Space Shuttle Program
FLIGHT DATA FILE

JSC–48027

Malfunction Procedures

Mission Operations Directorate
Operations Division

Generic, Rev F
February 9, 2004

NOTE
For STS–114 and subsequent flights

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas

United Space Alliance

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MISSION OPERATIONS DIRECTORATE

MALFUNCTION PROCEDURES

GENERIC, REVISION F
February 9, 2004

PREPARED BY

Harold L Scott 2/09/04
Harold L Scott
Book Manager

APPROVED BY

Michael D Feierstein
Manager, Shuttle Procedures Management

ACCEPTED BY

FOR Michael J Hurt
FDF Manager

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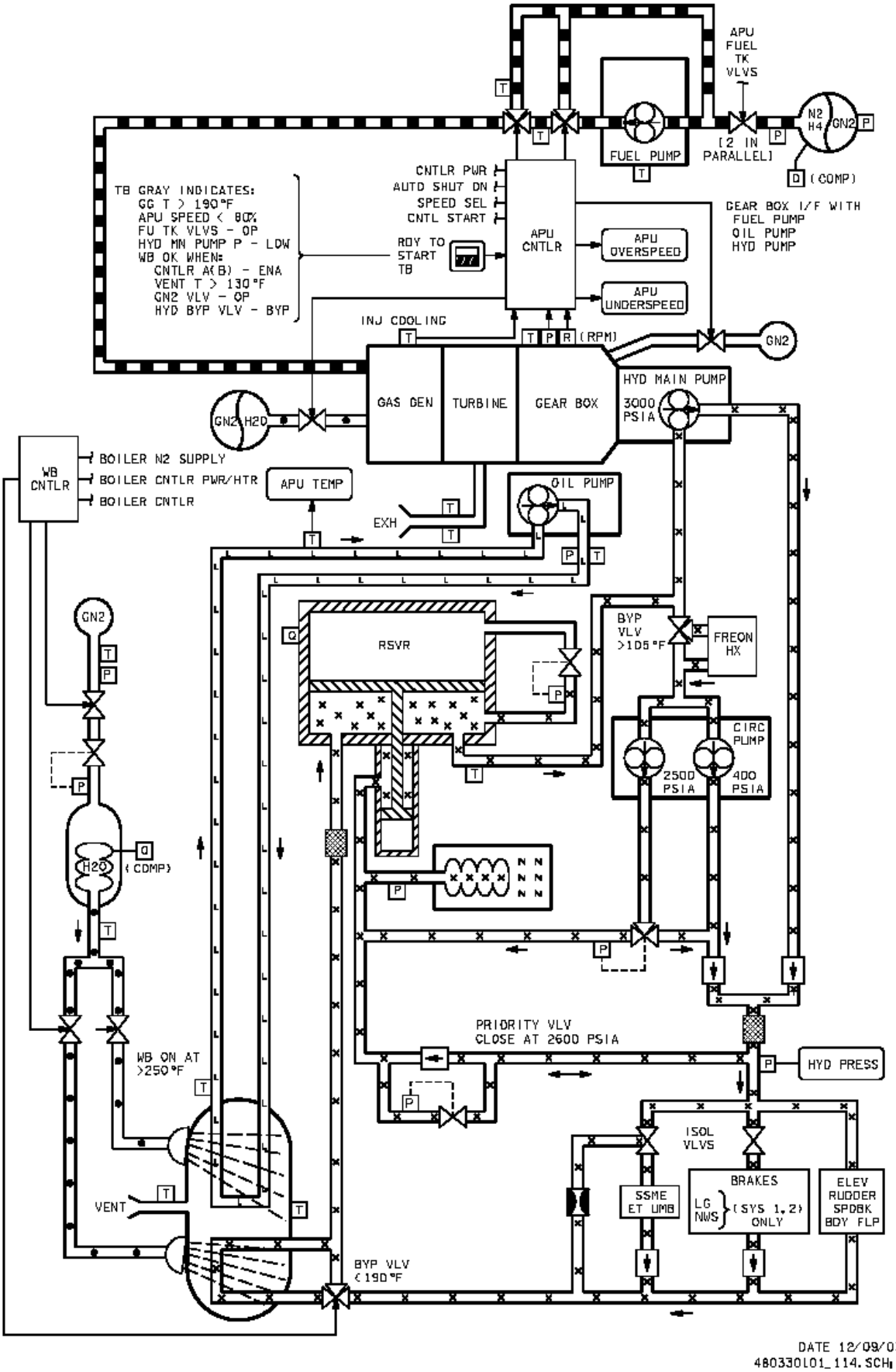
APU/HYD


APU FUEL TK VLVS
FUEL PUMP
(2 IN PARALLEL)
N2 H4
GN2
P
D
(COMP)
TB GRAY INDICATES:
GG T > 190°F
APU SPEED < 80%
FU TK VLVS - OP
HYD MN PUMP P - LOW
WB OK WHEN:
CNTLR A(B) - ENA
VENT T > 130°F
GN2 VLV - OP
HYD BYP VLV - BYP
CNTLR PWR
AUTO SHUT DN
SPEED SEL
CNTL START
RDY TO START TB
APU CNTLR
APU OVERSPEED
APU UNDERSPEED
GEAR BOX I/F WITH FUEL PUMP OIL PUMP HYD PUMP
INJ COOLING
T P R (RPM)
GN2
GAS GEN
TURBINE
GEAR BOX
HYD MAIN PUMP
3000 PSIA
GN2 H2O
WB CNTLR
BOILER N2 SUPPLY
BOILER CNTLR PWR/HTR
BOILER CNTLR
APU TEMP
EXH
OIL PUMP
RSVR
BYP VLV >105°F
FREON HX
CIRC PUMP
2500 PSIA
400 PSIA
H2O
(COMP)
PRIORITY VLV CLOSE AT 2600 PSIA
HYD PRESS
WB ON AT >250°F
VENT
ISOL VLVS
BRAKES
LG NWS
(SYS 1,2) ONLY
SSME ET UMB
ELEV RUDDER SPDBK BDY FLP
BYP VLV <190°F
DATE 12/09/03
480330101_114.SCH: 2

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APU/HYD

SM ALERT

S86 APU FUEL 1(2,3)

If:
APU 1(2,3) FUEL QTY < 50% or
APU 1(2,3) FUEL TK P
< 100 psia
> 350 psia

BFS

SM2 APU 1(2,3)

If:
APU 1(2,3) FUEL QTY < 20%

Nominal Config:
(R2)
APU OPER 1(2,3) – OFF
APU FUEL TK VLV 1(2,3) – CL

1.1a APU FUEL QTY ↓ APU FUEL TK P ↑↓

1

SM 86 APU/ HYD

- Match indications in chart to determine failure

(MDU) APU FUEL PRESS (1)	(CRT) APU FU TK P psia	(CRT) APU FU OUT P psia	(CRT) APU FUEL QTY %	FAILURE	
500	'↑' or 500 (H)	> 140	100	XDCR SHIFT OR FAILURE (1)	→ APU/HYD SSR–4
decr	decr	decr	decr	HYDRAZINE OR N2 LEAKING	→ APU/HYD 5 SSR–5 steps 1 to 4
0	0(L)	0	0	N2 LEAKED OUT	
–50, steady	50 ↓	0	~0	HYDRAZINE LEAKED OUT	
0	0(L)	> 140	0	XDCR SHIFT OR FAILURE (1)	→ APU/HYD SSR–4

(1) Puts qty computation in error. FU OUT P XDCR may be substituted in fuel qty calculation

APU/HYD

1.1b TK SURF T ↓, TK HTR T ↑↓, TEST LN T1(T2) ↑↓, FEED LN T ↑↓, PUMP IN T ↑↓, PUMP DRN LN T1(T2) ↑↓, PUMP OUT T ↑↓, PUMP BYP LN T ↑↓, GG SUPPLY LN T ↑↓, H2O LN INJ T ↑↓

SM ALERT

S88 APU TANK T 1(2,3)

If:
- TK SURF 1(2,3) < 45 degF or
- TK HTR 1(2,3) < 45 degF > 140 degF

S88 APU FU LN 1(2,3)

If:
- FEED LN 1(2,3) < 45 degF > 120 degF or
- PUMP IN 1(2,3) < 45 degF > 125 degF or
- TEST LN T1 1(2,3) < 45 degF > 110 degF or
- TEST LN T2 1(2,3) < 45 degF > 150 degF or
- DRN LN T1 1(2,3) < 48 degF > 95 degF or
- DRN LN T2 < 48 degF 1(2,3) > 140 degF 1(3) > 195 degF (2)

S88 APU FU PMP 1(2,3)

If:
- PUMP OUT T 1(2,3) < 50 degF > 210 degF or
- PUMP BYP LN T 1(2,3) < 60 degF > 200 degF or
- GGVM SPLY LN T 1(2,3) > 200 degF < 60 degF

S88 APU H2O T 1(2,3)

If:
- H2O LN INJ < 40 degF 1(2,3) > 110 degF 1(3) > 195 degF (2)

Nominal Config:

(A12)
- APU HTR GAS GEN/FUEL PUMP 1,2,3 (three) – A AUTO(B AUTO)
- APU HTR TK/FU LINE/H2O SYS
  - 1A,2A,3A (three) – AUTO(OFF)
  - 1B,2B,3B (three) – OFF (AUTO)

(R2)
- APU CNTLR PWR 1,2,3 (three) – OFF

1 Deactivate all APU fuel htrs

(A12)
APU HTR TK/FU LINE/H2O SYS
- 1A,2A,3A – OFF
- 1B,2B,3B – OFF

APU HTR GAS GEN/FUEL PUMP
- 1,2,3 – OFF

ORB PKT C/L, APU FUEL T

2 SM 88 APU/ENVIRON THERM

Param(s) off–scale high (H) or low (L) (Refer to SM FDA THERMAL LIMITS TABLE) ?

NO → **3** Param(s) high (↑) / Param(s) low (↓)

YES → **5** XDCR FAILURE

(1)

7
- Reactivate htrs per previous config

TK SURF T ↓ ?

YES → APU/HYD SSR–6

NO → **10**
- Continue normal ops

4 THERMOSTAT FAILED ON OR HTR SHORT

CAUTION
Do not reactivate affected htr sys

8
- Reactivate unaffected htrs (Refer to SM FDA THERMAL LIMITS TABLE)
- ✓MCC for affected htr config

6
- Switch to alternate htr/thermostat ckt as reqd
- Reactivate unaffected htrs per previous config
- Refer to table for XDCR range, low (↓) and high limits, (↑) and switch reconfig

Affected temp returns within limits ?

YES → **9** HTR/ THERMOSTAT CKT FAILED OFF

NO → **11** EXTREMELY COLD ENVIRONMENT OR XDCR SHIFT

(1) Transducer shift or failure causes erroneous fuel qty computation. Fuel tank temperature constant will be substituted in calculation

SM FDA THERMAL LIMITS TABLE

PARAM	XDCR RANGE degF	LOW LIMIT degF	HIGH LIMIT degF	SWITCHES
FUEL T				(A12) (2)
TK SURF	0–160	45		APU HTR TK/FU LINE/H2O/SYS
TK HTR	0–160	45	140	1B(2B,3B) – AUTO(OFF)
TEST LN 1	0–250	45	110	1A(2A,3A) – OFF(AUTO)
LN 2	0–250	45	150	
FEED LN	0–250	45	120	
PUMP IN	0–250	45	125	
DRN LN 1	0–250	43	95	
LN 2	0–250	43	140 (3) (4)	
H2O LN INJ	–75–300	40	110 (5)	
PUMP OUT	0–250	50	210	(A12) (2)
BYP LN	0–400	60	200	APU HTR GAS GEN/ FUEL PUMP 1(2,3)
GGVM SPLY LN	0–450	60	200	A AUTO OR B AUTO

(2) If subsequent failure occurs in remaining htr ckt, consult MCC

(3) SYS 2 upper limit is 195 degF; lower limit is 48 degF

(4) Because of Xdcr location, FU PUMP DRN LN T1 and T2 may not be equal. Generally, T2 will be higher than T1, which is more evident on SYS 2

(5) SYS 2 upper limit is 190 degF

APU/HYD

1.1c APU FUEL TK VLV T ↑↓

SM ALERT

S86 FU TK VLV 1(2,3)

BFS

SM2 FU TK VLV APU

If:
APU 1(2,3) FUEL TK VLV T A(B)
< 45 degF
> 140 degF

Nominal Config:
(A12)
APU HTR TK/FU LINE/H2O SYS
1A(2A,3A) – AUTO(OFF)
1B(2B,3B) – OFF (AUTO)
(R2)
APU OPER
1(2,3) – OFF
APU FUEL TK VLV
1(2,3) – CL
cb APU FU TK VLV
ENA 1A(2A,3A) – cl
ENA 1B(2B,3B) – cl

1
BFS SM SYS SUMM 2
SM 86 APU/HYD
•✓ APU FUEL TK VLV T A(B):
0 (L) 250 (H)
'↓'
'↑'

2 XDCR FAILURE

3 Open aff cb
(R2)
• cb APU FU TK VLV ENA 1(2,3) A(B) – op

4 Select alternate htr
(A12)
APU HTR TK/FU LINE/H2O SYS –
• 1A,2A,3A OFF(AUTO)
• 1B,2B,3B AUTO(OFF)
Temp returns within limits ?
NO → 5 XDCR SHIFT OR EXTREMELY COLD THERMAL ENVIRONMENT (1)
YES → 7 HTR/ THERMOSTAT FAILURE

6 Open aff cb
(R2)
• cb APU FU TK VLV ENA 1(2,3) A(B) – op
Temp stops increasing ?
NO → 8 Select alternate htr
(A12)
APU HTR TK/FU LINE/H2O SYS –
• 1A,2A,3A OFF(AUTO)
• 1B,2B,3B AUTO(OFF)
Temp returns within limits ?
NO → 10 XDCR SHIFT OR EXTREMELY HOT THERMAL ENVIRONMENT (1)
YES → 11 HTR/ THERMOSTAT FAILURE
YES → 9 APU FUEL TK VLV FAILED OPEN (2)

(1) MCC has access to alternate Xdcrs

(2) Normal operation of APU available through other fuel tk vlv

APU/HYD

1.2a RSVR P ↓, ACCUM P ↓

SM ALERT

S86 RSVR/ACC P 1(2,3)

If:
HYD 1(2,3) ACCUM 32 < P < 1930 psia
and/or
HYD 1(2,3) RSVR 2 < P < 28 psia

BFS

SM2 HYD ACCUM P 1(2,3)

If:
HYD 1(2,3) ACCUM 32 < P < 1930 psia
and/or
HYD 1(2,3) RSVR 2 < P < 28 psia

Nominal Config:
(R2)
HYD MN PUMP PRESS (three) – NORM (LO)
HYD CIRC PUMP (three) – GPC (ON,OFF)
(R4)
HYD BRAKE ISOL VLV 1,2,3 – GPC (tb–CL)
LG EXTEND ISOL VLV – GPC (tb–CL)
(A12)
HYD CIRC PUMP PWR 1 – MNA
2 – MNB
3 – MNC

ORB PKT C/L, HYD ACCUM (RSVR) PR LOW

1 2

1
(R2)
•✓HYD CIRC PUMP 1(2,3) – ON

2
SM 86 APU/HYD
• Confirm HYD CIRC PUMP P
HYD B/U P > 100 psia ?
YES
NO

3 Select alternate pwr
(A12)
• HYD CIRC PUMP 1(2,3) – MNB (MNC,MNA)
• Wait 30 sec
CIRC PUMP P (HYD B/U P) > 100 psia ?
YES
NO

4
(R2)
• Aff HYD CIRC PUMP 1(2,3) – GPC
• Wait 90 sec
CIRC PUMP P (HYD B/U P) > 100 psia ?
YES
NO

5
SM 86 APU/HYD
•✓HYD RSVR QTY 1(2,3) reading
HYD RSVR QTY 1(2,3) decreasing ?
YES → 1.2b 4
NO

7 Leave Pump ON

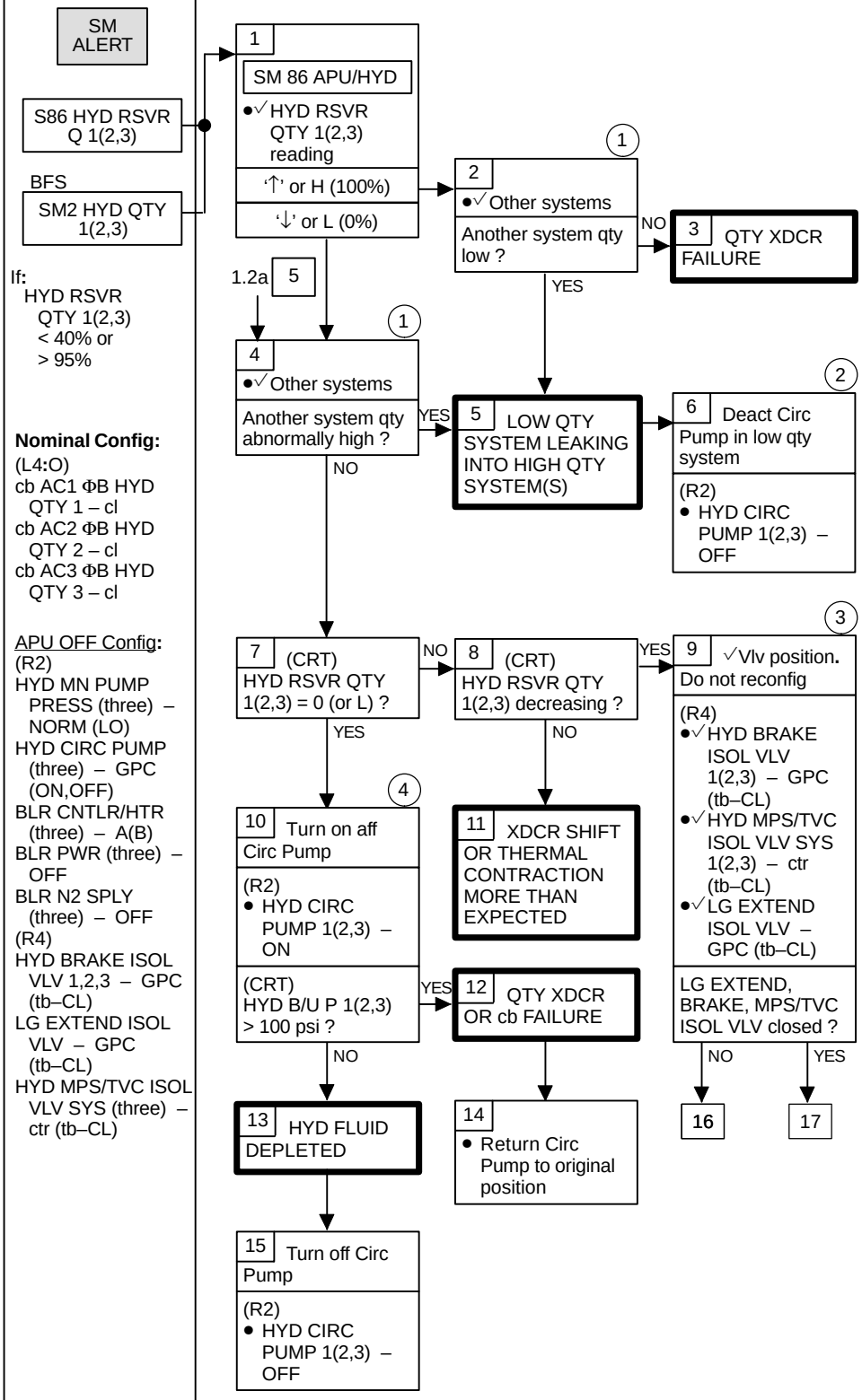
6 HYD 1(2,3) CIRC PUMP FAILURE

8 Turn off aff Circ Pump
(R2)
• HYD CIRC PUMP 1(2,3) – OFF

(1) ACCUM P is maintained automatically when Circ Pump sw is in GPC. At ACCUM P < 1960 psia or RSVR P < 32 psia, Circ Pump is commanded ON. If after 2 min ACCUM P > 1960 psia or RSVR P > 32 psia, Circ Pump is commanded OFF

(2) ACCUM P MGMT software is designed to turn on Circ Pump before pressure decay causes FDA alarm to ring, if Circ Pump sw is in GPC

1.2b HYD RSVR QTY ↑↓



If:
HYD RSVR QTY 1(2,3) < 40% or > 95%

Nominal Config:
(L4:O)
cb AC1 ΦB HYD QTY 1 – cl
cb AC2 ΦB HYD QTY 2 – cl
cb AC3 ΦB HYD QTY 3 – cl

APU OFF Config:
(R2)
HYD MN PUMP PRESS (three) – NORM (LO)
HYD CIRC PUMP (three) – GPC (ON,OFF)
BLR CNTLR/HTR (three) – A(B)
BLR PWR (three) – OFF
BLR N2 SPLY (three) – OFF
(R4)
HYD BRAKE ISOL VLV 1,2,3 – GPC (tb–CL)
LG EXTEND ISOL VLV – GPC (tb–CL)
HYD MPS/TVC ISOL VLV SYS (three) – ctr (tb–CL)

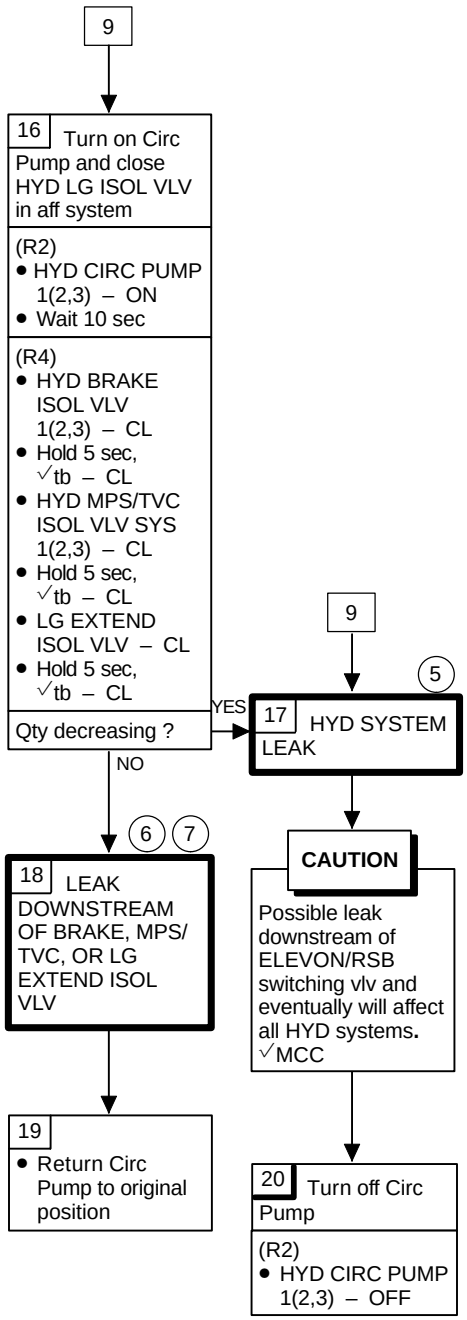
(1) Normal operating qty approx 60%, but compare qty with previous reading

(2) May be possible to pump fluid from high to low system by pressurizing high qty system relative to low qty system

(3) Circ Pumps or APUs must be operating in order to operate HYD BRAKE ISOL VLV, HYD MPS/TVC VLV, or LG EXTEND ISOL VLV if reqd

(4) If BFS SM 2, use HYD PRESS 1(2,3)

APU/HYD 1.2b (Cont)



(5) Hyd system may be lost for entry, depending on size of leak. Sys should remain OFF unless another system lost

(6) Since GNC on entry S/W will open LG EXTEND ISOL VLV prior to landing and HYD BRAKE ISOL VLV after touchdown, vlv must be reclosed

(7) Do not operate MPS/TVC vlv in affected system for SSME HYD Repress prior to entry

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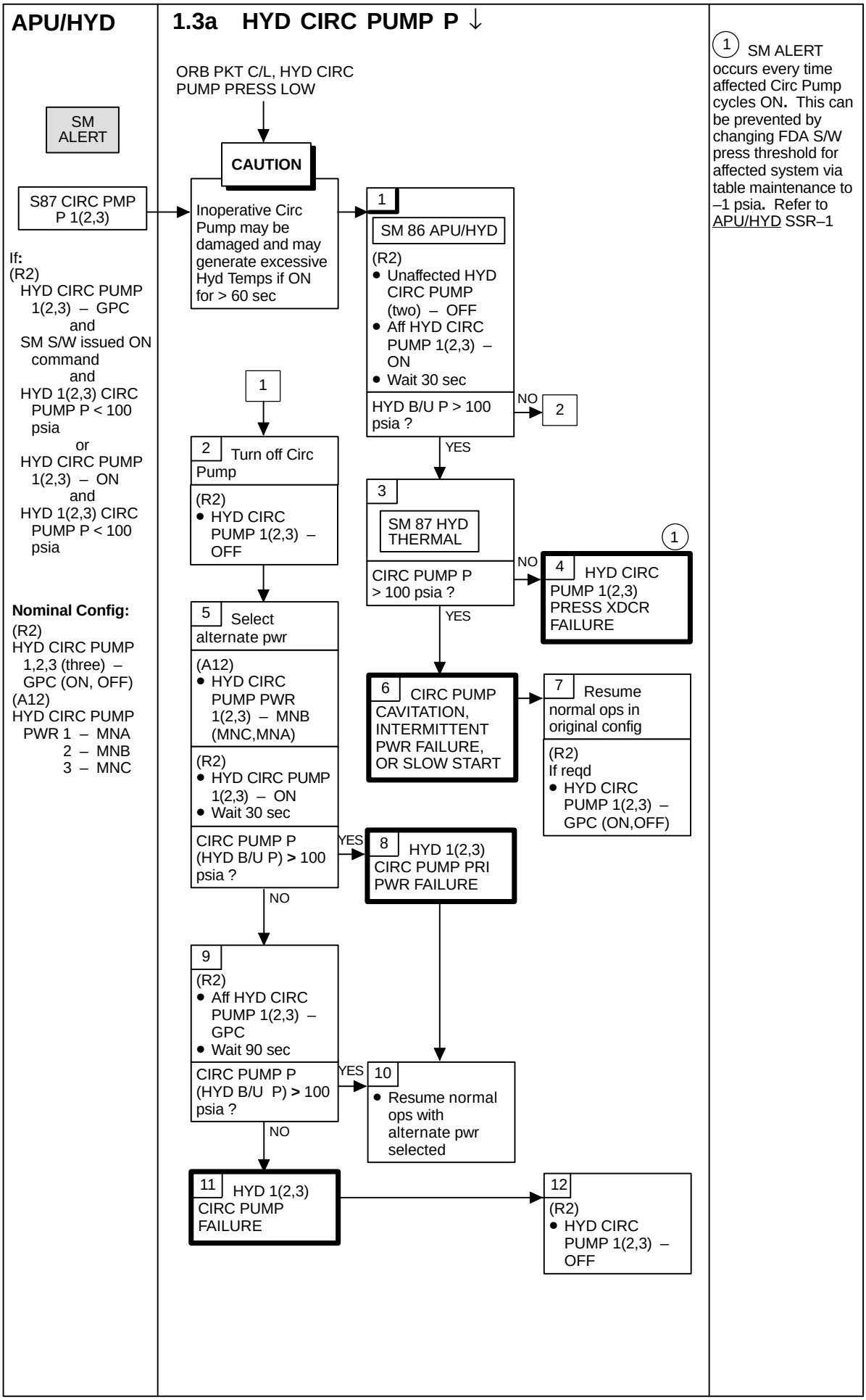
APU/HYD

1.3a HYD CIRC PUMP P ↓



(1) SM ALERT occurs every time affected Circ Pump cycles ON. This can be prevented by changing FDA S/W press threshold for affected system via table maintenance to –1 psia. Refer to APU/HYD SSR–1

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APU/HYD SSR–1
CIRC PUMP PRESS XDCR FAILURE WORKAROUND

To inhibit FDA alarm for affected Circ Pump

1. For Hyd Circ Pump 1 Press Xdcr failure:

   SM 60 SM TABLE MAINT

   ITEM 1 +0 5 8 0 1 3 7 EXEC
   If Xdcr failed '↓' (low), or DSC LOSS (L), or OI MDM failed (M), ITEM 2 –1 EXEC
   If Xdcr failed '↑' (high), ITEM 5 +8 0 1 EXEC

2. For Hyd Circ Pump 2 Press Xdcr failure:

   SM 60 SM TABLE MAINT

   ITEM 1 +0 5 8 0 2 3 7 EXEC
   If Xdcr failed '↓' (low), or DSC LOSS (L), or OI MDM failed (M), ITEM 2 –1 EXEC
   If Xdcr failed '↑' (high), ITEM 5 +8 0 1 EXEC

3. For Hyd Circ Pump 3 Press Xdcr failure:

   SM 60 SM TABLE MAINT

   ITEM 1 +0 5 8 0 3 3 7 EXEC
   If Xdcr failed '↓' (low), or DSC LOSS (L), or OI MDM failed (M), ITEM 2 –1 EXEC
   If Xdcr failed '↑' (high), ITEM 5 +8 0 1 EXEC

APU/HYD SSR–2
SIMULTANEOUS CIRC PUMP ON/GPC OPS

To allow normal GPC ops of other two Circ Pumps after failure of X Circ Pump Press Xdcr or manual ON ops of X Circ Pump

1. For Circ Pump 1, Press Xdcr failure or manual ON ops:

   SM 60 SM TABLE MAINT

   ITEM 16 +0 9 2 1 7 4 2 EXEC
   ITEM 17 +8 0 0 EXEC

2. For Circ Pump 2, Press Xdcr failure or manual ON ops:

   SM 60 SM TABLE MAINT

   ITEM 16 +0 9 2 1 8 4 2 EXEC
   ITEM 17 +8 0 0 EXEC

3. For Circ Pump 3, Press Xdcr failure or manual ON ops:

   SM 60 SM TABLE MAINT

   ITEM 16 +0 9 2 1 9 4 2 EXEC
   ITEM 17 +8 0 0 EXEC

APU/HYD SSR–3
CIRC PUMP XDCR FAILURE WORKAROUND

To allow normal GPC ops of Circ Pumps after accumulator or reservoir press or temp xdcr failure. Procedure changes corresponding upper and lower S/W limits to off–scale low, effectively removing xdcr from Circ Pump control. No action reqd for those params listed in the following tables that have FDA limits off–scale low or blank. They have been already removed from Circ Pump control.

The accumulator pressure sensors have only lower limit of 1960 psia as shown in tables. Low limit for accumulator pressure should be changed to –110. Low limit for reservoir pressure should be changed to –2. Only one item entry is reqd for accumulator or reservoir pressure sensor failure

SM 60 SM TABLE MAINT

ITEM 16 +_ _ (A) _ _ EXEC
ITEM 17 –8 0 EXEC
ITEM 16 +_ _ (B) _ _ EXEC
ITEM 17 –8 0 EXEC

(A) Choose the appropriate lower limit parameter ID number from table
(B) Choose the appropriate upper limit parameter ID number from table

HYDRAULIC SYSTEM 1 PARAMS

Param Name			Pump SW Control Constants				FDA	
			Low limit		High limit		Low limit	High limit
			ID Number	Value	ID Number	Value	degF	degF
LINE TEMPS								
	ELEVON	LOB1	0921728	–30 degF	0921729	–10 degF	–40	250
		ROB1	0921722	–30 degF	0921723	–10 degF	–40	250
	RD/SB	PDU1	0921738	–35 degF	0921739	–10 degF	–40	250
		FUS1	0921736	–30 degF	0921737	–10 degF	–40	250
	BDYFLP	FUS1	0921718	–30 degF	0921719	–10 degF	–40	250
HYD								
	ACCUM P1		0921740	1960 psi	NONE		1930 psi	
	RSVR P1		0920142	32 psi	NONE		28 psi	

HYDRAULIC SYSTEM 2 PARAMS

Param Name			Pump SW Control Constants				FDA	
			Low limit		High limit		Low limit	High limit
			ID Number	Value	ID Number	Value	degF	degF
LINE TEMPS								
	ELEVON	LIB2	0921822	–30 degF	0921823	–10 degF	–40	250
		ROB2	0921816	–30 degF	0921817	–10 degF	–40	250
	RD/SB	PDU2	0921832	–35 degF	0921833	–10 degF	–40	250
		FUS2	0921830	–30 degF	0921831	–10 degF	–40	250
	BDYFLP	PDU2	0921814	–35 degF	0921815	–10 degF	–40	250
HYD								
	ACCUM P2		0921834	1960 psi	NONE		1930 psi	
	RSVR P2		0920143	32 psi	NONE		28 psi	

HYDRAULIC SYSTEM 3 PARAMS

Param Name			Pump SW Control Constants				FDA	
			Low limit		High limit		Low limit	High limit
			ID Number	Value	ID Number	Value	degF	degF
LINE TEMPS								
	ELEVON	LOB3	0921920	–30 degF	0921921	–10 degF	–40	250
		RIB3	0921918	–30 degF	0921919	–10 degF	–40	250
	RD/SB	PDU3	0921930	–35 degF	0921931	–10 degF	–40	250
	BDYFLP	PDU3	0921914	–35 degF	0921915	–10 degF	–40	250
HYD								
	ACCUM P3		0921732	1960 psi	NONE		1930 psi	
	RSVR P3		0920144	32 psi	NONE		28 psi	

APU/HYD SSR–4
APU FU TK P XDCR FAILURE WORKAROUND

Selection of alternate Xdcr for APU fuel comp

1. For APU 1 QTY:

   SM 60 SM TABLE MAINT

   ITEM 16 +0 9 2 2 1 5 0 EXEC
   ITEM 17 +0 EXEC
   ITEM 16 +0 9 2 2 1 5 2 EXEC
   ITEM 17 +1 EXEC

2. For APU 2 QTY:

   SM 60 SM TABLE MAINT

   ITEM 16 +0 9 2 2 2 5 0 EXEC
   ITEM 17 +0 EXEC
   ITEM 16 +0 9 2 2 2 5 2 EXEC
   ITEM 17 +1 EXEC

3. For APU 3 QTY:

   SM 60 SM TABLE MAINT

   ITEM 16 +0 9 2 2 3 5 0 EXEC
   ITEM 17 +0 EXEC
   ITEM 16 +0 9 2 2 3 5 2 EXEC
   ITEM 17 +1 EXEC

APU/HYD SSR–5
APU FUEL LEAK (NONISOLATABLE)

Before proceeding, ✓MCC

R2 1. STEAM VENT HTR ACTIVATE
BLR PWR X – ON
✓CNTLR/HTR (three) – B(A)

2. GNC CONFIG
O14:F, O15:F, O16:F ASA (four) – ON
O17:A ATVC (four) – ON
C3 ✓FCS CH (four) – AUTO
O6 ✓MDM All FF and FA – ON
GNC I/O RESET
C3(A6U) ✓DAP: A/AUTO/VERN

3. DPS CONFIG
O14:F, O15:F ✓MMU 1,2 – ON

Perform G2 TO G8 TRANSITION (ORB OPS, DPS)

1: GNC, FCS/DED DIS C/O

4. APU PRESTART

2: SM 86 APU/HYD

CRT2 ✓APU,HYD,W/B status no '↑' or '↓' (except HYD B/U)
R4 ✓LG EXTEND ISOL VLV (tb–CL)
✓HYD BRAKE ISOL VLV X tb – CL
CIRC PUMP (three) – OFF
BLR N2 SPLY X – ON
✓APU AUTO SHUTDN (three) – ENA
CNTLR PWR X – ON
HYD MN PUMP PRESS X – LO
✓APU SPEED SEL (three) – NORM
✓OPER (three) – OFF
✓FUEL TK VLV (three) – CL
✓cb APU FU TK VLV ENA (six) – cl

Inform MCC: READY FOR APU START

Wait for MCC GO

5. APU START
R2 APU FUEL TK VLV X – OP
✓APU/HYD RDY X tb – gray

∗ If tb – bp, ✓MCC ∗

00:00 Start Event Timer
R2 APU OPER X – START/RUN
HYD/APU ✓HYD PRESS X ind – LOW green
R2 ✓APU/HYD RDY X tb – bp

∗ If APU did not start normally: ∗
∗ APU OPER X – OFF ∗
∗ FUEL TK VLV X – CL ∗
∗ ✓Shutdn (hyd press) ∗
∗ Report APU F7 lts ∗
∗ APU CNTLR PWR X – OFF ∗
∗ ✓MCC ∗

HYD MN PUMP PRESS X – NORM
HYD/APU ✓HYD PRESS X ind – HI green

6. MPS/TVC ISOL VLV CONFIG
R4 HYD MPS/TVC ISOL VLV X – OP
Hold 5 sec, ✓tb – OP

7. AEROSURFACE DRIVE

CRT1 SURF DR START – ITEM 10 EXEC (*)

NOTE

Pos '↓' may be indicated until HYD SYS is warm

* If FCS CH failure (↓) port status, reset aff FCS CH: *

C3 * FCS CH – ORIDE *

* – AUTO *

8. SECONDARY ACTUATOR CHECK

If Secondary Actuator Check has not been performed:

After ≥ 30 sec of aerosurface drive:

SURF DR STOP – ITEM 11 EXEC (*)

✓Surfaces not moving

NOTE

If port does not bypass during check, bypass aff port after APU shutdn:

SEC ACT BYPASS – ITEM 21 +X X EXEC

If aff port still does not bypass:

SEC ACT RESET – ITEM 22 +X X EXEC

(See DPS DICT, GNC, OPS G8 FOR ITEM ENTRY values)

CRT1 a. ✓POS STIM ENA, ITEM 20 – (*)

C3 b. ✓FCS CH 1,2,3,4 – AUTO

CRT1 c. SEC ACT CK, CH 1 – ITEM 15 EXEC (*)

d. ✓All CH 1 ports bypass '↓'

STOP – ITEM 19 EXEC (*)

C3 e. FCS CH 1 – ORIDE

CRT1 ✓All CH 1 ports reset (no ↓)

C3 FCS CH 1 – AUTO

f. Repeat steps c thru e for CH 2, 3, 4

CRT1 g. NEG STIM – ITEM 20 EXEC (no *)

h. Repeat steps b thru f

CRT1 SURF DR START – ITEM 10 EXEC (*)

9. APU FUEL DEPLETION AND AERO DRIVE TERMINATION

After APU shuts down due to fuel depletion:

CRT1 SURF DR STOP – ITEM 11 EXEC (*)

NOTE

'AERO DRIVE' Fault Msg may occur after APU shutdown

10. APU SHUTDOWN

R2 BLR PWR X – OFF

APU OPER X – OFF

FUEL TK VLV X – CL

✓Shutdn (hyd press)

APU CNTLR PWR X – OFF

BLR N2 SPLY X – OFF

11. HYD RECONFIG

R2 HYD CIRC PUMP X – ON

Wait 10 sec

R4 HYD MPS/TVC ISOL VLV X – CL

Hold 5 sec, ✓tb – CL

R2 HYD CIRC PUMP (three) – GPC

12. GNC/DPS RECONFIG

Perform G8 TO G2 TRANSITION (ORB OPS, DPS)

F8 INST PWR – OFF

O14:F, O15:F, O16:F ASA (four) – OFF

O17:A ATVC (four) – OFF

APU/HYD SSR–6
APU FU TK SURF T XDCR FAILURE WORKAROUND

Inputting a temperature constant for the APU Fuel Comp

1. For APU 1 QTY:

   SM 88 APU/ENVIRON THERM

   Note: APU 1 TK HTR T

   SM 60 SM TABLE MAINT

   ITEM 16 +0 9 2 2 1 6 0 EXEC
   ITEM 17 +0 EXEC
   ITEM 16 +0 9 2 2 1 4 0 EXEC
   ITEM 17 +APU 1 TK HTR T (from SPEC 88) EXEC

2. For APU 2 QTY:

   SM 88 APU/ENVIRON THERM

   Note: APU 2 TK HTR T

   SM 60 SM TABLE MAINT

   ITEM 16 +0 9 2 2 2 6 0 EXEC
   ITEM 17 +0 EXEC
   ITEM 16 +0 9 2 2 2 4 0 EXEC
   ITEM 17 +APU 2 TK HTR T (from SPEC 88) EXEC

3. For APU 3 QTY:

   SM 88 APU/ENVIRON THERM

   Note: APU 3 TK HTR T

   SM 60 SM TABLE MAINT

   ITEM 16 +0 9 2 2 3 6 0 EXEC
   ITEM 17 +0 EXEC
   ITEM 16 +0 9 2 2 3 4 0 EXEC
   ITEM 17 +APU 3 TK HTR T (from SPEC 88) EXEC

2.1 AUDIO
2.1a NO AUDIO (MULTIPLE PNL OR OTHER SUBSYSTEM) . . . . . 2−4

2.2 GCIL/KU COMM
2.2a 'S76 GCIL FAIL' − GCIL CONFIG: PNL,
'S76 KU−GMBL A TEMP' − KU GMBL TEMP A ↑,
'S76 KU−GMBL B TEMP' − KU GMBL TEMP B ↑,
'S76 KU−GYRO TEMP' − KU GYRO TEMP ↑,
'S76 KU−XMTR TEMP' − KU PA TEMP ↑ . . . . . 2−6

2.3 S−BD/UHF
COMM S−BD PM SCHEMATIC . . . . . 2−8
UPLINK/DOWNLINK COMMUNICATIONS TABLE . . . . . 2−10
2.3a NO S−BD COMM: TDRS . . . . . 2−11
2.3b 'ANTENNA' . . . . . 2−15
2.3c NO UHF VOICE (MULTI PNLS) . . . . . 2−16

2.4 S62 BCE BYP
PL COMM MALFUNCTION POINTS SCHEMATIC . . . . . 2−18
2.4a 'S62 BCE BYP OFA' . . . . . 2−19
2.4b OFB' . . . . . 2−21
2.4c OA' . . . . . 2−23
2.4d PL' . . . . . 2−25
2.4e PDI' . . . . . 2−27
2.4f PSP 1(2)' . . . . . 2−28
2.4g 'S62 PDI DECOM FAIL' . . . . . 2−30

2.5 PSP BIT
2.5a PSP BIT AND/OR FRAME SYNC LOCK FAIL . . . . . 2−32

2.6 OI DSC
2.6a OI DSC LOSS . . . . . 2−34

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COMM SSR−1 LOSS OF ALL VOICE COMM . . . . . 2−36
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COMM SSR−10 OI MDM LOST: OF1 . . . . . 2−39
SSR−11 OF2 . . . . . 2−40
SSR−12 OF3 . . . . . 2−41
SSR−13 OF4 . . . . . 2−43
SSR−14 OA1 . . . . . 2−44
SSR−15 OA2 . . . . . 2−45
SSR−16 OA3 . . . . . 2−46
SSR−17 OI DSC LOST: OF1 . . . . . 2−47
SSR−18 OF2 . . . . . 2−48
SSR−19 OF3 . . . . . 2−49
SSR−20 OF4 . . . . . 2−50
SSR−21 OL1 . . . . . 2−51
SSR−22 OL2 . . . . . 2−52
SSR−23 OR1 . . . . . 2−53
SSR−24 OR2 . . . . . 2−54
SSR−25 OM1 . . . . . 2−55
SSR−26 OM2 . . . . . 2−56
SSR−27 OA1 . . . . . 2−57
SSR−28 OA2 . . . . . 2−58
SSR−29 OA3 . . . . . 2−59
SSR−30 OM3 . . . . . 2−60

COMM SSR−31 OI DSC LOST: OP1 . . . . . 2−61
SSR−32 OP2 . . . . . 2−61

The following Fault Msgs have no corresponding MAL procedures in this book:

TFL FAIL
S76 COMM CAMR OVERTEMP
PA2(1) OVERTEMP
PA2(1) OUTPUT LO
NSP 2(1) BITE
COMSEC 2(1) BITE
BCE BYP KU

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COMM

Loss of Audio Affecting More Than One Audio Pnl or One or More of the Following:

1) UHF Transceiver
2) NSP Audio
3) Payload Bay Outlets
4) Audio Between Orbiter and Spacelab
5) Audio Between Orbiter and Vehicle at Orbiter Docking System

Nominal Config:

(R14:A)
cb MNA AUD MS
cb MNB AUD MIDDECK SPKR − cl
cb MNC AUD AUD CTR 2 − cl
cb MNC AUD PS/AIRLK − cl
(R14:F)
cb ESS 1BC AUD L − cl
cb ESS 2CA AUD R − cl
cb ESS 2CA AUD AUD CTR 1 − cl
(C3)
AUD CTR − 1
(R10)
MS AUD PWR − AUD/TONE
(O9)
R AUD PWR − AUD/TONE

102 only

(R14:A)
cb MNA AUD MS/OS − cl
cb MNB AUD MIDDECK SPKR/CCU − cl

2.1a NO AUDIO (MULTIPLE PNL OR OTHER SUBSYSTEM)

(1) MS or R AUDIO pnl must be pwrd (AUD or AUD TONE) to enable audio control signals to the ACCU

(2) Cycle (C3) AUD CTR sw several times to establish random audio loop config, ✓COMM with MCC after each cycle

(3) Further cycling could cause loss of comm

(1)

1 (O9,R10)
- ✓R AUD PWR, MS AUD PWR sw positions:

Both powered → 5

One powered → 2 (O9,R10)
- Turn other pwr sw to AUD

Audio OK ? YES → 3 DATA WORD FROM ORIGINALLY PWRD PNL FAILED

Audio OK ? NO → 1

Neither powered → 4 (R10)
- MS AUD PWR − AUD

(O9)
- R AUD PWR − AUD

Audio OK ? NO → 5 (C3)
- AUD CTR − 2(1)

Audio OK ? YES → 6 FAILURE OF PRI(SEC) ACCU CIRCUITS FOR AFF SYSTEMS/ LOOPS

Audio OK ? NO → 8 (R10)
- MS AUD PWR − OFF

(O9)
- R AUD PWR − OFF

(2) → 9 (C3)
- Cycle AUD CTR sw

Audio OK ? YES → (3) 10
- Inform MCC of audio config

Audio OK ? NO → 11 DOUBLE DATA WORD FAILURE OR ACCU PWR SWITCH FAILURE → 12 (R10)
- MS AUD PWR − AUD

(O9)
- R AUD PWR − AUD

→ 13
- Go to LOSS OF ALL VOICE COMM, step 2, COMM SSR−1

7 Normal sys ops

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COMM

2.2a GCIL CONFIG: PNL, KU GMBL TEMP A ↑, KU GMBL TEMP B ↑, KU GYRO TEMP ↑, KU PA TEMP ↑

SM ALERT

S76 GCIL FAIL

S76 KU−GMBL A TEMP

S76 KU−GMBL B TEMP

S76 KU−GYRO TEMP

S76 KU−XMTR TEMP

GCIL CONFIG: PNL
KU−BAND GMBL A > 150
KU−BAND GMBL B > 166
GYRO temp > 155
KU PA temp > 171

1
SM 76 COMMUNICATIONS
Which param is out of tolerance:
KU PA TEMP ↑
GCIL CONFIG: PNL ↓
KU−BAND GMBL TEMP A ↑, B ↑, or GYRO TEMP ↑

2
If AOS:
●✓MCC
If LOS:
(A1U)
- KU PWR − STBY
- KU CNTL − PNL,CMD

3
If AOS:
●✓MCC
If LOS:
(R14:C)
- cb MNB KU ANT HTR − op

1
4 MOMENTARY OR CONTINUOUS LOSS OF PWR TO GCIL, WHICH CAUSED COMM SYS CONFIG TO REVERT TO THAT INDICATED BY sw ON PNL A1

5
●✓MCC for GCIL status

(1) Upon pwr loss, GCIL will revert to High Frequency for S−Band PM. There is no switch on panel A1L for frequency; therefore, no action should be taken. MCC will reconfig network to match orbiter frequency if previously configured for Low Frequency. Reconfiguration could take up to 10 min

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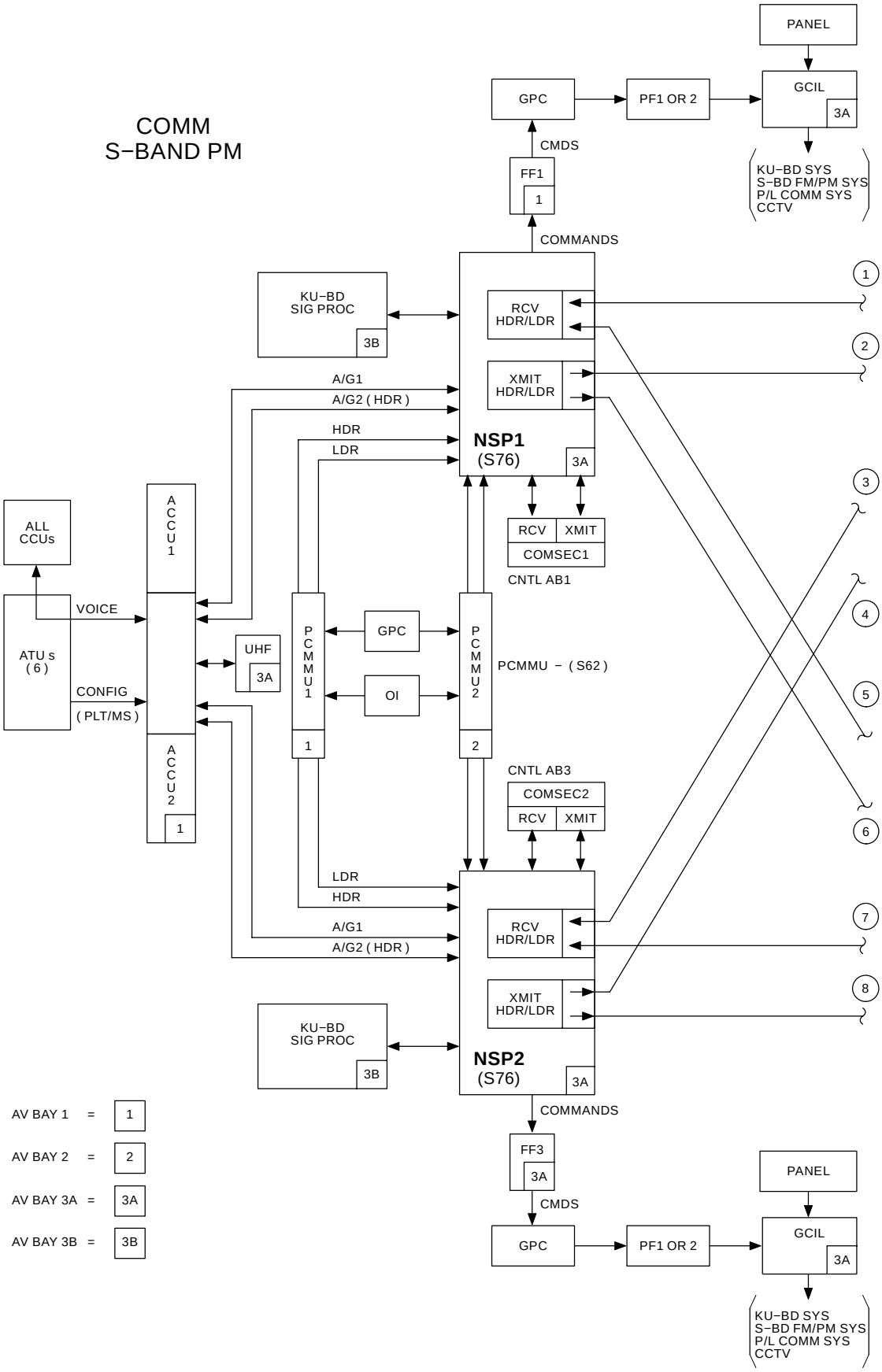
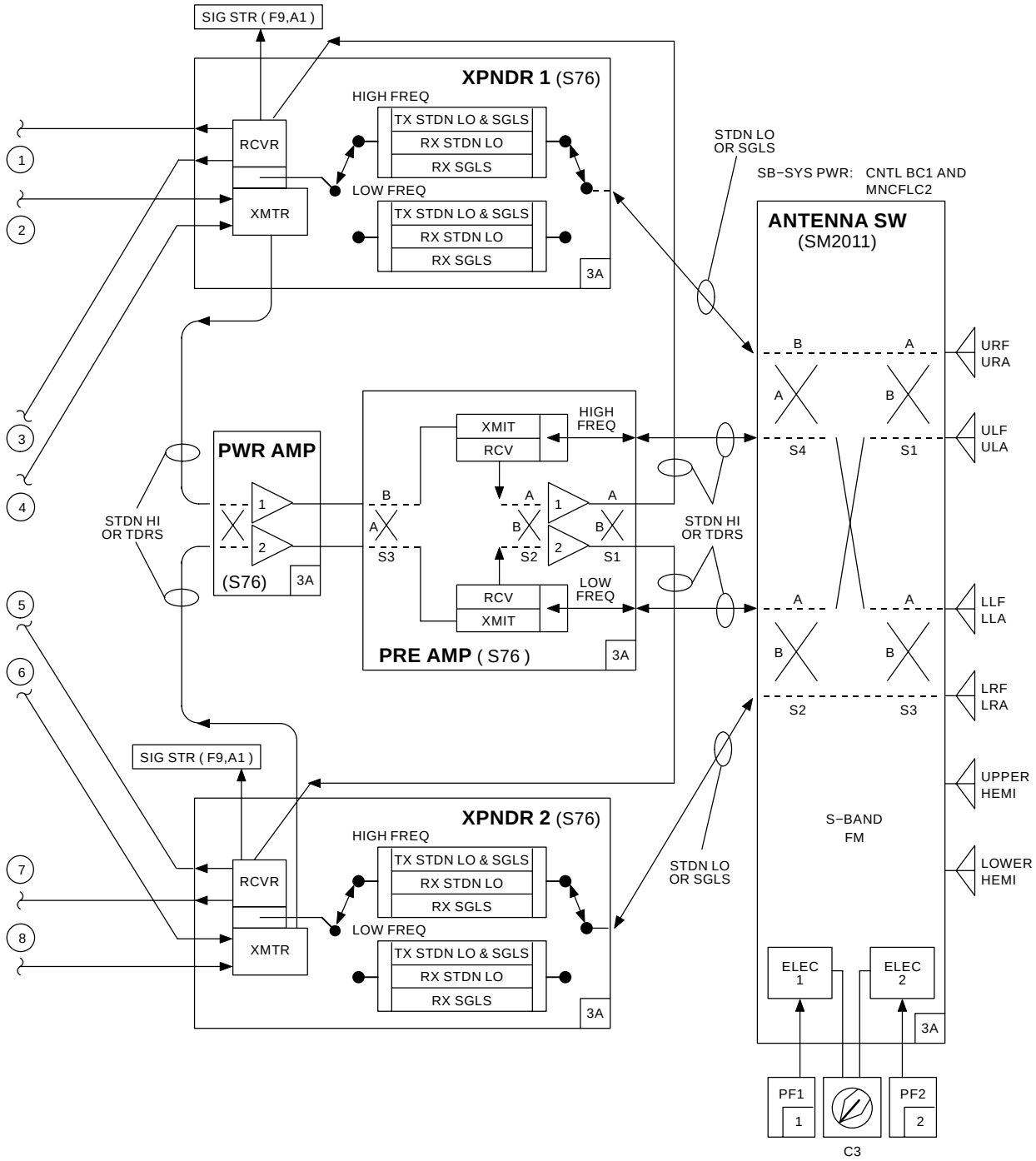
SB−SYS 1 PWR: CNTLBC1 AND MNBFLC2



SB−SYS 2 PWR: CNTLBC2 AND MNCFLC3



UPLINK/DOWNLINK COMMUNICATIONS TABLE

SITE ID	SITE TYPE	UPLINK DATA RATE ENCRYPTED OR CLEAR	DOWNLINK DATA RATE		UHF	TV	COMMENTS
			ENCRYPTED	CLEAR			
BDA							Decommissioned
CAN							Decommissioned
CTS	SGLS	HI/LO	HI/LO	HI/LO			
DFR	STDN	HI/LO	HI/LO	HI/LO	•	•	
DGS	SGLS	HI/LO	HI/LO	HI/LO			
GDX							Decommissioned
GTS	SGLS	HI/LO	HI/LO	HI/LO			
HTS	SGLS	HI/LO	HI/LO	HI/LO			
JSC	STDN	HI/LO	HI/LO	HI/LO	•	•	Emergency Only
MAD							Decommissioned
MIL	STDN	HI/LO	HI/LO	HI/LO	•	•	
NHS	SGLS	HI/LO	HI/LO	HI/LO			
OTS	SGLS	HI/LO	HI/LO	HI/LO	•		
VTS	SGLS	HI/LO	HI/LO	HI/LO			
WLP	STDN	HI/LO	HI/LO	HI/LO	•		

Three−letter site designators may be inhibited on SM 2011 by MCC if site use was not planned**.** Check World Map for sites that may be inhibited**.** Decommissioned sites are included in this table because they may appear on SM 2011 even though they have no orbiter communications equipment

COMM

2.3a NO S−BD COMM: TDRS

From ORB PKT, COMM LOST, step 12

Nominal Config:
Switches selected to SYS 1 (pnl mode backup)
(R14:A)
cb MNA AUD MS − cl
cb MNB AUD MIDDECK SPKR − cl
cb MNC AUD AUD CTR 2 − cl
cb MNC AUD PS/AIRLK − cl
(R14:B)
cb MNA UHF − cl
cb MNC UHF − cl
(R14:F)
cb ESS 1BC AUD L − cl
cb ESS 2CA AUD R − cl
cb ESS 2CA AUD CTR 1 − cl
(R10)
MS AUD PWR − AUD/TONE
(O9)
R AUD PWR − AUD/TONE

102 only
(R14:A)
cb MNA AUD MS/OS − cl
cb MB AUD MIDDECK SPKR/CCU − cl

1 Verify comm system config

SM 76 COMMUNICATIONS

- ✓Display

S−BAND PM	TDRS
ANT ELEC 1	ON
XPNDR 1	ON
PREAMP 1	ON
PWR AMPL 1	
OPER 1	ON
STBY 1	STBY
NSP 1	
BITE	GOOD
UL DATA SOURCE	S
DATA RATE XMIT	HI
RCV	HI
CODING XMIT	ON
RCV	ON
GCIL CONFIG	CMD

Displayed config matches A1L switches ? NO → 7

YES

(1)

2 Check for Ku−Band coverage

(A1U)
- ✓SIGNAL STR sw − Ku

Meter > 1 ? NO → 13

YES

3 Reconfigure to Ku receive

(A1L)
- NSP UPLK DATA − Ku
- ✓NSP CODING XMIT − ON
- NSP CODING RCV − OFF

(C3)
- ✓S−BD PM CNTL − PNL

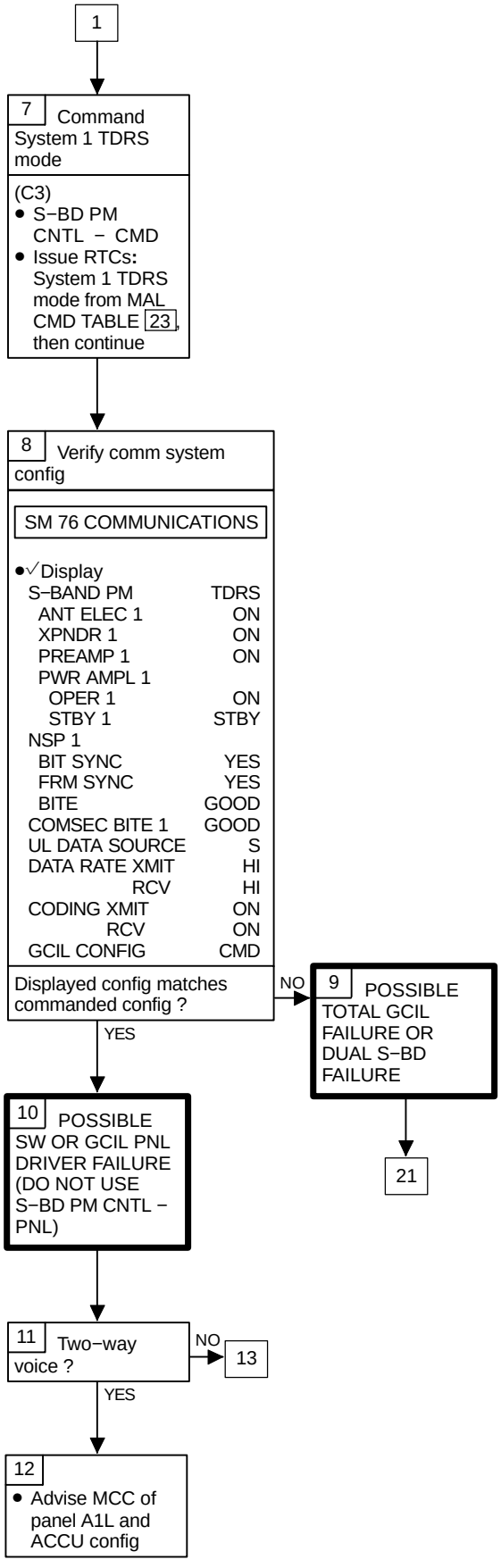
Two−way voice ? YES → **4** POSSIBLE ANT ELEC SW, S−BD FREQ OR DUAL S−BD FAILURE

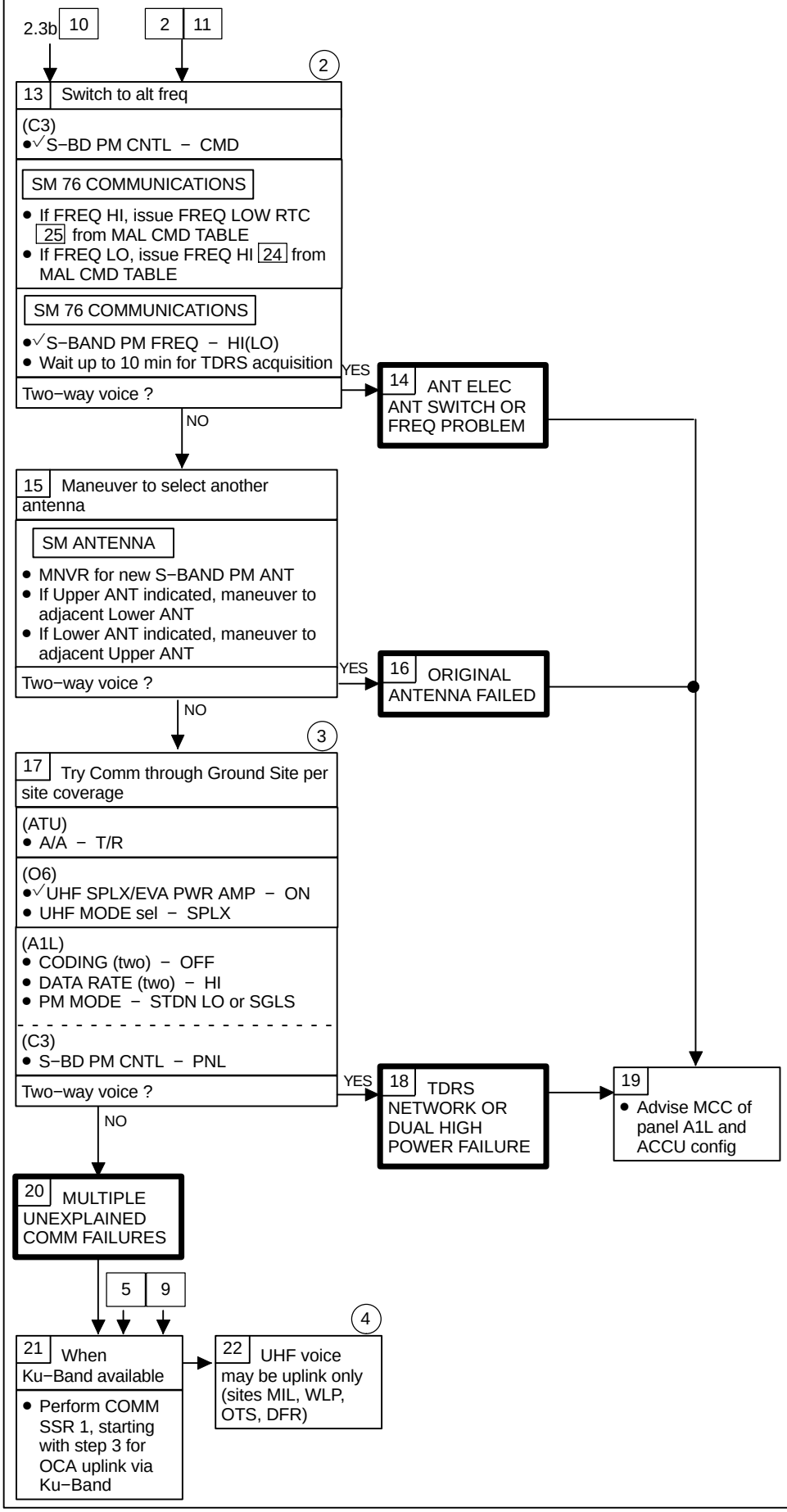
NO

5 DUAL NSP OR UNEXPLAINED FAILURE → 21

6
- Advise MCC of panel A1L and ACCU config

(1) Assumes Ku−Band deployed activated and comm mode


1
7 Command System 1 TDRS mode
(C3)
• S−BD PM CNTL − CMD
• Issue RTCs: System 1 TDRS mode from MAL CMD TABLE 23, then continue
8 Verify comm system config
SM 76 COMMUNICATIONS
•✓Display
S−BAND PM TDRS
ANT ELEC 1 ON
XPNDR 1 ON
PREAMP 1 ON
PWR AMPL 1
OPER 1 ON
STBY 1 STBY
NSP 1
BIT SYNC YES
FRM SYNC YES
BITE GOOD
COMSEC BITE 1 GOOD
UL DATA SOURCE S
DATA RATE XMIT HI
RCV HI
CODING XMIT ON
RCV ON
GCIL CONFIG CMD
Displayed config matches commanded config ?
NO
9 POSSIBLE TOTAL GCIL FAILURE OR DUAL S−BD FAILURE
21
YES
10 POSSIBLE SW OR GCIL PNL DRIVER FAILURE (DO NOT USE S−BD PM CNTL − PNL)
11 Two−way voice ?
NO
13
YES
12
• Advise MCC of panel A1L and ACCU config



(2) Payloads may have conflict with alt freq

(3) Ground sites are generally not active during Orb phase. Minimum 2 hr to call up

(4) UHF sites may not be active. Minimum 2 hr to call up

(5) The RTC (RESET PL1 or PL2) must be sent prior to any command

(6) CMD only those RTCs which do not match the expected comm config in block 1

MAL CMD TABLE

23 SYSTEM 1 TDRS MODE

SM 1 DPS UTILITY (5) (6)

Issue RTC (RESET PL1 or PL2)
- RTC − ITEM 13 +7 1 0 9 0 1 F F EXEC (PL1)
  or 7 1 0 A 0 1 F F EXEC (PL2)
- CMD − ITEM 14 EXEC

Issue RTC (PWR AMP 1 OPR ON)
- RTC − ITEM 13 +7 9 0 9 0 0 3 3 EXEC (PL1)
  or 7 9 0 A 0 0 3 3 EXEC (PL2)
- CMD − ITEM 14 EXEC
- Reissue RTC (RESET PL1 or PL2) above

Issue RTC (TDRS S−BD MODE)
- RTC − ITEM 13 +7 9 0 9 0 0 F 1 EXEC (PL1)
  or 7 9 0 A 0 0 F 1 EXEC (PL2)
- CMD − ITEM 14 EXEC
- Reissue RTC (RESET PL1 or PL2) above

Issue RTC (ANT ELEC SW1 ON)
- RTC − ITEM 13 +7 9 0 9 0 0 1 F EXEC (PL1)
  or 7 9 0 A 0 0 1 F EXEC (PL2)
- CMD − ITEM 14 EXEC
- Reissue RTC (RESET PL1 or PL2) above

Issue RTC (XPNDR 1 ON)
- RTC − ITEM 13 +7 9 0 9 0 0 3 E EXEC (PL1)
  or 7 9 0 A 0 0 3 E EXEC (PL2)
- CMD − ITEM 14 EXEC
- Reissue RTC (RESET PL1 or PL2) above

Issue RTC (PREAMP 1 ON)
- RTC − ITEM 13 +7 9 0 9 0 0 3 9 EXEC (PL1)
  or 7 9 0 A 0 0 3 9 EXEC (PL2)
- CMD − ITEM 14 EXEC
- Reissue RTC (RESET PL1 or PL2) above

Issue RTC (NSP 1 ON)
- RTC − ITEM 13 +7 9 0 9 0 0 5 0 EXEC (PL1)
  or 7 9 0 A 0 0 5 0 EXEC (PL2)
- CMD − ITEM 14 EXEC
- Reissue RTC (RESET PL1 or PL2) above

Issue RTC (DNLINK − HDR)
- RTC − ITEM 13 +7 9 0 9 0 0 5 3 EXEC (PL1)
  or 7 9 0 A 0 0 5 3 EXEC (PL2)
- CMD − ITEM 14 EXEC
- Reissue RTC (RESET PL1 or PL2) above

Issue RTC (UPLINK − HDR)
- RTC − ITEM 13 +7 9 0 9 0 0 7 EXEC (PL1)
  or 7 9 0 A 0 0 7 EXEC (PL2)
- CMD − ITEM 14 EXEC

24 FREQ HI

SM 1 DPS UTILITY

Issue RTC (RESET PL1 or PL2)
- RTC − ITEM 13 +7 1 0 9 0 1 F F EXEC (PL1)
  or 7 1 0 A 0 1 F F EXEC (PL2)
- CMD − ITEM 14 EXEC

Issue − RTC (XPNDR/PREAMP FREQ − HI)
- RTC − ITEM 13 +7 9 0 9 0 0 4 A EXEC (PL1)
  or 7 9 0 A 0 0 4 A EXEC (PL2)
- CMD − ITEM 14 EXEC

25 FREQ LOW

SM 1 DPS UTILITY

Issue RTC (RESET PL1 or PL2)
- RTC − ITEM 13 +7 1 0 9 0 1 F F EXEC (PL1)
  or 7 1 0 A 0 1 F F EXEC (PL2)
- CMD − ITEM 14 EXEC

Issue RTC (XPNDR/PREAMP FREQ − LOW)
- RTC − ITEM 13 +7 9 0 9 0 0 4 9 EXEC (PL1)
  or 7 9 0 A 0 0 4 9 EXEC (PL2)
- CMD − ITEM 14 EXEC

26 STDN LO

SM 1 DPS UTILITY

Issue RTC (RESET PL1 or PL2)
- RTC − ITEM 13 +7 1 0 9 0 1 F F EXEC (PL1)
  or 7 1 0 A 0 1 F F EXEC (PL2)
- CMD − ITEM 14 EXEC

Issue RTC (XPNDR MODE − STDN LOW)
- RTC − ITEM 13 +7 9 0 9 0 0 4 3 EXEC (PL1)
  or 7 9 0 A 0 0 4 3 EXEC (PL2)
- CMD − ITEM 14 EXEC

27 SGLS

SM 1 DPS UTILITY

Issue RTC (RESET PL1 or PL2)
- RTC − ITEM 13 +7 1 0 9 0 1 F F EXEC (PL1)
  or 7 1 0 A 0 1 F F EXEC (PL2)
- CMD − ITEM 14 EXEC

Issue RTC (XPNDR MODE − SGLS)
- RTC − ITEM 13 +7 9 0 9 0 0 4 4 EXEC (PL1)
  or 7 9 0 A 0 0 4 4 EXEC (PL2)
- CMD − ITEM 14 EXEC

COMM

2.3b 'ANTENNA'

SM ALERT

ANTENNA

If:
Actual selected quad antenna not the same as S/W commanded antenna, MDM OF3 or OF4 failure, antenna electronics failure, CNTL BC1 failure, PF MDM failure

Nominal Config:
(C3)
S−BD PM
ANT − GPC
CNTL − CMD
(A1L)
S−BD PM
ANT SW ELEC − 1
PRE AMP − 1
PWR AMPL STBY − 1
PWR AMPL OPER − 1
XPNDR − 1
NSP PWR − 1

1 SM ANTENNA

S BAND ANT QUAD '↓' ?

NO → 2 TLM PARAM ON PREVIOUSLY SELECTED ANTENNA FAILED OR TRANSIENT FAIL

YES

3
- Verify Comm with MCC

Two−way Comm ?

YES → 4 MCC will isolate failure, select alternate sys via ground cmd
- ✓ MCC for further action

NO

5 Select alternate S−BD PM system

(C3)
- S−BD PM CNTL − PNL/CMD

(CRT) S BAND ANT QUAD '↓' still present ?

NO → 6 ANT SW ELEC, GCIL CMD DRIVER OR PL MDM FAILURE

YES

(1)(2)

7 Select best quad antenna

(C3)
- S−BD PM ANT − as reqd

Two−way comm with MCC ?

YES → 8 GPC/MDM AUTO ANT SELECT MODE FAILURE. CREW WILL BE PRIME FOR SWITCHING ANTENNAS → 9
- ✓ MCC for further action

NO

(2)

10 Return S−BD PM ANT to GPC position

(C3)
- S−BD PM ANT − GPC

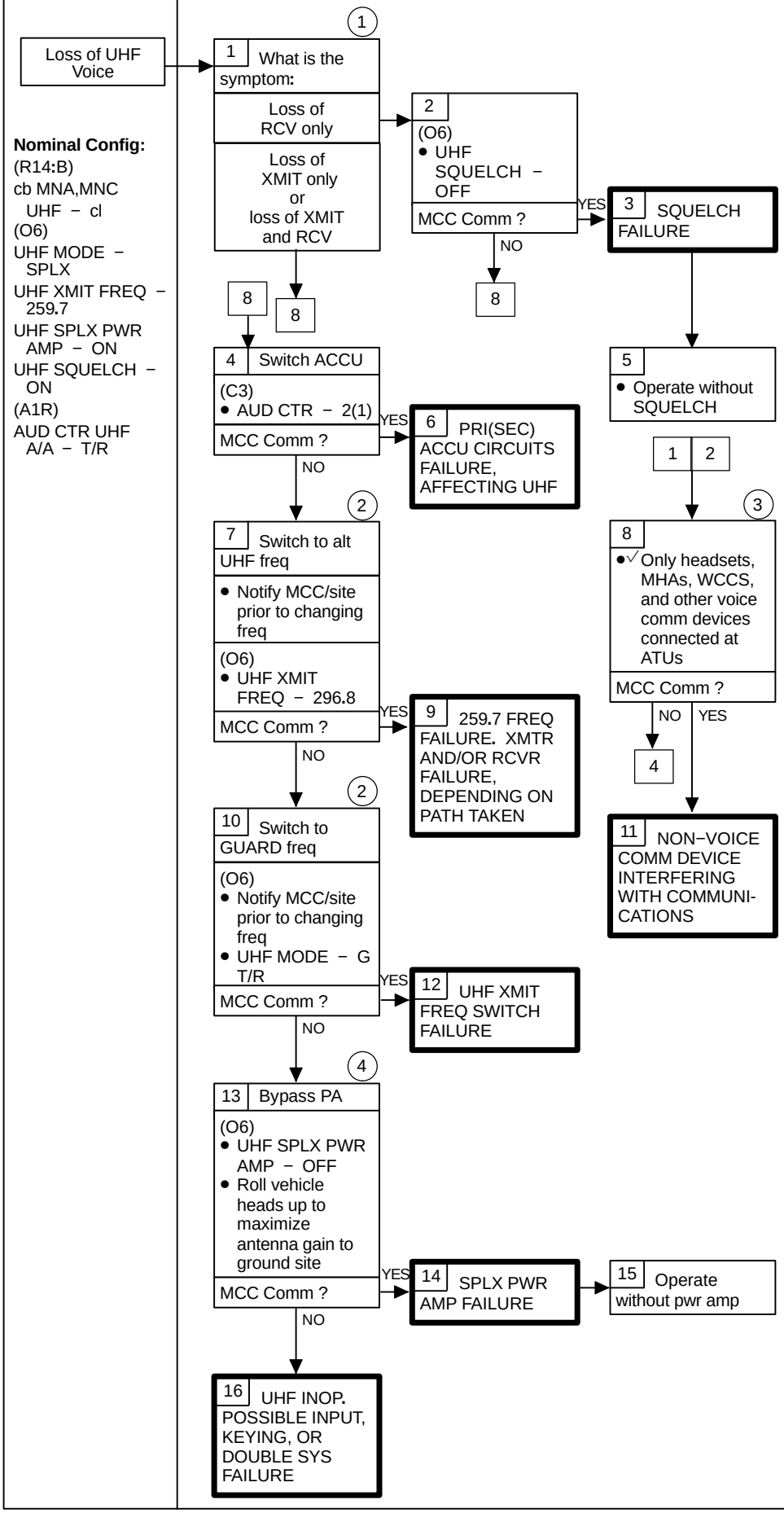
2.3a 13

(1) Switch failures may prevent certain antennas from being selected

(2) Pause 2 sec between antenna selections

COMM

2.3c NO UHF VOICE (MULTI PNLS)



1 XMTR range is 350 miles with PWR AMP

2 Up to 30 sec may be reqd for MCC/site response

3 Example: PADM provides constant UHF key if ATU configured to T/R. Loss of UHF comm would result

4 This step will limit UHF XMIT range

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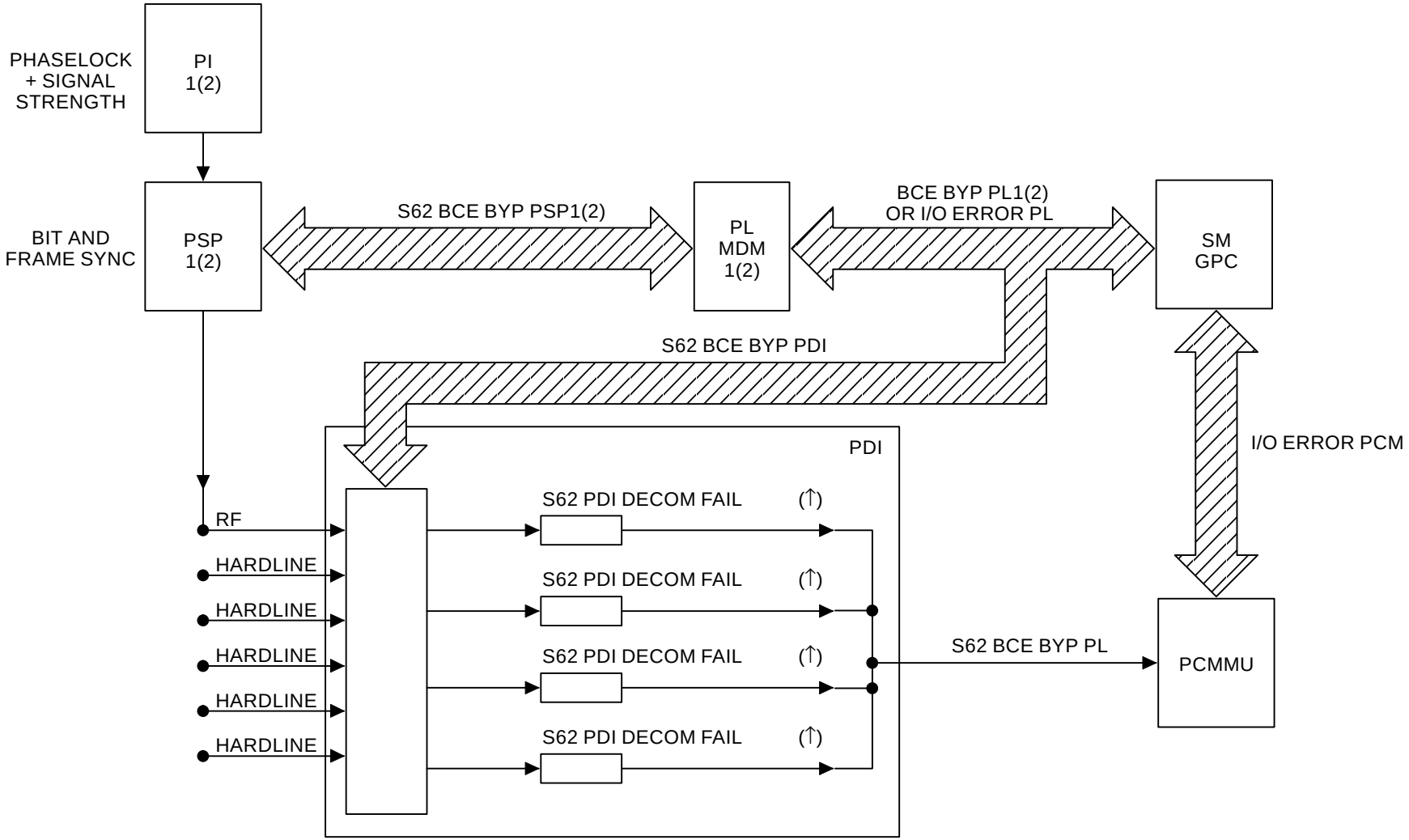
PL COMM MALFUNCTION POINTS



COMM

2.4a 'S62 BCE BYP OFA'

SM ALERT

S62 BCE BYP OFA

If:
OF1 or OF2 MDM failure, or Card failure in OF1 or OF2, or OF1/OF2 MDM data path PCMMU failure

Nominal Config:
(C3)
OI PCMMU PWR − 1
(O14:B,O15:B)
cb MNA,MNB OI MDM 1/2 A,B (two) − cl

1 Accompanied by 'S62 BCE BYP OFB' and 'S62 BCE BYP OA' ?
YES → 13
NO

2
- Determine which MDM affected: OF1 or OF2

SM SYS SUMM 1

Both FUEL CELL 1 STACK T and FUEL CELL 1 COOL P missing status (M) ?
NO → 3 On same disp, both FUEL CELL 2 STACK T and FUEL CELL 2 COOL P missing status (M) ?
NO → 4 SINGLE CARD LOSS IN OF1 OR OF2 MDM
YES

YES → 5 OF1 MDM DETECTED PROBLEM
YES → 6 OF2 MDM DETECTED PROBLEM
7 MCC will uplink msg for specific MDM/Card failure

6 → 8 On 2nd CRT (1)

SM 62 PCMMU/ PL COMM
- PCMMU I/O RESET PCM − ITEM 5 EXEC (*)

Missing status clear on previous lost params ?
YES → 9 TRANSIENT OF1 OR OF2 MDM FAILURE
NO

10
- ✓MCC

11 Cycle pwr for subject MDMs (1)

(O14:B)
- cb MNA OI MDM OF 1/2 A − op

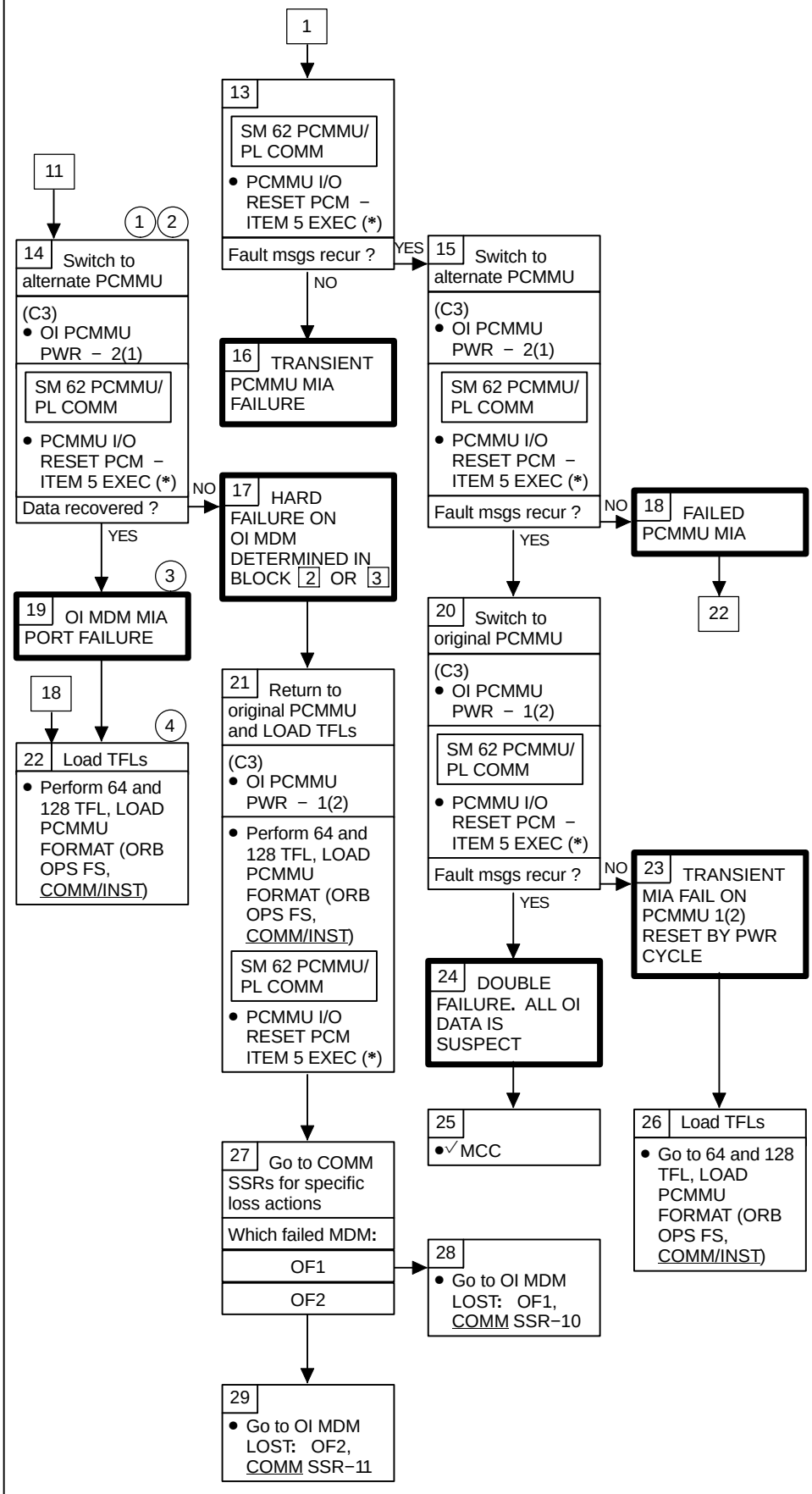
(O15:B)
- cb MNB OI MDM OF 1/2 B − op

(O14:B,O15:B)
- cb MNA,MNB OI MDM OF 1/2 A,B (two) − cl

SM 62 PCMMU/ PL COMM
- PCMMU I/O RESET PCM − ITEM 5 EXEC (*)

Data recovered ?
YES → 12 TRANSIENT OF1 OR OF2 MDM FAILURE
NO → 14

(1) I/O RESET PCM may cause additional SM alerts if previous OI failure, PDI not pwrd ON, PDI not receiving payload data which is FDAd



(1) I/O RESET PCM may cause additional SM alerts if previous OI failure, PDI not pwrd ON, PDI not receiving payload data which is FDAd

(2) Advise MCC of PCMMU switch

(3) Full data recovered by PCMMU switch. Redundant path to OF1(2) MDM lost

(4) Change PCDECOM connections (O5,MO30F) as reqd

COMM

2.4b ‘S62 BCE BYP OFB’

SM ALERT

S62 BCE BYP OFB

If:
OF3 or OF4 MDM failure, or Card failure in OF3 or OF4, or OF3/OF4 MDM data path to PCMMU failure

Nominal Config:
(C3)
OI PCMMU PWR − 1
(O14:B,O16:B)
cb MNA,MNB OI MDM OF 3/4 A,B (two) − cl

1 Accompanied by ‘S62 BCE BYP OFA’ and ‘S62 BCE BYP OA’ ?
YES → 13
NO

2
- Determine which MDM affected: OF3 or OF4

SM SYS SUMM 1

Both FUEL CELL 3 STACK T and FUEL CELL 3 COOL P missing status (M) ?
NO → 3 On same disp, both FUEL CELL 2 PUMP and FUEL CELL 3 PUMP missing status (M) ?
NO → 4 SINGLE CARD LOSS IN OF3 OR OF4 MDM
YES → 5 OF3 MDM DETECTED PROBLEM
YES → 6 OF4 MDM DETECTED PROBLEM
4 → 7 MCC will uplink msg for specific MDM/Card failure
6 → 8

6 → 8 On 2nd CRT (1)

SM 62 PCMMU/PL COMM
- PCMMU I/O RESET PCM − ITEM 5 EXEC (*)

Missing status clear on previous lost params ?
NO → 9 •✓MCC → 10 Cycle pwr on subject MDMs (1)
YES → 11 TRANSIENT OF3 OR OF4 MDM FAILURE

10 Cycle pwr on subject MDMs (1)
(O14:B)
- cb MNA OI MDM OF 3/4 A − op

(O16:B)
- cb MNC OI MDM OF 3/4 B − op

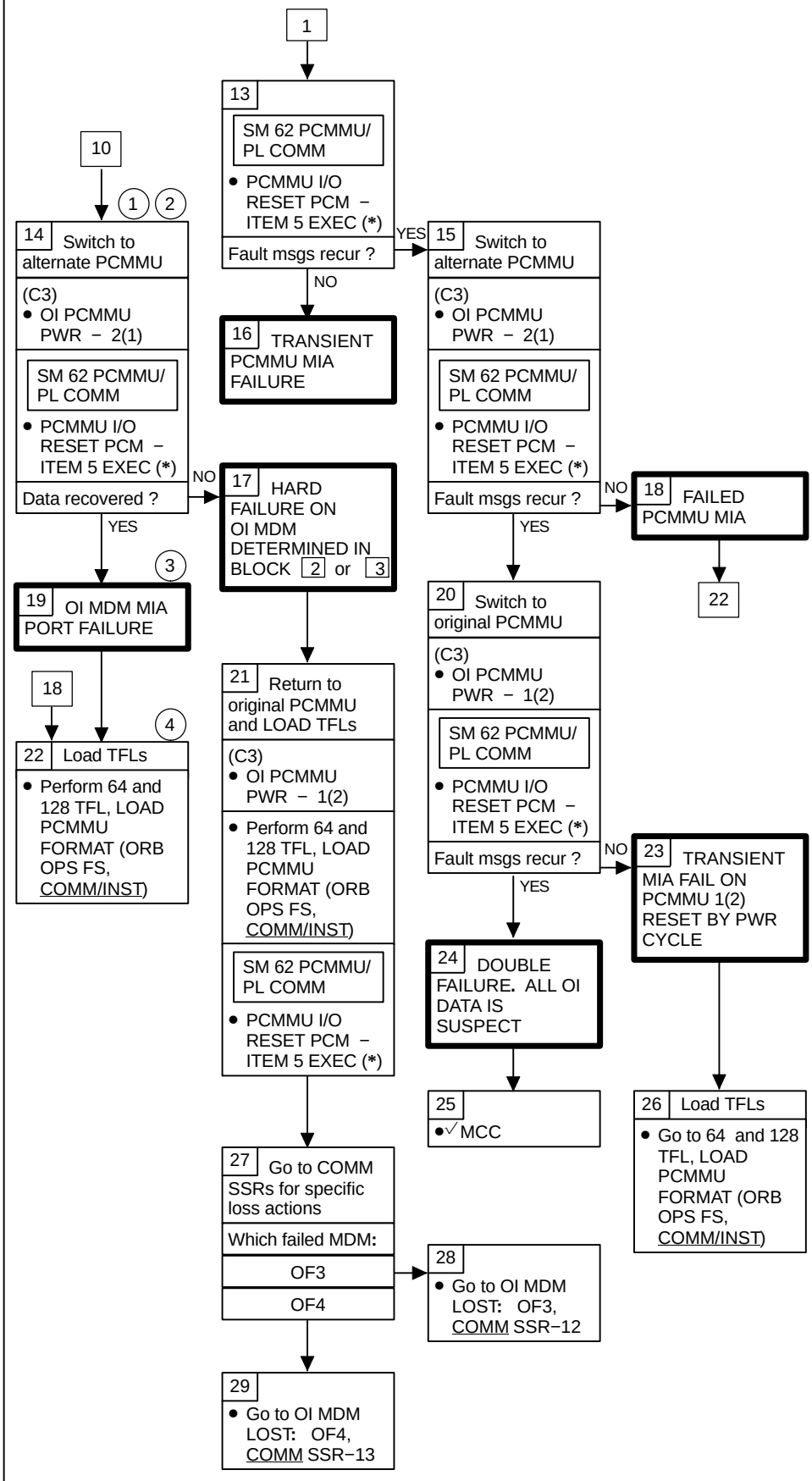
(O14:B,O16:B)
- cb MNA, MNC OI MDM OF 3/4 A,B (two) − cl

SM 62 PCMMU/PL COMM
- PCMMU I/O RESET PCM − ITEM 5 EXEC (*)

Data recovered ?
YES → 12 TRANSIENT OF3 OR OF4 MDM FAILURE
NO → 14

(1) I/O RESET PCM may cause additional SM alerts if previous OI failure, PDI not pwrd ON, PDI not receiving payload data which is FDAd

COMM 2.4b (Cont)



(1) I/O RESET PCM may cause additional SM alerts if previous OI failure, PDI not pwrd ON, PDI not receiving payload data which is FDAd

(2) Advise MCC of PCMMU switch

(3) Full data recovered by PCMMU switch. Redundant path to OF3(4) MDM lost

(4) Change PCDECOM connections (O5,MO30F) as reqd

COMM

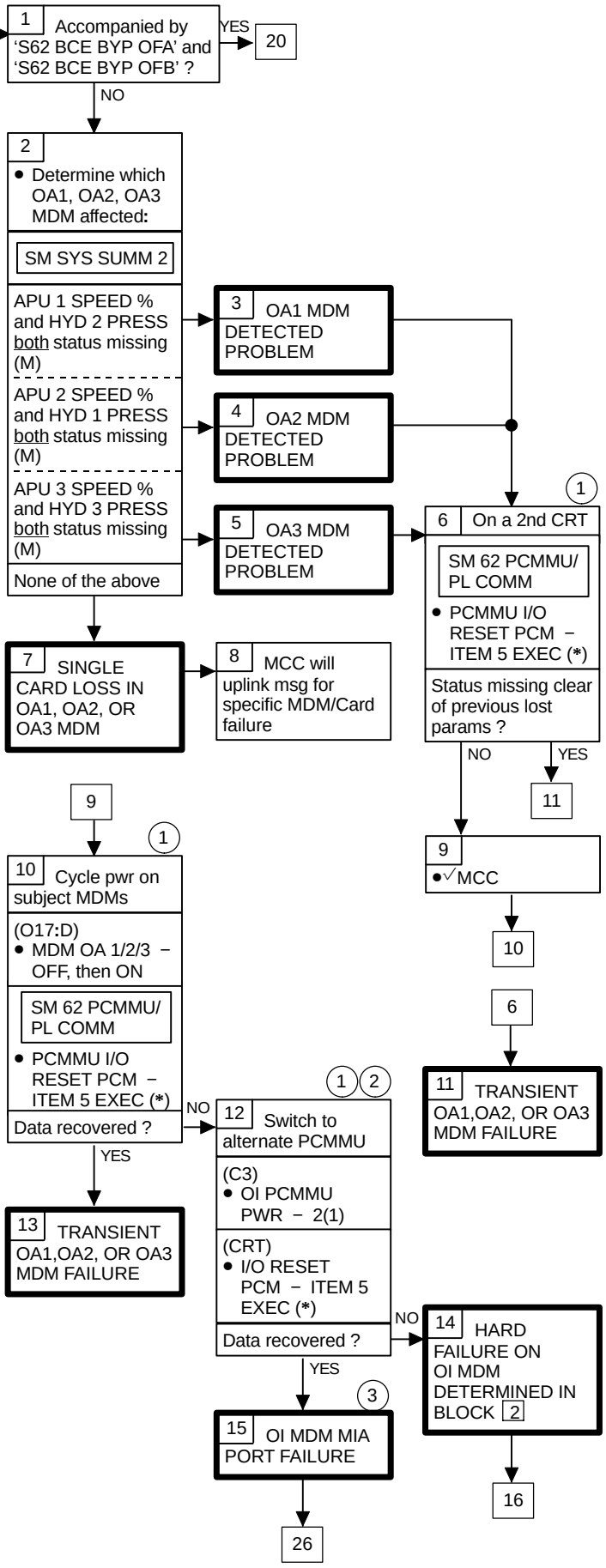
2.4c 'S62 BCE BYP OA'

SM ALERT

S62 BCE BYP OA

If:
OA1 or OA2 or OA3 MDM failure or Card failure in OA1(OA2,OA3) or OA1/OA2/OA3 data path to PCMMU failure

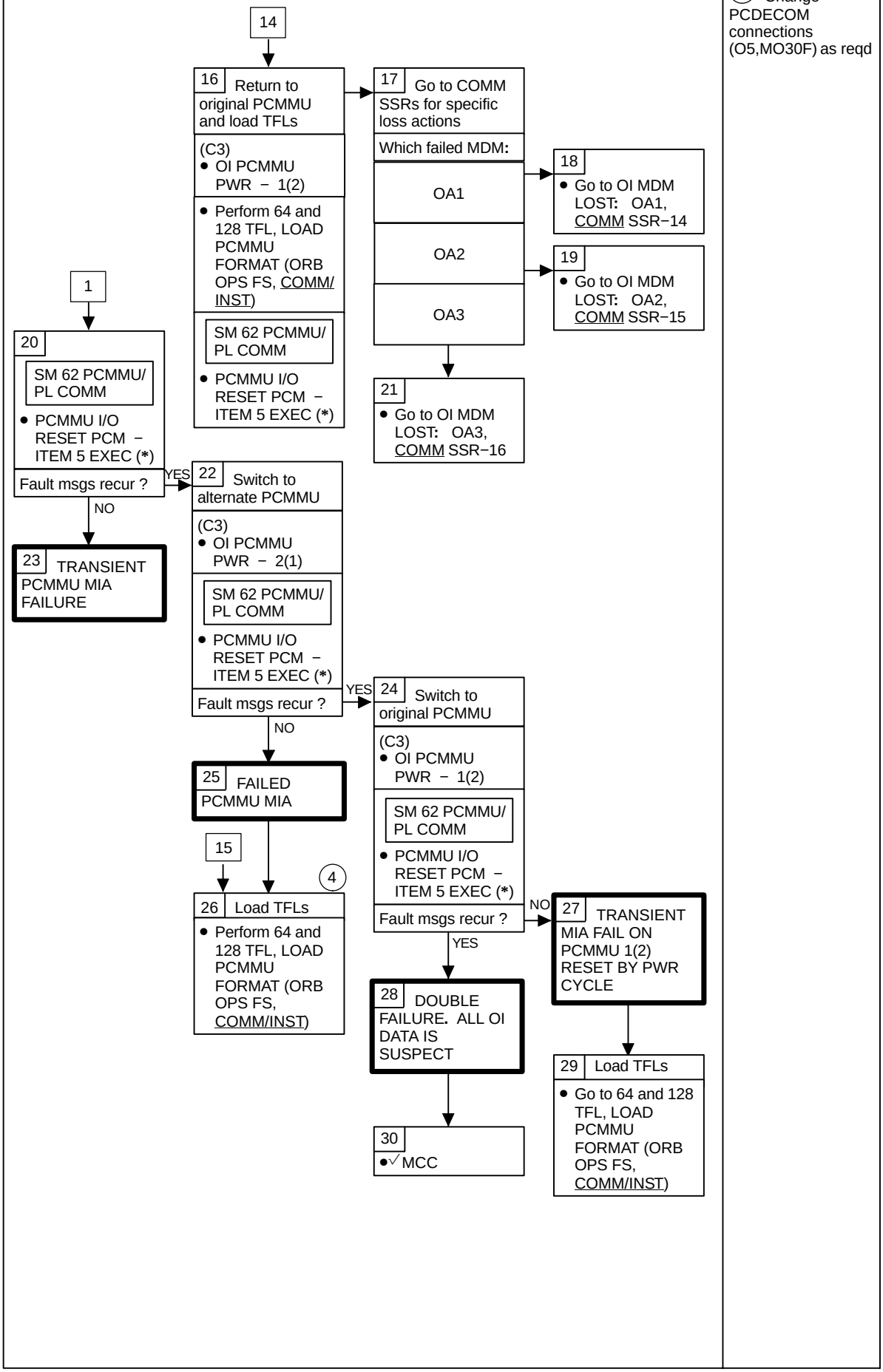
Nominal Config:
(C3)
OI PCMMU PWR − 1
(O17:D)
MDM OA 1/2/3 − ON



(1) I/O RESET PCM may cause additional SM alerts if previous OI failure, PDI not pwrd ON, PDI not receiving payload data which is FDAd

(2) Advise MCC of PCMMU switch

(3) Full data recovered by PCMMU switch. Redundant path to OA1(2,3) MDM lost


14
16 Return to original PCMMU and load TFLs
(C3)
• OI PCMMU PWR − 1(2)
• Perform 64 and 128 TFL, LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)
SM 62 PCMMU/PL COMM
• PCMMU I/O RESET PCM − ITEM 5 EXEC (*)
17 Go to COMM SSRs for specific loss actions
Which failed MDM:
OA1
OA2
OA3
18
• Go to OI MDM LOST: OA1, COMM SSR−14
19
• Go to OI MDM LOST: OA2, COMM SSR−15
21
• Go to OI MDM LOST: OA3, COMM SSR−16
1
20
SM 62 PCMMU/PL COMM
• PCMMU I/O RESET PCM − ITEM 5 EXEC (*)
Fault msgs recur ?
YES
NO
22 Switch to alternate PCMMU
(C3)
• OI PCMMU PWR − 2(1)
SM 62 PCMMU/PL COMM
• PCMMU I/O RESET PCM − ITEM 5 EXEC (*)
Fault msgs recur ?
YES
NO
23 TRANSIENT PCMMU MIA FAILURE
24 Switch to original PCMMU
(C3)
• OI PCMMU PWR − 1(2)
SM 62 PCMMU/PL COMM
• PCMMU I/O RESET PCM − ITEM 5 EXEC (*)
Fault msgs recur ?
NO
YES
25 FAILED PCMMU MIA
15
4
26 Load TFLs
• Perform 64 and 128 TFL, LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)
27 TRANSIENT MIA FAIL ON PCMMU 1(2) RESET BY PWR CYCLE
28 DOUBLE FAILURE. ALL OI DATA IS SUSPECT
29 Load TFLs
• Go to 64 and 128 TFL, LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)
30
•✓MCC
4 Change PCDECOM connections (O5,MO30F) as reqd

COMM

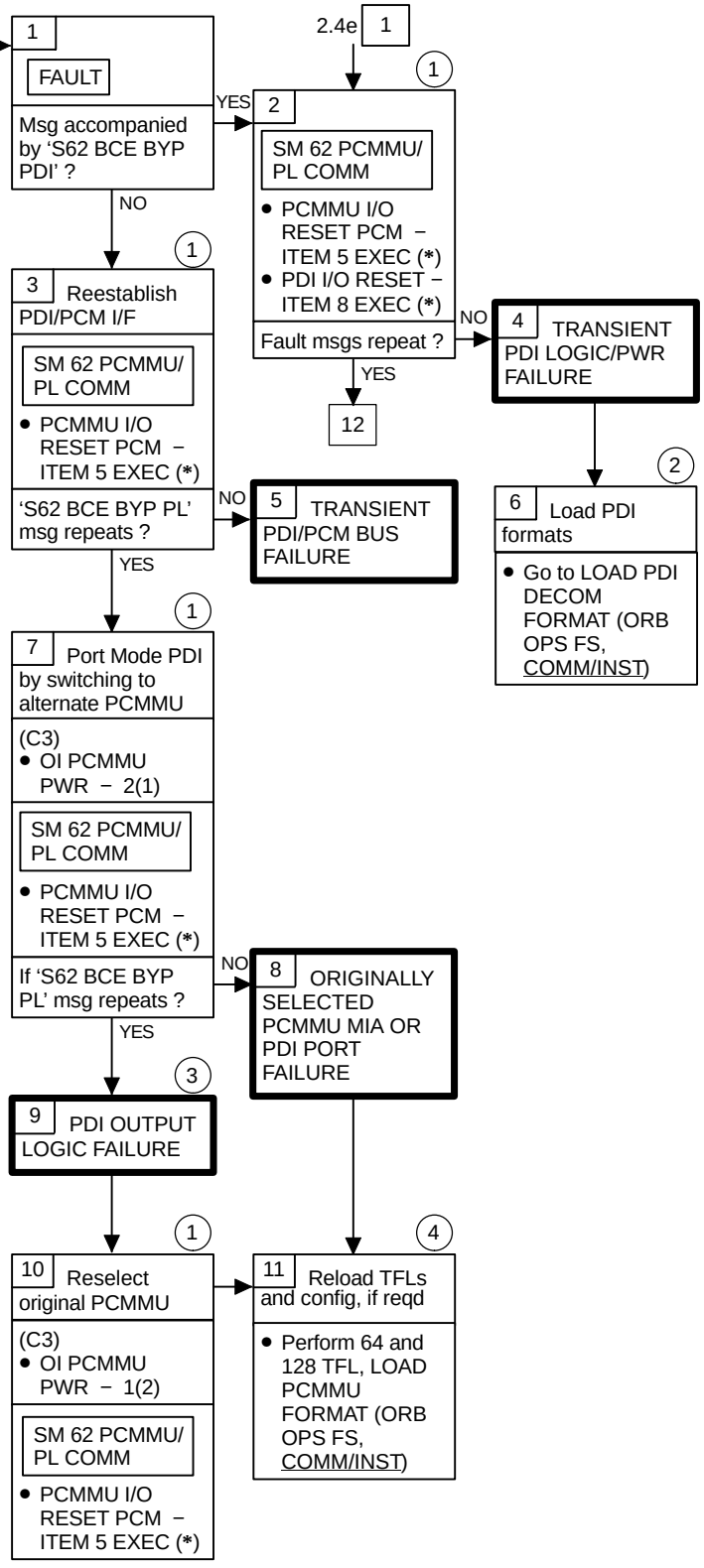
SM ALERT

S62 BCE BYP PL

If:
PDI port failure or PCMMU port failure or PDI to PCMMU data path failure

Nominal Config:
(C3)
OI PCMMU PWR − 1(2)
(A1L)
PL DATA INTLVR PWR − ON

2.4d 'S62 BCE BYP PL'



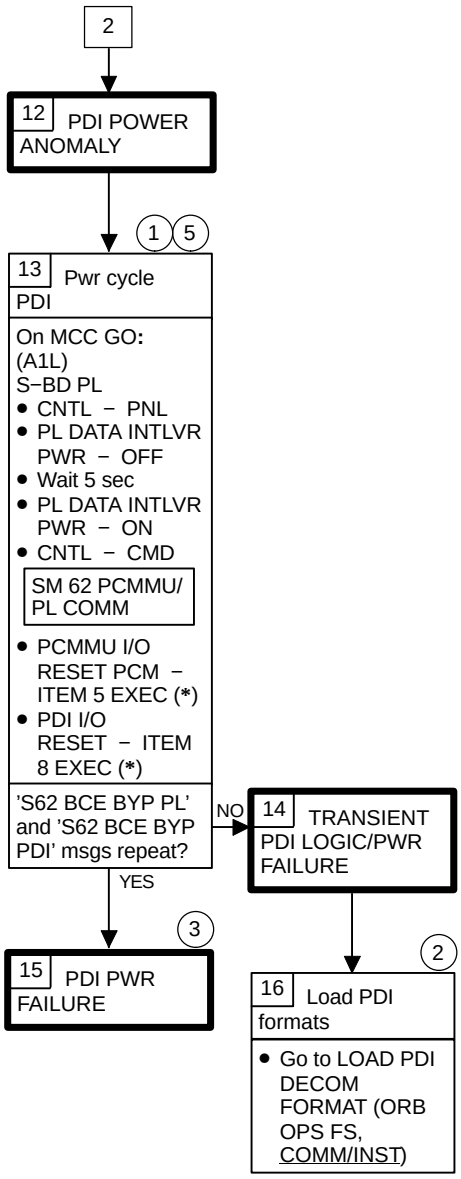
(1) I/O RESET PCM may cause additional SM alerts if previous OI failure, PDI not pwrd ON, PDI not receiving payload data which is FDAd

(2) MCC can uplink PDI loads when SM SPEC 62 is resumed

(3) IFM available whenever spare PDI is manifested

(4) Change PCDECOM connections (O5,MO30F) as reqd

COMM 2.4d (Cont)



(1) I/O RESET PCM may cause additional SM alerts if previous OI failure, PDI not pwrd ON, PDI not receiving payload data which is FDAd

(2) MCC can uplink PDI loads when SM SPEC 62 is resumed

(3) IFM available whenever spare PDI is manifested

(5) MCC has insight on power going to the PDI. MCC may desire not to cycle

COMM

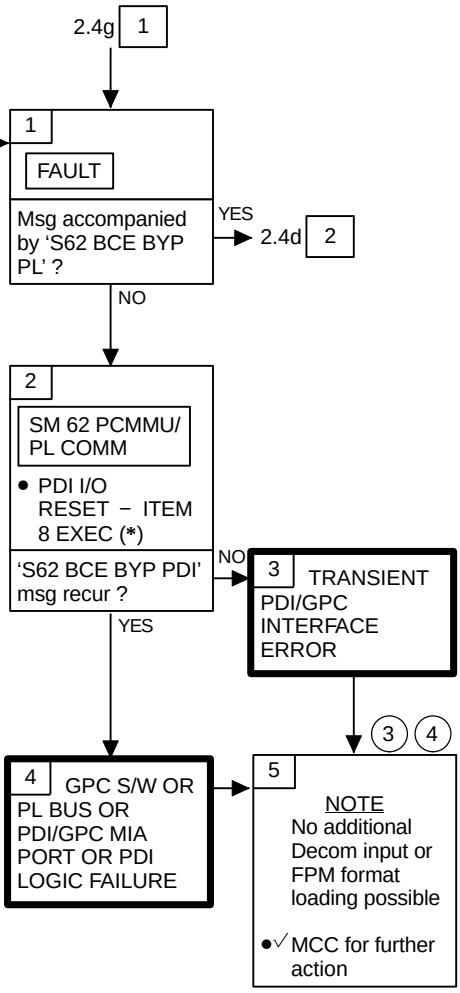
2.4e ‘S62 BCE BYP PDI’

SM ALERT

(1) (2) S62 BCE BYP PDI

If:
PDI PL Bus port failure or GPC port failure or PDI to GPC data path failure

Nominal Config:
(A1L)
PL DATA INTLVR PWR − ON



(1) May occur prior to ‘I/O ERROR PL1’ msg, which requires Mal procedure for that error condition be performed

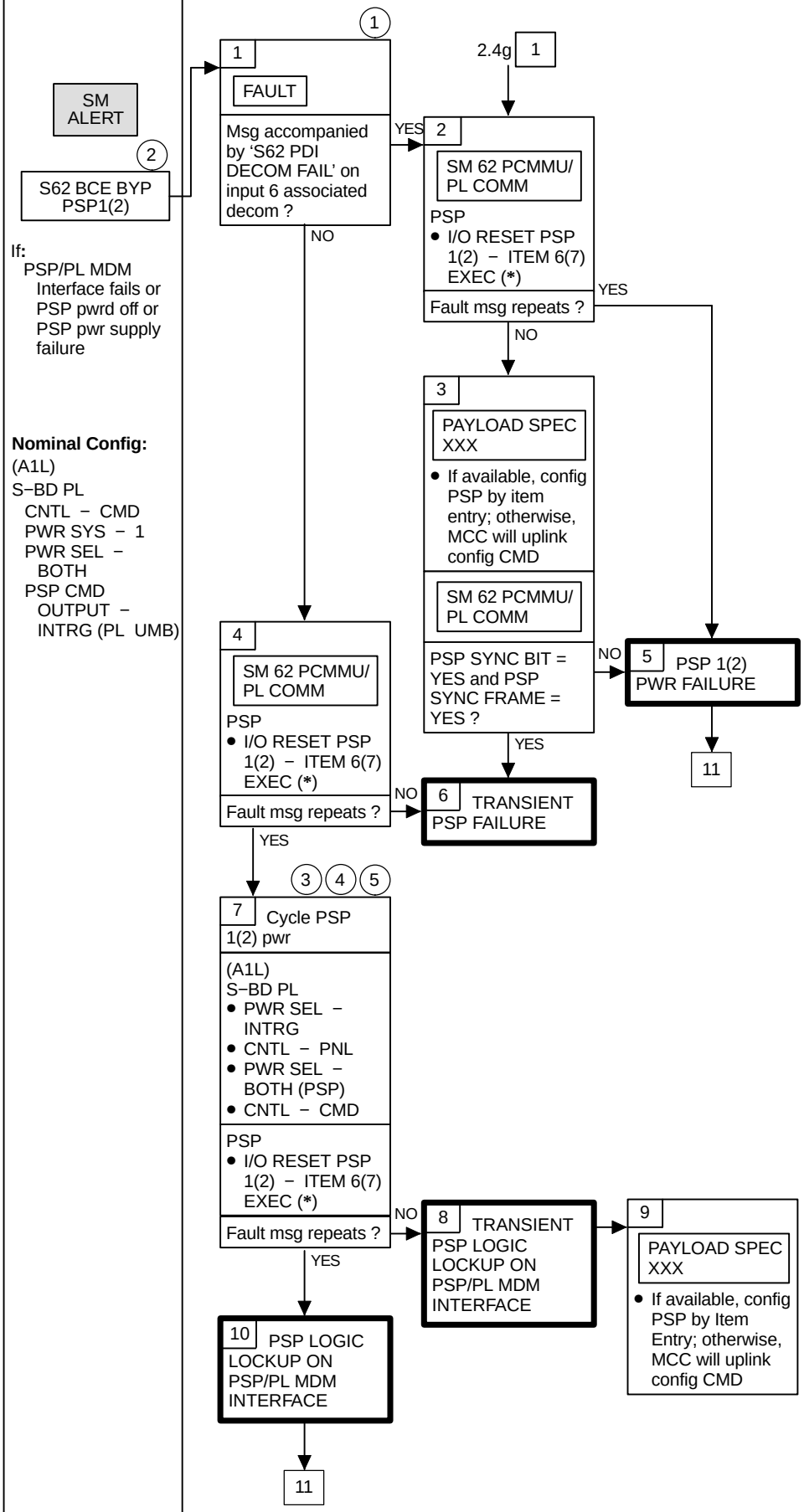
(2) Msg will occur if SM I/O RESET accomplished and PDI pwrd off

(3) Internal PDI logic lockup may be cleared by PDI pwr cycle. However, this will cause loss of currently loaded formats. Do not cycle pwr without MCC direction

(4) May be possible to clear if GPC MIA or GPC S/W with an SM GPC switch. ✓MCC for further action

COMM

2.4f ‘S62 BCE BYP PSP 1(2)’



If:
PSP/PL MDM Interface fails or PSP pwrd off or PSP pwr supply failure

Nominal Config:
(A1L)
S−BD PL
CNTL − CMD
PWR SYS − 1
PWR SEL − BOTH
PSP CMD
OUTPUT − INTRG (PL UMB)

(1) PDI DECOM FDA must be enabled to receive ‘S62 PDI DECOM FAIL’ and ↑

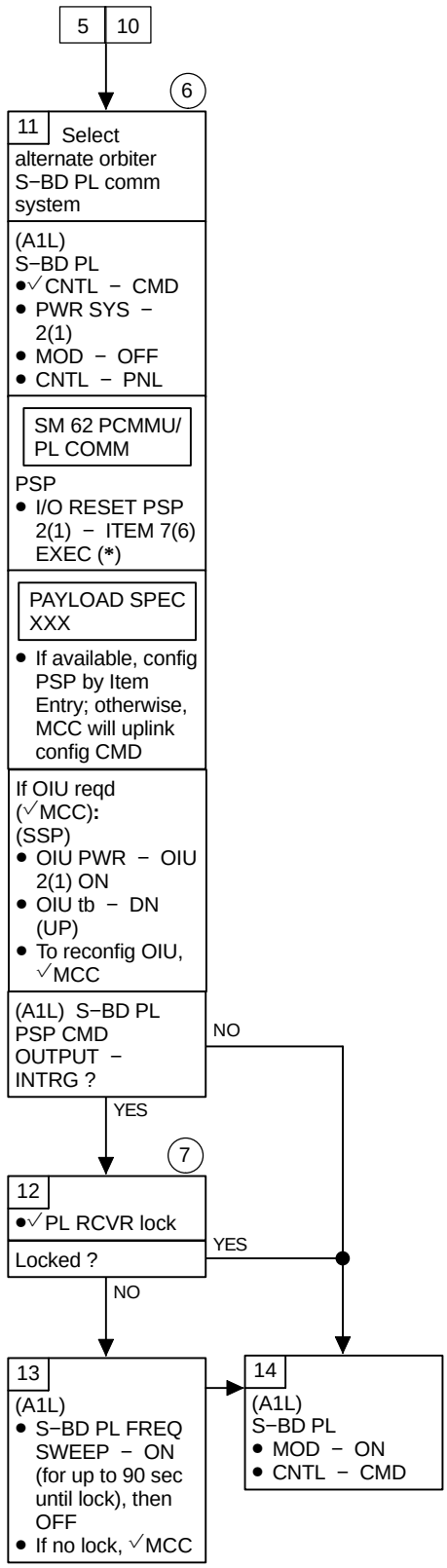
(2) Msg occurs if PSP pwrd off

(3) ‘S62 PDI DECOM FAIL’ fault msg may occur during PSP pwr cycle

(4) PSP config will be lost in next block steps

(5) S−BD PL PWR SEL sw position should reflect current operational requirements

COMM 2.4f (Cont)



(6) Selection of alternate S−BD PL sys will cause temporary loss of RF to PL

(7) Indications of PL RCVR lock vary with flight

COMM

SM ALERT

S62 PDI DECOM FAIL

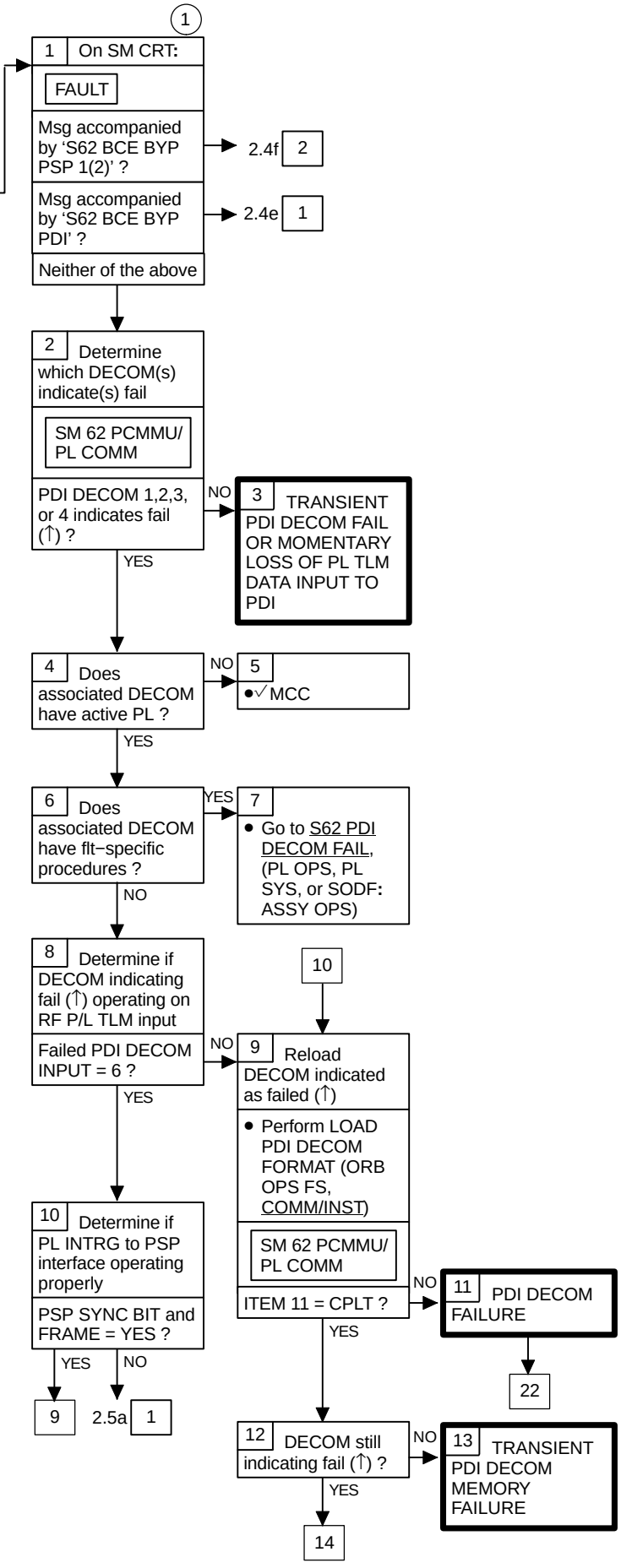
If:
PDI Decom fails, or PL to orbiter PI RF link fails, or PL TLM output to PDI fails, or PSP/PDI hardline failure

Nominal Config:
(A1L)
PL DATA INTLVR
PWR − ON

SM 62 PCMMU/PL COMM

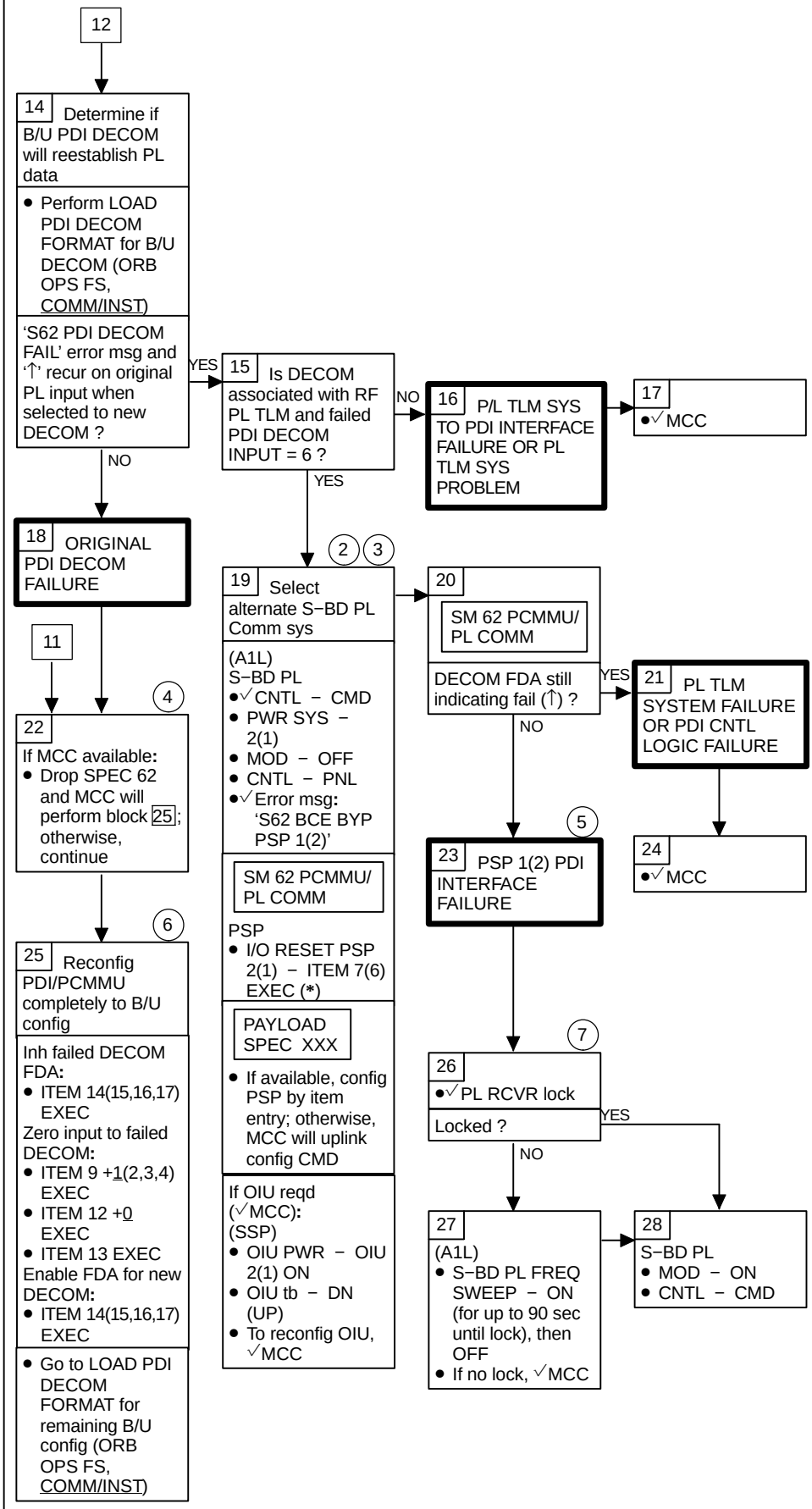
DECOM FDA
ENA − ITEM 14 (15,16,17) = ENA (*)
(A1L)
S−BD PL
PWR SYS − 1
PWR SEL − BOTH
PSP CMD OUPUT − INTRG(PL UMB)

2.4g 'S62 PDI DECOM FAIL'



1 Data on display driven by failed DECOM may be static

COMM 2.4g (Cont)



(2) Selection of alternate S−BD PL sys will cause temporary loss of RF to PL

(3) Some payloads, on a flight−specific basis, may not be supported by PL comm string 2

(4) MCC TFL/DFL loads cannot be performed with SPEC 62 active

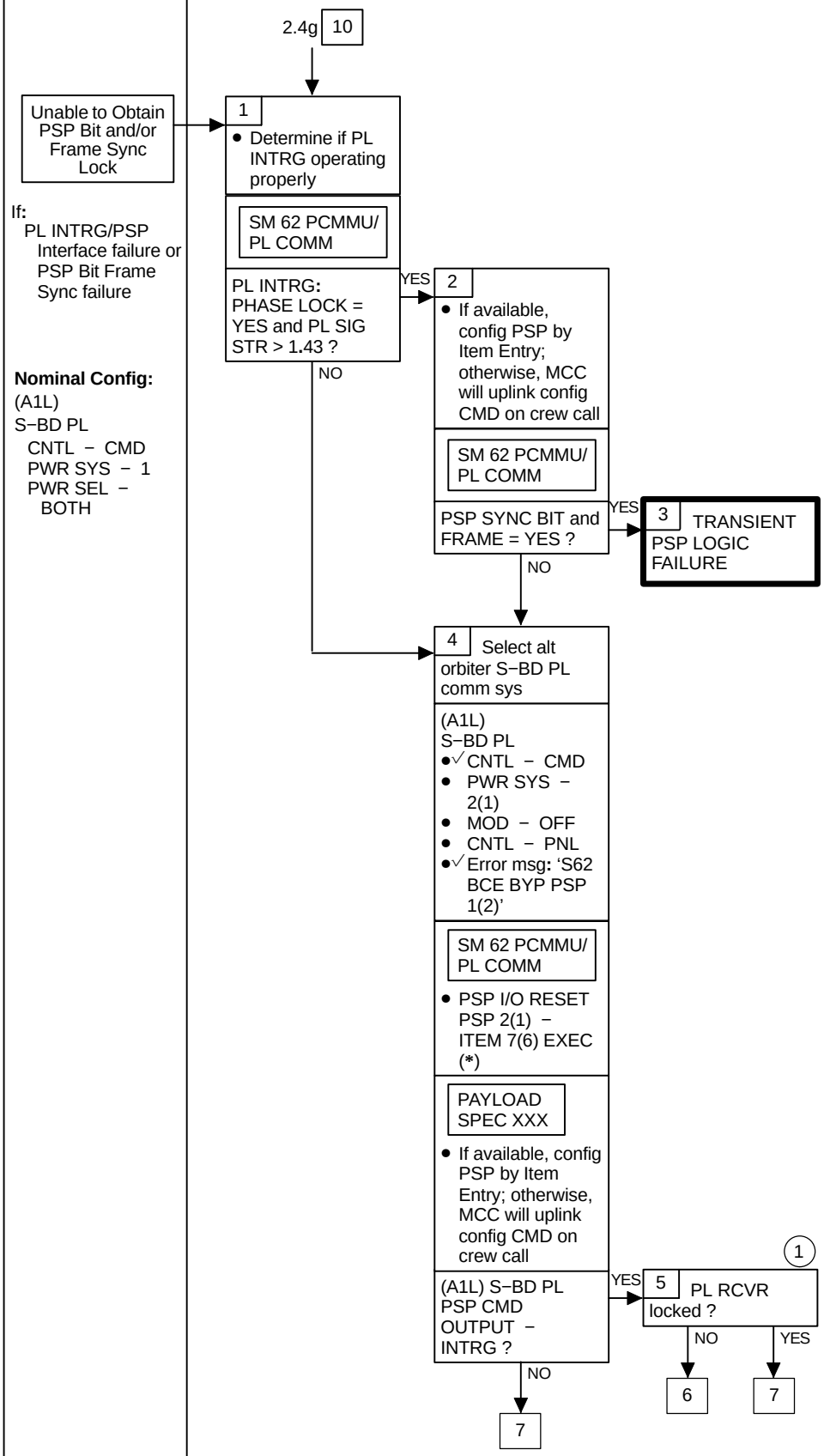
(5) Original orbiter S−BD PL TLM sys lost

(6) B/U DECOM config requires a TFL change

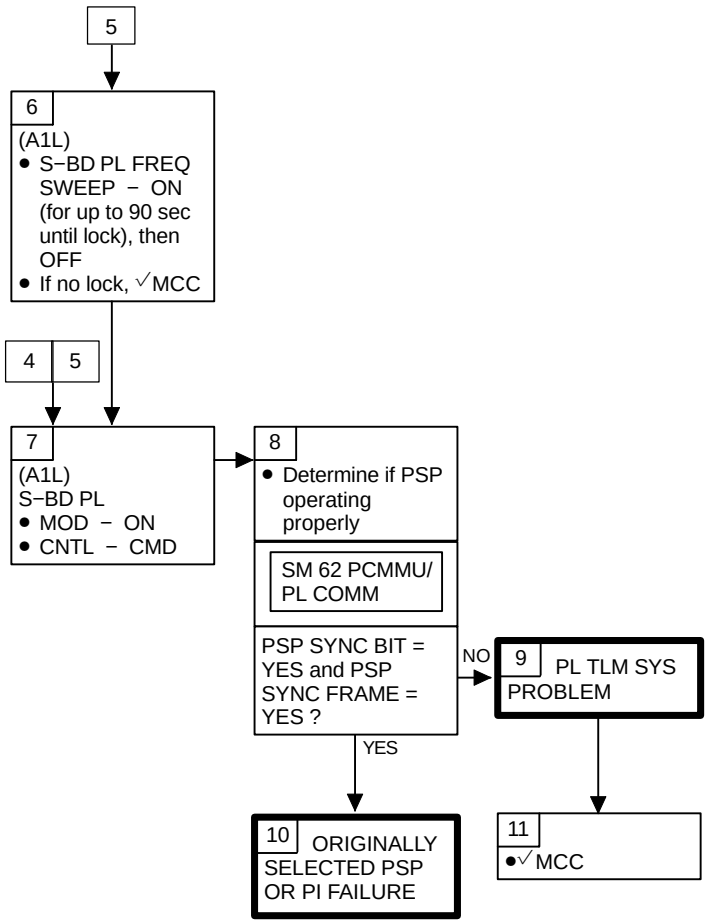
(7) PL RCVR lock indications vary with flight

COMM

2.5a PSP BIT AND/OR FRAME SYNC LOCK FAIL



COMM 2.5a (Cont)



COMM

2.6a OI DSC LOSS

(1) Multiple Params Indicate Off−Scale Low (Displaying 'L')

S69 FUEL CELL
S69 FUEL CELL H2O
S86 FU TK VLV 1(2,3)
S86 RSVR/ACC P 1(2,3)
S88 APU/FU PMP 1(2,3)

Simultaneous occurrence of these fault msgs indicates DSC OM3 problem

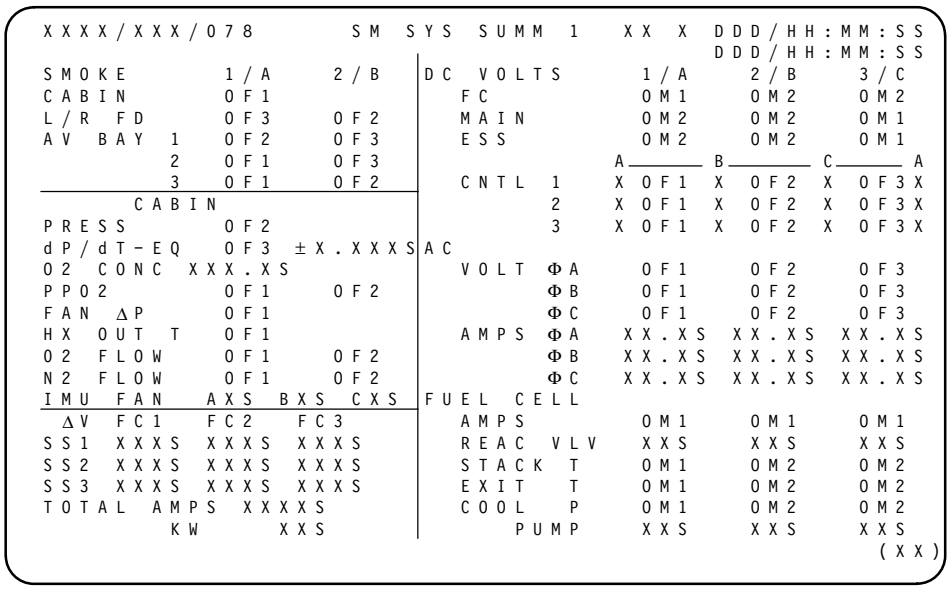
Nominal Config:
(O14:B)
cb MNA OI SIG CONDR OF 1/4 A − cl
(O15:B)
cb MNB OI SIG CONDR OF 1/4 B − cl
(O15:B)
cb MNB OI SIG CONDR OF 2/3 A − cl
(O16:B)
cb MNC OI SIG CONDR OF 2/3 B − cl
(O14:B)
cb MNA OI SIG CONDR OM 1/2 A − cl
(O15:B)
cb MNB OI SIG CONDR OM 1/2 B − cl
(O17:C)
SIG CONDR
OL 1/2 − ON
OR 1/2 − ON
(O17:D)
SIG CONDR
OA 1/2/3 − ON
(O15:B)
cb MNB OI SIG CONDR OM3 A − cl
(O16:B)
cb MNC OI SIG CONDR OM3 B − cl

(EDO only)
(R14:B)
cb MNA PALLET/ DSC 1A/2B − cl
cb MNB PALLET/ DSC 1B − cl
cb MNC PALLET/ DSC 2A − cl

1. Match param indicators on displays to determine failed DSC
2. ✓ cb(s) for particular DSC
3. DSC FAILURE

COMM SSR−17	OF1	OR2	COMM SSR−24
COMM SSR−18	OF2	OM1	COMM SSR−25
COMM SSR−19	OF3	OM2	COMM SSR−26
COMM SSR−20	OF4	OA1	COMM SSR−27
COMM SSR−21	OL1	OA2	COMM SSR−28
COMM SSR−22	OL2	OA3	COMM SSR−29
COMM SSR−23	OR1	OM3	COMM SSR−30
COMM SSR−31	OP1	OP2	COMM SSR−32

(1) Loss of signal conditioning will usually (but not always) cause display of off−scale low value for that param. 'L' will be displayed adjacent to this value



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

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

```
   APU          1        2        3
TEMP EGT     OA1      OA2      OA3
 B/U EGT     OA2      OA3      OA1
 OIL IN      OA1      OA2      OA3
     OUT     OA2      OA3      OA1
SPEED %      OA1      OA2      OA3
FUEL QTY     XXXS     XXXS     XXXS
 PMP LK P    OM3      OM3      OM3
OIL OUT P    OA1      OA2      OA3

 AV BAY
TEMP         OF2      OF3      OF1
FAN ΔP     X.XXS    X.XXS    X.XXS
```

```
   HYD        1        2        3
PRESS       OA2      OA1      OA3
RSVR  T     OA1      OA2      OA3
      P     OA1      OA2      OA3
   QTY      OA1      OA2      OA3
   W/B
H2O QTY     XXXS     XXXS     XXXS
BYP VLV     XXXS     XXXS     XXXS

THERM      CNTL      1        2
H2O PUMP    P        OF2      OF3
FREON FLOW           OF2      OF3
EVAP  OUT T          OA2      OA3
```

(XX)

```
XXXX/XXX/089       PRPLT THERMAL     XX X  DDD/HH:MM:SS
      POD            L       R             DDD/HH:MM:SS
OMS TK        OX   OL2     OR2
              FU   OL1     OR1
ENG I/F       OX   OL1     OR1
              FU   OL2     OR2
          OX VLV   OL1     OR1
          FU INJ   OL1     OR1

WEB KEEL       1   OL2     OR2
               2   OL2     OR2
      Y       OB   OL2     OR2
              UP   OL1     OR1
OX DRN P L     1   OL1     OR1
               2   OL1     OR1
ENG      COVER     OM1     OM2
     SERV PNL     OL2     OR2
GSE  SERV PNL     OL2     OR2
TEST HE/OX     1  OL1     OR1
               2  OL2     OR2
```

```
  OMS CRSFD      L       R       C
XFD          OX   OA1     OA2     OA3
      GMBL LN    OA1     OA2
DRN          OX   OA3     OA3
```

```
 FWD  RCS          FU      OX
     LINE   T1   OF2     OF4
            T2   OF4     OF2
```

```
 AFT  RCS          L       R
MANF  1       OX   OL1     OR1
DRN  PNL       1   OL2     OR2
               2   OL2     OR2
VERN  PNL      1   OL2     OR2
               2   OL2     OR2
```

(XX)

COMM SSR−1
LOSS OF ALL VOICE COMM

1. Perform NO AUDIO, COMM, 2.1a
2. Install AUDIO CTR BYP CONNECTORS
   Perform ACCU BYPASS CONNECTOR INSTALLATION (IFM, PROCEDURES A THRU F) for CDR and PLT ATUs

If still no COMM but CMD capability confirmed (ORB PKT, COMM, COMM LOST multi panels), MCC will attempt telecon via OCA

If Ku−Band not deployed/activated:

3. Perform KU−BD ANT DEPLOY and KU−BD ACTIVATION (ORB OPS, COMM/INST):
4. Configure for OCA telecom (ORB OPS, PGSC, VIDEO CONFERENCING) in low rate

L12
A1U

PDIP KU BD RATE − LOW
KU SIG PROC LDR − PL DIGITAL
HDR − TV
✓KU PWR − ON
✓KU MODE − COMM
✓KU − GPC
KU CNTL − PNL

If no OCA capability (CMD OK) and voice still cannot be established:

5. Perform next day PLS

6. Use Scratch Pad line(s) to inform MCC of no voice and for other msgs
   (MCC monitors all Scratch Pad lines)

NOTE
For letters above F, use ROW/COLUMN combinations below; i.e., 2B = N.
Use '..' when msg requires > 1 Scratch Pad line (expect ERR)

		COLUMN					
		A	B	C	D	E	F
ROW	1	G	H	I	J	K	L
	2	M	N	O	P	Q	R
	3	S	T	U	V	W	X
	4	Y	Z				

Standard Responses

11	YES
22	NO
33	MSG RCVD − STBY
44	MSG RCVD − WILCO
55	DON'T KNOW
66	RESEND MSG
77	REFERENCE MSG
88	? (DON'T UNDERSTAND − PLEASE CLARIFY)
99	MISSION STATUS − OK
00	MISSION STATUS − PROBLEM IDENTIFIED, PLEASE ADVISE
AA	PAGE NUMBER

EX:
ITEM 01 +77 (02) +924 (03) +88
'Reference Msg 924; Don't Understand − Please Clarify'

7. MCC will acknowledge by lighting Abort light:
   ON for at least 1 min, then OFF = MSG RCVD − STBY
   ON for 10 sec, then OFF = YES
   ON for 10 sec, then OFF for 10 sec, ON for 10 sec, then OFF = NO

If still no Comm, and no CMD:

8. Minimize perturbations and deorbit
   Cease payload ops, which cause vehicle movement
   Do not perform any unnecessary attitude maneuvers, vents, dumps, or purges
   Perform reqd attitude maneuvers, vents, dumps, and purges as close to Deorbit Burn as possible
   MNVR(TRK) −ZLV, +XVV attitude until Deorbit Prep
   TG = 2, BV = 3, OM = 180

OPS 202 PRO

GNC XXXX MNVR YYYY

If PEG 7 Δ Vs = 0 and TIG in future, then Deorbit to PLS at TIG in target set >>

Otherwise:

Perform GPS INCORPORATION (ORB OPS, GNC), then:

If GPS is functioning properly, Deorbit to next lighted CONUS opportunity or next CONUS if lighted doesn't exist (either current or next day PLS)

NOTE

Do not inhibit GPS for crew sleep

D/O, NOMINAL DEORBIT PREP PROCEDURES

Pen & Ink: Add "GPS INCORPORATION (EPCL, GNC)" at TIG−2:00 hr

If GPS is NOT functioning properly, Deorbit according to following priorities for altitude and available targets:

Current Altitude

1. Deorbit within next 13 hr if Hp ≥120 nmi
2. Deorbit within next 9 hr if 105 ≤ Hp < 120 or less

Available Targets

1. Next lighted CONUS opportunity
2. Next CONUS opportunity
3. Next lighted ELS opportunity

EXPLANATORY NOTES FOR OI MDM/DSC LOSS SSRs

NOTE

OI MDM/DSC Loss action items are based on loss of specific OI MDM or DSC. Each procedure defines crew actions reqd because of the lost measurements on failed OI MDM or DSC

For each procedure, the following assumptions/guidelines are used:

1. Only on−orbit and sleep configs are addressed. Entry changes will be uplinked with entry sw list changes

2. Only a few lost measurements have possible recoveries. Many Mal procedures will remain unusable. Actions reqd maximize capability

3. Pwr consumption is not a consideration. Loads will be balanced after the fact by MCC

4. Procedures include primary C/W inhibits (DSC only). MCC will do TMBUs to assure safe monitoring/control only, with no general TMBU of all affected measurements

5. Procedures do not represent a complete list of measurements affected. Procedures include only those measurement losses that are significant to crew and those with possible actions

6. Params affected by OI MDM loss will have 'M' displayed adjacent to them. Those params affected by DSC loss will have 'L' displayed adjacent to them (params displayed on meter will be pegged low). Do not use these data

COMM SSR−10
OI MDM LOST: OF1

	ACTIONS	MEASUREMENT LOSS
	If on PCS SYS 1: • Perform RECONFIG TO ALT PCS SYS, ECLS SSR−3	Most PCS 1 measurements
1	(L1) • AV BAY 3 FAN A,B (two) − ON • HUM SEP A,B (two) − ON If on IMU FAN A: • IMU FAN B(C) − ON • A − OFF • Monitor Cabin Fan flow by feel During sleep periods: • CAB FAN A,B (two) − ON	Av Bay 3 Fan ΔP temp (MCC cannot assess) Hum Sep A,B (two) Speed Snsr Waste Qty 1 IMU Fan ΔP A Speed Snsr Cab Fan ΔP
	• Maintain LiOH Canister(s) changeout schedule per cue card and FLIGHT PLAN	PPCO2 (MCC cannot assess)
		FC 1 pH Snsr
2	(R1) • MN BUS TIE B,C (two) − ON (tb−ON)	FC2 SS1 ΔV SS2 ΔV SS3 ΔV
	(L1) If FLASH EVAP CNTLR PRI B enabled: • Perform FES RESTART ECLS SSR−5, using PRI A	Most FES Feedline A Htr measurements
	(R14:C) • cb MNB KU ANT HTR − op	Ku Gyro temp monitoring
3	• ✓MCC about performing WASTE H2O DUMP	Waste Qty 1
4	(ML86B:A) • cb MNA,MNB H2O LINE HTR A, HTR B (two) − cl	Waste H2O Dump Line T
		N2 Qty (two) 1,2 (OV103,104) N2 Qty 2 (OV105)
5 5 5		Smoke Det A Concn Av Bay 2 A Concn Av Bay 3 Concn Cabin
6		HYD sys temps
	(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 1 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/ DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)	CO2 Cntlr 1 DC pwr indication CO2 Cntlr 1 BED A press VAC press CO2 Cntlr 1 malf indication CO2 Cntlr 2 AC pwr indication CO2 Cntlr 2 BED B press
7 8 9	(ML86B:C) • cb MNA,MNB EXT ARLK HTR STRUC (two) − cl	If no internal airlock: External Airlock LCG EV 1 Supply Line press External Airlock Fwd and Aft Truss Flange temps External Airlock H2O Line Zone 1 Htr A temp External Airlock H2O Line Zone 2 Htr B temp External Airlock H2O Shutoff Vlv position

NOTES

(1) If condensation in cabin, ✓MCC

(2) Buses will be untied for entry. MCC will TMBU FC ΔAMPS 2 limits and notify crew. If loss of comm, reset limits to present value ± 40

(3) WST TK will be dumped by time (≈2 %/min) to provide ullage to make EOM, MCC will provide the time

(4) This action activates redundant htrs on Supply H2O Dump Line, Waste H2O Dump Line, Vacuum Vent Line

(5) Smoke Det H/W Alarm still available

(6) Xdcrs on disp SM 87 HYD THERMAL will show 'M' for some parameters

(7) Visibility into Truss Flange temps lost

(8) One of two temps in each zone lost

(9) Vlv position is normally closed. Position can be verified during EMU recharge

COMM SSR−11
OI MDM LOST: OF2

	ACTIONS		MEASUREMENT LOSS
	If on PCS SYS 2: • Perform RECONFIG TO ALT PCS SYS, ECLS SSR−3		Most PCS Sys 2 measurements
	(L1) • AV BAY 1 FAN (two) − ON • ✓H2O PUMP LOOP 2 − ON • H2O PUMP LOOP 1 − OFF	1	Av Bay 1 Fan ΔP temp (MCC cannot assess) Most H2O Loop 1 measurements
	• Do not don Biomed Electrodes		EGG 1,2 Telemetry
2	(R11L) •✓PLY H2O TKC INLET, OUTLET (two) − OP (tb−OP)		Sply H2O Qty B Qty D
3	(R1) • MN BUS TIE C,A (two) − ON (tb−ON)		FC3 SS1 ΔV SS2 ΔV SS3 ΔV
	SM 66 ENVIRONMENT • Monitor AIRLK P and dP/dT for cabin integrity on−orbit		Cabin Press Snsr
			N2 Qty 2
			FC2 pH Snsr
4	(ML86B:A) • cb MNA,MNB H2O LINE HTR A, HTR B (two) − cl		Sply H2O Dump Line T
		5	Smoke Det A Concn Av Bay 1
		5	Smoke Det B Concn Av Bay 3
		5	Smoke Det Concn Right Flt Deck
			If no internal airlock: External Airlock LCG EV 2 Supply Line press
		6	External Airlock H2O Line Zone 1 MNA,B,C Htr ON status
		7	Vestibule Temp 1
		8	EXT A/L Struc Htr MNA,B Htr ON status
		9	Vestibule Isolation Vlv 1 and Depress Vlv 1 op/cl positions

NOTES

(1) Use interchanger flow to monitor H2O Loop 1 performance if reqd

(2) Crossover vlv needs to be checked and TKC unisolated to equalize tks to provide leak protection

(3) Buses will be untied for entry. MCC will TMBU FC ΔAMPS 3 limits and notify crew. If loss of comm, reset limits to present value ± 40

(4) This action activates dual htrs on Supply H2O Dump Line, Waste H2O Dump Line, Vacuum Vent Line

(5) Smoke det H/W Alarm still available

(6) Zone 1 temps verify proper switch config

(7) Vestibule Temp 2 available

(8) Structural temps verify proper switch config

(9) Vlvs still operational. Alternate vlvs available

COMM SSR−12
OI MDM LOST: OF3

	ACTIONS		MEASUREMENT LOSS	NOTES
	SM 66 ENVIRONMENT • Monitor Cabin Press for cabin leaks		Cabin dP/dT	(1) Use Interchanger flow to monitor H2O Loop 2 performance if reqd (2) Raises H2O Loop 1 Pump Out P Limit (3) Lowers H2O Loop 2 Pump Out P Limit (4) Causes loss of FC Auto purge capability (5) Avoids nuisance alarms (6) SM 76 COMM display S−BD PM mode static, SM GPC will continue selecting ANT for the mode shown (7) Force TDRS antenna pointing (8) Xdcrs on disp SM 87 HYD THERMAL will show 'M' for some parameters
	(L1) • AV BAY 2 FAN (two) − ON		Av Bay 2 Fan ΔP Av Bay 2 temp (MCC cannot assess)	
	• H2O PUMP LOOP 1 − ON • H2O LOOP 1 BYP MODE − AUTO • H2O PUMP LOOP 2 − OFF • H2O LOOP 2 BYP MODE − MAN	1	Most H2O Loop 2 measurements	
2 3	(R13U) • C/W PARAM SEL tw (three) − 105 • C/W LIMIT SET VALUE tw (three) − 1.50 • C/W LIMIT SET LIMIT − LOWER • C/W LIMIT SET FUNC − SET • C/W PARAM SEL tw (three) − 115 • C/W LIMIT SET VALUE tw (three) − 0.65 • C/W LIMIT SET LIMIT − LOWER • C/W LIMIT SET FUNC − SET • C/W PARAM SEL tw − > 119			
	When reqd: • Perform FUEL CELL PURGE − MANUAL (ORB OPS, EPS) (Cue Card) (Assume SM 2 not available when using Cue Card)	4	FC Purge Line temps FC3 pH Snsr	
5	SM 60 SM TABLE MAINT Inhibit S−BD ANT QUAD Alert: • Param ID − ITEM 1 +0 9 2 1 0 4 9 EXEC • INH − ITEM 10(15) EXEC		Antenna Select feedbacks	
	(L1) If FLASH EVAP CNTLR PRI A enabled: • Perform FES RESTART, ECLS SSR−5, using PRI B		Most FES Feedline B Htr measurements	
6 7	SM ANTENNA If TDRS: • GPC OVRD − ITEM 13 EXEC (*)		S−BD mode	
			N2 Qty (two) 1,2	
		8	HYD sys temps	
	(Continued)		(Continued)	

COMM SSR−12 (Cont)
OI MDM LOST: OF3

ACTIONS		MEASUREMENT LOSS
• Terminate all SUPPLY H2O Dump operations through dump nozzle • If Supply H2O Dump reqd, perform SUPPLY WATER DUMP USING FES (ORB OPS, ECLS)		Supply H2O Noz T A,B (two)
• Terminate all WASTE H2O Dump operations through dump nozzle		Waste H2O Noz T A,B (two)
(R11L) 9 • ✓SPLY H2O TKC INLET, OUTLET (two) − OP (tb−OP)		Supply H2O Qty C
	10 10 10	Smoke Det B Concn Av Bay 1 Bay 2 Smoke Det Concn Left Flt Deck
	11	FC 1,2,3 Amps
(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 2 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/ DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)		CO2 Cntlr 1 AC pwr indication CO2 Cntlr 1 BED ΔP CO2 Cntlr PPCO2 CO2 Cntlr 2 DC pwr indication CO2 Cntlr 2 BED A press CO2 Cntlr 2 malf indication
(ML86B:C) • cb MNA,MNB EXT ARLK HTR VEST (two) − cl • cb MNA,MNB EXT ARLK HTR STRUC (two) − cl	12 13 14 15 16	If no internal airlock: External Airlock H2O Line Zone 2 MNA,B,C Htr ON status External Airlock Vestibule MNA,B Htr ON status Vestibule Temp 2 External Airlock Lower Bulkhead temp External Airlock H2O Line Zone 1 and 2 LCG 2 temp External Airlock H2O Line Zone 2 QD Pnl temp Vestibule Isolation Vlv 2 op/cl positions

NOTES
(9) For leak detection
(10) Smoke Det H/W Alarm still available
(11) F9 meter still available
(12) Zone 2 temps verify proper switch config
(13) Both htrs activated since only one Vestibule temp available
(14) Vestibule Temp 1 available
(15) Both htrs activated since visibility into temps lost
(16) Vlv still operational. Alternate vlvs available

COMM SSR−13
OI MDM LOST: OF4

	ACTIONS		MEASUREMENT LOSS	NOTES
	When reqd: • Perform FUEL CELL PURGE − MANUAL (ORB OPS, EPS) (Cue Card) (Assume SM 2 not available when using Cue Card)		FC Auto Purge Start discretes	(1) No SM alerts for CCTV overtemp (2) May get Antenna alerts when manually operating (C3) S−BD PM ANT sw (loss of position discrete to SM) (3) Buses will be untied for entry. MCC will TMBU FC ΔAMPS 1 limits and notify crew. If loss of comm, reset limits to present value ± 40 (4) Vlv still operational. Alternate vlvs available
	• During CCTV Camr ops, monitor CCTV Camr temps on Monitor	1	CCTV Camr overtemp discrete	
	• Perform CIRC PUMP XDCR FAILURE WORKAROUND, APU/HYD SSR−3, for 'M' Xdcrs on display SM 87 HYD THERMAL		HYD sys temps	
	If Topping Evap enabled: (L1) • TOP EVAP HTR DUCT − A/B		Fwd,Aft Topping Duct Htr measurements	
	If High Load Evap enabled: (L1) • HI LOAD DUCT HTR − A/B		Hi Load Outbd Duct Htr measurements	
		2	S−BD Quad Ant Sel 1/2 − GPC	
	(A12) • APU HTR TK/FU LINE/H2O/SYS 1A,1B, 3A,3B (four) − AUTO		APU H2O sys temps (Htr mon)	
3	(R1) • MN BUS TIE A,B (two) − ON (tb−ON)		FC1 SS1 ΔV SS2 ΔV SS3 ΔV	
		4	If no internal airlock, Vestibule Vlv 2 op/cl position	
			PSP output port telemetry	

COMM SSR−14
OI MDM LOST: OA1

	ACTIONS		MEASUREMENT LOSS	NOTES
	• Perform Circ Pump Seq procedures for Circ Pump 1, CIRC PUMP PRESS XDCR FAILURE WORKAROUND, APU/HYD SSR−1 and SIMULTANEOUS CIRC PUMP ON/GPC OPS, APU/HYD SSR−2		HYD sys pressures and seq discretes	(1) GPC capability to monitor HYD Accumulator and Reservoir pressure lost for sys 1 (2) Loss of fuel injector temperature is no−go for non−critical on−orbit burns. The engine will be used for deorbit
	• Perform CIRC PUMP XDCR FAILURE WORKAROUND, APU/HYD SSR−3, for 'M' Xdcrs on display SM 87 HYD THERMAL	1	HYD sys temps HYD sys 1 Accumulator and Reservoir pressure	
			APU 1 Fuel Qty (Meter and CRT)	
	If High Load Evap Enabled: (L1) • HI LOAD DUCT HTR − A/B		Hi Load Inbd Duct Htr measurement	
	(A14) • RCS/OMS HTR OMS CRSFD LINES (two) − AUTO		Partial insight into OMS CRSFD Line Htr ops	
2	L OMS no−go for on−orbit burns		L OMS Fu Inj T	

COMM SSR–15
OI MDM LOST: OA2

	ACTIONS		MEASUREMENT LOSS	NOTES
	When reqd: • Perform FUEL CELL PURGE – MANUAL (ORB OPS, EPS) (Cue Card) (Assume SM 2 not available when using Cue Card)	1	FC Purge Line temps	(1) Causes loss of FC Auto purge capability (2) GPC capability to monitor HYD Accumulator and Reservoir pressure lost for sys 2 (3) Loss of fuel injector temperature is no–go for non–critical on–orbit burns. The engine will be used for deorbit
	• Perform Circ Pump Seq procedures for Circ Pump 2, CIRC PUMP PRESS XDCR FAILURE WORKAROUND, APU/HYD SSR–1, and SIMULTANEOUS CIRC PUMP ON/GPC OPS, APU/HYD SSR–2		HYD sys pressures, and seq discretes	
	• Perform CIRC PUMP XDCR FAILURE WORKAROUND, APU/HYD SSR–3, for 'M' Xdcrs on display SM 87 HYD THERMAL	2	HYD sys temps HYD sys 2 Accumulator and Reservoir pressure	
			APU 2 Fuel Qty (Meter and CRT)	
	(A14) • RCS/OMS HTR OMS CRSFD LINES (two) – AUTO		Partial insight into OMS CRSFD Line Htr ops	
3	R OMS no–go for on–orbit burns		R OMS Fu Inj T	
			N2 Qty 1 (OV105)	
			If no internal airlock, External Airlock H2O Transfer Line press	

COMM SSR–16
OI MDM LOST: OA3

ACTIONS		MEASUREMENT LOSS	NOTES
(A14) • RCS/OMS HTR OMS CRSFD LINES – A AUTO,B AUTO		OMS/RCS Htr monitoring temps	(1) GPC capability to monitor HYD Accumulator and Reservoir pressure lost for sys 3
• Perform Circ Pump Seq procedures for Circ Pump 3, CIRC PUMP PRESS XDCR FAILURE WORKAROUND, APU/HYD SSR–1 and SIMULTANEOUS CIRC PUMP ON/GPC OPS, APU/HYD SSR–2		HYD sys pressures and seq discretes	
• Perform CIRC PUMP XDCR FAILURE WORKAROUND, APU/HYD SSR–3, for 'M' Xdcrs on display SM 87 HYD THERMAL	1	HYD sys temps HYD sys 3 Accumulator and Reservoir pressure	
		APU 3 Fuel Qty (Meter and CRT)	
		N2 Qty 1 (OV105)	

COMM SSR–17
OI DSC LOST: OF1

	ACTIONS		MEASUREMENT LOSS	NOTES
	If on PCS Sys 1: • Perform RECONFIG TO ALT PCS SYS, ECLS SSR–3		Most PCS 1 measurements	(1) Turn on both Cabin Fans for sleep (2) C/W channels 14,34,54,104,114 also lost but high limit–sensed only (3) WST TK will be dumped by time (≈2%/min) to provide ullage to make EOM. MCC will provide the time (4) This action activates redundant htrs on Supply H2O Dump Line, Waste H2O Dump Line, and Vacuum Vent Line (5) Smoke Det H/W Alarm still available (6) Both htrs activated since visibility into temps lost (7) Alternate temps available in each zone (8) Use pnl F9 Meter for insight to AC volts
1	(L1) • Monitor Cabin Fan by feel • During sleep periods: CAB FAN A,B (two) – ON		Cab Fan ΔP	
2	(R13U) • C/W PARAM SEL tw (three) – 034 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 074 • C/W PARAM – INH • C/W PARAM SEL tw (three) – > 119		PPO2 A Cab Fan ΔP	
	(R14:C) • cb MNB KU ANT HTR – op		Ku Gyro temp monitoring	
3	• ✓MCC about performing WASTE H2O DUMP		Waste Qty 1	
4	(ML86B:A) • cb MNA,MNB H2O LINE HTR A,HTR B (two) – cl		Waste H2O Dump Line T	
			Sply H2O Qty A	
		5 5 5	Smoke Det A Concn Av Bay 2 A Concn Av Bay 3 Concn Cabin	
	(ML86B:C) • cb MNA,MNB EXT ARLK HTR STRUC (two) – cl		If no internal airlock: 6 External Airlock Fwd and Aft Truss Flange temps 7 External Airlock H2O Line Zone 1 Htr A temp External Airlock H2O Line Zone 2 Htr B temp	
		8	AC1 volts	

COMM SSR–18
OI DSC LOST: OF2

ACTIONS	MEASUREMENT LOSS	NOTES
GNC 23 RCS RCS FWD • ITEM 1 EXEC Reprioritize jets: DES INH on F3,4 jets: • F3L ITEM 10 EXEC (*) • F4R ITEM 14 EXEC (*) • F3U ITEM 18 EXEC (*) • F3D ITEM 24 EXEC (*) • F4D ITEM 28 EXEC (*) • F3F ITEM 32 EXEC (*) • Reselect auto deselected jets (2) Increase PRI Jet Fail Limit: • ITEM 4+4 EXEC Override Manf vlv status to CL for F3,4 Manifolds: OVRD MANF VLVS • F3 ITEM 42 EXEC (CL) • F4 ITEM 43 EXEC (CL)	Jet Pc, Pc discrete, Injector temps (Jet fail–off, leak RM detection)	(1) Auto overpressure protection lost for Fwd RCS Oxidizer Dual Reg failure (2) (O3) FWD RCS OXID He TK PRESS and FWD RCS FUEL PRPLT TK P and FWD RCS FUEL PRPLT TK P ind on meter is lost. FWD RCS OXID and FUEL PRPLT QTY ind on meter is invalid (3) C/W param 24,64,84 also lost, but high limit–sensed only (4) Use pnl F9 Meter for insight to AC volts
(O8) • FWD RCS MANF ISOL 5 – CL (tb–CL), then GPC	Jet Injector temps (Jet leak RM detection)	
• Perform LOSS OF VERNIER (ORB OPS, RCS)		
GNC SYS SUMM 2 2 • Monitor FWD RCS He ΔP for leaks. If FWD RCS leak suspected, secure sys and call MCC • ✓ MCC for sleep config	1 Fwd RCS Tk, Manf Press, Qty (Fwd leak detection)	
If on PCS SYS 2: • Perform RECONFIG TO ALT PCS SYS, ECLS SSR–3	Most PCS 2 measurements	
(R13U) 2 C/W PARAM SEL tw (three) – 004 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 016 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 044 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 105 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 106 • C/W PARAM – INH • C/W PARAM SEL tw (three) – > 119	3 Cab Press FRCS Fu Tk ULL P PPO2 B H2O Pump P1 Freon Flow 1	
	(A1R) Ops Rcdrs 1(2) Mode tb (two) logic	
	4 AC2 volts	
(Continued)	(Continued)	

COMM SSR–18 (Cont)
OI DSC LOST: OF2

ACTIONS	MEASUREMENT LOSS	NOTES
5 (R11L) • ✓SPLY H2O TKC INLET, OUTLET (two) – OP (tb–OP)	Sply H2O Qty B,D	(5) Crossover vlv needs to be checked and TKC unisolated to equalize tks to provide leak protection
SM 66 ENVIRONMENT • Monitor AIRLK P and dP/dT for cabin integrity on–orbit	Cabin Press Snsr	(6) This action activates redundant htrs on Supply H2O Dump Line, Waste H2O Dump Line, Vacuum Vent Line
6 (ML86B:A) • cb MNA,MNB H2O LINE HTR A, HTR B (two) – cl	Sply H2O Dump Line T	(7) Smoke Det H/W Alarm still available
	7 Smoke Det A Concn Av Bay 1 7 Smoke Det B Concn Av Bay 3 7 Smoke Det Concn Right Flt Deck	
	If no internal airlock, External Airlock LCG EV 2 Supply Line press	

COMM SSR–19
OI DSC LOST: OF3

ACTIONS	MEASUREMENT LOSS	NOTES
SM 66 ENVIRONMENT • Monitor CABIN PRESS for cabin leaks on–orbit	Cabin dP/dT	(1) C/W params 51,71,94 are also lost, but high limit–sensed only
(R13U) • C/W PARAM SEL tw (three) – 115 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 116 • C/W PARAM – INH • C/W PARAM SEL tw (three) – > 119	1 H2O Pump P2 Freon Flow 2	(2) Smoke Det H/W Alarm still available
	2 Smoke Det B Concn Av Bay 1 2 Bay 2 2 Smoke Det Concn Left Flt Deck	(3) Fwd RCS PASS Fu qty degraded, BFS Fu qty lost
	3 Fwd RCS Fu Tk T	(4) Both htrs activated since visibility into temps lost
(ML86B:C) • cb MNA,MNB EXT ARLK HTR STRUC (two) – cl	If no internal airlock: 4 External Airlock Lower Bulkhead temp External Airlock H2O Line Zone 1,2 LCG 2 temp External Airlock H2O Line Zone 2 QD Pnl temp	(5) Crossover vlv needs to be checked and TKC unisolated to equalize tks to provide leak protection
5 (R11L) • ✓SPLY H2O TKC INLET, OUTLET (two) – OP (tb–OP)	Sply H2O Qty C	(6) Use pnl F9 Meter for insight to AC volts
	6 AC3 volts	

COMM SSR–20
OI DSC LOST: OF4

	ACTIONS	MEASUREMENT LOSS	NOTES
	GNC 23 RCS RCS FWD • ITEM 1 EXEC Reprioritize jets: DES INH on F1,2 JETS • F1L ITEM 8 EXEC (*) • F2R ITEM 12 EXEC (*) • F1U ITEM 16 EXEC (*) • F2U ITEM 20 EXEC (*) • F1D ITEM 22 EXEC (*) • F2D ITEM 26 EXEC (*) • F1F ITEM 30 EXEC (*) • F2F ITEM 34 EXEC (*) • Reselect auto deselected jets (2) Increase PRI Jet Fail Limit: • ITEM 4+4 EXEC Override Manf vlv status to CL for F1,2 Manifolds: OVRD MANF VLVS 1 • F1 ITEM 40 EXEC (CL) • F2 ITEM 41 EXEC (CL)	Jet Pc, Pc discrete, Injector temps (Jet fail–off, leak RM detection)	(1) Without F1F, F2F no low Z translation capability; –X only one jet (usually 2) (2) Auto overpressure protection lost for Fwd RCS Fuel Dual Reg failure (3) (O3) FWD RCS Fuel He TK P and FWD RCS OXID PRPLT TK P ind on meter is lost
	GNC SYS SUMM 2 •✓MCC for sleep config	2 Fwd RCS TK and Manf Press and Qty	
	(R13U) 3 • C/W PARAM SEL tw (three) – 006 • C/W PARAM – INH • C/W PARAM SEL tw (three) – > 119	Fwd RCS OX Tk ULL P	
		If no internal airlock, External Airlock LCG EV 1 Supply Line press	

COMM SSR–21
OI DSC LOST: OL1

	ACTIONS		MEASUREMENT LOSS	NOTES
	GNC 23 RCS RCS L • ITEM 2 EXEC Reprioritize jets: DES INH on L1,2 JETS • L2L ITEM 10 EXEC (*) • L1L ITEM 14 EXEC (*) • L2U ITEM 18 EXEC (*) • L1U ITEM 20 EXEC (*) • L2D ITEM 26 EXEC (*) • L1A ITEM 32 EXEC (*) • Reselect auto deselected jets (2) Increase PRI Jet Fail Limit: • ITEM 4+3 EXEC Override Manf vlv status to CL for L1,2 Manifolds: OVRD MANF VLVS 1 • L1 ITEM 40 EXEC (CL) • L2 ITEM 41 EXEC (CL) If I'CNCT config: • ITEM 48 EXEC (INH)		Jet Pc, Pc discrete, Injector temps (Jet fail–off, leak RM detection)	(1) Prior to deorbit, override L1 Manf vlv status to op (2) Auto overpressure protection lost for L RCS Oxidizer Dual Reg failure (3) (O3) L RCS OXID He TK P, L RCS OXID PRPLT TK P, L OMS He P, and L OMS FU TK P ind on meter is lost. L RCS OXID PRPLT QTY ind on meter is invalid (4) Loss of fuel injector temp is no–go for noncritical on–orbit burns. Engine will be used for deorbit
	(O7) • AFT L RCS MANF ISOL 5 – CL (tb–CL), then GPC		Jet Injector temps (Jet leak RM detection	
	• Perform LOSS OF VERNIER RCS (ORB OPS, RCS)			
	GNC SYS SUMM 2 • Monitor L RCS He ΔP for 3 leaks. If L RCS leak suspected, secure sys and call MCC • ✓MCC for sleep config	2	Left RCS Tank and Manf Press and Qty (leak detection lost)	
	(R13U) 3 • C/W PARAM SEL tw (three) – 017 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 036 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 056 • C/W PARAM – INH • C/W PARAM SEL tw (three) – > 119		L OMS Fu Tk ULL pressure L RCS OX Tk ULL pressure L RCS leak	
	4 L OMS no–go for on–orbit burns		L OMS Fu Inj T	

COMM SSR–22
OI DSC LOST: OL2

ACTIONS	MEASUREMENT LOSS	NOTES
GNC 23 RCS RCS L • ITEM 2 EXEC Reprioritize jets DES INH on L3,4 jets: • L4L ITEM 8 EXEC (*) • L3L ITEM 12 EXEC (*) • L4U ITEM 16 EXEC (*) • L4D ITEM 24 EXEC (*) • L3D ITEM 28 EXEC (*) • L3A ITEM 30 EXEC (*) • Reselect auto deselected jets (2) Increase PRI Jet Fail Limit: • ITEM 4+3 EXEC Override Manf vlv status to CL for L3,4 Manifolds: OVRD MANF VLVS 1 • L3 ITEM 42 EXEC (CL) • L4 ITEM 43 EXEC (CL) If I'CNCT config: • ITEM 48 EXEC (INH)	Jet PC, PC discrete, Injector temps (Jet fail–off, leak RM detection)	(1) Prior to deorbit, override L3 Manf vlv status to OP (2) Auto overpressure protection lost for L RCS Fuel Dual Reg failure (3) (O3) L RCS FUEL He TK P, L OMS OXID TK P, and (F7) L OMS N2 TK P, L OMS Pc ind on meter is lost. (O3) L RCS FUEL PRPLT QTY ind on meter is invalid
GNC SYS SUMM 2 3 • Monitor L RCS He ΔP for leaks. If L RCS leak suspected, secure sys and call MCC • ✓ MCC for sleep config	2 Left RCS TK and Manf Press and Qty (leak detection lost)	
• P/I OMS Burn Monitor Cue Card to (1) Monitor GMBL Angles and BALL Vlvs for left OMS performance (2) • Perform OMS Pc LOW for L OMS '↓'	L OMS PC	
(R13U) 3 • C/W PARAM SEL tw (three) – 007 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 046 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 056 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 027 • C/W PARAM – INH • C/W PARAM SEL tw (three) – > 119	L OMS OX Tk ULL pressures L RCS Fu Tk ULL pressures L RCS leak L OMS PC	

COMM SSR–23
OI DSC LOST: OR1

	ACTIONS		MEASUREMENT LOSS	NOTES
	GNC 23 RCS RCS R • ITEM 3 EXEC Reprioritize jets: DES INH on R1,2 jets • R2R ITEM 10 EXEC (*) • R1R ITEM 14 EXEC (*) • R2U ITEM 18 EXEC (*) • R1U ITEM 20 EXEC (*) • R2D ITEM 26 EXEC (*) • R1A ITEM 30 EXEC (*) • Reselect auto deselected jets (2) Increase PRI Jet Fail Limit: • ITEM 4+3 EXEC 1 Override Manf vlv status to CL for R1,2 Manifolds: OVRD MANF VLVS • R1 ITEM 40 EXEC (CL) • R2 ITEM 41 EXEC (CL) If I'CNCT config: • ITEM 48 EXEC (INH)		Jet PC, PC discrete, Injector temps (Jet fail–off, leak RM detection)	(1) Prior to deorbit, override R1 Manf vlv status to OP (2) Loss of fuel injector temp is no–go for noncritical on–orbit burns. Engine will be used for deorbit (3) Auto overpressure protection lost for R RCS Oxidizer Dual Reg failure (4) (O3) R RCS OXID He TK P, R RCS OXID PRPLT TK P, R OMS FUEL TK P and (F7) R OMS He P ind on meter is lost. (O3) R RCS OXID PRPLT QTY ind on meter is invalid
	(O7) • AFT R RCS MANF ISOL 5 – CL (tb–CL), then GPC		Jet Injection temps (Jet leak RM detection)	
	• Perform LOSS OF VERNIER (ORB OPS, RCS)			
	GNC SYS SUMM 2			
4	• Monitor R RCS He ΔP for leaks. If R RCS leak suspected, secure sys and call MCC • ✓MCC for sleep config	3	Right RCS Tk and Manf Press and Qty (leak detection lost)	
	(R13U)			
4	• C/W PARAM SEL tw (three) – 066 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 047 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 086 • C/W PARAM – INH • C/W PARAM SEL tw (three) – > 119		R RCS OX ULL pressure R OMS Fu Tk ULL pressure R RCS leak	
2	R OMS no–go for on–orbit burns		R OMS Fu Inj T	

COMM SSR–24
OI DSC LOST: OR2

ACTIONS	MEASUREMENT LOSS	NOTES
GNC 23 RCS RCS R • ITEM 3 EXEC Reprioritize jets: DES INH on R3,R4 JETS • R4R ITEM 8 EXEC (*) • R3R ITEM 12 EXEC (*) • R4U ITEM 16 EXEC (*) • R4D ITEM 24 EXEC (*) • R3D ITEM 28 EXEC (*) • R3A ITEM 32 EXEC (*) • Reselect auto deselected jets (2) Increase PRI Jet Fail Limit: • ITEM 4+3 EXEC Override Manf vlv status to CL for R3,4 Manifolds OVRD MANF VLVS 1 • R3 ITEM 42 EXEC (CL) • R4 ITEM 43 EXEC (CL) If I'CNCT config: • ITEM 48 EXEC (INH)	Jet Pc, Pc discrete, Injector temps (Jet fail–off, leak RM detection)	(1) Prior to deorbit, override R3 Manf vlv status to OP (2) Auto overpressure protection lost for R RCS Fuel Dual Reg failure (3) (O3) R RCS FUEL He TK P, R RCS FUEL PRPLT TK P, R OMS OXID TK P and (F7) R OMS N2 TK P, R OMS PC ind on meter is lost. (O3) R RCS FUEL PRPLT QTY ind on meter is invalid
GNC SYS SUMM 2 3 • Monitor R RCS He ΔP for leaks. If R RCS leak suspected, secure sys and call MCC • ✓ MCC for sleep config	2 Right RCS Tank and Manf Press and Qty (leak detection lost)	
• P/I OMS Burn Monitor Cue Card to (1) Monitor GMBL Angles and BALL Vlvs for right OMS performance (2) • Perform OMS Pc LOW for R OMS '↓'	R OMS PC	
(R13U) 3 • C/W PARAM SEL tw (three) – 037 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 076 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 086 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 057 • C/W PARAM – INH • C/W PARAM SEL tw (three) – > 119	R OMS OX Tk ULL pressure R RCS Fu ULL pressure R RCS leak R OMS PC	

COMM SSR–25
OI DSC LOST: OM1

ACTIONS		MEASUREMENT LOSS
(A14) • RCS/OMS HTR OMS CRSFD LINES (two) – A AUTO, B AUTO		OMS/RCS Htr monitoring temps
When reqd: • Perform FUEL CELL PURGE – MANUAL (ORB OPS, EPS) (Cue Card) (Assume SM 2 not available when using Cue Card)	1	FC Purge O2 Vent Line temp FC Purge H2 Vent Line temp 2
(R13U) • C/W PARAM SEL tw (three) – 062 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 023 • C/W PARAM – INH • C/W PARAM SEL tw (three) – > 119	2	FC1 Stack temp MNC volts
• Perform CIRC PUMP XDCR FAILURE WORKAROUND, APU/HYD SSR–3 for 'L' Xdcrs on display SM 87 HYD THERMAL		HYD sys temps
If FLASH EVAP CNTLR PRI B enabled: • Perform FES RESTART, ECLS SSR–5, using PRI A		Most FES Feedline A Htr measurements
• Perform ECLS COMPUTATION INHIBIT, ECLS SSR–14, TABLE D for faulty parameters: 925522 SYS 1 N2 TK2 T 925524 SYS 2 N2 TK2 T 925529 SYS 1 N2 PRESS	3	N2 Qty (two) 1,2
	4 4 4	ESS 3AB volts FC1 volts FC 1,2,3 AMPS

NOTES

(1) Causes loss of FC Auto purge capability

(2) C/W params 1,21,41 are lost also, but high limit–sensed only

(3) Recoverable by TMBU

(4) Use pnl F9 Meter for insight to FC AMPS, ESS 3AB, and FC1 volts

COMM SSR–26
OI DSC LOST: OM2

	ACTIONS		MEASUREMENT LOSS
	(A14) • RCS/OMS HTR OMS CRSFD LINES – A AUTO, B AUTO		OMS/RCS Htr monitoring temps
1	(R13U) • C/W PARAM SEL tw (three) – 072 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 082 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 003 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 013 • C/W PARAM – INH • C/W PARAM SEL tw (three) – >119		FC 2,3 Stack Temp MNA,MNB volts
	• Perform CIRC PUMP XDCR FAILURE WORKAROUND, APU/HYD SSR–3 for 'L' Xdcrs, on display SM 87 HYD THERMAL		HYD sys temps
		2	HYD sys 2,3 Accumulator pressures
	If FLASH EVAP CNTLR PRI A enabled: • Perform FES RESTART, ECLS SSR–5, using PRI B		Most FES Feedline B Htr measurements
	If Topping Evap enabled: (L1) • TOP EVAP HTR DUCT – A/B		Fwd,Aft Topping Duct Htr measurements
	If High Load Evap enabled: (L1) • HI LOAD DUCT HTR – A/B		HI Load Outbd Duct Htr measurements
	• Perform ECLS COMPUTATION INHIBIT, ECLS SSR–14, TABLE D for faulty parameters: 925521 SYS 1 N2 TK1 T 925523 SYS 2 N2 TK1 T 925525 SYS 1 N2 TK3 T 925530 SYS 2 N2 PRESS	3	N2 Qty (two) 1,2
	(A12) • APU HTR TK/FU LINE/H2O/SYS 1A,1B, 3A,3B (four) – AUTO		APU H2O sys temps (Htr mon)
			If no internal airlock: External Airlock H2O Transfer Line press
		4	Vestibule Temp 1
		5	Vestibule Temp 2
		6	FC 2,3 volts
		6	ESS 1BC, 2CA volts

NOTES
(1) C/W params 11,31,61,72,82 are lost also, but high limit–sensed only
(2) GPC capability to monitor HYD Accumulator pressure lost for 2,3 systems. HYD Reservoir pressure monitoring remains
(3) Recoverable by TMBU
(4) Vestibule Temp 2 available
(5) Vestibule Temp 1 available
(6) Use pnl F9 Meter for insight to ESS and FC volts

COMM SSR–27
OI DSC LOST: OA1

	ACTIONS	MEASUREMENT LOSS	NOTES
	GNC 23 RCS If I'CNCT config: • ITEM 48 EXEC (INH) (A14) • RCS/OMS HTR OMS CRSFD LINES (two) – A AUTO, B AUTO	OMS/RCS Htr monitoring temps	(1) CW params 11,31,61, 72,82 are lost also, but high limit–sensed only
	• Perform CIRC PUMP XDCR FAILURE WORKAROUND, APU/HYD SSR–3 for 'L' Xdcrs, on display SM 87 HYD THERMAL	HYD sys temps	
	• Perform CIRC PUMP PRESS XDCR FAILURE WORKAROUND, APU/HYD SSR–1 for Circ Pump 1	HYD Circ Pump 1 press	
		APU 1 Fuel Qty (Meter and CRT)	
1	(R13U) • C/W PARAM SEL tw (three) – 009 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 039 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 099 • C/W PARAM – INH • C/W PARAM SEL tw (three) – > 119	MPS He Tk P C MPS He REG P C HYD B/U P 1	
	If High Load Evap enabled: (L1) • HI LOAD DUCT HTR – A/B	Hi Load Inbd Duct Htr measurement	

COMM SSR–28
OI DSC LOST: OA2

	ACTIONS	MEASUREMENT LOSS	NOTES
	GNC 23 RCS If I'CNCT config: • ITEM 48 EXEC (INH) (A14) • RCS/OMS HTR OMS CRSFD LINES – A AUTO, B AUTO	OMS/RCS Htr monitoring temps	(1) Causes loss of FC Auto Purge capability (2) C/W params 18,48,69 are lost also, but high limit–sensed only
1	When reqd: • Perform FUEL CELL PURGE – MANUAL (ORB OPS, EPS) (Cue Card) (Assume SM 2 not available when using Cue Card)	FC Purge H2 Vent Line temp 1	
	• Perform CIRC PUMP XDCR FAILURE WORKAROUND, APU/HYD SSR–3, for 'L' Xdcrs on display SM 87 HYD THERMAL	HYD sys temps	
	• Perform CIRC PUMP PRESS XDCR FAILURE WORKAROUND, APU/HYD SSR–1, for Circ Pump 2	HYD Circ Pump 2 press	
	• Perform APU FUEL TANK P XDUCER FAILURE WORKAROUND, APU/HYD SSR–4 for APU 2 • Perform APU FUEL TANK T XDUCER FAILURE WORKAROUND, APU/HYD SSR–6 for APU 2	APU 2 FUEL TK P APU 2 FUEL TK SURF T	
2	(R13U) • C/W PARAM SEL tw (three) – 107 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 019 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 049 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 109 • C/W PARAM – INH • C/W PARAM SEL tw (three) – > 119	EVAP OUT T 1 MPS He Tk P L MPS He REG P L HYD B/U P 2	
	(O7) • AFT R RCS MANF ISOL 5 – CL (tb–CL), then GPC	Jet Injector temps (Jet leak RM detection)	
	• Go to LOSS OF VERNIER (ORB OPS, RCS)		

COMM SSR–29
OI DSC LOST: OA3

ACTIONS	MEASUREMENT LOSS	NOTES
(A14) • RCS/OMS HTR OMS CRSFD LINES – A AUTO, B AUTO	OMS/RCS Htr monitoring temps	(1) C/W params 28,58,59,117 lost also, but high limit–sensed only (2) Recoverable by TMBU
• Perform CIRC PUMP PRESS XDCR FAILURE WORKAROUND, APU/HYD SSR–1, for Circ Pump 3	HYD Circ Pump 3 press	
(R13U) 1 • C/W PARAM SEL tw (three) – 029 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 059 • C/W PARAM – INH • C/W PARAM SEL tw (three) – 117 • C/W PARAM – INH • C/W PARAM SEL tw (three) – > 119	MPS He Tk P R MPS He REG P R EVAP OUT T 2	
• Perform CIRC PUMP XDCR FAILURE WORKAROUND, APU/HYD SSR–3, for 'L' Xdcrs on display SM 87 HYD THERMAL	HYD sys temps	
• Perform APU FUEL TANK P XDUCER FAILURE WORKAROUND, APU/HYD SSR–4 for APU 3 • Perform APU FUEL TANK T XDUCER FAILURE WORKAROUND, APU/HYD SSR–6 for APU 3	APU 3 FUEL TK P APU 3 FUEL TK SURF T	
• Go to ECLS COMPUTATION INHIBIT, ECLS SSR–14, TABLE D for faulty parameter: 925526 SYS 1 N2 TK4 T	2 N2 Qty 1 (OV105)	

COMM SSR–30
OI DSC LOST: OM3

ACTIONS	MEASUREMENT LOSS	NOTES
	1 HYD sys 1 Accumulator pressure	(1) GPC capability to monitor HYD Accumulator pressure lost for system 1. HYD Reservoir pressure monitoring remains

COMM SSR–31
OI DSC LOST: OP1

	ACTIONS	MEASUREMENT LOSS	NOTES
1	NONE	MNA PPCA1 Volts, Tks 6,8 Tk Press, Qty, EDO Pallet temp measurements	(1) Loss of instrumentation only

COMM SSR–32
OI DSC LOST: OP2

	ACTIONS	MEASUREMENT LOSS	NOTES
1	NONE	MNB PPCA2 Volts, Tks 7,9 Tk Press, Qty, EDO Pallet temp measurements	(1) Loss of instrumentation only

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SECTION

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4.1 PRIMARY C/W
4.1a PRIMARY C/W . . . . . 4−4
4.1b ALL ANNUN LTS ON EXCEPT BACKUP C/W ALARM . . . . . 4−7
4.1c NONRESETTABLE MA LT OR TONE . . . . . 4−8
4.1d PRI C/W SYS ANNUNCIATES FALSE ALARM . . . . . 4−11

4.2 OTHER C/W
4.2a NONRESETTABLE BACKUP C/W ALARM LT . . . . . 4−22
4.2b MA LT & C/W TONE − NO ANNUN LT . . . . . 4−23
4.2c KLAXON − NO RAPID dP/dT . . . . . 4−27
4.2d SIREN − NO SMOKE DETN LT . . . . . 4−29
4.2e PRI C/W SYS FAILS TO ANNUNCIATE OUT−OF−LIMIT PARAM . . . . . 4−30

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C/W

4

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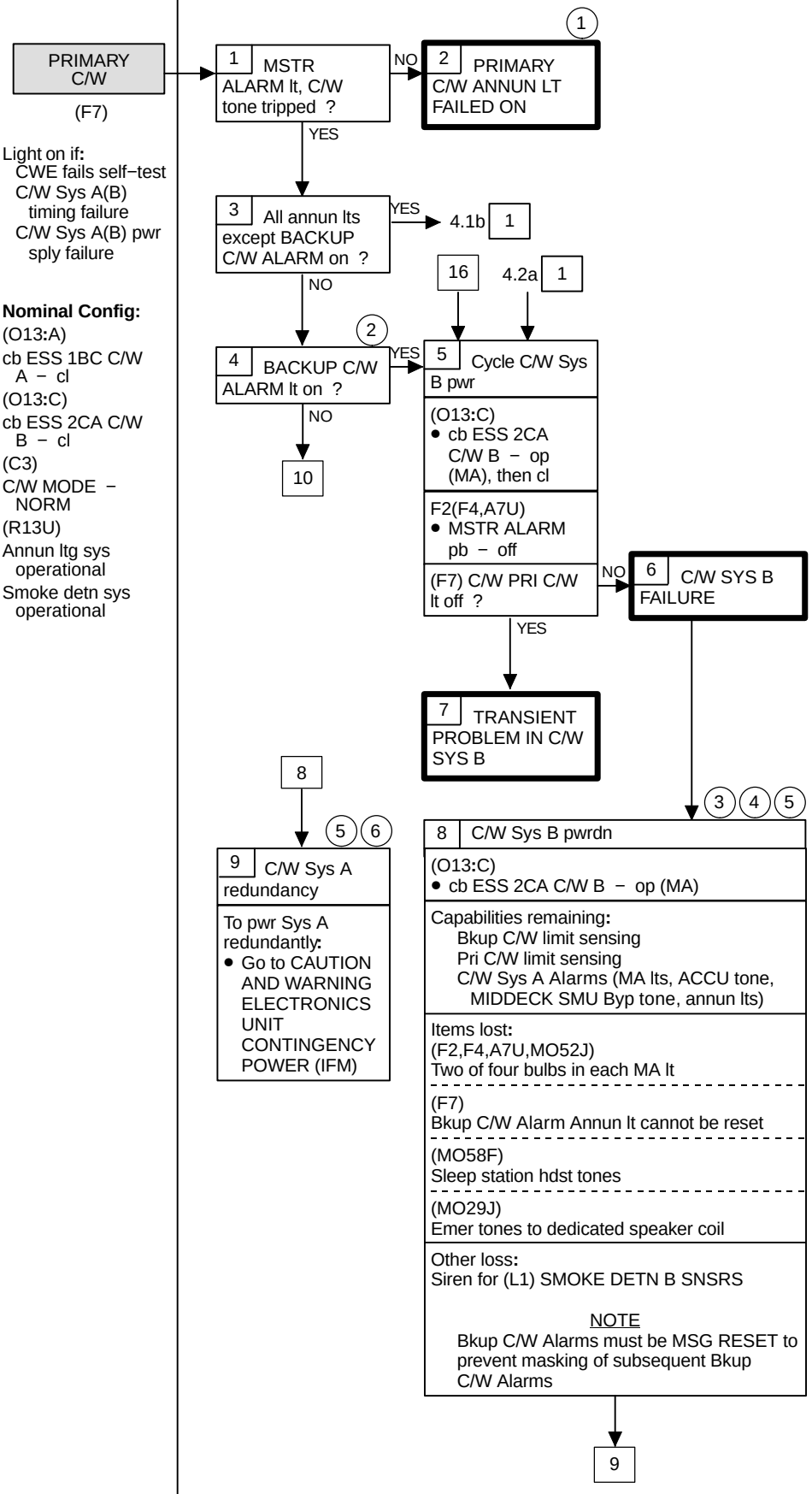
PRIMARY C/W

4.1

4.1a PRIMARY C/W



1 To extinguish PRIMARY C/W lt, remove bulbs or select (C3) C/W MODE − ACK

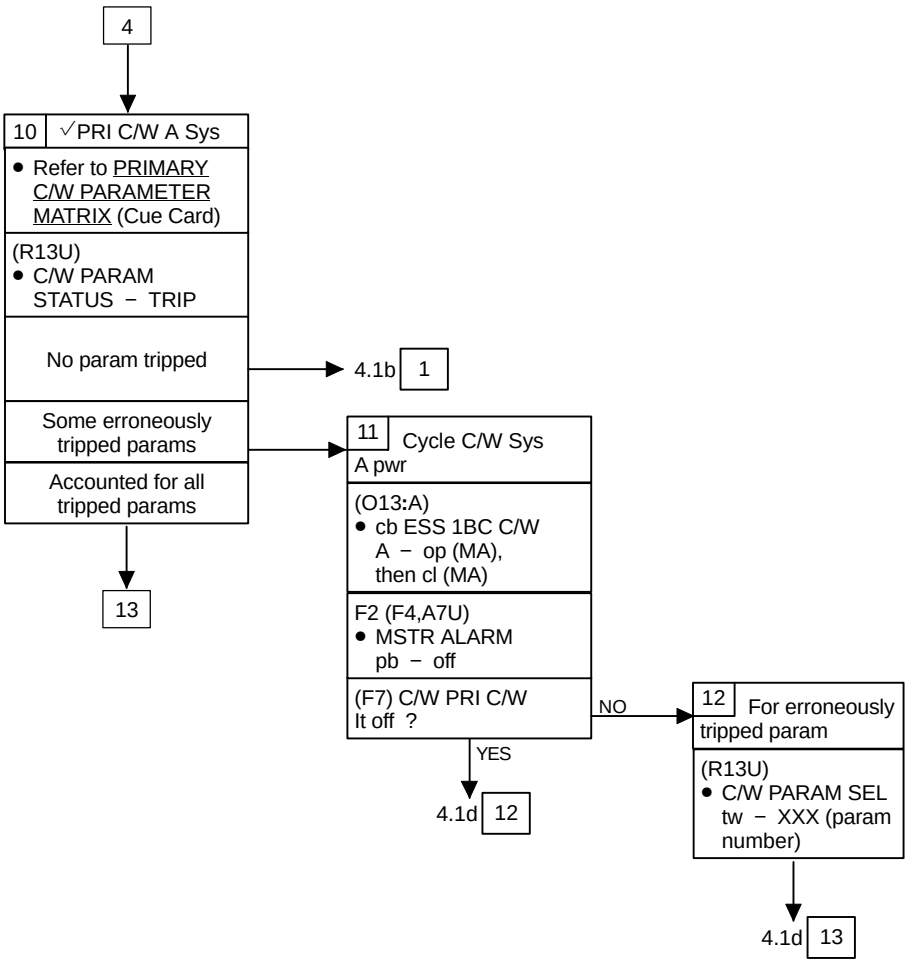
2 BACKUP C/W ALARM lt is not accompanied by fault msg and cannot be MSG RESET

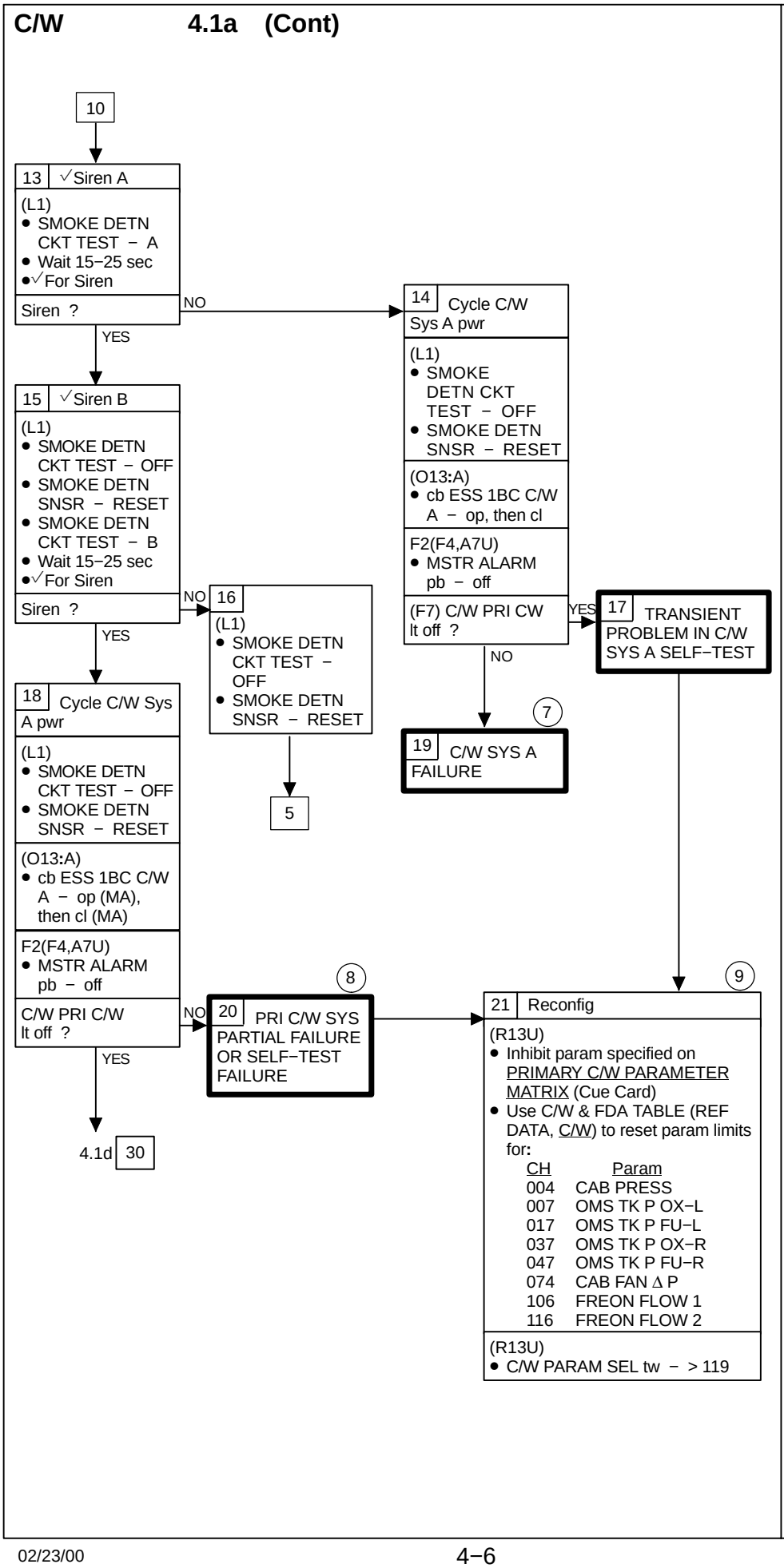
3 All four bulbs in each MA lt will illuminate during lamp test

4 To extinguish (F7) PRIMARY C/W and BACKUP C/W ALARM lts, remove bulbs or select (C3) C/W MODE − ACK

5 Until C/W IFM cables installed, loss of ESS 1BC DA1 would not generate aural alarm so that Fuel Cell 1 could be safed. FSMs must be continually monitored

6 Redundancy can be verified by opening cb ESS 1BC C/W A (O13:A) and receiving alarm tones


4
10 ✓PRI C/W A Sys
• Refer to PRIMARY C/W PARAMETER MATRIX (Cue Card)
(R13U)
• C/W PARAM STATUS − TRIP
No param tripped
4.1b 1
Some erroneously tripped params
Accounted for all tripped params
13
11 Cycle C/W Sys A pwr
(O13:A)
• cb ESS 1BC C/W A − op (MA), then cl (MA)
F2 (F4,A7U)
• MSTR ALARM pb − off
(F7) C/W PRI C/W lt off ?
NO
YES
4.1d 12
12 For erroneously tripped param
(R13U)
• C/W PARAM SEL tw − XXX (param number)
4.1d 13



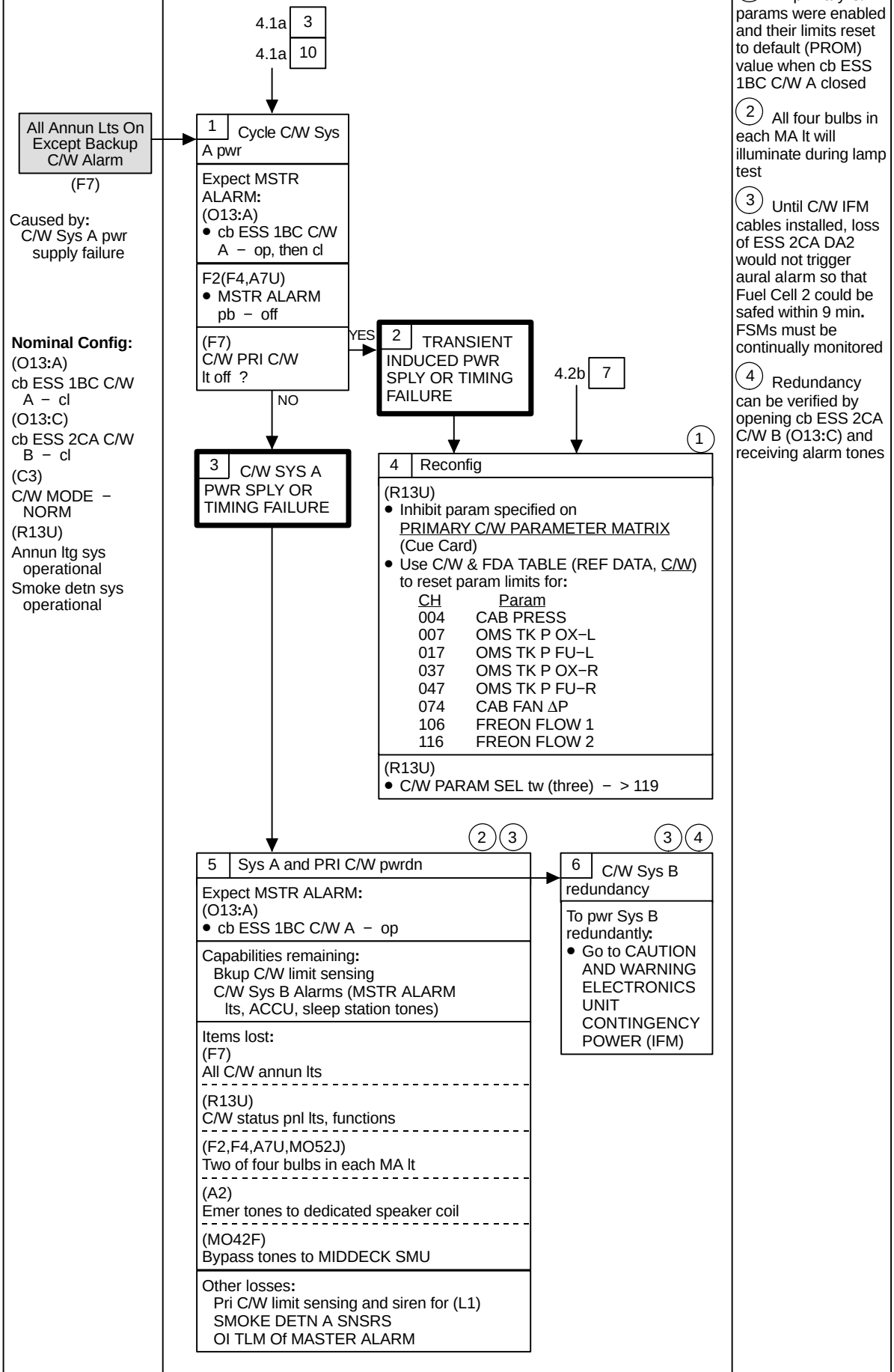
7 For any nuisance alarms that cannot be inhibited, use 4.1b 5 to pwrdn PRI C/W or use 4.1c 28 to disable tone

8 Notify MCC of tripped params. Param combinations will give clue to failure

9 All primary C/W params were enabled and their limits reset to default (PROM) value when cb ESS 1BC C/W A closed

C/W

4.1b ALL ANNUN LTS ON EXCEPT BACKUP C/W ALARM



Caused by:
C/W Sys A pwr supply failure

Nominal Config:
(O13:A)
cb ESS 1BC C/W A − cl
(O13:C)
cb ESS 2CA C/W B − cl
(C3)
C/W MODE − NORM
(R13U)
Annun ltg sys operational
Smoke detn sys operational

(1) All primary C/W params were enabled and their limits reset to default (PROM) value when cb ESS 1BC C/W A closed

(2) All four bulbs in each MA lt will illuminate during lamp test

(3) Until C/W IFM cables installed, loss of ESS 2CA DA2 would not trigger aural alarm so that Fuel Cell 2 could be safed within 9 min. FSMs must be continually monitored

(4) Redundancy can be verified by opening cb ESS 2CA C/W B (O13:C) and receiving alarm tones

4.1c NONRESETTABLE MA LT OR TONE

MSTR ALARM

(Cannot be reset by depressing any MSTR ALARM pb)

Caused by:
- Lamp driver failed on
- C/W Sys A(B) MA Signal failed on
- C/W Sys A(B) EMER, C/W, or SM alarm failed on
- Constant retriggering caused by PRI C/W trig mem or self−test failure

Nominal Config:

(O13:A)
cb ESS 1BC C/W A − cl
(O13:C)
cb ESS 2CA C/W B − cl
(C3)
C/W MODE − NORM
(R13U)
Annun ltg sys operational
Smoke detn sys operational

1 Constant alarm tone ?
- NO → 2 (F2,F4,A7U, MO52J) More than one MSTR ALARM lt on ?
  - NO → 3 LAMP DRIVER FAILED ON
  - YES → 4
    - (O13:C)
      - cb ESS 2CA CW B − op (MA)
    - F2(F4,A7U)
      - MSTR ALARM pb − off
    - MSTR ALARM lt off ?
      - NO → 5 C/W SYS A MASTER ALARM LT CIRCUIT FAILURE → (1) → 8
        - (O13:C)
          - cb ESS 2CA CW B − cl
      - YES → 7 C/W SYS B MSTR ALARM LT CKT FAILURE
- YES → 6 Tone disable
  - (O5,O9,L9,A13,R10, MO42F, MO58F)
    - AUD PWR (seven) − AUD (OFF)
  - Klaxon or Siren in MIDDECK speaker → 9 C/W SYS B EMER ALARM FAILED ON → 13
  - Klaxon or Siren in OS speaker
  - No Klaxon or Siren → 15

10 C/W SYS A EMER ALARM FAILED ON

(2) (3)

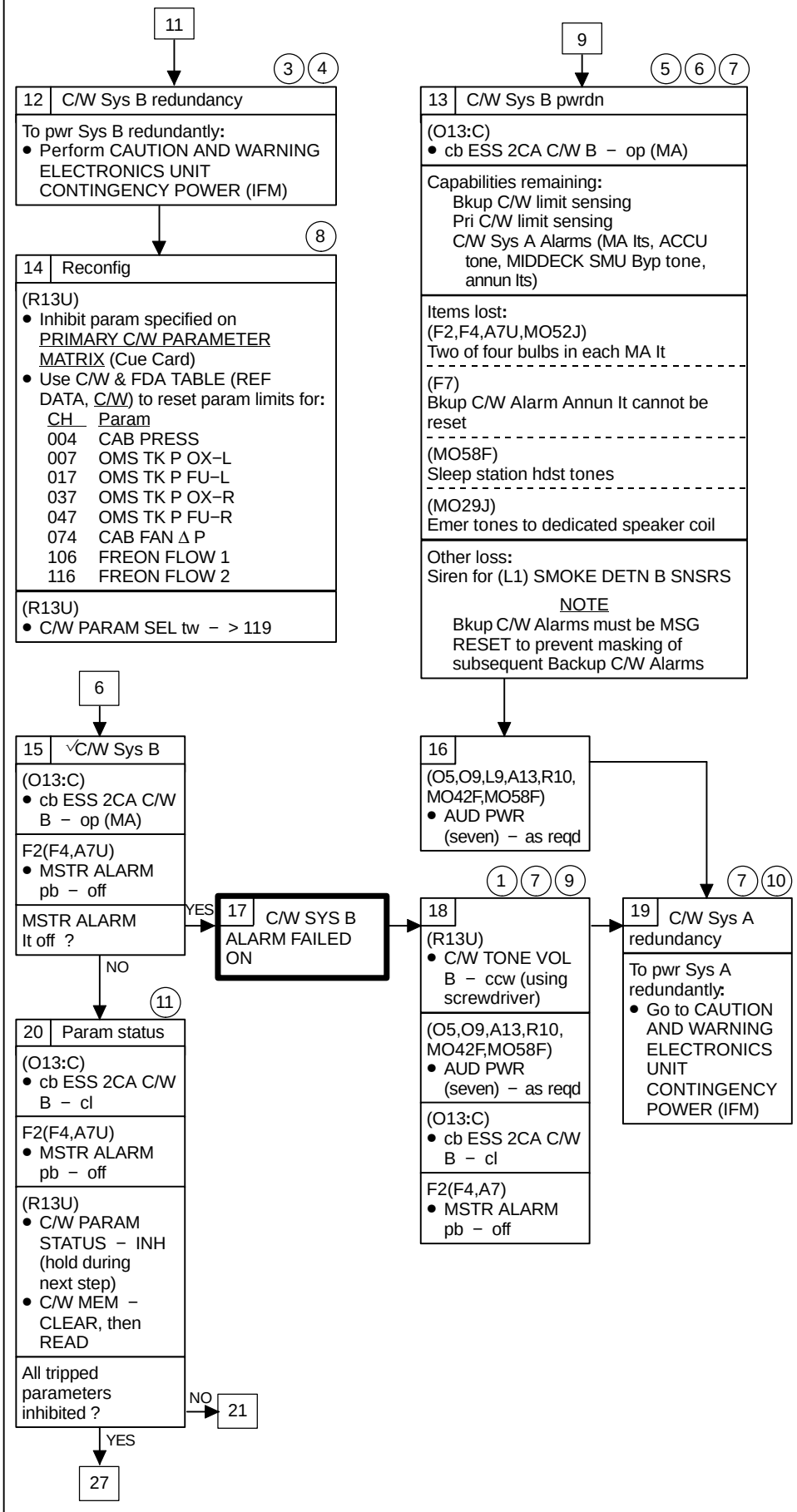
11 Disconnect OS speaker
- (O13:A)
  - cb ESS 1BC C/W A − op (MA)
- Perform OS SPEAKER BOX DISCONNECT (IFM)
- (R13U)
  - C/W TONE VOL A − ccw (using screwdriver)
- (MO42F)
  - BYP TONE VOL − ccw (using screwdriver)
  - MIDDECK SPKR AUD TONES − ACCU
- (O5,O9,L9,A13,R10,MO42F, MO58F)
  - AUDIO PWR (seven) − as reqd
- (O13:A)
  - cb ESS 1BC C/W A − cl (MA)
- F2(F4,A7U)
  - MSTR ALARM pb − off

→ 12

(1) Illuminated MA lt bulbs are mounted in sealed assy

(2) PRI C/W limit sensing and (F7) annun will still be functional

(3) Until C/W IFM cables installed, loss of ESS 2CA DA2 would not trigger aural alarm so that Fuel Cell 2 could be safed within 9 min. FSMs must be continually monitored



(1) Illuminated MA lt bulbs are mounted in sealed assy

(3) Until C/W IFM cables installed, loss of ESS 2CA DA2 would not trigger aural alarm so that Fuel Cell 2 could be safed within 9 min. FSMs must be continually monitored

(4) Redundancy can be verified by opening cb ESS 2CA C/W B (O13:C) and receiving alarm tones

(5) All four bulbs in each MA lt will illuminate during lamp test

(6) To extinguish (F7) PRIMARY C/W and BACKUP C/W ALARM lts, remove bulbs or select (C3) C/W MODE − ACK

(7) Until C/W IFM cables installed, loss of ESS 1BC DA1 would not generate aural alarm so that Fuel Cell 1 could be safed. FSMs must be continually monitored

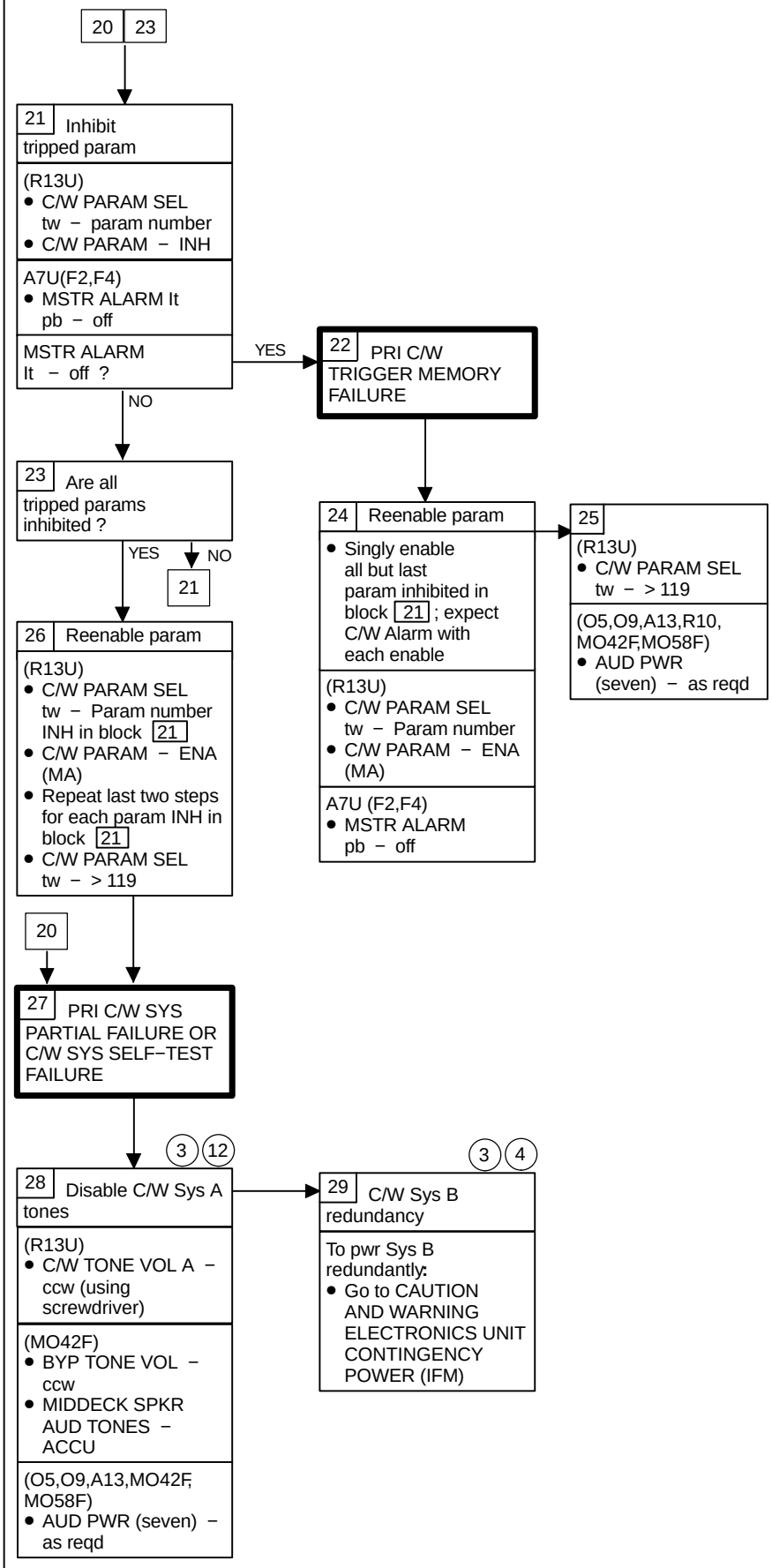
(8) All primary C/W params were enabled and their limits reset to default (PROM) value when cb ESS 1BC C/W A closed

(9) Lost C/W Sys B alarm tones except for emer tones in Middeck speaker. Sleep Station Hdst has constant tone

(10) Redundancy can be verified by opening cb ESS 1BC C/W A (O13:A) and receiving alarm tones

(11) Additional lts which light during C/W MEM − READ indicate tripped params that are not inhibited

C/W 4.1c (Cont)



(3) Until C/W IFM cables installed, loss of ESS 2CA DA2 would not trigger aural alarm so that Fuel Cell 2 could be safed within 9 min. FSMs must be continually monitored

(4) Redundancy can be verified by opening cb ESS 2CA C/W B (O13:C) and receiving alarm tones

(12) Should still have PRI C/W limit sensing with (F7) Annun lts and emer tone alarms via OS speaker

C/W

4.1d PRI C/W SYS ANNUNCIATES FALSE ALARM

PRI C/W Sys Annunciates False Alarm

(F7)
Annun lt on but indicated sys checks normal

Caused by:
- Annun lt failed on
- PRI C/W Sys Inhibit memory failure
- Limit value failure
- Limit sense failure
- Signal Conditioner failure
- Param Select or Multiplexer failure

Nominal Config:
(O13:A)
cb ESS 1BC C/W A − cl
(O13:C)
cb ESS 2CA C/W B − cl
(C3)
C/W MODE − NORM
(R13U)
Annun ltg sys operational
Smoke detn sys operational

7.5b 60

1 (F7) BACKUP C/W ALARM lt on w/o CRT fault msg ?
YES → 4.2a 1
NO

2
- Refer to PRIMARY C/W PARAMETER MATRIX (Cue Card)

(R13U)
- C/W PARAM STATUS − TRIP

Any status lt associated with false alarm (F7) Annun lt on ?
YES → 3 Param normally inhibited ? (1)
NO → 12
NO

3 Param normally inhibited ?
NO → 12
YES

4 Inhibit param

(R13U)
- C/W PARAM SEL tw − desired param
- C/W PARAM − INH
- C/W PARAM SEL tw − > 119

(F7) C/W Annun lt off ?
NO → 6 PRI C/W INHIBIT MEMORY FAILURE (2) (3)
YES (4)

10

5
(R13U)
- C/W PARAM STATUS − INH (hold during next step)
- C/W MEM − CLEAR, then READ
- Compare INH with MEMORY (equiv to tripped) lts

All MEMORY (tripped) param INH → 8 (F7) C/W ANNUN LT CKT FAILED ON (3)

Any MEMORY (tripped) param not INH → 10

7 PARAM ENABLED INADVERTENTLY (4)

10

9 IN ADDITION TO OTHER SYS PROBLEM, PRI C/W (F7) ANNUN LT SELECT CKT FAILURE

11 Reconfig

(R13U)
- Reenable param inhibited in block 10
- C/W PARAM SEL tw − > 119

- Notify MCC which param caused false annun

10
(F7)
- ✓Annun lt status as each out−of−limit param is inhibited

(R13U)
- C/W PARAM SEL tw − desired param
- C/W PARAM − INH

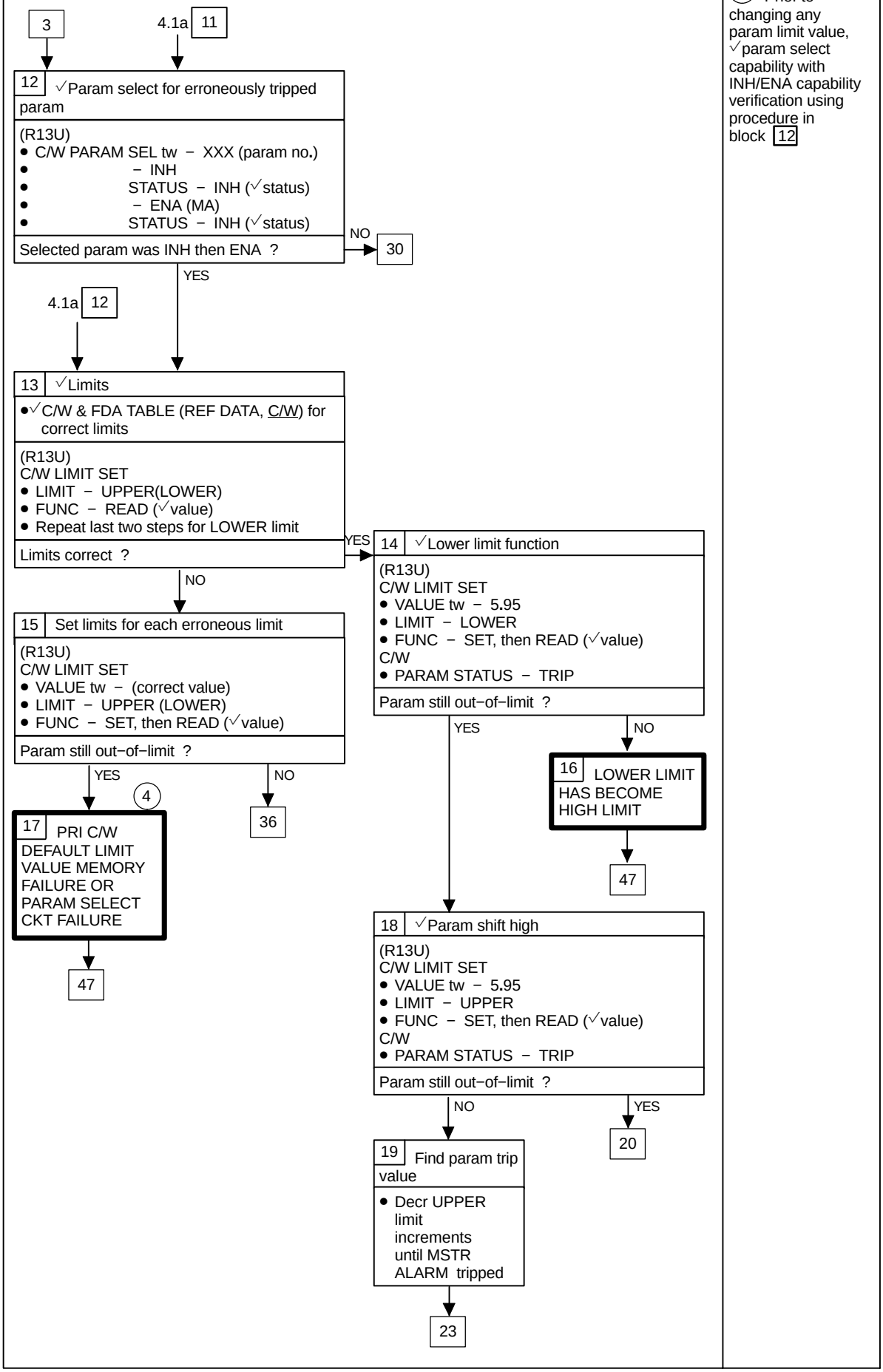
(F7) C/W Annun lt out ?
NO → 5
YES → 9

(1) Correct param inhibit status can be verified using PRIMARY C/W PARAMETER MATRIX Cue Card

(2) Depending on param value, lt may be extinguished by changing limits

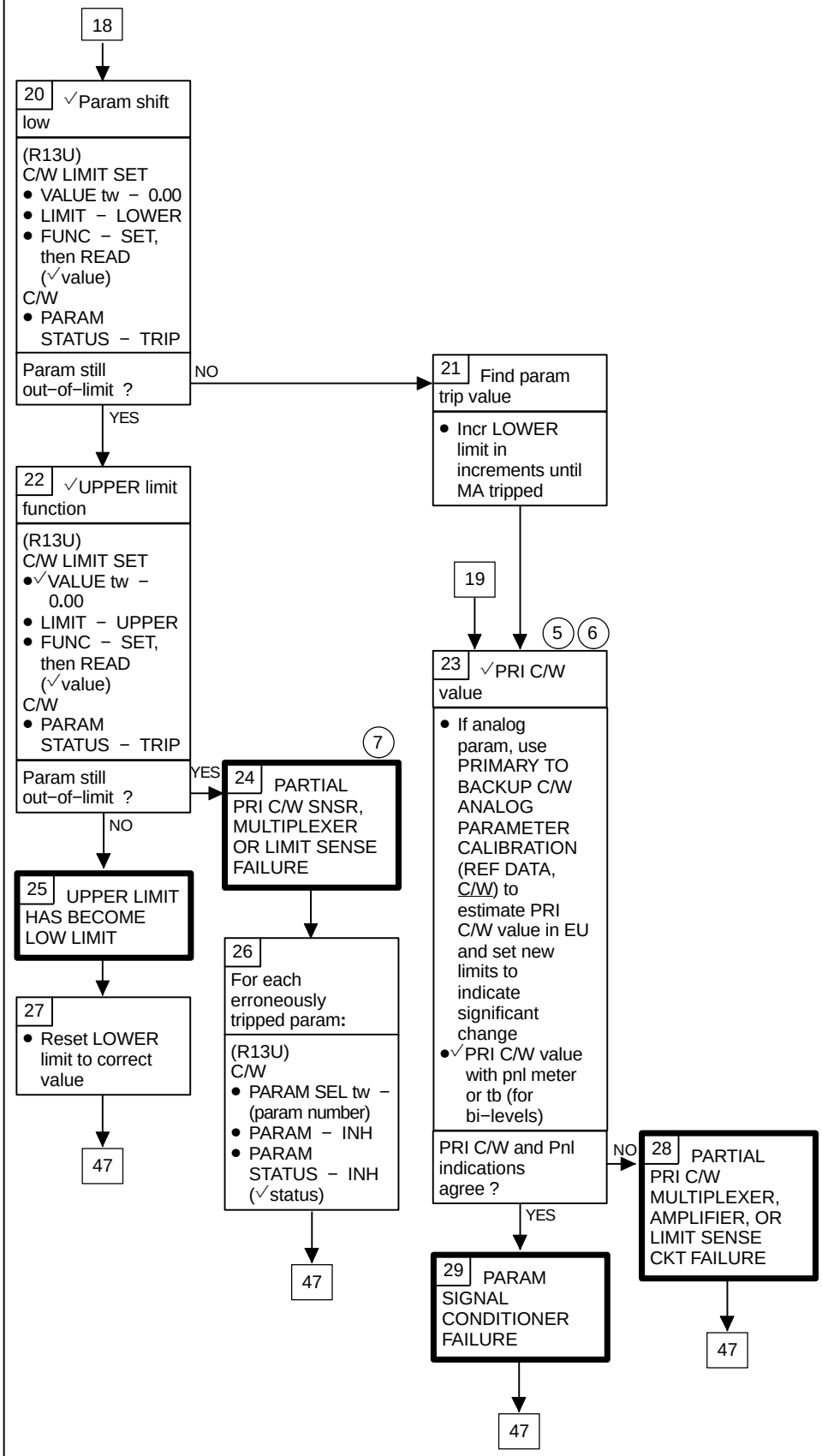
(3) To disable lts, remove illuminated bulbs or select (C3) C/W MODE − ACK

(4) Prior to changing any param limit value, ✓param select capability with INH/ENA capability verification using procedure in block 12



4 Prior to changing any param limit value, ✓param select capability with INH/ENA capability verification using procedure in block 12

C/W 4.1d (Cont)



(5) Notify MCC of change in PRI C/W param and limit values

(6) Bi−level params are identified in NOTES column of C/W & FDA TABLE (REF DATA, C/W)

(7) If pnl indicator and PRIMARY C/W param values agree, snsr output failed

12

4.1a 18

4.2e 2

30 ✓Param Select bit failed to '1'

(R13U)
- C/W LIMIT SET VALUE tw − 0.00
- C/W PARAM SEL tw − 000
- − INH
- STATUS − INH (✓status)
- − ENA
- STATUS − INH (✓status)

- Determine which param INH/ENA:

000	001 002 004	008 040 080	010 020 100	015 022	None of those listed

39 40 41 59

8

31 PARAM SEL CKT FAILURE. LIMIT VALUE CHANGE CAPABILITY PROBABLY AFFECTED → 47

32 ✓Param select for bit failed to '0'

(R13U)
- C/W LIMIT SET VALUE tw − 4.75
- C/W PARAM SEL tw − 119
- − INH
- STATUS − INH (✓status)
- − ENA
- STATUS − INH (✓status)
- Repeat above steps using param 088 and 077
- ✓Param select/results combinations for failure mode

Param Select/Results

119	088	077	BCD Bit(s) Failed to 0	Param Select Changes, Notes
119	088	077	None	Transient problem
118	088	076	Units 1	Subtract 1 from XY1, XY3, XY5, XY7, XY9 *
119	088	075	Units 2	2 from XY2, XY3, XY6, XY7 *
119	088	073	Units 4	4 from XY4, XY5, XY6, XY7 *
109	088	067	Tens 1	Subtract 10 from X1Z,X3Z,X5Z,X1Z,X9Z *
119	088	057	Tens 2	20 from X2Z,X3Z,X6Z,X7Z *
119	088	037	Tens 4	40 from X4Z,X5Z,X6Z,X7Z *
111	080	077	Units 8	Subtract 8 from XY8,XY9 *
110	080	070	All Units	Only param XY0 selectable
119	008	077	Tens 8	Subtract 80 from X8Z,X9Z *
109	008	007	All Tens	Only param X0Z selectable
100	000	000	All Tens & Units	Only param 000 & 100 selectable
019	088	077	Hundreds	Only param 0YZ selectable
010	080	070	Hund & Units	Only param 0Y0 selectable
009	008	007	Hund & Tens	Only param 00Z selectable
000	000	000	All	Only param 000 selectable

NOTE

* Thumbwheel selection of identified params will result in selection of subtracted param (e.g., for Units '2' bit failed to '0', selecting 046 will result in 044)

Did one of the identified trio of Param Select/Results combinations occur ?

YES → 33

NO → 34

(8) Prior to changing param limit, ✓that desired param and an unused param are selectable using two INH/ENA cycles (see procedure in block 12), then ✓desired limit value change capability on unused param

32

33 TRANSIENT PROBLEM OR PARAM SEL BIT(s) FAILED TO '0'

9

35 If pnl O13 cb ESS 1BC C/W A cycled op then cl:

- ✓Param inhibited per PRIMARY C/W PARAMETER MATRIX (Cue Card)
- Use C/W & FDA TABLE (REF DATA, C/W) to reset param limits for:

CH	Param
004	CAB PRESS
007	OMS TK P OX−L
017	OMS TK P FU−L
037	OMS TK P OX−R
047	OMS TK P FU−R
074	CAB FAN ΔP
106	FREON FLOW 1
116	FREON FLOW 2

(R13U)
If hundreds bit or tens '2' or '4' bit failed to '0':

- C/W PARAM SEL tw − 089

If hundreds bit or tens '2' or '4' bit not failed to '0':

- C/W PARAM SEL tw > 119 and < 170

32

8

34 PARAM SEL CKT FAILURE. LIMIT VALUE CHANGE CAPABILITY PROBABLY AFFECTED

47

15 38

4.2e 7

36 Select and inhibit unused param

(R13U)

- C/W PARAM SEL tw − 089 (or other param)
- C/W PARAM − INH
- C/W PARAM STATUS − INH (✓status)

Selected param INH ?

YES

37 ✓Limit value for bit failed to '1'

C/W LIMIT SET

- VALUE tw − 0.00
- LIMIT − UPPER
- FUNC − SET, then READ (✓value)

Which value read ?

None of those listed	0.05 0.20 0.40	0.10 0.80 1.00 4.00	0.60 1.50	2.00	0.00
45	48	49	62	50	55

NO

38

- C/W PARAM − ENA
- Select another unused, unhibited param from PRIMARY C/W PARAMETER MATRIX (Cue Card). Do not select Param 000, 001, 002, 004, 008, 016, 020, 040, or 080

36

(8) Prior to changing param limit, ✓that desired param and an unused param are selectable using two INH/ENA cycles (see procedure in block 12), then ✓desired limit value change capability on unused param

(9) All primary C/W params were enabled and their limits reset to default (PROM) value when cb ESS 1BC C/W A closed

30 → 39 (R13U)
- C/W PARAM SEL tw − 078

30 → 40 (R13U)
- C/W PARAM SEL tw − 024

30 → 41 (R13U)
- C/W PARAM SEL tw − 088

42 Param sel bit failure confirmation

(R13U)
- C/W LIMIT SET VALUE tw − 3.75
- C/W PARAM − INH
- STATUS − INH (✓status)
- − ENA
- STATUS − INH (✓status)
- ✓Param select/results combinations for failure mode

Param Select/Results

First	Second	BCD Bit Failed to '1'	Param Select Changes, Notes
000/001	078/079	Units 1	Add 1 to 0,2,4,6,8 Units sel
000/002	078/080	Units 2	Add 2 to 0,1,4,5,8,9 Units sel *
000/004	078/082	Units 4	Add 4 to 0,1,2,3,8,9 Units sel *
000/008	024/032	Units 8	Add 8 to 0,1,2,3,4,5,6,7 Units sel *
000/010	088/098	Tens 1	Add 10 to 0,2,4,6,8 Tens sel *
000/020	088/108	Tens 2	Add 20 to 0,1,4,5,8,9 Tens sel *(a)
000/040	024/064	Tens 4	Add 40 to 0,1,2,3,8,9 Tens sel *(a)
000/080	024/104	Tens 8	Add 80 to 0,1,2,3,4,5,6,7 Tens sel *(a)
000/100	088/None	Hundreds	Only param 100 thru 119 selectable

NOTE

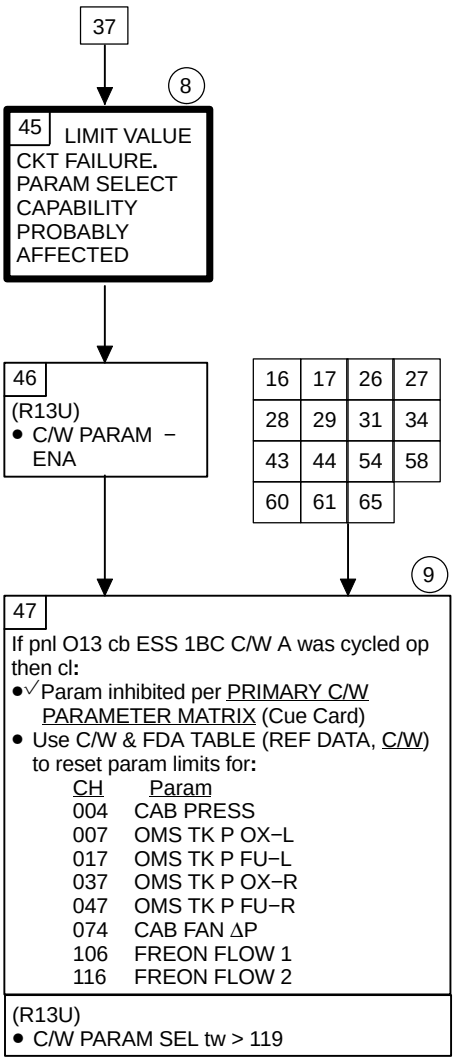
* Results > 10, carry to next digit (e.g., 099 + 4 = 103)
Results > 128, subtract 128 (e.g., 94 + 40 = 134 − 128 = 006)
Results 120 thru 127 select PRIMARY C/W self−test param. (F7) PRIMARY C/W ALARM, triggered by inhibiting or changing limit on self−test param, can only be cleared by cycling pwr using (O13) cb ESS 1BC C/W A and resetting Master Alarm
(a) Selection invalid if Hundreds selected to '1'

Did one of the identified pair of Param Select/Results combinations occur ?

YES → **43** PARAM SELECT SINGLE BIT FAILED TO '1' → 47

NO → (8) **44** PARAM SEL CKT FAILURE. LIMIT VALUE CHANGE CAPABILITY PROBABLY AFFECTED → 47

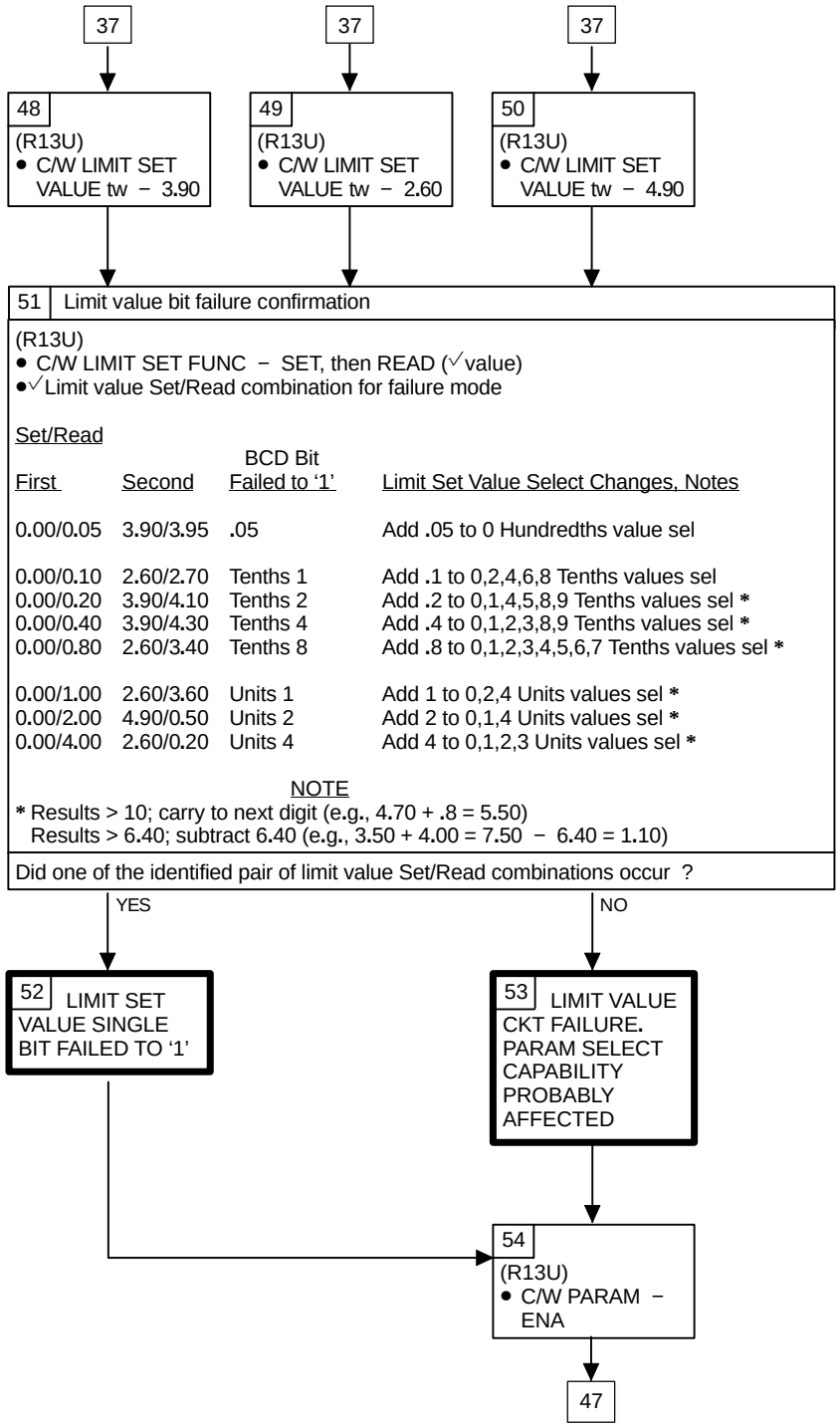
(8) Prior to changing param limit, ✓that desired param and an unused param are selectable using two INH/ENA cycles (see procedure in block 12), then ✓desired limit value change capability on unused param



(8) Prior to changing param limit, ✓that desired param and an unused param are selectable using two INH/ENA cycles (see procedure in block 12), then ✓desired limit value change capability on unused param

(9) All primary C/W params were enabled and their limits reset to default (PROM) value when cb ESS 1BC C/W A closed

C/W 4.1d (Cont)


37
37
37
48
(R13U)
• C/W LIMIT SET VALUE tw − 3.90
49
(R13U)
• C/W LIMIT SET VALUE tw − 2.60
50
(R13U)
• C/W LIMIT SET VALUE tw − 4.90
51 Limit value bit failure confirmation
(R13U)
• C/W LIMIT SET FUNC − SET, then READ (✓value)
•✓Limit value Set/Read combination for failure mode
Set/Read
First Second BCD Bit Failed to '1' Limit Set Value Select Changes, Notes
0.00/0.05 3.90/3.95 .05 Add .05 to 0 Hundredths value sel
0.00/0.10 2.60/2.70 Tenths 1 Add .1 to 0,2,4,6,8 Tenths values sel
0.00/0.20 3.90/4.10 Tenths 2 Add .2 to 0,1,4,5,8,9 Tenths values sel *
0.00/0.40 3.90/4.30 Tenths 4 Add .4 to 0,1,2,3,8,9 Tenths values sel *
0.00/0.80 2.60/3.40 Tenths 8 Add .8 to 0,1,2,3,4,5,6,7 Tenths values sel *
0.00/1.00 2.60/3.60 Units 1 Add 1 to 0,2,4 Units values sel *
0.00/2.00 4.90/0.50 Units 2 Add 2 to 0,1,4 Units values sel *
0.00/4.00 2.60/0.20 Units 4 Add 4 to 0,1,2,3 Units values sel *
NOTE
* Results > 10; carry to next digit (e.g., 4.70 + .8 = 5.50)
Results > 6.40; subtract 6.40 (e.g., 3.50 + 4.00 = 7.50 − 6.40 = 1.10)
Did one of the identified pair of limit value Set/Read combinations occur ?
YES
NO
52 LIMIT SET VALUE SINGLE BIT FAILED TO '1'
53 LIMIT VALUE CKT FAILURE. PARAM SELECT CAPABILITY PROBABLY AFFECTED
54
(R13U)
• C/W PARAM − ENA
47

C/W 4.1d (Cont)

37

55 ✓Limit value for bit(s) failed to '0'

(R13U)
- C/W LIMIT SET VALUE tw − 3.65
- FUNC − SET, then READ (✓value)
- Repeat above steps using limit value of 5.95
- ✓Limit value Set/Read result combinations for failure mode

Value Results

3.65	5.95	BCD Bit(s) Failed to '0'	Limit Value Select Changes
3.65	5.95	None	Transient problem
3.60	5.90	.05	Subtract .05 from X.Y5*
3.65	5.85	Tenths 1	Subtract .1 from X.1Z, X.3Z, X.5Z, X.7Z, X.9Z *
3.45	5.95	Tenths 2	.2 X.2Z, X.3Z, X.6Z, X.7Z *
3.25	5.95	Tenths 4	.4 X.4Z, X.5Z, X.6Z, X.7Z *
3.65	5.15	Tenths 8	.8 X.8Z, X.9Z *
3.05	5.05	All Tenths	Only X.0Z selectable
3.00	5.00	.05 & All Tenths	X.00 selectable
2.65	4.95	Units 1	Subtract 1 from 1.YZ, 3.YZ, 5.YZ *
1.65	4.95	Units 2	2 2.YZ, 3.YZ *
3.65	1.95	Units 4	4 4.YZ, 5.YZ *
0.65	0.95	All Units	Only 0.YZ selectable
0.05	0.05	Units & Tenths	Only 0.0Z selectable
0.60	0.90	Units & .05	Only 0.Y0 selectable
0.00	0.00	All	Only 0.00 selectable

NOTE

* Thumbwheel selection of identified limit value will result in selection of subtracted limit value (e.g., for Tenths '2' bit failed to '0', selecting 3.60 will result in 3.40)

Did one of the identified pair of limit value Set/Read combinations occur ?

YES

56 LIMIT SET VALUE BIT(s) FAILED TO '0'

NO

8

57 LIMIT VALUE CKT FAILURE. PARAM SELECT CAPABILITY PROBABLY AFFECTED

58 (R13U)
- C/W PARAM − ENA

47

8 Prior to changing param limit, ✓that desired param and an unused param are selectable using two INH/ENA cycles (see procedure in block 12), then ✓desired limit value change capability on unused param

30

59 ✓For Param Select tw signal short

(R13U)
- C/W LIMIT SET VALUE tw − 3.75
- PARAM SEL − 099
- − INH
- STATUS − INH (✓status)
- − ENA
- STATUS − INH (✓status)
- Repeat above steps using param 055
- ✓Param select/results combinations for failure mode

Param Sel/Results

000	099	055	tw Bit Shorted	Param Select Changes, Notes
015	099	055	Units 1	Param XY1, XY3, XY5, XY7, XY9 selectable *
015	105	065	Units 2	XY2, XY3, XY6, XY7 selectable *
015	105	055	Units 4	XY4, XY5, XY6, XY7 selectable *
015	099	065	Units 8	XY8, XY9 selectable *
022	099	055	Tens 1	Param X1Z, X3Z, X5Z, X7Z, X9Z selectable *
022	031	027	Tens 2	02Z, 03Z, 06Z, 07Z selectable *(a)
022	031	055	Tens 4	04Z, 05Z, 06Z, 07Z selectable *(a)
022	099	027	Tens 8	08Z, 09Z selectable *(a)

NOTE

* Param selections other than those indicated will cause all four bits in the failed group to become a '1'. For 'Units' failure this would add 15 to the Hundreds and Tenths selection. For 'Tens' failure this would add 150 to the Hundreds and Units selection. If > 128, subtract 128 from resulting number to find param selected

(a) Selection invalid if Hundreds selected to '1'

Did one of the identified trio of Param Sel/Results combinations occur ?

YES

60 PARAM SELECT tw SIGNAL SHORTED

47

NO

4

61 PARAM SELECT CKT FAILURE

47

(4) Prior to changing any param limit value, ✓param select capability with INH/ENA capability verification using procedure in block 12

C/W 4.1d (Cont)

37

62 ✓For limit value tw signal short

(R13U)
- C/W LIMIT SET VALUE tw − 3.60
- FUNC − SET, then READ (✓value)
- Repeat above steps using limit value of 2.50
- ✓Limit value Set/Read result combinations for failure mode

Value Result

000	3.60	2.50	tw BCD Signal Shorted	Limit Value Select Changes, Notes
0.60	3.60	1.50	Units 1	Value 1.YZ, 3.YZ, 5.YZ selectable *
0.60	3.60	2.50	Units 2	Value 2.YZ, 3.YZ selectable *
0.60	1.20	1.10	Units 4	Value 4.YZ, 5.YZ selectable *
1.50	4.50	2.50	Tenths 1	Value X.1Z, X.3Z, X.5Z, X.7Z, X.9Z selectable *
1.50	3.60	3.50	Tenths 2	Value X.2Z, X.3Z, X.6Z, X.7Z selectable *
1.50	3.60	2.50	Tenths 4	Value X.4Z, X.5Z, X.6Z, X.7Z selectable *
1.50	4.50	3.50	Tenths 8	Value X.8Z, X.9Z selectable *

NOTE

* Limit value selections other than those indicated will cause all bits in failed 'Units' or 'Tenths' group to become a '1'. For 'Units' failure this would add 7.00 to the Tenths and Hundredths selection. Subtract 6.40 from resulting number to determine the value selected (e.g., selecting 3.45 with Units '4' bit shorted would result in 7.45 − 6.40 = 1.50). For 'Tenths' failure this would add 1.50 to selected Units and Hundredths value (e.g., Selecting 3.45 with Tenths '2' bit shorted would result in 1.50 + 3.05 = 4.55). If resultant number greater than 6.40, subtract 6.40 as in 'Units' failure

Did one of identified trio of limit Value Result combinations occur ?

YES

63 LIMIT VALUE SELECT tw SIGNAL SHORTED TO STRUCTURE

NO

8

64 LIMIT VALUE CKT FAILURE PARAM SELECT CAPABILITY PROBABLY AFFECTED

65
(R13U)
- C/W PARAM − ENA

47

8 Prior to changing param limit, ✓that desired param and an unused param are selectable using two INH/ENA cycles (see procedure in block 12), then ✓desired limit value change capability on unused param

C/W

4.2a NONRESETTABLE BACKUP C/W ALARM LT

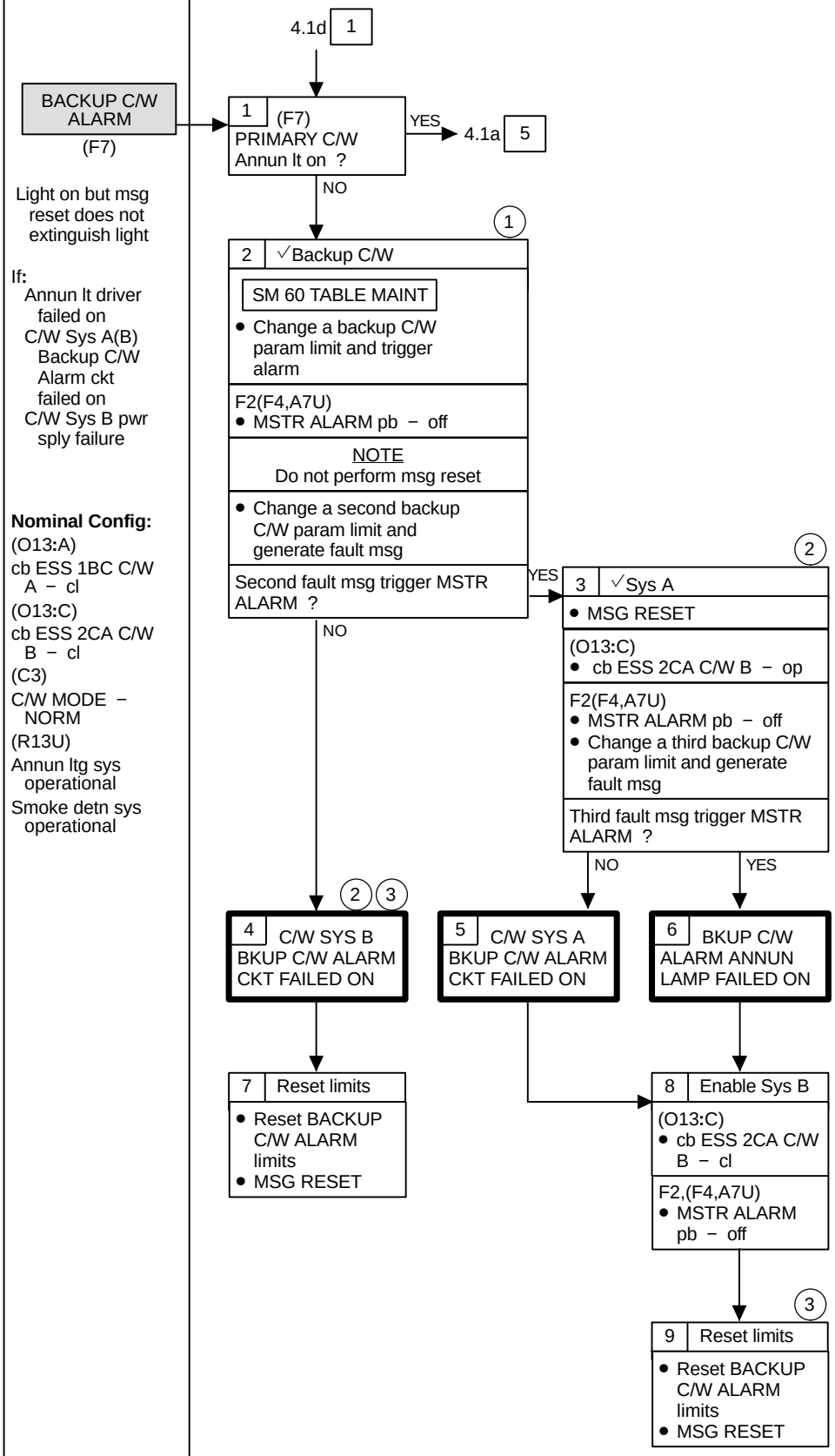
BACKUP C/W ALARM
(F7)

Light on but msg reset does not extinguish light

If:
- Annun lt driver failed on C/W Sys A(B)
- Backup C/W Alarm ckt failed on C/W Sys B pwr sply failure

Nominal Config:

(O13:A)
cb ESS 1BC C/W A − cl
(O13:C)
cb ESS 2CA C/W B − cl
(C3)
C/W MODE − NORM
(R13U)
Annun ltg sys operational
Smoke detn sys operational



(1) Usable onorbit inactive Backup C/W Alarm params include:

APU Exhaust Gas Temp
- Sys 1 − 0460140
- Sys 2 − 0460240
- Sys 3 − 0460340

APU Lube Oil Temp
- Sys 1 − 0460150
- Sys 2 − 0460250
- Sys 3 − 0460350

(2) Backup C/W Alarms must be msg reset to prevent masking of subsequent Backup C/W Alarm

(3) To extinguish (F7) Backup C/W Alarm lt, remove bulbs or select (C3) C/W MODE − ACK

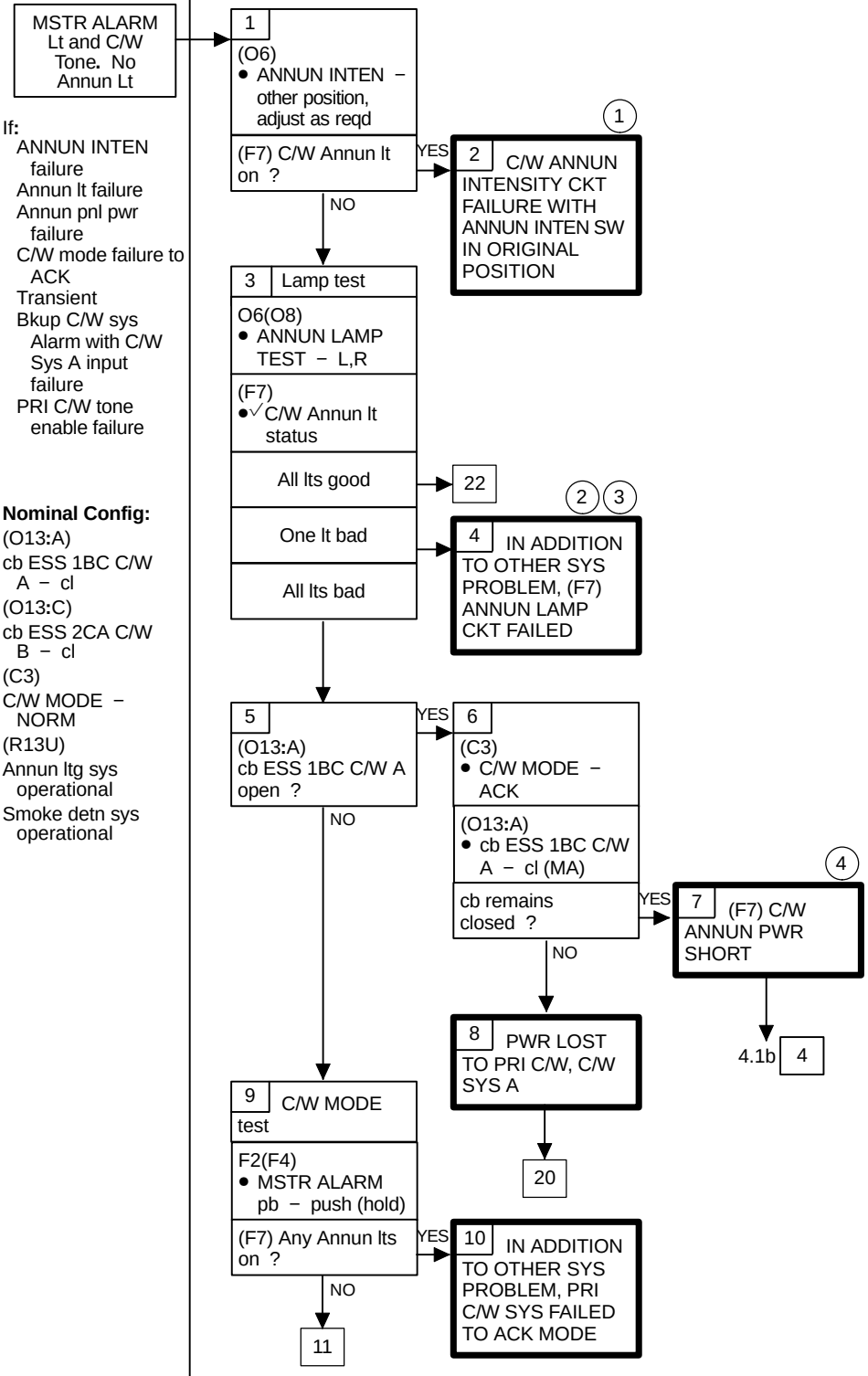
C/W

4.2b MA LT & C/W TONE − NO ANNUN LT

MSTR ALARM Lt and C/W Tone. No Annun Lt

If:
- ANNUN INTEN failure
- Annun lt failure
- Annun pnl pwr failure
- C/W mode failure to ACK
- Transient
- Bkup C/W sys Alarm with C/W Sys A input failure
- PRI C/W tone enable failure

Nominal Config:
(O13:A)
cb ESS 1BC C/W A − cl
(O13:C)
cb ESS 2CA C/W B − cl
(C3)
C/W MODE − NORM
(R13U)
Annun ltg sys operational
Smoke detn sys operational

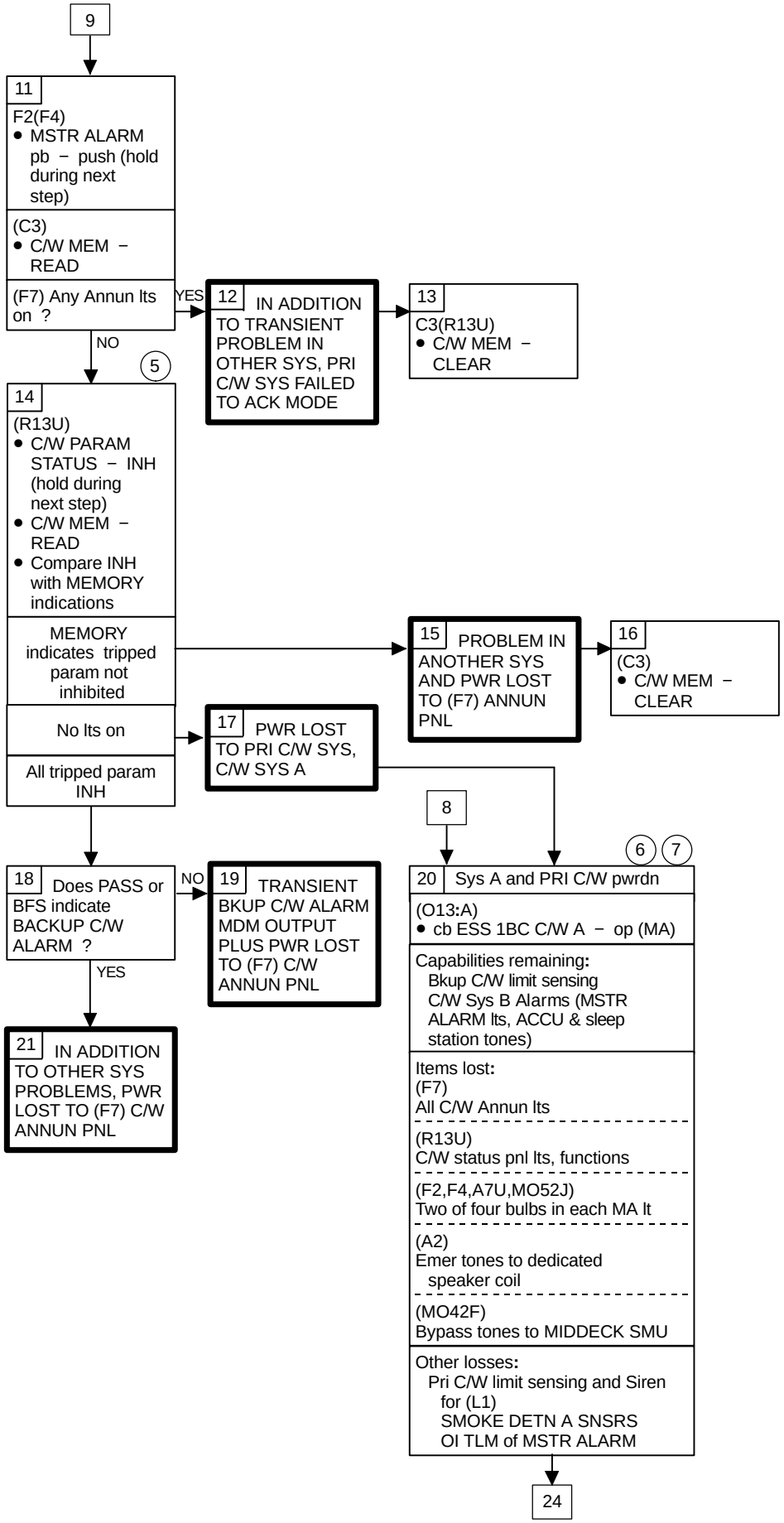


(1) ANNUN INTEN sw must be in non−failed position for normal (F7) C/W lt ops

(2) Verify lamp holder properly seated

(3) If reqd, IFM LIGHTBULB CHANGEOUT procedure may be used to swap bulbs with spare annunciator

(4) Use pnl A7U (MO52J) MSTR ALARM pb to reset alarms. If pnl F2(F4) pb must be used, pressing pb quickly may allow MA to reset without tripping cb. Pnl F7 annunciator lost

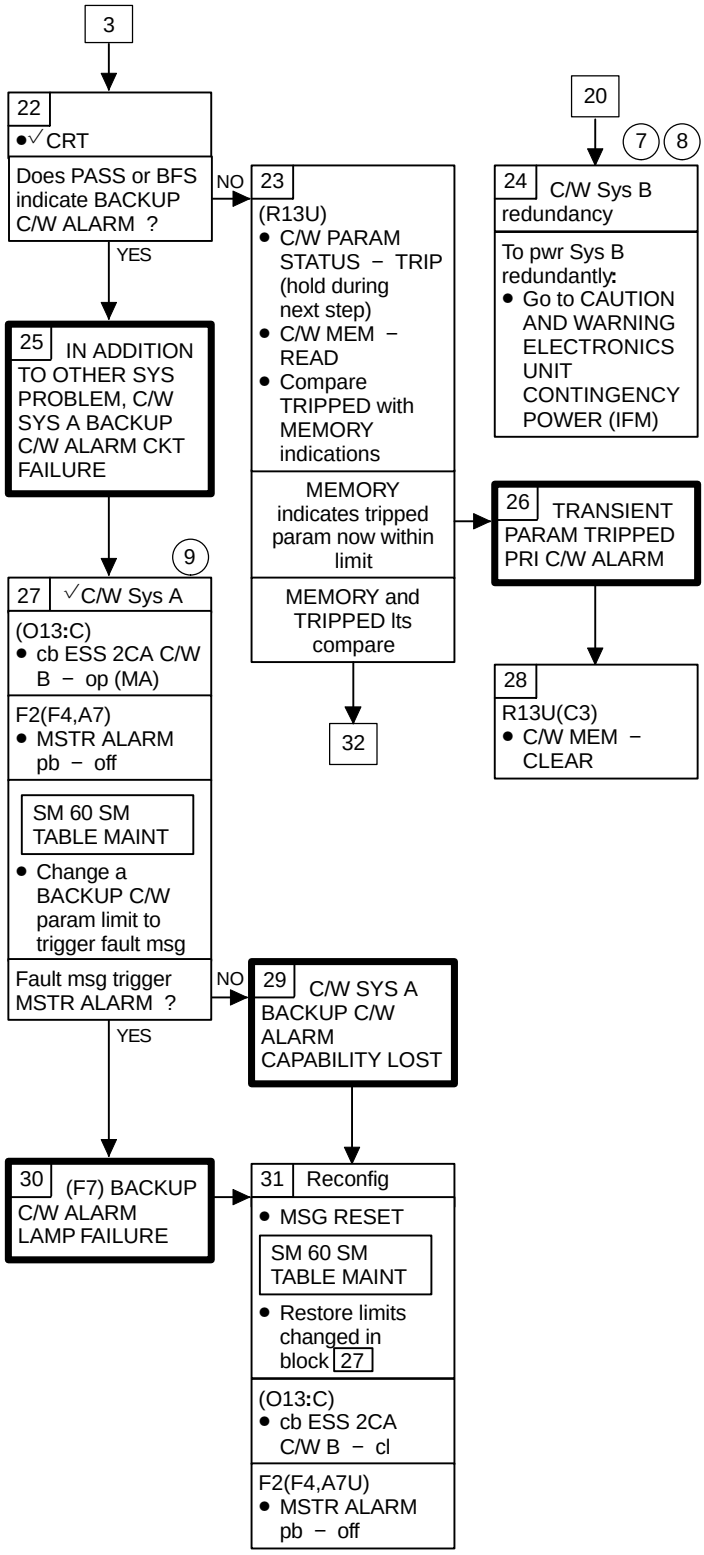


(5) Additional lts which light during C/W MEM − READ indicate tripped params that are not inhibited

(6) All four bulbs in each MA lt will illuminate during lamp test

(7) Until C/W IFM cables installed, loss of ESS 2CA DA2 would not trigger aural alarm so that Fuel Cell 2 could be safed within 9 min. FSMs must be continually monitored

C/W 4.2b (Cont)



(7) Until C/W IFM cables installed, loss of ESS 2CA DA2 would not trigger aural alarm so that Fuel Cell 2 could be safed within 9 min. FSMs must be continually monitored

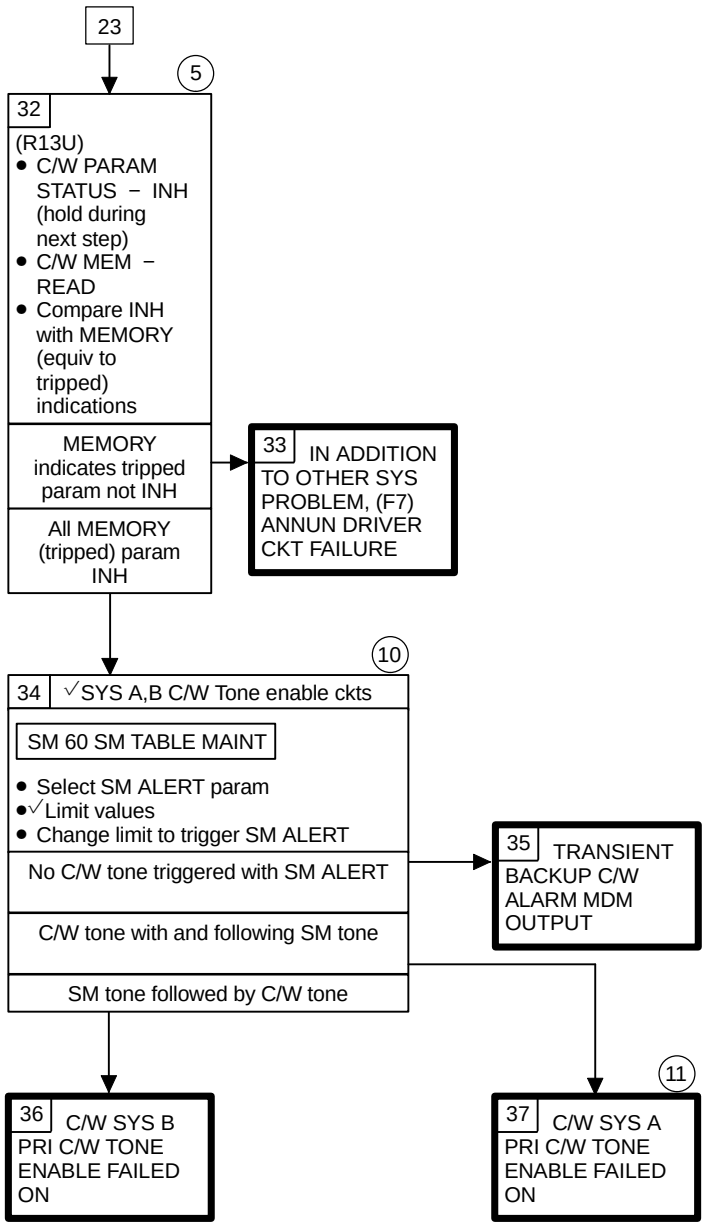
(8) Redundancy can be verified by opening cb ESS 2CA C/W B (O13:C) and receiving alarm tones

(9) Usable onorbit inactive BACKUP C/W ALARM params include:

APU Exhaust Gas Temp
- Sys 1 − 0460140
- Sys 2 − 0460240
- Sys 3 − 0460340

APU Lube Oil Temp
- Sys 1 − 0460150
- Sys 2 − 0460250
- Sys 3 − 0460350

C/W 4.2b (Cont)



(5) Additional lts which light during C/W MEM − READ indicate tripped params that are not inhibited

(10) Usable SM ALERT params include:

FC H2O LNT
- Sys 1 − 0450412
- Sys 2 − 0450281
- Sys 3 − 0450381

FC H2O VLV T
- Sys 1 − 0450412
- Sys 2 − 0450422
- Sys 3 − 0450432

(11) SM alert tone will trigger C/W tone without MA lt. Requires MA reset. Klaxon or Siren will also trigger C/W tone

C/W

4.2c KLAXON − NO RAPID dP/dT

KLAXON − No Rapid dP/dT

If:
- Snsr failure
- Alarm threshold shift
- C/W SYS A(B) Klaxon tone trigger or enable ckt failure

Nominal Config:
(O13:A)
cb ESS 1BC C/W A − cl
(O13:C)
cb ESS 2CA C/W B − cl
(C3)
C/W MODE − NORM
(R13U)
Annun ltg sys operational
Smoke detn sys operational

1
SM 66 ENVIRONMENT
SM SYS SUMM 1
CAB dP/dT indicates decay rate (−dP/dT) which:
- Exceeds 0.08
- ≃ 0.0

2 Cabin P decreasing ?
NO → **3** CAB dP/dT SNSR FAILURE
YES → **5**
- Go to O2(N2) FLOW HIGH/CAB P LOW/dP/dT (ORB PKT, ECLS)

4 Pwrdn Spkrs
(A13)
- ✓OS AUD SPKR PWR − OFF

(MO42F)
- ✓MIDDECK SPKR AUD SPKR PWR − OFF

NOTE
If Klaxon triggered during next step, note which spkr has Klaxon

(O15:D)
- cb MNB PPO2 C CAB dP/dT − op, then cl

- Klaxon on Middeck Spkr → **7** C/W SYS B KLAXON TRIGGER THRESHOLD SHIFTED. SYS LOST
- Klaxon on OS Spkr → **8** C/W SYS A KLAXON TRIGGER THRESHOLD SHIFTED. SYS LOST
- No Klaxon

6 Reconfig
(O15:D)
- cb MNB PPO2 C CAB dP/dT − op

- Go to ECLS COMPUTATION INHIBIT, ECLS SSR−14, TABLE C

9 Reconfig
F2(F4,A7U)
- MSTR ALARM pb − off

(A13)
- OS AUD SPKR PWR − as desired

(MO42F)
- MIDDECK SPKR AUD PWR − as desired

10 ✓Siren A
(L1)
- SMOKE DETN CKT TEST − A
- After 15−25 sec, ✓for siren (MA)

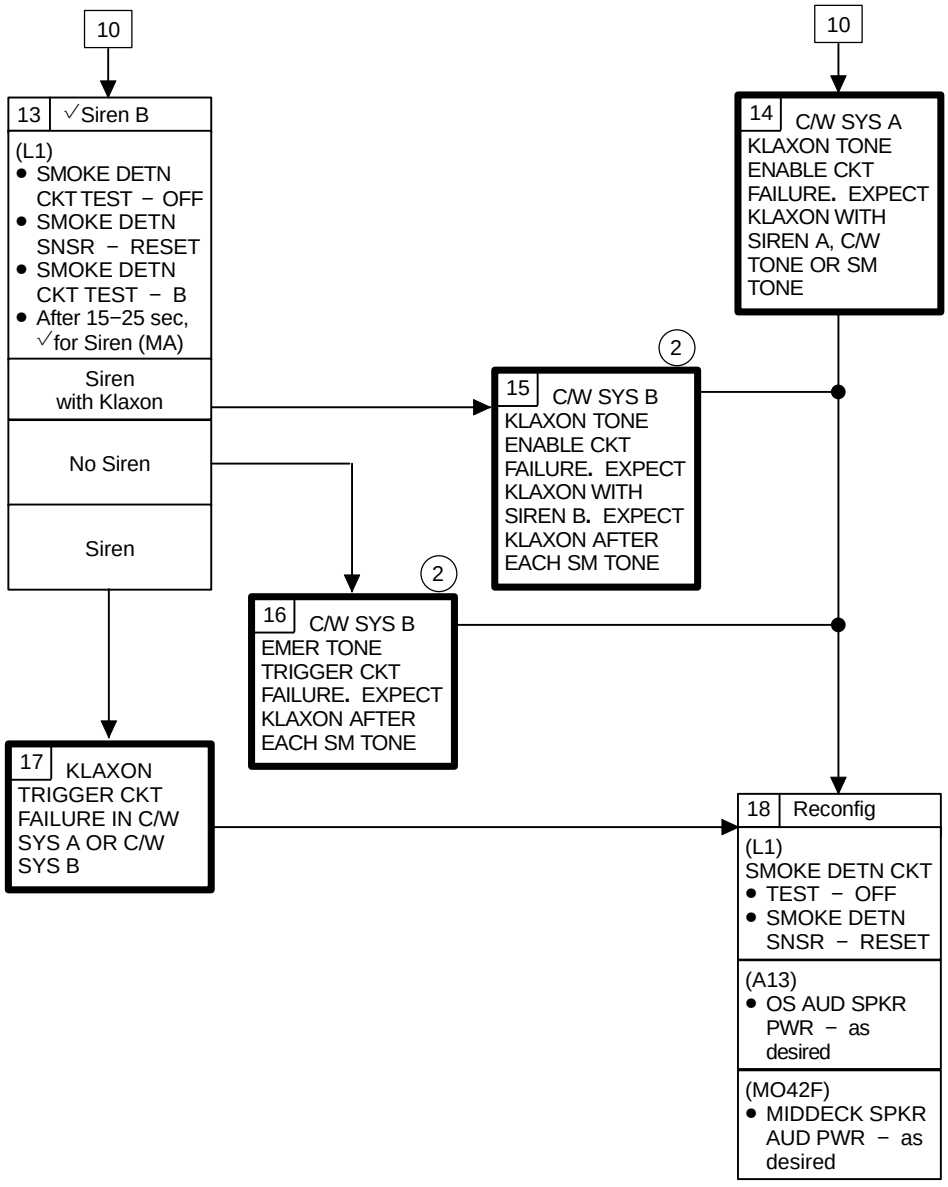
- Siren with Klaxon → 14
- No Siren → **11** C/W SYS A EMER TONE TRIG CKT FAILURE. KLAXON MAY BE TRIGGERED WITH SUBSEQUENT C/W TONE OR SM TONE
- Siren → 13

12 Reconfig
(L1)
SMOKE DETN CKT
- TEST − OFF
- SMOKE DETN SNSR − RESET

(A13)
- OS AUD SPKR PWR − as desired

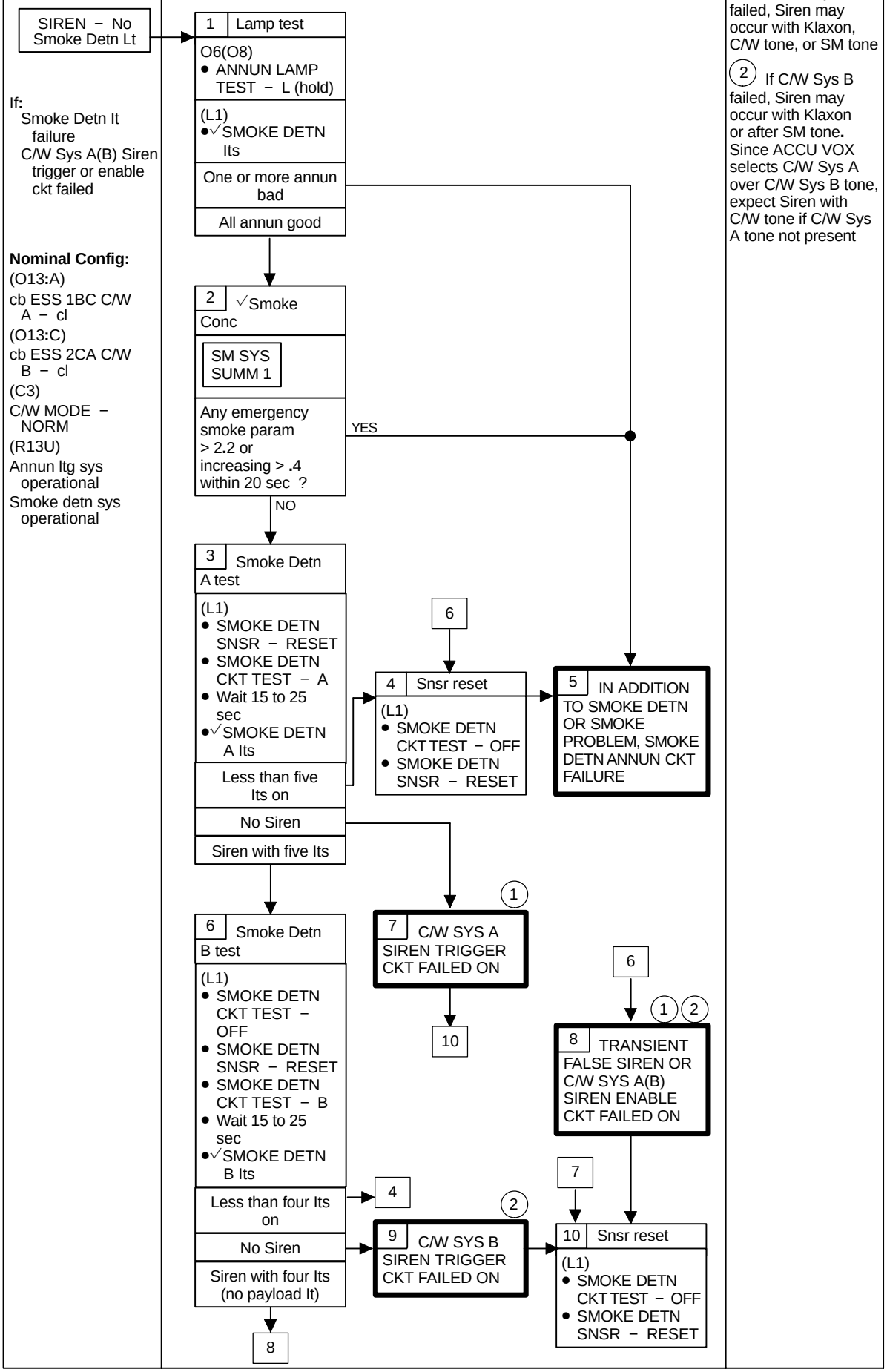
(MO42F)
- MIDDECK SPKR AUD PWR − as desired

(1) Loss of pwr to cb MNB PPO2 C CAB dP/dT results in loss of dP/dT and PPO2 C sensors



(2) ACCU VOX selects C/W Sys A over C/W Sys B tone. If C/W Sys A tone not present, expect Klaxon with C/W tone

4.2d SIREN − NO SMOKE DETN LT



4.2e PRI C/W SYS FAILS TO ANNUNCIATE OUT−OF−LIMIT PARAM

PRI C/W Sys Fails to Annun Out−of−Limit Param

C/W Alarm triggered by Backup C/W Sys

If:
- Pri C/W Sys Snsr Multiplexer
- Limit Value Limit Sense
- Inhibit Memory or Param Select failure

Nominal Config:
(O13:A)
cb ESS 1BC C/W A − cl
(O13:C)
cb ESS 2CA C/W B − cl
(C3)
C/W MODE − NORM
(R13U)
Annun ltg sys operational
Smoke detn sys operational

1 ✓Param Inhibit status

(R13U)
- C/W PARAM STATUS − INH

Param in question inhibited ?

NO → **2** ✓PARAM SEL for erroneously tripped param

(R13U)
- C/W PARAM SEL tw − XXX (Param number)
- C/W PARAM − INH
- STATUS − INH (✓status)
- − ENA
- STATUS − INH (✓status)

Selected param was INH then ENA ?

NO → 4.1d 30

YES → **4** ✓Limits for new out−of−limit param

- ✓C/W & FDA TABLE (REF DATA, C/W) for correct limits
- C/W PARAM SEL tw − param number
  LIMIT SET LIMIT − UPPER(LOWER)
  FUNC − READ (✓value)
- Repeat last two steps for LOWER limit

Limits correct ?

NO → **7** Set limits for each erroneous limit

(R13U)
- C/W LIMIT SET VALUE tw − correct value
- LIMIT − UPPER(LOWER)
- FUNC − SET, then READ (✓value)

Limits correct ?

NO → 4.1d 36

YES → **8** PRI C/W DEFAULT LIMIT VALUE MEMORY FAILURE OR PARAM SELECT CKT FAILURE

9 Reconfig

(R13U)
- C/W PARAM SEL tw − > 119

YES → 10

YES → **3** Enable param

NOTE
Annunciator It on pnl F7 and Mstr Alarm should be triggered as param is enabled

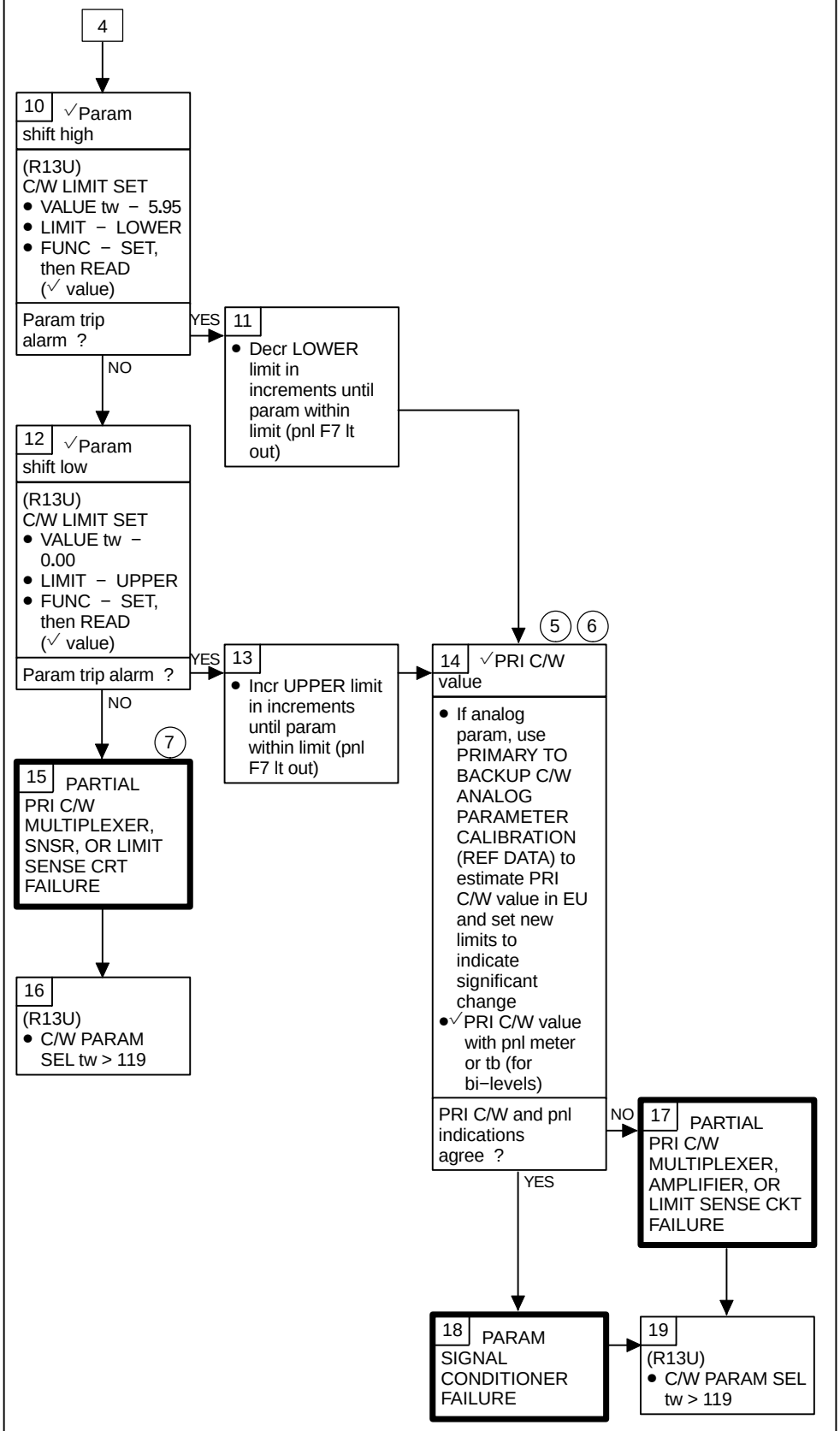
(R13U)
- C/W PARAM SEL tw − (param number)
- C/W PARAM − ENA
- C/W PARAM STATUS − INH (✓status)
- C/W PARAM SEL tw > 119

Param enabled ?

NO → **5** INHIBIT MEMORY FAILURE

YES → **6** PARAM INHIBITED INADVERTENTLY

1. Correct Param Inhibit status can be verified using PRIMARY C/W PARAMETER MATRIX (Cue Card)
2. Prior to changing any limit value, ✓PARAM SEL capability with an INH/ENA capability verification using procedure in block 2
3. If time permits, ✓all enabled param limits
4. Limits entered from pnl R13 use different memory than default limits



(5) Notify MCC of change in PRI C/W param and limit values

(6) Bi−level params are identified in NOTES column of C/W & FDA Table (REF DATA, C/W)

(7) If pnl indication and primary C/W param values agree, Snsr or Signal Conditioner failed

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DPS SSR

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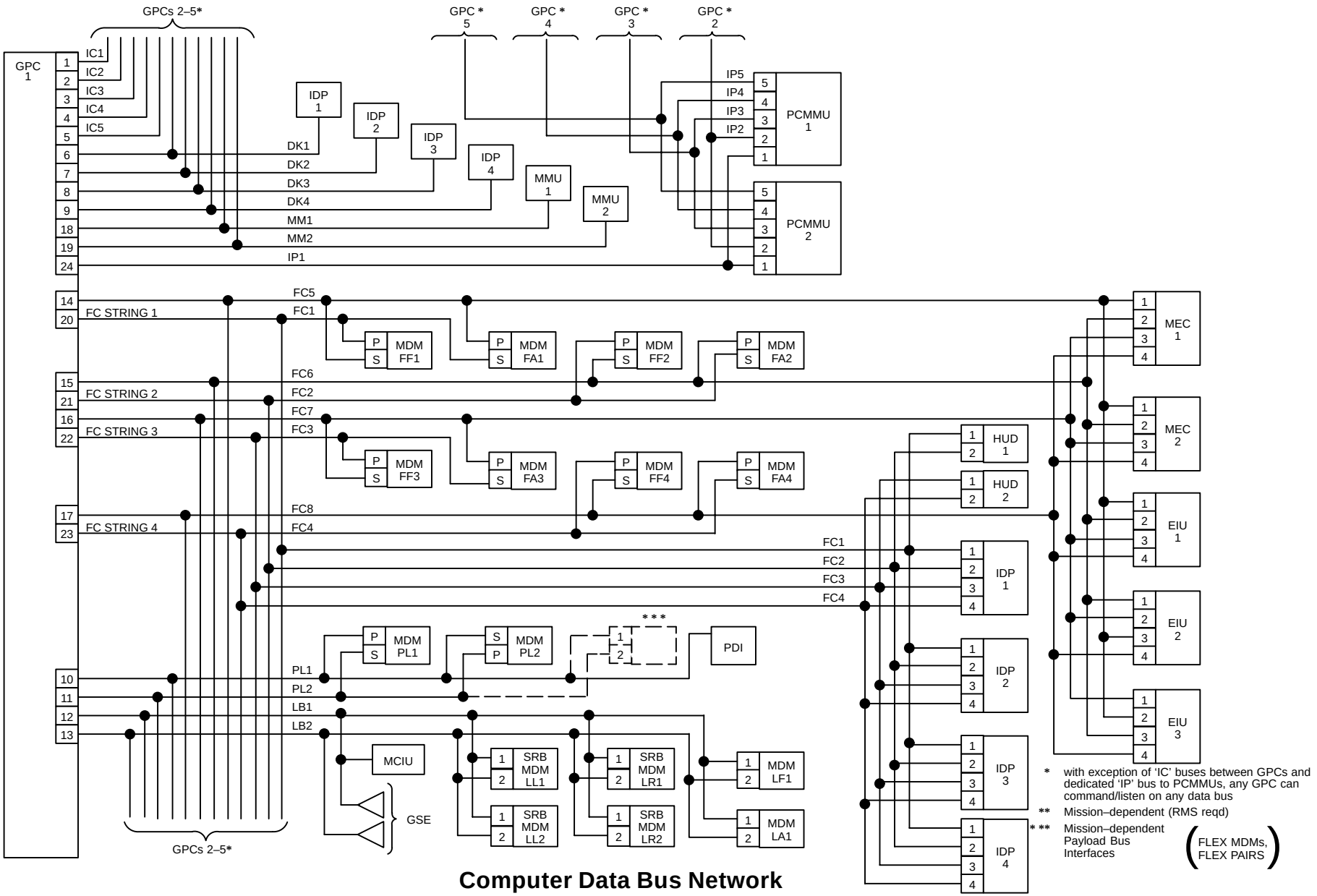
The following Fault Msgs have no corresponding MAL procedures in this book:

GPC FSM

- BCE STRG 1(2,3,4) PASS (BFS)
- BCE BYP KU
- CM BUF BSY CRT 1(2,3,4)
- DK XMTR 1(2,3,4) (BFS)
- > 3 DEU
- GPC 5
- GPC CONF
- GPC PWR (BFS)
- ILLEGAL ENTRY
- MDM OUTPUT FF(FA)
- PASS GPC BITE
- SUMWORD ICC
- TFL FAIL (BFS)
- TFL LOAD FAIL (PASS)
- TIME TONE

MEDS FSM

- CHECKSUM FAIL IDP 1(2,3,4)
- MDU LOAD FAIL mduX
- OPERATOR REQUEST FAIL mduX
- PORT CHANGE mduX



Computer Data Bus Network

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DPS

5.1a CS SPLIT

From ORB PKT, PASS SM GPC FAIL, step 5

From ORB PKT, PASS GNC GPC FAIL, step 3

CAM LT

BACKUP C/W ALARM

(F7)

GPC 1(2,3,4)

If:
- Fail−to−sync
- Force fail−to−sync
- IOP or CPU detected hdw errors
- Illegal BCE Xmtr failed ON

Assumptions:
QUIT = NO GPC FUNCTION
Common set of only two GPCs (1&4)

Nominal Config:
Single GNC Ops (O6)
GPC PWR 1,2,3,4,5 (five) − ON
GPC OUTPUT 1,2,3 (three) − NORM
GPC OUTPUT 4 − TERM
GPC MODE 1,4 (two) − RUN
2,3 (two) − HALT
Appropriate AV BAY FAN − ON

(1)(2)

1 S/W dump SM GPC and GNC GPC if IDPs/CRTs available (do not use GPC/CRT key)

- Perform GPC S/W INITIATED MEM DUMP, DPS SSR−2

4 Safe SM systems

- ✓MCC for comm config and radiation constraints

If no comm
- KU PWR − STBY
- CNTL − PNL, CMD
- Perform COMM LOST, steps 7 and 8 (ORB PKT, COMM)

SM 62 PCMMU/PL COMM

- FORMAT FXD − ITEM 1 EXEC (*)
- If reqd, perform PL/DPS RECONFIG, Secure (PL SYS or SODF: ASSY OPS)

7 Secure RMS (if reqd)

If RMS active:

SM 94 PDRS CONTROL

- Note WR range, PL ID, PL INIT ID, EE ID, SPEC 95 overrides

9 Secure GPC 1 and GPC 4

(CRT)
- DAP: FREE

(O6)
- GPC MODE 4 − STBY (tb−bp), HALT
- GPC MODE 1 − STBY (tb−bp), HALT
- MDM PL1, PL2 (two) − OFF, then ON_{NO}

2

9 (3)

2 Activate GPC 2 (new GNC GPC)

(O6)
- ✓GPC 2 PWR − ON
- GPC 2 OUTPUT − NORM
- GPC MODE 2 − STBY (tb−RUN), then RUN
- ✓GPC2 takes three FWD IDPs/CRTs (deassign CRT 3/reassign CRT 4 as reqd)

5 MC2 NBAT setup for target GPC 2

GNC 0 GPC MEMORY

NOTE
If currently active IMU was in STBY or IMU currently in STBY was active during time of G2 freeze−dry, do not assign associated string

- Assign target GPC, all FC strings (except as noted above), CRTs, and MMUs to GPC 2
- ✓PL1/2 and LDBs 1,2 deassigned

(3)(5)

8 Perform GNC OPS Transition

- DAP: FREE pb − press and hold during OPS transition
- Pri RJD DRIVER (eight) − OFF
- ✓RJD MANF L5/F5/R5 DRIVER − ON

- GNC, OPS 201 PRO

Were all FC strings assigned in block 2 (IMU STBY issue) ?

NO → 3

YES → 6

8

3 Configure IMU and Restring

GNC 21 IMU ALIGN

- Desel aff IMU from block 5
- Configure aff IMU from block 5 to STBY(OPER) as reqd to match GRP B PWRDN (PWRUP) (no * until restring)

GNC 0 GPC MEMORY

- Assign remaining FC string to GPC 2
- GNC, OPS 201 PRO

- ✓MCC for resel of aff IMU

8 (4)

6 Reestablish GNC Operational Config

- Pri RJD DRIVER (eight) − as reqd

GNC 20 DAP CONFIG

- Load desired DAP A,B per DAP Cue Card

GNC 22 S TRK/ COAS CNTL

- S TRK −Y, −Z: STAR TRK − ITEM 3,4 EXEC (*)

GNC 21 IMU ALIGN

- RESUME

GNC 23 RCS

- JET RESET − ITEM 45 EXEC
- If L(R) OMS/RCS I'CNCT L(R) OMS − ITEM 5(6) EXEC

If orbiter attitude control reqd:
- DAP: INRTL/VERN (ALT)

10

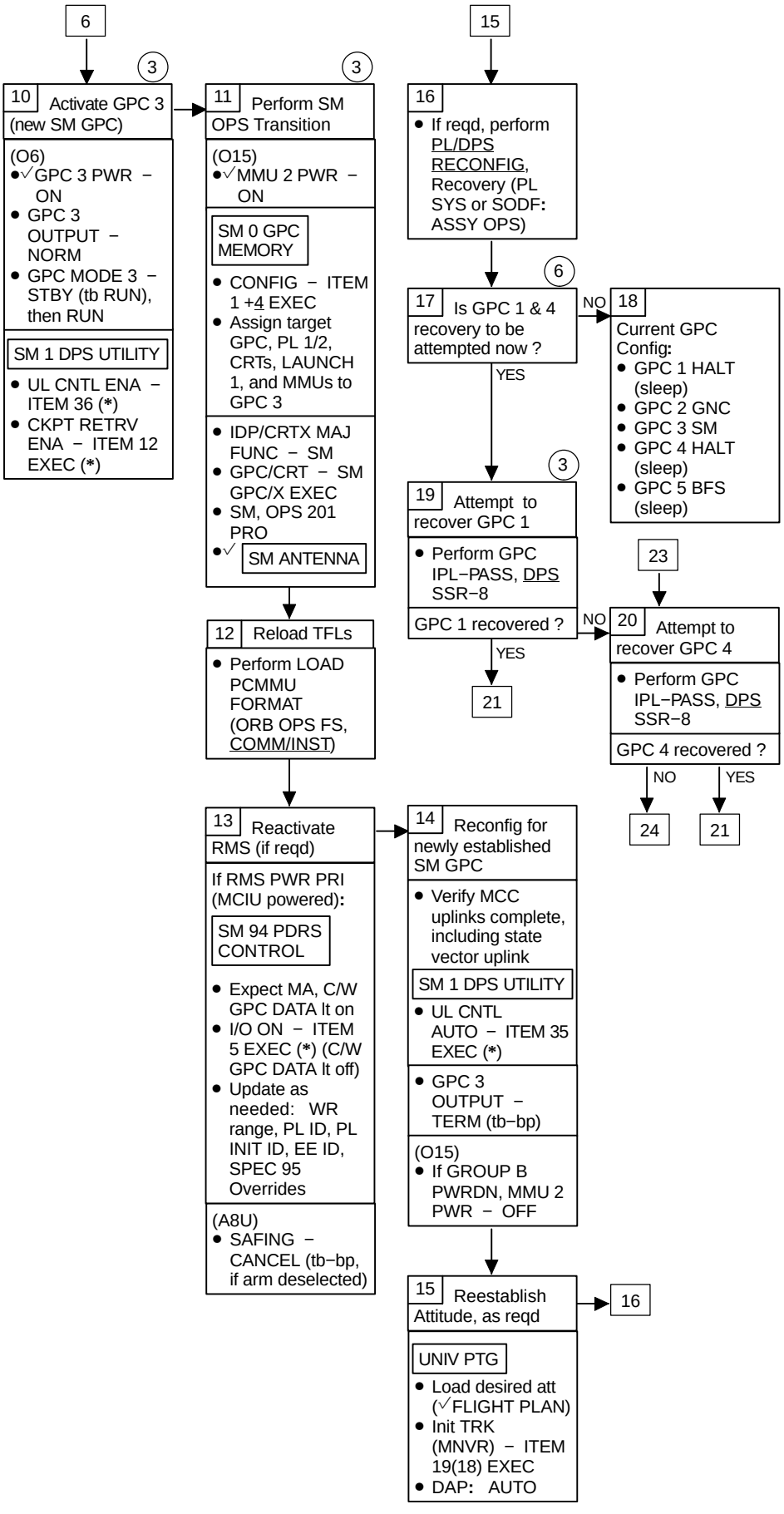
(1) Manual antenna commanding may be reqd because orbiter state vector is not being ICC'd to SM GPC

(2) If unable to perform GPC S/W dump of GPC 1 or 4 (no IDP/CRT Interface), ✓MCC for possible HISAM Dump after block 9

(3) Do not perform keyboard entries or sw throws 10 sec before and after moding PASS GPCs to RUN or making OPS transition requests

(4) MCC will uplink state vector. If no comm at AOS, sel best antenna

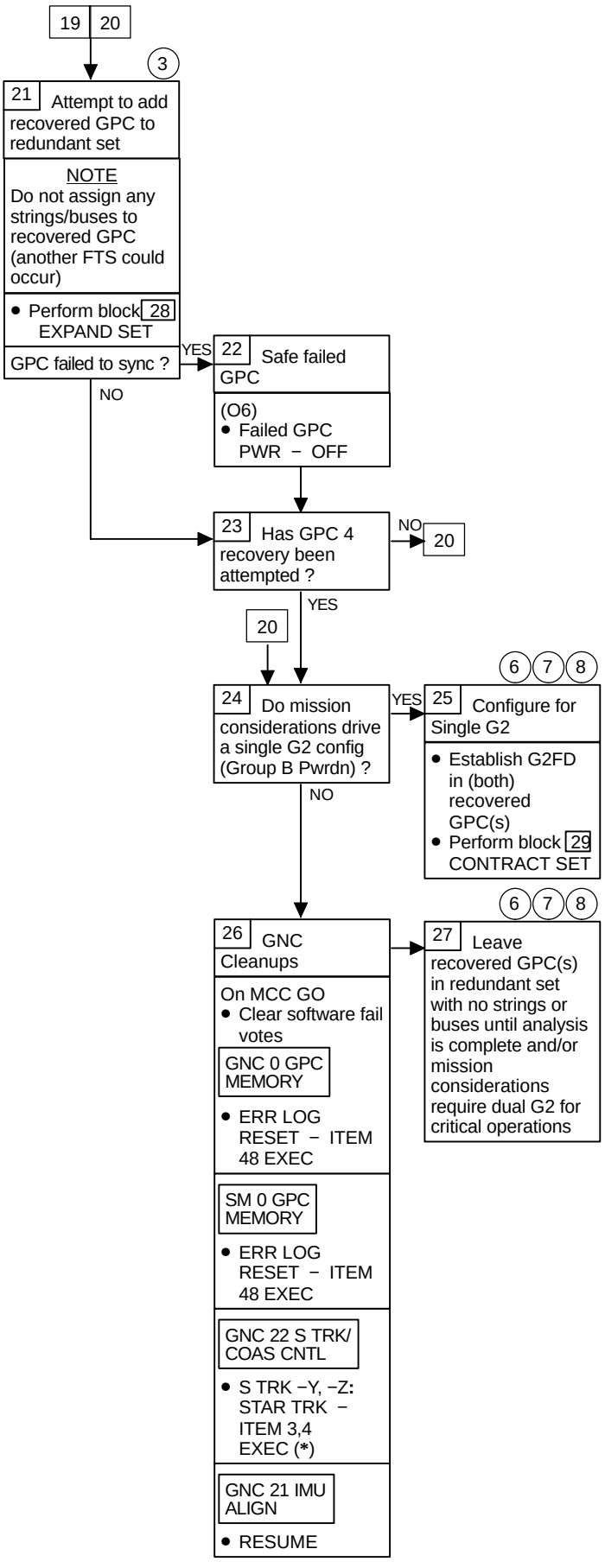
(5) If G2FD last freeze−dried while RS in G1(G3), holding DAP: FREE pb during OPS transition avoids PRCS false jet fail−off msgs (DAP defaults to A1/AUTO/PRI)



(3) Do not perform keyboard entries or sw throws 10 sec before and after moding PASS GPCs to RUN or making OPS transition requests

(6) MCC will utilize GPC 1 and 4 dump data to help determine the cause of CS split. Data analysis may take 24 to 48 hr

DPS 5.1a (Cont)



(3) Do not perform keyboard entries or sw throws 10 sec before and after moding PASS GPCs to RUN or making OPS transition requests

(6) MCC will utilize GPC 1 and 4 dump data to help determine the cause of CS split. Data analysis may take 24 to 48 hr

(7) Upon completion of procedure, MCC may request certain IDPs/CRTs to be pwrd on 10 sec to ensure IDP/DEU EQUIV uplink I/F to both GNC and SM. If MEDS, pwr−on IDP/CRT for at least 30 sec before pwr−off

(8) Avoid using GPC−1 or GPC−4 for critical burns or PROX OPS until GPC dump analysis confirms the GPC is not considered transient

28 EXPAND SET

NOTE

Do not perform any keyboard item entries or switch throws 10 sec before and after making an OPS transition request

CONFIGURE FOR SET EXPANSION

CRT GNC 0 GPC MEMORY

- If MM202: GNC, OPS 201 PRO
- CONFIG − ITEM 1 +2 EXEC
- Assign MC2 per table →

OPS MODE RECALL (11)

C3(A6U)
- DAP: FREE

CRT
- GNC, OPS 201 PRO
- Pause ≈ 30 sec (DAP settling), then

C3(A6U)
- DAP: as reqd

(9) (10)

If desired RS:	Dual G2 (1&2)	Dual G2 (2&4)	Triple G2 (1&2&4)
CONFIG GPC	2 12000	2 02040	2 12040
STR 1 2 3 4 PL 1/2	DO NOT MODIFY NBAT	DO NOT MODIFY NBAT	DO NOT MODIFY NBAT
CRT 1 2 3 4			
L 1 2			
MM 1 2			

(9) Whether expanding G2 set to Dual or Triple G2 config, modify only the GPC target set unless otherwise noted (don't assign strings or buses to target GPC)

(10) If GPC 1 previously recovered and added to RS, GPC 1 should remain in RS for Set Expansion (when adding GPC4)

(11) GPC downlist will default to lowest ID GPC in G2 set. MCC may request downlister change following OPS Mode Recall

29 CONTRACT SET

NOTE

Do not perform any keyboard item entries or switch throws 10 sec before and after making an OPS transition request

CONFIGURE FOR SET CONTRACTION

CRT If MM202: GNC, OPS 201 PRO

GNC 0 GPC MEMORY

- CONFIG − ITEM 1 +2 EXEC
- Assign MC2 per table →

If	Single G2
CONFIG GPC	2 02000
STR 1	2
2	2
3	2
4	2
PL 1/2	0
CRT 1	2
2	2
3	0
4	2
L 1	2
2	0
MM 1	2
2	2

OPS MODE RECALL (11)

C3(A6U)
- DAP: FREE
- VERN (ALT)

CRT
- GNC, OPS 201 PRO
- Pause ≈ 30 sec (DAP settling), then

C3(A6U)
- DAP: as reqd

FREEZE DRY GPC

CRTX
- CRTX MAJ FUNC − PL GPC/CRT G2FD/X EXEC

GNC 0 GPC MEMORY

- CONFIG − ITEM 45 +2 EXEC
- GPC − ITEM 46 +1(4) EXEC
- STORE − ITEM 47 EXEC

Store complete when MC = 02 (≈ 30 sec)

- ✓ All IDPs/CRTs deassigned from FD GPC

O6
- GPC MODE G2FD − STBY (tb−bp)
- − HALT (tb−bp)
- − STBY (tb−RUN)
- − HALT (tb−bp)

- If reqd, repeat Freeze Dry steps for 2nd GPC

CONFIG CLEANUP

GNC 22 S TRK/COAS CNTL

- S TRK −Y, −Z: STAR TRK − ITEM 3,4 EXEC (*)

GNC 21 IMU ALIGN

- RESUME

CLEAR SOFTWARE FAIL VOTES (12)

GNC 0 GPC MEMORY

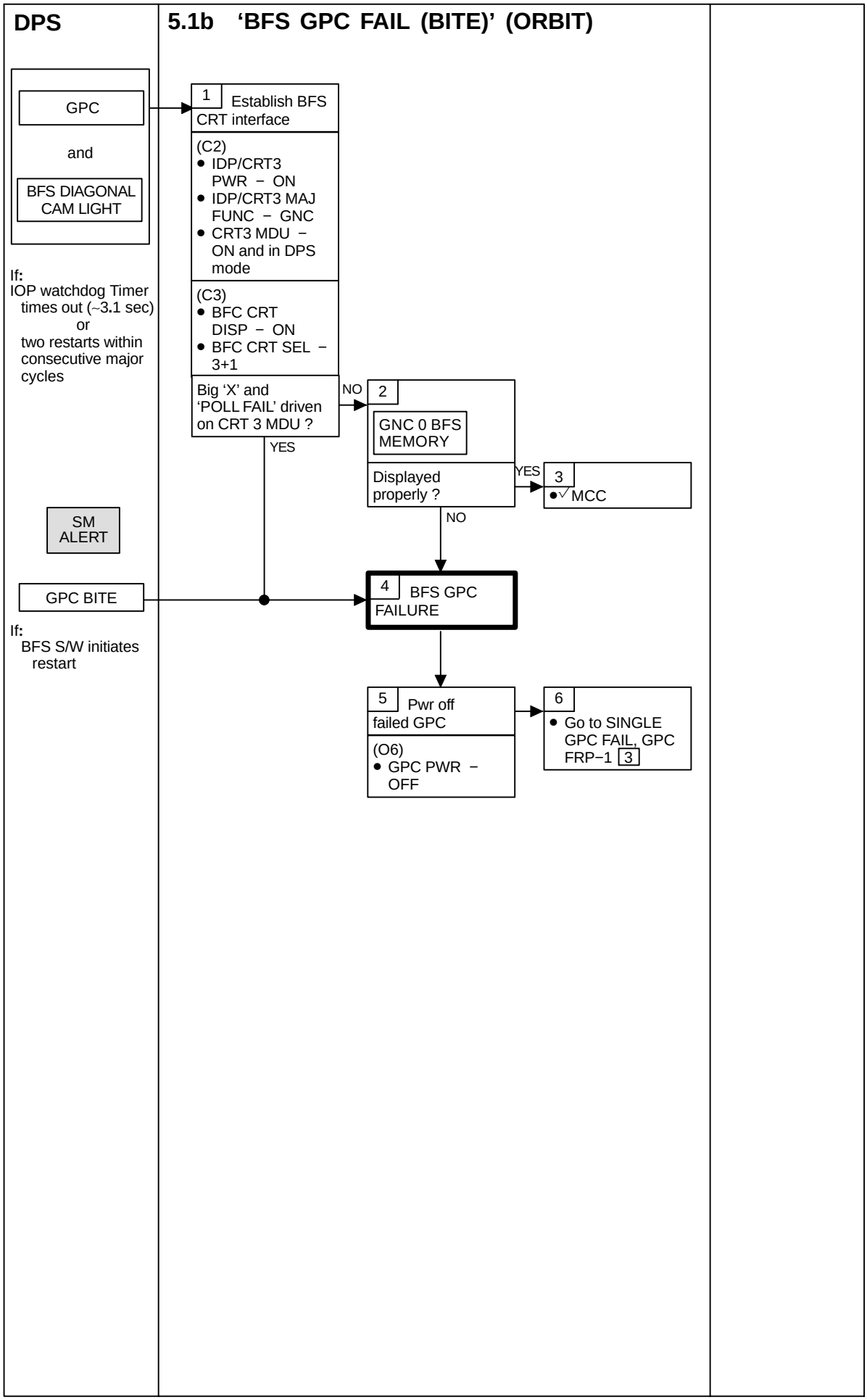
- ITEM 48 EXEC

SM 0 GPC MEMORY

- ITEM 48 EXEC

(11) GNC downlist will default to lowest ID GPC in G2 set. MCC may request downlister change following OPS Mode Recall

(12) Crew GO for Error Log Resets without prior MCC concurrence


DPS
5.1b 'BFS GPC FAIL (BITE)' (ORBIT)
GPC
and
BFS DIAGONAL CAM LIGHT
If:
IOP watchdog Timer times out (~3.1 sec)
or
two restarts within consecutive major cycles
SM ALERT
GPC BITE
If:
BFS S/W initiates restart
1 Establish BFS CRT interface
(C2)
• IDP/CRT3 PWR − ON
• IDP/CRT3 MAJ FUNC − GNC
• CRT3 MDU − ON and in DPS mode
(C3)
• BFC CRT DISP − ON
• BFC CRT SEL − 3+1
Big 'X' and 'POLL FAIL' driven on CRT 3 MDU ?
NO
YES
2
GNC 0 BFS MEMORY
Displayed properly ?
YES
NO
3
•✓MCC
4 BFS GPC FAILURE
5 Pwr off failed GPC
(O6)
• GPC PWR − OFF
6
• Go to SINGLE GPC FAIL, GPC FRP−1 3

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DPS

SM ALERT

I/O ERROR MMU 1(2)

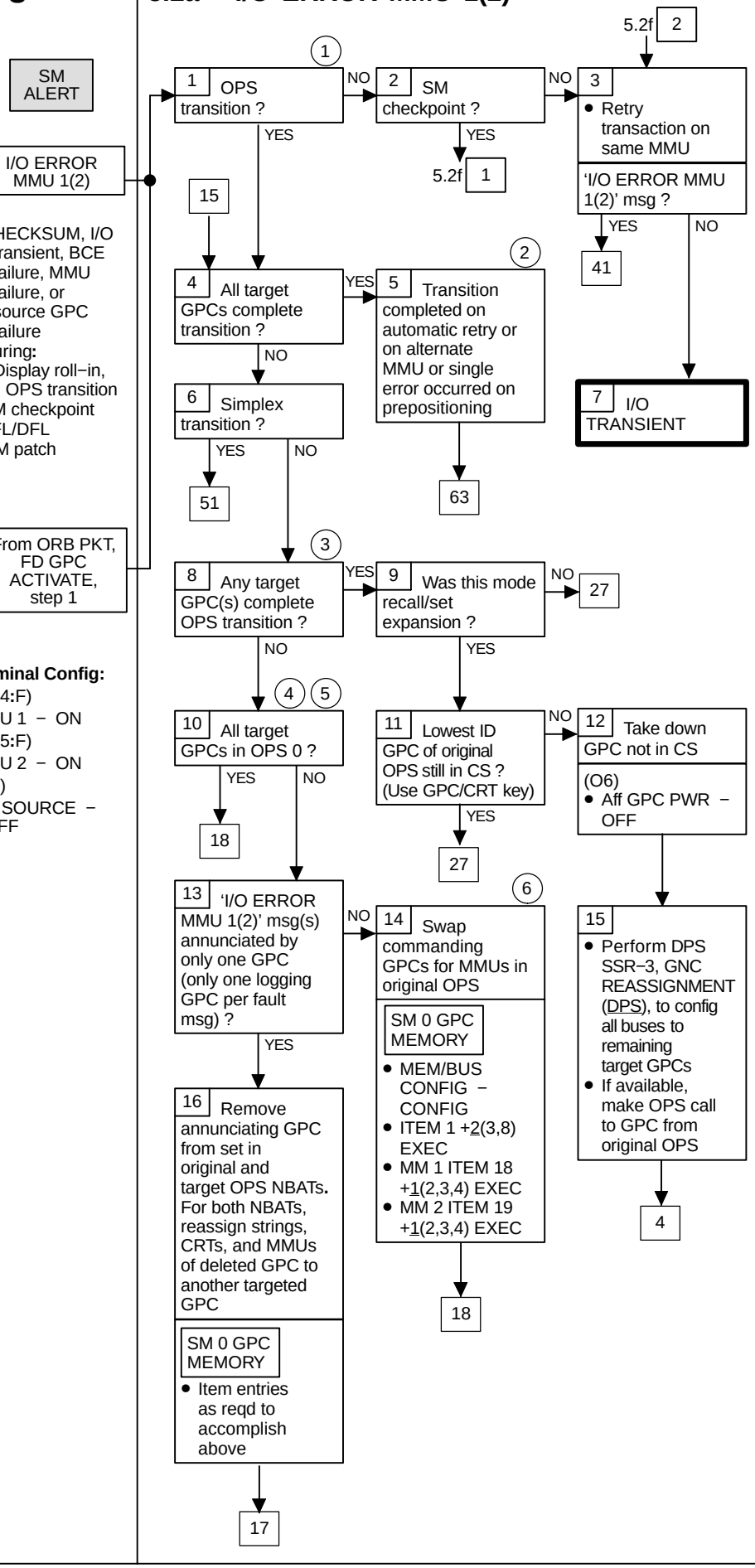
If:
- CHECKSUM, I/O transient, BCE failure, MMU failure, or source GPC failure

During:
- Display roll−in, OPS transition
- SM checkpoint
- TFL/DFL
- MM patch

From ORB PKT, FD GPC ACTIVATE, step 1

Nominal Config:
(O14:F)
MMU 1 − ON
(O15:F)
MMU 2 − ON
(O6)
IPL SOURCE − OFF

5.2a 'I/O ERROR MMU 1(2)'



(1) Any previously failed MMU should be prime selected for GNC prior to OPS transition

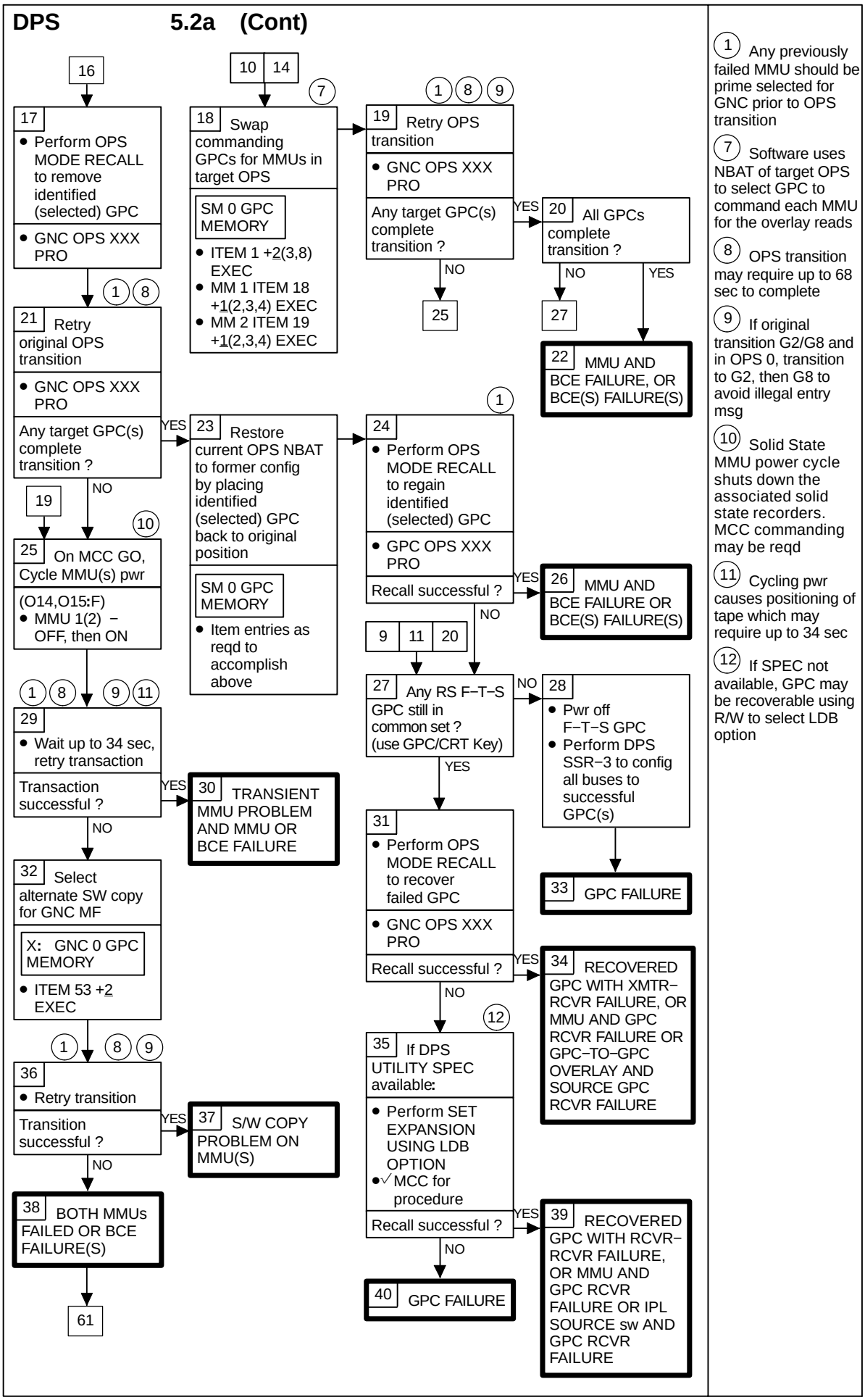
(2) Health of affected MMU can be verified by GNC OPS transition (with MCC concurrence), SM roll−in request, or IMU checkpoint read

(3) RS target GPC(s) not receiving overlay will F−T−S, but remain in OPS 0 of common set. For GPCs not receiving overlay, IDPs are still assigned per new OPS NBAT. Any IDPs targeted for F−T−S GPCs distributed to lowest number GPC of new target set

(4) If GPC fail votes and fault msgs and 'OFF/BUSY MMU' msg(s) occur, then GPCs are in CS OPS 0. Transition unsuccessful because of MMU or commanding GPC Xmtr failure, and alt MMU OFF/BSY or selected for IPL. For two GPC RS, will get off−diagonal CAM lights. For three or more GPC RS, will get I−fail

(5) For all RS GPCs in OPS 0, CRT assignments are determined by target NBAT

(6) Software uses NBAT of original OPS to select GPC to command each MMU for prepositioning



(1) Any previously failed MMU should be prime selected for GNC prior to OPS transition

(7) Software uses NBAT of target OPS to select GPC to command each MMU for the overlay reads

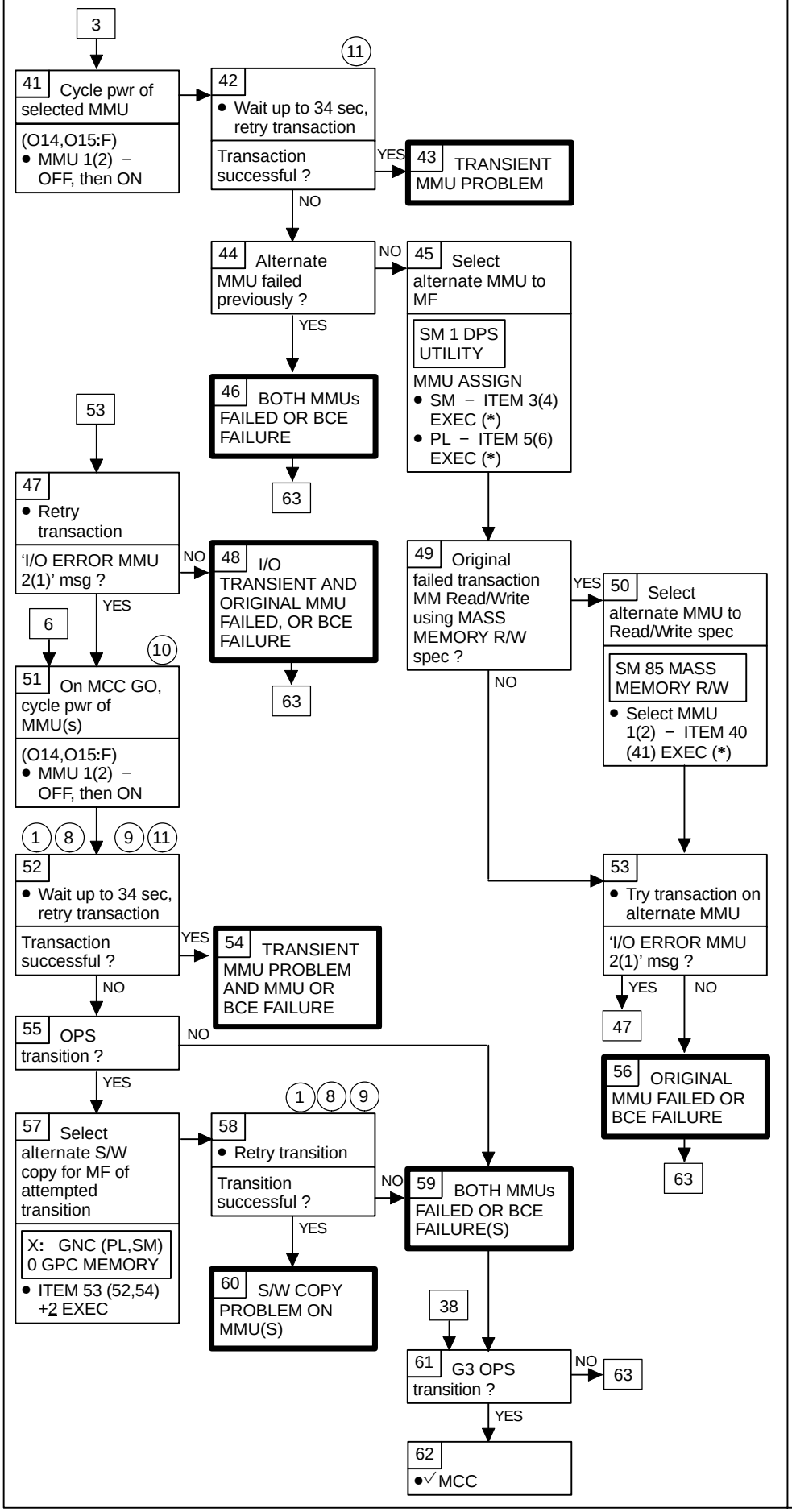
(8) OPS transition may require up to 68 sec to complete

(9) If original transition G2/G8 and in OPS 0, transition to G2, then G8 to avoid illegal entry msg

(10) Solid State MMU power cycle shuts down the associated solid state recorders. MCC commanding may be reqd

(11) Cycling pwr causes positioning of tape which may require up to 34 sec

(12) If SPEC not available, GPC may be recoverable using R/W to select LDB option



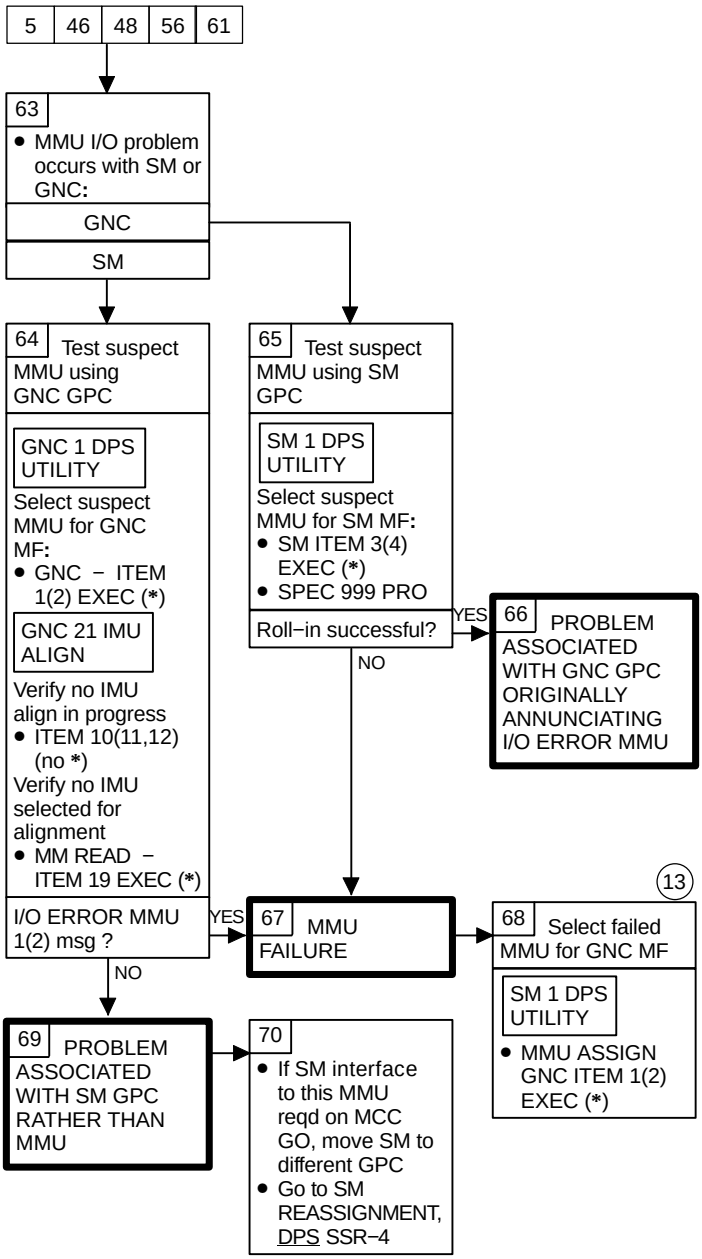
(1) Any previously failed MMU should be prime selected for GNC prior to OPS transition

(8) OPS transition may require up to 68 sec to complete

(9) If original transition G2/G8 and in OPS 0, transition to G2, then G8 to avoid illegal entry msg

(10) Solid State MMU power cycle shuts down the associated solid state recorders. MCC commanding may be reqd

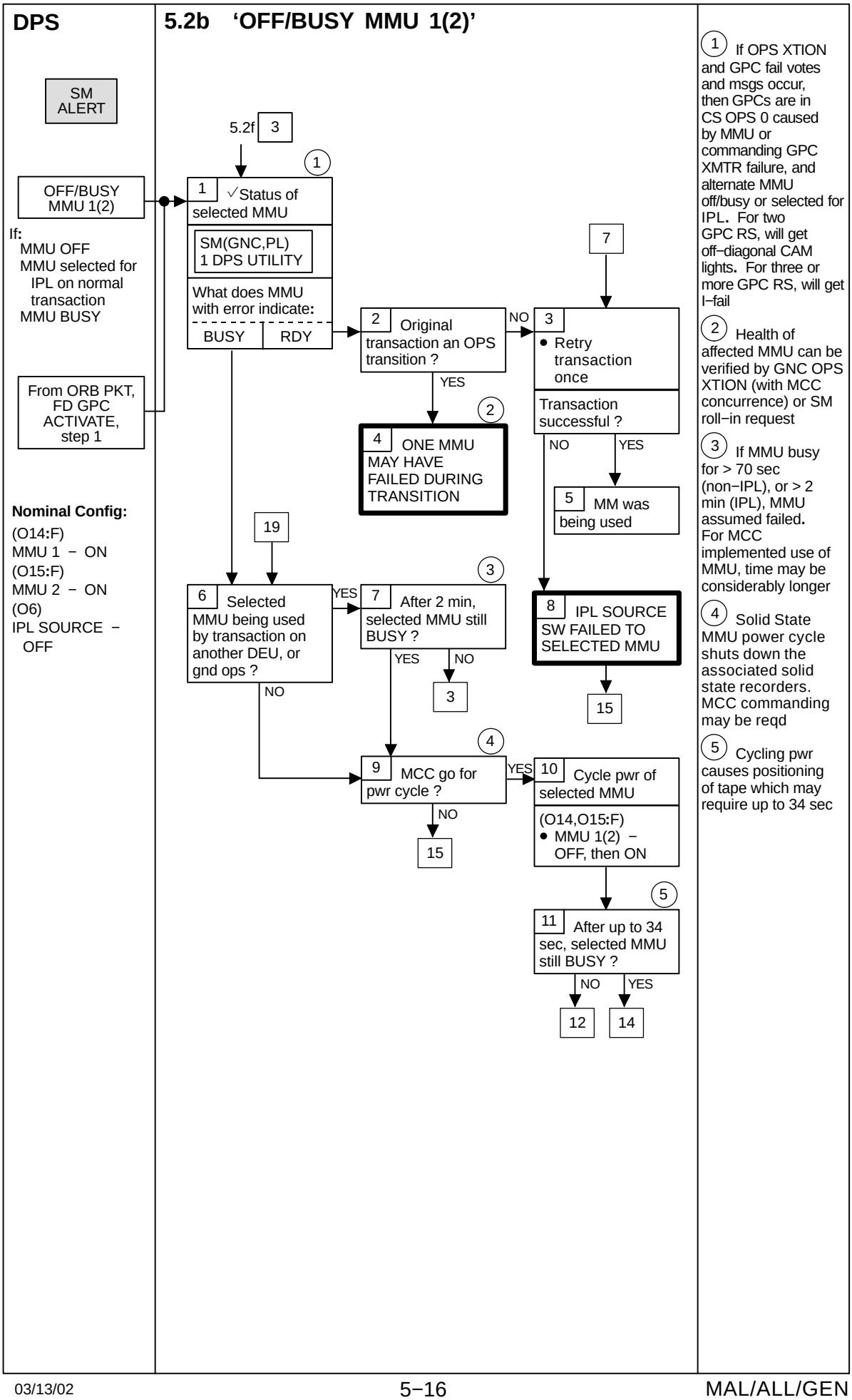
(11) Cycling pwr causes positioning of tape which may require up to 34 sec



(13) Selecting failed MMU for GNC MF protects against GPC RCV failures occurring after OPS transition prepositioning

DPS

5.2b 'OFF/BUSY MMU 1(2)'



(1) If OPS XTION and GPC fail votes and msgs occur, then GPCs are in CS OPS 0 caused by MMU or commanding GPC XMTR failure, and alternate MMU off/busy or selected for IPL. For two GPC RS, will get off−diagonal CAM lights. For three or more GPC RS, will get I−fail

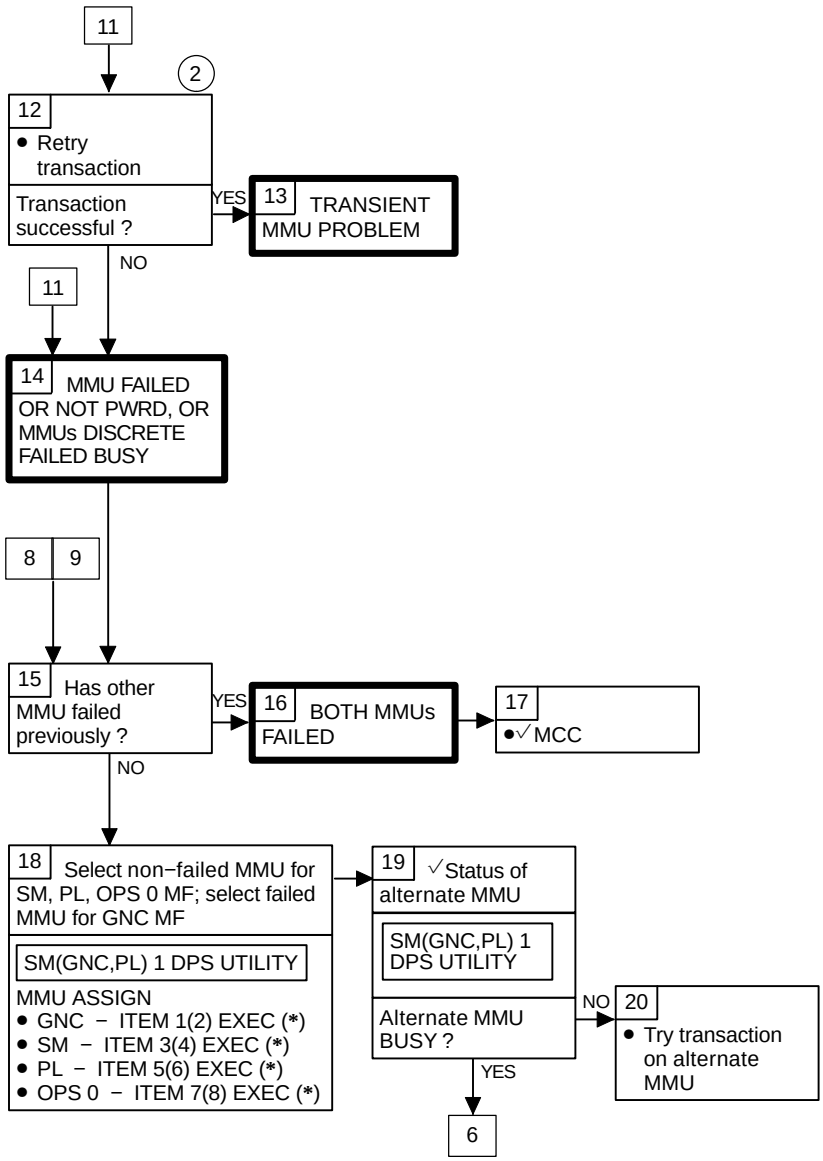
(2) Health of affected MMU can be verified by GNC OPS XTION (with MCC concurrence) or SM roll−in request

(3) If MMU busy for > 70 sec (non−IPL), or > 2 min (IPL), MMU assumed failed. For MCC implemented use of MMU, time may be considerably longer

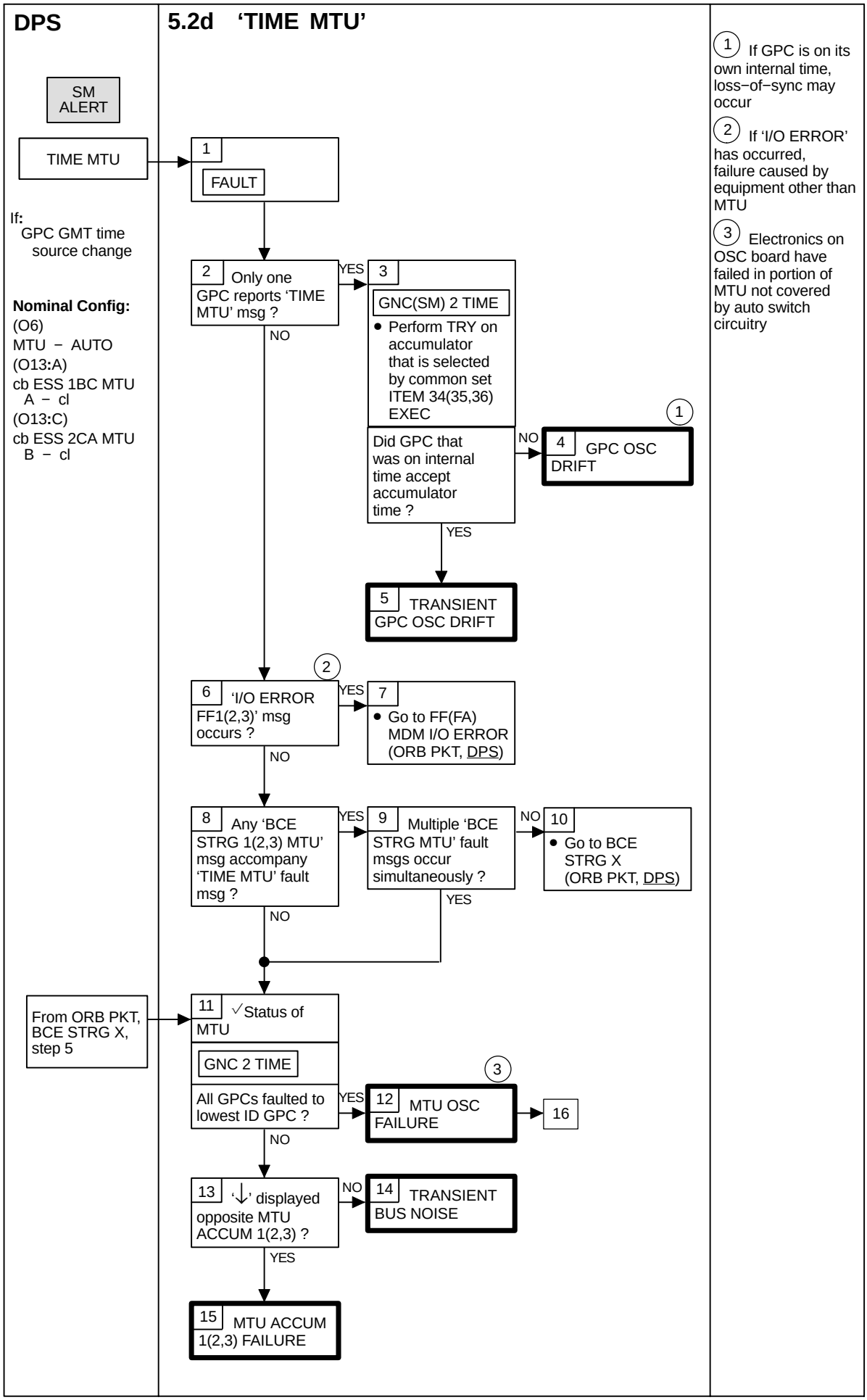
(4) Solid State MMU power cycle shuts down the associated solid state recorders. MCC commanding may be reqd

(5) Cycling pwr causes positioning of tape which may require up to 34 sec

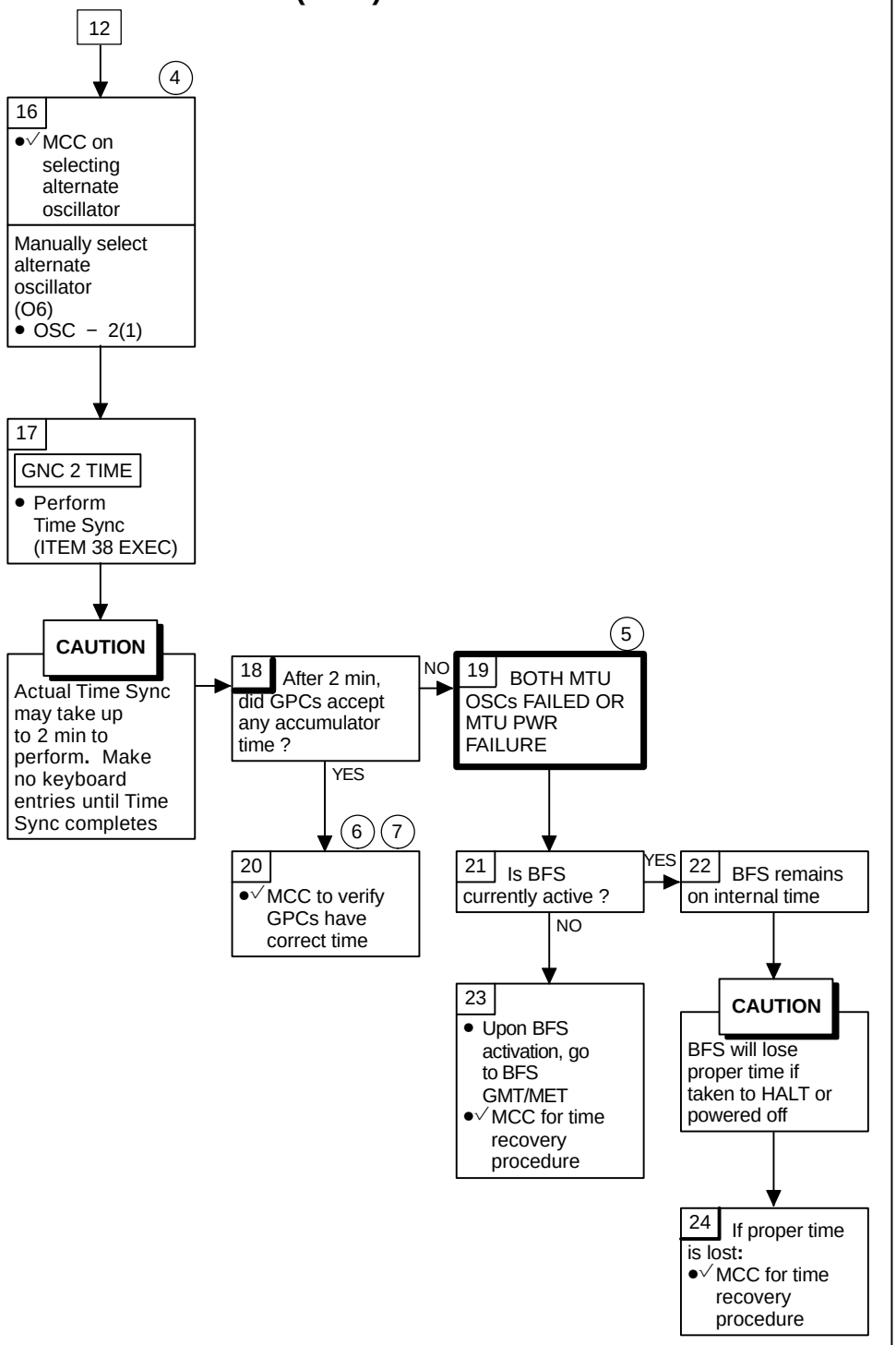
DPS 5.2b (Cont)



(2) Health of affected MMU can be verified by GNC OPS XTION (with MCC concurrence) or SM roll−in request


DPS
5.2d 'TIME MTU'
SM ALERT
TIME MTU
If:
GPC GMT time source change
Nominal Config:
(O6)
MTU − AUTO
(O13:A)
cb ESS 1BC MTU A − cl
(O13:C)
cb ESS 2CA MTU B − cl
1 FAULT
2 Only one GPC reports 'TIME MTU' msg ?
YES
NO
3 GNC(SM) 2 TIME
• Perform TRY on accumulator that is selected by common set ITEM 34(35,36) EXEC
Did GPC that was on internal time accept accumulator time ?
NO
4 GPC OSC DRIFT
YES
5 TRANSIENT GPC OSC DRIFT
6 'I/O ERROR FF1(2,3)' msg occurs ?
YES
NO
7 • Go to FF(FA) MDM I/O ERROR (ORB PKT, DPS)
8 Any 'BCE STRG 1(2,3) MTU' msg accompany 'TIME MTU' fault msg ?
YES
NO
9 Multiple 'BCE STRG MTU' fault msgs occur simultaneously ?
NO
YES
10 • Go to BCE STRG X (ORB PKT, DPS)
From ORB PKT, BCE STRG X, step 5
11 ✓Status of MTU
GNC 2 TIME
All GPCs faulted to lowest ID GPC ?
YES
NO
12 MTU OSC FAILURE
16
13 '↓' displayed opposite MTU ACCUM 1(2,3) ?
NO
YES
14 TRANSIENT BUS NOISE
15 MTU ACCUM 1(2,3) FAILURE
1 If GPC is on its own internal time, loss−of−sync may occur
2 If 'I/O ERROR' has occurred, failure caused by equipment other than MTU
3 Electronics on OSC board have failed in portion of MTU not covered by auto switch circuitry

DPS 5.2d (Cont)



(4) Crew cannot tell which oscillator is currently selected

(5) GPCs will remain on internal time

(6) '↓' on any remaining accumulators does not indicate problem. As long as GPCs accepted some accumulator time, time will update properly

(7) MTU GMT and MET may have errors. D&C Timers are invalid until time is corrected. Action will extinguish any lt on D&C Timers and reenable MTU sync signals

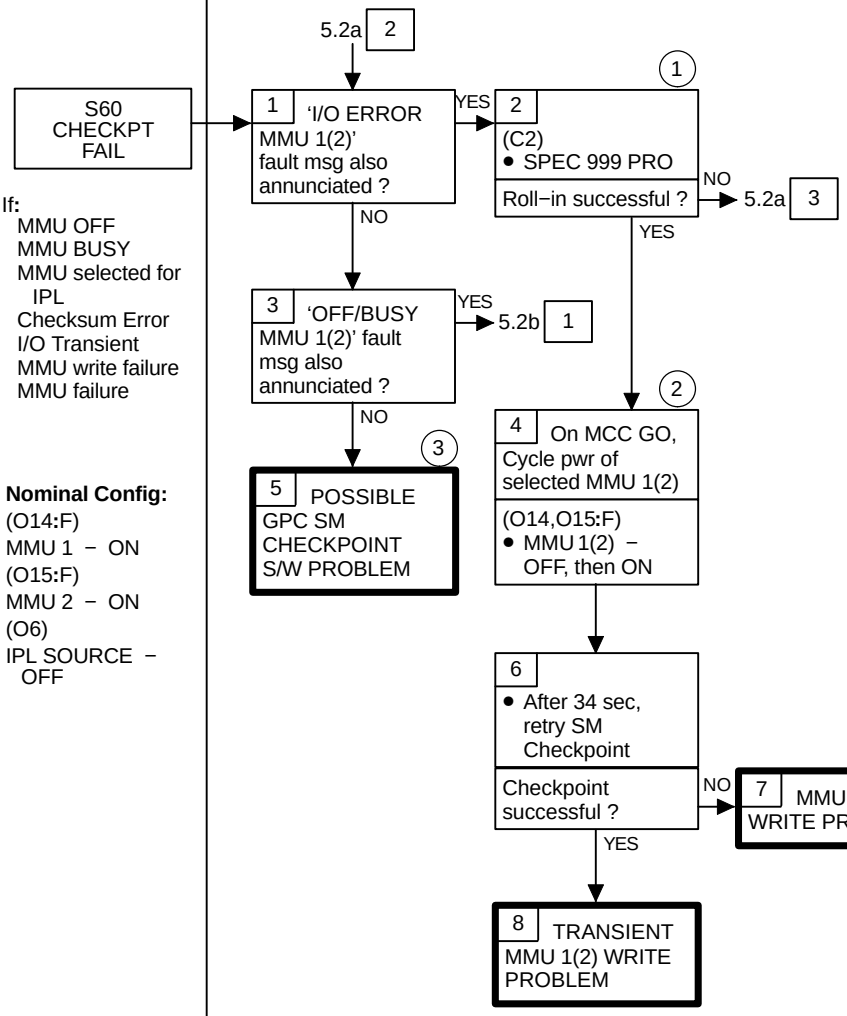
DPS

5.2f CHECKPOINT FAIL

S60 CHECKPT FAIL

If:
- MMU OFF
- MMU BUSY
- MMU selected for IPL
- Checksum Error
- I/O Transient
- MMU write failure
- MMU failure

Nominal Config:
(O14:F)
MMU 1 − ON
(O15:F)
MMU 2 − ON
(O6)
IPL SOURCE − OFF



(1) SPEC 999 may be blank

(2) Solid State MMU power cycle shuts down the associated solid state recorders. MCC commanding may be reqd

(3) MMUs may be used for all other transactions. ✓MCC for possible S/W dump of SM GPC

(4) Affected MMU may be used for any tape read transaction including OPS transitions, TFL loads, and SM roll−in displays

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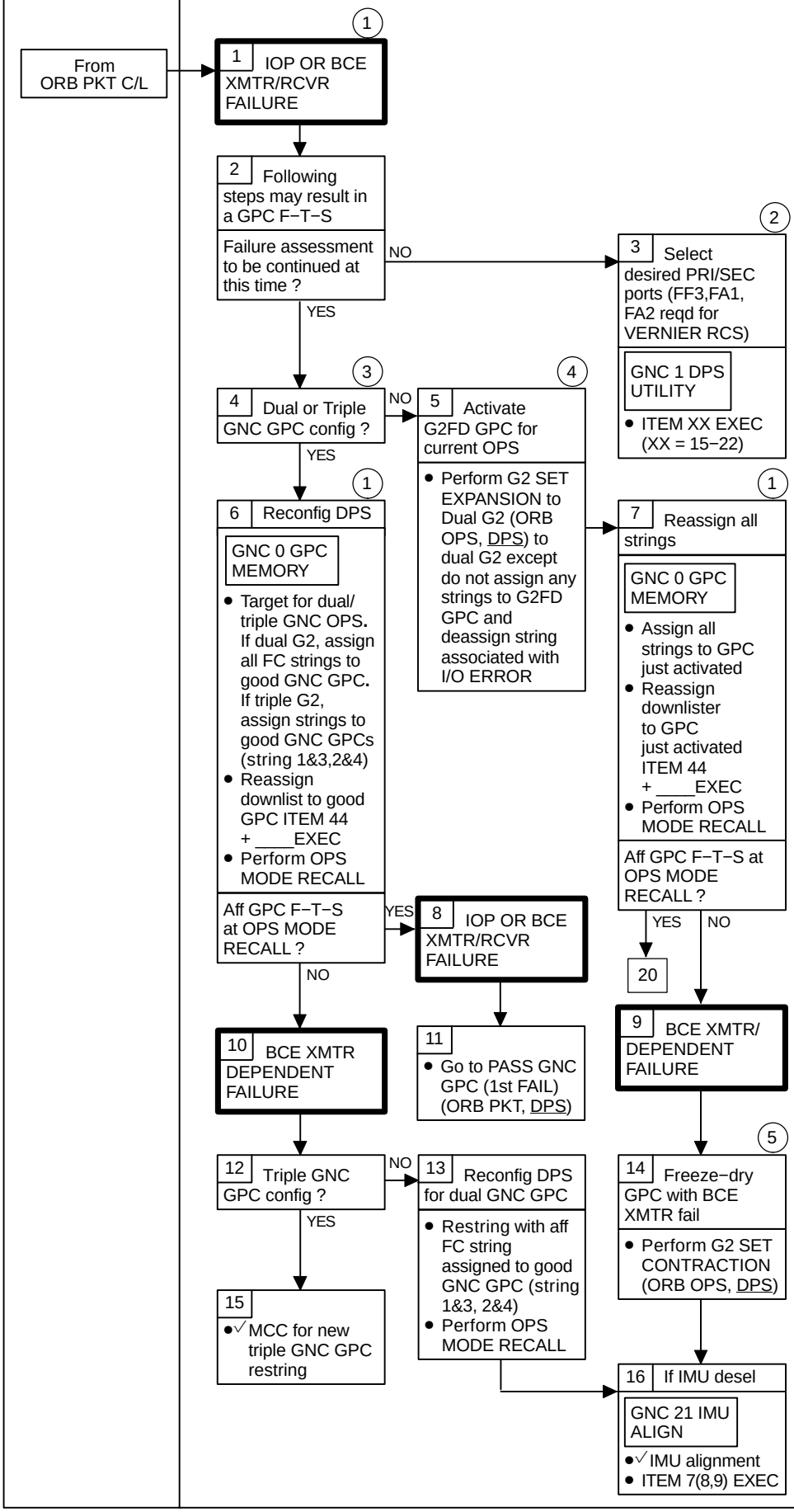
DPS

5.3a 'I/O ERROR FF(FA)'



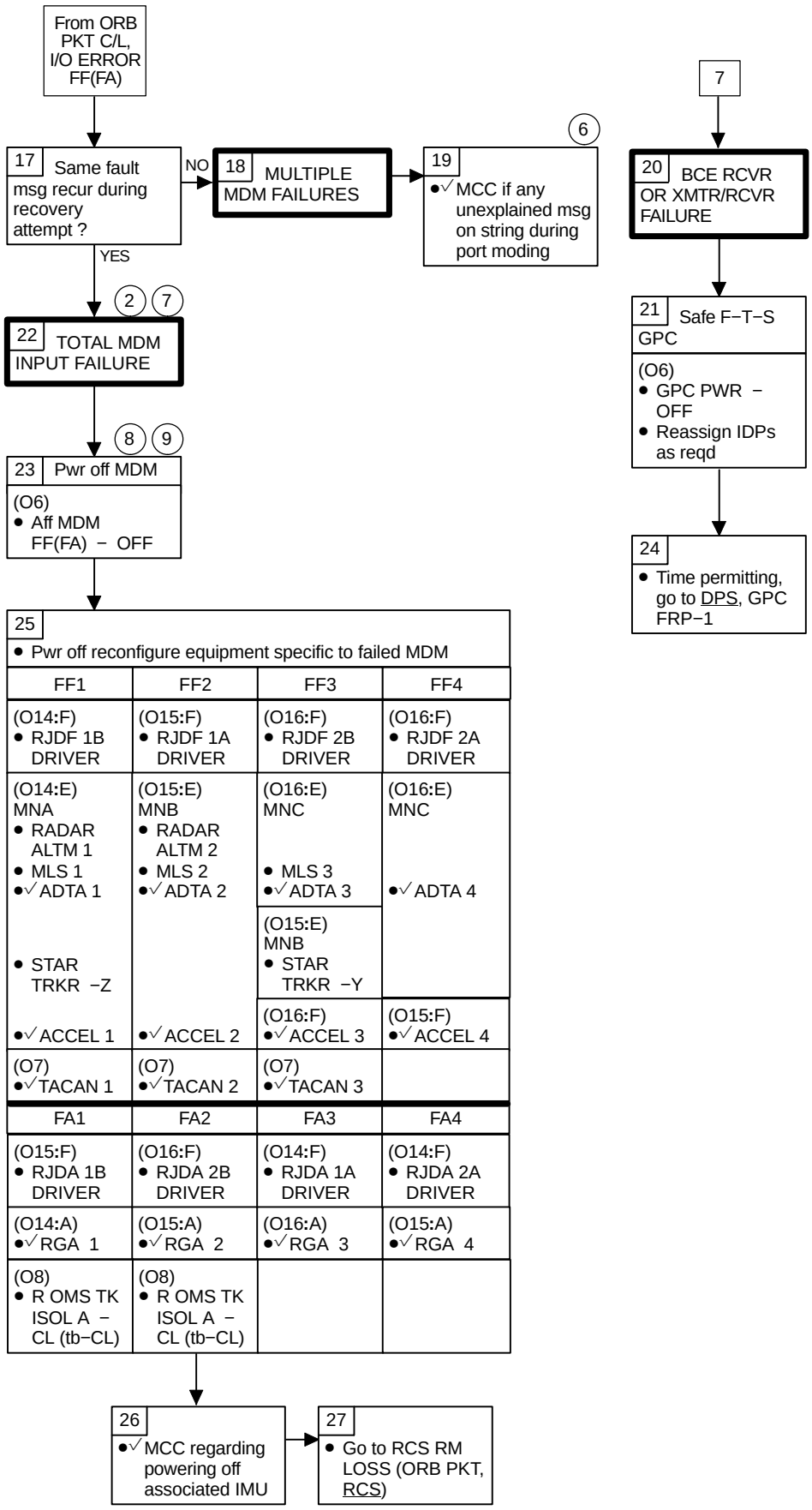
(1) Mult MDM or GPC failures indicated if 'I/O ERROR' msg reoccurs after restring with no F−T−S at blocks 6 or 7. ✓MCC

(2) Go to MDM (REF) for summary of data lost on non−recovered MDM

(3) BCE XMTR/ RCVR failures cannot be differentiated from BCE XMTR only failures in single GNC GPC configs. Failure mode will affect DPS config in G3

(4) Original GPC will F−T−S before overlays can be transferred to G2FD GPC if original GPC has BCE receiver failure on Flt Critical 1,2,3 if affected string is not deassigned for set expansion. Flt Critical 4 problem is handled same as Flt Critical 1,2,3 for procedure simplicity

(5) If G8 OPS, delay G2 freeze−dry activity until after transition back to G2



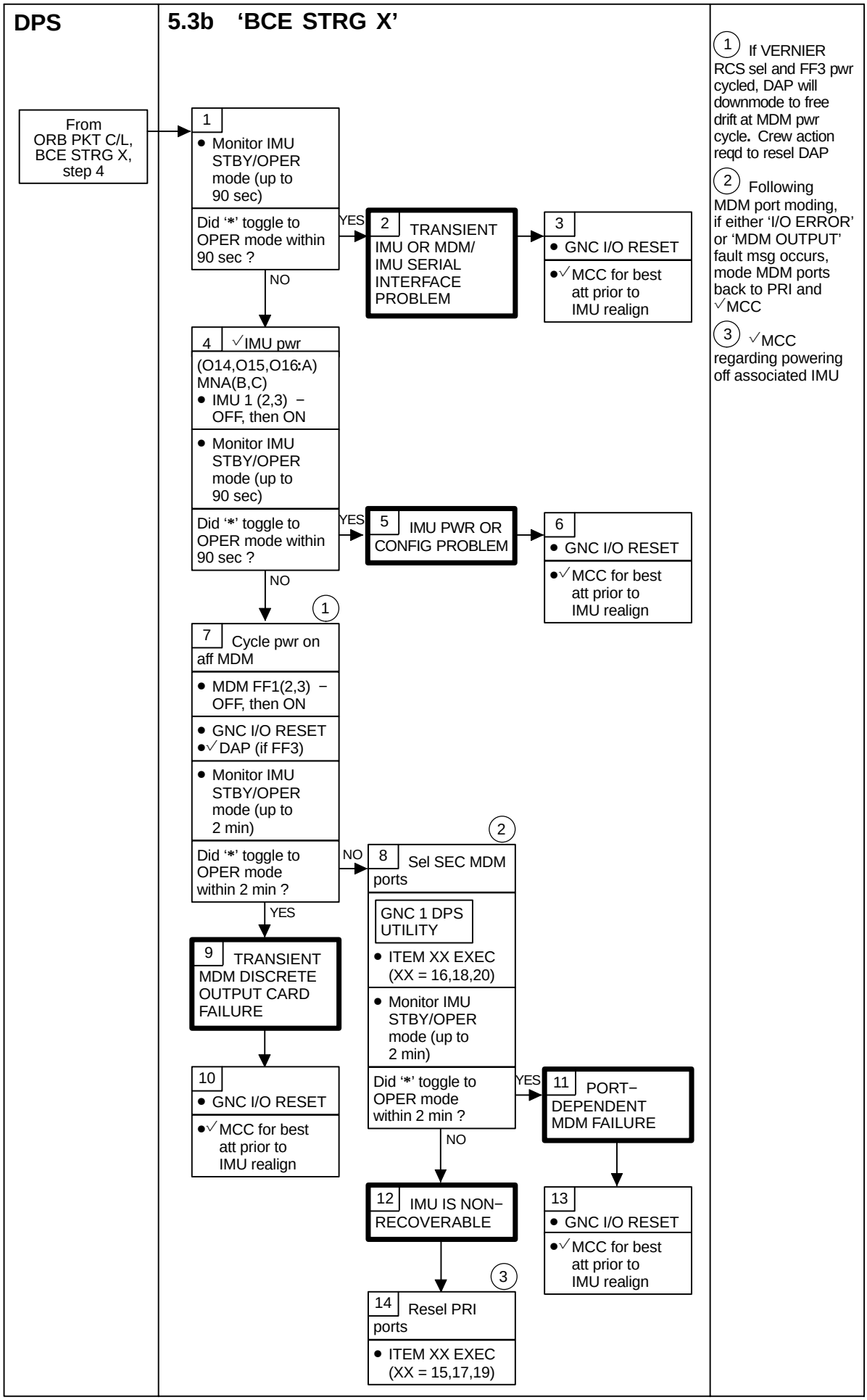
(2) Go to MDM (REF) for summary of data lost on non−recovered MDM

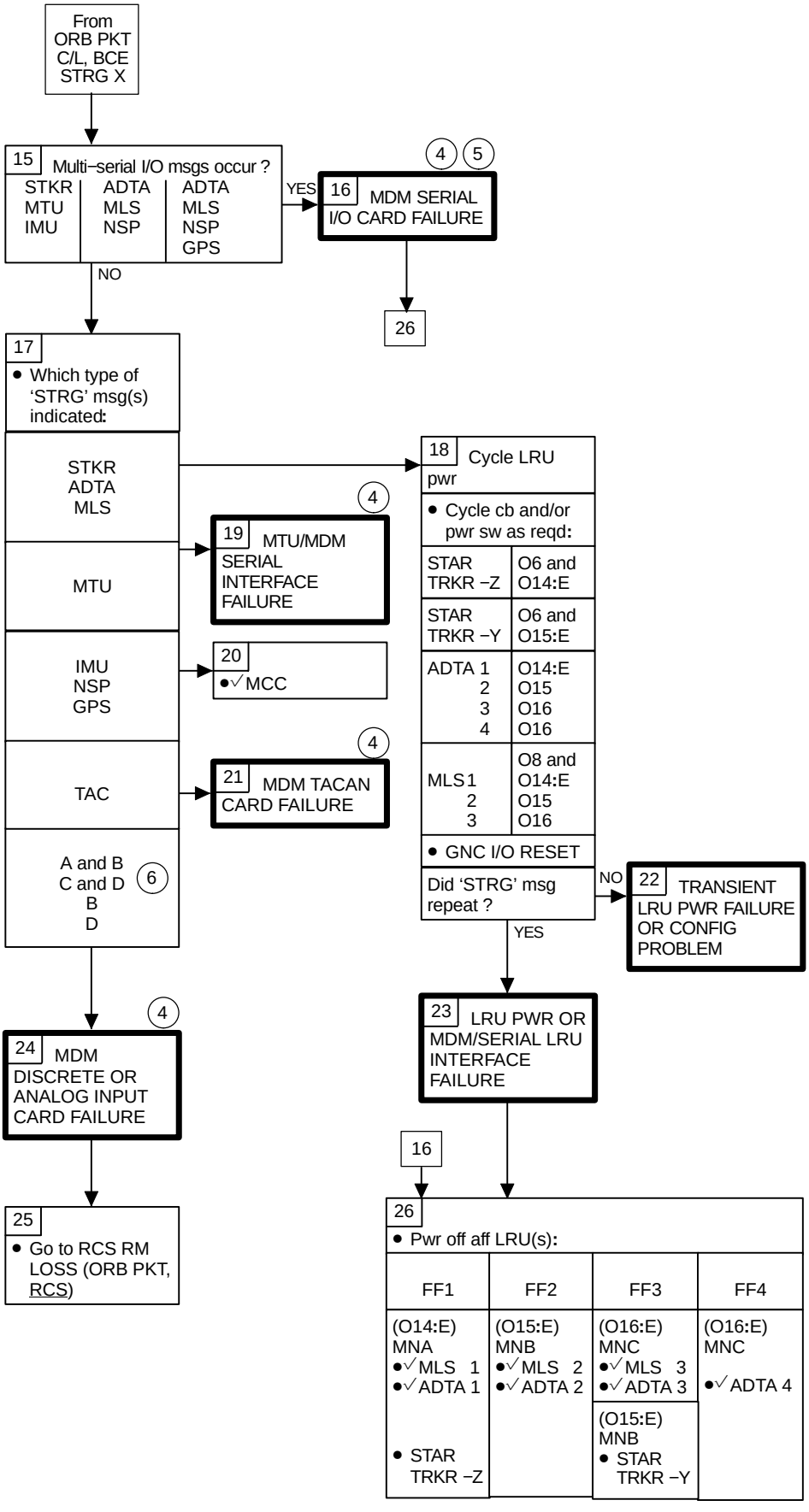
(6) Multiple MDM failures if any:
- 'BCE STRG'
- 'MDM OUTPUT' during attempt to recover 'I/O ERROR'
- 'I/O ERROR' during attempt to recover 'MDM OUTPUT'

(7) Outputs may be good, erroneous or non−existent. At later time, MCC may wish to perform MM202 OMS TVC chk to assess MDM's output capability

(8) If next ELEC, ECLS, APU/HYD, GNC, RCS, or DPS failure causes loss of fail−safe capability in FCS or RCS, the MDM may be repowered in order to regain any remaining output capability

(9) If failed MDM is FF1, FF2, or FF3, MDM may be candidate for MDM CHANGEOUT (IFM). ✓MCC


DPS
5.3b 'BCE STRG X'
From ORB PKT C/L, BCE STRG X, step 4
1
• Monitor IMU STBY/OPER mode (up to 90 sec)
Did '*' toggle to OPER mode within 90 sec ?
YES
NO
2 TRANSIENT IMU OR MDM/ IMU SERIAL INTERFACE PROBLEM
3
• GNC I/O RESET
•✓MCC for best att prior to IMU realign
4 ✓IMU pwr
(O14,O15,O16:A) MNA(B,C)
• IMU 1 (2,3) − OFF, then ON
• Monitor IMU STBY/OPER mode (up to 90 sec)
Did '*' toggle to OPER mode within 90 sec ?
YES
NO
5 IMU PWR OR CONFIG PROBLEM
6
• GNC I/O RESET
•✓MCC for best att prior to IMU realign
1
7 Cycle pwr on aff MDM
• MDM FF1(2,3) − OFF, then ON
• GNC I/O RESET
•✓DAP (if FF3)
• Monitor IMU STBY/OPER mode (up to 2 min)
Did '*' toggle to OPER mode within 2 min ?
NO
YES
2
8 Sel SEC MDM ports
GNC 1 DPS UTILITY
• ITEM XX EXEC (XX = 16,18,20)
• Monitor IMU STBY/OPER mode (up to 2 min)
Did '*' toggle to OPER mode within 2 min ?
YES
NO
9 TRANSIENT MDM DISCRETE OUTPUT CARD FAILURE
10
• GNC I/O RESET
•✓MCC for best att prior to IMU realign
11 PORT− DEPENDENT MDM FAILURE
13
• GNC I/O RESET
•✓MCC for best att prior to IMU realign
12 IMU IS NON− RECOVERABLE
3
14 Resel PRI ports
• ITEM XX EXEC (XX = 15,17,19)
1 If VERNIER RCS sel and FF3 pwr cycled, DAP will downmode to free drift at MDM pwr cycle. Crew action reqd to resel DAP
2 Following MDM port moding, if either 'I/O ERROR' or 'MDM OUTPUT' fault msg occurs, mode MDM ports back to PRI and ✓MCC
3 ✓MCC regarding powering off associated IMU



(4) Go to MDM (REF) for summary of data lost on nonrecovered MDM

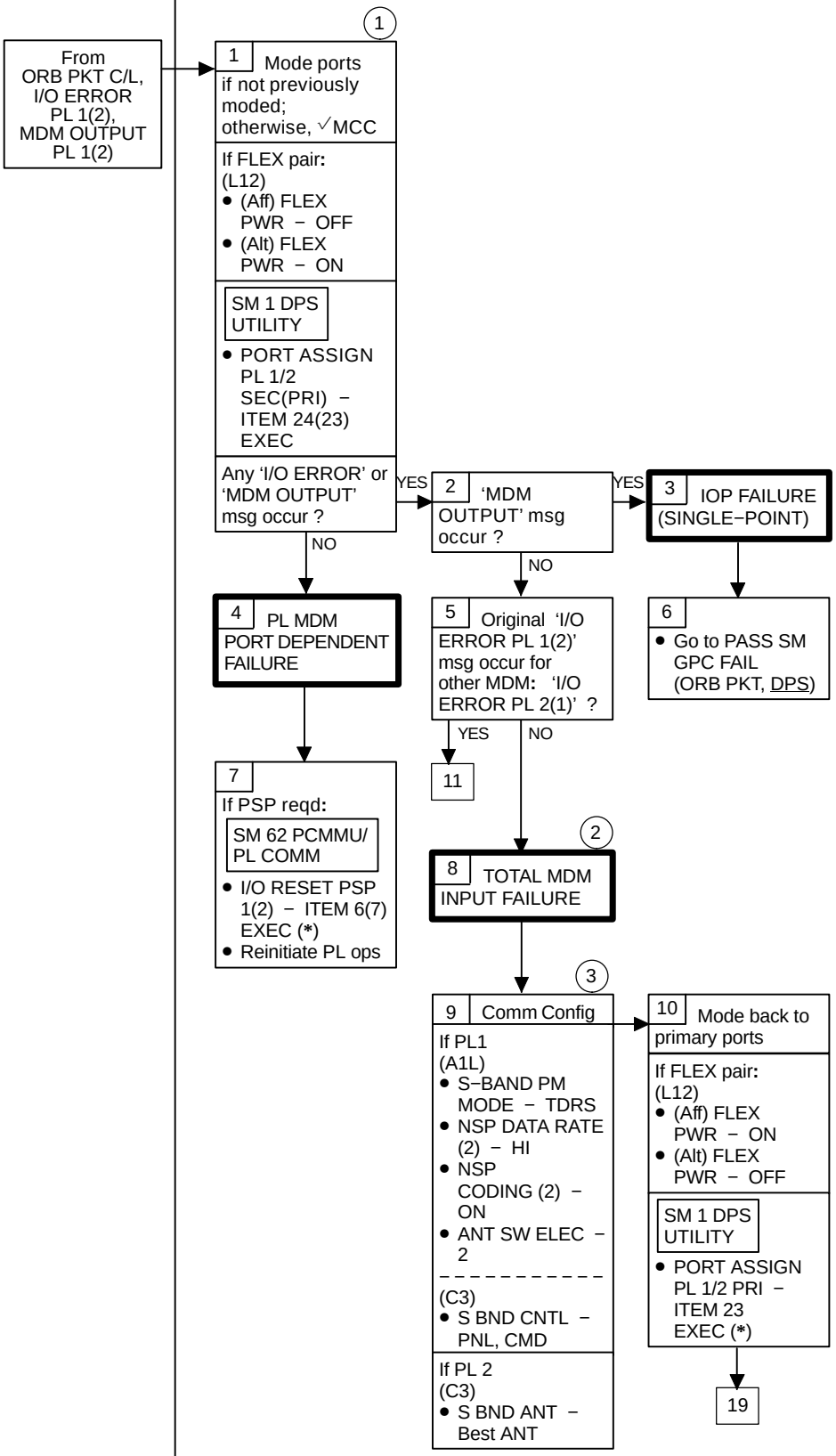
(5) Total serial I/O card failures may result in single or multiple 'BCE STRG' msgs:

Card Adrs	G2	G8
03	IMU MTU STKR	IMU MTU STKR
11	NSP GPS	MLS ADTA NSP GPS

(6) 'BCE STRG A(C)' msgs will always occur in combination with 'BCE STRG B(D)' msg (MDM card failure) or in combination with 'I/O ERROR' msg or 'MDM OUTPUT' msg (IOP or total MDM failure)

DPS

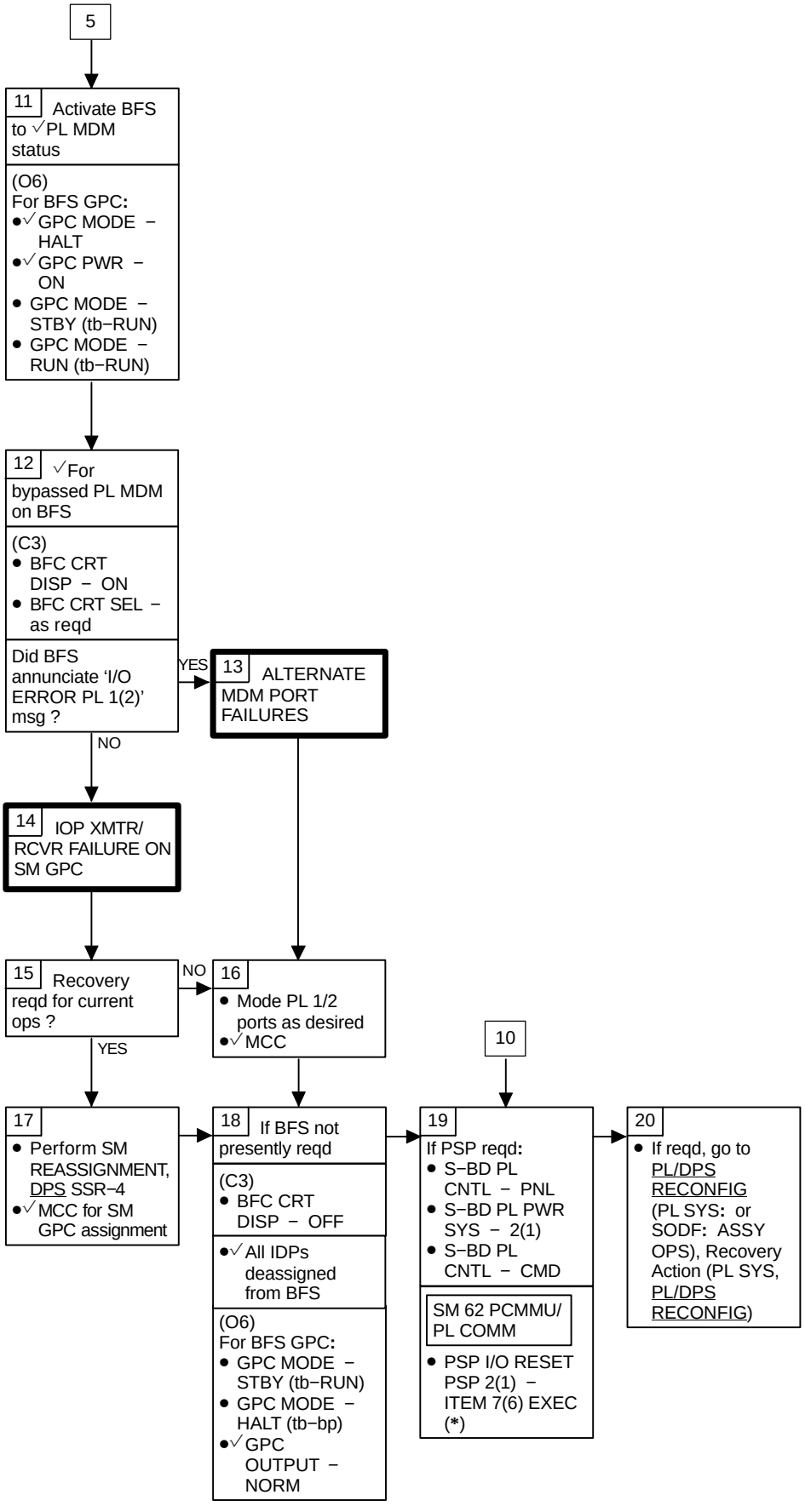
5.3c 'I/O ERROR PL1(2)' 'MDM OUTPUT PL1(2)'



(1) Port moding and I/O RESET causes fault msgs to occur for all previously bypassed LRU(s), BTU(s), Payload Signal Processor, mission selectable processes, and mission unique processes

(2) MDM outputs may still be good. MCC will advise if MDM should be turned off. Refer to MDM (REF DATA) for summary of data

(3) 140 sec pwr−amp warmup


5
11 Activate BFS to ✓PL MDM status
(O6)
For BFS GPC:
●✓GPC MODE − HALT
●✓GPC PWR − ON
● GPC MODE − STBY (tb−RUN)
● GPC MODE − RUN (tb−RUN)
12 ✓For bypassed PL MDM on BFS
(C3)
● BFC CRT DISP − ON
● BFC CRT SEL − as reqd
Did BFS annunciate 'I/O ERROR PL 1(2)' msg ?
YES
13 ALTERNATE MDM PORT FAILURES
NO
14 IOP XMTR/ RCVR FAILURE ON SM GPC
15 Recovery reqd for current ops ?
NO
16
● Mode PL 1/2 ports as desired
●✓MCC
YES
10
17
● Perform SM REASSIGNMENT, DPS SSR−4
●✓MCC for SM GPC assignment
18 If BFS not presently reqd
(C3)
● BFC CRT DISP − OFF
●✓All IDPs deassigned from BFS
(O6)
For BFS GPC:
● GPC MODE − STBY (tb−RUN)
● GPC MODE − HALT (tb−bp)
●✓GPC OUTPUT − NORM
19
If PSP reqd:
● S−BD PL CNTL − PNL
● S−BD PL PWR SYS − 2(1)
● S−BD PL CNTL − CMD
SM 62 PCMMU/ PL COMM
● PSP I/O RESET PSP 2(1) − ITEM 7(6) EXEC (*)
20
● If reqd, go to PL/DPS RECONFIG (PL SYS: or SODF: ASSY OPS), Recovery Action (PL SYS, PL/DPS RECONFIG)

DPS

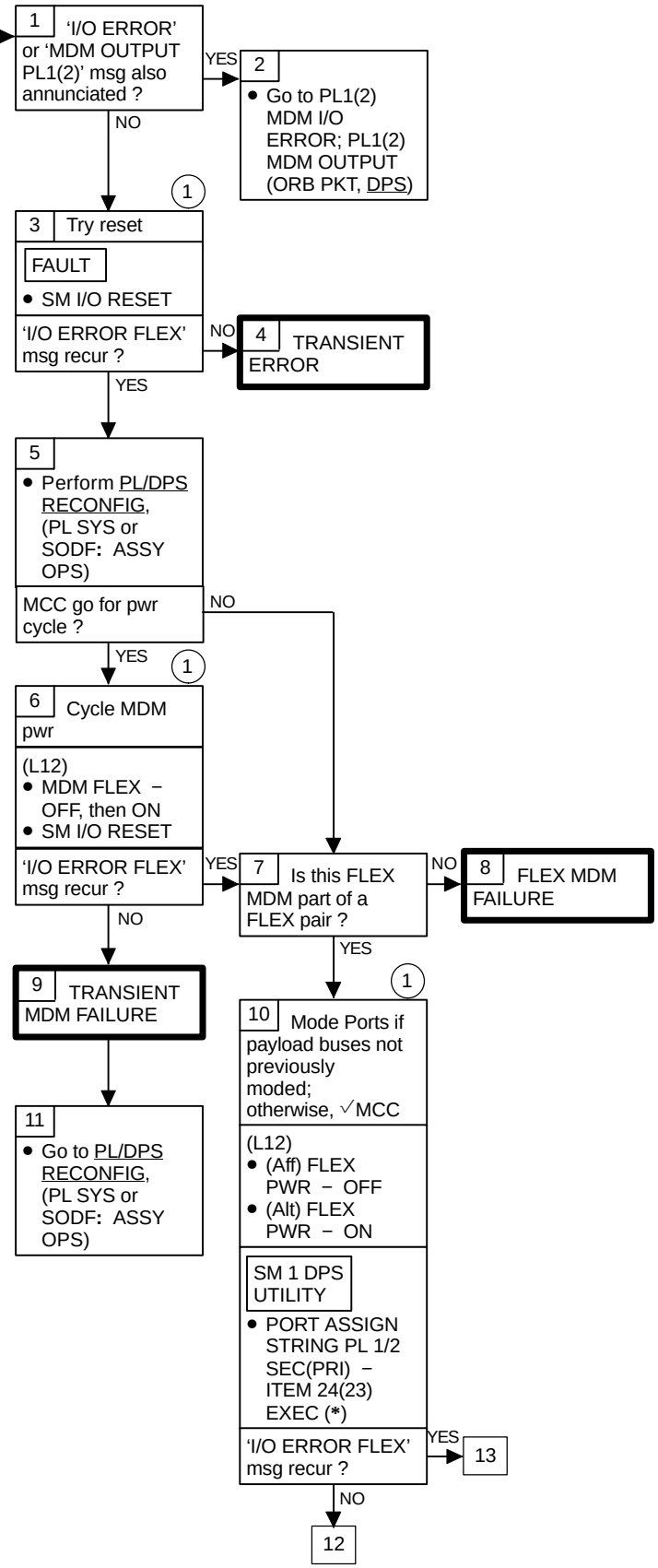
5.3e 'I/O ERROR FLEX'

SM ALERT

I/O ERROR FLEX

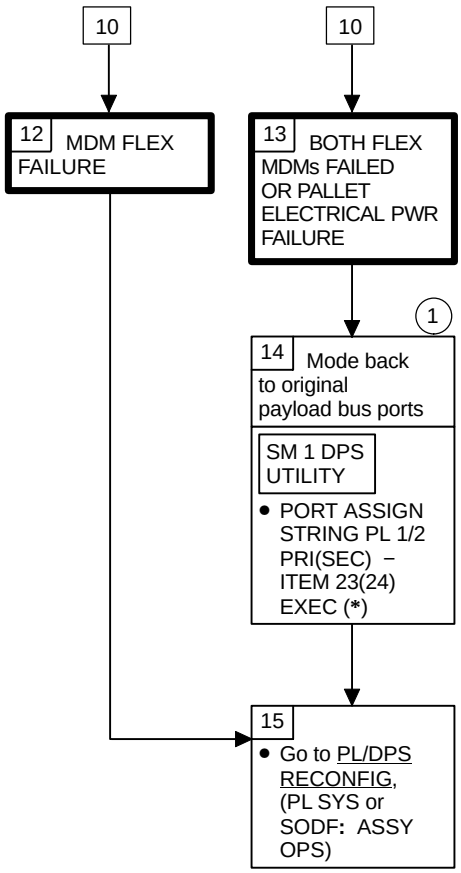
If:
- MDM FLEX failure
- IOP failure
- IOP Xmtr/Rcvr failure
- Pallet electrical failure

Nominal Config:
(L12)
MDM FLEX − ON
or
MDM FLEX 1(2) − ON
MDM FLEX 2(1) − OFF



(1) Port moding and I/O RESET causes fault msgs to occur for all previously bypassed LRU(s), BTU(s), Payload Signal Processor, mission selectable processes, and mission unique processes

DPS 5.3e (Cont)



(1) Port moding and I/O RESET causes fault msgs to occur for all previously bypassed LRU(s), BTU(s), Payload Signal Processor, mission selectable processes, and mission unique processes

DPS

5.3f 'BCE BYP FLEX'

SM ALERT

BCE BYP FLEX

If:
- MDM FLEX Card failure
- MDM/LRU FLEX interface failure
- IOP failure
- IOP Xmtr/Rcvr failure

Nominal Config:
(L12)
MDM FLEX − ON
or
MDM FLEX 1(2) − ON
MDM FLEX 2(1) − OFF

1 'I/O ERROR' or 'MDM OUTPUT PL1(2)' msg also annunciated ?

YES

2
- Go to PL1(2) MDM I/O ERROR; PL1(2) MDM OUTPUT (ORB PKT, DPS)

NO

(1)

3
FAULT
- SM I/O RESET

'BCE BYP FLEX' msg recur ?

NO

4 TRANSIENT ERROR

YES

5
- Perform PL/DPS RECONFIG, (PL SYS or SODF: ASSY OPS)

(1)

6 Cycle MDM pwr

(L12)
- MDM FLEX PWR − OFF, then ON

- SM I/O RESET

'BCE BYP FLEX' msg recur ?

YES

7 FLEX pair onboard ?

NO

8 MDM FLEX INPUT CARD FAILURE

YES

NO

9 TRANSIENT INPUT CARD ERROR

11
- Go to PL/DPS RECONFIG, (PL SYS or SODF: ASSY OPS)

(1)

10 Mode PL Bus ports for selection of alt FLEX MDM if ports not previously moded; otherwise, ✓MCC

(L12)
- (Aff) MDM FLEX PWR − OFF
- (Alt) MDM FLEX PWR − ON

SM 1 DPS UTILITY
- PORT ASSIGN STRING PL 1/2 SEC(PRI) − ITEM 24(23) EXEC (*)

'BCE BYP FLEX' msg recur ?

NO

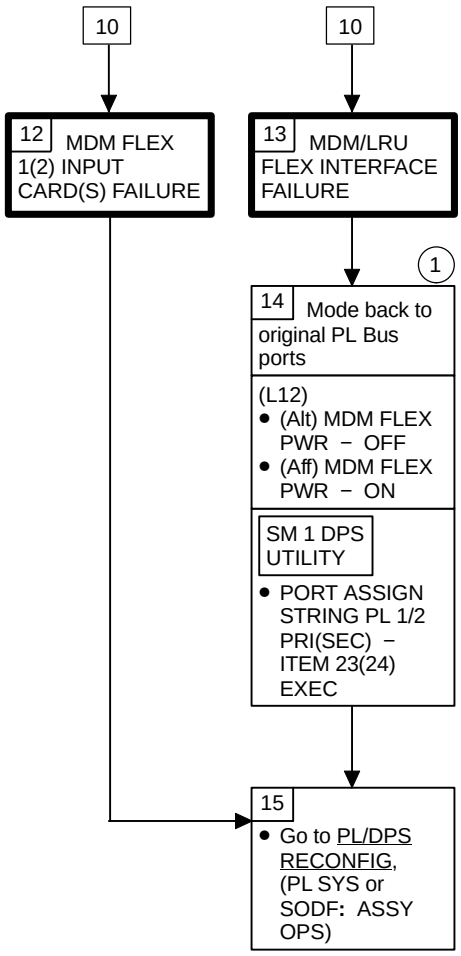
12

YES

13

(1) Port moding or I/O RESET causes fault msgs to occur for all previously bypassed LRU(s), BTU(s), Payload Signal Processor, mission selectable processes, and mission unique processes

DPS 5.3f (Cont)



(1) Port moding or I/O RESET causes fault msgs to occur for all previously bypassed LRU(s), BTU(s), Payload Signal Processor, mission selectable processes, and mission unique processes

DPS

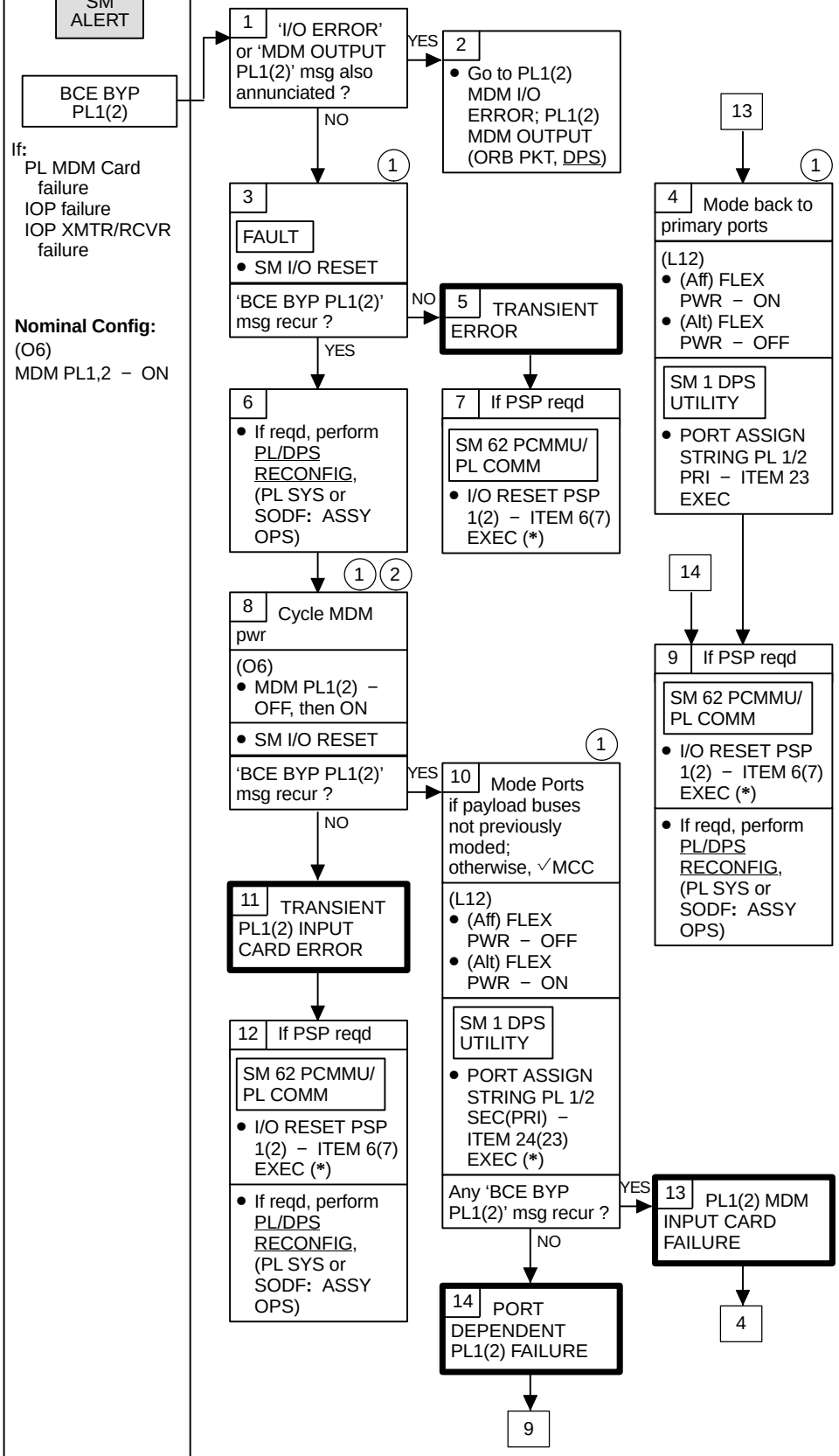
SM ALERT

BCE BYP PL1(2)

If:
- PL MDM Card failure
- IOP failure
- IOP XMTR/RCVR failure

Nominal Config:
(O6)
MDM PL1,2 − ON

5.3g 'BCE BYP PL1(2)'



(1) Port moding and I/O RESET causes fault msgs to occur for all previously bypassed LRU(s), BTU(s), Payload Signal Processor, mission selectable processes, and mission unique processes

(2) Associated GCIL Decoder now disabled. Associate recorders will now use pnl A1 sw positions

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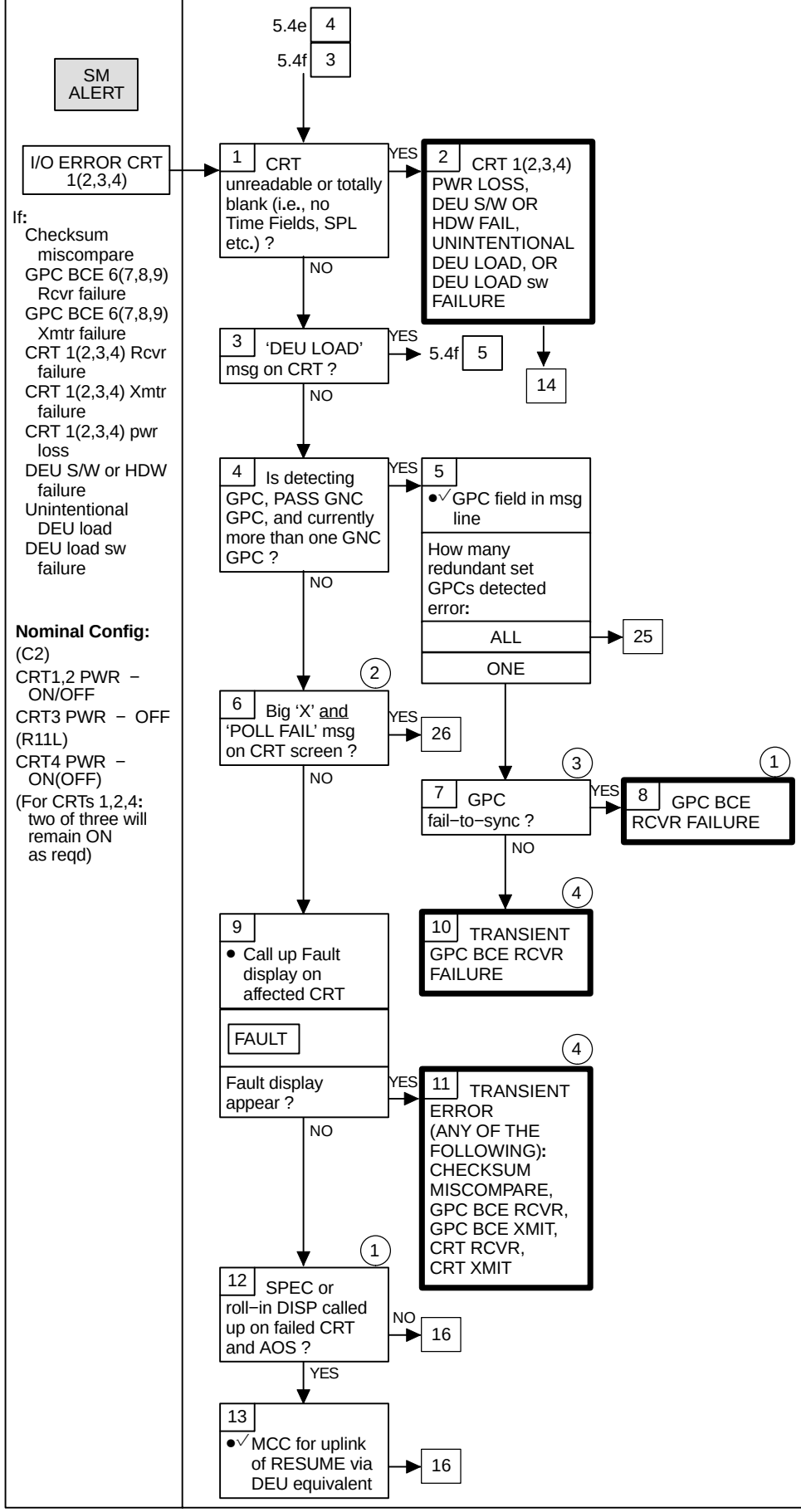
DPS

5.4a 'I/O ERROR CRT 1(2,3,4)'



If:
- Checksum miscompare
- GPC BCE 6(7,8,9) Rcvr failure
- GPC BCE 6(7,8,9) Xmtr failure
- CRT 1(2,3,4) Rcvr failure
- CRT 1(2,3,4) Xmtr failure
- CRT 1(2,3,4) pwr loss
- DEU S/W or HDW failure
- Unintentional DEU load
- DEU load sw failure

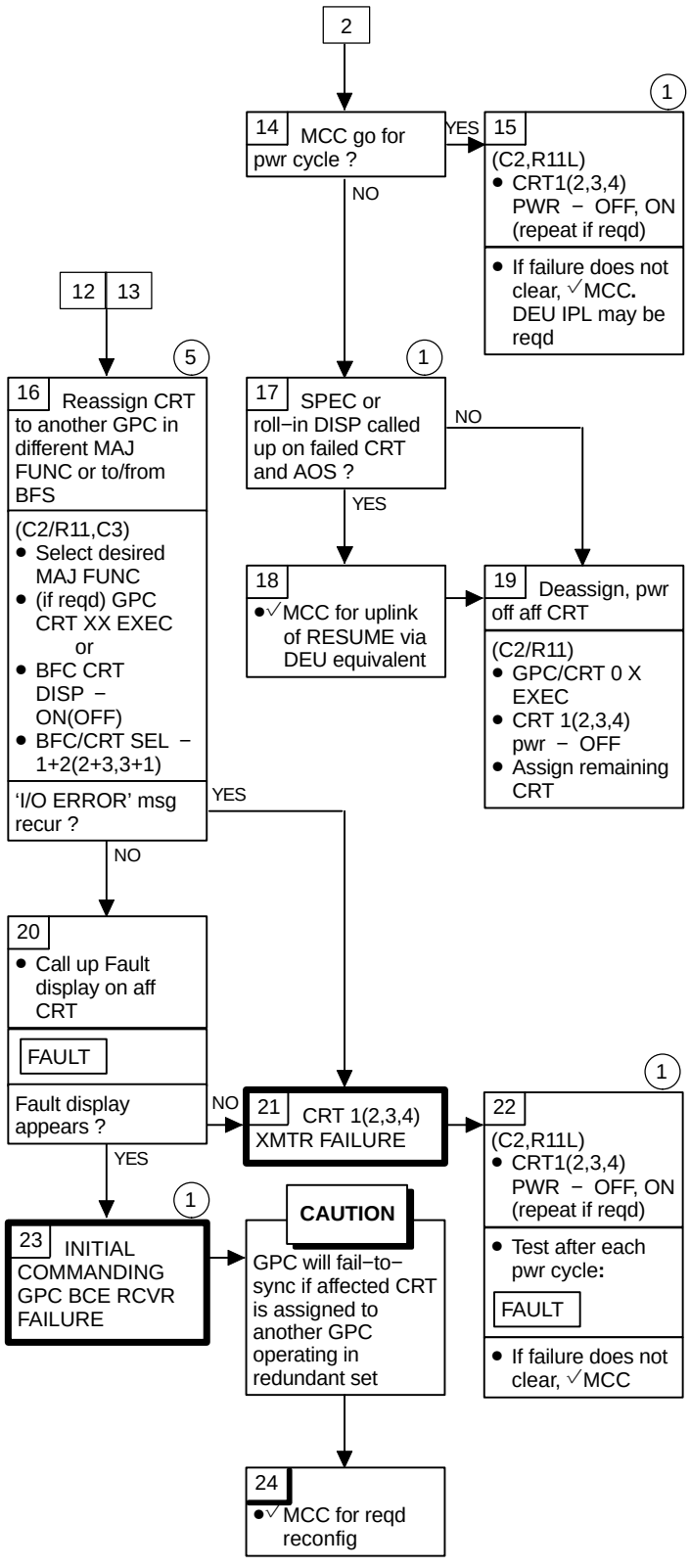
Nominal Config:
(C2)
CRT1,2 PWR − ON/OFF
CRT3 PWR − OFF (R11L)
CRT4 PWR − ON(OFF)
(For CRTs 1,2,4: two of three will remain ON as reqd)

(1) If failure does not clear, any SPEC or roll−in DISP active or buried on failed CRT will be trapped in GPC SW and counted against 2 SPEC/roll−in DISP limit per MF. Affected SPECs/roll−in DISPs are still available on other CRTs. SPEC/roll−in DISP can be released via OPS transition or DEU equivalent RESUME. If DISP was called up over a SPEC, two DEU equivalent RESUMEs may be reqd

(2) Both big 'X' and 'POLL FAIL' msgs appear for complete data path failure. Appearance of only one msg indicates either GPC or DEU internal S/W or HDW error has occurred. ✓MCC

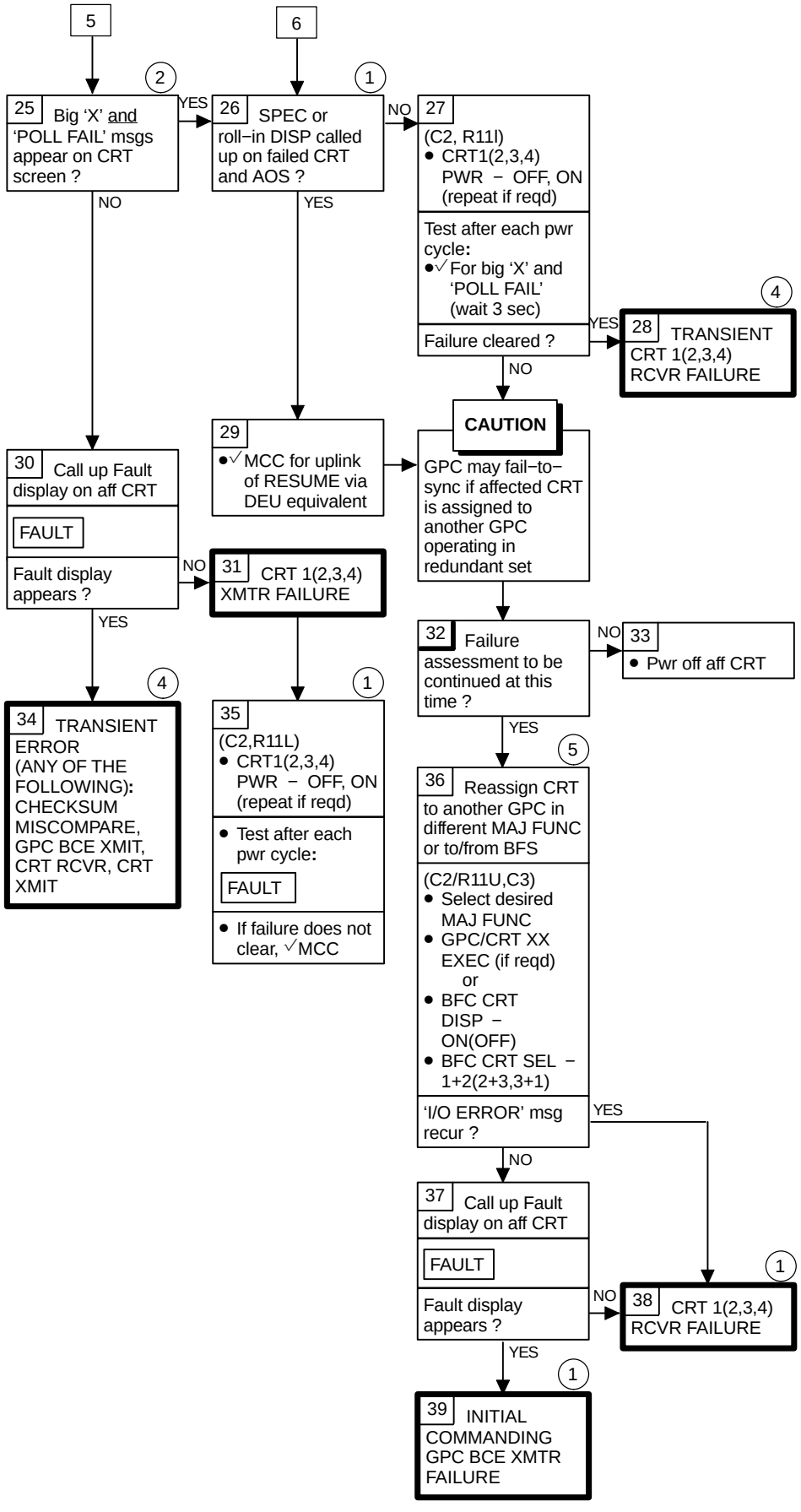
(3) GPC will fail−to−sync after two consecutive nonuniversal I/O errors

(4) Any kybd entry just prior to I/O ERROR CRT 1(2,3,4)' msg may have to be reentered



(1) If failure does not clear, any SPEC or roll−in DISP active or buried on failed CRT will be trapped in GPC SW and counted against 2 SPEC/roll−in DISP limit per MF. Affected SPECs/roll−in DISPs are still available on other CRTs. SPEC/roll−in DISP can be released via OPS transition or DEU equivalent RESUME. If DISP was called up over a SPEC, two DEU equivalent RESUMEs may be reqd

(5) GPC/CRT key input must be made on kybd with active GPC interface. Always use PASS kybd to avoid dual commanders. If assigning CRT to/from BFS, always deassign CRT first. Note that BFC CRT DISPLAY/SELECT sw will override any GPC/CRT kybd entry



(1) If failure does not clear, any SPEC or roll−in DISP active or buried on failed CRT will be trapped in GPC SW and counted against 2 SPEC/roll−in DISP limit per MF. Affected SPECs/roll−in DISPs are still available on other CRTs. SPEC/roll−in DISP can be released via OPS transition or DEU equivalent RESUME. If DISP was called up over a SPEC, two DEU equivalent RESUMEs may be reqd

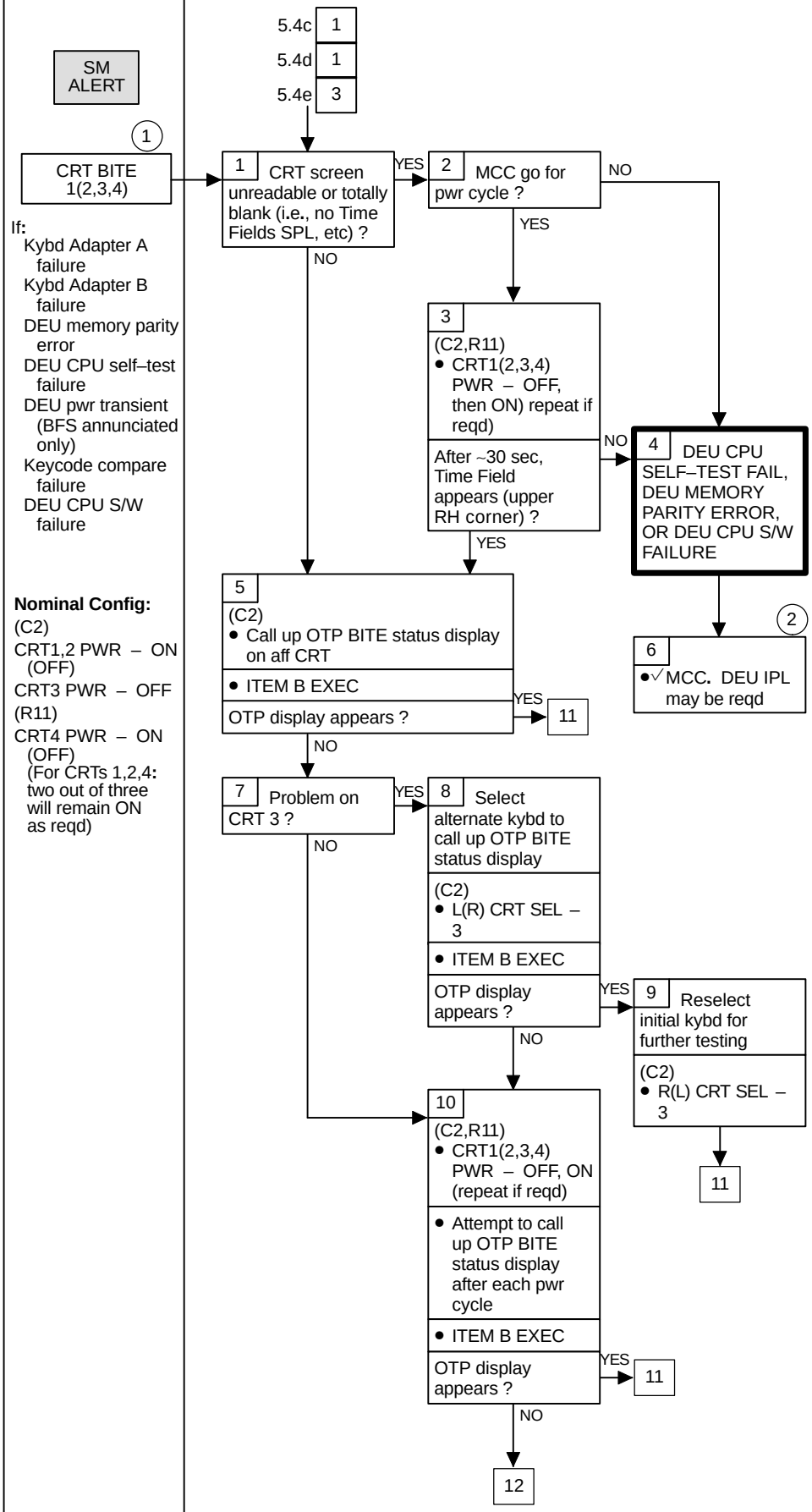
(2) Both big 'X' and 'POLL FAIL' msgs appear for complete data path failure. Appearance of only one msg indicates either GPC or DEU internal S/W or HDW error has occurred. ✓MCC

(4) Any kybd entry just prior to 'I/O ERROR CRT 1(2,3,4)' msg may have to be reentered

(5) GPC/CRT key input must be made on kybd with active GPC interface. Always use PASS kybd to avoid dual commanders. If assigning CRT to/from BFS, always deassign CRT first. Note that BFC CRT DISPLAY/SELECT sw will override any GPC/CRT kybd entry

DPS

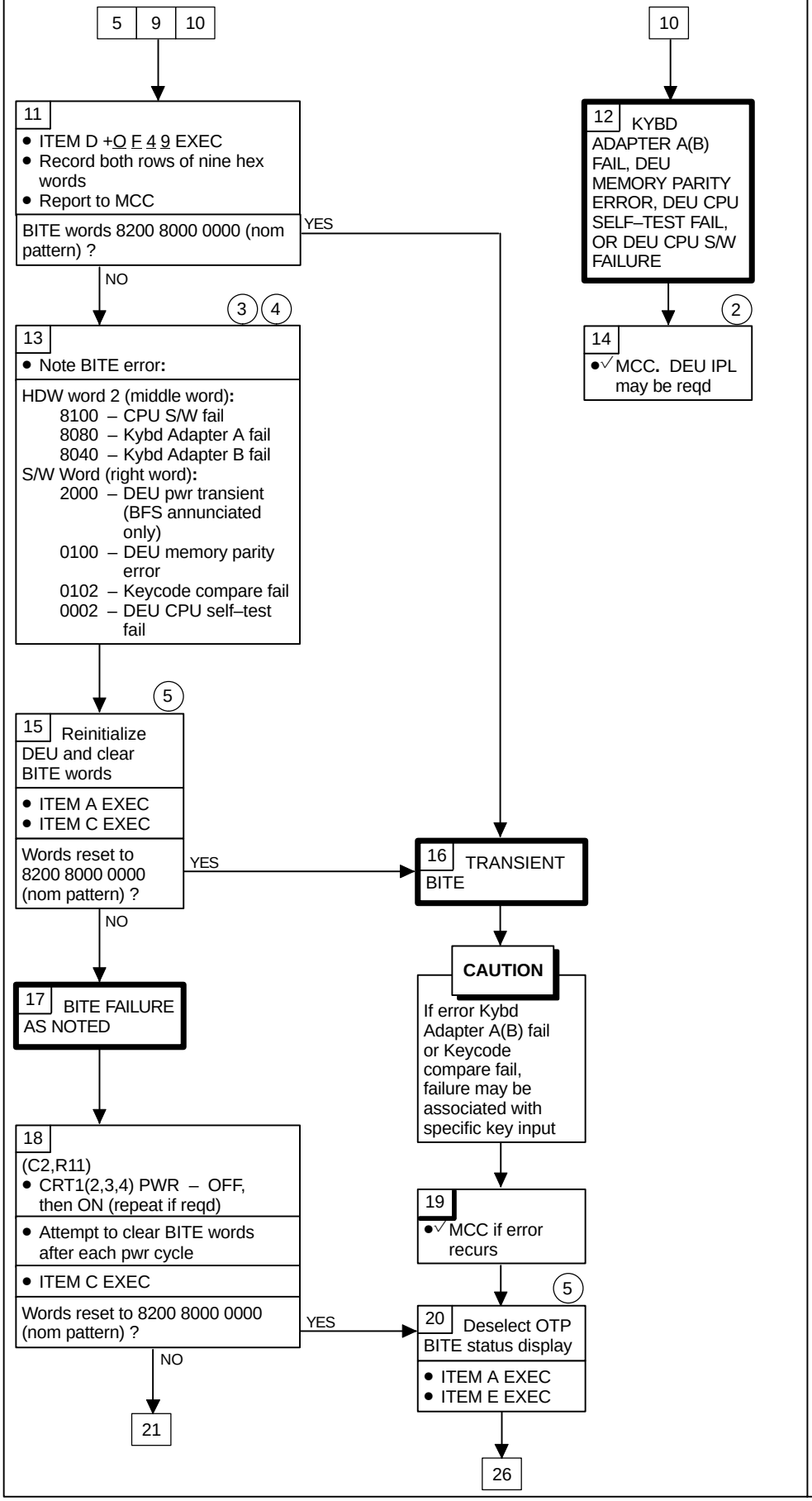
5.4b 'CRT BITE 1(2,3,4)'



1 'POLL FAIL' msg should appear on affected PASS CRT. BFS does not inhibit polling for BITE errors

2 User cannot RESUME CRT display. Any SPEC or roll–in DISP called on CRT will remain counted against 2 SPEC/2 roll–in DISP limit. SPEC/roll–in DISP can be released via OPS transition

DPS 5.4b (Cont)



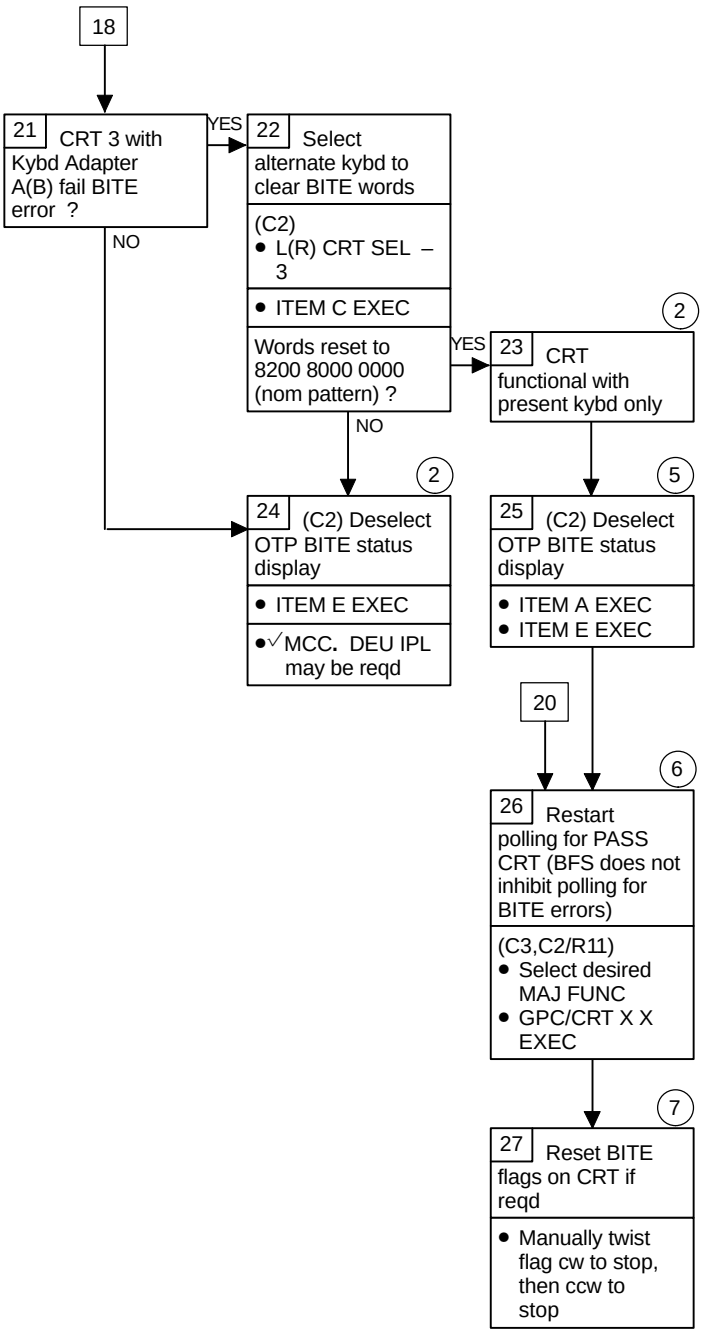
(2) User cannot RESUME CRT display. Any SPEC or roll–in DISP called on CRT will remain counted against 2 SPEC/2 roll–in DISP limit. SPEC/roll–in DISP can be released via OPS transition

(3) Listed status words for single failures only. Multiple failures summed. For multiple failures, record BITE words and continue

(4) Probability exists for getting memory parity error when MF sw for affected CRT is moved from one position to another (i.e., GNC to SM) (SMS DO23)

(5) Expect BITE words of 8202, 8100, 2000 after execution of ITEM A

DPS 5.4b (Cont)



(2) User cannot RESUME CRT display. Any SPEC or roll–in DISP called on CRT will remain counted against 2 SPEC/2 roll–in DISP limit. SPEC/roll–in DISP can be released via OPS transition

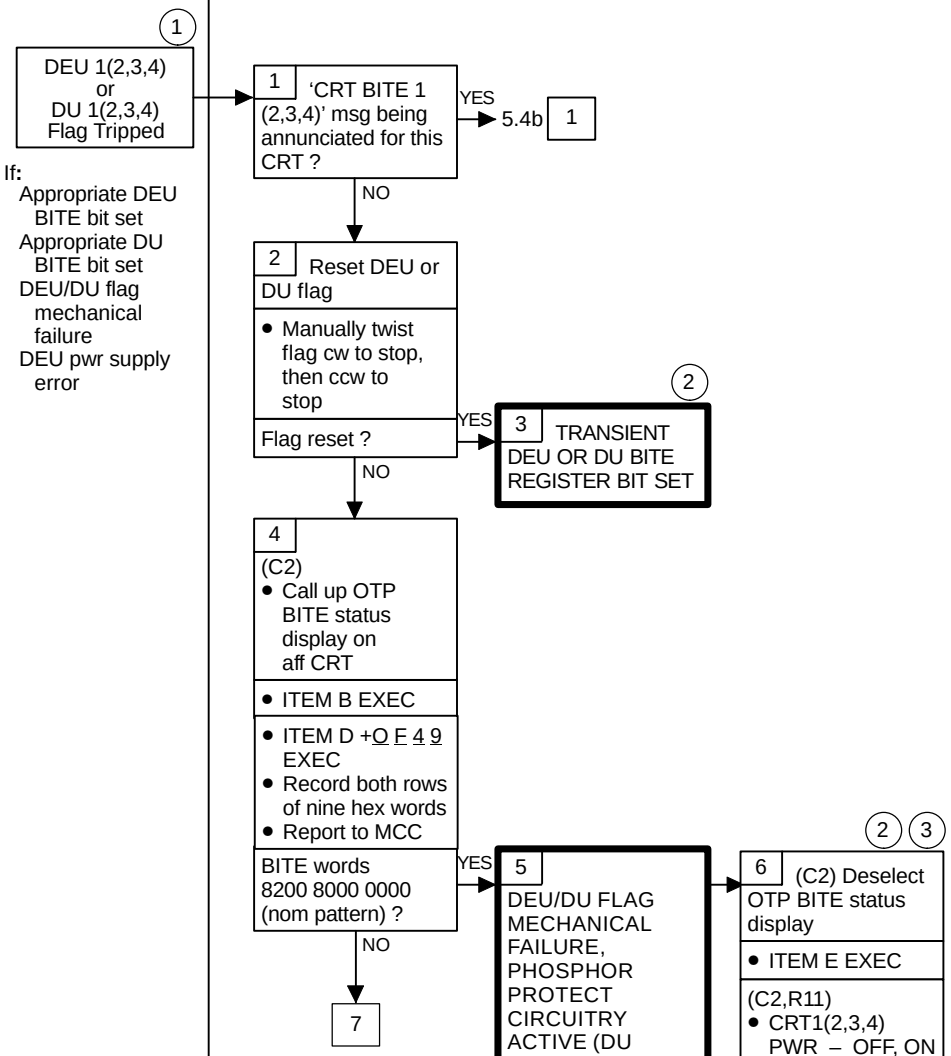
(5) Expect BITE words of 8202, 8100, 2000 after execution of ITEM A

(6) GPC/CRT key input must be made on kybd with active GPC interface. Always use PASS kybd to avoid dual commanders. If assigning CRT to/from BFS, deassign CRT first. Note that BFC CRT DISPLAY/SELECT sw will override any GPC/CRT kybd entry

(7) DEU flag tripped for CPU S/W fail, DEU memory parity error, or Kybd Adapter A/B fail errors. Continue CRT use

DPS

5.4c DEU OR DU FLAG TRIPPED



(1) Untripped flags all black; tripped flags are black and white. Flags may be inadvertently tripped during IPL, SASTP, or pwr transient. All DU errors except temperature status require arming by SASTP before being able to drive DU flag

(2) Continue CRT use

(3) Cycling pwr may result in 'I/O ERROR CRT 1(2,3,4)' msg

4

7

- Note which BITE bit error set:

BITE WORDS	FAILURE	FLAG TRIPPED
HEX CODE	BITE STATUS WORD 1 (left word)	
C200	IPL performed	——
A200	IPL error	DEU
9200	IPL circuit check error	——
8A00	Symbol generator intensity parity error	DEU
8600	Symbol generator sine–cosine parity error	DEU
8300	Symbol generator/character generator parity	DEU
8280	Oscillator error	DEU
8244	Analog zero deflection error (SASTP)	DEU
8224	Analog non–zero deflection error (SASTP)	DEU
8214	Analog pulse test fail (SASTP)	DEU
8208	Circle oscillator error	DEU
8202	Symbol generator display wrap error (SASTP)	DEU
8201	Symbol generator refresh error	DEU
	BITE STATUS WORD 2 (middle word)	
C000	DU deflection status	DU
A000	DU video status	DU
9000	DU phosphor protect status (not Flt units)	DU
8400	DU filament current status	DU
8200	DU temperature status	DU
8020	MIA echo check error	DEU
8012	MIA parity error	——
800A	MIA manchester error	——
8006	MIA bit count error	——
8001	DU power supply error	DU

8 Problem DU temperature status (BSW 2 = 8200) ?

YES → 9 (C2) Deselect OTP BITE status display
- ITEM E EXEC
- Resume specs on aff CRT, pwr unit OFF
- ✓MCC

NO →

10 (C2,R11)
- CRT1(2,3,4) PWR – OFF, ON (repeat if reqd)

BITE words 8200 8000 0000 ?

YES → 11 TRANSIENT NONCRITICAL BITE AS NOTED → 12 (C2) Deselect OTP BITE status display
- ITEM E EXEC
- Reset DEU(DU) flag
- Manually twist flag cw to stop, then ccw to stop

NO →

13 NONCRITICAL BITE AS NOTED → 14 (C2)Deselect OTP BITE status display
- ITEM E EXEC
- ✓MCC for further analysis

(2) Continue CRT use

(3) Cycling pwr may result in 'I/O ERROR CRT 1(2,3,4)' msg

(4) Listed status words for single failures only. Multiple failures summed. For multiple failures, record BITE words and continue

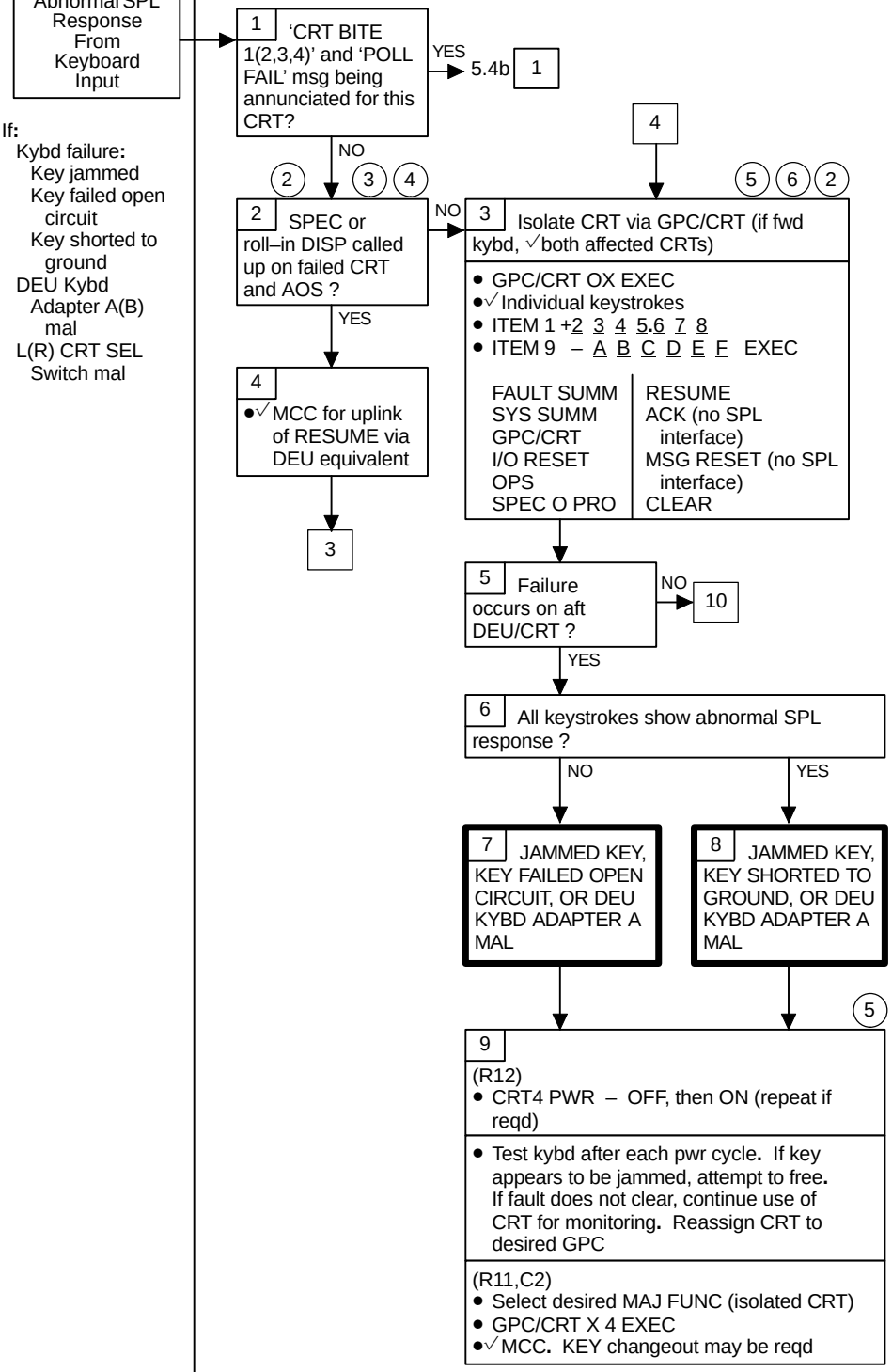
(5) Unit is force air–cooled via cabin fans. User should ✓proper cabin fan ops

DPS

(1) Abnormal SPL Response From Keyboard Input

If:
- Kybd failure:
  - Key jammed
  - Key failed open circuit
  - Key shorted to ground
- DEU Kybd
  - Adapter A(B) mal
- L(R) CRT SEL
  - Switch mal

5.4d ABNORMAL SPL RESPONSE FROM KYBD INPUT



Notes (cont)

(2) SPEC key also displays freeze function. Therefore, big 'X' will be removed upon depression of SPEC key and will reappear 3 sec after next keystroke. MSG RESET and ACK have no SPL interface. User should attempt to ✓these keys work properly when CRT assigned to GPC or ✓MCC for downlist verification

(1) Abnormal means keystroke does not appear on SPL or wrong keystroke appears. User should always ✓CRT SEL sw position if applicable and repeat keystroke sequence prior to performing this procedure to eliminate user error and transients

(2) SPECs and roll–in DISPs will be trapped in GPC software associated with failed CRT if GPC/CRT reassignment is performed and GPC/CRT interface is not regained. Affected SPECs and roll–in DISPs are still available on other CRTs, but trapped SPEC or roll–in DISP reduces SPEC or roll–in DISP allocation from 2 to 1 for associated major function

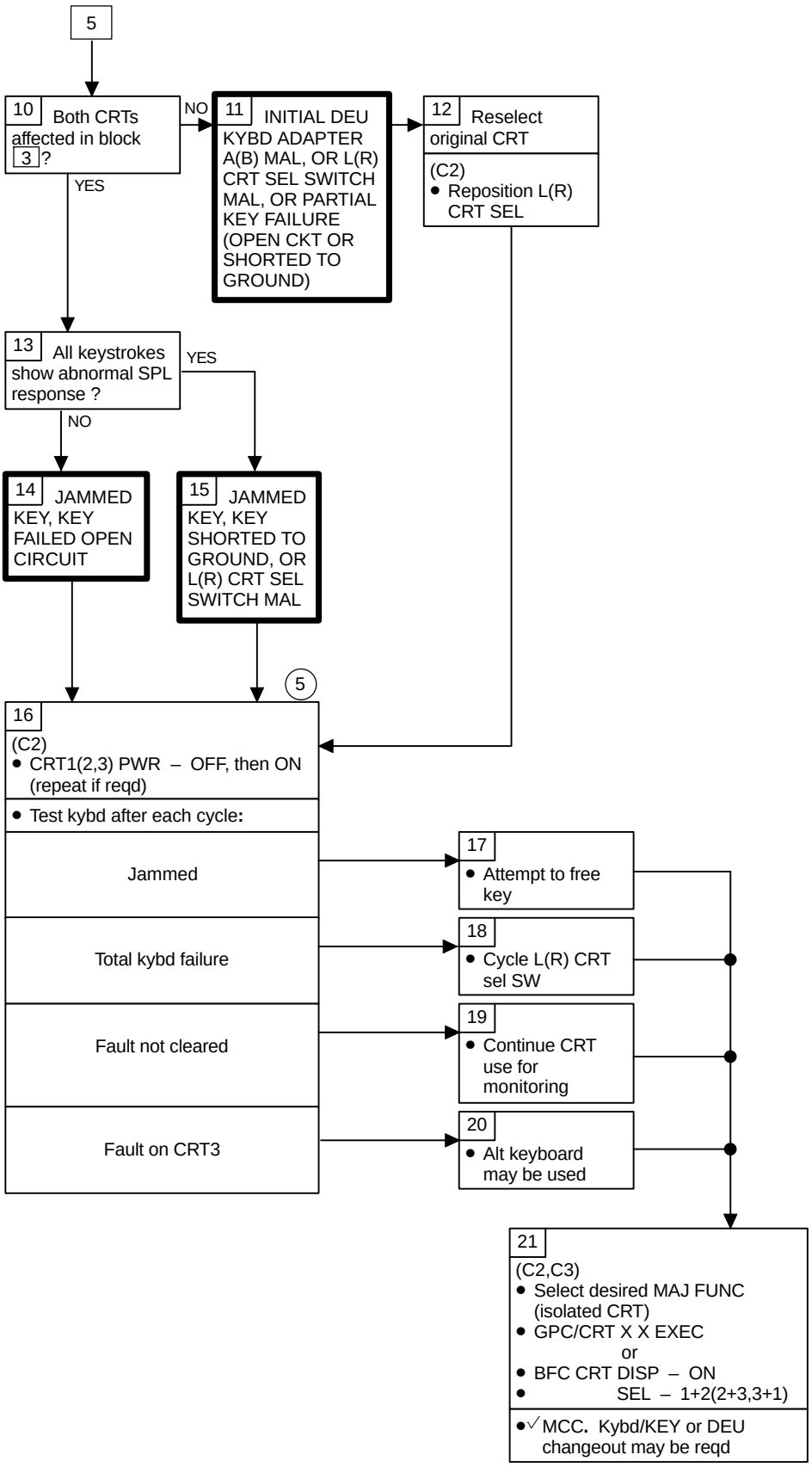
(3) Trapped SPEC or roll–in DISP will be cleared at OPS transition if SPEC/DISP is not RESUMEd and GPC/CRT interface is not regained

(4) If DISP was called up over SPEC, two RESUME DEU equivalents may be reqd to clear trapped SPEC

(5) GPC/CRT key input must be made on kybd with active GPC interface. Always use PASS kybd to avoid dual commanders. If assigning CRT to/from BFS, always deassign CRT first. BFC CRT DISPLAY/SELECT sw will override any GPC/CRT kybd entry

(6) During kybd checkout, take note of multiple keystroke/SPL anomalies and report

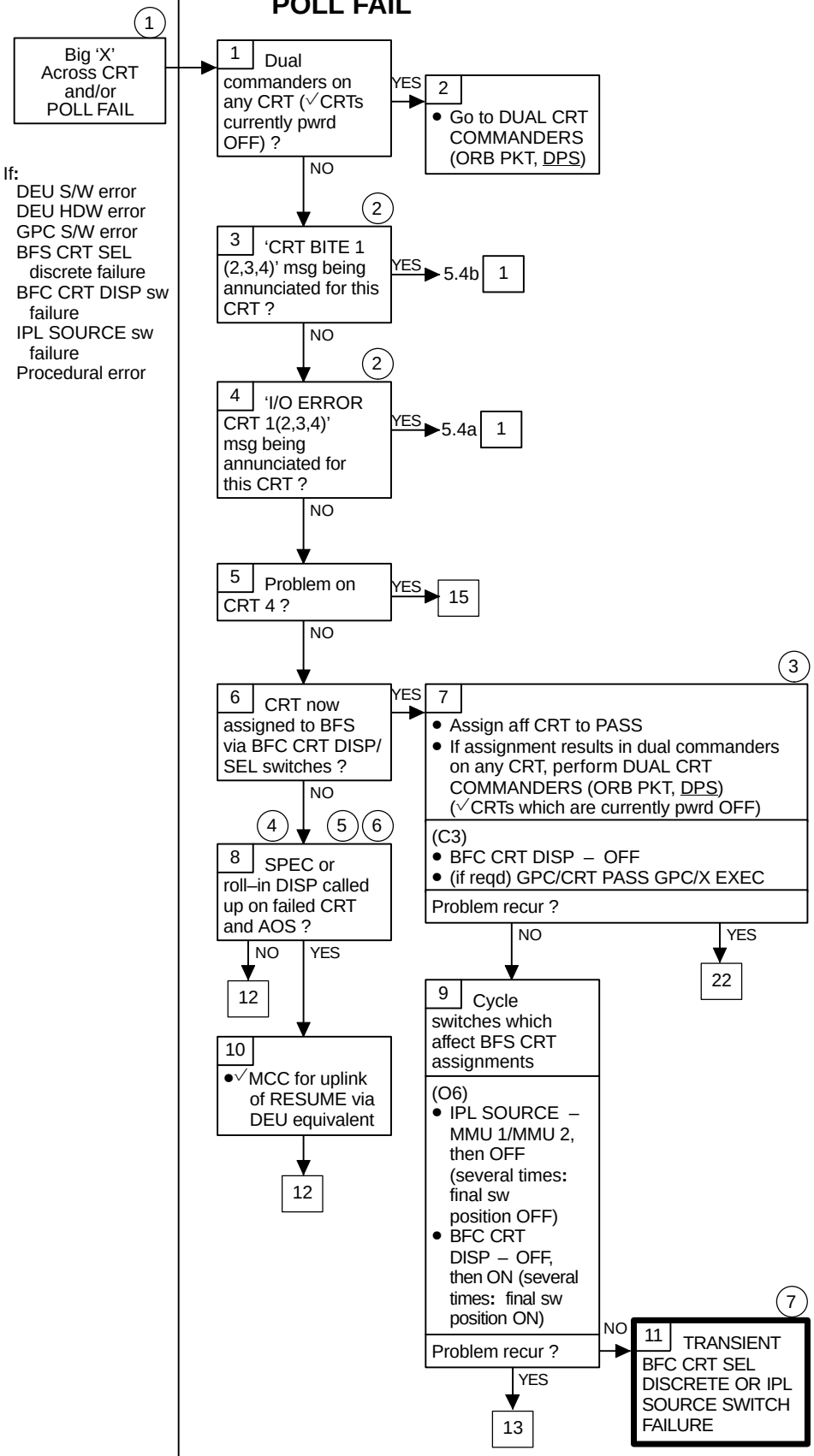
(Notes cont in left column)



(5) GPC/CRT key input must be made on kybd with active GPC interface. Always use PASS kybd to avoid dual commanders. If assigning CRT to/from BFS, always deassign CRT first. BFC CRT DISPLAY/ SELECT sw will override any GPC/ CRT kybd entry

DPS

5.4e BIG 'X' ACROSS CRT AND/OR POLL FAIL



(1) Big 'X' appears when DEU does not receive display update commands for 3 sec. POLL FAIL appears when DEU does not receive poll or time update commands for 3 sec

(2) User may have to establish alternate CRT interface to BFS or PASS as appropriate in order to observe fault msgs

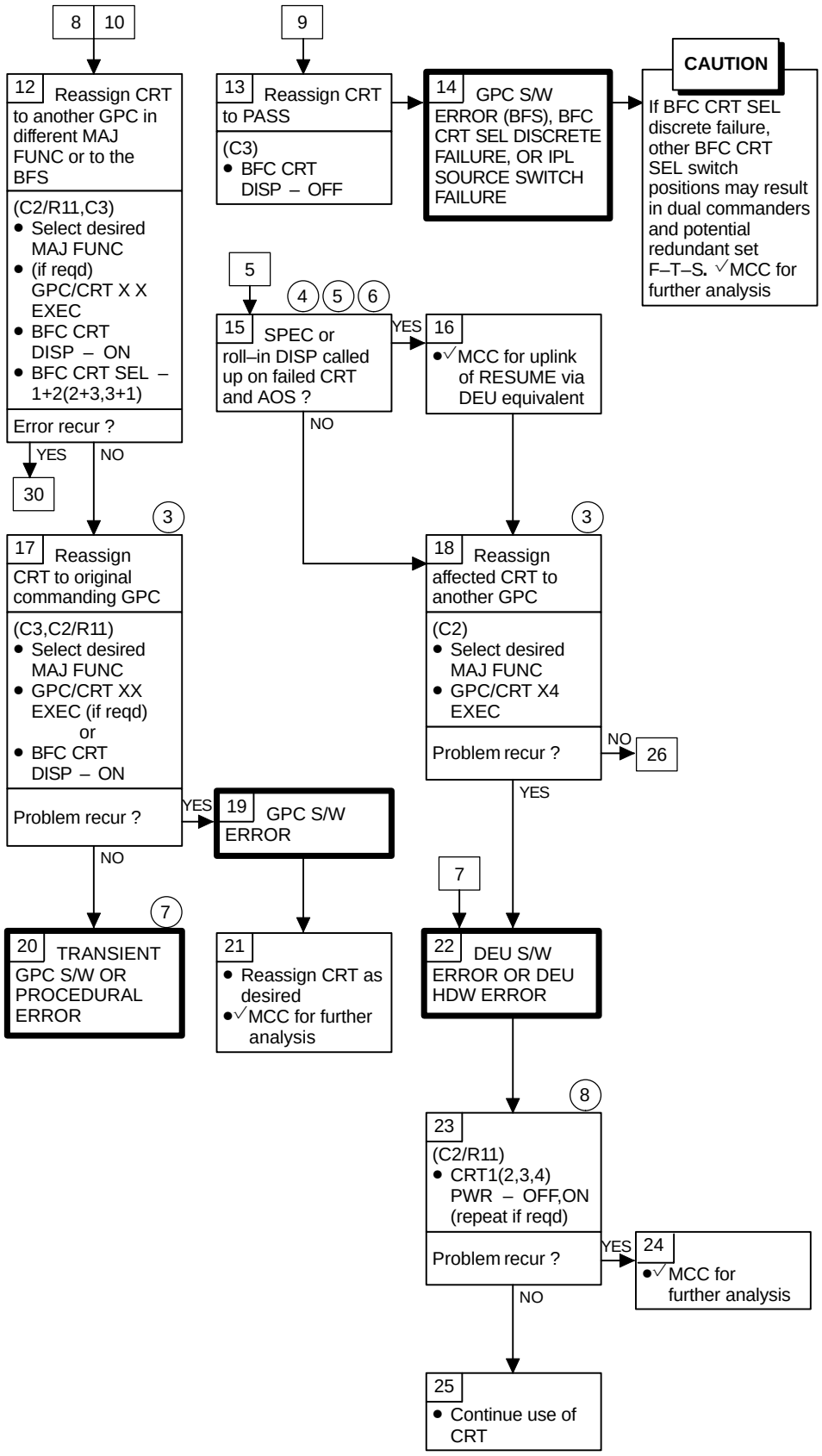
(3) GPC/CRT key input must be made on kybd with active GPC interface. Always use PASS kybd to avoid dual commanders. If assigning CRT to/ from BFS, always deassign CRT first. BFC CRT DISPLAY/ SELECT sw will override any GPC/ CRT kybd entry

(4) SPECs and roll–in DISPs will be trapped in GPC software associated with failed CRT if GPC/CRT reassignment is performed and GPC/CRT interface is not regained. Affected SPECs and roll–in DISPs are still available on other CRTs, but trapped SPEC or roll–in DISP reduces SPEC or roll–in DISP allocation from 2 to 1 for associated major function

(5) Trapped SPEC or roll–in DISP will be cleared at OPS transition if SPEC/ DISP is not RESUMEd and GPC/CRT interface is not regained

(6) If DISP was called up over SPEC, two RESUME DEU equivalents may be reqd to clear trapped SPEC

(7) Continue use of CRT



(3) GPC/CRT key input must be made on kybd with active GPC interface. Always use PASS kybd to avoid dual commanders. If assigning CRT to/ from BFS, always deassign CRT first. BFC CRT DISPLAY/ SELECT sw will override any GPC/ CRT kybd entry

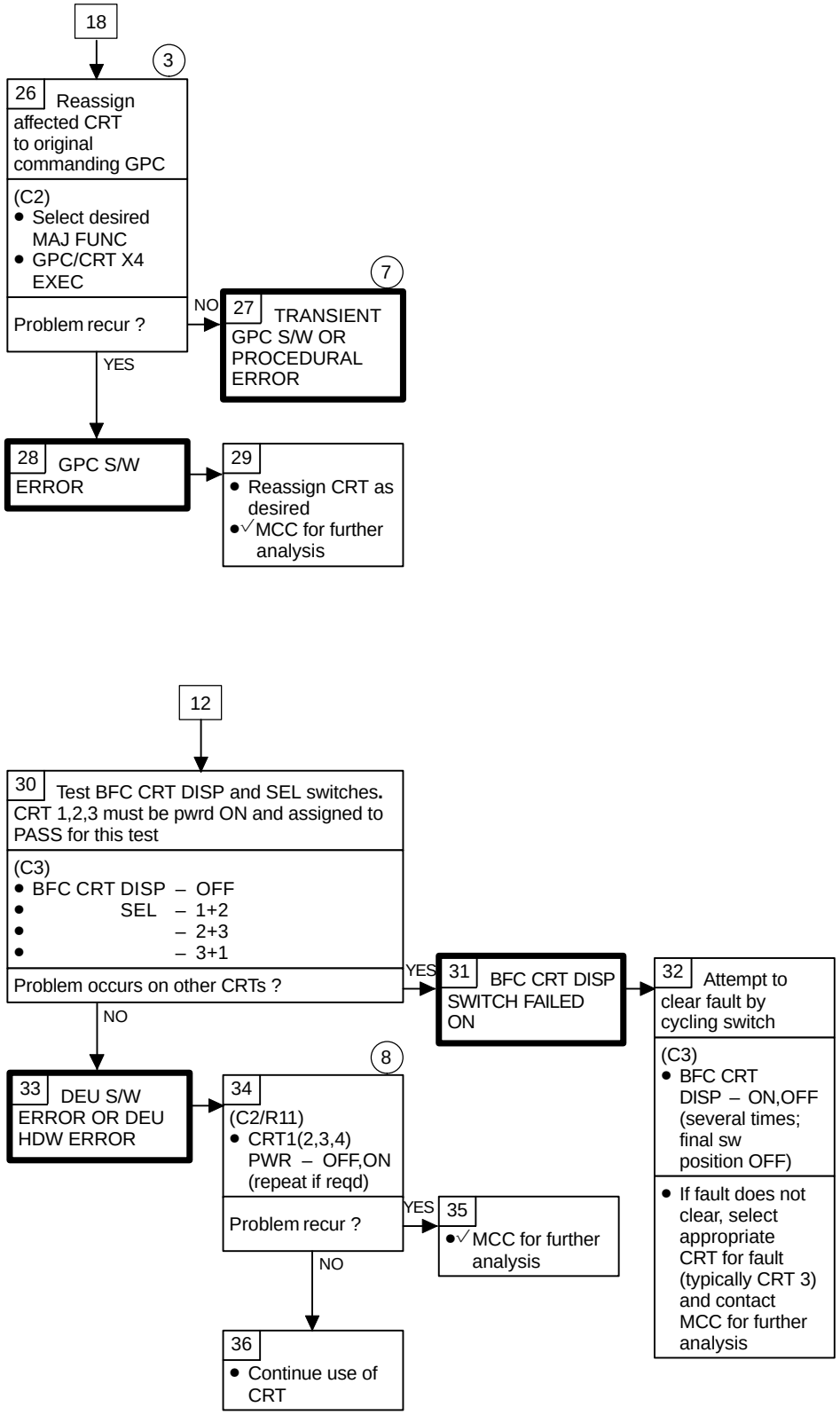
(4) SPECs and roll–in DISPs will be trapped in GPC software associated with failed CRT if GPC/CRT reassignment is performed and GPC/CRT interface is not regained. Affected SPECs and roll–in DISPs are still available on other CRTs, but trapped SPEC or roll–in DISP reduces SPEC or roll–in DISP allocation from 2 to 1 for associated major function

(5) Trapped SPEC or roll–in DISP will be cleared at OPS transition if SPEC/ DISP is not RESUMEd and GPC/CRT interface is not regained

(6) If DISP was called up over SPEC, two RESUME DEU equivalents may be reqd to clear trapped SPEC

(7) Continue use of CRT

(8) Cycling pwr may result in I/O ERROR CRT 1(2,3,4) msg



3 GPC/CRT key input must be made on kybd with active GPC interface. Always use PASS kybd to avoid dual commanders. If assigning CRT to/ from BFS, always deassign CRT first. BFC CRT DISPLAY/ SELECT sw will override any GPC/ CRT kybd entry

7 Continue use of CRT

8 Cycling pwr may result in I/O ERROR CRT 1(2,3,4) msg

DPS

5.4f CRT DISPLAY ERROR (BLANK/UNREADABLE/ABNORMAL)

(1)
CRT 1(2,3,4) Display Error

If:
- One–shot background transfer error
- DEU symbol generator failure
- DU fail
- Unintentional DEU load
- DEU LOAD switch failure
- DEU S/W error
- GPC S/W error

1 Problem appears to be dual commanders ?
- YES → 2
  - Go to DUAL CRT COMMANDERS (ORB PKT, DPS)
- NO

3 'I/O ERROR CRT 1(2,3,4)' msg being annunciated for this CRT ?
- YES → 5.4a 1
- NO

4 'DEU LOAD' msg on CRT ?
- YES → 5 UNINTEN–TIONAL DEU LOAD, DEU LOAD SWITCH FAILURE
- NO

12, 5.4a 3 → 5

6 Deassign aff CRT

(C2/R11)
- GPC/CRT 0 X EXEC

(2)

8
- After MCC confirmation, perform DEU IPL–PASS/BFS, DPS SSR–10
- Load aff CRT

7 MCC go for pwr cycle ?
- NO → 13
- YES

9 Cycle pwr for aff CRT. Note whether 'I/O ERROR CRT' msg annunciated when pwr cycled

(C2/R11)
- CRT1(2,3,4) PWR – OFF, then ON (repeat if reqd)

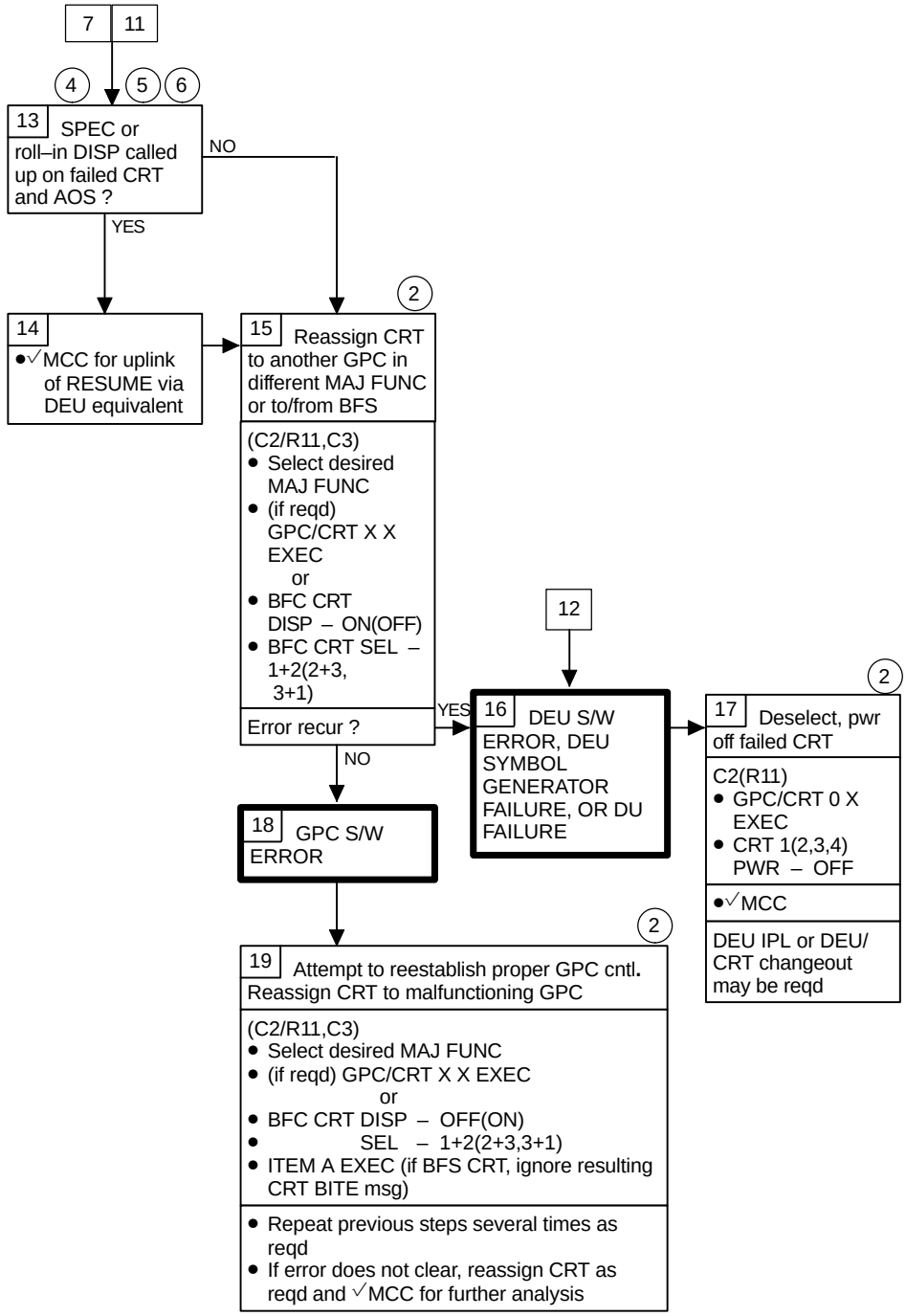
CRT display appears normal within 30 sec ?
- YES → (3) 10 ONE–SHOT BACKGROUND TRANSFER ERROR, TRANSIENT DEU SYMBOL GENERATOR OR DU FAILURE
- NO

11 CRT screen totally blank (i.e., no Time Fields SPL, etc.) ?
- YES → 12 'I/O ERROR CRT' msg annunciated in block 9 when pwr cycled ?
  - NO → 5
  - YES → 16
- NO → 13

(1) If screen blank, verify that BRIGHTENER cntl on CRT adjusted properly. If only time fields, SPL, msg line on CRT and assigned to BFS, ✓CRT MF sw not in PL

(2) GPC/CRT key input must be made on kybd with active GPC interface. Always use PASS kybd to avoid dual commanders. If assigning CRT to/from BFS, always deassign CRT first. BFC CRT DISPLAY/SELECT sw will override any GPC/CRT kybd entry

(3) Continue use of CRT



(2) GPC/CRT key input must be made on kybd with active GPC interface. Always use PASS kybd to avoid dual commanders. If assigning CRT to/from BFS, always deassign CRT first. BFC CRT DISPLAY/SELECT sw will override any GPC/CRT kybd entry

(4) SPECs and roll–in DISPs will be trapped in GPC software associated with failed CRT if GPC/CRT reassignment is performed and GPC/CRT interface is not regained. Affected SPECs and roll–in DISPs are still available on other CRTs, but trapped SPEC or roll–in DISP reduces SPEC or roll–in DISP allocation from 2 to 1 for associated major function

(5) Trapped SPEC or roll–in DISP will be cleared at OPS transition if SPEC/ DISP is not RESUMEd and GPC/CRT interface is not regained

(6) If DISP was called up over SPEC, two RESUME DEU equivalents may be reqd to clear trapped SPEC

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DPS

5.5a 'I/O ERROR PCM' (SM)

SM ALERT

I/O ERROR PCM

If data path fail from PCMMU to GPC:
SM BCE XMTR or RCVR fail
PCMMU MIA XMTR or RCVR fail
Total PCMMU fail

Nominal Config:
(C3)
OI PCMMU
PWR – 1
FORMAT – GPC

1

SM 62 PCMMU/ PL COMM

- PCMMU I/O RESET PCM – ITEM 5 EXEC (*)

'I/O ERROR PCM' msg recur ?

NO → 2 TRANSIENT SM GPC OR OI SYSTEM INTERFACE PROBLEM

YES

5.5c 3

3 If BFS in HALT, activate BFS to ✓param status

(O6)
For BFS GPC:
- ✓GPC MODE – HALT
- ✓GPC PWR – ON
- MODE – STBY (tb–RUN)

1

4 ✓For missing params

(C3)
- BFC CRT DISP – ON
- BFC CRT SEL – as reqd

BFS SYS SUMM 1,2

ALL params on these displays missing ?

YES → 5 PCMMU 1(2) FAILURE

NO

6 SM GPC/PCMMU DATA PATH FAILURE

9

7 Switch to alternate PCMMU

(C3)
- OI PCMMU PWR – 2(1)

SM 62 PCMMU/ PL COMM

- PCMMU I/O RESET PCM – ITEM 5 EXEC (*)

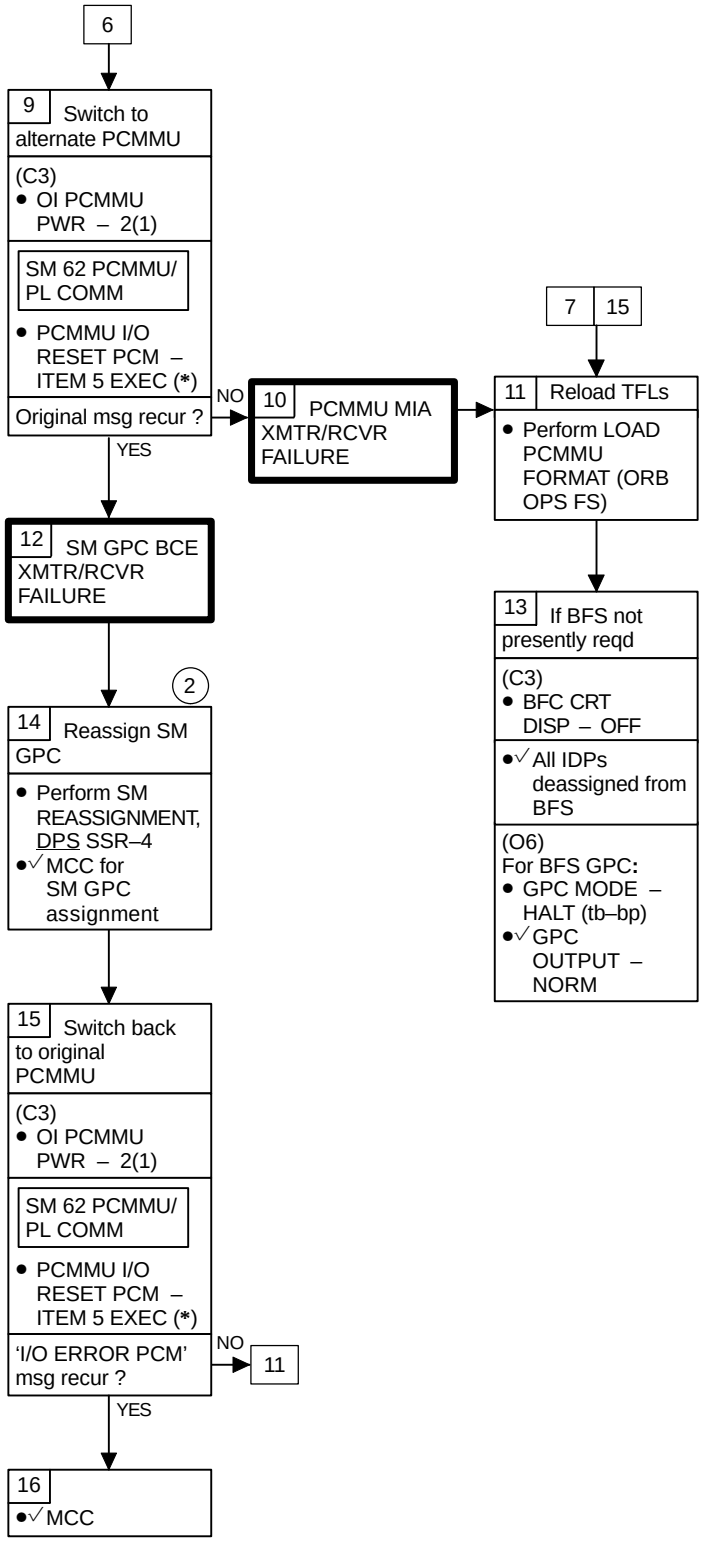
I/O ERROR PCM msg recur ?

NO → 11

YES

8
- ✓MCC

1 Because of differences between PASS/BFS S/W implementation, ignore any BFS 'I/O ERROR PCM' fault msg



2 BFS fault disp may be utilized for SM monitoring until PASS SM GPC reassigned

DPS

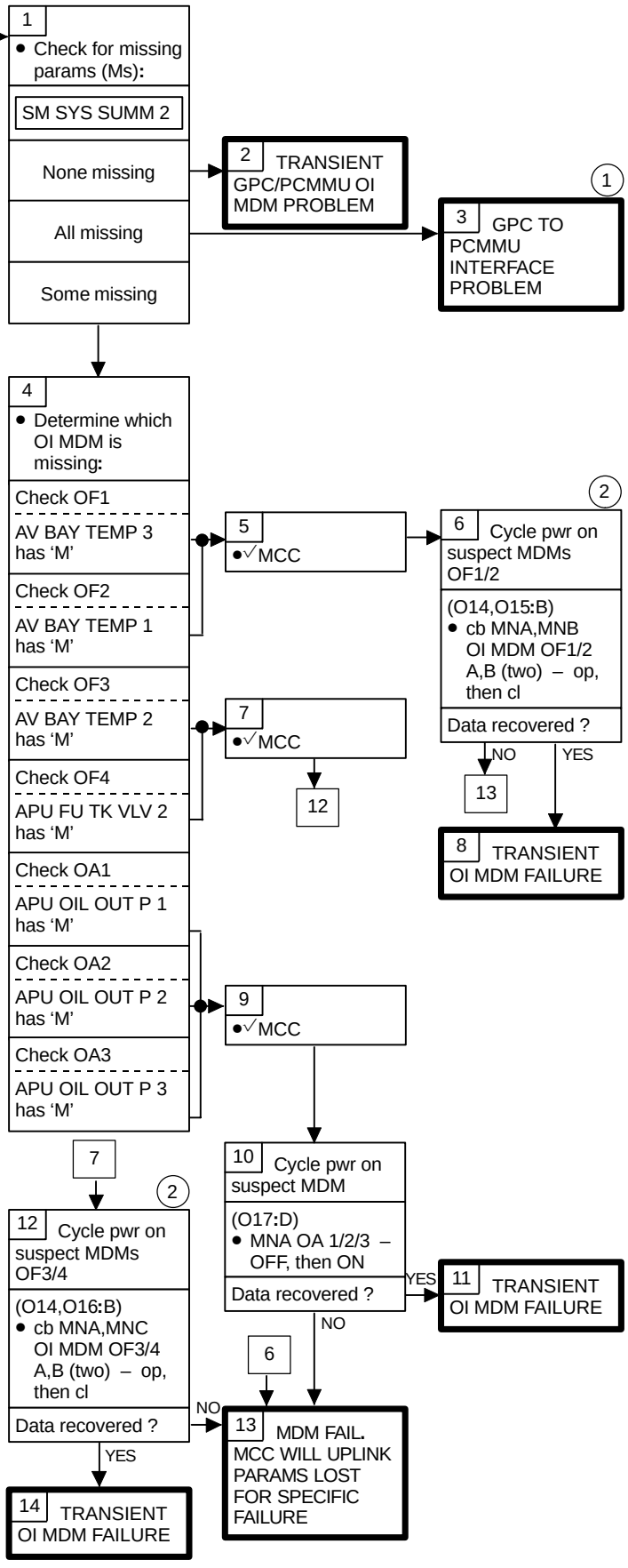
SM ALERT

I/O ERROR PCM

If:
Data Path fail
from OI MDM
to PCMMU or
from PCMMU
to GPC

Nominal Config:
(C3)
OI PCMMU
PWR – 1
FORMAT – GPC
(O14,O15:B)
cb MNA,MNB OI
MDM OF 1/2 A,B
(two) – cl
(O14,O16:B)
cb MNA,MNC OI
MDM OF 3/4 A,B
(two) – cl
(O17:D)
MDM OA 1/2/3 –
ON

5.5b 'I/O ERROR PCM' (BFS)



(1) ✓MCC regarding PCMMU switch. Selection of alternate PCMMU may preclude MCC viewing LDR telemetry

(2) Do not cycle open cb. ✓MCC

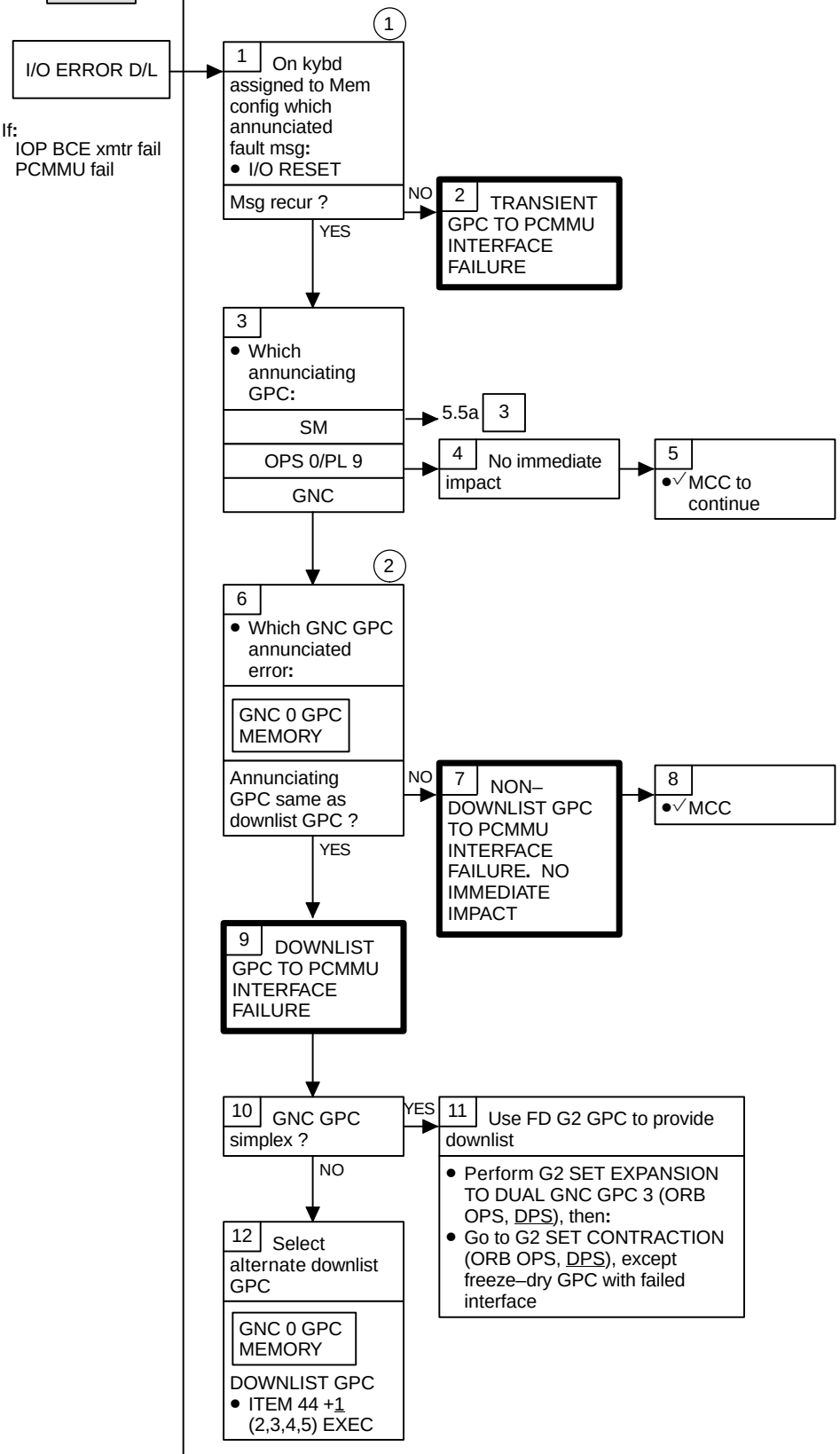
DPS

5.5c 'I/O ERROR D/L'

SM ALERT

I/O ERROR D/L

If:
IOP BCE xmtr fail
PCMMU fail



(1) I/O RESET not reqd to reestablish downlist. Action only verifies that anomaly continues

(2) All PASS GPCs output downlist. PCMMU ignores all but selected downlist GPC

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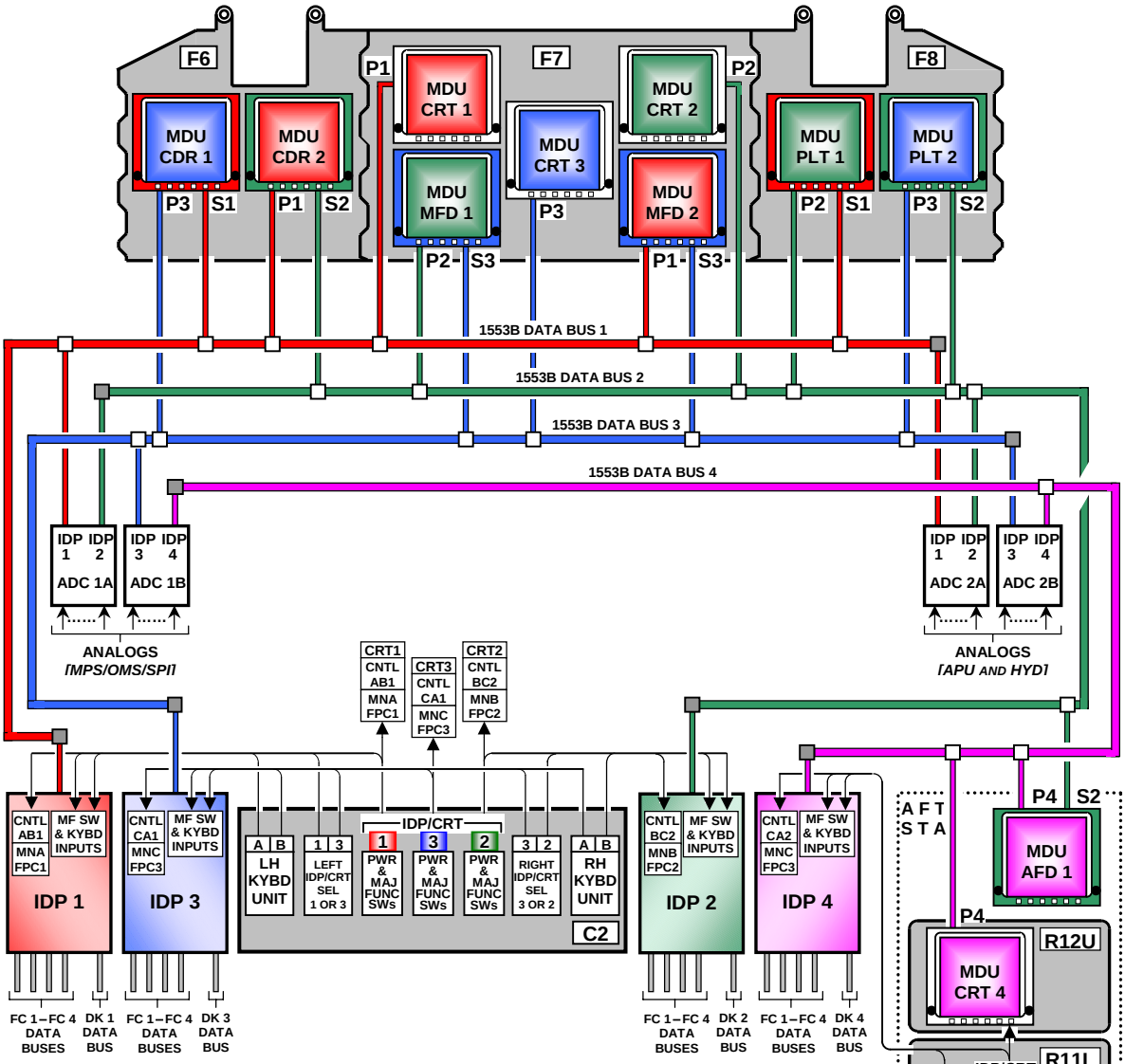
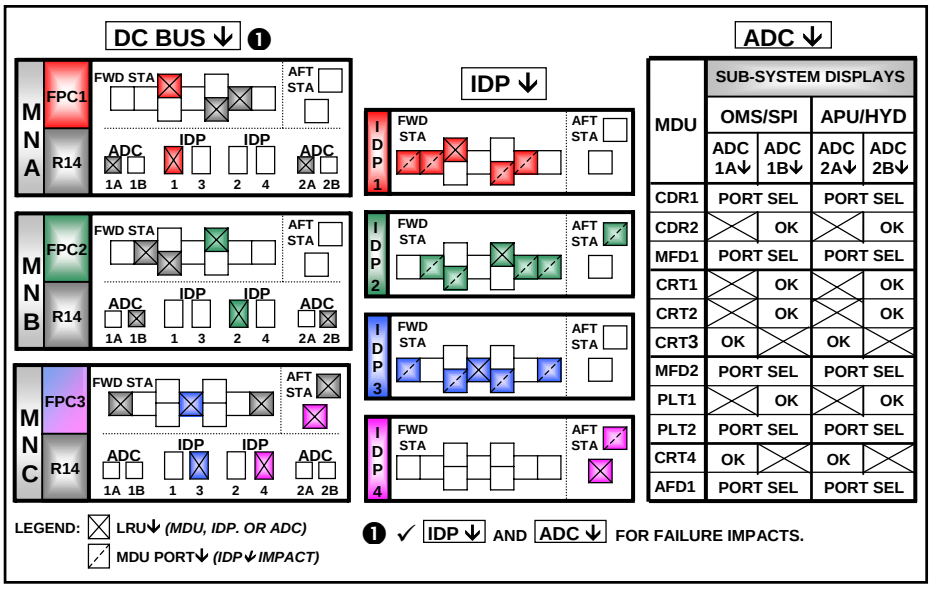


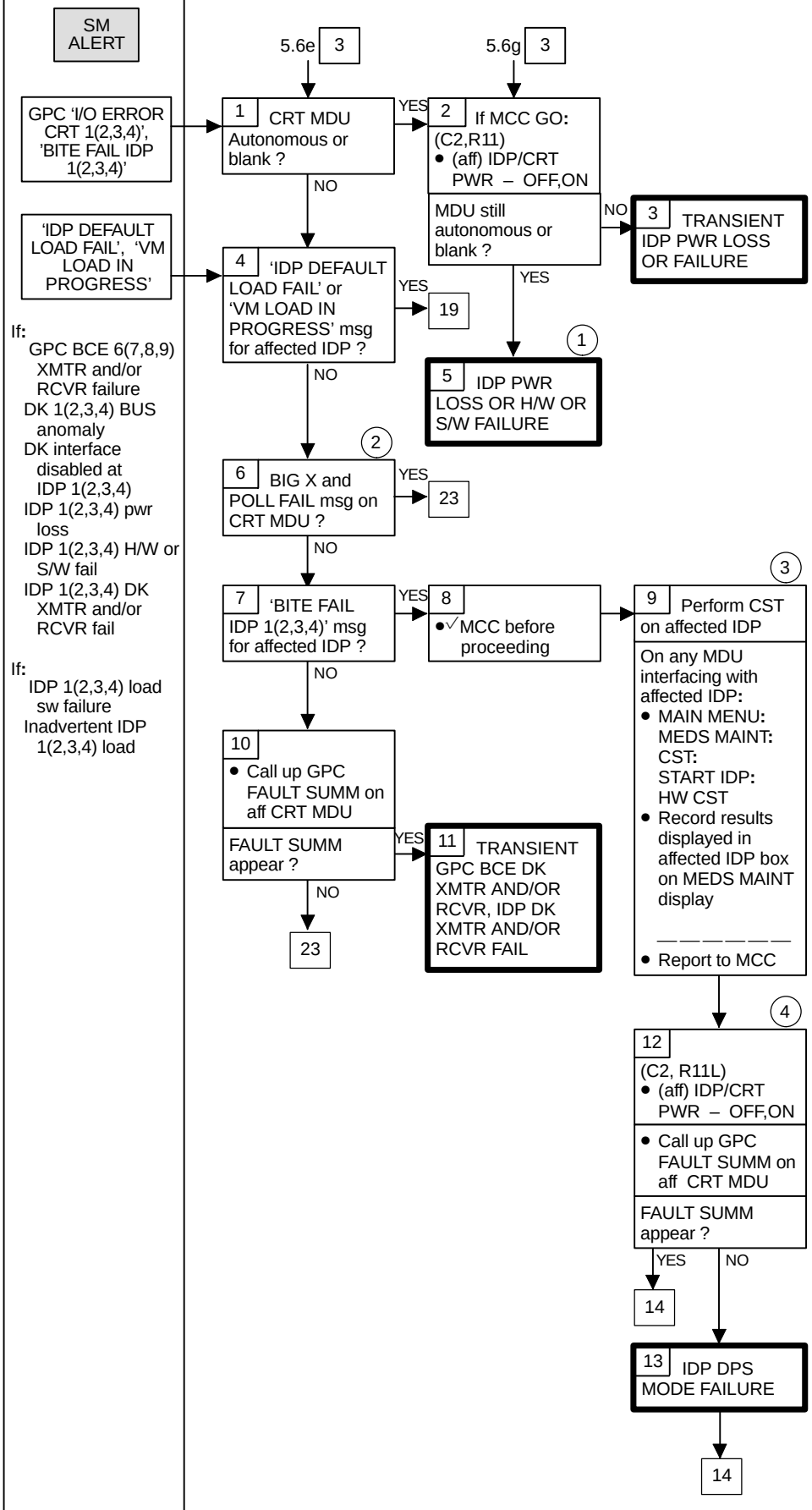
MEDS OVERVIEW

[POWER AND INTERNAL 1553B DATA BUS CONFIGURATION]



DPS

5.6a GPC 'I/O ERROR CRT 1(2,3,4)', 'BITE FAIL IDP 1(2,3,4)', 'IDP DEFAULT LOAD FAIL', 'VM LOAD IN PROGRESS'

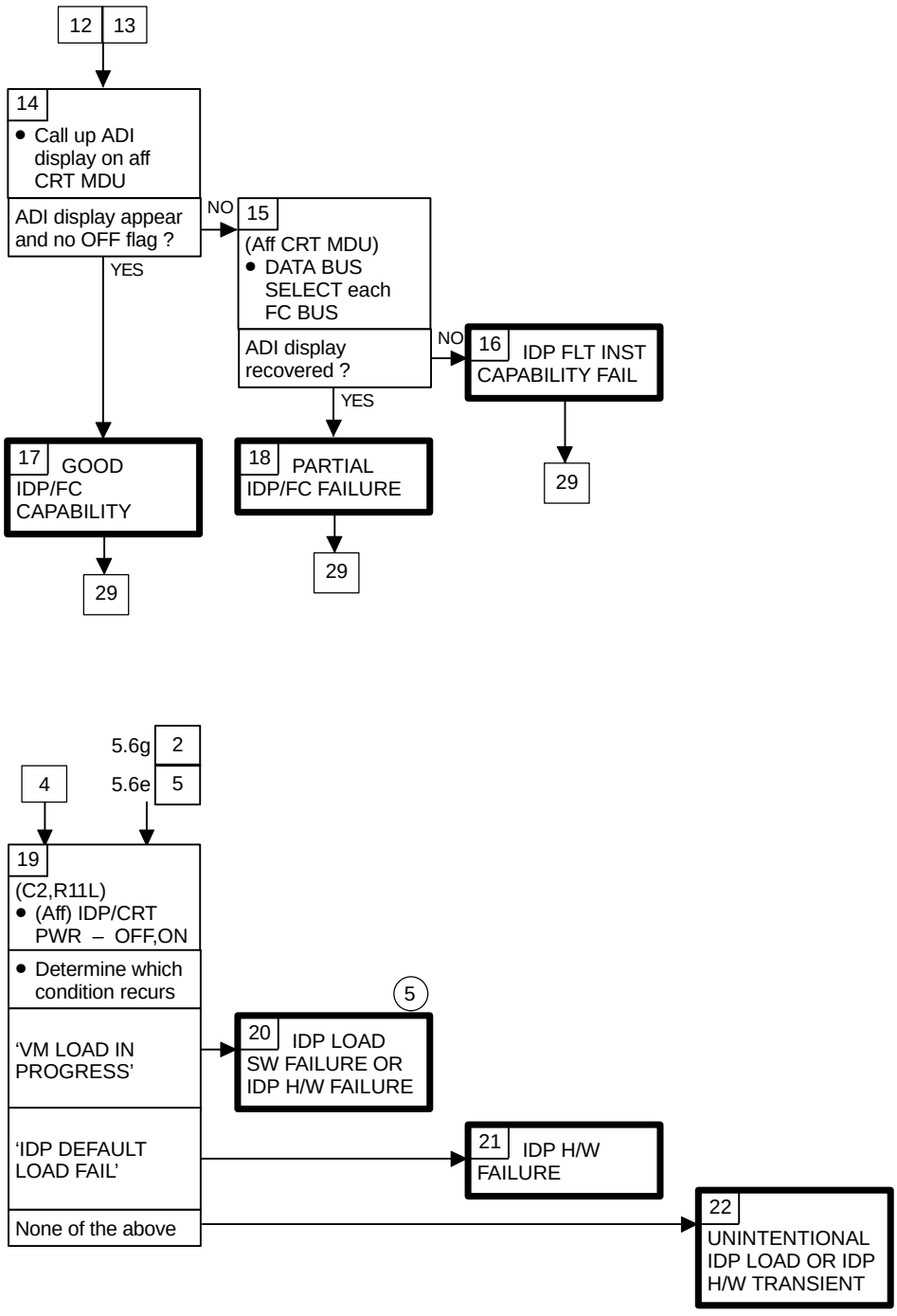


(1) ✓MCC for possible IFM replacement

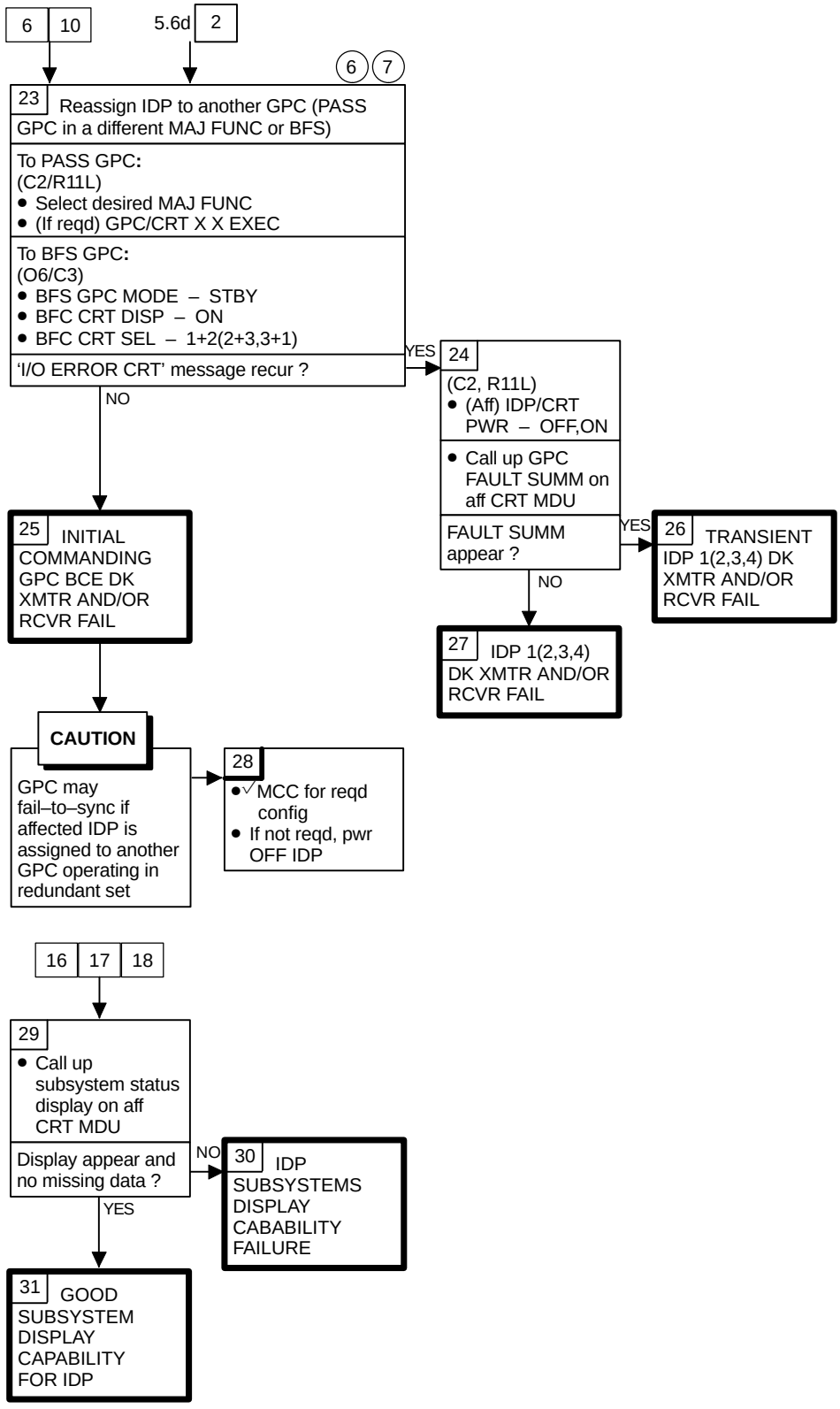
(2) Both Big X and POLL FAIL msgs appear for complete GPC Data path failure. Appearance of only 1 msg indicates an internal GPC or IDP problem

(3) Expect GPC 'I/O ERROR CRT X' message if a GPC is commanding the affected IDP. All other MDUs communicating with the IDP running CST will be temporarily inoperable. IDP CST results will be blank while H/W CST is running. IDP H/W CST takes ~75 sec. Nominal IDP CST result is '000000'

(4) Following blocks will test IDP capabilities remaining after BITE

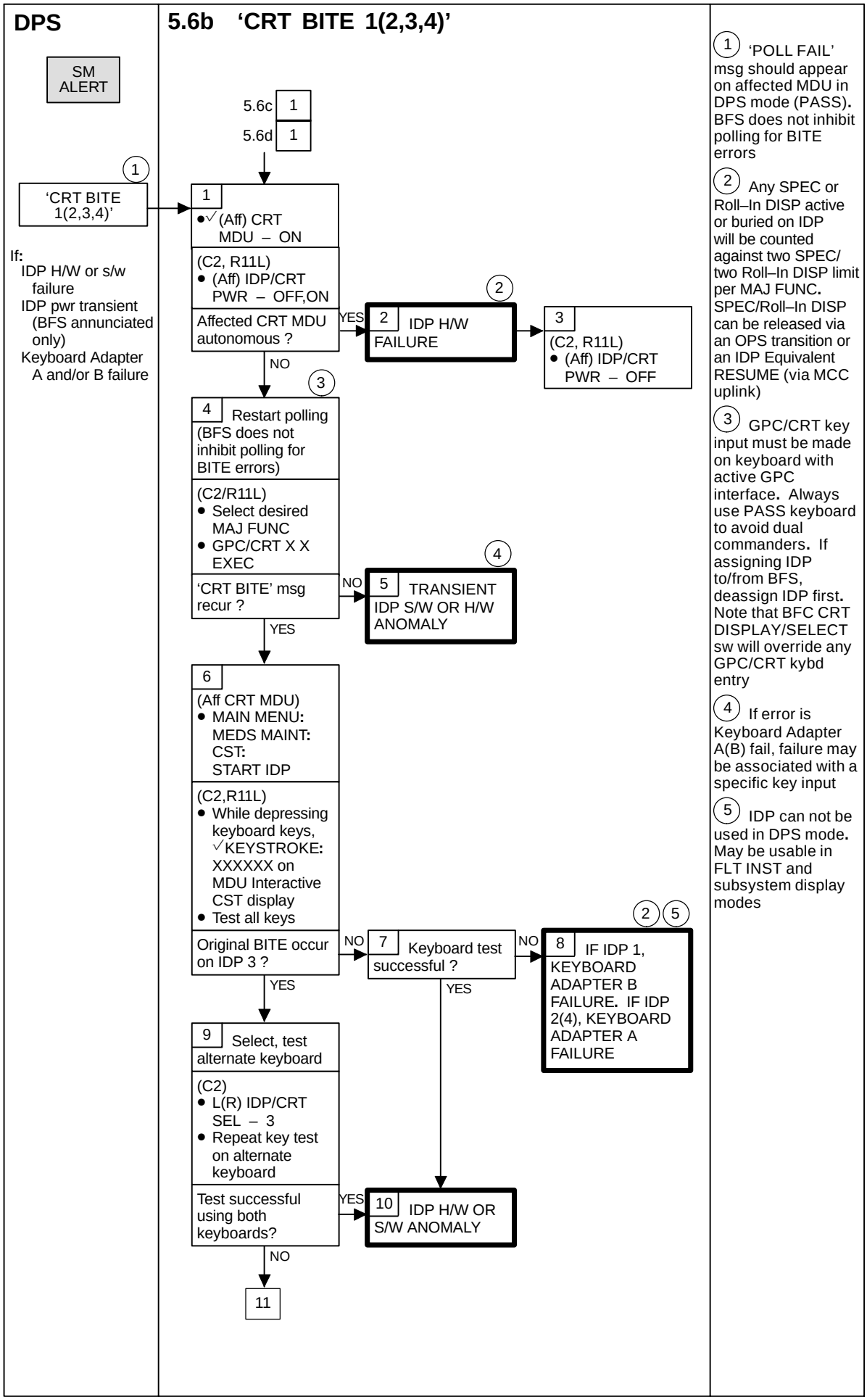


(5) IDP cannot be used in DPS mode

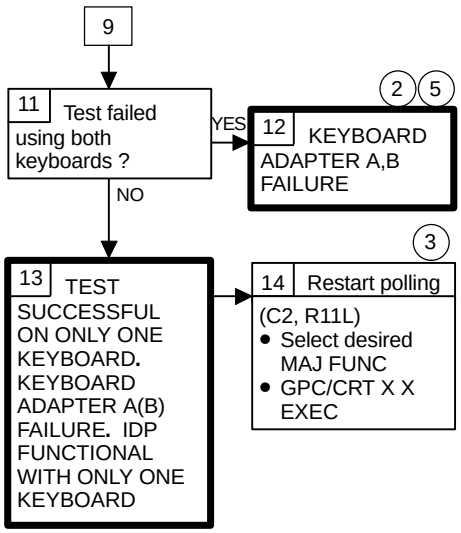


(6) Any SPEC or Roll–In DISP active or buried on IDP will be counted against two SPEC/ two Roll–In DISP limit per MAJ FUNC. SPEC/Roll–In DISP can be released via an OPS transition or an IDP Equivalent RESUME (via MCC uplink)

(7) GPC/CRT key input must be made on keyboard with active GPC interface. Always use PASS keyboard to avoid dual commanders. If assigning IDP to/from BFS, always deassign IDP first. Note that BFC CRT DISPLAY/SELECT sw will override any GPC/CRT kybd entry


DPS
5.6b 'CRT BITE 1(2,3,4)'
SM ALERT
5.6c 1
5.6d 1
1
'CRT BITE 1(2,3,4)'
If:
IDP H/W or s/w failure
IDP pwr transient (BFS annunciated only)
Keyboard Adapter A and/or B failure
1
•✓(Aff) CRT MDU – ON
(C2, R11L)
• (Aff) IDP/CRT PWR – OFF,ON
Affected CRT MDU autonomous ?
YES
2
IDP H/W FAILURE
3
(C2, R11L)
• (Aff) IDP/CRT PWR – OFF
NO
3
4 Restart polling (BFS does not inhibit polling for BITE errors)
(C2/R11L)
• Select desired MAJ FUNC
• GPC/CRT X X EXEC
'CRT BITE' msg recur ?
NO
4
5 TRANSIENT IDP S/W OR H/W ANOMALY
YES
6
(Aff CRT MDU)
• MAIN MENU: MEDS MAINT: CST: START IDP
(C2,R11L)
• While depressing keyboard keys, ✓KEYSTROKE: XXXXXX on MDU Interactive CST display
• Test all keys
Original BITE occur on IDP 3 ?
NO
7 Keyboard test successful ?
NO
2 5
8 IF IDP 1, KEYBOARD ADAPTER B FAILURE. IF IDP 2(4), KEYBOARD ADAPTER A FAILURE
YES
YES
9 Select, test alternate keyboard
(C2)
• L(R) IDP/CRT SEL – 3
• Repeat key test on alternate keyboard
Test successful using both keyboards?
YES
10 IDP H/W OR S/W ANOMALY
NO
11
1 'POLL FAIL' msg should appear on affected MDU in DPS mode (PASS). BFS does not inhibit polling for BITE errors
2 Any SPEC or Roll–In DISP active or buried on IDP will be counted against two SPEC/ two Roll–In DISP limit per MAJ FUNC. SPEC/Roll–In DISP can be released via an OPS transition or an IDP Equivalent RESUME (via MCC uplink)
3 GPC/CRT key input must be made on keyboard with active GPC interface. Always use PASS keyboard to avoid dual commanders. If assigning IDP to/from BFS, deassign IDP first. Note that BFC CRT DISPLAY/SELECT sw will override any GPC/CRT kybd entry
4 If error is Keyboard Adapter A(B) fail, failure may be associated with a specific key input
5 IDP can not be used in DPS mode. May be usable in FLT INST and subsystem display modes

DPS 5.6b (Cont)



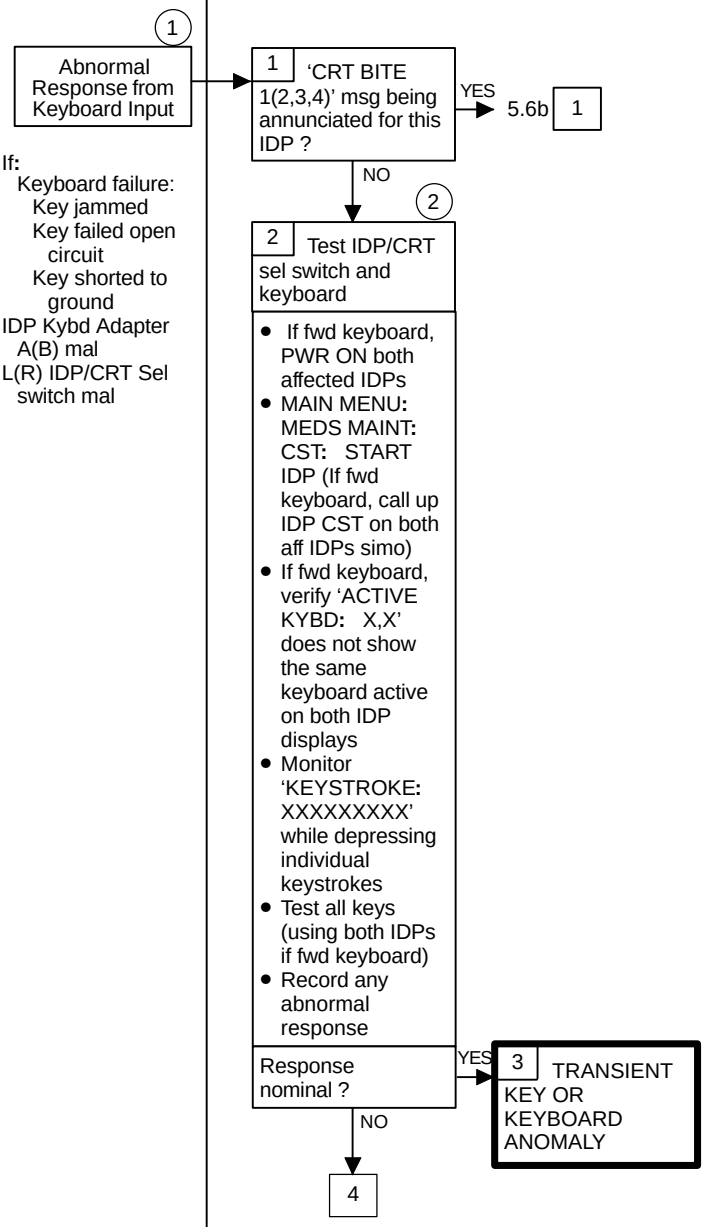
(2) Any SPEC or Roll–In DISP active or buried on IDP will be counted against two SPEC/ two Roll–In DISP limit per MAJ FUNC. SPEC/Roll–In DISP can be released via an OPS transition or an IDP Equivalent RESUME (via MCC uplink)

(3) GPC/CRT key input must be made on keyboard with active GPC interface. Always use PASS keyboard to avoid dual commanders. If assigning IDP to/from BFS, deassign IDP first. Note that BFC CRT DISPLAY/SELECT sw will override any GPC/CRT keyboard entry

(5) IDP can not be used in DPS mode. May be usable in FLT INST and subsystem display modes

DPS

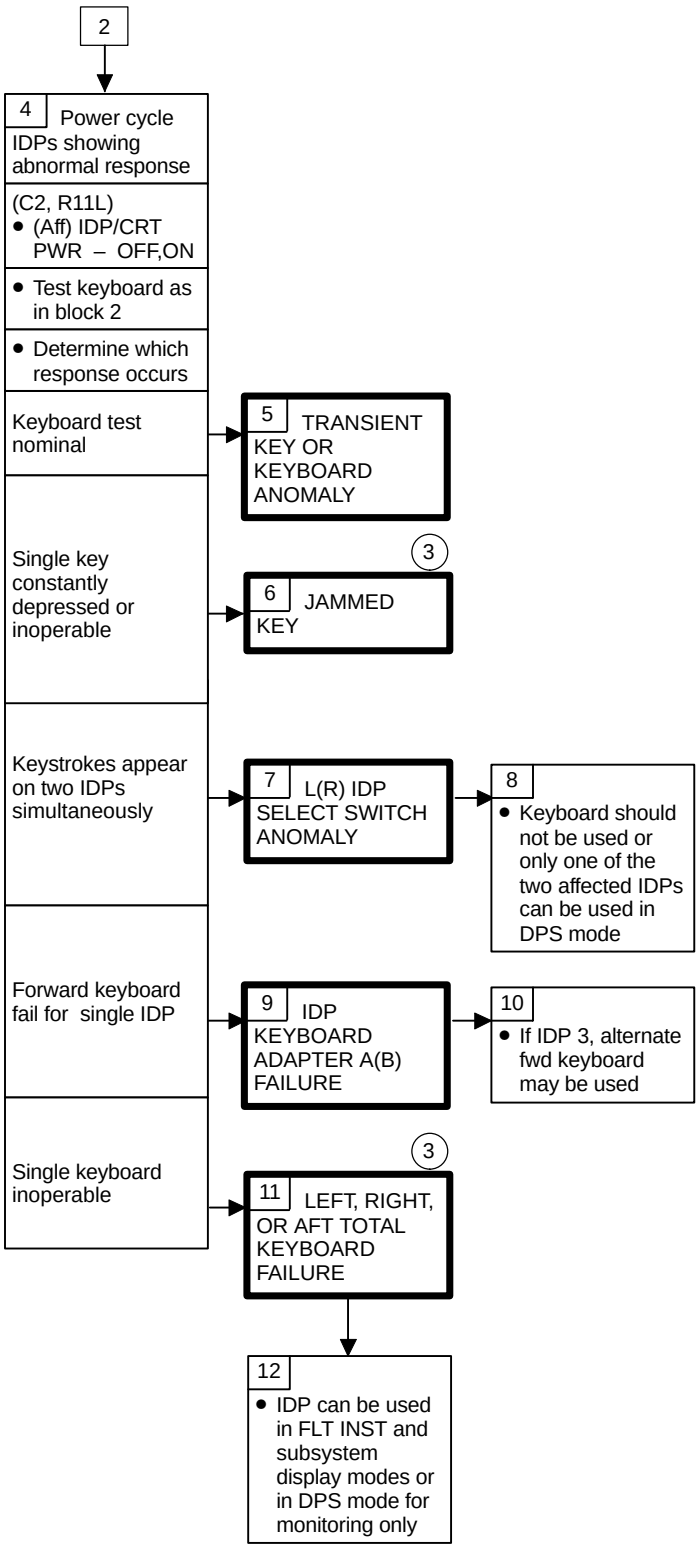
5.6c ABNORMAL RESPONSE FROM KEYBOARD INPUT



If:
- Keyboard failure:
  - Key jammed
  - Key failed open circuit
  - Key shorted to ground
- IDP Kybd Adapter A(B) mal
- L(R) IDP/CRT Sel switch mal

(1) Abnormal means keystroke does not appear on scratch pad line or wrong keystroke appears. User should always check IDP/CRT SEL sw position if applicable and repeat keystroke sequence prior to performing this procedure to eliminate user error and transients

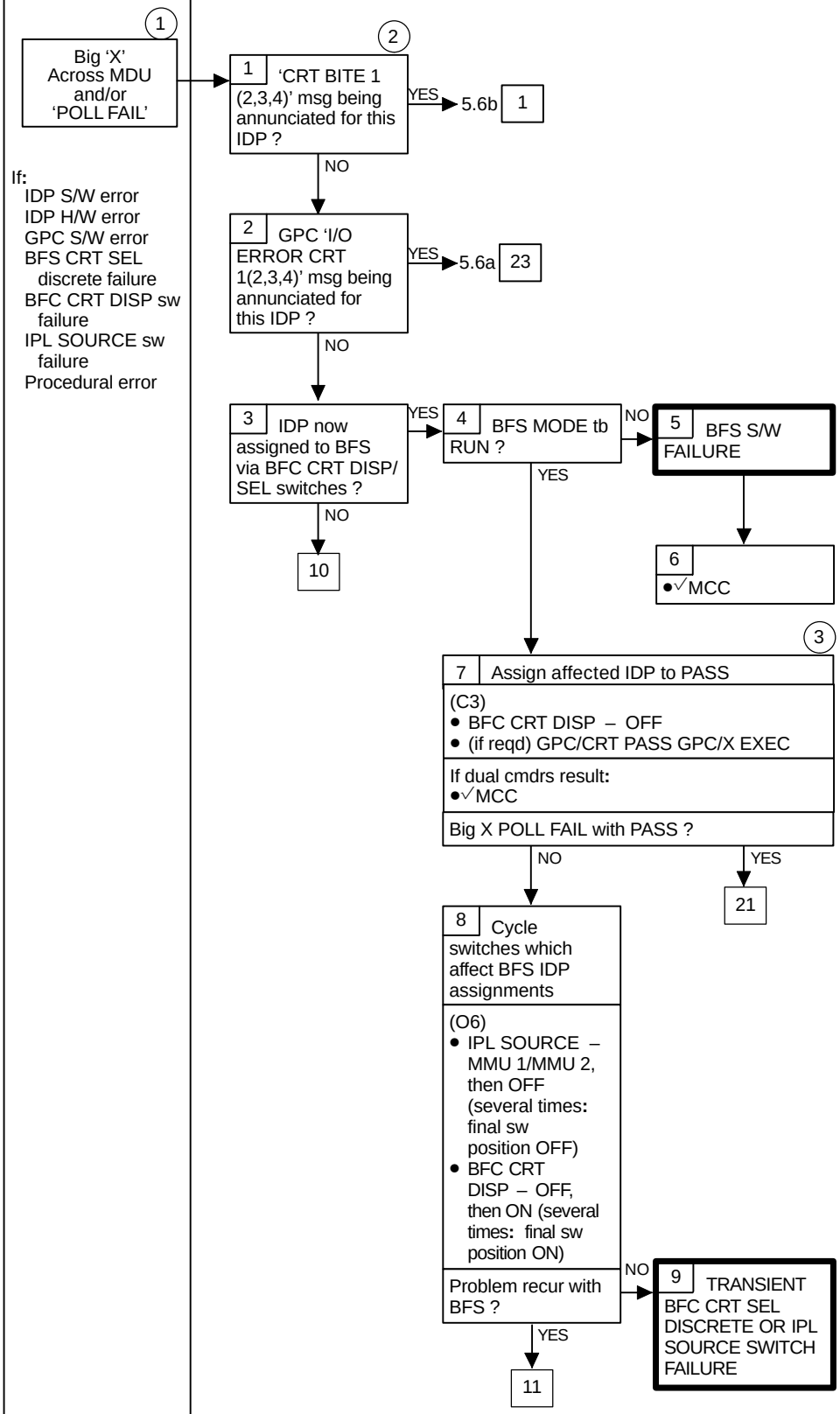
(2) Any SPEC or Roll–In DISP active or buried on IDP will be counted against two SPEC/ two Roll–In DISP limit per MAJ FUNC. SPEC/Roll–In DISP can be released via an OPS transition or an IDP Equivalent RESUME (via MCC uplink)



3 ✓MCC for possible IFM

DPS

5.6d BIG ‘X’ ACROSS MDU AND/OR ‘POLL FAIL’

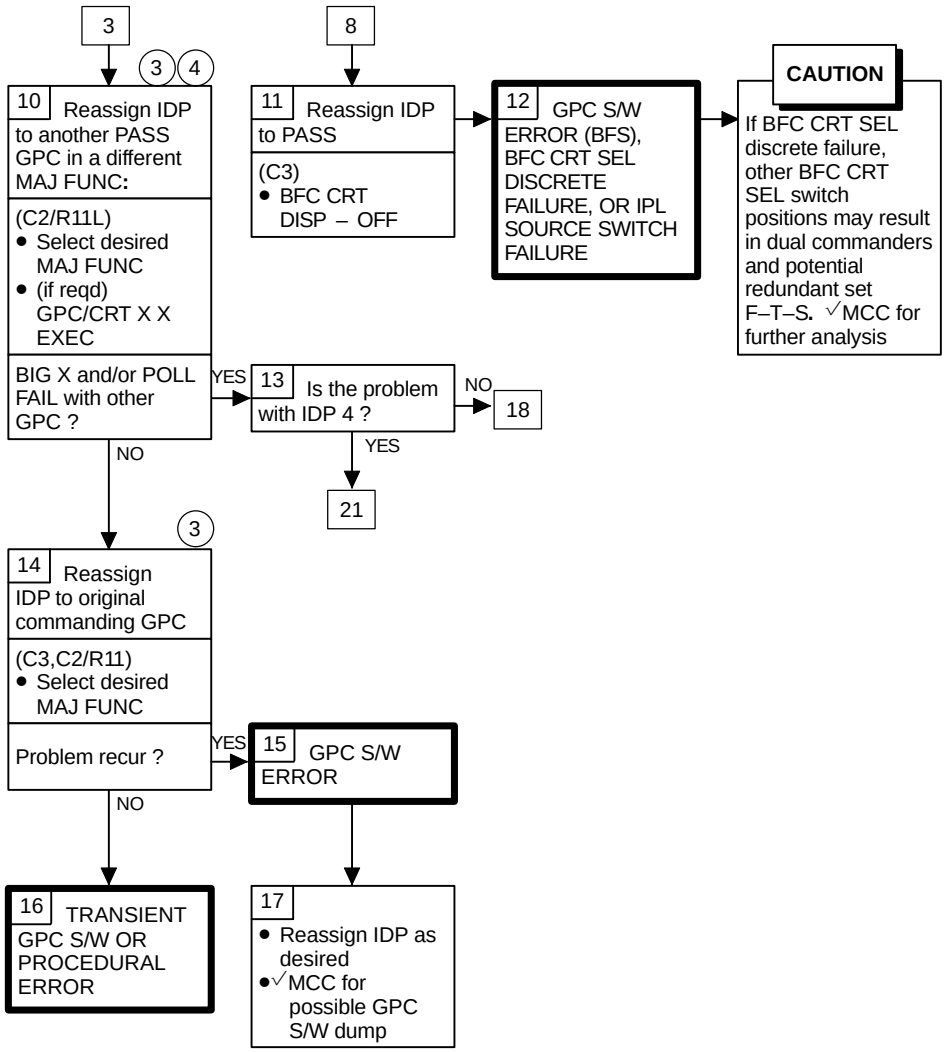


(1) Big ‘X’ appears when IDP does not receive display update commands for 3 sec. ‘POLL FAIL’ appears when IDP does not receive poll or time update commands for 3 sec

(2) User may have to establish alternate IDP interface to BFS or PASS or check with MCC as appropriate in order to observe fault msgs

(3) GPC/CRT key input must be made on keyboard with active GPC interface. Always use PASS keyboard to avoid dual commanders. If assigning IDP to/ from BFS, always deassign IDP first. BFC CRT DISPLAY/ SELECT sw will override any GPC/ CRT keyboard entry

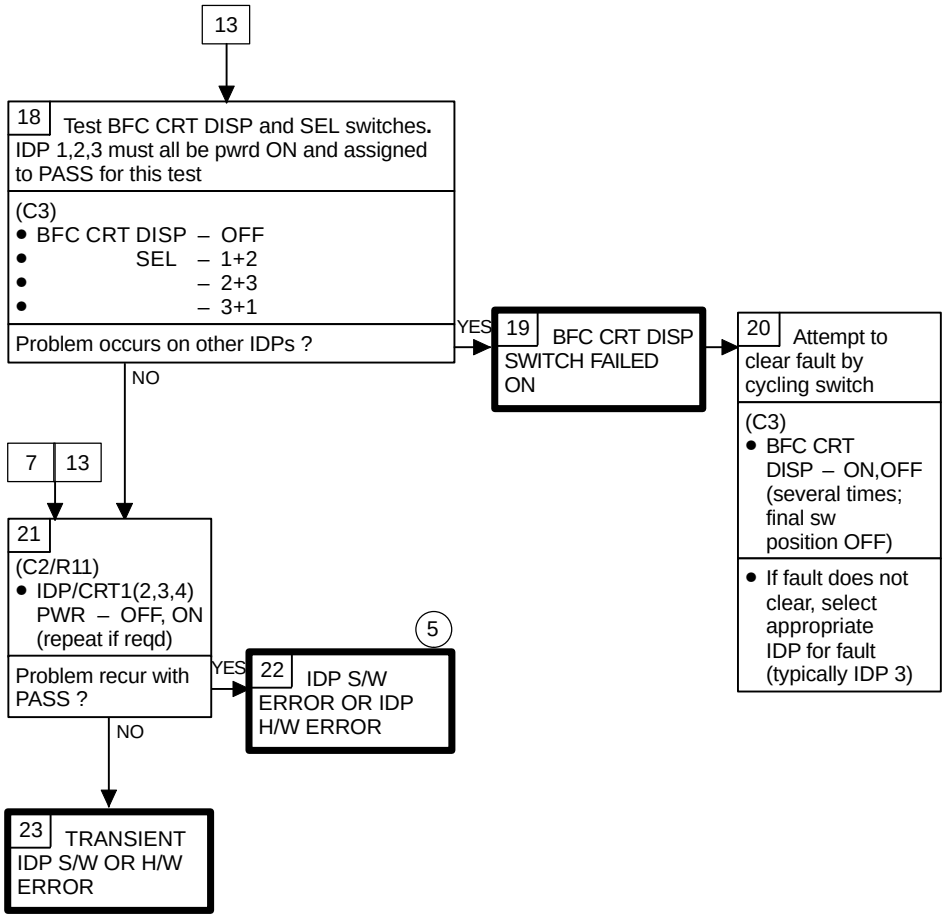
DPS 5.6d (Cont)



(3) GPC/CRT key input must be made on keyboard with active GPC interface. Always use PASS keyboard to avoid dual commanders. If assigning IDP to/ from BFS, always deassign CRT first. BFC CRT DISPLAY/ SELECT sw will override any GPC/ CRT keyboard entry

(4) Any SPEC or Roll–In DISP active or buried on IDP will be counted against two SPEC/ two Roll–In DISP limit per MAJ FUNC. SPEC/Roll–In DISP can be released via an OPS transition or an IDP Equivalent RESUME (via MCC uplink)

DPS 5.6d (Cont)



(5) IDP can not be used in DPS mode. May be usable in FLT INST and subsystem display modes

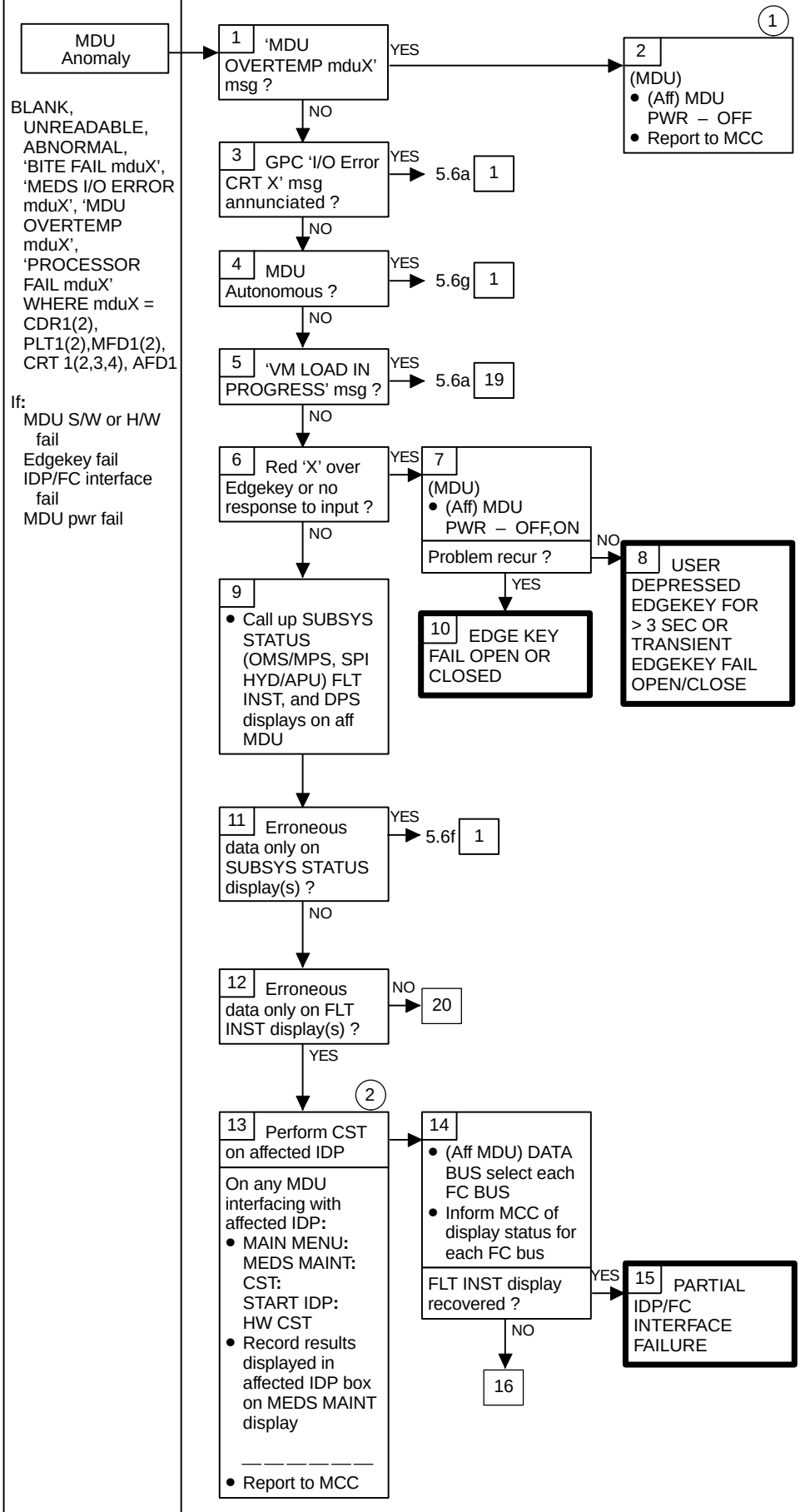
DPS

5.6e MDU ANOMALY

MDU Anomaly

BLANK,
UNREADABLE,
ABNORMAL,
'BITE FAIL mduX',
'MEDS I/O ERROR mduX', 'MDU OVERTEMP mduX',
'PROCESSOR FAIL mduX'
WHERE mduX = CDR1(2), PLT1(2),MFD1(2), CRT 1(2,3,4), AFD1

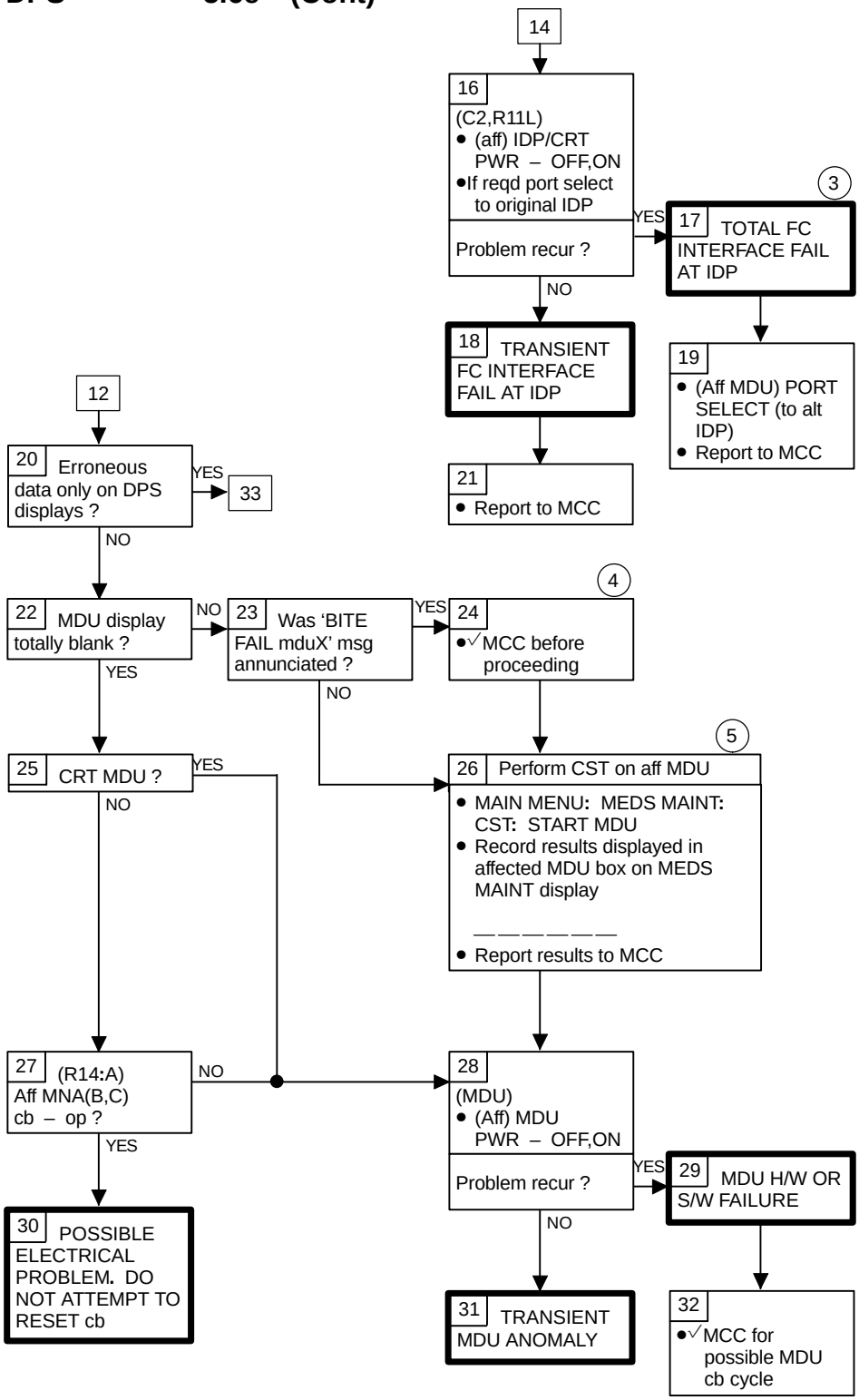
If:
- MDU S/W or H/W fail
- Edgekey fail
- IDP/FC interface fail
- MDU pwr fail



(1) Internal component has reached 212 degF. Do not repower unless asked by MCC

(2) Expect GPC 'I/O ERROR CRT X' message if GPC commanding the affected IDP. All other MDUs communicating with the IDP running CST will be temporarily inoperable. IDP CST results will be blank while H/W CST is running. IDP H/W CST takes ~75 sec. Nominal IDP CST result is '000000'

DPS 5.6e (Cont)

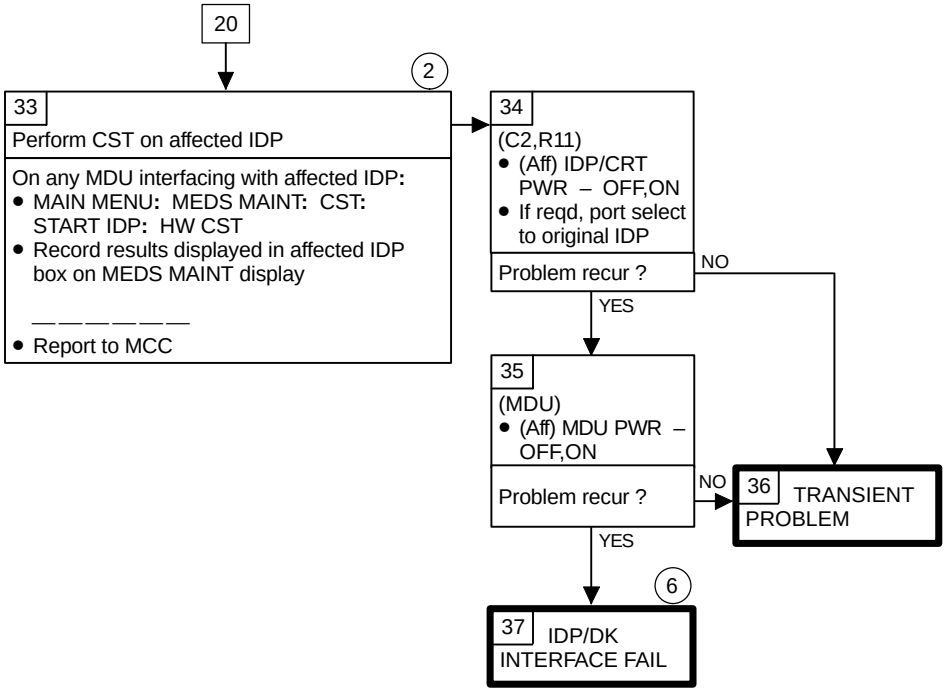


(3) IDP cannot be used in FLT INST mode. May be usable in DPS and subsystem display modes

(4) For MDU BITE caused by EEPROM failure, CST or pwr cycle should not be performed on MDU

(5) Expect 'MEDS I/O ERROR MDU X' messages. MDU CST will take ~75 sec to reach the edgekey test. IDPs will not be able to communicate with MDU while it is executing its CST. Nominal MDU CST result is '0000FF'

DPS 5.6e (Cont)

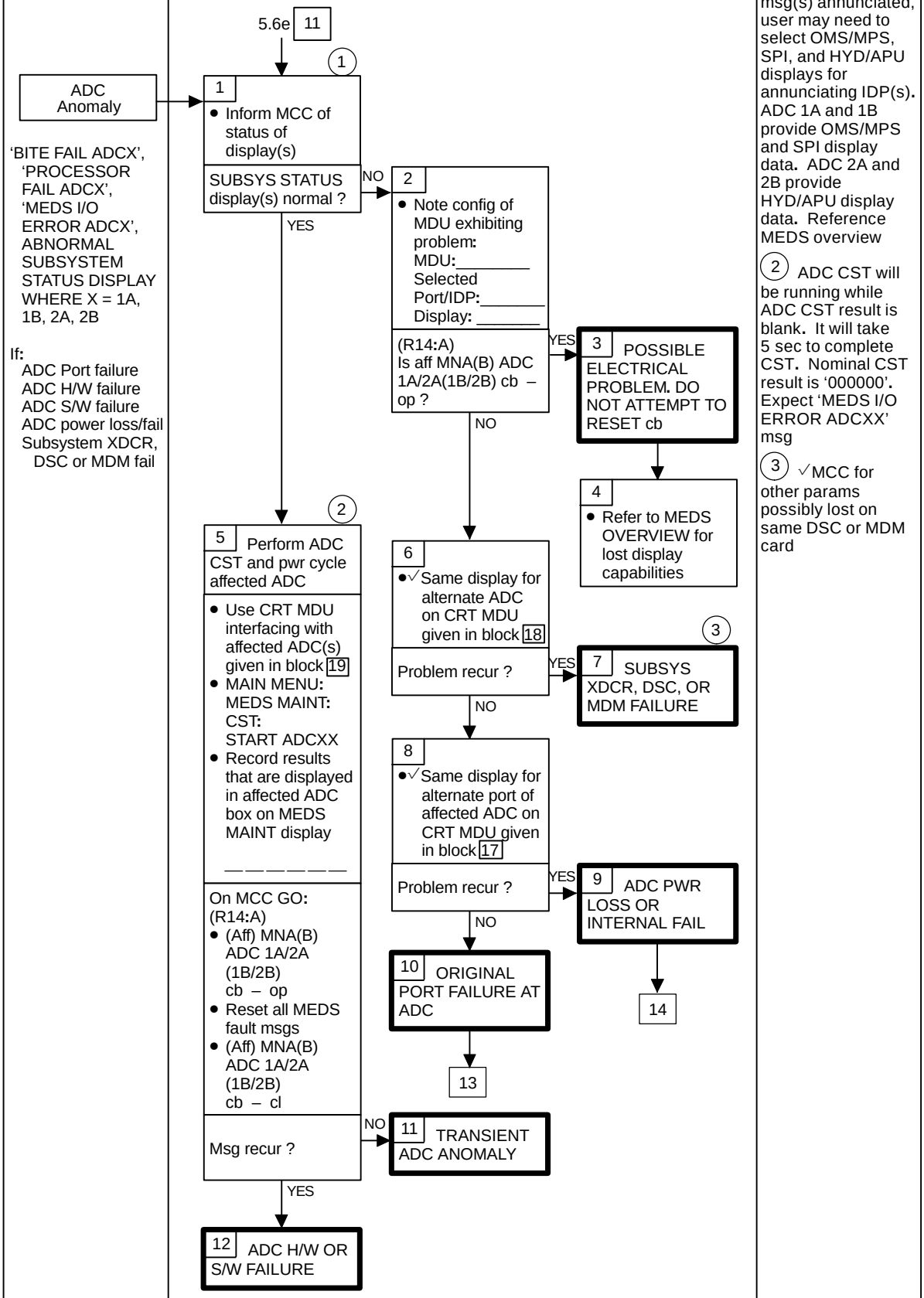


(2) Expect GPC 'I/O ERROR CRT X' message if GPC commanding the affected IDP. All other MDUs communicating with the IDP running CST will be temporarily inoperable. IDP CST results will be blank while H/W CST is running. IDP H/W CST takes ~75 sec. Nominal IDP CST result is '000000'

(6) IDP cannot be used in DPS mode. May be used in FLT INST and subsystem display modes

DPS

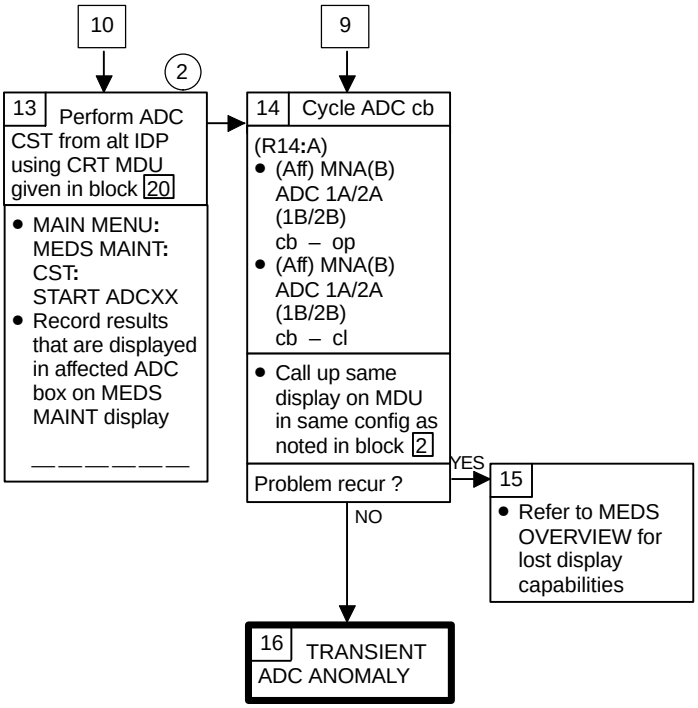
5.6f ADC ANOMALY



(1) If MEDS fault msg(s) annunciated, user may need to select OMS/MPS, SPI, and HYD/APU displays for annunciating IDP(s). ADC 1A and 1B provide OMS/MPS and SPI display data. ADC 2A and 2B provide HYD/APU display data. Reference MEDS overview

(2) ADC CST will be running while ADC CST result is blank. It will take 5 sec to complete CST. Nominal CST result is '000000'. Expect 'MEDS I/O ERROR ADCXX' msg

(3) ✓MCC for other params possibly lost on same DSC or MDM card



(4)

17 MDU with Subsys Display problem	Currently Selected Port (noted in block 2)	Use this CRT MDU
CDR1	Pri	CRT4
	Sec	CRT2
CDR2	Pri	CRT2
	Sec	CRT1
CRT1	–	CRT2
MFD1	Pri	CRT1
	Sec	CRT4
CRT3	–	CRT4
MFD2	Pri	CRT2
	Sec	CRT4
CRT2	–	CRT1
PLT1	Pri	CRT1
	Sec	CRT2
PLT2	Pri	CRT4
	Sec	CRT1
CRT4	–	CRT3
AFD1	Pri	CRT3
	Sec	CRT1

(2) ADC CST will be running while ADC CST result is blank. It will take 5 sec to complete CST. Nominal CST result is '000000'. Expect 'MEDS I/O ERROR ADCXX' msg

(4) Purpose of this chart is to select MDU that will always be connected to other IDP on ADC associated with problem. CRT MDU is chosen since it will always be connected to that IDP

(5)

18 MDU with Subsys Disp Prob (noted in block 2)	Selected Port (noted in block 2)	Use this CRT MDU
CDR1	Pri	CRT1
	Sec	CRT4
CDR2	Pri	CRT4
	Sec	CRT4
CRT1	–	CRT4
MFD1	Pri	CRT4
	Sec	CRT1
CRT3	–	CRT1
MFD2	Pri	CRT4
	Sec	CRT1
CRT2	–	CRT4
PLT1	Pri	CRT4
	Sec	CRT4
PLT2	Pri	CRT1
	Sec	CRT4
CRT4	–	CRT1
AFD1	Pri	CRT1
	Sec	CRT4

(6)

19 Perform CST for this ADC	Use this CRT MDU
ADC1A	CRT1 or CRT2
ADC1B	CRT4 or CRT3
ADC2A	CRT1 or CRT2
ADC2B	CRT4 or CRT3

(7)

20 Affected Display (noted in block 2)	Selected IDP for Affected MDU (noted in block 2)	Perform CST for this ADC	Use this CRT MDU
OMS/MPS/SPI	IDP 1	ADC 1A	CRT2
	IDP 2	ADC 1A	CRT1
	IDP 3	ADC 1B	CRT4
	IDP 4	ADC 1B	CRT3
HYD/APU	IDP 1	ADC 2A	CRT2
	IDP 2	ADC 2A	CRT1
	IDP 3	ADC 2B	CRT4
	IDP 4	ADC 2B	CRT3

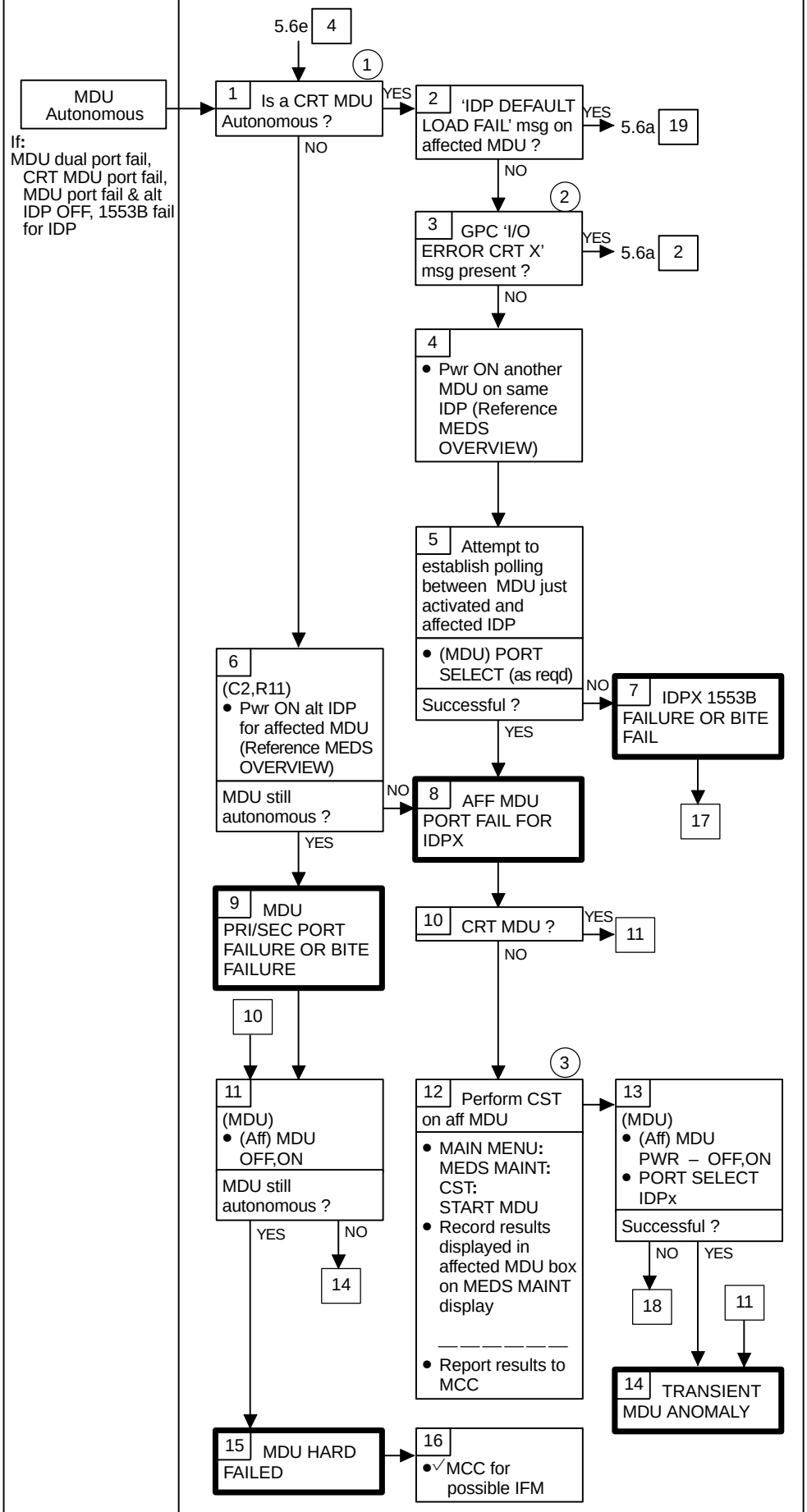
(5) Purpose of this chart is to select MDU that will always be connected to an IDP on alternate ADC for affected data. CRT MDU is chosen since it will always be connected to that IDP

(6) Purpose of this chart is to determine MDU on which to perform ADC CST. CRT MDU is chosen, since it will always be connected to aff ADC

(7) Purpose of this chart is to select ADC on which to perform ADC CST and MDU driven by IDP on alternate port of ADC. CRT MDU is chosen since it will always be connected to that IDP

DPS

5.6g MDU IS AUTONOMOUS

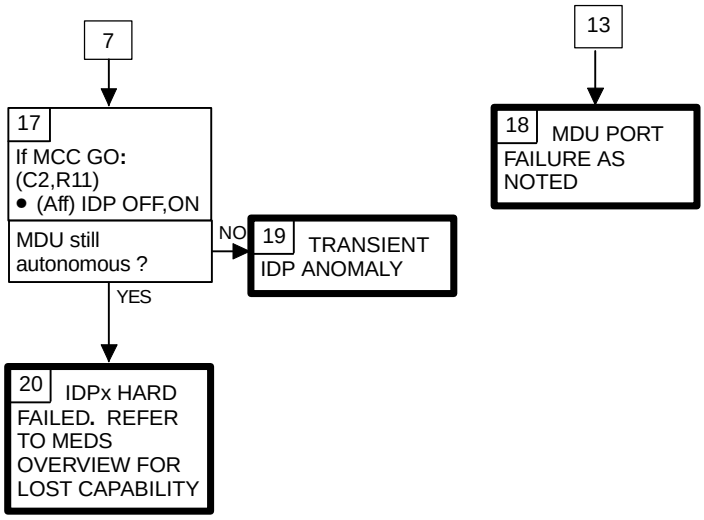


(1) If mult MDUs are autonomous, work MAL for CRT MDU

(2) User may have to establish alternate IDP interface to BFS or PASS or check with MCC as appropriate in order to observe fault msgs

(3) Expect 'MEDS I/O ERROR MDU X' messages. MDU CST will take ~75 sec to reach the edgekey test. IDPs will not be able to communicate with MDU while it is executing its CST. Nominal MDU CST result is '0000FF'

DPS 5.6g (Cont)

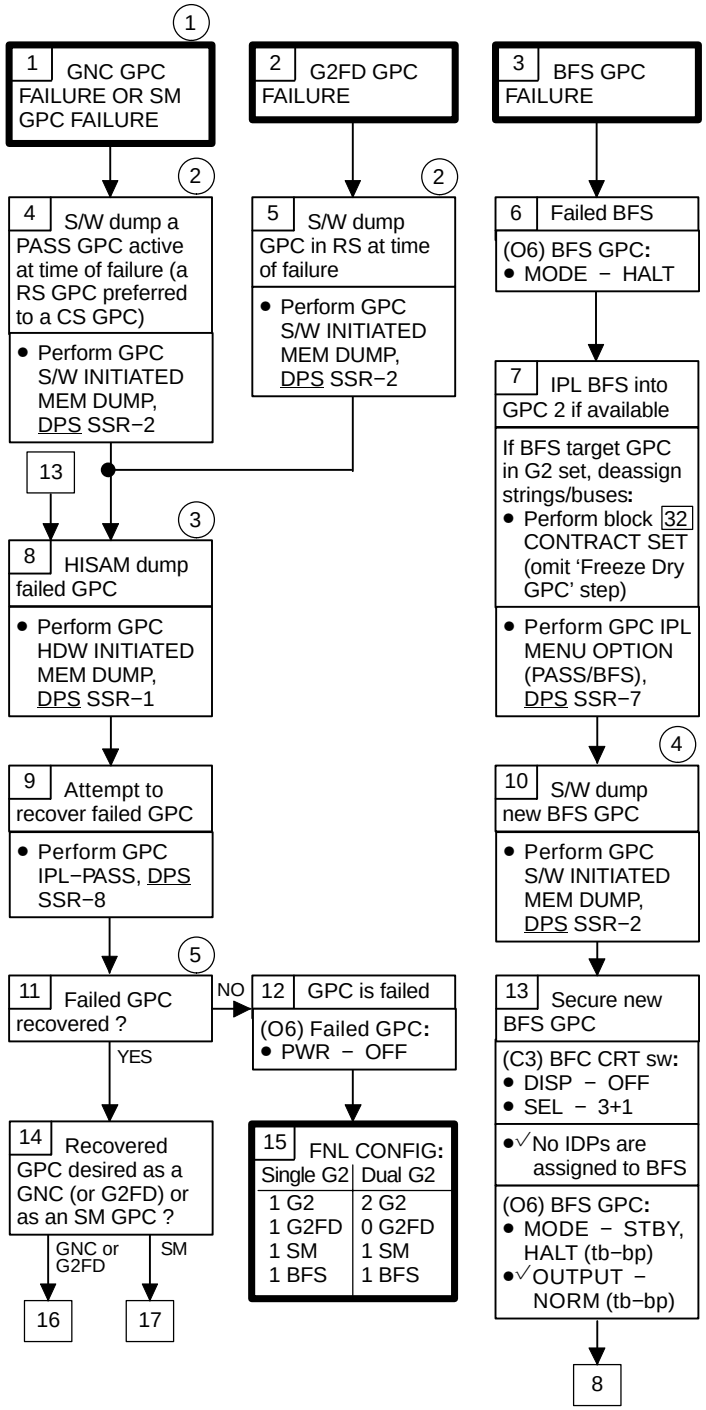

7
17
If MCC GO:
(C2,R11)
• (Aff) IDP OFF,ON
MDU still autonomous ?
NO
19
TRANSIENT IDP ANOMALY
YES
20
IDPx HARD FAILED. REFER TO MEDS OVERVIEW FOR LOST CAPABILITY
13
18
MDU PORT FAILURE AS NOTED

GPC FRP−1
SINGLE GPC FAIL

SINGLE GPC FAIL OBJECTIVE
Attempt failed GPC recovery following on−orbit DPS reconfiguration via APCL, OPCL, MAL, or PI procedure. If recovered, target the 'transient' GPC as a redundant G2, G2FD, or SM based upon operational objectives. If RNDZ, EVA, or a critical burn requires a Dual G2 config, recovered GPC will be made a G2FD

SCOPE
Procedure designed to handle any single G2, SM, G2FD, or BFS GPC failure occurring during ascent or on−orbit prior to entry prep

ASSUMPTIONS
If a multiple G2 configuration is reqd shortly following the GPC recovery attempt, such DPS reconfiguration will be performed before or after GPC recovery and is not an embedded part of this FRP



(1) If GPC FRP−1 following failure of 'GNC RECOVERY VIA G2FD' (OPCL), the following uplinks may be reqd upon a GPC recovery:
- state vector
- ADI quaternions
- IMU gyro bias
- IMU accel bias

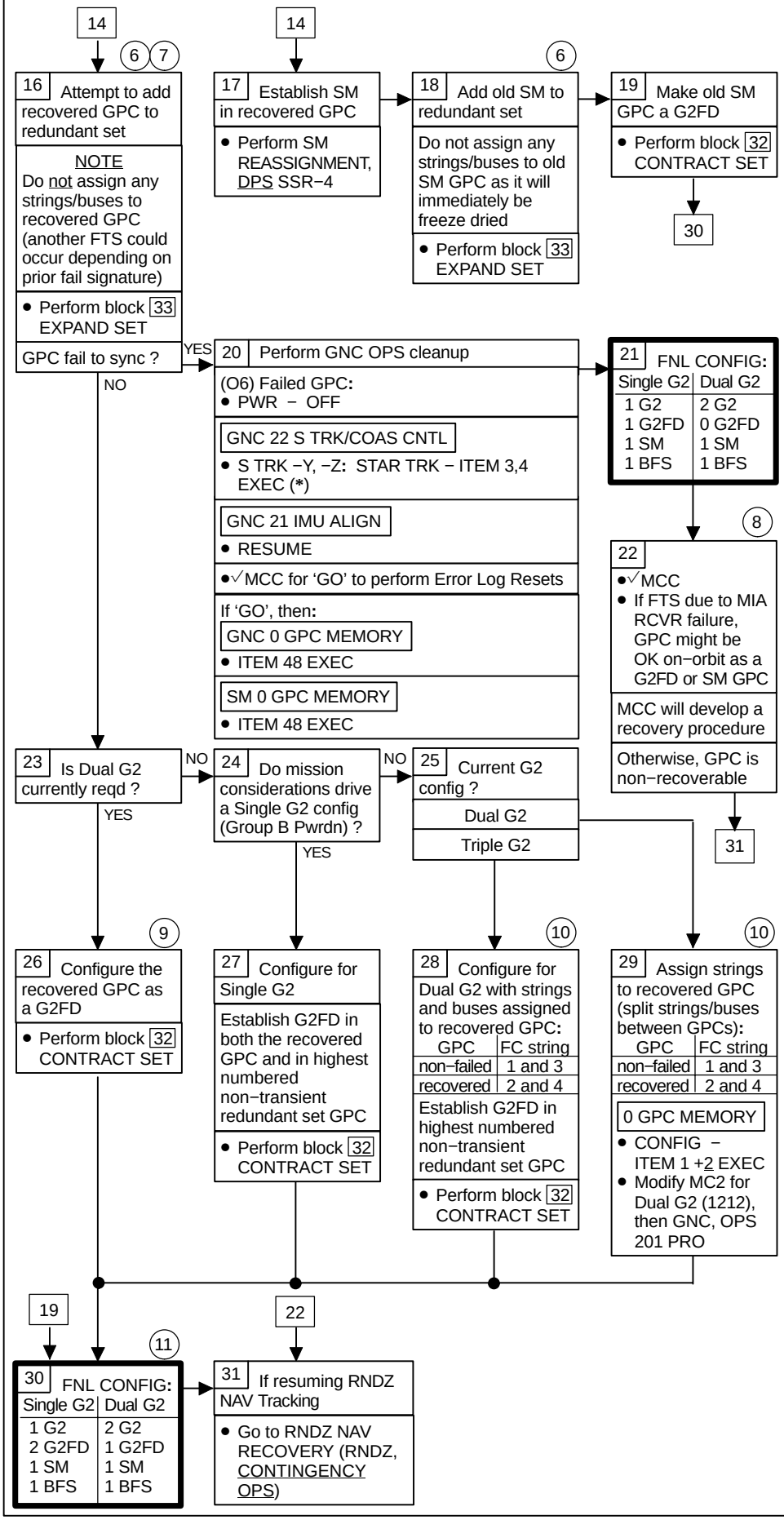
(2) S/W dump to capture GPC Sync Trace Log. MCC analysis of both S/W and H/W dumps may provide insight to the cause of a PASS GPC failure

(3) Prior to BFS H/W dump, current TFL must be capable of supporting a BFS downlist

(4) S/W dump to verify integrity of new BFS software load

(5) If GPC is recovered, upon completion of FRP, MCC may request certain IDPs be powered on for about 30 sec to ensure MCC uplink interfaces to both GNC and SM

GPC FRP−1 (Cont)



(6) This process establishes a GNC Major Function Base in the target G2. For the recovered GPC, the action verifies GPC can maintain redundant set sync

(7) Action verifies no FC MIA receiver failure exists

(8) 'Big Picture' recovery overview:

If failed GPC to be used as an SM, uplinked procedure will continue FRP after re−IPLing GPC in block 9

If failed GPC to be used as a restricted G2FD source, after re−IPLing GPC, uplinked procedure will add recovered GPC to redundant set with the affected string deassigned, collapse set with string deassigned, freeze dry GPC, and finally, reassign string and perform a GNC OPS Mode Recall

If GPC later used as G2FD source, string Dual G2must be deassigned before set expansion

(9) After critical mission phase is complete, if OPS considerations will permit continued use of a Dual G2 config, then establish G2FD in a redundant GPC and add recovered GPC to Dual G2 set

(10) MCC may correct NBAT if IMU config or other considerations drive alternate stringing [1221 or 1122 NBAT]

(11) Assign string 4 to recovered GPC during Entry phase (a transient GPC)

ASSUMPTIONS (Block 32):
The crew will need to adjust the GPC Target Set and nominal bus assignment table (NBAT) string/bus assignments in the "Configure For Set Contraction" step below to accommodate the actual DPS configuration (✓MCC if GPC target set or NBAT string/bus assignments unclear)

32 CONTRACT SET

NOTE
Do not perform any keyboard item entries or switch throws 10 sec before and after making an OPS transition request

- If RNDZ NAV enabled:

C3(A6U) DAP: LVLH
CRT GNC UNIV PTG
CNCL − ITEM 21 EXEC

- CONFIGURE FOR SET CONTRACTION

CRT If MM202: GNC, OPS 201 PRO
GNC 0 GPC MEMORY
CONFIG − ITEM 1 +2 EXEC
Assign MC2 per table →

If:	Single G2	Dual G2
CONFIG	2	2
GPC	10000	12000
STR 1	1	1
2	1	2
3	1	1
4	1	2
PL 1/2	0	0
CRT 1	1	1
2	1	2
3	0	0
4	1	2
L 1	0	0
2	0	0
MM 1	1	1
2	1	2

- OPS MODE RECALL (12)

C3(A6U) DAP: FREE
VERN(ALT)

CRT GNC, OPS 201 PRO
Pause ~30 sec
(DAP settling), then
C3(A6U) DAP: as reqd

- FREEZE DRY GPC

CRTX MAJ FUNC − PL
GPC/CRT G2FD/X EXEC
X PL GPC MEMORY
CONFIG − ITEM 45 +2 EXEC
GPC − ITEM 46 +2(3) EXEC
STORE − ITEM 47 EXEC
Store complete when MC = 02 (~30 sec)
✓All IDPs deassigned from FD GPC

O6 GPC MODE G2FD − STBY (tb−bp)
− HALT (tb−bp)
− STBY (tb−RUN)
− HALT (tb−bp)

- CONFIG FOR CLEANUP

GNC 22 S TRK/COAS CNTL
S TRK −Y, −Z: STAR TRK − ITEM 3,4 EXEC (*)
GNC 21 IMU ALIGN
RESUME

- CLEAR SOFTWARE FAIL VOTES (13)

GNC 0 GPC MEMORY
ITEM 48 EXEC
SM 0 GPC MEMORY
ITEM 48 EXEC

(12) GNC downlist will default to lowest ID GPC in G2 set. MCC may request downlister change following OPS Mode Recall

(13) Crew "GO" for Error Log resets without prior MCC concurrence

GPC FRP−1 (Cont)

ASSUMPTIONS (Block 33):
The crew will need to adjust the GPC Target Set in "Configure For Set Expansion" step below to accommodate the actual DPS configuration (✓MCC if GPC target set or NBAT string/bus assignments unclear)

Procedure assumes target GPC (recovered GPC or former SM GPC) is up and in 'RUN', which is normally the case. If target GPC not in common set, perform step 2 "Config G2FD GPC(s) For Set Expansion" of G2 SET EXPANSION procedure (DPS, ORB OPS)

33 EXPAND SET

NOTE
Do not perform any keyboard item entries or switch throws 10 sec before and after making an OPS transition request

- If RNDZ NAV enabled:

C3(A6U) DAP: LVLH
CRT GNC UNIV PTG
CNCL − ITEM 21 EXEC

- CONFIGURE FOR SET EXPANSION
If MM202: GNC, OPS 201 PRO
GNC 0 GPC MEMORY
CONFIG − ITEM 1 +2 EXEC
Assign MC2 per table (14)

If:	Dual G2	Triple G2
CONFIG GPC	2 12000	2 12300
STR 1 2 3 4 PL 1/2		
CRT 1 2 3 4	DON'T MODIFY NBAT	DON'T MODIFY NBAT
L 1 2		
MM 1 2		

- OPS MODE RECALL (15)

C3(A6U) DAP: FREE

CRT GNC, OPS 201 PRO
Pause ~30 sec
(DAP settling), then
C3(A6U) DAP: as reqd

(14) Whether expanding G2 set to a Dual or Triple G2 config, modify only the GPC target set unless otherwise noted (don't assign strings or buses to target GPC)

(15) GPC downlist will default to lowest ID GPC in G2 set. MCC may request downlister change following OPS Mode Recall

GPC FRP−3
BFS GPC FAIL RECOVERY (ENTRY)

NOTE

Procedure assumes config shown as established by BFS GPC FAIL (ENT PKT, DPS). The following BFS uplinks may be necessary after completion of FRP:

- Guidance targets
- ADI quaternions
- IMU gyro bias
- IMU accelerometer bias
- TMBU

Procedure assumes deorbit planned. If deorbit not planned, config for ORBIT and go to SINGLE GPC FAIL, GPC FRP−1 (DPS)

Initial Config FRP−3					
GPC OPS	1 G3	2 G3	3 G3	4 G3	5 −
POWER OUTPUT MODE	ON NORM RUN	ON NORM RUN	ON NORM RUN	ON NORM RUN	ON NORM HALT
CONFIG GPC	3 12340				
STR 1 2 3 4 PL 1/2	1 2 3 4 1				
CRT 1 2 3 4	1 2 3 0				
L 1 2	0 0				
MM 1 2	1 2				

a. Remove GPC2 from MC3

GNC 0 GPC MEMORY

- Config − ITEM 1 +3 EXEC
- Modify MC3 per table →
- GNC OPS 301 PRO (✓DAP)

CONFIG GPC	3 10340
STR 1 2 3 4 PL 1/2	1 4 3 4 1
CRT 1 2 3 4	1 4 3 0
L 1 2	0 0
MM 1 2	1 3

b. Establish new BFS in GPC 2

- Perform GPC IPL − MENU OPTION (PASS/BFS) . . . . DPS SSR−7

O6

- GPC OUTPUT − BKUP
- MODE − RUN

GNC 50 HORIZ SIT − ✓PASS R/W sel

c. Attempt recovery of failed GPC
- Perform GPC IPL−PASS ..... DPS SSR−8
- If GPC recovered, perform step d

Final Config for GPC 5 Not Recovered					
GPC OPS	1 G3	2 BFS3	3 G3	4 G3	5 −
POWER OUTPUT MODE	ON NORM RUN	ON BKUP RUN	ON NORM RUN	ON NORM RUN	OFF NORM HALT
CONFIG GPC	3 10340				
STR 1 2 3 4 PL 1/2	1 4 3 4 1				
CRT 1 2 3 4	1 4 3 0				
L 1 2	0 0				
MM 1 2	1 3				

d. GPC recovered, establish a four GPC redundant set

GNC 0 GPC MEMORY

- Config − ITEM 1 +3 EXEC
- Modify MC3 per table
- GNC OPS 301 PRO (✓DAP)
- (BFS) GNC, OPS 000 PRO
- 301 PRO

GNC 50 HORIZ SIT − ✓PASS R/W sel

CONFIG GPC	3 10345
STR 1 2 3 4 PL 1/2	1 4 3 5 1
CRT 1 2 3 4	1 4 3 0
L 1 2	0 0
MM 1 2	1 3

Final Config for GPC 5 Recovered					
GPC OPS	1 G3	2 BFS3	3 G3	4 G3	5 G3
POWER OUTPUT MODE	ON NORM RUN	ON BKUP RUN	ON NORM RUN	ON NORM RUN	ON NORM RUN
CONFIG GPC	3 10345				
STR 1 2 3 4 PL 1/2	1 4 3 5 1				
CRT 1 2 3 4	1 4 3 0				
L 1 2	0 0				
MM 1 2	1 3				

GPC FRP−4
PASS RECOVERY AFTER BFS ENGAGE (ASCENT/ORBIT/ENTRY)

NOTE

Procedure can be entered from direct Ascent/Entry engagement or from BFS ENGAGE (ORB PKT, DPS). Do not hardware dump or IPL freeze−dry GPC if activation was not attempted.
The following uplinks will be necessary during or after completion of the FRP:
- State Vector
- IMU desired REFSMMATs
- IMU gyro bias (if reqd)
- IMU accel bias (if reqd)
- ADI quaternion (orbit inertial)
- If immediate deorbit planned:
  - Guidance targets
  - Landing sites (if reqd)
  - TACAN table (if reqd)

1. Config GPCs:

O6 a. PASS GNC GPCs MODE − HALT

b. BFS GPC MODE − RUN

c. If BFS not in 301:

C2 (BFS) GNC, OPS 301 PRO

2. If SM GPC currently active:

O6 a. If SM GPC OUTPUT − TERM:
SM GPC OUTPUT − NORM
BFS ENGAGE pb − push (reset engage discretes)

O1 b. If SM GPC self−fail CAM lt on:
Perform PL/DPS RECONFIG (PL OPS or PL SYS or SODF: ASSY OPS):

SM 1 DPS UTILITY

CHECKPOINT RETRIEVE DISABLE:

C2 CKPT RETRV ENA − ITEM 12 EXEC (no *)

O6 SM GPC MODE − STBY, then RUN

C2 SM, OPS 201 PRO

c. Go to step 6

3. Attempt recovery of one GPC (begin with GPC 4 and proceed in descending order until a GPC is successfully IPL'd):
Perform GPC IPL − PASS . . . . . DPS SSR−8

4. For first successfully IPL'd GPC, establish SM GPC:
Perform SM REASSIGNMENT . . . . . DPS SSR−4 →

5. Select MET as MISSION TIME:

SM 2 TIME

C2 MISSION TIME MET − ITEM 2 EXEC

6. Hardware dump the remaining failed GPCs (if step 3 performed, do not dump IPL'd GPCs):
   a. Perform GPC HDW INITIATED MEM DUMP . . . . DPS SSR−1
   b. Repeat last step for each GPC . . . . . DPS SSR−1
   c. BFS ENGAGE pb − push (reset engage discretes)

7. Attempt recovery of each dumped GPC:
   a. Perform IPL:
      Perform GPC IPL−PASS . . . . . DPS SSR−8
      Repeat for each dumped GPC . . . . . DPS SSR−8
   b. Configure GPCs:
      If 1 PASS GPC, go to step 8
      If 2 PASS GPCs, go to steps 9−11
      If 3 PASS GPCs, go to steps 12−14
      If 4 PASS GPCs, go to steps 15−18

8. One PASS GPC, config for ENTRY:
   a. Perform LOAD PCMMU FORMAT (ENTRY) (ORB OPS FS, COMM/INST)
   b. Perform GNC REASSIGNMENT (G3) . . . . . DPS SSR−3 →
   c. Go to step 19; PASS IMU attitude reference recovery

GPC IPL'd

CONFIG GPC		1 4(5) 10000	2 4(5) 02000	3 4(5) 00300	4 4(5) 00040
STR	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	0
	4	0	0	0	0
PL	1/2	1	2	3	4
CRT	1	1	2	3	4
	2	1	2	3	4
	3	1	2	3	4
	4	0	0	0	0
L	1	1	2	3	4
	2	0	0	0	0
MM	1	1	2	3	4
	2	1	2	3	4

PASS GPC

CONFIG GPC		1 3 10000	2 3 02000	3 3 00300	4 3 00040
STR	1	1	2	3	4
	2	1	2	3	4
	3	1	2	3	4
	4	1	2	3	4
PL	1/2	1	2	3	4
CRT	1	1	2	3	4
	2	1	2	3	4
	3	1	2	3	4
	4	0	0	0	0
L	1	0	0	0	0
	2	0	0	0	0
MM	1	1	2	3	4
	2	1	2	3	4

8. (Cont)

Final Config for GPC 1					
GPC OPS	1 G3	2 −	3 −	4 −	5 BFS3
POWER OUTPUT MODE	ON NORM RUN	OFF NORM HALT	OFF NORM HALT	OFF NORM HALT	ON BKUP RUN
CONFIG GPC	3 10000				
STR 1 2 3 4 PL 1/2	1 1 1 1 1				
CRT 1 2 3 4	1 1 1 0				
L 1 2	0 0				
MM 1 2	1 1				

Final Config for GPC 2					
GPC OPS	1 −	2 G3	3 −	4 −	5 BFS3
POWER OUTPUT MODE	OFF NORM HALT	ON NORM RUN	OFF NORM HALT	OFF NORM HALT	ON BKUP RUN
CONFIG GPC	3 02000				
STR 1 2 3 4 PL 1/2	2 2 2 2 2				
CRT 1 2 3 4	2 2 2 0				
L 1 2	0 0				
MM 1 2	2 2				

Final Config for GPC 3					
GPC OPS	1 −	2 −	3 G3	4 −	5 BFS3
POWER OUTPUT MODE	OFF NORM HALT	OFF NORM HALT	ON NORM RUN	OFF NORM HALT	ON BKUP RUN
CONFIG GPC	3 00300				
STR 1 2 3 4 PL 1/2	3 3 3 3 3				
CRT 1 2 3 4	3 3 3 0				
L 1 2	0 0				
MM 1 2	3 3				

Final Config for GPC 4					
GPC OPS	1 −	2 −	3 −	4 G3	5 BFS3
POWER OUTPUT MODE	OFF NORM HALT	OFF NORM HALT	OFF NORM HALT	ON NORM RUN	ON BKUP RUN
CONFIG GPC	3 00040				
STR 1 2 3 4 PL 1/2	4 4 4 4 4				
CRT 1 2 3 4	4 4 4 0				
L 1 2	0 0				
MM 1 2	4 4				

C3

9. Two PASS GPCs:
   a. OI PCMMU FORMAT − FXD
   b. Establish single G3 config in lowest number GPC:
      Perform GNC REASSIGNMENT(G3) . . . . DPS SSR−3
   c. Perform step 19: PASS IMU attitude reference recovery, then:
   d. If ORBIT config desired, go to step 11

PASS GPCs

CONFIG GPC	1,2 1,3 1,4 3 10000	2,3 2,4 3 02000	3,4 3 00300
STR 1	1	2	3
2	1	2	3
3	1	2	3
4	1	2	3
PL 1/2	0	0	0
CRT 1	1	2	3
2	1	2	3
3	1	2	3
4	0	0	0
L 1	0	0	0
2	0	0	0
MM 1	1	2	3
2	1	2	3

10. Entry config desired, establish dual G3 config:
    a. Perform SM CHECKPOINT INITIATE (ORB OPS, DPS)
    b. Perform LOAD PCMMU FORMAT (ENTRY) (ORB OPS FS, COMM/INST)
    c. Perform GNC REASSIGNMENT (G3) . . . . . DPS SSR−3

PASS GPCs

CONFIG GPC	1,2 3 12000	1,3 3 10300	1,4 3 10040	2,3 3 02300	2,4 3 02040	3,4 3 00340
STR 1	1	3	1	3	2	3
2	2	1	4	2	4	4
3	1	3	1	3	2	3
4	2	1	4	2	4	4
PL 1/2	1	1	1	2	2	3
CRT 1	1	1	1	2	2	3
2	2	3	4	3	4	4
3	1	1	1	2	2	3
4	0	0	0	0	0	0
L 1	0	0	0	0	0	0
2	0	0	0	0	0	0
MM 1	1	1	1	2	2	3
2	2	3	4	3	4	4

10. (Cont)

Final Config for Two PASS GPCs and Entry Desired

GPCs 1,2					
GPC OPS	1 G3	2 G3	3 −	4 −	5 BFS3
POWER OUTPUT MODE	ON NORM RUN	ON NORM RUN	OFF NORM HALT	OFF NORM HALT	ON BKUP RUN
CONFIG GPC	3 12000				
STR 1 2 3 4 PL 1/2	1 2 1 2 1				
CRT 1 2 3 4	1 2 1 0				
L 1 2	0 0				
MM 1 2	1 2				

GPCs 1,3					
GPC OPS	1 G3	2 −	3 G3	4 −	5 BFS3
POWER OUTPUT MODE	ON NORM RUN	OFF NORM HALT	ON NORM RUN	OFF NORM HALT	ON BKUP RUN
CONFIG GPC	3 10300				
STR 1 2 3 4 PL 1/2	3 1 3 1 1				
CRT 1 2 3 4	1 3 1 0				
L 1 2	0 0				
MM 1 2	1 3				

GPCs 1,4					
GPC OPS	1 G3	2 −	3 −	4 G3	5 BFS3
POWER OUTPUT MODE	ON NORM RUN	OFF NORM HALT	OFF NORM HALT	ON NORM RUN	ON BKUP RUN
CONFIG GPC	3 10040				
STR 1 2 3 4 PL 1/2	1 4 1 4 1				
CRT 1 2 3 4	1 4 1 0				
L 1 2	0 0				
MM 1 2	1 4				

GPCs 2,3					
GPC OPS	1 −	2 G3	3 G3	4 −	5 BFS3
POWER OUTPUT MODE	OFF NORM HALT	ON NORM RUN	ON NORM RUN	OFF NORM HALT	ON BKUP RUN
CONFIG GPC	3 02300				
STR 1 2 3 4 PL 1/2	3 2 3 2 2				
CRT 1 2 3 4	2 3 2 0				
L 1 2	0 0				
MM 1 2	2 3				

10. (Cont)

Final Config for Two PASS GPCs and Entry Desired										
GPCs 2,4						GPCs 3,4					
GPC OPS	1 −	2 G3	3 −	4 G3	5 BFS3	GPC OPS	1 −	2 −	3 G3	4 G3	5 BFS3
POWER OUTPUT MODE	OFF NORM HALT	ON NORM RUN	OFF NORM HALT	ON NORM RUN	ON BKUP RUN	POWER OUTPUT MODE	OFF NORM HALT	OFF NORM HALT	ON NORM RUN	ON NORM RUN	ON BKUP RUN
CONFIG GPC	3 02040					CONFIG GPC	3 00340				
STR 1 2 3 4 PL 1/2	2 4 2 4 2					STR 1 2 3 4 PL 1/2	3 4 3 4 3				
CRT 1 2 3 4	2 4 2 0					CRT 1 2 3 4	3 4 3 0				
L 1 2	0 0					L 1 2	0 0				
MM 1 2	2 4					MM 1 2	3 4				

11. Orbit config desired, establish single G2:

a. Secure BFS:

C2 (BFS) GNC, OPS 000 PRO

C3 BFC CRT DISP − OFF
SEL − 3+1
✓All CRTs deassigned from BFS

O6 BFS GPC MODE − STBY, HALT (tb−bp)
OUTPUT − NORM

b. Perform GNC REASSIGNMENT (G3 to G2) .... DPS SSR−3

c. Perform LOAD PCMMU FORMAT (ORBIT)
(ORB OPS FS, COMM/INST)

d. If applicable, perform LOAD PDI DECOM FORMAT
(ORB OPS FS, COMM/INST)

C2 e. Configure IDPs:
GPC/CRT 03 EXEC
GPC/CRT DESIRED GPC/4 EXEC

O6 f. SM GPC OUTPUT − TERM

g. Reselect MTU accumulator:

SM(GNC) 2 TIME

C2 MTU ACCUM 1(2,3) TRY − ITEM 34(35,36)

NOTE

Down arrows will remain for accumulators not selected by GPC driving SPEC. If TRY is not successful, do not perform TIME SYNC. Continue with procedures, ✓MCC

	PASS GPCs 1,2 1,3 1,4	2,3 2,4	3,4
CONFIG GPC	2 10000	2 02000	2 00300
STR 1 2 3 4 PL 1/2	1 1 1 1 0	2 2 2 2 0	3 3 3 3 0
CRT 1 2 3 4	1 1 0 1	2 2 0 2	3 3 0 3
L 1 2	0 0	0 0	0 0
MM 1 2	1 1	2 2	3 3

11. (Cont)

Final Config for Two PASS GPCs and Orbit Desired

GPCs 1,2

GPC OPS	1 G2	2 SM	3 −	4 −	5 BFS
POWER OUTPUT MODE	ON NORM RUN	ON TERM RUN	OFF NORM HALT	OFF NORM HALT	ON NORM HALT
CONFIG GPC	2 10000	4(5) 02000			
STR 1	1	0			
2	1	0			
3	1	0			
4	1	0			
PL 1/2	0	2			
CRT 1	1	2			
2	1	2			
3	0	0			
4	1	2			
L 1	0	2			
2	0	0			
MM 1	1	2			
2	1	2			

GPCs 1,3

GPC OPS	1 G2	2 −	3 SM	4 −	5 BFS
POWER OUTPUT MODE	ON NORM RUN	OFF NORM HALT	ON TERM RUN	OFF NORM HALT	ON NORM HALT
CONFIG GPC	2 10000	4(5) 00300			
STR 1	1	0			
2	1	0			
3	1	0			
4	1	0			
PL 1/2	1	3			
CRT 1	1	3			
2	1	3			
3	0	0			
4	1	3			
L 1	0	3			
2	0	0			
MM 1	1	3			
2	1	3			

GPCs 1,4

GPC OPS	1 G2	2 −	3 −	4 SM	5 BFS
POWER OUTPUT MODE	ON NORM RUN	OFF NORM HALT	OFF NORM HALT	ON TERM RUN	ON NORM HALT
CONFIG GPC	2 10000	4(5) 00040			
STR 1	1	0			
2	1	0			
3	1	0			
4	1	0			
PL 1/2	0	4			
CRT 1	1	4			
2	1	4			
3	0	0			
4	1	4			
L 1	0	4			
2	0	0			
MM 1	1	4			
2	1	4			

GPCs 2,3

GPC OPS	1 −	2 G2	3 SM	4 −	5 BFS
POWER OUTPUT MODE	OFF NORM HALT	ON NORM RUN	ON TERM RUN	OFF NORM HALT	ON NORM HALT
CONFIG GPC	2 02000	4(5) 00300			
STR 1	2	0			
2	2	0			
3	2	0			
4	2	0			
PL 1/2	0	3			
CRT 1	2	3			
2	2	3			
3	0	0			
4	2	3			
L 1	0	3			
2	0	0			
MM 1	2	3			
2	2	3			

11. (Cont)

Final Config for Two PASS GPCs and Orbit Desired

GPCs 2,4					
GPC OPS	1 −	2 G2	3 −	4 SM	5 BFS
POWER OUTPUT MODE	OFF NORM HALT	ON NORM RUN	OFF NORM HALT	ON TERM RUN	ON NORM HALT
CONFIG GPC	2 02000	4(5) 00040			
STR 1	2	0			
2	2	0			
3	2	0			
4	2	0			
PL 1/2	0	4			
CRT 1	2	4			
2	2	4			
3	0	0			
4	2	4			
L 1	0	4			
2	0	0			
MM 1	2	4			
2	2	4			

GPCs 3,4					
GPC OPS	1 −	2 −	3 G2	4 SM	5 BFS
POWER OUTPUT MODE	OFF NORM HALT	OFF NORM HALT	ON NORM RUN	ON TERM RUN	ON NORM HALT
CONFIG GPC	2 00300	4(5) 00040			
STR 1	3	0			
2	3	0			
3	3	0			
4	3	0			
PL 1/2	0	4			
CRT 1	3	4			
2	3	4			
3	0	0			
4	3	4			
L 1	0	4			
2	0	0			
MM 1	3	4			
2	3	4			

C3 12. Three PASS GPCs:

a. OI PCMMU FORMAT − FXD

b. Establish G3 redundant set:

Perform GNC REASSIGNMENT (G3) . . . . DPS SSR−3 →

c. Perform step 19: PASS IMU attitude reference recovery, then:

PASS GPCs	1,2,3 1,2,4	1,3,4	2,3,4
CONFIG GPC	3 12000	3 10300	3 02300
STR 1	1	3	3
2	2	1	2
3	1	3	3
4	2	1	2
PL 1/2	0	0	0
CRT 1	1	1	2
2	2	3	3
3	1	1	2
4	0	0	0
L 1	0	0	0
2	0	0	0
MM 1	1	1	2
2	2	3	3

13. Config for ORBIT:
    a. Secure BFS:

C2 (BFS) GNC, OPS 000 PRO

C3 BFC CRT DISP − OFF
SEL − 3+1
✓All IDPs deassigned from BFS

O6 BFS GPC MODE − STBY,HALT (tb−bp)
OUTPUT − NORM

    b. Perform GNC REASSIGNMENT (G3 to G2) . . . . . DPS SSR−3
    c. Perform LOAD PCMMU FORMAT (ORBIT) (ORB OPS FS, COMM/INST)
    d. If applicable, perform LOAD PDI DECOM FORMAT (ORB OPS FS, COMM/INST)
    e. Configure IDPs:

C2 GPC/CRT 03 EXEC
DESIRED GPC/4 EXEC

O6 f. SM GPC OUTPUT − TERM
    g. Reselect MTU accumulator:

SM(GNC) 2 TIME

C2 MTU ACCUM 1(2,3) TRY − ITEM 34(35,36)

NOTE

Down arrows will remain for accumulators not selected by GPC driving SPEC. If try is not successful, do not perform TIME SYNC. Continue with procedures, ✓MCC

PASS GPCs	1,2,3 1,2,4	1,3,4	2,3,4
CONFIG GPC	2 12000	2 10300	2 02300
STR 1	1	1	2
2	2	3	3
3	1	1	2
4	2	3	3
PL 1/2	0	0	0
CRT 1	1	1	2
2	2	3	3
3	0	0	0
4	2	3	3
L 1	0	0	0
2	0	0	0
MM 1	1	1	2
2	2	3	3

    h. If single GNC GPC config desired, go to step 14

14. Establish single GNC GPC config:
    a. Perform GNC REASSIGNMENT (G2) . . . . . DPS SSR−3

PASS GPCs	1,2,3 1,2,4 1,3,4	2,3,4
CONFIG GPC	2 10000	2 02000
STR 1	1	2
2	1	2
3	1	2
4	1	2
PL 1/2	0	0
CRT 1	1	2
2	1	2
3	0	0
4	1	2
L 1	0	0
2	0	0
MM 1	1	2
2	1	2

    b. Perform FREEZE−DRY REASSIGNMENT (G3) . . . . . DPS SSR−5

PASS GPCs	1,2,3 1,2,4	1,3,4 2,3,4
CONFIG GPC	3(FD) 0200	3(FD) 00300
STR 1	2	3
2	2	3
3	2	3
4	2	3
PL 1/2	0	0
CRT 1	2	3
2	2	3
3	2	3
4	0	0
L 1	0	0
2	0	0
MM 1	2	3
2	2	3

14. (Cont)

Final Config for GPCs 1,2,3					
GPC OPS	1 G2	2 G3FD	3 SM	4 −	5 BFS
POWER OUTPUT MODE	ON NORM RUN	ON NORM HALT	ON TERM RUN	OFF NORM HALT	ON NORM HALT
CONFIG GPC	2 10000	4(5) 00300	3(FD) 02000		
STR 1	1	0	2		
2	1	0	2		
3	1	0	2		
4	1	0	2		
PL 1/2	0	3	0		
CRT 1	1	3	2		
2	1	3	2		
3	0	0	2		
4	1	3	0		
L 1	0	3	0		
2	0	0	0		
MM 1	1	3	2		
2	1	3	2		

Final Config for GPCs 1,2,4					
GPC OPS	1 G2	2 G3FD	3 −	4 SM	5 BFS
POWER OUTPUT MODE	ON NORM RUN	ON NORM HALT	OFF NORM HALT	ON TERM RUN	ON NORM HALT
CONFIG GPC	2 10000	4(5) 00040	3(FD) 02000		
STR 1	1	0	2		
2	1	0	2		
3	1	0	2		
4	1	0	2		
PL 1/2	0	4	0		
CRT 1	1	4	2		
2	1	4	2		
3	0	0	2		
4	1	4	0		
L 1	0	4	0		
2	0	0	0		
MM 1	1	4	2		
2	1	4	2		

Final Config for GPCs 1,3,4					
GPC OPS	1 G2	2 −	3 G3FD	4 SM	5 BFS
POWER OUTPUT MODE	ON NORM RUN	OFF NORM HALT	ON NORM HALT	ON TERM RUN	ON NORM HALT
CONFIG GPC	2 10000	4(5) 00040	3(FD) 00300		
STR 1	1	0	3		
2	1	0	3		
3	1	0	3		
4	1	0	3		
PL 1/2	0	4	0		
CRT 1	1	4	3		
2	1	4	3		
3	0	0	3		
4	1	4	0		
L 1	0	4	0		
2	0	0	0		
MM 1	1	4	3		
2	1	4	3		

Final Config for GPCs 2,3,4					
GPC OPS	1 −	2 G2	3 G3FD	4 SM	5 BFS
POWER OUTPUT MODE	OFF NORM HALT	ON NORM RUN	ON NORM HALT	ON TERM RUN	ON NORM HALT
CONFIG GPC	2 02000	4(5) 00040	3(FD) 00300		
STR 1	2	0	3		
2	2	0	3		
3	2	0	3		
4	2	0	3		
PL 1/2	0	4	0		
CRT 1	2	4	3		
2	2	4	3		
3	0	0	3		
4	2	4	0		
L 1	0	4	0		
2	0	0	0		
MM 1	2	4	3		
2	2	4	3		

15. Four PASS GPCs:

C3 a. OI PCMMU FORMAT − FXD

b. Establish G3 redundant set:

Perform GNC REASSIGNMENT (G3) . . . . . DPS SSR−3 →

CONFIG GPC	3 12300
STR 1	1
2	2
3	3
4	3
PL 1/2	0
CRT 1	1
2	2
3	3
4	0
L 1	0
2	0
MM 1	1
2	2

c. Perform step 19: PASS IMU attitude reference recovery, then:

16. Freeze−dry GPC:

a. Perform GNC REASSIGNMENT (G3) . . . . . DPS SSR−3 →

CONFIG GPC	3 12000
STR 1	1
2	2
3	1
4	2
PL 1/2	0
CRT 1	1
2	2
3	2
4	0
L 1	0
2	0
MM 1	1
2	2

b. Perform FREEZE−DRY REASSIGNMENT (G3) . . . . . DPS SSR−5 →

CONFIG GPC	3(FD) 00300
STR 1	3
2	3
3	3
4	3
PL 1/2	0
CRT 1	3
2	3
3	3
4	0
L 1	0
2	0
MM 1	3
2	3

17. Config for ORBIT:

a. Secure BFS:

C2 (BFS) GNC, OPS 000 PRO

C3 BFC CRT DISP − OFF
SEL − 3+1
✓All IDPs deassigned from BFS

O6 BFS GPC MODE − STBY,HALT (tb−bp)
OUTPUT − NORM

b. Perform GNC REASSIGNMENT (G3 to G2) . . . . . DPS SSR−3 →

c. Perform LOAD PCMMU FORMAT (ORBIT) (ORB OPS FS, COMM/INST)

d. If applicable, perform LOAD PDI DECOM FORMAT (ORB OPS FS, COMM/INST)

e. Configure IDPs:

C2 GPC/CRT 03 EXEC
GPC/CRT DESIRED GPC/4 EXEC

O6 f. SM GPC OUTPUT − TERM

g. Reselect MTU accumulator:

SM(GNC) 2 TIME

C2 MTU ACCUM 1(2,3) TRY − ITEM 34(35,36)

CONFIG GPC	2 12000
STR 1	1
2	2
3	1
4	2
PL 1/2	0
CRT 1	1
2	2
3	0
4	2
L 1	0
2	0
MM 1	1
2	2

NOTE

Down arrows will remain for accumulators not selected by GPC driving SPEC. If TRY is not successful, do not perform TIME SYNC. Continue with procedures, ✓MCC

h. If single GNC GPC config desired, perform step 18

Final Config for GPCs 1,2,3,4 Dual GNC GPCs					
GPC OPS	1 G2	2 G2	3 G3FD	4 SM	5 BFS
POWER	ON	ON	ON	ON	ON
OUTPUT	NORM	NORM	NORM	TERM	NORM
MODE	RUN	RUN	HALT	RUN	HALT

CONFIG GPC	2 12000	4(5) 00040	3(FD) 00300	
STR 1	1	0	3	
2	2	0	3	
3	1	0	3	
4	2	0	3	
PL 1/2	0	4	0	
CRT 1	1	4	3	
2	2	4	3	
3	0	0	3	
4	2	4	0	
L 1	0	4	0	
2	0	0	0	
MM 1	1	4	3	
2	2	4	3	

18. Establish single GNC GPC config:

a. Perform GNC REASSIGNMENT (G2) . . . . . DPS SSR−3

CONFIG GPC	2 10000
STR 1	1
2	1
3	1
4	1
PL 1/2	0
CRT 1	1
2	1
3	0
4	1
L 1	0
2	0
MM 1	1
2	1

b. Perform FREEZE−DRY REASSIGNMENT (G2) . . . . . DPS SSR−5

CONFIG GPC	2(FD) 02000
STR 1	2
2	2
3	2
4	2
PL 1/2	0
CRT 1	2
2	2
3	0
4	2
L 1	0
2	0
MM 1	2
2	2

Final Config for GPCs 1,3,4 Single GNC GPC					
GPC OPS	1 G2	2 G2FD	3 G3FD	4 SM	5 BFS
POWER OUTPUT MODE	ON NORM RUN	ON NORM HALT	ON NORM HALT	ON TERM RUN	ON NORM HALT

CONFIG GPC	2 10000	4(5) 00040	2(FD) 02000	3(FD) 00300
STR 1	1	0	2	3
2	1	0	2	3
3	1	0	2	3
4	1	0	2	3
PL 1/2	0	4	0	0
CRT 1	1	4	2	3
2	1	4	2	3
3	0	0	0	3
4	1	4	2	0
L 1	0	4	0	0
2	0	0	0	0
MM 1	1	4	2	3
2	1	4	2	3

19. PASS IMU attitude reference recovery:

O6 a. ✓STAR TRKR PWR (two) − ON

GNC 21 IMU ALIGN

b. Mode IMUs 1,2,3 to OPERATE:
IMU OPER 1(2,3) − ITEM 4(5,6) EXEC
(* will not appear until DISENGAGE step)

If extended loss of comm (ZOE not included) or no uplink CMD capability:
Recover IMU attitude reference utilizing the HUD and MATRIX alignment:

c. Deselect two IMUs leaving one IMU selected:
IMU DES 1(2,3) − ITEM 7(8,9)

d. Maneuver to attitude for subsequent HUD alignment,
STAR PAIRS PAD/CUE CARD (ORB OPS FS, PTG)

NOTE
Establish an inertial attitude which will simplify a manual maneuver to second star

e. Perform BFS disengagement (if comm, wait for MCC GO):

NOTE
BFS DISENGAGE can be verified Big X/POLL FAIL on MDU in DPS mode commanded by IDP 1, BFS GPC OUTPUT tb − bp (pnl O6), and BFC lt flashing (pnl F2/F4)

C2 ✓BFC CRT DISP − ON
SEL − 3+1 (BFS commanding MDUs via IDPs 3 and 1)
✓PASS GNC GPC driving MDUs via IDP 2

Deassign IDP 1 from PASS:
Via IDP 2, GPC/CRT 01 EXEC (BFS still commanding MDU via IDP 1)

On MCC GO, perform BFS disengage:
F6 BFC − DISENGAGE (repeat, as reqd)
C3 DAP: INRTL

Verify BFS disengage

C3 * If only PASS disengages: *
* (BFS commanding MDUs via IDPs 1 and 3, *
O6 * GNC GPC(s) OUTPUT tb − gray (pnl O6), *
* SPEC 6, GNC ✓no '↓' on strings) *
* *
* BFS, OPS 000 PRO *
* GPC 5 OUTPUT − NORM *
* − BACKUP *
* Verify BFS disengage *
* BFS, OPS 301 PRO *

C2 BFS − I/O RESET

Reassign IDP 1, as desired

F6/F8 ADI ATT (two) − REF
ADI REF pb − push

f. Perform IMU REFERENCE RECOVERY AFTER GNC GPCs IPL'd, GNC FRP−1 (GNC)

g. Go to step x

If good comm and uplink CMD capability:
Recover IMU attitude reference utilizing IMU/IMU alignments:

h. Deselect two IMUs leaving best IMU selected:
✓MCC for best IMU
IMU DES 1(2,3) − ITEM 7(8,9)

NOTE
Post BFS DISENGAGE, IMUs will be drifting uncompensated until MMREAD step is complete. Steps between BFS DISENGAGE and MMREAD must be performed without delay to reduce IMU drift

i. Disengagement of BFS:

NOTE
BFS DISENGAGE can be verified by Big X/POLL FAIL (on MDU in DPS mode commanded by IDP 1), BFS GPC OUTPUT tb − bp (pnl O6), and BFC lt flashing (pnl F2/F4)

C2 ✓BFC CRT DISP − ON
SEL − 3+1 (BFS commanding MDUs via IDPs 3 and 1)
✓PASS GNC GPC commanding MDUs via IDP 2

Deassign IDP 1 from PASS:
Via IDP 2, GPC/CRT 01 EXEC (BFS still commanding MDUs via IDP 1)

On MCC GO, perform BFS disengage:
F6 BFC − DISENGAGE (repeat, as reqd)
C3 DAP: INRTL

Verify BFS disengage

C3 * If only PASS disengages: *
O6 * (BFS commanding MDUs via IDPs 1 and 3), *
* GNC GPC(s) OUTPUT tb − gray (pnl O6), *
* SPEC 6, GNC ✓no '↓' on strings) *
* BFS, OPS 000 PRO *
* GPC 5 OUTPUT − NORM *
* − BACKUP *
* Verify BFS disengage *
* BFS, OPS 301 PRO *
*

C2 BFS − I/O RESET

Reassign IDP 1, as desired

j. Mass Memory Read of IMU calibration data:

GNC 21 IMU ALIGN

Select all IMUs for MASS MEMORY READ:
IMU 1,2,3 − ITEM 10,11,12 EXEC (*)
Initiate MMREAD:
MMREAD − ITEM 19 EXEC (*)
When MMREAD complete:
✓MMREAD − ITEM 19 (no *)

NOTE
'IMU BITE/T' may be annunciated until MMREAD is performed to restore IMU gyro delta bias terms

Recover Attitude Reference on one IMU:

k. Confirm with MCC that REFSMMAT uplink has been performed. Do not proceed without confirmation

l. Execute a modified IMU/IMU alignment:

CAUTION
IMU/IMU ALIGN MUST BE MANUALLY TERMINATED AS SOON AS DELTA ANGLES ON SPEC 21, FOR THE IMU BEING ALIGNED, ARE LESS THAN 0.05 IN ALL THREE AXES. THIS WILL OCCUR JUST PRIOR TO NOMINAL ALIGNMENT COMPLETION

GNC 21 IMU ALIGN

Utilize as reference the best IMU currently selected by RM:
IMU/IMU − ITEM 14 + ___ EXEC
✓MCC for IMU to be aligned:
ALIGN IMU 1(2,3) − ITEM 10(11,12) EXEC (*)
EXEC − ITEM 16 EXEC (*)

Manually TERMAINTE alignment as soon as delta angles on SPEC 21, for IMU being aligned, are less than 0.05 in all three axes:
TERM − ITEM 17 EXEC

m. Configure DAP:
C3 ✓DAP: INRTL
DAP ROT: PULSE/PULSE/PULSE

n. Deselect currently selected IMU (no selected IMUs):
IMU DES − ITEM 7(8,9) EXEC (*)

o. Reselect IMU aligned in step l:
IMU DES − ITEM 7(8,9) EXEC (no *)

p. Configure DAP:
C3 ✓DAP: INRTL
DAP ROT: DISC/DISC/DISC

Recover Attitude Reference on remaining two IMUs and desired platform skew on two IMUs:

q. Execute a nominal IMU/IMU alignment to recover attitude reference on all IMUs:

NOTE
Manual termination should not be performed. Alignment will require 3−4 min

GNC 21 IMU ALIGN

Utilize IMU recovered in step l (currently selected by RM) as reference:

IMU/IMU − ITEM 14 + __ EXEC
Select other two IMUs for alignment:
ALIGN IMU 1(2,3) − ITEM 10(11,12) EXEC (*)
EXEC − ITEM 16 EXEC (*)

r. When IMU/IMU alignment complete, reselect all IMUs:
IMU DES − ITEM 7(8,9) EXEC (no *)

Reestablish desired platform skew on remaining IMU:

s. Confirm with MCC that second REFSMMAT uplink has been performed. Do not proceed without confirmation

t. Execute a nominal IMU/IMU alignment to reestablish skew on all IMUs:

NOTE
Manual termination should not be performed. Alignment will require 3−6 min

GNC 21 IMU ALIGN

Align IMU previously utilized as reference in step q:
ALIGN IMU 1(2,3) − ITEM 10(11,12) EXEC (*)
Utilize either of the other two IMUs as current reference:
IMU/IMU − ITEM 14 + ___ EXEC
EXEC − ITEM 16 EXEC (*)

u. Mnvr to acquire stars using AUTO DAP for STRK align. Only Stars 11−60 are available in OPS3: choose appropriate star pair from pad STAR PAIRS PAD/CUE CARD (ORB OPS FS, PTG)

v. If STAR TRKRs powered on in step a, configure STAR TRKRs and open doors:
GNC I/O RESET

GNC 22 S TRK/COAS CNTL

If SHUTTER − CL:
ITEM 15(16) EXEC (*)
ITEM 15(16) EXEC (no *)
O6 S TRK DR CNTL SYS (two) − OP
✓POS tb (two) − bp (start timer)
When both tb − OP (8−24 sec), or either tb − bp for > 24 sec:
CNTL SYS (two) − OFF
If tb − bp > 8 sec, notify MCC
CRT STAR TRK − ITEM 3,4 EXEC (*)

w. If reqd, perform IMU ALIGN − S TRK (ORB OPS, GNC)

x. If only one GPC recovered:
GNC, OPS 201 PRO
GNC, OPS 301 PRO
(BFS) GNC, OPS 000 PRO
(BFS) GNC, OPS 301 PRO

GPC FRP−7
DPS RECONFIG FOR LOSS OF AV BAY COOLING (ASCENT/ORBIT)

NOTE

Procedure is designed to protect GPCs from overheating by moving G2, SM, BFS functions into cooled Av Bay GPCs (if not already there). G3FD and G2FD functions are placed into uncooled Av Bay GPCs and halted. If BFS is moved, new BFS GPC will be dumped to provide good BFS for Entry.

For Ascent, this FRP assumes LOSS OF AV BAY 1(2,3) COOLING/AV BAY 1(2,3) FIRE procedure (ASC PKT, PWRDN) has been accomplished.

If Orbit Config is G8 (FCS C/O), substitute for G2 where appropriate. If Orbit Config is G3, go to LOSS OF AV BAY 1(2,3) COOLING (ENT PKT, PWRDN) >>

	Perform steps
ASCENT (G1)	a−h
ORBIT (G2,G8/S2)	i−q

ASCENT

Initial ASCENT Config − Av Bay 1					
GPC OPS	1 −	2 G1	3 G1	4 −	5 BFS
POWER OUTPUT MODE	ON NORM HALT	ON NORM RUN	ON NORM RUN	ON NORM HALT	ON BKUP RUN
CONFIG GPC	1 12340				
STR 1 2 3 4 PL 1/2	3 2 3 2 2				
CRT 1 2 3 4	2 2 3 0				
L 1 2	1 2				
MM 1 2	2 3				

Initial ASCENT Config − Av Bay 2					
GPC OPS	1 G1	2 −	3 G1	4 G1	5 BFS
POWER OUTPUT MODE	ON NORM RUN	ON NORM HALT	ON NORM RUN	ON NORM RUN	ON NORM HALT
CONFIG GPC	1 12340				
STR 1 2 3 4 PL 1/2	1 4 3 4 1				
CRT 1 2 3 4	1 4 3 0				
L 1 2	1 2				
MM 1 2	1 3				

Initial ASCENT Config − Av Bay 3					
GPC OPS	1 G1	2 G1	3 −	4 G1	5 BFS
POWER OUTPUT MODE	ON NORM RUN	ON NORM RUN	ON NORM HALT	ON NORM RUN	ON BKUP RUN
CONFIG GPC	1 12340				
STR 1 2 3 4 PL 1/2	1 2 4 2 1				
CRT 1 2 3 4	1 2 4 0				
L 1 2	1 2				
MM 1 2	1 2				

a. Establish G2 freeze−dry GPC (Av Bay 1 − GPC 1; Av Bay 2 − GPC 2; Av Bay 3 − GPC 3)

- Perform FREEZE−DRY REASSIGNMENT . . . . . DPS SSR−5

b. Secure BFS (Av Bay 1,3 only)

C2 ● BFS GNC,OPS 000 PRO
C3 ● BFC CRT DISP − OFF
● ✓All IDPs deassigned from BFS
O6 ● GPC MODE 5 − STBY,HALT (tb−bp)
● OUTPUT 5 − NORM

c. Transition to GNC OPS 2

C2 GNC OPS 0 GPC MEMORY

- CONFIG ITEM 1+2 EXEC
- Modify MC 2 per table . . . . . →
- GNC, OPS 201 PRO

GNC UNIV PTG

	Av Bay 1	2	3
CONFIG GPC	2 02000	2 10000	2 12000
STR 1	2	1	1
2	2	1	2
3	2	1	1
4	2	1	2
PL 1/2	0	0	0
CRT 1	2	1	1
2	2	1	2
3	0	0	0
4	2	1	2
L 1	0	0	0
2	0	0	0
MM 1	2	1	1
2	2	1	2

d. Transition to OPS 2

- Perform SM REASSIGNMENT . . . . . DPS SSR−4 →

	Av Bay 1	2,3
CONFIG GPC	4 00300	4 00040
STR 1	0	0
2	0	0
3	0	0
4	0	0
PL 1/2	3	4
CRT 1	3	4
2	3	4
3	0	0
4	3	4
L 1	3	4
2	0	0
MM 1	3	4
2	3	4

e. If Av Bay 2, reassign BFS to GPC 3:

- Perform GPC IPL MENU OPTION (PASS/BFS) . . . . . DPS SSR−7

Dump newly IPL'd BFS:

- Perform GPC S/W INITIATED MEM DUMP GPC (3) (Target) . . . . . DPS SSR−2

C3 ● BFC CRT DISP − OFF
● ✓All IDPs deassigned from BFS
O6 ● GPC MODE 3 − STBY,HALT (tb−bp)
● ✓OUTPUT 3 − NORM

Re−IPL GPC 5:

- Perform GPC IPL − PASS . . . . . DPS SSR−8

O6 ● GPC MODE 5 − STBY (tb−bp),HALT
● − STBY (tb−RUN)
● − HALT (tb−bp)

f. Perform LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)

g. Config LRU switches:

	Av Bay 1		Av Bay 2		Av Bay 3
O14:A	BRAKES MNA − OFF	O15:A	BRAKES MNB − OFF	O13:A	cb ESS 1BC C/W A − op
:E	cb MNA ADTA 1 − op	:E	cb MNB ADTA 2 − op	O7	TACAN 3 MODE − OFF
O16:A	BRAKES MNC − OFF	O16:A	BRAKES MNC − OFF		
:E	cb MNC ADTA 3 − op	:E	cb MNC ADTA 4 − op		
O7	TACAN 1 MODE − OFF	O7	TACAN 2 MODE − OFF		
O8	MLS 1 − OFF	O8	MLS 2,3 (two) − OFF		
L4:P	cb AC3 ΦA LG SNSR 1 − op				

h. Config IDPs:

- GPC/CRT 03 EXEC
- GPC/CRT SM GPC/4 EXEC

C2

- IDP/CRT3 PWR − OFF
- MDU PWR − OFF (as desired)

At deorbit prep, perform LOSS OF AV BAY AIR COOLING (DEORBIT PREP, CONTINGENCY DELTA)
Final Config matrices at end of FRP

ORBIT

i. Orbit procedure assumes nominal ORBIT DPS config. If Orbit Config is G3 of less than 2 hr from deorbit burn, go to LOSS OF AV BAY 1(2,3) COOLING (ENT PKT, PWRDN) >>

If Av Bay 3:

- If triple G2, perform FREEZE−DRY REASSIGNMENT (Target GPC 3) . . . . . DPS SSR−5
- Go to step p

If Av Bay 1 and config is single G2:

- Expand set to include GPC 2 (in cooled Av Bay)
- Perform GNC REASSIGNMENT . . . . . DPS SSR−3 →

CONFIG GPC	2 12000
STR 1	1
2	2
3	1
4	2
PL 1/2	0
CRT 1	1
2	2
3	0
4	2
L 1	0
2	0
MM 1	1
2	2

j. Single G2 GPC ops

- Perform GNC REASSIGNMENT . . . . . DPS SSR−3 →

	Av Bay 1		Av Bay 2
CONFIG GPC	2 02000	CONFIG GPC	2 10000
STR 1	2	STR 1	1
2	2	2	1
3	2	3	1
4	2	4	1
PL 1/2	0	PL 1/2	0
CRT 1	2	CRT 1	1
2	2	2	1
3	0	3	0
4	2	4	1
L 1	0	L 1	0
2	0	2	0
MM 1	2	MM 1	1
2	2	2	1

If Av Bay 1, use BFS for systems monitoring:
- Perform SM CHECKPOINT INITIATE (ORB OPS, DPS)
- If reqd, perform PL/DPS RECONFIG, (PL SYS or SODF: ASSY OPS)

If RMS active:

SM 94 PDRS CONTROL

- Note WR range, PL ID, PL INIT ID, EE ID, SPEC 95 overrides

O6
- SM GPC MODE − STBY (tb−bp), RUN (tb−RUN)
- GPC OUTPUT 4 − NORM

C2
- IDP/CRT3 PWR − ON
- MDU PWR − ON (as desired)

C3
- BFC CRT SEL − 3+1
- DISP − ON
- ✓BFS GPC PWR − ON
- MODE − RUN (during LOS for C/W tones)
- − STBY (during AOS for gnd comm mgmt)
- If no comm at next AOS, select best antenna

k. If time insufficient for complete reconfig:

Av Bay 1	Av Bay 2
GPC 1,4 MODE − STBY (tb−bp),HALT	GPC 2 MODE − STBY (tb−bp),HALT
− STBY (tb−RUN)	− STBY (tb−RUN)
− HALT (tb−bp)	− HALT (tb−bp)
	✓5 MODE − HALT (tb−bp)

- Perform step p, and ✓MCC

l. Establish freeze−dry GPC (Av Bay 1 − GPC 1; Av Bay 2 − GPC 2)
- Perform FREEZE−DRY REASSIGNMENT . . . . . DPS SSR−5

m. Reassign GPC 3

If Av Bay 1, reassign SM to GPC 3:
- Perform SM REASSIGNMENT . . . . . DPS SSR−4 →

C2
- IDP/CRT3 PWR − OFF
- MDU PWR OFF as desired

C3
- BFC CRT DISP − OFF
- ✓All IDPs deassigned from BFS

O6
- BFS GPC MODE − STBY,HALT (tb−bp)
- ✓BFS GPC OUTPUT − NORM

If Av Bay 2, reassign BFS to GPC3:
- Perform GPC IPL MENU OPTION (PASS/BFS) . . . . . DPS SSR−7

CONFIG GPC	4 00300
STR 1	0
2	0
3	0
4	0
PL 1/2	3
CRT 1	3
2	3
3	0
4	3
L 1	3
2	0
MM 1	3
2	3

n. If time permits or multiple G2FD GPC:

- If Av Bay 2 perform GPC IPL − PASS
  (target GPC 5) . . . . . DPS SSR−8

GNC OPS 0 GPC MEMORY

- CONFIG ITEM 1+2 EXEC
- Modify MC 2 per table . . . . . →
- GNC, OPS 201 PRO

GNC UNIV PTG

- Perform FREEZE−DRY REASSIGNMENT
  (Av Bay 1 − GPC 4; Av Bay 2 − GPC 5) . . . . . DPS SSR−5

	Av Bay 1	Av Bay 2
CONFIG GPC	2 02040	2 10005
STR 1	2	1
2	2	1
3	2	1
4	2	1
PL 1/2	0	0
CRT 1	2	1
2	2	1
3	0	0
4	2	1
L 1	0	0
2	0	0
MM 1	2	1
2	2	1

o. If single G2FD config desired, halt GPCs in failed Av Bay

	Av Bay 1	Av Bay 2
O6	✓GPC 1 MODE − HALT	✓GPC 2 MODE − HALT
	4 MODE − STBY (tb−bp), HALT	5 MODE − STBY (tb−bp), HALT
	− STBY (tb−RUN)	
	− HALT (tb−bp)	

p. Config LRU switches:

	Av Bay 1	Av Bay 2	Av Bay 3
O14:A	✓BRAKES MNA − OFF	O15:A ✓BRAKES MNB − OFF	O13:A cb ESS 1BC C/W A − op
:E	✓cb MNA ADTA 1 − op	:E ✓cb MNB ADTA 2 − op	O7 ✓TACAN 3 MODE − OFF
O16:A	✓BRAKES MNC − OFF	O16:A ✓BRAKES MNC − OFF	
:E	✓cb MNC ADTA 3 − op	:E ✓cb MNC ADTA 4 − op	
O7	✓TACAN 1 MODE − OFF	O7 ✓TACAN 2 MODE − OFF	
O8	✓MLS 1 − OFF	O8 ✓MLS 2,3 (two) − OFF	
L4:P	✓cb AC3 ΦA LG SNSR 1 − op	L4:P ✓cb AC2 ΦA LG SNSR 2 − op	

q. If Av Bay 2, S/W dump newly IPL'd BFS GPC:

- Perform GPC S/W INITIATED MEM DUMP (Target GPC3) . . . . . DPS SSR−2

C3
- BFC CRT DISP − OFF
- ✓All IDPs deassigned from BFS

O6
- GPC MODE 3 − STBY,HALT (tb−bp)
- ✓OUTPUT 3 − NORM

At deorbit prep, go to LOSS OF AV BAY AIR COOLING (DEORB PREP, CONTINGENCY DELTAS)

FINAL CONFIG
(Ascent and Orbit with single G2FD GPC)

Av Bay 1					
GPC OPS	1 G2FD	2 G2	3 SM	4 −	5 BFS
POWER OUTPUT MODE	ON NORM HALT	ON NORM RUN	ON TERM RUN	ON NORM HALT	ON NORM HALT
CONFIG GPC	2 02000	4 00300			
STR 1	2	0			
2	2	0			
3	2	0			
4	2	0			
PL 1/2	0	3			
CRT 1	2	3			
2	2	3			
3	0	0			
4	2	3			
L 1	0	3			
2	0	0			
MM 1	2	3			
2	2	3			

Av Bay 2					
GPC OPS	1 G2	2 G2FD	3 BFS	4 SM	5 *
POWER OUTPUT MODE	ON NORM RUN	ON NORM HALT	ON NORM HALT	ON TERM RUN	ON NORM HALT
CONFIG GPC	2 10000	4 00040			
STR 1	1	0			
2	1	0			
3	1	0			
4	1	0			
PL 1/2	0	4			
CRT 1	1	4			
2	1	4			
3	0	0			
4	1	4			
L 1	0	4			
2	0	0			
MM 1	1	4			
2	1	4			

Av Bay 3					
GPC OPS	1 G2	2 G2	3 G2FD	4 SM	5 BFS
POWER OUTPUT MODE	ON NORM RUN	ON NORM RUN	ON NORM HALT	ON TERM RUN	ON NORM HALT
CONFIG GPC	2 12000	4 00040			
STR 1	1	0			
2	2	0			
3	1	0			
4	2	0			
PL 1/2	0	4			
CRT 1	1	4			
2	2	4			
3	0	0			
4	2	4			
L 1	0	4			
2	0	0			
MM 1	1	4			
2	2	4			

* BFS for orbit;
PASS OPS 0 for Ascent

GPC FRP−7 (Cont)

FINAL CONFIG
(Orbit with multiple G2FD GPCs)

Av Bay 1					
GPC OPS	1 G2FD	2 G2	3 SM	4 G2FD	5 BFS
POWER OUTPUT MODE	ON NORM HALT	ON NORM RUN	ON TERM RUN	ON NORM HALT	ON NORM HALT
CONFIG GPC	2 02000	4 00300			
STR 1	2	0			
2	2	0			
3	2	0			
4	2	0			
PL 1/2	0	3			
CRT 1	2	3			
2	2	3			
3	0	0			
4	2	3			
L 1	0	3			
2	0	0			
MM 1	2	3			
2	2	3			

Av Bay 2					
GPC OPS	1 G2	2 G2FD	3 BFS	4 SM	5 G2FD
POWER OUTPUT MODE	ON NORM RUN	ON NORM HALT	ON NORM HALT	ON TERM RUN	ON NORM HALT
CONFIG GPC	2 10000	4 00040			
STR 1	1	0			
2	1	0			
3	1	0			
4	1	0			
PL 1/2	0	4			
CRT 1	1	4			
2	1	4			
3	0	0			
4	1	4			
L 1	0	4			
2	0	0			
MM 1	1	4			
2	1	4			

Av Bay 3					
GPC OPS	1 G2	2 G2FD	3 G2FD	4 SM	5 BFS
POWER OUTPUT MODE	ON NORM RUN	ON NORM HALT	ON NORM HALT	ON TERM RUN	ON NORM HALT
CONFIG GPC	2 10000	4 00040			
STR 1	1	0			
2	1	0			
3	1	0			
4	1	0			
PL 1/2	0	4			
CRT 1	1	4			
2	1	4			
3	0	0			
4	1	4			
L 1	0	4			
2	0	0			
MM 1	1	4			
2	1	4			

DPS SSR−1
GPC HDW INITIATED MEM DUMP

NOTE
Perform during AOS

O6 1. ✓GPC MODE 1(2,3,4,5) − HALT
PWR 1(2,3,4,5) − ON
OUTPUT 1(2,3,4,5) − TERM

MO42F GPC MEM DUMP − 1(2,3,4,5)
Perform next step at noted dump time

2. If tape−driven MMU, ✓MCC to ensure OPS RCDR 1(2) configured for dump

3. SM 62 PCMMU/PL COMM
If reqd, load dump TFL: LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)

4. If PASS:
Select failed GPC X as downlister (avoids downlist contention)
SM(GNC) 0 GPC MEMORY
DOWNLIST GPC − ITEM 44 +X EXEC

O6 5. GPC MODE 1(2,3,4,5) − STBY (starts dump)
Wait: Double dump of PASS GPC complete after 4 min; single dump of BFS complete after 8 min
O6 GPC MODE 1(2,3,4,5) − HALT (stops dump)
OUTPUT 1(2,3,4,5) − NORM

6. If PASS:
Select lowest ID GNC GPC X as downlister
SM(GNC) 0 GPC MEMORY
DOWNLIST GPC − ITEM 44 +X EXEC

MO42F 7. GPC MEM DUMP − OFF

8. SM 62 PCMMU/PL COMM
If reqd, load post dump TFL:
LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)

DPS SSR−2
GPC S/W INITIATED MEM DUMP

NOTE

Perform AOS. This procedure will generate a complete GPC Software Memory Dump in all in−flight OPS. Single item entry dumps must be performed in a HDR TFL

1. If vehicle configured with tape−driven MMU: ✓MCC to ensure OPS RCDR 1(2) configured for dump

2. SM 62 PCMMU/PL COMM

   If reqd, load dump TFL: LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)

3. If PASS:

   a. If GNC, SM, or PL9 Memory Dump:

      On display assigned to GPC to be dumped,

      GNC(SM,PL) 0 GPC MEMORY

      If a specific GNC GPC to be dumped,
      ✓DOWNLIST GPC − ITEM 44 +X EXEC

      DUMP START/STOP − ITEM 43 EXEC
      Item 40 (up), 41 (down) entries begin counting
      Dump complete when ITEMs 40,41 blank

   b. If an OPS 0 GPC Memory Dump:

      If target OPS 0 GPC MODE − HALT:
      ✓Appropriate AV Bay Fan − ON
      ✓Target GPC PWR − ON
      Target GPC MODE − STBY (tb−RUN)
      − RUN (OUTPUT tb−gray)

      Assign desired IDP/CRT to OPS 0 GPC: GPC/CRT XX EXEC

      PL 0 GPC MEMORY

      DOWNLIST GPC − ITEM 44 +X EXEC
      DUMP START/STOP − ITEM 43 EXEC
      Item 40 (up), 41 (down) entries begin counting
      Dump complete when ITEMs 40,41 blank

      DOWNLIST GPC − ITEM 44 +X EXEC (lowest ID GNC GPC)

MF/OPS	GNC(OPS 0)	SM	PL9
DUMP TIME	2.2	5.7	MAX = 9.7

4. If BFS:

   GNC 0 BFS MEMORY

   DUMP START/STOP − ITEM 24 EXEC
   Item 21 (up), 22 (down) entries begin counting
   Dump complete when ITEMs 21,22 blank (after 8 min)

5. SM 62 PCMMU/PL COMM

   If reqd, load post−dump TFL:
   LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)

DPS SSR−3
GNC REASSIGNMENT

1. If target GPC MODE − HALT:

L1 ✓Appropriate AV BAY FAN − ON

O6 ✓Target GPC PWR − ON

MODE − STBY (tb−RUN), RUN

2. ✓Target GPC OUTPUT − NORM

3. If SM GPC being deleted:

If reqd, perform PL/DPS RECONFIG, Secure (PL SYS or SODF: ASSY OPS), then:

Perform SM CHECKPOINT INITIATE (ORB OPS, DPS), then:

SM(GNC) 1 DPS UTILITY

UL CNTL

ENA − ITEM 36 EXEC (*)

C3 UPLK − manually config for AOS/LOS

NOTE

Ku−Band system may be reqd to be taken to Standby to prevent exceeding radiation constraints

4. If AOS:

✓MCC for comm config and radiation constraints

If no comm:

A1U KU PWR − STBY

CNTL − PNL,CMD

Go to COMM LOST (ORB PKT, COMM) steps 7 and 8

5. ✓All GPCs being added to current redundant set in OPS 0.

If new GPC is in simplex ops (SM or PL), select OPS 0 via OPS 000 PRO

C2,R11L 6. IDP/CRT1(2,3,4) MAJ FUNC − GNC

GNC 0 GPC MEMORY

CONFIG − ITEM 1 +X EXEC

X = 1 if G1, 2 if G2, 8 if G8, 3 if G3

Assign desired GPC(s), strings, PL 1/2 (if no SM GPC active), CRTs, and MMs

If SM GPC active, deassign PL 1/2

7. If G3:

O14, RGAs 1,2,3,4 − ON

O15, ✓RJDA/RJDF (all) − ON

O16 cb ADTA (four) − cl

O8 MLS (three) − ON

C2,R11L 8. Using display assigned to a current redundant set GNC GPC,

IDP/CRT MAJ FUNC − GNC

C3 ✓BFC CRT DISP − OFF

9. GNC, OPS X X X PRO (✓DAP)

XXX = 106 if G1, 201 if G2, 301 if G3, 801 if G8

✓ GNC (Major Mode Display)

10. If PASS and BFS in G1(G3) and BFS not engaged, BFS I/O RESET

11. ✓Appropriate DAP mode selected

12. GNC 0 GPC MEMORY

DOWNLIST GPC − ITEM 44 +X EXEC

X = GNC GPC

13. Go to PL/DPS RECONFIG, Recovery (PL SYS or SODF: ASSY OPS)

DPS SSR−4
SM REASSIGNMENT

A1U 1. KU PWR − STBY
CNTL − PNL,CMD
If no comm, go to COMM LOST (ORB PKT, COMM) steps 7 and 8

2. If target GPC MODE − HALT:
L1 ✓Appropriate AV BAY FAN − ON
O6 ✓Target GPC PWR − ON
MODE − STBY (tb−RUN), RUN

3. ✓Target GPC OUTPUT − NORM

4. If target GPC not in OPS 0:
GNC 0 GPC MEMORY
CONFIG − ITEM 1 +X EXEC
X = 2 if G2, 8 if G8, 3 if G3
Reassign target GPC strings, CRTs, MMs
Do not reconfig target set
✓PL 1/2 deassigned from G2/G3/G8
GNC, OPS X X X PRO
DOWNLIST GPC − ITEM 44 +X EXEC
X = nontargeted GNC GPC
O6 GPC MODE (tgt) − STBY (tb−bp)
− RUN (tb−RUN)

5. If SM GPC currently active:
If reqd, perform PL/DPS RECONFIG, Secure (PL SYS or SODF: ASSY OPS), then:
If RMS active:
SM 94 PDRS CONTROL
Note WR range, PL ID, PL INIT ID, EE ID, SPEC 95 Overrides
Perform SM CHECKPOINT INITIATE (ORB OPS, DPS), then:
O6 SM GPC OUTPUT − NORM
MODE − STBY (tb−bp), RUN (tb−RUN)

6. SM(GNC) 1 DPS UTILITY
UL CNTL
ENA − ITEM 36 EXEC (*)
C3 UPLK − manually config for AOS/LOS
If checkpoint previously done, CKPT RETRV ENA − ITEM 12 EXEC (*)

C2 7. Desired IDP/CRT MAJ FUNC − SM
R11L If desired IDP not currently assigned to target GPC, GPC/CRT target GPC/desired IDP EXEC

8. SM 0 GPC MEMORY
CONFIG − ITEM 1 +4(5) EXEC
Assign desired GPC, PL 1/2, CRTs, LAUNCH 1, MMs

C2 9. SM, OPS 201(401) PRO
✓SM ANTENNA

10. If SM−reassign performed to troubleshoot SM GPC/LRU interface:
If original error recurs, problem at LRU:
Reconfig to prior DPS config
✓MCC for possible IFM
If error does not recur, problem at old SM GPC:
Perform DPS FRP−1, then:

11. Reload TFLs, LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)

12. If RMS PWR − PRI (MCIU powered):
SM 94 PDRS CONTROL (MA, C/W GPC DATA lt on)
I/O ON − ITEM 5 EXEC (*) (C/W GPC DATA lt off)
Update as needed:
WR range, PL ID, PL INIT ID, EE ID, SPEC 95 Overrides
SAFING − CANCEL (tb−bp if arm deselected)

13. If permanent SM GPC being established:
    If BFS not engaged:
O6 Target SM GPC OUTPUT − TERM
    SM(GNC) 1 DPS UTILITY
    UL CNTL
    AUTO − ITEM 35 EXEC (*)
C3 UPLK − ENA
    If reqd, go to PL/DPS RECONFIG, Recovery (PL SYS or SODF: ASSY OPS)

14. Clear software fail votes on MCC GO:
    GNC 0 GPC MEMORY
    I/O ERR LOG RESET
    ITEM 48 EXEC
    SM 0 GPC MEMORY
    I/O ERR LOG RESET
    ITEM 48 EXEC

DPS SSR−5
FREEZE−DRY REASSIGNMENT

O6 1. ✓Target FD GPC PWR − ON, OUTPUT − NORM, and MODE − RUN

2. If target GPC not in OPS 0:
   Reassign target GPC strings (if reqd):
   GNC 0 GPC MEMORY
   CONFIG − ITEM 1 +X EXEC (X = 1 if G1; 2 if G2; 8 if G8)
   Reassign strings, CRTS, and MMs
   GNC, OPS X X X PRO
   (Tgt) GPC MODE − STBY (tb−bp)
   − RUN (tb−RUN)

C2 3. If IDP not assigned to target GPC:
   Desired IDP/CRT MAJ FUNC − PL
   GPC/CRT target GPC/desired IDP EXEC

4. PL 0 GPC MEMORY
   DOWNLIST GPC − ITEM 44 +X EXEC (X = active GNC GPC)
   STORE MC:
   CONFIG − ITEM 45 +2(3) EXEC
   GPC − ITEM 46 +X EXEC (X = target GPC)
   STORE − ITEM 47 EXEC
   Store complete when MC = 2(3)

5. If G3FD, config NBAT for FD GPC:
   CONFIG − ITEM 1 +3 EXEC
   Assign FD GPC, all strings, CRTs 1,2,3, and MMs

O6 6. (FD GPC) GPC MODE − STBY (tb−bp), HALT
   − STBY (tb−RUN)
   − HALT (tb−bp)

DPS SSR−6
CONTINGENCY/VARIABLE S/W INITIATED MEM DUMP

NOTE
Perform AOS

1. If vehicle configured with tape−driven MMU: ✓MCC to ensure OPS RCDR 1(2) configured for dump

2. SM 62 PCMMU/PL COMM
   If reqd, load TFL: LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)

3. If PASS:
   a. On display assigned to GPC to be dumped:
      SM(GNC) 0 GPC MEMORY
      If GNC GPC to be dumped, ✓DOWNLIST GPC − ITEM 44 +X EXEC
   b. If OPS 0 GPC to be dumped:
      OPS 0 ENA − ITEM 49 EXEC (*) (TFL 163)
      If target OPS 0 GPC MODE − HALT:
      ✓Appropriate AV Bay Fan − ON
      ✓Target GPC PWR − ON
      Target GPC MODE − STBY (tb−RUN),RUN
      Assign desired IDP/CRT to OPS 0 GPC: GPC/CRT XX EXEC
   c. MEMORY DUMP (setup):
      If partial dump required: ✓MCC for input values in setup
      If complete dump required:
      START ID − ITEM 40 +0 0 0 0 0 EXEC
      NUMBER WDS − ITEM 41 +3 2 7 6 7 9 EXEC
      WDS/FRAME − ITEM 42 +X X X EXEC
      (128 If G1/G3, 112 if G2/G8, 48 if SM, 32 if OPS 0/PL9)
   d. MEMORY DUMP (start):
      GNC(SM,PL) 0 GPC MEMORY
      DUMP START/STOP − ITEM 43 EXEC
      Item 40 (up), 41 (down) entries begin counting
      Dump complete when ITEMs 40,41 blank
      Dump time (in min):

MF/OPS	GNC	SM	OPS 0 (PL9)
DUMP TIME	2.2	5.7	9.7

      If GNC GPC or OPS 0 GPC was dumped:
      ✓DOWNLIST GPC − ITEM 44 + X EXEC (lowest ID GNC GPC)
      If OPS 0/PL9 GPC was dumped:
      OPS 0 ENA − ITEM 49 EXEC (no *)
   e. Perform step 5

4. If BFS:
   a. MEMORY DUMP (setup):
      If partial dump required: ✓MCC for input values in setup
      If complete dump required:
      GNC 0 BFS MEMORY
      START ID − ITEM 21 +0 0 0 0 0 EXEC
      NUMBER WDS − ITEM 22 +2 6 2 1 4 4 EXEC
      WDS/FRAME − ITEM 23 +3 2 EXEC
   b. MEMORY DUMP (start):
      GNC 0 BFS MEMORY
      DUMP START/STOP − ITEM 24 EXEC
      Item 21 (up), 22 (down) entries begin counting
      Dump complete when ITEMs 21,22 blank (after 8 min)

5. SM 62 PCMMU/PL COMM
   If reqd, load post−dump TFL: LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)

DPS SSR−7
GPC IPL MENU OPTION (PASS/BFS)

NOTE

✓MCC for reapplication of GMEMs as reqd

1. SM 1 DPS UTILITY

   IPL SOURCE SW MASK − ITEM 38 EXEC (no *)

C2 2. IDP/CRT 3(1,2) PWR − ON
C3 BFC CRT DISP − ON
SEL − 3+1(1+2, 2+3) (Expect big 'X', POLL FAIL on MDU in DPS mode)

O6 3. IPL SOURCE − MMU 1(2)
GPC MODE 1(2,3,4,5) − HALT (tb−bp)
OUTPUT 1(2,3,4,5) − NORM (tb−bp)

4. GPC PWR 1(2,3,4,5) − OFF,ON

If BFS engaged:
F7 FLT CNTLR PWR − ON
BFS ENGAGE pb − push

If off−diagonal CAM lts on, execute error log reset:

GNC 0 GPC MEMORY

ERR LOG RESET − ITEM 48 EXEC
Repeat for SM, PL, OPS 0 as applicable

5. IPL 1(2,3,4,5) pb − push (tb−IPL, then bp within 2 min)

6. When tb − bp or 2 min:
O6 IDP LOAD 3(1,2) − LOAD
GPC MODE 1(2,3,4,5) − STBY (Tape−driven MMU: tb remains bp, expect CAM diagonal for 1 sec and Master Alarm) (Solid State MMU: tb remains bp, no CAM diagonal or Master Alarm expected)

7. If GPC IPL MENU does NOT appear in 2 min:
GPC MODE 1(2,3,4,5) − HALT
If first attempt:
IPL SOURCE − MMU 2(1)
Go to step 4 and proceed (one time only)

8. If GPC IPL MENU appears:

✓ID of GPC is correct
Record MSGS STILL IN LIST _____
Record ERROR/MSG CODEs in space provided below, pressing MSG RESET to cycle through list until MSGS STILL IN LIST = 0

	Nominal Codes
1. ERROR/MSG CODE_____	✓132 (GPCIPL XX.XX.XX.XX.XX LOADED)
2. ERROR/MSG CODE_____	✓137 (DCP XX.XX.XX.XX.XX LOADED)
3. ERROR/MSG CODE_____	
4. ERROR/MSG CODE_____	
5. ERROR/MSG CODE_____	

NOTE

If ERROR/MSG CODEs 097 (no IDP poll response) and/or 112 (IDP BITE error) are received in addition to the two nominal codes, ignore and continue. For any other codes, STOP. ✓MCC

9. If PASS IPL desired:

a. Load desired copy of PASS software from MM ITEM 1(3,5) EXEC (*) (MODE tb−RUN within 2 min) (Expect big 'X,' POLL FAIL on MDU in DPS mode)

O6 b. When tb − RUN or 2 min:
GPC MODE 1(2,3,4,5) − RUN
✓OUTPUT 1(2,3,4,5) − NORM (tb−gray)

C2,R11 Desired IDP/CRT MAJ FUNC − PL
BFC CRT DISP − OFF
GPC/CRT IPL'd GPC/desired IDP EXEC

c. If PL 0 GPC MEMORY does NOT appear in 2 min:
GPC MODE 1(2,3,4,5) − HALT
If first attempt:
C3 BFS CRT DISP − ON
O6 IPL SOURCE − MMU 2(1)
Go to step 4 and proceed (one time only)
If second attempt:
GPC PWR 1(2,3,4,5) − OFF

d. IPL SOURCE − OFF

e. Go to step 11

10. If BFS IPL desired:

a. If orbit config:
On MCC GO, select PCMMU format
C3 ✓OI PCMMU FORMAT − GPC
X: SM 62 PCMMU/PL COMM
PCMMU FMT SEL FXD − ITEM 1 EXEC (*)

O6 b. IPL SOURCE − OFF

c. Load desired copy of BFS software from MM:
ITEM 2(4) EXEC (*)

d. If 'BSL XX.XX.X.XX.XX LOADED' does not appear within 2 min:
GPC MODE 1(2,3,4,5) − HALT
If first attempt:
IPL SOURCE − MMU 2(1)
Go to step 4 and proceed (one time only)

e. If 'BSL XX.X.XX.XX LOADED' appears (within 2 min),
MSG RESET pb − push (repeat until 'MSGS STILL IN LIST' = 0)

f. Expect 'KSC XX.XX.X.XX.XX LOADED'
If 'KSC X.XX.X.XX.XX LOADED_SET MMU SEL SW TO OFF' appears,
continue with procedure and notify MCC when convenient
MSG RESET pb − push (repeat until 'MSGS STILL IN LIST' = 0)

g. ✓IDP/CRT MAJ FUNC − GNC
If GNC 0 BFS MEMORY does not appear within 2 min:
O6 GPC MODE 1(2,3,4,5) − HALT
If first attempt:
IPL SOURCE − MMU 2(1)
Go to step 4 and proceed (one time only)
If second attempt:
GPC PWR 1(2,3,4,5) − OFF

h. If entry config:
BFS/GNC, OPS 301 PRO

i. If orbit config, verify BFS will track PASS strings:
When time permits, on MCC GO:
O14,O15 All RGAs − ON
O16 cb ADTA (four) − cl
O8 MLS (three) − ON
O14,O15,O16 ✓Primary RJD LOGIC,DRIVER (sixteen) − ON
All strings, CRTs, MMs, assigned to current GNC GPCs in MC3
PASS, GNC OPS 301 PRO
BFS, GNC, OPS 301 PRO
BFS, GNC, OPS 000 PRO
PASS, GNC, OPS 201 PRO
O14,O15 All RGAs − OFF
O16 cb ADTA (four) − op
O8 MLS (three) − OFF
Reconfig DAP and attitude per FLIGHT PLAN

j. Select program PCMMU FORMAT:
✓OI PCMMU FORMAT − GPC
C3 X: SM 62 PCMMU/PL COMM
PCMMU FMT PGM − ITEM 2 EXEC
Power off IDP/CRTs as reqd

11. SM 1 DPS UTILITY
IPL SOURCE SELECT SW MASK − ITEM 38 EXEC (*)

DPS SSR−8
GPC IPL−PASS

NOTE
✓MCC for reapplication of GMEMs as reqd

1. SM 1 DPS UTILITY

   IPL SOURCE SW MASK − ITEM 38 EXEC (no *)

C3 2. BFC CRT DISP − OFF (BFS will default to IDPs 1,2 if engaged)

O6 3. IPL SOURCE − MMU 1(2)
   GPC OUTPUT 1(2,3,4,5) − NORM (tb−bp)
   MODE 1(2,3,4,5) − HALT (tb−bp)

4. GPC PWR 1(2,3,4,5) − OFF,ON
   If BFS engaged:
F7 FLT CNTLR PWR − ON
   BFS ENGAGE pb − push

   If off−diagonal CAM lts on, execute error log reset:

   GNC 0 GPC MEMORY

   ERR LOG RESET − ITEM 48 EXEC
   Repeat for SM, PL, OPS 0 as applicable

5. IPL 1(2,3,4,5) pb − push (tb−IPL, then bp within 2 min)

6. When tb − bp or 2 min:
   GPC MODE 1(2,3,4,5) − STBY (Tape−driven MMU: tb−RUN within 2 min, expect CAM diagonal for 1 sec and Master Alarm) (Solid State MMU: tb RUN within 2 min, no CAM or Master Alarm expected)

7. When tb − RUN or 2 min, determine if IPL'd GPC can command IDP:

   If BFS not engaged:

O6 a. GPC MODE1(2,3,4,5) − RUN (tb remains RUN)
   ✓OUTPUT 1(2,3,4,5) − NORM (tb−gray)

C2, R11 b. Desired IDP/CRT MAJ FUNC − PL

   c. GPC/CRT IPL'd GPC/desired IDP EXEC

   d. ✓ PL 0 GPC MEMORY driven by IPL'd GPC

   If BFS engaged:

C3 a. BFC CRT DISP − ON
   SEL − 3+1

   b. If BFS commanding IDP2,
   BFS − GPC/CRT 02 EXEC

C2 c. IDP/CRT2 MAJ FUNC − PL

O6 d. GPC MODE 1(2,3,4,5) − RUN (tb remains RUN)
   OUTPUT 1(2,3,4,5) − NORM (tb−bp)

   e. If another PASS GPC active, using IDP2
   GPC/CRT IPL'd GPC/2 EXEC
   ✓2: PL 0 GPC MEMORY driven by IPL'd GPC

8. If GPC CANNOT command IDP:
O6 GPC MODE 1(2,3,4,5) − HALT
   If first IPL attempt:
C3 IPL SOURCE − MMU 2(1)
   BFS CRT DISP − OFF
   Go to step 4 and proceed (one time only)
   If second IPL attempt:
   GPC PWR 1(2,3,4,5) − OFF

O6 9. IPL SOURCE − OFF

10. SM 1 DPS UTILITY

    IPL SOURCE SW MASK − ITEM 38 EXEC (*)

NOTE

Procedure assumes active PASS kybd available, functional PASS GPC in SM OPS 2/4 POST IPL OPS 0, PL9, or functional BFS GPC. If loading from BFS, note that PASS critical formats are not used by BFS. DEU has full capability and CRT can be assigned to PASS via PASS GPC/CRT kybd entry if desired and used to support all displays except the following:

FAULT	GNC SYS SUMM 1	OVERRIDE
HORIZ SIT	ENTRY TRAJ 1(2,3,4,5)	RCS
VERT SIT 1(2)	GPC MEMORY	
XXXXX MNVR YYYYY	S TRK/COAS CNTL	
XXXXXX TRAJ	IMU ALIGN	

The SM common buffer is utilized during SM 2/4 DEU IPL. Other operations which contend for the buffer are TFL loads, SM checkpoint/restore, orbiter mass memory read/write SPEC operations, and crew text uplinks (TUMMS)

C2/R11L 1. ✓CRT1(2,3,4) PWR − ON

CRT1(2,3,4) MAJ FUNC − SM (use PL if loading from PL9, Post IPL OPS 0, or BFS GPC)

C3 2. ✓DEU not assigned to BFS via BFC CRT DISP/SEL switches
On active PASS kybd,
C2/R11L GPC/CRT 0/1(2,3,4) EXEC
O6 DEU 1(2,3,4) LOAD − LOAD (repeat if reqd)
✓DEU LOAD msg appears on CRT

IF NO RESPONSE
C2/R11L CRT1(2,3,4) PWR − OFF, then ON
O6 DEU 1(2,3,4) LOAD − LOAD (repeat if reqd)

3. When DEU LOAD msg appears on CRT, on active PASS/BFS kybd:
C2/R11L GPC/CRT SM OPS 2/4 (PL9, POST IPL OPS 0, BFS) GPC/1(2,3,4) EXEC

If 'CM BUF BSY CRT X' msg annunciated, wait for contending operation to complete, then retry DEU IPL:
Go back to step 2 and proceed

4. ✓'IPL COMPLETE' msg followed by active display on CRT (ANTENNA for SM OPS 2/4, GPC MEMORY for POST IPL OPS 0, MASS MEMORY R/W for PL9, or blank display with active time fields for BFS)

IF NO RESPONSE OR 'IPL INCOMPLETE' MSG APPEARS ON CRT
C2/R11L CRT1(2,3,4) PWR − OFF, then ON
O6 DEU 1(2,3,4) LOAD − LOAD (repeat if reqd)

5. When active display appears,
C2/R11L CRT1(2,3,4) MAJ FUNC − GNC (SM,PL) (as desired)
If loading from BFS, CRT can be assigned to PASS via PASS GPC/CRT kybd entry if desired. However, displays noted above will not be supported

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6.2e 'S66 CAB O2 REG P 1(2)' – O2 REG P ↑ 6–25
6.2f RESERVED ..... not used
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6.4g 'S88 EVAP HI LD TEMP' – EVAP TEMP HI LOAD INBD (OUTBD) DUCT(NOZ) ↑↓ 6–47
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6.4i 'S88 EVAP TOP TEMP' – EVAP TOPPING L(R) NOZ ↑↓ 6–49
6.4j 'S88 EVAP FDLN T A(B)' – EVAP FDLN TEMP FWD(MID, AFT,TOP,HI LOAD,ACCUM) ↑↓ 6–50
6.4k RESERVED ..... not used
6.4l 'S88 H2O PUMP P 1(2)' – H2O PUMP P 1(2) ↑↓ 6–51
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NOTE A
The identified MAL represents a support procedure that is entered from other procedures or on MCC call

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'S66 WASTE H2O PRES'
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6.6 RESERVED

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The following Fault Msgs have no corresponding MAL procedures in this book:

'S66 CAB HX OUT TEMP'
'S78 CABIN O2 CONC'
'SM1 SMOKE CAB L FD'
'SM1 SMOKE CAB R FD'
'SM1 SMOKE CAB HX'
'SM1 SMOKE BAY 1(2,3) A(B)'
'S66 VAC VNT N2 TEMP'
'S66 CAB AIRLK PRESS'
'177 EXT A/L PRESS'
'177 A/L VEST DP'
'177 AL H2O LCG P1(2)'
'177 AL H2O XFER P'

BFS FSM INDEX

6.1 AV BAY/CABIN AIR

6.1a	'S66 CABIN FAN'	– CABIN FAN ΔP	6–4
6.1a	'SM1 CABIN FAN'	– CABIN FAN ΔP	6–4
6.1b	'SM2 AV BAY TEMP'	– AV BAY TEMP	6–5
6.1c	'SM2 AV BAY FAN'	– AV BAY FAN ΔP	6–6
6.1d	'SM1 CABIN IMU'	– CABIN IMU	6–8

6.2 CABIN ATM

6.2c	'SM1 CABIN PPO2'	– PPO2 ↑↓	6–21

6.4 FREON/H2O LOOP

6.4f	'SM0 THRM FRN'	– ACCUM QTY ↓	6–45
6.4g	'SM0 THRM EVAP'	– EVAP TEMP HI LOAD INBD (OUTBD) DUCT(NOZ) ↑↓	6–47
6.4h		– EVAP TOPPING DUCT T FWD(AFT), L(R) ↑↓	6–48
6.4i		– EVAP TOPPING L(R) NOZ ↑↓	6–49
6.4j		– EVAP FDLN TEMP FWD(MID,AFT, TOP,HI LOAD,ACCUM) ↑↓	6–50

The following Fault Msgs have no corresponding MAL procedures in this book**:**

SM1 CABIN HX T

SM2 TEMP

ECLS

AV BAY/ CABIN AIR
(F7)

BACKUP C/W ALARM
(F7)

S66 CABIN FAN

BFS
SM1 CABIN FAN

If:
CABIN FAN ΔP
< 4.2 or > 6.8
(< 2.8 or > 4.88 if 10.2 ops)

Nominal Config:
(L4:K)
cb AC1 ΦB CAB AIR S/C – cl
cb AC2 CAB FAN B (three) – cl
cb AC3 CAB FAN A (three) – cl
(L4:L)
cb AC1 ΦA CAB T CNTLR 1 – cl
cb AC2 ΦA CAB T CNTLR 2 – cl
(L1)
CAB FAN A(B) – ON
CAB TEMP CNTLR – 1(2)
CAB TEMP – as reqd

6.1a CABIN FAN ΔP

1 Turn off Cabin Fan
SM SYS SUMM 1
SM 66 ENVIRONMENT
(L1)
- CAB FAN A(B) – OFF

(CRT) CAB FAN ΔP = 0.0 (L) ?
NO → 3 CABIN FAN ΔP INST FAILURE
YES ↓

2 Turn on alternate Cabin Fan
(L1)
- CAB FAN B(A) – ON

(CRT) CABIN FAN ΔP indicates:
- 0.0 (L) → 3 CABIN FAN ΔP INST FAILURE
- NORMAL → 5 CAB FAN A(B) FAILURE, CHECK VLV FOR CAB FAN A(B) FAILED CLOSED OR CHECK VLV FOR CAB FAN B(A) FAILED OPEN (2 3)
- '↓' → 7 AIR DUCT LEAKAGE OR SNSR SHIFTED LOW (2 4)
- '↑' or 'H' ↓

3 CABIN FAN ΔP INST FAILURE → 4 Turn on original Cabin Fan (1)
(L1)
- CAB FAN A(B) – ON
- ✓CAB FAN B(A) – OFF
- Monitor flow by feel

6 ✓For debris
- ✓Debris trap for blockage
- Perform FILTER CLEANING – MIDDECK FLOOR (IFM) to clean CAB FAN Filter

(CRT) CABIN FAN ΔP normal ?
YES → 9 CLOGGED DEBRIS TRAPS CAUSED AIR FLOW BLOCKAGE
NO ↓

10 ✓Avionics filters
- Perform FLIGHT DECK PORT, STBD AND MIDDECK FILTER CLEANING (IFM)

(CRT) CABIN FAN ΔP normal ?
YES → 11 CLOGGED LRU FILTER(S) CAUSED AIR FLOW BLOCKAGE → 12 Turn on original Cabin Fan
(L1)
- CAB FAN A(B) – ON
- CAB FAN B(A) – OFF

NO (2 4) → 13 AIR DUCT BLOCKAGE OR SNSR SHIFTED HIGH DUE TO SLOPE CHANGE → 8

7 AIR DUCT LEAKAGE OR SNSR SHIFTED LOW → 8 Safe avionics (13) (5)
- Go to CABIN EQUIP PWRDN, ECLS SSR–6

(1) Turn on both Cabin Fans for sleep

(2) ✓MCC to determine exact failure

(3) If check vlv is failed open, fan currently selected is the only operational fan available

(4) May be possible to find duct leakage or blockage by checking airflow at all inlets and outlets

(5) This step prevents overtemping avionics while MCC is evaluating failure

ECLS

AV BAY/ CABIN AIR (F7)

BACKUP C/W ALARM (F7)

S66 AV BAY 1(2,3) TEMP

BFS

SM2 AV BAY TEMP

If:
AV BAY 1(2,3) TEMP > 130 degF

Nominal Config:

(L4:G)

cb AC1 ΦA,ΦB,ΦC AV BAY 1 FAN A (three) – cl

cb AC2 ΦA,ΦB,ΦC AV BAY 1 FAN B (three) – cl

cb AC3 ΦA,ΦB,ΦC AV BAY 3 FAN A (three) – cl

(L4:H)

cb AC1 ΦA,ΦB,ΦC AV BAY 3 FAN B (three) – cl

cb AC2 ΦA,ΦB,ΦC AV BAY 2 FAN A (three) – cl

cb AC3 ΦA,ΦB,ΦC AV BAY 2 FAN B (three) – cl

(L4:L)

cb AC1 ΦB AV BAY 2 S/C – cl

cb AC2 ΦB AV BAY 3 S/C – cl

cb AC3 ΦB AV BAY 1 S/C – cl

(L1)

AV BAY
1 FAN B(A) – ON
2 FAN A(B) – ON
3 FAN B(A) – ON

H2O LOOP
Nominal Config:
Refer to 6.4l

6.1b AV BAY TEMP

(1) Temps can be read from meter on pnl O1

(2) ✓MCC to determine exact failure

(1)

1

SM SYS SUMM 2
SM 66 ENVIRONMENT

Temps high and increasing in more than one bay ?

YES → 6.4p 23

NO

2 (CRT) AV BAY 1(2,3) FAN ΔP normal ?

NO → 6.1c 5

YES

3 ✓Air cooling

(L1)
- AV BAY 1(2,3) FANS A,B (two) – ON

(CRT) AV BAY 1(2,3) TEMP decr ?

YES → (2) 4 DEGRADED AIR COOLING OR TEMP XDCR FAILURE

NO

5 ✓H2O cooling

(L1)
- Switch H2O Loops
- Wait 5 min

(CRT) AV BAY 1(2,3) TEMP decr ?

YES → 7 DEGRADED H2O LOOP

NO

8 TEMP XDCR FAILURE

9 Reconfig

- Go to ECLS SSR–4 [4], RECONFIG TO ALT H2O LOOP

10 Reconfig

(L1)
- Reconfig AV BAY 1(2,3) FANS to original config
- Reconfig H2O Loops to original config

6 Safe avionics

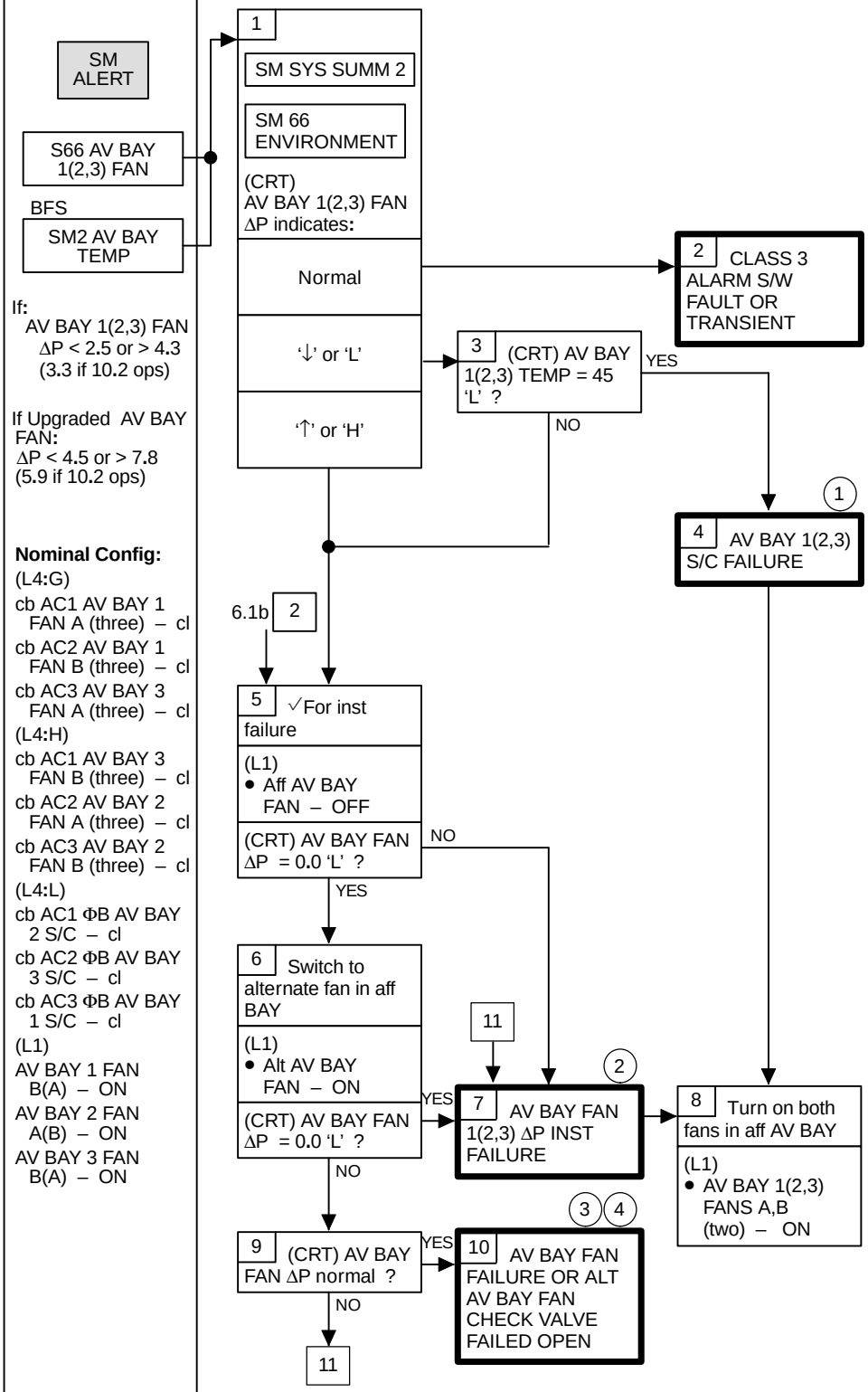
If MCC not available and AV BAY TEMP ≥ 130 or on MCC GO:
- Perform DPS RECONFIG FOR LOSS OF AV BAY COOLING (ASCENT/ ORBIT), GPC FRP–7 (DPS)

11 Reconfig

(L1)
On MCC GO:
- Reconfig AV BAY 1(2,3) FANS to original config

ECLS

6.1c AV BAY FAN ΔP

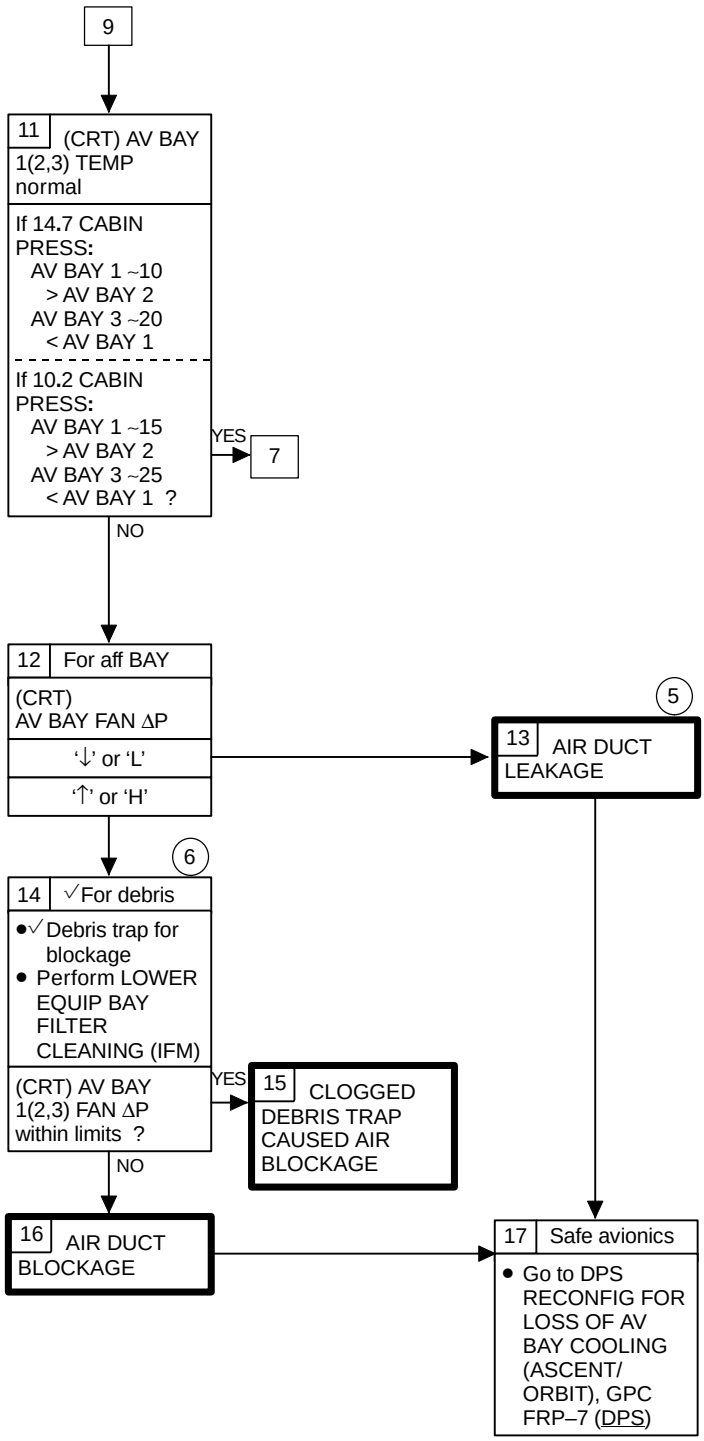


(1) If AV BAY 1(2,3) S/C cb is open, ✓MCC before attempting to reset cb

(2) With loss of ΔP, monitor AV BAY TEMP. If > 130 degF, there is AV BAY cooling problem. If AV BAY TEMP ~H2O LP PUMP OUT T, this is indication of fan failure or duct leakage between fan and HX

(3) ✓MCC to determine exact failure

(4) If check valve failed open, fan currently selected for that AV BAY is the only operational fan available



(5) ✓MCC about checking AV BAY duct integrity after completing next step

(6) ✓MCC about performing pwrdn of affected bay before performing AV BAY filter cleaning

ECLS

SM ALERT

S66 IMU FN SPD A(B,C)

IMU FAN Underspeed

S66 IMU FAN DP

BFS

SM1 CABIN IMU

IMU FAN ΔP < 3.7 (3.0 if 10.2 ops) or > 4.95 (3.8 if 10.2 ops)

Nominal Config:

(O14:B)

cb MNA OI H2O BYP LOOP 1 SNSR – cl

(L4:I)

cb AC1 IMU FAN A (three) – cl

cb AC2 IMU FAN B (three) – cl

cb AC3 IMU FAN C (three) – cl

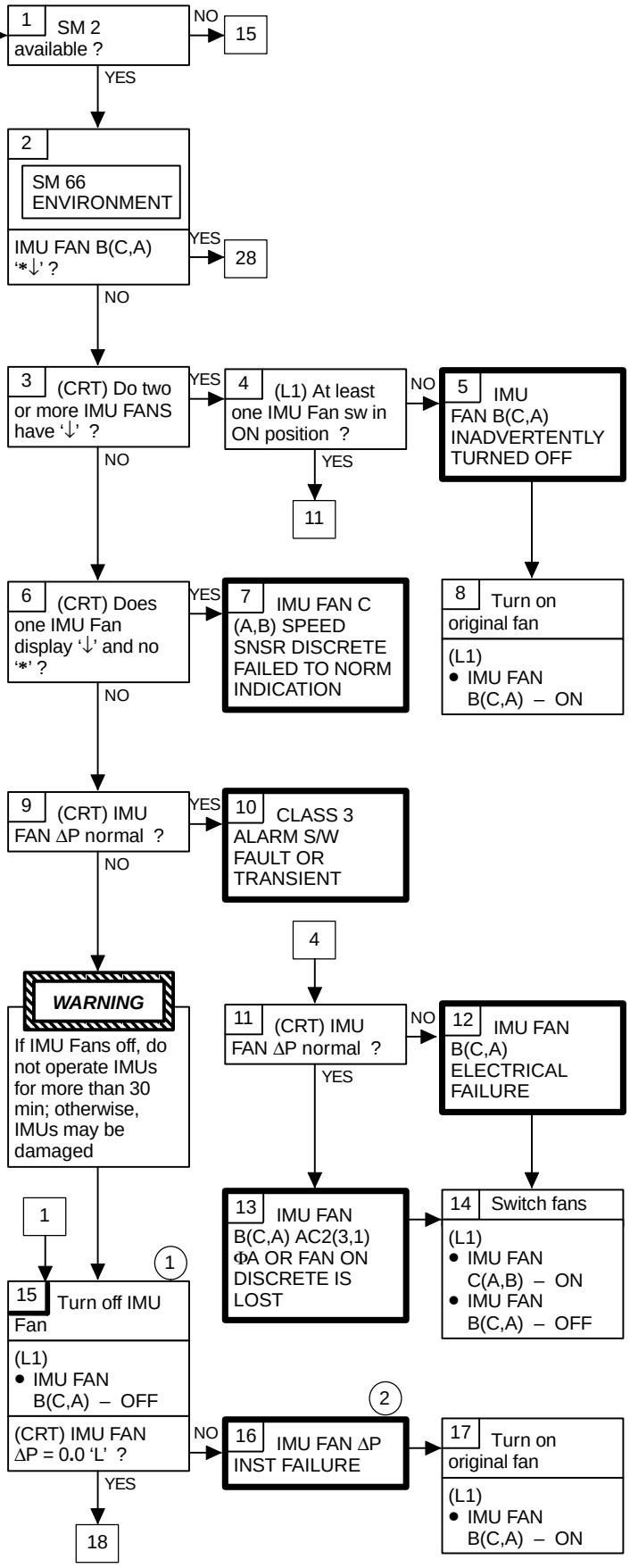
(L4:J)

cb AC3 ΦB SIG CONDR IMU FAN – cl

(L1)

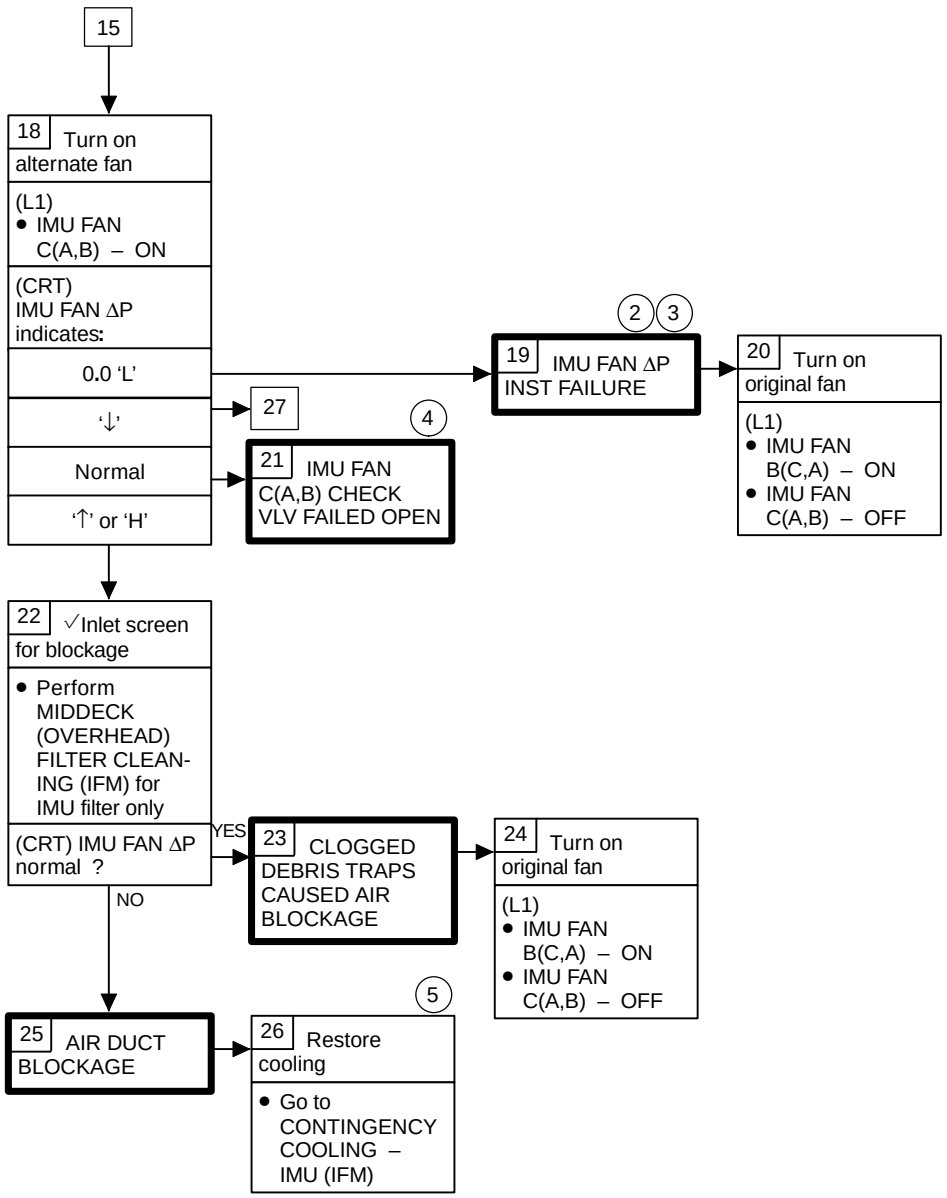
IMU FAN B(C,A) – ON

6.1d CABIN IMU



(1) If SM 2 not available, use BFS SYS SUMM 1 to monitor IMU FAN ΔP

(2) Monitor Speed Snsr '↓' for fan failure if IMU ΔP is lost



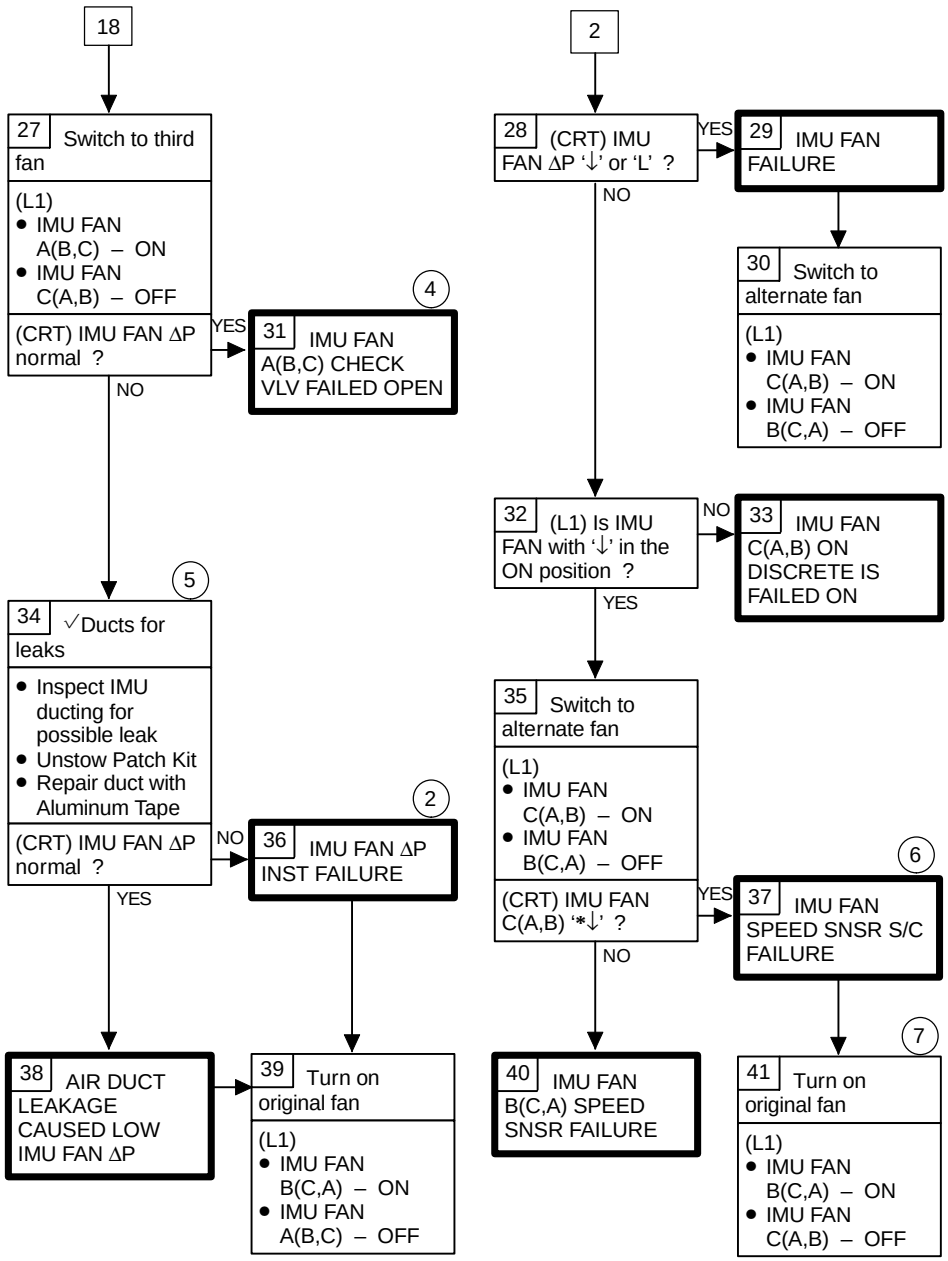
(2) Monitor Speed Snsr '↓' for fan failure if IMU ΔP is lost

(3) If cb MNA OI H2O BYP LOOP 1 SNSR – op, ✓MCC before attempting to reset cb

(4) Fan currently selected is the only operational fan available

(5) ✓MCC for proper IMU config and ops

ECLS 6.1d (Cont)



(2) Monitor Speed Snsr '↓' for fan failure if IMU ΔP is lost

(4) Fan currently selected is the only operational fan available

(5) ✓MCC for proper IMU config and ops

(6) If (pnl L4) cb AC3 ΦB SIG CONDR IMU FAN – op, ✓MCC before attempting to reset

(7) Second 'S66 CABIN IMU' msg will be generated**.** This is expected as Speed Snsr S/C failure will affect each IMU Fan

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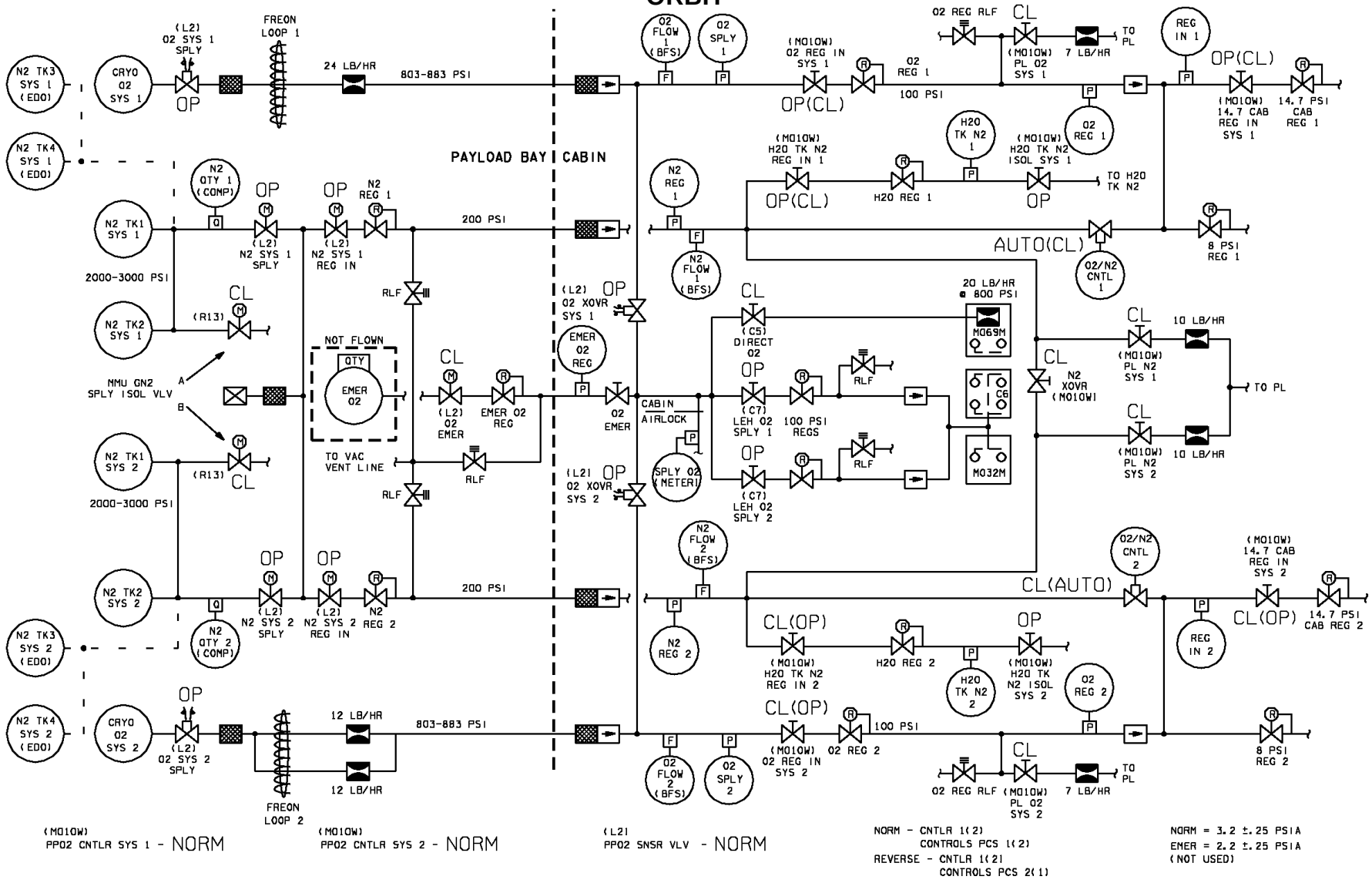
PRESSURE CONTROL SYSTEM
ORBIT



ECLS

6.2a O2(N2) FLOW ↑

From ORB PKT, O2(N2) FLOW HIGH/CAB P LOW/dP/dT

O2(N2) FLOW > 4.9 lb/hr

Nominal Config:
(ORBIT)
(O15:D)
cb MNB
PPO2 C CAB dP/dT – cl
(O14:D,O15:D)
cb MNA,MNB
N2 SPLY 1,2 – cl
O2/N2 CNTLR 1,2 – cl
O2 XOVR 1,2 – cl
N2 REG INLET 1,2 – cl
CAB VENT – op (O14 only)
CAB VENT ISOL – op (O14 only)
CAB RELIEF A – cl (O15 only)
(O16:D)
cb MNC
H2O ALT PRESS – cl
O2 EMER – op
CAB RELIEF B – cl
(ML86B:D)
cb MNA,MNB MMU GN2 SPLY ISOL VLV A,B – op (if flown, – cl)
(C5)
DIRECT O2 vlv – CL
(C6)
LEH O2 1,2,3,4 vlv (four) – CL
(C7)
LEH O2 SPLY vlv (two) – OP
(L1)
H2O ALT PRESS – CL
(L2)
CAB RELIEF A,B – ENA (tb–ENA)
CAB VENT ISOL – CL (tb–bp)
CAB VENT – CL (tb–bp)
O2 SYS 1,2 SPLY – OP (tb–OP)
O2 EMER – CL (tb–bp)
N2 SYS 1,2 SPLY – OP (tb–OP)
N2 SYS 1,2 REG INLET – OP (tb–OP)
O2 XOVR SYS 1,2 – OP
O2/N2 CNTLR VLV SYS 1(2) – AUTO
SYS 2(1) – CL
If 10.2 psi ops, SYS 1 – OP
SYS 2 – CL

(Cont in notes column)

1 SM SYS SUMM 1
SM 66 ENVIRONMENT
CABIN P < 13.8 (10.0) psi ? YES → 6.2b 6

NO

4 (CRT) CABIN P incr ? NO → 18 YES

6.2b 34

7 Which flow high or produced alarm ?
O2
N2

9 (L2)
• O2/N2 CNTLR VLV SYS 1(2) – CL
N2 FLOW 1(2) decr ? NO → 35 YES

12 LEAK IN O2/N2 SYS 1(2) COMMON MANIFOLD

14 Isolate leak
(MO10W)
• O2 REG INLET SYS 1(2) vlv – CL

5

16 Reconfig
• Go to RECONFIG TO ALT PCS SYS, ELCS SSR–3

8

2 LEAK IN PL O2 SYS 1(2). PL O2 SPLY NO LONGER AVAILABLE

13 15

5 10.2 psi ops ? YES → 6 Remain in current PCS Config
•✓MCC for P&I changes to repress procedure
NO → 16

CAUTION
Procedure should be expedited to prevent exceeding 25.0% O2 for 14.7 psi ops or 28.5% for 10.2 psi ops

8 (MO10W)
•✓PL O2 SYS 1(2) vlv – CL
(CRT) O2 FLOW 1(2) decr ? NO YES → 2

10 (MO10W)
• O2 REG INLET SYS 1(2) vlv – CL
O2 FLOW 1(2) decr ? NO → 11 LEAK IN O2 SYS 1(2) MANIFOLD BETWEEN O2 REG INLET VLV AND O2 FLOW DUCER
YES

13 O2 REG 1(2) SHIFTED HIGH OR LEAKING, OR REG RLF VLV LEAK, OR LINE LEAK DOWNSTREAM OF O2 REGULATOR

5

15 (L2)
• O2 SYS 1(2) SPLY – CL (tb–CL)
• O2 XOVR SYS 1(2) – CL

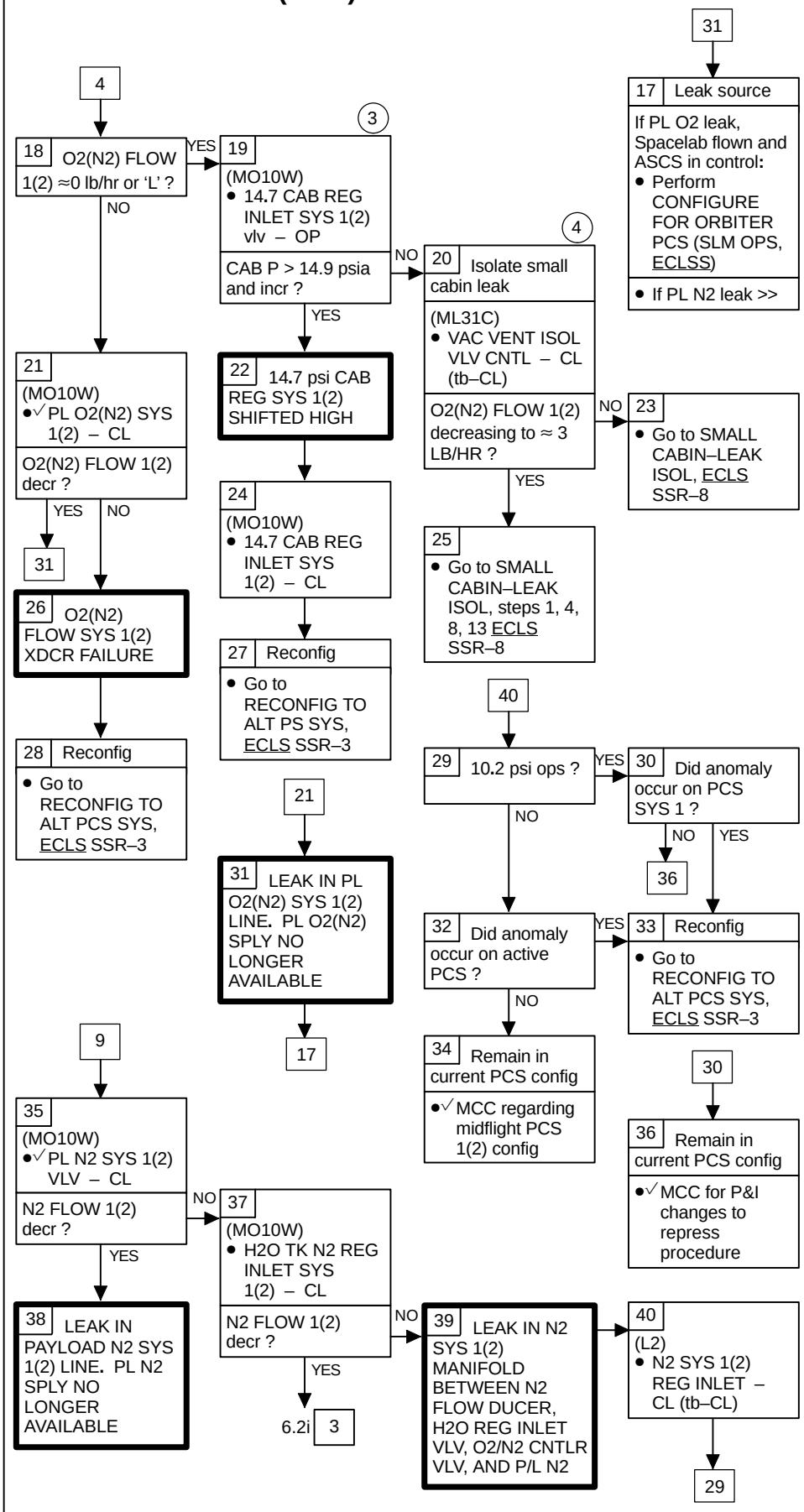
5

(1) Use numbers in parenthesis for 10.2 psi cabin ops

(2) PCS activated MET 3:00. Systems switched at mid flight

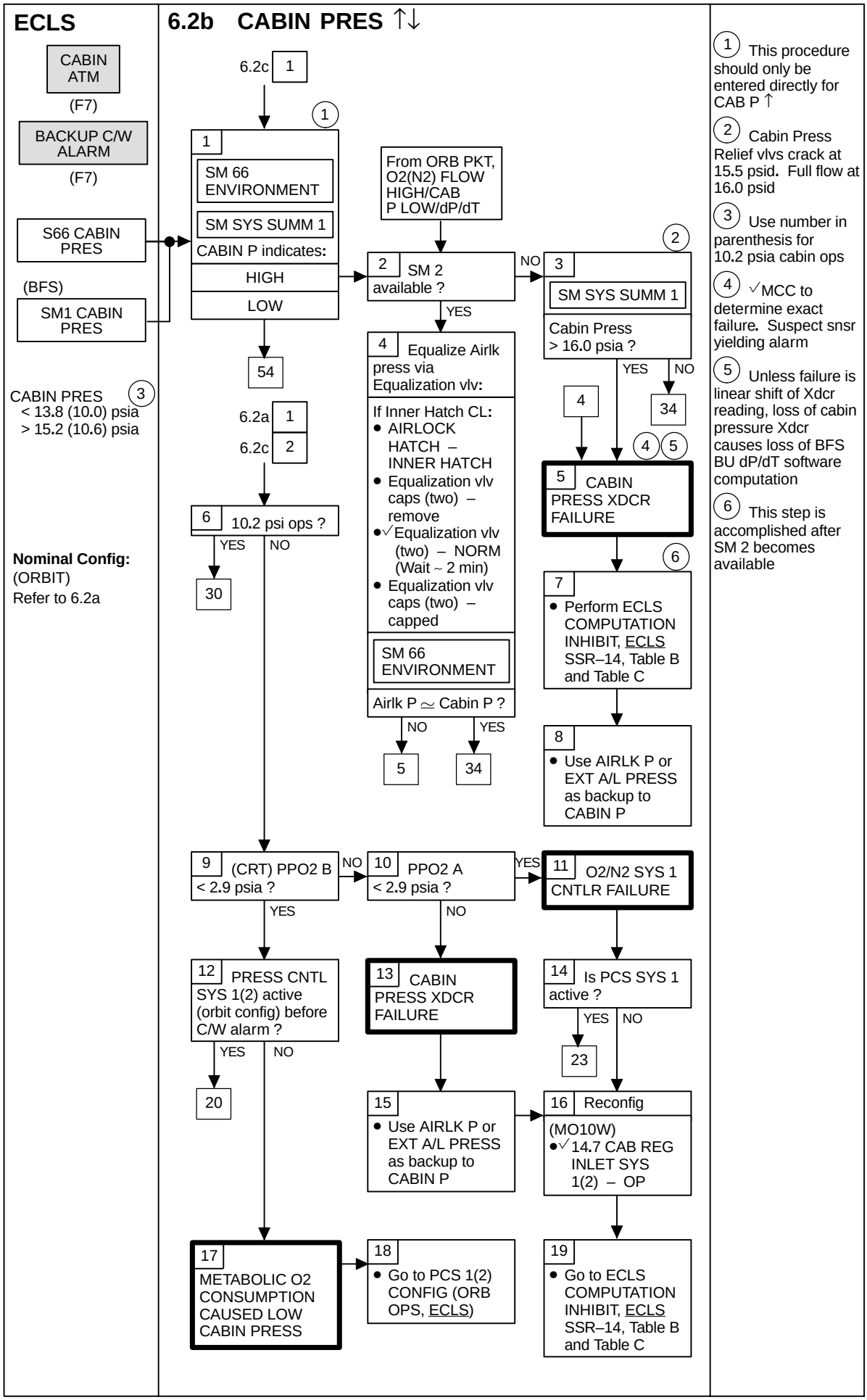
Nominal Config:
(ORBIT Cont)
PPO2 SNSR/VLV – NORM
(R13L)
MMU GN2 SPLY ISOL VLV A,B – CL (tb–CL)
(MO10W)
14.7 CAB REG INLET SYS 1 (SYS 2) – OP
INLET SYS 2 (SYS 1) – CL
If 10.2 psi ops, 14.7 CABIN REG INLET SYS 1,2 – CL
O2 REG INLET SYS 1 (SYS 2) – OP(CL)
PL O2 SYS 1,SYS 2 vlv – CL
PL N2 SYS 1,SYS 2 vlv – CL
O2 EMER vlv – CL
H2O TK N2 REG INLET SYS 1(SYS 2) vlv – OP(CL)
H2O TK N2 ISOL SYS 1, SYS 2 – OP
N2 XOVR vlv – CL
PPO2 CNTLR SYS 1, SYS 2 – NORM
(ML31C)
VAC VENT ISOL VLV BUS SEL – MNA
VAC VENT ISOL VLV CNTL – OP (tb–OP)
(Middeck FLR)
EMU O2 ISOL VLV – CL
CAB PURGE VLV – CL
CAB PURGE ISOL VLV – CL

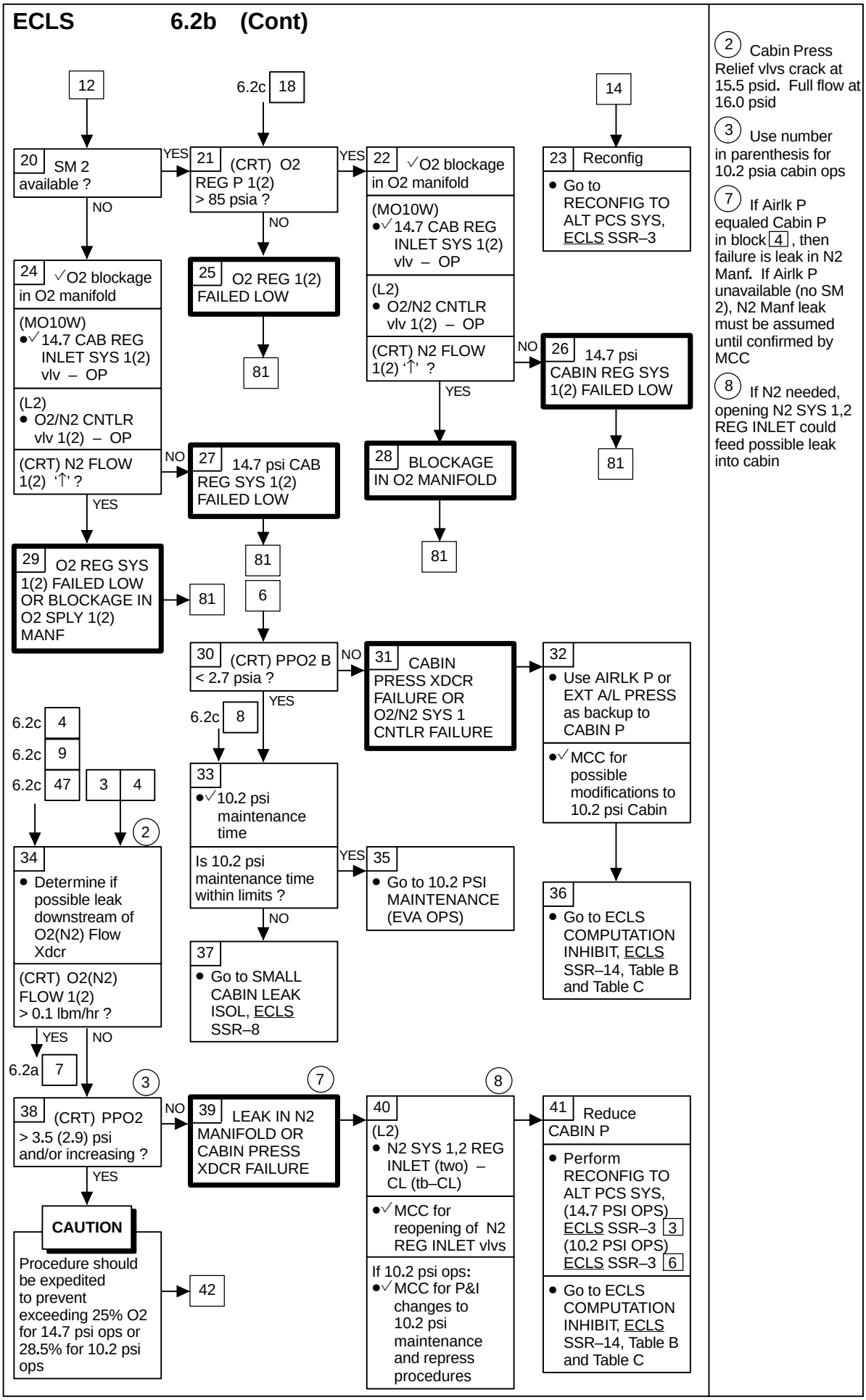
SPACEHAB (If flown)
Nominal Config:
(WCS)
VAC VLV – OP
PPRV ISOL VLV 1,2 (two) OP – *
(SSP)
CAB DEPRESS VLV SAFE tb – bp
NOT CLOSED tb – bp
SS DC BUS tb – gray
(FWD BKHD)
CAB DEP VLV man SOV – cl
NPRV covers (two) – cl
(OVERHEAD)
EXP VENT vlv – op



(3) May take several min to see change in cabin pressure

(4) Vacuum vent isolation vlv orifice flows approx 3.0 ± 0.25 lb/hr when closed. If leak rate is less than 3.25 lb/hr, then leak could still be in vacuum vent line


ECLS
6.2b CABIN PRES ↑↓
CABIN ATM
(F7)
BACKUP C/W ALARM
(F7)
S66 CABIN PRES
(BFS)
SM1 CABIN PRES
CABIN PRES
< 13.8 (10.0) psia
> 15.2 (10.6) psia
3
Nominal Config:
(ORBIT)
Refer to 6.2a
6.2c 1
1
1
SM 66 ENVIRONMENT
SM SYS SUMM 1
CABIN P indicates:
HIGH
LOW
54
6.2a 1
6.2c 2
6 10.2 psi ops ?
YES
NO
30
From ORB PKT, O2(N2) FLOW HIGH/CAB P LOW/dP/dT
2 SM 2 available ?
NO
YES
4 Equalize Airlk press via Equalization vlv:
If Inner Hatch CL:
• AIRLOCK HATCH – INNER HATCH
• Equalization vlv caps (two) – remove
• ✓Equalization vlv (two) – NORM (Wait ~ 2 min)
• Equalization vlv caps (two) – capped
SM 66 ENVIRONMENT
Airlk P ≃ Cabin P ?
NO
YES
5
34
2
3
SM SYS SUMM 1
Cabin Press > 16.0 psia ?
YES
NO
4
34
4 5
5 CABIN PRESS XDCR FAILURE
6
7
• Perform ECLS COMPUTATION INHIBIT, ECLS SSR–14, Table B and Table C
8
• Use AIRLK P or EXT A/L PRESS as backup to CABIN P
9 (CRT) PPO2 B < 2.9 psia ?
NO
10 PPO2 A < 2.9 psia ?
YES
11 O2/N2 SYS 1 CNTLR FAILURE
YES
NO
12 PRESS CNTL SYS 1(2) active (orbit config) before C/W alarm ?
YES
NO
20
13 CABIN PRESS XDCR FAILURE
14 Is PCS SYS 1 active ?
YES
NO
23
15
• Use AIRLK P or EXT A/L PRESS as backup to CABIN P
16 Reconfig
(MO10W)
• ✓14.7 CAB REG INLET SYS 1(2) – OP
17 METABOLIC O2 CONSUMPTION CAUSED LOW CABIN PRESS
18
• Go to PCS 1(2) CONFIG (ORB OPS, ECLS)
19
• Go to ECLS COMPUTATION INHIBIT, ECLS SSR–14, Table B and Table C
1 This procedure should only be entered directly for CAB P ↑
2 Cabin Press Relief vlvs crack at 15.5 psid. Full flow at 16.0 psid
3 Use number in parenthesis for 10.2 psia cabin ops
4 ✓MCC to determine exact failure. Suspect snsr yielding alarm
5 Unless failure is linear shift of Xdcr reading, loss of cabin pressure Xdcr causes loss of BFS BU dP/dT software computation
6 This step is accomplished after SM 2 becomes available



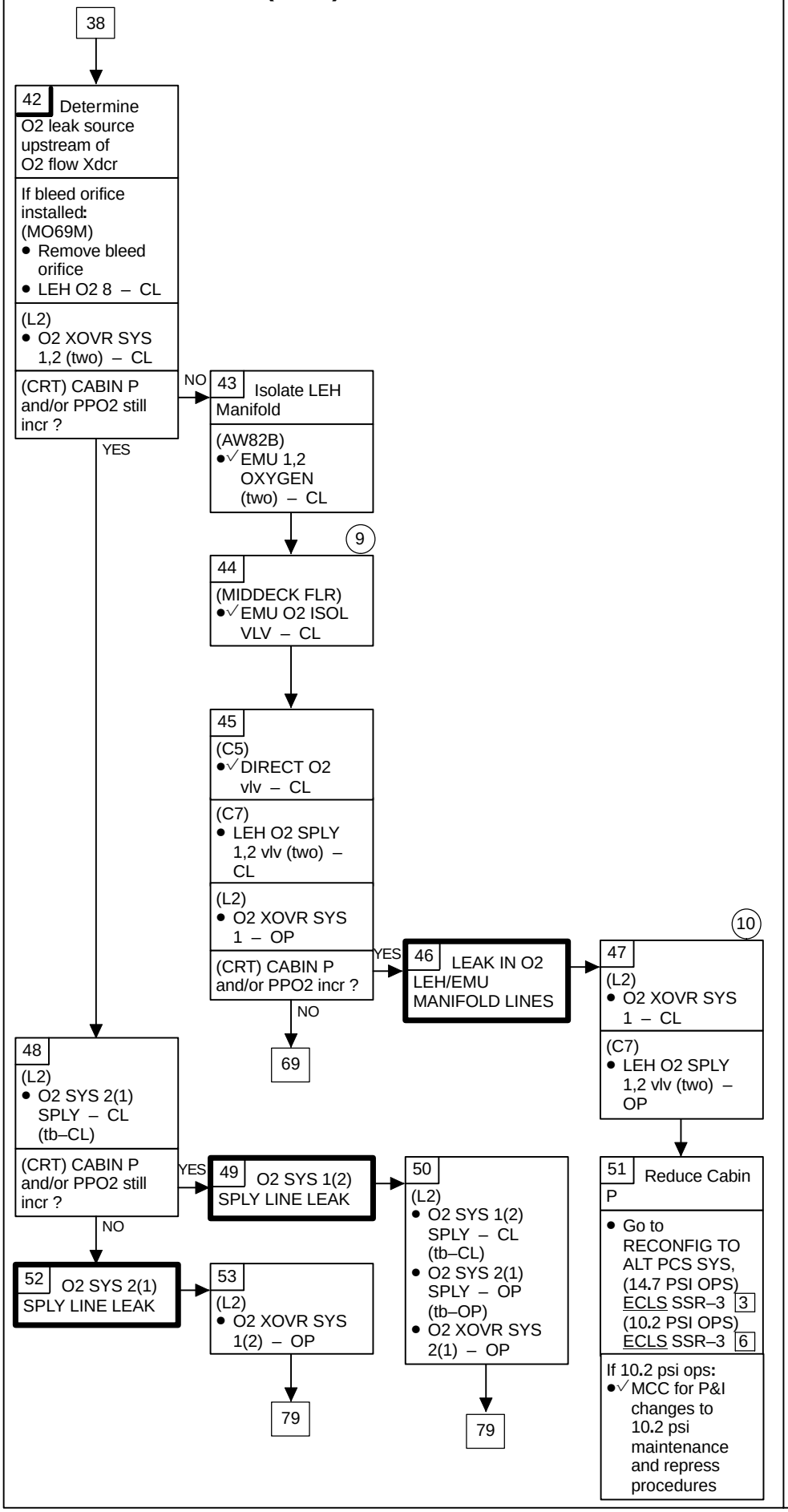
(2) Cabin Press Relief vlvs crack at 15.5 psid. Full flow at 16.0 psid

(3) Use number in parenthesis for 10.2 psia cabin ops

(7) If Airlk P equaled Cabin P in block 4, then failure is leak in N2 Manf. If Airlk P unavailable (no SM 2), N2 Manf leak must be assumed until confirmed by MCC

(8) If N2 needed, opening N2 SYS 1,2 REG INLET could feed possible leak into cabin

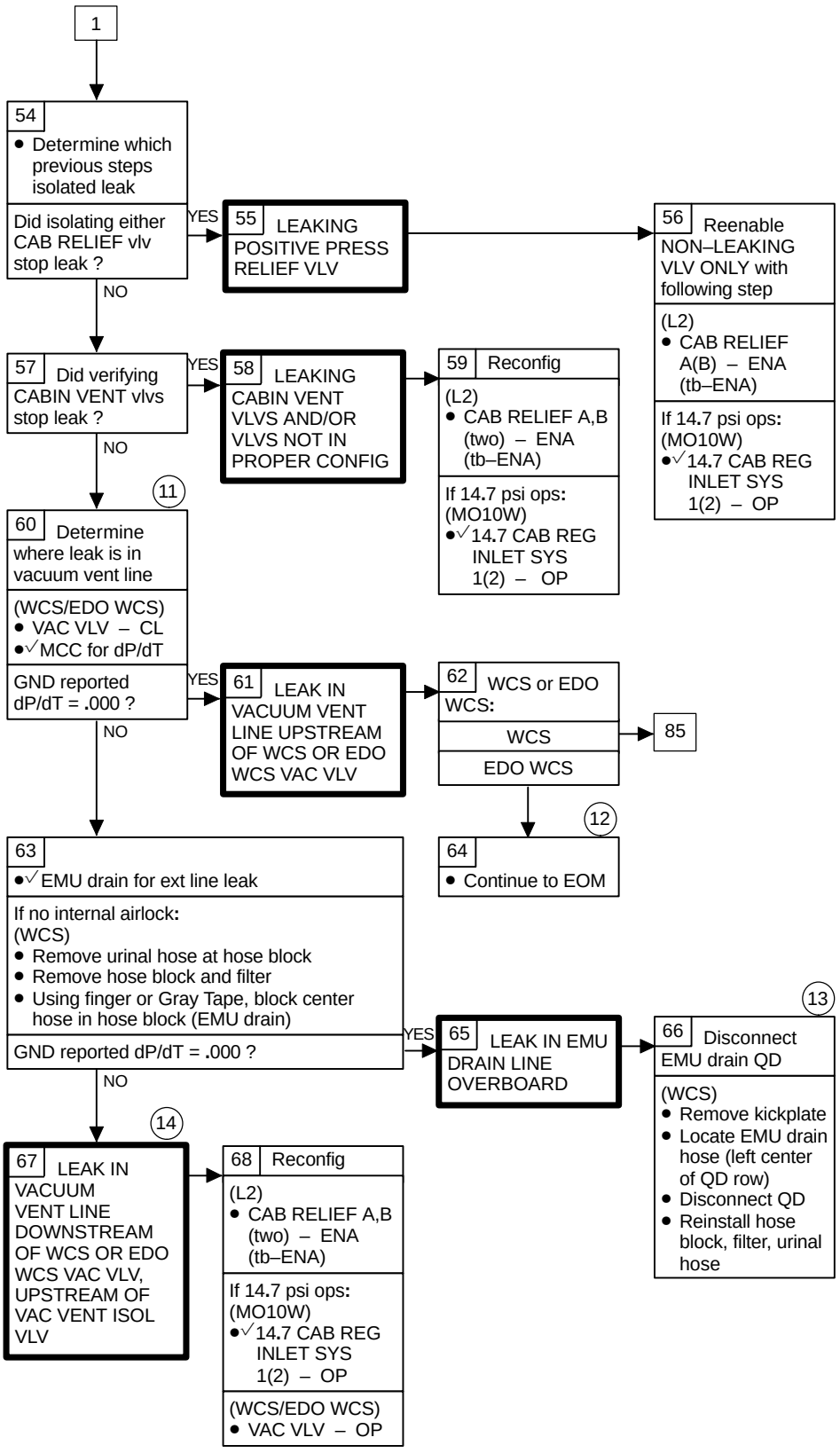
ECLS 6.2b (Cont)



9 Vlv normally closed except from pre–EVA PREP/ POST–EVA PREP

10 O2 XOVR vlvs must be reopened to supply oxygen to LEH O2 vlvs, EMU O2 vlvs, or DIRECT O2 vlv. ✓MCC before taking this action

ECLS 6.2b (Cont)

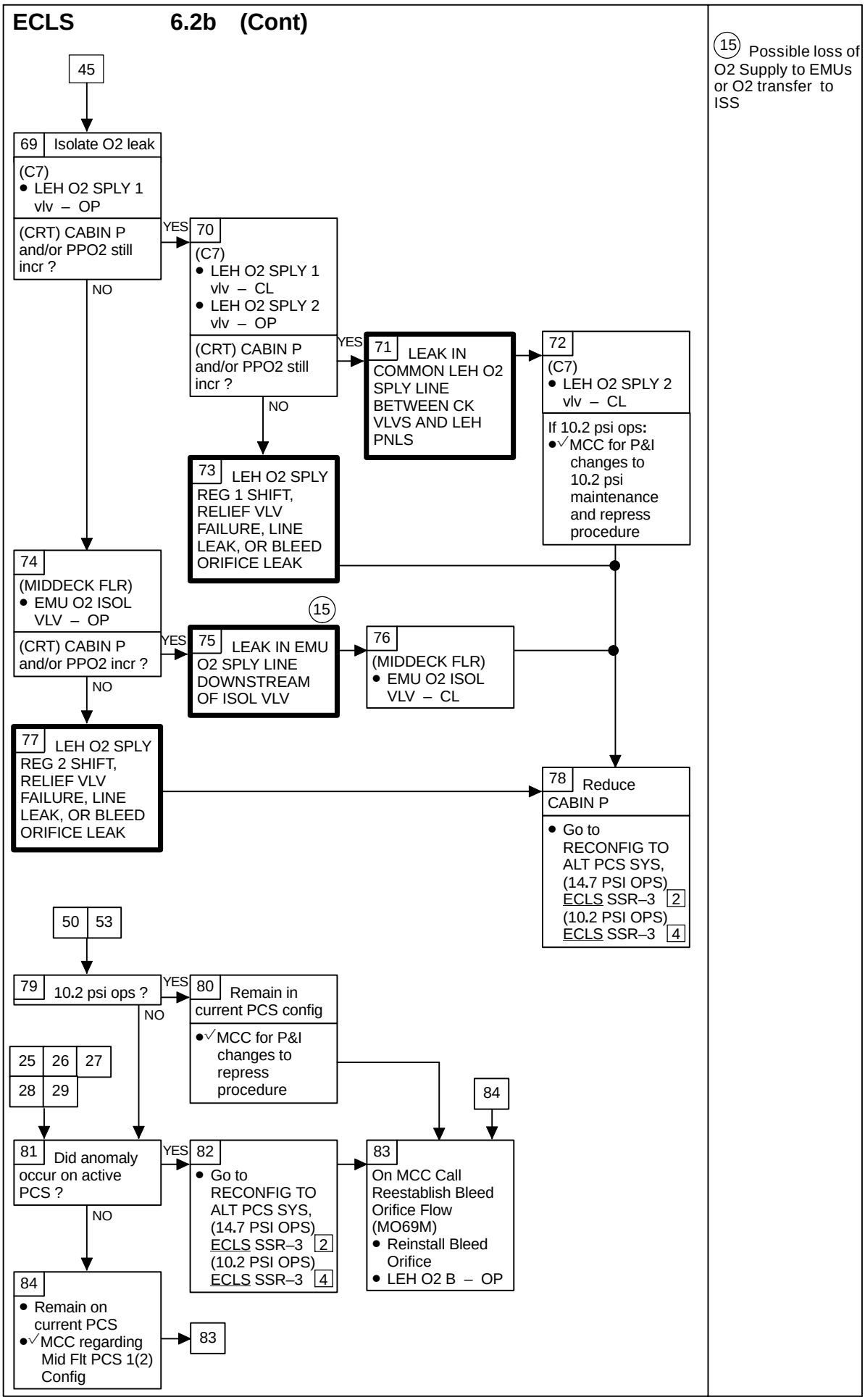


(11) MCC is reqd to determine if leak is isolated. Leak rate thru VAC Vent Isol vlv ~3 lb/hr (dP/dT = –0.004)

(12) Maintaining VAC VLV – CL to EOM may cause odor buildup due to inability to vent wet trash overboard

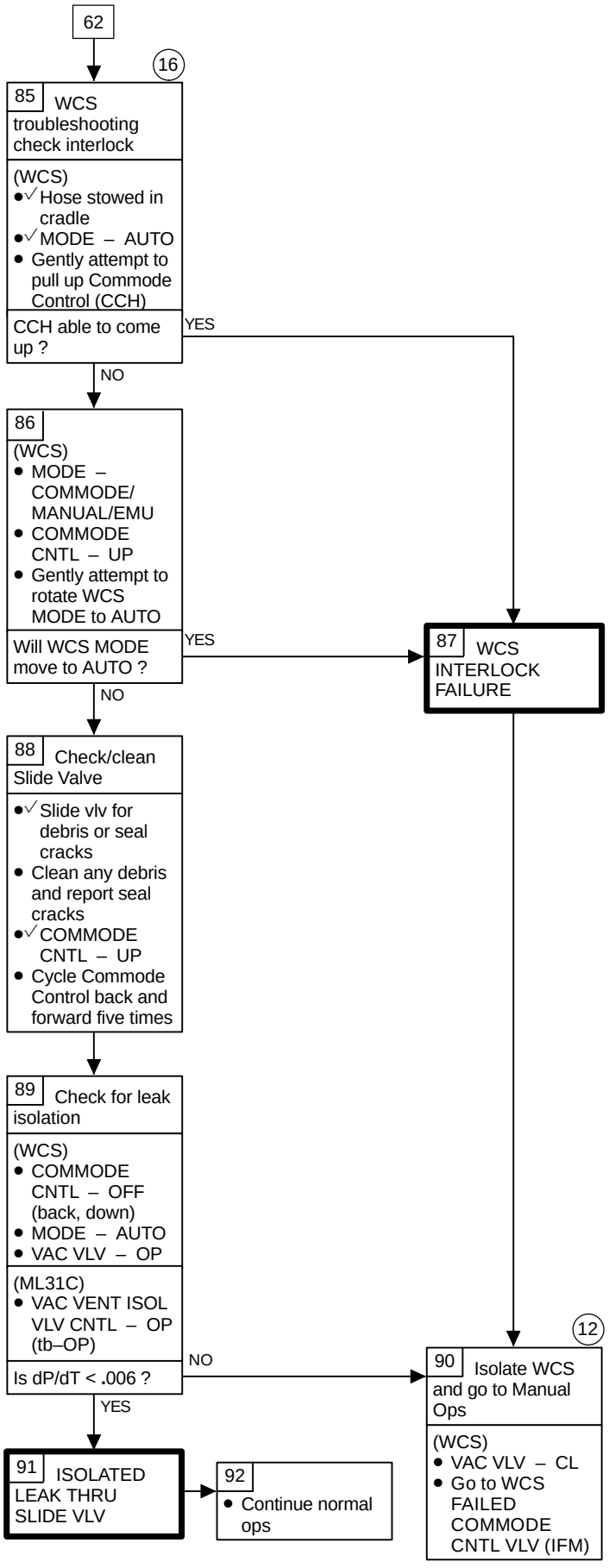
(13) EMU drain is lost

(14) By isolating cabin leak with VAC VENT ISOL VLV CNTL, hydrogen entrapment in vacuum vent line could create hazardous condition. ✓MCC for impacts of leaving this vlv closed



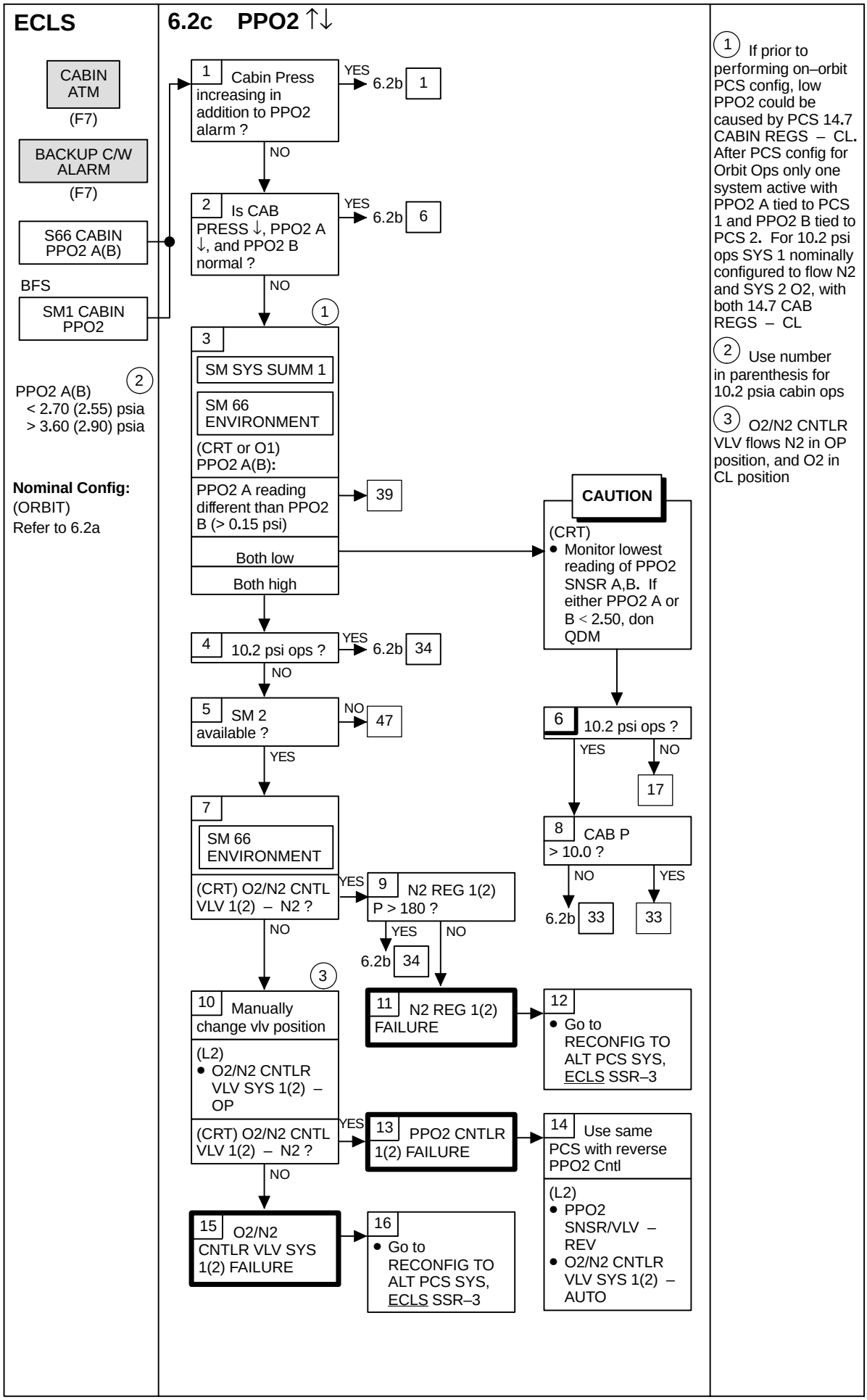
15 Possible loss of O2 Supply to EMUs or O2 transfer to ISS

ECLS 6.2b (Cont)

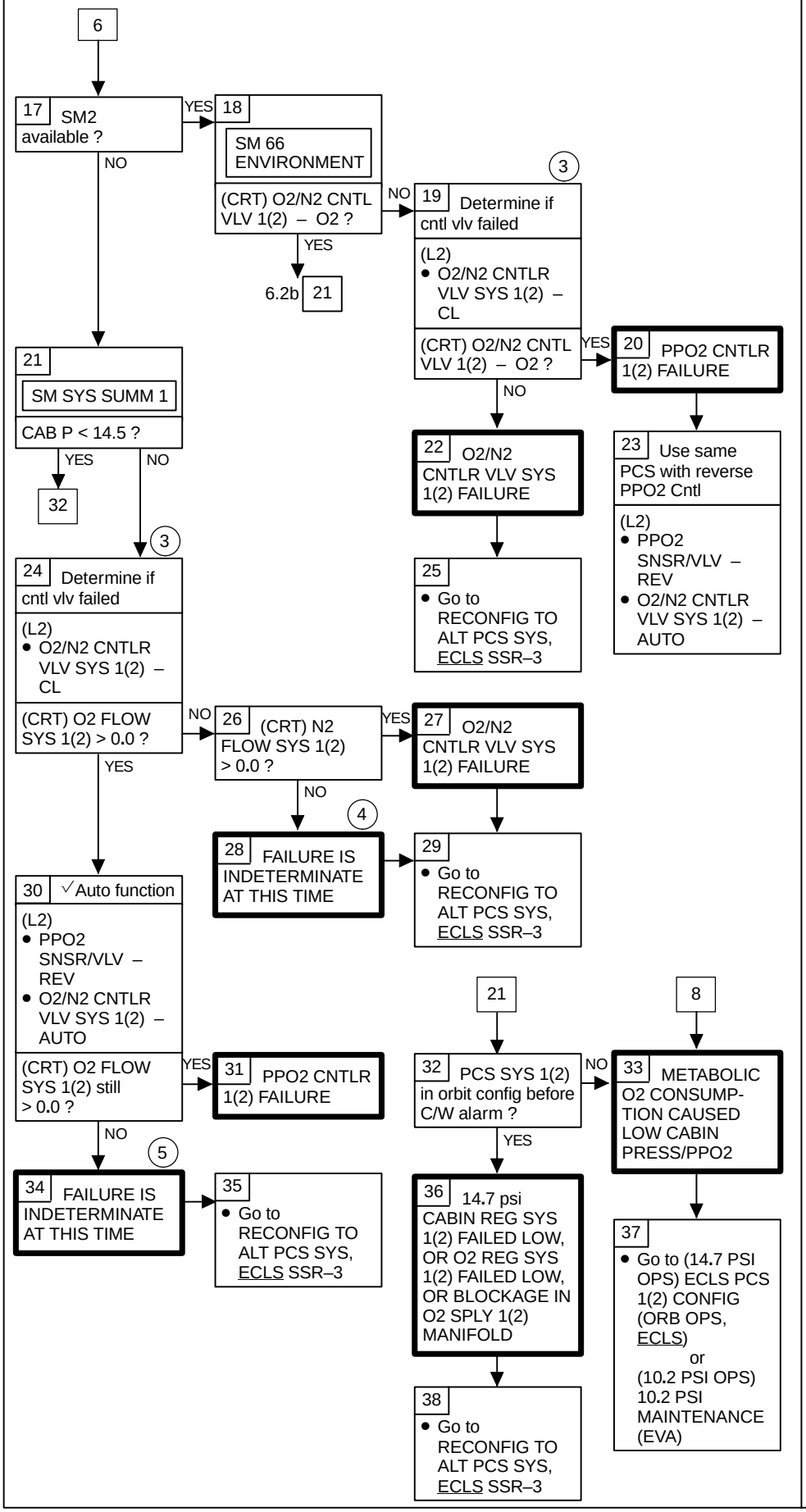


(12) Maintaining VAC VLV – CL to EOM may cause odor buildup due to inability to vent wet trash overboard

(16) CCH has range of travel in which path to vacuum and cabin can be open simultaneously**.** Slow or incomplete extension of CCH may therefore result in cabin leak


ECLS
6.2c PPO2 ↑↓
CABIN ATM
(F7)
BACKUP C/W ALARM
(F7)
S66 CABIN PPO2 A(B)
BFS
SM1 CABIN PPO2
PPO2 A(B)
< 2.70 (2.55) psia
> 3.60 (2.90) psia
Nominal Config:
(ORBIT)
Refer to 6.2a
1 Cabin Press increasing in addition to PPO2 alarm ?
YES 6.2b 1
NO
2 Is CAB PRESS ↓, PPO2 A ↓, and PPO2 B normal ?
YES 6.2b 6
NO
1
3
SM SYS SUMM 1
SM 66 ENVIRONMENT
(CRT or O1)
PPO2 A(B):
PPO2 A reading different than PPO2 B (> 0.15 psi)
39
Both low
Both high
CAUTION
(CRT)
• Monitor lowest reading of PPO2 SNSR A,B. If either PPO2 A or B < 2.50, don QDM
4 10.2 psi ops ?
YES 6.2b 34
NO
5 SM 2 available ?
NO 47
YES
7
SM 66 ENVIRONMENT
(CRT) O2/N2 CNTL VLV 1(2) – N2 ?
YES 9 N2 REG 1(2) P > 180 ?
YES 6.2b 34
NO
NO
3
10 Manually change vlv position
(L2)
• O2/N2 CNTLR VLV SYS 1(2) – OP
(CRT) O2/N2 CNTL VLV 1(2) – N2 ?
YES 13 PPO2 CNTLR 1(2) FAILURE
NO
15 O2/N2 CNTLR VLV SYS 1(2) FAILURE
16
• Go to RECONFIG TO ALT PCS SYS, ECLS SSR–3
11 N2 REG 1(2) FAILURE
12
• Go to RECONFIG TO ALT PCS SYS, ECLS SSR–3
14 Use same PCS with reverse PPO2 Cntl
(L2)
• PPO2 SNSR/VLV – REV
• O2/N2 CNTLR VLV SYS 1(2) – AUTO
6 10.2 psi ops ?
YES
NO
17
8 CAB P > 10.0 ?
NO
6.2b 33
YES
33
1 If prior to performing on–orbit PCS config, low PPO2 could be caused by PCS 14.7 CABIN REGS – CL. After PCS config for Orbit Ops only one system active with PPO2 A tied to PCS 1 and PPO2 B tied to PCS 2. For 10.2 psi ops SYS 1 nominally configured to flow N2 and SYS 2 O2, with both 14.7 CAB REGS – CL
2 Use number in parenthesis for 10.2 psia cabin ops
3 O2/N2 CNTLR VLV flows N2 in OP position, and O2 in CL position

ECLS 6.2c (Cont)

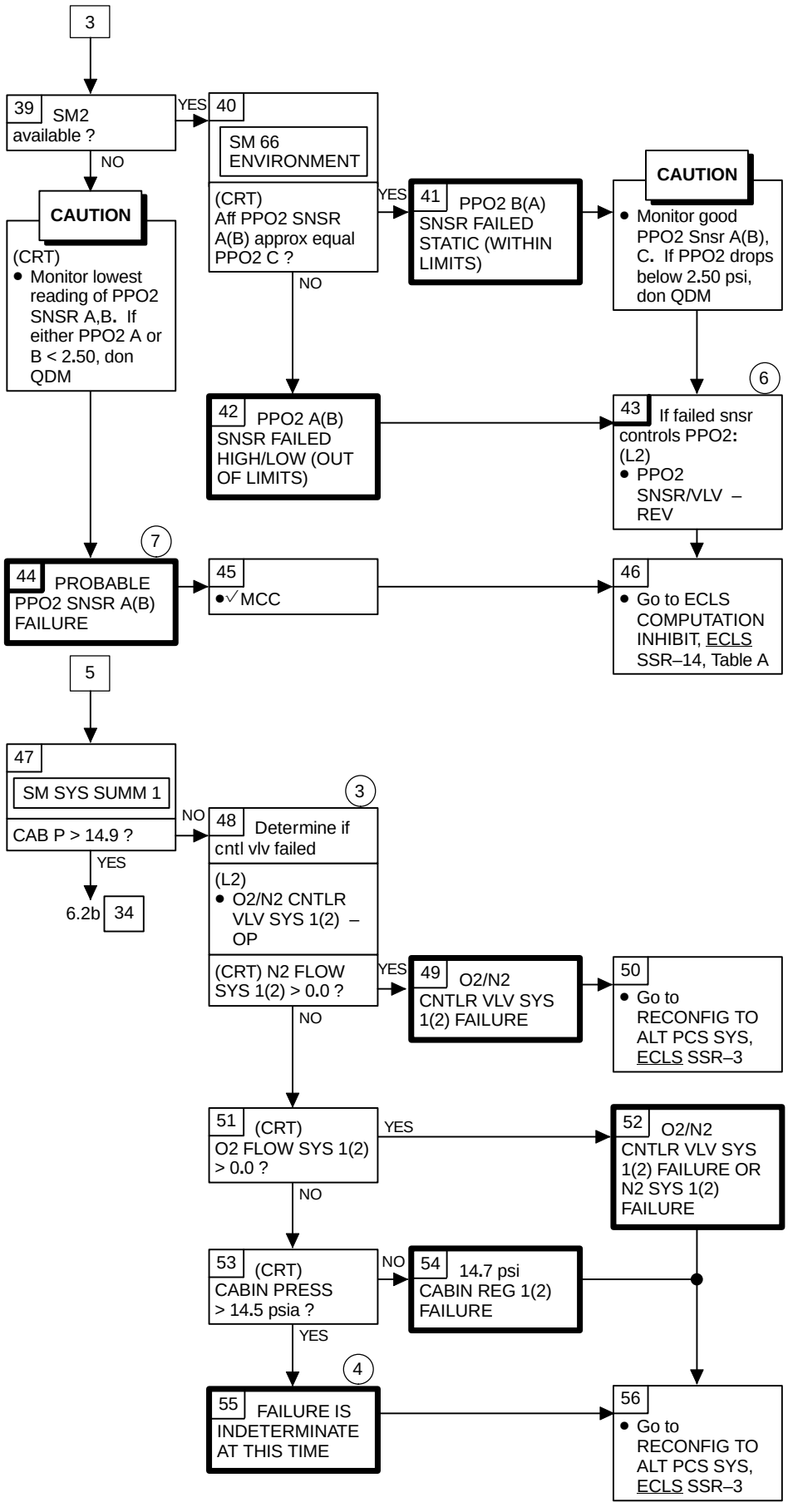


(3) O2/N2 CNTLR VLV flows N2 in OP position, and O2 in CL position

(4) Cabin P is within no flow region on cabin regulator. ✓MCC for further troubleshooting of that system

(5) Either Cabin P is within no flow region on cabin regulator or lost AUTO function on O2/N2 CNTL VLV. ✓MCC for further troubleshooting of that system

ECLS 6.2c (Cont)



(3) O2/N2 CNTLR VLV flows N2 in OP position, and O2 in CL position

(4) Cabin P is within no flow region on cabin regulator. ✓MCC for further troubleshooting of that system

(6) Monitor systems performance on Reverse snsr. If 10.2 psi operations, performance of snsr cannot be determined until cabin repressed and initiation of Auto PCS control. If Reverse snsr does not control PPO2 properly, ✓MCC regarding Manual Cabin ATM Management

(7) Only MCC can determine exact failure. Suspect snsr yielding alarm. MCC will determine whether to go to REVERSE on PPO2 SNSR/VLV

ECLS

6.2d N2 REG P ↑↓

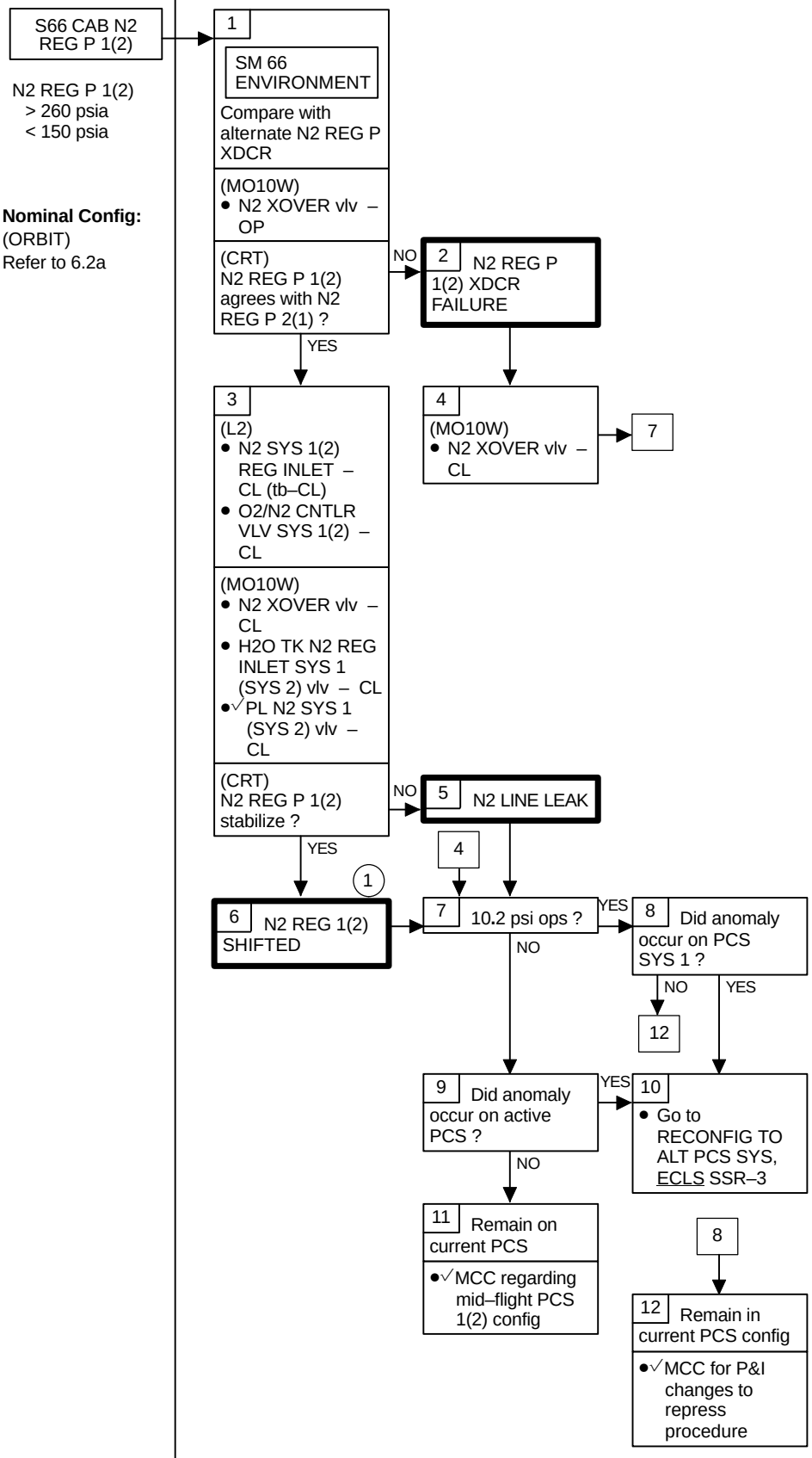
SM ALERT

S66 CAB N2 REG P 1(2)

N2 REG P 1(2)
> 260 psia
< 150 psia

Nominal Config:
(ORBIT)
Refer to 6.2a

1 If PL N2 line in use, ✓MCC for further isolation



ECLS

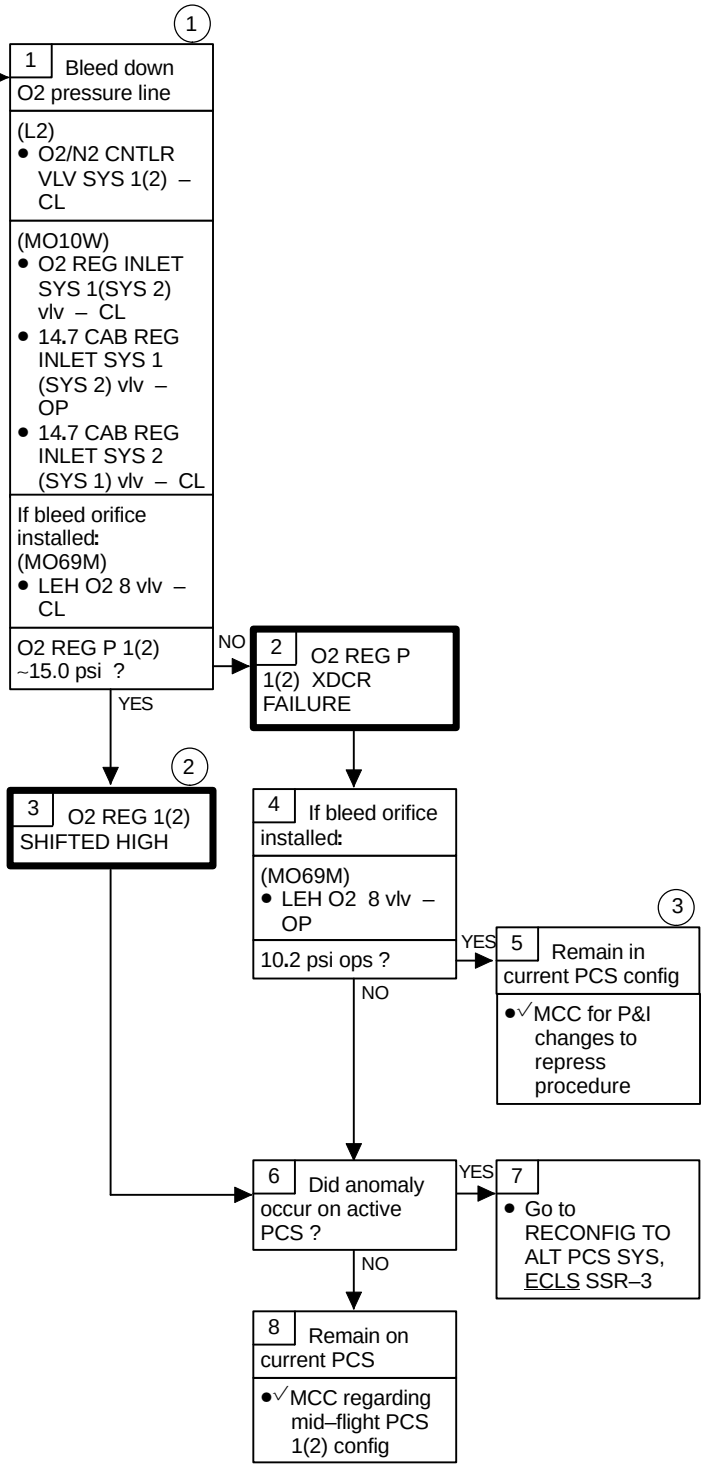
6.2e O2 REG P ↑

SM ALERT

S66 CAB O2 REG P 1(2)

O2 REG P 1(2) > 145 psia

Nominal Config:
(ORBIT)
Refer to 6.2a



(1) Cabin press must drop low enough to open 14.7 psia CABIN REG and bleed O2 Line

(2) High O2 REG P could possibly be caused by spec leakage through regulator

(3) For 10.2 psi ops, O2 will be supplied as reqd, via the direct O2 vlv

ECLS

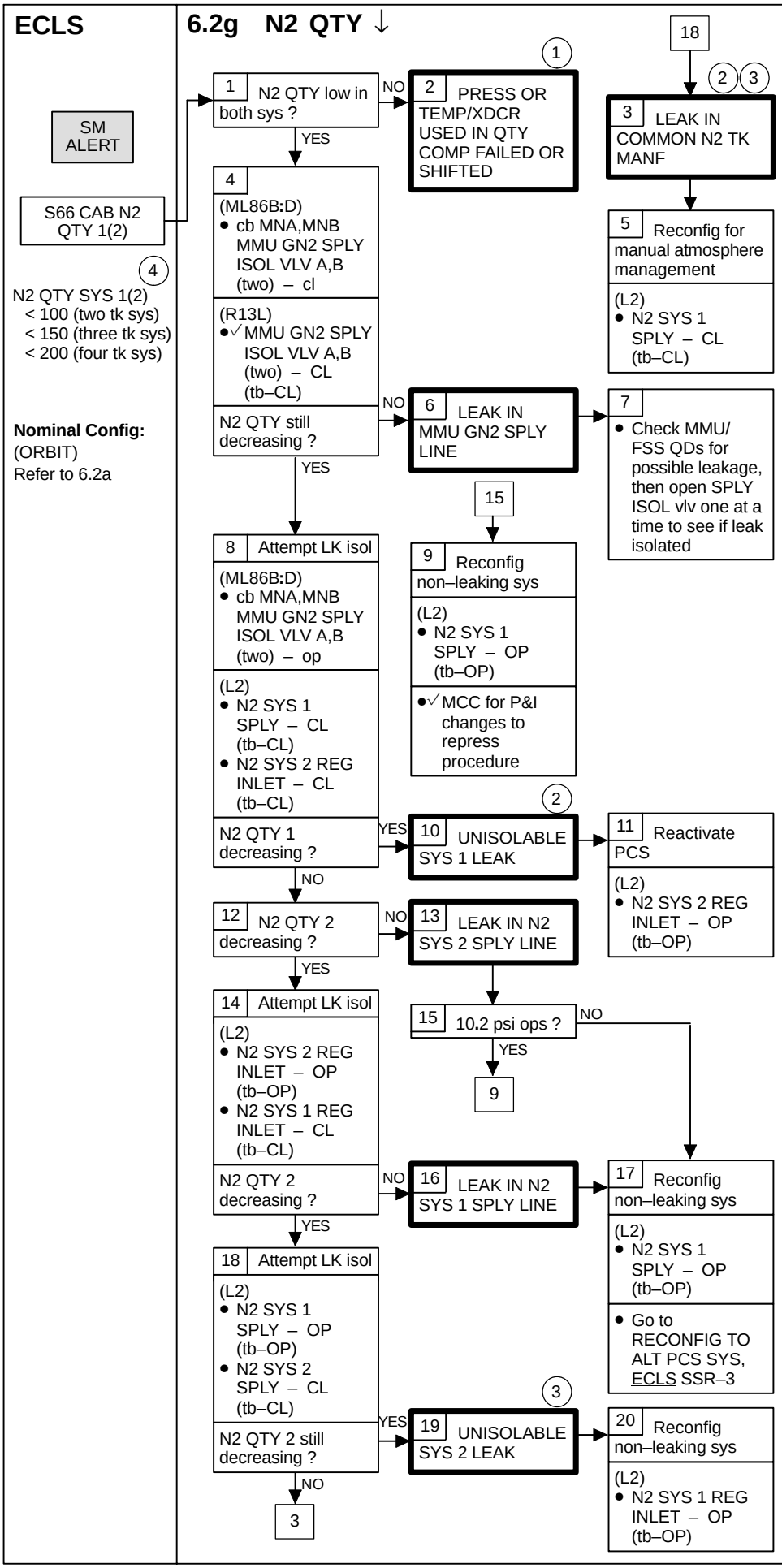
6.2g N2 QTY ↓

SM ALERT

S66 CAB N2 QTY 1(2)

(4) N2 QTY SYS 1(2)
< 100 (two tk sys)
< 150 (three tk sys)
< 200 (four tk sys)

Nominal Config:
(ORBIT)
Refer to 6.2a



(1) ✓MCC to determine exact failure

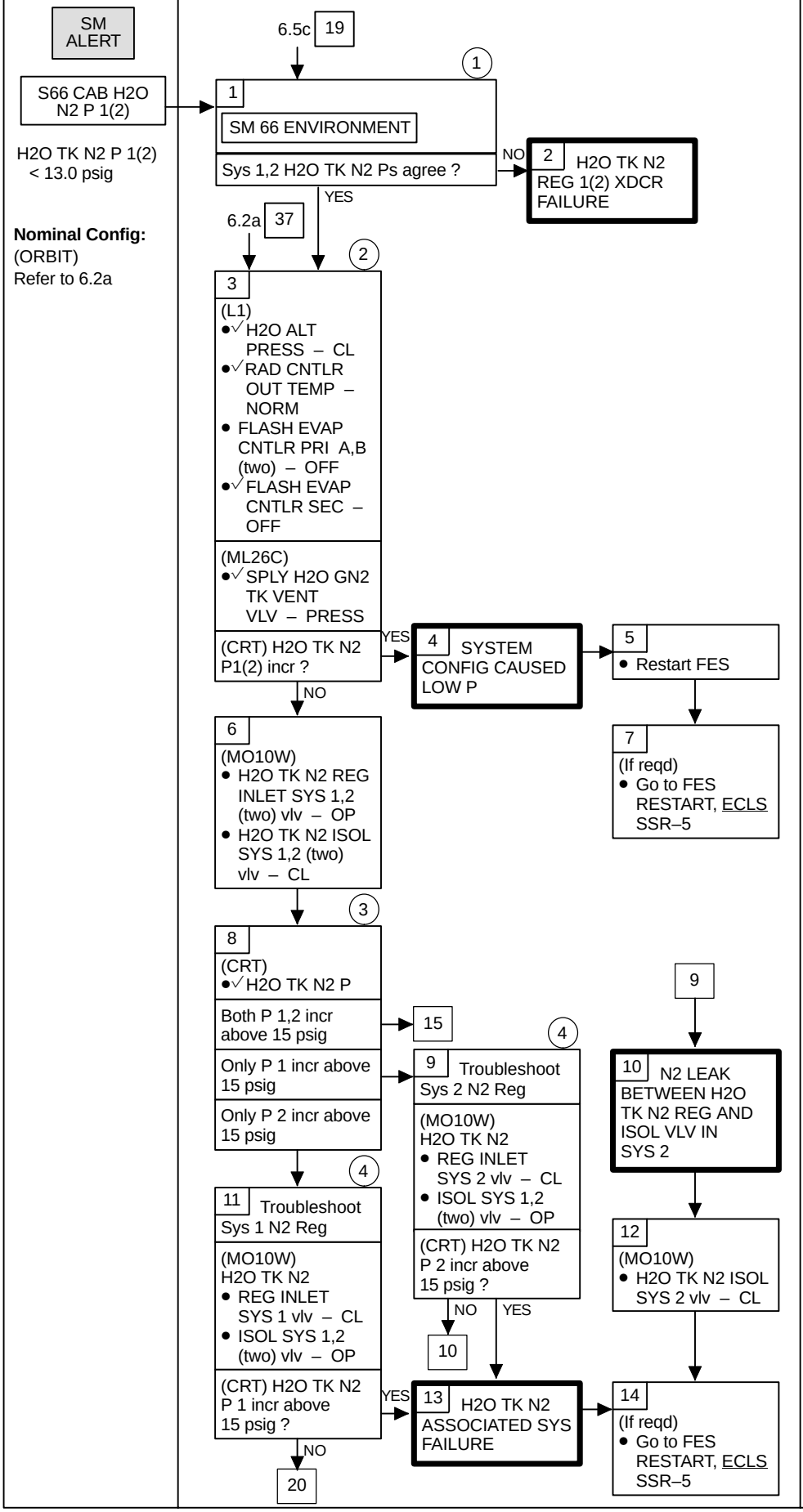
(2) Flight length will depend on remaining quantity

(3) ✓MCC. If cabin press decreases because of N2 TK isolation, cabin repress may be attempted. Isolate tks after each repress attempt

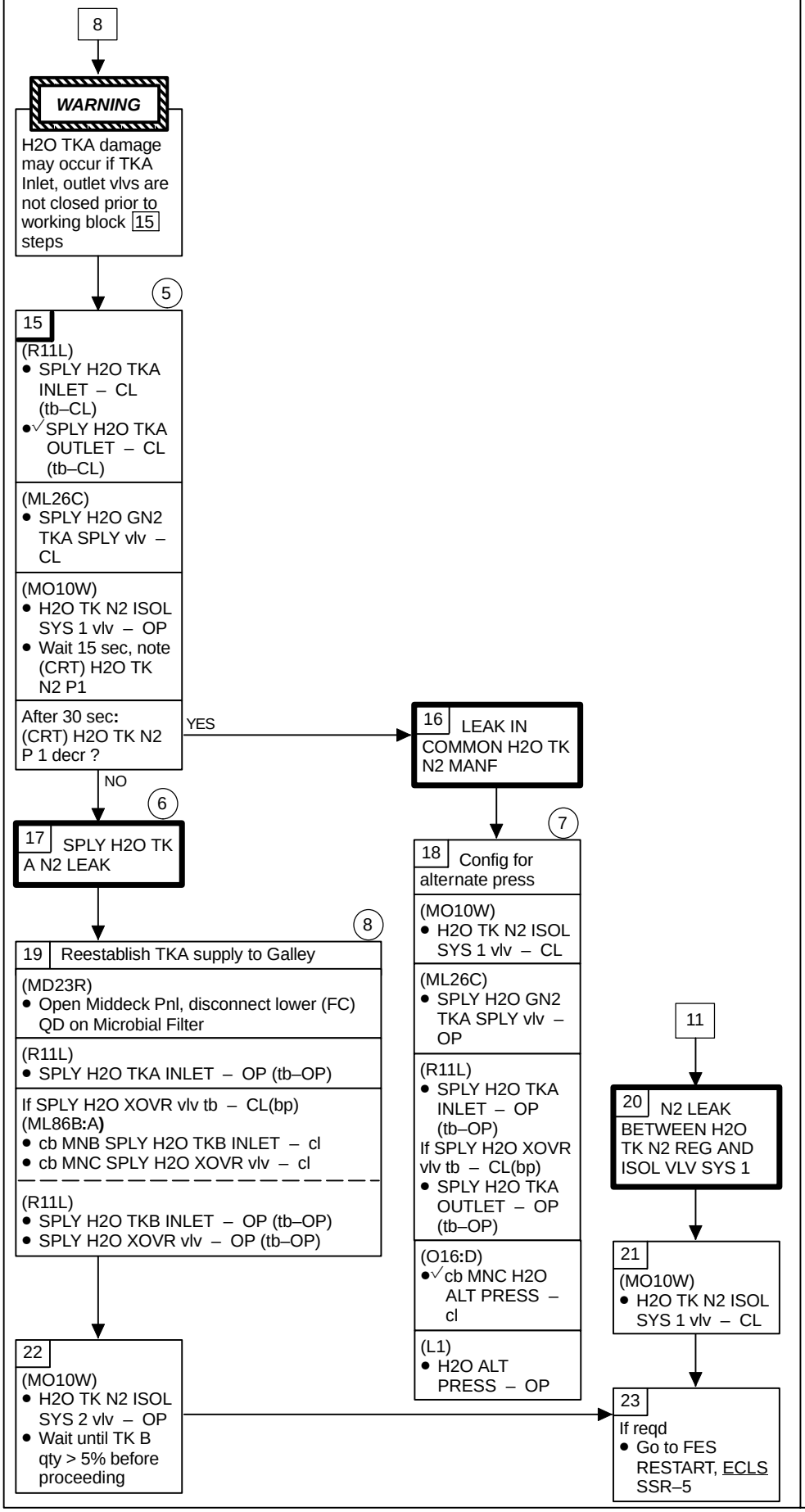
(4) Up to four tks per sys are possible. I–load value is 100 but limit is TMBUd at OPS 2 depending on number of tks flown

ECLS

6.2i H2O TK N2 P ↓



1. CRT label 'H2O TK N2 P' is really H2O REG 1(2) P not actual 'TK N2 PRESS'
2. Repressurization of SPLY H2O TK may cause Flash Evap shutdn if FLASH EVAP CNTLR not turned off
3. S66 H2O SUPPLY PRESS (psia) or H2O WASTE PRESS (psig) can be used as backup to H2O TK N2 P
4. Repressurization may require up to 15 min

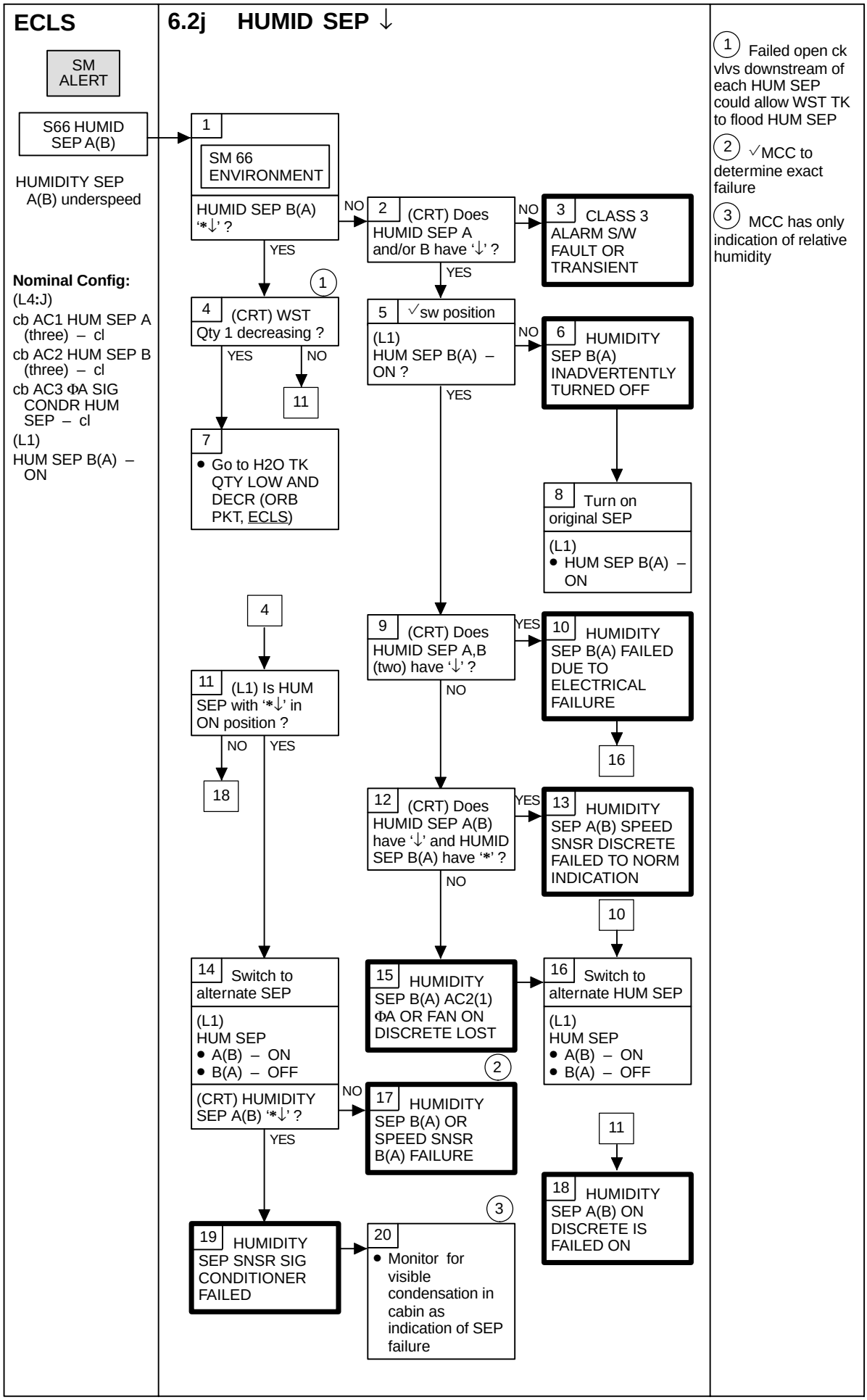


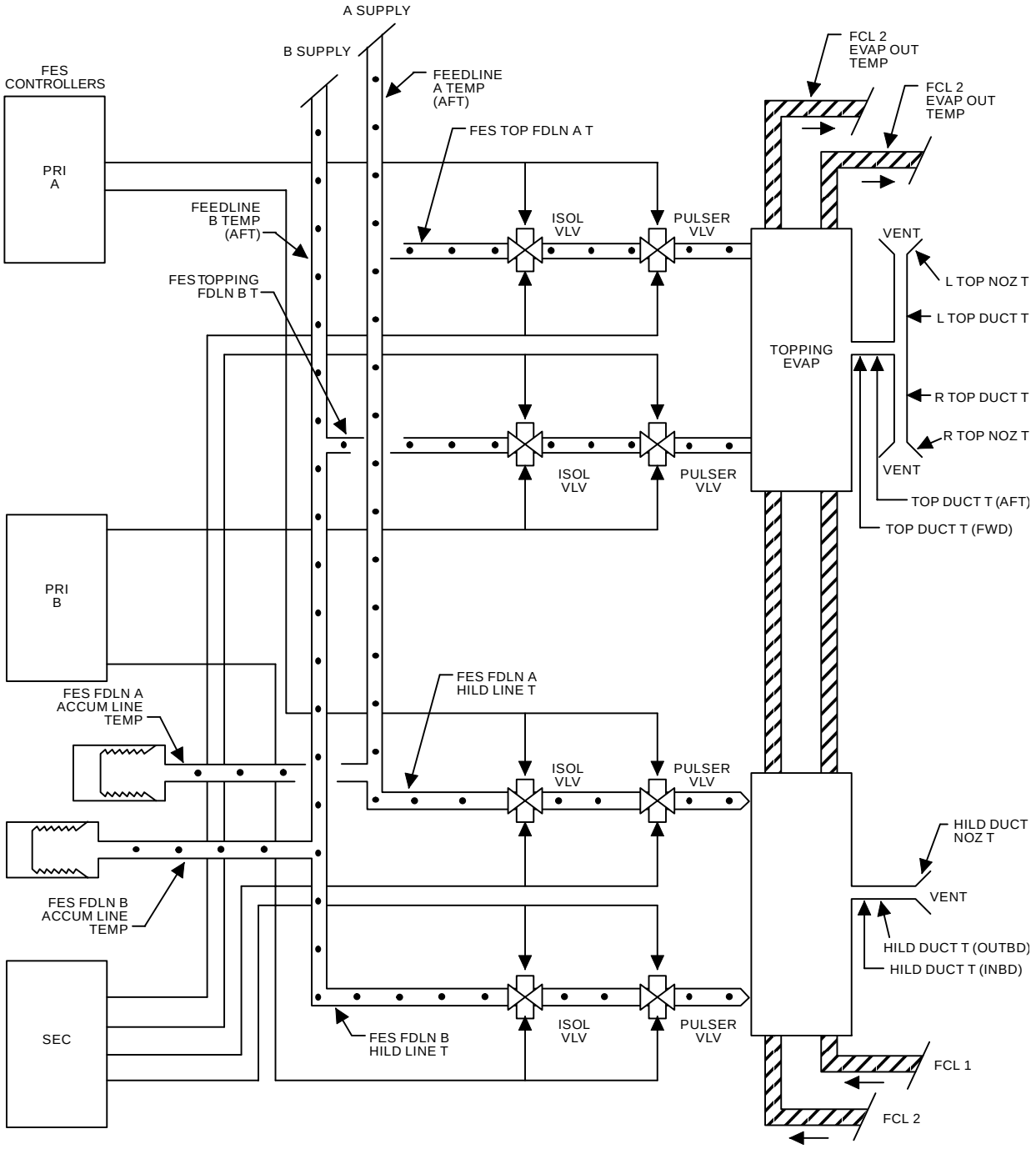
(5) Repressurization of H2O tanks (except TK A) will cause H2O TK N2 P1 to decrease initially. If no leak in the common manifold is present, the H2O TK N2 P1 will increase until it stabilizes at 15.5 to 17.0 psig

(6) SPLY H2O dumps may need to be scheduled more frequently depending upon FLASH EVAP usage

(7) SPLY H2O pressure to the galley will be affected. This may cause Galley RHS to dispense less than dialed quantity and PHS H2O pressure may be insufficient for use. If SPLY H2O TKA is isolated, SPLY H2O to galley will only be available at FCP rate

(8) Allows utilization of TKA H2O. Only TKs B,C,D will fill FCP H2O. To fill TKA, QD must be remated

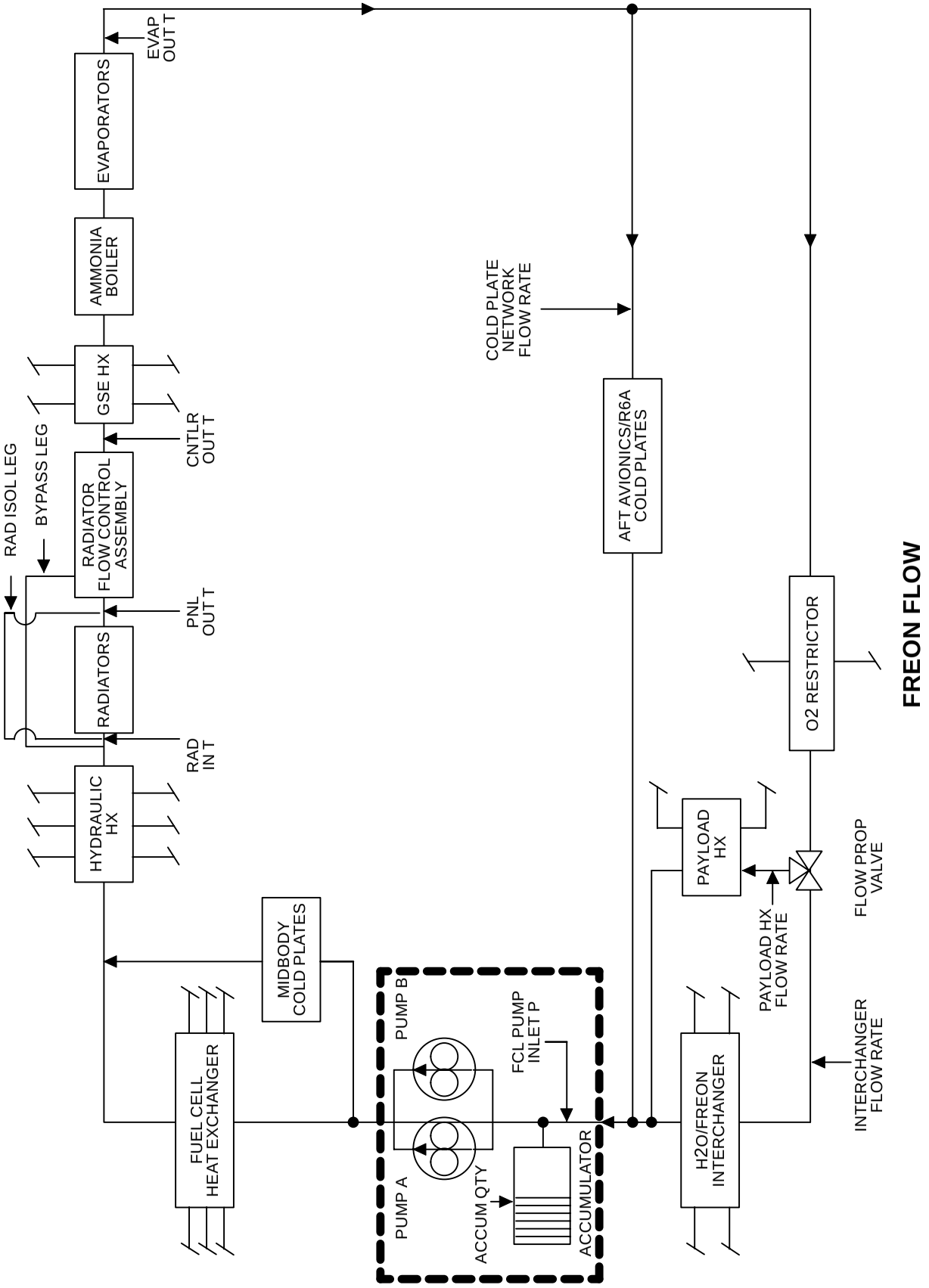

ECLS
6.2j HUMID SEP ↓
SM ALERT
S66 HUMID SEP A(B)
HUMIDITY SEP A(B) underspeed
Nominal Config:
(L4:J)
cb AC1 HUM SEP A (three) – cl
cb AC2 HUM SEP B (three) – cl
cb AC3 ΦA SIG CONDR HUM SEP – cl
(L1)
HUM SEP B(A) – ON
1 SM 66 ENVIRONMENT
HUMID SEP B(A) '*↓' ?
YES
NO
2 (CRT) Does HUMID SEP A and/or B have '↓' ?
YES
NO
3 CLASS 3 ALARM S/W FAULT OR TRANSIENT
4 (CRT) WST Qty 1 decreasing ?
YES
NO
11
7 • Go to H2O TK QTY LOW AND DECR (ORB PKT, ECLS)
5 ✓sw position
(L1) HUM SEP B(A) – ON ?
NO
YES
6 HUMIDITY SEP B(A) INADVERTENTLY TURNED OFF
8 Turn on original SEP
(L1) • HUM SEP B(A) – ON
4
9 (CRT) Does HUMID SEP A,B (two) have '↓' ?
YES
NO
10 HUMIDITY SEP B(A) FAILED DUE TO ELECTRICAL FAILURE
16
11 (L1) Is HUM SEP with '*↓' in ON position ?
NO
YES
18
12 (CRT) Does HUMID SEP A(B) have '↓' and HUMID SEP B(A) have '*' ?
YES
NO
13 HUMIDITY SEP A(B) SPEED SNSR DISCRETE FAILED TO NORM INDICATION
10
14 Switch to alternate SEP
(L1) HUM SEP • A(B) – ON • B(A) – OFF
(CRT) HUMIDITY SEP A(B) '*↓' ?
NO
YES
15 HUMIDITY SEP B(A) AC2(1) ΦA OR FAN ON DISCRETE LOST
2
17 HUMIDITY SEP B(A) OR SPEED SNSR B(A) FAILURE
16 Switch to alternate HUM SEP
(L1) HUM SEP • A(B) – ON • B(A) – OFF
11
18 HUMIDITY SEP A(B) ON DISCRETE IS FAILED ON
3
19 HUMIDITY SEP SNSR SIG CONDITIONER FAILED
20 • Monitor for visible condensation in cabin as indication of SEP failure
1 Failed open ck vlvs downstream of each HUM SEP could allow WST TK to flood HUM SEP
2 ✓MCC to determine exact failure
3 MCC has only indication of relative humidity

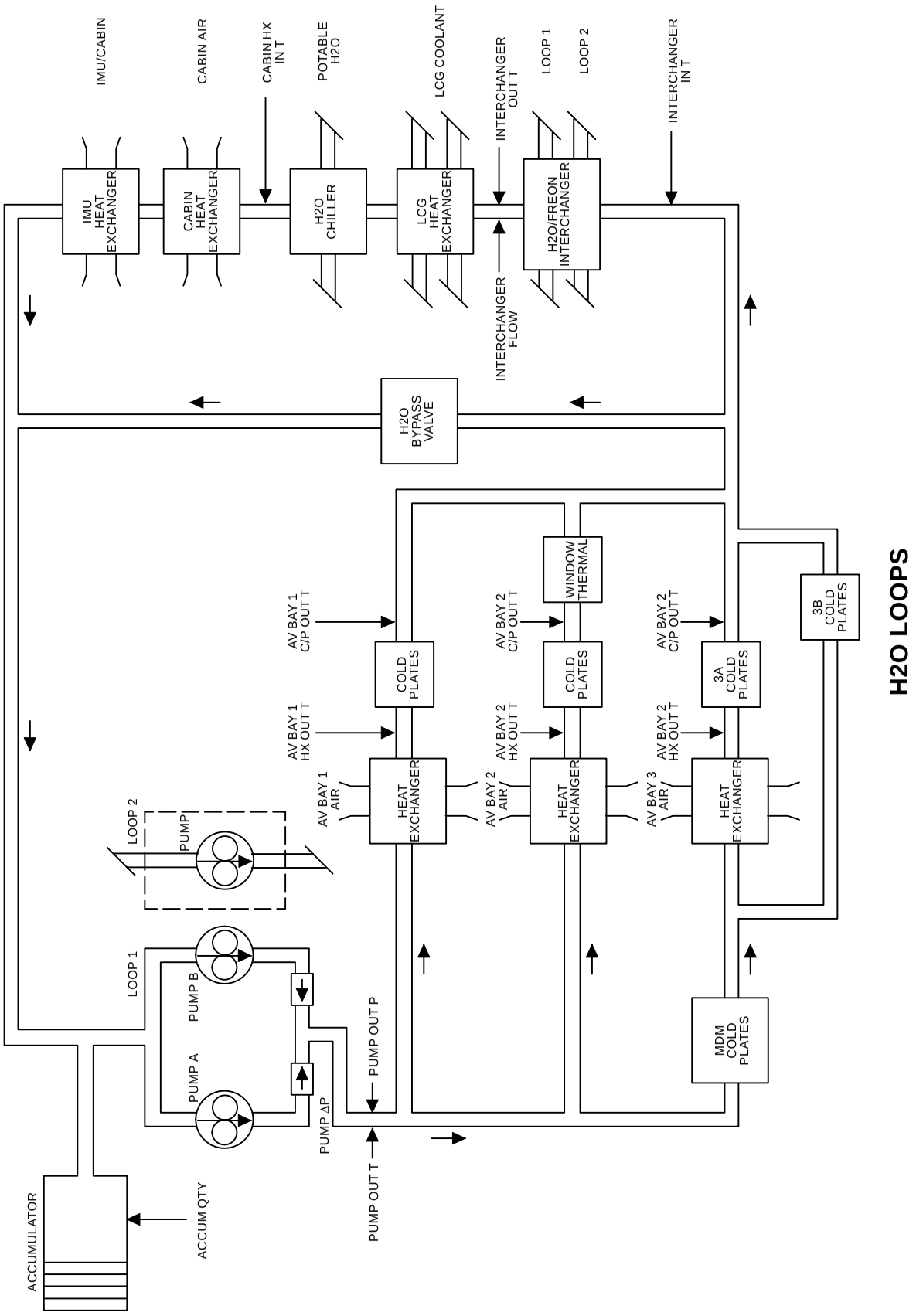


EVAPORATORS

FREON/H2O LOOP

6.4

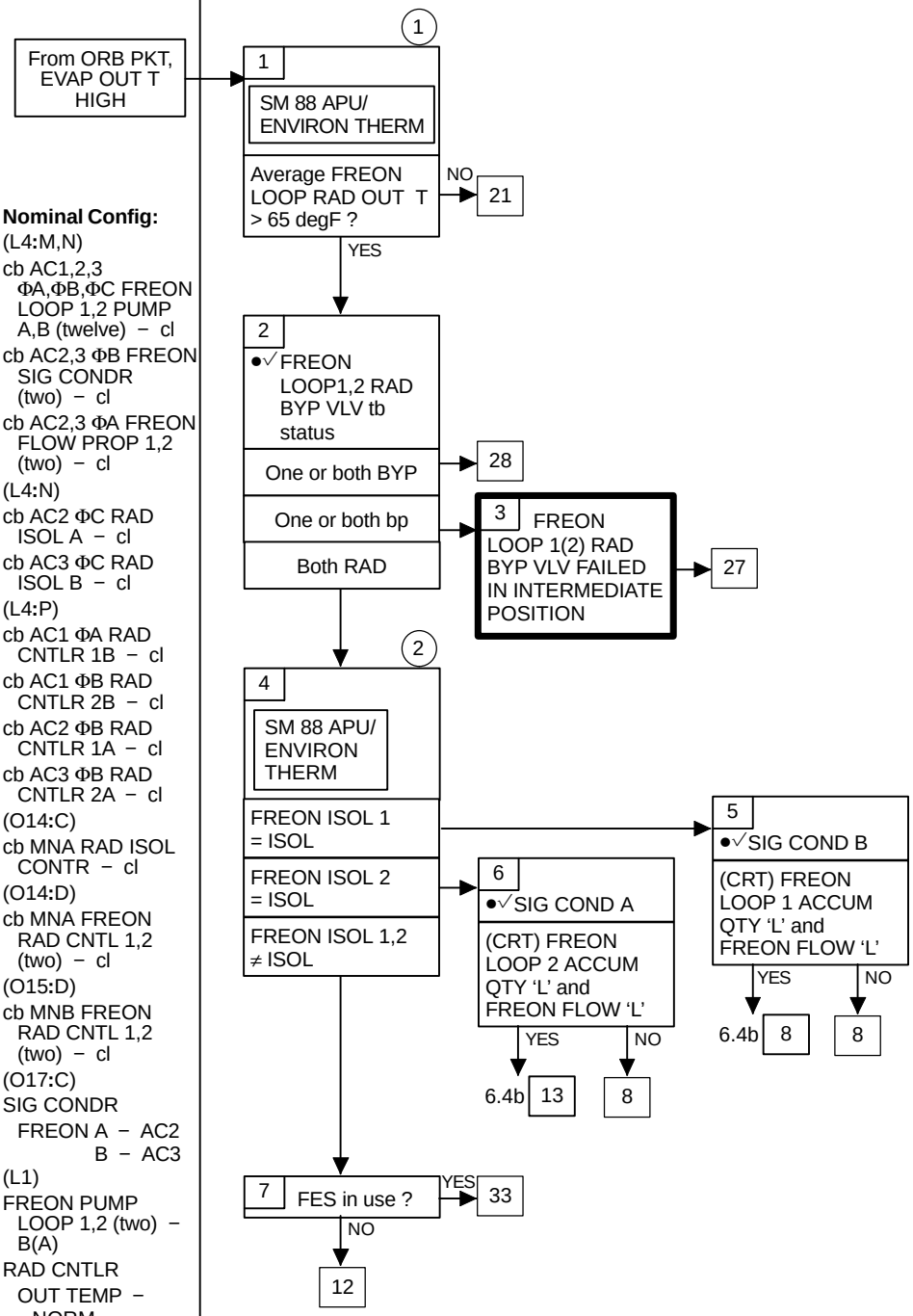

EVAPORATORS
EVAP OUT T
AMMONIA BOILER
GSE HX
CNTLR OUT T
RADIATOR FLOW CONTROL ASSEMBLY
RAD ISOL LEG
BYPASS LEG
RADIATORS
PNL OUT T
HYDRAULIC HX
RAD IN T
COLD PLATE NETWORK FLOW RATE
AFT AVIONICS/R6A COLD PLATES
O2 RESTRICTOR
FREON FLOW
PAYLOAD HX
FLOW PROP VALVE
PAYLOAD HX FLOW RATE
MIDBODY COLD PLATES
FUEL CELL HEAT EXCHANGER
PUMP B
FCL PUMP INLET P
PUMP A
ACCUM QTY
ACCUMULATOR
H2O/FREON INTERCHANGER
INTERCHANGER FLOW RATE


IMU/CABIN
CABIN AIR
CABIN HX IN T
POTABLE H2O
LCG COOLANT
INTERCHANGER OUT T
LOOP 1
LOOP 2
INTERCHANGER IN T
IMU HEAT EXCHANGER
CABIN HEAT EXCHANGER
H2O CHILLER
LCG HEAT EXCHANGER
H2O/FREON INTERCHANGER
INTERCHANGER FLOW
H2O BYPASS VALVE
WINDOW THERMAL
3B COLD PLATES
AV BAY 1 C/P OUT T
AV BAY 2 C/P OUT T
AV BAY 2 C/P OUT T
COLD PLATES
COLD PLATES
3A COLD PLATES
AV BAY 1 HX OUT T
AV BAY 2 HX OUT T
AV BAY 2 HX OUT T
AV BAY 1 AIR
AV BAY 2 AIR
AV BAY 3 AIR
HEAT EXCHANGER
HEAT EXCHANGER
HEAT EXCHANGER
LOOP 2
PUMP
LOOP 1
PUMP B
PUMP A
PUMP OUT P
PUMP ΔP
PUMP OUT T
MDM COLD PLATES
ACCUMULATOR
ACCUM QTY

H2O LOOPS

ECLS

6.4a EVAP OUT T ↑↓



Nominal Config:
(L4:M,N)
cb AC1,2,3 ΦA,ΦB,ΦC FREON LOOP 1,2 PUMP A,B (twelve) − cl
cb AC2,3 ΦB FREON SIG CONDR (two) − cl
cb AC2,3 ΦA FREON FLOW PROP 1,2 (two) − cl
(L4:N)
cb AC2 ΦC RAD ISOL A − cl
cb AC3 ΦC RAD ISOL B − cl
(L4:P)
cb AC1 ΦA RAD CNTLR 1B − cl
cb AC1 ΦB RAD CNTLR 2B − cl
cb AC2 ΦB RAD CNTLR 1A − cl
cb AC3 ΦB RAD CNTLR 2A − cl
(O14:C)
cb MNA RAD ISOL CONTR − cl
(O14:D)
cb MNA FREON RAD CNTL 1,2 (two) − cl
(O15:D)
cb MNB FREON RAD CNTL 1,2 (two) − cl
(O17:C)
SIG CONDR
FREON A − AC2
B − AC3
(L1)
FREON PUMP LOOP 1,2 (two) − B(A)
RAD CNTLR
OUT TEMP − NORM
LOOP 1,2 (two) − AUTO A(B)
BYP VLV
MAN SEL 1,2 (two) − ctr
MODE 1,2 (two) − AUTO
NH3 CNTLR A,B − OFF
FLASH EVAP CNTLR
PRI A(B) − ON
B(A) − OFF
SEC − A(B) SPLY OFF

(Cont in notes column)

(1) If OPS 2 not available, use EVAP OUT T

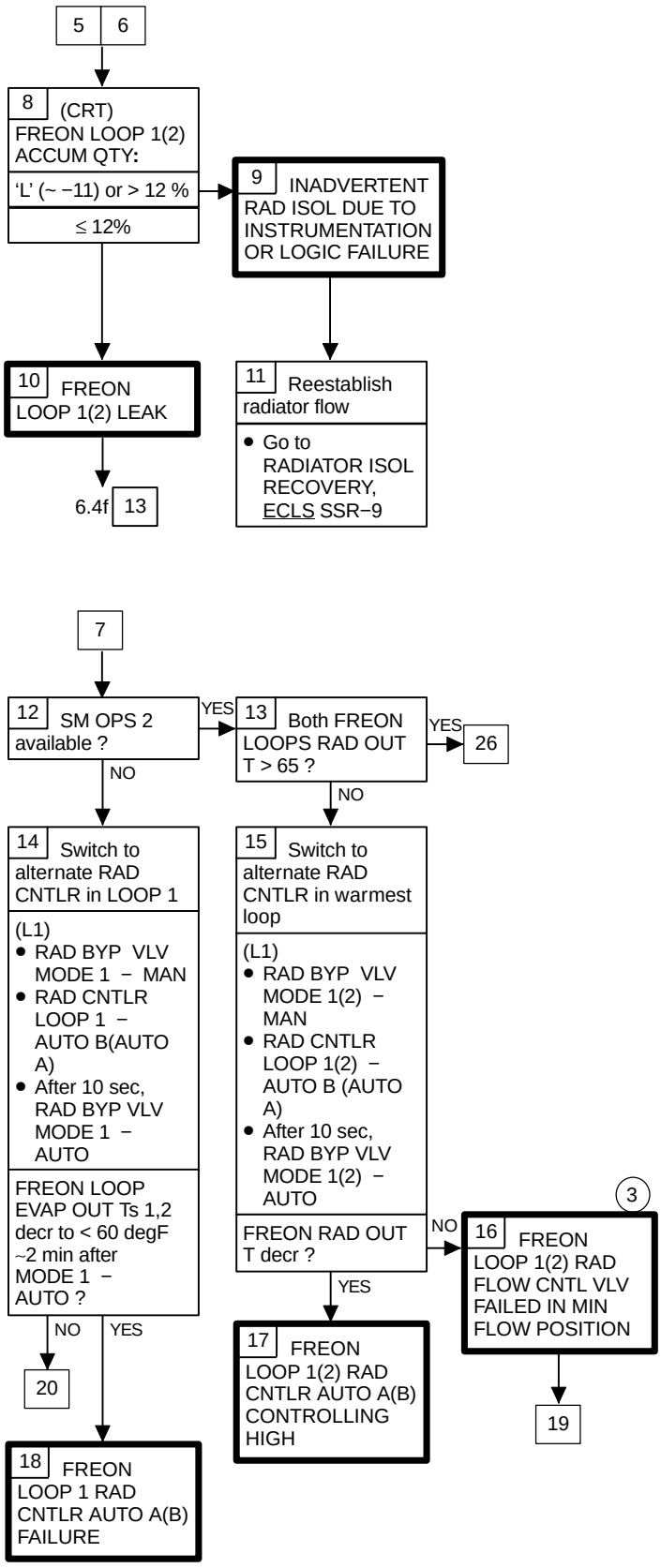
(2) If OPS 2 not available, continue with block 7

Nominal Config:
(Cont):
(L1)
HI LOAD
EVAP − OFF
DUCT HTR − OFF
TOP EVAP HTR
DUCT − A(B)
NOZ L,R − A(B) AUTO
FLOW PROP VLV
LOOP 1,2 − ICH

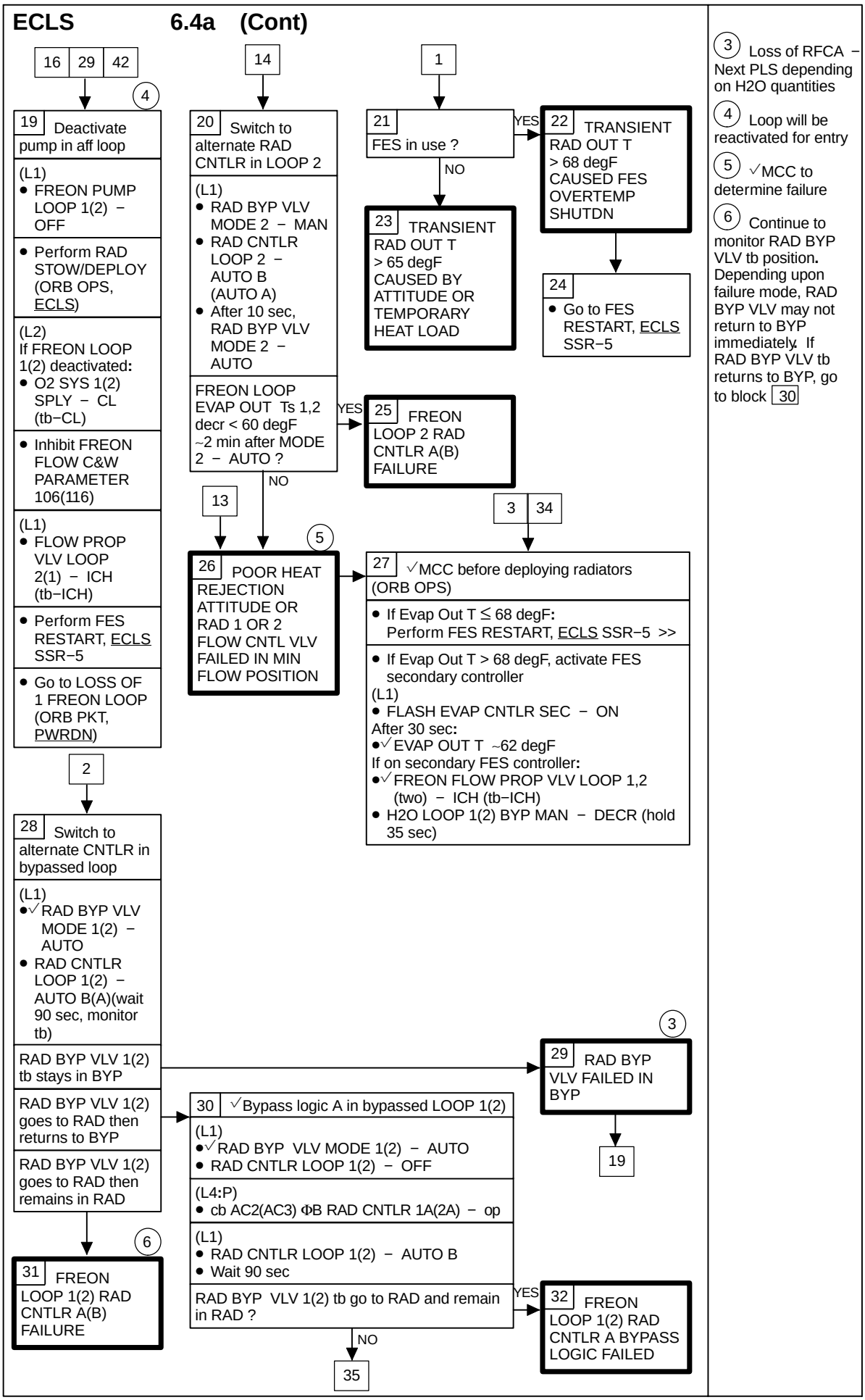
If payloads in use or crew comfort:
FLOW PROP VLV
LOOP 1,2 − PL
(L2)
FLASH EVAP FDLN HTR A,B SPLY − 1(2)
FREON ISOL
MODE − AUTO
LOOP 1 − ctr
LOOP 2 − ctr

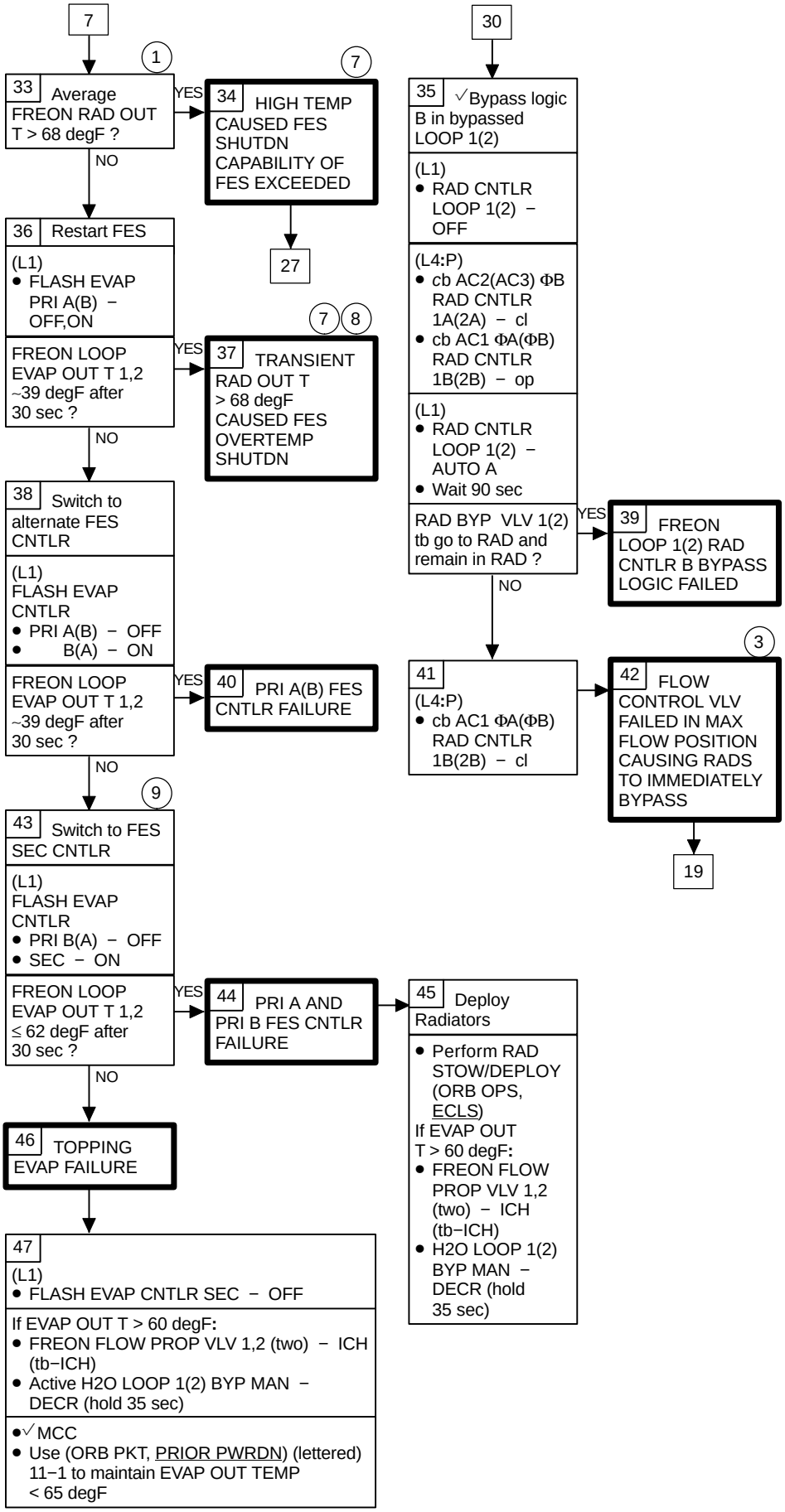
If RAD not in use:
(L1)
HI LOAD EVAP − ENA
HI LOAD EVA − DUCT HTR − A(B)

ECLS 6.4a (Cont)



3 Loss of RFCA − Next PLS depending on H2O quantities


16 29 42
4
19 Deactivate pump in aff loop
(L1)
• FREON PUMP LOOP 1(2) − OFF
• Perform RAD STOW/DEPLOY (ORB OPS, ECLS)
(L2)
If FREON LOOP 1(2) deactivated:
• O2 SYS 1(2) SPLY − CL (tb−CL)
• Inhibit FREON FLOW C&W PARAMETER 106(116)
(L1)
• FLOW PROP VLV LOOP 2(1) − ICH (tb−ICH)
• Perform FES RESTART, ECLS SSR−5
• Go to LOSS OF 1 FREON LOOP (ORB PKT, PWRDN)
2
28 Switch to alternate CNTLR in bypassed loop
(L1)
•✓RAD BYP VLV MODE 1(2) − AUTO
• RAD CNTLR LOOP 1(2) − AUTO B(A)(wait 90 sec, monitor tb)
RAD BYP VLV 1(2) tb stays in BYP
RAD BYP VLV 1(2) goes to RAD then returns to BYP
RAD BYP VLV 1(2) goes to RAD then remains in RAD
6
31 FREON LOOP 1(2) RAD CNTLR A(B) FAILURE
14
20 Switch to alternate RAD CNTLR in LOOP 2
(L1)
• RAD BYP VLV MODE 2 − MAN
• RAD CNTLR LOOP 2 − AUTO B (AUTO A)
• After 10 sec, RAD BYP VLV MODE 2 − AUTO
FREON LOOP EVAP OUT Ts 1,2 decr < 60 degF ~2 min after MODE 2 − AUTO ?
YES
NO
13
5
26 POOR HEAT REJECTION ATTITUDE OR RAD 1 OR 2 FLOW CNTL VLV FAILED IN MIN FLOW POSITION
1
21 FES in use ?
YES
NO
22 TRANSIENT RAD OUT T > 68 degF CAUSED FES OVERTEMP SHUTDN
24
• Go to FES RESTART, ECLS SSR−5
23 TRANSIENT RAD OUT T > 65 degF CAUSED BY ATTITUDE OR TEMPORARY HEAT LOAD
25 FREON LOOP 2 RAD CNTLR A(B) FAILURE
3 34
27 ✓MCC before deploying radiators (ORB OPS)
• If Evap Out T ≤ 68 degF: Perform FES RESTART, ECLS SSR−5 >>
• If Evap Out T > 68 degF, activate FES secondary controller
(L1)
• FLASH EVAP CNTLR SEC − ON
After 30 sec:
•✓EVAP OUT T ~62 degF
If on secondary FES controller:
•✓FREON FLOW PROP VLV LOOP 1,2 (two) − ICH (tb−ICH)
• H2O LOOP 1(2) BYP MAN − DECR (hold 35 sec)
30 ✓Bypass logic A in bypassed LOOP 1(2)
(L1)
•✓RAD BYP VLV MODE 1(2) − AUTO
• RAD CNTLR LOOP 1(2) − OFF
(L4:P)
• cb AC2(AC3) ΦB RAD CNTLR 1A(2A) − op
(L1)
• RAD CNTLR LOOP 1(2) − AUTO B
• Wait 90 sec
RAD BYP VLV 1(2) tb go to RAD and remain in RAD ?
YES
NO
35
3
29 RAD BYP VLV FAILED IN BYP
19
32 FREON LOOP 1(2) RAD CNTLR A BYPASS LOGIC FAILED
3 Loss of RFCA − Next PLS depending on H2O quantities
4 Loop will be reactivated for entry
5 ✓MCC to determine failure
6 Continue to monitor RAD BYP VLV tb position. Depending upon failure mode, RAD BYP VLV may not return to BYP immediately. If RAD BYP VLV tb returns to BYP, go to block 30



(1) If OPS 2 not available, use EVAP OUT T

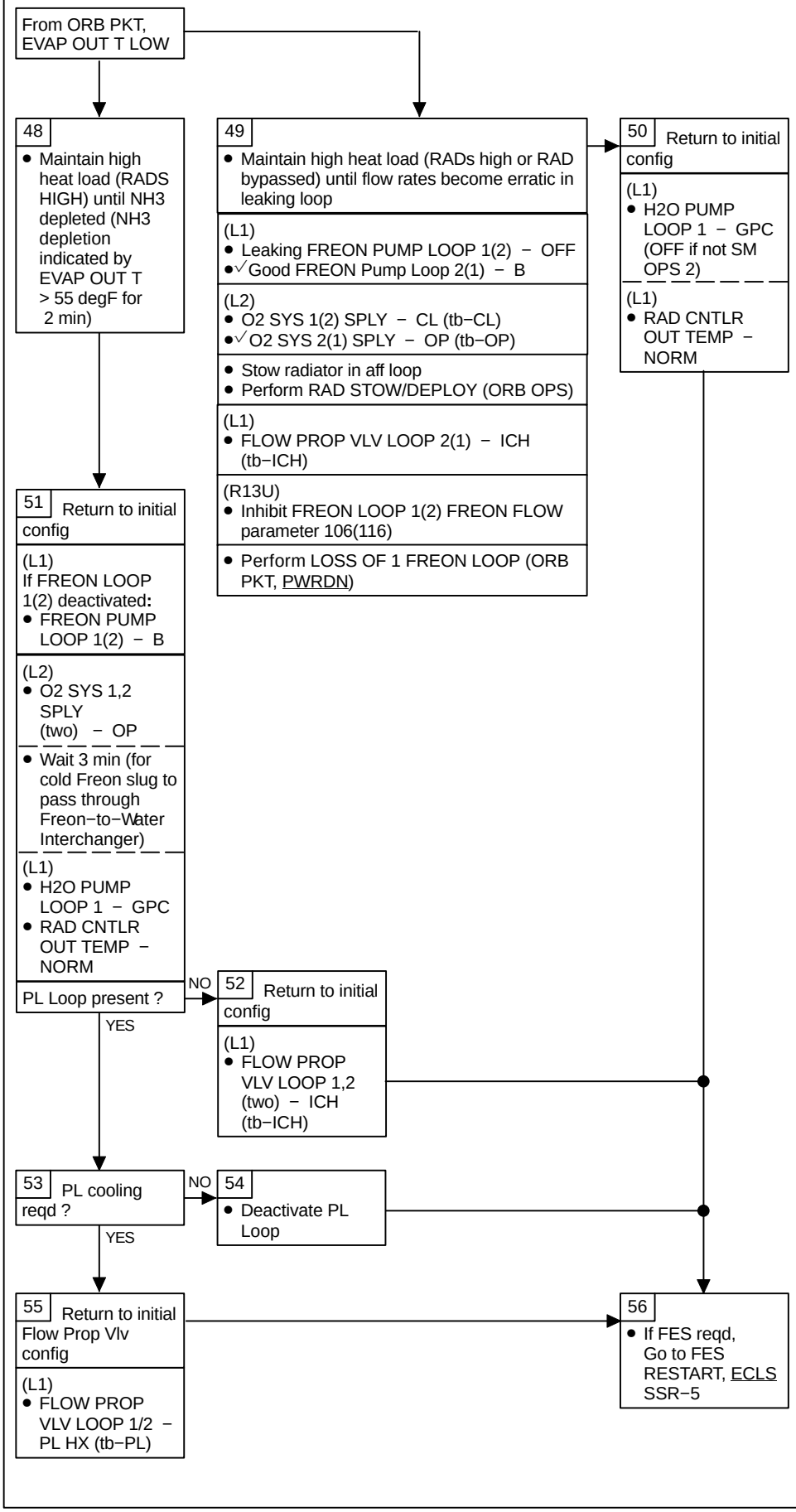
(3) Loss of RFCA − Next PLS depending on H2O quantities

(7) If RAD OUT T > 65 degF not explainable by attitude, troubleshoot radiators. Go to block 15

(8) Expect same transient on next daylight pass if same attitude

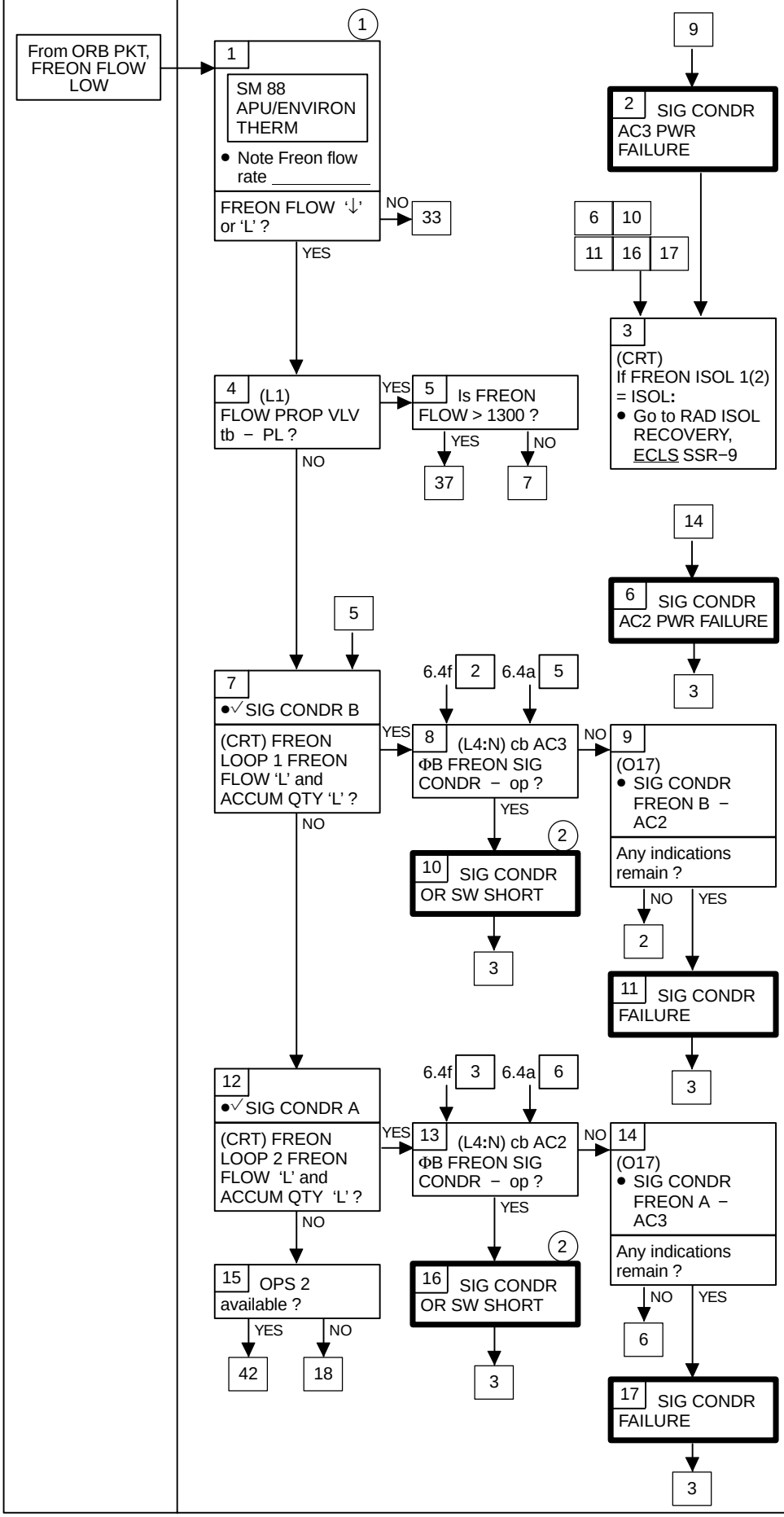
(9) SEC CNTLR controls at 62 degF. If EVAP OUT T < 62 degF, SEC CNTLR operation cannot be verified. Further troubleshooting reqd to determine complete failure

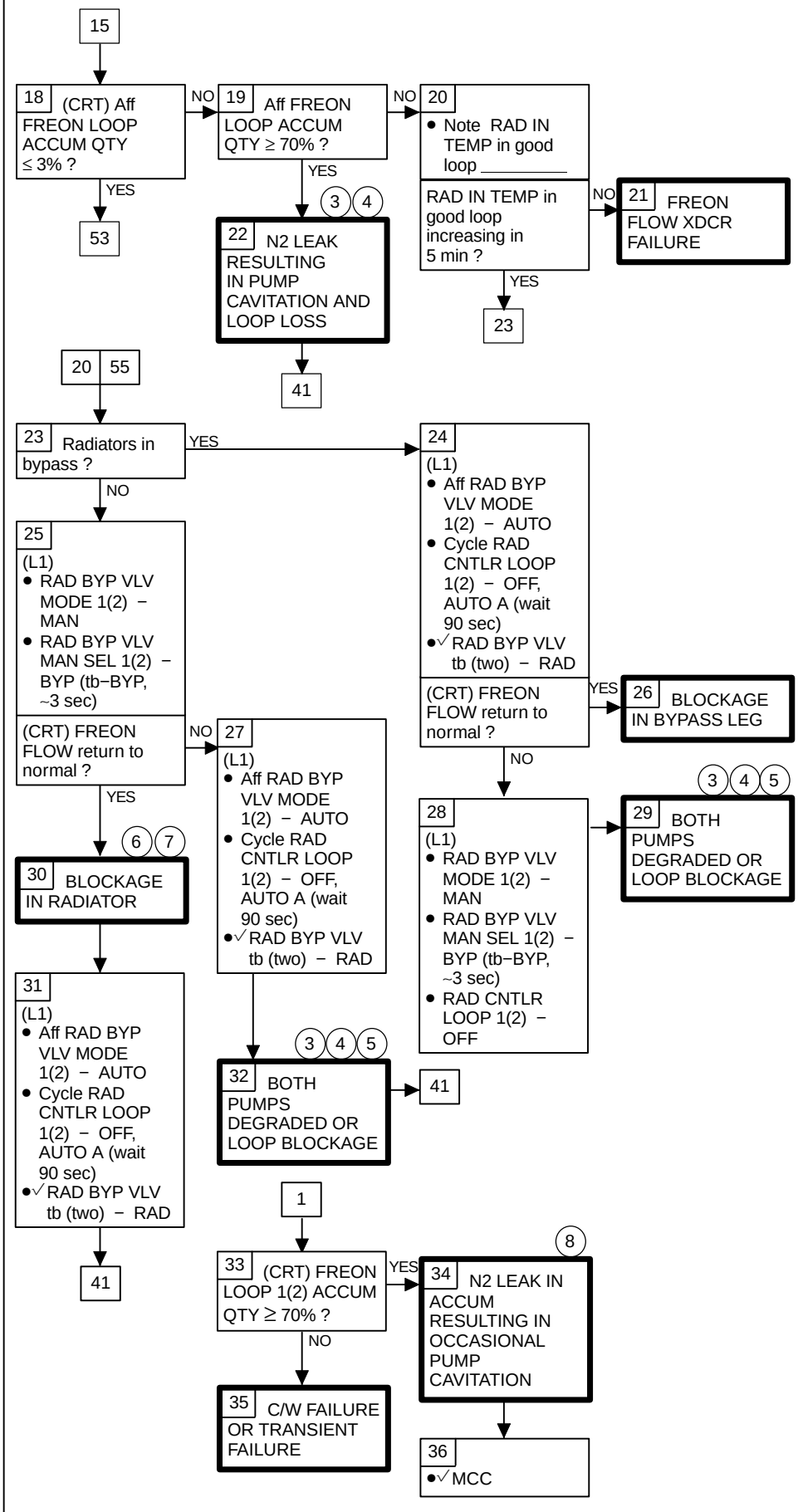
ECLS 6.4a (Cont)



ECLS

6.4b FREON FLOW LOW





(3) Pwrdn of some equipment may be reqd depending on heat load

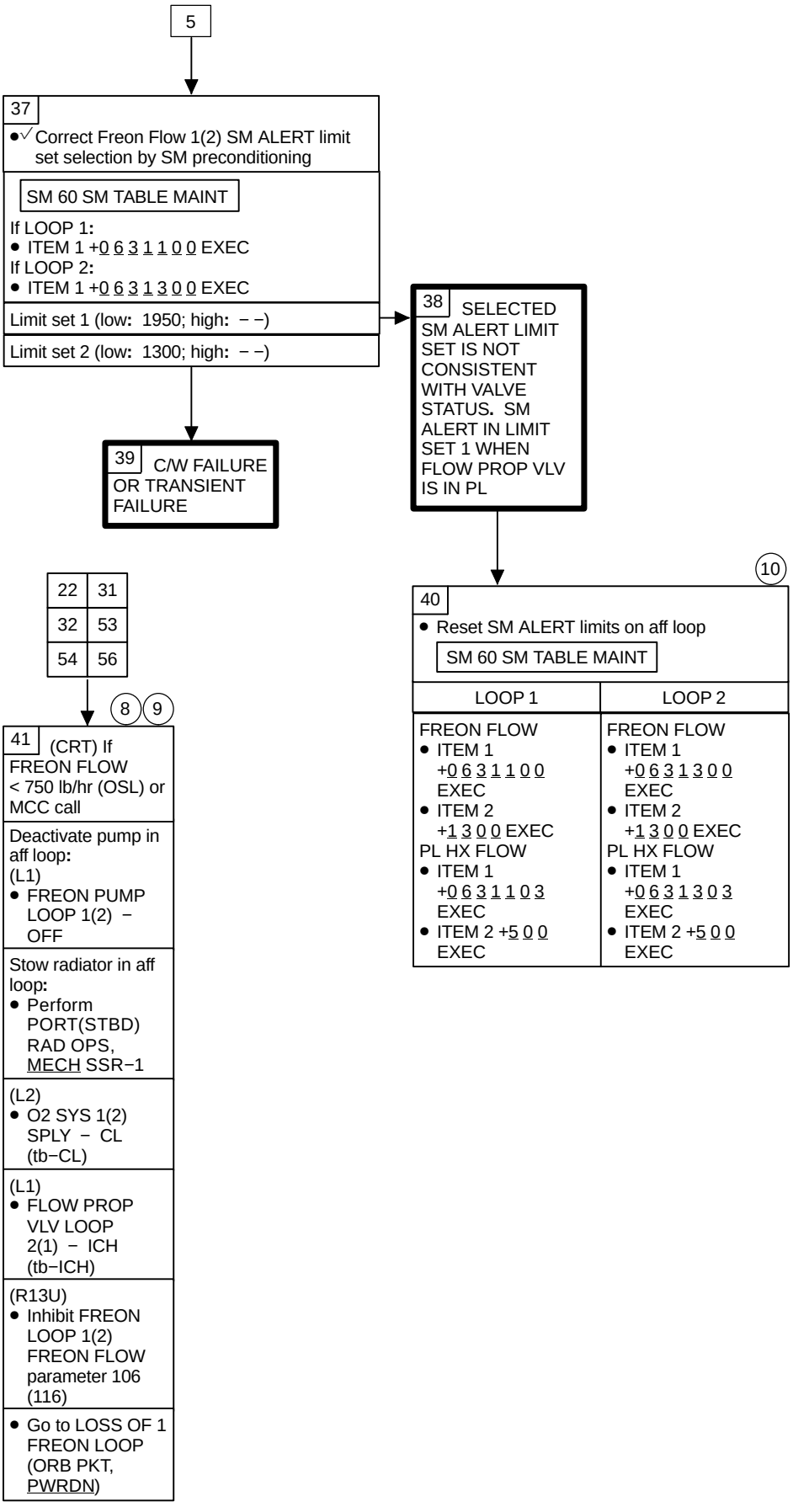
(4) Loss of Freon Loop next PLS entry

(5) ✓MCC to determine failure

(6) With blockage in radiator, RADS may be manually bypassed to incr loop's flow in the event of loss of other FCL

(7) If blockage in radiator deactivates Freon Loop, RADS may be manually bypassed and reactivated for entry

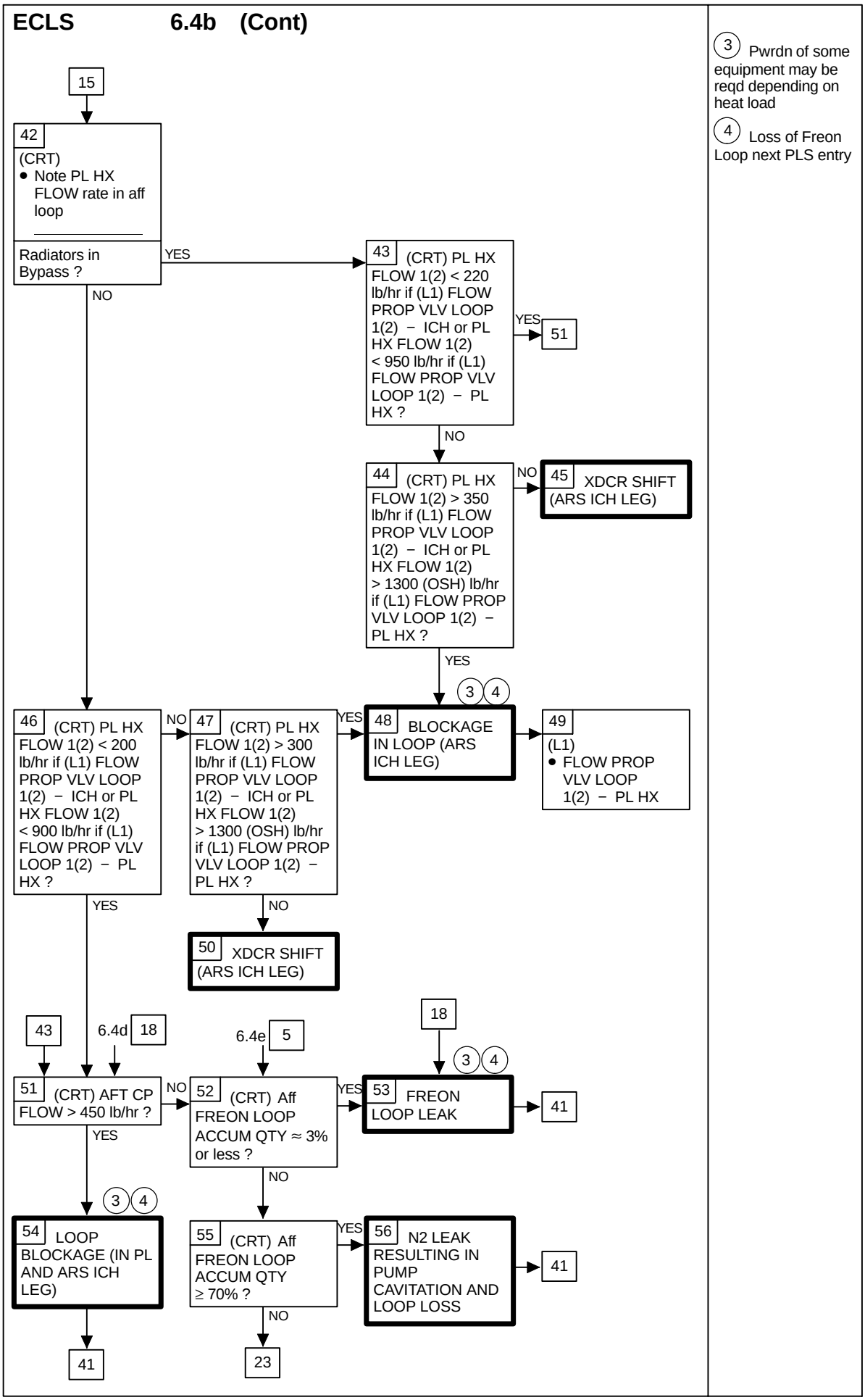
(8) If cavitation occurs frequently, loop is lost

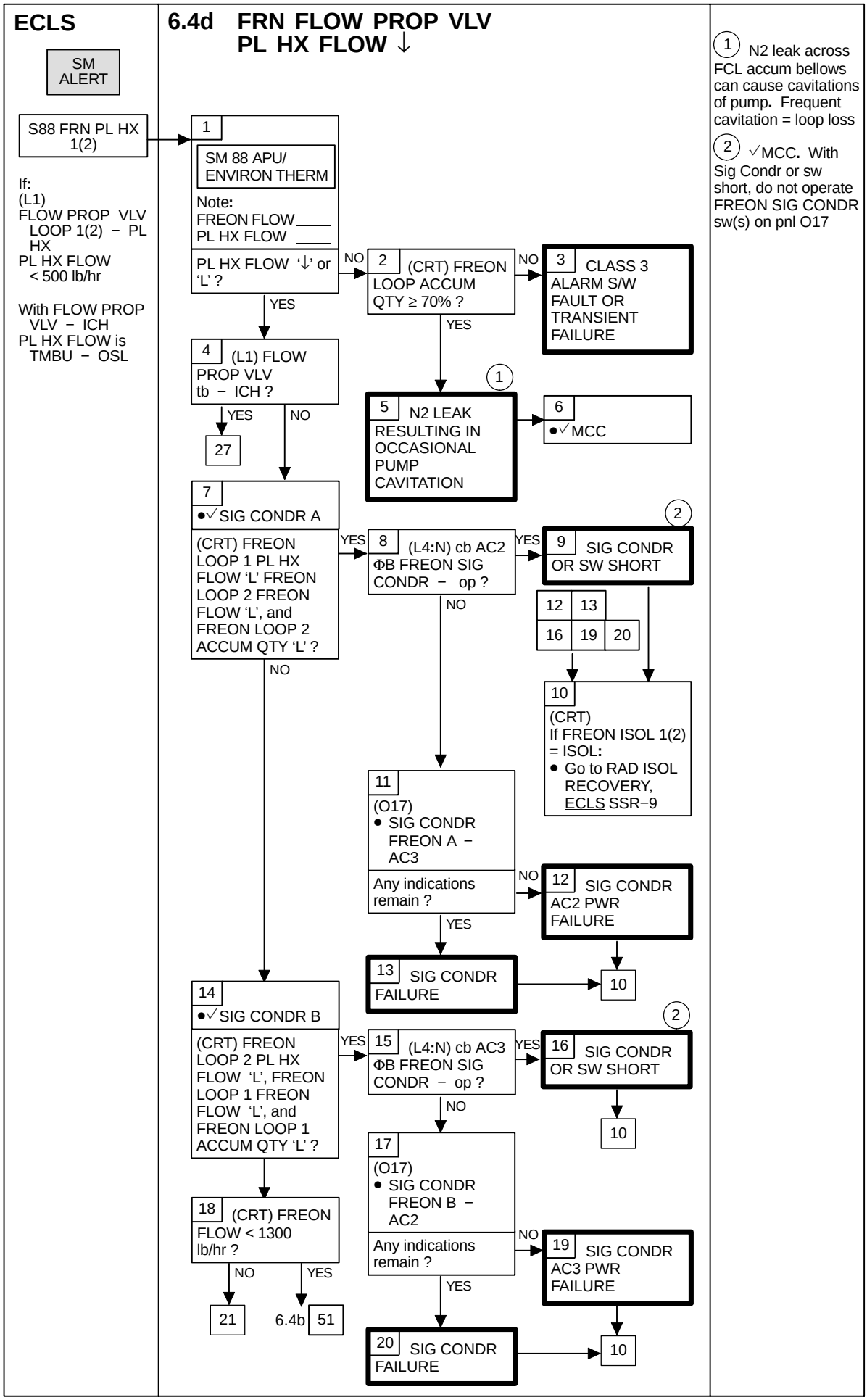


(8) If cavitation occurs frequently, loop is lost

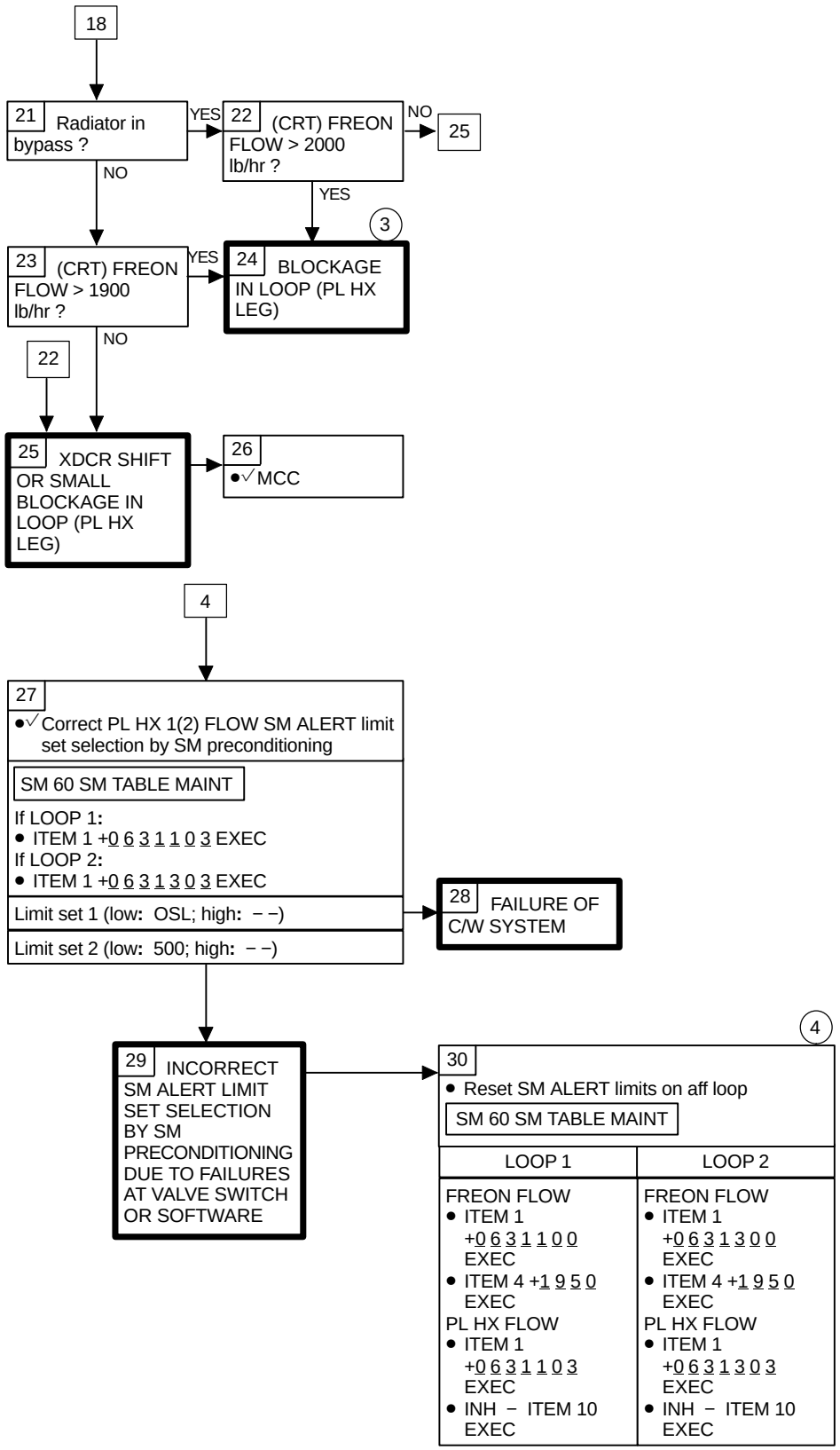
(9) FCL1 − PORT
FCL2 − STBD

(10) Crew may opt to have MCC manage software limits via TMBU


15
42
(CRT)
• Note PL HX FLOW rate in aff loop
Radiators in Bypass ?
YES
NO
43
(CRT) PL HX FLOW 1(2) < 220 lb/hr if (L1) FLOW PROP VLV LOOP 1(2) − ICH or PL HX FLOW 1(2) < 950 lb/hr if (L1) FLOW PROP VLV LOOP 1(2) − PL HX ?
YES
51
NO
44
(CRT) PL HX FLOW 1(2) > 350 lb/hr if (L1) FLOW PROP VLV LOOP 1(2) − ICH or PL HX FLOW 1(2) > 1300 (OSH) lb/hr if (L1) FLOW PROP VLV LOOP 1(2) − PL HX ?
NO
45
XDCR SHIFT (ARS ICH LEG)
YES
3 4
46
(CRT) PL HX FLOW 1(2) < 200 lb/hr if (L1) FLOW PROP VLV LOOP 1(2) − ICH or PL HX FLOW 1(2) < 900 lb/hr if (L1) FLOW PROP VLV LOOP 1(2) − PL HX ?
NO
47
(CRT) PL HX FLOW 1(2) > 300 lb/hr if (L1) FLOW PROP VLV LOOP 1(2) − ICH or PL HX FLOW 1(2) > 1300 (OSH) lb/hr if (L1) FLOW PROP VLV LOOP 1(2) − PL HX ?
YES
48
BLOCKAGE IN LOOP (ARS ICH LEG)
49
(L1)
• FLOW PROP VLV LOOP 1(2) − PL HX
YES
NO
50
XDCR SHIFT (ARS ICH LEG)
43
6.4d 18
6.4e 5
18
3 4
51
(CRT) AFT CP FLOW > 450 lb/hr ?
NO
52
(CRT) Aff FREON LOOP ACCUM QTY ≈ 3% or less ?
YES
53
FREON LOOP LEAK
41
YES
NO
3 4
54
LOOP BLOCKAGE (IN PL AND ARS ICH LEG)
55
(CRT) Aff FREON LOOP ACCUM QTY ≥ 70% ?
YES
56
N2 LEAK RESULTING IN PUMP CAVITATION AND LOOP LOSS
41
NO
41
23
3 Pwrdn of some equipment may be reqd depending on heat load
4 Loss of Freon Loop next PLS entry

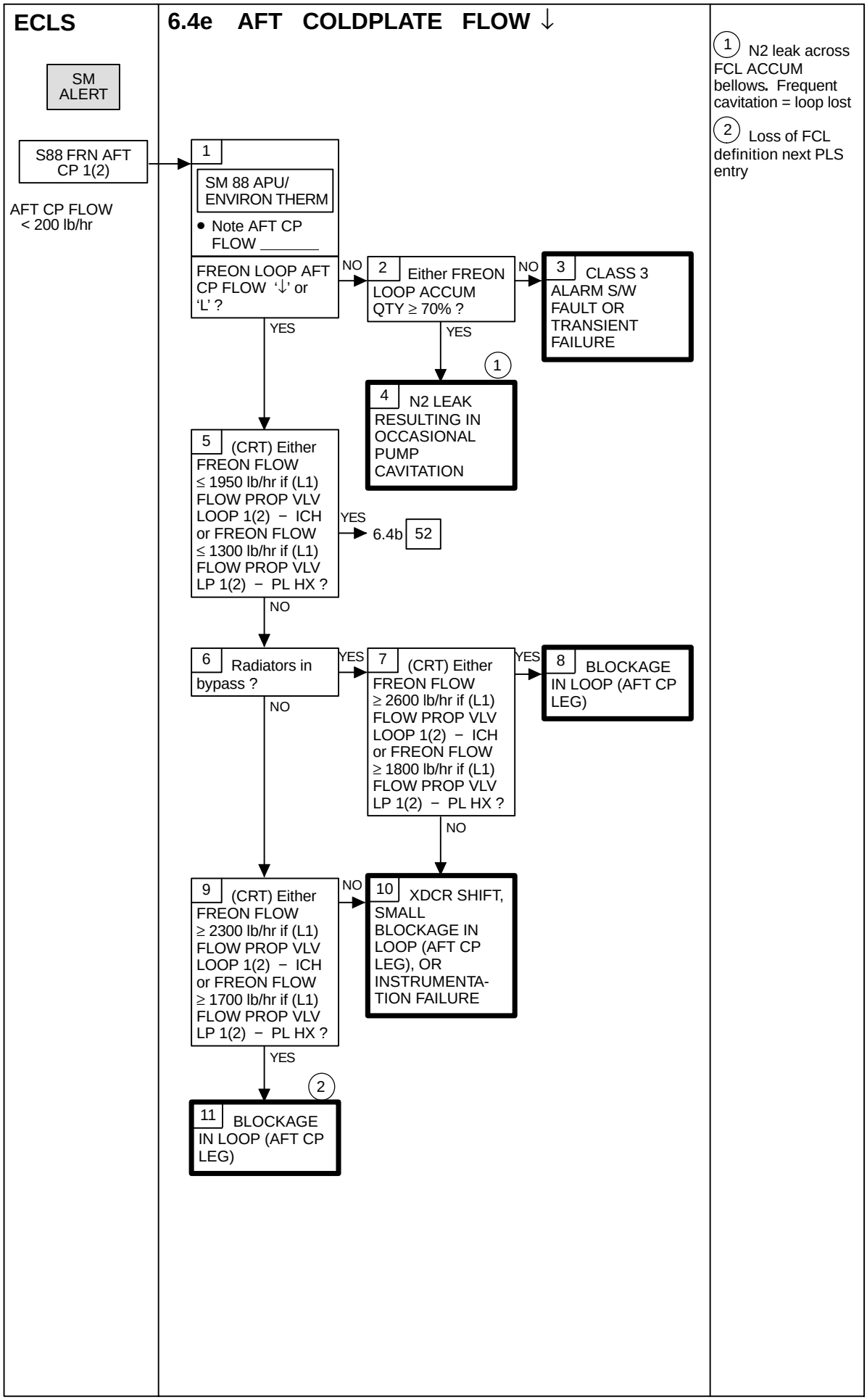

ECLS
6.4d FRN FLOW PROP VLV PL HX FLOW ↓
SM ALERT
S88 FRN PL HX 1(2)
If:
(L1) FLOW PROP VLV LOOP 1(2) − PL HX
PL HX FLOW < 500 lb/hr
With FLOW PROP VLV − ICH
PL HX FLOW is TMBU − OSL
1
SM 88 APU/ ENVIRON THERM
Note:
FREON FLOW ____
PL HX FLOW ____
PL HX FLOW '↓' or 'L' ?
NO
YES
2 (CRT) FREON LOOP ACCUM QTY ≥ 70% ?
NO
YES
3 CLASS 3 ALARM S/W FAULT OR TRANSIENT FAILURE
4 (L1) FLOW PROP VLV tb − ICH ?
YES
NO
27
1
5 N2 LEAK RESULTING IN OCCASIONAL PUMP CAVITATION
6 •✓MCC
7 •✓SIG CONDR A
(CRT) FREON LOOP 1 PL HX FLOW 'L' FREON LOOP 2 FREON FLOW 'L', and FREON LOOP 2 ACCUM QTY 'L' ?
YES
8 (L4:N) cb AC2 ΦB FREON SIG CONDR − op ?
YES
NO
2
9 SIG CONDR OR SW SHORT
12 13 16 19 20
10
(CRT)
If FREON ISOL 1(2) = ISOL:
• Go to RAD ISOL RECOVERY, ECLS SSR−9
NO
11
(O17)
• SIG CONDR FREON A − AC3
Any indications remain ?
NO
YES
12 SIG CONDR AC2 PWR FAILURE
13 SIG CONDR FAILURE
10
14 •✓SIG CONDR B
(CRT) FREON LOOP 2 PL HX FLOW 'L', FREON LOOP 1 FREON FLOW 'L', and FREON LOOP 1 ACCUM QTY 'L' ?
YES
15 (L4:N) cb AC3 ΦB FREON SIG CONDR − op ?
YES
NO
2
16 SIG CONDR OR SW SHORT
10
17
(O17)
• SIG CONDR FREON B − AC2
Any indications remain ?
NO
YES
19 SIG CONDR AC3 PWR FAILURE
20 SIG CONDR FAILURE
10
18 (CRT) FREON FLOW < 1300 lb/hr ?
NO
YES
21
6.4b 51
1 N2 leak across FCL accum bellows can cause cavitations of pump. Frequent cavitation = loop loss
2 ✓MCC. With Sig Condr or sw short, do not operate FREON SIG CONDR sw(s) on pnl O17

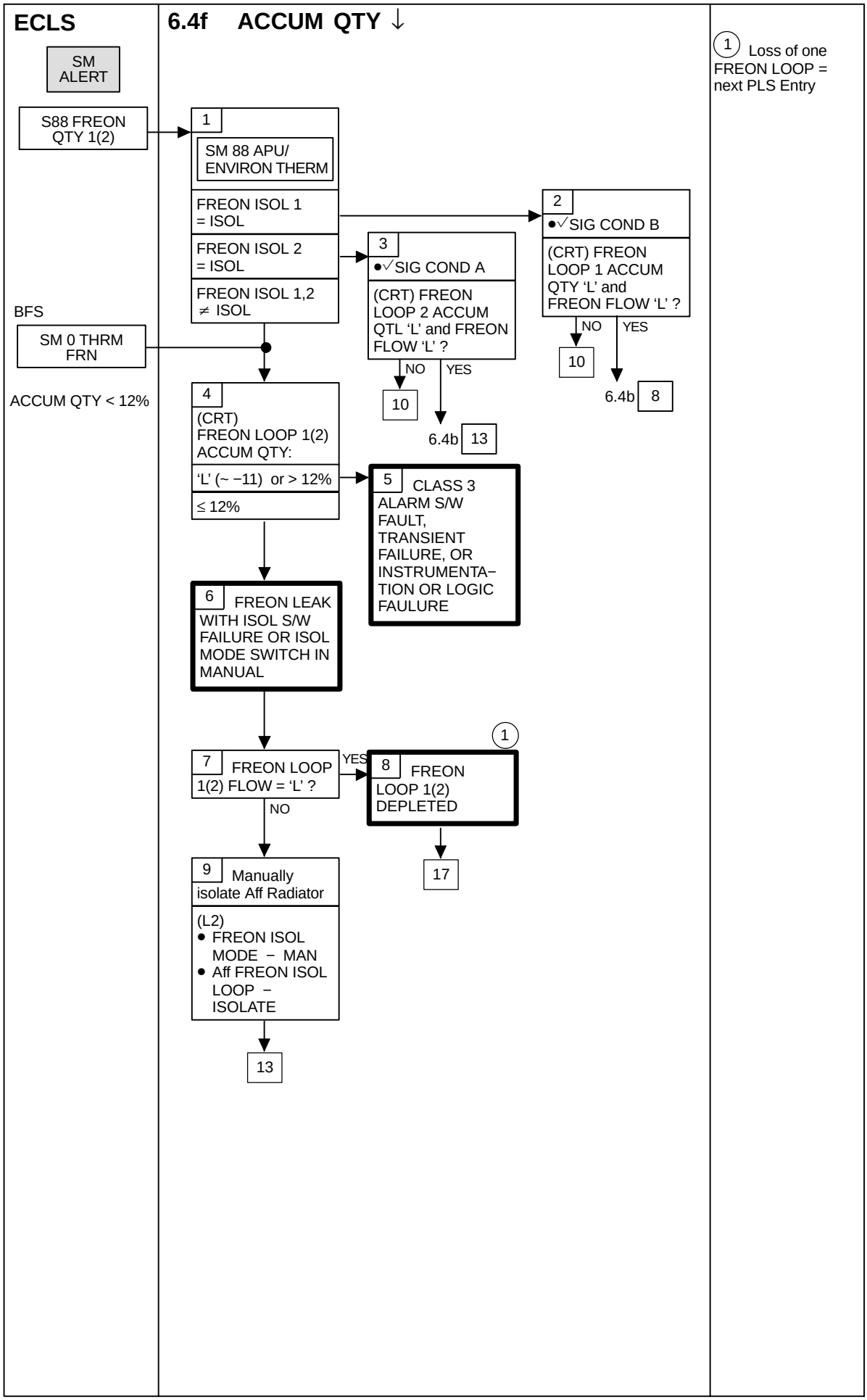
ECLS 6.4d (Cont)



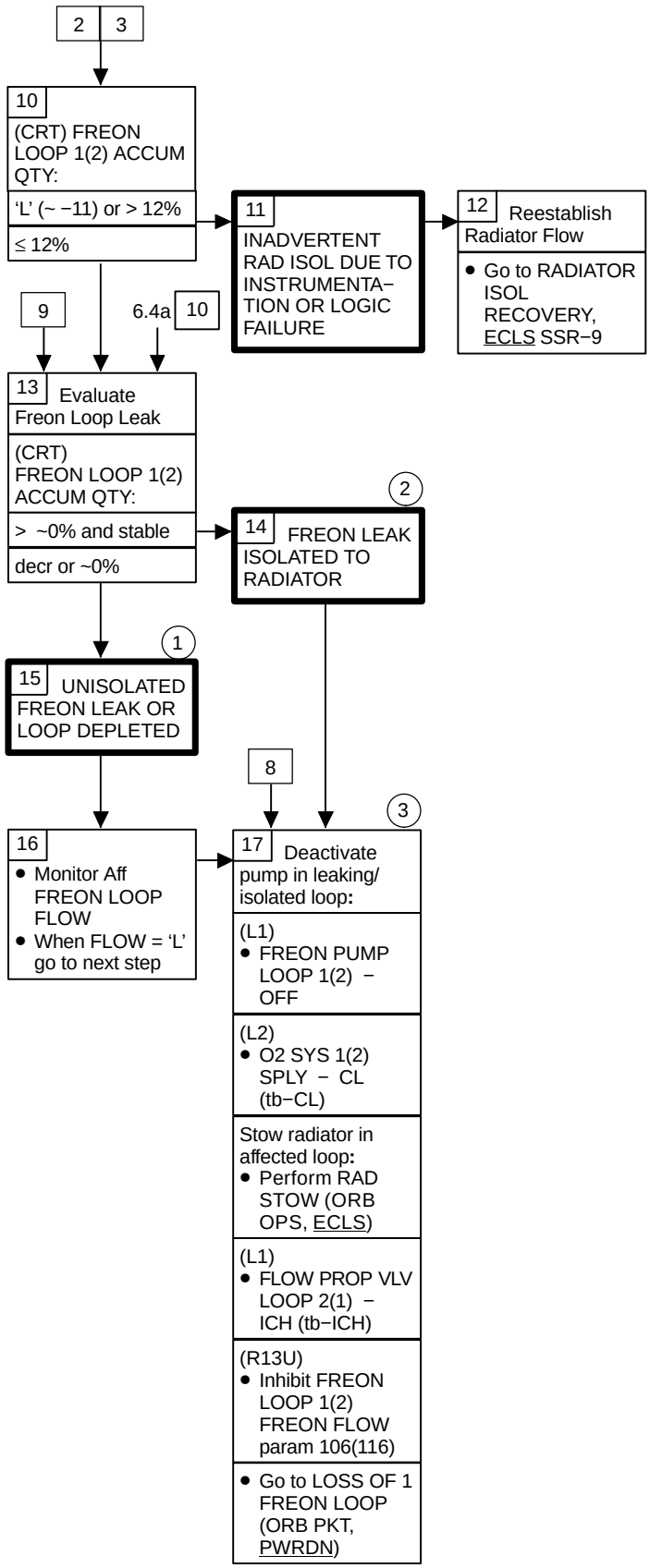
(3) Pwrdn of some equipment may be reqd depending on heat load and amount of blockage

(4) Crew may opt to have MCC manage software limits via TMBU


ECLS
6.4e AFT COLDPLATE FLOW ↓
SM ALERT
S88 FRN AFT CP 1(2)
AFT CP FLOW < 200 lb/hr
1
SM 88 APU/ ENVIRON THERM
• Note AFT CP FLOW _____
FREON LOOP AFT CP FLOW '↓' or 'L' ?
NO
2 Either FREON LOOP ACCUM QTY ≥ 70% ?
NO
3 CLASS 3 ALARM S/W FAULT OR TRANSIENT FAILURE
YES
YES
1
4 N2 LEAK RESULTING IN OCCASIONAL PUMP CAVITATION
5 (CRT) Either FREON FLOW ≤ 1950 lb/hr if (L1) FLOW PROP VLV LOOP 1(2) − ICH or FREON FLOW ≤ 1300 lb/hr if (L1) FLOW PROP VLV LP 1(2) − PL HX ?
YES
6.4b 52
NO
6 Radiators in bypass ?
YES
7 (CRT) Either FREON FLOW ≥ 2600 lb/hr if (L1) FLOW PROP VLV LOOP 1(2) − ICH or FREON FLOW ≥ 1800 lb/hr if (L1) FLOW PROP VLV LP 1(2) − PL HX ?
YES
8 BLOCKAGE IN LOOP (AFT CP LEG)
NO
NO
9 (CRT) Either FREON FLOW ≥ 2300 lb/hr if (L1) FLOW PROP VLV LOOP 1(2) − ICH or FREON FLOW ≥ 1700 lb/hr if (L1) FLOW PROP VLV LP 1(2) − PL HX ?
NO
10 XDCR SHIFT, SMALL BLOCKAGE IN LOOP (AFT CP LEG), OR INSTRUMENTA-TION FAILURE
YES
2
11 BLOCKAGE IN LOOP (AFT CP LEG)
1 N2 leak across FCL ACCUM bellows. Frequent cavitation = loop lost
2 Loss of FCL definition next PLS entry


ECLS
6.4f ACCUM QTY ↓
SM ALERT
S88 FREON QTY 1(2)
1
SM 88 APU/ ENVIRON THERM
FREON ISOL 1 = ISOL
FREON ISOL 2 = ISOL
FREON ISOL 1,2 ≠ ISOL
2
●✓SIG COND B
(CRT) FREON LOOP 1 ACCUM QTY 'L' and FREON FLOW 'L' ?
NO
YES
10
6.4b 8
3
●✓SIG COND A
(CRT) FREON LOOP 2 ACCUM QTL 'L' and FREON FLOW 'L' ?
NO
YES
10
6.4b 13
BFS
SM 0 THRM FRN
ACCUM QTY < 12%
4
(CRT) FREON LOOP 1(2) ACCUM QTY:
'L' (~ −11) or > 12%
≤ 12%
5
CLASS 3 ALARM S/W FAULT, TRANSIENT FAILURE, OR INSTRUMENTA−TION OR LOGIC FAULURE
6
FREON LEAK WITH ISOL S/W FAILURE OR ISOL MODE SWITCH IN MANUAL
7
FREON LOOP 1(2) FLOW = 'L' ?
YES
NO
1
8
FREON LOOP 1(2) DEPLETED
17
9
Manually isolate Aff Radiator
(L2)
• FREON ISOL MODE − MAN
• Aff FREON ISOL LOOP − ISOLATE
13
1 Loss of one FREON LOOP = next PLS Entry

ECLS 6.4f (Cont)



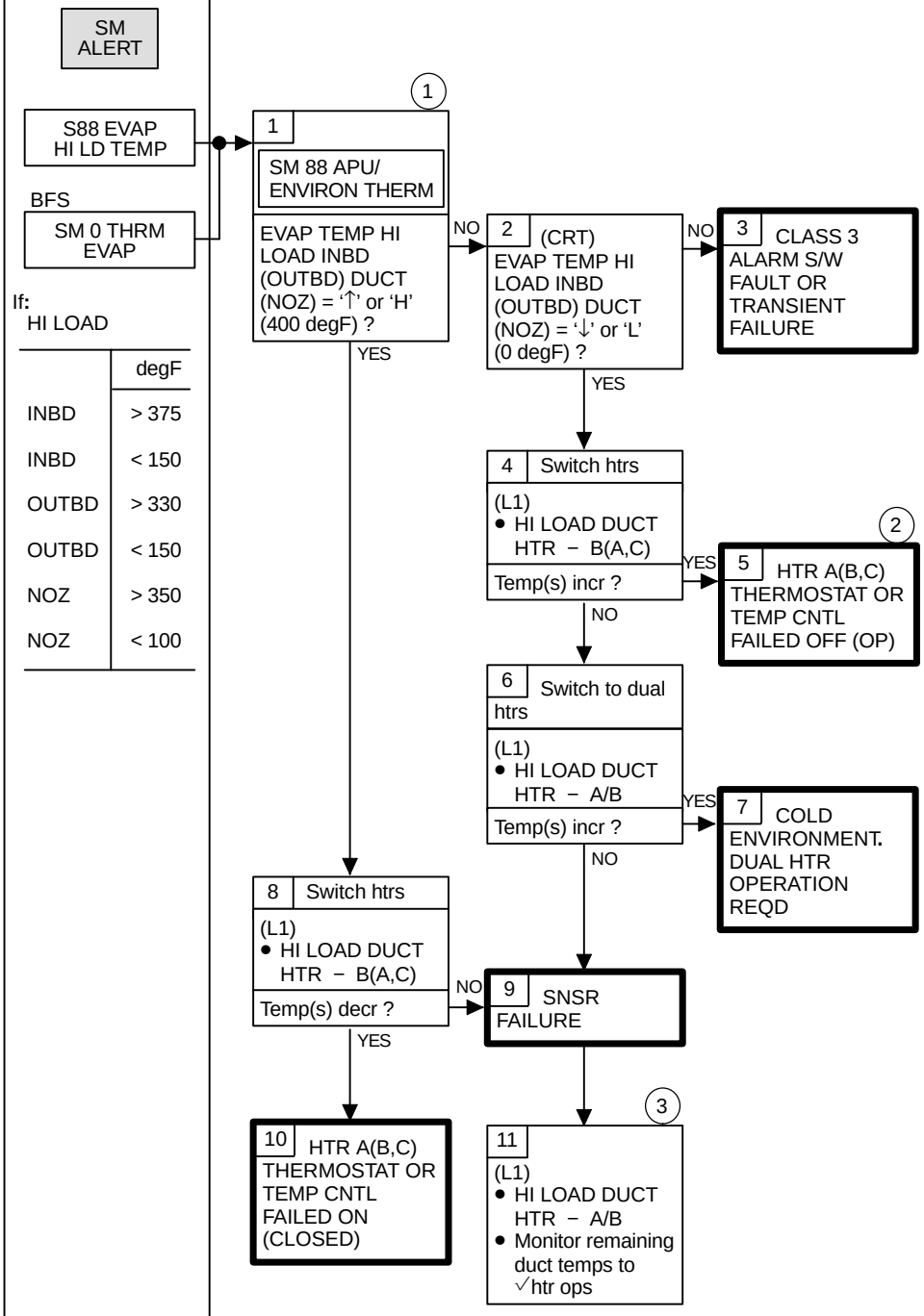
(1) Loss of one FREON LOOP = Next PLS Entry

(2) Leak isolated = Next PLS Entry, depending on Supply H2O quantities and management. Loss of RAD cooling in Aff FREON LOOP

(3) FCL1 = PORT
FCL2 = STBD

ECLS

6.4g EVAP TEMP HI LOAD INBD (OUTBD) DUCT(NOZ) ↑↓



If:
HI LOAD

	degF
INBD	> 375
INBD	< 150
OUTBD	> 330
OUTBD	< 150
NOZ	> 350
NOZ	< 100

(1) Upon initial activation of heaters, FDA limits are not enabled until following time has elapsed:

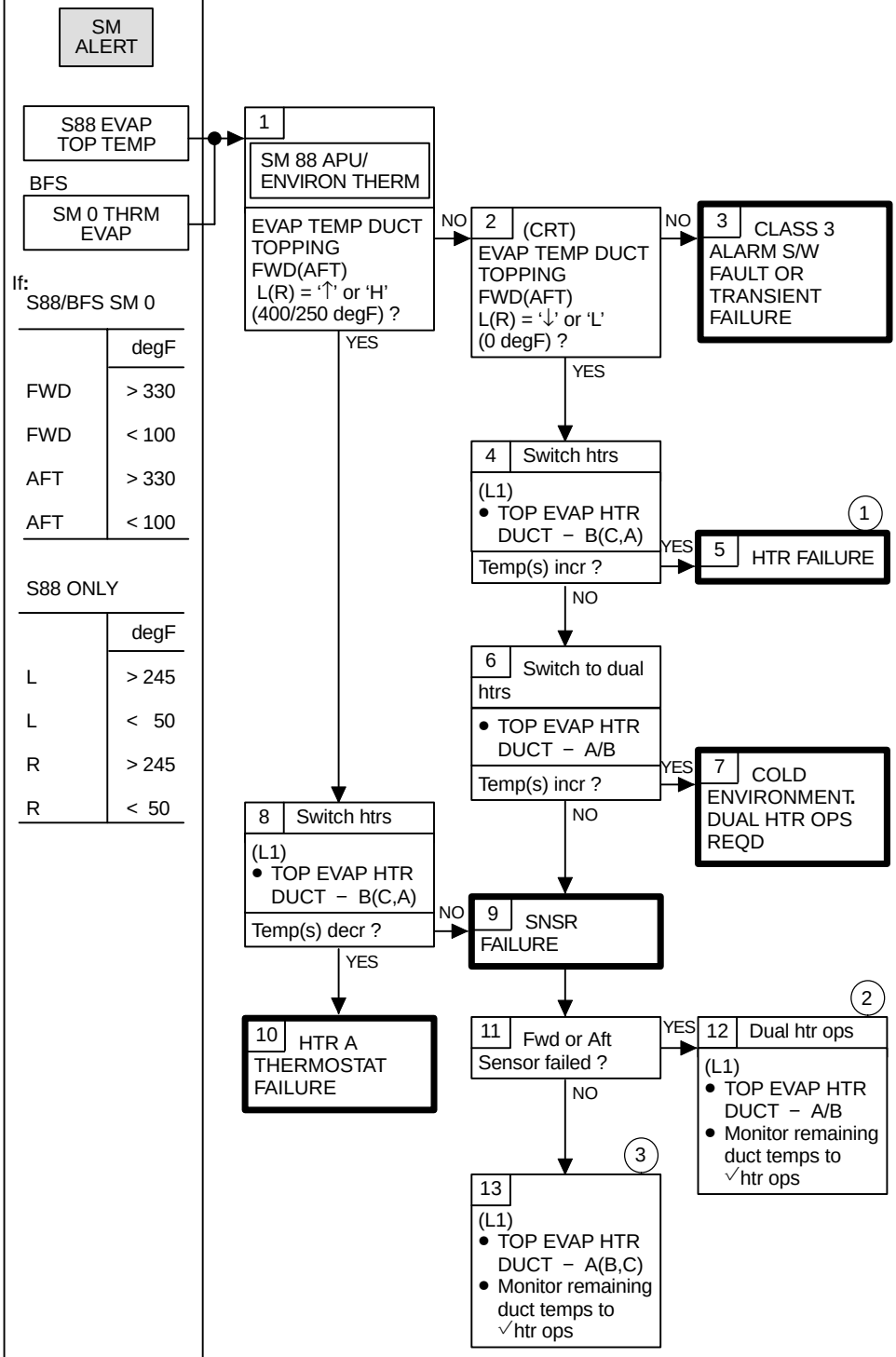
INBD T	25 min
OUTBD T	16 min
NOZ T	40 min

(2) If noz htr failed, HI LOAD EVAP still operational. If inbd/outbd duct htr failed, HI LOAD EVAP lost

(3) Loss of insight requires dual htr ops when htrs are activated

ECLS

6.4h EVAP TOPPING DUCT T FWD(AFT), L(R) ↑↓



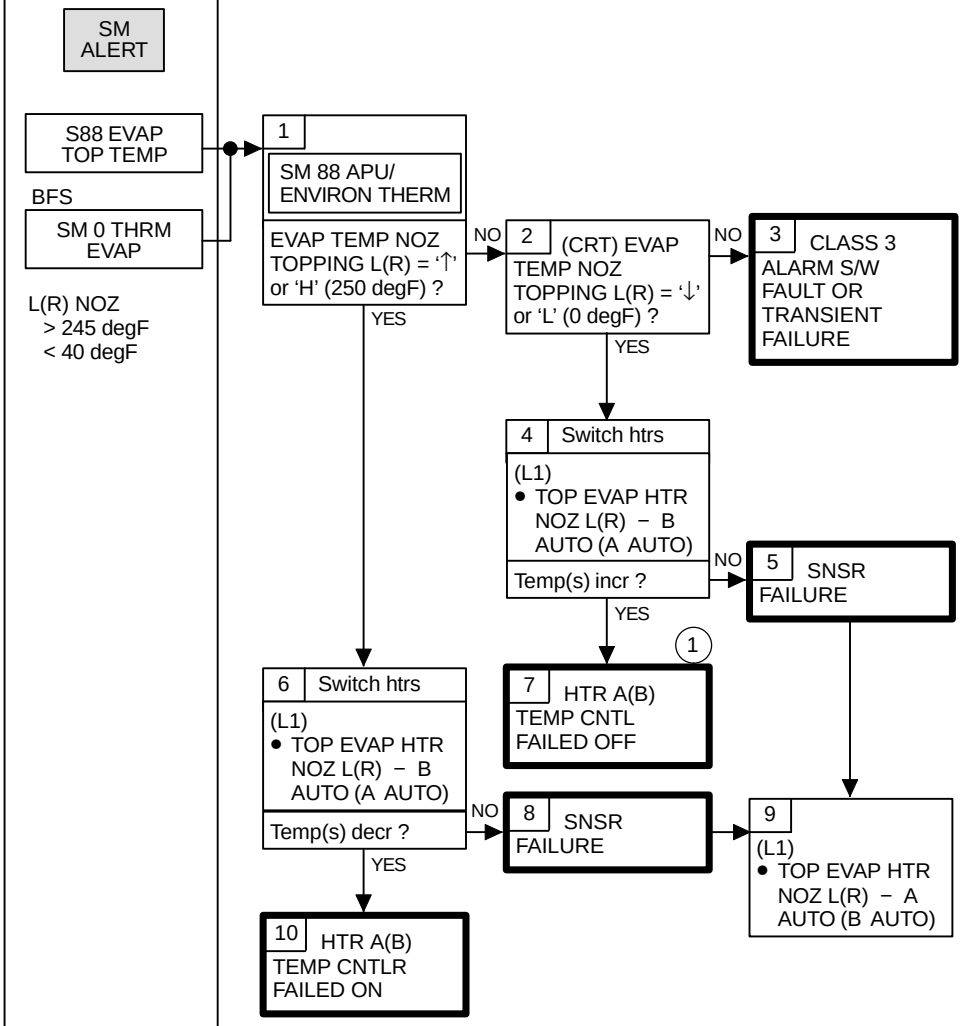
(1) Topping FES still operational if left, right htrs failed. Loss of fwd or aft htr could result in duct freezing and eventual loss of topping FES

(2) If instr loss is on either fwd or aft duct, then dual htr ops is reqd as these htrs are considered mandatory

(3) If instr loss is on either left or right duct, then only single htr ops is reqd

ECLS

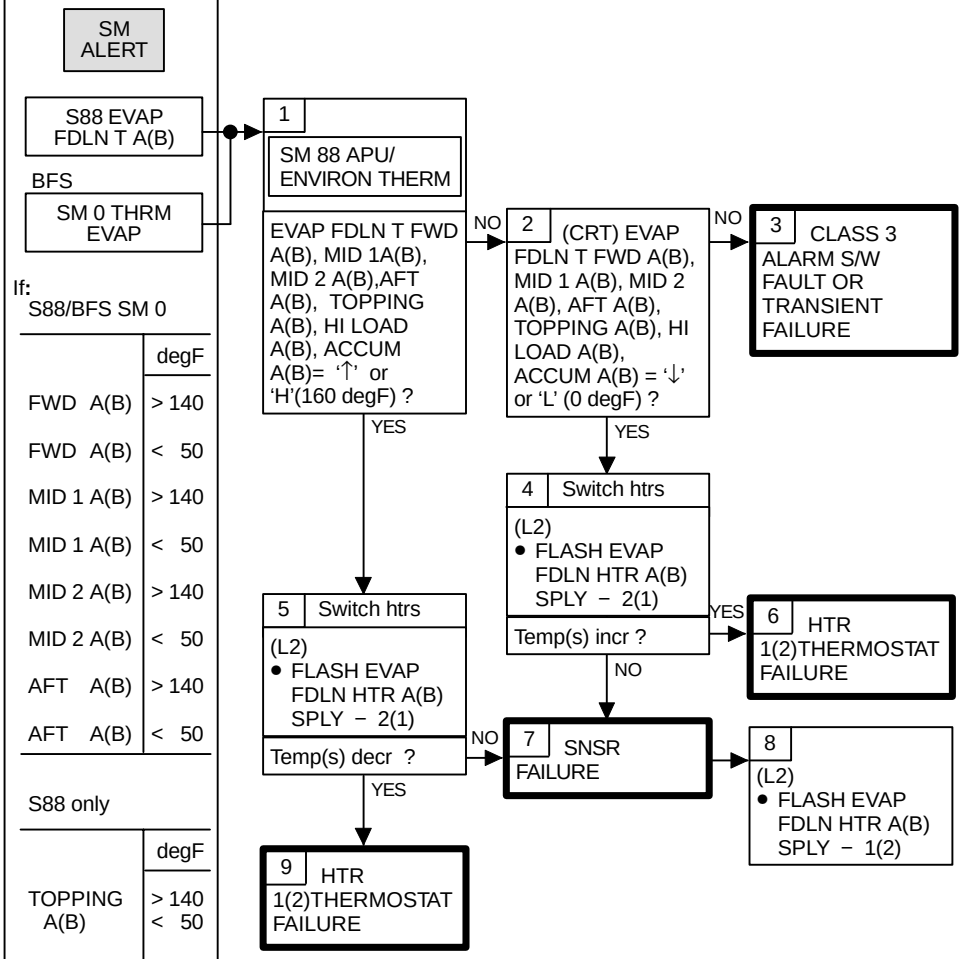
6.4i EVAP TOPPING L(R) NOZ ↑↓



(1) Topping FES still operational with Noz Htr failed off as long as fwd and aft duct htrs are operational

ECLS

6.4j EVAP FDLN TEMP FWD (MID,AFT,TOP,HI LOAD,ACCUM) ↑↓



If:

S88/BFS SM 0

	degF
FWD A(B)	> 140
FWD A(B)	< 50
MID 1 A(B)	> 140
MID 1 A(B)	< 50
MID 2 A(B)	> 140
MID 2 A(B)	< 50
AFT A(B)	> 140
AFT A(B)	< 50

S88 only

	degF
TOPPING A(B)	> 140
	< 50
HI LOAD A(B)	OSH
	< 50
ACCUM A(B)	> 140
	< 50

ECLS

H2O LOOP
(F7)

Light on if:
H2O LOOP 1(2) PUMP OUT P
< 19.5(45) psia
> 79.5(81) psia

BACKUP C/W ALARM
(F7)

S88 H2O PUMP P 1(2)

SM2 H2O PUMP P 1(2)

Light on if:
H2O LOOP 1(2) PUMP OUT P
< 19.5(45) psia
> 79.5(81) psia

SM ALERT

S88 H2O PUMP P 1(2)

Light on if:
H2O LOOP 1(2) PUMP OUT P
< 50 psia (4)
> 75 psia
or
< 20 psia (6)
(inactive loop)
or, light on if:
H2O LOOP 1(2) PUMP ΔP
< 33 psid (4)
> 46 psid
or
> 5 psid (6)
(inactive loop)

Nominal Config:
(L4:F)
H2O LOOP PUMP cb AC1 ΦA,ΦB,ΦC 1A/2 − op
cb AC2 ΦA,ΦB,ΦC 1B − cl
cb AC3 ΦA,ΦB,ΦC 2 − cl
(L4:L)
cb AC3 ΦA H2O CNTLR 1 − cl
(L4:K)
cb AC1 ΦA H2O CNTLR 2 − cl
(O14:B)
cb MNA OI H2O BYP LOOP 1 SNSR − cl
(O15:B)
cb MNB OI H2O BYP LOOP 2 SNSR − cl

(Cont in notes column)

6.4l H2O PUMP P 1(2) ↑↓

(1)

1 SM 88 APU/ ENVIRON THERM

H2O LOOP 1(2) PUMP OUT P:

- Normal → 2 C/W OR SM FAILURE OR TRANSIENT → 3 ●✓MCC
- 'H' → 4 PUMP OUT P XDCR SHIFT → 15
- 'L' → 5 H2O LOOP 1(2) PUMP OUT T 'L' and PUMP ΔP 'L' and ACCUM QTY 'L' ? → YES → 6 H2O LOOP 1(2) BYP CNTLR FAILED OR CNTLR PWR LOST (2) → 50
  - NO → 7 H2O LOOP 1(2) ACCUM QTY '↓' ? → NO → 8 INST FAILURE → 15
  - YES → 32
- '↑' or '↓'

9 H2O LOOP 1(2) ACCUM QTY:

- '↓' or 'L' → 10 ●✓Status of alt loop (3) → H2O LOOP 2(1) ACCUM QTY > 70% ? → YES → 31; NO → 32
- '↑' → 11 FREON/H2O LEAKAGE AT INTERCHANGER (5) → 50
- Normal

12 Aff LOOP PUMP sw positon:

- GPC → 42
- OFF → 40
- ON

44

13 H2O LOOP 1(2) PUMP ΔP:

- Normal → 14 PUMP OUT P XDCR SHIFT OR ACCUM GN2 LEAK. NO ACTION REQD (7)(8)
- '↓' or 'L' → 17
- '↑' → 18

(1) Meter on pnl O1 is alternate readout source

(2) ✓MCC about reset cb

(3) Normal accum quantities are about 45, 55 for H2O LOOP 1, H2O LOOP 2, respectively

(4) Preconditioning will select this limit set if (L1) H2O PUMP LOOP 1(2) − ON, or H2O PUMP LOOP 1(2) − GPC and GPC − ON signal present

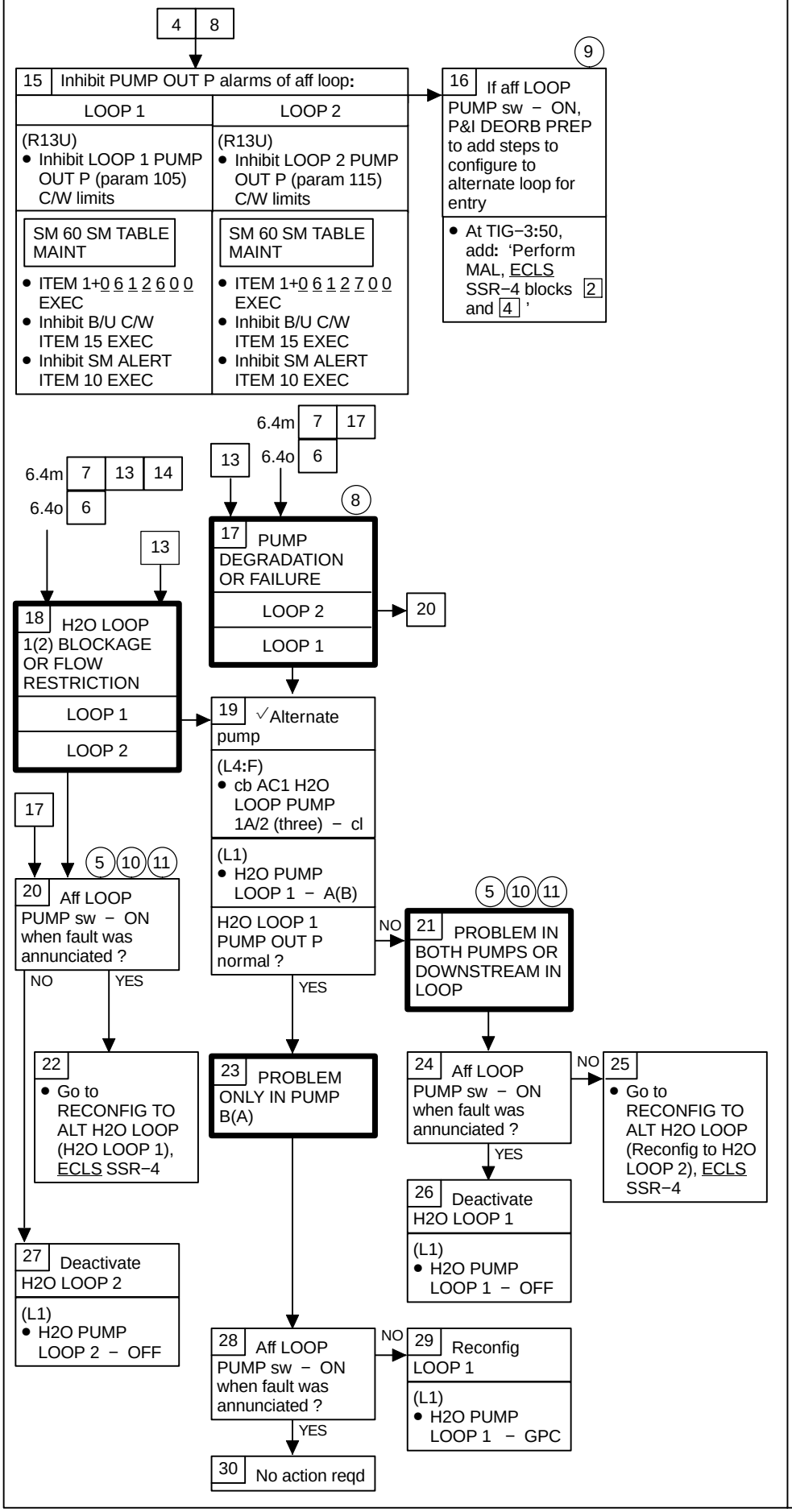
(5) Possible next PLS. ✓MCC

(6) Preconditioning will select this limit set if (L1) H2O PUMP LOOP 1(2) − OFF, or H2O PUMP LOOP 1(2) − GPC without presence of GPC − ON signal

(7) For GN2 leak from accum, PUMP OUT P will reach cabin press in the inactive loop and cabin press plus PUMP ΔP for active loop

(8) If repeated occurrence (same loop), ✓MCC for possibilities of ruptured bellows causing GN2 precharge and H2O to mix, or stuck bellows

Nominal Config:
(Cont)
(L4:L)
cb AC2 ΦA CAB T CNTLR 1 − cl
cb AC1 ΦA CAB T CNTLR 2 − cl
(L1)
H2O PUMP LOOP 2(1) − ON
1(2) − GPC
1 − B(A)
H2O LOOP 1 BYP MODE − MAN
H2O LOOP 2 BYP MODE − AUTO



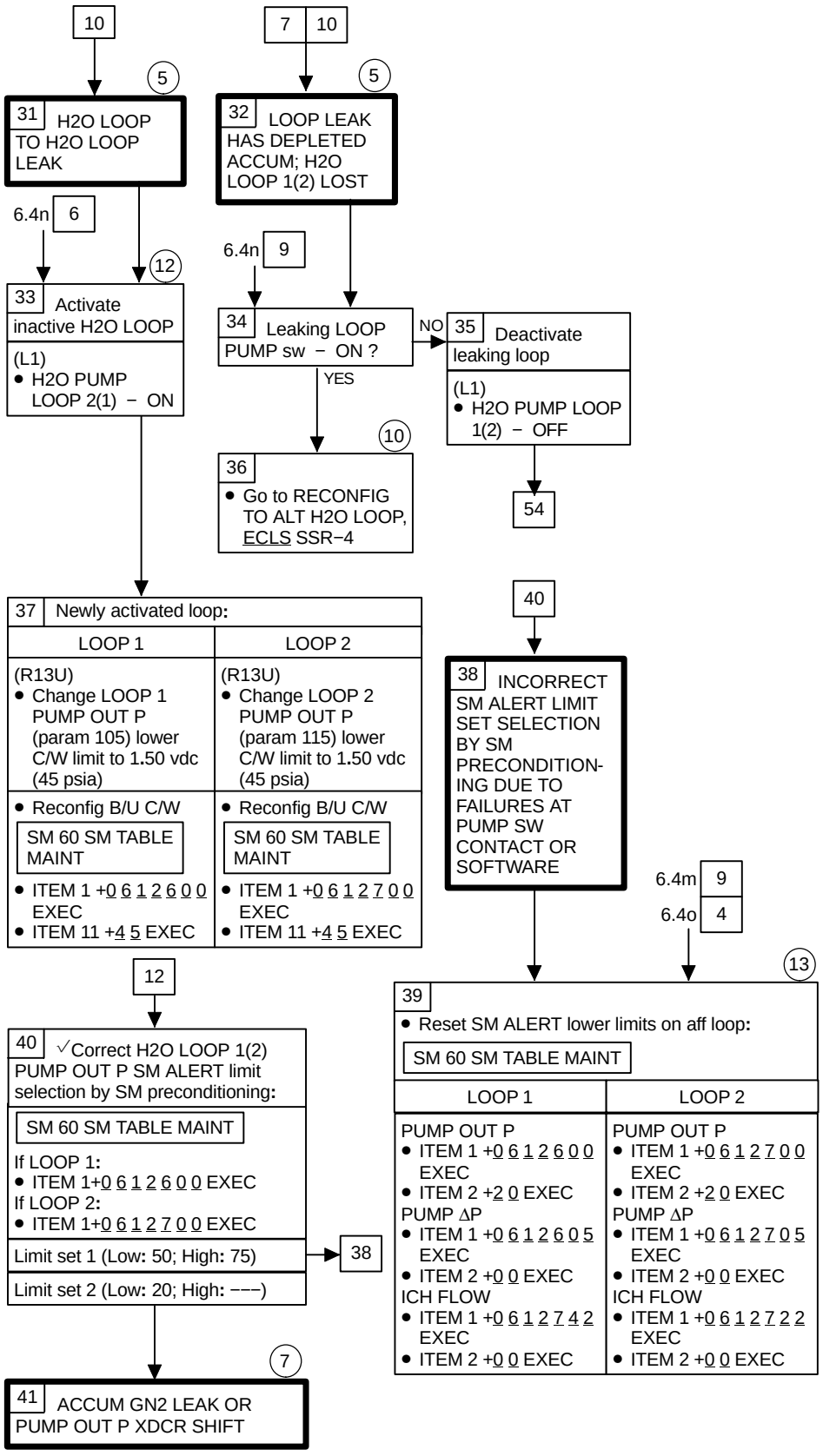
(5) Possible next PLS. ✓MCC

(8) If repeated occurrence (same loop), ✓MCC for possibilities of ruptured bellows causing GN2 precharge and H2O to mix, or stuck bellows

(9) Only PUMP OUT P is available on board while in BFS

(10) If both loops are failed:
(L1)
H2O PUMP LOOP 1,2 − OFF, then go to LOSS OF 2 H2O LOOPS (ORB PKT, PWRDN)

(11) As pumps utilize H2O flow for active cooling, extreme or total blockage will result in overheating and failure of the pump within min



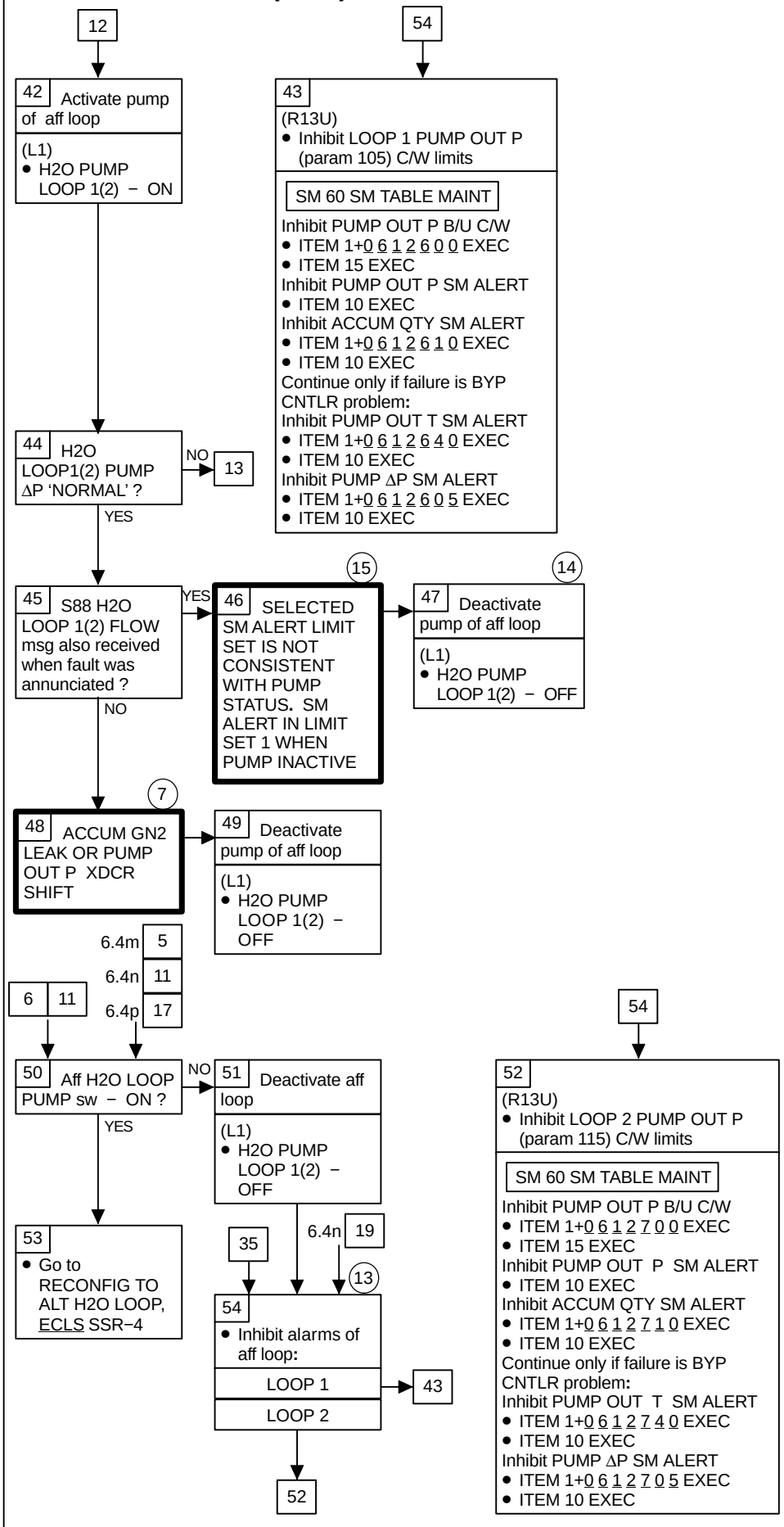
(5) Possible next PLS. ✓MCC

(7) For GN2 leak from accum, PUMP OUT P will reach cabin press in the inactive loop and cabin press plus PUMP ΔP for active loop

(10) If both loops are failed:
(L1)
H2O PUMP LOOP 1,2 − OFF, then go to LOSS OF 2 H2O LOOPS (ORB PKT, PWRDN)

(12) Operation of both H2O loops will prevent loss of H2O to alt loop

(13) Crew may opt to have MCC manage software limits via TMBU



(7) For GN2 leak from accum, PUMP OUT P will reach cabin press in the inactive loop and cabin press plus PUMP ΔP for active loop

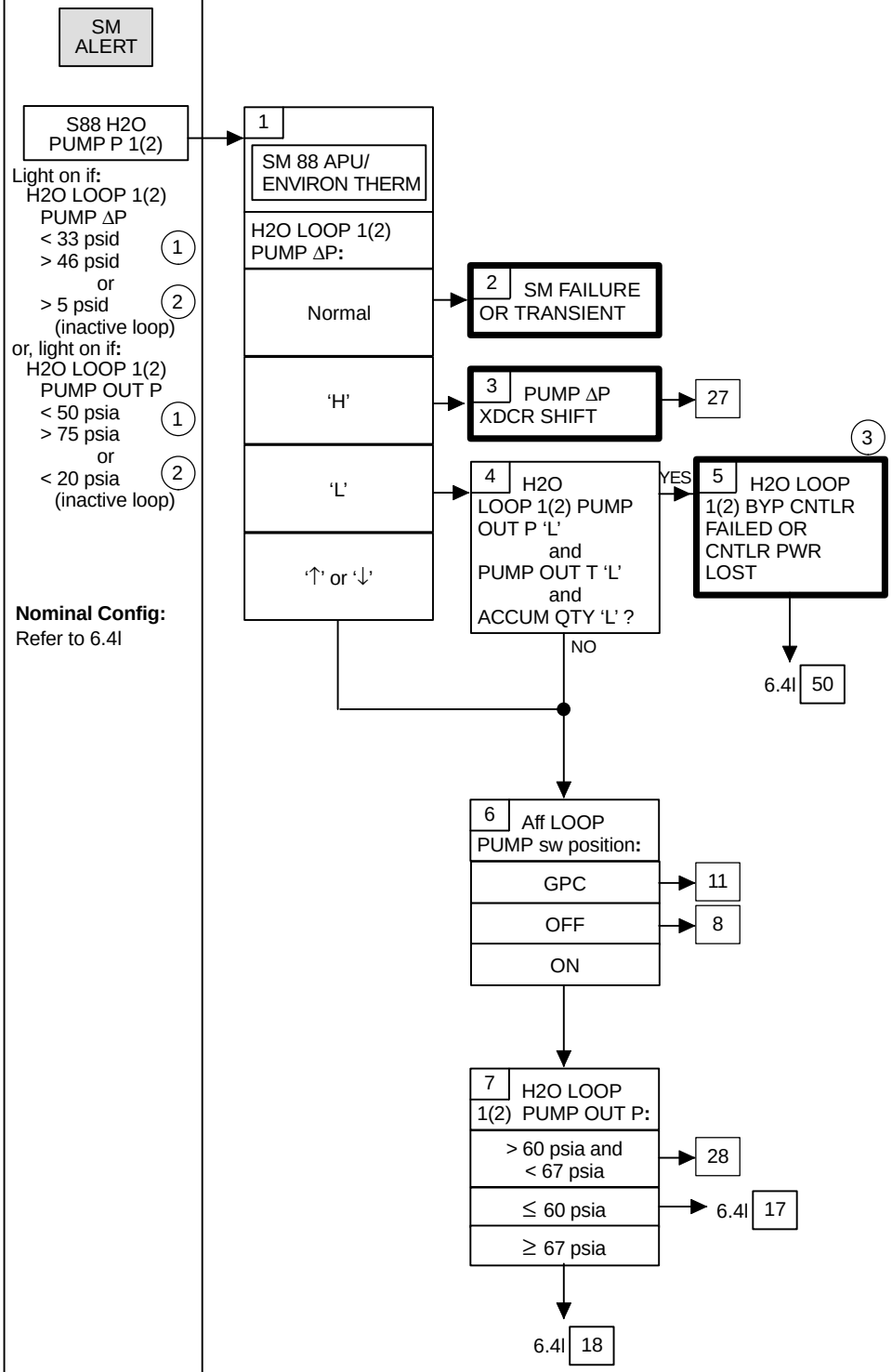
(13) Crew may opt to have MCC manage software limits via TMBU

(14) Possible causes:
PL−MDM failure or pump switch GPC position failure resulting in pump not receiving GPC PUMP − ON cmd; or SM preconditioning failure (pump switch contact or software) causing selection of incorrect SM ALERT limits

(15) Pump function sw ON position still available with full cooling capability

ECLS

6.4m H2O PUMP ΔP 1(2) ↑↓

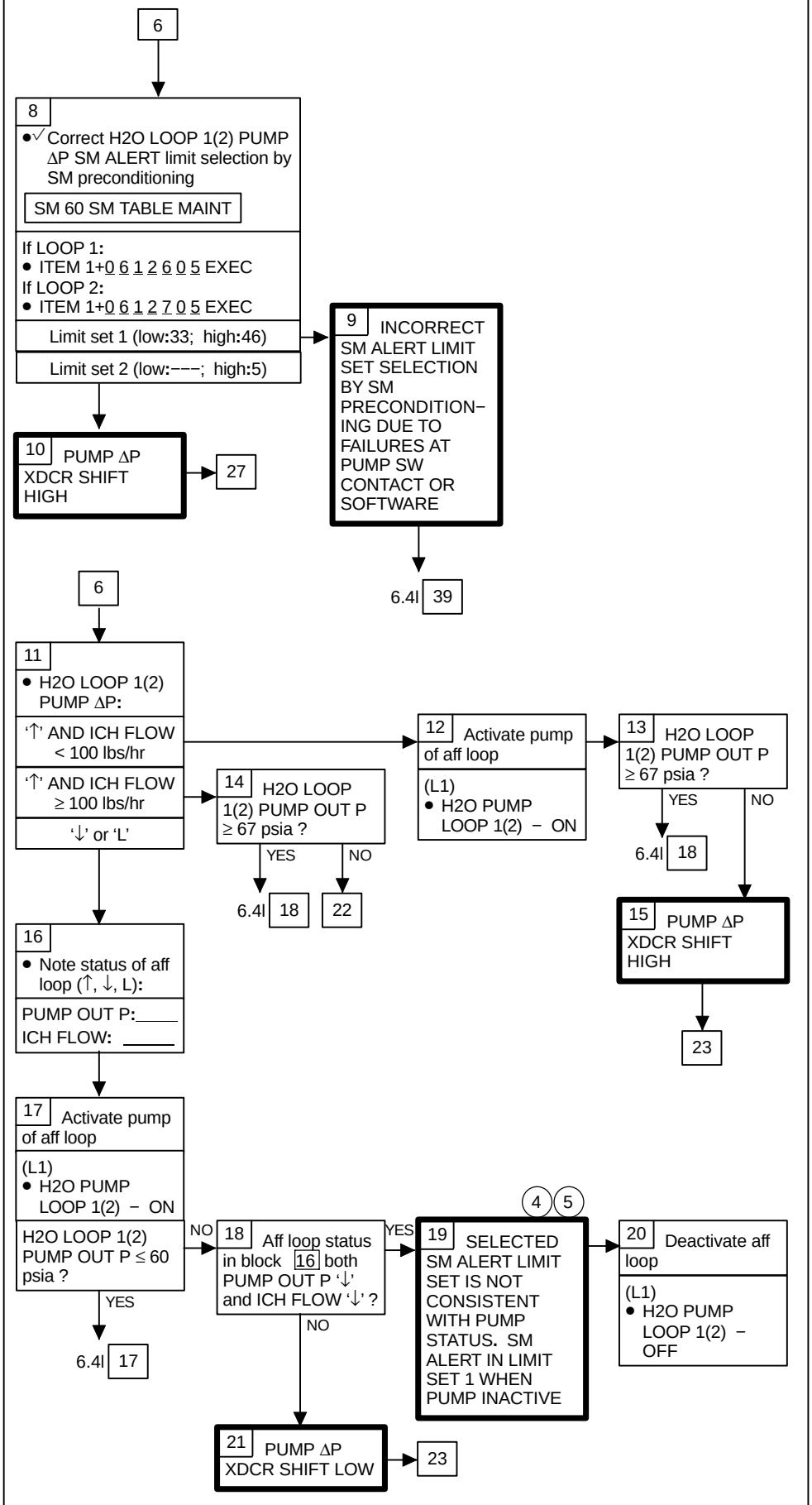


(1) Preconditioning will select this limit set if (L1) H2O PUMP LOOP 1(2) − ON, or H2O PUMP LOOP 1(2) − GPC and GPC − ON signal present

(2) Preconditioning will select this limit set if (L1) H2O PUMP LOOP 1(2) − OFF, or H2O PUMP LOOP 1(2) − GPC without presence of GPC − ON signal

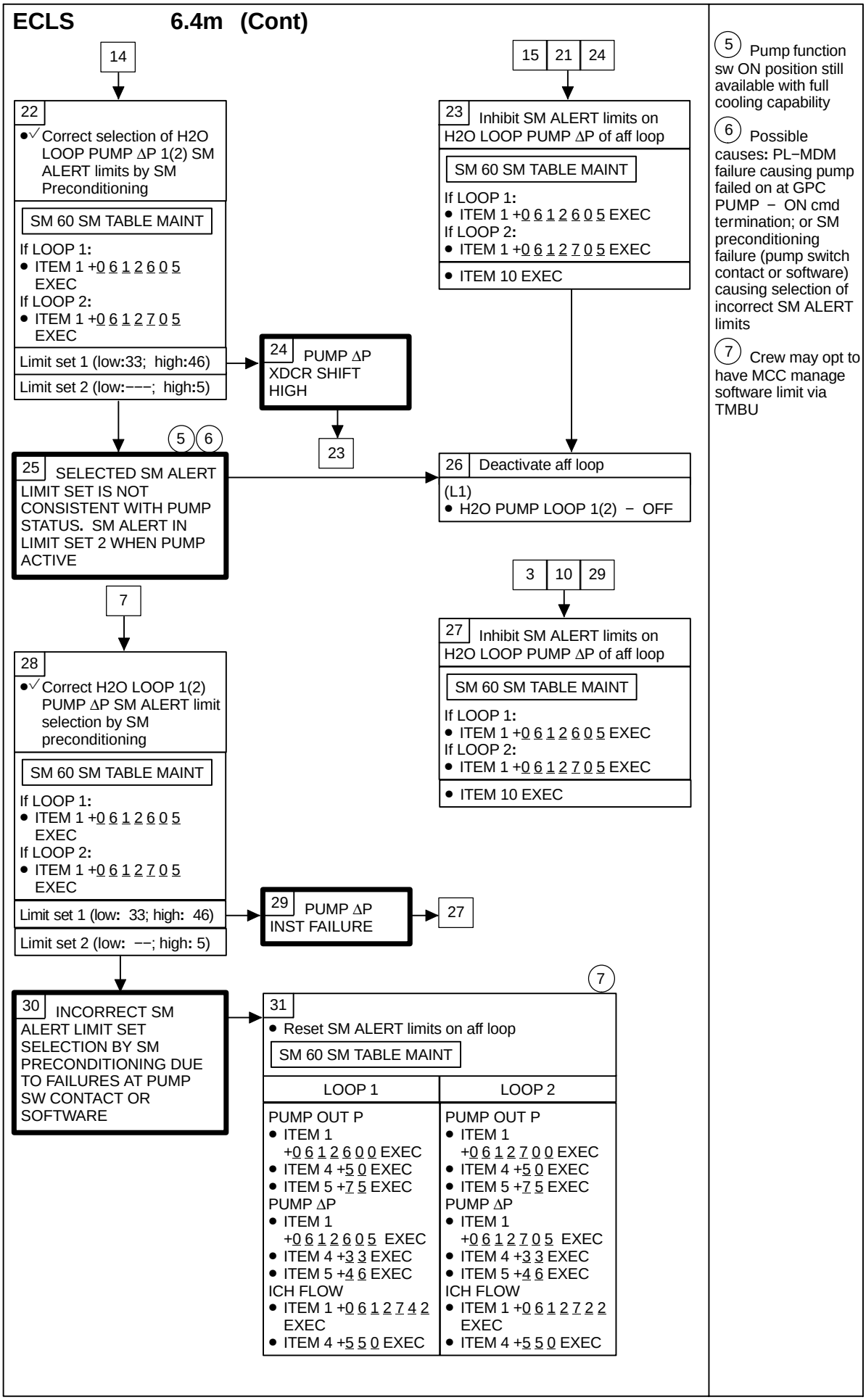
(3) ✓MCC about reset cb

ECLS 6.4m (Cont)



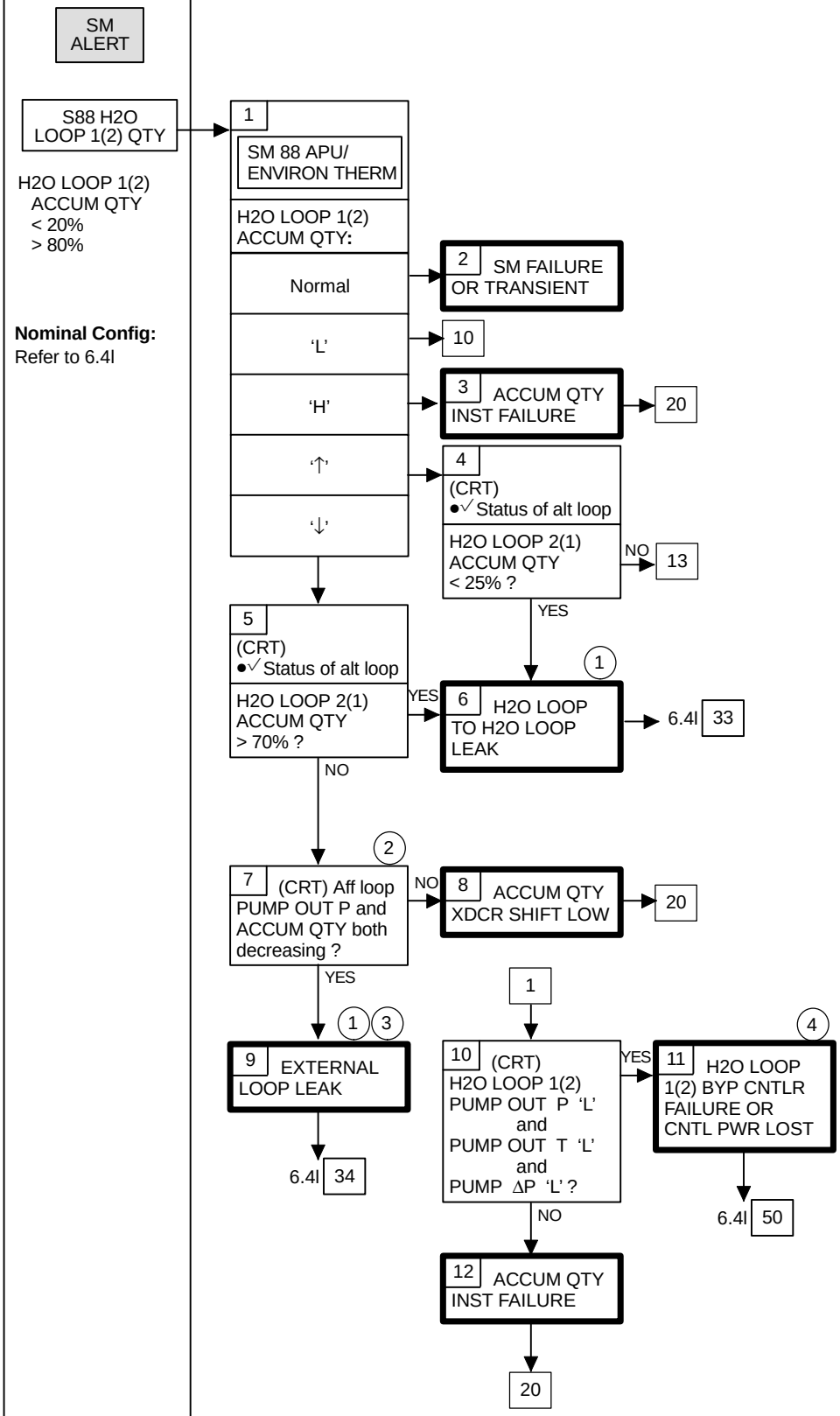
(4) Possible causes: PL−MDM failure or pump switch GPC position failure resulting in pump not receiving GPC PUMP − ON CMD; or SM preconditioning failure (pump switch contact or software) causing selection of incorrect SM ALERT limits

(5) Pump function sw ON position still available with full cooling capability


ECLS 6.4m (Cont)
14
22
•✓Correct selection of H2O LOOP PUMP ΔP 1(2) SM ALERT limits by SM Preconditioning
SM 60 SM TABLE MAINT
If LOOP 1:
• ITEM 1 +0 6 1 2 6 0 5 EXEC
If LOOP 2:
• ITEM 1 +0 6 1 2 7 0 5 EXEC
Limit set 1 (low:33; high:46)
Limit set 2 (low:−−−; high:5)
24 PUMP ΔP XDCR SHIFT HIGH
23
5 6
25 SELECTED SM ALERT LIMIT SET IS NOT CONSISTENT WITH PUMP STATUS. SM ALERT IN LIMIT SET 2 WHEN PUMP ACTIVE
7
28
•✓Correct H2O LOOP 1(2) PUMP ΔP SM ALERT limit selection by SM preconditioning
SM 60 SM TABLE MAINT
If LOOP 1:
• ITEM 1 +0 6 1 2 6 0 5 EXEC
If LOOP 2:
• ITEM 1 +0 6 1 2 7 0 5 EXEC
Limit set 1 (low: 33; high: 46)
Limit set 2 (low: −−; high: 5)
29 PUMP ΔP INST FAILURE
27
30 INCORRECT SM ALERT LIMIT SET SELECTION BY SM PRECONDITIONING DUE TO FAILURES AT PUMP SW CONTACT OR SOFTWARE
7
31
• Reset SM ALERT limits on aff loop
SM 60 SM TABLE MAINT
LOOP 1
PUMP OUT P
• ITEM 1 +0 6 1 2 6 0 0 EXEC
• ITEM 4 +5 0 EXEC
• ITEM 5 +7 5 EXEC
PUMP ΔP
• ITEM 1 +0 6 1 2 6 0 5 EXEC
• ITEM 4 +3 3 EXEC
• ITEM 5 +4 6 EXEC
ICH FLOW
• ITEM 1 +0 6 1 2 7 4 2 EXEC
• ITEM 4 +5 5 0 EXEC
LOOP 2
PUMP OUT P
• ITEM 1 +0 6 1 2 7 0 0 EXEC
• ITEM 4 +5 0 EXEC
• ITEM 5 +7 5 EXEC
PUMP ΔP
• ITEM 1 +0 6 1 2 7 0 5 EXEC
• ITEM 4 +3 3 EXEC
• ITEM 5 +4 6 EXEC
ICH FLOW
• ITEM 1 +0 6 1 2 7 2 2 EXEC
• ITEM 4 +5 5 0 EXEC
15 21 24
23 Inhibit SM ALERT limits on H2O LOOP PUMP ΔP of aff loop
SM 60 SM TABLE MAINT
If LOOP 1:
• ITEM 1 +0 6 1 2 6 0 5 EXEC
If LOOP 2:
• ITEM 1 +0 6 1 2 7 0 5 EXEC
• ITEM 10 EXEC
26 Deactivate aff loop
(L1)
• H2O PUMP LOOP 1(2) − OFF
3 10 29
27 Inhibit SM ALERT limits on H2O LOOP PUMP ΔP of aff loop
SM 60 SM TABLE MAINT
If LOOP 1:
• ITEM 1 +0 6 1 2 6 0 5 EXEC
If LOOP 2:
• ITEM 1 +0 6 1 2 7 0 5 EXEC
• ITEM 10 EXEC
5 Pump function sw ON position still available with full cooling capability
6 Possible causes: PL−MDM failure causing pump failed on at GPC PUMP − ON cmd termination; or SM preconditioning failure (pump switch contact or software) causing selection of incorrect SM ALERT limits
7 Crew may opt to have MCC manage software limit via TMBU

ECLS

6.4n H2O ACCUM QTY 1(2) ↑↓

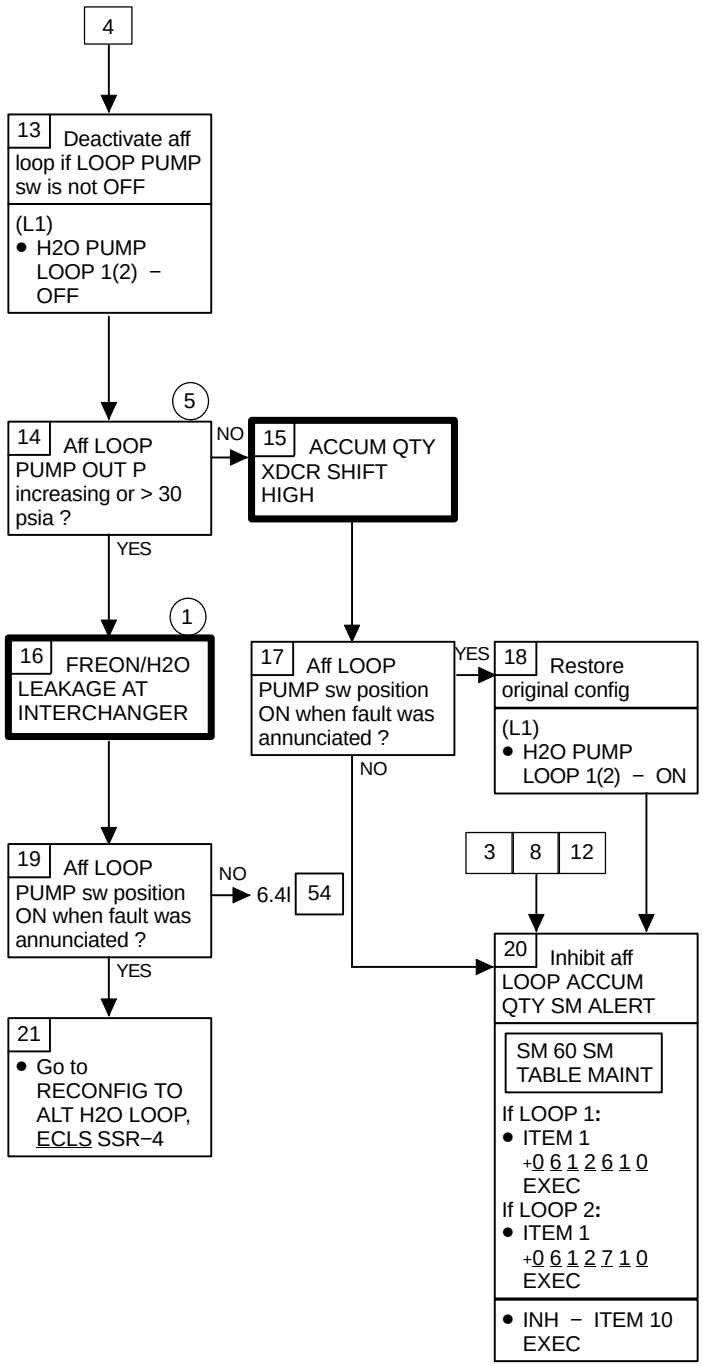


(1) Possible next PLS. ✓MCC

(2) For normal water loop charge, ~ one psia change in PUMP OUT P is observed for every 10 % change in ACCUM QTY

(3) If both loops failed:
(L1)
H2O PUMP LOOP1,2 − OFF, then go to LOSS OF 2 H2O LOOPS (ORB PKT, PWRDN)

(4) ✓MCC about reset cb
LOOP 1:
(L4) cb AC3 ΦA H2O CNTLR 1
LOOP 2:
(L4) cb AC1 ΦA H2O CNTLR 2



(1) Possible next PLS. ✓MCC

(5) For normal water loop charge, PUMP OUT P if inactive loop approaches 30 psia as ACCUM QTY approaches 100 pct in FCL/H2O interloop leakage failure. This PUMP OUT P will eventually reach equilibrium with FCL pressure at interchanger, which is greater than 60 psia normally

ECLS

6.4o H2O ICH FLOW 1(2) ↓

SM ALERT

S88 H2O LOOP 1(2) FLOW

H2O LOOP 1(2) ICH FLOW < 550 lb/hr (1)

Nominal Config:
Refer to 6.4l

1
SM 88 APU/ ENVIRON THERM
H2O LOOP 1(2) ICH FLOW:
Normal → 2 SM FAILURE OR TRANSIENT
'↓' or 'L'

3 Aff LOOP PUMP sw position:
OFF → 4 INCORRECT SM ALERT LIMIT SELECTION BY SM PRECONDITION−ING DUE TO FAILURE AT PUMP SW CONTACT OR SOFTWARE (2)
ON
GPC

4 → 6.4l 39

5 Activate pump of aff loop
(L1)
- H2O PUMP LOOP 1(2) − ON

(CRT) H2O LOOP 1(2) ICH FLOW 'NORMAL' ?
NO → 6 (CRT) H2O LOOP 1(2) PUMP OUT P:
YES (3)

6
≤ 60 psia → 6.4l 17
≥ 67 psia → 6.4l 18
> 60 psia and < 67 psia

7 SELECTED SM ALERT IS NOT CONSISTENT WITH PUMP STATUS. SM ALERT IN LIMIT SET 1 (LOW:550) WHEN PUMP INACTIVE

8
- Record temp of aff H2O LOOP

H2O LOOP 1(2) PUMP OUT T:
_____ degF

9 Adjust to max H2O LOOP ICH FLOW in aff loop
(L1)
- H2O LOOP 1(2) BYP MODE − MAN
- H2O LOOP 1(2) BYP MAN − DECR (hold 1 min)

H2O LOOP ICH FLOW incr ?
NO → 11
YES → 12

(4)

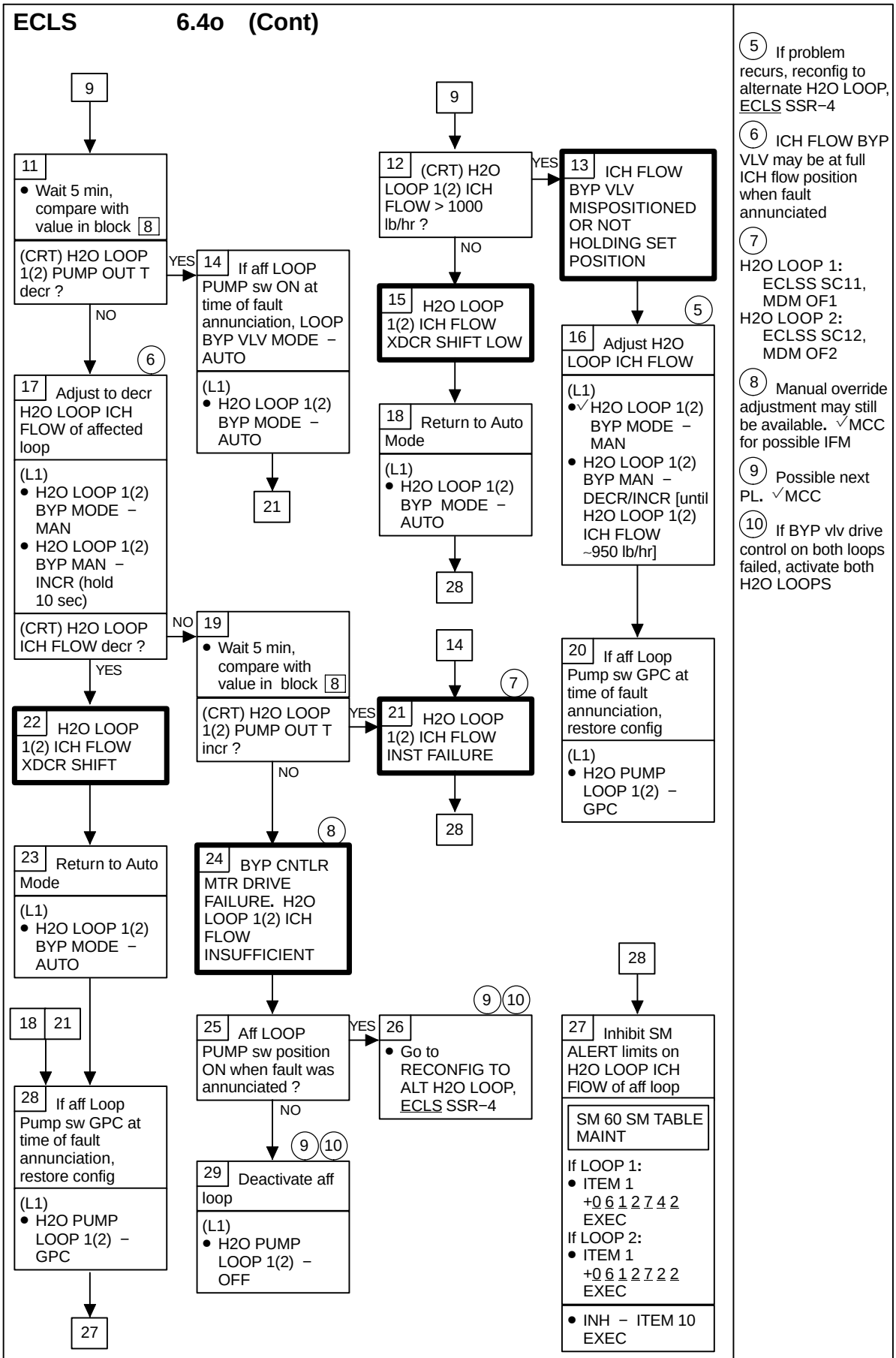
10 Deactivate pump of aff loop
(L1)
- H2O PUMP LOOP 1(2) − OFF

(1) Preconditioning will select this limit set if H2O PUMP LOOP 1(2) − ON; or H2O PUMP LOOP 1(2) − GPC and GPC − ON signal present

(2) Off−scale values are selected for FDA limits by SM preconditioning if H2O PUMP LOOP 1(2) − OFF; or H2O PUMP LOOP 1(2) − GPC without presence of GPC − ON signal

(3) Possible causes: PL−MDM failure or pump switch GPC failure resulting in pump not receiving GPC PUMP − ON cmd; or SM precondition ing failure (pump switch contact or software) causing selection of incorrect SM ALERT limits

(4) Pump function sw ON position still available



(5) If problem recurs, reconfig to alternate H2O LOOP, ECLS SSR−4

(6) ICH FLOW BYP VLV may be at full ICH flow position when fault annunciated

(7) H2O LOOP 1: ECLSS SC11, MDM OF1
H2O LOOP 2: ECLSS SC12, MDM OF2

(8) Manual override adjustment may still be available. ✓MCC for possible IFM

(9) Possible next PL. ✓MCC

(10) If BYP vlv drive control on both loops failed, activate both H2O LOOPS

ECLS

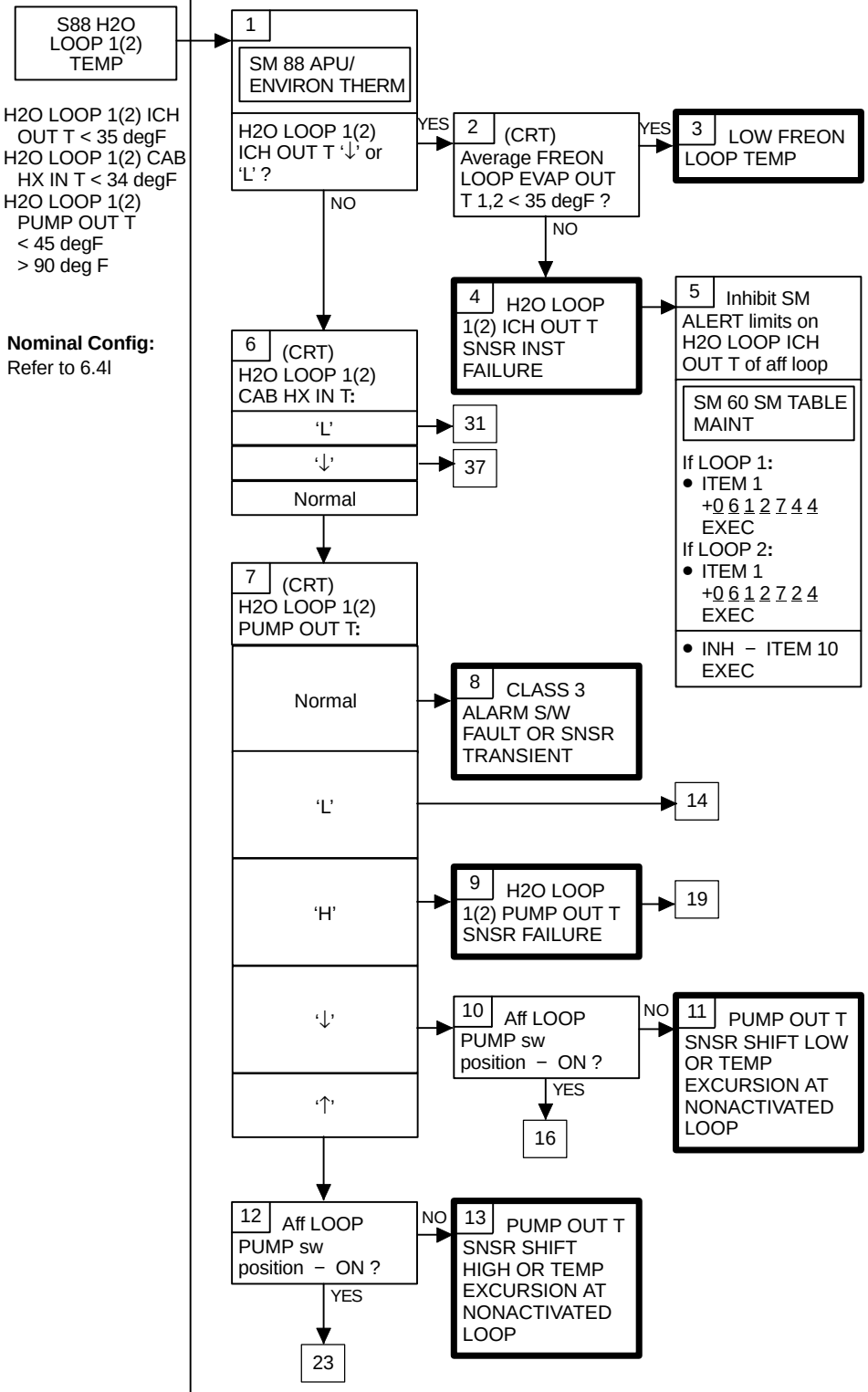
SM ALERT

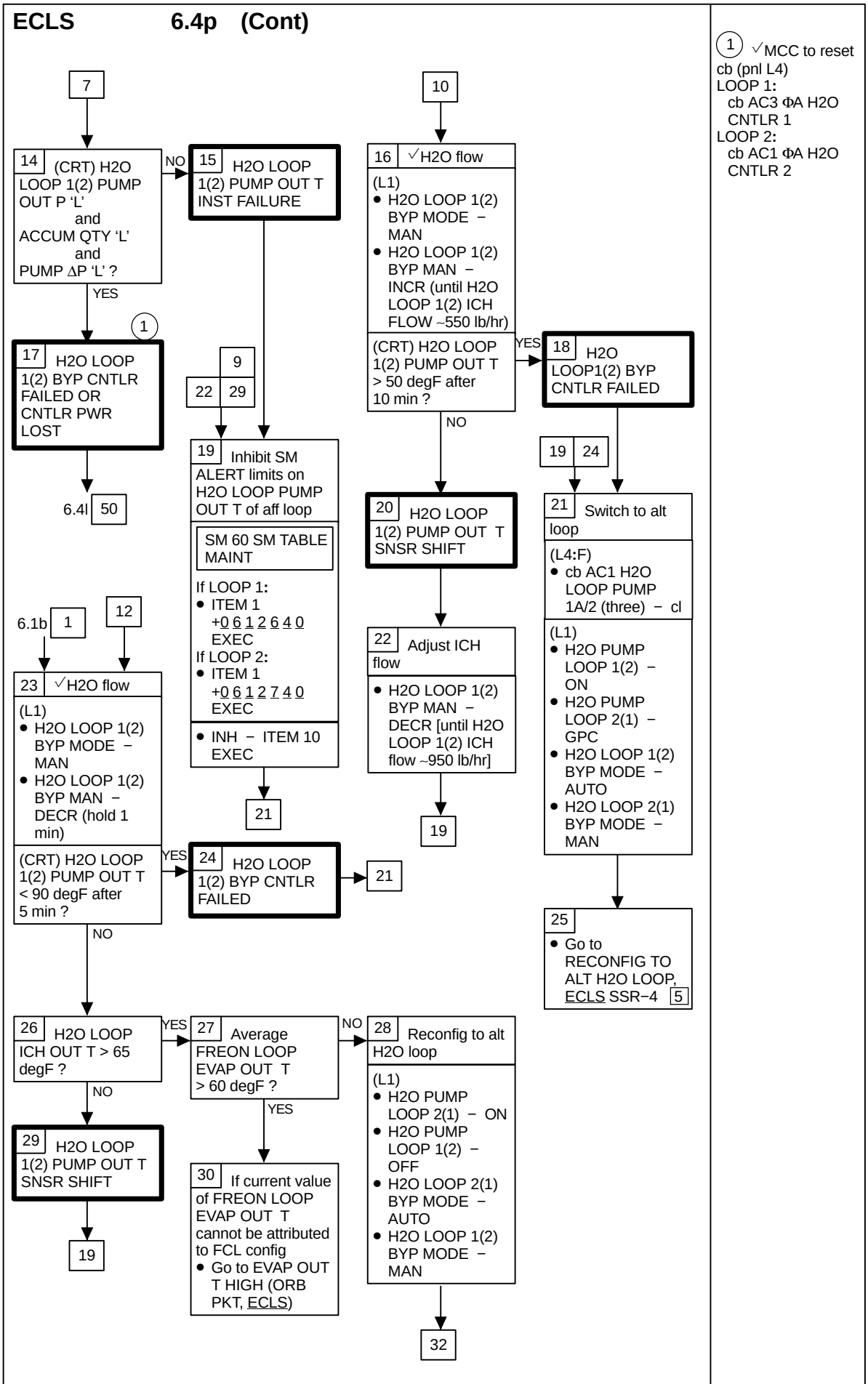
S88 H2O LOOP 1(2) TEMP

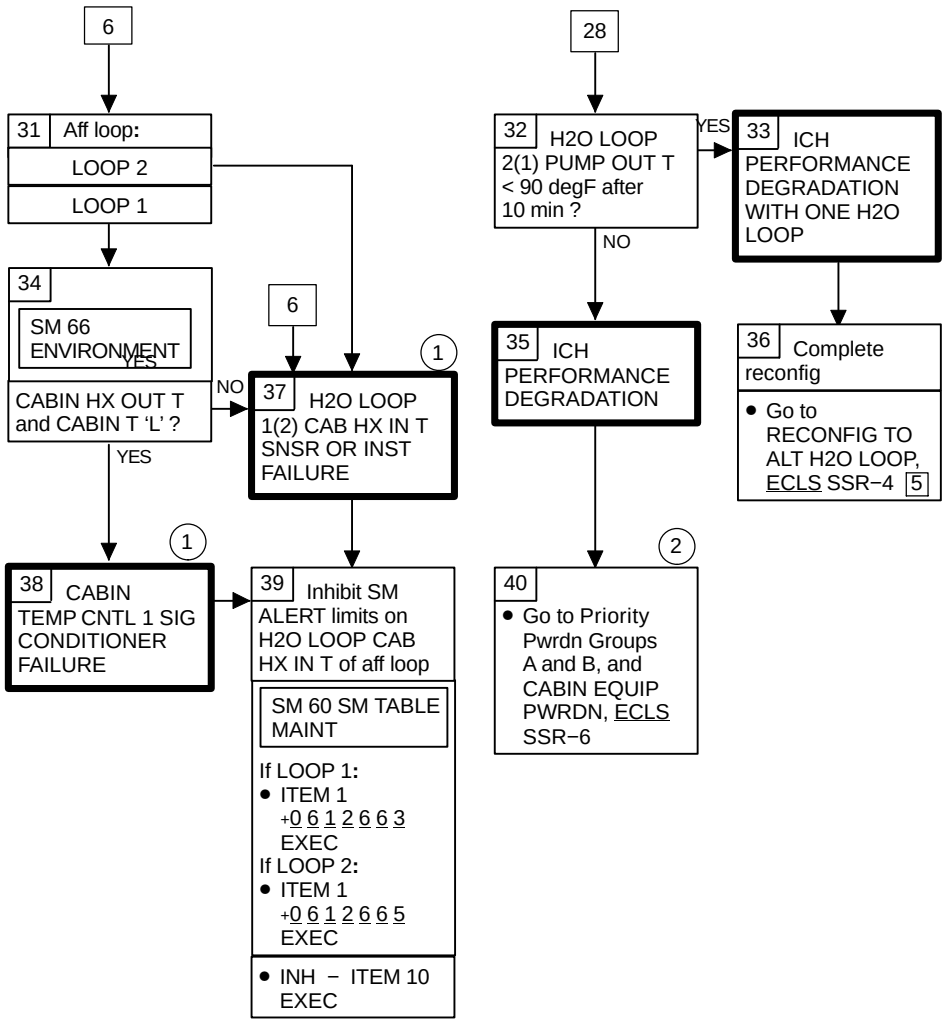
H2O LOOP 1(2) ICH OUT T < 35 degF
H2O LOOP 1(2) CAB HX IN T < 34 degF
H2O LOOP 1(2) PUMP OUT T
< 45 degF
> 90 deg F

Nominal Config:
Refer to 6.4l

6.4p H2O ICH OUT T 1(2) ↓ CAB HX IN T 1(2) ↓ PUMP OUT T 1(2) ↑↓




7
14 (CRT) H2O LOOP 1(2) PUMP OUT P 'L' and ACCUM QTY 'L' and PUMP ΔP 'L' ?
NO
15 H2O LOOP 1(2) PUMP OUT T INST FAILURE
YES
1
17 H2O LOOP 1(2) BYP CNTLR FAILED OR CNTLR PWR LOST
6.4l 50
9
22 29
19 Inhibit SM ALERT limits on H2O LOOP PUMP OUT T of aff loop
SM 60 SM TABLE MAINT
If LOOP 1:
• ITEM 1 +0 6 1 2 6 4 0 EXEC
If LOOP 2:
• ITEM 1 +0 6 1 2 7 4 0 EXEC
• INH − ITEM 10 EXEC
21
6.1b 1
12
23 ✓H2O flow
(L1)
• H2O LOOP 1(2) BYP MODE − MAN
• H2O LOOP 1(2) BYP MAN − DECR (hold 1 min)
(CRT) H2O LOOP 1(2) PUMP OUT T < 90 degF after 5 min ?
YES
24 H2O LOOP 1(2) BYP CNTLR FAILED
21
NO
26 H2O LOOP ICH OUT T > 65 degF ?
YES
27 Average FREON LOOP EVAP OUT T > 60 degF ?
NO
28 Reconfig to alt H2O loop
(L1)
• H2O PUMP LOOP 2(1) − ON
• H2O PUMP LOOP 1(2) − OFF
• H2O LOOP 2(1) BYP MODE − AUTO
• H2O LOOP 1(2) BYP MODE − MAN
NO
29 H2O LOOP 1(2) PUMP OUT T SNSR SHIFT
19
YES
30 If current value of FREON LOOP EVAP OUT T cannot be attributed to FCL config
• Go to EVAP OUT T HIGH (ORB PKT, ECLS)
32
10
16 ✓H2O flow
(L1)
• H2O LOOP 1(2) BYP MODE − MAN
• H2O LOOP 1(2) BYP MAN − INCR (until H2O LOOP 1(2) ICH FLOW ~550 lb/hr)
(CRT) H2O LOOP 1(2) PUMP OUT T > 50 degF after 10 min ?
YES
18 H2O LOOP1(2) BYP CNTLR FAILED
NO
20 H2O LOOP 1(2) PUMP OUT T SNSR SHIFT
22 Adjust ICH flow
• H2O LOOP 1(2) BYP MAN − DECR [until H2O LOOP 1(2) ICH flow ~950 lb/hr]
19
19 24
21 Switch to alt loop
(L4:F)
• cb AC1 H2O LOOP PUMP 1A/2 (three) − cl
(L1)
• H2O PUMP LOOP 1(2) − ON
• H2O PUMP LOOP 2(1) − GPC
• H2O LOOP 1(2) BYP MODE − AUTO
• H2O LOOP 2(1) BYP MODE − MAN
25
• Go to RECONFIG TO ALT H2O LOOP, ECLS SSR−4 5
1 ✓MCC to reset cb (pnl L4)
LOOP 1:
cb AC3 ΦA H2O CNTLR 1
LOOP 2:
cb AC1 ΦA H2O CNTLR 2



(1) ✓MCC to reset
LOOP 1:
(L4:L) cb AC2 ΦA
CAB T CNTLR 1
LOOP 2:
(L4:L) cb AC1 ΦA
CAB T CNTLR 2

(2) ✓MCC for further pwrdn reqd and H2O loop flowrate management

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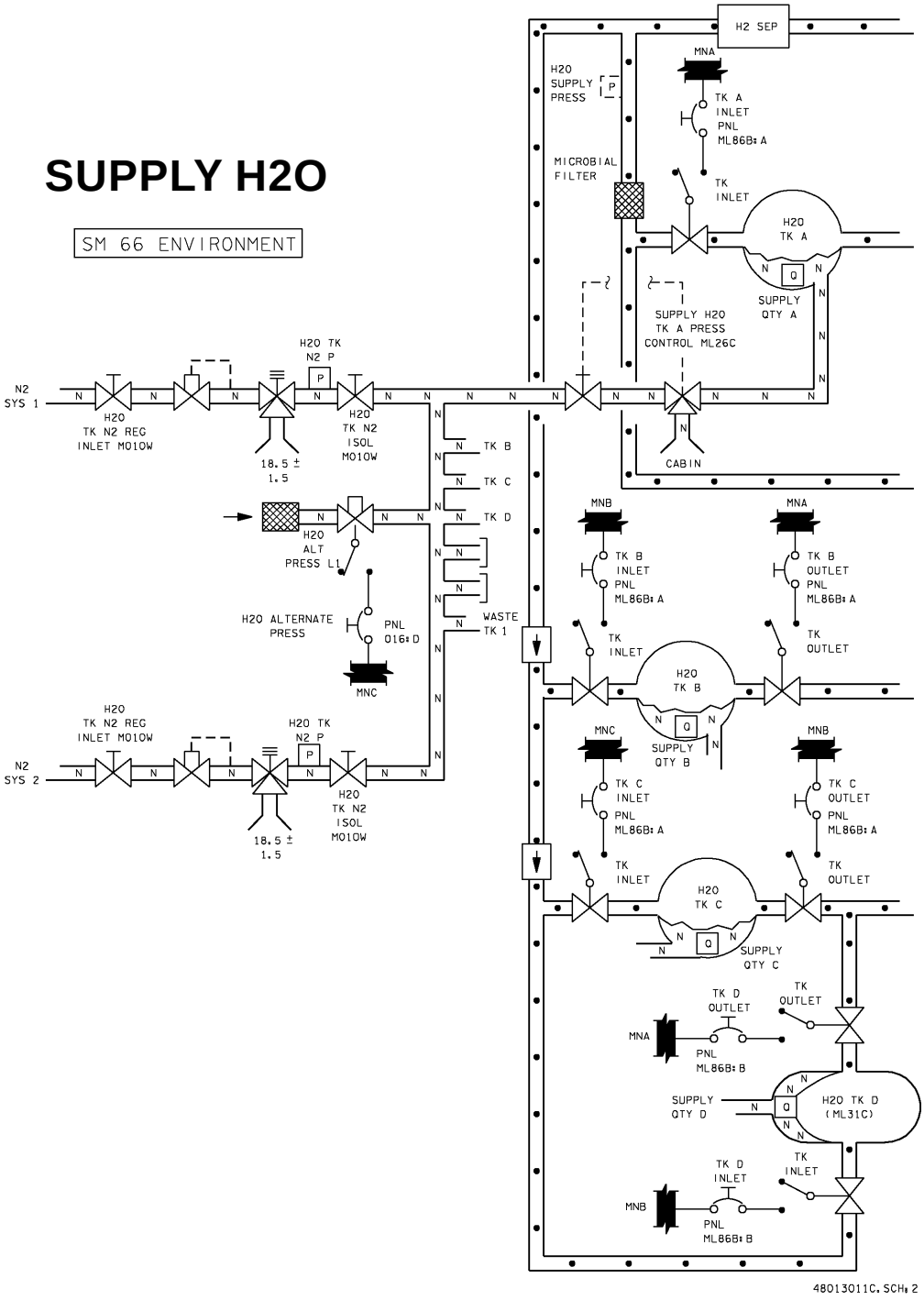
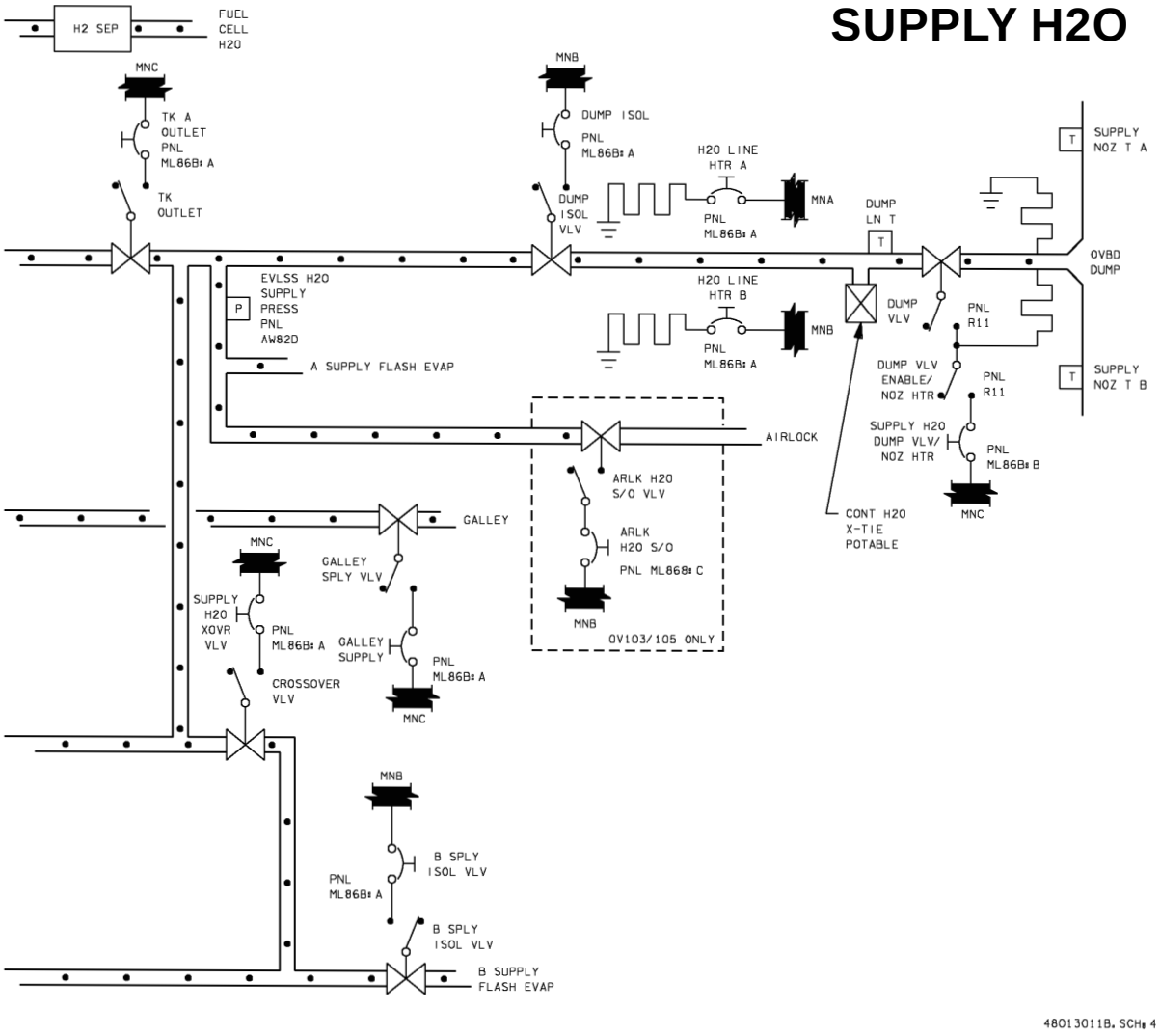
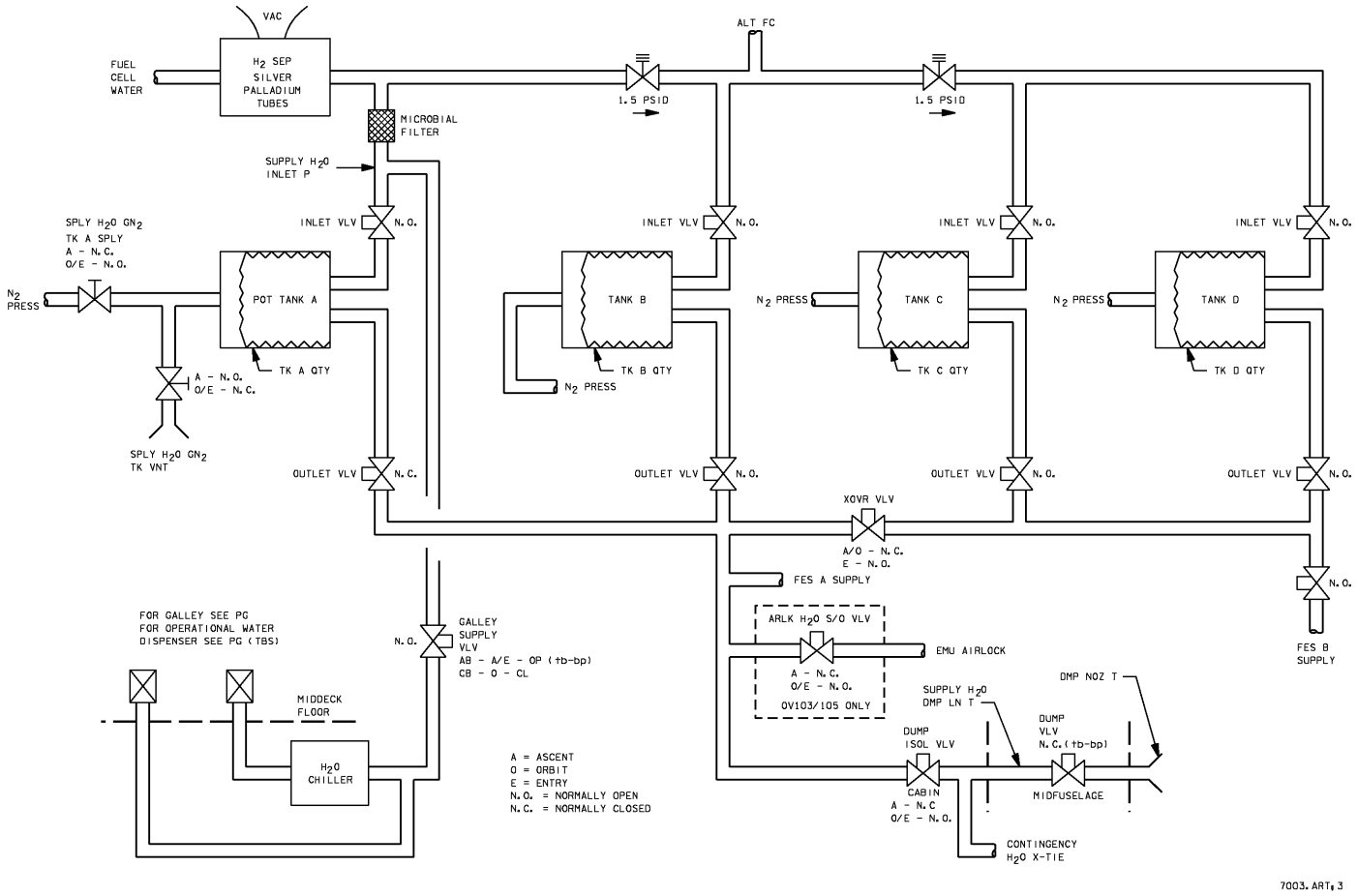
SUPPLY H2O

SM 66 ENVIRONMENT



SUPPLY H2O


H2 SEP
FUEL CELL H2O
MNC
TK A OUTLET PNL ML86B: A
TK OUTLET
MNB
DUMP ISOL PNL ML86B: A
DUMP ISOL VLV
H2O LINE HTR A
PNL ML86B: A
MNA
DUMP LN T
SUPPLY NOZ T A
OVBD DUMP
EVLSS H2O SUPPLY PRESS PNL AW82D
A SUPPLY FLASH EVAP
H2O LINE HTR B
MNB
PNL ML86B: A
DUMP VLV
PNL R11
DUMP VLV ENABLE/ NOZ HTR
SUPPLY NOZ T B
SUPPLY H2O DUMP VLV/ NOZ HTR
PNL ML86B: B
MNC
AIRLOCK
ARLK H2O S/O VLV
ARLK H2O S/O
PNL ML868: C
MNB
OV103/105 ONLY
CONT H2O X-TIE POTABLE
GALLEY
MNC
GALLEY SPLY VLV
SUPPLY H2O XOVR VLV
PNL ML86B: A
GALLEY SUPPLY
PNL ML86B: A
MNC
CROSSOVER VLV
MNB
B SPLY ISOL VLV
PNL ML86B: A
B SPLY ISOL VLV
B SUPPLY FLASH EVAP
48013011B. SCH: 4



SUPPLY H2O STORAGE

ECLS

6.5c WASTE H2O PRESS ↑↓, SUPPLY(WASTE) H2O DMP LN T ↑↓, SUPPLY(WASTE) NOZ T A(B) ↑

SM ALERT

S66 SPLY H2O TEMP

If:
SUPPLY H2O DMP LN T < 45 or > 125 degF
SUPPLY H2O NOZ T A(B) > 250 degF

1
SM 66 ENVIRONMENT
SUPPLY H2O DMP LN T ↑ → 12
SUPPLY H2O DMP LN T ↓ → 13
SUPPLY H2O NOZ T A(B) ↑ → 8

S66 WASTE H2O PRESS

If:
WASTE H2O PRESS < 13 or > 22 psig

1
2
SM 66 ENVIRONMENT
WASTE H2O PRESS ↑ → 3 (CRT) WASTE H2O QTY 1 ≥ 95 ?
WASTE H2O PRESS ↓ → **CAUTION** Waste tk bellows may be damaged because of high Delta P

3 (CRT) WASTE H2O QTY 1 ≥ 95 ?
NO → 18
YES → 4 WASTE TANK IS FULL

4 WASTE TANK IS FULL → 7 Dump TK
- Perform WASTE WATER DUMP (ORB OPS, ECLS)
- Dump until WASTE H2O QTY 1 ~10

CAUTION
Waste tk bellows may be damaged because of high Delta P → 5 Safe system

5 Safe system
(ML31C)
- WASTE H2O DUMP ISOL VLV − CL (tb−CL)

→ 19

S66 WASTE H2O TEMP

If:
WASTE H2O DMP LN T < 45 or > 125 degF
WASTE H2O NOZ T A(B) > 250 degF

6
SM 66 ENVIRONMENT
WASTE H2O DMP LN T ↑ → 12
WASTE H2O DMP LN T ↓ → 13
WASTE H2O NOZ T A(B) ↑

1

8
- ✓ Htr failure

(CRT) SUPPLY(WASTE) H2O NOZ T A(B) ≈ NOZ B(A) ?
NO → 9 NOZ TEMP XDCR FAILED OR SHIFTED
YES → 10 SUPPLY (WASTE) H2O NOZ HTR FAILED ON → 11

Nominal Config:
(ML86B:A)
cb MNA SPLY H2O TKA INLET − cl
TKB OUTLET − cl
cb MNA H2O LINE HTR A − op(cl)
cb MNA WASTE H2O DUMP VLV/NOZ HTR − cl
cb MNB SPLY H2O TKB INLET − cl
TKC OUTLET − cl
DUMP ISOL − cl
B SPLY ISOL VLV − cl
cb MNB H2O LINE HTR B − op(cl)
cb MNC SPLY H2O TKA OUTLET − cl
TKC INLET − cl
DUMP VLV/NOZ HTR − cl
XOVR VLV − cl
GALLEY SPLY − cl

(Cont in notes column)

Nominal Config:
(Cont)
DUMP VLV − CL (tb−bp)*
DUMP VLV ENA/ NOZ HTR − OFF
VAC VENT NOZ HTR − ON
ISOL VLV CNTL − OP (tb−OP)
ISOL VLV BUS SEL − MNA
SPLY H2O TKD INLET − OP (tb−OP)
OUTLET − OP (tb−OP)

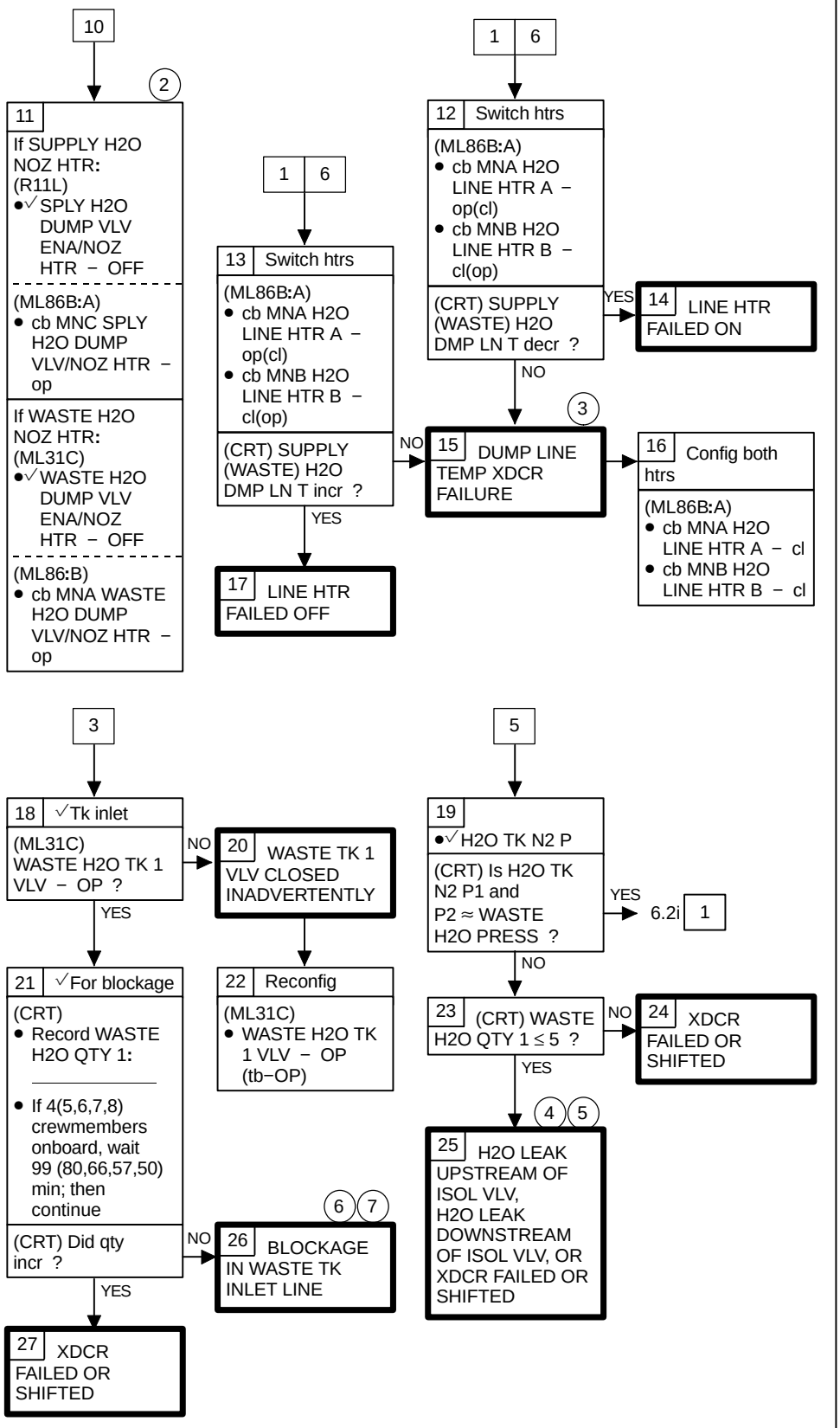
*Talkback will be bp when DUMP VLV ENA/NOZ HTR − OFF

(1) CRT label 'WASTE H2O PRESS' is same as 'WASTE LIQUID PRESSURE' on SSSH 6.5

Nominal Config:
(Cont)
(ML86B:B)
cb MNA WASTE H2O TK1 VLV − cl
H2O DUMP ISOL − cl
cb MNA VAC VENT ISOL VLV − cl
cb MNB WASTE H2O TK1 DRAIN − op
cb MNB VAC VENT NOZ HTR − cl
cb MNB VAC VENT ISOL VLV − cl
cb MNA SPLY H2O TKD OUTLET − cl
cb MNB SPLY H2O TKD INLET − cl
(O16:D)
cb MNC H2O ALT PRESS − cl
(ML26C)
SPLY H2O GN2 TKA SPLY vlv − OP
SPLY H2O GN2 TK VENT vlv − PRESS
(R11L)
SPLY H2O TKA INLET − OP (tb−OP)
SPLY H2O TKA OUTLET − CL (tb−CL)
TKB,C INLET, OUTLET − OP (tb−OP)
XOVR VLV − CL (tb−CL)
DUMP ISOL VLV − OP (tb−OP)
DUMP VLV − CL (tb−bp)*
DUMP VLV ENA/ NOZ HTR − OFF
GALLEY SPLY VLV − OP (tb−OP)
B SPLY ISOL VLV − OP (tb−OP)
(ML31C)
WASTE H2O TK1 DRAIN VLV − CL (tb−bp)
TK1 VLV − OP (tb−OP)
DUMP ISOL VLV − OP (tb−OP)

(Cont in left column)

ECLS 6.5c (Cont)



(2) Dump system is not lost. MCC will update ORB OPS DUMP procedure

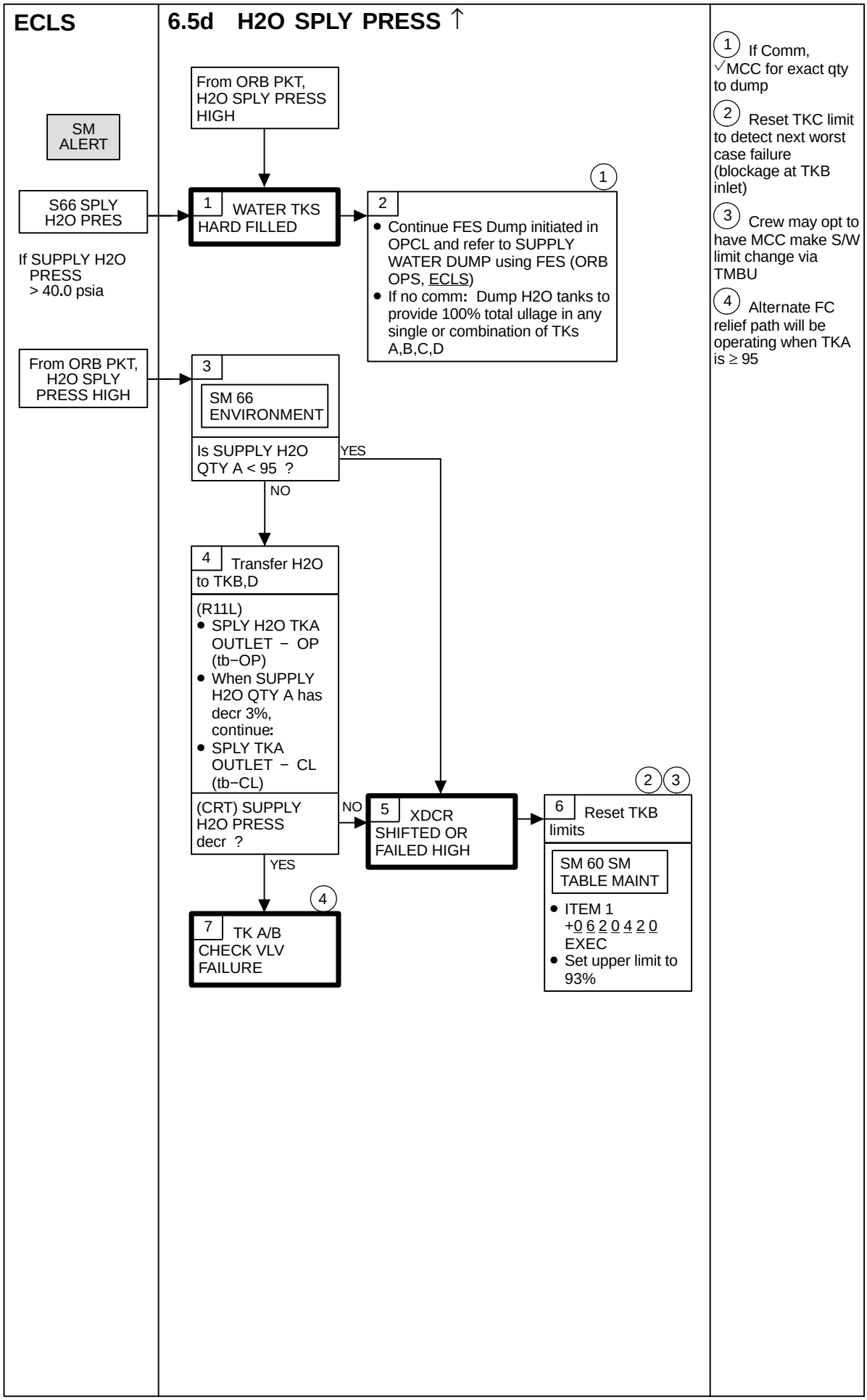
(3) If temperature xdcr is OSH, ✓MCC before doing next step

(4) ✓MCC about looking for H2O below middeck floor

(5) MCC may be able to determine exact failure

(6) ✓MCC on how to store condensate from humidity separator

(7) ✓MCC about attempting waste water dump to remove object blocking waste tank inlet


ECLS
6.5d H2O SPLY PRESS ↑
From ORB PKT, H2O SPLY PRESS HIGH
SM ALERT
S66 SPLY H2O PRES
If SUPPLY H2O PRESS > 40.0 psia
1 WATER TKS HARD FILLED
2
• Continue FES Dump initiated in OPCL and refer to SUPPLY WATER DUMP using FES (ORB OPS, ECLS)
• If no comm: Dump H2O tanks to provide 100% total ullage in any single or combination of TKs A,B,C,D
From ORB PKT, H2O SPLY PRESS HIGH
3
SM 66 ENVIRONMENT
Is SUPPLY H2O QTY A < 95 ?
YES
NO
4 Transfer H2O to TKB,D
(R11L)
• SPLY H2O TKA OUTLET − OP (tb−OP)
• When SUPPLY H2O QTY A has decr 3%, continue:
• SPLY TKA OUTLET − CL (tb−CL)
(CRT) SUPPLY H2O PRESS decr ?
NO
YES
5 XDCR SHIFTED OR FAILED HIGH
6 Reset TKB limits
SM 60 SM TABLE MAINT
• ITEM 1 +0 6 2 0 4 2 0 EXEC
• Set upper limit to 93%
7 TK A/B CHECK VLV FAILURE
1 If Comm, ✓MCC for exact qty to dump
2 Reset TKC limit to detect next worst case failure (blockage at TKB inlet)
3 Crew may opt to have MCC make S/W limit change via TMBU
4 Alternate FC relief path will be operating when TKA is ≥ 95

ECLS

6.7a EXT A/L H2O LN T ↑↓

177 A/L H2O LN T1(2)

H2O LINE TEMP:
- H2O SPLY T ZN1 < 42
- H2O SPLY T ZN1 > 130
- LCG2 SPLY T ZN1 < 50
- LCG2 SPLY T ZN1 > 130
- QD PNL T ZN2 < 42
- H2O SPLY T ZN2 < 42
- H2O SPLY T ZN2 > 130

Nominal Config:
(ML86B:C)
- cb MNA EXT ARLK HTR LNE ZN 1 − cl(op)
- cb MNA EXT ARLK HTR LINE ZN 2 − cl(op)
- cb MNB EXT ARLK HTR LINE ZN 1 − op(cl)
- cb MNB EXT ARLK HTR LINE ZN 2 − op(cl)
- cb MNC EXT ARLK HTR LINE ZN 1 − op(cl)
- cb MNC EXT ARLK HTR LINE ZN 2 − op(cl)

1 177 EXTERNAL AIRLOCK
Affected temps indicate:
↓
↑

2 Both zones affected ?
- YES
- NO

3 FAILED CLOSED OPERATIONAL AND OVERTEMP THERMOSTATS IN ONE HTR STRING

4 Only one zone affected ?
- NO
- YES

5 LOSS OF MNA(MNB,MNC) PWR SOURCE

6 FAILED OPEN THERMOSTAT IN HTR STRING

7 Switch to alternate htr pwr source

(ML86B:C)
- cb MNB (MNA,MNC) EXT ARLK HTR ZN 1,2 (two) − cl
- cb MNA (MNB,MNC) EXT ARLK HTR ZN 1,2 (two) − op

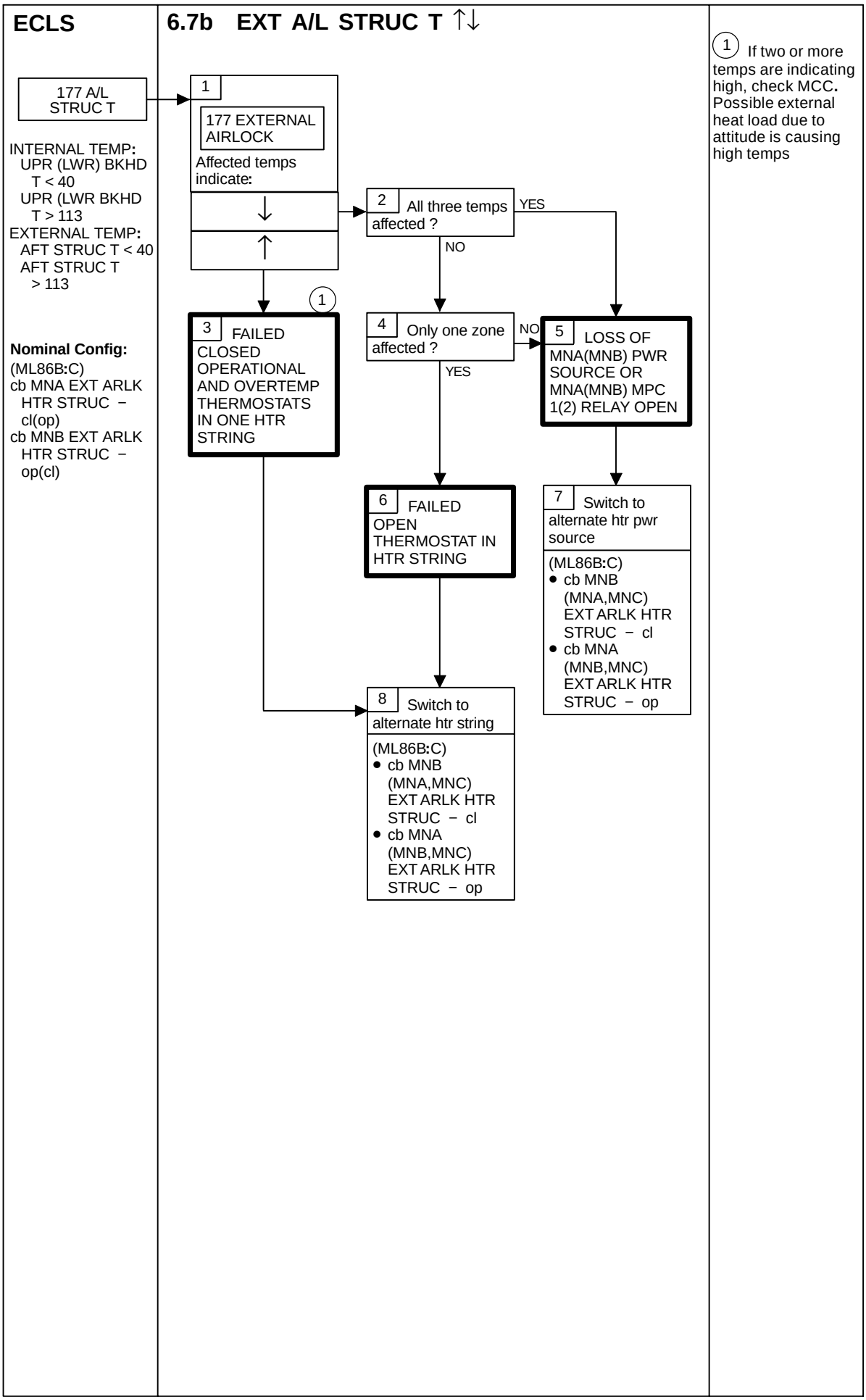
8 Switch to alternate htr string

(ML86B:C)
- cb MNB (MNA,MNC) EXT ARLK HTR ZN 1(2) − cl
- cb MNA (MNB,MNC) EXT ARLK HTR ZN 1(2) − op

(1) If both zone temps are indicating high, check MCC. Possible external heat load due to attitude is causing high temps

ECLS

6.7b EXT A/L STRUC T ↑↓



CO2

6.8

6.8a CO2 CNTLR 1(2) ↓

6.8b 3
6.8b 9

SM ALERT

S66 CO2 RL SYS MALF

'↓' will only illuminate for 6 sec
CO2 RMVL SYS CNTLR 1(2) FAIL lt − on(off)
CO2 RMVL SYS CNTLR 1(2) OPER lt − off

Nominal Config:
(ML86B:E)
cb MNA CO2 SYS 1 CNTLR − cl
cb MNB CO2 COM INSTR − cl
cb MNC CO2 SYS 2 CNTLR − cl
(MO51F)
CO2 RMVL SYS CNTLR 1(2) MNA(C) − ON
cb AC1(3) (three) − cl
CNTLR 1(2) FAIL lt − off
CNTLR 1(2) OPER lt − on
(ML31C)
VAC VENT ISOL VLV BUS SEL − MNA
VAC VENT ISOL VLV CNTL − OP (tb−OP)

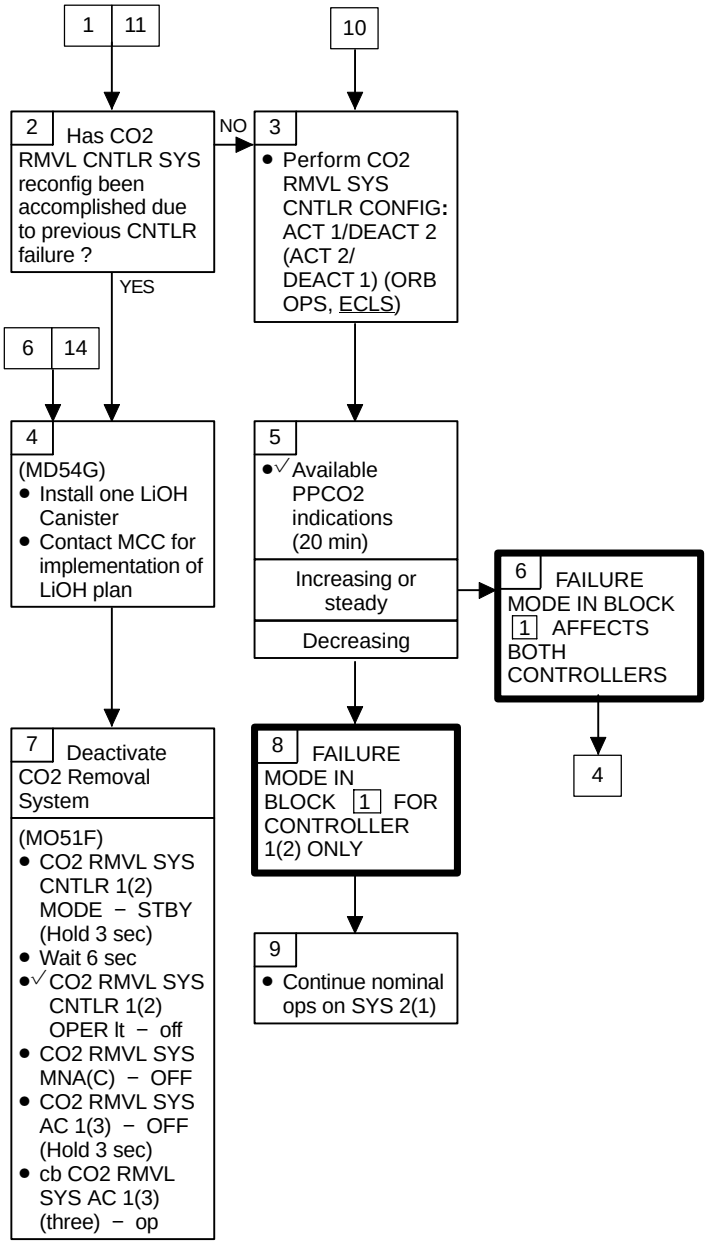
1

SM 66 ENVIRONMENT

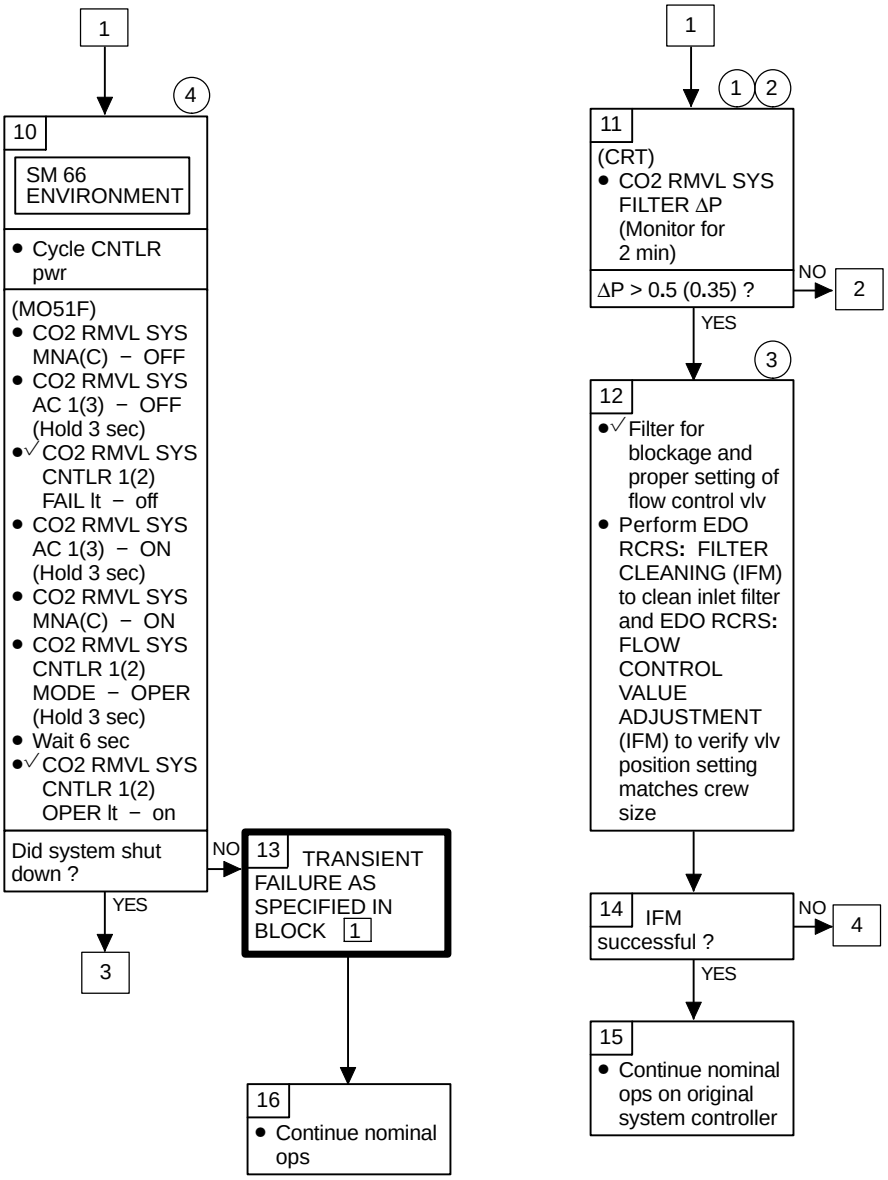
- Match indications in chart to determine failure

FAILURE CASE	(MO51F) CO2 RMVL SYS 1(2) FAIL lt	(MO51F) CO2 RMVL SYS 1(2) OPER lt	(CRT) CO2 CNTLR 1(2) '*'	(CRT) S66 CO2 RMVL SYS MALF fault msg	FAILURE MODE (Assumes all sw in nominal config)	
1	OFF	ON	'*'	NO	DEGRADED CO2 REMOVAL CAPABILITY	→ 11
2	OFF	OFF	BLANK	YES	LOSS OF MNA(C) PWR	→ 2
3	ON	OFF	BLANK	NO	LOSS OF AC 1(3) ΦA PWR	→ 2
4	ON	OFF	'*'	YES	CNTLR 1(2) FAULT SHUTDN	→ 10
5	ON	OFF	'*'	NO	CNTLR 1(2) COMMON BITE	→ 10
6	OFF	OFF	BLANK	NO	CNTLR 1(2) TOTAL PWR FAILURE	→ 2

ECLS 6.8a (Cont)



ECLS 6.8a (Cont)

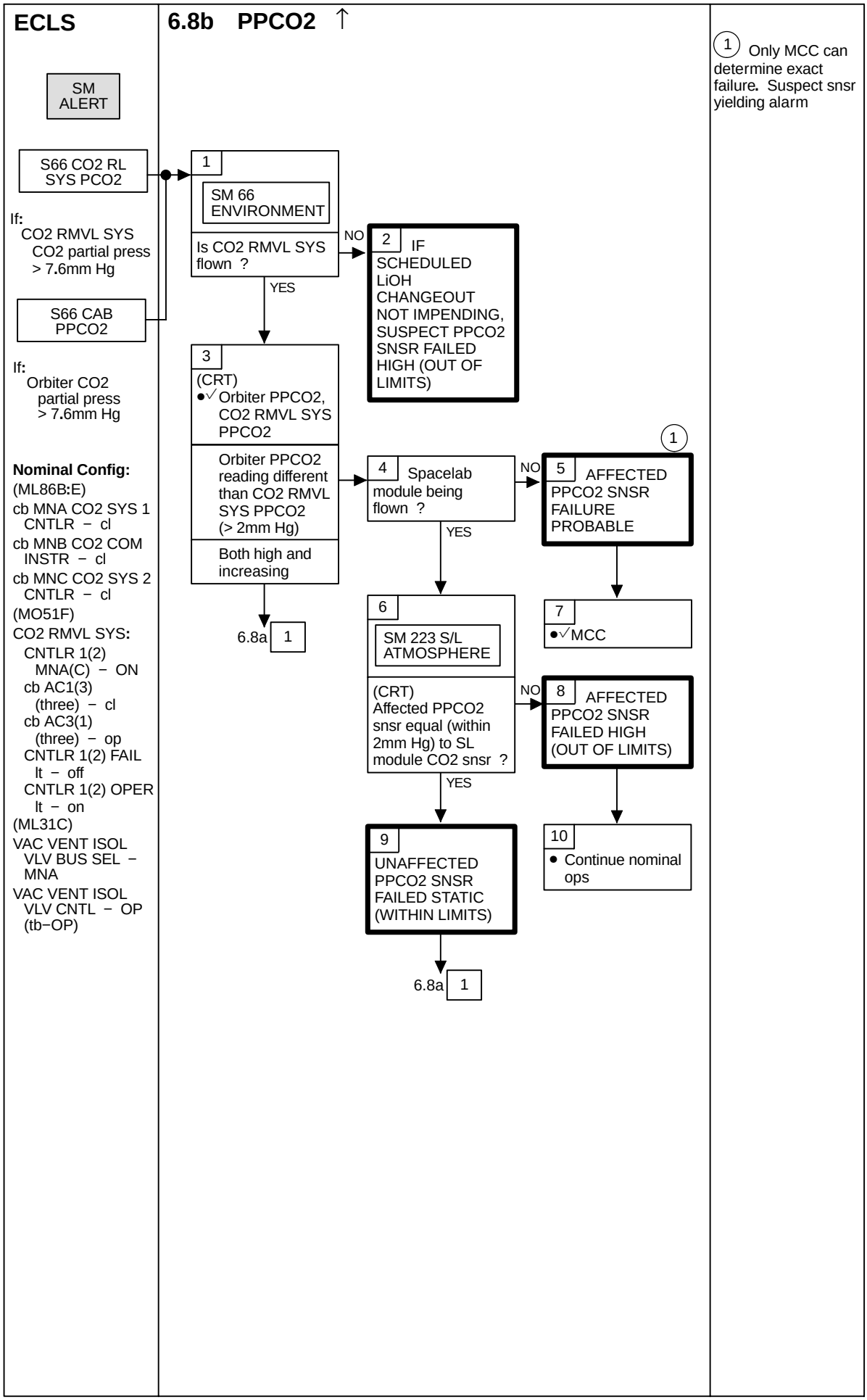


1 System isolates beds for 2 min 6 sec out at every 11 min

2 ΔP value in parenthesis corresponds to 10.2 psia cabin environment

3 ✓MCC before performing IFM

4 Allow 26 min for system cycle


ECLS
6.8b PPCO2 ↑
SM ALERT
S66 CO2 RL SYS PCO2
If:
CO2 RMVL SYS CO2 partial press > 7.6mm Hg
S66 CAB PPCO2
If:
Orbiter CO2 partial press > 7.6mm Hg
Nominal Config:
(ML86B:E)
cb MNA CO2 SYS 1 CNTLR − cl
cb MNB CO2 COM INSTR − cl
cb MNC CO2 SYS 2 CNTLR − cl
(MO51F)
CO2 RMVL SYS:
CNTLR 1(2) MNA(C) − ON
cb AC1(3) (three) − cl
cb AC3(1) (three) − op
CNTLR 1(2) FAIL lt − off
CNTLR 1(2) OPER lt − on
(ML31C)
VAC VENT ISOL VLV BUS SEL − MNA
VAC VENT ISOL VLV CNTL − OP (tb−OP)
1
SM 66 ENVIRONMENT
Is CO2 RMVL SYS flown ?
NO
YES
2 IF SCHEDULED LiOH CHANGEOUT NOT IMPENDING, SUSPECT PPCO2 SNSR FAILED HIGH (OUT OF LIMITS)
3
(CRT)
•✓Orbiter PPCO2, CO2 RMVL SYS PPCO2
Orbiter PPCO2 reading different than CO2 RMVL SYS PPCO2 (> 2mm Hg)
Both high and increasing
6.8a 1
4 Spacelab module being flown ?
NO
YES
5 AFFECTED PPCO2 SNSR FAILURE PROBABLE
1
7
•✓MCC
6
SM 223 S/L ATMOSPHERE
(CRT)
Affected PPCO2 snsr equal (within 2mm Hg) to SL module CO2 snsr ?
NO
YES
8 AFFECTED PPCO2 SNSR FAILED HIGH (OUT OF LIMITS)
9
UNAFFECTED PPCO2 SNSR FAILED STATIC (WITHIN LIMITS)
6.8a 1
10
• Continue nominal ops
1 Only MCC can determine exact failure. Suspect snsr yielding alarm

ECLS SSR−2
FES CORE FLUSH PROCEDURE

NOTE

This procedure is used to deice or to remove contamination from topping or hi load FES core by flowing warm Freon through core. Bypassed radiators and the Secondary FES Controller are used for the flush. A successful flush will be indicated by EVAP OUT temps stable at ~62 degF when FLASH EVAP CNTLR SEC is activated. Secondary cue is a very rapid decrease in duct temps, followed by rapid increase

SM 88 APU/ENVIRON THERM

TOPPING CORE FLUSH (RADS ACTIVATED)

L1 1. ✓FLASH EVAP CNTLR (three) − OFF
2. TOP EVAP HTR DUCT − A/B
3. ✓NOZ (two) − A AUTO(B AUTO)

CRT Proceed when TOP FWD(AFT) temps > 120 degF

4. RAD BYP VLV MODE (two) − MAN
5. CNTLR LOOP (two) − OFF, AUTO A
6. After 80 sec, RAD CNTLR LOOP (two) − OFF

CRT Proceed when EVAP OUT T > 90 degF for 2 min

L1 7. FLASH EVAP CNTLR SEC − ON (wait 30 sec)
8. − OFF (wait 30 sec)
9. Repeat steps 7 and 8 three times, then:
FLASH EVAP CNTLR SEC − ON

CRT 10. Proceed on MCC call, or if no comm, wait minimum 7 min, then proceed when EVAP OUT T ~62 degF and TOP FWD(AFT) > 120 degF

* If TOP FWD(AFT) < 40 degF, then *
* immediately perform steps 11,12,13,14 *

L1 11. FLASH EVAP CNTLR SEC − OFF
12. RAD CNTLR LOOP (two) − AUTO A
13. After 10 sec, RAD BYP VLV MODE 1,2 (two) − AUTO
RAD CNTLR OUT TEMP − HI
14. After 5 min, RAD CNTLR OUT TEMP − NORM

If successful flush:

15. After 30 min, TOP EVAP HTR DUCT − A(B)

If FES reqd, go to FES RESTART, ECLS SSR−5

HI LOAD CORE FLUSH (RADS ACTIVATED)

L1 1. ✓FLASH EVAP CNTLR (three) − OFF
2. HI LOAD DUCT HTR − A/B

CRT Proceed when HI LOAD INBD(OUTBD) Ts > 170 degF

L1 3. HI LOAD EVAP − ENA
4. RAD BYP VLV MODE (two) − MAN
5. CNTLR LOOP (two) − OFF, AUTO A
6. After 80 sec, RAD CNTLR LOOP (two) − OFF

CRT Proceed when EVAP OUT T > 90 degF for 2 min

L1 7. FLASH EVAP CNTLR SEC − ON (wait 30 sec)
8. − OFF (wait 30 sec)
9. Repeat steps 7 and 8 three times, then:
FLASH EVAP CNTLR SEC − ON

CRT 10. Proceed on MCC call, or if no comm, wait minimum 7 min, then proceed when EVAP OUT T ~62 degF and HI LOAD INBD(OUTBD) > 170 degF

* If HI LOAD INBD(OUTBD) < 40 degF, then *
* immediately perform steps 11,12,13,14 *

L1 11. FLASH EVAP CNTLR SEC − OFF
12. RAD CNTLR LOOP (two) − AUTO A
13. After 10 sec, RAD BYP VLV MODE 1,2 (two) − AUTO
RAD CNTLR OUT TEMP − HI
14. After 5 min, RAD CNTLR OUT TEMP − NORM

If successful flush:

15. HI LOAD EVAP − OFF
16. After 30 min, HI LOAD EVAP DUCT HTR − OFF

If FES reqd, go to FES RESTART, ECLS SSR−5

SM 0 THERMAL

TOPPING CORE FLUSH (RADS NOT ACTIVATED)

L1 1. TOP EVAP HTR DUCT − A/B
CRT Proceed when TOPPING DUCT temps within limits (no ↓; if PASS SM 88 available, TOP FWD(AFT) > 120 degF)
L1 2. FLASH EVAP CNTLR SEC − OFF
3. HI LOAD EVAP − OFF
O1 Proceed when EVAP OUT T > 90 degF for 2 min
L1 4. FLASH EVAP CNTLR SEC − ON (wait 30 sec)
5. − OFF (wait 30 sec)
6. Repeat steps 4 and 5 three times, then:
FLASH EVAP CNTLR SEC − ON
CRT 7. Proceed on MCC call, or, if no comm, wait minimum 7 min, then proceed when EVAP OUT T ~62 degF and TOP FWD(AFT) > 120 degF

* If TOP FWD(AFT) < 40 degF, then *
* immediately perform steps 12,13,14,15 *

L1 8. FLASH EVAP CNTLR SEC − OFF
9. HI LOAD EVAP − ENA
10. FLASH EVAP CNTLR PRI B − ON (wait 2 min)
O1 If EVAP OUT T ~39 degF (Topper recovered):
L1 11. TOP EVAP HTR DUCT − A(B) >>
12. FLASH EVAP CNTLR (three) − OFF (Topper not recovered)
13. HI LOAD EVAP − ENA
14. FLASH EVAP CNTLR SEC − ON
15. ✓TOP EVAP HTR DUCT − A(B)

HI LOAD CORE FLUSH (RADS NOT ACTIVATED)

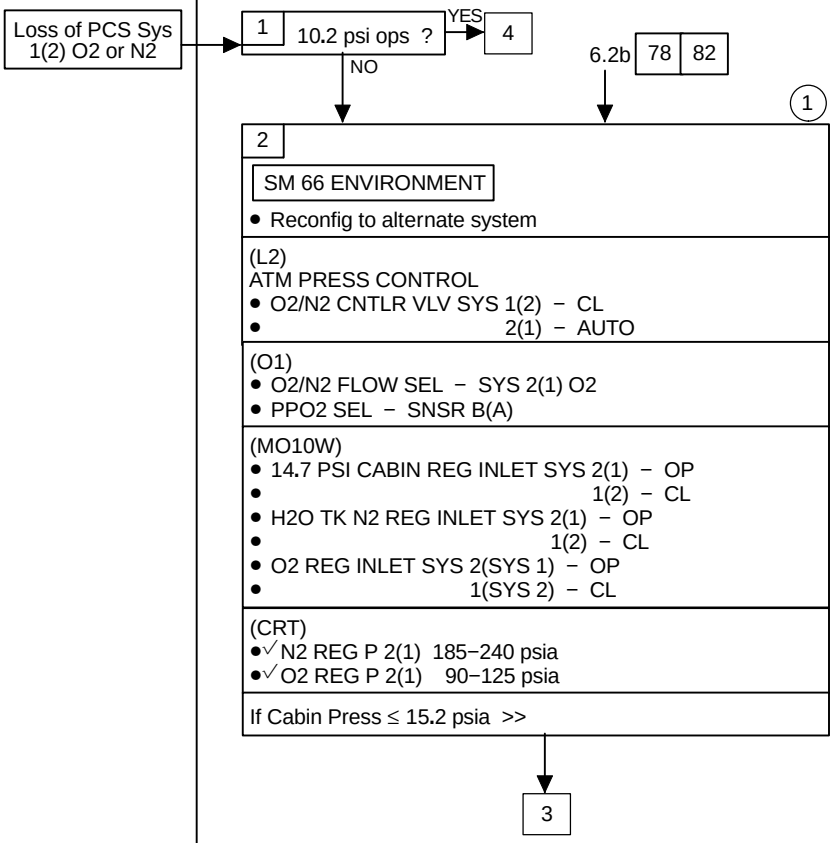
L1 1. HI LOAD EVAP DUCT HTR − A/B
CRT Proceed when HI LOAD DUCT temps within limits (no ↓; if PASS SM 88 available, when HI LOAD INBD(OUTBD) > 170 degF)
L1 2. FLASH EVAP CNTLR SEC − OFF
3. HI LOAD EVAP − ON
4. FLASH EVAP CNTLR SEC − ON (wait 30 sec)
5. − OFF (wait 30 sec)
6. Repeat steps 4 and 5 three times, then:
FLASH EVAP CNTLR SEC − ON
CRT 7. Proceed on MCC call, or, if no comm, wait minimum 7 min, then proceed when EVAP OUT T ~62 degF and HI LOAD INBD(OUTBD) > 170 degF

* If HI LOAD INBD (OUTBD) < 40 degF, then *
* immediately perform steps 12,13,14,15 *

L1 8. FLASH EVAP CNTLR SEC − OFF
9. HI LOAD EVAP − ENA
10. FLASH EVAP CNTLR PRI B − ON (wait 2 min)
O1 If EVAP OUT T ~39 degF (HI LOAD recovered):
L1 11. HI LOAD EVAP DUCT HTR − A >>
12. FLASH EVAP CNTLR (three) − OFF (HI LOAD not recovered)
13. HI LOAD EVAP − OFF
14. FLASH EVAP CNTLR SEC − ON
15. ✓HI LOAD EVAP DUCT HTR − A(B)

ECLS

ECLS SSR−3
RECONFIG TO ALT PCS SYS (AUTO OPS)



(1) Use this procedure for complete reconfig of Auto PCS or to depress cabin back to normal pressure after N2 or O2 leak occurred inside cabin. Some sws may be in desired position

ECLS SSR−3 (Cont)

6.2b | 41 | 51 → 3

6.2b | 78 | 82 → 4

2 → 3

1 → 4

3

SM 66 ENVIRONMENT

If Cabin Press > 15.2 psia

(MO13Q)
- MIDDECK FLOODS AIRLK 2 − ON/OFF

(Inner Hatch)
- Equalization vlv caps (two) − remove, stow
- Equalization vlv (two) − OFF
- Open, stow HATCH
- Rotate vent duct into airlock

(O15:D)
- cb MNB PPO2 C CAB dP/dT − op

(AW82B)
- AIRLK DEPRESS vlv cap − vent, remove

- Depress Cabin to ops level

(AW82B)
- AIRLK DEPRESS vlv − 5
  - ∗ If 'S66 CABIN PPO2 A(B)' ∗
  - ∗ AIRLK DEPRESS vlv − CL ∗
  - ∗ (C5) ∗
  - ∗ DIRECT O2 vlv − OP ∗
  - ∗ When PPO2 = 3.45, ∗
  - ∗ DIRECT O2 vlv − CL ∗
  - ∗ Continue to depress Cabin and ∗
  - ∗ add O2 as reqd ∗
- When 'S66 CAB O2(N2) FLO 1(2)'
  - If PPO2 > 3.6, continue depress until PPO2 < 3.6 psia
  - If PPO2 < 2.9, continue depress until CABIN PRESS = 14.5 psi
    AIRLK DEPRESS vlv − CL
    Allow CABIN PRESS and PPO2 to incr (~15 min). Repeat depress to CABIN PRESS = 14.5 until PPO2 > 2.9 psia

5 Reconfig from Cabin Depress

(AW82B)
- AIRLK DEPRESS vlv − CL, capped

(O15:D)
- cb MNB PPO2 C CAB dP/dT − cl

(Inner Hatch)
- If reqd, rotate vent duct and stow on AIRLK wall
- If reqd, close HATCH
- EQUAL vlv − norm and capped

(MO13Q)
- MIDDECK FLOODS AIRLK 2 − OFF/ON

4 10.2 psi reconfig

(L2)
ATM PRESS CONTROL
- O2/N2 CNTLR VLV SYS 1 − CL (O2)
- 2 − OP (N2)

(MO10W)
- H2O TK N2 REG INLET SYS 1 − CL
- 2 − OP

(CRT)
- ✓ N2 REG P 2(1) 185−240 psia
- ✓ O2 REG P 2(1) 90−110 psia
- P&I change to Cabin Maintenance:
  Change 'SYS 1' to 'SYS 2'
- ✓ MCC for P&I changes to repress procedure

If Cabin Press ≤ 10.6 psia >>

→ 6

(2) Swap PCS feeding nitrogen. Oxygen fed via Direct O2

ECLS SSR−3 (Cont)

6.2b | 41 | 51

4

6

SM 66 ENVIRONMENT

If Cabin Press > 10.6 psi

(O15:D)
- cb MNB PPO2 C CAB dP/dT − op

(AW82B)
- AIRLK DEPRESS vlv cap − vent, remove

- Depress Cabin to ops level

(AW82B)
- AIRLK DEPRESS VLV − 5

* If 'S66 CABIN PPO2' AIRLK *
* DEPRESS vlv − CL *
* (MO10W) *
* 14.7 REG INLET SYS 2 − OP or *
* open 14.7 REG INLET configured *
* for O2 when PPO2 = 2.8 *
* 14.7 REG INLET SYS 2 − CL *
* Continue to depress *
* Cabin and add O2 as reqd *

If PPO2 > 2.8, continue depress until PPO2 ≤ 2.8 and Cabin P = 10.2 < X < 10.4
If PPO2 < 2.55
- AIRLOCK DEPRESS vlv − CL
- Open 14.7 psi CABIN REG INLET which is configured to flow O2 to allow cabin press and PPO2 to incr until PPO2 = 2.8. Repeat depress until Cabin P = 10.2 < X < 10.4 and PPO2 > 2.55

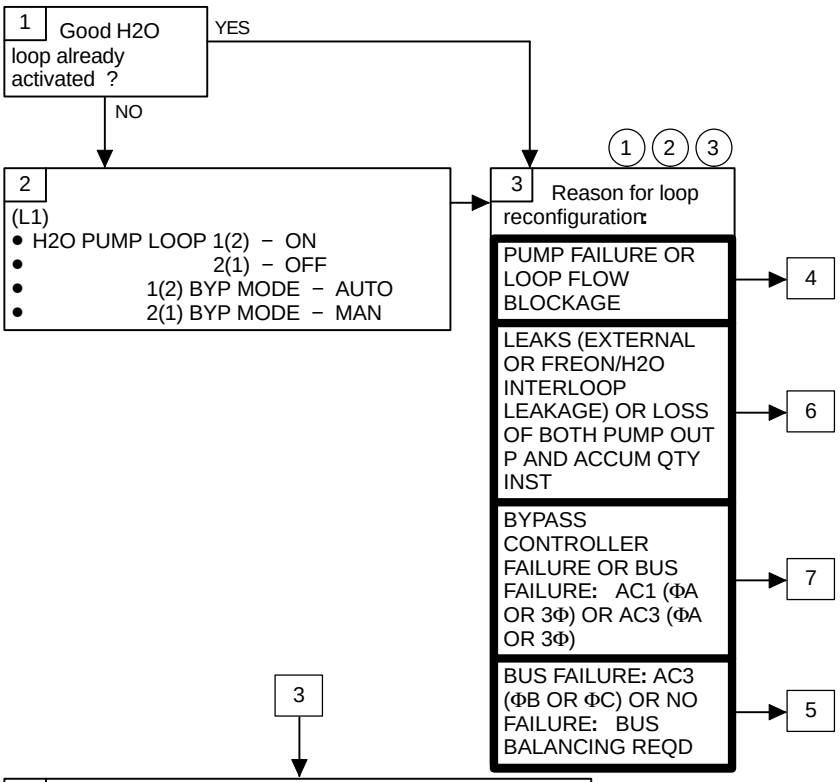
7 Reconfig from cabin depress

(AW82B)
- AIRLK DEPRESS vlv − CL

(O15:D)
- cb MNB PPO2 C CAB dP/dT − cl

- Go to 10.2 PSI MAINTENANCE (EVA) for subsequent cabin adjustments

ECLS SSR−4
RECONFIG TO ALT H2O LOOP



3

4 New active loop:

LOOP 1	LOOP 2
(R13U) • Inhibit LOOP 2 PUMP OUT P (param 115) • Change LOOP 1 PUMP OUT P (param 105) lower C/W to 1.50 vdc (45 psia)	(R13U) • Inhibit LOOP 1 PUMP OUT P (param 105) • Change LOOP 2 PUMP OUT P (param 115) lower C/W to 1.50 vdc (45 psia)
Reconfig B/U C/W SM 60 SM TABLE MAINT • ITEM 1 +0 6 1 2 7 0 0 EXEC • ITEM 15 EXEC • ITEM 1 +0 6 1 2 6 0 0 EXEC • ITEM 11 +4 5 EXEC	Reconfig B/U C/W SM 60 SM TABLE MAINT • ITEM 1 +0 6 1 2 6 0 0 EXEC • ITEM 15 EXEC • ITEM 1 +0 6 1 2 7 0 0 EXEC • ITEM 11 +4 5 EXEC

3

6.4p 25

6.4p 36

5 New active loop:

LOOP 1	LOOP 2
(R13U) • Change LOOP 1 PUMP OUT P (param 105) lower C/W limit to 1.50 vdc (45 psia) and LOOP 2 (param 115) to 0.70 vdc (19.5 psia)	(R13U) • Change LOOP 2 PUMP OUT P (param 115) lower C/W limit to 1.50 vdc (45 psia) and LOOP 1 (param 105) to 0.70 vdc (19.5 psia)
Reconfig B/U C/W SM 60 SM TABLE MAINT • ITEM 1 +0 6 1 2 6 0 0 EXEC • ITEM 11 +4 5 EXEC • ITEM 1 +0 6 1 2 7 0 0 EXEC • ITEM 11 +1 9.5 EXEC	Reconfig B/U C/W SM 60 SM TABLE MAINT • ITEM 1 +0 6 1 2 7 0 0 EXEC • ITEM 11 +4 5 EXEC • ITEM 1 +0 6 1 2 6 0 0 EXEC • ITEM 11 +1 9.5 EXEC

(1) Procedure assumes initial C/W and B/U C/W for PUMP OUT P set at 19.5 for inactive loop and 45 for active loop

(2) Loss of bypass controller results in loss of all instrumentation in affected loop except flow and some temperatures

(3) With loss of PUMP OUT P and ACCUM QTY instrumentation, Freon/H2O interloop leakage is not detectable. Affected loop should not be used unless reqd

ECLS SSR−4 (Cont)

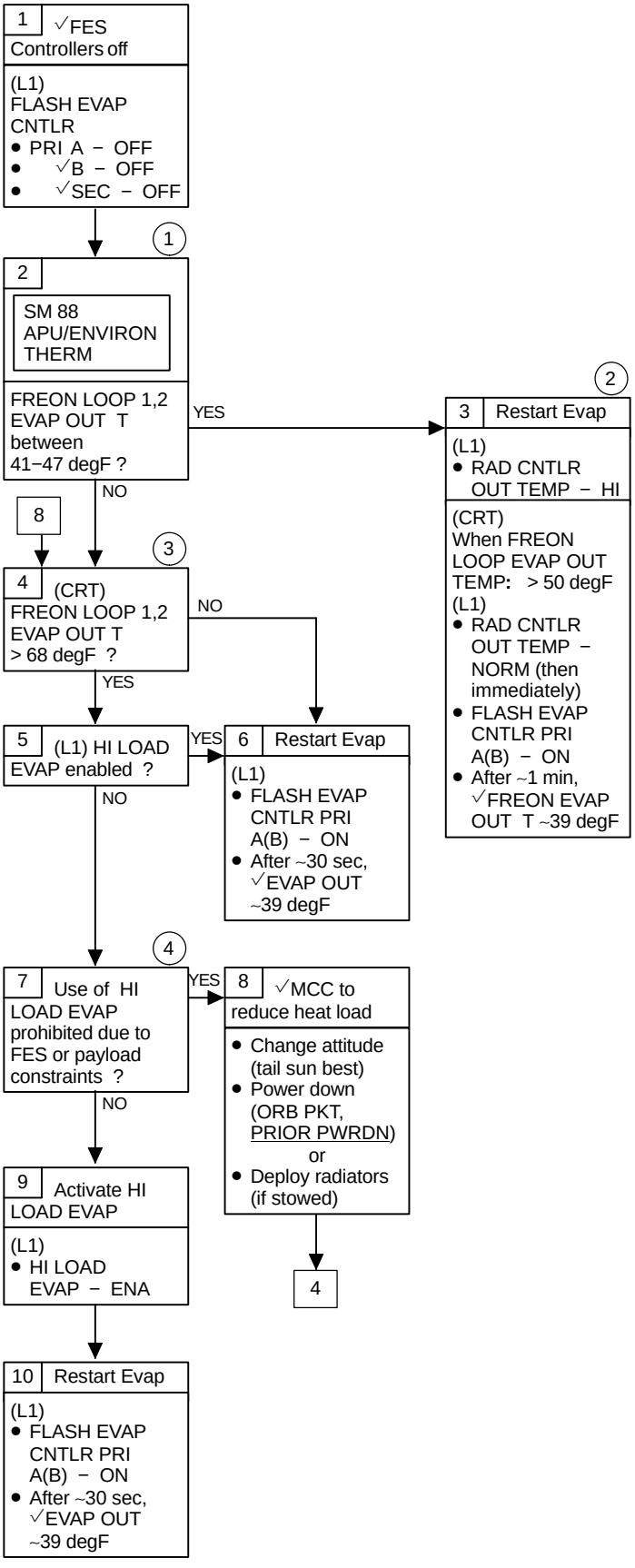
3

6	New active loop:	
	LOOP 1	LOOP 2
	(R13U) • Inhibit LOOP 2 PUMP OUT P (param 115) • Change LOOP 1 PUMP OUT P (param 105) lower C/W to 1.50 vdc (45 psia)	(R13U) • Inhibit LOOP 1 PUMP OUT P (param 105) • Change LOOP 2 PUMP OUT P (param 115) lower C/W to 1.50 vdc (45 psia)
	Reconfig B/U C/W SM 60 SM TABLE MAINT • ITEM 1 +0 6 1 2 6 0 0 EXEC • ITEM 11 +4 5 EXEC • ITEM 1 +0 6 1 2 7 0 0 EXEC • ITEM 15 EXEC	Reconfig B/U C/W SM 60 SM TABLE MAINT • ITEM 1 +0 6 1 2 7 0 0 EXEC • ITEM 11 +4 5 EXEC • ITEM 1 +0 6 1 2 6 0 0 EXEC • ITEM 15 EXEC
	Inhibit LOOP 2 SM ALERTS • ITEM 10 EXEC • ITEM 1 +0 6 1 2 7 1 0 EXEC • ITEM 10 EXEC	Inhibit LOOP 1 SM ALERTS • ITEM 10 EXEC • ITEM 1 +0 6 1 2 6 1 0 EXEC • ITEM 10 EXEC

3

7	New active loop:	
	LOOP 1	LOOP 2
	(R13U) • Inhibit LOOP 2 PUMP OUT P (param 115) • Change LOOP 1 PUMP OUT P (param 105) lower C/W to 1.50 vdc (45 psia)	(R13U) • Inhibit LOOP 1 PUMP OUT P (param 105) • Change LOOP 2 PUMP OUT P (param 115) lower C/W to 1.50 vdc (45 psia)
	Reconfig B/U C/W SM 60 SM TABLE MAINT • ITEM 1 +0 6 1 2 6 0 0 EXEC • ITEM 11 +4 5 EXEC • ITEM 1 +0 6 1 2 7 0 0 EXEC • ITEM 15 EXEC	Reconfig B/U C/W SM 60 SM TABLE MAINT • ITEM 1 +0 6 1 2 7 0 0 EXEC • ITEM 11 +4 5 EXEC • ITEM 1 +0 6 1 2 6 0 0 EXEC • ITEM 15 EXEC
	Inhibit LOOP 2 SM ALERTS • ITEM 10 EXEC • ITEM 1 +0 6 1 2 7 1 0 EXEC • ITEM 10 EXEC • ITEM 1 +0 6 1 2 7 4 0 EXEC • ITEM 10 EXEC • ITEM 1 +0 6 1 2 7 0 5 EXEC • ITEM 10 EXEC	Inhibit LOOP 1 SM ALERTS • ITEM 10 EXEC • ITEM 1 +0 6 1 2 6 1 0 EXEC • ITEM 10 EXEC • ITEM 1 +0 6 1 2 6 4 0 EXEC • ITEM 10 EXEC • ITEM 1 +0 6 1 2 6 0 5 EXEC • ITEM 10 EXEC

ECLS SSR−5
FES RESTART



(1) Prior flight experience has demonstrated that FES shutdns are most likely in this temp range

(2) To ensure positive FES restart, RADs are placed in HIGH to impose a load on FES

(3) TOPPING EVAP will overtemp shutdn when inlet temp exceeds ~68 degF and HI LOAD not activated

(4) Heat load beyond capability of topping evap

ECLS SSR−6
CABIN EQUIP PWRDN

Use one IDP/CRT with one MDU

F6/F8/A6U FLT CNTLR PWR (three) − OFF

O14:E ✓cb MNA DDU L,AFT (two) − op
O15:E ✓cb MNB DDU L,R (two) − op
O16:E ✓cb MNC DDU R,AFT (two) − op

L1 CAB TEMP − COOL(as reqd, WARM)
Minimize ltg
W1−10 Install Window Shades (ten)

O19 TV PWR − OFF
A3 MON 1,2 − OFF
R11 VTR PWR − OFF

MO39M MIDDECK COMM CCU PWR − OFF
MO42F SPKR AUD SPKR PWR − OFF
PWR − OFF

MO58F MIDDECK CCU AUD PWR − OFF
GALLEY DC PWR BUS A − OFF
B − OFF
MA73C:G cb AC3 GALLEY FAN (three) − op
or
Food Warmer − OFF, ✓light − off
All middeck lts − off

ECLS SSR−7
FLASH EVAPORATOR CHECKOUT

NOTE
Procedure used to check all components

PRETEST SETUP

a. ✓Rad flow, PLBD opened

L1 b. FLASH EVAP TOP DUCT HTR − A(B)
NOZ (two) − AUTO A(B)

If HI LOAD EVAP to be activated:
FLASH EVAP HI LOAD DUCT HTR − A(B)
Wait ~45 min before activating HI LOAD

L2 c. FLASH EVAP FDLN HTR A SPLY − 1(2)
B SPLY − 1(2)

R11L d. ✓SPLY H2O TKB OUTLET − OP (tb−OP)
✓B SPLY ISOL VLV − OP (tb−OP)
ML31C ✓TKD OUTLET − OP (tb−OP)

COMPONENT CHECKOUT SM 88 APU/ENVIRON THERM

a. PRIMARY CNTLR A,B and TOPPING FES CHECKOUT
Perform FES RESTART, ECLS SSR−5

b. SECONDARY CNTLR and TOPPING FES CHECKOUT

NOTE
This procedure ✓SEC CNTLR ops starting from standby mode. To check cntlr startup under load conditions, interchange steps 2 and 3 but pause between steps to allow EVAP OUT T to incr > 62 degF (approx 1 min)

L1 1. ✓HI LOAD EVAP − OFF
2. FLASH EVAP CNTLR PRI A,B − OFF
SEC − ON
3. RAD BYP VLV LOOP 1,2 MODE (two) − MAN
MAN SEL (two) − BYP until tb − BYP
CRT 4. After 2 min, ✓EVAP OUT T ~62 degF
L1 5. RAD BYP VLV LOOP 1,2 MODE (two) − AUTO
CNTLR LOOP 1,2 (two) − OFF, AUTO A(AUTO B)
After 90 sec, ✓tb − RAD (two)
6. Perform FES RESTART, ECLS SSR−5

c. SECONDARY CNTLR, HI LOAD FES, FEEDWATER A CHECKOUT

L1 1. HI LOAD EVAP − ENA
FLASH EVAP CNTLR SEC − A SPLY
2. PRI A,B − OFF
SEC − ON
3. RAD BYP VLV LOOP 1,2 MODE (two) − MAN
MAN SEL (two) − BYP until tb − BYP
CRT 4. After 2 min, ✓EVAP OUT T ~62 degF
L1 5. RAD BYP VLV LOOP 1,2 MODE (two) − AUTO
CNTLR LOOP 1,2 (two) − OFF, then AUTO A(AUTO B)
After 90 sec, ✓tb − RAD (two)
6. Perform FES RESTART, ECLS SSR−5
7. HI LOAD EVAP − OFF
After 30 min,
8. FLASH EVAP HI LOAD DUCT HTR − OFF

d. SECONDARY CONTROLLER, HI LOAD FES, FEEDWATER B CHECKOUT

L1 1. HI LOAD EVAP − ENA
FLASH EVAP CNTLR SEC − B SPLY
2. PRI A,B − OFF
SEC − ON
3. RAD BYP VLV LOOP 1,2 MODE (two) − MAN
MAN SEL (two) − BYP until tb − BYP
CRT 4. After 2 min, ✓EVAP OUT T ~62 degF
L1 5. RAD BYP VLV LOOP 1,2 MODE (two) − AUTO
CNTLR LOOP 1,2 (two) − OFF, then AUTO A(AUTO B)
After 90 sec, ✓tb − RAD (two)
6. Perform FES RESTART, ECLS SSR−5
7. HI LOAD EVAP − OFF
After 30 min,
8. FLASH EVAP HI LOAD DUCT HTR − OFF
9. CNTLR SEC − A SPLY

e. PRIMARY CNTLR A,B, TOPPING and HI LOAD EVAP, A and B SPLY CHECKOUT

L1 1. HI LOAD EVAP − ENA
FLASH EVAP CNTLR SEC − A SPLY(B SPLY)
2. PRI A − OFF
B − OFF
SEC − OFF
3. RAD BYP VLV LOOP 1,2 MODE (two) − MAN
MAN SEL (two) − BYP until tb − BYP
CRT 4. When EVAP OUT T > 47 degF, FLASH EVAP CNTLR PRI A − ON
5. After 60 sec, ✓EVAP OUT T ~39 degF ± 1 degF
L1 6. FLASH EVAP CNTLR PRI A − OFF
B − ON
CRT After 60 sec, ✓EVAP OUT T ~39 degF ± 1 degF
L1 7. RAD BYP VLV LOOP 1,2 MODE (two) − AUTO
CNTLR LOOP 1,2 (two) − OFF, AUTO A(AUTO B)
After 90 sec, ✓tb (two) − RAD
8. After 2 min, HI LOAD EVAP − OFF

f. PRIMARY CNTLR A,B, TOPPING, STARTUP FROM STBY CHECKOUT

1. Perform FES RESTART, ECLS SSR−5, using A CNTLR
CRT 2. ✓RAD OUT T ~39 degF (FES to STBY)
Pwrdn and/or change attitude if necessary
L1 3. RAD CNTLR OUT T − HIGH
CRT 4. After 2 min, ✓EVAP OUT T ~39 degF ± 1 degF
L1 5. FLASH EVAP CNTLR PRI A − OFF
B − ON
CRT 6. After 60 sec, ✓EVAP OUT T ~39 degF ± 1 degF
L1 7. RAD CNTLR OUT T − NORM, then immediately
8. FLASH EVAP CNTLR PRI B − OFF, ON
9. ✓RAD OUT T ~39 degF ± 1 degF
10. CNTLR OUT T − HIGH
11. After 2 min, ✓EVAP OUT T ~39 degF ± 1 degF
12. RAD CNTLR OUT T − NORM
13. FLASH EVAP CNTLR PRI B − OFF

ECLS SSR−8
SMALL CABIN−LEAK ISOL

NOTE

This procedure should only be performed on MCC call. MCC will call with specific steps to be performed. Steps may be sequentially performed in groups to expedite leak isolation. MCC will determine when leak has been isolated using cabin pressure decay

SM 66 ENVIRONMENT OR SM SYS SUMM 1

LEAK ISOLATION STEPS

If spacelab module, go to ECLS SSR−1 (SLM MAL, ECLS) >>

1. If manual cabin pressure control or 10.2 psi ops, go to step 3

MO10W 2. 14.7 CAB REG INLET SYS 1,SYS 2 vlv (two) − CL

WCS 3. ✓COMMODE CNTL − DN/OFF (N/A if EDO WCS)

WCS/ EDO WCS 4. VAC VLV − CL

Below SIDE HATCH 5. NEG PRESS RELIEF vlv covers (two) − cl (push firmly)

L2 6. CAB RELIEF A − CL (tb−CL)

7. CAB RELIEF B − CL (tb−CL)

8. If flown, deactivate CO2 RMVL SYS:

MO51F CO2 RMVL SYS CNTLR 1(2) MODE − STBY (hold 3 sec)
Wait 6 sec
✓CO2 RMVL SYS CNTLR 1(2) OPER lt − off
✓FAIL lt − on

CRT ✓VAC PRESS < 5.0
Record VAC PRESS _____

NOTE

Suspect possible duct leakage if VAC PRESS > 5.0 H or increases after next step

MD52M On MCC GO, replace LiOH canister in POS A

MIDDECK FLR 9. ✓CAB PURGE VLV − CL
✓ISOL VLV − CL

EXT A/L 10. EXT A/L DEPRESS vlv − CL
NEG PRESS RELIEF vlv covers (two) − CL (push firmly)

ML31C 11. VAC VENT ISOL VLV CNTL − CL (tb−CL)

WCS 12. CRADLE − AUTO INHIBIT
Remove urinal hose (at hose block), hose block, and filter
Place Gray Tape over center tube (EMU drain)

MIDDECK 13. A/L HATCH − CL (per decal)
Equal vlv (two) − OFF

RECOVERY STEPS (On MCC call)

L2 14. CAB RELIEF A − ENA (tb−ENA)

15. CAB RELIEF B − ENA (tb−ENA)

ML31C 16. VAC VENT ISOL VLV CNTL − OP (tb−OP)
If flown, reactivate CO2 RMVL SYS:

MO51F CO2 RMVL SYS MNA(MNC) − OFF
AC1(AC3) − OFF (hold 3 sec)
✓CNTLR 1(2) FAIL lt − off
AC1(AC3) − ON (hold 3 sec)
MNA(MNC) − ON
CNTLR 1(2) MODE − OPER (hold 3 sec)
Wait 6 sec
✓CO2 RMVL SYS CNTLR 1(2) OPER lt − on

ECLS SSR−8 (Cont)

WCS/ EDO WCS

17. VAC VLV − OP

PCS CONFIG (On MCC call)

18. ✓ MCC for PCS config and TIG time (if necessary)

LEAK SEALING (On MCC call)

19. Go to CABIN LEAK SEALING (PROCEDURES A thru F, IFM)

ECLS SSR−9
RAD ISOL RECOVERY

NOTE

Procedure reestablishes radiator flow after an inadvertent isolation due to an instrumentation or Freon isolation logic failure. Expect possible 'S88 EVAP OUT T 1(2)' msg

SM 88 APU/ENVIRON THERM

L1 1. FLASH EVAP CNTLR PRI A,B,SEC (three) − OFF

If Freon Loop 1 aff:

2. RAD BYP VLV MODE 1 − MAN
   CNTLR LOOP 1 − OFF, then
   AUTO A(AUTO B)
3. After 10 sec, RAD BYP VLV MODE 1 − AUTO
4. RAD CNTLR OUT TEMP − HI

L2 5. FREON ISOL MODE − MAN
   LOOP 1 − RADIATOR (hold 5 sec)

If Freon Loop 2 aff:

L1 6. RAD BYP VLV MODE 2 − MAN
   CNTLR LOOP 2 − OFF, then
   AUTO A(AUTO B)
7. After 10 sec, RAD BYP VLV MODE 2 − AUTO
8. RAD CNTLR OUT TEMP − HI

L2 9. FREON ISOL MODE − MAN
   LOOP 2 − RADIATOR (hold 5 sec)

L1 10. After 5 min, RAD OUT TEMP − NORM

If FES reqd, go to FES RESTART, ECLS SSR−5

ECLS SSR−10
H2O PUMP OPS VIA GPC

NOTE
Provides continuous GPC commanding of the H2O loop pumps

1. Reset pump cycling constants (if comm available. MCC can TMBU if desired)
   SM 60 SM TABLE MAINT
   ITEM 16 +9 2 0 6 4 1 EXEC
   17 +9 9 9 9 9 9 EXEC
   16 +9 2 0 6 4 0 EXEC
   17 +1 EXEC

2. If reqd, perform PL/DPS RECONFIG (PL SYS: or SODF: ASSY OPS), Secure (PL SYS)

3. Perform SM CHECKPOINT INITIATE (ORB OPS, DPS)

If WCL 1 for continuous ops:

If Pump A reqd:

L4:F 4. cb AC1 H2O LOOP PUMP 1 A/2 (three) − cl

L1 5. H2O PUMP LOOP 1 − A

If Pump B reqd:

6. ✓H2O PUMP LOOP 1 − B

7. H2O PUMP LOOP 1 − GPC
   LOOP 1 BYP MODE − AUTO
   2 BYP MODE − MAN

8. H2O PUMP LOOP 2 − OFF

O1 9. H2O PUMP OUT PRESS − 1

If WCL 2 for continuous ops:

L4:F 10. cb AC1 H2O LOOP PUMP 1 A/2 (three) − cl

L1 11. H2O PUMP LOOP 2 − GPC
   ✓LOOP 2 BYP MODE − AUTO
   ✓1 BYP MODE − MAN

12. H2O PUMP LOOP 1 − OFF

O1 13. ✓H2O PUMP OUT PRESS − 2

NOTE
Ops transition in steps 14 and 15 causes MCIU to lose I/O with the GPC. Coordinate ops transition with PDRS to avoid impacts to ongoing PDRS operations. Nominal PDRS ops are recovered in step 17, if required

14. SM OPS 000 PRO

15. SM OPS 201 PRO

16. S88 APU/ENVIRON THERM
    ✓H2O LOOP PUMP OUT P 1(2): 61−69

17. If reqd:
    S94 PDRS CONTROL
    I/O ON − ITEM 5 EXEC(*)
    SAFING − CANCEL

18. SM(GNC,PL) 1 DPS UTILITY
    CKPT RETRV ENA − ITEM 12 EXEC (*)
    UL CNTL AUTO − ITEM 35 EXEC (*)

19. If reqd, perform PL/DPS RECONFIG, (PL SYS: or SODF: ASSY OPS)

20. C/W update (if comm available, MCC can TMBU software limits if desired)

Loop 1 active	Loop 2 active
(R13U) ● Change Loop 1 PUMP OUT P (param) 105) lower C/W limit to 1.50 vdc (45 psia) and Loop 2 (param 115) to 0.70 vdc (19.5 psia)	(R13U) ● Change Loop 2 PMUP OUT P (param 115) lower C/W limit to 1.50 vdc (45 psia) and Loop 1 (param 105) to 0.70 vdc (19.5 psia)
Reconfig B/U C/W SM 60 SM TABLE MAINT ● ITEM 1 +0 6 1 2 6 0 0 EXEC ● ITEM 11 +4 5 EXEC ● ITEM 1 +0 6 1 2 7 0 0 EXEC ● ITEM 11 +1 9 . 5 EXEC	Reconfig B/U C/W SM 60 SM TABLE MAINT ● ITEM 1 + 0 6 1 2 7 0 0 EXEC ● ITEM 11 +4 5 EXEC ● ITEM 1 + 0 6 1 2 6 0 0 EXEC ● ITEM 11 + 1 9 . 5 EXEC

ECLS SSR−11
FES FEEDLINE PURGE

NOTE

Procedure provides evacuation of H2O from FES Feedlines in the event of dual htr failures or htr deactivation during major pwrdn. If purge of both feedlines is to be performed or if SPLY H2O dump reqd, perform dump before performing this procedure to provide ullage

L1 1. FLASH EVAP CNTLR PRI A − OFF
✓B − OFF
✓SEC − OFF

R11L 2. SPLY H2O DUMP ISOL VLV − CL (tb−CL)
✓VLV − CL (tb−CL)

3. Unstow (top drawer of IFM container):
Free Fluid Nozzle
Y/R QD Adapter
Towel

WCS 4. Install red−banded side of Y/R QD Adapter to Free Fluid Nozzle

NOTE

Hold Towel around Free Fluid Nozzle in the following step to soak up any H2O that leaks out of Nozzle during installation

5. Install yellow−banded side of Y/R QD Adapter to CONT H2O X−TIE POT QD

If only B FDLN requires purging:

NOTE

After evacuation of B FDLN, SPLY H2O can be managed in normal fashion by SPLY H2O dumps or boiling thru FES A SUPPLY WATER DUMP USING FES (ORB OPS, ECLS)

ML31L 6. SPLY H2O TKD OUTLET − CL (tb−CL)
R11L 7. TKA,TKB,TKC OUTLET − CL (tb−CL)
✓B SPLY ISOL VLV − OP
XOVR VLV − OP (tb−OP)
DUMP ISOL VLV − OP (tb−OP)
L1 8. RAD CNTLR OUT TEMP − HI
O1 9. When EVAP OUT T > 47 degF,
FLASH EVAP CNTLR PRI B − ON
10. When FES shuts down and EVAP OUT T again > 47 degF,
FLASH EVAP CNTLR PRI B − OFF, ON
11. Repeat step 10 until EVAP OUT T remains at ~57 degF,
then FLASH EVAP CNTLR PRI B − OFF
R11L 12. SPLY H2O B SPLY ISOL VLV − CL
XOVR VLV − CL (tb−CL)
13. DUMP ISOL VLV − CL (tb−CL)
14. TKB OUTLET − OP (tb−OP)
L2 15. FLASH EVAP FDLN HTR B SPLY − OFF
L1 16. ✓CNTLR SEC − A SPLY

If only A FDLN requires purging:

NOTE

After evacuation of A FDLN, SPLY H2O can be managed using FES B and SPLY H2O TKS C and/or D SUPPLY WATER DUMP USING FES (ORB OPS, ECLS)

R11L 17. SPLY H2O TKA,TKB OUTLET − CL (tb−CL)
✓XOVR VLV − CL (tb−CL)
DUMP ISOL VLV − OP (tb−OP)
L1 18. RAD CNTLR OUT TEMP − HI
O1 19. When EVAP OUT T > 47 degF,
FLASH EVAP CNTLR PRI A − ON
20. When FES shuts down and EVAP OUT T again > 47 degF,
FLASH EVAP CNTLR PRI A − OFF, ON
21. Repeat step 20 until EVAP OUT T remains at ~57 degF,
then FLASH EVAP CNTLR PRI A − OFF
R11L 22. SPLY H2O DUMP ISOL VLV − CL (tb−CL)
L2 23. FLASH EVAP FDLN HTR A SPLY − OFF
L1 ~ 24. CNTLR SEC − B SPLY

~
|
If both A,B FDLNs require purging:

NOTE
SPLY H2O can be managed by normal means after lines are refilled. Lines should be reevacuated after completion of dump

25. Perform steps 6 thru 11, then:
L1 FLASH EVAP CNTLR PRI A − ON
26. Perform steps 20 thru 22, then:
L2 27. FLASH EVAP FDLN HTR A,B SPLY (two) − OFF
L1 28. TOP EVAP HTR DUCT − OFF
NOZ L,R (two) − OFF
29. RAD CNTLR OUT TEMP − NORM
WCS 30. Remove Y/R QD Adapter from CONT H2O X−TIE POT QD
R11L SPLY H2O DUMP ISOL VLV − OP (tb−OP)
31. Stow Tools and Towel

NOTE
✓MCC for possible SPLY H2O DUMP after completion of procedure

ECLS SSR−12
AV BAY FIRE RECOVERY/RECONFIG

NOTES

1. This procedure is used to restore a single fault tolerance condition to orbiter after ORB PKT, PWRDN, AV BAY FIRE has been performed. It may be necessary to repower equipment in affected Av Bay to restore Single Fault Tolerance (SFT)

2. The following Reference Table identifies location of equipment to ensure SFT for entry:

Essential Equipment	Av Bay 1	Av Bay 2	Av Bay 3A
ANTISKID	X	X	
AUD CTR	1,2		
BRAKES	X	X	
COMM			X
C/W			X
OI MDM	OF1	OF2	OF3
OI DSC	OF1	OF2	OF3
PL MDM	PL1	PL2	
Minimum Equip reqd for SFT	**Av Bay 1**	**Av Bay 2**	**Av Bay 3A**
3 of 4 FF MDMs	FF1	FF2,FF4	FF3
3 of 4 ADTAs	1,3	2,4	
3 of 4 AAs	1,4	2,3	
2 of 3 MLSs	1	2,3	
2 of 3 TACANs	1	2	3
2 of 3 FMCAs	1	2	3
3 of 5 GPCs	1,4	2,5	3

3. Perform with MCC coverage, if possible
4. Recovery steps A,B, and C are reqd to provide valid smoke concentrations
5. Perform recovery steps D thru M if smoke conc stable or decreasing
6. FRCS dump will be 2 jet dump only

> CAUTION
> Do NOT close any cb(s) found open at time of fire that is normally closed. Unpower recovered component if smoke concentration increases during recovery

A. OI MDM RECOVERY (IF REQD)

If Av Bay 1 or 2 affected:

O14:B 1. cb MNA OI MDM OF 1/2 A − cl

If cb not reset then:

O15:B 2. cb MNB OI MDM OF 1/2 B − cl

If Av Bay 3A affected:

O14:B 3. cb MNA OI MDM OF 3/4 A − cl

If cb not reset then:

O16:B 4. cb MNC OI MDM OF 3/4 B − cl

SM 62 PCMMU/PL COMM

5. PCMMU I/O RESET PCM − ITEM 5 EXEC (*)

B. OI DSC RECOVERY (IF REQD)

If Av Bay 1 affected:

O14:B 1. cb MNA OI SIG CONDR OF 1/4 A − cl

If cb not reset, then:

O15:B 2. cb MNB OI SIG CONDR OF 1/4 B − cl

If Av Bay 2 or 3A affected:

O15:B 3. cb MNB OI SIG CONDR OF 2/3 A − cl

If cb not reset, then:

O16:B 4. cb MNC OI SIG CONDR OF 2/3 B − cl

C. AV BAY FAN RECONFIG

> CAUTION
> With Av Bay Fan activation, a momentary rise in smoke concentration may result. If smoke concentration continues to increase for > 1 min, unpower affected bay

If Av Bay 1 affected:

L4:G 1. cb AC2 ΦA,ΦB,ΦC AV BAY 1 FAN B (three) − cl

SM 67 ELECTRIC

Note AC2 AMPS

L1 2. AV BAY 1 FAN B − ON

If AC AMPS not incr 0.5−0.9 amps/Φ or AV BAY 1 FAN ΔP < 2.5 or > 4.3 (3.3 for 10.2 ops)

3. AV BAY 1 FAN B − OFF

If MCC not available, unpower Av Bay 1 >>

If Av Bay 2 affected:

L4:H 4. cb AC3 ΦA,ΦB,ΦC AV BAY 2 FAN B (three) − cl

SM 67 ELECTRIC

Note AC3 AMPS

L1 5. AV BAY 2 FAN B − ON

If AC AMPS not incr 0.5−0.9 amps/Φ or AV BAY 2 FAN ΔP < 2.5 or > 4.3 (3.3 for 10.2 ops)

6. AV BAY 2 FAN B − OFF

If MCC not available, unpower Av Bay 2 >>

If Av Bay 3A affected:

L4:H 7. cb AC1 ΦA,ΦB,ΦC AV BAY 3 FAN B (three) − cl

SM 67 ELECTRIC

Note AC1 AMPS

L1 8. AV BAY 3 FAN B − ON

If AC AMPS not incr 0.5−0.9 amps/Φ or AV BAY 3 FAN ΔP < 2.5 or > 4.3 (3.3 for 10.2 ops)

9. AV BAY 3 FAN B − OFF

If MCC not available, unpower Av Bay 3 >>

D. COMM RECOVERY (FOR AV BAY 1 ONLY) (IF REQD)

C3 1. AUD CTR − 1

If Voice comm not restored:

2. AUD CTR − 2

If Voice comm still not restored:

3. AUD CTR − OFF

4. Perform COMM SSR−1

E. COMM RECOVERY (FOR AV BAY 3A ONLY) (IF REQD)

If no comm:

A1L 1. NSP DATA RATE XMIT − HI
RCV − HI
UPLK DATA − S−BD
CODING XMIT − ON
RCV − ON
PWR − 1
ENCRYPTION PWR − ON
MODE − SEL
SEL − BYP
S−BD PM ANT SW ELEC − 1
PRE−AMP − 1
PWR AMPL STBY − 1
OPER − 1
XPNDR − 1

C3 2. S−BD PM CNTL − PNL

If comm not restored:

3. Perform COMM, 2.3a, then:

F. IMU FAN RECONFIG

SM 66 ENVIRONMENT

If Av Bay 1 affected:

L1 1. IMU FAN C(B) − OFF

CRT If IMU FAN ΔP < 3.7 or > 4.95

L1 2. IMU FAN C(B) − ON
C(B) − OFF

CRT 3. ✓IMU FAN ΔP OK

If Av Bay 2 affected:

L1 4. IMU FAN A(C) − OFF

CRT If IMU FAN ΔP < 3.7 or > 4.95

L1 5. IMU FAN A(C) − ON
C(A) − OFF

CRT 6. ✓IMU FAN ΔP ok

If Av Bay 3A affected:

L1 7. IMU FAN A(B) − OFF

CRT If IMU FAN ΔP < 3.7 or > 4.95

L1 8. IMU FAN A(B) − ON
B(A) − OFF

CRT 9. ✓IMU FAN ΔP OK

G. CAUTION AND WARNING RECOVERY (For AV BAY 3A only)

O13:C 1. cb ESS 2CA C/W B − cl (MA)

F2(F4,A7) 2. MSTR ALARM pb − off

O13:A 3. cb ESS 1BC C/W A − cl (MA)

F2(F4,A7) 4. MSTR ALARM pb − off

NOTE

C/W parameters must be reset to nominal on−orbit config since temporary loss of pwr has set hardware C/W parameters to their default values

R13U 5. Inhibit parameters specified for on−orbit ops on PRIMARY C/W PARAMETER MATRIX Cue Card

6. Use C/W & FDA TABLE (REF DATA) to reset limits for:

CH	Param
004	CAB PRESS
007	OMS TK P OX − L
017	OMS TK P FU − L
037	OMS TK P OX − R
047	OMS TK P FU − R
074	CAB FAN Delta P

7. C/W MEM − CLEAR

8. C/W PARAM SEL tw (three) − >119

H. AC BUS RECOVERY

If AC Bus is suspect, go to step 13

1. Isolate 3Φ bus per table →

(L4,MA73C)
cb − open all (3Φ,ΦA, ΦB,ΦC) on aff AC bus

Number of cb to open:

BUS		L4	MA73C
AC1	3Φ	1	4
	ΦA	15	5
	ΦB	15	4
	ΦC	12	5
AC2	3Φ	0	9
	ΦA	15	5
	ΦB	16	4
	ΦC	13	5
AC3	3Φ	1	7
	ΦA	15	3
	ΦB	16	3
	ΦC	12	3

NOTE

3Φ AC UTIL PWR cbs are located on pnl L4:B

SM 67 ELECTRIC

O13:A(C,E) 2. cb ESS 1BC (2CA,3AB) AC1(AC2,AC3) SNSR − cl

R1 3. Aff AC BUS SNSR − OFF

CAUTION
Following steps should be reviewed carefully prior to their execution since affected AC system may be tied into a short

Repower ΦA:

4. cb aff AC CONTR ΦA − cl
   Aff INV PWR − ON
   INV/AC BUS − ON

CRT ✓Aff AC VOLTS > 110 and < 120
✓Aff AC AMPS < 1

If AC VOLTS, AMPS limits exceeded:

5. Aff INV/AC BUS − OFF (tb−OFF)
   INV PWR − OFF (tb−OFF)
6. cb aff AC CONTR ΦA − op
7. Repeat steps 4 thru 6 for ΦB, then ΦC

If no phases recovered:

O13:A(C,E) 8. cb ESS 1BC(2CA,3AB) AC1(AC2,AC3) SNSR − op

If any phase recovered:

9. Aff AC BUS SNSR − AUTO
10. For recovered phases, all single Φ cbs − cl

If all 3 Φs recovered:

11. All 3Φ cbs − cl

If 2 or 3Φs recovered:

12. Perform FC RESTART, EPS SSR−6
13. Perform aff AC Bus Loss Actions (assume shorted Φ), if reqd

I. GPC RECOVERY

NOTE
Three of five GPCs reqd for single fault tolerance

If requirement not met:
Perform GNC REASSIGNMENT, DPS SSR−3
If first GPC recovery fails, then try other GPC, if available

J. FF MDM

NOTE
Three of four FF MDMs reqd for single fault tolerance. MDM FF2 reqd for FRCS dump

If requirements not met, reactivate MDM(s) in affected bay:

O6 MDM FF1(FF2,FF3,FF4) − ON
CRT GNC I/O RESET

K. PL MDM RECOVERY

O6 MDM PL1(PL2) − ON
CRT SM I/O RESET

L. ADTA, AA, MLS, TACAN

NOTE
Three of four ADTAs reqd for single fault tolerance.
Three of four AAs reqd for single fault tolerance.
Two of three MLSs reqd for single fault tolerance.
Two of three TACANs reqd for single fault tolerance

If requirement not met:
Perform FCS CHECKOUT, DISPLAY/DPS CONFIG and ON−ORBIT FCS CHECKOUT, PART 2 (ORB OPS, GNC) to verify equipment function in the affected Av Bay for single fault tolerance (as a minimum)

NOTE
Following FCS CHECKOUT, recovered equipment may be unpowered until deorb prep

M. FMCA

NOTE
Two of three FMCAs reqd for single fault tolerance

If requirement not met (confirmed by MCC):

MA73C:A MCA LOGIC MNA(MNB,MNC) FWD 1(2,3) − ON

ECLS SSR−13
ON−ORBIT RAD CNTLR SWITCH

NOTE

Procedure switches Radiator Controllers in affected Freon Coolant Loop Radiator. 10−sec pause is necessary to prevent movement of bypass vlv, thus eliminating possibility of bypass vlv failing in bypass. Expect possible 'S88 EVAP OUT T 1(2)' msg

L1 FLASH EVAP CNTLR PRI A,B,SEC (three) − OFF
If Freon Loop 1 aff:
  RAD BYP VLV MODE 1 − MAN
    CNTLR LOOP 1 − AUTO B(AUTO A)
  After 10 sec, RAD BYP VLV MODE 1 − AUTO
If Freon Loop 2 aff:
  RAD BYP VLV MODE 2 − MAN
    CNTLR LOOP 2 − AUTO B(AUTO A)
  After 10 sec, RAD BYP VLV MODE 2 − AUTO

If FES reqd, wait 4 min, then:
O1 If FREON EVAP OUT TEMP > 41 and ≤ 47 degF:
L1 RAD CNTLR OUT TEMP − HI
O1 When FREON EVAP OUT TEMP > 50 degF:
L1 RAD CNTLR OUT TEMP − NORM, then immediately,
      FLASH EVAP CNTLR PRI A(B) − ON
O1 If FREON EVAP OUT TEMP ≤ 41 or > 47 degF:
L1 FLASH EVAP CNTLR PRI A(B) − ON

ECLS SSR−14
ECLS COMPUTATION INHIBIT

TABLE A

REMOVAL OF FAILED/DEGRADED PPO2 SNSR FROM O2 CONCENTRATION COMPUTATION

SM 60 SM TABLE MAINT

If PPO2 SNSR A failed/degraded	If PPO2 SNSR B failed/degraded	If PPO2 SNSR C failed/degraded
CONSTANT ID − ITEM 16 +9 2 2 1 3 1 EXEC ✓Update of CONSTANT ID CONSTANT VALUE − ITEM 17 +0 EXEC ✓Update of CONSTANT VALUE	CONSTANT ID − ITEM 16 +9 2 2 1 3 2 EXEC ✓Update of CONSTANT ID CONSTANT VALUE − ITEM 17 +0 EXEC ✓Update of CONSTANT VALUE	CONSTANT ID − ITEM 16 +9 2 2 1 3 3 EXEC ✓Update of CONSTANT ID CONSTANT VALUE − ITEM 17 +0 EXEC ✓Update of CONSTANT VALUE
• Notify MCC of disabled constant		

TABLE B

O2 CONCENTRATION COMPUTATION INHIBIT

SM 60 SM TABLE MAINT

PARAM ID − ITEM 1 +9 2 2 1 0 4 EXEC
✓Update of PARA.03M ID
INH − ITEM 10 EXEC

• Notify MCC of inhibited parameter

TABLE C

EQUIVALENT dP/dT COMPUTATION INHIBIT

SM 60 SM TABLE MAINT

PARAM ID − ITEM 1 +9 2 4 9 3 5 EXEC
✓Update of PARAM ID
INH − ITEM 10 EXEC

• Notify MCC of inhibited parameter

TABLE D

REMOVAL OF FAILED/DEGRADED N2 TANK TEMP/PRESSURE FROM N2 QTY COMPS

Normally all temperature and pressure transducer flags are set to 1. If transducer fails, disable failed transducer's flag. For example, if SYS 1 N2 TANK 1 TEMP has failed, disable its flag, then the comp uses TK 2 TEMP in lieu of TANK 1 TEMP in the quantity computation. ✓MCC for multiple failures

SM 60 SM TABLE MAINT

Update CONSTANT ID:

ITEM 16 + _ _ _ _ _ _ _ EXEC (ID numbers below)
ITEM 17 + _ EXEC (1 = transducer is OK, 0 = transducer is faulty)

CONSTANT ID	NAME	CONSTANT ID	NAME
925521	SYS 1 N2 TANK 1 TEMP FLAG	925526	SYS 1 N2 TANK 4 TEMP FLAG
925522	SYS 1 N2 TANK 2 TEMP FLAG	925527	SYS 2 N2 TANK 3 TEMP FLAG
925523	SYS 2 N2 TANK 1 TEMP FLAG	925528	SYS 2 N2 TANK 4 TEMP FLAG
925524	SYS 2 N2 TANK 2 TEMP FLAG	925529	SYS 1 N2 PRESS FLAG
925525	SYS 1 N2 TANK 3 TEMP FLAG	925530	SYS 2 N2 PRESS FLAG

TABLE E

N2 TANK CONFIG

The following table is used to enable/disable N2 tank depending on whether or not it is flown. ✓MCC to verify vehicle config shown below. '*' designates flight−specific tanks

SM 60 SM TABLE MAINT

Update CONSTANT ID:

ITEM 16 + _ _ _ _ _ _ _ EXEC (ID numbers below)
ITEM 17 + _ EXEC (1 = tank active, 0 = tank inactive)

CONSTANT ID	NAME	VEHICLE CONFIG (ITEM 17)
925531	SYS 1 N2 TANK 1 FLAG	*
925532	SYS 1 N2 TANK 2 FLAG	*
925533	SYS 1 N2 TANK 3 FLAG	1
925534	SYS 1 N2 TANK 4 FLAG	1
925535	SYS 2 N2 TANK 1 FLAG	1
925536	SYS 2 N2 TANK 2 FLAG	1
925537	SYS 2 N2 TANK 3 FLAG	*
925538	SYS 2 N2 TANK 4 FLAG	*

ECLS SSR−16
FREE WATER LEAKING FROM HUM SEP

> CAUTION
> Leave one Humidity Sep running continuously. Deactivating both Humidity Separators simultaneously could cause further flooding of Humidity Sep and damage Humidity Sep when restarted

L1 1. HUM SEP A(B) − ON
B(A) − OFF

2. Perform LiOH STOWAGE VOLUME REMOVAL (IFM)

3. Clean up free water in Lower Equipment Bay
If practical, contact MCC prior to performing FREE FLUID DISPOSAL (IFM), for possible waste water dump; otherwise, use towels to soak up water. For remainder of flight, check pre/post−sleep daily for free water in Lower Equipment Bay. Report to MCC

4. If second HUM SEP LEAKS WATER, perform the following steps:
If any step stops water from leaking, >>

5. HUM SEP A,B (two) − ON
Monitor HUM SEP operation by checking for water around outlet screen. If over 15 min, Report to MCC

6. Depress H2O TKs:
✓Best HUM SEP − ON
Other HUM SEP − OFF
FLASH EVAP CNTLR PRI A(B) − OFF
MO10W H2O TK N2 ISOL SYS 1,SYS 2 vlv (two) − CL
ML26C SPLY H2O GN2 TK VENT vlv − VENT
✓TKA SPLY vlv − OP
Expect audible vent and 'S66 WASTE H2O PRES' alert for Waste Press '↓' (See SSR−17 for H2O dumps)

7. Perform HUM SEP AIR OUTLET H2O ABSORPTION (IFM)

8. Go to HUM SEP CONTINGENCY H2O REMOVAL (IFM)

ECLS SSR−17
WATER TANK REPRESS/DEPRESS

NOTE

This SSR may be reqd for water dumps in the event water tanks are depressed for humidity separator problems. Repressing water tanks for supply or waste water dumps decreases amount of time reqd for dump

1. Start repress ~30 min prior to water dump

ML26C 2. SPLY H2O GN2 TK VENT vlv − PRESS
✓TKA SPLY vlv − OP

MO10W 3. H2O TK N2 REG INLET SYS 1,SYS 2 vlv (two) − OP
ISOL SYS 1,SYS 2 vlv (two) − OP
Expect 'S66 CAB H2O N2 P1,P2' msgs for H2O TK N2 P '↓'

4. Perform SUPPLY(WASTE) WATER DUMP (ORB OPS, ECLS)
Depress Tanks

5. H2O TK N2 ISOL SYS 1,SYS 2 vlv (two) − CL

ML26C 6. SPLY H2O GN2 TK VENT vlv − VENT
✓TKA SPLY vlv − OP
Expect audible vent and 'S66 WASTE H2O PRES' alert for Waste Press '↓'

7. Visually inspect Lower Equipment Bay for free water
Report to MCC

ECLS SSR−18
SMALL SUPPLY H2O LEAK ISOL

NOTE

This procedure assumes that MCC is available for assistance and would inform crew of tank C leak (which is normally isolated) or dump line leak at nozzle. This procedure also assumes that tanks B, D are tied together and that tank C is isolated. Also note that Supply H2O tanks remain pressurized during troubleshooting

SM 66 ENVIRONMENT

L1 1. FLASH EVAP CNTLR PRI A,B − OFF
R11L SPLY H2O XOVR vlv − CL (tb−CL)
B SPLY ISOL VLV − CL (tb−CL)
MCC,CRT If no TK QTY decr or incr at a reduced rate:
Perform steps 8, 10 >>
R11L SPLY H2O DUMP ISOL VLV − CL (tb−CL)
MCC,CRT If no SPLY H2O TK QTY decr or incr at a reduced rate:
Perform steps 8−11 >>
SPLY H2O DUMP ISOL VLV − OP (tb−OP)

SM 177 EXTERNAL AIRLOCK

MO13Q ARLK H2O S/O VLV − CL (tb−CL)
If H2O XFER P decr or ~0:
Perform steps 8,9,10,12 >>
MO13Q ARLK H2O S/O VLV − OP (tb−OP)

CRT 2. If SPLY H2O TK QTY D decr:
ML31C SPLY H2O TK D INLET, OUTLET (two) − CL (tb−CL)
CRT If SPLY H2O TK QTY D decr:
Perform step 6
Perform SUPPLY/WASTE WATER DUMP (ORB OPS, ECLS) for TK D on MCC call
ML31C SPLY H2O TK D INLET, OUTLET (two) − CL (tb−CL)
Perform steps 7−11 >>
MCC,CRT If SPLY H2O TK QTY B decr or incr at a reduced rate:
Perform steps 6, 8, 9, 11 >>
MCC,CRT If no SPLY H2O TK QTY decr or incr a reduced rate:
Perform steps 9−11 >>
CRT 3. If SPLY H2O TK QTY A > 90% (on MCC call):
R11L SPLY H2O TK A OUTLET − OP (tb−OP)
✓B OUTLET − OP (tb−OP)
CRT When SPLY H2O TK QTY A < 80% or MCC call:
R11L SPLY H2O TK A OUTLET − CL (tb−CL)
Go to step 4 or 5 based on H2O tank qty observation

CRT 4. If SPLY H2O TK QTY B decr:
R11L SPLY H2O TK B INLET,OUTLET (two) − CL (tb−CL)
CRT If SPLY H2O TK QTY B decr:
Perform step 6
Perform SUPPLY/WASTE WATER DUMP (ORB OPS, ECLS) for TK B on MCC call
R11L SPLY H2O TK B INLET,OUTLET (two) − CL (tb−CL)
Perform steps 7−11 >>
AW82B If PRESS H2O decr or ~0:
Perform steps 9−11 using FES CNTRL PRI B on MCC call
R11L SPLY H2O TK B INLET − OP (tb−OP) >>
Perform steps 6, 8, 9, 11 (leak at tank B inlet manifold)
SPLY H2O TK B OUTLET − OP (tb−OP) >>
MCC,CRT 5. If SPLY H2O TK QTY A decr or incr at reduced rate:
R11L SPLY H2O GALLEY SPLY VLV − CL (tb−CL)
MCC,CRT If SPLY H2O TK QTY A decr or incr at reduced rate:
R11L SPLY H2O TK A INLET − CL (tb−CL)
MD23R Open middeck pnl and disconnect lower (FC) QD on microbial filter
CRT If SPLY H2O TK QTY A decr:
Perform step 6
Perform SUPPLY/WASTE WATER DUMP (ORB OPS, ECLS) for TK A on MCC call
SPLY H2O TK A INLET, OUTLET (two) − CL (tb−CL)
Perform steps 7−11 >>
CRT If SUPPLY H2O PRESS ~15:
Perform steps 8−11
✓MCC to restore Galley ops >>
MD23R Open middeck pnl and reconnect lower (FC) QD on microbial filter
R11L SPLY H2O GALLEY SPLY VLV − OP (tb−OP)
MD80R Open middeck pnl and inspect for free H2O
Perform steps 6, 8, 9, 11 on MCC call
Perform steps 8−11 on MCC call
✓MCC to restore Galley ops >>

ECLS SSR−18 (Cont)

MO10W 6. H2O TK N2 ISOL SYS 1,SYS 2 vlv − CL
ML26C SPLY H2O GN2 TANK A SPLY − OP
VENT − VENT
Expect audible vent and ‘S66 WASTE H2O PRES’ alert for Waste Pres ‘↓’

ML26C 7. SPLY H2O GN2 TANK A SPLY − OP
VENT − PRESS
MO10W H2O TK N2 ISOL SYS 1,SYS 2 vlv − OP
Expect ‘S66 CAB H2O N2 P1, P2’ msgs for H2O TK N2 P ‘↓’

R11L 8. SPLY H2O XOVR vlv − OP (tb−OP)
9. B SPLY ISOL VLV − OP (tb−OP)
10. Perform TOPPING FES STARTUP (ORB OPS, ECLS)
11. Visually inspect LEB and perform FREE FLUID DISPOSAL (IFM) as reqd
12. Visually inspect Middeck floor (water line close out area) and Ext A/L
Go to FREE FLUID DISPOSAL (IFM) as reqd

ECLS SSR−19
SMALL WASTE H2O LEAK ISOL

This procedure assumes that MCC is available for assistance.
This procedure has the Waste Tank pressurized for a portion of troubleshooting

SM 66 ENVIRONMENT

CREW 1. Report any increase in pungent odor
ML31C WASTE H2O DUMP ISOL VLV − CL (tb−CL)
CRT 2. If WASTE H2O QTY 1 decr:
L1 HUM SEP A,B − OFF
Terminate WCS use
ML31C WASTE H2O TK 1 VLV − CL (tb−CL)
CRT If WASTE H2O QTY 1 decr:
L1 3. FLASH EVAP CNTLR PRI A,B − OFF
MO10W H2O TK N2 ISOL SYS 1,2 vlv (two) − CL
ML26C ✓SPLY H2O GN2 TANK A SPLY − OP
VENT − VENT
Expect 'S66 WASTE H2O PRES' msg
MCC,CRT If WASTE H2O QTY 1 decr AT SAME RATE with no pungent odor (Bellows leak):
Perform steps 5, 6, 8 >>
4. Perform SUPPLY/WASTE WATER DUMP (ORB OPS, ECLS) for WST TANK
ML31C WST H2O TK 1 VLV − CL (tb−CL)
Perform steps 5, 6, 8 >>
Perform steps 7, 8, 9
✓MCC for Waste Dump plan >>

CLEAN UP STEPS
5. ✓MCC to install CWC at CONT − XTIE/WST H2O QD
6. ✓MCC to install WST TK N2 Supply with IFM
7. ✓MCC to install CWCs at Humidity Separator outlet and WCS Urine QD
ML26C 8. ✓SPLY H2O GN2 TANK A SPLY − OP
VENT − PRESS
MO10W H2O TK N2 ISOL SYS 1,2 vlv (two) − OP
Expect 'S66 CAB H2O N2 P1, P2' msgs for H2O TK N2 P '↓'
L1 HUM SEP B − ON
Perform TOPPING FES STARTUP (ORB OPS, ECLS)
Continue WCS ops as reqd
9. ✓MCC to perform SUPPY(WASTE) H2O PURGE FROM DUMP LINE(S) (IFM)

ECLS SSR−20
SMALL SUPPLY H2O LEAK ISOL − WATER TRANSFER CONFIGURATION

NOTE

This procedure assumes that the Supply Water System is in a Water Transfer Configuration and MCC is available for assistance. Also note that Supply H2O tanks require pressurization during troubleshooting. Suspend galley use until procedure is complete or on MCC GO

SM 66 ENVIRONMENT

L1 FLASH EVAP CNTLR PRI A,B (two) − OFF

A. DETERMINE A/B OR C/D LEAK

MCC/CRT If SPLY H2O QTY C,D decr or filling at a decr rate:

If SPLY H2O QTY A,B > 90%, provide ullage in TKs A,B (on MCC call):

1. Perform steps 4−5 of CWC FILL using SHUTTLE/ISS H2O CONTAINER FILL (ORB OPS, ECLS); no samples or additives required

When SPLY H2O QTY A < 80% or on MCC call:

2. Perform step 9 of CWC FILL using SHUTTLE/ISS H2O CONTAINER FILL (ORB OPS, ECLS), then:

3. If SPLY H2O QTY C,D still decr or filling at a decr rate, continue procedure at step 31; otherwise, continue with step B

B. DETERMINE IF EXTERNAL AIRLOCK FLOWN

SM 177 EXTERNAL AIRLOCK

MO13Q 4. ARLK H2O S/O VLV − CL (tb−CL)

MCC/CRT If H2O XFER P decr or ~0 (leak in External Airlock H2O Transfer Line):

5. Visually inspect middeck floor (water line closeout area) and Ext A/L
6. Perform step 54 using FES PRI B on MCC call >>

SM 66 ENVIRONMENT

C. LEAK DETERMINATION A/B SIDE

MCC/CRT If SPLY H2O QTY A,B decr or filling at a decr rate:

R11L 7. SPLY H2O GALLEY SPLY VLV − CL (tb−CL)

MCC/CRT If SPLY H2O QTY A,B incr at nominal rate (leak in Galley):

8. Perform steps 53−54 using FES PRI B on MCC call
9. ✓MCC to restore Galley ops >>

R11L 10. SPLY H2O DUMP ISOL vlv − CL (tb−CL)

MCC/CRT If SPLY H2O QTY A,B incr at nominal rate (leak in Supply H2O Dump Line):

11. Perform steps 52−55 using FES PRI B on MCC call >>

R11L 12. SPLY H2O TKA INLET − CL (tb−CL)

13. TKA,B OUTLET (two) − CL (tb−CL)

MCC/CRT If SPLY H2O QTY A decr (leak in TK A):

ML86B:A 14. cb MNB SPLY H2O TK B INLET − cl

R11L 15. SPLY H2O TKB INLET − OP (tb−OP)

16. Perform SUPPLY/WASTE WATER DUMP (ORB OPS, ECLS) for TK A on MCC call; dump TK A to ~0%, then:

17. ✓MCC to restore Galley ops

18. Perform steps 51−55 using FES PRI B on MCC call >>

MCC/CRT If SPLY H2O QTY B decr (leak in TK B):

R11L 19. SPLY H2O TKA INLET − OP (tb−OP)

20. Perform SUPPLY/WASTE WATER DUMP (ORB OPS, ECLS) for TK B on MCC call; dump TK B to ~0%, then:

21. Perform steps 51−55 using FES PRI B on MCC call >>

MCC/CRT If SPLY H2O QTY C,D not filling or filling at a decr rate (leak in Inlet Manifold or Galley Supply Line):

22. Open LEB access pnl on middeck floor and disconnect lower (FC) QD from Microbial Filter (IFM, IFM PROCEDURES, GALLEY, FAILED SUPPLY LINE, BYPASS, step 1)

If SPLY H2O QTY C,D filling at a nominal rate (leak in Galley Supply Line):

23. ✓MCC to restore Galley ops
24. Perform steps 51, 53−55 >>

If SPLY H2O QTY C,D still not filling or filling at a decr rate (leak in A/B Inlet Manifold; depress H2O Tanks):

25. Open LEB access pnl on middeck floor and reconnect lower (FC) QD from Microbial Filter
26. Perform steps 48−53, 55 >>

If SPLY H2O QTY A,B not decr (leak in TK A/B Outlet Manifold):

ML86B:A 27. cb MNB SPLY H2O TK B INLET − cl

R11L 28. SPLY H2O TKA,B INLET (two) − OP (tb−OP)

29. Open LEB access pnl on middeck floor and reconnect lower (FC) QD to Microbial Filter

30. Perform steps 54−55 using FES PRI B on MCC call >>

Cont next page

ECLS SSR−20 (Cont)

D. LEAK DETERMINATION C/D SIDE

MCC/CRT If SPLY H2O QTY C,D decr:
R11L 31. SPLY H2O B SPLY ISOL VLV − CL (tb−CL)

MCC/CRT If SPLY H2O QTY C,D const (leak in FES Feedline B):
32. Perform step 54 using FES PRI A on MCC call >>
R11L 33. SPLY H2O TKC INLET,OUTLET (two) − CL (tb−CL)
ML31C 34. TKD INLET,OUTLET (two) − CL (tb−CL)

MCC/CRT If SPLY H2O QTY C decr (leak in TK C):
R11L 35. SPLY H2O B SPLY ISOL VLV − OP (tb−OP)
ML31C 36. TKD INLET − OP (tb−OP)
37. Perform SUPPLY/WASTE WATER DUMP (ORB OPS, ECLS) for TK C on MCC call; dump TK C to ~0% >>

MCC/CRT If SPLY H2O QTY D decr (leak in TK D):
R11L 38. SPLY H2O B SPLY ISOL VLV − OP (tb−OP)
39. TKC INLET − OP (tb−OP)
40. Perform SUPPLY/WASTE WATER DUMP (ORB OPS, ECLS) for TK D on MCC call; dump TK D to ~0% >>

MCC/CRT If SPLY H2O QTY A,B,C,D filling at a nominal rate (leak in TK C/D Outlet Manifold):
R11L 41. SPLY H2O TKC INLET − OP (tb−OP)
ML31C 42. TKD INLET − OP (tb−OP)
43. Perform steps 54−55 using FES PRI A on MCC call >>

MCC/CRT If SPLY H2O QTY A,B decr or filling at a decr rate (leak in TK C/D Inlet Manifold; depress H2O Tanks):
R11L 44. SPLY H2O TKC OUTLET − OP (tb−OP)
45. B SPLY ISOL VLV − OP (tb−OP)
ML31C 46. TKD OUTLET − OP (tb−OP)
47. Perform steps 48−51, 55 >>

E. CLEAN UP STEPS

MO10W 48. H2O TK N2 ISOL SYS 1,2 vlv (two) − CL
ML26C 49. ✓SPLY H2O GN2 TK A SPLY vlv − OP

NOTE
Expect audible vent and 'S66 WASTE H2O PRES' alert for WASTE H2O PRESS ↓

50. SPLY H2O GN2 TK VENT vlv − VENT
R11L 51. DUMP ISOL − OP (tb−OP)
52. GALLEY SPLY VLV − OP (tb−OP)
MO13Q 53. ARLK H2O S/O VLV − OP (tb−OP)
54. If FES reqd, perform TOPPING FES STARTUP (ORB OPS, ECLS), then:
55. Visually inspect LEB and perform FREE FLUID DISPOSAL (IFM, PROCEDURES S THRU Z), as reqd

ECLS FRP−1
MANUAL CABIN ATMOSPHERE MANAGEMENT

NOTE
This procedure assumes Cabin P < 14.7 psi and is structured to flow N2 from PCS 1 and flow O2 from PCS 2, with metabolic makeup from Bleed Orifice

If SETUP completed, go to CABIN REPRESS

SETUP

L2 O2/N2 CNTLR VLV SYS 1 − OP
2 − CL

C7 ✓LEH O2 SPLY vlv (two) − OP

MO10W 14.7 CAB REG INLET SYS 1,SYS 2 vlv (two) − CL
O2 REG INLET SYS 1,SYS 2 vlv (two) − OP

MA9L Unstow O2 Bleed Orifice Assembly

MO69M ✓LEH O2 8 vlv − CL
Insert O2 Bleed Orifice Assembly into LEH O2 8 QD
LEH O2 8 vlv − OP

CABIN REPRESS

SET C&W LIMITS

PARAMETER NAME	C/W CH	H/W C/W HI V	ENA/ INH	PARA ID	B/U C/W HI EU
PPO2 A	34	3.40		0612511	3.40
PPO2 B	44	3.40		0612513	3.40

NOTE
Expect possible 'S66 CAB O2 FLO 2' C&W alarm during execution of next step

MO10W 14.7 CAB REG INLET SYS 2 vlv − OP

* If C&W alarm:
* CABIN ATM and/or B/U 'S66 CABIN PPO2 A(B)'
*
* NOTE
* Expect possible 'S66 CAB N2 FLO 1' C&W alarm
* during execution of next step
*
* 14.7 CAB REG INLET SYS 2 vlv − CL
* 1 vlv − OP
*
* When N2 FLOW SYS 1 < 1.0 or CABIN PRESS > 14.7,
* 14.7 CAB REG INLET SYS 1 vlv − CL

When O2 FLOW SYS 2 < 1.0 or CABIN PRESS > 14.7,
14.7 CAB REG INLET SYS 2 vlv − CL

If prior to sleep:
14.7 CAB REG INLET vlv (two) − CL

RESET C&W LIMITS

PARAMETER NAME	C/W CH	H/W C/W HI V	ENA/ INH	PARA ID	B/U C/W HI EU
PPO2 A	34	3.60		0612511	3.60
PPO2 B	44	3.60		0612513	3.60

Pen and Ink PRE−SLEEP ACTIVITY (ORB OPS, CREW SYS) to perform this procedure each sleep period if necessary

ECLS FRP−2
POST−FIRE CABIN CLEANUP CONTINUATION

NOTE
This procedure is applicable to both avionics bay fires and cabin fires

1. Every 15 min perform the following:
   a. Record MET and CSA−CP scan location (general)
      LOCATION: _____
   b. Record contaminant levels
   c. Report contaminant levels to MCC

	Time (MET)	O2%	CO	HCN	HCL
1	: :				
2	: :				
3	: :				
4	: :				
5	: :				
6	: :				
7	: :				
8	: :				

LiOH/ATCO/CHARCOAL CHANGEOUT CRITERIA

If ATCO canister not yet installed:

2. When HCL < 5 ppm, install ATCO (in place of one LiOH canister)

If CO2 Removal Sys flown:

3. Replace charcoal canister after 2 hr
4. When HCN < 0.7 ppm or stable, replace charcoal canister with LiOH canister

If no CO2 Removal Sys flown:

5. Every 15 min replace one LiOH canister
6. When HCN < 0.7 ppm or stable, changeout LiOH canister(s) per preflight schedule

7. When CO < 55 ppm replace ATCO canister with LiOH canister

> WARNING
> If any crewmember exhibits adverse symptoms when visors are raised, lower all visors. Symptoms could include the following:
> Irritation of the eyes, nose, throat
> Cough, difficulty breathing
> Headache, nausea

8. Raise visors on MCC call

* If loss of communications, visors/QDMs down until all the following limits are met: *
* No visible indication of smoke in cabin *
* Cabin smoke detector readings are < 1.2 *
* No symptoms of smoke inhalation *
* HCN < 0.7 ppm HCL < 1 ppm CO < 20 ppm *

9. If symptoms experienced prior to donning QDM/LES, QDM/LES may be doffed only if all crewmembers are symptom free for > 10 min

10. If CO2 Removal Sys flown, on MCC call, perform CO2 REMOVAL SYS CNTLR 1(2) CONFIG (ORB OPS, ECLS), then:

11. If QDM/visor flow must continue, initiate O2 control: perform CONTINGENCY CABIN O2 CONTROL, ECLS, FRP−3; otherwise, ✓MCC for backout steps >>

ECLS FRP−3
CONTINGENCY CABIN O2 CONTROL

SM SYS SUMM 1
SM 66 ENVIRONMENT

NOTE

This procedure is applicable for:
- Cabin/Av Bay Fire
- Level 4 Hazardous Spill
- Unisolatable O2 Leak into cabin

For Av Bay fires: Ensure purge initiated before start of depress

TMAX DETERMINATION

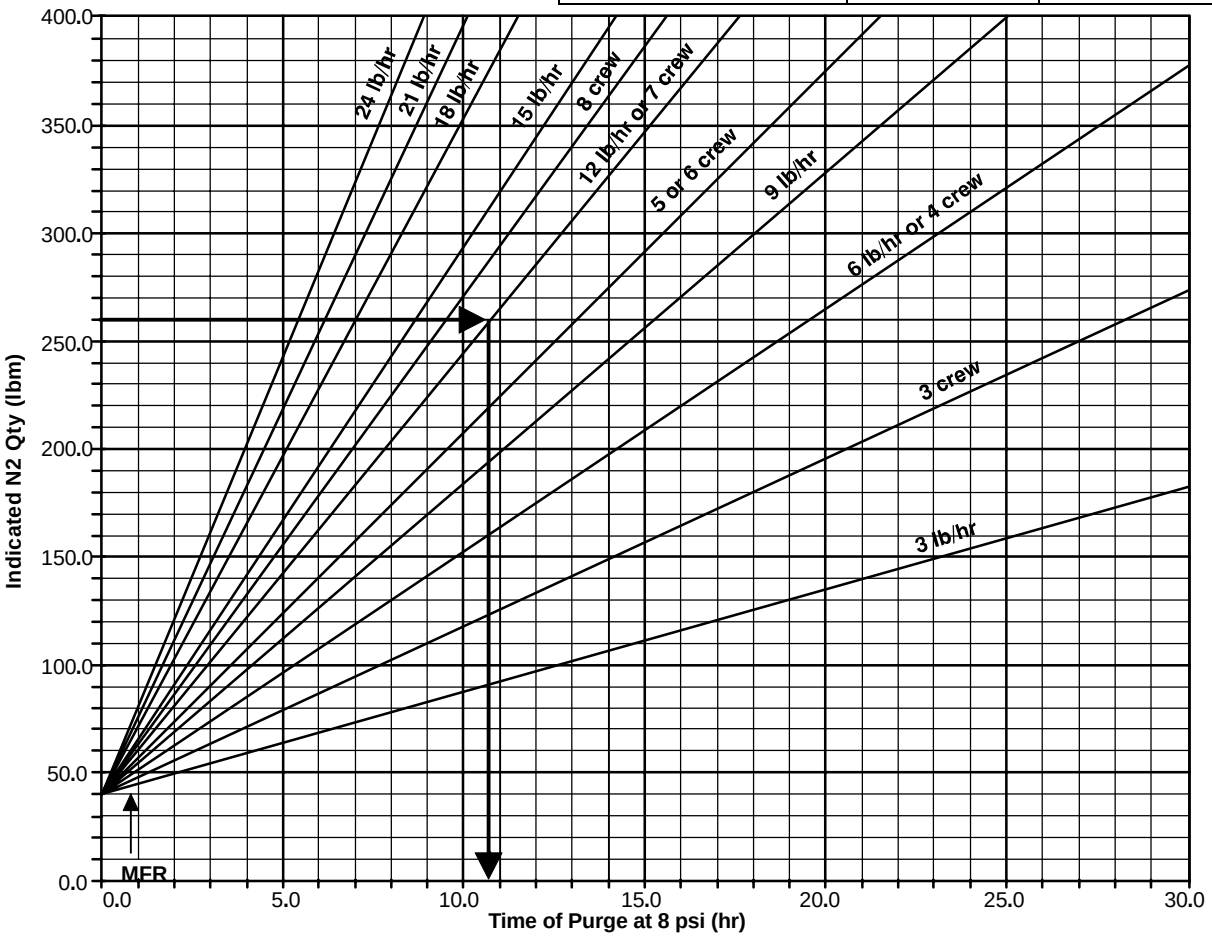
1. Determine TMAX from table & graph below:

If ASC, use the following for N2 Qty:
- 4 N2 tanks: 260 lbs N2
- 5 N2 tanks: 325 lbs N2
- 6 N2 tanks: 390 lbs N2

2. If TMAX < 3 hr, install ATCO if not already performed

a. Time to 8 psi (from chart at right) _____hr
b. Time of purge (from graph below) +_____hr
− 1:00 hr
Latest TIG:
c. TMAX =_____hr

CAUSE		Time to 8 psi in hr	
		From 14.7 psi	From 10.2 psi
Fire (Cab/Av Bay)		1.55	0.67
Haz Spill		1.55	0.67
O2 Leak	3 lbm/hr	5.83	2.50
	6 lbm/hr	2.95	1.28
	9 lbm/hr	2.13	0.95
	12 lbm/hr	1.55	0.67
	15 lbm/hr	1.18	0.52
	18 lbm/hr	0.97	0.45
	21 lbm/hr	0.80	0.38
	24 lbm/hr	0.70	0.33



DEPRESS & PURGE SETUP

MO32M, MO69M, C6 3. LEH 1(2 . . . 8) − OP (as reqd)

L2 4. O2 XOVR SYS 1,2 (two) − OP

5. O2/N2 CNTLR VLV SYS 1,2 (two) − OP (N2 flow)

If LES helmet donned:

6. TABS/Visor − CL

7. LES O2 − ON

MO10W 8. 14.7 CAB REG INLET SYS 1,SYS 2 vlv (two) − CL

9. O2 REG INLET SYS 1,SYS 2 vlv (two) − CL

START DEPRESS TO 8 PSI

AW82B 10. AIRLK DEPRESS vlv cap − vent, remove, stow

11. Throttle AIRLK DEPRESS vlv until desired EQ dP/dT is established as follows per table below; tape in place (dP/dT sensor response lags approx 1 min)

CAUSE	EQ dP/dT	AIRLK DEPRESS VLV CONFIG
Fire (Cab/Av Bay)	− 0.10	Throttled
Haz Spill	− 0.10	Throttled
O2 Leak − 3 (lbm/hr)	− 0.02	Throttled
6	− 0.04	Throttled
9	− 0.07	Throttled
12	− 0.10	Throttled
15	− 0.13	Throttled
18	− 0.16	Throttled
21	− 0.19	Throttled
24	− 0.22	Throttled

NOTE

If SM SYS SUMM not available, EQ dP/dT = dP/dT x 14.7/Cab Press

If prior to OPS 3, when Cab Press < 10.0 psia:

12. CM1 perform LOSS OF CAB PRESS PWRDN (ORB PKT, PWRDN)
CM2 continue with procedure

O2 MANAGEMENT DURING 8 PSIA PURGE

When Cab Press = 8 psia:

Maintain PPO2 between 2.8 and 3.05 psia for the duration of purge

13. Close Inner Hatch

If O2 leak ≤ 9 lb/hr or ≤ 4 crew on QDM/LESs:

INNER HATCH
14. EQUAL vlv (one) − OFF
Other EQUAL vlv − NORM, capped

When PPO2 ≥ 3.05:

15. EQUAL vlv (without cap) − NORM, install cap

When PPO2 ≤ 2.8:

16. EQUAL vlv (one) − remove cap, OFF
17. Continue O2 mgmt per steps 15, 16

18. When ready for entry or LES/QDMs no longer reqd, go to step 24

INNER HATCH
19. EQUAL vlv (without cap) − NORM, install cap

When PPO2 ≥ 3.05:

20. EQUAL vlv cap (one) − remove, temp stow

When PPO2 ≤ 2.8:

21. EQUAL vlv cap − reinstall
Other EQUAL vlv − NORM, capped
22. Continue O2 mgmt per steps 20, 21

23. When ready for entry or LES/QDMs no longer reqd, go to step 24

END PURGE AND REPRESS

NOTE

~82 lbm N2 reqd for total repress from 8 psia

24. Prepare for entry or purge termination

If QDM/Visor O2 reqd through entry:

25. Post D/O Burn:

MO10W
14.7 CAB REG INLET SYS 1,SYS 2 (two) − OP >>

If QDM/Visor O2 no longer reqd:

INNER HATCH
26. Inner hatch EQUAL vlv caps (two) − remove, stow
EQUAL vlv (two) − NORM

27. When ΔP < 0.5, open, stow Inner Hatch

AW82B
28. AIRLK DEPRESS vlv − CL

29. vlv cap − reinstall

L2
30. O2/N2 CNTLR SYS 2 − AUTO

MO10W
31. O2 REG INLET SYS 2 − OP

32. 14.7 CABIN REG INLET SYS 1,SYS 2 (two) − OP

If Av Bay fire, ✓MCC to terminate AV BAY PURGE

33. Disconnect, stow IFM hoses and free fluid nozzle

If Cab Press > 13 psia following repress, backout of LOSS OF CAB PRESS PWRDN may be performed

If N2 not depleted after repress, reconfig PCS:

34. Go to PCS 1(2) CONFIG (ORB OPS, ECLS)

BFS FSM INDEX 7–6

7.1 FC REAC/PMP/STACK T
- 7.1a RESERVED . . . . . not used
- 7.1b 'S69 FC STACK T 1(2,3)' – FC STACK T 1(2,3) ↑↓ 7–8
- 7.1c 'S69 FC H2 PUMP 1(2,3)' – H2 PUMP ↑↓ 7–12

7.2 FC PURGE
- 7.2a RESERVED . . . . . not used
- 7.2b 'FC PURGE TEMP' – FC PURGE TEMP 7–14
- 7.2c 'FC PURGE SEQ' – FC PURGE SEQ 7–14

7.3 FUEL CELL
- 7.3a 'S69 FC PH 1(2,3)' / 'S69 H2O LN PH' – FC/H2O LINE pH HIGH 7–16
- 7.3b 'S69 FC AMPS 1(2,3)' / 'S67 MAIN BUS V A(B,C)' / 'S69 FC VOLTS 1(2,3)' – FUEL CELL VOLTS ↑↓, FUEL CELL AMPS ↑↓, MAIN BUS V A(B,C) ↑↓ 7–18
- 7.3c RESERVED . . . . . not used
- 7.3d 'S69 FC EXIT T 1(2,3)' – FUEL CELL EXIT T ↑↓ 7–23
- 7.3e 'S69 FC COOL P 1(2,3)' – FUEL CELL COOL P ↑↓ (CIL) 7–26
- 7.3f 'S69 FC H2O PRI 1(2,3)' – FUEL CELL H2O LN T ↑↓ 7–31
- 7.3g 'S69 FC H2O RLF 1(2,3)' / 'S69 FC H2O RLF LINE' – FUEL CELL H2O RLF VLV T ↑↓, FUEL CELL H2O RLF LINE T ↑↓ 7–32
- 7.3h RESERVED . . . . . not used
- 7.3i 'S69 FC PRG LN O2(H2)' – FUEL CELL O2(H2) PURGE LN T ↑ 7–33
- 7.3j 'S69 FC O2(H2) FLOW 1(2,3)' – FUEL CELL O2(H2) FLOW ↑ 7–34
- 7.3k 'S69 FC H2O RLF HTR' – FUEL CELL RELIEF HTR SW FAIL 7–37
- 7.3l 'S69 FC H2O ALT' – FUEL CELL ALT H2O RLF T ↑↓ 7–38
- 7.3m 'S69 DELTA AMPS 1(2,3) ↑↓' – FC DELTA AMPS ↑↓ 7–39

7.4 DC VOLTAGE
- 7.4a RESERVED . . . . . not used
- 7.4b '168 PALLET V A(B)' – PALLET VOLTS ↓ 7–40
- 7.4c '168 PALLET T' – PALLET TEMP ↑↓ 7–41

7.5 AC VOLTAGE/OVLD
- 7.5a 'S67 AC VOLTS 1(2,3)' – AC VOLTS 1(2,3) ↓↑ 7–42
- 7.5b 'S67 AC OVLD 1(2,3) ↓' – AC OVLD 1(2,3) ↓ 7–47
- 7.5c 'S67 AC AMPS 1(2,3)' – AC BUS CURRENT HIGH 7–54

7.6 CRYO

CRYO TABLE A – CRYO HEATER SWITCH PROCEDURAL NOMENCLATURE 7–58

7.6a RESERVED . . . . . not used

7.6b 'S68 O2(H2) CNTL P 1(2,3,4,5)'
'168 O2(H2) CNTL P 6(7,8,9)'
'168 O2(H2) TK P 6(7,8,9)'
'S68 O2(H2) TK P 1(2,3,4,5)' – CRYO O2(H2) PRES, TK P ↓↑ 7–59

7.6c RESERVED . . . . . not used

7.6d 'S68 O2(H2) MANF PRESS' – O2(H2) MANF P ↓ 7–63

7.6e RESERVED . . . . . not used

7.6f 'S68 H2 HTR T 1(2,3,4,5)'
'168 H2 HTR T 6(7,8,9)' – H2 HTR T 7–64

7.6g RESERVED . . . . . not used

7.6h RESERVED . . . . . not used

7.6i RESERVED . . . . . not used

7.6j RESERVED . . . . . not used

7.6k 'S68 O2 HTR TRP 1(2,3,4,5)'
'168 O2 HTR TRP 6(7,8,9)' – O2 HTR CUR SNSR = TRIP 7–65

7.6l 'S68 O2 HTR T 1(2,3,4,5)
'168 O2 HTR T 6(7,8,9)' – O2 HTR T 7–66

EPS SSR

EPS SSR–1 FC MONITORING SYS (FCMS) OPS 7–68

SSR–2 RESERVED . . . . . not used

SSR–3 FC SHUTDN C&W LIMIT CHANGE 7–70

SSR–4 FC STANDBY 7–74

SSR–5 RESERVED . . . . . not used

SSR–6 FC RESTART 7–77

SSR–7 TWO–PHASE FAN START PROCEDURE 7–85

SSR–8 BUS LOADING – LRU SELECT 7–91

SSR–9 RESERVED . . . . . not used

The following msgs have support procedures in the ORB PKT, but not in this book:

'S69 FC REAC 1(2,3)↓'
'S69 FC PUMP 1(2,3)↓'
'S69 FC DELTA V 1(2,3)'
'S69 FC H2O RLF NOZ'
'S67 ESS BUS V 1BC(2CA,3AB)'
'S67 CNTL BUS V'
'S67 CNTL RPC'

The following msgs have no support procedures in this book or in ORB PKT C/L:

'S67 APC/ALC A(B,C)'
'S67 FPC/FLC 1(2,3)'
'S67 MPC 1(2,3)'
'S68 O2(H2) MANF VLV'
'S69 FC READY 1(2,3)'
'FC PURGE 1(2,3)'

EXPLANATORY NOTES FOR BUS LOSS SSRs 7–92
EPS SSR–10 MNA DA1 (CIL) 7–96
SSR–11 FPC1 (CIL) 7–105
SSR–12 MPC1 7–108
SSR–13 APC1 7–110
SSR–14 APC4 7–111
SSR–15 FLC1 (CIL) 7–114
SSR–16 ALC1 7–115
SSR–17 FMC1 7–117
SSR–18 MMC1 7–117
SSR–19 MMC3 7–118
SSR–20 AMC1 7–119
SSR–21 R14 7–120
SSR–22 O14&A8 7–121
SSR–23 O14 7–122
SSR–24 R1A1 7–124
SSR–25 A6&A14 7–124
SSR–26 ML86B 7–125
SSR–27 PPC1 7–127
SSR–28 A15EDO 7–127
SSR–29 A7 7–127
SSR–30 MNB DA2 (CIL) 7–128
SSR–31 FPC2 (CIL) 7–137
SSR–32 MPC2 7–141
SSR–33 APC2 7–143
SSR–34 APC5 7–144
SSR–35 FLC2 (CIL) 7–147
SSR–36 ALC2 7–148
SSR–37 FMC2 7–150
SSR–38 MMC1 7–150
SSR–39 MMC2 7–151
SSR–40 MMC3 7–152
SSR–41 MMC4 7–152
SSR–42 AMC2 7–153
SSR–43 R14 7–154
SSR–44 O15&A8 7–154
SSR–45 O15 7–155
SSR–46 R1A1 7–157
SSR–47 A6&A14 7–158
SSR–48 ML86B 7–159
SSR–49a PPC2 7–161
SSR–49b A15EDO 7–161
SSR–49c A7 7–161
SSR–50 MNC DA3 (CIL) 7–162
SSR–51 FPC3 (CIL) 7–170
SSR–52 MPC3 7–173
SSR–53 APC3 7–175
SSR–54 APC6 7–176
SSR–55 FLC3 (CIL) 7–179
SSR–56 ALC3 7–180
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SSR–71 FP&LC1 7–192
SSR–72 MPC1 (CIL) 7–192
SSR–73 ML86B 7–193
SSR–74 FD (CIL) 7–194
SSR–75 O13&R14 7–195
SSR–80 ESS2CA DA2 (CIL) 7–197
SSR–81 FP&LC2 7–199
SSR–82 MPC2 (CIL) 7–199
SSR–83 FD (CIL) 7–200
SSR–84 O13&R14 7–201
SSR–85 ML86B 7–202
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SSR–91 FP&LC3 7–204
SSR–92 MPC3 (CIL) 7–205
SSR–93 FD (CIL) 7–206
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SSR–105 CNTLBC3 7–228
SSR–106 CNTLCA1 7–231
SSR–107 CNTLCA2 7–235
SSR–108 CNTLCA3 7–239
SSR–109 CONTROL BUS – PANEL WIRING MATRIX 7–242
SSR–110 AC1 7–244
SSR–111 AC1 ΦA 7–248
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SSR–113 ΦC 7–251
SSR–114 FMC1 7–254
SSR–115 MMC1 7–254
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SSR–125 MMC1 7–265
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SSR–127 MMC3 7–266
SSR–128 MMC4 7–266
SSR–129 AMC2 7–266
SSR–130 AC3 7–267
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SSR–132 ΦB 7–272
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	SSR–144	AC2 POD/AMC2	7–279
	SSR–145	AC3 POD/AMC3	7–280
	SSR–146	MNA/B POD/AMC1	7–280
	SSR–147	MNB/C POD/AMC2	7–281
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	SSR–150	ALTERNATE PRIMARY PAYLOAD PWR	7–282
	SSR–200	AC PWR TRANSFER CABLE	7–283
	SSR–201	CRYO HTR MANUAL OPS	7–295
	SSR–202	PREFLIGHT TEST BUS USE	7–297

7.1 FC REAC/PMP/STACK T

7.1b	'SM1 FC STACK T 1(2,3)'	– FC STACK T 1(2,3) ↑↓	7–8

7.3 FUEL CELL

7.3b	'SM1 FC AMPS 1(2,3)' 'SM1 MAIN BUS V A(B,C)' 'SM1 DC VOLT FC 1(2,3)'	– FUEL CELL VOLTS ↑↓, FUEL CELL AMPS ↑↓, MAIN BUS V A(B,C) ↑↓	7–18
7.3d	'SM1 FC EXIT T 1(2,3)'	– FUEL CELL EXIT T ↑↓	7–23
7.3e	'SM1 FC COOL P 1(2,3)'	– FUEL CELL COOL P ↑↓	7–26

7.5 AC VOLTAGE/OVLD

7.5a	'SM1 AC VOLTS 1(2,3)'	– AC VOLTS 1(2,3) ↓↑	7–42
7.5b	'SM1 AC OVLD 1(2,3)'	– AC OVLD 1(2,3) ↓	7–47

7.6 CRYO

7.6b	'SM2 CRYO O2(H2) PRES' '168 PALLET O2(H2) PRES' '168 PALLET O2(H2) TK P'	– CRYO O2(H2) PRESS, TK P ↓↑	7–59
7.6d	'SM2 CRYO O2(H2) MANF'	– O2(H2) MANF P ↓	7–63
7.6l	'168 PALLET O2 HTR' 'SM2 CRYO O2 HTR'	– O2 HTR T	7–66

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EPS

7.1b FC STACK T 1(2,3) ↑↓

FUEL CELL STACK TEMP
(F7)
BACKUP C/W ALARM
(F7)
S69 FC STACK T 1(2,3) ↑↓
BFS
SM1 FC STACK T 1(2,3)

If FC operating and:
STACK T > 243.7 or < 172.5 degF
If FC shutdn and:
STACK T > 243.7 or < 50.8

S69 FC STACK T 1(2,3)
BFS
SM1 FC STACK T 1(2,3)

If:
FC LOAD (FC VOLTS X AMPS)/ STACK T

kW	STACK TEMP
< 3.5	< 180 or > 212
> 3.5	<190 or > 222
> 7.5	< 198 or > 238
FC SHTD	< 50.8 or > 212

Nominal Config:
(L4:C)
cb AC1 ΦA,ΦB,ΦC FC1 PUMPS (three) – cl
cb AC2 ΦA,ΦB,ΦC FC2 PUMPS (three) – cl
cb AC3 ΦA,ΦB,ΦC FC3 PUMPS (three) – cl
(O14)
FC1 CNTLR – ON
(O15)
FC2 CNTLR – ON
(O16)
FC3 CNTLR – ON

(Cont in notes column)

1 Is FC shutdn ? YES → 49
NO

2
SM 69 FUEL CELLS
SM SYS SUMM 1
(O2)
FC STACK TEMP ind:
- Off–scale LOW or HIGH → 3 STACK T SNSR FAILURE (FC OK)
- > 172 degF and < 243 degF → 4 CRT msg has '*' in text ? NO → 25; YES → 6 B/U C/W FAILURE OR TRANSIENT
- < 172 degF → ***WARNING*** Ops < 172 degF may result in FC damage → 5 • Perform BUS TIE (Cue Card) → 8
- > 243 degF → ***WARNING*** Ops at > 243 degF may result in catastrophic FC failure → 7 (CRT) Any other FCs with COOL T > 140 degF ? NO → 11; YES → 10 POSSIBLE FREON LOOP PROBLEM

7 → 11 • Perform BUS TIE (Cue Card) → 15

8
(R11U)
•✓FC STARTUP HTR – ENA

1 2
9
(CRT)
• Observe amps of aff FC and tied FC
(R1)
• FC1(FC2,FC3) – START (hold 5 sec)
(CRT)
Aff FC AMPS decr and tied FC AMPS incr ? NO → 16
YES → 12 FC THERMAL CONTROL AND SUSTAINER HTR FAILED OFF

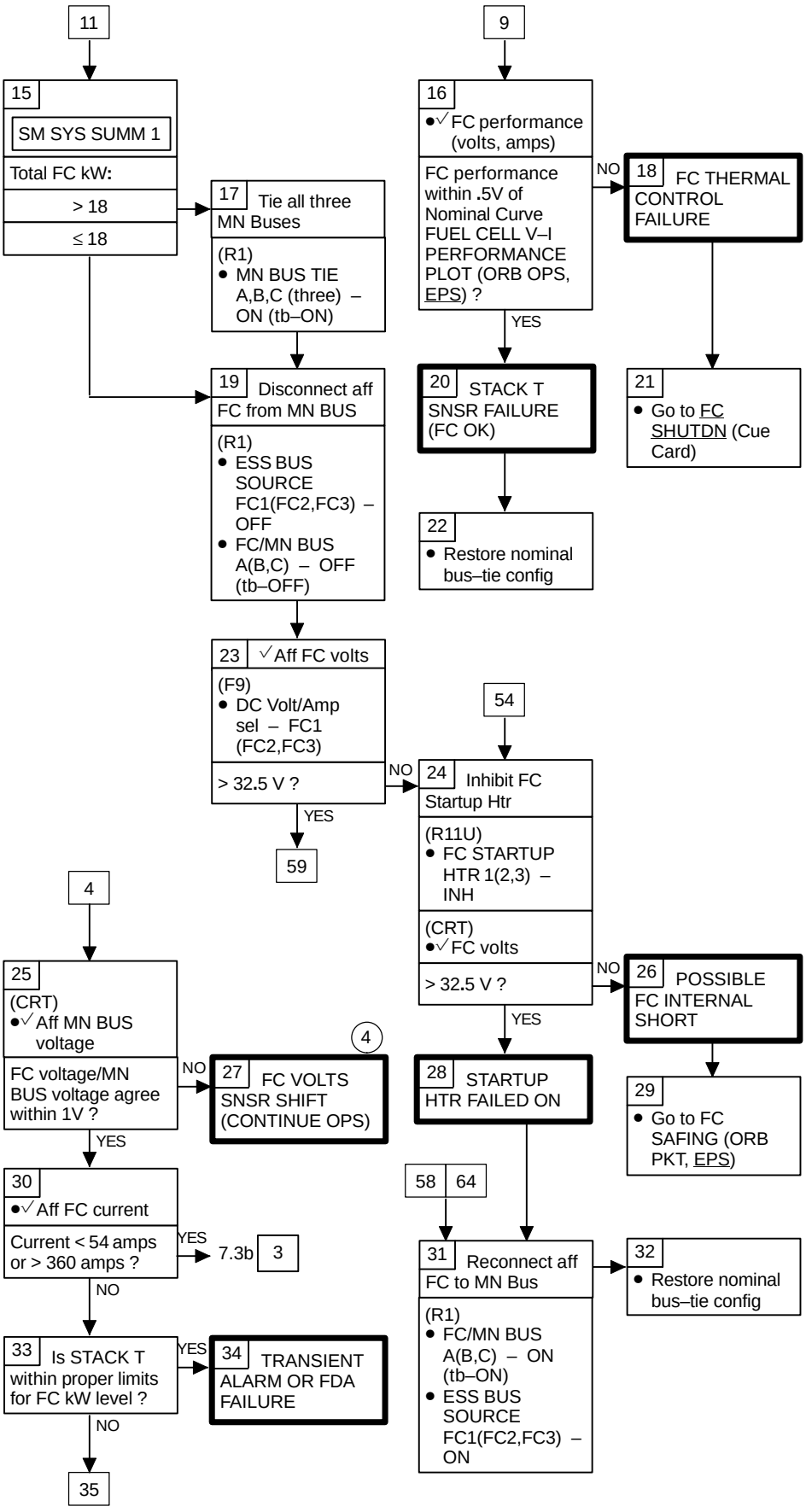
1 3
13
(R1)
• Maintain FC START sw in START
→ 14
• Restore nominal bus–tie config

1 Confirming cue of STARTUP HTR activity is READY FOR LOAD tb – bp whenever htr cycles ON

2 FC STARTUP HTR amps do not flow thru affected FC ammeter. Increased load will drop FC volts and shared load will be shifted to other FC

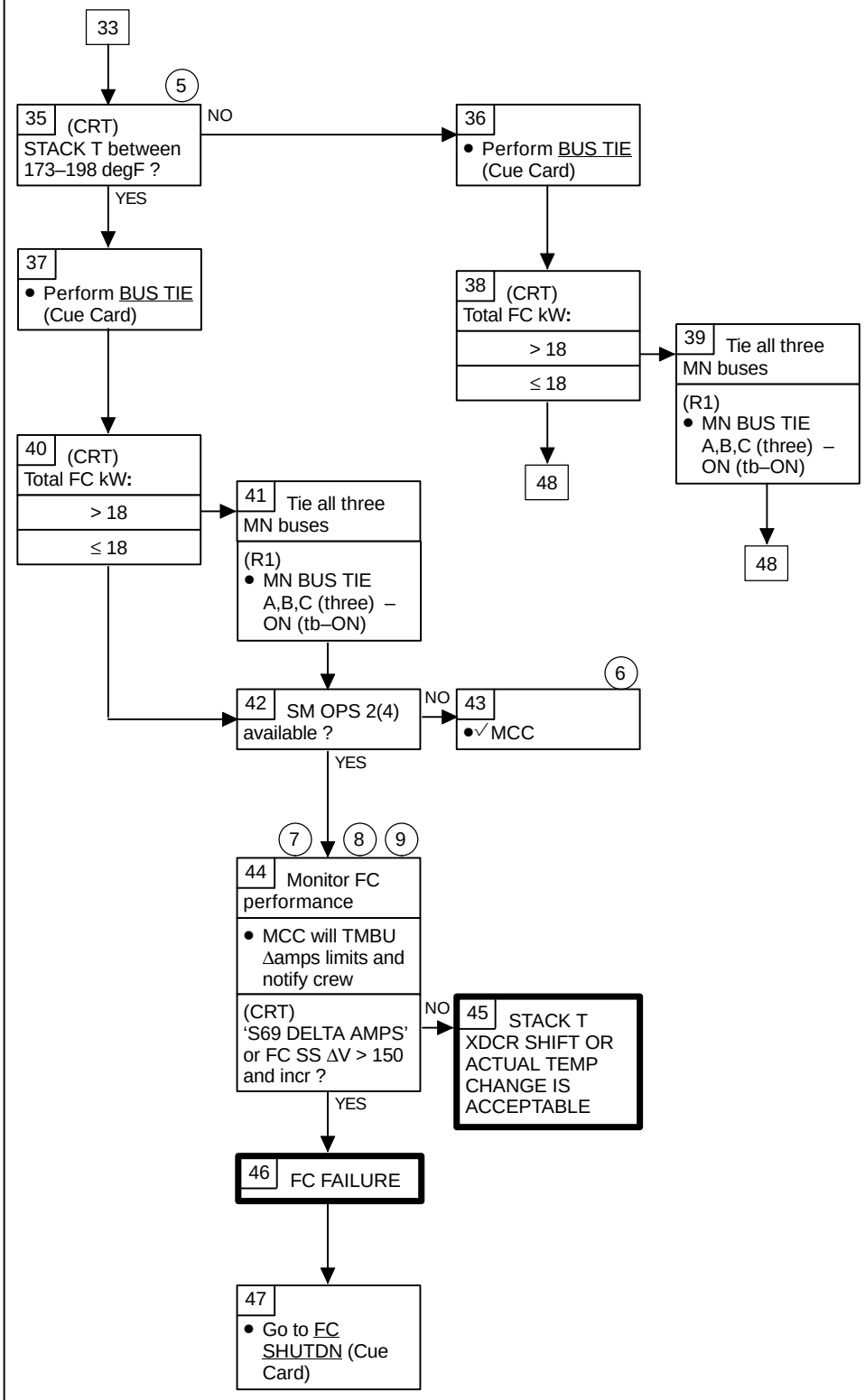
3 FC STARTUP HTR may be used to cntl STACK T to acceptable temp by holding or maintaining FC START sw in START

Nominal Config:
(Cont)
(R11U)
FC STARTUP HTR 1,2,3 (three) – ENA
If FC operating:
(R1)
FC RDY (three) tb – gray
FC1(2,3) COOL PUMP ΔP tb (three) – gray
If FC shutdn:
Aff FC RDY tb – bp
Aff FC COOL PUMP ΔP tb – bp



(4) Loss of correct precondition check for STACK T FDA Class 3 limit set based on kW for this FC

EPS 7.1b (Cont)



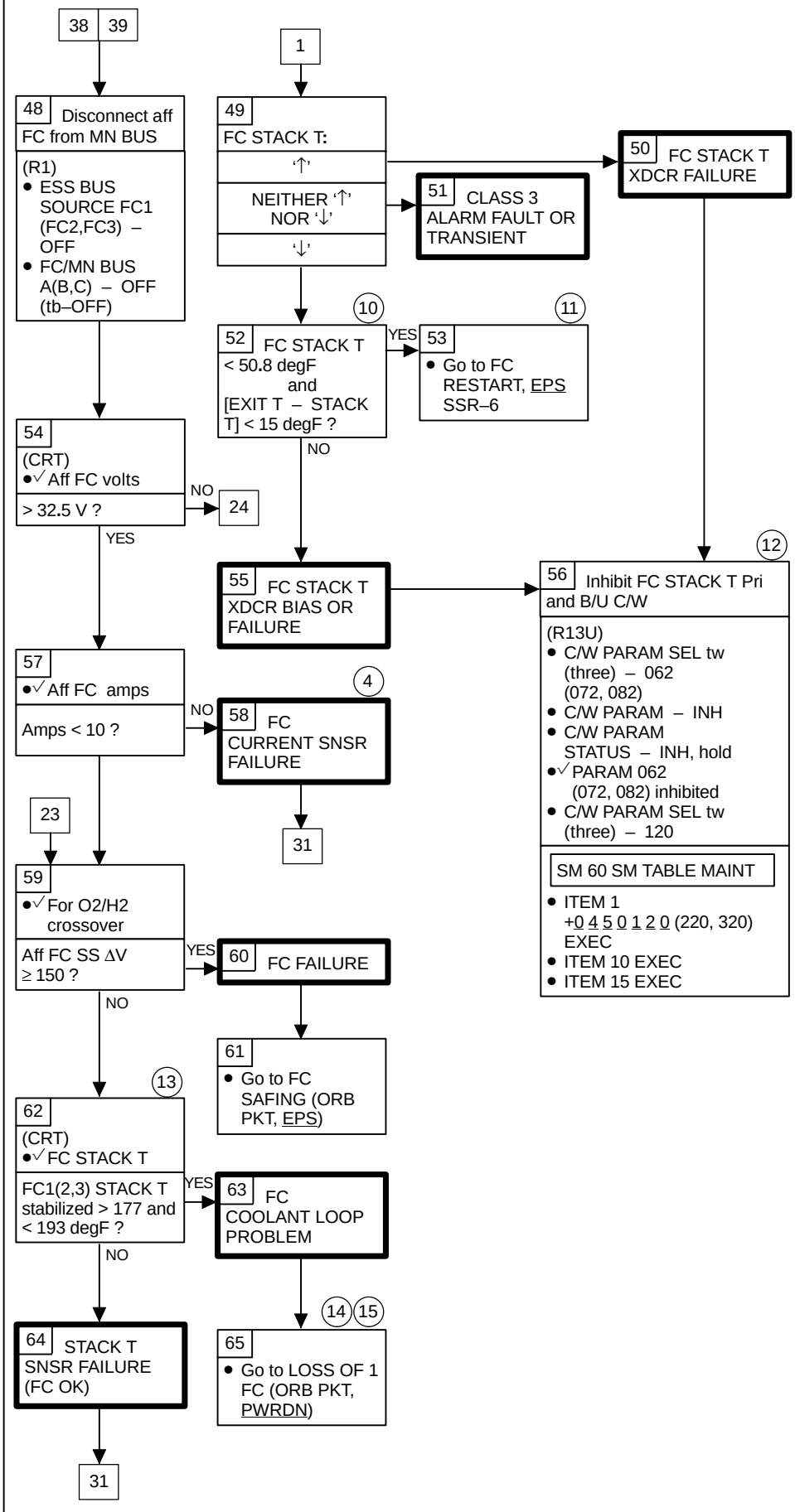
(5) This is the temp range that could result in low stack temp SM ALERT

(6) MCC will monitor FC performance by observing Δamps changes

(7) If loss of comm, reset Δamps limits to present value ± 40 (± 40 takes into account possible differences in FC V–I curves which would cause a Δamps change with a load change)

(8) Depending on load, may take several hours for performance change. Do not purge this FC for 5 hr

(9) With FCs thermally stabilized and at a constant load, a 12–amp change in delta amps would indicate approximately 3% change in KOH concentration. High concentration (indicated by improved performance) > 48% can allow O2/H2 crossover. Low concentration (indicated by degraded performance) < 26% indicates flooding



(4) Loss of correct precondition check for STACK T FDA Class 3 limit set based on kW for this FC

(10) Based upon STS–2, 51, 54, & 57 data, FC STACK T and EXIT T should remain within 15 degF of each other during cooldown

(11) Lower limit on allowable temp for reusable FC is 48 degF (includes Xdcr error). FC must be restarted to maintain temp above 48 degF. 50.8 degF was selected due to being closest value to 48 degF in Primary C/W System

(12) With loss of FC STACK T, FC temp may be obtained only from FC EXIT T

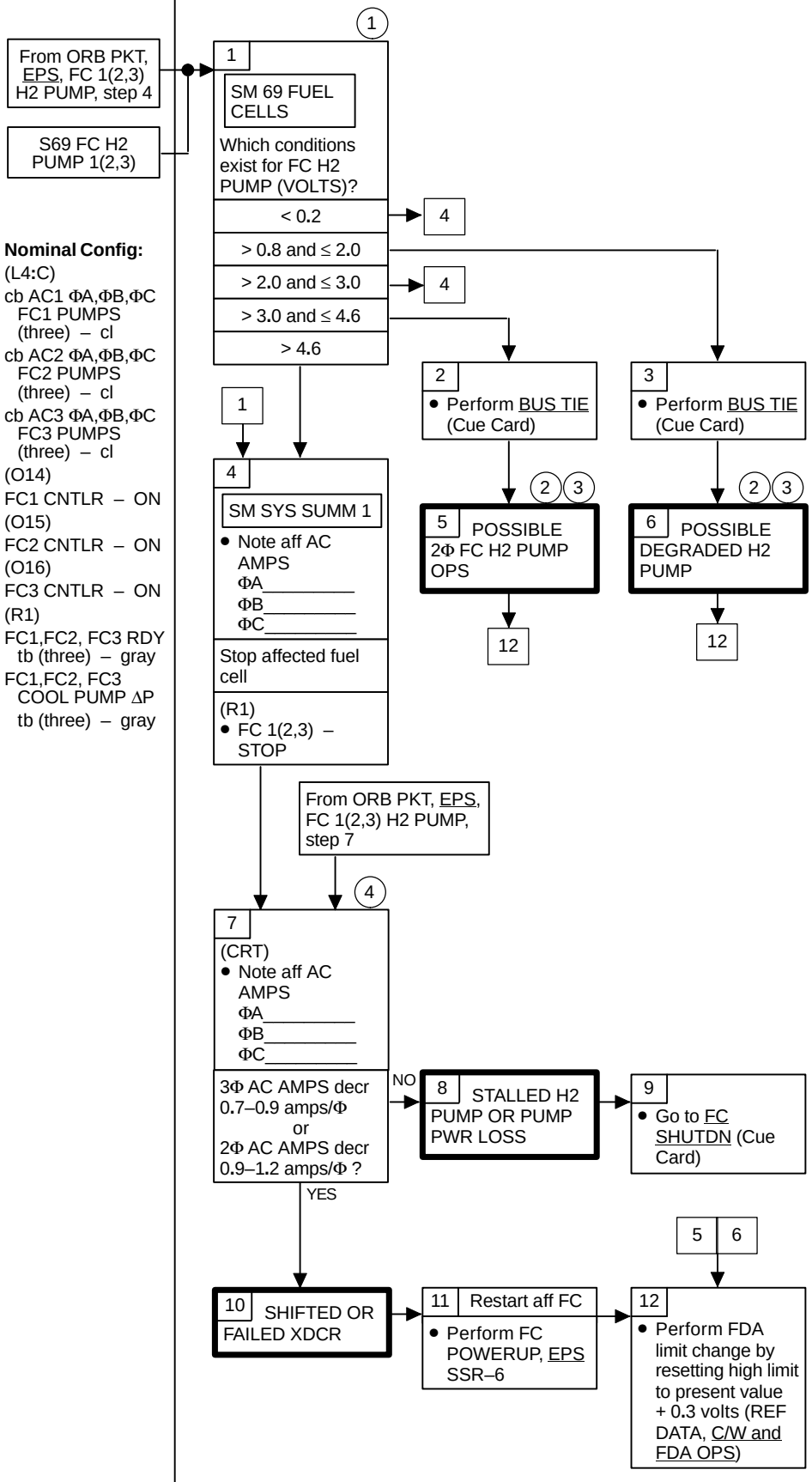
(13) FC sustaining heater maintaining stack temp

(14) After cooldown, FC may be usable on cyclic basis or with extensive vehicle pwrdn

(15) Leave FC in STBY mode. MCC analysis may determine later need for FC shutdn

EPS

7.1c H2 PUMP ↑↓



Nominal Config:

(L4:C)

cb AC1 ΦA,ΦB,ΦC FC1 PUMPS (three) – cl

cb AC2 ΦA,ΦB,ΦC FC2 PUMPS (three) – cl

cb AC3 ΦA,ΦB,ΦC FC3 PUMPS (three) – cl

(O14)

FC1 CNTLR – ON

(O15)

FC2 CNTLR – ON

(O16)

FC3 CNTLR – ON

(R1)

FC1,FC2, FC3 RDY tb (three) – gray

FC1,FC2, FC3 COOL PUMP ΔP tb (three) – gray

(1) Normal H2 Pump range 0.28–0.65 volt. See Table A

(2) If degradation of H2 pump worsens, FC should be shut down so that pump could be used during entry

(3) Non–satisfactory H2 pump ops would eventually be reflected in FC amps (low) SSDV (erratic), exit temp, and FC pH (event)

(4) H2 PUMP operates at .3A/Φ for 3–phase and .45A/Φ for 2–phase operation. Coolant pump operates at .5A/Φ for 3–phase and .62A/Φ for 2–phase operation

Table A

FC PUMP PACKAGE POWER RANGES

3–PHASE OPERATION

	COOLANT PUMP	H2 PUMP	
LOAD	AMPS/PHASE	AMPS/PHASE	VOLTS
NORMAL	0.51	0.3	0.28–0.65
OVERLOAD		0.5	> 0.8
STALL	1.0	1.2	2.2

2–PHASE OPERATION

	COOLANT PUMP	H2 PUMP	
LOAD	AMPS/PHASE	AMPS/PHASE	VOLTS
NORMAL (open motor winding)	0.62	0.45	3.15–3.5
NORMAL (1Φ cb open)	0.62	0.45	4.15–4.5
STALL	1.0	1.3	4.8

EPS

7.2b FC PURGE TEMP

FC PURGE TEMP

If:

SM 69 FUEL CELLS

FC PURGE LN O2 T < 69 degF or
FC PURGE LN H2 T1 < 79 degF or
FC PURGE LN H2 T2 < 40 degF
After 27 min since AUTO PURGE SEQ started

(1)

1 GPC PURGE OR INSTRU–MENTATION FAILURE. LOSS OF AUTO PURGE SEQUENCE

2
- Go to FUEL CELL PURGE – MANUAL (ORB OPS, EPS)

(1) GPC will terminate AUTO PURGE SEQ as indicated by (R11U) FC GPC PURGE SEQ tb – bp. (R11U) ON position of FC PURGE HTR sw utilizes redundant htrs

(2) If this alarm occurs: Purge vlv commanded closed. Purge line htrs are commanded OFF. May be verified by (R11U) FC GPC PURGE SEQ tb – bp

7.2c FC PURGE SEQ

FC PURGE SEQ

If:

S/W detects AUTO PURGE SEQ, purge–line htrs ON–signal has been lost after GPC AUTO PURGE SEQ initiated

Nominal Config:
(R11U)
FC PURGE HTR – GPC

(2)

1 MDM CHANNEL OR INSTRU–MENTATION FAILURE. LOSS OF AUTO PURGE SEQUENCE

2
- Go to FUEL CELL PURGE – MANUAL (ORB OPS, EPS)

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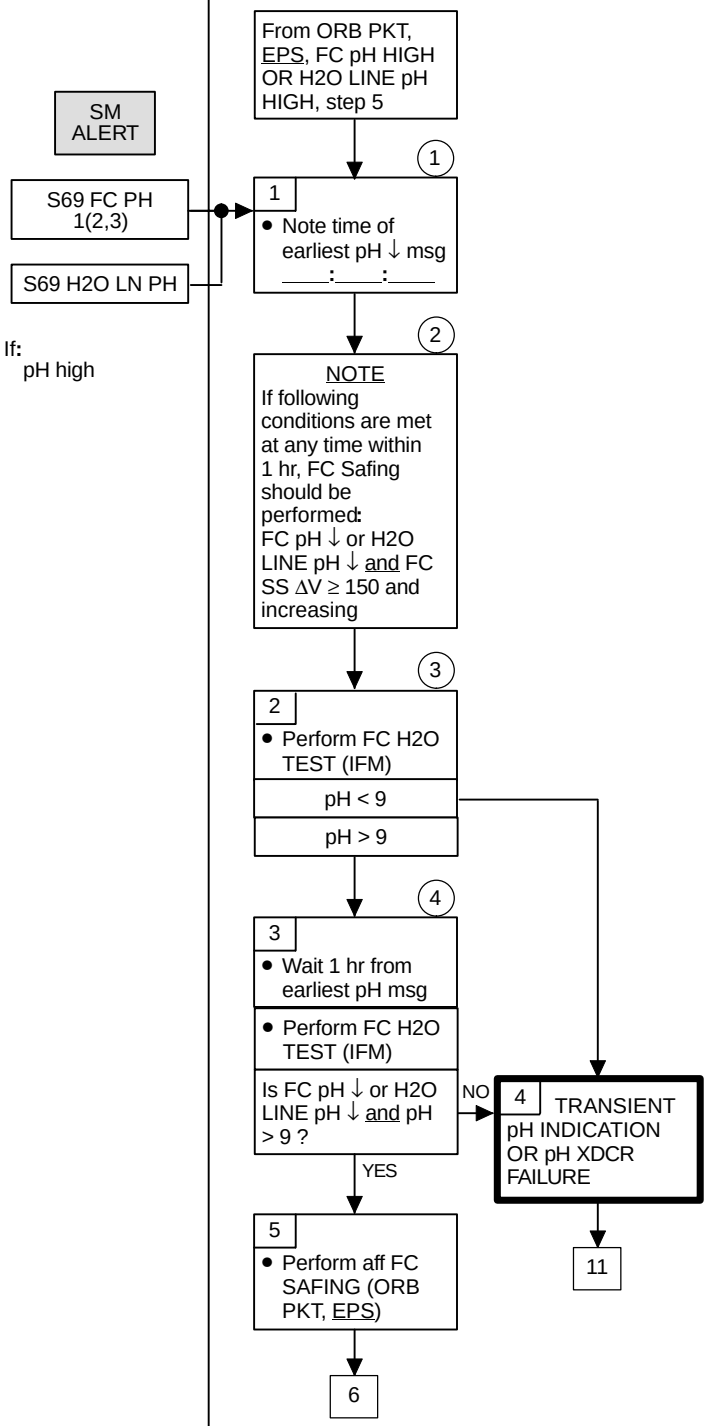
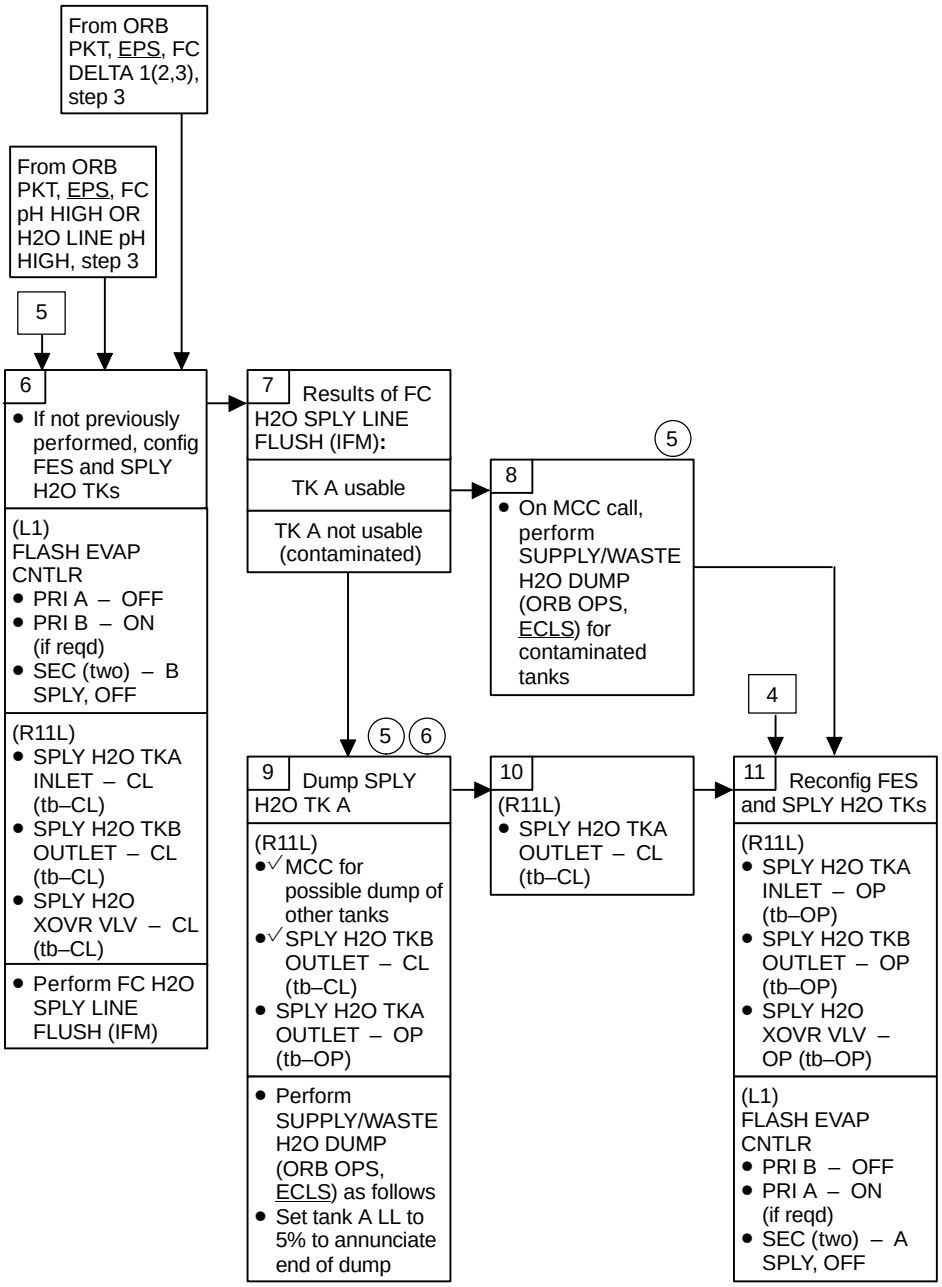
EPS

7.3a FC/H2O LINE pH HIGH



1. After individual pH alarm, 10 min could elapse before H2O Line pH alarm activates
2. FC health and performance will be monitored for 1 hr. If signs of FC flooding occur, FC Safing will be performed
3. May take as long as 20 min for aff FC H2O to reach galley QD
4. Waiting 1 hr may allow transient pH condition to clear



(5) SPLY TKB may be contaminated. TKB will be dumped and then flushed per nominal TKB management

(6) SPLY TKA will be dumped periodically to flush pH out of system

7.3b FUEL CELL VOLTS ↑↓, FUEL CELL AMPS ↑↓, MAIN BUS V A(B,C) ↑↓

BACKUP C/W ALARM

(F7)

SM ALERT

S67 MAIN BUS V A(B,C)

BFS

SM1 MAIN BUS V A(B,C)

If:
MNA(B,C) BUS
VOLTS < 27 vdc
> 32 vdc

S69 FC VOLTS 1(2,3)

S69 FC AMPS 1(2,3)

If FC operating and
FC AMPS:
< 54
> 360

If FC shutdn and
AMPS < current C/W FDA lower limit, > current C/W FDA upper limit

BFS

SM1 DC VOLT FC1(2,3)

If FC operating and:
VOLTS < 27.5 vdc
> 32.5 vdc

If FC shutdn and
Volts < current C/W FDA lower limit, > current C/W FDA upper limit

BFS

SM1 FC AMPS 1(2,3)

If FC AMPS < 54
> 410

Nominal Config:
(O13:A)
cb ESS 1BC MNA CONTR – cl
(O13:C)
cb ESS 2CA MNB CONTR – cl
(O13:E)
cb ESS 3AB MNC CONTR – cl

(Cont in notes column)

From ORB PKT, EPS, MN BUS U/V FC VOLTS, step 22

1 Is FC shutdn ?
YES → 2
- FC VOLTS msg → 48
- FC AMPS msg → 62

NO

7.1b 30

3 SM 67 ELECTRIC
Following conditions met:

MN VOLTS	FC VOLTS	FC AMPS	
		HIGH > 360	→ 11
	LOW < 27.5		→ 4
LOW < 27			→ 4
HIGH > 32			→ 4
	HIGH > 32.5		→ 5
		LOW < 54	→ 34
None of the above			

4 FC and MN Bus volts differ by > 1V ?
YES → 7
NO → 13

5 FC and MN Bus volts differ by > 1V ?
YES → 7
NO → 8

4 5

6 C/W FAULT OR TRANSIENT

7 VOLTS SNSR FAILED

8 FC/MN BUS LIGHTLY LOADED

9
(R13U)
- Determine which param triggered C/W ALARM

10
- Incr load to decr volts

3

11 SM 69 FUEL CELLS

Does FC AMPS (± 50) = O2 FLOW x 47.5
or
FC AMPS (± 68) = H2 FLOW x 377 ?
NO → 12 FC AMP SNSR FAILURE
YES

7.3j 11 4

13 Aff Bus tied ?
YES → 14 Untie Buses
NO → 15

14 Untie Buses
(R1)
- MN BUS TIE A(B,C) – OFF (tb–OFF)
- MN BUS TIE B(C,A) – OFF (tb–OFF)

15

1 Meters on pnl F9 should be used only if SM is not available, since wiring of TM vs METER results in a different reading in the case of a shunt blowing

2 FC Stack Temp Class 3 FDA may cause erroneous alarms and is unreliable. MCC will inhibit Class 3 FDA via TMBU. Class 2 FDA still exists

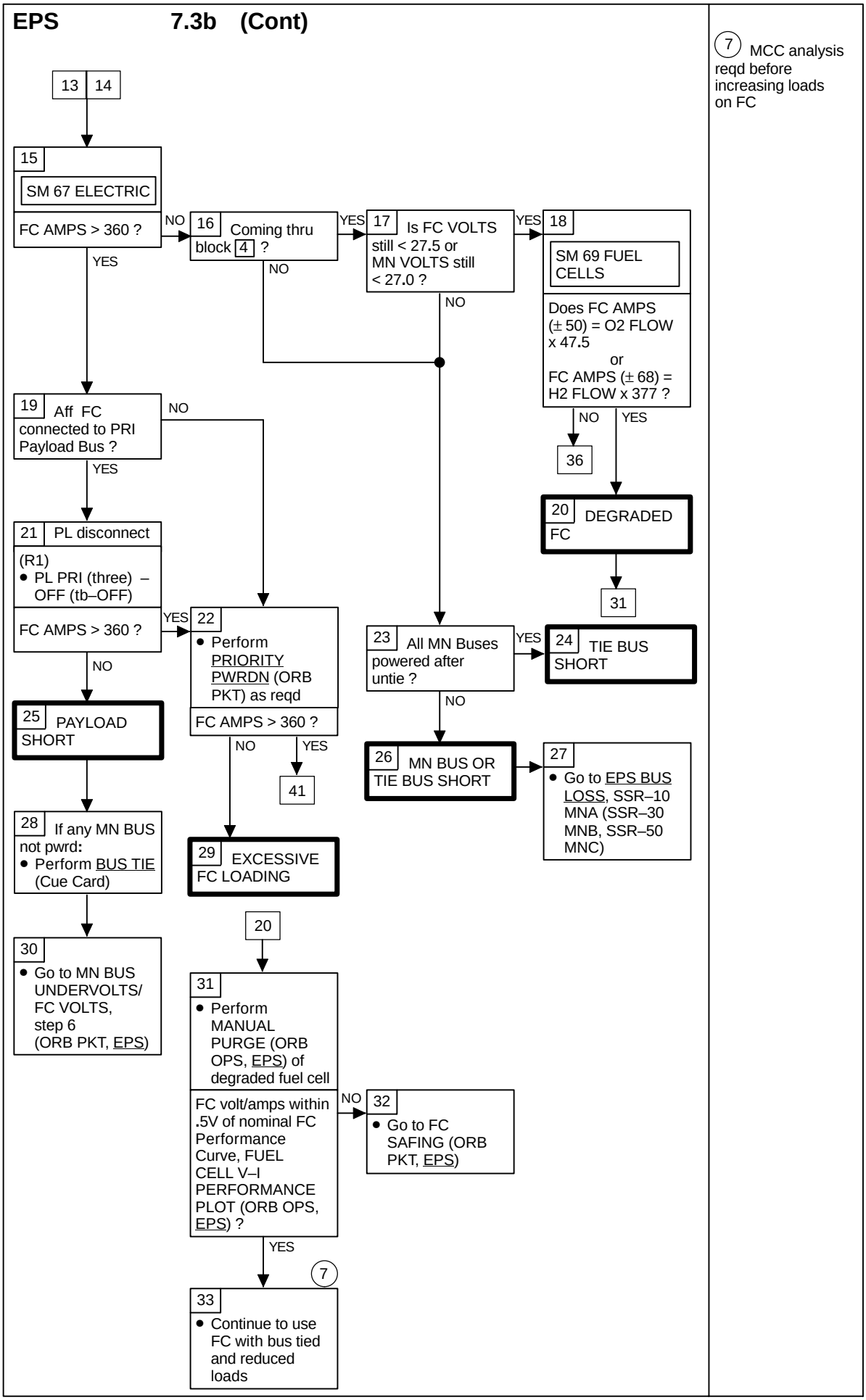
3 If hi amps caused transient and short cleared, cockpit check should be made for open cbs or bus loss indications

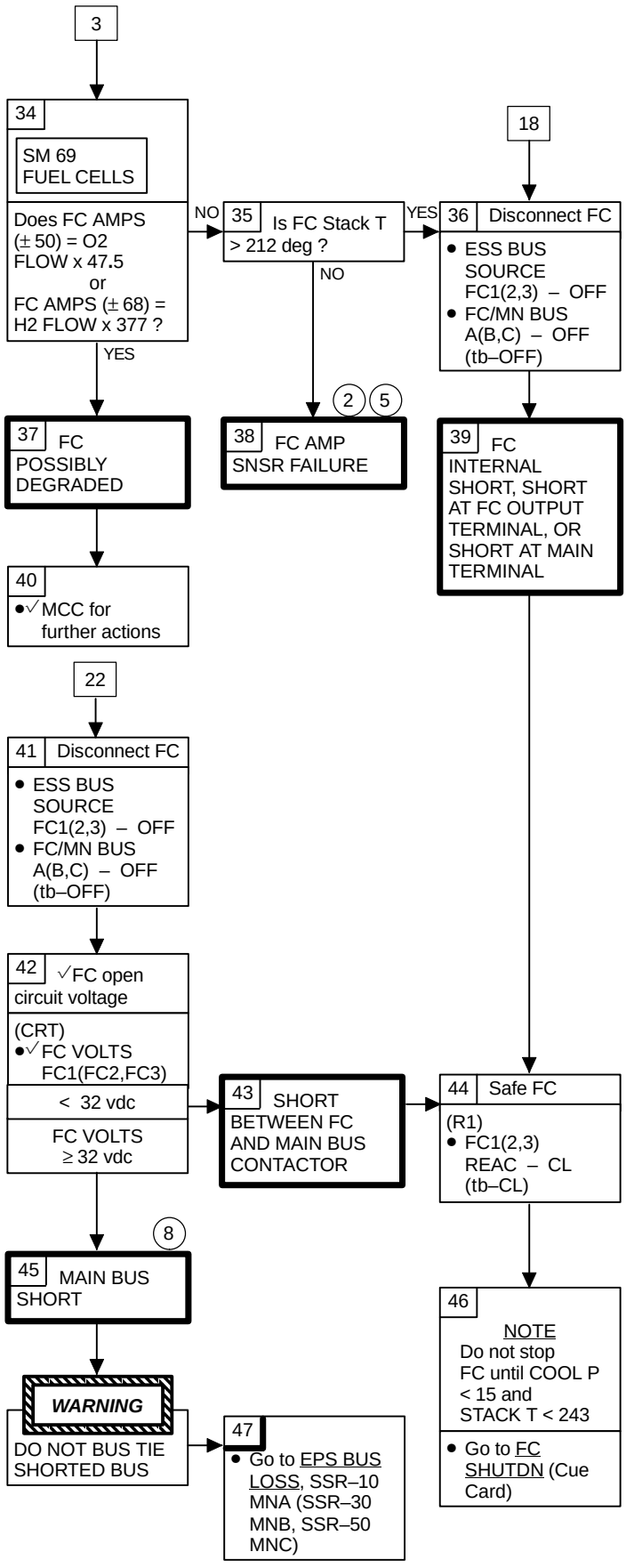
4 Consult MCC for powerup

5 If SM OPS 2, FC amps may be approximated by utilizing Reac flows in the following equations:
AMPS (± 50) = O2 FLOW x 47.5
AMPS (± 68) = H2 FLOW x 377

6 FC AMPS up to 450 may be expected if FC pwrs MN BUS plus PRI PL Bus or FC pwrs two main buses

Nominal Config:
(Cont)
(O13:E)
PL PRI FC3 – OFF (tb–OFF)
PL PRI MNB – OFF (tb–OFF)
PL PRI MNC – ON (tb–ON)
If FC operating:
(R1)
FC/MAIN BUS A(B,C) – ON (tb–ON)
FC1(2,3) REAC (six) – OP
If FC shutdn:
Aff FC/MN BUS – OFF (tb–OFF)
Aff FC REAC (two) – CL

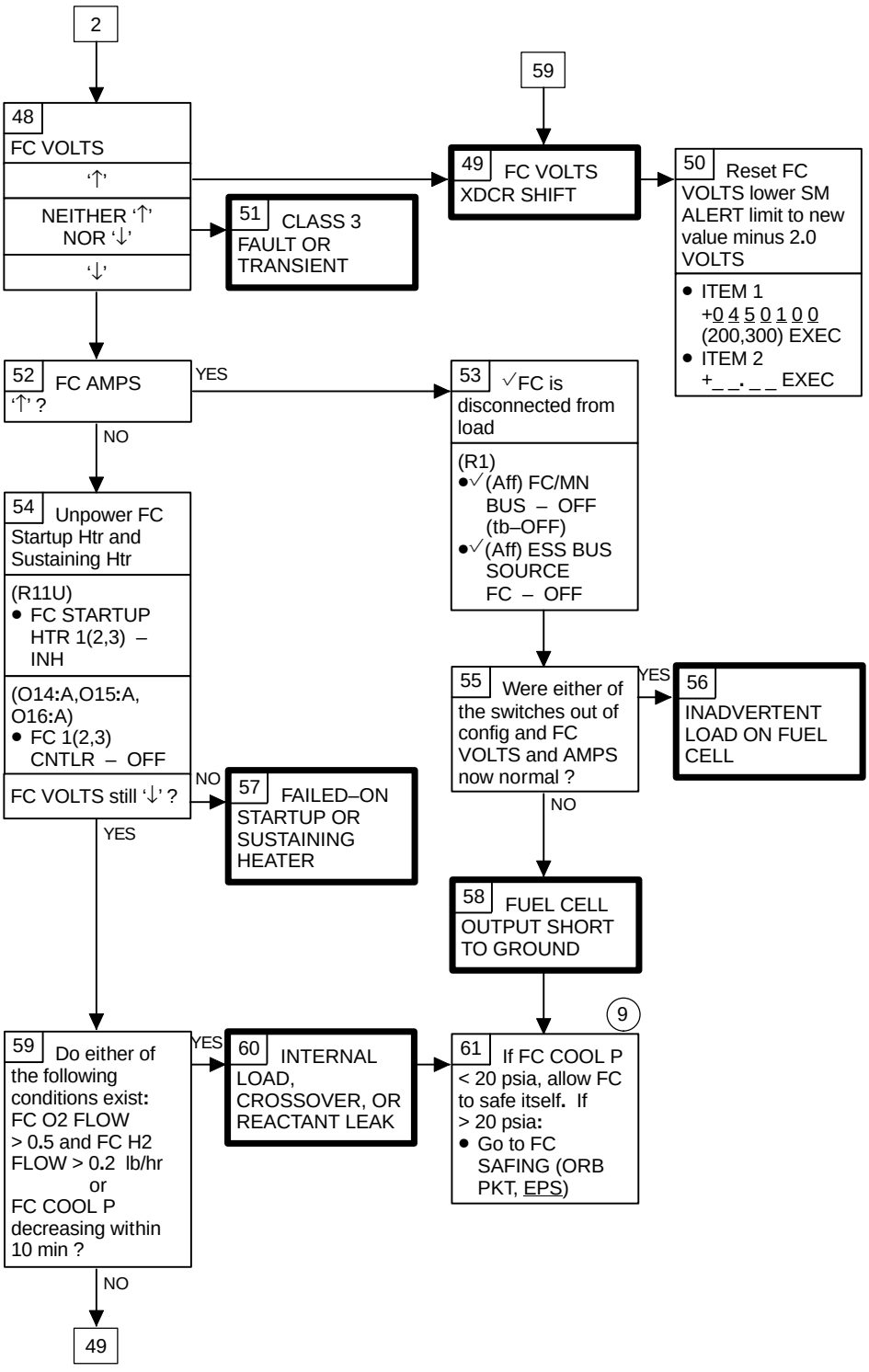

13 14
15
SM 67 ELECTRIC
FC AMPS > 360 ?
NO
YES
16 Coming thru block 4 ?
YES
NO
17 Is FC VOLTS still < 27.5 or MN VOLTS still < 27.0 ?
YES
NO
18
SM 69 FUEL CELLS
Does FC AMPS (± 50) = O2 FLOW x 47.5
or
FC AMPS (± 68) = H2 FLOW x 377 ?
NO
YES
36
20 DEGRADED FC
31
19 Aff FC connected to PRI Payload Bus ?
NO
YES
21 PL disconnect
(R1)
• PL PRI (three) – OFF (tb–OFF)
FC AMPS > 360 ?
YES
NO
22
• Perform PRIORITY PWRDN (ORB PKT) as reqd
FC AMPS > 360 ?
NO
YES
41
23 All MN Buses powered after untie ?
YES
NO
24 TIE BUS SHORT
25 PAYLOAD SHORT
26 MN BUS OR TIE BUS SHORT
27
• Go to EPS BUS LOSS, SSR–10 MNA (SSR–30 MNB, SSR–50 MNC)
28 If any MN BUS not pwrd:
• Perform BUS TIE (Cue Card)
29 EXCESSIVE FC LOADING
30
• Go to MN BUS UNDERVOLTS/ FC VOLTS, step 6 (ORB PKT, EPS)
20
31
• Perform MANUAL PURGE (ORB OPS, EPS) of degraded fuel cell
FC volt/amps within .5V of nominal FC Performance Curve, FUEL CELL V–I PERFORMANCE PLOT (ORB OPS, EPS) ?
NO
32
• Go to FC SAFING (ORB PKT, EPS)
YES
7
33
• Continue to use FC with bus tied and reduced loads
7 MCC analysis reqd before increasing loads on FC



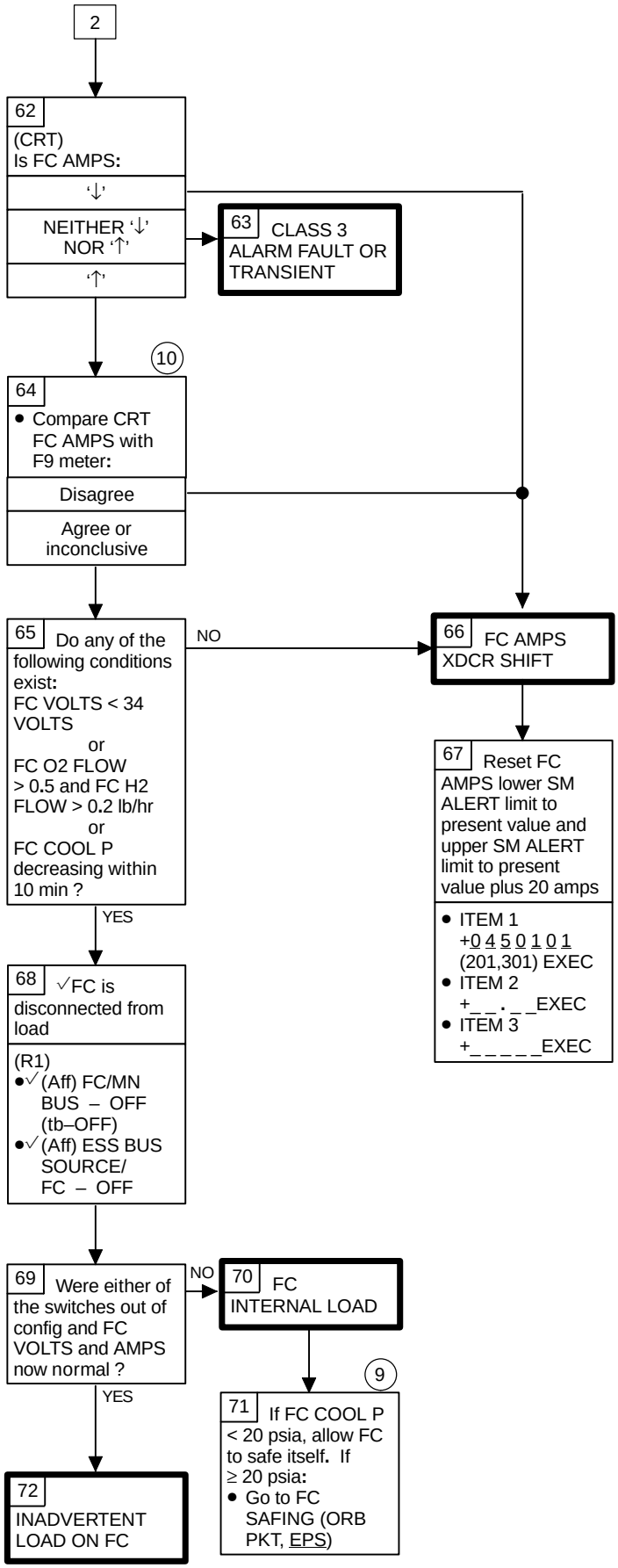
(2) FC Stack Temp Class 3 FDA may cause erroneous alarms and is unreliable. MCC will inhibit class 3 FDA via TMBU. Class 2 FDA still exists

(5) If SM OPS 2, FC amps may be approximated by utilizing Reac flows in the following equations:
AMPS (± 50) = O2 FLOW x 47.5
AMPS (± 68) = H2 FLOW x 377

(8) Short on MN BUS causes FC loss. For loss of MNC, FC3 pumps will be pwrd with AC Transfer Cable and FC3 pwr will be supplied to MNB through PL pwr contactors



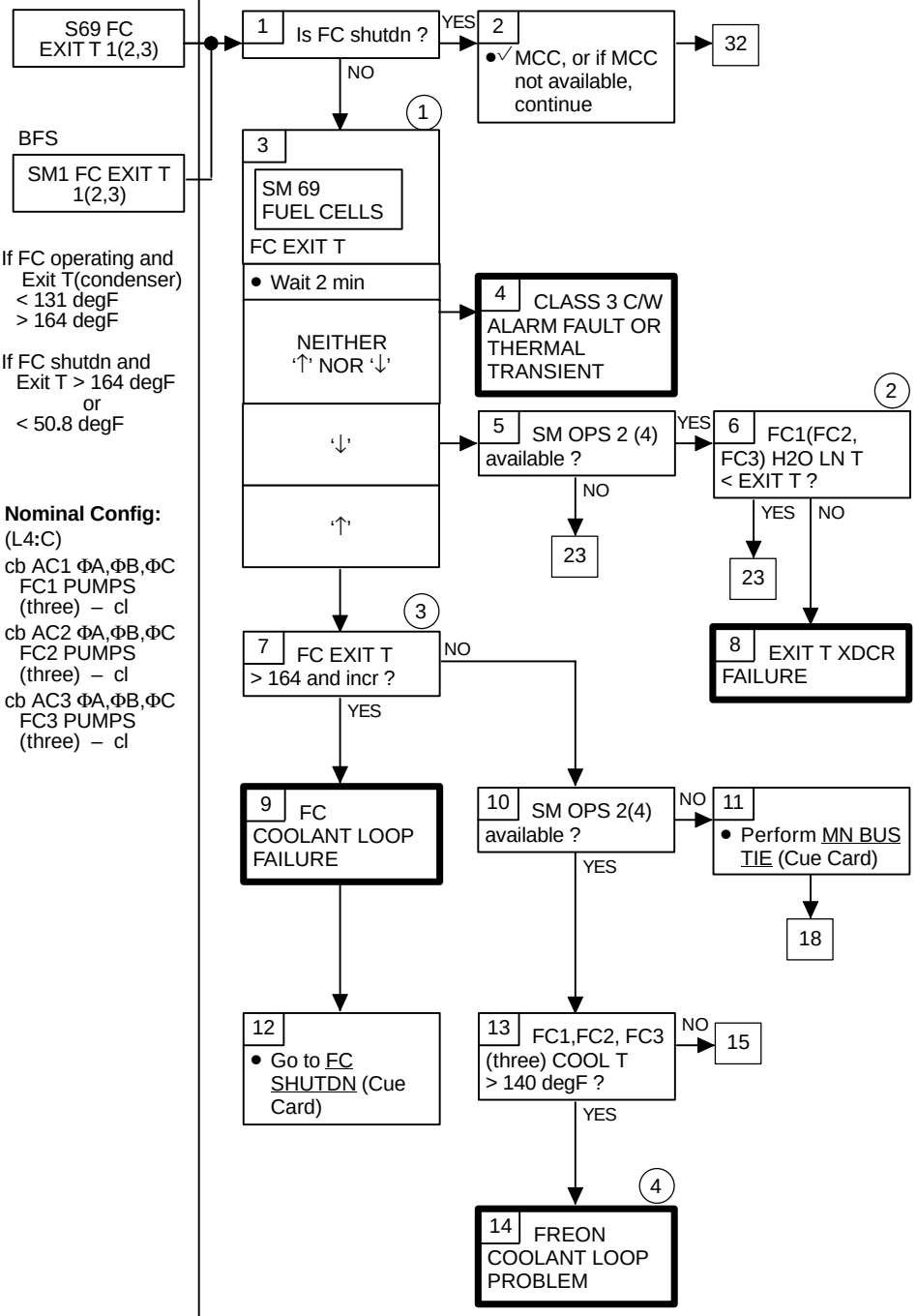
(9) At FC coolant pressure of less than 20 psia, electrolyte boiling may occur (i.e., KOH escaping from cell matrix); in addition, Dual Gas Regulator may not control O2/H2 relative pressures and crossover may result



(9) At FC coolant pressure of less than 20 psia, electrolyte boiling may occur (i.e., KOH escaping from cell matrix); in addition, Dual Gas Regulator may not control O2/H2 relative pressures and crossover may result

(10) Due to limited resolution of F9 meter, close comparison may be unobtainable

7.3d FUEL CELL EXIT T ↑↓

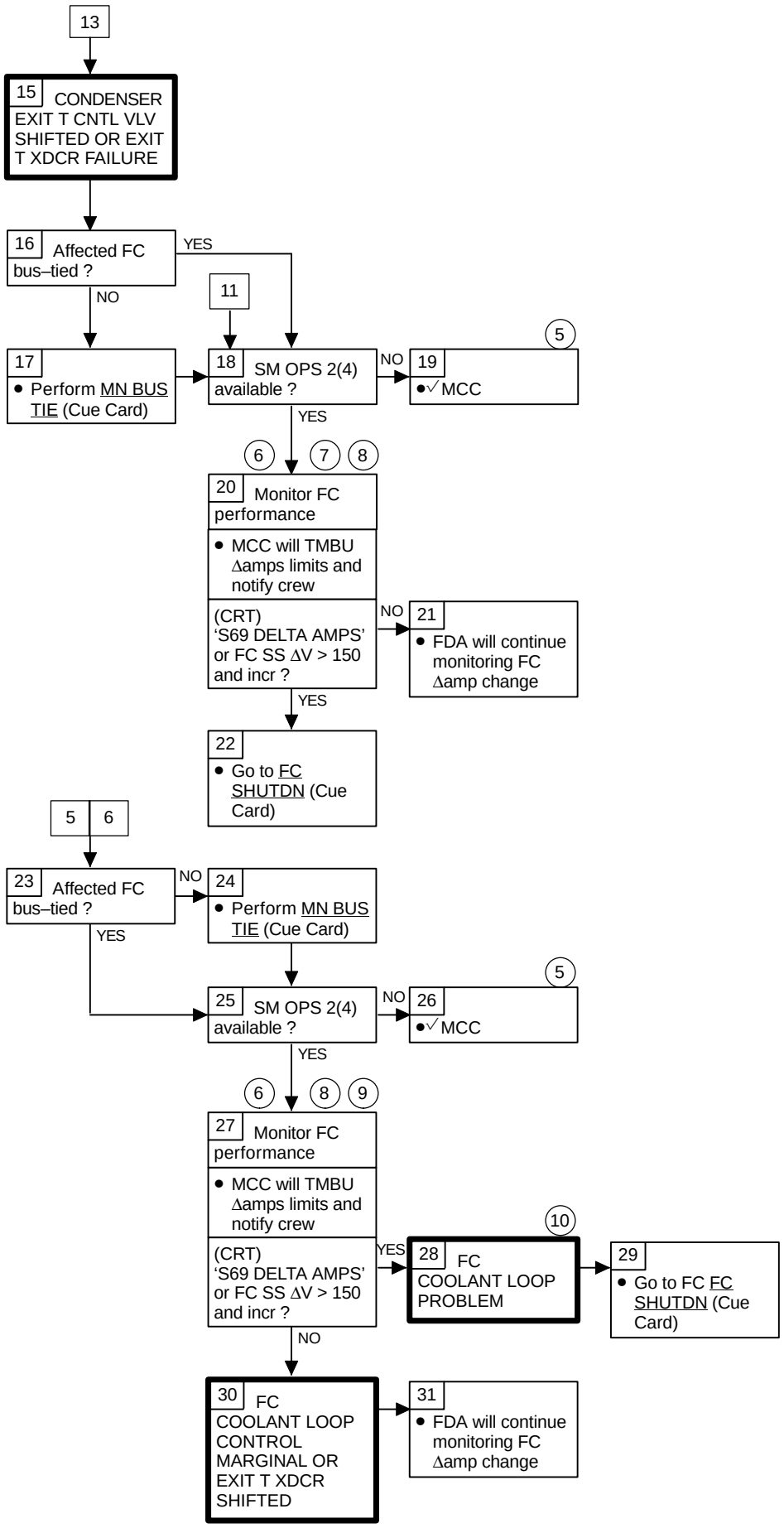


(1) Transient loads may cause EXIT T < LN T for up to 2 min

(2) Data indicates H2O LN T < EXIT T by up to 15 degF

(3) FC EXIT T will quickly increase to FC STACK T if CONDENSER COOLANT FLOW is stopped while H2 PUMP is operational. FC should be quickly shutdn for possible Coolant Pump failure

(4) ✓MCC



(5) MCC will monitor FC performance by observing Δamps change

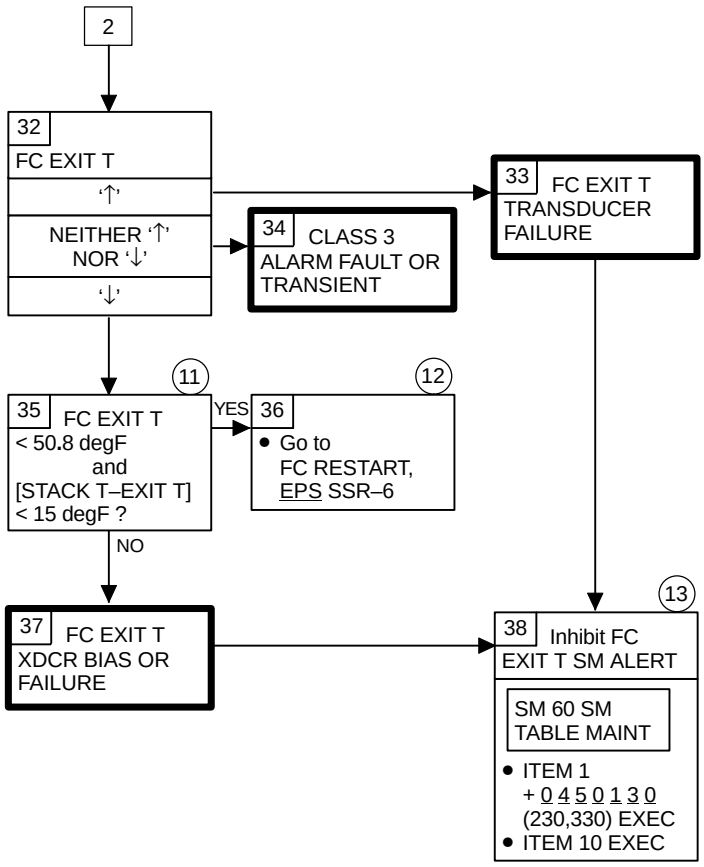
(6) If loss of comm, reset Δamps limits to present value ± 40 (± 40 takes into account possible differences in FC V–I curves which would cause a Δamps change with a load change)

(7) High FC EXIT T will reduce H2O removal rate and may result in cell flooding. Uniform cell flooding may not be detected by change in FC SS ΔV

(8) With FCs thermally stabilized and at a constant load, a delta amp change of 12 indicates ~3% change in KOH concentration. Nominal KOH concentration is ~36%. High Concentration (> 48%) would be indicative of FC dryout leading to possible O2/H2 crossover. Low concentration (< 26%) would be indicative of FC flooding

(9) Low FC EXIT T will increase H2O removal and may result in cell dryout sufficient to allow O2/H2 crossover. Individual cell crossover should be detected by change in FC SS ΔV. Uniform cell dryout would result in increased FC performance

(10) Depending on extent of failure after cooldown, FC may be usable in cyclic mode



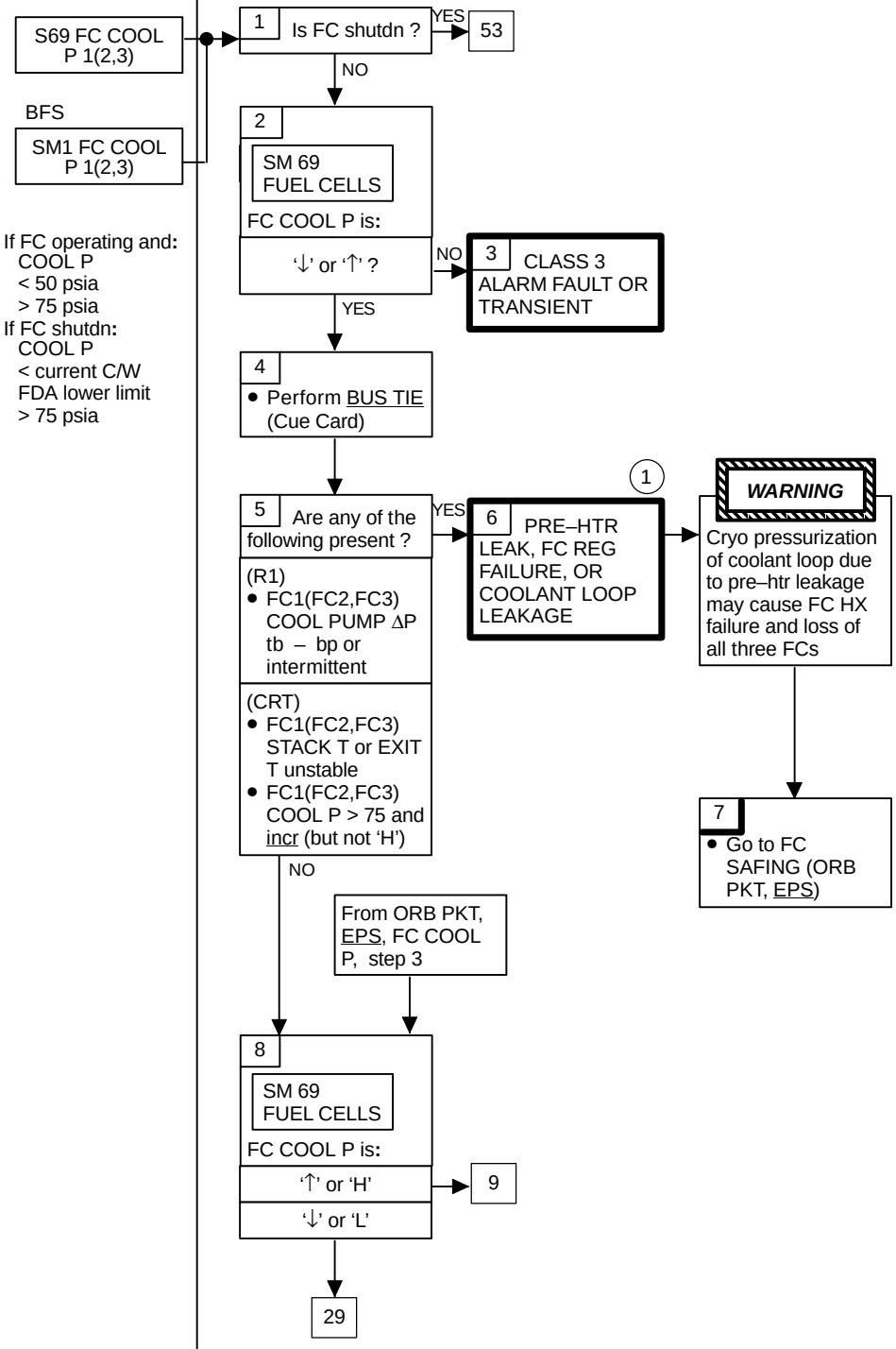
(11) Based upon STS–2 data, FC EXIT and STACK T should remain within 15 degF of each other during cooldown

(12) Lower limit on allowable temp for reusable FC is 48 degF (includes Xdcr error). FC must be restarted to maintain temp above 48 degF. 50.8 degF was selected due to being the closest value to 48 degF in the Primary C/W System

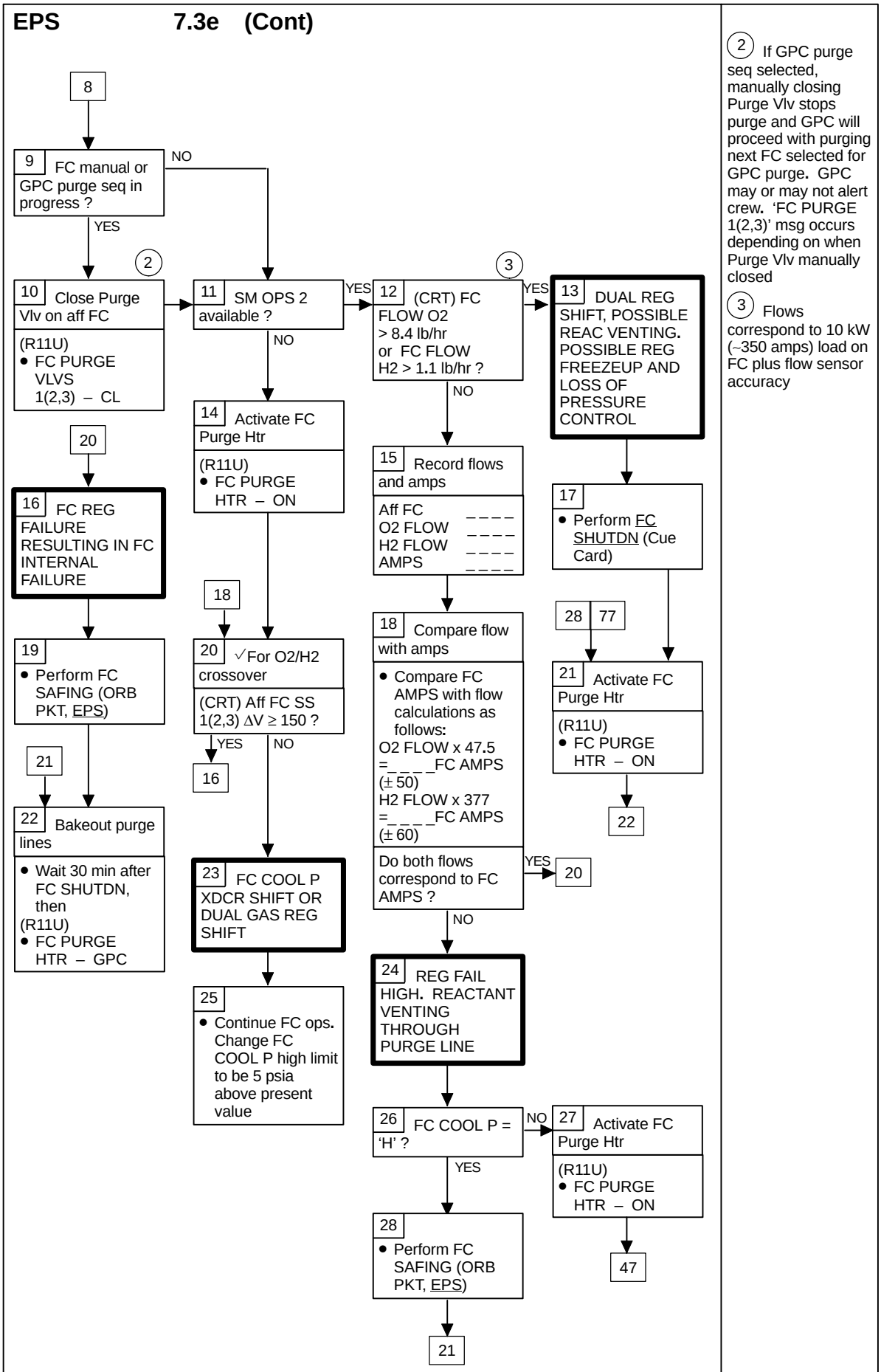
(13) With loss of FC EXIT T, FC temp may be obtained only from FC STACK T

EPS

7.3e FUEL CELL COOL P ↑↓

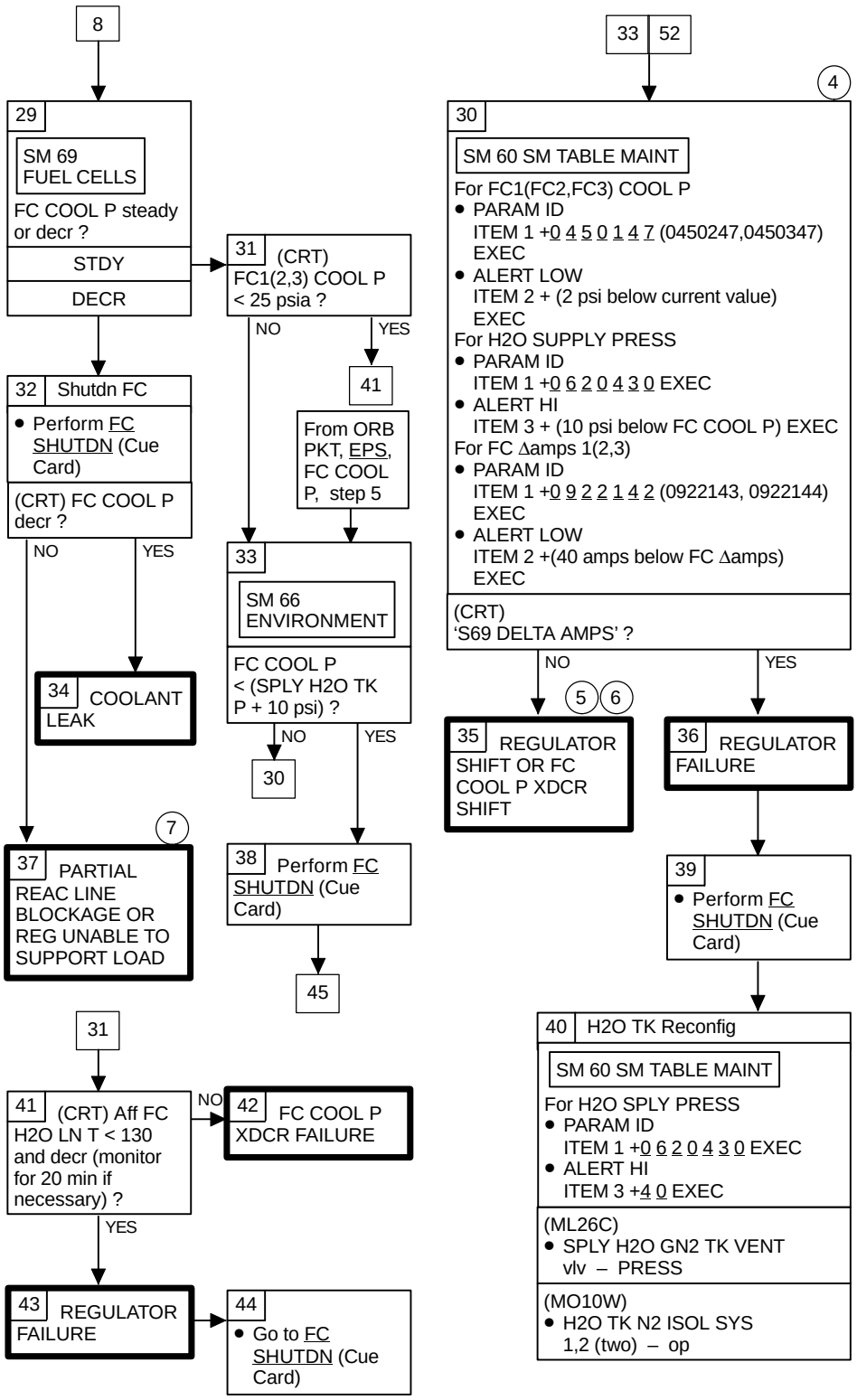


(1) Erratic FC COOL T on SM 69 display may also be indicative of pre–htr internal leak



(2) If GPC purge seq selected, manually closing Purge Vlv stops purge and GPC will proceed with purging next FC selected for GPC purge. GPC may or may not alert crew. 'FC PURGE 1(2,3)' msg occurs depending on when Purge Vlv manually closed

(3) Flows correspond to 10 kW (~350 amps) load on FC plus flow sensor accuracy

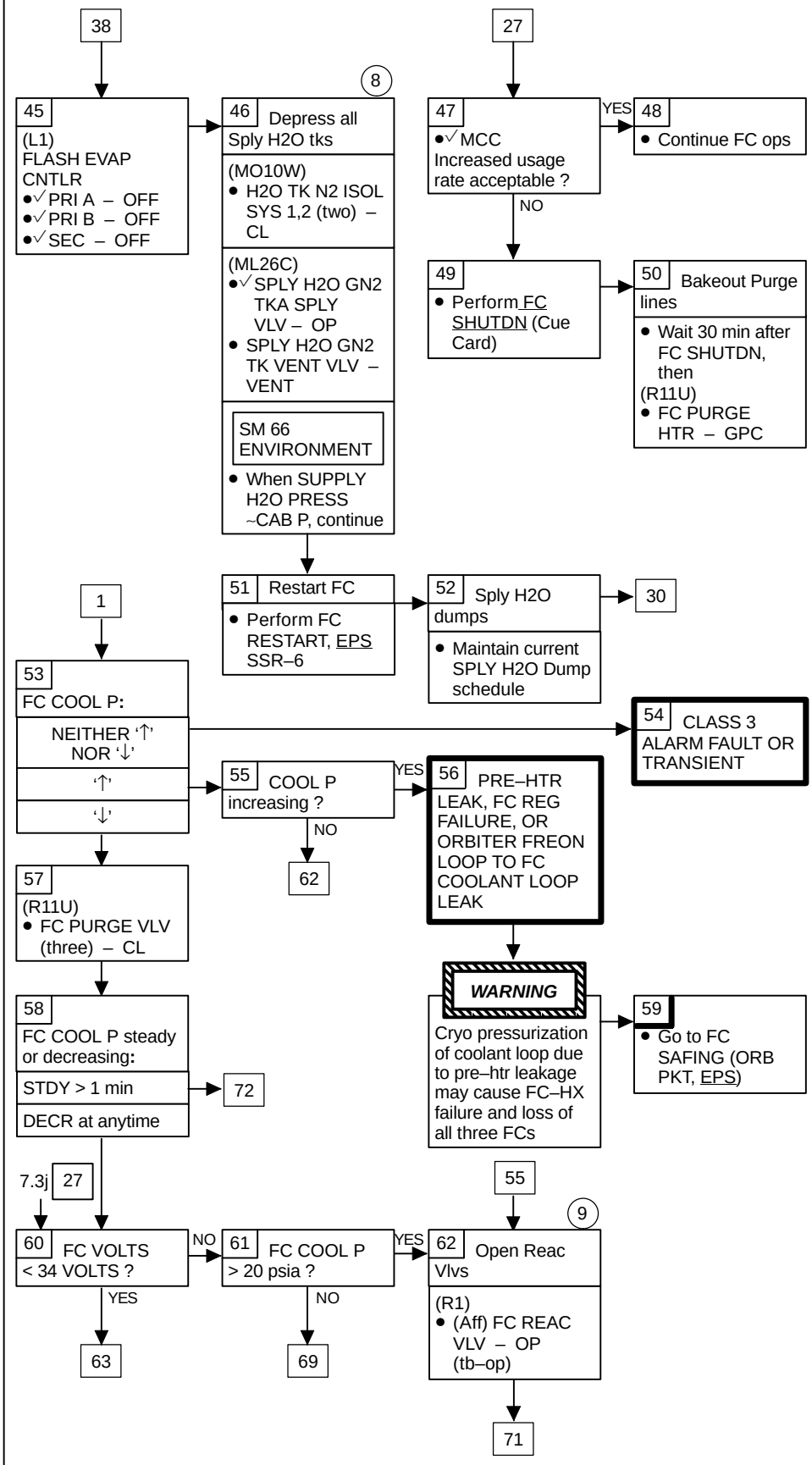


(4) Possible KOH in O2 sys. Do not purge suspect FC until nominal performance at this pressure demonstrated for at least 6 hr

(5) Drop in FC volts vs amps performance that corresponds to new pressure would indicate Regulator shift. If reqd, update FC V–I Curve, FUEL CELL V–I PERFORMANCE PLOT (ORB OPS, EPS), with new nominal data after next purge

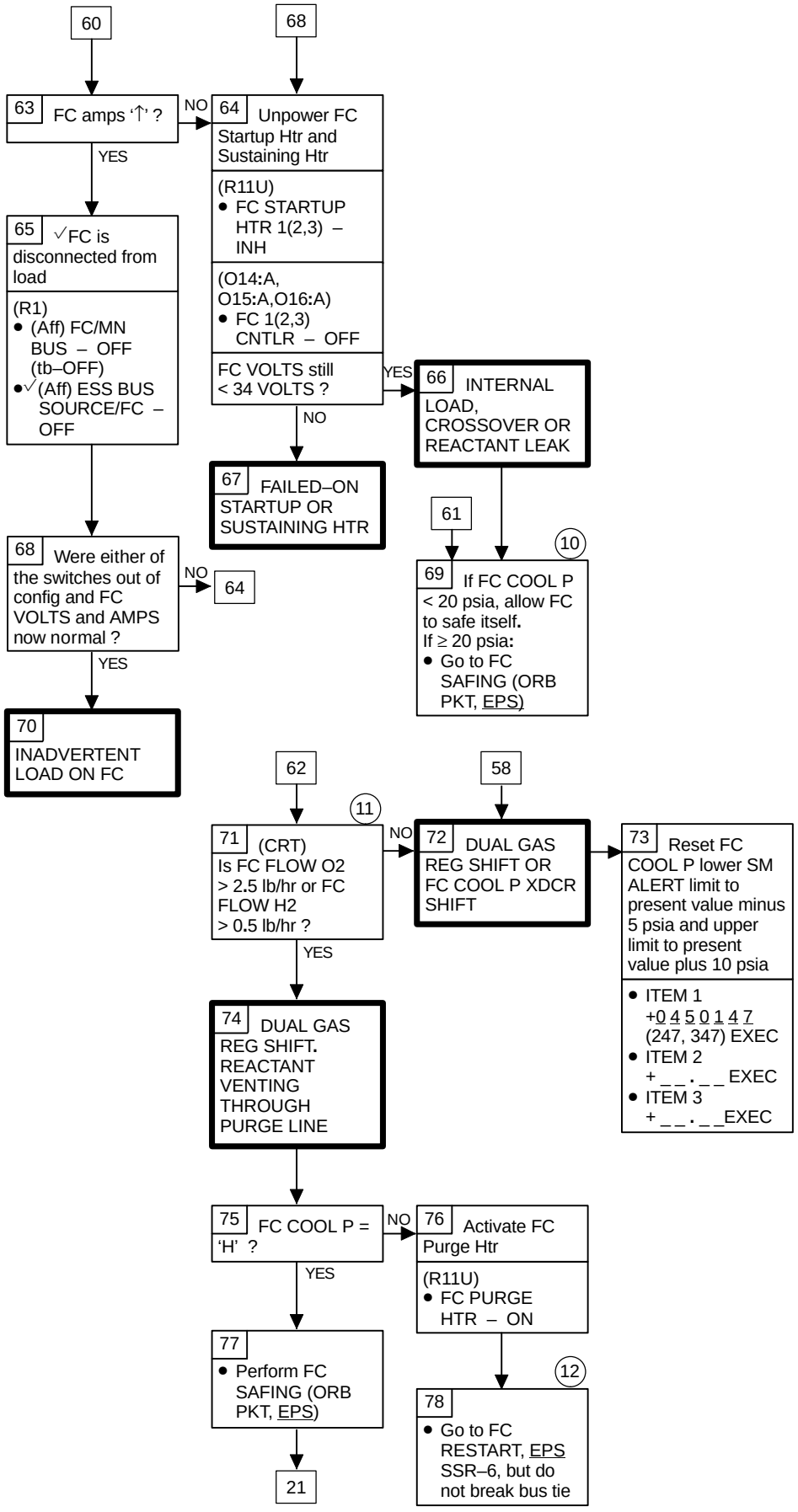
(6) For Regulator shift, future FC ops would depend on SPLY H2O TK QTY, FES ops requirement, and FC loads. Suspect FC can be open circuited and saved for entry

(7) FC may be usable if loads reduced to point where reactant demand can be met



8 For FES ops, SPLY H2O TKB, TKC, TKD may need to be repressurized. ✓MCC

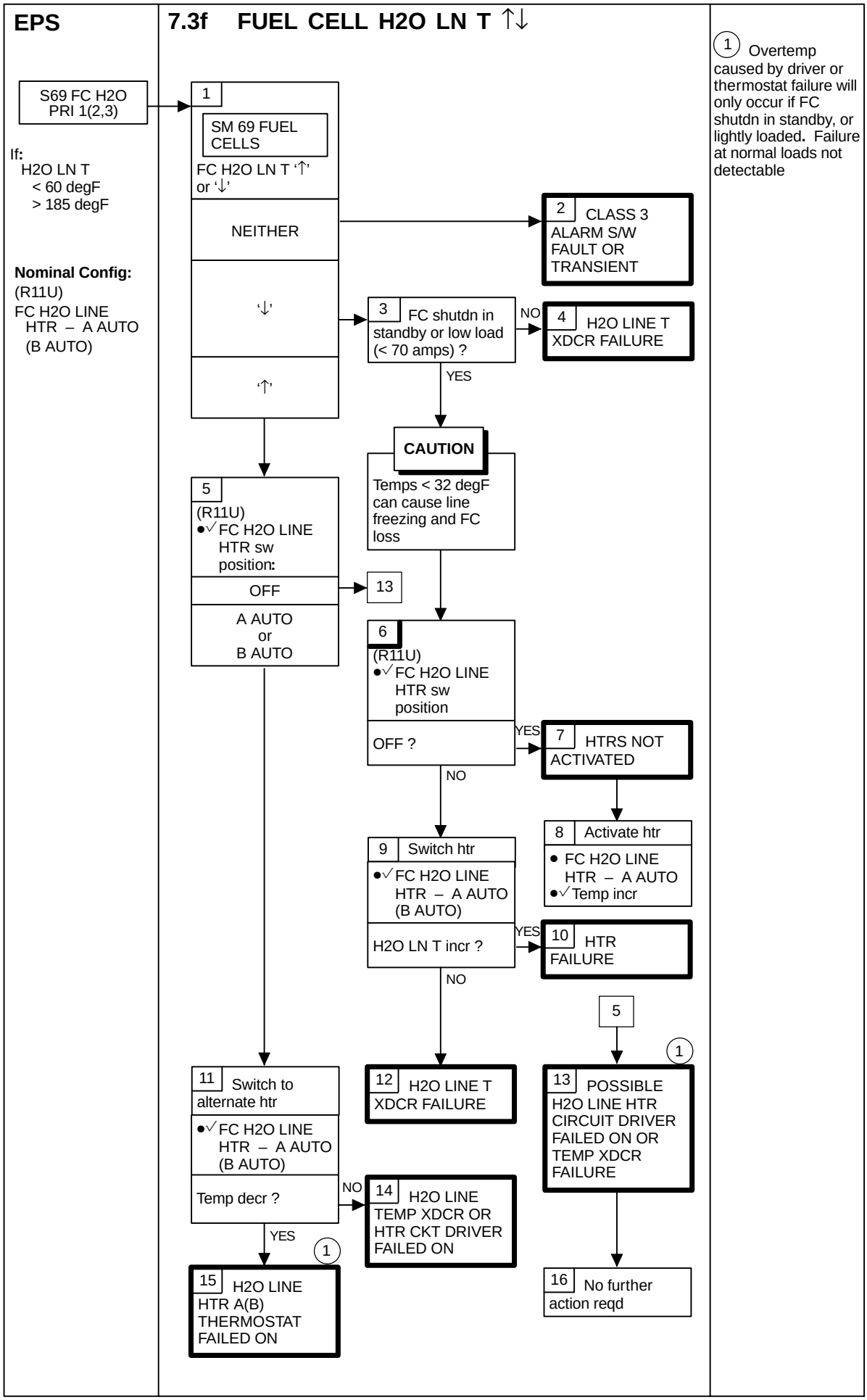
9 For Dual Gas Regulator shift high, reactants may be venting through purge line. If Reac Vlvs are not open, FC could evacuate (i.e., safe)



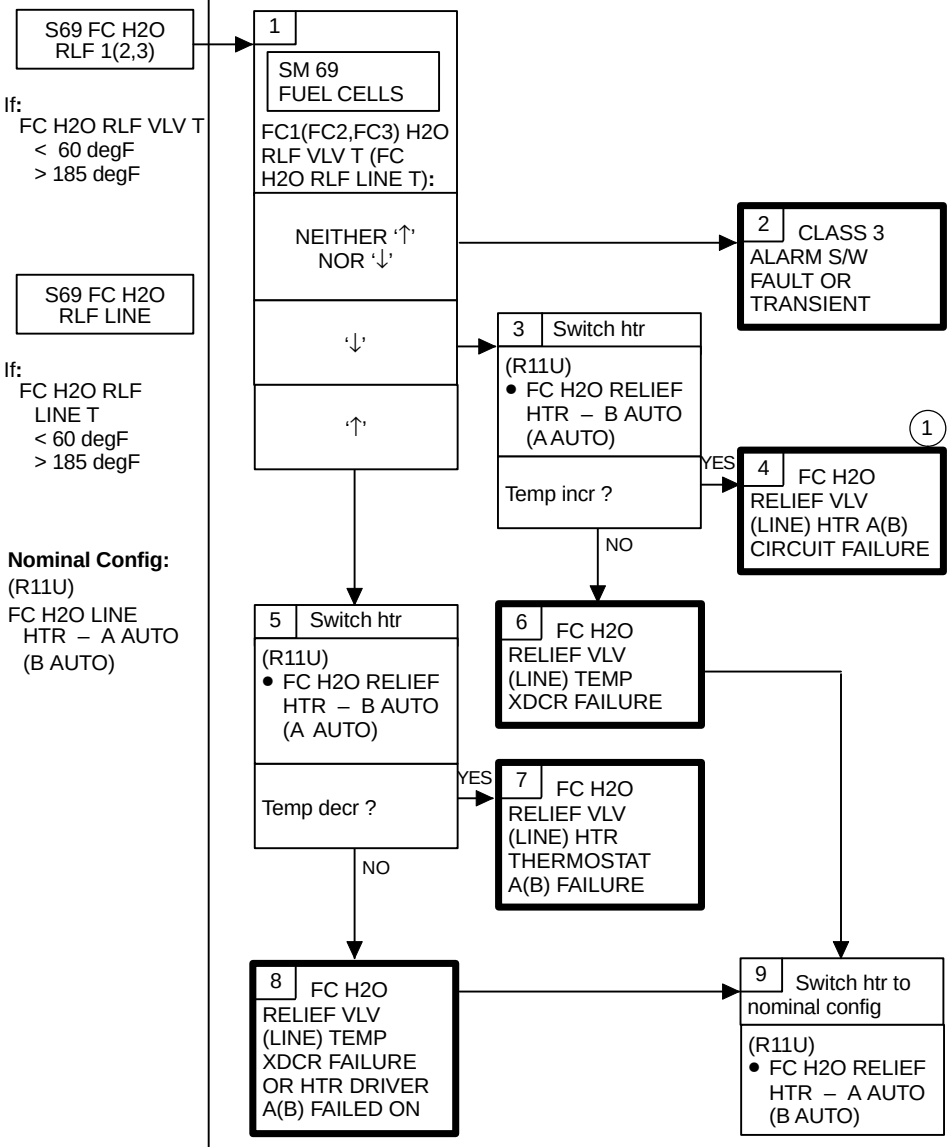
(10) At FC coolant pressure of less than 20 psia, electrolyte boiling may occur (i.e., KOH escaping from cell matrix); in addition, Dual Gas Regulators may not control O2/H2 relative pressures and crossover may result

(11) Typical values for FC purges

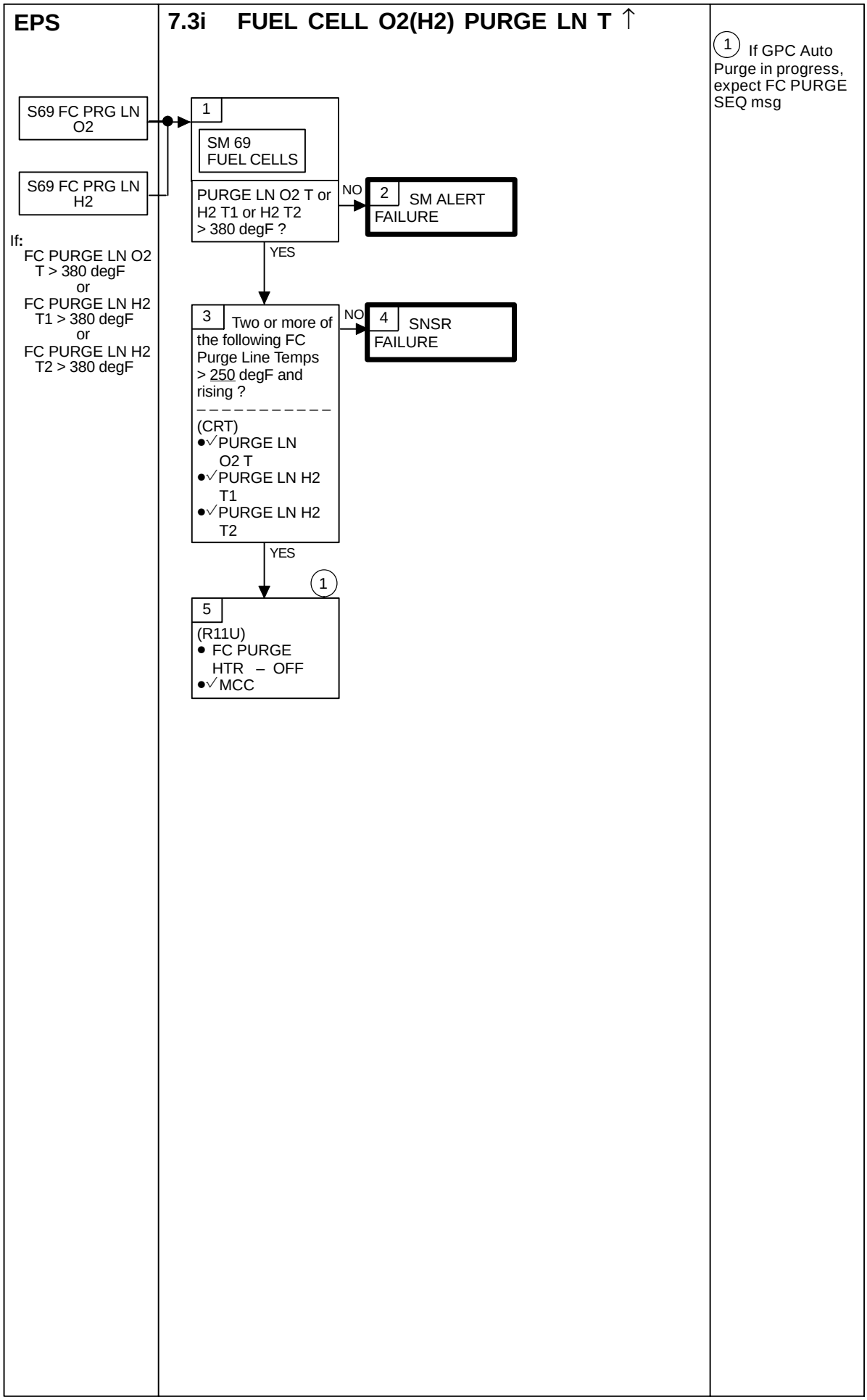
(12) With FC shutdn and no coolant flow, there exists no preheating capability of the incoming reactants. Continuous purge flow may freeze or damage regulator

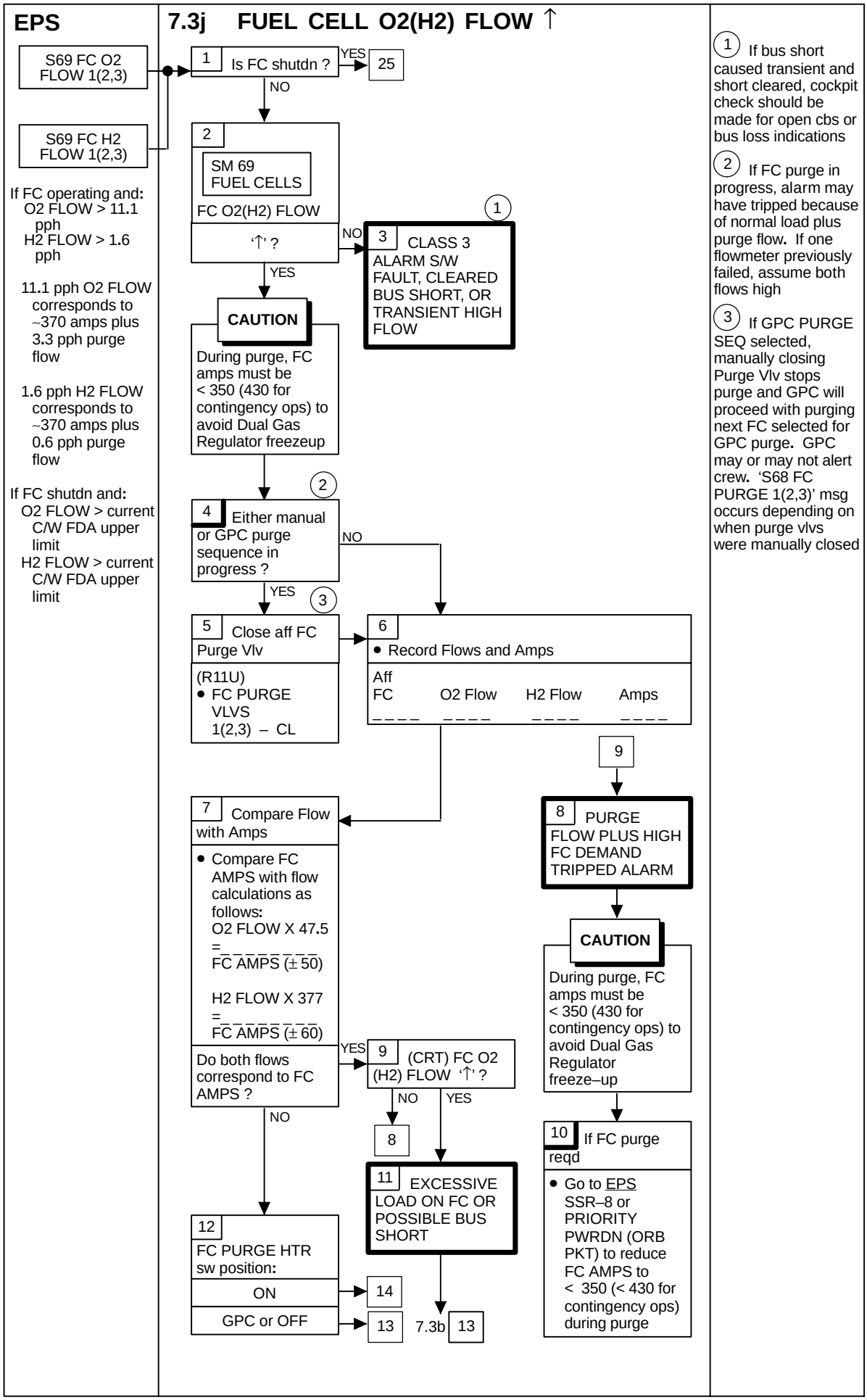

EPS
7.3f FUEL CELL H2O LN T ↑↓
S69 FC H2O PRI 1(2,3)
If:
H2O LN T
< 60 degF
> 185 degF
Nominal Config:
(R11U)
FC H2O LINE
HTR – A AUTO
(B AUTO)
1
SM 69 FUEL CELLS
FC H2O LN T '↑' or '↓'
NEITHER
'↓'
'↑'
2 CLASS 3 ALARM S/W FAULT OR TRANSIENT
3 FC shutdn in standby or low load (< 70 amps) ?
NO
4 H2O LINE T XDCR FAILURE
YES
CAUTION
Temps < 32 degF can cause line freezing and FC loss
5
(R11U)
●✓FC H2O LINE HTR sw position:
OFF
13
A AUTO or B AUTO
6
(R11U)
●✓FC H2O LINE HTR sw position
OFF ?
YES
7 HTRS NOT ACTIVATED
NO
8 Activate htr
● FC H2O LINE HTR – A AUTO
●✓Temp incr
9 Switch htr
●✓FC H2O LINE HTR – A AUTO (B AUTO)
H2O LN T incr ?
YES
10 HTR FAILURE
NO
5
1
11 Switch to alternate htr
●✓FC H2O LINE HTR – A AUTO (B AUTO)
Temp decr ?
NO
14 H2O LINE TEMP XDCR OR HTR CKT DRIVER FAILED ON
YES
1
15 H2O LINE HTR A(B) THERMOSTAT FAILED ON
12 H2O LINE T XDCR FAILURE
13 POSSIBLE H2O LINE HTR CIRCUIT DRIVER FAILED ON OR TEMP XDCR FAILURE
16 No further action reqd
1 Overtemp caused by driver or thermostat failure will only occur if FC shutdn in standby, or lightly loaded. Failure at normal loads not detectable

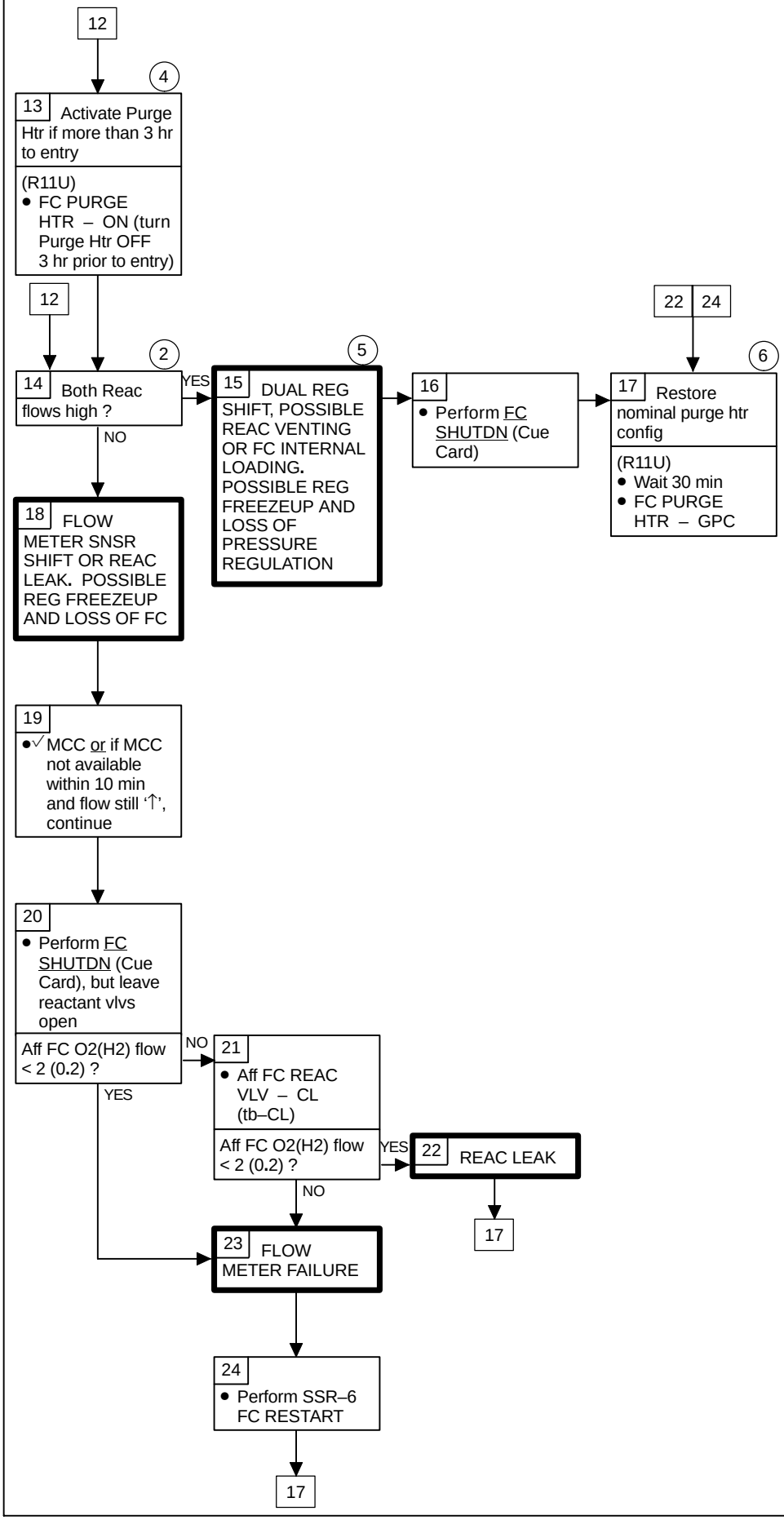
7.3g FUEL CELL H2O RLF VLV T ↑↓ FUEL CELL H2O RLF LINE T ↑↓



(1) Switching htrs isolated failed circuit


EPS
7.3i FUEL CELL O2(H2) PURGE LN T ↑
1 If GPC Auto Purge in progress, expect FC PURGE SEQ msg
S69 FC PRG LN O2
S69 FC PRG LN H2
If:
FC PURGE LN O2 T > 380 degF
or
FC PURGE LN H2 T1 > 380 degF
or
FC PURGE LN H2 T2 > 380 degF
1
SM 69 FUEL CELLS
PURGE LN O2 T or H2 T1 or H2 T2 > 380 degF ?
NO
2 SM ALERT FAILURE
YES
3 Two or more of the following FC Purge Line Temps > 250 degF and rising ?
(CRT)
●✓PURGE LN O2 T
●✓PURGE LN H2 T1
●✓PURGE LN H2 T2
NO
4 SNSR FAILURE
YES
1
5
(R11U)
● FC PURGE HTR – OFF
●✓MCC


EPS
7.3j FUEL CELL O2(H2) FLOW ↑
S69 FC O2 FLOW 1(2,3)
S69 FC H2 FLOW 1(2,3)
If FC operating and:
O2 FLOW > 11.1 pph
H2 FLOW > 1.6 pph
11.1 pph O2 FLOW corresponds to ~370 amps plus 3.3 pph purge flow
1.6 pph H2 FLOW corresponds to ~370 amps plus 0.6 pph purge flow
If FC shutdn and:
O2 FLOW > current C/W FDA upper limit
H2 FLOW > current C/W FDA upper limit
1 Is FC shutdn ?
YES
25
NO
2
SM 69 FUEL CELLS
FC O2(H2) FLOW '↑' ?
NO
1
3 CLASS 3 ALARM S/W FAULT, CLEARED BUS SHORT, OR TRANSIENT HIGH FLOW
YES
CAUTION
During purge, FC amps must be < 350 (430 for contingency ops) to avoid Dual Gas Regulator freezeup
2
4 Either manual or GPC purge sequence in progress ?
NO
YES
3
5 Close aff FC Purge Vlv
(R11U)
• FC PURGE VLVS 1(2,3) – CL
6
• Record Flows and Amps
Aff FC O2 Flow H2 Flow Amps
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
9
8 PURGE FLOW PLUS HIGH FC DEMAND TRIPPED ALARM
CAUTION
During purge, FC amps must be < 350 (430 for contingency ops) to avoid Dual Gas Regulator freeze–up
7 Compare Flow with Amps
• Compare FC AMPS with flow calculations as follows:
O2 FLOW X 47.5 = _ _ _ _ _ _ _ _ FC AMPS (± 50)
H2 FLOW X 377 = _ _ _ _ _ _ _ _ FC AMPS (± 60)
Do both flows correspond to FC AMPS ?
YES
9 (CRT) FC O2 (H2) FLOW '↑' ?
NO
YES
8
11 EXCESSIVE LOAD ON FC OR POSSIBLE BUS SHORT
NO
10 If FC purge reqd
• Go to EPS SSR–8 or PRIORITY PWRDN (ORB PKT) to reduce FC AMPS to < 350 (< 430 for contingency ops) during purge
12
FC PURGE HTR sw position:
ON
14
GPC or OFF
13
7.3b 13
1 If bus short caused transient and short cleared, cockpit check should be made for open cbs or bus loss indications
2 If FC purge in progress, alarm may have tripped because of normal load plus purge flow. If one flowmeter previously failed, assume both flows high
3 If GPC PURGE SEQ selected, manually closing Purge Vlv stops purge and GPC will proceed with purging next FC selected for GPC purge. GPC may or may not alert crew. 'S68 FC PURGE 1(2,3)' msg occurs depending on when purge vlvs were manually closed

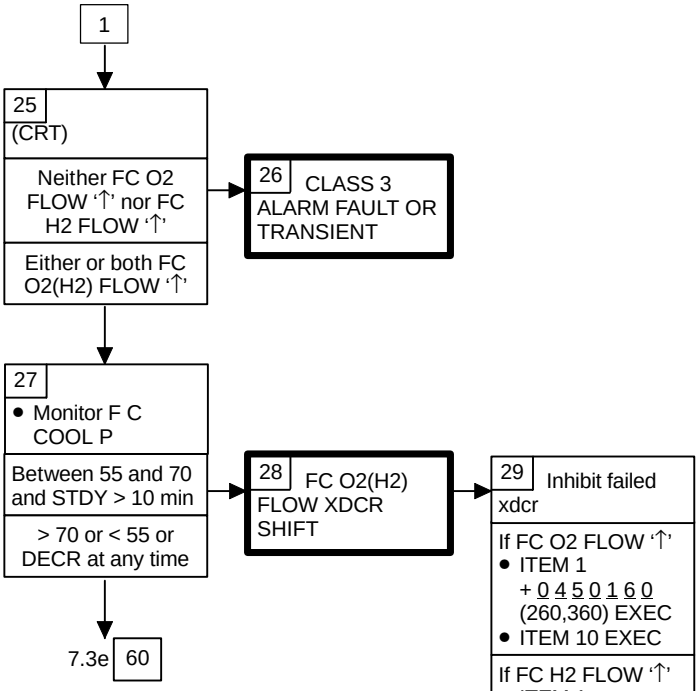


(2) If FC purge in progress, alarm may have tripped because of normal load plus purge flow. If one flowmeter previously failed, assume both flows high

(4) Turning htrs off prevents excessive heat during entry and possible htr element damage

(5) Reactant venting indication: Cool P ≥ 66 psia

(6) Htrs must remain on for 30 min to bakeout purge vent lines


1
25
(CRT)
Neither FC O2 FLOW '↑' nor FC H2 FLOW '↑'
Either or both FC O2(H2) FLOW '↑'
26
CLASS 3 ALARM FAULT OR TRANSIENT
27
• Monitor F C COOL P
Between 55 and 70 and STDY > 10 min
> 70 or < 55 or DECR at any time
28
FC O2(H2) FLOW XDCR SHIFT
29
Inhibit failed xdcr
If FC O2 FLOW '↑'
• ITEM 1
+ 0 4 5 0 1 6 0
(260,360) EXEC
• ITEM 10 EXEC
If FC H2 FLOW '↑'
• ITEM 1
+ 0 4 5 0 1 7 0
(270,370) EXEC
• ITEM 10 EXEC
7.3e 60

EPS

7.3k FUEL CELL RELIEF HTR SW FAIL

S69 FC H2O RLF HTR

If:

SM 69 FUEL CELLS

H2O RLF HTR SW – OFF
H2O RLF HTR SW – A/B

Nominal Config:
(R11U)
If pre–htr reconfig:
FC H2O RELIEF HTR – A AUTO

If post–htr reconfig:
FC H2O RELIEF HTR – B AUTO

1 SM 69 FUEL CELLS
H2O RLF HTR SW:
- OFF
- A/B
- A or B

2 (R11U) FC H2O RELIEF HTR – OFF ?
YES → 3 SWITCH IN OFF POSITION
NO

4 Select sw to alternate position
(R11U)
- FC H2O RELIEF HTR – OFF, then B AUTO (A AUTO)

5 Select nominal config
(R11U)
- FC H2O RELIEF HTR – A AUTO (B AUTO)

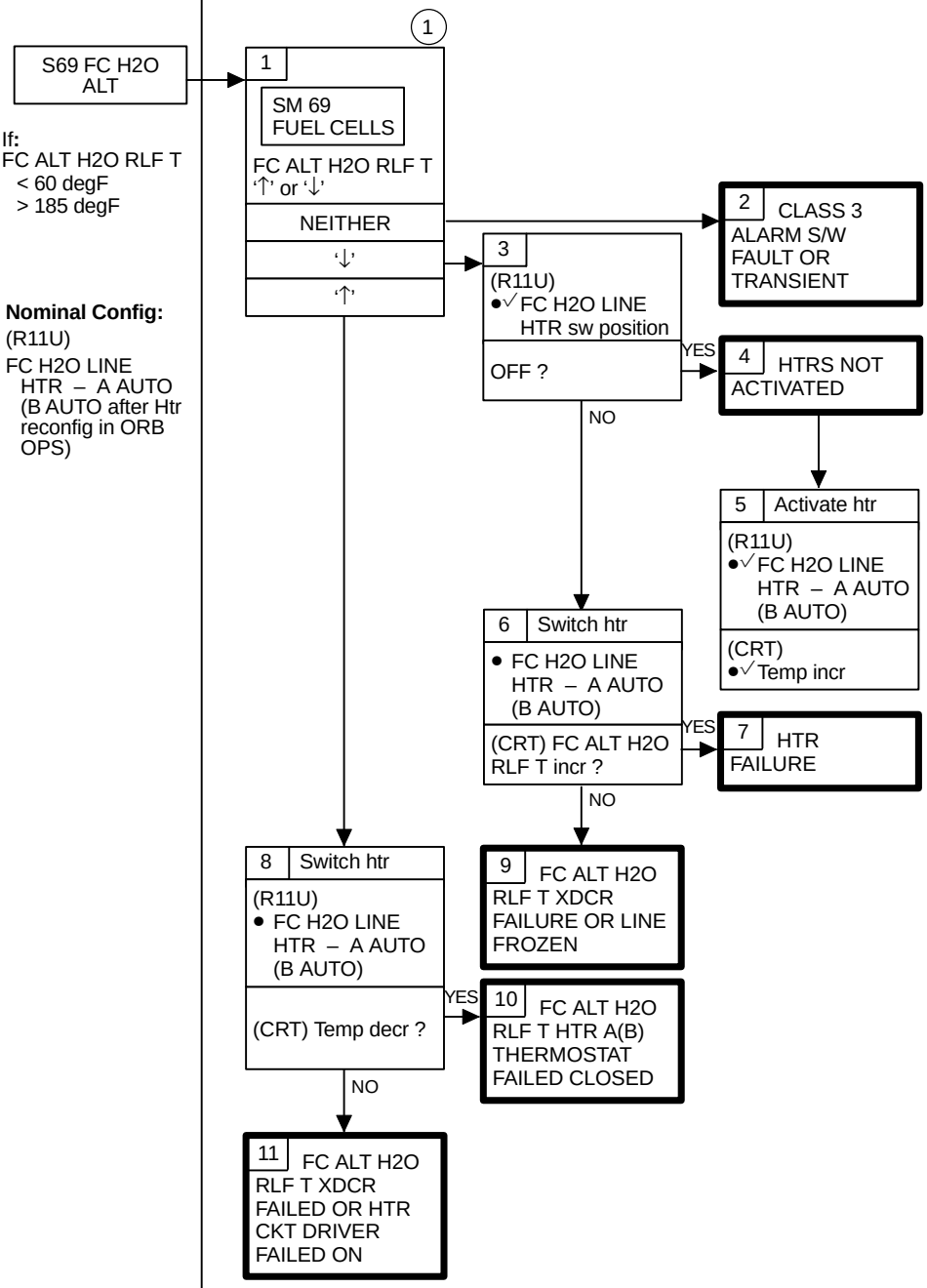
6 C/W FAILURE, DIODE FAILURE, OR TRANSIENT
(1)

7 SM 69 FUEL CELLS
H2O RLF HTR SW:
- A or B → 8 SWITCH CONTACT CONTROL BUS, DIODE, OR INSTRUMENTA–TION FAILURE; OR SWITCH IN OFF POSITION
- A/B
- OFF → 9 SWITCH CONTACT, DIODE, OR INSTRU–MENTATION FAILURE

10 (CRT) H2O RLF NOZ T A(B) < 170 and decr ?
NO → 11 INSTRU–MENTATION FAILURE
YES → 12 SWITCH CONTACT(S) AND/OR CONTROL BUS(ES) FAILURE

(1) Diode failure would be indicated if an A/B alarm occurred during nozzle htr ops. Alt htr could be selected to eliminate alarms

7.3l FUEL CELL ALT H2O RLF T ↑↓



(1) FC ALT H2O RLF LINE T normally controlled to 70–90 degF

EPS

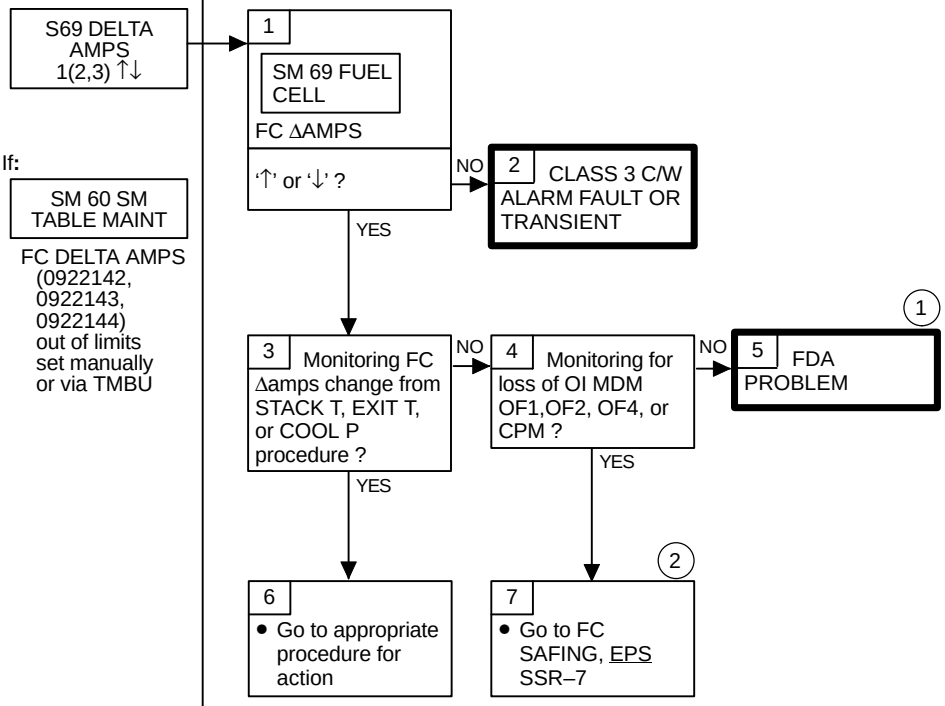
7.3m FC DELTA AMPS ↑↓

S69 DELTA AMPS 1(2,3) ↑↓

If:

SM 60 SM TABLE MAINT

FC DELTA AMPS (0922142, 0922143, 0922144) out of limits set manually or via TMBU

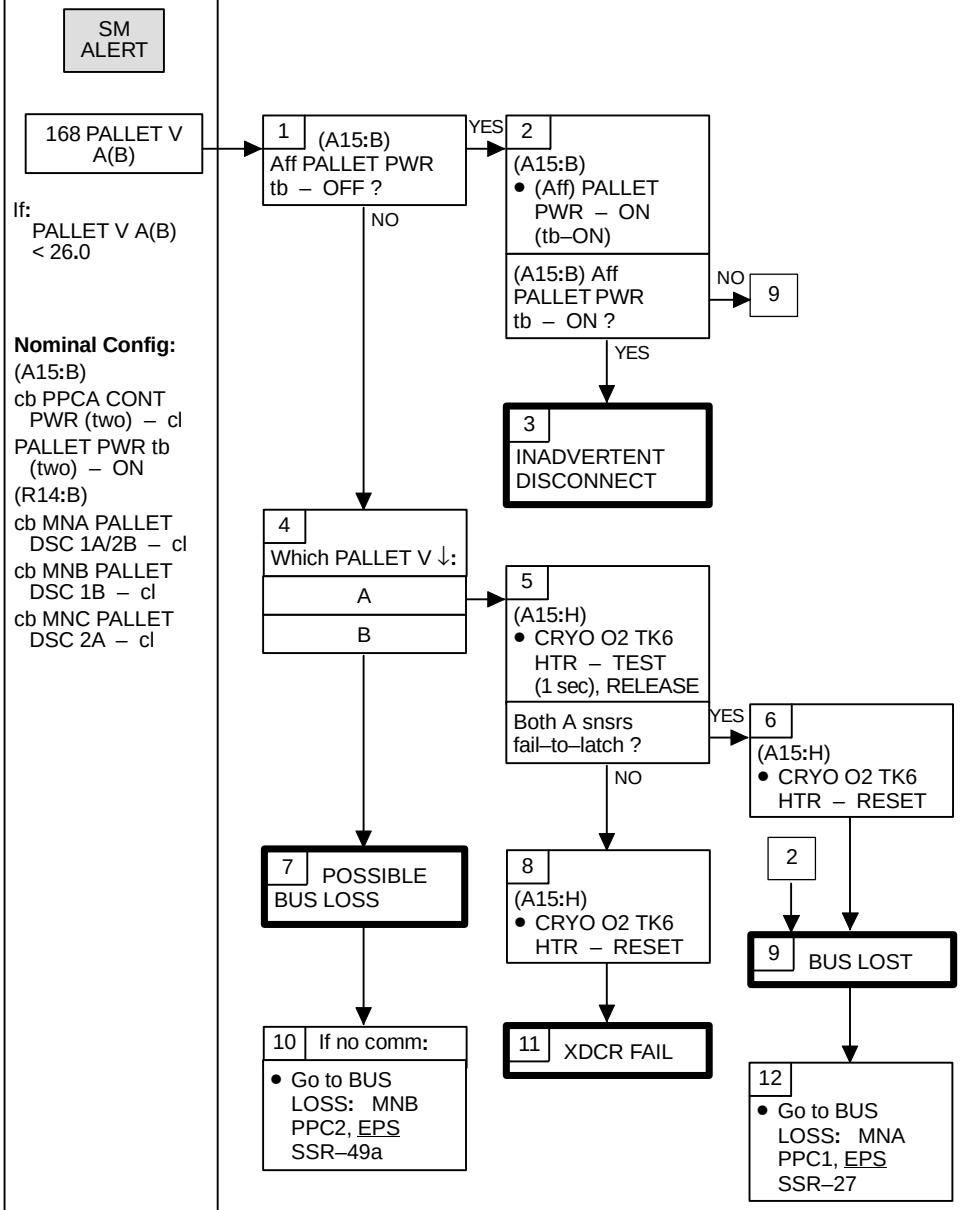


(1) Default limits are OSL, OSH

(2) A ΔAMPS shift of 12 amps between two tied FCs is equivalent to an ~300 mV degradation in one of the 96 cells of the FC. This degree of performance change, which is not related to load changes, may indicate an internal cell problem and, if allowed to continue, could lead to a crossover condition

EPS

7.4b PALLET VOLTS ↓



EPS

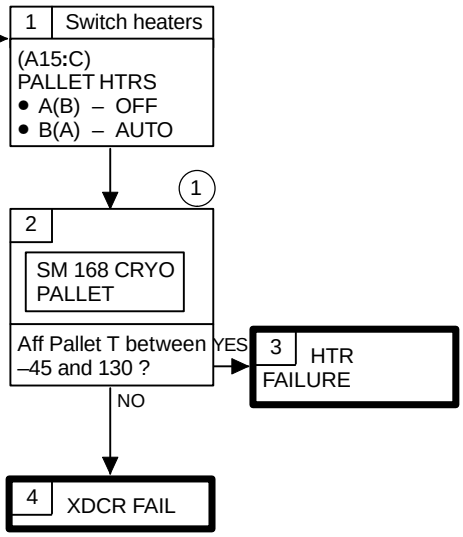
7.4c PALLET TEMP ↑↓

SM ALERT

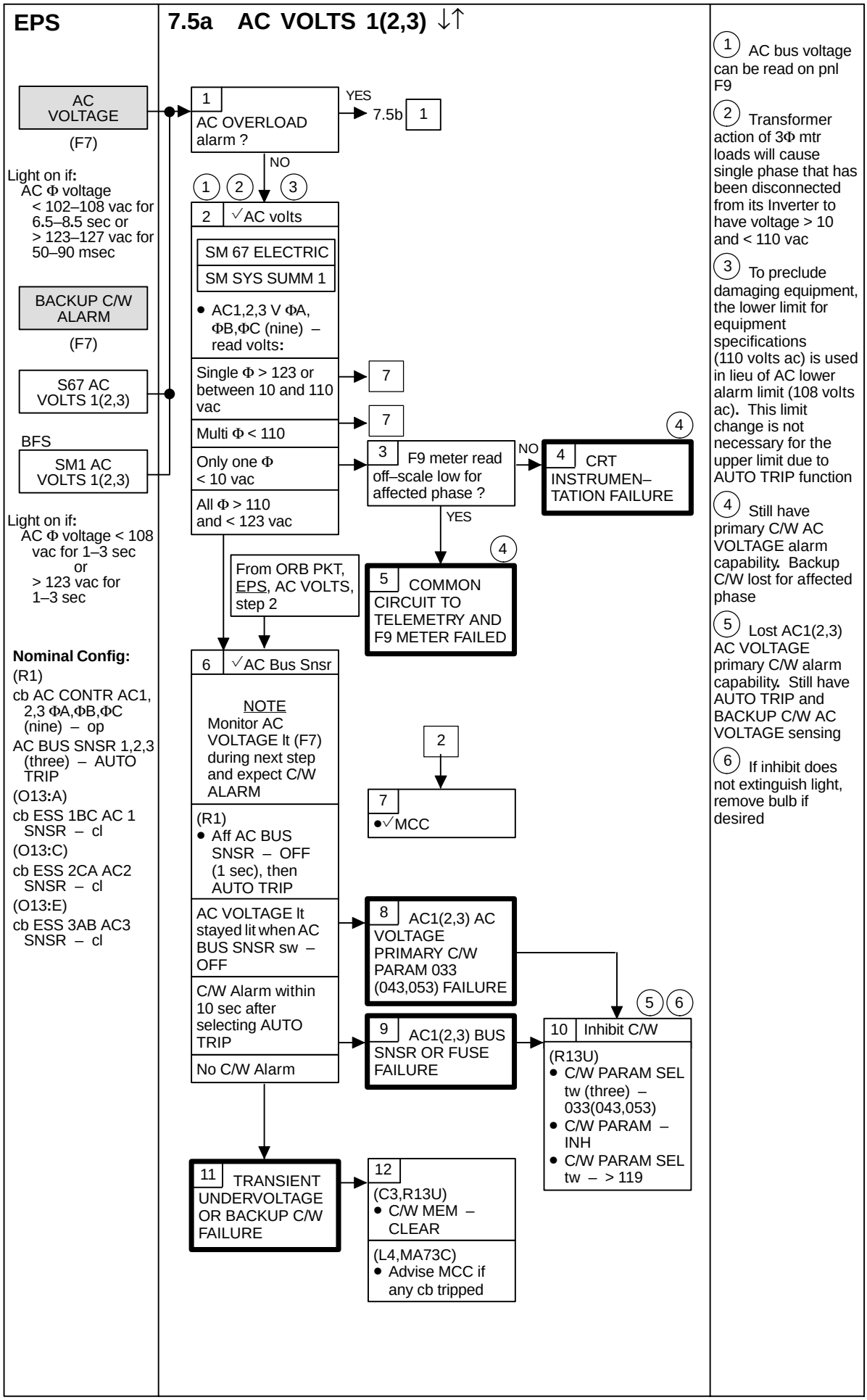
168 PALLET T

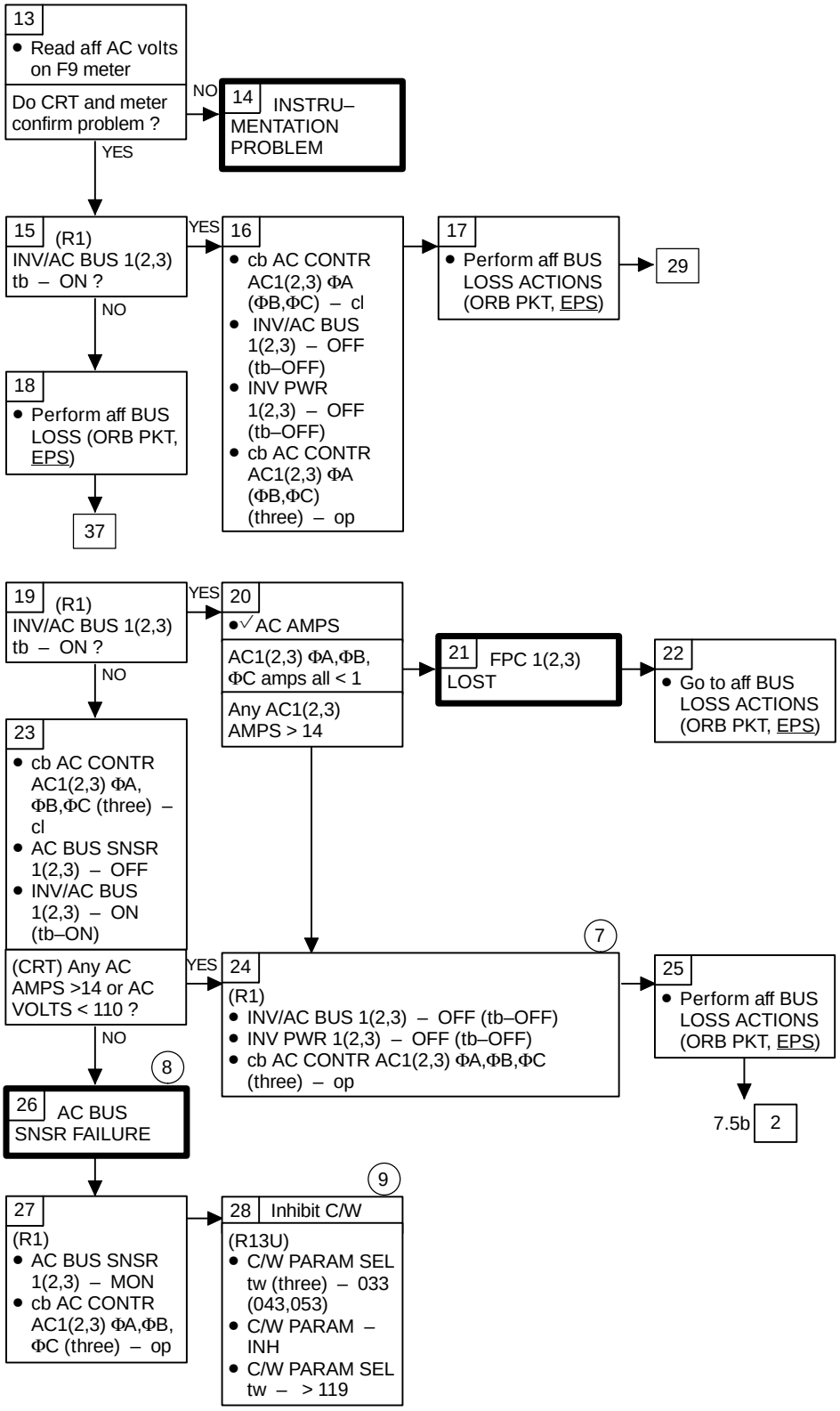
PALLET T
< –45
> 130

Nominal Config:
(A15:C)
PALLET HTRS
A(B) – AUTO
B(A) – OFF
(R14:B)
cb MNA PALLET
DSC 1A/2B – cl
cb MNB PALLET
DSC 1B – cl
cb MNC PALLET
DSC 2A – cl



(1) May take several minutes

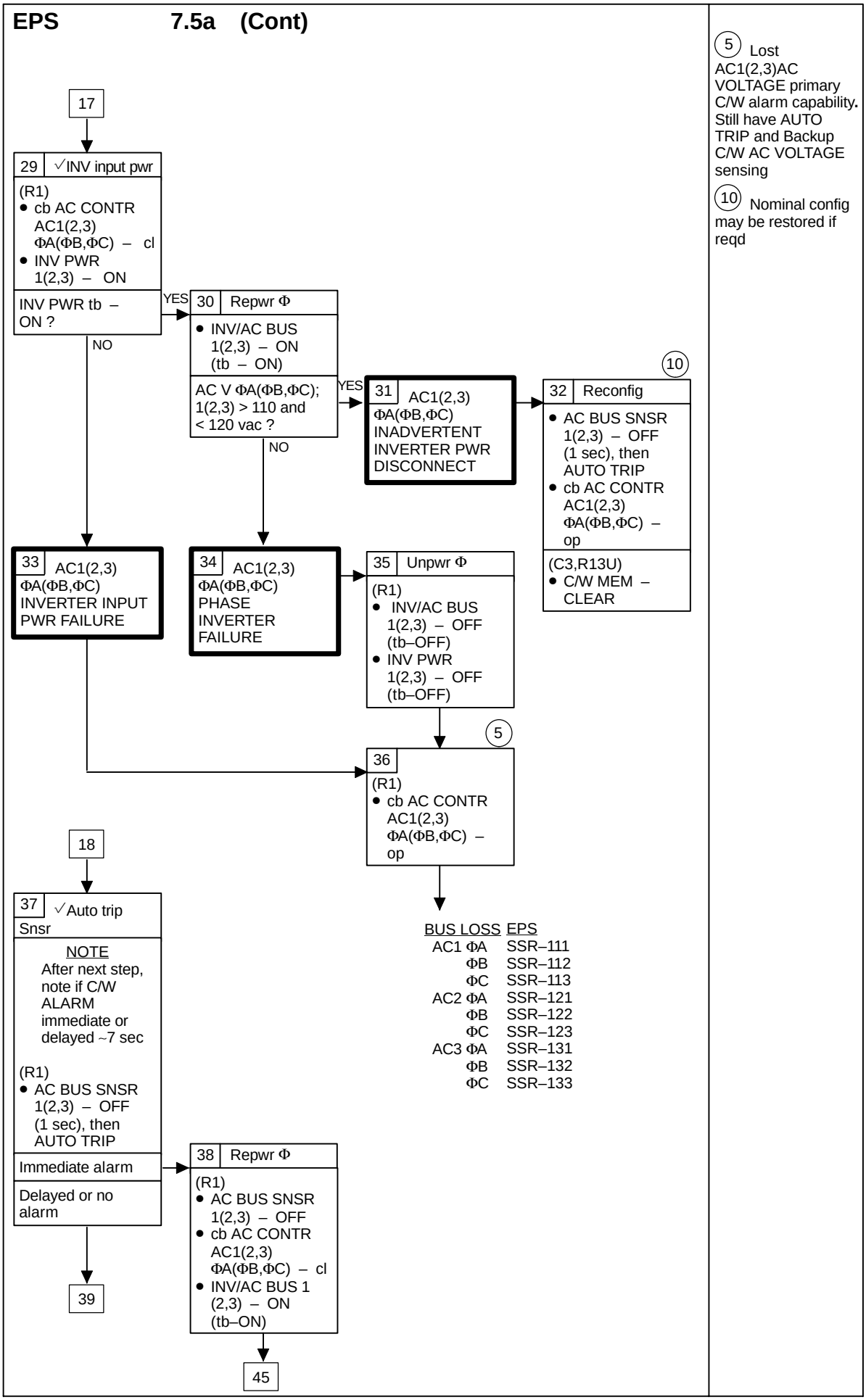

EPS
7.5a AC VOLTS 1(2,3) ↓↑
AC VOLTAGE
(F7)
Light on if:
AC Φ voltage
< 102–108 vac for 6.5–8.5 sec or
> 123–127 vac for 50–90 msec
BACKUP C/W ALARM
(F7)
S67 AC VOLTS 1(2,3)
BFS
SM1 AC VOLTS 1(2,3)
Light on if:
AC Φ voltage < 108 vac for 1–3 sec
or
> 123 vac for 1–3 sec
Nominal Config:
(R1)
cb AC CONTR AC1, 2,3 ΦA,ΦB,ΦC (nine) – op
AC BUS SNSR 1,2,3 (three) – AUTO TRIP
(O13:A)
cb ESS 1BC AC 1 SNSR – cl
(O13:C)
cb ESS 2CA AC2 SNSR – cl
(O13:E)
cb ESS 3AB AC3 SNSR – cl
1 AC OVERLOAD alarm ?
YES
7.5b 1
NO
1 2 3
2 ✓AC volts
SM 67 ELECTRIC
SM SYS SUMM 1
• AC1,2,3 V ΦA, ΦB,ΦC (nine) – read volts:
Single Φ > 123 or between 10 and 110 vac
7
Multi Φ < 110
7
Only one Φ < 10 vac
3 F9 meter read off–scale low for affected phase ?
NO
4 CRT INSTRUMEN–TATION FAILURE
4
YES
4
5 COMMON CIRCUIT TO TELEMETRY AND F9 METER FAILED
All Φ > 110 and < 123 vac
From ORB PKT, EPS, AC VOLTS, step 2
6 ✓AC Bus Snsr
NOTE
Monitor AC VOLTAGE lt (F7) during next step and expect C/W ALARM
(R1)
• Aff AC BUS SNSR – OFF (1 sec), then AUTO TRIP
2
7
•✓MCC
AC VOLTAGE lt stayed lit when AC BUS SNSR sw – OFF
8 AC1(2,3) AC VOLTAGE PRIMARY C/W PARAM 033 (043,053) FAILURE
C/W Alarm within 10 sec after selecting AUTO TRIP
9 AC1(2,3) BUS SNSR OR FUSE FAILURE
5 6
10 Inhibit C/W
(R13U)
• C/W PARAM SEL tw (three) – 033(043,053)
• C/W PARAM – INH
• C/W PARAM SEL tw – > 119
No C/W Alarm
11 TRANSIENT UNDERVOLTAGE OR BACKUP C/W FAILURE
12
(C3,R13U)
• C/W MEM – CLEAR
(L4,MA73C)
• Advise MCC if any cb tripped
1 AC bus voltage can be read on pnl F9
2 Transformer action of 3Φ mtr loads will cause single phase that has been disconnected from its Inverter to have voltage > 10 and < 110 vac
3 To preclude damaging equipment, the lower limit for equipment specifications (110 volts ac) is used in lieu of AC lower alarm limit (108 volts ac). This limit change is not necessary for the upper limit due to AUTO TRIP function
4 Still have primary C/W AC VOLTAGE alarm capability. Backup C/W lost for affected phase
5 Lost AC1(2,3) AC VOLTAGE primary C/W alarm capability. Still have AUTO TRIP and BACKUP C/W AC VOLTAGE sensing
6 If inhibit does not extinguish light, remove bulb if desired

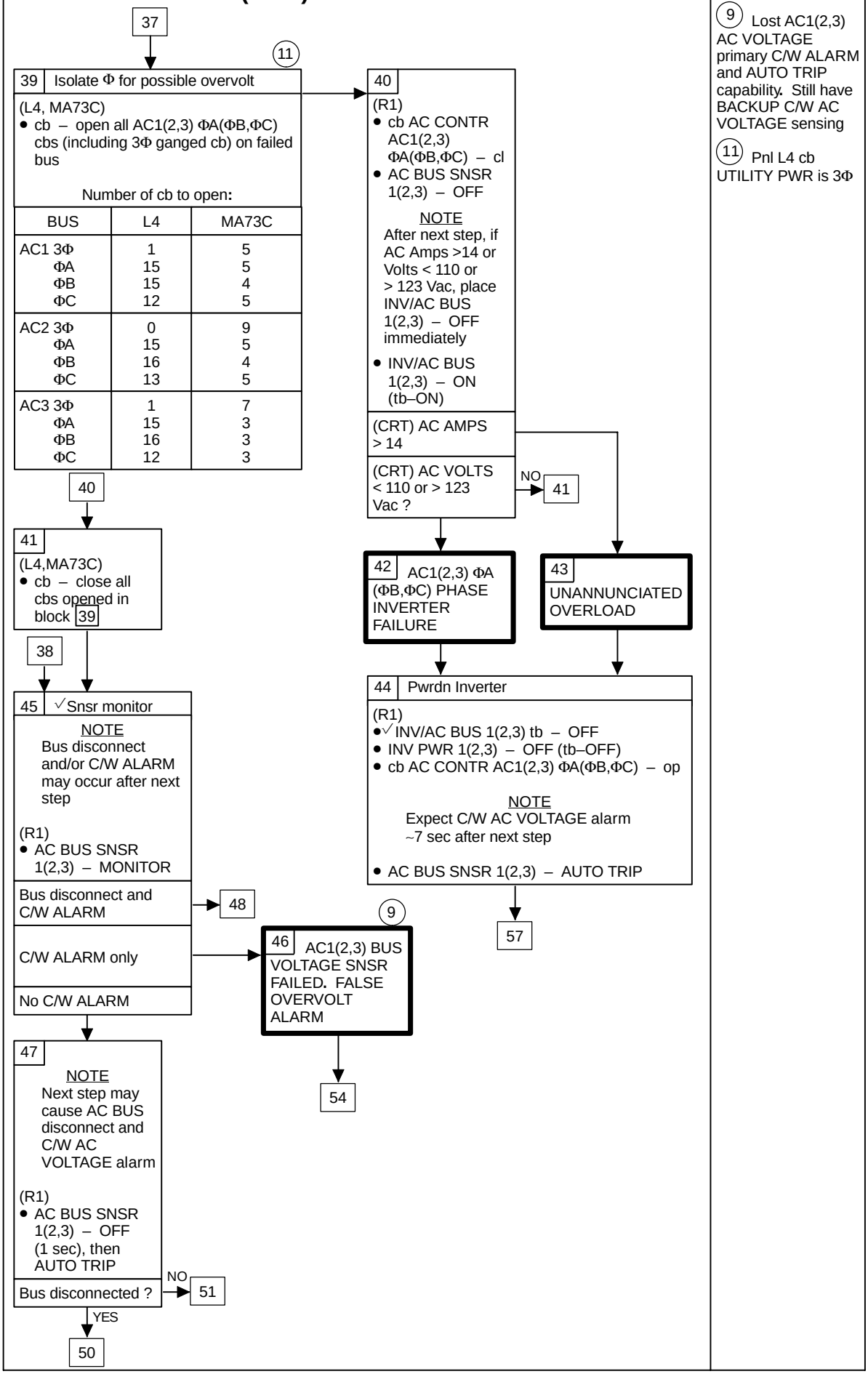


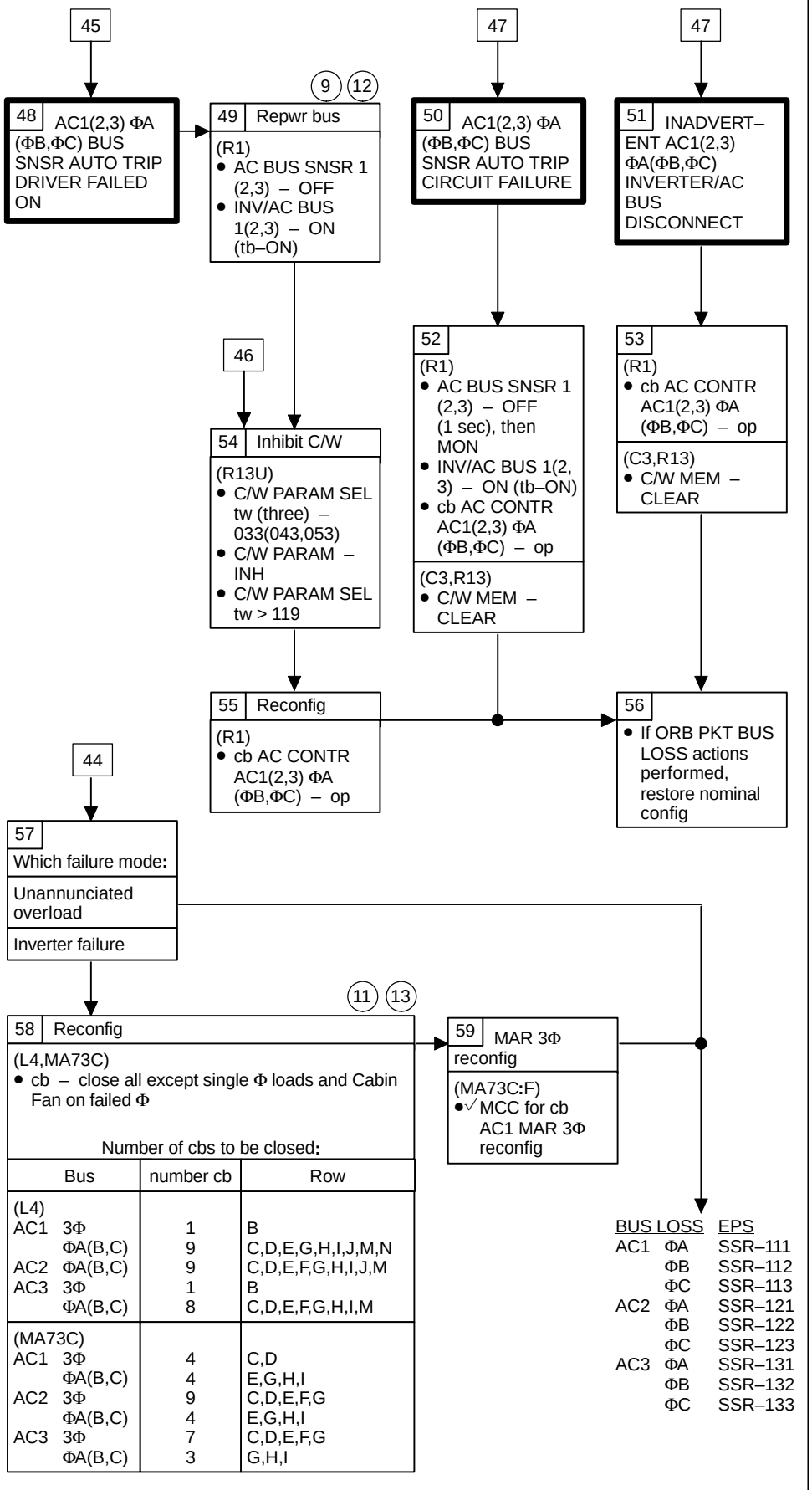
(7) AC BUS short and AC BUS SNSR OVLD alarm not operational

(8) AC BUS SNSR 1(2,3) failed causing auto trip on multiple phases

(9) Lost AC1(2,3) AC VOLTAGE primary C/W alarm and AUTO TRIP capability. Still have BACKUP C/W AC VOLTAGE sensing


17
29 ✓INV input pwr
(R1)
• cb AC CONTR AC1(2,3) ΦA(ΦB,ΦC) – cl
• INV PWR 1(2,3) – ON
INV PWR tb – ON ?
YES
NO
30 Repwr Φ
• INV/AC BUS 1(2,3) – ON (tb – ON)
AC V ΦA(ΦB,ΦC); 1(2,3) > 110 and < 120 vac ?
YES
NO
31 AC1(2,3) ΦA(ΦB,ΦC) INADVERTENT INVERTER PWR DISCONNECT
32 Reconfig
• AC BUS SNSR 1(2,3) – OFF (1 sec), then AUTO TRIP
• cb AC CONTR AC1(2,3) ΦA(ΦB,ΦC) – op
(C3,R13U)
• C/W MEM – CLEAR
10
33 AC1(2,3) ΦA(ΦB,ΦC) INVERTER INPUT PWR FAILURE
34 AC1(2,3) ΦA(ΦB,ΦC) PHASE INVERTER FAILURE
35 Unpwr Φ
(R1)
• INV/AC BUS 1(2,3) – OFF (tb–OFF)
• INV PWR 1(2,3) – OFF (tb–OFF)
5
36
(R1)
• cb AC CONTR AC1(2,3) ΦA(ΦB,ΦC) – op
BUS LOSS EPS
AC1 ΦA SSR–111
ΦB SSR–112
ΦC SSR–113
AC2 ΦA SSR–121
ΦB SSR–122
ΦC SSR–123
AC3 ΦA SSR–131
ΦB SSR–132
ΦC SSR–133
18
37 ✓Auto trip Snsr
NOTE
After next step, note if C/W ALARM immediate or delayed ~7 sec
(R1)
• AC BUS SNSR 1(2,3) – OFF (1 sec), then AUTO TRIP
Immediate alarm
Delayed or no alarm
38 Repwr Φ
(R1)
• AC BUS SNSR 1(2,3) – OFF
• cb AC CONTR AC1(2,3) ΦA(ΦB,ΦC) – cl
• INV/AC BUS 1 (2,3) – ON (tb–ON)
39
45
5 Lost AC1(2,3)AC VOLTAGE primary C/W alarm capability. Still have AUTO TRIP and Backup C/W AC VOLTAGE sensing
10 Nominal config may be restored if reqd


37
11
39 Isolate Φ for possible overvolt
(L4, MA73C)
• cb – open all AC1(2,3) ΦA(ΦB,ΦC) cbs (including 3Φ ganged cb) on failed bus
Number of cb to open:
BUS | L4 | MA73C
AC1 3Φ | 1 | 5
ΦA | 15 | 5
ΦB | 15 | 4
ΦC | 12 | 5
AC2 3Φ | 0 | 9
ΦA | 15 | 5
ΦB | 16 | 4
ΦC | 13 | 5
AC3 3Φ | 1 | 7
ΦA | 15 | 3
ΦB | 16 | 3
ΦC | 12 | 3
40
41
(L4,MA73C)
• cb – close all cbs opened in block 39
38
45 ✓Snsr monitor
NOTE
Bus disconnect and/or C/W ALARM may occur after next step
(R1)
• AC BUS SNSR 1(2,3) – MONITOR
Bus disconnect and C/W ALARM
48
C/W ALARM only
9
46 AC1(2,3) BUS VOLTAGE SNSR FAILED. FALSE OVERVOLT ALARM
54
No C/W ALARM
47
NOTE
Next step may cause AC BUS disconnect and C/W AC VOLTAGE alarm
(R1)
• AC BUS SNSR 1(2,3) – OFF (1 sec), then AUTO TRIP
Bus disconnected ?
NO
51
YES
50
40
(R1)
• cb AC CONTR AC1(2,3) ΦA(ΦB,ΦC) – cl
• AC BUS SNSR 1(2,3) – OFF
NOTE
After next step, if AC Amps >14 or Volts < 110 or > 123 Vac, place INV/AC BUS 1(2,3) – OFF immediately
• INV/AC BUS 1(2,3) – ON (tb–ON)
(CRT) AC AMPS > 14
(CRT) AC VOLTS < 110 or > 123 Vac ?
NO
41
42 AC1(2,3) ΦA (ΦB,ΦC) PHASE INVERTER FAILURE
43 UNANNUNCIATED OVERLOAD
44 Pwrdn Inverter
(R1)
• ✓INV/AC BUS 1(2,3) tb – OFF
• INV PWR 1(2,3) – OFF (tb–OFF)
• cb AC CONTR AC1(2,3) ΦA(ΦB,ΦC) – op
NOTE
Expect C/W AC VOLTAGE alarm ~7 sec after next step
• AC BUS SNSR 1(2,3) – AUTO TRIP
57
9 Lost AC1(2,3) AC VOLTAGE primary C/W ALARM and AUTO TRIP capability. Still have BACKUP C/W AC VOLTAGE sensing
11 Pnl L4 cb UTILITY PWR is 3Φ



Number of cbs to be closed:

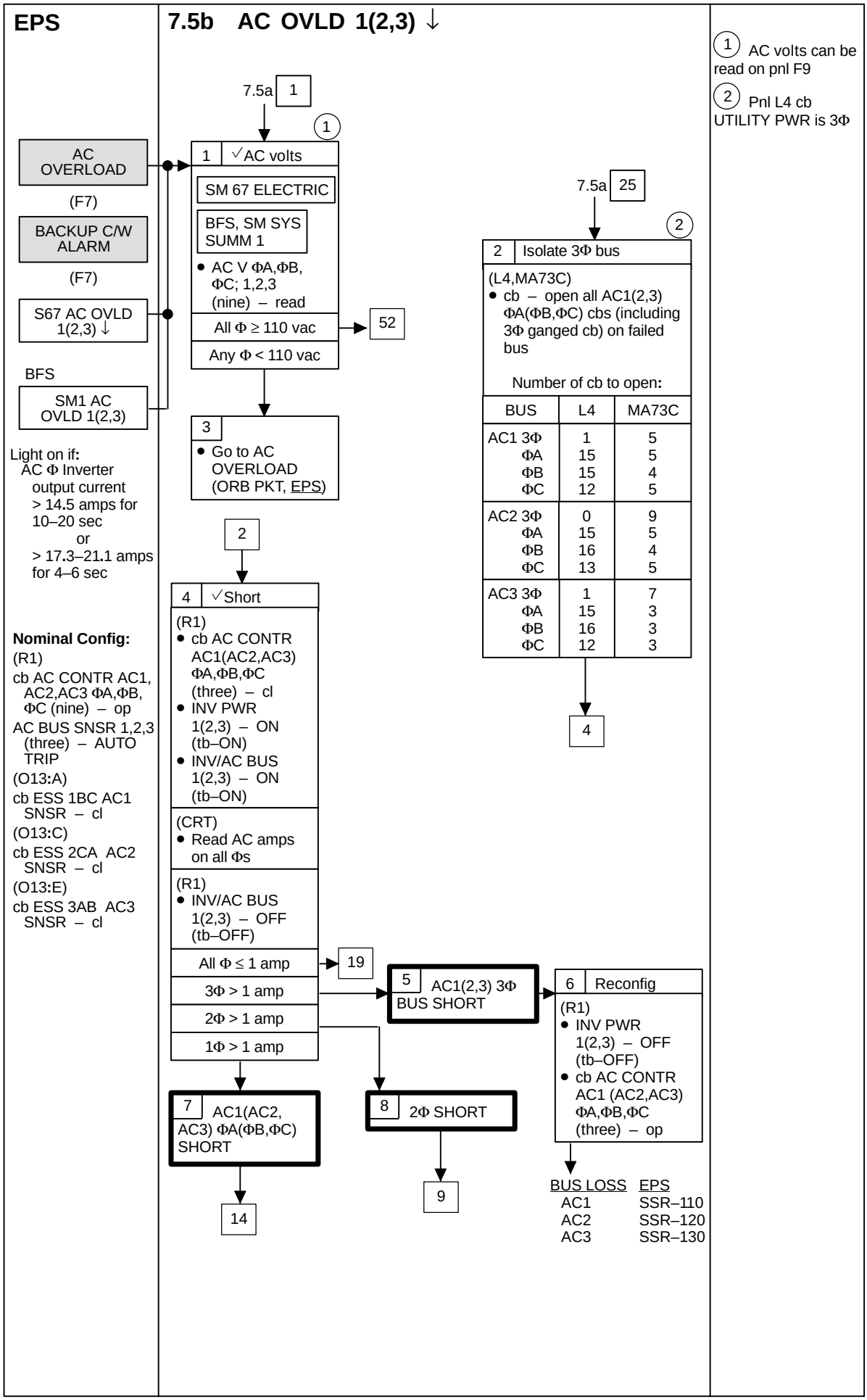
Bus	number cb	Row
(L4)		
AC1 3Φ	1	B
ΦA(B,C)	9	C,D,E,G,H,I,J,M,N
AC2 ΦA(B,C)	9	C,D,E,F,G,H,I,J,M
AC3 3Φ	1	B
ΦA(B,C)	8	C,D,E,F,G,H,I,M
(MA73C)		
AC1 3Φ	4	C,D
ΦA(B,C)	4	E,G,H,I
AC2 3Φ	9	C,D,E,F,G
ΦA(B,C)	4	E,G,H,I
AC3 3Φ	7	C,D,E,F,G
ΦA(B,C)	3	G,H,I

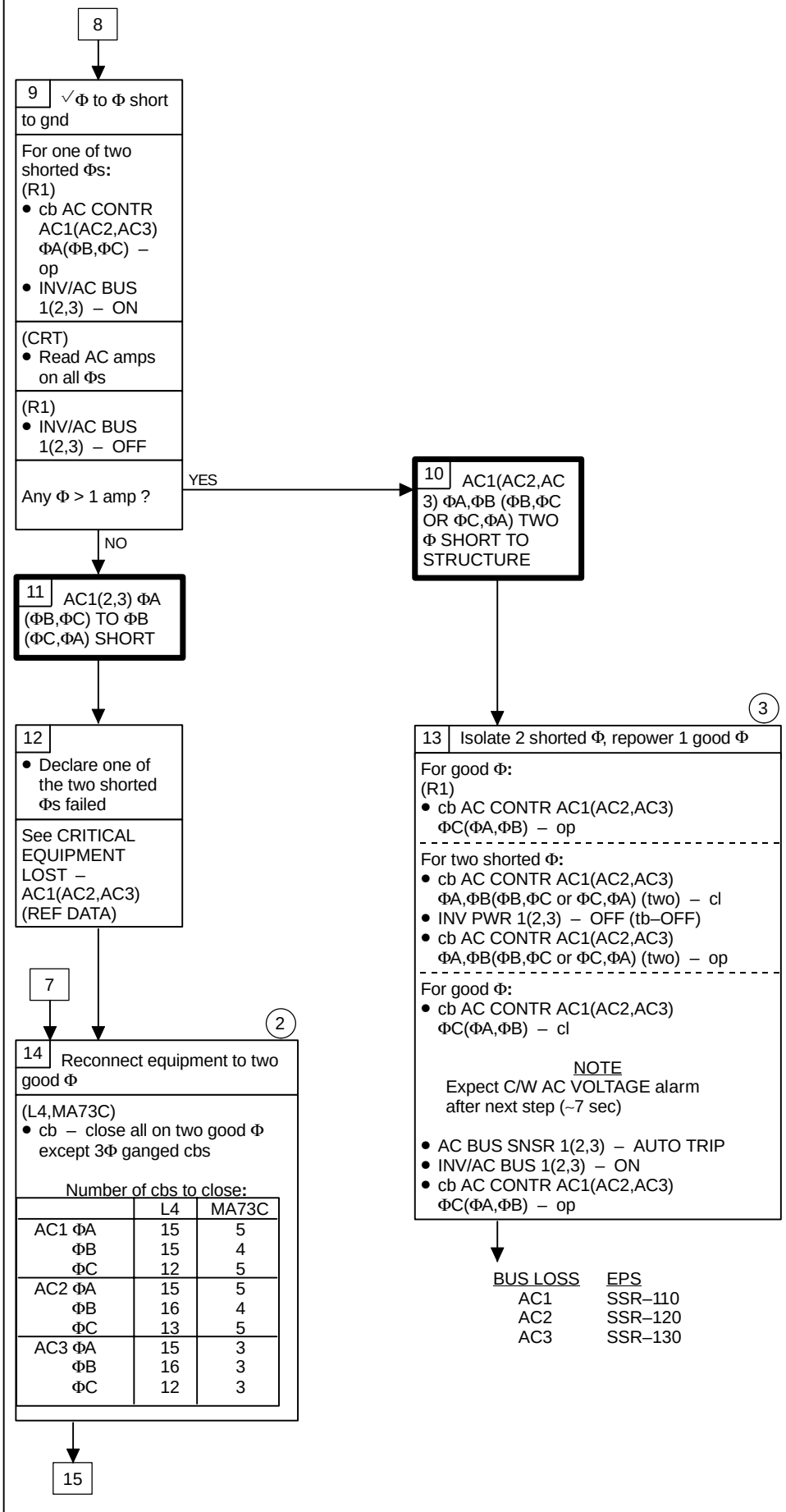
(9) Lost AC1(2,3) AC VOLTAGE primary C/W ALARM and AUTO TRIP capability. Still have BACKUP C/W AC VOLTAGE sensing

(11) Pnl L4 cb UTILITY PWR is 3Φ

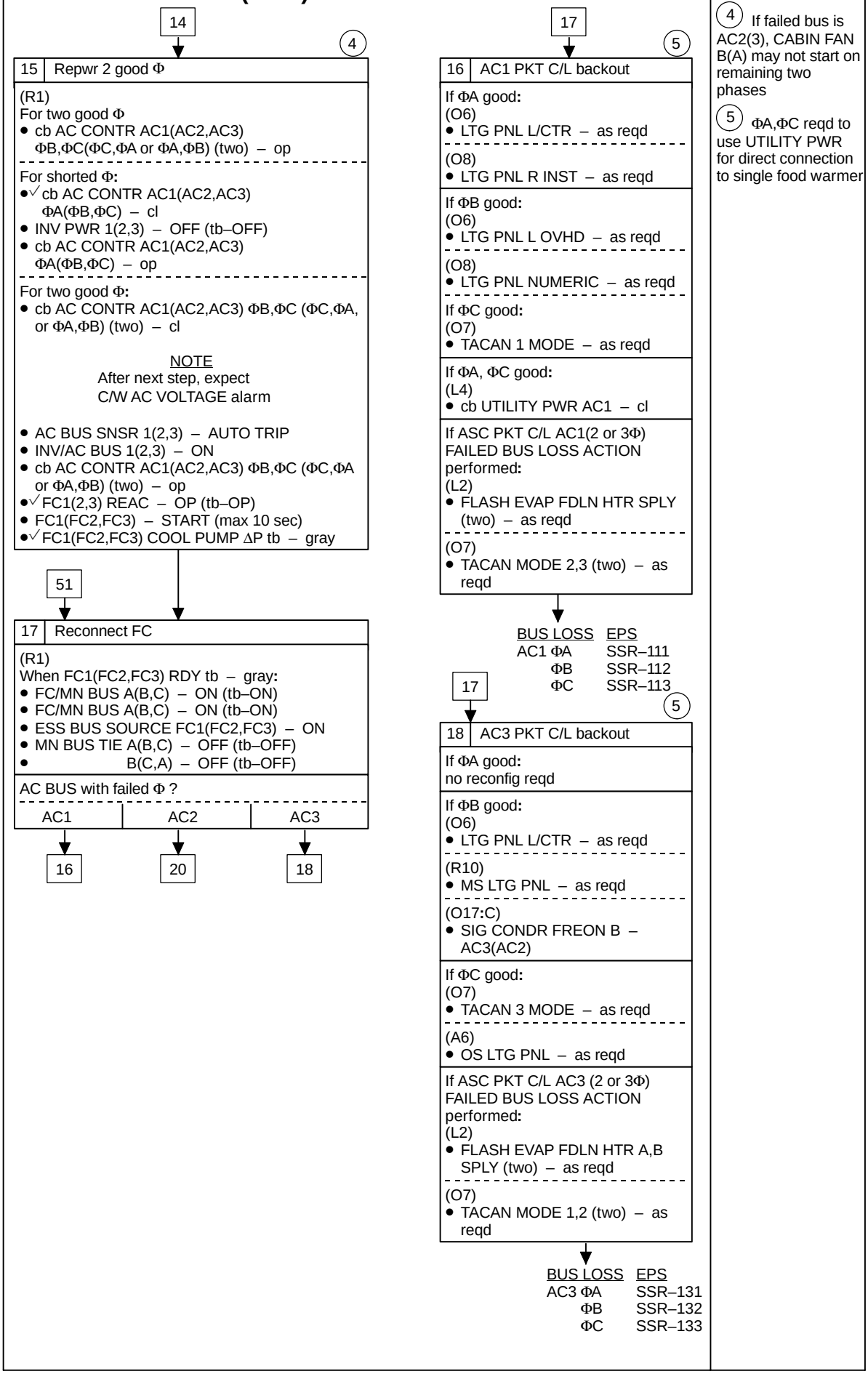
(12) Lost AC1(2,3) OVLD AUTO TRIP and C/W alarm capability

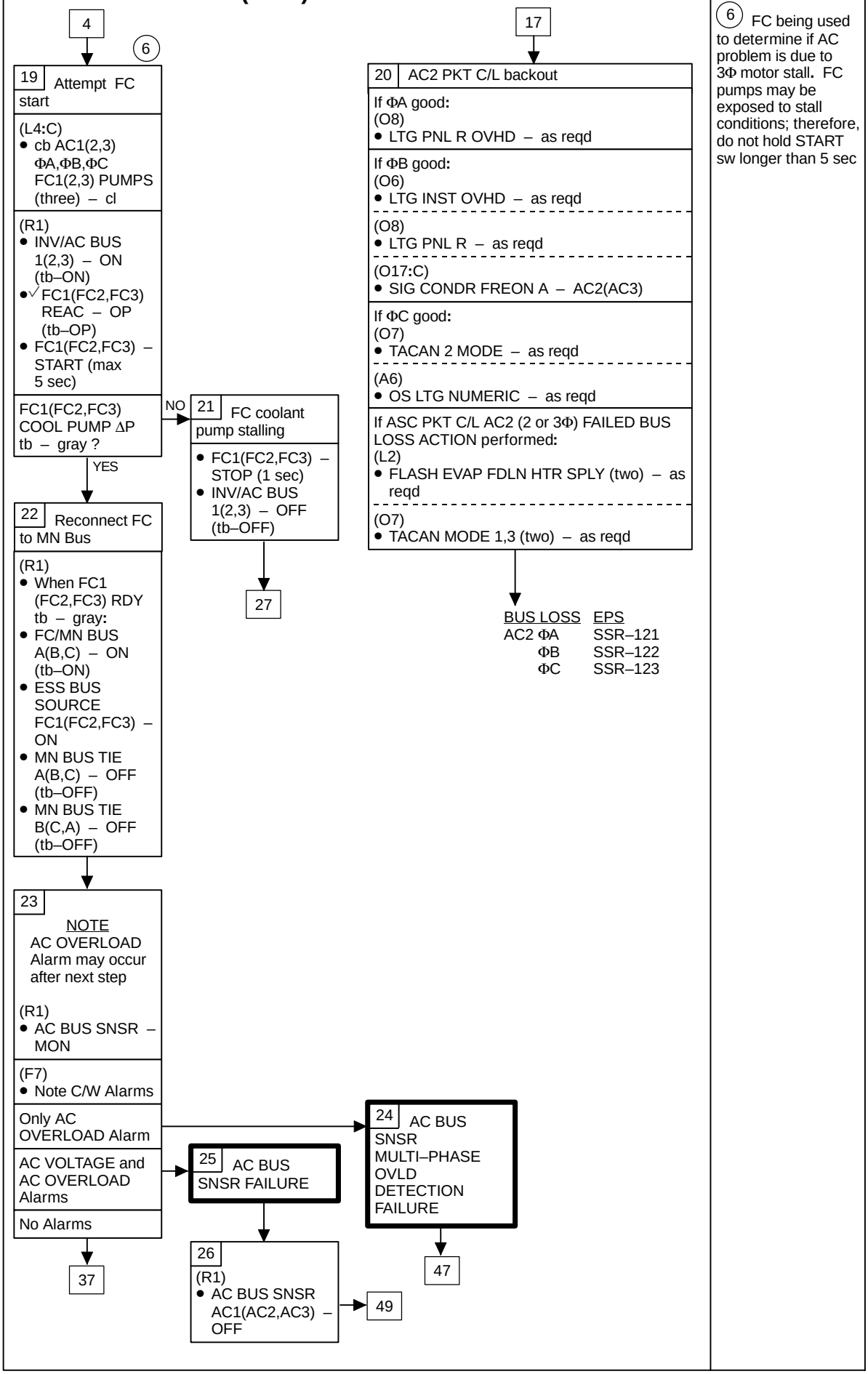
(13) Removing single Φ loads permits lighter loaded motors to support heavier loaded motors by coupling energy via unpowered Φ. Cabin fan on two Φs cannot support additional single Φ loads. All three cbs must be closed to start cabin fan but unpowered Φ cb should be open while running

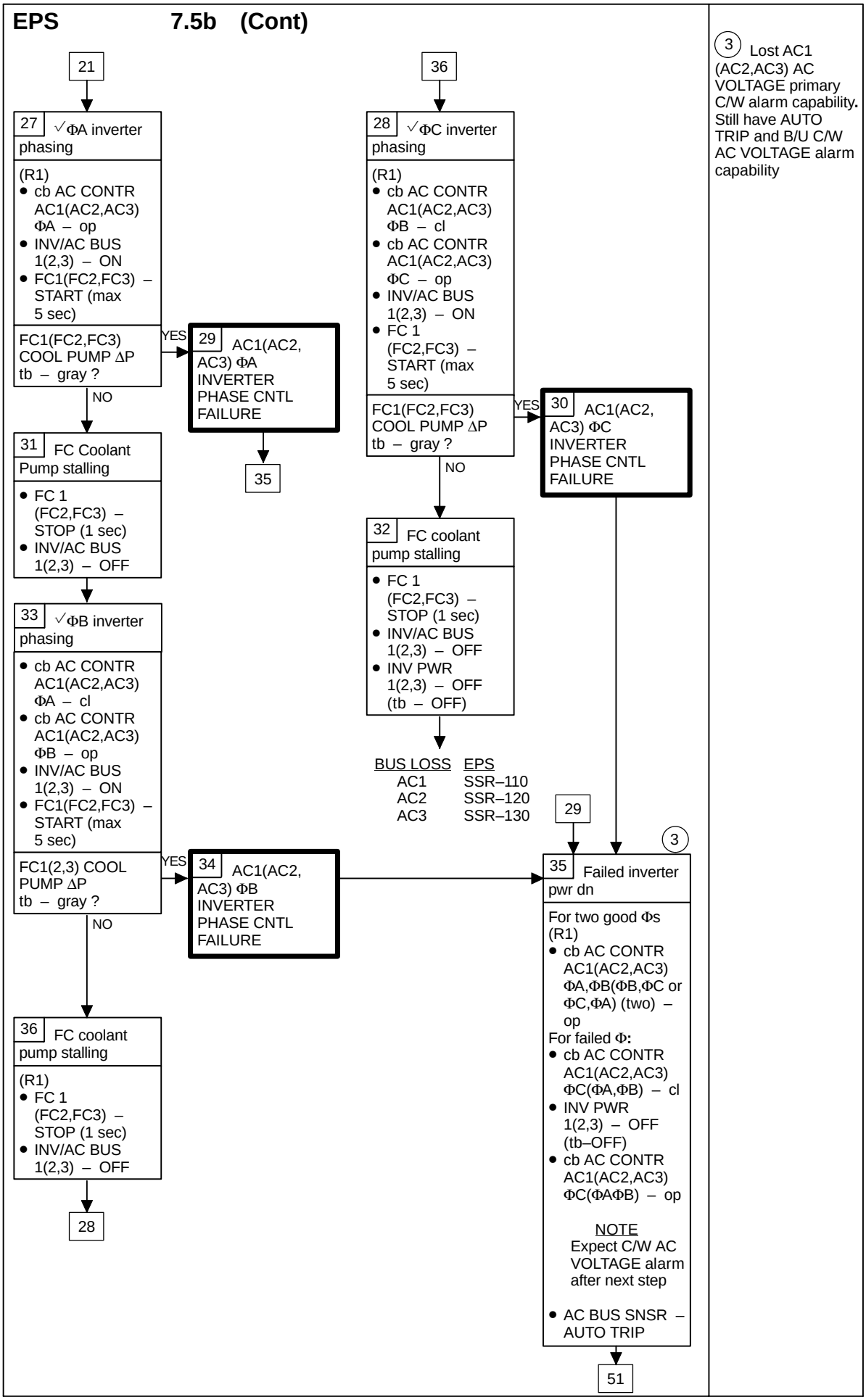

EPS
7.5b AC OVLD 1(2,3) ↓
1 AC volts can be read on pnl F9
2 Pnl L4 cb UTILITY PWR is 3Φ
7.5a 1
1
AC OVERLOAD
(F7)
BACKUP C/W ALARM
(F7)
S67 AC OVLD 1(2,3) ↓
BFS
SM1 AC OVLD 1(2,3)
Light on if:
AC Φ Inverter output current
> 14.5 amps for 10–20 sec
or
> 17.3–21.1 amps for 4–6 sec
Nominal Config:
(R1)
cb AC CONTR AC1, AC2,AC3 ΦA,ΦB, ΦC (nine) – op
AC BUS SNSR 1,2,3 (three) – AUTO TRIP
(O13:A)
cb ESS 1BC AC1 SNSR – cl
(O13:C)
cb ESS 2CA AC2 SNSR – cl
(O13:E)
cb ESS 3AB AC3 SNSR – cl
1 ✓AC volts
SM 67 ELECTRIC
BFS, SM SYS SUMM 1
• AC V ΦA,ΦB, ΦC; 1,2,3 (nine) – read
All Φ ≥ 110 vac
52
Any Φ < 110 vac
3
• Go to AC OVERLOAD (ORB PKT, EPS)
7.5a 25
2
2 Isolate 3Φ bus
(L4,MA73C)
• cb – open all AC1(2,3) ΦA(ΦB,ΦC) cbs (including 3Φ ganged cb) on failed bus
Number of cb to open:
BUS | L4 | MA73C
AC1 3Φ | 1 | 5
ΦA | 15 | 5
ΦB | 15 | 4
ΦC | 12 | 5
AC2 3Φ | 0 | 9
ΦA | 15 | 5
ΦB | 16 | 4
ΦC | 13 | 5
AC3 3Φ | 1 | 7
ΦA | 15 | 3
ΦB | 16 | 3
ΦC | 12 | 3
4
2
4 ✓Short
(R1)
• cb AC CONTR AC1(AC2,AC3) ΦA,ΦB,ΦC (three) – cl
• INV PWR 1(2,3) – ON (tb–ON)
• INV/AC BUS 1(2,3) – ON (tb–ON)
(CRT)
• Read AC amps on all Φs
(R1)
• INV/AC BUS 1(2,3) – OFF (tb–OFF)
All Φ ≤ 1 amp
19
3Φ > 1 amp
2Φ > 1 amp
1Φ > 1 amp
5 AC1(2,3) 3Φ BUS SHORT
6 Reconfig
(R1)
• INV PWR 1(2,3) – OFF (tb–OFF)
• cb AC CONTR AC1 (AC2,AC3) ΦA,ΦB,ΦC (three) – op
BUS LOSS | EPS
AC1 | SSR–110
AC2 | SSR–120
AC3 | SSR–130
7 AC1(AC2, AC3) ΦA(ΦB,ΦC) SHORT
14
8 2Φ SHORT
9

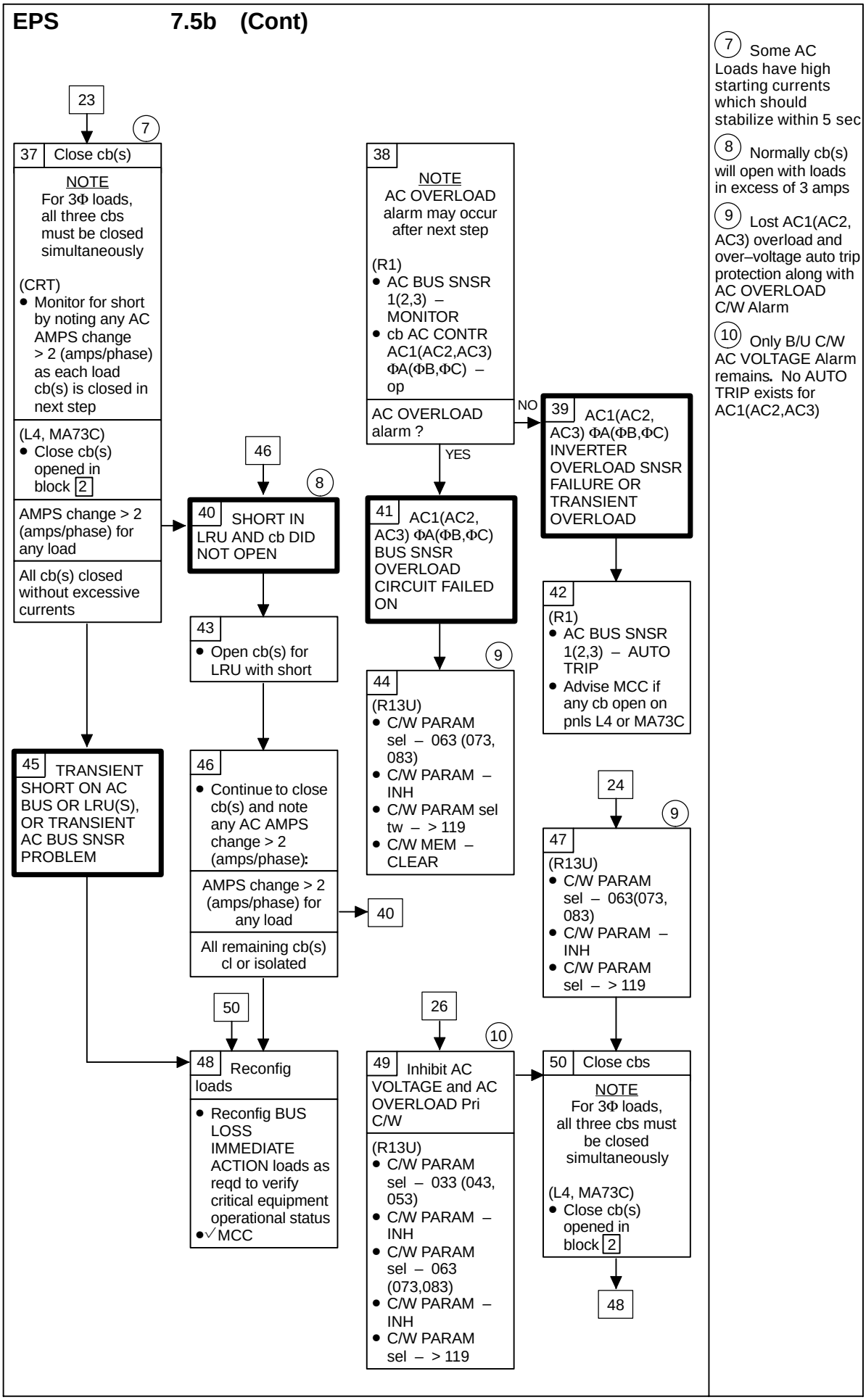


	L4	MA73C
AC1 ΦA	15	5
ΦB	15	4
ΦC	12	5
AC2 ΦA	15	5
ΦB	16	4
ΦC	13	5
AC3 ΦA	15	3
ΦB	16	3
ΦC	12	3


14
4
15 Repwr 2 good Φ
(R1)
For two good Φ
• cb AC CONTR AC1(AC2,AC3) ΦB,ΦC(ΦC,ΦA or ΦA,ΦB) (two) – op
For shorted Φ:
•✓cb AC CONTR AC1(AC2,AC3) ΦA(ΦB,ΦC) – cl
• INV PWR 1(2,3) – OFF (tb–OFF)
• cb AC CONTR AC1(AC2,AC3) ΦA(ΦB,ΦC) – op
For two good Φ:
• cb AC CONTR AC1(AC2,AC3) ΦB,ΦC (ΦC,ΦA, or ΦA,ΦB) (two) – cl
NOTE
After next step, expect C/W AC VOLTAGE alarm
• AC BUS SNSR 1(2,3) – AUTO TRIP
• INV/AC BUS 1(2,3) – ON
• cb AC CONTR AC1(AC2,AC3) ΦB,ΦC (ΦC,ΦA or ΦA,ΦB) (two) – op
•✓FC1(2,3) REAC – OP (tb–OP)
• FC1(FC2,FC3) – START (max 10 sec)
•✓FC1(FC2,FC3) COOL PUMP ΔP tb – gray
51
17 Reconnect FC
(R1)
When FC1(FC2,FC3) RDY tb – gray:
• FC/MN BUS A(B,C) – ON (tb–ON)
• FC/MN BUS A(B,C) – ON (tb–ON)
• ESS BUS SOURCE FC1(FC2,FC3) – ON
• MN BUS TIE A(B,C) – OFF (tb–OFF)
• B(C,A) – OFF (tb–OFF)
AC BUS with failed Φ ?
AC1
AC2
AC3
16
20
18
17
5
16 AC1 PKT C/L backout
If ΦA good:
(O6)
• LTG PNL L/CTR – as reqd
(O8)
• LTG PNL R INST – as reqd
If ΦB good:
(O6)
• LTG PNL L OVHD – as reqd
(O8)
• LTG PNL NUMERIC – as reqd
If ΦC good:
(O7)
• TACAN 1 MODE – as reqd
If ΦA, ΦC good:
(L4)
• cb UTILITY PWR AC1 – cl
If ASC PKT C/L AC1(2 or 3Φ) FAILED BUS LOSS ACTION performed:
(L2)
• FLASH EVAP FDLN HTR SPLY (two) – as reqd
(O7)
• TACAN MODE 2,3 (two) – as reqd
BUS LOSS EPS
AC1 ΦA SSR–111
ΦB SSR–112
ΦC SSR–113
17
5
18 AC3 PKT C/L backout
If ΦA good:
no reconfig reqd
If ΦB good:
(O6)
• LTG PNL L/CTR – as reqd
(R10)
• MS LTG PNL – as reqd
(O17:C)
• SIG CONDR FREON B – AC3(AC2)
If ΦC good:
(O7)
• TACAN 3 MODE – as reqd
(A6)
• OS LTG PNL – as reqd
If ASC PKT C/L AC3 (2 or 3Φ) FAILED BUS LOSS ACTION performed:
(L2)
• FLASH EVAP FDLN HTR A,B SPLY (two) – as reqd
(O7)
• TACAN MODE 1,2 (two) – as reqd
BUS LOSS EPS
AC3 ΦA SSR–131
ΦB SSR–132
ΦC SSR–133
4 If failed bus is AC2(3), CABIN FAN B(A) may not start on remaining two phases
5 ΦA,ΦC reqd to use UTILITY PWR for direct connection to single food warmer


4
6
19 Attempt FC start
(L4:C)
• cb AC1(2,3) ΦA,ΦB,ΦC FC1(2,3) PUMPS (three) – cl
(R1)
• INV/AC BUS 1(2,3) – ON (tb–ON)
• ✓ FC1(FC2,FC3) REAC – OP (tb–OP)
• FC1(FC2,FC3) – START (max 5 sec)
FC1(FC2,FC3) COOL PUMP ΔP tb – gray ?
NO
21 FC coolant pump stalling
• FC1(FC2,FC3) – STOP (1 sec)
• INV/AC BUS 1(2,3) – OFF (tb–OFF)
27
YES
22 Reconnect FC to MN Bus
(R1)
• When FC1 (FC2,FC3) RDY tb – gray:
• FC/MN BUS A(B,C) – ON (tb–ON)
• ESS BUS SOURCE FC1(FC2,FC3) – ON
• MN BUS TIE A(B,C) – OFF (tb–OFF)
• MN BUS TIE B(C,A) – OFF (tb–OFF)
23
NOTE
AC OVERLOAD Alarm may occur after next step
(R1)
• AC BUS SNSR – MON
(F7)
• Note C/W Alarms
Only AC OVERLOAD Alarm
AC VOLTAGE and AC OVERLOAD Alarms
No Alarms
37
25 AC BUS SNSR FAILURE
26
(R1)
• AC BUS SNSR AC1(AC2,AC3) – OFF
49
24 AC BUS SNSR MULTI–PHASE OVLD DETECTION FAILURE
47
17
20 AC2 PKT C/L backout
If ΦA good:
(O8)
• LTG PNL R OVHD – as reqd
If ΦB good:
(O6)
• LTG INST OVHD – as reqd
(O8)
• LTG PNL R – as reqd
(O17:C)
• SIG CONDR FREON A – AC2(AC3)
If ΦC good:
(O7)
• TACAN 2 MODE – as reqd
(A6)
• OS LTG NUMERIC – as reqd
If ASC PKT C/L AC2 (2 or 3Φ) FAILED BUS LOSS ACTION performed:
(L2)
• FLASH EVAP FDLN HTR SPLY (two) – as reqd
(O7)
• TACAN MODE 1,3 (two) – as reqd
BUS LOSS EPS
AC2 ΦA SSR–121
ΦB SSR–122
ΦC SSR–123
6 FC being used to determine if AC problem is due to 3Φ motor stall. FC pumps may be exposed to stall conditions; therefore, do not hold START sw longer than 5 sec


21
27 ✓ΦA inverter phasing
(R1)
• cb AC CONTR AC1(AC2,AC3) ΦA – op
• INV/AC BUS 1(2,3) – ON
• FC1(FC2,FC3) – START (max 5 sec)
FC1(FC2,FC3) COOL PUMP ΔP tb – gray ?
YES
29 AC1(AC2, AC3) ΦA INVERTER PHASE CNTL FAILURE
35
NO
31 FC Coolant Pump stalling
• FC 1 (FC2,FC3) – STOP (1 sec)
• INV/AC BUS 1(2,3) – OFF
33 ✓ΦB inverter phasing
• cb AC CONTR AC1(AC2,AC3) ΦA – cl
• cb AC CONTR AC1(AC2,AC3) ΦB – op
• INV/AC BUS 1(2,3) – ON
• FC1(FC2,FC3) – START (max 5 sec)
FC1(2,3) COOL PUMP ΔP tb – gray ?
YES
34 AC1(AC2, AC3) ΦB INVERTER PHASE CNTL FAILURE
NO
36 FC coolant pump stalling
(R1)
• FC 1 (FC2,FC3) – STOP (1 sec)
• INV/AC BUS 1(2,3) – OFF
28
36
28 ✓ΦC inverter phasing
(R1)
• cb AC CONTR AC1(AC2,AC3) ΦB – cl
• cb AC CONTR AC1(AC2,AC3) ΦC – op
• INV/AC BUS 1(2,3) – ON
• FC 1 (FC2,FC3) – START (max 5 sec)
FC1(FC2,FC3) COOL PUMP ΔP tb – gray ?
YES
30 AC1(AC2, AC3) ΦC INVERTER PHASE CNTL FAILURE
NO
32 FC coolant pump stalling
• FC 1 (FC2,FC3) – STOP (1 sec)
• INV/AC BUS 1(2,3) – OFF
• INV PWR 1(2,3) – OFF (tb – OFF)
BUS LOSS EPS
AC1 SSR–110
AC2 SSR–120
AC3 SSR–130
29
3
35 Failed inverter pwr dn
For two good Φs (R1)
• cb AC CONTR AC1(AC2,AC3) ΦA,ΦB(ΦB,ΦC or ΦC,ΦA) (two) – op
For failed Φ:
• cb AC CONTR AC1(AC2,AC3) ΦC(ΦA,ΦB) – cl
• INV PWR 1(2,3) – OFF (tb–OFF)
• cb AC CONTR AC1(AC2,AC3) ΦC(ΦAΦB) – op
NOTE
Expect C/W AC VOLTAGE alarm after next step
• AC BUS SNSR – AUTO TRIP
51
3 Lost AC1 (AC2,AC3) AC VOLTAGE primary C/W alarm capability. Still have AUTO TRIP and B/U C/W AC VOLTAGE alarm capability

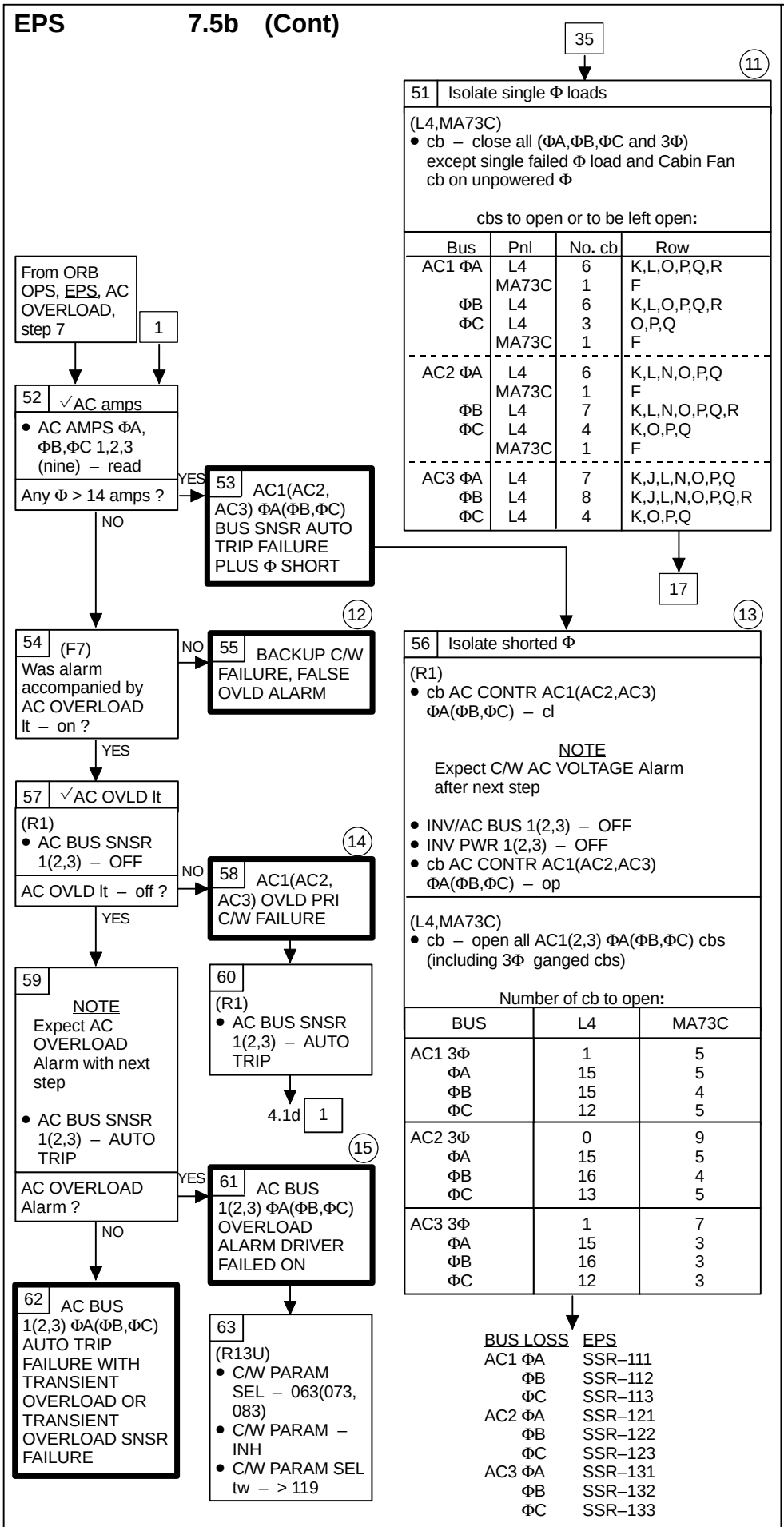


7 Some AC Loads have high starting currents which should stabilize within 5 sec

8 Normally cb(s) will open with loads in excess of 3 amps

9 Lost AC1(AC2, AC3) overload and over–voltage auto trip protection along with AC OVERLOAD C/W Alarm

10 Only B/U C/W AC VOLTAGE Alarm remains. No AUTO TRIP exists for AC1(AC2,AC3)



(11) Removing single Φ loads and opening aff cb to Cabin Fan will maximize coupled energy available to heavier loaded mtrs without overstressing lighter loaded mtrs. All three cabin fan cbs must be closed to start fan but unpowered Φ cb should be open while fan running

(12) Lost AC1(AC2, AC3) backup C/W OVLD alarm capability

(13) If shorted bus is AC2(3), CABIN FAN B(A) will not start on remaining two phases

(14) OVLD Alarm capability remains via backup C/W

(15) Lost OVLD Pri C/W alarms only. Auto trip still available

7.5c AC BUS CURRENT HIGH

SM ALERT

S67 AC AMPS 1(2,3)

If:
AC AMPS 1(2,3) > 10 amps

1 ✓AC amps
SM SYS SUMM 1
More than one Φ has high amps ?

YES

2 On aff Bus
(MA73C)
- cb – open all except rows E & F

Any current decr ?

YES

3 CNTL LIMIT SW SIGNAL FAILURE CAUSES UNWANTED RUN/STALL MTR CURRENTS

NO

8

4
(MA73C,L4,R11)
- cb – op and cl ΦA,ΦB,ΦC together on each 3Φ load noting AC amps change on aff bus

Normal cb current listed in parentheses

EQUIPMENT	ID (AMPS/Φ) AC1	AC2	AC3
(MA73C) :E WCS FAN SEP PAYLOAD	1 (.9)*	2 (.9)* AC2 (0)*	AC3 (< 1.7)
(L4) UTILITY PWR (3Φ cb)	(0)		(0)
:C FC PUMPS	1 (.8)	2 (.8)	3 (.8)
:D C,R ENG	C (< 1.6)*	C (< 1.6)*	R (< 1.6)*
:E R,L ENG	R (< 1.6)*	L (< 1.6)*	L (< 1.6)*
:F H2O LOOP PUMP	1A/2 (1.0)*	1B (1.0)*	2 (1.0)
:G AV BAY FAN	1A (.9)*	1B (.9)	3A (.9)*
:H AV BAY FAN	3B (.9)	2A (.9)	2B (.9)*
:I IMU FAN	A (.2)*	B (.2)	C (.2)*
:J HUM SEP	A (.3)*	B (.3)	
:K CAB FAN		B (1.7)*	A (1.7)
:M,N FREON LOOP PUMP	1A (1.7)* 2B (1.7)	1B (1.7)	2A (1.7)*

(CRT) Any AC amps excessive ?

NO

5 EXCESSIVE 3Φ LOAD ON AC1(2,3)

18

YES

6 CURRENT LIMITED SHORT OR EXCESSIVE MTR LOAD

12

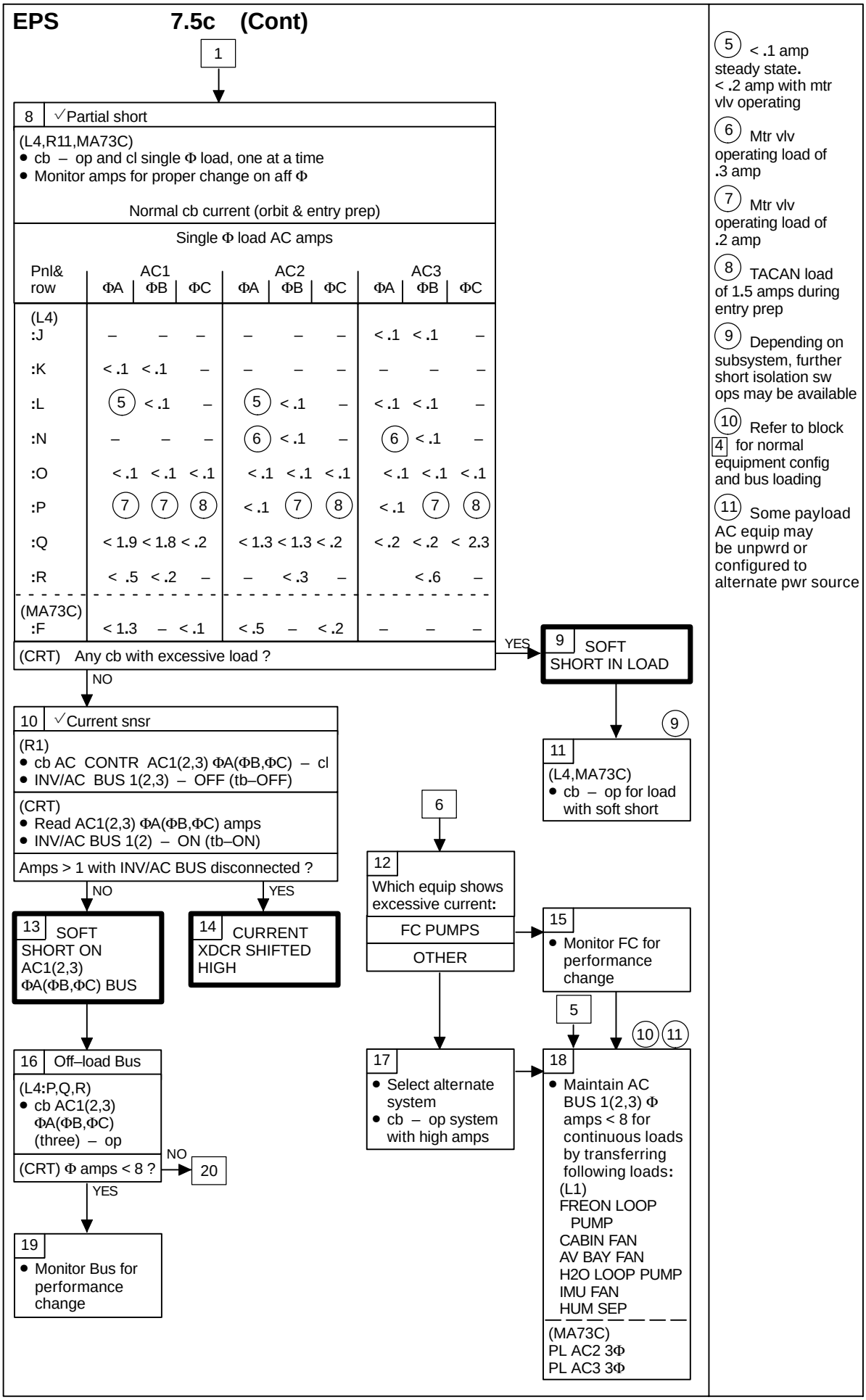
7
(MA73C)
- cb ΦA,ΦB,ΦC of each load – cl together while watching for AC amps change on aff bus
- cb – cl all except those feeding excess load

1 All (MA73C) 3Φ loads are transient loads normally active as response to flight crew/GPC command. All loads are on < 2 min except row E

2 Normally '*' not active

3 Some mtrs have thermal cutoff sw that may remove load unexpectedly. In this event, block 4 will be inconclusive

4 AC Bus Snsr fused at 3 amps/Φ. AC volt meter and telemetry signal are fused at .5 amps/Φ



(5) < .1 amp steady state. < .2 amp with mtr vlv operating

(6) Mtr vlv operating load of .3 amp

(7) Mtr vlv operating load of .2 amp

(8) TACAN load of 1.5 amps during entry prep

(9) Depending on subsystem, further short isolation sw ops may be available

(10) Refer to block 4 for normal equipment config and bus loading

(11) Some payload AC equip may be unpwrd or configured to alternate pwr source

16

(12)

20	Isolate shorted Φ

(L4,MA73C)
- cb – open all AC1(2,3) ΦA(ΦB,ΦC) cbs (including 3Φ ganged cbs) on failed bus

Number of cb to open:

BUS	L4	MA73C
AC1 3Φ	1	5
ΦA	16	5
ΦB	16	4
ΦC	13	5
AC2 3Φ	0	9
ΦA	15	5
ΦB	16	4
ΦC	13	5
AC3 3Φ	1	7
ΦA	15	3
ΦB	16	3
ΦC	12	3

(R1)
- cb AC CONTR AC1(2,3) ΦA(ΦB,ΦC) – cl

NOTE
Expect C/W AC VOLTAGE alarm after next step

- INV/AC BUS 1(2,3) – OFF (tb–OFF)
- INV PWR 1(2,3) – OFF (tb–OFF)
- cb AC CONTR AC1(2,3) ΦA(ΦB,ΦC) – op

BUS LOSS	EPS
AC1 ΦA	SSR–111
ΦB	SSR–112
ΦC	SSR–113
AC2 ΦA	SSR–121
ΦB	SSR–122
ΦC	SSR–123
AC3 ΦA	SSR–131
ΦB	SSR–132
ΦC	SSR–133

(12) If shorted bus is AC2(3), CABIN FAN B(A) will not start on remaining two phases

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CRYO TABLE A
CRYO HEATER SWITCH PROCEDURAL NOMENCLATURE

OXYGEN

HEATER SET		FIVE–TK SET		FIVE–TK SET + PALLET	
O2 TK 1	A	(R1)	O2 TK1 HTR A	(R1)	O2 TK1 HTR A
	B		O2 TK1 HTR B		O2 TK1 HTR B
O2 TK 2	A		O2 TK2 HTR A		O2 TK2 HTR A
	B		O2 TK2 HTR B		O2 TK2 HTR B
O2 TK 3	A		O2 TK3 HTR A		O2 TK3 HTR A
	B		O2 TK3 HTR B		O2 TK3 HTR B
O2 TK 4	A	(A11)	CRYO TK4 HTR O2 A	(A11)	CRYO TK4 HTR O2 A
	B		CRYO TK4 HTR O2 B		CRYO TK4 HTR O2 B
O2 TK 5	A	(A15)	CRYO TK5 HTR O2 A	(A15)	CRYO TK5 HTR O2 A
	B		CRYO TK5 HTR O2 B		CRYO TK5 HTR O2 B
O2 TK 6	A		N/A		PALLET O2 TK6 HTR A
	B		N/A		PALLET O2 TK6 HTR B
O2 TK 7	A		N/A		PALLET O2 TK7 HTR A
	B		N/A		PALLET O2 TK7 HTR B
O2 TK 8	A		N/A		PALLET O2 TK8 HTR A
	B		N/A		PALLET O2 TK8 HTR B
O2 TK 9	A		N/A		PALLET O2 TK9 HTR A
	B		N/A		PALLET O2 TK9 HTR B

HYDROGEN

HEATER SET		FIVE–TK SET		FIVE–TK SET + PALLET	
H2 TK 1	A	(R1)	H2 TK1 HTR A	(R1)	H2 TK1 HTR A
	B		H2 TK1 HTR B		H2 TK1 HTR B
H2 TK 2	A		H2 TK2 HTR A		H2 TK2 HTR A
	B		H2 TK2 HTR B		H2 TK2 HTR B
H2 TK 3	A		H2 TK3 HTR A		H2 TK3 HTR A
	B		H2 TK3 HTR B		H2 TK3 HTR B
H2 TK 4	A	(A11)	CRYO TK4 HTR H2 A	(A11)	CRYO TK4 HTR H2 A
	B		CRYO TK4 HTR H2 B		CRYO TK4 HTR H2 B
H2 TK 5	A	(A15)	CRYO TK5 HTR H2 A	(A15)	CRYO TK5 HTR H2 A
	B		CRYO TK5 HTR H2 B		CRYO TK5 HTR H2 B
H2 TK 6	A		N/A		PALLET H2 TK6 HTR A
	B		N/A		PALLET H2 TK6 HTR B
H2 TK 7	A		N/A		PALLET H2 TK7 HTR A
	B		N/A		PALLET H2 TK7 HTR B
H2 TK 8	A		N/A		PALLET H2 TK8 HTR A
	B		N/A		PALLET H2 TK8 HTR B
H2 TK 9	A		N/A		PALLET H2 TK9 HTR A
	B		N/A		PALLET H2 TK9 HTR B

EPS

7.6b CRYO O2(H2) PRES, TK P ↓↑

O2(H2) PRESS

BACKUP C/W ALARM

(F7)

If:
O2(H2) CNTL (TK) P
> 985(293.8) psia
< 540(153) psia

168 O2(H2) CNTL P 6(7,8,9)

S68 O2(H2) CNTL P 1(2,3,4,5)

BFS

SM2 CRYO O2 (H2) PRES

SM ALERT

S68 O2(H2) TK P 1(2,3,4,5)

168 O2(H2) TK P 6(7,8,9)

If:
O2(H2) TK P:
> 960(283)
< 740(189.3) with AUTO htrs
< 575(165) with htr not in AUTO

BFS

168 PALLET H2 TKP (PRESS)

If:
H2 TK P (CNTL P)
< 165.6 (153)

Nominal Config:
(O13)
cb ESS 2CA,1BC CRYO CNTLR O2,H2 TK1,2 (four) − cl
cb ESS 2CA,1BC CRYO QTY O2,H2 TK1,2 (four) − cl
(ML86B:G)
cb ESS 3AB,1BC, 2CA CRYO CNTLR O2,H2 TK3 (two) − cl
cb ESS 3AB,1BC, 2CA CRYO QTY O2,H2 TK3 (two) − cl
(O14:C)
cb MNA CRYO O2 HTR TK1 SNSR 1 − cl
(Cont in notes column)

From ORB PKT, EPS, CRYO O2(H2) PRESS/ TEMP HIGH, step 3

1

1
SM 68 CRYO SYSTEM
SM SYS SUMM 2
SM 168 CRYO PALLET
- Aff O2(H2) TK HTR (two) − OFF
- O2(H2) MANF VLV TK1,2 (two) − OP (tb−OP)

Aff P and TK P agree ? YES → 10

NO

2

2 Which pressure (P or TK P) disagrees with MANF P:
- TK P → 3 INSTRUMENTATION FAILURE. OPS NORMAL (3)
- P

4
- P ↑ → 5 INSTRUMENTATION FAILURE → 6 ●✓MCC for cryo config
- P ↓

ORB PKT, EPS, CRYO O2(H2) LEAK, step 1

7 O2 and H2 P ↓ ? NO → 24

YES

4

8 LOSS OF ESS, SUBBUS COMMON TO BOTH AFF O2 AND H2 HTR CNTLRS. AFF TK QTYS ALSO LOST

9

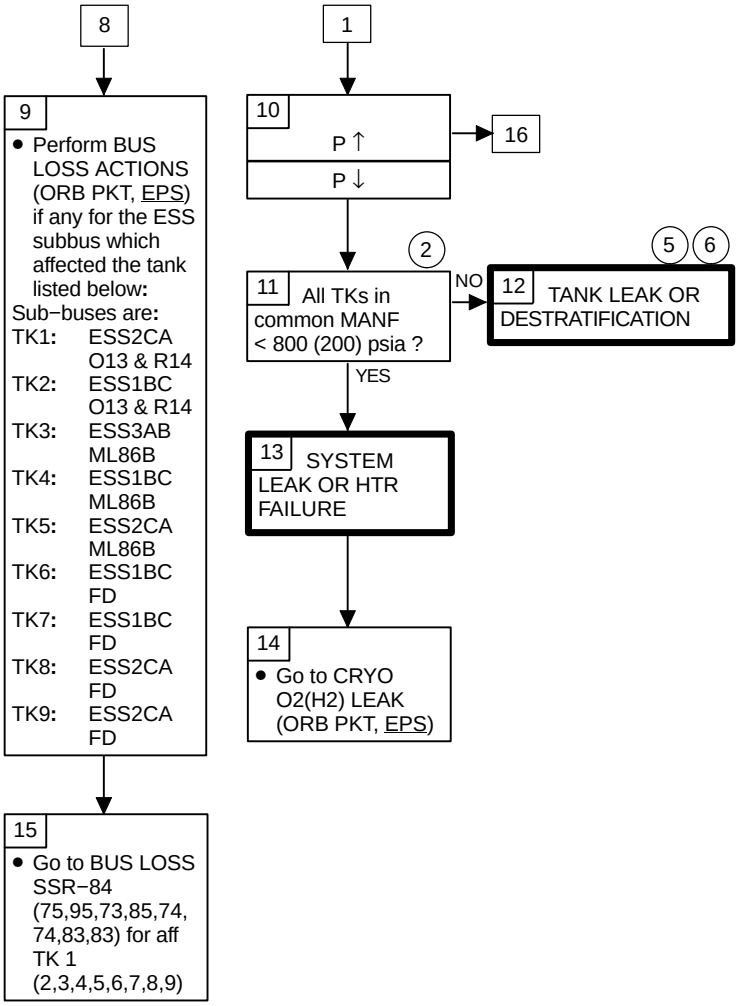
(1) Use pnl O2 meter or 168 CRYO PALLET (BFS) for TK P if SM2 not available

(2) O2(H2) TK AUTO Control pressure ranges:
TK 1/2:
803−854 (200−226)
TK 3−9:
832−882 (217−243)

(3) AUTO htr ops still available with failure of this Xdcr

(4) Loss of ESS bus, cb failed open, or loss of htr cntlr results in P Xdcr reading off−scale low (O2: 515 psia, H2: 145 psia) and loss of AUTO capability

Nominal Config:
(Cont):
(O15:C)
cb MNB CRYO O2 HTR TK2 SNSR 2 − cl
(O16:C)
cb MNC CRYO O2 HTR
TK1 SNSR 2 − cl
TK2 SNSR 1 − cl
(ML86B:F)
cb MNA,MNB,MNC CRYO O2 HTR
TK3,4,5 SNSR 1,2 (six) − cl
(A15)
cb PALLET ESS 1BC,2CA TK7,8,9 CNTLR O2,H2 (eight) − cl
cb PALLET ESS 1BC,2CA TK7,8,9 QTY O2,H2 (eight) − cl
cb PALLET MNA TK6−9
O2 SNSR 1 (four) − cl
cb PALLET MNB TK6−9
O2 SNSR 2 (four) − cl
(R14:B)
cb MNA,MNB,MNC PALLET DSC 1A/2B,1B,2C (three) − cl

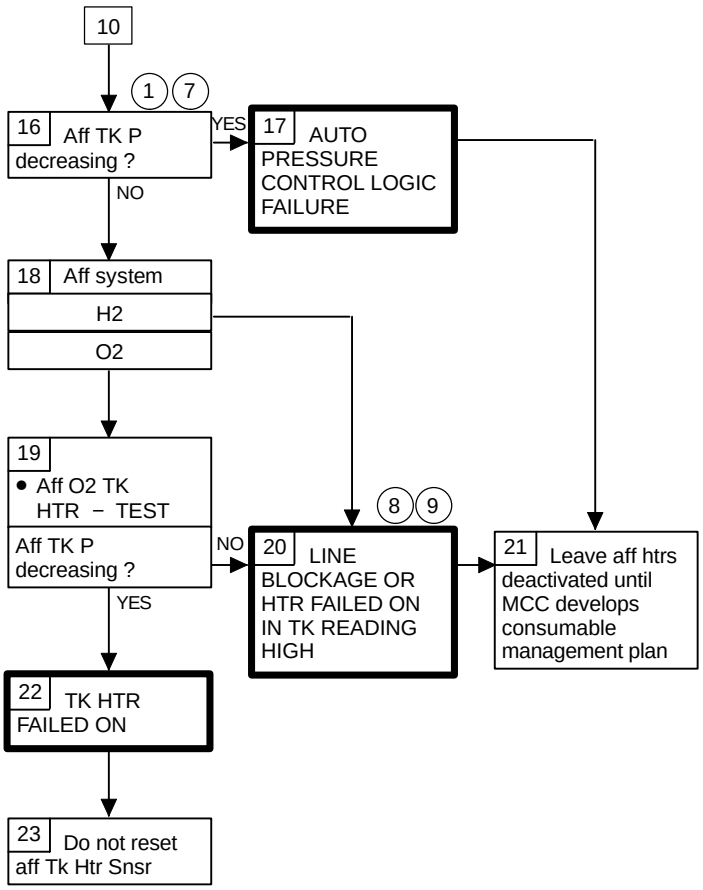


(2) O2(H2) TK AUTO Control pressure ranges: TK1/2: 803−854 (200−226) TK 3−9: 832−882 (217−243)

(5) For destratified tk, natural heat leak into tk will eventually build pressure back up

(6) Operating htrs below critical pressure could be hazardous in presence of two−phase fluid. Therefore, htrs are left deactivated

EPS 7.6b (Cont)

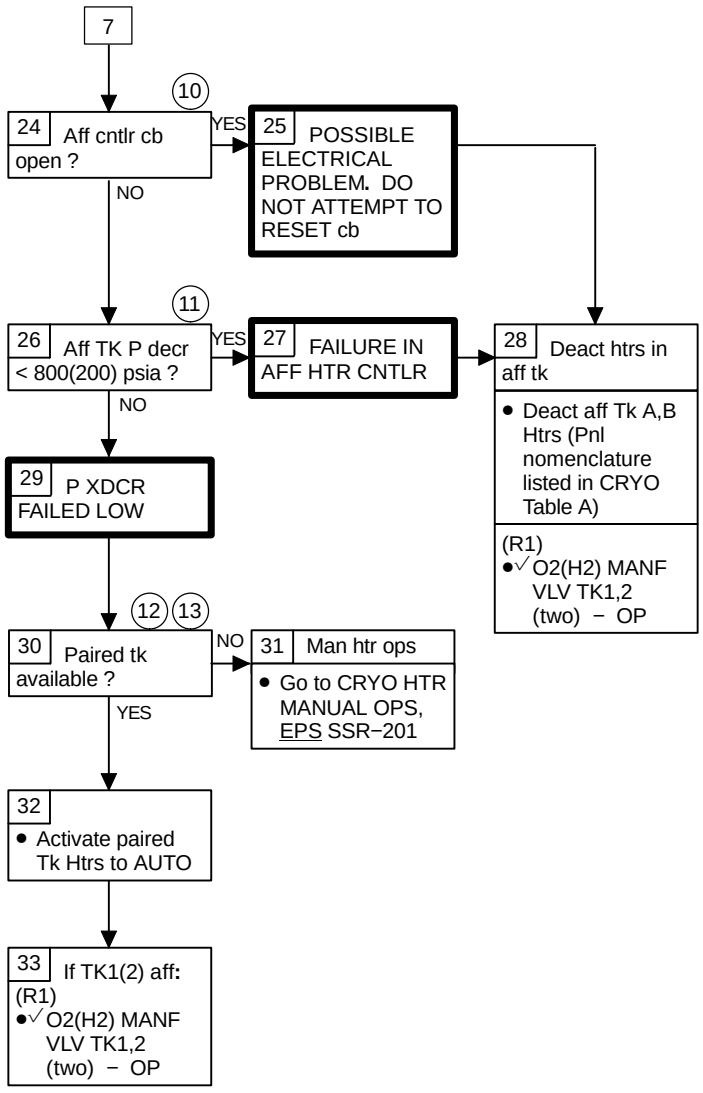


(1) Use pnl O2 meter or 168 CRYO PALLET (BFS) for TK P if SM2 not available

(7) Once htrs are deactivated in tk with high P, the P should decrease to normal value

(8) Even with htrs OFF, environmental heat leak will eventually cause tk relief vlv to crack

(9) Failed−on htr may require temporarily dropping a main bus until IFM 'CRYO TANK HEATER FUSE REMOVAL' can be performed. If pressure exceeds 1,000(300) psi, overboard relief vlv may open



(10) Check nominal config column for cb location

(11) Could take 3 hr to bleed pressures down

(12) For P xdcr failed low, tk can be operated in AUTO only if tk can run simultaneously with a tk paired within its logic. Logic pairings for P controllers are:
1,2
3,4
6,7
8,9
TK5 not paired

(13) TKs 1,2 cannot be operated simultaneously if a manifold vlv is closed

EPS

7.6d O2(H2) MANF P ↓

S68 O2 MANF PRESS

S68 H2 MANF PRESS

BFS

SM2 CRYO O2 MANF

SM2 CRYO H2 MANF

If:
- O2 MANF P < 200 psia (740 psia for BFS)
- H2 MANF P < 150 psia (189.9 psia for BFS)

Nominal Config:
Refer to 7.6b

(1)

1 SM 68 CRYO SYSTEM / SM 168 CRYO PALLET

Both O2(H2) MANF Ps agree with each other ?

YES → 2 LARGE LEAK INDICATED → 3 If CRYO LEAK procedure not already in progress
- Go to CRYO O2 (H2) LEAK (ORB PKT, EPS)

NO

4 (R1) Both O2(H2) MANF VLV TK tb − OP ?

YES → 5 INSTRUMEN−TATION ↓

NO

6 (CRT) Do two or more TK Ps connected to aff Manf disagree with Manf P ?

YES → 7 INSTRUMEN−TATION FAILURE

NO

8 Do aff P and TK P agree with manf P ?

YES → 9 O2(H2) LEAK → 11
- Go to CRYO O2 (H2) LEAK (ORB PKT, EPS)

NO

10 ASAP

(R1)
- O2(H2) MANF VLV TK 1,2 (two) − OP

12 (CRT) Both O2(H2) Manf Ps agree with each other ?

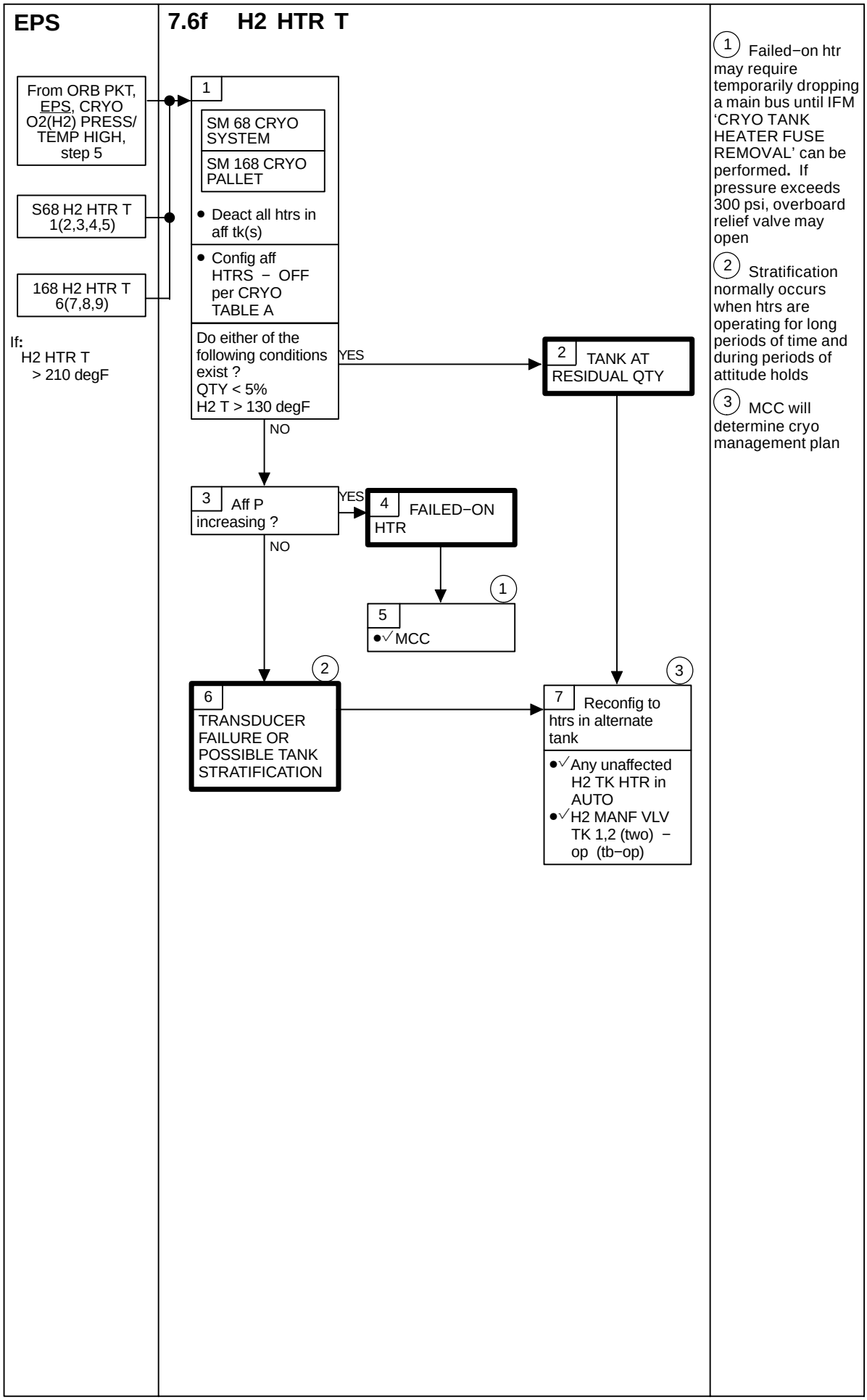
YES → 13 TK SPLY BLOCKAGE → 15
- Config aff tk htrs to OFF
- Config other tk htrs to AUTO (Pnl nomenclature listed in CRYO Table A)

NO

14 Reconfig Manf Vlvs to original config
- O2(H2) MANF VLV TK 1(2) − CL

16 INSTRUMEN−TATION FAILURE

(1) Assumes both Manf vlvs are open. If indicative of continuing system problem, there would have been previous alarms for P and TK P low


EPS
7.6f H2 HTR T
From ORB PKT, EPS, CRYO O2(H2) PRESS/ TEMP HIGH, step 5
S68 H2 HTR T 1(2,3,4,5)
168 H2 HTR T 6(7,8,9)
If:
H2 HTR T > 210 degF
1
SM 68 CRYO SYSTEM
SM 168 CRYO PALLET
• Deact all htrs in aff tk(s)
• Config aff HTRS − OFF per CRYO TABLE A
Do either of the following conditions exist ?
QTY < 5%
H2 T > 130 degF
YES
NO
2 TANK AT RESIDUAL QTY
3 Aff P increasing ?
YES
NO
4 FAILED−ON HTR
1
5
•✓MCC
2
6
TRANSDUCER FAILURE OR POSSIBLE TANK STRATIFICATION
3
7 Reconfig to htrs in alternate tank
•✓Any unaffected H2 TK HTR in AUTO
•✓H2 MANF VLV TK 1,2 (two) − op (tb−op)
1 Failed−on htr may require temporarily dropping a main bus until IFM 'CRYO TANK HEATER FUSE REMOVAL' can be performed. If pressure exceeds 300 psi, overboard relief valve may open
2 Stratification normally occurs when htrs are operating for long periods of time and during periods of attitude holds
3 MCC will determine cryo management plan

EPS

7.6k O2 HTR CUR SNSR = TRIP

SM ALERT

S68 O2 HTR TRP 1(2,3,4,5)

168 O2 HTR TRIP 6(7,8,9)

If:
HTR CUR SNSR = '↓' (tripped)

1

SM 68 CRYO SYSTEM

SM 168 CRYO PALLET

TK1 and/or TK2 the aff tk ?

YES

2 (R1) Both TK HTRS A,B in AUTO or ON ?

YES

1 2

3 Deact aff htr and one htr in other tk

(R1)
- O2 TK1(2) HTRS A(B) (one) − OFF
- O2 TK2(1) HTRS A(B) (one) − OFF

NO

2

4 If tk was in use, switch to inactive htr in aff tk

(R1)
O2 TK 1(2) HTRS
- A(B) − OFF
- B(A) − AUTO

NO

3

5 Was aff tk htr activated at time of failure ?

NO

6 ALERT IS PROBABLY CAUSED BY FALSE TRIP INDICATION

YES

CAUTION

Do not operate htr ckt in which trip occurred. Do not reset htr trip indication

3

7 (R1) Both TK Htrs A,B activated ?

YES

1 2

8 Deact aff htr and one htr in logically paired tk

- Config for half htr AUTO ops (Pnl nomenclature listed in CRYO Table A)

NO

2

9 Switch to inactive htr

- Config aff htr to OFF and alternate htr to AUTO in aff TK per CRYO Table A
- Check to ensure that only half htrs are being used in logically paired TK

10 POSSIBLE INTERNAL SHORT CAUSING HTR TO BE DISABLED AUTOMATICALLY

CAUTION

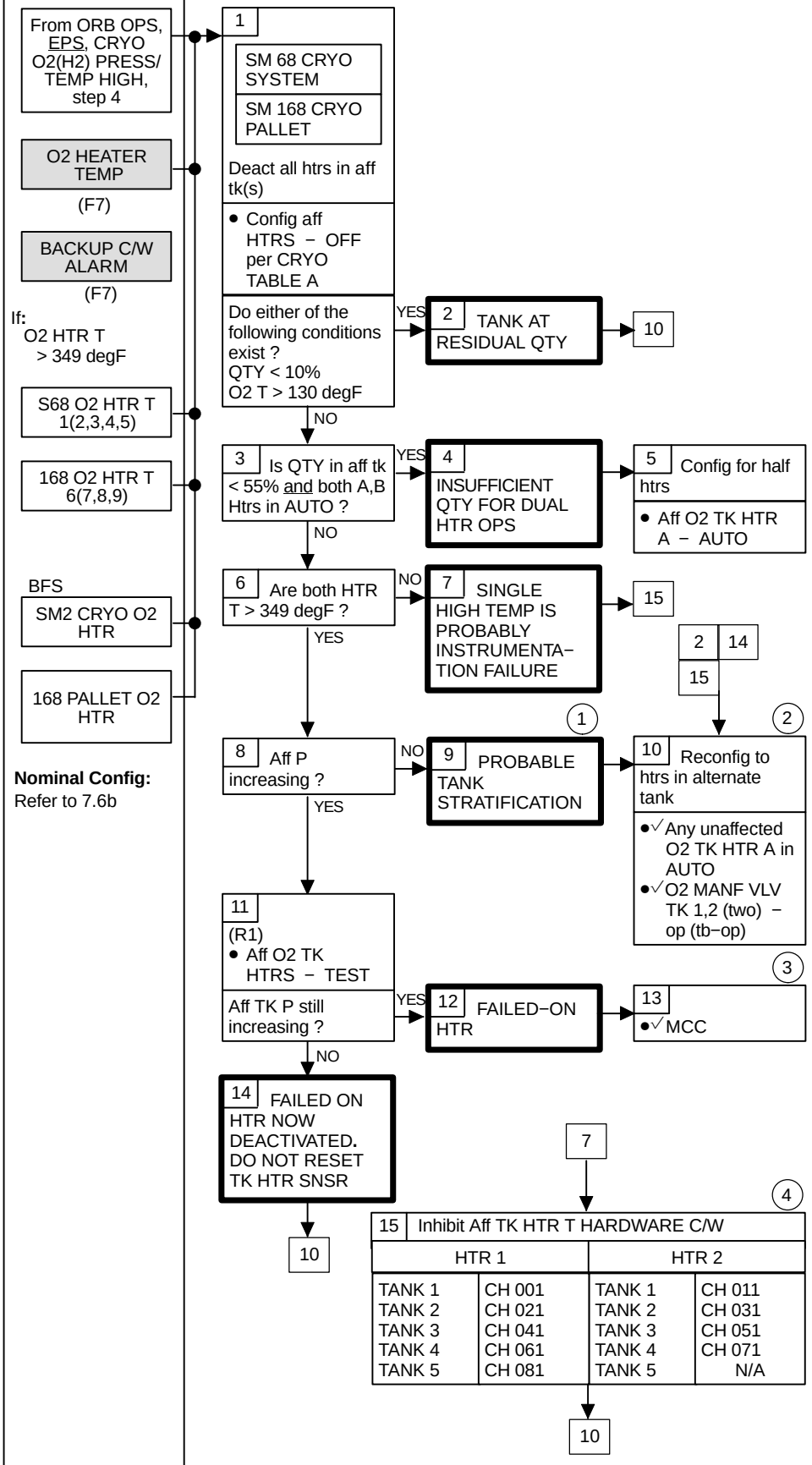
Do not operate htr circuit in which trip occurred. Do not reset htr trip indication

(1) If all Snsrs in tk (or one A and one B Snsr) indicate tripped, deactivate all htrs in affected tk and open manf vlvs. Do not reconfig htrs in other tk

(2) Unless htr pwr in both tks is approx equal, pressurization rates will not be equal and quantity imbalance will eventually result

(3) Use CRYO Table A to determine which htr sets were active

7.6l O2 HTR T



(1) Stratification normally occurs when htrs are operating for long periods of time or during periods of attitude holds

(2) MCC will determine cryo management plan

(3) Failed−on htr may require temporarily dropping a main bus until IFM 'CRYO TANK HEATER FUSE REMOVAL' can be performed. If pressure exceeds 1,000 psi, overboard relief valve may open

(4) Tank 5 Htr 2 and all Cryo Pallet tank htrs have no associated hardware C/W

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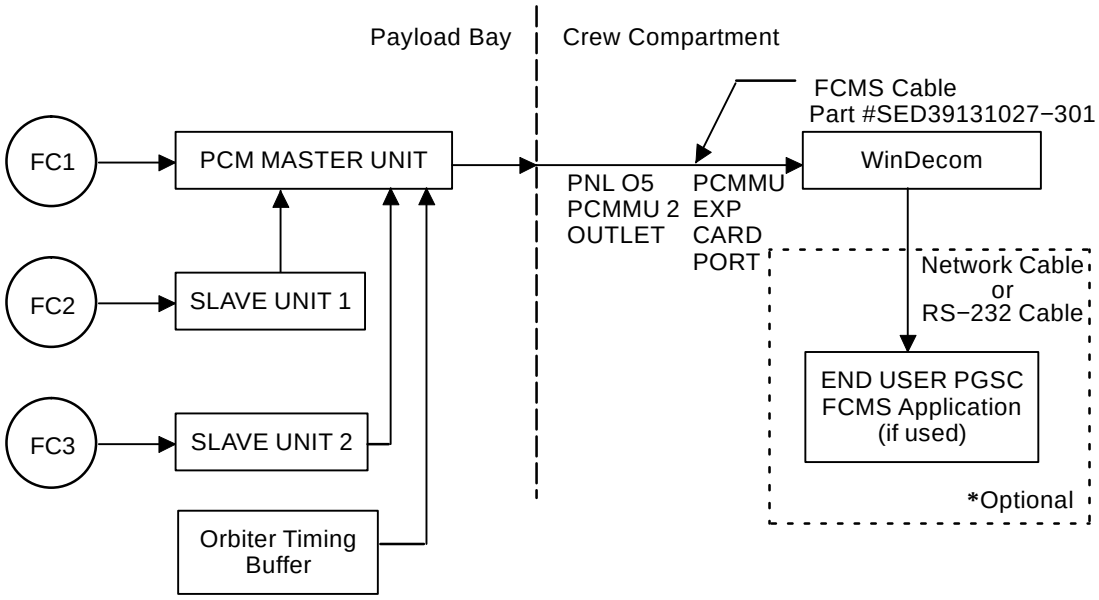
NOTE

The FCMS application has capability to display FC single cell voltages and also to record those cell voltages in ASCI data file. Primary mode of operation will be to connect WinDecom using the FCMS data cable, bring up the WinDecom−FCMS application. Start the FCMS application to record data, then downlink the data file to MCC via OCA for analysis.

The recorded data file names will have the format fcXXXXXX.fcv or fcXXXXXX.ZIP where 'XXXXXX' references the GMT of the first data point of the file dropping the hundreds place for the day. Every recorded data file will contain the single cell voltages from all three fuel cells. If recording a full rate data file, temporarily terminate all other applications on the same PGSC

FCMS DATA DIAGRAM



*The FCMS Application can be run on any one of the following PGSCs

a. WinDecom PGSC
b. Any End User Networked PGSC using a network cable
c. Any End User PGSC connected to WinDecom serial port (com 1) using RS232Y Cable

If WinDecom currently running
Double−click 'Shuttle Apps' > 'WinDecom' > 'WinDecom shutdown'
Sel 'OK' to shutdown Telemetry System

ACTIVATION

1. WinDecom PGSC − on
   End user PGSC pwr − on (if used)
2. Disconnect PCMMU cable from PCMMU expansion port on WinDecom PGSC

O5 If reqd, disconnect PCMMU cable from pnl O5 PCMMU 2 outlet

NOTE

FCMS cable pin out is different than standard PCMMU data cable

3. Connect FCMS cable from pnl O5 PCMMU 2 outlet to PCMMU expansion card port on WinDecom PGSC

EPS SSR

ML86B:D 4. cb MNA FC PCM − cl

WinDecom PGSC

5. At Startup Menu, sel PCMMU Expansion Unit config
6. Double−click ‘Shuttle Apps’ > ‘Fuel Cell Monitoring’ > ‘WinDecom−FCMS’

NOTE

Minimizing FCMS App will reduce PGSC resources being used

FCMS Application

7. If reqd for End User PGSC, sel appropriate Expansion unit config at startup menu
8. Double−click ‘Shuttle Apps’ > ‘Fuel Cell Monitoring’ > Fuel Cell Monitoring System’
9. Verify data being received on crew FCMS display
10. Record full rate data file using record option unless otherwise specified by MCC (Either full rate or one sample every X seconds for X hours)
11. When recording is complete, transfer data file (fcXXXXX.ZIP) from C:\SPOCAPPS\FCMS directory to C:\oca_down directory on Proshare PGSC, notify MCC

If fuel cell open circuit voltage recording requested, following steps will be coordinated with MCC:

12. BUS TIE ___,___(two) − ON (tb−ON)
13. ESS BUS SOURCE FC ___ − OFF
14. FC/MN BUS ___ − OFF
15. Record data file using record option specified by MCC (Either full rate or one sample every X seconds for X hours)

When open circuit recording complete, notify MCC

16. FC/MN BUS ___ − ON
17. ESS BUS SOURCE FC ___ − ON
18. Bus Tie config per MCC

DEACTIVATION

ML86B:D 1. cb MNA FC PCM − op

FCMS Application

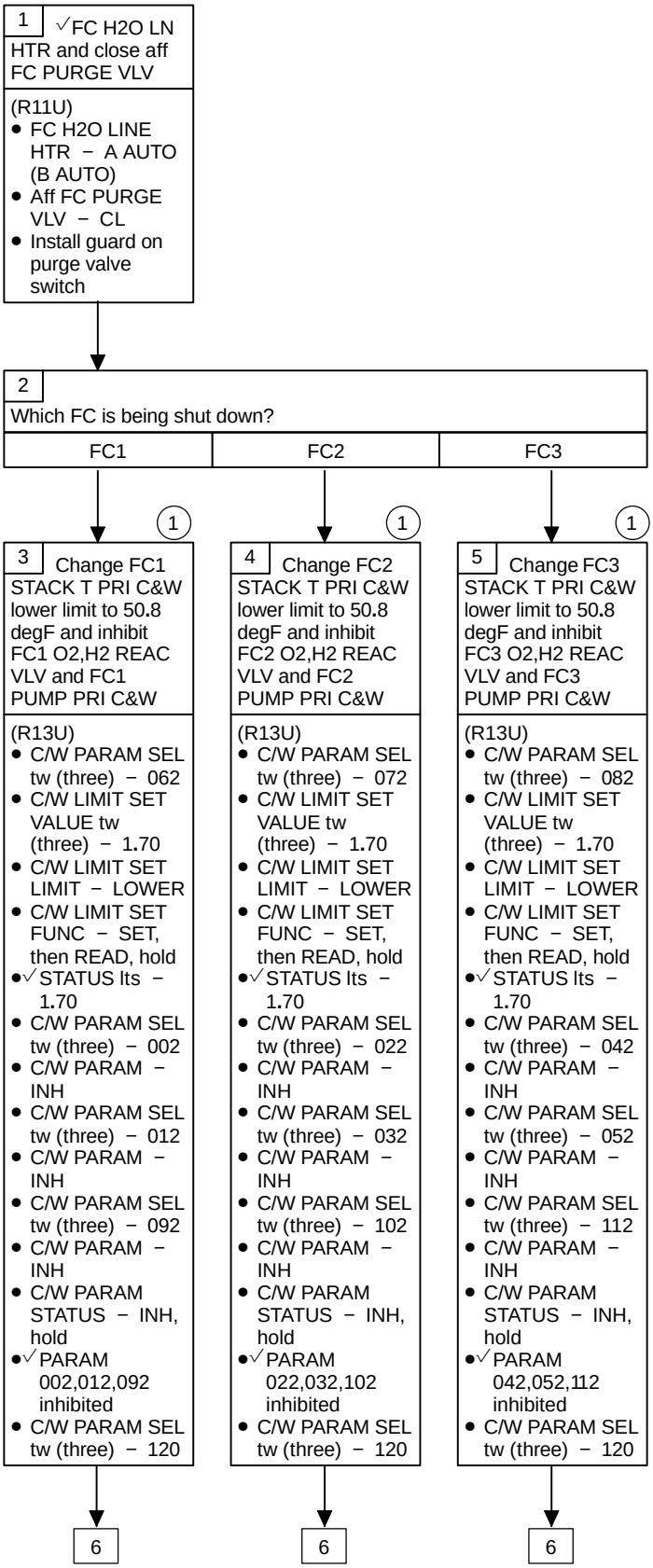
2. Close FCMS application
   If End User PGSC used
   Disconnect and stow RS232Y cable
   Shutdown Windows − as reqd

WinDecom PGSC

3. To exit:
   Double−click ‘Shuttle Apps’ > ‘Fuel Cell Monitoring’ > ‘WinDecom Shutdown’
4. Perform as reqd
   Disconnect FCMS cable
   Shutdown Windows
   Disconnect pwr cable

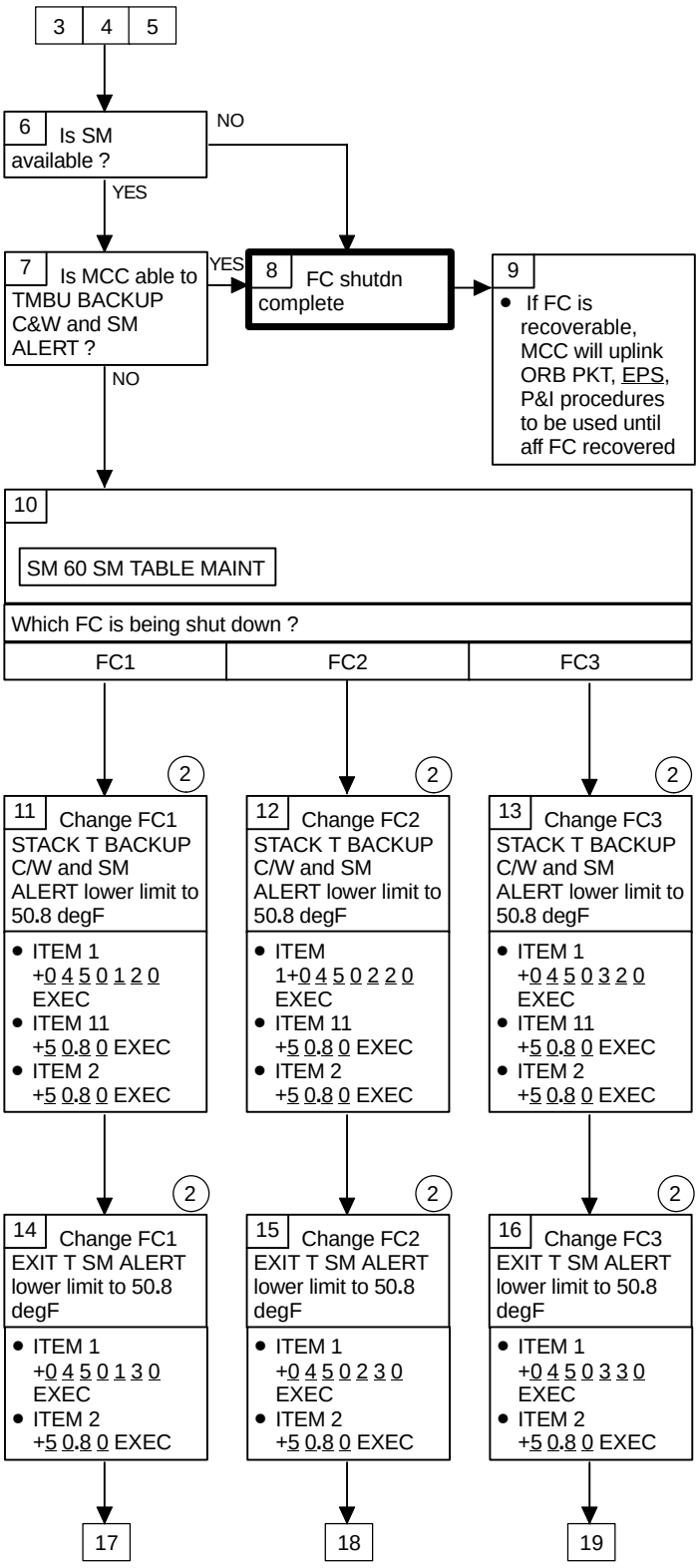
O5 5. Connect PCMMU cable between WinDecom’s PCMMU expansion card port and pnl O5 PCMMU 1 outlet

EPS SSR−3
FC SHUTDN C&W LIMIT CHANGE



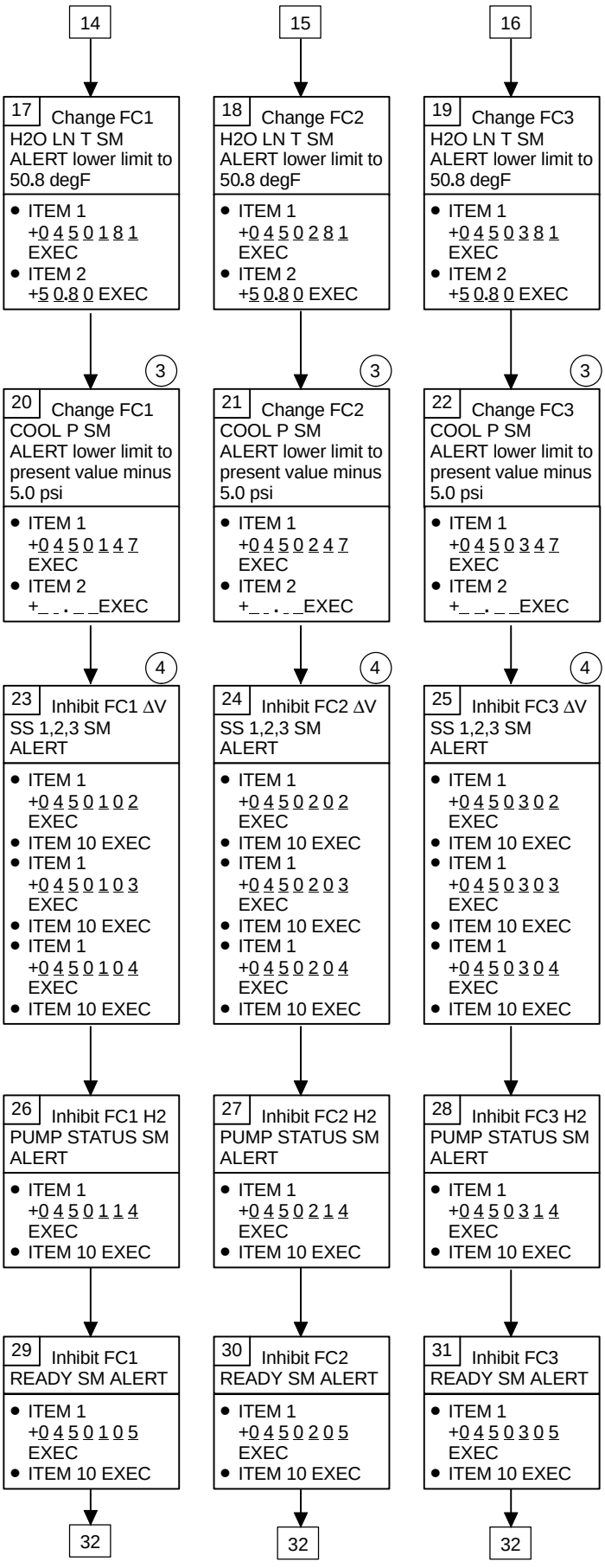
(1) Lower limit on FC temp during cooldown is 48 degF to protect from ice formation. Closest value > 48 degF that PRI C&W system can be set is 50.8 degF

EPS SSR−3 (Cont)



(2) Equal to value set in PRIMARY C&W SYSTEM. Lower limit on FC temp during cooldown is 48 degF to protect from ice formation. Closest value > 48 degF that PRI C&W system can be set is 50.8 degF

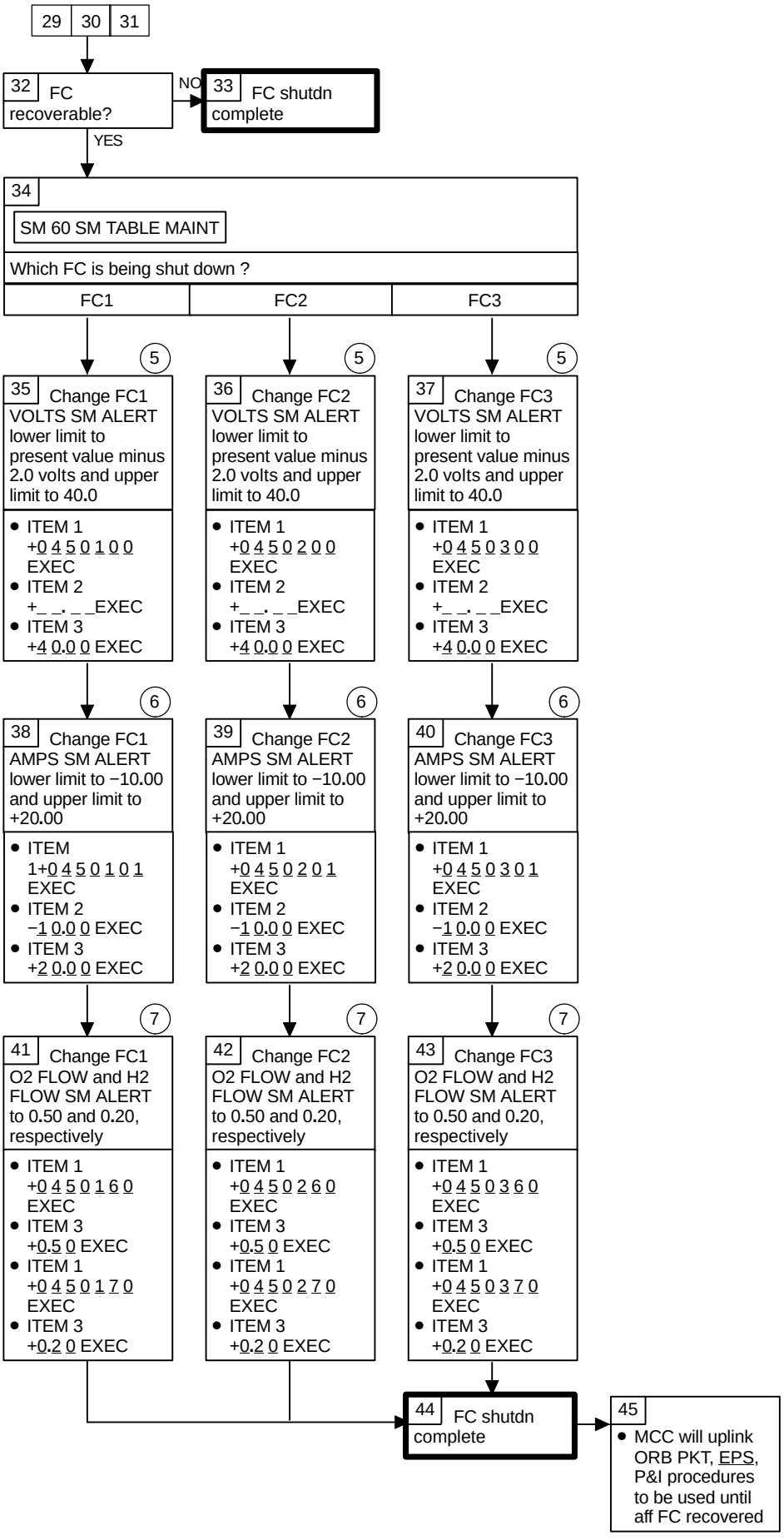
EPS SSR−3 (Cont)



(3) Decrease in FC COOL P with fuel cell shutdn and REAC vlvs closed may indicate internal leak, crossover, or reactant leak

(4) FC SUBSTACK ΔVOLTS are not usable when fuel cell is shut down

EPS SSR−3 (Cont)

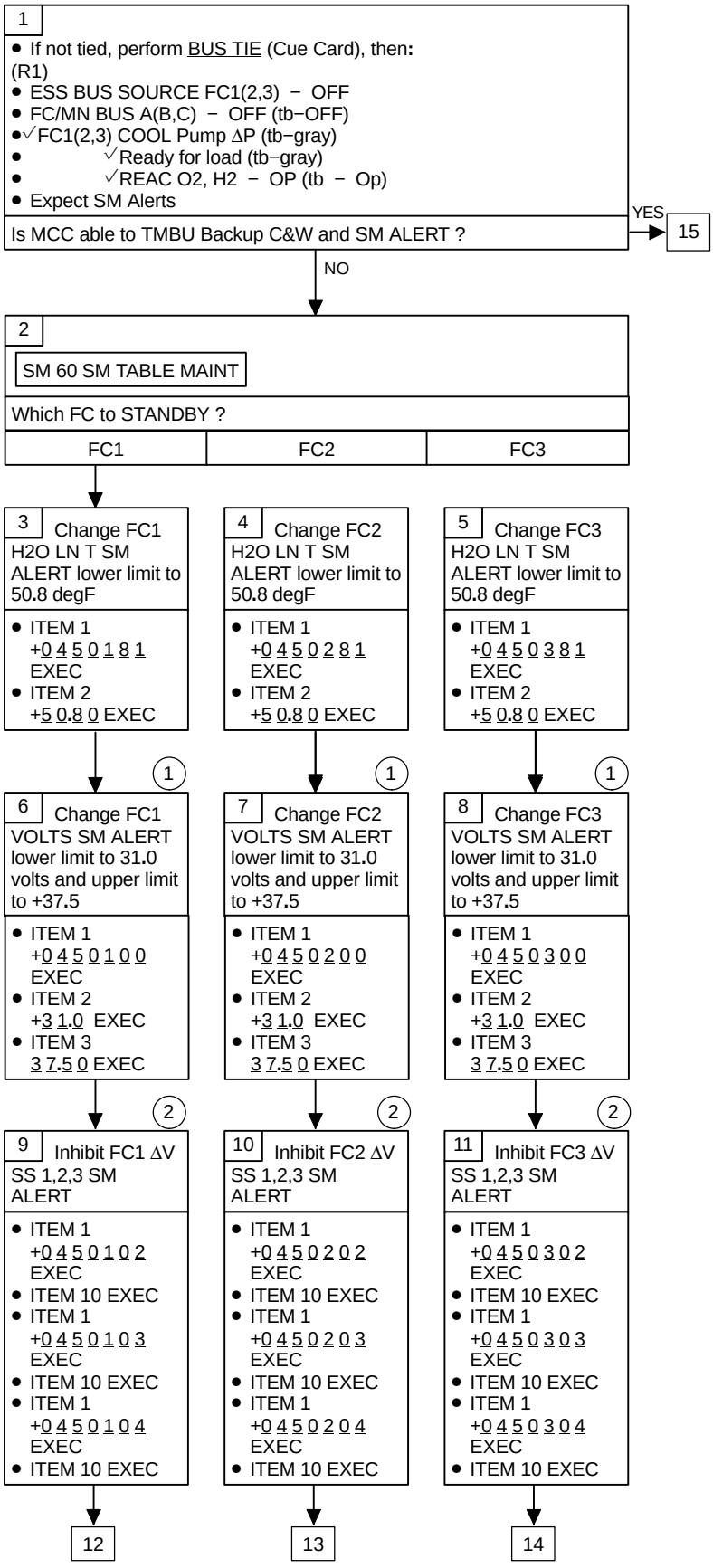


(5) Decrease in FC VOLTS while fuel cell is shut down may indicate internal load, crossover, or reactant leak

(6) Increase in FC O2,H2 FLOWS while fuel cell is shut down may indicate internal load or reactant leak

(7) Increase in FC O2,H2 FLOWS while fuel cell is shut down may indicate internal load or reactant leak

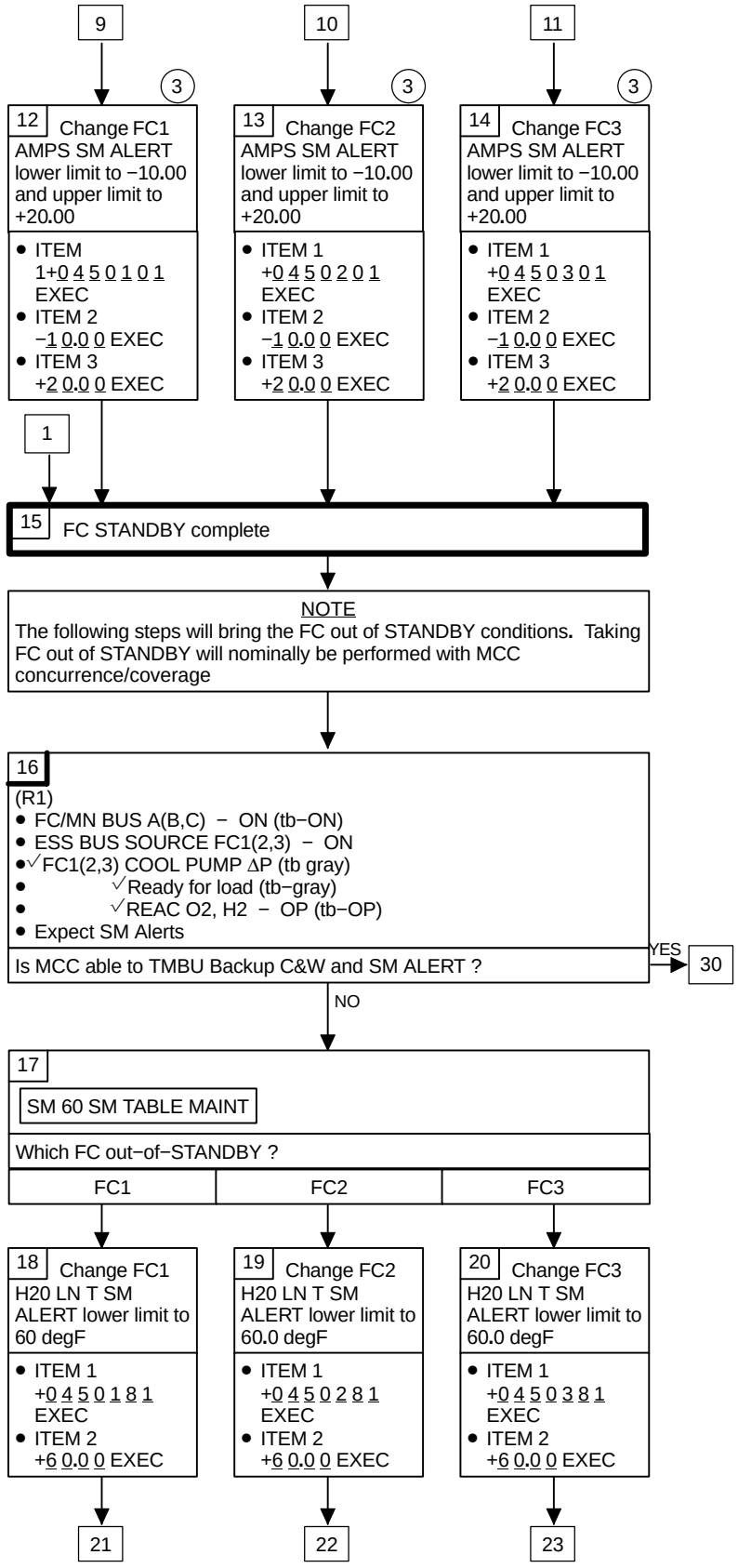
EPS SSR−4
FC STANDBY



(1) Decrease in FC VOLTS beyond FDA limit while fuel cell is in STANDBY may indicate internal load, crossover, or reactant leak

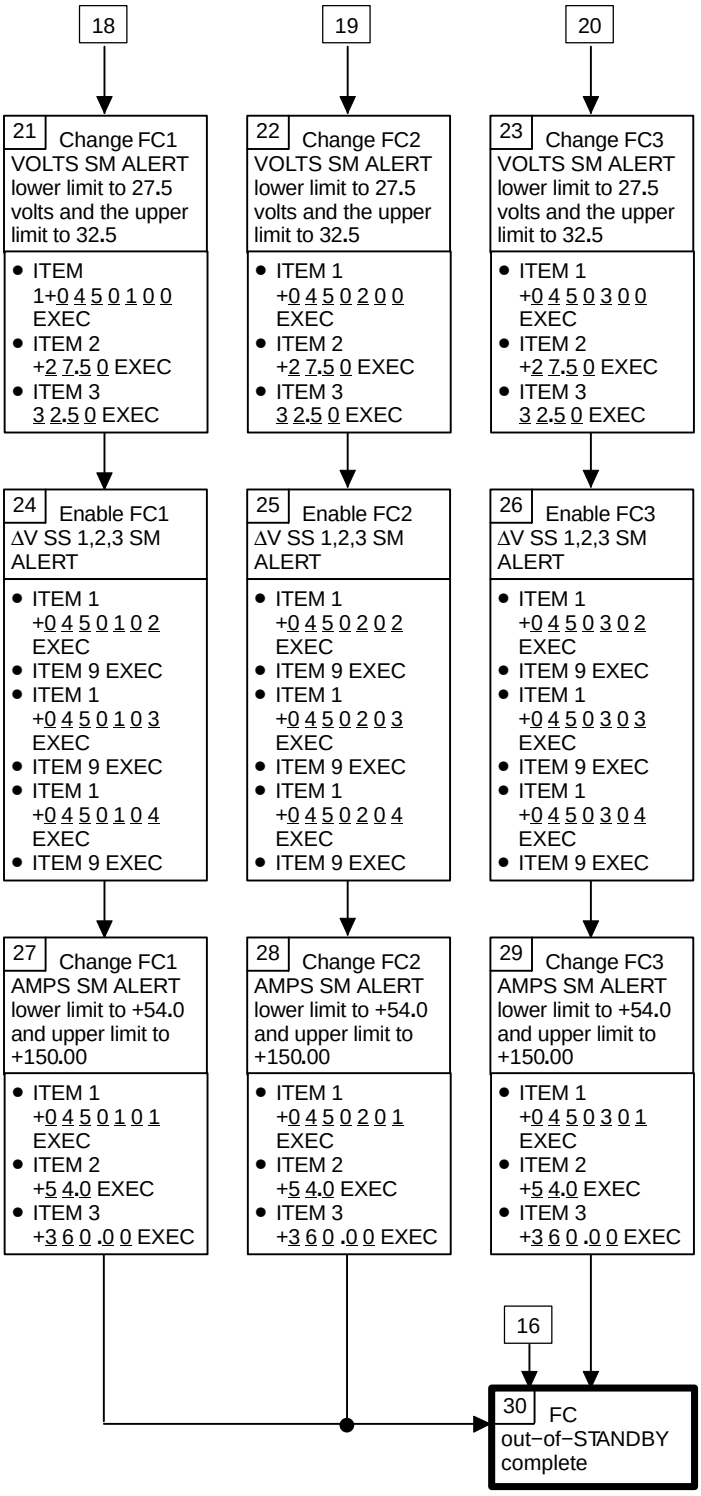
(2) FC SUBSTACK ΔVOLTS are not usable when fuel cell is in STANDBY

EPS SSR−4 (Cont)

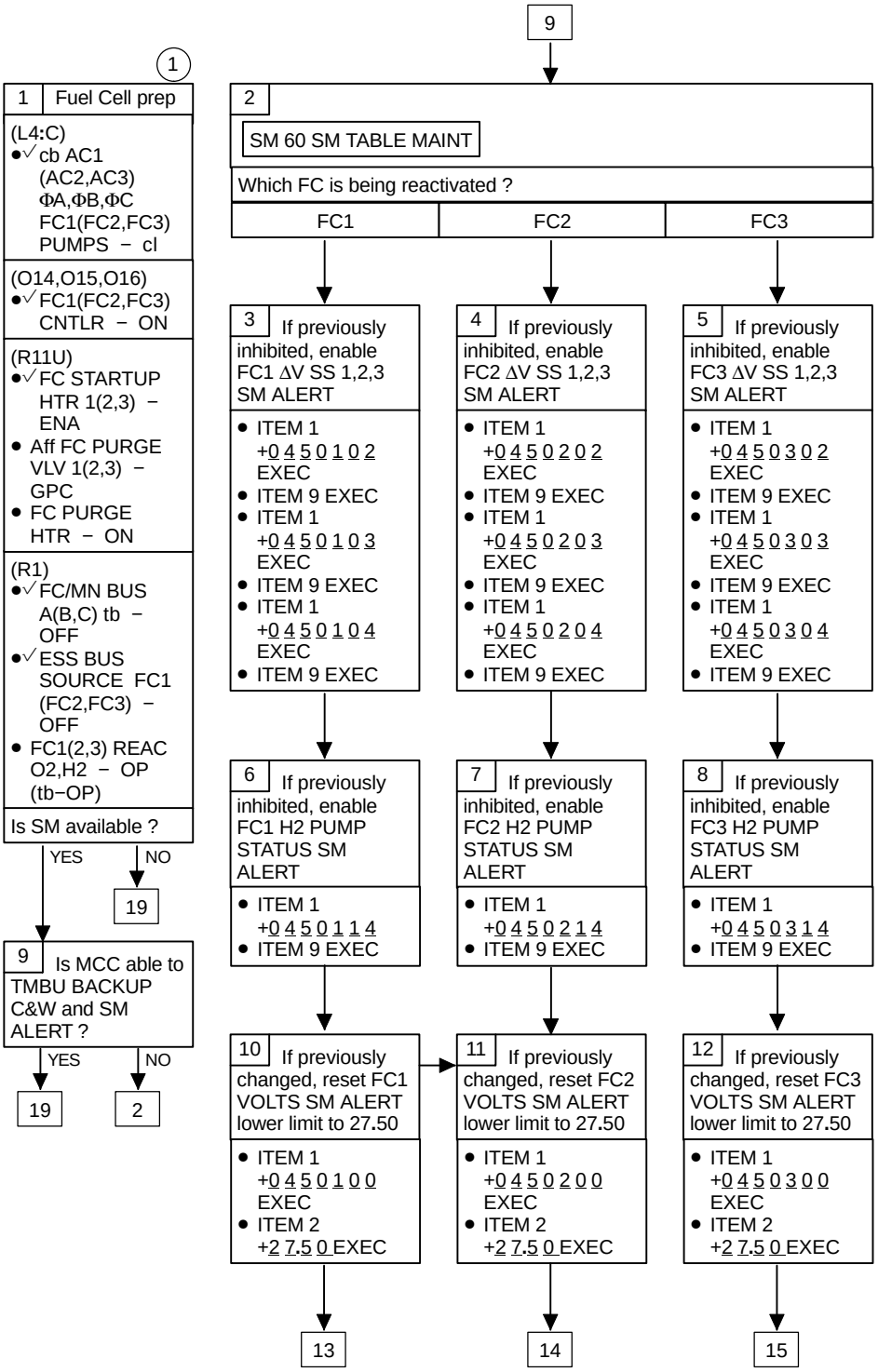


(3) Increase in FC Amps beyond the FDA limit while fuel cell is in STANDBY may indicate external load on the fuel cell

EPS SSR−4 (Cont)

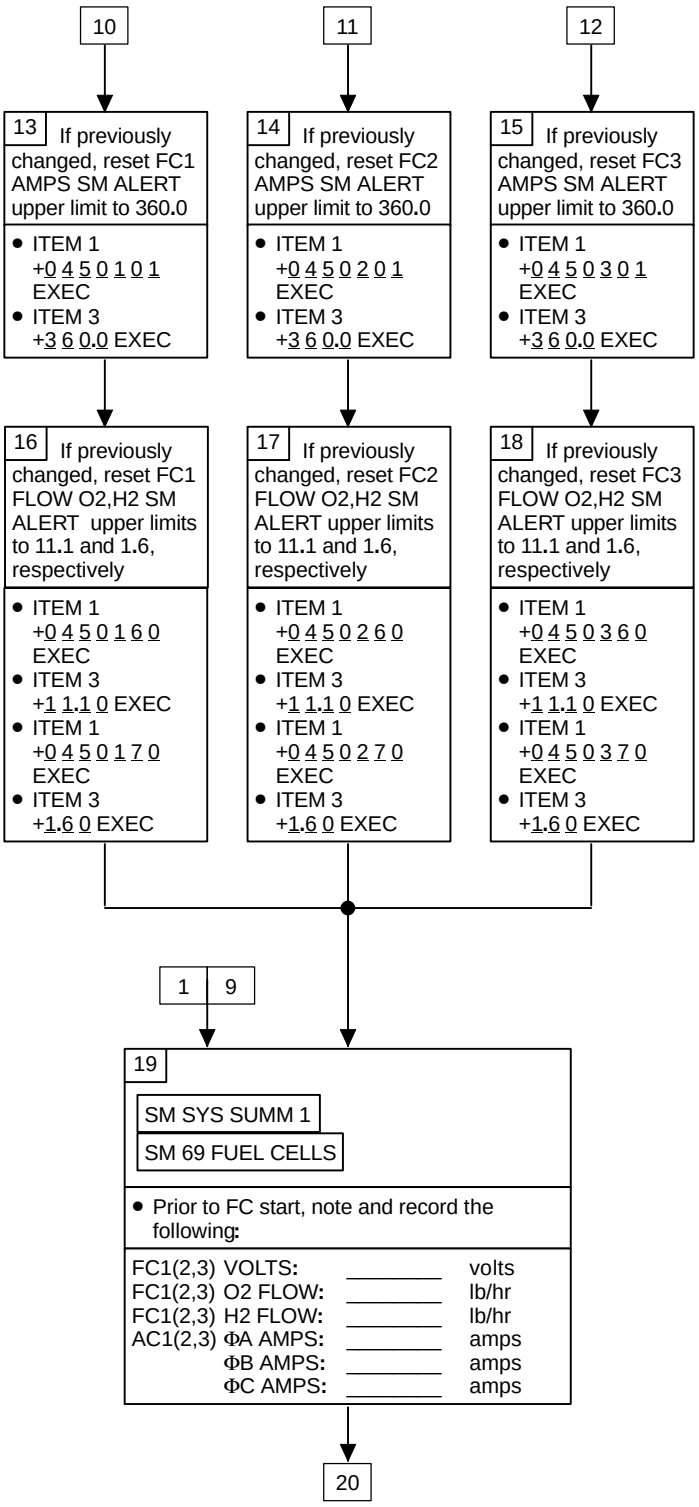


EPS SSR−6
FC RESTART

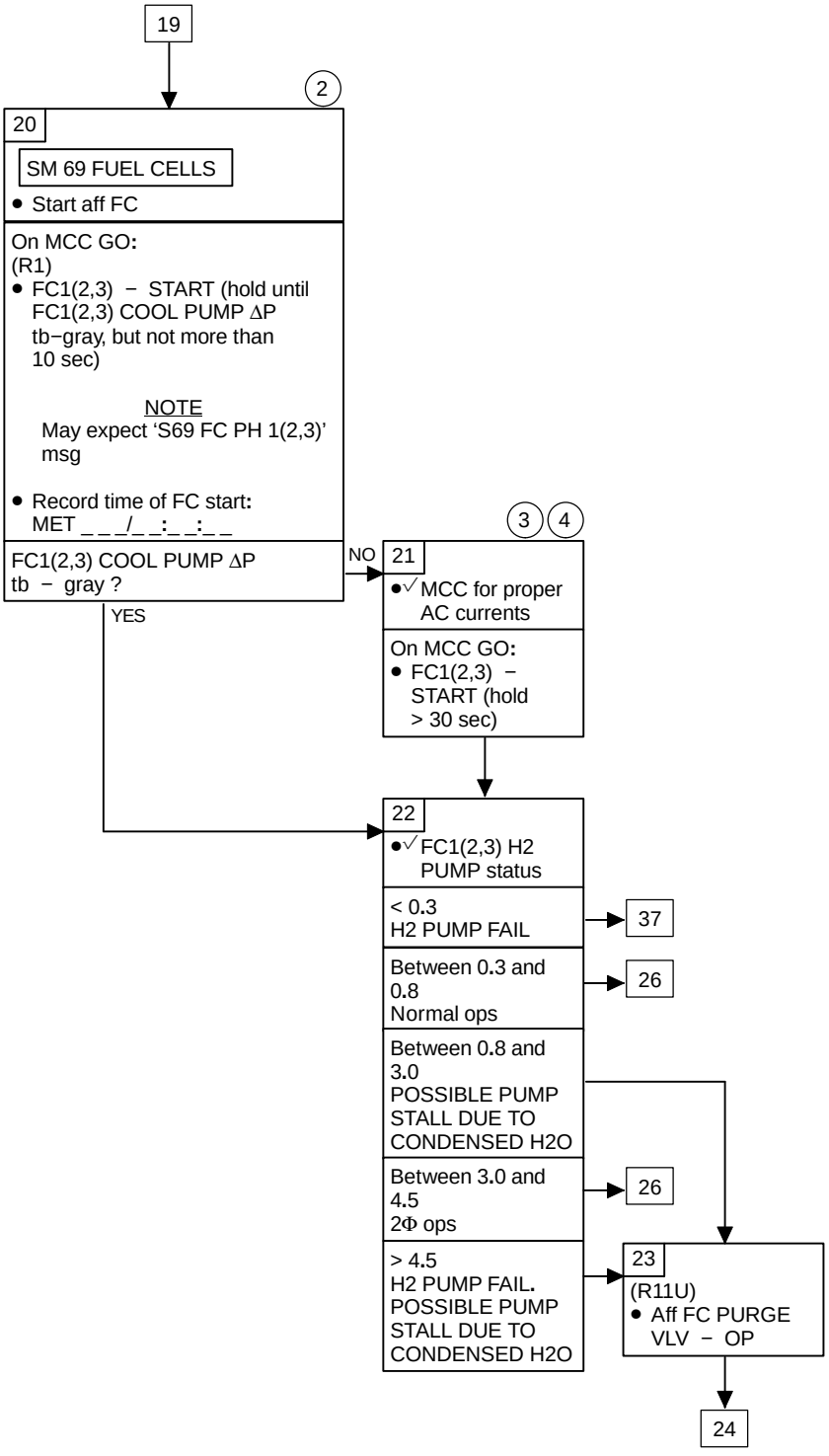


(1) FC may be restarted on two Φs. Loss of AC1(2,3) ΦA cb causes loss of FC1(2,3) pH sensing. Loss of AC2 ΦB cb causes loss of common pH sensing

EPS SSR−6 (Cont)



EPS SSR−6 (Cont)

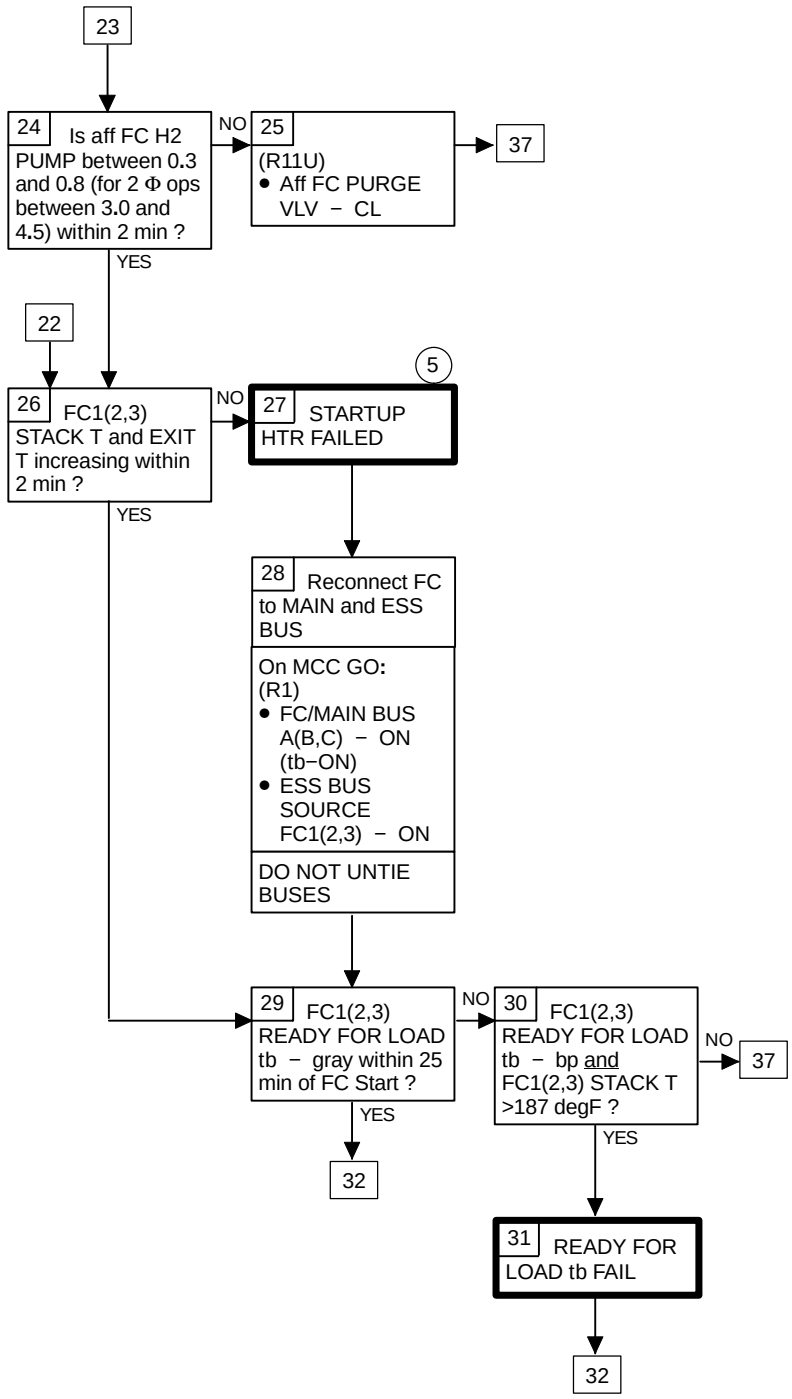


(2) May expect FC pH FSM when FC is started on some fuel cells due to addition of pH self−test capability

(3) Expected AC currents are an increase of ~0.8 amps/Φ (0.55 amps/Φ for COOL PUMPS and 0.25 amps//Φ for H2 mtr)

(4) Failure of COOL PUMP ΔP tb will inhibit FC startup. Holding sw in START for > 30 sec will bypass Logic Timer and allow COOL PUMP and H2 mtr to run

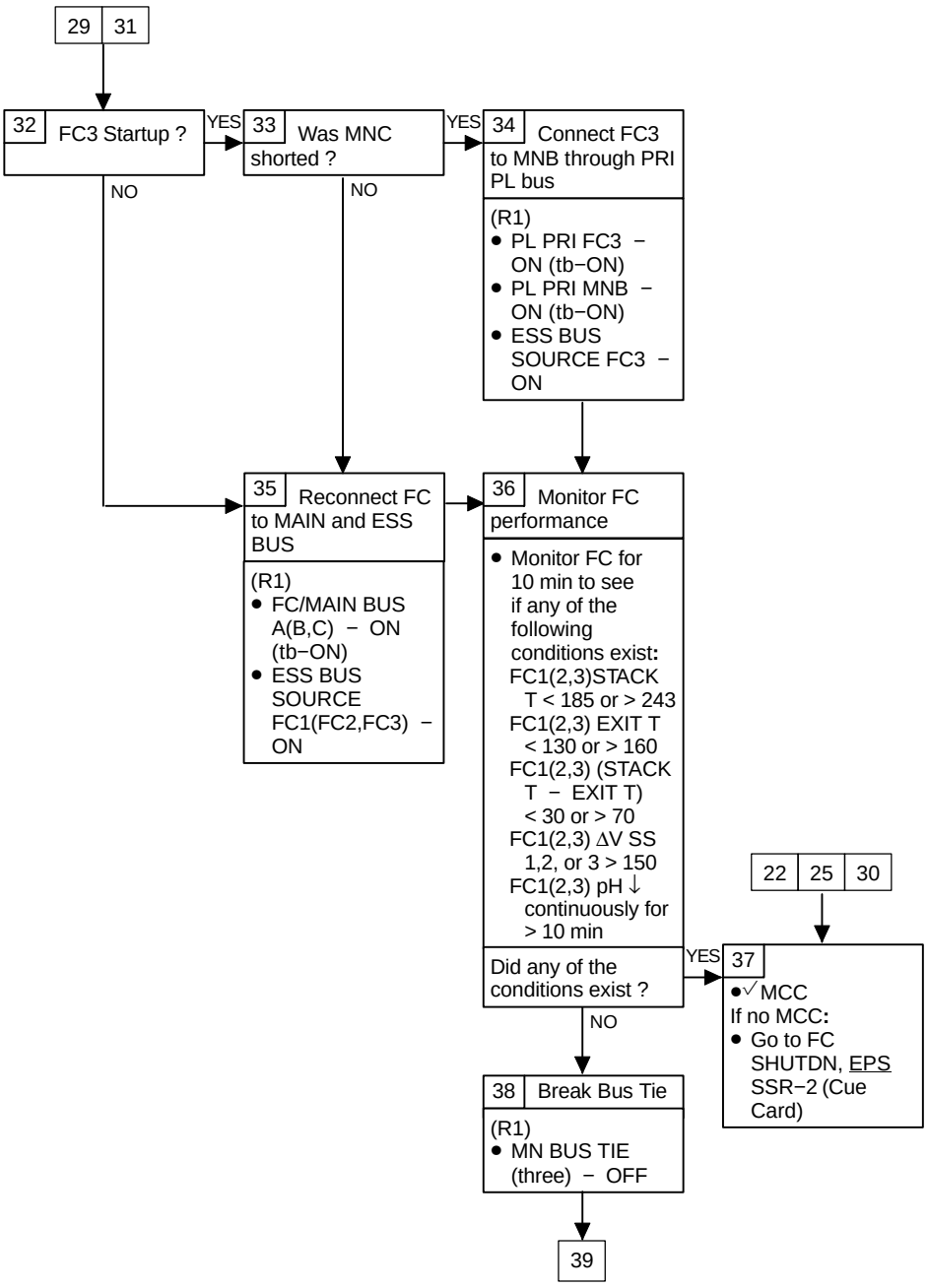
EPS SSR−6 (Cont)



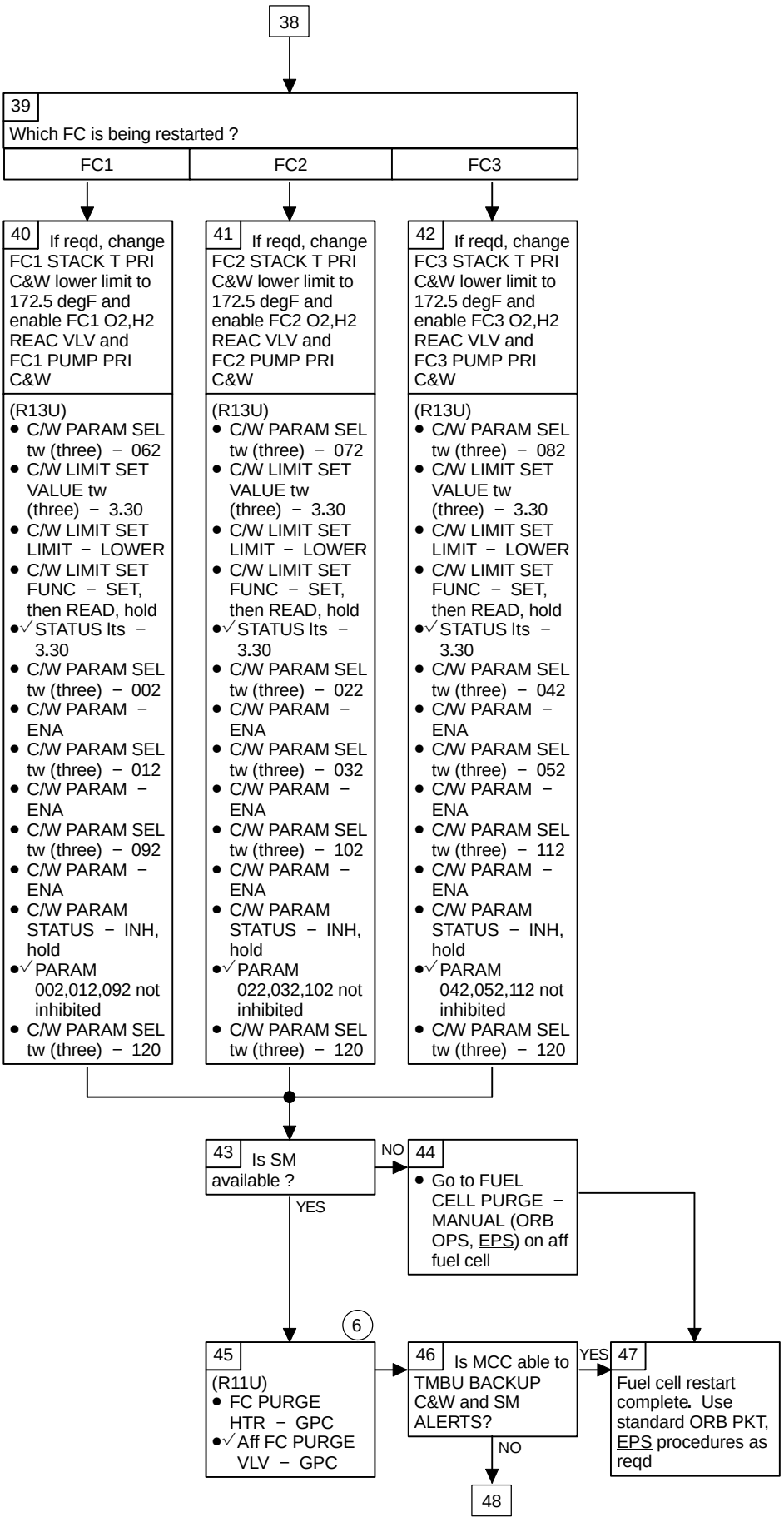
(5) Expected indications of operating STARTUP HTR are:
- FC VOLTS ~32V
- FC O2 Flow ~1.4 lb/hr
- FC H2 FLOW ~0.2 lb/hr

Placing FC on MAIN BUS will generate sufficient heat to raise FC temp to operating levels

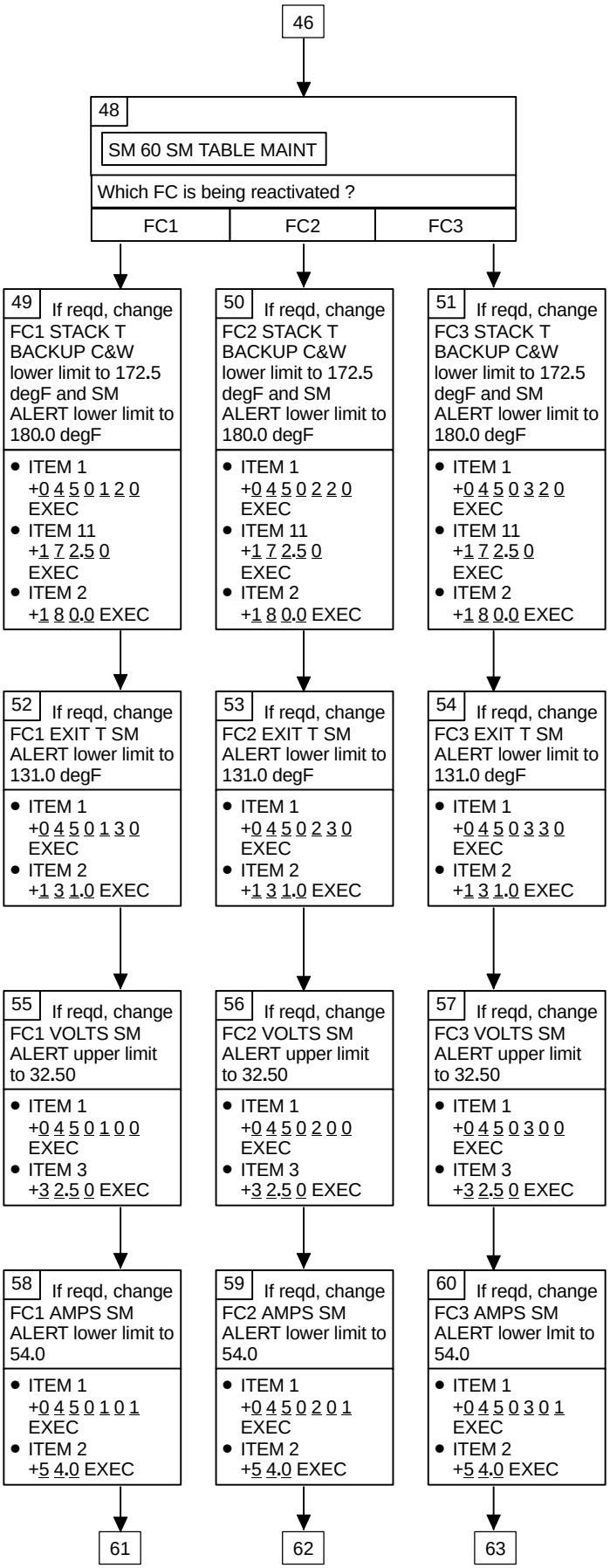
EPS SSR−6 (Cont)



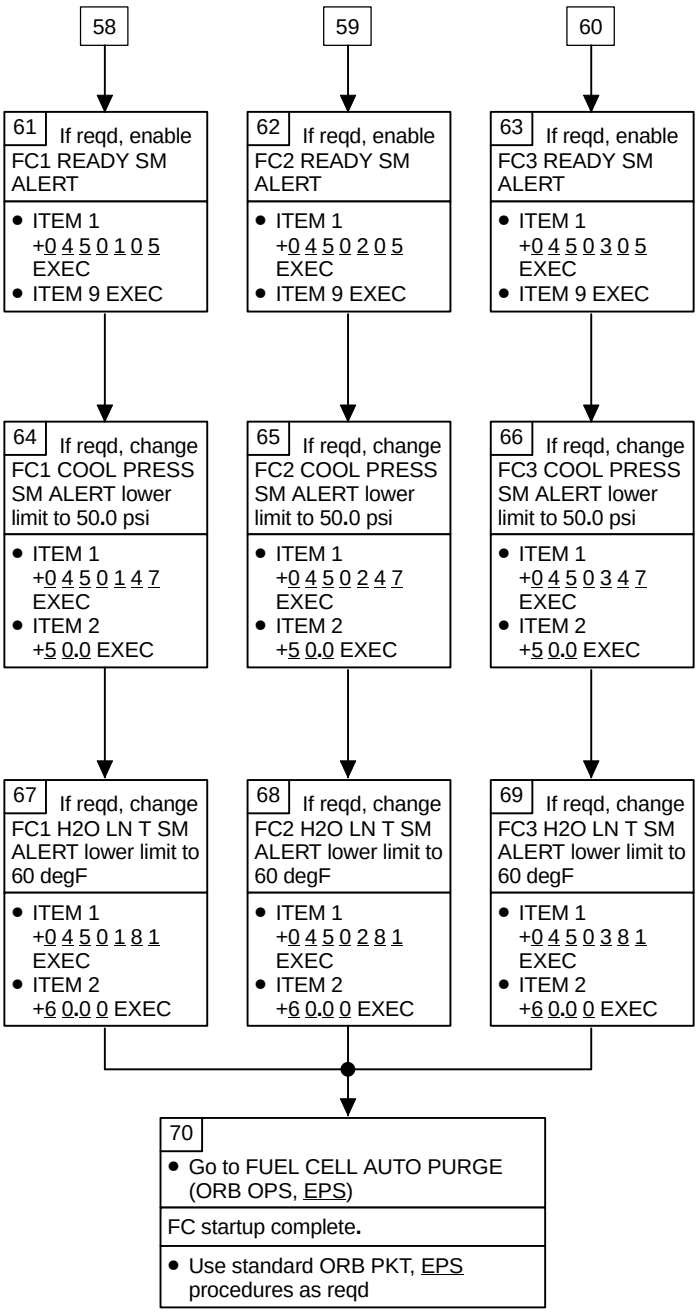
EPS SSR−6 (Cont)



EPS SSR−6 (Cont)



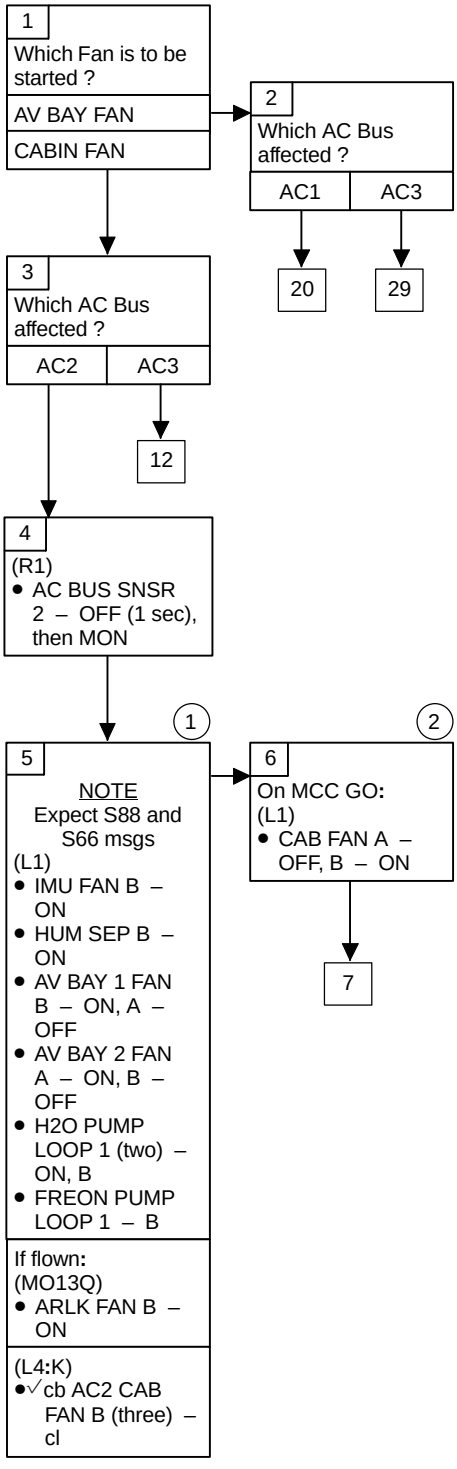
EPS SSR–6 (Cont)



EPS SSR–7
TWO–PHASE FAN START PROCEDURE

NOTE

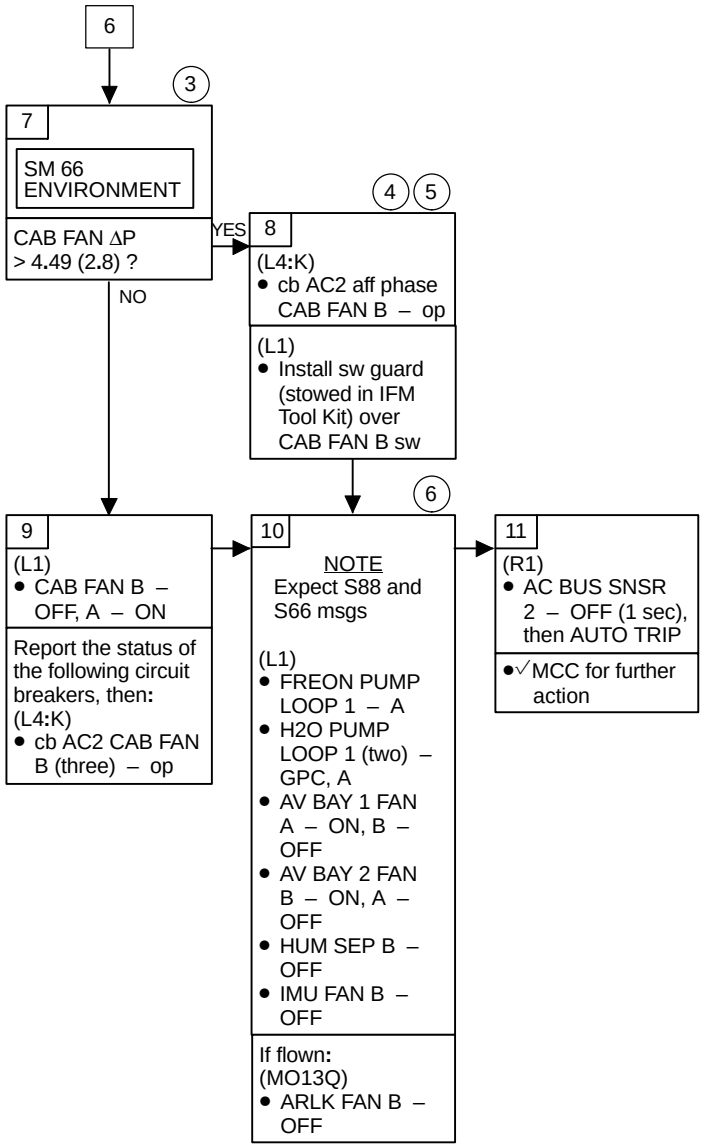
This procedure assumes the EPS MAL BUS LOSS SSR for the affected phase (not shorted) has already been completed. This procedure will be performed during MCC coverage



(1) Reconfig 3Φ AC equipment to bus with lost phase to create an induced voltage reqd to start large fan

(2) Off time not to exceed 20 min due to DDU cooling constraints

EPS SSR–7 (Cont)

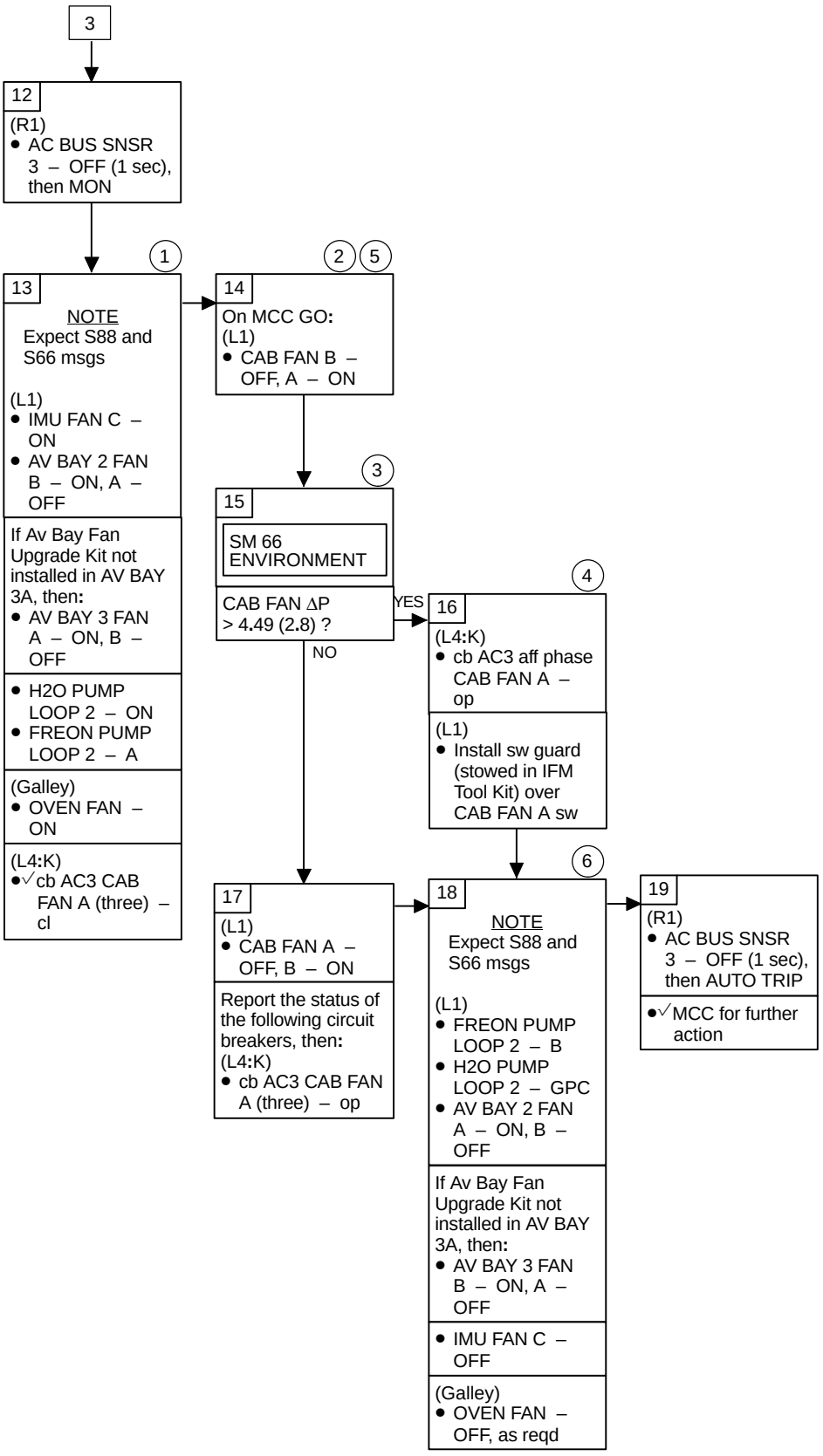


(3) Value in ( ) is the ΔP when the Cabin Press is at 10.2 psi

(4) Switch guard installed to prevent CAB Fan from being turned off during LiOH can changeout and cabin fan filter cleaning

(5) May receive 'S67 AC AMPS' msg

(6) Reconfig back to alternate equipment



(1) Reconfig 3Φ AC equipment to bus with lost phase to create an induced voltage reqd to start large fan

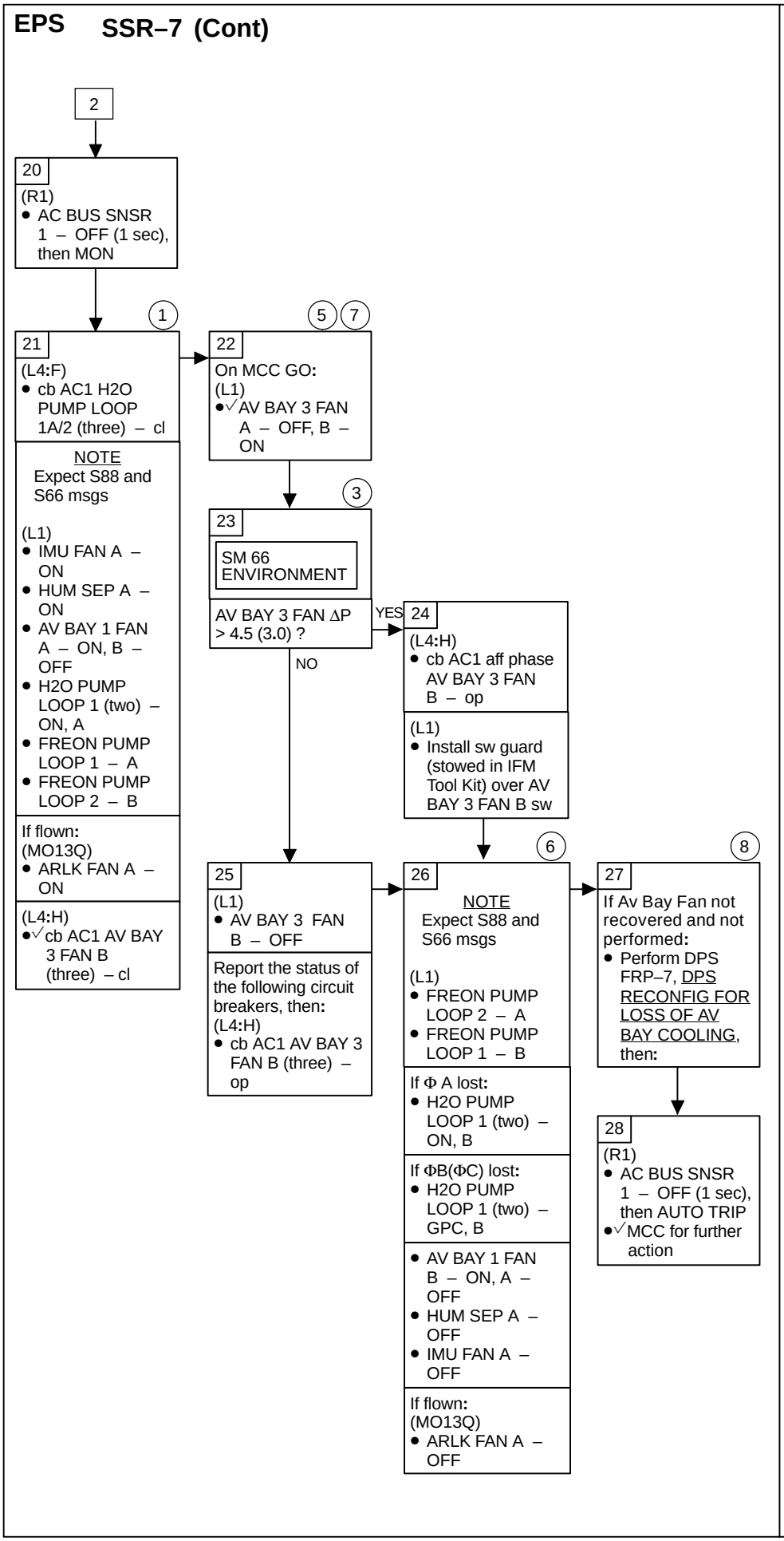
(2) Off time not to exceed 20 min due to DDU cooling constraints

(3) Value in ( ) is the ΔP when the Cabin Press is at 10.2 psi

(4) Switch guard installed to prevent CAB Fan from being turned off during LiOH can changeout and cabin fan filter cleaning

(5) May receive 'S67 AC AMPS' msg

(6) Reconfig back to alternate equipment



(1) Reconfig 3Φ AC equipment to bus with lost phase to create an induced voltage reqd to start large fan

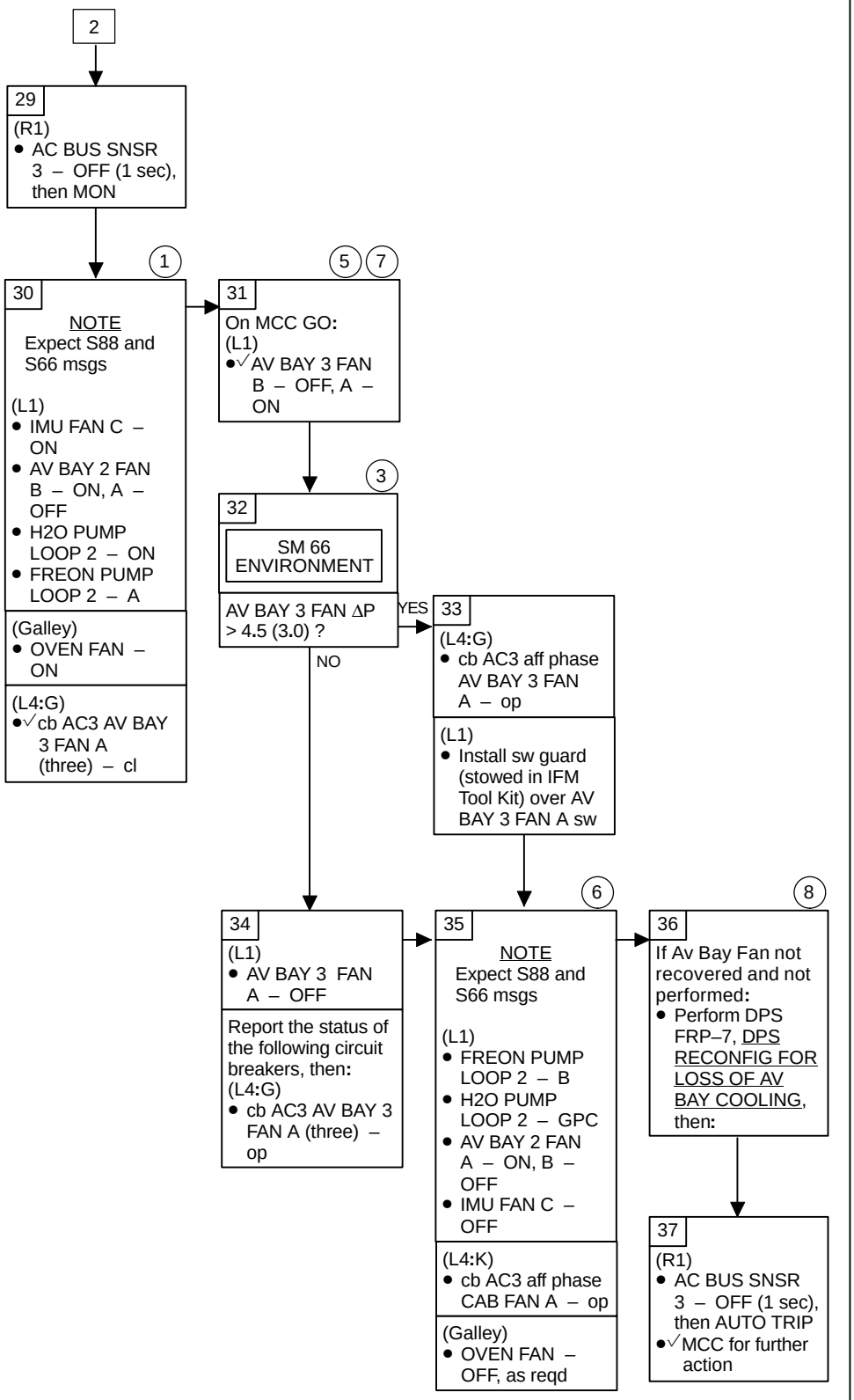
(3) Value in ( ) is the ΔP when the Cabin Press is at 10.2 psi

(5) May receive 'S67 AC AMPS' msg

(6) Reconfig back to alternate equipment

(7) Off time not to exceed 26 min due to GPC cooling constraints. If GPC 3 Off, time not to exceed 1 hr due to Caution & Warning cooling constraints

(8) The Av Bay air cooled equipment must be powered down due to loss of Av Bay Air Cooling



1 Reconfig 3Φ AC equipment to bus with lost phase to create an induced voltage reqd to start large fan

3 Value in ( ) is the ΔP when the Cabin Press is at 10.2 psi

5 May receive 'S67 AC AMPS' msg

6 Reconfig back to alternate equipment

7 Off time not to exceed 26 min due to GPC cooling constraints. If GPC 3 Off, time not to exceed 1 hr due to Caution & Warning cooling constraints

8 The Av Bay air cooled equipment must be powered down due to loss of Av Bay Air Cooling

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EPS SSR–8
BUS LOADING – LRU SELECT

1	To load MAIN A, select:

NOTE
Do not change LRU config on LRU(s) configured for Cryo O2/H2 conservation, thermal control, or failure. Only LRUs with > 100 watts load and powered from single bus are listed

(L1)
1. • TOP EVAP HTR DUCT – A
2. • AV BAY 1 FAN A – ON
   • B – OFF
3. • 3 FAN B – ON
   • A – OFF
4. • FREON PUMP LOOP 1 – A
5. • 2 – B

(L2)
6. • FES FEEDLINE HTR A SUP – 1
7. • FES FEEDLINE HTR B SUP – 2

(R1/A11/A15)
8. • CRYO O2,H2 TK 1,3,5 HTR A (six) – AUTO (as reqd)
   • CRYO O2,H2 TK 1,2,3,4,5 HTR B (ten) – OFF
   • CRYO O2,H2 TK 2,4 HTR A (four) – OFF

(A12)
APU HTR
9. • GG/FP 1 – A AUTO
10. • 3 – B AUTO
11. • LUBE OIL LINE 1 – A AUTO
12. • 3 – B AUTO
13. • TK/FU LN/H2O 1A,3B (two) – AUTO
    • TK/FU LN/H2O 1B,3A (two) – OFF

HYD HTR
14. • SPD BK A – AUTO
    • B – OFF
15. • BDY FLP A – AUTO
    • B – OFF
16. • ELEV A – AUTO
    • B – OFF

HYD
17. • CIRC PUMP 3 – MNA

(A14)
RCS/OMS HTR
18. • FWD RCS – A AUTO
19. • L POD A – A AUTO
    • B – OFF
20. • R POD B – B AUTO
    • A – OFF
21. • OMS CRSFD LINES – A AUTO

2	To load MAIN B, select:

NOTE
Do not change LRU config on LRU(s) configured for Cryo O2/H2 conservation, thermal control, or failure. Only LRUs with > 100 watts load and powered from single bus are listed

(L1)
31. • TOP EVAP HTR DUCT – B
32. • AV BAY 1 FAN B – ON
    • A – OFF
33. • 2 FAN A – ON
    • B – OFF
34. • FREON PUMP LOOP 1 – B
35. • CABIN FAN B – ON
    • A – OFF

(L2)
36. • FES FEEDLINE HTR A SUP – 2

(R1/A11/A15)
37. • CRYO O2,H2 TK 2,3,4 HTR B (six) – AUTO (as reqd)
    • CRYO O2,H2 TK 1,2,3,4,5 HTR A (ten) – OFF
    • CRYO O2,H2 TK 1,5 HTR B (four) – OFF
38. • PL PRI MNB – ON (tb–ON)
    • MNC – OFF (tb–OFF)
    • FC3 – OFF (tb–OFF)

(A12)
APU HTR
39. • GG/FP 1 – B AUTO
40. • 2 – A AUTO
41. • LUBE OIL LINE 1 – B AUTO
42. • 2 – A AUTO
43. • TK/FU LN/H2O 1B,2A (two) – AUTO
    • TK/FU LN/H2O 1A,2B (two) – OFF

HYD HTR
44. • SPD BK B – AUTO
    • A – OFF
45. • BDY FLP B – AUTO
    • A – OFF
46. • ELEV B – AUTO
    • A – OFF

HYD
47. • CIRC PUMP 1 – MNB

(A14)
RCS/OMS HTR
48. • FWD RCS – B AUTO
49. • L POD B – B AUTO
    • A – OFF
50. • R POD A – A AUTO
    • B – OFF
51. • OMS CRSFD LINES – B AUTO

3	To load MAIN C, select:

NOTE
Do not change LRU config on LRU(s) configured for Cryo O2/H2 conservation, thermal control, or failure. Only LRUs with > 100 watts load and powered from single bus are listed

(L1)
61. • TOP EVAP HTR DUCT – C
62. • AV BAY 2 FAN B – ON
    • A – OFF
63. • 3 FAN A – ON
    • B – OFF
64. • FREON PUMP LOOP 2 – A
65. • CABIN FAN A – ON
    • B – OFF

(L2)
66. • FES FEEDLINE HTR B SUP – 1

(R1/A11/A15)
67. • CRYO O2,H2 TK 1 HTR B (two) – AUTO
    • CRYO O2,H2 TK 1 HTR A (two) – OFF
    • CRYO O2,H2 TK 2 HTR A (two) – AUTO
    • CRYO O2,H2 TK 2 HTR B (two) – OFF
    • CRYO O2,H2 TK 4 HTR A (two) – AUTO
    • CRYO O2,H2 TK 4 HTR B (two) – OFF
    • CRYO O2,H2 TK 5 HTR B (two) – AUTO
    • CRYO O2,H2 TK 5 HTR A (two) – OFF

(A12)
APU HTR
68. • GG/FP 2 – B AUTO
69. • 3 – A AUTO
70. • LUBE OIL LINE 2 – B AUTO
71. • 3 – A AUTO
72. • TK/FU LN/H2O 2B,3A (two) – AUTO
    • TK/FU LN/H2O 2A,3B (two) – OFF

HYD
73. • CIRC PUMP 2 – MNC

(A14)
RCS/OMS HTR
74. • L POD B – B AUTO
    • A – OFF
75. • R POD B – B AUTO
    • A – OFF

EXPLANATORY NOTES FOR BUS LOSS SSRs

Bus Loss SSRs contain all the orbiter reconfig steps necessary following a bus loss for > 100 electrical power buses. SSRs also list all orbiter equipment lost and resultant onboard crew indications for each bus loss. If a bus powers one or more sub–buses, the sub–bus SSRs do not need to be utilized unless referenced in the SSR (i.e., each stands alone).

The ORB PKT BUS LOSS ACTIONS lists all the reconfig steps that need to be accomplished immediately following recognition of a bus loss. Following completion of the ORB PKT BUS LOSS ACTIONS, the action contained in the BUS LOSS SSR should be accomplished as soon as practical. The following buses are not included in the ORB PKT BUS LOSS ACTIONS listings as no loss of equipment requires quick reconfig:

MNA MMC1, MMC3, AMC1, O14&A8, R1A1, A6&A14, ML86B

MNB MMC1, MMC2, MMC3, MMC4, AMC2, R14, O15&A8, R1A1, A6&A14, ML86B

MNC MPC3, APC3, FMC3, MMC2, MMC4, AMC3, O16RJD, R1A1, A6&A14, ML86B

ESS1BC FP&LC1, ML86B

ESS2CA FP&LC2

ESS3AB FP&LC3, O13, ML86B

AC1 FMC1, MMC1, MMC3, AMC1

AC2 FMC2, MMC1, MMC2, MMC3, MMC4, AMC2

AC3 FMC3, MMC2, MMC4, AMC3

Entry into a BUS LOSS SSR may be from a MAL procedure, from the Bus Loss ID Tables in the PKT C/L, from a direct readout of bus power loss by crew or MCC, or from the PKT C/L BUS LOSS ACTION.

The following additional information refers to each column of SSR–10 thru SSR–148:

1. ACTIONS

   The ACTIONS column lists, by panel, all the orbiter reconfig steps necessary following a bus loss. Reconfig performed prior to starting the ACTIONS, such as from PKT C/L BUS LOSS ACTIONS, is repeated in the ACTIONS column for completeness. No trouble–shooting steps are listed based on the assumption that the bus loss has been confirmed prior to starting the SSR. ACTIONS are config independent, making many of the switch position listings verification steps. Equipment or function loss that necessitates each reconfig step is listed adjacent to that step in the EQUIP/FUNCTION LOST column.

2. BUS ISOLATION

   The BUS ISOLATION steps do not have to be performed following a bus loss since equipment being unpowered is already unpowered if the bus is dead. The BUS ISOLATION column can be used as a shopping list if power must be reduced on a particular bus for any reason. Any equipment loss resulting in each isolation step is listed adjacent to the step in the EQUIP/FUNCTION LOST column if the same equipment is not already listed adjacent to a reconfig ACTION step. Equipment isolation steps listed in the ACTIONS column are not repeated in the BUS ISOLATION column.

3. EQUIP/FUNCTION LOST

   This column lists all equipment of the functions that are lost because of a bus loss. If reconfig action is necessary because of equipment loss, the equipment is listed adjacent to the appropriate ACTIONS column step(s). If no reconfig is necessary, but equipment may be isolated from bus, the equipment is listed adjacent to BUS ISOLATION STEP. Equipment lost for which there is no reconfig or isolation is listed separately. Equipment that is used only during ascent, such as the ET door system, is not included.

4. CREW INDICATIONS

Onboard crew indications that occur when a bus fails are grouped according to the type of indication. C/W lights are listed together, as are Fault Summary Messages and lights lost. Dedicated displays and tbs are grouped by the panels on which they are located. Indications listed would occur immediately when bus failed; exceptions are explained by a note or preceded by a qualifier. Indications that are config dependent are preceded by a qualifier such as "If H2O Loop 2 Pump Action."

If a Fault Summary Message (FSM) is available in OPS 2 only, without a similar message in BFS or OPS 3, the FSM is followed by '(2)'. If FSM is available in OPS 3 only or BFS only, the FSM is followed by '(3)' or '(B)'. If FSM is available in OPS 3 and BFS, the FSM is followed by '(3,B)'. Nothing is listed for FSMs that are available in all mission phases (available in OPS 2 and OPS 3 or in OPS 2 and BFS). OPS 1 and 8 were not considered.

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EPS SSR–10
BUS LOSS: MNA DA1 (Includes all MNA sub–buses and AC)

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
• Perform FC1 SHUTDN (FC SHUTDN Cue Card)	FC1 PUMPS, pH Snsr Purge Vlv O2,H2 Flow Xdcrs Cell Perf Monitor 1 MNA pwr to AUX PLA Bus 1 ESS2CA 1 ESS3AB 1 CNTLAB1,2,3 1 CNTLCA1,2,3	MASTER ALARM Light/ Tone – on SM ALERT Light/Tone – on	(1) Buses remained pwrd (2) Pwrs PL Timing Buffer and OIU 1 (if flown). OIU 1 redundant pwr MNB MPC2 via CAB PL3 (3) Indications do not appear until jet commanded (4) * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
• Perform LOSS OF 1 FC (ORB PKT, PWRDN)		(F7) MDU CRT 1 blanks	
(R1) • PL CAB – MNB • cb AC CONTR AC1 ΦA,ΦB,ΦC (three) – cl • INV/AC BUS 1 – OFF (tb–OFF) • INV PWR 1 – OFF (tb–OFF) • cb AC CONTR AC1 ΦA, ΦB,ΦC, (three) – op • O2,H2 MANF VLV TK1,2 (four) – OP	2 MNA pwr to CABPL 1,2,3 buses AC1 ΦA,ΦB,ΦC Inverters	(F1) MDU MFD 2 blanks	
		(F8) MDU PLT 1 blanks	
		(F7) C/W CABIN ATM lt – on C/W FREON LOOP lt – on C/W AV BAY/CAB AIR lt – on C/W MN BUS UNDERVOLT lt – on C/W AC VOLT lt – on C/W FC PUMP lt – on 3 C/W RCS JET lt – on C/W H2O LOOP lt – on EVENT TIMER ind – blank	
(R1) If O2(H2) Tk1 in use: • O2(H2) TK1 HTR B – AUTO • O2(H2) TK1 HTR A – OFF If O2(H2) Tk3 in use: • O2(H2) TK3 HTR B – AUTO • O2(H2) TK1 HTR A – OFF	Cryo O2,H2 Tk1 Htrs A Cryo O2,H2 Tk3 Htrs A	(COMM LOST) MS,OS audio lost Xmit to gnd via UHF	
(A11) If OV104 or OV105 & Tk5 in use: • O2(H2) TK5 HTR B – AUTO • O2(H2) TK5 HTR A – OFF	(OV104, OV105) Cryo O2,H2 Tk5 Htrs A	(LIGHTS LOST) L Console Floodlt Pnl lts L/Ctr (pnls L1,L2,L4, C2,C3,F2,F6,F7) Pnl lts L/OH (pnls O5,O6, O7,O13,O14,O15) Numeric lts (pnls O3, F7) Instr lts R (pnls C2,F8,F9) PS Floodlt Orbit Sta Instr lts (pnls A1,A2) Middeck Floodlts 1,8 WMC Floodlt MO13Q pnl lt 2 Airlock Floodlt 1 PLB Floodlts Aft Stbd,Fwd Port, Docking TA Floodlt 2	
	Av Bay 3 Agent discharge capability		
If EMU(s) in battery charge mode: (AW18H) • PWR/BATT CHGR EMU 1(2) BUS SEL – MNB	EMU 1,2 PWR/BATT Charger MNA pwr	(F9) AC1 ΦA,ΦB,ΦC AC volts ind – < 90 DC VOLTS MNA ind – OSL	
(A12) APU HTR 4 • GAS GEN/FUEL PUMP 1 – B AUTO 4 • GAS GEN/FUEL PUMP 3 – A AUTO • LUBE OIL LINE 1 – B AUTO • LUBE OIL LINE 3 – A AUTO APU HTR TK/FU LINE/H2O 4 • SYS 1A – OFF 4 • 1B – AUTO 4 • 3A – AUTO 4 • 3B – OFF HYD HTR • RUD SPD BK A – OFF • B – AUTO • BDY FLP A – OFF • B – AUTO • ELEV A – OFF • B – AUTO	APU 1 GG/Fu Pump Htrs A APU 3 GG/Fu Pump Htrs B APU 1 Lube Oil Line Htrs A APU 3 Lube Oil Line Htrs B APU 1 Tk/Fu Ln Htrs A APU 1 Inj H2O Htrs A 3 Tk/Fu Ln Htrs B Rud/Spd Brake Htr A Body Flap Htr A Elevon Actr Htrs A	(FSMs) S86 HYD RSVR Q SM2 HYD QTY (B) S86 WSB T SM0 THRM HYD (B) S66 AV BAY 3 FAN S66 AV BAY 2 FAN S66 CABIN FAN S66 CABIN PPCO2 S66 IMU FAN DP S66 CABIN PPO2 A S66 CABIN PRESS SM1 CABN DP/DT BU (B) S67 AC VOLTS 1 S69 FC PUMP 1 S69 FC H2 PUMP 1 S88 FREON FLOW 2 S88 FRN AFT CP 2 S88 FRN PL HX 2 S88 H2O LOOP 1 FLOW S88 H2O LOOP 2 QTY S88 H2O LOOP 2 TEMP S88 H2O PUMP P 2 I/O ERROR CRT 1 S67 MAIN BUS V	
(Continued)	(Continued)	(Continued)	

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A12) HYD CIRC • PUMP PWR 1 – MNB • 3 – MNC	Circ Pump 1 MNA pwr 3 MNA pwr	(FSMs) S88 THERMAL FRN (2) S88 THERMAL H2O (2) S67 FPC/FLC 1 S67 MPC 1 S67 APC/ALC A 168 PALLET V A 3 L RCS D,L JET RM DLMA MANF	(3) Indications do not appear until jet commanded (5) After MET 3:30, tb already bp (6) Vlv holds position. N2 Sys 2 remains (7) Crew and ground have lost PPCO2 XDCR if Cabin Air Sig Condr not recovered (8) B/U pwr remains for RMS ops (9) All brakes ON and safing initiated (10) Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists (11) Vlv holds position (12) Vlv holds position. Man OP capability remains (13) Do not reconfig for reg switch or I'CNCT procedures (14) Vlv holds position. Man CL and full GPC cntl remains
If RAD CNTLR LOOP 1,2 – AUTO B: • Perform ON–ORBIT RAD CNTLR SWITCH, ECLS SSR–13 for Freon Loop 1,2 (L1) • FLASH EVAP CNTLR PRI A (SEC) – ON (if reqd) • TOP EVAP HTR NOZ L – B AUTO • TOP EVAP HTR DUCT – B If HI LOAD EVAP enabled: • HI LOAD DUCT HTR – B(C)	Freon Loop 1 Rad Cntlr B 2 Rad Cntlr B FES Pri B Cntlr Top Evap L Noz Htr A Top Evap Duct L,R,Fwd,Aft Htrs A Hi Load Duct Outbd,Inbd Noz Htrs A	If ADTA 1, MLS 1, – STAR TRKR pwrd: 'BCE STRG 1 ADTA' (3,B) 'BCE STRG 1 MLS' (3) 'BCE STRG 1 STKR'	
7 • Maintain LiOH Canister(s) changeout per cue card and FLIGHT PLAN		(L2) 5 CAB VENT ISOL tb – bp 5 CAB VENT tb – bp 6 O2 SYS 1 SPLY tb – CL 6 N2 SYS 1 SPLY tb – bp 6 N2 SYS 1 REG INLET tb – bp	
(L2) FLASH EVAP FDLN • HTR A SPLY – 2 • B SPLY – 1	FES H2O Fdln A Htrs 1 (all) B Htrs 2 (all)	(O1) AIR TEMP AV BAY 2 ind – 45 degF H2O PUMP OUT PRESS LOOP 2 ind – 0 psia O2/N2 FLOW SYS 1 ind – 0 pph CAB PRESS ind – 0 psia PPO2 SNSR A ind – 0 psia	
• FREON ISOL MODE – OFF	Auto radiator isolation function		
(A8L) • PORT RMS HTR A – OFF • PORT RMS HTR B – AUTO	Port RMS: 8 Primary pwr 9 MCIU 10 Mid MRL Mtr 1 10 Aft MRL Mtr 2 Shldr Brace Rel Htr A 8 D&C Primary ltg	(O3) RCS/OMS Prplt Qty Gage blanks Mission Timer blanks	
		HYD/APU HYD QTY 1 ind – 0% APU H2O QTY 3 ind – 0%	
(F6,F8) • HSI SEL SOURCE – (other than MLS 1) • RDR ALTM – 2	MLS 1 Radar Altm 1	(R1) FC1 COOL PUMP ΔP tb – bp	
(O6) • ANNUN BUS SEL ACA 1 – MNB	ACA 1 MNA pwr	(R4) 11 HYD BRAKE ISOL VLV 1 tb – OP 11 LG EXTEND ISOL VLV tb – OP 11 HYD MPS/TVC ISOL VLV SYS 1 tb – CL	
• For attitude control, LOSS OF VERNIER (ORB OPS, RCS)	RCS Manf L5 RJD pwr (L5L,L5D) RCS Manf F1 RJD pwr (F1F,F1L,F1U,F1D)		
Refer to OMS/RCS Slide Rule for vlv loss info 13 Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT L RCS He PRESS A,B • R RCS He PRESS A	12 L,R,F RCS He Pr Isol A GPC Cntl and man CL capability 14 Aft L RCS He Pr Isol B man OP capability	(O7) 12 AFT L,R RCS He PRESS A (two) tb – bp AFT L,R RCS TK ISOL 3/4/5 A tb – bp (if vlv in CL position)	
(O8) • FWD RCS He PRESS A		(O8) 12 FWD RCS He PRESS A tb – bp 11 FWD RCS TK ISOL 3/4/5 tb – bp 11 FWD RCS MANF ISOL 1 tb – bp	
GNC 23 RCS • Reprioritize L,R Manf 2 Jets to first priority: DES INH twice all other jets; highest priority first, then next highest, etc • Set aft pod(s) PRI JET FAIL LIMIT to 6	Aft RCS L,R Jet 2 Htrs	(R11L) 11 SPLY H2O TKA INLET tb – bp 11 SPLY H2O TKB OUTLET tb – bp	
		(R13L) RAD CNTL STBD,PORT (two) tb – bp	
(Continued)	(Continued)	(Continued)	

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(O8) • If Straight Feed config, Left OMS XFEED B – OP (tb–OP). Otherwise, ✓MCC	15	OMS Eng/Xfeed Vlv Redundancy	SM 168 CRYO PALLET Pallet Volts MNA ~0 ↓	(9) All brakes ON and safing initiated
(C2) • L IDP/CRT SEL – 3 • GPC/CRT 01 EXEC	16 17	IDP 1 MDU CRT 1 MDU MFD 2 MDU PLT 1 ADC 1A/2 A	11 (R13L) MMU GN2 SPLY ISOL VLV A tb – bp (A4) EVENT TIME ind – blank	(11) Vlv holds position (15) Maintains deorbit capability for MNB DA2 failure
SM 1 DPS UTILITY (G2,G8,S2) MMU ASSIGN 18 • GNC ITEM 1 EXEC • SM ITEM 4 EXEC • PL ITEM 6 EXEC		MMU 1	9 (A8U) Port RMS D&C tb – bp except: Brakes tb – OFF RATE MIN tb – OFF RATE HOLD tb – OFF SOFT STOP tb – gray RATE SCALE tb – gray	(16) Loss of redundant port to the following: MDU CDR 1 (S) MDU CDR 2 (P)
(R11U) • FC H2O LINE HTR – B AUTO • FC H2O RELIEF HTR – B AUTO 19 • MS AUD CNTL – PS	 20	FC H2O Line Htrs A FC H2O Relief Htrs A MS ATU, CCU & FD Spkr	(A8L) Port RMS: DPY/STO tb – bp RETEN LAT tb – bp R–F–L MID tb – bp	(17) IDP 1, IDP 2 ADC data lost. MDU port select may be reqd (18) Selecting failed MMU for GNC MF protects against GPC MMU Rcvr failure after OPS XTION prepositioning
(L9) • ✓PS AUD PNL config for use			SM 94 PDRS CONTROL Indications lost: Mid MRL Mtr 1 LAT/REL/RDY Aft MRL Mtr 2 LAT/REL/RDY	(19) Only listen capability restored for MS ATU (CCU only)
(A14) RCS/OMS HTR • FWD RCS – B AUTO • L POD (two) – A OFF, B AUTO • R POD (two) – B OFF, A AUTO • OMS CRSFD LINES – A OFF, B AUTO	 21 21 22 21	 Fwd RCS A Htrs (all) L Pod A Htrs (all) R Pod B Htrs (partial) OMS Crsfd Ln A Htrs (all)	If cooling by FES B only: 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'	(20) Loss of MS ATU causes loss of redundant path for ACCU config control bits, loss of xmit capability from CCU, and loss of FD Spkr
(ML86B:A) • cb MNB H2O LINE HTR B – cl --- (ML86B:D) cb MNB • MMU PORT,STBD HTR B (two) – cl	 21	H2O Line Htrs A: Waste Dump Line Htr A Sply Dump Line Htr A Vac Vent Line Htr A --- MMU Port,Stbd Htr A	11 (ML31C) WASTE H2O TK 1 VLV tb – bp 11 WASTE H2O DUMP ISOL VLV tb – bp 11 WASTE H2O DUMP VLV tb – bp 11 SPLY H2O TKD OUTLET tb – bp	(21) Htr B remains (22) Htr A remains
(A15:D,E,F,G) For any Pallet Cryo Tk Htr A in AUTO: • (Aff) TK HTR A – OFF • B – AUTO --- (A15:C) • PALLET HTRS A – OFF • B – AUTO	 	 Pallet Cryo Tk 6–9 Htrs A --- Pallet Structural Htrs A	23 (AW82D) EMU 2 H2O SPLY, WASTE tb (two) – CL	(23) Vlv holds position. May have to interface EMU 2 with SCU 1 to provide total H2O servicing/recharge
For PLBD ops: • OP/CL Drs in man mode		PLBD: C/L Lat 1–4, 5–8, 9–12 Mtrs 1 Port,Stbd Fwd Blkhd Mtrs 1 Port Aft Blkhd Mtr Stbd Door Mtr 1 Port Door Mtr 2 CL Limit sw	If OMS Gmbl Cmd Abs value > 2 deg: C/W OMS TVC lt – on 'L OMS GMBL' (3,B) SM (BFS SM 63) PL BAY DOORS If in <u>AUTO</u> OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG' --- During <u>MAN</u> PLBD OP/CL, single mtr run time noted on actuators listed at left	(24) Lost TM: GNC SYS SUMM 2 L OMS N2 P VLV: If Eng – ARM/PRESS, assume vlv OP L,R OMS ENG VLV 1: Assume Vlv 1 status same as Vlv 2 (25) Man Cntl remains. Redundant Isol remains (26) Maintains He Isol redundancy
24 Save L OMS for deorbit (If reqd for on–orbit burn, ✓MCC)	24	L OMS GN2 Press Vlv Op TM	During Rad Dpy/Sto ops: (R13L) RAD LAT CNTL tbs (two) indicate single mtr ops	
24 Prior to using L(R) OMS: (O8)	25	L,R OMS He Pr Isol A GPC OP Cntl		
26 L(R) OMS He PRESS/VAP • ISOL A – OP • B – GPC	25	L,R OMS He Vap Isol 1 GPC OP Cntl		
(Continued)		(Continued)	(Continued)	

EPS SSR–10 (Cont)
BUS LOSS: MNA DA1

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
GNC XXXXX MNVR YYYYY (3,B) Sel L OMS SEC: • OMS L GMBL SEL – ITEM 30 EXEC Sel R OMS PRI: • OMS R GMBL PRI – ITEM 29 EXEC		L OMS Pri TVC R OMS Sec TVC	If OMS Gmbl Cmd Abs value > 2 deg and Sec TVC selected: C/W OMS TVC lt – on 'R OMS GMBL' (3,B)	(11) Vlv holds position (27) Vlv fails closed. IFM or real–time flow test will be required. ✓MCC for additional direction (28) O2/N2 Cntl Vlv 1 normally closed when unpowered (29) PEVs, Actuators, Bed A P, Bed B P, and Bed dP will be recovered after system reconfig (30) Not yet active on all vehicles (31) Sys A Sec Cntlr man on capability remains (32) Lose Auto Temp Cntl via Cntlr 2 and H2O Loop 2 Cabin Hx In Temp snsr. Hx Byp vlv holds position. May be repwrd after AC Pwr Transfer Cable connected (33) Inhibits H2O Loop 2 Pump ΔP, Pump Out Press, Pump Out Temp, Accum Qty, respectively
If Waste H2O Dump reqd: • Perform WASTE H2O SYS BACKUP DUMP (IFM)	11	Waste H2O: Dump Vlv Cntl Noz Htr	If Hum Sep A ON: 'S66 HUMID SEP A'	
If on PCS1: • Perform RECONFIG TO ALT PCS SYS, ECLS SSR–3	 11 11 11 27 28	O2/N2 Cntl Sys 1: O2/N2 Sys 1 Flow Xdcrs O2 Sys 1 Sply Vlv Cntl N2 Sply Vlv 1 Cntl N2 Reg Inlet Vlv 1 Cntl O2 Xovr Vlv 1 OP capability O2/N2 Cntl Vlv 1 man Cntl PPO2 Snsr A	If H2O Loop 1 Pump A active: 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP' 'S88 H2O PUMP P 1'	
		Cabin Press Snsr Emer dP/dT B/U Comp	(O1) H2O PUMP OUT PRESS LOOP 1 ind – 20–25 psia	
(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 1 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)	29	CO2 Rmvl Sys Cntlr 1: Fan AC1 pwr Compressor AC1 pwr	(F7) If APUs active, and using BLR CNTLR/HTR 1B or 3A: C/W APU TEMP lt – on after ~ 2 min	
	30	FC3 Redundant Reac Vlv Cntl on pnl C3	If first AA failure and S/W Processing Accel data: RM FAIL ACC (3)	
If reqd during entry (< 120K ft): (L1) • NH3 CNTLR B – PRI/GPC	31	NH3 Sys A Pri Cntlr	Impending: 'S66 CO2 RL SYS PCO2'	
(ML31C) • VAC VENT ISOL VLV BUS SEL – MNB		Vac Vent Isol Vlv MNA Cntl	CCTV Video and TV Annun lts lost if MNA selected for VCU CCTV Mon 1 lost	
If AC Pwr Transfer cable to be installed to regain AC: • Go to EPS SSR–200; otherwise, continue with Bus Loss Actions			STAR TRKR DR POS –Y OP/CL time incr from 8 to 16 sec	
If Cab Temp Cntlr 2 active: (L1) • CAB TEMP CNTLR – OFF	32	Cabin Temp Cntlr 2 and Hx Byp Vlv Mtr 2	L ADP deploy time incr from 15 to 30 sec	
(MD44F) • Remove pin from SEC Actuator and BYP vlv linkage, connect linkage to PRI Actuator				
(L1) • CAB TEMP CNTLR – 1				
(R13U) H2O LOOP 2 OUT P • C/W PARAM SEL tw – 115 • PARAM – INH • C/W PARAM SEL tw – > 119				
33 SM 60 TABLE MAINT • Inhibit 0612705, 0612700, 0612740, 0612710				
(Continued)		(Continued)		

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(WCS) • ✓MODE – AUTO • ✓CRADLE – AUTO • ✓Hose stowed in cradle • ✓WCS ON lt – OFF • FAN SEP SEL sw – OFF • HOSE BLOCK – SEP 2 • In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30–sec run complete • FAN SEP SEL sw – 2		WCS Fan/Sep 1 Sep Fan 1 Mtr Relay		(34) H2O Loop 2 Byp vlv holds position (35) H2O Loop 2 Pump Out Press, Pump ΔP, Accum Qty, Pump Out Temp snsrs lost (36) May be repwrd after AC Pwr Transfer Cable connected (37) AV Bay 2 Fan ΔP, Air Out Temp snsrs lost (38) Use streamers (if flown) or monitor by feel during wake period if Cabin Air Sig Condr not recovered (39) AC1 Bus Isolation for AC Pwr Transfer Cable installation accomplished in MNA DA1 ACTIONS column. No additional bus isolation steps reqd
(EDO WCS) • URINAL SEL – SEP 2 • WCS PWR SEL – OFF 1, AUTO 2 • URINE DIVERTER VLV – FAN SEP 2		Urine Fan 1 Urine Sep 1 Commode Fan 1 Controller MNA pwr Compactor MNA Cntl		
(R2) • BLR CNTLR/HTR 1 – A • 3 – B		Hyd H2O Blr Cntlr 1B 3A		
(L1) • HUM SEP A – OFF • B – ON • IMU FAN A – OFF • B(C) – ON • H2O PUMP LOOP 1 – ON, B • H2O PUMP LOOP 2 – OFF • AV BAY 1 FAN A – OFF • ✓B – ON • AV BAY 2 FAN (two) – ON • AV BAY 3 FAN A – ON • B – OFF • FREON PUMP LOOP 1 – B • 2 – A	34 35 36 37	Humidity Sep A IMU Fan A H2O Loop 2 Byp Cntlr, Sig Condr H2O Loop 2 Byp Vlv pwr 2 Pump GPC Cntl 1 Pump A Av Bay 1 Fan A Av Bay 2 Sig Condr, Xdcrs (ECLS SC3) Av Bay 3 Fan B Freon Loop 1 Pump A 2 Pump B		
38 During sleep periods: • CAB FAN (two) – ON		Cabin Air Sig Condr (ECLS SC6)		
(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN A – OFF • B – ON		Arlk/Tnl Fan A		
39 **BUS ISOLATION**				
ONLY ON MCC CALL, PERFORM				
• MDU CRT 1 PWR – OFF • MDU MFD 2 PWR – OFF • MDU PLT 1 PWR – OFF				
(C2) • IDP/CRT 1 PWR – OFF				
(O6) • STAR TRKR PWR –Z – OFF		–Z Star Trkr Dr OP capability Tracker		
(O8) • RADAR ALTM 1 – OFF • MLS 1 – OFF				
(Continued)		(Continued)		

EPS SSR–10 (Cont)
BUS LOSS: MNA DA1

	BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	ONLY ON MCC CALL, PERFORM				(40) Redundant pwr source remains for equipment
	(O14:B) cb MNA				(41) H2O Loop 1 Intchgr Flow rate and IMU Fan ΔP snsrs lost
40	• OI SIG CONDR OF 1/4 A – op				(42) Cabin Smoke Detector remains
40	• OI SIG CONDR OM 1/2 A – op				(43) Current Snsr 2 remains
40	• OI MDM OF 1/2 A – op				(44) Cntlr A remains
40	• 3/4 A – op				(45) NWS 2 is still available
	• OI H2O BYP LOOP 1 SNSR – op	41	H2O Byp Loop 1 Snsr (ECLS SC11)		(46) Six vlvs fail to non–isolation position
	• MNC CONTR – op				
	• MSN TIMER FWD – op		Fwd Mission Timer		
	• EVENT TIMER AFT – op		Aft Event Timer		
	(O14:C) cb MNA				
	• TACAN 1 – op		Tacan 1		
42	• SMOKE DETN L/R FLT DK – op	42	L,R Flt Dk Smoke Detectors		
	• SMOKE DETN BAY 2A/3B – op		Av Bay 2 Smoke Detector A Av Bay 3A Smoke Detector B		
	• FIRE SUPPR BAY 3 – op				
	• UTIL PWR O19/MO52J – op		MNA Utility pwr		
	• FLOOD L CNSL – op		L Console Floodlt		
	• ANNUN FWD ACA 1 – op				
	• cb MNA CRYO O2 HTR TK1 SNSR 1 – op	43	Cryo O2 Tk1 Htr Current Snsr 1		
	• cb RAD ISOL CONTR – op		Auto radiator isolation function		
	(O14:D) cb MNA				
44	• FREON RAD CNTLR 1 – op				
44	• FREON RAD CNTLR 2 – op				
	• N2 SPLY 1 – op				
	• O2/N2 CNTLR 1 – op				
	• O2 XOVR 1 – op				
	• N2 REG INLET 1 – op				
	• CAB VENT – op		Cabin Vent Vlv		
	• VENT ISOL – op		Vent Isol		
	(O14:E) cb MNA				
	• RDR ALTM 1 – op				
	• MLS 1 – op				
	• ADTA 1 – op		ADTA 1		
	• S TRK –Z – op				
	• ACCEL 1 – op		AA 1		
40	• DDU L – op				
40	• AFT – op				
45	• NWS – op		NWS 1		
	(O14:F) • MMU 1 – OFF				
		46	ATVC 2 Isol ME		
	(R11U) • FC PURGE VLV 1 – CL				
	• FC STARTUP HTR 1 – ENA		FC1 Startup Htr Inh capability		
	(Continued)		(Continued)		

BUS LOSS: MNA DA1

	BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	ONLY ON MCC CALL, PERFORM				(40) Redundant pwr source remains for equipment (47) Capability to xmit to gnd from UHF degraded (48) GCIL also pwrd via MNC cb (49) MNB pwr may be selected via TV pwr sw (pnl A7) or GCIL if reqd (50) All docking mechanisms will have single mtr times (51) Logic buses 1(3) remain pwrd via MNB(MNC)
	(R14:A) • cb MNA AUD MS – op • ADC 1A/2A – op • MDU MFD 2 – op • PLT 1 – op		MS ATU OS SU		
40	(R14:B) cb MNA cb PALLET/DSC • 1A/2B – op (EDO) • 3A – op (EDO) • UHF – op • GCILC – op • CNTL BUS BC1/2/3 – op	47 48	UHF Splx Pwr Amp GCIL MNA pwr MNA pwr for Cntl BC1,2,3 Buses		
	(R14:D) cb MNA • TV C AFT BAY CAMR/ PAN–TILT – op • TV C AFT BAY CAMR HTR – op • TV C AFT BAY PAN–TILT HTR – op • TV CONTR UNIT – op • MON 1 – op	 49	TV C Aft Bay Camr and Pan–Tilt TV C Aft Bay Camr Htr TV C Aft Bay Camr Pan–Tilt Htr Video Cntl Unit MNA pwr CTVM 1		
	(R14:E) cb MNA • PS FLOOD – op • TV D STBD RMS TV CAMR/ PAN–TILT – op • TV D STBD RMS TV CAMR HTR – op • TV D STBD RMS TV PAN–TILT HTR – op		PS Floodlt TV D STBD RMS Camr and PAN–TILT TV D STBD RMS Camr Htr TV D STBD RMS Camr PAN–TILT Htr		
	(A7U) PL BAY • FLOOD AFT STBD – OFF • FWD PORT – OFF • DOCKING – OFF • PORT RMS LIGHT – OFF		PLB Aft Stbd Floodlt Fwd Port Floodlt Docking Floodlt Port RMS lt		
	(A7L) IF DOCKING MISSION • cb DEP MNA SYS 1 VENT ISOL – op • cb DEP MNA SYS 1 VENT – op		Vest Dep Vlv Sys 1 Vent Vent Isol		
	(A7L) IF DOCKING MISSION cb DOCK LT MNA • TRUSS FWD – op • VEST PORT – op • SYS PWR SYS 1 MNA – OFF • PSU PWR MNA – OFF cb MNA • LOGIC 1 – op • 3 – op • PYRO PWR MNA – OFF LIGHTS • AIRLK 1/4 MNA – OFF	 50 51	MNA A7 Fwd Truss Docking lt Port Vestibule Docking lt DSP SYS 1 Pwr PSU MNA Pwr MNA pwr to DSP Logic buses 1,3 MNA Pyro System External Airlock lts 1,4	DSP SYS PWR SYS 1 tb – OFF	
	(Continued)		(Continued)		

EPS SSR–10 (Cont)
BUS LOSS: MNA DA1

BUS ISOLATION		EQUIP/FUNCTION LOST
ONLY ON MCC CALL, PERFORM		
(A7L) MADS • STRAIN GAGE – OFF • W/B/ACIP PCM – OFF		MADS W/B FDM, WBSC, SGSC, ACIP PCM
(MA73C:A,B) MCA LOGIC MNA • FWD 1 – OFF • AFT 1 – OFF • MID 1,3 (two) – OF		MNA FMC1 Bus pwr AMC1 Bus pwr MMC1 Bus pwr MMC3 Bus pwr
(ML86B:A) • cb MNA H2O LINE HTR A – op • cb MNA SUPPLY H2O TKA INLET – OP • cb MNA SUPPLY H2O TKB OUTLET – OP • cb MNA WASTE H2O DUMP VLV/NOZ HTR – OP	11 11	Sply H2O TKA Inlet Vlv Cntl Sply H2O TKB Outlet Vlv Cntl
(ML86B:B) • cb MNA WASTE H2O TK1 VLV – op • cb MNA SPLY H2O TKD OUTLET – op • cb MNA WASTE H2O DUMP ISOL – op • cb MNA VAC VENT ISOL VLV – op • cb MNA WCS CNTLR – op • cb MNA GALLEY OVEN – op	11 11 11	Waste H2O TK1 Inlet Vlv Cntl Sply H2O TKD Outlet Vlv Cntl Waste H2O Dump Isol Cntl
(ML86B:D) cb MNA MMU • PORT/STBD HTR A (two) – op • GN2 SPLY ISOL VLV A – op	21 11	MMU Port,Stbd Htr A MMU GN2 Sply Isol Vlv A
(ML86B:E) cb MNA EMU 2 H2O • SPLY – op • WASTE – op cb MNA FLOOD • TNL ADAPT 2 – op		TA Floodlt 2
(ML86B:F) cb MNA FLOODS • MIDDECK 1/8 – op • WMC/MO13Q – op • AIRLK 1 – op cb MNA CRYO • O2 HTR TK3 SNSR 1 – op • O2 HTR TK5 SNSR 1 – op (OV104, OV105)	 43	Middeck floodlts 1,8 WMC Floodlt, MO13Q pnl lt 2 Airlk Floodlt 1 Cryo O2 Tk3 Htr Current Snsr 1 (OV104, OV105) Cryo O2 Tk5 Htr Current Snsr 1
(Continued)		(Continued)

CREW INDICATIONS	NOTES
	(11) Vlv holds position (21) Htr B remains (43) Current Snsr 2 remains

EPS SSR–10 (Cont)
BUS LOSS: MNA DA1

BUS ISOLATION
(A15:H,I,J,K) • cb MNA TK6–TK9 O2 HTR SNSR 1 – op

	EQUIP/FUNCTION LOST
52	Cryo O2 Tk 6–9 Htr Current Snsr 1
	CDR HUD
	Port,Stbd Rad Dpy/Sto Mtr 1 Port,Stbd Rad Lat 1–6, 7–12 Mtrs 1
	Fwd RCS Jet 1 Htrs
53	L OMS Purge Vlv 1,2
54	L OMS Eng Pr Vlv Coil 1
55	L OMS Cntl Vlv 1,2 Coils 1
55	R OMS Eng Pr Vlv Coil 2 and Cntl Vlv 1,2 Coils 2
56	OMS Qty Gaging
57	APU 1 Cntlr Pwr Sply A
58	1 Fu Tk Vlv A 1 GBX GN2 Repress Vlv
59	3 Cntlr Pwr Sply B
58	3 Fu Tk Vlv B
	Hyd Rsvr 1 Qty Snsr
11	TVC Hyd Sys 1 Isol Cntl
11	Hyd Brake Isol Vlv 1 Cntl
60	LG Extend Isol Vlv
60	Vlv 1
61	NWS Hyd Sys 1
	–Y Star Trkr Dr Sys 1 OP/CL capability LH Vents 5,6,8,9 Mtrs 1 RH Vents 1,2,3,5,6 Mtrs 1
62	L ADP Deploy Mtr 1
63	Htr Cntlr 1
64	Hyd Main Pump 1 Depress Solenoid RPC A
64	Hyd Main Pump 3 Depress Solenoid RPC B
6	Atm Press Cntl O2 Sys 1 Sply Vlv Cntl
23	EMU 2 Sply and Waste H2O Vlv Cntl
65	EMU 1,2 Pwr/Batt Chgr MNA pwr
	PL Reten Sys A Rel/Lat Mtrs
	MPS:
66	Ctr Eng He Intercon Outlet Vlv
58	Ctr Eng He Isol A
58	Pneu He Isol 1
67	He Sply Blowdn Vlv 1,2
68	Prplt F/D Inbd LH2 Vlv
69	ET Door Mtrs: C/L Lat Actr 1 Mtr 1 2 Mtr 1 L Dr Closure Mtr 1 Uplock Lat Mtr 1
70	Ku–Bd Jettison Sys A
	Tacan 1
71	Freon Loop 1,2 Cntlr B Rad Byp Vlv Mtrs
	Ops Hyd Actr Instr

CREW INDICATIONS
Ctr MPS He reg A < 680 during entry (MM303)

NOTES (Cont)

(67) Vlv fails closed. Aft compartment, OMS pods, ET umbilical cavity will not be purged during entry (MM304)

(68) Vlv holds position. Loss of manual capability to inert LH2 Manf

(69) Redundant mtrs remain

(70) Sys B remains

(71) Bypass vlv holds position and Cntlr A Rad Byp Vlv Mtr remains

NOTES

(6) Vlv holds position. N2 Sys 2 remains

(11) Vlv holds position

(23) Vlv holds position. May have to interface EMU 2 with SCU 1 to provide total H2O servicing/ recharge

(52) Snsr 2 remains

(53)

CAUTION

No purge. Wait 10 min between burns

(54) Unable to confirm redundant coils

(55) Redundant coils remain

(56) ✓MCC for OMS Qtys. Aft Qtys are frozen on

GNC SYS SUMM 2

(57) Pwr Sply B remains. GG Bed T and GBX P ind lost when APU running

(58) Vlv fails closed. Redundant vlv remains

(59) Pwr Sply A remains. Turbine speed ind lost

(60) Loss of Hyd Sys 1 deploy capability for all Ldg Gear. Pyro backup release sys will deploy Ldg Gear. NLG can also be deployed by Hyd Sys 2

(61) Hyd Sys 2 still available for NWS

(62) Mtr 2 remains

(63) Htr Cntlr 2 remains

(64) Redundant RPC remains

(65) MNB pwr select capability remains

(66) Vlv fails closed

EPS SSR–11
BUS LOSS: MNA FPC1 (Includes MNA FLC1, MNA FMC1, AC1)

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1	• Perform FC1 SHUTDN (FC SHUTDN Cue Card), pwrdn not needed, then:	2	FC1 Pumps & pH Snsr	MASTER ALARM Light/Tone – on CRT 1 blanks	(1) * TIME CRITICAL * FC1 must be shutdn within 9 min to avoid potentially hazardous condition
	(R1) • cb AC CONTR AC1 (three) – cl • INV/AC BUS 1 – OFF (tb–OFF) • INV PWR 1 – OFF (tb–OFF) • cb AC CONTR AC1 (three) – op		AC1 ΦA, ΦB, ΦC Inverters	(F7) C/W FC PUMP lt – on C/W AC VOLT lt – on C/W FREON LOOP lt – on C/W AV BAY/CAB AIR lt – on C/W H2O LOOP lt – on SM ALERT Light/Tone – on EVENT TIMER ind – blank	(2) Will be repwrd after AC Pwr Transfer Cable connected
3	• Maintain LiOH canister(s) changeout per cue card and FLIGHT PLAN			(F9) AC1 ΦA,ΦB,ΦC AC volts < 90	(3) Crew and gnd have lost PPO2 Xdcr if Cabin Air Sig Condr not recovered
4	Refer to OMS/RCS Slide Rule for vlv loss info Reconfig following vlv(s) only if leak isolation reqd: (O8) • FWD RCS He PRESS A	5	Fwd RCS He Press Isol A GPC Cntl and man CL capability RCS Manf F1 RJD Driver (F1F,F1L,F1U,F1D)	(LIGHTS LOST) Instr lts R (pnls C2, F8, F9) Pnl lts L/Ctr (pnls L1,L2,L4, C2,C3,F2,F6,F7) Pnl lts L/OH (pnls O5,O6, O7,O13,O14,O15) Numeric lts (pnls O3, F7) Orbit Sta Instr lts (pnls A1,A2)	(4) Do not reconfig for reg switch or I'CNCT procedures (5) Vlv holds position. Man OP capability remains. Isol B remains
	(C2) • L IDP/CRT SEL – 3 On MCC GO: • GPC/CRT 01 EXEC	6	IDP 1 MDU CRT 1	(FSMs) S67 FPC/FLC 1 S67 AC VOLTS 1 S86 HYD RSVR Q SM2 HYD QTY (B) S86 WSB T SM0 THRM HYD (B) S66 AV BAY 2 FAN S66 AV BAY 3 FAN S66 CABIN FAN S69 FC PUMP 1 S69 FC H2 PUMP 1 S88 FREON FLOW 2 S88 FRN AFT CP 2 S88 FRN PL HX 2 S88 H2O LOOP 2 FLOW S88 H2O LOOP 2 QTY S88 H2O LOOP 2 TEMP S88 H2O PUMP P2 I/O ERROR CRT 1 RM DLMA MANF	(6) Loss of redundant port to the following: MDU CDR 1 (S) MDU CDR 2 (P) MDU MFD 2(P) MDU PLT 1 (S)
	SM 1 DPS UTILITY (G2,G8,S2) MMU ASSIGN 7 • GNC – ITEM 1 EXEC • SM – ITEM 4 EXEC • PL – ITEM 6 EXEC • OPS 0 – ITEM 8 EXEC		MMU 1		(7) Selecting failed MMU for GNC MF protects against GPC MMU Rcvr failure after OPS XTION prepositioning
	(A14) • RCS/OMS HTR FWD RCS – B AUTO		Fwd RCS A Htrs (all)		(8) Temp sensing lost
	If EMU(s) in battery charge mode: (AW 18M) • PWR/BATT CHGR EMU 1(2) BUS SEL – MNB		EMU 1,2 Pwr/Batt Chgr MNA pwr		(9) All brakes ON and safing initiated
8	(A8L) • PORT RMS HTR A – AUTO • PORT RMS HTR B – AUTO	9 10 10 11 11	Port RMS: MCIU Mid MRL Mtr 1 Aft MRL Mtr 2 Shldr Brace Release D&C Primary Ltg	(R1) FC1 COOL PUMP ΔP tb – bp	(10) Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists. May be repwrd after AC Pwr Transfer Cable connected
	Pre–seat ingress: • Discharge handheld fire ext into AV BAY 3		Av Bay 3 agent discharge capability	HYD/APU HYD QTY 1 ind – 0% APU H2O QTY 3 ind – 0%	(11) May be repwrd after AC Pwr Transfer Cable connected
	If AC Pwr Transfer Cable to be installed to regain AC: • Go to EPS SSR–200; otherwise, continue with bus loss actions			(O1) FREON FLOW LOOP 1 ind – 578 pph AIR TEMP AV BAY 2 ind – 45 degF H2O PUMP OUT PRESS LOOP 2 ind – 0 psia	(12) Vlv holds position
				(O3) RCS/OMS PRPLT QTY Gage and MSN TIMER ind – blank	
		5 12 12		(O8) Fwd RCS He PRESS A tb – bp TK ISOL 3/4/5 tb – bp MANF ISOL 1 tb – bp	
				L ADP deploy time incr from 15 to 30 sec	
	(Continued)		(Continued)	(Continued)	

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
If Cab Temp Cntlr 2 active: (L1) • CAB TEMP CNTLR – OFF	13 Cabin Temp Cntlr 2, Hx Byp Vlv Mtr 2	STAR TRKR DR POS –Y OP/CL time incr from 8 to 16 sec	(9) All brakes ON and safing initiated
(MD44F) • Remove pin from SEC Actuator and BYP vlv linkage, connect linkage to PRI Actuator		(L1) If H2O PUMP LOOP 1 A active: 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP' 'S88 H2O PUMP P1' If FREON PUMP LOOP 2 B – ON: 'S88 FREON FLOW 2' 'S88 FRN AFT CP 2' 'S88 FRN PL HX 2'	(13) Lose Auto Temp Cntl via Cntlr 2 and H2O Loop 2 Cabin Hx In Temp snsrs. Hx Byp Vlv holds position. May be repwrd after AC Pwr Transfer Cable connected
(L1) • CAB TEMP CNTLR – 1		(O1) H2O PUMP OUT PRESS LOOP 1 ind – 20–25 psia FREON FLOW LOOP 2 ind – 578 pph	(14) Inhibits H2O Loop 2 Pump ΔP, Pump Out Press, Pump Out Temp, Accum Qty, respectively
(R13U) H2O LOOP 2 OUT P • C/W PARAM SEL tw – 115 • PARAM – INH • C/W PARAM SEL tw – > 119		If Hum Sep A ON: 'HUMID SEP A'	(15) H2O Loop 2 Byp Vlv holds position
14 SM 60 SM TABLE MAINT • Inhibit 0612705, 0612700, 0612740, 0612710		If IMU Fan A ON: 'S66 IMU FAN DP' 'S66 IMU FN SPD A'	(16) H2O Loop 2 Pump Out Press, Pump ΔP, Accum Qty, Pump Out Temp snsrs lost
(R2) • BLR CNTLR/HTR 1 – A • 3 – B	Hyd H2O Blr 1 Cntlr B 3 Cntlr A Rsvr 1 Qty Snsr	(F7) If APUs active and using BLR CNTLR/HTR 1B or 3A: C/W APU TEMP lt – on after ~2 min	(17) Av Bay 2 Fan ΔP, Air Out Temp snsrs lost
(L1) • HUM SEP A – OFF • ✓B – ON • IMU FAN A – OFF • B(C) – ON • H2O PUMP LOOP 1 – ON, B • H2O PUMP LOOP 2 – OFF • AV BAY 1 FAN A – OFF • ✓B – ON • AV BAY 2 FAN A,B (two) – ON • AV BAY 3 FAN A – ON • B – OFF • FREON PUMP LOOP 1 – B • FREON PUMP LOOP 2 – A	Hum Sep A IMU Fan A 15 H2O Loop 2 Byp Cntlr, Sig 16 Condr H2O Loop 2 Byp Vlv pwr 2 Pump GPC Cntl 1 Pump A Av Bay 1 Fan A Av Bay 2 Sig Condr, Xdcrs 17 (ECLS SC3) Av Bay 3 Fan B Freon Loop 1 Pump A 2 Pump B	9 (A8U) Port RMS D&C tb – bp except: BRAKES tb – OFF RATE MIN tb – OFF RATE HOLD tb – OFF SOFT STOP tb – gray RATE SCALE tb – gray	(18) Use streamers (if flown) or monitor by feel during wake periods if Cabin Air Sig Condr not recovered
(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN A – OFF • B – ON	Arlk/Tnl Fan A	'S66 CO2 RL SYS PCO2' (MO51F) CO2 RMVL SYS CNTLR 1 FAIL lt on	(19) CO2 partial Press and Cabin Fan ΔP snsrs lost
18 During sleep periods: • CAB FAN (two) – ON	19 Cabin Air Sig Condr (ECLS SC6)		
(WCS) • ✓MODE – AUTO • ✓CRADLE – AUTO • ✓Hose stowed in cradle • ✓WCS ON lt – OFF • FAN SEP SEL sw – OFF • HOSE BLOCK – SEP 2 • In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30–sec run complete • FAN SEP SEL sw – 2	WCS Fan/Sep 1		
(Continued)	(Continued)		

EPS SSR–11 (Cont)
BUS LOSS: MNA FPC1

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(EDO WCS) • URINAL SEL – SEP 2 • WCS PWR SEL – OFF 1, AUTO 2 • URINE DIVERTER VLV – FAN SEP 2		Urine Sep 1 Urine Fan 1 Commode Fan 1		(20) PEVs, Actuators, Bed A P, Bed B P, and Bed dP will be recovered after system reconfig
• Perform LOSS OF 1 FC (ORB PKT, PWRDN)				(21) AC1 Bus Isolation for AC Pwr Transfer Cable installation accomplished in MNA FPC1 ACTIONS column. No additional bus isolation steps reqd
(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 1 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/ DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)	20	CO2 Rmvl Sys Cntlr 1		(22) Mtr 2 remains
				(23) Htr Cntlr 2 remains
21 **BUS ISOLATION**				(24) Loss of Hyd Sys 1 deploy capability for all Ldg Gear. Pyro backup Release Sys will deploy Ldg Gear. NLG can also be deployed by Hyd Sys 2
ONLY ON MCC CALL, PERFORM				(25) Buses remain pwrd
• MDU CRT 1 PWR – OFF				(26) Redundant mtrs remain
(C2) • IDP/CRT 1 PWR – OFF				(27) Hyd Sys 2 still available for NWS
(O14:C) • cb MNA FIRE SUPPR BAY 3 – op				(28) Bypass vlv holds position and Cntlr A Rad Byp Vlv Mtr remains
(O14:F) • MMU 1 – OFF				
(MA73C:A) • MCA LOGIC MNA FWD 1 – OFF		MNA FMC1 Bus pwr		
		CDR HUD –Y Star Trkr Dr Sys 1 OP/CL capability		
	22 23	L ADP Dpy Mtr 1 Htr Cntlr 1		
		RH Vents 1,2,3,5,6 Mtrs 1 LH Vents 5,6,8,9 Mtrs 1		
	24	LG Extend Vlv 1		
	25	MNA pwr to Cntl Buses AB1, AB2,AB3,CA1,CA2,CA3		
	26	ET Door Mtrs: C/L Lat Actr 1 Mtr 1 Actr 2 Mtr 1 L Dr Closure Mtr 1 Uplock Lat Mtr 1		
	27	NWS Hyd Sys 1		
	28	Freon Loop 1,2 Cntlr B Rad Byp Vlv Mtrs		
		Port,Stbd Rad Lat 1–6, 7–12 Mtrs 1 Port,Stbd Rad Dpy/Sto Mtr 1		
		PLBD: C/L Lat 1–4, 5–8, 9–12 Mtrs 1 Port,Stbd Fwd Blkhd Mtr 1 Port Aft Blkhd Mtr 1 Stbd Door Mtr 1		
		PL Reten Sys A Rel/Lat Mtrs		

EPS SSR–12
BUS LOSS: MNA MPC1 (Includes MNA MMC1 & MNA MMC3)

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
1	• Perform MNA BUS TIE (BUS TIE Cue Card) • Monitor, record Δamps between FC1 and tied FC	1 1	FC1 Purge Vlv O2,H2 Flow Xdcrs SS ΔV Snsrs	2	(L2) O2 SYS 1 SPLY tb – CL	(1) Buses are tied due to: Loss of FC1 Purge capability. As FC1 loses performance, tied FC will pick up load, slowing FC1 degradation. If degradation projection does not allow nominal EOM, FC1 will be shutdn. ✓MCC; and Loss of FC1 SS ΔV Snsrs. Change in ΔAmps >12 amps indicates possible cell crossover problem. ΔAmps shift due to loss of FC1 Purge capability is indicated by change in ΔAmps between pre and post purge readings. MCC will aid in this determination
	(R1) • PL CAB – MNB	3	MNA pwr to CABPL1,2,3 buses		(R13L) RAD CNTL STBD tb – bp PORT tb – bp	
	(A8L) • PORT RMS HTR A – OFF • PORT RMS HTR B – AUTO	4 5 5	Port RMS: Primary pwr Mid MRL Mtr 1 Aft MRL Mtr 2 Htr A		(A8L) PORT RMS: DPY/STO tb – bp RETEN LAT tb – bp R–F–L MID tb – bp	
	(L1) • TOP EVAP HTR DUCT – B If Hi Load Evap enabled: • HI LOAD DUCT HTR – B (C)		Top Evap Duct Fwd,Aft Htrs A Hi Load Duct Outbd,Inbd Htrs A		SM 94 PDRS CONTROL Indications lost: Mid MRL Mtr 1 LAT/REL/RDY Aft MRL Mtr 2 LAT/REL/RDY	
	(L2) FLASH EVAP FDLN HTR • A SPLY – 2 • B SPLY – 1		FES H2O Fdln A Mid 2 Htr 1 B Mid 2 Htr 2		PLB FloodIts lost: Fwd Port Aft Stbd Docking	
	(R11U) FC H2O • LINE HTR – B AUTO • RELIEF HTR – B AUTO		FC H2O Line Htrs A Relief Htrs A		SM (BFS,SM) 63 PL BAY DOORS If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG'	
6	(MA73C:C,D) • cb MCA PWR AC1 3Φ MID 1,3 (two) – op	6 7	Port,Stbd Rad Lat 1–6,7–12 Mtrs 1 Limit sw Port,Stbd Rad Dpy/Sto Mtrs 2 Limit sw Port,Stbd Rad Dpy/Sto Mtrs 1		During MAN PLBD OP/CL, single mtr run time noted on actuators listed at left	(2) Vlv holds position. Sys 2 remains
8	(ML86B:C) • cb MNB EXT ARLK HTR STRUC – cl	8	Ext A/L Structural Htrs MNA pwr			(3) Pwrs PL Timing Buffer and OIU 1. OIU 1 redundant pwr MNB MPC2 via CAB PL3
	For PLBD ops: • OP/CL Drs in man mode		PLBD: C/L Lat 1–4,5–8,9–12 Mtrs 1 Port,Stbd Fwd Blkhd Lat Mtrs 1 Port Aft Blkhd Lat Mtr 1 Stbd Door Mtr 1 Port Door Mtr 2 CL Limit sw		(4) B/U pwr remains for RMS ops. All brakes ON and safing initiated
						(5) Single mtr time. One failure away from loss of two out of three MRLs. EVA or jettison capability exists
	BUS ISOLATION					(6) If AC1 MMC1 and MMC3 cbs not opened, Lat Mtrs 1 of actuators for Port and Stbd Rad Lat 1–6, 7–12 continue to run until Sys A Lat Cntl sw placed to OFF
	ONLY ON MCC CALL, PERFORM					(7) Mtrs 2 will continue to drive until Sys A,B Cntl sw are taken to OFF
	(R11U) • FC PURGE VLV 1 – CL					(8) MNB htrs remain
9	• FC STARTUP HTR 1 – ENA	9	FC1 Startup Htr Inh capability			(9) FC1 Startup Htr is disconnected
	(A7U) PL BAY FLOOD • AFT STBD – OFF • FWD PORT – OFF • DOCKING – OFF • PORT RMS LIGHT – OFF		PLB Aft Stbd Floodlt Fwd Port Floodlt Docking Floodlt Port RMS lt			
	(A7L) IF DOCKING MISSION • cb DEP MNA SYS 1 VENT ISOL – op • cb DEP MNA SYS 1 VENT – op		Vest Dep Vlv Sys 1 Vent Vent Isol			
	(Continued)		(Continued)			

EPS SSR–12 (Cont)
BUS LOSS: MNA MPC1 (Includes MNA MMC1 & MNA MMC3)

	BUS ISOLATION		EQUIP/FUNCTION LOST
	(A7L) IF DOCKING MISSION cb DOCK LT MNA • TRUSS FWD – op • VEST PORT – op • SYS PWR SYS 1 MNA – OFF • PSU PWR MNA – OFF cb MNA • LOGIC 1 – op • 3 – op • PYRO PWR MNA – OFF LIGHTS • AIRLK 1/4 MNA – OFF		MNA A7 Fwd Truss Docking lt Port Vestibule Docking lt DSP SYS 1 Pwr 10 PSU MNA Pwr 11 MNA pwr to DSP Logic buses 1,3 MNA Pyro System External Airlock lts 1,4
	(A7L) MADS • STRAIN GAGE – OFF • WB/ACIP PCM – OFF		MADS W/B FDM, WBSC, SGSC, ACIP PCM
	(MA73C:A,B) • MCA LOGIC MNA MID 1,3 (two) – OFF		MNA MMC1 and MNA MMC3 Bus pwr
		12	MNA pwr to ESS2CA and ESS3AB AUXPLA Bus Pwr
		13	Freon Loop 1,2 Cntlr B Rad Byp Vlv Mtrs Man Cntl
		2	ATM Press Cntl O2 Sys 1 Sply Vlv Cntl
			Port Rad Dpy/Sto Mtr 1 Stbd Rad Dpy/Sto Mtr 1 LH Vents 5,6 Mtrs 1 RH Vents 3,5,6 Mtrs 1
	(A15:H,I,J,K) • cb MNA TK6–TK9 O2 HTR SNSR 1 – op	14	Cryo O2 Tk 6–9 Htr Current Snsr 1
			FC3 Redundant Reac Vlv Close Cntl on pnl C3
8	(ML86B:C) • cb MNA EXT ARLK HTR STRUC – op	8	Ext A/L Structural Htrs MNA pwr
	(ML86B:D) • cb MNA FC PCM – op	15	FCMS

CREW INDICATIONS	NOTES
DSP SYS PWR SYS 1 tb – OFF	(2) Vlv holds position. Sys 2 remains (8) MNB htrs remain (10) All docking mechanisms will have single mtr times (11) Logic buses 1(3) remain pwrd via MNB(MNC) (12) Buses remain pwrd (13) Cntlrs A,B Rad Byp Vlv mtrs auto cntl and Cntlr A Rad Byp Vlv mtr remain (14) Snsr 2 remains (15) Lost capability to observe and record FC single cell voltages

EPS SSR–13
BUS LOSS: MNA APC1

ACTIONS	EQUIP/FUNCTION LOST
For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS)	2 RCS Manf L5 RJD pwr (L5L,L5D)
Refer to OMS/ RCS Slide Rule for vlv loss info (use APC 4 Slide for Aft RCS)	3 Aft L,R RCS He Pr Isol A GPC Cntl and Man CL capability
GNC 23 RCS 4 DES INH on L Manf 3 Jets: • ITEM 2 EXEC • L3L ITEM 12 EXEC (*) • L3D ITEM 28 EXEC (*) • L3A ITEM 30 EXEC (*) Set aft pod(s) PRI JET FAIL LIMIT to 6	
5 Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT L RCS He PRESS A,B • R RCS He PRESS A	6 Aft L RCS He Pr Isol B Man OP capability
(A12) APU HTR TK/FU LINE/H2O • SYS 1A – OFF • 1B – AUTO • 3A – AUTO • 3B – OFF HYD HTR • RUD SPD BK A – OFF • B – AUTO	APU 1 Inj H2O Htrs A APU 3 GG Inj H2O Htrs B Rud/Spd Brake Htr A
(A14) RCS/OMS HTRS • L POD (two) – A OFF, B AUTO • R POD (two) – B OFF, A AUTO • OMS CRSFD LINES (two) – A OFF, B AUTO	7 L Pod A Htrs (all) 8 R Pod B Htrs (partial) 7 OMS Crsfd Ln A Htrs (all)
9 Prior to using L(R) OMS: (O8) 11 L(R) OMS He PRESS/VAP • ISOL A – OP • B – GPC	10 L,R OMS He Pr A GPC Cntl 10 L,R OMS He Vap Isol 1 GPC Cntl
GNC XXXXX MNVR YYYYY (3,B) Sel L OMS SEC TVC: • L OMS GMBL SEC – ITEM 30 EXEC Sel R OMS PRI TVC: • R OMS GMBL PRI – ITEM 29 EXEC	L OMS Pri TVC R OMS Sec TVC

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

CREW INDICATIONS
1 MASTER ALARM Light/Tone – on
(F7) C/W RCS JET lt – on
(FSM) L RCS D(L) JET
If OMS GMBL cmd abs value > 2 deg: C/W OMS TVC lt 'L OMS GMBL' (3,B)
If OMS GMBL cmd abs value > 2 deg and Sec TVC selected: C/W OMS TVC lt 'R OMS GMBL' (3,B)

NOTES
(1) Indications do not appear until jet commanded
(2) Manf status not automatically declared closed. Fail–offs will occur when jets commanded
(3) Vlv holds position. Man OP capability remains
(4) Maintains control capability for APC6 failure
(5) Do not reconfig for reg switch or I'CNCT procedures
(6) Vlv holds position. Man CL and full GPC cntl remain
(7) Htr B remains
(8) Htr A remains
(9) Lost TM: GNC SYS SUMM 2 L,R OMS ENG BALL VLV 1: Assume Vlv 1 status same as Vlv 2
(10) Vlv fails closed. Man cntl remains. Redundant Isols remain
(11) Maintains He Isol redundancy

EPS SSR–14
BUS LOSS: MNA APC4 (Includes MNA APC1, MNA ALC1, MNA AMC1)

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
	(A12) APU HTR GAS GEN/FUEL			1	MASTER ALARM Light/Tone – on	(1) Indications do not appear until jet commanded
2	• PUMP 1 – B AUTO		APU 1 GG/Fu Pump Htrs A		(F7) C/W RCS JET lt – on SM ALERT Light/Tone – on	(2) * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
2	• 3 – A AUTO		3 GG/Fu Pump Htrs B			
	APU HTR • LUBE OIL LINE 1 – B AUTO		APU 1 Lube Oil Line Htr A		(FSMs) L RCS D(L) JET	
	• LUBE OIL LINE 3 – A AUTO		APU 3 Lube Oil Line Htr B			
	APU HTR TK/FU LINE/H2O		APU 1 Tk/Fu Ln Htrs A		(R4)	
2	• SYS 1A – OFF			3	HYD BRAKE ISOL VLV 1 tb – OP	
2	• 1B – AUTO		APU 1 Inj H2O Htrs A	4	LG EXTEND ISOL VLV tb – OP	
2	• 3A – AUTO		3 Tk/Fu Ln Htrs B	3	HYD MPS/TVC ISOL VLV SYS 1 tb – CL	(3) Vlv holds position
2	• 3B – OFF					
	HYD HTR				(O7)	(4) Vlv holds position. Loss of Hyd Sys 1 deploy capability for all Ldg Gear. Pyro backup release sys will deploy Ldg Gear. NLG can also be deployed by Hyd Sys 2
	• RUD SPD BK A – OFF		Rud/Spd Brake Htr A		AFT L RCS He PRESS A tb – bp	
	• BK B – AUTO			5	AFT R RCS He PRESS A tb – bp	
	• BDY FLP A – OFF		Body Flap Htr A	6	AFT L,R RCS TK ISOL 3/4/5A tb – bp (if vlv in CL position)	
	• B – AUTO					
	• ELEVON A – OFF		Elevon Actr Htrs A		(F7) If APUs active, and using BLR CNTLR/HTR 1B or 3A: C/W APU TEMP lt – on after ~2 min	(5) Vlv holds position. Man OP capability remains
	• B – AUTO					
	HYD CIRC PUMP				If OMS GMBL cmd abs value > 2 deg: C/W OMS TVC lt L OMS GMBL (3,B)	(6) Full vlv capability remains. If switch in CL, vlv will continuously drive to CL position
	• PWR 1 – MNB		Circ Pump 1 MNA pwr			
	• 3 – MNC		3 MNA pwr		If OMS GMBL cmd abs value > 2 deg and TVC selected: C/W OMS TVC lt R OMS GMBL (3,B)	(7) Manf status not automatically declared closed. Fail–offs will occur when jet commanded
	(L1)					
	• FLASH EVAP CNTLR PRI A(SEC) – ON (if reqd)		FES Pri B Cntlr		If cooling by FES B only: C/W FREON LOOP lt 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'	(8) Htr B remains
	• TOP EVAP HTR NOZ L – B AUTO		Top Evap L Noz Htr A			(9) Htr A remains
	• TOP EVAP HTR DUCT – B		Top Evap Duct L,R Htrs A			(10) Do not reconfig for reg switch or I'CNCT procedures
	If Hi Load Evap enabled: • HI LOAD DUCT HTR – B (C)		Hi Load Duct Noz Htr A			(11) Vlv holds position. Man CL, full GPC Cntl remains
	(L2) FLASH EVAP FDLN		FES H2O Fdln A Htrs 1 (all except MID 2)			
	• HTR A SPLY – 2		FES H2O Fdln B Htrs 2 (all except MID 2)			
	• B SPLY – 1					
	(R2)		Hyd H2O Blr 1 Cntlr B			
	• BLR CNTLR/HTR 1 – A		3 Cntlr A			
	• BLR CNTLR/HTR 3 – B					
	• For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS)	7	RCS Manf L5 RJD pwr (L5L,L5D)			
	(A14) RCS/OMS HTR					
	• L POD (two) – A OFF, B AUTO	8	L Pod A Htrs (all)			
	• R POD (two) – B OFF, A AUTO	9	R Pod B Htrs (partial)			
	• OMS CRSFD LINES (two) – A OFF, B AUTO	8	OMS Crsfd Ln A Htrs (all)			
	Refer to OMS/RCS Slide Rule for vlv loss info					
10	Reconfig following vlv(s) only if leak isolation reqd: (O7)	5	Aft L,R RCS He Pr Isol A GPC Cntl and man CL capability			
	• AFT L RCS He PRESS A,B	11	Aft L RCS He Pr Isol B man OP capability			
	• R RCS He PRESS A					
	If ICNCT config: (07)					
6	• AFT L RCS TK ISOL 3/4/5 A – GPC (tb–bp)		AFT L,R RCS TK ISOL 3/4/5 A CL microswitch feedback			
	• AFT R RCS TK ISOL 3/4/5 A – GPC (tb–bp)					
	(Continued)		(Continued)			

BUS LOSS: MNA APC4

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	GNC 23 RCS • Reprioritize L,R Manf 2 Jets to first priority: DES INH twice all other jets, highest priority first, then next highest, etc		Aft RCS L,R Jet 2 Htrs		(12) Maintains control capability for APC3 failure
12	DES INH on L Manf 3 Jets: • ITEM 2 EXEC • L3L ITEM 12 EXEC (*) • L3D ITEM 28 EXEC (*) • L3A ITEM 30 EXEC (*) • Set aft pod(s) PRI JET FAIL LIMIT to 6				(13) Lost TM: GNC SYS SUMM 2 L OMS N2 P VLV: If Eng – ARM/PRESS, assume vlv OP L,R OMS ENG VLV 1: Assume Vlv 1 status same as Vlv 2
13	• Save L OMS eng for deorbit (If reqd for additional on–orbit burns, ✓MCC)	13 14	L OMS GN2 Press Vlv OP TM Eng Pr Vlv Coil 1		(14) Unable to confirm redundant coils
	(O8) • If Straight feed config, L OMS Crossfeed B – OP (tb–OP). Otherwise, ✓MCC	15	OMS Eng/Crossfeed Vlv Redundancy		(15) Maintains deorbit capability for MNB DA2 failure
17	Prior to using L(R) OMS: (O8) L(R) OMS He PRESS/VAP • ISOL A – OP • B – GPC	16 16 18 18 19 20	L,R OMS He Pr Isol A GPC Cntl L,R OMS He Vap Isol 1 GPC Cntl L OMS Eng Cntl Vlv 1,2 Coils 1 R OMS Eng Pr Vlv Coil 2 and Cntl Vlv 1,2 Coils 2 L OMS Purge Vlv 1,2 OMS Qty Gage		(16) Vlv fails closed. Man cntl remains. Redundant Isols remain (17) Maintains He Isol redundancy (18) Redundant coils remain
	GNC XXXXX MNVR YYYYY (3,B) Sel L OMS SEC TVC: • L OMS GMBL SEC – ITEM 30 EXEC Sel R OMS PRI TVC: • R OMS GMBL PRI – ITEM 29 EXEC		L OMS Pri TVC R OMS Sec TVC		(19) **CAUTION** No purge. Wait 10 min between burns (20) ✓MCC for OMS Qtys. Disregard qtys on meter and GNC SYS SUMM 2
	If reqd during entry (< 120K ft): (L1) • NH3 CNTLR B – PRI/GPC If NH3 CNTLR A(B) – SEC/ON reqd, then: (L1) • H2O PUMP LOOP 1,2 (two) – ON • ✓FLOW PROP VLV LOOP 1,2 (two) – ICH • Activate PL H2O LOOP(s) (if applicable)	21	NH3 Sys A Pri Cntlr and Auto Sw over to Sec Cntlr		(21) Sys A Sec Cntlr man on capability remains (22) Pwr Sply B remains. GG Bed T and GBX P ind lost when APU running (23) Vlv B remains (24) Pwr Sply A remains. Turbine speed ind lost (25) Vlv A remains
	BUS ISOLATION ONLY ON MCC CALL, PERFORM (MA73C:B) • MCA LOGIC MNA AFT 1 – OFF		MNA AMC1 Bus pwr LH Vent 8,9 Mtr 1		
		22 23 24 25	APU 1 Cntlr pwr Sply A 1 Fu Tk Vlv A 1 GBX GN2 Repress Vlv 3 Cntlr pwr Sply B 3 Fu Tk Vlv B		

(Continued)

EPS SSR–14 (Cont)
BUS LOSS: MNA APC4

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	3	Hyd Brake Isol Vlv Cntl 4 LG Extend Isol Vlv Cntl 3 TVC Hyd Sys 1 Isol Cntl	Ctr MPS He reg A < 680 during entry (MM303)	(3) Vlv holds position (4) Vlv holds position. Loss of Hyd Sys 1 deploy capability for all Ldg Gear. Pyro backup release sys will deploy Ldg Gear. NLG can also be deployed by Hyd Sys 2 (26) Hyd Sys 2 stillavailable for NWS (27) Redundant RPC remains (28) Six vlvs fail to non–isolation position (29) Vlv fails closed (30) Vlv fails closed. Redundant vlv remains (31) Vlv fails closed. Aft compartment, OMS pods, and ET Umbilical cavity will not be purged during entry (MM304) (32) Vlv holds position. Loss of manual capability to inert LH2 manf (33) Redundant mtrs remain (34) Actuators continue to operate until Stow, Rel/Lat, or OP/CL sw is taken to GND or OFF
	26 27	NWS Hyd Sys 1 Hyd Main Pump 1 Depress Solenoid RPC A 27 Hyd Main Pump 3 Depress Solenoid RPC B		
	28	ATVC 2 Isol ME		
	29	L OMS Purge Vlv 1,2 Qty gauging		
		MPS: 30 Pneu He Isol 1 30 Ctr Eng He Isol A 29 Ctr Eng He Intercon Outlet Vlv 31 He Sply Blowdn Vlv 1,2 32 Prplt F/D Inbd LH2 Vlv		
	33	ET Door Mtrs: C/L Lat Actr 1 Mtr 1 GPC Cntl C/L Lat Actr 2 Mtr 1 GPC Cntl L Dr Closure Mtr 1 GPC CL capability L Dr Uplock Lat Mtr 1 GPC Lat capability		
	34	AC pwr removal capability via Limit sw for ET Dr Mtrs: C/L Lat Actr 1 Mtr 1 2 Mtr 1 L Dr Closure Mtr 1 Uplock Lat Mtr 1		

EPS SSR–15
BUS LOSS: MNA FLC1

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
Refer to OMS/RCS Slide Rule for vlv loss info	1 Fwd RCS He Press Isol GPC CNTL and MAN CL capability	MASTER ALARM Light/Tone – on	(1) Vlv holds position. Man OP capability remains
2 Reconfig following vlv(s) only if leak isolation reqd: (O8) • FWD RCS He PRESS A		3 (F7) C/W RCS JET lt – on	(2) Do not reconfig for reg switch or I'CNCT procedures
4 GNC 23 RCS Override F1 Manf status to CL: • RCS FWD – ITEM 1 EXEC • MANF VLVS 1 OVRD – ITEM 40 EXEC	RCS Manf F1 RJD pwr (F1F,F1L,F1U,F1D)	3 (FSM) F RCS D(F,L,U) JET	(3) Indications do not appear until jet commanded
Pre–seat ingress for entry: • Discharge handheld fire ext into AV BAY 3	Av Bay 3 agent discharge capability	1 (O8) FWD RCS He PRESS A tb – bp	(4) Manf status <u>not</u> automatically declared closed. Jet fail–offs may occur
			(5) Htr Cntlr 2 remains

BUS ISOLATION
<u>ONLY</u> ON MCC CALL, PERFORM
(O14:C) • cb MNA FIRE SUPPR BAY 3 – op

5 L ADP Htr Cntlr 1

EPS SSR–16
BUS LOSS: MNA ALC1

ACTIONS	EQUIP/FUNCTION LOST
(A12) APU HTR	
2 • GAS GEN/FUEL PUMP 1 – B AUTO	APU 1 GG/Fu Pump Htrs A
2 • GAS GEN/FUEL PUMP 3 – A AUTO	APU 3 GG/FU Pump Htrs B
• LUBE OIL LINE 1 – B AUTO	APU 1 Lube Oil Line Htrs A
• LUBE OIL LINE 3 – A AUTO	APU 3 Lube Oil Line Htrs B
APU HTR TK/FU LINE/H2O	
2 • SYS 1A – OFF	APU 1 Tk/Fu Ln Htrs A
2 • 1B – AUTO	3 Tk/Fu Ln Htrs B
2 • 3A – AUTO	
2 • 3B – OFF	
HYD HTR	
• RUD SPD BK A – OFF	Rud/Spd Brake Htr A
• B – AUTO	
• BDY FLP A – OFF	Body Flap Htr A
• B – AUTO	
• ELEV A – OFF	Elevon Actr Htrs A
• B – AUTO	
HYD CIRC PUMP	
• PWR 1 – MNB	Circ Pump 1 MNA pwr
• 3 – MNC	3 MNA pwr
(L1)	
• FLASH EVAP CNTLR PRI A(SEC) – ON (if reqd)	FES Pri B Cntlr
• TOP EVAP HTR NOZ L – B AUTO	Top Evap L Noz Htr A
• TOP EVAP HTR DUCT – B	Top Evap Duct L,R Htrs A
If Hi Load Evap enabled	
• HI LOAD DUCT HTR – B (C)	Hi Load Duct Noz Htr A
(L2)	
FLASH EVAP FDLN HTR	
• A SPLY – 2	FES H2O Fdln A Htrs 1 (all except MID 2)
• B SPLY – 1	FES H2O Fdln B Htrs 2 (all except MID 2)
(R2)	
• BLR CNTLR/HTR 1 – A	6 Hyd H2O Blr 1 Cntlr B
• 3 – B	6 3 Cntlr A
For attitude control:	
• Perform LOSS OF VERNIERS (ORB OPS, RCS)	7 RCS Manf L5 RJD pwr (L5L,L5D)
(A14)	
RCS/OMS HTR OMS	
• CRSFD LINES (two) – A OFF, B AUTO	OMS Crsfd Ln A Htrs (partial)
Refer to OMS/RCS Slide Rule for vlv loss info	
8 Reconfig following vlv(s) only if leak isolation reqd:	4 Aft L,R RCS He Pr Isol A GPC Cntl and man CL capability
(O7)	
• AFT L RCS He PRESS A,B	9 Aft L RCS He Pr Isol B man OP capability
• R RCS He PRESS A	
GNC 23 RCS	
• Reprioritize L,R Manf 2 Jets to first priority: DES INH twice all other jets, highest priority first, then next highest priority, etc	Aft RCS L,R Jet 2 Htrs
• Set aft pod(s) PRI JET FAIL LIMIT to 6	
(Continued)	(Continued)

CREW INDICATIONS
1 MASTER ALARM Light/Tone – on
(R4)
3 HYD BRAKE ISOL VLV 1 tb – OP
3 HYD MPS/TVC ISOL VLV SYS 1 tb – CL
(O7)
4 AFT L RCS He PRESS A tb – bp
4 AFT R RCS He PRESS A tb – bp
5 AFT L,R RCS TK ISOL 3/4/5A tb (two) – bp (if vlv in CL position)
If cooling by FES only using PRI B CNTLR: C/W FREON LOOP lt – on 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'
(F7) If APUs active and using BLR CNTLR/HTR 1B or 3A: C/W APU TEMP lt – on after ~ 2 min
(F7)
1 C/W RCS JET lt
(FSM)
1 L RCS D(L) JET

NOTES
(1) Indications do not appear until jet commanded
(2) * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
(3) Vlv holds position
(4) Vlv holds position. Man OP capability remains
(5) Full vlv capability remains. If switch in CL, vlv will continuously drive to CL position
(6) HYD H2O Blr and Tk Htrs still operative, but GN2 SOV fails open and steam vent htr and spray logic are disabled. Alternate controller must be selected
(7) Manf status not automatically declared closed. Fail–offs will occur when jet commanded
(8) Do not reconfig for reg switch or I'CNCT procedures
(9) Vlv holds position. Man CL and full GPC Cntl remain

EPS SSR–16 (Cont)
BUS LOSS: MNA ALC1

ACTIONS	EQUIP/FUNCTION LOST
If ICNCT config: (O7) 5 • AFT L RCS TK ISOL 3/4/5 A – GPC (tb–bp) • AFT R RCS TK ISOL 3/4/5 A – GPC (tb–bp)	AFT L,R RCS TK ISOL 3/4/5 A CL microswitch feedback
10 Save L OMS eng for deorbit (If reqd for additional on–orbit burns, ✓MCC)	11 L OMS GN2 Press Vlv OP TM 12 L OMS Eng Pr Vlv Coil 1
Prior to using OMS: (O8) 13 L(R) OMS He PRESS/VAP • ISOL A – OP • B – GPC	14 L,R OMS He Pr Isol A GPC Cntl
If reqd during entry (< 120K ft): (L1) • NH3 CNTLR B – PRI/GPC	15 NH3 Sys A Pri Cntlr & Auto sw over to Sec Cntlr
If NH3 CNTLR A(B) – SEC/ON reqd, then: (L1) • H2O PUMP LOOP 1,2 (two) – ON • ✓FLOW PROP VLV LOOP 1,2 (two) – PL HX If applicable • Activate P/L H2O LOOP(s)	

BUS ISOLATION	
ONLY ON MCC CALL, PERFORM	
NONE	16 L OMS Cntl Vlv 1,2 Coils 1 16 R OMS Eng Pr Vlv Coil 2 and Cntl Vlv 1,2 Coils 2
	10 OMS Qty gauging 17 L OMS GN2 Purge Vlv 1,2
	18 APU 1 Fu Tk Vlv A 18 3 Fu Tk Vlv B 19 Hyd Brake Isol Vlv 1 Cntl 19 TVC Hyd Sys 1 Isol Cntl
	MPS: 20 Pneu He Isol 1 20 Ctr Eng He Isol A 18 Ctr Eng He Intercon Outlet Vlv 21 He Sply Blowdn Vlv 1,2 19 Prplt F/D Inbd LH2 Vlv

CREW INDICATIONS	NOTES
Ctr MPS He Reg A < 680 during entry (MM303)	(5) Full vlv capability remains. If switch in CL, vlv will continuously drive to CL position (10) ✓MCC for OMS Qtys. Disregard Qtys on meter and GNC SYS SUMM 2 (11) Lost TM: GNC SYS SUMM 2 L OMS N2 P VLV: If Eng – ARM/PRESS, assume vlv OP (12) Unable to confirm redundant coils (13) Maintains He Isol redundancy (14) Vlv fails closed. Man cntl remains. Isol B remains (15) Sys A Sec Cntlr man on capability remains (16) Redundant coils remains (17) **CAUTION** No purge. Wait 10 min between burns (18) Vlv fails closed (19) Vlv holds position. Loss of manual capability to inert LH2 Manf (20) Vlv fails closed. Redundant vlv remains (21) Vlv fails closed. Aft compartment, OMS pods, and ET umbilical cavity will not be purged during entry (MM304)

EPS SSR–17
BUS LOSS: MNA FMC1

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(L1) • H2O PUMP LOOP 1 – B	H2O Loop 1 Pump A	MASTER ALARM Light/ Tone – on	(1) Vlv holds position
Refer to OMS/RCS Slide Rule for vlv loss info		(F7) SM ALERT Light/Tone – on	(2) If this action taken, H2O Pump Loop 2 must be pwrd
GNC 23 RCS Override F1 Manf status to OP: • RCS FWD ITEM 1 EXEC • MANF VLVS 1 OVRD ITEM 40 EXEC		(FSM) RM DLMA MANF	(3) Mtr 2 remains
		(O8) FWD RCS 1 TK ISOL 3/4/5 tb – bp 1 MANF ISOL 1 tb – bp	(4) Htr Cntlr 2 remains
		L ADP deploy time incr from 15 to 30 sec	
		STAR TRKR DR POS –Y OP time incr from 8 to 16 sec	
		If H2O PUMP LOOP 1,A active: C/W H2O LOOP lt – on 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP' 'S88 H2O PUMP P 1'	
		(O1) H2O PUMP OUT PRESS LOOP 1 ind – 20–25 psia	

BUS ISOLATION	EQUIP/FUNCTION LOST
ONLY ON MCC CALL, PERFORM	
(L1) 2 • H2O PUMP LOOP 1 – OFF	
(MA73C:A) • MCA LOGIC MNA FWD 1 – OFF	MNA FMC 1 Bus pwr
	RH Vent 1,2 Mtr 1 3 L ADP Deploy Mtr 1 Disc 1 4 Htr Cntlr 1 –Y Star Trkr Dr Sys 1 OP/CL capability

EPS SSR–18
BUS LOSS: MNA MMC1

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(MA73C:C) 1 • cb MCA PWR AC1 3Φ MID 1 – op	1 Port Rad Lat 1–6,7–12 Mtrs 1 Limit sw Port Rad Dpy/Sto Mtr 1 2 Stbd Rad Dpy/Sto Mtr 2 Limit sw	(R13L) RAD CNTL STBD tb – bp If PORT RAD pnl stowed: RAD CNTL PORT tb – bp	(1) If AC1 MMC1 cb not opened, Lat Mtrs 1 of both Port Lat 1–6,7–12 Actuators continue to run until Sys A Lat Cntl sw placed to OFF
For PLBD ops: • OP/CL Drs in man mode	PLBD: C/L Lat 9–12 Mtr 1 Port,Stbd Fwd Blkhd Lat Mtrs 1 Stbd Door Mtr 1 Port Door Mtr 2 CL Limit sw	SM (BFS SM 63) PL BAY DOORS If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG'	(2) Mtr 2 will continue to drive until Sys A Cntl sw is taken to OFF
		During MAN PLBD OP/CL, single mtr run time noted on actuators listed at left	(3) Single mtr time
		(A8L) PORT RMS: RETEN LAT tb – bp R–F–L MID tb – bp	
		SM 94 PDRS CONTROL Indications lost: Mid MRL Mtr 1 LAT/REL/RDY	

BUS ISOLATION	EQUIP/FUNCTION LOST
ONLY ON MCC CALL, PERFORM	
(MA73C:A) • MCA LOGIC MNA MID 1 – OFF	MNA MMC1 Bus pwr RH Vents 3,5,6 Mtrs 1
	3 Port RMS Mid MRL Mtr 1

EPS SSR–19
BUS LOSS: MNA MMC3

ACTIONS
(MA73C:D) 1 • cb MCA LOGIC MCA PWR AC1 3Φ MID 3 – op
For PLBD ops: • OP/CL Drs in man mode

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:B) • MCA LOGIC MNA MID 3 – OFF

EQUIP/FUNCTION LOST
1 Stbd Rad Lats 1–6,7–12 Mtrs 1 Limit sw Stbd Rad Dpy/Sto Mtr 1 2 Port Rad Dpy/Sto Mtr 2 Limit sw
PLBD: C/L Lat 1–4,5–8 Mtr 1 Port Aft Blkhd Lats Mtr 1
MNA MMC3 Bus pwr LH Vents 5,6 Mtr 1
3 Port RMS Aft MRL Mtr 2

CREW INDICATIONS
1 (R13L) RAD CNTL PORT tb – bp If STBD RAD pnl stowed: RAD CNTL STBD tb – bp
SM (BFS SM 63) PL BAY DOORS If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG'
During MAN PLBD OP/CL, single mtr run time noted on actuators listed at left
PORT RMS: SM 94 PDRS CONTROL Indication lost: Aft MRL Mtr 2 LAT/REL/RDY

NOTES
(1) If AC1 MM3 cb not opened, Lat Mtrs 1 of both Stbd Lat 1–6,7–12 Actuators continue to run until Sys A Lat Cntl sw placed to OFF
(2) Mtr 2 will continue to drive until Sys B Cntl sw is taken to OFF
(3) Single mtr time

EPS SSR−20
BUS LOSS: MNA AMC1

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:B) • MCA LOGIC MNA AFT 1 − OFF

	EQUIP/FUNCTION LOST
	LH Vent 8,9 Mtr 1
	MNA AMC1 Bus pwr
2	ET Door Mtrs: C/L Lat Actr 1 Mtr 1 GPC Cntl C/L Lat Actr 2 Mtr 1 GPC Cntl L Dr Closure Mtr 1 GPC CL capability L Dr Uplock Lat Mtr 1 GPC Lat capability
3	AC pwr removal capability via Limit sw for ET Dr Mtrs: C/L Lat Actr 1 Mtr 1 2 Mtr 1 L Dr Closure Mtr 1 Uplock Lat Mtr 1
1	LG Extend Isol Vlv
4	NWS Hyd Sys 1

	CREW INDICATIONS	NOTES
1	(R4) LG EXTEND ISOL VLV tb − OP	(1) Vlv holds position. Loss of Hyd Sys 1 deploy capability for all Ldg Gear. Pyro backup release sys will deploy Ldg Gear. NLG can also be deployed by Hyd Sys 2 (2) Redundant mtrs remain (3) Actuators continue to operate until the Stow, Rel/Lat, or OP/CL sw is taken to GND or OFF (4) Hyd Sys 2 still available for NWS

EPS SSR−21
BUS LOSS: MNA R14

ACTIONS	EQUIP/FUNCTION LOST
(R12L) 1 • MS AUD CNTL − PS	2 MS ATU, CCU, FD Spkr
(L9) • ✓PS ATU PNL config for use	

BUS ISOLATION	
ONLY ON MCC CALL, PERFORM	
(R14:A) • cb MNA AUD MS − op • ADC 1A/2A − op • MDU MFD 2 − op • MDU PLT 1 − op	MS ATU OS SU
(R14:B) 3 cb PALLET/DSC • 1A/2B − op (EDO) • 3A − op (EDO) cb MNA • UHF − op • GCILC − op • CNTL BUS BC 1/2/3 − op	 4 UHF Splx Pwr Amp 5 GCILC MNA pwr 6 MNA pwr for Cntl BC 1,2,3 Buses
(R14:D) cb MNA • TV C AFT BAY CAMR/PAN− TILT − op • TV C AFT BAY CAMR HTR − op • TV C AFT BAY PAN−TILT HTR − op • CONTR UNIT − op • MON 1 − op	 TV C Aft Bay Camr and Pan−Tilt TV C Aft Bay Camr Htr TV C Aft Bay Camr Pan−Tilt Htr 7 Video Cntl Unit MNA pwr CCTV Mon 1
(R14:E) cb MNA • PS FLOOD − op cb MNA D STBD RMS • TV D CAMR and PAN−TILT − op • TV D CAMR HTR − op • PAN−TILT HTR − op	 PS Floodlt TV D STBD RMS: Camr and Pan−Tilt Camr Htr Pan−Tilt Htr
• MDU MFD 2 PWR − OFF • MDU PLT 1 PWR − OFF	MDU MFD 2 MDU PLT 1 8 ADC 1A/2A

CREW INDICATIONS	NOTES
PS Floodlt lost MS, OS CCTV Video lost if MNA selected for VCU CCTV Mon 1 lost	(1) Only listen capability regained for MS ATU (CCU only) (2) Causes loss of redundant path for ACCU config control bits, loss of xmit capability via CCU, loss of FD spkr (3) Redundant pwr source remains for equipment (4) Possible loss of capability for xmitting to gnd via UHF (5) GCILC also pwrd via MNC cb (6) Buses remain powered (7) MNB pwr may be selected via TV pwr sw (pnl A7) or GCILC, if reqd (8) IDP 1 and IDP 2 ADC data lost. MDU port select may be reqd
(F7) MDU MFD 2 blanks	
(F8) MDU PLT 1 blanks	

EPS SSR−22
BUS LOSS: MNA O14&A8

ACTIONS
(A8L) • PORT RMS HTR A − OFF • PORT RMS HTR B − AUTO

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

	EQUIP/FUNCTION LOST
	Port RMS:
1	Primary pwr
2	MCIU Htr A
3	ON control for RCS Manf F1 RJD pwr (F1F,F1L,F1U,F1D)

	CREW INDICATIONS
	(A8U)
2	Port RMS D&C tb − bp except: BRAKES tb − OFF RATE MIN tb − OFF RATE HOLD tb − OFF SOFT STOP tb − gray RATE SCALE tb − gray

NOTES
(1) B/U drive capability remains. All brakes ON and safing initiated
(2) All brakes ON and safing initiated
(3) If driver sw OFF when bus failed, F1 Manf Drivers lost

EPS SSR−23
BUS LOSS: MNA O14

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(R1) 1 • MN BUS TIE C − ON (tb−ON)		MASTER ALARM Light/ Tone − on	(1) FC3 only one failure away (loss of ESS3AB) from inability to bus tie
(L1) If RAD CNTLR LOOP 1,2 − AUTO B: • Perform ON−ORBIT RAD CNTLR SWITCH, ECLS SSR−13 for Freon Loop 1,2	Freon Loop 1,2 Rad Cntlr B	(F7) C/W CAB ATM lt − on SM ALERT Light/Tone − on	(2) H2O Loop 1 Intchgr flowrate and IMU fan ΔP snsrs lost
(L2) • FREON ISOL MODE − OFF	Auto radiator isolation function	(FSMs) 2 S66 IMU FAN DP S66 CABIN PPO2 A S66 CABIN PRES 2 S88 H2O LOOP 1 FLOW SM0 TIRE PRESS S78 CABIN O2 CONC	(3) ACA recovered by switching to alternate pwr
(F6,F8) • HSI SEL SOURCE (two) − other than MLS 1 • RDR ALTM − 2	MLS 1 Radar Altm 1	If ADTA 1, MLS 1, −Z STAR TRKR pwrd: 'BCE STRG 1 ADTA' (3,B) 'BCE STRG 1 MLS' (3) 'BCE STRG 1 STKR'	(4) After MET 3:30, tb already bp
(O6) • ANNUN BUS SEL ACA 1 − MNB	3 ACA 1 MNA pwr	(L2) 4 CAB VENT ISOL tb − bp 4 tb − bp 5 N2 SYS 1 SPLY tb − bp 5 N2 SYS 1 REG INLET tb − bp	(5) Vlv holds position (6) Vlv fails closed. IFM or real−time flow test will be required. ✓MCC for additional direction
If on PCS 1: • Perform RECONFIG TO ALT PCS SYS, ECLS SSR−3	O2/N2 Cntl Sys 1: O2/N2 Sys 1 Flow Xdcrs 5 N2 Sply Vlv 1 Cntl 5 N2 Reg Inlet Vlv 1 Cntl 6 O2 Xovr Vlv 1 OP capability 7 O2/N2 Cntl Vlv 1 man Cntl PPO2 Snsr A Cabin Press Snsr Emer dP/dT B/U comp	(O1) O2/N2 FLOW SYS 1 ind − 0 pph CAB PRESS ind − 0 psia PPO2 SNSR A ind − 0 psia	(7) O2/N2 Cntl Vlv 1 normally closed when unpowered (8) Inhibits Cabin P, Cabin PPO2A, Cabin O2 Flow 1, Cabin N2 Flow 1, IMU Fan ΔP, and H2O Loop ICH Flow 1 respectively (9) Inhibits Primary C/W for Cabin P, Cabin PPO2A, Cabin O2 Flow 1 and Cabin N2 Flow 1 respectively
SM 60 SM TABLE MAINT 8 • Inhibit 0612405, 0612511, 0612105, 0612553, 0612869, 0612742 • Perform ECLS COMPUTATION INHIBIT, ECLS SSR−14 Table B		(O3) MSN TIME ind − blank	
		(A4) EVENT TIME ind − blank	
		If first AA failure and S/W processing accel data: 'RM FAIL ACC' (3)	
(R13 U) 9 • C/W PARAM SEL tw (three) − 004, 034, 014, 054 • C/W PARAM − INH • C/W MEM − CLEAR • C/W PARAM SEL tw (three) − > 119		(LIGHTS LOST) L Console Floodlt 3 If ACA 1 − MNA, lights lost: (C3) DAP lights left four columns ALL (F2) PBIs except MA	
• Pre−seat ingress for entry: discharge hand−held fire ext into AV BAY 3	Av Bay 3 agent discharge capability	If NWS 1 selected: (F3) NWS FAIL lt − on	
(Continued)	(Continued)		

EPS SSR−23 (Cont)
BUS LOSS: MNA O14

	BUS ISOLATION		EQUIP/FUNCTION LOST
	ONLY ON MCC CALL, PERFORM		
	(O6) • S TRK PWR −Z − OFF		−Z Star Tracker Dr OP capability −Z Star Tracker
	(O8) • RDR ALTM 1 − OFF • MLS 1 − OFF		
	(O14:B) cb MNA OI SIG CONDR		
10	• OF 1/4 A − op		
10	• OM 1/2 A − op		
	cb MNA OI MDM OF		
10	• 1/2 A − op		
10	• 3/4 A − op		
	cb MNA OI H2O		
	• BYP LOOP 1 SNSR − op	2	H2O Byp Loop 1 Snsr (ECLS SC11)
	cb MNA OI		
	• TIRE PRESS − op	11	Tire Press Sig Cond A1,A2
	cb MNA		
	• MNC CONTR − op		
	• MSN TIMER FWD − op		Fwd Mission Timer
	• EVENT TIMER AFT − op		Aft Event Timer
	(O14:C) cb MNA		
	• TACAN 1 − op		Tacan 1
12	• SMOKE DETN L/R FLT DK − op	12	L,R Flt Dk Smoke Detectors
	• SMOKE DETN BAY 2A/3B − op		Av Bay 2 Smoke Detector A 3A Smoke Detector B
	• FIRE SUPPR BAY 3 − op		Av Bay 3 agent discharge capability
	• UTIL PWR O19/MO52J − op		MNA Utility pwr
	• FLOOD L CNSL − op		L Console Floodlt
	• ANNUN FWD ACA 1 − op		
13	• cb MNA CRYO O2 HTR TK1 SNSR 1 − op	13	Cryo O2 Tk 1 Htr Current Snsr 1
	• cb RAD ISOL CONTR − op		Auto radiator isolation function
	(O14:D)		
14	cb MNA		
	• FREON RAD CNTLR 1,2 (two) − op		
	• N2 SPLY 1 − op		
	• O2/N2 CNTLR 1 − op		
	• O2 XOVR 1 − op		
	• N2 REG INLET 1 − op		
	• CAB VENT − op		Cabin Vent Vlv
	• VENT ISOL − op		Isol
	(O14:E) cb MNA		
	• RDR ALTM 1 − op		
	• MLS 1 − op		
	• ADTA 1 − op		ADTA 1
	• S TRK −Z − op		
	• ACCEL 1 − op		AA 1
10	• DDU L,AFT (two) − op	10	L DDU MNA pwr
		10	Aft DDU MNA pwr
15	• NWS − op		NWS 1

CREW INDICATIONS	NOTES
	(2) H2O Loop 1 Intchgr flowrate and IMU fan ΔP snsrs lost (10) Redundant pwr source remains for equip (11) Redundant measurement remains. FDA Alarm − BFS only; OPS 3,6 (12) Cabin Smoke Detector remains (13) Current Snsr 2 remains (14) Cntlr A remains (15) NWS 2 still available

EPS SSR−24
BUS LOSS: MNA R1A1

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

	EQUIP/FUNCTION LOST
1	MNA pwr to CNTL buses AB1,AB2,AB3,CA1,CA2, CA3
1	MNA pwr to ESS2CA, ESS3AB

CREW INDICATIONS
NONE

NOTES
(1) Buses remain pwrd

EPS SSR−25
BUS LOSS: MNA A6&A14

ACTIONS
GNC 23 RCS • Reprioritize FRCS Manf 1 Jets to first priority: DES INH twice all other jets; highest priority first, then next highest, etc • Set forward pod PRI JET FAIL LIMIT to 4

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

	EQUIP/FUNCTION LOST
	Fwd RCS Jet 1 Htrs
	PL Reten Sys A Rel/Lat Mtrs
	ROEU
	Logic Pwr Sys 1
1	Orbiter arm drive mtr (ODM mtr 1 − mate A, demate A, relax A)
1	ODA mtr 1 latch/release

CREW INDICATIONS
(A6U) PL RETEN RDY tb − bp RETEN/LAT tb − bp
(A6A1 − pnl overlay) RELAX tb − bp DEMATE tb − bp MATE tb − bp ELEC CONT tb − bp
SM 97 PL RETENTION Indication lost: RELAX DEMATE MATE

NOTES
(1) Single mtr time

EPS SSR−26
BUS LOSS: MNA ML86B

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(ML86B:A) • cb MNB H2O LINE HTR B − cl	1	H2O Line Htrs A: Waste Dump Line Htr A Sply Dump Line Htr A Vac Vent Ln Htr A	2 (R11L) SPLY H2O TKA INLET tb − bp 2 SPLY H2O TKB OUTLET tb − bp	(1) Htr B remains (2) Vlv holds position (3) Vlv holds position. May have to interface EMU 2 with SCU 1 to provide total H2O servicing/ recharge (4) Without circulation, H2O will lose heat with time and never reheat to nominal temp (5) PEVs, Actuators, Bed A P, Bed B P, and Bed dP will be recovered after system reconfig (6) MNB and MNC line htrs remain. MNB struc and vestibule htrs remain
(ML86B:D) cb MNB MMU • PORT,STBD HTR B (two) − cl	1	MMU Port,Stbd Htr A	2 (R13L) MMU GN2 SPLY ISOL VLV A tb − bp	
If Waste H2O Dump reqd: • Perform WASTE WATER SYS BACKUP DUMP (IFM)	2	Waste H2O: Dump Vlv Cntl Noz Htr	2 (ML31C) WASTE H2O TK 1 VLV tb − bp 2 WASTE H2O DUMP ISOL VLV tb − bp 2 WASTE H2O DUMP VLV tb − bp 2 SPLY H2O TKD OUTLET tb − bp	
(ML31C) • VAC VENT ISOL VLV BUS SEL − MNB		Vac Vent Isol MNA Cntl		
(WCS) • ✓MODE − AUTO • ✓CRADLE − AUTO • ✓Hose stowed in cradle • ✓WCS ON lt − OFF • FAN SEP SEL sw − OFF • HOSE BLOCK − SEP 2 • In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30−sec run complete • FAN SEP SEL sw − 2		WCS Sep Fan 1 Mtr Relay		
(EDO WCS) • WCS PWR SEL − OFF 1, AUTO 2		Controller MNA pwr Compactor MNA Cntl	3 (AW82D) EMU 2 H2O SPLY, WASTE (two) tb − CL	
(GALLEY) • OVEN/RHS − OFF • ✓OVEN FAN: OFF • Config for backup H2O dispense per ECLS	4	Galley Electronics Assy Oven One of six htr strips Galley Hot H2O Tk	(LIGHTS LOST) Middeck Floodlts 1,8 WMC Floodlt MO13Q pnl lt 2 Airlk Floodlt 1 TA Flood 2 (SL only)	
(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 1 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/ DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)	5	CO2 Rmvl Sys Cntlr 1	'S66 CO2 RL SYS MALF' Impending: 'S66 CO2 RL SYS PCO2' 'S66 CAB PPCO2'	
(ML86B:C) • cb MNB(MNC) EXT ARLK HTR LINE ZN1 − cl • cb MNB(MNC) EXT ARLK HTR LINE ZN2 − cl • cb MNB EXT ARLK HTR STRUC − cl If in Rendezvous or Docked: • cb MNB EXT ARLK HTR VEST Z1/2/3 − cl	6	Ext A/L H2O and Structural Htrs MNA pwr		

BUS ISOLATION		
ONLY ON MCC CALL, PERFORM		
(ML86B:A) cb MNA H2O • LINE HTR A − op cb MNA SPLY H2O • TKA INLET − op • TKB OUTLET − op cb MNA WASTE H2O • DUMP VLV/NOZ HTR − op	2 2	Sply H2O TkA Inlet Vlv Cntl Sply H2O TkB,D Outlet Vlv Cntl
(Continued)		(Continued)

EPS SSR−26 (Cont)
BUS LOSS: MNA ML86B

	BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	ONLY ON MCC CALL, PERFORM				(1) Htr B remains (2) Vlv holds position (3) Vlv holds position. May have to interface EMU 2 with SCU 1 to provide total H2O servicing/ recharge (6) MNB and MNC line htrs remain. MNB struc and vestibule htrs remain (7) Current Snsr 2 remains (8) Sys B remains (9) Lost capability to observe and record FC single cell voltages
	(ML86B:B) cb MNA WASTE H2O • TK1 VLV − op • DUMP ISOL − op cb MNA SPLY H2O • TKD OUTLET − op cb MNA VAC • VENT ISOL VLV − op cb MNA • WCS CNTLR − op • GALLEY OVEN − op		Waste H2O Dump Isol Cntl Tk1 Inlet Vlv Cntl Galley Oven Electronics Assy		
7	(ML86B:F) • cb MNA CRYO O2 HTR TK3 SNSR 1 − op • cb MNA CRYO O2 HTR TK5 SNSR 1 − op	7	Cryo O2 Tk 3 Htr Current Snsr 1 Cryo O2 Tk 5 Htr Current Snsr 1 (OV105 only)		
	(ML86B:D) cb MNA MMU • PORT,STBD HTR A (two) − op • GN2 SPLY ISOL VLV A − op cb MNA PYRO JETT SYS A • KU ANT − op • STBD RMS − op	1 2 8	MMU Port,Stbd Htr A MMU GN2 Sply Isol Vlv A Ku−Bd Jettison Sys A		
	(ML86B:E) cb MNA EMU 2 H2O • SPLY − op • WASTE − op cb MNA FLOOD • TNL ADAPT 2 − op cb MNA • CO2 SYS 1 CNTLR − op		TA Floodlt 2		
	(ML86B:F) cb MNA FLOODS • MIDDECK 1/8 − op • WMC/MO13Q − op • AIRLK 1 − op		Middeck Floodlts 1,8 WMC Floodlt, MO13Q pnl lt 2 Airlk Floodlt 1		
		3	EMU 2 Sply H2O Vlv Cntl Waste H2O Vlv Cntl		
6 6 6 6	(ML86B:C) • cb MNA EXT ARLK HTR LINE ZN1 − op • cb MNA EXT ARLK HTR LINE ZN2 − op • cb MNA EXT ARLK HTR STRUC − op • cb MNA EXT ARLK HTR VEST Z1/2/3 − op	6	Ext A/L H2O and Structural Htrs MNA pwr		
	(ML86B:D • cb MNA FC PCM − op	9	FCMS		

EPS SSR−27
BUS LOSS: MNA PPC1

ACTIONS
(A15:D,E,F,G) For any Pallet Cryo Tk Htr A in Auto: • (Aff) TK HTR A − OFF • B − AUTO
(A15:C) • PALLET HTRS A − OFF • B − AUTO

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(A15:B) • PALLET PWR PPCA−1 MNA − OFF

EQUIP/FUNCTION LOST
Pallet Cryo Tk 6−9 Htrs A
Pallet Structural Htrs A

CREW INDICATIONS	NOTES
SM ALERT Light/Tone − on	
(FSMs) 168 PALLET V A	
SM 168 CRYO PALLET Pallet Volts MNA ~0 ↓	

EPS SSR−28
BUS LOSS: MNA A15EDO

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(A15:H,I,J,K) • cb PALLET MNA TK6−9 O2 SNSR 1 − op

	EQUIP/FUNCTION LOST
1	Cryo O2 Tk 6−9 Htr Current Snsr 1

CREW INDICATIONS	NOTES
	(1) Snsr 2 remains

EPS SSR−29
BUS LOSS: MNA A7

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(A7L) IF DOCKING MISSION cb DEP MNA SYS 1 • VENT ISOL − op • VENT − op LIGHTS • AIRLK 1/4 MNA − OFF cb DOCK LT • MNA TRUSS FWD − op

EQUIP/FUNCTION LOST
Vestibule Depress Vlv Sys 1 Vent Isol Vestibule Depress Vlv Sys 1 Vent External Airlock lts 1,4 Fwd Truss Docking lt

	CREW INDICATIONS	NOTES
	VEST DEP VLV SYS 1 VENT ISOL tb − bp VEST DEP VLV SYS 1 VENT tb − bp	(1) DSP SYS 1 PWR still available to all users except MNA A7
1	DSP SYS PWR SYS 1 tb − OFF	

EPS SSR−30
BUS LOSS: MNB DA2 (Includes all MNB sub−buses and AC2)

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
• Perform FC2 SHUTDN (FC SHUTDN Cue Card)		FC2 Pumps and pH Snsr Purge Vlv O2,H2 Flow Xdcrs Cell Perf Monitor	MASTER ALARM Light/ Tone − on SM ALERT Light/Tone − on	(1) Buses remain pwrd
• Perform LOSS OF 1 FC (ORB PKT, PWRDN)	1 1 1 1 1	MNB pwr to AUX PLB BUS ESS1BC ESS3AB CNTLAB1,2,3 CNTLBC1,2,3	(F6) MDU CDR 2 blanks	(2) Pwrs PL Timing Buffer, OIU 1, and OIU 2 (if flown). OIU 1 redundant pwr MNA MPC1 via CAB PL3
(R1) • PL CAB − MNA • cb AC CONTR AC2 ΦA,ΦB,ΦC (three) − cl • INV/AC BUS 2 − OFF (tb−OFF) • INV PWR 2 − OFF (tb−OFF) • cb AC CONTR AC2 ΦA,ΦB,ΦC (three) − op	2	MNB pwr to CABPL 1,2,3 buses AC2 ΦA,ΦB,ΦC Inverters	(F7) MDU CRT 2 blanks MDU MFD 1 blanks C/W CABIN ATM lt − on C/W MN BUS UNDERVOLT lt − on C/W AC VOLT lt − on C/W FC PUMP lt − on C/W FREON LOOP lt − on 3 C/W RCS JET lt − on	(3) Indications do not appear until jet commanded
• O2,H2 TK1 HTRS A − AUTO • O2,H2 MANF vlv TK1,TK2 − OP		Cryo O2(H2) Tk2,3,4 Htrs A if in Auto Cryo O2,H2 Tk2,3,4 Htrs B	(COMM LOST) All S−BD A/G voice lost if Sys 1 selected Middeck Spkr audio lost	(4) MNA PPC1 will now supply 100% of pwr to A and B Cryo Tk Htrs
(A15:C) • PALLET HTRS B − OFF • A − AUTO		Pallet Structural Htrs B	(LIGHTS LOST) R Ovhd pnl (pnls O1,O2, O3,O8,O9,O16,O17) R Pnl (pnls F4,F8,F9, R1,R2,R4) Ovhd Instr (pnls O1,O2,O3) OS Numeric (pnls A2,A4) L Seat/Ctr Cnsl Floodlts R Ovhd Cnsl Floodlt OS Floodlt Middeck Floodlts 2,6 Bunk Floodlts 2/4 PHS Floodlt Airlock Floodlt 3 PLB Fwd Blkhd Floodlt PLB Mid Port Floodlt PLB Fwd Stbd Floodlt TA Floodlt 3	(5) * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
(A15:D,E,F,G) • ✓ That at least one htr (A or B) per Tk turned off	4	Redundant pwr to Pallet Cryo Tk 6−9 Htrs B		(6) Rad isolation may cause FES shutdown
		Av Bay 1 Agent discharge capability		
(A12) APU HTR 5 • GAS GEN/FUEL PUMP 1 − A AUTO 5 • GAS GEN/FUEL PUMP 2 − B AUTO • LUBE OIL LINE 1 − A AUTO • LUBE OIL LINE 2 − B AUTO APU HTR TK/FU LINE/H2O 5 • SYS 1A − AUTO 5 • 1B − OFF 5 • 2A − OFF 5 • 2B − AUTO HYD HTR • RUD SPD BK A − AUTO • B − OFF • BDY FLP A − AUTO • B − OFF • ELEV A − AUTO • B − OFF • AFT FUS A − OFF • B − AUTO HYD CIRC • PUMP PWR 1 − MNA • 2 − MNC		APU 1 GG/Fu Pump Htrs B APU 2 GG/Fu Pump Htrs A APU 1 Lube Oil Line Htrs B 2 Lube Oil Line Htrs A 1 Tk/Fu Line Htr B APU 1 GG Inj H2O Htrs B 2 Tk/Fu Line Htr A Rudder/Speed Brake Htr B Body Flap Htr B Elev Act Htr B Aft Fuselage Htrs A Circ Pump 1 MNB pwr 2 MNB pwr	(F9) AC2 ΦA,ΦB,ΦC AC volts ind − < 90 DC VOLTS MNB ind − OSL (FSM) S67 AC VOLTS 2 S86 HYD RSVR Q SM2 HYD QTY (B) S86 WSB T SM0 THRM HYD (B) S66 AV BAY 1,2 FAN S66 AV BAY 3 FAN S78 CABIN DP/DT S66 CABIN PPO2 B,C S66 IMU FAN DP S66 IMU FN SPD B S69 FC PUMP 2 S69 FC H2 PUMP 2 S88 FREON FLOW 1 S88 FRN AFT CP 1 S88 FRN PL HX 1 S88 FREON QTY 2 S88 FREON FLOW 2 6 Possible 'S88 EVAP OUT T 1(2)' 3 R RCS D,R JET S67 MAIN BUS V B I/O ERROR CRT 2 S67 FPC/FLC 2	
(Continued)		(Continued)	(Continued)	

EPS SSR−30 (Cont)
BUS LOSS: MNB DA2

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
	(A1L) S−BD PM • ANT SW ELEC − 2 • XPNDR − 2 • PWR AMPL OPER − 2 • STBY − 2 • PRE AMP − 2 NSP • PWR − 2		S−BD PM Sys 1: Xpndr 1 PreAmp 1 NSP 1 COM SEC 1 Pwr Amp 1 PM and FM Ant SW 1		(FSM) S67 MPC 2 S67 APC/ALC B 168 PALLET V B RM DLMA MANF If ADTA 2, MLS 2, −Y STAR TRKR pwrd: 'BCE STRG 2 ADTA' (3,B) 'BCE STRG 2 MLS' (3) 'BCE STRG 3 STKR'	(3) Indications do not appear until jet commanded (7) Vlv holds position (8) REACQ and PSP reconfig procedures are flight specific. If reqd, procedures are found in payload or ISS specific books (9) OIU CABLE SWAP (IFM PROCEDURES, IFM) will be reqd to regain OIU cmd via OIU 1 and PSP 2 (10) When gear deployed, tb does not indicate DN (11) Vlv holds position. Loss of redundant hyd NLG deploy and NWS redundancy if failed closed (12) Instrumentation loss caused rad isolation (13) May be repwrd after AC Pwr Transfer Cable connected (14) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison (15) Single mtr time (16) One failure away from loss of jettison capability
	(A1L) If PSP and/or INTRG reqd for PL or ISS ops: • S−BD PL PWR SYS − 2 • CNTL − PNL • − CMD 8 • Reconfig PSP 8 • Perform PL INTRG REACQ (if reqd)		S−BD PL Intrg 1 PSP 1 SW PL Ant capability to 2RH,2LH		SM 168 CRYO PALLET Pallet Volts MNB ~0↓	
9	If OIU reqd, √MCC	3	OIU 2 OIU 1 MNB Pwr		(L2) 7 CAB RELIEF A tb − bp 7 O2 SYS 2 SPLY tb − CL 7 N2 SYS 2 SPLY tb − bp 7 N2 SYS 2 REG INLET tb − bp	
	(A1R) • S−BD FM PWR − 2		S−BD FM Sig Proc 1 Xmtr 1		SM 212 OIU OIU 2 TEMP ≥ 140 SM 62 PCMMU/PL COMM If OIU 2, active possible msg 'S62 PDI DECOM FAIL'	
	If no comm: (C3) • S−BD PM CNTL − PNL • − CMD				(F6/F8) 10 LDG GEAR L, NOSE (two) tb − bp	
	(L1) • Perform ON−ORBIT RAD CNTLR SWITCH, ECLS SSR−13 for Freon Loop 1,2 • FLASH EVAP CNTLR PRI A(B) − ON (if reqd) • TOP EVAP HTR NOZ L − A AUTO • TOP EVAP HTR NOZ R − B AUTO • TOP EVAP HTR DUCT − A(C) If Hi Load Evap enabled: • HI LOAD DUCT HTR − A(C)		Freon Loop 1,2 Rad Cntlr A FES Sec Cntlr Top Evap L Noz Htr B Top Evap L R Noz Htr A Top Evap Duct R Fwd,Aft Htrs B Hi Load Duct Inbd,Outbd Noz Htrs B		(F7) FWD EVENT TIME ind − blank	
	(L2) • FLASH EVAP FDLN HTR A SPLY − 1		FES H2O Fdln A Htrs 2 (all)		(R1) FC2 COOL PUMP ΔP tb − bp	
12	• Perform RAD ISOL RECOVERY, ECLS SSR−9 for Freon Loop 2 (select AUTO B)				(R4) 7 HYD MPS/TVC ISOL VLV SYS 2 tb − CL 11 HYD BRAKE ISOL VLV 2 tb − OP	
	(L4:P) • cb AC3 ΦA LG SNSR 1 − cl	13	Prox Snsr Electronics Box 2		If Sys 1 pwrd: 'S62 BCE BYP PSP 1' Loss of PL TLM and CMD If PDI FDA enabled: 'S62 PDI DECOM FAIL'	
	(A8L) • PORT RMS HTR B − OFF • PORT RMS HTR A − AUTO		Port RMS: B/U Pwr MPM Mtr 2 14 Fwd MRL Mtr 1 15 Mid MRL Mtr 2 15 D&C B/U edge ltg 13 Htr B Jettison Sys A 16 Deadface Relays		(O7) 7 AFT R RCS He PRESS B tb − bp AFT L,R RCS TK ISOL 3/4/5B tb − bp (if vlv in CL position)	
	(F6) • HSI SEL SOURCE − (other than MLS 2)		MLS 2		(O8) FWD RCS 7 He Press B tb − bp 7 MANF ISOL 2 tb − bp	
	(F6,F8) • RDR ALTM − 1		RA 2		(R11L) SPLY H2O 7 DUMP ISOL VLV tb − bp 7 TKB INLET tb − bp 7 TKC OUTLET tb − bp 7 B SPLY ISOL VLV tb − bp	
					(R13L) 7 MMU GN2 SPLY ISOL VLV B tb − bp	
	(Continued)		(Continued)		(Continued)	

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(O6) ANNUN BUS • SEL ACA 1 − MNA • 2/3 − MNC	ACA 1 MNB pwr ACA 2/3 MNB pwr	(ML31C) 7 WASTE H2O TK1 DRAIN VLV tb − bp 7 SPLY H2O TKD INLET tb − bp	(7) Vlv holds position
• For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS)	17 RCS Manf R5 RJD pwr (R5R,R5D)	(O1) AIR TEMP AV BAY 3 ind − 45 degF FREON FLOW LOOP 2 ind − 443 pph CAB dP/dT ind − .45 O2/N2 FLOW SYS 2 ind − 0 pph PPO2 SNSR B,C ind − 0	(17) Manf status not automatically declared closed. Fail−offs will occur when jet commanded
Refer to OMS/RCS Slide Rule for vlv loss info	RCS manf F2 RJD pwr (F2F,F2R,R2U,F2D)		(18) Do not reconfig for reg switch or I'CNCT procedures
18 Reconfig following vlvs only if leak isolation reqd: (O7) • AFT L RCS He PRESS A • R RCS He PRESS A,B	19 F,L,R RCS He Pr Isol A man OP capability 20 F,R RCS He Pr Isol B GPC Cntl, man CL capability	(A4) MSN and EVENT TIME ind − blank	(19) Man CL and GPC cntl remain. Vlv holds position
(O8) • FWD RCS He PRESS A,B		21 If Site AOS and using S−BD Ant Elect 1: 'ANTENNA' (2)	(20) Man OP capability remains. Vlv holds position
(C2) • R IDP/CRT SEL − 3 • GPC/CRT O2 EXEC	22 IDP 2 MDU CRT 2 MDU CDR 2 MDU MFD 1 23 ADC 1B/2B	If NSP 1 selected: 'BCE STRG 1 NSP'	(21) Antenna miscompare causes FSM
SM 1 DPS UTILITY (G2,G8,S2) MMU ASSIGN 24 • GNC − ITEM 2 EXEC • SM − ITEM 3 EXEC • PL − ITEM 5 EXEC	MMU 2	If Hum Sep B ON: 'S66 HUMID SEP B'	(22) Loss of redundant port to the following: MDU PLT 1 (P) MDU PLT 2 (S) MDU AFD 1 (S)
(A6U) • ANNUN BUS SEL − MNC	ACA 4/5 MNB pwr	If Cabin Fan B ON: C/W AV BAY/CAB AIR lt − on 'S66 CABIN FAN'	(23) IDP 3, IDP 4 ADC data lost. MDU port select may be reqd
(A14) RCS/OMS HTR • FWD RCS − A AUTO • L POD (two) − A AUTO, B OFF • R POD (two) − A OFF, B AUTO • OMS CRSFD LINES − A AUTO, B OFF	Fwd RCS Htrs B (all) 25 L Pod B Htrs (partial) 26 R Pod A Htrs (all) 18 OMS Crsfd Ln Htrs B (all)	If IMU Fan B ON: 'S66 IMU FAN DP' 'S66 IMU FAN SPD B'	(24) Selecting failed MMU for GNC MF protects against GPC MMU Rcvr failure after OPS XTION prepositioning
(ML86B:A) • cb MNA H2O LINE HTR A − cl	H2O Line Htrs B: Waste Dump Line Htr Sply Dump Line Htr Vac Vent Line Htr	If Freon Loop 1 Pump B ON: 'S88 FREON FLOW 1' 'S88 FRN AFT CP 1' 'S88 FRN PL HX 1'	(25) Htr A remains
(ML86B:D) cb MNA MMU • PORT HTR A − cl • STBD HTR A − cl	25 MMU Port,Stbd Htr B	If H2O Loop 1 Pump B ON: C/W H2O LOOP lt 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP' 'S88 H2O PUMP P 1'	(26) Htr B remains
• If on PCS 2: Perform RECONFIG TO ALT PCS SYS, ECLS SSR−3	O2/N2 Cntl Sys 2: 7 O2 Sply Vlv Cntl 7 N2 Sply Vlv 2 Cntl 7 Reg Inlet Vlv 2 Cntl 27 O2/N2 Cntl Vlv 2 Man Cntl 28 O2 Xovr Vlv 2 OP capability O2/N2 Sys 2 Flow Xdcrs PPO2 Snsrs B,C	(O1) H2O PUMP OUT PRESS LOOP 1 ind − 20−25 psia	(27) O2/N2 Cntl Vlv 2 normally closed when unpowered
	dP/dT Snsr	During Rad Dpy/Sto ops: (R13L) RAD CNTL tbs (four) indicate single mtr ops	(28) Vlv fails closed. IFM or real−time flow test will be required. ✓MCC for additional direction
		(A8L) PORT RMS: DPY/STO tb − bp RETEN LAT tb − bp R−F−L FWD tb − bp	
		SM 94 PDRS CONTROL Indications lost: MPM Mtr 2 STO/DPY FWD MRL Mtr 1 LAT/REL/RDY MID MRL Mtr 2 LAT/REL/RDY	
		If Freon sig condr A(B) on pnl O17:C in AC2 position: 'S88 FREON FLOW 2(1)' 'S88 FRN PL HX 1(2)' 'S88 FREON QTY 2(1)'	
(Continued)	(Continued)	(Continued)	

EPS SSR−30 (Cont)
BUS LOSS: MNB DA2

	ACTIONS		EQUIP/FUNCTION LOST
	For PLBD ops: • OP/CL Drs in man mode		PLBD: C/L Lat 13−16 Mtr 2 Stbd Aft Blkhd Mtr 2 Port Door Mtr 2 Stbd Door Mtr 2 Port,Stbd Fwd Blkhd Mtrs 2 Port,Stbd Door Mtr 1 CL Limit sws
29 31 33	Prior to using L(R) OMS: (O8) L OMS He PRESS/VAP ISOL • A − GPC • B − OP R OMS He PRESS/VAP ISOL • A(B) − GPC • B(A) − CL	30 32	L OMS He Pr Isol B and Vap Isol 2 GPC Cntl R OMS He Pr Isol A, B man Cntl and Vap Isol 1,2 man A,B Cntl
	(O8) • Right OMS TK ISOL A − CL (tb−CL)	34	OMS Eng/Xfeed Redundancy
	If Supply H2O Dump reqd and DUMP ISOL VLV failed closed: • Perform SUPPLY WATER DUMP USING FES (ORB OPS, ECLS)	7	Supply H2O Dump Isol Cntl
	If EMU(s) in battery charge mode: (AW18H) • PWR/BATT CHGR EMU 1(2) BUS SEL − MNA		EMU 1,2 Pwr/Batt Chgr MNB pwr
	GNC 23 RCS • Reprioritize L,R Manf 1, F Manf 3 Jets to first priority: DES INH twice all other jets; highest priority first, then next highest, etc • Set aft pod(s) PRI JET FAIL LIMIT to 3 • Set forward pod PRI JET FAIL LIMIT to 4		Aft RCS L,R Jet 1 Htrs Fwd RCS Jet 3 Htrs
	If CCTV reqd: (A7U) • TV PWR CONTR UNIT − MNA		Video Cntl Unit MNB pwr
		35	FC1 Redundant Reac Vlv Cntl on pnl C3
	For SSME Hyd Repress: (R4) • HYD MPS/TVC ISOL VLV SYS 1,3 (two) − OP, wait 10 sec, then CL	7	MPS/TVC Hyd Sys 2 Isol Cntl
	GNC XXXXX MNVR YYYYY Sel L OMS PRI GMBL • ITEM 28 EXEC		L OMS Sec TVC
	(ML31C) • VAC VENT ISOL VLV BUS SEC − MNA		Vac Vent Isol MNB Cntl
	If reqd during entry (< 120 K ft): (L1) • NH3 CNTLR A(B) − PRI/GPC	36	NH3 Sys B Sec Cntlr Man capability
	(Continued)		(Continued)

CREW INDICATIONS	NOTES
(O1) FREON FLOW LOOP 2(1) ind − 443 pph	(7) Vlv holds position
CCTV video TV Annun lts lost if MNB selected for VCU CCTV Mon 2 lost (VTR input lost)	(29) Lost TM: GNC SYS SUMM 2 L OMS ENG VLV 2: Assume VLV 2 status same as VLV 1
(F7) If APUs active and using BLR CNTLR/HTR 1A or 2B: C/W APU TEMP lt − on after ~2 min	(30) Man cntl remains. Vap Isol closes. Pr Isol normally closed
SM (BFS,SM) 63 PL BAY DOORS If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG'	(31) Maintains He Isol redundancy
During MAN PLBD OP/CL single mtr run time noted on actuators listed at left	(32) GPC cntl remains. Vlv fails closed
If OMS Gmbl cmd abs value > 2 deg and Sec TVC selected: OMS TVC C/W lt 'L OMS GMBL' (3,B)	(33) Prevents simultaneous opening of parallel reg paths and possibly rupturing burst disk
If first AA failure and S/W Processing Accel data: 'RM FAIL ACC' (3)	(34) Maintains deorbit capability for CNTL AB1 failure
If first RGA failure and rates sensed: 'RM FAIL RGA' (3)	(35) Not yet active on all vehicles
Star Trkr Dr −Z OP/CL time and −Y CL time incr from 8 to 16 sec	(36) Sys B Pri Cntlr, auto switchover to Sec Cntlr remain
L,R ADP deploy times incr from 15 to 30 sec	

BUS LOSS: MNB DA2

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
If AC Pwr Transfer Cable to be installed to regain AC: • Go to EPS SSR−200; otherwise, continue with Bus Loss Actions				(37) Av Bay 3 Fan ΔP, Air Out Temp Snsrs lost (38) Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate, and Accum Qty snsrs lost (39) Freon Loop 2 P/L Hx Flow Rate, Freon Loop 1 ICH Flow Rate, and Accum Qty snsrs lost (40) Lose Auto Temp Cntl via Cntlr 1 and Cabin Temp, Cabin Hx Air Out Temp, and H2O Loop 1 Cabin Hx In Temp snsrs. Hx Byp Vlv holds position
(WCS) • ✓MODE − AUTO • ✓CRADLE − AUTO • ✓Hose stowed in cradle • ✓WCS ON lt − OFF • FAN SEP SEL sw − OFF • HOSE BLOCK − SEP 1 • In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30−sec run complete • FAN SEP SEL sw − 1				
(EDO WCS) • URINAL SEL − SEP 1 • WCS PWR SEL − AUTO 1, OFF 2 • URINE DIVERTER VLV FAN SEP 1		Urine Sep 2 Fan 2 Commode Fan 2 Controller MNB pwr Compactor MNB Cntl		
(R2) • BLR CNTLR/HTR 1 − B • 2 − A		Hyd H2O Blr 1 Cntlr A 2 Cntlr B		
(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl				
(L1) • HUM SEP B − OFF • A − ON • IMU FAN B − OFF • A(C) − ON • H2O PUMP LOOP 1 − A • CAB FAN B − OFF • ✓A − ON • AV BAY 1 FAN B − OFF • A − ON • 2 FAN A − OFF • B − ON • AV BAY 3 FAN A,B (two) − ON • FREON PUMP LOOP 1 − A	37	Hum Sep B IMU Fan B H2O Loop 1 Pump B Cabin Fan B AV Bay 1 Fan B AV Bay 2 Fan A AV Bay 3 Sig Condr, Xdcrs (ECLS SC4) Freon Loop 1 Pump B		
(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN B − OFF • ✓A − ON		Arlk/Tnl Fan B		
(O17:C) • SIG CONDR FREON A − AC3 • SIG CONDR FREON B − AC3	38 39	Freon Sig Condr A AC2 pwr (ECLS SC 1A) Freon Sig Condr B AC2 pwr (ECLS SC 1B)		
(CDR's SEAT) • SEAT PWR − AC3		CDR Seat Adj via AC2 pwr		
(PLT's SEAT) • SEAT PWR − AC3		PLT Seat Adj via AC2 pwr		
• If Cab Temp Cntlr 1 active: (L1) • CAB TEMP CNTLR − OFF	40	Cabin Temp Cntlr 1, Hx Byp Vlv Mtr 1		
(MD44F) • Remove pin from PRI Actuator BYP vlv linkage, connect linkage to SEC Actuator				
(L1) • CAB TEMP CNTLR − 2 (Continued)		(Continued)		

BUS LOSS: MNB DA2

	BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	ONLY ON MCC CALL, PERFORM				(41) AC2 Bus Isolation for AC Pwr Transfer Cable installation accomplished in MNB DA2 Actions column. No additional bus isolation steps reqd
42	(L1) • H2O PUMP LOOP 1 − OFF				(42) If this action taken, activate H2O Pump Loop 2
	(L4:N) • cb AC2 ΦC RAD ISOL A − op	43	Freon Loop 1,2 Rad Isol Motor A		(43) Motor B remains
	• MDU CRT 2 PWR − OFF • MDU CDR 2 PWR − OFF • MDU MFD 1 PWR − OFF				(44) Redundant pwr source remains for equipment
	(C2) • IDP/CRT 2 PWR − OFF				(45) H2O Loop 2 ICH Flow Rate snsr lost
	(C3) • MSTR MADS PWR − OFF				(46) Other detn in Av Bay remains
	(O6) • STAR TRKR PWR −Y − OFF		−Y Star Tracker		(47) Current Snsr 1 remains
	(O8) • RADAR ALTM 2 − OFF • MLS 2 − OFF				(48) Cntlr B remains
	(O15:A) • RGA 2 − OFF		RGA 2		
	(O15:B) cb MNB OI SIG CONDR				
44	• OF 1/4 B − op				
44	• OF 2/3 A − op				
	cb MNB				
44	• OM 1/2 B − op				
44	• OI MDM OF 1/2 B − op				
	• OI SIG CONDR OM 3A − op				
44	• OI H2O BYP LOOP 2 SNSR − op	45	H2O Byp Loop 2 Snsr (ECLS SC12)		
	(O15:B) • cb MNA CONTR − op				
	• MSN TIMER AFT − op		Aft Mission Timer		
	• EVENT TIMER FWD − op		Fwd Event Timer		
	(O15:C) cb MNB				
	• TACAN 2 − op		Tacan 2		
46	• SMOKE DETN BAY 1B/3A − op		Av Bay 1 Smoke Det B, Av Bay 3 Smoke Det A		
	• FIRE SUPPR BAY 1 − op				
	• UTIL PWR F1/MO13Q − op		MNB Utility pwr		
	• FLOOD R CNSL − op		R Console Floodlt		
	• L CTR − op		L Seat/Ctr Console Floodlt		
	• ANNUN FWD ACA 1 − op				
	• ANNUN FWD ACA 2/3 − op				
	• ANNUN AFT ACA 4/5 − op				
	• CRYO O2 HTR TK2 SNSR 2 − op	47	Cryo O2 Tk2 Htr Current Snsr 2		
	• GPS 2 PRE AMPL UPPER − op				
	(A15:H,I,J,K) • cb MNB TK6−TK9 O2 HTR SNSR 2 − op	47	Cryo O2 Tk6−9 Htr Current Snsr 2		
	(O15:D) cb MNB				
48	• FREON RAD CNTLR 1 − op				
48	• FREON RAD CNTLR 2 − op				
	(Continued)		(Continued)		

EPS SSR−30 (Cont)
BUS LOSS: MNB DA2

BUS ISOLATION		EQUIP/FUNCTION LOST
ONLY ON MCC CALL, PERFORM		
• PPO2 C CAB dP/dT − op • GPS 2 PRE AMPL LOWER − op • N2 SPLY 2 − op • O2/N2 CNTLR − op • O2 XOVR 2 − op • N2 REG INLET 2 − op • CAB RELIEF A − op 49 • NWS − op		Cabin Relief Vlv A Cntl NWS − 2
(O15:E) cb MNB • RDR ALTM 2 − op • MLS 2 − op • ADTA 2 − op • STAR TRKR −Y − op • ACCEL 2 − op 44 • DDU L − op 44 R − op • DRAG CHUTE SYS 2 − op	7 50	ADTA 2 AA2 Drag Chute, PLT Arm
(O15:F) • MMU 2 − OFF		
	51	ASA 4 Isol
	51 51	ATVC 3 Isol ME 4 Isol ME
(R1) • PL AFT MNB − OFF		Aft PL MNB pwr
(R11U) • FC PURGE VLV 2 − CL • FC STARTUP HTR 2 − ENA		FC2 Startup Htr Inhibit capability
(R14:A) • cb MNB AUD MIDDECK SPKR − op • ADC 1B/2B − op • MDU MFD 1 − op • MDU CDR 2 − op		Middeck ATU
(R14:B) • cb MNB CNTL BUS CA 1/2/3 − op 44 cb PALLET/DSC • 1B − op (EDO) • 4B − op (EDO)	1	MNB pwr for CNTL CA 1,2,3 Buses
(R14:C) cb MNB KU • ELEC − op • ANT HTR − op • CABLE HTR − op	 52	Ku−Bd sys (I/F and cont Unit, RDR) Sig Proc & Dpy Assy Deployed Assy Htrs
(R14:D) cb MNB • TV A FWD BAY CAMR/ PAN−TILT − op • TV A FWD BAY CAMR HTR − op • TV A FWD BAY PAN−TILT HTR − op • TV CONTR UNIT − op • TV MON 2 − op		TV A Fwd Bay Camr/Pan−Tilt TV A Fwd Bay Camr Htr TV A Fwd Bay Camr Pan−Tilt Htr CCTV Mon 2
(R14:E) cb MNB • OS FLOOD − op • RMS PORT RMS TV CAMR/PAN−TILT − op • RMS PORT RMS TV CAMR HTR − op • RMS PORT RMS TV PAN−TILT HTR − op		OS Floodlt Port RMS Camr/Pan−Tilt Port RMS Camr Htr Port RMS Camr Pan−Tilt Htr
(Continued)		(Continued)

CREW INDICATIONS	NOTES
	(1) Buses remain pwrd (7) Vlv holds position (44) Redundant pwr source remains for equipment (49) NWS 1 still available (50) CDR Arm remains (51) Six vlvs fail to non−isolation position (52) KU−BAND ANTENNA: CONTINGENCY STOW − W/EVA ANT GIMBAL ALIGNMENT (IFM) reqd to stow Ku−Bd. Jettison reqd if antenna cannot be positioned within GO FOR PLBD CLOSURE envelope

EPS SSR−30 (Cont)
BUS LOSS: MNB DA2

BUS ISOLATION		EQUIP/FUNCTION LOST
ONLY ON MCC CALL, PERFORM		
(A7U) PL BAY FLOOD • FWD BHD − OFF • MID PORT − OFF • FWD STBD − OFF		PLB Fwd Blkhd Floodlt Mid Port Floodlt Fwd Stbd Floodlt
(A7L) IF DOCKING MISSION • cb DEP MNB SYS 2 VENT ISOL − op • cb DEP MNB SYS 2 VENT − op		Vest Dep Vlv Sys 2 Vent Vent Isol
(A7L) IF DOCKING MISSION cb DOCK LT MNB • TRUSS AFT − op • VEST STBD − op • SYS PWR SYS 2 MNB − OFF • PSU PWR MNB − OFF cb MNB • LOGIC 1 − op • 2 − op LIGHTS • AIRLK 2/3 MNB − OFF	 53 54 	MNB A7 Aft Truss Docking lt Stbd Vestibule Docking lt DSP SYS 2 Pwr PSU MNB Pwr MNB pwr to DSP Logic buses 1,2 External Airlock lts 2,3
(MA73C:A,B) MCA LOGIC MNB • FWD 2 − OFF • AFT 2 − OFF • MID 1,2,3,4 (four) − OFF		MNB FMC2 Bus pwr AMC2 Bus pwr MMC1,MMC2,MMC3, MMC4 Bus pwr
(ML86B:A) cb MNB • H2O LINE HTR B − op • SUPPLY H2O TKB INLET − op • SUPPLY H2O TKC OUTLET − op • SUPPLY H2O DUMP ISOL − op • SUPPLY H2O B SPLY ISOL VLV − op	 7 7 7	 Sply H2O TKB Inlet Vlv Cntl Sply H2O TKC Outlet Vlv Cntl Sply H2O B Sply ISOL Vlv Cntl
(ML86B:B) cb MNB • VAC VENT NOZ HTR − op • WASTE H2O TK1 DRAIN − op • SUPPLY H2O TKD INLET − op • VAC VENT ISOL VLV − op • WCS CNTLR − op • GALLEY H2O HTR − op	 55 7 7 	 Waste H2O Vac Vent Noz Htr Tk1 Drain Vlv Cntl Sply H2O TKD Inlet Vlv Cntl WCS Press Xdcr Galley H2O Htrs
(ML86B:D) cb MNB MMU • PORT,STBD HTR B − op • GN2 SPLY ISOL VLV B − op	 25 7	 MMU Port,Stbd Htr B GN2 Sply Isol Vlv B
(ML86B:E) cb MNB SEAT • LEFT − op • RIGHT − op cb MNB FLOOD • TNL ADAPT 3 − op cb MNB • CO2 COM INSTR − op		CO2 Rmvl Sys Filter dP CO2 Rmvl Sys Vacuum Press CO2 Rmvl Sys PPCO2 Snsr Inlet Temp TA Floodlt 3
(ML86B:F) cb MNB FLOODS • MIDDECK 2/6 − op • BUNK 2/4 − op		Middeck Floods 2,6 Bunk Floodlts 2/4
(Continued)		(Continued)

CREW INDICATIONS	NOTES
DSP SYS PWR SYS 2 tb − OFF	(7) Vlv holds position (25) Htr A remains (53) All docking mechanisms will have single mtr times (54) Logic buses 1(2) remain pwrd via MNA(MNC) (55) No redundancy

EPS SSR−30 (Cont)
BUS LOSS: MNB DA2

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM		L MPS He reg A < 680 during entry (MM 303)	(7) Vlv holds position
• PHS − op • AIRLK 3 − op cb MNB CRYO O2 47 • HTR TK3 SNSR 2 − op 56 • TK4 SNSR 1 − op	PHS Floodlt Airlk Flood 3 Cryo O2: 47 Tk 3 Htr Current Snsr 2 56 4 Htr Current Snsr 1		(11) Vlv holds position. Loss of redundant hyd NLG deploy and NWS redundancy if failed closed (47) Current Snsr 1 remains (56) Current Snsr 2 remains
	57 Port,Stbd Rad Mtrs 2 Dpy capability Port,Stbd Rad Lat 1−6 Mtrs 2		(57) Mtrs 2 stow capability unaffected
	Fwd RCS Jet 2 Htrs 58 L OMS ENG Press Vlv Coil 2, Cntl Vlv 1,2 Coil 2		(58) Redundant coils remain
	59 OMS Qty Gauging for all L OMS single engine burns		(59) ✓MCC for OMS Qtys
	11 Hyd Brake Isol Vlv 2 Cntl 60 APU 1 Cntlr Pwr Sply B 61 1 Fuel Tk Vlv B 62 2 Cntlr Pwr Sply A 2 Fuel Tk Vlv A APU 2 GBX GN2 Repress Vlv Hyd Rsvr 2 Qty Snsr		(60) Pwr supply A remains. Turbine speed ind lost (61) Vlv fails closed. Redundant vlv remains (62) Pwr supply B remains. GG Bed T and GBX P lost when APU running
	63 Freon Loop 2 Cntlr A Rad Byp Vlv Mtr Man Cntl 64 Freon Loop 1 Cntlr A Rad Byp Vlv Mtr 7 Freon Loop 1 Flow Prop Vlv Freon Loop 1 Cold Plate Flow Xdcr		(63) Cntlrs A,B Rad Byp Vlv Mtrs Auto Cntl and Cntlr B Rad Byp Vlv Mtr Man Cntl remain (64) Bypass vlv holds position and Cntlr B Rad Byp Vlv Mtr remains
	65 L,R ADP Dpy Mtrs 2 66 Htr Cntlr 2 RH Vents 1,2,6,8,9 Mtrs 2 LH Vents 1,2,3,5,8,9 Mtrs 2		(65) Mtr 1 remains (66) Htr Cntlr 1 remains
	Tacan 2		
	NLG B/U Rel and Ext Sys 2 LMG, RMG B/U Rel Sys 2		
	−Y Star Trkr Dr OP and Sys 2 CL capability −Z Star Trkr Dr Sys 1 OP/CL capability		(67) ✓MCC for stow reqmts
	PL Reten Sys B Rel/Lat Mtrs 67 Ku Ant Sto/Dpy Mtr 2		(68) Vlv fails closed
	MPS: 68 L Eng He Intercon Outlet Vlv 63 L Eng He Isol A 63 Pneu He Isol 2 69 Prplt F/D Inbd LO2 Vlv 69 Outbd LH2 Vlv 70 Manf Repress LH2 Vlv 1,2		(69) Vlv holds position. Loss of manual capability to inert LO2 and LH2 Manf (70) Vlv fails closed. LH2 Manf will not be pressurized with He during entry (MM304)
	71 ET Door Mtrs: C/L Lat Actr 1 Mtr 2 L Dr Uplock Lat Mtr 2 R Dr Closure Mtr 2 Uplock Lat Mtr 2		(71) Redundant mtrs remains
	72 NWS Hyd Sys 2		(72) Hyd Sys 1 still available for NWS
	11 LG Extend Vlv 2		
	Ops Hyd Actr Instr 73 Hyd Main Pump 2 Depress Solenoid RPC A 73 Hyd Main Pump 1 Depress Solenoid RPC B		(73) Redundant RPC remains

EPS SSR−31
BUS LOSS: MNB FPC2 (Includes MNB FLC2, MNB FMC2, AC2)

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1	• Perform FC2 SHUTDN (FC SHUTDN Cue Card), pwrdn not needed, then:	2	FC2 Pumps and pH Snsr	MASTER ALARM Light/Tone − on CRT 2 blanks	(1) * TIME CRITICAL * FC2 must be shutdn within 9 min to avoid potentially hazardous condition
	(R1) • cb AC CONTR AC2 (three) − cl • INV/AC BUS 2 − OFF (tb−OFF) • INV PWR 2 − OFF (tb−OFF) • cb AC CONTR AC2 (three) − op		AC2 ΦA,ΦB,ΦC Inverters	(F7) C/W FC PUMP lt − on C/W AC VOLT lt − on C/W FREON LOOP lt − on C/W AV BAY/CAB AIR SM ALERT Light/Tone − on	
	(L4:P) • cb AC3 ΦA LG SNSR 1 − cl	2	Prox Snsr Electronics Box 2	(F9) AC2 ΦA,ΦB,ΦC AC volts < 90	(2) Will be repwrd after AC Pwr Transfer Cable connected
	Refer to OMS/RCS Slide Rule for vlv loss info Reconfig following vlv only if leak isolation reqd:	3	Fwd RCS He Press Isol A man OP capability	(COMM LOST) All S−BD A/G voice lost if Sys 1 selected	(3) Man CL and full GPC cntl remains. Vlv holds position
5	(O8) • FWD RCS He PRESS A,B	4	Fwd RCS He Press Isol B man CL and full GPC Cntl RCS Manf F2 RJD pwr (F2F,F2R,F2U,F2D)	(LIGHTS LOST) Right Ovhd pnl (pnls O1, O2,O3,O8,O9,O16,O17) Right pnl (pnls F4,F8,F9, R1,R2,R4) Ovhd Instr (pnls O1,O2,O3) Orbit Sta Numeric lts (pnls A2,A4)	(4) Man OP capability remains. Vlv holds position
					(5) Do not reconfig for reg switch or I'CNCT procedures
	(A1L) S−BD PM • ANT SW ELEC − 2 • XPNDR − 2 • PWR AMPL OPER − 2 • STBY − 2 • PRE AMPL − 2 NSP • PWR − 2		S−BD PM Sys 1: Xpndr 1 Pre−Amp 1 Pwr Amp 1 PM, FM Ant Sw 1 NSP 1/COMSEC 1	(FSMs) S67 FPC/FLC 2 S67 AC VOLTS 2 S86 HYD RSVR Q SM2 HYD QTY (B) S86 WSB T SM0 THRM HYD (B) S66 AV BAY 1,2 FAN S66 AV BAY 3 FAN S69 FC PUMP 2 S69 FC H2 PUMP 2 S88 FRN AFT CP 1 S88 FREON FLOW 1 S88 FRN PL HX 1	(6) Rad isolation may cause FES shutdown
	If simo loss of MNA & MNB: • NSP ENCRYPTION MODE − SEL • NSP ENCRYPTION SEL − BYP				(7) REACQ and PSP reconfig procedures are flight specific. If reqd, procedures can be found in payload or ISS specific books
6				Possible 'S88 EVAP OUT T 1(2)'	
	If PSP and/or INTRG reqd for PL or ISS ops: • S−BD PL PWR SYS − 2 • CNTL − PNL • − CMD		S−BD PL Intrg 1 PSP 1	RM DLMA MANF S88 I/O ERROR CRT 2 S66 CABIN FAN S66 IMU FAN DP S66 IMU FN SPD B	(8) When gear deployed, tb will not indicate DN
7 7	• Reconfig PSP • Perform PL INTRG REACQ (if reqd)				(9) OIU 2 interfaces with PSP 2 for commanding
	(A1R) • S−BD FM PWR − 2		S−BD FM Sys 1	(F6/F8) LDG GEAR L, NOSE tb − bp	(10) Vlv holds position
8				HYD/APU APU H2O QTY 1 ind − 0% HYD QTY 2 ind − 0%	(11) Loss of redundant port to the following: MDU CDR 2 (S) MDU MFD 1 (P) MDU PLT 1 (P) MDU PLT 2 (S) MDU AFD 1 (S)
	If no comm: (C3) • S−BD PM CNTL − PNL • − CMD				
9	If OIU reqd: (SSP) • OIU PWR − OIU 2 ON • OIU tb − DN • ✓MCC, OIU reconfig			(R1) 4 FC2 COOL PUMP ΔP tb − bp	
				(O8) 10 FWD RCS He PRESS B tb − bp FWD RCS MANF ISOL 2 tb − bp	
	(C2) • R IDP/CRT SEL − 3 On MCC GO: • GPC/CRT O2 EXEC	11	IDP 2 MDU CRT 2	(O1) AIR TEMP AV BAY 3 ind − 45 degF AIR TEMP CAB HX OUT ind − 45 degF FREON FLOW LOOP 1 ind − 578 pph	
	(A14) • RCS/OMS HTR FWD RCS A AUTO		Fwd RCS Htrs B (all)		
	(Continued)		(Continued)	(Continued)	

EPS SSR−31 (Cont)
BUS LOSS: MNB FPC2

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
	DPS UTILITY (G2,G8,S2)				(A4) MSN and EVENT TIME ind − blank	(11) Selecting failed MMU for GNC MF protects against GPC MMU Rcvr failure after OPS XTION prepositioning
11	MMU ASSIGN • GNC − ITEM 2 EXEC • SM − ITEM 3 EXEC • PL − ITEM 5 EXEC • OPS 0 − ITEM 7 EXEC		MMU 2		L,R ADP deploy times incr from 15 to 30 sec	(12) FSM caused by antenna miscompare
	If EMU(s) in battery charge mode: (AW18H) • PWR/BATT CHGR EMU 1(2) BUS SEL − MNA		EMU 1,2 Pwr/Batt Chgr MNB pwr	12	If site AOS and using S−BD Ant Elec 1: 'ANTENNA' (2)	(13) Instrumentation loss caused rad isolation
	Pre−seat ingress for Entry: • Discharge handheld fire ext into AV BAY 1		Av Bay 1 agent discharge capability		−Y,−Z Star Trkr Drs OP/CL time incr from 8 to 16 sec	(14) AV Bay 3 Fan ΔP Air Out Temp Snsrs lost
	If AC Pwr Cable to be installed to regain AC: • Go to EPS SSR−200; otherwise, continue with Bus Loss Actions				If Sys 1 pwrd: 'S62 BCE BYP PSP1' Loss of PL TLM and CMD	(15) Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate and Accum Qty Snsrs lost
	(R2) • BLR CNTLR/HTR 1 − B • 2 − A		Hyd H2O Blr 1 Cntlr A 2 Cntlr B RSVR 2 Qty Snsr		If PDI FDA Enabled: 'S62 PDI DECOM FAIL'	(16) Freon Loop 2 P/L Hx Flow Rate, Freon Loop 1 ICH Flow Rate and Accum Qty Snsrs lost
	If NSP 1 selected: 'BCE STRG 1 NSP'					
13	• Perform RAD ISOL RECOVERY, ECLS SSR−9 for Freon Loop 2				If Freon Loop 1 Pump B ON: 'S88 FREON FLOW 1' 'S88 FRN AFT CP 1' 'S88 FRN PL HX 1'	
	(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl				If Freon Sig Condr A(B) (O17:C) in AC2 position: 'S88 FREON FLOW 2(1)' 'S88 FRN PL HX 1(2)' 'S88 FREON QTY 2(1)'	
	(L1) • HUM SEP B − OFF • A − ON • CAB FAN B − OFF • A − ON • IMU FAN B − OFF • A(C) − ON • H2O PUMP LOOP 1 − A • AV BAY 1 FAN B − OFF • A − ON • 2 FAN A − OFF • B − ON • AV BAY 3 FAN A,B (two) − ON • FREON PUMP LOOP 1 − A • 2 − A	14	Humidity Sep B Cabin Fan B IMU Fan B H2O Loop 1 Pump B Av Bay 1 Fan B Av Bay 2 Fan A Av Bay 3 Sig Condr, Xdcrs (ECLS SC4) Freon Loop 1 Pump B		(O1) FREON FLOW LOOP 2(1) ind − 578 pph	
	(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN B − OFF • ✓A − ON		Arlk/Tnl Fan B		If H2O Loop 1 Pump B ON: C/W H2O LOOP lt 'S88 H2O PUMP P 1' 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP'	
	(O17:C) • SIG CONDR FREON A − AC3 • SIG CONDR FREON B − AC3	15 16	Freon Sig Condr A AC2 pwr (ECLS SC1A) Freon Sig Condr B AC2 pwr (ECLS SC1B)		(O1) H2O PUMP OUT PRESS LOOP 1 ind − 20−25 psia	
	(WCS) • ✓MODE − AUTO • ✓CRADLE − AUTO • ✓Hose stowed in cradle • ✓WCS ON lt − OFF • FAN SEP SEL sw − OFF • HOSE BLOCK − SEP 1 • In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30−sec run complete • FAN SEP SEL sw − 1		WCS Fan/Sep 2		(F7) If APUs active and using H2O Blr Cntlr 2B(3A): C/W APU TEMP lt after ~2 min	
					During Rad Dpy/Sto ops: (R13L) RAD LAT CNTL tbs (two) indicate single mtr ops	
	(Continued)		(Continued)			

EPS SSR−31 (Cont)
BUS LOSS: MNB FPC2

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(EDO WCS) URINAL SEL − SEP 1 • WCS PWR SEL − AUTO 1, OFF 2 • URINE DIVERTER VLV FAN SEP 1		Urine Sep 2 Fan 2 Commode Fan 2		(10) Vlv holds position (17) Lost Auto Temp Cntl via Cntlr 1 and Cabin Temp, Cabin Hx Air Out Temp and H2O Loop Cabin Hx In Temp Snsrs Hx Byp Vlv holds position (18) Bypass vlv holds position and Cntlr B Rad Byp vlv mtr remains (19) AC2 Bus isolation for AC Pwr Transfer Cable installation accomplished in MNB FPC2 Actions Column. No additional bus isolation steps reqd (20) Motor B remains (21) Buses remain pwrd (22) Vlv holds position. Loss of redundant hyd NLG deploy and NWS hyd redundancy, if failed closed (23) Hyd Sys 1 still available for
(CDR's SEAT) • CDR SEAT PWR BUS SEL − AC3 (dn)		CDR Seat Adj via AC2 pwr		
(PLT's SEAT) • PLT SEAT PWR BUS SEL − AC3 (dn)		PLT Seat Adj via AC2 pwr		
If Cab Temp Cntlr 1 active: (L1) • CAB TEMP CNTLR − OFF	17	Cabin Temp Cntlr 1 and Hx Byp vlv Mtr 1		
(MD44F) • Remove pin from PRI Actuator and BYP vlv linkage • Connect linkage to SEC Actuator				
(L1) • CAB TEMP CNTLR − 2				
• Perform LOSS OF 1 FC (ORB PKT, PWRDN)				
	18 10	Freon Loop 1 Cntlr A Rad Byp Vlv Mtr Freon Loop 1 Flow Prop Vlv		

19 BUS ISOLATION				
ONLY ON MCC CALL, PERFORM				
(L1) • H2O PUMP LOOP 1 − OFF • 2 − ON				
(L4:N) • cb AC2 ΦC RAD ISOL A − op	20	Freon Loop 1,2 Rad Isol Motor A		
• MDU CRT 2 PWR − OFF				
(C2) • IDP/CRT 2 PWR − OFF				
(O15:F) • MMU 2 − OFF				
(A7L) • MADS RCDR PWR − OFF		MADS Rcdr All MADS and ACIP data		
(MA73C:A) • MCA LOGIC MNB FWD 2 − OFF		MNB FMC2 Bus pwr		
(O15:C) • cb MNB FIRE SUPPR BAY 1 − op	21	MNB Pwr to CNTL Buses AB1,AB2,AB3,BC1,BC2,BC3		
	22 23	NLG B/U Rel and Ext Sys 2 LMG,RMG B/U Rel Sys 2 LG Extend Vlv 2 NWS Hyd Sys 2		
		−Y Star Trkr Dr Sys 2 OP/CL capability −Z Star Trkr Dr Sys 1 OP/CL capability		
		(Continued)		

EPS SSR−31 (Cont)
BUS LOSS: MNB FPC2

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
		L,R ADP Dpy Mtrs 2 Htr Cntlr 2 RH Vents 1,2,6,8,9 Mtrs 2 LH Vents 1,2,3,5,8,9 Mtrs 2		(2) Will be repwrd after AC Pwr Transfer Cable connected
	24	ET Door Mtrs: C/L Lat Actr 1 Mtr 2 L Dr Uplock Lat Mtr 2 R Dr Closure Mtr 2 Uplock Lat Mtr 2		(24) Redundant mtrs remain
		Tacan 2		(25) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison. May be repwrd after AC Pwr Transfer Cable connected
	25 26 26 2	Port RMS: MPM Mtr 2 Fwd MRL Mtr 1 Mid MRL Mtr 2 D&C B/U edge ltg		(26) Single mtr time. May be repwrd after AC Pwr Transfer Cable connected
	27	Ku Ant Sto/Dpy Mtr 2		(27) ✓MCC for stow reqmts
		PL Reten Sys B Rel/Lat Mtrs		
		Port,Stbd Rad Lat 1−6 Mtrs 2		

EPS SSR−32
BUS LOSS: MNB MPC2

(Includes MNB MMC1, MNB MMC2, MNB MMC3, MNB MMC4)

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 • Perform MNB BUS TIE (BUS TIE Cue Card) • Monitor, record Δamps between FC2 and tied FC	1 FC2 Purge Vlv O2,H2 Flow Xdcrs 1 SS ΔV Snsrs	2 (L2) O2 SYS 2 SPLY tb − CL	(1) Buses are tied due to: Loss of FC2 Purge Capability. As FC2 loses performance, tied FC will pick up load, slowing FC2 degradation. If degradation projection does not allow nominal EOM, Fuel Cell will be shut down. ✓MCC and Loss of FC2 SSΔV Snsrs. Change in ΔAmps > 12 amps indicates possible cell crossover problem. The ΔAmps shift due to loss of FC2 purge capability is indicated by change in ΔAmps between pre− and post−purge readings. MCC will aid in this determination
(R1) • PL CAB − MNA	3 MNB pwr to CABPL1,2,3 Buses	(LIGHTS LOST) PLB Fwd Blkhd Floodlt Mid Port Floodlt Fwd Stbd Floodlt	
(A8L) • PORT RMS HTR B − OFF • PORT RMS HTR A − AUTO	Port RMS: B/U pwr 4 MPM Mtr 2 5 Fwd MRL Mtr 1 5 Mid MRL Mtr 2 Htr B	(A8L) PORT RMS: DPY/STO tb − bp RETEN LAT tb − bp R−F−L FWD tb − bp	
(L1) • TOP EVAP HTR DUCT − A If Hi Load Evap enabled • HI LOAD DUCT HTR − A(C)	Top Evap Duct Fwd,Aft Htrs B HI Load Duct Inbd,Outbd Htrs B	SM 94 PDRS CONTROL Indications lost: MPM Mtr 2 STO/DPY Fwd MRL Mtr 1 LAT/REL/RDY Mid MRL Mtr 2 LAT/REL/RDY	
(L2) • FLASH EVAP FDLN HTR A SPLY − 1	FES H2O Fdln A Mid 2 Htr 2	(R13L) During Rad Dpy ops: RAD CNTL tbs (two) indicate single mtr ops	
(A12) • HYD HTR AFT FUS B − AUTO • HYD HTR AFT FUS A − OFF	Aft Fuselage Hyd Htrs A	If in RDR/Comm Track, will break track (A1U) SIG STRENGTH − 0 SM 201 ANTENNA SIG STR − 0 Erratic antenna motion	
(MA73C:C,D) 6 • cb MCA PWR AC2 3Φ MID 2 − op 6 • cb MCA PWR AC2 3Φ MID 4 − op	6 Stbd Rad Lat 1−6 Mtr 2 Limit sw 6 Port Rad Lat 1−6 Mtr 2 Limit sw	SM (BFS SM 63) PL BAY DOORS If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG' During MAN PLBD OP/CL single mtr run time noted on actuators listed at left	(2) Vlv holds position (3) Pwrs PL Timing Buffer, OIU 1, and OIU 2 (if flown). OIU 1 redundant pwr MNA MPC1 via CAB PL3
For PLBD ops: • OP/CL Drs in man mode	PLBD: C/L Lat 13−16 Mtr 2 Stbd Aft Blkhd Lat Mtr 2 Port Door Mtr 2 Port,Stbd Fwd Blkhd Lat Mtr 2 Stbd Door Mtr 2 Port,Stbd Door Mtr 1 CL Limit sw		(4) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison (5) Single mtr time
(R14:C) cb MNB KU • ELEC − op • ANT HTR − op • CABLE HTR − op cb MNC KU • SIG PROC − op		S177 EXTERNAL AIRLOCK Indications lost: EXT A/L PRESS	(6) If AC2 cbs not opened, Lat Mtrs 2 of actuators for Port and Stbd Rad Lat 1−6 continues to run until Sys B Lat Cntl sw placed to OFF
(ML86B:C) 7 • cb MNA EXT ARLK HTR STRUC − cl	7 Ext A/L Structural Htrs MNB pwr	SM 212 OIU OIU 2 TEMP ≥ 140 SM 62 PCMMU/PL COMM If OIU 2 active msg, 'S62 PDI DECOM FAIL'	(7) MNA htrs remain
If OIU reqd, ✓MCC: (SSP 1) • OIU PWR − OIU 1 ON	3 OIU 2 OIU 1 MNB pwr		
(AIL) • S−BD PL PWR SYS − 1 • CNTL − PNL • − CMD			
(Continued)	(Continued)		

EPS SSR−32 (Cont)
BUS LOSS: MNB MPC2

BUS ISOLATION		EQUIP/FUNCTION LOST
ONLY ON MCC CALL, PERFORM		
(R11U) • FC PURGE VLV 2 − CL • FC STARTUP HTR 2 − ENA		FC2 Startup Htr Inhibit capability
(A7U) PL BAY FLOOD • FWD BHD − OFF • MID PORT − OFF • FWD STBD − OFF		PLB Fwd Blkhd Floodlt Mid Port Floodlt Fwd Stbd Floodlt
ONLY ON MCC CALL, PERFORM		
(A7L) IF DOCKING MISSION • cb DEP MNB SYS 2 VENT ISOL − op • cb DEP MNB SYS 2 VENT − op		Vest Dep Vlv Sys 2 Vent Vent Is
(A7L) IF DOCKING MISSION cb DOCK LT MNB • TRUSS AFT − op • VEST STBD − op • SYS PWR SYS 2 MNB − OFF • PSU PWR MNB − OFF cb MNB • LOGIC 1 − op • 2 − op LIGHTS • AIRLK 2/3 MNB − OFF		MNB A7 Aft Truss Docking lt Stbd Vestibule Docking lt DSP SYS 2 pwr 8 PSU MNB pwr 9 MNB pwr to DSP Logic buses 1,2 External Airlock lts 2,3
(A7L) • MADS PCM − OFF		MADS PCM
(MA73C:A,B) • MCA LOGIC MNB MID (four) − OFF		MNB MMC1,2,3,4 Bus pwr
	10 2	10 Freon Loop 2 Cntlr A Rad Byp Vlv Mtr Man Cntl 2 Atm Press Cntl O2 Sys 2 Sply Vlv Cntl
	11	11 Port,Stbd Rad Mtrs 2 Dpy capability LH Vent 3,5 Mtrs 2 RH Vent 6 Mtrs 2
	12	12 MNB pwr to ESS1BC, ESS3AB AUX PLB BUS Pwr
	13 14 15 16	13 Ku Ant Sto/Dpy Mtr 2 Sto and Dpy Limit sw 14 Ku−Bd Sys Deployed Assy including Htr Ckts (Rdr & Comm) 15 Redundant Ku−Bd Xmit Enable 16 Redundant Ku−Bd Boom Stow Enable II Excitation Signal
(A15:H,I,J,K) • cb MNB TK6−TK9 O2 HTR SNSR 2 − op	17	17 Cryo O2 Tk 6−9 Htr Current Snsr 2
		FC1 Redundant Reac Vlv Close Cntl on pnl C3
(ML86B:C) 7 • cb MNB EXT ARLK HTR STRUC − op	7	7 Ext A/L Structural Htrs MNB pwr

CREW INDICATIONS	NOTES
DSP SYS PWR SYS 2 tb − OFF	(2) Vlv holds position (7) MNA htrs remain (8) All docking mechanisms will have single mtr times (9) Logic buses 1(2) remain pwrd via MNA(MNC) (10) Cntlrs, A,B Rad Byp Vlv Mtrs Auto Cntl and Cntlr B Rad Byp Vlv Mtr Man Cntl remain (11) Mtr 2 stow capability remains (12) Buses remain pwrd (13) With an inoperative limit sw, mtr will continue to run until DPY/STO sw placed to GND position (14) KU−BAND ANTENNA: CONTINGENCY STOW − W/EVA ANT GIMBAL ALIGNMENT (IFM) reqd to stow Ku−Bd. Jettison reqd if ant cannot be positioned within GO FOR PLBD CLOSURE envelope (15) MNC MMC2 pwr for Ku−Bd Xmit Enable signal remains (16) MNC MMC2 pwr remains to supply pwr to Boom stow Enable II signal for stow mtrs (17) Snsr 1 remains

EPS SSR−33
BUS LOSS: MNB APC2

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
Refer to OMS/RCS Slide Rule for vlv loss info	1 Aft L,R RCS He Pr Isol A man OP capability	2 MASTER ALARM Light/ Tone − on	(1) Man CL and full GPC cntl remains. Vlv holds position
3 Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT R RCS He PRESS A,B • L RCS He PRESS A	4 Aft R RCS He Pr Isol B GPC Cntl and man CL capability	If OMS GMBL cmd abs value > 2 deg and Sec TVC selected: C/W OMS TVC lt − on 'L OMS GMBL' (3,B)	(2) Indications do not appear until jet commanded
• For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS)	5 RCS Manf R5 RJD pwr (R5R,R5D)	(F7) 2 C/W RCS JET lt − on	(3) Do not reconfig for reg switch or I'CNCT procedures
(A12) APU HTR TK/FU LINE/H2O • SYS 1A − AUTO • 1B − OFF HYD HTR RUD SPD • BK A − AUTO • B − OFF	APU 1 GG Inj H2O Htrs B Rudder/Speed Brake Htr B 6 APU 2 Fu TK Vlv A CL capability via APU 2 Auto Shutdn Signal	(FSM) 2 R RCS D, R JET	(4) Man OP capability remains. Vlv holds position
7 Prior to using L(R) OMS: (O8) 8 L OMS He PRESS/VAP ISOL 7 • A − GPC • B − OP 10 R OMS He PRESS/VAP ISOL • A(B) − GPC • B(A) − CL	9 Left OMS He Pr Isol B and Vap Isol 2 GPC Cntl 11 Right OMS He Pr Isol A,B man Cntl and Vap Isol 1,2 man A,B Cntl		(5) Manf status not automatically declared closed. Fail−offs will occur when jet commanded
(A14) RCS/OMS HTR • R POD (two) − A OFF, B AUTO • OMS CRSFD LINES − A AUTO, B OFF • L POD (two) − A AUTO, B OFF	12 Right Pod A Htrs (all) 13 Left Pod B Htrs (partial) 13 OMS Crsfd Ln B Htrs (all)		(6) In event of APU 2 auto shutdn, vlv remains OP until pwr removed by APU FUEL TK VLV sw throw
GNC XXXXX MNVR YYYYY Sel L OMS PRI TVC: • GMBL L PRI − ITEM 28 EXEC	L OMS Sec TVC		(7) Lost TM: GNC SYS SUMM 2 L OMS ENG VLV 2: assume VLV 2 status same as VLV 1
			(8) Maintains He Isol redundancy
			(9) Man cntl remains. Vap Isol closes. Pr Isol normally closed
			(10) Prevents simultaneous opening of parallel reg paths and possibly rupturing burst disk
			(11) GPC cntl remains. Vlv fail closed
			(12) B Htrs remain
			(13) A Htrs remain
			(14) Six vlvs fail to non−isolation position

BUS ISOLATION	EQUIP/FUNCTION LOST
ONLY ON MCC CALL, PERFORM	
(R1) • PL AFT MNB − OFF	Aft PL MNB pwr
	14 ASA 4 Isol ATVC 4 Isol ME

EPS SSR−34
BUS LOSS: MNB APC5

(Includes MNB APC2, MNB ALC2, MNB AMC2)

	ACTIONS		EQUIP/FUNCTION LOST
	(A12) APU HTR		
2	• GAS GEN/FUEL PUMP 1 − A AUTO		APU 1 GG/Fu Pump Htrs B
2	• GAS GEN/FUEL PUMP 2 − B AUTO		APU 2 GG/Fu Pump Htrs A
	• LUBE OIL LINE 1 − A AUTO		APU 1 Lube Oil Line Htrs B
	• LUBE OIL LINE 2 − B AUTO		APU 2 Lube Oil Line Htrs A
	APU HTR TK/FU LINE/H2O		
2	• SYS 1A − AUTO		APU 1 Tk/Fu Line Htr B
2	• 1B − OFF		GG Inj H2O Htrs B
2	• 2A − OFF		2 Tk/Fu Line Htr A
2	• 2B − AUTO		
	HYD HTR		
	• RUD SPD BK A − AUTO		
	• B − OFF		Body Flap Htr B
	• BDY FLP A − AUTO		Elev Act Htr B
	• B − OFF		
	• ELEV A − AUTO		Rudder/Speed Brake Htr B
	• B − OFF		
	HYD CIRC PUMP		
	• PWR 1 − MNA		Circ Pump 1 MNB pwr
	• 2 − MNC		2 MNB pwr
	(L1)		
	• FLASH EVAP CNTLR PRI A(B) − ON (if reqd)		FES Sec Cntlr
	• TOP EVAP HTR NOZ L − A AUTO		Top Evap L Noz Htr B
	• TOP EVAP HTR NOZ R − B AUTO		Top Evap R Noz Htr A
	• TOP EVAP HTR DUCT − A		Top Evap Duct L,R Htrs B
	If Hi Load Evap enabled		Hi Load Duct Noz Htr B
	• HI LOAD DUCT HTR − A(C)		
	(L2)		
	• FLASH EVAP FDLN HTR A SPLY − 1		FES H2O Fdln A Htrs 2 (all except Mid 2)
	(R2)		
	• BLR CNTLR/HTR 1 − B		Hyd H2O Blr 1 Cntlr A
	• 2 − A		2 Cntlr B
	• For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS)	7	RCS Manf R5 RJD pwr (R5R,R5D)
	Refer to OMS/RCS Slide Rule for vlv loss info	8	Aft L RCS He Pr Isol A man OP capability
9	Reconfig following vlv(s) only if leak isolation reqd:	8	Aft R RCS He Pr Isol A man OP capability
	(O7)	5	Aft R RCS He Pr Isol B GPC Cntl and man Cl capability
	• AFT R RCS He PRESS A,B		
	• L RCS He PRESS A		
	GNC 23 RCS		Aft RCS L,R Jets 1 Htrs
	• Reprioritize L,R Manf 1 Jets to first priority: DES INH twice all other jets; highest priority first, then next highest, etc		
	• Set aft pod(s) PRI JET FAIL LIMIT to 3		
	If ICNCT config:		
	(O7)		
6	• AFT L RCS TK ISOL 3/4/5 B − GPC (tb−bp)		AFT L,R RCS TK ISOL 3/4/5 B CL microswitch feedback
	• AFT R RCS TK ISOL 3/4/5 B − GPC (tb−bp)		
	(Continued)		(Continued)

	CREW INDICATIONS
1	MASTER ALARM Light/Tone − on
	(R4)
3	HYD MPS/TVC ISOL VLV SYS 2 tb − CL
4	HYD BRAKE ISOL VLV 2 tb − OP
	(O7)
5	AFT R RCS He PRESS B tb − bp
6	AFT L,R RCS TK ISOL 3/4/5 B tb − bp (if vlv in CL position)
	(F7)
	If APUs active and using BLR CNTLR/HTR 1A or 2B:
	C/W APU TEMP lt − on after ~ 2 min
	If OMS GMBL cmd abs valve > 2 deg and Sec TVC selected:
	C/W OMS TVC lt − on 'L OMS GMBL' (3,B)
	If first RGA failure and rates sensed:
	'RM FAIL RGA' (3)
	(F7)
1	C/W RCS JET lt − on
	(FSM)
1	R RCS D,R JET

NOTES

(1) Indications do not appear until jet commanded

(2) * TIME CRITICAL *
If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp

(3) Vlv holds position

(4) Vlv holds position. Loss of redundant hyd NLG deploy and NWS hyd redundancy if failed closed

(5) Man OP capability remains. Vlv holds position

(6) Full vlv capability remains. If switch in CL, vlv will continuously drive to CL position

(7) Manf status not automatically declared closed. Fail−offs will occur when jet commanded

(8) Man CL and GPC cntl remains. Vlv holds position

(9) Do not reconfig for reg switch or I'CNCT procedures

EPS SSR−34 (Cont)
BUS LOSS: MNB APC5

ACTIONS		EQUIP/FUNCTION LOST
(A14) RCS/OMS HTR • R POD (two) − A OFF, B AUTO • L POD (two) − A AUTO, B OFF • CRSFD LINES − A AUTO, B OFF	10 11 11	R Pod A Htrs (all) L Pod B Htrs (partial) OMS Crsfd Ln Htrs B
(O8) • If Straight feed config, Right OMS Crossfeed A − OP (tb−OP). Otherwise, ✓MCC 13 • Right OMS TK ISOL A − CL (tb−CL)	12	OMS Engine/Crossfeed Valve Redundancy OMS Eng/XFeed Redundancy
Prior to using L(R) OMS: (O8) 14 L OMS He PRESS/VAP ISOL 16 • A − GPC • B − OP 18 R OMS He PRESS/VAP ISOL • A(B) − GPC • B(A) − CL	15 17	Left OMS He Pr Isol B and Vap Isol 2 GPC Cntl Right OMS He Pr Isol A,B man Cntl and Vap Isol 1,2 man OP
For SSME Hyd Repress: (R4) • HYD MPS/TVC ISOL VLV SYS 1,3 (two) − OP, wait 10 sec, then CL	3	MPS/TVC Hyd Sys 2 Isol Cntl
GNC XXXXX MNVR YYYYY Sel L OMS PRI TVC: • GMBL L PRI − ITEM 28 EXEC		L OMS Sec TVC
If reqd during entry (< 120K ft): (L1) • NH3 CNTLR A(B) − PRC/GPC	19	NH3 Sys B Sec Cntlr man ON capability

BUS ISOLATION		EQUIP/FUNCTION LOST
ONLY ON MCC CALL, PERFORM		
(R1) • PL AFT MNB − OFF		Aft PL MNB pwr
(O15:A) • RGA 2 − OFF		RGA 2
	20	ASA 4 Isol ATVC 3 Main Eng Isol 4 Main Eng Isol
(MA73C:B) • MCA LOGIC MNB AFT 2 − OFF		MNB AMC 2 Bus pwr LH,RH Vents 8,9 Mtrs 2
	21 22	L OMS Eng Press Vlv Coil 2, Cntl Vlv 1,2 Coil 2 OMS Qty Gaging for all L OMS Single engine burns
	23 24	NWS Hyd Sys 2 Hyd Brake Isol Vlv 2 Cntl
	25 25	Hyd Main Pump 1 Depress Solenoid RPC B Hyd Main Pump 2 Depress Solenoid RPC A

(Continued)

CREW INDICATIONS	NOTES
	(3) Vlv holds position (10) B Htrs remain (11) A Htrs remain (12) Maintain deorbit capability for MNC DA3 failure (13) Maintains deorbit capability for CNTL AB1 failure (14) Maintains He Isol redundancy (15) Man cntl remains. Vap Isol closes. Primary Isol normally closed (16) Lost TM: GNC SYS SUMM 2 L OMS ENG VLV 2: Assume Vlv 2 status same as Vlv 1 (17) GPC cntl remains. Vlv fails closed (18) Prevents simultaneous opening of parallel reg paths and possibly rupturing burst disk (19) Sys B Pri Cntlr, auto switchover to Sec Cntlr remain (20) Six vlvs fail to nonisolation position (21) Redundant coils remain (22) ✓MCC for OMS Qtys (23) Hyd Sys 1 still available for NWS (24) Vlv holds position. Loss of redundant hyd NLG deploy and NWS hyd redundancy if failed closed (25) Redundant RPC remains

EPS SSR−34 (Cont)
BUS LOSS: MNB APC5

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
		Freon Loop 1 Cold Plate Flow Xdcr	L MPS He Reg A < 680 during entry (MM 303)	(26) Pwr Sply A remains. Turbine speed ind lost
	26	APU 1 Cntlr Pwr Sply B		(27) Vlv A remains
	27	Fu Tk Vlv B		(28) Pwr Sply B remains. GG Bed T and GBX P ind lost when APU running
	28	2 Cntlr Pwr Sply A		(29) Vlv B remains
	29	Fu Tk Vlv A		(30) Vlv fails closed
		GBX GN2 Repress Vlv		(31) Vlv fails closed. Redundant vlv remains
		MPS:		(32) Vlv holds position. Loss of manual capability to inert LO2 and LH2 manfs
	30	L Eng He Intercon Outlet Vlv		(33) Vlv fails closed. LH2 Manf will not be pressurized with He during entry (MM304)
	31	L Eng He Isol A		(34) Redundant mtrs remain
		Pneu He Isol 2		(35) Actuators continue to operate until Stow, Rel/Lat, or OP/CL sw is taken to OFF
	32	Prplt F/D Inbd LO2 Vlv		
	32	Outbd LH2 Vlv		
	33	Manf Repress LH2 Vlv 1,2		
	34	ET Door Mtrs:		
		C/L Lat Actr 1 Mtr 2 GPC Cntl		
		L Dr Uplock Lat Mtr 2 GPC Lat capability		
		R Dr Uplock Lat Mtr 2 GPC Lat capability		
		R Dr Closure Mtr 2 GPC CL capability		
	35	AC pwr removal capability via Limit sw for ET Dr Mtrs:		
		C/L Lat Actr 1 Mtr 2		
		L Dr Uplock Lat Mtr 2		
		R Dr Uplock Lat Mtr 2		
		Closure Mtr 2		

EPS SSR−35
BUS LOSS: MNB FLC2

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
Refer to OMS/RCS Slide Rule for valve loss info	1 Fwd RCS He Press Isol A man OP capability 4 Fwd RCS He Press Isol B man CL and GPC Cntl	2 MASTER ALARM Light/Tone − on	(1) Man CL and full GPC cntl remains. Vlv holds position
3 Reconfig following vlv(s) only if leak isolation reqd: (O8) • FWD RCS He PRESS A,B		2 (F7) C/W RCS JET lt − on	(2) Indications do not appear until jet commanded
(A1L) S−BD PM • ANT SW ELEC − 2 • XPNDR − 2 • PWR AMPL OPER − 2 • STBY − 2 • PRE AMP − 2 • NSP PWR − 2	S−BD PM Sys 1: Xpnder 1 Pre Amp 1 Pwr Amp 1 FM, PM Auto sw 1 NSP 1	(COMM LOST) All S−BD A/G voice lost if Sys 1 selected	(3) Do not reconfig for reg switch or I'CNCT procedures
If PSP and/or INTRG reqd for PL or ISS ops: • S−BD PL PWR SYS − 2 • CNTL − PNL • − CMD 6 • Reconfig PSP 6 • Perform PL INTRG REACQ (if reqd)	S−BD PL Intrg 1 PSP 1	(FSM) 2 'F RCS D(F,R,U) JET'	(4) Man OP capability remains. Vlv holds position
If no comm: (C3) • S−BD PM CNTL − PNL • − CMD		If site AOS and using S−BD ANT ELEC 1: 5 'ANTENNA' (2)	(5) FSM caused by antenna miscompare
8 If OIU reqd: (SSP) • OIU PWR − OIU 2 ON • OIU tb − DN • ✓MCC, OIU reconfig		If sys 1 pwrd: 'S62 BCE BYP PSP1' Loss of PL TLM and CMD	(6) REACQ and PSP reconfig procedures are flight specific. If reqd, procedure can be found in payload or ISS specific books
(A1R) • S−BD FM PWR − 2	S−BD FM Sys 1	If PDI FDA enabled: 'S62 PDI DECOM FAIL'	(7) When gear deployed, tb will not indicate DN
9 GNC 23 RCS Override F2 Manf status to CL: • RCS FWD − ITEM 1 EXEC • MANF VLVS 2 OVRD − ITEM 41 EXEC	RCS Manf F2 RJD pwr (F2F,F2R,F2U,F2D)	If NSP 1 selected, 'BCE STRG 1 NSP'	(8) OIU 2 interfaces with PSP 2 for commanding
Pre−seat ingress: • Discharge handheld fire ext into AV BAY 1	Av Bay 1 agent discharge capability	(F6/F8) 7 LDG GEAR L,NOSE tb − bp	(9) Manf status not automatically declared closed. Jet fail−offs may occur
		4 (O8) FWD RCS He PRESS B tb − bp	(10) Htr Cntlr 1 remains

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(O15:C) • cb MNB FIRE SUPPR BAY 1 − op

10 L,R ADP Htr Cntlr 2

LMG, NLG, B/U Rel 2 Fire 2, Arm

EPS SSR−36
BUS LOSS: MNB ALC2

	ACTIONS		EQUIP/FUNCTION LOST
	(A12) APU HTR		
2	• GAS GEN/FUEL PUMP 1 − A AUTO		APU 1 GG/Fu Pump Htrs B
2	• GAS GEN/FUEL PUMP 2 − B AUTO		APU 2 GG/Fu Pump Htrs A
	• LUBE OIL LINE 1 − A AUTO		APU 1 Lube Oil Line Htrs B
	• LUBE OIL LINE 2 − B AUTO		APU 2 Lube Oil Line Htrs A
	APU HTR TK/FU LINE/H2O		
2	• SYS 1A − AUTO		
	• 1B − OFF		APU 1 Tk/Fu Line Htr B
	• 2A − OFF		
2	• 2B − AUTO		APU 2 Tk/Fu Line Htr A
	HYD HTR		
	• RUD SPD BRK A − AUTO		Body Flap Htr B
	• B − OFF		
	• BDY FLP A − AUTO		Elev Act Htr B
	• B − OFF		
	• ELEV A − AUTO		Rud/Spd Brake Htr B
	• B − OFF		
	HYD CIRC PUMP		
	• PWR 1 − MNA		Circ Pump 1 MNB pwr
	• 2 − MNC		2 MNB pwr
	(L1)		
	• FLASH EVAP CNTLR PRI A(B) − ON (if reqd)		FES Sec Cntlr
	TOP EVAP HTR		
	• NOZ L − A AUTO		Top Evap L Noz Htr B
	• R − B AUTO		R Noz Htr A
	• DUCT − A		Duct L,R Htrs B
	If Hi Load Evap enabled:		
	• HI LOAD DUCT HTR − A(C)		HI Load Duct Noz Htr B
	(L2)		
	• FLASH EVAP FDLN HTR A SPLY − 1		FES H2O Fdln A Htrs 2 (all except Mid 2)
	(R2)		
	• BLR CNTLR/HTR 1 − B	8	Hyd H2O Blr 1 Cntlr A
	• 2 − A	8	2 Cntlr B
	Refer to OMS/RCS Slide Rule for vlv loss info	7	Aft L,R RCS He Pr Isol A man OP capability
9	Reconfig following vlv(s) only if leak isolation reqd:	5	Aft R RCS He Pr Isol B GPC Cntl and man CL capability
	(O7)		
	• AFT R RCS He PRESS A,B		
	• L RCS He PRESS A		
	For attitude control:	10	RCS Manf R5 RJD pwr (R5R,R5D)
	• Perform LOSS OF VERNIERS (ORB OPS, RCS)		
	GNC 23 RCS		
	• Reprioritize L,R Manf 1 Jets to first priority: DES INH twice all other jets; highest priority first, then next highest, etc		Aft L,R RCS Jet 1 Htrs
	• Set aft pod(s) PRI JET FAIL LIMIT to 6		
	(A14)		
	• RCS/OMS HTR OMS CRSFD LINES (two) − A AUTO, B OFF		OMS Crsfd Ln B Htrs (partial)
	(Continued)		(Continued)

	CREW INDICATIONS
1	MASTER ALARM Light/ Tone − on
	(R4)
3	HYD BRAKE ISOL VLV 2 tb − OP
4	HYD MPS/TVC ISOL VLV SYS 2 tb − CL
	(O7)
5	AFT R RCS He PRESS B tb − bp
6	AFT L,R RCS TK ISOL 3/4/5 B tb − bp (if vlv in CL position)
	(F7) If APUs active and using BLR CNTLR/HTR 1A or 2B: C/W APU TEMP lt − on after ~2 min
	(F7)
1	C/W RCS JET lt − on
	(FSM)
1	R RCS D,R JET

NOTES

(1) Indications do not appear until jet commanded

(2) * TIME CRITICAL *
If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp

(3) Vlv holds position. Loss of redundant hyd NLG deploy and NWS hyd redundancy if failed closed

(4) Vlv holds position

(5) Man OP capability remains. Vlv holds position

(6) Full vlv capability remains. If switch in CL, vlv will continuously drive to Cl position

(7) Man CL and full GPC Cntl remains. Vlv holds position

(8) HYD H2O Blr and Tk Htrs still operative, but GN2 SOV fails open and steam vent htr and spray logic are disabled. Alternate controller must be selected

(9) Do not reconfig for reg switch or I'CNCT procedures

(10) Manf status not automatically declared closed. Fail−offs will occur when jet commanded

EPS SSR−36 (Cont)
BUS LOSS: MNB ALC2

	ACTIONS		EQUIP/FUNCTION LOST
6	If ICNCT config: (O7) • AFT L RCS TK ISOL 3/4/5 B − GPC (tb−bp) • AFT R RCS TK ISOL 3/4/5 B − GPC (tb−bp)	6	AFT L,R RCS TK ISOL 3/4/5 B CL microswitch feedback
	(O8) • Right OMS TK ISOL A − CL (tb−CL)	11	OMS Eng/Xfeed Redundancy
12	Prior to using L OMS: (O8) L OMS He PRESS/VAP ISOL • A − GPC • B − OP	13	L OMS He Pr Isol B GPC Cntl
	For SSME Hyd Repress: (R4) • HYD MPS/TVC ISOL VLV SYS 1,3 (two) − OP • Wait 10 sec, then CL	4	MPS/TVC Hyd Sys 2 Isol Cntl
	If reqd during entry (< 120K ft): (L1) • NH3 CNTLR A(B) − PRI/GPC	14	NH3 Sys B Sec Cntlr man ON capability

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

	EQUIP/FUNCTION LOST
13	L OMS Eng Pr Vlv Coil 2 and Cntl Vlv 1,2 Coils 2
15	OMS Qty gauging for all L OMS single engine burns
16	APU 1 Fu Tk Vlv B
16	2 Fu Tk Vlv A
4	TVC Hyd Sys 2 Isol Cntl
3	Hyd Brake Isol 2 Cnt
17	NWS Hyd Sys 2
	MPS:
18	L Eng He Intercon Outlet Vlv
16	L Eng He Isol A
16	Pneu He Isol 2
19	Prplt F/D Inbd LO2 Vlv
19	Outbd LH2 Vlv
20	Manf Repress LH2 Vlv 1,2

CREW INDICATIONS
L MPS He Reg A < 680 during entry (MM303)

NOTES
(3) Vlv holds position. Loss of redundant hyd NLG deploy and NWS hyd redundancy if failed closed
(4) Vlv holds position
(6) Full vlv capability remains. If switch in CL, vlv will continuously drive to Cl position
(11) Maintains deorbit capability for CNTL AB1 failure
(12) To maintain He Isol redundancy
(13) Man cntl remains
(14) Sys B Pri Cntlr, auto switchover to Sec Cntlr remain
(15) ✓MCC for OMS Qtys
(16) Vlv fails closed. Redundant vlv remains
(17) Hyd Sys 1 still available for NWS
(18) Vlv fails closed
(19) Vlv holds position. Loss of manual capability to inert LO2,LH2 Manfs
(20) Vlv fails closed. LH2 Manf will not be pressurized with He during entry (MM304)

EPS SSR−37
BUS LOSS: MNB FMC2

ACTIONS
(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl
(L1) • H2O PUMP LOOP 1 − A
Refer to OMS/RCS Slide Rule for vlv loss info GNC 23 RCS Override F2 Manf status to OP • RCS FWD ITEM 1 EXEC • MANF VLVS 2 OVRD ITEM 41 EXEC

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:A) • MCA LOGIC MNB FWD 2 − OFF

EQUIP/FUNCTION LOST
H2O Loop 1 Pump B
MNB FMC2 Bus pwr L,R Vents 1,2 Mtrs 2 1 ADP Deploy Mtrs 2 Deploy Disc 2 2 Htr Cntlr 2 1 −Y Star Trkr Dr Sys 2 OP/CL capability 1 −Z Star Trkr Dr Sys 1 OP/CL capability

CREW INDICATIONS
MASTER ALARM Light/ Tone − on
(F7) SM ALERT Light/Tone − on
(FSM) RM DLMA MANF
(O8) FWD RCS MANF ISOL 2 tb − bp
If H2O PUMP LOOP 1,B ON: C/W H2O LOOP lt − on 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP' 'S88 H2O PUMP P 1' (O1) H2O PUMP OUT PRESS LOOP 1 ind − 20−25 psia
L,R ADP deploy time incr from 15 to 30 sec
STAR TRKR DRS POS −Y,−Z OP/CL time incr from 8 to 16 sec

NOTES
(1) Redundant mtr remains (2) Htr Cntlr 1 remains

EPS SSR−38
BUS LOSS: MNB MMC1

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:A) • MCA LOGIC MNB MID 1 − OFF

EQUIP/FUNCTION LOST
MNB MMC1 Bus pwr
LH Vent 5 Mtr 2

CREW INDICATIONS
NONE

NOTES

EPS SSR−39
BUS LOSS: MNB MMC2

ACTIONS
(MA73C:C) 1 • cb MCA PWR AC2 3Φ MID 2 − op
For PLBD ops: • OP/CL Drs in man mode MANUAL PLBD CLOSING (DEORBIT PREP)

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:A) • MCA LOGIC MNB MID 2 − OFF

EQUIP/FUNCTION LOST
1 Stbd Rad Lat 1−6 Mtr 2 Limit sw 2 Stbd Rad Mtr 2 Dpy capability
PLBD: C/L Lat 13−16 Mtr 2 Stbd Aft Blkhd Lat Mtr 2 Port Door Mtr 2 Stbd Door Mtr 1 CL Limit sw
MNB MMC2 Bus pwr
Port RMS: 3 MPM Mtr 2 4 Fwd MRL Mtr 1
LH Vent 3 Mtr 2

CREW INDICATIONS
SM (BFS SM 63) PL BAY DOORS
If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG'
During MAN PLBD OP/CL, single mtr run time noted on actuators listed at left
(A8L) PORT RMS: RETEN LAT tb − bp R−F−L FWD tb − bp
SM 94 PDRS CONTROL
Indication lost: Mid MRL Mtr 1 LAT/REL/RDY
(R13L) During RAD Dpy ops: RAD CNTL STBD tb indicates single mtr ops

NOTES
(1) If AC2 cb not opened, Lat Mtr 2 of Stbd Lat 1−6 Actuator continues to run until Sys B Lat Control sw placed to OFF
(2) Mtr 2 stow capability remains
(3) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison
(4) Single mtr time

EPS SSR−40
BUS LOSS: MNB MMC3

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:B) • MCA LOGIC MNB MID 3 − OFF

EQUIP/FUNCTION LOST
MNB MMC3 Bus pwr

CREW INDICATIONS	NOTES
NONE	

EPS SSR−41
BUS LOSS: MNB MMC4

	ACTIONS
1	(MA73C:D) • cb MCA PWR AC2 3Φ MID 4 − op
	For PLBD ops: • OP/CL Drs in man mode MANUAL PLBD CLOSING (DEORBIT PREP)

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:B) • MCA LOGIC MNB MID 4 − OFF

	EQUIP/FUNCTION LOST
1	Port Rad Lat 1−6 Mtr 2 Limit sw
2	Port Rad Mtr 2 Dpy capability
	PLBD: Port,Stbd Fwd Blkhd Lat Mtrs 2 Stbd Door Mtr 2 Port Door Mtr1 CL Limit sw
	MNB MMC4 Bus pwr
	RH Vent 6 Mtr 2
	Port RMS: 3 Mid MRL Mtr 2
4	Ku Ant Sto/Dpy Mtr 2 Sto and Dpy Limit sw
5	Redundant Ku−Band Xmit Enable
6	Redundant Boom Stow Enable II Excitation Signal

CREW INDICATIONS
SM (BFS SM 63) PL BAY DOORS
If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG'
During MAN PLBD OP/CL, single mtr run time noted on actuators listed at left
(R13L) During Rad Dpy ops, RAD CNTL PORT tb indicates single mtr ops
SM 94 PDRS CONTROL
Indications lost: MPM Mtr 2 STO/DPY Mid MRL Mtr 2 LAT/REL/RDY

NOTES
(1) If AC2 cb not opened, Lat Mtr 2 of Port Lat 1−6 Actuator continues to run until Sys B Lat Cntl sw placed to OFF
(2) Mtr 2 stow capability remains
(3) Single mtr time
(4) With inoperative limit sw, mtr will continue to run until DPY/STO sw is placed in GND position
(5) Redundant pwr (MNC) enables Ku−Band xmit
(6) MNC MMC2 pwr remains to supply pwr to Boom Stow Enable II signal for stow mtrs

EPS SSR−42
BUS LOSS: MNB AMC2

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:B) • MCA LOGIC MNB AFT 2 − OFF

	EQUIP/FUNCTION LOST
	MNB AMC2 Bus pwr LH,RH Vents 8,9 Mtrs 2
1	ET Door Mtrs: C/L Lat Actr 1 Mtr 2 GPC Cntl L Dr Uplock Lat Mtr 2 GPC Lat capability R Dr Uplock Lat Mtr 2 GPC Lat capability R Dr Closure Mtr 2 GPC CL capability
2	AC pwr removal capability via Limit sw for ET Dr Mtrs: C/L Lat Actr 1 Mtr 2 L Dr Uplock Lat Mtr 2 R Dr Uplock Lat Mtr 2 Closure Mtr 2

CREW INDICATIONS
NONE

NOTES
(1) Redundant mtrs remain (2) Actuators continue to operate until the Stow, Rel/Lat, or OP/CL sw is taken to OFF

EPS SSR−43
BUS LOSS: MNB R14

ACTIONS		EQUIP/FUNCTION LOST
(A7U) If CCTV reqd: • TV PWR CONTR UNIT − MNA		Video Cntl Unit MNB pwr
(R14:C) • cb MNC KU SIG PROC − op	1	MDU CDR 2 MDU MFD 1 ADC 1B/2B
(A12) If VPU flown • VPU PWR − OFF		VPU OSVS OUT 2A video input to VPU

BUS ISOLATION		
ONLY ON MCC CALL, PERFORM		
• MDU CDR 2 PWR − OFF • MDU MFD 1 PWR − OFF		Middeck ATU
(R14:A) • cb MNB AUD MIDDECK SPKR − op • ADC 1B/2B − op • MDU MFD 1 − op • MDU CDR 2 − op		
(R14:B) • cb MNB CNTL BUS CA1/2/3 − op	2	MNB Pwr for CNTL CA1,2,3 Buses
3 cb PALLET/DSC • 1B − op (EDO) • 4B − op (EDO)		
(R14:C) cb MNB KU • ELEC − op • ANT HTR − op • CABLE HTR − op	4	Ku−Bd Sys Rdr & Comm I/F Cont Unit (EA−1), RDR Sig Proc, Deployed Assy and Deployed Assy Htrs
(R14:D) cb MNB TV A FWD BAY • CAMR/PAN−TILT − op • CAMR HTR − op • PAN−TILT HTR − op cb MNB TV • CONTR UNIT − op • MON 2 − op		TV A Fwd Bay Camr and Pan−Tilt TV A Fwd Bay Camr Htr TV A Fwd Bay Camr Pan−Tilt Htr CCTV Mon 2
(R14:E) • cb MNB OS FLOOD − op cb MNB RMS PORT TV • CAMR/PAN−TILT − op • CAMR HTR − op • PAN−TILT HTR − op		OS Floodlt Port RMS: Camr/Pan−Tilt Camr Htr Camr Pan−Tilt Htr

CREW INDICATIONS	NOTES
CCTV Video and TV Annun lts lost if MNB selected for VCU CCTV Mon 2 lost	(1) IDP3, IDP4 ADC data lost. MDU port select may be reqd (2) MNA and MNC pwr sources remain (3) Redundant pwr source remains for equipment (4) KU−BAND ANTENNA: CONTINGENCY STOW − W/EVA ANT GIMBAL ALIGNMENT (IFM) reqd to stow Ku−Bd. Jettison reqd if antenna cannot be positioned within GO FOR PLBD CLOSURE envelope
OS Floodlt lost	
(FSM) 'BCE BYP KU' (2)	
(A2) Meters: X−PNTR will display 'OFF' flag Digital − display will blank	
(F6) MDU CDR 2 blanks	
(F7) MDU MFD 1 blanks	
OSVS OUT 2A video to ISS is lost	

EPS SSR−44
BUSS LOSS: MNB O15&A8

ACTIONS		EQUIP/FUNCTION LOST
(A8L) • PORT RMS HTR B − OFF • PORT RMS HTR A − AUTO		Port RMS: B/U pwr Htr B

BUS ISOLATION		
ONLY ON MCC CALL, PERFORM		
(C3) • MSTR MADS PWR − OFF		All MADS equipment
	1	RJDF 1A Drivers ON Cntl (Jets F2F,F2R,F2U,F2D)

CREW INDICATIONS	NOTES
NONE	(1) If Driver sw OFF when bus failed, F2 Manf Drivers lost

EPS SSR−45
BUS LOSS: MNB O15

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1	(R1) • BUS TIE MNA − ON (tb−ON)			MASTER ALARM Light/Tone − on	(1) FC1 only one failure away (loss of ESS1BC) from inability to bus tie (2) ACAs recovered by switching to alternate pwr (3) Vlv holds position (4) O2/N2 Cntl Vlv 2 normally closed when unpowered (5) Vlv fails closed. IFM or real−time flow test will be required. ✓MCC for additional direction (6) Current Snsr 1 remains (7) Inhibits Cabin PPO2 B, Cabin O2 Flow 2, Cabin N2 Flow 2, and H2O Loop ICH Flow 2 respectively (8) Inhibits Primary C/W for Cabin PPO2 B, Cabin O2 Flow 2, and Cabin N2 Flow 2 respectively
	(L1) • Perform ON−ORBIT RAD CNTLR SWITCH, ECLS SSR−13 for Freon Loop 1,2		Freon Loop 1,2 Rad Cntlr A	(F7) C/W CAB ATM lt SM ALERT Light/Tone − on Fwd EVENT TIME ind blank	
	(F6,F8) • HSI SEL SOURCE (two) − (other than MLS 2)		MLS 2	(A4) MSN TIME ind blank	
	(F6,F8) • RADAR ALTM − 1		RA 2	(O1) CABIN dP/dT ind − .45 O2/N2 FLOW SNSR 1 ind − 0 pph PPO2 SNSR B,C ind − 0 psia	
	(O6) ANNUN BUS SEL • ACA 1 − MNA • 2/3 − MNC	2 2	ACA 1 MNB pwr 2/3 MNB pwr	(FSMs) S66 CABIN PPO2 B,C S88 H2O LOOP 2 FLOW SM0 TIRE PRESS	
	(A6U) • ANNUN BUS SEL − MNC	2	ACA 4/5 MNB pwr	If ADTA 2, MLS 2, −Y Star Trkr pwrd: BCE STRG 2 ADTA (3,B) BCE STRG 2 MLS (3) BCE STRG 3 STKR (2,3)	
	If on PCS 2: • Perform RECONFIG TO ALT PCS SYS, ECLS SSR−3	3 3 4 5	O2/N2 Cntl Sys 2: N2 Sply Vlv 2 Cntl N2 Reg Inlet Vlv 2 Cntl O2/N2 Cntl Vlv 2 man Cntl O2 Xover Vlv 2 OP capability O2/N2 Sys 2 Flow Xdcrs PPO2 Snsr B,C	(L2) 6 CABIN RELIEF A tb − bp 6 N2 SYS 2 SPLY tb − bp 6 N2 SYS 2 REG INLET tb − bp	
			dP/dT Snsr	If first AA failure and S/W processing accel data: 'RM FAIL ACC' (3)	
7	SM 60 SM TABLE MAINT • Inhibit 0612513, 0612205, 0612554, 0612722 • Perform ECLS COMPUTATION INHIBIT ECLS SSR−14 Table A			(LIGHTS LOST) L Seat/Ctr Cnsl Floodlt R Ovhd Cnsl Floodlt If ACA 1 − MNB, lights lost: (C3) 2 DAP lights left four columns ALL (F2) PBIs except MA	
8	(R13 U) • C/W PARAM SEL tw (three) − 044, 024, 064 • C/W PARAM − INH • C/W MEM − CLEAR • C/W PARAM SEL tw (three) − > 119			If ACA 2/3 − MNB, lights lost: (C3) 2 DAP lights right two columns ALL (F6) Landing Gear ARM/DOWN (L1) Smoke detection, fire suppression ALL	
	• Prior to seat ingress for entry: discharge handheld ext into AV BAY 1		Av Bay 1 Agent discharge capability	If NWS 2 selected: (F3) NWS FAIL lt − on	
				2 If ACA 4/5 − MNB, lights lost: (A6U) DAP lights ALL (A7U Video input, output, Gamma, ALC	
	(Continued)		(Continued)		

EPS SSR−45 (Cont)
BUS LOSS: MNB O15

	BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	ONLY ON MCC CALL, PERFORM				(3) Vlv holds position
	(O6) • STAR TRKR PWR −Y − OFF		−Y Star Trkr Dr OP capability Trkr		(6) Current Snsr 1 remains
	(O8) • RADAR ALTM 2 − OFF • MLS 2 − OFF				(9) Redundant pwr source remains
9	(O15:B) cb MNB • OI SIG CONDR OF 1/4 B − op • OI SIG CONDR OF 2/3 A − op • OI SIG CONDR OM 1/2 B − op • OI MDM OF 1/2 B − op • OI SIG CONDR OM3 A − op • OI H2O BYP LOOP 2 SNSR − op • OI TIRE PRESS − op • MNA CONTR − op • MSN TIMER AFT − op • EVENT TIMER FWD − op	10 11	H2O Byp Loop 2 Snsr (ECLS SC12) Tire Press Sig Condr A3,A4 Aft Mission Timer Fwd Event Timer		(10) H2O Loop 2 ICH Flow Rate snsr lost (11) Redundant measurement remains. FDA Alarm BFS only; OPS 3,6 (12) Cntlr B remains (13) NWS 1 still available (14) CDR Arm remains
	(O15:C) cb MNB • TACAN 2 − op • SMOKE DETN BAY 1B/3A − op • FIRE SUPPR BAY 1 − op • UTIL PWR F1/MO13Q − op • FLOOD R CNSL − op • L CTR − op • ANNUN FWD ACA 1,2/3 (two) − op • ANNUN AFT ACA 4/5 − op • CRYO O2 HTR TK2 SNSR 2 − op GPS 2 PRE AMPL UPPER − op	 6 	 Tacan 2 Av Bay 1 Smoke Det B 3 Smoke Det A MNB Utility pwr R Ovhd Console Floodlt L Seat/Ctr Cnsl Floodlts Cryo O2 Tk2 Htr Current Snsr 2 		
12	(O15:D) cb MNB • FREON RAD CNTLR 1,2 (two) − op • PPO2 C CAB dP/dT − op • N2 SPLY 2 − op • O2/N2 CNTLR 2 − op • O2 XOVR 2 − op • N2 REG INLET 2 − op • CAB RELIEF A − op 13 • NWS − op GPS 2 PRE AMPL LOWER − op	 3 	 PPO2 Snsr C Cabin Relief Vlv A Cntlr NWS 2 		
	(O15:E) cb MNB • RADAR ALTM 2 − op • MLS 2 − op • ADTA 2 − op • STAR TRKR −Y − op • ACCEL 2 − op • DDU L − op • R − op • DRAG CHUTE SYS 2 − op	 9 9 14	 ADTA 2 AA2 Left DDU MNB pwr Right DDU MNB pwr Drag Chute, PLT Arm		

EPS SSR−46
BUS LOSS: MNB R1A1

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

	EQUIP/FUNCTION LOST
1	MNB pwr to CNTLAB 1,2,3 CNTLBC 1,2,3 ESS1BC ESS3AB

CREW INDICATIONS
NONE

NOTES
(1) Buses remain pwrd

EPS SSR−47
BUS LOSS: MNB A6&A14

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
GNC 23 RCS • Reprioritize Fwd Manf 2,3 Jets to first priority: DES INH twice all other jets; highest priority first, then next highest, etc • Set forward pod PRI JET FAIL LIMIT to 4	Fwd RCS Jet 2,3 Htrs	SM 97 RETENTION Indication lost: RELAX DEMATE MATE	(1) Single mtr time

BUS ISOLATION		
ONLY ON MCC CALL, PERFORM		
(C3) • MSTR MADS PWR − OFF	PL Reten Sys B Rel/Lat Mtrs All MADS equipment	
	ROEU Logic Pwr Sys 2 1 Orbiter arm drive mtr (ODM mtr 2 − mate B, demate B, relax B) 1 ODA mtr 2 latch/release	

EPS SSR−48
BUS LOSS: MNB ML86B

ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
(ML86B:A) • cb MNA H2O LINE HTR A − cl		H2O Line Htr B: Waste Dump Line Sply Dump Line Vac Vent Line		(R11L) SPLY H2O 1 DUMP ISOL VLV tb − bp 1 TKB INLET tb − bp 1 TKC OUTLET tb − bp 1 B SPLY ISOL VLV tb − bp	(1) Vlv holds position (2) Htr A remains (3) MNA,MNC line htrs remain. MNA struct htrs remain
(ML86B:D) cb MNA MMU • PORT,STBD HTR A (two) − cl	2	MMU Port,Stbd Htr B		(R13L) 1 MMU GN2 SPLY ISOL VLV B tb − bp	
(ML31C) • VAC VENT ISOL VLV BUS SEL − MNA		Vac Vent Isol Vlv MNB Cntl		(ML31C) 1 WASTE H2O TK1 DRAIN VLV tb − bp 1 SPLY H2O TKD INLET tb − bp	
(WCS) • ✓MODE − AUTO • ✓CRADLE − AUTO • ✓Hose stowed in cradle • ✓WCS ON lt − OFF • FAN SEP SEL sw − OFF • HOSE BLOCK − SEP 1 • In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30−sec run complete • FAN SEP SEL sw − 1		WCS Sep Fan 2 Mtr Relay		(LIGHTS LOST) Middeck Floodlts 2,6 Bunk Floodlts 2/4 PHS Floodlt Airlk Floodlt 3 TA Floodlt 3 (SL only)	
(EDO WCS) • WCS PWR SEL − AUTO 1, OFF 2		Controller MNB pwr WCS Compactor MNB Cntl		(MO13Q) 1 ARLK H2O S/O VLV − bp	
(CDR's SEAT) • CDR SEAT PWR BUS SEL − AC3 (dn)		CDR Seat Adj via AC2 pwr			
(PLT's SEAT) • PLT SEAT PWR BUS SEL − AC3 (dn)		PLT Seat Adj via AC2 pwr			
If Supply H2O Dump reqd and dump ISOL VLV is failed closed: • Perform SUPPLY WATER DUMP USING FES (ORB OPS, ECLS)	1	Sply H2O Dump Isol Vlv Cntl			
(ML86B:C) • cb MNA(MNC) EXT ARLK HTR LINE ZN1 − cl • cb MNA(MNC) EXT ARLK HTR LINE ZN2 − cl • cb MNA EXT ARLK HTR STRUC − cl	3	Ext A/L H2O and Structural Htrs MNB pwr			
(Continued)		(Continued)			

EPS SSR−48 (Cont)
BUS LOSS: MNB ML86B

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM				(1) Vlv holds position (2) Htr A remains (3) MNA,MNC line htrs remain. MNA struct htrs remain (4) No redundancy (5) One htr strip pwrd by MNA ML86B still remains. Water will still heat, but at a very slow rate (6) One failure away from loss of jettison capability (7) Current Snsr 1 remains (8) Current Snsr 2 remains
(ML86B:A) cb MNB • SPLY H2O TKB INLET − op	1	Sply H2O: Tk B Inlet Vlv Cntl		
• SPLY TKC OUTLET − op	1	Tk C Outlet Vlv Cntl		
• DUMP ISOL − op • SPLY H2O B SPLY ISOL VLV − op	1	B Sply Isol Vlv Cntl		
• H2O LINE HTR B − op				
(ML86B:B) cb MNB • VAC VENT NOZ HTR − op	4	Waste H2O Vac Vent NozHtr		
• WASTE H2O TK1 DRAIN − op	1	Tk 1 Drain Vlv Cntl		
• SPLY H2O TKD INLET − op	1	Sply H2O Tk D Inlet Vlv Cntl		
• VAC VENT ISOL VLV − op				
• WCS CNTLR − op		WCS Press Xdcr		
• GALLEY H2O HTR − op	5	Galley Hot H2O Htr (Five of six htr strips lost)		
(ML86B:D) cb MNB MMU • PORT HTR B − op	2	MMU Port Htr B		
• STBD HTR B − op	2	Stbd Htr B		
• GN2 SPLY ISOL VLV B − op	1	GN2 Sply Isol Vlv B		
cb PYRO JETT SYS A • PORT RMS − op	6	Port RMS: Jett Sys A Deadface Relays		
(ML86B:E) cb MNB SEAT • LEFT − op		CO2 Rmvl Sys Filter dP		
• RIGHT − op		CO2 Rmvl Sys Vacuum Press		
cb MNB FLOOD • TNL ADAPT 3 − op		CO2 Rmvl Sys PPCO2 Snsr Inlet Temp TA Floodlt 3		
cb MNB • CO2 COM INSTR − op				
(ML86B:F) cb MNB FLOODS • MIDDECK 2/6 − op		Middeck Floodlts 2,6		
• BUNK 2/4 − op		Bunk Floodlts 2/4		
• PHS − op		PHS Floodlt		
• AIRLK 3 − op cb MNB CRYO		Airlk Floodlt 3		
7 • O2 HTR TK3 SNSR 2 − op	7	Cryo O2 Tk 3 Htr Current Snsr 2		
8 • O2 HTR TK4 SNSR 1 − op	8	Cryo O2 Tk 4 Htr Current Snsr 1		
(ML86B:C) • cb MNB EXT ARLK HTR LINE ZN1 − op	3	Ext A/L H2O Line and Structural Htrs MNB pwr		
• cb MNB EXT ARLK HTR LINE ZN2 − op				
• cb MNB EXT ARLK HTR STRUC − op				
• cb MNB EXT ARLK HTR S/O VLV − op	1	A/L H2O Isol Vlv Cntl		

EPS SSR−49a
BUS LOSS: MNB PPC2

ACTIONS
(A15:C) • PALLET HTRS B − OFF • A − AUTO
(A15:D,E,F,G) •✓ That at least one Htr (A or B) per Tk turned off

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(A15:B) • PALLET PWR MNB − OFF

	EQUIP/FUNCTION LOST
	Pallet Structural Htrs B
1	Redundant pwr to Pallet Cryo Tk 6−9 Htrs B

CREW INDICATIONS
SM ALERT Light/Tone − on
(FSMs) 168 PALLET V B
SM 168 CRYO PALLET Pallet Volts MNB ~0 ↓

NOTES
(1) MNA PPC1 will now supply 100% of pwr to A and B Cryo Tk Htrs

EPS SSR−49b
BUS LOSS: MNB A15EDO

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(A15:H,I,J,K) • cb MNB TK6−TK9 O2 HTR SNSR 2 − op

	EQUIP/FUNCTION LOST
1	Cryo O2 Tk 6−9 Htr Current Snsr 2

CREW INDICATIONS

NOTES
(1) Snsr 1 remains

EPS SSR−49c
BUS LOSS: MNB A7

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(A7L) IF DOCKING MISSION • cb DEP MNB SYS 2 VENT ISOL − op • cb DEP MNB SYS 2 VENT − op • LTS AIRLK 2/3 MNB − OFF • cb DOCK LT MNB TRUSS AFT − op

	EQUIP/FUNCTION LOST
	Vestibule Depress Vlv Sys 2 Vent Isol Vestibule Depress Vlv Sys 2 Vent
	External Airlock lts 2,3 Aft Truss Docking lt

	CREW INDICATIONS
	VEST DEP VLV SYS 2 VENT ISOL tb − bp VEST DEP VLV SYS 2 VENT tb − bp
1	DSP SYS PWR SYS 2 tb − OFF

NOTES
(1) DSP SYS 2 pwr still available to all users except MNB A7

EPS SSR−50
BUS LOSS: MNC DA3 (Includes all MNC sub−buses & AC3)

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 2	• Perform FC3 SHUTDN (FC SHUTDN Cue Card)	2 1	FC3 Pumps and pH Snsr Purge Vlv O2,H2 Flow Xdcrs Cell Perf Monitor	SM ALERT Light/Tone − on MASTER ALARM Light/Tone − on	(1) Because of FC3 Purge Vlv loss, FC3 will remain isolated to limit voltage degradation and allow FC3 to MNB use during entry via PL Bus contactors
		3	MNC pwr to ESS1BC	(F6) MDU CDR 1 blanks	
		3	ESS2CA		
		3	CNTLBC1,2,3	(F8) MDU PLT 2 blanks	
		3	CNTLCA1,2,3		
	• Perform LOSS OF 1 FC (ORB PKT, PWRDN)			(AFT) MDU AFD 1 blanks	(2) May be repwrd after AC Pwr Transfer Cable connected
	(R1) • cb AC CONTR AC3 ΦA,ΦB,ΦC (three) − cl • INV/AC BUS 3 − OFF (tb−off) • INV PWR 3 − OFF (tb−off) • cb AC CONTR AC3 ΦA,ΦB,ΦC (three) − op		AC3 ΦA,ΦB,ΦC Inverters	(F7) C/W MN BUS UNDERVOLT lt − on BACKUP C/W ALARM lt − on C/W FREON LOOP lt − on C/W FC PUMP lt − on C/W AC VOLT lt − on C/W H2O LOOP lt − on MDU CRT 3,4 blank	(3) Buses remain pwrd
	• O2,H2 MANF VLV TK1,2 (four) − OP • O2,H2 TK3 HTR A − AUTO		Cryo O2,H2 Tk1 Htrs A if in Auto Cryo O2,H2 Tk1 Htrs B Tk2 Htrs A Tk4 Htrs A (OV104, OV105) Cryo O2,H2 Tk5 Htrs A in Auto Cryo O2,H2 Tk5 Htrs B		(4) If Aud Ctr 2 selected, all intercomm, A/G, and recorded voice lost until AUD CTR 1 selected
		4	All S−BD A/G voice lost if Sys 2 selected	(COMM LOST) Comm via PS ATU & A/L	(5) Loss of redundant port to the following: IDP 3 MDU MFD 1 (S) MDU MFD 2 (S) IDP 4 MDU MFD 1 (P)
	(C2) • L IDP/CRT SEL − 1 • R IDP/CRT SEL − 2 • GPC/CRT 03 EXEC • 04 EXEC	5	IDP 3,4 MDU CRT 3,4 MDU CDR 1 MDU PLT 2 MDU AFD 1	(LIGHTS LOST) Inst lts L/Ctr (pnls C2,F6,F7) MS pnl lts (pnls R10,R12) OS pnl lts (pnls A1,A2,A6, A7,A8,A13,L9) PLB Floodlts Aft Port, Mid Stbd MS Floodlt R Seat/Ctr Cnsl Floodlts Middk Floodlts 3,4,5,7 MO13Q pnl lt 1 Bunk Floodlts 1/3 Airlock Floodlt 4 TA Floodlt 4	(6) REACQ and PSP reconfig procedures are flight specific. If reqd, procedures can be found in payload or ISS specific books
	(A1L) S−BD PM • ANT SW ELEC − 1 • XPNDR − 1 • PWR AMPL OPER − 1 • STBY − 1 • PRE AMPL − 1 NSP • PWR − 1		S−BD PM Sys 2: Xpndr 2 Pre Amp 2 Pwr Amp 2 PM, FM Ant sw 2 NSP 2 COM SEC 2		(7) OIU 1 interfaces with PSP 1 for commanding
	If PSP and/or INTRG reqd for PL or ISS ops: (A1L) • S−BD PL PWR SYS − 1 • CNTL − PNL • − CMD 6 • Reconfig PSP 6 • Perform PL INTRG REACQ (if reqd)		S−BD PL Intrg 2 PSP 2	(F9) AC3 ΦA,ΦB,ΦC AC volts ind − < 90 DC VOLTS MNC ind − OSL	(8) * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
7	If OIU reqd: (SSP) • OIU PWR − OIU 1 ON • OIU tb − UP • ✓MCC, OIU reconfig			(FSMs) S67 CNTL RPC S67 AC VOLTS 3 S86 HYD RSVR Q SM2 HYD QTY (B) S86 WSB T S66 AV BAY 1 FAN S66 CABIN FAN (2) S68 FC PUMP 3 S69 FC H2 PUMP 3 S88 H2O PUMP P2 S88 H2O LOOP 2 FLOW S88 H2O LOOP 2 TEMP S88 H2O PUMP P 1 S88 H2O LOOP 1 TEMP S88 H2O LOOP 1 QTY S67 MAIN BUS V C RCS PWR FAIL S88 FREON FLOW 1 S88 FRN PL HX 2 S88 FREON QTY 1	(9) Rad isolation may cause FES shutdown
	(A12) APU HTR		APU 2 GG/Fu Pump Htrs B		
8	• GAS GEN/FUEL PUMP 2 − A AUTO		APU 3 GG/Fu Pump Htrs A		
8	• GAS GEN/FUEL PUMP 3 − B AUTO		APU 2 Lube Oil Ln Htr B 3 Lube Oil Ln Htr A		
	• LUBE OIL LINE 2 − A AUTO • LUBE OIL LINE 3 − B AUTO				
	(Continued)		(Continued)	(Continued)	

BUS LOSS: MNC DA3

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS		NOTES
	(A12) APU HTR TK/FU LINE/H2O SYS		APU 2 Tk/Fu Ln Htr B 3 Tk/Fu Ln Htr A		(FSMs) I/O ERROR CRT 3 I/O ERROR CRT 4 RM DLMA MANF S67 FPC/FLC3 S67 MPC 3 S67 APC/ALC C		(2) May be repwrd after AC Pwr Transfer Cable connected
8 8 8 8	• 2A − AUTO • 2B − OFF • 3A − OFF • 3B − AUTO		APU 3 GG Inj H2O Htrs 3A, 23A				(8) * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
	HYD HTR • AFT FUS A − AUTO • B − OFF		Aft Fuselage Hyd Htrs B		If NSP 2 selected: BCE STRG 3 NSP If cooling by FES only: C/W FREON LOOP lt − on 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'		
	(A1R) • S−BD FM PWR − 1		S−BD Fm Sig Proc 2, Xmtr 2				
	If no comm: (C3) • S−BD PM CNTL − PNL • − CMD • AUD CTR − 1		Audio Ctr 2	10 10	(L2) O2 EMER tb − bp CAB RELIEF B tb − bp		(10) Vlv holds position
	(L1) • FLASH EVAP CNTLR PRI A − OFF • FLASH EVAP CNTLR PRI B(SEC) − ON (If reqd)		Flash Evap Cntlr Pri A		(R1) FC3 COOL PUMP ΔP tb − bp		(11) Indicates DN when NLG down
	• TOP EVAP HTR NOZ R − A AUTO • TOP EVAP HTR DUCT − A(B) If Hi Load Evap enabled: • HI LOAD DUCT HTR − A(B)		Topping Evap R Noz Htr B Topping Evap Duct Fwd,Aft Htrs C Hi Load Duct Inbd,Outbd, Noz Htrs C	11 12	(F6,F8) NOSE LDG GEAR tb − bp R LDG GEAR tb − bp		(12) Will not indicate DN when RMG down
	(L2) • FLASH EVAP FDLN HTR B SPLY − 2		FES H2O Fdln B Htrs 1 (all)		HYD/APU HYD QTY 3 ind − 0% APU H2O QTY 2 ind − 0%		(13) Instrumentation loss caused rad isolation
13	• Perform RAD ISOL RECOVERY, ECLS SSR−9 for Freon Loop 1				If SYS 2 pwrd: 'S62 BCE BYP PSP2' Loss of PL TLM and CMD If PDI FDA enabled: 'S62 PDI DECOM FAIL'		(14) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison
	(L4:P) • cb AC2 ΦA LG SNSR 2 − cl	2	Prox Snsr Electronics Box 1		(O1) H2O PUMP OUT PRESS LOOP 1 ind − 0 psia H2O PUMP OUT PRESS LOOP 2 ind − 20−25 psia		(15) Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists
			Av Bay 2 Agent discharge capability		(O3) RCS/OMS PRPLT QTY display is blank		(16) One failure away from loss of jettison capability
		14 15 15 16	Port RMS: MPM Mtr 1 Fwd MRL Mtr 2 Aft MRL Mtr 1 Jettison Sys B		R ADP deploy time incr from 15−30 sec		(17) Do not reconfig for reg switch or I'CNCT procedures
	• For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS)		RCS Manf F5 RJD pwr (F5L,F5R)	10 10 10	(O7) AFT L RCS He PRESS B tb − bp AFT L RCS MANF ISOL 5 tb − bp AFT R RCS MANF ISOL 5 tb − bp		(18) Man CL and GPC cntl remains
			RCS Manf F4 RJD pwr (F4R,F4D)	10 10 10	(O8) FWD RCS TK ISOL 1/2 tb − bp FWD RCS MANF ISOL 4 tb − bp FWD RCS MANF ISOL 5 tb − bp		(19) If SPLY H2O DUMP VLV ENA/NOZ HTR − OFF, tb upward and already bp
	(F6,F8) • HSI SEL SOURCE − other than MLS or TACAN 3		MLS 3 Tacan 3				
	(O6) • ANNUN BUS SEL ACA 2/3 − MNB		ACA 2/3 MNC pwr	10 10	(R4) HYD BRAKE ISOL VLV 3 tb − OP HYD MPS/TVC ISOL VLV SYS 3 tb − CL		
17	Refer to OMS/RCS Slide Rule for vlv loss info Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT L RCS He PRESS B • R RCS He PRESS B	10 18	Aft L RCS He Press Isol B GPC Cntl, man CL capability F,R RCS He Press Isol B man OP capability	10 19 10	(R11L) SPLY H2O TKA OUTLET tb − bp SPLY H2O DUMP VLV tb − bp SPLY H2O XOVR VLV tb − bp		
	(Continued)		(Continued)		(Continued)		

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
	(O8) • FWD RCS He PRESS B				(R11L) 10 SPLY H2O GALLEY SPLY VLV tb − bp 10 SPLY H2O TKC INLET tb − bp	(10) Vlv holds position (20) Lat Mtrs 2 of both actuators for Port,Stbd Rad will continue to run until Sys B Lat Cntl sw placed OFF (21) Lost TM: GNC SYS SUMM 2 R OMS ENG VLV 2: Assume VLV 2 status same as Vlv 1 R OMS N2 P VLV: If ENG − ARM/PRESS, assume vlv OP (22) Unable to confirm redundant coil (23) Maintains He Isol redundancy (24) Vlv norm closed. Manual cntl remains (25) Prevents simultaneous opening of parallel reg paths and possibly rupturing burst disk (26) FSM caused by Antenna miscompare
	GNC 23 RCS • Reprioritize L,R Manf 3,4 Jets to first priority: DES INH twice all other jets; highest priority first, then next highest priority, etc • Set aft pod(s) PRI JET FAIL LIMIT of 6		Aft RCS L,R Jet 3,4,5 Htrs Fwd RCS Jet 4,5 Htrs		(R13L) 20 RAD CNTL STBD,PORT (two) tb − bp	
21	Save R OMS for deorbit (if reqd for additional on−orbit burns, ✓MCC)	21 22	R OMS GN2 Press Vlv Op TM Eng Pr Vlv Coil 1		(A8L) PORT RMS: DPY/STO tb − bp RETEN LAT tb − bp R−F−L AFT tb − bp	
21	Prior to using L(R) OMS: (O8)				SM 94 PDRS CONTROL Indications lost: MPM Mtr 1 STO/DPY Fwd MRL Mtr 2 LAT/REL/RDY Aft MRL Mtr 1 LAT/REL/RDY	
23	R OMS He PRESS/VAP ISOL • A − GPC • B − OP	24 24 21	R OMS He Vap Isol 2 GPC Cntl R OMS He Pr Isol B GPC Cntl L OMS He Pr/Vap Isol A,B man Cntl			
25	L OMS He PRESS/VAP ISOL • A(B) − GPC • B(A) − CL				(AW82D) 10 EMU 1 H2O SPLY,WASTE tb − CL	
	GNC XXXXX MNVR VYYYY (3,B) Sel R OMS SEC TVC: • OMS GMBL SEC R ITEM 31 EXEC		R OMS Pri TVC		STAR TRKR DR POS −Z OP/CL time incr from 8−16 sec	
	(A6U) • ANNUN BUS SEL − MNB		ACA 4/5 MNC pwr		If Cabin Fan A selected: C/W AV BAY/CAB AIR lt − on 'S66 CABIN FAN'	
	(A12) HYD CIRC PUMP • PWR 2 − MNB • 3 − MNA		MNC Circ Pump 2 pwr 3 pwr		If site AOS and using S−BD ANT ELEC 2: 26 'ANTENNA' (2)	
	(A14) RCS/OMS HTR • L POD (two) − A AUTO, B OFF • R POD (two) − A AUTO, B OFF		L,R Pod Htrs B (partial)		If H2O Loop 2 Pump active: 'S88 H2O PUMP P2'	
					If OMS Gmbl cmd abs value > 2 deg: C/W OMS TVC lt − on 'R OMS GMBL' (3,B)	
	(AW18D) • AIRLK AUD CNTL − MIDDECK		AL ATU,EMU CCU 1,2 PS ATU and CCU		(F7) If APUs active and using BLR CNTLR/HTR 2A or 3B: C/W APU TEMP lt − on after ~2 min	
	(R11U) • FC H2O LINE HTR − A AUTO • FC H2O RELIEF HTR − A AUTO		FC H2O Line Htrs B FC H2O Relief Htrs B Noz Htr		If first RGA failure and Rates sensed: 'RM FAIL RGA'	
	For PLBD ops: • OP/CL Drs in man mode		PLBD: C/L Lat 13−16 Mtr 1 1−4,5−8,9−12 Mtrs 2 Stbd Aft Blkhd Mtr 1 Port Aft Blkhd Mtr 2 Port Door Mtr 1 Stbd Door Mtr 2 CL Limit sw		If ANNUN BUS SEL ACA 2/3 − MNC, L/R Event Seq lts lost	
					(L2) 10 O2 EMER tb − bp 10 CAB RELIEF B tb − bp	
	If supply H2O dump reqd: For TK A and/or TK B • Perform SUPPLY H2O SYS BACKUP DUMP TK A,B (IFM) For TK C and/or TK D • Perform SUPPLY WATER DUMP USING FES (ORB OPS, ECLS) using FLASH EVAP CNTLR PRI B	10 10	Sply H2O Dump Vlv Cntl Noz Htr Xovr Vlv Cntl			
	(Continued)		(Continued)		(Continued)	

EPS SSR−50 (Cont)
BUS LOSS: MNC DA3

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
For SSME Hyd Repress: (R4) • HYD MPS/TVC ISOL VLV SYS 1,2 (two) − OP, wait 10 sec, then CL	10	MPS/TVC Hyd Sys 3 Isol Cntl	SM (BFS,SM) 63 PL BAY DOORS If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG'	(10) Vlv holds position
If reqd during entry (< 120K ft): (L1) • NH3 CNTLR A − PRI/GPC If reqd for Post Rollout: • NH3 CNTLR B − SEC/ON	27 28	NH3 Sys A Sec Cntlr man ON capability NH3 Sys B Pri Cntlr	During MAN PLBD OP/CL, single mtr run time noted on actuators listed at left	(27) Sys A Pri Cntlr, auto switchover to Sec Cntlr remain (28) Sys B Sec Cntlr man On capability remains
If AC Pwr Transfer Cable to be installed to regain AC: • Go to EPS SSR−200; otherwise, continue with bus loss actions			(R13L) During Rad Dpy/Sto ops: RAD LAT CNTL tb (two) indicate single mtr ops	(29) Not yet active on all vehicles
(R2) • BLR CNTLR/HTR 2 − B • 3 − A		Hyd H2O Blr 2 Cntlr A 3 Cntlr B	Impending: 'S66 CO2 RL SYS PCO2' 'S66 CAB PPCO2'	(30) PEVs, Actuators, Bed A P, Bed B P, Bed dP will be recovered after system reconfig
	29	FC2 Redundant Reac Vlv Cntl on pnl C3		(31) H2O Loop 1 Pump Out P, Pump ΔP, Accum Qty, Pump Out Temp snsrs lost
(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 2 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)	30	CO2 Rmvl Sys Cntlr 2 Fan AC3 pwr Compressor AC3 pwr		(32) Av Bay 1 Fan ΔP, Air Out Temp snsrs lost
(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl				(33) Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate, and Accum Qty snsrs lost
(L1) • IMU FAN B(A) − ON • C − OFF • H2O PUMP LOOP 2 − GPC • Perform SSR−10 (H2O Loop 2 only), H2O PUMP OPS via GPC, ECLS • H2O PUMP LOOP 1 − OFF • CAB FAN A − OFF • B − ON • AV BAY 1 FAN A,B (two) − ON • ✓AV BAY 2 FAN A − ON • B − OFF • 3 FAN A − OFF • ✓B − ON • FREON PUMP LOOP 2 − B	 10 31 32 	IMU Fan C H2O Loop 2 Pump man ON capability H2O Loop 1 Byp Cntlr, Sig Condr H2O Loop 1 Byp Vlv pwr Cabin Fan A Av Bay 1 Sig Condr, Xdcrs (ECLS SC2) Av Bay 2 Fan B 3 Fan A Freon Loop 2 Pump A		(34) Freon Loop 2 P/L Hx Flow Rate, Freon Loop 1 ICH Flow Rate, and Accum Qty snsrs lost
(O17:C) • SIG CONDR FREON A − AC2 • SIG CONDR FREON B − AC2	33 34	Freon S/C A AC3 pwr (ECLS SC 1A) Freon S/C B AC3 pwr (ECLS SC 1B)		(35) Maintains deorbit capability for CNTL BC1 failure
(CDR SEAT PNL) • CDR SEAT PWR BUS SEL − AC2 (up)		CDR Seat adj via AC3 pwr		
(PLT SEAT PNL) • PLT SEAT PWR BUS SEL − AC2 (up)		PLT Seat adj via AC3 pwr		
(O8) • Right OMS XFEED B − OP (tb−OP)	35	OMS Eng/Xfeed Vlv Redundancy		
(Continued)		(Continued)		

EPS SSR−50 (Cont)
BUS LOSS: MNC DA3

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	SM 60 SM TABLE MAINT				(10) Vlv holds position
36	• Inhibit 0612605, 0612600, 0612640, 0612610				(36) Inhibits H2O Loop 1 Pump ΔP, Pump Out Temp, Accum Qty, respectively
37	**BUS ISOLATION**				(37) AC3 bus isolation for AC Pwr Transfer Cable installation accomplished in MNC DA3 ACTIONS column. No additional bus isolation steps reqd
	ONLY ON MCC CALL, PERFORM				(38) Motor A remains
	• MDU CRT 3 PWR − OFF • MDU CDR 1 PWR − OFF • MDU PLT 2 PWR − OFF				(39) Redundant pwr source remains
	(C2) • IDP/CRT 3 PWR − OFF				(40) Current Snsr 1 remains
	(L4:N) • cb AC3 ΦC RAD ISOL B − op	38	Freon Loop 1,2 Rad Isol Motor B		(41) Current Snsr 2 remains
	(R1) • PL AFT MNC − OFF		Aft Payload C pwr		(42) If Emer O2 Mission Kit not flown, cb is open prelaunch
	(O8) • MLS 3 − OFF • R SEAT/CTR CNSL FLOOD − OFF		R Seat/Ctr Cnsl FloodIts		
	(O16:A) • RGA 3 − OFF		RGA 3		
39	(O16:B) cb MNC • OI SIG CONDR OM3B − op • OI SIG CONDR OF 2/3 − op • OI MDM OF 3/4B − op • MNB CONTR − op • AUX TIMING BUFFER − op		Orbiter Timing Buffer Aft Mission Timer		
	(O16:C) cb MNC • TACAN 3 − op • SMOKE DETN CAB − op • SMOKE DETN BAY 1A/2B − op • FIRE SUPPR BAY 2 − op • UTIL PWR A11/A15/MO30F − op • FLOOD R CTR − op • ANNUN FWD ACA 2/3 − op • ANNUN AFT ACA 4/5 − op • cb MNC CRYO O2 HTR TK1 SNSR 2 − op • cb MNC CRYO O2 HTR TK2 SNSR 1 − op	 40 41	Tacan 3 Cabin Smoke Detector Av Bay 1 Smoke Detector A 2 Smoke Detector B MNC DC Utility pwr outlets at panels A11, A15, MO30F Cryo O2 Tk1 Htr Current Snsr 2 Cryo O2 Tk2 Htr Current Snsr 1		
42	(O16:D) cb MNC • H2O ALT PRESS − op • O2 EMER − op • CAB RELIEF B − op	10 10 10	Emer O2 Sply Vlv Cntl Cabin Relief Vlv B Cntl H2O Alternate Press Vlv Cntl		
	(Continued)		(Continued)		

EPS SSR−50 (Cont)
BUS LOSS: MNC DA3

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM				(43) PLT Arm remains (44) Six vlvs fail to non−isolation position (45) Logic buses 2(3) remain pwrd via MNB(MNA) (46) Redundant pwr source remains for equipment (47) Ku Comm and RDR function lost. KU−BAND CONT STOW − EA1 ALTERNATE POWER IFM reqd to stow antenna. Jettison reqd if antenna cannot be positioned within GO FOR PLBD CLOSURE envelope
(O16:E) cb MNC • ADTA 3,4 (two) − op • MLS 3 − op • DDU R,AFT (two) − op • RCS/OMS PRPLT QTY GAUGE − op • DRAG CHUTE SYS 1 − op	 43	 ADTA 3, 4 MLS 3 RCS/OMS Prplt Qty Gauge Drag Chute, CDR Arm		
	44	ATVC 1 Isol ME		
(A7U) PL BAY • FLOOD AFT PORT − OFF • MID STBD − OFF		 PLB Aft Port Floodlt Mid Stbd Floodlt		
(A7L) IF DOCKING MISSION • PYRO PWR MNC − OFF cb MNC • LOGIC 2 − op • 3 − op	 45	 MNC Pyro system MNC pwr to DSP Logic buses 2,3		
(R11U) • FC PURGE VLV 3 − CL • FC START UP HTR 3 − ENA • IDP/CRT 4 PWR − OFF • MDU CRT 4 PWR − OFF • MDU AFD 1 PWR − OFF		 FC3 Start Up Htr Inhibit capability		
(R14:A) cb MNC • AUD CTR 2 − op • AUD PS/AIRLK − op • MDU CDR 1 − op • MDU PLT 2 − op • MDU AFD 1 − op				
(R14:B) cb MNC • UHF − op • GCILC − op • CNTL BUS AB1/2/3 − op		 UHF redundant pwr GCIL redundant pwr MDM cmds to CCTV Sys MNC pwr for CNTLAB 1,2,3 Buses		
46 (R14:B) cb PALLET/DSC • 2A − op (EDO) • 3B/4A − op (EDO)				
(R14:C) • cb MNC KU SIG PROC − op	47	Ku−Bd Sys Rdr & Comm I/F Cont Unit (EA1), Ku Comm Sig Proc		
(R14:D) cb MNC B • TV B KEEL/EVA CAMR/PAN−TILT − op • TV B KEEL/EVA CAMR HTR − op • TV B KEEL/EVA PAN−TILT HTR − op • cb MNC TV CAB − op		 TV B Keel/EVA Camr Pan/Tilt Htr TV B Keel/EVA Camr Pan/Tilt Htr Flt,Middeck TV Camrs and VFMs		
(R14:E) • cb MNC MS FLOOD − op		MS Floodlt		
(Continued)		(Continued)		

EPS SSR−50 (Cont)
BUS LOSS: MNC DA3

BUS ISOLATION		EQUIP/FUNCTION LOST
ONLY ON MCC CALL, PERFORM		
(ML86B:F) cb MNC FLOODS • MIDDECK 5/7 − op • MIDDECK 3/4/MO13Q − op • BUNK 1/3 − op • AIRLK 4 − op		Middeck Floodlts 3,4,5,7 MO13Q Pnl Lt 1 Bunk Floodlts 1/3 Airlock Lt 4
(MA73C:A,B) • MCA LOGIC MNC FWD 3 − OFF • MCA LOGIC MNC MID 2 − OFF • MCA LOGIC MNC MID 4 − OFF • MCA LOGIC MNC AFT 3 − OFF		MNC FMC3 Bus pwr MMC2 Bus pwr MMC4 Bus pwr AMC3 Bus pwr
	48	Ku Ant Sto/Dpy Mtr 1
	49	R HUD −Z Star Trkr Dr Sys 2 OP/CL capability
		PL MNC Cur Sig Condr
		Port,Stbd Rad Dpy/Sto Mtr 2 Port,Stbd Rad Lat 7−12 Mtrs 2 49 R ADP Dpy Mtr 1 50 Htr Cntlr 1 LH Vents 1,2,3 Mtrs 1 6 Mtrs 2 RH Vents 8,9 Mtrs 1 3,5 Mtrs 2 NLG Extend Sys 1 51 NLG,LMG,RMG Bkup Rel Sys 1
(ML86B:A) • cb MNC SPLY H2O TKA OUTLET − op • cb MNC SPLY H2O TKC INLET − op • cb MNC DUMP VLV/NOZ HTR − op • cb MNC SPLY H2O XOVR VLV − op	10 10	Sply H2O TK A Out Vlv Cntl C In Vlv Cntl
• cb MNC SPLY H2O GALLEY SPLY − op	10	Galley H2O Sply Vlv Cntl
(ML86B:D) cb PYRO JETT SYS B • KU ANT − op • PORT RMS − op 54 • STBD RMS − op	52 53	Ku−Bd Jettison Sys B Port RMS Jettison Sys B
(ML86B:E) cb MNC EMU 1 H2O • WASTE − op • SPLY − op cb MNC SEAT • L − op • R − op cb MNC FLOOD • TNL ADAPT 4 − op cb MNC • CO2 SYS 2 CNTLR − op	10 10	EMU 1 Waste H2O Vlv Cntl Sply H2O Vlv Cntl TA Floodlt 4
(ML86B:F) • cb MNC CRYO O2 HTR TK4 SNSR 2 − op (OV104, OV105) • cb MNC CRYO O2 HTR TK5 SNSR 2 − op	40	Cryo O2 Tk4 Htr Current Snsr 2 (OV104, OV105) Cryo O2 Tk5 Htr Current Snsr 2
(Continued)		(Continued)

CREW INDICATIONS	NOTES
	(10) Vlv holds position (40) Current Snsr 1 remains (48) ✓MCC for Ku Ant stow reqmts (49) Redundant mtr remains (50) Htr Cntl 2 remains (51) LG can still be deployed by redundant Pyro Bkup Rel Sys 2 and by Pri Hyd Sys. NLG extension pwr assist available from redundant sys. NLG can also be deployed by Hyd Sys 2 (52) SYS A remains (53) One failure away from loss of jettison capability (54) Normally not installed

BUS LOSS: MNC DA3

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(MO63P) cb CB2/J2,CB3/J3, CB4/J4,CB5/J5,CB6/J6, RLY PWR (six) − op		MO63P DC Utility Pwr panel	R MPS He reg A < 680 during entry MM303)	(10) Vlv holds position (55) Unable to confirm redundant coils (56) Redundant coils remain (57) Vlv fails closed **CAUTION** No purge. Wait 10 min between burns (58) ✓MCC for OMS Tot Qtys. Aft Qtys are found on GNC SYS SUMM 2 (59) Pwr Sply A remains. Turbine speed ind lost (60) Pwr Sply B remains. GG Bed T and GBX P ind lost when APU running (61) Vlv fails closed. Redundant vlv remains (62) Cntlrs A,B Rad Byp Mtrs Auto Cntl and Cntlr B Rad Byp Vlv Mtr remain (63) Bypass vlv holds position and Cntlr B Rad Byp Vlv Mtr remains (64) Vlv fails closed (65) Vlv fails closed. LO2 manf will not be pressured with He during entry (MM304) (66) Vlv holds position. Loss of manual capability to inert LO2 manf (67) Redundant mtrs remain (68) Brake/Skid Cntl Box A,B enabled before WOW (69) Redundant RPC remain
	55 56 57 58	R OMS ENG Pr Vlv Coil 1 R OMS ENG Cntl Vlv 1,2 Coils 1 R OMS Purge Vlv 1,2 OMS QTY Gauging for all R OMS Single Engine burns Press Vlv Op Sig		
	59 60 61 57 10	APU 2 Cntlr Sply B pwr 3 Cntlr Sply A pwr 2 Fu Tk Vlv B 3 Fuel Tk Vlv A APU 3 GBX GN2 Repress Vlv Hyd Brake Isol 3 Cntl Rsvr 3 Qty Snsr		
	10 10	EMU 1 Waste H2O Vlv Cntl Sply H2O Vlv Cntl		
	62 63 10 	Freon Loop 1 Cntlr A Rad Byp Vlv Mtr man Cntl Freon Loop 2 Cntlr A Rad Byp Vlv Mtr Freon Loop 2 Flow Prop vlv Freon Loop 2 Cold Plate Flow Xdcr		
	 64 64 61 65 66	MPS: R Eng He Intercon Outlet Vlv L Eng He Xovr Vlv R Eng He Isol A Manf Repress LO2 Vlv 1,2 Prplt F/D Outbd LO2 Vlv		
	67	ET Door Mtrs: C/L Lat Actr 2 Mtr 2 L Dr Closure Mtr 2 R Dr Closure Mtr 1 Uplock Lat Mtr 1		
	68	No WOW Relay K9,K11,K13		
	      	PLBD: C/L Lat 1−4, 5−8 Mtrs 2 9−12 Mtr 2 13−16 Mtr 1 Stbd Aft Blkhd Mtr 1 Port Aft Blkhd Mtr 2 Door Mtr 1		
	69 69	Hyd Main Pump 3 Depress Solenoid RPC A Hyd Main Pump 2 Depress Solenoid RPC B		

EPS SSR−51
BUS LOSS: MNC FPC3 (Includes MNC FLC3, MNC FMC3, AC3)

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1	• Perform FC3 SHUTDN (FC SHUTDN Cue Card), pwrdn not needed, then:	2	FC3 Pumps and pH Snsr	MASTER ALARM Light/Tone − on CRT 3,4 blank	(1) * TIME CRITICAL * FC3 must be shutdn within 9 min to avoid potentially hazardous condition
	(R1) • cb AC CONTR AC3 (three) − cl • INV/AC BUS 3 − OFF (tb−OFF) • INV PWR 3 − OFF (tb−OFF) • cb AC CONTR AC3 (three) − op		AC3 ΦA,ΦB,ΦC Inverters	(F7) C/W FREON LOOP lt − on C/W FC PUMP lt − on C/W AC VOLT lt − on C/W H2O LOOP lt − on SM ALERT Light/Tone − on	
				(F9) AC3 ΦA,ΦB,ΦC AC volts < 90	(2) Will be repwrd after AC Pwr Transfer Cable connected
	(C2) • L IDP CRT SEL − 1 • R IDP CRT SEL − 2 On MCC GO: • GPC/CRT 03 EXEC • 04 EXEC	3	IDP 3,4 MDU CRT 3,4	(COMM LOST) All S−BD A/G voice lost if Sys 2 selected	(3) Loss of redundant port to the following: IDP 3 MDU CDR 1 (P) MDU MFD 1 (S) MDU MFD 2 (S) MDU PLT 2 (P) IDP 4 MDU AFD 1 (P)
	(A1L) S−BD PM • ANT SW ELEC − 1 • XPNDR − 1 • PWR AMPL OPER − 1 • STBY − 1 • PRE AMPL − 1 NSP • PWR − 1		S−BD PM Sys 2: Xpndr 2 Pre Amp 2 Pwr Amp 2 PM,FM Ant Sw 2 NSP 2/COM SEC 2	(LIGHTS LOST) Instr lts L/Ctr (pnls C2,F6,F7) MS pnl lts (pnls R10,R12) OS pnl lts (pnls A1,A2, A6, A7,A8,A13,L9)	
4 4	If PSP and/or INTRG reqd for PL or ISS ops: • S−BD PL PWR SYS − 1 • CNTL − PNL • − CMD • Reconfig PSP • Perform PL INTRG REACQ (if reqd)		S−BD PL Intrg 2 PSP 2	(FSMs) S67 FPC/FLC 3 S69 FC H2 PUMP 3 S66 AV BAY 1 FAN S66 CABIN FAN S66 IMU FN SPD B S67 AC VOLTS 3 S69 FC PUMP 3 S86 HYD RSVR Q SM2 HYD QTY (B) S86 WSB T SM0 THRM HYD (B) S88 FREON FLOW 1 S88 FRN PL HX 2 S88 FREON QTY 1 S88 H2O PUMP P2 S88 H2O LOOP 2 FLOW S88 H2O LOOP 2 TEMP BCE BYP KU (2) S88 H2O PUMP P1 S88 H2O LOOP 1 TEMP S88 H2O LOOP 1 QTY	(4) REACQ and PSP reconfig procedures are flight specific. If reqd, procedures can be found in payload or ISS specific books
	(A1R) • S−BD FM PWR − 1		S−BD FM Sys 2		(5) Rad isolation may cause FES shutdown
	If no comm: (C3) • S−BD PM CNTL − PNL • − CMD				(6) OIU 1 interfaces with PSP 1 for commanding
6	If OIU reqd: (SSP) • OIU PWR − OIU 1 ON • OIU tb − UP • ✓MCC, OIU reconfig			5 Possible 'S88 EVAP OUT T 1(2)'	(7) Instrumentation loss caused rad isolation
7	• Perform RAD ISOL RECOVERY, ECLS SSR−9 for Freon Loop 1			I/O ERROR CRT 3 I/O ERROR CRT 4 RM DLMA MANF	(8) Vlv holds position. Do not reconfig for reg switch or I'CNCT procedures
	(L4:P) • cb AC2 ΦA LG SNSR 2 − cl		Prox Snsr Electronics Box 1	If CABIN FAN A selected: C/W AV BAY/CAB AIR lt − on 'S66 CABIN FAN'	(9) Will indicate DN when NLG down
	Refer to OMS/RCS Slide Rule for vlv loss info Reconfig following vlv(s) only if leak isolation reqd: (O8) • FWD RCS He PRESS B	8	Fwd RCS He Press Isol B man OP capability	If SYS 2 pwrd: 'S62 BCE BYP PSP 2' Loss of PL TLM and CMD If PDI FDA enabled: 'S62 PDI DECOM FAIL'	(10) Will not indicate DN when RMG down
	• For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS)		RCS Manf F5 RJD pwr (F5L,F5R)	If NSP 2 selected: BCE STRG 3 NSP If site AOS and using S−BD Ant Elect 2: 'ANTENNA' (2)	(11) KU−BAND CONT STOW − EA1 ALTERNATE POWER IFM reqd to stow Ku Ant. Jettison reqd if antenna cannot be positioned within GO FOR PLBD CLOSURE envelope
			RCS Manf F4 RJD pwr (F4R,F4D)	(R1) FC3 COOL PUMP ΔP tb − bp	(12) Performing DIRECT STOW, MECH SSR−5, may be reqd. ✓MCC
12	(R14:C) • cb MNC KU SIG PROC − op	11	Ku−Bd Sys Rdr & Comm I/F Cont Unit (EA1)	(F6,F8) 9 LDG GEAR NOSE L tb − bp 10 LDG GEAR R,L tb − bp	
	(Continued)		(Continued)	(Continued)	

EPS SSR−51 (Cont)
BUS LOSS: MNC FPC3

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
Pre−seat ingress for Entry: • Discharge handheld fire ext into AV BAY 2		Av Bay 2 agent discharge capability	HYD/APU HYD QTY 3 ind − 0% APU H2O QTY 2 ind − 0%	(13) MPM and MRLS may be repwrd after AC Pwr Transfer Cable connected
	13 14 15 16	Port RMS: MPM Mtr 1 Fwd MRL Mtr 2 Aft MRL Mtr 1	(O8) FWD RCS 17 TK ISOL 1/2 tb − bp 17 MANF ISOL 4 tb − bp 17 5 tb − bp	(14) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison
If AC Pwr Transfer Cable to be installed to regain AC: • Go to EPS SSR−200; otherwise, continue with bus loss actions			(O1) H2O PUMP OUT PRESS LOOP 1 ind − 0 psia H2O PUMP OUT PRESS LOOP 2 ind − 20−25 psia	(15) Single mtr time. If unlatched, one failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists. If latched, one failure away from inability to use RMS
SM 60 SM TABLE MAINT 16 • INHIBIT 0612605, 0612600, 0612640, 0612610			AIR TEMP AV BAY ind − 45 degF FREON FLOW 1 ind − 578 pph	(16) Inhibits H2O Loop 1 Pump ΔP, Pump Out Press, Pump Out Temp, Accum Qty, respectively
(CDR SEAT PNL) • CDR SEAT PWR BUS SEL − AC2 (up)		CDR Seat Adj via AC3 pwr	R ADP deploy time incr from 15 to 30 sec	(17) Vlv holds position
(PLT SEAT PNL) • PLT SEAT PWR BUS SEL − AC2 (up)		PLT Seat Adj via AC3 pwr	(F7) If APUs active and using BLR CNTLR/HTR 2A or 3B: C/W APU TEMP lt − on after ~2 min	(18) Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate, and Accum Qty snsrs lost
(O17) • SIG CONDR FREON A − AC2 • SIG CONDR FREON B − AC2	 18 19	 Freon Sig Condr A AC3 pwr (ECLS SC 1A) Freon Sig Condr B AC3 pwr (ECLS SC 1B)	STAR TRKR DR POS −Z OP/CL time incr from 8 to 16 sec	(19) Freon Loop 2 P/L Hx Flow Rate, Freon Loop 1 ICH Flow Rate, and Accum Qty snsrs lost
(R2) • BLR CNTLR/HTR 2 − B • 3 − A		Hyd H2O Blr 2 Cntlr A 3 Cntlr B Rsvr 3 Qty Snsr	Impending: 'S66 CO2 RL SYS PCO2' 'S66 CAB PPCO2' (MO51F) CO2 RMVL SYS CNTLR 2 FAIL lt on	(20) H2O Loop 1 Pump Out P, Pump ΔP, Accum Qty, Pump Out Temp snsrs lost
(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl				(21) AV Bay 1 Fan ΔP, Air Out Temp snsrs lost
(L1) • IMU FAN B(A) − ON • C − OFF • H2O PUMP LOOP 2 − GPC • Perform (H2O Loop 2 only) H2O PUMP OPS via GPC, ECLS SSR−10 • H2O PUMP LOOP 1 − OFF • CAB FAN A − OFF • B − ON • AV BAY 1 FAN (two) − ON • ✓AV BAY 2 FAN A − ON • B − OFF • 3 FAN A − OFF • ✓B − ON • ✓FREON PUMP LOOP 2 − B	 17 20 21 	IMU Fan C H2O Loop 2 Pump man ON capability H2O Loop 1 Byp Cntlr, Sig Condr H2O Loop 1 Byp vlv pwr Cabin Fan A Av Bay 1 Sig condr, Xdcrs (ECLS SC2) Av Bay 2 Fan B Av Bay 3 Fan A Freon Loop 2 Pump A		(22) PEVs, Actuators, Bed A P, Bed B P, and Bed dP will be recovered after system reconfig
(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 2 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)	 22	 CO2 Rmvl Sys Cntlr 2		
(Continued)		(Continued)		

EPS SSR−51 (Cont)
BUS LOSS: MNC FPC3

23 BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM				(17) Vlv holds position
• MDU CRT 3 PWR − OFF				(23) AC3 Bus Isolation for AC Pwr Transfer Cable installation accomplished in MNC FPC 3 ACTIONS column. No additional bus isolation steps reqd
(L4:N) • cb AC3 ΦC RAD ISOL B − op	24	Freon Loop 1,2 Rad Isol Motor B		(24) Motor A remains
(C2) • IDP/CRT 3 PWR − OFF				(25) Mtr 2 remains
(O16:C) • cb MNC FIRE SUPPR BAY 2 − op				(26) Htr Cntlr 2 remains
• MDU CRT 4 PWR − OFF				(27) LG can still be deployed by Pri Hyd System or by redundant Pyro Backup Release System 2. NLG extension pwr assist still available from redundant sys. NLG can also be deployed by Hyd Sys 2
(R11L) • IDP/CRT 4 PWR − OFF				(28) Redundant mtrs remain
(MA73C:A) • MCA LOGIC MNC FWD 3 − OFF		MNC FMC 3 Bus pwr		(29) Bypass vlv holds position and Cntlr B Rad Byp Vlv Mtr remains
(R14:C) • cb MNB KU ELEC − op				(30) ✓MCC for Ku Ant stow reqmts
		AC3 FMC3 Bus Pwr LH Vents 1,2,3 Mtr 1 6 Mtr 2 −Z Star Trkr Dr Sys 2 OP/CL capability		
	25	R ADP Dpy Mtr 1		
		PLT HUD		
	26	R ADP Htr Cntlr 1		
	27	NLG Ext Sys 1		
	27	NLG,LMG,RMG Bkup Rel Sys 1		
		MNC Pwr to CNTL Buses BC1,BC2,BC3,CA1,CA2, CA3		
	28	ET Door Mtrs: C/L Lat Actr 2 Mtr 2 L Dr Closure Mtr 2 R Dr Closure Mtr 1 Uplock Lat Mtr 1		
	29	Freon Loop 2 Cntlr A Rad Byp Vlv Mtr		
	17	Freon Loop 2 Flow Prop Vlv		
		Port,Stbd Rad Lat 7−12 Mtrs 2 Port,Stbd Rad Dpy/Sto Mtrs 2		
		PLBD: C/L Lat 1−4, 5−8 Mtrs 2 9−12 Mtr 2 13−16 Mtr 1 Stbd Aft Blkhd Mtr 1 Port Aft Blkhd Mtr 2 Door Mtr 1		
	30	Ku Ant Sto/Dpy Mtr 1		

EPS SSR−52
BUS LOSS: MNC MPC3 (Includes MNC MMC2 & MNC MMC4)

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 • Perform MNC BUS TIE (BUS TIE Cue Card) 1 • Monitor, record Δamps between FC3 and tied FC	1 FC3 Purge Vlv O2,H2 Flow Xdcrs SS ΔV Snsrs	1 (R13L) RAD CNTL PORT,STBD (two) tb − bp	(1) Buses are tied due to: Loss of FC3 Purge capability. As FC3 loses performance the tied FC will pick up load, slowing FC3 degradation. If degradation projection does not allow for nominal EOM, Fuel Cell will be shut down. ✓MCC and Loss of FC3 SS ΔV Snsrs. Change in ΔAmps >12 amps indicates possible cell crossover problem. ΔAmps shift due to loss of FC3 purge capability is indicated by change in ΔAmps between pre− and post−purge readings. MCC will aid in this determination
(L2) • FLASH EVAP FDLN HTR B SPLY − 2	FES H2O Fdln B Mid 2 Htr 1	(Lights Lost) PLB FloodIts Aft Port, Mid Stbd	
(A12) • HYD HTR AFT FUS A − AUTO • HYD HTR AFT FUS B − OFF	Aft Fuselage Hyd Htrs B	If first RGA failure and rates sensed: 'RM FAIL RGA' (3)	
(R11U) • FC H2O LINE HTR − A AUTO • FC H2O RELIEF HTR − A AUTO	FC H2O Line Htrs B Relief Htrs B Noz Htr	If FC H2O Rlf Htrs in B AUTO: SM ALERT Light/Tone − on 'S69 FUEL CELL'	
		SM (BFS SM 63) PL BAY DOORS	
		If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG'	
		During MAN PLBD OP/CL, single mtr run time noted on actuators listed at left	
(MA73C:C,D) 2 • cb MCA PWR AC3 3Φ MID 2 − op 2 • cb MCA PWR AC3 3Φ MID 4 − op	2 Port,Stbd Rad Lat 7−12 Mtr 2 Limit sw 3 Port,Stbd Rad Dpy/Sto Mtrs 1 Limit sw Port,Stbd Rad Dpy/Sto Mtrs 2		(2) If AC3 MMC2 and MMC4 cbs not opened, Lat Mtrs 2 of actuators for Port,Stbd Rad Lat 7−12 continues to run until Sys B Lat Cntl sw placed to OFF
For PLBD ops: • OP/CL Drs in man mode	PLBD: C/L Lat 13−16 Mtr 1 1−4,5−8,9−12 Mtr 2 Stbd Aft Blkhd Lat Mtr 1 Port Aft Blkhd Lat Mtr 2 Door Mtr 1 Stbd Door Mtr 2 CL Limit sw	(A8L) PORT RMS: DPY/STO tb − bp RETEN LAT tb − bp R−F−L AFT tb − bp	
		SM 94 PDRS CONTROL	
		Indications lost: MPM Mtr 1 STO/DPY Fwd MRL Mtr 2 LAT/REL/RDY Aft MRL Mtr 1 LAT/REL/RDY	
(L1) • TOP EVAP HTR DUCT − A(B) If Hi Load Evap enabled: • HI LOAD DUCT HTR − A(B)	Topping Evap Duct Fwd,Aft Htr C Hi Load Duct Inbd,Outbd Htr C		(3) Mtrs 1 will continue to drive until Sys A,B Cntl sw are taken to OFF
			(4) Logic buses 2(3) remain pwrd via MNB(MNA)
			(5) Buses remain pwrd
			(6) Cntlrs A,B Rad Byp Mtrs Auto Cntl and Cntlr B Rad Byp Vlv Mtr Man Cntl remain

BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(A7U) PL BAY FLOOD • AFT PORT − OFF • MID STBD − OFF	PLB Aft Port Floodlt Mid Stbd Floodlt		
(A7L) IF DOCKING MISSION • PYRO PWR MNC − OFF cb MNC • LOGIC 2 − op • 3 − op	MNC Pyro system 4 MNC pwr to DSP Logic buses 2,3		
(O16:A) • RGA 3 − OFF	RGA 3		
(R11U) • FC PURGE VLV 3 − CL • FC STARTUP HTR 3 − ENA	FC3 Startup Htr INH capability		
(MA73C:A,B) • MCA LOGIC MNC MID 2,4 (two) − OFF	MNC MMC2, MNC MMC4 Bus pwr		
	5 MNC pwr to ESS1BC,2CA		
	6 Freon Loop 1 Cntlr A Rad Byp Vlv Mtr man Cntl		
	(Continued)		

EPS SSR−52 (Cont)
BUS LOSS: MNC MPC3

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
		Port RMS:		(7) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison
	7	MPM Mtr 1		
	8	Fwd MRL Mtr 2		
	8	Aft MRL Mtr 1		
		RH Vent 3 Mtr 2 5 Mtr 2 LH Vent 3 Mtr 2 6 Mtr 2		(8) Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists
	9	Ku Ant Dpy/Sto Mtr 1 Limit sw		(9) With an inop limit sw, mtr will continue to run until primary sw returned to GND
	10	Redundant Ku Band Xmit Enable		(10) Redundant sig (MNB) enables Ku Band Xmit
	11	Redundant Boom Stow Enable II Excitation Signal		(11) MNB MMC4 pwr remains to supply pwr to Boom Stow Enable II signal for stow mtrs
		FC2 Redundant Reac Vlv Close Cntl on pnl C3		

EPS SSR−53
BUS LOSS: MNC APC3

ACTIONS	EQUIP/FUNCTION LOST
GNC 23 RCS	
1 DES INH on L Manf 3 Jets: • ITEM 2 EXEC • L3L ITEM 12 EXEC (*) • L3D ITEM 28 EXEC (*) • L3A ITEM 30 EXEC (*) Set aft pod(s) PRI JET FAIL LIMIT to 6	
Refer to OMS/RCS Slide Rule for vlv loss info (use APC6 Slide for Aft RCS)	2 Aft L RCS He Press Isol B GPC Cntl, man CL capability
3 Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT L RCS He PRESS B • R RCS He PRESS B	4 Aft R RCS He Press Isol B man OP capability 2 Aft L,R RCS Manf Isol 5 Cntl
(A12) APU HTR TK/FU LN/H2O • SYS 3B − AUTO	APU 3 GG Inj H2O Htrs 3A,23A
(A14) RCS/OMS HTR • L POD (two) − A AUTO, B OFF • R POD (two) − A AUTO, B OFF	L,R Pod Htrs B (partial)
5 Prior to using L,R OMS: (O8)	
6 R OMS He PRESS/VAP ISOL • A − GPC • B − OP	7 R OMS He Vap Isol 2 GPC Cntl 7 R OMS He Pr Isol B GPC Cntl
8 L OMS He PRESS/VAP ISOL • A(B) − GPC • B(A) − CL	9 L OMS He Pr/Vap Isol A,B man Cntl
GNC XXXXX MNVR YYYYY (3,B)	
Sel R OMS SEC TVC: • GMBL SEC R − ITEM 31 EXEC	R OMS Pri TVC

BUS ISOLATION	
ONLY ON MCC CALL, PERFORM	
(R1) • PL AFT MNC − OFF	Aft Payload C pwr
	R OMS BPV 2 OP sig 10 APU 2 Fu Tk Vlv B

CREW INDICATIONS
If OMS GMBL cmd abs value > 2 deg: C/W OMS TVC lt − on 'R OMS GMBL' (3,B)

NOTES

(1) Maintains control capability for APC4 failure

(2) Vlv holds position

(3) Do not reconfig for reg switch or I'CNCT procedures

(4) Man CL and GPC cntl remains

(5) Lost TM:

GNC SYS SUMM 2

R OMS Eng Vlv 2: Assume Vlv 2 status same as Vlv 1

(6) Maintains He Isol redundancy

(7) Vlv normally closed. Man cntl remains

(8) Prevents simultaneous opening of parallel reg paths and possibly rupturing burst disk

(9) Vlv normally closed. GPC cntl remains

(10) Vlv fails closed. Redundant vlv remains

EPS SSR−54
BUS LOSS: MNC APC6 (Includes MNC APC3, MNC ALC3, MNC AMC3)

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(L1) • FLASH EVAP CNTLR PRI A − OFF • FLASH EVAP CNTLR PRI B(SEC) − ON (If reqd) • TOP EVAP HTR NOZ R − A AUTO If HI LOAD EVAP enabled: • HI LOAD DUCT HTR − A(B)	Flash Evap Cntlr Pri A Topping Evap R Noz Htr B Hi Load Duct Noz Htr C	1 (R4) 1 HYD BRAKE ISOL VLV 3 tb − OP 1 HYD MPS/TVC ISOL VLV SYS 3 tb − CL	(1) Vlv holds position (2) Do not reconfig for reg switch or I'CNCT procedures (3) Man CL and GPC cntl remains (4) Maintains control capability for APC1 failure (5) * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
(L2) • FLASH EVAP FDLN HTR B SPLY − 2	FES H2O Fdln B Htrs 1 (all except Mid 2)	(O7) 1 AFT L RCS He PRESS B tb − bp 1 AFT L,R RCS MANF ISOL 5 (two) tb − bp	
Refer to OMS/RCS Slide Rule for vlv loss info 2 Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT L RCS He PRESS B • R RCS He PRESS B	1 Aft L RCS He Press Isol B GPC Cntl and man CL capability 3 Aft R RCS He Press Isol B man OP capability	(FSMs) S88 FRN AFT CP 2 RCS PWR FAIL	
GNC 23 RCS • Reprioritize L,R Manf 3,4 Jets to first priority: DES INH twice all other jets; highest priority first, then next highest, etc 4 DES INH on L Manf 3 Jets: • ITEM 2 EXEC • L3L ITEM 12 EXEC (*) • L3D ITEM 28 EXEC (*) • L3A ITEM 30 EXEC (*) • Set aft pod(s) PRI JET FAIL LIMIT to 6	Aft RCS L,R Jets 3,4 Htrs	If cooling by FES only: C/W FREON LOOP lt − on 'S88 EVAP OUT T 1' 'S88 EVAP OUT T 2'	
		(F7) If APUs active and using BLR CNTLR/HTR 2A or 3B, C/W APU TEMP lt − on after ~2 min	
		If OMS Gmbl cmd abs value > 2 deg: C/W OMS TVC lt − on 'R OMS GMBL' (3,B)	
(R2) • BLR CNTLR/HTR 2 − B • 3 − A	Hyd H2O Blr 2 Cntlr A Blr 3 Cntlr B	No R MPS He usage during entry (MM304)	
(A12) APU HTR TK/FU LINE H2O 5 • SYS 2A − AUTO • 2B − OFF 5 • SYS 3A − OFF • 3B − AUTO APU HTR GAS GEN/FUEL 5 • PUMP 2 − A AUTO 5 • 3 − B AUTO APU HTR • LUBE OIL LINE 2 − A AUTO • LUBE OIL LINE 3 − B AUTO HYD CIRC • PUMP PWR 2 − MNB • 3 − MNA	APU 2 TK/FU Ln Htr B 3 TK/FU Ln Htr A 3 GG Inj H2O Htrs 3A,23A APU 2 GG/FU Pump Htr B 3 GG/FU Pump Htr A APU 2 Lube Oil Ln Htr B APU 3 Lube Oil Ln Htr A Circ Pmp 2 MNC pwr 3 MNC pwr		
(A14) RCS/OMS HTR • L POD (two) − A AUTO, B OFF • R POD (two) − A AUTO, B OFF	L,R Pod Htrs B (partial)		
(Continued)	(Continued)		

EPS SSR−54 (Cont)
BUS LOSS: MNC APC6

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
6 Save R OMS Eng for deorbit (If reqd for additional on−orbit burns, ✓MCC)	6 R OMS GN2 Press Vlv OP TM 7 R OMS Eng Pr Vlv Coil 1		(1) Vlv holds position (6) Lost TM: GNC SYS SUMM 2 R OMS N2 P VLV If Eng − ARM/PRESS assume vlv OP R OMS ENG Vlv 2: assume Vlv 2 status same as Vlv 1 (7) Unable to confirm redundant coils (8) Maintains He Isol redundancy (9) Vlv normally closed. Man cntl remains (10) Prevents simultaneous opening of parallel reg paths and possibly rupturing burst disk (11) Vlv normally closed. GPC cntl remains (12) Sys A Pri Cntlr, auto switchover to Sec Cntlr remain (13) Sys B Sec Cntlr man On capability remains (14) Six vlvs fail in non−isolation position (15) Pwr Sply A remains. Turbine Speed ind lost (16) Vlv fails closed. Redundant vlv remains (17) Pwr Sply B remains. GG Bed T and GBX P ind lost when APU running (18) Redundant RPC remains
Prior to using L(R) OMS: (O8) 8 R OMS He PRESS/VAP ISOL • A − GPC • B − OP 10 L OMS He PRESS/VAP ISOL • A(B) − GPC • B(A) − CL	9 R OMS He Vap Isol 2 GPC Cntl 9 R OMS He Pr Isol B GPC Cntl 11 L OMS He Pr/Vap Isol A,B man Cntl		
GNC XXXXX MNVR YYYYY (3,B) Sel R OMS SEC TVC: • GMBL SEC R − ITEM 31 EXEC	R OMS Pri TVC		
For SSME Hyd Repress: (R4) • HYD MPS/TVC ISOL VLV SYS 1,2 (two) − OP, wait 10 sec, then CL	1 MPS/TVC Hyd Sys 3 Isol Cntl		
If reqd during entry (< 120K ft): (L1) • NH3 CNTLR A − PRI/GPC If reqd for Post Rollout: • NH3 CNTLR B − SEC/ON	12 NH3 Sys A Sec Cntlr Man ON capability 13 NH3 Sys B Pri Cntlr and Auto switchover to Sec Cntlr		
If NH3 CNTLR A(B) − SEC/ON reqd, then: (L1) • H2O PUMP LOOP 1,2 (two) − ON • ✓FLOW PROP VLV LOOP 1,2 (two) − ICH If applicable: • Activate PL H2O LOOP(s)			

BUS ISOLATION	
ONLY ON MCC CALL, PERFORM	
(R1) • PL AFT MNC − OFF	Aft Payload C pwr PL MNC Cur Sig Condr
	14 ATVC 1 Isol ME
(MA73C:B) • MCA LOGIC MNC AFT 3 − OFF	MNC AMC3 Bus pwr RH Vents 8,9 Mtr 1
	Freon Loop 2 Cold Plate Flow Xdcr 15 APU 2 Cntlr Pwr Sply B 16 Fu Tk Vlv B 17 APU 3 Cntlr Pwr Sply A 16 Fu Tk Vlv A GBX GN2 Repress Vlv
	18 Hyd Main Pump 3 Depress Solenoid RPC A 18 Hyd Main Pump 2 Depress Solenoid RPC B
	(Continued)

EPS SSR−54 (Cont)
BUS LOSS: MNC APC6

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	1	Hyd Brake Isol 3 Cntl	R MPS He reg A < 680 during entry (MM303)	(1) Vlv holds position
	19	R OMS Cntl Vlv 1,2 Coils 1		(19) Redundant coils remain
	20	OMS Qty Gauging for all R OMS single engine burns		(20) ✓MCC for OMS Qtys
	21	R OMS Purge Vlv 1,2 Aft RCS L,R Jet 5 Htr		(21) **CAUTION** No Purge. Wait 10 min between burns
		MPS:		
	22	R Eng He Intercon Outlet Vlv		(22) Vlv fails closed
	23	R Eng He Isol A		(23) Vlv fails closed. Redundant vlv remains
	22	L Eng He Xovr Vlv		
	24	Manf Repress LO2 Vlv 1,2		(24) Vlv fails closed. LO2 Manf will not be pressurized with He during entry (MM304)
	25	Prplt F/D Outbd LO2 Vlv		(25) Vlv holds position. Loss of manual capability to inert LO2 manf
	26	ET Door Mtrs: C/L Lat Actr 2 Mtr 2 GPC Cntl L Dr Closure Mtr 2 GPC CL capability R Dr Closure Mtr 1 GPC CL capability R Dr Uplock Lat Mtr 1 GPC Lat capability		(26) Redundant mtrs remain
		AC Pwr removal capability via Limit sw for ET Dr Mtrs: C/L Lat Actr 2 Mtr 2 L Dr Closure Mtr 2 R Dr Closure Mtr 1 Uplock Lat Mtr 1		

EPS SSR−55
BUS LOSS: MNC FLC3

	ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(A1L) S−BD PM • ANT SW ELEC − 1 • XPNDR − 1 • PWR AMPL OPER − 1 • PWR AMPL STBY − 1 • PRE AMP − 1 NSP • PWR − 1	S−BD PM Sys 2: FM, PM Ant Sw 2 Xpndr 2 Pwr Ampl 2 Pre Amp 2 NSP 2	(COMM LOST) All S−BD A/G voice lost if Sys 2 selected	(1) Indications do not appear until jets commanded
	If PSP and/or INTRG reqd for PL or ISS ops: • S−BD PL PWR SYS − 1 • CNTL − PNL • − CMD	S−BD PL Intrg 2 PSP 2	(F7) 1 C/W RCS JET lt − on	(2) Does not indicate DN when RMG down
5 5	• Reconfig PSP • Perform PL INTRG REACQ (if reqd)		(F6,F8) 2 LDG GEAR R tb − bp 3 LDG GEAR NOSE tb − bp	(3) Indicates DN when Nose Gear down
	(A1R) • S−BD FM PWR − 1	S−BD FM Sys 2	(O8) 4 FWD RCS MANF ISOL 5 tb − bp	(4) Vlv holds position
	If no comm: (C3) • S−BD PM CNTL − PNL • − CMD		(FSMs) 1 F RCS D(R) JET RM DLMA MANF	(5) REACQ and PSP reconfig procedures are flight specific. If reqd, procedures can be found in payload or ISS specific books
7	If OIU reqd: (SSP) • OIU PWR − OIU 1 ON • OIU tb − UP • ✓MCC, OIU reconfig		If NSP 2 selected: 'BCE STRG 3 NSP' 6 If site AOS and using S−BD ANT Elec 2: 'ANTENNA (2)	(6) FSM caused by Antenna miscompare
	• For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS)	RCS Manf F5 RJD pwr (F5L,F5R)	If Sys 2 pwrd: 'S62 BCE BYP PSP2' Loss of PL TLM and CMD If PDI FDA enabled: 'S62 PDI DECOM FAIL'	(7) OIU 1 interfaces with PSP 1 for commanding
8	GNC 23 RCS Override F4 Manf status to CL: • RCS FWD − ITEM 1 EXEC • MANF VLVS 4 OVRD − ITEM 43 EXEC	RCS Manf F4 RJD pwr (F4R,F4D)		(8) Manf status not automatically declared closed. Jet fail−offs may occur when commanded
9	Refer to OMS/RCS Slide Rule for vlv loss info Reconfig following vlv only if leak isolation reqd: (O8) • FWD RCS He PRESS B	4 Fwd RCS He Press Isol B man OP capability		(9) Do not reconfig for reg switch or I'CNCT procedures
	• Pre−seat ingress for Entry, discharge hand−held fire ext into AV BAY 2	Av Bay 2 agent discharge capability		(10) Htr Cntlr 2 remains

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(O16:C) • cb MNC FIRE SUPPR BAY 2 − op

10 R ADP Htr Cntlr 1
NWS fail indication (pnl F2)

NLG, RMG B/U Rel 1 Fire 2, Arm

EPS SSR−56
BUS LOSS: MNC ALC3

	ACTIONS		EQUIP/FUNCTION LOST
	(L1) • FLASH EVAP CNTLR PRI A − OFF • FLASH EVAP CNTLR PRI B(SEC) − ON (If reqd) • TOP EVAP HTR NOZ R − A AUTO If HI LOAD EVAP enabled: • HI LOAD DUCT HTR − A(B)		FES Cntlr Pri A Topping Evap R Noz Htr B Hi Load Duct Noz Htr C
	(L2) • FLASH EVAP FDLN HTR B SPLY − 2		FES H2O Fdln B Htrs 1 (all except Mid 2)
2	Refer to OMS/RCS Slide Rule for bus loss info Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT R RCS He PRESS B • L RCS He PRESS B	1	Aft R RCS He Pr Isol B man OP capability Aft L RCS He Press Isol B GPC Cntl, man CL capability
	GNC 23 RCS • Reprioritize L,R Manf 3,4 Jets to first priority: DES INH twice all other jets; highest priority first, then next highest, etc • Set aft pod(s) PRI JET FAIL LIMIT to 6		Aft RCS L,R Jet 3,4 Htrs
	(R2) • BLR CNTLR/HTR 2 − B • 3 − A	3 3	Hyd H2O Blr 2 Cntlr A 3 Cntlr B
4 4 4 4 	(A12) APU HTR TK/FU LINE/H2O • SYS 2A − AUTO • 2B − OFF • 3A − OFF • 3B − AUTO APU HTR GAS GEN/FUEL • PUMP 2 − A AUTO • 3 − B AUTO APU HTR LUBE OIL • LINE 2 − A AUTO • 3 − B AUTO HYD CIRC • PUMP PWR 2 − MNB • 3 − MNA		 APU 2 Tk/Fu Ln Htr B APU 3 Tk/Fu Ln Htr A APU 2 GG/FU Pump Htr B 3 GG/FU Pump Htr A APU 2 Lube Oil Ln Htr B 3 Lube Oil Ln Htr A Circ Pump 2 MNC pwr 3 MNC pwr
5	Save R OMS eng for deorbit (If reqd for additional on−orbit burns, ✓MCC)	5 6	R OMS GN2 Press Vlv OP TM R OMS Eng Pr Vlv Coil 1
7	Prior to using R OMS: (O8) R OMS He PRESS/VAP ISOL • A − GPC • B − OP	8	R OMS He Pr Isol B GPC Cntl
	For SSME Hyd Repress: (R4) • HYD MPS/TVC ISOL VLV SYS 1,2 (two) − OP, wait 10 sec, then CL	1	MPS/TVC Hyd Sys 3 Isol Cntl
	(Continued)		(Continued)

	CREW INDICATIONS
1 1	(R4) HYD BRAKE ISOL VLV 3 tb − OP HYD MPS/TVC ISOL VLV SYS 3 tb − CL
1 1	(O7) AFT L RCS He PRESS B tb − bp AFT L,R RCS MANF ISOL 5 (two) tb − bp
	(FSMs) RCS PWR FAIL
	If cooling by FES only: C/W FREON LOOP lt − on 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'
	(F7) If APUs active and using BLR CNTLR/HTR 2A or 3B: C/W APU TEMP lt − on after ~2 min

NOTES
(1) Vlv holds position
(2) Do not reconfig for reg switch or I'CNCT procedures
(3) HYD H2O Blr and Tk Htrs are still operative, but GN2 SOV fails open and steam vent htr and spray logic are disabled. Alternate controller must be selected
(4) * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
(5) Lost TM: GNC SYS SUMM 2 R OMS N2 P VLV If Eng − ARM/PRESS, assume vlv OP
(6) Unable to confirm redundant coils
(7) Maintains He Isol redundancy
(8) Vlv normally closed. Man cntl remains

EPS SSR−56 (Cont)
BUS LOSS: MNC ALC3

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
If reqd during entry (< 120K ft): (L1) • NH3 CNTLR A − PRI/GPC If reqd for Post Rollout: • NH3 CNTLR B − SEC/ON	9 10	NH3 Sys A Sec Cntlr man ON capability NH3 Sys B Pri Cntlr and Auto sw over to Sec Cntlr	R MPS He reg A < 680 during entry (MM303)	(1) Vlv holds position (9) Sys A Pri Cntlr, auto switchover to Sec Cntlr remain (10) Sys B Sec Cntlr man On capability remains (11) Redundant coils remain (12) ✓MCC for OMS Qtys (13) **CAUTION** No Purge. Wait 10 min between burns (14) Vlv fails closed. Redundant vlv remains (15) Vlv fails closed (16) Vlv fails closed. LO2 Manf will not be pressurized with He during entry (MM304) (17) Vlv holds position. Loss of manual capability to inert LO2 manf
If NH3 CNTLR A(B) − SEC/ON reqd, then: (L1) • H2O PUMP LOOP 1,2 (two) − ON • ✓FLOW PROP VLV LOOP 1,2 (two) − ICH If applicable: • Activate PL H2O LOOP(s)				
BUS ISOLATION				
ONLY ON MCC CALL, PERFORM				
NONE	11 12 13 1 14 14 15 14 15 16 17	R OMS Eng Cntl Vlv 1,2 Coils 1 OMS Qty Gauging for all R OMS Single Engine burns R OMS Purge Vlv 1,2 Aft RCS L,R Jet 5 Htr Hyd Brake Isol 3 Cntl APU 2 Fu Tk Vlv B 3 Fu Tk Vlv A MPS: R Eng He Intercon Outlet Vlv R Eng He Isol A L Eng He Xovr Vlv Manf Repress LO2 Vlv 1,2 Prplt F/D Outbd LO2 Vlv		

EPS SSR−57
BUS LOSS: MNC FMC3

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
• Refer to OMS/RCS Slide Rule for vlv loss info GNC 23 RCS Override F4 Manf status to OP • RCS FWD − ITEM 1 EXEC • MANF VLVS 4 OVRD − ITEM 43 EXEC		(FSM) RM DLMA MANF (O8) 1 FWD RCS TK ISOL 1/2 tb − bp 1 FWD RCS MANF ISOL 4 tb − bp R ADP deploy time incr from 15 to 30 sec STAR TRKR DR POS −Z OP/CL time incr from 8 to 16 sec	(1) Vlv holds position (2) Mtr 2 remains (3) Htr Cntlr 2 remains
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
	2 −Z Star Trkr Dr Sys 2 OP/CL capability R ADP Deploy Mtr 1 Disc 1		
(MA73C:A) • MCA LOGIC MNC FWD 3 − OFF	3 MNC FMC3 Bus pwr R ADP Htr Cntlr 1 LH Vent 1,2 Mtr 1		

EPS SSR−58
BUS LOSS: MNC MMC2

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 (MA73C:C) • cb MCA PWR AC3 3Φ MID 2 − op	1 Stbd Rad Lat 7−12 Mtr 2 Limit sw 2 Port Rad Dpy/Sto Mtr 1 Limit sw Stbd Rad Dpy/Sto Mtr 2	1 (R13L) RAD CNTL PORT tb − bp If STBD RAD pnl deployed: RAD CNTL STBD tb − bp	(1) If AC3 MMC2 cb not opened, Lat Mtr 2 of Stbd Lat 7−12 Actuator continues to run until Sys B Lat Cntl sw placed to OFF
For PLBD Ops: • OP/CL Drs in man mode, MANUAL PLBD CLOSING (DEORBIT PREP)	PLBD: C/L Lat 1−4 Mtr 2 5−8 Mtr 2 Port Aft Blkhd Lat Mtr 2	SM (BFS SM 63) PL BAY DOORS If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG'	(2) Mtr 1 will continue to drive until Sys B Cntl sw is taken to OFF
		During MAN PLBD OP/CL, single mtr run time noted on actuators listed at left	(3) With an inoperative limit switch, mtr will continue to run until stow sw returned to gnd
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM		(A8L) PORT RMS: DPY/STO tb − bp RETEN LAT tb − bp R−F−L AFT tb − bp	(4) Redundant sig (MNB) enables Ku−Band Xmit
(MA73C:A) • MCA LOGIC MNC MID 2 − OFF	MNC MMC2 Bus pwr	SM 94 PDRS CONTROL Indications lost: MPM Mtr 1 STO/DPY Aft MRL Mtr 1 LAT/REL/RDY	(5) MNB MMC4 pwr remains to supply pwr to Boom Stow Enable II Signal for Stow mtrs
	LH Vents 3 Mtr 1 6 Mtr 2		(6) Single mtr time
	3 Ku Ant Dpy/Sto Mtr 1 limit sw 4 Redundant Ku−Band Xmit Enable 5 Redundant Boom Stow Enable II Excitation Signal		
	6 Port RMS Aft MRL Mtr 1		

EPS SSR−59
BUS LOSS: MNC MMC4

ACTIONS
(MA73C:D) 1 • cb MCA PWR AC3 3Φ MID 4 − op
For PLBD ops: • OP/CL Drs in man mode, MANUAL PLBD CLOSING (DEORBIT PREP)

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:B) • MCA LOGIC MNC MID 4 − OFF

	EQUIP/FUNCTION LOST
1	Port Rad Lat 7−12 Mtr 2 Limit sw
	Port Rad Dpy/Sto Mtr 2
2	Stbd Rad Dpy/Sto Mtr 1 Limit sw
	PLBD: C/L Lat 9−12 Mtr 2 13−16 Mtr 1 Stbd Aft Bkhd Lat Mtr 1 Port Door Mtr 1 Stbd Door Mtr 2 CL Limit sw
	MNC MMC 4 Bus pwr
	RH Vent 5 Mtr 2 3 Mtr 2
	Port RMS: 3 MPM Mtr 1 4 Fwd MRL Mtr 2

CREW INDICATIONS
(R13L) RAD CNTL STBD tb − bp If PORT RAD pnl deployed: RAD CNTL PORT tb − bp
SM (BFS SM 63) PL BAY DOORs If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG'
During MAN PLBD OP/CL, single mtr run time noted on actuators listed at left
PORT RMS: SM 94 PDRS CONTROL Indications lost: Fwd MRL Mtr 2 LAT/REL/RDY

NOTES
(1) If AC3 MMC4 cb not opened, Lat Mtr 2 of Port Lat 7−12 Actuator continues to run until Sys B Lat Control sw placed to OFF
(2) Mtr 1 will continue to drive until Sys A Cntl sw is taken to OFF
(3) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison
(4) Single mtr time

EPS SSR−60
BUS LOSS: MNC AMC3

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:B) • MCA LOGIC MNC AFT 3 − OFF

	EQUIP/FUNCTION LOST
	RH Vents 8,9 Mtr 1
	MNC AMC3 Bus pwr
1	ET Door Mtrs: C/L Lat Actr 2 Mtr 2 GPC Cntl L Dr Closure Mtr 2 GPC CL capability R Dr Closure Mtr 1 GPC CL capability R Dr Uplock Lat Mtr 1 GPC Lat capability
	AC pwr removal capability via Limit sw for ET Dr Mtrs: C/L Lat Actr 2 Mtr 2 L Dr closure Mtr 2 R Dr closure Mtr 1 Uplock Mtr 1

CREW INDICATIONS
NONE

NOTES
(1) Redundant mtrs remain

EPS SSR−61
BUS LOSS: MNC R14

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(C3) 1 • AUD CTR − 1	1 Audio Center 2	MS Floodlt lost Comm via PS ATU lost 1 If Aud Ctr 2 selected, all comm lost	(1) If AUD CTR 2 selected, all intercom, A/G, recorded voice lost until AUD CTR 1 selected
(AW18D) • AIRLK AUD CNTL − MIDDECK	A/L ATU, EMU CCU 1,2 PS ATU, CCU	2 If operating Ku−Band comm, no U/L voice	(2) Ku comm function lost. RDR function OK
		(F6) MDU CDR 1 blanks	(3) Redundant pwr source remains for equipment
		(F8) MDU PLT 2 blanks	
		(AFT) MDU AFD 1 blanks	

BUS ISOLATION	
ONLY ON MCC CALL, PERFORM	
(R14:A) cb MNC • AUD AUD CTR 2 − op • PS/AIRLK − op • MDU CDR 1 − op • MDU PLT 2 − op • MDU AFD 1 − op	MDU CDR 1 MDU PLT 2 MDU AFD 1
(R14:B) cb MNC • UHF − op • GCILC − op • CNTL BUS AB1/2/3 − op 3 cb PALLET/DSC • 2A − op (EDO) • 3B/4A − op (EDO)	UHF redundant pwr GCIL redundant pwr MDM cmds to CCTV Sys MNC pwr for CNTL AB1,AB2 AB3
(R14:C) • cb MNC KU SIG PROC − op	2 Ku Comm Sig Proc
(R14:D) cb MNC TV • CAB − op cb MNC TV B KEEL/EVA • CAMR/PAN−TILT − op • CAMR HTR − op • KEEL/EVA PAN−TILT HTR − op	Flt, Middeck TV Camrs, VFMs TV B Keel/EVA Camr/Pan−Tilt TV B Keel/EVA Camr Htr Pan−Tilt Htr
(R14:E) • cb MNC MS FLOOD − op	MS Floodlt
• MDU CDR 1 PWR − OFF • MDU PLT 2 PWR − OFF • MDU AFD 1 PWR − OFF	

EPS SSR−62
BUS LOSS: MNC O16RJD

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

	EQUIP/FUNCTION LOST
1	ON Cntl of RCS F4 Manf Drivers (F4D,F4R)

CREW INDICATIONS

NOTES
(1) F4 Manf Drivers lost if both F3 Driver sw and F4 Driver sw OFF when bus failed. F1 Driver sw now controls pwr to F3 Manf Drivers

EPS SSR−63
BUS LOSS: MNC O16

	ACTIONS
1	(R1) • BUS TIE MNB − ON (tb−ON)
	(O6) • ANNUN BUS SEL ACA 2/3 − MNB
	(F6,F8) • HSI SEL SOURCE (two) − other than MLS 3
	(A6U) • ANNUN BUS SEL − MNB
	(Continued)

	EQUIP/FUNCTION LOST
2	ACA 2/3 MNC pwr
	MLS 3
2	ACA 4/5 MNC pwr
	(Continued)

	CREW INDICATIONS
	(FSMs) BCE STRG 3 ADTA (3,B) 4 ADTA (3,B) 3 MLS (3)
	(O3) RCS/OMS Prplt Qty Gauge blanks
3	(L2) O2 EMER tb − bp CAB RELIEF B tb − bp
	Time stops updating
2	(LIGHTS LOST) R Seat/Ctr Cnsl FloodIts If ACA 2/3 − MNC, lights lost: (C3) DAP lights right two columns ALL (F6) Landing Gear ARM/DOWN (F3) NWS FAIL lt (L1) Smoke detection fire suppression ALL
2	If ACA 4/5 − MNC, lights lost: (A6U) DAP lights ALL (A7U) Video input, output, Gamma, ALC

NOTES
(1) FC2 only one failure away (loss of ESS2CA) from inability to bus tie (2) ACAs recovered by switching to alternate pwr (3) If EMER O2 Mission Kit not flown, cb is opened prelauncht

EPS SSR−63 (Cont)
BUS LOSS: MNC O16

ACTIONS		EQUIP/FUNCTION LOST
Pre−seat ingress for entry, • Discharge handheld fire ext into AV BAY 2		Av Bay 2 Agent discharge capability
BUS ISOLATION		
ONLY ON MCC CALL, PERFORM		
(O8) • MLS 3 − OFF • R SEAT/CTR CNSL FLOOD − OFF		R Seat/Ctr Cnsl FloodIts
(O16:B) cb MNC 4 • OI SIG CONDR OM3 B − op • OI SIG CONDR OF 2/3 B − op • OI MDM OF 3/4 B − op • MNB CONTR − op • AUX TIMING BUFF − op		Orbiter Timing Buffer Aft Mission Timer
(O16:C) cb MNC • TACAN 3 − op • SMOKE DETN CAB − op • SMOKE DETN BAY 1A/2B − op • UTIL PWR A11/A15/ MO30F − op • FIRE SUPP BAY 2 − op • FLOOD R CTR − op • ANNUN FWD ACA 2/3 − op • ANNUN AFT ACA 4/5 − op • CRYO O2 HTR TK1 SNSR 2 − op • CRYO O2 HTR TK2 SNSR 1 − op	 6 7	Tacan 3 5 Cabin Smoke Detector Av Bay 1 Smoke Detector A 2 Smoke Detector B MNC Utility pwr Cryo O2 Tk1 Htr Current Snsr 2 Cryo O2 Tk2 Htr Current Snsr 1
(O16:D) cb MNC • H2O ALT PRESS − op 3 • O2 EMER − op • CAB RELIEF B − op	 8 9 9	 H2O Alternate Press Vlv Emer O2 Sply Vlv Cabin Relief Vlv B
(O16:E) cb MNC • ADTA 3,4 (two) − op • MLS 3 − op • DDU R, AFT (two) − op • RCS/OMS PRPLT QTY GAUGE − op • DRAG CHUTE SYS 1 − op	 4 10 11	 ADTA 3,4 R,Aft DDU MNC pwr RCS/OMS Prplt Qty Gauge Drag Chute, CDR Arm

CREW INDICATIONS	NOTES
	(3) If EMER O2 Mission Kit not flown, cb is opened prelaunch (4) Redundant pwr remains (5) L,R L+ DK smoke detectors remain (6) Current Snsr 1 remains (7) Current Snsr 2 remains (8) Vlv remains closed (9) Vlv holds position (10) ✓MCC for total OMS Qtys. Aft Qtys are found on GNC SYS SUMM 2 (11) PLT Arm remains

EPS SSR−64
BUS LOSS: MNC R1A1

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

	EQUIP/FUNCTION LOST
1	MNC pwr to CNTLBC1,2,3 and CNTLCA1,2,3
2	MNC pwr to ESS1BC, ESS2CA

CREW INDICATIONS

NOTES
(1) Cntl Buses remain pwrd
(2) ESS1BC and ESS2CA remain pwrd

EPS SSR−65
BUS LOSS: MNC A14

ACTIONS
GNC 23 RCS • Reprioritize Fwd Manf 4 jets to first priority: Des INH twice all other jets, highest priority first, then next highest priority, etc

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

EQUIP/FUNCTION LOST
Fwd RCS Jet 4,5 Htrs

CREW INDICATIONS

NOTES

EPS SSR−66
BUS LOSS: MNC ML86B

ACTIONS
(PLT SEAT PNL) • PLT SEAT PWR BUS SEL − AC2 (up)
(CDR SEAT PNL) • CDR SEAT PWR BUS SEL − AC2 (up)
If Supply H2O Dump reqd: For TK A and/or TK B • Perform SUPPLY WATER DUMP USING FES (ORB OPS, ECLS), using FLASH EVAP CNTLR PRI A For TK C and/or TK D • Perform SUPPLY WATER DUMP USING FES (ORB OPS, ECLS), using FLASH EVAP CNTLR PRI B
(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 2 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)
(ML86B:C) • cb MNA(MNB) EXT ARLK HTR LINE ZN1 − cl • cb MNA(MNB) EXT ARLK HTR LINE ZN2 − cl

	EQUIP/FUNCTION LOST
	CDR Seat Adj via AC3 pwr
	PLT Seat Adj via AC3 pwr
	Supply H2O:
1	Dump Vlv Cntl
	Noz Htr
1	Xovr Vlv Cntl
3	CO2 Rmvl Sys Cntlr 2
4	Ext A/L H2O Line Htrs MNC pwr

	CREW INDICATIONS
	(AW82D)
1	EMU 1 H2O SPLY tb − CL
1	WASTE tb − CL
	(R11L)
	SPLY H2O
1	TKA OUTLET tb − bp
2	DUMP VLV tb − bp
1	XOVR VLV tb − bp
1	GALLEY SPLY VLV tb − bp
1	TKC INLET tb − bp
	(LIGHTS LOST) Middeck Floodlts 3,4,5,7 Bunk Floodlts 1/3 Airlock Floodlt 4 MO13Q Pnl lt 1 TA Floodlt 4
	'S66 CO2 RL SYS MALF'

NOTES
(1) Vlv holds position
(2) If SPLY H2O DUMP VLV ENA/NOZ HTR − OFF, tb unpwrd and already bp
(3) PEVs, Actuators, Bed A P, Bed B P, Bed dP will be recovered after system reconfig
(4) MNA,MNB line htrs remain

EPS SSR−66 (Cont)
BUS LOSS: MNC ML86B

BUS ISOLATION		EQUIP/FUNCTION LOST
ONLY ON MCC CALL, PERFORM		
(ML86B:A) cb SPLY H2O • GALLEY SPLY − op • XOVR VLV − op • TK C INLET − op • TKA OUTLET − op • DUMP VLV/NOZ HTR − op	1	Galley H2O Sply Vlv Cntl 1 Sply H2O Tk C In Vlv Cntl Tk A Out Vlv Cntl Dump Noz Htr
(ML86B:D) cb PYRO JETT SYS B • KU ANT − op • PORT RMS − op 7 • STBD RMS − op	5 6	Ku−BD Jettison Sys B Port RMS Jettison Sys B
(ML86B:E) cb MNC EMU 1 H2O • WASTE − op • SPLY − op cb MNC SEAT • L − op • R − op cb MNC FLOOD • TNL ADAPT 4 − op • cb MNC CO2 SYS 2 CNTLR − op	1 1	EMU 1 Waste H2O Vlv Cntl Sply H2O Vlv Cntl TA Floodlt 4
(ML86B:F) cb MNC FLOODS • MIDDECK 5/7 − op • MIDDECK 3/4/MO13Q − op • BUNK 1/3 − op • AIRLK 4 − op cb MNC CRYO • O2 HTR TK4 SNSR 2 − op (OV105 only) • cb MNC CRYO O2 HTR TK5 SNSR 2 − op	8	Middeck Floodlts 3,4,5,7 MO13Q Pnl lt 1 Bunk Floodlts 1/3 Airlk Floodlt 4 Cryo O2 Tk4 Current Snsr 2 (OV105 only) Cryo O2 Tk5 Current Snsr 2
(ML86B:C) • cb MNC EXT ARLK HTR LINE ZN1 − op • cb MNC EXT ARLK HTR LINE ZN2 − op	4	Ext A/L H2O Line Htrs MNC pwr

CREW INDICATIONS	NOTES
	(1) Vlv holds position (4) MNA,MNB line htrs remain (5) Sys A remains (6) One failure away from loss of jettison capability (7) Normally not installed (8) Current Snsr 1 remains

EPS SSR−70
BUS LOSS: ESS1BC DA1 (Includes all ESS1BC sub−buses)

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
1 3 4	• Perform FC1 SHUTDN (FC SHUTDN Cue Card), then:	1 4	FC1 Controller and Pumps FC1 Reac Vlv Cntl via pnl R1 sw	2	MASTER ALARM Light/Tone − on	(1) * TIME CRITICAL * FC1 must be shut down within 9 min to avoid potentially hazardous condition
	(R1) • PL CAB − MNB	5	MNA pwr to CABPL 1,2,3 buses		L Audio lost L Glrshld Floodlt lost	
2	(O5) • L AUD CNTL − R	2	L Audio pwr	6	(F7) No C/W lts Two of four bulbs in MA lts not lt SM ALERT Light/Tone − on	(2) No intercom, A/G, or recorded voice from CDR ATU. When L AUD CNTL switched to RIGHT, only listen capability restored
	(O6) • MTU − OSC 2		MTU Pwr Sply A/Osc 1			
	If add'l ltg reqd: (C3) • EMER LTG − ON/OFF	8	L Glareshield Floodlts via pnl O6 sw	7 7 9 4 4 4 11	(R1) FC/MN BUS A tb − OFF MN BUS TIE A tb − OFF INV/AC BUS 1 tb − OFF O2 MANF VLV TK1 tb − CL H2 MANF VLV TK1 tb − CL FC1 REAC (two) tb − CL FC1 RDY tb − bp FC1 COOL PUMP ΔP tb − bp	(3) FC/MN BUS A and MN BUS TIE A sws work, but tbs are lost
	(R1) • O2,H2 TK2 HTRS A,B (four) − OFF • O2,H2 TK1,3 HTRS A (four) − AUTO • O2,H2 MAN VLV TK2 (two) − OP	10	Cryo O2,H2 Tk1 Manf Vlv Cntl Cryo Tk1 O2,H2 Htrs Auto ops if O2,H2 Tk2 Htrs A(B) in Auto Cryo Tk2 O2,H2 Htrs Auto ops			(4) Vlv holds position, but tb and sw lost. Redundant Reac Vlv Close Cntl on pnl C3 remains
	(A11) • O2,H2 TK4 HTRS A,B (four) − OFF (refer to EPS, 7.6 CRYO TABLE A for nomenclature)		Cryo Tk3 Htrs in Auto ops if Tk4 in Auto Cryo Tk4 Htrs Auto ops		(FSMs) S67 ESS BUS V 1BC S69 FC PUMP 1 S69 FC REAC 1 S68 O2 MANF VLV S68 H2 MANF VLV S68 O2 CNTL P 2,4 S68 H2 CNTL P 2,4 S69 FC H2 PUMP 1	(5) Pwrs PL Timing Buffer and VTR
			Pallet Cryo Tk 6,7 Htrs Auto ops			(6) Retain backup C/W thru Sys B. Ref C/W MAL 4.1b 5 for C/W capabilities lost. Only two of four bulbs lit in MA lt
			Cryo Tk3 O2,H2 Htrs Auto ops if O2,H2 Tk4 Htrs A(B) in AUTO Cryo Tk4 O2,H2 Htrs Auto ops			(7) Switch works but tb lost
12	If GPC 1 or 4 dump reqd, attempt S/W dump in RUN	12 12	GPC Mode sw Halt Contacts for GPCs 1,4 (pnl O6) GPC Output sw Terminate capability for GPCs 1,4			(8) Flood lts available via EMER LTG (C3,ML18F)
13 14	To release crewmember from constant monitoring requirement: • Perform C&W EU CONTINGENCY POWER (IFM)					(9) AC1 remains pwrd, but tb lost. INV/AC BUS 1 sw inop. INV PWR 1 sw also inop
	When reqd: • For FC1, perform FUEL CELL PURGE − MANUAL (ORB OPS, EPS)	15	FC1 Auto purge capability		**NOTES** (Cont)	(10) Vlv holds position, but tb and sw lost
	(Continued)		(Continued)		(13) Until IFM cables installed: a) Loss of ESS2CA DA2 would not generate aural alarm so that Fuel Cell 2 could be safed within 9 min. FSM should be closely monitored. b) Loss of C/W B system would not be annunciated and subsequent orbiter problems would not trigger aural alarm (14) IFM procedure recovers C/W A system by providing pwr source, which bypasses failed ESS1BC DA1 bus (15) Caused by loss of purge vlv sw position TM	(11) FC1 Coolant Pump ΔP tb lost (12) Unable to HALT or terminate GPC, IPL GPC, or perform HISAM dump. Do not pwr off GPCs 1 or 4 since they must be transitioned thru HALT to force RUN state

BUS LOSS: ESS1BC DA1

	BUS ISOLATION		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
	ONLY ON MCC CALL, PERFORM				(F9) ESS 1BC DC VOLTS − OSL	(3) FC/MN BUS A and MN BUS TIE A sws work, but tbs are lost
6	(O13:A) cb ESS 1BC • C/W A − op • AC1 SNSR − op • MTU A − op	6 16	Pri C/W Sys, Annun pnl F7 AC1 Bus Snsr		SM 67 ELECTRIC ESS 1BC VOLTS < 20	(6) Retain backup C/W thru Sys B. Ref C/W MAL 4.1b [5] for C/W capabilities lost. Only two of four bulbs lit in MA lt
	(O13:B) cb ESS 1BC • CRYO CNTLR O2,H2 TK2 (two) − op • CRYO QTY O2,H2 TK2 (two) − op		Cryo O2,H2 Tk2 Htrs Auto ops Cryo O2,H2 Tk2 Qty Xdcrs		(O2) CRYO O2,H2 TK2,4 QTY METER (four) − 0%	(16) Disables AC1 AUTO TRIP. AC1 Voltage and OVLD c/w lost
	(R14:F) cb ESS 1BC • FLOOD L GLRSHLD − op • AUD L − op			17	Airlock Floodlt 2 lost Tnl Adapt Floodlt 1 lost (A15) PALLET PWR MNA tb − OFF	(17) MNA PPC1 bus pwr remains; tb pwr lost
	(ML86B:G) cb ESS 1BC • FLOOD AIRLK 2 − op • FLOOD TNL ADAPT 1 − op • CRYO CNTLR O2,H2 TK4 (two) − op • CRYO QTY O2,H2 TK4 (two) − op		Airlock Floodlt 2 Tnl Adapt Floodlt 1 Cryo O2,H2 Tk4 Htrs Auto ops Cryo O2,H2 Tk4 Qty Xdcrs			(18) AC1 inverters and buses remain pwrd, but sws and tb lost. INV/AC BUS 1 sw inop. INV PWR 1 sw also inop
			Cryo Tk2,Tk4 Htr Snsr Test/ Reset sw			(19) Vlv closes. Redundant vlv B remains
		18 3	AC1 Inverters: Input DC pwr Cntl INV/AC Bus Cntl ESS pwr to FC1 MN BUS A and MN BUS TIE A pwr contactor cntl Capability to switch to MADS Rcdr Trk Seq 2 AUX PL A BUS LG Arm/Dn Reset capability Tacan 1 Auto Self−Test			
		19	APU 1 Fu Tk Vlv A			

EPS SSR−71
BUS LOSS: ESS1BC FP&LC1

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

	EQUIP/FUNCTION LOST
1	AC1 Inverters Input DC pwr Cntl
	Capability to switch to MADS Rcdr Trk Seq 2

	CREW INDICATIONS
	(R1)
1	INV PWR 1 tb − OFF

NOTES
(1) Inverters remain pwrd, but tb and sw lost

EPS SSR−72
BUS LOSS: ESS1BC MPC1

	ACTIONS
1 2	• Perform FC1 SHUTDN (FC SHUTDN Cue Card)

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

	EQUIP/FUNCTION LOST
1 2	FC1 Controller and Pumps FC1 Reac Vlv Cntl via pnl R1 sw
2	Cryo O2,H2 Tk1 Manf Vlv Cntl

	CREW INDICATIONS
	MASTER ALARM Light/Tone − on
2	(F7) C/W FC REAC lt C/W FC PUMP lt SM ALERT Light/Tone
2 2 2 3	(R1) O2 MANF VLV TK1 tb − CL H2 MANF VLV TK1 tb − CL FC1 REAC (two) tb − CL FC1 RDY tb − bp FC1 COOL PUMP ΔP tb − bp
2	(FSMs) S68 H2 MANF VLV S68 O2 MANF VLV S69 FC PUMP 1 S69 FC REAC 1 S69 FC H2 PUMP 1

NOTES
(1) * TIME CRITICAL * FC1 must be shut down within 9 min to avoid potentially hazardous condition (2) Vlv holds position, but tb and sw lost. Redundant Reac Vlv Close Cntl on pnl C3 remains (3) FC1 Coolant Pump ΔP tb lost

EPS SSR−73
BUS LOSS: ESS1BC ML86B

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A11) • CRYO TK4 HTR O2,H2 A,B (four) − OFF	Cryo Tk3 O2,H2 Htrs Auto ops if O2,H2 Tk4 Htrs A(B) in Auto Cryo Tk4 O2,H2 Htrs Auto ops	MASTER ALARM Light/Tone − on	
		(F7) C/W O2 PRESS lt C/W H2 PRESS lt	
		(FSMs) S68 H2 CNTL P 4 S68 O2 CNTL P 4	
BUS ISOLATION		(O2) CRYO O2,H2 QTY TK4 meters (two) = 0%	
ONLY ON MCC CALL, PERFORM		Airlk Floodlt 2 lost TA Floodlt 1	
(ML86B:G) cb ESS 1BC • FLOOD AIRLK 2 − op • FLOOD TNL ADAPT 1 − op • CRYO CNTLR O2,H2 TK4 (two) − op • CRYO QTY O2,H2 TK4 (two) − op	Airlk Floodlt 2 TA Floodlt 1 Cryo O2,H2 Tk4 Qty Xdcrs		

EPS SSR−74
BUS LOSS: ESS1BC FD

	ACTIONS
1	• Perform FC1 SHUTDN (FC SHUTDN Cue Card), then:
	(R1) • PL CAB − MNB
3	If GPC 1 or 4 dump reqd, attempt S/W dump in RUN
	When reqd: • For FC1, perform FUEL CELL PURGE − MANUAL (ORB OPS, EPS)
	(A15) If Tk6,7 in use: • PALLET TK6,TK7 HTRS A,B (eight) − OFF then:
	(R1) • O2,H2 TK3 HTR A (two) − AUTO

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

	EQUIP/FUNCTION LOST
1	FC1 Controller and Pumps
2	MNA pwr to CABPL 1,2,3 Buses
3	GPC Mode sw Halt Contacts for GPCs 1,4 (pnl O6)
3	GPC Output sw Terminate capability for GPCs 1,4 (pnl O6)
5	FC1 Auto purge capability
	Pallet Cryo Tk 6,7 Htrs Auto ops
6	OIU 1 MNA pwr
5	AUXPLA Bus
7	AC1 Inverters: Input DC Pwr Cntl Inv/AC Bus Cntl
	Cryo O2 Tk2,4 Htr Snsr Test/Reset sw
	Tacan 1 Auto Self Test

	CREW INDICATIONS
	MASTER ALARM Light/Tone − on
	(F7) C/W FC PUMP lt
	(R1) FC1 RDY tb − bp
4	FC1 COOL PUMP ΔP tb − bp
	(FSMs) S69 FC H2 PUMP 1 S69 FC PUMP 1
	(F9) ESS 1BC DC VOLTS − OSL
	SM 67 ELECTRIC ESS1BC Volts 25−32V

NOTES
(1) * TIME CRITICAL * FC1 must be shut down within 9 min to avoid potentially hazardous condition
(2) Pwrs PL Timing Buffer and OIU 1 (if flown). OIU 1 redundant pwr MNB MPC2 via CAB PL3
(3) Unable to HALT or terminate GPC, IPL GPC, or perform HISAM dump. Do not pwr off GPCs 1 or 4 since they must be transitioned through HALT to force RUN state
(4) FC1 Coolant Pump ΔP tb lost
(5) Caused by loss of purge vlv sw position TM
(6) OIU 1 redundant pwr MNB MPC2 via CAB PC3
(7) AC1 inverters and buses remain pwrd. INV PWR 1 and INV/AC BUS 1 switches and INV PWR 1 tb lost

EPS SSR−75
BUS LOSS: ESS1BC O13&R14

	ACTIONS
1	(O5) • L AUD CNTL − R
	(O6) • MTU − OSC 2
	(R1) • O2,H2 TK1,3 HTRS A (four) − AUTO • O2,H2 TK2 HTRS A,B (four) − OFF • O2,H2 MANF VLV TK2 (two) − OP
	If add'l ltg reqd: (C3) • EMER LTG − ON/OFF
5	To release crewmember from constant monitoring requirement:
6	• Perform C&W EU CONTINGENCY POWER (IFM)
	(Continued)

	EQUIP/FUNCTION LOST
1	L Audio pwr
	MTU Pwr Sply A/Osc 1
	Cryo Tk1 O2,H2 Htrs Auto ops if O2,H2 Tk2 Htrs A(B) in Auto Cryo Tk2 O2,H2 Htrs Auto ops
3	L Glareshield Floodlts via pnl O6 sw
	(Continued)

	CREW INDICATIONS
1	MASTER ALARM Light/Tone − on
	L Audio lost L Glrshld Floodlt lost
	(F7) 2 No C/W lts Two of four bulbs in MA lts not ON SM ALERT Light/Tone − on
	(FSMs) S68 H2 CNTL P 2 S68 O2 CNTL P 2
	(R1) 4 INV/AC BUS 1 tb − OFF
	(O2) CRYO O2,H2 QTY TK2 METER (two) ind − 0%

NOTES
(1) No intercom, A/G, or recorded voice from CDR ATU. When L AUD CNTL switched to RIGHT, only listen capability is restored
(2) Retain BACKUP C/W thru Sys B. Ref C/W MAL 4.1b for C/W capabilities lost. Only two of four bulbs lit in MA lts
(3) Floodlts available via EMER LTG (C3, ML18F)
(4) AC1 bus remains pwrd. INV/AC BUS 1 sw works, but tb lost
(5) Until IFM cables installed: a) Loss of ESS2CA DA2 would not generate aural alarm so that Fuel Cell 2 could be safed within 9 min. FSM should be closely monitored. b) Loss of C/W B system would not be annunciated and subsequent orbiter problems would not trigger aural alarm
(6) IFM procedure recovers C/W A system by providing pwr source, which bypasses failed ESS1BC O13&R14 bus

EPS SSR−75 (Cont)
BUS LOSS: ESS1BC O13&R14

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM				(2) Retain BACKUP C/W thru Sys B. Ref C/W MAL 4.1b for C/W capabilities lost. Only two of four bulbs lit in MA lts (7) Disables AC1 Auto Trip. AC1 Voltage and OVLD C/W lost (8) Switches and tbs still operate
(O13:A) cb ESS1BC • C/W A − op • AC1 SNSR − op • MTU A − op	2 7	Pri C/W Sys, Annun Pnl F7 AC1 Bus Snsr		
(O13:B) cb ESS1BC • CRYO CNTLR O2,H2 TK2 (two) − op • CRYO QTY O2,H2 TK2 (two) − op		Cryo O2,H2 Tk2 Htrs Auto ops Cryo O2,H2 Tk2 Qty Xdcrs		
(R14:F) cb ESS1BC • FLOOD L GLRSHLD − op • AUD L − op				
		LG ARM/DN Reset capability		
	8	ESS pwr to FC/MN BUS A and MN BUS TIE A Pwr Contactor Cntl		

EPS SSR−80
BUS LOSS: ESS2CA DA2 (Includes all ESS2CA sub−buses)

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
1 3 4	• Perform FC2 SHUTDN (FC SHUTDN Cue Card), then:	1 4	FC2 Controller and Pumps FC2 Reac Vlv Cntl via pnl R1 sw	2 2	All comm lost via AUD CTR 1 R AUDIO lost R Glareshield Floodlt lost	(1) * TIME CRITICAL * FC2 must be shut down within 9 min to avoid potentially hazardous condition
	(R1) • PL CAB − MNA	5	MNB pwr to CABPL 1,2,3 Buses		MASTER ALARM Light/Tone − on	(2) If Aud Ctr 1 active, all intercom, A/G, and recorded voice lost until Aud Ctr 2 selected. No intercom A/G, or recorded voice from PLT ATU. When R AUD CNTL switched to LEFT, only listen capability restored
2	(C3) • AUD CTR − 2	2	Audio Center 1	4 6	(F7) C/W O2 PRESS lt − on C/W H2 PRESS lt − on C/W FC REAC lt − on C/W FC PUMP lt − on C/W PRI C/W lt − on C/W BACKUP C/W ALARM lt − on Two of four bulbs in MA lts − inoperative SM ALERT lt/Tone − on	(3) FC/MN BUS B and MN BUS TIE B SWS work, but tbs lost
2	(O9) • R AUD CNTL − L	2	R Audio pwr			(4) Vlv holds position, but tb and sw lost. Redundant Reac Vlv Close Cntl on pnl C3 remains
	(O6) • MTU − OSC 1		MTU Pwr Sply B/Osc 2			(5) Pwrs PL Timing Buffer and VTR
	If add'l ltg reqd: (C3) • EMER LTG − ON/OFF	7	R Glareshield Floodlts via pnl O8 sw		(FSMs) S69 FC PUMP 2 S69 FC REAC 2 S67 ESS BUS V 2CA S68 O2 CNTL P 1 S68 H2 CNTL P 1 S68 H2 MANF VLV S68 O2 MANF VLV S69 FC H2 PUMP 2	(6) Retain C/W Sys A Alarm tones (Pri & B/U) Ref C/W MAL 4.1a [8] for capabilities lost. Only two of four bulbs lit in MA lt. PRIMARY C/W and BACKUP C/W ALARM lts are not resettable
	(R1) • O2,H2 MANF VLV TK1 (two) − OP • O2,H2 TK1 HTRS A,B (four) − OFF • O2,H2 TK2,3 HTRS A (four) − AUTO	8	Cryo O2,H2 Tk2 Manf Vlv Cntl Cryo Tk2 O2,H2 Htrs Auto ops if O2,H2 Tk1 Htrs A(B) in Auto Cryo Tk1 O2,H2 Htrs Auto ops Pallet Cryo Tk 8,9 Htrs Auto ops			(7) Floodlts availble via EMER LTG (C3, ML18F)
	When reqd: • Perform FUEL CELL PURGE − MANUAL (ORB OPS, EPS)	10	All FC Auto Purge capability			(8) Vlv holds position, but tb and sw lost
11	If GPC 2 or 5 dump reqd, attempt S/W dump in RUN	11 11	GPC Mode sw Halt Contacts for GPCs 2,5 (pnl O6) GPC Output sw Terminate capability for GPCs 2,5 (pnl O6)			(9) MNB PPC2 bus pwr remains; tb pwr lost
				9	(A15) PALLET PWR MNB tb − OFF	(10) Caused by loss of FC Purge Htr − GPC sw position TM pwr
						(11) Unable to HALT or terminate GPC, IPL GPC, or perform HISAM dump. Do not pwr−off GPC 2 since it must be transitioned thru HALT to force RUN state. GPC 5 (BFS) may be pwrd off, but pwrd up in STBY
	(Continued)		(Continued)		(Continued)	

EPS SSR−80 (Cont)
BUS LOSS: ESS2CA DA2

ACTIONS
12 To release crewmember from constant monitoring requirement:
13 • Perform C&W EU CONTINGENCY POWER (IFM)

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(O13:C) cb ESS 2CA 16 • C/W B − op 17 • AC2 SNSR − op • MTU B − op
(O13:D) cb ESS 2CA • CRYO CNTLR O2,H2 TK1 (two) − op • CRYO QTY O2,H2 TK1 (two) − op
(R14:F) cb ESS 2CA • FLOOD R GLRSHLD − op • AUD R − op • CTR 1 − op
(OV105 only) (ML86B:G) cb ESS 2CA • CRYO CNTLR O2,H2 TK5 (two) − OP
(OV105 only) • CRYO QTY O2,H2 TK5 (two) − OP

EQUIP/FUNCTION LOST
16 C/W Sys B Alarm Tones 17 AC2 Bus Snsr
Cryo O2,H2 Tk1 Htrs Auto ops Cryo O2,H2 Tk1 Qty Xdcrs
(OV105 only) Cryo O2,H2 Tk5 Htrs Auto ops
(OV105 only) Cryo O2,H2 Tk5 Qty Xdcr
Cryo O2 Tk1 Htr Snsr Test/ Reset sw
(OV105 only) Cryo O2 Tk5 Htr Snsr Test/Reset sw
AUX PL B BUS 14 AC2 Inverters: Input DC Pwr Cntl INV/AC BUS Cntl ESS pwr to FC/MN BUS B and MN BUS TIE B Pwr Contactor Cntl 18 MNB/PRIPL and MNC/PRIPL pwr−off capability via Spacelab Pwr−Kill Signal
Tacan 2 Auto Self−Test
19 APU 2 Fu Tk Vlv A

CREW INDICATIONS
(R1) 3 FC/MN BUS B tb − OFF 3 MN BUS TIE B tb − OFF 3 PL PRI MNB tb − OFF 14 INV/AC BUS 2 tb − OFF 8 O2 MANF VLV TK2 tb − CL 8 H2 MANF VLV TK2 tb − CL 8 FC2 REAC (two) tb − CL FC2 RDY tb − bp 15 FC2 COOL PUMP ΔP tb − bp
(F9) ESS2CA DC VOLTS − OSL
SM 67 ELECTRIC ESS2CA Volts < 20
(O2) CRYO O2,H2 QTY TK1 meters (two) ind − 0%

NOTES
(3) FC/MN BUS B and MN BUS TIE B sws work, but tbs lost
(8) Vlv holds position, but tb and sw lost
(12) Until IFM cables installed: a) Loss of ESS1BC DA1 would not generate aural alarm so that Fuel Cell 1 could be safed within 9 min. FSM should be closely monitored. b) Loss of C/W A system would not be annunciated and subsequent orbiter problems would not trigger aural alarm
(13) IFM procedure recovers C/W B system by providing pwr source, which bypasses failed ESS 2CA DA2 bus
(14) AC2 Inverters and buses remain pwrd, but switches and tbs lost
(15) FC2 Coolant Pump ΔP tb lost
(16) Retain C/W Sys A Alarm tones (Pri & B/U) Ref C/W MAL 4.1a [8] for capabilities lost. Only lower two of four bulbs lit in MA lt. PRIMARY C/W and BACKUP C/W ALARM lts are not resettable
(17) Disables AC2 AUTO Trip. AC2 Voltage and OVLD C/W lost
(18) FC3/PRIPL pwr−off capability of SL not affected. MNB/PRIPL sw, MNC/PRIPL sw, pnl R1 not affected
(19) Vlv closes. Redundant vlv B remains

EPS SSR−81
BUS LOSS: ESS2CA FP&LC2

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

	EQUIP/FUNCTION LOST
1	AC2 Inverters Input DC Pwr Cntl

	CREW INDICATIONS
	(R1)
1	INV PWR 2 tb − OFF

NOTES
(1) Loss of tb and sw. Inverters remain pwrd

EPS SSR−82
BUS LOSS: ESS2CA MPC2

	ACTIONS
1	• Perform FC2 SHUTDN (FC SHUTDN Cue Card)

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

	EQUIP/FUNCTION LOST
1	FC2 Controller and Pumps
2	FC2 Reac Vlv Cntl via pnl R1 sw
3	Cryo O2,H2 Tk2 Manf Vlv Cntl
4	MNB/PRIPL and MNC/PRIPL pwr−off capability via Spacelab Pwr−Kill Signal

	CREW INDICATIONS
	MASTER ALARM Light/Tone − on
	(F7)
2	C/W FC REAC lt
	C/W FC PUMP lt
	SM ALERT Light/Tone
	(R1)
2	O2 MANF VLV TK2 tb − CL
2	H2 MANF VLV TK2 tb − CL
2	FC2 REAC (two) tb − CL
	RDY tb − bp
5	FC2 COOL PUMP ΔP tb − bp
	(FSMs)
2	S69 FC PUMP 2
	S69 FC REAC 2
	S69 FC H2 PUMP 2
	S68 H2 MANF VLV
	S68 O2 MANF VLV

NOTES
(1) * TIME CRITICAL * FC2 must be shut down within 9 min to avoid potentially hazardous condition
(2) Vlv holds position, but tb and sw lost. Redundant Reac Vlv Close Cntl on pnl C3 remains
(3) Vlv holds position, but tb and sw lost
(4) FC3/PRIPL pwr−off capability of SL not affected. MNB/PRIPL sw, MNC/PRIPL sw, pnl R1 not affected
(5) FC2 Coolant Pump ΔP tb lost

EPS SSR−83
BUS LOSS: ESS2CA FD

	ACTIONS
1	• Perform FC2 SHUTDN (FC SHUTDN Cue Card)
	(R1) • PL CAB − MNA
	When reqd: • Perform FUEL CELL PURGE − MANUAL (ORB OPS, EPS)
5	If GPC 2 or 5 dump reqd, attempt S/W dump in RUN
	(A15) If Tks 8,9 in use: • PALLET TK8,TK9 HTRS A,B (eight) − OFF then:
	(R1) • O2,H2 TK3 HTR A (two) − AUTO
	If OIU reqd: (SSP 1) • OIU PWR − OIU 1 ON
	(AIL) • S−BD PL PWR SYS − 1 • CNTL − PNL • − CMD

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

	EQUIP/FUNCTION LOST
1	FC2 Controller and Pumps
2	MNB pwr to CABPL 1,2,3 Buses
3	All FC Auto Purge capability
5	GPC Mode sw Halt Contacts for GPCs 2,5 (Pnl O6)
5	GPC Output sw Terminate capability for GPCs 2,5 (pnl O6)
	Pallet Cryo Tk 8,9 Htrs Auto ops
2	OIU 2 OIU 1 MNB pwr
6	AUX PL B BUS AC2 Inverters: Input DC Pwr Cntl Inv/AC Bus Cntl
	Tacan 2 Auto Self−Test
	Cryo O2 Tk1 Htr Snsr Test/Reset sw
	(OV105 only) Cryo O2 Tk5 Htr Snsr Test/Reset sw

	CREW INDICATIONS
	MASTER ALARM Light/Tone − on
	(F7) C/W FC PUMP lt
4	(R1) FC2 RDY tb − bp FC2 COOL PUMP ΔP tb − bp
	(FSMs) S69 FC PUMP 2 S69 FUEL CELL
	(F9) ESS2CA DC VOLTS − OSL
	SM 67 ELECTRIC ESS2CA Volts 25−32V
	SM 62 PCMMU 'S62 PDI DECOM FAIL' S 212 OIU OIU 2 TEMP ≥ 140

NOTES
(1) * TIME CRITICAL * FC2 must be shut down within 9 min to avoid potentially hazardous condition
(2) Pwrs PL Timing Buffer, OIU 1, and OIU 2 (if flown). OIU 1 redundant pwr MNA MPC1 via CAB PL3
(3) Caused by loss of FC Purge Htr − GPC sw position TM pwr
(4) FC 2 Coolant Pump ΔP tb lost
(5) Unable to HALT or terminate GPC, IPL GPC, or perform HISAM dump. Do not pwr−off GPC 2 since it must be transitioned thru HALT to force RUN state. GPC 5 (BFS) may be pwrd off, but pwrd up in STBY
(6) AC2 inverters and buses remain pwrd. INV PWR 2 and INV/AC BUS 2 switches lost and INV PWR 2 tb lost

EPS SSR−84
BUS LOSS: ESS2CA O13&R14

	ACTIONS
1	(C3) • AUD CTR − 2
2	(O9) • R AUD CNTL − L
	(O6) • MTU − OSC 1
	(R1) • O2,H2 TK1 HTRS A,B (four) − OFF • O2,H2 TK2,3 HTRS A (four) − AUTO • O2,H2 MANF VLV TK1 (two) − OP
	If add'l ltg reqd: (C3) • EMER LTG − ON/OFF
5	To release crewmember from constant monitoring requirement:
7	• Perform C&W EU CONTINGENCY POWER (IFM)

	BUS ISOLATION
	ONLY ON MCC CALL, PERFORM
4 8	(O13:C) cb ESS 2CA • C/W B − op • AC2 SNSR − op • MTU B − op
	(O13:D) cb ESS 2CA • CRYO CNTLR O2,H2 TK1 (two) − op • CRYO QTY O2,H2 TK1 (two) − op
	(R14:F) cb ESS 2CA • FLOOD R GLRSHLD − op • AUD R − op • CTR 1 − op
	(Continued)

	EQUIP/FUNCTION LOST
1	Audio Center 1
2	R Audio pwr
	MTU Pwr Sply B/OSC 2
	Cryo Tk2 O2,H2 Htrs Auto ops if O2,H2 Tk1 Htrs A(B) in Auto Cryo Tk1 O2,H2 Htrs Auto ops
3	R Glareshield Floodlts via pnl O8 sw
4 8	C/W Sys B Alarm Tones AC2 Bus Snsr
	Cryo O2,H2 Tk1 Htrs Auto ops Cryo O2,H2 Tk1 Qty Xdcrs
9	ESS pwr to FC/MN BUS B and MN BUS TIE B Pwr Contactor Cntl
	(Continued)

	CREW INDICATIONS
1	All Comm lost via AUD CTR 1 selected
2 3	R Audio lost R Glareshield Floodlt lost
	MASTER ALARM Light/Tone − on
4	(F7) C/W O2 PRESS lt − on C/W H2 PRESS lt − on C/W PRI C/W lt − on C/W BACKUP C/W ALARM lt − on Two of four bulbs in MA lts − inoperative
	(FSMs) S68 H2 CNTL P 1 S68 O2 CNTL P 1
6	(R1) INV/AC BUS 2 tb − OFF
	(O2) CRYO O2,H2 QTY TK1 METER (two) − 0%

NOTES
(1) If Audio Ctr 1 active, all intercom, A/G, and recorded voice lost until Audio Ctr 2 selected
(2) No intercom, A/G, or recorded voice from PLT ATU until R AUD CNTL switched to LEFT which then restores only listen capability
(3) Flood lt available via EMER LTG (C3, ML18F)
(4) Retain C/W Sys A alarm tones (Pri & B/U) Ref C/W MAL 4.1a 8 for C/W capabilities lost. Only two of four bulbs lit in MA lt. PRIMARY C/W, BACKUP C/W ALARM lts are not resettable
(5) Until IFM cables installed: a) Loss of ESS1BC DA1 would not generate aural alarm so that Fuel Cell 1 could be safed within 9 min. FSM should be closely monitored. b) Loss of C/W A system would not be annunciated and subsequent orbiter problems would not trigger aural alarm
(6) AC2 bus remains pwrd. INV/AC BUS 2 sw works, but tb lost
(7) IFM procedure recovers C/W B system by providing pwr source, which bypasses failed ESS2CA O13&R14 bus
(8) Disables AC2 Auto Trip. AC2 Voltage and OVLD C/W lost
(9) Switches and tbs still operate

EPS SSR−85
BUS LOSS: ESS2CA ML86B

ACTIONS
If OV105 and Tk5 in use: (R1) • O2,H2 TK3 HTR A − AUTO

BUS ISOLATION
(ML86B:G) (OV105 only) cb ESS 2CA • CRYO CNTLR O2,H2 TK5 (two) − op • CRYO QTY O2,H2 TK5 (two) − op

EQUIP/FUNCTION LOST
(OV105) Cryo Tk5 O2,H2 Htrs if in Auto
(OV105) Cryo O2,H2 Tk5 Qty Xdcrs

CREW INDICATIONS
(OV105) MASTER ALARM Light/Tone − on
(F7) (OV105) C/W O2 PRESS lt C/W H2 PRESS lt
(FSMs) (OV105) S68 CRYO O2 PRESS S68 CRYO H2 PRESS
(O2) (OV105) CRYO O2,H2 QTY Tk5 = 0%

NOTES

EPS SSR−90
BUS LOSS: ESS3AB DA3

ACTIONS
1 2 3 • Perform FC3 SHUTDN (FC SHUTDN Cue Card)
(R1) • O2,H2 MANF VLV TK1,2 (four) − OP • O2,H2 TK1,2 HTRS A (four) − AUTO
6 • If GPC 3 dump reqd, attempt S/W dump in RUN

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(O13:E) cb ESS 3AB 9 • AC3 SNSR − op • GPC STAT − op
(C3) 10 • EMER LTG − OFF/ON
(ML18F) 10 • EMER LTG − ON/OFF
(ML86B:G) cb ESS 3AB • CRYO CNTLR TK3 (two) − op • CRYO QTY TK3 (two) − op

EQUIP/FUNCTION LOST
1 3 FC3 Controller and Pumps Reac Vlv Cntl via pnl R1 sw
Cryo Tk3 O2,H2 Htrs Auto ops Cryo O2,H2 Tk4 Htr Auto ops if O2,H2 Tk3 Htrs A(B) in Auto
4 FC GPC Purge Seq Start sw
6 GPC Mode sw Halt Contacts for GPC 3 (pnl O6) 6 GPC Output sw Terminate capability for GPC 3 (pnl O6)
9 AC3 Bus Snsr Computer Status Matrix (pnl O1) and CCIU
10 Emer Ltg capability (Middeck Floodlts 6,7,8, L,R Glrshld Floodlts, OS Floodlt)
Cryo O2,H2 Tk3 Htrs Auto ops Cryo O2,H2 Tk3 Qty Xdcrs
7 AC3 Inverters: Input DC Pwr Cntl INV/AC Bus Cntl
Cryo O2 Tk3 Htr Snsr Test/ Reset sw

(Continued)

CREW INDICATIONS
MASTER ALARM Light/Tone − on
(F7) C/W O2 PRESS lt − on C/W H2 PRESS lt − on 3 C/W FC REAC lt − on C/W FC PUMP lt − on SM ALERT lt/Tone − on
(R1) 5 FC/MN BUS C tb − OFF 5 MN BUS TIE C tb − OFF 7 INV/AC BUS 3 tb − OFF 5 PL PRI FC3 tb − OFF 5 PL PRI MNC tb − OFF 3 FC3 REAC (two) tb − CL FC3 RDY tb − bp 8 FC3 COOL PUMP ΔP tb − bp
(A12) 5 FC3 STRUCT RTN tb − OFF
(FSMs) S67 ESS BUS V 3AB S68 H2 CNTL P 3 S68 O2 CNTL P 3 S69 FC PUMP 3 3 S69 FC REAC 3 S69 H2 PUMP 3
(F9) ESS 3AB DC VOLTS ind − OSL
SM 67 ELECTRIC ESS 3AB Volts < 20
(O1) GPC status lts lost
(O2) CRYO O2,H2 QTY TK3 ind (two) − 0%

NOTES
(1) * TIME CRITICAL * FC3 must be shut down within 9 min to avoid potentially hazardous condition
(2) FC/MN BUS C and MN BUS TIE C switches work, but tbs are lost
(3) Vlv holds position, but tb and sw lost. Redundant Reac Vlv Close Cntl on pnl C3 remains
(4) GPC Purge Seq Start capability remains using TMBU or SM 60 constant. MCC will normally initiate auto purge via TMBU
(5) Switch works, but tb lost
(6) Unable to HALT or terminate GPC, IPL GPC, or perform HISAM dump. Do not pwr−off GPC 3 since it must be transitioned thru HALT to force RUN state
(7) AC3 inverters and buses remain pwrd. INV PWR 3 and INV/AC BUS 3 switches and tbs lost
(8) FC3 Coolant Pump ΔP tb lost
(9) Disables AC3 Auto Trip. AC3 Voltage and OVLD C/W lost
(10) Ltg pwr remains via individual lt sws

EPS SSR−90 (Cont)
BUS LOSS: ESS3AB DA3

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	11	Lost BFS select and BF engage capability to all GPCs		(2) FC/MN BUS C and MN BUS TIE C switches work, but tbs are lost (11) Pressing Engage button will cause all PASS GNC GPCs to go to software halt (12) MNB/PRIPL and MNC/PRIPL pwr−off capability of SL not affected. FC3/PRIPL sw, pnl R1 not affected (13) Vlv closes. Redundant vlv B remains
	12	FC3/PRIPL pwr−off capability via Spacelab Pwr−Kill Signal		
		Tacan 3 Auto Self Test		
	2	ESS pwr to FC/MN BUS C and MN BUS TIE C Pwr Contactor Cntl		
	13	APU 3 Fu Tk Vlv A		

EPS SSR−91
BUS LOSS: ESS3AB FP&LC3

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE	1 AC3 Inverters Input DC Pwr Cntl	1 (R1) INV PWR 3 tb − OFF	(1) Inverters remain pwrd, but tb and sw lost
	2 Emer Ltg capability (Middeck Floodlts 6,7,8, L,R Glareshield Floodlts, OS Floodlt)		(2) Ltg pwr remains via individual lt switches

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
2 (C3) • EMER LTG − OFF/ON
2 (ML18F) • EMER LTG − ON/OFF

EPS SSR−92
BUS LOSS: ESS3AB MPC3

ACTIONS
1 • Perform FC3 SHUTDN 2 (FC SHUTDN Cue Card)

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
NONE

	EQUIP/FUNCTION LOST
1	FC3 Controller and Pumps
2	FC3 Reac Vlv Cntl via pnl R1 sw
3	FC3/PRIPL pwr−off capability via Spacelab Pwr−Kill Signal

	CREW INDICATIONS
	MASTER ALARM Light/Tone − on
	(F7)
2	C/W FC REAC lt − on
	C/W FC PUMP lt − on
	(R1)
2	FC3 REAC (two) tb − CL
	FC3 RDY tb − bp
4	FC3 COOL PUMP ΔP tb − bp
	(FSMs)
	S69 FC PUMP 3
2	S69 FC REAC 3
	S69 FC H2 PUMP 3

NOTES
(1) * TIME CRITICAL * FC3 must be shut down within 9 min to avoid potentially hazardous condition
(2) Vlv holds position, but tb and sw lost. Redundant Reac Vlv Close Cntl on pnl C3 remains
(3) MNB/PRIPL and MNC/PRIPL pwr−off capability of SL not affected. FC3/PRIPL sw pnl R1 not affected
(4) FC3 Coolant Pump ΔP tb lost

EPS SSR−93
BUS LOSS: ESS3AB FD

	ACTIONS
1	• Perform FC3 SHUTDN (FC SHUTDN Cue Card)
3	• If GPC 3 dump reqd, attempt S/W dump in RUN

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(C3) 5 • EMER LTG − OFF/ON
(ML18F) 5 • EMER LTG − ON/OFF

	EQUIP/FUNCTION LOST
1	FC3 Controller and Pumps
2	FC GPC Purge Seq Start sw
3	GPC Mode sw Halt Contact for GPC 3 (pnl O6)
3	GPC Output sw Terminate capability for GPC 3 (pnl O6)
5	Emer Ltg capability (Middeck Floodlts 6,7,8, L,R Glrshld Floodlts OS Floodlt)
6	Lost BFS select and BFS engage capabliity to all GPCs
7	AC3 Inverters: Input DC Pwr Cntl INV/AC Bus Cntl
	Cryo O2 Tk3 Htr Snsr Test/Reset sw
	Tacan 3 Auto Self−Test

	CREW INDICATIONS
	MASTER ALARM Light/Tone − on
	(F7) C/W FC PUMP lt
	(R1) FC3 RDY tb − bp
4	FC3 COOL PUMP ΔP tb − bp
	(FSMs) S69 FC PUMP 3 S69 FC H2 PUMP 3
	(F9) ESS3AB DC VOLTS − OSL
	SM 67 ELECTRIC
	ESS3AB Volts 25−32V

NOTES
(1) * TIME CRITICAL * FC3 must be shut down within 9 min to avoid potentially hazardous condition
(2) GPC Purge Seq Start capability remains using TMBU or SM 60 constant. MCC will normally initiate auto purge via TMBU
(3) Unable to HALT or terminate GPC, IPL GPC, or perform HISAM dump. Do not pwr−off GPC 3 since it must be transitioned thru HALT to force RUN state
(4) FC3 Coolant Pump ΔP tbs lost
(5) Ltg pwr remains via individual lt sws
(6) Pressing the engage button will cause all PASS GNC GPCs to go to software halt
(7) AC3 Inverters and Buses remain pwrd. INV PWR 3 and INV/AC BUS 3 switches lost and INV PWR 3 tb lost

EPS SSR−94
BUS LOSS: ESS3AB O13

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(O13:E) cb ESS 3AB 2 • AC3 SNSR − op • GPC STAT − op

	EQUIP/FUNCTION LOST
1	ESS pwr to FC/MN BUS C and MN BUS TIE C pwr Contractor Cntl
3	AC3 Bus Snsr Computer Status Matrix (pnl O1) and CICU

	CREW INDICATIONS
2	(R1) INV/AC BUS 3 tb − OFF
	(O1) GPC status lts lost

NOTES
(1) Switches and tbs still operate (2) AC1 Bus remains pwrd. INV/AC BUS 3 sw works but tb lost (3) Disables AC3 Auto Trip. AC3 Voltage and OVLD C/W lost

EPS SSR−95
BUS LOSS: ESS3AB ML86B

ACTIONS
(R1) • O2,H2 TK1,2 HTRS A (four) − AUTO • O2,H2 MANF VLV TK 1,2 (four) − OP

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(ML86B:G) cb ESS 3AB • CRYO CNTLR O2,H2 TK3 (two) − op • CRYO QTY O2,H2 TK3 (two) − op

EQUIP/FUNCTION LOST
Cryo Tk3 O2,H2 Htrs Auto ops Cryo O2,H2 Tk4 Htr Auto ops if O2,H2 Tk3 Htrs A(B) in Auto
Cryo O2,H2 Tk3 Qty Xdcrs

CREW INDICATIONS
Master Alarm Light/Tone − on
(F7) C/W O2 PRESS lt C/W H2 PRESS lt
(FSMs) S68 H2 CNTL P 3 S68 O2 CNTL P 3
(O2) CRYO O2,H2 QTY TK3 METER (two) ind − 0%

NOTES

EPS SSR−100
BUS LOSS: CNTLAB1

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A12) APU HTR 1 • GAS GEN/FUEL PUMP 1 − B AUTO 1 • GAS GEN/FUEL PUMP 3 − A AUTO • LUBE OIL LINE 1 − B AUTO APU HTR TK/FU LINE/H2O/ 1 • SYS 1A − OFF 1 • 1B − AUTO 1 • 3A − AUTO 1 • 3B − OFF HYD HTR • ELEV A − OFF • B − AUTO • AFT FUS A − OFF • B − AUTO HYD CIRC PUMP • PWR 1 − MNB • 3 − MNC	(A12) APU 1 GG/Fu Pump Htrs A APU 3 GG/Fu Pump Htrs B APU 1 Lube Oil Line Htrs A 1 Tk/Fu Ln Htrs A APU 1,2 GG Inj H2O Htrs 4A,5A APU 3 Tk/Fu Ln Htrs B Elevon Actr Htrs A Aft Fuselage Htrs A Circ Pump 1 MNA pwr 3 MNA pwr	CRT 1 blanks SM ALERT Light/Tone − on	(1) * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
(L1) If using B CNTLR: • FLASH EVAP CNTLR PRI B − ON • TOP EVAP HTR DUCT − B If Hi Load Evap enabled: • HI LOAD DUCT HTR − B(C)	(L1A2) 3 Flash Evap Cntlr Pri B GPC Sel capability Top Evap Duct Fwd,Aft L,R Htrs A Hi Load Duct Outbd,Inbd Noz Htrs A	(FSMs) S68 H2 MANF VLV S68 O2 MANF VLV S86 APU/HYD APU SM0 THRM HYD S67 CNTL BUS V 2 S69 FC REAC 1 I/O ERROR CRT 1	(2) Msg occurs only if A AUTO (pnl R12U) selected for FC H2O Relief Htr
(L2) • FLASH EVAP FDLN HTR B SPLY − 2	(L2A1) FES H2O Fdln B Htrs 1	SM 67 ELECTRIC CNTL AB1 Volts < 20	(3) Pri B Man ON Sel capability remains. Pri A and Sec Cntlrs remain
(R2) • BLR CNTLR/HTR 1 − A	(R2) Hyd H2O Blr 1 Cntlr B	During Rad Dpy/Sto: (R13L) RAD CNTL tbs (four) indicate single mtr ops	(4) Vlv holds position. Vlv B remains
Refer to OMS/RCS Slide Rule for vlv loss info 5 Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT L RCS He PRESS A • AFT L,R RCS XFEED 3/4/5	(O7) 4 Aft L RCS He Pr Isol A man CL capability 6 Aft L,R RCS Xfeed Vlv 3/4/5 man CL capability	L ADP deploy time incr from 15 to 30 sec	(5) Do not reconfig for reg switch or I'CNCT procedures
(O8) • L OMS XFEED A • R OMS XFEED A • FWD RCS He PRESS A	(O8) 7 R OMS He Press Isol A man Cntl and He Vap Isol 1,2 man Cntl 4 L,R OMS Tk Isol A man CL capability 4 L,R OMS Xfeed Vlv A man CL capability 4 Fwd RCS He Press Isol A man CL capability	STAR TRKR DR POS −Y OP/CL time incr from 8 to 16 sec	(6) Vlv holds position
	8 (R13A2) PLBD: C/L Lat 9−12 Mtr 1 Port,Stbd Fwd Blkhd Mtrs 1 Stbd Door Mtr 1	(F7) If APUs active and using BLR CNTLR/HTR 1B: C/W APU TEMP lt − on after ~2 min	(7) Vlv normally closed
If AB1,2,3 unpwrd at same time: GNC 23 RCS Override F1 Manf status to CL: • RCS FWD − ITEM 1 EXEC • MANF VLVS 1 OVRD − ITEM 40 EXEC	(O14) RCS Manf F1 RJD pwr (F1F, F1L, F1U, F1D)	CCTV Video TV Annun is lost if MNA selected for VCU	(8) Pwr to MCA Drivers lost through ENABLE sw
		SM 76 COMMUNICATIONS Ku Band A,B, GMBL and PA TEMP Read High '↑'	
		SM (BFS,SM) 63 PL BAY DOORS During PLBD OP/CL, single mtr run time noted on actuators listed at left	
(Continued)	(Continued)		

EPS SSR−100 (Cont)
BUS LOSS: CNTLAB1

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(C2) • L IDP/CRT SEL − 3 On MCC GO: • GPC/CRT 01 EXEC	9	(C2A2) MDU CRT 1 IDP 1		(7) Vlv normally closed (9) Loss of redundant port to the following: MDU CDR 1 (S) MDU CDR 2 (P) MDU MFD 2 (P) MDU PLT 1 (S) (10) Selecting failed MMU for GNC MF protects against GPC MMU Rcvr failure after OPS XTION prepositioning (11) Noz Htr A not wired; Noz Htr B still operates in A AUTO position. Other A Relief Htrs lost (12) Right Trim and Body Flap cntl remains. Left Trim and Body Flap cntl function is regained after the lost contacts have been deselected in OPS−8 (3,B) (13) B Htrs remain (14) Sys A Pri Cntlr, Auto switchover to Sec Cntlr remains (15) When SM not available, use NSP block to inhibit UL cmds. 'BCE STRG 1(3) NSP' annunciates and it requires GNC I/O RESET after UPLK − ENA for AOS
10	SM 1 DPS UTILITY (G2,G8,S2) MMU ASSIGN • GNC − ITEM 1 EXEC • SM − ITEM 4 EXEC • PL − ITEM 6 EXEC • OPS 0 − ITEM 8 EXEC		(O14) MMU 1		
	(R11U) • FC H2O RELIEF HTR − B AUTO • FC H2O LINE HTR − B AUTO	11	(R11U) FC H2O Relief: Vlv Htrs A Vent Line Htrs A Barrel Htrs A Noz Htrs A H2O Line Htrs A		
	When reqd: • For FC1, perform FUEL CELL PURGE − AUTO (ORB OPS, EPS)	7	(R11U) FC1 Purge Vlv man Cntl		
	During OPS 8: GNC 43 CONTROLLERS Deselect L Pnl Trim L1: • DES PNL TRIM L1 − ITEM 36 EXEC Deselect Bdy Flp UP/DN L1: • DES BDY FLP L1 − ITEM 19 EXEC	12 12 12	(F6A7) L Trim RHC INH capability Pnl ON capability (L2A1) L Bdy Flp UP/DN capability		
	(A14) RCS/OMS HTR • FWD RCS − B AUTO • L POD (two) − A OFF, B AUTO	13 13	(A14) Fwd RCS A Htrs (all) L Pod A Htrs (all)		
	GNC 23 RCS • Reprioritize L, R Manf 2 Jets to first priority: DES INH twice, all other jets highest priority first, then next highest priority, etc • Set aft pod(s) PRI JET FAIL LIMIT to 3		(A14) Aft RCS L,R Jet 2 Htrs		
			COMSEC 1 & 2 Pwr Redundancy		
	If reqd during entry (< 120K ft): (L1) • NH3 CNTLR A(B) − PRI/GPC	14	(L1A2) NH3 Sys A Sec Cntlr man ON capability		
15	If AB1,2,3 unpwrd at same time: (AIL) • NSP ENCRYPTION MODE − SEL • NSP ENCRYPTION SEL − BYP		If AB1,2,3 unpwrd at same time: (A1A2) COMSEC 1,2 Key		
	No SM GPC and LOS: (C3) • UPLK − NSP BLK				
	(Continued)		(Continued)		

BUS LOSS: CNTLAB1

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
If CCTV reqd: (A7U) • TV PWR CONTR UNIT − MNB				(6) Vlv holds position (16) Loss of manual capability to inert LH2 Manf (17) Auto Cntl of these Htrs also lost if single Htr Ops and tank not paired (18) Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists (19) Single mtr time (20) Vlv holds position. FC1 Redundant Reac Vlv Close Cntl on pnl C3 remains (21) Vlv holds position. Sys 2 remains (22) Cntlrs A,B Rad Byp Vlv Mtrs Auto Cntl and Cntlr A Rad Byp Vlv Mtr Man Cntl remain
BUS ISOLATION				
ONLY ON MCC CALL, PERFORM				
• MDU CRT 1 PWR − OFF				
(C2) • IDP/CRT1 PWR − OFF				
(O14:F) • MMU 1 − OFF				
(F3) • TRIM RHC PNL − ENA • PNL − OFF				
(R4) • MPS FILL/DRAIN LH2 INBD − GND	16	(R4) Prplt F/D Inbd LH2 Vlv Man OP capability		
(R14D) • cb MNA TV CONTR UNIT − op		(A7A1) Video Cntl Unit MNA pwr		
(A7U) PL BAY • FLOOD AFT STBD − OFF • FLOOD FWD PORT − OFF • FLOOD FWD BHD − OFF		(A7A1) PLB Floodlts: Aft Stbd Fwd Port Blkhd		
	17 6	(R1A2) Man ON Cntl of Cryo O2,H2 Tk1 Htrs B, Tk3 Htrs A Cryo O2,H2 Tk1 Manf Vlv Cntl		
	18 18 18	(A8L) Port RMS: Fwd MRL Mtr 1 Mid MRL Mtr 1 Aft MRL Mtr 2		
	19 19	ROEU AC1 PBM MMC 1 pwr to: Orbiter arm drive mtr (ODM mtr 1 − mate A, demate A, relax A) ODA mtr 1 latch/ release		
	20	(R1A2) FC1 Reac Vlv Cntl via pnl R1 sw FC1 STOP capability via START/STOP sw (pnl R1)		
		(R2) Ctr MPS He Isol A Man Cntl		
		(C3) FC3 Redundant Reac Vlv Close Cntl		
	21 22	(L2A1) Atm Press Cntl O2 Sys 1 Sply Vlv Cntl (L1A2) Freon Loop 1,2 Cntlr B Rad Byp Vlv Mtrs Man Cntl		
		(Continued)		

EPS SSR−100 (Cont)
BUS LOSS: CNTLAB1

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(O14) 23 RJDF 1B F1 Manf Logic sw pwr (F1F,F1L,F1U,F1D)	24 (F3) NWS fail lt (for actuator pressure sw)	(6) Vlv holds position (23) **WARNING** Driver pwr to F1 jets lost if RJDF 1B Driver sw OFF (O14:F) (24) NWS fail light still driven by miscompare logic feedback on rollout (25) Redundant mtrs remain (26) Vlv closes. Redundant vlv remains (27) Redundant pwr sply remains. GG Bed T and GBX P ind lost when APU running (28) Redundant RPC remains (29) Vlv holds position. GPC OP capability remains during entry (30) Loss of redundant hyd NLG deploy and NWS redundancy (31) Hyd Sys 1 still available for NWS (32) MNB pwr select capability remains (33) Mtr 2 remains (34) Htr Cntlr 2 remains (35) L OMS auto shutdown if Pc < 80% and '↓' on MNVR EXEC display **CAUTION** No Purge. Wait 10 min between burns (36) Redundant coils remain
	(F6A1) L ADI Att Ref Set capability		
	(R13A2) 25 Rad Cntl Sys: Port Lat 7−12 Mtr 1 Dpy/Sto Mtr 1 Stbd Lat 1−6 Mtr 1 Dpy/Sto Mtr 2		
	(R2) 26 APU 1 Fu Tk Vlv A 27 Cntlr Pwr Sply A APU 1 GBX GN2 Repress Vlv 28 Hyd Main Pump 1 Depress Solenoid RPC A 28 Hyd Main Pump 3 Depress Solenoid RPC B		
	(R4) 6 TVC Hyd Sys 1 Isol man Cntl 29 Hyd Brake Isol 1 man Cntl (F6A6,F8A5) NLG Backup Rel and Extension Sys 2 LMG, RMG Backup Rel Sys 2 30 LG Extend Vlv 2 31 NWS Hyd Sys 2		
	(FPC1/AW18H) 32 EMU 1,2 Pwr/Batt chgr MNA pwr		
	(O6) −Y Star Trkr Dr Sys 1 OP/CL capability		
	(C3A5) 33 L ADP Dpy Mtr 1 34 Htr Cntlr 1		
	(A6A1) PL Reten Sys A Rel/Lat Mtrs		
	(R2) 25 ET Door Mtrs: C/L Lat Actr 1 Mtr 1 man STO capability C/L Lat Act 2 Mtr 1 man STO capability L Dr Closure Mtr 1 man Cntl L Dr Uplock Lat Mtr 2 man Cntl R Dr Uplock Lat Mtr 2 man Cntl		
	(A14) 6 Ku−Band Temp Meas PA, Rcvr, A&B Gimbal, Rate Snsr, Ant Feed		
	(C3A1) 35 L OMS Arm 1, Arm/Press 1 sw Contacts 36 L OMS Eng Pr Vlv Coil 1, Cntl Vlv 1,2 Coils 1		

EPS SSR−101
BUS LOSS: CNTLAB2

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A12) APU HTR 2 • GAS GEN/FUEL PUMP 1 − B AUTO APU HTR TK/FU LINE/H2O/ 2 • SYS 1A − OFF 2 • 1B − AUTO 2 • 3A − AUTO 2 • 3B − OFF HYD HTR • RUD SPD BK A − OFF • B − AUTO • CIRC PUMP PWR 1 − MNB	(A12) APU 1 GG/Fu Pump Htrs A APU 1 TK/Fu Ln Htrs A APU GG Inj H2O Tank Htrs 1A,2A APU 3 Tk/Fu Ln Htrs B Rud/Spd Brk Htr A (R2) Circ Pump 1 MNA pwr	1 (F7) C/W RCS JET lt − on SM ALERT Light/Tone − on (FSMs) S86 APU/HYD W/B SM0 THRM HYD (B) S67 CNTL BUS V S67 DISPLAY SW L 1 F RCS D(F,L,U) JET S68 H2 MANF VLV S68 O2 MANF VLV SM 67 ELECTRIC CNTL AB2 Volts < 20 During Rad Dpy/Sto ops: (R13L) RAD CNTL tbs (four) indicate single mtr ops If H2O PUMP LOOP 1,A active: C/W H2O LOOP lt − on 'S88 H2O PUMP P1' 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP' (O1) H2O PUMP OUT PRESS meter ind − 20−25 psia L ADP deploy time incr from 15 to 30 sec STAR TRKR DR POS −Y CL time incr from 8 to 16 sec (F7) If APUs active and using H2O BLR CNTLR/HTR 1B: C/W APU TEMP lt − on after ~2 min SM (BFS,SM) 63 PL BAY DOORS During PLBD OP/CL, single mtr run time noted on actuators listed at left	(1) Indications do not appear until jet commanded (2) * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp (3) Pri B GPC Sel capability remains. Pri A and Sec Cntlrs remain (4) In OPS 2, FES GPC cmd is not present, but one may be sent if reqd (5) Vlv holds position. Isol B remains (6) Do not reconfig for reg switch or I'CNCT procedures (7) Vlv holds position (8) Pwr to MCA Drivers lost through ENABLE sw (9) Vlv holds position. GPC OP capability remains during entry
(L1) • H2O PUMP LOOP 1 − B • FLASH EVAP CNTLR PRI A − ON (if reqd) • TOP EVAP HTR NOZ L − A AUTO • TOP EVAP HTR DUCT − B If Hi Load Evap enabled • HI LOAD DUCT HTR − B(C)	(L1A2) H2O Loop 1 Pump A man ON capability 3 Flash Evap Cntlr Pri B man 4 ON Sel capability Top Evap L Noz Htr B Top Evap Duct Fwd,Aft L,R Htrs A Hi Load Duct Outbd,Inbd Htrs A
(L2) • FLASH EVAP FDLN HTR A SPLY − 2	(L2A1) FES H2O Fdln A Htrs 1 (all)
Place CDR disp sws (eight) to green dot position: (F6) • AIR DATA − NAV • ADI ATT − LVLH • ERR − MED • RATE − MED • HSI SEL MODE − ENTRY • HSI SEL SOURCE (two) − NAV, 3	(F6A1) Air Data Source Sel capability L ADI Att, Err, Rate Sel capability (F6A5) L HSI Mode, Source Sel capability
(F7) • RADAR ALTM − 2	(F6A7) L Radar Altm Sel capability
Refer to OMS/RCS Slide Rule for vlv loss info 6 Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT R RCS He PRESS A • L, R RCS XFEED 3/4/5	(O7) 5 Aft L RCS He Pr Isol A man Cntl and GPC CL capability 5 Aft R RCS He Pr Isol A man CL capability 7 Aft L,R RCS Xfeed Vlv 3/4/5 man CL capability
(O8) • L OMS XFEED A • R OMS XFEED A	(O8) 5 L,R OMS Tk Isol A man CL cap 5 L,R OMS Xfeed Vlv A man CL cap 5 Fwd RCS He Pr Isol A man Cntl and GPC CL cap Fwd RCS Tk Isol 3/4/5 man CL and man Ovrd of GPC CL cap
	(R13A2) 8 PLBD: C/L Lat 1−4, 5−8 Mtrs 1 Port Aft Blkhd Mtr 1
	9 (R4) LG Extend Isol Vlv man Cntl
(Continued)	(Continued)

BUS LOSS: CNTLAB2

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(R1) If TK1 in use: O2,H2 TK1 • HTR A (two) − AUTO • B (two) − OFF If TK3 in use: O2,H2 TK3 HTR • HTR A (two) − OFF • B (two) − AUTO		(R1A2) 7 Cryo O2,H2 Tk1 Manf Vlv Cntl Cryo O2,H2 Tk1 Htrs B Cryo O2,H2 Tk3 Htrs A		(7) Vlv holds position (10) Auto Cntl of these Htrs also lost if single Htr Ops and tank not paired (11) Manf status not automatically declared closed. Jet fail−offs may occur (12) Selecting failed MMU for GNC MF protects against GPC MMU Rcvr failure after OPS XTION prepositioning (13) When SM unavailable, use NSP block to inhibit UL Cmds. 'BCE STRING 1(3) NSP' annunciates and it requires GNC I/O RESET after UPLK − ENA for AOS (14) Vlv normally closed (15) B Htrs remain (16) RM sw downmodes to 2−level for −X position
			10 (A15) Pallet Cryo Tk 6−9 Htrs A man On Cntl		
	(R2) • BLR CNTLR/HTR 1 − A		(R2) Hyd H2O Blr 1 Cntlr B		
11	GNC 23 RCS Override F1 Manf status to CL: • RCS FWD − ITEM 1 EXEC • MANF VLVS 1 OVRD − ITEM 40 EXEC		(O14) RCS Manf F1 RJD pwr (F1F,F1L,F1U,F1D)		
12	SM 1 DPS UTILITY (G2,G8,S2) MMU ASSIGN • GNC − ITEM 2 EXEC • SM − ITEM 3 EXEC • PL − ITEM 5 EXEC • OPS 0 − ITEM 7 EXEC		(O15) MMU 2		
16	If Network Sig Proc Encryption Select − Bypass (A1L) and no SM GPC: (C3) • UPLK − NSP BLK		(C3A5) 13 Uplink switch GPC block of UL Cmds capability		
	When reqd: • Perform FC1 purges in AUTO mode (ORB OPS)		(R11U) 14 FC1 Purge Vlv man Cntl		
			(C3) FC3 Redundant Reac Vlv Close Cntl		
	(A14) RCS/OMS HTR • FWD RCS − B AUTO • L POD (two) − A OFF, B AUTO		Fwd RCS A Htrs (all) 15 L Pod A Htrs (partial)		
	If SENSE − −Z: (A6U) • SENSE − −X • Wait at least 1 sec, then reposition as desired		(A6A1) 16 3−level sw RM for −X Sense		
	(A15) • PALLET HTR A − OFF • B − AUTO		(A15) Pallet Structure Htr A Stbd		
	If AB1,2,3 unpwrd at same time: (A1L) • NSP ENCRYPTION MODE − SEL • NSP ENCRYPTION SEL − BYP		If AB1,2,3 unpwrd at same time: (A1A2) COMSEC 1,2 Key		
	(Continued)		(Continued)		

EPS SSR−101 (Cont)
BUS LOSS: CNTLAB2

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
If reqd during entry (< 120K ft): (L1) • NH3 CNTLR A(B) − PRI/GPC	17	(L1A2) NH3 Sys B Sec Cntlr man ON capability		(7) Vlv holds position (17) Sys B Pri Cntlr, Auto switchover to Sec Cntlr remain (18) Loss of manual capability to inert LH2 Manf (19) Six vlvs fail to non−isolation position (20) Vlv holds positions. FC1 Redundant Reac Vlv Close Cntl on pnl C3 remains (21) FC1 can be stopped via FC1 CNTLR sw (O14:A) (22) Vlv holds position. Sys 2 remains (23) Redundant mtrs remain (24) Mtr 2 remains (25) Htr Cntlr 2 remains (26) **WARNING** Driver pwr to L5 jets lost if L5/F5/R5 Driver sw OFF (O16:F)
BUS ISOLATION				
ONLY ON MCC CALL, PERFORM				
(R2) • MPS He I'CNECT CTR − GPC		(R2) Ctr MPS He Intercom Vlvs man Cntl		
(R4) • MPS FILL/DRAIN LH2 INBD − GND	18	(R4) Prplt F/D LH2 Inbd Vlv man Cntl		
(O15:F) • MMU 2 − OFF				
	19	(O17) ATVC 2 Isol ME		
	20 21	(R1A2) FC1 Reac Vlv Cntl via pnl R1 sw FC1 STOP capability via START/STOP sw (pnl R1)		
	22	(L2A1) Atm Press Cntl O2 Sys 1 Sply Vlv Cntl		
		(F6) L HUD		
		(F6A1) L ADI Att Ref Set capability		
	7	(R4) TVC Hyd Sys 1 Isol man Cntl		
	23	(O6) −Y Star Trkr Dr Sys 1 CL capability		
	24 25	(C3A5) L ADP Deploy Mtr 1 Htr Cntlr 1		
		(R2) L MPS He Isol B man Cntl		
	23	(R13A2) Rad Cntl Sys Port Lat 1−6 Mtr 1 Dpy/Sto Mtr 1 Stbd Lat 7−12 Mtr 1 Dpy/Sto Mtr 2		
	26	(O15) RJDA L Vernier Logic pwr (L5L)		

(Continued)

EPS SSR−101 (Cont)
BUS LOSS: CNTLAB2

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(R2) 23 ET Door Mtrs C/L Lat Actr 1 Mtr 2 man Stow capability C/L Lat Actr 2 Mtr 2 man Stow capability L Dr Uplock Lat Mtr 2 man Cntl R Dr Closure Mtr 2 man Cntl R Dr Uplock Lat Mtr 2 man Cntl		(23) Redundant mtrs remain (27) L OMS auto shutdown if Pc < 80% and '↓' on MNVR EXEC display **CAUTION** No Purge. Wait 10 min between burns (28) Redundant coils remain (29) Vlv closes. Redundant vlv remains (30) Redundant RPC remains
	(C3A1) 27 L OMS ARM 2, ARM/PRESS 2 sw Contacts 28 L OMS Eng Pr Vlv Coil 2, Cntl Vlv 1,2 Coils 2		
	(R2) 29 APU 2 Fu TK Vlv B 30 Hyd Main Pump 1 Depress Solenoid RPC A 30 Hyd Main Pump 3 Depress Solenoid RPC B		

EPS SSR−102
BUS LOSS: CNTLAB3 (Includes MNA FMC1, MNA MMC1, MNA MMC3, MNA AMC1)

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A12) APU HTR 1 • GAS GEN/FUEL PUMP 1 − A AUTO • LUBE OIL LINE 1 − A AUTO APU HTR TK/FU LINE/H2O/ 1 • SYS 1A − OFF 1 • 1B − AUTO 1 • 3A − AUTO 1 • 3B − OFF HYD HTR • BDY FLP A − OFF • B − AUTO • CIRC PUMP PWR 1 − MNA	(A12) APU 1 GG/Fu Pump Htrs B 1 Lube Oil Line Htrs B 1 Tk/Fu Ln Htrs A APU 3 Tk/Fu Ln Htrs B APU 3 GG Inj H2O Htrs 3B, 23B Body Flap Htr A Circ Pump 1 MNB pwr	SM ALERT Light/Tone − on 'S67 CNTL/ESS V' 'S88 THERMAL FRN' (2)	(1) * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
		(FSM) RM DLMA MANF	
		(L1) 2 FLOW PROP VLV LOOP 1 tb − bp	(2) Freon Loop 1 Flow Prop Vlv operation not affected
		(O8) FWD RCS 3 TK ISOL 3/4/5 tb − bp 3 MANF ISOL 1 tb − bp	
		(R13L) 4 RAD CNTL STBD tb − bp 4 PORT tb − bp	(3) Vlv holds position
(R2) • BLR CNTLR/HTR 1,3 (two) − B	(R2) Hyd H2O BLR 1,3 Cntlr A	SM 67 ELECTRIC CNTL AB3 Volts < 20	(4) If AC1 cb not opened, Lat Mtrs 1 of actuators for Port,Stbd Rad Lat 1−6,7−12 continue to run until Sys A Lat Cntl sw placed to OFF. Other equip pwrd by AC1 MMC1 and AC1 MMC3 are lost because MNA MMC1 and MNA MMC3 lost
(A14) RCS/OMS HTR • OMS CRSFD LINES − A OFF, B AUTO	(A14) OMS Crsfd Ln Htrs A	LADP deploy time incr from 15 to 30 sec	
(L1) • H2O PUMP LOOP 1 − B • TOP EVAP HTR DUCT − B If Hi Load Evap enabled: • HI LOAD DUCT HTR − B(C)	(L1A2) H2O Loop 1 Pump A Top Evap Duct Fwd,Aft Htrs A Hi Load Duct Outbd,Inbd Noz Htrs A	(F7) If APUs active and using H2O BLR CNTLR/HTR 1A or 3A: C/W APU TEMP lt − on after ~2 min	
Refer to OMS/RCS Slide Rule for vlv loss info	5 (O7) Aft R RCS He Press Isol A man Cntl, GPC CL capability		(5) Vlv holds position. GPC OP capability remains. Isol B remains. Auto Overpress protection lost on R RCS A reg
4 (MA73C:C,D) • cb MCA PWR AC1 3Φ MID 1,3 (two) − op	4 (MA73C) Port,Stbd Rad Lat 1−6,7−12 Mtrs 1 Limit sw		
For PLBD ops: • OP/CL Drs in man mode	(MA73C) PLBD: C/L Lat 1−4,5−8,9−12 Mtrs 1 Port,Stbd Fwd Blkhd Mtrs 1 Port Aft Blkhd Mtr 1 Stbd Door Mtr 1 Port Door Mtr 2 CL Limit sw	SM (BFS,SM) 63 PL BAY DOORS If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG' During MAN PLBD OP/CL, single mtr run time noted on actuators listed at left	
Do not perform if AB1,2,3 unpwrd at same time: GNC 23 RCS Override F1 Manf status to OP: • RCS FWD − ITEM 1 EXEC • MANF VLVS 1 OVRD − ITEM 40 EXEC			
• PLT RHC pb − push, if BFS engage reqd	(F6) CDR BFS no eng capability GPC 1,2,4 no eng capabiliity		
	COMSEC 1 & 2 Pwr Redundancy		
(Continued)	(Continued)	(Continued)	

EPS SSR−102 (Cont)
BUS LOSS: CNTLAB3

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
6 AB1,2,3 unpwrd at same time: (A1L) NSP ENCRYPTION MODE − SEL NSP ENCRYPTION SEL − BYP	If AB 1,2,3 unpwrd at same time: (A1A2) COMSEC 1,2 Key	STAR TRKR DR POS −Y OP/CL time incr from 8 to 16 sec	(6) When SM not available, use NSP block to inhibit UL cmds. 'BCE STRG 1(3) NSP' annunciates and it requires GNC I/O RESET after UPLK − ENA for AOS
No SM GPC or LOS: (C3) UPLK − NSP BLK		(L1) If H2O PUMP LOOP1,A ON: C/W H2O LOOP lt − on 'S88 H2O PUMP P1' 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP' (O1) H2O PUMP OUT PRESS LOOP 1 ind − 20−25 psia	(7) Lose Hyd deploy capability for all Ldg Grs. Pyro backup release sys will deploy Ldg Grs. NLG can also be deployed by Hyd Sys 2
(A15) If Tk6−Tk9 in use: • (Aff) TK HTRS A − OFF • B − AUTO • PALLET HTR A − OFF • B − AUTO	(A15) Pallet Cryo Tk 6−9 Htrs A Pallet Structure Htr A Port	(A8L) PORT RMS: DPY/STO tb − bp RETEN LAT tb − bp R−F−L MID tb − bp	(8) Hyd Sys 2 still available for NWS
BUS ISOLATION		SM 94 PDRS CONTROL	(9) Mtr 2 remains
ONLY ON MCC CALL, PERFORM	(MA73C) Stbd Rad Dpy/Sto Mtr 1 Port Rad Dpy/Sto Mtr 1 −Y Star Trkr Dr Sys 1 OP/CL capability	Indications lost: Mid MRL Mtr 1 LAT/REL/RDY Aft MRL Mtr 2 LAT/REL/RDY	(10) Htr Cntlr 2 remains
NONE	(R4) 7 LG Extend Vlv 1 8 NWS Hyd Sys 1		(11) Vlv closes. Redundant vlv remains
	(MA73C) LH Vents 5,6,8,9 Mtrs 1 RH Vents 1,2,3,5,6 Mtrs 1		(12) Redundant pwr sply remains. Turbine speed ind lost
	(MA73C) 9 L ADP Deploy Mtr 1 Disc 1 10 Htr Cntlr 1		(13) Use pb on Aft pnl A6
	(R2) 11 APU 3 Fu Tk Vlv B 12 Cntlr Pwr B Sply B		(14) Loss of manual capability to inert LH2 Manf
	(C3A6) 13 Fwd Pnl Trans X,Y Norm, Pulse, and Fwd Pnl Roll, Pitch,Yaw Disc Rate, Pulse, Select capability 13 Fwd Pnl Trans Z High, Norm, Pulse Sel capability 13 Fwd Pnl Trans Low Z Sel capability 13 Fwd Pnl PRI,ALT,VERN Sel capability 13 Fwd Pnl PCT Exec capability		(15) Redundant mtrs remain
	(R4) 14 MPS Inbd LH2 Prplt Vlv man Cntl		
	(R2) MPS Pneu He Isol 1 man Cntl R MPS He Isol B man Cntl		
	(MA73C) 15 ET Door Mtrs: C/L Lat Actr 1 Mtr 1 GPC Cntl C/L Lat Actr 2 Mtr 1 GPC Cntl L Dr Closure Mtr 1 GPC CL capability L Dr Uplock Lat Mtr 1 GPC Lat capability		

EPS SSR−102 (Cont)
BUS LOSS: CNTLAB3

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
		(MA73C) AC pwr removal capability via Limit sw for ET Door Mtrs: C/L Lat Actr 1 Mtr 1 2 Mtr 1 L Dr Closure Mtr 1 Uplock Lat Mtr 1		(16) Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists
	16 16	(MA73C) Port RMS: Mid MRL Mtr 1 Aft MRL Mtr 2		

EPS SSR−103
BUS LOSS: CNTLBC1

	ACTIONS	EQUIP/FUNCTION LOST
	(A12) APU HTR	(A12)
1	• GAS GEN/FUEL PUMP 1 − A AUTO	APU 1 GG/Fu Pump Htrs B
1	• GAS GEN/FUEL PUMP 2 − B AUTO	APU 2 GG/Fu Pump Htrs A
	• LUBE OIL LINE 2 − B AUTO	APU 2 Lube Oil Line Htrs A
	APU HTR TK/FU LINE/H2O/	
1	• SYS 1A − AUTO	APU 1 Tk/Fu Ln Htr B
1	• 1B − OFF	APU 1,2 GG Inj H2O Htrs 4B,5B
1	• 2A − OFF	
1	• 2B − AUTO	APU 2 Tk/Fu Line Htr A
	HYD HTR	
	• BDY FLP A − AUTO	Body Flap Htr B
	• B − OFF	
	• CIRC PUMP PWR 1 − MNA	MNB Circ Pump 1 pwr
	• CIRC PUMP PWR 2 − MNC	MNB Circ Pump 2 pwr
	(A1L) S−BD PM	(A1A2) S−BD PM Sys 1**:** Xpndr 1 Pre−Amp 1 Pwr Amp 1 PM Ant Sw 1 FM Ant Sw 1
	• ANT SW ELEC − 2	
	• XPNDR − 2	
	• PWR AMPL OPER − 2	
	• STBY − 2	
	• PRE AMP − 2	
	NSP	
	• PWR − 2	
	If PSP and/or INTRG reqd for PL or ISS ops**:**	NSP 1/COMSEC 1
	• S−BD PL PWR SYS − 2	
	• CNTL − PNL	S−BD PL INTRG 1
	• − CMD	
6	• Reconfig PSP	
6	• Perform PL INTRG REACQ (if reqd)	PSP 1
	(A1R) • S−BD FM PWR − 2	(A1A3) S−BD FM Sys 1
	If no comm**:** (C3) • S−BD PM CNTL − PNL • − CMD	
7	If OIU reqd**:** (SSP) • OIU PWR − OIU 2 ON • OIU tb − DN • ✓MCC, OIU reconfig	
	(L1) • TOP EVAP HTR NOZ L − B AUTO	(L1A2) Top Evap L Noz Htr A
	• TOP EVAP HTR DUCT − A	Top Evap Duct Fwd,Aft Htrs B
	If Hi Load Evap enabled**:** • HI LOAD DUCT HTR − A (C)	Hi Load Duct Outbd,Inbd Noz Htrs B
	(R2) • BLR CNTLR/HTR 2 − A	(R2) Hyd H2O Blr 2 Cntlr B
8		(R13A2) PLBD**:** C/L Lat 13−16 Mtr 2 Stbd Aft Blkhd Mtr 2 Port Drive Mtr 2
	(Continued)	(Continued)

CREW INDICATIONS	NOTES
MASTER ALARM Light/Tone − on	(1) * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU**.** However, SM ALERT occurs above freezing temp
(F7) SM ALERT Light/Tone − on	
SM 67 ELECTRIC	
CNTL BC1 Volts < 20	
2 C/W RCS JET lt − on	
(FSMs) S69 FC H2O RLF HTR S67 CNTL BUS V	
3 S86 APU/HYD W/B SM0 THRM HYD (B)	
2 F,L,R RCS L,R,D JET	
(COMM LOST) All S−BD A/G voice lost if Sys 1 selected	(2) Indications do <u>not</u> appear until jet commanded
(L1)	
4 RAD BYP VLV 2 tb − bp	(3) Msg occurs only if B AUTO (pnl R12U) selected for FC H2O Relief Htr
If Site AOS and using S−BD Ant Elec 1**:**	(4) Vlv still functional
5 'ANTENNA'	(5) FSM caused by antenna miscompare
If NSP 1 selected**:** 'BCE STRG 1 NSP'	(6) REACQ and PSP reconfig procedures are flight specific**.** If reqd, procedures can be found in payload or ISS specific books
During Rad Dpy/Sto**:** (R13L) RAD CNTL STBD tb indicates single mtr ops RAD LAT CNTL tbs (two) indicate single mtr ops	(7) OIU 2 interfaces with PSP 2 for commanding
L,R ADP deploy time incr from 15 to 30 sec	(8) Pwr to MCA Drivers lost through ENABLE sw
STAR TRKR DR POS −Y CL time incr from 8 to 16 sec	
STAR TRKR DR POS −Z OP/CL time incr from 8 to 16 sec	
If SYS 1 pwrd**:** 'S62 BCE BYP PSP 1' Loss of PL TLM and CMD If PDI FDA enabled**:** 'S62 PDI DECOM FAIL'	
If first RGA failure and rates sensed**:** 'RM FAIL RGA' (3)	
(F7) If APUs active and using BLR CNTLR/HTR 2B**:** C/W APU TEMP lt − on after ~2 min	
CCTV Video and Annun is lost if MNB selected for VCU	
PLB Floodlts lost**:** Fwd Stbd Mid Port	
SM (BFS,SM) 63 PL BAY DOORS	
During PLBD OP/CL, single mtr run time noted on actuators listed at left	

EPS SSR−103 (Cont)
BUS LOSS: CNTLBC1

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(O8) • If Straight feed config, Right OMS Crossfeed A − OP (tb−OP). Otherwise, ✓MCC	9	OMS Eng/Xfeed Vlv Redundancy		(9) Maintains deorbit capability for MNC DA3 failure (10) Vlv holds position. Man OP and full GPC cntl remains (11) Do not reconfig for reg switch or I'CNCT procedures (12) Manf status not automatically declared closed. Fail−offs will occur when jet commanded (13) NOZ Htr A not wired (14) Vlv normally closed. GPC cntl remains. Man override of GPC OP CMD is lost
	Refer to OMS/RCS Slide Rule for vlv loss info Reconfig following vlv(s) only if leak isolation reqd: (O7)	10	(O8) F,R,RCS He Press Isol B man CL capability		
11	• AFT R RCS He PRESS B				
	(O8) • L OMS XFEED B • R OMS XFEED B • FWD RCS He PRESS B	10 10	(O8) L OMS Tk Isol B man CL capability L,R OMS Xfeed Vlv B man CL capability		
	If BC1,2,3 unpwrd at same time: GNC 23 RCS Override F2 Manf status to CL: • RCS FWD − ITEM 1 EXEC • MANF VLVS 2 OVRD − ITEM 41 EXEC				
	For attitude control, perform RCS, LOSS OF VERNIERS (ORB OPS)	12	(O16) RCS Manf F5,L5,R5 RJD pwr (F5L,F5R,L5L,L5D,R5R,R5D)		
	GNC 23 RCS • Reprioritize L,R Manf 1 Jets to first priority: DES INH twice, all other jets highest priority first, then next highest priority, etc • Set aft pod(s) PRI JET FAIL LIMIT to 3		(A14) Aft RCS L,R Jet 1 Htrs		
	(A14) RCS/OMS HTR • FWD RCS − A AUTO • L POD (two) − A AUTO, B OFF • R POD (two) − A OFF, B AUTO		(A14) Fwd RCS Htrs B (all) L Pod Htrs B (all) R Pod Htrs A (all)		
	(R11U) FC H2O • LINE HTR − A AUTO		(R11U) FC H2O Line Htrs B Relief Htrs B Vent Line Htrs B Barrel Htrs B Rlf Noz Htrs B		
13	• RELIEF HTR − A AUTO				
	When reqd: • For FC2, perform FUEL CELL PURGE − AUTO (ORB OPS, EPS)	14	(R11U) FC2 Purge Vlv man Cntl		
	Prior to using L(R) OMS: (O8) L, R OMS He PRESS/VAP • ISOL A (two) − OP, then • − GPC • B (two) − GPC	14	(O8) L,R OMS He Press Isol B man Cntl and VAP ISOL 1,2 Man B Cntl		
	If CCTV reqd: (A7U) • TV PWR CONTR UNIT − MNA		(A7A1) Video Cntl Unit MNB pwr		
	(Continued)		(Continued)		

BUS LOSS: CNTLBC1

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
If EMU(s) in battery charge mode: (AW18H) • PWR/BATT CHGR EMU 1(2) BUS SEL − MNA		(FPC2/AW18H) EMU 1,2 Pwr/Batt Chgr MNB pwr		(15) Right Trim and Body Flap Cntl remains. Left Trim and Body Flap cntl function is regained after the lost contacts have been deselected in OPS−8 (3,B) (16) Vlv holds position (17) Vlv holds position. Loss of manual capability to inert LO2 and LH2 Manfs (18) Auto Cntl of these Htrs also lost if single Htr Ops and tank not paired (19) Vlv holds position. FC2 Redundant Reac Vlv Close Cntl on pnl C3 remains (20) FC2 can be stopped via FC2 CNTLR sw on pnl O15:A (21) Cntlrs A, B Rad Byp Vlv Mtrs Auto Cntl and Cntlr B Rad Byp Vlv Mtr Man Cntl remain
During OPS 8: GNC 43 CONTROLLERS Deselect L Pnl Trim L2: • DES PNL TRIM L2 − ITEM 37 EXEC Deselect L Bdy Flp UP/DN L2: • DES BDY FLP L2 − ITEM 20 EXEC	15 15 15	(F6A7) L Trim RHC − INH capability Pnl − ON capability (L2A1) L Bdy Flp Cntl		
For SSME Hyd Repress: (R4) • HYD MPS/TVC ISOL VLV SYS 1,3 (two) − OP • Wait 10 sec, then CL	16	(R4) MPS/TVC Hyd Sys 2 Isol man Cntl		
BUS ISOLATION				
ONLY ON MCC CALL, PERFORM				
(F3) • TRIM RHC − ENA • PNL − OFF				
(R4) MPS • FILL/DRAIN LO2 INBD − GND • FILL/DRAIN LH2 OUTBD − GND	17 17	(R4) Prplt F/D Inbd LO2 Vlv man OP capability Prplt F/D Outbd LH2 Vlv man Cntl		
(O15:A) • RGA 2 − OFF		(O15) RGA 2		
(R14:D) cb MNB • TV CONTR UNIT − op				
(A7U) PL BAY FLOOD • MID PORT − OFF • FWD STBD − OFF		(A7A1) PLB Mid Port Floodlt Fwd Stbd Floodlt		
	18 16	(R1A2) Cryo O2,H2 Tk2,4 Htrs A man On Cntl Cryo O2,H2 Tk2 Manf Vlv Cntl		
		(R2) R MPS He isol B man Cntl		
		(A15) (OV105 only) Cryo O2,H2 Tk5 Htr B man On Cntl		
	19 20	(R1A2) FC2 Reac Vlv Cntl via pnl R1 sw FC2 Stop capability via START/STOP sw (pnl R1)		
		(C3) FC1 Redundant Reac Vlv Cntl		
	21	(L1A2) Freon Loop 1 Cntlr A Rad Byp Vlv Mtr man Cntl		
		(Continued)		

EPS SSR−103 (Cont)
BUS LOSS: CNTLBC1

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
		(L2A1) 22 Atm Press Cntl O2 Sys 2 Sply Vlv Cntl		(22) Vlv holds position. Sys 1 remains
		(F8) R HUD Rt ADI Aft Ref Set capability (C3A5) L,R ADP Dpy Mtrs 2 Probe Htr Cntlr 2		(23) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison
		(A8L,R13A2) Port RMS: 23 MPM Mtr 2 24 Fwd MRL Mtr 1 24 Mid MRL Mtr 2		(24) Single mtr time
		ROEU AC2 pwr to: 24 Orbiter arm drive mtr (ODM mtr 2 − mate B, demate B, relax B) 24 ODA mtr 2 latch/ release		(25) **WARNING** Driver pwr to F2 jets lost if RJDF 1A Driver sw OFF (pnl O15:F)
		(O6) −Y Star Trkr Dr Sys 2 CL capability −Z Star Trkr Dr Sys 1 OP/CL capability		(26) Redundant pwr sply remains. Turbine speed ind lost
		(O15) 25 RJDF 1A F2 Manf Logic pwr (F2F,F2R,F2U,F2D)		(27) Redundant RPC remains
		(R2) 26 APU 1 Cntlr Pwr Sply B 27 Hyd Main Pump 2 Depress Solenoid RPC A 27 Hyd Main Pump 1 Depress Solenoid RPC B 28 APU 1 Fu Tk Vlv B		(28) Vlv closes. Redundant vlv A remains
		(F6A5,F8A5) NLG Ext 2 Fire 1, Fire 2 NLG,LMG,RMG Bkup Rel 2 Fire 1 29 LG Extend Vlv 2 30 NWS Hyd Sys 2 (R4) 31 Hyd Brake Isol 2 Man Cntl		(29) Loss of redundant hyd NLG deploy and NWS redundancy (30) Hyd Sys 1 still available for NWS
		(R13A2) Rad Cntl sys: Stbd Rad Lat 1−6 Mtr 2 Dpy/Sto Mtr 1 Port Rad Lat 1−6 Mtr 2		(31) Vlv holds position. GPC cntl remains. Loss of redundant hyd NLG deploy and NWS redundancy if failed closed
		(R13A2) PL Reten Sys B Rad/Lat Mtrs 32 Ku Ant Sto/Dpy Mtr 2 Direct Stow Mtr 2 33 Redundant Stow Initiate Signal to Ku−Band		(32) Mtr 1 remains (33) Redundant stow initiate sig (CNTL CA1) to Ku−Band remains
		(F2,F3) 34 CDR Dpy Fire 2 34 Jett Fire 2		(34) Plt Dpy/Jett remains

EPS SSR−104
BUS LOSS: CNTLBC2

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
	(A1L) S−BD PM		(A1A2) S−BD PM Sys 2:		All S−BD A/G voice lost if sys 2 selected CRT 2 blanks	(1) If S−BD PM Sys 2 being used at time of bus failure, A/G comm capabilities lost until Sys 1 selected
1 1	• ANT SW ELEC − 1 • XPNDR − 1		Xpndr 2			(2) Indications do not appear until jets commanded
	• PWR AMP OPER − 1 • STBY − 1 • PRE AMP − 1		Pre Amp 2, Pwr Amp 2 PM and FM Ant sw 2	2	(F7) RCS JET C/W lt − on SM ALERT Light/Tone − on	(3) REACQ and PSP reconfig procedures are flight specific. If reqd, procedures can be found in payload or ISS specific books
	NSP				(FSMs) S86 APU/HYD W/B SM0 THRM HYD (B) BCE STRG 3 NSP (if using NSP 2) S67 CNTL/ESS V DISPLAY SW R	(4) Indication appears only during site AOS for antenna miscompares
1	• PWR − 1		NSP 2/COM SEC 2	2	F,L,R RCS(F,R,L,U,D) JET I/O ERROR CRT2	(5) OIU 1 interfaces with PSP 1 for commanding
	If PSP and/or INTRG reqd for PL or ISS ops: • S−BD PL PWR SYS − 1 • CNTL − PNL • − CMD		S−BD PL Intrg 2 PSP 2		SM 67 ELECTRIC CNTL BC2 Volts < 20	(6) TIME CRITICAL If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
3 3	• Reconfig PSP • Perform PL INTRG REACQ (if reqd)			4	If site AOS and using S−BD Ant Elec 2: 'ANTENNA' (2)	(7) Sec Cntlr Man ON Sel capability remains. Pri A,B Cntlrs remain
	(A1R) • S−BD FM PWR − 1		(A1A3) S−BD FM Sys 2		(L1) If H2O PUMP LOOP 1,B active: C/W H2O LOOP lt 'S88 H2O PUMP P1' 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP'	(8) Single mtr time
	If no comm: (C3) • S−BD PM CNTL − PNL • − CMD				(O1) H2O PUMP OUT PRESS LOOP 1 − 20−25 psia	(9) Pwr to MCA Drivers lost through ENABLE sw
5	If OIU reqd: (SSP) • OIU PWR − OIU 1 ON • OIU tb − UP • ✓MCC, OIU reconfig				During Rad Dpy/Sto: (R13L) RAD LAT CNTL tbs (two) indicate single mtr ops RAD CNTL STBD tb indicates single mtr ops	
	(A12) APU HTR		(A12) APU 2 GG/Fu Pump Htrs A		STAR TRKR DR POS −Y OP/CL time incr from 8 to 16 sec	
6	• GAS GEN/FUEL PUMP 2 − B AUTO		1 Tk/Fu Line Htrs B		STAR TRKR DR POS −Z CL time incr from 8 to 16 sec	
	APU HTR TK/FU LINE/H2O/				(F7) If APUs active and using H2O BLR CNTLR/HTR 2B: C/W APU TEMP lt − on after ~2 min	
6 6 6 6	• SYS 1A − AUTO • 1B − OFF • 2A − OFF • 2B − AUTO		APU GG Inj H2O Tank Htrs B APU 2 Tk/Fu Line Htrs A Elevon Actr Htrs B		If sys pwrd: 'S62 BCE BYP PSP 2' Loss of PL TLM and CMD If PDI FDA enabled: 'S62 PDI DECOM FAIL'	
	HYD HTR • ELEV A − AUTO • B − OFF • CIRC PUMP PWR 2 − MNC		(R2) Circ Pump 2 MNB pwr		SM (BFS SM 63) PL BAY DOORS During PLBD OP/CL, single mtr run time noted on actuators listed at left	
	(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl					
	(L1) • H2O PUMP LOOP 1 − A		(L1A2) H2O Loop 1 Pump B man ON capability			
	If using Sec Cntlr: • FLASH EVAP CNTLR SEC − ON • TOP EVAP HTR DUCT − A	7	FES Sec Cntlr GPC Sel capability Top Evap Duct Fwd,Aft Htrs B			
	If Hi Load Evap enabled: • HI LOAD DUCT HTR − A(C)		Hi Load Duct Outbd,Inbd Noz Htrs B			
	(L2) • FLASH EVAP FDLN HTR A SPLY − 1		(L2A1) FES H2O Fdln A Htrs 2 (all)			
			ROEU AC2 pwr to:			
		8	Orbiter arm drive mtr (ODM mtr 2 − mate B, demate B, relax B)			
		8	ODA mtr 2 latch/ release			
			(R13A2)			
		9	PLBD: Port,Stbd Fwd Blkhd Mtrs 2 Stbd Door Mtr 2			
	(Continued)		(Continued)			

BUS LOSS: CNTLBC2

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	Refer to OMS/RCS Slide Rule for vlv loss info		(O8)		(10) Vlv holds position. GPC OP capability remains. Isol A remains
11	Reconfig following vlv(s) only if leak isolation reqd: (O8) • L OMS XFEED B • R OMS XFEED B	10	F,R RCS He Pr Isol B man Cntl, GPC CL capability		(11) Do not reconfig for reg switch or I'CNCT procedures
		12	L OMS Tk Isol B man CL capability		
		12	L,R OMS Xfeed Vlv B man CL capability		(12) Vlv holds position. Man OP and full GPC Cntl remains
	(R1) If Tk2 in use:	13	(R1A2) Cryo O2,H2 Tk2 Manf Vlv Cntl		(13) Vlv holds position
14	O2,H2 TK2 • HTR A (two) − OFF • B (two) − AUTO		Cryo O2,H2 Tk2 Htrs A		(14) Refer to EPS 7.6 CRYO TABLE A for switch nomenclature
	(A11) If Tk4 in use:				(15) Loss of redundant port to the following: MDU CDR 2 (S) MDU MFD 1 (P) MDU PLT 1 (P) MDU PLT 2 (S) MDU AFD 1 (S)
14	O2,H2 TK4 • HTR A (two) − OFF • B (two) − AUTO		(A11) Cryo O2,H2 Tk4 Htrs A		
14	(R1) • O2 TK3 HTR A − AUTO • H2 TK3 HTR A,B − AUTO				(16) Manf status not automatically declared closed. Jet fail−offs may occur
	(R2) • BLR CNTLR/HTR 2 − A		(R2) Hyd H2O Blr 2 Cntlr B		(17) When SM not available, use NSP block to inhibit UL cmds. 'BCE STRING 1(3) NSP' annunciates and it requires GNC I/O RESET after UPLK − ENA for AOS
	(C2) • R IDP/CRT SEL − 3 On MCC GO: • GPC/CRT O2 EXEC		(C2A2) MDU CRT 2		
	GNC 23 RCS	15	IDP 2		
16	Override F2 Manf status to CL: • ITEM 1,41 EXEC		(C3) FC1 Redundant Reac Vlv Close Cntl		
	• For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS)				
17	If Network Sig Proc Encryption Select − Bypass (A1L) and no SM GPC: (C3) • UPLK − NSP BLK		(O15) RCS Manf F2 RJD pwr (F2F,F2R,F2U,F2D)		
	Place PLT disp sws (eight) to green dot position: (F8) • AIR DATA − NAV • ADI ATT − LVLH • ERR − MED • RATE − MED • HSI SEL MODE − ENTRY • HSI SEL SOURCE (two) − NAV 3 • RADAR ALTM − 1	16	(O16) RCS Manf F5/R5/L5 RJD pwr (F5L,F5R,L5L,L5D,R5R, R5D)		
		17	(C3A5) Uplink switch GPC Block of UL Cmd capability		
			(F8) Air Data Source Sel capability R ADI Att, Err, Rate Sel capability		
			R HSI Mode, Source Sel capability		
			R Radar ALTM Sel capability		
	(Continued)		(Continued)		

EPS SSR−104 (Cont)
BUS LOSS: CNTLBC2

ACTIONS		EQUIP/FUNCTION LOST
When reqd: • For FC2, perform FUEL CELL PURGE − AUTO (ORB OPS, EPS)	18	(R11U) FC2 Purge Vlv man Cntl
(A6U) If SENSE − −Z: • SENSE − −X • Wait 1 sec, reposition as desired	19	(A6A1) 3−Level sw RM for −X Sense
During OPS 8: GNC 43 CONTROLLER Desel R Pnl Trim R2: • DES PNL TRIM R2 ITEM 39 EXEC Desel R Bdy Flp up/dn R2: • DES BDY FLP UP/DN R2 ITEM 22 EXEC	20 20 20	(F8) R Trim RHC INH capability R Trim Pnl ON capability (C3A1) R Bdy Flp UP/DN capability
For SSME Hyd Repress: (R4) • HYD MPS/TVC ISOL VLV SYS 1,2 − OP, wait 10 sec, then CL	13	(R4) MPS/TVC Hyd Sys 2 Isol man Cntl
If reqd during entry (< 120K ft): (L1) • NH3 CNTLR A − PRI/GPC If reqd for Post Rollout: (L1) • NH3 CNTLR B − SEC/ON	21	(L1A2) NH3 SYS B Pri Cntlr and Auto Swover to Sec Cntlr
If NH3 CNTLR A(B) − SEC/ON reqd, then: (L1) H2O PUMP • LOOP 1 (two) − ON, A(B) • LOOP 2 − ON • ✓FLOW PROP VLV LOOP (two) − ICH • Activate PL H2O loop(s) (if applicable)		
(A14) RCS/OMS HTR • FWD RCS − A AUTO • L POD (two) − A AUTO, B OFF • R POD (two) − A OFF, B AUTO	22 22 23	(A14) Fwd RCS B Htrs (all) L Pod B Htrs (partial) R Pod A Htrs (partial)

BUS ISOLATION		
ONLY ON MCC CALL, PERFORM		
• MDU CRT 2 PWR − OFF		
(C2) • IDP/CRT2 PWR − OFF		
(F3) • R TRIM RHC/PNL − ENA • PNL − OFF		
(R2) • MPS He I'CNECT L − GPC		(R2) L MPS He Intercon Vlv man Cntl
(R4) • MPS FILL/DRAIN LO2 INBD − GND	24	(R4) MPS Prplt F/D Inbd LO2 Vlv man OP capability
		(Continued)

CREW INDICATIONS	NOTES
	(13) Vlv holds position (18) Vlv normally closed (19) RM sw downmodes to 2−level for −X position (20) Left Trim and Body Flap control remains. Right Trim and Body Flap cntl function is regained after the lost contacts have been deselected in OPS−8 (3,B) (21) Sys B Sec Cntlr man ON capability remains (22) A Htrs remain (23) B Htrs remain (24) Vlv holds position. Loss of manual capability to inert LO2 Manf

EPS SSR−104 (Cont)
BUS LOSS: CNTLBC2

BUS ISOLATION		EQUIP/FUNCTION LOST
		(O16)
	25	ASA 4 Isol Driver pwr
		(L2A1)
	13	Atm Press Cntl O2 Sys 2 Sply Vlv Cntl
		(R1A2)
	26	FC2 Reac Vlv Cntl via pnl R1 sw
	27	FC2 STOP capability via START/STOP sw (pnl R1)
		(R2)
		C MPS He Isol B man Cntl
		(A6A1)
		R ADI Att Ref set capability
	28	Aft Pnl Trans X,Y Norm and Pulse Sel capability
	28	Aft Pnl Trans Z High,Norm, and Pulse Sel capability
	28	Aft Pnl Trans Low Z Sel capability
	28	Aft Pnl Rot Roll,Pitch,Yaw Disc Rate, and Pulse Sel capability
	28	Aft Pnl PRI,ALT,VERN Sel capability
	28	Aft Pnl PCT Exec capability
		(R13A2)
	29	Rad Cntl Sys: Port,Stbd Lat 1−6 Mtr 2 Stbd Dpy/Sto Mtr 1
		(C3A5)
	29	L,R ADP Dpy Mtrs 2
	30	Htr Cntlrs 2
		(O6)
	29	−Y Star Trkr Dr Sys 2 OP/CL capability
	29	−Z Star Trkr Dr Sys 1 CL capability
		(F6A5, F8A5)
	31	NLG Bkup Release,Extension Sys 2
	31	LMG, RMG Bkup Release Sys 2
	32	NWS Hyd Sys 2
	33	LG Extend Vlv 2
		(R13A2)
		PL Reten Sys B Rel/Lat Mtrs
		(R13A2)
	34	Ku Ant Sto/Dpy Mtr 2 Direct Sto Mtr 2
		(R2)
	35	APU 2 Cntlr pwr Sply A
		APU 2 GBX GN2 Repress Vlv
	36	Hyd Main Pump 2 Depress Solenoid RPC A
	36	Hyd Main Pump 1 Depress Solenoid RPC B
		(R13A2)
		Port RMS:
	37	MPM Mtr 2
	8	Fwd MRL Mtr 1
	8	Mid MRL Mtr
		(Continued)

CREW INDICATIONS	NOTES
	(8) Single mtr time
	(13) Vlv holds position
	(25) Six vlvs fail to non−isolation position
	(26) Vlv holds position. FC2 Redundant Reac Vlv Close Cntl on pnl C3 remains
	(27) Able to stop FC2 via FC2 CNTLR sw (pnl O15:A)
	(28) Use Fwd pnl C3 pbs
	(29) Redundant mtrs remain
	(30) Htr Cntlrs 1 remain
	(31) Sys 1 remains
	(32) Hyd Sys 1 still available for NWS
	(33) Loss of redundant hyd NLG deploy and NWS redundancy
	(34) Mtr 1 remains
	(35) Redundant pwr sply remains. GG Bed T and GBX P ind lost when APU running
	(36) Redundant RPC remains
	(37) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison

EPS SSR−104 (Cont)
BUS LOSS: CNTLBC2

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
		(O17) Freon Loop 1 Cold Plate Flow Xdcr Aft PL MNB current Xdcr		(38) Vlv closes. Redundant Vlv A remains (39) PLT Dpy/Jett remains
	38	(R2) APU 2 Fu Tk Vlv B		
	39 39	(F2,F3) CDR Dpy Fire 1 Jett Fire 1		

EPS SSR−105
BUS LOSS: CNTLBC3 (Includes MNB FMC2, MNB MMC1, MNB MMC2, MNB MMC3, MNB MMC4, MNB AMC2)

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
	(A12) APU HTR		(A12)		SM ALERT Light/Tone − on S67 CNTL/ESS V	(1) * TIME CRITICAL *
1	• GAS GEN/FUEL PUMP 2 − A AUTO		APU 2 GG/Fu Pump Htr B 2 Lube Oil Line Htrs B 1 Tk/Fu Line Htr B		SM 67 ELECTRIC CNTL BC3 Volts < 20	If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
	• LUBE OIL LINE 2 − A AUTO				(FSM) RM DLMA MANF	(2) Vlv holds position
	APU HTR TK/FU LINE/H2O/					(3) In OPS 2, FES GPC cmd is not present, but one may be sent if reqd
1	• SYS 1A − AUTO					(4) Sec Cntlr On sel capability remains. Pri A,B Cntlrs remain
1	• 1B − OFF		APU 2 Tk/Fu Line Htr A			(5) If AC2 cbs not opened, Lat Mtrs 2 of actuators for Port,Stbd Rad Lat 1−6 continue to run until Sys B Lat Cntl sw placed to OFF. Other equip pwrd by AC2 MMC2 and AC2 MMC4 lost because of MNB MMC2 and MNB MMC4 loss
1	• 2A − OFF					(6) Sys A Sec Cntlr man On capability remains
1	• 2B − AUTO					
	HYD HTR					
	• RUD SPD BK A − AUTO		Rud/Spd Bk Htr B			
	• B − OFF					
	HYD					
	• CIRC PUMP PWR 2 − MNB		Circ Pump 2 MNC pwr			
	(A14) • RCS/OMS HTR OMS CRSFD LINES − A AUTO, B OFF		(A14) OMS Crsfd Ln Htrs B (all)			
	(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl					
	(L1) • H2O PUMP LOOP 1 − A		(L1A2) H2O Loop 1 Pump B			
3	• FLASH EVAP CNTLR SEC − GPC (if using Sec Cntlr)	4	FES Sec Cntlr man On Sel capability			
	• TOP EVAP HTR NOZ R − B AUTO		Top Evap R Noz Htr A			
	• TOP EVAP HTR DUCT − A(C)		Top Evap Duct Fwd,Aft L,R Htrs B			
	If HI LOAD EVAP enabled: • HI LOAD DUCT HTR − A(C)		Hi Load Duct Outbd,Inbd Htrs B			
	(R2) • BLR CNTLR/HTR 1,2 (two) − B		(R2) Hyd H2O Blr 1,2 Cntlr A			
	Refer to OMS/RCS Slide Rule for vlv loss info Do not perform if BC1,2,3 unpwrd at same time: GNC 23 RCS Override F2 Manf status to OP: • RCS FWD − ITEM 1 EXEC • MANF VLVS 2 OVRD − ITEM 41 EXEC				If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG'	
					During MAN PLBD OP/CL, single mtr run time noted on actuators listed at left	
					(A8L) Port RMS: DPY/STO tb − bp RETEN LAT tb − bp R−F−L FWD tb − bp	
5	(MA73C:C,D) • cb MCA PWR AC2 3Φ MID 2,4 (two) − op	5	(MA73C) Stbd,Port Rad Lat 1−6 Mtr 2 Limit sw			
	For PLBD ops: • OP/CL Drs in man mode		(MA73C) PLBD: C/L Lat 13−16 Mtr 2 Stbd Aft Blkhd Mtr 2 Port Drive Mtr 2 Port,Stbd Fwd Blkhd Mtr 2 Stbd Door Mtr 2 Port,Stbd Door Mtr 1 CL Limit sw		SM 94 PDRS CONTROL Indications lost: MPM Mtr 2 STO/DPY Fwd MRL Mtr 1 LAT/REL/RDY Mid MRL Mtr 2 LAT/REL/RDY	
	If reqd during entry (< 120K ft): (L1) • NH3 CNTLR B − PRI/GPC	6	(L1A2) NH3 Sys A Pri Cntlr and Auto Swover to Sec Cntlr			
	(Continued)		(Continued)			

EPS SSR−105 (Cont)
BUS LOSS: CNTLBC3

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
		(MA73C) Port RMS: 7 MPM Mtr 2 8 Fwd MRL Mtr 1 8 Mid MRL Mtr 2		(7) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison (8) Single mtr time (9) **WARNING** Driver pwr to F4/F5 Jets lost only if both RJDF 2B and L5/F5/R5 Driver sws (pnl O16:F) OFF simultaneously (10) Six vlvs fail to non−isolation position (11) Auto Cntl of these Htrs also lost if single Htr Ops and tank not paired (12) Use pb on AFT pnl A6 (13) Stow capability remains
If NH3 CNTLR A(B) − SEC/ON reqd, then: (L1) H2O PUMP • LOOP 1 (two) − ON, A(B) • LOOP 2 − ON • ✓FLOW PROP VLV LOOP (two) − ICH If applicable: • Activate PL H2O LOOP(s)				
BUS ISOLATION				
ONLY ON MCC CALL, PERFORM				
(L1) • SMOKE DETN CKT TEST − OFF		(L1A1) Smoke Detn Test capability (all dets)		
	9	(O16) RJDF 2B F4/F5 Manf Logic pwr (F4R,F4D,F5L,F5R)		
	10 10	(O17) TVC 3 Isol ME 4 Isol ME		
	11	(R1A2) Man ON Cntl of Cryo O2,H2 Tk 2,4 Htrs B		
		(A15) (OV105 only) Cryo O2, H2 Tk5 Htr B		
		(MA73C) L Vents 1,2,3,5,8,9 Mtrs 2 R Vents 1,2,6,8,9 Mtrs 2		
	12 12 12 12 12	(C3A6) Fwd Pnl Trans X,Y Norm, Pulse, Fwd Pnl Rot Roll, Pitch,Yaw Disc Rate, Pulse Sel capability Fwd Pnl Trans Low Z Sel capability Fwd Pnl Trans Z High,Norm, Pulse Sel capability Fwd Pnl PRI,ALT,VERN Sel capability Fwd Pnl PCT Exec capability		
		(R2) Pneu He Isol 2 man Cntl L MPS He Isol A man Cntl (F6A5, F8A5) NLG, LMG, RMG Bkup Rel Sys 1, NLG Pyro Extension Sys 1		
	13	(MA73C) Port,Stbd Rad Mtrs 2 Dpy capability −Y Star Trkr Dr Sys 2 OP/CL capability −Z Star Trkr Dr Sys 1 OP/CL capability L,R ADP Htr Cntlr 2 Deploy Mtrs 2 Deploy Disc 2		
		(Continued)		

EPS SSR−105 (Cont)
BUS LOSS: CNTLBC3

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	14	(MA73C) ET Door Mtrs: C/L Lat Actr 1 Mtr 2 GPC Cntl L Dr Uplock Lat Mtr 2 GPC Lat capability R Dr Uplock Lat Mtr 2 GPC Lat capability R Dr Closure Mtr 2 GPC CL capability		(14) Redundant mtrs remain (15) With inoperative limit sw, mtr will continue to run until DPY/STO sw is placed to GND position (16) MNC MMC2 pwr for Ku−Bd Xmit Enable signal remains (17) MNC MMC2 pwr remains to supply pwr to Boom stow enable II signal for stow mtrs (18) Vlv closes. Redundant Vlv A remains
		(MA73C) AC pwr removal capability via Limit sw for ET Dr Mtrs: C/L Lat Actr 1 Mtr 2 L Dr Uplock Lat Mtr 2 R Dr Uplock Lat Mtr 2 Closure Mtr 2		
	15 16 17	(MA73C) Ku Ant Sto/Dpy Mtr 2 Sto and Dpy Limit sw Redundant Ku−Bd Xmit Enable Signal Redundant Ku−Bd Boom Stow Enable II Excitation Signal		
	18	(R2) APU 3 Fu Tk Vlv B		

EPS SSR−106
BUS LOSS: CNTLCA1

	ACTIONS		EQUIP/FUNCTION LOST
	(A12) APU HTR		(A12)
1	• GAS GEN/FUEL PUMP 2 − A AUTO		APU 2 GG/Fu Pump Htr B
1	• GAS GEN/FUEL PUMP 3 − B AUTO		APU 3 GG/Fu Pump Htr A 3 Lube Oil Ln Htr A
	• LUBE OIL LINE 3 − B AUTO		2 Tk/Fu Ln Htr B
	APU HTR TK/FU LINE/H2O/		
1	• SYS 2A − AUTO		APU 3 Tk/Fu Ln Htr A
1	• 2B − OFF		
1	• 3A − OFF		
1	• 3B − AUTO		
	HYD HTR • AFT FUS A − AUTO		Aft Fuselage Htrs B
	• B − OFF		
	HYD CIRC PUMP PWR • 2 − MNB		Circ Pump 2 MNC pwr
	• 3 − MNA		3 MNC pwr
	(L1) • H2O PUMP LOOP 2 − ON		(L1A2) H2O Loop 2 Pump GPC Cntl
	• H2O PUMP LOOP 1 − GPC		
2	• FLASH EVAP CNTLR PRI A − ON (if using A Cntlr)	2	FES Cntlr Pri A GPC Sel capability
	• TOP EVAP HTR NOZ R − A AUTO		Topping Evap R Noz Htr B
	If HI LOAD EVAP enabled: • HI LOAD DUCT HTR − A(B)		Topping Evap Duct L,R Fwd, Aft Htr C Hi Load Duct Inbd,Outbd Htrs C
	(L2) • FLASH EVAP FDLN HTR B SPLY − 1		(L2A1) FES H2O Fdln B Htrs 2 (all)
	(C2) • L IDP/CRT SEL − 1		(C2A2) MDU CRT 3
	• R IDP/CRT SEL − 2 On MCC GO: • GPC/CRT 03 EXEC	4	IDP 3
	(R2) • BLR CNTLR/HTR 3 − A		(R2) Hyd H2O Blr 3 Cntlr B
	• If BFS in GPC 3 or 5, move BFS		(F6A5) GPC 3,5 engage capability
	• If BFS in GPC 1, 2, or 4; and if engage reqd, use pb CDR RHC		PLT BFS engage capability
	If CA1,2,3 unpwrd at same time: GNC 23 RCS Override F3 Manf status to CL: • RCS FWD − ITEM 1 EXEC • MANF VLVS 3 OVRD − ITEM 42 EXEC		(O16) RCS Manf F3 RJD pwr (F3F, F3L,F3U,F3D)
	(A14) • RCS/OMS HTR R POD (two) − A AUTO, B OFF		(A14) R Pod Htrs B (all)
	Refer to OMS/RCS Slide Rule for vlv loss info		(O7) Aft L RCS He Press Isol B man CL capability
5	Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT L RCS He PRESS B		Aft L,R RCS Tk Isol 1/2 man CL capability Aft L,R RCS Xfeed Vlv 1/2 man CL capability
	• TK 1/2		
	• XFEED 1/2		
	• R RCS TK 1/2		
	• XFEED 1/2		
	(Continued)		(Continued)

CREW INDICATIONS	NOTES
(F7) SM ALERT Light/Tone − on CRT 3 blanks	(1) * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
(FSMs) S69 FC REAC S67 CNTL BUS V I/O ERROR CRT3	
SM 67 ELECTRIC CNTL CA1 < 20 V	
During Rad Dpy/Sto ops: (R13L) RAD CNTL PORT tb indicates single mtr ops RAD LAT CNTL STBD tb indicates single mtr ops	(2) Pri A man On Sel capability remains. Pri B and Sec Cntlrs remain
R ADP deploy time incr from 15 to 30 sec	(3) Wrong FDA limit set is selected by SM preconditioning software due to loss of H2O Loop 2 pump On switch scan
PLB FloodIts lost: Mid Stbd Aft Port Docking	(4) Loss of redundant port to the following: MDU CDR 1 (P) MDU MFD 1 (S) MDU MFD 2 (S) MDU AFD 1 (S) MDU PLT 2 (P)
(F7) If APUs active and using BLR CNTLR/HTR 3B: C/W APU TEMP lt − on after ~2 min	(5) Do not reconfig for reg switch or I'CNCT procedures
SM (BFS,SM) 63 PL BAY DOORS During PLBD OP/CL, single mtr run time noted on actuators listed at left	
3 SM 88 APU/ENVIRON THERM H2O LOOP 2 PUMP ΔP↑	

BUS LOSS: CNTLCA1

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(O8) • R OMS TK ISOL B		(O8) R OMS Tk Isol B man CL capability		(6) Vlv normally closed
GNC 23 RCS • Reprioritize L,R Manf 3 Jets to first priority: DES INH twice all other jets, highest priority first, then next highest, etc • Set aft pod(s) PRI JET FAIL LIMIT to 3		(A14) Aft RCS L,R Jet 3 Htrs		(7) Sys B Pri Cntlr, auto switchover to Sec Cntlr remain (8) Loss of manual capability to inert LO2 Manf
When reqd: • For FC3, perform FUEL CELL PURGE − AUTO (ORB OPS, EPS)	6	(R11U) FC3 Purge Vlv man Cntl		(9) Six vlvs fail to non−isolation position (10) Redundant mtr remains
Prior to using L OMS: (O8) L OMS He PRESS/VAP ISOL • A − GPC • B − OP		(O8) L OMS He Press Isol A man Cntl, He Vap Isol 1,2 man A Cntl		(11) Htr Cntlr 2 remains
For SSME Hyd Repress: (R4) • HYD MPS/TVC ISOL VLV SYS 1,2 − OP, wait 10 sec, then CL		(R4) MPS/TVC Hyd Sys 3 Isol man Cntl		(12) Vlv holds position. FC3 Redundant Reac Vlv Close Cntl on pnl C3 remains
If reqd during entry (< 120K ft): (L1) • NH3 CNTLR A(B) − PRI/GPC	7	(L1A2) NH3 Sys B Sec Cntlr man On capability		(13) FC3 can be stopped via FC3 CNTLR sw (O16:A)

BUS ISOLATION		
ONLY ON MCC CALL, PERFORM		
• MDU CRT 3 PWR − OFF		
(C2) • IDP/CRT3 PWR − OFF		
(R2) • MPS He I'CNECT R − GPC		(R2) R Eng He Intercon Vlv man Cntl
(R4) • MPS FILL/DRAIN LO2 OUTBD − GND	8	(R4) Prplt F/D Outbd LO2 Vlv man Cntl
(O16:A) • RGA 3 − OFF		(O16) RGA 3
	9	(O17) ATVC 1 Isol ME
(A7U) PL BAY • FLOOD AFT PORT − OFF • MID STBD − OFF • DOCKING − OFF • PORT RMS LIGHT − OFF		(A7A1) PLB Floodlts Aft Port Mid Stbd Docking Port RMS lt
	10 11	(C3A5) R ADP Dpy Mtr 1 Htr Cntlr 1
	12 13	(R1A2) FC3 Reac Vlv Cntl via pnl R1 sw FC3 STOP capability via START/STOP sw

(Continued)

EPS SSR−106 (Cont)
BUS LOSS: CNTLCA1

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
		(C3) FC2 Redundant Reac Vlv Close Cntl		(10) Redundant mtr remains
	14	(R1A2) Cryo O2,H2 Tk1 Htrs A man On and Tk3 Htrs B man On Cntl		(14) Auto Cntl of these Htrs also lost if single Htr Ops and tank not paired
		(R2) L MPS He Isol B man Cntl		(15) Pwr to MCA Drivers lost through ENABLE sw
	14	Cryo O2,H2 Tk5 Htr A man On Cntl Pallet Cryo Tk 6,9 Htr B man On Cntl		(16) Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists
	15	(R13A2) PLBD: C/L Lat 1−4, 5−8 Mtrs 2 Port Aft Blkhd Mtr 2		(17) Cntlrs A, B Rad Byp Vlv Mtrs Auto Cntl and Cntlr B Rad Byp Vlv Mtr Man Cntl remain
(A15) • PALLET HTR B − OFF • A − AUTO		(A15) Pallet Structure Htr B Stbd		(18) **WARNING** Driver pwr to F3 Jets lost if RJDF 2A Driver sw OFF (O16:F)
	16 16 16	(A8L) Port RMS: Fwd MRL Mtr 2 Mid MRL Mtr 2 Aft MRL Mtr 1		(19) Redundant coils remain
	17	(L1A2) Freon Loop 2 Cntlr A Rad Byp Vlv Mtr man Cntl		(20) R OMS auto shtdn if Pc < 80% and '↓' on MNVR EXEC display **CAUTION** No Purge. Wait 10 min between burns
		(A6A1) Aft ADI Att ref set capability		(21) Vlv holds position. GPC capability remains
	18	(O16) RJDF 2A F3 Manf Logic pwr (F3L,F3D,F3U,F3F)		(22) Lost Hyd deploy capability for all Ldg Grs. Pyro Backup Release Sys will deploy Ldg Grs. NLG can also be deployed by Hyd Sys 2
	19 20	(C3A1) R OMS Eng Pr Vlv Coil 1 and Cntl Vlv 1,2 Coils 1 R OMS Arm 1, Arm/Press 1 sw contacts		(23) Hyd Sys 2 still available for NWS
	21 22 23	(R4) Hyd Brake Isol 3 man Cntl (F6A5,F8A5) LG Extend Vlv 1 NWS Hyd Sys 1		
	10	(O6) −Z Star Trkr Dr Sys 2 OP/CL capability		
		(R13A2) Rad Cntl Sys: Stbd Rad Lat 7−12 Mtr 2 Port Rad Dpy/Sto Mtr 2		
	10	(R2) ET Door Mtrs: C/L Lat Actr 1 Mtr 1 man Sto capability C/L Lat Actr 2 Mtr 1 man Sto capability L Dr Closure Mtr 2 man Cntl L Dr Uplock Lat Mtr 1 man Cntl R Dr Uplock Lat Mtr 1 man Cntl		
		(Continued)		

EPS SSR−106 (Cont)
BUS LOSS: CNTLCA1

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	24	(R13A2) Ku Ant Sto/Dpy Mtr 1 Direct Sto Mtr 1		(24) Mtr 2 remains
	25	(R13A2) Redundant Sto Initiate Signal to Ku−Band		(25) Redundant stow initiate sig (CNTL BC1) to Ku−Band remains
		(O17) Freon Loop 2 Cold Plate Flow Xdcr		(26) Vlv fails closed. Redundant vlv remains
	26 27 27	(R2) APU 1 Fu Tk Vlv B Hyd Main Pump 3 Depress Solenoid RPC A Hyd Main Pump 2 Depress Solenoid RPC B		(27) Redundant RPC remains
		(O17) Aft PL MNC current Xdcr		(28) CDR Dpy/Jett remains
	28 28	(F3,F4) PLT Dpy Fire 2 Jett Fire 2		

EPS SSR−107
BUS LOSS: CNTLCA2

	ACTIONS		EQUIP/FUNCTION LOST
	(A12)		(A12)
1	• APU HTR GAS GEN/FUEL PUMP 3 − B AUTO		APU 3 GG/Fu Pmp Htrs A 2 Tk/Fu Ln Htrs B
	APU HTR TK/FU LINE/H2O/		
1	• SYS 2A − AUTO		APU 3 Tk/Fu Ln Htrs A
1	• 2B − OFF		
1	• 3A − OFF		APU 3 GG Inj H2O Htrs 3A,23A
1	• 3B − AUTO		(R2)
	• HYD CIRC PUMP PWR 3 − MNA		Circ Pump 3 MNC pwr
	(R1)		(R1A2)
	If TK1 in use:		Cryo O2,H2 Tk1 Htr A
	• O2,H2 TK1 HTR B (two) − AUTO		
	• O2,H2 TK1 HTR A (two) − OFF		
	If TK3 in use:		Cryo O2,H2 Tk3 Htr B
	• O2,H2 TK3 HTR A (two) − AUTO		
	• O2,H2 TK3 HTR B (two) − OFF		
	(A15)		(A15)
	If OV105 and Tk5 in use:		Cryo O2,H2 Tk5 Htr A (OV105 only)
	• O2,H2 TK5 HTR B (two) − AUTO		
	• O2,H2 TK5 HTR A (two) − OFF		
			Pallet Cryo Tk 6−9 Htr B
	(A15)		Pallet Structure Htr B Port
	• PALLET HTRS B − OFF		
	• A − AUTO		
	(R2)		(R2)
	• BLR CNTLR/HTR 3 − A		Hyd H2O Blr 3 Cntlr B
	(L1)		(L1A2)
	• FLASH EVAP CNTLR PRI A − OFF	5	FES Cntlr Pri A man ON Sel capability
	• FLASH EVAP CNTLR PRI B − ON (if reqd)		
	• TOP EVAP HTR DUCT − A(B)		Topping Evap Duct Fwd,Aft Htrs C
	If HI LOAD EVAP enabled:		
	• HI LOAD DUCT HTR − A(B)		Hi Load Duct Inbd,Outbd, Noz Htrs C
	(C2)		(R12A2)
	On MCC GO:	6	IDP 4
	• GPC/CRT 04 EXEC		MDU CRT 4
			(C3)
			FC2 Redundant Reac Vlv Close Cntl
	(Continued)		(Continued)

	CREW INDICATIONS	NOTES
	MASTER ALARM Light/Tone − on	(1) * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
	(F7)	
	SM ALERT Light/Tone − on	
2	C/W FREON LOOP lt − on	
3	C/W RCS JET lt − on	
	CRT 4 blanks	
	(FSMs)	
	S67 CNTL BUS V	
	S67 DISPLAY SW A (2)	
2	S88 EVAP OUT T 1,2	
3	F RCS D(L,U,F) JET	
4	I/O ERROR CRT4	
	SM 67 ELECTRIC	
	CNTL CA2 < 20 V	
	During Rad Dpy/Sto ops: (R13L) RAD CNTL PORT tbs (two) indicate single motor ops	
	R ADP deploy time incr from 15 to 30 sec	
	STAR TRKR DR POS −Z CL time incr from 8 to 16 sec	
	(F7)	
	If APUs active and using BLR CNTLR/HTR 3B:	
	C/W APU TEMP lt − on after ~2 min	
	During PLBD OP/CL, single mtr run time noted on actuators listed at left	

(2) If FES Cntlr Pri A in ON position and cooling by FES only

(3) Indications do not appear until jets commanded

(4) If GPC commands CRT

(5) Pri A GPC Sel capability remains. Pri B and Sec Cntlrs remain

(6) Loss of redundant port to the following:
MDU AFD 1 (P)

EPS SSR−107 (Cont)
BUS LOSS: CNTLCA2

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	Refer to OMS/RCS Slide Rule for vlv loss info		(O7) AFT L RCS: Tk Isol 1/2 man CL capability He Press Isol B man Cntl, GPC CL capability Xfeed vlv 1/2 man CL capability AFT R RCS: Tk Isol 1/2 man CL capability Xfeed Vlv 1/2 man CL capability (O8) R OMS Tk Isol B man CL capability FWD RCS: Tk Isol 1/2 man CL and man Ovrd of GPC CL capability		(7) Do not reconfig for reg switch or I'CNCT procedures (8) Vlv normally closed (9) Manf status not automatically declared closed. Jet fail−offs may occur (10) RM sw downmodes to 2−level for −X position
7	Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT L,R RCS TK 1/2 • XFEED 1/2				
	When reqd: • Perform FC3 purges in AUTO mode (ORB OPS)	8	(R11U) FC3 Purge Vlv man Cntl		
	(A6U) • ADI ATT − LVLH • ERR − MED • RATE − MED		(A6A1) Aft ADI capability: Att Sel Error Scale Sel Rate Scale Sel Att ref set		
	(A14) RCS/OMS HTR • R POD (two) − A AUTO, B OFF		(A14) R Pod B Htrs (partial)		
	GNC 23 RCS		(O16) RCS Manf F3 RJD pwr (F3L,F3D,F3U,F3F)		
9	Override F3 Manf status to CL: • RCS FWD − ITEM 1 EXEC • OVRD MANF VLVS STAT 3 − ITEM 42 EXEC				
	(A6U) If SENSE −Z: • SENSE − −X • Wait at least 1 sec, then reposition as desired	10	(A6A1) 3−level sw RM for −X Sense		
	GNC 23 RCS • Reprioritize L,R Manf 4 Jets to first priority: DES INH twice all other jets, highest priority first, then next highest priority, etc • Set aft pod(s) PRI JET FAIL LIMIT to 6		(A14) Aft RCS L,R Jet 4 Htr		
	(Continued)		(Continued)		

EPS SSR−107 (Cont)
BUS LOSS: CNTLCA2

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
During OPS 8: GNC 43 CONTROLLERS Deselect R Pnl Trim R1: • DES PNL TRIM R1 − ITEM 38 EXEC Deselect R BDY FLP UP/DN R1: • DES BDY FLP R1 − ITEM 21 EXEC	11 11 11	(F8A7) R Trim RHC − INH capability PNL − ON capability (C3A1) R Bdy Flp − UP/DN capability		(11) L Trim and Body Flap cntls remain. Right Trim and Body Flap cntl function is regained after lost contacts have been deselected in OPS−8 (3,B) (12) Sys A Pri Cntlr, auto switchover to Sec Cntlr remain (13) Redundant mtrs remain (14) Vlv holds position. FC3 Redundant Reac Vlv Close Cntl on pnl C3 remains (15) FC3 can be stopped via FC3 CNTLR sw (pnl O16:A) (16) Htr Cntlr 2 remains (17) Use pbs at pnl C3 (18) Redundant coils remain (19) R OMS auto shtdn if Pc < 80% and '↓' on MNVR EXEC display **CAUTION** No Purge. Wait 10 min between burns
For SSME Hyd Repress: (R4) • HYD MPS/TVC ISOL VLV SYS 1,2 − OP, wait 10 sec, then CL		(R4) MPS/TVC Hyd Sys 3 Isol man Cntl		
If reqd during entry (< 120K ft): (L1) • NH3 CNTLR A(B) − PRI/GPC	12	(L1A2) NH3 Sys A Sec Cntlr man On capability		
BUS ISOLATION				
ONLY ON MCC CALL, PERFORM				
(F3) • TRIM RHC − ENA • PNL − OFF	13	(O6) −Z Star Trkr Dr Sys 2 CL capability		
(R11L) • IDP/CRT4 PWR − OFF	14	(R1A2) FC3 Reac Vlv Cntl via pnl R1 sw		
• MDU CRT 4 PWR − OFF	15	FC3 STOP capability via START/STOP sw		
	13 16	(C3A5) R ADP Dpy Mtr 1 Htr Cntlr 1		
	17 17 17 17 17	(A6A1) Aft Panel Trans X,Y, Norm, Pulse, Rot Roll, Pitch, Yaw Disc Rate, and Pulse Sel capability Aft Pnl Trans Z High,Norm Pulse Sel capability Aft Pnl Trans Low Z Sel capability Aft Pnl PRI,ALT,VERN Sel capability Aft Pnl PCT Exec capability		
	18 19	(C3A1) R OMS Eng Pr Vlv Coil 2 and Cntl Vlv 1,2 Coil 2 R OMS Arm 2, Arm/Press 2 sw contacts		
		(F6A5,F8A5) NLG Ext Sys 1 NLG,LMG,RMG Bkup Rel Sys 1		
		(R2) R MPS He Isol A man Cntl		
		(R13A2) Rad Cntl Sys: Port RAD Lat 7−12 Mtr 2 Dpy/Sto Mtr 2		
		(Continued)		

EPS SSR−107 (Cont)
BUS LOSS: CNTLCA2

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	20	(A8L) Port RMS MPM Mtr 1		(13) Redundant mtrs remain (20) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison (21) Mtr 2 remains (22) Vlv closed. Redundant vlv remains (23) Redundant pwr sply remains. Turbine speed ind lost (24) Redundant RPC remains (25) Pwr to MCA Drivers lost through ENABLE sw (26) CDR Dpy/Jett remains
	13	(R2) ET Door Mtrs: C/L Lat Actr 1 Mtr 2 man Stow capability C/L Lat Actr 2 Mtr 2 man Stow capability L Dr Uplock Lat Mtr 1 man R Dr Closure Mtr 1 man Cntl R Dr Uplock Lat Mtr 1 man Cntl		
	21	(R13A2) Ku Ant Sto/Dpy Mtr 1 Direct Sto Mtr 1		
	22 23 24 24	(R2) APU 2 Fu Tk Vlv A Cntlr Pwr Sply B Hyd Main Pump 3 Depress Solenoid RPC A Hyd Main Pump 2 Depress Solenoid RPC B		
	25	(R13A2) PLBD: C/L Lat 9−12 Mtr 2 13−16 Mtr 1 Stbd Aft Blkhd Mtr 1 Port Door Mtr 1		
	26 26	(F3,F4) PLT Dpy Fire 1 Jett Fire 1		

EPS SSR−108
BUS LOSS: CNTLCA3 (Includes MNC FMC3, MNC MMC2, MNC MMC4, MNC AMC3)

	ACTIONS	EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
	(A12) APU HTR	(A12)		MASTER ALARM Light/Tone − on	(1) * TIME CRITICAL *
1	• GAS GEN/FUEL PUMP 3 − A AUTO	APU 3 GG/Fu Pump Htrs B		(F7) SM ALERT Light/Tone − on	If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
	• LUBE OIL LINE 3 − A AUTO	APU 3 Lube Oil Ln Htr B		(FSM) S67 CNTL BUS V RM DLMA MANF	(2) Vlv holds position
	APU HTR TK/FU LINE/H2O/			SM 67 ELECTRIC	(3) Vlv ops not affected
1	• SYS 2A − AUTO	APU 2 Tk/Fu Ln Htr B		CNTL CA3 Volts < 20	(4) Refer to EPS 7.6 CRYO TABLE A for switch nomenclature
1	• 2B − OFF		2	(O8) FWD RCS TK ISOL 1/2 tb − bp	(5) If AC3 cbs not opened, Lat Mtrs 2 of actuators for Port,Stbd Rad Lat 7−12 would continue to run until Sys B Lat Cntl sw placed to OFF. Other equip pwrd by AC3 MMC2 and AC3 MMC4 is lost because of MNC MMC2 and MNC MMC4 loss
1	• 3A − OFF	APU 3 Tk/Fu Ln Htr A	2	FWD RCS MANF ISOL 3,4 tb − bp	
1	• 3B − AUTO				(6) Manf 4 status automatically declared closed
	HYD CIRC		3	(L1) RAD BYP VLV 1 tb − bp	
	• PUMP PWR 3 − MNC	Hyd Circ Pump 3 MNA pwr	3	FLOW PROP VLV LOOP 2 tb − bp	
	(R1)	(R1A2)			
	If Tk2 in use:	Cryo O2,H2 Tk2 Htrs B	5	(R13L) RAD CNTL (two) tb − bp	
4	O2, H2 TK2				
	• HTR A (two) − AUTO			R ADP deploy time incr from 15 to 30 sec	
	• HTR B (two) − OFF				
	(A11)			STAR TRKR DR POS −Z OP/CL time incr from 8 to 16 sec	
	If TK4 in use:	(A11)			
4	O2, H2 TK4	Cryo O2,H2 TK4 Htrs B		(F7) If APUs active, using BLR CNTLR/HTR 2A or 3A: C/W APU TEMP lt − on after ~2 min	
	• HTR A (two) − AUTO				
	• HTR B (two) − OFF				
	(R2)	(R2)			
	• BLR CNTLR/HTR 2 − B	Hyd H2O Blr 2 Cntlr A			
	• 3 − B	3 Cntlr A			
	Refer to OMS/RCS Slide Rule for vlv loss info				
		(O16)			
		6 RCS Manf F4 RJD pwr (F4R,F4D)			
	(MA73C:C,D)	(MA73C)			
5	• cb MCA PWR AC3 MID 2,4 (two) − op	5 Stbd,Port Rad Lat 7−12 Mtr 2 Limit sw			
	(Continued)	(Continued)			

EPS SSR−108 (Cont)
BUS LOSS: CNTLCA3

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
For PLBD ops: • OP/CL Drs in man mode	(MA73C) Port,Stbd Rad Dpy/Sto Mtrs 2 PLBD: C/L Lat 1−4,5−8,9−12 Mtrs 2 13−16 Mtr 1 Port Aft Blkhd Mtr 2 Stbd Aft Blkhd Mtr 1 Port Door Mtr 1 Stbd Door Mtr 2 CL Limit sw	SM (BFS,SM) 63 PL BAY DOORS If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG' During MAN PLBD OP/CL, single mtr run time noted on actuators listed at left	(7) Mtr 2 remains (8) Htr Cntlr 2 remains (9) Redundant mtrs remain (10) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison (11) Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists
(L1) • TOP EVAP HTR DUCT − A(B) If HI LOAD EVAP enabled: • HI LOAD DUCT HTR − A(B)	(L1A2) Topping Evap Duct Fwd,Aft Htrs C Hi Load Duct Outbd,Inbd Noz Htrs C	(A8L) PORT RMS: DPY/STO tb − bp RETEN LAT tb − bp R−F−L AFT tb − bp	
BUS ISOLATION		SM 94 PDRS CONTROL Indications lost: MPM Mtr 1 STO/DPY Fwd MRL Mtr 2 LAT/REL/RDY Aft MRL Mtr 1 LAT/REL/RDY	
ONLY ON MCC CALL, PERFORM	(A14) Aft RCS L,R Jet 5 Htrs		
	(R2) C MPS He Isol B man Cntl		
	(MA73C) −Z Star Trkr Dr Sys 2 OP/CL capability 7 R ADP Deploy Mtr 1 8 Deploy Dsc 1 Htr Cntlr 1		
	(MA73C) LH Vents 1,2,3 Mtrs 1 Vent 6 Mtr 2 RH Vents 8,9 Mtrs 1 Vent 3 Mtr 2 Vent 5 Mtr 2		
	(MA73C) 9 ET Door Mtrs: C/L Lat Actr 2 Mtr 2 GPC Cntl L Dr Closure Mtr 2 GPC CL capability R Dr Closure Mtr 1 GPC CL capability R Dr Uplock Lat Mtr 1 GPC Lat capability		
	(MA73C) AC pwr removal capability via Limit sw for ET Dr Mtrs: C/L Lat Actr 2 Mtr 2 L Dr Closure Mtr 2 R Dr Closure Mtr 1 Uplock Lat Mtr 1		
	(MA73C) Port RMS: 10 MPM Mtr 1 11 Fwd MRL Mtr 2 11 Aft MRL Mtr 1		
	(Continued)		

EPS SSR−108 (Cont)
BUS LOSS: CNTLCA3

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	12	(MA73C) Ku Ant Sto/Dpy Mtr 1 Limit sw and Stow capability		(12) With an inop limit sw, mtr will continue to run until primary sw returned to GND
	13	(MA73C) Redundant Ku−Bd Xmit Enable Signal		(13) MNB MMC4 pwr for Ku−Bd Xmit Enable Signal remains
	14	Redundant Boom Stow Enable II Excitation Signal		(14) MNB MMC4 pwr remains to supply pwr to Boom stow enable II signal for stow mtrs
	15	(R2) APU 3 FU Tk Vlv A		(15) Vlv closed. Redundant vlv remains
	16	Cntlr pwr Sply A GBX GN2 Repress Vlv		(16) Redundant pwr sply remains

EPS SSR−109
CONTROL BUS − PANEL WIRING MATRIX

CNTL BUS / PANEL	AB1	AB2	AB3	BC1	BC2	BC3	CA1	CA2	CA3
O6	X	X	X	X	X	X	X	X	X
O14	X	X					X	X	X
L2A1	X	X		X	X		X		
L1A2	X	X	X	X	X	X	X	X	X
L1A1						X			
F6	X	X	X	X	X	X	X	X	X
C3A7	X			X			X		
C3A1	X	X	X	X	X	X	X	X	X
C3A5	X	X	X	X	X		X	X	X
C3A6			X			X			X
C2A2	X			X	X		X		
F8	X	X	X	X	X	X	X	X	X
O7	X	X	X	X	X		X	X	X
O15	X	X		X	X	X	X		X
R1A2	X	X		X	X	X	X	X	X
R2	X	X	X	X	X	X	X	X	X
R4	X	X	X	X	X	X	X	X	X
O16				X	X	X	X	X	X
O8	X	X		X	X		X	X	
O17	X	X	X	X	X	X	X	X	X
R12A1	X	X		X	X		X	X	
R12A2								X	
R13A2	X	X	X	X	X		X	X	X
A1A2	X		X	X	X		X		
A1A3	X	X		X	X		X	X	
A11A1				X	X	X			X
A12	X	X	X	X	X	X	X	X	X
A6A1	X	X		X	X		X	X	
A7A1	X			X			X		
A8A2	X	X		X			X	X	X
A13	X			X			X	X	
A14	X	X	X	X	X	X	X	X	X
MA73C	X	X	X	X	X	X	X	X	X

NOTE
This table shows control bus and “daisy−chained” panels that make up that particular control bus

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EPS SSR−110
BUS LOSS: AC1

(Includes all AC1 sub−buses)

	ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1	• Perform FC1 SHUTDN FC SHUTDN (Cue Card)	FC1 Pumps and pH Snsr	MASTER ALARM Light/Tone − on	(1) * TIME CRITICAL * FC1 must be shutdn within 9 min to avoid potentially hazardous condition
	(R2) • BLR CNTLR/HTR 1 − A • 3 − B	Hyd H2O Blr 1 Cntlr B 3 Cntlr A	(F7) EVENT TIME ind blank C/W FC PUMP lt − on C/W AC VOLT lt − on C/W FREON LOOP lt − on C/W AV BAY/CAB AIR lt − on C/W H2O LOOP lt − on SM ALERT Light/Tone − on	
	(L1) • HUM SEP A − OFF • ✓B − ON • IMU FAN A − OFF • B(C) − ON • H2O PUMP LOOP 1 (two) − ON, B • H2O LOOP 1 BYP MODE − AUTO • H2O PUMP LOOP 2 − OFF • AV BAY 1 FAN A − OFF • ✓B − ON • AV BAY 2 FAN (two) − ON • AV BAY 3 FAN A − ON • B − OFF • FREON PUMP LOOP 1 − B • FREON PUMP LOOP 2 − A	Humidity Sep A IMU Fan A 2 H2O Loop 2 Byp Cntlr, Sig Condr 3 H2O Loop 2 Byp Vlv pwr 2 Pump GPC Cntl 1 Pump A Av Bay 1 Fan A 4 Av Bay 2 Sig Condr, Xdcrs (ECLS SC3) Av Bay 3 Fan B Freon Loop 1 Pump A 2 Pump B	(F9) AC1 ΦA,ΦB,ΦC AC volts < 90	(2) H2O Loop 2 Pump Out Press, Pump ΔP, Accum Qty, Pump Out Temp snsrs lost (3) H2O Loop 2 Byp vlv holds position (4) Av Bay 2 Fan ΔP, Air Out Temp snsrs lost (5) Crew and gnd have lost PPCO2 Xdcr (6) Use streamers (if flown) or monitor by feel during wake period (7) CO2 partial Press and Cabin Fan ΔP snsrs lost (8) Inhibits Primary C/W for AC1 Voltage, CAB Fan ΔP, H2O Loop 2 Pump P, FC1 stack Temp, FC1 Cool Pump ΔP (9) Inhibits H2O Loop 2 Pump ΔP, Pump Out Press, Pump Out Temp, Accum Qty, respectively
	(LIGHTS LOST) Instr lts R (pnls C2,F8,F9) Pnl lts L/Ctr (pnls L1,L2,L4, C2,C3,F2,F6,F7) Pnl lts L/OH (pnls O5,O6, O7,O13,O14,O15) Numeric lts (pnls O3,F7) Orbit Sta Instr lts (pnls A1, A2)			
	(FSMs) S67 AC VOLTS 1 S86 HYD RSVR Q S86 WSB T SM2 HYD QTY (B) SM0 THRM HYD (B) S66 AV BAY 3 FAN S66 AV BAY 2 FAN S69 FC PUMP 1 S69 FC H2 PUMP 1 S88 FREON FLOW 2 S88 FRN AFT CP 2 S88 FRN PL HX 2 S88 H2O PUMP P 2 S88 H2O LOOP 2 QTY S88 H2O LOOP 2 TEMP		
	(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN A − OFF • B − ON	Arlk/Tnl Fan A	(R1) FC1 COOL PUMP ΔP tb − bp	
5	• Maintain LiOH canister(s) changeout per cue card and FLIGHT PLAN During sleep periods: (L1)		HYD/APU HYD QTY 1 ind − 0% APU H2O QTY 3 ind − 0%	
6	• CAB FAN (two) − ON	7 Cabin Air S/C (ECLS SC6)	(O1) AIR TEMP AV BAY 2 ind − 45 degF H2O PUMP OUT PRESS LOOP 2 ind − 0 psia FREON FLOW LOOP 1 ind − 578 pph	
	(R13U) • C/W PARAM SEL tw (three) − 033,115,074, 092, 062		(O3) RCS/OMS PRPLT QTY Gage and MSN TIME ind blank	
8	• C/W PARAM − INH • MEM − CLEAR • C/W PARAM SEL tw (three) − > 119		(L1) If H2O LOOP 1 PUMP A active: 'S88 H2O PUMP P 1' 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP'	
9	SM 60 SM TABLE MAINT • Inhibits 0612705, 0612700, 0612740, 0612710		(O1) H2O PUMP OUT PRESS LOOP 1 ind − 20−25 psia	
	(WCS) • ✓MODE − AUTO • ✓CRADLE − AUTO • ✓Hose stowed in cradle • ✓WCS ON lt − OFF • FAN SEP SEL sw − OFF • HOSE BLOCK − SEP 2 • In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30−sec run complete • FAN SEP SEL sw − 2	WCS Fan/Sep 1	If HUM SEP A ON: 'S66 HUMID SEP A'	
	(EDO WCS) • URINAL SEL − SEP 2 • URINE DIVERTER VLV − FAN SEP 2	Urine Sep 1 Fan 1 Commode Fan 1		
	(Continued)	(Continued)	(Continued)	

BUS LOSS: AC1

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
If CAB TEMP CNTLR 2 active: (L1) • CAB TEMP CNTLR − OFF	10	Cabin Temp Cntlr 2, Hx Byp Vlv Mtr 2	(MO51F) CO2 RMVL SYS CNTLR 1 FAIL lt on Impending: 'S66 CO2 RL SYS PCO2'	(10) Lose Auto Temp Cntl via Cntlr 2 and H2O Loop 2 Cabin Hx In Temp Snsr. Hx Byp Vlv holds position
(MD44F) • Remove pin from SEC ACTUATOR and BYP vlv linkage, connect linkage to PRI ACTUATOR			If IMU FAN A ON: 'S66 IMU FN SPD A' 'S66 IMU FAN DP'	(11) PEVs, Actuators, Bed A P, Bed B P, Bed dP will be recovered after system reconfig
(L1) • CAB TEMP CNTLR − 1			If APUs active and using H2O BLR CNTLR/HTR 1B or 3A, then C/W APU TEMP lt on after ~2 min	(12) Redundant mtr remains
(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 1 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/ DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)	11	CO2 Rmvl Sys: Cntlr 1 Fan AC1 pwr Compressor AC1 pwr	STAR TRKR DR POS −Y OP/CL time incr from 8 to 16 sec	(13) Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists
			L ADP deploy time incr from 15 to 30 sec	
Refer to OMS/RCS Slide Rule for vlv loss info (use FPC1 Slide for Aft RCS and FMC1 Slide for Fwd RCS)			If Freon Loop 2 Pump B on: 'S88 FREON FLOW 2' 'S88 FRN AFT CP 2' 'S88 FRN PL HX 2'	
			(O1) FREON FLOW LOOP 2 ind − 578 pph	
BUS ISOLATION			SM (BFS SM 63) PL BAY DOORS	
ONLY ON MCC CALL, PERFORM			During PLBD OP/CL, single mtr run time noted on actuators listed at left	
(MA73C:C) cb MCA PWR • AC1 3Φ FWD 1 − op • MID 1 − op	 12 12	AC1 FMC1 Bus pwr RH Vent 1,2 Mtr 1 −Y Star Trkr Dr Sys 1 OP/CL capability L ADP Dpy Mtr 1 AC1 MMC1 Bus pwr RH Vents 3,5,6 Mtrs 1 PL Reten Sys A Rel/Lat Mtrs Port Rad Lat 1−6, 7−12 Mtrs 1 Port Rad Dpy/Sto Mtr 1 PLBD: C/L Lat 9−12 Mtr 1 Port,Stbd Fwd Blkhd Mtrs 1 Stbd Door Mtr 1	During Rad Dpy/Sto ops: (R13L) RAD CNTL tbs (four) indicate single mtr ops	
(MA73C:D) cb MCA PWR • AC1 3Φ MID 3 − op • AFT 1 − op		PLBD: C/L Lat 1−4, 5−8 Mtrs 1 Port, Aft Blkhd Mtr 1 AC1 MMC3 Bus pwr AMC1 Bus pwr LH Vent 8,9 Mtr 1		
(MA73C:E) • cb AC1 WCS FAN SEP 1 (three) − op				
(MA73C:F) cb AC1 • RMS PRI ΦA − op • MAR 3Φ − op • OPS INST HYD ACTR ΦC − op	 13 13	Port RMS: Mid MRL Mtr 1 Aft MRL Mtr 2 D&C Primary ltg Shldr Brace release AC1 Middeck Utility Pnl (MUP) Ops Hyd Actr Instr		
(MA73C:G) IF DOCKING MISSION • cb AC1 ARLK/TNL FAN A (three) − op		Arlk/Tnl Fan A		
(Continued)		(Continued)		

EPS SSR−110 (Cont)
BUS LOSS: AC1

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM				(14) Bypass vlvs hold position and Cntlr A Rad Byp Vlv Mtrs remain
(MA73C:H,I) • cb AC1 FWD RCS VLV (three) − op • cb AC1 AFT POD VLV GP 1 (three) − op				
(L4:A−E) • cb UTIL PWR F1/MO52J • AC1 − op		AC1 Util pwr (F1/MO52J)		
cb AC1 • FC1 PUMPS (three) − op • CTR ENG (three) − op • R ENG (three) − op				
(L4:F−J) cb AC1 • √H2O LOOP PUMP 1A/2 (three) − op • AV BAY 1 FAN A (three) − op • AV BAY 3 FAN B (three) − op • IMU FAN A (three) − op • HUM SEP A (three) − op				
(L4:K) cb AC1 • ΦA H2O CNTLR 2 − op • ΦB CAB AIR S/C − op				
(L4:L) cb AC1 • ΦA CAB T CNTLR 2 − op • ΦB AV BAY 2 S/C − op				
(L4:M,N) cb AC1 ΦA,ΦB,ΦC • FREON LOOP 1 PUMP A (three) − op • FREON LOOP 2 PUMP B (three) − op				
(L4:O) cb AC1 • ΦA BLR HYD BYP 1B − op • ΦB HYD QTY 1 − op • ΦC BLR HYD BYP 3A − op		Hyd Rsvr 1 Qty Snsr		
(L4:P) cb AC1 • ΦA RAD CNTLR 1B − op • ΦB RAD CNTLR 2B − op • ΦC TACAN 1 − op	14	Freon Loop 1 Cntlr B Rad Byp Vlv Mtr Freon Loop 2 Cntlr B Rad Byp Vlv Mtr Tacan 1		
(L4:Q) cb AC1 • ΦA LTG PNL L/CTR − op • ΦB LTG PNL L OVHD − op • ΦC LTG INST OS − op		Pnl lts L/Ctr Pnl lts L/OH (pnls O5,O6,O7, O13,O14,O15) Orbit Sta Instr lts		
(Continued)		(Continued)		

EPS SSR−110 (Cont)
BUS LOSS: AC1

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM				(12) Redundant mtr remains (15) ✓MCC for total OMS Qtys. Aft Qtys are found on GNC SYS SUMM 2
(L4:R) cb AC1 • ΦA LG INST R − op • ΦB NUMERIC FWD − op	15	Inst lts R Numeric lts (pnls O3,F7) (RCS/OMS Prplt Qty, Gauge, Mission and Event Timers)		
		LH Vents 5,6 Mtrs 1 Stbd Rad 1 Lat 1−6,7−12 Mtrs 1 Stbd Rad Dpy/Sto Mtr 1		
	12	ET Door Mtrs: C/L Lat Actr 1,2 Mtr 1 L Dr Closure Mtr 1 Uplock Lat Mtr 1		

EPS SSR−111
BUS LOSS: AC1 ΦA

	ACTIONS		EQUIP/FUNCTION LOST
	(L1) • ✓HUM SEP A − OFF • ✓B − ON • ✓IMU FAN A − OFF • ✓B(C) − ON • H2O PUMP LOOP 1 (two) − ON, B • H2O LOOP 1 BYP MODE − AUTO • H2O PUMP LOOP 2 − OFF • ✓FREON PUMP LOOP 1 − B • ✓FREON PUMP LOOP 2 − A • ✓AV BAY 1 FAN A − OFF • ✓B − ON • 3 FAN A − ON • B − OFF		1Φ of Hum Sep A 1Φ of IMU Fan A 1 H2O Loop 2 Byp Cntlr, Sig Condr, Byp Vlv pwr 1Φ of H2O Loop 2 Pump GPC Cntlr pwr 1Φ of H2O Loop 1 Pump A Freon Loop 1 Pump A 2 Pump B 1Φ of AV Bay 1 Fan A 1Φ of AV Bay 3 Fan B
	(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN A − OFF • B − ON		1Φ of Arlk/Tnl Fan A
	(R2) • BLR CNTLR/HTR 1 − A		Hyd H2O Blr 1 Cntlr B
2	SM 60 SM TABLE MAINT • Inhibit 0612705, 0612700, 0612740, 0612710 • Reset upper limit of 0450114 (FC1 H2 PUMP STATUS) to current value +0.3 volts		1Φ of FC1 H2 Pump 1Φ of FC1 Coolant Pump
	If CAB TEMP CNTLR 2 active: (L1) • CAB TEMP CNTLR − OFF	4	Cabin Temp Cntlr 2, Hx Byp Vlv Mtr 2
	(MD44F) • Remove pin from SEC ACTUATOR and BYP vlv linkage, connect linkage to PRI ACTUATOR		
	(L1) • CAB TEMP CNTLR − 1		
5	(R13U) • C/W PARAM SEL tw (three) − 033,115 • C/W PARAM − INH • MEM − CLEAR • C/W PARAM SEL tw (three) − > 119		
	(WCS) • ✓MODE − AUTO • ✓CRADLE − AUTO • ✓Hose stowed in cradle • ✓WCS ON lt − OFF • FAN SEP SEL sw − OFF • HOSE BLOCK − SEP 2 • In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30−sec run complete. • FAN SEP SEL sw − 2	6	1Φ of WCS Fan/Sep 1
	(EDO WCS) • URINAL SEL − SEP 2 • URINE DIVERTER VLV − FAN SEP 2	6	Urine Sep 1 Fan 1 1Φ of Commode Fan 1
	(Continued)		(Continued)

CREW INDICATIONS	NOTES
MASTER ALARM Light/Tone − on	(1) H2O Loop 2 Byp Vlv holds position and H2O Loop 2 Pump Out Press, Pump ΔP Accum Qty, Pump Out Temp snsrs lost
(F7) C/W AC VOLT lt − on C/W H2O LOOP lt − on SM ALERT Light/Tone − on	(2) Inhibits H2O Loop 2 Pump ΔP, Pump Out Press, Pump Out Temp, and Accum Qty, respectively
(F9) AC1 ΦA AC volts < 90	(3) If H2O Loop 1 Pump A active, Loop 1 Pump Out Press must drop below 45 psia to trigger C/W
(LIGHTS LOST) Instr lts R (pnls C2,F8,F9) Pnl lts L/Ctr (pnls L1,L2,L4, C2,C3,F2,F6,F7)	(4) Lose Auto Temp Cntl via Cntlr 2 and H2O Loop 2 Cabin Hx In Temp snsr. Hx Byp vlv holds position
(FSMs) S67 AC VOLTS 1 S69 FC H2 PUMP 1 S86 WSB T SM0 THRM HYD (B) S88 H2O PUMP P 2 S88 H2O LOOP 2 QTY S88 H2O LOOP 2 TEMP	(5) Inhibits Primary C/W for AC1 voltage and H2O Loop 2 Pump P
(O1) H2O PUMP OUT PRESS LOOP 2 ind − 0 psia	(6) For EDO WCS, Urine Fans and Seps are DC motors. AC converted to DC internal to controller. Design is such that loss of one AC phase results in loss of Urine Fan or Sep. Commode Fans may work with 1Φ down; however, crew actions will pwr fans through alternate pwr source, with full 3Φ pwr. For WCS, 2Φ ops will result in degraded airflow. Urine Fan, Seps are unusable for urine collection or EMU drain
If H2O PUMP LOOP 1, A active: 3 'S88 H2O PUMP P 1'	
3 (O1) H2O PUMP OUT PRESS LOOP 1 ind − 40−45 psia	
If IMU FAN A ON: 'S66 IMU FN SPD A' 'S66 IMU FAN DP'	
If HUM SEP A ON: 'S66 HUMID SEP A'	
If APUs active, and using BLR CNTLR/HTR 1B: C/W APU TEMP lt − on after ~2 min	

EPS SSR−111 (Cont)
BUS LOSS: AC1 ΦA

	ACTIONS		EQUIP/FUNCTION LOST
		7	1Φ of AC Utility Power Outlets at F1 and MO52J
8	If bus shorted: • Open all AC1 ΦA cbs that pwr 3Φ loads on pnls L4: C−J,M,N (9 cbs), MA73C: E,G,H,I (4 cbs) • Open all AC1 3Φ ganged cbs on pnls L4: B (1 cb), MA73C: C,D,F (5cbs)	8	AC1 FMC1 Bus pwr MMC1 Bus pwr MMC3 Bus pwr AMC1 Bus pwr
	(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 1 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)	9	CO2 Rmvl Sys Cntlr 1 1Φ of CO2 Rmvl Sys: Fan AC1 pwr Compressor AC1 pwr
10	If bus not shorted: • Perform the following BUS ISOLATION steps		

10	BUS ISOLATION		
	IF BUS NOT SHORTED, PERFORM		
	(L4:K) • cb AC1 ΦA H2O CNTLR 2 − op		
	(L4:L) • cb AC1 ΦA CAB T CNTLR 2 − op		
	(L4:O) • cb AC1 ΦA BLR HYD BYP 1B − op		
	(L4:P) • cb AC1 ΦA RAD CNTLR 1B − op	11	Freon Loop 1 Cntlr B Rad Byp Vlv Mtr
	(L4:Q) • cb AC1 ΦA LTG PNL L/CTR − op		Pnl lts L/Ctr (pnls L1,L2,L4, C2,C3,F2,F6,F7)
	(L4:R) • cb AC1 ΦA INST R − op		Instr lts R (pnls C2,F8,F9)
	(MA73C:F) • cb AC1 RMS PRI ΦA − op		Port RMS Shldr Brace Release D&C Primary ltg 1Φ of Mid MRL Mtr 1 Aft MRL Mtr 2
			FC1 pH Snsr

CREW INDICATIONS	NOTES
(MO51F) CO2 RMVL SYS CNTLR 1 FAIL lt − on Impending: 'S66 CO2 RL SYS PCO2' 'S66 CAB PPCO2'	(7) MCC will provide equipment reconfig info if required (8) Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into shorts. After opening cbs, refer to the following SSRs for functions lost and crew indications caused by unpowering sub−buses: SSR−114, SSR−115, SSR−116, SSR−117 (9) PEVs, Actuators, Bed A P, Bed B P, Bed dP will be recovered after system reconfig (10) For unshorted bus, perform single Φ isolation steps to prevent powering single phase loads with coupled energy from remaining two phases (11) Bypass vlv holds position and Cntlr A Rad Byp Vlv Mtr remains

EPS SSR−112
BUS LOSS: AC1 ΦB

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(L1) • ✓HUM SEP A − OFF • ✓B − ON • ✓IMU FAN A − OFF • ✓B(C) − ON • H2O PUMP LOOP 2 − ON • H2O PUMP LOOP 1 (two) − GPC, B • AV BAY 2 FAN (two) − ON • FREON PUMP LOOP 1 − B • FREON PUMP LOOP 2 − A • ✓AV BAY 1 FAN A − OFF • ✓B − ON • 3 FAN A − ON • B − OFF		1Φ of Hum Sep A 1Φ of IMU Fan A 1Φ of H2O Loop 2 Pump GPC Cntlr pwr 1 1Φ of H2O Loop 1 Pump A 2 Av Bay 2 Sig Condr, Xdcrs (ECLS SC3) 1Φ Freon Loop 1 Pump A 2 Pump B 1Φ of AV Bay 1 Fan A 1Φ of AV Bay 3 Fan B	MASTER ALARM Light/Tone − on (F7) C/W AC VOLT lt − on C/W AV BAY/CAB AIR lt − on SM ALERT Light/Tone − on (F7) EVENT TIME ind blank (F9) AC1 ΦB volts < 90 (LIGHTS LOST) Pnl lts L/OH (pnls O5,O6, O7,O13,O14,O15) Numeric lts (pnls O3,F7) (FSMs) S67 AC VOLTS 1 S69 FC H2 PUMP 1 S86 HYD RSVR Q SM2 HYD QTY (B) S66 AV BAY 2 FAN S66 CAB PPCO2 S66 CABIN FAN S88 H2O LOOP 2 TEMP HYD/APU HYD QTY 1 − 0% (O1) AIR TEMP AV BAY 2 − 45 degF (O3) RCS/OMS PRPLT QTY Gage and MSN TIME ind blank If H2O PUMP LOOP 1,A active: 1 H2O LOOP C/W lt 'S88 H2O PUMP P 1' (O1) 1 H2O PUMP OUT PRESS LOOP 1 − 40−45 psia	(1) If H2O Loop 1 Pump A active, Loop 1 Pump Out Press must drop below 45 psia to trigger C/W (2) Av Bay 2 Fan ΔP, Air Out Temp snsrs lost (3) Crew and gnd have lost PPCO2 Xdcr (4) Use streamers (if flown) or monitor by feel during wake period (5) CO2 partial Press and Cabin Fan ΔP snsrs lost (6) Inhibits Primary C/W for AC1 voltage and Cabin Fan ΔP (7) For EDO WCS, Urine Fans and Seps are DC mtrs. AC converted to DC internal to controller. Design is such that loss of one AC phase results in loss of Urine Fan or Sep. Commode Fans may work with 1Φ down; however, crew actions will pwr fans through alternate pwr source with full 3Φ pwr. For WCS, 2Φ ops will result in degraded airflow. Urine Fan, Seps are unusable for urine collection or EMU drain (8) MCC will provide equipment reconfig info if reqd
3 4	• Maintain LiOH canister(s) changeout per cue card and FLIGHT PLAN During sleep periods: (L1) • CAB FAN (two) − ON	4 5	Cab Air Sig Cond (ECLS SC6)		
6	(R13U) • C/W PARAM SEL tw (three) − 033,074 • C/W PARAM − INH • MEM − CLEAR • C/W PARAM SEL tw (three) − > 119				
	(WCS) • ✓MODE − AUTO • ✓CRADLE − AUTO • ✓Hose stowed in cradle • ✓WCS ON lt − OFF • FAN SEP SEL sw − OFF • HOSE BLOCK − SEP 2 • In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30−sec run complete. • FAN SEP SEL sw − 2	7	1Φ of WCS Fan/Sep 1		
	(EDO WCS) • URINAL SEL − SEP 2 • URINE DIVERTER VLV − FAN SEP 2	7	Urine Fan 1 Sep 1 1Φ of Commode Fan 1		
	SM 60 SM TABLE MAINT • Reset upper limit of 0450114 (FC1 H2 PUMP STATUS) to current value + 0.3 volts		1Φ of FC1 H2 Pump 1Φ of FC1 Coolant Pump		
	(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 1 selected: • Perform CO2 REMOVAL SYSTEM CNTLR 1(2) CONFIG (ORB OPS, ECLS)		1Φ of CO2 Rmvl Sys: Fan AC1 pwr Compressor AC1 pwr		
		8	1Φ of AC Utility Power Outlets at F1 and MO52J		
	(Continued)		(Continued)		

EPS SSR−112 (Cont)
BUS LOSS: AC1 ΦB

	ACTION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
9	If bus shorted: • Open all AC1 ΦB cbs that pwr 3Φ loads on pnls L4: C−J,M,N (9 cbs), MA73C: E,G,H,I (4 cbs) • Open all AC1 3Φ ganged cbs on pnlsL4:B (1 cb), MA73C: C,D,F (5 cbs)	9	AC1 FMC1 Bus pwr MMC1 Bus pwr MMC3 Bus pwr AMC1 Bus pwr		(9) Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into short. After opening cbs, refer to the following SSRs for functions lost and crew indications caused by unpowering sub−buses: SSR−114, SSR−115, SSR−116, SSR−117 (10) For unshorted bus, perform single Φ isolation steps to prevent powering single phase loads with coupled energy from remaining two phases (11) Bypass vlv holds position and Cntlr A Rad Byp Vlv Mtr remains (12) ✓MCC for total OMS Qtys. Aft Qtys are found on GNC SYS SUMM 2
10	If bus not shorted: • Perform the following BUS ISOLATION steps				

BUS ISOLATION		
IF BUS NOT SHORTED, PERFORM		
	Port RMS: 1Φ of Mid MRL Mtr 1 Aft MRL Mtr 2	
(L4:K) • cb AC1 ΦB CAB AIR S/C − op		
(L4:L) • cb AC1 ΦB AV BAY 2 S/C − op		
(L4:O) • cb AC1 ΦB HYD QTY 1 − op	Hyd Rsvr 1 Qty Snsr	
(L4:P) • cb AC1 ΦB RAD CNTLR 2B − op	11 Freon Loop 2 Cntlr B Rad Byp Vlv Mtr	
(L4:Q) • cb AC1 ΦB LTG PNL L OVHD − op	Pnl lts L/OH (pnls O5,O6,O7, O13,O14,O15)	
(L4:R) • cb AC1 ΦB NUMERIC FWD − op	12 Numeric lts (pnls O3,F7) (RCS/OMS Prplt Qty Gage, Mission, and Event Timers)	

EPS SSR−113
BUS LOSS: AC1 ΦC

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(R2) • BLR CNTLR/HTR 3 − B		Hyd H2O Blr 3 Cntrl A	MASTER ALARM Light/Tone − on	(1) For unshorted bus, perform single Φ isolation steps to prevent powering single phase loads with coupled energy from remaining two phases (2) If H2O Loop 1 Pump A active, Loop 1 Pump Out Press must drop below 45 psia to trigger C/W
	(L1) • ✓HUM SEP A − OFF • ✓B − ON		1Φ of Hum Sep A	(F7) C/W AC VOLT lt − on SM ALERT Light/Tone − on	
	• ✓IMU FAN A − OFF • ✓B(C) − ON	1	1Φ of IMU Fan A	(F9) AC1 ΦC AC volts < 90	
	• H2O PUMP LOOP 2 − ON		1Φ of H2O Loop 2 Pump GPC Cntlr pwr	(LIGHTS LOST) Orbit Sta Instr lts (pnls A1,A2)	
	• H2O PUMP LOOP 1 (two) − GPC, B	2	1Φ of H2O Loop 1 Pump A	(FSMs) S67 AC VOLTS 1 S69 FC H2 PUMP 1 S86 WSB T SM0 THRM HYD (B)	
	• FREON PUMP LOOP 1 − B • 2 − A		1Φ Freon Loop 1 Pump A 2 Pump B		
	• ✓AV BAY 1 FAN A − OFF • ✓B − ON		1Φ of AV Bay 1 Fan A		
	• 3 FAN A − ON • B − OFF		1Φ of AV Bay 3 Fan A		
	(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN A − OFF • B − ON		1Φ of Arlk/Tnl Fan A	HYD/APU APU H2O QTY 3 − 0%	
	(Continued)		(Continued)	(Continued)	

BUS LOSS: AC1 ΦC

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(R13U) • C/W PARAM SEL tw (three) − 033 (AC1 voltage) • C/W PARAM − INH • MEM − CLEAR • C/W PARAM SEL tw (three) − > 119		If H2O PUMP LOOP 1, A active: 2 C/W H2O LOOP lt − on 'S88 H2O PUMP P 1' (O1) 2 H2O PUMP OUT PRESS LOOP 1 − 40−45 psia	(2) If H2O Loop 1 Pump A active, Loop 1 Pump Out Press must drop below 45 psia to trigger C/W
(WCS) •✓MODE − AUTO •✓CRADLE − AUTO •✓Hose stowed in cradle •✓WCS ON lt − OFF • FAN SEP SEL sw − OFF • HOSE BLOCK − SEP 2 • In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30−sec run complete. • FAN SEP SEL sw − 2	3 1Φ of WCS Fan/Sep 1	If APUs active and using H2O BLR CNTLR/HTR 3A: C/W APU TEMP lt − on after ~2 min	(3) For EDO WCS, Urine Fans and Seps are DC mtrs. AC converted to DC internal to controller. Design is such that loss of one AC phase results in loss of Urine Fan or Sep. Commode Fans may work with 1Φ down; however, crew actions will pwr fans through alternate pwr source with full 3Φ pwr. For WCS, 2Φ ops will result in degraded airflow. Urine Fan, Seps are unusable for urine collection or EMU drain
(EDO WCS) • URINAL SEL − SEP 2 • URINE DIVERTER VLV − FAN SEP 2	Urine Sep 1 Fan 1 3 1Φ of Commode Fan 1		
SM 60 SM TABLE MAINT • Reset upper limit of 0450114 (FC1 H2 PUMP STATUS) to current value + 0.3 volts	1Φ of FC1 H2 Pump 1Φ of FC1 Coolant Pump		(4) MCC will provide equipment reconfig info if reqd
	4 1Φ of AC Utility Power Outlets at F1 and MO52J		
5 If bus shorted: • Open all AC1 ΦC cbs that pwr 3Φ loads on pnls L4: C−J,M,N (9 cbs), MA73C: E,G,H,I (4 cbs) • Open all AC1 3Φ ganged cbs on pnls L4:B (1 cb), MA73C: C,D,F (5 cbs)	5 AC1 FMC1 Bus pwr MMC1 Bus pwr MMC3 Bus pwr AMC1 Bus pwr		(5) Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into short. After opening cbs, refer to the following SSRs for functions lost and crew indications caused by unpowering sub−buses: SSR−114, SSR−115, SSR−116, SSR−117
If bus not shorted: • Perform the following BUS ISOLATION steps			
(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 1 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)	1Φ of CO2 Rmvl Sys: Fan AC1 pwr Compressor AC1 pwr		(6) For unshorted bus, perform single isolation steps to prevent powering single phase loads with coupled energy from remaining two phases

6 BUS ISOLATION	
IF BUS NOT SHORTED, PERFORM	
(L4:O) • cb AC1 ΦC BLR HYD BYP 3A − op	
(L4:P) • cb AC1 ΦC TACAN 1 − op	Tacan 1
(L4:Q) • cb AC1 ΦC LTG INST OS − op	Orbit Sta Instr lts (Pnls A1,A2)
(Continued)	(Continued)

EPS SSR−113 (Cont)
BUS LOSS: AC1 ΦC

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(MA73C:F) • cb AC1 OPS INST HYD ACTR ΦC − op	Ops Hyd Actr Instr		
	Port RMS: 1Φ of Mid MRL Mtr 1 Aft MRL Mtr 2		

EPS SSR−114
BUS LOSS: AC1 FMC1

ACTION
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:C) • cb MCA LOGIC MCA PWR AC1 3Φ FWD 1 − op

	EQUIP/FUNCTION LOST
	AC1 FMC1 Bus pwr RH Vent 1,2 Mtr 1
1	L ADP Dpy Mtr 1
1	−Y Star Trkr Dr Sys 1 OP/CL capability

CREW INDICATIONS
L ADP deploy time incr from 15 to 30 sec
−Y Star Trkr OP/CL time incr from 8 to 16 sec

NOTES
(1) Redundant mtr remains

EPS SSR−115
BUS LOSS: AC1 MMC1

ACTION
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:C) • cb MCA LOGIC MCA PWR AC1 3Φ MID 1 − op

	EQUIP/FUNCTION LOST
	PLBD: C/L Lat 9−12 Mtr 1 Port,Stbd Fwd Blkhd Mtrs 1 Stbd Door Mtr 1 RH Vents 3,5,6 Mtrs 1 AC1 MMC1 Bus pwr
	Port Rad Lat 1−6, 7−12 Mtrs 1 Dpy/Sto Mtr 1 PL Reten Sys A Rel/Lat Mtrs
1	Port RMS Mid MRL Mtr 1
1 1	ROEU Orbiter arm drive mtr (ODM mtr 1 − mate A, demate A, relax A) ODA mtr 1 latch/release

CREW INDICATIONS
SM (BFS SM 63) PL BAY DOORS
During PLBD OP/CL, single mtr run time noted on actuators listed at left
During Rad Dpy/Sto ops: (R13L) RAD CNTL PORT tb (two) indicates single mtr ops

NOTES
(1) Single mtr time

EPS SSR−116
BUS LOSS: AC1 MMC3

ACTION
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:D) • cb MCA LOGIC MCA PWR AC1 3Φ MID 3 − op

	EQUIP/FUNCTION LOST
	PLBD C/L Lat 1−4, 5−8 Mtrs 1 Port Aft Blkhd Mtr 1 LH Vents 5,6 Mtrs 1 AC1 MMC3 Bus pwr Stbd Rad Lat 1−6, 7−12 Mtrs 1 Dpy/Sto Mtr 1
1	Port RMS Aft MRL Mtr 2

CREW INDICATIONS
SM (BFS SM 63) PL BAY DOORS
During PLBD OP/CL, single mtr run time noted on actuators listed at left
During Rad Dpy/Sto ops: (R13L) RAD CNTL STBD tb (two) indicates single mtr ops

NOTES
(1) Single mtr time

EPS SSR−117
BUS LOSS: AC1 AMC1

ACTION
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:D) • cb MCA PWR AC1 3Φ AFT 1 − op

	EQUIP/FUNCTION LOST
	AC1 AMC1 Bus pwr LH Vent 8,9 Mtr 1
1	ET Door Mtrs: C/L Lat Actr 1 Mtr 1 2 Mtr 1 L Dr Closure Mtr 1 Uplock Lat Mtr 1

CREW INDICATIONS	NOTES
NONE	(1) Redundant mtrs remain

EPS SSR−120
BUS LOSS: AC2

(Includes all AC2 sub−buses)

	ACTION		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
1	• Perform FC2 SHUTDN (FC SHUTDOWN Cue Card)		FC2 Pumps and pH Snsr		MASTER ALARM Light/Tone − on	(1) * TIME CRITICAL * FC2 must be shut down within 9 min to avoid potentially hazardous condition
	(R2) • BLR CNTLR/HTR 1 − B • 2 − A		Hyd H2O Blr 1 Cntlr A 2 Cntlr B		(F7) C/W FC PUMP lt − on C/W AC VOLT lt − on C/W FREON LOOP lt − on SM ALERT Light/Tone − on C/W AV BAY/CABIN AIR lt	
	(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl				(F9) AC2 ΦA,ΦB,ΦC AC volts < 90	(2) Av Bay 3 Fan ΔP, Air Out Temp snsrs lost
	(L1) • HUM SEP B − OFF • A − ON • CAB FAN B − OFF • A − ON • IMU FAN B − OFF • A(C) − ON • H2O PUMP LOOP 1 (two) − GPC, A • H2O PUMP LOOP 2 − ON • AV BAY 1 FAN B − OFF • A − ON • 2 FAN A − OFF • B − ON • AV BAY 3 FAN (two) − ON		Humidity Sep B Cabin Fan B IMU Fan B H2O Loop 1 Pump B Av Bay 1 Fan B Av Bay 2 Fan A Av Bay 3 Sig Condr, Xdcrs (ECLS SC4)		(LIGHTS LOST) R Ovhd pnl (pnls O1,O2, O3,O8,O9,O16,O17) R pnl (pnls F4,F8,F9,R1,R2, R4) Ovhd Instr (pnls O1,O2,O3) Orbit Sta Numeric (pnls A2,A4)	(3) Freon Loop 2 pump switched to avoid having both loops powered by AC 1
3	• FREON PUMP LOOP 1,2 (two) − A		Freon Loop 1 Pump B		(FSMs) S67 AC VOLTS 2 S86 HYD RSVR Q SM2 HYD QTY (B) S86 WSB T SM0 THRM HYD (B) S66 AV BAY 1,2,3 FAN S69 FC PUMP 2 S69 FC H2 PUMP 2 S88 FREON FLOW 1 S88 FRN AFT CP 1 S88 FRN PL HX 1 S88 FREON QTY 2 S88 FREON FLOW 2 S88 H2O LOOP 1 TEMP S66 IMU FN SPD B S66 IMU FAN DP	(4) Instrumentation loss caused rad isolaton (5) Rad isolation may cause FES shutdown (6) Brake/Skid Cntl Box A,B enabled before WOW (7) Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate, and Accum Qty snsrs lost
4	If AV BAY FIRE POWERDOWN not performed: • Perform RAD ISOL RECOVERY, ECLS SSR−9 for Freon Loop 2			5	Possible 'S88 EVAP OUT T 1(2)'	(8) When gear deployed, tb will not indicate DN
	(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN B − OFF • ✓A − ON		Arlk/Tnl Fan B	8	(F6,F8) LDG GEAR L,NOSE tb − bp	(9) Freon Loop 2 P/L Hx Flow Rate, Freon Loop 1 ICH Flow Rate and Accum Qty snsrs lost
	(L4:P) • cb AC3 ΦA LG SNSR 1 − cl	6	Prox Snsr Elec Box 2		HYD/APU APU H2O QTY 1 ind − 0% HYD QTY 2 ind − 0%	
	(O17:C) • SIG CONDR FREON A − AC3 • SIG CONDR FREON B − AC3	7 9	Freon Sig Condr A AC2 pwr (ECLS SC1A) Freon Sig Condr B AC2 pwr (ECLS SC1B)			
	(CDR SEAT PNL) • CDR SEAT PWR BUS SEL − AC3 (dn)		CDR Seat Adj via AC2 pwr			
	(Continued)		(Continued)		(Continued)	

EPS SSR−120 (Cont)
BUS LOSS: AC2

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(PLT SEAT PNL) • PLT SEAT PWR BUS SEL − AC3 (dn)		PLT Seat Adj via AC2 pwr	(R1) FC2 COOL PUMP ΔP tb − bp	(10) Inhibits Primary C/W for AC2 Voltage, FC2 Stack Temp, and Pump ΔP
(R13U) • C/W PARAM SEL tw (three) − 043,072,102 • C/W PARAM − INH 10 • MEM − CLEAR • C/W PARAM SEL tw (three) − > 119			(O1) AIR TEMP AV BAY 3 − 45 degF FREON FLOW LOOP 2 − 578 pph AIR TEMP CAB HX OUT − 45 degF	(11) Lose Auto Temp Cntl via Cntlr 1 and Cabin Temp, Cabin Hx Air Out Temp and H2O Loop 1 Cabin Hx In Temp snsrs. Hx Byp Vlv holds position
(WCS) • ✓MODE − AUTO • ✓CRADLE − AUTO • ✓Hose stowed in cradle • ✓WCS ON lt − OFF • FAN SEP SEL sw − OFF • HOSE BLOCK − SEP 1 • In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30−sec run complete • FAN SEP SEL sw − 1		WCS Fan/Sep 2	(A4) Mission and Event Timers blank	(12) Redundant mtr remains
(EDO WCS) • URINAL SEL − SEP 1 • URINE DIVERTER VLV − FAN SEP 1		Urine Sep 2 Fan 2 Commode Fan 2	If Freon Loop 1 Pump B ON: 'S88 FREON FLOW 1'	
If CAB TEMP CNTLR 1 active: (L1) • CAB TEMP CNTLR − OFF	11	Cabin Temp Cntlr 1 and Hx Byp Vlv Mtr 1	If APU active and using H2O Blr Cntlr 1A or 2B: C/W APU TEMP lt − on after ~2 min	
(MD44F) • Remove pin from PRI ACTUATOR and BYP Vlv linkage, connect linkage to SEC ACTUATOR			If H2O Loop 1 Pump B active: H2O LOOP C/W lt 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP' 'S88 H2O PUMP P1' (O1) H2O PUMP OUT PRESS LOOP 1 − 20−25 psia	
(L1) • CAB TEMP CNTLR − 2			L,R ADP deploy times incr from 15 to 30 sec	
Refer to OMS/RCS Slide Rule for vlv loss info (use FPC2 Slide for Aft RCS and FMC2 for Fwd RCS)			SM (BFS SM 63) PL BAY DOORS During PLBD OP/CL, single mtr run time noted on actuators listed at left	
			(R13L) During Rad Dpy/Sto ops: RAD LAT CNTL tbs (two) indicate single mtr ops	

BUS ISOLATION		EQUIP/FUNCTION LOST
ONLY ON MCC CALL, PERFORM		
(MA73C:C) cb MCA PWR • AC2 3Φ FWD 2 − op		AC2 FMC2 Bus pwr 12 L,R Vents 1,2 Mtrs 2 12 ADP Deploy Mtrs 2
• AC2 3Φ MID 1 − op	12	−Y Star Trkr Dr Sys 2 OP/CL capability
• AC2 3Φ MID 2 − op		−Z Star Trkr Dr Sys 1 OP/CL capability AC2 MNC1 Bus pwr LH Vent 5 Mtr 2 AC2 MMC2 Bus pwr PLBD C/L Lat 13−16 Mtr 2 Stbd Aft Blkhd Mtr 2 Port Door Mtr 2 Stbd Rad Lat 1−6 Mtr 2 LH Vent 3 Mtr 2
(Continued)		(Continued)

EPS SSR−120 (Cont)
BUS LOSS: AC2

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM				(13) ✓MCC for Ku Ant stow reqmts (14) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison (15) Single mtr time
(MA73C:D) cb MCA PWR • AC2 3Φ AFT 2 − op • AC2 3Φ MID 3 − op • AC2 3Φ MID 4 − op	13	Ku Ant Sto/Dpy Mtr 2 AC2 AMC2 Bus pwr LH,RH Vents 8,9 Mtr 2 AC2 MMC3 Bus pwr PL Reten Sys B Rel/Lat Mtrs AC2 MMC4 Bus pwr PLBD Port,Stbd Fwd Blkhd Mtrs 2 PLBD Stbd Door Mtr 2 Port Rad Lat 1−6 Mtr 2 RH Vent 6 Mtr 2		
(MA73C:E) • cb AC2 WCS FAN SEP 2 (three) − op • cb AC2 PAYLOAD 3Φ − op		AC2 pwr to MS,PS Patch pnl		
(MA73C:F) cb AC2 • RMS B/U ΦA − op • OPS INST HYD ACTR ΦC − op	14 15 15	Port RMS: MPM Mtr 2 Fwd MRL Mtr 1 Mid MRL Mtr 2 D&C B/U edge ltg Ops Hyd Actr Inst		
(MA73C:G) IF DOCKING MISSION • cb AC2 ARLK/TNL FAN B (three) − op		Arlk/Tnl Fan B		
(MA73C:H,I) cb AC2 • FWD RCS VLV (three) − op • AFT POD VLV GP 2 (three) − op				
(L4:C−E) cb AC2 • FC2 PUMPS (three) − op • CTR ENG (three) − op • L ENG (three) − op				
(L4:F−I) cb AC2 • H2O LOOP PUMP 1B (three) − op • AV BAY 1 FAN B (three) − op • AV BAY 2 FAN A (three) − op • IMU FAN B (three) − op				
(L4:J−K) cb AC2 • HUM SEP B (three) − op • CAB FAN B (three) − op				
(L4:L) cb AC2 • ΦA CAB T CNTLR 1 − op • ΦB AV BAY 3 S/C − op				
(L4:M) cb AC2 • FREON LOOP 1 PUMP B (three) − op				
(Continued)		(Continued)		

EPS SSR−120 (Cont)
BUS LOSS: AC2

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM				(12) Redundant mtr remains (16) Flow prop vlv holds position (17) Motor B remains (18) Bypass vlv holds position and Cntlr B Rad Byp Vlv Mtr remains
(L4:N) cb AC2 • ΦA FREON FLOW PROP 1 − op • ΦB FREON SIG CONDR − op	16	Freon Loop 1 Flow Prop Vlv		
• cb AC2 ΦC RAD ISOL A − op	17	Freon Loop 1,2 Rad Isol Motor A		
(L4:O) cb AC2 • ΦA BLR HYD BYP 1A − op • ΦB HYD QTY 2 − op • ΦC BLR HYD BYP 2B − op		Hyd Rsvr 2 Qty Snsr		
(L4:P) cb AC2 • ΦA LG SNSR 2 − op • ΦB RAD CNTLR 1A − op • ΦC TACAN 2 − op	18	Freon Loop 1 Cntlr A Rad Byp Vlv Mtr Tacan 2		
(L4:Q) cb AC2 • ΦA LTG PNL R OVHD − op • ΦB LTG PNL R − op • ΦC LTG NUMERIC OS − op		R Ovhd Pnl lts R Pnl Lts OS Numeric lts		
(L4:R) • cb AC2 ΦB LTG INST OVHD − op		Ovhd Inst lts		
	12	ET Doors Mtrs: C/L Lat Actr 1 Mtr 2 L Dr Uplock Lat Mtr 2 R Dr Closure Mtr 2 Uplock Lat Mtr 2		
		NLG, LMG B/U Rel 2 Fire 2, Arm		

EPS SSR−121
BUS LOSS: AC2 ΦA

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS		NOTES
	(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl				MASTER ALARM Light/Tone − on		(1) If H2O Loop 1 Pump B active, Loop 1 Pump Out Press must drop below 45 psia to trigger C/W
	(L1) • HUM SEP A − ON • B − OFF • IMU FAN A(C) − ON • B − OFF • H2O PUMP LOOP 1 (two) − GPC,A • H2O PUMP LOOP 2 − ON		1Φ of Hum Sep B 1Φ of IMU Fan B 1 1Φ of H2O Loop 1 Pump B 1Φ of Freon Loop 1 Pump B		(F7) C/W AC VOLT lt − on SM ALERT Light/Tone − on		(2) Freon Loop 2 pump switched to avoid having both loops powered by AC1
2	• FREON PUMP LOOP 1,2 (two) − A • AV BAY 1 FAN A − ON • B − OFF • 2 FAN A − OFF • B − ON		1Φ of AV Bay 1 Fan B 1Φ of AV Bay 2 Fan A		(F9) AC2 ΦA AC volts < 90		(3) When gear deployed, tb will not indicate DN
	(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN B − OFF • ✓A − ON		1Φ of Arlk/Tnl Fan B		(LIGHTS LOST) R Ovhd pnl lts (pnls O1,O2, O3,O8,O9,O16,O17)		(4) Brake/Skid Cntl Box A,B enabled before WOW
			1Φ of Cabin Fan B		(F6/F8) LDG GEAR L,NOSE tb − bp	3	(5) For EDO WCS, Urine Fans and Seps are DC mtrs. AC converted to DC internal to controller. Design is such that loss of one AC phase results in loss of Urine Fan or Sep. Commode Fans may work with 1Φ down; however, crew actions will pwr fans through alternate pwr source, with full 3Φ pwr. For WCS, 2Φ ops will result in degraded airflow. Urine Fan, Seps are unusable for urine collection or EMU drain
	(L4:P) • cb AC3 ΦA LG SNSR 1 − cl	4	Prox Snsr Elec Box 2		HYD/APU APU H2O QTY 3 ind − 0%		
	(R2) • BLR CNTLR/HTR 1 − B		Hyd H2O Blr 1 Cntlr A		(FSMs) S67 AC VOLTS 2 S69 FC H2 PUMP 2 S86 WSB T SM0 THRM HYD (B) S66 IMU FAN DP S66 IMU FN SPD B S88 H2O LOOP 1 TEMP		
	(WCS) • ✓MODE − AUTO • ✓CRADLE − AUTO • ✓Hose stowed in cradle • ✓WCS ON lt − OFF • FAN SEP SEL sw − OFF • HOSE BLOCK − SEP 1 • In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30−sec run complete • FAN SEP SEL sw − 1	5	1Φ of WCS Fan/Sep 2		(O1) AIR TEMP CAB HX OUT ind − 45 degF		(6) Lose Auto Temp Cntl via Cntlr 1 and Cabin Temp, Cabin Hx A Out Temp and H2O Loop 1 Cabin Hx In Temp snsrs Hx Byp Vlv hold position
				1	If H2O PUMP LOOP 1,B active: C/W H2O LOOP lt − on 'S88 H2O PUMP P 1'		
	(EDO WCS) • URINAL SEL − SEP 1 • URINE DIVERTER VLV − FAN SEP 1		Urine Sep 2 Fan 2 5 1Φ of Commode Fan 2	1	(O1) H2O PUMP OUT PRESS LOOP 1 ind − 40−45 psia		
					If IMU FAN B ON: 'S66 IMU FAN DP' 'S66 IMU FN SPD B'		
					If HUM SEP B ON: 'S66 HUMID SEP B'		
	If Cab Temp Cntlr 1 active: (L1) • CAB TEMP CNTLR − OFF	6	Cabin Temp Cntlr 1, Hx Byp Vlv Mtr 1		If APUs active and using BLR CNTLR/HTR 1A: C/W APU TEMP lt − on after ~2 min		
	(MD44F) • Remove pin from PRI Actuator and BYP vlv linkage, connect linkage to SEC Actuator						
	(L1) • CAB TEMP CNTLR − 2						
	(Continued)		(Continued)				

EPS SSR−121 (Cont)
BUS LOSS: AC2 ΦA

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(R13U) • C/W PARAM SEL tw (three) − 043 (AC2 voltage) • C/W PARAM − INH • MEM − CLEAR • C/W PARAM SEL tw (three) − > 119				(7) Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from two phases into short (8) Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into short. After opening cbs, refer to the following SSRs for functions lost and crew indications caused by unpwring sub−buses: SSR−124, SSR−125, SSR−126, SSR−127, SSR−128, SSR−129 (9) For unshorted bus, perform single Φ isolation steps to prevent pwring single phase loads with coupled energy from remaining two phases (10) Flow prop vlv holds position
	SM 60 SM TABLE MAINT • Reset upper limit of 0450214 (FC2 H2 PUMP STATUS) to current value + 0.3 volts		1Φ of FC2 H2 Pump 1Φ of FC2 Coolant Pump		
8	If bus shorted: • Open all AC2 ΦA cbs that pwr 3Φ loads on pnl L4: C−K,M (10 cbs), pnl MA73C: E,G,H,I (4 cbs) • Open all AC2 3Φ ganged cbs on pnl MA73C: C−G (9 cbs)	7 8	If bus shorted: AC2 payload 3Φ Bus pwr (pwrs MS, PS Patch panel) AC2 FMC2 Bus pwr MMC1 Bus pwr MMC2 Bus pwr MMC3 Bus pwr MMC4 Bus pwr AMC2 Bus pwr		
9	If bus not shorted: • Perform the following BUS ISOLATION steps				

9	BUS ISOLATION		
	IF BUS NOT SHORTED, PERFORM		
	(L4:L) • cb AC2 ΦA CAB T CNTLR 1 − op		
	(L4:N) • cb AC2 ΦA FREON FLOW PROP 1 − op	10	Freon Loop 1 Flow Prop Vlv
	(L4:O) • cb AC2 ΦA BLR HYD BYP 1A − op		
	(L4:P) • cb AC2 ΦA LG SNSR 2 − op		
	(L4:Q) • cb AC2 ΦA LTG PNL R OVHD − op		R Ovhd pnl lts (pnls O1,O2, O3,O8,O9,O16,O17)
	(MA73C:F) • cb AC2 RMS B/U ΦA − op		Port RMS: D&C B/U edge ltg MPM Mtr 2 FWD MRL Mtr 1 MID MRL Mtr 2
			NLG, LMG B/U Rel 2 Fire 2, Arm
			FC2 pH Snsr

EPS SSR−122
BUS LOSS: AC2 ΦB

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS		NOTES
	(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl				MASTER ALARM Light/Tone − on		(1) If H2O Loop 1 Pump B active, Loop 1 Pump Out Press must drop below 45 psia to trigger C/W
	(L1) • HUM SEP A − ON • B − OFF • IMU FAN A(C) − ON • B − OFF • H2O PUMP LOOP 1 (two) − GPC,A • H2O PUMP LOOP 2 − ON • AV BAY 3 FAN (two) − ON • FREON PUMP LOOP 1,2 (two) − A • AV BAY 1 FAN A − ON • B − OFF • 2 FAN A − OFF • B − ON		1Φ of Hum Sep B 1Φ of IMU Fan B 1 1Φ of H2O Loop 1 Pump B 2 AV Bay 3 Sig Condr,Xdcrs (ECLS SC4) 3 1Φ of Freon Loop 1 Pump B AV Bay 1 Fan B 1Φ of AV Bay 2 Fan A		(F7) C/W AC VOLT lt C/W FREON LOOP lt SM ALERT Light/Tone		(2) Av Bay 3 Fan ΔP, Air Out Temp snsrs lost (3) Freon Loop 2 pump switched to avoid having both Freon loops powered by AC1 (4) Instrumentation loss caused rad isolation (5) Rad isolation may cause FES shutdown (6) Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate, and Accum Qty snsrs lost (7) Freon Loop 2 P/L Hx Flow Rate, Freon Loop 1 ICH Flow Rate, and Accum Qty snsrs lost (8) For EDO WCS, Urine Fans and Seps are DC mtrs. AC converted to DC internal to controller. Design is such that loss of one AC phase results in loss of Urine Fan or Sep. Commode Fans may work with 1Φ down; however, crew actions will pwr fans through alternate pwr source, with full 3Φ pwr. For WCS, 2Φ ops will result in degraded airflow. Urine Fan and Seps are unusable for urine collection or EMU drain
					(F9) AC2 ΦB AC volts < 90		
					(LIGHTS LOST) Ovhd Instr (pnls O1,O2,O3) R pnl (pnls F4,F8,F9,R1, R2,R4)		
4	• Perform RAD ISOL RECOVERY, ECLS SSR−9 for Freon Loop 2				(FSMs) S67 AC VOLTS 2 S69 FC H2 PUMP 2 S86 HYD RSVR Q SM2 HYD QTY (B) S66 AV BAY 3 TEMP S66 AV BAY 3 FAN S88 FREON FLOW 2 S88 FRN PL HX 1 S88 FREON QTY 2 5 Possible 'S88 EVAP OUT T 1(2)'		
	(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN B − OFF • ✓A − ON		1Φ of Arlk/Tnl Fan B				
			1Φ of Cabin Fan B		(A4) Mission and Event Timers blank		
	(O17:C) • SIG CONDR FREON A − AC3 • SIG CONDR FREON B − AC3		6 Freon Sig Condr A AC2 pwr (ECLS SC1A) 7 Freon Sig Condr B AC2 pwr (ECLS SC1B)		HYD/APU HYD QTY 2 − 0%		
	(R13U) • C/W PARAM SEL tw (three) − 043 (AC2 voltage) • C/W PARAM − INH • MEM − CLEAR • C/W PARAM SEL tw (three) − > 119				(O1) AIR TEMP AV BAY 3 − 45 degF FREON FLOW LOOP 2 − 578 pph		
	SM 60 SM TABLE MAINT • Reset upper limit of 0450214 (FC2 H2 PUMP STATUS) to current value + 0.3 volts		1Φ of FC2 H2 Pump 1Φ of FC2 Coolant Pump		1 If H2O Loop 1 Pump active: C/W H2O LOOP lt 'S88 H2O PUMP P1'		
	(WCS) • ✓MODE − AUTO • ✓CRADLE − AUTO • ✓Hose stowed in cradle • ✓WCS ON lt − OFF • FAN SEP SEL sw − OFF • HOSE BLOCK − SEP 1 • In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30−sec run complete • FAN SEP SEL sw − 1		8 1Φ of WCS Fan/Sep 2		1 (O1) H2O PUMP OUT PRESS LOOP 1 − 40−45 psia		
	(Continued)		(Continued)				

BUS LOSS: AC2 ΦB

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(EDO WCS) • URINAL SEL − SEP 1 • URINE DIVERTER VLV − FAN SEP 1	8	Urine Sep 2 Fan 2 1Φ of Commode Fan 2		(8) For EDO WCS, Urine Fans and Seps are DC mtrs. AC converted to DC internal to controller. Design is such that loss of one AC phase results in loss of Urine Fan or Sep. Commode Fans may work with 1Φ down; however, crew actions will pwr fans through alternate pwr source, with full 3Φ pwr. For WCS, 2Φ ops will result in degraded airflow. Urine Fan and Seps are unusable for urine collection or EMU drain
9	If bus shorted: • Open all AC2 ΦB cbs that pwr 3Φ loads on pnl L4: C−K,M (10 cbs), pnl MA73C: E,G,H,I (4 cbs) • Open all AC2 3Φ ganged cbs on pnl MA73C: C−G (9 cbs)	10	If bus shorted: AC2 payload 3Φ Bus pwr (pwrs MS, PS Patch panel) 9 AC2 FMC2 Bus pwr MMC1 Bus pwr MMC2 Bus pwr MMC3 Bus pwr MMC4 Bus pwr AMC2 Bus pwr		(9) Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into short. After opening cbs, refer to the following SSRs for functions lost and crew indications caused by unpwring sub−buses: SSR−124, SSR−125, SSR−126, SSR−127, SSR−128, SSR−129
11	If bus not shorted: • Perform the following BUS ISOLATION steps				(10) Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into short
					(11) For unshorted bus, perform single Φ isolation steps to prevent pwring single phase loads with coupled energy from remaining two phases
					(12) Bypass vlv holds position and Cntlr B Rad Byp Vlv Mtr remains

11	BUS ISOLATION		
	IF BUS NOT SHORTED, PERFORM		
	(L4:L) • cb AC2 ΦB AV BAY 3 S/C − OP		
	(L4:N) • cb AC2 ΦB FREON SIG CONDR − op		
	(L4:O) • cb AC2 ΦB HYD QTY 2 − op	12	Hyd Rdvr 2 Qty Snsr
	(L4:P) • cb AC2 ΦB RAD CNTLR 1A − op		Freon Loop 1 Cntlr A Rad Byp Vlv Mtr H2O Ln pH Snsr
	(L4:Q) • cb AC2 ΦB LTG PNL R − op		R pnl ltg (pnls F4,F8,F9,R1, R2,R4)
	(L4:R) • cb AC2 ΦB INST OVHD − op		Ovhd Instr ltg (pnls O1,O2, O3)
			Port RMS: 1Φ of MPM Mtr 2 FWD MRL Mtr 1 MID MRL Mtr 2
			1Φ of AC2 payload 3Φ Bus pwr (pwrs MS, PS Patch pnl)

EPS SSR−123
BUS LOSS: AC2 ΦC

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
	(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl				MASTER ALARM Light/Tone − on	(1) If H2O Loop 1 Pump B active, Loop 1 Pump Out Press must drop below 45 psia to trigger C/W (2) Freon Loop 2 pump switched to avoid having both loops powered by AC1 (3) For EDO WCS, Urine Fans and Seps are DC mtrs. AC converted to DC internal to controller. Design is such that loss of one AC phase results in loss of Urine Fan or Sep. Commode Fans may work with 1Φ down; however, crew actions will pwr fans through alternate pwr source with full 3Φ pwr. For WCS, 2Φ ops will result in degraded airflow. Urine Fan and Seps are unusable for urine collection or EMU drain
	(L1) • HUM SEP A − ON • B − OFF • IMU FAN A(C) − ON • B − OFF • H2O PUMP LOOP 1 (two) − GPC,A • H2O PUMP LOOP 2 − ON		1Φ of Hum Sep B 1Φ of IMU Fan B 1 1Φ of H2O Loop 1 Pump B		(F7) C/W AC VOLT lt SM ALERT Light/Tone	
2	• FREON PUMP LOOP 1,2 (two) − A • AV BAY 1 FAN A − ON • B − OFF • 2 FAN A − OFF • B − ON		1Φ of Freon Loop 1 Pump B AV Bay 1 Fan B 1Φ of AV Bay 2 Fan A		(LIGHTS LOST) Orbit Sta Numeric (pnls A2,A4) (FSM) S67 AC VOLTS 2 S69 FC H2 PUMP 2 S86 WSB T SM0 THRM HYD (B)	
	(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN B − OFF • ✓A − ON		1Φ of Arlk/Tnl Fan B	1	If H2O Loop 1 Pump B active: C/W H2O LOOP lt 'S88 H2O PUMP P 1'	
			1Φ of Cabin Fan B		(O1) H2O PUMP OUT PRESS LOOP 1 = 40−45 psia	
	(R2) • BLR CNTRL/HTR 2 − A		HYD H2O Blr 2 Cntlr B		If APUs active and using H2O BLR CNTLR 2B: C/W APU TEMP lt after ~2 min	
	(R13U) • C/W PARAM SEL tw (three) − 043 (AC2 voltage) • C/W PARAM − INH • C/W MEM − CLEAR • C/W PARAM SEL tw (three) − > 119					
	SM 60 SM TABLE MAINT • Reset upper limit of 0450214 (FC2 H2 PUMP STATUS) to current value + 0.3 volts		1Φ of FC2 H2 Pump 1Φ of FC2 Coolant Pump			
	(WCS) • ✓MODE − AUTO • ✓CRADLE − AUTO • ✓Hose stowed in cradle • ✓WCS ON lt − OFF • FAN SEP SEL sw − OFF • HOSE BLOCK − SEP 1 • In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30−sec run complete • FAN SEP SEL sw − 1		3 1Φ of WCS Fan/Sep 2			
	(EDO WCS) • URINAL SEL − SEP 1 • URINE DIVERTER VLV − FAN SEP 1		3 Urine Sep 2 Fan 2 1Φ of Commode Fan 2			
	(Continued)		(Continued)			

BUS LOSS: AC2 ΦC

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
4	If bus shorted: • Open all AC2 ΦC cbs that pwr 3Φ loads on pnl L4: C−K,M (10 cbs), pnl MA73C: E,G,H,I (4 cbs) • Open all AC2 3Φ ganged cb1 on pnl MA73C: C−G (9 cbs)	5	If bus shorted: AC2 payload 3Φ Bus pwr (pwrs MS, PS Patch panel)		(4) Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into short. After opening cbs, refer to the following SSRs for functions lost and crew indications caused by unpwring sub−buses: SSR−124, SSR−125, SSR−126, SSR−127, SSR−128, SSR−129
6	If bus not shorted: • Perform the following BUS ISOLATION steps	4	AC2 FMC2 Bus pwr MMC1 Bus pwr MMC2 Bus pwr MMC3 Bus pwr MMC4 Bus pwr AMC2 Bus pwr		(5) Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into short
					(6) For unshorted bus, perform single isolation steps to prevent pwring single phase loads with coupled energy from remaining two phases
					(7) Motor B remains

6	BUS ISOLATION		
	IF BUS NOT SHORTED, PERFORM		
	(L4:N) • cb AC2 ΦC RAD ISOL A − op	7	Freon Loop 1,2 Rad Isol Motor A
	(L4:O) • cb AC2 ΦC BLR HYD BYP 2B − op		
	(L4:P) • cb AC2 ΦC TACAN 2 − op		Tacan 2
	(L4:Q) • cb AC2 ΦC LTG NUMERIC OS − op		Orbit Sta Numeric Ltg (pnls A2,A4)
	(MA73C:F) • cb AC2 OPS INST HYD ACTR ΦC − op		Ops Hyd Act Inst
			Port RMS: 1Φ of MPM Mtr 2 FWD MRL Mtr 1 MID MRL Mtr 2
			1Φ of AC2 payload 3Φ Bus pwr (pwrs MS, PS Patch pnl)

EPS SSR−124
BUS LOSS: AC2 FMC2

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:C) • cb MCA LOGIC MCA PWR AC2 3Φ FWD 2 − op

	EQUIP/FUNCTION LOST
	AC2 FMC2 Bus pwr
1	L,R Vents 1,2 Mtrs 2
1	ADP Dpy Mtrs 2
1	−Y Star Trkr Dr Sys 2 OP/CL capability
1	−Z Star Trkr Dr Sys 1 OP/CL capability

CREW INDICATIONS	NOTES
L,R ADP deploy times incr from 15 to 30 sec	(1) Redundant mtr remains
−Y,−Z Star Trkr OP/CL time incr from 8 to 16 sec	

EPS SSR−125
BUS LOSS: AC2 MMC1

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:C) • cb MCA LOGIC MCA PWR AC2 3Φ MID 1 − op

EQUIP/FUNCTION LOST
AC2 MMC1 Bus pwr LH Vent 5 Mtr 2

CREW INDICATIONS	NOTES
NONE	

EPS SSR−126
BUS LOSS: AC2 MMC2

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:C) • cb MCA LOGIC MCA PWR AC2 3Φ MID 2 − op

	EQUIP/FUNCTION LOST
	Port RMS:
1	MPM Mtr 2
2	Fwd MRL Mtr 1
	AC2 MMC2 Bus pwr PLBD C/L Lat 13−16 Mtr 2 Stbd Aft Bkhd Mtr 2 Port Door Mtr 2
	Stbd Rad Lat 1−6 Mtr 2 LH Vent 3 Mtr 2

CREW INDICATIONS	NOTES
SM (BFS SM 63) PL BAY DOORS	(1) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison
During PLBD OP/CL, single mtr run time noted on actuators listed at left	(2) Single mtr time
(R13) During Rad Dpy/Sto ops, RAD LAT CNTL STBD tb indicates single mtr ops	

EPS SSR−127
BUS LOSS: AC2 MMC3

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:D) • cb MCA LOGIC MCA PWR AC2 3Φ MID 3 − op

	EQUIP/FUNCTION LOST
	AC2 MMC3 Bus pwr PL Reten Sys B Rel/Lat Mtrs
	ROEU
1	Orbiter arm drive mtr (ODM mtr 2 − mate B, demate B, relax B)
1	ODA mtr 2 latch/release

CREW INDICATIONS	NOTES
NONE	(1) Single mtr time

EPS SSR−128
BUS LOSS: AC2 MMC4

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:D) • cb MCA LOGIC MCA PWR AC2 3Φ MID 4 − op

	EQUIP/FUNCTION LOST
	AC2 MMC4 Bus pwr PLBD Port,Stbd Fwd Bkhd Mtrs 2 PLBD Stbd Door Mtr 2
	Port Rad Lat 1−6 Mtr 2 RH Vent 6 Mtr 2
1	Port RMS Mid MRL Mtr 2
2	Ku Ant Sto/Dpy Mtr 2

CREW INDICATIONS	NOTES
SM (BFS SM 63) PL BAY DOORS During PLBD OP/CL, single mtr run time noted on actuators listed at left	(1) Single mtr time (2) ✓MCC for Ku Ant stow reqmts
(R13L) During Rad Dpy/Sto ops: RAD LAT CNTL PORT tb indicates single mtr ops	

EPS SSR−129
BUS LOSS: AC2 AMC2

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:D) • cb MCA LOGIC MCA PWR AC2 3Φ AFT 2 − op

	EQUIP/FUNCTION LOST
	AC2 AMC2 Bus pwr LH,RH Vents 8,9 Mtr 2
1	ET Door Mtrs: C/L Lat Actr 1 Mtr 2 L Dr Uplock Lat Mtr 2 R Dr Closure Mtr 2 Uplock Lat Mtr 2

CREW INDICATIONS	NOTES
NONE	(1) Redundant mtrs remain

EPS SSR−130
BUS LOSS: AC3 (Includes all AC3 sub−buses)

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
1	• Perform FC3 SHUTDN (FC SHUTDN Cue Card) then:		FC3 Pumps and pH Snsr		MASTER ALARM Light/Tone − on	(1) * TIME CRITICAL * FC3 must be shut down within 9 min to avoid potentially hazardous condition
	(R2) • BLR CNTLR/HTR 2 − B • 3 − A		Hyd H2O Blr 2 Cntlr A 3 Cntlr B		(F7) C/W FREON LOOP lt − on C/W FC PUMP lt − on C/W AC VOLT lt − on C/W H2O LOOP lt − on SM ALERT Light/Tone − on	
	(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl				(F9) AC ΦA,ΦB,ΦC AC volts < 90	(2) Vlv holds position
	(L1) • IMU FAN B(A) − ON • C − OFF • H2O PUMP LOOP 2 − GPC • Perform (H2O Loop 2 only), H2O PUMP OPS via GPC, ECLS SSR−10 • H2O PUMP LOOP 1 − OFF • CAB FAN A − OFF • B − ON • AV BAY 1 FAN (two) − ON •✓AV BAY 2 FAN A − ON • B − OFF • 3 FAN A − OFF • ✓B − ON • FREON PUMP LOOP 2 − B	2 3	IMU Fan C H2O Loop 2 Pump man ON capability H2O Loop 1 Byp Cntlr, Sig Condr H2O Loop 1 Byp Vlv pwr Cabin Fan A Av Bay 1 Sig Condr, Xdcrs (ECLS SC2) Av Bay 2 Fan B Av Bay 3 Fan A Freon Loop 2 Pump A		(LIGHTS LOST) Instr lts L/Ctr (pnls C2,F6, F7) MS pnl lts (pnls R10, R12) OS pnl lts (pnls A1,A2,A6, A7,A8,A13,L9)	(3) Av Bay 1 Fan ΔP, Air Out Temp snsrs lost
4	If AV BAY FIRE POWERDOWN not performed: • Perform RAD ISOL RECOVERY, ECLS SSR−9 for Freon Loop 1				(FSMs) S67 AC VOLTS 3 S86 HYD RSVR Q S86 WSB T S66 AV BAY 1 FAN S66 CABIN FAN (2) S66 IMU FN SPD B S69 FC PUMP 3 S69 FC H2 PUMP 3 S88 FREON FLOW 1 S88 FREON QTY 1 S88 FRN PL HX 2 S88 H2O PUMP P1 S88 H2O PUMP P2 SM0 THRM HYD (B) SM2 HYD QTY (B)	(4) Instrumentation loss caused rad isolation (5) Rad isolation may cause FES shutdown
	(L4:P) • cb AC2 ΦA LG SNSR 2 − cl	6	Prox Snsr Elec box 1	5	Possible 'S88 EVAP OUT T 1(2)'	(6) Brake/Skid Cntl Box A,B enabled before WOW
	(O17:C) • SIG CONDR FREON A − AC2 • SIG CONDR FREON B − AC2	7 10	Freon Sig Condr A AC3 pwr (ECLS SC1A) Freon Sig Condr B AC3 pwr (ECLS SC1B)		(R1) FC3 COOL PUMP ΔP tb − bp	(7) Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate, and Accum Qty snsrs lost
	(CDR SEAT PNL) • CDR SEAT PWR BUS SEL − AC2 (up)		CDR Seat Adj via AC3 pwr	8 9	(F6,F8) LDG GEAR NOSE, R tb − bp	(8) Indicates DN when NLG down
	(PLT SEAT PNL) • SEAT PWR BUS SEL − AC2 (up)		PLT Seat Adj via AC3 pwr		HYD/APU HYD QTY 3 ind − 0% APU H2O QTY ind − 0%	(9) Will not indicate DN when RMG down
11	SM 60 SM TABLE MAINT • Inhibit 0612605, 0612600, 0612640, 0612610				(O1) H2O PUMP OUT PRESS LOOP 1 meter ind: 0 psia H2O PUMP OUT PRESS LOOP 2 ind: 20−25 psia	(10) Freon Loop 2 P/L Hx Flow Rate, Freon Loop 1 ICH Flow Rate, and Accum Qty snsrs lost
12	(R13U) • C/W PARAM SEL tw (three) − 082, 112, 053, 105, 115 • C/W PARAM − INH • C/W MEM − CLEAR • C/W PARAM SEL tw (three) − > 119				If CABIN FAN A selected: C/W AV BAY/CAB AIR lt − on 'S66 CABIN AIR'	(11) Inhibits H2O Loop 1 Pump ΔP, Pump Out Press, Pump Out Temp, Accum Qty, respectively
	Refer to OMS/ RCS Slide Rule for vlv loss info (use FPC3 Slide for Aft RCS, and FMC3 for Fwd RCS)				If APUs active and using BLR CNTLR/HTR 2A or 3B: C/W APU TEMP lt − on after ~2 min	(12) Inhibits Primary C/W for FC3 Stack Temp and Pump ΔP, AC3 Voltage, H2O Loop 1,2 Pump P
			NLG, RMG B/U Rel 1 Fire 2, Arm		STAR TRKR DR POS −Z − OP/CL time incr from 8 to 16 sec	
	(Continued)		(Continued)		(MO51F) CO2 RMVL SYS CNTLR 2 FAIL lt − on Impending: 'S66 CO2 RL SYS PCO2' 'S66 CAB PPCO2' (Continued)	

EPS SSR−130 (Cont)
BUS LOSS: AC3

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM			R ADP deploy time incr from 15 to 30 sec	(13) PEVs, Actuators, Bed A P, Bed B P, and Bed dP will be recovered after system reconfig
(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 2 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)	13	CO2 Rmvl Sys: Cntlr 2 Fan AC3 pwr Compressor AC3 pwr	SM (BFS SM 63) PL BAY DOORS During PLBD OP/CL, single mtr run time noted on actuators listed at left	(14) ✓MCC for Ku Ant stow reqmts
(MA73C:C) cb MCA LOGIC MCA PWR • AC3 3Φ FWD 3 − op	14 15 15	KU ANT Sto/Dpy Mtr 1 AC3 FMC3 Bus pwr R ADP Dpy Mtr 1 −Z Star Trkr Dr Sys 2 OP/CL capability	During Rad Dpy/Sto ops: (R13L) RAD CNTL tbs (four) indicate single mtr ops	(15) Redundant mtrs remain
• AC3 3Φ MID 2 − op		LH Vents 1,2 Mtr 1 AC3 MMC2 Bus pwr PLBD C/L Lat 1−4 Mtr 2 5−8 Mtr 2 Port Aft Blkhd Mtr 2 Stbd Rad Lat 7−12 Mtr 2 Dpy/Sto Mtr 2 LH Vent 6 Mtr 2 3 Mtr 1		(16) Hum Sep A,B Speed Norm Snsrs lost
(MA73C:D) cb MCA LOGIC MCA PWR • AC3 3Φ AFT 3 − op • MID 4 − op		AC3 AMC3 Bus pwr RH Vents 8,9 Mtr 1 AC3 MMC4 Bus pwr PLBD C/L Lat 9−12 Mtr 2 13−16 Mtr 1 Stbd Aft Blkhd Mtr 1 Port Door Mtr 1 Port Rad Lat 7−12 Mtr 2 Dpy/Sto Mtr 2 RH Vents 3,5 Mtrs 2		(17) IMU Fan A,B,C Speed Norm Snsrs lost
(MA73C:E) • cb AC3 PAYLOAD 3Φ − op		AC3 pwr to MS, PS Patch pnls		
(MA73C:G) • cb AC3 GALLEY FAN (three) − op		Galley Fan		
(MA73C:H,I) • cb AC3 FWD RCS VLV (three) − op • cb AC3 AFT POD VLV GP 3 (three) − op				
(L4:A) • cb UTIL PWR A15/MO13Q AC3 − op		AC3 Utility pwr (A15/MO13Q)		
(L4:C−E) cb AC3 • FC3 PUMPS (three) − op • R ENG (three) − op • L ENG (three) − op				
(L4:F−H) cb AC3 • H2O LOOP PUMP 2 (three) − op • AV BAY 3 FAN A (three) − op • AV BAY 2 FAN B (three) − op				
(L4:I,J) cb AC3 • IMU FAN C (three) − op • ΦA SIG/CONDR HUM SEP − op • ΦB SIG/CONDR IMU FAN − op	16 17	Hum Sep Sig Condr (ECLS SC5) IMU Fan Sig Condr (ECLS SC7)		
(Continued)		(Continued)		

EPS SSR−130 (Cont)
BUS LOSS: AC3

ACTIONS		EQUIP/FUNCTION LOST
ONLY ON MCC CALL, PERFORM		
(L4:K,L) cb AC3 • CABIN FAN A (three) − op • ΦA H2O CNTLR 1 − op • ΦB AV BAY 1 S/C − op		
(L4:M,N) cb AC3 • FREON LOOP 2 PUMP A (three) − op • ΦA FREON FLOW PROP 2 − op • ΦB FREON SIG/CONDR − op	2	Freon Loop 2 Flow Prop Vlv
(L4:N) • cb AC3 ΦC RAD ISOL B − op	18	Freon Loop 1,2 Rad Isol Motor B
(L4:O) cb AC3 • ΦA BLR HYD BYP 1A − op • ΦB HYD QTY 3 − op • ΦC BLR HYD BYP 3B − op		Hyd Rsvr 3 Qty Snsr
(L4:P) cb AC3 • ΦA LG SNSR 1 − op • ΦB RAD CNTLR 2A − op • ΦC TACAN 3 − op	19	Freon Loop 2 Cntlr A Rad Byp Vlv Mtr Tacan 3
(L4:Q) cb AC3 • ΦA LTG COAS − op • ΦB LTG PNL MS − op • ΦC LTG PNL OS − op		Sta 1,2 COAS ltg pwr MS pnl lts (pnls R10,R12) OS pnl lts (pnls A1,A2,A6, A7,A8,A13,L9)
(L4:R) • cb AC3 ΦB INST L/CTR − op		L/Ctr Inst lts (pnls C2,F6,F7)
	15	ET Door Mtrs: C/L Lat Actr 2 Mtr 2 L Dr Closure Mtr 2 R Dr Closure Mtr 1 Uplock Lat Mtr 1
	20 21 21	Port RMS: MPM Mtr 1 FWD MRL Mtr 2 AFT MRL Mtr 1

CREW INDICATIONS	NOTES
	(2) Vlv holds position (15) Redundant mtrs remain (18) Motor A remains (19) Bypass vlv holds position and Cntlr B Rad Byp Vlv Mtr remains (20) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison (21) Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists

EPS SSR−131
BUS LOSS: AC3 ΦA

	ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS	NOTES
	(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl				MASTER ALARM Light/Tone − on	(1) If H2O Loop 2 Pump active, Loop 2 Pump Out Press must drop below 45 psia to trigger C/W
	(L1) • ✓IMU FAN B − ON • ✓C − OFF • H2O PUMP LOOP 1 (two) − ON, B • H2O PUMP LOOP 2 − GPC • Perform (H2O Loop 2 only), H2O PUMP OPS via GPC, ECLS SSR−10 • H2O PUMP LOOP 1 − OFF • FREON PUMP LOOP 2 − B • ✓AV BAY 2 FAN A − ON • ✓B − OFF • ✓3 FAN A − OFF • ✓B − ON		1Φ of IMU Fan C 1Φ of H2O Loop 2 Pump man ON H2O Loop 1 Byp Cntlr, Sig Condr H2O Loop 1 Byp vlv pwr 1Φ of Freon Loop 2 Pump A 1Φ of AV Bay 2 Fan B 1Φ of AV Bay 3 Fan A	1	(F7) C/W AC VOLT lt − on C/W H2O LOOP lt − on	(2) Indicates DN when NLG down (3) H2O Loop 1 Pump Out Press, Pump ΔP, Accum Qty, Pump Out Temp snsrs lost
			1Φ of Cabin Fan A		(F9) AC3 ΦA AC volts < 90	(4) Will not indicate DN when RMG down
	(L4:P) • cb AC2 ΦA LG SNSR 2 − cl		Prox Snsr Electronics Box 1	2 4	(F6/F8) LDG GEAR NOSE, R tb − bp	(5) H2O Loop 1 Byp Vlv holds position
7	SM 60 SM TABLE MAINT • Inhibit 0612605, 0612600, 0612640, 0612610 • Reset upper limit of 0450314 (FC3 H2 PUMP STATUS) to current value +0.3 volts		1Φ of FC3 H2 Pump 1Φ of FC3 Coolant Pump		(O1) H2O PUMP OUT PRESS LOOP 1 meter ind − 0 psia (FSMs) S67 AC VOLTS 3 S69 FC H2 PUMP 3 S86 WSB T S66 HUMID SEP B S88 H2O PUMP P 1 S88 H2O LOOP TEMP S88 H2O LOOP 1 QTY SM0 THRM HYD (B)	(6) Brake/Skid Cntl Box A,B enabled before WOW (7) Inhibits H2O Loop 1 Pump ΔP, Pump Out Press, Pump Out Temp, Accum Qty, respectively
	(R2) • BLR CNTLR/HTR 2 − B		Hyd H2O Blr 2 Cntlr A		HYD/APU APU H2O QTY 2 ind − 0%	(8) Inhibits Primary C/W for H2O Loop 1,2 Pump P and AC3 voltage
8	(R13U) • C/W PARAM SEL tw (three) − 105, 115, 053 • C/W PARAM − INH • C/W MEM − CLEAR • C/W PARAM SEL tw (three) − > 119			1	If H2O PUMP LOOP 2 active: 'S88 H2O PUMP P 2' (O1) H2O PUMP OUT PRESS LOOP 2 ind − 40−45 psia	(9) Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into short. After opening cbs, refer to the following SSRs for functions lost and crew indications caused by unpwring sub−buses: SSR−134, SSR−135, SSR−136, SSR−137
9	If bus shorted: • Open all AC3 ΦA cbs that pwr 3Φ loads on pnls L4: C−I,K,M (9 cbs), MA73C: G−I (3 cbs) • Open all AC3 3Φ ganged cbs on pnls L4:B (1 cb), MA73C: C−G (7 cbs)	10	If bus shorted: AC3 payload 3Φ Bus pwr (pwrs MS, PS Patch panel) AC3 FMC3 Bus pwr MMC2 Bus pwr MMC4 Bus pwr AMC3 Bus pwr	9	If APUs active and using BLR CNTLR/HTR 2A: C/W APU TEMP lt − on after ~2 min If IMU FAN C ON: S66 IMU FAN DP S66 IMU FN SPD C If CO2 Removal Sys Cntlr 2 selected: (MO51F) CO2 RMVL SYS CNTLR 2 FAIL lt − on	(10) Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into short
		11	1Φ of AC Utility Power Outlets at A15 and MO13Q			(11) MCC will provide equipment reconfig info if reqd
	(Continued)		(Continued)			

EPS SSR−131 (Cont)
BUS LOSS: AC3 ΦA

	ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 2 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)	12	CO2 Rmvl Sys Cntlr 2 1 Φ of CO2 Rmvl Sys: Fan AC3 pwr Compressor AC3 pwr	(M051F) CO2 RMVL SYS CNTLR 2 FAIL lt − on Impending: 'S66 CO2 RL SYS PCO2' 'S66 CAB PPCO2'	(12) PEVs, Actuators, Bed A dP, Bed B dP, and Fan dP will be recovered after system recovered
13	If bus not shorted: (L1)				(13) For unshorted bus, perform single Φ isolation steps to prevent pwring single phase loads with coupled energy from remaining two phases
14	• Install sw guard (stowed in IFM tool kit) over Cab Fan A sw • Perform the following BUS ISOLATION steps				(14) Switch guard installed to prevent Cab Fan A from being turned off during LiOH can changeout and cabin fan filter cleaning
					(15) Hum Sep A,B Speed Norm snsrs lost
					(16) Vlv holds position

13	BUS ISOLATION		
	IF BUS NOT SHORTED, PERFORM		
	(L4:J) • cb AC3 ΦA SIG CONDR HUM SEP − op	15	Hum Sep Sig Condr (ECLS SC 5)
	(L4:L) • cb AC3 ΦA H2O CNTLR 1 − op		
	(L4:N) • cb AC3 ΦA FREON FLOW PROP 2 − op	16	Freon Loop 2 Flow Prop Vlv
	(L4:O) • cb AC3 ΦA BLR HYD BYP 2A − op		
	(L4:P) • cb AC3 ΦA LG SNSR 1 − op		
	(L4:Q) • cb AC3 ΦA LTG COAS − op		Sta 1,2 COAS pwr
			NLG,RMG Backup Rel 1 Fire 2, Arm FC 3 pH Snsr
			Port RMS: 1Φ of MPM Mtr 1 FWD MRL Mtr 2 AFT MRL Mtr 1
			1Φ of AC3 payload 3Φ Bus pwr (pwrs MS, PS Patch pnl)

EPS SSR−132
BUS LOSS: AC3 ΦB

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl		MASTER ALARM Light/Tone − on	(1) If H2O Loop 2 Pump active, Loop 2 Pump Out Press must drop below 45 psia to trigger C/W
(L1) • ✓IMU FAN B − ON • ✓C − OFF • H2O PUMP LOOP 1 (two) − ON,B • H2O PUMP LOOP 2 − GPC • H2O PUMP LOOP 1 BYP MODE − AUTO • H2O PUMP LOOP 2 BYP MODE − MAN • AV BAY 1 FAN (two) − ON • FREON PUMP LOOP 2 − B • ✓AV BAY 2 FAN A − ON • ✓B − OFF • ✓3 FAN A − OFF • ✓B − ON	1Φ of IMU Fan C 1 1Φ of H2O Loop 2 Pump man ON capability 2 Av Bay 1 Sig Condr, Xdcrs (ECLS SC2) 1Φ of Freon Loop 2 Pump A 1Φ of AV Bay 2 Fan B 1Φ of AV Bay 3 Fan A	(F7) C/W AC VOLT lt C/W FREON LOOP lt SM ALERT lt C/W H2O PUMP lt	(2) Av Bay 1 Fan ΔP, Air Out Temp snsrs lost
		(F9) AC3 ΦB AC volts < 90	(3) Instrumentation loss caused rad isolation
		(FSMs) S67 AC VOLTS 3 S69 FC H2 PUMP 3 S86 HYD RSVR Q SM2 HYD QTY (B) S66 AV BAY 1 FAN S66 IMU FN SPD B S88 FREON FLOW 1 S88 FRN PL HX 2 S88 FREON QTY 1 S88 H2O PUMP P 2	(4) Rad isolation may have caused FES shutdown
3 • Perform RAD ISOL RECOVERY, ECLS SSR−9 for Freon Loop 1		4 Possible 'S88 EVAP OUT T 1(2)'	(5) Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate, and Accum Qty snsrs lost
	1Φ of Cabin Fan A	HYD/APU HYD QTY 3 − 0%	(6) Freon Loop 2 P/L Hx Flow Rate Freon Loop 1 ICH Flow Rate, and Accum Qty snsrs lost
(O17:C) • SIG CONDR FREON A − AC2 • SIG CONDR FREON B − AC2	5 Freon Sig Condr A AC3 pwr (ECLS SC1A) 6 Freon Sig Condr B AC3 pwr (ECLS SC1B)	(LIGHTS LOST) L/Ctr Instr lts (pnls C2,F6,F7) MS pnl lts (pnls R10,R12)	(7) Inhibits Primary C/W for AC3 Voltage and H2O Loop 2 Pump P
(R13U) 7 • C/W PARAM SEL tw (three) − 053,115 • C/W PARAM − INH 8 • Change PRI C/W PARAM 105 low limit to 1.50 • C/W MEM − CLEAR • C/W PARAM SEL tw (three) − > 119		(O1) 1 H2O PUMP OUT PRESS LOOP 2 − 40−45 psia FREON FLOW 1 − 578 pph AV Bay 1 Air Out − 45 degF	(8) Sets H2O Loop 1 Pump P low limit to 45 psia
SM 60 SM TABLE MAINT • Reset upper limit of 0450314 (FC3 H2 PUMP STATUS) to current value + 0.3 volts	1Φ of FC3 H2 Pump 1Φ of FC3 Coolant Pump		(9) Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into short. After opening cbs, refer to the following SSRs for functions lost and crew indications caused by unpwring sub−buses: SSR−134, SSR−135, SSR−136, SSR−137
(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 2 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/ DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)	1Φ of CO2 Rmvl Sys: Fan AC3 pwr Compressor AC3 pwr		(10) Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into shorts
9 If bus shorted: • Open all AC3 ΦB cbs that pwr 3Φ loads on pnls L4: C−I,K,M (9 cbs), MA73C: G−I (3 cbs) • Open all AC3 3Φ ganged cbs on pnls L4:B (1 cb), MA73C: C−G (7 cbs)	10 If bus shorted: AC3 payload 3Φ Bus pwr (pwrs MS, PS Patch panel) 9 AC3 FMC3 Bus pwr MMC2 Bus pwr MMC4 Bus pwr AMC3 Bus pwr		(11) MCC will provide equipment reconfig info if reqd
	11 1Φ of AC Utility Power Outlets at A15 and MO13Q		
(Continued)	(Continued)		

EPS SSR−132 (Cont)
BUS LOSS: AC3 ΦB

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
12 If bus not shorted: (L1) 13 • Install sw guard (stowed in IFM tool kit) over Cab Fan A sw • Perform the following BUS ISOLATION steps			(12) For unshorted bus, perform single Φ isolation steps to prevent pwring single phase loads with coupled energy from remaining two phases (13) Switch guard installed to prevent Cab Fan A from being turned off during LiOH can changeout and cabin fan filter cleaning (14) IMU Fan A,B,C Speed Norm snsr lost (15) Bypass vlv holds position and Cntlr B Rad Byp Vlv Mtr remains

12 BUS ISOLATION	
IF BUS NOT SHORTED, PERFORM	
(L4:J) • cb AC3 ΦB SIG CONDR IMU FAN − op	14 IMU Fan Sig Condr (ECLS SC7)
(L4:L) • cb AC3 ΦB AV BAY 1 S/C − op	
(L4:N) • cb AC3 ΦB FREON SIG CONDR − op	
(L4:O) • cb AC3 ΦB HYD QTY 3 − op	Hyd Rsvr 3 Qty Snsr
(L4:P) • cb AC3 ΦB RAD CNTLR 2A − op	15 Freon Loop 2 Cntlr A Rad Byp Vlv Mtr
(L4:Q) • cb AC3 ΦB LTG PNL MS − op	MS pnl lts (pnl R10,R12)
(L4:R) • cb AC3 ΦB INST L/CTR − op	L/Ctr Inst lts (pnl C2,F6,F7)
	Port RMS: 1Φ of MPM Mtr 1 FWD MRL Mtr 2 AFT MRL Mtr 1
	1Φ of AC3 payload 3Φ Bus pwr (pwrs MS, PS Patch pnl)

EPS SSR−133
BUS LOSS: AC3 ΦC

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) − cl		MASTER ALARM Light/Tone − on	(1) H2O Loop 2 Pump Out Press must drop below 45 psia to trigger C/W
(L1) •✓IMU FAN B − ON • ✓C − OFF • H2O PUMP LOOP 1 (two) − ON,B • H2O PUMP LOOP 2 − GPC • H2O PUMP LOOP 1 BYP MODE − AUTO • H2O PUMP LOOP 2 BYP MODE − MAN •✓FREON PUMP LOOP 2 − B •✓AV BAY 2 FAN A − ON • ✓B − OFF • ✓3 FAN A − OFF • ✓B − ON	1Φ of IMU Fan C 1 1Φ of H2O Loop 2 Pump man ON capability 1Φ of Freon Loop 2 Pump A 1Φ of AV Bay 2 Fan B 1Φ of AV Bay 3 Fan A	(F7) C/W AC VOLT lt − on C/W FREON LOOP lt − on SM ALERT lt − on C/W H2O PUMP lt − on	(2) Inhibits Primary C/W for AC3 Voltage and H2O Loop 2 Pump P
	1Φ of Cabin Fan A	(F9) AC3 ΦC AC volts < 90	(3) Sets H2O Loop 1 Pump P low limit to 45 psia
(R2) • BLR CNTLR/HTR 3 − A	Hyd H2O Blr 3 Cntlr B	(LIGHTS LOST) OS pnl lts (pnls A1,A2,A6, A7,A8,A13,L9)	(4) Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into shorts
(R13U) • C/W PARAM SEL tw (three) − 053, 115 2 • C/W PARAM − INH 3 • Change PRI C/W PARAM 105 low limit to 1.50 • C/W MEM − CLEAR • C/W PARAM SEL tw (three) − > 119		(FSMs) S69 FC H2 PUMP 3 S86 WSB T SM0 THRM HYD (B) 1 S88 H2O PUMP P 2 1 (O1) H2O PUMP OUT PRESS LOOP 2 ind − 40−45 psia If APUs active and using BLR CNTLR/HTR 3B: C/W APU TEMP lt − on after ~2 min	(5) Ganged cd. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into short. After opening cbs, refer to the following SSRs for functions lost and crew indications caused by unpwring subbuses: SSR−134, SSR−135, SSR−136, SSR−137
SM 60 SM TABLE MAINT • Reset upper limit of 0450314 (FC3 H2 PUMP STATUS) to current value + 0.3 volts	1Φ of FC3 H2 Pump 1Φ of FC3 Coolant Pump		(6) For unshorted bus, perform single Φ isolation steps to prevent pwring single phase loads with coupled energy from remaining two phases
(MO51F) If CO2 RMVL SYS flown and if CO2 RMVL SYS CNTLR 2 selected: • Perform CO2 RMVL SYS CNTLR CONFIG: ACT 1/ DEACT 2(ACT 2/DEACT 1) (ORB OPS, ECLS)	1 Φ of CO2 Rmvl Sys: Fan AC3 pwr Compressor AC3 pwr		(7) MCC will provide equipment reconfig info if reqd
If bus shorted: 5 • Open all AC3 ΦC cbs that pwr 3Φ loads on pnls L4: C−I,K,M (9 cbs), MA73C: G−I (3 cbs) • Open all AC3 3Φ ganged cbs on pnls L4:B (1 cb), MA73C: C−G (7 cbs)	4 If bus shorted: AC3 payload 3Φ Bus pwr (pwrs MS, PS Patch panel) 5 AC3 FMC3 Bus Pwr MMC2 Bus Pwr MMC4 Bus Pwr AMC3 Bus Pwr		(8) Switch guard installed to prevent Cab Fan A from being turned off during LiOH can changeout and cabin fan filter cleaning
6 If bus not shorted: (L1) 8 • Install sw guard (stowed in IFM tool kit) over Cab Fan A sw • Perform the following BUS ISOLATION steps	7 1Φ of AC Utility Power Outlets at A15 and MO13Q		
(Continued)	(Continued)		

EPS SSR−133 (Cont)
BUS LOSS: AC3 ΦC

	BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
6	IF BUS NOT SHORTED, PERFORM				(6) For unshorted bus, perform single Φ isolation steps to prevent pwring single phase loads with coupled energy from remaining two phases
	(L4:N) • cb AC3 ΦC RAD ISOL B − op	9	Freon Loop 1,2 Rad Isol Motor B		(9) Motor A remains
	(L4:O) • cb AC3 ΦC BLR HYD BYP 3B − op				
	(L4:P) • cb AC3 ΦC TACAN 3 − op		Tacan 3		
	(L4:Q) • cb AC3 ΦC LTG PNL OS − op		OS pnl lts (pnls A1,A2,A6, A7,A8,A13,L9)		
			Port RMS: 1Φ of MPM Mtr 1 FWD MRL Mtr 2 AFT MRL Mtr 1		
			1Φ of AC3 payload 3Φ Bus pwr (pwrs MS, PS Patch pnl)		

EPS SSR−134
BUS LOSS: AC3 FMC3

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:C) • cb MCA LOGIC MCA PWR AC3 3Φ FWD 3 − op

	EQUIP/FUNCTION LOST
	AC3 FMC3 Bus pwr LH Vent 1,2 Mtr 1
1	R ADP Dpy Mtr 1
1	−Z Star Trkr Dr Sys 2 OP/CL capability

CREW INDICATIONS	NOTES
−Z Star Trkr Dr OP/CL time incr from 8 to 16 sec	(1) Redundant mtr remains
R ADP deploy time incr from 15 to 30 sec	

EPS SSR−135
BUS LOSS: AC3 MMC2

ACTIONS
NONE

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:C) • cb MCA LOGIC MCA PWR AC3 3Φ MID 2 − op

	EQUIP/FUNCTION LOST
	AC3 MMC2 Bus pwr PLBD C/L Lat 1−4 Mtr 2 5−8 Mtr 2 Port Aft Bkhd Mtr 2 Stbd Rad Lat 7−12 Mtr 2 Dpy/Sto Mtr 2 LH Vent 6 Mtr 2 3 Mtr 1
1	Port RMS Aft MRL Mtr 1
2	KU ANT Dpy/Sto Mtr 1

CREW INDICATIONS	NOTES
SM (BFS SM 63) PL BAY DOORS	(1) Single mtr time
During PLBD OP/CL, single mtr run time noted on actuators listed at left	(2) ✓MCC for Ku Ant stow reqmts
(R13L) During Rad Dpy/Sto ops, RAD CNTL STBD tb (two) indicates single mtr ops	

EPS SSR−136
BUS LOSS: AC3 MMC4

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE	1 2	Port RMS: MPM Mtr 1 Fwd MRL Mtr 2	SM (BFS SM 63) PL BAY DOORS	(1) Single mtr time. One failure away from EVA to stow MPM or from RMS jettison
			During PLBD OP/CL, single mtr run time noted on actuators listed at left	(2) Single mtr time
BUS ISOLATION			(R13L) During Rad Dpy/Sto ops, RAD CNTL PORT tb (two) indicates single mtr ops	
ONLY ON MCC CALL, PERFORM				
(MA73C:D) • cb MCA LOGIC MCA PWR AC3 3Φ MID 4 − op		AC3 MMC4 Bus pwr PLBD C/L Lat 9−12 Mtr 2 13−16 Mtr 1 Stbd Aft Blkhd Mtr 1 Port Door Mtr 1 RH Vents 3,5 Mtrs 2 Port Rad Lat 7−12 Mtr 2 Dpy/Sto Mtr 2		

EPS SSR−137
BUS LOSS: AC3 AMC3

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE			NONE	(1) Redundant mtrs remain
BUS ISOLATION				
ONLY ON MCC CALL, PERFORM				
(MA73C:D) • cb MCA LOGIC MCA PWR AC3 3Φ AFT 3 − op		AC3 AMC3 Bus pwr RH Vents 8,9 Mtr 1		
	1	ET Door Mtrs: C/L Lat Actr 2 Mtr 2 L Dr Closure Mtr 2 R Dr Closure Mtr 2 Uplock Lat Mtr 1		

EPS SSR−140
BUS LOSS: AC1 RCS/FMC1

ACTIONS
Refer to OMS/RCS Slide Rule for vlv loss info (Use FMC1 Slide for Fwd RCS)

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:H) • cb AC1 FWD RCS VLV (three) − op

EQUIP/FUNCTION LOST

	CREW INDICATIONS	NOTES
1	The following tb indications do not change position in response to cmds: (O8) FWD RCS TK ISOL 3/4/5 MANF ISOL 1	(1) Vlv remains in tb indicated position

EPS SSR−141
BUS LOSS: AC2 RCS/FMC2

ACTIONS
Refer to OMS/RCS Slide Rule for vlv loss info (Use FMC2 Slide for Fwd RCS)

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:H) • cb AC2 FWD RCS VLV (three) − op

EQUIP/FUNCTION LOST

	CREW INDICATIONS	NOTES
1	The following tb indication does not change position in response to cmds: (O8) FWD RCS MANF ISOL 2	(1) Vlv remains in tb indicated position

EPS SSR−142
BUS LOSS: AC3 RCS/FMC3

ACTIONS
Refer to OMS/RCS Slide Rule for vlv loss info (Use FMC3 Slide for Fwd RCS)

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:H) • cb AC3 FWD RCS VLV (three) − op

EQUIP/FUNCTION LOST

	CREW INDICATIONS	NOTES
1	The following tb indications do not change position in response to cmds: (O8) FWD RCS TK ISOL 1/2 MANF ISOL 3 4	(1) Vlv remains in tb indicated position

EPS SSR−143
BUS LOSS: AC1 POD/AMC1

	ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1	Refer to OMS/RCS Slide Rule for vlv loss info (use FPC1 Slide for Aft RCS)			(1) Vlv remains in tb indicated position

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:I) • cb AC 1 AFT POD VLV GP 1 (three) − op

EPS SSR−144
BUS LOSS: AC2 POD/AMC2

	ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1	Refer to OMS/RCS Slide Rule for vlv loss info (use FPC2 Slide for Aft RCS)			(1) Vlv remains in tb indicated position

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:I) • cb AC2 AFT POD VLV GP 2 (three) − op

EPS SSR−145
BUS LOSS: AC3 POD/AMC3

ACTIONS
1 Refer to OMS/RCS Slide Rule for vlv loss info (use FPC3 Slide for Aft RCS)

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:I) • cb AC3 AFT POD VLV GP 3 (three) − op

EQUIP/FUNCTION LOST

CREW INDICATIONS

NOTES
(1) Vlv remains in tb indicated position

EPS SSR−146
BUS LOSS: MNA/B POD/AMC1

ACTIONS
1 Refer to OMS/RCS Slide Rule for vlv loss info (use FPC1 Slide for Aft RCS)

BUS ISOLATION
ONLY ON MCC CALL, PERFORM
(MA73C:I) • AFT POD VLV LOGIC GP 1/3, 1/2 (two) − OFF

EQUIP/FUNCTION LOST
2 OMS Qty Gauging Degraded

CREW INDICATIONS
1 (O8) L,R OMS TK ISOL A tb − bp L OMS XFEED A tb − bp
(O7) AFT L,R RCS TK ISOL 3/4/5 A tb − bp MANF ISOL 2 tb − bp XFEED 3/4/5 tb − bp
(FSMs) RCS PWR FAIL

NOTES
(1) Vlv remains in last commanded position (2) ✓MCC for impacts to OMS Gauging

EPS SSR−147
BUS LOSS: MNB/C POD/AMC2

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 Refer to OMS/RCS Slide Rule for vlv loss info (use FPC2 Slide for Aft RCS)		1 (O8) L,R OMS XFEED B tb − bp	(1) Vlv remains in last commanded position (2) ✓MCC for impacts to OMS Gauging
BUS ISOLATION		(O7) AFT L,R RCS TK ISOL 3/4/5 B tb − bp MANF ISOL 1 tb − bp	
ONLY ON MCC CALL, PERFORM		(FSMs) RCS PWR FAIL	
(MA73C:I) • AFT POD VLV LOGIC GP 1/2, 2/3 (two) − OFF	2 OMS Qty Gauging Degraded		

EPS SSR−148
BUS LOSS: MNC/A POD/AMC3

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 Refer to OMS/RCS Slide Rule for vlv loss info (use FPC3 Slide for Aft RCS)		(O8) L,R OMS TK ISOL B tb − bp R OMS XFEED A tb − bp	(1) Vlv remains in last commanded position (2) ✓MCC for impacts to OMS Gauging
BUS ISOLATION		(O7) AFT L,R RCS TK ISOL 1/2 tb − bp MANF ISOL 3,4 tb − bp XFEED 1/2 tb − bp	
ONLY ON MCC CALL, PERFORM		(FSMs) RCS PWR FAIL	
(MA73C:I) • AFT POD VLV LOGIC GP 1/3, 2/3 (two) − OFF	2 OMS Qty Gauging Degraded		

EPS SSR−150
ALTERNATE PRIMARY PAYLOAD PWR

1.1

Attempt MNC/PRIPL connection again:

O13:E 1. ✓cb ESS 3AB MNC CONTR − cl
O14:B 2. ✓cb MNA MNC CONTR − cl
R1 3. PL PRI MNC − OFF, ON (tb−ON)

If MNC/PRIPL connection failed, attempt FC3/PRIPL connection:

R1 4. PL PRI MNC − OFF (tb−OFF)
5. FC3 − ON (tb−ON)

If FC3/PRIPL connection failed, attempt MNB/PRIPL connection:

O13:C 6. ✓cb ESS 2CA MNB CONTR − cl
O16:B 7. ✓cb MNC MNB CONTR − cl
R1 8. PL PRI FC3 − OFF (tb−OFF)
9. MNB − ON (tb−ON)

EPS SSR−200
AC PWR TRANSFER CABLE

NOTE

This procedure is designed to be a standalone procedure with all necessary Bus Loss Actions included. The procedure also may be entered from the MN bus or FPC Bus Loss Actions (MAL or ENT PKT)

1 (1) * TIME CRITICAL *

FC must be shut down within 9 min to avoid potentially hazardous condition

1 Which AC Bus is affected ?

AC1 | AC2 | AC3

2 Isolate AC1

- Perform FC1 SHUTDN (FC SHUTDN Cue Card), pwrdn not needed

(R2)
- BLR CNTLR/HTR 1 − A
- ✓3 − B

(L1)
- HUM SEP A − OFF
- B − ON
- IMU FAN A − OFF
- ✓B(C) − ON
- H2O PUMP LOOP 1 (two) − GPC,B
- H2O PUMP LOOP 2 − ON
- AV BAY 1 FAN A − OFF
- ✓B − ON
- ✓AV BAY 2 FAN A − ON
- B − OFF
- AV BAY 3 FAN A − ON
- B − OFF
- ✓FREON PUMP LOOP 1 − B
- FREON PUMP LOOP 2 − A

If CAB TEMP CNTLR 2 active:
(L1)
- CAB TEMP CNTLR − OFF

(MD44F)
- Remove pin from SEC ACTUATOR and BYP vlv linkage, connect linkage to PRI ACTUATOR

(L1)
- CAB TEMP CNTLR − 1

(WCS)
- ✓MODE − AUTO
- ✓CRADLE − AUTO
- ✓Hose stowed in cradle
- ✓WCS ON lt − OFF
- FAN SEP SEL sw − OFF
- HOSE BLOCK − SEP 2
- In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30−sec run complete
- FAN SEP SEL sw − 2

(EDO WCS)
- URINE DIVERTER VLV − FAN SEP 2
- URINAL SEL − SEP 2

→ 5

3 Isolate AC2

- Perform FC2 SHUTDN (FC SHUTDN Cue Card), pwrdn not needed

(R2)
- BLR CNTLR/HTR 1 − B
- 2 − A

(L4:F)
- cb AC1 H2O LOOP PUMP 1A/2 (three) − cl

(L1)
- HUM SEP B − OFF
- A − ON
- CABIN FAN B − OFF
- ✓A − ON
- IMU FAN B − OFF
- A(C) − ON
- H2O PUMP LOOP 1 (two) − GPC,A
- ✓H2O PUMP LOOP 2 − ON
- AV BAY 1 FAN B − OFF
- A − ON
- AV BAY 2 FAN A − OFF
- B − ON
- ✓AV BAY 3 FAN B − ON
- A − OFF
- FREON PUMP LOOP 1 − A

If CAB TEMP CNTLR 1 active:
(L1)
- CAB TEMP CNTLR − OFF

(MD44F)
- Remove pin from PRI ACTUATOR and BYP vlv linkage, connect linkage to SEC ACTUATOR

(L1)
- CAB TEMP CNTLR − 2

(WCS)
- ✓MODE − AUTO
- ✓CRADLE − AUTO
- ✓Hose stowed in cradle
- ✓WCS ON lt − OFF
- FAN SEP SEL sw − OFF
- HOSE BLOCK − SEP 1
- In next step, alternate fan sep will turn on for 30 sec. Normal ops may proceed after 30−sec run complete
- FAN SEP SEL sw − 1

→ 6

4 Isolate AC3

- Perform FC3 SHUTDN (FC SHUTDN Cue Card), pwrdn not needed

(R2)
- BLR CNTLR/HTR 2 − B
- 3 − A

(L4:F)
- cb AC1 H2O LOOP PUMP 1A/2 (three) − cl

(L1)
- IMU FAN C − OFF
- ✓B(A) − ON
- CABIN FAN A − OFF
- B − ON
- H2O PUMP LOOP 2 − GPC
- Perform (H2O Loop 2 only) H2O PUMP OPS via GPC, ECLS SSR−10
- H2O PUMP LOOP 1 − OFF
- ✓AV BAY 1 FAN B − ON
- A − OFF
- ✓AV BAY 2 FAN A − ON
- B − OFF
- AV BAY 3 FAN A − OFF
- ✓B − ON
- ✓FREON PUMP LOOP 2 − B

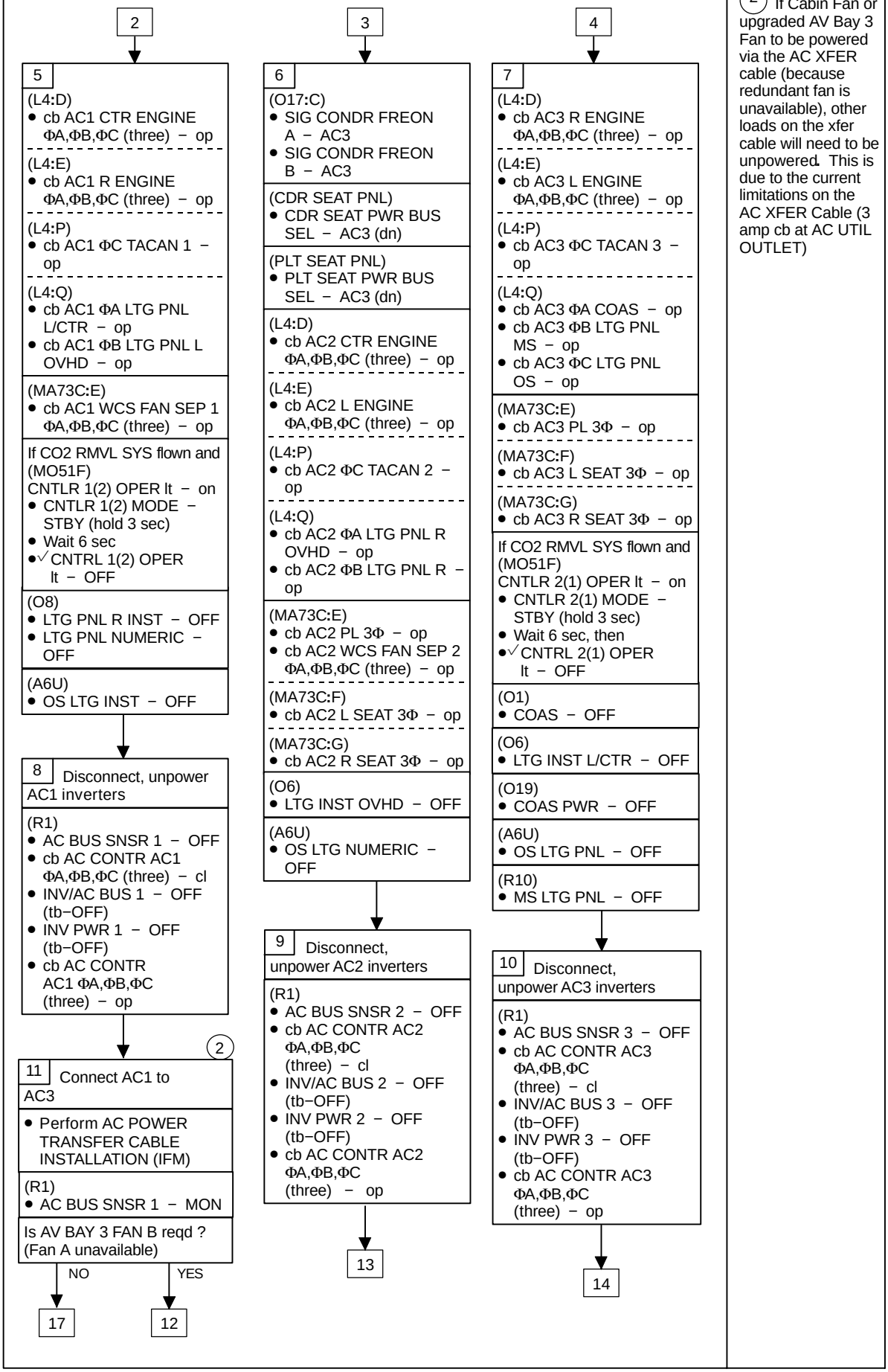
(O17:C)
- SIG CONDR FREON A − AC2
- SIG CONDR FREON B − AC2

(CDR SEAT PNL)
- CDR SEAT PWR BUS SEL − AC2 (up)

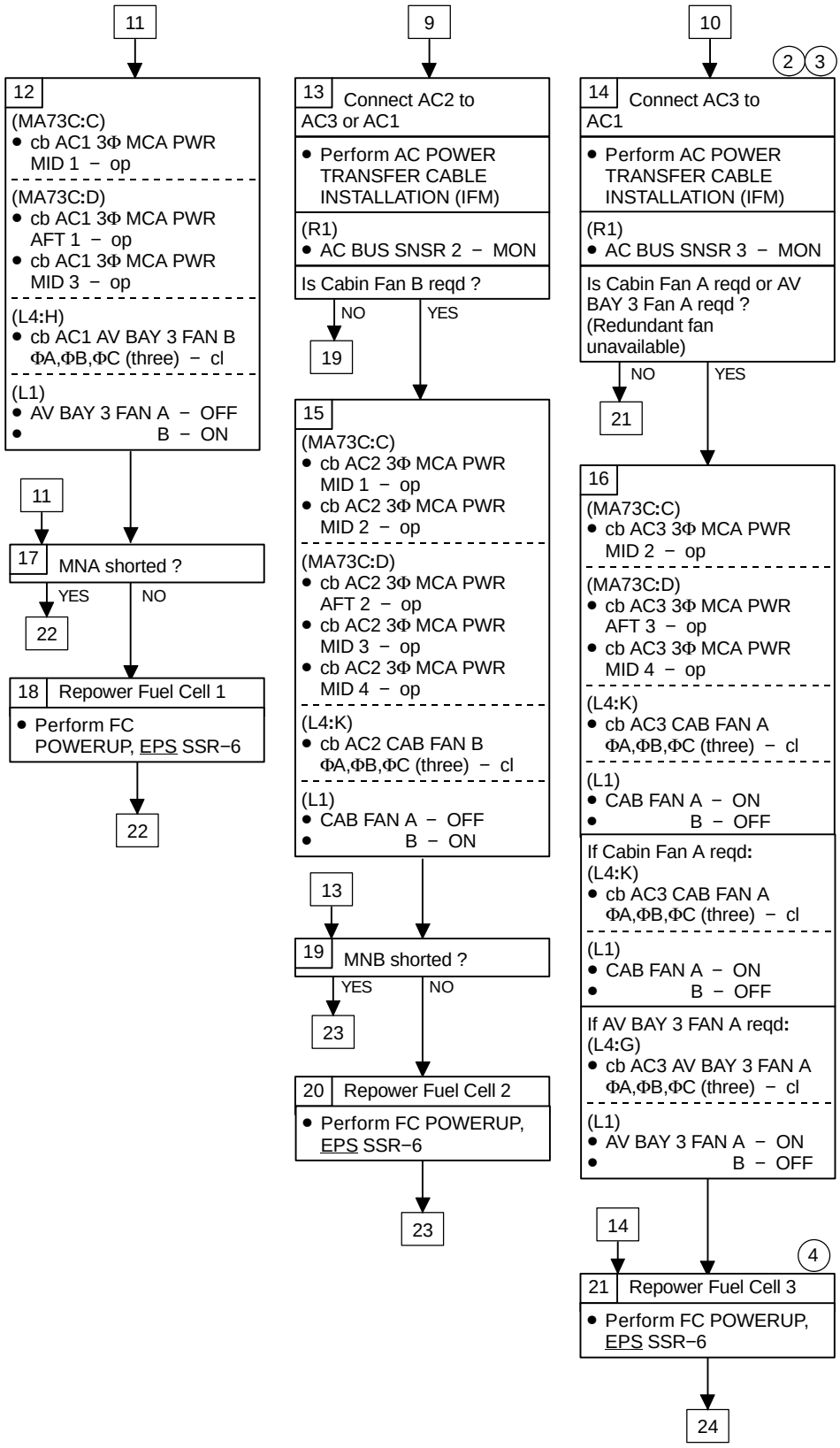
(PLT SEAT PNL)
- PLT SEAT PWR BUS SEL − AC2 (up)

→ 7

EPS SSR−200 (Cont)



(2) If Cabin Fan or upgraded AV Bay 3 Fan to be powered via the AC XFER cable (because redundant fan is unavailable), other loads on the xfer cable will need to be unpowered. This is due to the current limitations on the AC XFER Cable (3 amp cb at AC UTIL OUTLET)



(2) If Cabin Fan or upgraded AV Bay 3 Fan to be powered via the AC XFER cable (because redundant fan is unavailable), other loads on the xfer cable will need to be unpowered. This is due to the current limitations on the AC XFER Cable (3 amp cb at AC UTIL OUTLET)

(3) Due to the limitations of the AC UTIL OUTLET 3 amp cb, the Cabin Fan and AV Bay Fan cannot be powered on the transfer cable simultaneously

(4) For MNC short, SSR−6 ties FC3 to MNB through the PL PRI BUS

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AC1 LOAD REFERENCE TABLE

(5)

22 **CONTINUOUS EQUIPMENT** **After cable installation, the following equipment will be powered CONTINUOUSLY:**	AC CURRENT (amps/phase)	AC1 CURRENT AFTER CABLE INSTALLED		
		ΦA	ΦB	ΦC
(R1) FUEL CELL 1 PUMPS (6)	.81	.81	.81	.81
(L4:K) AC1 ΦA H2O CNTLR 2 (S/C)	.06	.06		
ΦB CAB AIR S/C	.04		.04	
(L4:L) ΦB AV BAY 2 S/C	.02		.02	
(L4:O) ΦB HYD QTY 1	.02		.02	
ΦA BLR HYD BYP SENSOR 1B	.07	.07		
ΦC BLR HYD BYP SENSOR 3A	.07			.07
(L4:L) ΦA CABIN TEMP CNTLR 2 (EL)	.04	.04		
(MA73C:F) ΦC OPS HYD ACTR INST (7)	.06			.06
(8)	SUBTOTAL AMPS/PHASE	.98	.89	.94
INTERMITTENT EQUIPMENT **After cable installation, the following equipment will be available for INTERMITTENT operation:**	AC CURRENT (amps/phase)	AC1 CURRENT		
		ΦA	ΦB	ΦC
(L4:K) AC1 ΦA H2O CNTLR 2 (BYP VLV) (9)	.14			
(L4:O) ΦA BLR HYD BYP VLV 1B	.21			
ΦC BLR HYD BYP VLV 3A	.21			
(L4:P) ΦA RAD CNTLR 1B (FREON LOOP 1 CNTLR B RAD BYP VLV MTR) (9) (10)	.17			
ΦB RAD CNTLR 2B (FREON LOOP 2 CNTLR B RAD BYP VLV MTR) (9) (10)	.17			
(MA73C:C) AC1 3Φ FWD 1 RH VENTS 1/2 MTR 1	OP − .28 CL − .21			
−Y STAR TRKR DR SYS 1 OP/CL (9)	.14			
L ADP DPY MTR 1 (9)	.14			
AC1 3Φ MID 1 RH VENT 3 MTR 1	OP − .59 CL − .29			
5 MTR 1	OP − .59 CL − .29			
6 MTR 1	OP − .57 CL − .27			
PL RETEN LAT MTR 1	.41			
PORT RAD LAT 1−6, 7−12 MTRS 1 (2 ea)	.26			
PORT RAD DPY/STO MTR 1	.26			
PLBD C/L LAT 9−12 MTR 1	.72			
PORT, STBD FWD BLKHD MTRS 1	.87			
PLBD STBD DOOR MTR 1	1.64			
PORT RMS MID RETN LAT MTR 1	.25			
(Cont)				

(5) Total current for each phase of AC bus must not exceed 3 amps continuous. Table should be used to calculate total phase current. CONTINUOUS EQUIPMENT will be powered continuously. INTERMITTENT EQUIPMENT will be available for intermittent ops. CONTINGENCY EQUIPMENT will be available for contingency use only

(6) If MNA shorted, FC pumps will not be restarted

(7) Includes RUD/SPDBRK and ELVN SW VLV Xdcrs

(8) AC Utility Outlet cb can handle up to 6 amps for up to 5 sec. AC current for vent door ops peaks at ~4.5 amps/phase for 1 sec for dual mtr ops, peaks for 6 sec for single mtr ops. The cb should not trip if steady−state loads less than 3 amps/phase for dual mtr ops or less than 1 amp/phase for single mtr ops on all associated vent doors

(9) Normal individual load operation should not trip AC Utility Outlet cb if steady−state loads less than 3 amps/phase

(10) If MNA DA1 is not regained, these mtrs (auto and man cntl) will not be operational

AC1 LOAD REFERENCE TABLE (Cont)

INTERMITTENT EQUIPMENT (Cont)	AC CURRENT (amps/phase)	AC1 CURRENT AFTER CABLE INSTALLED		
		ΦA	ΦB	ΦC
(MA73C:D) AC1 3Φ MID 3 PLBD LAT 1−4, 5−8 MTR 1 (2 ea)	.72			
L AFT BLKHD MTR 1	.87			
LH VENTS 5 MTR 1	OP − .59 CL − .27			
6 MTR 1	OP − .57 CL − .27			
STBD RAT LAT 1−6, 7−12 MTRS 1 (2 ea)	.26			
STBD RAD DPY/STO MTR 1	.26			
PORT RMS AFT RETN LAT MTR 2	.25			
AC1 3Φ AFT 1 LH VENT 8/9 MTR 1	OP − .67 CL − .39			
ET DOORS L DRIVE MTR 1	1.06			
L LAT MTR 1	1.28			
C/L LAT 1 MTR 1	.41			
C/L LAT 2 MTR 1	.41			
(MA73C:F) ΦA RMS PRIMARY	.93			
(MA73C:H) FWD RCS VLV (3 ea) (9)	.42			
(MA73C:I) AFT POD VLV GP 1 AFT RCS ISOL L MANF 2 FU VLV (9)	.42			
L MANF 2 OX VLV	.42			
R MANF 2 FU VLV	.42			
R MANF 2 OX VLV	.42			
L TK 3/4/5A FU VLV	.42			
L TK 3/4/5A OX VLV	.42			
R TK 3/4/5A FU VLV	.42			
R TK 3/4/5A OX VLV	.42			
RCS XFEED R MANF 3/4/5 FU VLV	.42			
R MANF 3/4/5 OX VLV	.42			
L MANF 3/4/5 FU VLV	.42			
L MANF 3/4/5 OX VLV	.42			
L OMS XFEED 3/4/5 FU VLV	.42			
3/4/5 OX VLV	.42			
OMS ISOL L FU VLV A	.42			
L OX VLV A	.42			
R FU VLV A	.42			
R OX VLV A	.42			
(Cont)				

(9) Normal individual load operation should not trip AC Utility Outlet cb if steady−state loads less than 3 amps/phase

AC1 LOAD REFERENCE TABLE (Cont)

CONTINGENCY EQUIPMENT **After cable installation, the following AC1 continuous equipment will be powered off but available for CONTINGENCY use only. Minimize loading to prevent exceeding 3 amps/phase**	AC CURRENT (amps/phase)	AC1 CURRENT AFTER CABLE INSTALLED		
		ΦA	ΦB	ΦC
(L4:J) HUM SEP A (9)	.28			
(L4:I) IMU FAN A (9)	.17			
(L4:F) H2O LOOP PUMP 1A (9)	1.01			
(L4:F) H2O LOOP PUMP 2 (9) (11)	1.03			
(L4:G) AV BAY 1 FAN A (9)	.69			
(L4:H) AV BAY 3 FAN B (upgraded) (9)	1.66			
(L4:H) AV BAY 3 FAN B (9)	.73			
(L4:M) FREON LOOP 1 PUMP A	1.68			
(L4:N) FREON LOOP 2 PUMP B (9)	1.68			
(L4:L) AC1 ΦA CABIN TEMP CNTLR 2	.15			
(L4:Q) AC1 ΦA LTG PNL L/CTR (12)	2.85			
ΦB LTG PNL L/OVHD (12)	1.94			
(L4:R) ΦA LTG R INST	.31			
ΦB LTG NUMERIC	.16			
(L4:Q) ΦC OS LTG INST	.13			
(L4:P) ΦC TACAN 1 (old)	1.66			
(MA73C:E) WCS FAN SEP 1	.86			
(F1/MO52J) AC1 UTILITY POWER				
VACUUM CLEANER	1.44			
(MO51F) CO2 RMVL SYS 1(2) (9)	.91			
	TOTAL AMPS/PHASE			

(9) Normal individual load operation should not trip AC Utility Outlet cb if steady−state loads less than 3 amps/phase

(11) H2O LOOP 2 PUMP GPC position pwrd by AC1

(12) cb opened to prevent powering lights inadvertently

19 | 20 AC2 LOAD REFERENCE TABLE

23 CONTINUOUS EQUIPMENT **After cable installation, the following AC2 equipment will be powered CONTINUOUSLY:**	AC CURRENT (amps/phase)	AC2 CURRENT AFTER CABLE INSTALLED		
		ΦA	ΦB	ΦC
(R1) FUEL CELL 2 PUMPS (13)	.81	.81	.81	.81
(L4:L) AC2 ΦB AV BAY 3 S/C	.02		.02	
(L4:O) ΦB HYD QTY 2	.02		.02	
(L4:L) ΦA CABIN TEMP CNTLR 1 (EL)	.04	.04		
(L4:O) ΦA BLR HYD CNTL SENSOR 1A	.07	.07		
ΦC BLR HYD CNTL SENSOR 2B	.06			.06
(L4:P) ΦA LG PROX SNSR 2	.07	.07		
(MA73C:F) ΦC OPS INST HYD ACTR (14)	.13			.13
(15)	SUBTOTAL AMPS/PHASE	.99	.85	1.00
INTERMITTENT EQUIPMENT **After cable installation, the following equipment will be available for INTERMITTENT operation:**	AC CURRENT (amps/phase)	AC2 CURRENT		
		ΦA	ΦB	ΦC
(L4:O) AC2 ΦA BLR HYD BYPASS VLV 1A	.22			
ΦC BLR HYD BYPASS VLV 2B	.21			
(L4:P) ΦB RAD CNTLR 1A (FREON LOOP 1 CNTLR A RAD BYP VLV MTR) (9) (16)	.17			
(L4:N) ΦA FREON FLOW PROP 1 (VLV) (9)	.30			
(MA73C:C) AC2 3 Φ FWD 2 LH VENTS 1/2 MTR 2	OP − .28 CL − .15			
RH VENTS 1/2 MTR 2	OP − .28 CL − .15			
L,R ADP DPY MTR 2 (9)	.14			
−Y STR TRKR DR SYS 2 MTR CNTL (9)	.14			
−Z STR TRKR DR SYS 1 MTR CNTL (9)	.14			
AC2 3 Φ MID 1 LH VENT 5 MTR 2	OP − .65 CL − .33			
AC2 3 Φ MID 2 LH VENT 3 MTR 2	OP − .65 CL − .33			
PLBD PORT DOOR MTR 2	1.64			
STBD AFT BLKHD LAT MTR 2	.87			
C/L LATCH 13−16 MTR 2	.72			
KU BAND ANT DPLY MTR 2	.82			
STBD RAD LAT 1−6 MTR 2	.26			
PORT RMS DPLY MTR 2	.29			
PORT RMS FWD RETN LAT MTR 1	.25			

(5) Total current for each phase of AC bus must not exceed 3 amps continuous. Table should be used to calculate total phase current. CONTINUOUS EQUIPMENT will be powered continuously. INTERMITTENT EQUIPMENT will be available for intermittent ops. CONTINGENCY EQUIPMENT will be available for contingency use only

(9) Normal individual load operation should not trip AC Utility Outlet cb if steady−state loads less than 3 amps/phase

(13) If MNB lost, FC2 pumps will not be restarted

(14) Includes ELIVN PS2 and ME TVC SW VLV Xdcrs

(15) AC Utility Outlet cb can handle up to 6 amps for up to 5 sec. AC current for vent door ops peaks at ~5.1 amps/phase for 1 sec for dual mtr ops, peaks for 6 sec for single mtr ops. The cb should not trip if steady−state loads less than 3 amps/phase for dual mtr ops or less than 1 amp/phase for single mtr ops on all associated vent doors

(16) If MNB DA2 is not regained, this mtr (auto cntl) will not be operational

AC2 LOAD REFERENCE TABLE (Cont)

INTERMITTENT EQUIPMENT (Cont)	AC CURRENT (amps/phase)	AC2 CURRENT		
		ΦA	ΦB	ΦC
(MA73C:C) (Cont) AC2 3 Φ AFT 2 RH VENTS 8/9 MTR 2	OP − .73 CL − .35			
LH VENTS 8/9 MTR 2	OP − .67 CL − .38			
ET DOORS L LAT MTR 2	1.28			
C/L LAT 1 MTR 2	.41			
ET DOORS R DRIVE MTR 2	1.06			
R LAT MTR 2	1.28			
AC2 3 Φ MID 3				
PL RET LAT MTR 2	.41			
AC2 3 Φ MID 4				
RH VENT 6 MTR 2	OP − .59 CL − .29			
PLBD STBD DOOR MTR 2	1.64			
PORT FWD BLKHD LAT MTR 2	.87			
STBD FWD BLKHD LAT MTR 2	.87			
PORT RAD LAT 1−6 MTR 2	.26			
DPLY MTR 2	.26			
PORT RMS MID RETN LAT MTR 2	.25			
(MA73C:F) PAYLOAD				
AC2 ΦA RMS BACKUP	.07			
LEFT SEAT (9)	.99			
AC2 ΦA PORT RMS SHLD BRACE ACTR	.25			
(MA73C:G) OMS KIT VLV				
(MA73C:H) FWD RCS VLV (3 ea) (9)	.42			
(MA73C:I) AFT POD VLV GP 2 (9) AFT RCS ISOL L MANF 1 FU VLV	.42			
L MANF 1 OX VLV	.42			
R MANF 1 FU VLV	.42			
R MANF 1 OX VLV	.42			
L TK 3/4/5B FU VLV	.42			
L TK 3/5/5B OX VLV	.42			
R TK 3/4/5B FU VLV	.42			
R TK 3/4/5B OX VLV	.42			
OMS XFEED L FU VLV B	.42			
L OX VLV B	.42			
R FU VLV B	.42			
R OX VLV B	.42			
(Cont)				

(9) Normal individual load operation should not trip AC Utility Outlet cb if steady−state loads less than 3 amps/phase

AC2 LOAD REFERENCE TABLE (Cont)

CONTINGENCY EQUIPMENT **After cable installation, the following AC2 continuous equipment will be powered off but available for CONTINGENCY use only. Minimize loading to prevent exceeding 3 amps/phase**		AC CURRENT (amps/phase)	AC2 CURRENT AFTER CABLE INSTALLED		
			ΦA	ΦB	ΦC
(L4:F) H2O LOOP PUMP 1B	(9)	1.02			
(L4:G) AV BAY 1 FAN B	(9)	.69			
(L4:H) AV BAY 2 FAN A	(9)	.70			
(L4:I) IMU FAN B	(9)	.18			
(L4:J) HUM SEP B	(9)	.28			
(L4:K) CABIN FAN B		1.67			
(L4:M) FREON LOOP 1 PUMP B	(9)	1.68			
(L4:L) AC2 ΦA CABIN TEMP CNTLR 1		.15			
(L4:R) AC2 ΦB LTG INST OVHD		.26			
(L4:Q) AC2 ΦB OS LTG NUMERIC		.20			
(L4:P) AC2 ΦC TACAN 2 (old)		1.66			
(L4:Q) AC2 ΦA LTG PNL R OVHD	(12)	1.34			
AC2 ΦB LTG PNL R	(12)	1.51			
(L4:N) AC2 ΦB FREON SIG CONDR		.05			
(MA73C:E) WCS FAN SEP 2	(9)	0.86			
		TOTAL AMPS/PHASE			

(9) Normal individual load operation should not trip AC Utility Outlet cb if steady−state loads less than 3 amps/phase

(12) cb opened to prevent powering lights inadvertently

21 AC3 LOAD REFERENCE TABLE

(5)

24 **CONTINUOUS EQUIPMENT** **After cable installation, the following AC3 equipment will be powered CONTINUOUSLY:**	AC CURRENT (amps/phase)	AC3 CURRENT AFTER CABLE INSTALLED ΦA	ΦB	ΦC
(R1) FUEL CELL 3 PUMPS	.81	.81	.81	.81
(L4:J) AC3 ΦA HUM SEP S/C	.02	.02		
(L4:J) AC3 ΦB IMU FAN S/C	.02		.02	
(L4:L) AC3 ΦA H2O CNTLR 1 (S/C)	.06	.06		
AC3 ΦB AV BAY 1 S/C	.02		.02	
(L4:O) AC3 ΦB HYD QTY 3	.02		.02	
AC3 ΦA BLR HYD BYP SENSOR 2A	.07	.07		
AC3 ΦC BLR HYD BYP SENSOR 3B	.07			.07
(L4:P) AC3 ΦA LG PROX SNSR 1	.07	.07		
(15)	SUBTOTAL AMPS/PHASE	1.03	.87	.87
INTERMITTENT EQUIPMENT **After cable installation, the following AC3 equipment will be available for INTERMITTENT operation:**	AC CURRENT (amps/phase)	AC3 CURRENT ΦA	ΦB	ΦC
(L4:L) AC3 ΦA H2O CNTLR 1 (BYP VLV) (9)	.14			
(L4:N) AC3 ΦA FREON FLOW PROP 2 (VLV) (9)	.30			
(L4:O) AC3 ΦA BLR HYD BYP VLV 2A	.21			
AC3 ΦC BLR HYD BYP VLV 3B	.21			
(L4:P) AC3 ΦB RAD CNTLR 2A (FREON LOOP 2 CNTLR A RAD BYP VLV MTR) (9)	.17			
(MA73C:C) AC3 3Φ FWD 3 FWD RCS ISOL TK 1/2 FU VLV (9)	.42			
TK 1/2 OX VLV (9)	.42			
MANF 3 FU VLV (9)	.42			
OX VLV (9)	.42			
4 FU VLV (9)	.42			
OX VLV (9)	.42			
LH VENTS 1/2 MTR 1	OP − .29 CL − .21			
R ADP MTR 1, 18	.14			
−Z STAR TRKR SYS 2 MTR CNTRL (9)	.14			
AC3 3Φ MID 2 LH VENT 3 MTR 1	OP − .59 CL − .29			
LH VENT 6 MTR 2	OP − .59 CL − .29			
PLBD PORT AFT BLKHD LAT MTR 2	.87			
(Cont)				

(5) Total current for each phase of AC bus must not exceed 3 amps continuous. Table should be used to calculate total phase current. CONTINUOUS EQUIPMENT will be powered continuously. INTERMITTENT EQUIPMENT will be available for intermittent ops. CONTINGENCY EQUIPMENT will be available for contingency use only

(9) Normal individual load operation should not trip AC Utility Outlet cb if steady−state loads less than 3 amps/phase

(15) AC Utility Outlet cb can handle up to 6 amps for up to 5 sec. AC current for vent door ops peaks at ~4.2 amps/phase for 1 sec for dual mtr ops, peaks for 6 sec for single mtr ops. The cb should not trip if steady−state loads less than 3 amps/phase for dual mtr ops or less than 1.3 amp/phase for single mtr ops on all associated vent doors

AC3 LOAD REFERENCE TABLE (Cont)

INTERMITTENT EQUIPMENT (Cont)	AC CURRENT (amps/phase)	AC3 CURRENT AFTER CABLE INSTALLED		
		ΦA	ΦB	ΦC
(MA73C:C) (Cont) AC3 Φ3 PLBD C/L 1−4 LAT MTR 2	.72			
C/L 5−8 LAT MTR 2	.72			
KU BAND ANT DPLY MTR 1	.82			
STBD RAD DPY/STD MTR 2	.26			
LAT 7−12 MTR 2	.26			
AC3 Φ3 MID 2 PORT RMS AFT SYS RETN LCH MTR 1	.25			
(MA73C:D) AC3 3Φ AFT 3 RH VENTS 8/9 MTR 1	OP − .68 CL − .34			
ET DOORS L DRIVE MTR 2	1.06			
C/L LAT 2 MTR 2	.41			
R DRIVE MTR 1	1.06			
R LAT MTR 1	1.28			
AC3 3Φ MID 4 RH VENT 3 MTR 2	OP − .65 CL − .32			
5 MTR 2	OP − .65 CL − .32			
PLBD PORT DOOR MTR 1	1.64			
STBD AFT BLKHD LAT MTR 1	.87			
C/L 9−12 LAT MTR 2	.72			
C/L 13−16 LAT MTR 1	.72			
KU BAND ANT DPY MTR 1	.82			
PORT RAD DPY MTR 2	.26			
7−12 LAT MTR 2	.26			
PORT RMS DPY MTR 1	.29			
FWD RETN LAT MTR 2	.25			
(MA73C:E) PAYLOAD				
(MA73C:G) GALLEY FAN (9)	.37			
RIGHT SEAT (9)	.99			
(MA73C:H) FWD RCS VLV (3 ea) (9)	.42			
(MA73C:I) AFT POD VLV GP 3 (9) AFT RCS ISOL L TK 1/2 FU VLV	.42			
L TK 1/2 OX VLV	.42			
R TK 1/2 FU VLV	.42			
R TK 1/2 OX VLV	.42			
L MANF 3 FU VLV	.42			
L MANF 3 OX VLV	.42			
(Cont)				

(9) Normal individual load operation should not trip AC Utility Outlet cb if steady−state loads less than 3 amps/phase

AC3 LOAD REFERENCE TABLE (Cont)

INTERMITTENT EQUIPMENT (Cont)	AC CURRENT (amps/phase)	AC3 CURRENT AFTER CABLE INSTALLED		
		ΦA	ΦB	ΦC
(MA73C:I) (Cont) AFT RCS ISOL R MANF 3 FU VLV	.42			
R MANF 3 OX VLV	.42			
L MANF 4 FU VLV	.42			
L MANF 4 OX VLV	.42			
(MA73C:I) (9) AFT POD VLV GP 3 R MANF 4 FU VLV	.42			
R MANF 4 OX VLV	.42			
AFT RCS XFEED L MANF 1/2 FU VLV	.42			
L MANF 1/2 OX VLV	.42			
R MANF 1/2 FU VLV	.42			
R MANF 1/2 OX VLV	.42			
OMS XFEED R FU VLV A	.42			
R OX VLV A	.42			
OMS ISOL L FU VLV B	.42			
L OX VLV B	.42			
R FU VLV B	.42			
R OX VLV B	.42			
CONTINGENCY EQUIPMENT **After cable installation, the following AC3 continuous equipment will be switched off but available for CONTINGENCY use only. Minimize loading to prevent exceeding 3 amps/phase**				
(L4:F) H2O LOOP PUMP 2 (9) (17)	1.03			
(L4:G) AV BAY 3 FAN A (upgraded) (9)	1.66			
(L4:G) AV BAY 3 FAN A (9)	.75			
(L4:H) AV BAY 2 FAN B (9)	.75			
(L4:I) IMU FAN C (9)	.18			
(L4:K) CABIN FAN A	1.66			
(L4:M) FREON LOOP 2 PUMP A (9)	1.68			
(L4:R) AC3 ΦB LTG INST L/CTR	.31			
(L4:P) AC3 ΦC TACAN 3 (old)	1.66			
(L4:N) AC3 ΦB FREON SIG CONDR	.05			
(L4:Q) AC3 ΦA LIGHTING COAS	.11			
(R10) AC3 ΦB MS LTG PNL	.31			
AC3 ΦC LIGHTING PANEL OS (12)	2.66			
(MO51F) CO2 RMVL SYS 2(1) (9)	.91			
(A15,MO13Q) AC3 UTILITY POWER				
VACUUM CLEANER	1.44			
	TOTAL AMPS/PHASE			

(9) Normal individual load operation should not trip AC Utility Outlet cb if steady−state loads less than 3 amps/phase

(12) cb opened to prevent powering lights inadvertently

(17) H2O LOOP 2 PUMP Man ON pwrd by AC3

EPS SSR−201
CRYO HTR MANUAL OPS

(1)

1	Config limits

Config SM ALERT limits for affected tank which requires manual htr ops via SM SPEC 60. Do not use B/U C/W limits unless necessary (e.g., Tank P XDCR failure). Do not alter hardware C/W limits. Use appropriate ID listed below to modify SM ALERT, limit set #1

TANK #	SM ALERT (TANK P)		B/U C/W (CNTLR P)	
	O2	H2	O2	H2
1	0451100	0452100	0451110	0452110
2	0451200	0452200	0451210	0452210
3	0451300	0452300	0451310	0452310
4	0451400	0452400	0451410	0452410
5	0451500	0452500	0451510	0452510
6	0453100	0454100	0453110	0454110
7	0453200	0454200	0453210	0454210
8	0453300	0454300	0453310	0454310
9	0453400	0454400	0453410	0454410

(2) (3)

2	Define alert limits

Define upper and lower limits to be used for tank which requires manual heater operations

CRYOGENIC	LOWER LIMIT	UPPER LIMIT
O2	780	920
H2	200	260

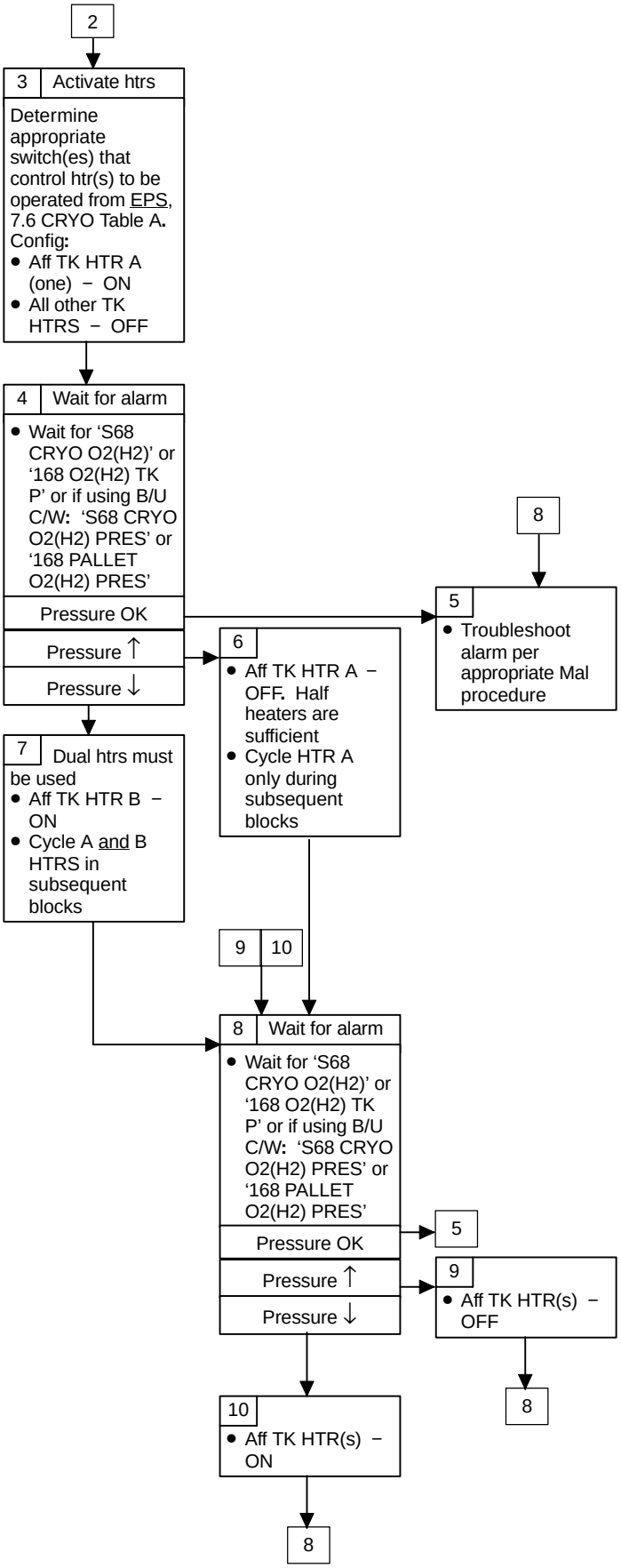
3

(1) SM ALERT LIMIT SET 1 is used when both heater switches are in OFF or ON. Limit set 2 is used only when one or both heater switches are in AUTO

(2) MCC may recommend new lower limit based on TK quantity. Limit supplied is ok for all TK QTYs

(3) This procedure assumes that both manifold vlvs are open

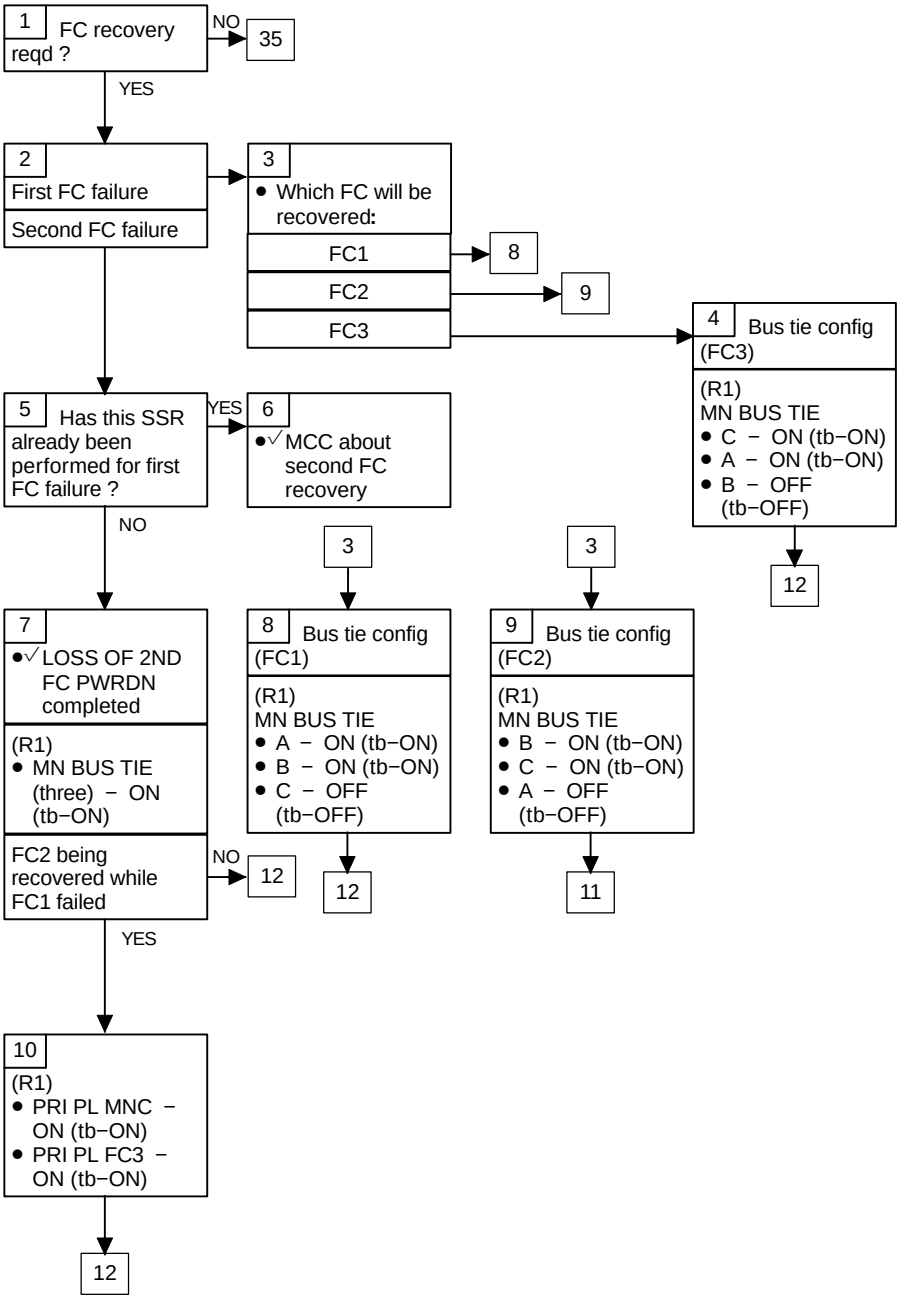
EPS SSR−201 (Cont)



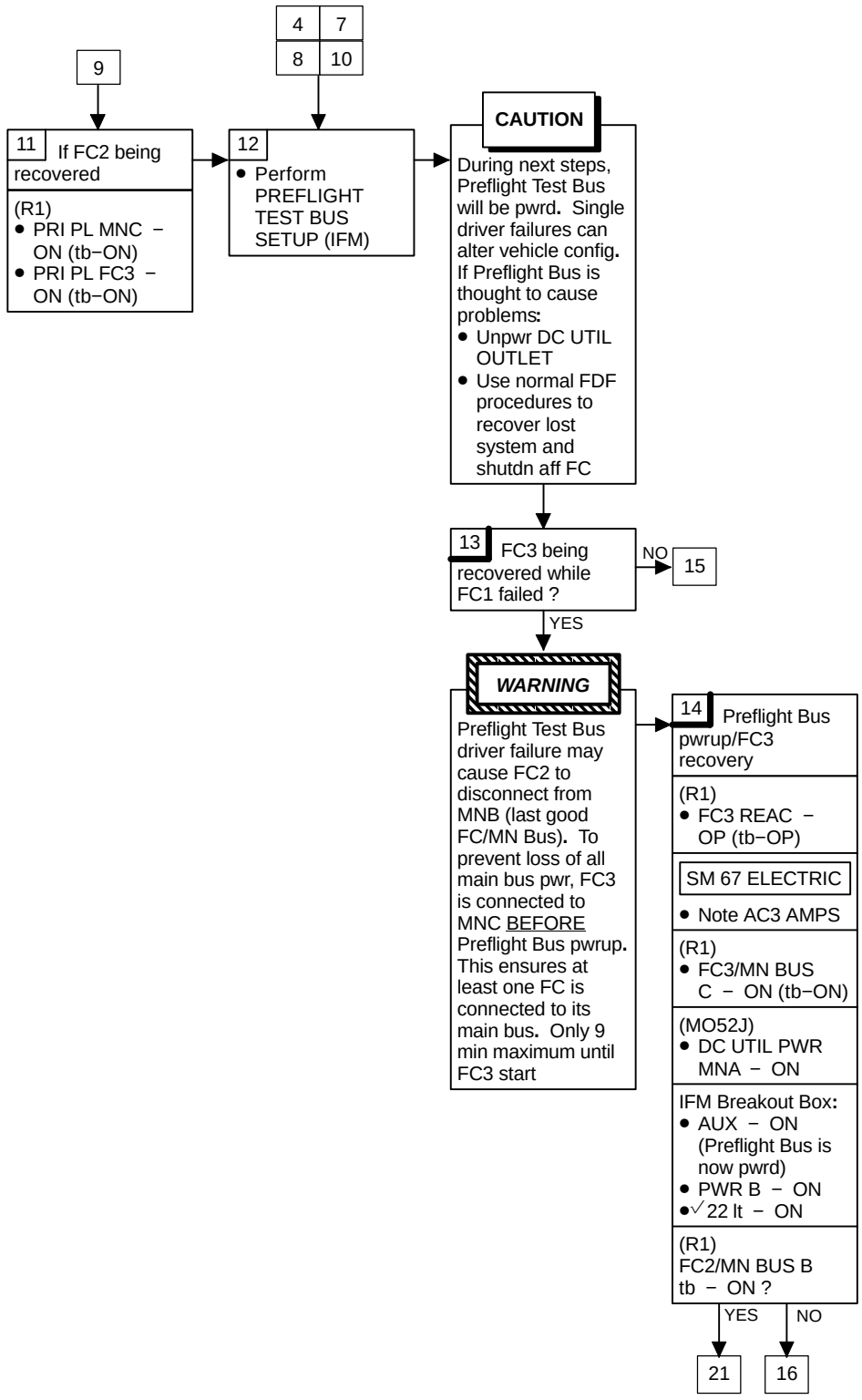
EPS SSR−202
PREFLIGHT TEST BUS USE

NOTE

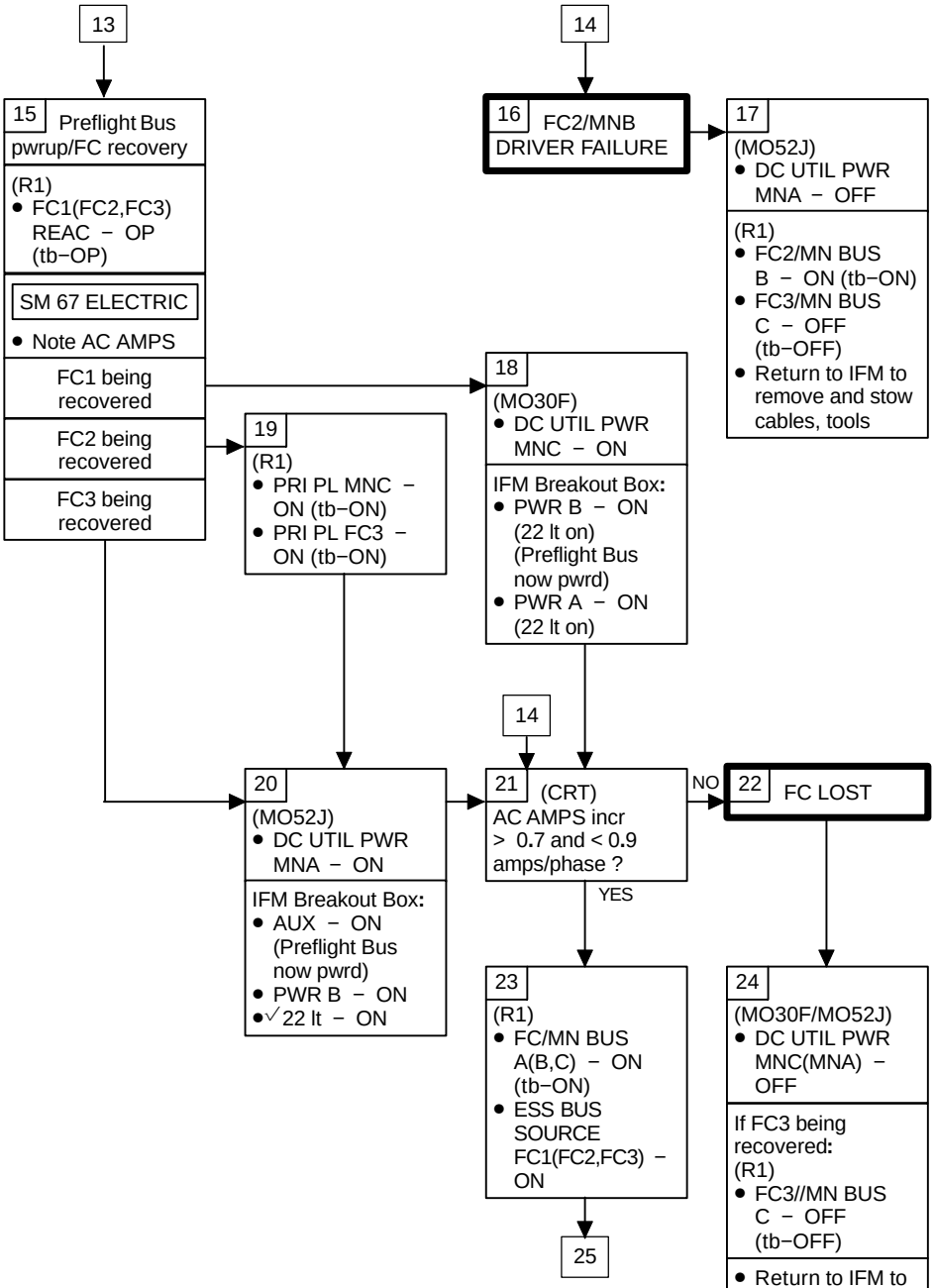
Powering Preflight Test Bus enables single string circuits that use launch MDMs and data bus normally used to operate many orbiter systems during ground turnaround. Due to design, a single driver failure could cause equipment to be inadvertently commanded whenever Preflight Test Bus is powered. See Table 1 for reference to possible commands available through Preflight MDM/data bus. For any problems experienced that could be attributed to Preflight Bus, remove pwr to Preflight Bus, recover lost systems, and shut down affected FC within 9 min if reqd



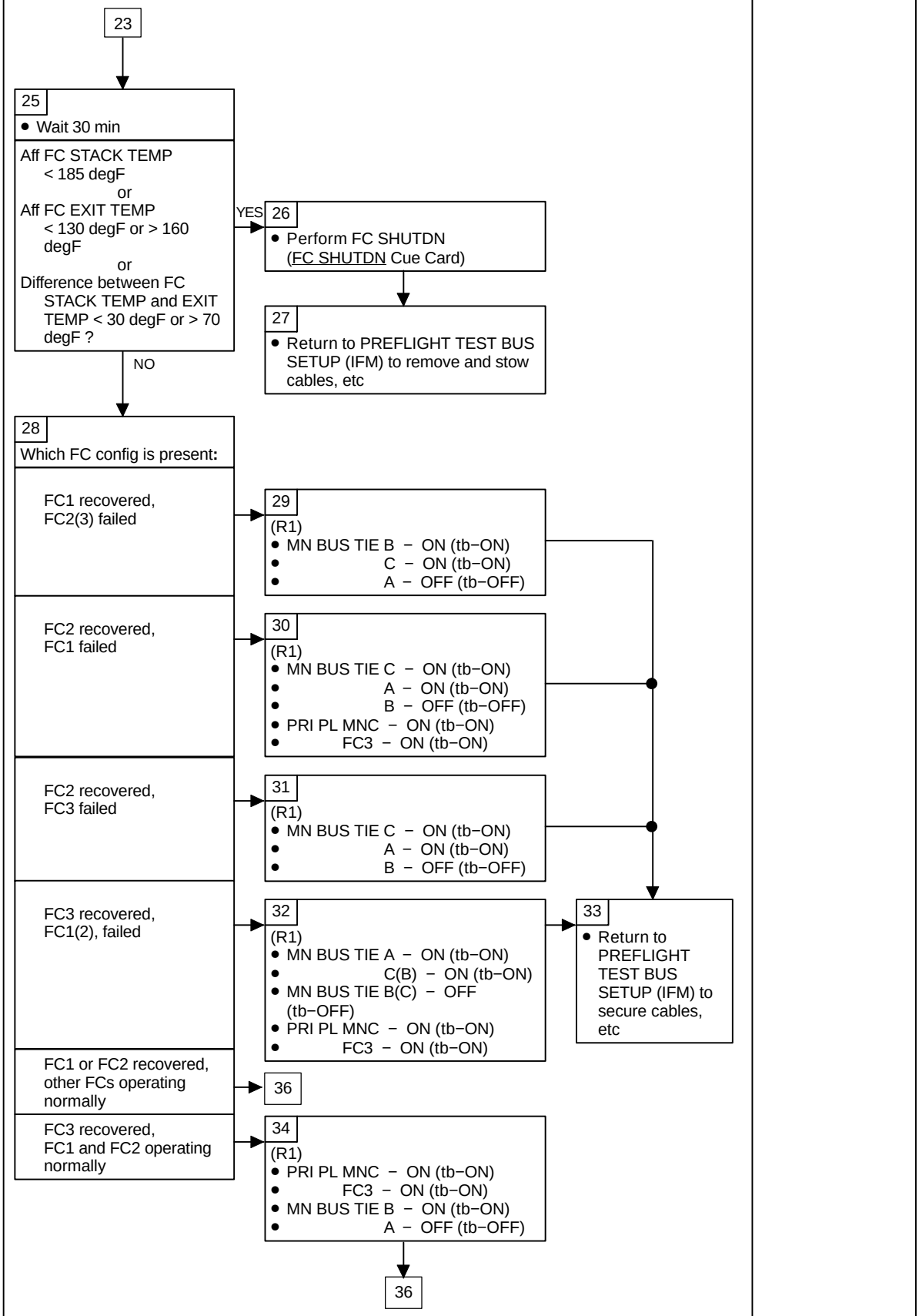
EPS SSR−202 (Cont)



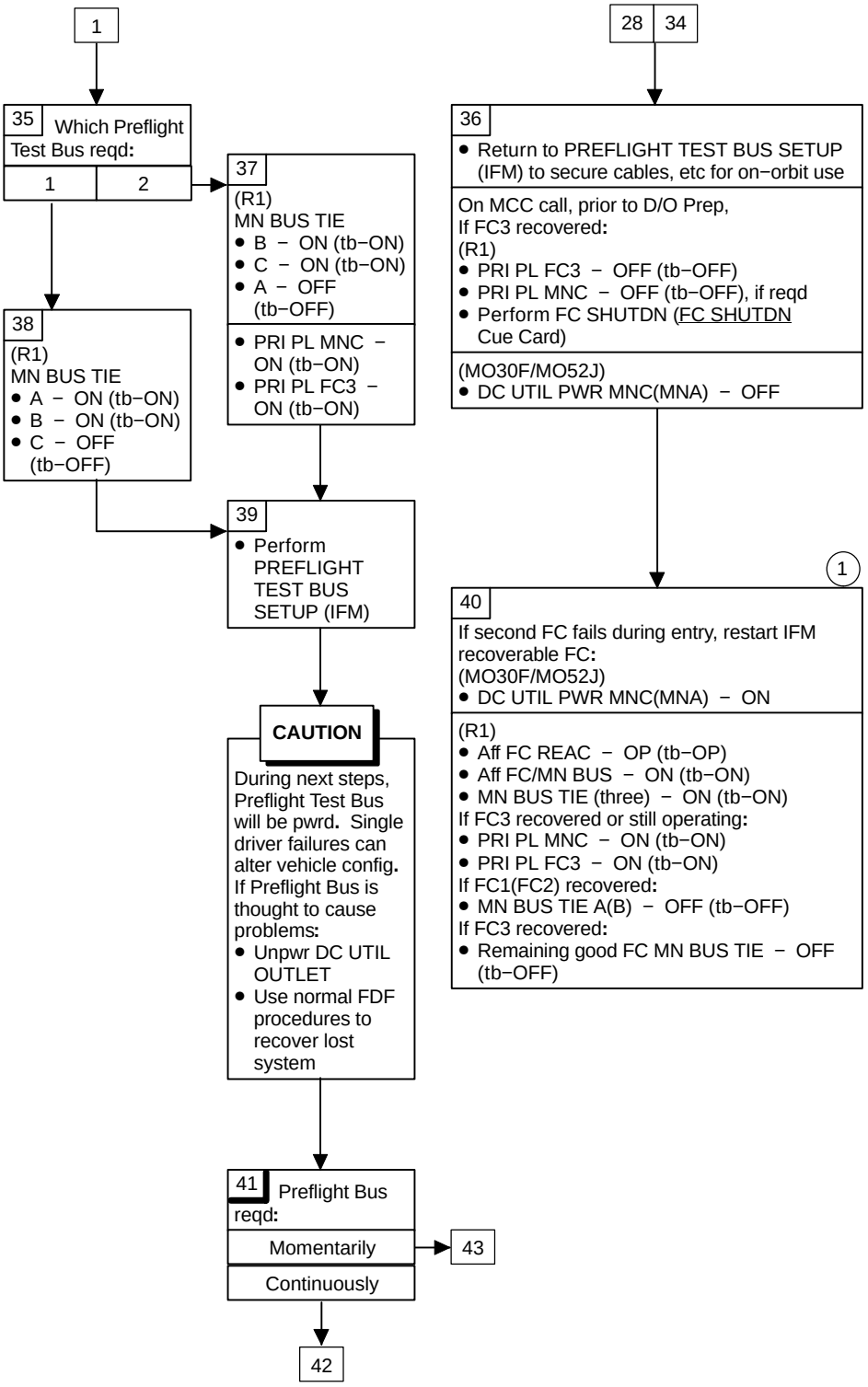
EPS SSR−202 (Cont)



EPS SSR−202 (Cont)

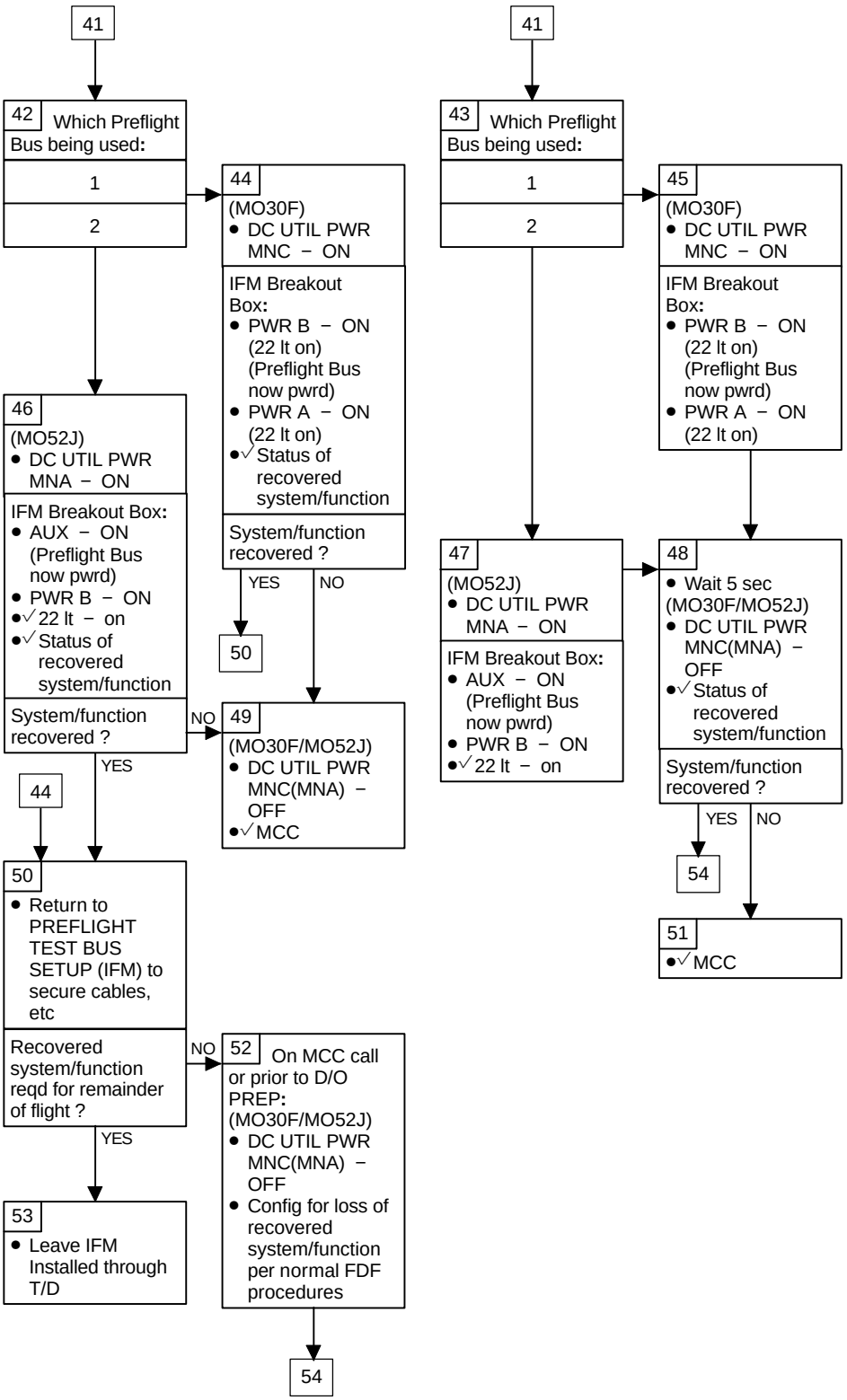


EPS SSR−202 (Cont)



(1) Crewmember must be able to reach DC UTIL PWR switch while secured in seat

EPS SSR−202 (Cont)



EPS SSR−202 (Cont)

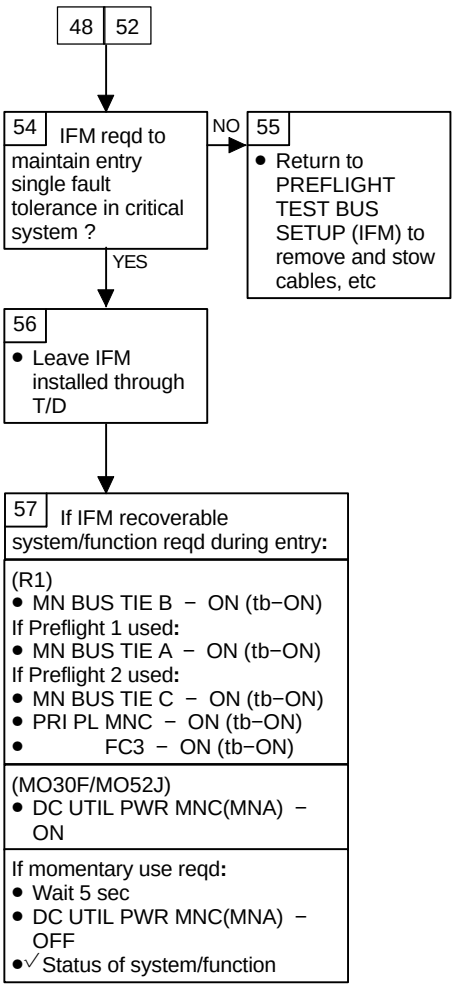


TABLE 1
POSSIBLE PREFLIGHT TEST AND DATA BUSES COMMANDS

NOTE

This table identifies the major Preflight Test Bus single−driver failures that impact critical orbiter systems. After the Preflight Test Bus has been powered, if a driver failure is suspected, the Preflight Test Bus must be unpowered before the affected system can be recovered by standard FDF procedures

Preflight Test Bus 1	Preflight Test Bus 2
FC1 PUMP POWER	FC2(3) PUMP POWER
AV BAY 3 FIRE SUPP INH	AV BAY 1(2) FIRE SUPP INH
FC1 TO MNA ON/OFF	FC2(3) TO MNB(C) ON/OFF
MNA BUS TIE ON/OFF	MNB(C) BUS TIE ON/OFF
AC1 INV PWR ON/OFF	AC2(3) INV PWR ON/OFF
AC1 INV TO BUS ON/OFF	AC2(3) INV TO BUS ON/OFF
APU 1 FU VLV 1 OP (NC)	APU 2(3) FU VLV 1 OP (NC)
APU 1 FU VLV 2 CL (NO)	APU 2(3) FU VLV 2 CL (NO)
FCL PUMP 1A ON	FCL PUMP 2A ON
SMOKE DETN H/W ALERT INH	CAB FAN A(B) ON
	IMU FAN A(B,C) ON

GNC FRP

GNC FRP–1 IMU REFERENCE RECOVERY AFTER GNC GPCs IPL'D 8–4
FRP–2 RECOVERY 8–5
FRP–3 IMU RECOVERY WITH AT LEAST ONE IMU AS GOOD REFERENCE 8–6

GNC SSR

GNC SSR–1 ACTIVATE IMU(s) 8–8
SSR–2 MATRIX (STAR) ALIGN USING HUD STAR DATA 8–8
SSR–3 ALIGN USING STR TRKR STAR DATA 8–10
SSR–4 RESERVED ..... not used
SSR–5 RESERVED ..... not used
SSR–6 RESERVED ..... not used
SSR–7 RESERVED ..... not used
SSR–8 POSITION OMS THROUGH CG 8–11
SSR–9 RM DESELECTION OF FAILED OPEN THC CONTACT 8–12

The following Fault Msgs have no corresponding MAL procedures in this book:

AERO DRIVE
DAP DNMODE
DISPLAY SW A(L,R)
L(R) OMS GMBL
NAV EDIT
SEL AUTO
SENSE SW
IMU BITE/T
RM FAIL IMU
RM DLMA IMU
RHC L(R,A)
SBTC/THC L(R,A)

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GNC FRP–1
IMU REFERENCE RECOVERY AFTER GNC GPCs IPL'D

NOTE
Preferable to accomplish this procedure in GNC OPS 2; however, procedure is also valid for MM301

O6 1. Ensure pwr ON to both STAR TRKRs and doors open
✓STAR TRKR PWR (two) – ON
✓DR CNTL SYS (two) – OP

2. Mass Memory Read of IMU calibration data (gyro and accel biases, scale factors, etc.) computed in preflight cal

GNC 21 IMU ALIGN

Select all IMUs for MASS MEMORY READ
IMU 1,2,3 – ITEM 10,11,12 EXEC (*)
MM READ – ITEM 19 EXEC (*)
✓MM READ – ITEM 19 (no *)

NOTE
'IMU BITE/T' may be annunciated until READ/WRITE is performed to restore IMU gyro delta bias terms. Previous IMU Bias and Scale Factor READ/WRITEs of uplinks will have to be performed again

3. Reselect one IMU for attitude reference

GNC 21 IMU ALIGN

✓IMU 1,2, or 3: DES – ITEM 7,8, or 9 (no *)
Deselect remaining two IMUs
✓IMU DES – ITEM 7(8,9) (*)

4. Perform Matrix Align of IMUs 1,2,3 in MATRIX (STAR) ALIGN USING HUD STAR DATA . . . . . GNC SSR–2

5. Reselect all deselected IMUs

GNC 21 IMU ALIGN

IMU DES – ITEM 7(8,9) EXEC (no *)

NOTE
Do not proceed until uplink of REFSMMATs verified with MCC

6. Reestablish skew between IMUs with IMU TO IMU ALIGN
Perform IMU ALIGNMENT IMU/IMU – IMUs 1,2,3 using best IMU as reference (ORB OPS, GNC)

NOTE
IPL causes loss of previous HUD CAL.
✓MCC for performing CAL

7. Go to IMU ALIGN – S TRK (ORB OPS, GNC)

GNC FRP–2
IMU REFERENCE RECOVERY

NOTE

If GNC GPCs IPL'd, use GNC FRP–1 for Reference Recovery. Preferable to accomplish this procedure in OPS 2; however, it is also valid for MM301

O6 1. Apply pwr to both STAR TRKRs
✓STAR TRKR PWR –Y,–Z – ON

O14:A, O15:A, O16:A 2. Ensure pwr applied to all IMUs
IMU 1,2,3 – ON

If not, ACTIVATE IMU(s). . . . . GNC SSR–1

3. Ensure all IMUs in OPERATE mode

GNC 21 IMU ALIGN

✓IMUs: OPER – ITEM 4,5,6 EXEC (*)

NOTE

If ITEMS 4,5, or 6 executed, wait for asterisks to appear (~90 sec)

4. Enable serial data link
GNC I/O RESET

5. Select one IMU for attitude reference

GNC 21 IMU ALIGN

✓IMU 1,2, or 3: DES – ITEM 7,8, or 9 EXEC (no *)
Deselect remaining two IMUs
✓IMUs: DES – ITEM 7(8,9) EXEC (*)

6. Perform MATRIX ALIGN IMUs 1,2,3 USING HUD STAR DATA. . . . . GNC SSR–2

7. Reselect all deselected IMUs

GNC 21 IMU ALIGN

✓IMUs: DES – ITEM 7(8,9) EXEC (no *)

8. Reestablish skew between IMUs with IMU TO IMU ALIGN
Perform IMU/IMU ALIGNMENT – IMUs 1,2,3 using best IMU as reference (ORB OPS, GNC)

9. Go to IMU ALIGN – S TRK (ORB OPS, GNC)

GNC FRP–3
IMU RECOVERY WITH AT LEAST ONE IMU AS GOOD REFERENCE

NOTE
Procedure must be accomplished in GNC OPS 2 or GNC OPS 3

1. Deselect IMUs being recovered

   GNC 21 IMU ALIGN

   ✓IMUs: DES – ITEM 7(8,9) EXEC (*)

O14:A, O15:A, O16:A

2. Ensure pwr applied to all IMUs
   If not, ACTIVATE IMU(s) . . . . . GNC SSR–1

3. Ensure all IMUs in OPERATE mode

   GNC 21 IMU ALIGN

   ✓IMUs: OPER – ITEM 4,5,6 EXEC (*)

NOTE
If ITEMS 4,5, or 6 executed, wait for asterisks to appear (~90 sec)

4. Enable serial data link
   GNC I/O RESET

NOTE
Possible erroneous IMU BITE/T 1(2,3) msg after GNC I/O RESET. Ignore msg unless MCC advises otherwise, or if no comm

5. Reestablish skew between IMUs. Choose IMU with good reference and align other two IMUs with IMU to IMU ALIGN. Use good IMU as reference for align – IMU to IMU ALIGNMENT (ORB OPS, GNC)

NOTE
Both nonreference IMUs should be aligned to preclude possibility of IMU RM FAIL (RM threshold reset following any align)

6. Reselect IMUs previously deselected

   GNC 21 IMU ALIGN

   DES – ITEM 7(8,9) EXEC (no *)

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GNC SSR–1
ACTIVATE IMU(s)

O6 ✓MDM FF 1(2,3) – ON
O14:A, IMU 1(2,3) – ON
O15:A,
O16:A
L1 ✓IMU FAN A(B,C) – ON (if avail)

GNC 21 IMU ALIGN

NOTE
IMU 1(2,3) TEMP – LO indication may be displayed. Proceed

CRT ✓IMU 1(2,3): DES – ITEM 7(8,9) EXEC (*)
OPER – ITEM 4(5,6) EXEC (*)

NOTE
If ITEMS 4,5, or 6 executed, wait for asterisks to appear (~90 sec)

GNC I/O RESET

GNC SSR–2
MATRIX (STAR) ALIGN USING HUD STAR DATA

CAUTION
If RMS/payload unberthed, either enable Aft PRCS only or berth payload before proceeding

NOTE
In OPS 201, if Verniers not available, use FREE mode

Remove L(R) HUD Cover
F3 L(R) HUD PWR – ON
F6U(F8U) MODE – TEST
Wait ~15 sec for final symbology of test mode
✓Final test mode display symbology
(ORB OPS, HUD CALIBRATION, GNC 201)
L(R) HUD BRT – MAN NIGHT
MAN BRT – as reqd

O14:E, ✓cb DDU L(R) (two) – cl
O15:E,
O16:E
F7(F8) FLT CNTLR PWR – ON

If OPS 2:
Change DAP A,B to A1,B5
DAP: INRTL/VERN(FREE/PRI)
If OPS 3:

GNC 23 RCS

CRT RCS FWD – ITEM 1 EXEC (*)
MANF VLV OVRD 1 – ITEM 40 EXEC (CL)
2 – ITEM 41 EXEC (CL)
3 – ITEM 42 EXEC (CL)
4 – ITEM 43 EXEC (CL)
5 – ITEM 44 EXEC (CL)

NOTE
Position ADI ATT sw on pnl F6(F8) to REF and depress ATT REF pb prior to enabling COAS SIGHT mode

GNC 22 S TRK/COAS CNTL

✓S TABLE CLR – ITEM 20 EXEC
COAS REQD ID – ITEM 21 +__ __ __ EXEC

POS +X – ITEM 26 EXEC
SIGHT mode – ITEM 22 EXEC (*)
DAP: as reqd for precise manual mnvr
Mnvr to center star in HUD boresight ('P' in 'COMPLETE'):

F6(F8) ATT REF pb – push
(Repeat mark if desired)
CRT COAS ACCEPT – ITEM 23 EXEC
✓S TABLE TRK ID 2: (reqd ID)

CAUTION
Do not deselect COAS SIGHT mode between sightings

DAP: as reqd for large manual mnvr
Mnvr to second HUD star att

NOTE
Second star should be > 35° and < 145° from the first

CRT COAS REQD ID – ITEM 21 +__ __ __ EXEC
DAP: as reqd for precise manual mnvr
Mnvr to center star in HUD boresight:
F6(F8) ATT REF pb – push
(Repeat mark if desired)
CRT COAS ACCEPT – ITEM 23 EXEC
✓S TABLE TRK ID 1: (reqd ID)
ANG DIF 1 ≥ 35 deg, ≤ 145 deg
ERR 1 ≤ .2
✓SEL – ITEM 17,18 (*)
COAS: DES – ITEM 25 EXEC (*)
F7(F8) FLT CNTLR PWR – OFF
O14:E, O15:E, O16:E cb DDU L(R) (two) – as reqd

GNC 21 IMU ALIGN

✓IMU 1(2,3) STAT – (blank)
ALIGN IMU 1(2,3) – ITEM 10(11,12) EXEC (*)
If Matrix Align
| ALIGN MATRIX – ITEM 15 EXEC (*)
| DAP: INRTL
| DAP ROT: PULSE/PULSE/PULSE
CRT | EXEC – ITEM 16 EXEC (*), Rcd MET __ __ : __ __ : __ __
| ✓EXEC – ITEM 16 (no *)
| DAP: as reqd
If Star Align
STAR ALIGN – ITEM 13 EXEC (*)
✓ANG 1,2,3 ΔX,ΔY,ΔZ: < = .80
Rcd ANG 1 2 3
ΔX ( ) __ . __ __ ( ) __ . __ __ ( ) __ . __ __
ΔY ( ) __ . __ __ ( ) __ . __ __ ( ) __ . __ __
ΔZ ( ) __ . __ __ ( ) __ . __ __ ( ) __ . __ __

CAUTION
If ANG ΔX,ΔY,ΔZ > .80 for two or more IMUs: DO NOT TORQUE PLATFORMS EXCEPT UNDER MCC INSTRUCTIONS

CRT EXEC – ITEM 16 EXEC (*), Rcd MET __ __ : __ __ : __ __
✓EXEC – ITEM 16 (no *)

GNC SSR–2 (Cont)

F6U(F8U) HUD MODE – NORM
F3 PWR – OFF
Install L(R) HUD Cover
If OPS 3:

GNC 23 RCS

RCS FWD – ITEM 1 EXEC (*)
MANF VLVS OVRD 1 – ITEM 40 EXEC (OP)
2 – ITEM 41 EXEC (OP)
3 – ITEM 42 EXEC (OP)
4 – ITEM 43 EXEC (OP)
5 – ITEM 44 EXEC (OP)
DAP: as reqd

GNC SSR–3
MATRIX ALIGN USING STR TRKR STAR DATA

NOTE
Procedure assumes S TRKs on at least 15 min and vehicle at S TRK star attitude. DAP as reqd for star trk ops

GNC 22 S TRK/COAS CNTL

✓S TRK –Y,–Z REQD ID, ITEM 11,12 0
STATUS – (no BITE)
SHUTTER – OP
✓S TABLE CLR – ITEM 20 EXEC (*)
STAR TRK –Y,–Z – ITEM 3,4 EXEC (*)
✓S TABLE TRK ID 1,2 (reqd ID)
ANG ERR: < .09, Rcd __ . __ __
SEL – ITEM 17,18 (*)

GNC 21 IMU ALIGN

✓IMU 1(2,3) STAT – (blank)
MATRIX – ITEM 15 EXEC (*)
ALIGN IMU 1(2,3) – ITEM 10(11,12) EXEC (*)
EXEC – ITEM 16 EXEC (*), Rcd MET __ __ : __ __ : __ __
✓EXEC – ITEM 16 (no *)

GNC SSR–8
POSITION OMS THROUGH CG

NOTE

This procedure sets up a dummy single engine L(R) OMS burn to position L(R) OMS Thrust Vector through CG. Actual burn will not be executed. When procedure completed, L(R) OMS will be protected from loss due to PRI(SEC) GMBL pwr or data path failures

GNC, OPS 202(302) PRO

GNC XXXXX MNVR YYYYY

If L OMS to be positioned:
| L OMS PRI(SEC) SEL – ITEM 28(30) EXEC
If R OMS to be positioned:
R OMS PRI(SEC) – ITEM 29(31) EXEC

C3 ✓OMS ENG (two) – OFF
CRT SEL OMS L(R) – ITEM 2(3) EXEC

TRIM LOAD P ITEM 6 ±X.X EXEC
LY ITEM 7 +X.X EXEC
RY ITEM 8 –X.X EXEC

NOTE

Actual values dependent on CG.
If reqd, generic CG trims are:
P = +0.0
LY = +5.2
RY = –5.2

TGT PEG 7
ITEM 19 +1.0 +0 +0 EXEC
TIG – ITEM 10 + (current MET + 2 min) EXEC
LOAD – ITEM 22 EXEC

NOTE

Do NOT MNVR to burn attitude; ignore flashing EXEC

After T–15 sec:
✓GMBL position: P = ±X.X
LY = +X.X
RY = –X.X
L(R) GMBL OFF – ITEM 32(33) EXEC

If in OPS 202:
| GNC, OPS 201 PRO
If in OPS 3, and at burn attitude:
Reload Burn Pad

NOTE

Displayed GMBL position is not updated when GMBL OFF.
If in OPS 2, on transition to OPS 3 (prior to deorbit) P/Y positions will read 1.0 deg and GMBL fail will be annunciated

GNC SSR–9
RM DESELECTION OF FAILED OPEN THC CONTACT

NOTE

This procedure will allow RM to deselect failed open THC contact in OPS 2. Use this SSR only under direction from MCC. Procedure will cause primary RCS jet firings which must be coordinated with MCC. Assumes two good channels exist in axis/direction with failed open contact

1. CONFIG DAP FOR MINIMUM TRANS PULSE

GNC 20 DAP CONFIG

DAP A(B) TRANS PLS – ITEM 17(37) +0.0 1 EXEC
C3 DAP TRANS: PULSE/PULSE/PULSE/LOW Z

2. RESELECT FAILED OPEN CONTACT

GNC 25 RM ORBIT

SEL FAILED CONTACT – ITEM X EXEC

Verify no '↓'s on affected row
✓ SW RM INH – ITEM 16 (no *)

3. DEFLECT THC

O14:E, O15:E, O16:E ✓ cb DDU L(A) (two) – cl

F7(A6U) L(A) FLT CNTLR PWR – ON

L(A) THC – deflect in aff axis for 1 sec

NOTE

This step will cause PRCS jets to fire for 80–320 msec. Expect SBTC/THC Fault Summary msg

Verify '↓' for failed contact

4. RECONFIG DAP

GNC 20 DAP CONFIG

Reload DAP A(B) as reqd
DAP TRANS: as reqd
F7(A6U) L(A) FLT CNTLR PWR – OFF
O14:E, O15:E, O16:E cb DDU L(A) (two) – as reqd

RADIATOR POWER CONFIGURATION 9–2
PLBD CLOSING TABLE 9–3

9.1 PLB DOORS
9.1a NO MOTION/'OP/CL' NOT BLANK/'O' OR 'C'/'R' MICROSW = 1 AFTER DRIVE INITIATION 9–4
9.1b '?' DISPLAYED IN 'OP/CL' COLUMN 9–6
9.1c PBD SEQ FAIL 9–7
9.1d LATCH GANG NOT 'OP' IN SINGLE MTR TIME 9–8
9.1e 'CL' IN SINGLE MTR TIME 9–10
9.1f DOOR NOT 'OP' IN SINGLE MTR TIME 9–12
9.1g 'CL' IN SINGLE MTR TIME 9–15
9.1h PBD CONFIG 9–17

9.2 RADIATOR
9.2a RAD LAT CNTL PORT(STBD) tb NOT LAT IN 60 SEC OR REL IN 30 SEC 9–18
9.2b RAD CNTL tb NOT DPY OR STO WITHIN 50 SEC AND NO MOTION 9–20

9.3 KU ANT
9.3a KU ANT tb NOT DPY IN 46 SEC 9–22
9.3b NOT STO IN 46 SEC 9–23
9.3c GIMBAL ANGLES INCORRECT AFTER 50 SEC 9–24

9.4 MEC ROEU
9.4a ROEU DEMATE – tb NOT REL, MICROSW IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME 9–26
9.4b ROEU MATE – tb NOT LAT, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME 9–28
9.4c ROEU RELEASE – tb NOT REL, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME 9–30
9.4d ROEU LATCH – tb NOT LAT, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME 9–32
9.4e ROEU RELAX – tb NOT NOMINAL, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME 9–34
9.4f ROEU ELEC CONT – tb NOT NOMINAL OR IND NOT NOMINAL 9–36

MECH SSR
MECH SSR–1 PORT(STBD) RAD OPS 9–38
SSR–2 CONTINGENCY PLBD CLOSURE 9–39
SSR–3 SIMULTANEOUS PLBD CL 9–46
SSR–4 PLBD CHECKOUT AFTER MDM CHANGEOUT 9–51
SSR–5 CONTINGENCY KU–BD ANT DIRECT STOW (CIL) 9–52
SSR–6 PLBD CL MICROSW FAILURE WORKAROUND 9–53
SSR–7 KU–BAND ANTENNA DPY/STO MICROSW FAILURE 9–55
SSR–8 RAD DPY/STO MICROSW FAILURE WORKAROUND 9–57

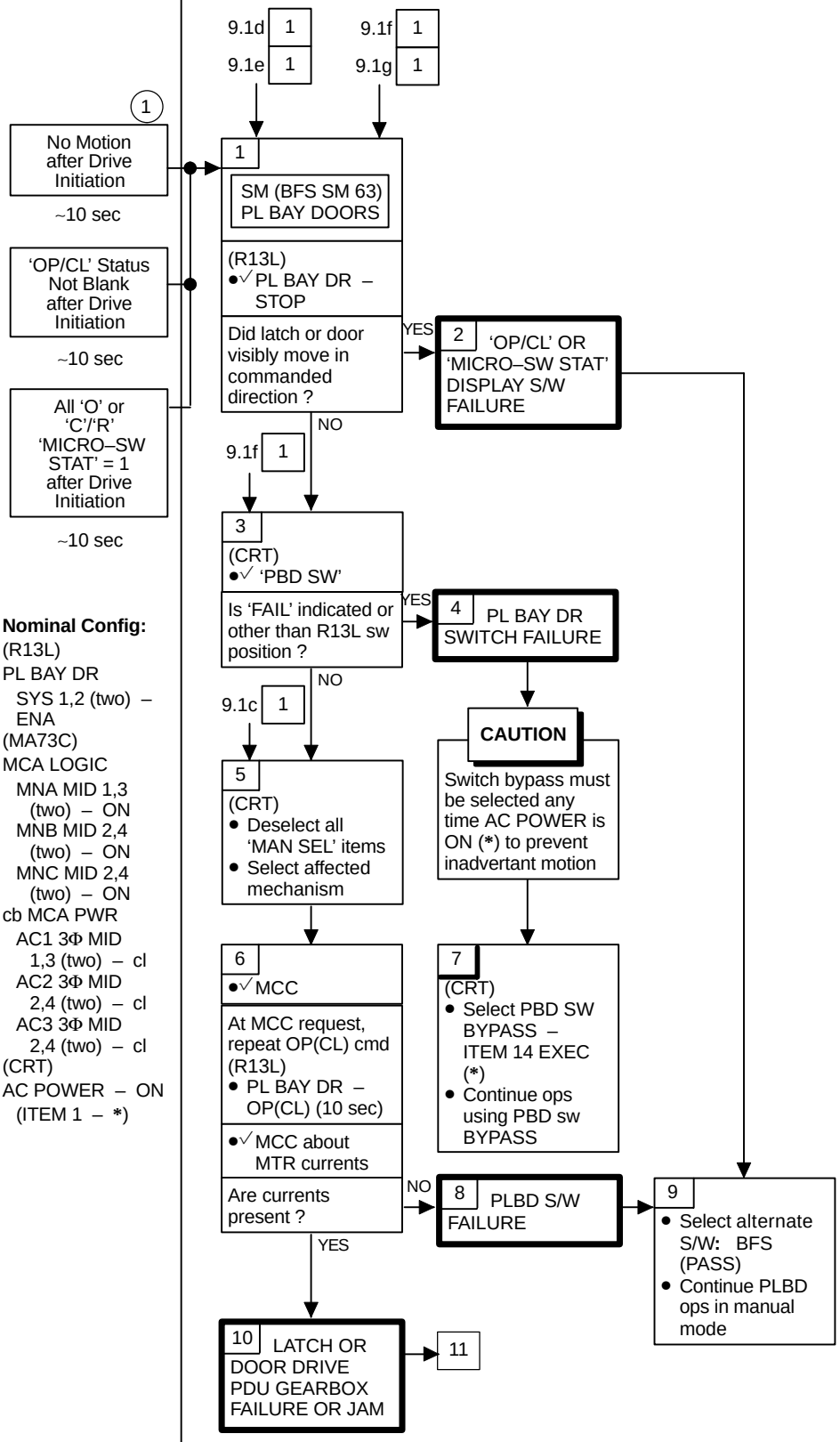
RADIATOR POWER CONFIGURATION

ACTUATOR	MTR	M–MCA	AC PWR			MCA LOGIC		LAT CNTL		RAD CNTL	
			BUS	MECH PWR 1	MECH PWR 2	DC BUS	CNTL BUS	SYS A	SYS B	SYS A	SYS B
STBD 1–6	1	3	1		AB1,CA1 AND AB2,CA2	A (MPC1)	AB3	AB1			
	2	2	2	BC1 AND BC2		B (MPC2)	BC3		BC1		
STBD 7–12	1	3	1		AB1,CA1 AND AB2,CA2	A (MPC1)	AB3	AB2			
	2	2	3	AB1,CA1 AND AB2,CA2		C (MPC3)	CA3		CA1		
STBD DRIVE	1	3	1		AB1,CA1 AND AB2,CA2	A (MPC1)	AB3				BC1 AND BC2
	2	2	3	AB1,CA1 AND AB2,CA2		C (MPC3)	CA3			AB1 AND AB2	
PORT 1–6	1	1	1	AB1,CA1 AND AB2,CA2		A (MPC1)	AB3	AB2			
	2	4	2		BC1 AND BC2	B (MPC2)	BC3		BC2		
PORT 7–12	1	1	1	AB1,CA1 AND AB2,CA2		A (MPC1)	AB3	AB1			
	2	4	3		AB1,CA1 AND AB2,CA2	C (MPC3)	CA3		CA2		
PORT DRIVE	1	1	1	AB1,CA1 AND AB2,CA2		A (MPC1)	AB3			AB1 AND AB2	
	2	4	3		AB1,CA1 AND AB2,CA2	C (MPC3)	CA3				CA1 AND CA2

FUNCTION	PLBD CONTROL								PLBD DISPLAY PL MDM								
	Ref: MA73C: C&D for MCA (cb)																
	MTR 1				MTR 2				C	C	O	O	C	R	R	R	O
	AC/MCA	CNTL	MDM	SYS	AC/MCA	CNTL	MDM	SYS	A	B	A	B		A	B	C	
LATCH																	
5–8	1/MID3	AB3/AB2	PL1	2	3/MID2	CA3/CA1	PL2	1	1	2	1	2					
9–12	1/MID1	AB3/AB1	PL1	1	3/MID4	CA3/CA2	PL2	2	1	2	1	2					
1–4	1/MID3	AB3/AB2	PL1	2	3/MID2	CA3/CA1	PL2	1	1	2	1	2					
13–16	3/MID4	CA3/CA2	PL2	2	2/MID2	BC3/BC1	PL1	1	2	1	2	1					
S FWD	1/MID1	AB3/AB1	PL1	1	2/MID4	BC3/BC2	PL2	2	1	2	1	2					
S AFT	3/MID4	CA3/CA2	PL2	2	2/MID2	BC3/BC1	PL1	1	2	1	2	1					
S DOOR	1/MID1	AB3/AB1	PL1	1	2/MID4	BC3/BC2	PL2	2					1	1	2	2	1
													2	1	2	2	2
P FWD	1/MID1	AB3/AB1	PL1	1	2/MID4	BC3/BC2	PL2	2	1	2	1	2					
P AFT	1/MID3	AB3/AB2	PL1	2	3/MID2	CA3/CA1	PL2	1	1	2	1	2					
P DOOR	3/MID4	CA3/CA2	PL2	2	2/MID2	BC3/BC1	PL1	1					2	1	1	2	2
													1	1	1	2	1

MECH

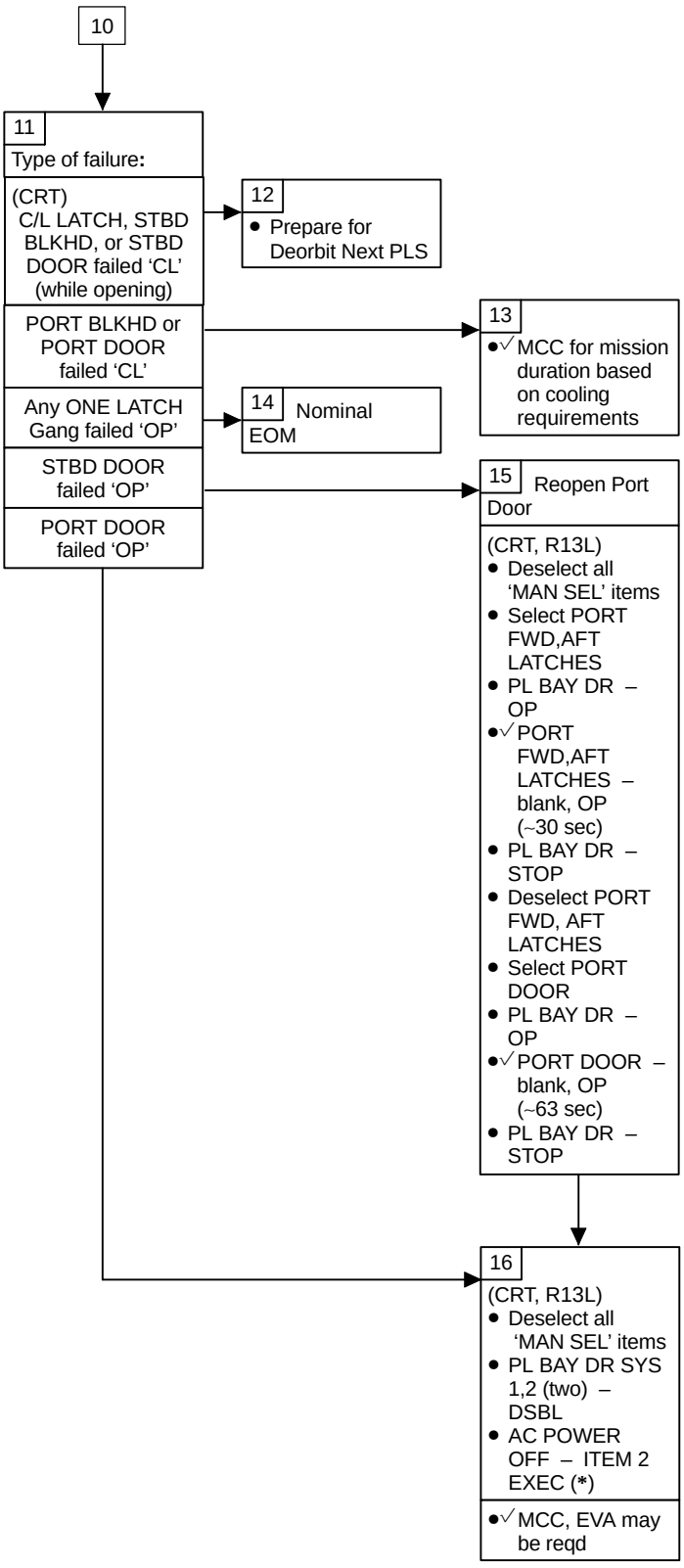
9.1a NO MOTION/'OP/CL' NOT BLANK/'O' OR 'C'/'R' MICROSW = 1 AFTER DRIVE INITIATION



Nominal Config:
(R13L)
PL BAY DR
SYS 1,2 (two) – ENA
(MA73C)
MCA LOGIC
MNA MID 1,3 (two) – ON
MNB MID 2,4 (two) – ON
MNC MID 2,4 (two) – ON
cb MCA PWR
AC1 3Φ MID 1,3 (two) – cl
AC2 3Φ MID 2,4 (two) – cl
AC3 3Φ MID 2,4 (two) – cl
(CRT)
AC POWER – ON (ITEM 1 – *)

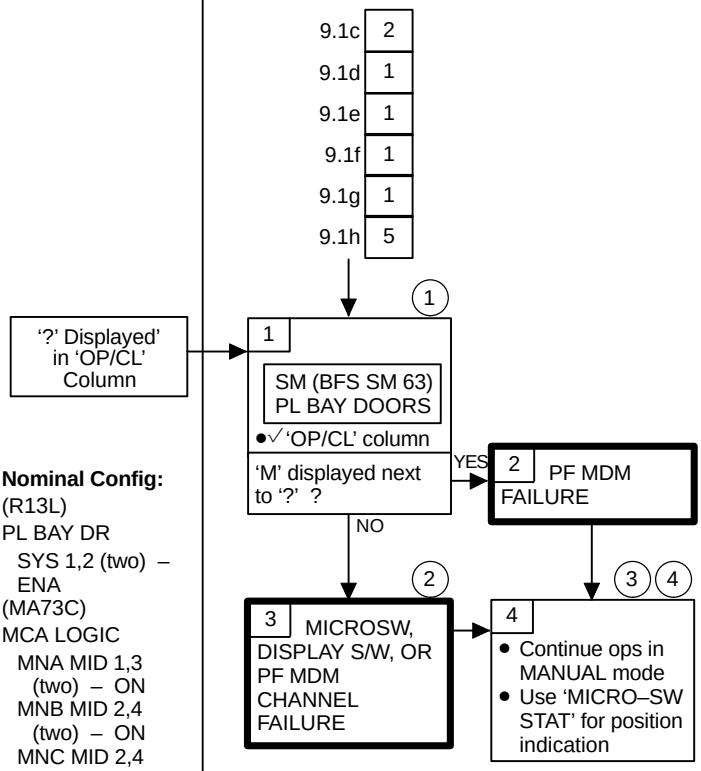
(1) Ops Times
CENTER LATCHES
2 mtrs ~20 sec
1 mtr ~40 sec
FWD AFT LATCHES
2 mtrs ~30 sec
1 mtr ~60 sec
DOORS
2 mtrs ~63 sec
1 mtr ~126 sec

MECH 9.1a (Cont)



MECH

9.1b ‘?’ DISPLAYED IN ‘OP/CL’ COLUMN



Nominal Config:
(R13L)
PL BAY DR
SYS 1,2 (two) – ENA
(MA73C)
MCA LOGIC
MNA MID 1,3 (two) – ON
MNB MID 2,4 (two) – ON
MNC MID 2,4 (two) – ON
cb MCA PWR
AC1 3Φ MID 1,3 (two) – cl
AC2 3Φ MID 2,4 (two) – cl
AC3 3Φ MID 2,4 (two) – cl
(CRT)
AC POWER – ON
(ITEM 1 – *)

(1) ‘?’ is displayed for the following:
LATCH:
At least one ‘1’ displayed for both ‘O’ and ‘C’ microsws
DOOR:
‘1’ displayed in:
two ‘C’ and two ‘O’ microsws
or
two ‘C’ and not (two of three) FWD and AFT ‘R’ microsws
or
two ‘O’ and (two of three) FWD or AFT ‘R’ microsws

(2) Failed–on door CL microsw can be bypassed to regain mtr function (refer to MECH SSR–6)

(3) In most cases, AUTO mode will not work with ‘?’ indicated

(4) One microsw attained in commanded direction within single mtr time is sufficient verification of position if visual cues not available

MECH

9.1c PBD SEQ FAIL

PBD SEQ FAIL

SM (BFS SM 63) PL BAY DOORS

If:
'↓' in 'AUTO SEQ' column adjacent to timed–out PLBD mechanism

BFS:

S63 PBD SEQ FAIL

Nominal Config:
(R13L)
PL BAY DR
SYS 1,2 (two) – ENA
(MA73C)
MCA LOGIC
MNA MID 1,3 (two) – ON
MNB MID 2,4 (two) – ON
MNC MID 2,4 (two) – ON
cb MCA PWR
AC1 3Φ MID 1,3 (two) – cl
AC2 3Φ MID 2,4 (two) – cl
AC3 3Φ MID 2,4 (two) – cl
(CRT)
AC POWER – ON (ITEM 1 – *)
AUTO MODE – SEL (ITEM 3 – *)

(1)

1
(R13L)
- PL BAY DR – STOP

SM (BFS SM 63) PL BAY DOORS

Deselect AUTO MODE SEL
- ITEM 3 EXEC (no *)
- ✓ PBD SW BYPASS – ITEM 14 (no *)

Did latch or door visibly move in commanded direction ?

NO → 9.1a 5

YES ↓

2
(CRT)
- ✓ 'OP/CL' column

'?' adjacent to '↓' in 'AUTO SEQ' column ?

YES → 9.1b 1

NO ↓

3 Mechanism affected:

LATCH
DOOR

4
Desired position:
'CL' → 9.1e 2
'OP' → 9.1d 2

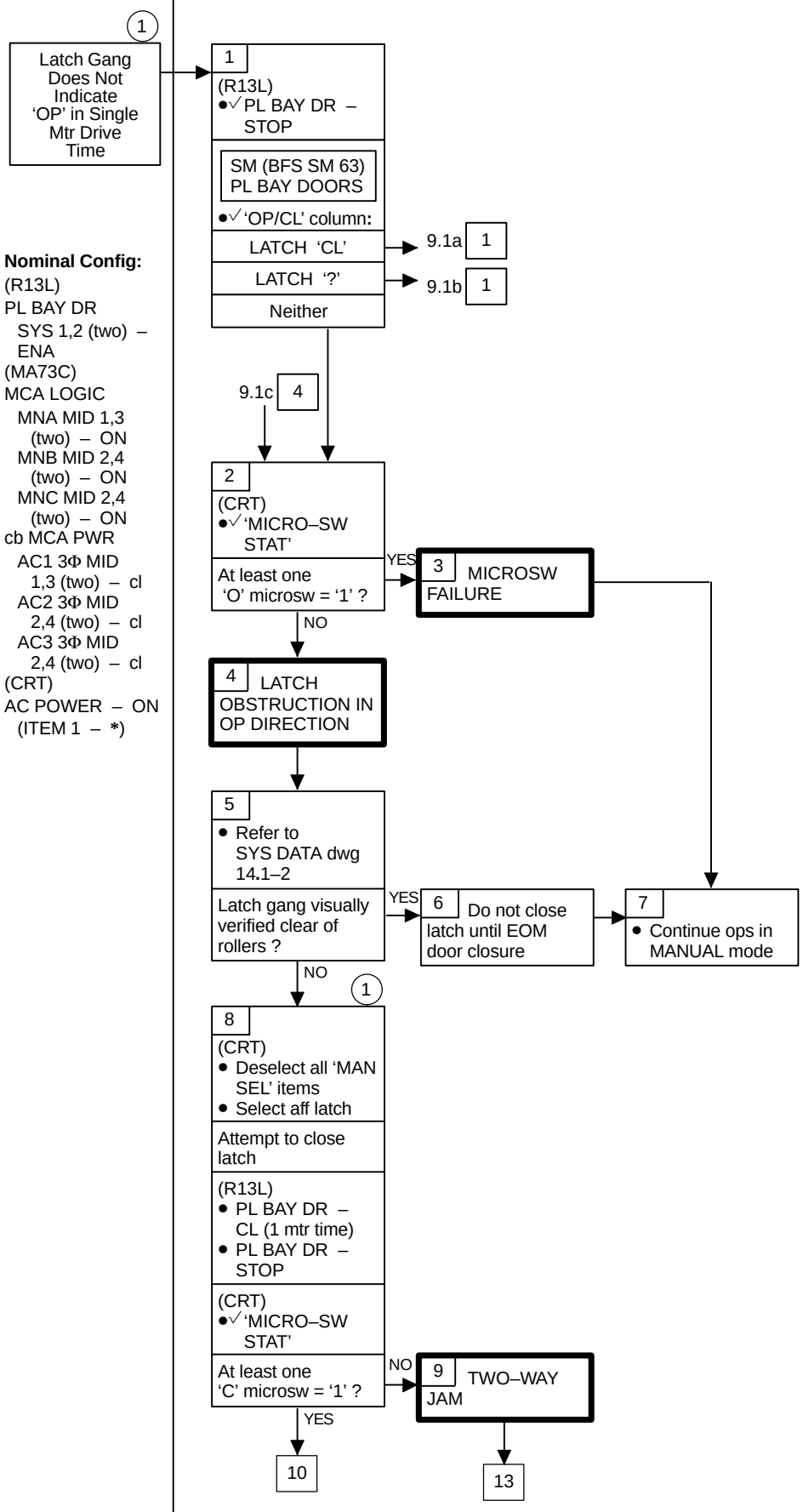
5
- Select aff DOOR 'MAN SEL' item

6
Desired position:
'CL' → 9.1g 2
'OP' → 9.1f 1

(1) Although PBD SEQ FAIL will terminate AUTO MODE, ITEM 3 (AUTO MODE SEL) remains selected (*). To reselect AUTO MODE, ITEM 3 must be turned OFF, then ON

MECH

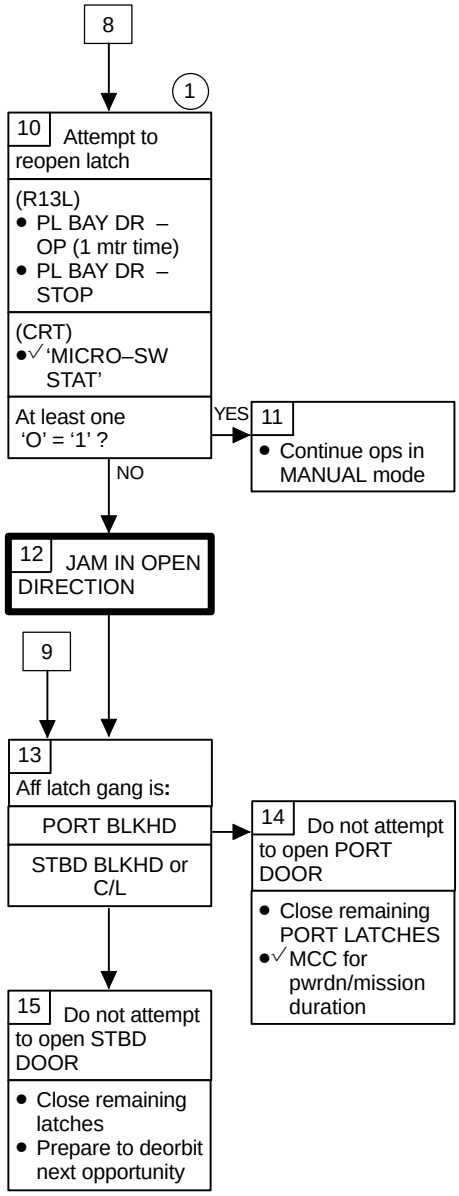
9.1d LATCH GANG NOT 'OP' IN SINGLE MTR TIME



Nominal Config:
(R13L)
PL BAY DR
SYS 1,2 (two) – ENA
(MA73C)
MCA LOGIC
MNA MID 1,3 (two) – ON
MNB MID 2,4 (two) – ON
MNC MID 2,4 (two) – ON
cb MCA PWR
AC1 3Φ MID 1,3 (two) – cl
AC2 3Φ MID 2,4 (two) – cl
AC3 3Φ MID 2,4 (two) – cl
(CRT)
AC POWER – ON (ITEM 1 – *)

(1) Ops Times
CENTER LATCHES
2 mtrs ~20 sec
1 mtr ~40 sec
FWD,AFT LATCHES
2 mtrs ~30 sec
1 mtr ~60 sec
DOORS
2 mtrs ~63 sec
1 mtr ~126 sec

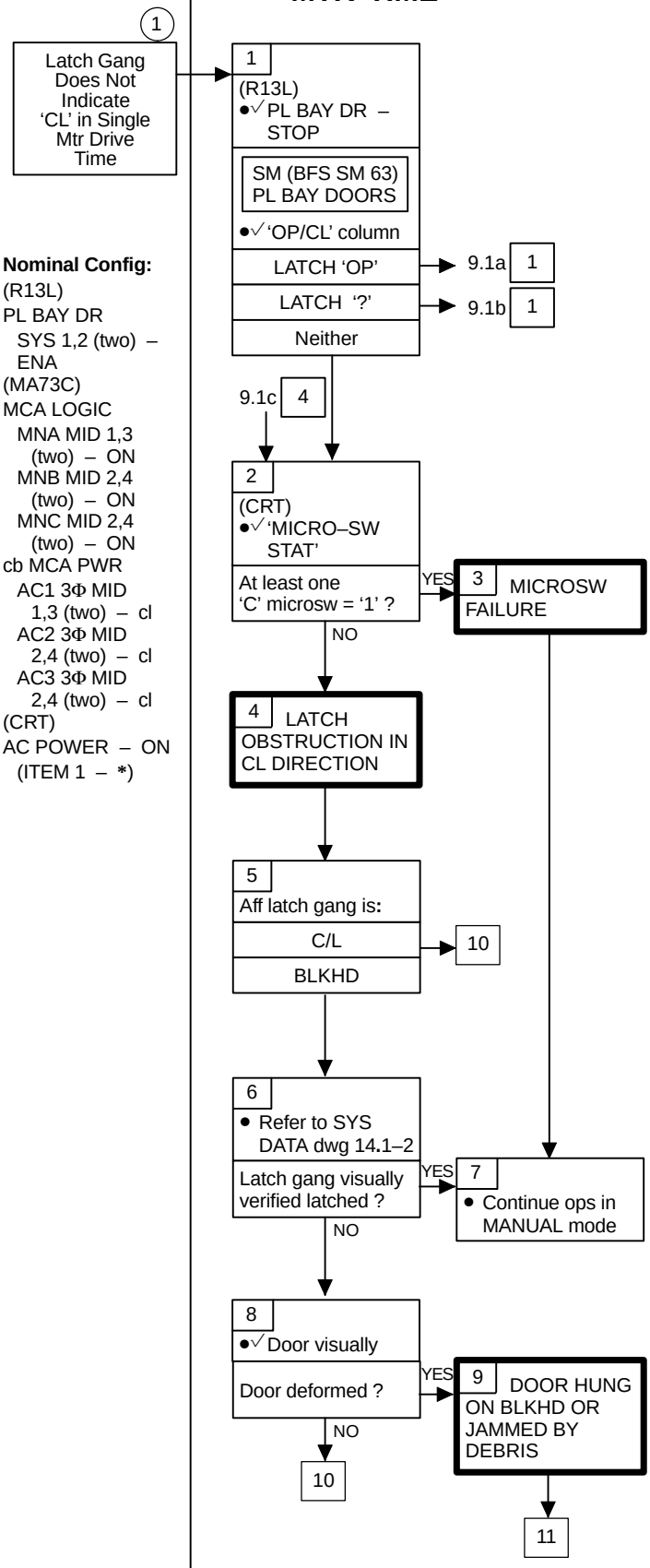
MECH 9.1d (Cont)



(1) Ops Times
CENTER LATCHES
2 mtrs ~20 sec
1 mtr ~40 sec
FWD,AFT LATCHES
2 mtrs ~30 sec
1 mtr ~60 sec
DOORS
2 mtrs ~63 sec
1 mtr ~126 sec

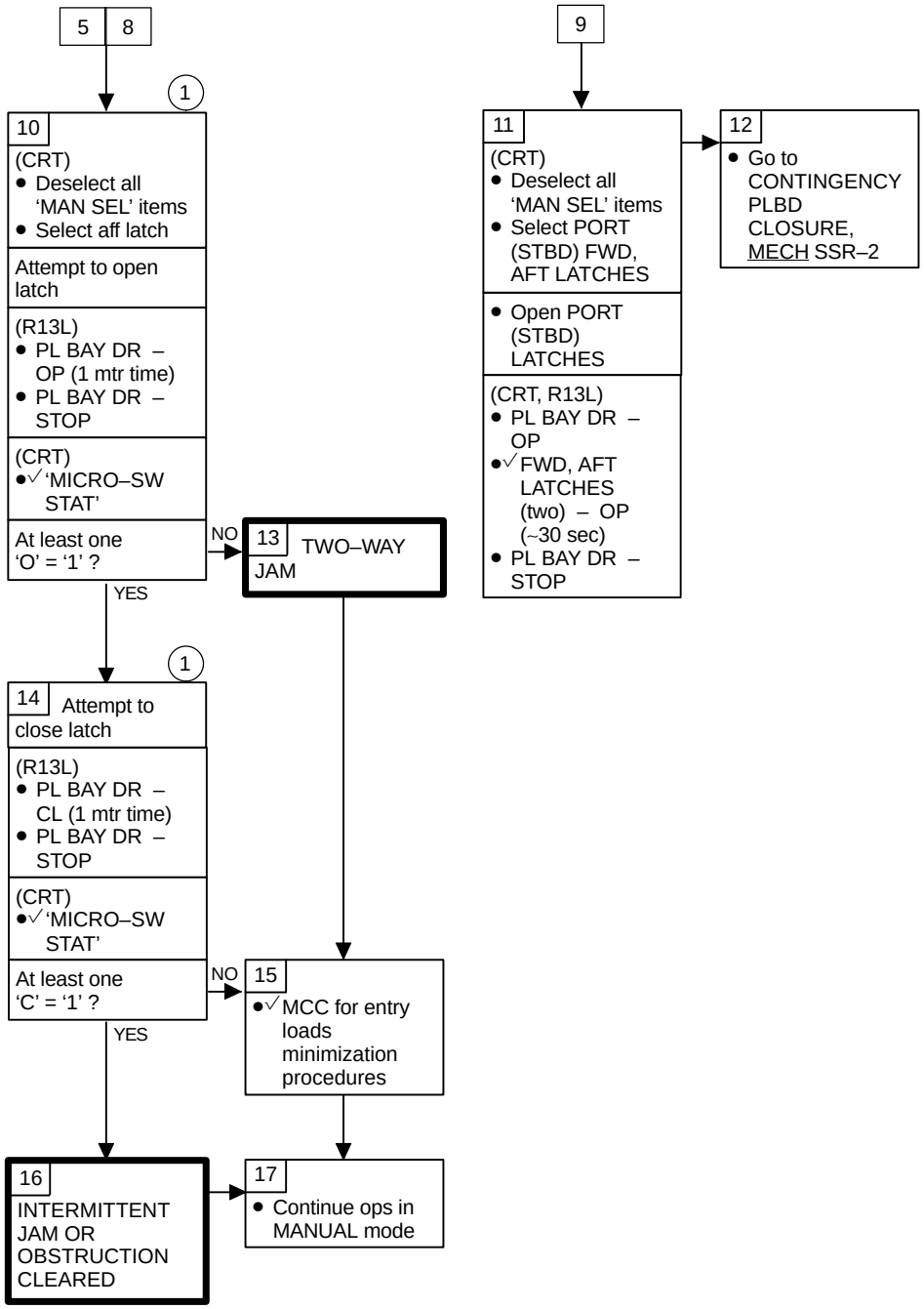
MECH

9.1e LATCH GANG NOT 'CL' IN SINGLE MTR TIME



Nominal Config:
(R13L)
PL BAY DR
SYS 1,2 (two) – ENA
(MA73C)
MCA LOGIC
MNA MID 1,3 (two) – ON
MNB MID 2,4 (two) – ON
MNC MID 2,4 (two) – ON
cb MCA PWR
AC1 3Φ MID 1,3 (two) – cl
AC2 3Φ MID 2,4 (two) – cl
AC3 3Φ MID 2,4 (two) – cl
(CRT)
AC POWER – ON
(ITEM 1 – *)

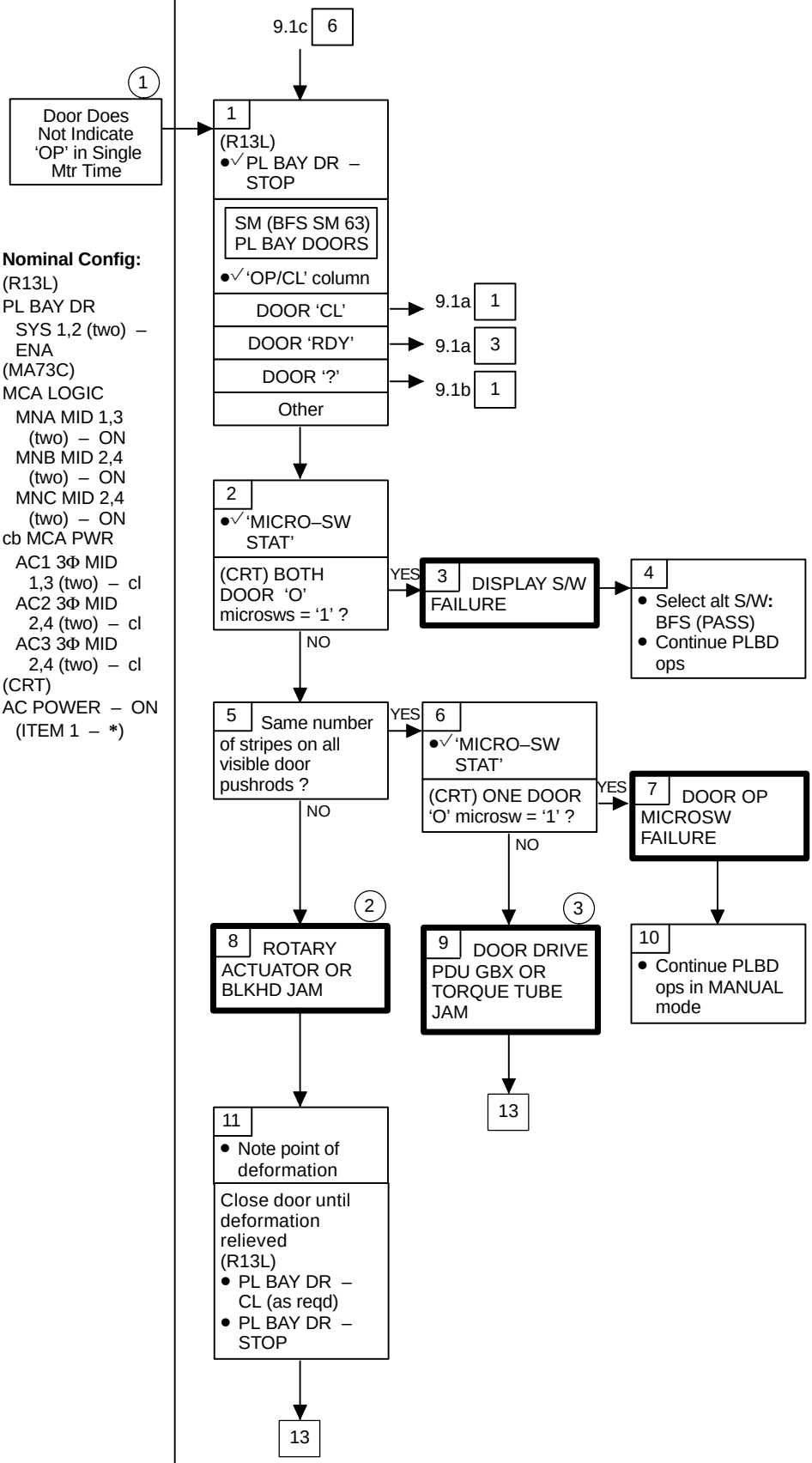
1 Ops Times
CENTER LATCHES
2 mtrs ~20 sec
1 mtr ~40 sec
FWD,AFT LATCHES
2 mtrs ~30 sec
1 mtr ~60 sec
DOOR
2 mtrs ~63 sec
1 mtr ~126 sec



(1) Ops Times
CENTER LATCHES
2 mtrs ~20 sec
1 mtr ~40 sec
FWD, AFT LATCHES
2 mtrs ~30 sec
1 mtr ~60 sec
DOOR
2 mtrs ~63 sec
1 mtr ~126 sec

MECH

9.1f DOOR NOT 'OP' IN SINGLE MTR TIME

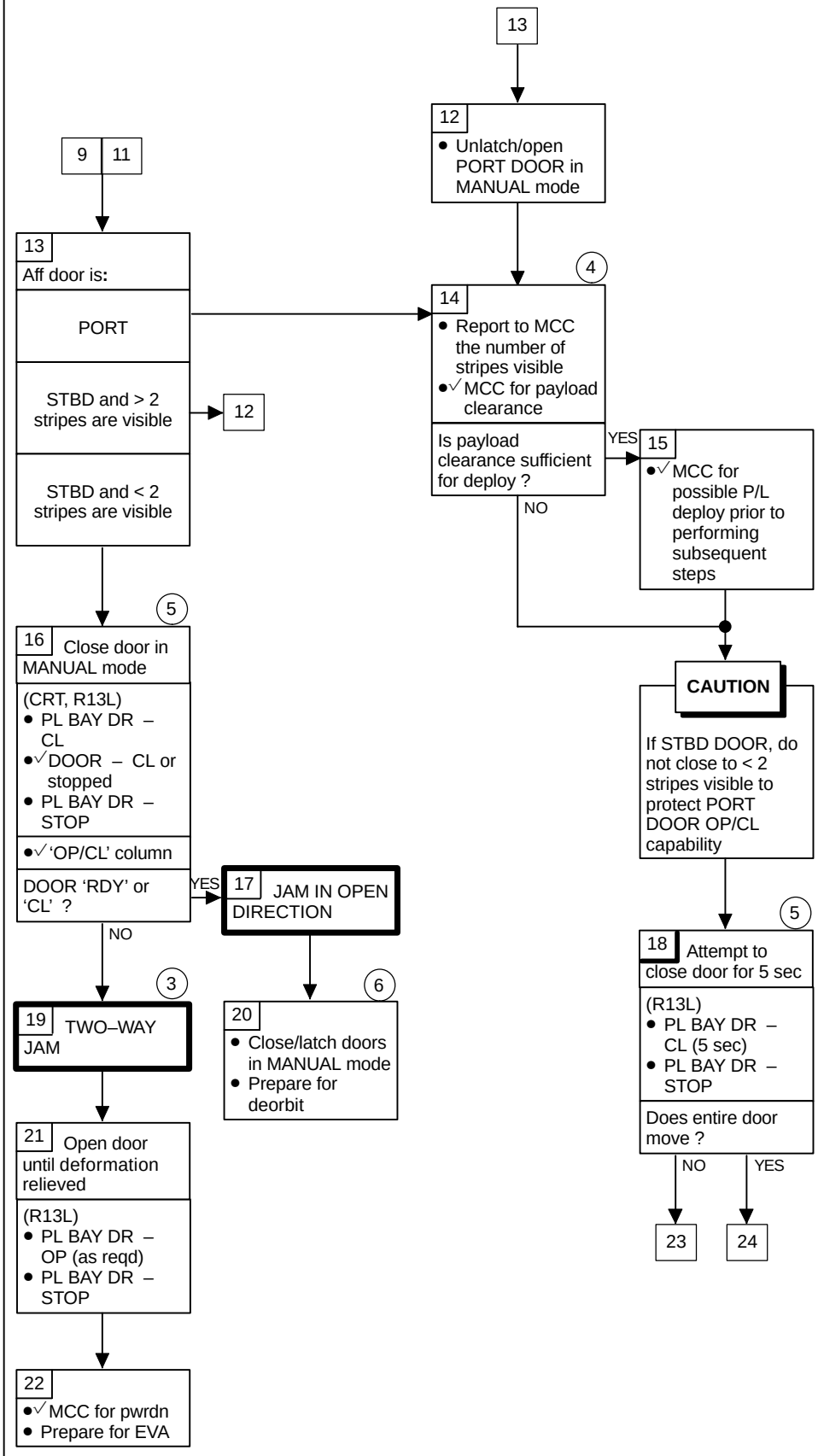


Nominal Config:
(R13L)
PL BAY DR
SYS 1,2 (two) – ENA
(MA73C)
MCA LOGIC
MNA MID 1,3 (two) – ON
MNB MID 2,4 (two) – ON
MNC MID 2,4 (two) – ON
cb MCA PWR
AC1 3Φ MID 1,3 (two) – cl
AC2 3Φ MID 2,4 (two) – cl
AC3 3Φ MID 2,4 (two) – cl
(CRT)
AC POWER – ON (ITEM 1 – *)

(1) Ops Times
CENTER LATCHES
2 mtrs ~20 sec
1 mtr ~40 sec
FWD,AFT LATCHES
2 mtrs ~30 sec
1 mtr ~60 sec
DOORS
2 mtrs ~63 sec
1 mtr ~126 sec

(2) EVA reqd to cut PLB door drive linkage for at least one rotary actuator (i.e., one nearest point of deformation)

(3) EVA reqd to disconnect PDU



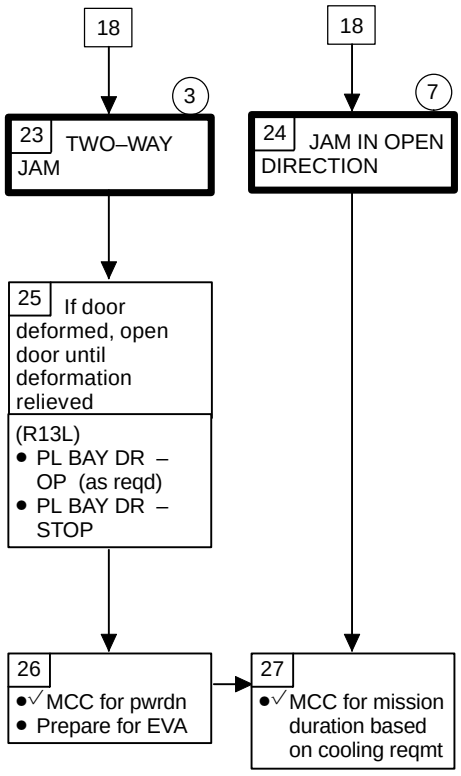
(3) EVA reqd to disconnect PDU

(4) Door may interfere with P/L deploy

(5) Cmd DOOR CL to see if EVA necessary to CL

(6) If door reopen were attempted, two–way jam could occur causing day–1 EVA

MECH 9.1f (Cont)



(3) EVA reqd to disconnect PDU

(7) No EVA reqd to close door

MECH

9.1g DOOR NOT 'CL' IN SINGLE MTR TIME

(1) Door Does Not indicate 'CL' in Single Mtr Drive Time

Nominal Config:
(R13L)
PL BAY DR
SYS 1,2 (two) – ENA
(MA73C)
MCA LOGIC
MNA MID 1,3 (two) – ON
MNB MID 2,4 (two) – ON
MNC MID 2,4 (two) – ON
cb MCA PWR
AC1 3Φ MID 1,3 (two) – cl
AC2 3Φ MID 2,4 (two) – cl
AC3 3Φ MID 2,4 (two) – cl
(CRT)
AC POWER – ON (ITEM 1 – *)

1 (R13L)
●✓ PL BAY DR – STOP

SM (BFS SM 63) PL BAY DOORS
●✓ 'OP/CL' column

DOOR 'OP' → 9.1a 1
DOOR '?' → 9.1b 1
Neither

9.1c 6

2 Is door deformed (indicated by C/L edge warpage and/or different number of stripes visible on door drive pushrods) ?

YES → 3 (CRT) ●✓ 'OP/CL' column; Is DOOR 'RDY' ?
YES → 4 BLKHD JAM CAUSED BY THERMAL WARPAGE OR OBSTRUCTION → 5 ● Go to CONTINGENCY PLBD CLOSURE, MECH SSR–2
NO → (2) 6 ROTARY ACTUATOR JAM AT POINT OF DEFORMATION → 8 ● Note point of deformation → 15

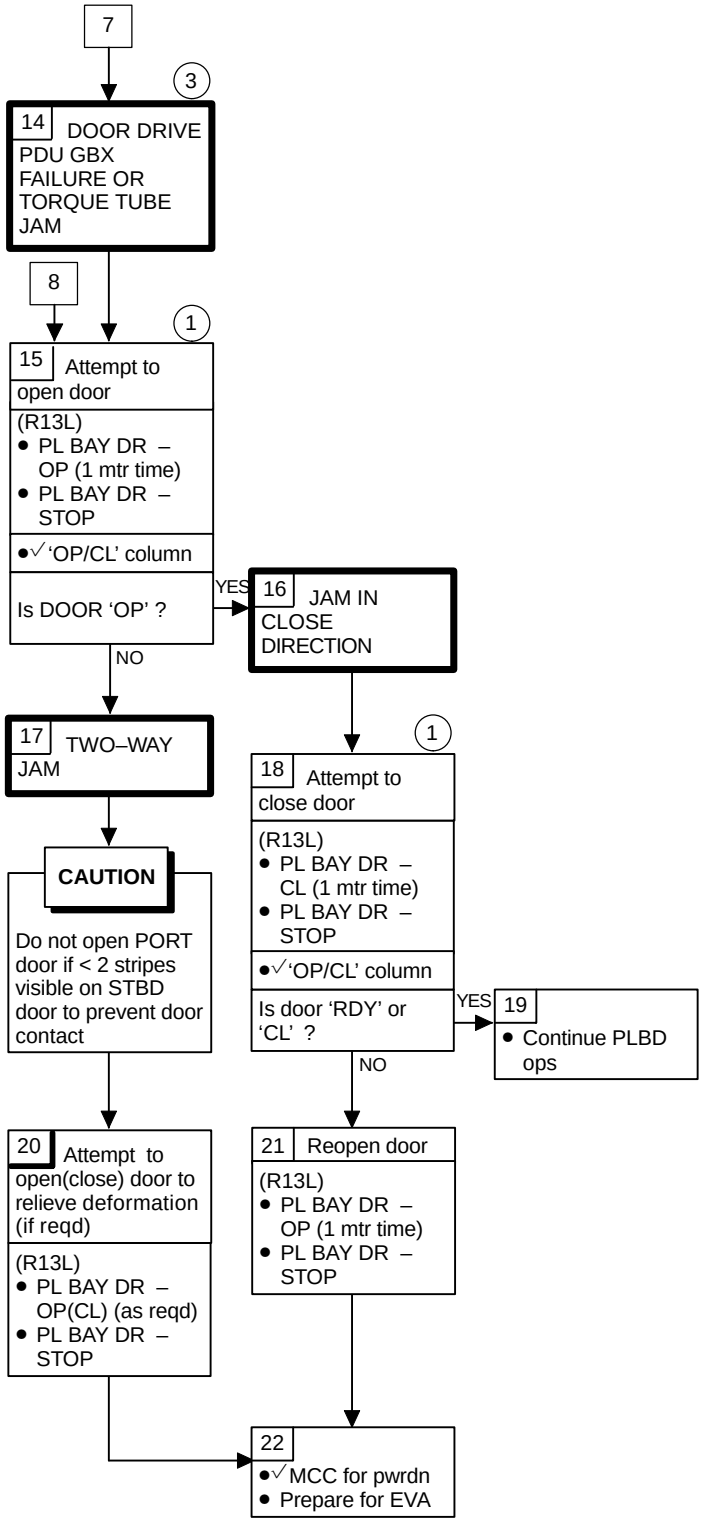
NO → 7 ●✓ Door position on PLBD BLKHD LATCH GO/NO–GO DIAGRAM, MECH SSR–2, fig. 9–1; Is conclusion GO ?

YES → 9 (CRT) ●✓ 'MICRO–SW STAT'; Both DOOR 'C' microsws = '1' and at least two of three FWD and AFT 'R' microsws = '1' ?
YES → 10 DISPLAY S/W FAILURE → 11 ● Select alt S/W: BFS (PASS) ● Continue PLBD ops
NO → 12 DOOR CL MICROSW FAILURE → 13 ● Continue PLBD ops in MANUAL mode ● Visual verification reqd for latch capture

NO → 14

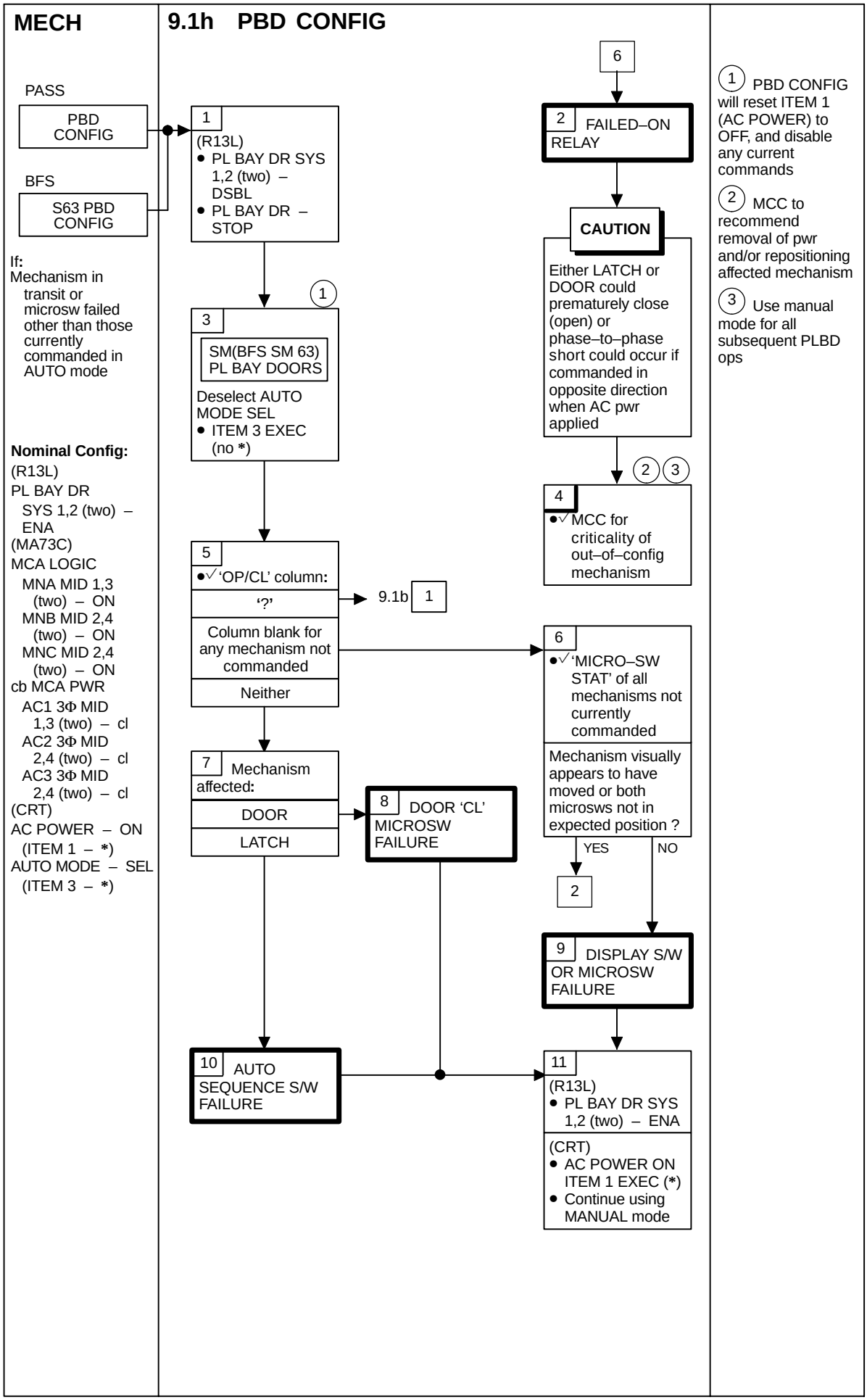
(1) Ops Times
CENTER LATCHES
2 mtrs ~20 sec
1 mtr ~40 sec
FWD,AFT LATCHES
2 mtrs ~30 sec
1 mtr ~60 sec
DOORS
2 mtrs ~63 sec
1 mtr ~126 sec

(2) EVA reqd to cut PLB door drive linkage for at least one rotary actuator (i.e., one nearest point of deformation)



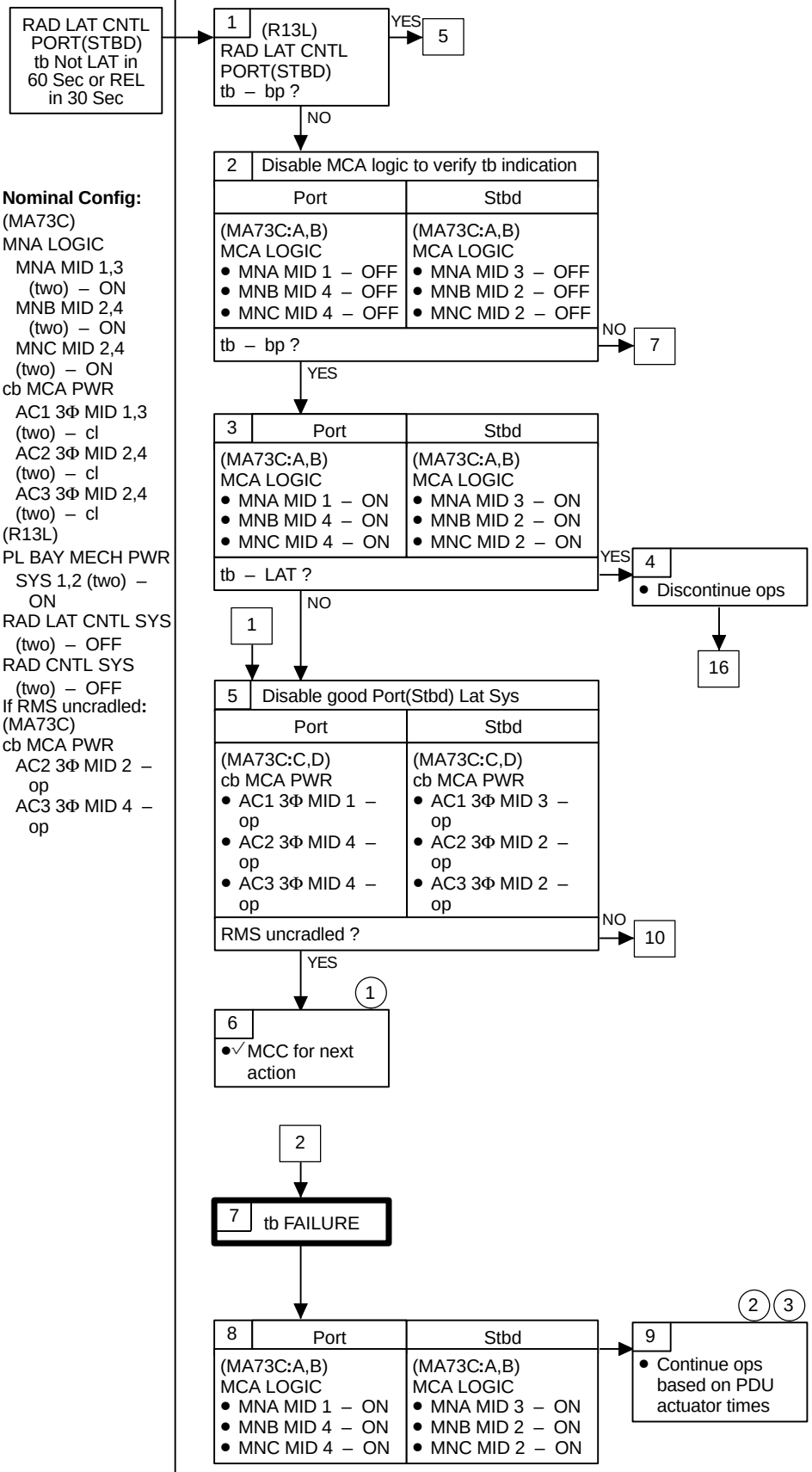
(1) Ops Times
CENTER LATCHES
2 mtrs ~20 sec
1 mtr ~40 sec
FWD,AFT LATCHES
2 mtrs ~30 sec
1 mtr ~60 sec
DOORS
2 mtrs ~63 sec
1 mtr ~126 sec

(3) EVA reqd to disconnect PDU


MECH
9.1h PBD CONFIG
PASS
PBD CONFIG
BFS
S63 PBD CONFIG
If:
Mechanism in transit or microsw failed other than those currently commanded in AUTO mode
Nominal Config:
(R13L)
PL BAY DR
SYS 1,2 (two) – ENA
(MA73C)
MCA LOGIC
MNA MID 1,3 (two) – ON
MNB MID 2,4 (two) – ON
MNC MID 2,4 (two) – ON
cb MCA PWR
AC1 3Φ MID 1,3 (two) – cl
AC2 3Φ MID 2,4 (two) – cl
AC3 3Φ MID 2,4 (two) – cl
(CRT)
AC POWER – ON (ITEM 1 – *)
AUTO MODE – SEL (ITEM 3 – *)
1 (R13L) • PL BAY DR SYS 1,2 (two) – DSBL • PL BAY DR – STOP
3 SM(BFS SM 63) PL BAY DOORS
Deselect AUTO MODE SEL • ITEM 3 EXEC (no *)
5 •✓'OP/CL' column:
'?'
9.1b 1
Column blank for any mechanism not commanded
Neither
7 Mechanism affected:
DOOR
LATCH
8 DOOR 'CL' MICROSW FAILURE
10 AUTO SEQUENCE S/W FAILURE
6
2 FAILED–ON RELAY
CAUTION
Either LATCH or DOOR could prematurely close (open) or phase–to–phase short could occur if commanded in opposite direction when AC pwr applied
2 3
4 •✓MCC for criticality of out–of–config mechanism
6 •✓'MICRO–SW STAT' of all mechanisms not currently commanded
Mechanism visually appears to have moved or both microsws not in expected position ?
YES
NO
2
9 DISPLAY S/W OR MICROSW FAILURE
11 (R13L) • PL BAY DR SYS 1,2 (two) – ENA
(CRT) • AC POWER ON ITEM 1 EXEC (*) • Continue using MANUAL mode
1 PBD CONFIG will reset ITEM 1 (AC POWER) to OFF, and disable any current commands
2 MCC to recommend removal of pwr and/or repositioning affected mechanism
3 Use manual mode for all subsequent PLBD ops

MECH

9.2a RAD LAT CNTL PORT(STBD) tb NOT LAT IN 60 SEC OR REL IN 30 SEC



Nominal Config:
(MA73C)
MNA LOGIC
- MNA MID 1,3 (two) – ON
- MNB MID 2,4 (two) – ON
- MNC MID 2,4 (two) – ON

cb MCA PWR
- AC1 3Φ MID 1,3 (two) – cl
- AC2 3Φ MID 2,4 (two) – cl
- AC3 3Φ MID 2,4 (two) – cl

(R13L)
PL BAY MECH PWR
- SYS 1,2 (two) – ON

RAD LAT CNTL SYS
- (two) – OFF

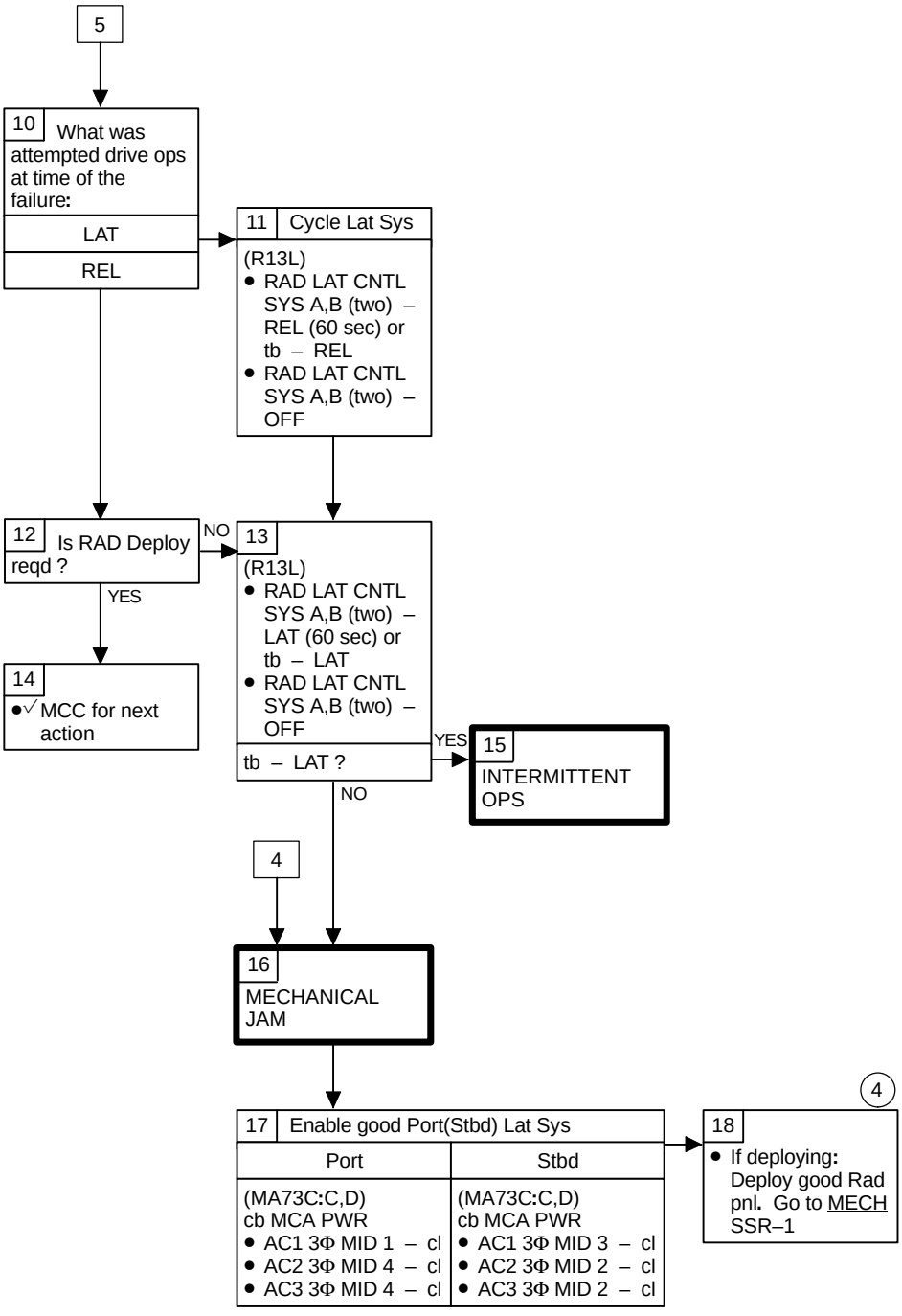
RAD CNTL SYS
- (two) – OFF

If RMS uncradled:
(MA73C)
cb MCA PWR
- AC2 3Φ MID 2 – op
- AC3 3Φ MID 4 – op

(1) Opened MCA cbs (for RMS uncradled) prevent verification of dual motor ops during RAD troubleshooting

(2) PDU Actuator Times
NORMAL
Lat – 30 sec
Rad – 50 sec
SINGLE MTR
Lat – 60 sec
Rad – 100 sec

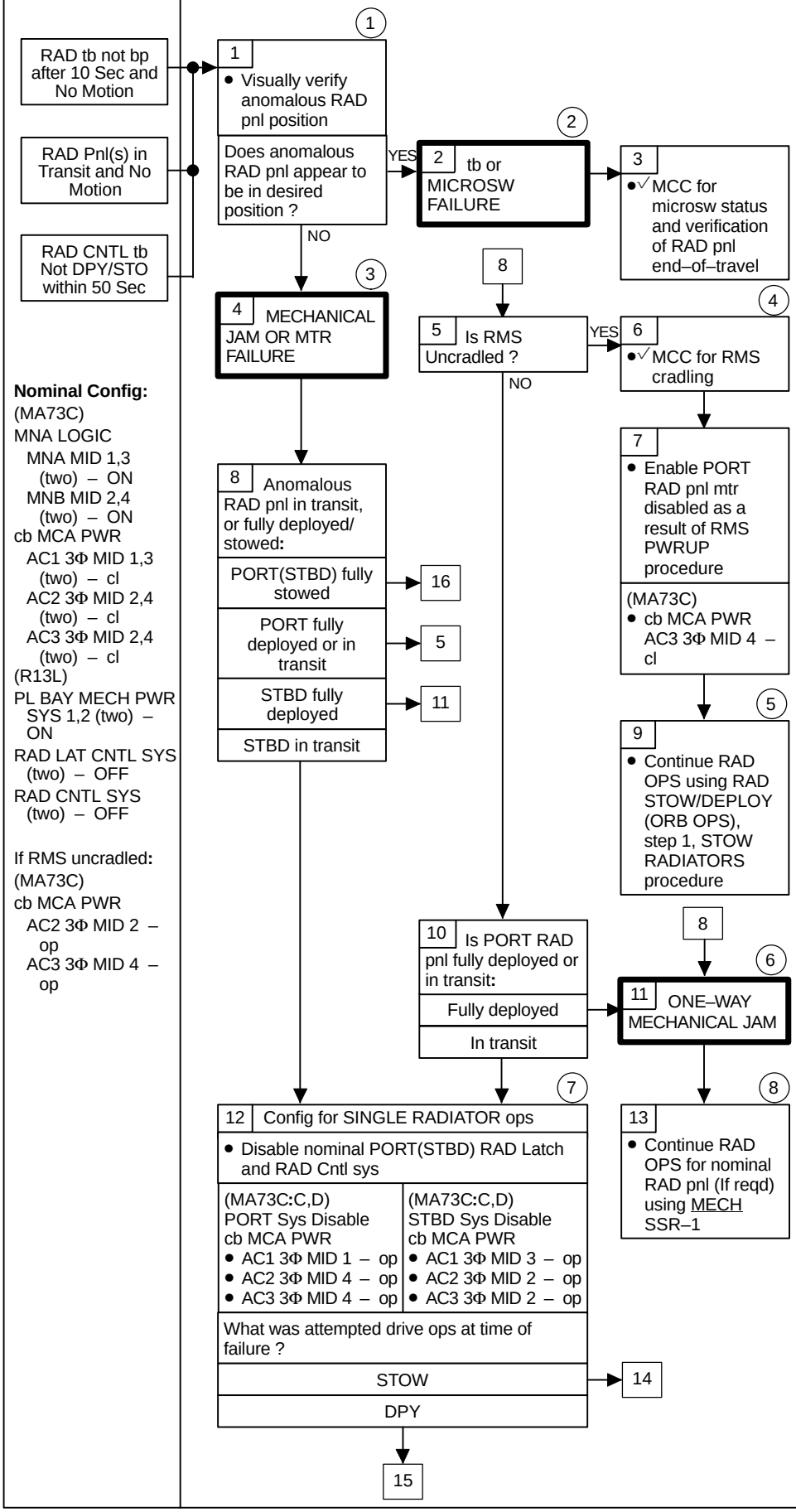
(3) Need MCC verification of microsw status for failed tb



4 ✓MCC to determine pwrdn reqd, if any

MECH

9.2b RAD CNTL tb NOT DPY OR STO WITHIN 50 SEC AND NO MOTION



Nominal Config:
(MA73C)
MNA LOGIC
MNA MID 1,3 (two) – ON
MNB MID 2,4 (two) – ON
cb MCA PWR
AC1 3Φ MID 1,3 (two) – cl
AC2 3Φ MID 2,4 (two) – cl
AC3 3Φ MID 2,4 (two) – cl
(R13L)
PL BAY MECH PWR SYS 1,2 (two) – ON
RAD LAT CNTL SYS (two) – OFF
RAD CNTL SYS (two) – OFF

If RMS uncradled:
(MA73C)
cb MCA PWR
AC2 3Φ MID 2 – op
AC3 3Φ MID 4 – op

(1) Compare PORT (STBD) RAD pnl with fixed RAD pnls or deployed STBD(PORT) RAD pnl

(2) If dual microsw failure, microsws can be bypassed to regain mtrs function (refer to MECH SSR–8)

(3) Both redundant deploy mtrs must be operational to be GO for deploy

(4) Opened MCA cbs (if RMS uncradled) conflict with Rad troubleshooting

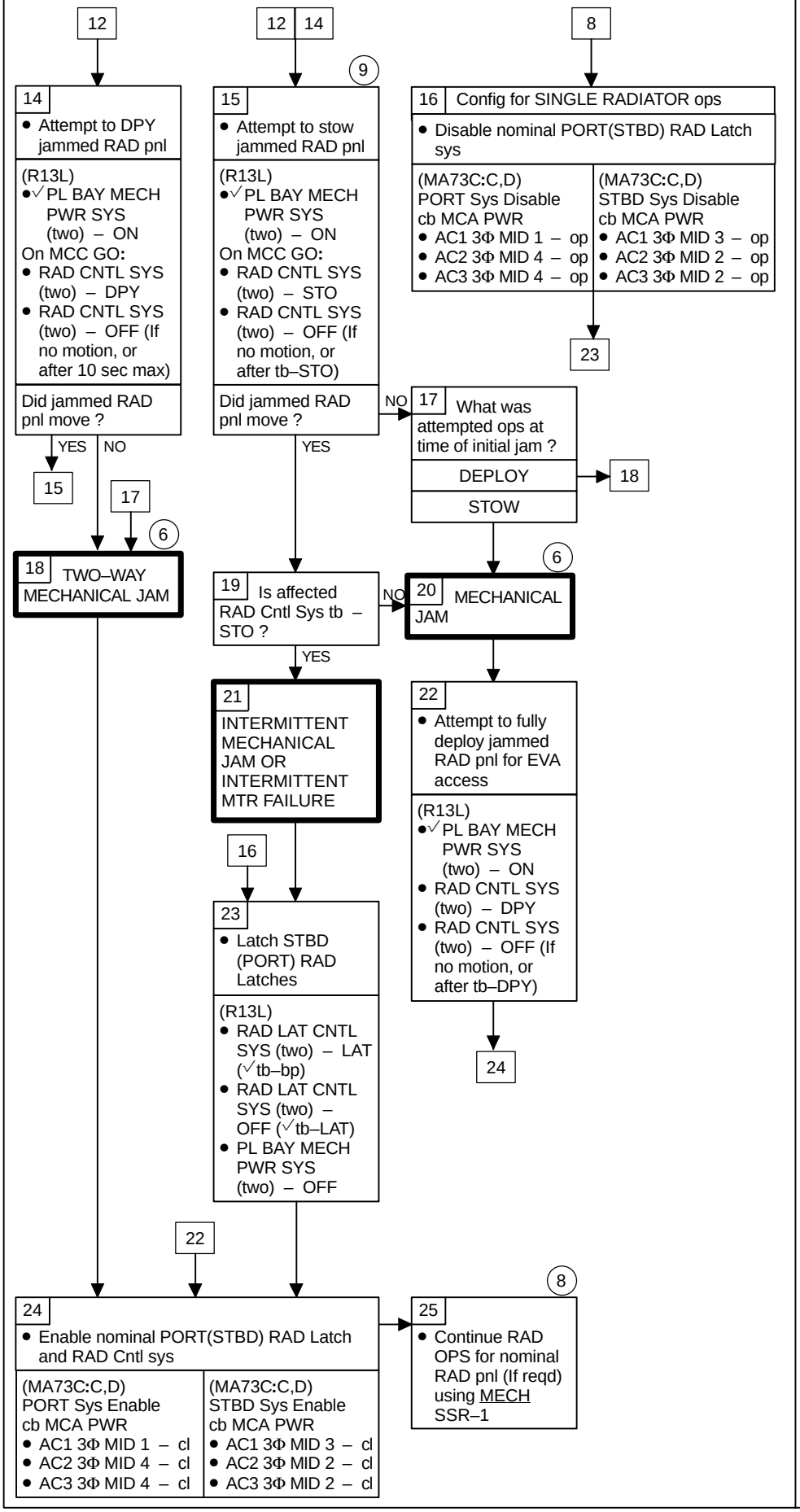
(5) Resume in block 12 if RAD STOW/DPY OPS unsuccessful, and affected RAD pnl failed in transit

(6) EVA reqd to stow jammed Rad pnl

(7) If RMS uncradled, expect single mtr drive time for PORT RAD

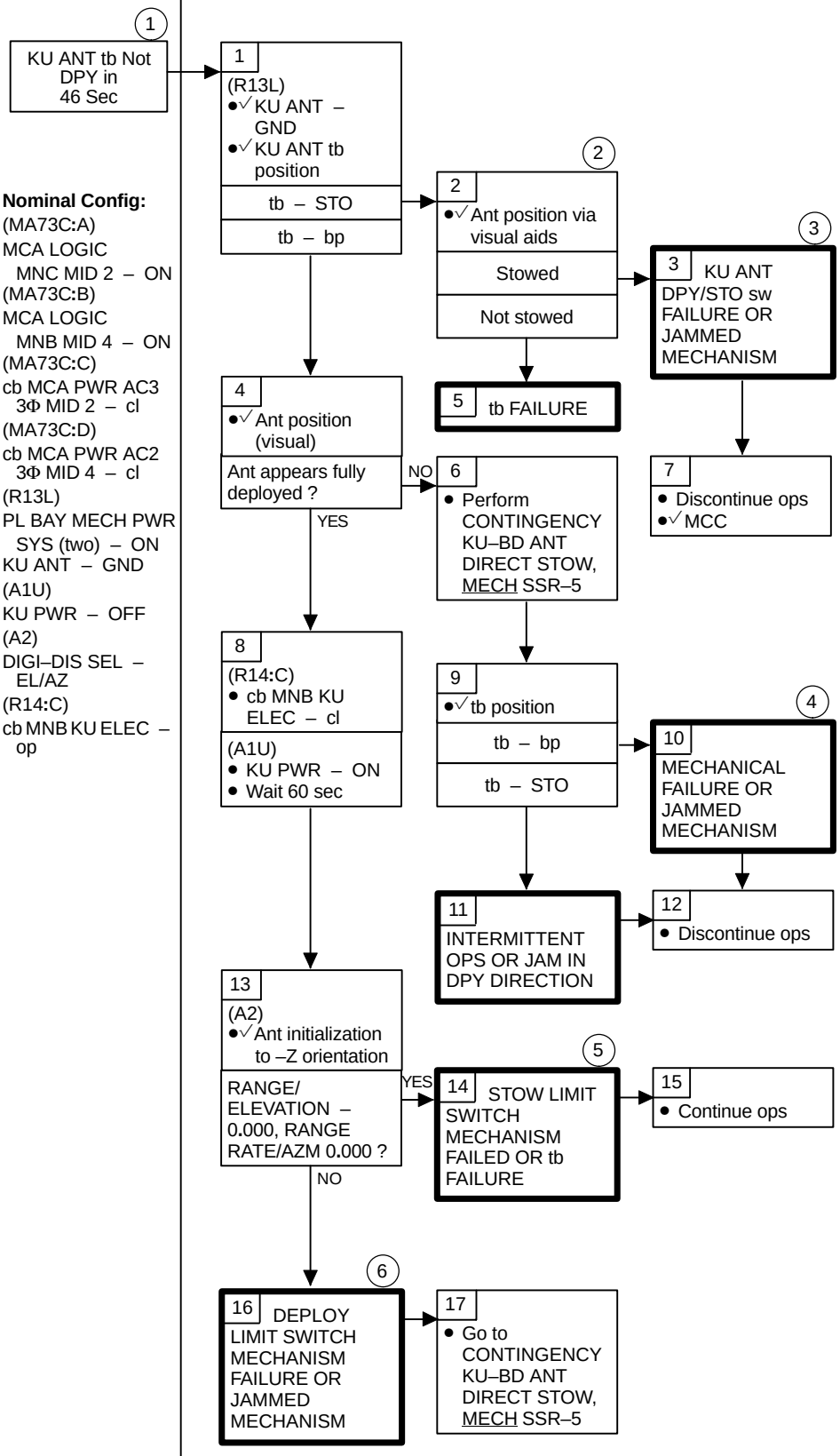
(8) ✓MCC to determine if pwrdn is reqd

MECH 9.2b (Cont)



MECH

9.3a KU ANT tb NOT DPY IN 46 SEC



Nominal Config:

(MA73C:A)
MCA LOGIC
MNC MID 2 – ON
(MA73C:B)
MCA LOGIC
MNB MID 4 – ON
(MA73C:C)
cb MCA PWR AC3 3Φ MID 2 – cl
(MA73C:D)
cb MCA PWR AC2 3Φ MID 4 – cl
(R13L)
PL BAY MECH PWR SYS (two) – ON
KU ANT – GND
(A1U)
KU PWR – OFF
(A2)
DIGI–DIS SEL – EL/AZ
(R14:C)
cb MNB KU ELEC – op

(1) Drive Time
Single mtr – 46 sec
Dual mtr – 23 sec

(2) KU–BD CCTV overlay located in Middeck Transparency Kit

(3) KU–BAND ANTENNA CONTINGENCY DEPLOY/STOW FAILED DEPLOY STOW SWITCH (IFM) may be reqd

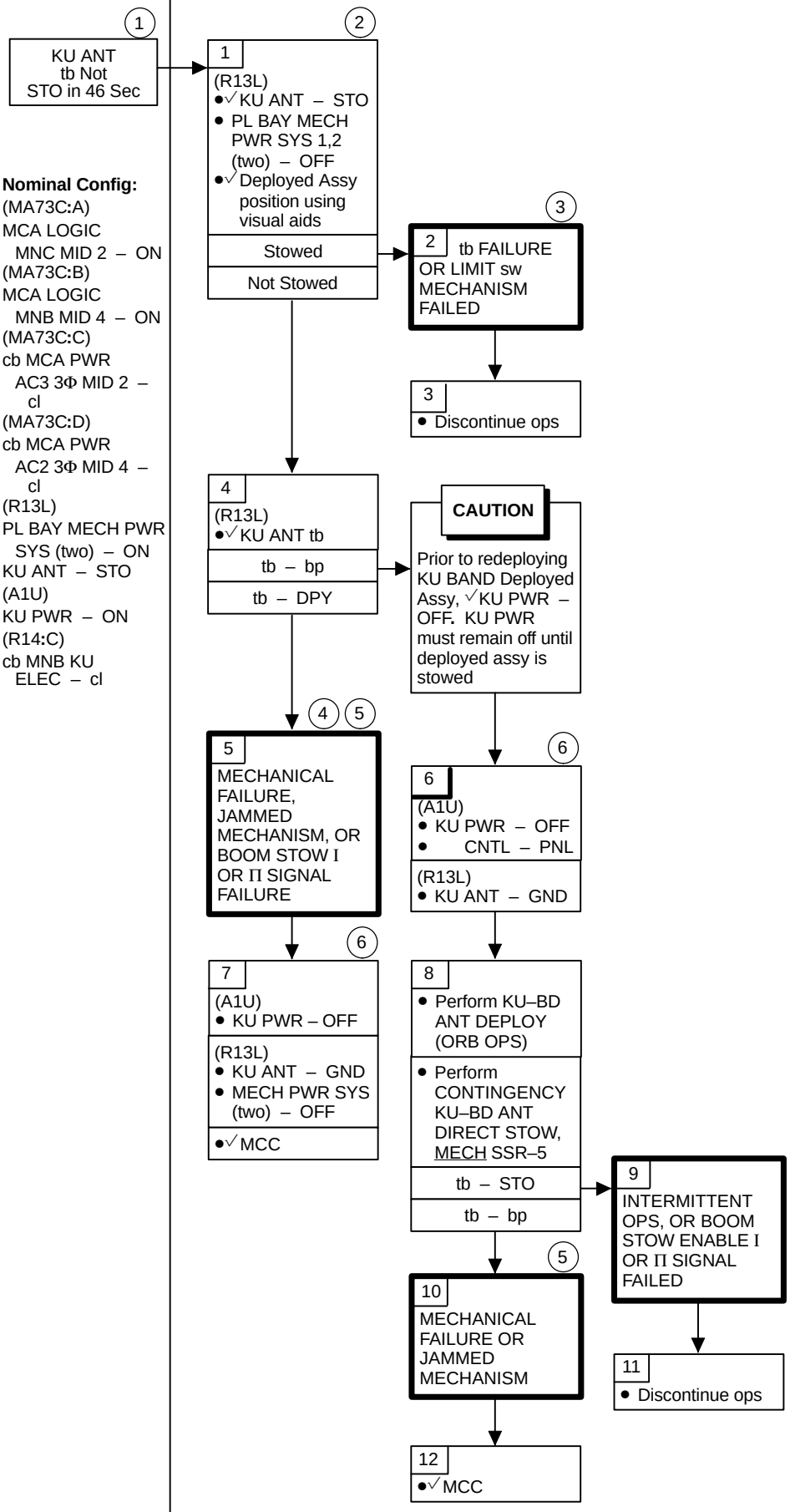
(4) Possible Ant jettison reqd

(5) If limit sw mechanism failed in stow position, MECH SSR–7 reqd for stow ops

(6) If limit sw mechanism failed to transfer deploy signal, failure results in loss of Ku–Bd comm and radar ops

MECH

9.3b KU ANT tb NOT STO IN 46 SEC



Nominal Config:
(MA73C:A)
MCA LOGIC
MNC MID 2 – ON
(MA73C:B)
MCA LOGIC
MNB MID 4 – ON
(MA73C:C)
cb MCA PWR
AC3 3Φ MID 2 – cl
(MA73C:D)
cb MCA PWR
AC2 3Φ MID 4 – cl
(R13L)
PL BAY MECH PWR SYS (two) – ON
KU ANT – STO
(A1U)
KU PWR – ON
(R14:C)
cb MNB KU ELEC – cl

(1) Drive Time
Single mtr – 46 sec
Dual mtr – 23 sec

(2) KU–BAND CCTV overlay located in Middeck Transparency Kit

(3) If limit sw mechanism failed in deploy position, MECH SSR–7 reqd for subsequent deploy ops

(4) If Boom Stow Enable signal failure, MECH SSR–5 reqd for stow ops

(5) Antenna jettison may be reqd; KU–BD ANT JETTISON (ORB OPS)

(6) KU PWR must be turned off prior to taking KU ANT – GND to prevent gimbal locking pins from retracting

MECH

9.3c KU ANT GIMBAL ANGLES INCORRECT AFTER 50 SEC

KU ANT Gimbal Movement within 50 Sec and/or Gimbal Angles Incorrect after 50 Sec

Nominal Config:
(MA73C:A)
MCA LOGIC
MNC MID 2 – ON
(MA73C:B)
MCA LOGIC
MNB MID 4 – ON
(MA73C:C)
cb MCA PWR
AC3 3Φ MID 2 – cl
(MA73C:D)
cb MCA PWR
AC2 3Φ MID 4 – cl
(R13L)
PL BAY MECH PWR SYS (two) – OFF
KU ANT – STO
(A1U)
KU PWR – ON
(R14:C)
cb MNB KU ELEC – cl

1
(R13L)
●✓KU ANT – STO
●✓PL BAY MECH PWR SYS 1,2 (two) – OFF

(A2)
●✓KU ANT GIMBAL ANGLES

RANGE/ ELEVATION = –27.0 (± 1.0) and RANGE RATE/AZM = –123.0 (± 1.0)

Different config

1
2 KU ANT sw FAILURE

3
(R13L)
● KU ANT – GND
●✓MCC

2
4 GIMBAL LOCK FAILURE, α/β GIMBAL FAILURE, OR EA–1 FAILURE

3
5
(R13L)
● KU ANT – GND
●✓MCC

(1) KU–BAND ANTENNA CONTINGENCY DEPLOY/STOW – FAILED DEPLOY/STOW SWITCH (IFM) may be reqd

(2) EVA and/or KU–BAND ANTENNA CONTINGENCY STOW–GIMBAL LOCK (IFM) may be reqd

(3) Selecting GND will allow ant to assume safe config

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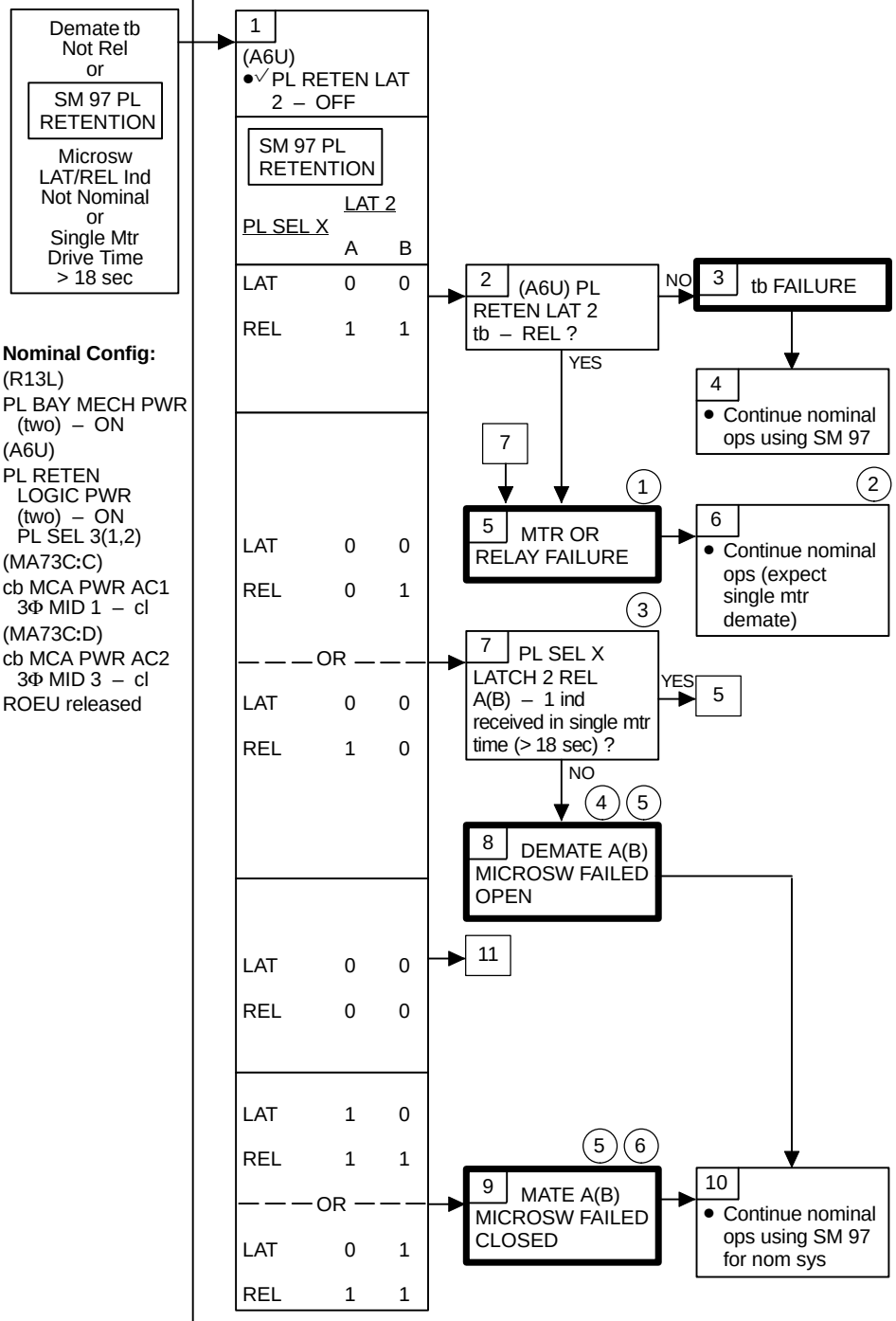
MECH

9.4a ROEU DEMATE – tb NOT REL, MICROSW IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME



Nominal Config:

(R13L)
PL BAY MECH PWR (two) – ON
(A6U)
PL RETEN LOGIC PWR (two) – ON
PL SEL 3(1,2)
(MA73C:C)
cb MCA PWR AC1 3Φ MID 1 – cl
(MA73C:D)
cb MCA PWR AC2 3Φ MID 3 – cl
ROEU released

(1) MCC can determine which condition exists

(2) Expect single mtr mate/demate/ relax for mtr failure

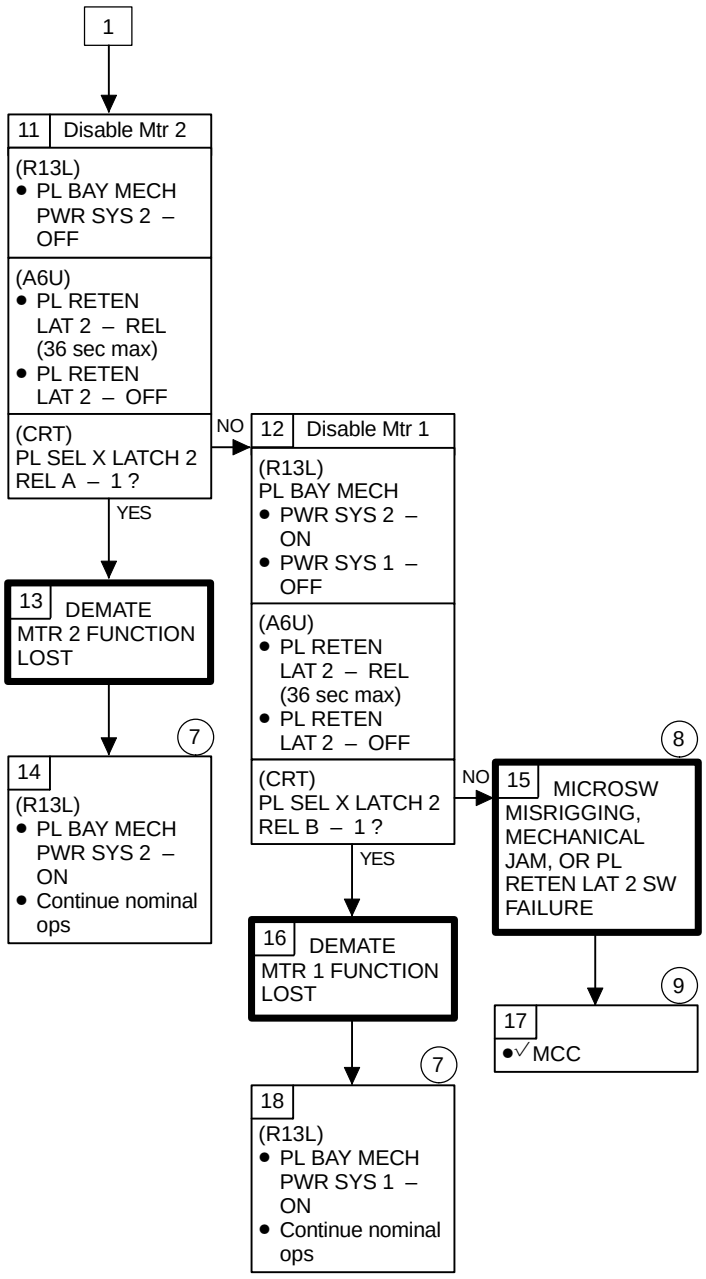
(3) If PL SEL X LATCH 2 REL A(B) – 1 ind received in single mtr time, microsw misrigged

(4) One mtr will continue to drive while demating until PL RETEN LAT 2 sw turned OFF

(5) If SYS A Microsw failed, tb will be inaccurate

(6) Expect single mtr drive time for mate

MECH 9.4a (Cont)



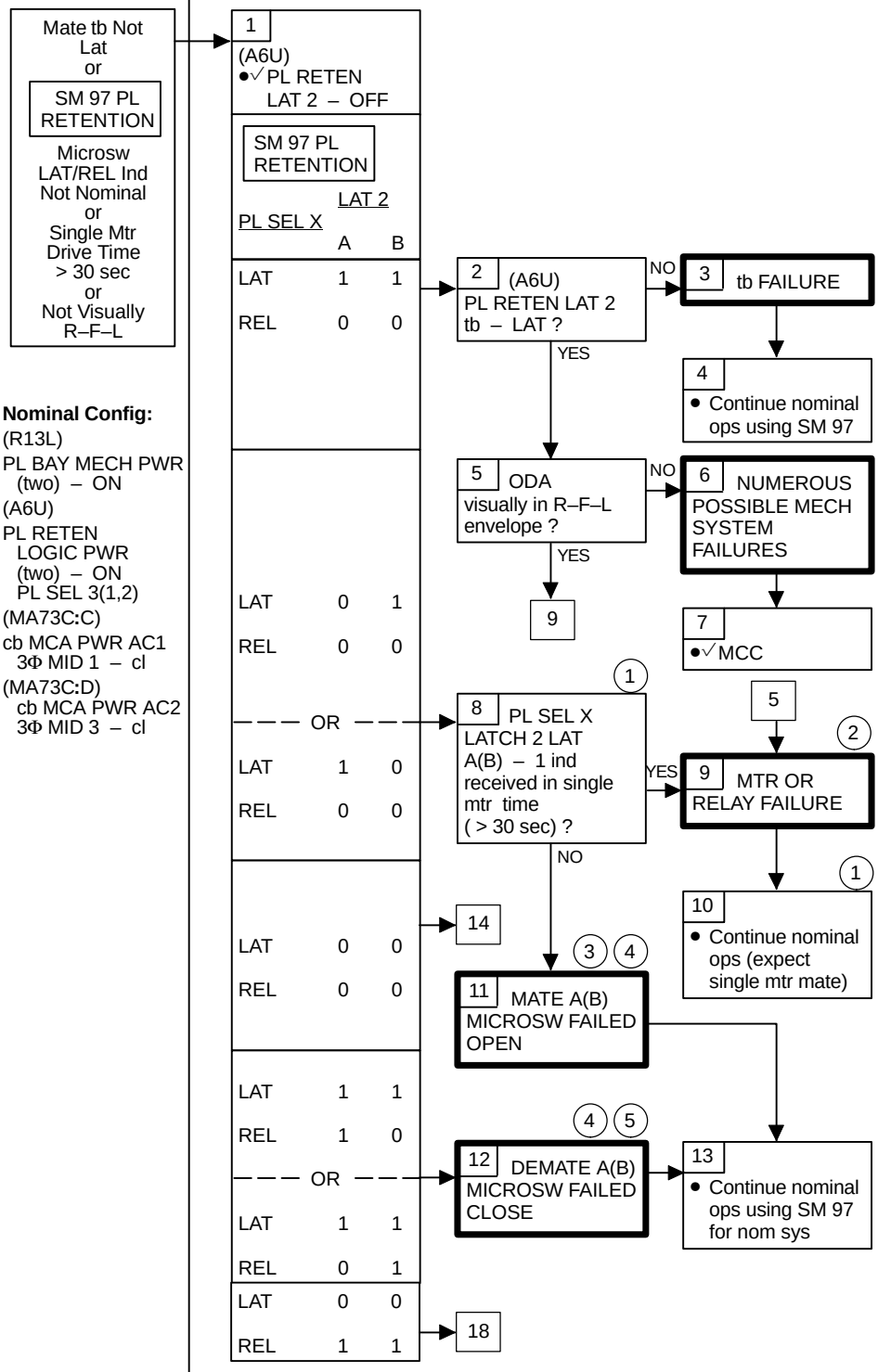
(7) One mtr Φ lost. Good mtr will backdrive failed mtr. Subsequent mate, relax, and demate ops will be performed on single mtr. Good mtr will be isolated by turning PL BAY MECH PWR OFF for failed system

(8) EVA capability exists to perform ROEU demate

(9) MCC can determine if switch is failed

MECH

9.4b ROEU MATE – tb NOT LAT, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME



Nominal Config:
(R13L)
PL BAY MECH PWR (two) – ON
(A6U)
PL RETEN LOGIC PWR (two) – ON
PL SEL 3(1,2)
(MA73C:C)
cb MCA PWR AC1 3Φ MID 1 – cl
(MA73C:D)
cb MCA PWR AC2 3Φ MID 3 – cl

(1) If PL SEL X LATCH 2 LAT A(B) – 1 ind received in single mtr time, microsw misrigged

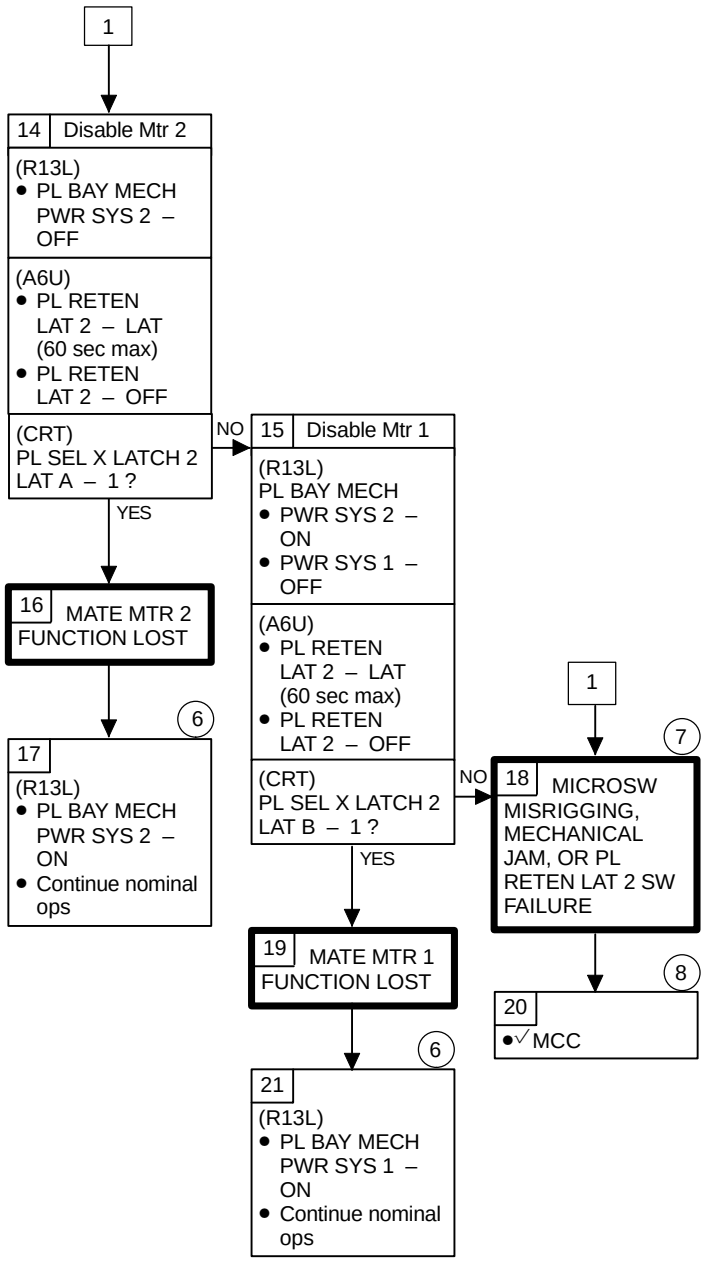
(2) MCC can determine which condition exists

(3) One mtr will continue to drive while mating until PL RETEN LAT 2 sw turned OFF

(4) If SYS A Microsw failed, tb will be inaccurate

(5) Expect single mtr drive time for demate

MECH 9.4b (Cont)



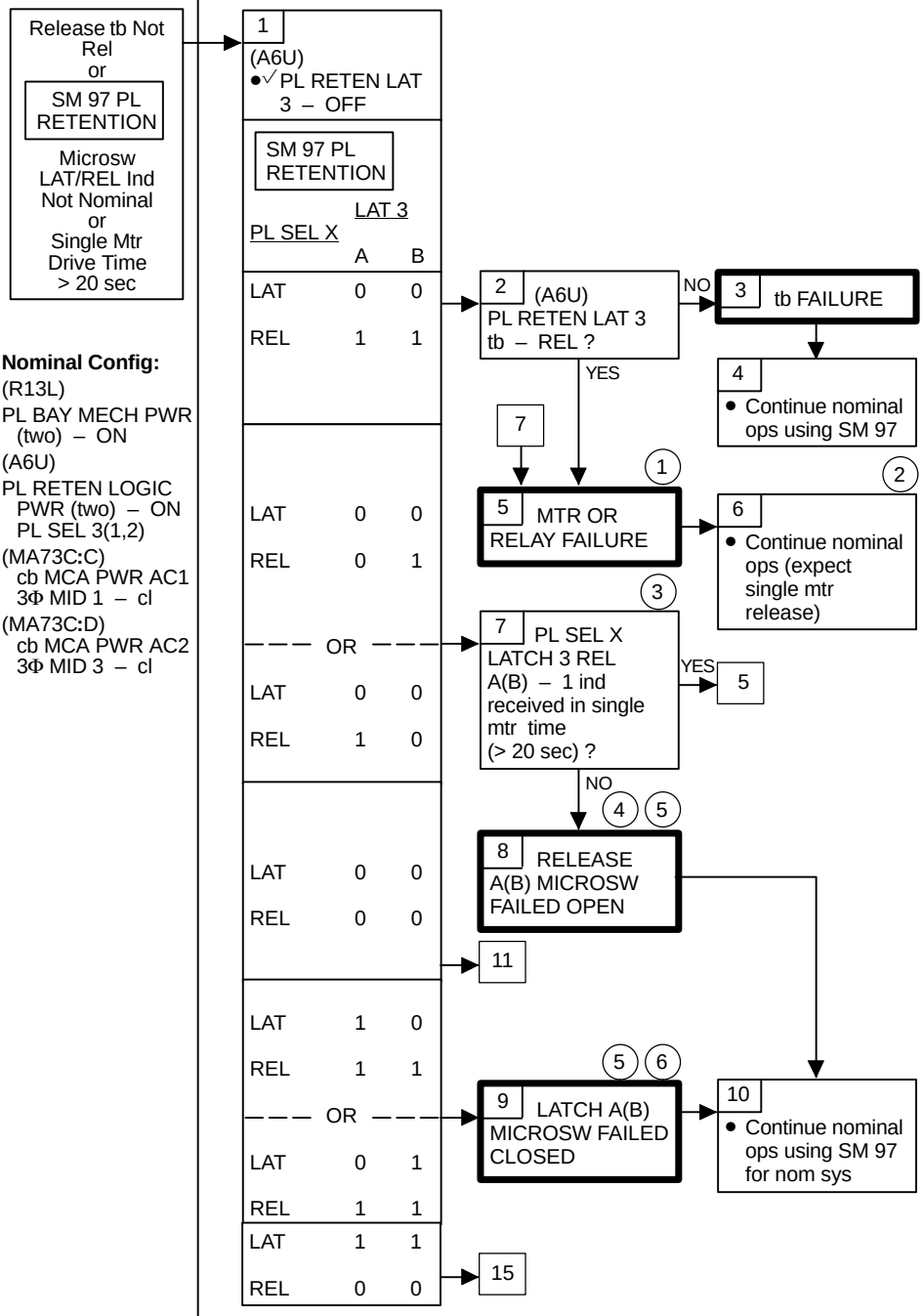
(6) One mtr Φ lost. Good mtr will backdrive failed mtr. Subsequent mate, relax, and demate ops will be performed on single mtr. Good mtr will be isolated by turning PL BAY MECH PWR OFF for failed system

(7) EVA capability exists to perform ROEU demate

(8) MCC can determine if switch is failed

MECH

9.4c ROEU RELEASE – tb NOT REL, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME



Nominal Config:
(R13L)
PL BAY MECH PWR (two) – ON
(A6U)
PL RETEN LOGIC PWR (two) – ON
PL SEL 3(1,2)
(MA73C:C)
cb MCA PWR AC1 3Φ MID 1 – cl
(MA73C:D)
cb MCA PWR AC2 3Φ MID 3 – cl

(1) MCC can determine which condition exists

(2) Expect single mtr latch/release for mtr failure

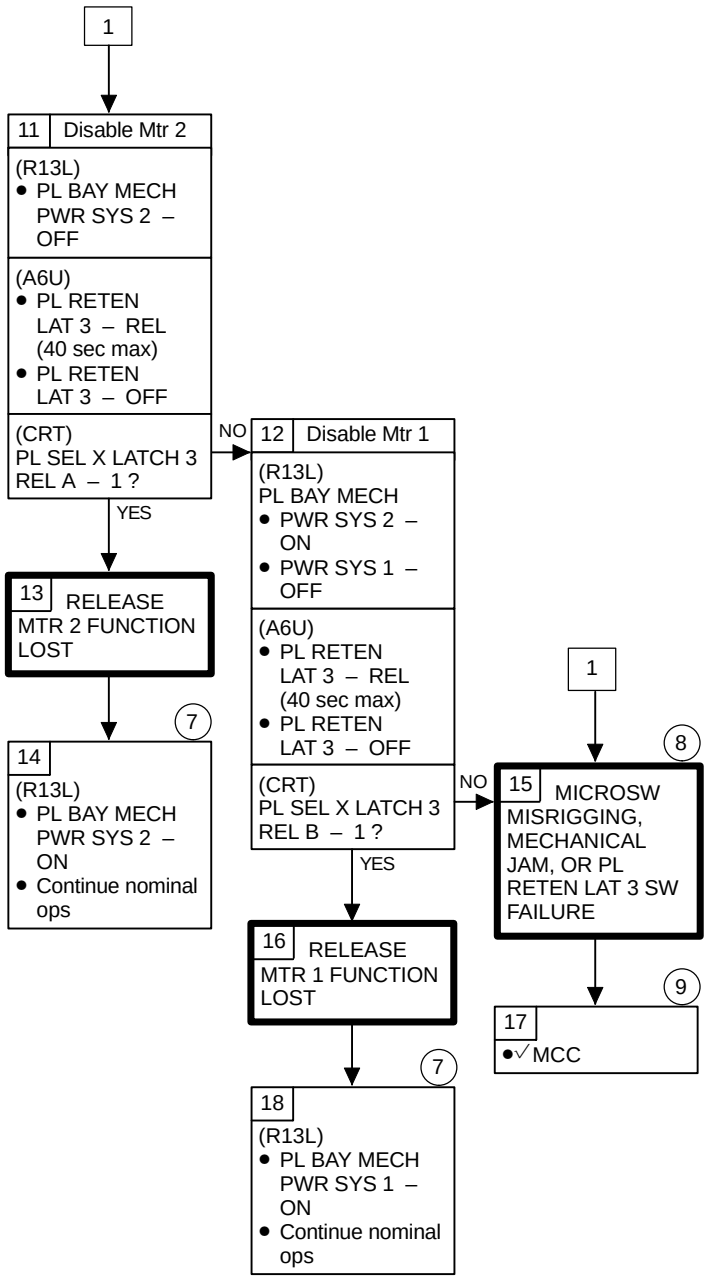
(3) If PL SEL X LATCH 3 REL A(B) – 1 ind received in single mtr time, microsw misrigged

(4) One mtr will continue to drive while releasing until PL RETEN LAT 3 sw turned OFF

(5) If SYS A Microsw failed, tb will be inaccurate

(6) Expect single mtr drive time for latch

MECH 9.4c (Cont)



(7) One mtr Φ lost. Good mtr will backdrive failed mtr. Subsequent release and latch ops will be performed on single mtr. Good mtr will be isolated by turning PL BAY MECH PWR OFF for failed system

(8) EVA capability exists to perform ROEU releaseE

(9) MCC can determine if switch is failed

MECH

9.4d ROEU LATCH – tb NOT LAT, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME

Latch tb Not Lat
or
SM 97 PL RETENTION
Microsw LAT/REL Ind Not Nominal
or
Single Mtr Drive Time > 20 sec

Nominal Config:
(R13L)
PL BAY MECH PWR (two) – ON
(A6U)
PL RETEN LOGIC PWR (two) – ON
PL SEL – 3 (1,2)
(MA73C:C)
cb MCA PWR AC1 3Φ MID 1 – cl
(MA73C:D)
cb MCA PWR AC2 3Φ MID 3 – cl

1
(A6U)
•✓PL RETEN LAT 3 – OFF

SM 97 PL RETENTION

PL SEL X	LAT 3 A	LAT 3 B
LAT	1	1
REL	0	0
LAT	0	1
REL	0	0
OR		
LAT	1	0
REL	0	0
LAT	0	0
REL	0	0
LAT	1	1
REL	1	0
OR		
LAT	1	1
REL	0	1
LAT	0	0
REL	1	1

2 (A6U) PL RETEN LAT 3 tb – LAT ?
NO → 3 tb FAILURE
YES

4
• Continue nominal ops using SM 97

7
5 MTR OR RELAY FAILURE (1)
→ 6 (2)
• Continue nominal ops (expect single mtr latch)

3
7 PL SEL X LATCH 3 LAT A(B) – 1 ind received in single mtr time (> 20 sec) ?
YES → 5
NO

(4) (5)
8 LATCH A(B) MICROSW FAILED OPEN

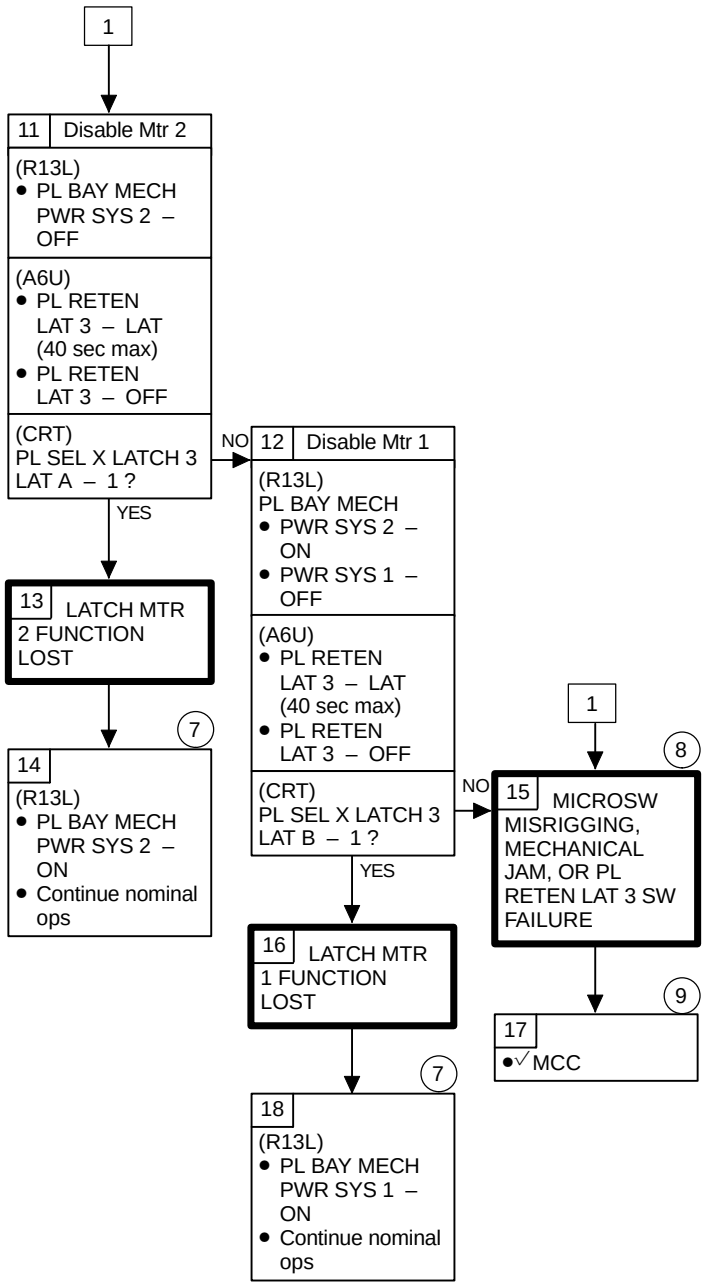
11

(5) (6)
9 RELEASE A(B) MICROSW FAILED CLOSE
→ 10
• Continue nominal ops using SM 97 for nom sys

15

1. MCC can determine which condition exists
2. Expect single mtr latch/release for mtr failure
3. If PL SEL X LATCH 3 LAT A(B) – 1 ind received in single mtr time, microsw misrigged
4. One mtr will continue to drive while latching until PL RETEN LAT 3 sw turned OFF
5. If SYS A Microsw failed, tb will be inaccurate
6. Expect single mtr drive time for release/latch

MECH 9.4d (Cont)



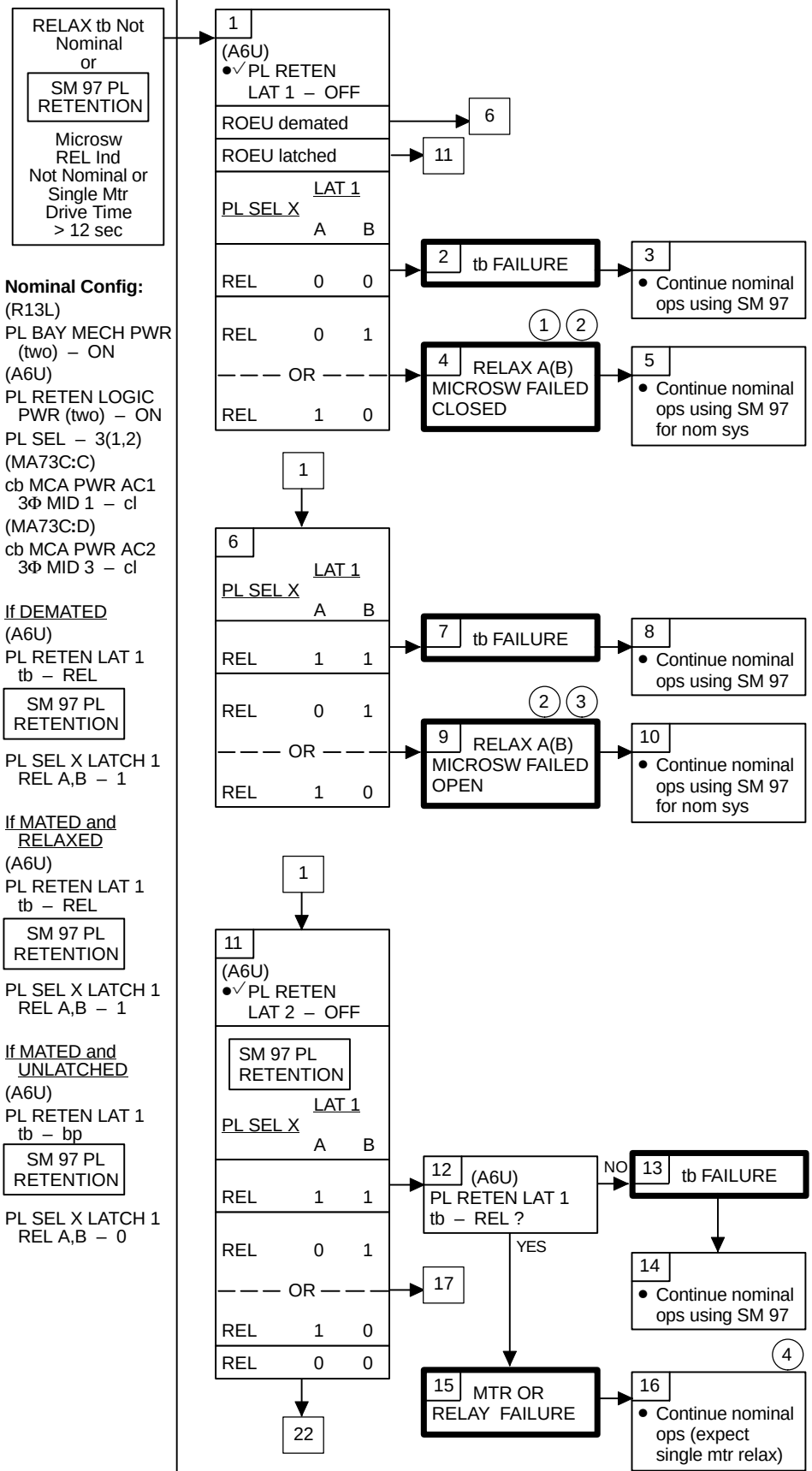
(7) One mtr Φ lost. Good mtr will backdrive failed mtr. Subsequent release and latch ops will be performed on single mtr. Good mtr will be isolated by turning PL BAY MECH PWR OFF for failed system

(8) EVA capability exists to perform ROEU latch

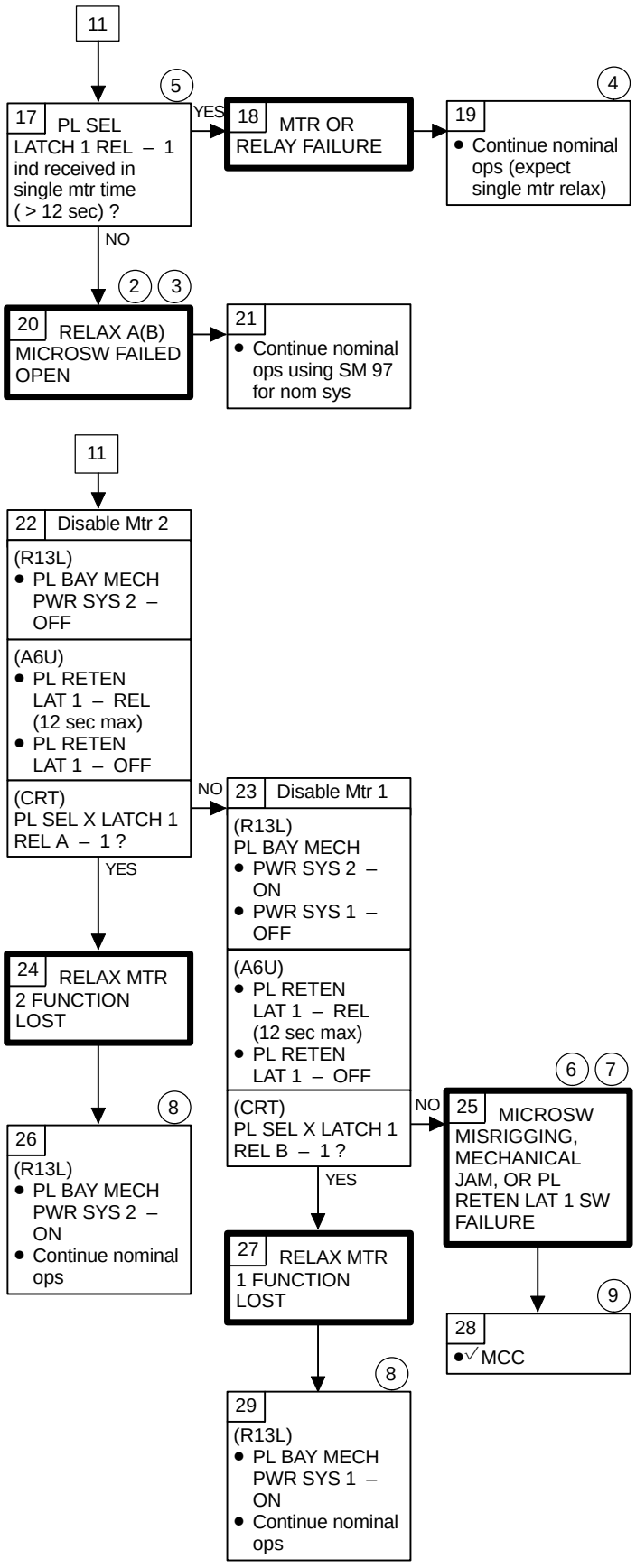
(9) MCC can determine if switch is failed

MECH

9.4e ROEU RELAX – tb NOT NOMINAL, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME



MECH 9.4e (Cont)



(2) If SYS A Microsw failed, tb will be inaccurate

(3) One mtr will continue to drive while relaxing until PL RETEN LAT 1 sw turned OFF

(4) MCC can determine which condition exists. If MTR failure, demate, mate and relax will be single mtr time

(5) If PL SEL LATCH 1 REL – 1 ind received in single mtr time, microsw misrigged

(6) EVA capability exists to perform ROEU relax

(7) PL RETEN LAT 2 sw to demate may be used to relax ROEU. MCC will explain implementation

(8) Subsequent mate, relax, and demate ops will be performed on single mtr. Good mtr will be isolated by turning PL BAY MECH PWR OFF for failed system

(9) MCC can determine if switch is failed

MECH

9.4f ROEU ELEC CONT – tb NOT NOMINAL OR IND NOT NOMINAL

(1) If SYS A Microsw failed, tb will be inaccurate

ELEC CONT tb Not Nominal
or
SM 97 PL RETENTION
RDY Ind Not Nominal

Nominal Config:
(R13L)
PL BAY MECH PWR (two) – ON
(A6U)
PL RETEN LOGIC PWR (two) – ON
PL SEL – 3(1,2)
(MA73C:C)
cb MCA PWR AC1 3Φ MID 1 – cl
(MA73C:D)
cb MCA PWR AC2 3Φ MID 3 – cl

If LATCHED
(A6U)
PL RETEN RDY 1 tb – gray
SM 97 PL RETENTION
PL SEL X LATCH 3 RDY A,B – 1

If UNLATCHED
(A6U)
PL RETEN RDY 1 tb – bp
SM 97 PL RETENTION
PL SEL X LATCH 3 RDY A,B – 0

1
(A6U)
●✓PL RETEN LAT 3 – OFF

SM 97 PL RETENTION

PL SEL X	LAT 3 A	LAT 3 B
RDY	1	1
LAT	1	1
REL	0	0
RDY	0	1
LAT	1	1
REL	0	0
— OR —		
RDY	1	0
LAT	1	1
REL	0	0
RDY	0	1
LAT	0	0
REL	1	1
— OR —		
RDY	1	0
LAT	0	0
REL	1	1
RDY	0	0
LAT	0	0
REL	1	1

2 tb FAILED bp → 3 ● Continue nominal ops using SM 97

(1) → 4 ELECTRICAL CONTINUITY A(B) CIRCUIT/IND FAILED OPEN

(1) → 5 ELECTRICAL CONTINUITY A(B) CIRCUIT/IND FAILED CLOSED → 6 ● Continue nominal ops using SM 97 for nom sys

7 tb FAILED GRAY → 8 ● Continue nominal ops using SM 97

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MECH SSR–1
PORT(STBD) RAD OPS

WARNING

To preclude failures causing inadvertent MPM cycling, RMS must be cradled. This procedure assumes that the RMS (if flown) is cradled

1 Disable STBD(PORT) RAD sys

STBD Panel Disable (MA73C:D,C)
cb MCA PWR
- AC1 3Φ MID 3 – op
- AC2 3Φ MID 2 – op
- AC3 3Φ MID 2 – op

PORT Panel Disable (MA73C:C,D)
cb MCA PWR
- AC1 3Φ MID 1 – op
- AC2 3Φ MID 4 – op
- AC3 3Φ MID 4 – op

2 PORT(STBD) ops reqd:

STO

DPY

3 Stow,latch PORT(STBD) (1)

(R13L)
- PL BAY MECH PWR SYS 1,2 – ON
- RAD CNTL SYS A,B – STO
- PORT(STBD) tb – STO
- SYS A,B – OFF
- LAT CNTL SYS A,B – LAT
- RAD LAT CNTL PORT(STBD) tb – LAT
- RAD LAT CNTL SYS A,B – OFF
- PL BAY MECH PWR SYS 1,2 – OFF

4 Release,deploy PORT(STBD) RAD (1)

(R13L)
- PL BAY MECH PWR SYS 1,2 – ON
- RAD LAT CNTL SYS A,B – REL
- RAD LAT CNTL PORT(STBD) tb – REL
- RAD LAT CNTL SYS A,B – OFF
- RAD CNTL SYS A,B – DPY
- RAD CNTL PORT(STBD) tb – DPY
- RAD CNTL SYS A,B – OFF
- PL BAY MECH PWR SYS 1,2 – OFF

5 Enable STBD(PORT) RAD sys

STBD (MA73C:D,C)
cb MCA PWR
- AC1 3Φ MID 3 – cl
- AC2 3Φ MID 2 – cl
- AC3 3Φ MID 2 – cl

PORT (MA73C:C,D)
cb MCA PWR
- AC1 3Φ MID 1 – cl
- AC2 3Φ MID 4 – cl
- AC3 3Φ MID 4 – cl

(1) PDU Actuator Times Normal (2 mtr)
Lat – 30 sec
Rad – 50 sec
Single Mtr
Lat – 60 sec
Rad – 100 sec

MECH SSR–2
CONTINGENCY PLBD CLOSURE

NOTE

This procedure assumes that DOOR has jammed in 'RDY' position resulting from orbiter thermal warpage or debris

1

SM (BFS SM 63) PL BAY DOORS

✓'OP/CL' status:
- ✓PORT(STBD) BLKHD LAT (two) – 'OP'

- Deselect all 'MAN SEL' items

Select PORT(STBD) 'MAN SEL'
- ITEM 13(10) EXEC (*)

Cycle door open, visually check area of jam for debris or other cause:
(R13L)
- PL BAY DR – OP (10 sec)
- – STOP
- Perform visual check. If debris or other cause found, ✓MCC before proceeding
- PL BAY DR – CL ('RDY' + 6 sec)
- – STOP

4

2

(CRT)
- ✓'OP/CL' column and visually ✓door

Is DOOR 'CL' or 'RDY' and:

If FWD:
Not deformed → 7

If AFT:
GO (see fig. 9–1, PLBD BULKHEAD LATCH GO/NO–GO DIAGRAM) → 7

OTHER

3

- ✓MCC

Does time permit one full DAY SIDE PASS TOP SUN ATTITUDE and also MCC determines temperature delta is a problem ?

YES → 4 Open door, complete one DAY SIDE PASS TOP SUN ATTITUDE and close door

(R13L)
- PL BAY DR – OP (~63 sec)
- Complete TOP SUN PASS, then at sunset:
- PL BAY DR – CL (~63 sec)

2

NO

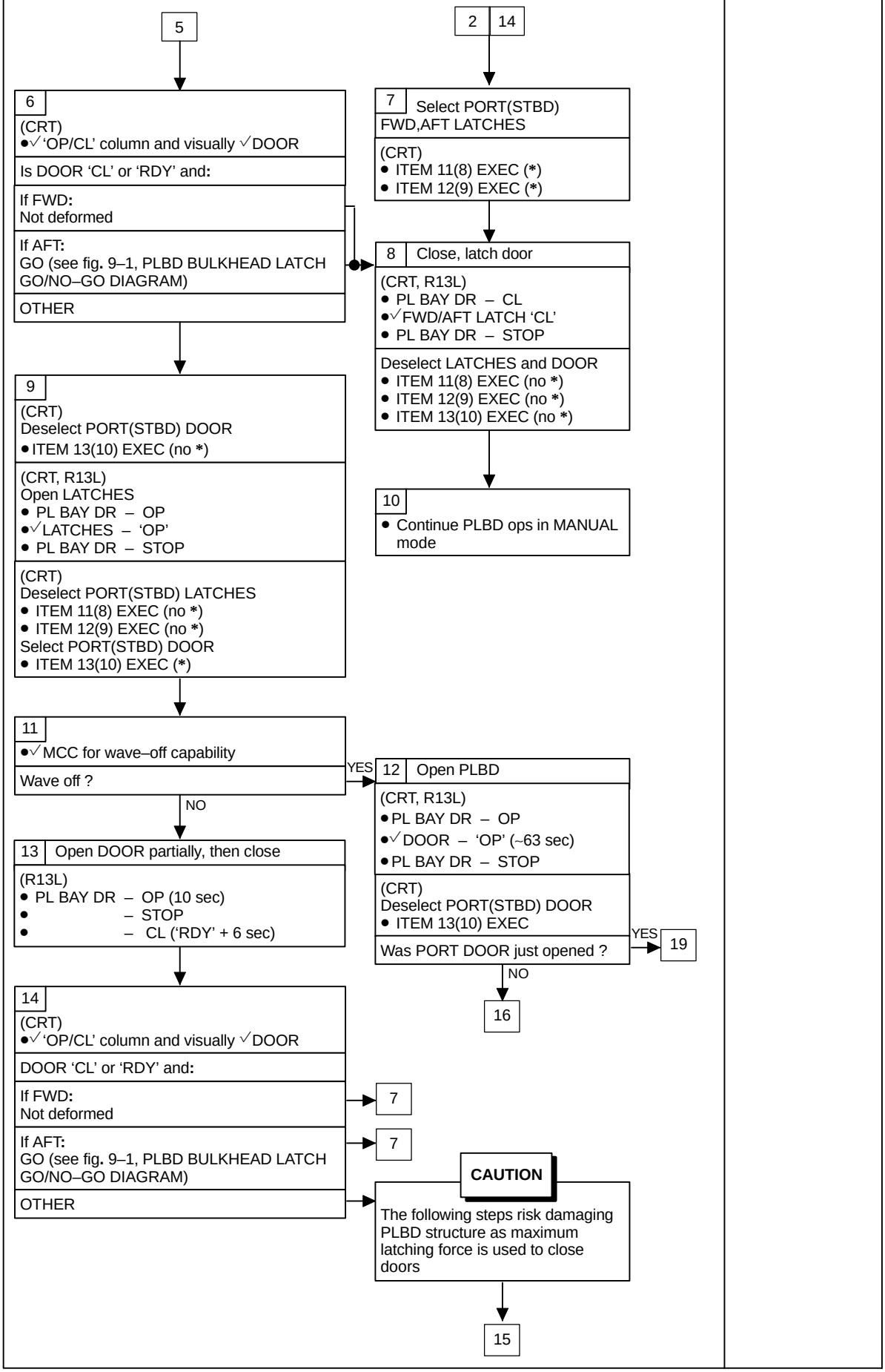
5 Select PORT(STBD) LATCHES

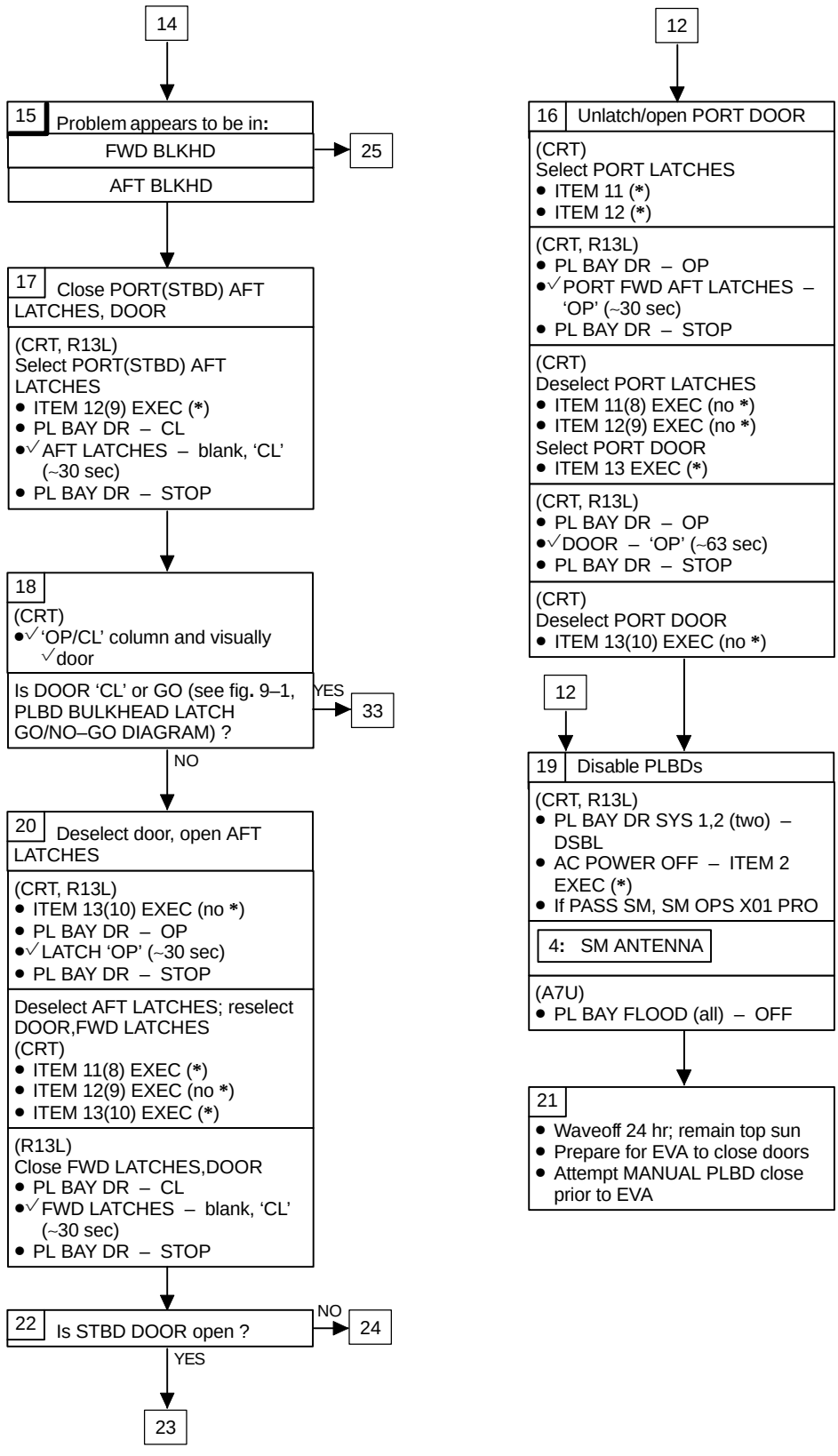
(CRT)
- ITEM 11(8) EXEC (*)
- ITEM 12(9) EXEC (*)

Partially close LATCHES and DOOR
(R13L)
- PL BAY DR – CL (~15 sec)
- Observe aft C/L for deflection (see photo, fig. 9–2)
- PL BAY DR – STOP

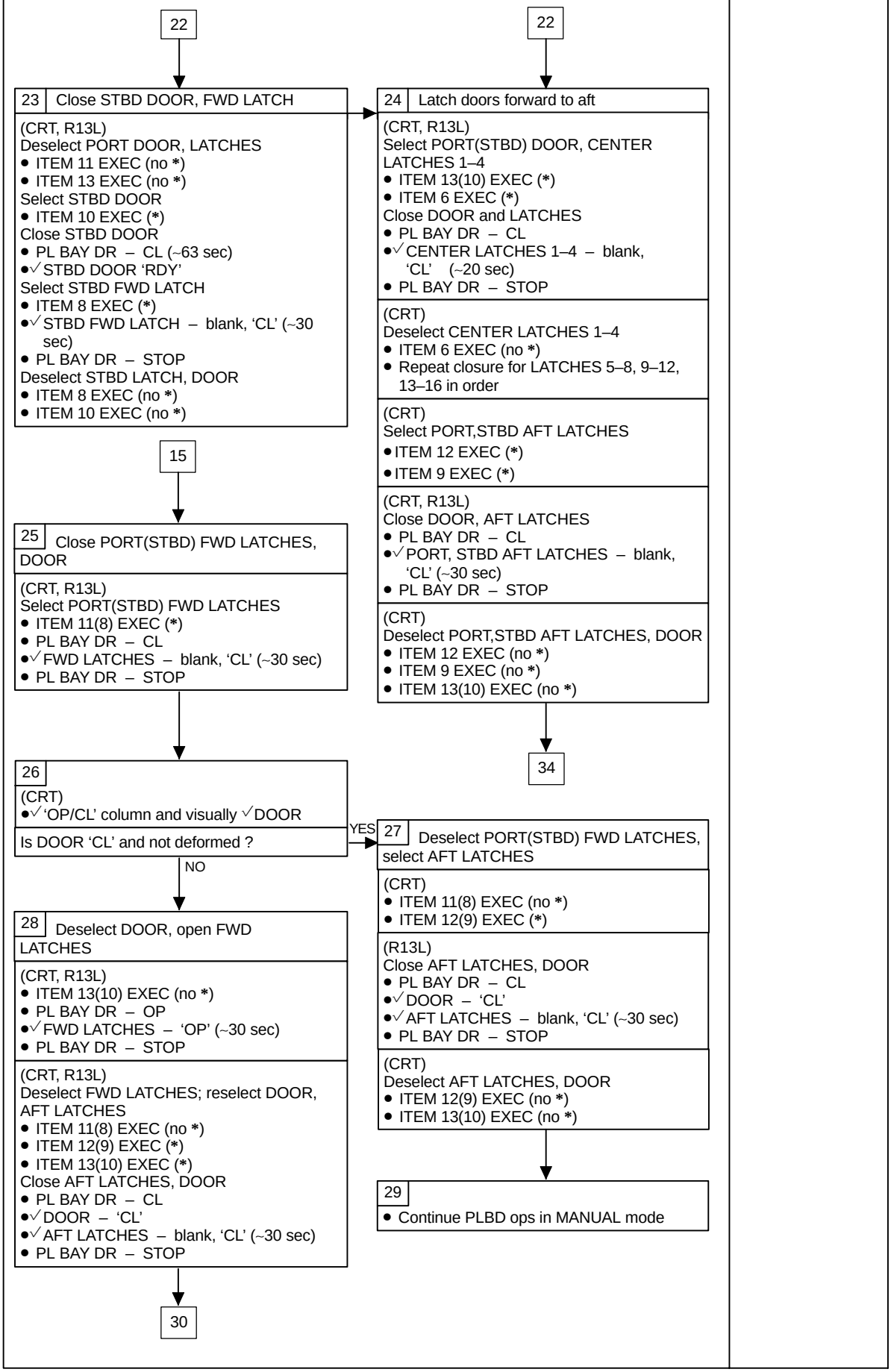
6

MECH SSR–2 (Cont)

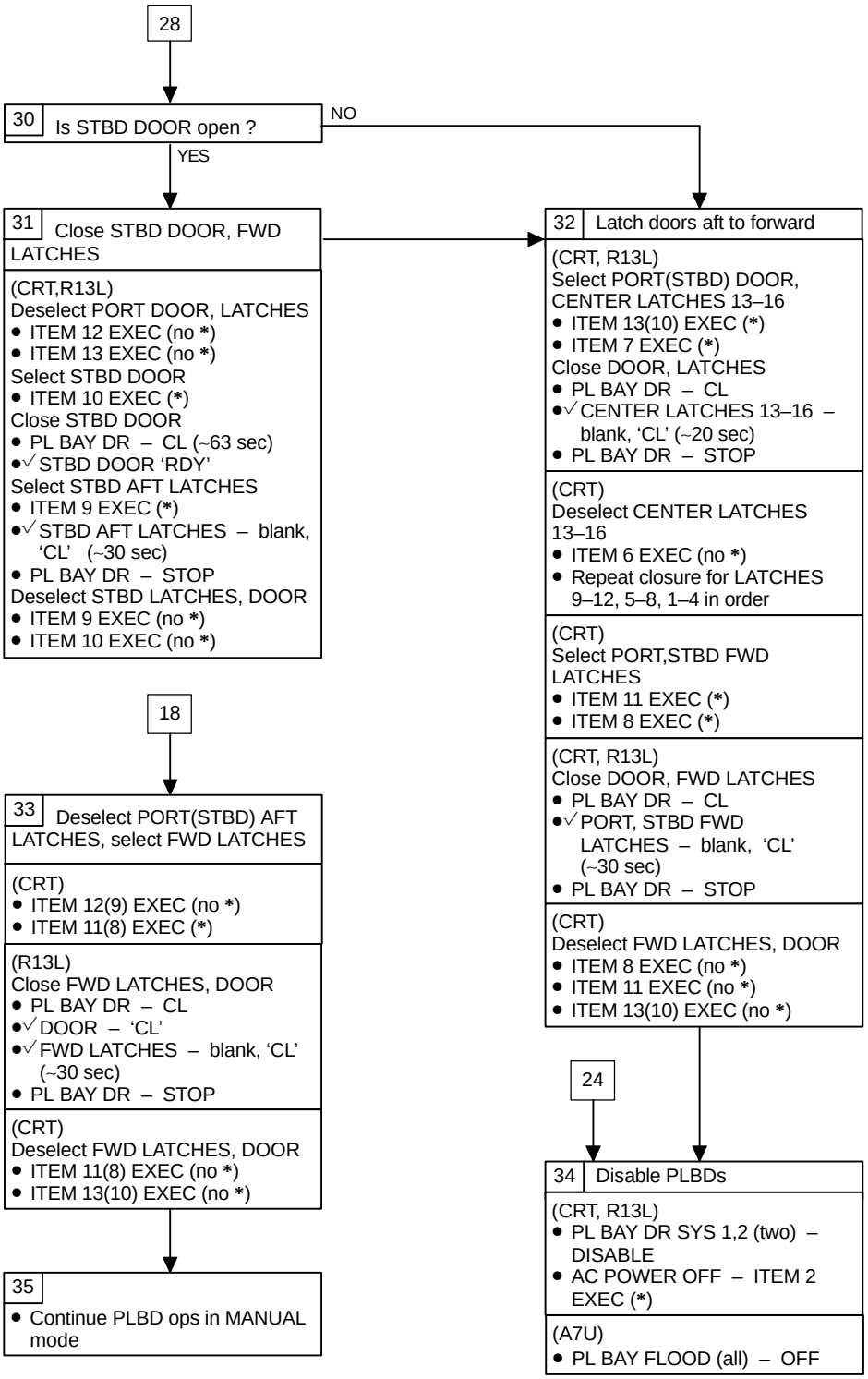


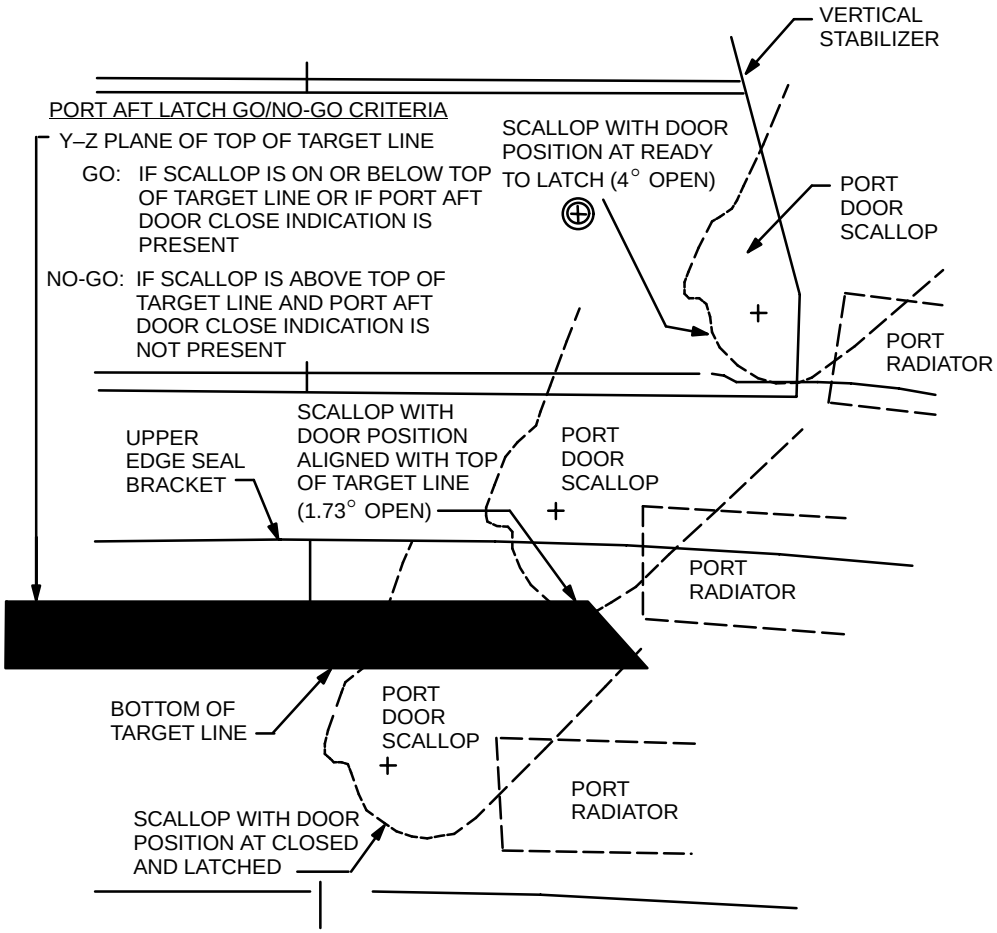

14
15 Problem appears to be in:
FWD BLKHD
AFT BLKHD
25
17 Close PORT(STBD) AFT LATCHES, DOOR
(CRT, R13L)
Select PORT(STBD) AFT LATCHES
• ITEM 12(9) EXEC (*)
• PL BAY DR – CL
•✓AFT LATCHES – blank, 'CL' (~30 sec)
• PL BAY DR – STOP
18
(CRT)
•✓'OP/CL' column and visually ✓door
Is DOOR 'CL' or GO (see fig. 9–1, PLBD BULKHEAD LATCH GO/NO–GO DIAGRAM) ?
YES
33
NO
20 Deselect door, open AFT LATCHES
(CRT, R13L)
• ITEM 13(10) EXEC (no *)
• PL BAY DR – OP
•✓LATCH 'OP' (~30 sec)
• PL BAY DR – STOP
Deselect AFT LATCHES; reselect DOOR,FWD LATCHES
(CRT)
• ITEM 11(8) EXEC (*)
• ITEM 12(9) EXEC (no *)
• ITEM 13(10) EXEC (*)
(R13L)
Close FWD LATCHES,DOOR
• PL BAY DR – CL
•✓FWD LATCHES – blank, 'CL' (~30 sec)
• PL BAY DR – STOP
22 Is STBD DOOR open ?
NO
24
YES
23
12
16 Unlatch/open PORT DOOR
(CRT)
Select PORT LATCHES
• ITEM 11 (*)
• ITEM 12 (*)
(CRT, R13L)
• PL BAY DR – OP
•✓PORT FWD AFT LATCHES – 'OP' (~30 sec)
• PL BAY DR – STOP
(CRT)
Deselect PORT LATCHES
• ITEM 11(8) EXEC (no *)
• ITEM 12(9) EXEC (no *)
Select PORT DOOR
• ITEM 13 EXEC (*)
(CRT, R13L)
• PL BAY DR – OP
•✓DOOR – 'OP' (~63 sec)
• PL BAY DR – STOP
(CRT)
Deselect PORT DOOR
• ITEM 13(10) EXEC (no *)
12
19 Disable PLBDs
(CRT, R13L)
• PL BAY DR SYS 1,2 (two) – DSBL
• AC POWER OFF – ITEM 2 EXEC (*)
• If PASS SM, SM OPS X01 PRO
4: SM ANTENNA
(A7U)
• PL BAY FLOOD (all) – OFF
21
• Waveoff 24 hr; remain top sun
• Prepare for EVA to close doors
• Attempt MANUAL PLBD close prior to EVA

MECH SSR–2 (Cont)



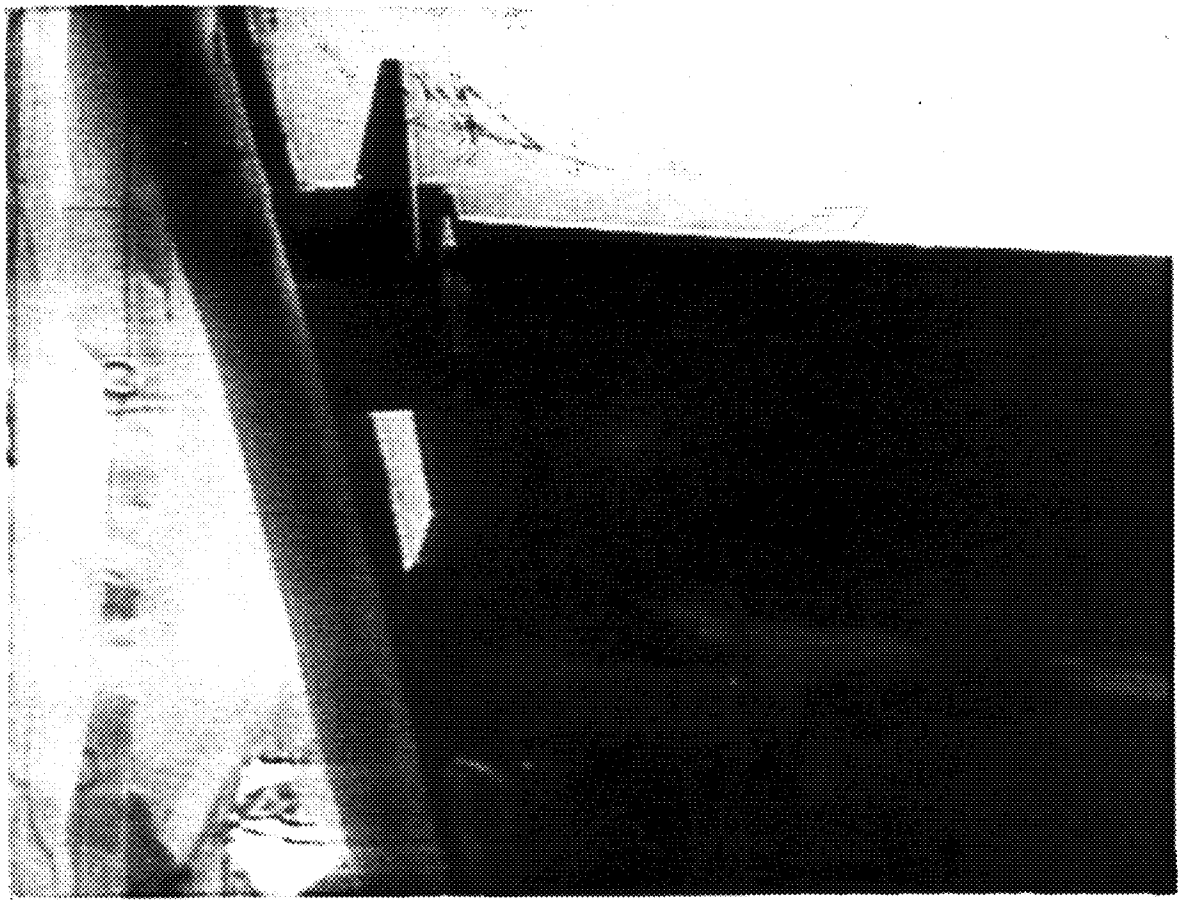
MECH SSR–2 (Cont)





(REVERSE FOR STBD DOOR)

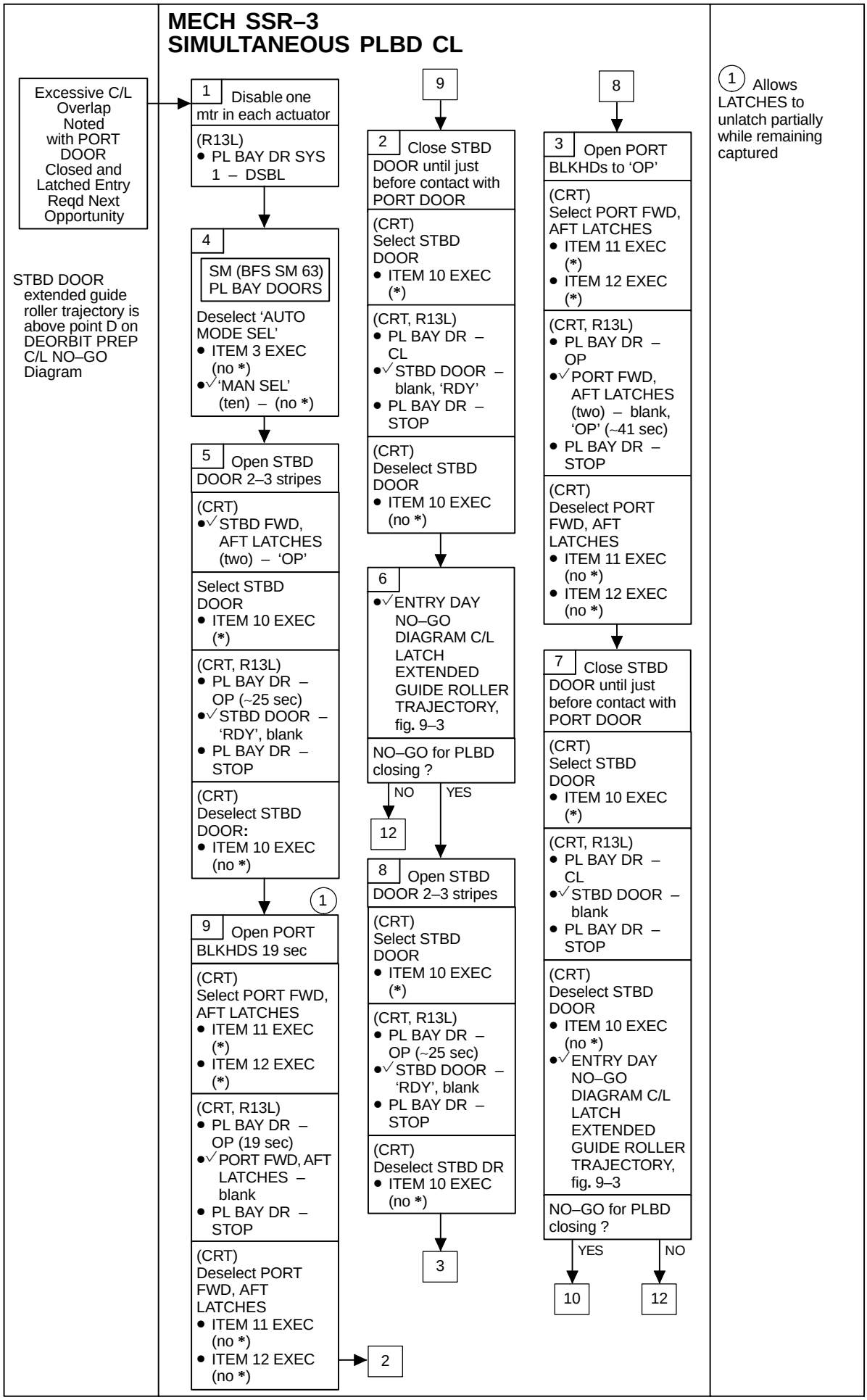
Figure 9–1.– PLBD bulkhead latch GO/NO–GO diagram.



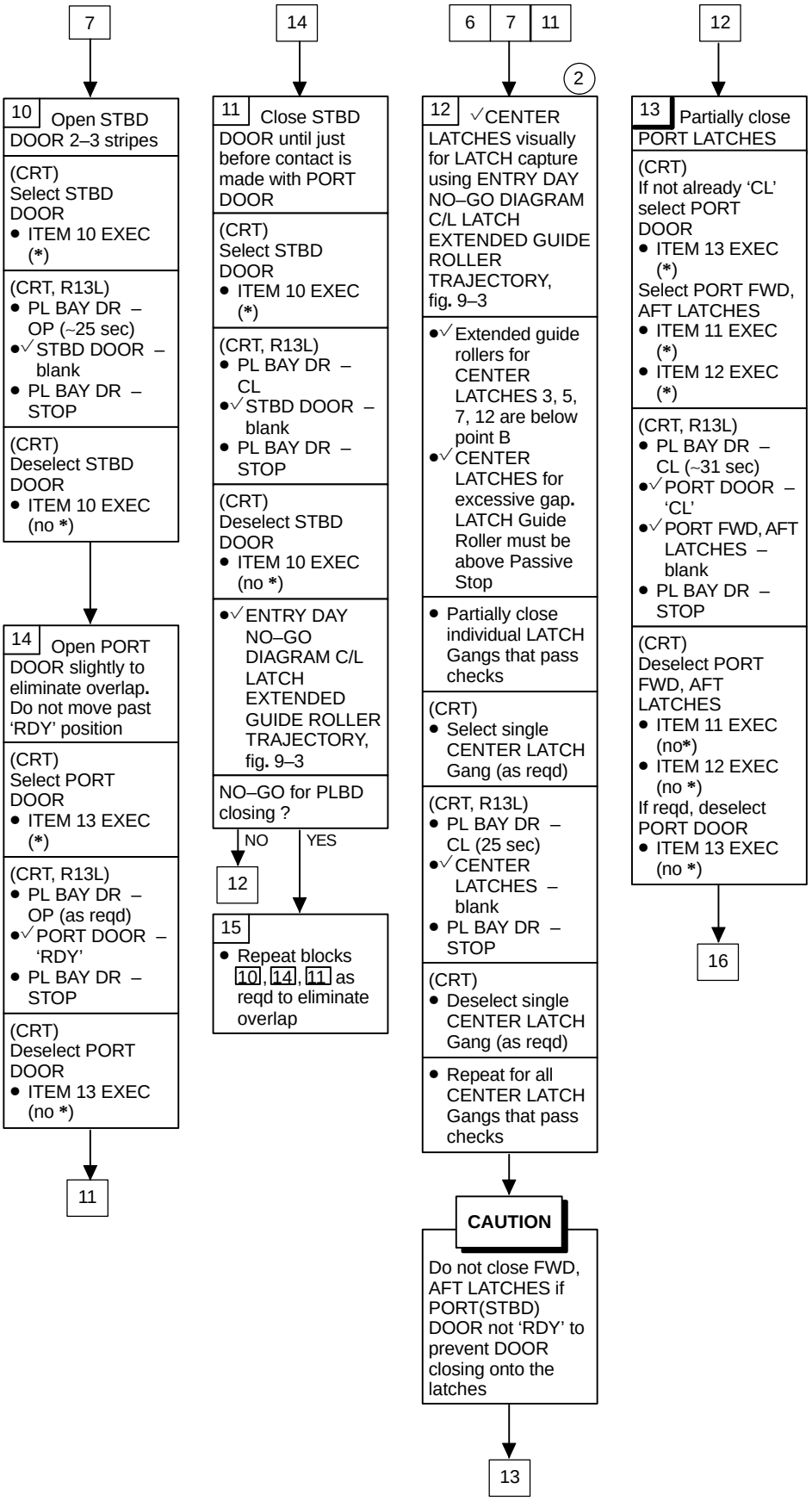
Shows worst case deflection up of aft breather panel seen on STS–4

Figure 9–2.– Port Aft C/L viewed by Camr C.

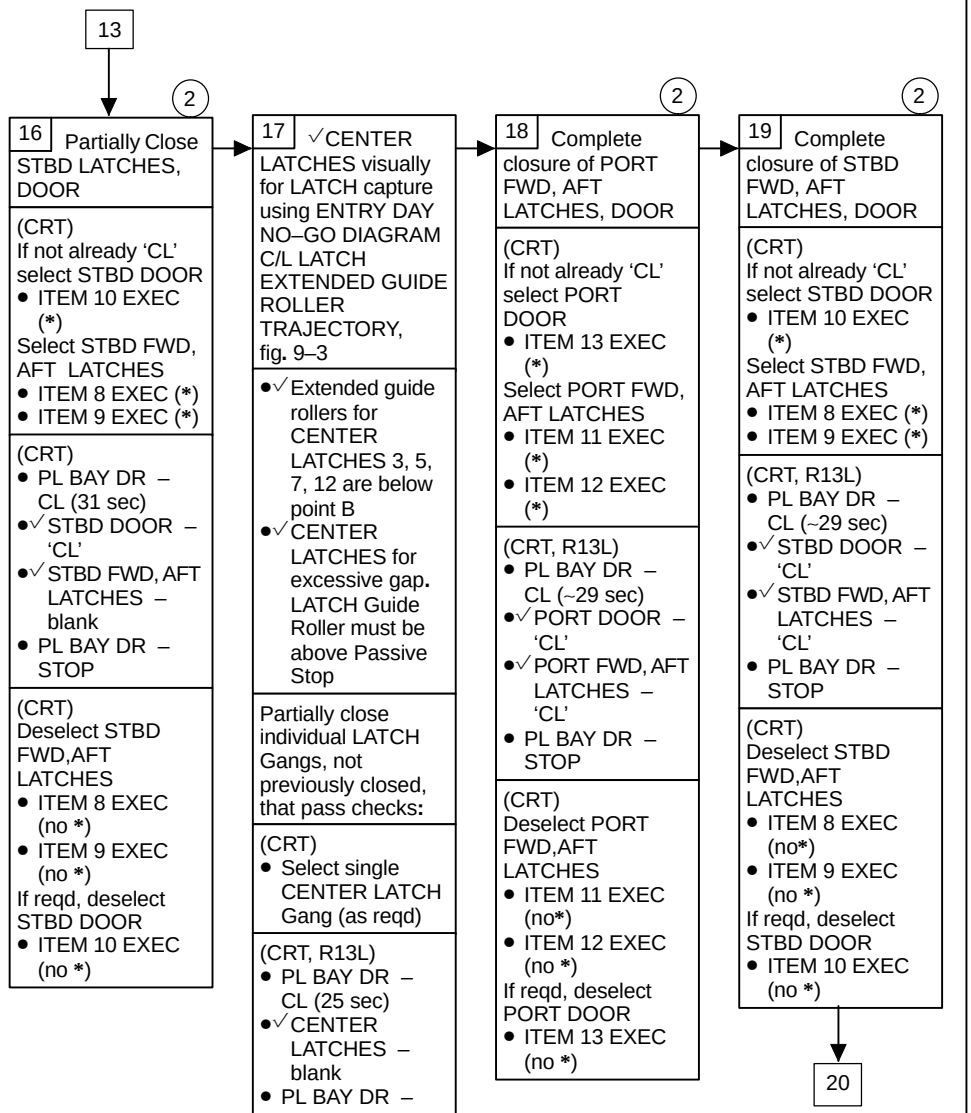
MECH SSR–3
SIMULTANEOUS PLBD CL



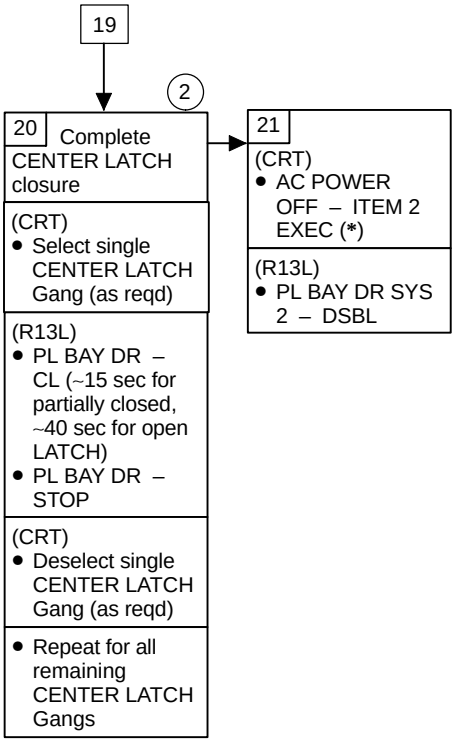
MECH SSR–3 (Cont)



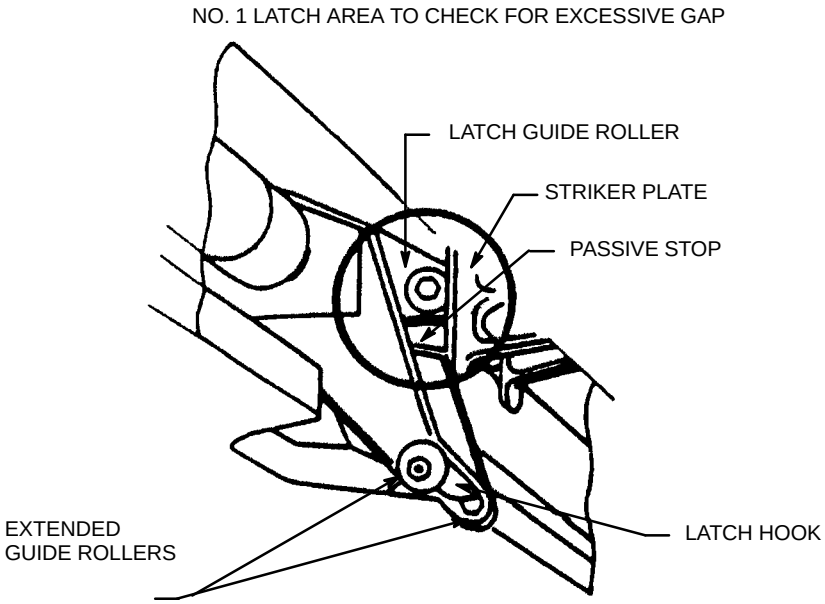
MECH SSR–3 (Cont)



MECH SSR–3 (Cont)



(2) Allows LATCHES to latch partially



VIEW OF NO. 1 C_L LATCH FROM PORT AFT WINDOW

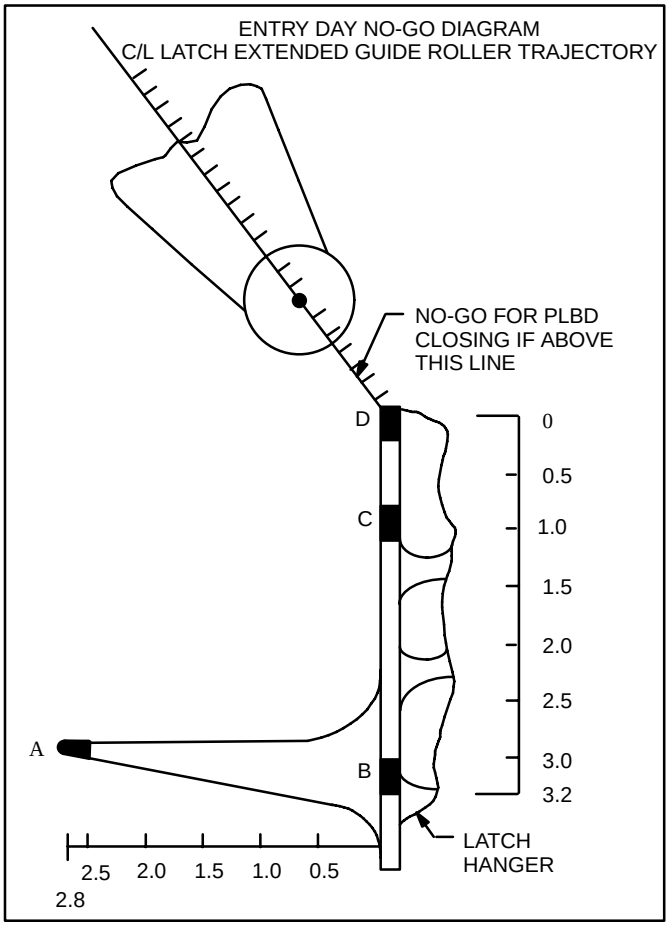
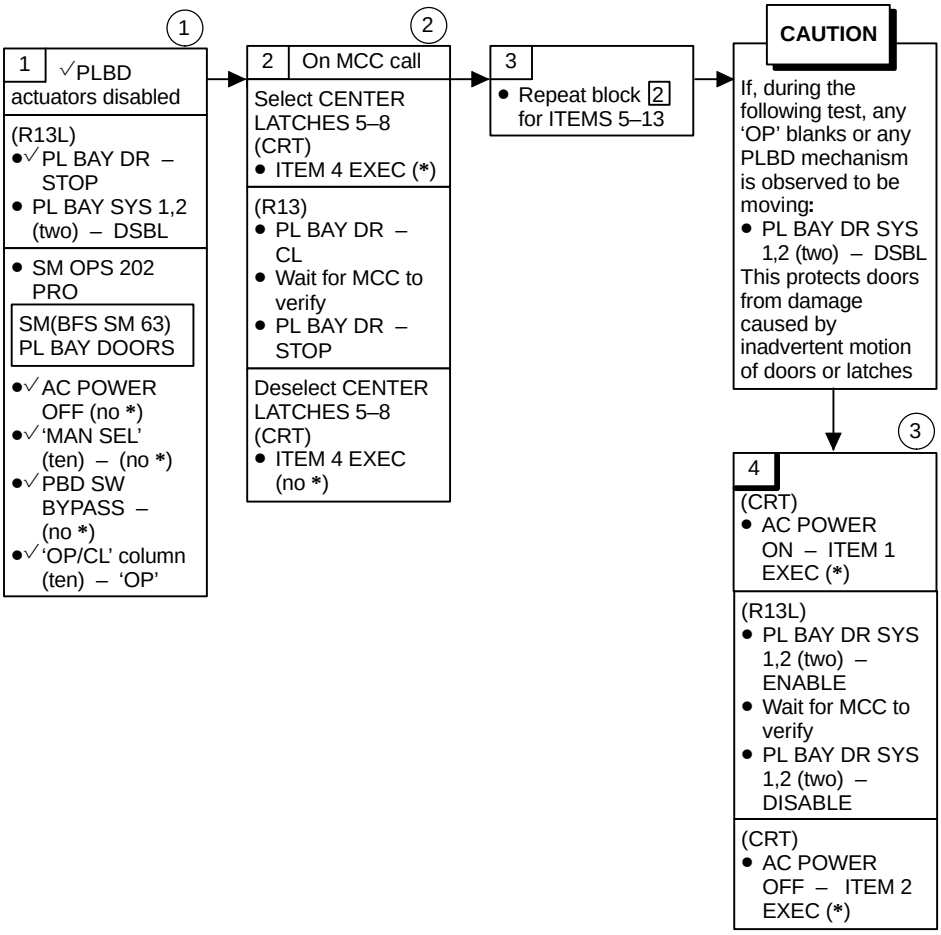


Figure 9–3.– Entry day NO–GO diagram.

MECH SSR–4
PLBD CHECKOUT AFTER MDM CHANGEOUT



(1) Procedure assumes doors and latches open

(2) MCC to check MCA relay status

(3) MCC to check enable relay status

MECH SSR–5
CONTINGENCY KU–BD ANT DIRECT STOW

> CAUTION
> ✓MCC to verify Gimbals are locked before applying this procedure

Config CCTVs to monitor KU Ant motion
Point CCTV as reqd
Record all motion on VTR

R13L ✓PL BAY MECH PWR SYS (two) – OFF
A1U KU PWR – OFF
CNTL – PNL
R13L ANT – GND

> CAUTION
> Ku Ant switch must be in GND position prior to use of Direct Stow sw to prevent phase–to–phase short of STO/DPY mtrs

KU ANT DIRECT STO – ON
PL BAY MECH PWR SYS (two) – ON
✓KU ANT tb – bp

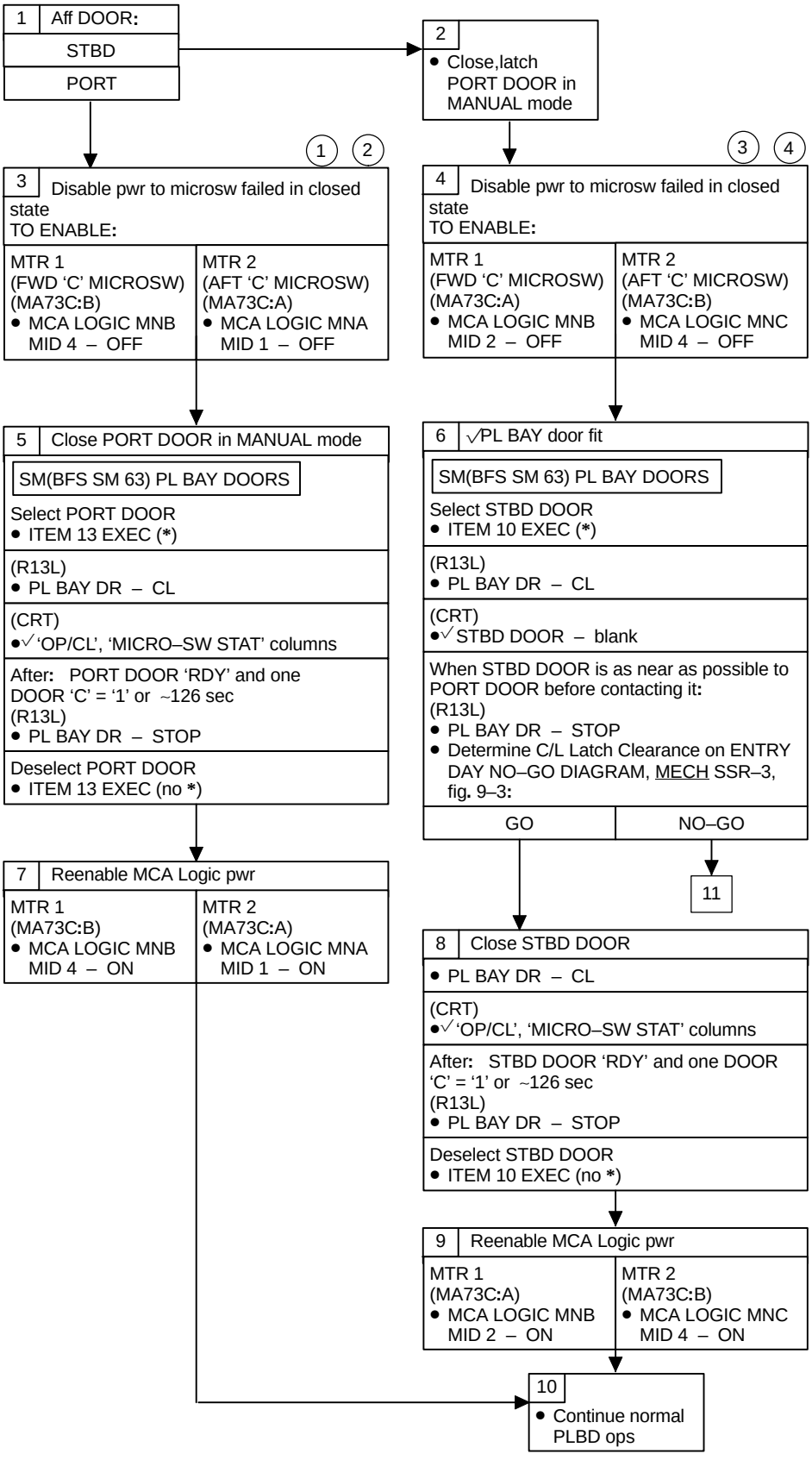
When KU ANT tb – STO (~23–46 sec),
KU ANT DIRECT STO – OFF
PL BAY MECH PWR SYS (two) – OFF

✓KU–BD is within STO envelope

> NOTE
> KU–BD CCTV overlay is located in Middeck Transparency Kit

MECH SSR–6
PLBD CL MICROSW FAILURE WORKAROUND

This procedure regains door close capability for door–closed microsw failed–on (closed) (Mtr 1 or Mtr 2 inhibited from running). Procedure will not work for opening or closing latches or opening doors



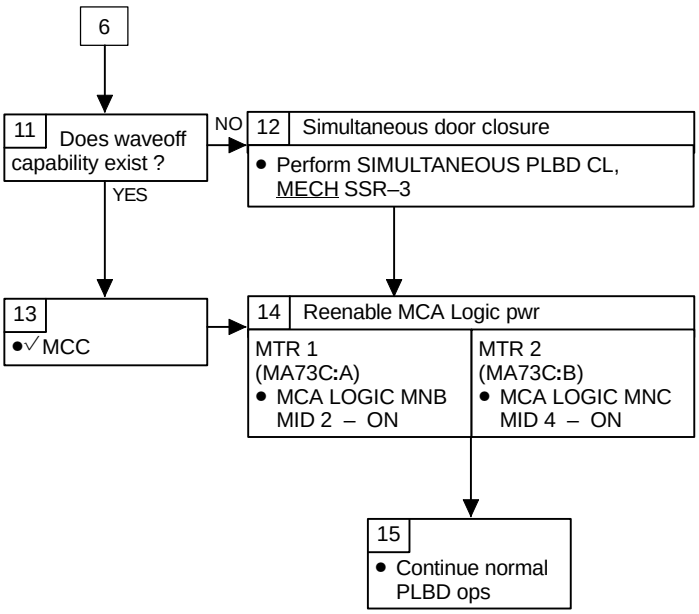
(1) To enable mtr 1, this step also disables pwr to:
PORT FWD BLKHD MTR 2
STBD DOOR MTR 2
STBD FWD BLKHD MTR 2

(2) To enable mtr 2, this step also disables pwr to:
PORT FWD BLKHD MTR 1
STBD DOOR MTR 1
STBD FWD BLKHD MTR 1
C/L 9–12 MTR 1

(3) To enable mtr 1, this step also disables pwr to:
PORT DOOR MTR 2
STBD AFT BLKHD MTR 2
C/L 13–16 MTR 2

(4) To enable mtr 2, this step also disables pwr to:
PORT DOOR MTR 1
STBD AFT BLKHD MTR 1
C/L 9–12 MTR 2
C/L 13–16 MTR 1

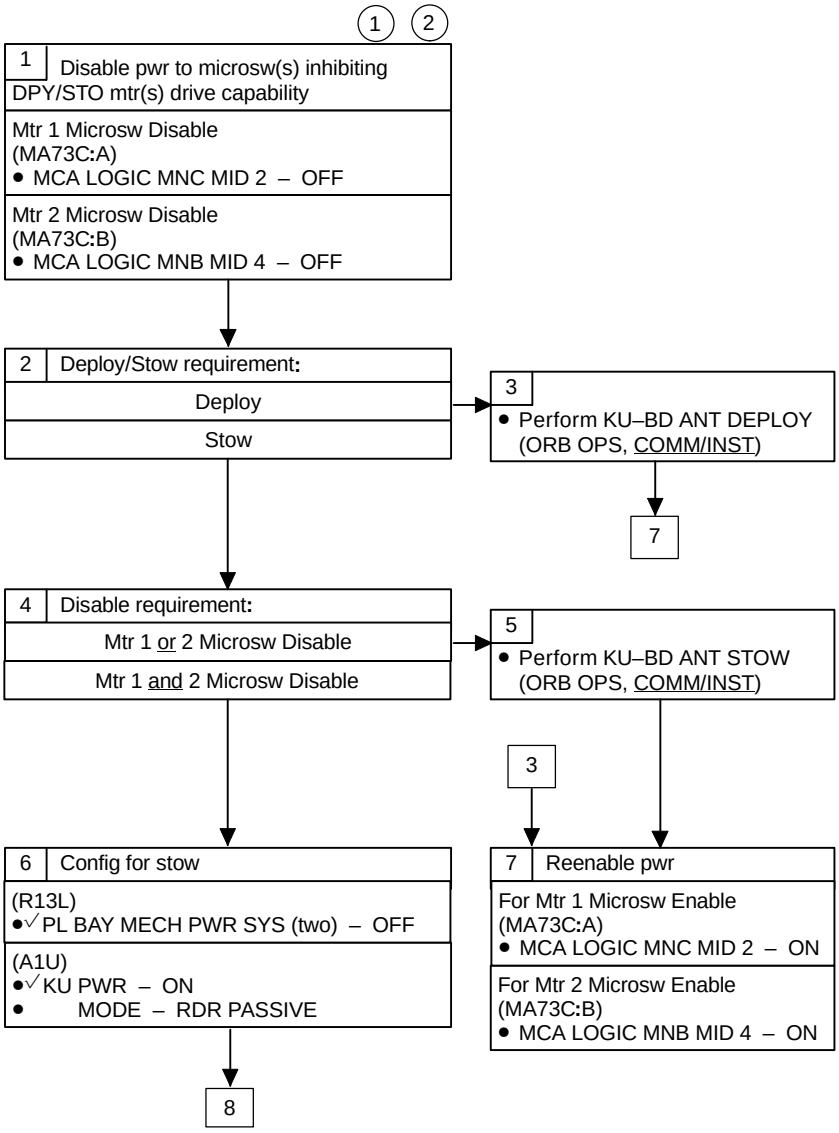
MECH SSR–6 (Cont)



MECH SSR–7
KU–BAND ANTENNA DPY/STO MICROSW FAILURE

NOTE

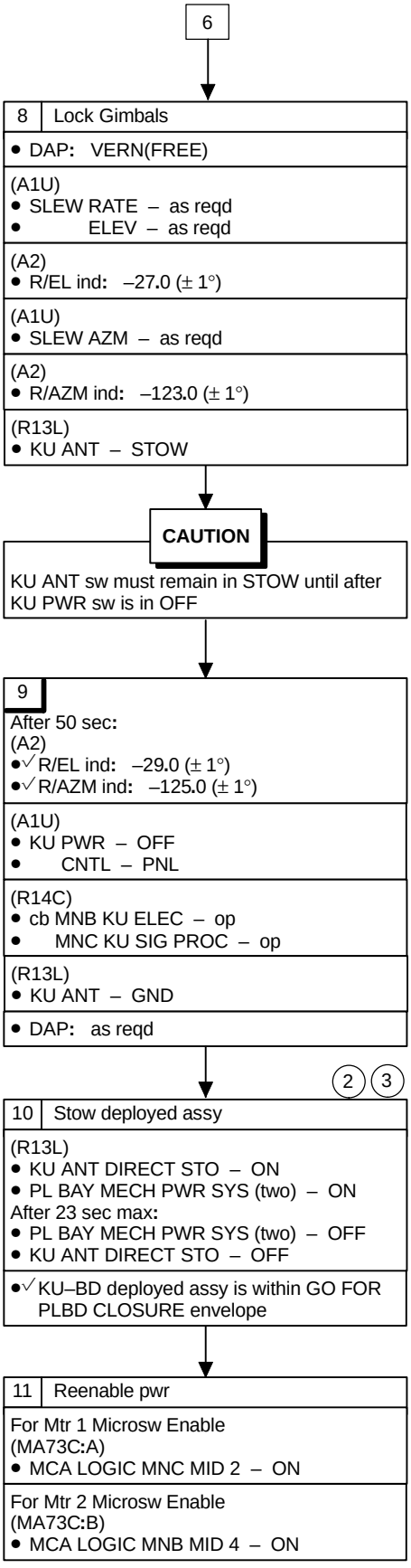
This procedure regains capability to deploy or stow antenna if (DPY/STO) microsw(s) is (are) failed on, inhibiting deploy/stow mtr ops



(1) Logic pwr does not inhibit mtr drive capability if pwrd off

(2) Inhibiting logic pwr to both mtr microswitches inhibits pwr for Boom Stow Enable II signals. KU ANT DIRECT STOW sw must be used to stow deployed assy

MECH SSR–7 (Cont)



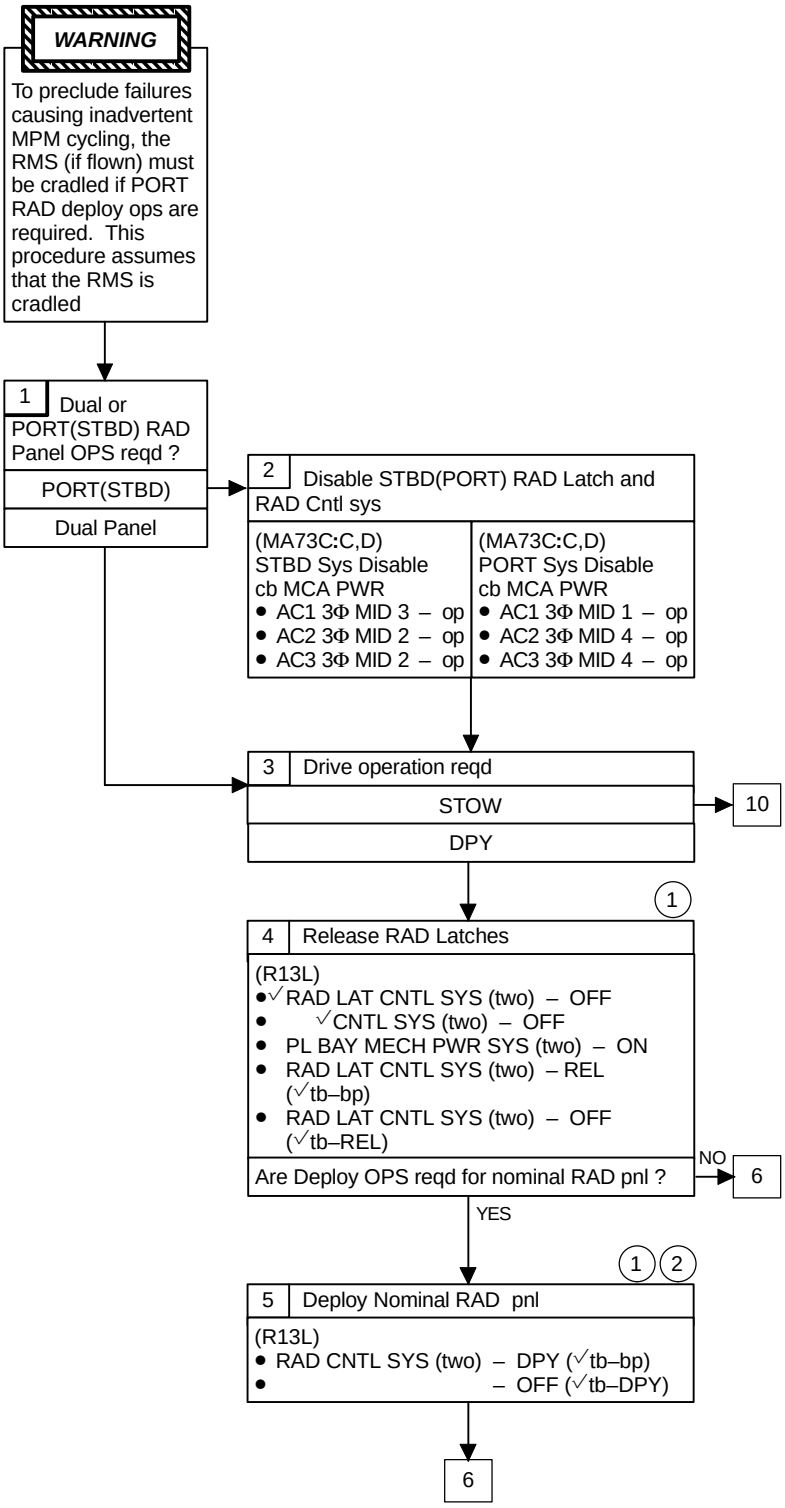
(2) Inhibiting logic pwr to both mtr microswitches inhibits pwr for Boom Stow Enable II signals. KU ANT DIRECT STOW sw must be used to stow deployed assy

(3) KU–BD CCTV overlay is located in Middeck Transparency Kit

MECH SSR–8
RAD DPY/STO MICROSW FAILURE WORKAROUND

NOTE

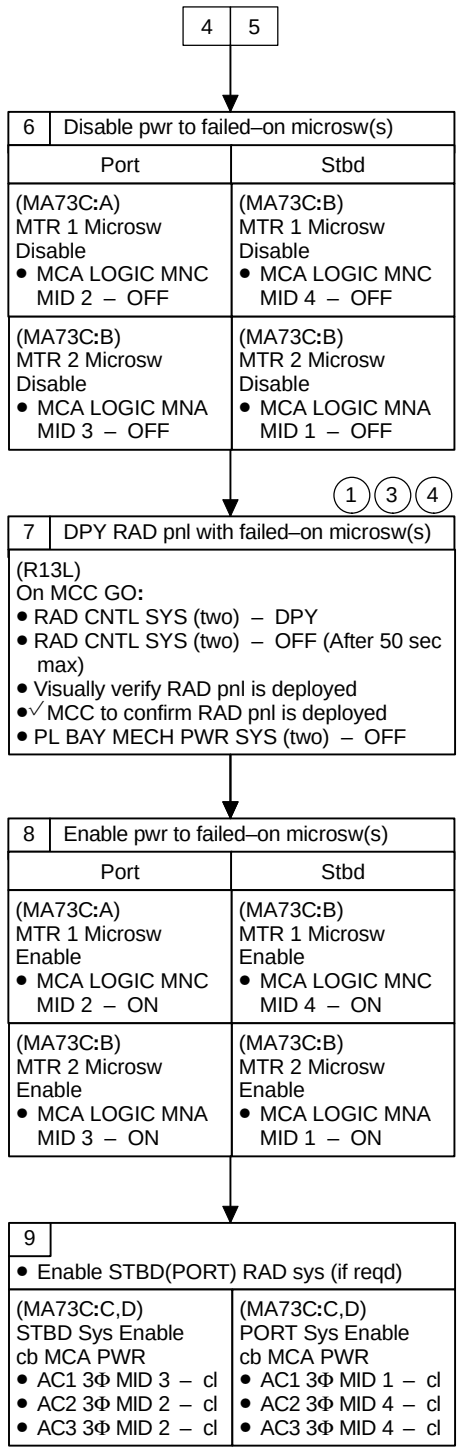
This procedure regains radiator panel deploy or stow capability if DPY/STO microsw(s) is (are) failed on, inhibiting deploy/stow mtr ops. This procedure accommodates PORT(STBD) and/or dual panel ops



(1) PDU Actuator Times
(Dual Mtr)
Lat – 30 sec
Rad – 50 sec
(Single Mtr)
Lat – 60 sec
Rad – 100 sec

(2) For either a dual microsw or microsw/mtr failure, failed pnl will be inhibited from driving

MECH SSR–8 (Cont)

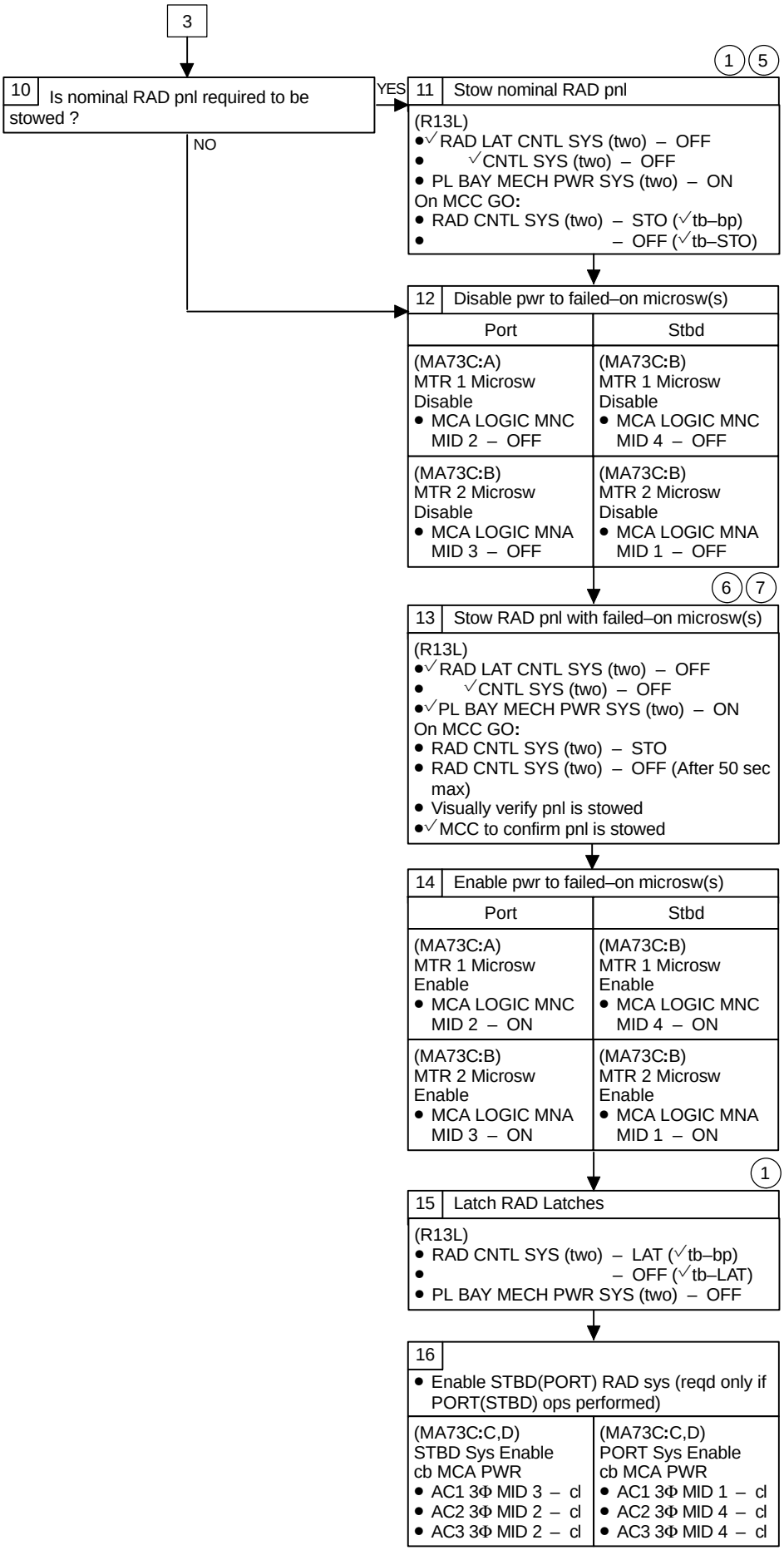


(1) PDU Actuator Times
(Dual Mtr)
Lat – 30 sec
Rad – 50 sec
(Single Mtr)
Lat – 60 sec
Rad – 100 sec

(3) Only nominal RAD Panel tb will be operational. MCC verification of AC bus slip currents will verify mechanism end–of–travel

(4) For dual microsw failure expect dual mtr drive time. Expect single mtr drive time (drive for 100 sec) for microsw/mtr failure

MECH SSR–8 (Cont)



(1) PDU Actuator Times
(Dual Mtr)
Lat – 30 sec
Rad – 50 sec
(Single Mtr)
Lat – 60 sec
Rad – 100 sec

(5) For either dual microsw or microsw and mtr failure, failed pnl will be inhibited from driving

(6) For dual microsw failure, expect dual mtr drive time. For microsw and mtr failure, expect single mtr drive time (drive for 100 sec)

(7) RAD pnl tb is not operational. MCC verification of AC bus slip currents will verify mechanism end–of–travel

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RCS SCHEMATIC 10–3

10.1 RCS JET/DLMA/PWR
10.1a 'L(R,F) RCS (L,U,D,R,A,F) JET', 'F(L,R) RCS TK P', 'F(L,R) RCS LEAK' 10–4
10.1b 'RM DLMA MANF' 10–10
10.1c 'RCS PWR FAIL' 10–11

10.2 RCS VLV MISCOMP
10.2a RCS VLV tb – bp 10–12
10.2b tb AND sw POSITION DISAGREE 10–15

10.3 RCS PRPLT THERM/SYS
10.3a 'S89 PRPLT THRM RCS' 10–16
10.3b 'G23 RCS SYSTEM F(L,R)' 10–17

RCS SSR
RCS SSR–1 RCS MIXED XFEED MEM READ/WRITE 10–20
SSR–2 HOT FIRE RCS 10–22
SSR–3 AFT RCS MANF/LEG PRESS, READ/WRITE 10–25
SSR–4 STAGED, MANF REPRESS 10–27
SSR–5 LEAKING RCS PRPLT/He BURN 10–28

The following Fault Msgs have no corresponding MAL procedures in this book:

ET SEP AUTO (INH,MAN)
F(L,R) RCS PVT
F(L,R) RCS He P
G23 OMS/RCS QTY
RCS XFEED L(R)

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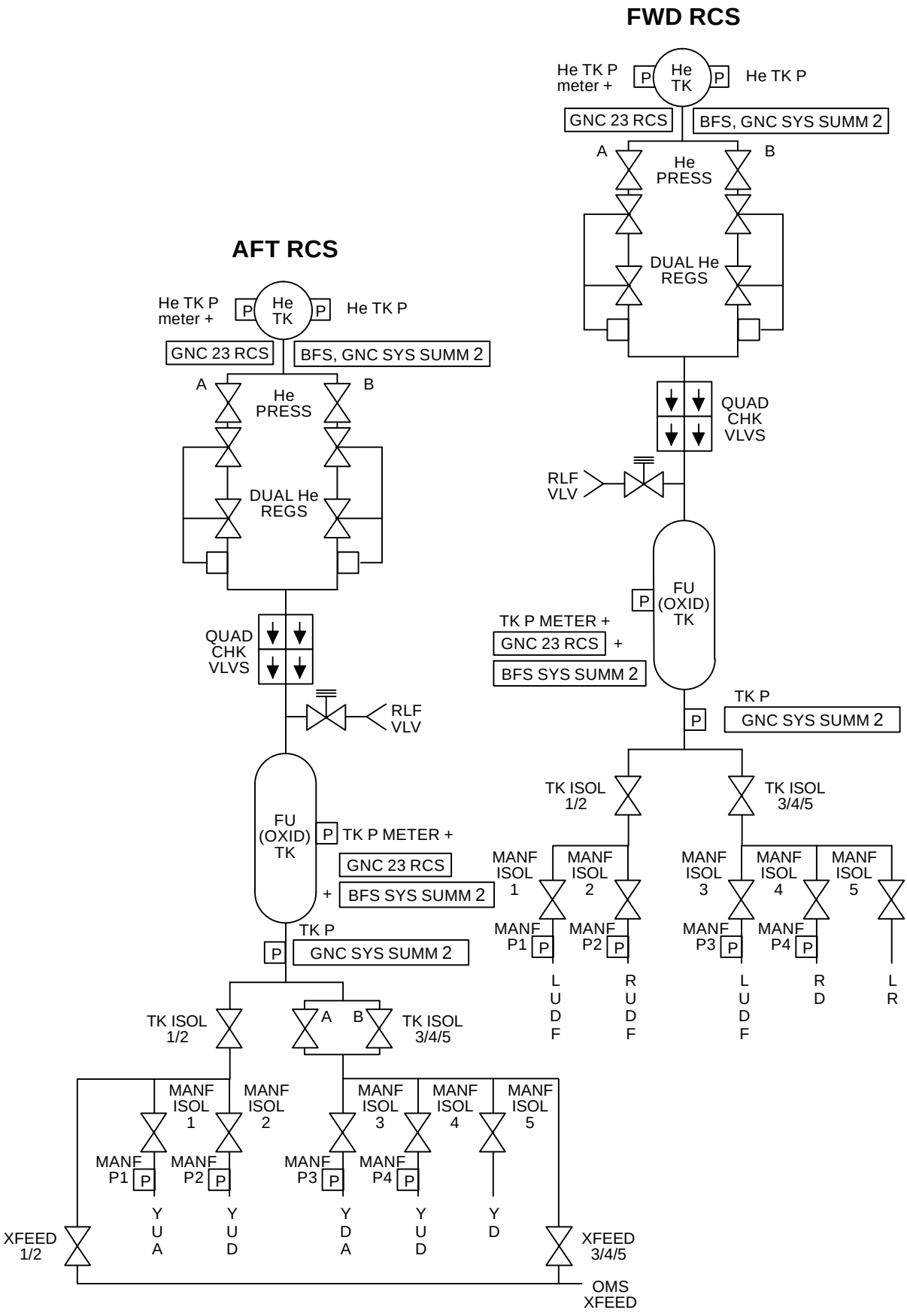
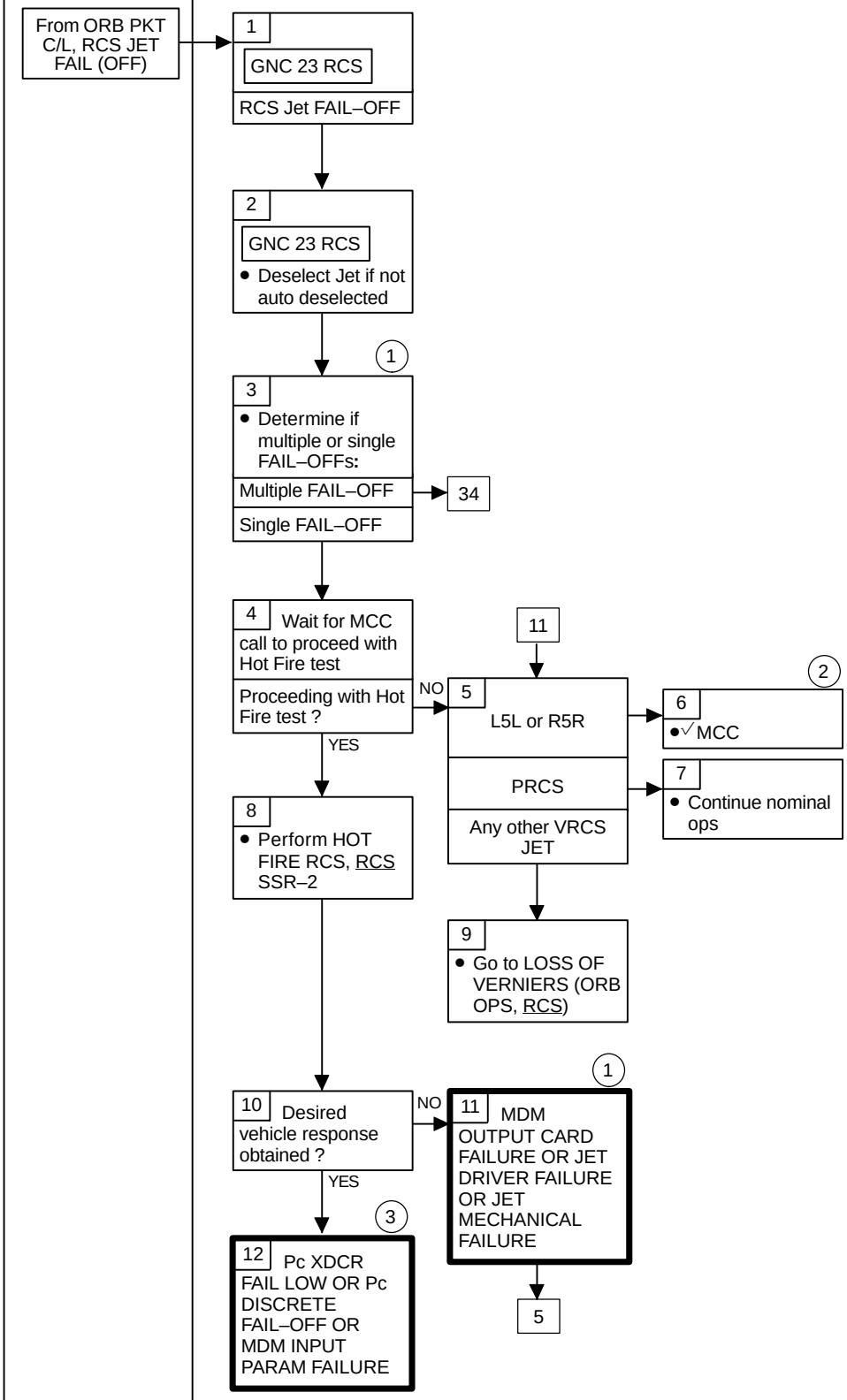

FWD RCS
He TK P meter +
P
He TK
P
He TK P
GNC 23 RCS
BFS, GNC SYS SUMM 2
A
B
He PRESS
DUAL He REGS
QUAD CHK VLVS
RLF VLV
FU (OXID) TK
P
TK P METER +
GNC 23 RCS
+
BFS SYS SUMM 2
TK P
P
GNC SYS SUMM 2
TK ISOL 1/2
TK ISOL 3/4/5
MANF ISOL 1
MANF ISOL 2
MANF ISOL 3
MANF ISOL 4
MANF ISOL 5
MANF P1
MANF P2
MANF P3
MANF P4
L UDF
R UDF
L UDF
R D
L R
AFT RCS
He TK P meter +
P
He TK
P
He TK P
GNC 23 RCS
BFS, GNC SYS SUMM 2
A
B
He PRESS
DUAL He REGS
QUAD CHK VLVS
RLF VLV
FU (OXID) TK
P
TK P METER +
GNC 23 RCS
+
BFS SYS SUMM 2
TK P
P
GNC SYS SUMM 2
TK ISOL 1/2
A
B
TK ISOL 3/4/5
MANF ISOL 1
MANF ISOL 2
MANF ISOL 3
MANF ISOL 4
MANF ISOL 5
MANF P1
MANF P2
MANF P3
MANF P4
Y UA
Y UD
Y DA
Y UD
Y D
XFEED 1/2
XFEED 3/4/5
OMS XFEED

RCS

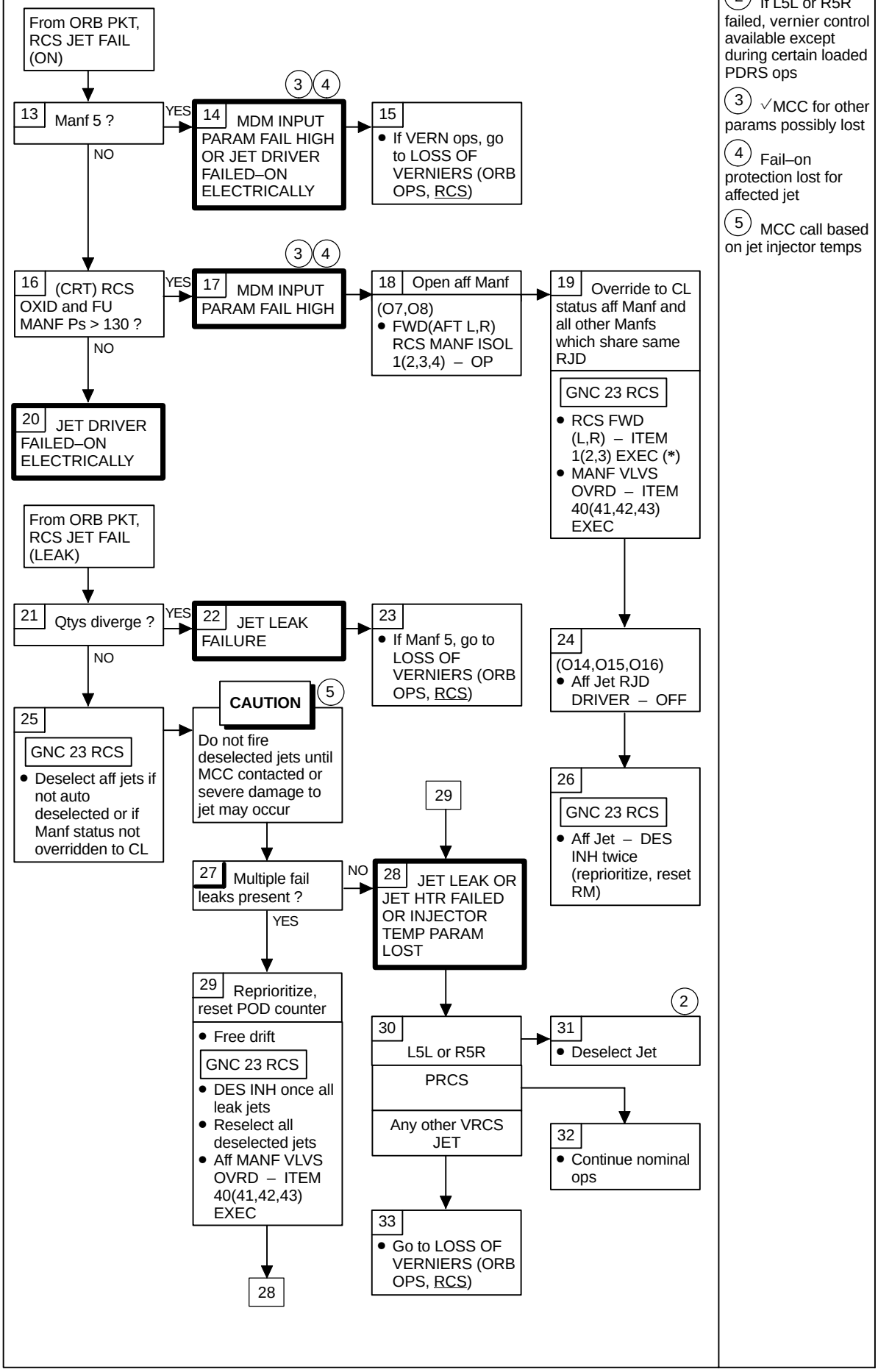
10.1a 'L(R,F) RCS (L,U,D,R,A,F) JET'
'F(L,R) RCS TK P'
'F(L,R) RCS LEAK'



(1) To determine if multiple fail–off jets occurred, ✓both Aft pods

(2) If L5L or R5R failed, vernier control available except during certain loaded PDRS ops

(3) ✓MCC for other params possibly lost

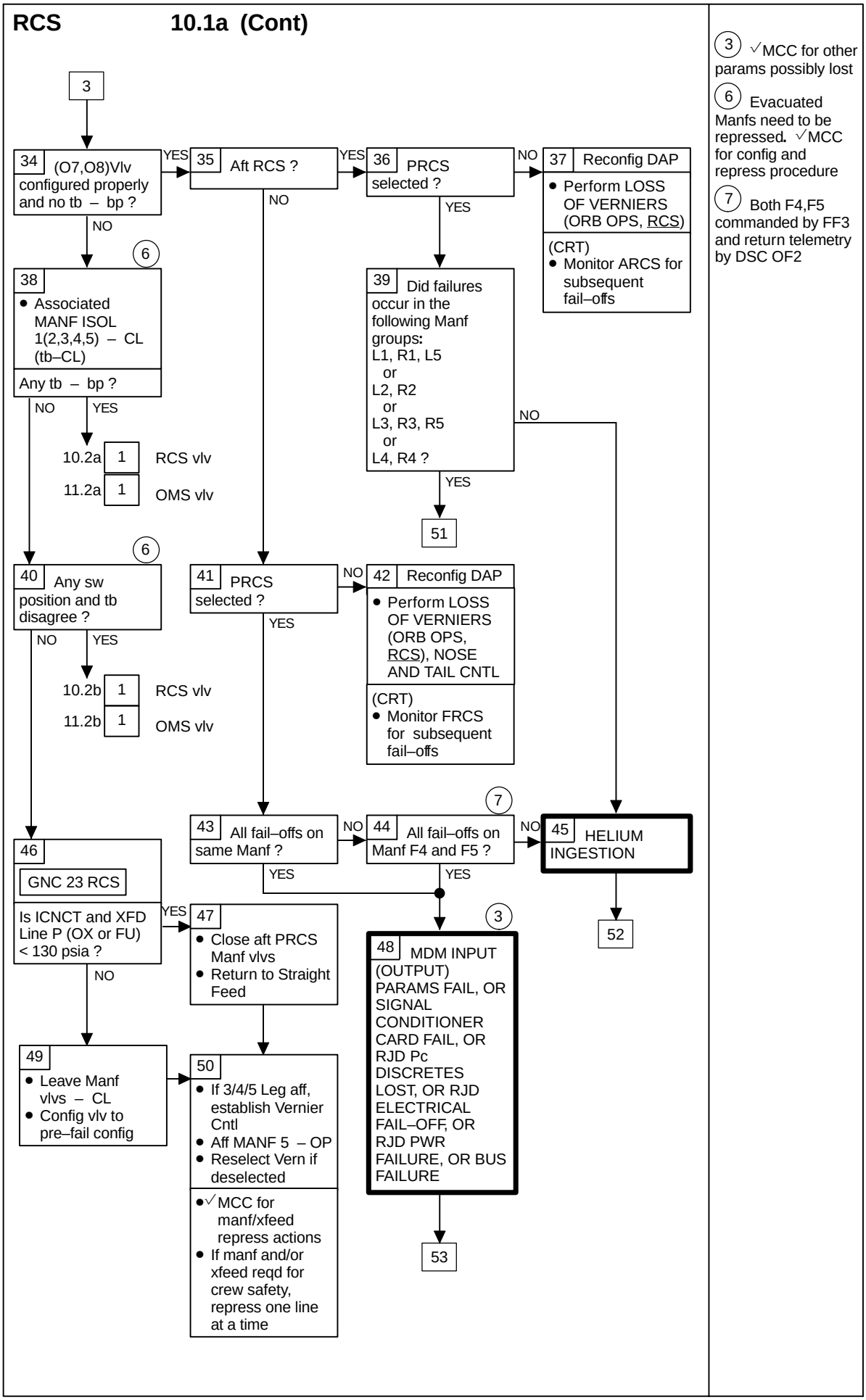


(2) If L5L or R5R failed, vernier control available except during certain loaded PDRS ops

(3) ✓MCC for other params possibly lost

(4) Fail–on protection lost for affected jet

(5) MCC call based on jet injector temps

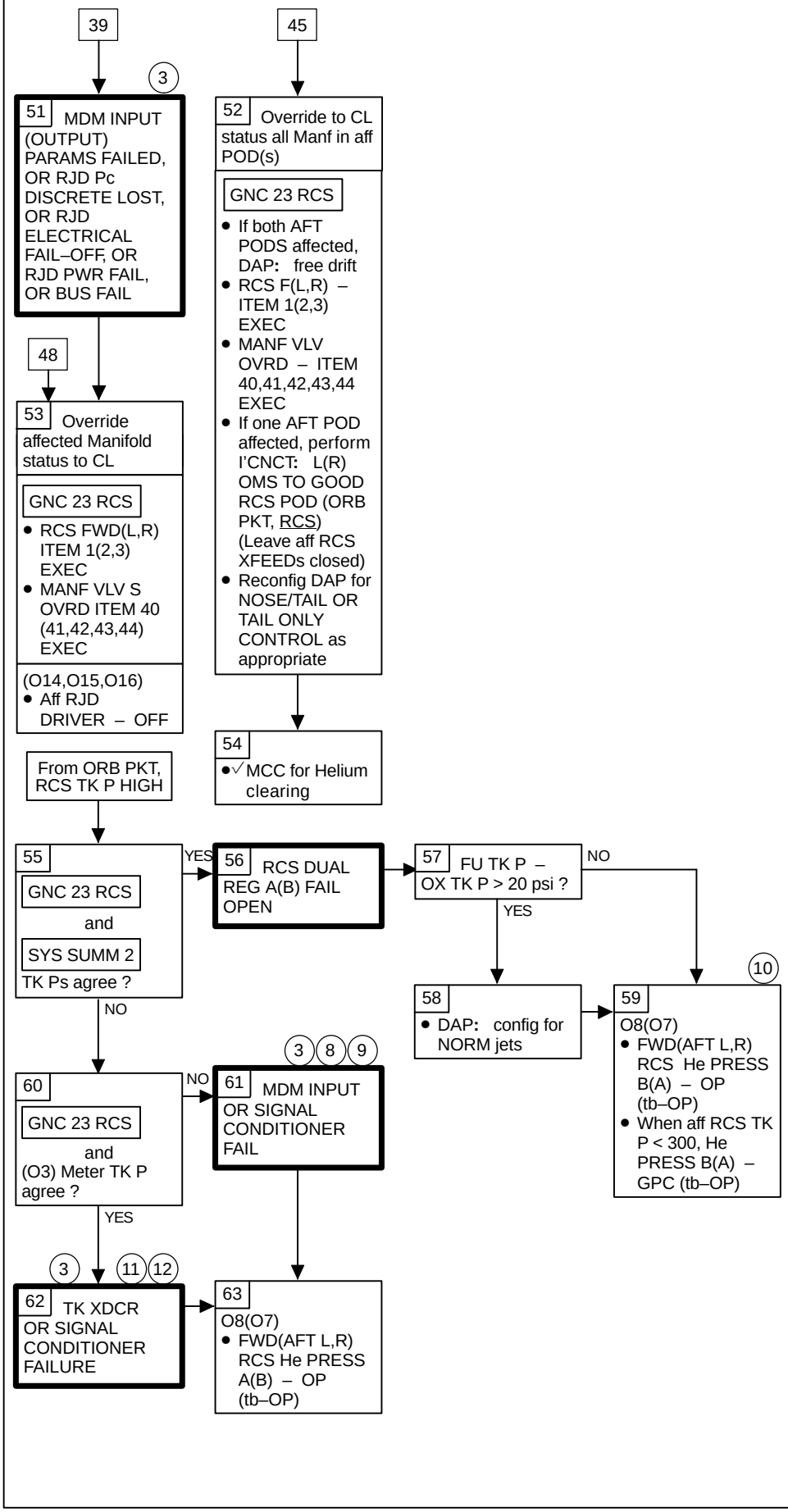


3 ✓MCC for other params possibly lost

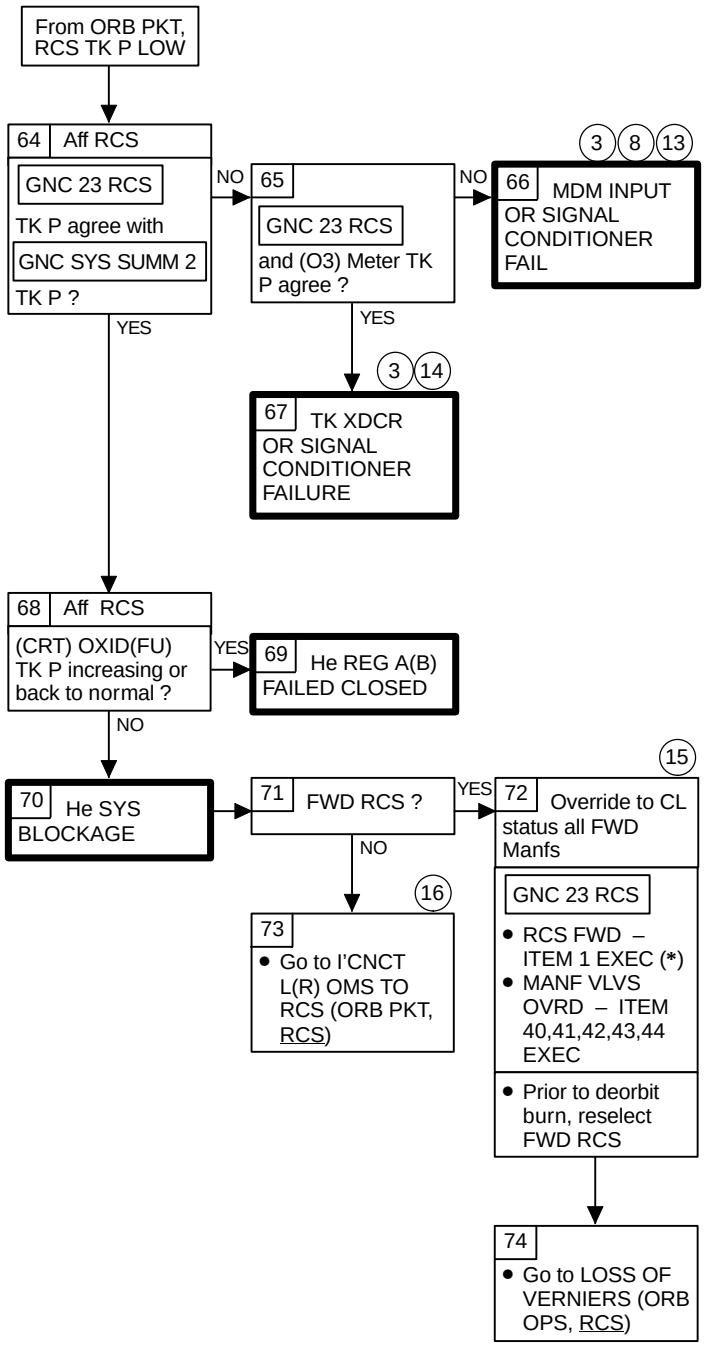
6 Evacuated Manfs need to be repressed. ✓MCC for config and repress procedure

7 Both F4,F5 commanded by FF3 and return telemetry by DSC OF2

RCS 10.1a (Cont)



RCS 10.1a (Cont)



(3) ✓MCC for other params possibly lost

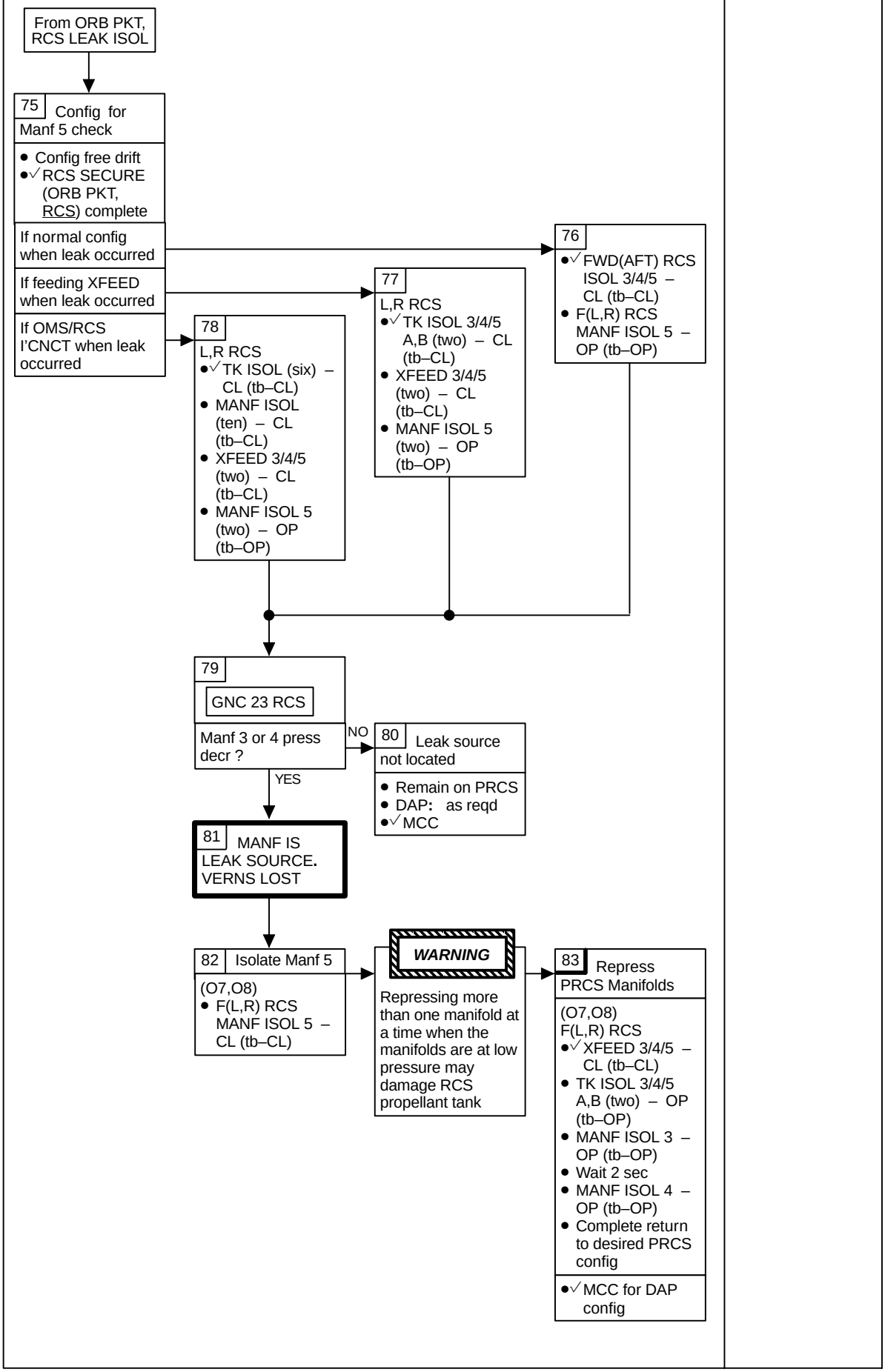
(8) H/W C&W remains

(13) Use SYS SUMM 2 or (O3) meter TK P only
(O3) Meter

(14) RCS PVT for aff OX(FU) may be in error. Use aff pod FU(OX) for qty

(15) Prior to deorbit burn, reselect FWD RCS. Secure FWD RCS when TK P < 190

(16) Xfeed from good RCS prior to deorbit. Propellant with He blockage available until TK P < 190 psi if reqd


From ORB PKT, RCS LEAK ISOL
75 Config for Manf 5 check
• Config free drift
•✓RCS SECURE (ORB PKT, RCS) complete
If normal config when leak occurred
If feeding XFEED when leak occurred
If OMS/RCS I'CNCT when leak occurred
76
•✓FWD(AFT) RCS ISOL 3/4/5 – CL (tb–CL)
• F(L,R) RCS MANF ISOL 5 – OP (tb–OP)
77
L,R RCS
•✓TK ISOL 3/4/5 A,B (two) – CL (tb–CL)
• XFEED 3/4/5 (two) – CL (tb–CL)
• MANF ISOL 5 (two) – OP (tb–OP)
78
L,R RCS
•✓TK ISOL (six) – CL (tb–CL)
• MANF ISOL (ten) – CL (tb–CL)
• XFEED 3/4/5 (two) – CL (tb–CL)
• MANF ISOL 5 (two) – OP (tb–OP)
79
GNC 23 RCS
Manf 3 or 4 press decr ?
NO
80 Leak source not located
• Remain on PRCS
• DAP: as reqd
•✓MCC
YES
81 MANF IS LEAK SOURCE. VERNS LOST
82 Isolate Manf 5
(O7,O8)
• F(L,R) RCS MANF ISOL 5 – CL (tb–CL)
WARNING
Repressing more than one manifold at a time when the manifolds are at low pressure may damage RCS propellant tank
83 Repress PRCS Manifolds
(O7,O8)
F(L,R) RCS
•✓XFEED 3/4/5 – CL (tb–CL)
• TK ISOL 3/4/5 A,B (two) – OP (tb–OP)
• MANF ISOL 3 – OP (tb–OP)
• Wait 2 sec
• MANF ISOL 4 – OP (tb–OP)
• Complete return to desired PRCS config
•✓MCC for DAP config

RCS

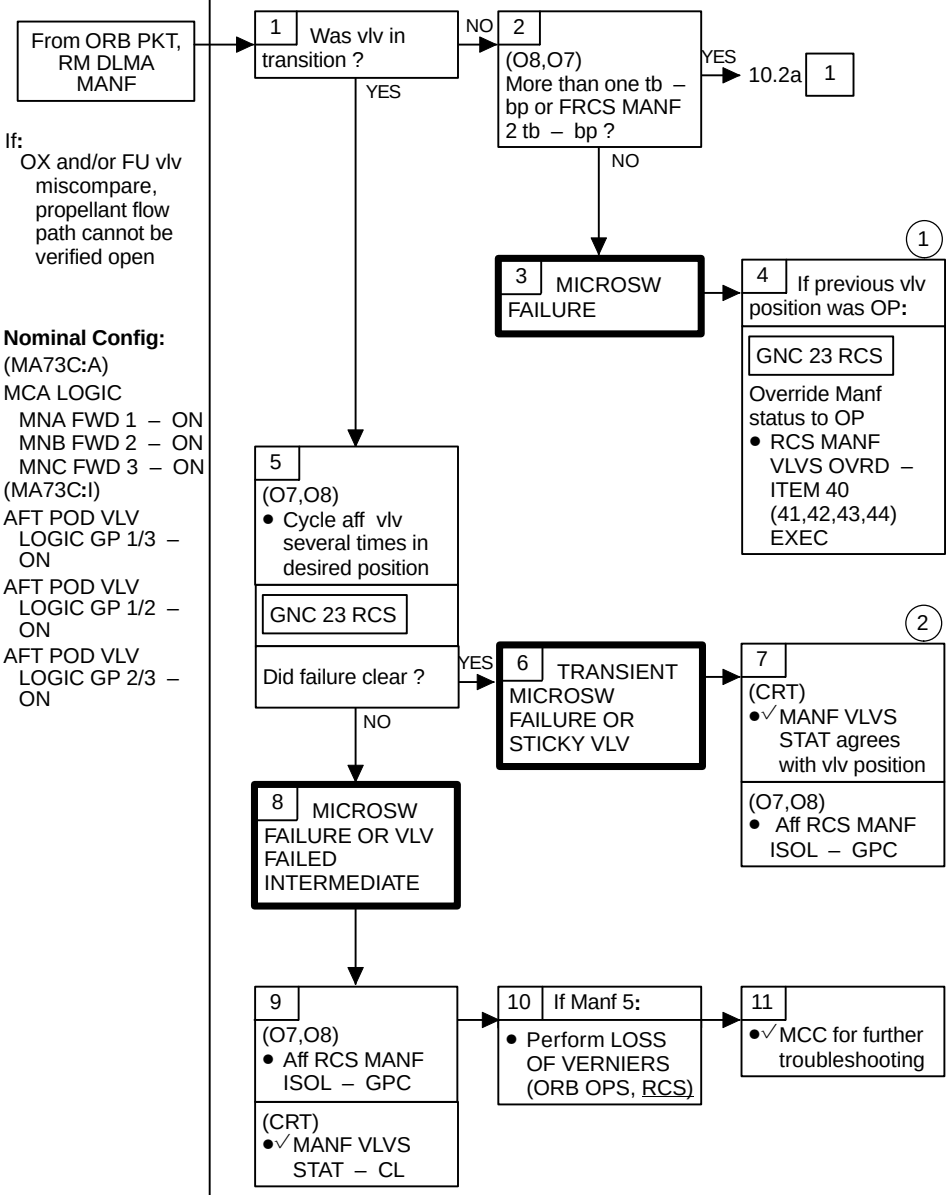
10.1b 'RM DLMA MANF'

SM ALERT

From ORB PKT, RM DLMA MANF

If:
OX and/or FU vlv miscompare, propellant flow path cannot be verified open

Nominal Config:
(MA73C:A)
MCA LOGIC
MNA FWD 1 – ON
MNB FWD 2 – ON
MNC FWD 3 – ON
(MA73C:I)
AFT POD VLV LOGIC GP 1/3 – ON
AFT POD VLV LOGIC GP 1/2 – ON
AFT POD VLV LOGIC GP 2/3 – ON



(1) If position discretes are intermediate, MANF ISOL STAT will be evaluated at each change of state. It may be necessary to repeat RCS MANF VLVS OVRD later

(2) Prevent continuous pwr if microsw fails again

RCS

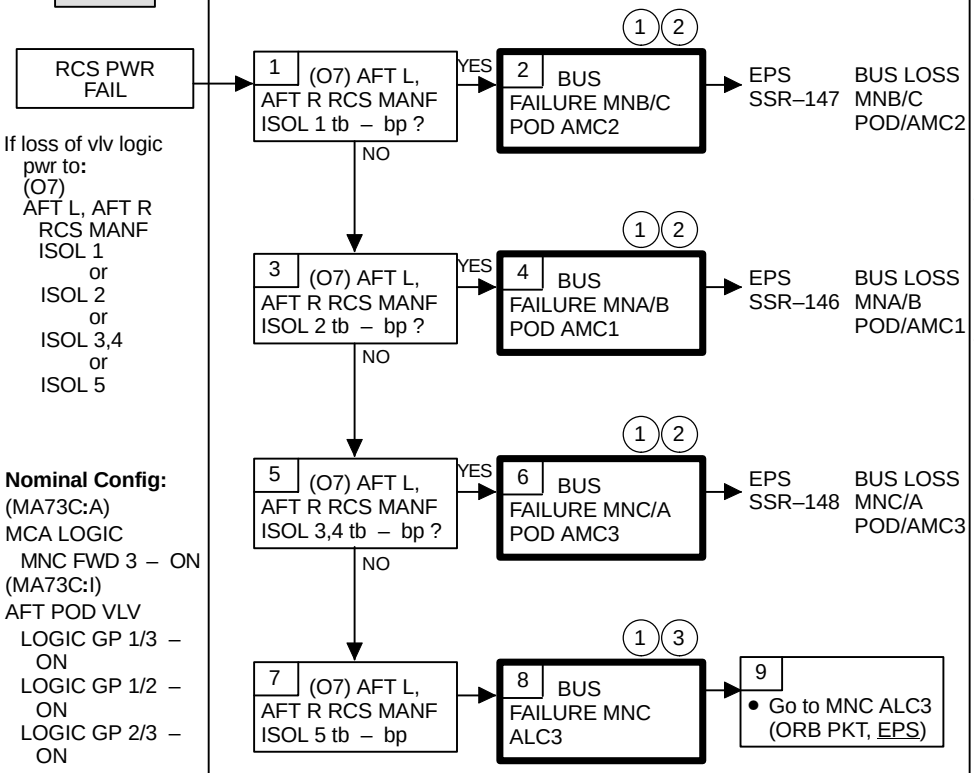
10.1c 'RCS PWR FAIL'

SM ALERT

RCS PWR FAIL

If loss of vlv logic pwr to:
(O7)
AFT L, AFT R RCS MANF
ISOL 1
or
ISOL 2
or
ISOL 3,4
or
ISOL 5

Nominal Config:
(MA73C:A)
MCA LOGIC
MNC FWD 3 – ON
(MA73C:I)
AFT POD VLV
LOGIC GP 1/3 – ON
LOGIC GP 1/2 – ON
LOGIC GP 2/3 – ON



(1) If subsequent leak on affected manf:
GNC 23 RCS
ITEM 2(3) EXEC (as reqd). ✓Manf status: If OP, override to CL with ITEM 40–43. To isolate leak, close TK ISOL vlv. Affected RCS MANF ISOL vlv cannot be moved from current status

(2) Failure possibly caused by dual CNTL or dual APC bus failures or CNTL and APC bus failure

(3) Failure possibly caused by loss of MNC APC6 or MNC DA3

RCS

10.2a RCS VLV tb – bp

RCS Vlv tb – bp

If tb – bp:
O8(O7)
FWD(AFT L,R)
RCS
He PRESS A(B)
TK ISOL 1/2
TK ISOL 3/4/5 A(B)
MANF ISOL
1(2,3,4,5)
AFT L,R RCS
XFEED
1/2(3/4/5)

Nominal Config:
(MA73C:A)
MCA LOGIC
MNA FWD 1 – ON
MNB FWD 2 – ON
MNC FWD 3 – ON
(MA73C:I)
AFT POD VLV
LOGIC GP
1/3 – ON
1/2 – ON
2/3 – ON
(MA73C:H)
cb AC1,AC2,AC3
FWD RCS VLV
ΦA,ΦB,ΦC
(nine) – cl
(MA73C:I)
cb AC1,AC2,AC3
AFT POD VLV GP
1,2,3 ΦA,ΦB,ΦC
(nine) – cl
(R14:C)
cb MNC MANF ISOL
L5,R5,F5 ENA
(three) – cl

10.1a 38
10.1b 2
10.2b 2

1 (O8,O7) More than one tb – bp or FRCS MANF 2 tb – bp ? YES → 13

NO → 33

2 Was vlv reconfig in progress ? NO

YES → 10.2b 5

3 Aff vlv:

(O7,O8) RCS He PRESS A(B) vlv → 4
- ✓RCS He P B(A) vlv GPC (tb–OP)

(O8) FWD RCS TK ISOL 1/2 → 5
- FWD RCS MANF ISOL 1,2 (two) – CL (tb–CL)

(O8) FWD RCS TK ISOL 3/4/5 → 6
- FWD RCS MANF ISOL 3,4 (two) – CL (tb–CL)
- FWD RCS MANF ISOL 5 – CL (tb–CL)
- Perform LOSS OF VERNIERS (ORB OPS, RCS)

(O7) AFT L(R) RCS TK ISOL 1/2 → 7
- Go to desired propellant feed config except:

GNC 23 RCS
- OVERRIDE AFF POD MANF VLVS STATUS 1,2 – CL
- ✓Aff POD RCS XFD 1/2 – CL (tb–CL)

(O7) AFT L(R) RCS TK ISOL 3/4/5 A(B) → 8
- Return to RCS STRAIGHT FEED
- ✓Aff POD RCS TK ISOL 3,4,5 B(A) – OP (tb–OP)

(O7,O8) FWD(AFT L,R) RCS MANF ISOL → 9

GNC 23 RCS
- ✓Aff MANF VLVS STATUS – CL
- If MANF 5, perform LOSS OF VERNIERS (ORB OPS, RCS)

(O7) AFT L(R) RCS XFEED → 10

(C3)
- ✓DAP: FREE

(O8)
- ✓OMS XFEED VLVS (four) – CL (tb–CL)

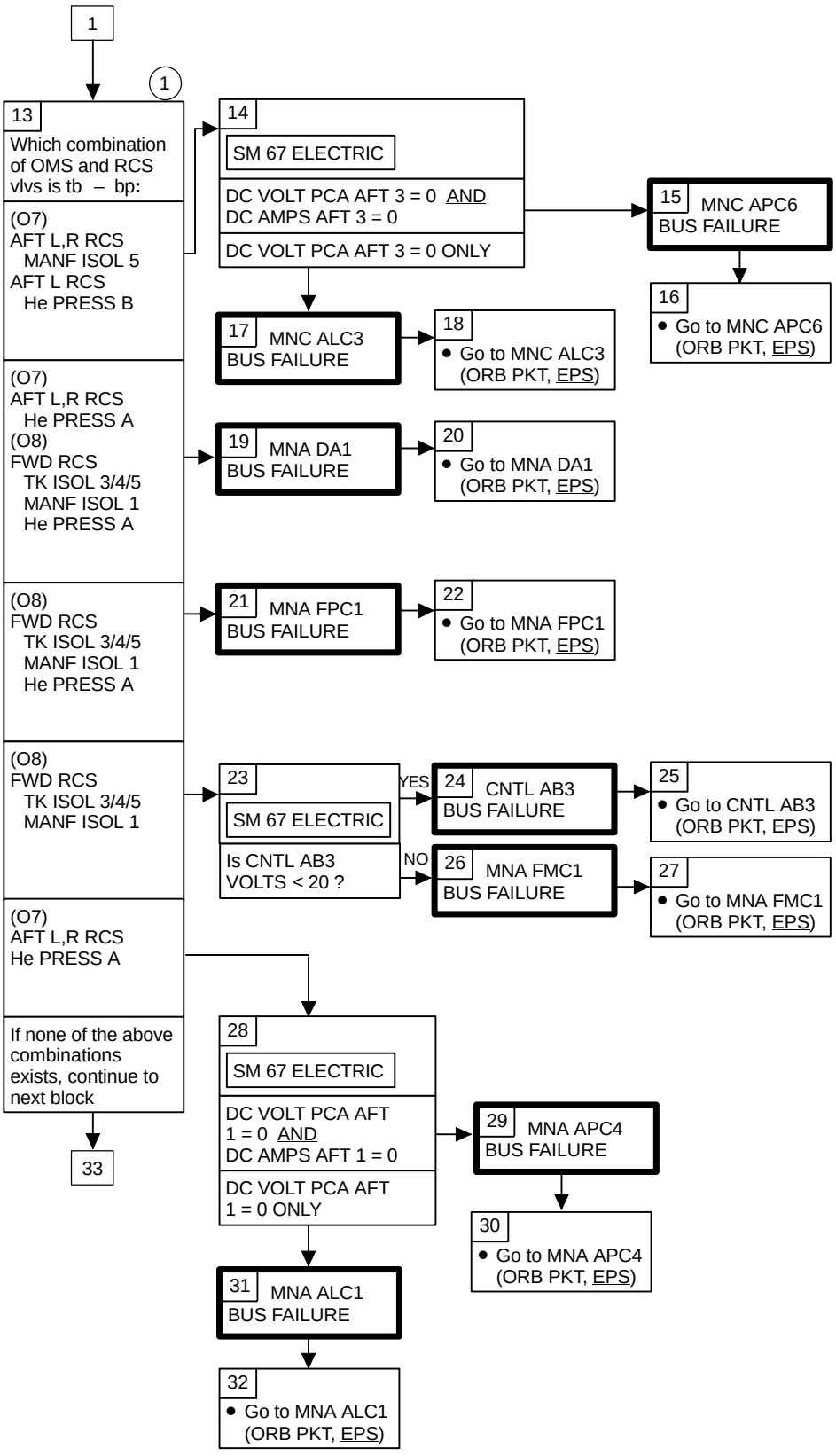
(O7)
- ✓RCS XFEED VLVS (four) – CL (tb–CL)
- Return to RCS straight feed
- DAP: as reqd

11 Remove vlv pwr

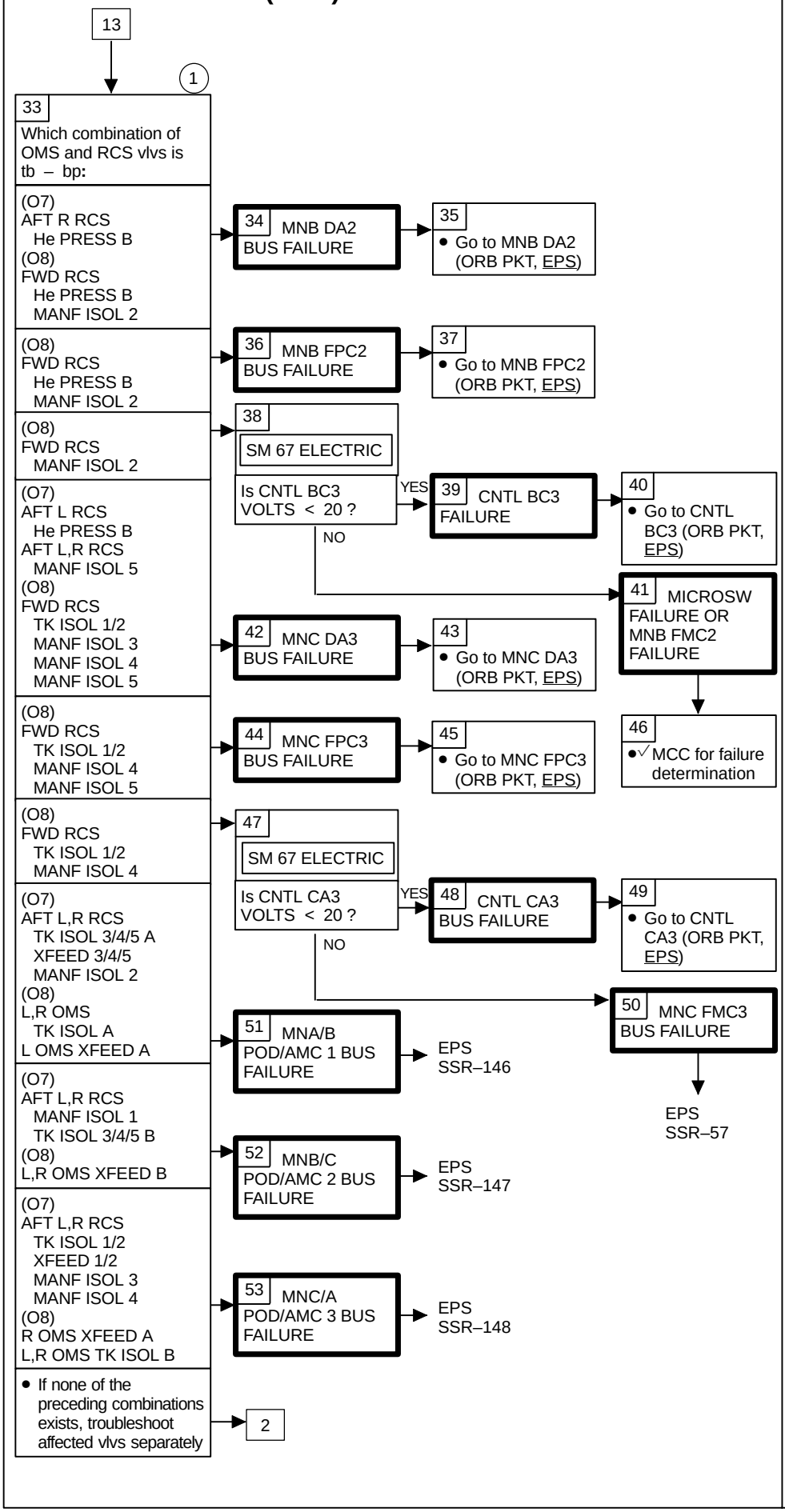
O7(O8)
- Note aff sw position
- Aff sw – GPC

12 POTENTIAL MICROSW FAILURE.
✓MCC FOR FAILURE DETERMINATION

RCS 10.2a (Cont)



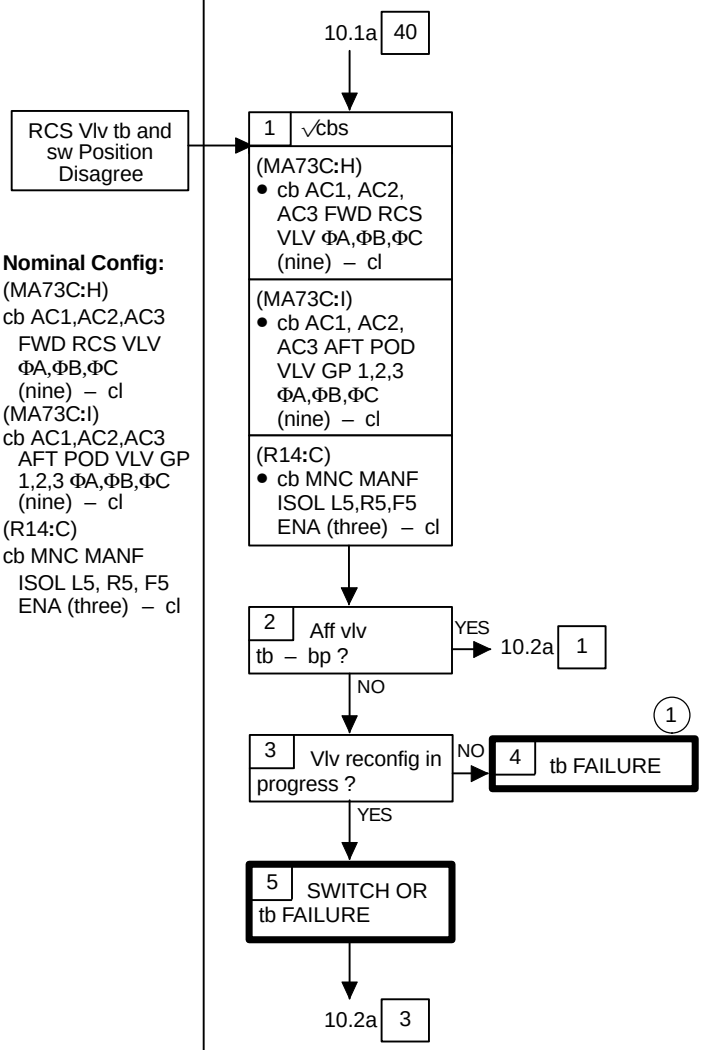
(1) Refer to BUS LOSS ID Table (ORB PKT, EPS) for bus loss verification. Proceed to BUS LOSS SSR if bus loss confirmed. For OMS/RCS function loss, refer to OMS/RCS operational Slide Rule for appropriate bus failure


13
1
33
Which combination of OMS and RCS vlvs is tb – bp:
(O7) AFT R RCS He PRESS B (O8) FWD RCS He PRESS B MANF ISOL 2
34 MNB DA2 BUS FAILURE
35 • Go to MNB DA2 (ORB PKT, EPS)
(O8) FWD RCS He PRESS B MANF ISOL 2
36 MNB FPC2 BUS FAILURE
37 • Go to MNB FPC2 (ORB PKT, EPS)
(O8) FWD RCS MANF ISOL 2
38 SM 67 ELECTRIC
Is CNTL BC3 VOLTS < 20 ?
YES
39 CNTL BC3 FAILURE
40 • Go to CNTL BC3 (ORB PKT, EPS)
NO
(O7) AFT L RCS He PRESS B AFT L,R RCS MANF ISOL 5 (O8) FWD RCS TK ISOL 1/2 MANF ISOL 3 MANF ISOL 4 MANF ISOL 5
41 MICROSW FAILURE OR MNB FMC2 FAILURE
42 MNC DA3 BUS FAILURE
43 • Go to MNC DA3 (ORB PKT, EPS)
(O8) FWD RCS TK ISOL 1/2 MANF ISOL 4 MANF ISOL 5
44 MNC FPC3 BUS FAILURE
45 • Go to MNC FPC3 (ORB PKT, EPS)
46 •✓MCC for failure determination
(O8) FWD RCS TK ISOL 1/2 MANF ISOL 4
47 SM 67 ELECTRIC
Is CNTL CA3 VOLTS < 20 ?
YES
48 CNTL CA3 BUS FAILURE
49 • Go to CNTL CA3 (ORB PKT, EPS)
NO
(O7) AFT L,R RCS TK ISOL 3/4/5 A XFEED 3/4/5 MANF ISOL 2 (O8) L,R OMS TK ISOL A L OMS XFEED A
50 MNC FMC3 BUS FAILURE
51 MNA/B POD/AMC 1 BUS FAILURE
EPS SSR–146
EPS SSR–57
(O7) AFT L,R RCS MANF ISOL 1 TK ISOL 3/4/5 B (O8) L,R OMS XFEED B
52 MNB/C POD/AMC 2 BUS FAILURE
EPS SSR–147
(O7) AFT L,R RCS TK ISOL 1/2 XFEED 1/2 MANF ISOL 3 MANF ISOL 4 (O8) R OMS XFEED A L,R OMS TK ISOL B
53 MNC/A POD/AMC 3 BUS FAILURE
EPS SSR–148
• If none of the preceding combinations exists, troubleshoot affected vlvs separately
2
1 Refer to BUS LOSS ID Table (ORB PKT, EPS) for bus loss verification. Proceed to BUS LOSS SSR if bus loss confirmed. For OMS/RCS function loss, refer to OMS/RCS operational Slide Rule for appropriate bus failure

RCS

10.2b RCS VLV tb AND sw POSITION DISAGREE

(1) gnore tb. Vlv in commanded position

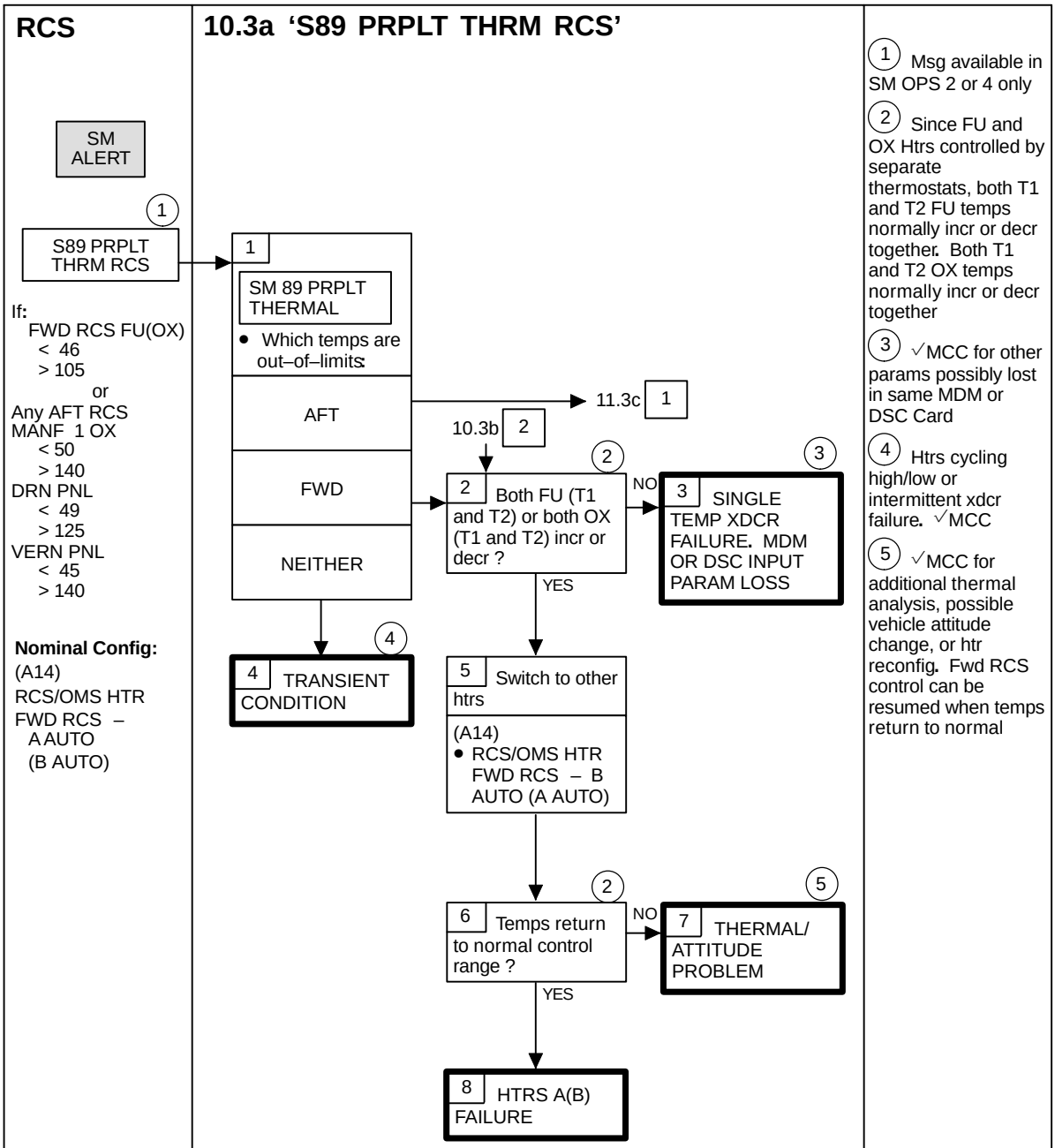


Nominal Config:

(MA73C:H)
cb AC1,AC2,AC3 FWD RCS VLV ΦA,ΦB,ΦC (nine) – cl
(MA73C:I)
cb AC1,AC2,AC3 AFT POD VLV GP 1,2,3 ΦA,ΦB,ΦC (nine) – cl
(R14:C)
cb MNC MANF ISOL L5, R5, F5 ENA (three) – cl

RCS

10.3a 'S89 PRPLT THRM RCS'



1. Msg available in SM OPS 2 or 4 only
2. Since FU and OX Htrs controlled by separate thermostats, both T1 and T2 FU temps normally incr or decr together. Both T1 and T2 OX temps normally incr or decr together
3. ✓MCC for other params possibly lost in same MDM or DSC Card
4. Htrs cycling high/low or intermittent xdcr failure. ✓MCC
5. ✓MCC for additional thermal analysis, possible vehicle attitude change, or htr reconfig. Fwd RCS control can be resumed when temps return to normal

10.3b 'G23 RCS SYSTEM F(L,R)'

SM ALERT

G23 RCS SYSTEM F(L,R)

If:
- FWD RCS
  - OXID(FU) PRPLT TK T
    - < 50 degF
    - > 90 degF
- or L,R RCS
  - OXID(FU) PRPLT TK T
    - < 50 degF
    - > 100 degF
- or GNC SYS SUMM 2
  - FWD(L,R) OXID (FU) TK P
    - < 220 psi
    - > 300 psi

Nominal Config:

O8(O7)

FWD(AFT L, AFT R)
- RCS He PRESS
  - A(B) – GPC (tb–OP)
  - B(A) – CL (tb–CL)

(A14)

RCS/OMS HTR
- FWD RCS – A AUTO (B AUTO)

RCS/OMS HTR L
- POD (two) – A AUTO(B AUTO) B OFF(A OFF)

RCS/OMS HTR R
- POD (two) – A AUTO(B AUTO) B OFF(A OFF)

1

GNC 23 RCS
- RCS FWD(L,R) ITEM 1(2,3) EXEC (*)

OXID(FU) 'PRPLT TK T' out–of–limits ?

NO → 11

YES

2

'S89 PRPLT THRM' msg present for:

- POD → 11.3c 1
- RCS → 10.3a 2
- NEITHER

3 OXID (FU) PRPLT TK T off–scale high or low ?

YES → 4 (1 2) OXID(FU) PRPLT TK T XDCR FAILURE; MDM OR DSC INPUT PARAM LOSS

NO

5 Switch to other htr/thermostat ckt

Which Pod failed:

- FWD RCS → 6 (A14)
  - RCS/OMS HTR FWD RCS – B AUTO (A AUTO)
- L(R) RCS

7 (A14)
- RCS/OMS HTR L(R) POD – A OFF(B OFF)
- RCS/OMS HTR L(R) POD – B AUTO(A AUTO)

8 Temp returns to normal ?

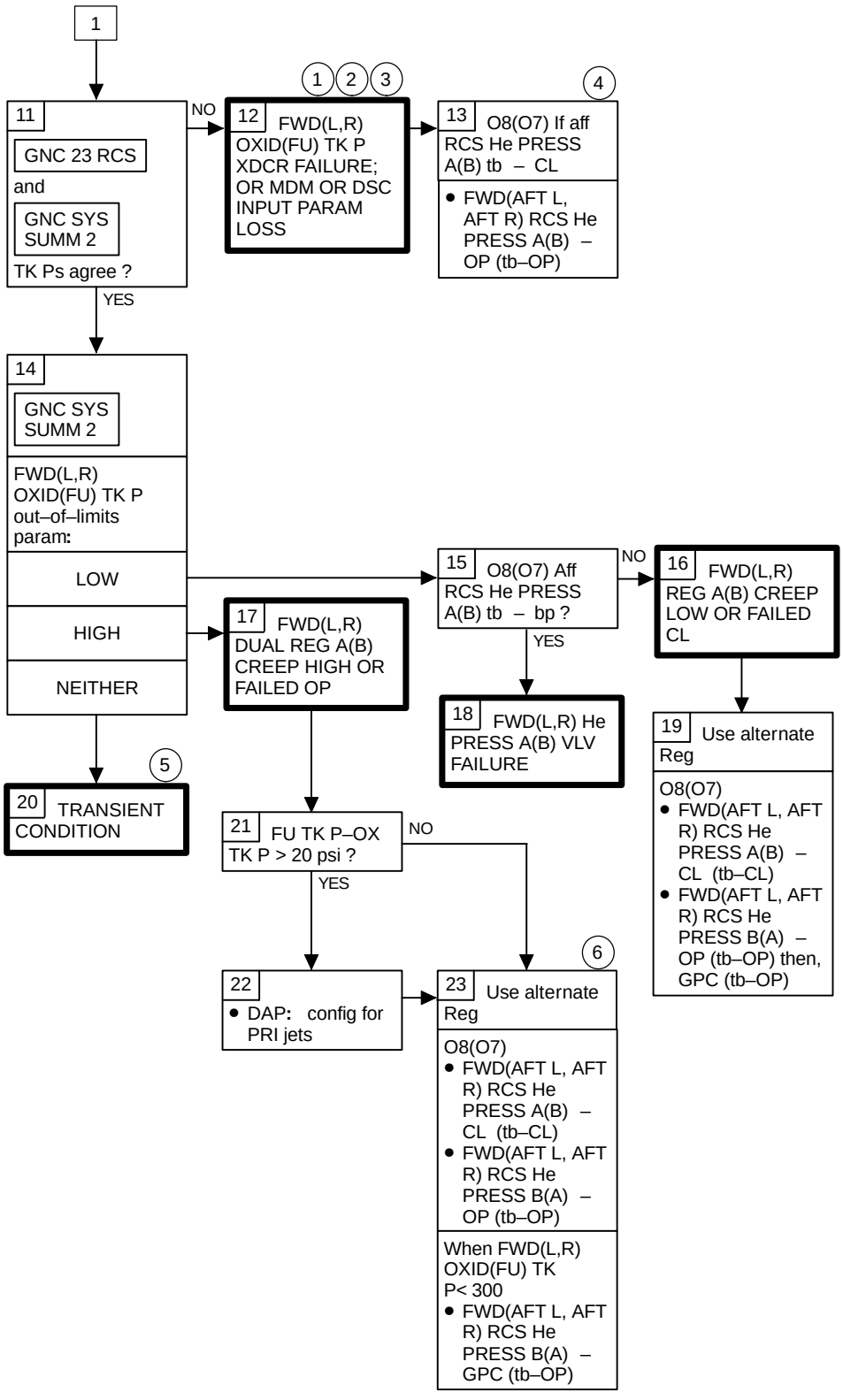
NO → 9 (1 2) OXID(FU) PRPLT TK T XDCR BIAS; OR BIAS FROM MDM OR DSC INPUT PARAM

YES → 10 HTR/ THERMOSTAT CKT A(B) FAILURE

(1) MCC can determine other params possibly lost in same MDM or DSC Card

(2) RCS PVT for affected OXID(FU) may be in error for failed or biased temp or press Xdcr

RCS 10.3b (Cont)



(1) MCC can determine other params possibly lost in same MDM or DSC Card

(2) RCS PVT for affected OXID(FU) may be in error for failed or biased temp or press Xdcr

(3) OXID (FU) PRPLT TK P can be monitored on GNC 23 RCS display or RCS/OMS Press meter (pnl O3)

(4) Overpress protection lost

(5) Transient Xdcr bias or pressure surge

(6) Vern jets can be used when FU TK P–OX TK P ≤ 20 psi

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RCS SSR–1
RCS MIXED XFEED MEM READ/WRITE

NOTE

This procedure must be performed in OPS 3. OMS/RCS interconnect is assumed to be the initial configuration. A backout procedure is provided in the event of a deorbit waveoff, which would require a return from Mixed RCS Crossfeed to OMS–RCS Interconnect. Address locations are S/W release dependent and will be supplied by the MCC. This procedure requires realtime ground verification (24 hr) prior to use

1. Check config:

O7 ✓AFT L,R RCS TK ISOL (six) – CL (tb–CL)
✓XFEED (four) – OP (tb–OP)

O8 ✓L,R OMS XFEED A (two) – CL (tb–CL)
✓L(R) OMS XFEED B – OP (tb–OP)
✓R(L) OMS XFEED B – CL (tb–CL)

O7 2. MSTR RCS XFEED – FEED FROM L

NOTE

ADD IDs, TABLEs A, B, C, and D will be supplied by MCC

3. Zero (0) the appropriate RCS TK ISOL reset command:

GNC 0 GPC MEMORY

✓HEX – ITEM 27 (*)
BIT RST – ITEM 23 EXEC (*)
Enter ADD IDs and DESIRED values

ADD ID	DESIRED	TABLE A	TABLE B
28 _ _ _ _	29 1000	_ _ _ _	_ _ _ _
30 _ _ _ _	31 0400	_ _ _ _	_ _ _ _
32 _ _ _ _	33 1000	_ _ _ _	_ _ _ _
34 _ _ _ _	35 0400	_ _ _ _	_ _ _ _
36 _ _ _ _	37 1000	_ _ _ _	_ _ _ _
38 _ _ _ _	39 0400	_ _ _ _	_ _ _ _

✓Data values in ACTUAL column agree with TABLE A
WRITE – ITEM 25 EXEC
✓Data values in ACTUAL column agree with TABLE B

4. Set to one (1) the appropriate RCS TK ISOL set command
BIT SET – ITEM 22 EXEC (*)
Enter ADD IDs and DESIRED values

ADD ID	DESIRED	TABLE C	TABLE D
28 _ _ _ _	29 1000	_ _ _ _	_ _ _ _
30 _ _ _ _	31 0400	_ _ _ _	_ _ _ _
32 _ _ _ _	33 1000	_ _ _ _	_ _ _ _
34 _ _ _ _	35 0400	_ _ _ _	_ _ _ _
36 _ _ _ _	37 1000	_ _ _ _	_ _ _ _
38 _ _ _ _	39 0400	_ _ _ _	_ _ _ _

✓Data values in ACTUAL column agree with TABLE C
WRITE – ITEM 25 EXEC
✓Data values in ACTUAL column agree with TABLE D

5. During AOS, perform ARCS reconfig
   DAP: INRTL
   DAP ROT: PULSE/PULSE/PULSE
O8 L,R OMS XFEED (four) – CL (tb–CL)
O7 AFT L,R RCS XFEED (four) – CL (tb–CL)
   TK ISOL (six) – GPC (tb–bp)

> CAUTION
> Wait for MCC verification of correct config

AFT L,R RCS XFEED (four) – OP (tb–OP)

6. Resume attitude control:
   DAP: as reqd

RCS MIXED XFEED TERMINATE (PERFORM IN OPS 3)

Establish L(R) OMS interconnect config:

F7 1. ✓FLT CNTLR PWR – OFF
C3 DAP: INRTL
   DAP ROT: PULSE/PULSE/PULSE

O7 2. L,R RCS TK ISOL (six) – CL (tb–CL)
   ✓XFEED (four) – OP (tb–OP)

3. If RCS MANF P (OX and FU) > 130, continue
   Otherwise, ✓MCC >>

O8 4. ✓L(R) OMS He PRESS/VAP ISOL (two) – CL
   TK ISOL (two) – OP (tb–OP)
   ✓R(L) OMS XFEED (two) – CL (tb–CL)
   L(R) OMS XFEED A – CL (tb–CL)
   B – OP (tb–OP)

O7 5. MSTR RCS XFEED – OFF

C3 6. DAP: as reqd

> NOTE
> Gauging not avail in OPS 3

7. After OPS 2 transition:

GNC 23 RCS

OMS PRESS ENA L(R) OMS – ITEM 5(6) EXEC

RCS SSR–2
HOT FIRE RCS

O7(O8) ✓Prop feed vlvs – OP
O14(O15,O16) ✓Appropriate RJD LOGIC,DRIVER – ON
Perform Hot Fire during AOS

CONFIG DAP FREE DRIFT FOR HOT FIRE

1. If OPS 2:

GNC 20 DAP CONFIG

If PRI:
ITEM 13 +0.3 EXEC
ITEM 17 +0.1 EXEC
If VERN:
ITEM 26 +0.0 3 EXEC

DAP: A/FREE/PRI(VERN)
DAP TRANS: PULSE/PULSE/PULSE

If OPS 3:
DAP: INRTL
DAP ROT: PULSE/PULSE/PULSE

SET UP FOR HOT FIRE

2. GNC 23 RCS

Deselect jets per table

3. If jet to be selected is fail–off,
reselect affected jet (Do not toggle RM)

O14,O15,O16 4. ✓cb L(R) DDU (two) – cl
If VERN Hotfire:

GNC 25 RM ORBIT

SW RM INH – ITEM 16 (*)
F7/F8 FLT CNTLR PWR L(R) – ON
SW RM INH – ITEM 16 (no *)
If PRI Hotfire:
F7/F8 FLT CNTLR PWR L(R) – ON

HOT FIRE (Perform during AOS)

5. If OPS 2:
Command maneuver per table with RHC(THC) and release
If OPS 3:
Command maneuver per table with RHC(THC)
If THC, command for approximately 1 sec and release
If RHC, command past soft stop (ACCEL mode) for approximately 1 sec and release

6. GNC 23 RCS

If primary jet:
- If correct response (Failure indication was false.
  - Have lost fail–off protection). Perform following steps to place jet in last priority and to regain fail LK auto deselect protection:
    - DES INH twice (reprioritize, reset RM)
    - Repeat maneuver (expect jet fail–off)
    - Reselect jet (in order to reset auto deselect counter)

NOTE

If > 1 jet/pod/dir lost fail–off RM, after OPS 301 transition, reselect jets

- If no response:
  - Deselect jet

NOTE

During entry, reselect jet if reqd to maintain 1 pitch or 2 yaw Aft RCS jets

If vernier jet:
- If jet fired (✓MCC):
  - Continue vernier control (Failure indication was false. Have lost fail–off protection)
- If jet did not fire (✓MCC):
  - If L5L or R5R:
    - Deselect jet
    - Continue vernier control
  - If F5L,F5R, L5D, or R5D:
    - Deselect jet
    - Perform LOSS OF VERN (ORB OPS, RCS)

CLEAN UP AFTER HOT FIRE

7. GNC 23 RCS

Reselect jets deselected in step 2

C3 8. Config DAP: as reqd

F7(F8) 9. FLT CNTLR PWR L(R) – OFF

O14, O15, O16 10. Config cb L,R DDU (four) – as reqd

HOT FIRE TABLE

SUBJECT JET	DESELECT JETS	MANEUVER REQD
F1F F2F F3F	F2F, F3F F1F, F3F F1F, F2F	(–) X TRANSLATION
F1L F3L F5L	F3L, R1R, R2R, R3R, R4R F1L, R1R, R2R, R3R, R4R R5R	(+) YAW
F2R F4R F5R	F4R, L1L, L2L, L3L, L4L F2R, L1L, L2L, L3L, L4L L5L	(–) YAW
F1U F2U F3U	F2U, F3U, L2D, L3D, L4D, R2D, R3D, R4D F1U, F3U, L2D, L3D, L4D, R2D, R3D, R4D F1U, F2U, L2D, L3D, L4D, R2D, R3D, R4D	(–) PITCH
F1D F2D F3D F4D	F2D, F3D, F4D, L1U, L2U, L4U, R1U, R2U, R4U F1D, F3D, F4D, L1U, L2U, L4U, R1U, R2U, R4U F1D, F2D, F4D, L1U, L2U, L4U, R1U, R2U, R4U F1D, F2D, F3D, L1U, L2U, L4U, R1U, R2U, R4U	(+) PITCH
L1L L2L L3L L4L L5L	L2L, L3L, L4L, F2R, F4R L1L, L3L, L4L, F2R, F4R L1L, L2L, L4L, F2R, F4R L1L, L2L, L3L, F2R, F4R F5R	(–) YAW
L1A L3A	L3A, R1A, R3A L1A, R1A, R3A	(+) X TRANSLATION
L1U L2U L4U	L2U, L4U, R1U, R2U, R4U, F1D, F2D, F3D, F4D L1U, L4U, R1U, R2U, R4U, F1D, F2D, F3D, F4D L1U, L2U, R1U, R2U, R4U, F1D, F2D, F3D, F4D	(+) PITCH
L2D L3D L4D L5D	L3D, L4D, R2D, R3D, R4D, F1U, F2U, F3U L2D, L4D, R2D, R3D, R4D, F1U, F2U, F3U L2D, L3D, R2D, R3D, R4D, F1U, F2U, F3U R5D	(–) PITCH
R1R R2R R3R R4R R5R	R2R, R3R, R4R, F1L, F3L R1R, R3R, R4R, F1L, F3L R1R, R2R, R4R, F1L, F3L R1R, R2R, R3R, F1L, F3L F5L	(+) YAW
R1A R3A	R3A, L1A, L3A R1A, L1A, L3A	(+) X TRANSLATION
R1U R2U R4U	R2U, R4U, L1U, L2U, L4U, F1D, F2D, F3D, F4D R1U, R4U, L1U, L2U, L4U, F1D, F2D, F3D, F4D R1U, R2U, L1U, L2U, L4U, F1D, F2D, F3D, F4D	(+) PITCH
R2D R3D R4D R5D	R3D, R4D, L2D, L3D, L4D, F1U, F2U, F3U R2D, R4D, L2D, L3D, L4D, F1U, F2U, F3U R2D, R3D, L2D, L3D, L4D, F1U, F2U, F3U L5D	(–) PITCH

RCS SSR–3
AFT RCS MANF/LEG PRESS, READ/WRITE

NOTE

This procedure is used when affected RCS propellant lines, both oxidizer and fuel (manifold or leg) pressure, is less than or equal to propellant vapor pressure plus instrumentation error (OX P < 49 psia, FU P < 35 psia).

Starting condition for this procedure is straight RCS feed with appropriate MANF or TK ISOL vlv upstream of evacuated section closed.

Manually repressing evacuated aft RCS propellant line (manifold or leg) can result in jet thruster vlv bounce and/or seal leakage. This can result in 'zot' firings which can damage respective thruster(s). Zot firings can be avoided by staggering opening of upstream OX and FU vlvs. However, since both vlvs are gang–commanded by manual switch settings, one of the vlvs must be individually commanded by using GMEM R/W. This procedure uses GMEM R/W to repress evacuated line, from same pod OMS propellant tanks, by setting appropriate GPC open command bit for RCS XFEED OX vlv, then manually opening appropriate FU vlv. Once line repress has been completed, nominal RCS propellant feed is resumed.

Reqd GPC address locations for TABLES 1 and 2 are software release dependent and will be supplied by MCC

1. DAP: FREE

2. Config RCS for repress:

O7 ✓Aff RCS TK ISOL 1/2(3/4/5 A,B) – CL (tb–CL)
✓XFEED 1/2(3/4/5) – CL (tb–CL)
MANF ISOL 1,2(3,4,5) – OP (tb–OP)

3. Config SAME side OMS vlv:

O8 ✓L(R) OMS TK ISOL A,B – OP (tb–OP)
✓XFEED A – CL (tb–CL)
XFEED B – OP (tb–OP)

4. Zero (0) appropriate RCS XFEED VLV reset command:

GNC 0 GPC MEMORY

✓HEX 27*
BIT RST – ITEM 23 EXEC
Obtain and enter ADD IDs and DESIRED values from TABLE 1

ADD ID	DESIRED	Value A	Value B
28 __ __ __ __ __	29 __ __ __ __	__ __ __ __	__ __ __ __

✓Data values in ACTUAL column agree with Value A (MCC supplied)
WRITE – ITEM 25 EXEC
✓Data values in ACTUAL column agree with Value B (MCC supplied)

5. Set to One (1) the appropriate RCS XFEED VLV set command:

BIT SET – ITEM 22 EXEC
Obtain and enter ADD IDs and DESIRED values from TABLE 2

ADD ID	DESIRED	Value C
28 __ __ __ __ __	29 __ __ __ __	__ __ __ __

✓Data values in ACTUAL column agree with Value C (MCC supplied)
WRITE – ITEM 25 EXEC
✓Data values in ACTUAL column agree with DESIRED

6. During AOS, perform OX line repress from OMS

O7 L(R) RCS XFEED 1/2(3/4/5) – GPC (tb–bp)
Wait 10 sec

GNC 23 RCS

✓OX MANF P > 130 psia

CRT
O8
O7

* If MANF P < 130 psia:
* L(R) OMS XFEED VLV A,B – CL (tb–CL)
* RCS XFEED VLV 1/2(3/4/5) – CL (tb–CL)
* Set aff MANF VLVS STAT to CL
* GNC 23 RCS
* ITEM 2(3) EXEC
* ITEM 40,41(42,43,44) EXEC
* DAP: as reqd
* ✓MCC >>

7. Perform FU line repress from OMS

O7 L(R) RCS XFEED 1/2(3/4/5) – OP (tb–OP)
Wait 10 sec

CRT ✓FU MANF P > 130 psia

* If MANF P < 130 psia:
O8 * L(R) OMS XFEED A,B – CL (tb–CL)
O7 * RCS XFEED 1/2(3/4/5) – CL (tb–CL)
* Set aff MANF VLVS STAT to CL
* GNC 23 RCS
* ITEM 2(3) EXEC
* ITEM 40,41(42,43,44) EXEC
* DAP: as reqd
* ✓MCC >>

8. Cleanup and reconfig:

O8 L(R) OMS XFEED A,B – CL (tb–CL)
O7 RCS XFEED 1/2(3/4/5) – CL (tb–CL)
ISOL 1/2(3/4/5 A,B) – OP (tb–OP)
✓MANF ISOL 1,2(3,4,5) – OP (tb–OP)

9. Reselect jets as reqd

10. DAP: as reqd

11. Zero (0) the appropriate RCS XFEED VLV set command:

GNC 0 GPC MEMORY

✓HEX 27*
BIT RST – ITEM 23 EXEC
Obtain and enter ADD IDs and DESIRED values from TABLE 2

ADD ID	DESIRED	Value D	Value E
28 __ __ __ __ __	29 __ __ __ __	__ __ __ __	__ __ __ __

✓Data values in ACTUAL column agree with Value D (MCC supplied)
WRITE – ITEM 25 EXEC
✓Data values in ACTUAL column agree with Value E (MCC supplied)

12. Set to One (1) the appropriate RCS XFEED VLV reset command:
BIT SET – ITEM 22 EXEC
Obtain and enter ADD IDs and DESIRED values from TABLE 1

ADD ID	DESIRED	Value F	Value G
28 __ __ __ __ __	29 __ __ __ __	__ __ __ __	__ __ __ __

✓Data values in ACTUAL column agree with Value F (MCC supplied)
WRITE – ITEM 25 EXEC
✓Data values in ACTUAL column agree with Value G (MCC supplied)

	TABLE 1		
X–REF	ADD ID BIT RESET ADDRESS	COMMANDS	DESIRED
(1)	__ __ __ __ __	L RCS OX 1/2 XFEED	4 0 0 0
(2)	__ __ __ __ __	L RCS OX 3/4/5 XFEED	0 0 4 0
(3)	__ __ __ __ __	R RCS OX 1/2 XFEED	4 0 0 0
(4)	__ __ __ __ __	R RCS OX 3/4/5 XFEED	0 0 1 0

	TABLE 2		
X–REF	ADD ID BIT SET ADDRESS	COMMANDS	DESIRED
(1)	__ __ __ __ __	L RCS OX 1/2 XFEED	4 0 0 0
(2)	__ __ __ __ __	L RCS OX 3/4/5 XFEED	0 0 4 0
(3)	__ __ __ __ __	R RCS OX 1/2 XFEED	4 0 0 0
(4)	__ __ __ __ __	R RCS OX 3/4/5 XFEED	0 0 1 0

RCS SSR–4
STAGED, MANF REPRESS

NOTE

1. This procedure attempts to pressurize non–leaking Manf P (OX or FU) to greater than 130 psia, so manifold can then be repressed directly from tank

2. Do not use this procedure if OX MANF P < 49 psia and FU MANF P < 35 psia

3. All manifolds on same tank leg will be affected

WARNING
Repressing more than one manifold at a time may damage RCS propellant tanks when manifolds are below vapor pressure (See Note 2.)

GNC 23 RCS

1. DAP: FREE

O7(O8) 2. Aff RCS XFEED(s) – CL (tb–CL)
TK ISOL(s) – CL (tb–CL)
MANF ISOL(s) – OP (tb–OP)

3. If aff MANF P(s) < 130 (OX and FU):
   Aff RCS MANF ISOL(s) – CL (tb–CL)
   TK ISOL(s) – OP (tb–OP)
   Repeat step 2
4. If aff MANF P(s) > 130 (OX or FU):
   Aff RCS MANF ISOL(s) – CL (tb–CL)
   TK ISOL(s) – OP (tb–OP)
   MANF ISOL(s) – OP (tb–OP) one at a time

5. DAP: as reqd

RCS SSR–5
LEAKING RCS PRPLT/He BURN

TERMINATE CONDITIONS

Terminate RCS burn/dump when any one of the following conditions exists:

If He LEAK:

Aff He P < 456 psia, or
CUR HP = 95 nmi, or
Dump Time from below table expired

RCS PRPLT TO BE DUMPED TO ACHIEVE MAX BLOWDN
CURRENT NON–LEAKING (OX OR FU)%

	24	25	30	35	40	45	50	55	60	65	70	75	80	85	90
FRCS –X,AFT +X DUMP (2 JETS)	0:00	0:03	0:19	0:34	0:49	1:05	1:20	1:36	1:51	2:07	2:22	2:36	2:53	3:08	3:24
OPS 3 FRCS DUMP (4 JETS)	0:00	0:02	0:11	0:20	0:29	0:38	0:47	0:56	1:05	1:14	1:23	1:32	1:41	1:50	1:59

TIME FROM DUMP INITIATION (M:S)

If PRPLT LEAK:

First RCS jet FAIL OFF or
CUR HP = 95 nmi

If FWD RCS LEAK, perform either –X TRANSLATION (uses OPS 2, part A) or FRCS DUMP (uses OPS 3, part B)
(If no MCC, perform –X TRANSLATION)

A. **If FRCS –X TRANSLATION:**

1. RCS BURN PREP

O14:F, O15:F, O16:F
✓Pri RJD LOGIC,DRIVER (sixteen) – ON

O8
FWD He PRESS A(B) – OP (tb–OP)
B(A) – CL (tb–CL)
✓TK ISOL (two) – OP (tb–OP)
✓MANF ISOL 1,2,3,4 (four) – OP (tb–OP)

GNC 55 GPS STATUS

✓GPS TO NAV – INH (*)

2. MNVR TO BURN ATTITUDE

✓MCC for preferred burn
If no COMM, maneuver to closest out–of–plane attitude and execute burn ASAP

DAP: B1/AUTO/PRI

GNC UNIV PTG

TGT ID: 2

If retro burn (heads down):
BODY VECTOR: 5
P: 88
Y: 0
OM: 180
Start TRK – ITEM 19 EXEC (CUR – *)

C2
GNC, OPS 202 PRO

GNC ORBIT MNVR EXEC

RCS SEL – ITEM 4 EXEC
TIG – ITEM 10 +(consult MCC) EXEC
ΔVX – ITEM 19 –1 0 0 EXEC
ΔVY – ITEM 20 +0 EXEC
ΔVZ – ITEM 21 +0 EXEC
LOAD – ITEM 22 EXEC
TIMER – ITEM 23 EXEC

Do not maneuver, ignore computed ATT, perform burn in final ATT
Go to step A3

If out–of–plane burn:
BODY VECTOR: 3
OM: 90 (270 for nose south)
Start TRK – ITEM 19 EXEC (CUR – *)

3. BURN EXEC

F6(F8) ADI ERROR/RATE – MED

If retro burn:

ADI ATT – LVLH
✓ATT

Retro
Heads Down
R: 180
P: 358
Y: 000

If burning OOP, verify burn attitude, execute burn ASAP, and ignore TIG references

GNC 20 DAP CONFIG

P,Y OPTION – ITEM 35,36 EXEC (NOSE)

F7 FLT CNTLR PWR – ON

DAP TRANS: NORM/PULSE/PULSE

TIG–0:30> DAP: B1/INRTL/PRI

ADI ATT – REF

ATT REF pb – push

F5 At TIG: THC – X (pull)

When terminate conditions are met:

THC – release

If burn is terminated at CUR Hp = 95, finish burn out–of–plane (step A2)

4. POST BURN RECONFIG

F7 FLT CNTLR PWR – OFF

C2 If retro burn: GNC, OPS 201 PRO

DAP TRANS: PULSE/PULSE/PULSE

GNC 20 DAP CONFIG

P,Y OPTION – ITEM 15,16 EXEC (TAIL)
– ITEM 35,36 EXEC (TAIL)

O8 If He leak:

FWD He PRESS A(B) – CL (tb–CL)

MANF ISOL 5 – OP (tb–OP), GPC

If Prplt leak:

Perform RCS SECURE (FWD,AFT) (ORB PKT, RCS)

O16 RJD L5/F5/R5 DRIVER – OFF

DAP: as reqd >>

B. **If FRCS DUMP:**

1. RCS DUMP PREP

O14:F, ✓Pri RJD LOGIC,DRIVER (sixteen) – ON
O15:F,
O16:F

O8 FWD He PRESS A(B) – OP (tb–OP)
B(A) – CL (tb–CL)
TK ISOL (two) – OP (tb–OP)
MANF ISOL 1,2,3,4 (four) – OP (tb–OP)

Perfom G2/G8 TO G3 TRANS (ENT PKT, DPS)

2. PERFORM FWD RCS DUMP

GNC DEORB MNVR COAST

FWD RCS ARM – ITEM 36 EXEC

DUMP – ITEM 37 EXEC

When terminate conditions met:

FWD RCS OFF – ITEM 38 EXEC

3. POST DUMP RECONFIG

Perform G3 to G2/G8 TRANS (ENT PKT, DPS)

Reconfig NBAT to pre–dump config

GNC 20 DAP CONFIG

P,Y OPTION – ITEM 15,16 EXEC (TAIL)
– ITEM 35,36 EXEC (TAIL)

O8 If He leak:

FWD He PRESS A(B) – CL (tb–CL)

MANF ISOL 5 – OP (tb–OP), GPC

If Prplt leak: Perform RCS SECURE (FWD,AFT) (ORB PKT, RCS)

O16 RJD L5/F5/R5 DRIVER – OFF

DAP: as reqd >>

C. **If AFT RCS LEAK, perform +X TRANSLATION:**

1. XFEED FROM LEAKING RCS 1/2 LEG TO GOOD RCS 1/2 LEG

O14:F, O15:F, O16:F — ✓Pri RJD LOGIC,DRIVER (sixteen) – ON

✓DAP: FREE

O8 — ✓L,R OMS XFEED (four) – CL (tb–CL)

O7 — AFT L,R RCS TK ISOL 3/4/5 (four) – CL (tb–CL)
Good AFT RCS TK ISOL 1/2 – CL (tb–CL)
Leaking AFT RCS TK ISOL 1/2 – OP (tb–OP)
He PRESS A(B) – OP (tb–OP)
B(A) – CL (tb–CL)
AFT L,R RCS MANF ISOL 1 (two) – OP (tb–OP)
2,3,4 (six) – CL (tb–CL)
5 (two) – CL (tb–CL), GPC
XFEED 1/2 (two) – OP (tb–OP)
3/4/5 (two) – CL (tb–CL)

If prior config was interconnect:

GNC 23 RCS

OMS PRESS ENA OFF – ITEM 7 EXEC (*)

GNC UNIV PTG

CNCL – ITEM 21 EXEC

2. MNVR TO BURN ATTITUDE

✓MCC for preferred burn
If no COMM, maneuver to closest out–of–plane attitude and execute burn ASAP
DAP: B1/AUTO/PRI

GNC 55 GPS STATUS

✓GPS TO NAV – INH (*)

C2 — GNC, OPS 202 PRO

GNC ORBIT MNVR EXEC

RCS SEL – ITEM 4 EXEC
TV ROLL – ITEM 5 +1 8 0 EXEC
If out–of–plane burn:
- TIG – ITEM 10 + (current MET + 10 min) EXEC
- ΔVX – ITEM 19 +0 EXEC
- ΔVY – ITEM 20 –1 0 0 EXEC (+1 0 0 for nose south) EXEC
- ΔVZ – ITEM 21 +0 EXEC
- LOAD – ITEM 22 EXEC
- TIMER – ITEM 23 EXEC
- MNVR – ITEM 27 EXEC (*)
- Go to step C3

If retro burn:
- TIG – ITEM 10 +(consult MCC) EXEC
- ΔVX – ITEM 19 –1 0 0 EXEC
- ΔVY – ITEM 20 +0 EXEC
- ΔVZ – ITEM 21 +0 EXEC
- LOAD – ITEM 22 EXEC
- TIMER – ITEM 23 EXEC
- MNVR – ITEM 27 EXEC (*)

3. BURN EXEC

F6(F8) — ADI ERR/RATE – MED
ATT – INRTL

✓ADI ATT
ADI ATT – REF
ATT REF pb – push
If burning out–of–plane, execute burn ASAP and ignore TIG references

GNC 20 DAP CONFIG

DAP B: P,Y OPTION – ITEM 35,36 EXEC (TAIL)

F7 — FLT CNTLR PWR – ON
DAP TRANS: NORM/PULSE/PULSE

TIG–0:30 — DAP: B/INRTL/PRI

F5 At TIG: THC +X
When terminate conditions are met:
THC – release
If burn was terminated at CUR Hp = 95, finish burn out–of–plane (step C2)
DAP: FREE
O7 Leaking RCS He PRESS A(B) – CL (tb–CL)
C2 GNC, OPS 201 PRO
If He leak, go to step C10

4. SETUP TO CLEAR He
O7 Leaking RCS TK ISOL 1/2 – CL (tb–CL)
O8 √L OMS TK ISOL (two) – OP (tb–OP)
XFEED B(A) – OP (tb–OP)

GNC 23 RCS

L OMS → AFT – ITEM 5 EXEC (*)
Reselect failed–off jets

Set L,R pod fail limit to 0:
RCS L – ITEM 2 EXEC
FAIL LIM – ITEM 4 +0 EXEC
RCS R – ITEM 3 EXEC
FAIL LIM – ITEM 4 +0 EXEC

5. SET UP DAP

GNC 20 DAP CONFIG

Change DAP A to A1

6. CLEAR He FROM LEFT RCS +X
DAP: A/INRTL/PRI
TRANS: NORM/NORM/NORM
If Hp ≤ 98, maneuver out–of–plane

F5 THC +X
After 7 sec,
THC – release

7. CLEAR He FROM XFEED LINE AND RIGHT RCS +X

GNC 23 RCS

Deselect L1A:
RCS L – ITEM 2 EXEC
JET DES – ITEM 33 EXEC

F5 THC +X
After 16 sec,
THC – release

8. CLEAR He FROM RCS MANF 1 PITCH AND YAW
DAP: B/FREE/PRI
TRANS: NORM/NORM/NORM

RHC +yaw past soft stop (ACCEL mode) for 2 sec
RHC –yaw past soft stop (ACCEL mode) for 2 sec

RHC +pitch past soft stop (ACCEL mode) for 2 sec
DAP: A/INRTL/PRI
TRANS: PULSE/PULSE/PULSE

9. POST He CLEAR CLEANUP
F7 FLT CNTLR PWR – OFF

GNC 23 RCS

Reselect L1A:
JET DES – ITEM 33 EXEC

Reset L,R Pod Fail Limit to 2:
FAIL LIM – ITEM 4 +2 EXEC
RCS R – ITEM 3 EXEC
FAIL LIM – ITEM 4 +2 EXEC

Reset RCS RM fail counters on all jets:
JET RESET – ITEM 45 EXEC

DAP: FREE
AFT L,R RCS XFEED 3/4/5 (two) – OP (tb–OP)
MANF ISOL 2, 3, 4 (six) – OP (tb–OP)
5 (two) – OP (tb–OP), GPC
If Group B(C) Powerdown:
O14:F, Pri RJD LOGIC,DRIVER (sixteen) – OFF
O15:F, RJD A 1A L2/R2 MANF DRIVER – ON
O16:F

DAP: A,B as reqd >>

10. SYSTEMS CLEANUP FOR He LEAKS
F7 FLT CNTLR PWR – OFF
DAP: FREE
O7 Leaking RCS TK ISOL 1/2 – CL (tb–CL)
AFT L,R RCS XFEED 3/4/5 (two) – OP (tb–OP)
MANF ISOL 2,3,4, (six) – OP (tb–OP)
5 (two) – OP (tb–OP), GPC
✓L OMS TK ISOL (two) – OP (tb–OP)
XFEED B(A) – OP (tb–OP)

GNC 23 RCS

Initiate interconnect usage counter:
L OMS AFT – ITEM 5 EXEC (*)
If Group B(C) Powerdown:
O14:F, Pri RJD LOGIC,DRIVER (sixteen) – OFF
O15:F, RJD A 1A L2/R2 MANF DRIVER – ON
O16:F

DAP TRANS: as reqd
DAP: A,B as reqd

BFS FSM INDEX 11–2

OMS SCHEMATIC 11–3

11.1 L(R) OMS
11.1a 'L(R) OMS TK P' 11–4

11.2 OMS SW/VLV MISCOMP
11.2a OMS VLV tb – bp 11–10
11.2b tb AND sw POSITION DISAGREE 11–12

11.3 OMS PRPLT THERMAL
11.3a 'S89 PRPLT THRM OMS' – PRPLT THRM OMS 11–14
11.3b (see Note A) – THRM PRPLT 11–15
11.3c 'S89 PRPLT THRM POD' – PRPLT THRM POD 11–16

OMS SSR
OMS SSR–1 MIXED XFD: OMS PRPLT FAILURE 11–18

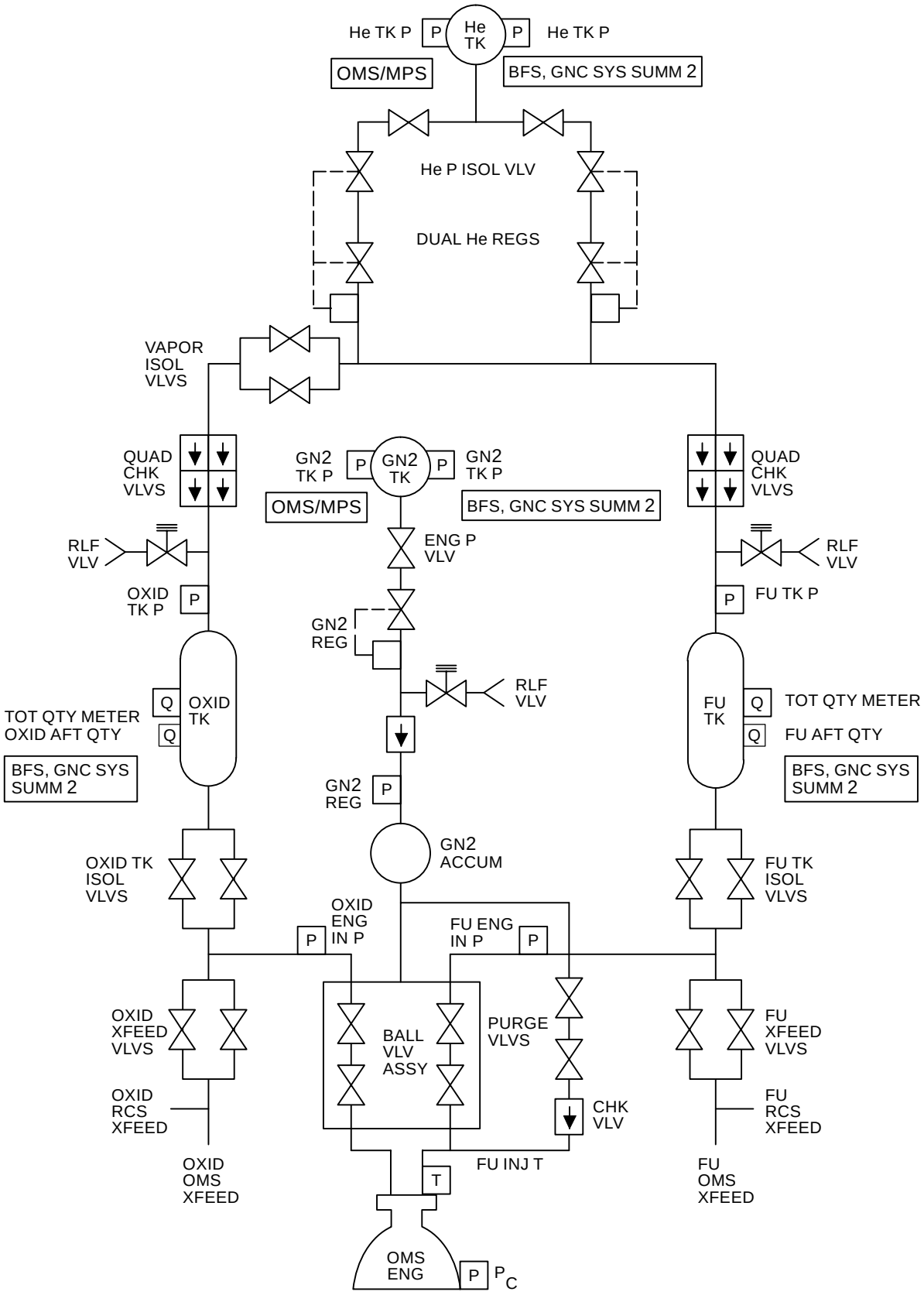
The following Fault Msgs have no corresponding MAL procedures in this book:

S89 L(R) OMS TEMP
G23 OMS/RCS QTY
L(R) OMS GMBL
L(R) OMS VLV
L(R) OMS QTY
L(R) OMS PC

NOTE A
The identified MAL represents a support procedure that is entered from other procedures or on MCC call

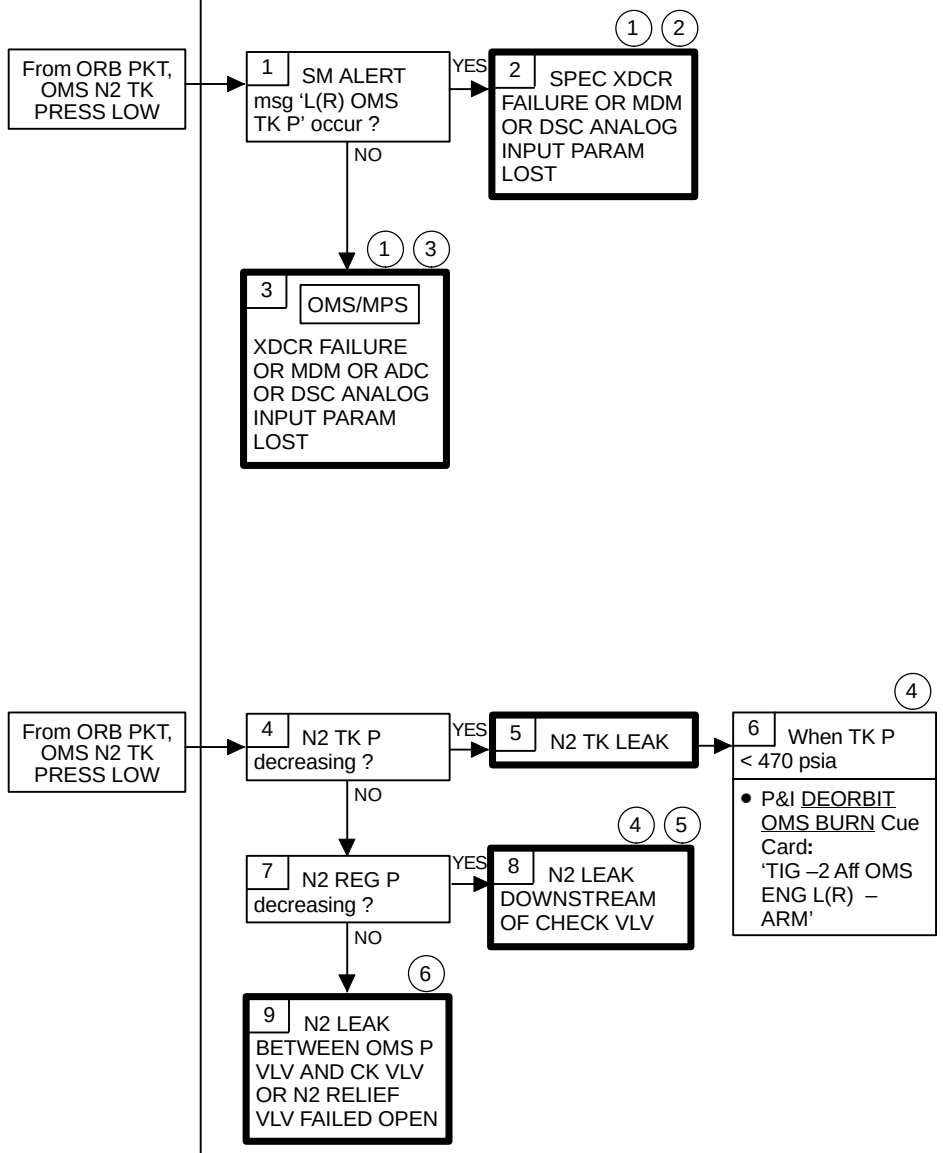
11.3 OMS PRPLT THERMAL
11.3b ‘SM 0 THRM PRPLT’ – THRM PRPLT 11–15

OMS SCHEMATIC



OMS

11.1a 'L(R) OMS TK P'



(1) ✓MCC for other params possibly lost in same MDM or ADC or DSC card

(2) N2 P available on OMS/MPS

(3) N2 P available on GNC SYS SUMM 2 display

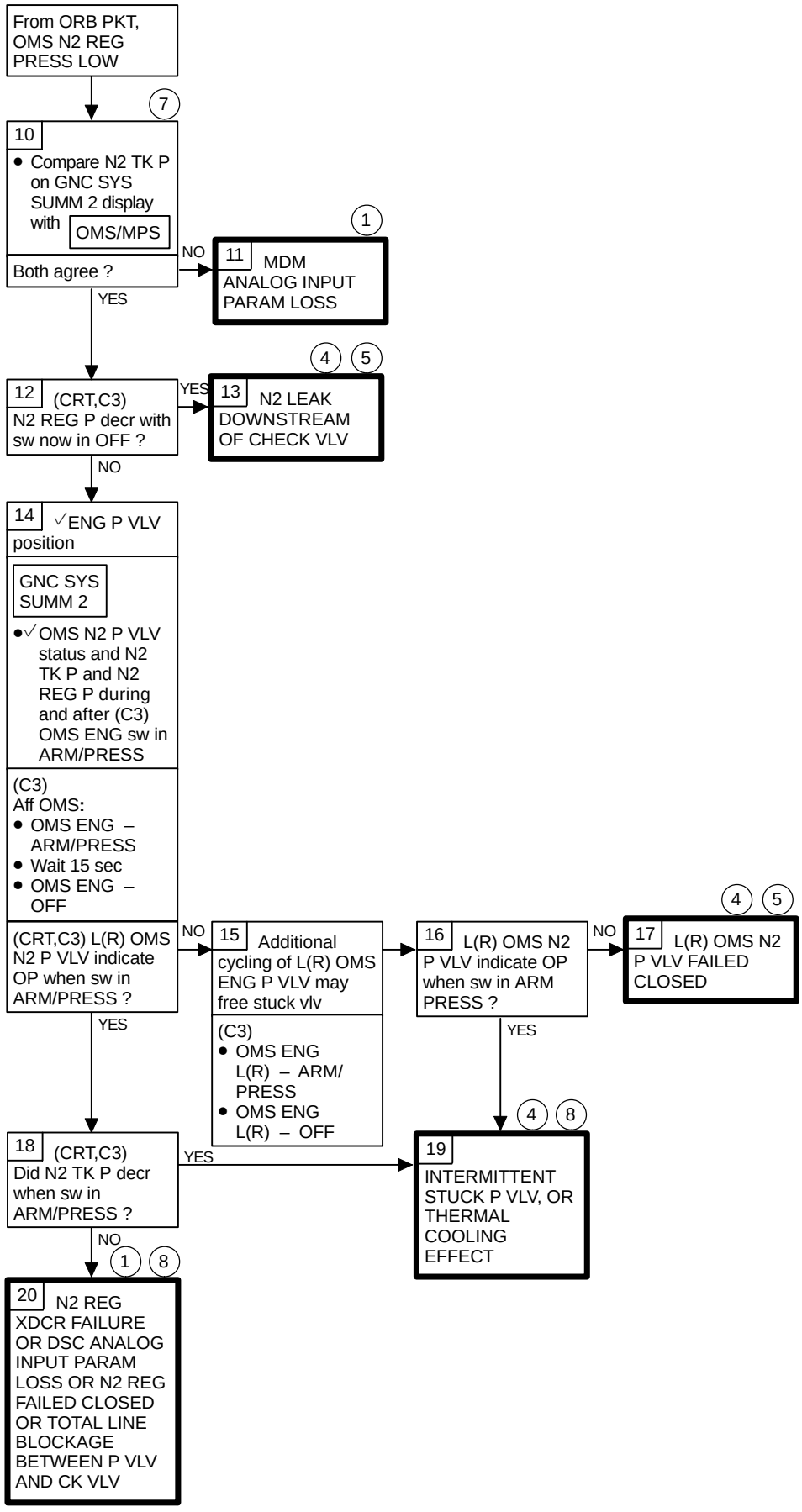
(4) Do not use engine for additional on–orbit burns

(5) ✓MCC to determine if engine is usable for deorbit

(6) If after manual repress, N2 REG P < 299 psia, OMS engine inop

N2 TK P > 564 psia
Attempt repress of N2 sys prior to each burn. Monitor N2 REG P

N2 TK P < 564 psia
Save for Deorbit Burn. Capability exists to allow one additional actuation of bipropellant vlvs from N2 REG. Ignore 'L(R) OMS TK P' msg caused by low N2 REG P (P < 299 psia)



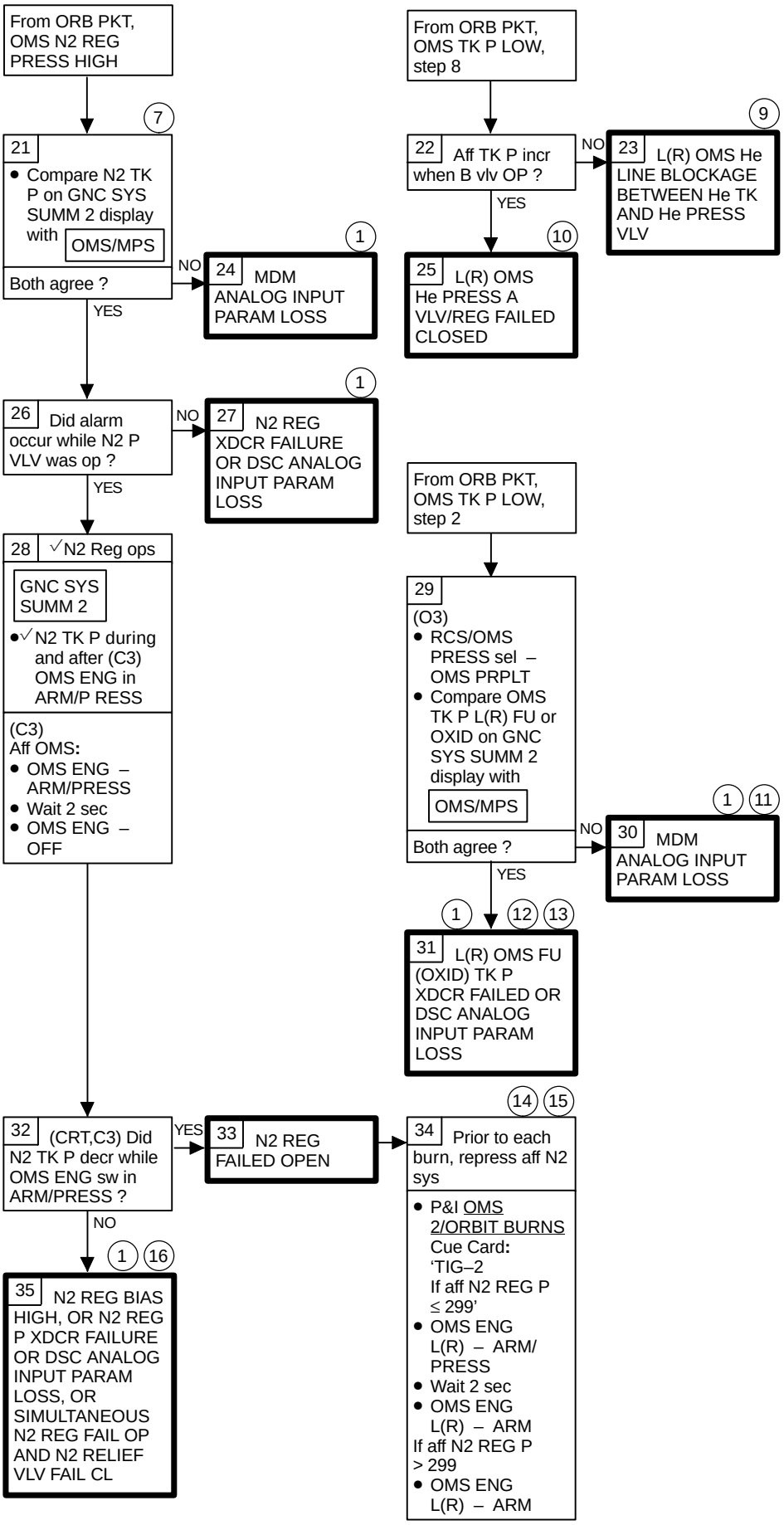
(1) ✓MCC for other params possibly lost in same MDM or DSC card

(4) Do not use engine for additional on–orbit burns

(5) ✓MCC to determine if engine is usable for deorbit

(7) N2 REG xdcr and N2 TK P xdcr on CRT have common MDM card. This check detects MDM card failure

(8) ✓MCC for further engine use



(1) ✓MCC for other params possibly lost in same MDM or DSC card

(7) N2 REG xdcr and N2 TK P xdcr on CRT have a common MDM card. This check detects MDM card failure

(9) ✓MCC for blowdown capability. If full blowdown exists, continue with nominal mission profile. If not full blowdown, save available blowdown for deorbit burn

(10) OMS and RCS operational in nominal config. When reqd or on MCC call, use (O8) L(R) OMS He PRESS VAP ISOL B to repress

(11) CRT display of affected TK P and associated msg are invalid. Use OMS/MPS and C/W for status

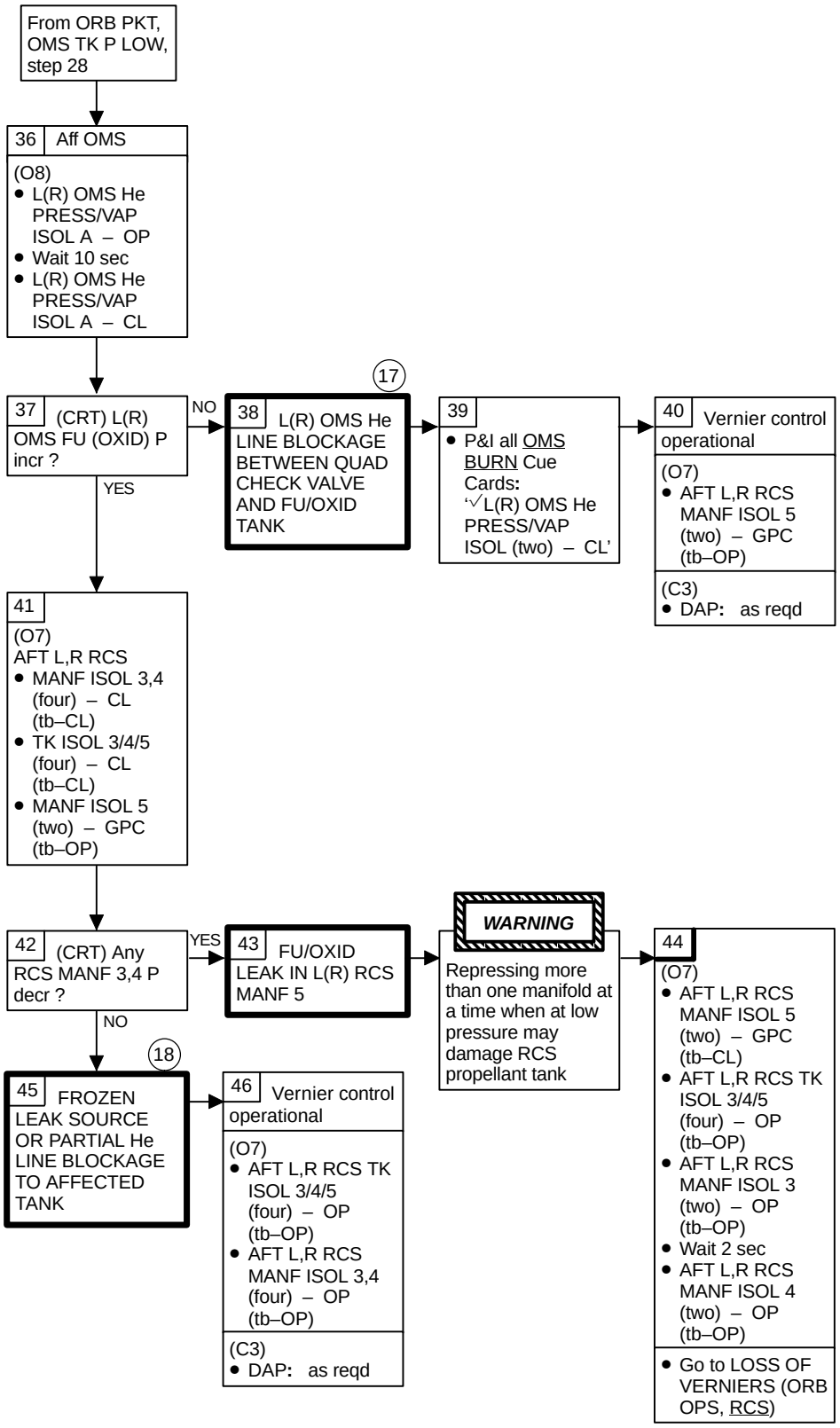
(12) On GNC SYS SUMM 2 display, use ENG IN P as B/U to failed PRPLT TK P xdcr

(13) H/W C/W lost for affected TK P

(14) Flow through failed Reg will exceed relief vlv setting: 450 psig – RELIEF400 psig – RESEAT

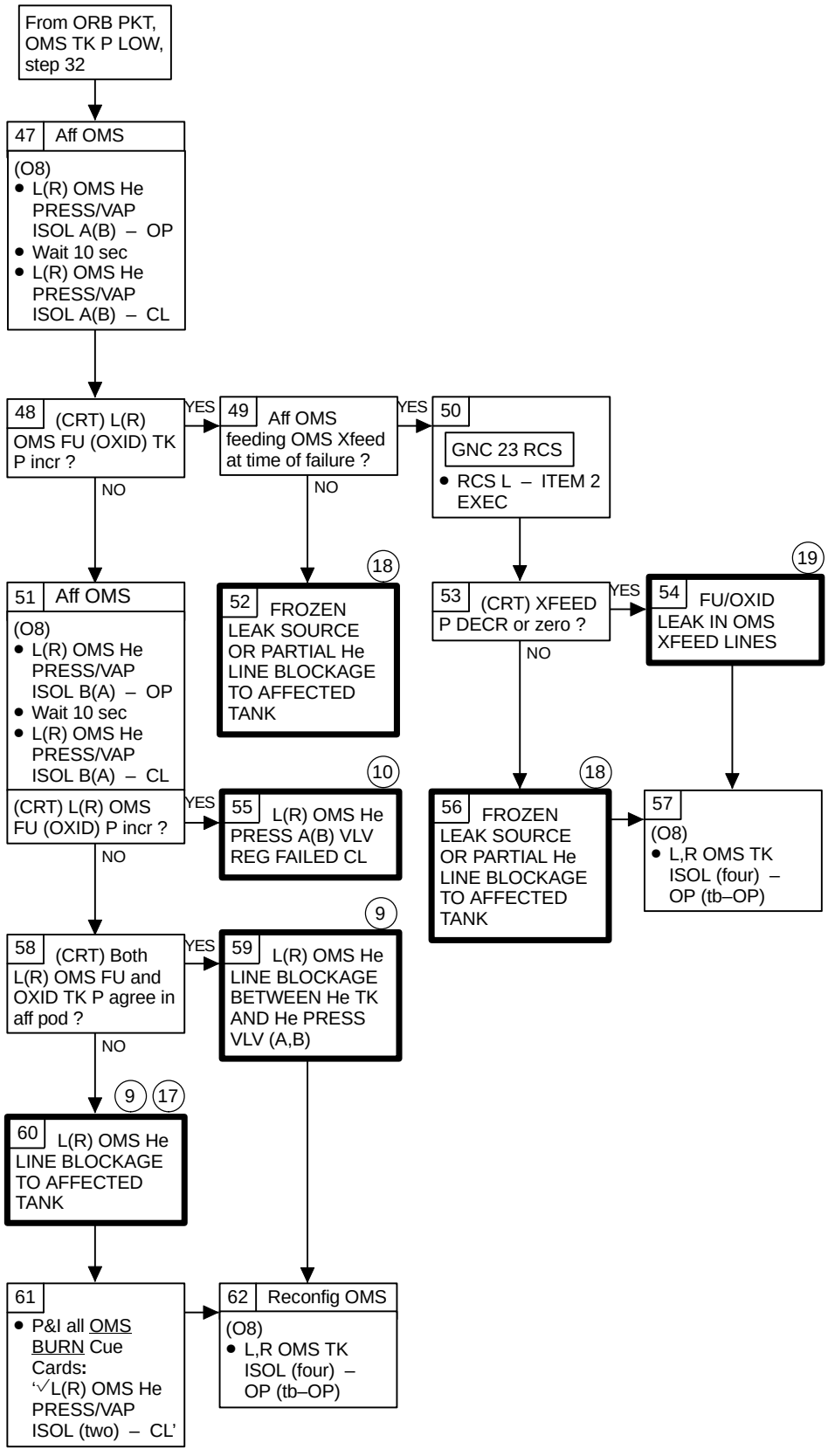
(15) If affected N2 TK P < 564 psia, do NOT use engine for orbit burns

(16) Single failure can result in N2 Reg failing OP and N2 Relief vlv failing CL (N2 Reg P > 500 psia)



(17) Perform subsequent burns in blowdown in affected pod to prevent mixture ratio variations

(18) ✓MCC on action to be taken to minimize failure effects and config for subsequent burns



(9) √MCC for blowdown capability. If full blowdown exists, continue with nominal mission profile. If not full blowdown, save available blowdown for deorbit burn

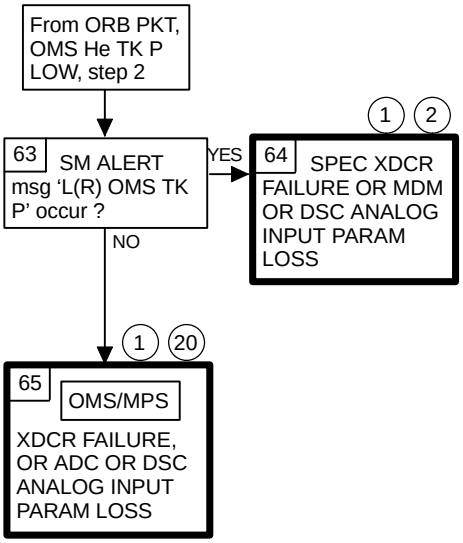
(10) OMS and RCS operational in nominal config. When reqd or on MCC call, use (O8) L(R) OMS He PRESS VAP ISOL B to repress

(17) Perform subsequent burns in blowdown in affected pod to prevent mixture ratio variations

(18) √MCC on action to be taken to minimize failure effects and config for subsequent burns

(19) OMS and RCS operational in nominal config. Do not Xfeed or i'cnct

OMS 11.1a (Cont)



(1) ✓MCC for other params possibly lost in same MDM or DSC card

(2) N2 P available on OMS/MPS

(20) He P available on GNC SYS SUMM 2 display

OMS

11.2a OMS VLV tb – bp

10.1a 38

OMS Vlv tb – bp

If:
Miscompare exists in L,R OMS TK ISOL VLV A(B) or L,R OMS XFEED VLV A(B)

Nominal Config:
(MA73C:I)
cb AC1 AFT POD VLV GP 1 ΦA(ΦB,ΦC) – cl
cb AC2 AFT POD VLV GP 2 ΦA(ΦB,ΦC) – cl
cb AC3 AFT POD VLV GP 3 ΦA(ΦB,ΦC) – cl
AFT POD VLV LOGIC GP
1/3 – ON
1/2 – ON
2/3 – ON

1 (O8) More than one tb – bp ?
YES
NO

2 Which OMS vlv tb – bp:

(O8)
L OMS TK ISOL A and R OMS TK ISOL A and L OMS XFEED A → 3 POD/AMC1 BUS FAILURE
EPS SSR–143

L OMS XFEED B and R OMS XFEED B → 4 POD/AMC2 BUS FAILURE
EPS SSR–144

L OMS TK ISOL B and R OMS TK ISOL B and R OMS XFEED A → 6 POD/AMC3 BUS FAILURE
EPS SSR–145

Neither → 5 SEPARATE FAILURES. TROUBLESHOOT VLVS INDIVIDUALLY

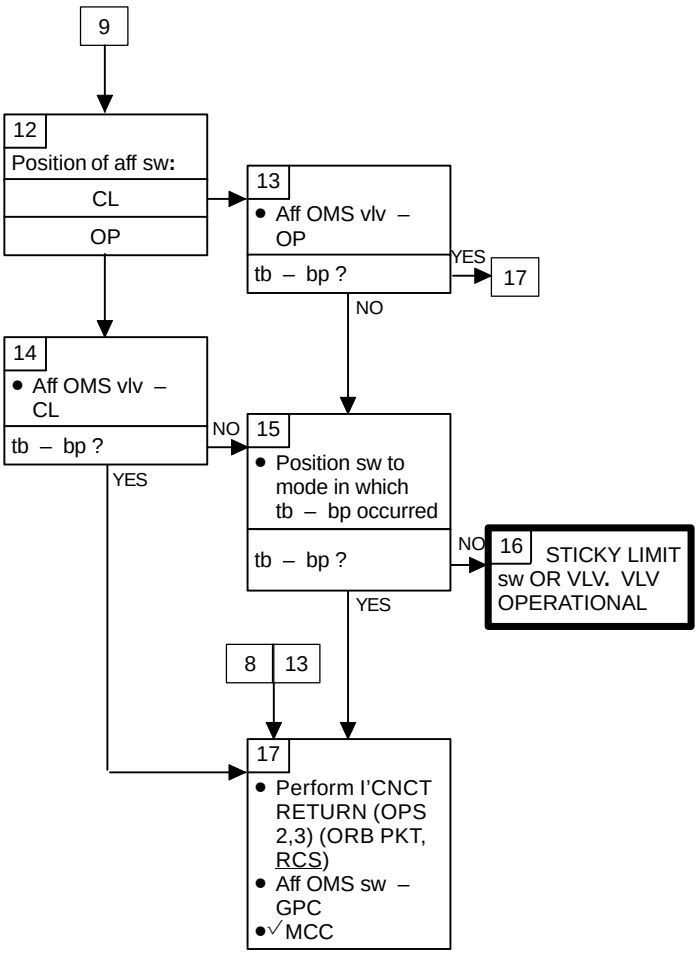
7 During reconfig, tb – bp occurred ?
NO → 8 VLV FAILURE OR tb FAILURE OR MICROSW FAILURE → 17
YES

9 ✓AC motor thermal overload
- Aff OMS sw – GPC
- Wait 3 min, then reposition sw to mode in which tb – bp occurred

tb – bp ?
NO → 10 VLV CONTINUOUS PWR PROBLEM. THERMAL OVERLOAD RESET. VLV OPERATIONAL → (1) 11
- Aff OMS sw – GPC

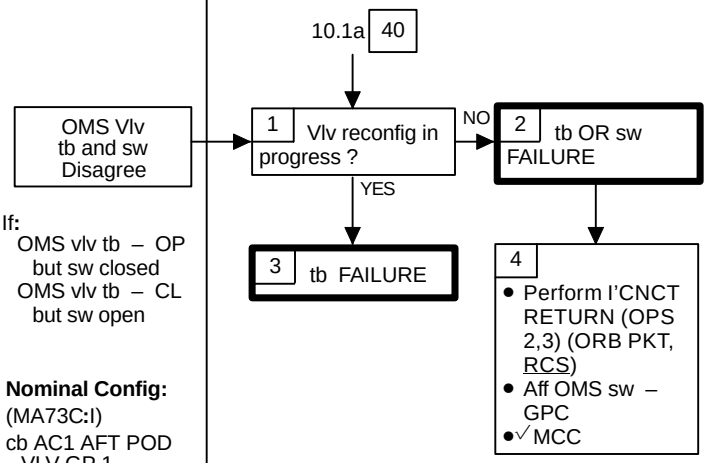
YES → 12

(1) For subsequent reconfig, ignore tb – bp. After vlv commanded, wait 3 sec; then position appropriate sw to GPC


9
12
Position of aff sw:
CL
OP
13
• Aff OMS vlv – OP
tb – bp ?
YES
17
NO
14
• Aff OMS vlv – CL
tb – bp ?
NO
15
• Position sw to mode in which tb – bp occurred
tb – bp ?
NO
16
STICKY LIMIT sw OR VLV. VLV OPERATIONAL
YES
8
13
17
• Perform I'CNCT RETURN (OPS 2,3) (ORB PKT, RCS)
• Aff OMS sw – GPC
• ✓MCC

OMS

11.2b OMS VLV tb AND sw POSITION DISAGREE



If:
OMS vlv tb – OP
but sw closed
OMS vlv tb – CL
but sw open

Nominal Config:
(MA73C:I)
cb AC1 AFT POD
VLV GP 1
ΦA(ΦB,ΦC) – cl
cb AC2 AFT POD
VLV GP 2
ΦA(ΦB,ΦC) – cl
cb AC3 AFT POD
VLV GP 3
ΦA(ΦB,ΦC) – cl
AFT POD VLV
LOGIC GP
1/3 – ON
1/2 – ON
2/3 – ON

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OMS

11.3a PRPLT THRM OMS

SM ALERT

(1) S89 PRPLT THRM OMS

If:
- Any param on OMS Thermal Limit Table out–of–limits
- Refer to OMS THERMAL LIMIT TABLE

Nominal Config:
(A14)
RCS/OMS HTR OMS CRSFD LINES (two) – A AUTO(B AUTO), B OFF(A OFF)

1 SM 89 PRPLT THERMAL

Param(s) out–of–limits high or low:
- '↑'
- '↓'
- Neither

2 TRANSIENT CONDITION

3 HTR/ THERMOSTAT CKT FAILED OFF OR HEATING FROM CONTROLLING CKT INADEQUATE OR INST FAILURE OR BIAS

4 HTR/ THERMOSTAT CKT FAILED ON OR EXTREMELY HOT ENVIRONMENT OR INST FAILURE OR BIAS

5 Switch to other htr/thermostat ckt

(A14)
RCS/OMS HTR OMS CRSFD LINES
- A OFF(B OFF)
- B AUTO (A AUTO)

OMS THERMAL LIMIT TABLE

PARAMETER					FDA LIMIT LOW	FDA LIMIT HIGH
OMS CRSFD	L	R	C			
XFD	OX XXXS	XXXS	XXXS		50	90 (6)
GMBL	LN XXXS	XXXS			50	90 (6)
DRN	OX XXXS	XXXS			50	100 (7)
	FU	OX				

(1) Msg available with SM in RUN mode only

(2) Htrs cycling high/low or intermittent xdcr failure. ✓MCC

(3) Because of insufficient onboard data and complexity of interacting htr/thermostat groups, crew cannot identify specific failure or determine instrument faults

(4) ✓MCC for further analysis, possible reconfig, and/or attitude change

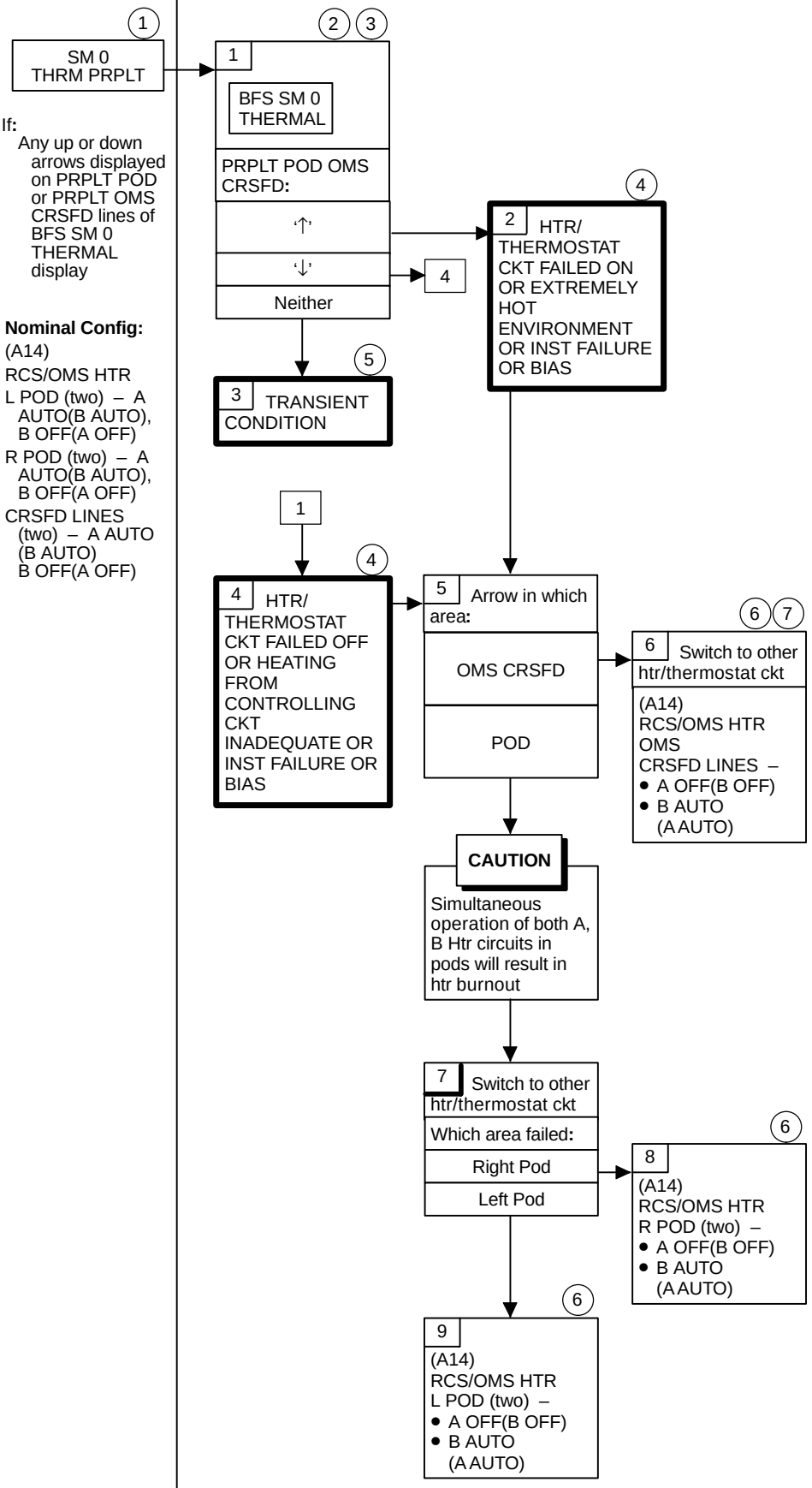
(5) When no onboard thermal visibility into crossfeed lines (no SM and no BFS) exists, both A,B Htr sets will be turned to AUTO

(6) OMS CRSFD L GMBL LN and OMS CRSFD C XFD OX upper limit is 100 degF

(7) OMS CRSFD R DRN OX upper limit is 110 degF

OMS

11.3b THRM PRPLT



(1) BFS msg available in MM 104, 105, 106, 301, 302, 303, and when BFS in OPS 0

(2) If SM 89 PRPLT THERMAL is available, display may be used to provide insight into problem, with MCC consultation

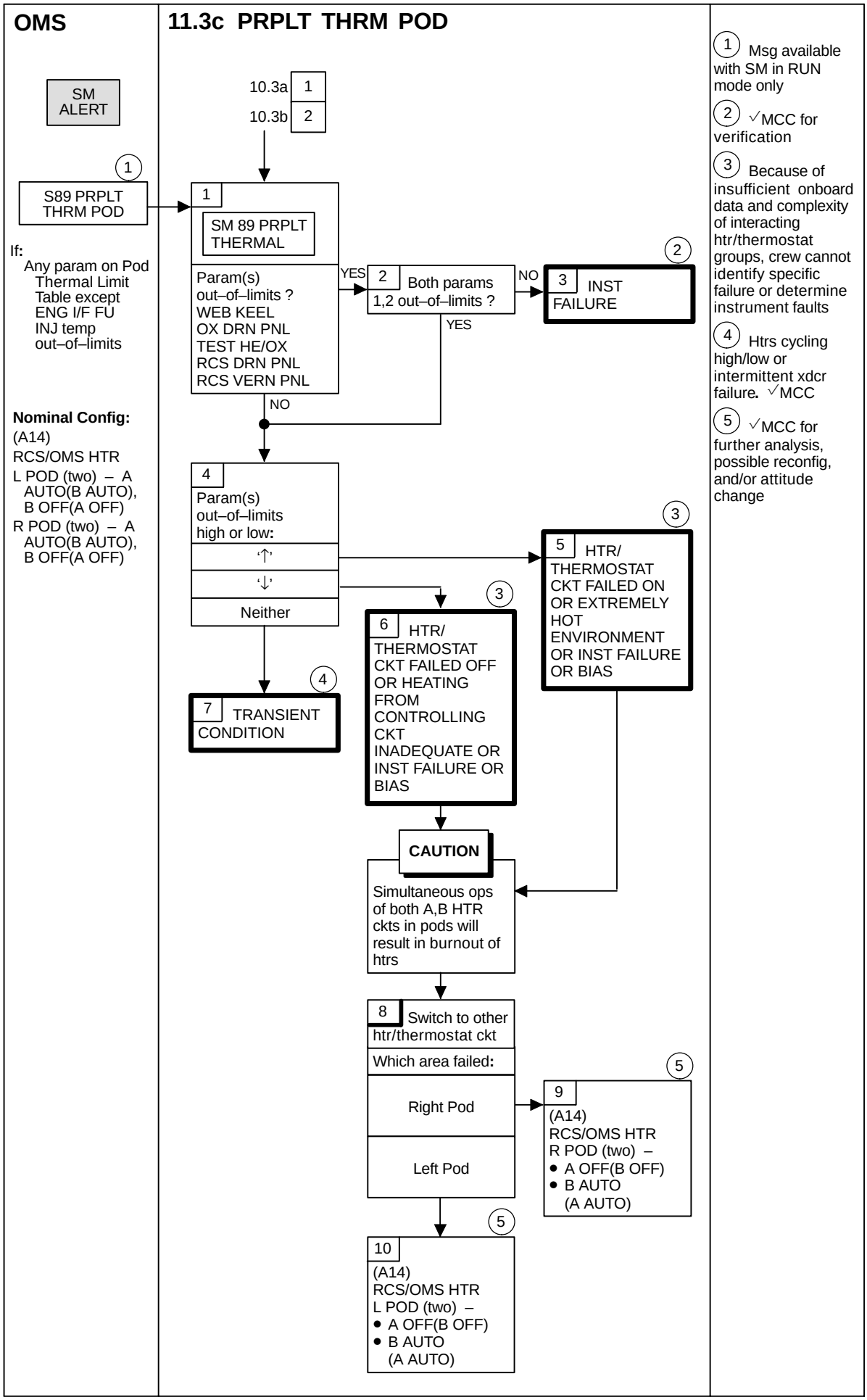
(3) THERMAL display available only from BFS. No values displayed, only ↑, ↓, M, H, or L

(4) Because of insufficient onboard data and complexity of interfacing htr/thermostat groups, crew cannot identify specific failure or determine instrument faults

(5) Htrs cycling high/low or intermittent xdcr failure. ✓MCC

(6) ✓MCC for further analysis, possible reconfig, and/or attitude change

(7) When no onboard thermal visibility into CRSFD LINES (no SM and no BFS) exists, both A,B Htr sets will be turned to AUTO


OMS
11.3c PRPLT THRM POD
SM ALERT
1
S89 PRPLT THRM POD
If:
Any param on Pod Thermal Limit Table except ENG I/F FU INJ temp out–of–limits
Nominal Config:
(A14)
RCS/OMS HTR
L POD (two) – A AUTO(B AUTO), B OFF(A OFF)
R POD (two) – A AUTO(B AUTO), B OFF(A OFF)
10.3a 1
10.3b 2
1
SM 89 PRPLT THERMAL
Param(s) out–of–limits ? WEB KEEL OX DRN PNL TEST HE/OX RCS DRN PNL RCS VERN PNL
YES
2 Both params 1,2 out–of–limits ?
NO
2
3 INST FAILURE
YES
NO
4
Param(s) out–of–limits high or low:
'↑'
'↓'
Neither
3
5 HTR/ THERMOSTAT CKT FAILED ON OR EXTREMELY HOT ENVIRONMENT OR INST FAILURE OR BIAS
3
6 HTR/ THERMOSTAT CKT FAILED OFF OR HEATING FROM CONTROLLING CKT INADEQUATE OR INST FAILURE OR BIAS
4
7 TRANSIENT CONDITION
CAUTION
Simultaneous ops of both A,B HTR ckts in pods will result in burnout of htrs
8 Switch to other htr/thermostat ckt
Which area failed:
Right Pod
Left Pod
5
9
(A14)
RCS/OMS HTR
R POD (two) –
• A OFF(B OFF)
• B AUTO (A AUTO)
5
10
(A14)
RCS/OMS HTR
L POD (two) –
• A OFF(B OFF)
• B AUTO (A AUTO)
1 Msg available with SM in RUN mode only
2 ✓MCC for verification
3 Because of insufficient onboard data and complexity of interacting htr/thermostat groups, crew cannot identify specific failure or determine instrument faults
4 Htrs cycling high/low or intermittent xdcr failure. ✓MCC
5 ✓MCC for further analysis, possible reconfig, and/or attitude change

POD THERMAL LIMIT TABLE

PARAM					FDA LIMIT	
					LOW	HIGH
POD			L	R		
OMS	TK	OX	XXXS	XXXS	45	95
		FU	XXXS	XXXS	45	95
ENG	I/F	OX	XXXS	XXXS	45	110
		FU	XXXS	XXXS	45	110
	OX VLV		XXXS	XXXS	40	122
	FU INJ		XXXS	XXXS	36	260
WEB	KEEL	1	XXXS	XXXS	45	100
		2	XXXS	XXXS	45	100
	Y	OB	XXXS	XXXS	45	120
		UP	XXXS	XXXS	45	120
OX	DRN PNL	1	XXXS	XXXS	45	110
		2	XXXS	XXXS	45	110
ENG	COVER		XXXS	XXXS	45	
	SERV PNL		XXXS	XXXS	45	140
GSE	SERV PNL		XXXS	XXXS	45	120
TEST	HE/OX	1	XXXS	XXXS	35	95
		2	XXXS	XXXS	35	95

OMS SSR–1
MIXED XFD: OMS PRPLT FAILURE

NOTE

Procedure uses MEMORY READ/WRITE to set appropriate OMS TK ISOL vlv and OMS XFEED vlv commands in order to connect usable OMS tk to opposite side. For single tank or single inlet failures, select engine in good pod. Unstow ASC PKT and reference DEORBIT MIXED XFD BURN PREP procedure on 7–6 for reqd address IDs. Desired values are given in Tables 1 thru 8

O8 1. L,R OMS TK ISOL (four) – CL (tb–CL)
XFEED (four) – CL (tb–CL)

O7 2. AFT L,R RCS XFEED (four) – CL (tb–CL)
✓MSTR RCS XFEED – OFF

WARNING
Do not use MSTR RCS XFEED until post burn or loss of Deorbit capability may occur

3. Select failure case table

Single Failures	Use Table
L OMS OX TK	4
L OMS OX INLET	4
L OMS FU TK	6
L OMS FU INLET	6
R OMS OX TK	3
R OMS OX INLET	3
R OMS FU TK	5
R OMS FU INLET	5

Dual Failures	Use Table
L OMS FU TK AND R OMS OX TK	1
L OMS OX TK AND R OMS FU TK	2
L OMS FU TK AND R OMS OX INLET	3
L OMS OX INLET AND R OMS FU TK	4
L OMS OX TK AND R OMS FU INLET	5
L OMS FU INLET AND R OMS OX TK	6
L OMS OX INLET AND R OMS FU INLET	7
L OMS FU INLET AND R OMS OX INLET	8

CRT 4. Set up GPC vlvs

GNC 0 GPC MEMORY

✓HEX 27**
BIT RST – ITEM 23 EXEC (*)
Obtain and enter ADD ID from ASC PKT, 7–6, DEORBIT MIXED XFD BURN PREP, step 3.
Obtain and enter DESIRED values from Tables 1 thru 8

ADD ID		DESIRED	
28	__ __ __ __ __	29	_ _ _ _
30	__ __ __ __ __	31	_ _ _ _
32	__ __ __ __ __	33	_ _ _ _
34	__ __ __ __ __	35	_ _ _ _

From Tables 1–8

Table A	Table B
_ _ _ _	_ _ _ _
_ _ _ _	_ _ _ _
_ _ _ _	_ _ _ _
_ _ _ _	_ _ _ _

✓Data values in ACTUAL column agree with Table A (MCC supplied)
WRITE – ITEM 25 EXEC
✓Data values in ACTUAL column agree with Table B (MCC supplied)

5. BIT SET – ITEM 22 EXEC (*)
Obtain and enter ADD ID from ASC PKT, 7–6, DEORBIT MIXED XFD BURN PREP, step 4.
Obtain and enter DESIRED values from Tables 1 thru 8

ADD ID		DESIRED	
28	__ __ __ __ __	29	_ _ _ _
30	__ __ __ __ __	31	_ _ _ _
32	__ __ __ __ __	33	_ _ _ _
34	__ __ __ __ __	35	_ _ _ _

From Tables 1–8

Table C
0 0 0 0
0 0 0 0
0 0 0 0
0 0 0 0

✓Data values in ACTUAL column agree with Table C
WRITE – ITEM 25 EXEC
✓Data values in ACTUAL column agree with DESIRED

6. During AOS, perform reconfig:
O8 L,R OMS TK ISOL (four) – GPC
XFEED (four) – GPC
✓Vlv config with MCC

7. Go to DEORBIT BURN (MIXED XFEED) (Cue Card) to perform deorbit burn
(✓Burn engine in Tables 1 thru 8)

TABLE 1

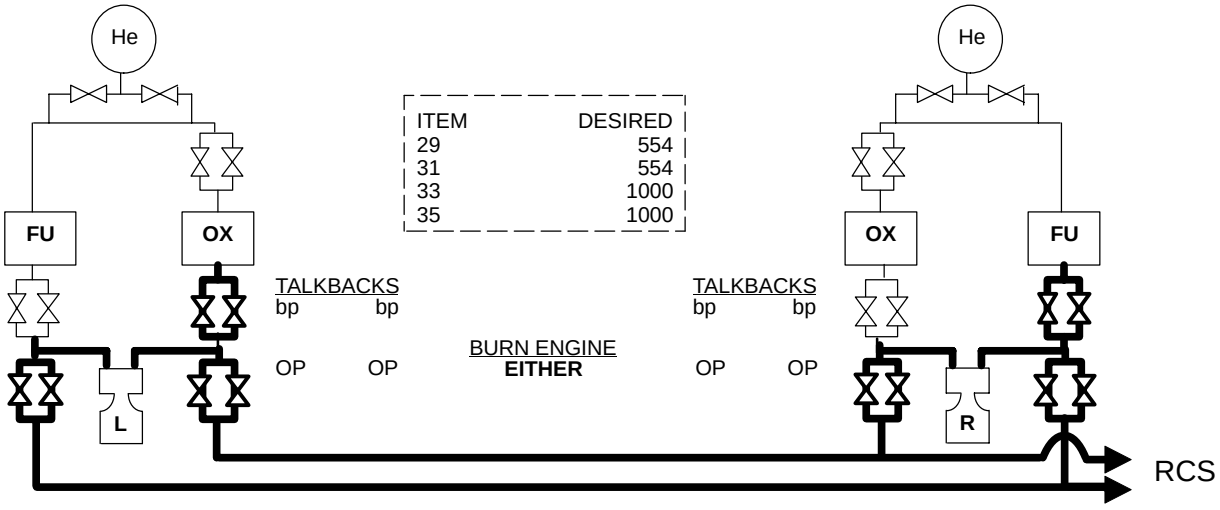


TABLE 2

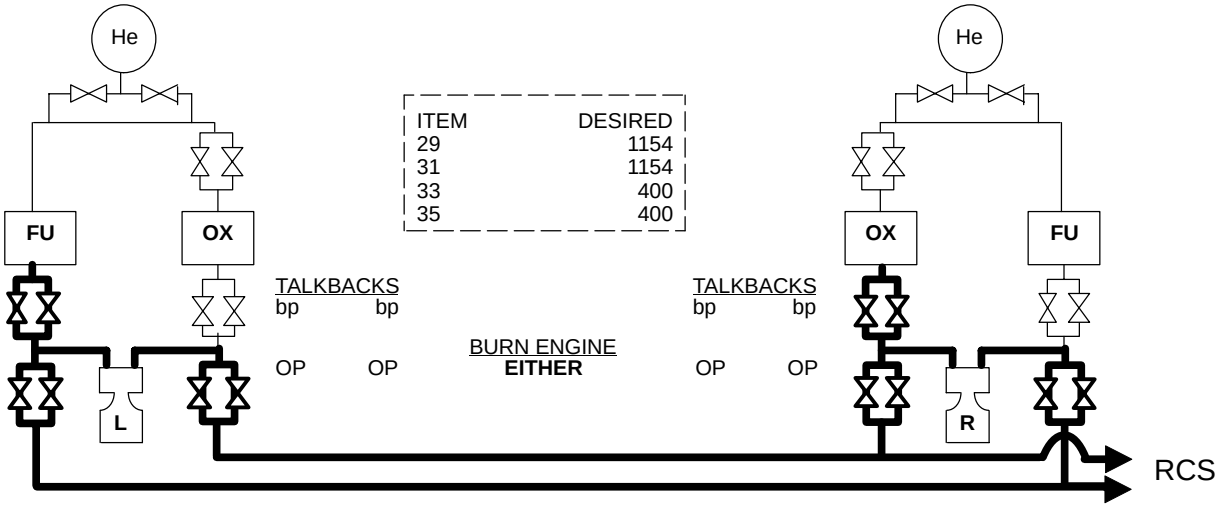


TABLE 3

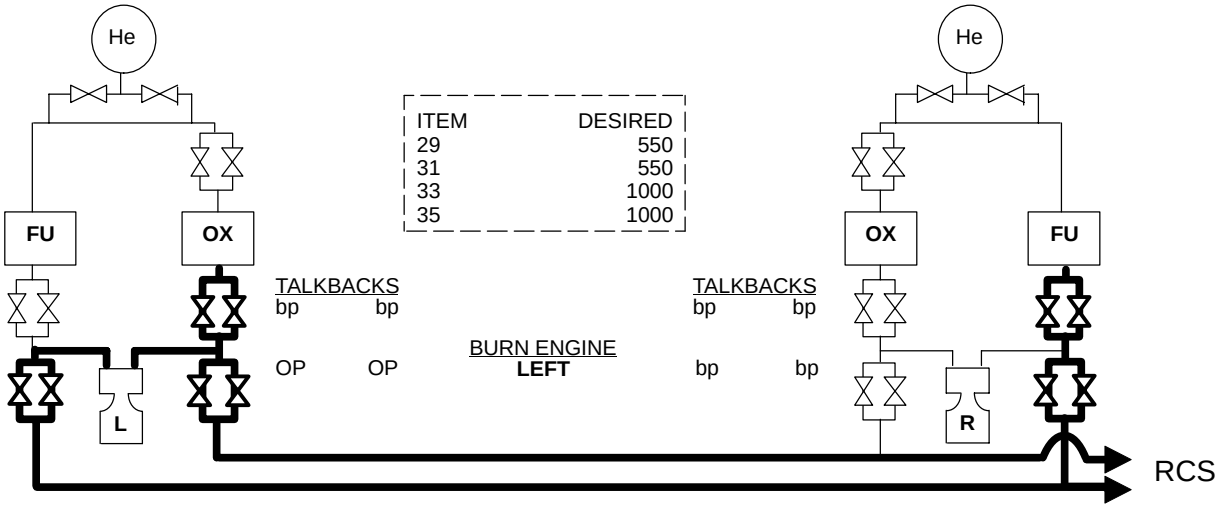


TABLE 4

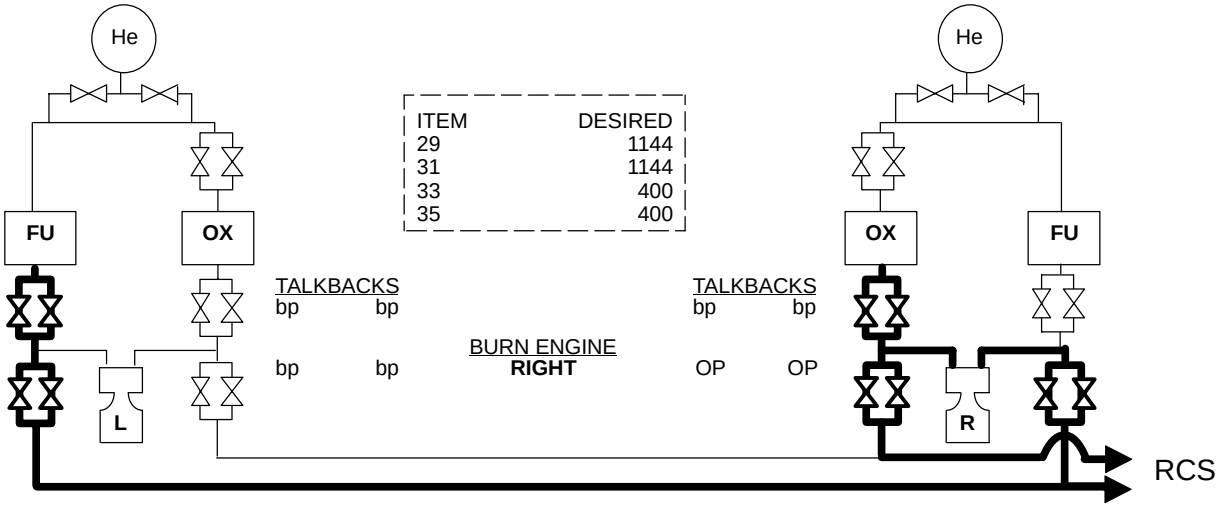


TABLE 5

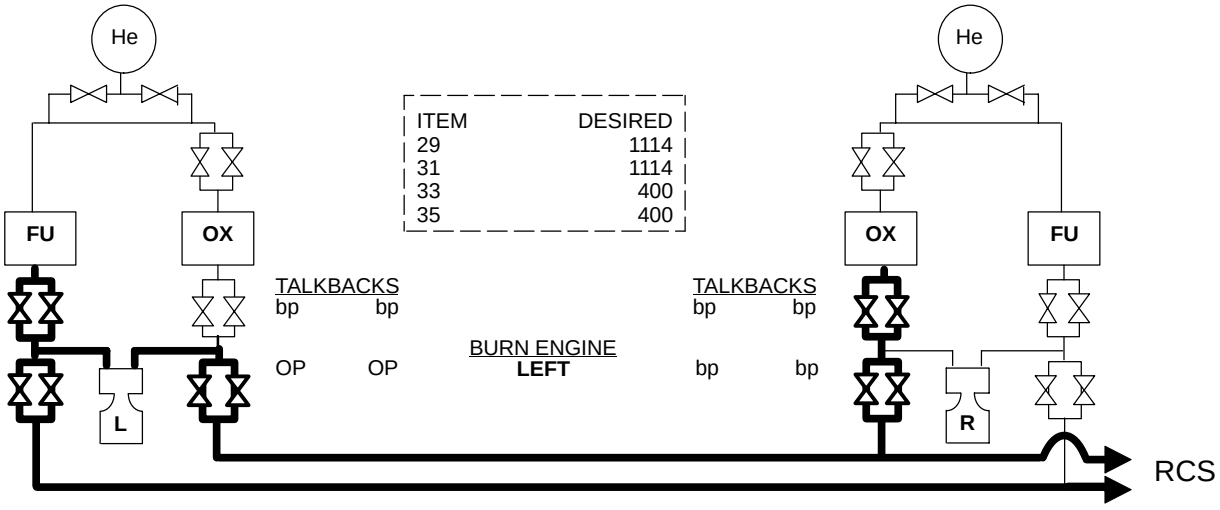


TABLE 6

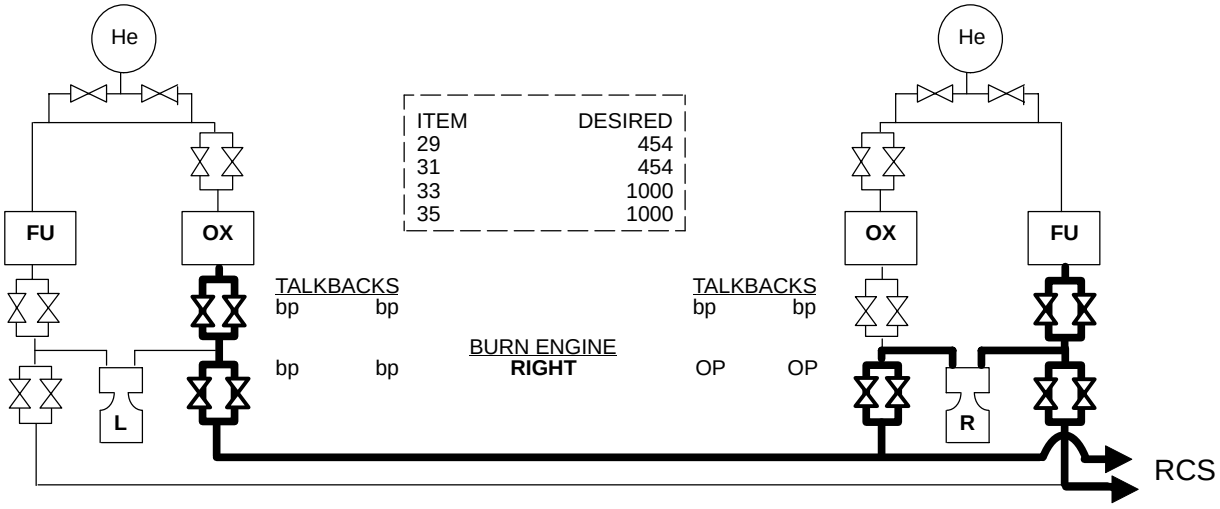


TABLE 7

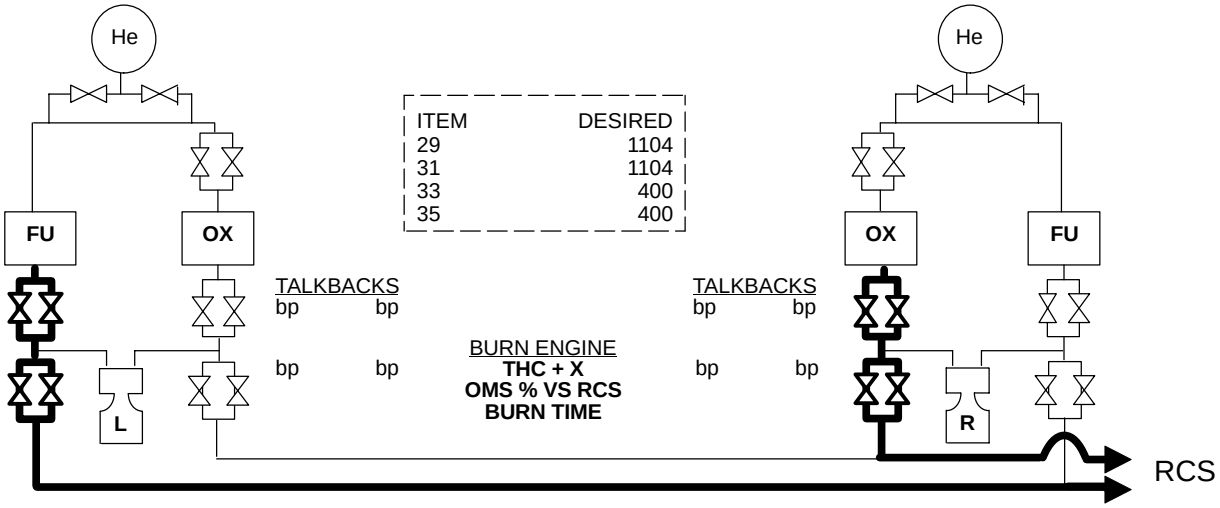
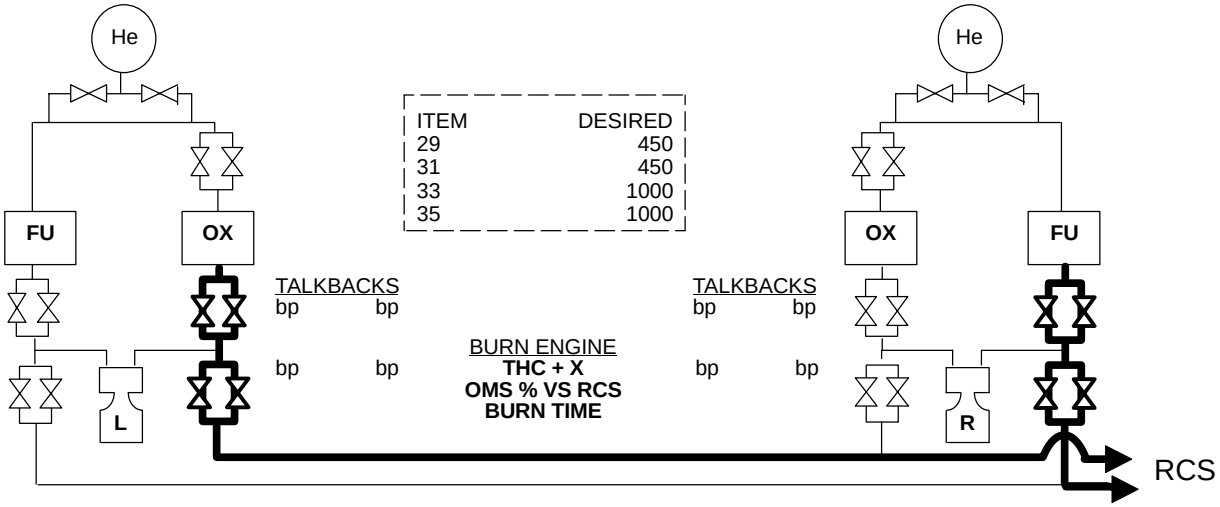


TABLE 8



12.1 RMS C/W

12.1a C/W LT(S) ON, BUT RMS MSTR ALARM LT/TONE OFF 12–4
12.1b MULTIPLE C/W LTS AND PDRS MSGS 12–5
12.1c C/W MCIU LT 12–6
12.1d ABE LT OR S96 PDRS ABE COMM(SY, SP, EP, WP, WY, WR) . . . 12–8
12.1e CONTR ERR LT – S96 PDRS CNTL SY(SP, EP, WP, WY, WR) OR PDRS CNTL POR 12–19
12.1f GPC DATA LT OR BCE BYP MCIU 12–22
12.1g CHECK CRT LT 12–24
12.1h – S96 PDRS CKCRT D 12–26
12.1i – S96 PDRS TEST SPA 12–27
12.1j – S96 PDRS CKCRT SY(SP, EP, WP, WY, WR) 12–31
12.1k – S96 PDRS CKCRT EE 12–33
12.1l – S96 PDRS CKCRT T CK 12–36
12.1m – S96 PDRS CKCRT HC 12–37
12.1n – PDRS SLIP SY(SP, EP, WP, WY, WR, ALL) . . 12–38
12.1o – S94 PDRS WR R 12–39
12.1p – PDRS TEST BRK(C/W, NMI, FS, LOSS) 12–40
12.1q – S96 PDRS CKCRT FS 12–42
12.1r RELEASE LT – PDRS REL 12–43
12.1s – PDRS REL (CUE CARD EXECUTED) 12–44
12.1t DERIGIDIZE LT – PDRS DERIG 12–45
12.1u – PDRS DERIG (CUE CARD EXECUTED) 12–48
12.1v PORT TEMP LT – PDRS TEMP PORT 12–49

12.2 RMS D&C

12.2a MSTR ALARM ON, BUT C/W LT(S) OFF 12–52
12.2b BRAKES – ON, BUT BRAKES tb – OFF 12–53
12.2c – OFF, BUT BRAKES tb – ON 12–54
12.2d SAFING – AUTO, BUT SAFING tb – bp 12–55
12.2e RESERVED . . . . . not used
12.2f RESERVED . . . . . not used
12.2g SELECTED MODE ANNUN – OFF OR ALL A8 LTS – OFF 12–57
12.2h SHLDR BRACE REL tb – bp AFTER CMD 12–59

12.3 END EFFECTOR

12.3a EE FAILS TO CAPTURE/RIGIDIZE IN AUTO 12–60
12.3b RELEASE/DERIGIDIZE IN AUTO 12–64
12.3c CLOSE IN EE MODE – MAN (EE C/O ONLY) 12–68
12.3d EE FAILS TO RIGIDIZE IN EE MODE – MAN (EE CHECKOUT ONLY) 12–69
12.3e EE FAILS TO RELEASE IN EE MODE – MAN 12–71
12.3f DERIGIDIZE/EXTEND IN MANUAL 12–73
12.3g EE tb ABNORMAL WHILE NO EE CMDS (EE MODE – AUTO OR MAN) 12–75
12.3h EE tb ABNORMAL WHILE EE MODE OFF 12–77
12.3i CAPTURE SEQ ABORTED (CUE CARD EXECUTED) 12–79
12.3j NO AUTO RELEASE (CUE CARD EXECUTED) 12–80
12.3k MANUAL RELEASE (CUE CARD EXECUTED) 12–82
12.3l DERIGID (CUE CARD EXECUTED) 12–84

12.4 RMS OPS
12.4a ARM RESPONSE ABNORMAL IN MANUAL MODES 12–86
12.4b AUTO MODES 12–88
12.4c JOINT RESPONSE ABNORMAL IN SINGLE MODE 12–90
12.4d DIRECT MODE 12–93

12.5 MPM/MRL
12.5a MPM DPY – tb NOT DPY, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME 12–96
12.5b MPM STO – tb NOT STO, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME 12–98
12.5c MRL REL – tb NOT REL, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME 12–100
12.5d MRL LAT – tb NOT LAT, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME 12–102
12.5e PORT RMS RETEN LATCHES R–F–L tb – bp WHEN CRADLED 12–104
12.5f PORT RMS RETEN LATCHES R–F–L tb – gray WHEN UNCRADLED 12–104

PDRS

12 PDRS SSR
PDRS SSR–1 MPM MTR INHIBIT DISABLE 12–106
SSR–2 RESERVED . . . . . not used
SSR–3 BACKDRIVE TECHNIQUE – JOINT FREE 12–107
SSR–4 RMS IFM D&C KIT 12–115

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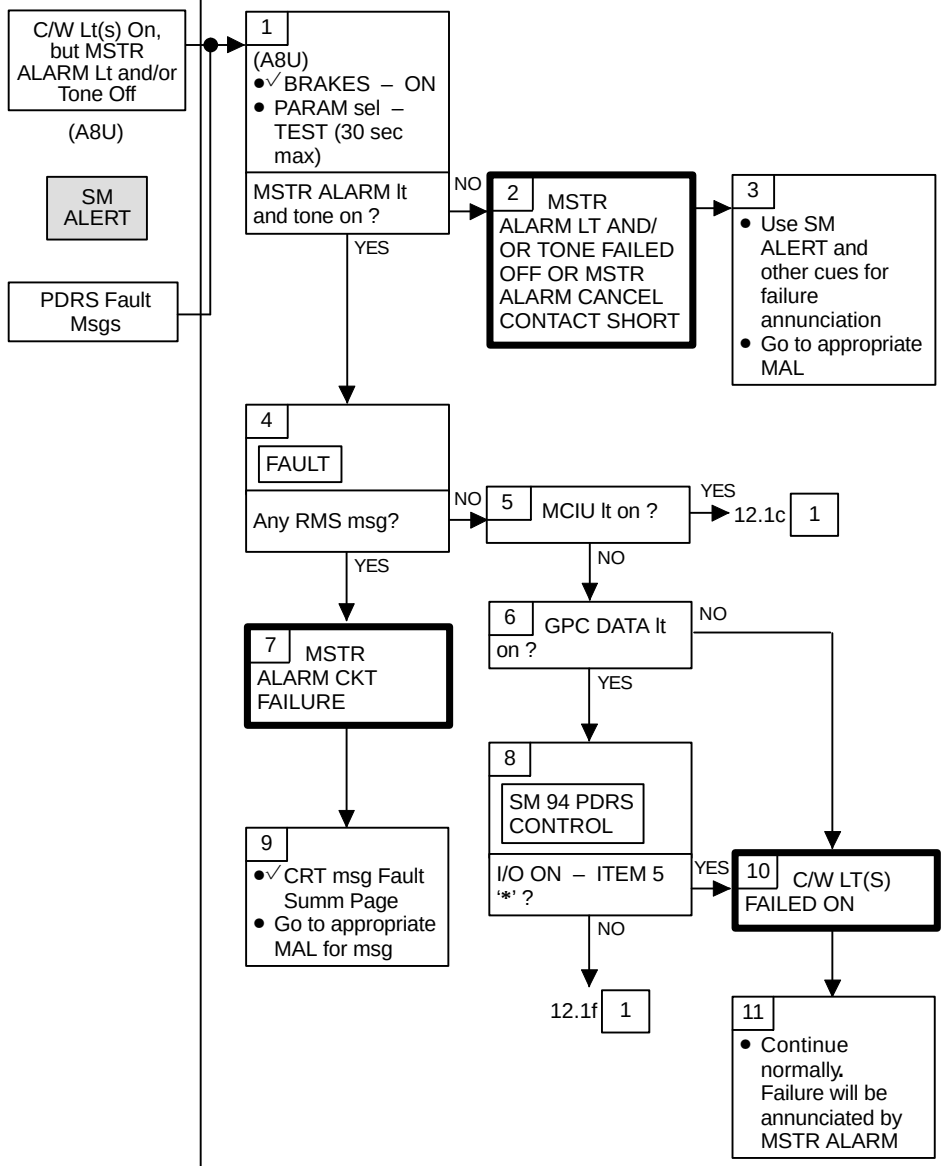
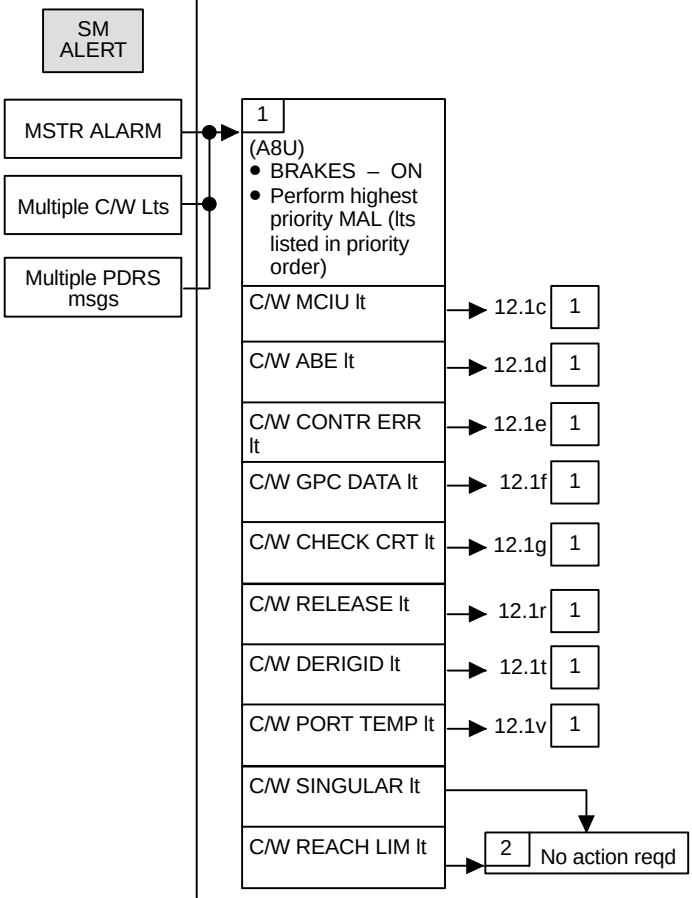
PDRS

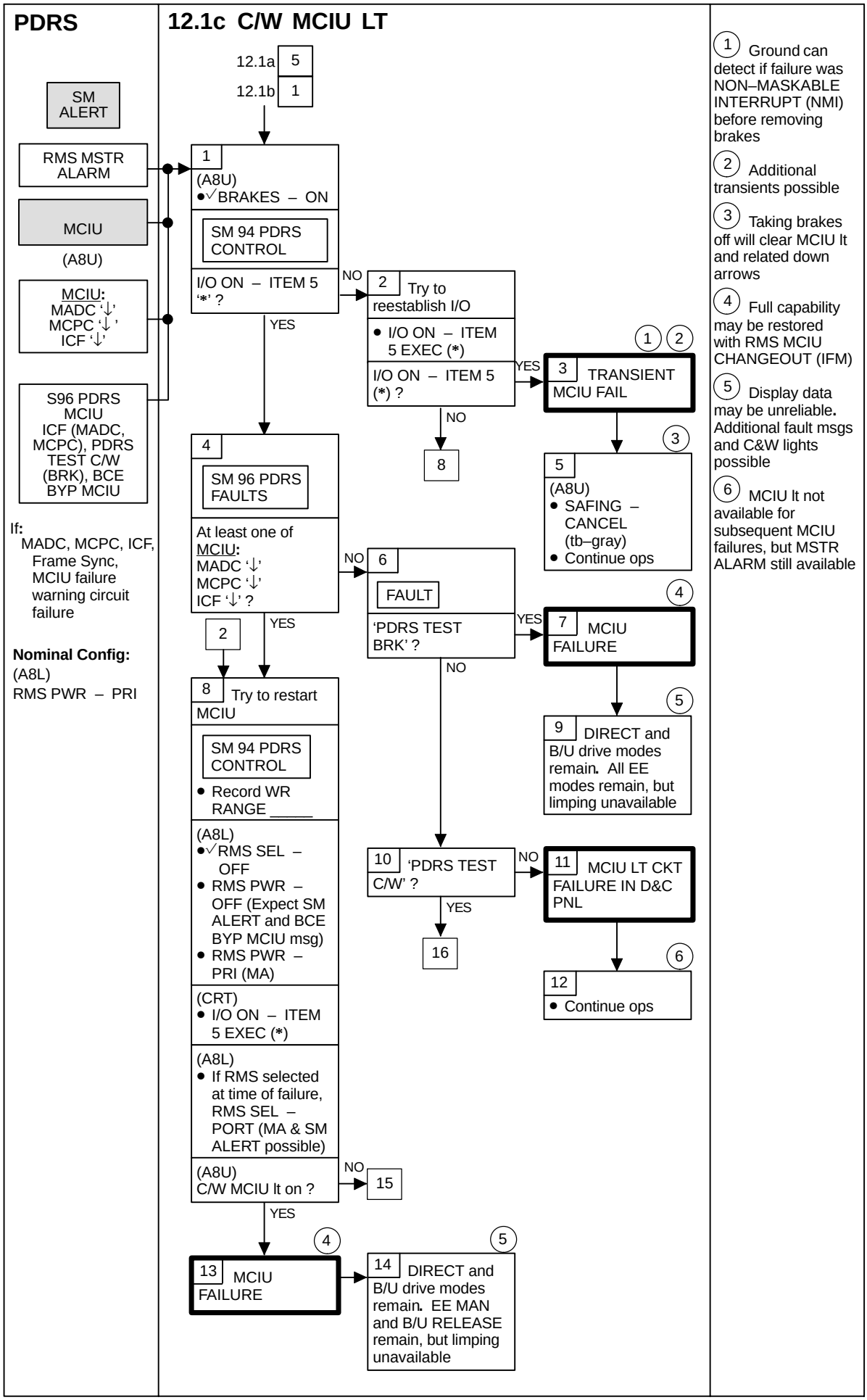
12.1a C/W LT(S) ON, BUT RMS MSTR ALARM LT/TONE OFF

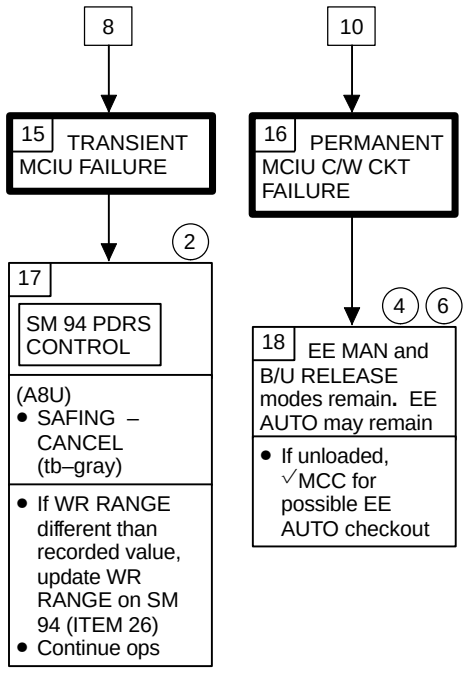


PDRS

12.1b MULTIPLE C/W LTS AND PDRS MSGS




PDRS
12.1c C/W MCIU LT
12.1a 5
12.1b 1
SM ALERT
RMS MSTR ALARM
MCIU
(A8U)
MCIU: MADC '↓' MCPC '↓' ICF '↓'
S96 PDRS MCIU ICF (MADC, MCPC), PDRS TEST C/W (BRK), BCE BYP MCIU
If:
MADC, MCPC, ICF, Frame Sync, MCIU failure warning circuit failure
Nominal Config:
(A8L)
RMS PWR – PRI
1
(A8U)
•✓BRAKES – ON
SM 94 PDRS CONTROL
I/O ON – ITEM 5 '*' ?
NO
2 Try to reestablish I/O
• I/O ON – ITEM 5 EXEC (*)
I/O ON – ITEM 5 (*) ?
YES
3 TRANSIENT MCIU FAIL
NO
8
YES
4
SM 96 PDRS FAULTS
At least one of MCIU: MADC '↓' MCPC '↓' ICF '↓' ?
NO
6
FAULT
'PDRS TEST BRK' ?
YES
7 MCIU FAILURE
NO
2
YES
8 Try to restart MCIU
SM 94 PDRS CONTROL
• Record WR RANGE _____
(A8L)
•✓RMS SEL – OFF
• RMS PWR – OFF (Expect SM ALERT and BCE BYP MCIU msg)
• RMS PWR – PRI (MA)
(CRT)
• I/O ON – ITEM 5 EXEC (*)
(A8L)
• If RMS selected at time of failure, RMS SEL – PORT (MA & SM ALERT possible)
(A8U)
C/W MCIU lt on ?
NO
15
YES
13 MCIU FAILURE
14 DIRECT and B/U drive modes remain. EE MAN and B/U RELEASE remain, but limping unavailable
5
(A8U)
• SAFING – CANCEL (tb–gray)
• Continue ops
9 DIRECT and B/U drive modes remain. All EE modes remain, but limping unavailable
10 'PDRS TEST C/W' ?
NO
11 MCIU LT CKT FAILURE IN D&C PNL
YES
16
12
• Continue ops
1 Ground can detect if failure was NON–MASKABLE INTERRUPT (NMI) before removing brakes
2 Additional transients possible
3 Taking brakes off will clear MCIU lt and related down arrows
4 Full capability may be restored with RMS MCIU CHANGEOUT (IFM)
5 Display data may be unreliable. Additional fault msgs and C&W lights possible
6 MCIU lt not available for subsequent MCIU failures, but MSTR ALARM still available



(2) Additional transients possible

(4) Full capability may be restored with RMS MCIU CHANGEOUT (IFM)

(6) MCIU lt not available for subsequent MCIU failures, but MSTR ALARM still available

PDRS

12.1d C/W ABE LT OR S96 PDRS ABE COMM (SY, SP, EP, WP, WY, WR)

SM ALERT

RMS MSTR ALARM

ABE

S96 PDRS ABE COMM (SY, SP, EP, WP, WY, WR)

Nominal Config:
(A8L)
RMS PWR – PRI
RMS SEL – PORT
(CRT)
SM 94 I/O ON – ITEM 5 (*)

12.1b 1

1
- ✓BRAKES – ON

SM 96 PDRS FAULTS

ABE: COMM '↓' ? NO → 17

YES

2 Reset ABE

SM 94 PDRS CONTROL

- Record WR R ___

(A8U)
- Record WR _____

(A8L)
- RMS SEL – OFF
- RMS SEL – PORT
- If WR changed > 90 deg, update WR R on SM 94 to recorded value (ITEM 26)

Any ABE related annunciations ? NO → 3 TRANSIENT FAILURE → 4
- Continue nominal ops

YES

5

SM 96 PDRS FAULTS

ABE BITE: or CHECK CRT: SPA BITE TEST: Joint related ABE BITE or BITE TEST for one or more joints ? NO → 6 SPA OR MCIU FAILURE (1) → 7 DIRECT and B/U drive modes remain

YES

8 Identify failed joint

ABE BITE: or CHECK CRT: SPA BITE TEST: Choose first joint in sequence SY, SP,EP,WP,WY,WR which has ABE or BITE TEST annun

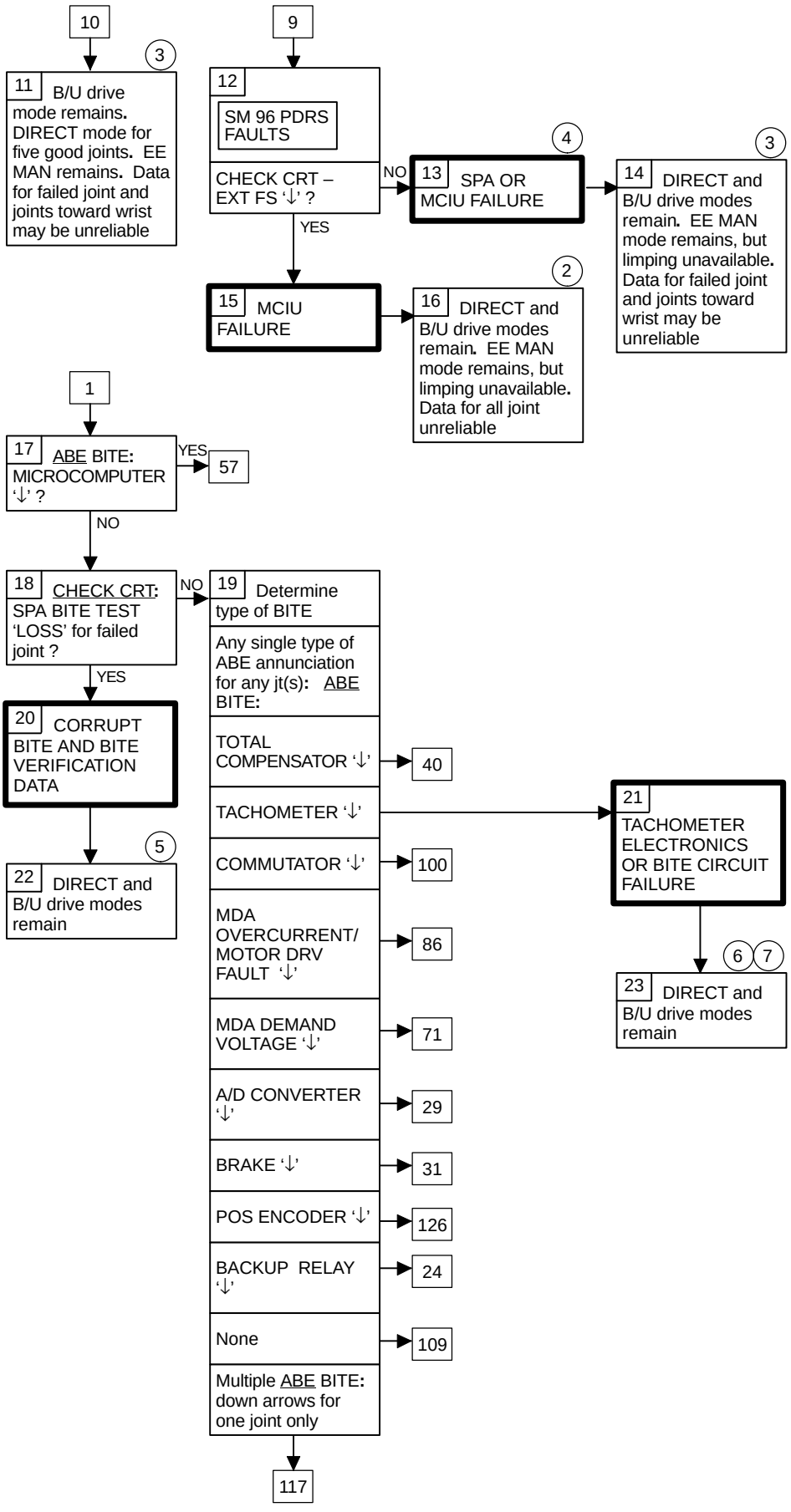
9 Attempt to drive joint

(A8U)
- JOINT – failed one
- MODE – DIRECT
- SINGLE (DIRECT) DR – '+' and '–' (✓for motion)
- MODE – not DIRECT

Joint drive properly ? NO → 10 SPA FAILURE → 11

YES → 12

(1) Full capability may be regained by RMS MCIU CHANGEOUT (IFM)



(2) Full capability will be regained by RMS MCIU CHANGEOUT (IFM)

(3) If any wrist joint data is unreliable, EE Auto mode may be lost

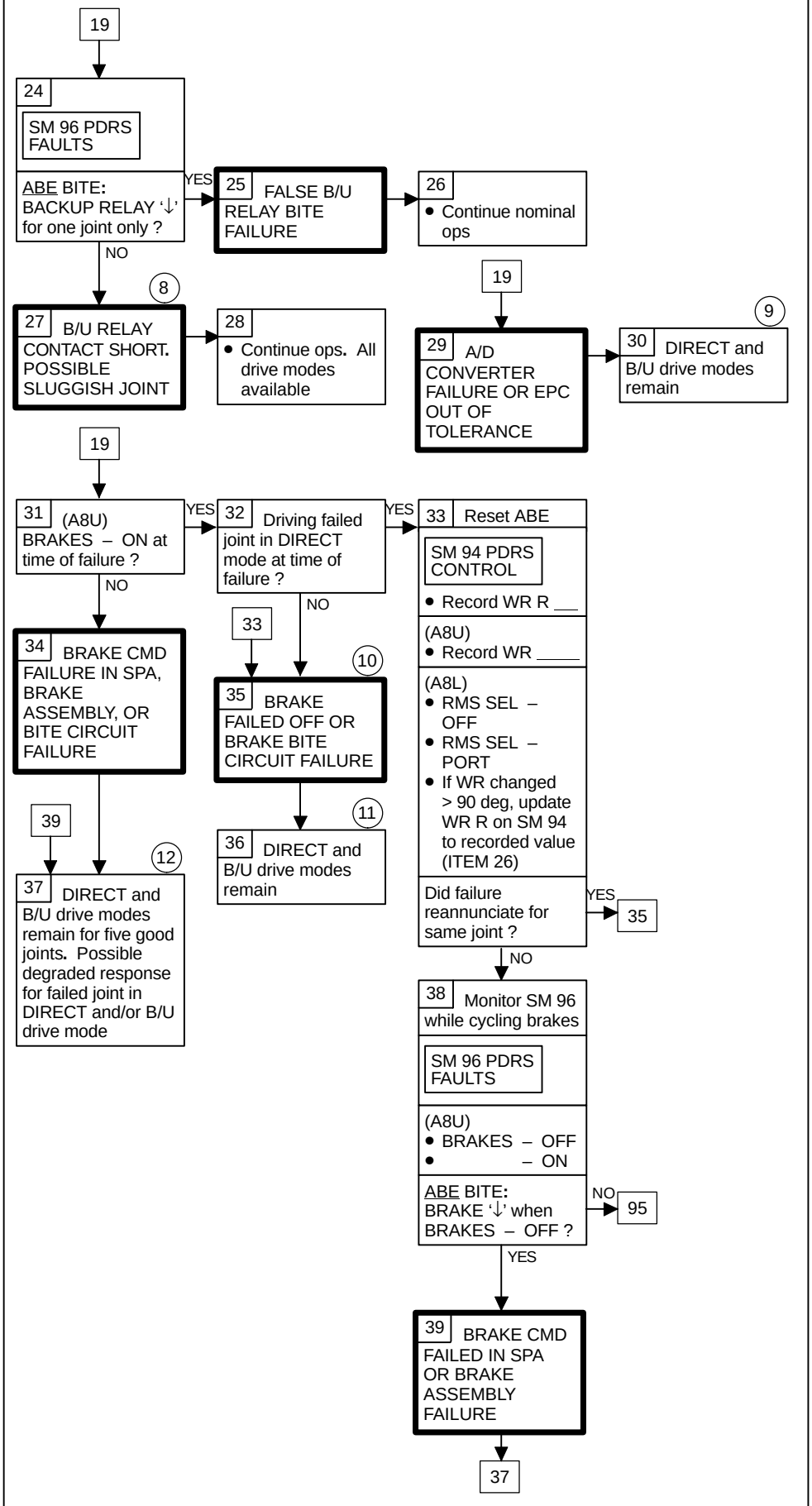
(4) If annunciation for all six joints is identical, full capability may be regained by RMS MCIU CHANGEOUT (IFM). If annunciation is not for all six joints, then SPA failure

(5) Computer supported modes available but subsequent SPA failure for same joint may not be annunciated or protected by autobrakes. May receive spurious SPA or EEEU annunciations

(6) For BITE circuit failure, MCIU OVERRIDE: ABE OVRD A (ITEM 36) on SPEC 95, PDRS OVERRIDE, can be used to remove autobrakes and regain computer supported modes (on MCC GO). Subsequent tachometer failure for same joint will be annunciated by CONTR ERR and protected by autobrakes

(7) For tach failure, rate data is unreliable

PDRS 12.1d (Cont)



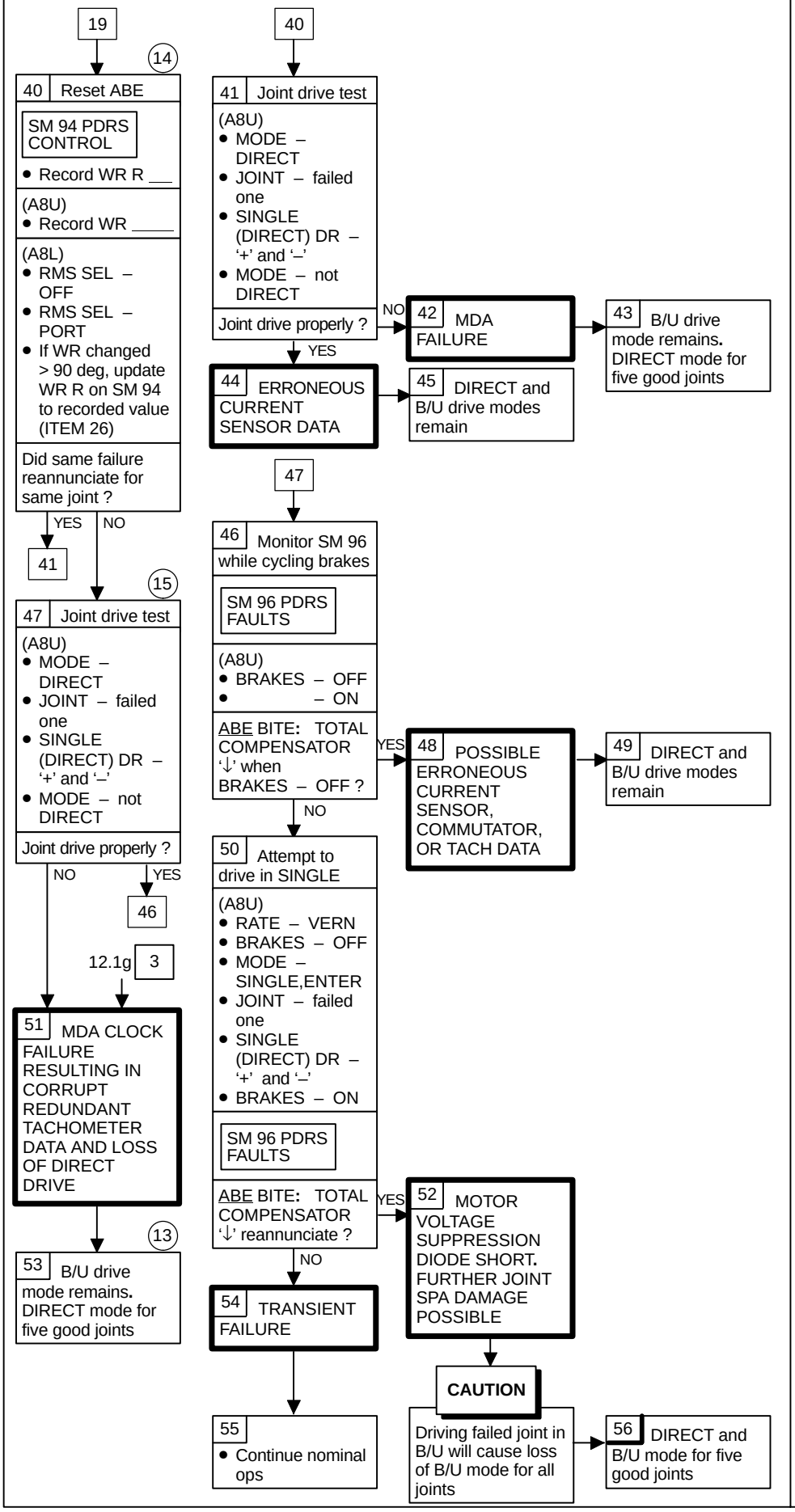
(8) Possible TOTAL COMPENSATOR BITE for failed joint while driving. Direct Drive joint test may determine failed joint

(9) For A/D Converter failure MCIU OVERRIDE ABE OVRD C (ITEM 38) on SPEC 95 , PDRS OVERRIDE, can be used to remove autobrakes and regain computer supported modes (on MCC GO). Subsequent failures for same joint will be annunciated by CONTR ERR and protected by autobrakes

(10) MCIU OVERRIDE: ABE OVRD B (ITEM 37) on SPEC 95, PDRS OVERRIDE, can be used to remove autobrakes and regain computer supported modes (on MCC GO). Subsequent failure for same joint will not be annunciated or protected by autobrakes

(11) If brake failed off, brakes available for five good joints and dynamic braking for failed joint

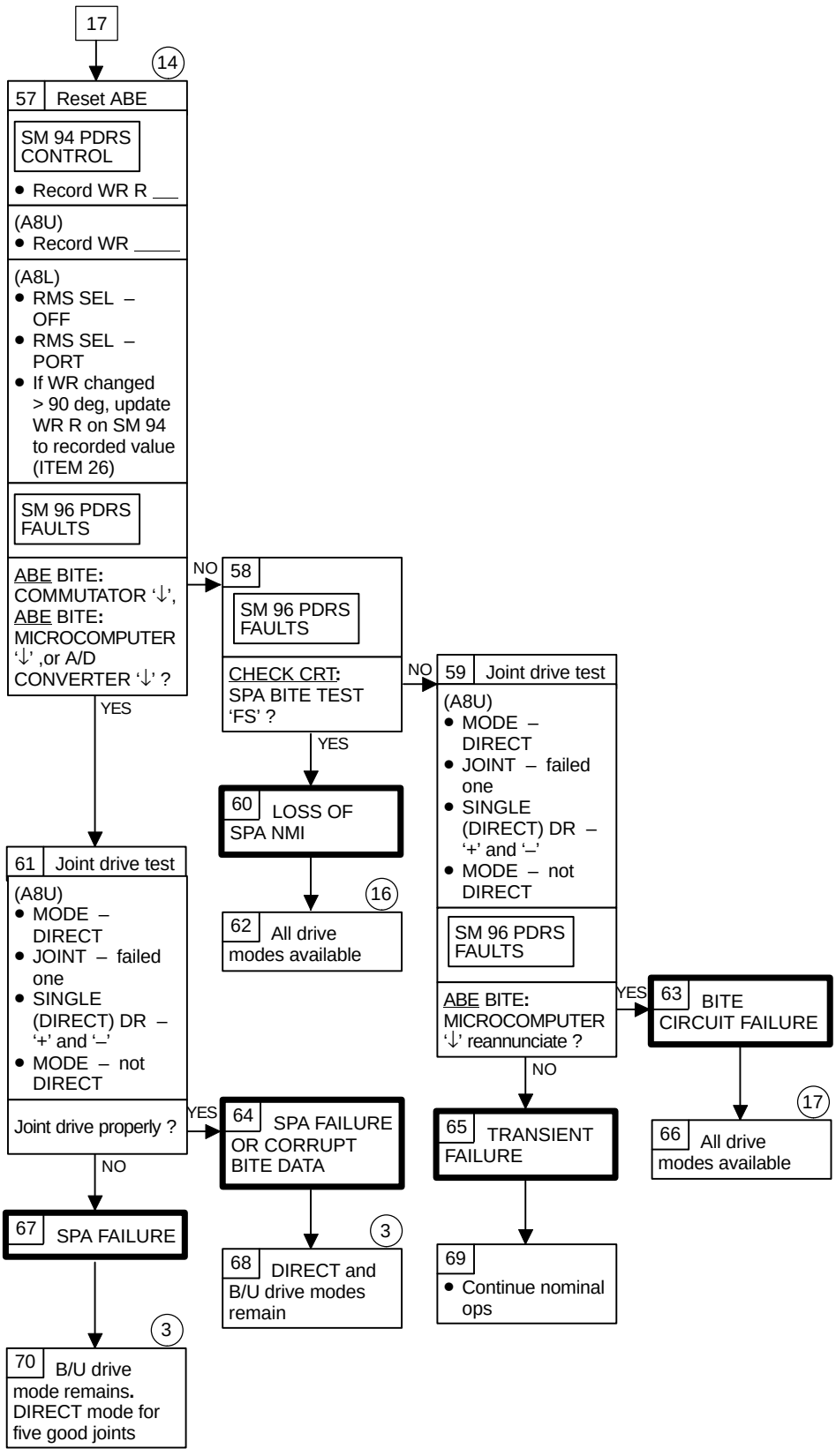
(12) MCIU OVERRIDE: ABE OVRD B (ITEM 37) on SPEC 95, PDRS OVERRIDE, can be used to remove autobrakes and regain computer supported modes (on MCC GO). Possible brake overdrive for failed joint. Ground may determine if joint is sluggish



(13) MCIU OVERRIDE: ABE OVRD C (ITEM 38) on SPEC 95, PDRS OVERRIDE, can be used to remove autobrakes and regain computer supported modes (on MCC GO). Subsequent failures for same joint will be annunciated by CONTR ERR and protected by autobrakes

(14) Additional annunciations may be received after ABE reset

(15) May receive CHECK CRT and DIRECT DRIVE BITE annunciation when driving in Direct mode. Cycle Brake sw to clear failure

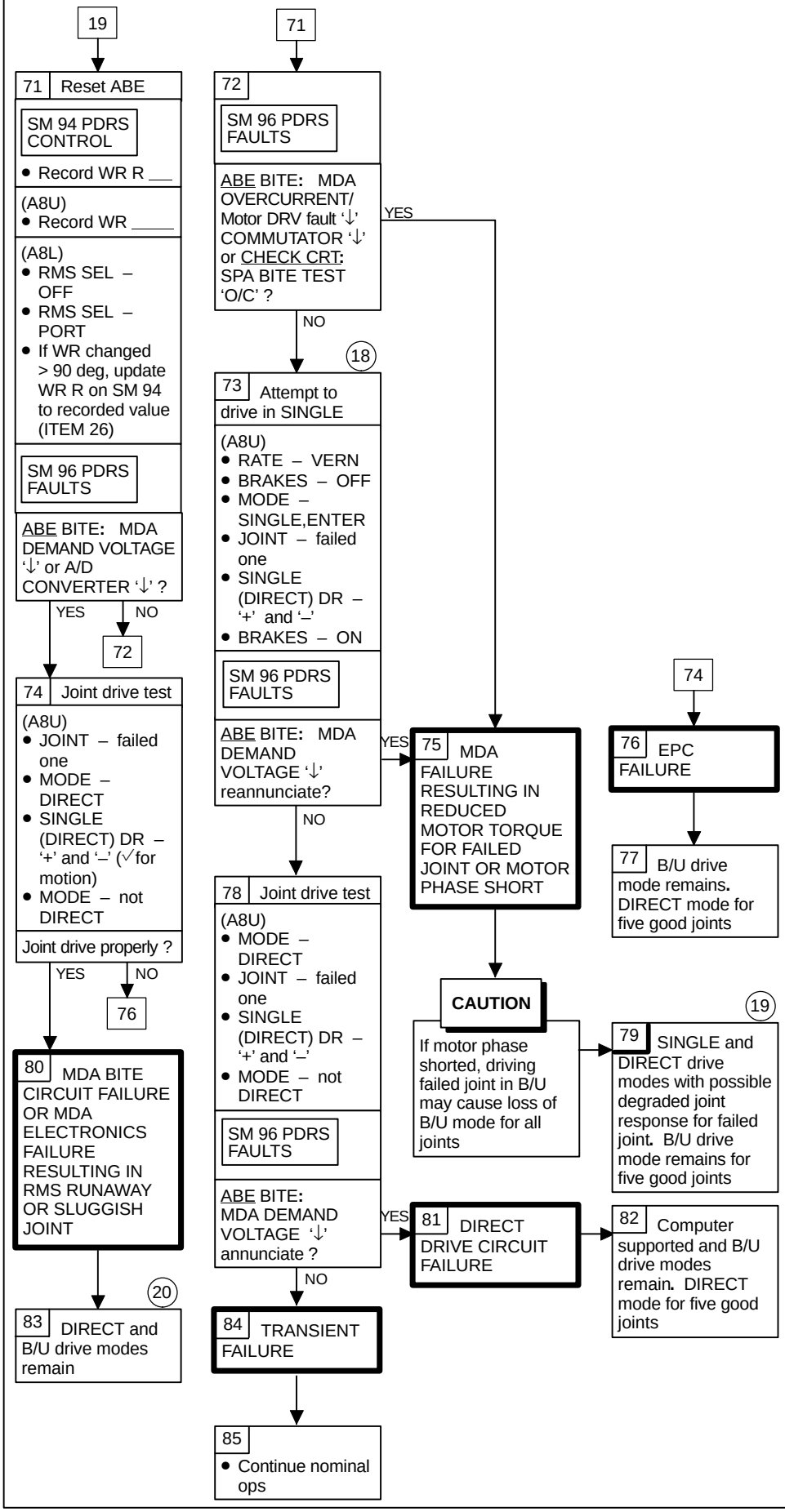


(3) If any wrist joint data is unreliable, EE Auto mode may be lost

(14) Additional annunciations may be received after ABE reset

(16) One failure away from possible uncommanded motion, but protected by auto brakes and annunciated by CONTR ERR

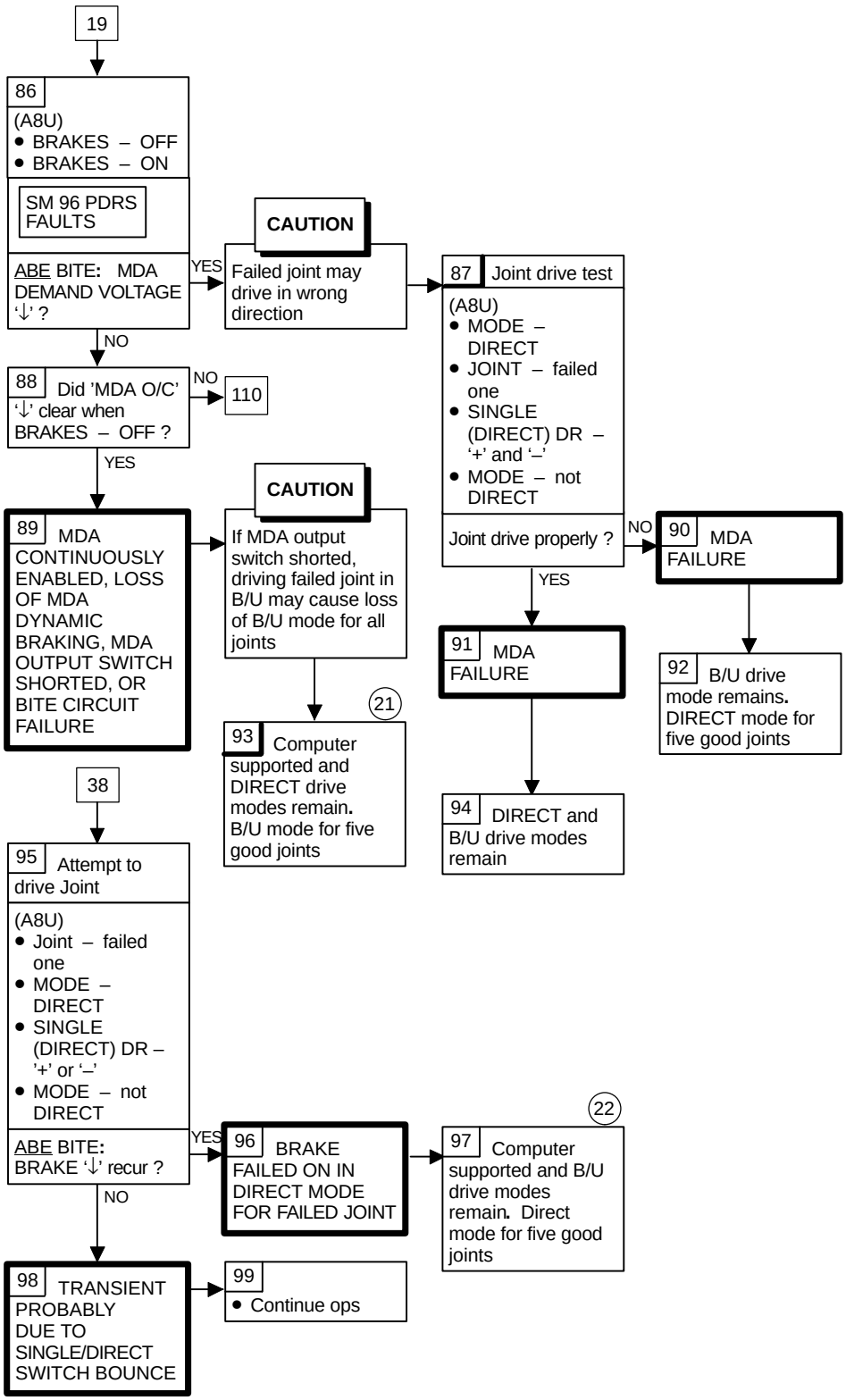
(17) When driving failed joint in DIRECT, failure will reannunciate. Recycle arm select to regain computer supported modes



(18) Removing brakes may result in reannunciation of failure and autobrakes

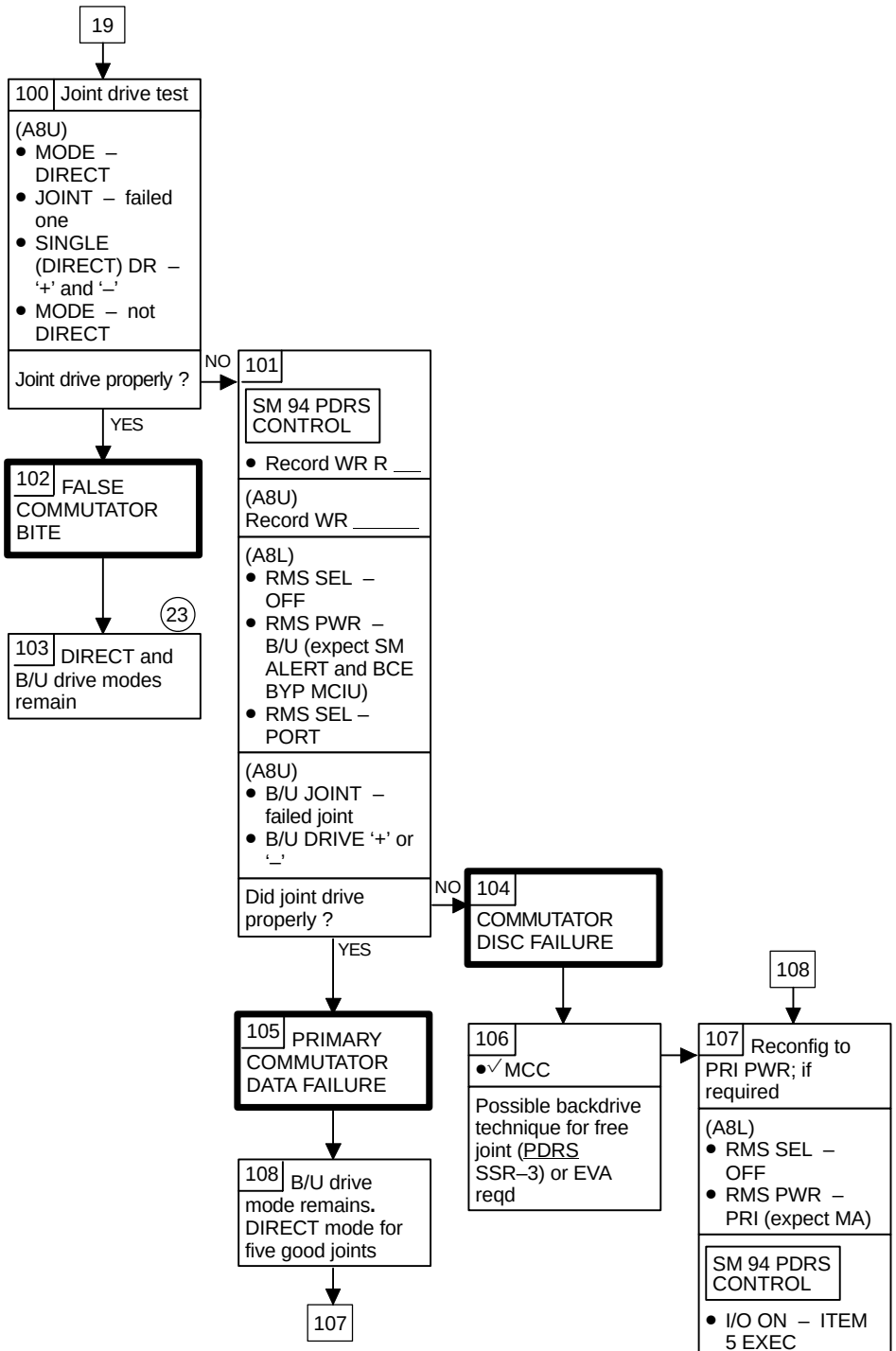
(19) Subsequent MDA Demand Voltage BITE possible while driving failed joint. For commutator and MDA demand voltage failures, MCIU OVERRIDE ABE OVRD B (ITEM 37) on SPEC 95, PDRS OVERRIDE, can be used to remove autobrakes and regain SINGLE drive mode (on MCC GO). Subsequent failure for same joint will not be annunciated or protected by autobrakes

(20) For MDA BITE circuit failure or sluggish joint, MCIU OVERRIDE: ABE OVRD B (ITEM 37) on SPEC 95, PDRS OVERRIDE, can be used to remove autobrakes and regain computer supported modes or SINGLE drive mode respectively (on MCC GO). Subsequent failures for same joint will be annunciated by CONTR ERR and protected by autobrakes

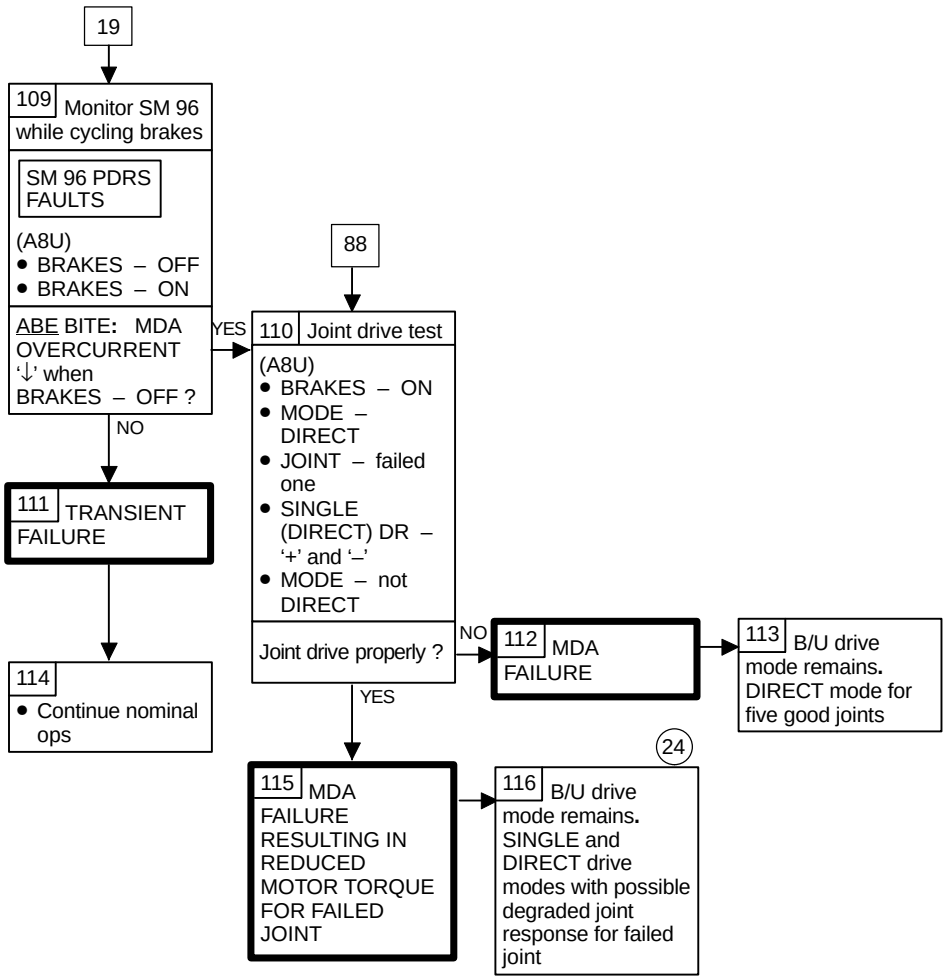


(21) For MDA continuously enabled or loss of dynamic braking, subsequent failure (runaway or failed free joint) will be annunciated but not stopped by autobrakes or dynamic braking respectively

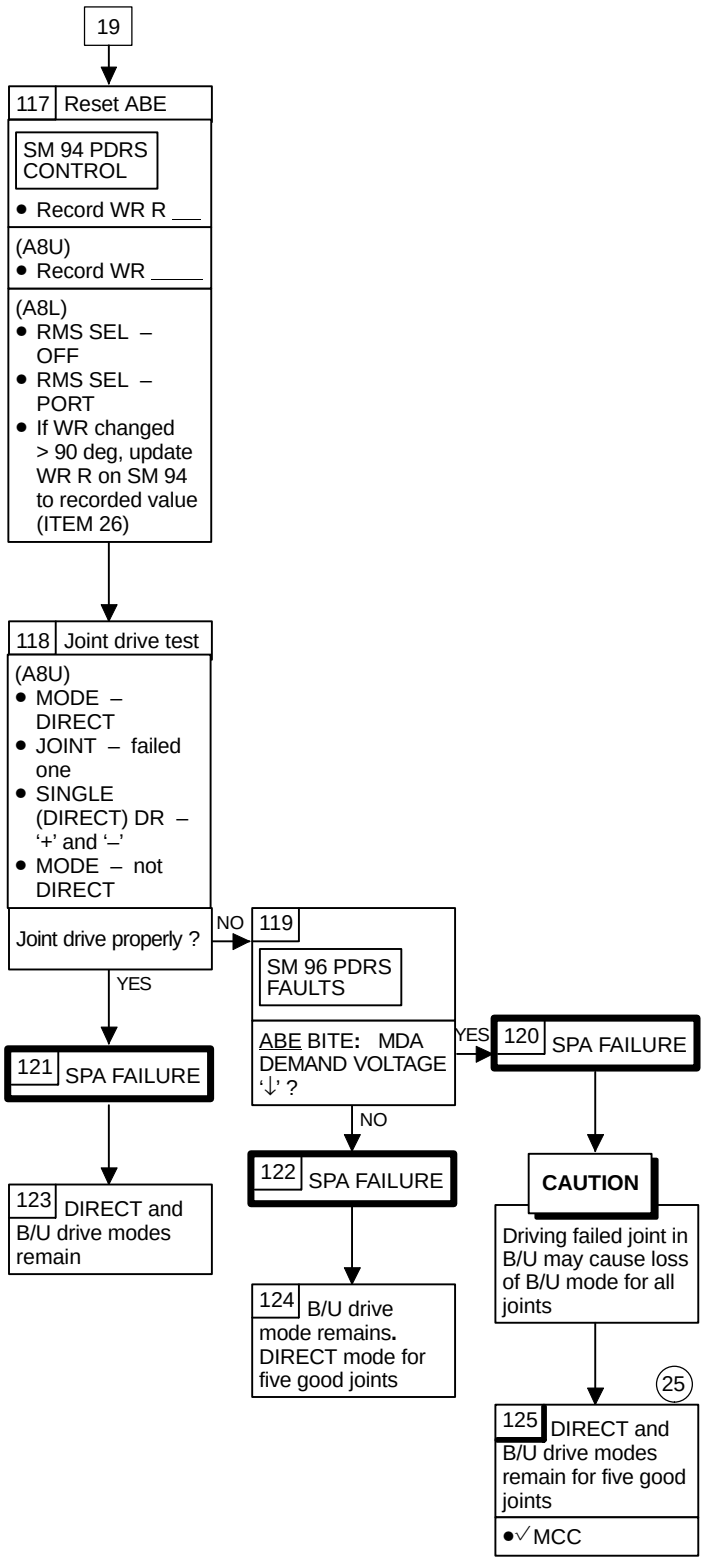
(22) Port RMS SEL will need to be cycled to regain computer supported modes



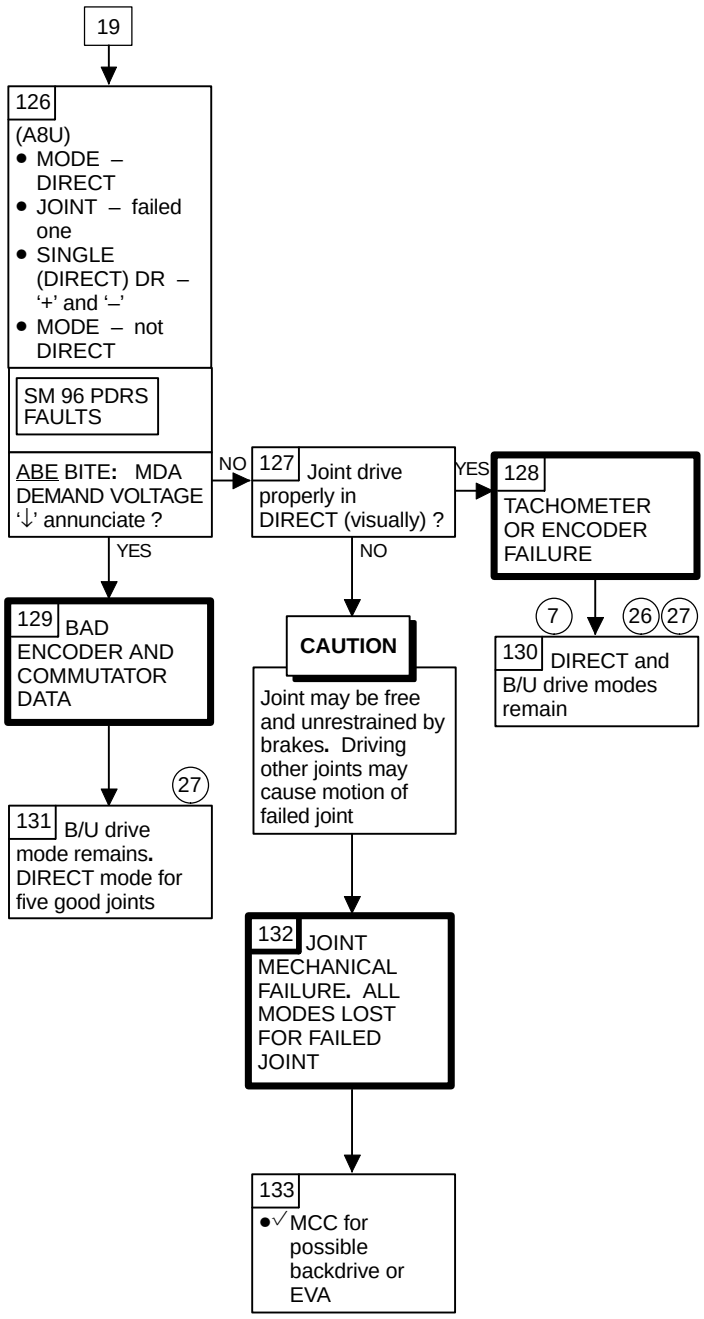
(23) MCIU OVERRIDE: ABE OVRD B (ITEM 37) on SPEC 95, PDRS OVERRIDE, can be used to remove autobrakes and regain single mode for five good joints (on MCC GO)



(24) Subsequent MDA Demand Voltage BITE possible while driving failed joint



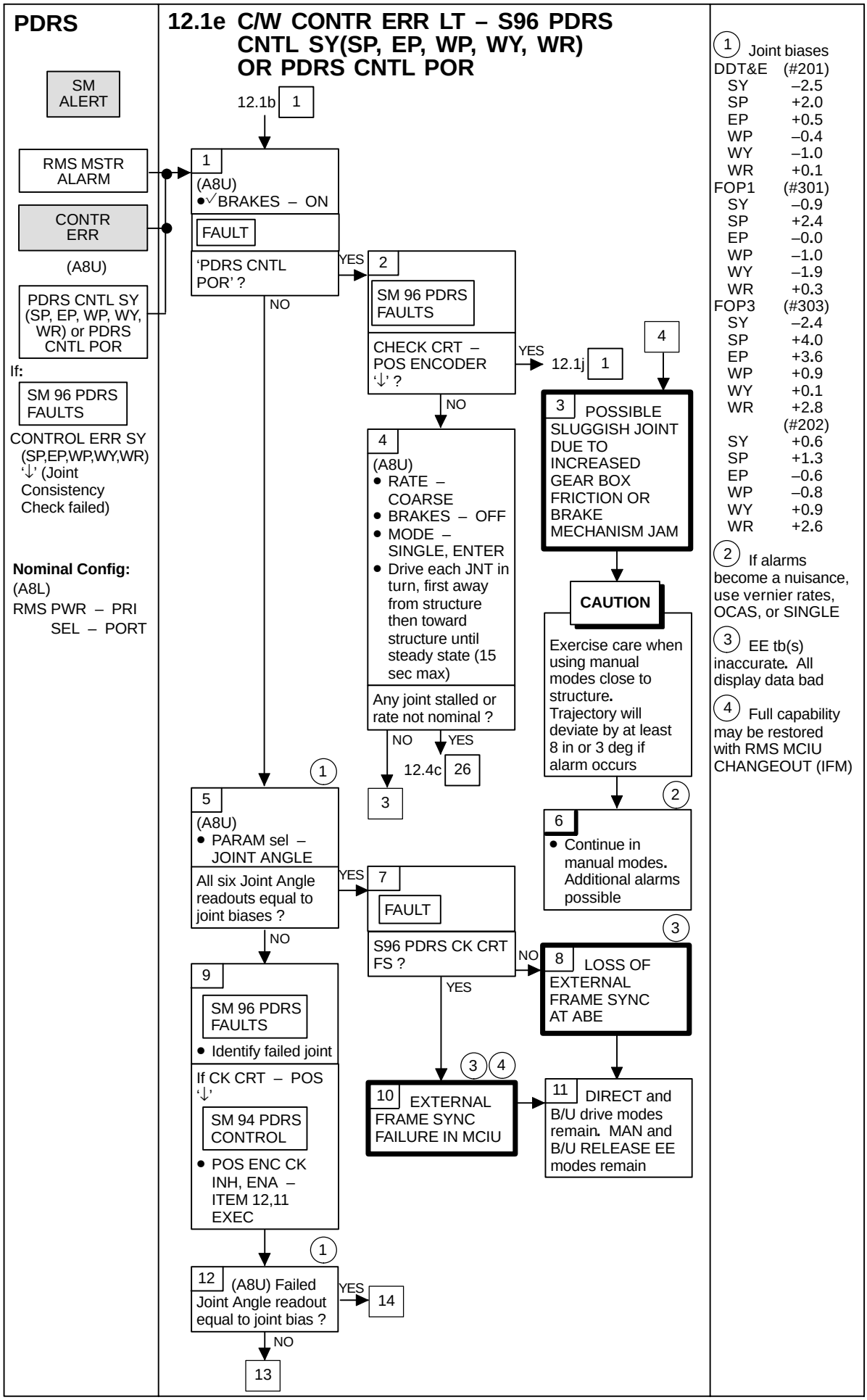
(25) Additional annunciations of TOTAL COMPENSATOR or BACKUP RELAY is good indication that driving failed joint in B/U will cause loss of B/U for all joints

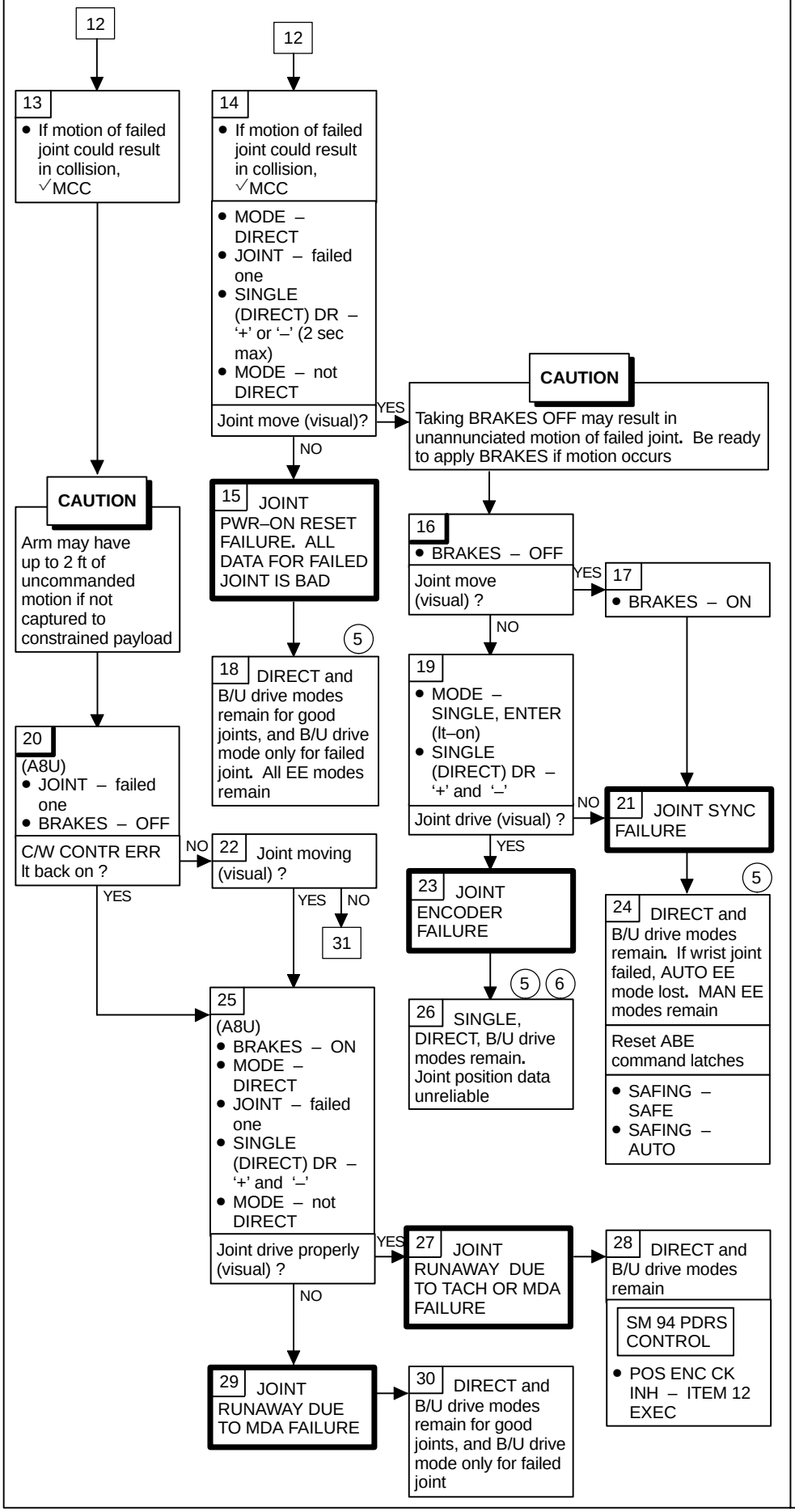


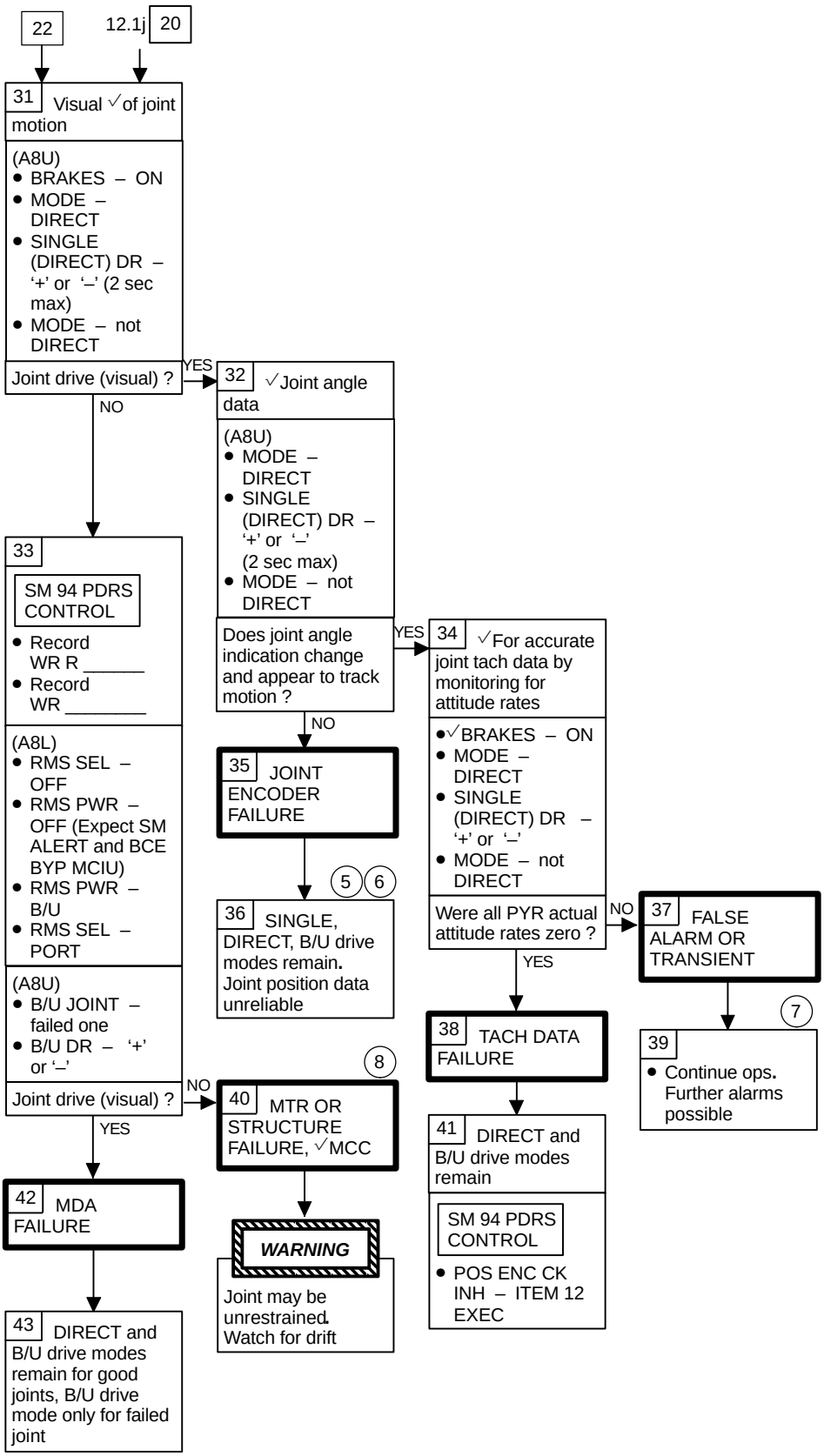
(7) For tach failure, rate data is unreliable

(26) For encoder failure, MCIU OVERRIDE: ABE OVRD A (ITEM 36) on SPEC 95, PDRS OVERRIDE, can be used to remove autobrakes and regain SINGLE mode (on MCC GO). Position hold is not functional for failed joint. Subsequent TACH failure will be annunciated by CONTR ERR or TOTAL COMPENSATOR and protected by autobrakes

(27) For encoder failure, joint data is unreliable. REACH LIMIT and SOFT STOP annunciations not available for failed joint


PDRS
12.1e C/W CONTR ERR LT – S96 PDRS CNTL SY(SP, EP, WP, WY, WR) OR PDRS CNTL POR
SM ALERT
RMS MSTR ALARM
CONTR ERR
(A8U)
PDRS CNTL SY (SP, EP, WP, WY, WR) or PDRS CNTL POR
If:
SM 96 PDRS FAULTS
CONTROL ERR SY (SP,EP,WP,WY,WR) '↓' (Joint Consistency Check failed)
Nominal Config:
(A8L)
RMS PWR – PRI
SEL – PORT
12.1b 1
1
(A8U)
•✓BRAKES – ON
FAULT
'PDRS CNTL POR' ?
YES
NO
2
SM 96 PDRS FAULTS
CHECK CRT – POS ENCODER '↓' ?
YES
12.1j 1
NO
4
(A8U)
• RATE – COARSE
• BRAKES – OFF
• MODE – SINGLE, ENTER
• Drive each JNT in turn, first away from structure then toward structure until steady state (15 sec max)
Any joint stalled or rate not nominal ?
NO
YES
12.4c 26
3
4
3 POSSIBLE SLUGGISH JOINT DUE TO INCREASED GEAR BOX FRICTION OR BRAKE MECHANISM JAM
CAUTION
Exercise care when using manual modes close to structure. Trajectory will deviate by at least 8 in or 3 deg if alarm occurs
2
6
• Continue in manual modes. Additional alarms possible
1
5
(A8U)
• PARAM sel – JOINT ANGLE
All six Joint Angle readouts equal to joint biases ?
YES
NO
7
FAULT
S96 PDRS CK CRT FS ?
NO
YES
3
8 LOSS OF EXTERNAL FRAME SYNC AT ABE
9
SM 96 PDRS FAULTS
• Identify failed joint
If CK CRT – POS '↓'
SM 94 PDRS CONTROL
• POS ENC CK INH, ENA – ITEM 12,11 EXEC
3 4
10 EXTERNAL FRAME SYNC FAILURE IN MCIU
11 DIRECT and B/U drive modes remain. MAN and B/U RELEASE EE modes remain
1
12 (A8U) Failed Joint Angle readout equal to joint bias ?
YES
14
NO
13
1 Joint biases
DDT&E (#201)
SY –2.5
SP +2.0
EP +0.5
WP –0.4
WY –1.0
WR +0.1
FOP1 (#301)
SY –0.9
SP +2.4
EP –0.0
WP –1.0
WY –1.9
WR +0.3
FOP3 (#303)
SY –2.4
SP +4.0
EP +3.6
WP +0.9
WY +0.1
WR +2.8
(#202)
SY +0.6
SP +1.3
EP –0.6
WP –0.8
WY +0.9
WR +2.6
2 If alarms become a nuisance, use vernier rates, OCAS, or SINGLE
3 EE tb(s) inaccurate. All display data bad
4 Full capability may be restored with RMS MCIU CHANGEOUT (IFM)


12
13
• If motion of failed joint could result in collision, ✓MCC
12
14
• If motion of failed joint could result in collision, ✓MCC
• MODE – DIRECT
• JOINT – failed one
• SINGLE (DIRECT) DR – '+' or '–' (2 sec max)
• MODE – not DIRECT
Joint move (visual)?
YES
NO
CAUTION
Taking BRAKES OFF may result in unannunciated motion of failed joint. Be ready to apply BRAKES if motion occurs
CAUTION
Arm may have up to 2 ft of uncommanded motion if not captured to constrained payload
15 JOINT PWR–ON RESET FAILURE. ALL DATA FOR FAILED JOINT IS BAD
16
• BRAKES – OFF
Joint move (visual) ?
YES
17
• BRAKES – ON
NO
5
18 DIRECT and B/U drive modes remain for good joints, and B/U drive mode only for failed joint. All EE modes remain
19
• MODE – SINGLE, ENTER (lt–on)
• SINGLE (DIRECT) DR – '+' and '–'
Joint drive (visual) ?
NO
YES
21 JOINT SYNC FAILURE
20
(A8U)
• JOINT – failed one
• BRAKES – OFF
C/W CONTR ERR lt back on ?
NO
YES
22 Joint moving (visual) ?
YES
NO
31
23 JOINT ENCODER FAILURE
5
24 DIRECT and B/U drive modes remain. If wrist joint failed, AUTO EE mode lost. MAN EE modes remain
Reset ABE command latches
• SAFING – SAFE
• SAFING – AUTO
5
6
26 SINGLE, DIRECT, B/U drive modes remain. Joint position data unreliable
25
(A8U)
• BRAKES – ON
• MODE – DIRECT
• JOINT – failed one
• SINGLE (DIRECT) DR – '+' and '–'
• MODE – not DIRECT
Joint drive properly (visual) ?
YES
NO
27 JOINT RUNAWAY DUE TO TACH OR MDA FAILURE
28 DIRECT and B/U drive modes remain
SM 94 PDRS CONTROL
• POS ENC CK INH – ITEM 12 EXEC
29 JOINT RUNAWAY DUE TO MDA FAILURE
30 DIRECT and B/U drive modes remain for good joints, and B/U drive mode only for failed joint
5 REACH LIMITs and SOFT STOPs annunciation not available for failed joint
6 Position hold function will not work for failed joint

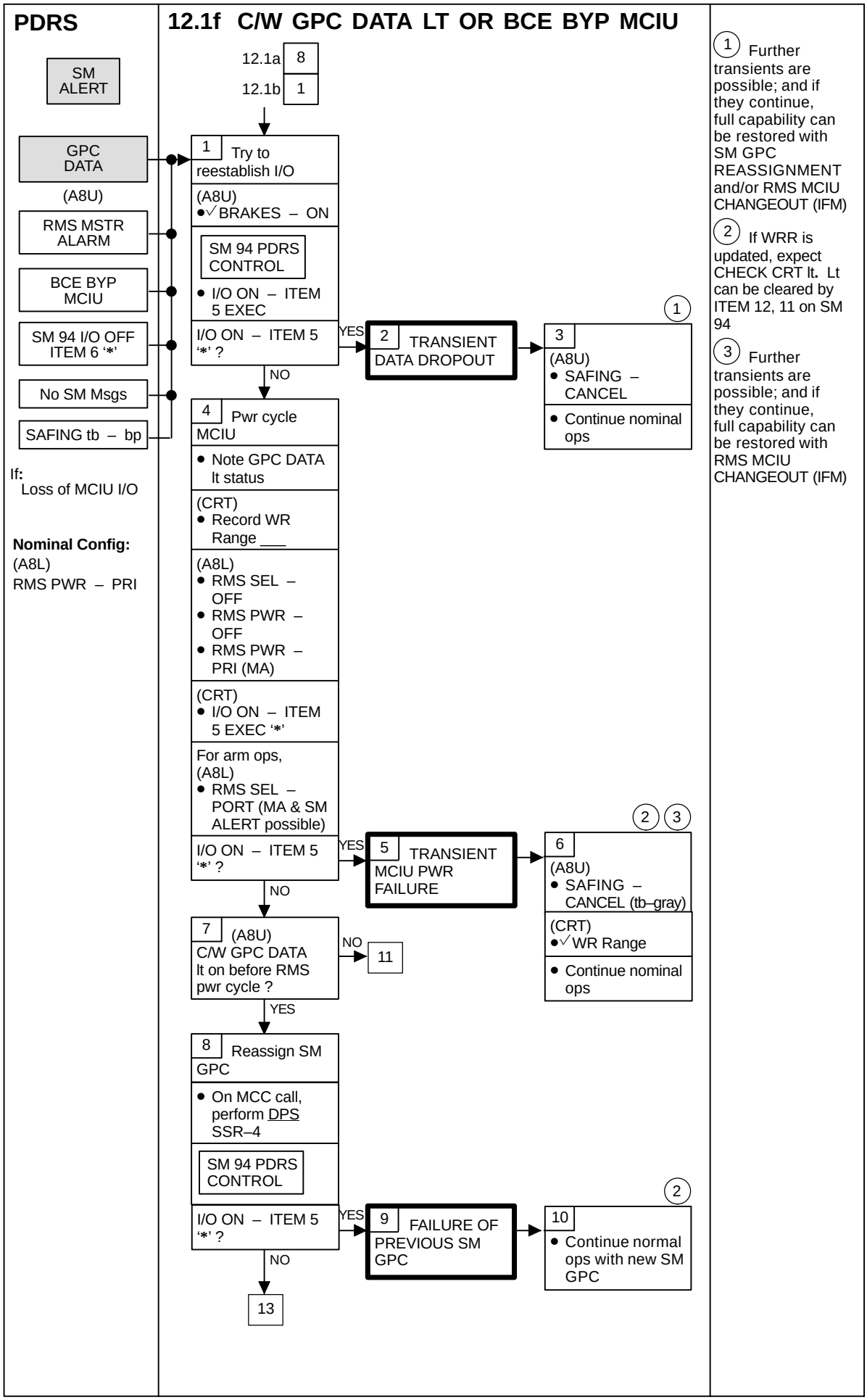


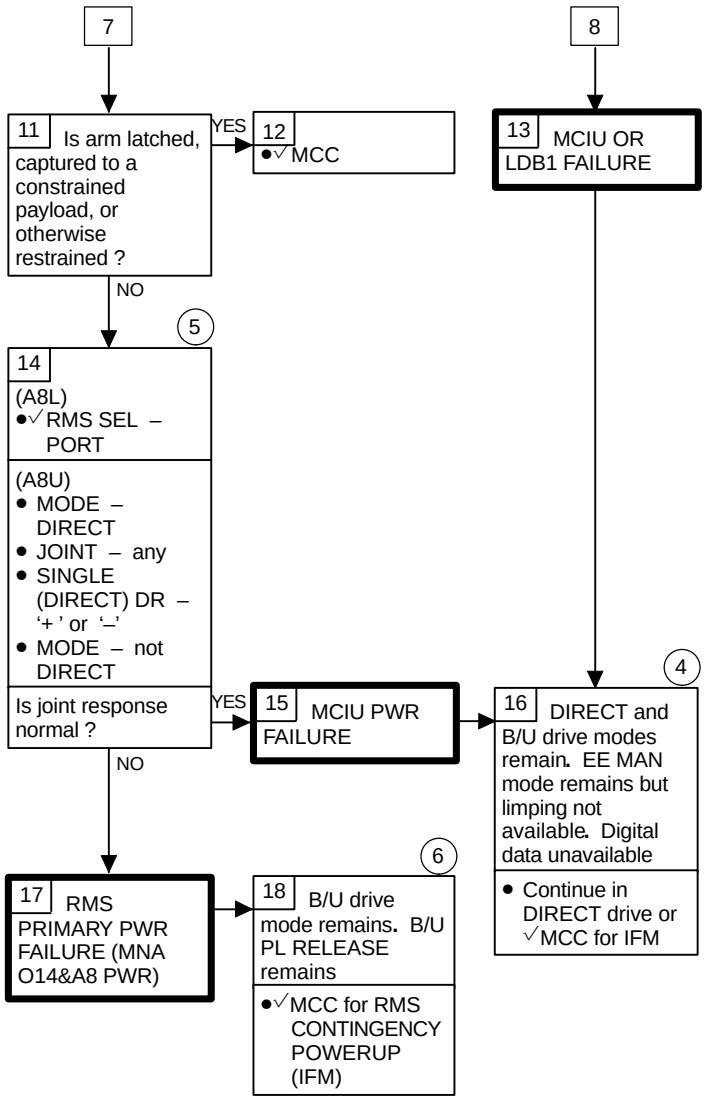
(5) REACH LIMITs and SOFT STOPs annunciation not available for failed joint

(6) Position hold function will not work for failed joint

(7) MCC can determine if fwd/backdrive flag failure is cause of false alarm

(8) Whiplash technique or EVA may be reqd to cradle arm

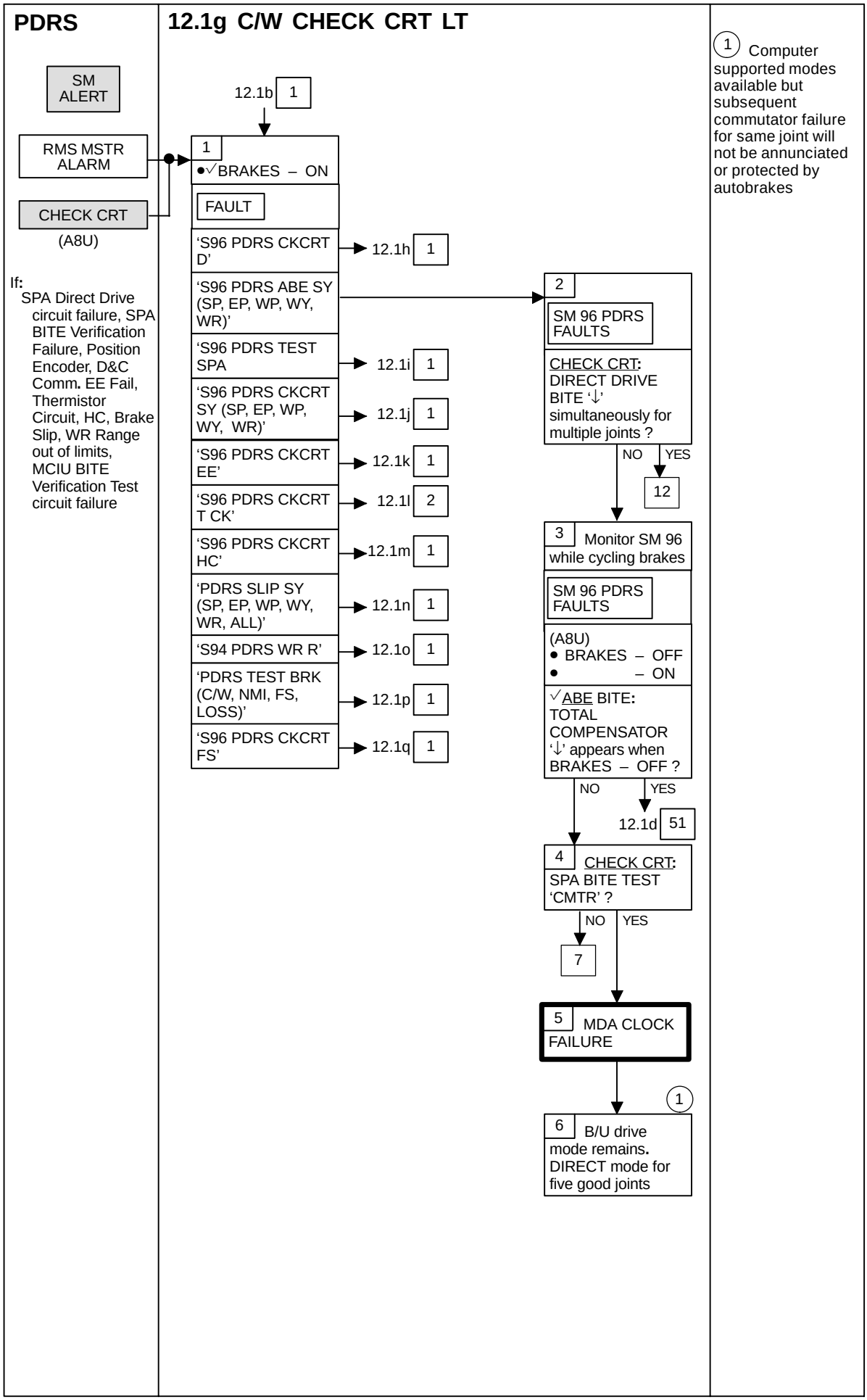

PDRS
12.1f C/W GPC DATA LT OR BCE BYP MCIU
SM ALERT
GPC DATA
(A8U)
RMS MSTR ALARM
BCE BYP MCIU
SM 94 I/O OFF ITEM 6 '*'
No SM Msgs
SAFING tb – bp
If:
Loss of MCIU I/O
Nominal Config:
(A8L)
RMS PWR – PRI
12.1a 8
12.1b 1
1 Try to reestablish I/O
(A8U)
•✓BRAKES – ON
SM 94 PDRS CONTROL
• I/O ON – ITEM 5 EXEC
I/O ON – ITEM 5 '*' ?
YES
2 TRANSIENT DATA DROPOUT
3
(A8U)
• SAFING – CANCEL
• Continue nominal ops
1
NO
4 Pwr cycle MCIU
• Note GPC DATA lt status
(CRT)
• Record WR Range ___
(A8L)
• RMS SEL – OFF
• RMS PWR – OFF
• RMS PWR – PRI (MA)
(CRT)
• I/O ON – ITEM 5 EXEC '*'
For arm ops,
(A8L)
• RMS SEL – PORT (MA & SM ALERT possible)
I/O ON – ITEM 5 '*' ?
YES
5 TRANSIENT MCIU PWR FAILURE
6
(A8U)
• SAFING – CANCEL (tb–gray)
(CRT)
•✓WR Range
• Continue nominal ops
2 3
NO
7 (A8U) C/W GPC DATA lt on before RMS pwr cycle ?
NO
11
YES
8 Reassign SM GPC
• On MCC call, perform DPS SSR–4
SM 94 PDRS CONTROL
I/O ON – ITEM 5 '*' ?
YES
9 FAILURE OF PREVIOUS SM GPC
10
• Continue normal ops with new SM GPC
2
NO
13
1 Further transients are possible; and if they continue, full capability can be restored with SM GPC REASSIGNMENT and/or RMS MCIU CHANGEOUT (IFM)
2 If WRR is updated, expect CHECK CRT lt. Lt can be cleared by ITEM 12, 11 on SM 94
3 Further transients are possible; and if they continue, full capability can be restored with RMS MCIU CHANGEOUT (IFM)

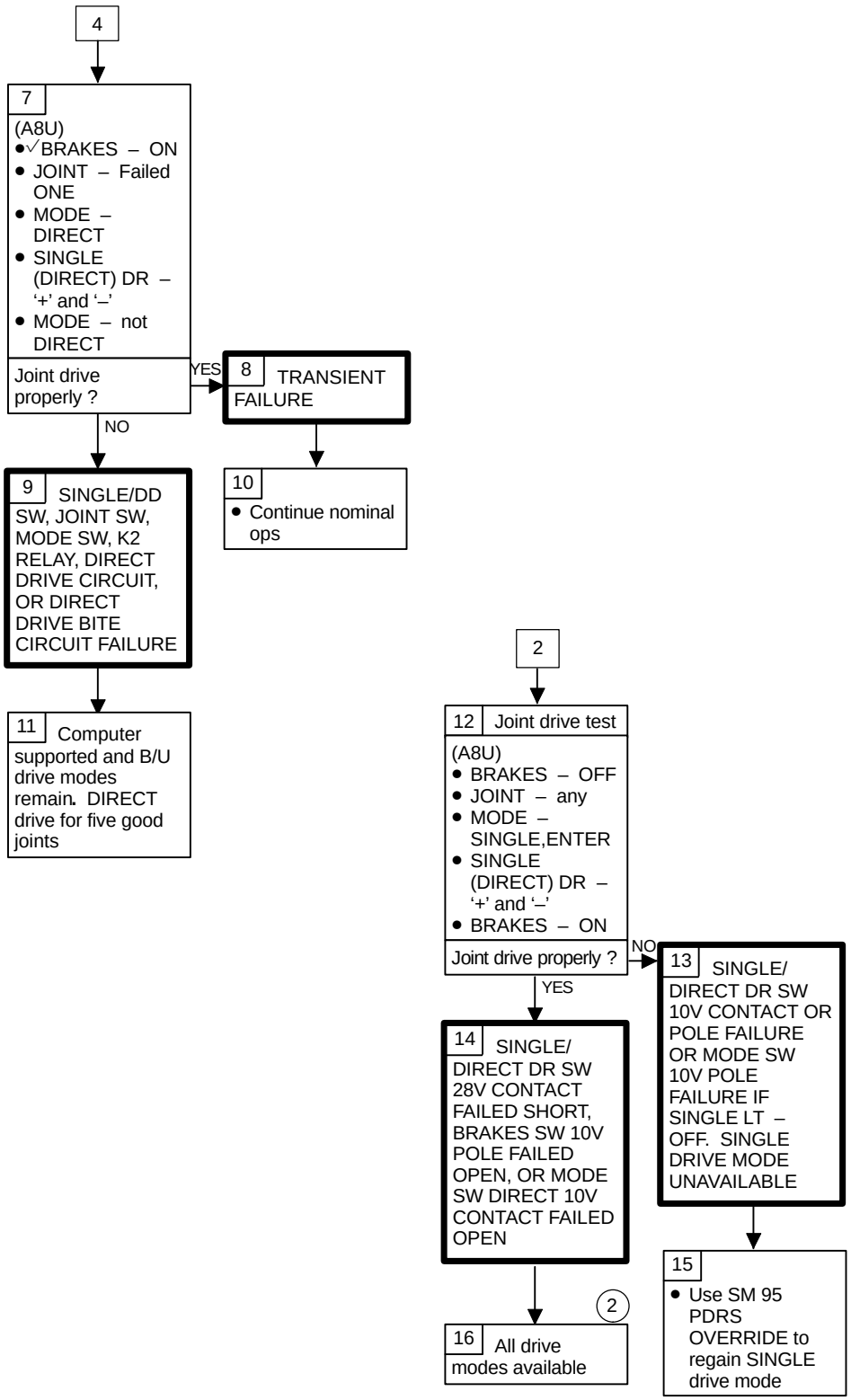


(4) Full capability may be restored with MCIU CHANGEOUT (IFM)

(5) Mode lt may not illuminate

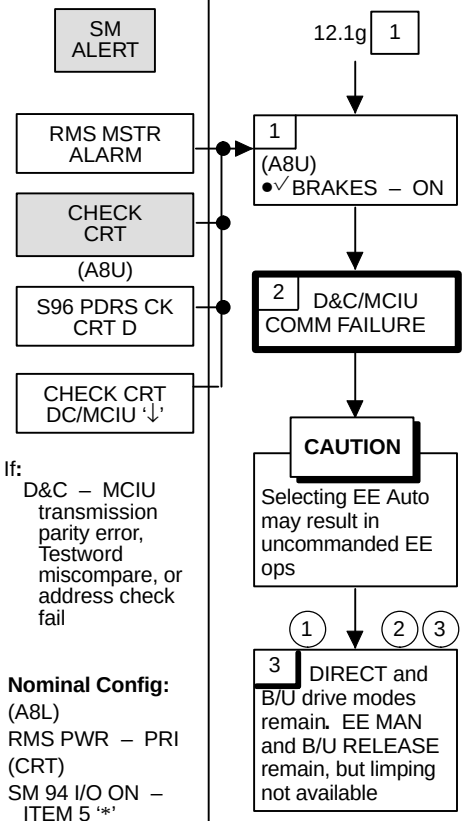
(6) Primary pwr may be restored following IFM. Panel edge lighting may not be available


PDRS
12.1g C/W CHECK CRT LT
SM ALERT
RMS MSTR ALARM
CHECK CRT
(A8U)
If:
SPA Direct Drive circuit failure, SPA BITE Verification Failure, Position Encoder, D&C Comm. EE Fail, Thermistor Circuit, HC, Brake Slip, WR Range out of limits, MCIU BITE Verification Test circuit failure
12.1b 1
1
•✓BRAKES – ON
FAULT
'S96 PDRS CKCRT D'
12.1h 1
'S96 PDRS ABE SY (SP, EP, WP, WY, WR)'
'S96 PDRS TEST SPA
12.1i 1
'S96 PDRS CKCRT SY (SP, EP, WP, WY, WR)'
12.1j 1
'S96 PDRS CKCRT EE'
12.1k 1
'S96 PDRS CKCRT T CK'
12.1l 2
'S96 PDRS CKCRT HC'
12.1m 1
'PDRS SLIP SY (SP, EP, WP, WY, WR, ALL)'
12.1n 1
'S94 PDRS WR R'
12.1o 1
'PDRS TEST BRK (C/W, NMI, FS, LOSS)'
12.1p 1
'S96 PDRS CKCRT FS'
12.1q 1
2
SM 96 PDRS FAULTS
CHECK CRT: DIRECT DRIVE BITE '↓' simultaneously for multiple joints ?
NO
YES
12
3
Monitor SM 96 while cycling brakes
SM 96 PDRS FAULTS
(A8U)
• BRAKES – OFF
• – ON
✓ABE BITE: TOTAL COMPENSATOR '↓' appears when BRAKES – OFF ?
NO
YES
12.1d 51
4
CHECK CRT: SPA BITE TEST 'CMTR' ?
NO
YES
7
5
MDA CLOCK FAILURE
1
6
B/U drive mode remains. DIRECT mode for five good joints
1 Computer supported modes available but subsequent commutator failure for same joint will not be annunciated or protected by autobrakes


4
7
(A8U)
•✓BRAKES – ON
• JOINT – Failed ONE
• MODE – DIRECT
• SINGLE (DIRECT) DR – '+' and '–'
• MODE – not DIRECT
Joint drive properly ?
YES
8 TRANSIENT FAILURE
NO
9 SINGLE/DD SW, JOINT SW, MODE SW, K2 RELAY, DIRECT DRIVE CIRCUIT, OR DIRECT DRIVE BITE CIRCUIT FAILURE
10
• Continue nominal ops
11 Computer supported and B/U drive modes remain. DIRECT drive for five good joints
2
12 Joint drive test
(A8U)
• BRAKES – OFF
• JOINT – any
• MODE – SINGLE,ENTER
• SINGLE (DIRECT) DR – '+' and '–'
• BRAKES – ON
Joint drive properly ?
NO
YES
13 SINGLE/ DIRECT DR SW 10V CONTACT OR POLE FAILURE OR MODE SW 10V POLE FAILURE IF SINGLE LT – OFF. SINGLE DRIVE MODE UNAVAILABLE
14 SINGLE/ DIRECT DR SW 28V CONTACT FAILED SHORT, BRAKES SW 10V POLE FAILED OPEN, OR MODE SW DIRECT 10V CONTACT FAILED OPEN
15
• Use SM 95 PDRS OVERRIDE to regain SINGLE drive mode
2
16 All drive modes available
2 One failure away from uncommanded joint drive in DIRECT

PDRS

12.1h C/W CHECK CRT LT – S96 PDRS CKCRT D



If:
- D&C – MCIU transmission parity error, Testword miscompare, or address check fail

Nominal Config:

(A8L)

RMS PWR – PRI

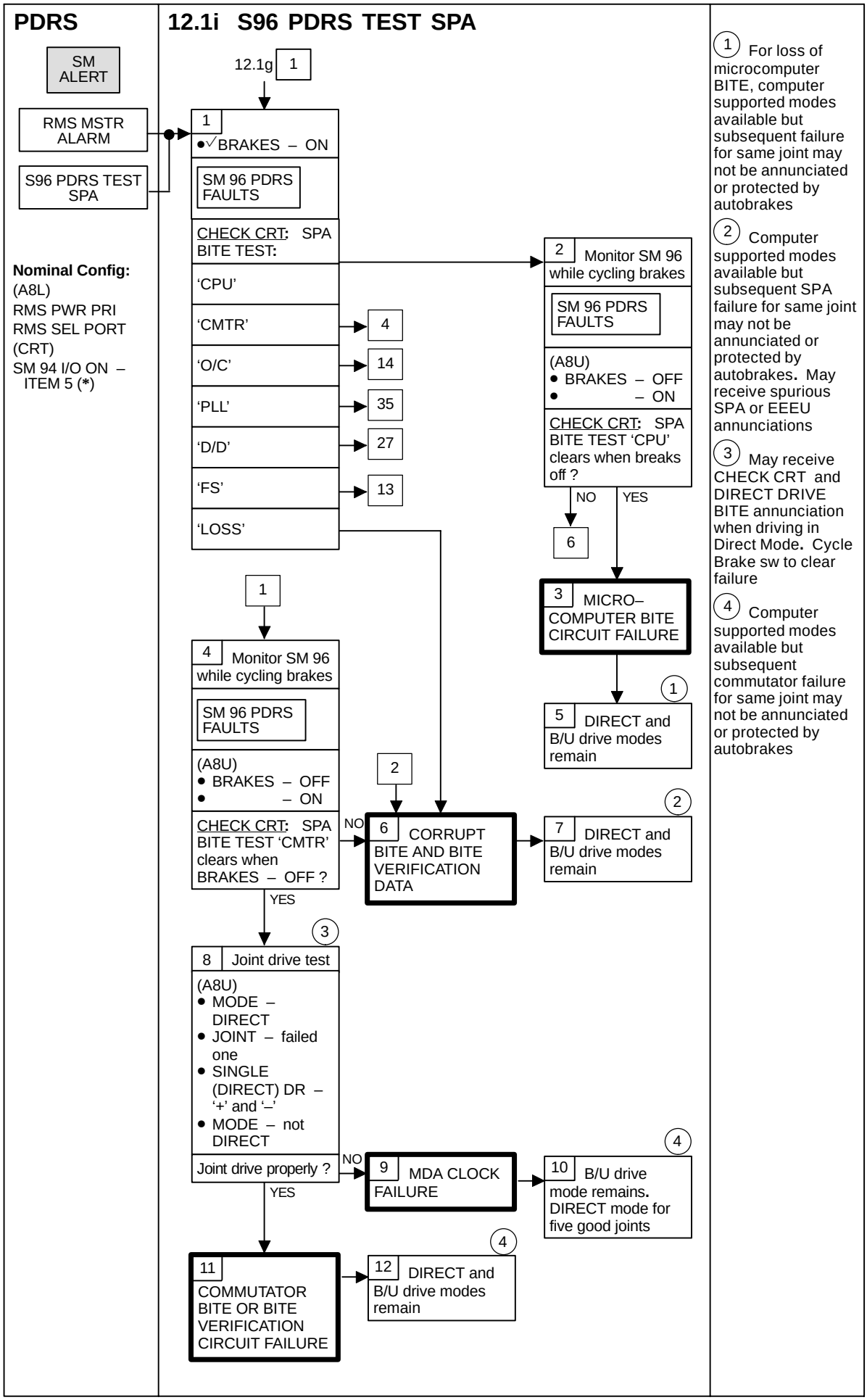
(CRT)

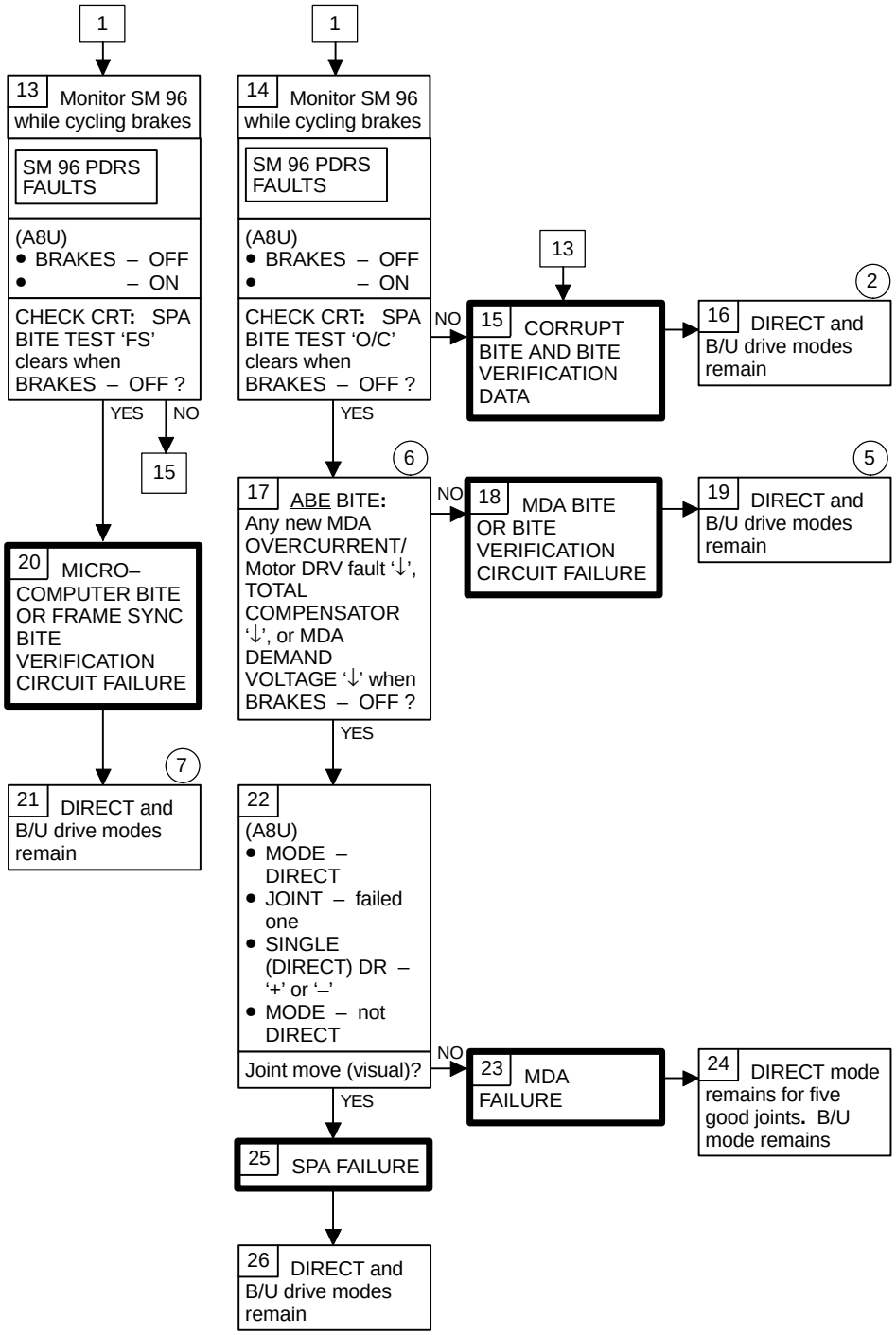
SM 94 I/O ON – ITEM 5 '*'

(1) Data may be unreliable on D&C pnl. ABE data on SM 169 still good

(2) Full capability may be restored with RMS MCIU CHANGEOUT (IFM). If problem is in D&C pnl, MCIU changeout will not restore capability

(3) Possible PDRS SLIP msgs if driving in DIRECT (once per joint). Possible PDRS DERIG and PDRS RELEASE msgs when performing EE release


PDRS
12.1i S96 PDRS TEST SPA
SM ALERT
RMS MSTR ALARM
S96 PDRS TEST SPA
Nominal Config:
(A8L)
RMS PWR PRI
RMS SEL PORT (CRT)
SM 94 I/O ON – ITEM 5 (*)
12.1g 1
1
•✓BRAKES – ON
SM 96 PDRS FAULTS
CHECK CRT: SPA BITE TEST:
'CPU'
'CMTR'
'O/C'
'PLL'
'D/D'
'FS'
'LOSS'
4
14
35
27
13
2 Monitor SM 96 while cycling brakes
SM 96 PDRS FAULTS
(A8U)
• BRAKES – OFF
• – ON
CHECK CRT: SPA BITE TEST 'CPU' clears when breaks off ?
NO
YES
6
3 MICRO–COMPUTER BITE CIRCUIT FAILURE
1
5 DIRECT and B/U drive modes remain
1
4 Monitor SM 96 while cycling brakes
SM 96 PDRS FAULTS
(A8U)
• BRAKES – OFF
• – ON
CHECK CRT: SPA BITE TEST 'CMTR' clears when BRAKES – OFF ?
NO
2
6 CORRUPT BITE AND BITE VERIFICATION DATA
2
7 DIRECT and B/U drive modes remain
YES
3
8 Joint drive test
(A8U)
• MODE – DIRECT
• JOINT – failed one
• SINGLE (DIRECT) DR – '+' and '–'
• MODE – not DIRECT
Joint drive properly ?
NO
9 MDA CLOCK FAILURE
4
10 B/U drive mode remains. DIRECT mode for five good joints
YES
4
11 COMMUTATOR BITE OR BITE VERIFICATION CIRCUIT FAILURE
12 DIRECT and B/U drive modes remain
1 For loss of microcomputer BITE, computer supported modes available but subsequent failure for same joint may not be annunciated or protected by autobrakes
2 Computer supported modes available but subsequent SPA failure for same joint may not be annunciated or protected by autobrakes. May receive spurious SPA or EEEU annunciations
3 May receive CHECK CRT and DIRECT DRIVE BITE annunciation when driving in Direct Mode. Cycle Brake sw to clear failure
4 Computer supported modes available but subsequent commutator failure for same joint may not be annunciated or protected by autobrakes

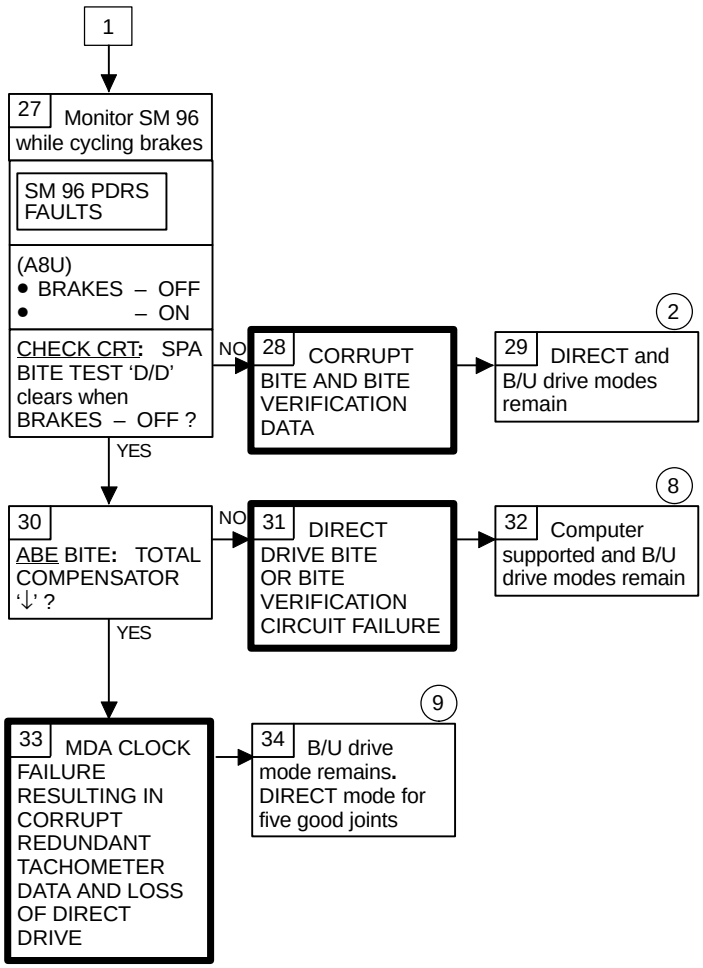


(2) Computer supported modes available but subsequent SPA failure for same joint may not be annunciated or protected by autobrakes. May receive spurious SPA or EEEU annunciations

(5) For MDA BITE circuit failure, computer supported modes available but subsequent MDA failure for same joint will not be annunciated or protected by autobrakes

(6) IF TOTAL COMPENSATOR and MDA DEMAND VOLTAGE occur together, BRAKE and A/D CONVERTER will annunciate due to multiple failure combination

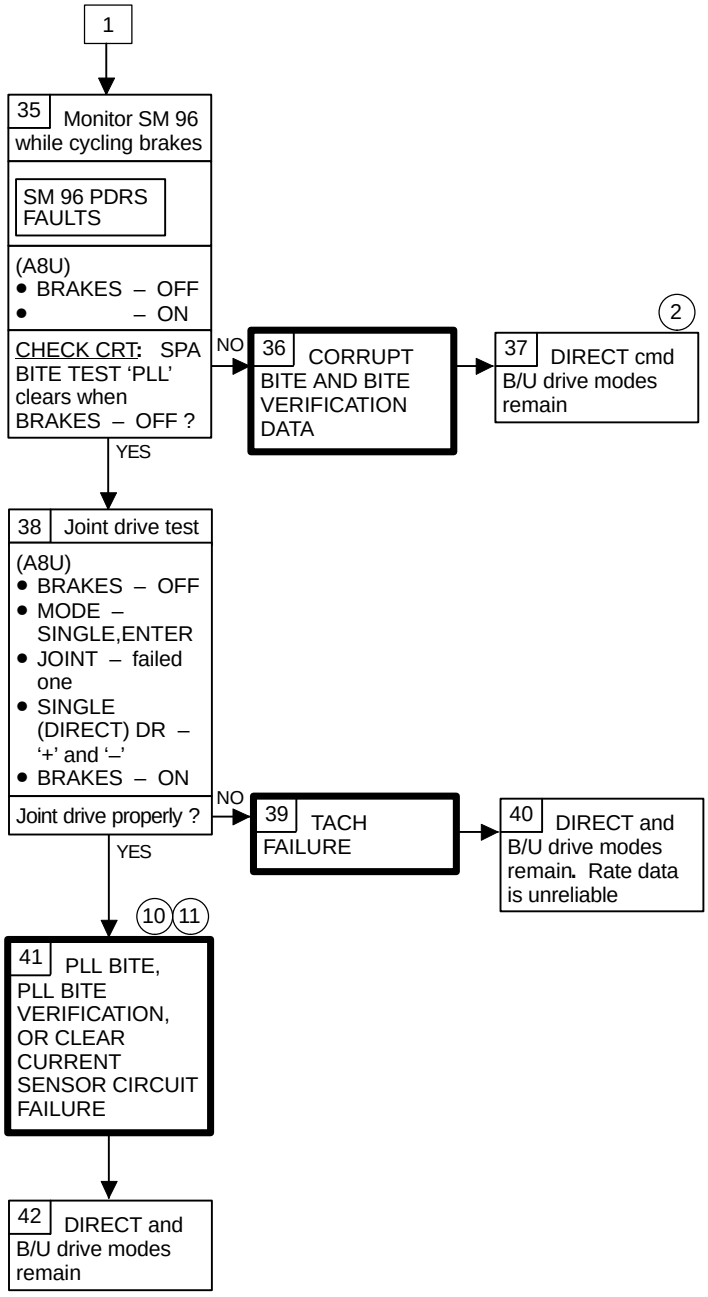
(7) For loss of microcomputer BITE, computer supported modes available but subsequent failure for same joint will not be annunciated or protected by autobrakes



(2) Computer supported modes available but subsequent SPA failure for same joint may not be annunciated or protected by autobrakes. May receive spurious SPA or EEEU annunciations

(8) For DIRECT DRIVE BITE failure, DIRECT mode available but for subsequent failure joint could drive in wrong direction or drive two joints simultaneously

(9) MCIU OVERRIDE: ABE OVRD C (ITEM 38) on SPEC 95, PDRS OVERRIDE, can be used to remove autobrakes and regain computer supported modes (on MCC GO). Subsequent failures for same joint will be annunciated by CONTR ERR and protected by autobrakes

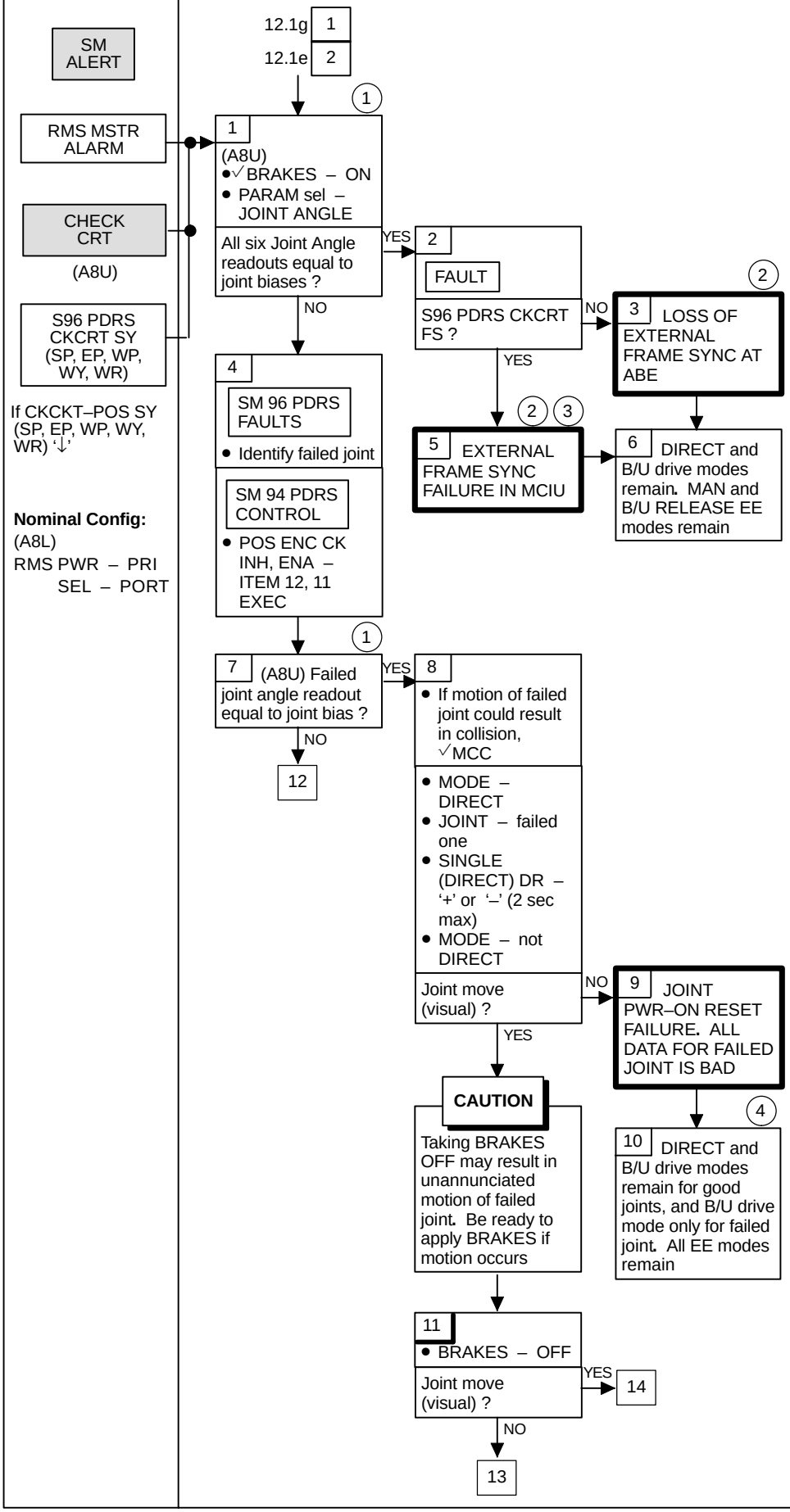


(2) Computer supported modes available but subsequent SPA failure for same joint may not be annunciated or protected by autobrakes. May receive spurious SPA or EEEU annunciations

(10) For PLL BITE Circuit Failure Subsequent tachometer failure for same joint will be annunciated by POS ENCODER BITE and protected by autobrakes

(11) For clear current sensor circuit failure, subsequent loss of 12.8 MHz clock will result in joint driving at last commanded rate. Not annunciated or protected by auto brakes

12.1j C/W CHECK CRT LT – S96 PDRS CKCRT SY(SP, EP, WP, WY, WR)



(1) Joint biases

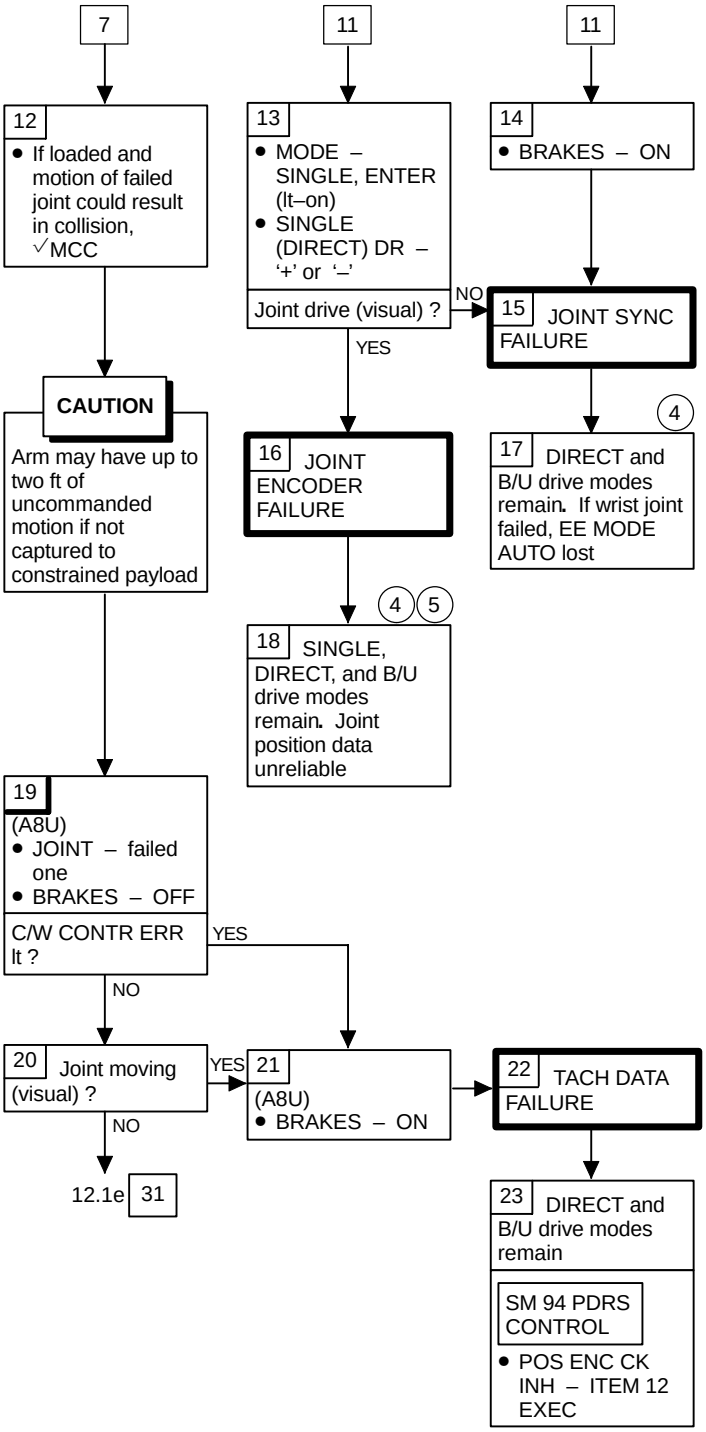
DDT&E	(201)
SY	–2.5
SP	+2.0
EP	+0.5
WP	–0.4
WY	–1.0
WR	+0.1
FOP1	(301)
SY	–0.9
SP	+2.4
EP	–0.0
WP	–1.0
WY	–1.9
WR	+0.3
FOP3	(303)
SY	–2.4
SP	+4.0
EP	+3.6
WP	+0.9
WY	+0.1
WR	+2.8
	(202)
SY	+0.6
SP	+1.3
EP	–0.6
WP	–0.8
WY	+0.9
WR	+2.6

(2) EE tb(s) inaccurate. All display data bad

(3) Full capability may be restored with RMS MCIU CHANGEOUT (IFM)

(4) REACH LIMITs and SOFT STOPs annunciation not available for failed joint

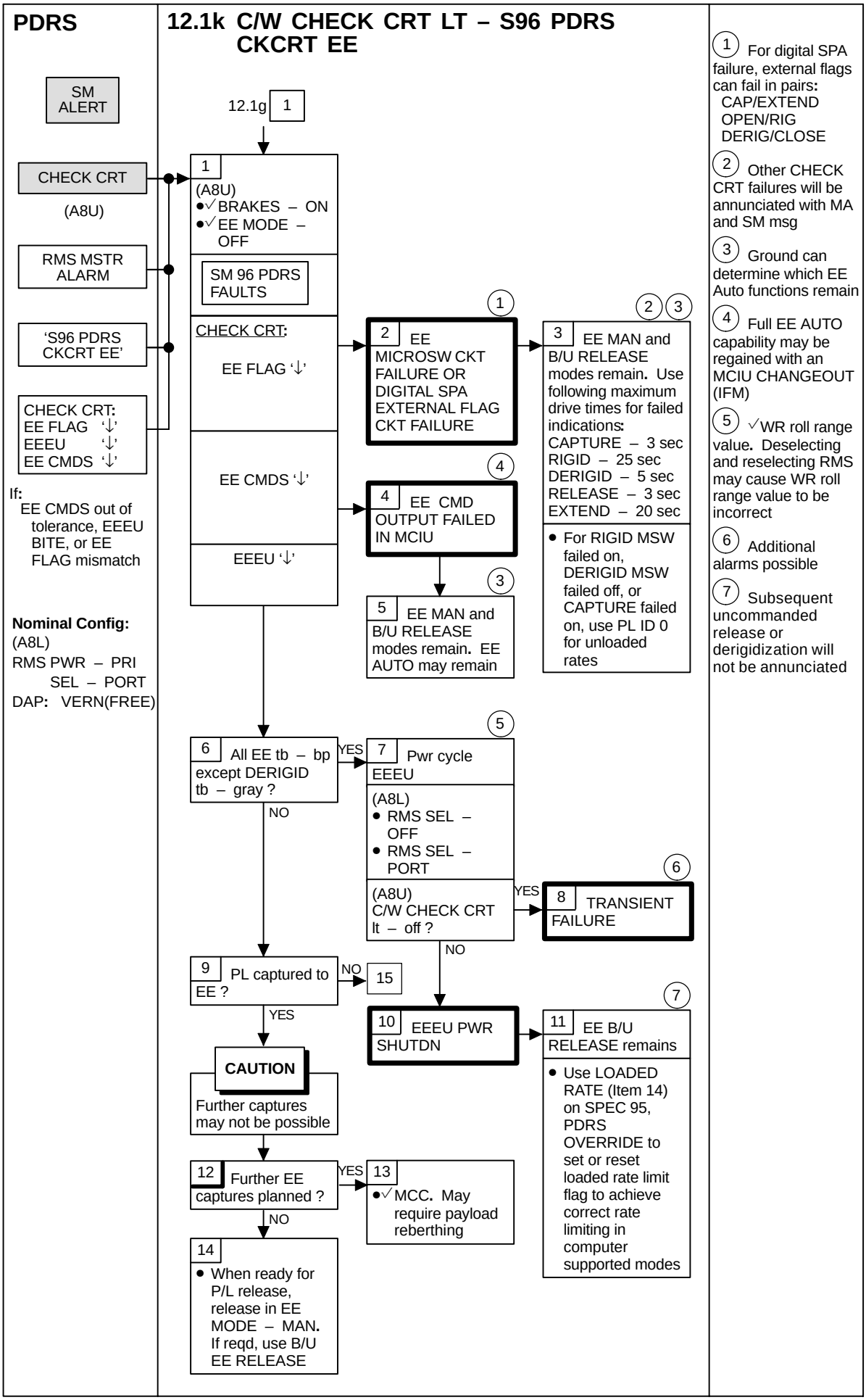
PDRS 12.1j (Cont)



(4) REACH LIMITs and SOFT STOPs annunciation not available for failed joint

(5) Position hold function will not work for failed joint

12.1k C/W CHECK CRT LT – S96 PDRS CKCRT EE



(1) For digital SPA failure, external flags can fail in pairs:
CAP/EXTEND
OPEN/RIG
DERIG/CLOSE

(2) Other CHECK CRT failures will be annunciated with MA and SM msg

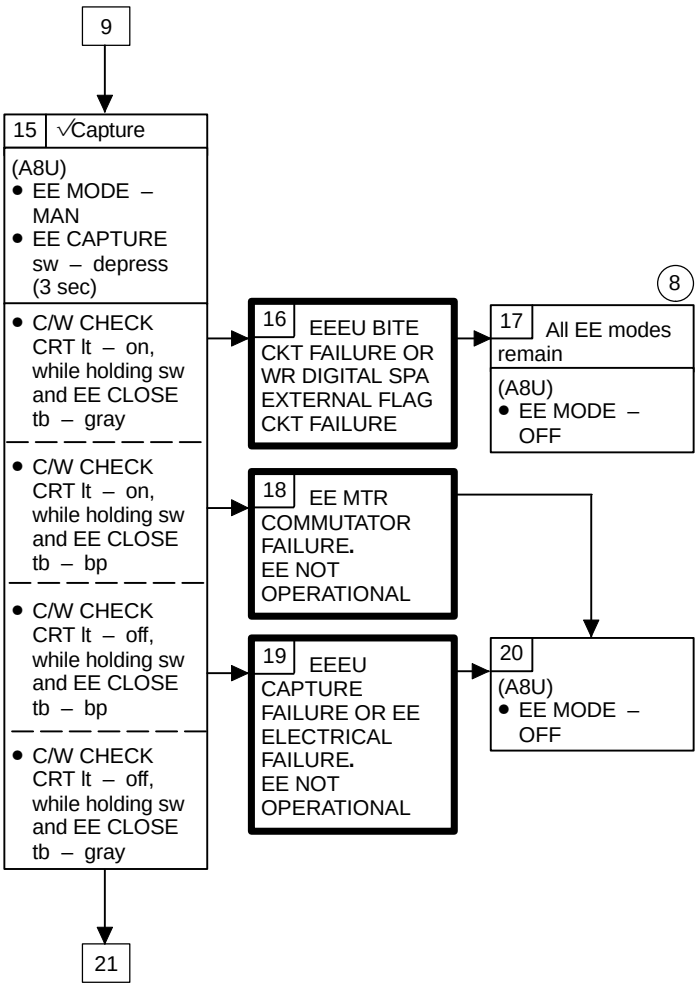
(3) Ground can determine which EE Auto functions remain

(4) Full EE AUTO capability may be regained with an MCIU CHANGEOUT (IFM)

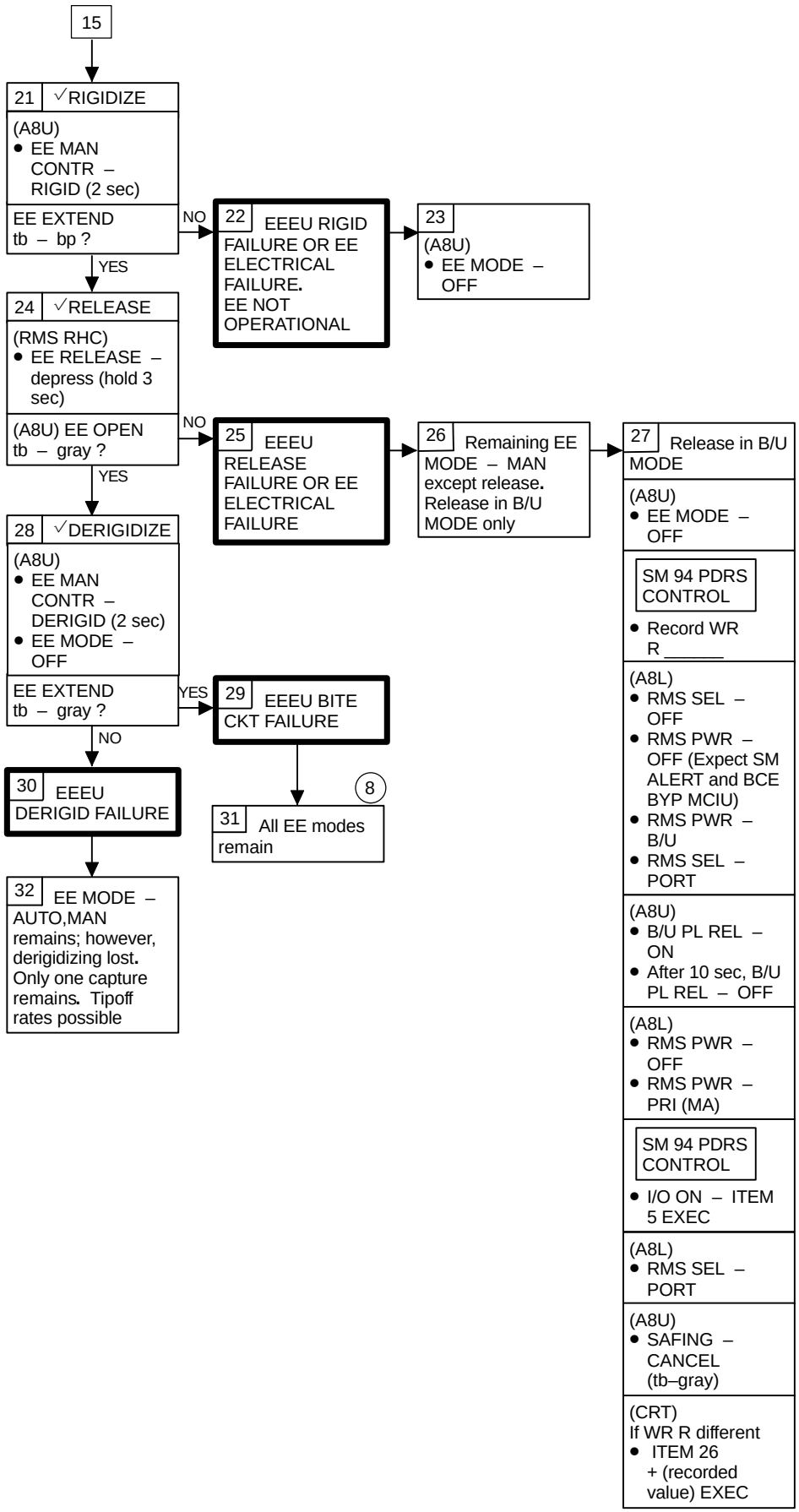
(5) ✓WR roll range value. Deselecting and reselecting RMS may cause WR roll range value to be incorrect

(6) Additional alarms possible

(7) Subsequent uncommanded release or derigidization will not be annunciated



(8) EEEU BITE checks will be masked. Other CHECK CRT failures will be annunciated with MA and SM msg



(8) EEEU BITE checks will be masked. Other CHECK CRT failures will be annunciated with MA and SM msg

PDRS

12.1l C/W CHECK CRT LT – S96 PDRS CKCRT T CK

SM ALERT

RMS MSTR ALARM

CHECK CRT LT

SM 96 PDRS FAULTS
CHECK CRT:
TMP CKT '↓'

S96 PDRS CKCRT T CK

PORT TEMP CAUTION AND PDRS TEMP PORT

If:
Thermistor circuit reference voltage fail

Nominal Config:
(A8L)
PORT RMS HTR A(B) – AUTO

1
(A8U)
●✓BRAKES – ON

12.1g 1

2 TEMP CKT FAILED IN MCIU

3
(A8L)
● PORT RMS HTR A,B (two) – AUTO

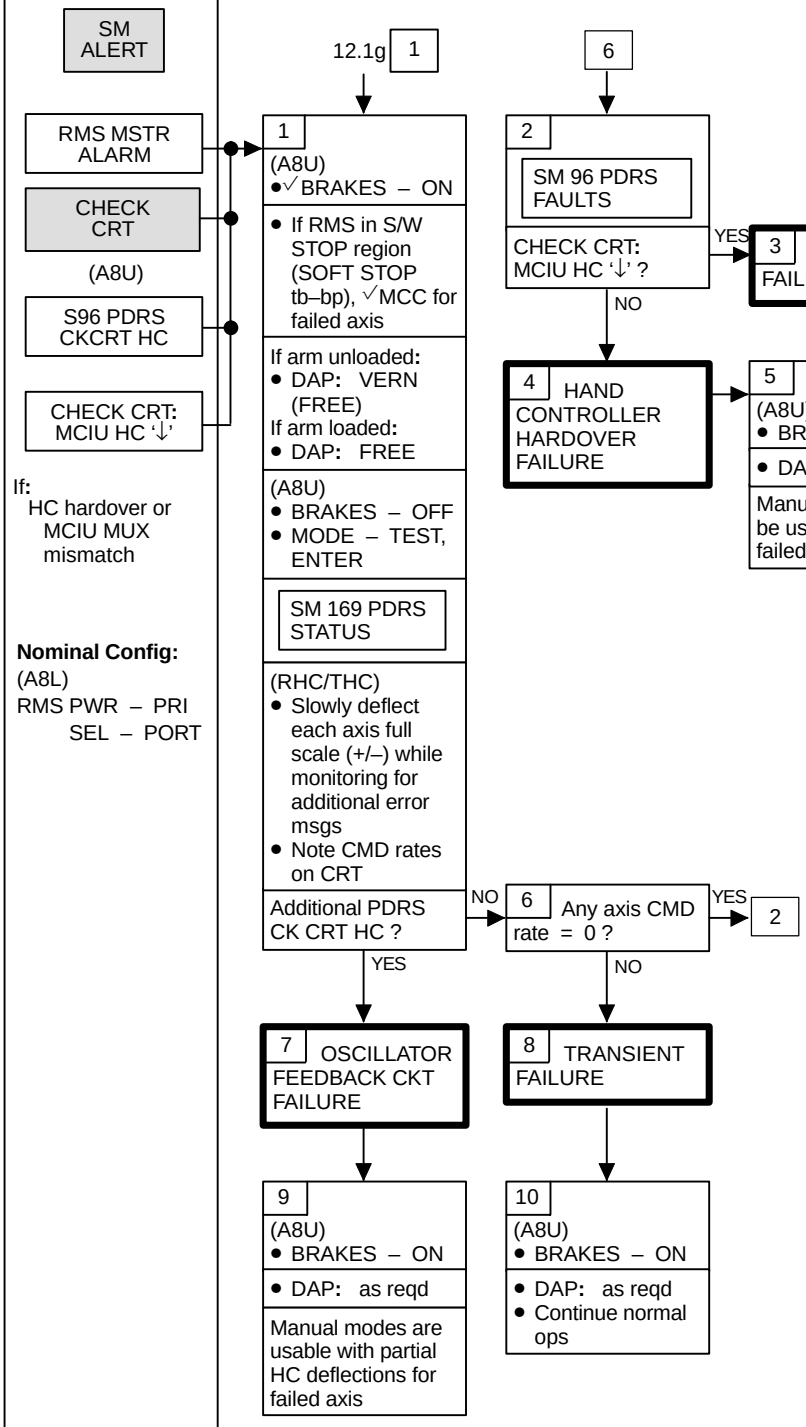
4
● Continue ops. Temp data may be incorrect

(1)

(1) MCC may TMBU temp limits to prevent nuisance alarms

PDRS

12.1m C/W CHECK CRT LT – S96 PDRS CKCRT HC

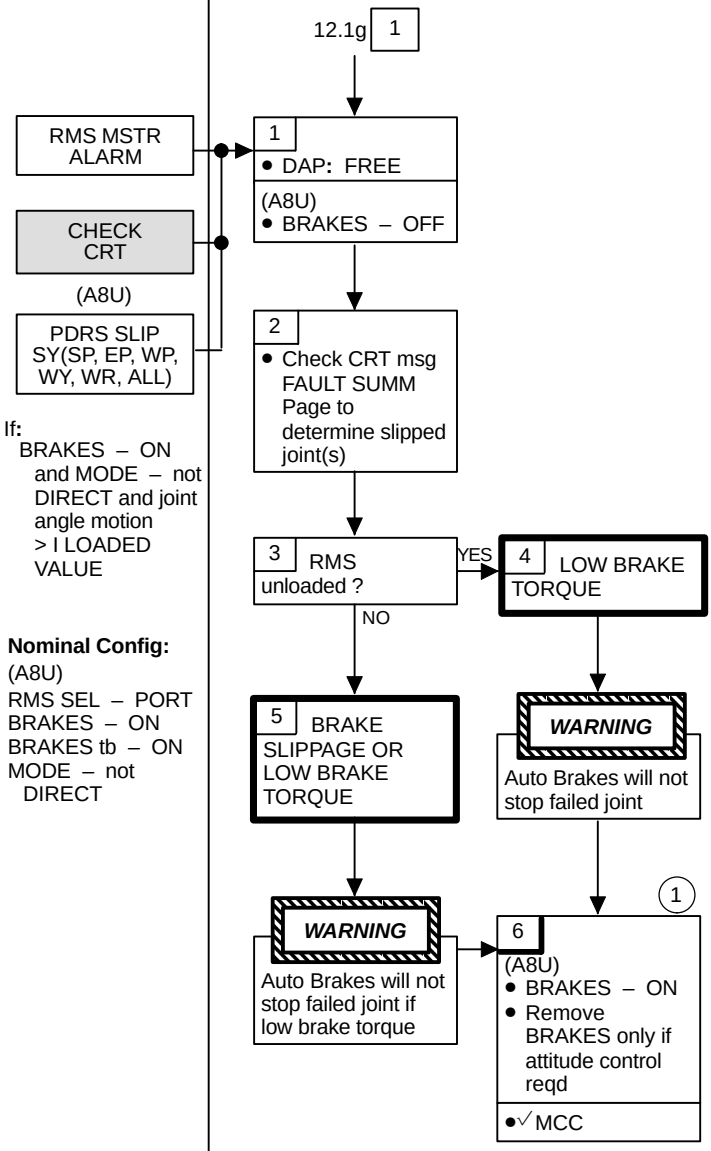


(1) Full capability may be restored with RMS MCIU CHANGEOUT (IFM)

(2) Single HC axis failure workaround capability exists via SM 95 PDRS OVERRIDE. Each time item 33 or 34 is toggled will result in MA and SM alert being reannunciated

PDRS

12.1n C/W CHECK CRT LT – PDRS SLIP SY(SP, EP, WP, WY, WR, ALL)



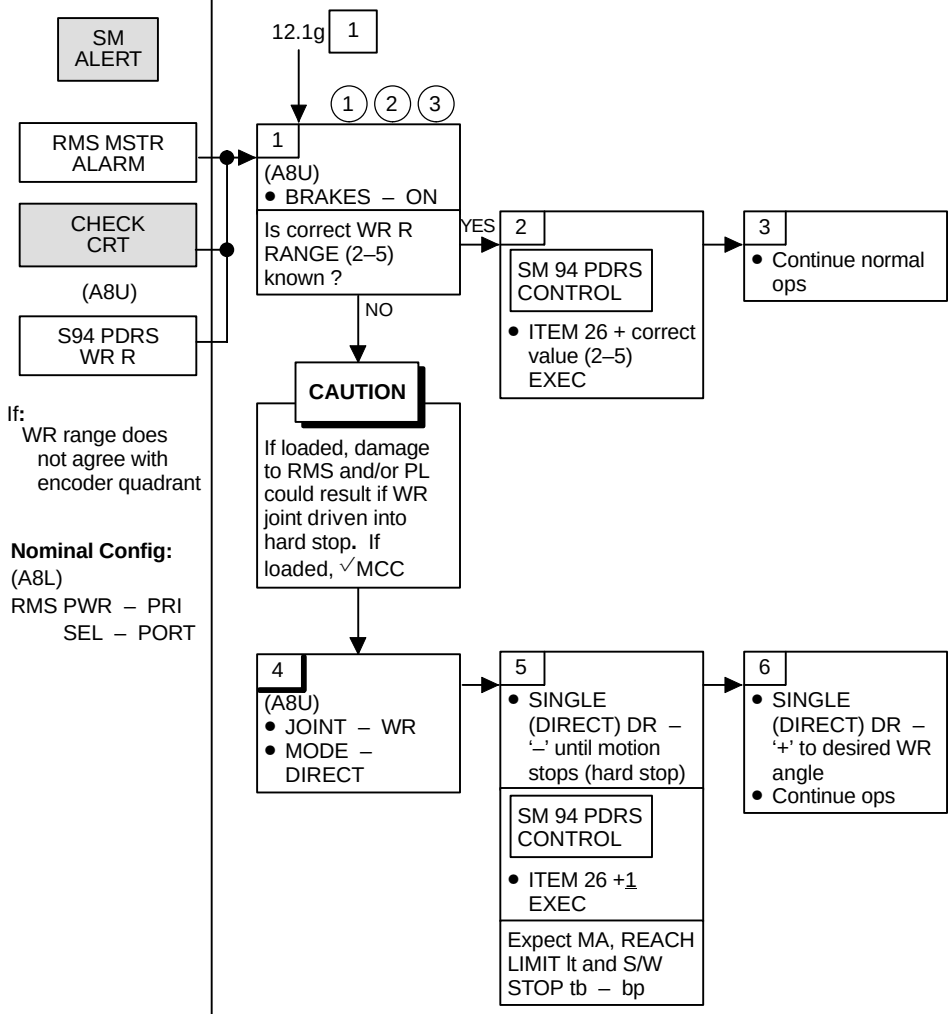
If:
BRAKES – ON and MODE – not DIRECT and joint angle motion > I LOADED VALUE

Nominal Config:
(A8U)
RMS SEL – PORT
BRAKES – ON
BRAKES tb – ON
MODE – not DIRECT

(1) MCC can attempt to correlate jet activity with 'PDRS SLIP' msg or may recommend a joint drive test to ascertain brake health

PDRS

12.1o C/W CHECK CRT LT – S94 PDRS WR R



If:
WR range does not agree with encoder quadrant

Nominal Config:
(A8L)
RMS PWR – PRI
SEL – PORT

(1) MCC may be able to determine correct value

(2) Msg may result because of RMS deselect and reselect, driving WR in B/U, or SM major function move to another GPC

(3)

WR	WRR
–360 to –450	1
–180 to –360	2
0 to –180	3
0 to 180	4
180 to 360	5
360 to 450	6

PDRS

12.1p C/W CHECK CRT LT – PDRS TEST BRK (C/W, NMI, FS, LOSS)

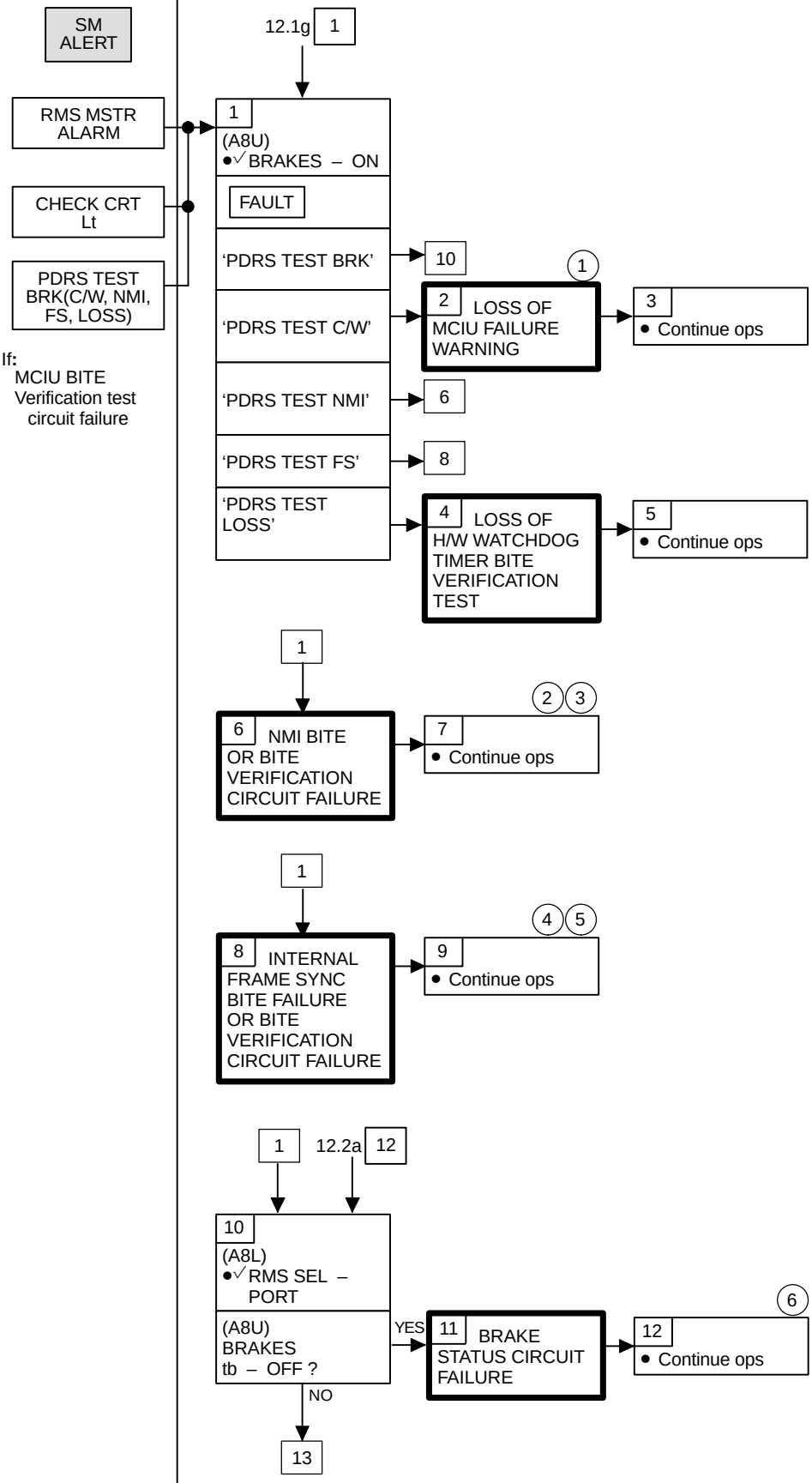
SM ALERT

RMS MSTR ALARM

CHECK CRT Lt

PDRS TEST BRK(C/W, NMI, FS, LOSS)

If:
MCIU BITE Verification test circuit failure



(1) MCIU failure warning/Master Alarm may not be available for subsequent failures. Autobrakes remain

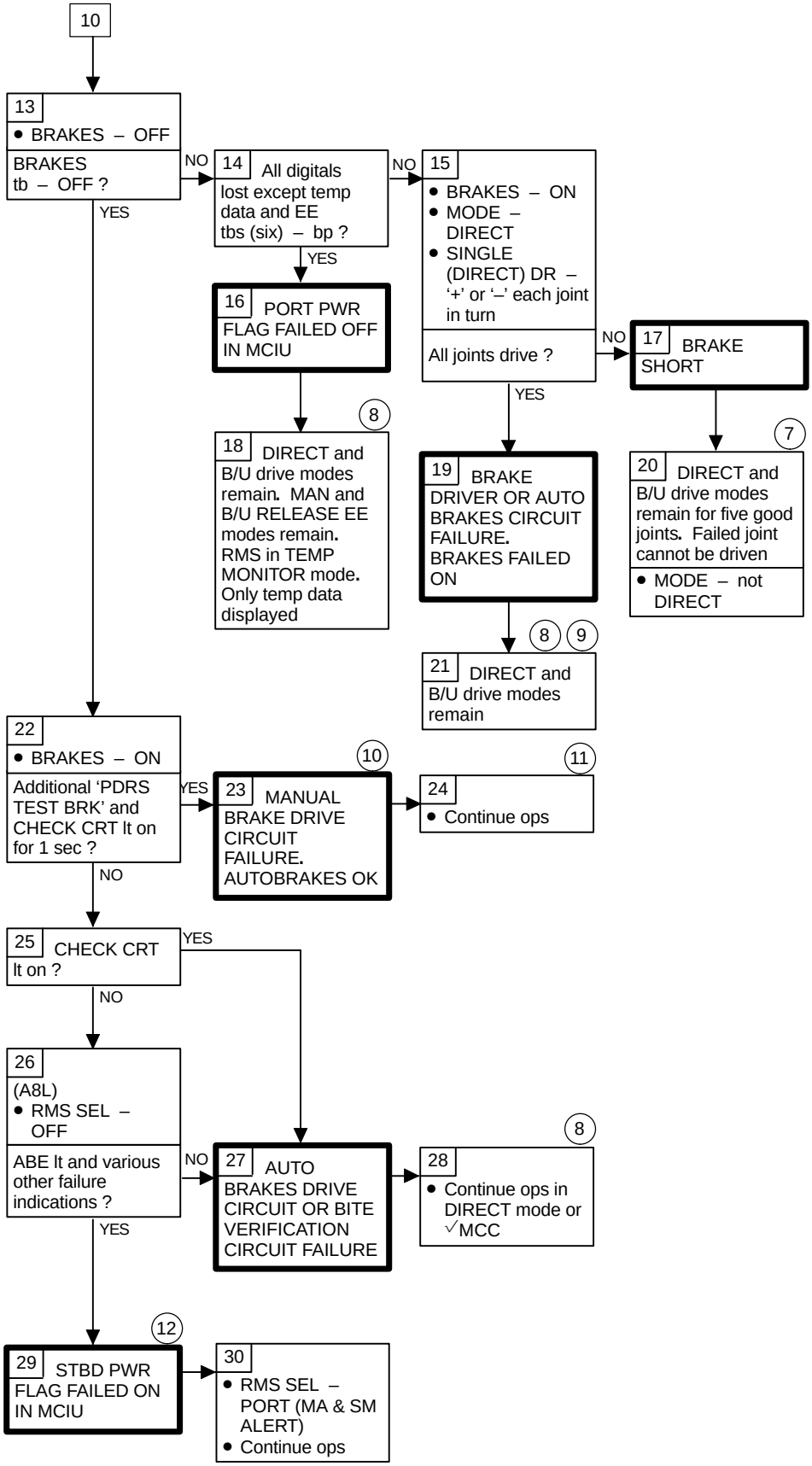
(2) Subsequent MCIU failure warning may be accompanied by additional msgs

(3) NMI may be lost for subsequent H/W Watchdog Timer failure. Autobrakes remain

(4) Autobrakes may not be available for a subsequent loss of Internal Frame Sync

(5) Next failure may result in a six–joint runaway at last commanded rates. Annunciated

(6) Brakes operate nominally, but tb will remain OFF



(7) Driving failed joint in B/U will blow +28V BDA fuse for all joints. EVA may be reqd to cradle arm

(8) Full capability may be restored with RMS MCIU CHANGEOUT (IFM)

(9) RMS limping will not exist during EE ops. Use EE MAN RELEASE for single joint ops

(10) MCIU BITE verification test will apply brakes 1 sec after brake sw on

(11) Failure will reannunciate with BRAKE sw transition from OFF to ON

(12) RMS temperature monitor mode not available

PDRS

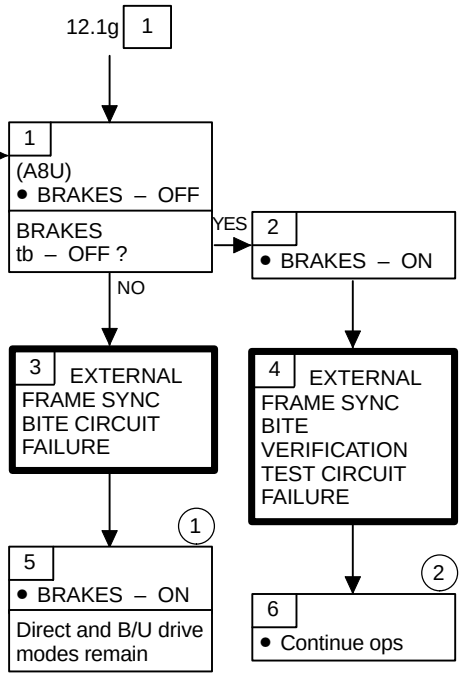
12.1q C/W CHECK CRT LT – S96 PDRS CKCRT FS

SM ALERT

RMS MSTR ALARM

CHECK CRT lt

If:
MCIU External Frame Sync BITE or BITE Verification Test Circuit failure

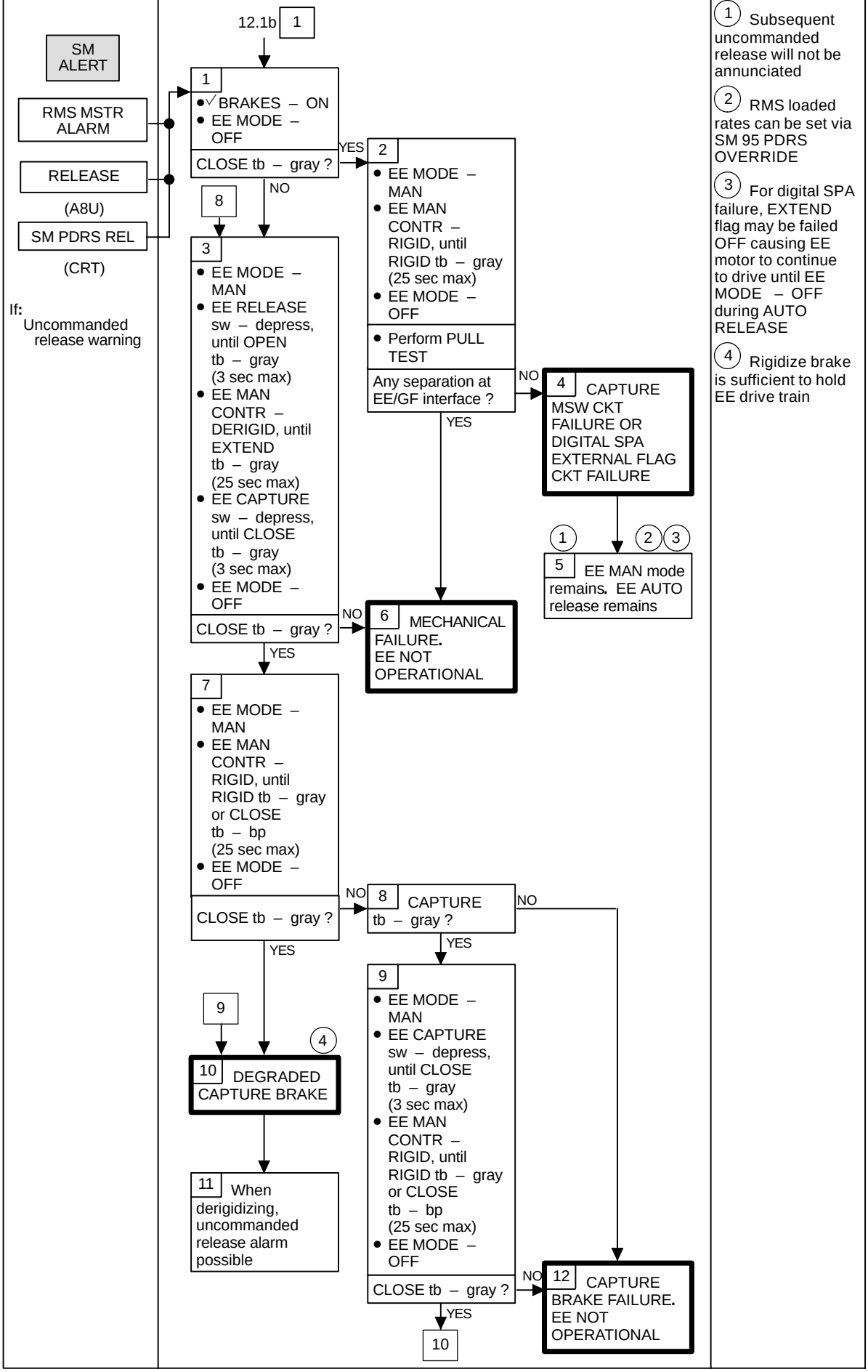


(1) Full capability will be restored with RMS MCIU CHANGEOUT (IFM)

(2) Auto brakes available for subsequent loss of External Frame Sync due to SPA detected loss of Frame Sync

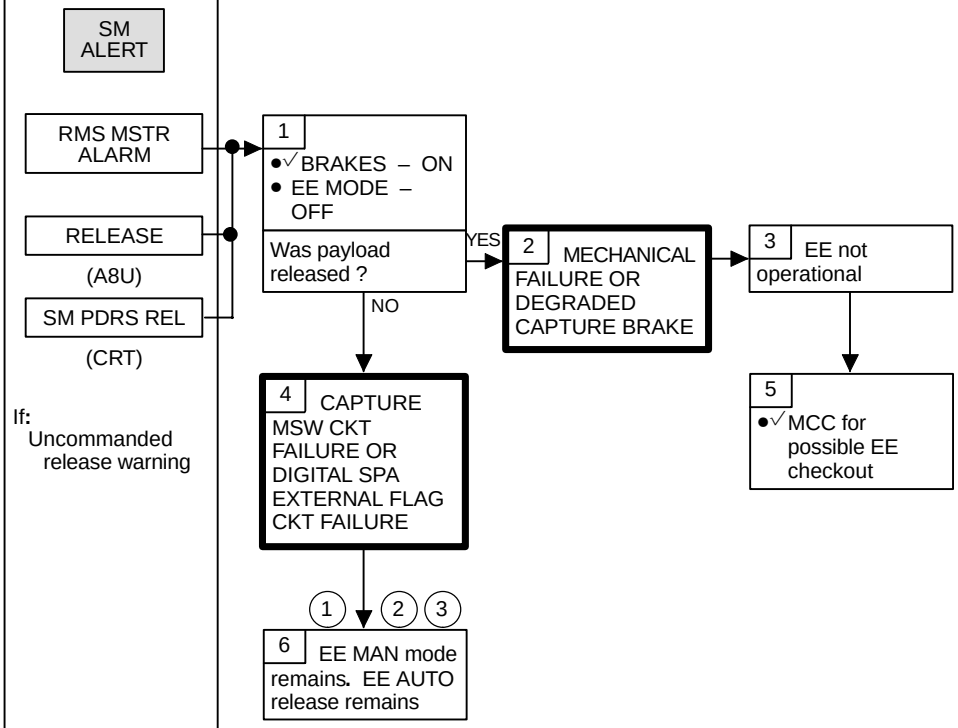
PDRS

12.1r C/W RELEASE LT – PDRS REL



PDRS

12.1s C/W RELEASE LT – PDRS REL (CUE CARD EXECUTED)



(1) Subsequent uncommanded release will not be annunciated

(2) For subsequent capture, RMS loaded rates can be set via SM 95 PDRS OVERRIDE

(3) For digital SPA failure, EXTEND flag may be failed off causing EE motor to continue to drive until EE MODE – OFF during AUTO RELEASE

PDRS

SM ALERT

DERIGIDIZE

(A8U)

RMS MSTR ALARM

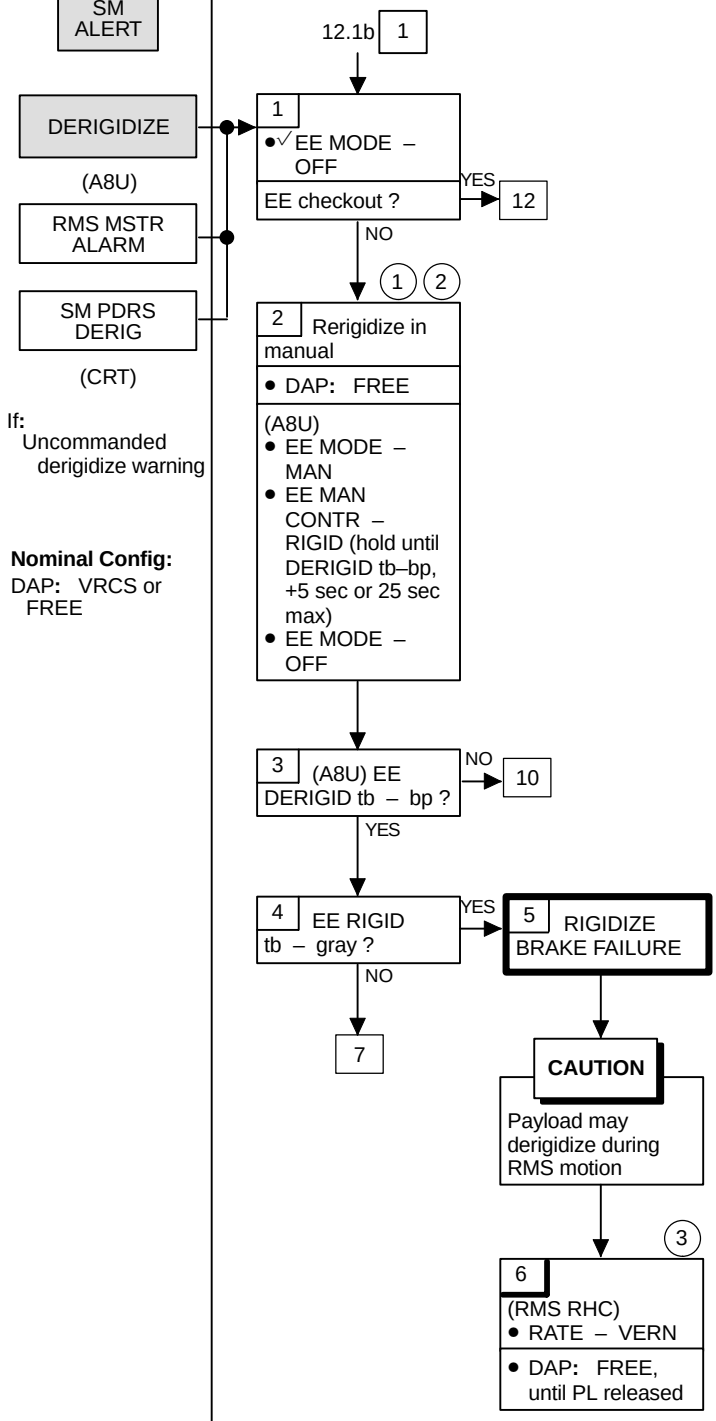
SM PDRS DERIG

(CRT)

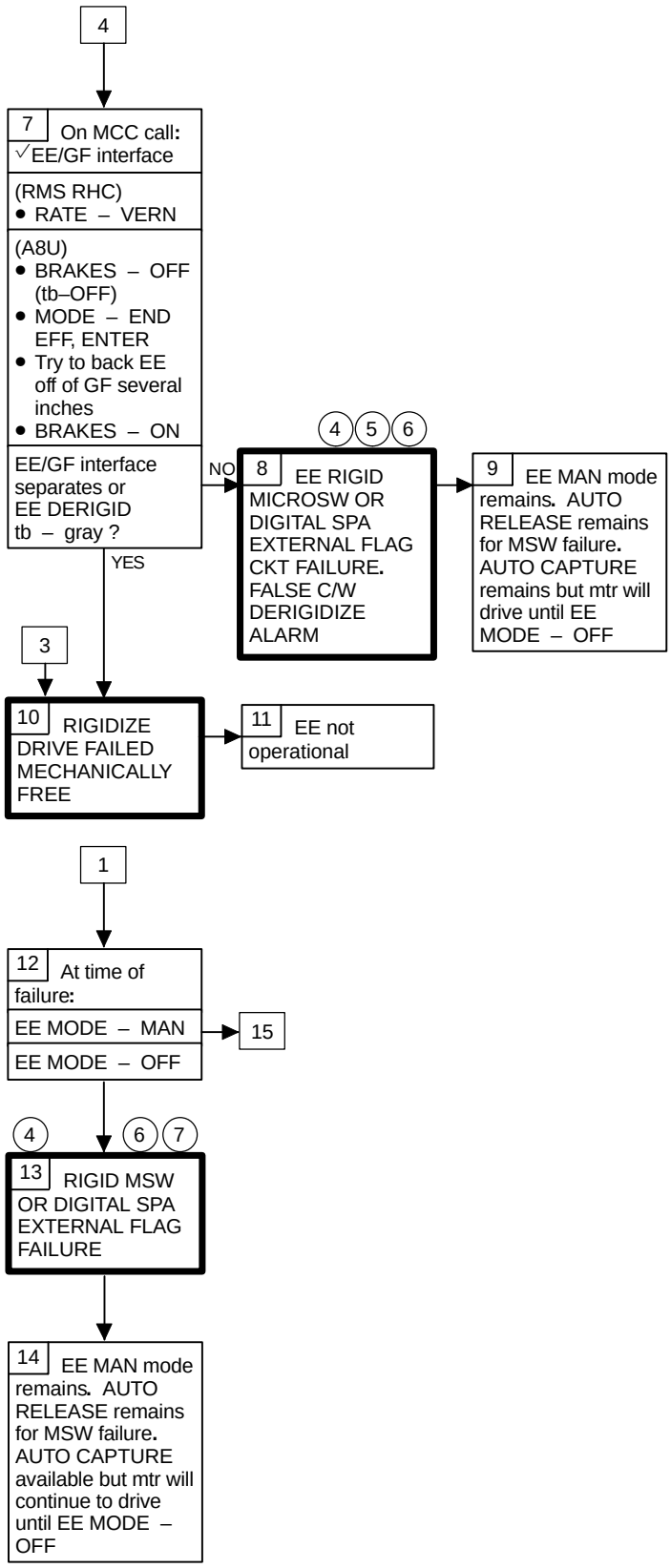
If:
Uncommanded derigidize warning

Nominal Config:
DAP: VRCS or FREE

12.1t C/W DERIGIDIZE LT – PDRS DERIG



1. DERIGID tb used because MSW failure affects RIGID tb
2. RIGID CMD will reset C/W DERIGIDIZE
3. Additional DERIG alarms possible

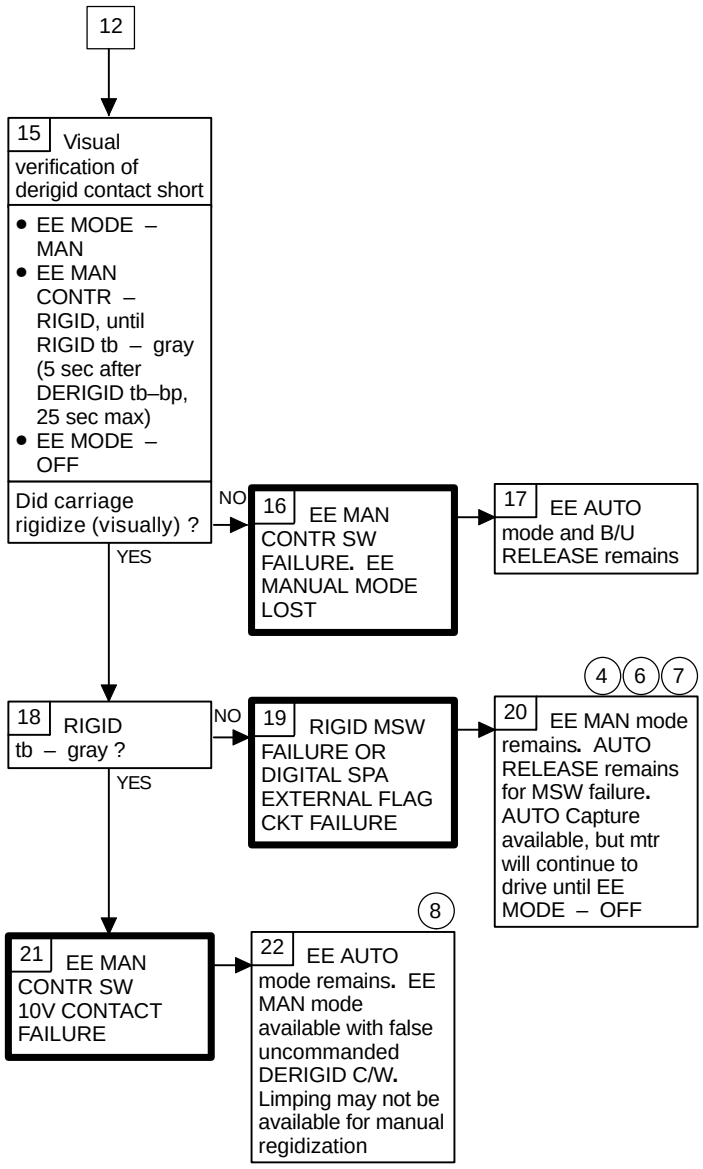


(4) Further uncommanded derigidizations will not be annunciated

(5) RMS loaded rates can be set via SM 95 PDRS OVERRIDE after next payload capture

(6) For digital SPA failure, OPEN flag may be failed OFF

(7) RMS loaded rates can be set via SM 95 PDRS OVERRIDE



(4) Further uncommanded derigidizations will not be annunciated

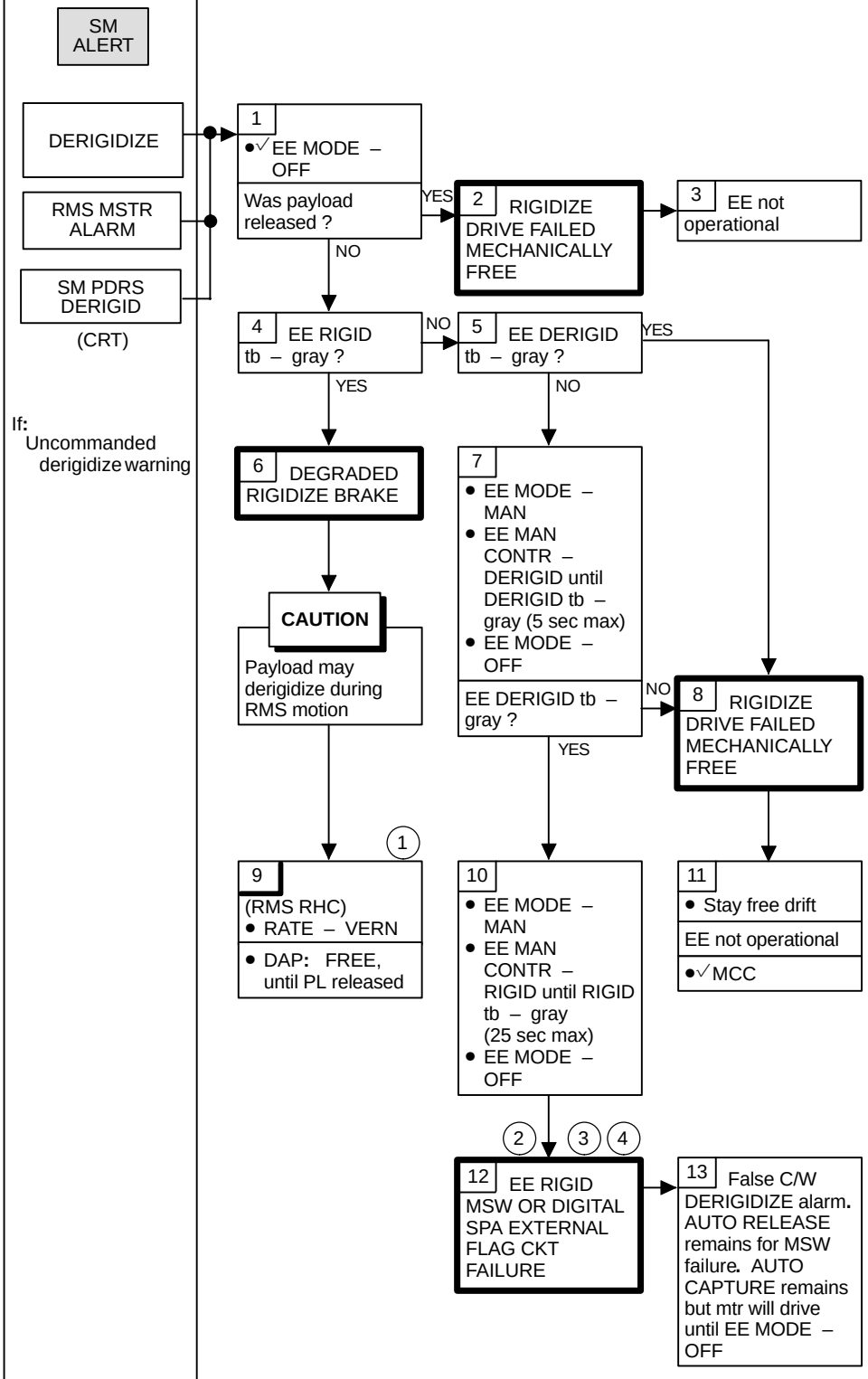
(6) For digital SPA failure, OPEN flag may be failed OFF

(7) RMS loaded rates can be set via SM 95 PDRS OVERRIDE

(8) MCC can see 10V contact and determine if limping available for manual rigidization

PDRS

12.1u C/W DERIGIDIZE LT – PDRS DERIG (CUE CARD EXECUTED)



(1) Additional DERIGID alarms possible

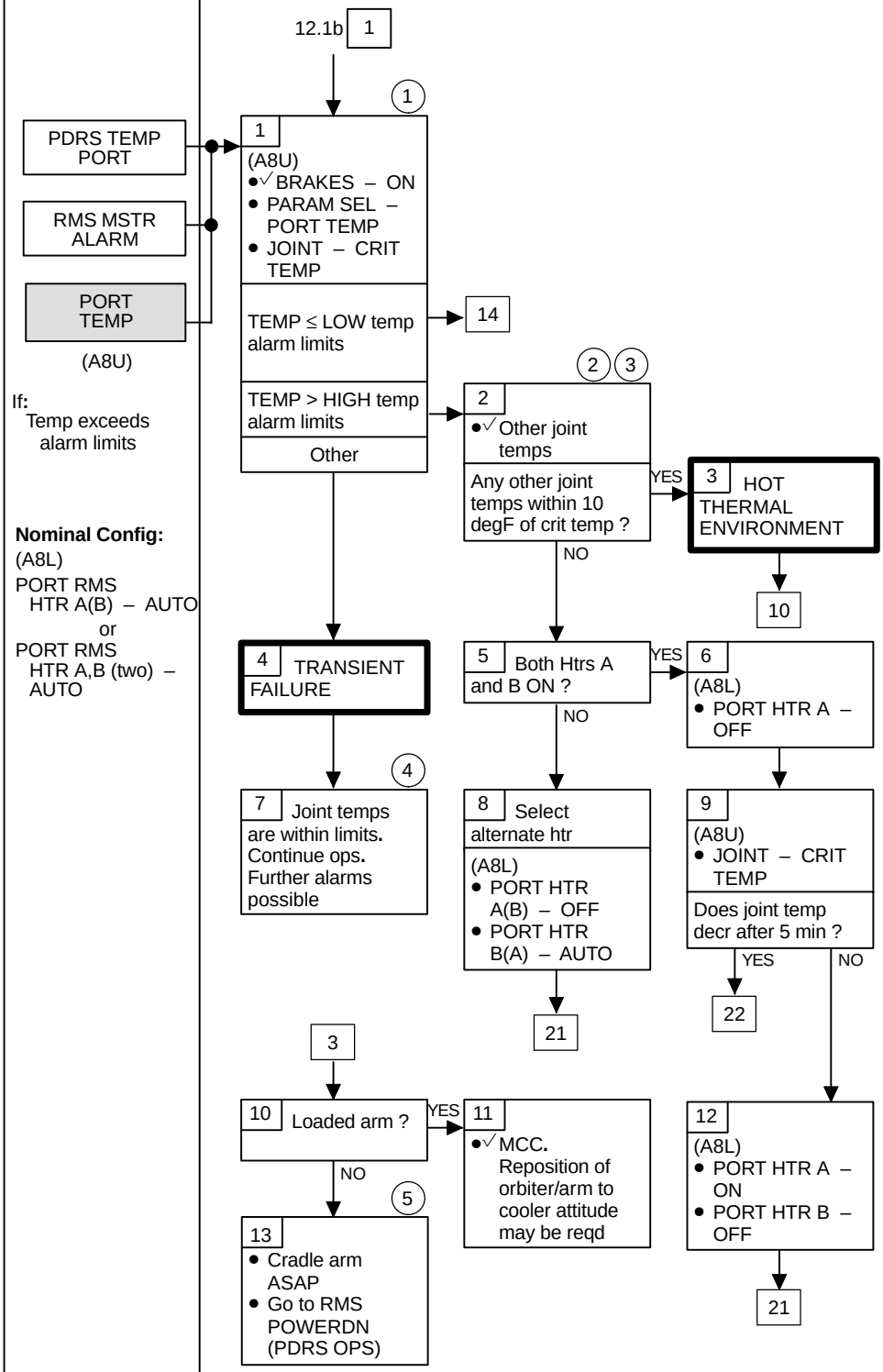
(2) Further uncommanded derigidizations will not be annunciated

(3) RMS loaded rates can be set via SM 95 PDRS OVERRIDE after next payload capture

(4) For digital SPA failure, OPEN flag may be failed off

PDRS

12.1v C/W PORT TEMP LT – PDRS TEMP PORT



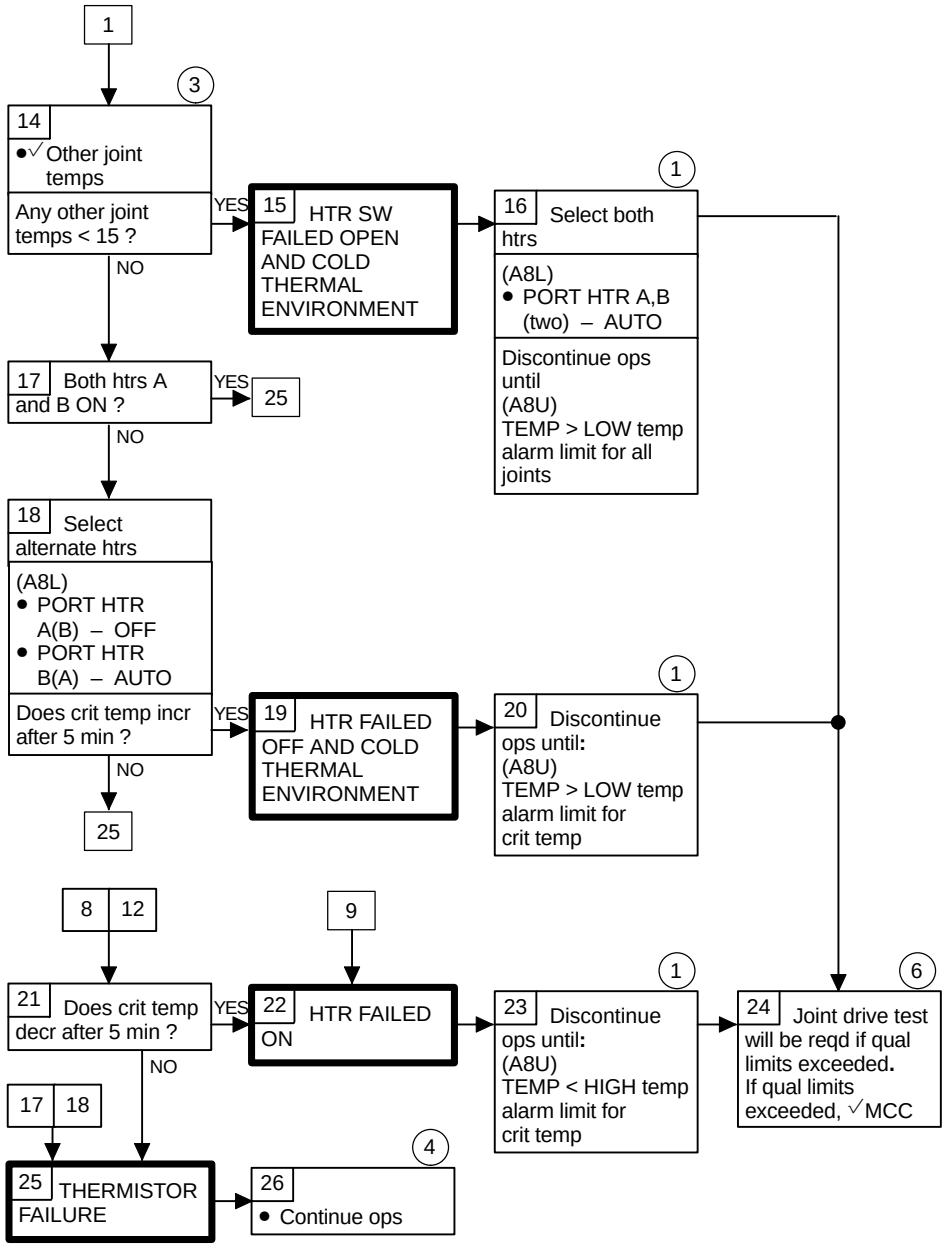
(1) HIGH temp alarm limits:
LED = 172
ABE (SPA) = 106
ABE (EE) = 144
LOW temp alarm limits:
LED = 0
ABE (ALL) = 0

(2) Normally, joint temps vary between 15 degF and 60 degF

(3) SP ABE and SY ABE represent single temp reading. WP ABE and WY ABE represent single temp reading

(4) MCC may TMBU temp limits to prevent nuisance alarms

(5) Arm must be cradled and latched before temp reaches acceptance temp limit (LED 181 degF, ABE SPA 117, ABE EE 154 degF). When arm reaches acceptance temp limit, pwr will be removed



(1) HIGH temp alarm limits:
LED = 172
ABE (SPA) = 106
ABE (EE) = 144
LOW temp alarm limits:
LED = 0
ABE (ALL) = 0

(3) SP ABE and SY ABE represent single temp reading. WP ABE and WY ABE represent single temp reading

(4) MCC may TMBU temp limits to prevent nuisance alarms

(6) Arm qual temp high limits:
LED = 202
ABE = (SPA) = 136
ABE (EE) = 176
Arm qual temp low limits:
LED = –10
ABE = –10

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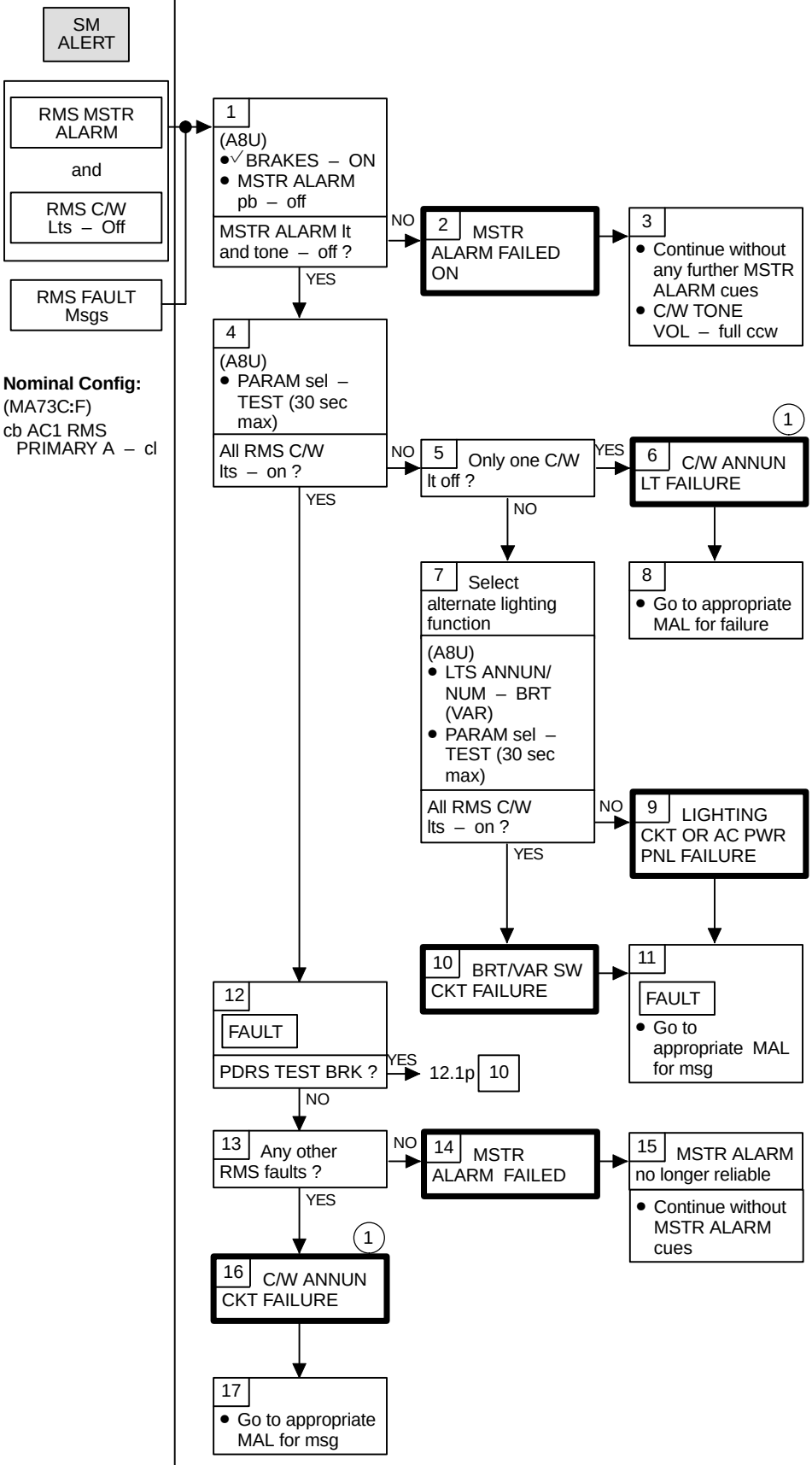
PDRS

12.2a MSTR ALARM ON, BUT C/W LT(S) OFF

(1) C/W lt associated with fault msg will not illuminate

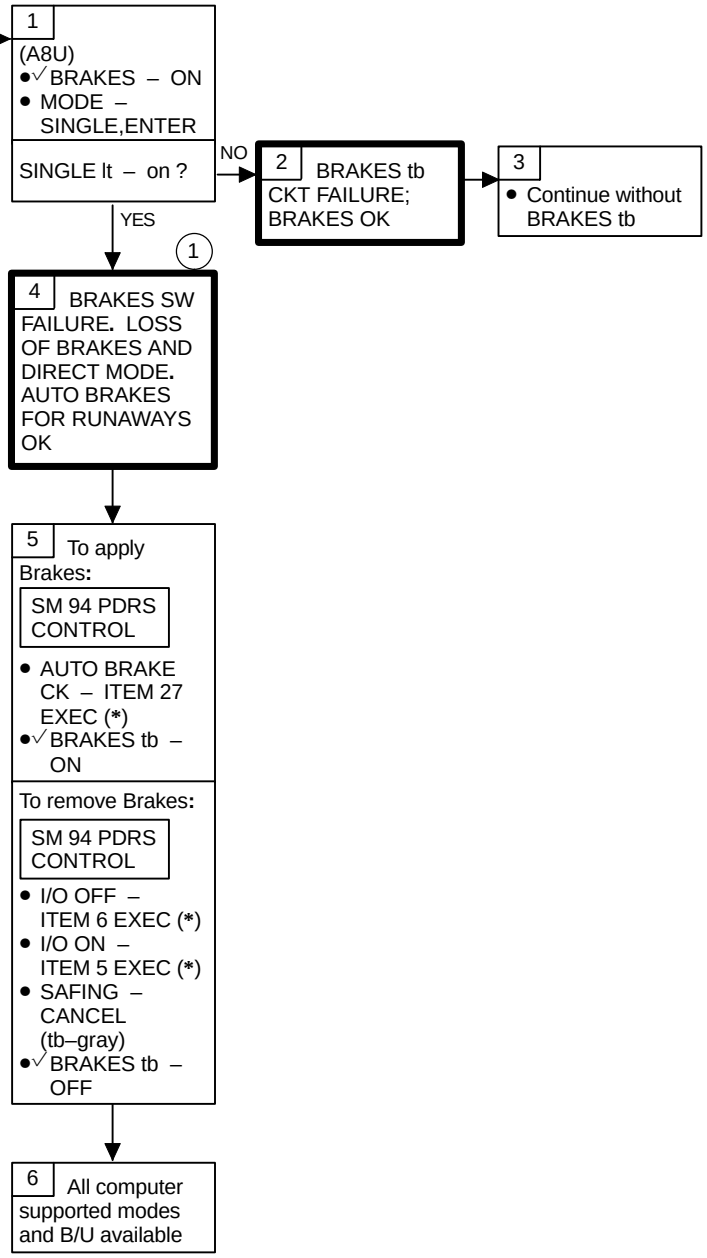


PDRS

12.2b BRAKES – ON, BUT BRAKES tb – OFF

BRAKES – ON
But
BRAKES
tb – OFF

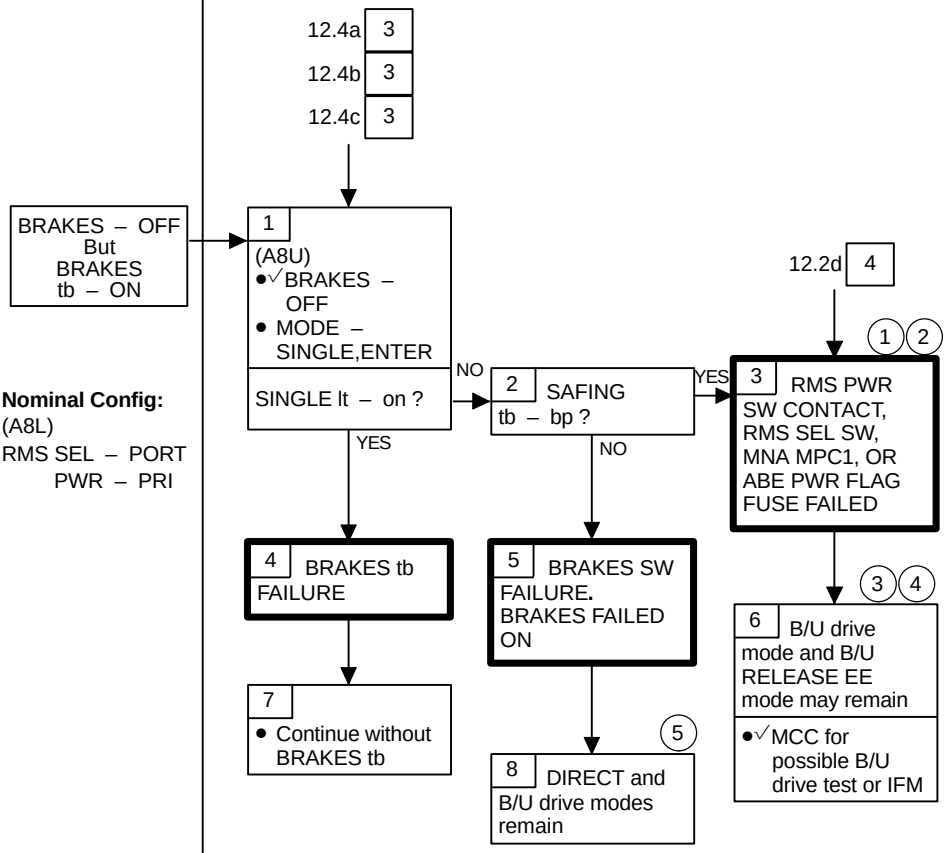
Nominal Config:
(A8L)
RMS PWR – PRI
SEL – PORT
(A8U)
BRAKES – ON



(1) RMS IFM D&C Kit available to regain DIRECT mode. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), AND PDRS SSR–4, RMS IFM D&C KIT

PDRS

12.2c BRAKES – OFF, BUT BRAKES tb – ON



Nominal Config:
(A8L)
RMS SEL – PORT
PWR – PRI

(1) For RMS pwr sw failure, all ABE data lost. For all other failures, only arm temp data remains

(2) Ground can determine if RMS pwr sw is failed

(3) RMS IFM D&C KIT available to regain DIRECT mode and EE – MAN modes for ABE PWR FLAG fuse, but ABE data will be unavailable. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

(4) For RMS pwr or RMS select sw, Contingency Powerup IFM is available to regain primary drive modes and end effector capability. Refer to CONTINGENCY POWERUP (IFM)

(5) RMS limping will not exist during EE ops. Use EE MAN release for single joint ops

PDRS

SAFING – AUTO and SAFING tb – bp

All RMS C/W lts – Off

MASTER ALARM – Off

No CRT SM Msgs

No SM ALERT

Nominal Config:
(A8L)
RMS PWR – PRI
SEL – PORT

12.2d SAFING – AUTO, BUT SAFING tb – bp

1
(A8U)
- ✓BRAKES – ON
- SAFING – CANCEL (mom)

SAFING tb – gray while holding sw ?

YES → 2 SAFING SW 28V CONTACT FAILED OPEN → 3 Continue without SAFING tb

NO

4
(A8U)
- BRAKES – OFF

BRAKES tb – OFF ?

NO → 12.2c 3

YES

5
(A8U)
- MODE – SINGLE,ENTER

SINGLE lt – on ?

YES → 6
- If captured to constrained payload or if captured payload near structure, ✓MCC

→ 7
(A8U)
- BRAKES – ON
- MODE – DIRECT
- JOINT – any
- SINGLE (DIRECT) DR – '+' or '–'
- MODE – not DIRECT

Does joint drive properly ?

YES → 13

NO → 16

NO

(1)

8
SM 95 PDRS OVERRIDE
- SAFING CAN – ITEM 35 EXEC

SAFING tb – gray ?

NO → (2) 9 SAFING SW FAILED TO SAFE

11
(A8U)
- BRAKES – ON

Continue without SAFING tb and override in place

YES

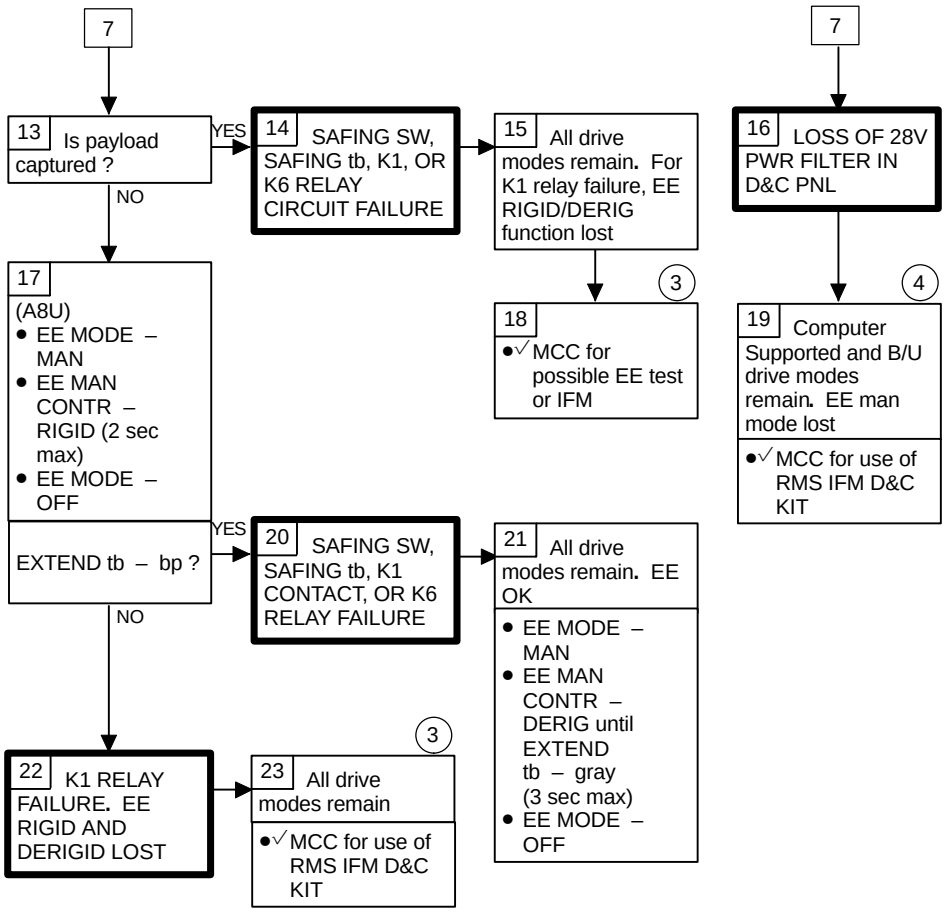
(2)

10 SAFING SW 10V POLE FAILED

12
- Continue ops with override in place

(1) SM 95 ITEM 35 SAFING CAN override is a toggle. If left in place it will override a D&C panel safing command

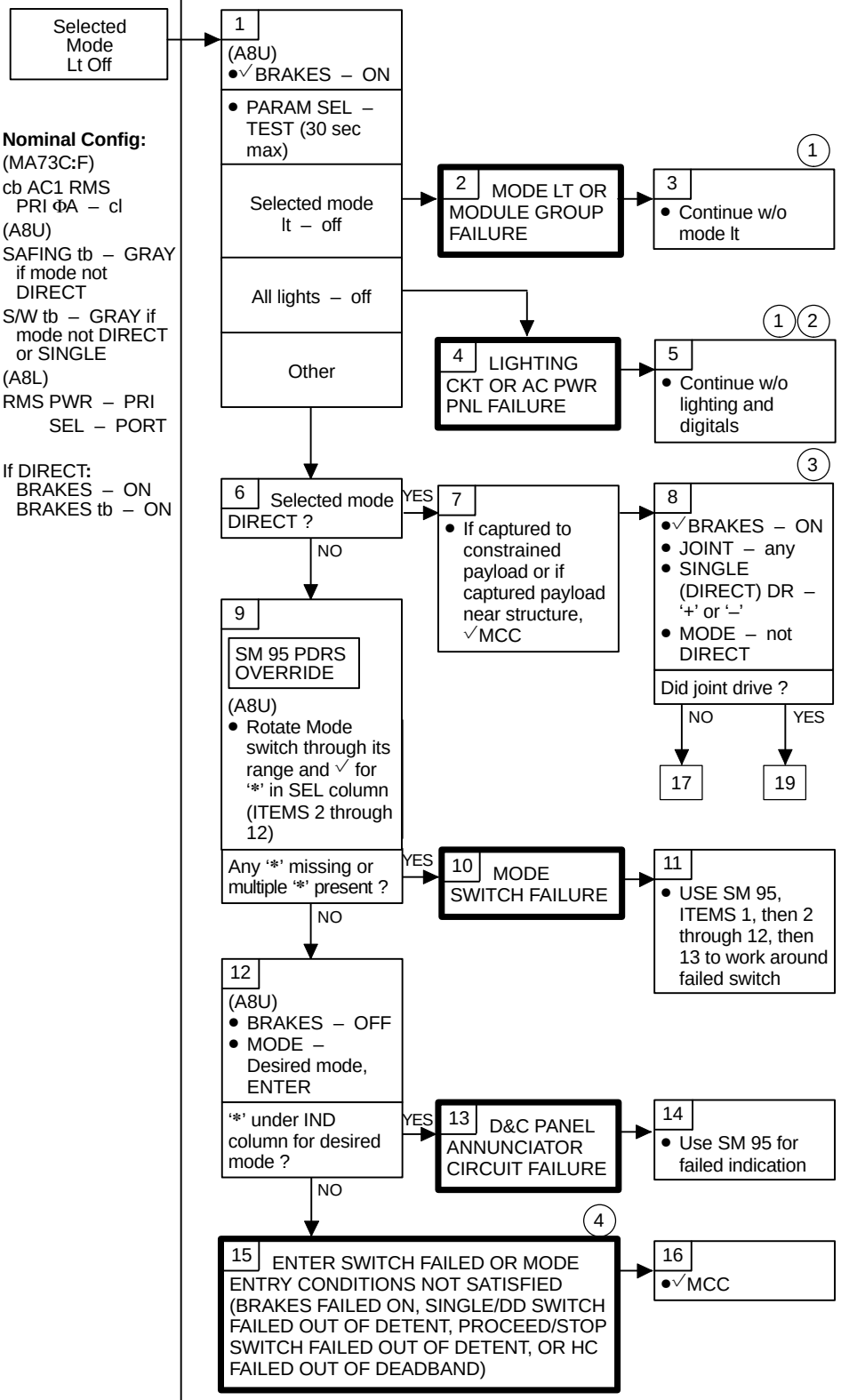
(2) MCIU SAFING circuit still operational



(3) For K1 relay failure, EE MODE – MAN may be restored with RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

(4) DIRECT drive, and EE MODE – MAN may be restored with RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

12.2g SELECTED MODE ANNUN – OFF OR ALL A8 LTS – OFF



Nominal Config:
(MA73C:F)
cb AC1 RMS PRI ΦA – cl
(A8U)
SAFING tb – GRAY if mode not DIRECT
S/W tb – GRAY if mode not DIRECT or SINGLE
(A8L)
RMS PWR – PRI
SEL – PORT

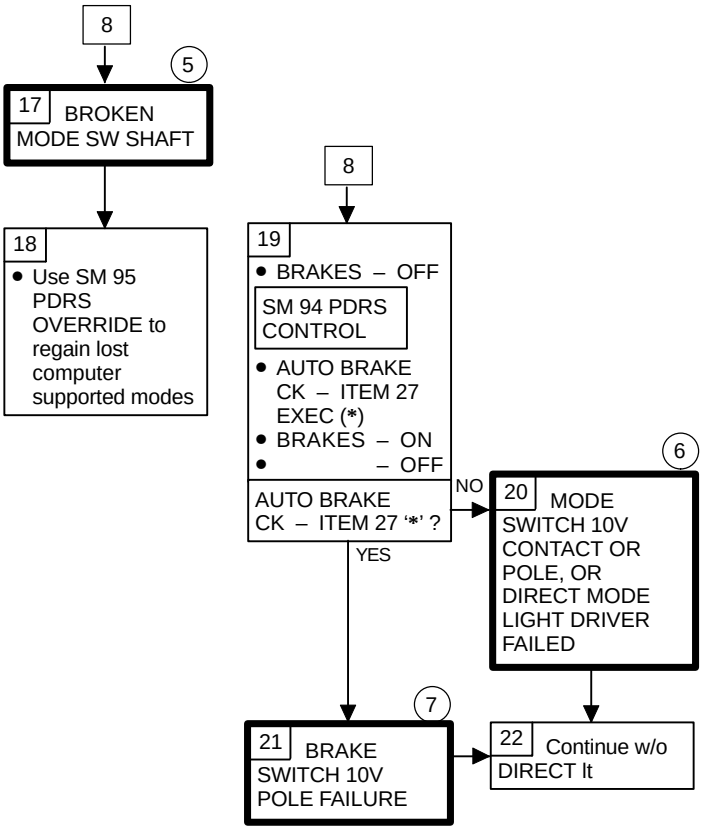
If DIRECT:
BRAKES – ON
BRAKES tb – ON

(1) MODE indications can be read using SM 95 PDRS OVERRIDE

(2) Joint Angles can be read using SM 169 PDRS STATUS

(3) May receive CK CRT lt and DIRECT DRIVE BITE '↓' for one or more joints

(4) SM 95 PDRS OVERRIDE available to work around ENTER pb, SINGLE/DD SW or PROCEED/STOP SW. Deflecting HCs may regain manual modes



(5) DIRECT mode can be regained with RMS IFM D&C KIT

(6) For MODE sw pole failure, use SPEC 95 for computer supported modes

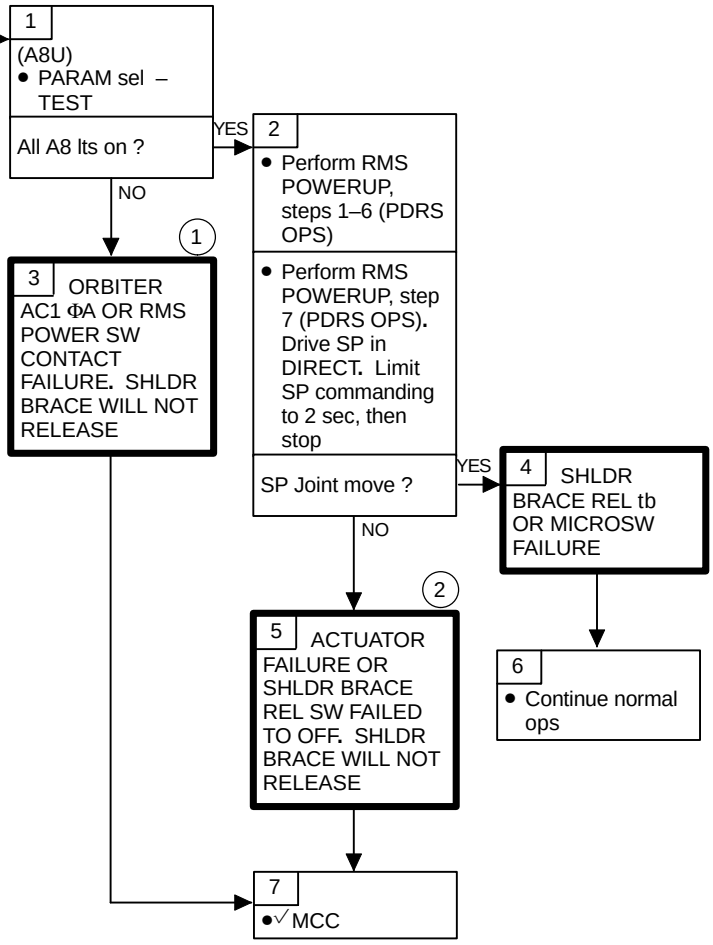
(7) For brake sw failure, auto brakes can be removed via SM 94 PDRS CONTROL, ITEM 6, ITEM 5, and SAFING – CANCEL

PDRS

12.2h SHLDR BRACE REL tb – bp AFTER CMD

SHLDR BRACE REL tb – bp After Cmd

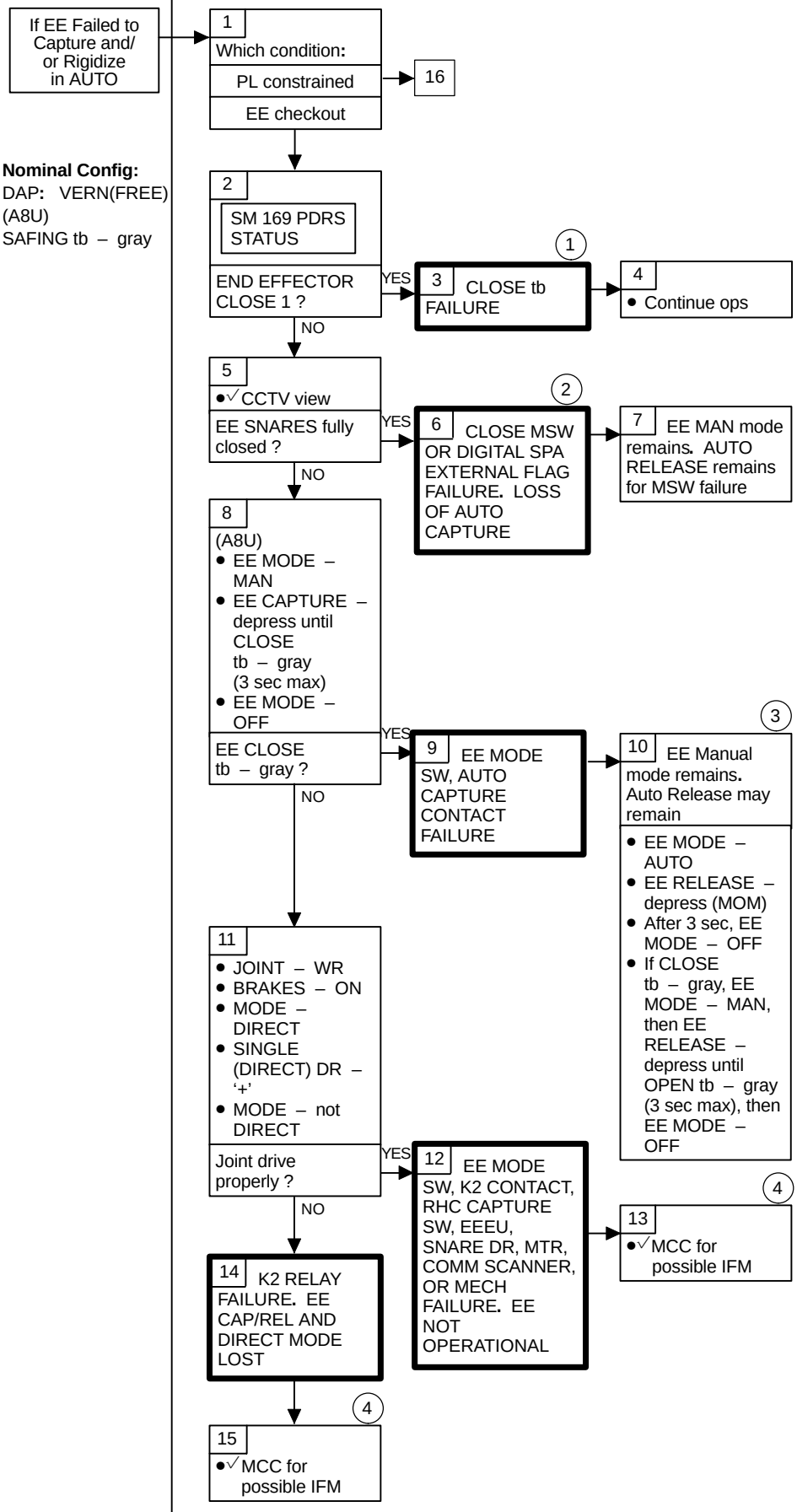
Nominal Config:
(MA73C:F)
cb AC1 RMS PRI ΦA – cl
(A8L)
RMS PWR – PRI SEL – PORT
SM 94 PDRS CONTROL
I/O ON – ITEM 5(*)



(1) RMS IFM D&C KIT available to recover loss of AC1 ΦA for SHLDR brace release sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM) and PDRS SSR–4, RMS IFM D&C KIT

(2) If actuator failure, EVA possible to release shldr brace. If SW failure, RMS IFM D&C kit available to regain shldr brace

12.3a EE FAILS TO CAPTURE/RIGIDIZE IN AUTO

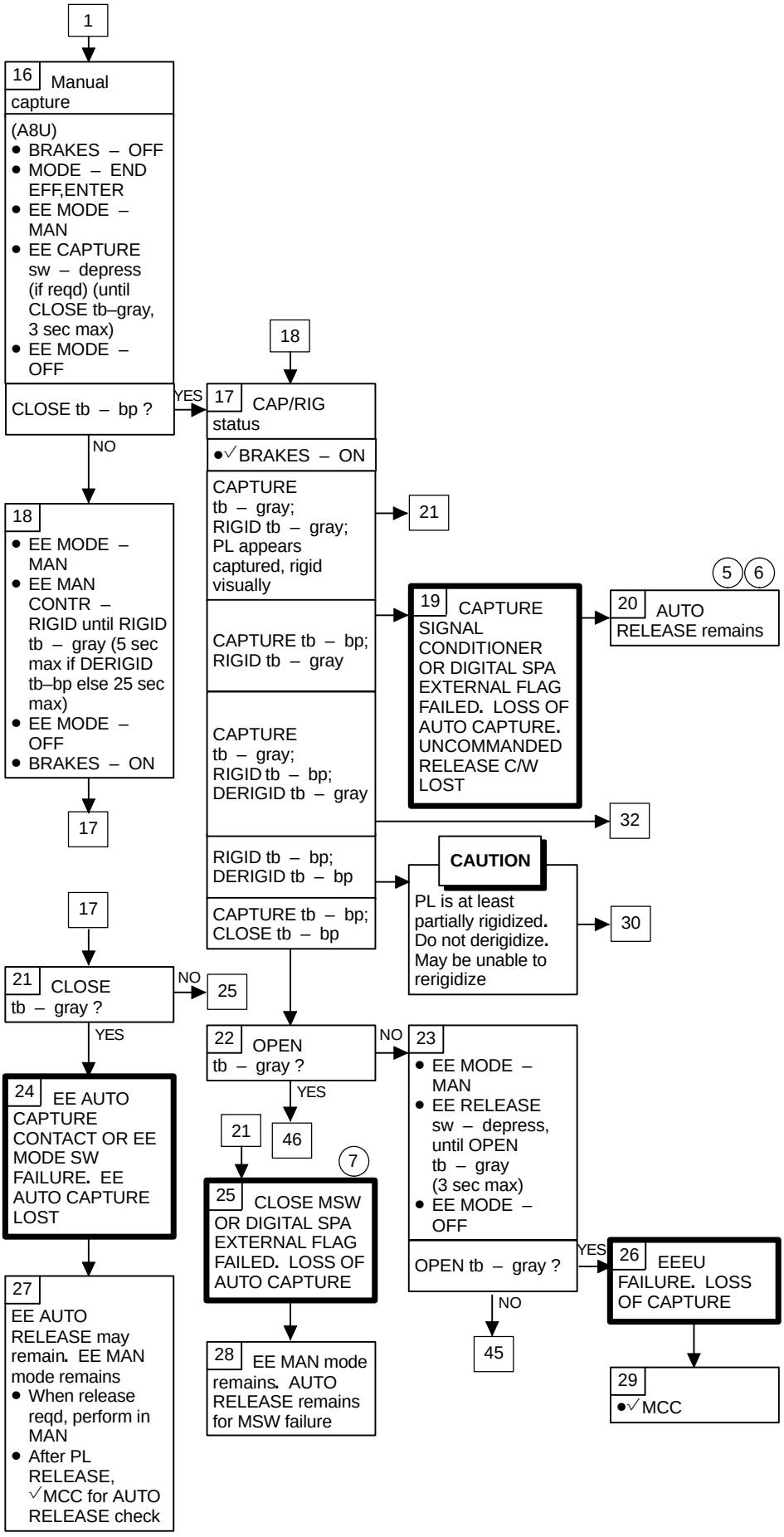


(1) For future EE OPS, use SM 94 PDRS CONTROL or SM 169 PDRS STATUS to determine status of affected EE tb

(2) For digital SPA failure, DERIG flag may be failed on

(3) Limping will not occur in EE Manual for Auto Capture contact failure

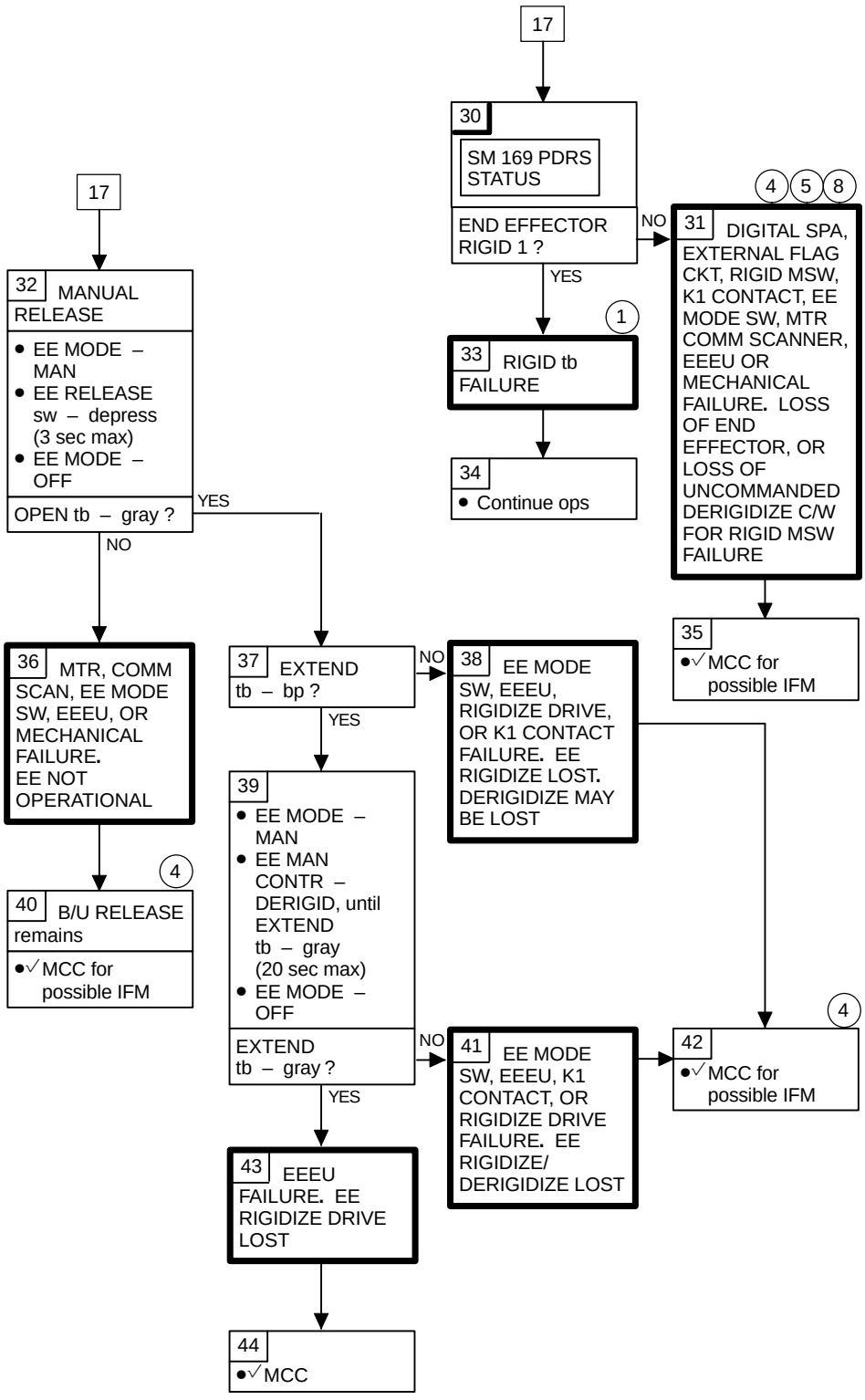
(4) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS D&C IFM KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT



5 Arm will move at unloaded rates. RMS loaded rates can be set via SM 95 PDRS OVERRIDE

6 For digital SPA failure, EXTEND flag may be failed OFF causing motor to continue to drive until EE MODE – OFF

7 For digital SPA failure, DERIG flag may be failed ON

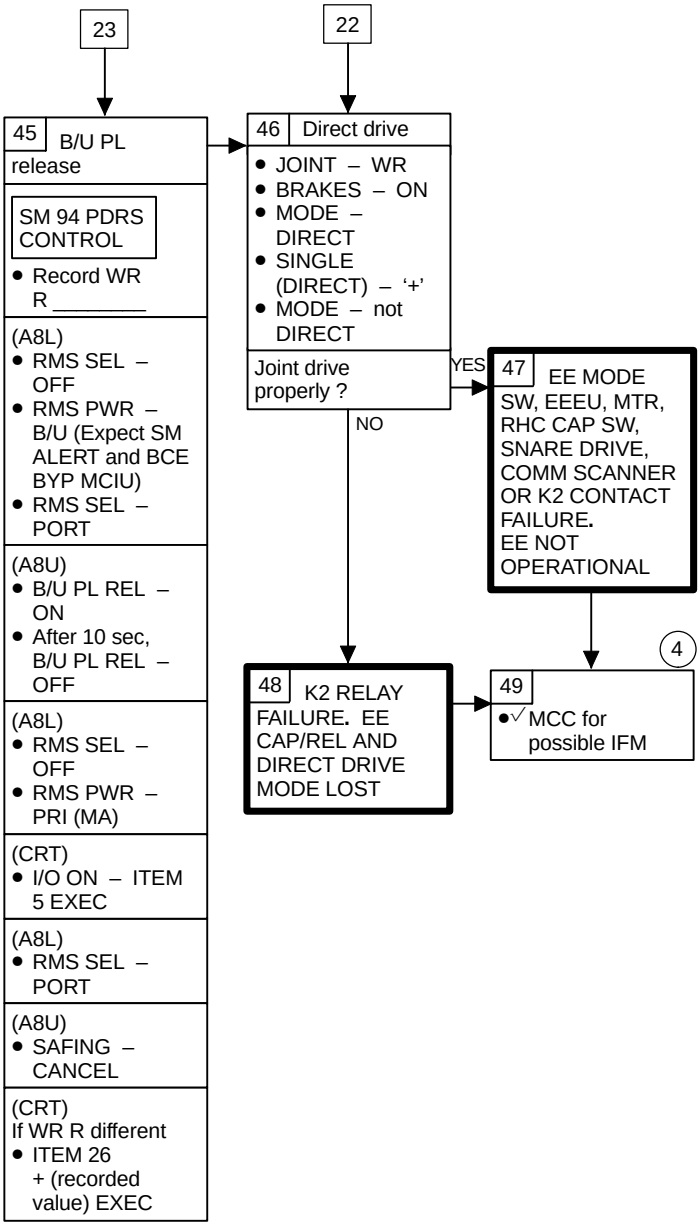


(1) For future EE OPS, use SM 94 PDRS CONTROL or SM 169 PDRS STATUS to determine status of affected EE tb

(4) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KI

(5) Arm will move at unloaded rates. RMS loaded rates can be set via SM 95 PDRS OVERRIDE

(8) For digital SPA failure, OPEN flag may be failed OFF



(4) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

PDRS

12.3b EE FAILS TO RELEASE/DERIGIDIZE IN AUTO

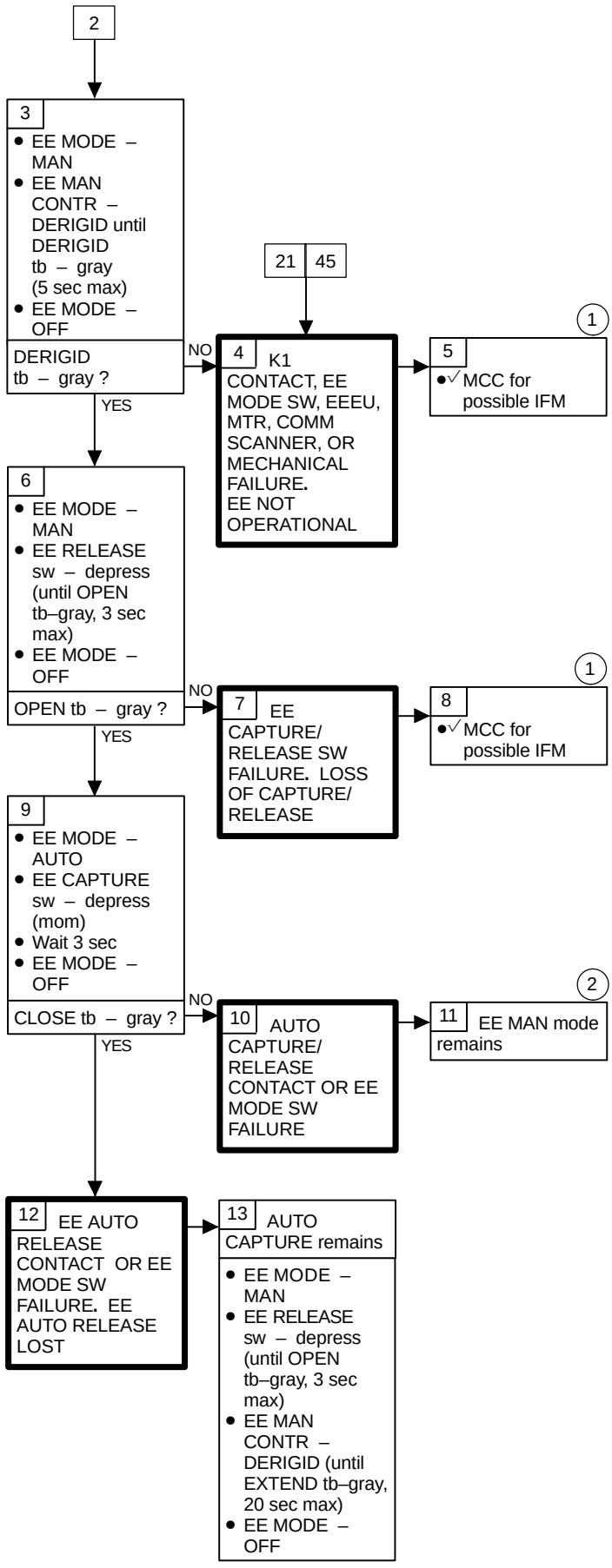
EE Fails to Derigidize or Release in AUTO

Nominal Config:
DAP**:** VERN(FREE) (A8U)
SAFING tb – gray

1
(A8U)
- EE MODE – OFF

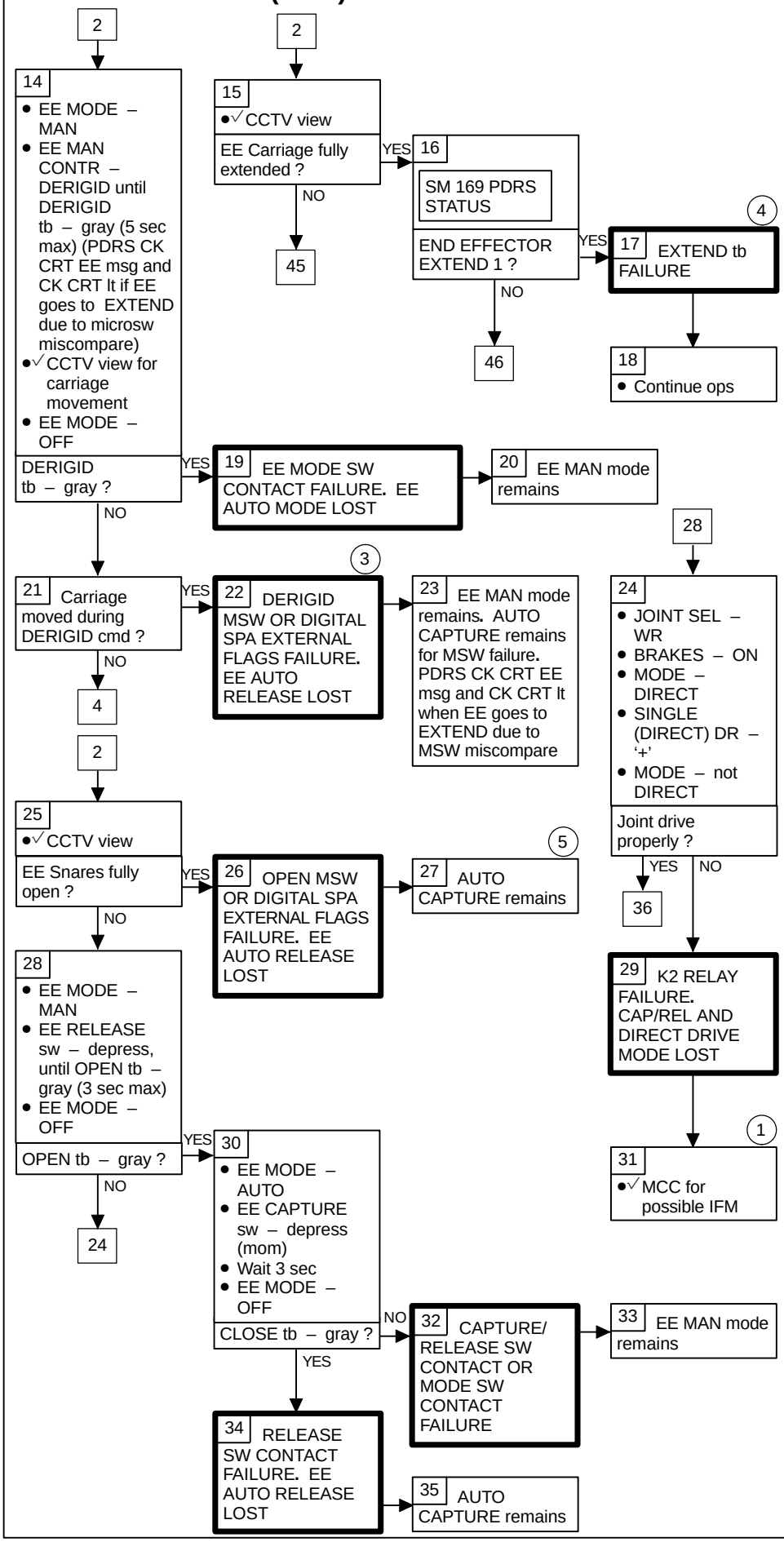
2 Which condition exists**:**

- RIGID tb – gray → 3
- RIGID tb – bp and DERIGID tb – bp → 14
- DERIGID tb – gray and OPEN tb – bp → 25
- OPEN tb – gray and EXTEND tb – bp → 15



(1) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

(2) Limping will not occur in EE MANUAL for AUTO CAPTURE contact failure

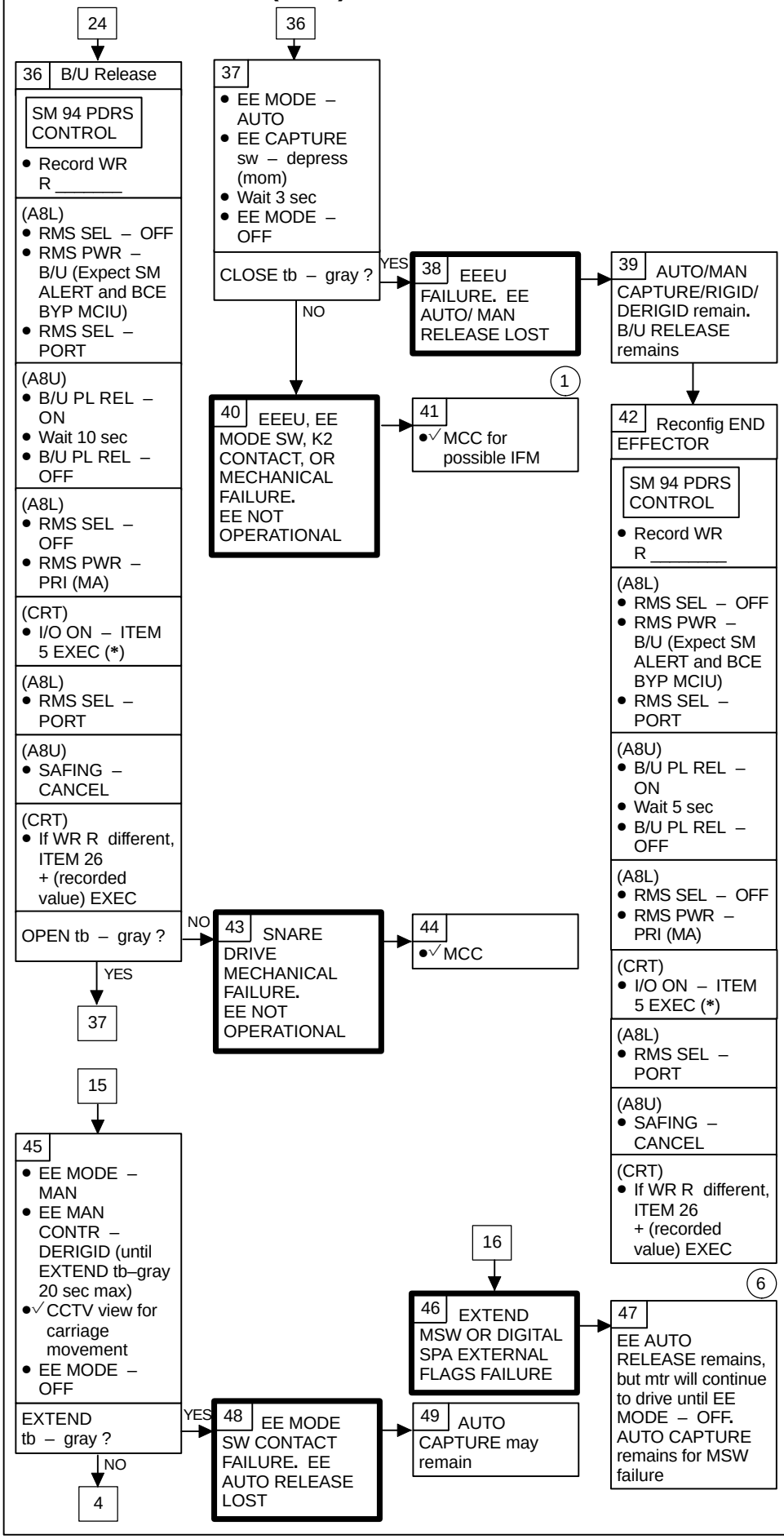


(1) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

(3) For digital SPA, CLOSE flag may be failed ON

(4) For future EE OPS, use SM 94 PDRS CONTROL or SM 169 PDRS STATUS to determine status of affected EE tb

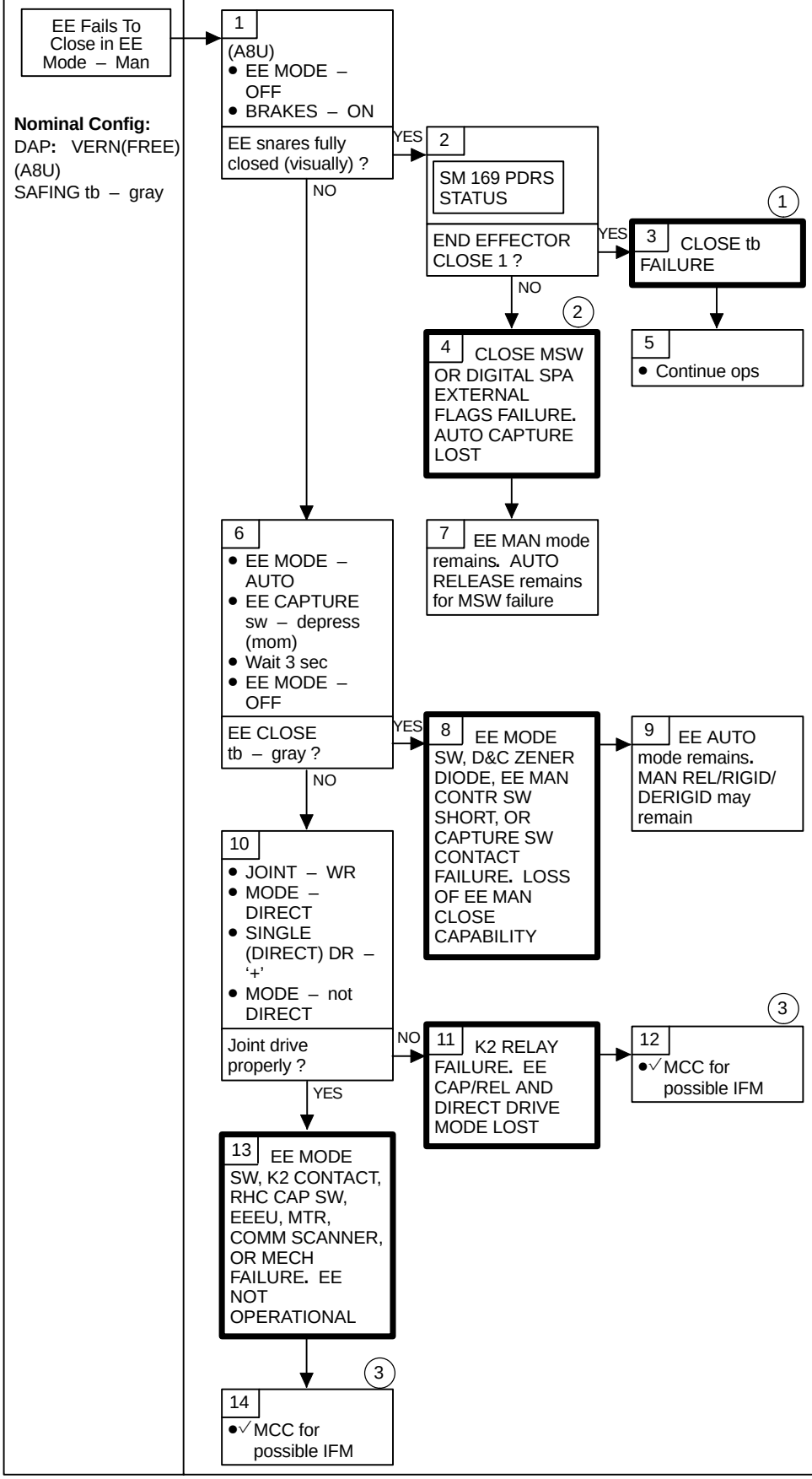
(5) For digital SPA failure, RIGID flag may be failed OFF causing loss of loaded rates and motor to continue to drive until EE MODE – OFF during AUTO CAPTURE. Loaded rates can be set via SM 95 PDRS OVERRIDE



(1) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

(6) For digital SPA failure CAPTURE flag may be failed OFF

12.3c EE FAILS TO CLOSE IN EE MODE – MAN (EE C/O ONLY)



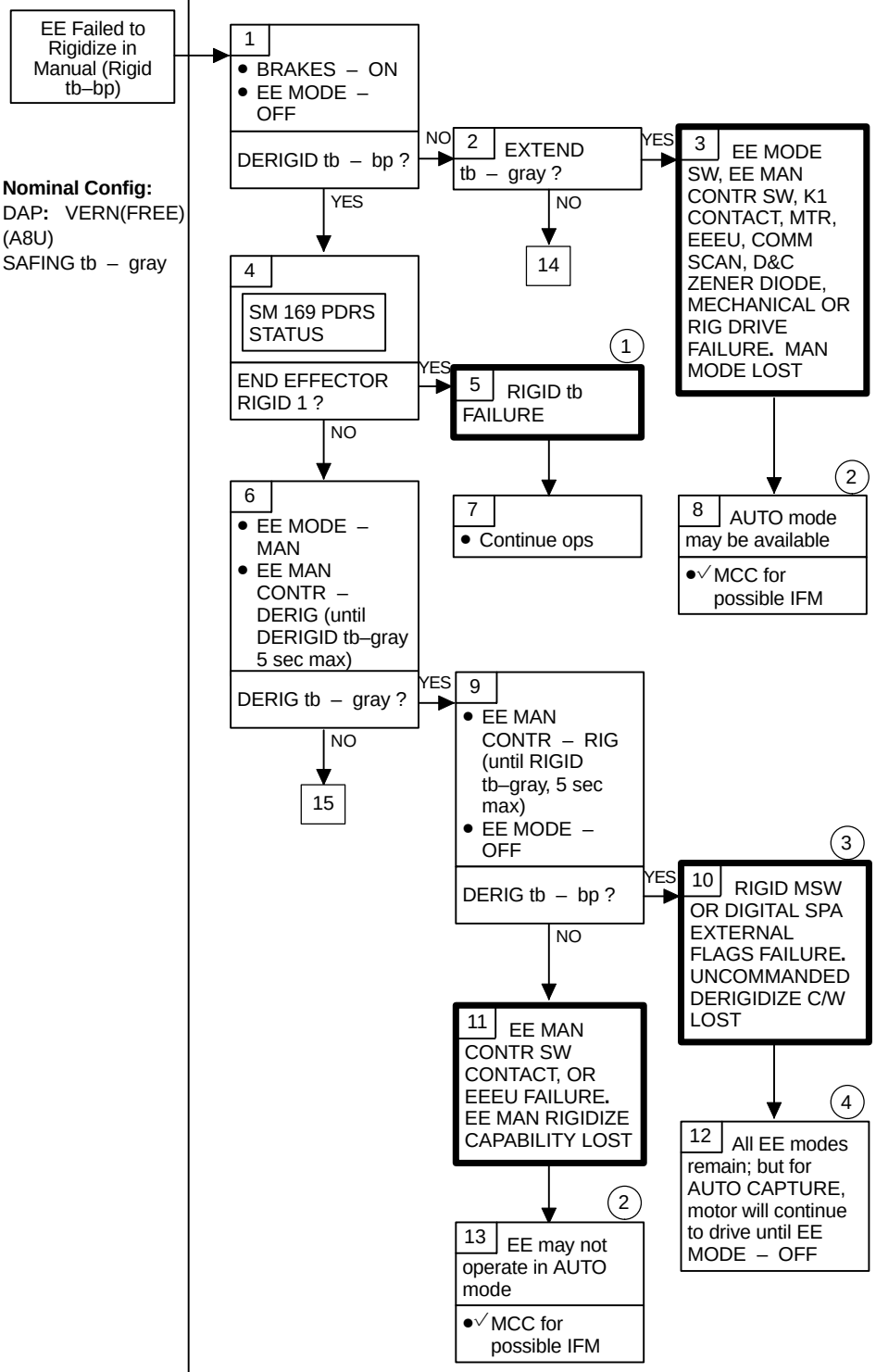
(1) For future EE OPS, use SM 94 PDRS CONTROL or SM 169 PDRS STATUS to determine status of affected EE tb

(2) For digital SPA failure, DERIG flag may be failed ON

(3) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC capture/ release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

PDRS

12.3d EE FAILS TO RIGIDIZE IN EE MODE – MAN (EE CHECKOUT ONLY)

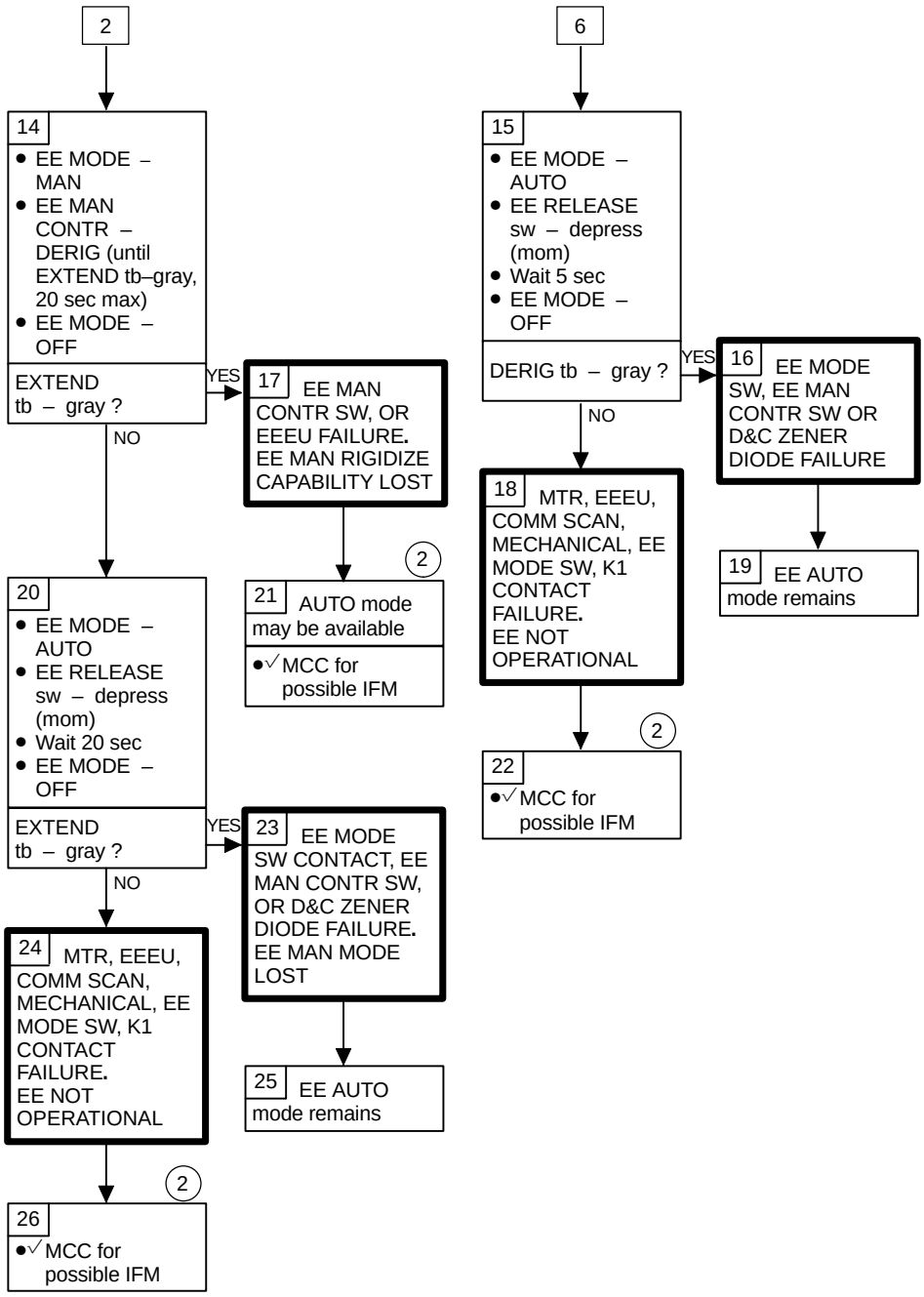


(1) For future EE OPS, use SM 94 PDRS CONTROL or SM 169 PDRS STATUS to determine status of affected EE tb

(2) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC capture/ release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

(3) For digital SPA failure, OPEN flag may be failed OFF causing motor to continue to drive snares open during AUTO REL until EE MODE – OFF

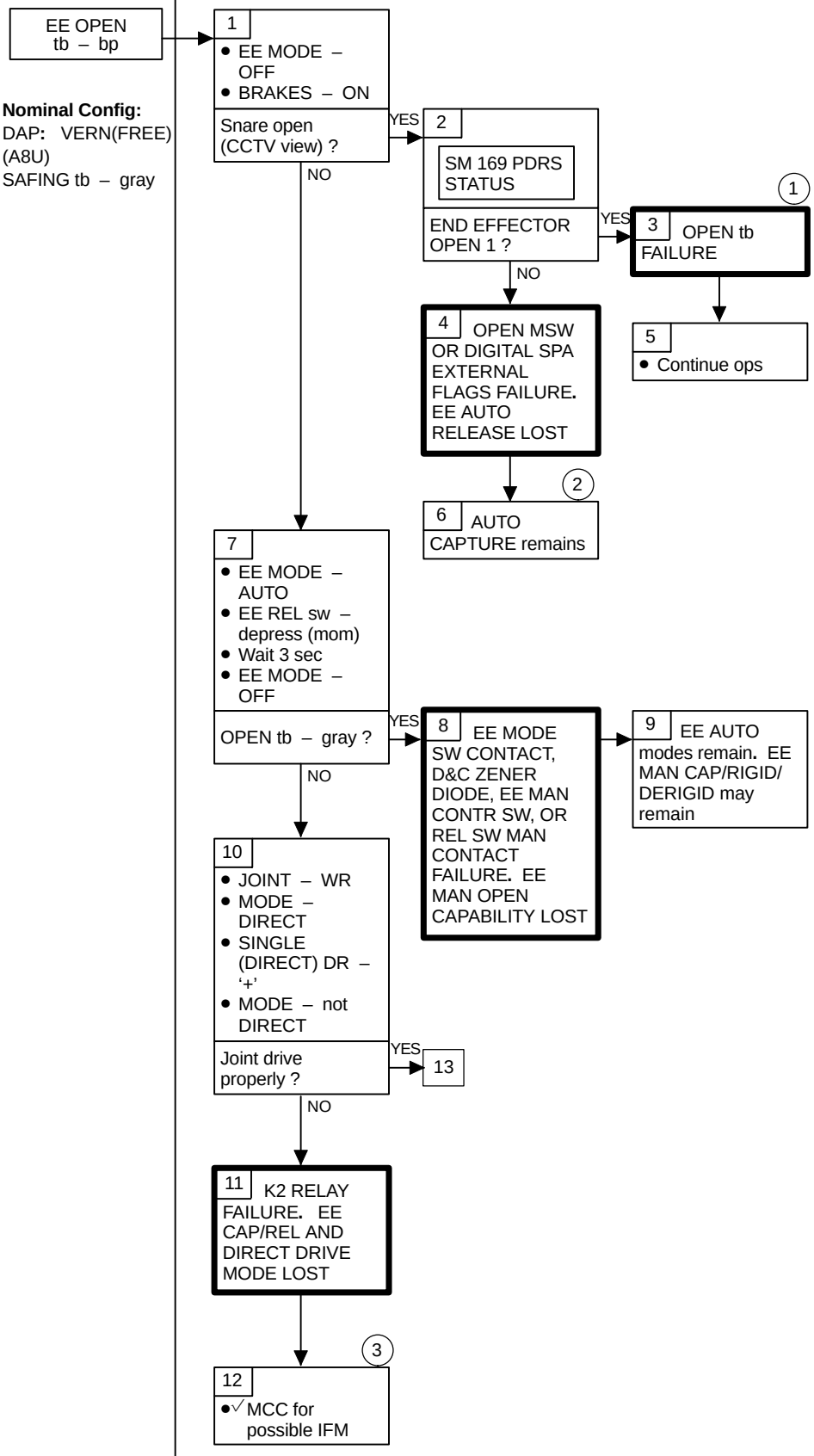
(4) Arm will move at unloaded rates. RMS loaded rates can be set via SM 95 PDRS OVERRIDE



(2) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC capture/ release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

PDRS

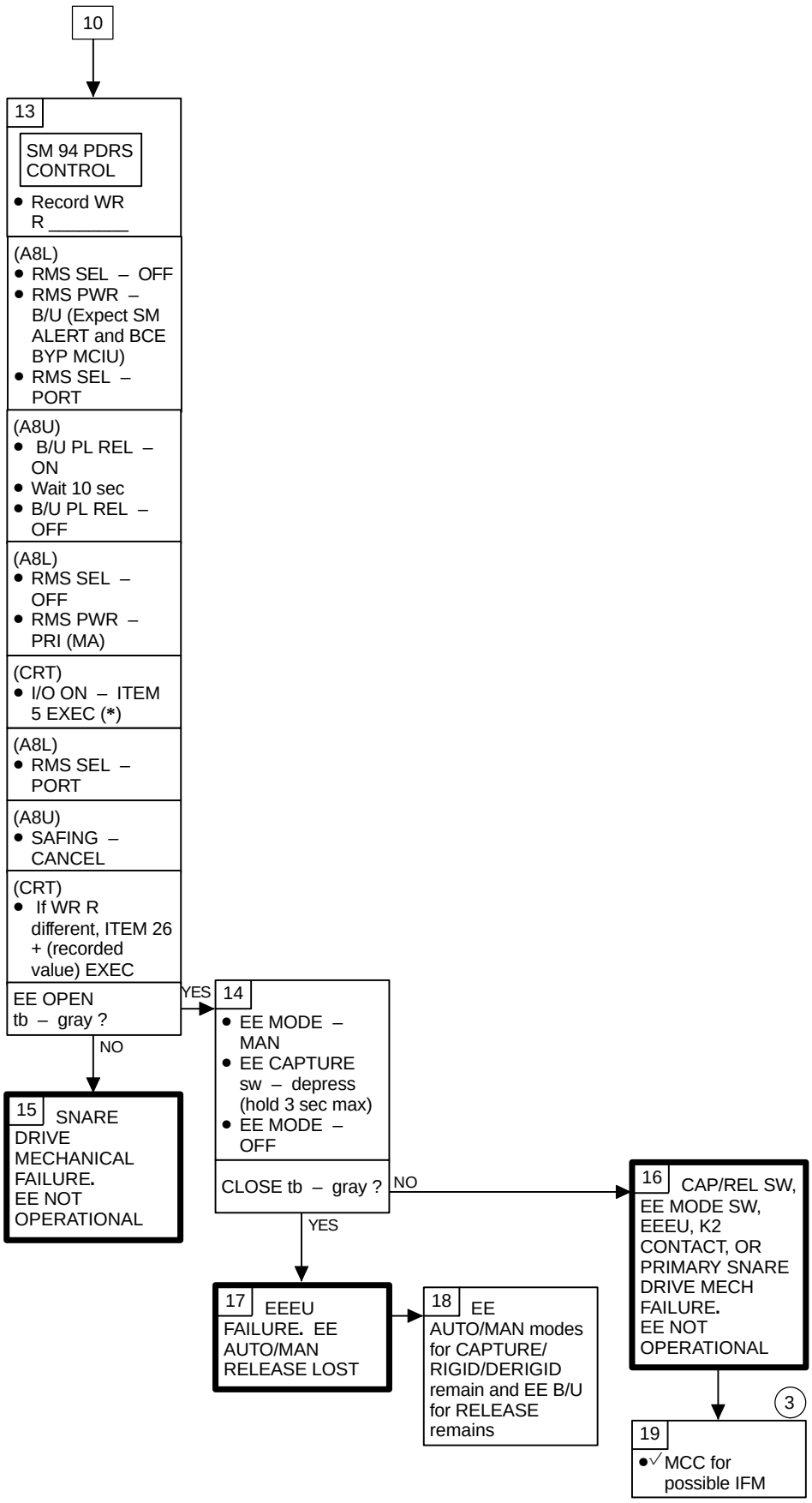
12.3e EE FAILS TO RELEASE IN EE MODE – MAN



(1) For future EE OPS, use SM 94 PDRS CONTROL or SM 169 PDRS STATUS to determine status of affected EE tb

(2) For digital SPA failure, RIGID flag may be failed OFF causing loss of loaded rates and motor to continue to drive until EE MODE – OFF during AUTO capture. Loaded rates can be set via SM 95 PDRS OVERRIDE

(3) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC capture/release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT



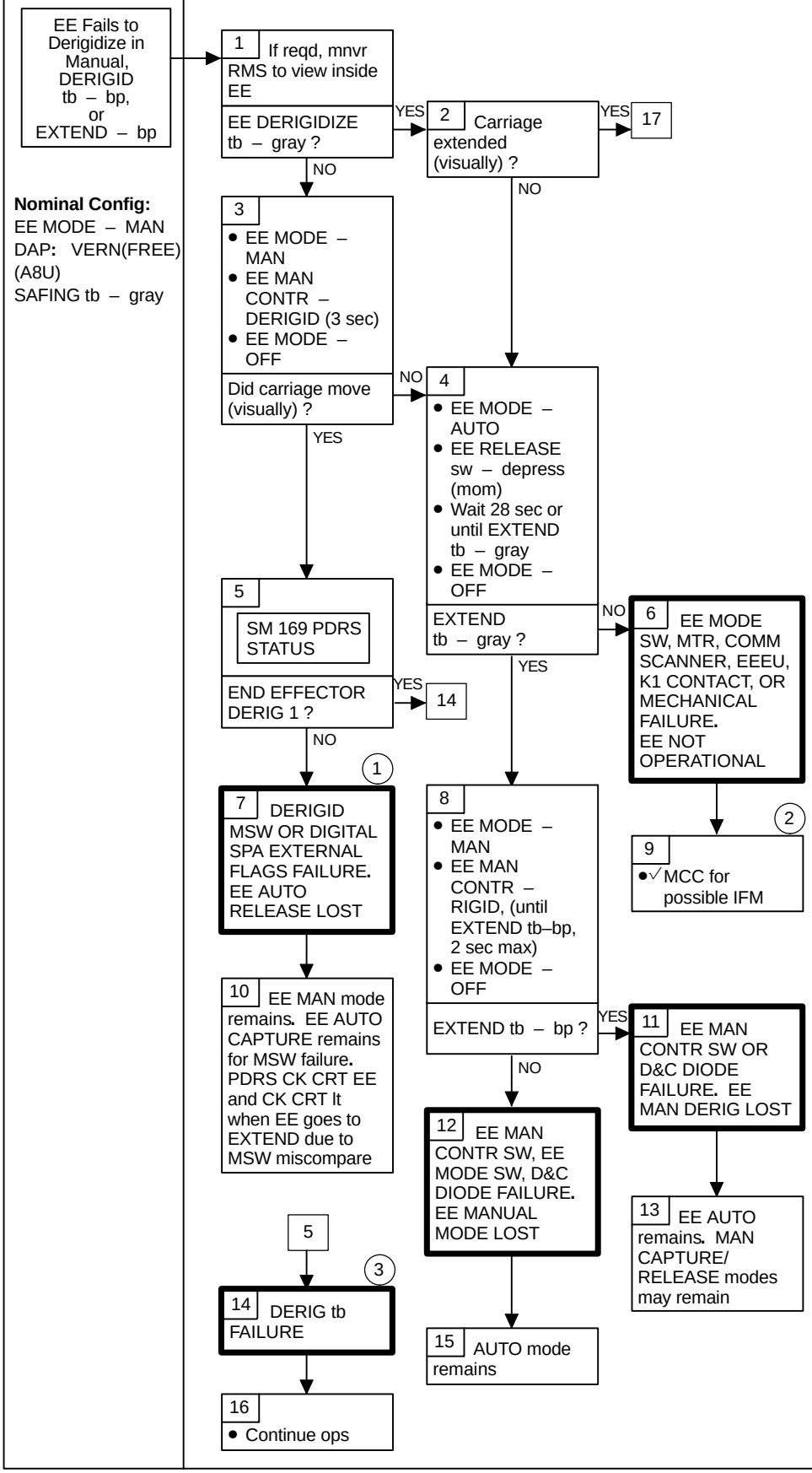
3 RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

PDRS

12.3f EE FAILS TO DERIGIDIZE/EXTEND IN MANUAL

EE Fails to Derigidize in Manual, DERIGID tb – bp, or EXTEND – bp

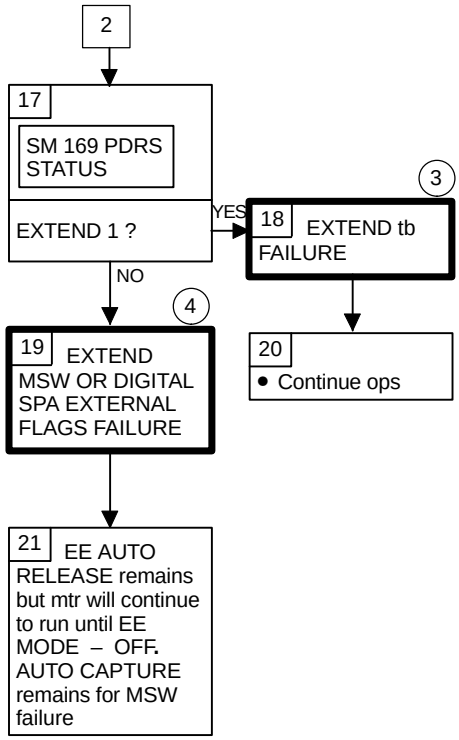
Nominal Config:
EE MODE – MAN
DAP: VERN(FREE) (A8U)
SAFING tb – gray



(1) For digital SPA failure, CLOSE flag may be failed ON

(2) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC capture/ release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

(3) For future EE OPS, use SM 94 PDRS CONTROL or SM 169 PDRS STATUS to determine status of affected EE tb



(3) For future EE OPS, use SM 94 PDRS CONTROL or SM 169 PDRS STATUS to determine status of affected EE tb

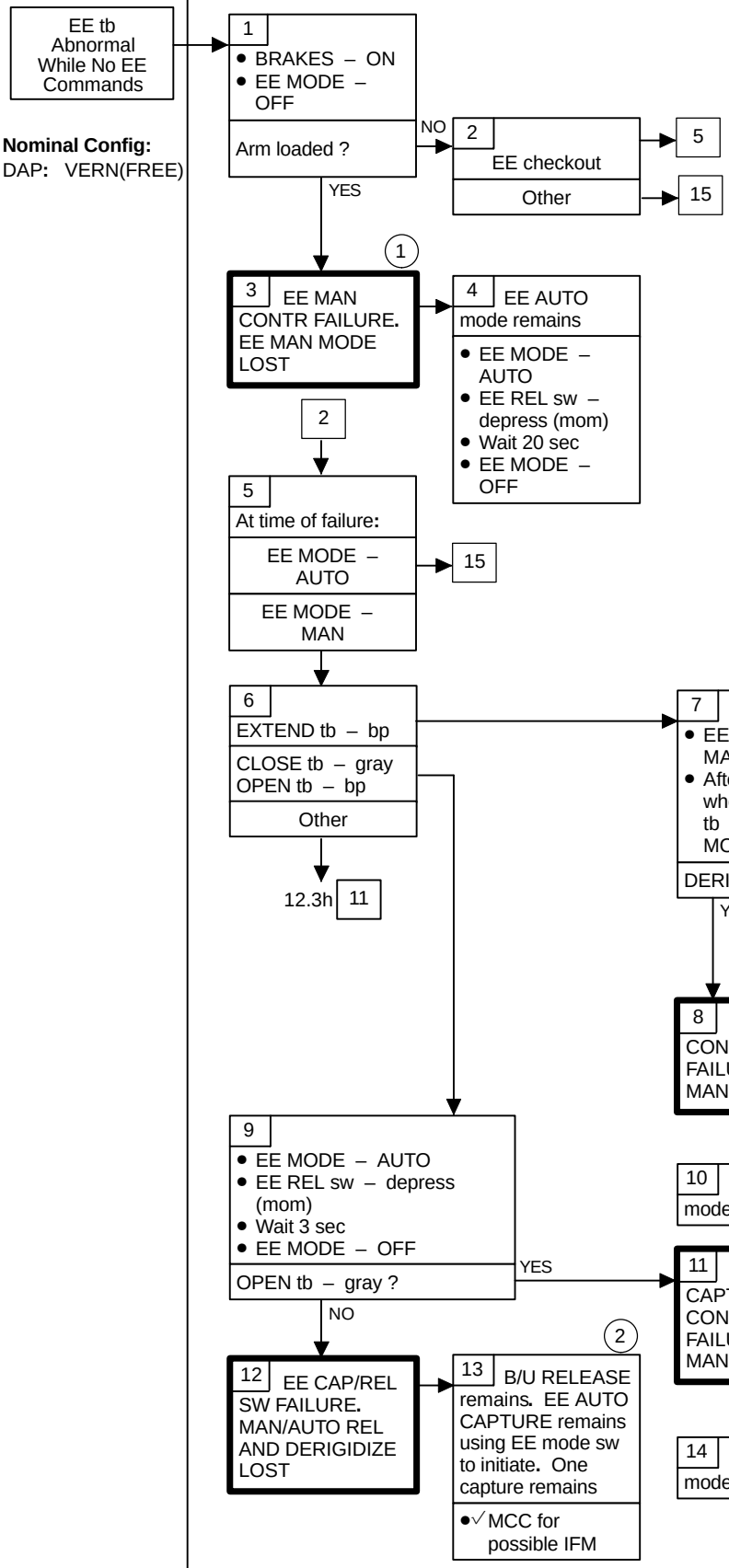
(4) For digital SPA failure, CAPTURE flag may be failed OFF

PDRS

12.3g EE tb ABNORMAL WHILE NO EE CMDS (EE MODE – AUTO OR MAN)

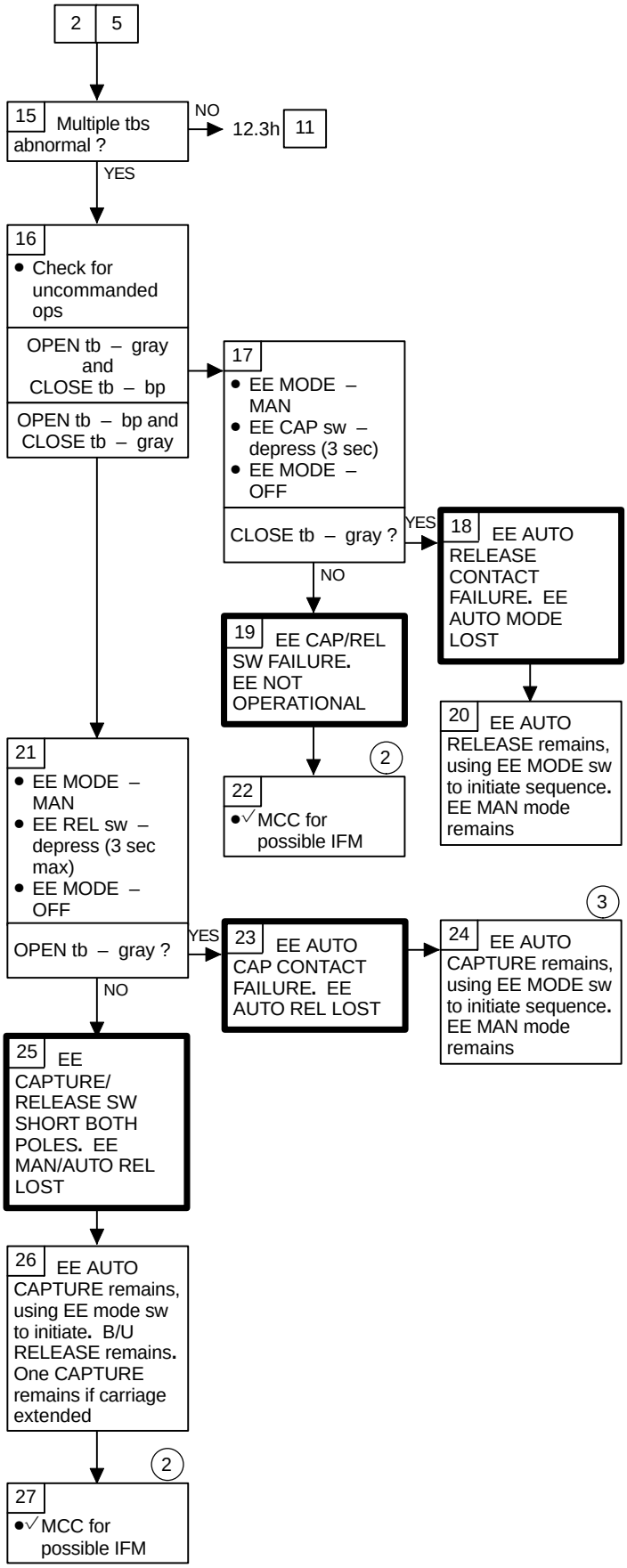
EE tb Abnormal While No EE Commands

Nominal Config:
DAP: VERN(FREE)



(1) Assumes PL about to be released

(2) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT



(2) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

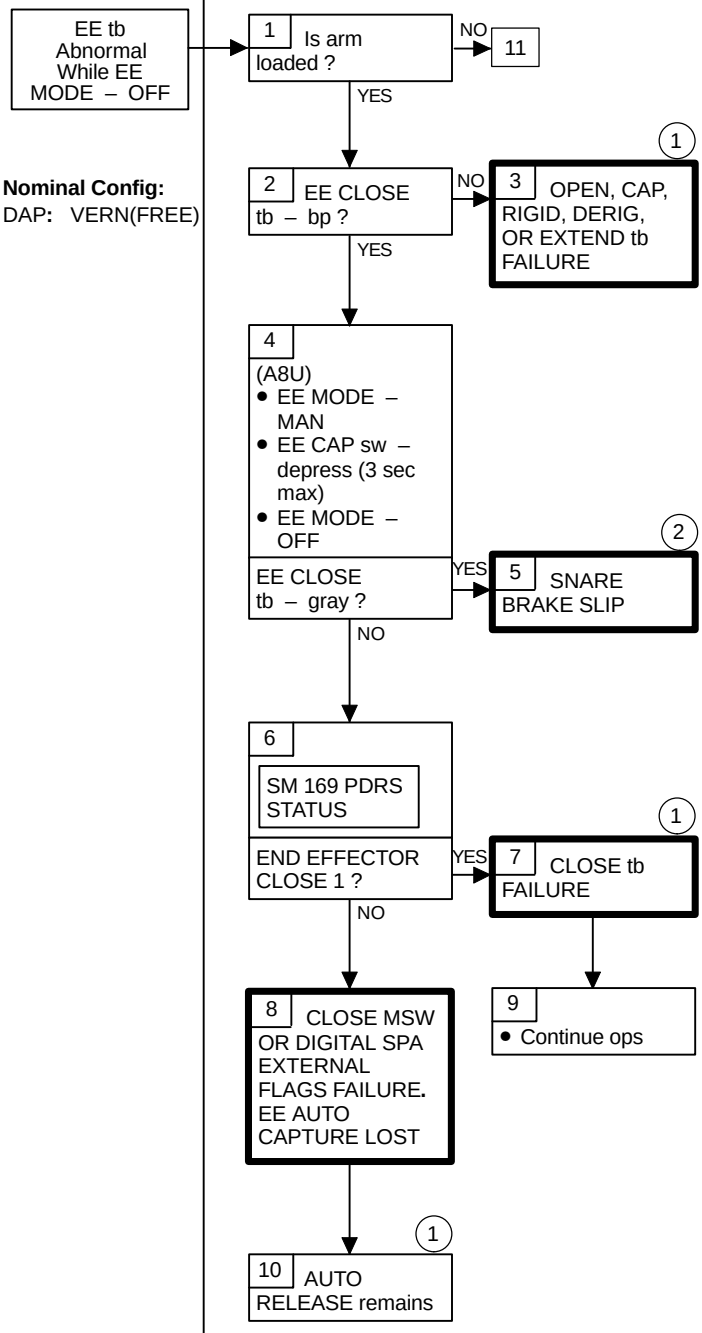
(3) RMS limping will occur whenever EE MODE sw is not in OFF position and RMS is in computer supported mode

PDRS

12.3h EE tb ABNORMAL WHILE EE MODE OFF

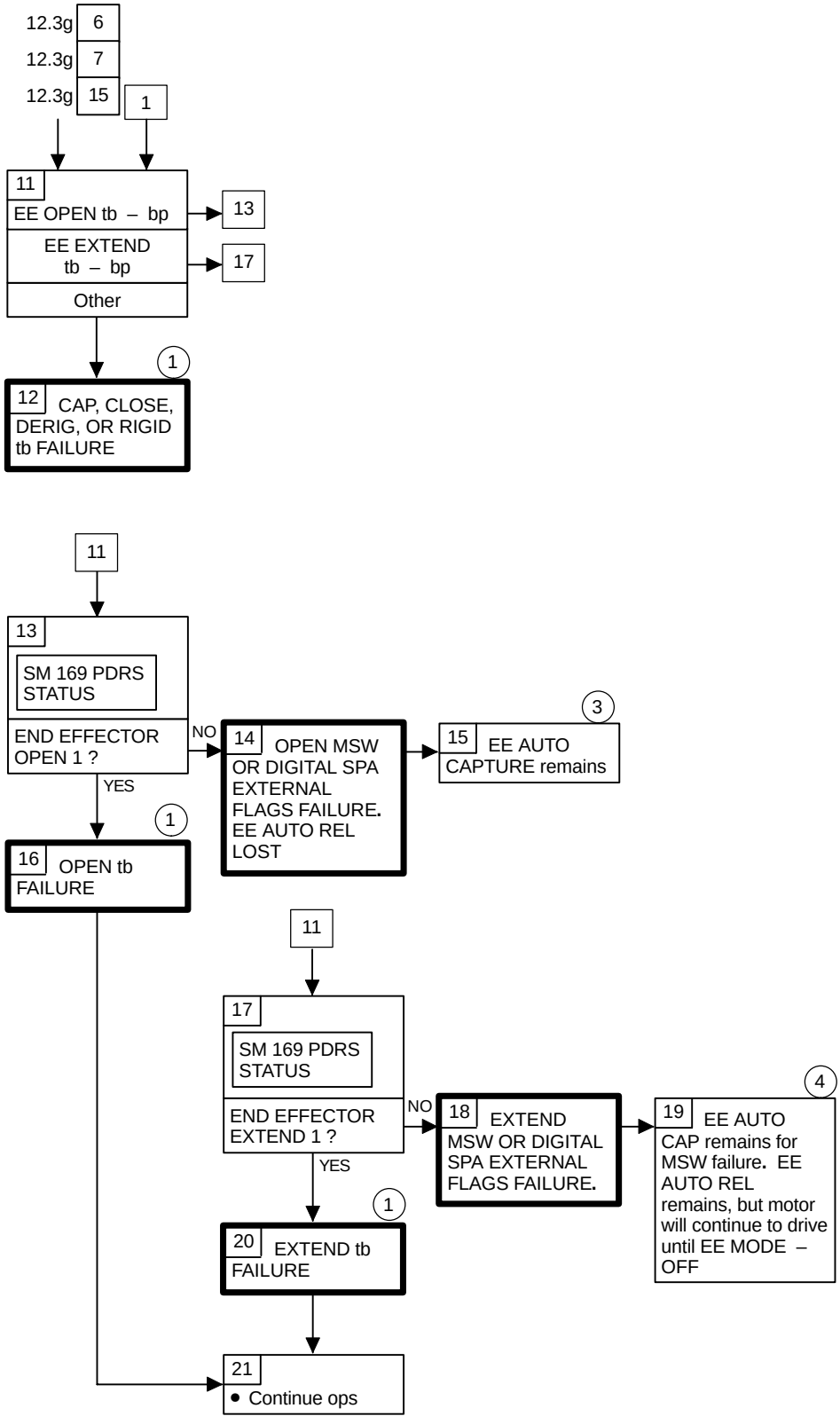
EE tb Abnormal While EE MODE – OFF

Nominal Config:
DAP: VERN(FREE)



(1) For future EE OPS, use SM 94 PDRS CONTROL or SM 169 PDRS STATUS to determine status of affected EE tb

(2) Subsequent slipping may occur



(1) For future EE OPS, use SM 94 PDRS CONTROL or SM 169 PDRS STATUS to determine status of affected EE tb

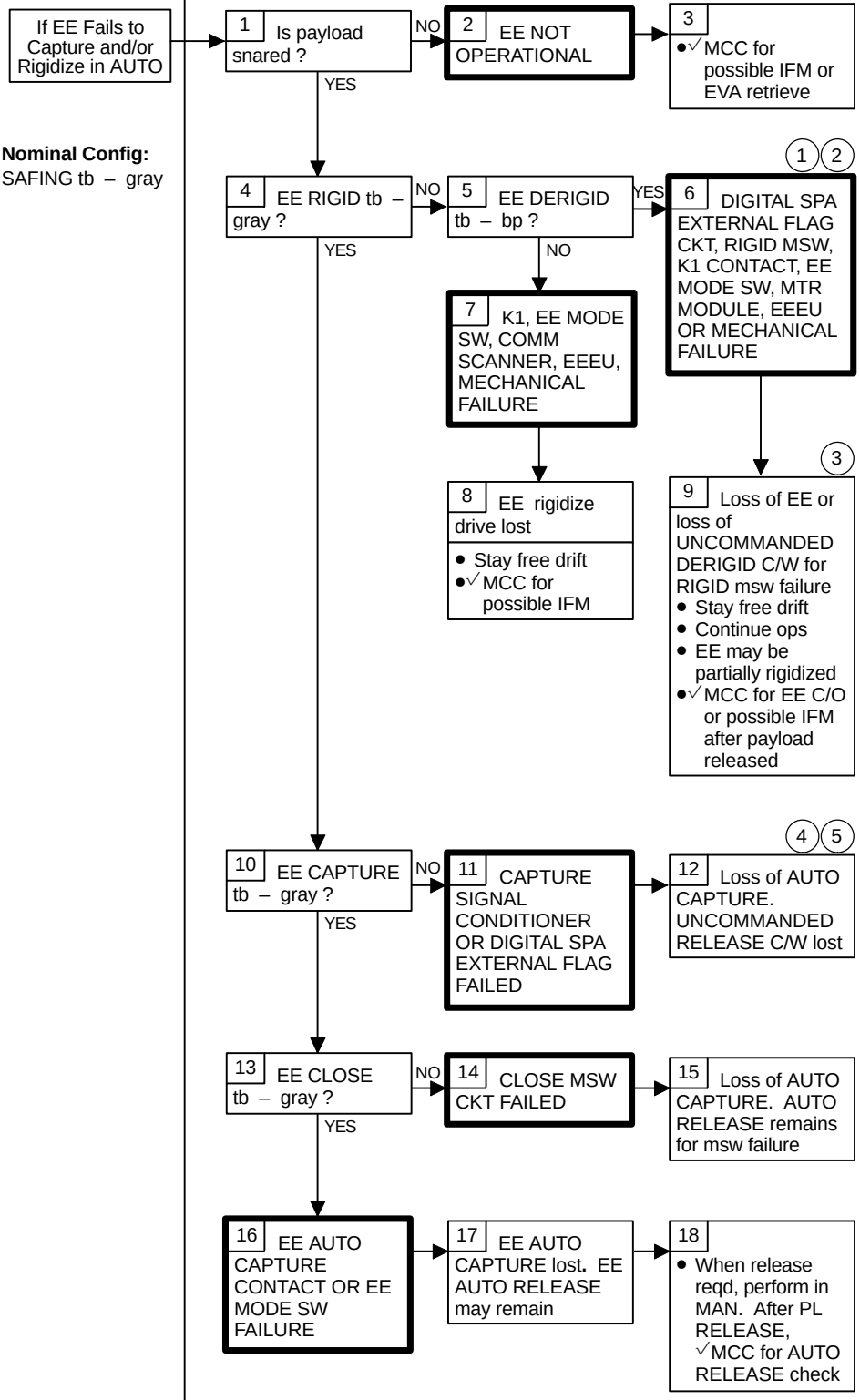
(3) For digital SPA failure, RIGID flag may be failed OFF causing loss of loaded rates and motor to continue to drive until EE MODE – OFF during AUTO CAPTURE. Loaded rates can be sent via SM 95 PDRS OVERRIDE

(4) For digital SPA failure, CAPTURE flag may be failed OFF

12.3i CAPTURE SEQ ABORTED (CUE CARD EXECUTED)

If EE Fails to Capture and/or Rigidize in AUTO

Nominal Config:
SAFING tb – gray



(1) Arm will move at unloaded rates. RMS loaded rates can be set via SM 95 PDRS OVERRIDE

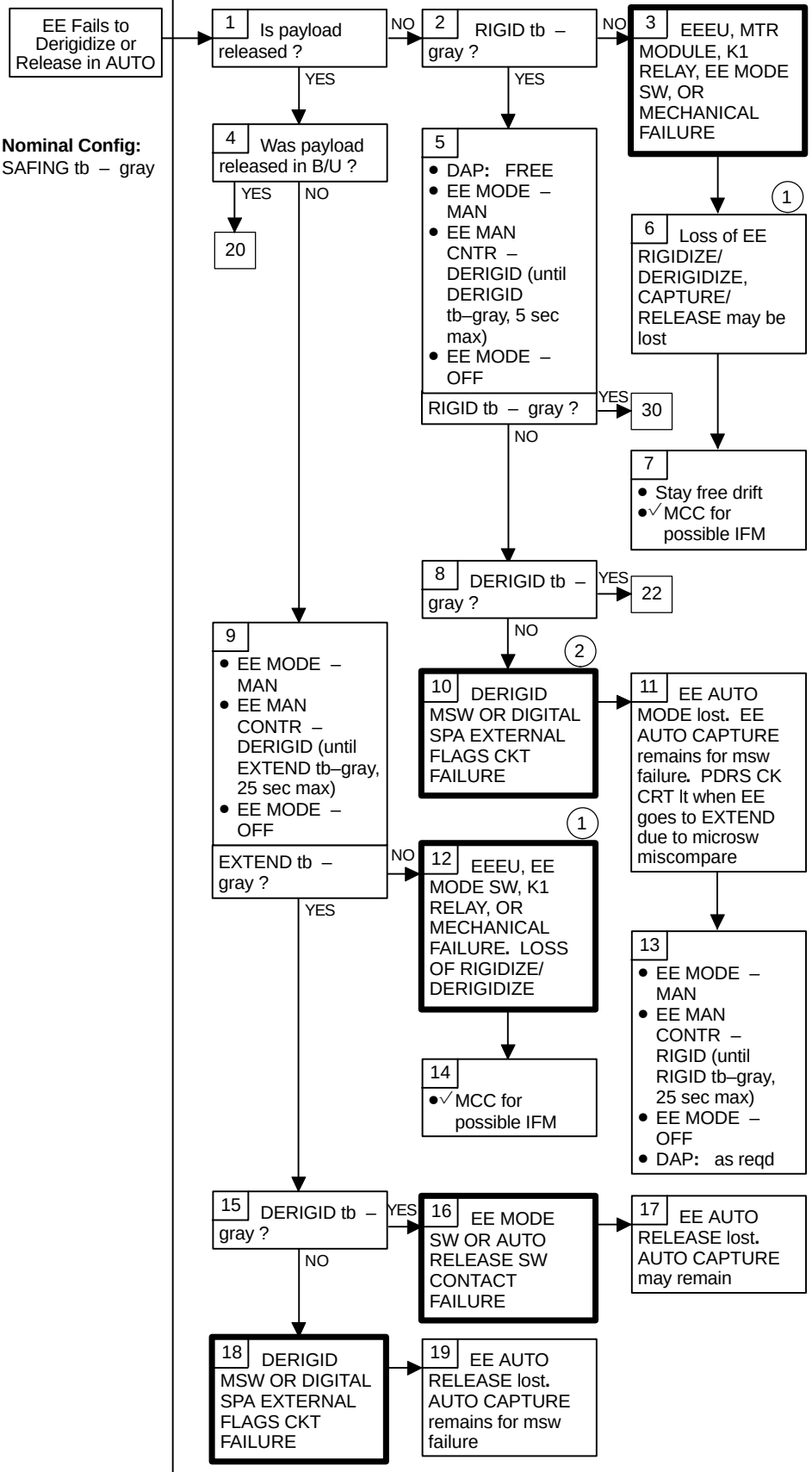
(2) For digital SPA failure, OPEN flag may be failed off

(3) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

(4) Arm will move at unloaded rates. RMS loaded rates can be set via SM 95 PDRS OVERRIDE

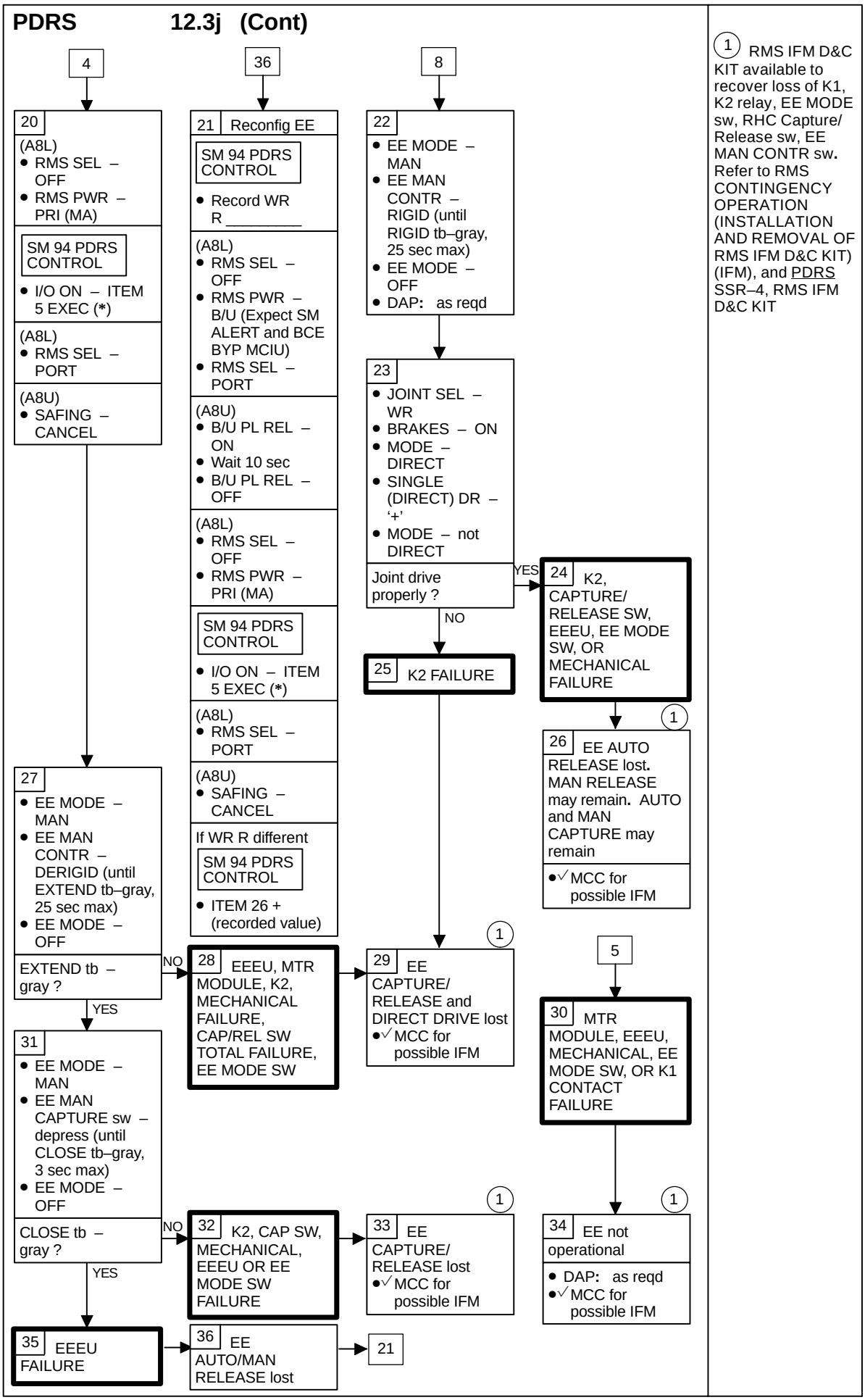
(5) For digital SPA failure, EXTEND flag may be failed off causing motor to continue to drive until EE MODE – OFF during AUTO RELEASE

12.3j NO AUTO RELEASE (CUE CARD EXECUTED)



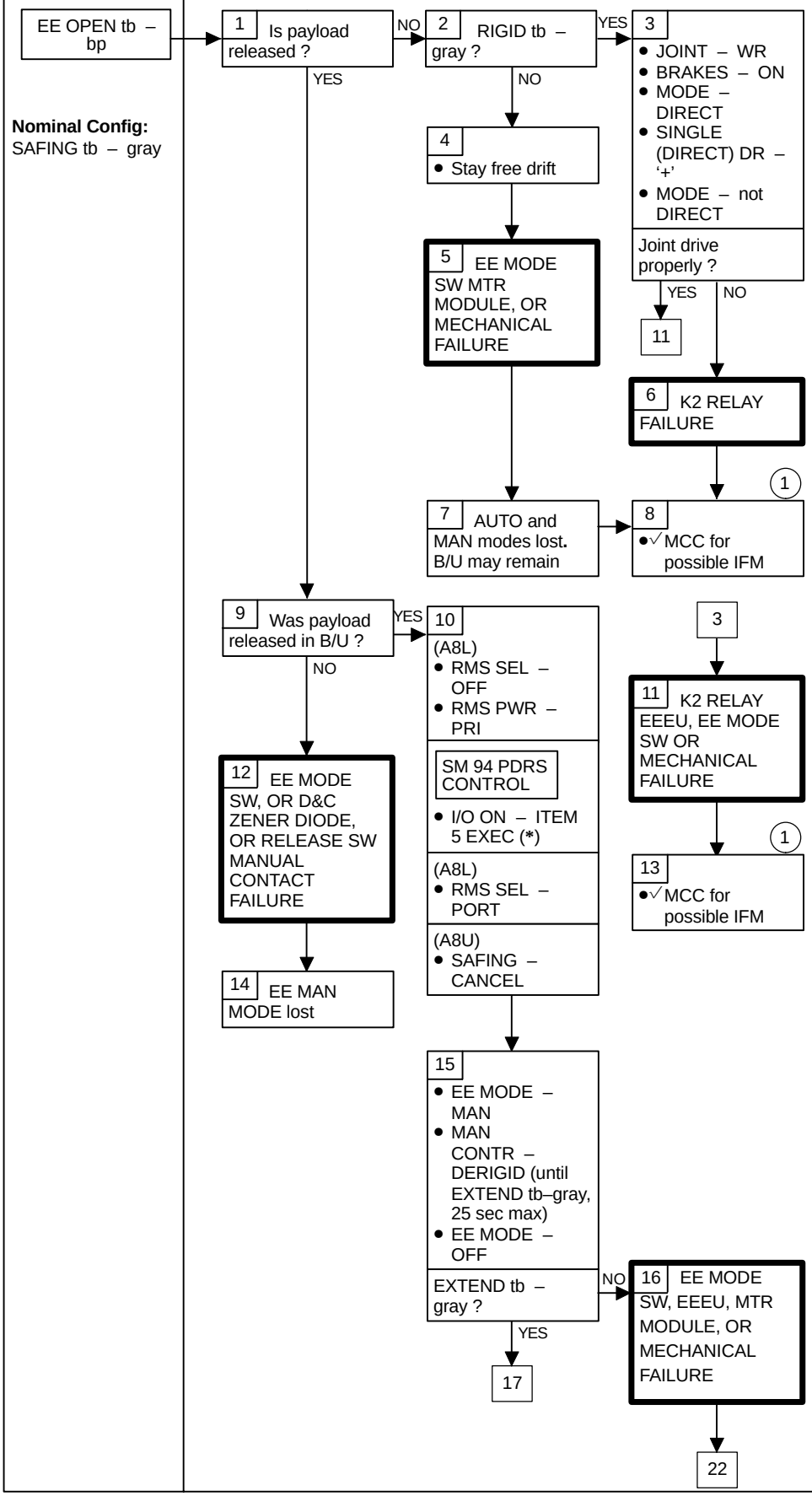
(1) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

(2) For digital SPA, CLOSE flag may be failed ON

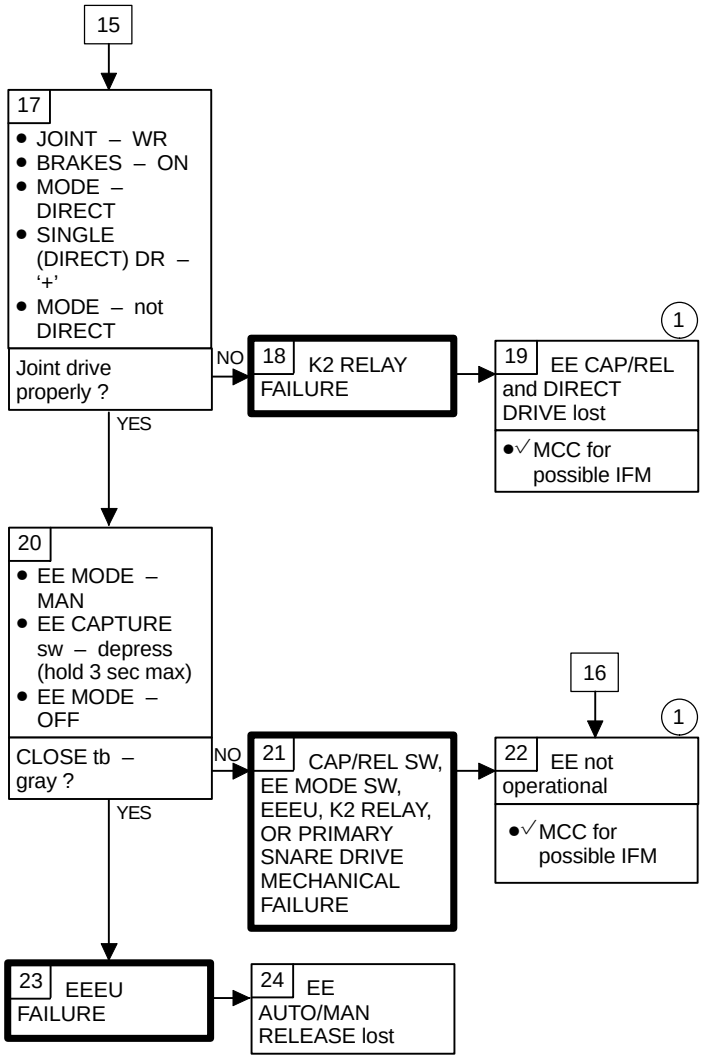


1 RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

12.3k NO MANUAL RELEASE (CUE CARD EXECUTED)

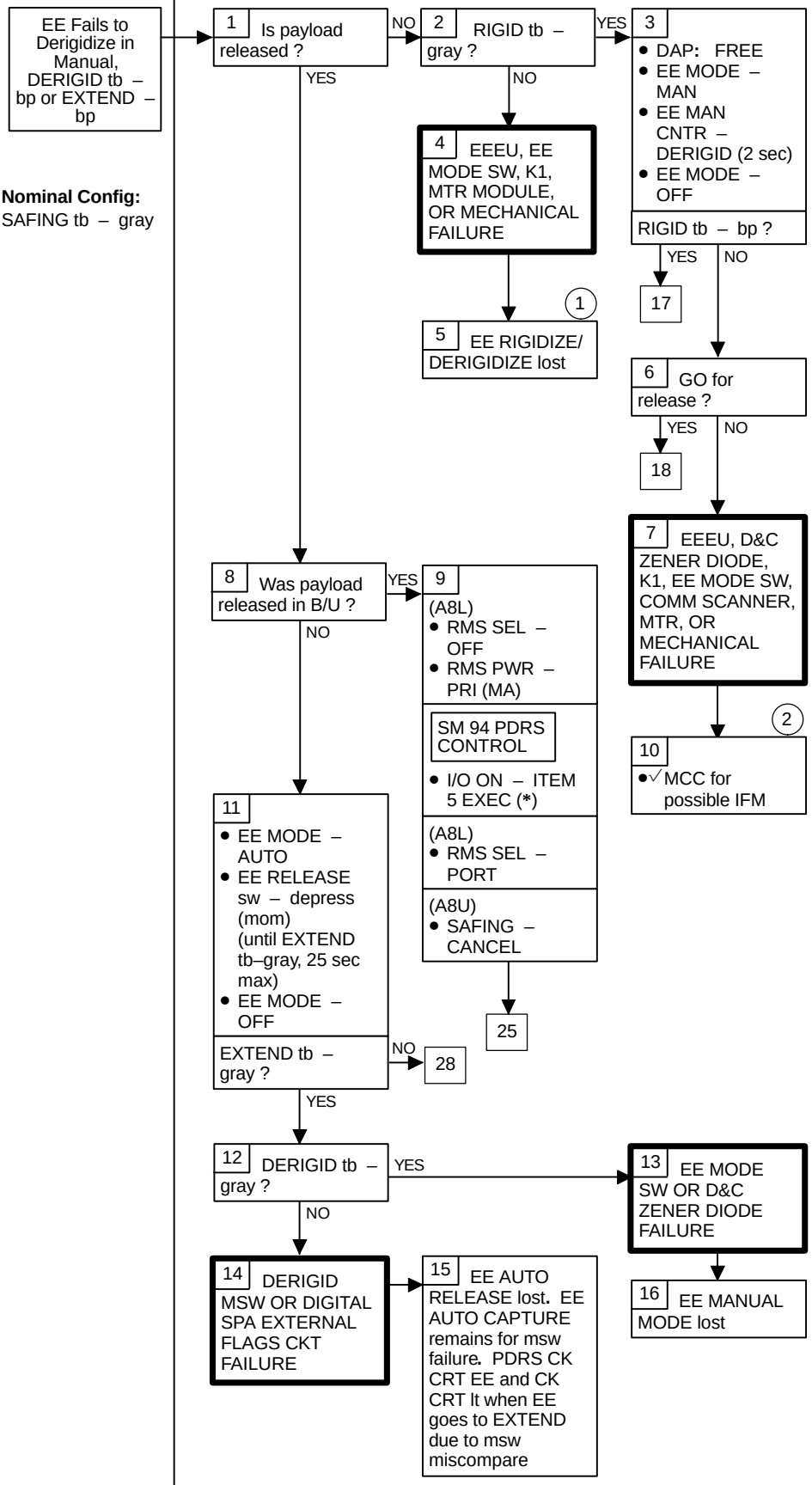


(1) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT



(1) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

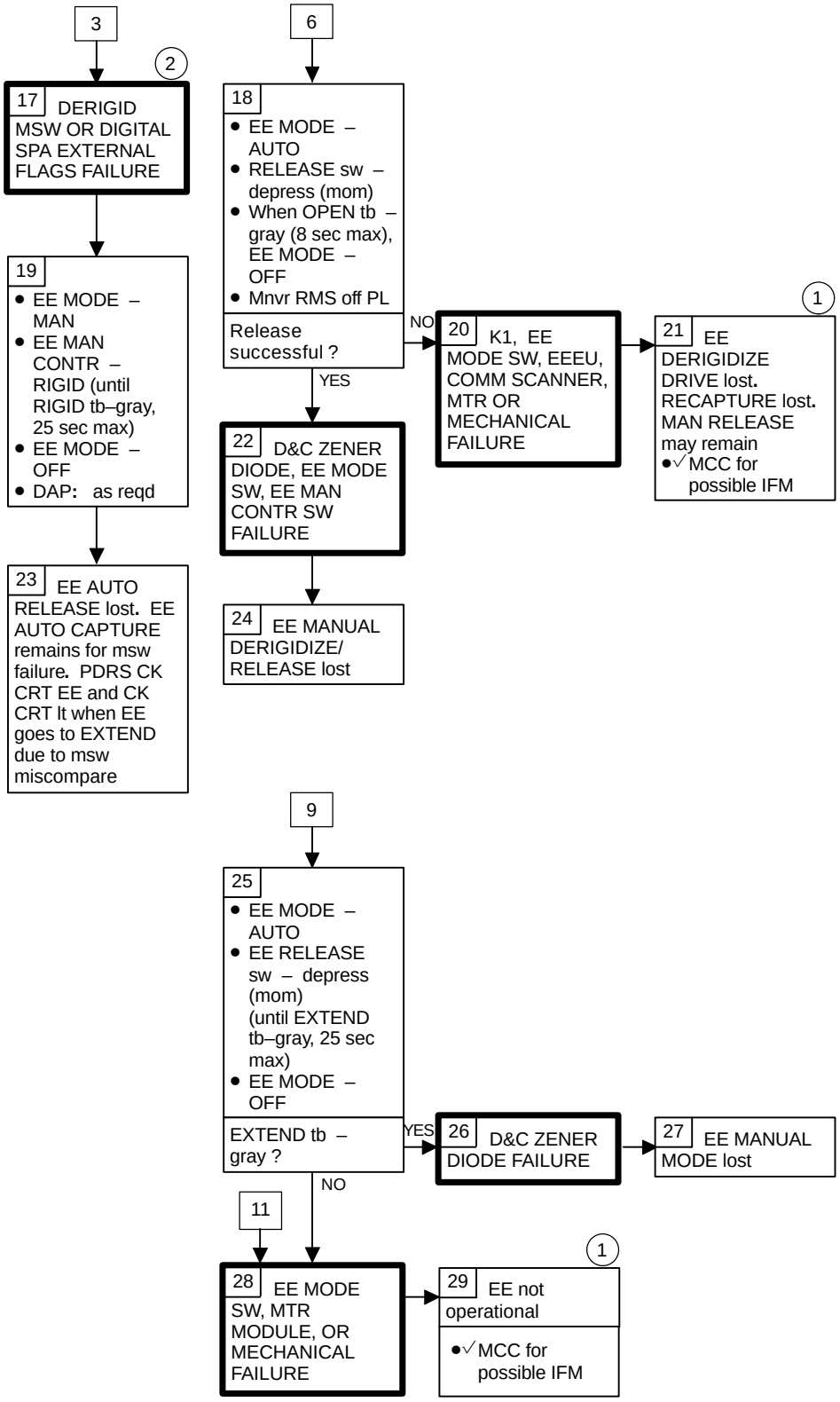
12.3l NO MANUAL DERIGID (CUE CARD EXECUTED)



(1) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

(2) For digital SPA, CLOSE flag may be failed ON

PDRS 12.3l (Cont)



(1) RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, RHC Capture/ Release sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT

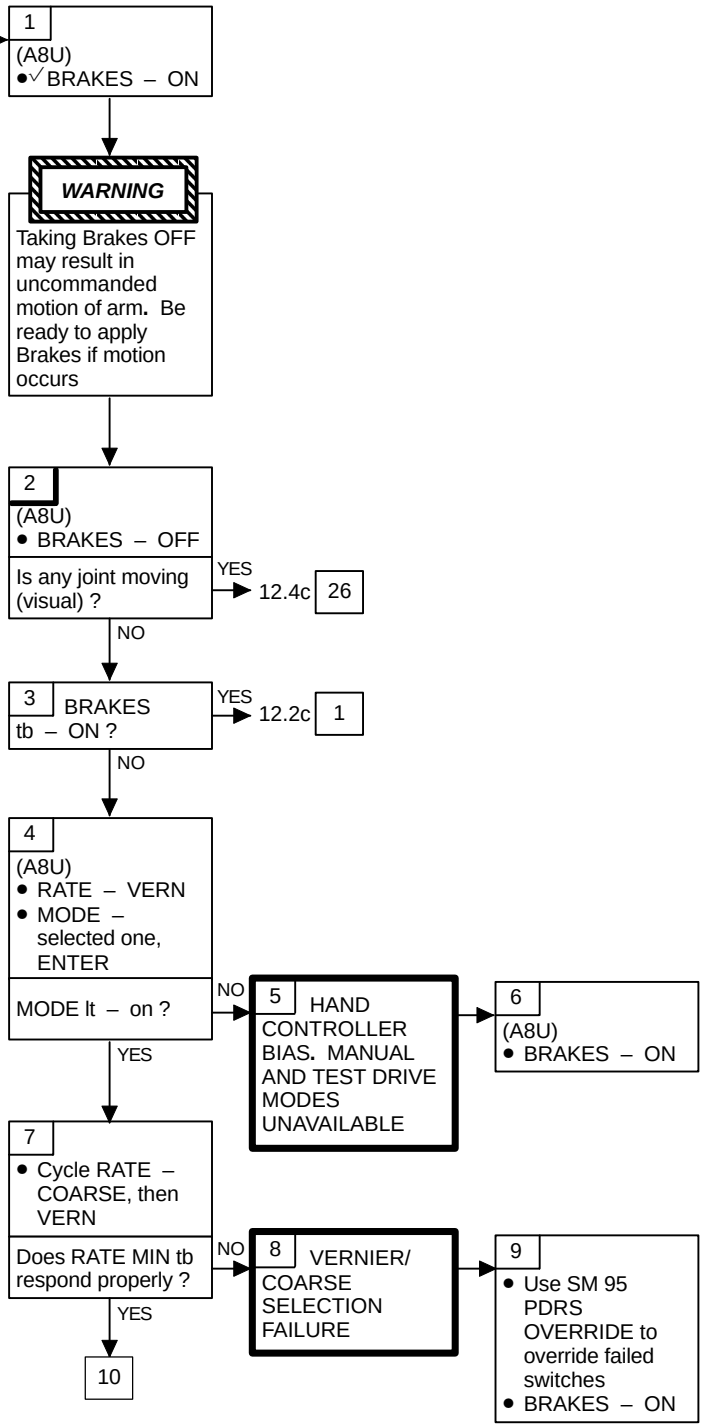
(2) For digital SPA, CLOSE flag may be failed ON

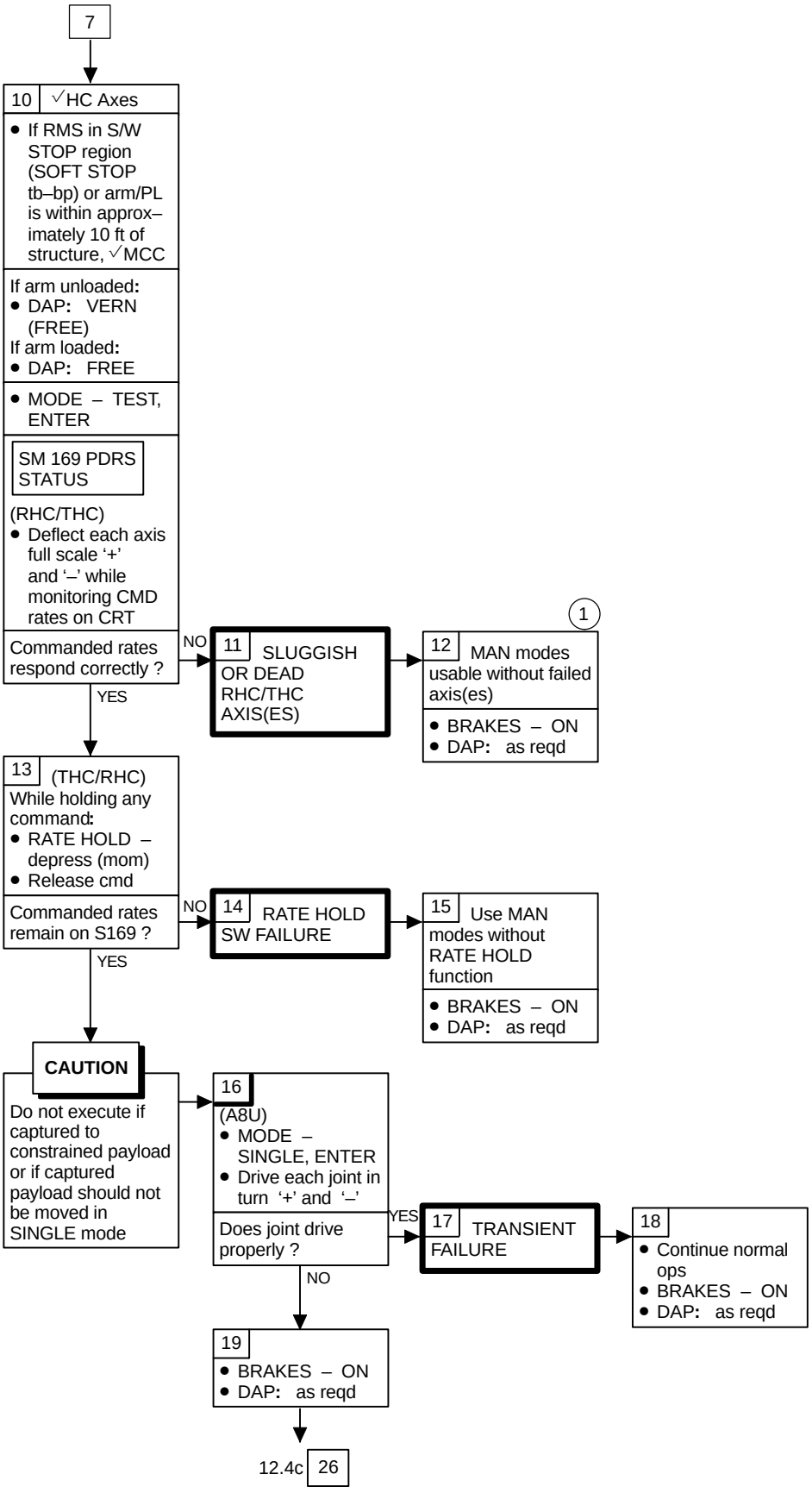
PDRS

12.4a ARM RESPONSE ABNORMAL IN MANUAL MODES

Arm Response Not Normal for Commands in Manual Modes

Nominal Config:
(A8L)
RMS PWR – PRI
SEL – PORT
(A8U)
SAFING – AUTO
SAFING tb – gray
S/W STOP – gray
EE MODE – OFF



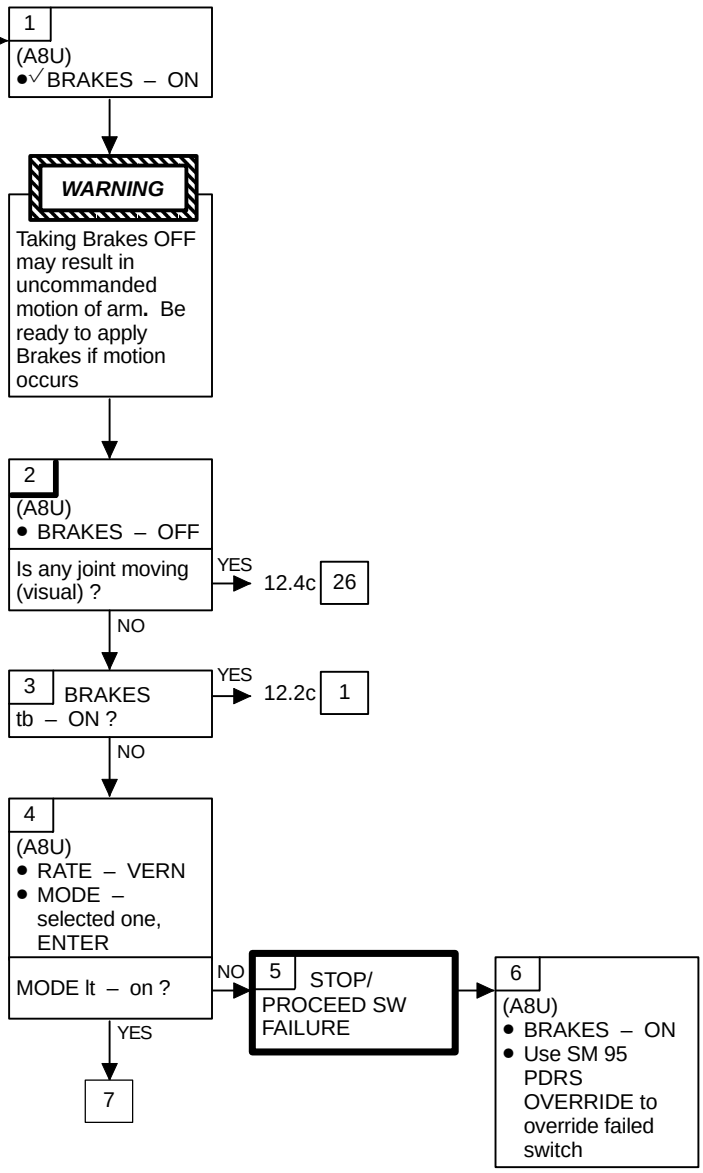


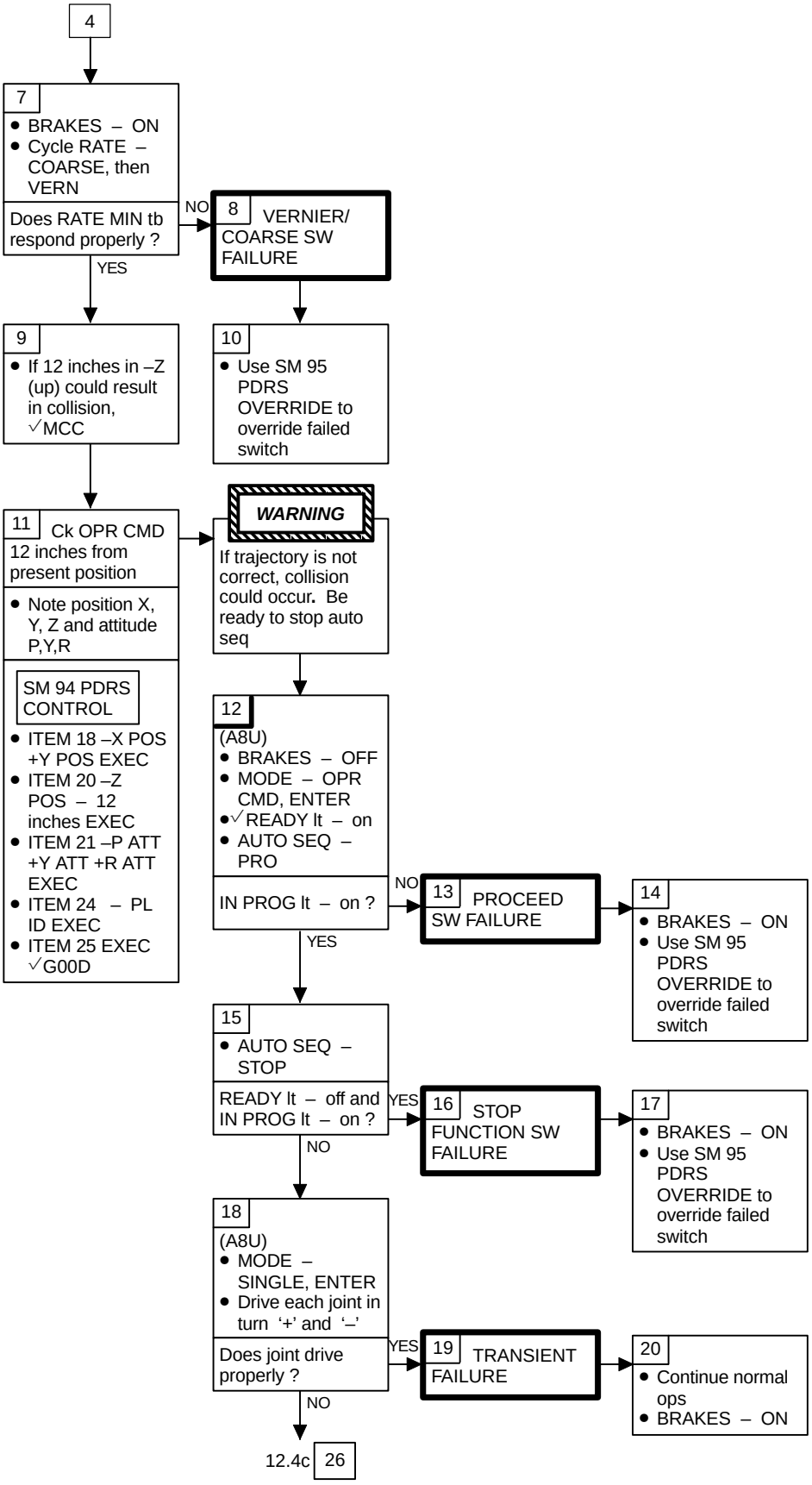
(1) Single HC axis failure workaround capability exists via SM 95 PDRS OVERRIDE

12.4b ARM RESPONSE ABNORMAL IN AUTO MODES

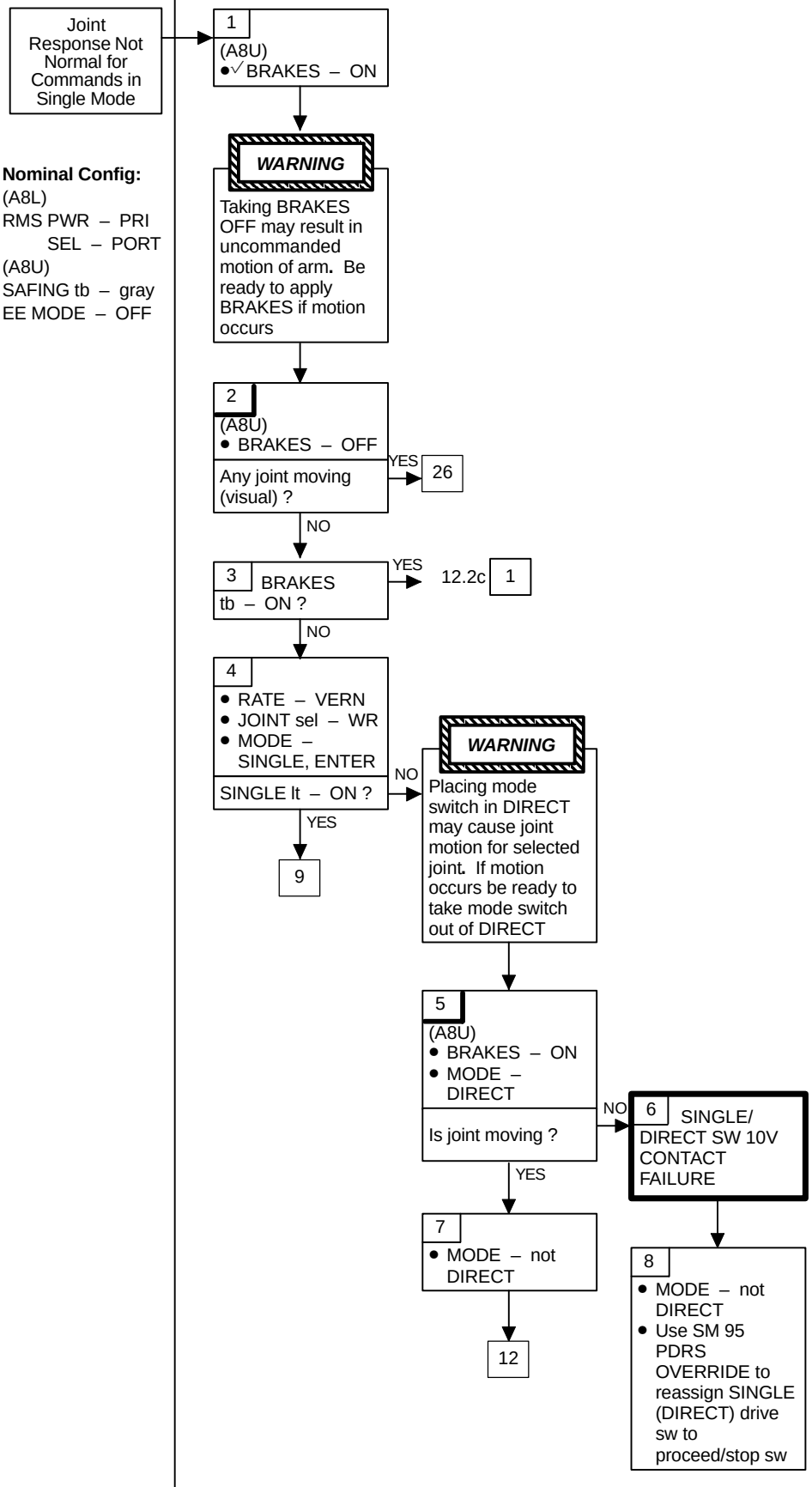
Arm Response Not Normal for Commands in Auto Modes

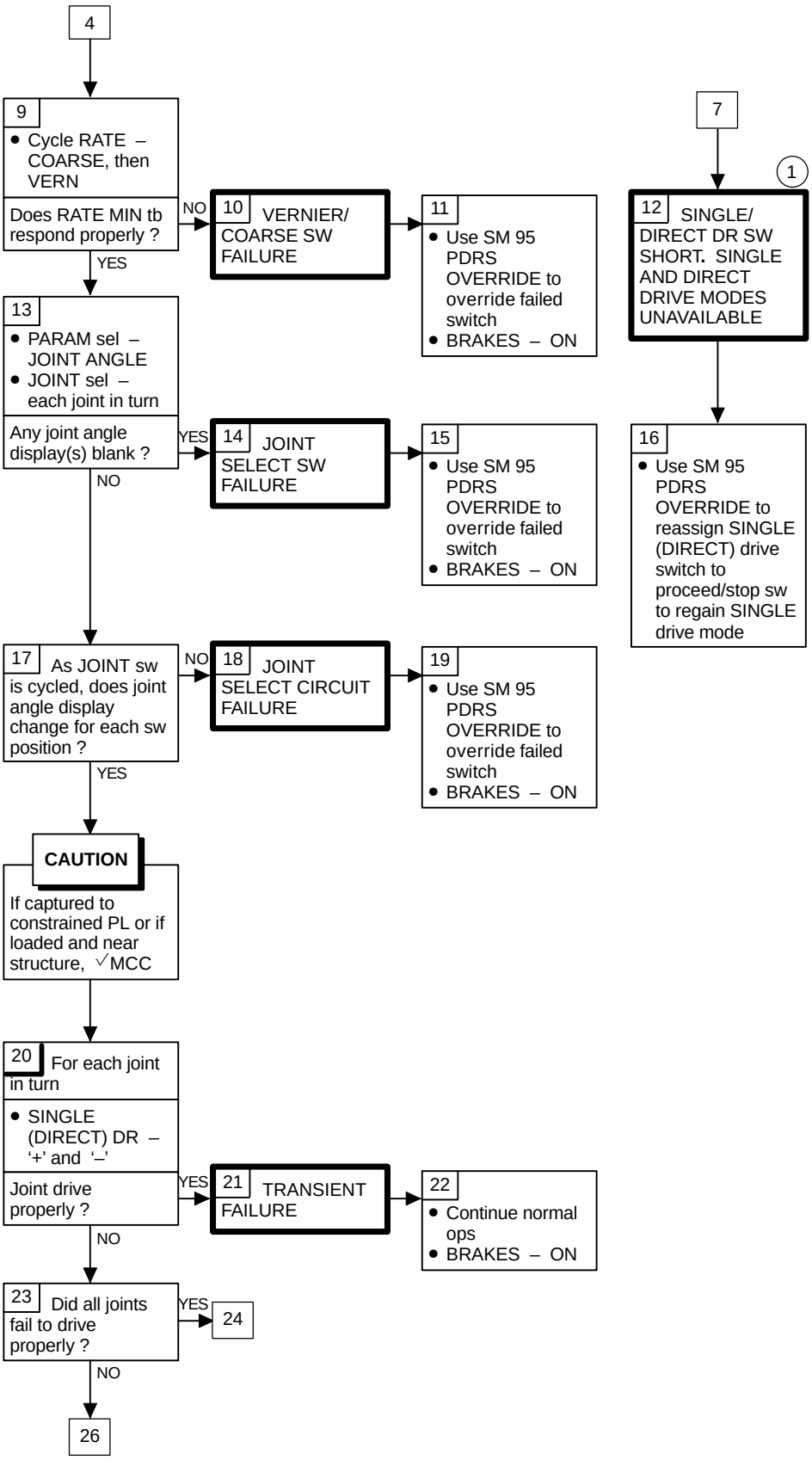
Nominal Config:
(A8L)
RMS PWR – PRI
SEL – PORT
(A8U)
SAFING tb – gray
S/W STOP – gray
EE MODE – OFF



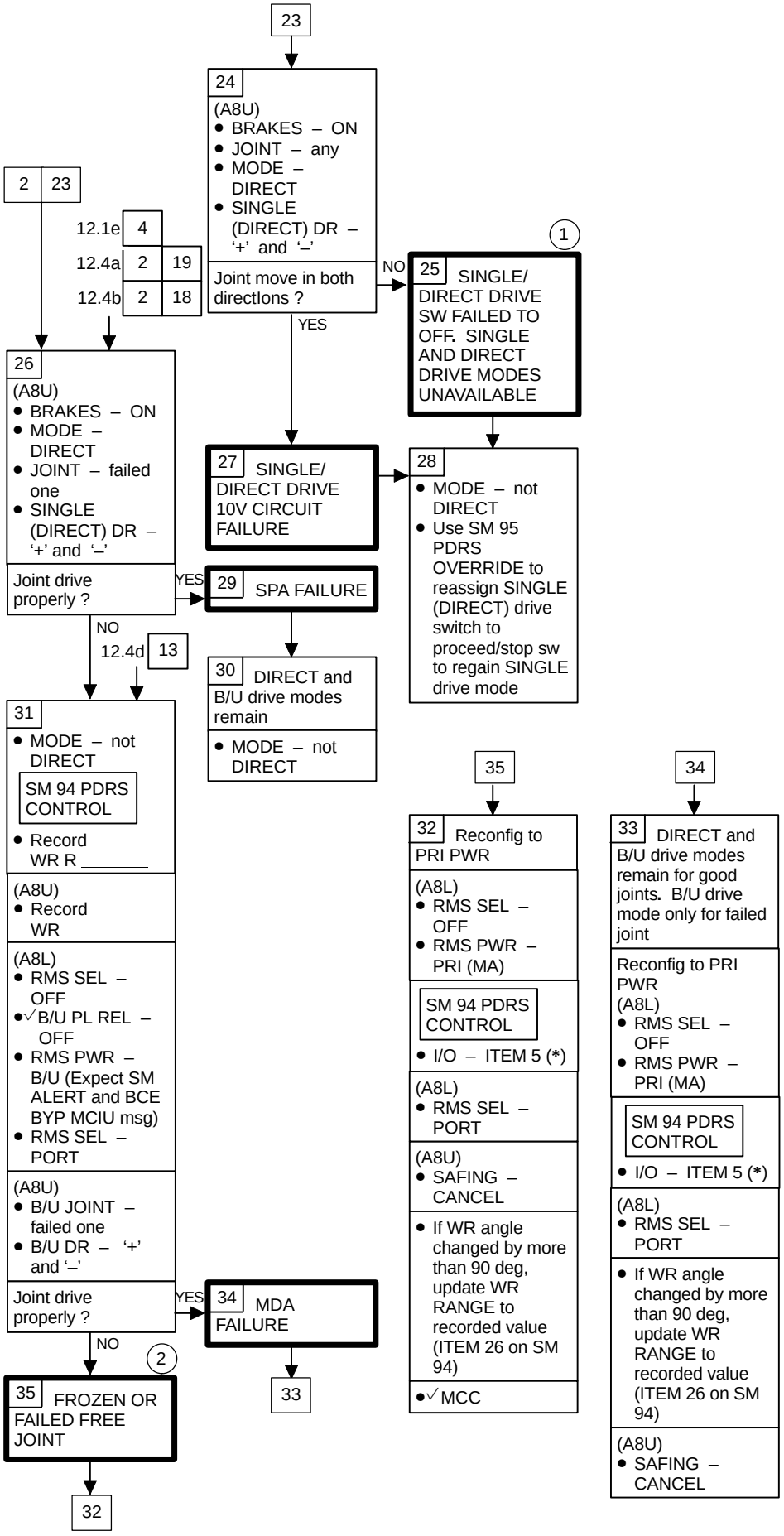

4
7
• BRAKES – ON
• Cycle RATE – COARSE, then VERN
Does RATE MIN tb respond properly ?
NO
8 VERNIER/ COARSE SW FAILURE
YES
9
• If 12 inches in –Z (up) could result in collision, ✓MCC
10
• Use SM 95 PDRS OVERRIDE to override failed switch
11 Ck OPR CMD 12 inches from present position
• Note position X, Y, Z and attitude P,Y,R
SM 94 PDRS CONTROL
• ITEM 18 –X POS +Y POS EXEC
• ITEM 20 –Z POS – 12 inches EXEC
• ITEM 21 –P ATT +Y ATT +R ATT EXEC
• ITEM 24 – PL ID EXEC
• ITEM 25 EXEC ✓G00D
WARNING
If trajectory is not correct, collision could occur. Be ready to stop auto seq
12
(A8U)
• BRAKES – OFF
• MODE – OPR CMD, ENTER
• ✓READY lt – on
• AUTO SEQ – PRO
IN PROG lt – on ?
NO
13 PROCEED SW FAILURE
14
• BRAKES – ON
• Use SM 95 PDRS OVERRIDE to override failed switch
YES
15
• AUTO SEQ – STOP
READY lt – off and IN PROG lt – on ?
YES
16 STOP FUNCTION SW FAILURE
17
• BRAKES – ON
• Use SM 95 PDRS OVERRIDE to override failed switch
NO
18
(A8U)
• MODE – SINGLE, ENTER
• Drive each joint in turn '+' and '–'
Does joint drive properly ?
YES
19 TRANSIENT FAILURE
20
• Continue normal ops
• BRAKES – ON
NO
12.4c 26

12.4c JOINT RESPONSE ABNORMAL IN SINGLE MODE





(1) DIRECT mode can be regained with RMS IFM D&C KIT. Refer to RMS CONTINGENCY OPERATION/ INSTALLATION AND REMOVAL OF THE RMS IFM D&C KIT (IFM), and PDRS SSR–4 RMS IFM D&C KIT



(1) DIRECT mode can be regained with RMS IFM D&C KIT. Refer to RMS CONTINGENCY OPERATION/ INSTALLATION AND REMOVAL OF THE RMS IFM D&C KIT (IFM), and PDRS SSR–4 RMS IFM D&C KIT

(2) BACKDRIVE TECHNIQUE – JOINT FREE, PDRS SSR–3 or EVA reqd to cradle arm for failed free joint

12.4d JOINT RESPONSE ABNORMAL IN DIRECT MODE

Joint Response Not Normal for Commands in Direct Mode

Nominal Config:
(A8L)
RMS PWR – PRI SEL – PORT
(A8U)
BRAKES – ON
BRAKES tb – ON
SAFING tb – gray

1
(A8U)
- ✓BRAKES – ON
- MODE – not DIRECT
- JOINT – WR

WARNING
Placing mode switch in DIRECT may cause joint motion for selected joint. If motion occurs, be ready to take mode switch out of DIRECT

2
(A8U)
- MODE – DIRECT

Joint motion of selected joint ?

YES → 3
- MODE – not DIRECT

NO

WARNING
Driving in DIRECT may cause incorrect joint to drive or motion in incorrect direction. If captured to constrained PL or if loaded and near structure, ✓MCC

1 → 4 SINGLE/ DIRECT DR SW SHORT. SINGLE AND DIRECT DRIVE MODES UNAVAILABLE

5
- Use SM 95 PDRS OVERRIDE to reassign SINGLE (DIRECT) drive switch to regain SINGLE drive mode

6
(A8U)
- SINGLE (DIRECT) DR – each joint in turn '+ ' and '– '

Two joints drive simultaneously ?

YES → 1 → 7 6V/12V JOINT SEL SW CONTACT SHORT. DIRECT DRIVE MODE UNAVAILABLE

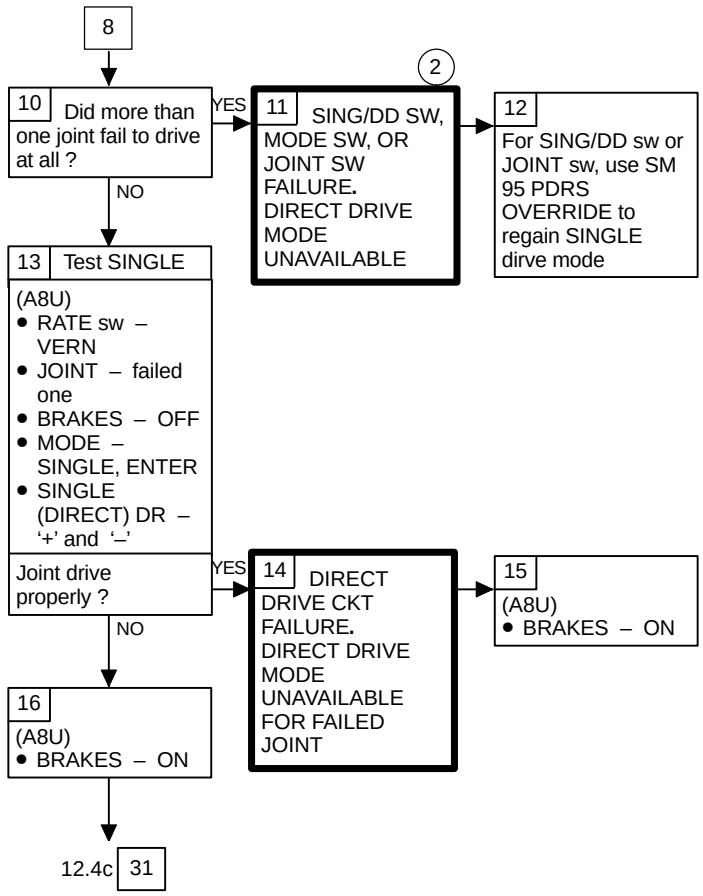
NO

8 Any joint drive in wrong direction ?

YES → 1 → 9 ZENER DIODE FAILURE. DIRECT DRIVE MODE LOST

NO → 10

(1) DIRECT mode can be regained with RMS IFM D&C Kit. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR–4, RMS IFM D&C KIT



(2) DIRECT mode can be regained with RMS D&C IFM KIT

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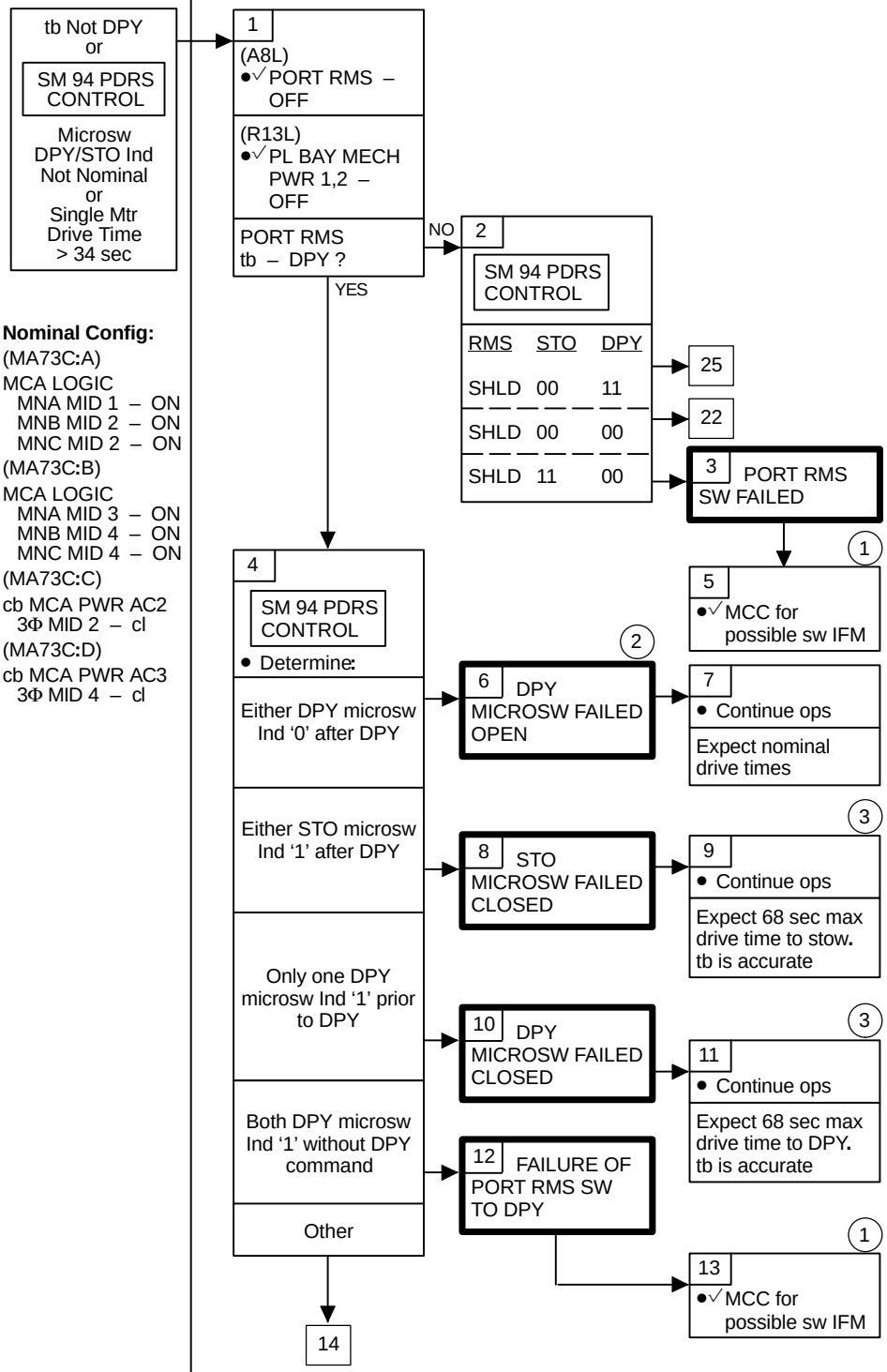
PDRS

12.5a MPM DPY – tb NOT DPY, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME



Nominal Config:

(MA73C:A)
MCA LOGIC
MNA MID 1 – ON
MNB MID 2 – ON
MNC MID 2 – ON

(MA73C:B)
MCA LOGIC
MNA MID 3 – ON
MNB MID 4 – ON
MNC MID 4 – ON

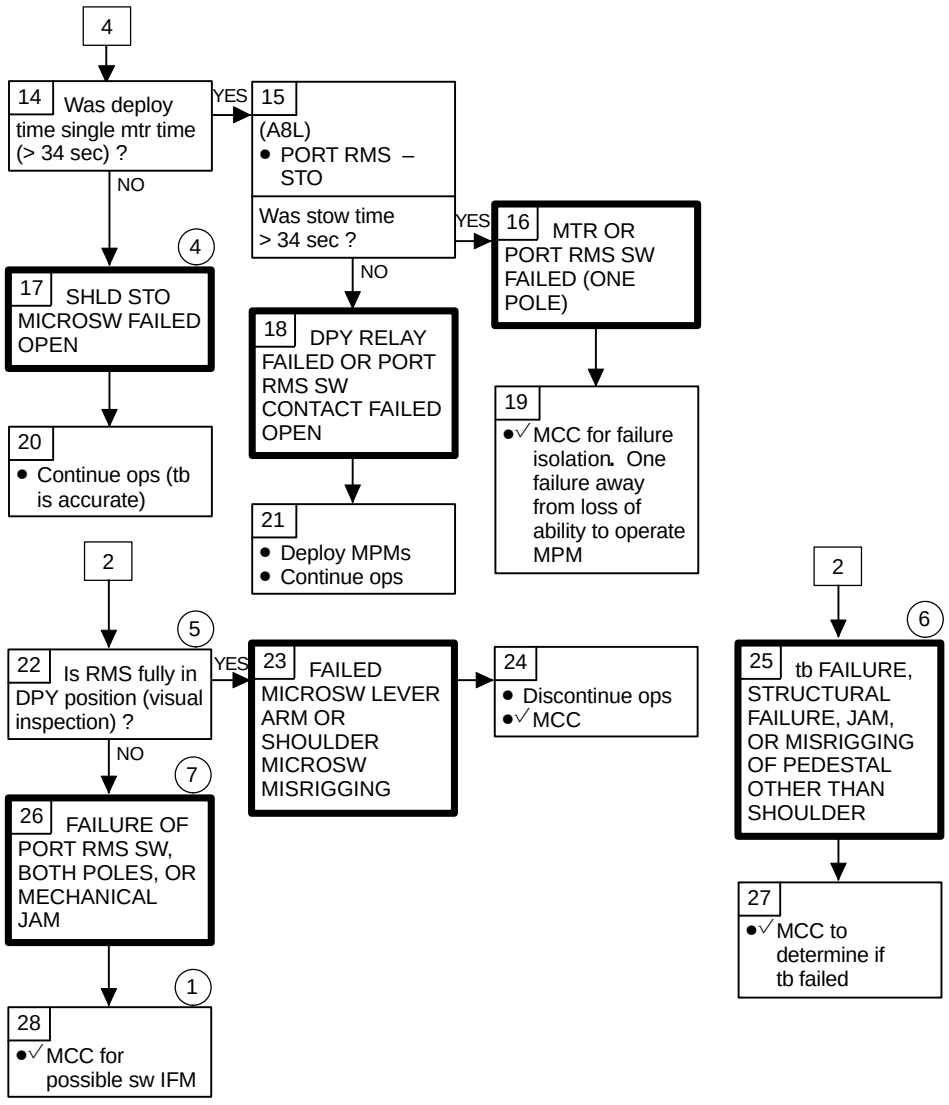
(MA73C:C)
cb MCA PWR AC2 3Φ MID 2 – cl

(MA73C:D)
cb MCA PWR AC3 3Φ MID 4 – cl

(1) Refer to RMS – MANIPULATOR POSITIONING MECHANISM (MPM) CONTINGENCY DEPLOY/STOW (IFM)

(2) One mtr will continue to run while deploying until PORT RMS STO/DPY sw is turned OFF

(3) PDRS SSR–1 MPM MTR INHIBIT DISABLE available to regain motor drive in the failed direction



(1) Refer to RMS – MANIPULATOR POSITIONING MECHANISM (MPM) CONTINGENCY DEPLOY/STOW (IFM)

(4) One mtr will continue to run while stowing until PORT RMS STO/DPY sw is turned OFF

(5) RMS should not be used unless shoulder linkage is overcenter locked

(6) Signals from Aft, Mid, Fwd, and Shld pedestals command tb. To trip tb, all four SYS 1 or SYS 2 indications are reqd

(7) MCC can determine if switch is failed

PDRS

12.5b MPM STO – tb NOT STO, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME

tb Not STO
or
SM 94 PDRS CONTROL
or
Microsw DPY/STO Ind Not Nominal
or
Single Mtr Drive Time (> 34 sec)

Nominal Config:
(MA73C:A)
MCA LOGIC
MNA MID 1 – ON
MNB MID 2 – ON
MNC MID 2 – ON
(MA73C:B)
MCA LOGIC
MNA MID 3 – ON
MNB MID 4 – ON
MNC MID 4 – ON
(MA73C:C)
cb MCA PWR
AC2 3Φ MID 2 – cl
(MA73C:D)
cb MCA PWR
AC3 3Φ MID 4 – cl

1
(A8L)
•✓PORT RMS – OFF
(R13L)
•✓PL BAY MECH PWR 1,2 – OFF
PORT RMS tb – STO ?

NO → 2
SM 94 PDRS CONTROL

RMS	STO	DPY	
SHLD	11	00	→ 16
SHLD	00	00	→ 21
SHLD	00	11	→ 3 PORT RMS SW FAILED

YES

4
SM 94 PDRS CONTROL

- Either STO microsw Ind '0' after stow → 6 STO MICROSW FAILED OP → 7 • Continue ops; Expect nominal drive time
- Either DPY microsw ind '1' after stow → 8 DPY MICROSW FAILED CL → 9 • Continue ops; Expect 68 sec max drive time to DPY. tb is accurate
- Only one STO microsw ind '1' prior to stow → 10 STO MICROSW FAILED CL → 11 • Continue ops; Expect 68 sec max drive time to STO. tb is accurate
- Both STO microsw ind '1' without stow command → 12 PORT RMS SW FAILED TO STOW
- Other

5 •✓MCC for possible sw IFM (1)

13 •✓MCC for possible sw IFM (1)

14 Was stow time single mtr time (> 34 sec) ?
YES → 15 STOW RELAY, MTR, OR PORT RMS STO/DPY SW FAILED → 18 •✓MCC prior to deploying MPM
NO → (4) 17 SHLD DPY MICROSW FAILED OPEN → 19 • Continue ops (tb is accurate)

(2) → 16 tb FAILURE, STRUCTURAL FAILURE, OR JAM OF PEDESTAL OTHER THAN SHOULDER → 20 •✓MCC to determine if tb failed

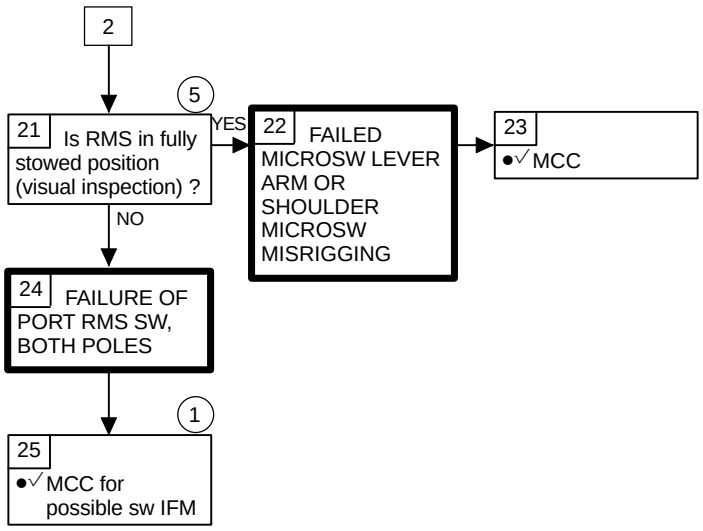
(1) Refer to RMS – MANIPULATOR POSITIONING MECHANISM (MPM) CONTINGENCY DEPLOY/STOW (IFM)

(2) One mtr will continue to run while stowing until Port RMS sw is turned OFF

(3) Signals from AFT, MID, FWD, and SHLD pedestals command tb. To trip tb, all four SYS 1 or all four SYS 2 indications reqd

(4) One mtr will continue to run while deploying until Port RMS STO/DPY sw is turned OFF

PDRS 12.5b (Cont)



(1) Refer to RMS – MANIPULATOR POSITIONING MECHANISM (MPM) CONTINGENCY DEPLOY/STOW (IFM)

(5) RMS should not be used unless shoulder linkage is overcenter locked

PDRS

12.5c MRL REL – tb NOT REL, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME

tb Not REL
or
SM 94 PDRS CONTROL
Microsw Rel/Lat Ind Not Nominal
or
Single Mtr Drive Time (> 8 sec)

Nominal Config:
(MA73C:A)
MCA LOGIC
MNA MID 1 – ON
MNB MID 2 – ON
MNC MID 2 – ON
(MA73C:B)
MCA LOGIC
MNA MID 3 – ON
MNB MID 4 – ON
MNC MID 4 – ON
(MA73C:C)
cb MCA PWR
AC1 3Φ MID 1 – cl
AC2 3Φ MID 2 – cl
AC3 3Φ MID 2 – cl
(MA73C:D)
cb MCA PWR
AC1 3Φ MID 3 – cl
AC2 3Φ MID 4 – cl
AC3 3Φ MID 4 – cl

1
(A8L)
●✓PORT RMS RETEN LAT – OFF
(R13L)
●✓PL BAY MECH PWR 1,2 – OFF
PORT RMS RETEN LAT tb – REL ?

NO → 2
SM 94 PDRS CONTROL
• Determine:

RMS	REL
AFT	11
MID	11
FWD	11

→ 3 tb FAILURE

Any one pedestal	REL
	01

→ 15

RMS	LAT
AFT	11
MID	11
FWD	11

→ 16

Any one pair of REL ind = '0' → 17

RMS	LAT	REL
AFT	00	00
MID	00	00
FWD	00	00

→ 14

3 tb FAILURE → 4
• Continue ops using SM 94 display

YES → 5
SM 94 PDRS CONTROL

All REL microsw ind '1' prior to commanding REL → 6 FAILURE OF PORT RMS RETEN LAT SW TO RELEASE → 7 ●✓MCC for possible sw IFM (1)

Any one pedestal REL 10 → 8 RELEASE MICROSW FAILED OPEN → 9 Nominal drive time to latch and release, and tb is accurate (2)
• Continue ops

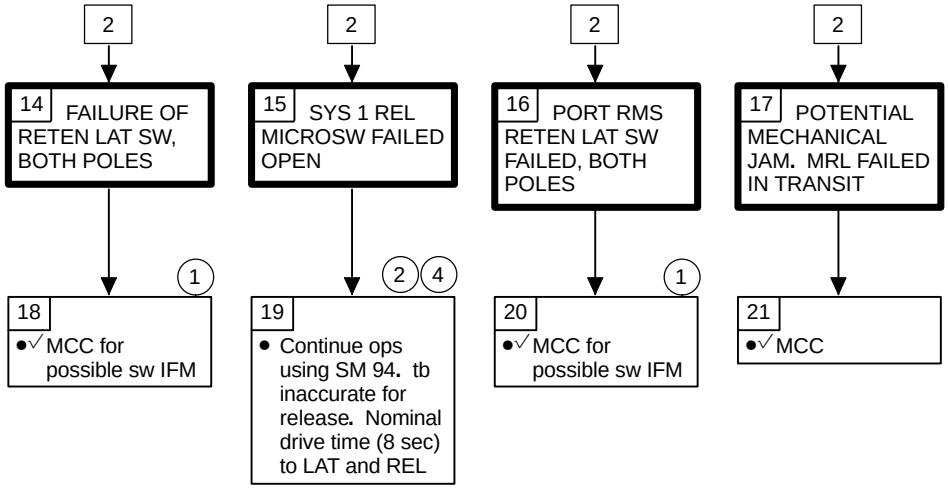
Any single rel ind '1' prior to REL command → 10 RELEASE MICROSW FAILED CLOSED → 11 (3)
• 18 sec max drive time to release. If SYS 1 microsw failed, tb is suspect for release. If SYS 2 microsw failed, tb is accurate. Continue ops using SM 94 display

Other → 12 FAILURE OF PORT RMS RETEN LAT SW, ONE POLE OR RELAY OR MTR → 13 (1)
●✓MCC for possible failure isolation. Single mtr drive time (18 sec) for release. IFM possible if switch failure. Potentially one failure away from ability to safely latch RMS for entry

(1) Refer to RMS – MANIPULATOR RETENTION LATCHES (MRL) CONTINGENCY RELEASE/LATCH (IFM)

(2) One mtr will continue to drive when commanding release until PORT RMS RETEN LAT – OFF

(3) Failed–on microsw disables one mtr. The tb is inaccurate from 8–18 sec (latch halfway open at 8 sec)



(1) Refer to RMS – MANIPULATOR RETENTION LATCHES (MRL) CONTINGENCY RELEASE/LATCH (IFM)

(2) One mtr will continue to drive when commanding release until PORT RMS RETEN LAT – OFF

(4) tb is activated by receiving all three microsw indications from SYS 1 only

PDRS

12.5d MRL LAT – tb NOT LAT, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME

tb Not LAT
or
SM 94 PDRS CONTROL
Microsw Rel/Lat Ind Not Nominal
or
Single Mtr Drive Time (> 8 sec)

Nominal Config:

(MA73C:A)
MCA LOGIC
MNA MID 1 – ON
MNB MID 2 – ON
MNC MID 2 – ON

(MA73C:B)
MCA LOGIC
MNA MID 3 – ON
MNB MID 4 – ON
MNC MID 4 – ON

(MA73C:C)
cb MCA PWR
AC1 3Φ MID 1 – cl
AC2 3Φ MID 2 – cl
AC3 3Φ MID 2 – cl

(MA73C:D)
cb MCA PWR
AC1 3Φ MID 3 – cl
AC2 3Φ MID 4 – cl
AC3 3Φ MID 4 – cl

1
(A8L)
•✓PORT RMS RETEN LAT – OFF
(R13L)
•✓PL BAY MECH PWR 1,2 – OFF
PORT RMS RETEN tb – LAT ?

NO

2
SM 94 PDRS CONTROL
• Determine:

RMS	LAT
AFT	11
MID	11
FWD	11

→ 3 tb FAILURE

Any one pedestal	LAT
	01

→ 15

RMS	REL
AFT	11
MID	11
FWD	11

→ 16

Any one pair of LAT ind = '0' → 17

RMS	LAT	REL
AFT	00	00
MID	00	00
FWD	00	00

→ 14

3 tb FAILURE → 4
• Continue ops using SM 94 display

YES

5
SM 94 PDRS CONTROL

All LAT microsw ind '1' prior to commanding LAT → 6 FAILURE OF PORT RMS RETEN LAT SW TO LATCH → 7 •✓MCC for possible sw IFM (1)

Any one pedestal LAT 10 → 8 LATCH MICROSW FAILED OPEN → 9 Nominal drive time to latch and release. tb is accurate (2)
• Continue ops

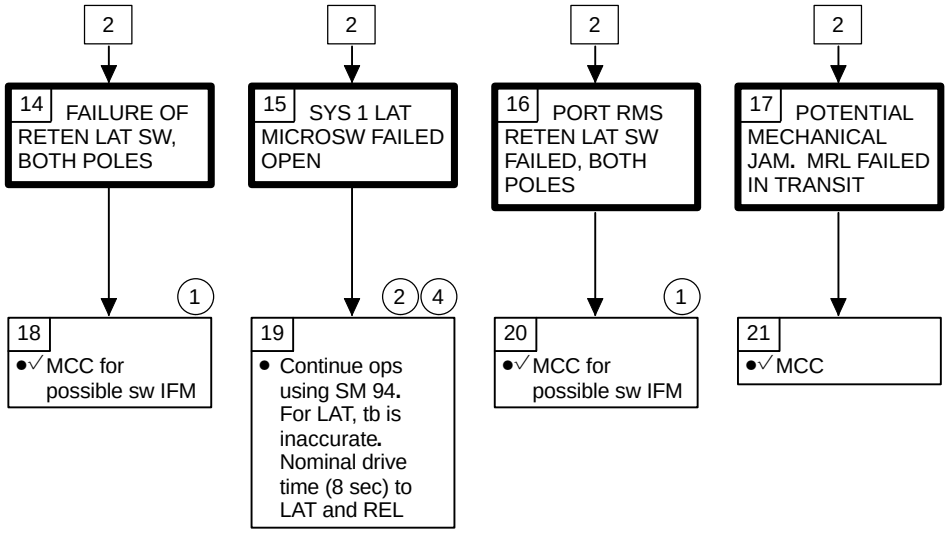
Any single LAT ind '1' prior to LAT command → 10 LATCH MICROSW FAILED CLOSED → 11 18 sec max drive time to LATCH. tb is suspect for release if SYS 1 microsw failed. tb is accurate if SYS 2 microsw failed. Continue Ops using SM 94 display (3)

Other → 12 FAILURE OF PORT RMS RETEN LAT–SW, ONE POLE OR RELAY OR MTR → 13 •✓MCC for possible failure isolation (1)
Single mtr drive time (18 sec) for LATCH. IFM possible if switch failure. Potentially one failure away from ability to safely latch RMS for entry

(1) Refer to RMS – MANIPULATOR RETENTION LATCHES (MRL CONTINGENCY RELEASE LATCH) (IFM)

(2) One mtr will continue to drive when commanding LATCH until Port RMS RETEN LAT switch is off

(3) Failed–on microsw disables one mtr. The tb is inaccurate from 8–18 sec (latch halfway closed at 8 sec)



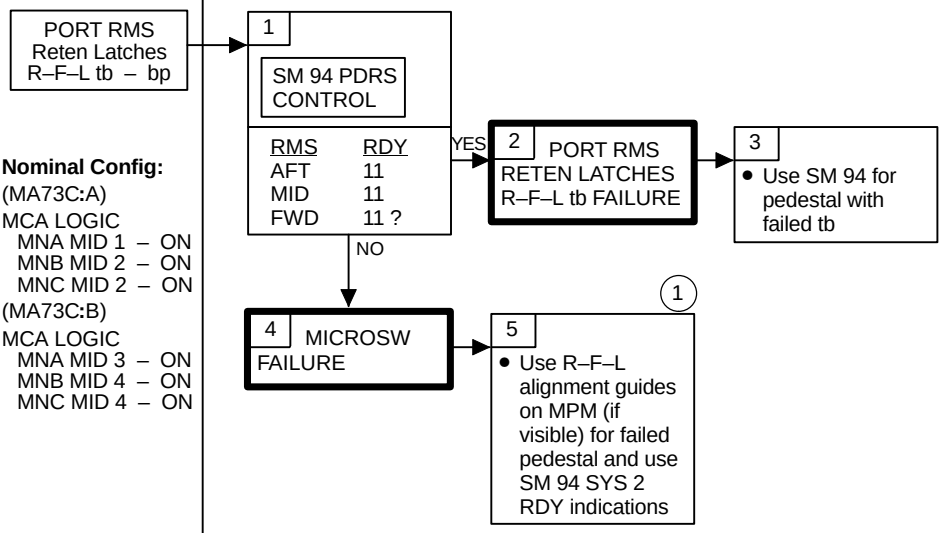
(1) Refer to RMS – MANIPULATOR RETENTION LATCHES (MRL CONTINGENCY RELEASE/LATCH) (IFM)

(2) One mtr will continue to drive when commanding LATCH until Port RMS RETEN LAT switch is off

(4) tb is activated by receiving all three microsw indications from SYS 1 only

PDRS

12.5e PORT RMS RETEN LATCHES R–F–L tb – bp WHEN CRADLED

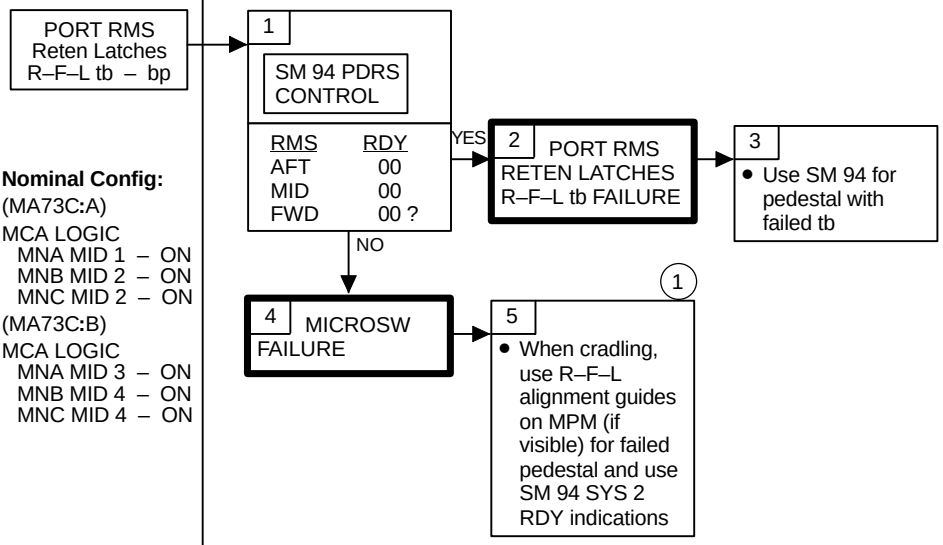


Nominal Config:
(MA73C:A)
MCA LOGIC
MNA MID 1 – ON
MNB MID 2 – ON
MNC MID 2 – ON
(MA73C:B)
MCA LOGIC
MNA MID 3 – ON
MNB MID 4 – ON
MNC MID 4 – ON

(1) Inaccurate tb because tb is driven by SYS 1 only

PDRS

12.5f PORT RMS RETEN LATCHES R–F–L tb – gray WHEN UNCRADLED



Nominal Config:
(MA73C:A)
MCA LOGIC
MNA MID 1 – ON
MNB MID 2 – ON
MNC MID 2 – ON
(MA73C:B)
MCA LOGIC
MNA MID 3 – ON
MNB MID 4 – ON
MNC MID 4 – ON

(1) Inaccurate tb because tb is driven by SYS 1 only

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PDRS SSR–1
MPM MTR INHIBIT DISABLE

NOTE

Use this procedure to replace step 6 of ON–ORBIT INIT (PDRS OPS), or step 5 of RMS PWRDN (PDRS OPS) or step 4 of RMS PWRUP (PDRS OPS)

SM 94 PDRS CONTROL

If RMS STO/DPLY – 1 X 1 X :

1. INHIBIT MICROSWITCH

MA73C:A MCA LOGIC MNC MID 2 – OFF

CRT ✓RMS STO/DPLY – 0 X 0 X

2. STOW(DEPLOY) MPM

CAUTION
If switch is not turned off, mtr will continue to run. Mechanical damage to mtr may result

A8L PORT RMS – STO(DPY) as reqd (68 sec max)
– OFF

✓MPM is stowed(deployed) using CRT indication (tb inaccurate):

CRT Stowed: RMS STO/DPLY – 0 1 0 X
(Deployed: RMS STO/DPLY – 0 X 0 1)

MCC can verify status of FWD, MID, AFT pedestals

3. ENABLE BUS

MA73C:A MCA LOGIC MNC MID 2 – ON

A8L ✓PORT RMS tb – STO(DPY) >>

If RMS STO/DPLY – X 1 X 1:

4. INHIBIT MICROSWITCH

MA73C:B MCA LOGIC MNB MID 4 – OFF

CRT ✓RMS STO/DPLY – X 0 X 0

5. STOW(DEPLOY) MPM

CAUTION
If switch is not turned off, mtr will continue to run. Mechanical damage to mtr may result

A8L PORT RMS – STO(DPY) as reqd (68 sec max)
– OFF

✓MPM is stowed(deployed) using CRT indication (tb accurate):

CRT Stowed: RMS STO/DPLY – 1 0 X 0
(Deployed: RMS STO/DPLY – X 0 1 0)

MCC can verify status of FWD, MID, AFT pedestals

6. ENABLE BUS

MA73C:B MCA LOGIC MNB MID 4 – ON

A8L ✓PORT RMS tb – STO(DPY)

PDRS SSR–3
BACKDRIVE TECHNIQUE – JOINT FREE

SP – FAILED

WARNING
PORT RADIATOR must be stowed

NOTE
Can expect CONT ERR and Master Alarm

1. SETUP
If RADIATORS deployed:
Perform RAD STOW (ORB OPS, ECLS)

✓BRAKES – ON (tb–ON)
PARAM sel – JOINT ANGLE

✓DAP: VERN(FREE)

If SP < 7.5 deg, go to step 3

Calculate IC: If SP < 45, IC = –(2 x SP)
Otherwise, IC = –90

MODE – DIRECT (lt on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
+ 75	FREE	IC	0	0	0

MODE – not DIRECT (lt off)

SM 94 PDRS CONTROL

AUTO BRAKES INH – ITEM 10 EXEC (*)

2. BACKDRIVE OPERATION

NOTE
Hold SINGLE DR command for 4 sec,
apply BRAKES – ON, then release
SINGLE DR command

RATE – COARSE (RATE MIN tb–OFF)

JOINT sel – EP
BRAKES – OFF (tb–OFF)
MODE – SINGLE, ENTER

SINGLE DR – '+' after 4 sec and while holding sw
BRAKES – ON (tb–ON)

If SP < 7.5 deg, go to step 3

If EP ≥ –15 deg, reconfig EP:
MODE – DIRECT (lt on)
DIRECT DR EP to: –(2 x SP) or max –90
MODE – not DIRECT (lt off)

Repeat step 2

3. RECONFIG JOINTS FOR CRADLE

CAUTION
Use CCTVs to monitor proximity of RMS to orbiter

✓BRAKES – ON (tb–ON)
MODE – DIRECT (lt on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
CURRENT VALUE	FREE	+1	+10	0	0
0					
		–1			

MODE – not DIRECT (lt off)

4. START RMS CRADLE

NOTE
Hold SINGLE DR command for 1/2 sec
Apply BRAKES – ON then release
SINGLE DR command

JOINT sel – EP
BRAKES – OFF (tb–OFF)
MODE – SINGLE, ENTER

SINGLE DR – '+' after 1/2 sec and while holding sw
BRAKES – ON (tb–ON)

If PORT RMS R–F–L FWD tb – gray, go to step 5

If EP ≥ +1 deg, reconfig EP:
MODE – DIRECT (lt on)
DIRECT DR EP to: 0
MODE – not DIRECT (lt off)

Repeat step 4

5. COMPLETE RMS CRADLE
✓BRAKES – ON (tb–ON)
MODE – DIRECT (lt on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
0	FREE	0	0	0	0

MODE – not DIRECT (lt off)

✓PORT RMS R–F–L tb (three) – gray

Go to step 3, RMS PWRDN (PDRS OPS) >>

EP – FAILED

NOTE
Can expect CONT ERR and Master Alarm

1. SETUP

✓BRAKES – ON (tb–ON)
PARAM sel – JOINT ANGLE

✓DAP: VERN(FREE)

If EP ≥ –1 deg, go to step 3

Calculate IC: If EP > –65, IC = –(2 x EP)
Otherwise, IC = +130

MODE – DIRECT (lt on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
CURRENT VALUE	IC	FREE	+5	0	0
0					

MODE – not DIRECT (lt off)

SM 94 PDRS CONTROL

AUTO BRAKES INH – ITEM 10 EXEC (*)

2. BACKDRIVE OPERATION

NOTE
Hold SINGLE DR command for 4 sec
Apply BRAKES – ON, then release
SINGLE DR command

RATE – COARSE (RATE MIN tb–OFF)

JOINT sel – SP
BRAKES – OFF (tb–OFF)
MODE – SINGLE, ENTER

SINGLE DR – '–' after 4 sec and while holding sw
BRAKES – ON (tb–ON)

If EP ≥ –1 deg, go to step 3

If SP < –(EP), reconfig SP:
MODE – DIRECT (lt on)
DIRECT DR SP to: –(2 x EP) or max +130
MODE – not DIRECT (lt off)

Repeat step 2

3. RECONFIG FOR CRADLE
✓BRAKES – ON (tb–ON)
MODE – DIRECT (lt on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
CURRENT VALUE	+ 15	FREE	+ 10	0	0
0					

MODE – not DIRECT (lt off)

4. START RMS CRADLE

NOTE
Hold SINGLE DR command for 1/2 sec
Apply BRAKES – ON, then release
SINGLE DR command

JOINT sel – SP
BRAKES – OFF (tb–OFF)
MODE – SINGLE, ENTER

If EP > +0.1:
SINGLE DR – '+' after 1/2 sec and while holding sw
BRAKES – ON (tb–ON)

If EP < –0.1:
SINGLE DR – '–' after 1/2 sec and while holding sw
BRAKES – ON (tb–ON)

Repeat step 4 until –0.1 < EP < +0.1

5. COMPLETE RMS CRADLE
✓BRAKES – ON (tb–ON)
MODE – DIRECT (lt on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
0	0	FREE	0	0	0

MODE – not DIRECT (lt off)

✓PORT RMS R–F–L tb (three) – gray

Go to step 3, RMS PWRDN (PDRS OPS)

WP – FAILED

NOTE
Can expect CONT ERR and Master Alarm

1. SETUP
✓BRAKES – ON (tb–ON)
✓DAP: VERN(FREE)
MODE – DIRECT (lt on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
0	+ 90	– 90	Free	0	+ 19.5

MODE – not DIRECT (lt off)

PARAM sel – JOINT ANGLE

SM 94 PDRS CONTROL

AUTO BRAKES INH – ITEM 10 EXEC (*)

2. BACKDRIVE OPERATION (To config –0.1 ≤ WP ≤ +0.1 deg)

NOTE
For steps 2a and 2b, THC input will be at 1/3 to 1/2 deflection. After 2–3 sec, quickly command full scale deflection in opposite direction. When WP joint angle displayed is constant, apply BRAKES – ON and release THC

2a. If WP < –0.1 deg

RATE sw – COARSE (RATE MIN tb–OFF)
If WP > –2.0 deg,
RATE sw – VERN (RATE MIN tb–ON)

✓JOINT sel – WP
BRAKES – OFF (tb–OFF)
MODE – END EFF, ENTER

THC – '–Z' (UP) 1/3 to 1/2 deflection

After 2–3 sec,
THC – '+Z' (DOWN) full deflection

When WP joint angle is constant:
BRAKES – ON (tb–ON)
Release THC

If –0.1 ≤ WP ≤ +0.1, go to step 2c

If SP > 120 deg or < 60 deg, go to step 3

If WP < –0.1 deg, repeat step 2a

If WP > +0.1 deg, go to step 2b

2b. If WP > +0.1 deg

✓RATE sw – COARSE (RATE MIN tb–OFF)
If WP < +2.0 deg,
RATE sw – VERN (RATE MIN tb–ON)

✓JOINT sel – WP
BRAKES – OFF (tb–OFF)
MODE – END EFF, ENTER

THC – '+Z' (DOWN) 1/3 to 1/2 deflection

After 2–3 sec,
THC – '–Z' (UP) full deflection

When WP joint angle is constant:
BRAKES – ON (tb–ON)
Release THC

If –0.1 ≤ WP ≤ +0.1, go to step 2c

If SP > 120 deg or < 60 deg, reconfig per step 3

If WP > +0.1 deg, repeat step 2b

If WP < –0.1 deg, go to step 2a

2c. If –0.1 ≤ WP ≤ +0.1 deg

✓BRAKES – ON (tb–ON)
MODE – DIRECT (lt on)

DIRECT DR to cradle:

SY	SP	EP	WP	WY	WR
0	CURRENT VALUE	+ 1 MA	FREE	0	0
	0 (MA)	0			

MODE – not DIRECT (lt off)

✓PORT RMS R–F–L tb (three) – gray

Go to step 3, RMS PWRDN (PDRS OPS) >>

3. RECONFIG OF JOINTS
✓BRAKES – ON (tb–ON)
MODE – DIRECT (lt on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
0	+ 90	– 90	FREE	0	+ 19.5

MODE – not DIRECT (lt off)

If WP < –0.1 deg, go to step 2a

If WP > +0.1 deg, go to step 2b

WY – FAILED

NOTE
Can expect CONT ERR and Master Alarm

1. SETUP
   ✓BRAKES – ON (tb–ON)
   ✓DAP: VERN(FREE)
   MODE – DIRECT (lt on)

   DIRECT DR to:

SY	SP	EP	WP	WY	WR
0	+ 90	– 90	0	FREE	+ 19.5

   MODE – not DIRECT (lt off)
   PARAM sel – JOINT ANGLE

   SM 94 PDRS CONTROL

   AUTO BRAKES INH – ITEM 10 EXEC (*)

2. BACKDRIVE OPERATION (To config –0.1 ≤ WY ≤ +0.1 deg)

   NOTE
   For steps 2a and 2b, THC input will be at 1/3 to 1/2 deflection. After 2–3 sec, quickly command full scale deflection in opposite direction. When WY joint angle displayed is constant, apply BRAKES – ON and release THC

   2a. If WY < –0.1 deg

   RATE sw – COARSE (RATE MIN tb–OFF)
   If WP > –2.0 deg,
   RATE sw – VERN (RATE MIN tb–ON)

   ✓JOINT sel – WY
   BRAKES – OFF (tb–OFF)
   MODE – END EFF, ENTER

   THC – '+Y' (PORT) 1/3 to 1/2 deflection

   After 2–3 sec,
   THC – '–Y' (STBD) full deflection

   When WY joint angle is constant:
   BRAKES – ON (tb–ON)
   Release THC

   If –0.1 ≤ WY ≤ +0.1 deg, go to step 2c

   If SP > 120 deg or < 60 deg, go to step 3

   If WP < –0.1 deg, repeat step 2a

   If WP > +0.1 deg, go to step 2b

   2b. If WY > +0.1 deg

   ✓RATE sw – COARSE (RATE MIN tb–OFF)
   If WY < +2.0 deg,
   RATE sw – VERN (RATE MIN tb–ON)

   ✓JOINT – WY
   BRAKES – OFF (tb–OFF)
   MODE – END EFF, ENTER

   THC – '–Y' (STBD) 1/3 to 1/2 deflection

   After 2–3 sec,
   THC – '+Y' (PORT) full deflection

   When WY joint angle is constant:
   BRAKES – ON (tb–ON)
   Release THC

If –0.1 ≤ WY ≤ +0.1 deg, go to step 2c

If SP > 120 deg or < 60 deg, go to step 3

If WP > +0.1 deg, repeat step 2b

If WP < –0.1 deg, go to step 2a

2c. If –0.1 ≤ WY ≤ 0.1 deg

✓BRAKES – ON (tb–ON)
MODE – DIRECT (lt on)

DIRECT DR to cradle:

SY	SP	EP	WP	WY	WR
0	CURRENT VALUE	+ 1 MA	+ 5	FREE	0
	0	0	0		

MODE – not DIRECT (lt off)
✓PORT RMS R–F–L tb (three) – gray

Go to step 3, RMS PWRDN (PDRS OPS) >>

3. RECONFIG OF JOINTS
✓BRAKES – ON (tb–ON)
MODE – DIRECT (lt on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
0	+ 90	– 90	0	FREE	+ 19.5

MODE – not DIRECT (lt off)

If WP < –0.1 deg, go to step 2a

If WP > +0.1 deg, go to step 2b

NOTE

Applicable AC/DC sw powering kit will remain OFF until immediately prior to reqd operation and will be returned to OFF immediately after operation is completed. When kit is powered, RMS is one failure away from uncommanded motion and/or End Effector ops.

If unexpected arm motion occurs during D&C Kit ops, turn RMS PWR (pnl A8L) to OFF, take DC UTIL PWR MNA (pnl O19) to OFF, then ✓MCC. If failure causing unexpected motion is in D&C Kit, applying brakes will be ineffective.

All pnl A8U,A8L tbs and C/W annunciators are functional with RMS IFM D&C Kit installed. All pnl A8U functions available except those provided by RMS IFM D&C Kit.

Operation of kit END EFFECTOR, JOINT SELECT, DIRECT DRIVE switches is similar to corresponding pnl A8U switches. Limping of arm not available for End Effector functions. May get brakeslip msg during direct drive ops. Cancel MSTR ALARM, and cycle BRAKES sw or cycle RMS SEL sw. TMBU can prevent subsequent msg.

For loaded RMS ops, downlink must be available to confirm lack of End Effector stall currents.

Orbiter pilot must be available to perform separation in case of uncommanded release. Review RMS–LOADED/RELEASE (Cue Card)

1. SETUP

Install RMS IFM D&C KIT, RMS CONTINGENCY OPERATION/INSTALLATION AND REMOVAL OF THE RMS IFM D&C KIT (IFM, PROCEDURES M THRU R)

A8L — RMS PWR – PRI (MA)

SM 94 PDRS CONTROL

I/O ON – ITEM 5 EXEC (*)

A8L — RMS SEL – PORT
A8U — SAFING – CANCEL (tb–gray)

CRT — If WR R different,
ITEM 26 +(recorded value) EXEC

2. IF SHOULDER BRACE RELEASE REQD

O19 — COAS PWR – ON

D&C Kit — SHOULDER BRACE – RELEASE (Hold for 2 sec following tb–gray on pnl A8U)

O19 — COAS PWR – OFF
Go to step 7

3. INITIAL D&C KIT POWERUP FOR END EFFECTOR/DIRECT DRIVE

Position RMS/payload at least 5 ft away from structure, using best available mode on pnl A8U

If unloaded:

D&C Kit — JOINT sw – WRIST YAW

If loaded:

✓MCC for JOINT sw position for benign motion if uncommanded direct drive occurs and for RMS position for payload rotations due to uncommanded derig/release

WARNING

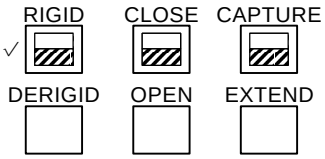
If unexpected arm/payload motion occurs, (A8L) RMS PWR – OFF, (O19) DC UTIL PWR MNA – OFF, then ✓MCC

O19 — DC UTIL PWR MNA – ON
✓No arm/payload motion
DC UTIL PWR MNA – OFF

4. UNLOADED END EFFECTOR TEST
(Reqd for End Effector ops, Direct Drive)

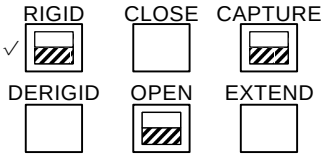
> CAUTION
> End Effector test must be completed within 2.5 min of DC UTIL PWR MNA sw – ON or End Effector mtr burnout could occur

A8U ✓BRAKES – ON (tb–ON)
✓tb(s)



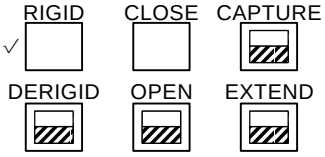
O19 DC UTIL PWR MNA – ON
✓No tb(s) change

D&C Kit EE CAPTURE/RELEASE sw – CAPTURE, until CLOSE tb – gray (3 sec max)



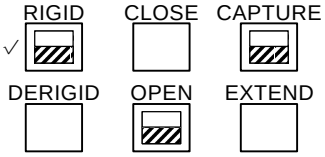
✓No tb(s) change after capture

EE RIGID/DERIGID sw – RIGID, until RIGID tb – gray (20 sec max)

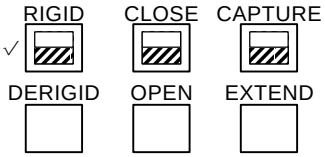


✓No tb(s) change after rigidizing

EE RIGID/DERIGID sw – DERIGID; until DERIGID,EXTEND tb – gray (20 sec max)
(MA, DERIGIDIZE lt – ON)



EE CAPTURE/RELEASE sw – RELEASE, until OPEN tb – gray (3 sec max)
(Expect MA, RELEASE lt – on during actual Payload Release)



O19 DC UTIL PWR MNA – OFF

To extinguish DERIGIDIZE lt, take EE MAN CONTR sw to RIGID momentarily or cycle RMS SEL sw

5. DIRECT DRIVE TEST (For Direct Drive ops only)

A8U ✓BRAKES – ON (tb–ON)
PARAM sel – JOINT ANGLE

O19 DC UTIL PWR MNA – ON

D&C Kit For first joint:
Drive '+' then '–'
✓Correct joint responses and that only selected joint drives
(Expect MA, CK CRT lt on, and 'S96 PDRS ABE' for five undriven joints)

For other joints:
Drive '+'
✓Correct joint responses
(Expect MA, CK CRT lt on, and 'S96 PDRS ABE' for five undriven joints)

O19 DC UTIL PWR MNA – OFF

6. END EFFECTOR/DIRECT DRIVE

NOTE

(Pnl O19) DC UTIL PWR MNA sw – OFF immediately after completing Direct Drive, or End Effector ops, or when unattended

DC UTIL PWR MNA – ON

Perform RMS IFM D&C Kit End Effector/Direct Drive function as reqd

DC UTIL PWR MNA – OFF

7. RECONFIG

Remove RMS IFM D&C KIT, RMS CONTINGENCY OPERATION/INSTALLATION AND REMOVAL OF THE RMS IFM D&C KIT (IFM, PROCEDURES M THRU R)

Power up RMS if further ops reqd
Refer to ON–ORBIT INITIALIZATION, step 2 and RMS POWERUP, step 2 (PDRS OPS)
(Note: disregard joint angle and position data)

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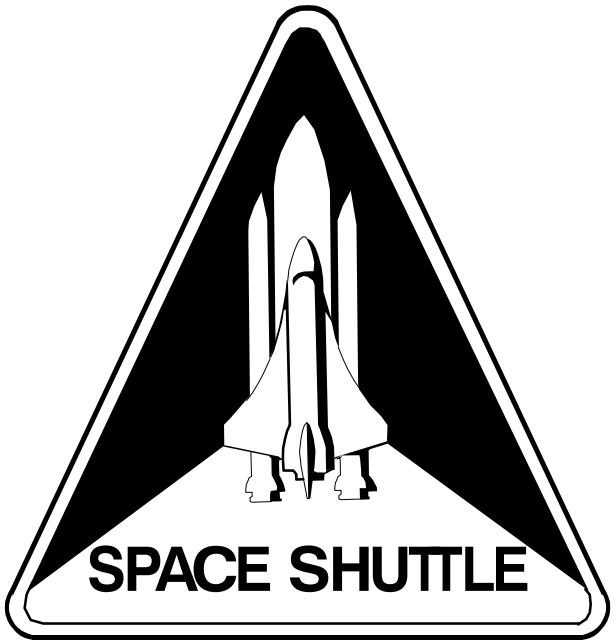
Space Shuttle Program
FLIGHT DATA FILE

JSC–48027
GENERIC, REV F



MALFUNCTION PROCEDURES

STS
ALL

Flight Cover (trim bottom to expose tabs)