates triple or quad redundancy

FF4/FA4

FF4				
BCE	GPC INPUT		BCE	GPC INPUT
A	F RCS TKT & P (QTY) - A* MANF 3 P		ADTA	ADTA 4
B	AA 4 F RCS MANF 3 JET RM JETs (OPS 1 & 6) R ADS DEPLOY DISC - 8*		GPC OUTPUT	
	CNTLRs/PBIs/SWs: AFT DAP AXES - 8* CNTL - 2* RHC (ROLL) - 2* FCS CH 2 ORIDE - 3* 3 ORIDE - 1* 4 ORIDE - 1* ENTRY MODE - 4* R BDY FLP - 8* FCS MODE - 3* PNL TRIM - 8* RHC - 3* TRIM INH - 8* TRIM - 8* RUD PEDAL - 3* SBTC - 3* MAN - 3* SEP ET & SRB - 2* NWS POS FDBK - 3* STATUS - 2*		AA 4 TEST ADTA 4 TEST F RCS MANF 3 JETs R OMS GMBL PRI SEL  DISPLAYS: R RCS MODE LIGHTS: BDY FLP MAN P & R/Y CSS SPD BRK MAN NWS FAIL LIGHT in GPC MODE	

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

FA4	
BCE	GPC INPUT
C	ROMS ENG VLVs FU IN P He TK P PC (FDI) L, R RCS MANF 4 P R RCS T & P (BFS QTY)      - B*
D	FCS CH 4 FDBK BYP IND HYD 1 P                      - 3* 3 P                        - 2* L, R RCS MANF 4 JET RM JETs (OPS 1 & 6) ROMS ARM                    - A* ARM/PRESS               - A* GMBL PRI N2 P VLV POS IND RGA 4
GPC OUTPUT	
	FCS CH 4 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* ROMS CNTL VLV 2            - A* GMBL PRI He P/VAP ISOL B PURGE VLV 2 RGA 4 - TEST

PL1/PL2

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

PL1/PL2

PL1		
BCE	GPC INPUT	
PL	PLBD CTRLINE LATs	- A (13-16 B)
	DOOR SW	- 2,3
	L AFT BHD RDY TO LAT	- 1,2
	LAT	- A
	FWD BHD RDY TO LAT	- 1,2
	LAT	- A
	OP/CL	- B
	R AFT BHD RDY TO LAT	- 1
	LAT	- B
	FWD BHD RDY TO LAT	- 1
	LAT	- A
	OP/CL	- A
	KU	KU-A COMM
GPC OUTPUT		
	FLASH EVAP CNTLR PRI B	
	FREON PUMP LOOP 2 B (Auto Switch, OPS 1)	
	FC1 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*
	OP/CL	- B*
	R BHD FWD & AFT BHD LATs	- A*
	OP/CL	- A*
	PL RCDR	
	S-BD FM ANT SW ELECT 1	
	PM ANT SW ELECT 1	
	PSP 1	
	CIE 1	
	KU-A COMM/RDR	
	DISPLAYS:	
	ABORT LIGHT	- A*
	PL BAY DOORS tb	- A*

\* 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 CTRLINE LATs - B (13-16 A)
	DOOR SW - 1,4
	L AFT BHD RDY TO LAT - 3
	LAT - B
	FWD BHD RDY TO LAT - 3
	LAT - B
	OP/CL - A
	RAFT BHD RDY TO LAT - 2,3
	LAT - A
	FWD BHD RDY TO LAT - 2,3
	LAT - B
	OP/CL - B
GPC OUTPUT	
	CCTV UPLINK COMMAND
	FLASH EVAP CNTLR PRI A
	SEC
	FREON PUMP LOOP 1 B (Auto Switch, OPS 1)
	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*
	OP/CL - A*
	R BHD FWD & AFT BHD LATs - B*
	OP/CL - B*
	S-BD FM ANT SW ELECT 2
	PM ANT SW ELECT 2
	PSP 2
	CIE 2
	DISPLAYS:
	ABORT LIGHT - B*
	APU FUEL QTY
	H2O QTY
	L & R BFC LIGHT
	PL BAY DOORS tb - B*

**OIDSC  
LOSS**

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

# 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 are the result of the failure of an OI DSC.

A failure of DSC OM 3 will result in four simultaneous messages.

S69 FUEL CELL  
S69 FUEL CELL H2O  
S88 FU TK VLV APU  
S88 THERMAL APU

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

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2-15

REF/ALL/GEN A

1 2 3 4 5  
 12345678901234567890123456789012345678901

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					
4	CABIN	OF1		DC VOLTS	1/A	2/B	3/C	
5	L/RFD	OF3	OF2	FC	OM1	OM2	OM2	
6	AVBAY 1	OF2	OF3	MAIN	OM2	OM2	OM1	
7	2	OF1	OF3	CNTL AB	OF1	OF1	OF1	
8	3	OF1	OF2	BC	OF2	OF2	OF2	
9	CABIN			CA	OF3	OF3	OF3	
10	PRESS	OF2		ESS	OM2	OM2	OM1	
1	4P/4T	OF3		AC				
2				VOLT	♦A	OF1	OF2	OF3
3	PP02	OF1	OF2	♦B	OF1	OF2	OF3	
4	FAN ΔP	OF1		♦C	OF1	OF2	OF3	
5	HX OUT T	OF1		AMPS	♦A	XX.XS	XX.XS	XX.XS
6	O2 FLOW	OF1	OF2	♦B	XX.XS	XX.XS	XX.XS	
7	N2 FLOW	OF1	OF2	♦C	XX.XS	XX.XS	XX.XS	
8	INU FAN	AXS	BXS	CXS	FUEL CELL			
9	ΔV FC1	FC2	FC3	AMPS	OM1	OM1	OM1	
20	SS1	XXXS	XXXS	XXXS	REAC VLV	XXS	XXS	XXS
1	SS2	XXXS	XXXS	XXXS	STACK T	OM1	OM2	OM2
2	SS3	XXXS	XXXS	XXXS	EXIT T	OM1	OM2	OM2
3	TOTAL AMPS	XXXXS			COOL P	OM1	OM2	OM2
4		KW	XXS		PUMP	XXS	XXS	XXS

\*L\* suggests loss of Dedicated Signal Conditioner

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2-16

REF/ALL/GEN A

	1			2			3			4			5		
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
1	XXXX/XXX/079														
2	SM SYS SUMM 2 XX X														
3	DDD/HH:MM:SS														
4	DDD/HH:MM:SS														
5	CRYO TK 1 2 3 4 5														
6	H2 PRESS XXXS XXXS XXXS XXXS														
7	O2 PRESS XXXXS XXXXS XXXXS XXXXS														
8	HTR T1 OM1 OM1 OM1 OM2 OF2														
9	T2 OM2 OM2 OF3 OF3 OF3														
10	APU 1 2 3														
1	TEMP EGT	OA1	OA2	OA3	HYD	1	2	3							
2	B/U EGT	OA2	OA3	OA1	PRESS	OA2	OA1	OA3							
3	OIL IN	OA1	OA2	OA3	RSVR T	OA1	OA2	OA3							
4	OIL OUT	OA2	OA3	OA1	QTY	OA1	OA2	OA3							
5	SPEED X	OA1	OA2	OA3	W/B										
6	FUEL QTY	XXS	XXS	XXS	H2O QTY	XXXS	XXXS	XXXS							
7	PMP LK P	OM2	OM2	OM2	BYP VLV	XXXS	XXXS	XXXS							
8	OIL OUT P	OA1	OA2	OA3	THERM CNTL										
9	AV BAY														
20	H2O PUMP P 1 2														
1	TEMP	OF2	OF3	OF1	FREON FLOW	OF2	OF3	OF3							
2	FAN ΔP	XXS	XXS	XXS	EVAP OUT T	OA2	OA3	OA3							
3															
4															
5															
6	(XX)														

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

1	XXXX/XXX/080	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		
1		2 OL2	OR2		
2	Y	OB OL2	OR2	BLD AFT FUS	OA3 OA3
3		UP OL1	OR1	PL BAY	OM1 OM2
4	OX DRN PNL	1 OL1	OR1		
5		2 OL1	OR1	FWD RCS	FU OX
6	ENG COVER	OM1	OM2	LINE	T1 OF2 OF4
7	SERV PNL	OL2	OR2		T2 OF4 OF2
8	GSE SERV PNL	OL2	OR2		
9	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					(XX)

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2-17

REF/ALL/GEN A

1 2 3 4 5  
 12345678001234567800123456780012345678001234567800123

XXXX/XXX/010		GNC SYS SUMM 2				XX X DDD/MM:MM:SS			
						BFS DDD/MM:MM:SS			
OMS	AFT	QTY	L	R	OMS	L	R		
		OXID XX.XS XX.XS				TK P HE		OL2	OR1
		FU XX.XS XX.XS				OXID		OA2/OL2	OA1/OR2
		FU INJ T		OL1	OR1	FU		OL1	OR1
						H2 TK P		OL1	OR1
						REG P		OL1	OR1
						P VLV		XXS	XXS
						ENG IN P			
						OXID		OL1	OR1
						FU		OL2	OR2
						VLV 1		XXXS	XXXS
						2		XXXS	XXXS
RCS		OXID		FU	JET	ISOL			
	FWD	HE P	OF4	OF2	FAIL	VLV			
		TK P	OF4	OF2					
		QTY	OF2/OF4	OF2/OF3/OF4					
	MANF	1 P	OF4	OF4	XXX	XXS			
		2 P	OF4	OF4	XXX	XXS			
		3 P	OF2	OF2	XXX	XXS			
		4 P	OF2	OF2	XXX	XXS			
		5			XXX	XXS			
	AFT	HE P	OL2	OL1			HE P	OR2	OR1
	L	TK P	OL1	OA1/OL2			TK P	OR1	OA2/OR2
		QTY	OL1/OL2	OL1/OL2			QTY	OR1/OR2	OR1/OR2
	MANF	1 P	OL1	OL1	XXX	XXS	1 P	OR1	OA1/OR1
		2 P	OL1	OL1	XXX	XXS	2 P	OR1	OA2/OR1
		3 P	OL2	OA2/OL2	XXX	XXS	3 P	OR2	OA2/OR2
		4 P	OL2	OA1/OA2	XXX	XXS	4 P	OR2	OR2
		5			XXX	XXS	5		
							6		
								XXX	XXS

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2-18

REF/ALL/GEN A

FAULT MESSAGES

3-1

REF/ALL/GEN A

FAULT  
MSG

# FAULT MSG

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
S67 ACOVLD SM1	1(2,3)	S2,4 SM	<ul style="list-style-type: none"> <li>• ACOVLD ↓</li> </ul>	
S67 AC VOLTS SM1	1(2,3)	S2,4 SM	<ul style="list-style-type: none"> <li>• AC VOLTS ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>• ANY PHASE</li> </ul>
AERO DRIVE		G8	<ul style="list-style-type: none"> <li>• SURFACE CMD/POS MISCOMPARE (I LOAD)</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• THRESHOLDS: ELEV = 5.8° RUD = 5.5° S/B = 10.9°</li> </ul>
ANTENNA		S2,4	<ul style="list-style-type: none"> <li>• QUAD ANT FAIL ↓</li> </ul>	<ul style="list-style-type: none"> <li>• MSG ONLY DURING AOS - CORRECTIVE ACTION BY MCC</li> </ul>
SM2 APU 1(2,3)		SM	<ul style="list-style-type: none"> <li>• FU QTY ↓ APU OIL OUT T ↑↓</li> <li>• PUMP LK PRESS ↑</li> </ul>	
S86 APU/HYD	APU	S2,4	<ul style="list-style-type: none"> <li>• FU QTY ↓ FU TK P ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
			<ul style="list-style-type: none"> <li>• GG BED T ↓↑</li> </ul>	
			<ul style="list-style-type: none"> <li>• GBX P ↓</li> </ul>	
			<ul style="list-style-type: none"> <li>• OIL OUT T ↑↓</li> </ul>	
			<ul style="list-style-type: none"> <li>• OIL OUT P ↑↓</li> </ul>	
			<ul style="list-style-type: none"> <li>• FU PMP BDY T ↑</li> <li>• FU VLV T ↑</li> <li>• GBX BRG T ↑</li> </ul>	

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MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
S86 APU/HYD	HYD	S2,4		<ul style="list-style-type: none"> <li>• RSVR T ↑↓</li> <li>• RSVR P ↓</li> <li>• RSVR QTY ↑↓</li> <li>• ACCUM P ↓</li> </ul>	
	W/B	S2,4		<ul style="list-style-type: none"> <li>• REG P ↑↓</li> <li>• N2 P ↓</li> <li>• H2O QTY ↓</li> <li>• TK T ↓</li> <li>• BLRT ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>• IF (R2) BLR CNTLR HTR B, CK SM DISP 218 FOR TK T STATUS</li> </ul>
SM2 APU SPD HI	1(2,3)		SM	• TURBINE OVERSPEED	• NO MAL
SM2 APU SPD LO	1(2,3)		SM	• TURBINE UNDERSPEED	• NO MAL
S86 APU TEMP SM2	1(2,3)	S2,4	SM	<ul style="list-style-type: none"> <li>• BACKUP EGT ↑</li> <li>• OIL TEMP ↑↓</li> </ul>	
S66 AV BAY SM2	FAN TEMP	S2,4	SM	• AV BAY FAN ΔP ↑↓	
		S2,4	SM	• AV BAY FAN AIR OUT T ↑	

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B

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
S62 BCE BYP	OA	S2,4	● OA1, OA2, or OA3 MDM or MDM CARD FAIL	● MSG OCCURS at SM OPS TRANSITION if PDI POWER OFF ● MSG OCCURS at SM OPS TRANSITION if PDI POWER OFF or if SPACELAB and SSC or EXC POWER OFF
	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	
	PL	S2,4	● PDI SSC or EXC INTERFACE to PCMMU FAIL	
	PSP 1(2)	S2,4	● PSP 1(2) to PL 1(2) MDM SERIAL I/O FAIL	
BCE BYP FLEX		S2,4	● BCE BYPASS ON FLEX/FLEX PAIR	
BCE BYP KU		S2,4	● PL 1 KU COMM/RADAR S10 FAIL	● RADAR: GPC MODE NOT VALID UNLESS TRACKING, AUTO-TRACK MODE is VALID ● NO MAL
BCE BYP PL1(2)		S2,4	● BCE BYPASS on PL BUSES	
BCE BYP SCA		S2,4	● BCE BYPASS on SCA	

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MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
BCE STRG 1	A	G1,2,3, 6,8	G0,1,2, 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>
	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		
	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 1</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 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				
	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				
	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				
	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 ALSO 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>

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SH

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
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		
	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		
	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		

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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			G0,1,3,6	<ul style="list-style-type: none"> <li>PRESSURE &gt; 180 PSI IN BRAKES DRIVEN BY HYDRAULIC SYSTEM 1/3</li> <li>PRESSURE &gt; 180 PSI IN BRAKES DRIVEN BY HYDRAULIC SYSTEM 2/3</li> </ul>	
SM0 BRAKE P 2/3			G0,1,3,6		

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
S66 CABIN	S2,4		<ul style="list-style-type: none"> <li>• EMER O2 QTY REG P</li> <li>• H2O TK N2 P ↓</li> <li>• O2 REG P ↑</li> <li>• N2 REG P ↑↓</li> <li>• CAB T ↑</li> <li>• HUMID SEP ↓(SPEED)</li> <li>• N2 SPLY QTY ↓</li> <li>• AIRLOCK P ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>• EMER O2 MSG ONLY WHEN EMER O2 TK MANIFESTED</li> </ul>	
S66 CABIN or SM1 CABIN				<ul style="list-style-type: none"> <li>• ΔP AIRLOCK TO AMB (PL)</li> </ul>	
	O2	S2,4	SM	<ul style="list-style-type: none"> <li>• O2 FLOW ↑</li> </ul>	<ul style="list-style-type: none"> <li>• A,E PKT CL - CAB P LK</li> </ul>
	PCO2	S2,4		<ul style="list-style-type: none"> <li>• PCO2 ↑</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
	PRES	S2,4	SM	<ul style="list-style-type: none"> <li>• CAB P ↓↑</li> </ul>	
	PPO2	S2,4	SM	<ul style="list-style-type: none"> <li>• PPO2 ↓↑</li> </ul>	
	N2	S2,4	SM	<ul style="list-style-type: none"> <li>• N2 FLOW ↑</li> </ul>	<ul style="list-style-type: none"> <li>• A,E PKT CL - CAB P LK</li> </ul>
	FAN	S2,4	SM	<ul style="list-style-type: none"> <li>• FAN ΔP ↓↑</li> </ul>	
	HX T	S2,4		<ul style="list-style-type: none"> <li>• CAB HX OUT T</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL - LIMITS OSL AND OSH</li> </ul>
IMU	S2,4	SM	<ul style="list-style-type: none"> <li>• CAB IMU ↓↑</li> </ul>	<ul style="list-style-type: none"> <li>• IMU FAN ΔP (PASS ONLY)/SPEED (PASS AND BFS)</li> </ul>	
S60 CHECKPT FAIL	S2,4		<ul style="list-style-type: none"> <li>• SM CHECKPOINT FAILED ON WRITE OR RESTORE DUE TO AN I/O FAILURE BETWEEN THE GPC AND MMU, OR MMU WAS OFF/BUSY</li> </ul>	<ul style="list-style-type: none"> <li>• ATTEMPT RECOVERY USING MMU MALS</li> </ul>	
CIRC PUMP	S2,4		<ul style="list-style-type: none"> <li>• CIRC PUMP FAILS TO TURN OFF</li> </ul>	<ul style="list-style-type: none"> <li>• INHIBITS CONTINUATION OF PUMP CYCLING SEQ</li> </ul>	

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8h

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
S67 CNTL/ESS V SM1	S2,4	SM	<ul style="list-style-type: none"><li>• DC VOLT CNTL ↓</li><li>• DC VOLT ESS ↓</li></ul>	
S76 COMM	S2,4		<ul style="list-style-type: none"><li>• GCIL CONFIG - PNL ↓</li><li>• CAMERA OVERTEMP - YES</li><li>• KU GMBL TEMP A ↑</li><li>• B ↑</li><li>• GYRO TEMP ↑</li></ul>	
CRT BITE 1(2,3,4)	ALL	ALL	<ul style="list-style-type: none"><li>• A BITE ERROR DETECTED IN INDICATED DEU</li></ul>	
S68 CRYO H2	S2,4		<ul style="list-style-type: none"><li>• TK P ↑↓</li><li>• HTR T ↑</li><li>• MANF P ↓</li><li>• VLV = CL</li></ul>	
S68 CYRO H2 or SM2 CRYO H2	PRES S2,4	SM	<ul style="list-style-type: none"><li>• TK HTR CNTL P ↑↓</li></ul>	
S68 CRYO O2	S2,4		<ul style="list-style-type: none"><li>• TK P ↑↓</li><li>• MANF P ↓</li><li>• VLV = CL</li><li>• HTR CUR SNSR = TRIP</li></ul>	
S68 CRYO O2 or SM2 CRYO O2	HTR PRES S2,4	SM SM	<ul style="list-style-type: none"><li>• TK HTR T ↑</li><li>• TK HTR CNTL P ↑↓</li></ul>	



MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
DAP RECONF	G2,8		<ul style="list-style-type: none"> <li>• DESELECTION OF ONE OR MORE DOWNFIRING VERNIER JETS</li> </ul>	<ul style="list-style-type: none"> <li>• IF USING PRI RCS, MSG INDICATES FAILURE OF DOWNFIRING VERN JET W/O DOWNMODING</li> <li>• IF USING VERN RCS, OR UPON TRANS FROM PRI TO VERN RCS, DAP WILL DOWNMODE TO FREE DRIFT</li> </ul>
SM1 DC VOLT FC 1(2,3)		SM	<ul style="list-style-type: none"> <li>• FC VOLT ↑↓</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>• 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>• ATT SEL SW</li> <li>• AIR DATA SW</li> <li>• HSI MODE/SOURCE/TRAN SW</li> <li>• 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>• ATT SEL SW</li> <li>• AIR DATA SW</li> <li>• HSI MODE/SOURCE/TRAN SW</li> <li>• RADAR ALT SW</li> </ul>	

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MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
SM1 EMER dP/dT BU		SM	<ul style="list-style-type: none"> <li>CAB LEAK</li> </ul>	<ul style="list-style-type: none"> <li>S/W CABIN PRESSURE RATE-OF-CHANGE COMP</li> <li>NO MAL</li> <li>NOT IN PRELAUNCH OPS 0</li> </ul>	
ET SEP	AUTO	G6	<ul style="list-style-type: none"> <li>ET SEP MODE SW FAIL</li> </ul>	<ul style="list-style-type: none"> <li>NO MAL</li> <li>SW DEFAULTS TO AUTO IN G6</li> </ul>	
	INH	G1,6	G1,6	<ul style="list-style-type: none"> <li>AUTO SEP INH</li> <li>G1 = BODY RATES &amp; FDLN DISC VLVS</li> <li>G6 = BODY RATES, <math>\alpha</math> and <math>\beta</math></li> </ul>	<ul style="list-style-type: none"> <li>NO MAL</li> <li>USE CUE CARDS FOR DISC VLVS</li> </ul>
	MAN	G1		<ul style="list-style-type: none"> <li>ET SEP SW FAIL (RM)</li> </ul>	<ul style="list-style-type: none"> <li>NO MAL</li> <li>USE SPEC 51 OVERRIDE</li> </ul>
S77 EVA-MMU T PORT STBD		S2,4		<ul style="list-style-type: none"> <li>MMU/FSS TEMP OUT OF LIMITS</li> </ul>	
S88 EVAP OUT T SM2	1(2)	S2,4	SM	<ul style="list-style-type: none"> <li>OUT T <math>\uparrow\downarrow</math></li> </ul>	
G23 EXCESS FU AAPS		G2		<ul style="list-style-type: none"> <li>EXCESSIVE FUEL AAPS JET FIRING</li> </ul>	

SD

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
SM1 FC AMPS 1(2,3)		SM	● FC AMPS ↑ ↓	
SM1 FC COOL P 1(2,3)		SM	● FC COOL P ↑ ↓	
SM1 FC DELTA V 1(2,3)		SM	● FC SUBSTACK ΔV > 150 MV	
S69 FC END HTR SM0	S2,4	SM	● FC END CELL HTR FAIL ON	
SM1 FC EXIT T 1(2,3)		SM	● FC EXIT T ↑ ↓	
SM1 FC PH 1(2,3)		SM	● FC PH HIGH	
S69 FC PUMP SM1	S2,4	SM	● FC COOL PUMP ΔP ↓	
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

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MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
S69 FC REAC SM1	1(2,3)	S2,4 SM	<ul style="list-style-type: none"> <li>• FC REAC ↓</li> </ul>	<ul style="list-style-type: none"> <li>• FC REAC VLV - CL</li> </ul>	
FCS CH	1(2,3,4)	G1	G1	<ul style="list-style-type: none"> <li>• SRB CHANNEL BYPASS</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• ROCK &amp; TILT ACT A(B,C,D) CH FAIL</li> <li>• NO MAL</li> <li>• MPS ENG PITCH (YAW) CH FAIL</li> <li>• NO MAL</li> <li>• ELEV (RUD,S/B) ACT CH FAIL</li> </ul>
		G1	G1,6	<ul style="list-style-type: none"> <li>• MPS CHANNEL BYPASS</li> </ul>	
		G1,3,6	G1,3,6	<ul style="list-style-type: none"> <li>• AERO CHANNEL BYPASS</li> </ul>	
FCS SAT	POS	G3,6	G3,6	<ul style="list-style-type: none"> <li>• L/R IB/OB ELEVON POSITION SATURATION</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• ELEVON SAT (&gt; +12 OR &lt;-15 DEG) SEE ENT C/L, ENT MON NOTES</li> </ul>
	MOM	G3,6	G3,6	<ul style="list-style-type: none"> <li>• L/R IB/OB PRI DELTA PRESS</li> </ul>	
S69 FC STACK T SM1	1(2,3)	S2,4 SM	<ul style="list-style-type: none"> <li>• FC STACK T ↑↓</li> </ul>		

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
F RCS	JET		G1,3,6	<ul style="list-style-type: none"> <li>● F 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>
	DJET	G1,2,3,6,8		<ul style="list-style-type: none"> <li>● F DOWN JET 1(2,3,4) FAIL ON/OFF/LK</li> </ul>	<ul style="list-style-type: none"> <li>● NO MAL</li> </ul>
	FJET	G1,2,3,6,8		<ul style="list-style-type: none"> <li>● F FWD JET 1(2,3) FAIL ON/OFF/LK</li> </ul>	<ul style="list-style-type: none"> <li>● FAIL OFF DETECTION NOT PERFORMED IN MM 101 &amp; 102 FOR PASS</li> </ul>
	LJET	G1,2,3,6,8		<ul style="list-style-type: none"> <li>● F LEFT JET 1(3,5) FAIL ON/OFF/LK</li> </ul>	
	RJET	G1,2,3,6,8		<ul style="list-style-type: none"> <li>● F RIGHT JET 2(4,5) FAIL ON/OFF/LK</li> </ul>	
	UJET	G1,2,3,6,8		<ul style="list-style-type: none"> <li>● F UP JET 1(2,3) FAIL ON/OFF/LK</li> </ul>	
	He P	G2,8	G1,3,6	<ul style="list-style-type: none"> <li>● F He (FU OR OX) TK P 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 Δ QTY &gt; 12.6%</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/QTY CALC SUSPENDED</li> </ul>
	TK P	G2,8	G1,3,6	<ul style="list-style-type: none"> <li>● FWD RCS (FU OR OX) TK ULL PRESS HI/LOW</li> </ul>	<ul style="list-style-type: none"> <li>● QTY CALC SUSPENDED</li> </ul>
S88 FREON FLOW SM2	1(2)	S2,4	SM	<ul style="list-style-type: none"> <li>● FLOW ↓</li> </ul>	<ul style="list-style-type: none"> <li>● FCL ICH FLOW</li> </ul>

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**G**

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MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
S69 FUEL CELL	S2,4		<ul style="list-style-type: none"> <li>• FC VOLT ↑↓</li> <li>• AMPS ↑↓</li> <li>• EXIT T ↑↓</li> <li>• COOL P ↑↓</li> <li>• O2(H2) FLOW ↑</li> <li>• H2O LNT ↑↓</li> <li>• pH - pH ↓</li> <li>• H2O VLV T ↑↓</li> <li>• RLF LNT ↑↓</li> <li>• O2 PURGE LNT ↑</li> <li>• H2 PURGE LNT 1(2) ↑</li> <li>• SUBSTACK ΔV &gt; 150 MV</li> <li>• H2O LINE pH ↓</li> <li>• FC H2 PUMP STATUS ↑↓</li> <li>• H2O RLF HEATER STATUS ↓</li> <li>• READY ↓</li> <li>• ALT H2O RLF TEMP ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>• pH &gt; 9 BILEVEL</li> <li>• pH &gt; 9 BILEVEL</li> </ul>
H2O	S2,4		<ul style="list-style-type: none"> <li>• FC H2O RLF NOZ T A(B) ↑↓</li> </ul>	
S86 FU TK VLV APU	S2,4		<ul style="list-style-type: none"> <li>• APU FUEL TANK VLV TEMP ↑↓</li> </ul>	
SM2 FU TK VLV APU		SM	<ul style="list-style-type: none"> <li>• APU FUEL TANK VLV TEMP ↑↓</li> </ul>	

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
GPC	BITE	ALL	ALL	<ul style="list-style-type: none"> <li>● SW FORCED CLOSED PROCESS DUE TO GPC H/W (SW) FAULT</li> <li>● BFS RESTART INDICATION</li> </ul>	<ul style="list-style-type: none"> <li>● IN PASS</li> </ul>
	CONF	ALL		<ul style="list-style-type: none"> <li>● NBAT TGT GPCs NOT IN RUN OR NOT SPECIFIED</li> </ul>	<ul style="list-style-type: none"> <li>● IN BFS</li> <li>● NO MAL</li> <li>● PROCEDURAL ERROR OR SWITCH ERROR</li> </ul>
	SUM		ALL	<ul style="list-style-type: none"> <li>● BFS GPC FAIL: CHECKSUM</li> </ul>	
	1	ALL		<ul style="list-style-type: none"> <li>● INDICATED GPC HAS FAILED</li> </ul>	
	2	ALL			
	3	ALL			
	4	ALL			
5	ALL				
GPC PWR			ALL	<ul style="list-style-type: none"> <li>● PWR TRANSITIONS TO BFS GPC</li> </ul>	<ul style="list-style-type: none"> <li>● BFS WILL DISENGAGE</li> <li>● SW DOES AUTO RESTART</li> </ul>

SS

H

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
S66 H2O	S2,4		<ul style="list-style-type: none"> <li>• SPLY QTY TK A(B,C,D) ↓, C(D) ↑</li> <li>• SPLY (WASTE) DUMP LNT ↑↓</li> <li>• WASTE P ↑↓</li> <li>• SPLY (WASTE) NOZ T A(B) ↑</li> <li>• VAC VENT NOZ T</li> <li>• WASTE QTY 1 ↓↑</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL- LIMITS OSL AND OSH</li> <li>• NO MAL FOR QTY HIGH</li> </ul>
PRES	S2,4		<ul style="list-style-type: none"> <li>• SUPPLY H2O IN P ↓↑</li> </ul>	
S88 H2O PUMP P SM2	1(2) S2,4	SM	<ul style="list-style-type: none"> <li>• P 1(2) ↑↓</li> </ul>	
HIGH G	G3,6		<ul style="list-style-type: none"> <li>• HIGH G</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
SM2 HYD ACUM P	1(2,3)	SM	<ul style="list-style-type: none"> <li>• ACCUM P ↓</li> </ul>	
S86 HYD PRESS SM2	1(2,3) S2,4	SM	<ul style="list-style-type: none"> <li>• HYD SYS SPLY P ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
SM2 HYD QTY	1(2,3)	SM	<ul style="list-style-type: none"> <li>• RSVR QTY ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> </ul>
SM2 HYD RSVR T	1(2,3)	SM	<ul style="list-style-type: none"> <li>• RSVR T ↓↑</li> </ul>	
ILLEGAL ENTRY	ALL	ALL	<ul style="list-style-type: none"> <li>• ILLEGAL KYBD ENTRY WITH RESPECT TO OPS SELECT/TRANSITION, DATA LOAD, INITIAL-IZATION, 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>

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MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
I/O ERROR	CRT1	ALL	ALL	● ERROR IN DEU 1(2,3,4) MSG (I/O OR CHECKSUM)	
	CRT2	ALL	ALL		
	CRT3	ALL	ALL	● I/O ERROR ON DOWNLIST INTERFACE WITH PCMMU	
	CRT4	ALL	ALL		
	D/L	ALL			
	FA1	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
	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		
	FF1	G1,2,3, 6,8	G0,1, 3,6		
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		● I/O ERROR FLEX/FLEX PAIR		

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
I/O ERROR MMU 1(2)		ALL		<ul style="list-style-type: none"> <li>CHECKSUM ERROR OR I/O ERROR ON MMU TRANSACTION, OR GPC-GPC OL FAILURE</li> <li>TFL FORMAT NOT FOUND IN BUFFER FOLLOWING RETRIEVAL FROM MMU</li> <li>I/O ERROR DURING DEU 1(2,3,4) LOAD</li> </ul>	<ul style="list-style-type: none"> <li>MAY OCCUR WHILE EXPANDING REDUNDANT SET AS NEW GPC TAKES COMMAND OF MMU</li> </ul>
	PCM	S2,4	SM	<ul style="list-style-type: none"> <li>I/O ERROR ON PCMMU</li> </ul>	
	PL1	S2,4	SM	<ul style="list-style-type: none"> <li>I/O ERROR ON PL BUS 1/2</li> </ul>	
	PL2	S2,4	SM		
IMU BITE/T	1(2,3)	G1,2,3,6,8		<ul style="list-style-type: none"> <li>IMU 1,2,3 PLATFORM TEMP SAFE, CAPRI TEMP SAFE, OR IMU BITE</li> </ul>	<ul style="list-style-type: none"> <li>BITE PARAMETERS CAN BE MASKED VIA CREW RAW</li> <li>BFS ONLY USES H/W BITE</li> <li>DAP DOWNMODES TO MAN PULSE FOR BITE IN SINGLE IMU CASE (OPS 2 &amp; 8 ONLY)</li> </ul>
ITEM RJCT PSP		S2,4		<ul style="list-style-type: none"> <li>PCP CC CMD REJECTED DUE TO PSP CMD DATA TRANSMISSION IN PROGRESS</li> </ul>	<ul style="list-style-type: none"> <li>NO MAL</li> </ul>
L OMS	GMBL	G1,2,3	G1,3	<ul style="list-style-type: none"> <li>PITCH (YAW) CMD/FEEDBACK <math>\Delta 2^\circ</math> FOR 3.8 SEC</li> </ul>	<ul style="list-style-type: none"> <li>NO MAL</li> </ul>
	PC	G1,2,3,6	G1,3,6	<ul style="list-style-type: none"> <li>ENG CHAMBER PRESS LOW</li> </ul>	

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MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
LOMS	QTY	G1,2,3,6,8		● ENG FU OR OX TK LEVEL LOW	
	TEMP		G1,3	● ENG FU INJ T HI	● NO MAL
	TK P	G2,8	G1,3	● FU OR OX TK ULLAGE P HI/LOW	
	VLV		G1,3,6	● He OR N2 TK P LOW ● N2 REG P HI/LOW ● He P/VAP ISOL VLV MISMATCH	
S89 L OMS TEMP		S2,4		● ENG FU INJ T HI/LOW	● NO MAL
L RCS	JET		G1,3,6	● LEFT JET MANF 1(2,3,4) FAIL ON/OFF	● NO FAIL LK DETECTION IN BFS ● FAIL OFF DETECTION NOT PERFORMED IN MM101 & 102 FOR PASS
	AJET	G1,2,3,6,8		● L AFT JET 1(3) FAIL ON/OFF/LK	
	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 CL - RCS LEAK ISOL ● OX/FU ΔQTY > 12.6% ● NO MAL/QTY CALC SUSPENDED
	LEAK	G2,3,8	G1,3,6	● PROP/He LEAK	
	PVT	G2,3,8		● LOSS OF P OR T DATA FOR RCS QTY CALC	
	TK P	G2,8	G1,2,3,6	● L RCS AFT (FU OR OX) TK ULL PRESS HI/LOW	

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M

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
S67 MAIN BUS V A(B,C) SM1	S2,4	SM	• V ↑ ↓	
MDM OUTPUT FF1 2 3 4 FA1 2 3 4 PL1 2	ALL		• MDM RETURN WORD FAILURE (ON MDM OUTPUT)	

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MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
ME SHDN SW C(L,R)	G1,6		● SW CONTACT DISAGREE	● SHUTDOWN FUNCTION OF SWITCH NO LONGER WORKS
MPS CMD C(L,R)	G1,6	G1,6	● MPS C(L,R) CMD PATH FAIL	● REF AESP CUE CARDS ● BFS DOES NOT SUPPORT CMD PATH FAIL ANNUNCIATION PRE-ENGAGED
MPS DATA C(L,R)	G1,6	G1,6	● DATA PATH FAIL	● REF AESP CUE CARDS
MPS ELEC C(L,R)	G1,6	G1,6	● ELECTRONIC LOCKUP MODE FAIL	● REF AESP CUE CARDS
MPS HYD C(L,R)	G1,6	G1,6	● HYD LOCKUP MODE FAIL	● REF AESP CUE CARDS
MPS He P C(L,R)		G1,6	● MPS He TK P HI/LOW ● INDICATED REG P HI/LOW ● HI LEAK RATE dP/dT	
MPS LH2/O2 MANF		G1,6	● MPS LH2 ENG MANF P HI ● LOX ENG MANF P HI	
ULL		G1,6	● ET ULL P HI/O	

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N

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
NAV EDIT  ALT  TAC	G2		<ul style="list-style-type: none"> <li>• RNDZ NAV EDIT</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> </ul>
	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>• MLS NAV EDIT MESSAGE (MLSNV) SEEN ONLY ON HUD</li> </ul>
	G3,6		<ul style="list-style-type: none"> <li>• TACAN DATA NOT PROCESSING &lt; 140k FT</li> </ul>	
G23 NEED JETS AAPS	G2		<ul style="list-style-type: none"> <li>• NEED MORE JETS TO SATISFY COMMAND</li> </ul>	
OFF/BUSY MMU 1(2)	ALL		<ul style="list-style-type: none"> <li>• AN MMU TRANSACTION IS REQUESTED WHEN THE MMU IS OFF/BUSY, FAILED OFF, OR SELECTED FOR IPL</li> </ul>	
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>

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MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
PBD CONFIG S63	S2,4	SM	<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>
PBD SEQ FAIL S63	S2,4	SM	<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>
S62 PDI DECOM FAIL	S2,4		<ul style="list-style-type: none"> <li>● DECOM 1 FMT ↑</li> <li>● 2 FMT ↑</li> <li>● 3 FMT ↑</li> <li>● 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	S2,4		<ul style="list-style-type: none"> <li>● ABE/MCIU MISCOMPARE</li> </ul>	
COMM	S2,4		<ul style="list-style-type: none"> <li>● SHOULDER JPC FAIL</li> </ul>	
JPC1	S2,4		<ul style="list-style-type: none"> <li>● WRIST JPC FAIL</li> </ul>	
JPC2	S2,4			
SY	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>
SP				
EP				
WP				
WY				
WR				

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MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
S96 PDRS CKCRT	D	S2,4		<ul style="list-style-type: none"> <li>• D&amp;C CMD CK DISP FAIL</li> </ul>	
	SY	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>
	SP				
	EP				
	WP				
	WR				
	EE	S2,4		<ul style="list-style-type: none"> <li>• EE PWR (PROCESSING) FUNCTION FAIL</li> </ul>	
	T CK	S2,4		<ul style="list-style-type: none"> <li>• MCIU TEMP MONITOR CIRCUIT FAIL</li> </ul>	
PDRS CKCRT	HC	S2,4		<ul style="list-style-type: none"> <li>• RHC (TMC) HARDOVER (ANY AXIS)</li> </ul>	<ul style="list-style-type: none"> <li>• S/W DOWNMODE TO IDLE IF IN MANUAL (TEST)</li> </ul>
S96 PDRS CNTL	SY	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>
	SP				
	EP				
	WP				
	WY				
	WR				
PDRS DERIG		S2,4		<ul style="list-style-type: none"> <li>• UNCOMMANDED DERIGIDIZE</li> </ul>	<ul style="list-style-type: none"> <li>• POSSIBLE EE STRUTS FAIL</li> </ul>
S94 PDRS GPC		S2,4		<ul style="list-style-type: none"> <li>• MCIU-GPC DATA MISCOMPARE</li> </ul>	<ul style="list-style-type: none"> <li>• AUTO SAFING COMMANDED</li> <li>• S/W DNMODE TO 'SUSPEND'</li> </ul>



MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
S96 PDRS MCIU	MADC	S2,4		● MADC REF VOLT TEST FAIL	● AUTO SAFING COMMANDED
	MCPC	S2,4		● MCPC REF VOLT TEST FAIL	● AUTO SAFING COMMANDED
	ICF	S2,4		● ICF FAIL	● AUTO SAFING
S96 PDRS RCH	SY SP EP WP WY WR	S2,4		● JOINT EXCEEDS POS OR NEG RCH LIMIT	● APPROX 2° PRIOR TO S/W STOP 4° PRIOR TO HARDSTOP
PDRS REL		S2,4		● UNCOMMANDED P/L RELEASE	● POSSIBLE EE STRUCT FAIL
PDRS SING	SY	S2,4		● SY/WY WITHIN 3 FT OF COALIGNMENT	● LOSE ± Y DEG OF FREEDOM AT SINGULARITY
	EP	S2,4		● EP > -7.6°	● LOSE -X DEG OF FREEDOM AT SINGULARITY
	WY	S2,4		● WY WITHIN ± 15° OF ± 90° SING	● LOSE ROLL DEG OF FREEDOM AT SINGULARITY
PDRS SLIP	SY SP EP WP WY WR ALL	S2,4		● JOINT SLIPPAGE WITH THE BRAKES ON AND NOT IN DIRECT MODE	● SLIPPAGE GREATER THAN 0.5° PER JOINT OR SUM OF 2.0° FOR ALL JOINTS

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MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
PDRS TEMP	PORT STBD	S2,4		<ul style="list-style-type: none"> <li>• JOINT/EE TEMP OUT OF LIMITS</li> </ul>	
S94 PDRS WR R		S2,4		<ul style="list-style-type: none"> <li>• PDRS WRIST ROLL RANGE CHECK FAILURE</li> </ul>	
PL ALERT		G2,3		<ul style="list-style-type: none"> <li>• GENERAL ANNUNCIATION BY GNC OF SPECIFIC SM PAYLOAD ALERT</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</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 ASCENT/ENTRY SYSTEMS PROCEDURES (SPACELAB MODULE CONFIGURATION ONLY)</li> </ul>
206 PL CL3			SM	<ul style="list-style-type: none"> <li>• AUX BUS A/B U/V ↓</li> <li>• SS INV IN AMPS ↑</li> <li>• TEMP ↑</li> <li>• EXP INV IN AMPS ↑</li> <li>• 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>
PL CW		G2,3		<ul style="list-style-type: none"> <li>• GENERAL ANNUNCIATION BY GNC OF SPECIFIC SM PAYLOAD CW</li> </ul>	<ul style="list-style-type: none"> <li>• SPECIFIC MESSAGE AVAILABLE ON SM FAULT DISPLAY</li> </ul>

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MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
PL MSG		G,2,3	<ul style="list-style-type: none"> <li>GENERAL ANNUNCIATION BY GNC OF SPECIFIC SM PAYLOAD CLASS 4 (MESSAGE ONLY) ANNUNCIATION</li> </ul>	
PNL TRIM	L(R)	G3,6	<ul style="list-style-type: none"> <li>LH(RH) +/- P/R/Y TRIM SW DISAGREE</li> </ul>	<ul style="list-style-type: none"> <li>NO MAL</li> </ul>
PROBES		G3,6	<ul style="list-style-type: none"> <li>EITHER ADTA PROBE NOT DEPLOYED DURING 1 &lt; M &lt; 2.5</li> </ul>	<ul style="list-style-type: none"> <li>NO MAL</li> </ul>
S89 PRPLT THRM	OMS POD RCS	S2,4	<ul style="list-style-type: none"> <li>OX(FU) LN STRUCT T HI/LOW</li> </ul>	
		S2,4	<ul style="list-style-type: none"> <li>PROP AND STRUCT T HI/LOW</li> </ul>	
		S2,4	<ul style="list-style-type: none"> <li>FWD AND L/R RCS STRUCT T HI/LOW</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>✓RCS VLV tb. If bp VLV PWR FAIL, VLV POS CANNOT BE CHANGED</li> </ul>
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>FAIL = SM ALERT</li> <li>RHC LOST FOR DISAGREE</li> </ul>
	L	G2,3,8	<ul style="list-style-type: none"> <li>CHANNEL FAIL</li> <li>R(P,Y) DISAGREE</li> </ul>	
	R	G2,3,8	<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>

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MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
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>• DES/SEL AVAILABLE</li> </ul>
	MLS	G3		<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>• APCL, EPCL - HYD P LOW</li> <li>• OPCL - HYD ACCUM (RSVR) P LOW</li> </ul>
	WOW	G3,6		<ul style="list-style-type: none"> <li>• A/N GATE LATCHED TO NULL</li> </ul>	<ul style="list-style-type: none"> <li>• NO MAL</li> <li>• BOTH WOW AT TRANSACTION OR WOWs DISAGREE</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>	

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MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
RM FAIL	ACC	G1,3,6		● FAIL	● NO MAL ● DES/SEL AVAILABLE OPS 3,8 ONLY
	ADTA	G3,6	G3,6	● FAIL	● NO MAL ● DES/SEL AVAILABLE
	IMU	G1,2,3,6,8	G1,3,6	● FAIL ● COMMFAULT CAUSES BFS RM FAIL	● DES/SEL AVAILABLE
	MLS	G3		● FAIL	● NO MAL ● DES/SEL AVAILABLE OPS 8 ONLY ● NO CRT DATA OPS 3
	RGA	G1,3,6		● FAIL	● NO MAL ● DES/SEL AVAILABLE OPS 3,8 ONLY
	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

S

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
R 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		● 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 RCS	JET		G1,3,6	● RIGHT JET MANF 1(2,3,4) FAIL ON/OFF	● NO FAIL LK DETECTION IN BFS ● FAILED OFF DETECTION NOT PERFORMED IN MM101 & 102 FOR PASS
	AJET	G1,2,3,6,8		● RAFT JET 1(3) FAIL ON/OFF/LK	
	DJET	G1,2,3,6,8		● R DOWN JET 2(3,4,5) FAIL ON/OFF/LK	
	RJET	G1,2,3,6,8		● R RIGHT JET 1(2,3,4,5) FAIL ON/OFF/LK	
	UJET	G1,2,3,6,8		● R UP JET 1(2,4) FAIL ON/OFF/LK	
	He P	G2,8	G1,3,6	● R 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 > 12.6%
	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	● R RCS AFT (FU OR OX) TK ULL PRESS HI/LOW		

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MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
SBTC/THC	A	G2,8	<ul style="list-style-type: none"> <li>● AFT THC POS/NEG X/Y/Z OUTPUT A/B/C FAIL</li> <li>● AFT THC POS/NEG X/Y/Z OUTPUT DISAGREE</li> </ul>	
	L	G3	<ul style="list-style-type: none"> <li>● L SBTC CMD A(B,C) FAIL</li> <li>● DISAGREE</li> </ul>	
	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>	
	R	G3	<ul style="list-style-type: none"> <li>● R SBTC CMD A(B,C) FAIL</li> <li>● 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	<p>ANY OF THE FOLLOWING MDM SERIAL I/O LINK ERROR CONDITIONS OCCURRED FOR SSC OR EXC:</p> <p>NO SL RESP ↓</p> <p>GPC NO MATCH ↓</p> <p>SL LENGTH ↓</p> <p>AR NO MATCH ↓</p> <p>SR NO MATCH ↓</p> <p>MSG REJECT (ITEM OR GNC) ↓</p> <p>LINK BUSY ↓</p> <p>DSBL ↓</p>	<ul style="list-style-type: none"> <li>● SL MAL, <u>CDMS</u>, MDM/MTU/PCMMU</li> </ul>

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T

MESSAGE	OPS AVAIL		CAUSE	COMMENTS
	PASS	BFS		
212 SL LINK TERM	S2,4		MDM SERIAL I/O LINK TO SPACELAB TERMINATED. CAUSED BY ANY OF THE FOLLOWING FOR SSC OR EXC: NOP IND ↓ COMM ↓ LINK INTRPT ↓	• SL MAL, <u>CDMS</u> , MDM/MTU/PCMMU
SM1 SMOKE ALARM	S2,4	SM	• ANY SMOKE SENSOR CONCEN ↑	
SPD BRK	G3,6		• SPEED BRAKE POSITION > 20% FROM AUTO SCHEDULE DURING 0.95 < M < 9.8	
SSME FAIL C(L,R)	G1,6	G1,6	• PREMATURE ME SHUTDOWN	• IN MM101, MSG ANNUNCIATED BY BFS ONLY
SUMWORD ICC 1(2,3,4,5)	ALL		• SUMWORD MISCOMPARE IN DATA FROM INDICATED GPC	
SW TO MEP	G3,6	G3	• MEP ALERT	• NO MAL

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PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W 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	-10.0	250.0			
	3 <sup>a</sup>			0580392	87					
WHL	2 <sup>a</sup>			0580841	87	-10.0	250.0			
	3 <sup>a</sup>			0580842	87	-10.0	250.0			
LMG UPLK <sup>a</sup>				0580125	87					
NLG MFUS	1 <sup>a</sup>			0580127	87					
	2 <sup>a</sup>			0581143	87	-50.0	150.0			
UPLK <sup>a</sup>				0580126	87	-10.0	150.0			

<sup>a</sup> PASS only

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hc

MESSAGE		OPS AVAIL		CAUSE	COMMENTS
		PASS	BFS		
S88 THERMAL	APU	S2,4		<ul style="list-style-type: none"> <li>• APU TK SURF T, (TK HTR T, TEST LN T1, T2, FEED LN T, PUMP LN T (OUT T), PUMP DRN LN T1, T2, PUMP BYP LN T, H2O LN PRI (SEC) T, H2O LN INJ T) ↑↓</li> </ul>	
	EVAP FRN	S2,4		<ul style="list-style-type: none"> <li>• FES NOZ, DUCT OR FDLN T ↑↓</li> </ul>	
		S2,4		<ul style="list-style-type: none"> <li>• PL HX FLOW ↓</li> <li>• AFT CP FLOW ↓</li> <li>• ACCUM QTY ↓</li> <li>• CNTL OUT T 1(2) ↓</li> </ul>	
	H2O	S2,4		<ul style="list-style-type: none"> <li>• ACCUM QTY ↑↓</li> <li>• PUMP OUT T ↑↓</li> <li>• CAB HX IN T ↓</li> <li>• ICH OUT T ↓</li> <li>• FLOW ↓</li> <li>• PUMP ΔP ↑↓</li> </ul>	
S87 THERMAL	CNTL	S2,4		<ul style="list-style-type: none"> <li>• LN T ELEV RD/SPBK/BDY FLP ↑↓</li> <li>• BRK NLG, L(R) MG T ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>• ACTIVE LOOP ONLY</li> <li>• ΔP HIGH ONLY FOR INACTIVE LOOP</li> <li>• ΔP HIGH OR LOW ACTIVE LOOP ONLY</li> </ul>
	HYD	S2,4		<ul style="list-style-type: none"> <li>• CIRC PUMP P ↓</li> <li>• HX OUT T ↓</li> </ul>	

MESSAGE	OPS AVAIL		CAUSE	COMMENTS	
	PASS	BFS			
SMO THRM	APU		SM	<ul style="list-style-type: none"> <li>● GG BED ↓, APU INJ T ↓</li> </ul>	<ul style="list-style-type: none"> <li>● NO MAL</li> <li>● APCL, EPCL - THERM HTR</li> </ul>
	APU		SM	<ul style="list-style-type: none"> <li>● APU FU FEED LNT ↑↓, PUMP IN T ↑↓,</li> <li>● PUMP OUT T ↑↓, FU TEST LNT ↑↓,</li> <li>● PUMP DRN LNT ↑↓, PUMP BYP LNT ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>● NO MAL</li> </ul>
	EVAP		MM104 TO 106, ORB OPS 0, MM301 TO 303	<ul style="list-style-type: none"> <li>● FES NOZ, DUCT OR FDLN T ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>● ONLY SELECTED DUCTS AND FDLN T's ARE SENSED FOR STATUS</li> </ul>
	FRN			<ul style="list-style-type: none"> <li>● ACCUM QTY ↓</li> <li>● RAD IN T ↑</li> </ul>	<ul style="list-style-type: none"> <li>● NO ASC/ENT PKT C/L</li> </ul>
	H2O			<ul style="list-style-type: none"> <li>● H2O SPLY IN P ↑↓</li> </ul>	
	HYD			<ul style="list-style-type: none"> <li>● H2O BLR T ↑↓</li> </ul>	<ul style="list-style-type: none"> <li>● NO MAL</li> <li>● APCL, EPCL - THERM HTR</li> </ul>
SMO THRM PRPLT			MM104 TO 106, ORB OPS 0, MM301 TO 303	<ul style="list-style-type: none"> <li>● OMS FU/OX BLD/DRAIN LNT</li> <li>● POD RCS HOUSING</li> <li>● RCS STRUCT T</li> <li>● OX ENG IN OR ENG FU FDLN T</li> </ul>	
TIME	MTU TONE	ALL		<ul style="list-style-type: none"> <li>● AUTOMATIC TIME SOURCE CHANGE</li> </ul>	
		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>
SMO TIRE PRESS			G3,6	<ul style="list-style-type: none"> <li>● NOSE GEAR/MLG TIRE PRESS ↓</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>	

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CAUTION & WARNING

CW

4-1

REF/ALL/GEN A

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**C/W POWER SUPPLY FAILURE**

**PRIMARY C/W** plus:

**SYS A PWR SPLY:**

All F-7 annunc lts ON  
except BACKUP C/W

Loss of:

C/W status panel lts and  
function (R13)

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 SMU

**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 head-  
set tones

CW

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 UNDERVOLT (R)	AC VOLTAGE	AC OVERLOAD
FREON LOOP (R)	AV BAY/CABIN AIR	IMU	FWD RCS (R)	RCS JET
H <sub>2</sub> O LOOP	ROA/ACCEL	AIR DATA (R)	LEFT RCS (R)	RIGHT RCS (R)
	LEFT RMC (R)	RIGHT/AFT RMC (R)	LEFT OMS (R)	RIGHT OMS (R)
PAYLOAD WARNING (R)	GPC	FCS SATURATION (R)	OMS KIT	OMS TVC (R)
PAYLOAD CAUTION (R)	PRIMARY C/W	FCS CHANNEL	MPS (R)	
BACKUP C/W ALARM (R)	APU TEMP	APU OVERSPEED	APU UNDERSPEED	HYD PRESS

(3473072)

### C/W & FDA TABLE

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
AC OVLD 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		
V1 φA	33		5.00	0761500	67			108.0	123.0	• PRI C/W AC OV-UV (BL)
B	33		5.00	0761501	67			108.0	123.0	
C	33		5.00	0761502	67			108.0	123.0	
2 φA	43		5.00	0761600	67			108.0	123.0	• PRI C/W AC OV-UV (BL)
B	43		5.00	0761601	67			108.0	123.0	
C	43		5.00	0761602	67			108.0	123.0	
3 φA	53		5.00	0761700	67			108.0	123.0	• PRI C/W AC OV-UV (BL)
B	53		5.00	0761701	67			108.0	123.0	
C	53		5.00	0761702	67			108.0	123.0	
ADTA	91		2.50							• NAV SENSOR FAIL (BL)
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			

a PASS OPS S2,4; BFS MM104-106, 301-303, OPS 0

b PASS only

8L

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
AFT RCS MANF 1 OX L <sup>a</sup>				0422204	89	50.0	140.0			
R <sup>a</sup>				0423204	89	50.0	140.0			
VERN PNL 1 L <sup>b</sup> (PASS)				0434701	89	45.0	140.0			
(BFS)						45.0	150.0			
R <sup>b</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			
APU B/U EGT 1 <sup>a</sup>				0460140	86				1260.0	
2 <sup>a</sup>				0460240	86				1260.0	
3 <sup>a</sup>				0460340	86				1260.0	
FUEL FEED LNT 1				0460104	88	45.0	120.0			
2				0460204	88	45.0	120.0			
3				0460304	88	45.0	120.0			
H2O LN INJT 1				0460501	88	38.0	110.0			
2				0460502	88	38.0	190.0			
3				0460503	88	38.0	110.0			
T PRI 1				0460193	88	38.0	110.0			
2				0460293	88	44.0	110.0			
3				0460393	88	38.0	110.0			

a PASS only      b 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		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
APU FUEL H2O LNT SEC 1				0460194	88	38.0	110.0			
2				0460294	88	42.0	110.0			
3				0460394	88	38.0	110.0			
PUMP BYP LNT 1				0460128	88	60.0	180.0			
2				0460228	88	60.0	180.0			
3				0460328	88	60.0	180.0			
DRN LNT 1				0460186	88	45.0	95.0			
2				0460286	88	45.0	95.0			
3				0460386	88	45.0	95.0			
T2 1				0460170	88	45.0	140.0			
2				0460270	88	45.0	195.0			
3				0460370	88	45.0	140.0			
INT 1				0460108	88	45.0	120.0			
2				0460208	88	45.0	120.0			
3				0460308	88	45.0	120.0			
OUTT 1				0460112	88	50.0	202.0			
2				0460212	88	50.0	202.0			
3				0460312	88	50.0	202.0			



PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
APU FUEL 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	40.0	90.0			
2				0460283	88	40.0	90.0			
3				0460383	88	40.0	90.0			
T2 1				0460184	88	40.0	90.0			
2				0460284	88	40.0	90.0			
3				0460384	88	40.0	90.0			
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	110.0	350.0			
2 <sup>a</sup>				0460200	86	110.0	350.0			
3 <sup>a</sup>				0460300	86	110.0	350.0			
TK 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				

a PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
APU FUEL TK VLV AT 1				0461175	86	45.0	160.0			<ul style="list-style-type: none"> <li>• GG/FU PMP HTRS - OFF OR APU CNTRLR PWR - ON (P)</li> <li>• GG/FU PMP HTRS A OR B - ON AND APU PWR - OFF (P)</li> </ul>
2				0461275	86	45.0	160.0			
3				0461375	86	45.0	160.0			
BT 1				0461173	86	45.0	160.0			
2				0461273	86	45.0	160.0			
3				0461373	86	45.0	160.0			
GBX BRGT 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				
GG BED T 1 (PASS)				0460122	86	100.0				
(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				

<sup>a</sup> PASS only

es

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PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
APU INJ 1*				0460174		258.0				<ul style="list-style-type: none"> <li>● APU X ON (P)</li> <li>● APU X OFF (P)</li> </ul>
2*				0460274		258.0				
3*				0460374		258.0				
OIL OUT P 1 (PASS)				0460153	86	25.0	150.0			
(PASS)					86	0.0	150.0			
(BFS)						25.0	150.0			
2 (PASS)				0460253	86	25.0	150.0			
(PASS)					86	0.0	150.0			
(BFS)						25.0	150.0			
3 (PASS)				0460353	86	25.0	150.0			
(PASS)					86	0.0	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	

a BFS only

h2

PARAMETER NAME	CW CH	H/W CW		SOFTWARE ID	PASS SPEC	SM ALERT		S/W CW		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
APU OVERSPEED 1	68		5.00							• > 129% (BL)
2	78		5.00							
3	88		5.00							
FUEL PMP LK P 1*				0460190			25.0			• APU X ON & NOT IN HIGH SPD MODE (P) • APU X ON & IN HIGH SPD MODE (P)
2*				0460290			25.0			
3*				0460390			25.0			
PUMP/VLV COOL PMP T 1				0460192	86		200.0			
2				0460292	86		200.0			
3				0460392	86		200.0			
VLV T 1				0460171	86		209.0			
2				0460271	86		209.0			
3				0460371	86		209.0			
SPEED % 1 (PASS) (BFS)				0460135	86	40.0	112.0	80.0	122.0	
								80.0	129.0	

a BFS only

B

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PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W 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 X ON &amp; NOT IN HIGH SPD MODE (P)</li> <li>• APU X ON &amp; IN HIGH SPD MODE (P)</li> </ul>
								80.0	129.0	
3 (PASS) (BFS)				0460335	86	40.0	112.0	80.0	122.0	
								80.0	129.0	
TEMP EGT 1	8		4.20	0460142						
2	18		4.20	0460242						
3	28		4.20	0460342						
UNDERSPEED 1	98		5.00							• < 80% (BL)
2	108		5.00							
3	118		5.00							
AV BAY FAN ΔP 1				0612642	66	1.45	4.00			
2				0612647	66	1.45	4.00			
3				0612658	66	2.15	4.50			
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	

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
BRAKE PRESSURE LH OB 2A <sup>a</sup>				0510722			180			● INHIBITED AFTER LANDING GEAR UPLOCK DISCRETES ARE OFF (0) (V51X0100X, 0200X) (P)
4A <sup>a</sup>				0510724			180			
IB 3A <sup>a</sup>				0510726			180			
1A <sup>a</sup>				0510728			180			
RH OB 2A <sup>a</sup>				0510742			180			
4A <sup>a</sup>				0510744			180			
IB 3A <sup>a</sup>				0510746			180			
1A <sup>a</sup>				0510748			180			
CABIN AIRLOCK P <sup>b</sup>				0640101	66	13.8	15.7			
P (PASS)				0612405	66	7.5		13.8	15.2	● LOW C/W DEFAULT VALUE 3.45 V
(OV102)	4	3.45	3.85 <sup>c</sup>							
(OV103)	4	3.40	3.80 <sup>c</sup>							
(OV104)	4	3.40	3.80 <sup>c</sup>							
(BFS)								13.8	15.35	● HIGH C/W DEFAULT VALUE 3.80 V
T <sup>b</sup>				0612552	66		90.0			

- a BFS only      b PASS only  
c CABIN P H/W C/W high limit set prelaunch (Crew Pre-Ingress sw Reconfiguration) to: (OV102) = 3.90 V/15.41 psia; (OV103) = 3.85 V/15.44 psia; (OV104) = 3.80 V/15.38 psia. Post Insertion, crew resets limits to those shown above (except for OV104, which is already correct)

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87

PARAMETER NAME	CW CH	H/W CW		SOFTWARE ID	PASS SPEC	SM ALERT		S/W CW		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
CABIN EMER O2 QTY <sup>a</sup> REG P <sup>a</sup>				0920305 0612166	66 66					<ul style="list-style-type: none"> <li>• HIGH CW DEFAULT VALUE 4.40(7.04)</li> <li>• LOW CW DEFAULT VALUE 1.75(2.80)</li> </ul>
FAN ΔP	74	2.65	4.25	0612556	66			4.2	6.8	
HX OUT T <sup>a</sup>	114		5.00	0612635	66					
H2O TK N2 P 1 <sup>a</sup> 2 <sup>a</sup>				0612307 0612311	66 66	13.0 13.0				
N2 FLOW 1 2	54 64		4.90 4.90	0612553 0612554	66 66				4.9 4.9	
QTY 1 <sup>a</sup> 2 <sup>a</sup>				0920315 0920318	66 66	100.0 100.0				
REG P 1 <sup>a</sup> 2 <sup>a</sup>				0612310 0612410	66 66	150.0 150.0	260.0 260.0			
O2 FLOW 1 <sup>b</sup> 2 <sup>b</sup>	14 24		4.90 4.90	0612105 0612205	66 66				4.9 4.9	
REG P 1 <sup>a</sup> 2 <sup>a</sup>				0612115 0612215	66 66		145.0 145.0			
PPCO2 <sup>a</sup>				0612540	66		7.6			

<sup>a</sup> PASS only

<sup>b</sup> Until OV104: O2 FLOW SENSOR are changed out, the upper limit on OV104 O2 FLOW 1 and 2 H/W CW will be set prelaunch to 3.90 V and 3.95 V, respectively. The software limits will be changed to the same values (3.90 lb/hr, 3.95 lb/hr) via a TMBU sent from the ground during POST-INSERTION

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W 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(2.7)</li> <li>• POST-LANDING BFS TRANSITION TO OPS 0 (P)</li> </ul>
PPO2 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	<ul style="list-style-type: none"> <li>• 2.70(2.7)</li> <li>• POST-LANDING BFS TRANSITION TO OPS 0 (P)</li> </ul>
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>
CRYO H2 HTR T TK 1 <sup>a</sup>				0452107	68		210.0			
2 <sup>a</sup>				0452207	68		210.0			
3 <sup>a</sup>				0452307	68		210.0			
4 <sup>a</sup>				0452407	68		210.0			
5 <sup>a</sup>				0452507	68		210.0			
MANF PTK 1 <sup>a</sup>				0452140	68	150.0				
2 <sup>a</sup>				0452145	68	150.0				

a PASS only

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PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
CRYO H2 MANF VLV TK 1 <sup>a</sup> 2 <sup>a</sup>				0452141	68	0				● VALVE CLOSED (BL)
				0452146	68	0				
P TK 1	50	.25	4.65	0452110	68			153.0	293.8	● HTRS NOT IN AUTO (P) ● A OR B HEATER IN AUTO (P)
	60	.25	4.65	0452210	68			153.0	293.8	
	70	.25	4.65	0452310	68			153.0	293.8	
	80	.25	4.65	0452410	68			153.0	293.8	
TK P TK 1 <sup>a</sup>				0452100	68	165.0 189.8	283.0 283.0			
				0452200	68	165.0 189.8	283.0 283.0			
				0452300	68	165.0 189.8	283.0 283.0			
				0452400	68	165.0 189.8	283.0 283.0			
				0452500	68	165.0 189.8	283.0 283.0			

a PASS only

88

90

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)	
		LOW	HIGH			LOW	HIGH	LOW	HIGH		
CRYO O2 HTR CUR SNSR 1A	1 <sup>a</sup>			0451185	68	1				● EXCESSIVE HTR CURRENT (BL)	
	2 <sup>a</sup>			0451285	68	1					
	3 <sup>a</sup>			0451385	68	1					
	4 <sup>a</sup>			0451485	68	1					
	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				
		4/5 <sup>a/b</sup>			0451487	68	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				
	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				
		4/5 <sup>a/b</sup>			0451488	68	1				
T1TK	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	c	c	0451507	68				349.0		

a PASS only    b If five cryo tanks are installed, these indicate status for Tank 5 (SNSR 1A, 2A)  
 c Mission and configuration dependent

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
CRYO O2 HTR T 2 TK	1	11	4.30	0451109	68				349.0	● VALVE CLOSED (BL)
	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	a	a	0451509	68				349.0	
MANFP 1 <sup>b</sup> 2 <sup>b</sup>				0451140	68	200.0				
				0451145	68	200.0				
VLV 1 <sup>b</sup> 2 <sup>b</sup>				0451141	68	0				
				0451146	68	0				
PTK1	0	.25	4.70	0451110	68			540.0	985.0	
	2	.25	4.70	0451210	68			540.0	985.0	
	3	.25	4.70	0451310	68			540.0	985.0	
	4/5	30	.25	4.70	0451410	68			540.0	985.0
									540.0	985.0

a Mission and configuration dependent b PASS only

eb

PARAMETER NAME	CW CH	H/W CW		SOFTWARE ID	PASS SPEC	SM ALERT		S/W CW		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
CRYO O2 TK P TK 1 <sup>a</sup>				0451100	68	575.0 740.0	960.0 960.0			<ul style="list-style-type: none"> <li>● HTRS NOT IN AUTO (P)</li> <li>● A OR B HTR IN AUTO (P)</li>   <li>● TK 5 HTR NOT IN AUTO (P)</li> <li>● TK 5 HTR IN AUTO (P)</li> </ul>
2 <sup>a</sup>				0451200	68	575.0 740.0	960.0 960.0			
3 <sup>a</sup>				0451300	68	575.0 740.0	960.0 960.0			
4 <sup>a</sup>				0451400	68	575.0 740.0	960.0 960.0			
5 <sup>a</sup>				0451500	68	575.0 740.0	960.0 960.0			
DC VOLT 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				

a PASS only

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PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
DC VOLT CNTL CA 1				0760320	67	24.5				
2				0760321	67	24.5				
3				0760322	67	24.5				
ESS 1 (BC)				0760130	67	25.0				
2 (CA)				0760230	67	25.0				
3 (AB)				0760330	67	25.0				
FC 1				0450100	67	27.5	32.5			
2				0450200	67	27.5	32.5			
3				0450300	67	27.5	32.5			
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 AC				0631892	88	50.0	140.0			
BC				0631894	88	50.0	140.0			

a PASS OPS G3,6; BFS OPS 3,6    b BFS only    c PASS only

H6

PARAMETER NAME	CW CH	H/W CW		SOFTWARE ID	PASS SPEC	SM ALERT		S/W CW		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
EVAP FDLN T AFT A <sup>a</sup>				0631876	88	50.0	140.0			
B <sup>a</sup>				0631877	88	50.0	140.0			
FWD A <sup>a</sup>				0631870	88	50.0	140.0			
B <sup>a</sup>				0631871	88	50.0	140.0			
HILOAD A <sup>b</sup>				0631895	88	50.0	OSH			
B <sup>b</sup>				0631896	88	50.0	OSH			
MID 1 A <sup>a</sup>				0631872	88	50.0	140.0			
B <sup>a</sup>				0631873	88	50.0	140.0			
2 A <sup>a</sup>				0631874	88	50.0	140.0			
B <sup>a</sup>				0631875	88	50.0	140.0			
TOPPING A <sup>b</sup>				0631891	88	50.0	140.0			
B <sup>b</sup>				0631893	88	50.0	140.0			
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 (P)</li> <li>● ALL HI LOAD DUCT HTRS OFF (P)</li> <li>● NO PRECOND IN BFS</li> </ul>
(PASS)					88		375.0			
(BFS) <sup>c</sup>						150.0	375.0			

a PASS OPS S2,4; BFS MM 104-106, 301-303, OPS 0 b PASS only c BFS only; MM104-MM106, 301-303, OPS 0

F

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
EVAP TEMP HI LOAD OUTBD DUCT (PASS)				0631821	88	150.0	330.0			<ul style="list-style-type: none"> <li>• ANY HI LOAD DUCT HTR ON (P)</li> <li>• ALL HI LOAD DUCT HTRS OFF (P)</li> <li>• NO PRECOND IN BFS</li> </ul>
(PASS)					88		330.0			
(BFS) <sup>a</sup>						150.0	330.0			
NOZ (PASS)				0631890	88	100.0	350.0			<ul style="list-style-type: none"> <li>• ANY HI LOAD DUCT HTR ON (P)</li> <li>• ALL HI LOAD DUCT HTRS OFF (P)</li> <li>• NO PRECOND IN BFS</li> </ul>
(PASS)					88		350.0			
(BFS) <sup>a</sup>						100.0	350.0			
TOPPING AFT <sup>b</sup>				0631802	88	100.0	330.0			
FWDB <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 52,4; BFS MM 104-106, 301-303, OPS 0    <sup>c</sup> PASS only.

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PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
FC ALT H2O RLF TEMP 1a 2a 3a				0450182	69	60.0	185.0			
				0450282	69	60.0	185.0			
				0450382	69	60.0	185.0			
AMPS 1 (PASS) (BFS) 2 (PASS) (BFS) 3 (PASS) (BFS)				0450101	69	54.0	360.0			
						54.0	410.0			
				0450201	69	54.0	360.0			
						54.0	410.0			
				0450301	69	54.0	360.0			
						54.0	410.0			
COOL P 1 2 3				0450147	69	50.0	75.0			
				0450247	69	50.0	75.0			
				0450347	69	50.0	75.0			

a PASS only

96



PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W 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		
END HTR 1A (PASS) <sup>a</sup> (BFS)				0922122	69	1				• HTRON > 6 MIN
1B (PASS) <sup>a</sup> (BFS)				0984450	69	1				
2A (PASS) <sup>a</sup> (BFS)				0922123	69	1				
2B (PASS) <sup>a</sup> (BFS)				0984451	69	1				
3A (PASS) <sup>a</sup> (BFS)				0922124	69	1				
3B (PASS) <sup>a</sup> (BFS)				0984452	69	1				
EXIT T 1 (PASS) (BFS)				0922125	69	1				
2 (PASS) (BFS)				0984453	69	1				
3 (PASS) (BFS)				0922126	69	1				
				0984454	69	1				
				0922127	69	1				
				0984455	69	1				
EXIT T 1 (PASS) (BFS)				0450130	69	131.0	164.0			
2 (PASS) (BFS)				0450230	69	131.0	170.0			
3 (PASS) (BFS)				0450330	69	131.0	170.0			
						131.0	170.0			

<sup>a</sup> PASS parameters are in special process code and cannot be changed

86

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
FC FLOW H2 1 <sup>a</sup>				0450170	69		1.6			• HIGH PH (BL)
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		0.8			
2 <sup>a</sup>				0450214	69		0.8			
3 <sup>a</sup>				0450314	69		0.8			
H2O LINE PH <sup>a</sup>				0450462	69	1				
LNT 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			
RLF 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			

<sup>a</sup> PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
FC H2O 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				• HIGH PH (BL)
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			
REACH2 1	12	4.80		0452150	69			0		• VALVE CLOSED (BL)
2	32	4.80		0452155	69			0		
3	52	4.80		0452160	69			0		
O2 1	2	4.80		0451150	69			0		• VALVE CLOSED (BL)
2	22	4.80		0451155	69			0		
3	42	4.80		0451160	69			0		
READY 1 <sup>a</sup>				0450105	69	0				• (BL)
2 <sup>a</sup>				0450205	69	0				• (BL)
3 <sup>a</sup>				0450305	69	0				• (BL)

a PASS only

bb

100

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W 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>• &lt; 3.5 KW OUTPUT (P)</li> <li>• 3.5-7.5 KW OUTPUT (P)</li> <li>• &gt; 7.5 KW OUTPUT (P)</li> </ul>
(BFS)					69	190.0	222.0			
(PASS)					69	198.0	238.0			
(BFS)	72	3.30	4.25	0450220	69	180.0	212.0	172.5	243.7	
2 (PASS)					69	190.0	222.0			
(BFS)					69	198.0	238.0			
(PASS)	82	3.30	4.25	0450320	69	180.0	212.0	172.5	243.7	
(BFS)					69	190.0	222.0			
(PASS)					69	198.0	238.0			
(BFS)	1 ΔV SS1				69	150.0				
2					69	150.0				
3					69	150.0				
2 ΔV SS1					69	150.0				
					2	69	150.0			
					3	69	150.0			
3 ΔV SS1					69	150.0				
					2	69	150.0			
					3	69	150.0			

101

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
FCS CH BYPASS	111		2.50							● (BL)
SATURATION	101		2.50							● (BL)
FREON LOOP ACCUM QTY 1 <sup>a</sup>				0631130	88	12.0				
2 <sup>a</sup>				0631330	88	12.0				
AFT CP FLOW 1 <sup>b</sup>				0631105	88	200.0				
2 <sup>b</sup>				0631305	88	200.0				
EVAP OUT T 1 (PASS)	107	.35	1.9 <sup>c</sup>	0631207	88			32.2	64.8	● HIGH C/W DEFAULT VALUE 1.90(64.9)
(BFS)								32.2	115.0	● ASCENT
								32.2	64.8	● POST OMS 1 (TMBU), ENTRY
2 (PASS)	117	.35	1.9 <sup>c</sup>	0631407	88			32.2	64.8	● HIGH C/W DEFAULT VALUE 1.90(64.9)
(BFS)								32.2	115.0	● ASCENT
								32.2	64.8	● POST OMS 1 (TMBU), ENTRY
FREON FLOW 1 (PASS)	106	1.00		0631100	88	1950.0		1200.0		● FLOW PROP VLV - INTERCHANGER (P)
(PASS)					88	1300.0				● FLOW PROP VLV - PL HX
(BFS)								1200.0		● NO PRECOND IN BFS

a PASS OPS S2,4; BFS MM104-106, 301-303, OPS 0

b PASS only

c EVAP OUT T H/W C/W high limits set to 4.3 V (115° F) Prelaunch at crew pre-ingress sw reconfiguration and set back to 1.90 V (64.9° F) Post Insertion

102

PARAMETER NAME	CW CH	H/W CW		SOFTWARE ID	PASS SPEC	SM ALERT		SW CW		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
FREON LOOP FREON FLOW 2 (PASS)	116	1.00		0631300	88	1950.0		1200.0		
(PASS) (BFS)					88	1300.0				
PL HX FLOW 1 <sup>a</sup>				0631103	88	OSL		1200.0		
						500.0				
2 <sup>a</sup>				0631303	88	OSL		1200.0		
						500.0				
RAD INT 1 <sup>b</sup>				0631209	88		150.0	1200.0		
2 <sup>b</sup>						0631409				150.0
OUT T 1 <sup>a</sup>				0631208	88	32.0		1200.0		
2 <sup>a</sup>						0631408	88			32.0
FWD RCS LINE T1 FU <sup>a</sup>				0421306	89	46.0	105.0	1200.0		
OX <sup>a</sup>						0421206	89			46.0
T2 FU <sup>a</sup>				0421308	89	46.0	105.0	1200.0		
OX <sup>a</sup>						0421208	89			46.0

a PASS only    b BFS only; MM104-106, 301-303, OPS 0

G

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
GCIL CONFIG <sup>a</sup>				0745052	76	0				<ul style="list-style-type: none"> <li>• COMM CONTROL IS REVERTED TO PANEL (BL)</li> </ul>
GPC 1	5		2.50							• (BL)
2	15		2.50							• (BL)
3	25		2.50							• (BL)
4	35		2.50							• (BL)
5	45		2.50							• (BL)
H2O LOOP ACCUM QTY 1 <sup>a</sup>				0612610	88	20.0	80.0			
2 <sup>a</sup>				0612710	88	20.0	80.0			
CAB HX INT 1 <sup>a</sup>				0612663	88	34.0				
2 <sup>a</sup>				0612665	88	34.0				
ICH FLOW 1 <sup>a</sup>				0612742	88	550.0				<ul style="list-style-type: none"> <li>• LOOP 1 PUMP SWITCH - ON OR GPC, AND EITHER PUMP ON - CMD ISSUED (P)</li> <li>• LOOP 1 PUMP SWITCH - OFF (P)</li> <li>• LOOP 1 PUMP SWITCH - GPC, AND NEITHER PUMP - ON CMD PRESENT</li> </ul>

<sup>a</sup> PASS only

103

104

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
H2O LOOP ICH FLOW 2 <sup>a</sup>				0612722	88	550.0				<ul style="list-style-type: none"> <li>• LOOP 2 PUMP SWITCH - ON OR - GPC AND PUMP ON - CMD ISSUED (P)</li> <li>• LOOP 2 PUMP SWITCH - OFF OR - GPC AND PUMP - ON CMD NOT PRESENT (P)</li> <li>• LOOP 1 PUMP SWITCH - ON OR GPC AND EITHER PUMP ON - CMD ISSUED (P)</li> <li>• LOOP 1 PUMP SWITCH - OFF (P)</li> <li>• LOOP 1 PUMP SWITCH - GPC AND NEITHER PUMP ON - CMD PRESENT (P)</li> <li>• NO PRECOND IN BFS</li> </ul>
OUT T 1 <sup>a</sup>				0612744	88	35.0				
2 <sup>a</sup>				0612724	88	35.0				
PUMP OUT P 1(PASS)	105	0.65	2.65	0612600	88	50.0	75.00	19.5	79.5	
(PASS)					88	20.0				
(PASS)					88	20.0				
(BFS)								19.5	79.5	

a PASS only



105

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
H2O LOOP PUMP OUT P 2 (PASS)	115	1.50	2.70	0612700	88	50.0	75.0	45.0	81.0	<ul style="list-style-type: none"> <li>• LOOP 2 PUMP SWITCH - ON OR - GPC AND PUMP ON - CMD ISSUED (P)</li> <li>• LOOP 2 PUMP SWITCH OFF OR - GPC AND PUMP ON - CMD NOT PRESENT (P)</li> <li>• NO PRECOND IN BFS</li> <li>• LOOP 1 PUMP SWITCH - ON OR - GPC, AND EITHER PUMP ON - CMD ISSUED (P)</li> <li>• LOOP 1 PUMP SWITCH - OFF (P)</li> <li>• LOOP 1 PUMP - GPC AND NEITHER PUMP ON - CMD PRESENT (P)</li> <li>• LOOP 2 PUMP SWITCH - ON OR - GPC AND PUMP ON - COMMAND ISSUED (P)</li> <li>• LOOP 2 PUMP SWITCH - OFF OR - GPC AND PUMP ON - CMD NOT PRESENT (P)</li> </ul>
(PASS)					88	20.0				
(BFS)								45.0	81.0	
ΔP 1 <sup>a</sup>				0612605	88	33.0	46.0			
							5.0			
							5.0			
2 <sup>a</sup>				0612705	88	33.0	46.0			
							5.0			

<sup>a</sup> PASS only

106

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
H2O LOOP PUMP OUT T 1 <sup>a</sup>				0612640	88	45.0	90.0			
2 <sup>a</sup>				0612740	88	45.0	90.0			
SUPPLY DUMP LN T <sup>a</sup>				0620418	66	45.0	125.0			
NOZ T A <sup>a</sup>				0620440	66		250.0			
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					

a PASS only b PASS OPS S2,4; BFS MM 104-106, 301-303, OPS 0

PARAMETER NAME	CW CH	H/W CW		SOFTWARE ID	PASS SPEC	SM ALERT		S/W CW		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
HUMID SEP A <sup>a</sup>				0612557	66	0				<ul style="list-style-type: none"> <li>● SEP X - ON OR OTHER SEP - NOT ON (P); SEP X SPD NOT NORMAL (BL)</li> <li>● SEP X - NOT ON (P); SEP X SPD NORMAL (BL)</li> </ul>
B <sup>a</sup>				0612558	66	0				
HYD ACCUM P 1				0580167	86	1930.0				<ul style="list-style-type: none"> <li>● PUMP X ON (P)</li> <li>● PUMP X OFF (P)</li> </ul>
2				0580267	86	1930.0				
3				0580367	86	1930.0				
B/U P 1	99	3.00		0580115	86			2400.0		
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				

a PASS only

107

108

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
HYD RSVRP 1 <sup>a</sup>				0580131	86	45.0				
2 <sup>a</sup>				0580231	86	45.0				
3 <sup>a</sup>				0580331	86	45.0				
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)
FAN A (PASS)				0612860	66	0				• FAN X - ON OR ALL OTHER FANS - NOT ON (P); FAN X SPD NOT NORMAL (BL)
(PASS)					66	1				• FAN X - NOT ON (P); FAN X SPD NORMAL
(BFS)						0				• NO PRECOND IN BFS; FAN X NOT NORMAL (BL-BFS)
B (PASS)				0612861	66	0				X = A(B,C)
(PASS)					66	1				
(BFS)						0				

a PASS only

109

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
IMU FAN C (PASS)				0612862	66	0				<ul style="list-style-type: none"> <li>● FAN X - ON OR ALL OTHER FANS - NOT ON (P); FAN X SPD NOT NORMAL (BL)</li> <li>● FAN X - NOT ON (P); FAN X SPD NORMAL</li> <li>● NO PRECOND IN BFS; FAN X NOT NORMAL (BL-BFS)</li> <li>X = A(B,C)</li> </ul>
(PASS)					66	1				
(BFS)						0				
$\Delta P^a$				0612869	66	3.7	4.95			
KU-BAND GMBL T A <sup>a</sup>				0742965	76		180.0			
B <sup>a</sup>				0742969	76		180.0			
GYRO T <sup>a</sup>				0742967	76		180.0			
LEFT RHC	100		2.50							
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

011

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		SW 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	-10.0	250.0			
	3 <sup>a</sup>			0580392	87					
WHL	2 <sup>a</sup>			0580841	87	-10.0	250.0			
	3 <sup>a</sup>			0580842	87	-10.0	250.0			
LMG UPLK <sup>a</sup>				0580125	87					
NLG MFUS	1 <sup>a</sup>			0580127	87					
	2 <sup>a</sup>			0581143	87	-50.0	150.0			
UPLK <sup>a</sup>				0580126	87	-10.0	150.0			

a PASS only

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
LINE TEMPS R BRAKE FUS 1 <sup>a</sup>				0580192	87	-50.0	250.0			• ENABLED IF LG ARM SWITCH HAS NOT BEEN ACTIVATED
2 <sup>a</sup>				0580296	87	-10.0	250.0			
3 <sup>a</sup>				0580393	87	-10.0	250.0			
WHL 1 <sup>a</sup>				0580846	87	-35.0	250.0			
2 <sup>a</sup>				0580293	87					
3 <sup>a</sup>				0580845	87	-10.0	250.0			
RD/SB FUS 1 <sup>a</sup>				0580198	87	-10.0	250.0			
2 <sup>a</sup>				0580284	87	-10.0	250.0			
3 <sup>a</sup>				0580384	87					
PDU 1 <sup>a</sup>				0581006	87	-15.0	250.0			
2 <sup>a</sup>				0580298	87	-15.0	250.0			
3 <sup>a</sup>				0580398	87	-15.0	250.0			
RMG FUS <sup>a</sup>				0580129	87	-50.0	150.0			
UPLK <sup>a</sup>				0580128	87	-35.0	150.0			
MLG LH INBD TIRE PRESS 1 <sup>b</sup>				051P0571		50				
2 <sup>b</sup>				051P0573		50				
OTBD TIRE PRESS 1 <sup>b</sup>				051P0570		50				
2 <sup>b</sup>				051P0572		50				
RH INBD TIRE PRESS 1 <sup>b</sup>				051P0471		50				
2 <sup>b</sup>				051P0473		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		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
MLG RH OTBD TIRE PRESS 1 <sup>a</sup> 2 <sup>a</sup>				051P0470 051P0472		50 50				● ENABLED IF LG ARM SWITCH HAS NOT BEEN ACTIVATED
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			

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



113

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
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			
MPS ET ULL P LH2 HI (GNC) <sup>a</sup> LO				V97U6783C V97U6784C		31.6	46.0			
LO2 HI (GNC) <sup>a</sup> LO				V97U6785C V97U6786C		0.0	29.0			
He dP/dt (GNC) <sup>a</sup>				V99U6943C			20.0			
REG P (GNC) <sup>a</sup> C	39	3.40 (680)	4.05 (810)	V96U8499C		679.0	806.0			
L	49	3.40 (680)	4.05 (810)							
R	59	3.40 (680)	4.05 (810)							
TK P (GNC) <sup>a</sup> C	9	1.15 (1150)		V97U6826C				1150.0		

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

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
MPS He TK P L	19	1.15 (1150)								• ENABLED IF LG ARM SWITCH HAS NOT BEEN ACTIVATED
R	29	1.15 (1150)								
MANF P LH2	79		3.00 (60.0)	V97U6828C						
HI (GNC) <sup>a</sup>									60.0	
LO2	69		4.15 (249.0)	V97U6831C						
HI (GNC) <sup>a</sup>									249.0	
NLG LH TIRE PRESS 1 <sup>b</sup>				051P0370		50				
PRESS 2 <sup>b</sup>				051P0372		50				
RH TIRE PRESS 1 <sup>b</sup>				051P0371		50				
PRESS 2 <sup>b</sup>				051P0373		50				
OMS CRSFD BLD AFT FUS FU <sup>c</sup>				0436238	89	50.0	110.0			
OX <sup>c</sup>				0436239	89	50.0	110.0			
PL BAY FU <sup>c</sup>				0436234	89	45.0	100.0			
OX <sup>c</sup>				0436235	89	45.0	100.0			
DRN OX L <sup>c</sup>				0436236	89	50.0	100.0			
R <sup>c</sup>				0436237	89	50.0	110.0			

a BFS only; OPS 1,6

b BFS only; OPS 3,6

c PASS OPS S2,4; BFS MM104-106, 301-303, OPS 0

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115

PARAMETER NAME	CW CH	H/W CW		SOFTWARE ID	PASS SPEC	SM ALERT		S/W CW		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
OMS CRSFD GMBL LN L <sup>a</sup> R <sup>a</sup>  XFD OX C <sup>a</sup> L <sup>a</sup> R <sup>a</sup>				0436218	89	50.0	100.0			
				0436219	89	50.0	90.0			
				0436242	89	50.0	100.0			
				0436243	89	50.0	90.0			
ENGL R	27		2.50							● (BL) ● (BL)
	57		2.50							
N2 REG P HI (GNC) <sup>b</sup> LO				V97U6847C			434.0			
				V97U6848C		299.0				
TK P (GNC) <sup>b</sup>				V97U6846C		1200.0				
Pc (GNC) <sup>c</sup> (PASS) (BFS)				V97U4208C				2.5		● PASS IS IN VOLTS; BFS IS IN PERCENT
				V99U6942C				80.0		
RCS QTY (GNC) <sup>d</sup>				V97U9826C		1000.0				
TK P FU/OX HI (GNC) (PASS) HI (BFS) LO				V97U6852C					284.0	
				V97U9869C				288.0		
				V97U6853C				234.0		

a PASS only    b PASS OPS G2,8; BFS OPS 1,3,6    c PASS OPS G1,3,6; BFS OPS 1,3,6    d PASS OPS G2

116

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
OMS TK P FU										
L	17	2.90 (232.0)	3.60 (288.0)							● HIGH C/W DEFAULT VALUE 3.55(284.0)  3.55(284.0)
R	47	2.90 (232.0)	3.60 (288.0)							
He (GNC)				V97U6840C		1500.0				
OX										
L	7	2.90 (232.0)	3.60 (288.0)							● HIGH C/W DEFAULT VALUE 3.55(284.0)  3.55(284.0)
R	37	2.90 (232.0)	3.60 (288.0)							
TVC	67		2.50							● (BL)

P

PARAMETER NAME	CW CH	H/W CW		SOFTWARE ID	PASS SPEC	SM ALERT		S/W CW		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 AND 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>
				0920106	62	0.00	6.00			
2 <sup>a</sup>				0920107	62		0.00			
3 <sup>a</sup>				0920108	62	0.00	6.00			
4 <sup>a</sup>				0920109	62	0.00	6.00			

<sup>a</sup> PASS only

117

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
PDRS JOINT SLIP TOLERANCE VALUE	SY			0986951			0.5			NOTE: SLIPPAGE GREATER THAN 0.5° PER JOINT OR SUM OF 2.0° FOR ALL JOINTS
	SP			0986952			0.5			
	EP			0986953			0.5			
	WP			0986954			0.5			
	WY			0986955			0.5			
	WR			0986956			0.5			
	TOTAL			0986957			2.0			
PDRS PORT ABE 1(2) S	HI			0966800			144.0			NOTE: PDRS LIMITS ARE MANAGED THROUGH THE CONSTANTS PORTION OF SM 60 TABLE MAINTENANCE
	LO			0966817	1.0					
3 EP	HI			0966801			144.0			
	LO			0966818	1.0					
4(5) WP	HI			0966802			144.0			
	LO			0966819	1.0					
6 WR	HI			0966803			144.0			
	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					

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119

PARAMETER NAME	CW CH	H/W CW		SOFTWARE ID	PASS SPEC	SM ALERT		S/W CW		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
PDRS PORT LED 4 WP HI				0966793			172.0			NOTE: PDRS LIMITS ARE MANAGED THROUGH THE CONSTANTS PORTION OF SM 60 TABLE MAINTENANCE
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				
POD ENG COVER La				0434720	89	45.0				
Ra				0435720	89	45.0				
I/F FU Lb				0434642	89	45.0	110.0			
Rb				0435642	89	45.0	110.0			
INJLa				0434643	89	36.0	260.0			
Ra				0435643	89	36.0	260.0			
OX Lb				0434216	89	45.0	110.0			
Rb				0435216	89	45.0	110.0			
VLV La				0434641	89	40.0	122.0			
Ra				0435641	89	40.0	122.0			

a PASS only      b PASS OPS S2,4; BFS MM104-106, 301-303, OPS 0

120

PARAMETER NAME	CW CH	HW CW		SOFTWARE ID	PASS SPEC	SM ALERT		SW CW		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
POD ENG SERV PNL La Ra				0434707	89	45.0	140.0			
				0435707	89	45.0	140.0			
GSE SERV PNL Lb Rb				0434706	89	45.0	120.0			
				0435706	89	45.0	120.0			
OMS TK FU Lb Rb				0434315	89	45.0	95.0			
				0435315	89	45.0	95.0			
OX Lb Rb				0434215	89	45.0	95.0			
				0435215	89	45.0	95.0			
OX DRN PNL 1 La Ra				0434704	89	45.0	110.0			
				0435704	89	45.0	110.0			
2 La Ra				0434705	89	45.0	110.0			
				0435705	89	45.0	110.0			
TEST He/OX 1 Lb Rb				0434708	89	35.0	95.0			
				0435708	89	35.0	95.0			
2 Lb Rb				0434718	89	35.0	95.0			
				0435718	89	35.0	95.0			

a PASS OPS S2,4; BFS MM104-106, 301-303, OPS 0      b PASS only



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PARAMETER NAME	CW CH	H/W CW		SOFTWARE ID	PASS SPEC	SM ALERT		SW CW		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
POD WEB KEEL 1 L <sup>a</sup>				0434700	89	45.0	100.0			<ul style="list-style-type: none"> <li>• (BL)</li> <li>• LEAK ALERT OR TANK ULLAGE PRESSURE (PARAMETERS 6,16/36,46)</li> </ul>
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 O B L <sup>a</sup>				0434702	89	45.0	120.0			
R <sup>a</sup>				0435702	89	45.0	120.0			
U P 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							
LEAK (GNC) <sup>b</sup>				V97U9807C				9.5		
LEAK/TK P F	26		2.50							
L	56		2.50							
R	86		2.50							
TK OUT P FU/OX HI (GNC)				V97U6870C						
LO				V97U6871C				220.0	300.0	

a PASS only

b PASS OPS G2,3,8; BFS OPS 1,3,6

122

PARAMETER NAME	CW CH	H/W CW		SOFTWARE ID	PASS SPEC	SM ALERT		S/W CW		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
RCS TK P FU/OX HI (GNC) LO				V97U6876C V97U6877C				200.0	312.0	
FUF	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)							
OXF	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)							
RCS TK T FU/OX HI (GNC) LO				V97U6873C V97U6874C		50.0	90.0			
RGAA	93		2.50							• (BL)
RIGHT/AFT RHC	110		2.50							• (BL)

S

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W C/W		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
S BAND ANT QUAD <sup>a</sup>				0921049		1				● VERIFICATION FAIL (BL)
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	
SPACELAB: (BFS ONLY)										
AV FAN ΔP				9021515				.044	.074	
BUS AUX A/B UV				9011004		0				
MAIN				9011201		24	31.8			
H2O LOOP ΔP STAT				9041106				0		
INVERTER EXP A IN				9011121			125.0			
TEMP				9011138			122			
SS A IN				9011101			125.0			
TEMP				9011118			122			
SS BUS VOLTS ΦA				9011301		110	122			
ΦB				9011302		110	122			
ΦC				9011303		110	122			

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a PASS only

124

PARAMETER NAME	CW CH	HW CW		SOFTWARE ID	PASS SPEC	SM ALERT		SW CW		PRECONDITION (P) AND/OR BILEVEL STATE (BL)
		LOW	HIGH			LOW	HIGH	LOW	HIGH	
W/B BLR T 1 <sup>a</sup> (PASS)				0580162	86	45.0	120.0			<ul style="list-style-type: none"> <li>• W/B X CNTLR HTR ON (P)</li> <li>• W/B X CNTLR HTR OFF (P)</li> </ul>
(PASS)					86		209.0			
(BFS) <sup>b</sup>				0580163	86	45.0	120.0			
(PASS)					86		209.0			
(PASS)										
2 <sup>a</sup> (PASS)				0580262	86	45.0	120.0			
(PASS)					86		209.0			
(BFS) <sup>b</sup>				0580263	86	45.0	120.0			
(PASS)					86		209.0			
(PASS)										
3 <sup>a</sup> (PASS)				0580362	86	45.0	120.0			
(PASS)					86		209.0			
(BFS) <sup>b</sup>				0580363	86	45.0	120.0			
(PASS)					86		209.0			

<sup>a</sup> Upper ID for BOILER CNTLR PWR/HTR SW position A  
 Lower ID for BOILER CNTLR PWR/HTR SW position B

<sup>b</sup> BFS only; 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		S/W 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>• BLR CNTLR/HTR SW - A (P)</li> <li>• BLR CNTLR/HTR SW - OFF OR B (P)</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

126

PARAMETER NAME	C/W CH	H/W C/W		SOFTWARE ID	PASS SPEC	SM ALERT		S/W 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	221.0			<ul style="list-style-type: none"> <li>• W/B X CNTLR A ON (P)</li> <li>• W/B X CNTLR A OFF (P)</li>   <li>• W/B X CNTLR B ON (P)</li> <li>• W/B X CNTLR B OFF (P)</li> </ul>
2 <sup>a</sup>				0580261	86	40.0	221.0			
3 <sup>a</sup>				0580361	86	40.0	221.0			
B 1 <sup>a</sup>				0580164	86	40.0	221.0			
2 <sup>a</sup>				0580264	86	40.0	221.0			
3 <sup>a</sup>				0580364	86	40.0	221.0			

a 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 REACH2	*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		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		*65		*90		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	RGAA/AA	118	APU 3 UNDERSPEED
19	MPS HE TK P - L	44	CAB PPO2 B	69	MPS MANF P LO2	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

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PRIMARY TO BACKUP C/W ANALOG PARAMETER CALIBRATION

(1)	(2)	(3)	(4)	(5a)	(5b)	(5c)	(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	0.28 TO 19.68	0.04 TO 20.04	0.32 TO 20.14	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	579 TO 2617
.00	-417	-76.7	-3.1	0.28	0.04	0.32	0	0	0	0	0	8	24.9	45	145	515	579
.05	-408	-72.9	1.9	0.47	0.24	0.51	.08	.4	1	1.5	3	23	25.9	46	146.6	520	613
.10	-399	-69.2	6.9	0.67	0.44	0.71	.16	.8	2	3	6	38	27	47	148.2	525	646
.15	-390	-65.4	11.9	0.86	0.64	0.91	.24	1.2	3	4.5	9	53	28	48	149.8	530	680
.20	-381	-61.7	16.9	1.06	0.84	1.11	.32	1.6	4	6	12	68	29.1	49	151.4	535	712
.25	-373	-57.9	21.9	1.25	1.04	1.31	.4	2	5	7.5	15	84	30.1	50	153	540	745
.30	-364	-54.2	26.9	1.44	1.24	1.50	.48	2.4	6	9	18	99	31.2	51	154.6	545	777
.35	-355	-50.4	31.9	1.64	1.44	1.70	.56	2.8	7	10.5	21	114	32.2	52	156.2	550	809
.40	-346	-46.7	36.9	1.83	1.64	1.90	.64	3.2	8	12	24	129	33.3	53	157.8	555	841
.45	-337	-42.9	41.9	2.03	1.84	2.10	.72	3.6	9	13.5	27	144	34.3	54	159.4	560	872
.50	-328	-39.2	46.9	2.22	2.04	2.30	.8	4	10	15	30	159	35.4	55	161	565	903
.55	-320	-35.4	51.9	2.41	2.24	2.50	.88	4.4	11	16.5	33	174	36.4	56	162.6	570	933
.60	-311	-31.7	56.9	2.61	2.44	2.69	.96	4.8	12	18	36	189	37.5	57	164.2	575	963
.65	-302	-27.9	61.9	2.80	2.64	2.89	1.04	5.2	13	19.5	39	205	38.5	58	165.8	580	993
.70	-293	-24.2	66.9	3.00	2.84	3.09	1.12	5.6	14	21	42	220	39.6	59	167.4	585	1023
.75	-284	-20.4	71.9	3.19	3.04	3.29	1.2	6	15	22.5	45	235	40.6	60	169	590	1052
.80	-275	-16.7	76.9	3.38	3.24	3.49	1.28	6.4	16	24	48	250	41.7	61	170.6	595	1081
.85	-266	-12.9	81.9	3.58	3.44	3.68	1.36	6.8	17	25.5	51	265	42.7	62	172.2	600	1109
.90	-258	-9.2	86.9	3.77	3.64	3.88	1.44	7.2	18	27	54	280	43.8	63	173.8	605	1137
.95	-249	-5.5	91.9	3.97	3.84	4.08	1.52	7.6	19	28.5	57	295	44.8	64	175.4	610	1165
1.00	-240	-1.7	96.8	4.16	4.04	4.28	1.6	8	20	30	60	310	45.9	65	177	615	1193
1.05	-231	2	101.8	4.35	4.24	4.48	1.68	8.4	21	31.5	63	325	46.9	66	178.6	620	1220
1.10	-222	5.8	106.8	4.55	4.44	4.68	1.76	8.8	22	33	66	341	48	67	180.2	625	1247

- 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 OV-102  
b OV-103  
c OV-104
- ⑥ CAB FAN ΔP
- ⑦ MAIN BUS VOLTS  
X10 = OMS  
TK ULL P  
X10 = RCS  
TK ULL P  
X100 = HYD  
SYS P



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1.15	-213	9.5	111.8	4.74	4.64	4.87	1.84	9.2	23	34.5	69	356	49	68	181.8	630	1274
1.20	-205	13.3	116.8	4.94	4.84	5.07	1.92	9.6	24	36	72	371	50.1	69	183.4	635	1300
1.25	-196	17	121.8	5.13	5.04	5.27	2	10	25	37.5	75	386	51.1	70	185	640	1326
1.30	-187	20.8	126.8	5.32	5.24	5.47	2.08	10.4	26	39	78	401	52.2	71	186.6	645	1352
1.35	-178	24.5	131.8	5.52	5.44	5.67	2.16	10.8	27	40.5	81	416	53.2	72	188.2	650	1378
1.40	-169	28.3	136.8	5.71	5.64	5.86	2.24	11.2	28	42	84	431	54.3	73	189.8	655	1403
1.45	-160	32	141.8	5.91	5.84	6.06	2.32	11.6	29	43.5	87	446	55.3	74	191.4	660	1428
1.50	-152	35.8	146.8	6.10	6.04	6.26	2.4	12	30	45	90	462	56.4	75	193	665	1453
1.55	-143	39.5	151.8	6.29	6.24	6.46	2.48	12.4	31	46.5	93	477	57.4	76	194.6	670	1477
1.60	-134	43.3	156.8	6.49	6.44	6.66	2.56	12.8	32	48	96	492	58.5	77	196.2	675	1501
1.65	-125	47	161.8	6.68	6.64	6.86	2.64	13.2	33	49.5	99	507	59.5	78	197.8	680	1525
1.70	-116	50.8	166.8	6.88	6.84	7.05	2.72	13.6	34	51	102	522	60.6	79	199.4	685	1548
1.75	-107	54.5	171.8	7.07	7.04	7.25	2.8	14	35	52.5	105	537	61.6	80	201	690	1572
1.80	-98	58.3	176.8	7.26	7.24	7.45	2.88	14.4	36	54	108	552	62.7	81	202.6	695	1595
1.85	-90	62	181.8	7.46	7.44	7.65	2.96	14.8	37	55.5	111	567	63.7	82	204.2	700	1617
1.90	-81	65.7	186.8	7.65	7.64	7.85	3.04	15.2	38	57	114	582	64.8	83	205.8	705	1640
1.95	-72	69.5	191.8	7.85	7.84	8.05	3.12	15.6	39	58.5	117	598	65.8	84	207.4	710	1662
2.00	-63	73.2	196.8	8.04	8.04	8.24	3.2	16	40	60	120	613	66.9	85	209	715	1684
2.05	-54	77	201.8	8.23	8.24	8.44	3.28	16.4	41	61.5	123	628	67.9	86	210.6	720	1706
2.10	-45	80.7	206.8	8.43	8.44	8.64	3.36	16.8	42	63	126	643	69	87	212.2	725	1727
2.15	-37	84.5	211.8	8.62	8.64	8.84	3.44	17.2	43	64.5	129	658	70	88	213.8	730	1748
2.20	-28	88.2	216.8	8.82	8.84	9.04	3.52	17.6	44	66	132	673	71.1	89	215.4	735	1769
2.25	-19	92	221.8	9.01	9.04	9.23	3.6	18	45	67.5	135	688	72.1	90	217	740	1790
2.30	-10	95.7	226.8	9.20	9.24	9.43	3.68	18.4	46	69	138	703	73.2	91	218.6	745	1810
2.35	-1	99.5	231.8	9.40	9.44	9.63	3.76	18.8	47	70.5	141	719	74.2	92	220.2	750	1831
2.40	8	103.2	236.8	9.59	9.64	9.83	3.84	19.2	48	72	144	734	75.3	93	221.8	755	1851
2.45	16	107	241.8	9.79	9.84	10.03	3.92	19.6	49	73.5	147	749	76.3	94	223.4	760	1870
2.50	25	110.7	246.8	9.98	10.04	10.23	4	20	50	75	150	764	77.4	95	225	765	1890

- 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

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(1)	(2)	(3)	(4)	(5a)	(5b)	(5c)	(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	0.28 TO 19.68	0.04 TO 20.04	0.32 TO 20.14	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	579 TO 2617
2.55	34	114.5	251.8	10.17	10.24	10.42	4.08	20.4	51	76.5	153	779	78.4	96	226.6	770	1909
2.60	43	118.2	256.8	10.37	10.44	10.62	4.16	20.8	52	78	156	794	79.5	97	228.2	775	1928
2.65	52	122	261.8	10.56	10.64	10.82	4.24	21.2	53	79.5	159	809	80.5	98	229.8	780	1947
2.70	61	125.7	266.8	10.75	10.84	11.02	4.32	21.6	54	81	162	824	81.6	99	231.4	785	1965
2.75	70	129.4	271.8	10.95	11.04	11.22	4.4	22	55	82.5	165	840	82.6	100	233	790	1984
2.80	78	133.2	276.8	11.14	11.24	11.41	4.48	22.4	56	84	168	855	83.7	101	234.6	795	2002
2.85	87	136.9	281.8	11.34	11.44	11.61	4.56	22.8	57	85.5	171	870	84.7	102	236.2	800	2020
2.90	96	140.7	286.8	11.53	11.64	11.81	4.64	23.2	58	87	174	885	85.8	103	237.8	805	2037
2.95	105	144.4	291.8	11.72	11.84	12.01	4.72	23.6	59	88.5	177	900	86.8	104	239.4	810	2055
3.00	114	148.2	296.8	11.92	12.04	12.21	4.8	24	60	90	180	915	87.9	105	241	815	2072
3.05	123	151.9	301.8	12.11	12.24	12.41	4.88	24.4	61	91.5	183	930	88.9	106	242.6	820	2089
3.10	131	155.7	306.8	12.31	12.44	12.60	4.96	24.8	62	93	186	945	90	107	244.2	825	2106
3.15	140	159.4	311.8	12.50	12.64	12.80	5.04	25.2	63	94.5	189	960	91	108	245.8	830	2123
3.20	149	163.2	316.8	12.69	12.84	13.00	5.12	25.6	64	96	192	976	92.1	109	247.4	835	2139
3.25	158	166.9	321.8	12.89	13.04	13.20	5.2	26	65	97.5	195	991	93.1	110	249	840	2155
3.30	167	170.7	326.8	13.08	13.24	13.40	5.28	26.4	66	99	198	1006	94.2	111	250.6	845	2171
3.35	176	174.4	331.8	13.28	13.44	13.59	5.36	26.8	67	100.5	201	1021	95.2	112	252.2	850	2187
3.40	185	178.2	336.8	13.47	13.64	13.79	5.44	27.2	68	102	204	1036	96.3	113	253.8	855	2203
3.45	193	181.9	341.8	13.66	13.84	13.99	5.52	27.6	69	103.5	207	1051	97.3	114	255.4	860	2218
3.50	202	185.7	346.8	13.86	14.04	14.19	5.6	28	70	105	210	1066	98.4	115	257	865	2233
3.55	211	189.4	351.8	14.05	14.24	14.39	5.68	28.4	71	106.5	213	1081	99.4	116	258.6	870	2249
3.60	220	193.2	356.8	14.25	14.44	14.59	5.76	28.8	72	108	216	1097	100.5	117	260.2	875	2263

- 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 OV-102  
b OV-103  
c OV-104
- ⑥ CAB FAN ΔP
- ⑦ MAIN BUS VOLTS  
X10 = OMS  
TK ULL P  
X10 = RCS  
TK ULL P  
X100 = HYD  
SYS P

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3.65	229	196.9	361.8	14.44	14.64	14.78	5.84	29.2	73	109.5	219	1112	101.5	118	261.8	880	2278
3.70	238	200.6	366.8	14.63	14.84	14.98	5.92	29.6	74	111	222	1127	102.6	119	263.4	885	2293
3.75	246	204.4	371.8	14.83	15.04	15.18	6	30	75	112.5	225	1142	103.6	120	265	890	2307
3.80	255	208.1	376.8	15.02	15.24	15.38	6.08	30.4	76	114	228	1157	104.7	121	266.6	895	2321
3.85	264	211.9	381.8	15.22	15.44	15.58	6.16	30.8	77	115.5	231	1172	105.7	122	268.2	900	2335
3.90	273	215.6	386.8	15.41	15.64	15.78	6.24	31.2	78	117	234	1187	106.8	123	269.8	905	2349
3.95	282	219.4	391.8	15.60	15.84	15.97	6.32	31.6	79	118.5	237	1202	107.8	124	271.4	910	2363
4.00	291	223.1	396.8	15.80	16.04	16.17	6.4	32	80	120	240	1217	108.9	125	273	915	2376
4.05	299	226.9	401.8	15.99	16.24	16.37	6.48	32.4	81	121.5	243	1233	109.9	126	274.6	920	2390
4.10	308	230.6	406.8	16.19	16.44	16.57	6.56	32.8	82	123	246	1248	111	127	276.2	925	2403
4.15	317	234.4	411.8	16.38	16.64	16.77	6.64	33.2	83	124.5	249	1263	112	128	277.8	930	2416
4.20	326	238.1	416.8	16.57	16.84	16.96	6.72	33.6	84	126	252	1278	113.1	129	279.4	935	2429
4.25	335	241.9	421.8	16.77	17.04	17.16	6.8	34	85	127.5	255	1293	114.1	130	281	940	2442
4.30	344	245.6	426.8	16.96	17.24	17.36	6.88	34.4	86	129	258	1308	115.2	131	282.6	945	2454
4.35	353	249.4	431.8	17.16	17.44	17.56	6.96	34.8	87	130.5	261	1323	116.2	132	284.2	950	2467
4.40	361	253.1	436.8	17.35	17.64	17.76	7.04	35.2	88	132	264	1338	117.3	133	285.8	955	2479
4.45	370	256.9	441.8	17.54	17.84	17.96	7.12	35.6	89	133.5	267	1354	118.3	134	287.4	960	2491
4.50	379	260.6	446.8	17.74	18.04	18.15	7.2	36	90	135	270	1369	119.4	135	289	965	2503
4.55	388	264.4	451.8	17.93	18.24	18.35	7.28	36.4	91	136.5	273	1384	120.4	136	290.6	970	2515
4.60	397	268.1	456.8	18.13	18.44	18.55	7.36	36.8	92	138	276	1399	121.5	137	292.2	975	2527
4.65	406	271.8	461.8	18.32	18.64	18.75	7.44	37.2	93	139.5	279	1414	122.5	138	293.8	980	2539
4.70	414	275.6	466.8	18.51	18.84	18.95	7.52	37.6	94	141	282	1429	123.6	139	295.4	985	2550
4.75	423	279.3	471.8	18.71	19.04	19.14	7.6	38	95	142.5	285	1444	124.6	140	297	990	2562
4.80	432	283.1	476.8	18.90	19.24	19.34	7.68	38.4	96	144	288	1459	125.7	141	298.6	995	2573
4.85	441	286.8	481.8	19.10	19.44	19.54	7.76	38.8	97	145.5	291	1475	126.7	142	300.2	1000	2584
4.90	450	290.6	486.8	19.29	19.64	19.74	7.84	39.2	98	147	294	1490	127.8	143	301.8	1005	2595
4.95	459	294.3	491.8	19.48	19.84	19.94	7.92	39.6	99	148.5	297	1505	128.8	144	303.4	1010	2606
5.00	468	298.1	496.8	19.68	20.04	20.14	8	40	100	150	300	1520	129.9	145	305	1015	2617

- 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

C/W AND  
FDA OPS

**FDA LIMIT CHANGE**

SM 60 SM TABLE MAINTI

- 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 MAINTI

- 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 MAINTI

- 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

CW AND  
FDA OPS

**FDA PARAM ANNUN ENABLE**

ISM 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**

ISM 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**

ISM 60 SM TABLE MAINT

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

**FDA ANNUN ENABLE**

ISM 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
  - F7 C/W 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
  - R13U ✓STATUS lts (parameters out of limits since C/W memory clear) - on
  - C3 C/W MEM - CLEAR
  - C3 ✓STATUS lts - off
  
3. C/W Memory Clear
  - C3 C/W MEM - CLEAR
  - (R13U)



GPC  
R/W

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;">0: GPC MEMORY</div>																
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>						29	<table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>								
30	<table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						31	<table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>								
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## 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 60-110 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, 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, 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  
STARS

## NAV STAR REFERENCE TABLE ①

Star ID	Name	*** MEAN OF 1950 ***				
		RA ②	Dec	Pitch ③	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	DENEB	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	DENEBOLA	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	DENEB ALGEDI	326	-16	19	328	3
59	SCHEAT	345	28	331	347	2
60	ENIF	325	10	348	326	2

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## NAV STAR REFERENCE TABLE ①

Star ID	Name	*** MEAN OF 1950 ***				
		RA ②	Dec	Pitch ③	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	KAPPA SCORPII	265	-39	96	309	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	ALPHA MUSCAE	189	-69	111	357	3
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	MU SCORPII	252	-38	111	311	3
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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REF/ALL/GEN A

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