

Malfunction Procedures

**Mission Operations Directorate
Operations Division**

**Generic, Rev J
October 20, 2008**

NOTE

For STS-126 and subsequent flights

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas



MALFUNCTION PROCEDURES

GENERIC, REV J (Oct 20, 2008)

PCN-2 (Mar 18, 2009) Sheet 1 of 1

List of Implemented Change Requests (482s):

MAL-1720

Incorporate the following:

1. Replace iii thru vi
2. Replace 6-109 & 6-110

NOTE

For STS-125 and subsequent flights

Prepared by:


Publication Manager

Approved by:


Manager, Flight Procedures

Accepted by:


FDF Manager

Encl: 6 pages

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MALFUNCTION PROCEDURES

GENERIC, REV J (Oct 20, 2008)

PCN-1 (Jan 22, 2009) Sheet 1 of 1

List of Implemented Change Requests (482s):

MULTI-1833 MAL-1704
MULTI-1834 MAL-1705

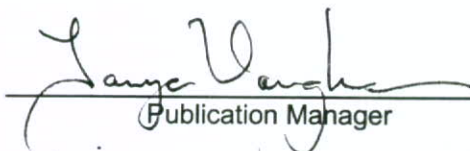
NOTE

For STS-119 and subsequent flights

Incorporate the following:

1. Replace iii thru x
2. Replace 5-65 thru 5-68, 5-97 thru 5-100
3. Replace 6-111 & 6-112
4. Replace 7-75 & 7-76
5. Replace 10-27 thru 10-34

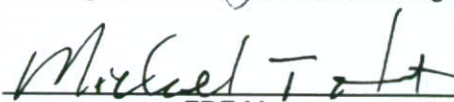
Prepared by:


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Approved by:


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Accepted by:


FDF Manager

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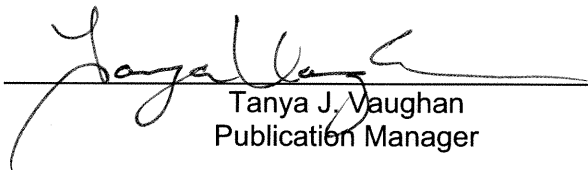
MISSION OPERATIONS DIRECTORATE

MALFUNCTION PROCEDURES

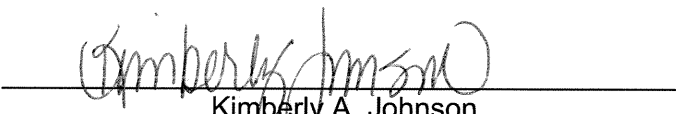
GENERIC, REVISION J

October 20, 2008

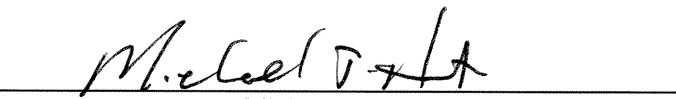
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Incorporates the following:		
482#:	MAL-1700 MAL-1701A	MAL-1702 MAL-1703

AREAS OF TECHNICAL RESPONSIBILITY

Publication Manager	DO35/T. Vaughan	281-483-4180
Alternate	DO35/J. Woodard	281-483-9685
APU/HYD	DS421/J. Dake	281-483-6538
COMM	DS231/D. Branham	281-483-1187
C/W	DS431/G. Peck	281-244-7309
DPS	DS221/J. McDonald	281-483-0793
ECLS	DS441/D. Fasbender	281-483-7857
EPS	DS431/M. Friant	281-483-0682
GNC	DS621/D. Gruber	281-483-0709
MECH	DS421/J. Dake	281-483-6538
OMS/RCS	DS631/T. Campa	281-244-1002
PDRS	DX2/G. Pollock	281-483-0883

MALFUNCTION PROCEDURES

LIST OF EFFECTIVE PAGES

GENERIC	05/10/88	PCN-1	01/22/09
REV J	10/20/08	PCN-2	03/18/09

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iii	* ALL/GEN J,2	2-9	ALL/GEN J
iv	* ALL/GEN J,1	2-10	ALL/GEN J
v	* ALL/GEN J,2	2-11	ALL/GEN J
vi	* ALL/GEN J,1	2-12	ALL/GEN J
vii	* ALL/GEN J	2-13	ALL/GEN J
viii	* ALL/GEN J	2-14	ALL/GEN J
ix	* ALL/GEN J,1	2-15	ALL/GEN J
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xi	ALL/GEN J	2-17	ALL/GEN J
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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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7.6h	RESERVED	not used
7.6i	RESERVED	not used
7.6j	RESERVED	not used
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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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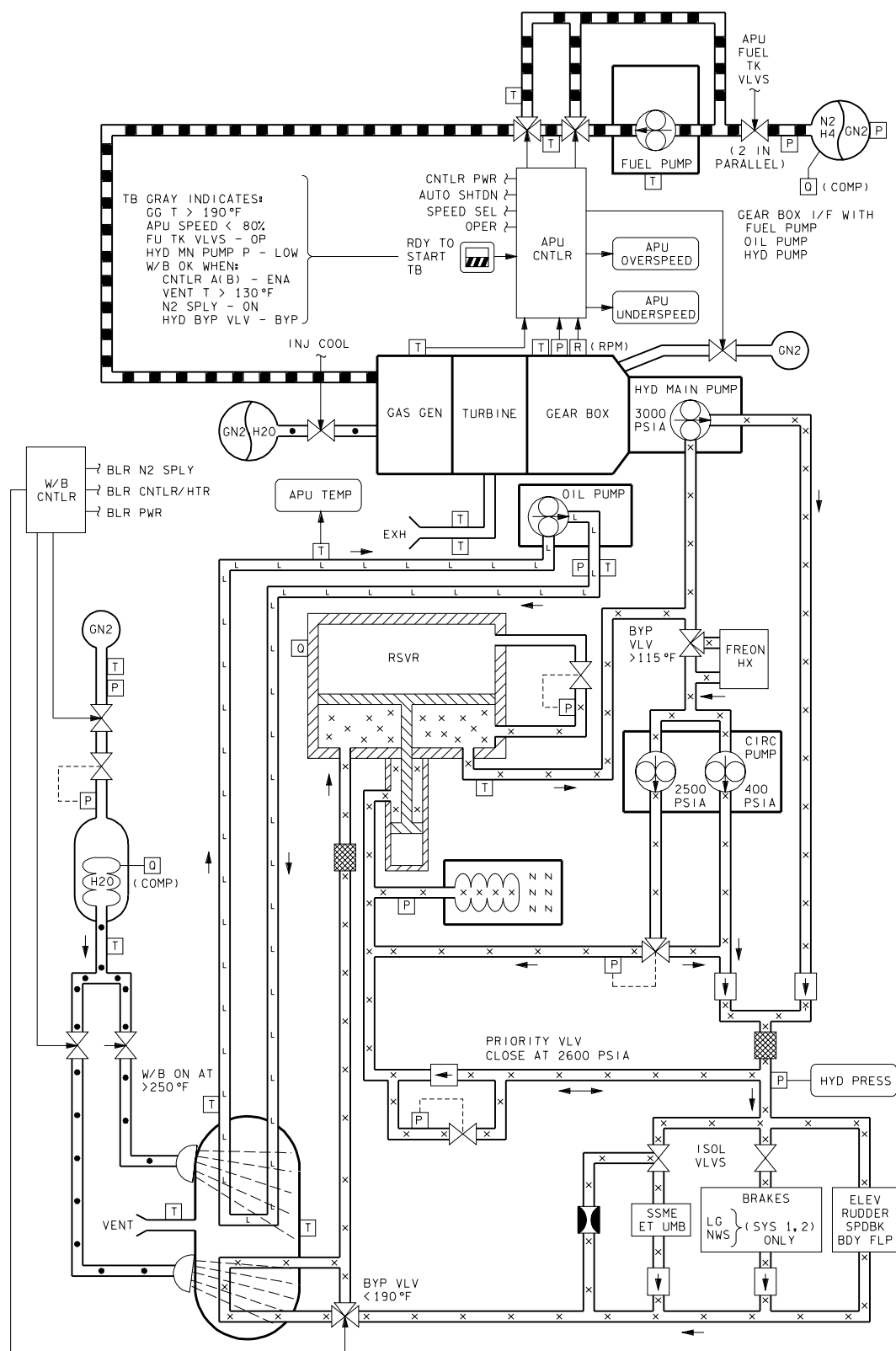
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APU/HYD

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APU/HYD



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APU/HYD

1.1a APU FUEL QTY ↓
APU FUEL TK P ↑↓

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 FU TK VLV
1(2,3) – CL

1			
SM 86 APU/HYD			
• Match indications in chart to determine failure			
APU FUEL TK P psia	APU FUEL OUT P psia	APU FUEL QTY %	FAILURE
↑ or 500(H)	< 300 > 150	100	XDCR SHIFT OR FAILURE ①
decr	decr	decr	HYDRAZINE OR N2 LEAKING
0(L)	0	0	N2 LEAKED OUT
80 ↓	0	~0	HYDRAZINE LEAKED OUT
0(L)	< 300 > 150	0	XDCR SHIFT OR FAILURE ①

→ APU/HYD
SSR-4

→ APU/HYD 5
SSR-5
steps 1 to 4

→ APU/HYD
SSR-4

① Puts qty computation in error. FUEL OUT P XDCR may be substituted in fuel qty calculation

APU/HYD

SM
ALERT

S88 APU
TANK T 1(2,3)

If APU FUEL T:
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 APU FUEL T:
TEST LN 1 1(2,3)
< 45 degF
> 110 degF or
TEST LN 2 1(2,3)
< 45 degF
> 150 degF or
FEED LN 1(2,3)
< 45 degF
> 120 degF or
PUMP IN 1(2,3)
< 45 degF
> 125 degF or
PUMP DRN LN 1
1(2,3)
< 43 degF
> 95 degF or
PUMP DRN LN 2
< 43 degF 1(3)
< 48 degF 2
> 140 degF 1(3)
> 195 degF 2

S88 APU
FU PMP 1(2,3)

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

S88 APU
H2O T 1(2,3)

If:
H2O LN INJ
< 40 degF 1(2,3)
> 110 degF 1(3)
> 190 degF 2

Nominal Config:

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

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

**1.1b APU FUEL T: TK SURF ↓, TK HTR ↑↓,
TEST LN 1(2) ↑↓,
FEED LN ↑↓, PUMP IN ↑↓,
PUMP DRN LN 1(2) ↑↓,
PUMP OUT ↑↓, PUMP BYP LN ↑↓,
GG SPLY LN ↑↓; H2O LN INJ ↑↓**

1 Deactivate all
APU fuel htrs
(A12)
APU HTR TK/FU
LN/H2O SYS
• 1A,2A,3A – OFF
• 1B,2B,3B – OFF
APU HTR GAS
GEN/FU PUMP
• 1,2,3 – OFF

2 Reactivate
unaffected htrs per
previous config
(Refer to SM FDA
THERMAL LIMITS
TABLE)

ORB PKT
C/L, APU
FUEL T

3
SM 88
APU/ENVIRON
THERM
Param(s) off-scale
high (H) or low (L)
(Refer to SM FDA
THERMAL LIMITS
TABLE) ?

6 XDCR
FAILURE

8 TK SURF low
(L) ?

APU/HYD
SSR-6

11
• Continue normal
ops

4 Param(s) high
(↑)
Param(s) low (↓)

7
• Switch to
alternate htr for
affected sys
(Refer to SM FDA
THERMAL
LIMITS TABLE)
Affected temp(s)
returns within
limits ?

12 EXTREMELY
COLD
ENVIRONMENT
OR XDCR SHIFT

5 THERMOSTAT
FAILED ON OR
HTR SHORT

CAUTION
Do not reactivate
affected htr sys

9
• √MCC for affected
htr config

10 HTR/
THERMOSTAT
CKT FAILED OFF

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

APU/HYD 1.1b (Cont)

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
TK HTR	0-160	45	140	LN/H2O/SYS
TEST LN 1	0-250	45	110	1B(2B,3B) –
LN 2	0-250	45	150	AUTO(OFF)
FEED LN	0-250	45	120	1A(2A,3A) –
PUMP IN	0-250	45	125	OFF(AUTO)
DRN LN 1	0-250	43	95	
LN 2	0-250	43	140 (3) (4)	
H2O LN INJ	-75-300	40	110 (5)	
FUEL T				(A12) (2)
PUMP OUT	0-250	50	210	APU HTR GAS GEN/
BYP LN	0-400	60	200	FU PUMP 1(2,3) –
GG SPLY LN	0-450	60	200	B AUTO(A 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)

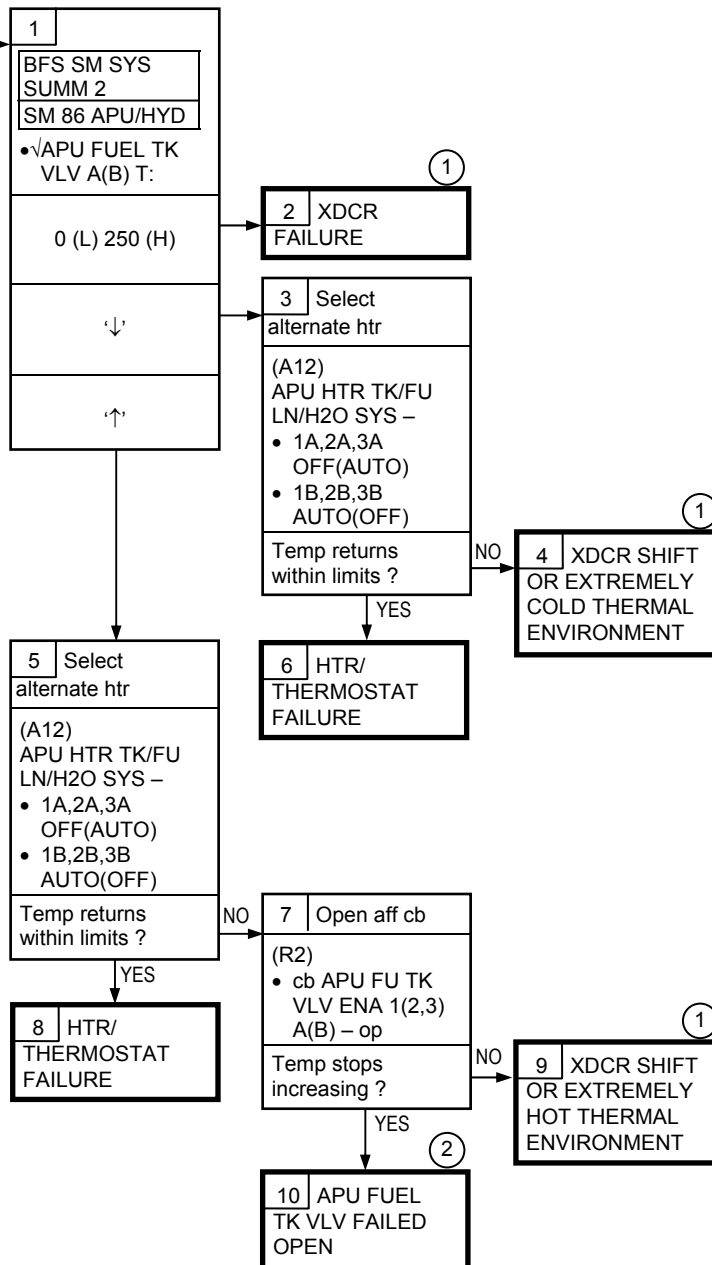
BFS

SM2 FU TK
VLV APU

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

Nominal Config:
(A12)
APU HTR TK/FU
LN/H2O SYS
1A(2A,3A) –
AUTO(OFF)
1B(2B,3B) – OFF
(AUTO)

(R2)
APU OPER
1(2,3) – OFF
APU FU TK VLV
1(2,3) – CL
cb APU FU TK VLV
ENA 1A(2A,3A) –
cl
ENA 1B(2B,3B) –
cl



① MCC has access to alternate Xdcrs

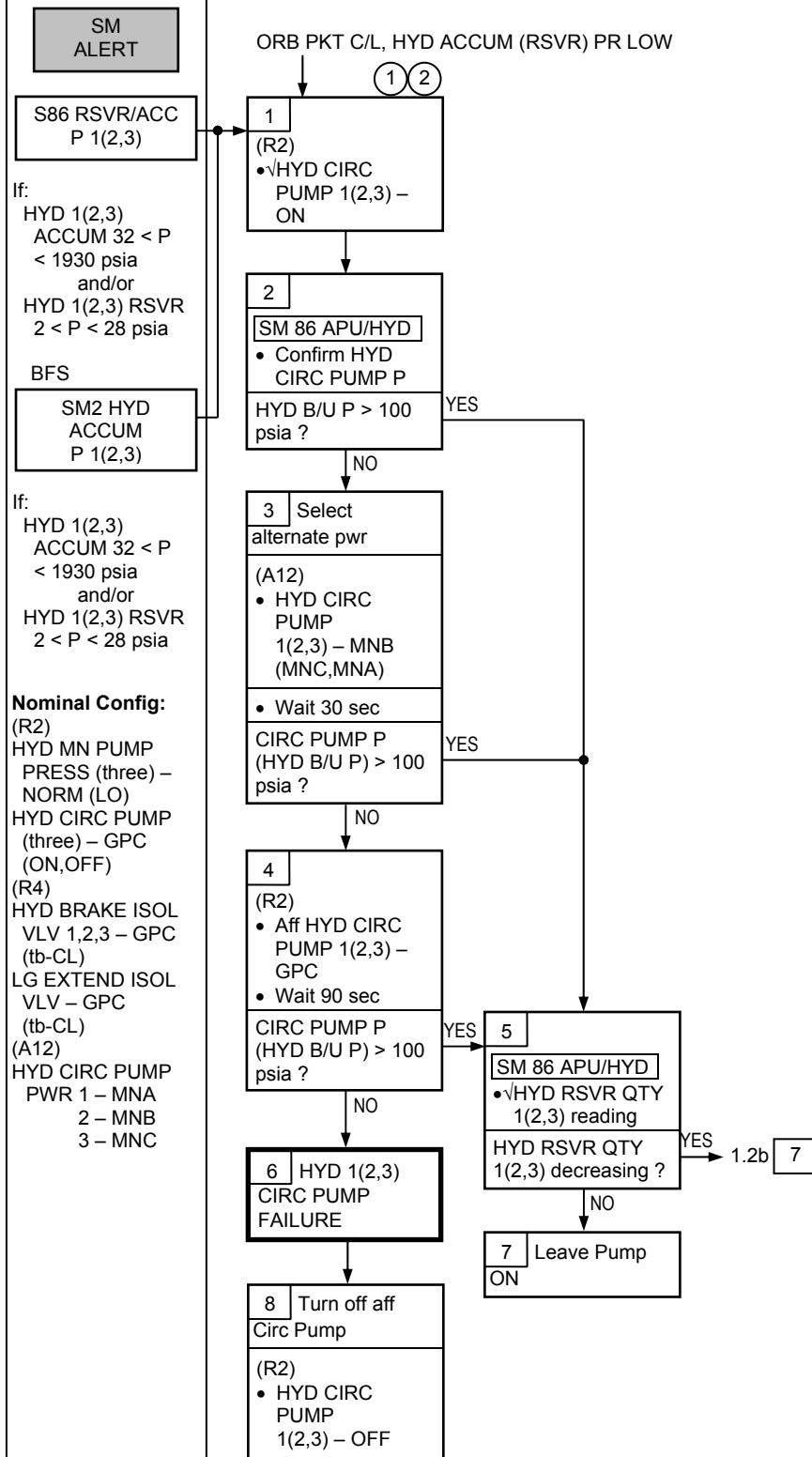
② Normal operation of APU available through other fuel tk vlv

HYD

1.2

APU/HYD

1.2a RSVR P ↓, ACCUM P ↓

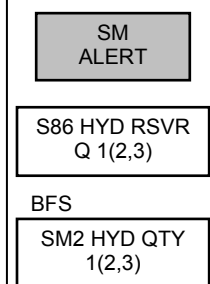


① ACCUM P is maintained automatically when Circ Pump sw is in GPC. At ACCUM P < 1960 psia or RSVR P < 32 psia, Circ Pump is commanded ON. If after 2 min ACCUM P > 1960 psia or RSVR P > 32 psia, Circ Pump is commanded OFF

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

APU/HYD

1.2b HYD RSVR QTY ↑↓



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

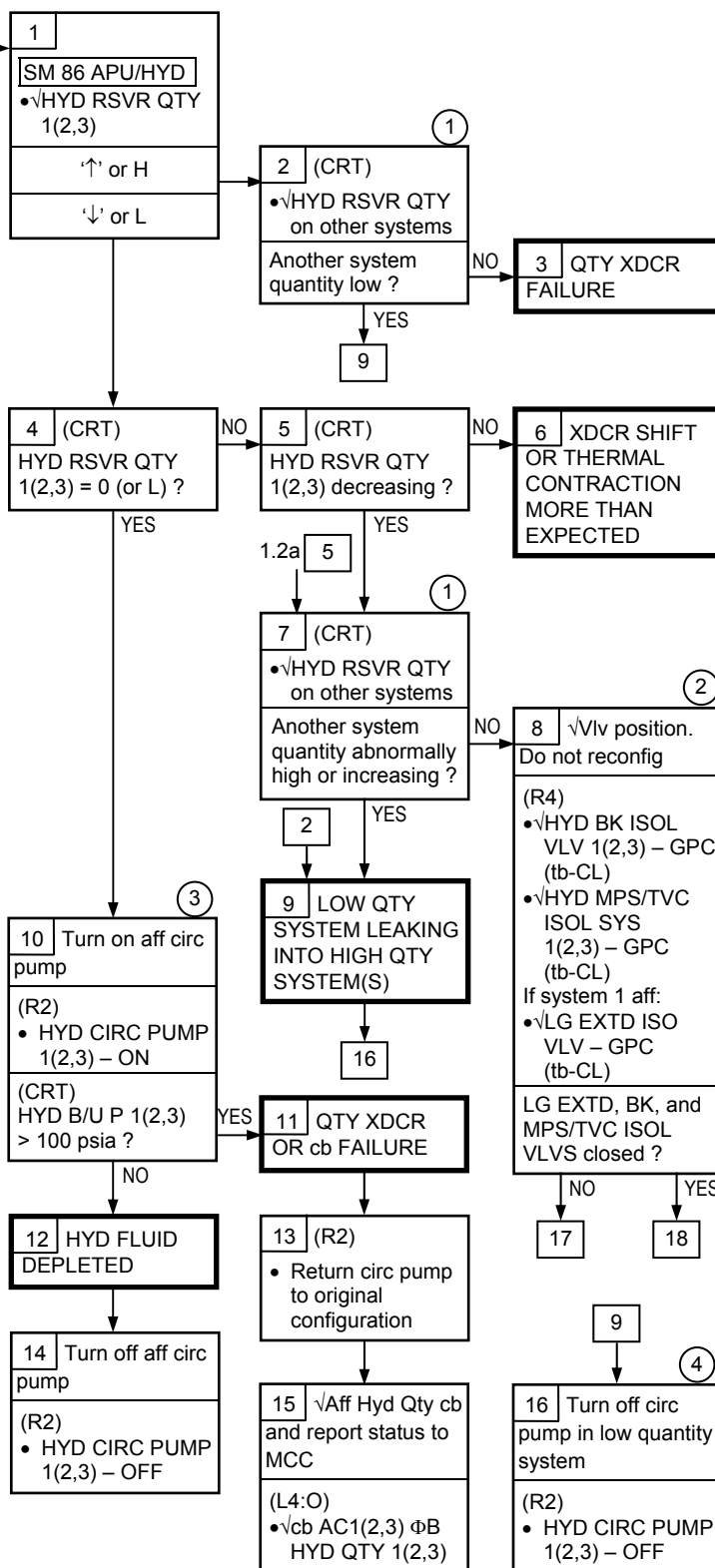
Nominal Config:

(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
HYD CIRC PUMP
(three) – GPC (ON)
BLR CNTLR/HTR
(three) – A(B)
BLR PWR (three) –
OFF
BLR N2 SPLY
(three) – OFF

(R4)
HYD BK ISOL VLV
(three) – GPC
(tb-CL)
LG EXTD ISO VLV –
GPC (tb-CL)
HYD MPS/TVC ISOL
SYS (three) – GPC
(tb-CL)



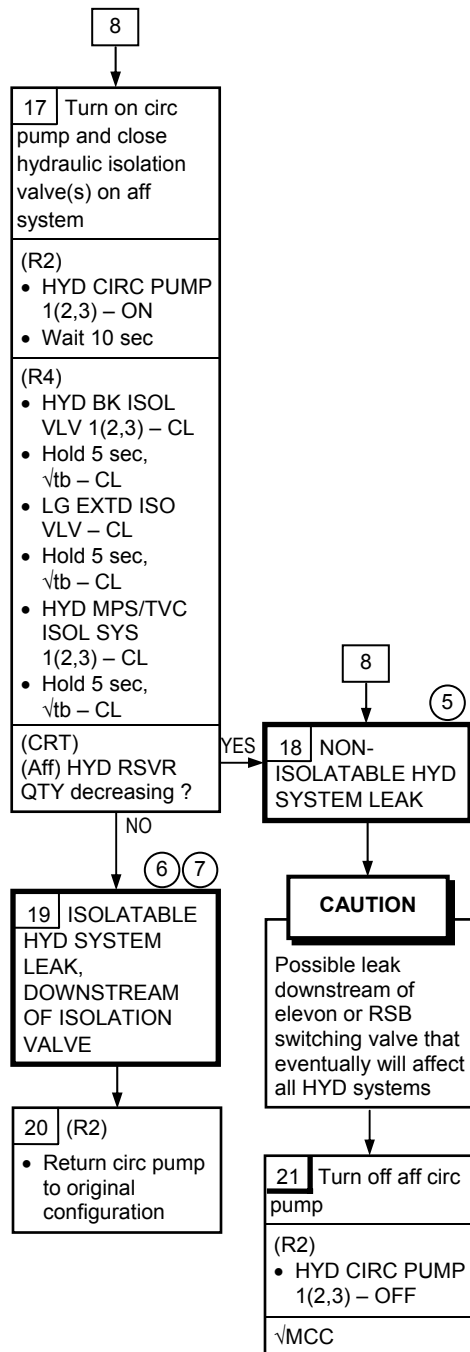
① Normal operating qty approx 60%, but compare qty with previous reading

② Circ pumps or APUs must be operating in order to operate LG EXTD, BK, and MPS/TVC ISOL VLVs if reqd

③ If BFS SYS SUMM 2, use HYD PRESS 1(2,3)

④ May be possible to pump fluid from high to low system by pressurizing high qty system relative to low qty system

APU/HYD 1.2b (Cont)



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

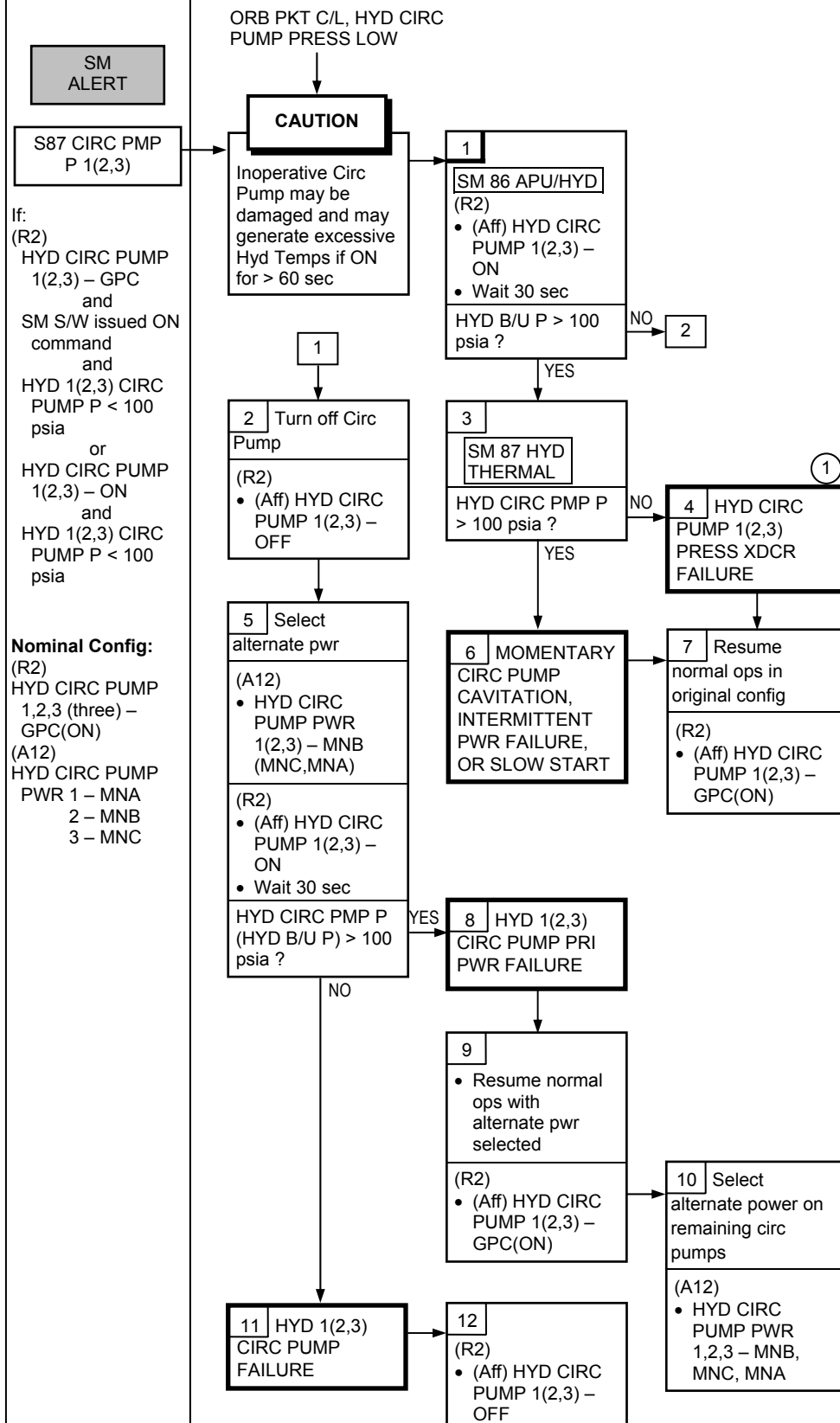
⑥ Valve must be closed manually after automatic opening during entry

⑦ If leak isolated by aff MPS/TVC ISOL vlv, do not open aff vlv for SSME HYD REPRESS during 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 for the following failures: accumulator press/temp xdcr, reservoir press/temp xdcr, MDM, or DSC. Procedure changes corresponding upper and lower S/W limits to off-scale low, effectively removing xdcr 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

APU/HYD SSR-3 (Cont)

HYDRAULIC SYSTEM 1 PARAMS

Param Name	Pump SW Control Constants				FDA		MDM	DSC
	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	OF4	OM1
ROB1	0921722	-30 degF	0921723	-10 degF	-40	250	OA2	OM2
RD/SB PDU1	0921738	-35 degF	0921739	-10 degF	-40	250	OA1	OA1
FUS1	0921736	-30 degF	0921737	-10 degF	-40	250	OA2	OA2
BDYFLP FUS1	0921718	-30 degF	0921719	-10 degF	-40	250	OA1	OA1
HYD								
ACCUM P1	0921740	1960 psi	NONE		1930 psi		OA1	OM3
RSVR P1	0920142	32 psi	NONE		28 psi		OA1	OA1

HYDRAULIC SYSTEM 2 PARAMS

Param Name	Pump SW Control Constants				FDA		MDM	DSC
	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	OF4	OM2
ROB2	0921816	-30 degF	0921817	-10 degF	-40	250	OF4	OM1
RD/SB PDU2	0921832	-35 degF	0921833	-10 degF	-40	250	OA1	OA1
FUS2	0921830	-30 degF	0921831	-10 degF	-40	250	OA2	OA2
BDYFLP PDU2	0921814	-35 degF	0921815	-10 degF	-40	250	OA1	OA1
HYD								
ACCUM P2	0921834	1960 psi	NONE		1930 psi		OA2	OM2
RSVR P2	0920143	32 psi	NONE		28 psi		OA2	OA2

HYDRAULIC SYSTEM 3 PARAMS

Param Name	Pump SW Control Constants				FDA		MDM	DSC
	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	OA2	OM2
RIB3	0921918	-30 degF	0921919	-10 degF	-40	250	OF4	OM2
RD/SB PDU3	0921930	-35 degF	0921931	-10 degF	-40	250	OA1	OA1
BDYFLP PDU3	0921914	-35 degF	0921915	-10 degF	-40	250	OA3	OA3
HYD								
ACCUM P3	0921932	1960 psi	NONE		1930 psi		OA3	OM2
RSVR P3	0920144	32 psi	NONE		28 psi		OA3	OA3

APU/HYD SSR-4

APU FUEL TK P XDCR FAILURE WORKAROUND

Selection of alternate xdcr for APU fuel comp

1. For APU 1 FUEL 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 FUEL 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 FUEL 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. <u>STEAM VENT HTR ACTIVATE</u> BLR PWR X – ON √CNTLR/HTR (three) – B(A)	
O14:F, O15:F, O16:F O17:A C3 O6 C3(A6U)	2. <u>GNC CONFIG</u> ASA (four) – ON ATVC (four) – ON √FCS CH (four) – AUTO √MDM All FF and FA – ON GNC I/O RESET √DAP: A/AUTO/VERN	
O14:F, O15:F	3. <u>DPS CONFIG</u> √MMU 1,2 – ON Perform G2 TO G8 TRANSITION (ORB OPS, <u>DPS</u>) Use the "If FCS Checkout" steps (TFL change required) <u>1: GNC, FCS/DED DIS C/O</u>	
	4. <u>APU PRESTART</u> <u>2: SM 86 APU/HYD</u>	
R4	√HYD BK ISOL VLV X tb – CL	
	√LG EXT D ISO VLV tb – CL	
R2	BLR N2 SPLY X – ON	
	HYD CIRC PUMP X – OFF	
	√cb APU FU TK VLV ENA (six) – cl	
	√APU FU TK VLV (three) – CL	
	√AUTO SHTDN (three) – ENA	
	√SPEED SEL (three) – NORM	
	√OPER (three) – OFF	
	HYD MN PUMP PRESS X – LO	
	APU CNTLR PWR X – ON	
	Inform MCC: READY FOR APU START	
	Wait for MCC GO	
R2	5. <u>APU START</u> APU FU TK VLV X – OP √APU/HYD RDY X tb – gray * If tb – bp, √MCC *	
00:00	Start Event Timer	
	APU OPER X – START/RUN	
<u>HYD/APU</u>	√HYD PRESS X ind – LO green	
R2	√APU/HYD RDY X tb – bp	
	* If APU did not start normally: *	
	* APU OPER X – OFF *	
	* FU TK VLV X – CL *	
	* √Shutdn (HYD PRESS < 200) *	
	* Report APU F7 lts *	
	* APU CNTLR PWR X – OFF *	
	* √MCC *	
<u>HYD/APU</u>	HYD MN PUMP PRESS X – NORM	
	√HYD PRESS X ind – HI green	
R4	6. <u>MPS/TVC ISOL VLV CONFIG</u> HYD MPS/TVC ISOL VLV SYS X – OP (hold 5 sec, tb–OP)	

APU/HYD SSR-5 (Cont)

- CRT1 7. AEROSURFACE DRIVE
SURF DR START – ITEM 10 EXEC (*)
- NOTE
Pos '↓' may be indicated until HYD SYS is warm
- C3 * If FCS CH failure (↓) port status, reset aff FCS CH: *
* FCS CH – ORIDE *
* – AUTO *
8. SECONDARY ACTUATOR CHECK
On MCC GO:
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
- SURF DR START – ITEM 10 EXEC (*)
9. APU FUEL DEPLETION AND AERO DRIVE TERMINATION
After APU shuts down due to fuel depletion:
SURF DR STOP – ITEM 11 EXEC (*)
- NOTE
'AERO DRIVE' Fault Msg may occur after APU shutdown.
- * If continuous 'AERO DRIVE' Fault Msg: *
* ITEM 15 EXEC (*) *
10. APU SHUTDOWN
R2 BLR PWR X – OFF
APU OPER X – OFF
FU TK VLV X – CL
√Shutdn (HYD PRESS < 200)
APU CNTLR PWR X – OFF
BLR N2 SPLY X – OFF
11. HYD RECONFIG
HYD CIRC PUMP X – ON
Wait 10 sec
R4 HYD MPS/TVC ISOL VLV SYS X – CL (hold 5 sec, tb-CL)
R2 CIRC PUMP X – GPC
12. GNC/DPS RECONFIG
Perform G8 TO G2 TRANSITION (ORB OPS, DPS)
O14:F, ASA (four) – OFF
O15:F,
O16:F
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 FUEL T 1 TK HTR

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 FUEL T 1 TK HTR (from SPEC 88) EXEC

2. For APU 2 QTY:

SM 88 APU/ENVIRON THERM

Note: APU FUEL T 2 TK HTR

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 FUEL T 2 TK HTR (from SPEC 88) EXEC

3. For APU 3 QTY:

SM 88 APU/ENVIRON THERM

Note: APU FUEL T 3 TK HTR

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 FUEL T 3 TK HTR (from SPEC 88) EXEC

COMM

<u>2.1</u>	<u>AUDIO</u>	
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	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

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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AUDIO

2.1

COMM

2.1a NO AUDIO
(MULTIPLE PNL OR OTHER SUBSYSTEM)

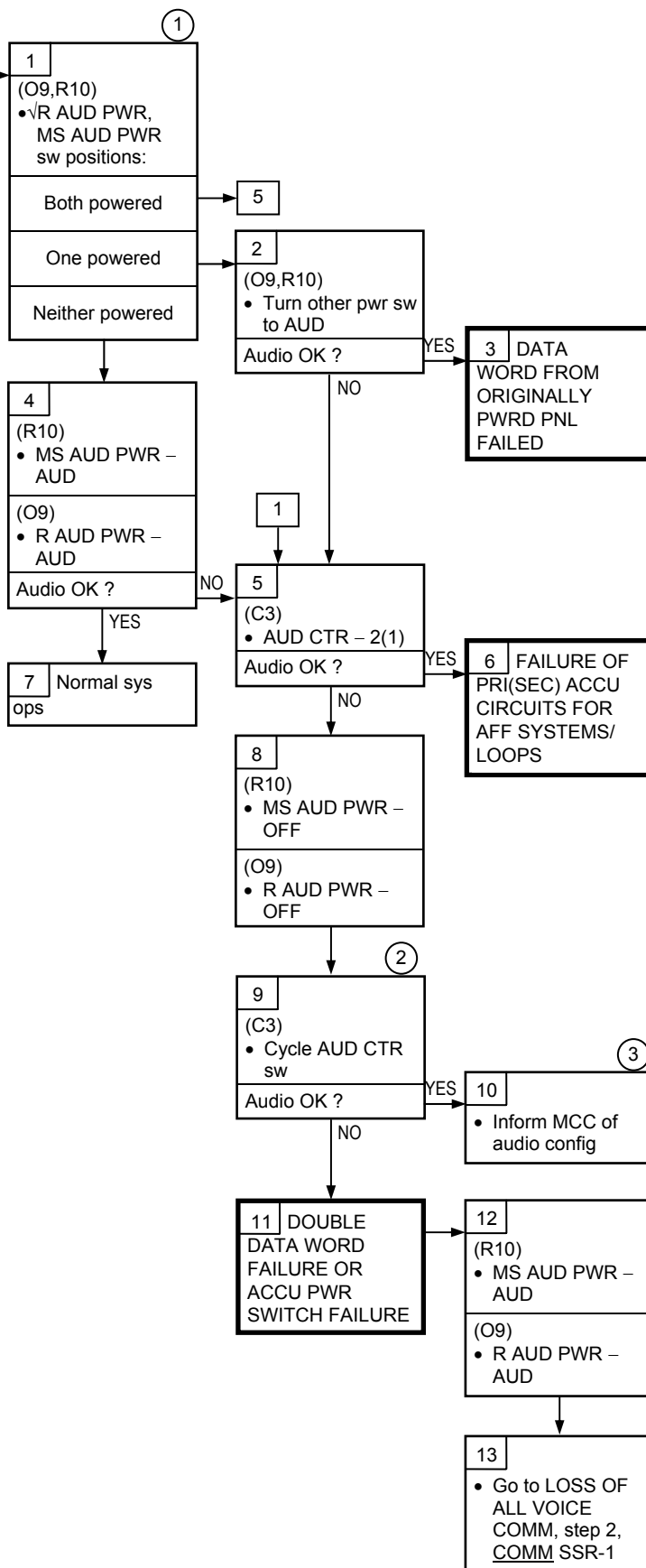
Loss of Audio Affecting More Than One Audio Pnl or One or More of the Following:

- 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

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



① MS or R AUDIO pnl must be pwr'd (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

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S76 GCIL FAIL

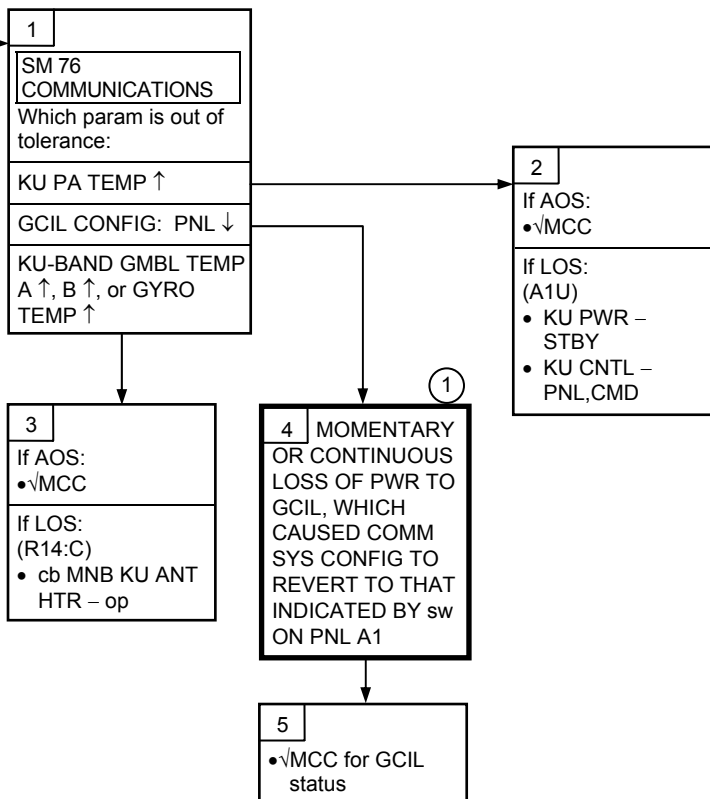
ALERT

S76 GCIL FAIL

S76 KU-GMBL
A TEMP

S76 KU-GMBL
R TEMPS76 KU-GYRO
TEMPS76 KU-XMTR
TEMP

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

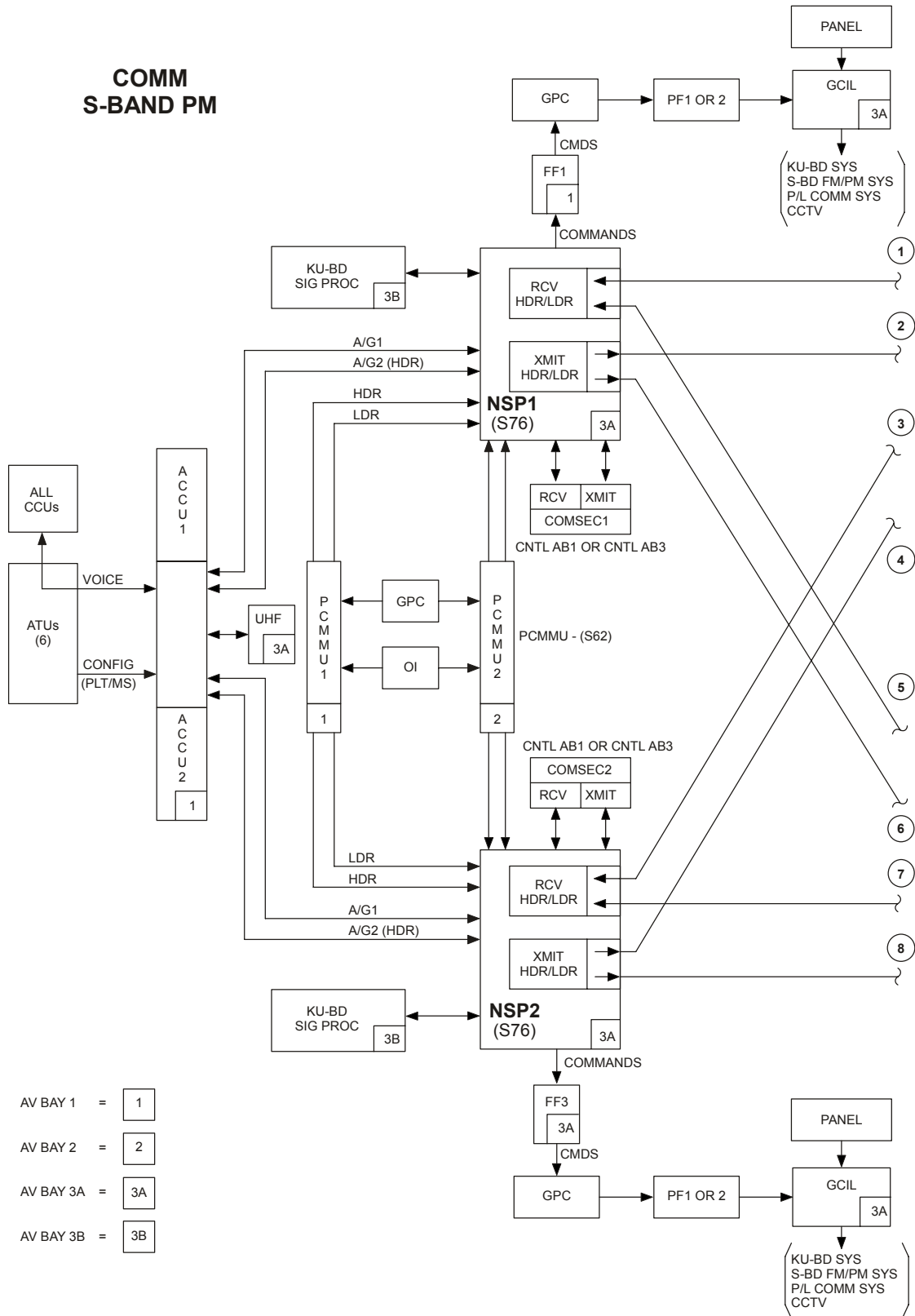


① Upon pwr loss, GCIL will revert to High Frequency for S-Band PM. There is no switch on panel A1L for frequency; therefore, no action should be taken. MCC will reconfig network to match orbiter frequency if previously configured for Low Frequency. Reconfiguration could take up to 10 min

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SB-SYS 1 PWR: CNTLBC1 AND MNBFLC2

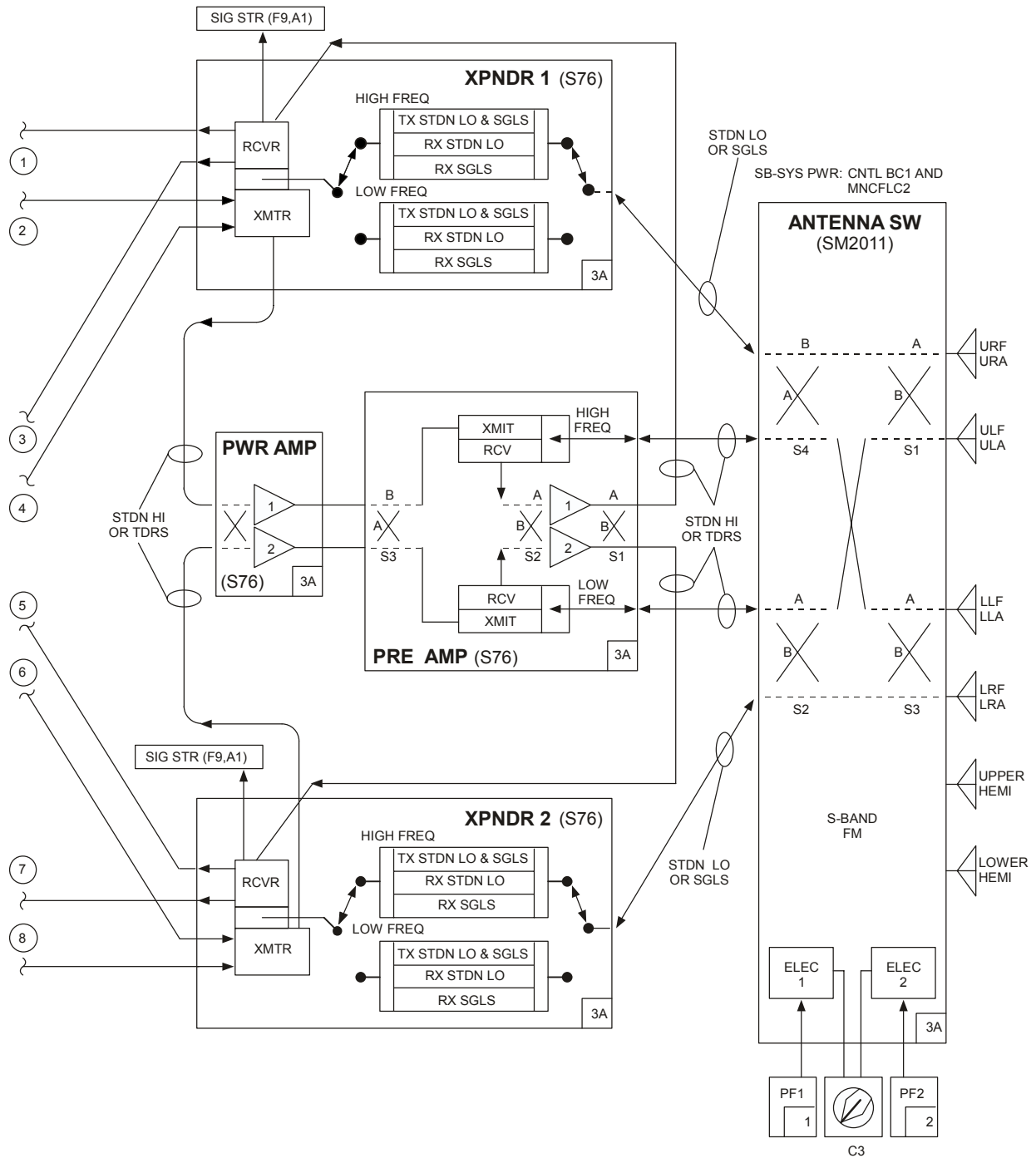
COMM S-BAND PM



S-BD/UHF

2.3

SB-SYS 2 PWR: CNTLBC2 AND MNCFLC3



UPLINK/DOWNLINK COMMUNICATIONS TABLE

SITE ID	S-Band	UHF	TV	COMMENTS
BDA	N/A			Decommissioned
CAN	N/A			Decommissioned
CTS	SGLS			
DFR	STDN	•	•	
DGS	SGLS			
GDX	N/A			Decommissioned
GTS	SGLS			
HTS	SGLS			
JSC	STDN	•	•	Emergency Only
MAD	N/A			Decommissioned
MIL	STDN	•	•	
NHS	SGLS			
OTS	SGLS			
SAL (Northrup)	N/A	•		Salinas Peak for WSSH landing at Northrup
VTs	SGLS			
WLP	STDN	•	•	TV record/playback

All S-band sites can handle Hi/Lo Data rates, encryption/clear uplink or downlink.
 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 here because they may appear on SM 2011 even though they no longer have orbiter support equipment.
 OTS(LION) no longer has UHF equipment.
 SAL (Salinas Peak) can now support UHF comm for overhead passes or entry.

COMM

2.3a NO S-BD COMM: TDRS

① Assumes Ku-Band deployed activated and comm mode

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

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

NO

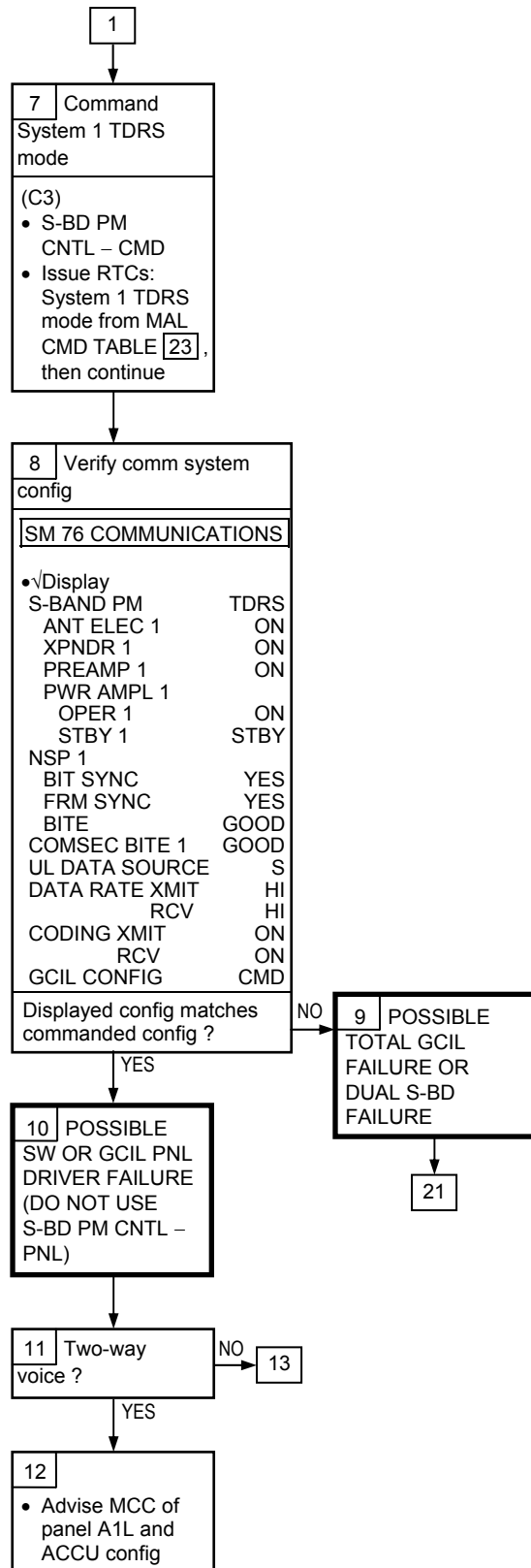
5 DUAL NSP OR
UNEXPLAINED FAILURE

21

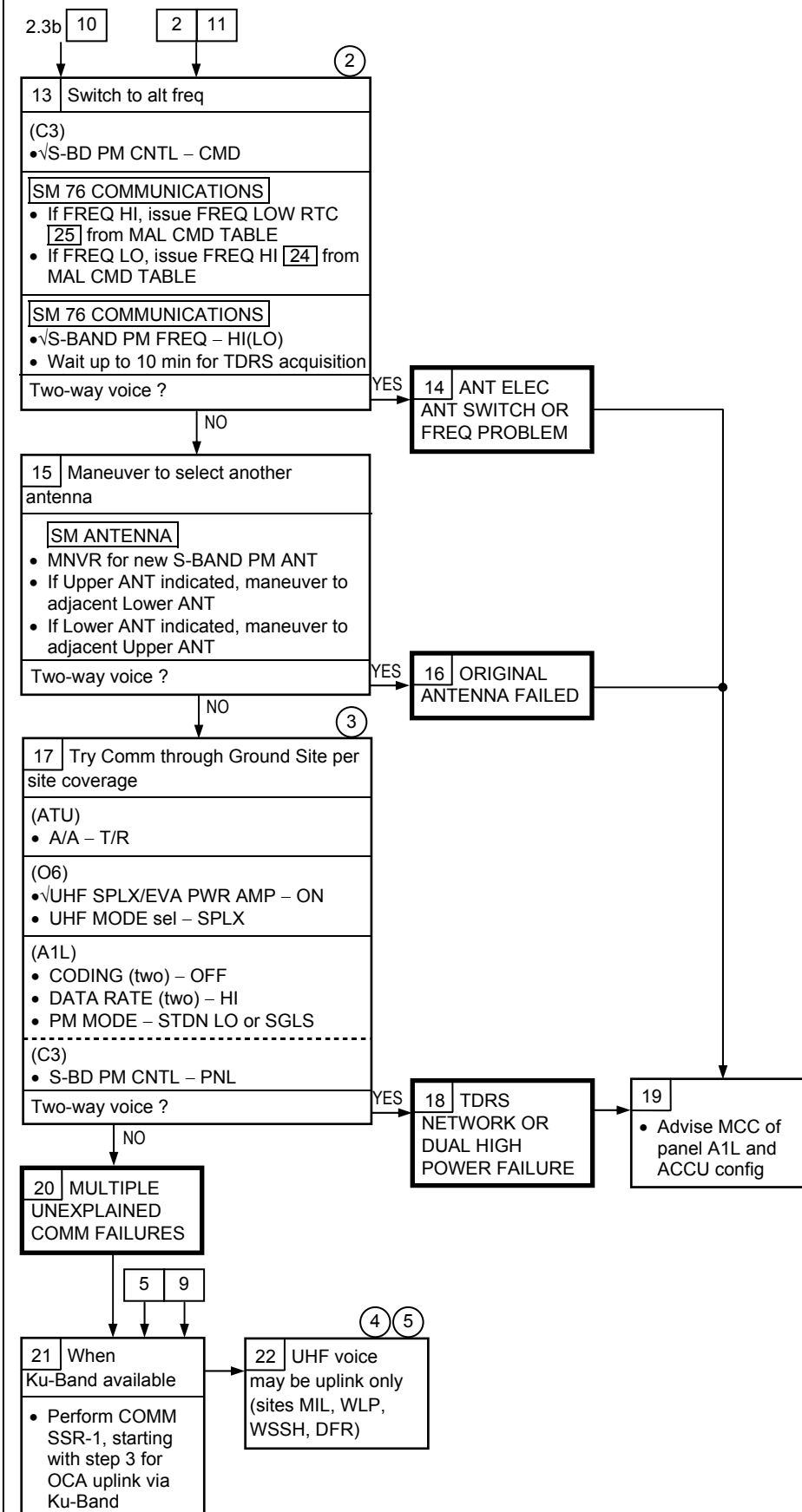
4 POSSIBLE
ANT ELEC SW,
S-BD FREQ OR
DUAL S-BD
FAILURE

6
• Advise MCC of
panel A1L and
ACCU config

COMM 2.3a (Cont)



COMM 2.3a (Cont)



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 MIL - MILA MERRITT ISLAND, FL

WLP - WALLOPS ISLAND, MARYLAND

WSSH - WHITE SANDS SPACE HARBOR, NEW MEXICO

DFR - DRYDEN FLIGHT RESEARCH CENTER PALM DALE, CA

⑥ The RTC (RESET PL1 or PL2) must be sent prior to any command

⑦ 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

⑥ ⑦

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

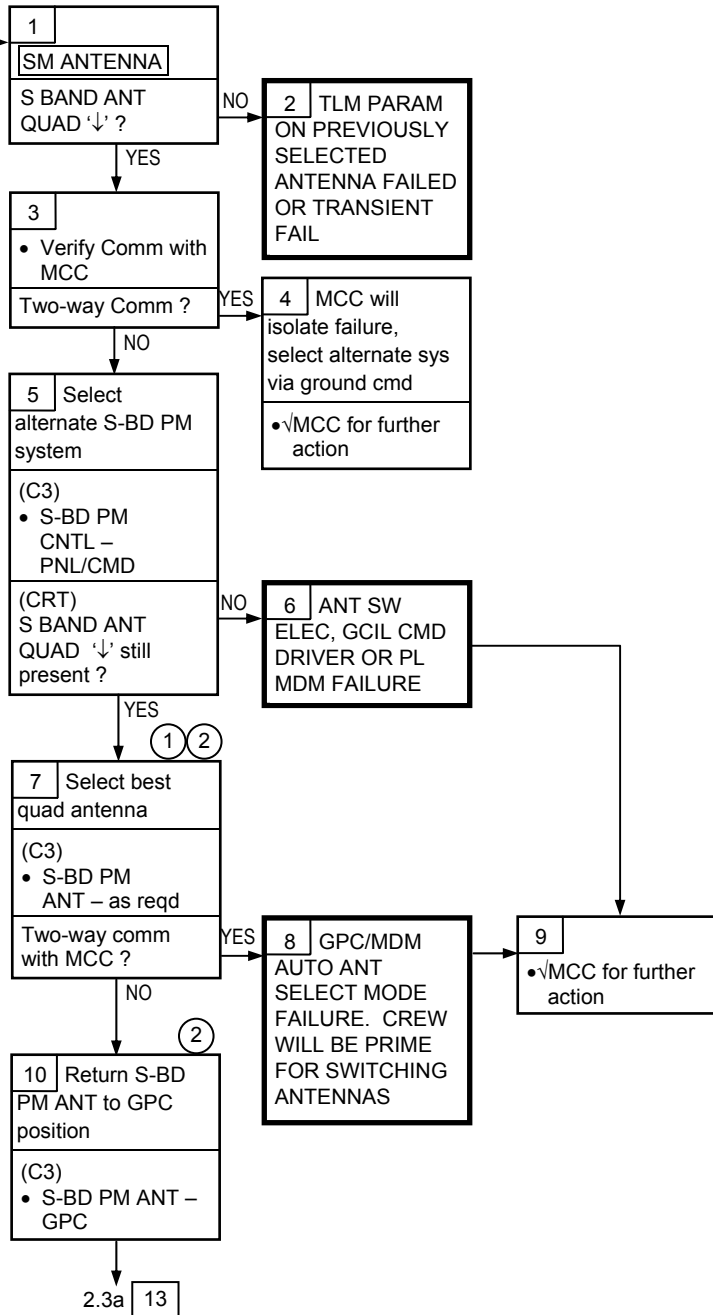
2.3b 'ANTENNA'

**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 Switch failures may prevent certain antennas from being selected

② Pause 2 sec between antenna selections

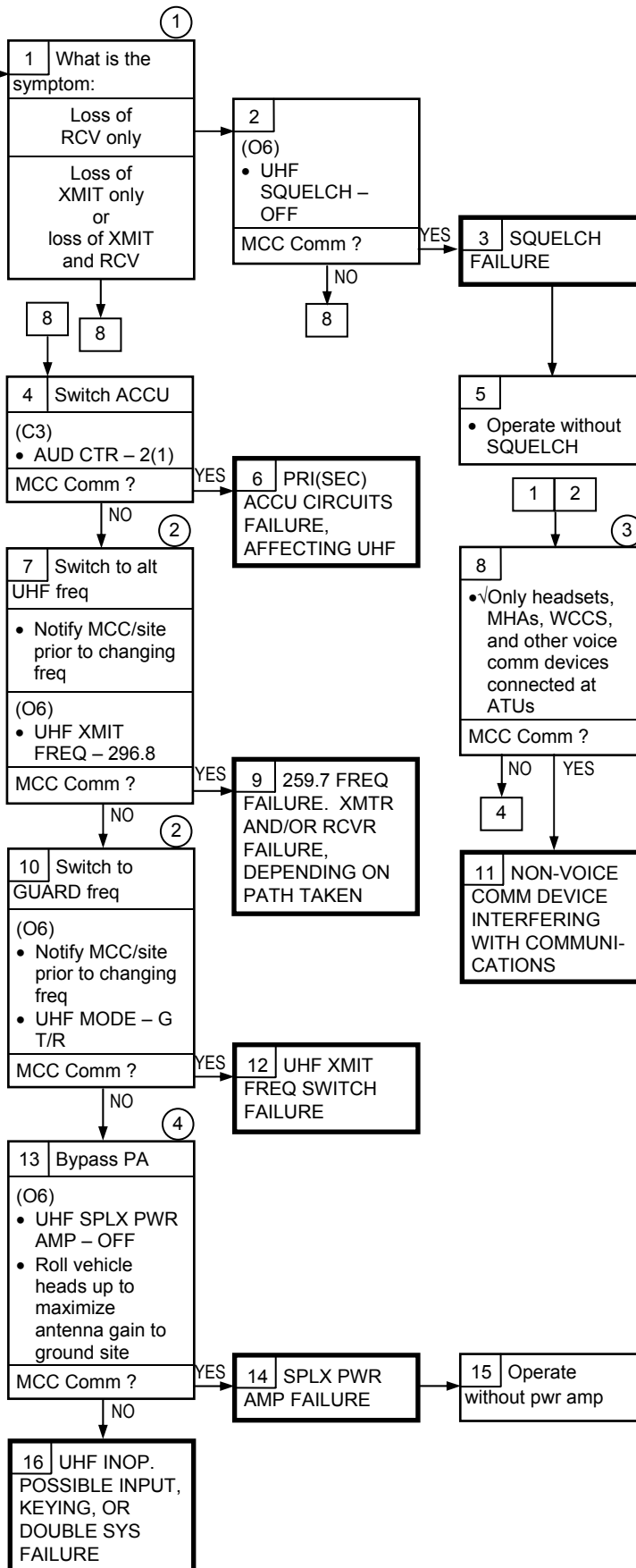
COMM

2.3c NO UHF VOICE (MULTI PNLS)

Loss of UHF Voice

Nominal Config:

(R14:B)
cb MNA,MNC
UHF – cl
(O6)
UHF MODE –
SPLX
UHF XMIT FREQ –
259.7
UHF SPLX PWR
AMP – ON
UHF SQUELCH –
ON
(A1R)
AUD CTR UHF
A/A – T/R



① XMTR range is 350 miles with PWR AMP

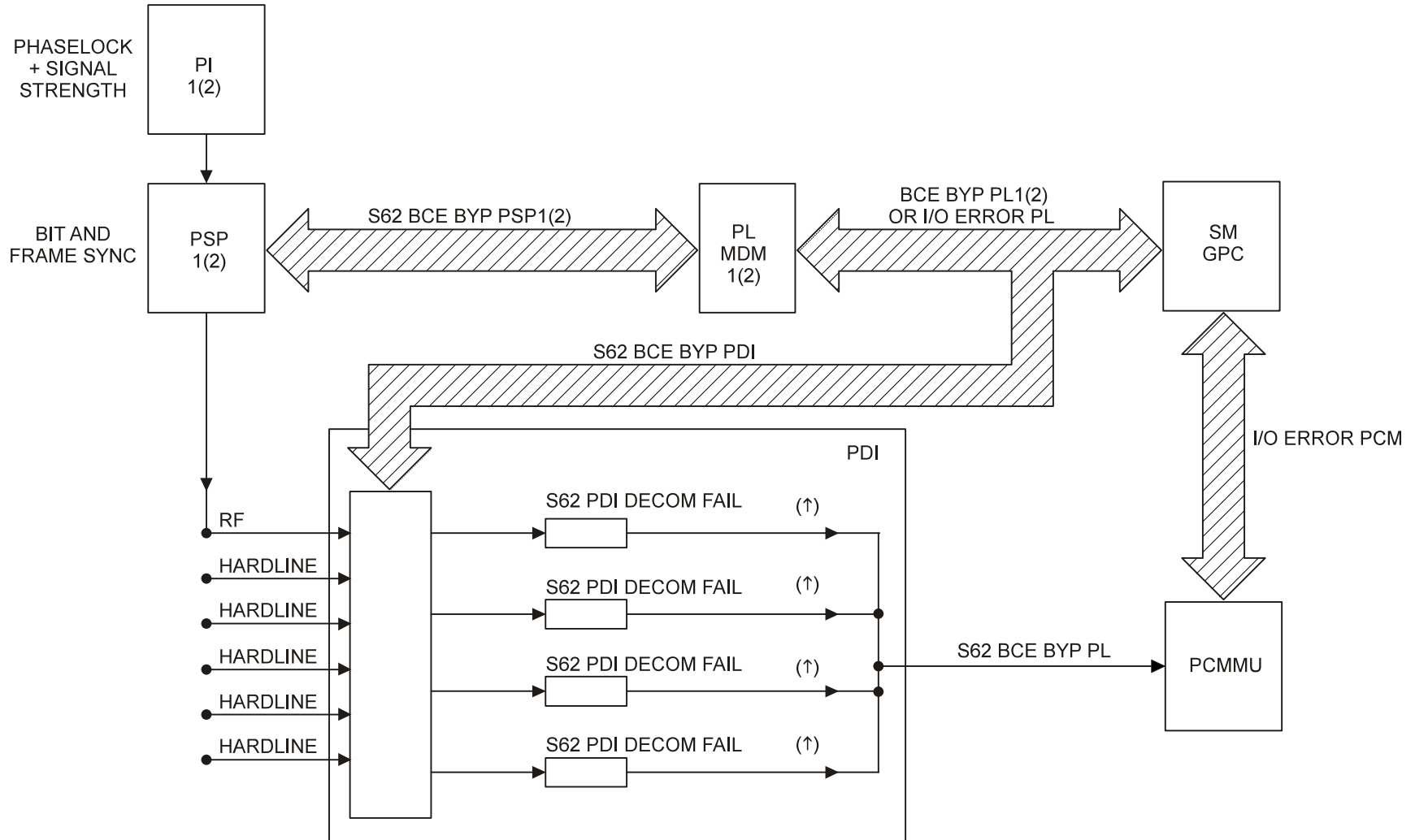
② Up to 30 sec may be reqd for MCC/site response

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

SM
ALERT

S62 BCE BYP
OFA

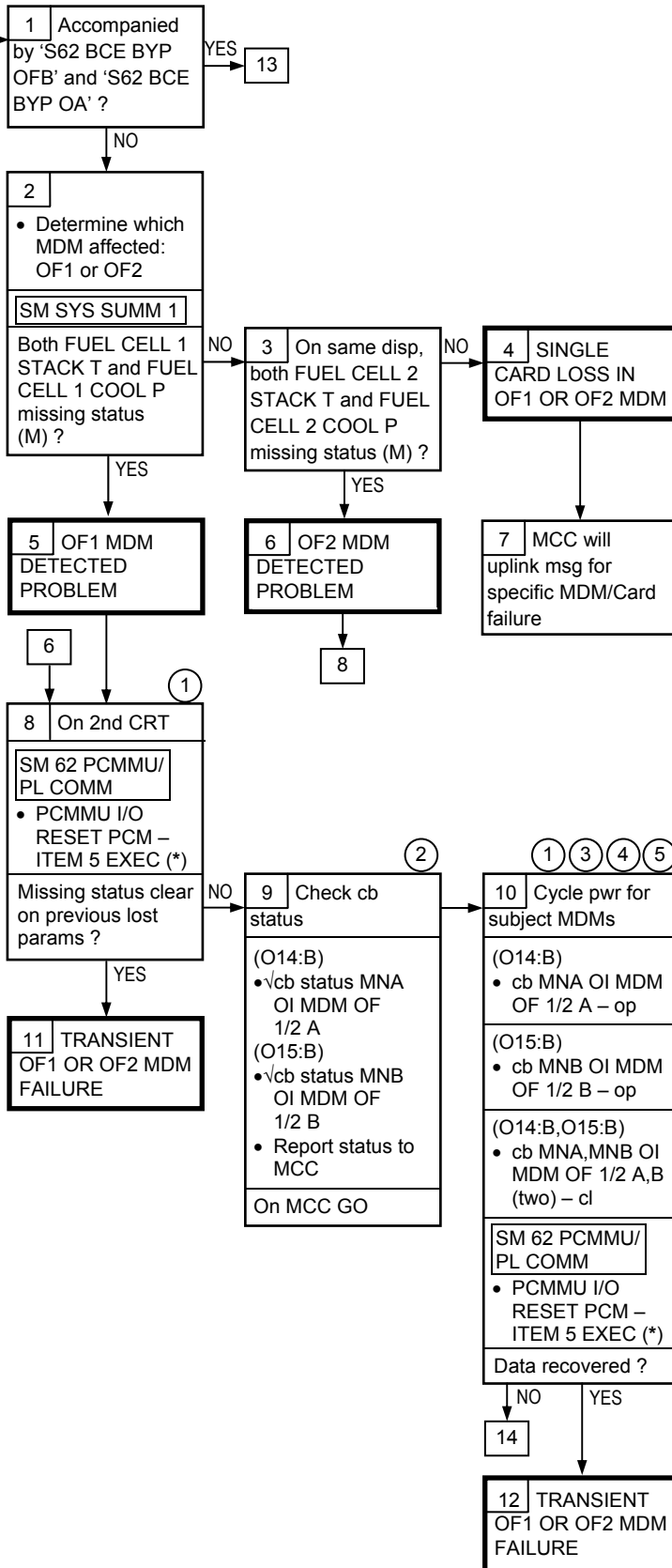
If:

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

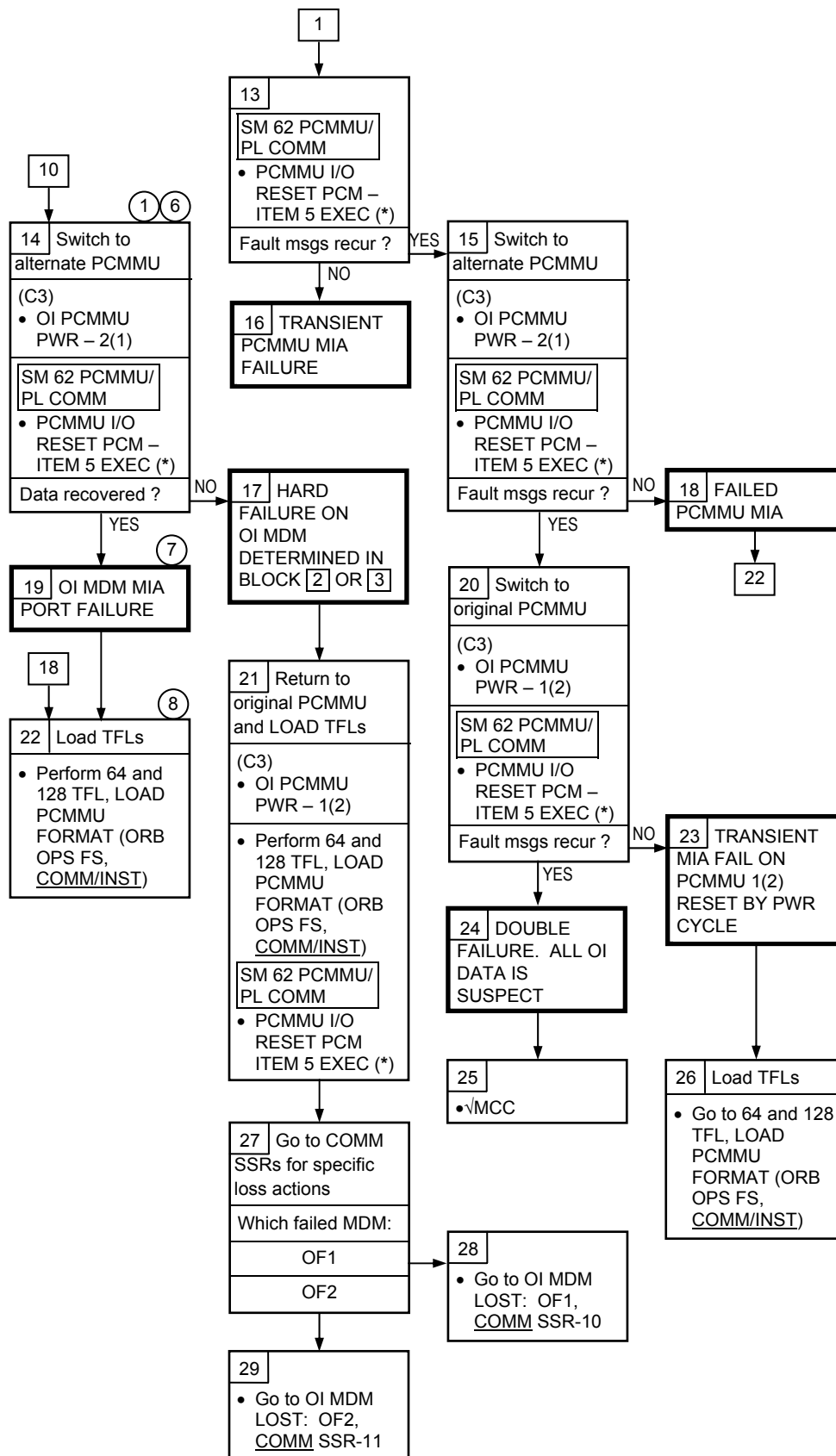
Nominal Config:

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

2.4a 'S62 BCE BYP OFA'



- ① I/O RESET PCM may cause additional SM alerts if continuing problems with OI MDMs or PDI
- ② Must obtain GO from MCC for cb cycle before proceeding to step 10
- ③ Additional SM alerts when power is removed
- ④ Do not close any cb found (reported) OPEN (tripped) without MCC consent
- ⑤ Both cbs must be open for 3 to 5 seconds to remove power from the MDM



- ① I/O RESET
PCM may cause
additional SM alerts if
continuing problems
with OI MDMs or PDI
- ⑥ Advise MCC of
PCMMU switch
- ⑦ Full data
recovered by
PCMMU switch.
Redundant path to
OF1(2) MDM lost
- ⑧ Change
WINDECOM
connections
(O5,MO30F) as reqd

COMM

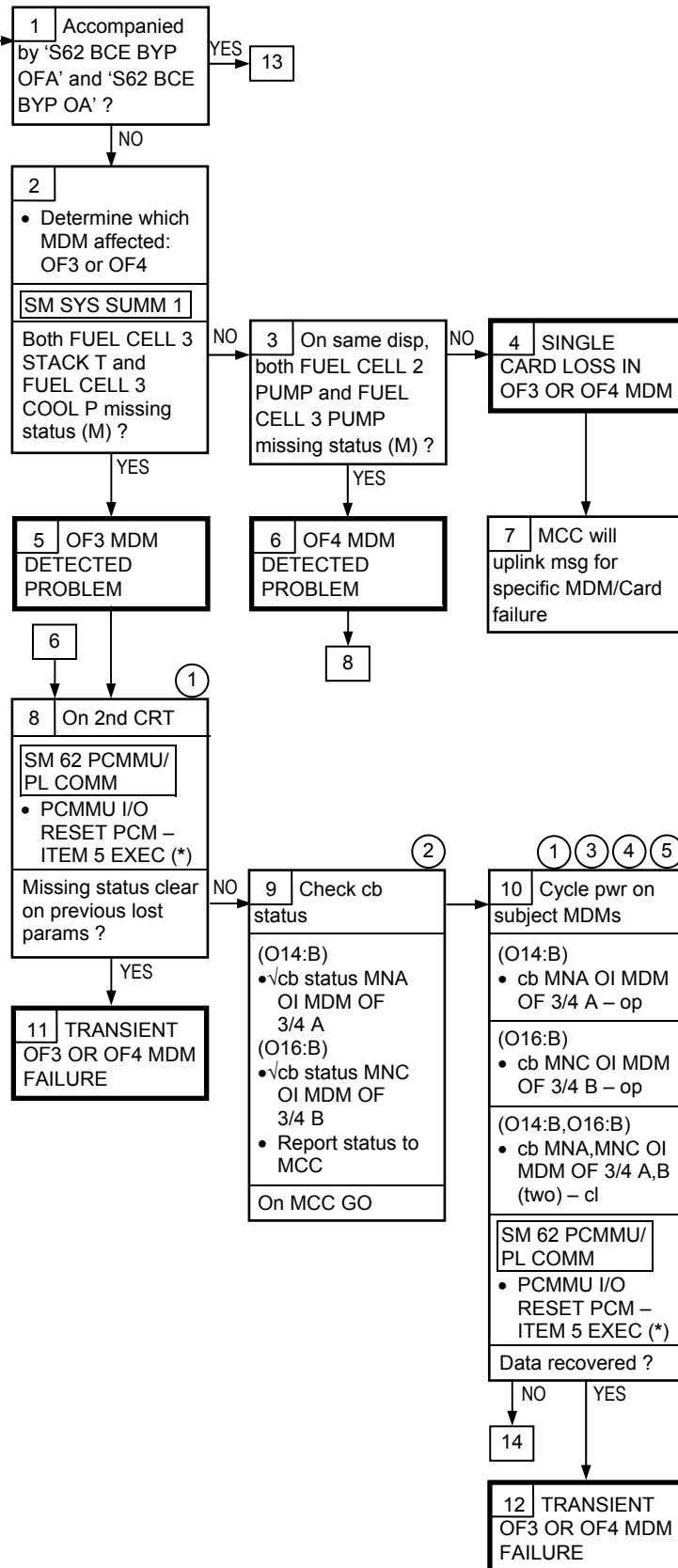
2.4b 'S62 BCE BYP OFB'

SM ALERT

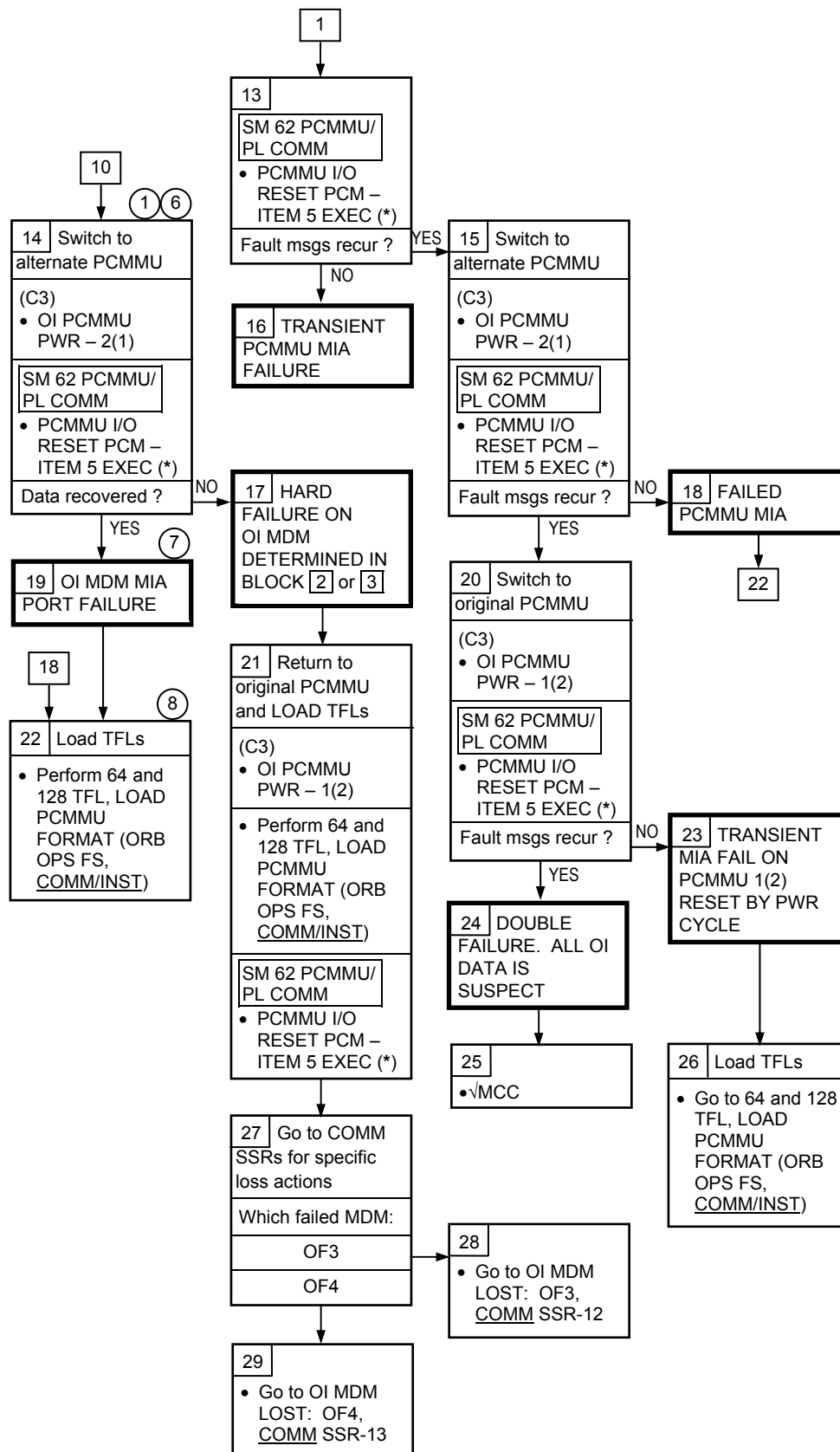
S62 BCE BYP OFB

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,MNC OI MDM OF 3/4 A,B (two) – cl



- ① I/O RESET PCM may cause additional SM alerts if continuing problems with OI MDMs or PDI
- ② Must obtain GO from MCC for cb cycle before proceeding to step 10
- ③ Additional SM alerts when power is removed
- ④ Do NOT close any cb found (reported) OPEN (tripped) without MCC consent
- ⑤ Both cbs must be open for 3 to 5 seconds to remove power from the MDM



① I/O RESET
PCM may cause
additional SM alerts if
continuing problems
with OI MDMs or PDI

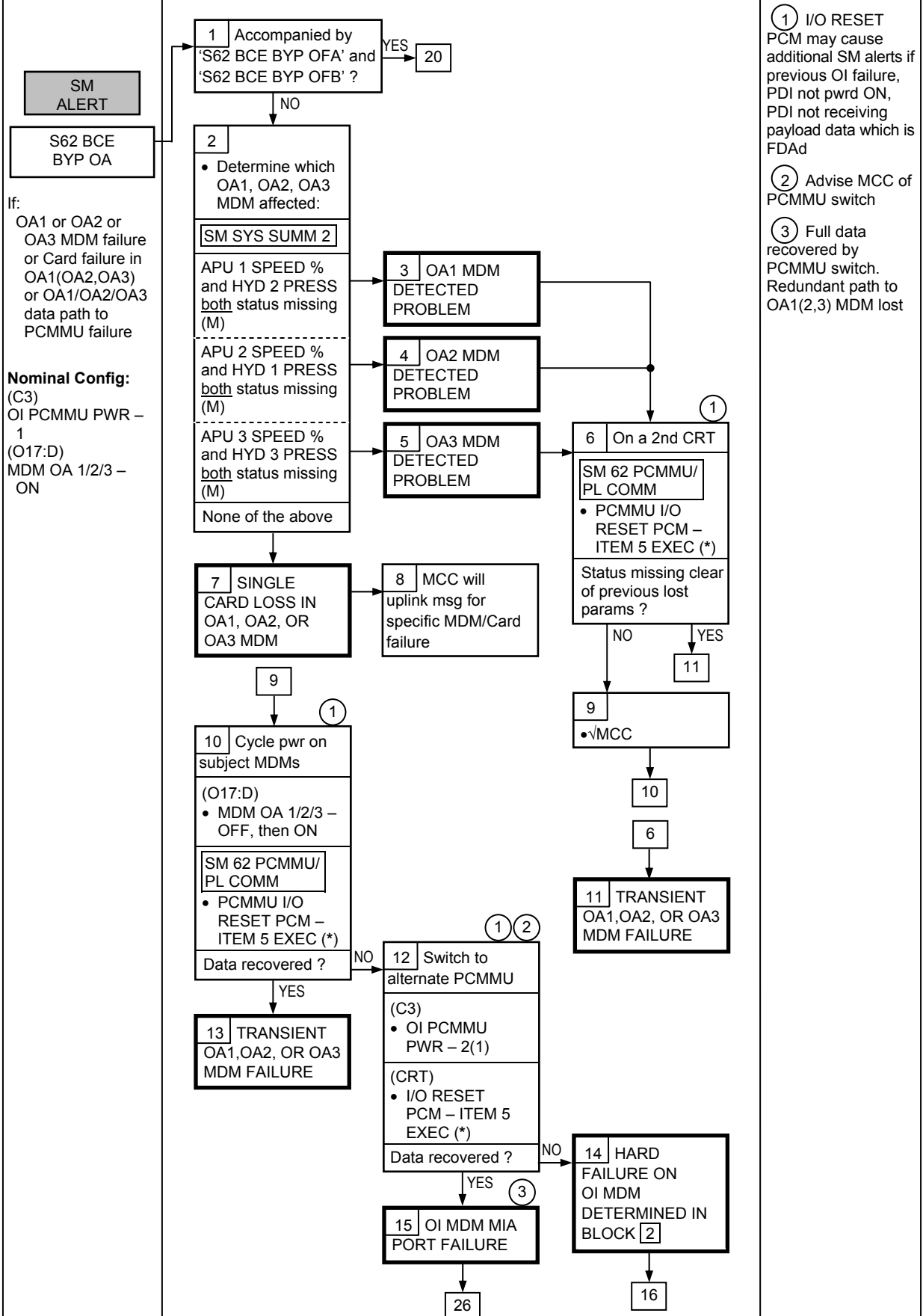
⑥ Advise MCC of
PCMMU switch

⑦ Full data
recovered by
PCMMU switch.
Redundant path to
OF3(4) MDM lost

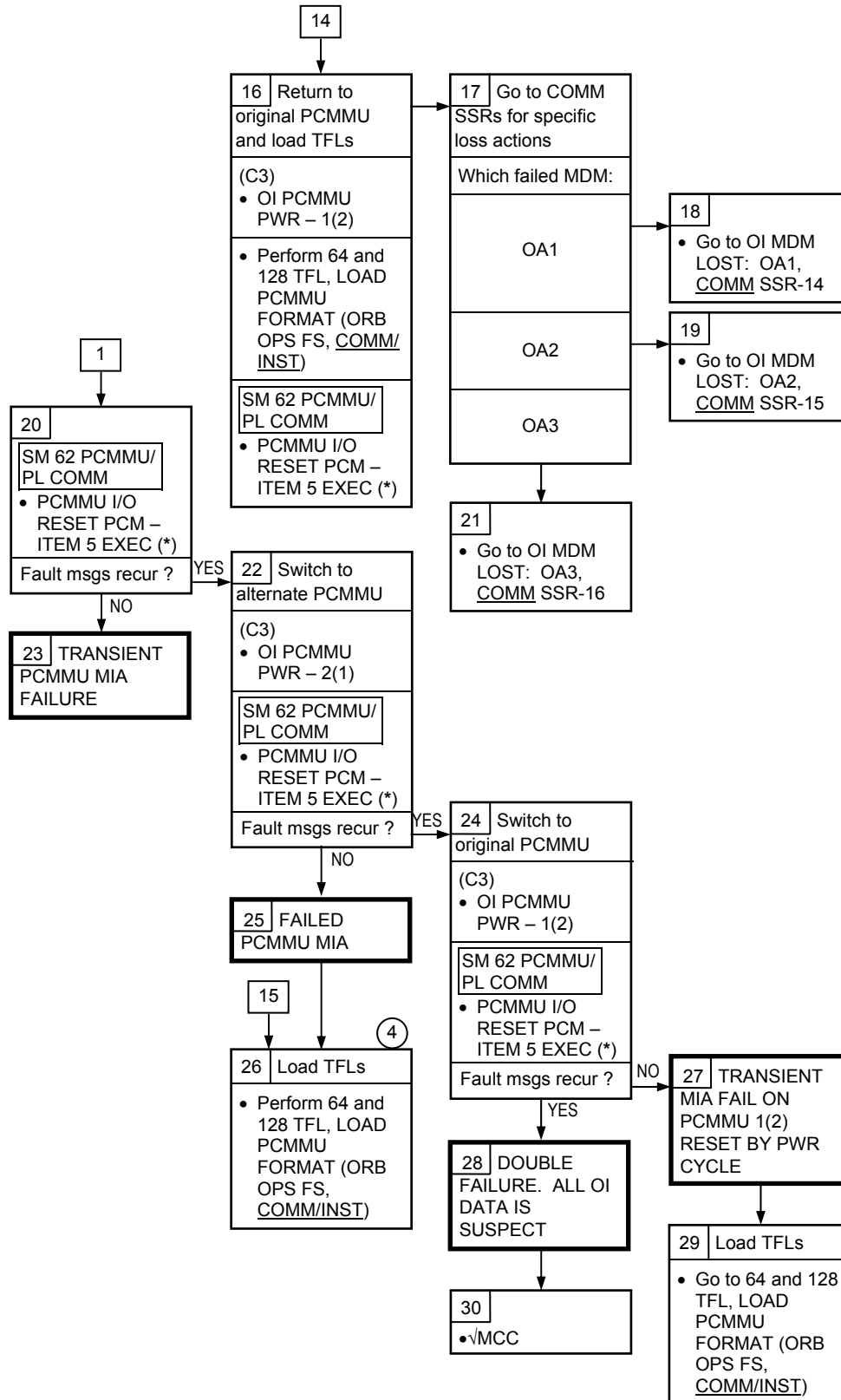
⑧ Change
WINDECOM
connections
(O5,MO30F) as reqd

COMM

2.4c 'S62 BCE BYP OA'



④ Change WINDECOM connections (O5,MO30F) as reqd



COMM

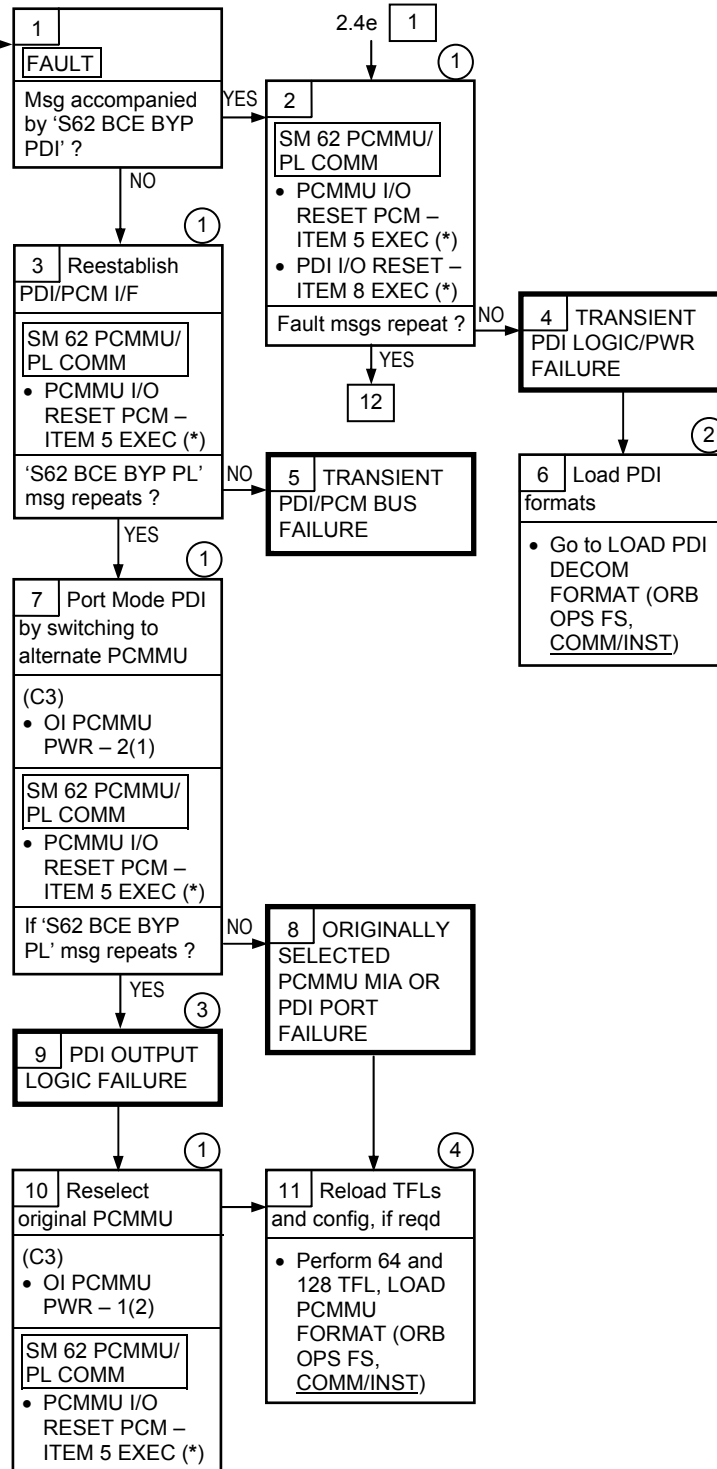
2.4d 'S62 BCE BYP PL'

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



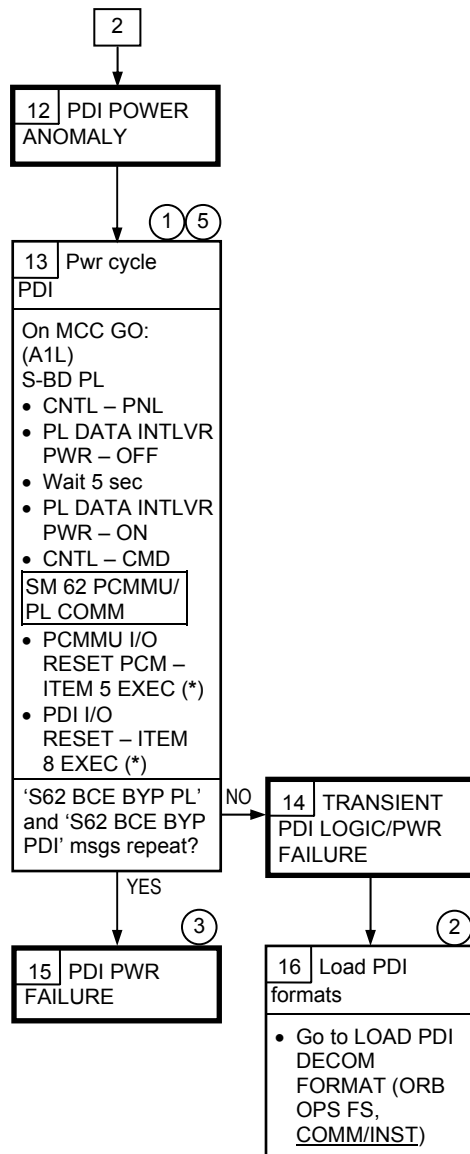
① I/O RESET PCM may cause additional SM alerts if previous OI failure, PDI not pwr'd ON, PDI not receiving payload data which is FDAd

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 pwr 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'

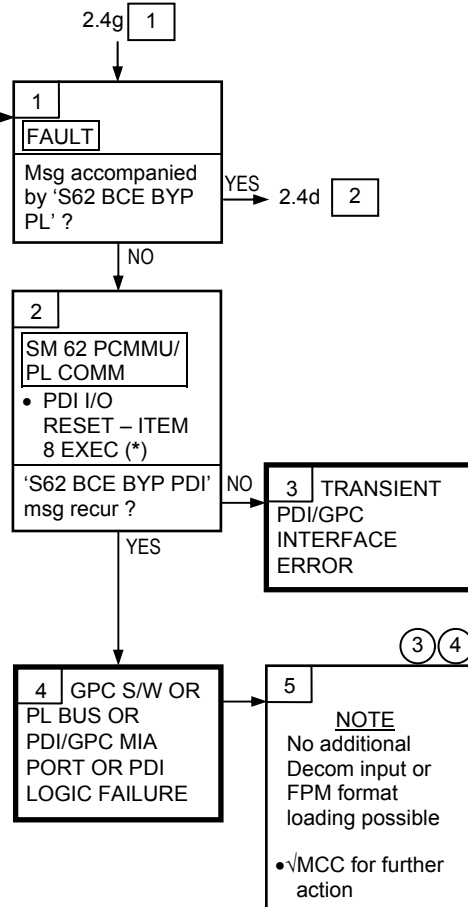
**SM
ALERT**

(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

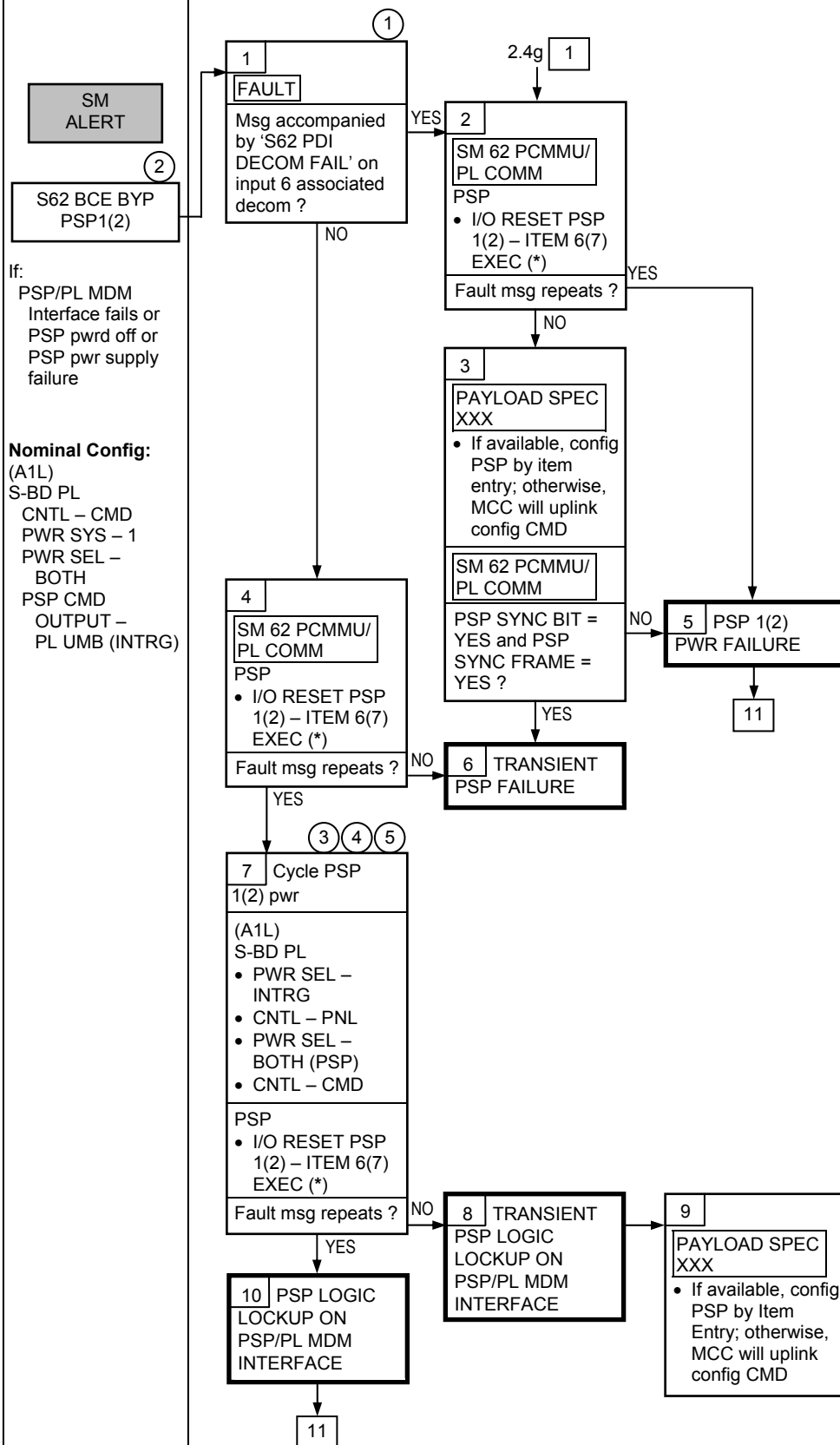
(2) Msg will occur if SM I/O RESET accomplished and PDI pwr'd off

(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)'



① PDI DECOM FDA must be enabled to receive 'S62 PDI DECOM FAIL' and ↑

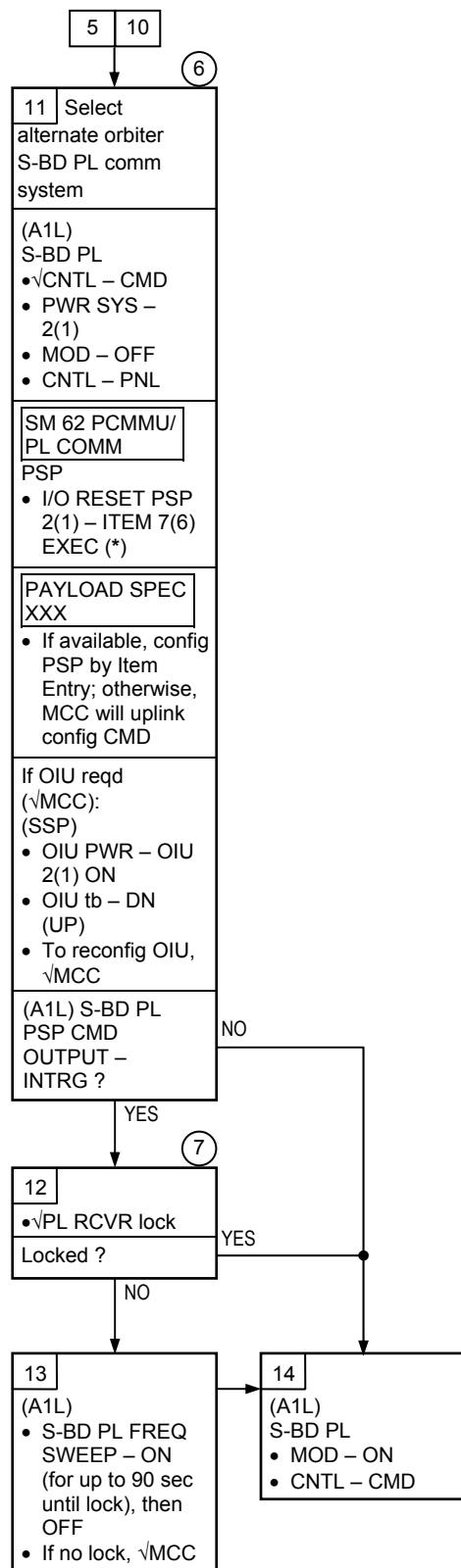
② Msg occurs if PSP pwrd off

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)

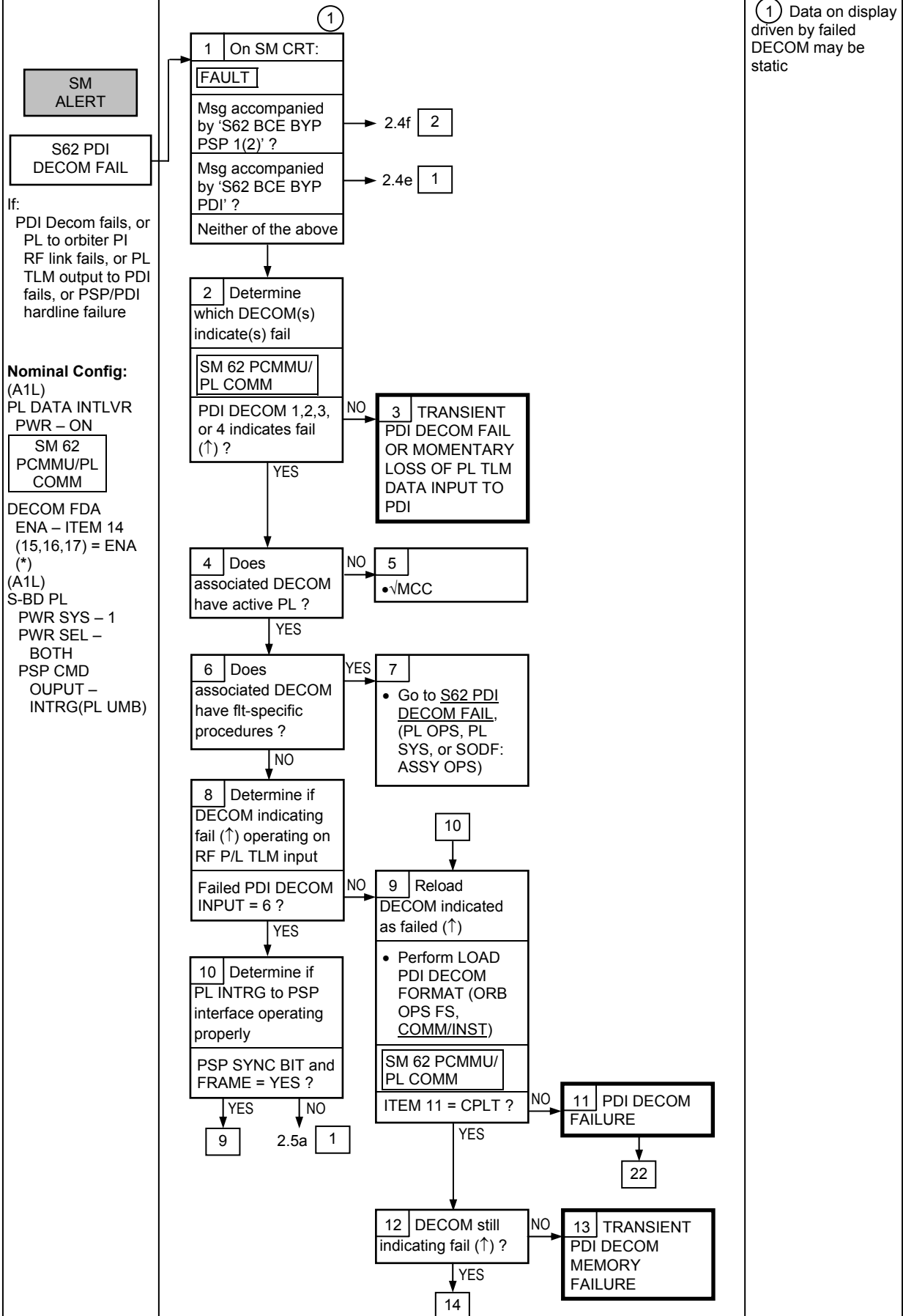


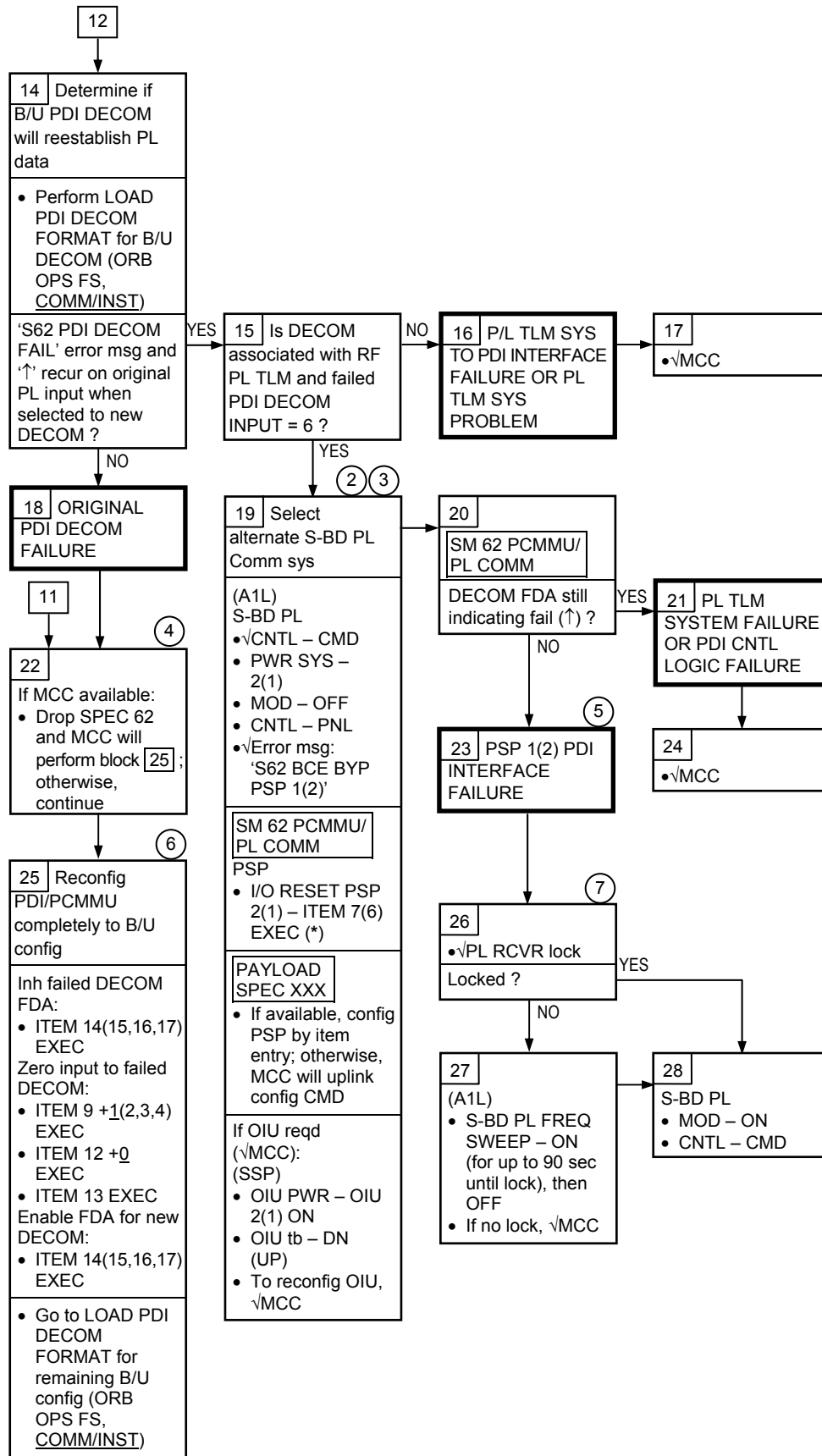
⑥ Selection of alternate S-BD PL sys will cause temporary loss of RF to PL

⑦ Indications of PL RCVR lock vary with flight

COMM

2.4g 'S62 PDI DECOM FAIL'



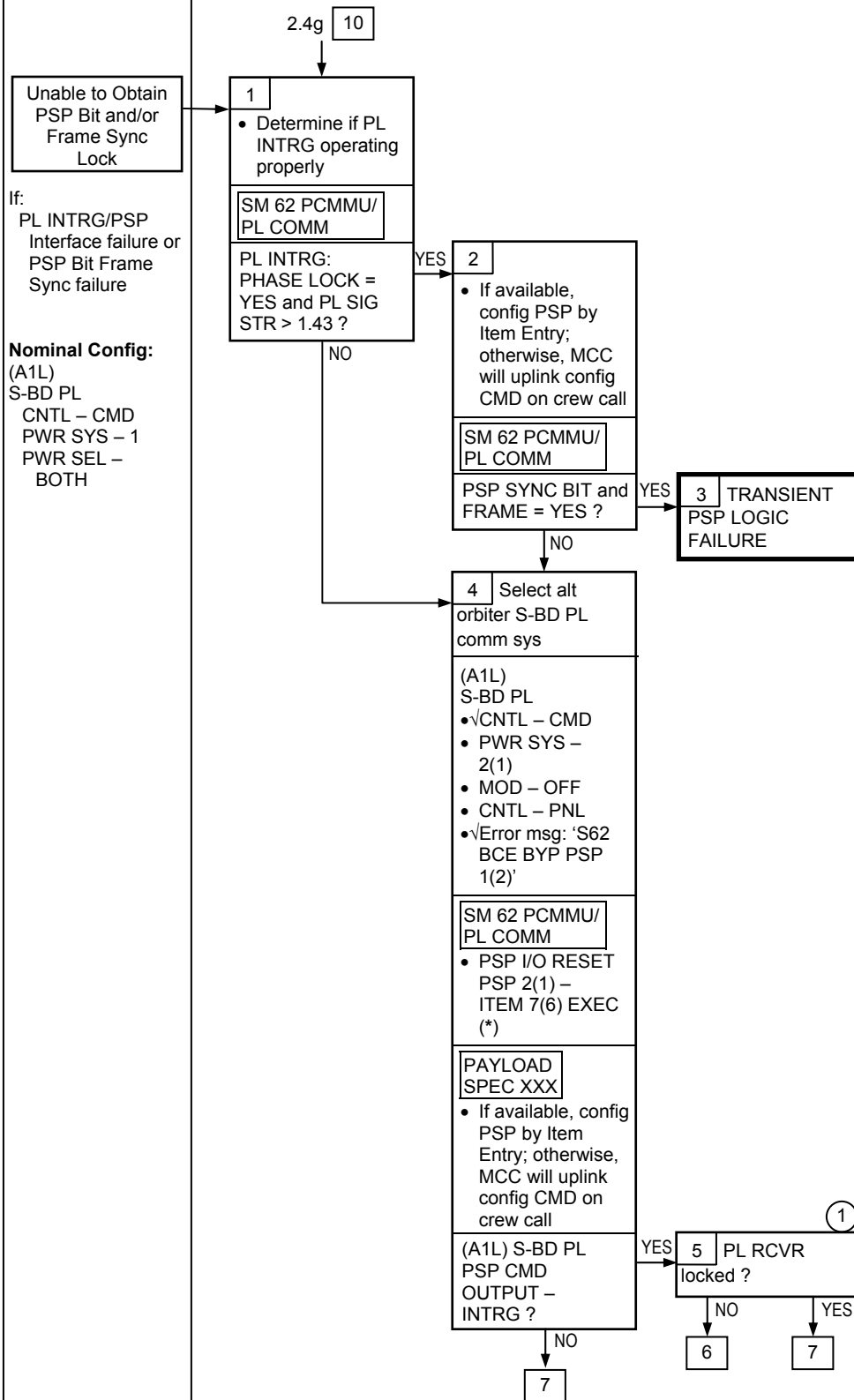
COMM

- 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

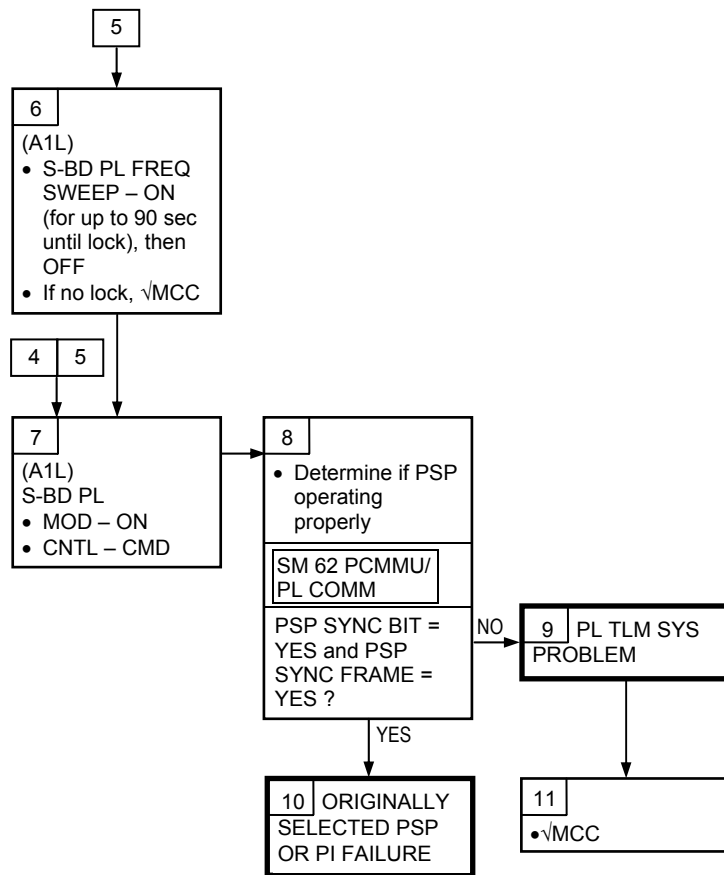
PSP BIT

2.5

COMM

2.5a PSP BIT AND/OR
FRAME SYNC LOCK FAIL

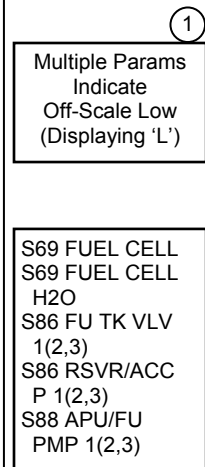
① PL RCVR lock
indications vary with
flight



COMM

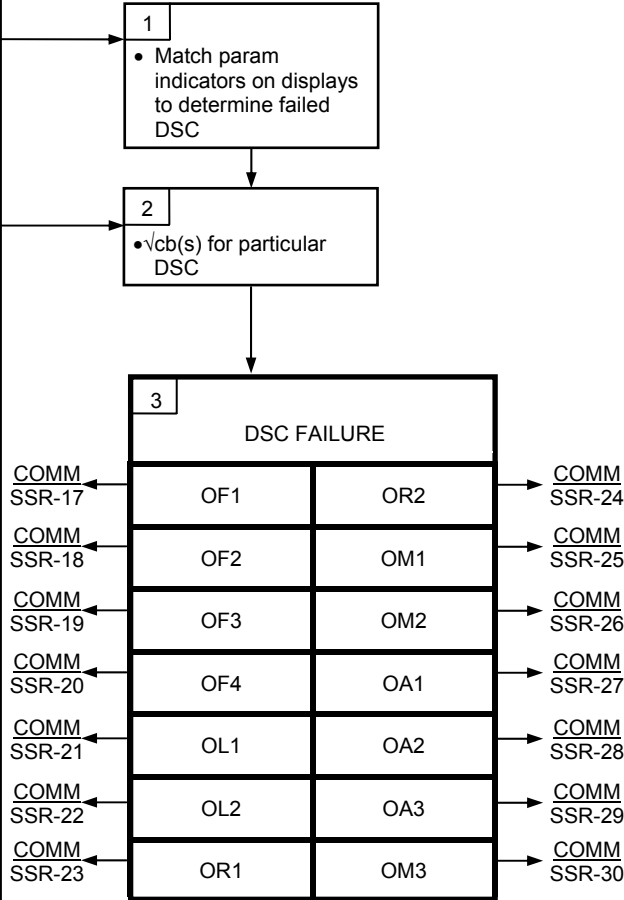
2.6a OI DSC LOSS

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



Simultaneous occurrence of these fault msgs indicates DSC OM3 problem

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



XXXX / XXX / 078				SM	SYS	SUMM	1	XX	X	DDD / HH : MM : SS
										DDD / HH : MM : SS
SMOKE	1 / A	2 / B		DC	VOLTS	1 / A	2 / B	3 / C		
CABIN	OF1			FC		OM1	OM2	OM2		
L / R FD	OF3	OF2		MAIN		OM2	OM2	OM1		
AV BAY	1 OF2	OF3		ESS		OM2	OM2	OM1		
	2 OF1	OF3								
	3 OF1	OF2		CNTL	1	X OF1	X OF2	X OF3	X	
CABIN					2	X OF1	X OF2	X OF3	X	
PRESS	OF2				3	X OF1	X OF2	X OF3	X	
dP / dT - EQ	OF3	± X . XXXS	A C							
O2 CONC	XXX . XS			VOLT	ΦA	OF1	OF2	OF3		
PPO2	OF1	OF2			ΦB	OF1	OF2	OF3		
FAN ΔP	OF1				ΦC	OF1	OF2	OF3		
HX OUT T	OF1			AMPS	ΦA	XX . XS	XX . XS	XX . XS		
O2 FLOW	OF1	OF2			ΦB	XX . XS	XX . XS	XX . XS		
N2 FLOW	OF1	OF2			ΦC	XX . XS	XX . XS	XX . XS		
IMU FAN	AXS	BXS	CXS	FUEL CELL						
ΔV	FC1	FC2	FC3	AMPS		OM1	OM1	OM1		
SS1	XXXS	XXXS	XXXS	REAC VLV		XXS	XXS	XXS		
SS2	XXXS	XXXS	XXXS	STACK T		OM1	OM2	OM2		
SS3	XXXS	XXXS	XXXS	EXIT T		OM1	OM2	OM2		
TOTAL AMPS	XXXXS			COOL P		OM1	OM2	OM2		
	KW	XXS		PUMP		XXS	XXS	XXS		
										(XX)

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	XXXXS	XXXXS	XXXXS	XXXXS	XXXXS
O2	PRESS	XXXXXS	XXXXXS	XXXXXS	XXXXXS	XXXXXS
HTR	T1	OM1	OM1	OM1	OM2	OF2
	T2	OM2	OM2	OF3	OF3	OF3

APU	1	2	3	HYD	1	2	3
TEMP EGT	OA1	OA2	OA3	PRESS	OA2	OA1	OA3
B / U EGT	OA2	OA3	OA1	RSVR T	OA1	OA2	OA3
OIL IN	OA1	OA2	OA3	P	OA1	OA2	OA3
OUT	OA2	OA3	OA1	QTY	OA1	OA2	OA3
SPEED %	OA1	OA2	OA3	W / B			
FUEL QTY	XXXXS	XXXXS	XXXXS	H2O QTY	XXXXS	XXXXS	XXXXS
PMP LK P	OM3	OM3	OM3	BYP VLV	XXXXS	XXXXS	XXXXS
OIL OUT P	OA1	OA2	OA3				
AV BAY				THERM CNTL	1	2	
TEMP	OF2	OF3	OF1	H2O PUMP P	OF2	OF3	
FAN ΔP	X . XXS	X . XXS	X . XXS	FREON FLOW	OF2	OF3	
				EVAP OUT T	OA2	OA3	

(XX)

XXXX / XXX / 089 PRPLT THERMAL XX X DDD / HH : MM : SS
DDD / HH : MM : SS

POD	L	R				
OMS TK	OX	OL2	OR2	OMS CRSFD	L	R
	FU	OL1	OR1	XFD	OX	OA1
ENG I / F	OX	OL1	OR1		GMBL	LN
	FU	OL2	OR2		OA1	OA2
	OX	VLV	OL1	DRN	OX	OA3
	FU	INJ	OL1		OA3	OA3

WEB KEEL	1	OL2	OR2
	2	OL2	OR2
Y	OB	OL2	OR2
	UP	OL1	OR1
OX DRN PL	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

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

L12
A1U

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
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
R O W	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
MNV(R) (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 >>

COMM SSR

COMM SSR-1 (Cont)

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 $H_p \geq 120$ nmi
2. Deorbit within next 9 hr if $105 \leq H_p < 120$ 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	NOTES
	If on PCS SYS 1: • Perform RECONFIG TO ALT PCS SYS, <u>ECLS</u> SSR-3	Most PCS 1 measurements	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 ⑩ Freon Loop 2 Automatic Radiator Isolation capability is lost ⑪ Call MCC for MMU 1 action. If MMU 1 off, ITEM 4 EXEC
	(L1) • AV BAY 3 FAN B – OFF • A – ON	Av Bay 3 Fan ΔP Temp (MCC has limited insight) 1 Hum Sep A,B (two) Speed Snr Waste Qty 1	
	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	IMU Fan ΔP A Speed Snr Cab Fan ΔP	
	• Maintain LiOH Canister(s) changeout schedule per cue card and FLIGHT PLAN	PPCO2 (MCC cannot assess)	
		FC 1 pH Snr	
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 <u>ECLS</u> 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	
		5 Smoke Det A Concn Av Bay 2 5 A Concn Av Bay 3 5 Concn Cabin	
		6 HYD sys temps	
	(ML86B:C) • cb MNA,MNB EXT ARLK HTR STRUC (two) – cl • cb MNA, MNB EXT ARLK HTR LINE ZN 1,2 (four) – cl	External Airlock LCG EV 1 Supply Line press 7 External Airlock Fwd and Aft Truss Flange temps 8 External Airlock H2O Line Zone 1 Htr A temp External Airlock H2O Line Zone 2 Htr B temp 9 External Airlock H2O Shutoff Vlv position	
11	(O15:F) • MMU 2 – ON	10 Freon Loop 2 Accum Qty	

COMM SSR-11 **OI MDM LOST: OF2**

ACTIONS	MEASUREMENT LOSS	NOTES
If on PCS SYS 2: • Perform RECONFIG TO ALT PCS SYS, <u>ECLS</u> SSR-3	Most PCS Sys 2 measurements	① Use interchanger flow to monitor H2O Loop 1 performance if reqd
(L1) • AV BAY 1 FAN B – OFF • A – ON • √H2O PUMP LOOP 2 – ON • H2O PUMP LOOP 1 – OFF	Av Bay 1 Fan ΔP Temp (MCC has limited insight) 1 Most H2O Loop 1 measurements	② Crossover vlv needs to be checked and TKC unisolated to equalize tks to provide leak protection
• Do not don Biomed Electrodes	ECG 1,2 Telemetry	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
(R11L) 2 • √PLY H2O TKC INLET, OUTLET (two) – OP (tb-OP)	Sply H2O Qty B Qty D	④ This action activates dual htrs on Supply H2O Dump Line, Waste H2O Dump Line, Vacuum Vent Line
(R1) 3 • MN BUS TIE C,A (two) – ON (tb-ON)	FC3 SS1 ΔV SS2 ΔV SS3 ΔV	⑤ Smoke det H/W Alarm still available
SM 66 ENVIRONMENT • Monitor AIRLK P and dP/dT for cabin integrity on-orbit	Cabin Press Snsr	⑥ Zone 1 temps verify proper switch config
	N2 Qty 2	⑦ Vestibule Temp 2 available
	FC2 pH Snsr	⑧ Structural temps verify proper switch config
(ML86B:A) 4 • cb MNA,MNB H2O LINE HTR A, HTR B (two) – cl	Sply H2O Dump Line T	⑨ Vlv's still operational. Alternate vlv's available
	5 Smoke Det A Conc'n Av Bay 1 5 Smoke Det B Conc'n Av Bay 3 5 Smoke Det Conc'n Right Flt Deck	⑩ Freon Loop 1 Automatic Radiator Isolation capability is lost
	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	
	10 Freon Loop 1 Accum Qty	

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 ΔP Temp (MCC has limited insight)	
• 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	
(R13U) • C/W PARAM SEL tw (three) – 105 2 • 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 3 • 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, <u>EPS</u>) (Cue Card) (Assume SM 2 not available when using Cue Card)		4 FC Purge Line temps FC3 pH Snr	
SM 60 SM TABLE MAINT 5 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, <u>ECLS</u> SSR-5, using PRI B		Most FES Feedline B Htr measurements	
SM ANTENNA 6 If TDRS: 7 • 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	NOTES
• Terminate all SUPPLY H2O Dump operations through dump nozzle • If Supply H2O Dump reqd, perform SUPPLY WATER DUMP USING FES (ORB OPS, ECLS) • Terminate all WASTE H2O Dump operations through dump nozzle	Supply H2O Noz T A,B (two)	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
(R11L) 9 • SUPPLY H2O TKC INLET, OUTLET (two) – OP (tb-OP)	Waste H2O Noz T A,B (two)	
	Supply H2O Qty C	
	10 Smoke Det B Concn Av Bay 1 10 Bay 2 10 Smoke Det Concn Left Flt Deck	
	11 FC 1,2,3 Amps	
(ML86B:C) • cb MNA,MNB EXT ARLK HTR VEST (two) – cl • cb MNA,MNB EXT ARLK HTR STRUC (two) – cl • cb MNA,MNB EXT ARLK HTR LINE ZN 1,2 (four) – cl	12 External Airlock H2O Line Zone 2 MNA,B,C Htr ON status 13 External Airlock Vestibule MNA,B Htr ON status 14 Vestibule Temp 2 15 External Airlock Lower Bulkhead temp External Airlock H2O Line Zone 1 and 2 LCG 2 temp External Airlock Line Zone 2 Temp A O2 Sply 16 Vestibule Isolation Vlv 2 op/cl positions	

COMM SSR-13 **OI MDM LOST: OF4**

ACTIONS	MEASUREMENT LOSS	NOTES
When reqd: Perform FUEL CELL PURGE – MANUAL (ORB OPS, <u>EPS</u>) (Cue Card) (Assume SM 2 not available when using Cue Card)	FC Auto Purge Start discretes	① No SM alerts for CCTV overtemp
During CCTV Camr ops, monitor CCTV Camr temps on Monitor	1 CCTV Camr overtemp discrete	② Xdcrs on disp SM 87 HYD THERM will show 'M' for some parameters
Perform CIRC PUMP XDCR FAILURE WORKAROUND, <u>APU/HYD SSR-3</u>, for 'M' Xdcrs on display SM 87 HYD THERMAL	2 HYD sys temps	③ Inhibits FES High Load duct alerts. Pre-condition steering could cause nuisance alarms unless params are inhibited
If Topping Evap enabled: (L1) TOP EVAP HTR DUCT – A/B	Fwd,Aft Topping Duct Htr measurements	④ May get Antenna alerts when manually operating (C3) S-BD PM ANT sw (loss of position discrete to SM)
If High Load Evap enabled: (L1) HI LOAD DUCT HTR – A/B	Hi Load Outbd Duct Htr measurements	⑤ 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
3 If High Load Evap <u>not</u> enabled: SM 60 SM TABLE MAINT - ITEM 1 +0 6 3 1 8 2 0 - ITEM 10 EXEC - ITEM 1 +0 6 3 1 8 2 1 - ITEM 10 EXEC - ITEM 1 +0 6 3 1 8 9 0 - ITEM 10 EXEC		⑥ Vlv still operational. Alternate vlvs available
	4 S-BD Quad Ant Sel 1/2 – GPC	⑦ Freon Loop 1,2 Automatic Radiator Isolation capability is lost
(A12) APU HTR TK/FU LINE/H2O/SYS 1A,1B, 3A,3B (four) – AUTO	APU H2O sys temps (Htr mon)	
(R1) 5 • MN BUS TIE A,B (two) – ON (tb-ON)	FC1 SS1 ΔV SS2 ΔV SS3 ΔV	
	6 Vestibule Vlv 2 op/cl position	
(L2) FREON LOOP ISOL MODE – OFF	7 Radiator Isolation Auto Mode indication	

COMM SSR-14
OI MDM LOST: OA1

ACTIONS	MEASUREMENT LOSS	NOTES
• Perform CIRC PUMP PRESS XDCR FAILURE WORKAROUND, <u>APU/HYD</u> SSR-1 for Circ Pump 1 • Perform SIMULTANEOUS CIRC PUMP ON/GPC OPS, <u>APU/HYD</u> SSR-2 for Circ Pump 1	HYD sys 1 Circ Pump pressure	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, <u>APU/HYD</u> 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 (MDU and CRT)	
If High Load Evap Enabled: (L1)	Hi Load Inbd Duct Htr measurement	
• HI LOAD DUCT HTR – A/B		
(A14)	Partial insight into OMS CRSFD Line Htr ops	
• RCS/OMS HTR OMS CRSFD LINES (two) – AUTO		
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, <u>EPS</u>) (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 PRESS XDCR FAILURE WORKAROUND, <u>APU/HYD</u> SSR-1 for Circ Pump 2 - Perform SIMULTANEOUS CIRC PUMP ON/GPC OPS, <u>APU/HYD</u> SSR-2 for Circ Pump 2	HYD sys 2 Circ Pump pressure	
Perform CIRC PUMP XDCR FAILURE WORKAROUND, <u>APU/HYD</u> 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 (MDU 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 PRESS XDCR FAILURE WORKAROUND, <u>APU/HYD</u> SSR-1 for Circ Pump 3 • Perform SIMULTANEOUS CIRC PUMP ON/GPC OPS, <u>APU/HYD</u> SSR-2 for Circ Pump 3	HYD sys 3 Circ Pump pressure	
• Perform CIRC PUMP XDCR FAILURE WORKAROUND, <u>APU/HYD</u> 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 (MDU 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, <u>ECLS</u> SSR-3	Most PCS 1 measurements	① Turn on both Cabin Fans for sleep
(L1) • Monitor Cabin Fan by feel • During sleep periods: CAB FAN A,B (two) – ON	Cab Fan ΔP	② C/W channels 14,34,54,104,114 also lost but high limit-sensed only
(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	③ WST TK will be dumped by time (≈2%/min) to provide ullage to make EOM. MCC will provide the time
(R14:C) • cb MNB KU ANT HTR – op	Ku Gyro temp monitoring	④ This action activates redundant htrs on Supply H2O Dump Line, Waste H2O Dump Line, and Vacuum Vent Line
•√MCC about performing WASTE H2O DUMP	Waste Qty 1	⑤ Smoke Det H/W Alarm still available
(ML86B:A) • cb MNA,MNB H2O LINE HTR A,HTR B (two) – cl	Waste H2O Dump Line T	⑥ Both htrs activated since visibility into temps lost
	Sply H2O Qty A	⑦ Alternate temps available in each zone
	5 Smoke Det A Concn Av Bay 2 5 A Concn Av Bay 3 5 Concn Cabin	⑧ Use pnl F9 Meter for insight to AC volts
(ML86B:C) • cb MNA,MNB EXT ARLK HTR STRUC (two) – cl	6 If no internal airlock: 7 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	
	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)					
2	GNC SYS SUMM 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, <u>ECLS</u> SSR-3		Most PCS 2 measurements			
2	(R13U) 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		
		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 ③ Fwd RCS PASS Fu qty degraded, BFS Fu qty lost
	2 Smoke Det B Concn Av Bay 1 2 Bay 2 2 Smoke Det Concn Left Flt Deck	④ Both htrs activated since visibility into temps lost
	3 Fwd RCS Fu Tk T	⑤ Crossover vlv needs to be checked and TKC unisolated to equalize tks to provide leak protection
(ML86B:C) • cb MNA,MNB EXT ARLK HTR STRUC (two) – cl	4 If no internal airlock: External Airlock Lower Bulkhead temp External Airlock H2O Line Zone 1,2 LCG 2 temp External Airlock H2O Line Zone 2 QD Pnl temp	⑥ Use pnl F9 Meter for insight to AC volts ⑦ Use pnl A1U for S-Band PM Signal Strength
5 (R11L) • √SPLY H2O TKC INLET, OUTLET (two) – OP (tb-OP)	Sply H2O Qty C	
	6 AC3 volts	
	7 Pnl F9 S-Band Signal Strength	

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 - 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	
	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 • Perform LOSS OF VERNIER RCS (ORB OPS, RCS)	Jet Injector temps (Jet leak RM detection)	
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 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 (OMS/MPS) L OMS N2 TK P, L OMS Pc are 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 • 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 '↓'	2 Left RCS TK and Manf Press and Qty (leak detection lost)	
(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 PC	
	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 Override Manf vlv status to CL for R1,2 Manifolds: 1 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 (O3) R RCS OXID He TK P, R RCS OXID PRPLT TK P, R OMS FUEL TK P and ([OMS/MPS]) R OMS He P are lost. (O3) R RCS OXID PRPLT QTY ind on meter is invalid ③ Auto overpressure protection lost for R RCS Oxidizer Dual Reg failure ④ Loss of fuel injector temp is no-go for noncritical on-orbit burns. Engine will be used for deorbit
(O7) • AFT R RCS MANF ISOL 5 – CL (tb-CL), then GPC • Perform LOSS OF VERNIER (ORB OPS, RCS)	Jet Injection temps (Jet leak RM detection)	
GNC SYS SUMM 2 2 • 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) 2 • 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	
4 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 ([OMS/MPS]) R OMS N2 TK P, R OMS PC are 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 • 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 '↓'	2 Right RCS Tank and Manf Press and Qty (leak detection lost)	
(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 PC	
	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	NOTES
When reqd: • Perform FUEL CELL PURGE – MANUAL (ORB OPS, <u>EPS</u>) (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	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
(R13U) 2 • 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	FC1 Stack temp MNC volts	
• Perform CIRC PUMP XDCR FAILURE WORKAROUND, <u>APU/HYD</u> SSR-3 for 'L' xdcrs on display SM 87 HYD THERMAL	HYD sys temps	
If FLASH EVAP CNTLR PRI B enabled: • Perform FES RESTART, <u>ECLS</u> SSR-5, using PRI A	Most FES Feedline A Htr measurements	
• Perform ECLS COMPUTATION INHIBIT, <u>ECLS</u> 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 ESS 3AB volts 4 FC1 volts 4 FC 1,2,3 AMPS	

COMM SSR-26
OI DSC LOST: OM2

ACTIONS		MEASUREMENT LOSS		NOTES
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	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 Use pnl F9 Meter for insight to ESS and FC volts
	• Perform CIRC PUMP XDCR FAILURE WORKAROUND, <u>APU/HYD</u> SSR-3 for 'L' xdcrs on display SM 87 HYD THERMAL	2	HYD sys temps HYD sys 2,3 Accumulator pressures	
	If FLASH EVAP CNTLR PRI A enabled: • Perform FES RESTART, <u>ECLS</u> 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, <u>ECLS</u> 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 LN/H2O SYS 1A,1B,3A,3B (four) – AUTO		APU H2O sys htr monitoring temps	
	(ML86B:C) If Rendezvous or Docked • cb MNA,MNB EXT ARLK HTR VEST Z1/2/3 (two) – cl		External Airlock H2O Transfer Line press Vestibule Temps 1,2	
		4	FC 2,3 volts	
		4	ESS 1BC, 2CA 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 C/W param 109 is also lost, but is inhibited during post insertion
Perform CIRC PUMP XDCR FAILURE WORKAROUND, <u>APU/HYD</u> SSR-3 for 'L' xdcrs on display SM 87 HYD THERMAL	HYD sys temps	
Perform CIRC PUMP PRESS XDCR FAILURE WORKAROUND, <u>APU/HYD</u> SSR-1 for Circ Pump 1	HYD Circ Pump 1 pressure	
	APU 1 Fuel Qty (MDU and CRT)	
(R13U) 1 - 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) – > 119	MPS He Tk P C MPS He REG P C	
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; C/W param 99 is also lost, but is inhibited during post insertion
When reqd: Perform FUEL CELL PURGE – MANUAL (ORB OPS, <u>EPS</u>) (Cue Card) (Assume SM 2 not available when using Cue Card)	1 FC Purge H2 Vent Line temp 1	
Perform CIRC PUMP XDCR FAILURE WORKAROUND, <u>APU/HYD</u> SSR-3, for 'L' xdcrs on display SM 87 HYD THERMAL	HYD sys temps	
Perform CIRC PUMP PRESS XDCR FAILURE WORKAROUND, <u>APU/HYD</u> SSR-1 for Circ Pump 2	HYD Circ Pump 2 pressure	
- Perform APU FUEL TANK P XDUCER FAILURE WORKAROUND, <u>APU/HYD</u> SSR-4 for APU 2 - Perform APU FUEL TANK T XDUCER FAILURE WORKAROUND, <u>APU/HYD</u> SSR-6 for APU 2	APU 2 FUEL TK P	
	APU 2 FUEL T TK SURF	
(R13U) 2 - 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) – > 119	EVAP OUT T 1	
	MPS He Tk P L	
	MPS He REG P L	
(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, <u>RCS</u>)		

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; C/W param 119 is also lost, but is inhibited during post insertion ② Recoverable by TMBU
• Perform CIRC PUMP PRESS XDCR FAILURE WORKAROUND, <u>APU/HYD</u> SSR-1 for Circ Pump 3	HYD Circ Pump 3 pressure	
1 (R13U) • 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	
	HYD sys temps	
	APU 3 FUEL TK P	
• Perform APU FUEL TANK P XDUCER FAILURE WORKAROUND, <u>APU/HYD</u> SSR-4 for APU 3	APU 3 FUEL T TK SURF	
• Perform APU FUEL TANK T XDUCER FAILURE WORKAROUND, <u>APU/HYD</u> SSR-6 for APU 3		
• Go to ECLS COMPUTATION INHIBIT, <u>ECLS</u> 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
Perform CIRC PUMP XDCR FAILURE WORKAROUND, <u>APUY/HYD</u> SSR-3 for ACCUM P 1 xdcr	1 HYD sys 1 Accumulator pressure	① GPC capability to monitor HYD Accumulator pressure lost for system 1. HYD Reservoir pressure monitoring remains

RESERVED
SECTION

3 RESERVED

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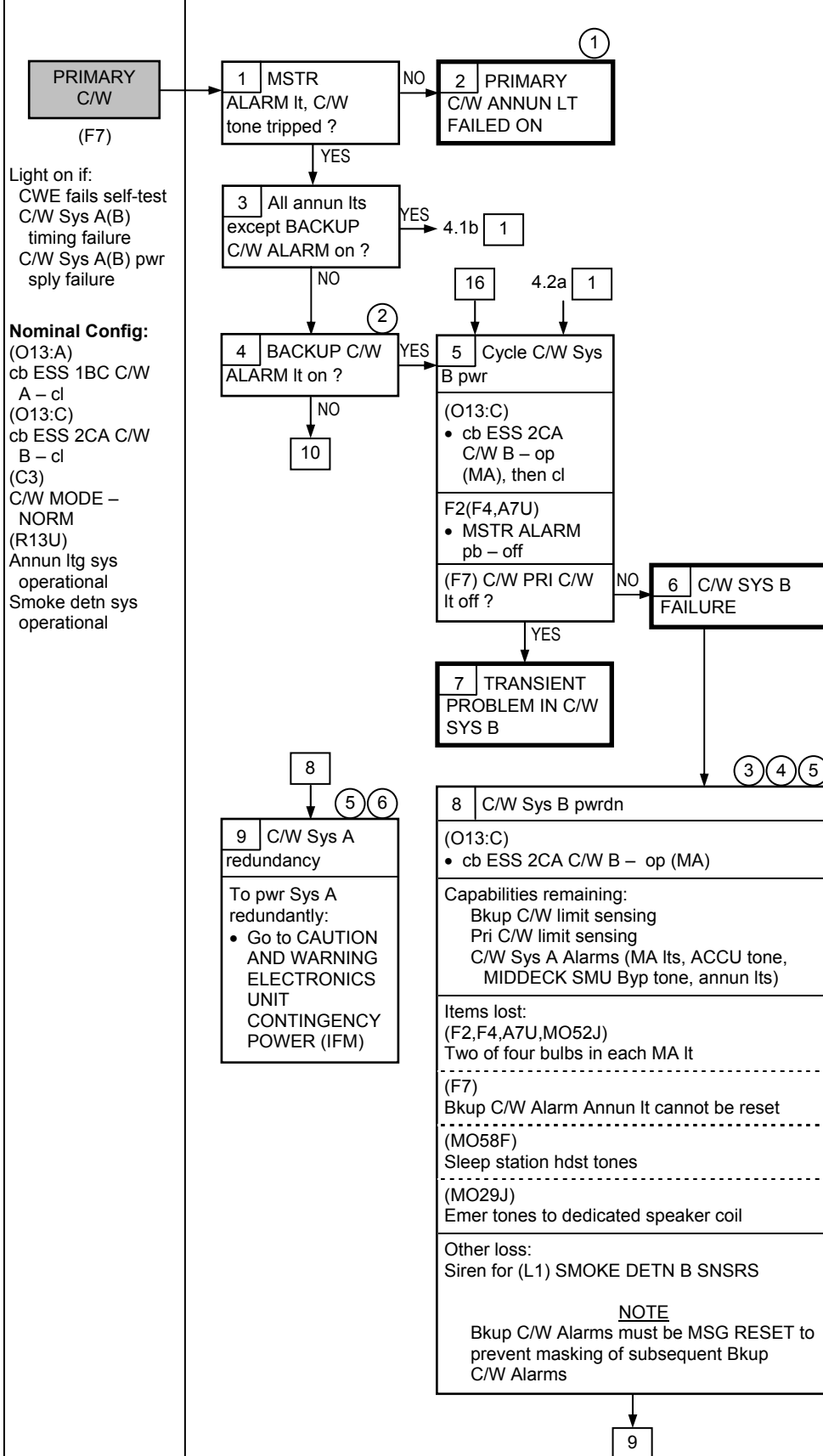
C/W

<u>4.1</u>	<u>PRIMARY C/W</u>	
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
<u>4.2</u>	<u>OTHER C/W</u>	
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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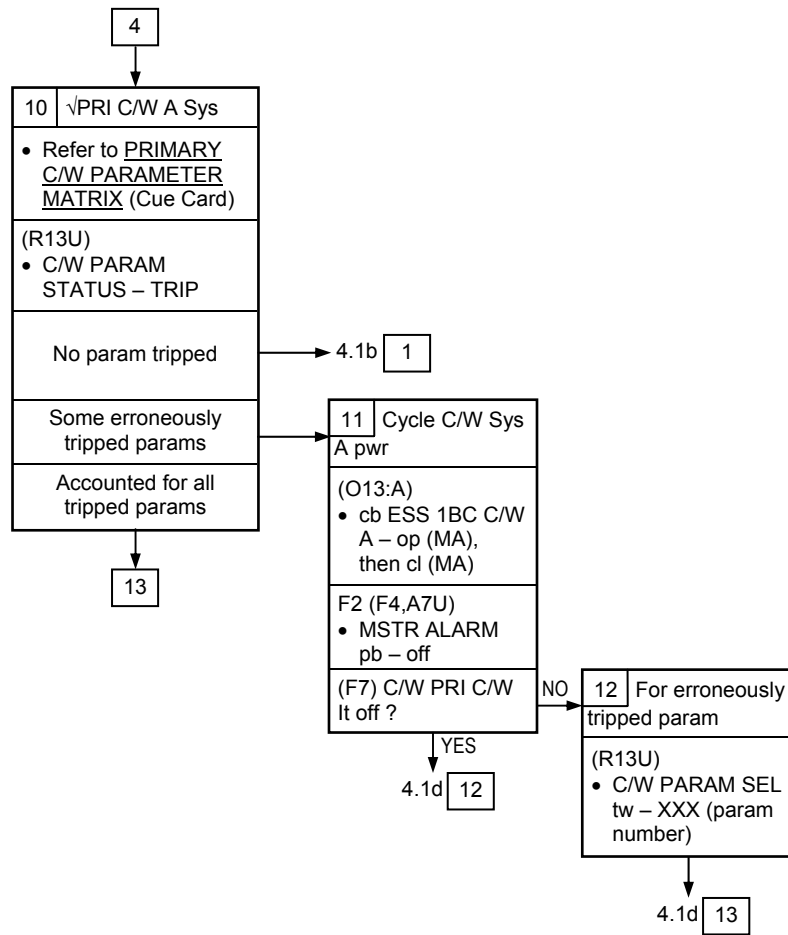
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4.1a PRIMARY C/W

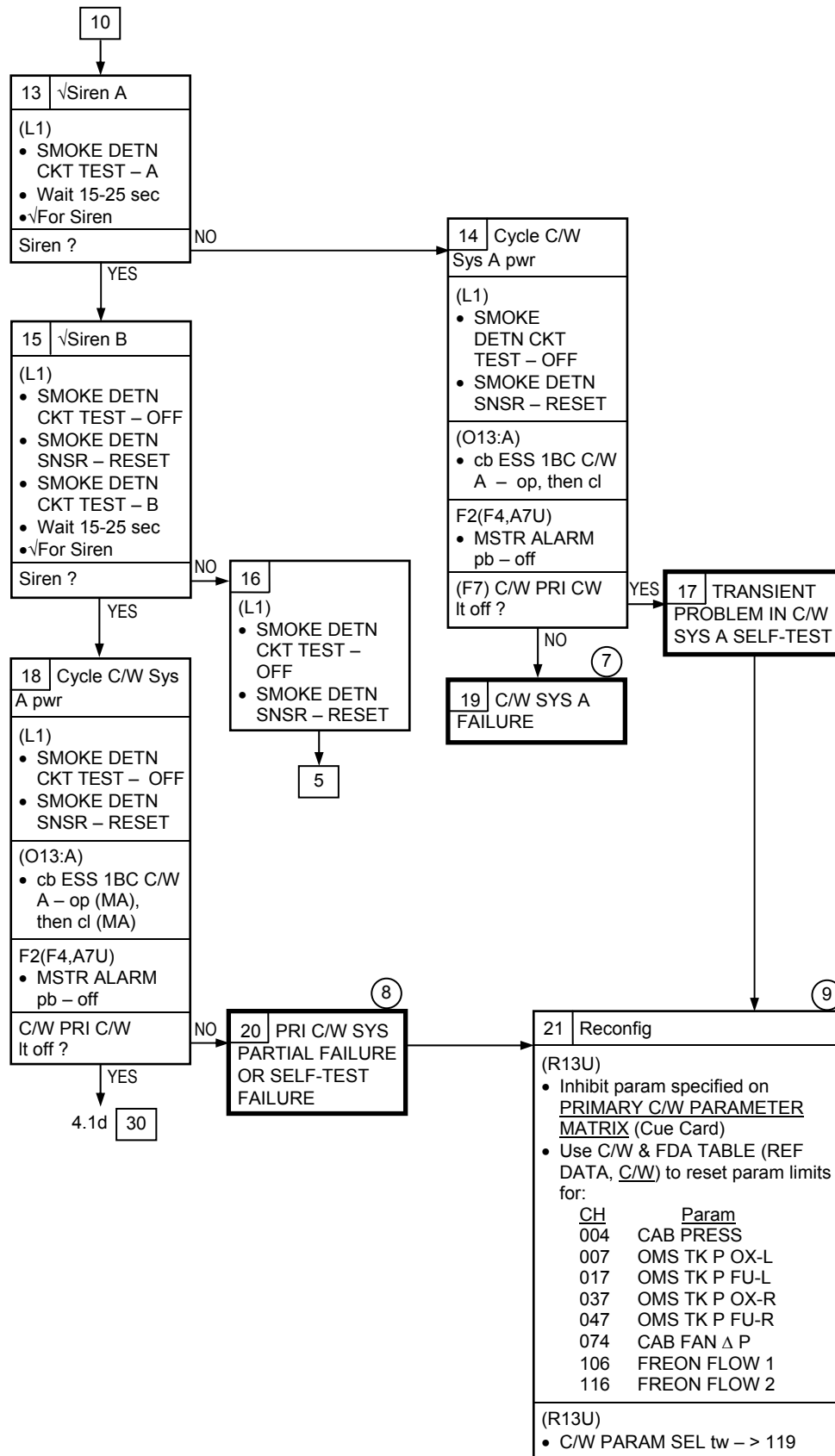


- ① To extinguish PRIMARY C/W It, remove bulbs or select (C3) C/W MODE – ACK
- ② BACKUP C/W ALARM It is not accompanied by fault msg and cannot be MSG RESET
- ③ All four bulbs in each MA It will illuminate during lamp test
- ④ To extinguish (F7) PRIMARY C/W and BACKUP C/W ALARM Its, remove bulbs or select (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

C/W 4.1a (Cont)



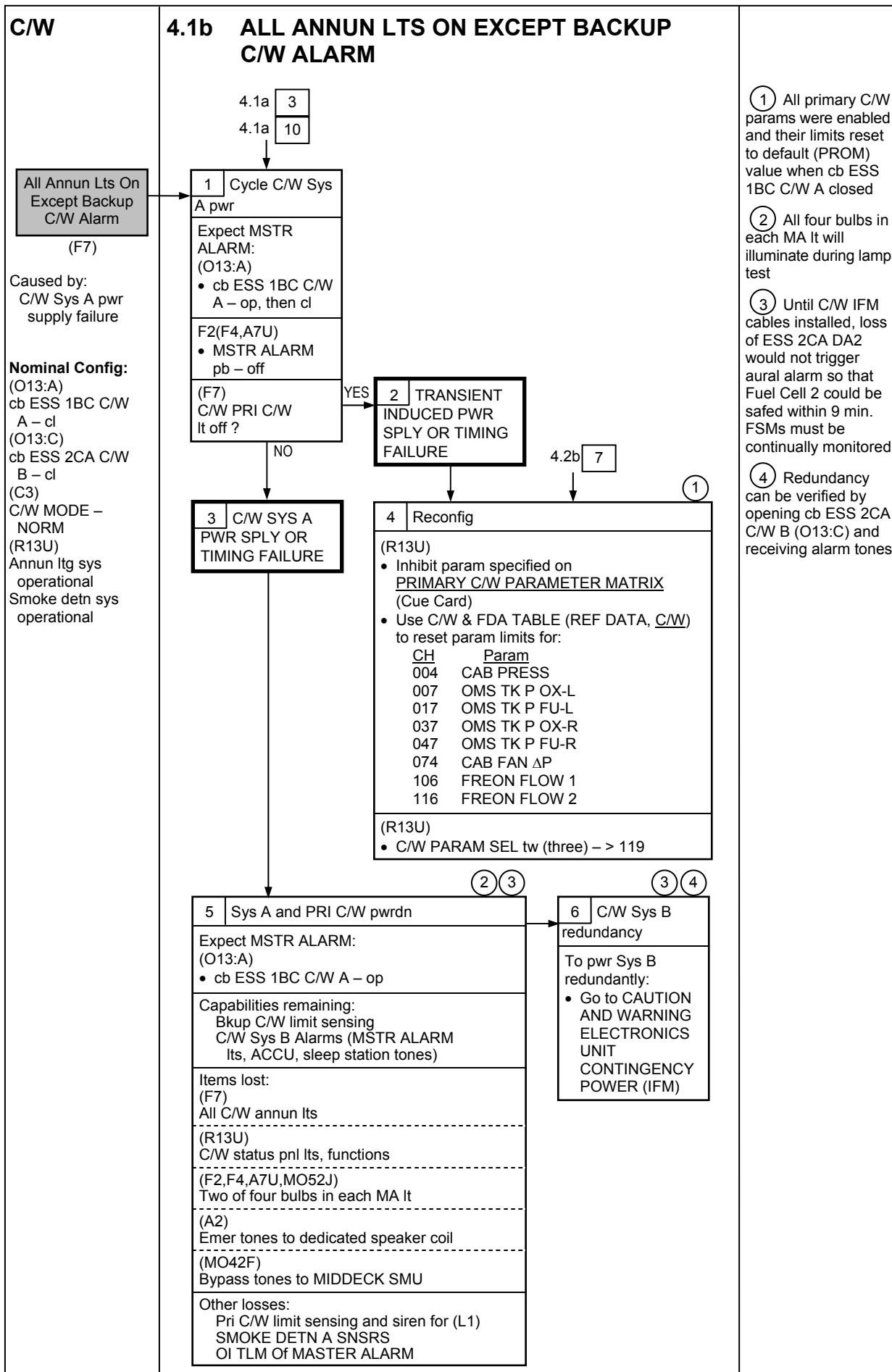
C/W 4.1a (Cont)



⑦ For any nuisance alarms that cannot be inhibited, use 4.1b **5** to pwrn 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



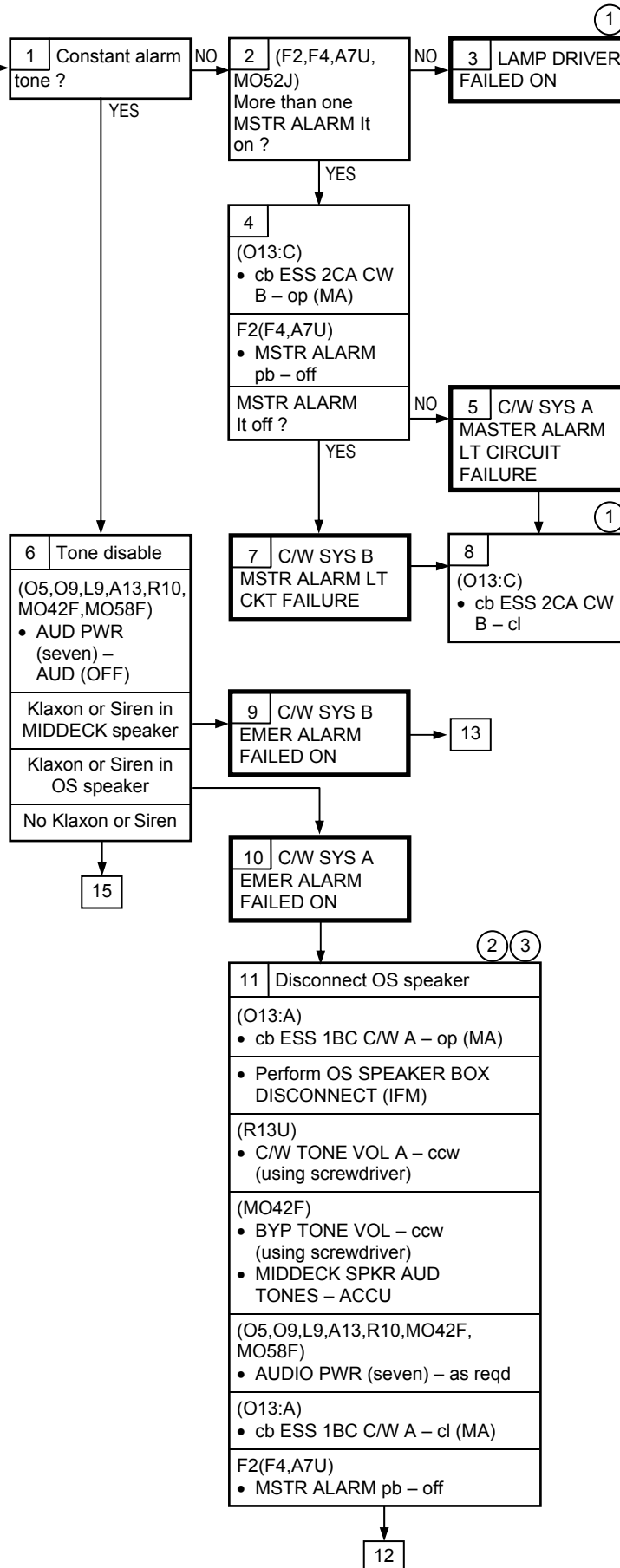
C/W

4.1c NONRESETTABLE MA LT OR TONE

(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 ltrg sys operational
Smoke detn sys operational



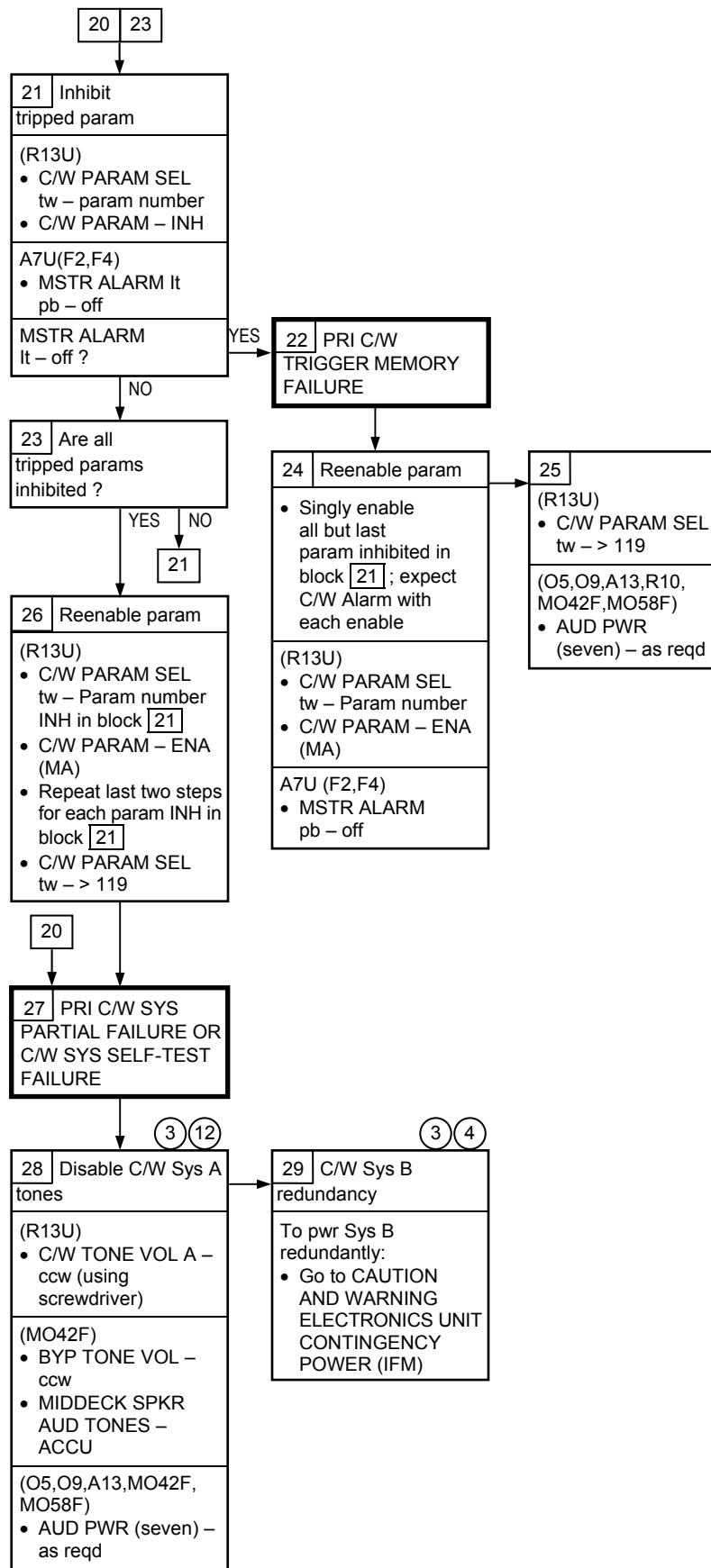
① Illuminated MA It bulbs are mounted in sealed assy

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

MAL/ALL/GEN J

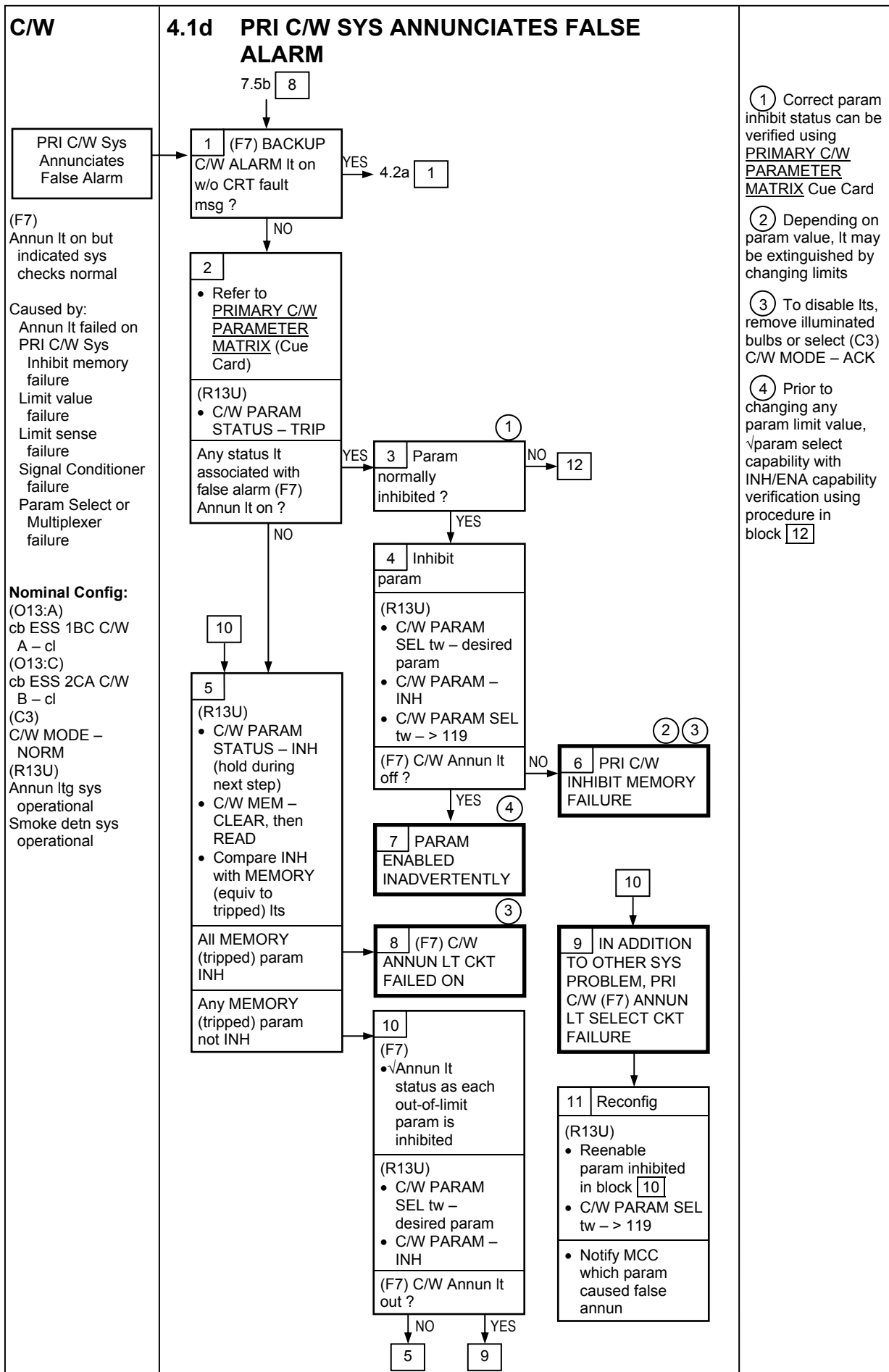
C/W 4.1c (Cont)

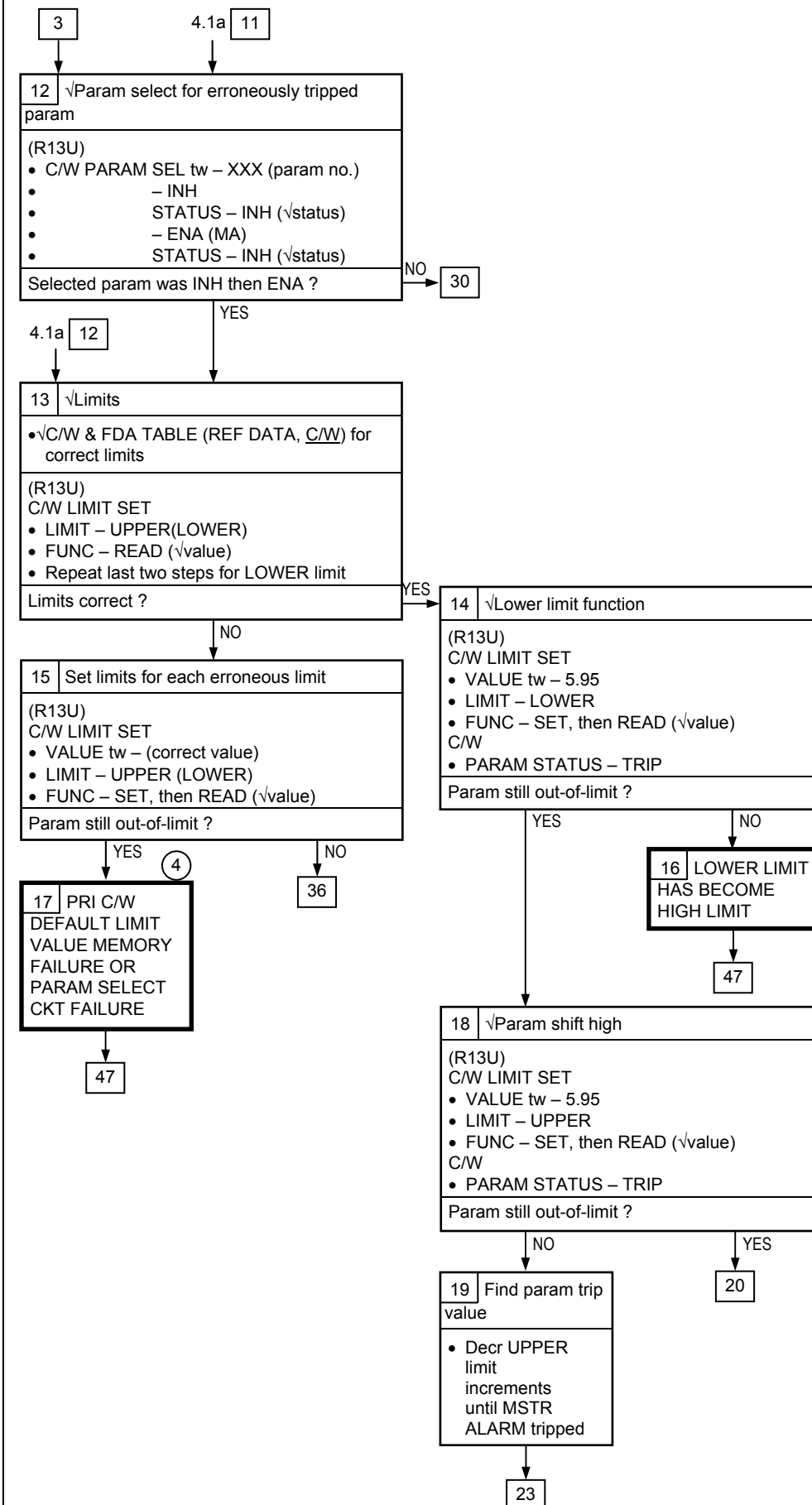


③ Until C/W IFM cables installed, loss of ESS 2CA DA2 would not trigger aural alarm so that Fuel Cell 2 could be safed within 9 min. FSMs must be continually monitored

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

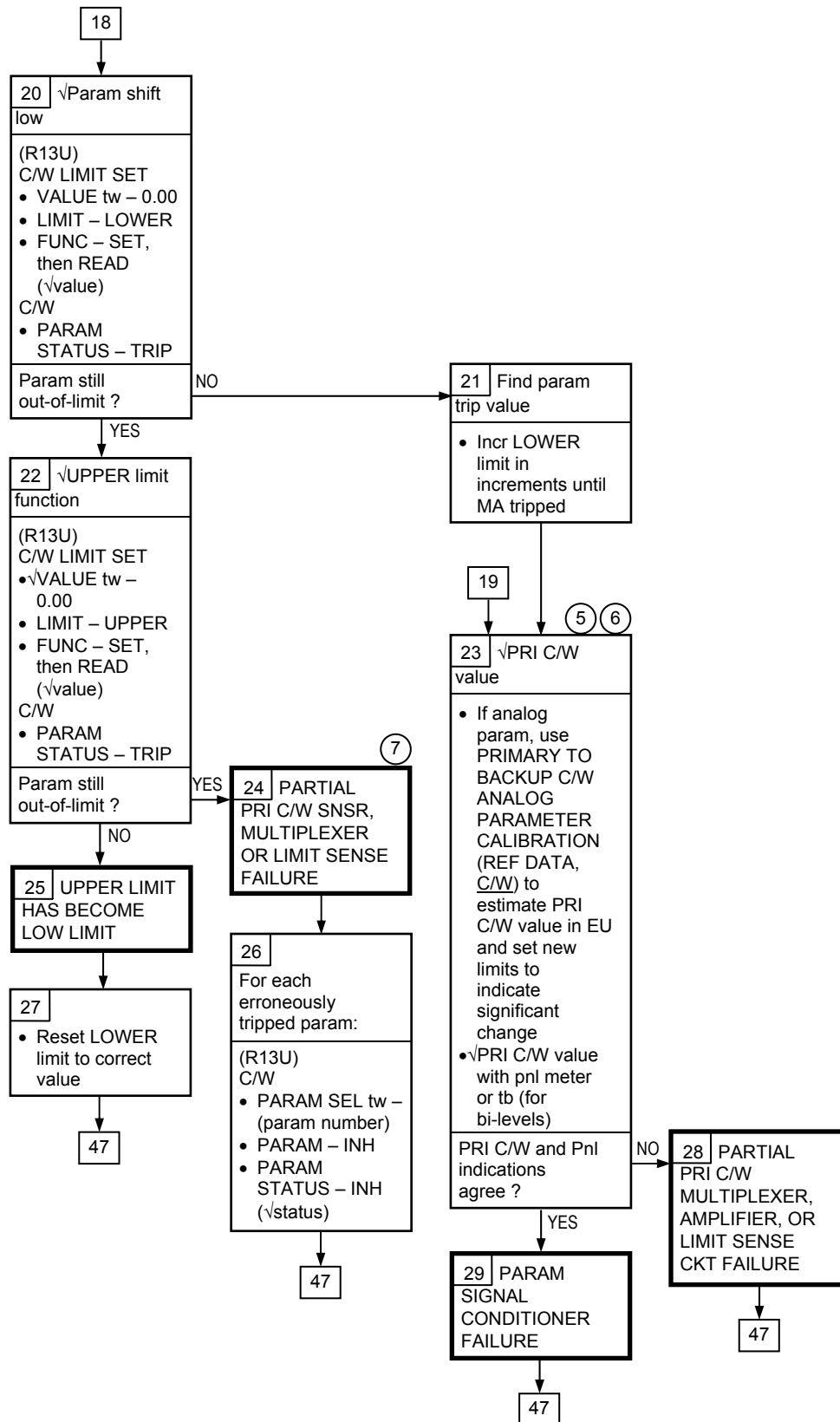
⑫ Should still have PRI C/W limit sensing with (F7) Annun Its and emer tone alarms via OS speaker



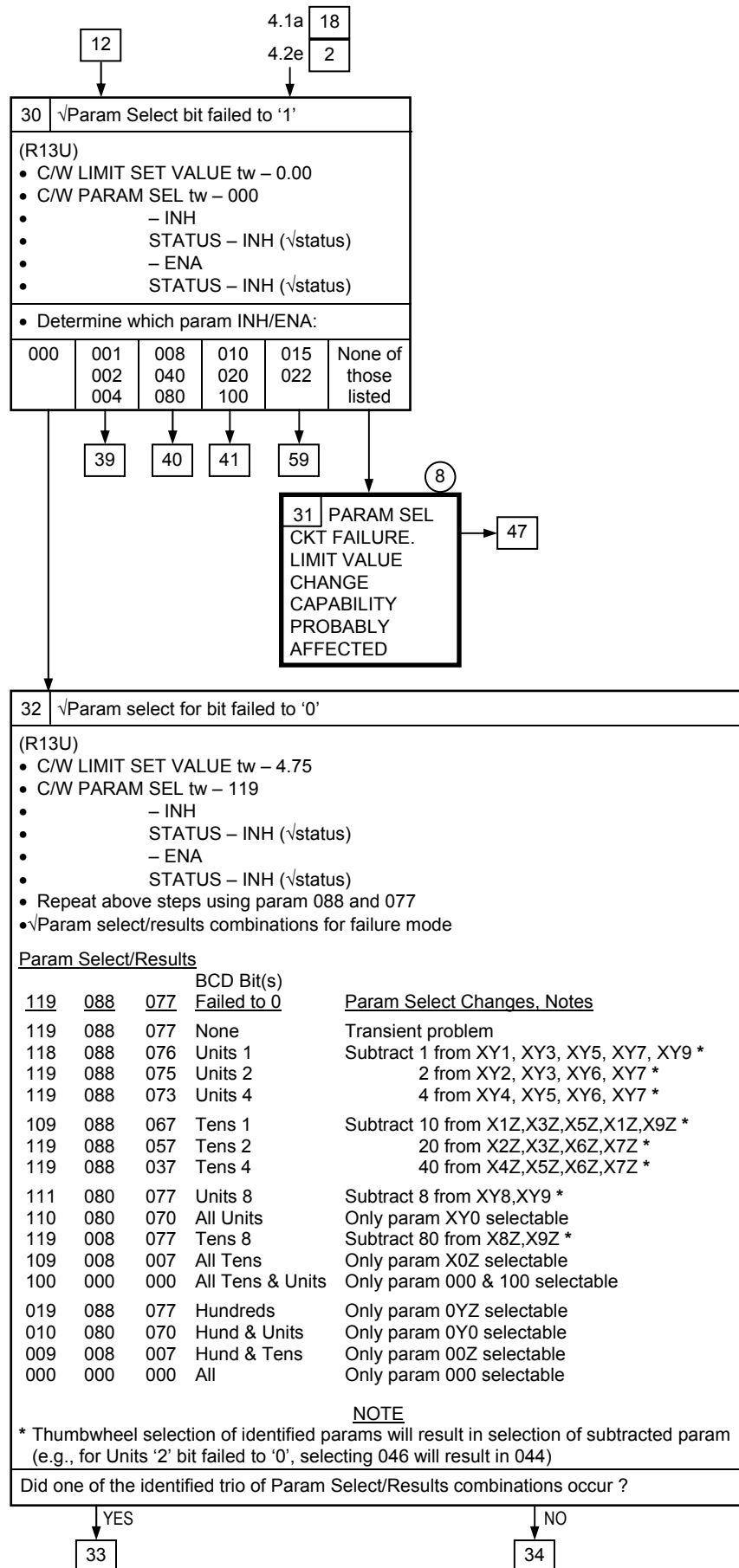
C/W**4.1d (Cont)**

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)

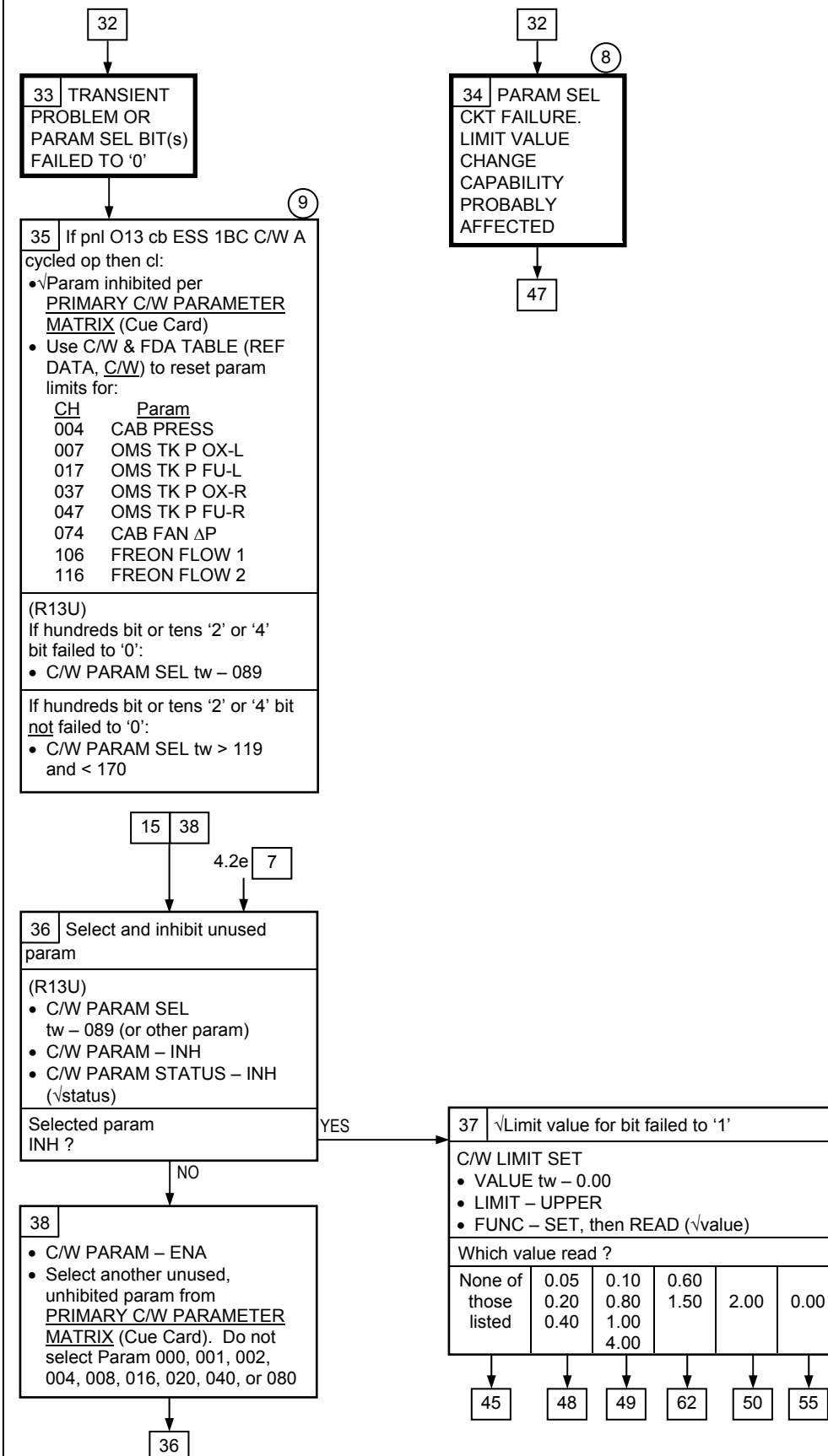


- ⑤ Notify MCC of change in PRI C/W param and limit values
- ⑥ Bi-level params are identified in NOTES column of C/W & FDA TABLE (REF DATA, C/W)
- ⑦ If pnl indicator and PRIMARY C/W param values agree, sns output failed



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

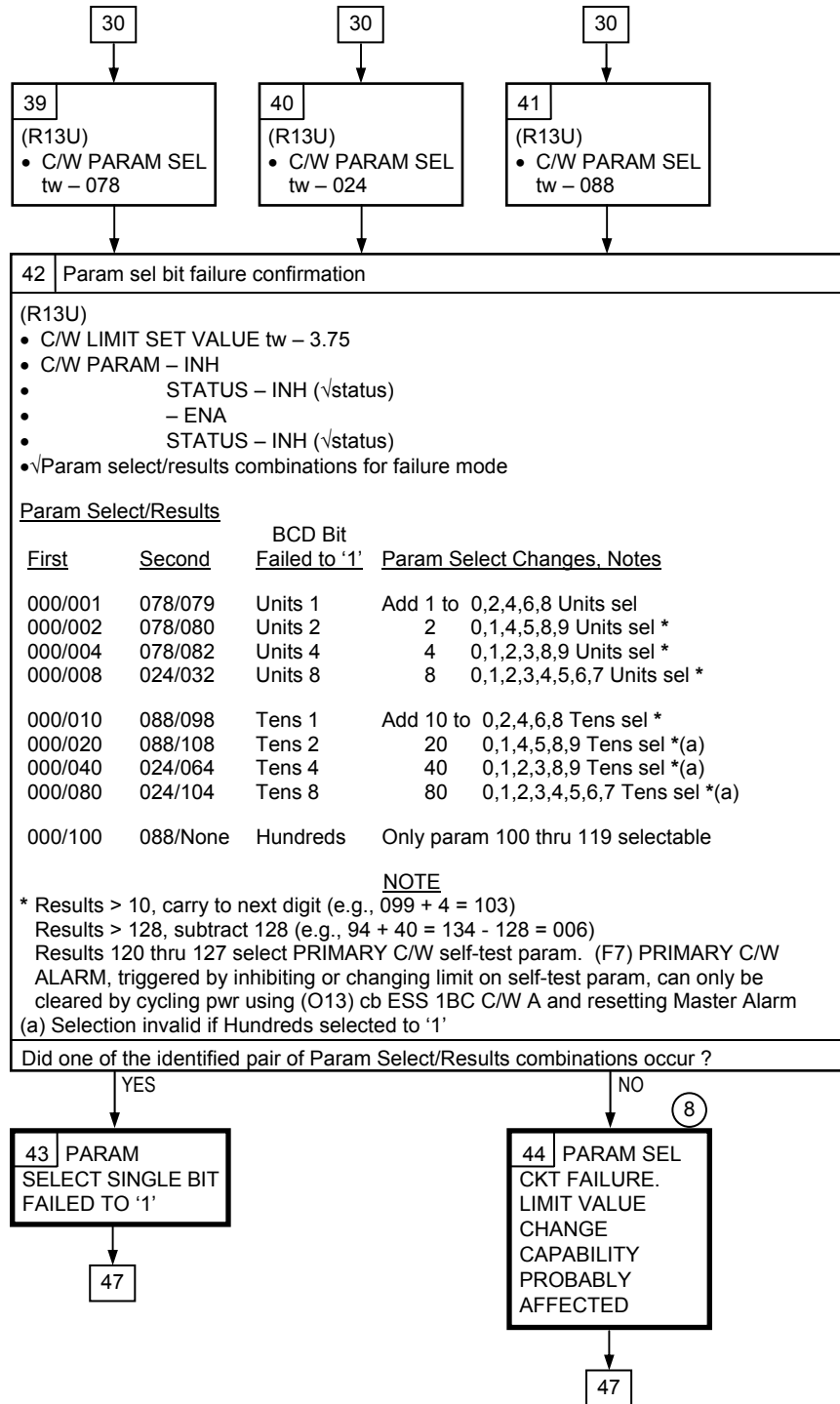
C/W 4.1d (Cont)



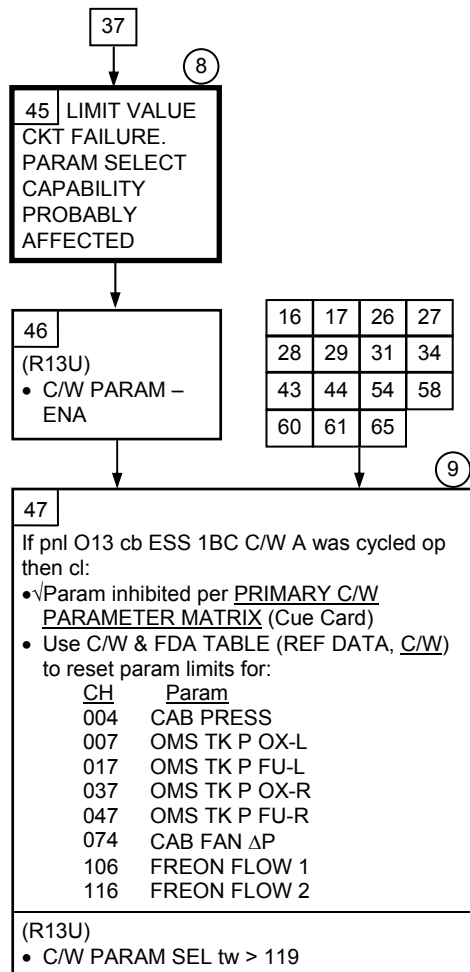
8 Prior to changing param limit, $\sqrt{\text{that desired param and an unused param are selectable using two INH/ENA cycles (see procedure in block 12)}}$, then $\sqrt{\text{desired limit value change capability on unused param}}$

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)



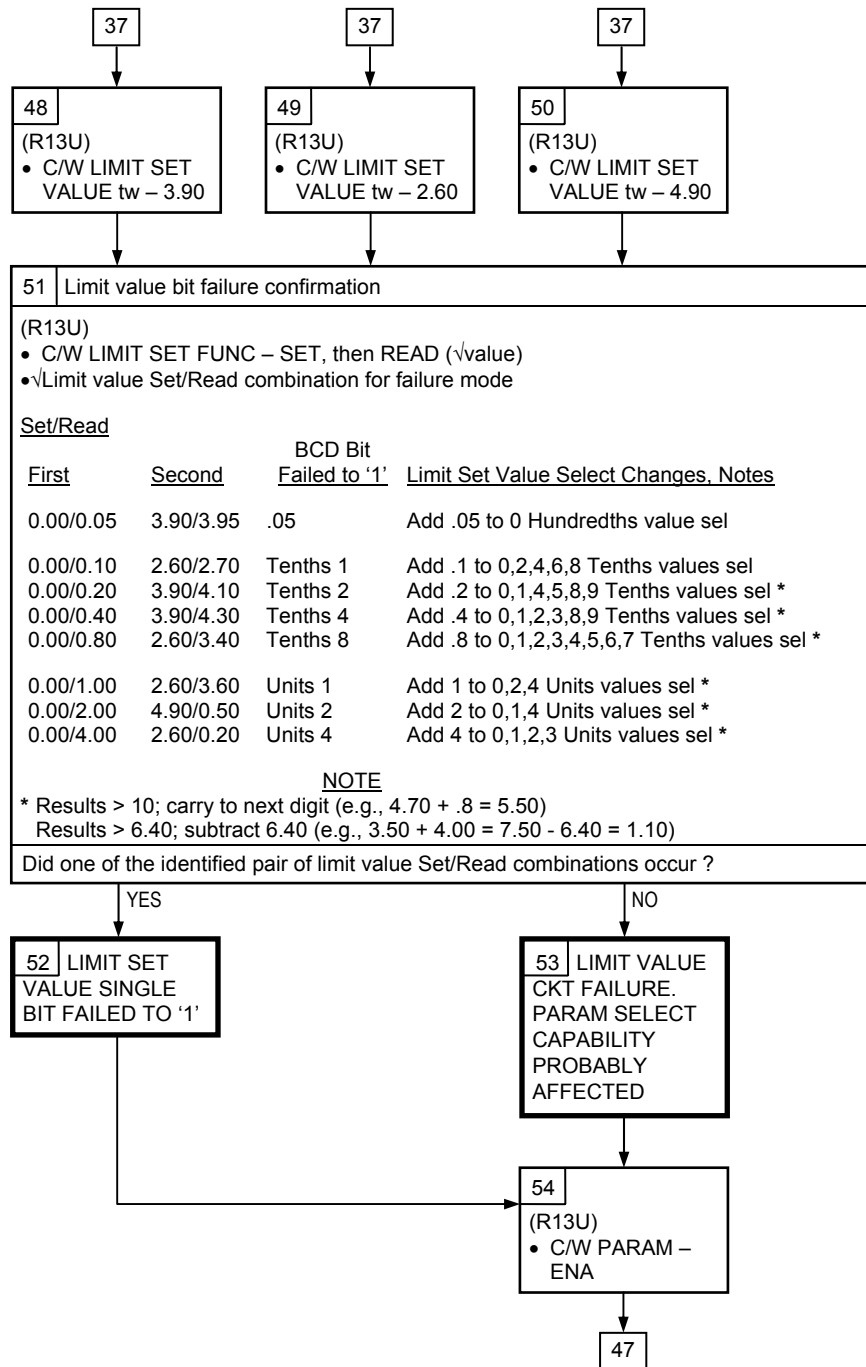
8 Prior to changing param limit, $\sqrt{\text{that desired param and an unused param are selectable using two INH/ENA cycles (see procedure in block [12])}}$, then $\sqrt{\text{desired limit value change capability on unused param}}$

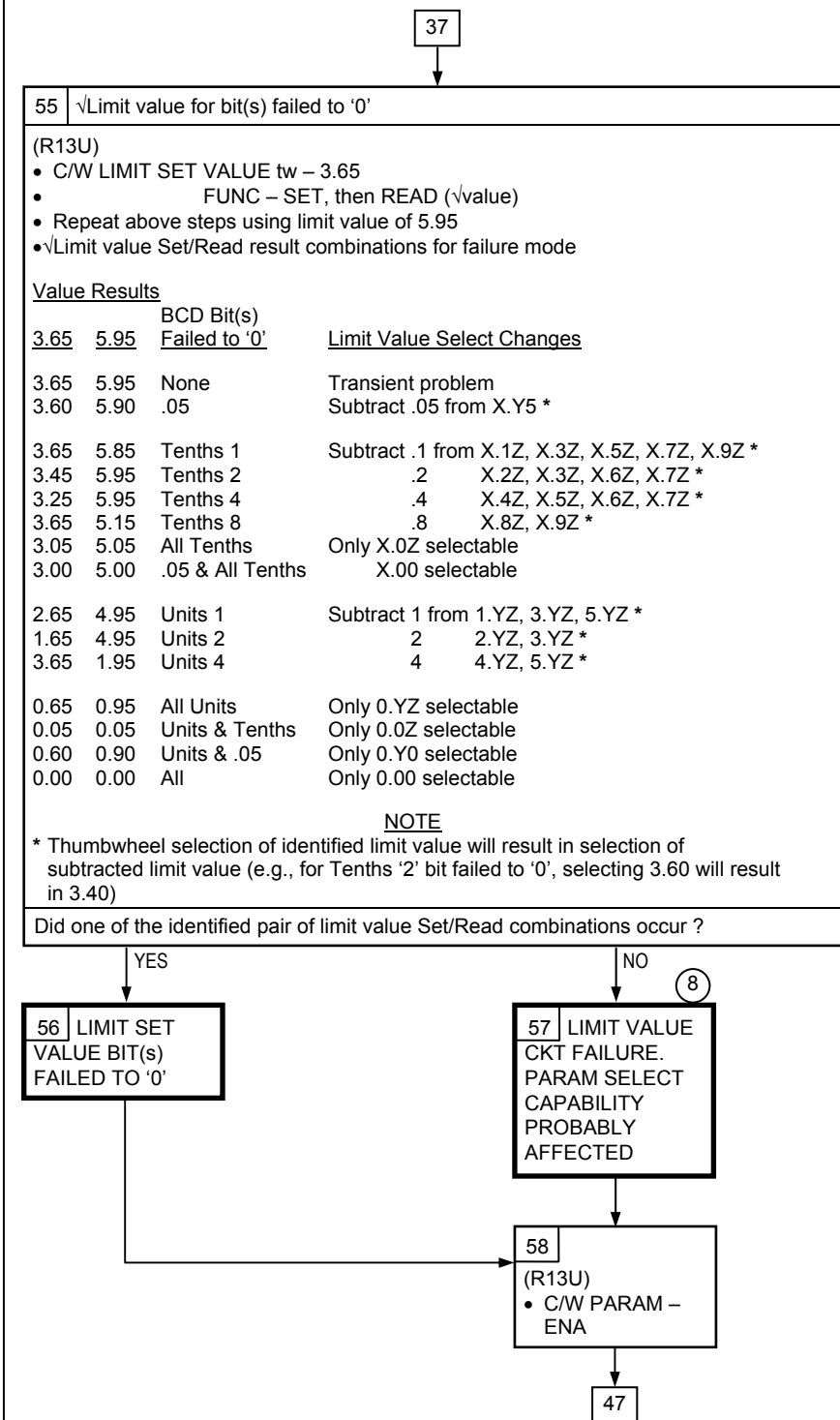


8 Prior to changing param limit, √that desired param and an unused param are selectable using two INH/ENA cycles (see procedure in block 12), then √desired limit value change capability on unused param

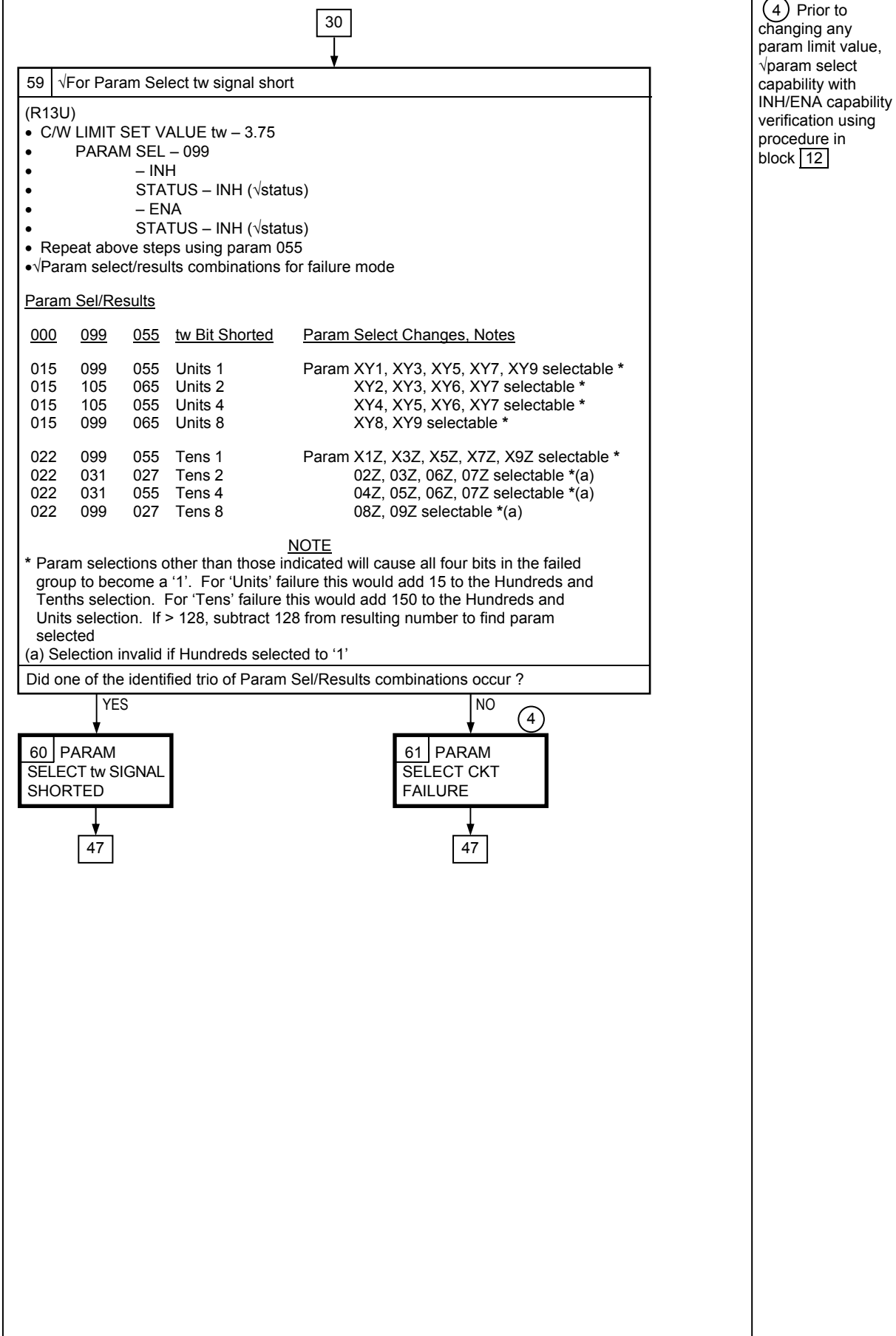
9 All primary C/W params were enabled and their limits reset to default (PROM) value when cb ESS 1BC C/W A closed

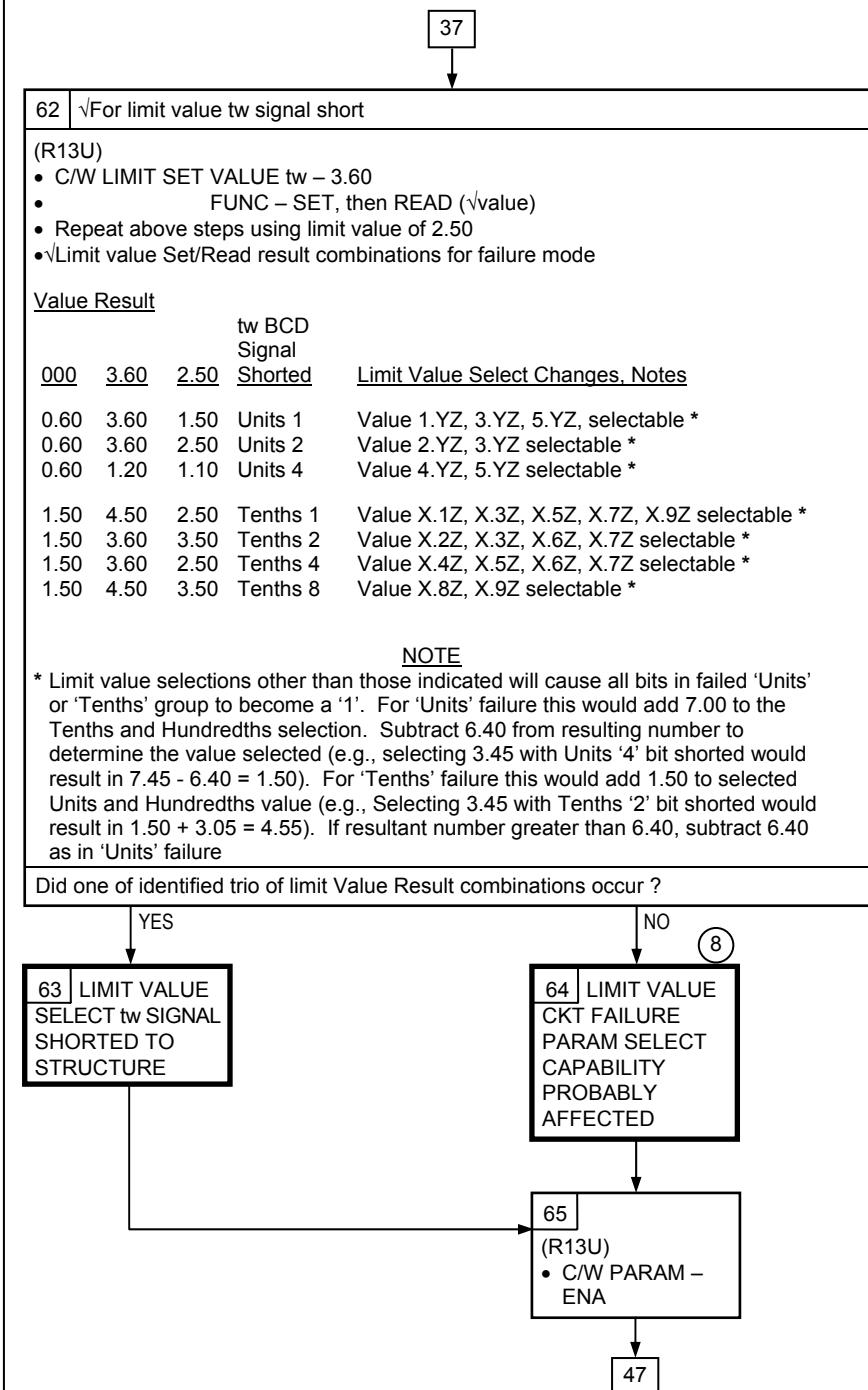
C/W 4.1d (Cont)





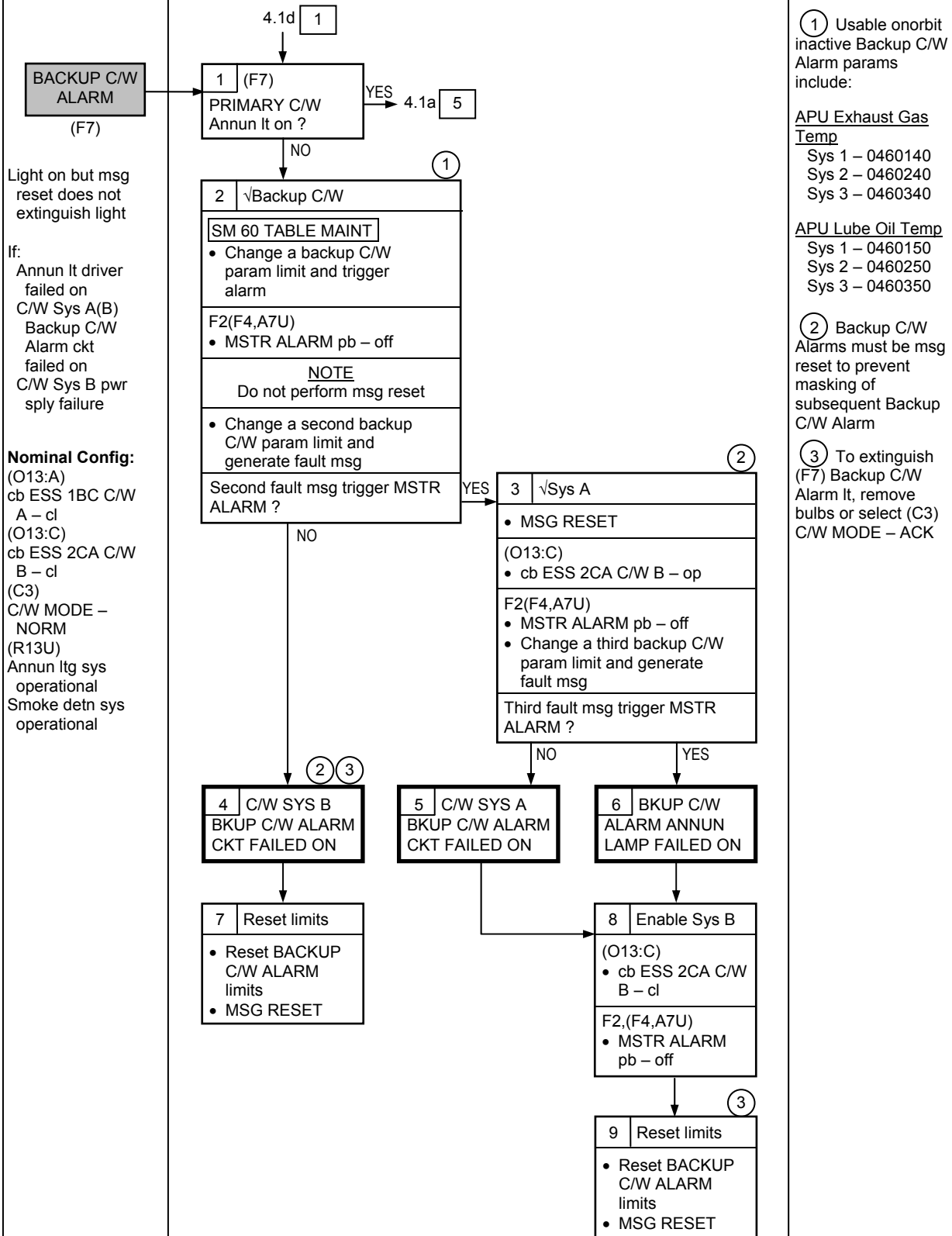
8 Prior to changing param limit, $\sqrt{\text{that desired param and an unused param are selectable using two INH/ENA cycles (see procedure in block 12)}}$, then $\sqrt{\text{desired limit value change capability on unused param}}$

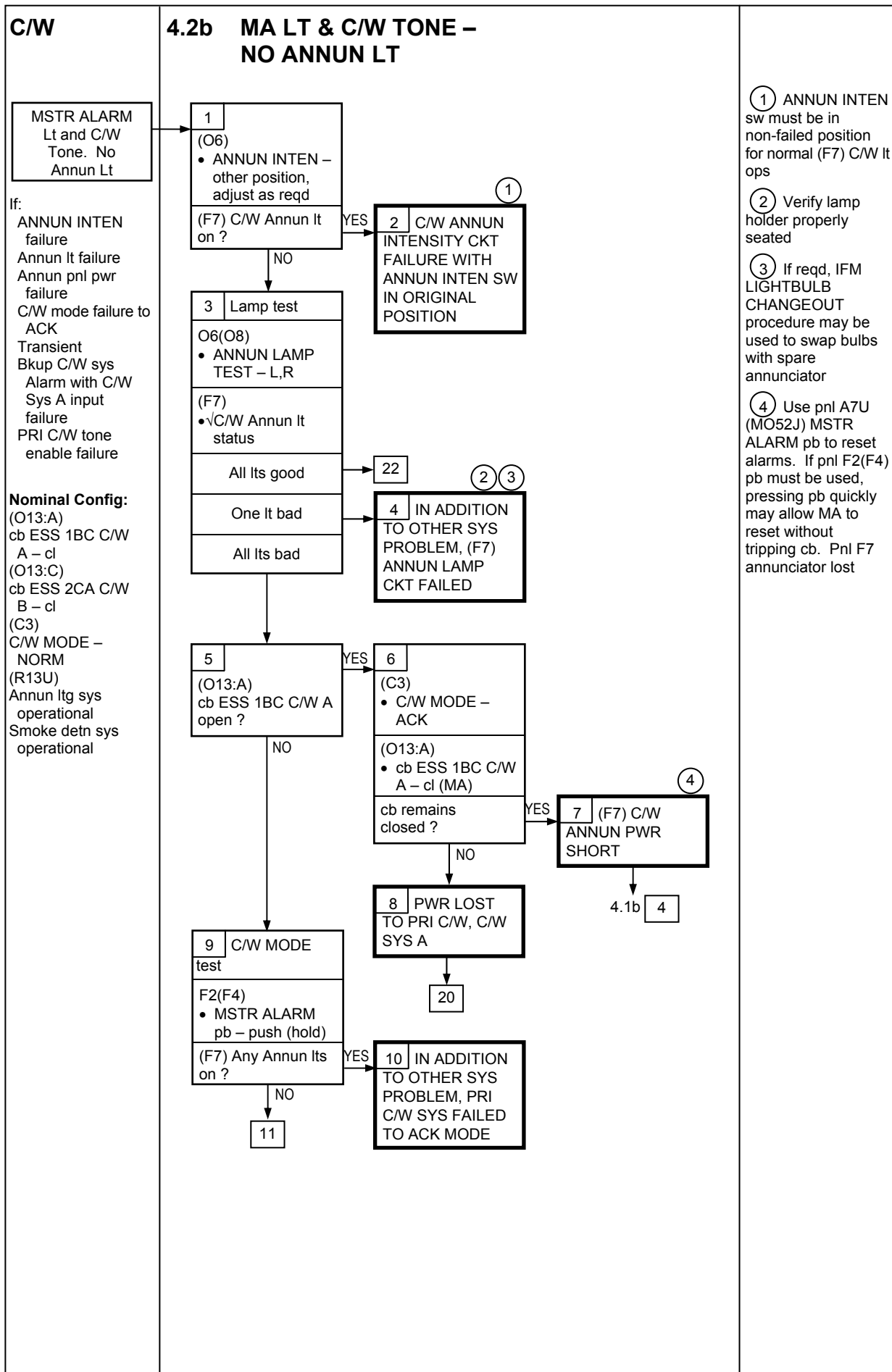




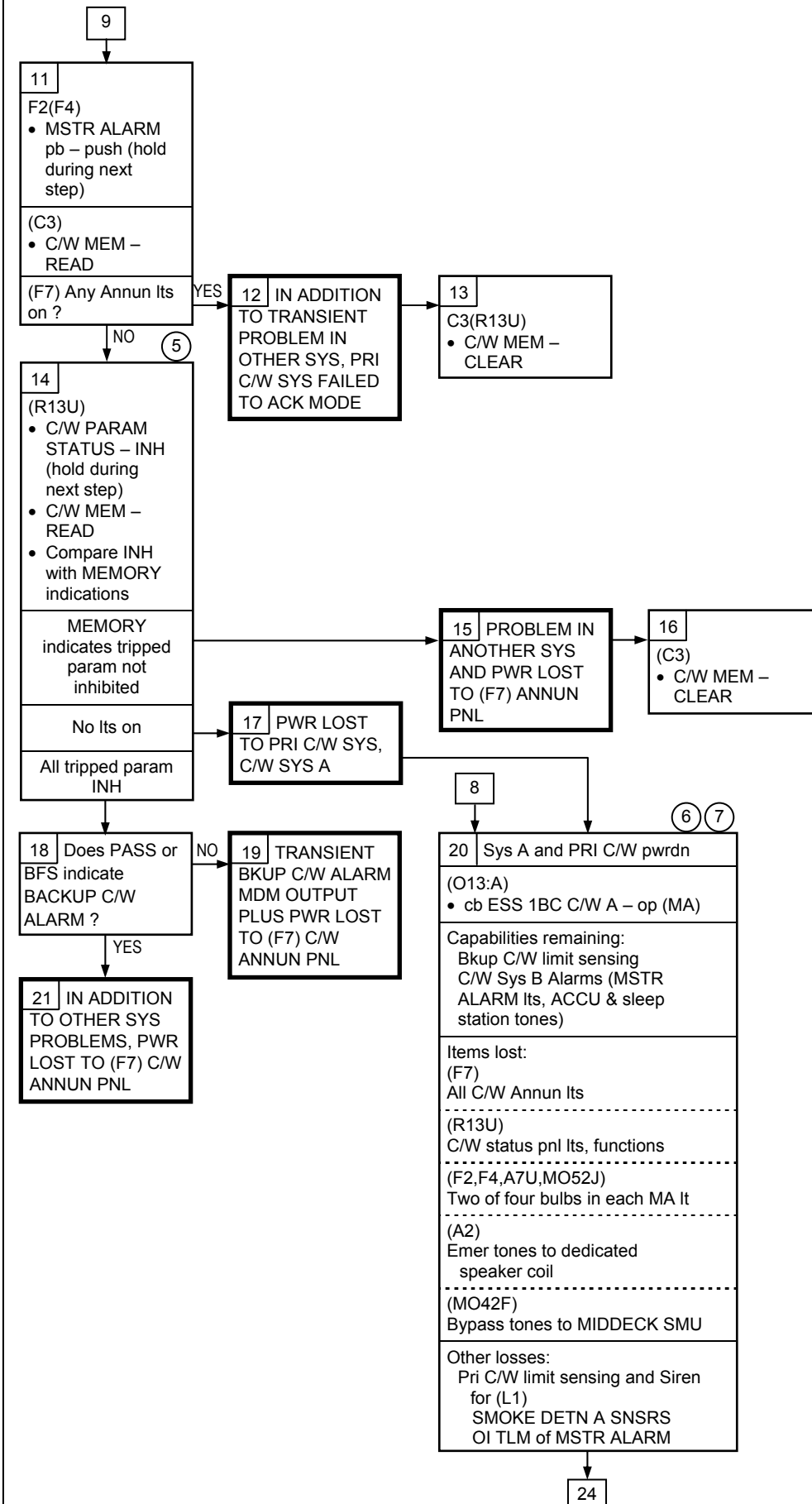
⑧ Prior to changing param limit, √that desired param and an unused param are selectable using two INH/ENA cycles (see procedure in block 12), then √desired limit value change capability on unused param

C/W

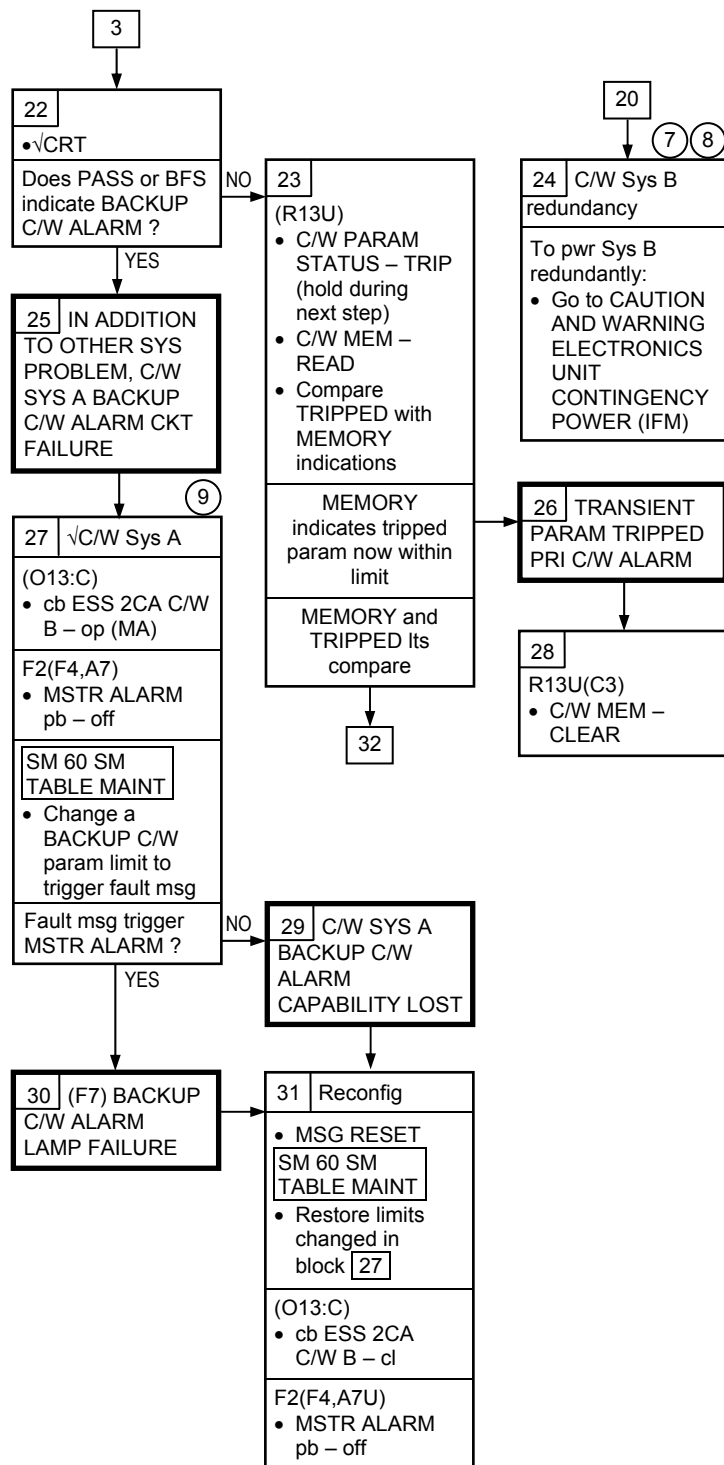
4.2a NONRESETTABLE BACKUP
C/W ALARM LT



C/W 4.2b (Cont)



- ⑤ Additional Its which light during C/W MEM – READ indicate tripped params that are not inhibited
- ⑥ All four bulbs in each MA It 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



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:

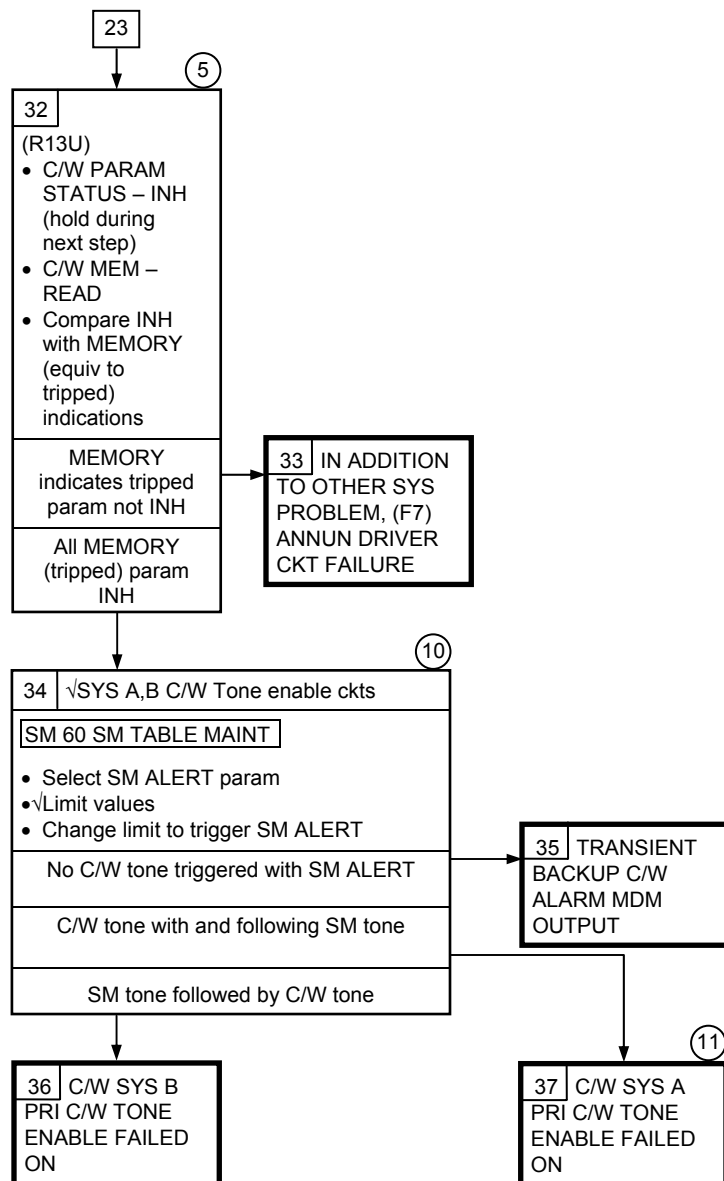
APU Exhaust Gas Temp

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

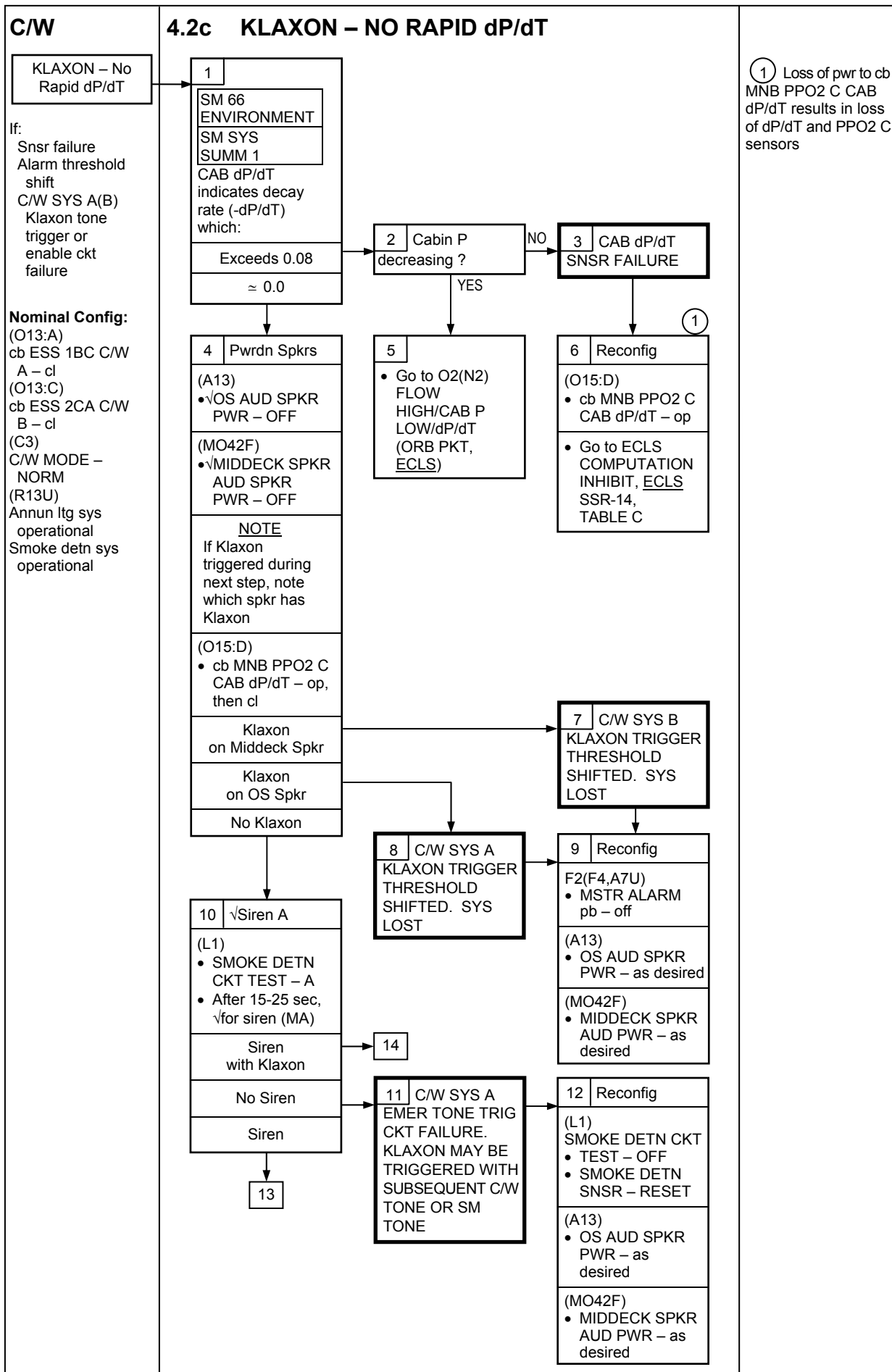
FC H2O VLV T

Sys 1 – 0450412

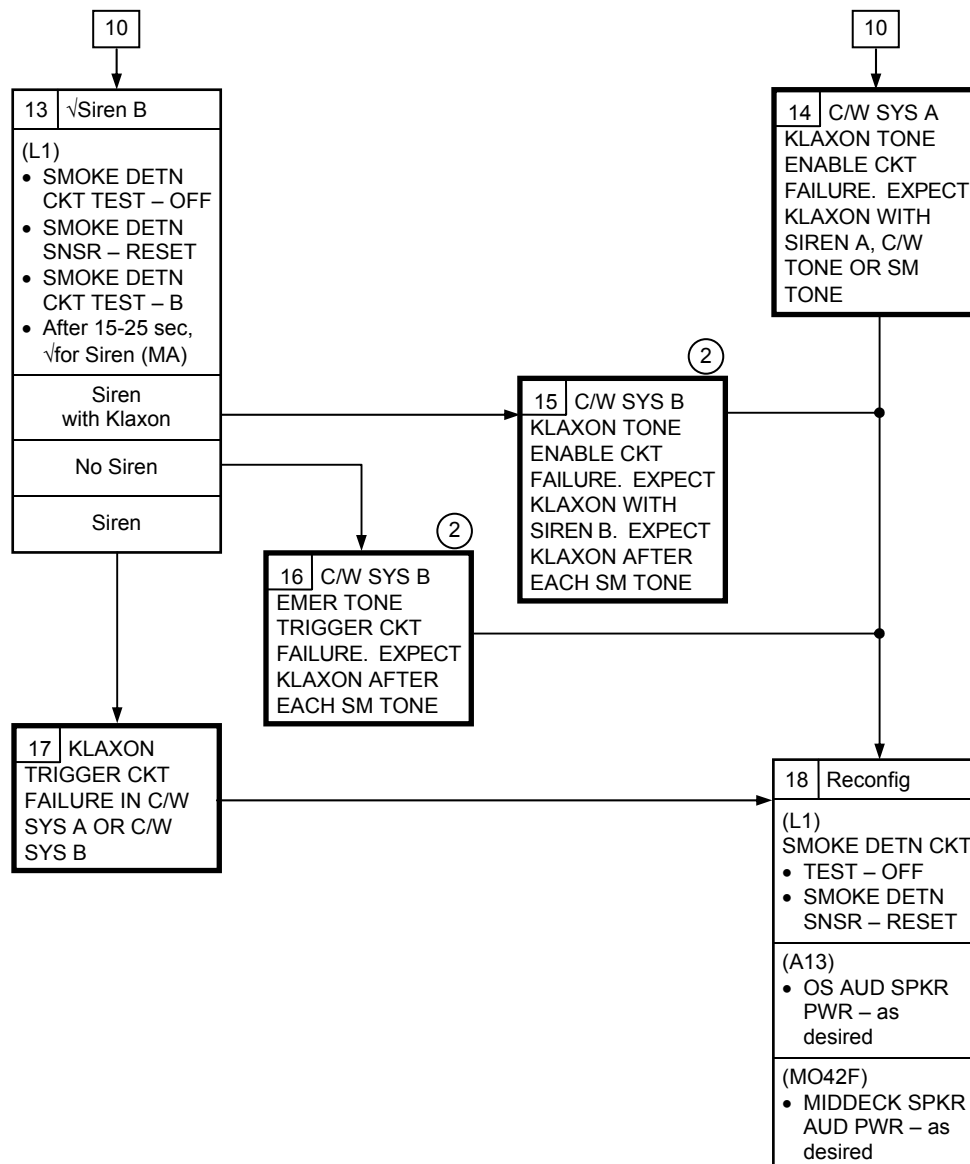
Sys 2 – 0450422

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

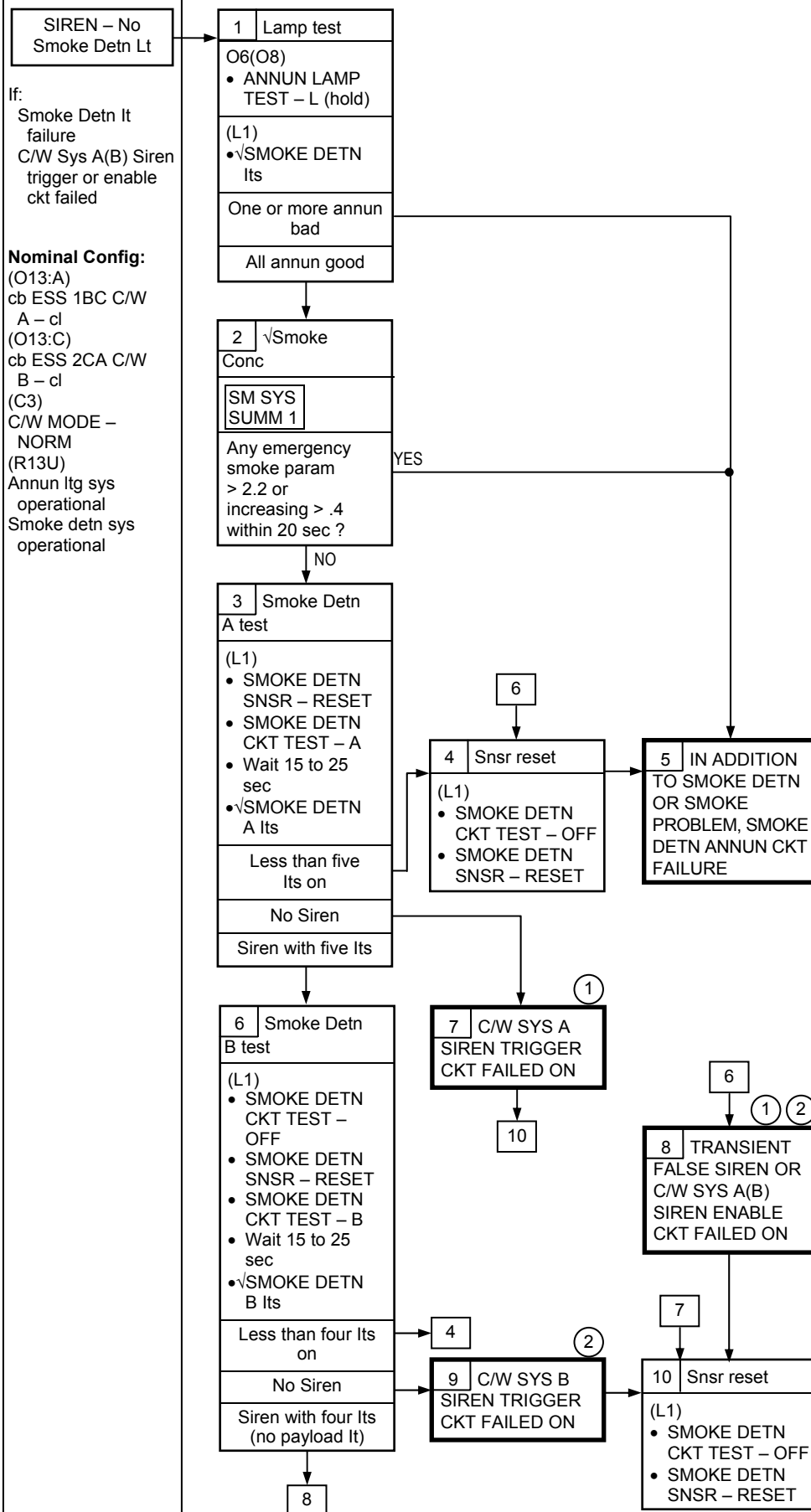


C/W 4.2c (Cont)



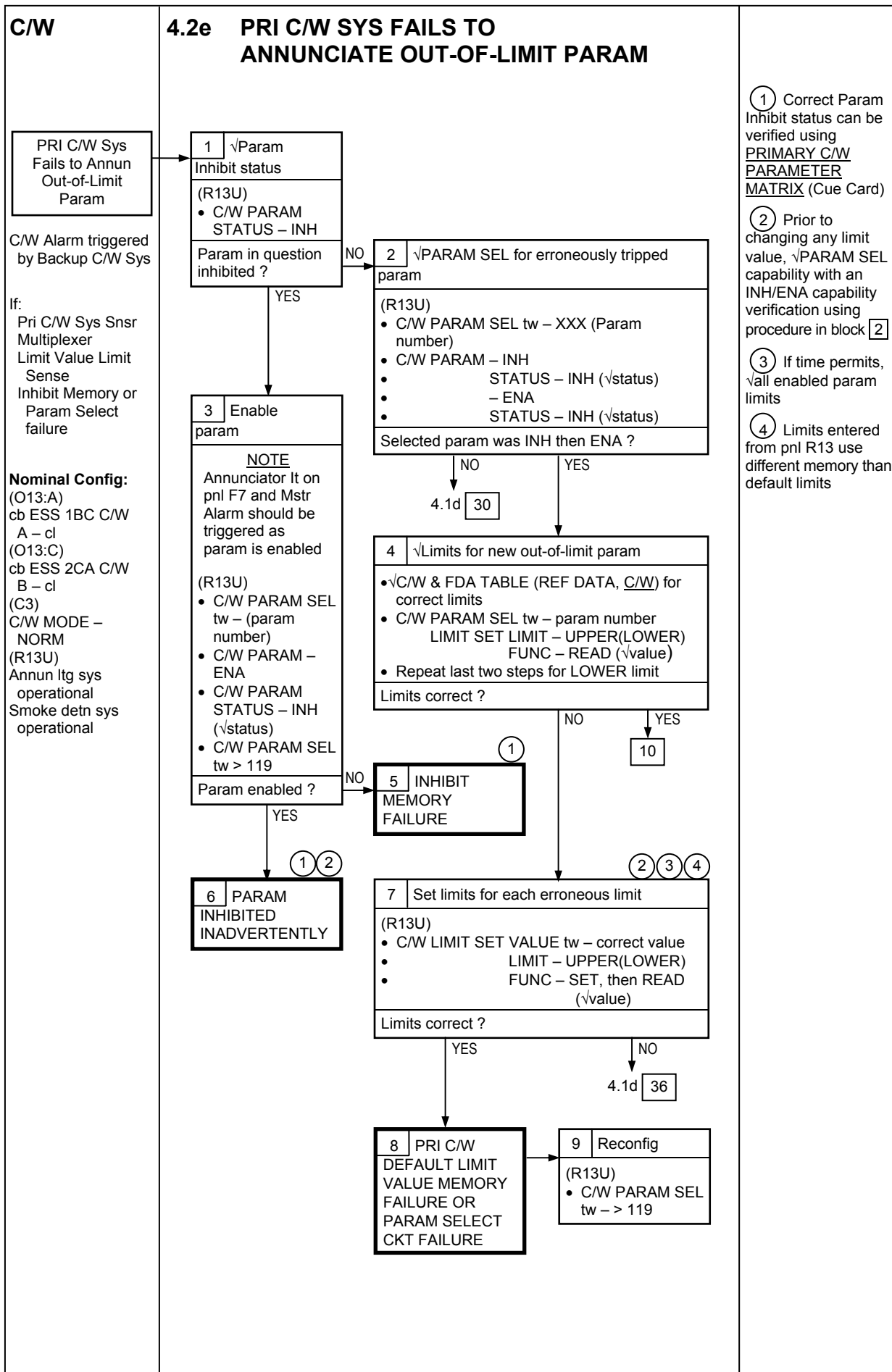
② ACCU VOX selects C/W Sys A over C/W Sys B tone. If C/W Sys A tone not present, expect Klaxon with C/W tone

4.2d SIREN – NO SMOKE DETN LT

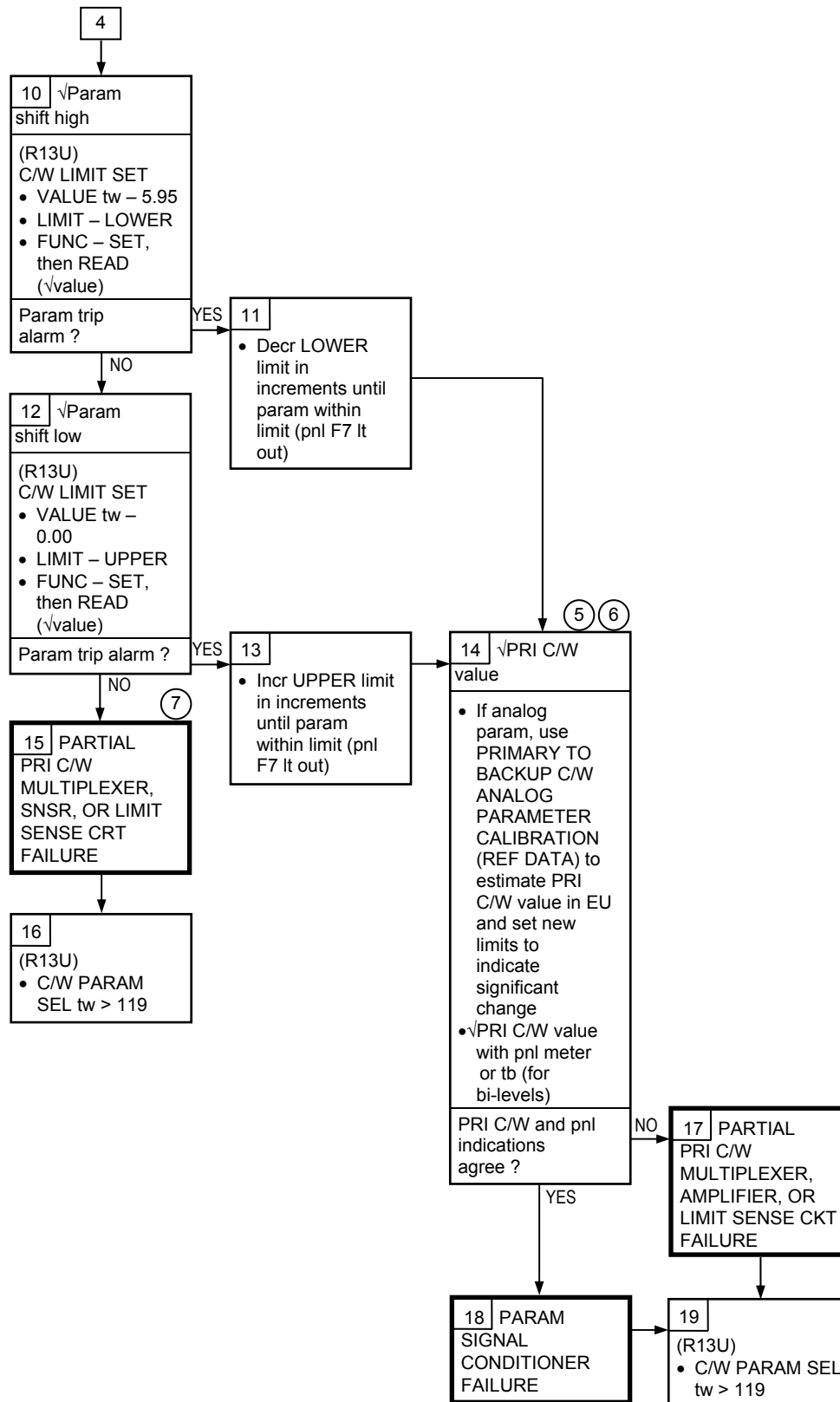


① If C/W Sys A failed, Siren may occur with Klaxon, C/W tone, or SM tone

② If C/W Sys B failed, Siren may occur with Klaxon or after SM tone. Since ACCU VOX selects C/W Sys A over C/W Sys B tone, expect Siren with C/W tone if C/W Sys A tone not present



C/W 4.2e (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 indication and primary C/W param values agree, Snsr or Signal Conditioner failed

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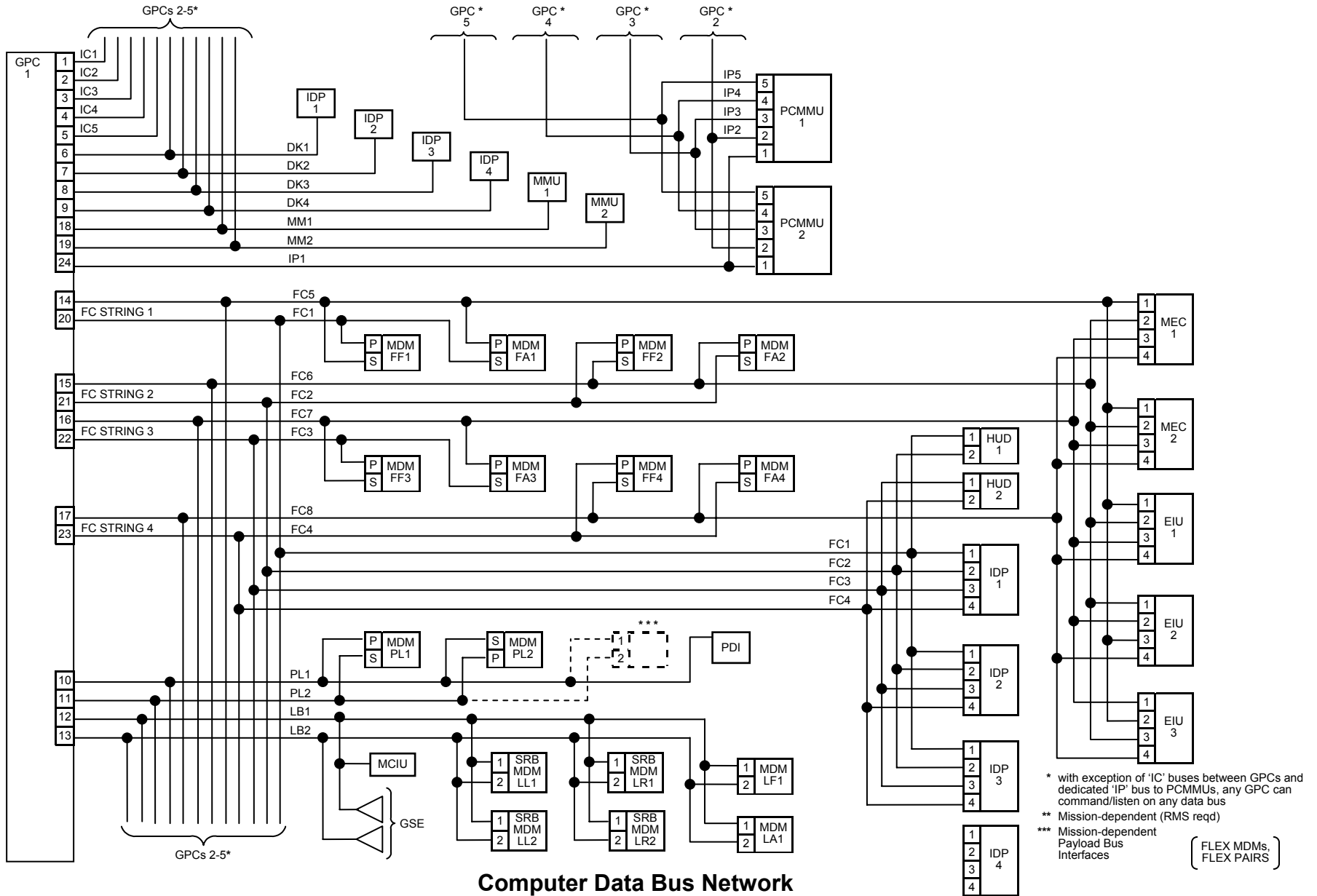
The following Fault Msgs have no corresponding MAL procedures in this book:

GPC FSM

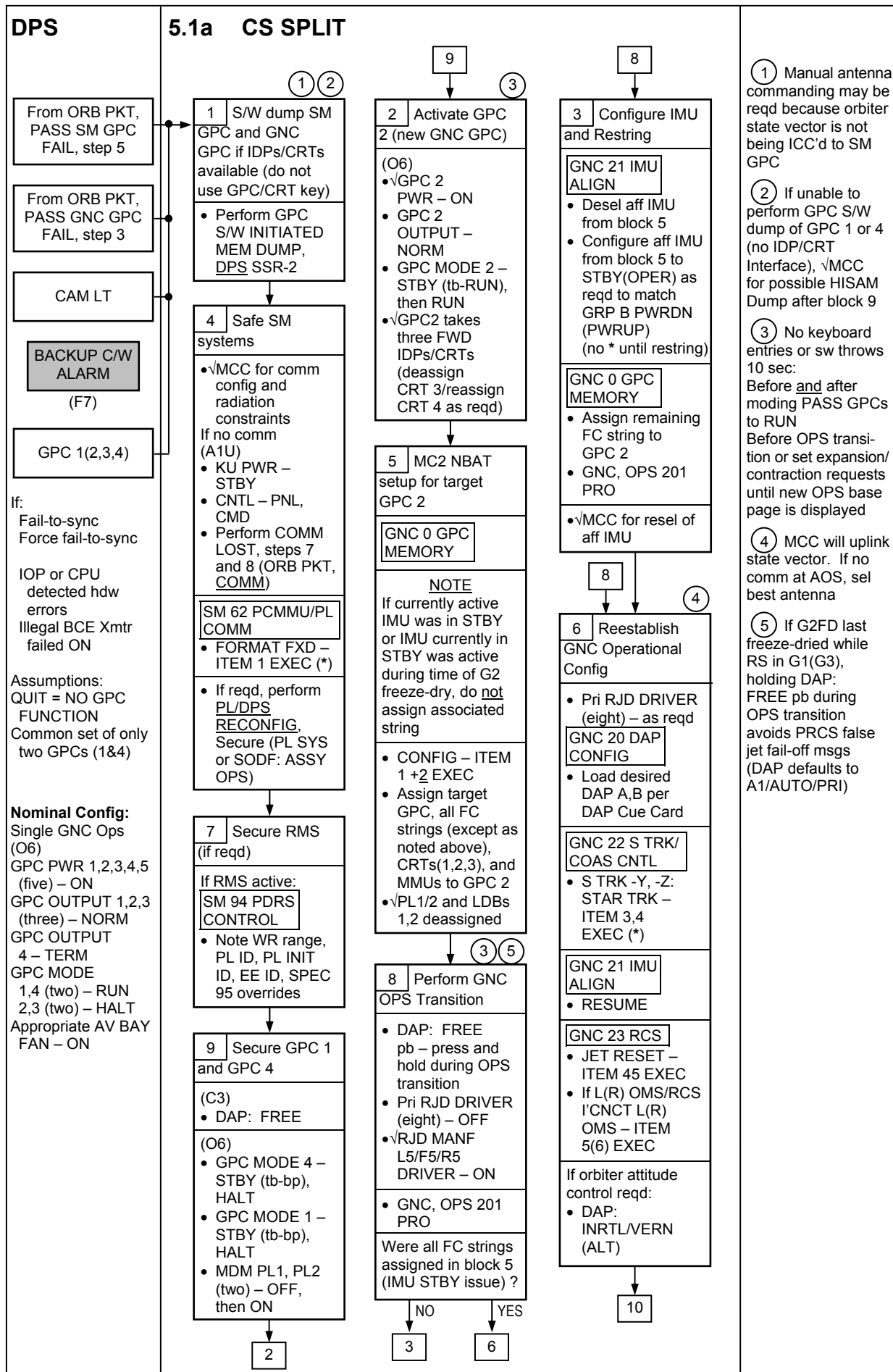
BCE STRG 1(2,3,4) PASS (BFS)
BCE BYP KU
CM BUF BSY CRT 1(2,3,4)
DK XMTR 1(2,3,4) (BFS)
> 3 DEU
GPC 5
GPC CONF
GPC PWR (BFS)
ILLEGAL ENTRY
MDM OUTPUT FF(FA)
PASS GPC BITE
SUMWORD ICC
TFL FAIL (BFS)
TFL LOAD FAIL (PASS)
TIME TONE

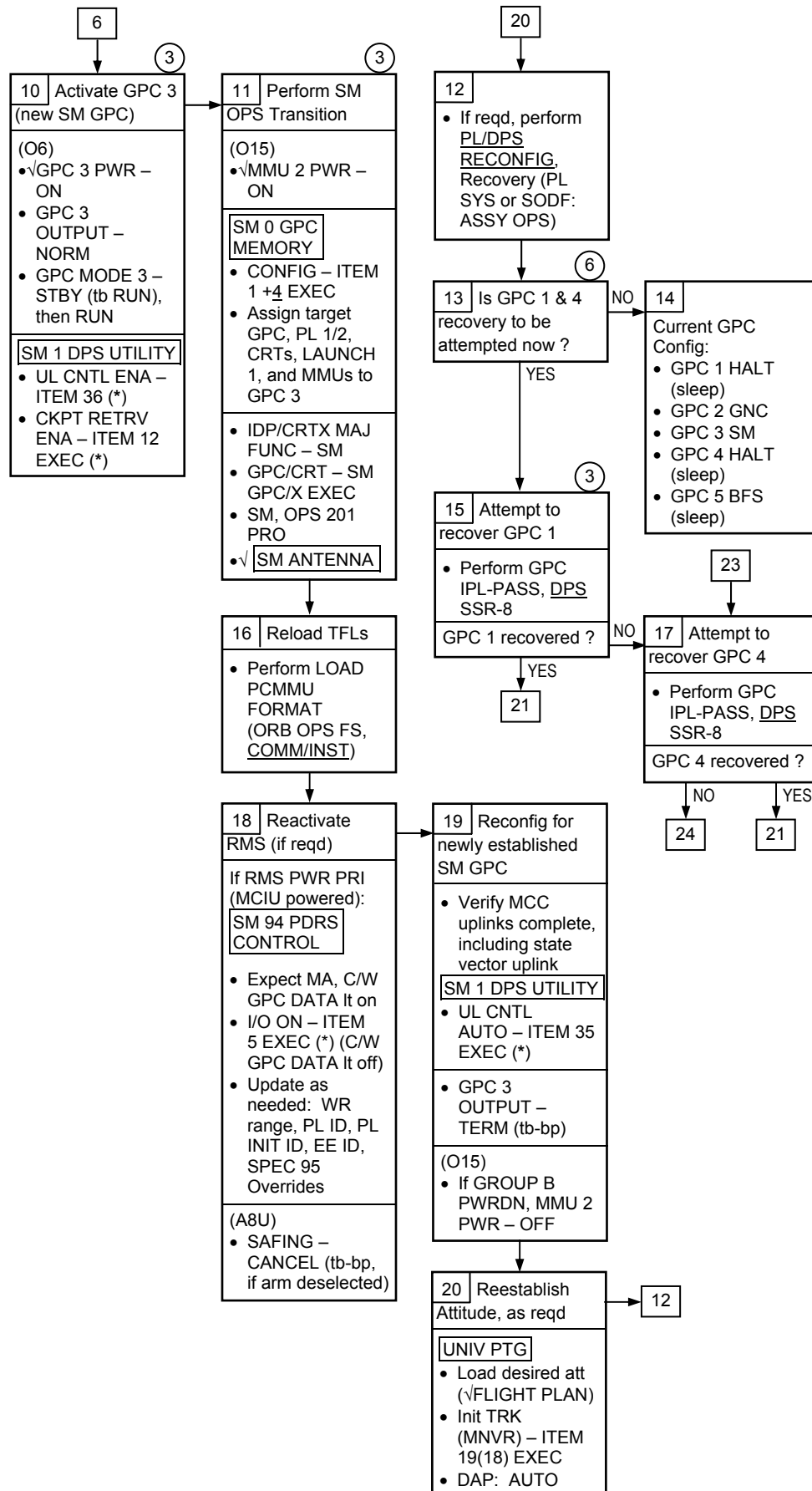
MEDS FSM

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



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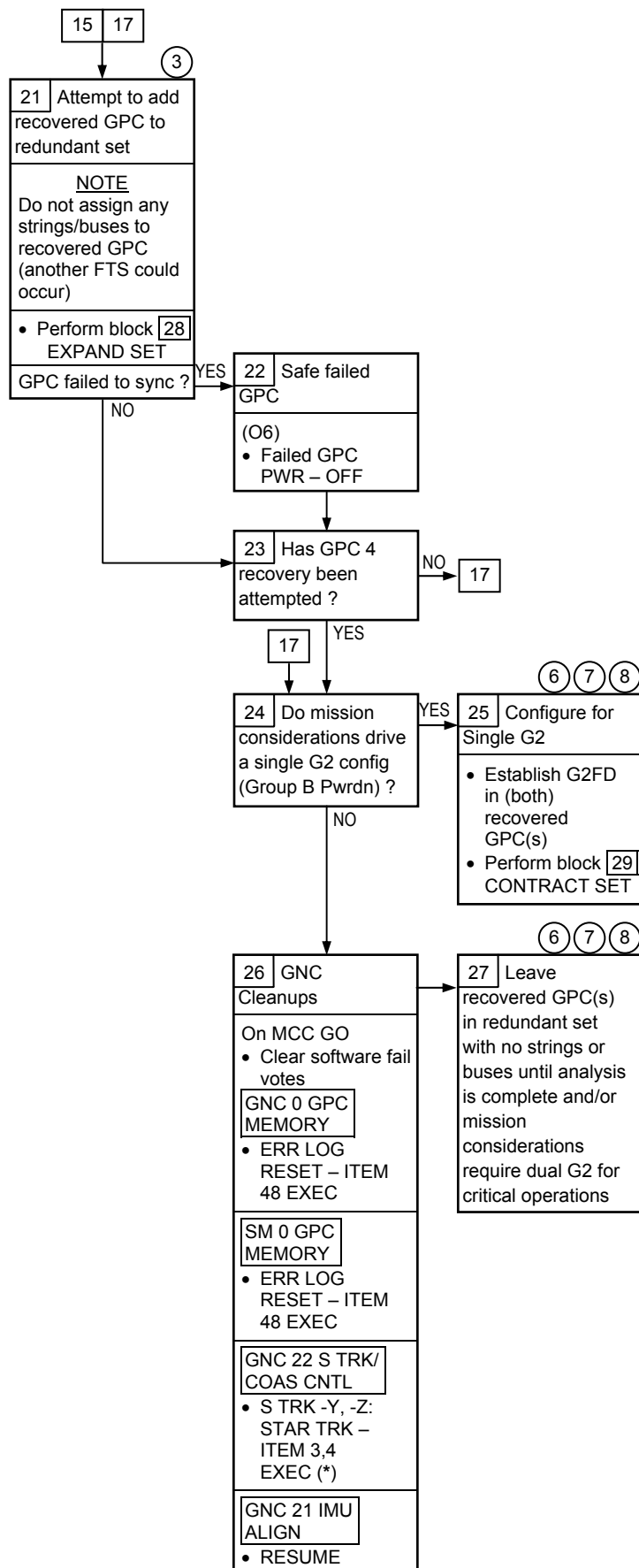


③ No keyboard entries or sw throws 10 sec:

Before and after moding PASS GPCs to RUN

Before OPS transition or set expansion/contraction requests until new OPS base page is displayed

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



③ No keyboard entries or sw throws 10 sec:
Before and after moding PASS GPCs to RUN
Before OPS transition or set expansion/contraction requests until new OPS base page is displayed

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 pwr'd 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

No keyboard entries or sw throws 10 sec:
 Before and after moding PASS GPCs to RUN
 Before OPS transition or set expansion/contraction
 requests until new OPS base page is displayed

CONFIGURE FOR SET EXPANSION

CRT

GNC 0 GPC MEMORY

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

C3(A6U)

- OPS MODE RECALL** (11)
- DAP: FREE

CRT

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

C3(A6U)

- DAP: as reqd

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			
CRT 1	DO NOT	DO NOT	DO NOT
2	MODIFY	MODIFY	MODIFY
3	NBAT	NBAT	NBAT
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 downlist change following OPS Mode Recall

29 CONTRACT SET

NOTE

No keyboard entries or sw throws 10 sec:
 Before and after moding PASS GPCs to RUN
 Before OPS transition or set expansion/contraction
 requests until new OPS base page is displayed

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

C3(A6U) OPS MODE RECALL (11)

- 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

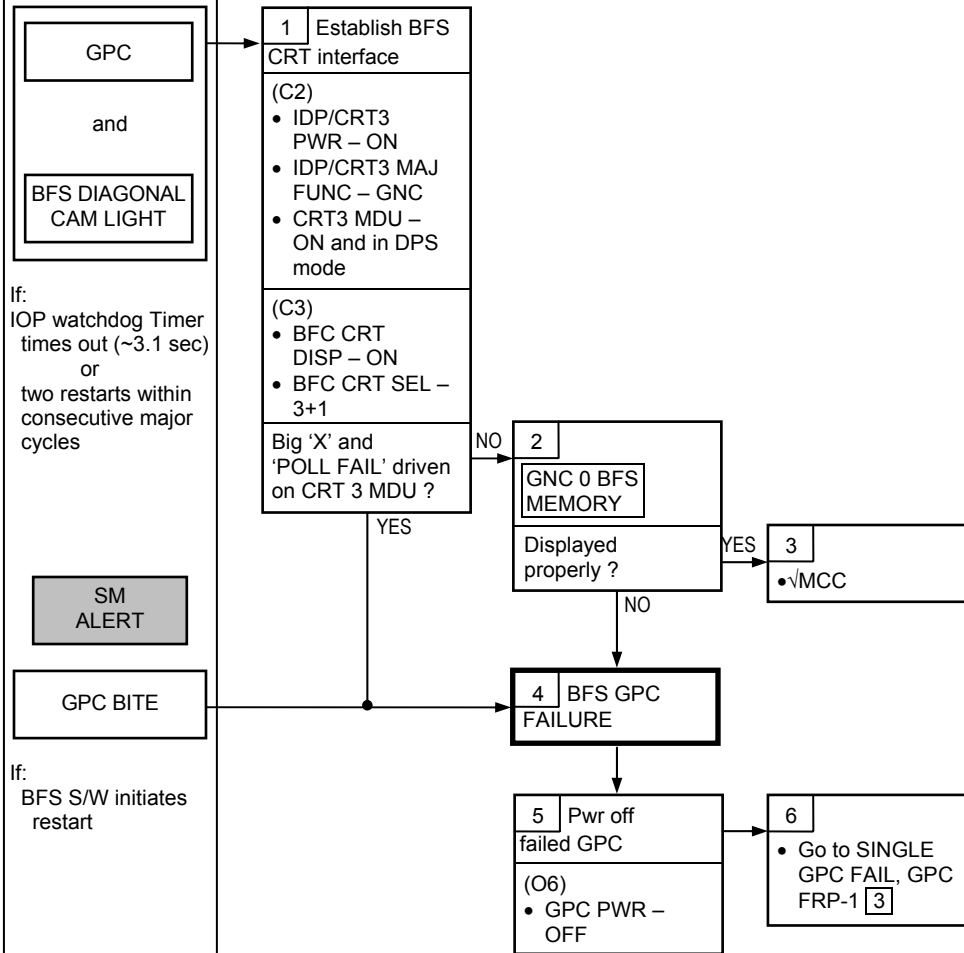
- ITEM 48 EXEC

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

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

DPS

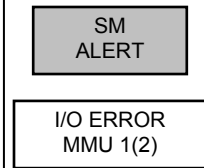
5.1b 'BFS GPC FAIL (BITE)' (ORBIT)



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DPS

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



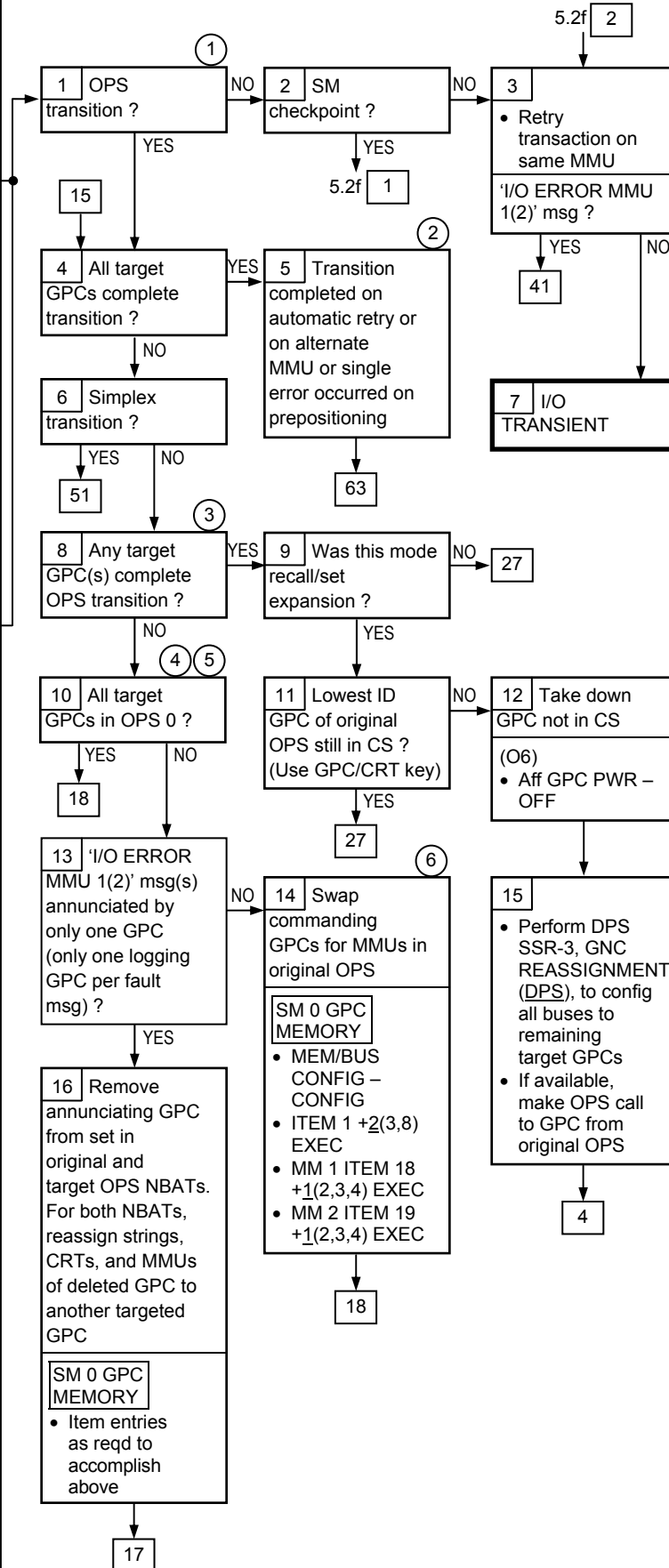
If:
CHECKSUM, I/O transient, BCE failure, MMU failure, or source GPC failure

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



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

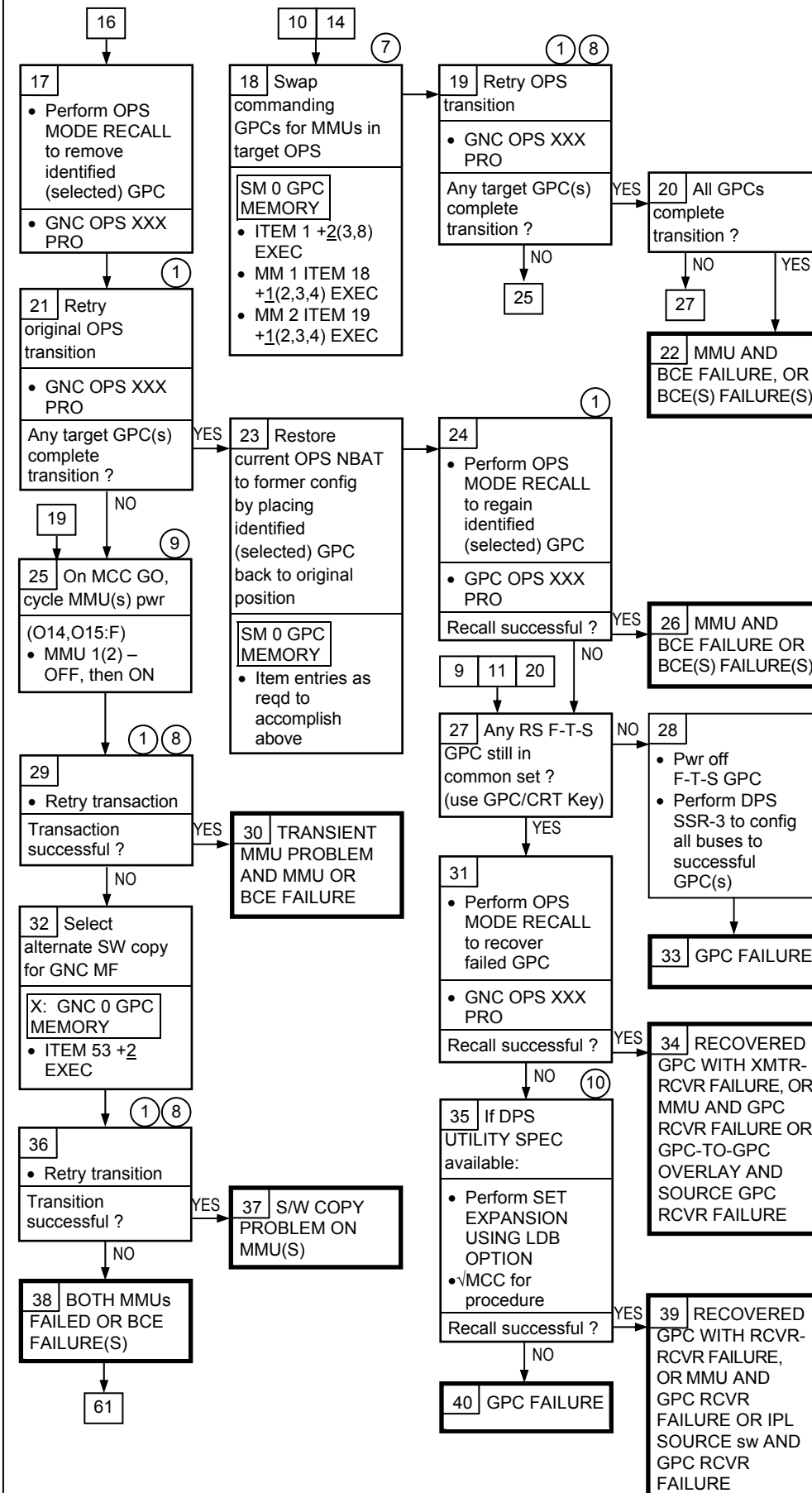
② Health of affected MMU can be verified by GNC OPS transition (with MCC concurrence), SM roll-in request, or IMU checkpoint read

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

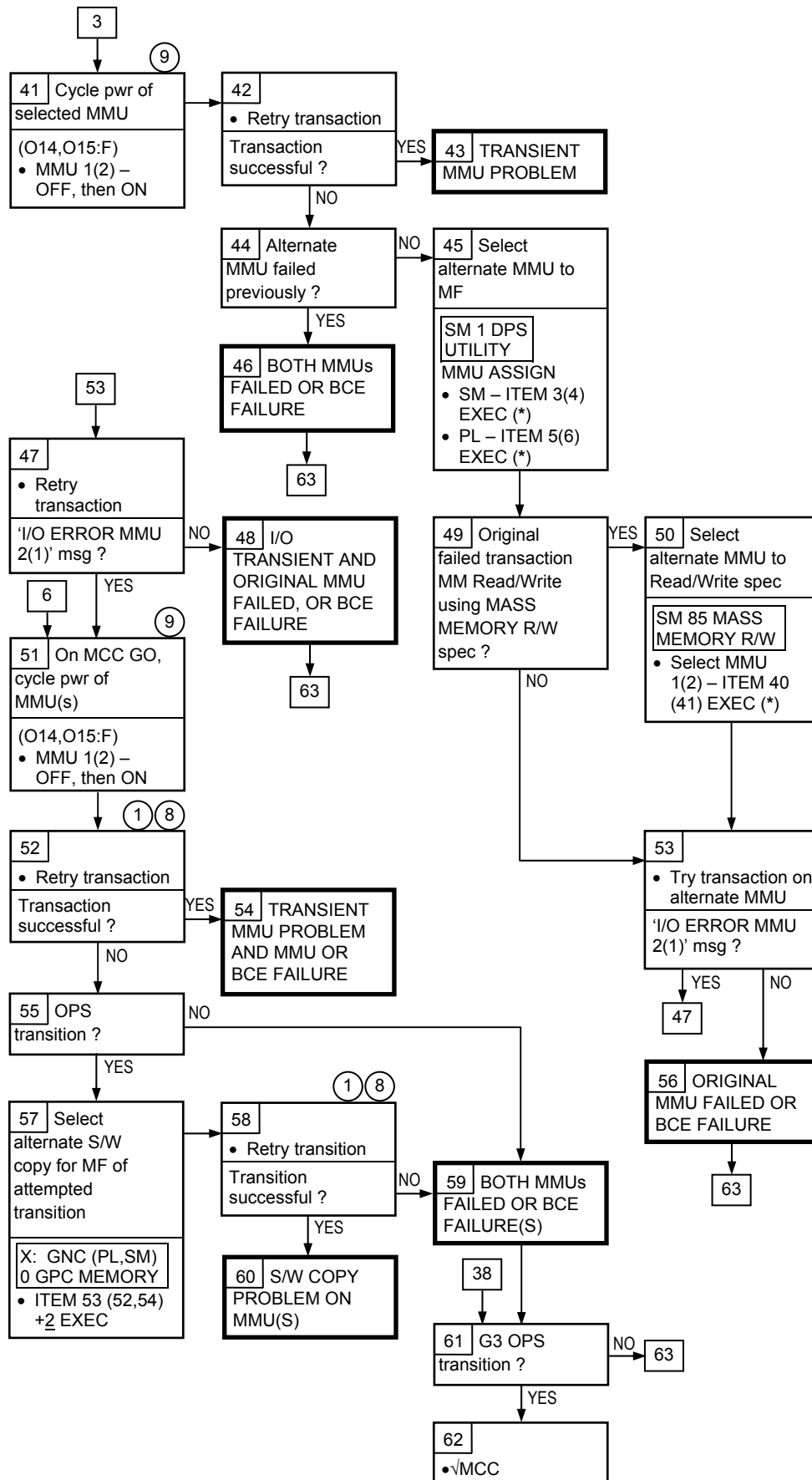
④ If GPC fail votes and fault msg(s) and 'OFF/BUSY MMU' msg(s) occur, then GPCs are in CS OPS 0. Transition unsuccessful because of MMU or commanding GPC Xmtr failure, and alt MMU OFF/BSY or selected for IPL. For two GPC RS, will get off-diagonal CAM lights. For three or more GPC RS, will get I-fail

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



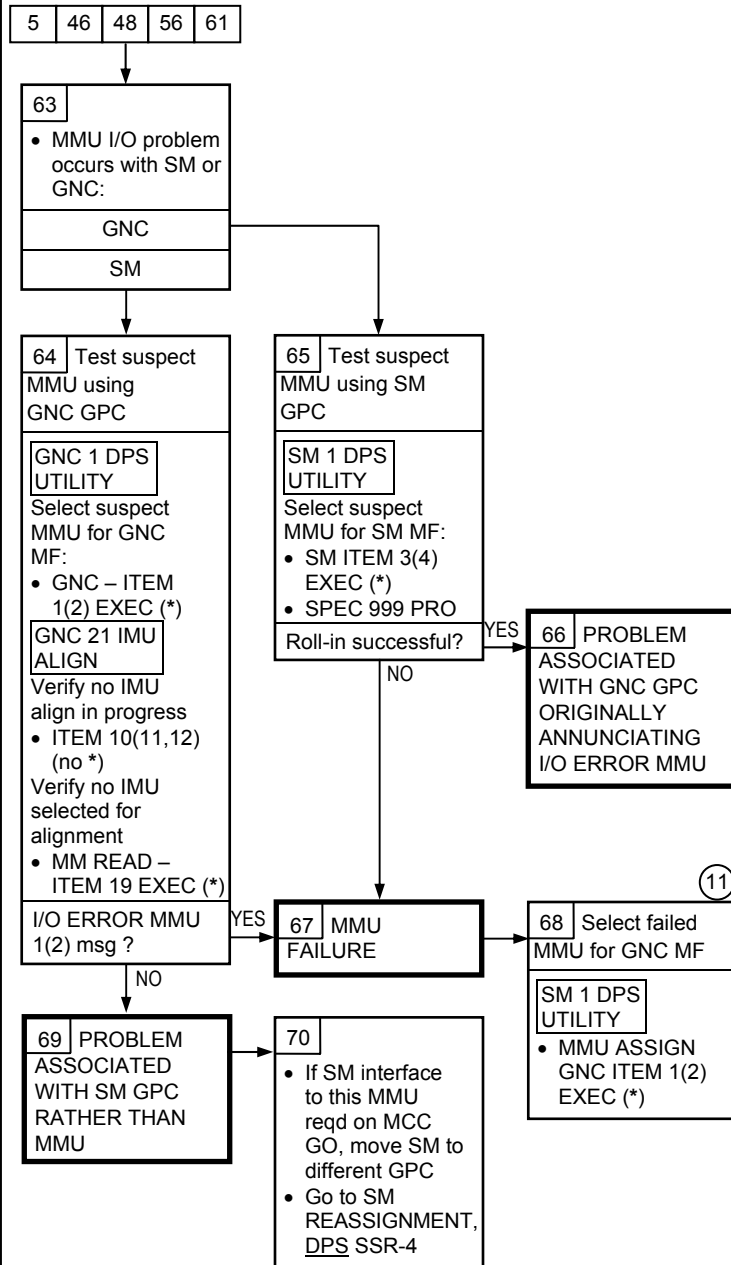
- ① Any previously failed MMU should be prime selected for GNC prior to OPS transition
- ⑦ Software uses NBAT of target OPS to select GPC to command each MMU for the overlay reads
- ⑧ If original transition G2/G8 and in OPS 0, transition to G2, then G8 to avoid illegal entry msg
- ⑨ Solid State MMU power cycle shuts down the associated solid state recorders. MCC commanding may be reqd
- ⑩ 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 If original transition G2/G8 and in OPS 0, transition to G2, then G8 to avoid illegal entry msg

⑨ Solid State MMU power cycle shuts down the associated solid state recorders. MCC commanding may be reqd



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

DPS

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

SM
ALERT

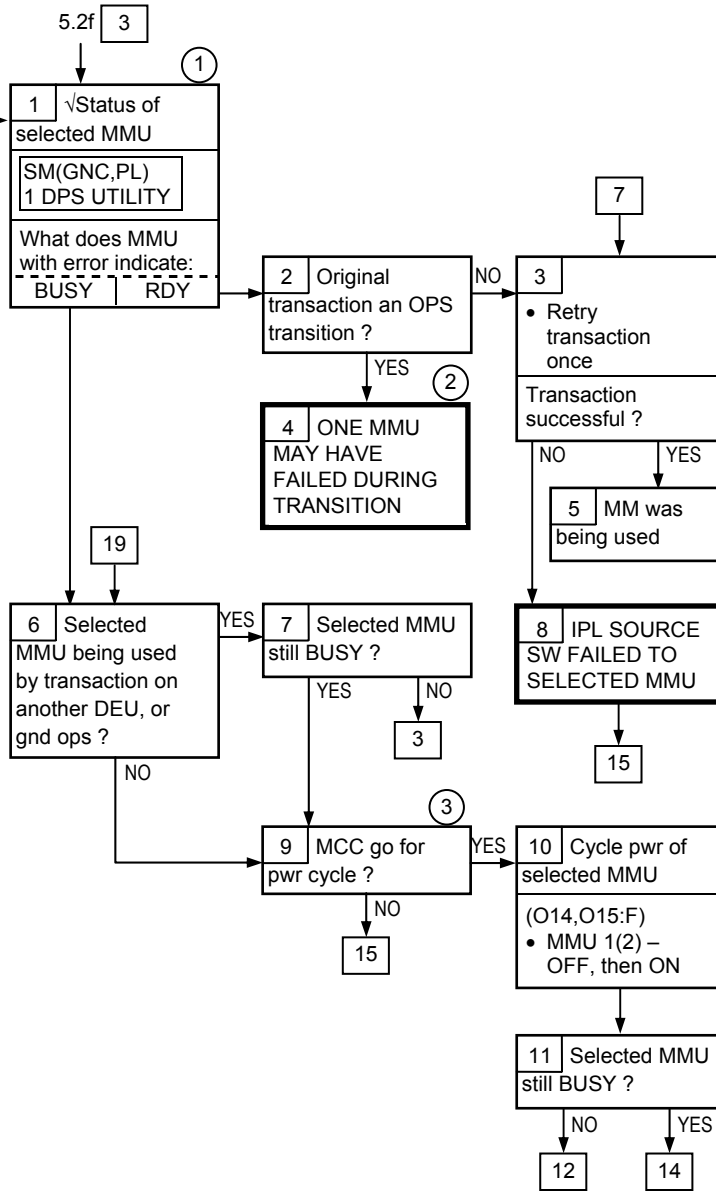
OFF/BUSY
MMU 1(2)

If:
MMU OFF
MMU selected for
IPL on normal
transaction
MMU BUSY

From ORB PKT,
FD GPC
ACTIVATE,
step 1

Nominal Config:

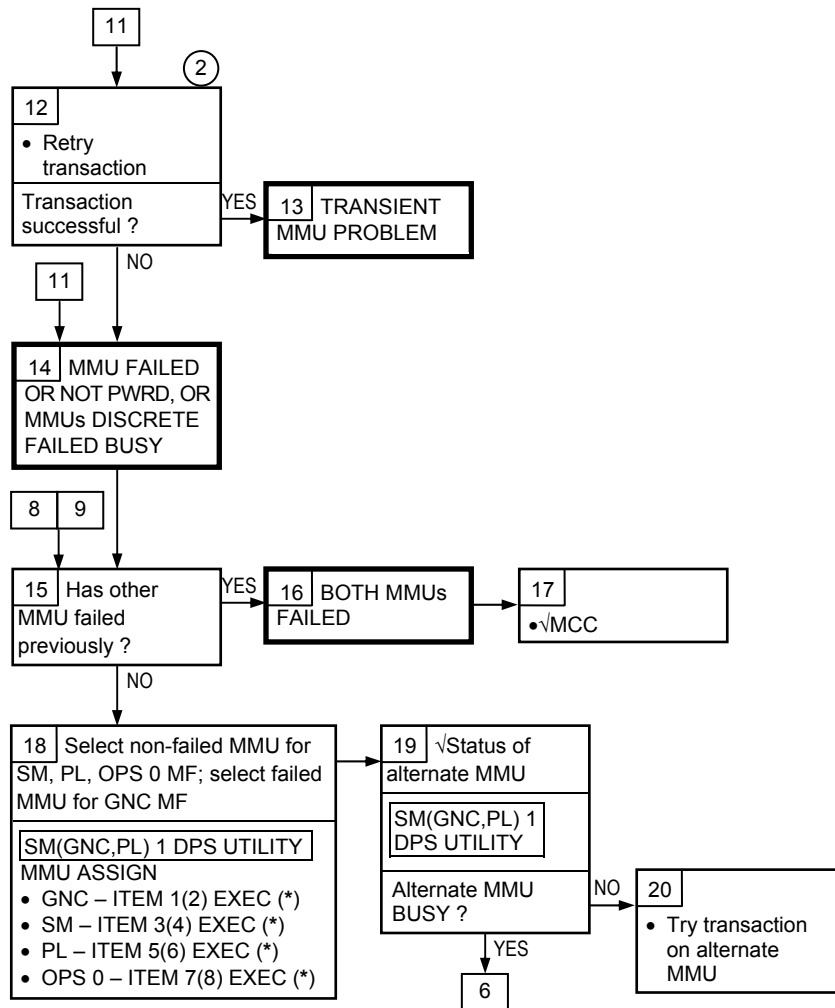
(O14:F)
MMU 1 – ON
(O15:F)
MMU 2 – ON
(O6)
IPL SOURCE –
OFF



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



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

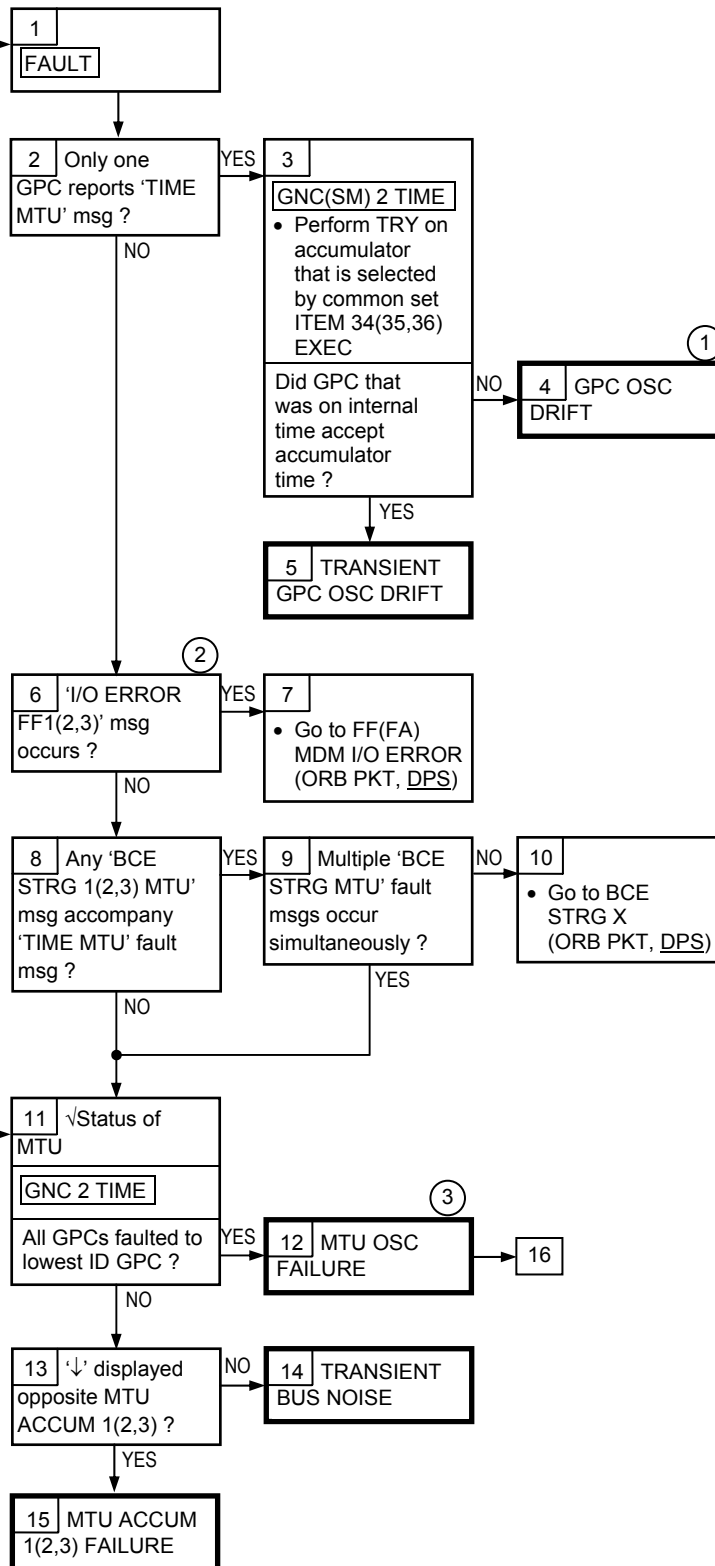
TIME MTU

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

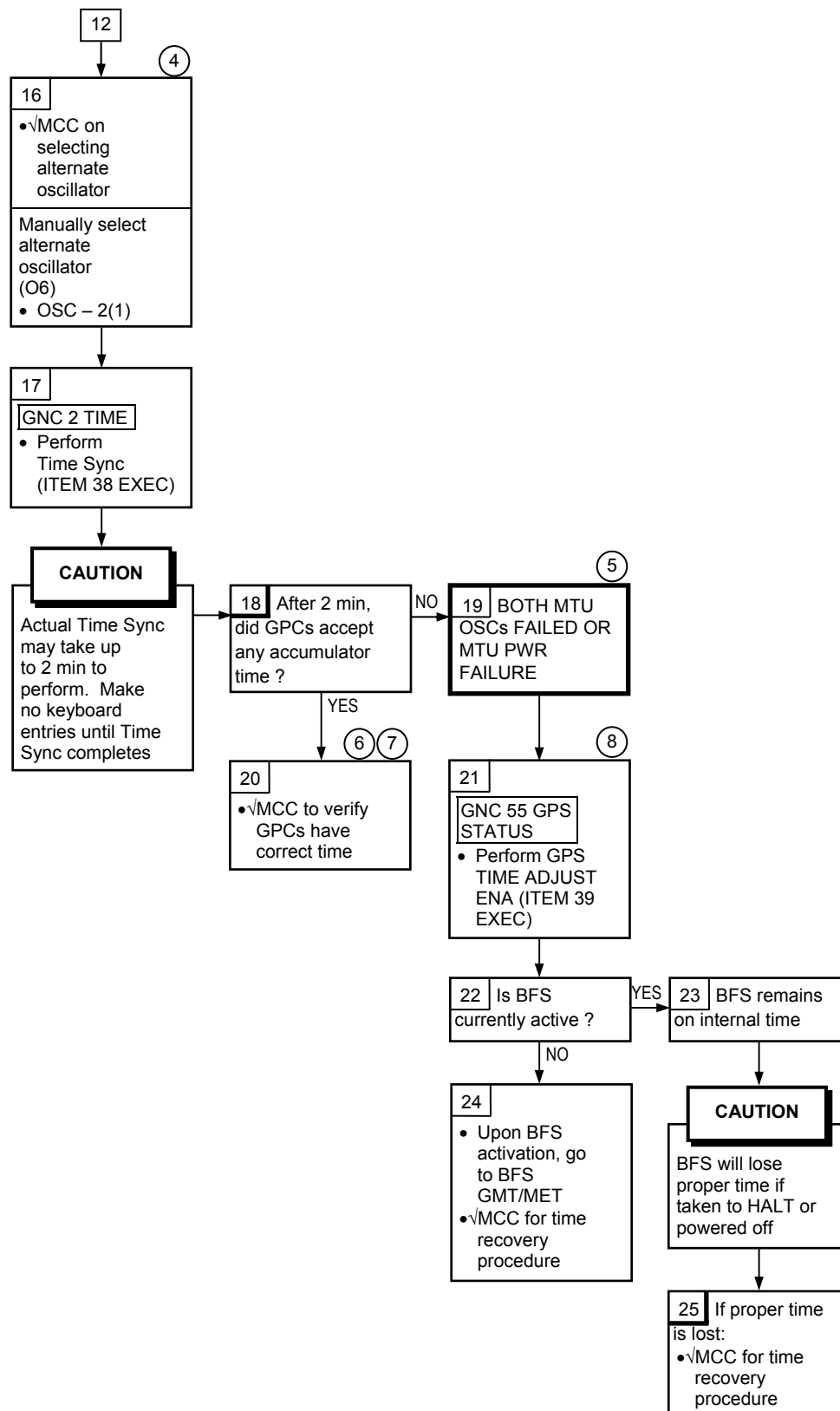
From ORB PKT,
BCE STRG X,
step 5



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



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 It on D&C Timers and reenable MTU sync signals

⑧ If GPS is currently in PVA mode (approximately 1 hr after MTU fails) then MCC will need to uplink a command to the GPS to fix aiding for entry

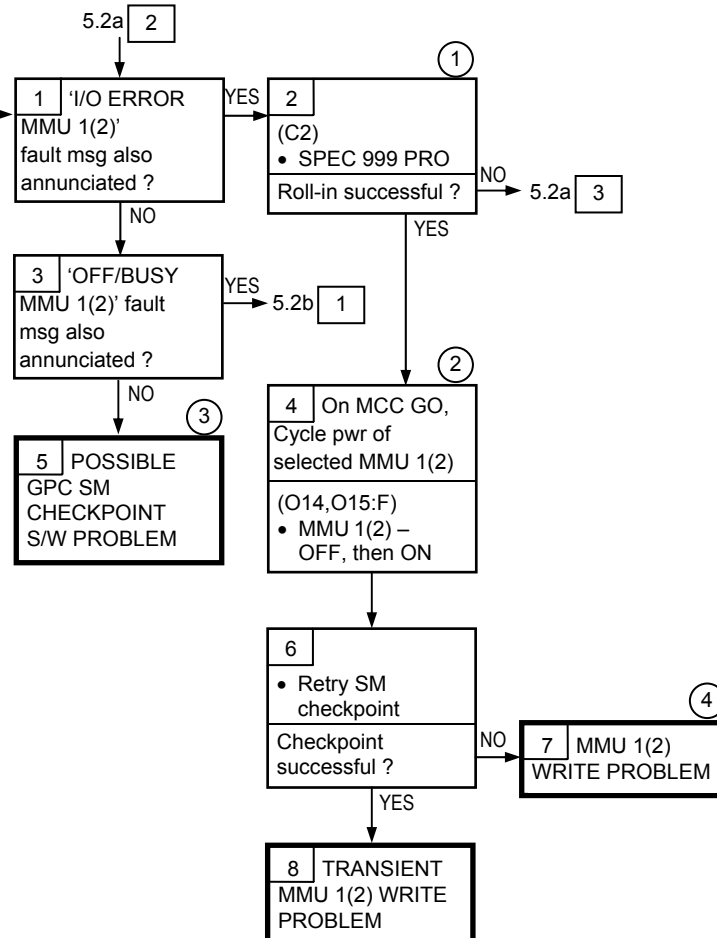
DPS

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 read
transaction
including OPS
transitions, TFL
loads, and SM roll-in
displays

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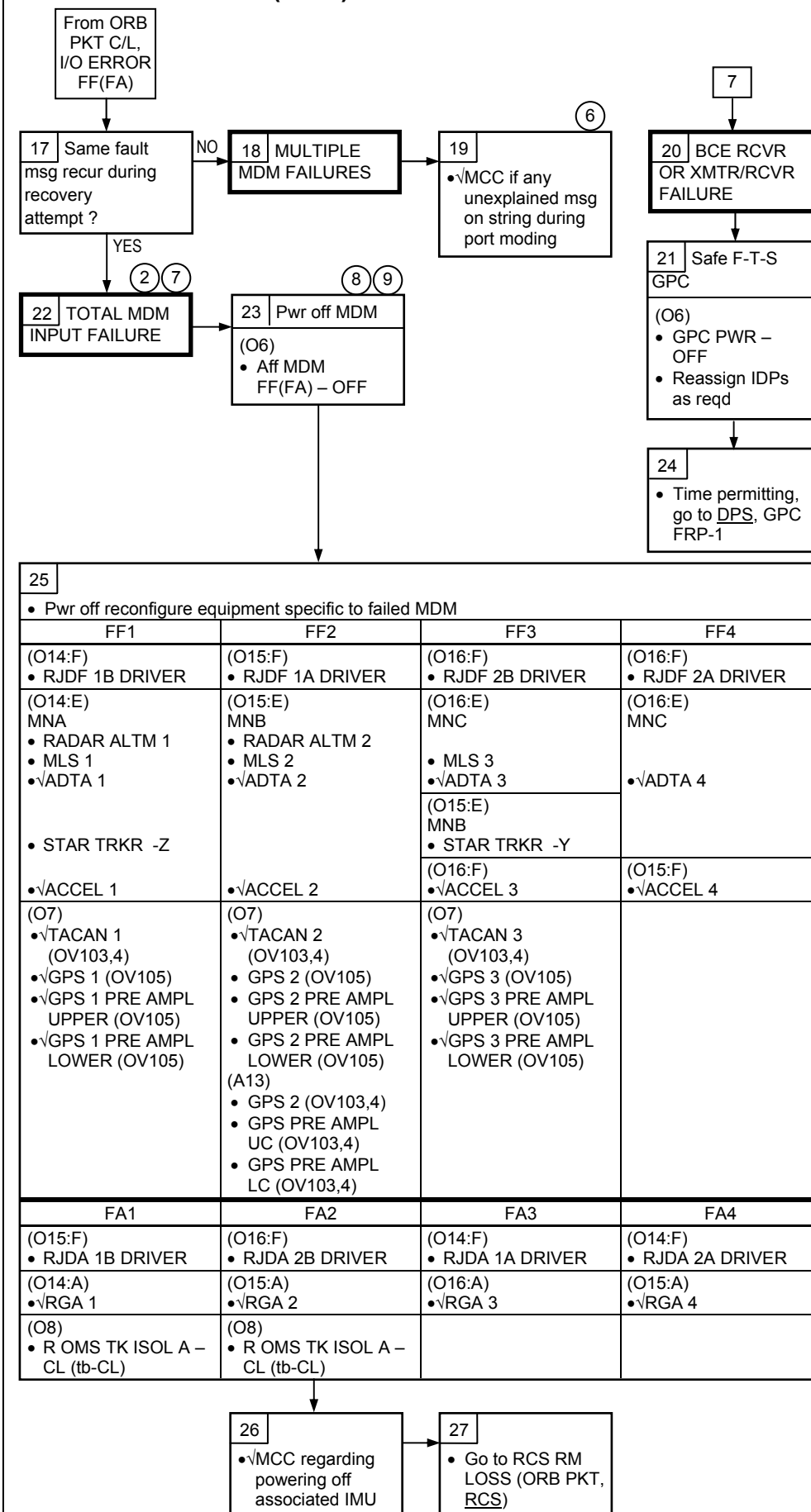
MDM

5.3



DPS

5.3a (Cont)



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

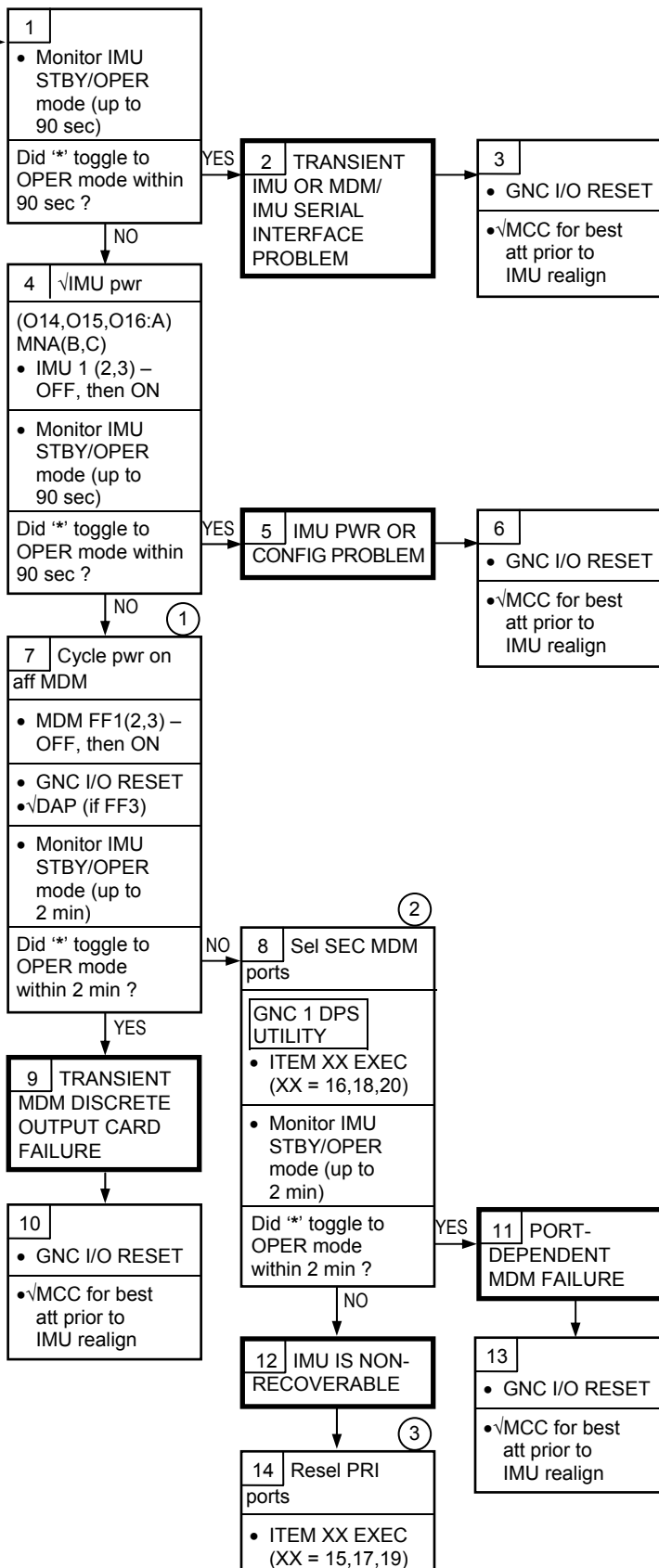
⑧ If next ELEC, ECLS, APU/HYD, GNC, RCS, or DPS failure causes loss of fail-safe capability in FCS or RCS, the MDM may be repowered in order to regain any remaining output capability

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

DPS

5.3b 'BCE STRG X'

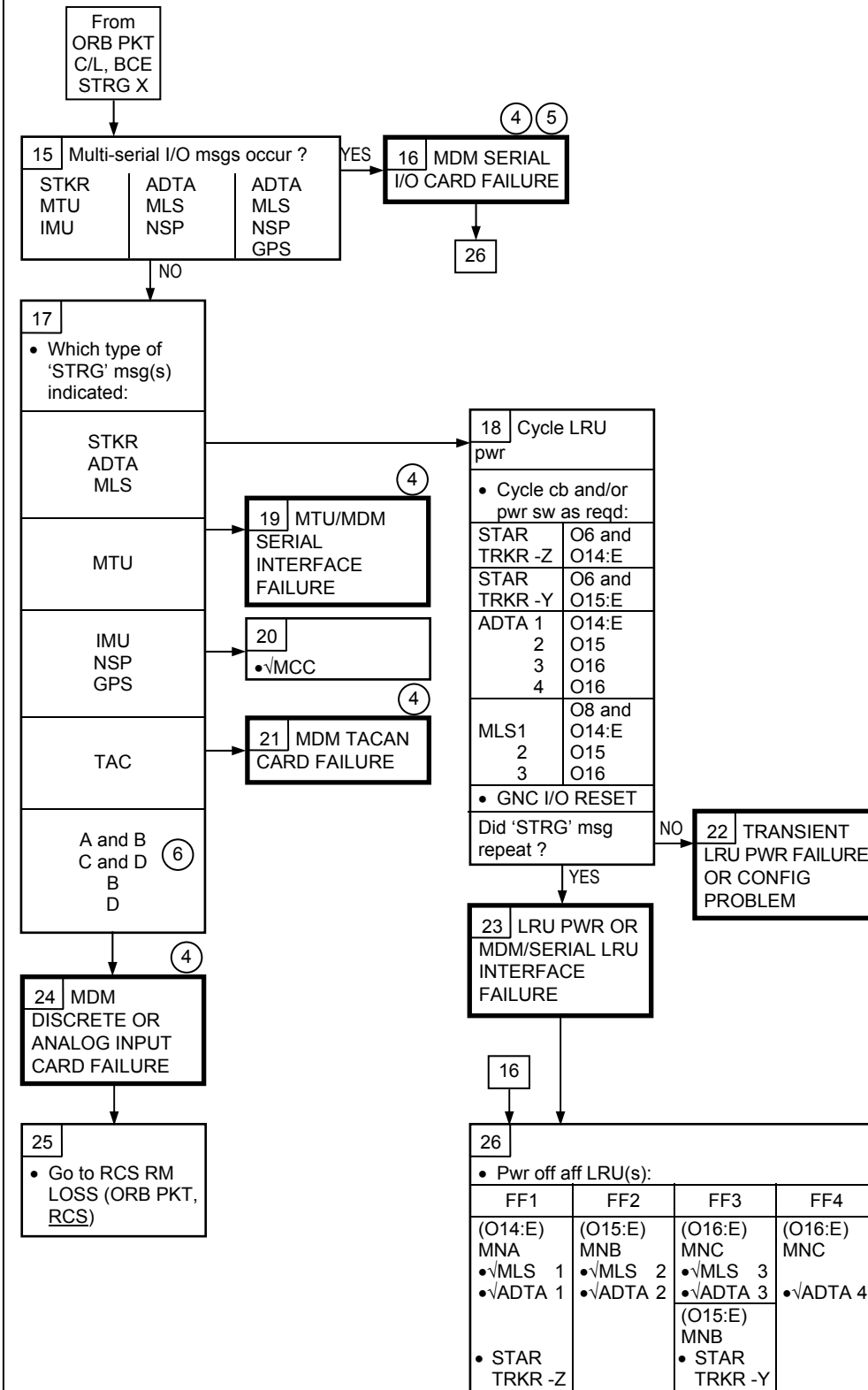
From
ORB PKT C/L,
BCE STRG X,
step 4



① 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

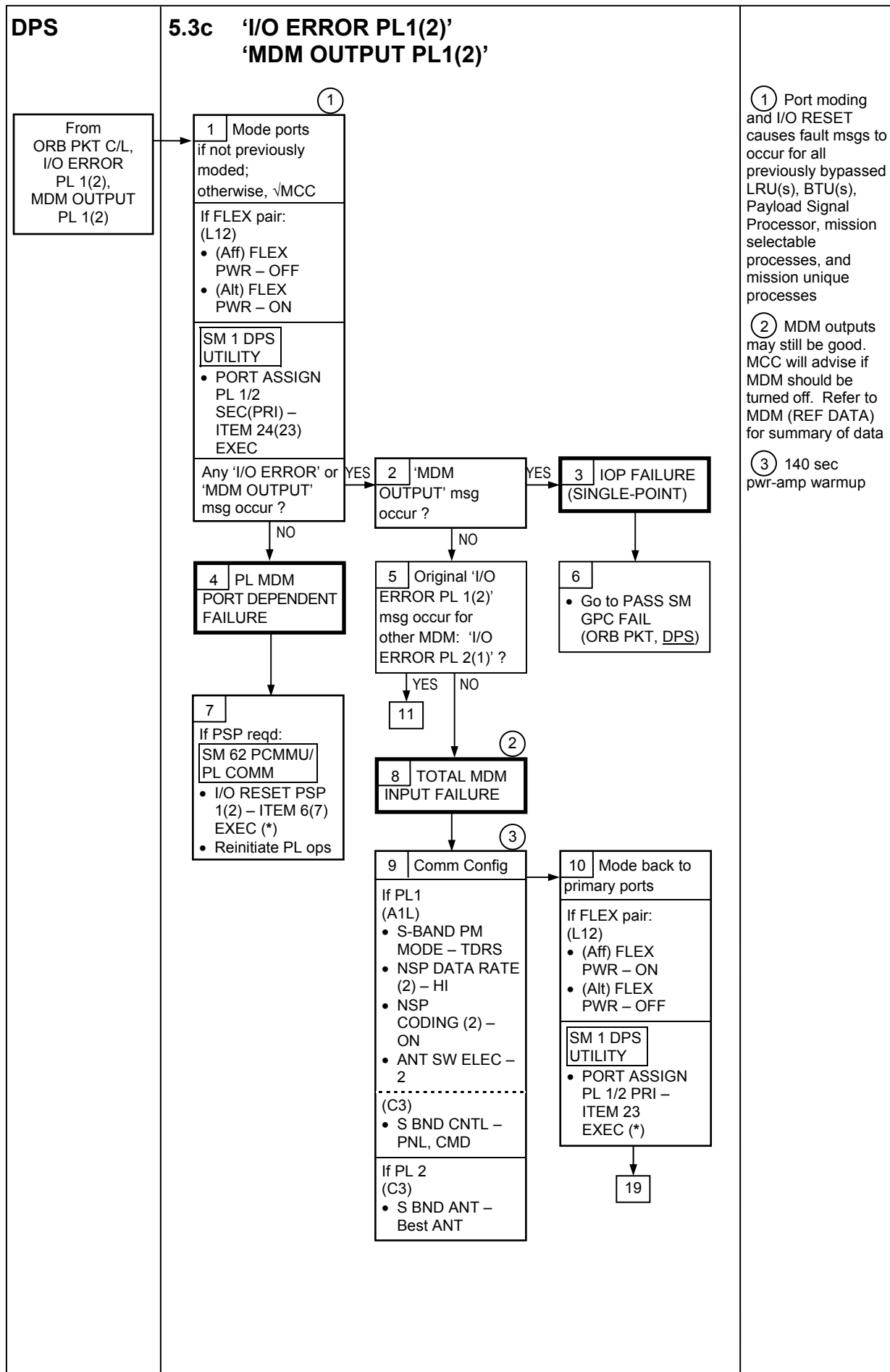


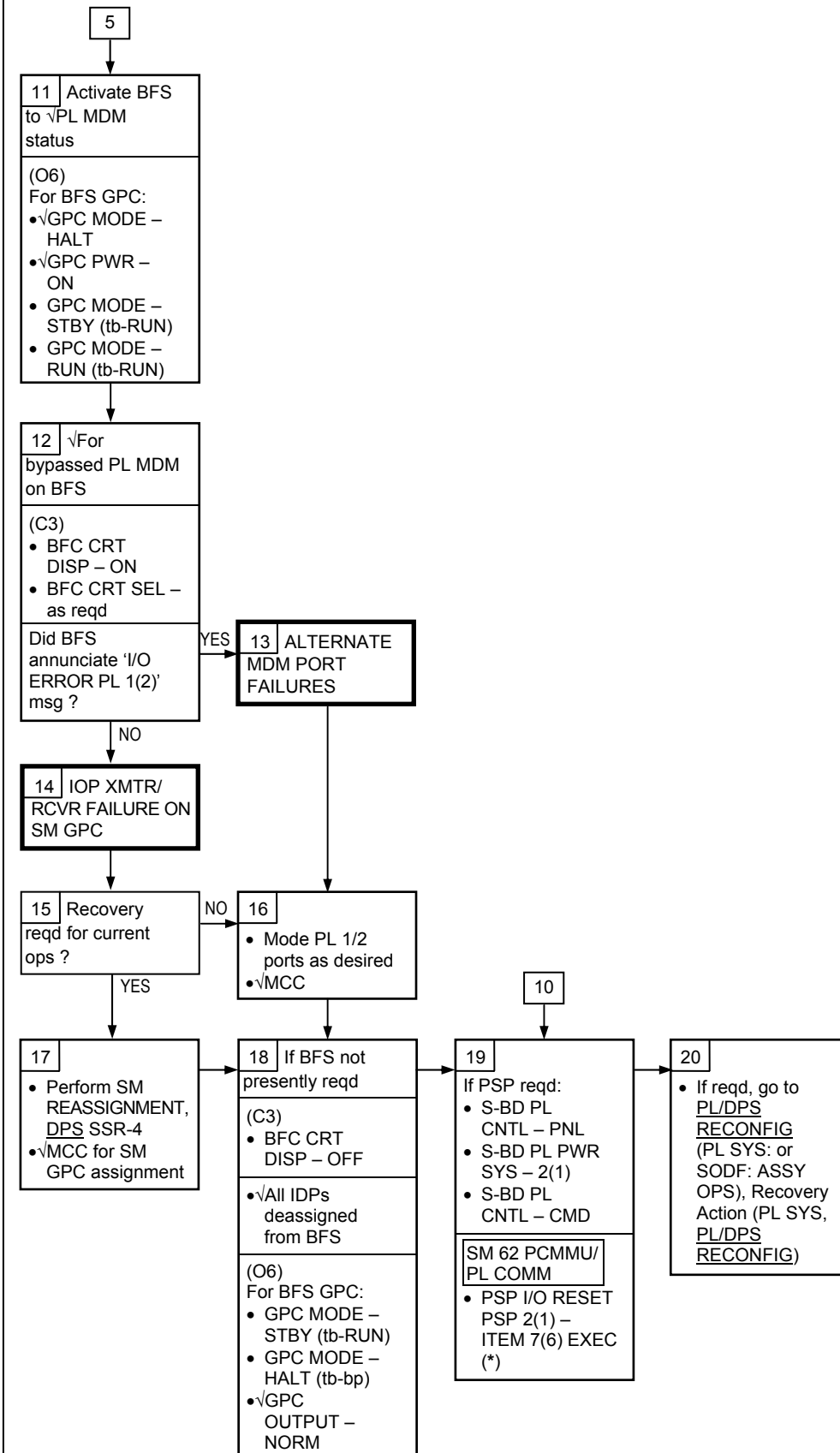
4 Go to MDM (REF) for summary of data lost on nonrecovered MDM

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

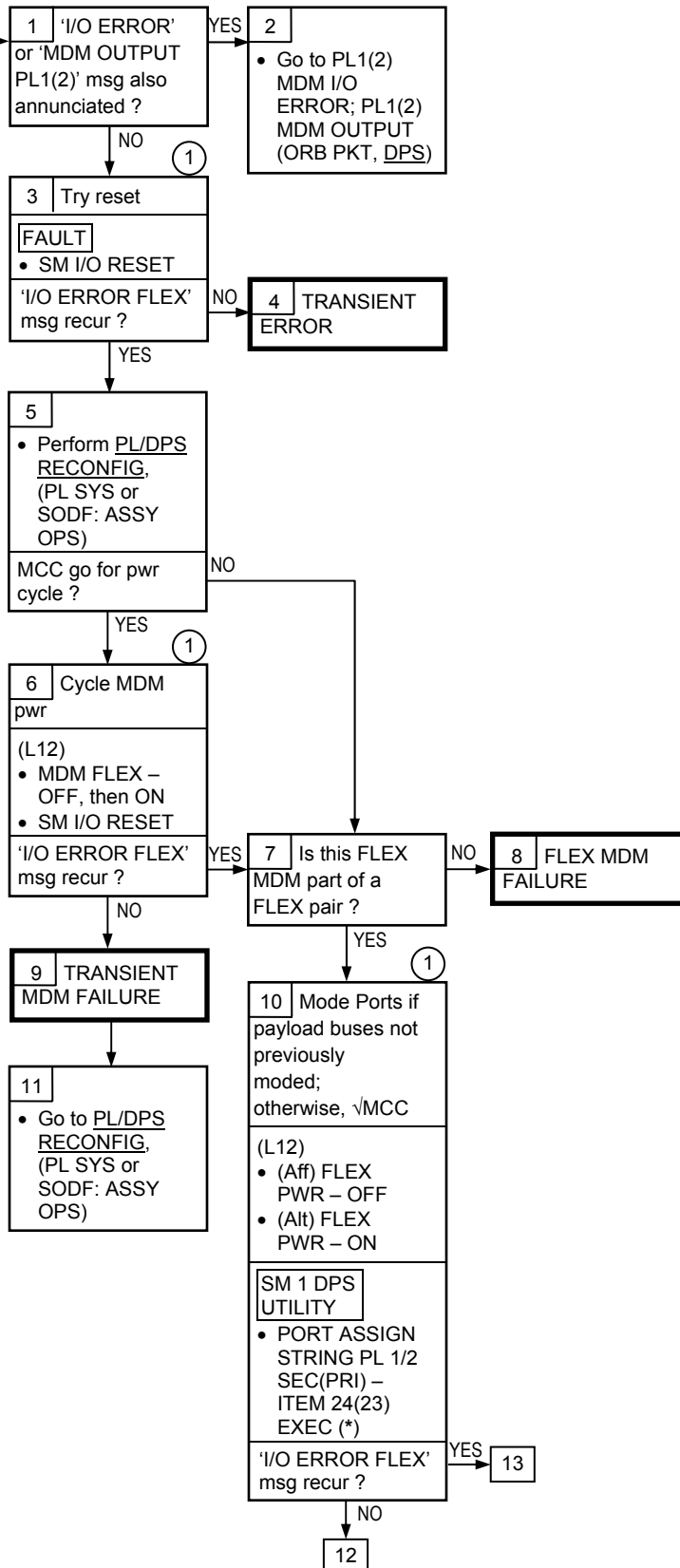
5.3e 'I/O ERROR FLEX'

SM
ALERT

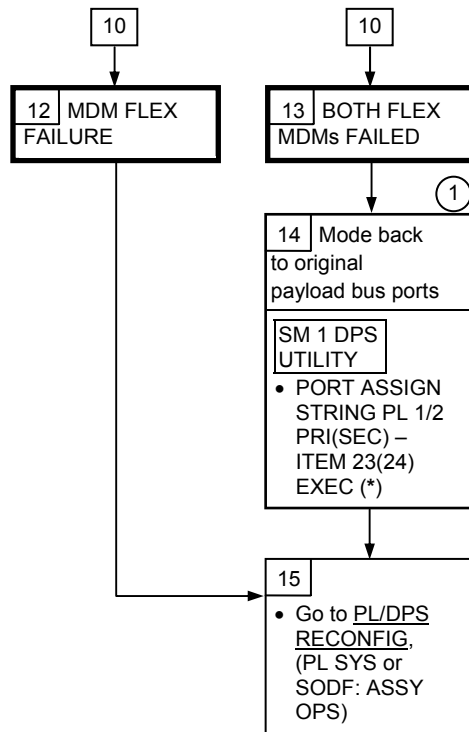
I/O ERROR
FLEX

If:
MDM FLEX 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 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



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

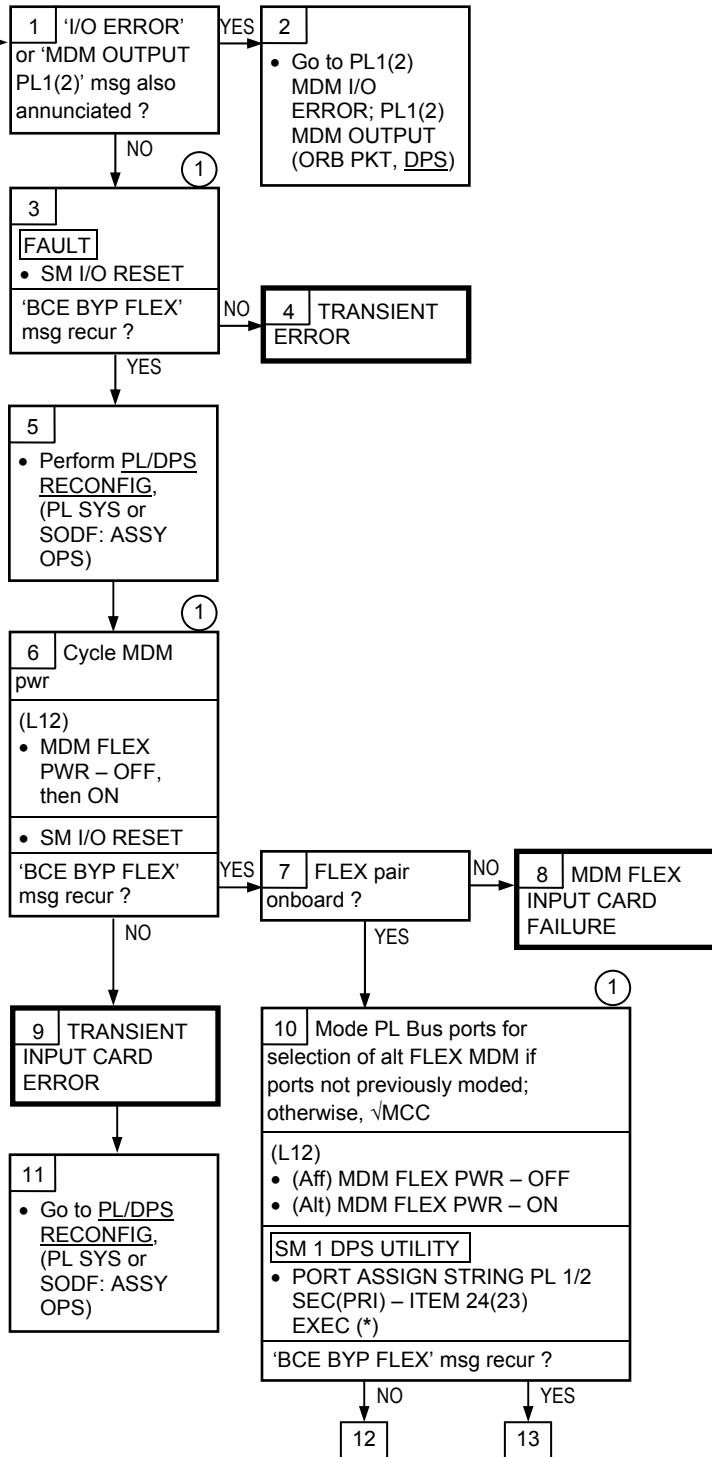
5.3f 'BCE BYP FLEX'

SM
ALERT

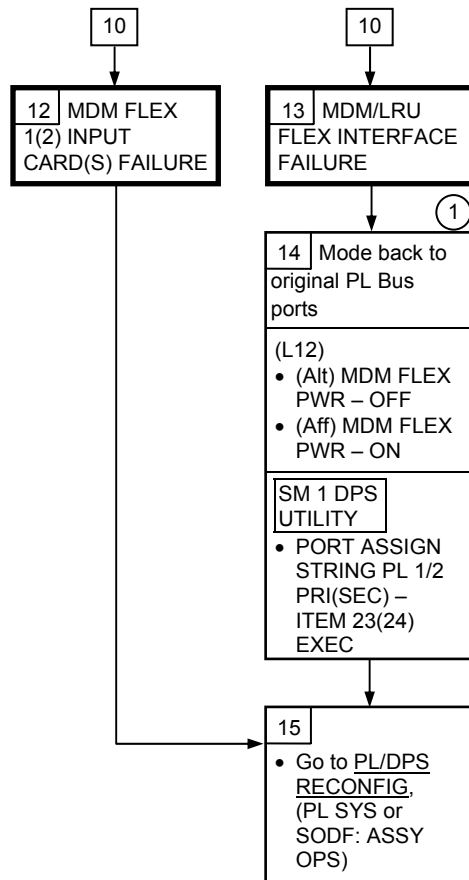
BCE BYP
FLEX

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



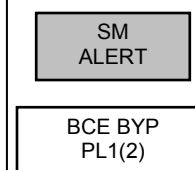
① Port moding or I/O RESET causes fault msgs to occur for all previously bypassed LRU(s), BTU(s), Payload Signal Processor, mission selectable processes, and mission unique processes



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

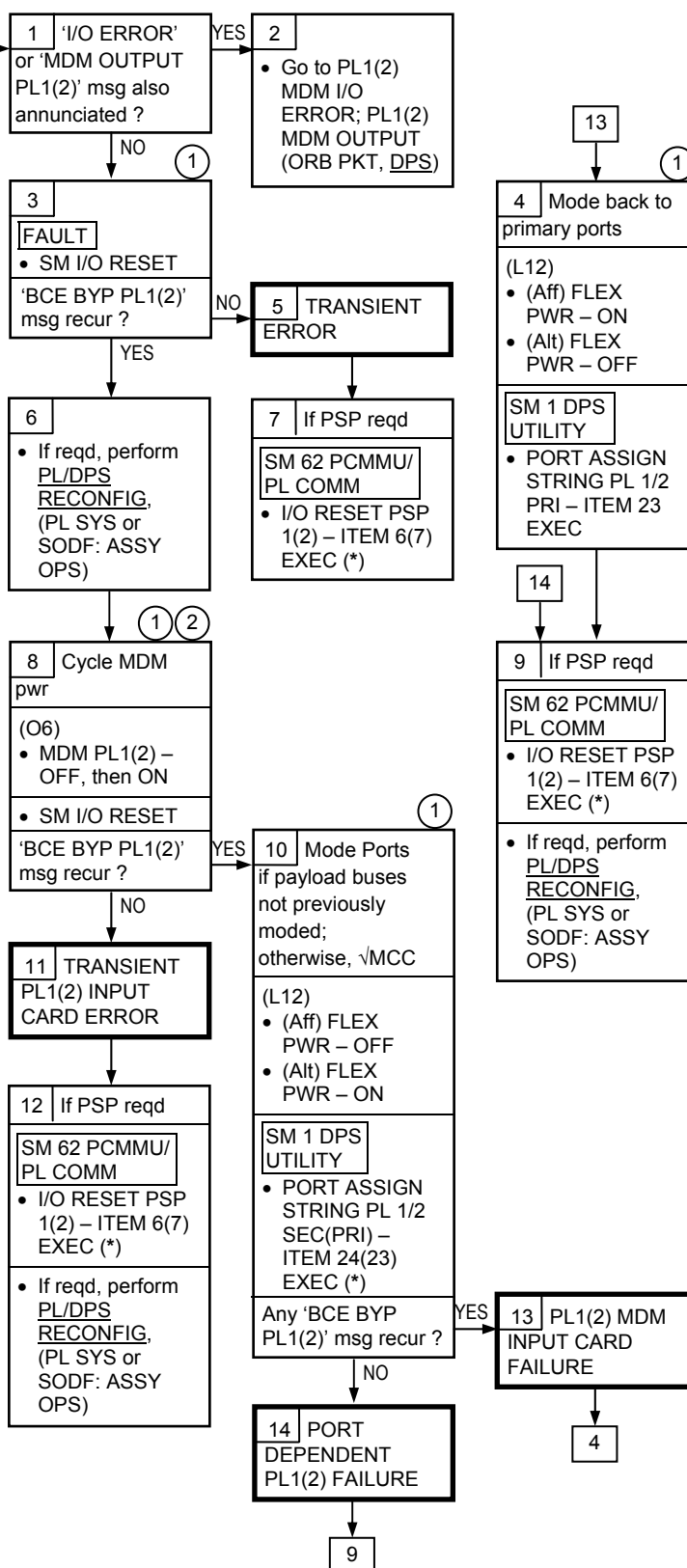
DPS

5.3g 'BCE BYP PL1(2)'



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

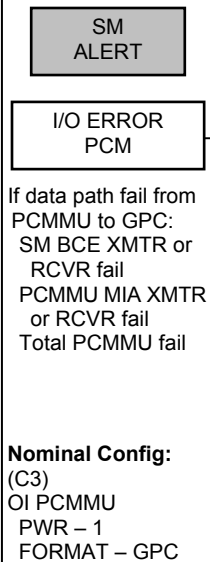
Nominal Config:
(O6)
MDM PL1,2 – ON



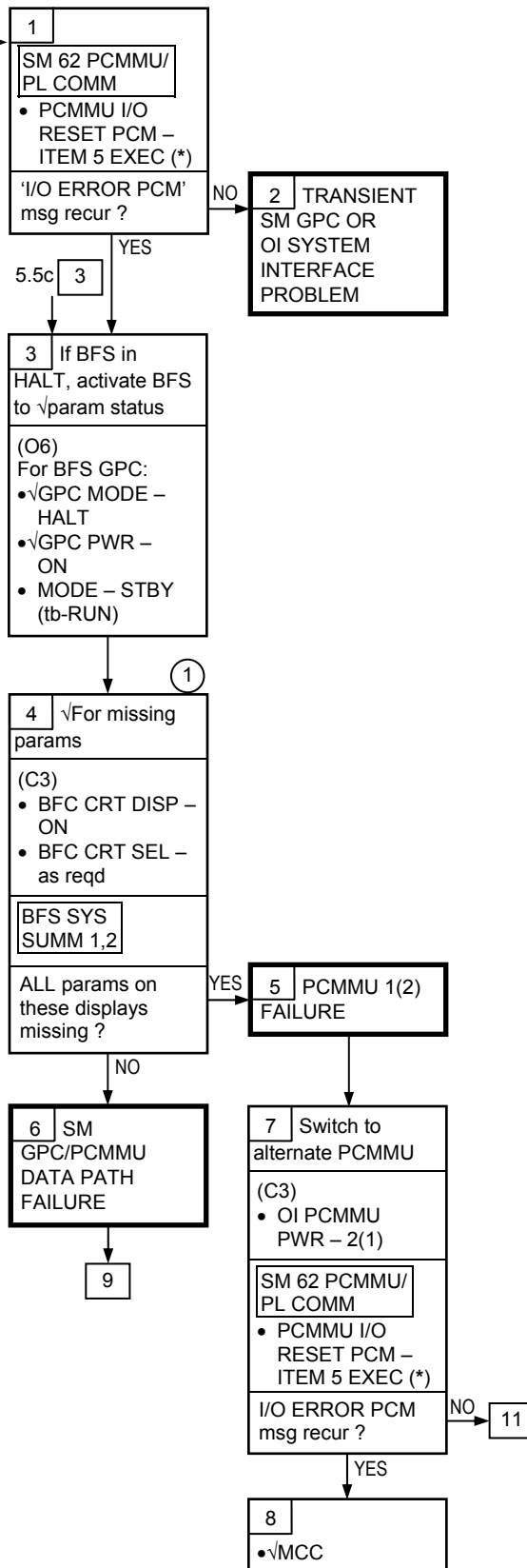
- ① Port moding and I/O RESET causes fault msgs to occur for all previously bypassed LRU(s), BTU(s), Payload Signal Processor, mission selectable processes, and mission unique processes
- ② Associated GCIL Decoder now disabled

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DPS

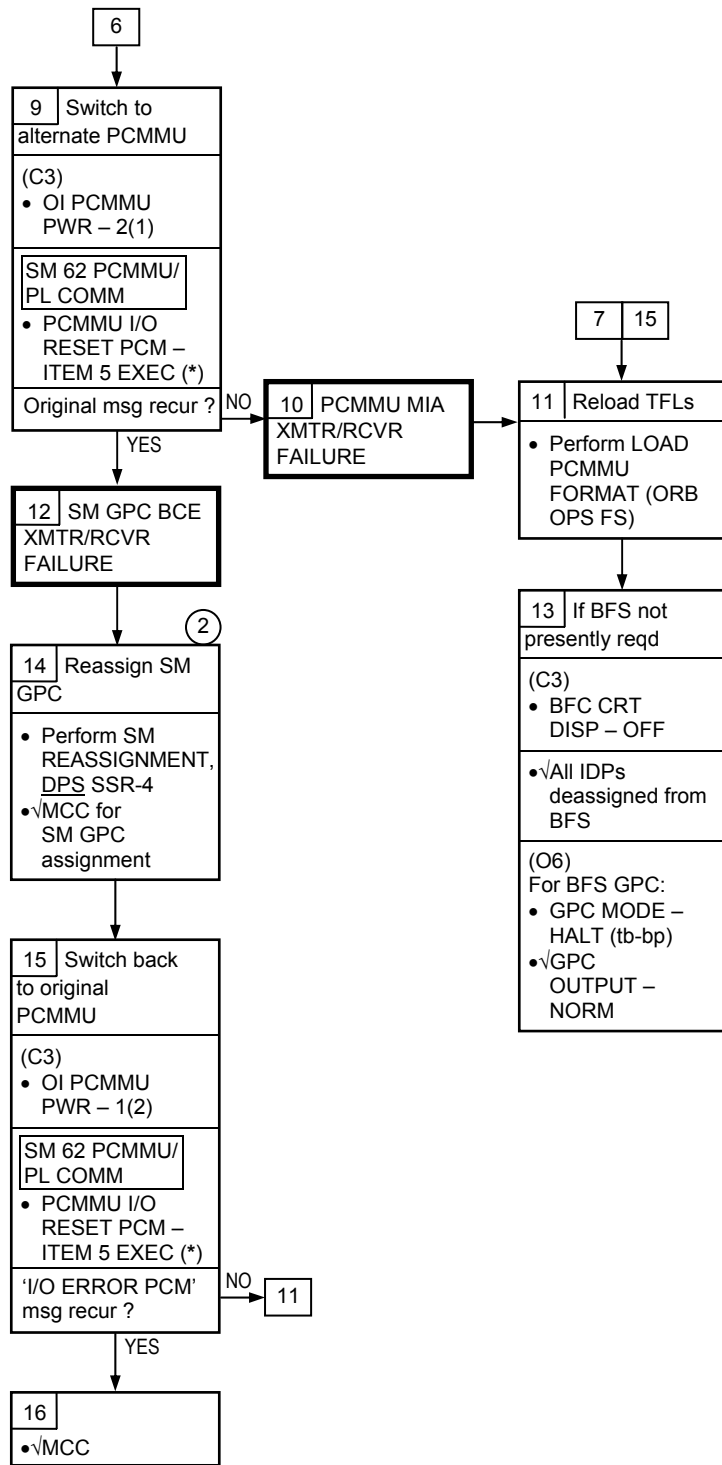


5.5a 'I/O ERROR PCM' (SM)



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

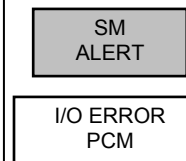
DPS 5.5a (Cont)



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

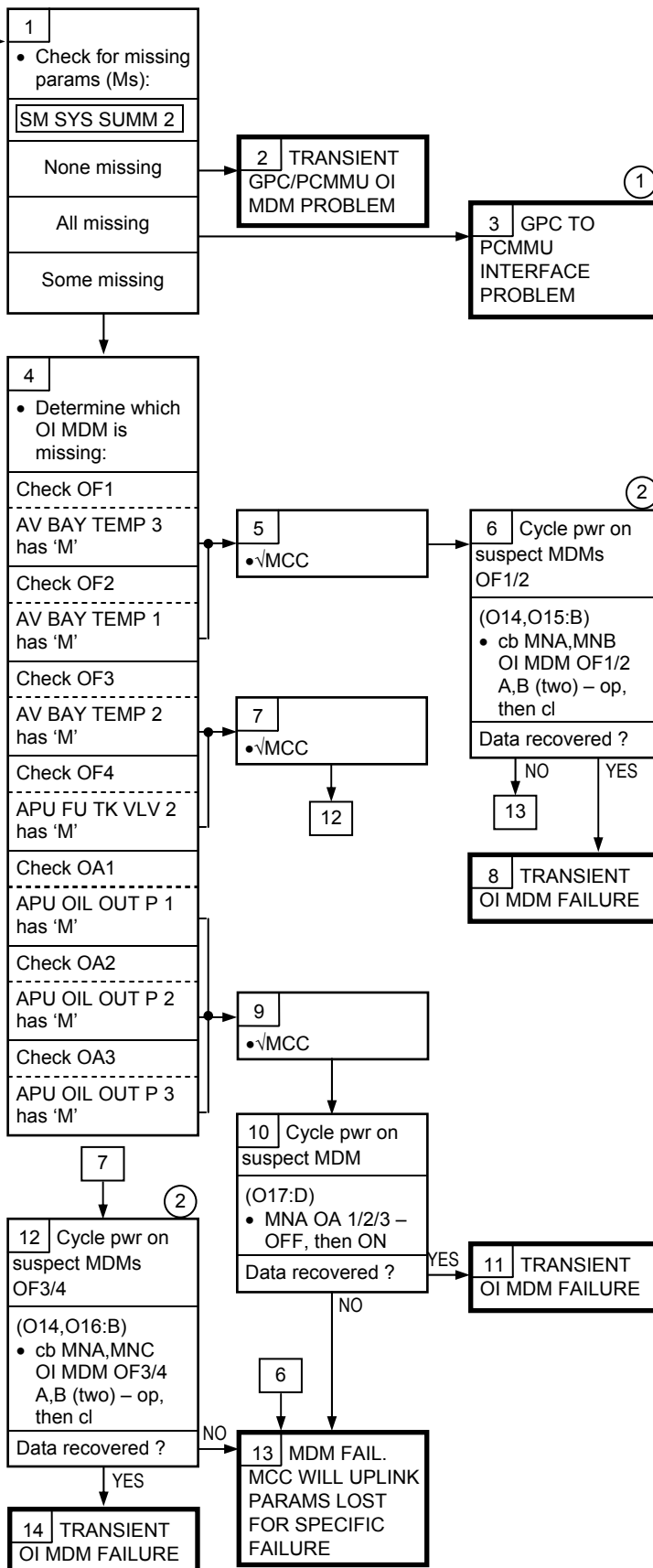
DPS

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



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

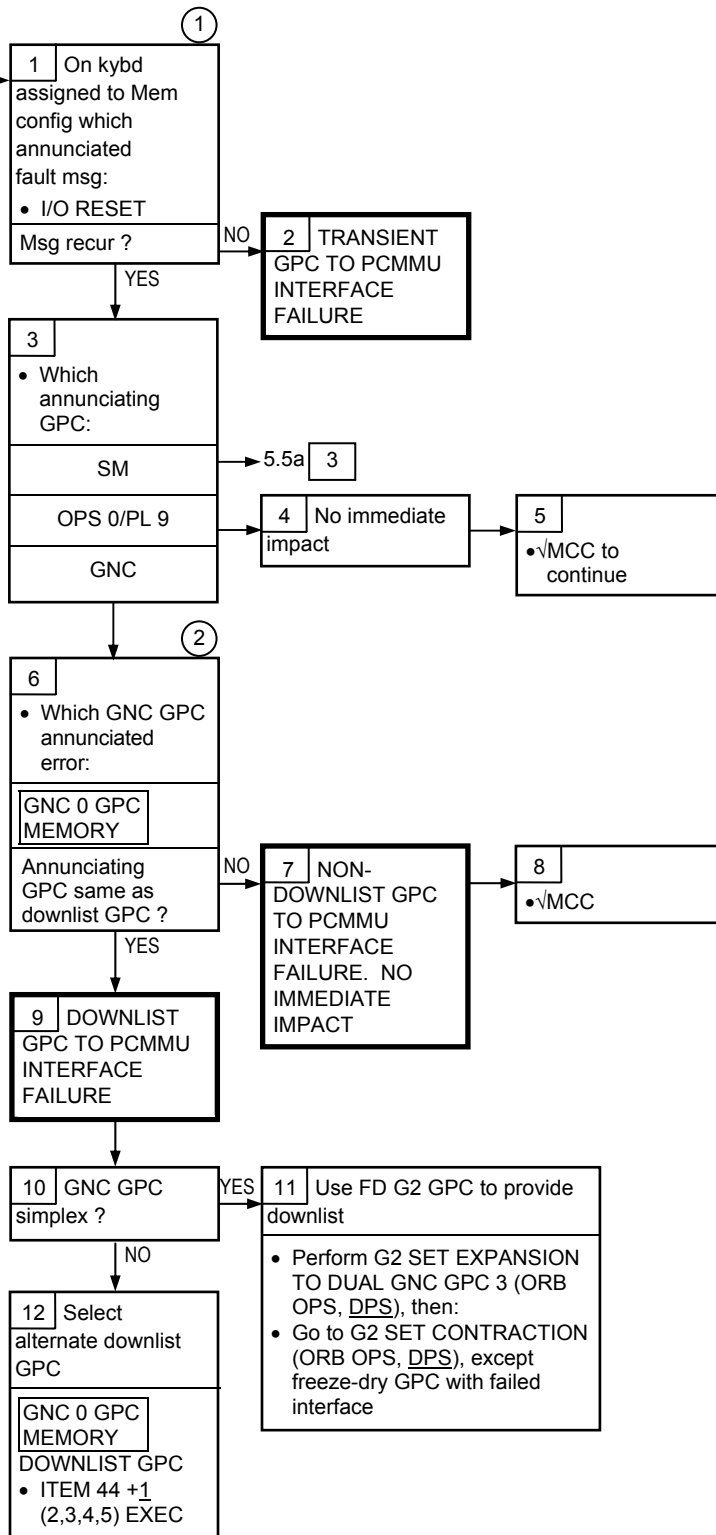
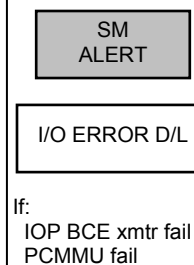


① √MCC regarding PCMMU switch. Selection of alternate PCMMU may preclude MCC viewing LDR telemetry

② Do not cycle open cb. √MCC

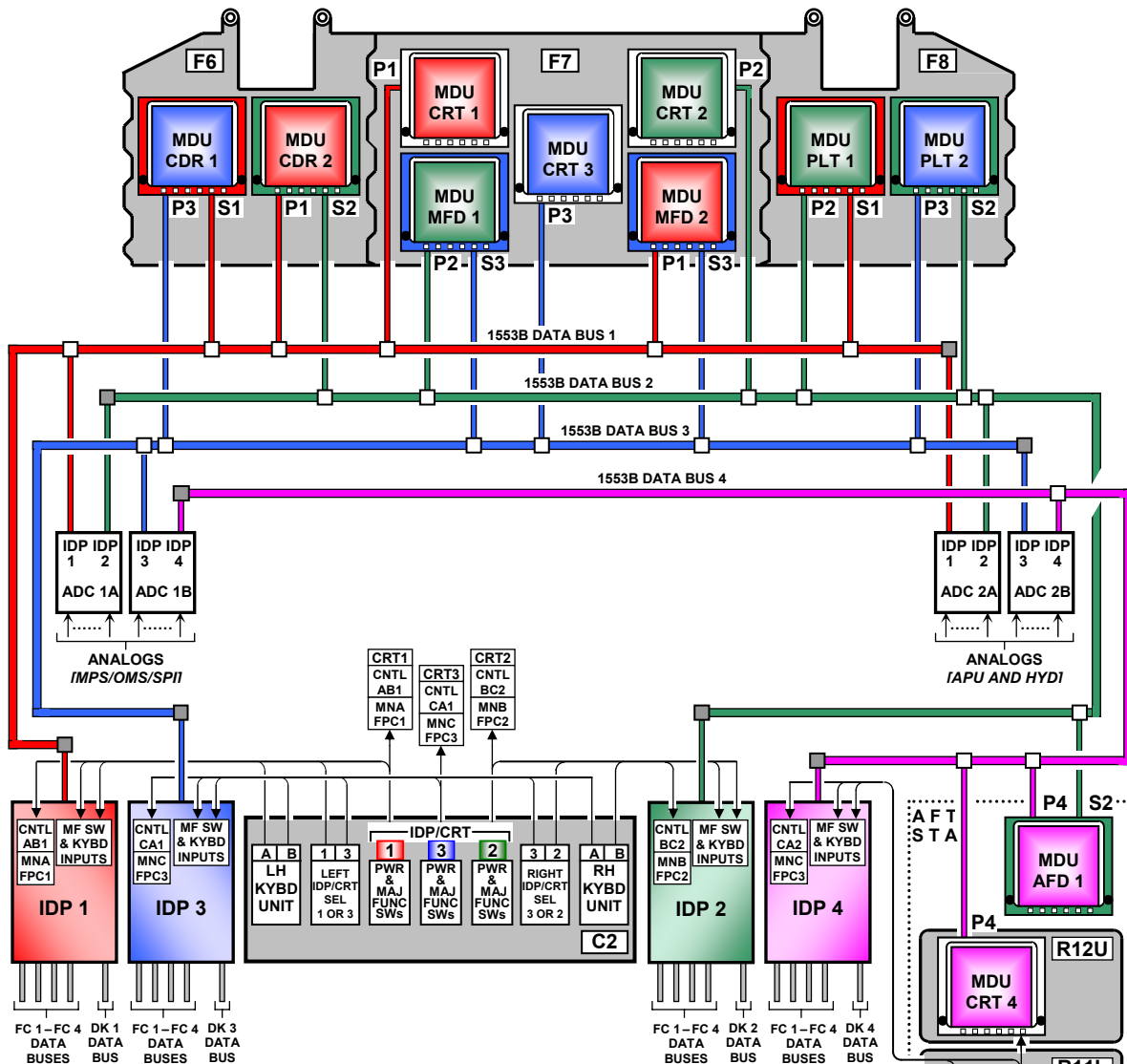
DPS

5.5c 'I/O ERROR D/L'

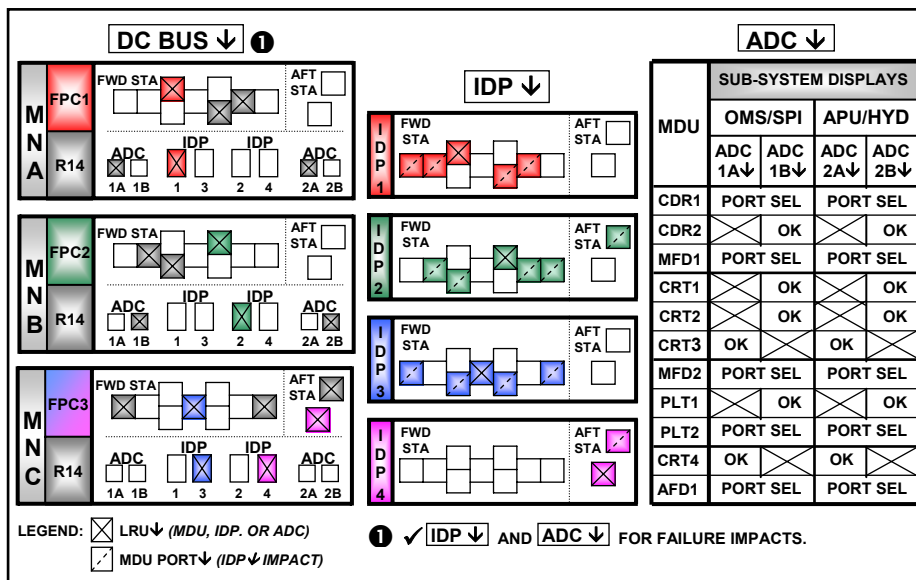


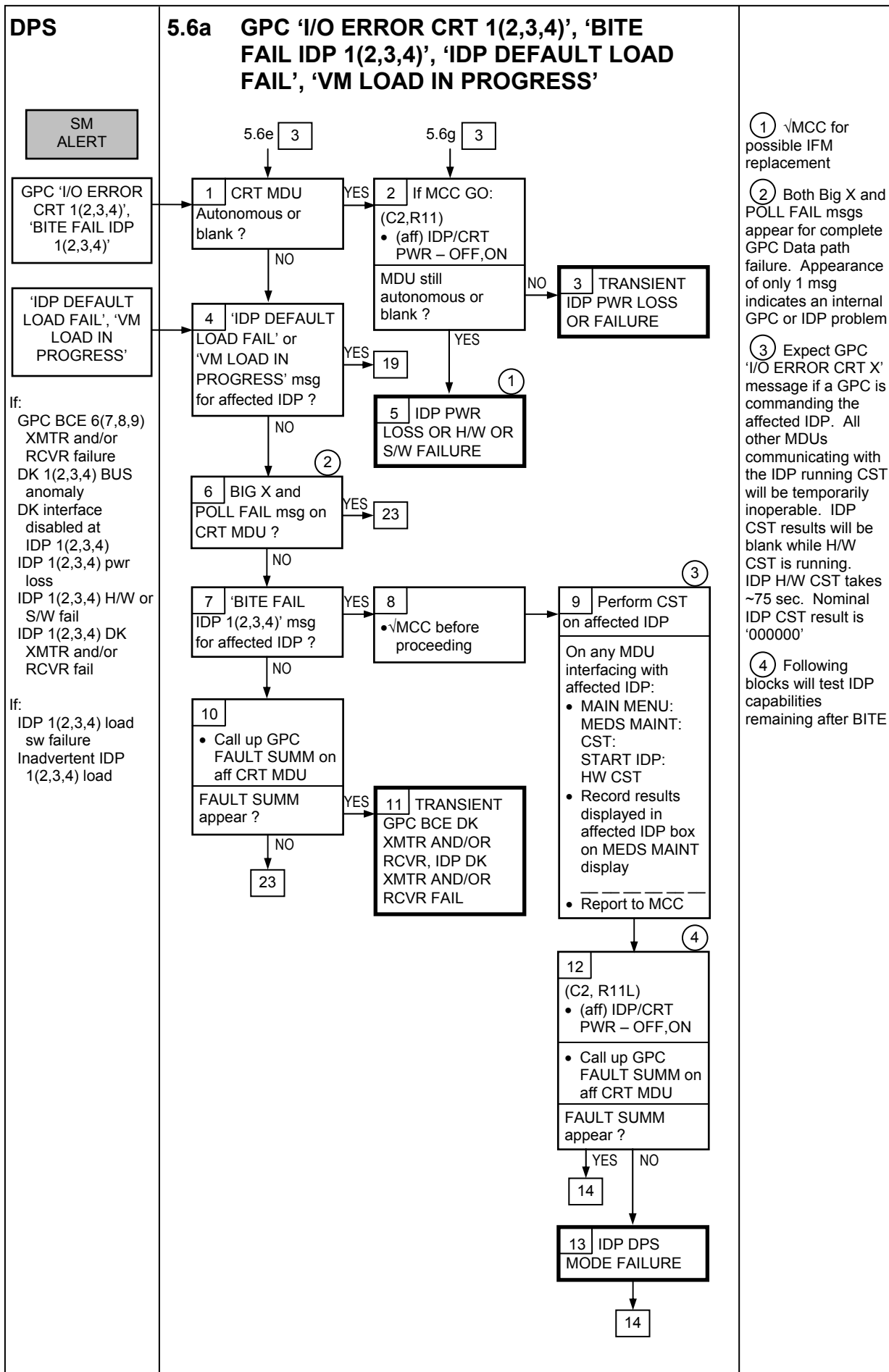
- ① I/O RESET not reqd to reestablish downlist. Action only verifies that anomaly continues
- ② All PASS GPCs output downlist. PCMMU ignores all but selected downlist GPC

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MEDS OVERVIEW
[POWER AND INTERNAL 1553B DATA BUS CONFIGURATION]

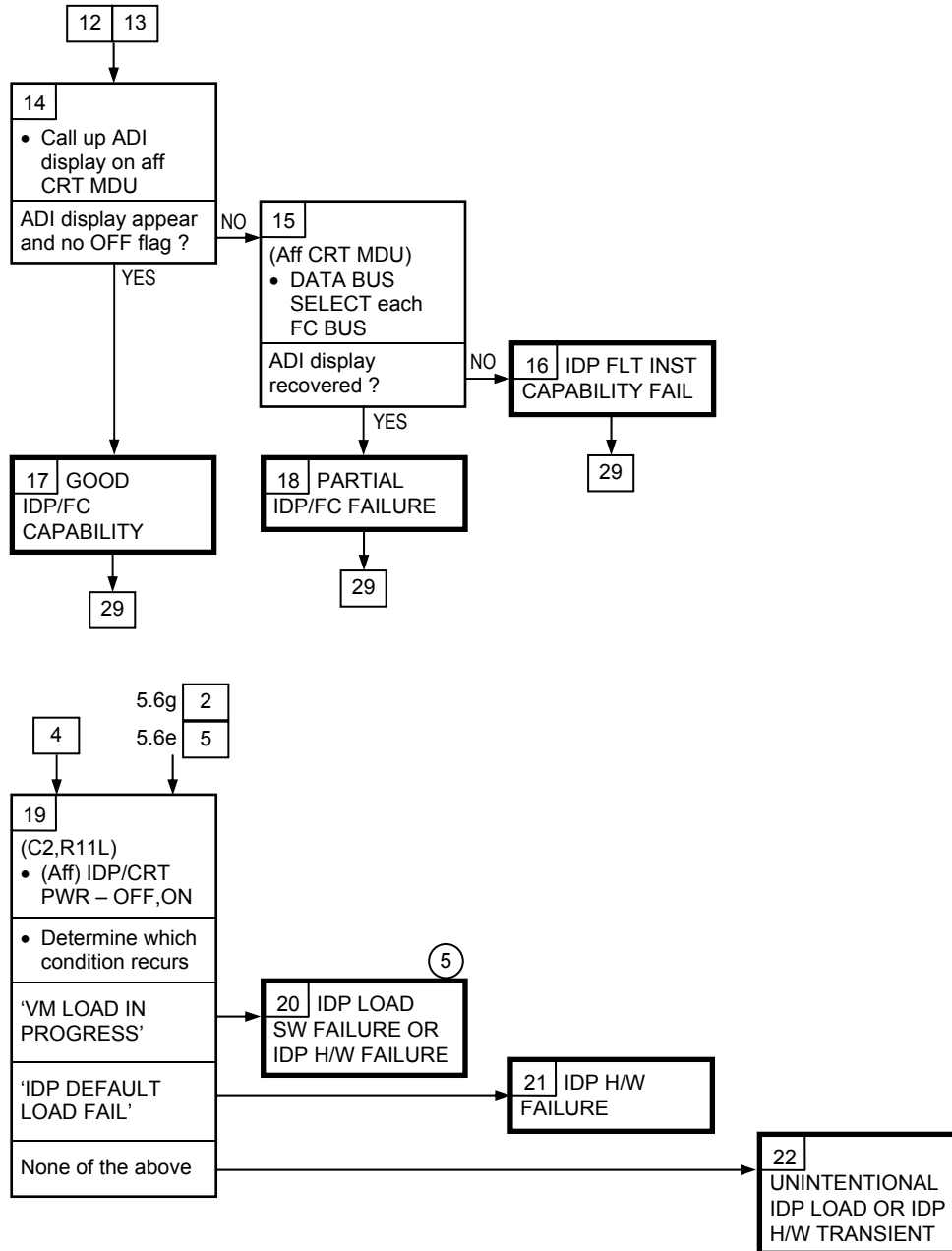


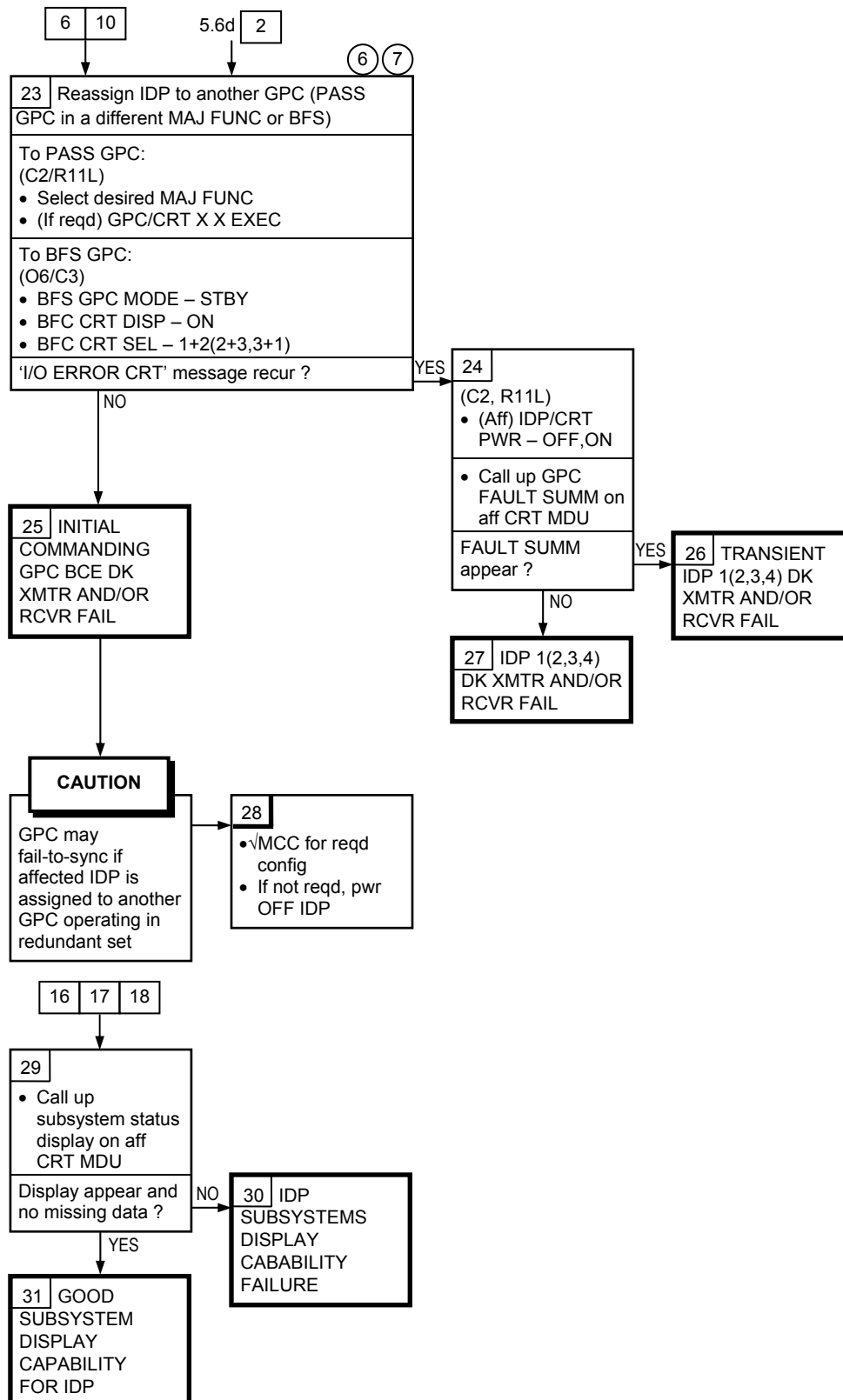


DPS

5.6a (Cont)

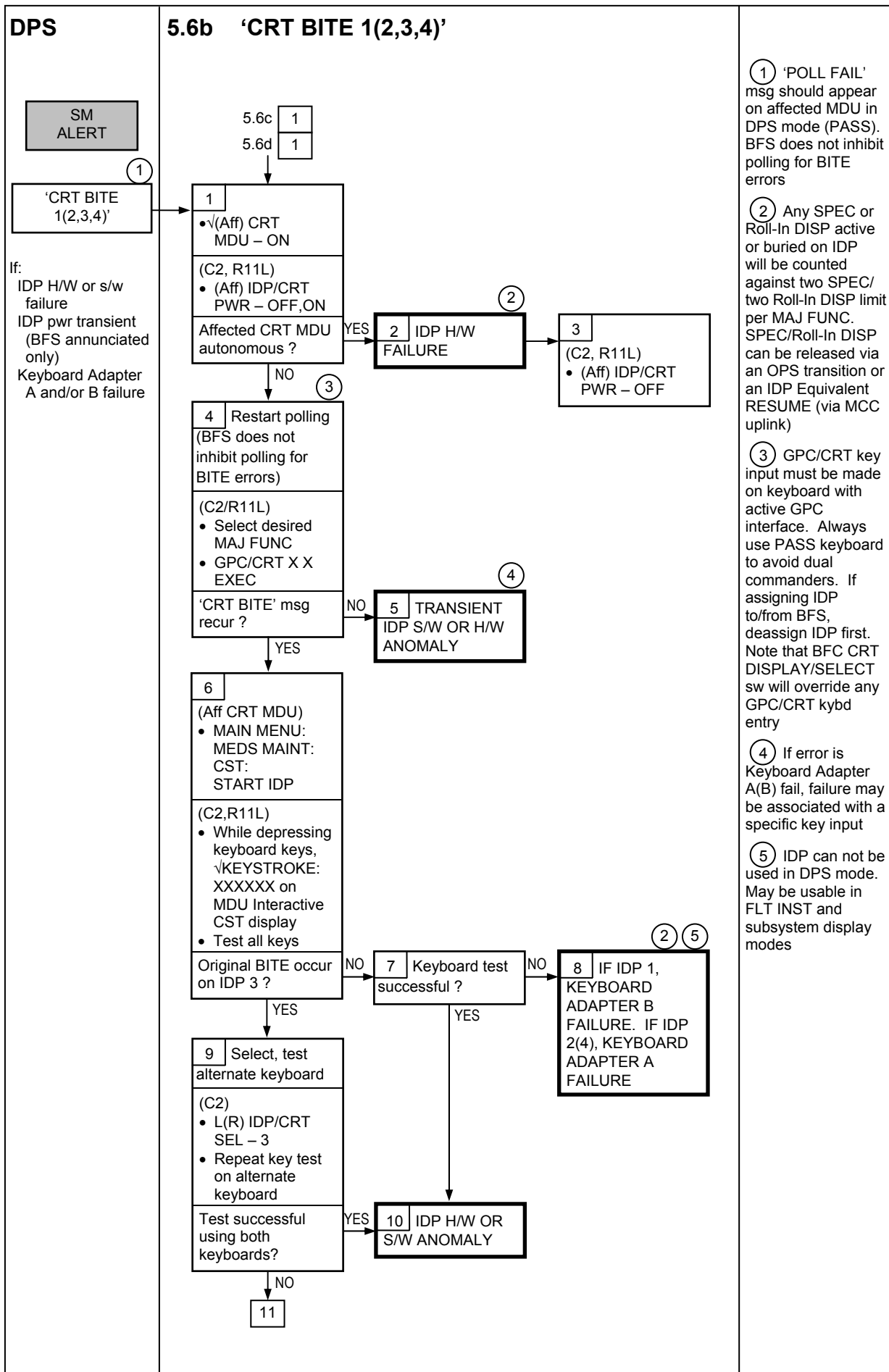
⑤ IDP cannot be used in DPS mode

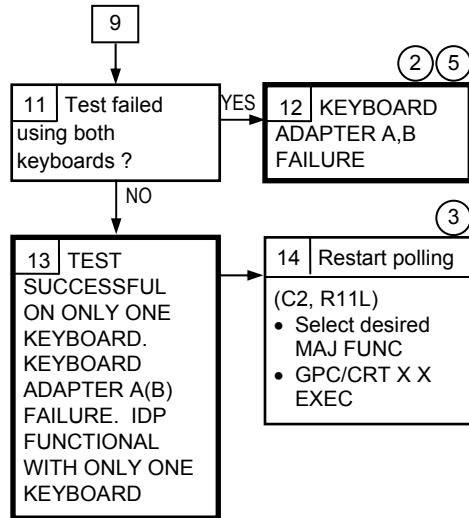




⑥ Any SPEC or Roll-In DISP active or buried on IDP will be counted against two SPEC/ two Roll-In DISP limit per MAJ FUNC. SPEC/Roll-In DISP can be released via an OPS transition or an IDP Equivalent RESUME (via MCC uplink)

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

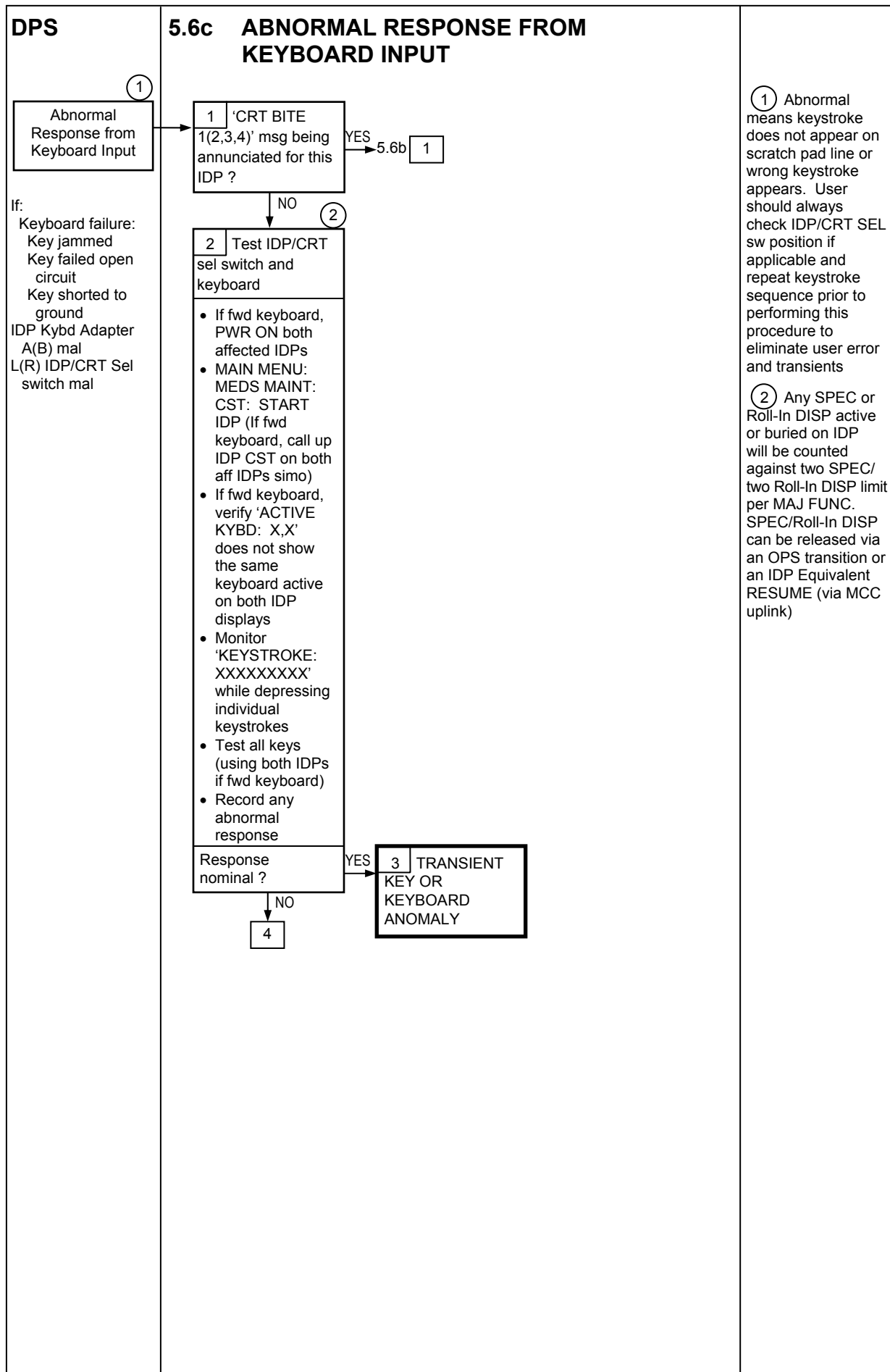


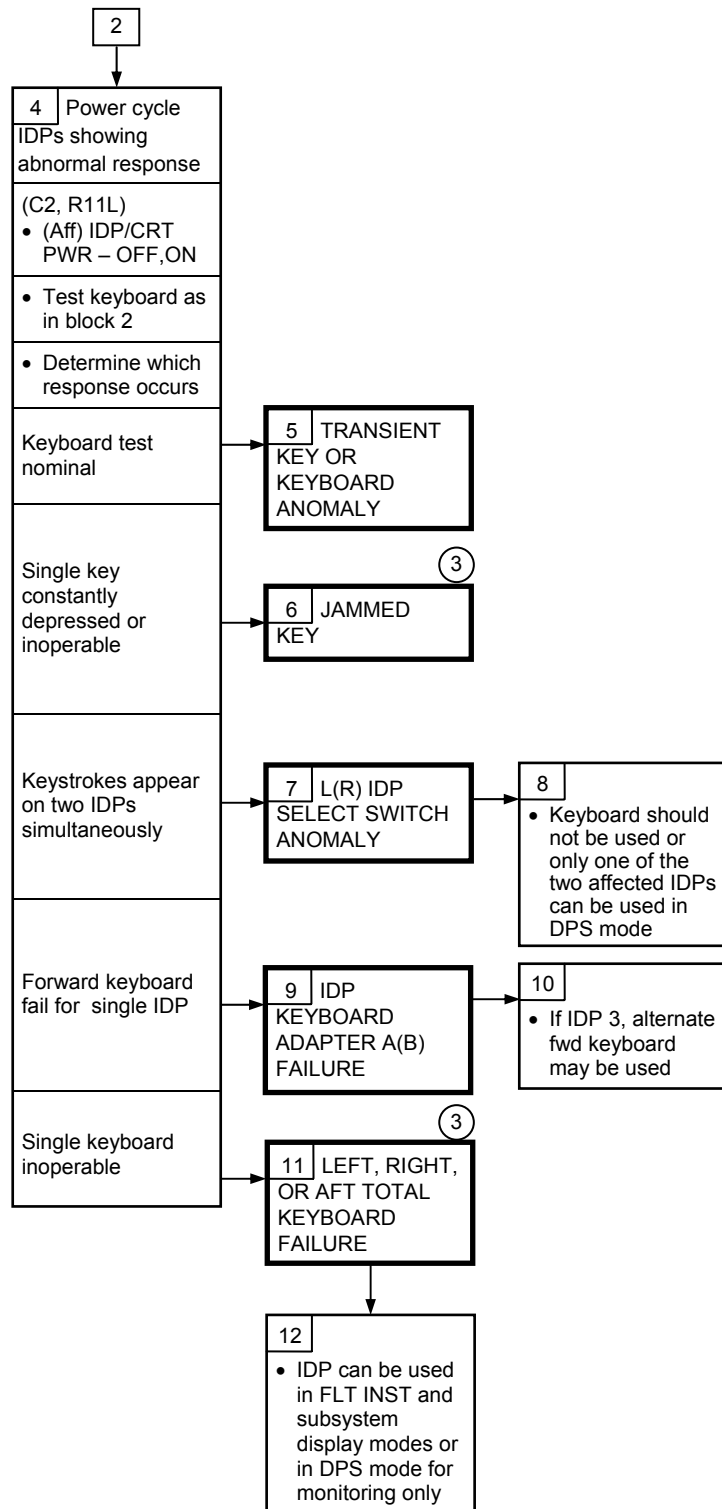


② Any SPEC or Roll-In DISP active or buried on IDP will be counted against two SPEC/ two Roll-In DISP limit per MAJ FUNC. SPEC/Roll-In DISP can be released via an OPS transition or an IDP Equivalent RESUME (via MCC uplink)

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

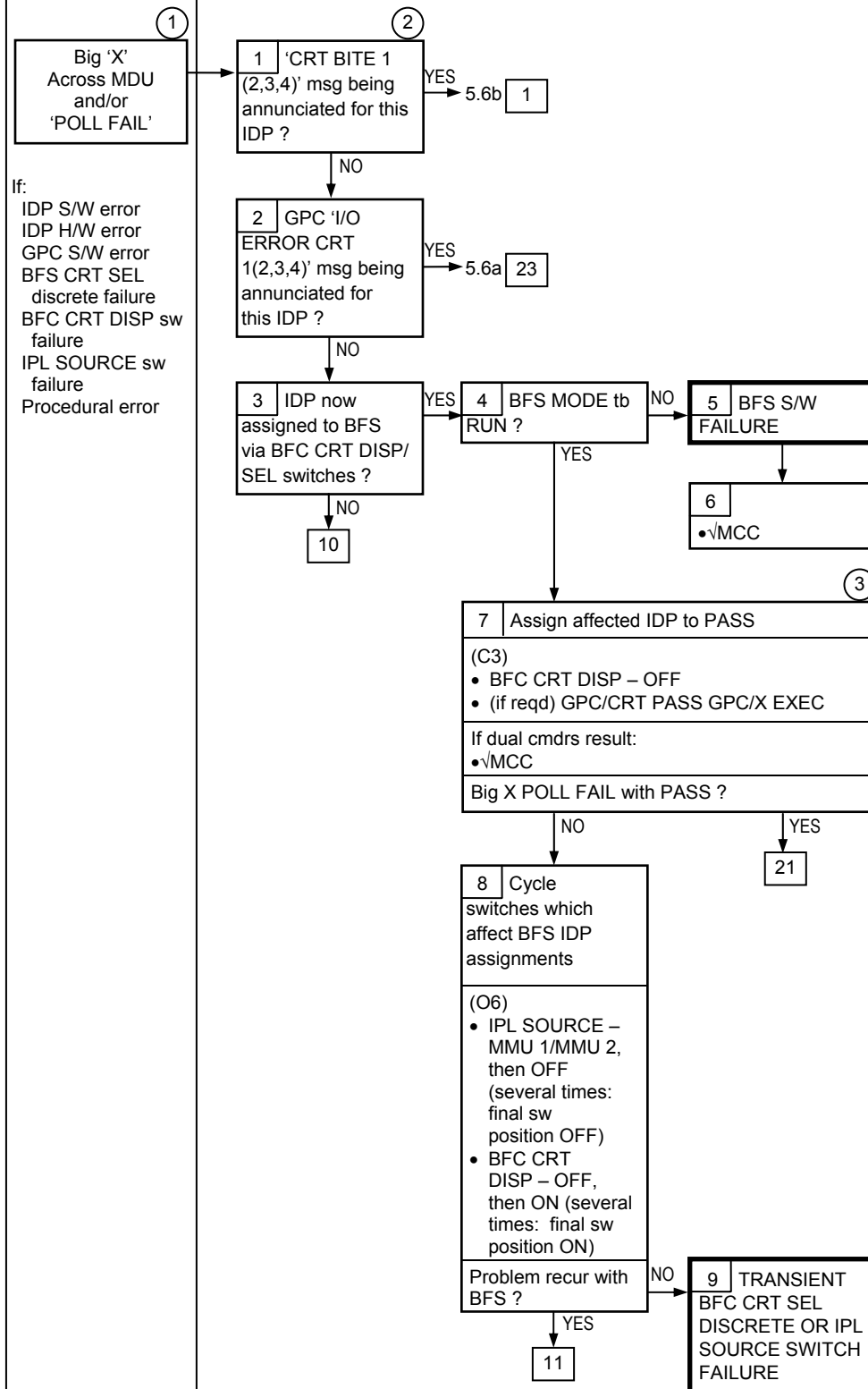
⑤ IDP can not be used in DPS mode. May be usable in FLT INST and subsystem display modes





DPS

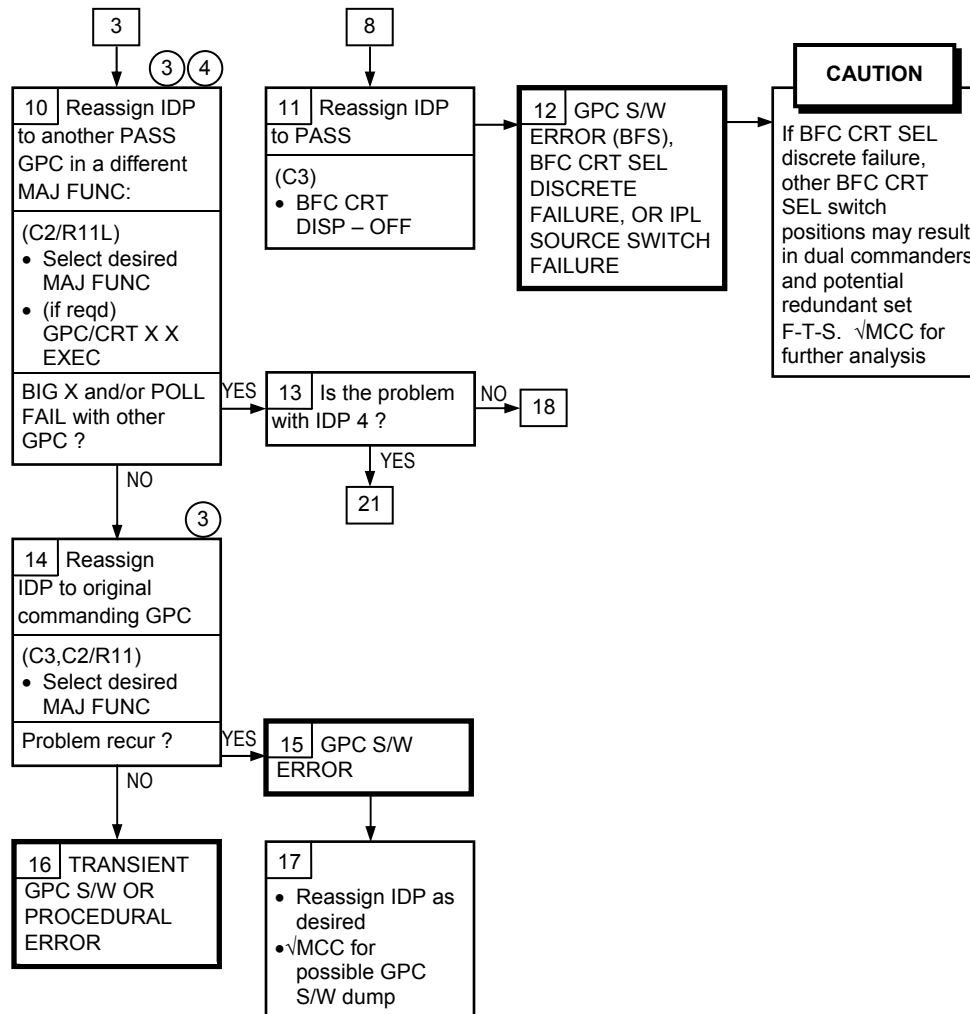
5.6d BIG 'X' ACROSS MDU AND/OR 'POLL FAIL'



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

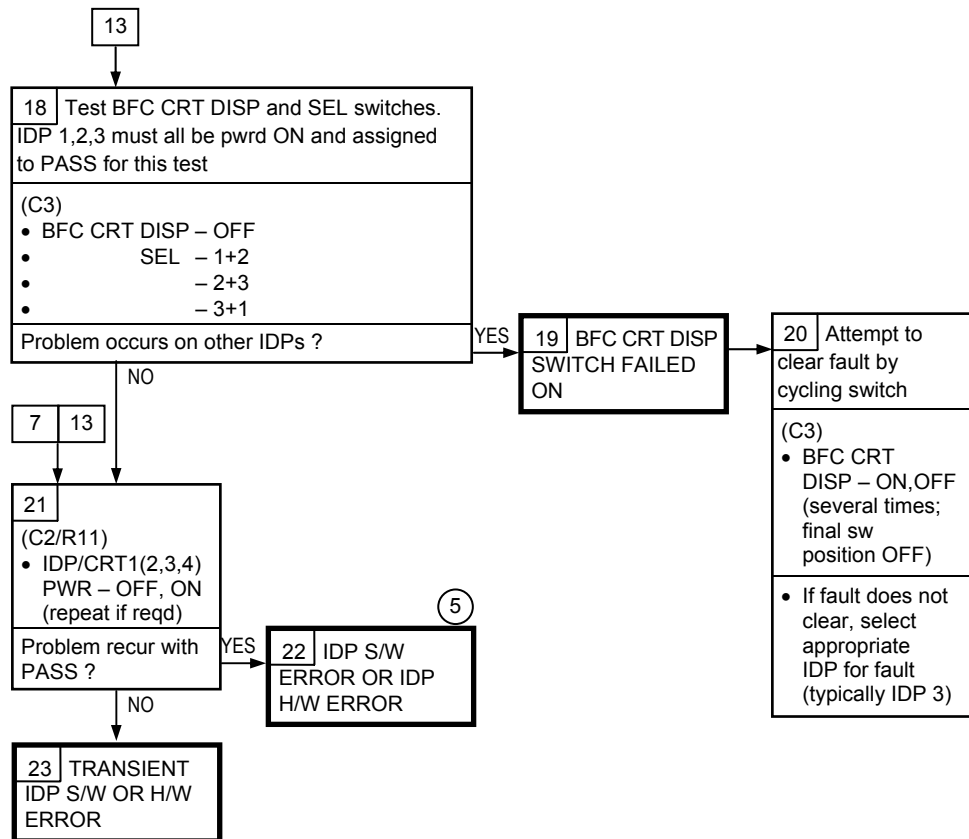
2 User may have to establish alternate IDP interface to BFS or PASS or check with MCC as appropriate in order to observe fault msgs

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



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)



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

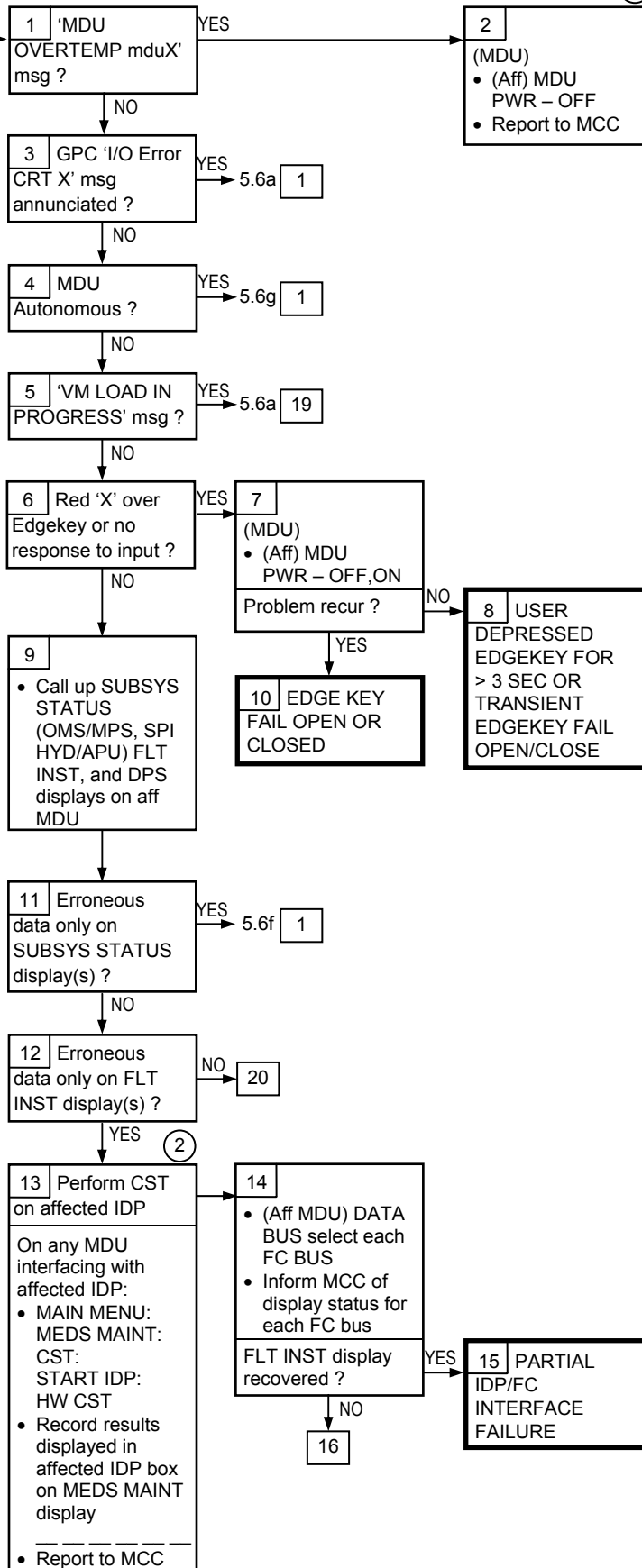
DPS

5.6e MDU ANOMALY

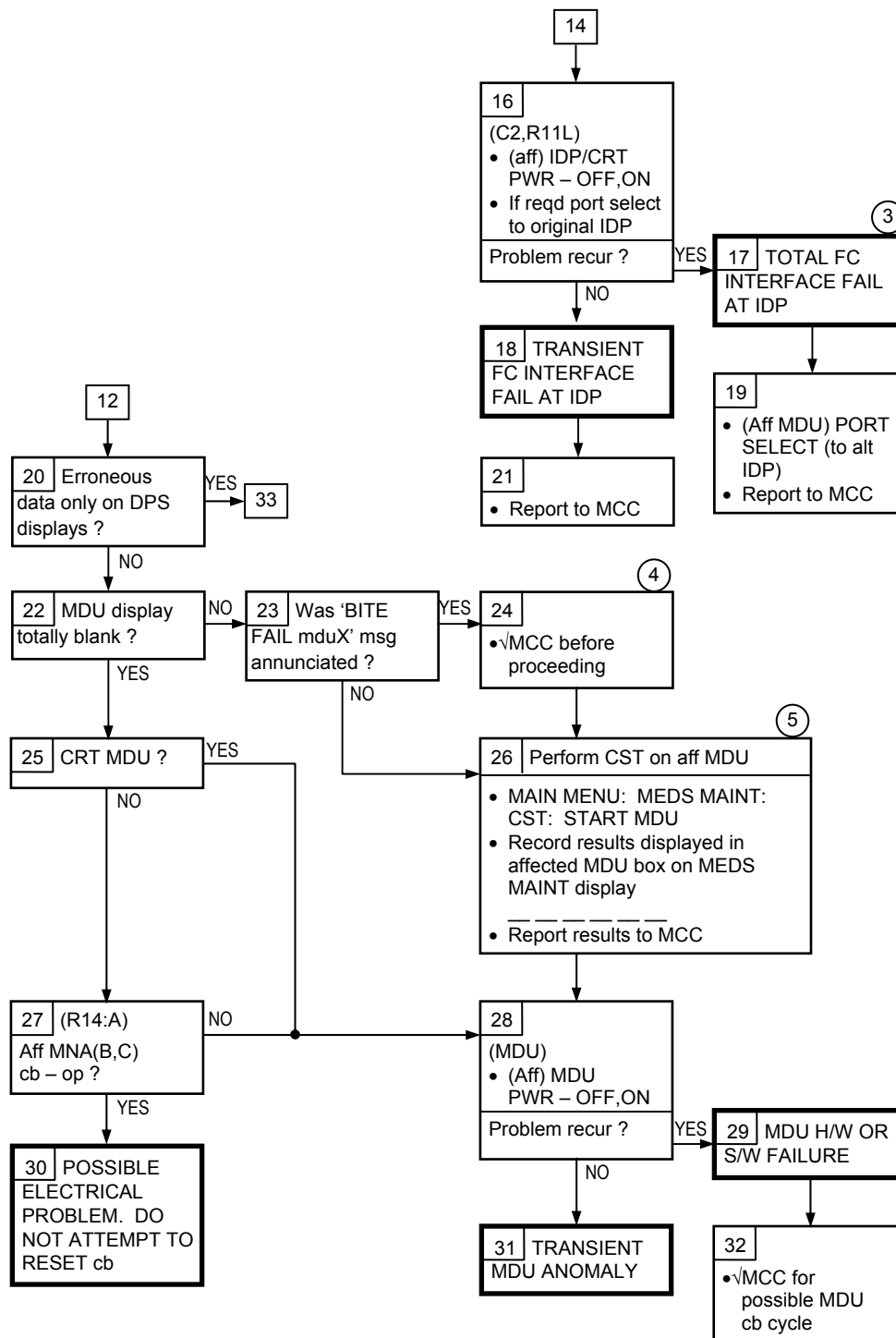
MDU Anomaly

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



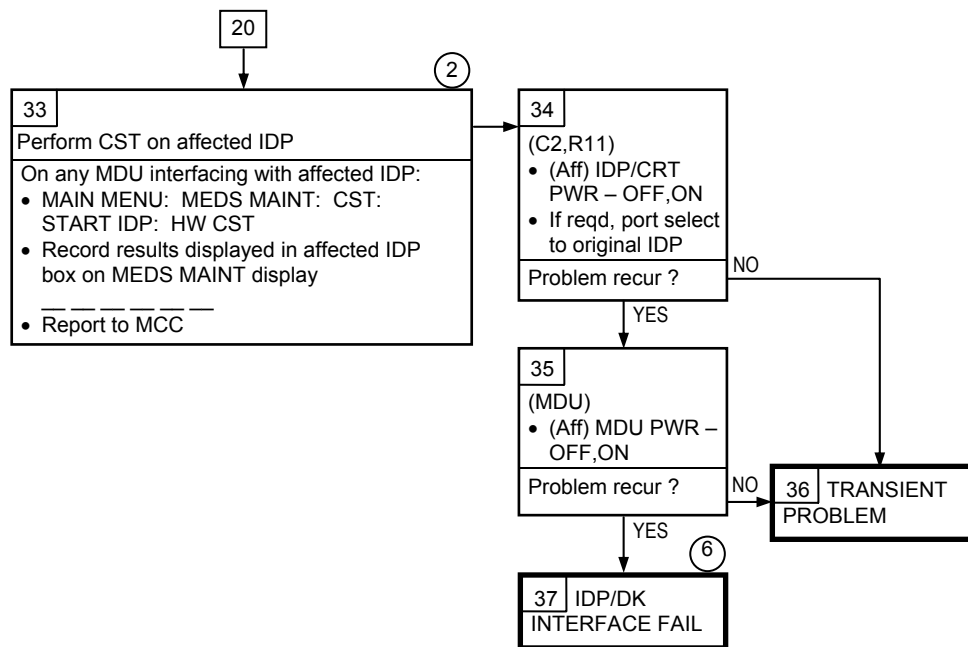
- ① Internal component has reached 212 degF. Do not repower unless asked by MCC
- ② Expect GPC 'I/O ERROR CRT X' message if GPC commanding the affected IDP. All other MDUs communicating with the IDP running CST will be temporarily inoperable. IDP CST results will be blank while H/W CST is running. IDP H/W CST takes ~75 sec. Nominal IDP CST result is '000000'



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'



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'

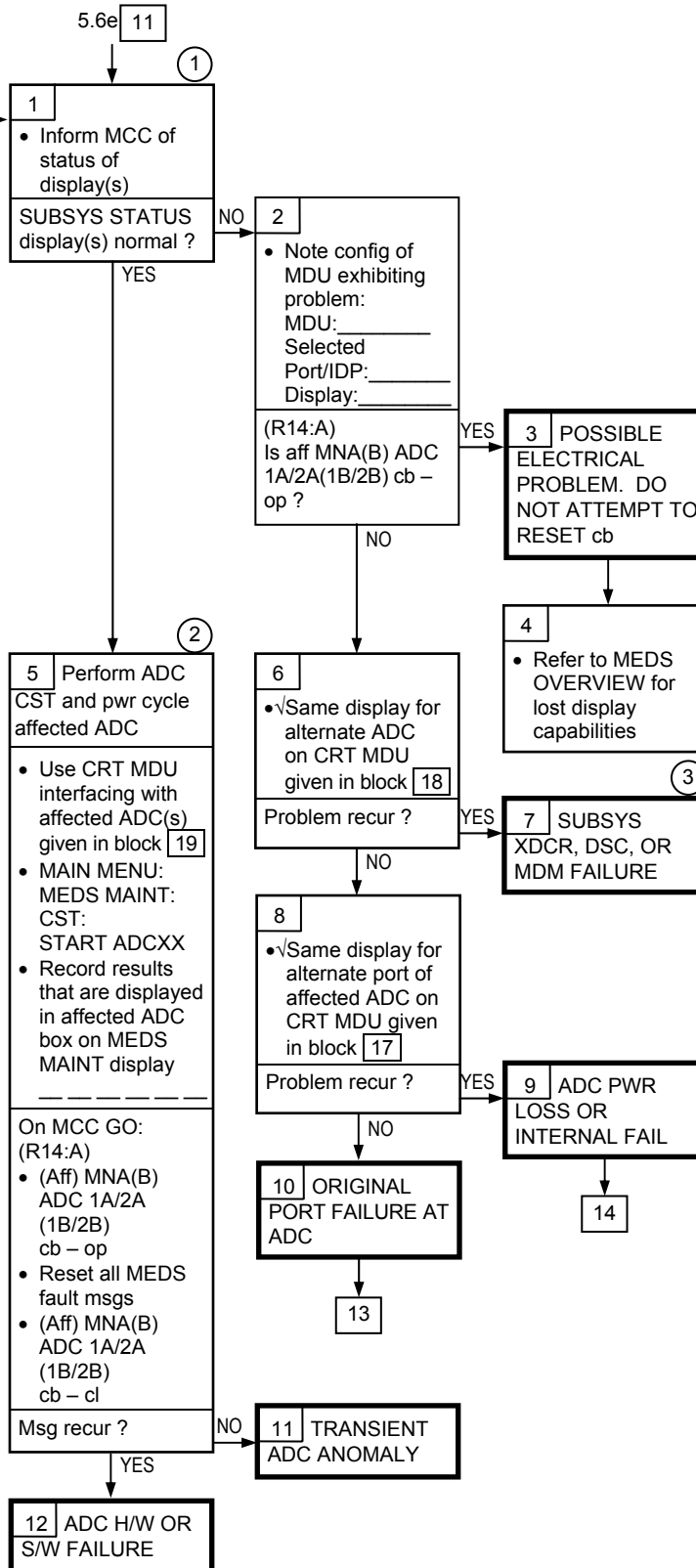
⑥ IDP cannot be used in DPS mode. May be used in FLT INST and subsystem display modes

DPS

5.6f ADC ANOMALY

'BITE FAIL ADCX',
'PROCESSOR
FAIL ADCX',
'MEDS I/O
ERROR ADCX',
ABNORMAL
SUBSYSTEM
STATUS DISPLAY
WHERE X = 1A,
1B, 2A, 2B

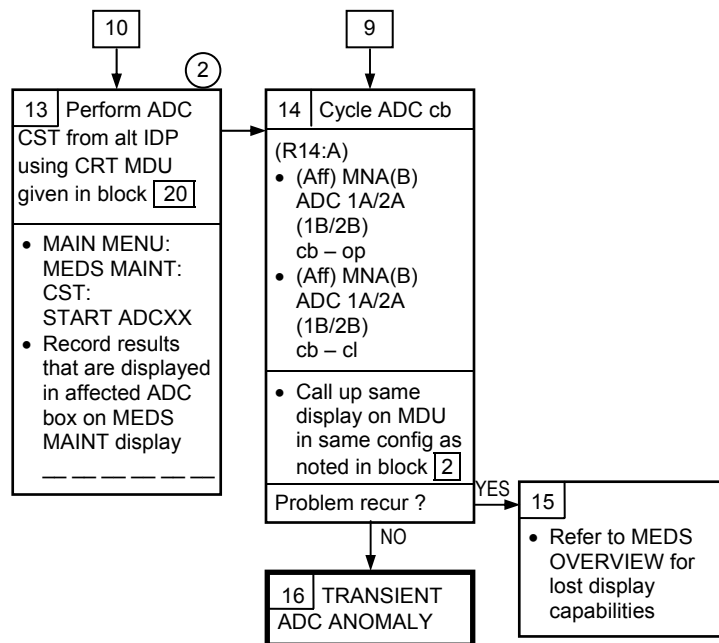
If:
ADC Port failure
ADC H/W failure
ADC S/W failure
ADC power loss/fail
Subsystem XDRCR,
DSC or MDM fail



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



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

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

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

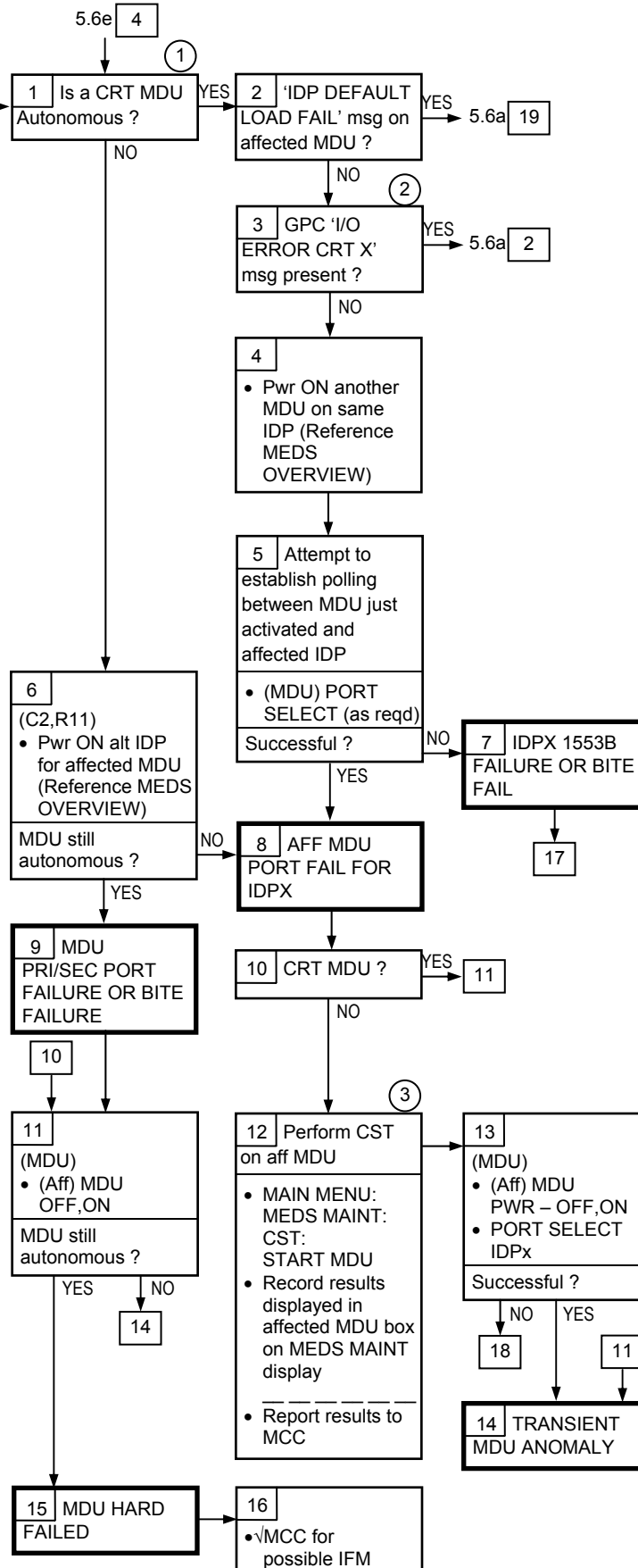
⑥ Purpose of this chart is to determine MDU on which to perform ADC CST. CRT MDU is chosen, since it will always be connected to aff ADC

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

If:
MDU dual port fail,
CRT MDU port fail,
MDU port fail & alt
IDP OFF, 1553B fail
for IDP

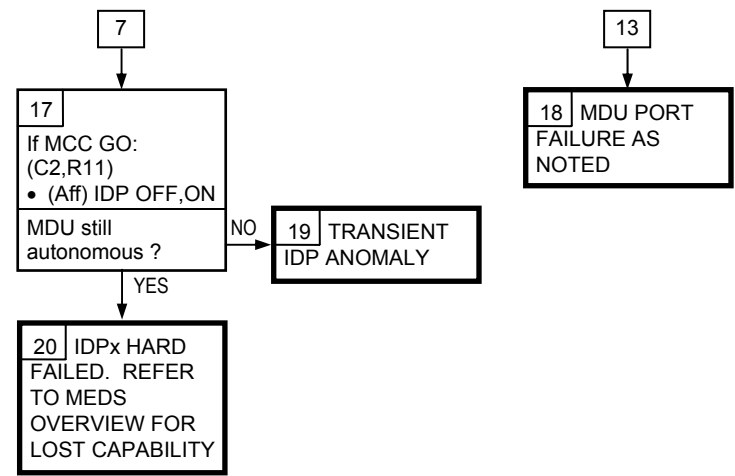


① If mult MDUs are autonomous, work MAL for CRT MDU

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

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)



GPC FRP

SINGLE GPC FAIL OBJECTIVE

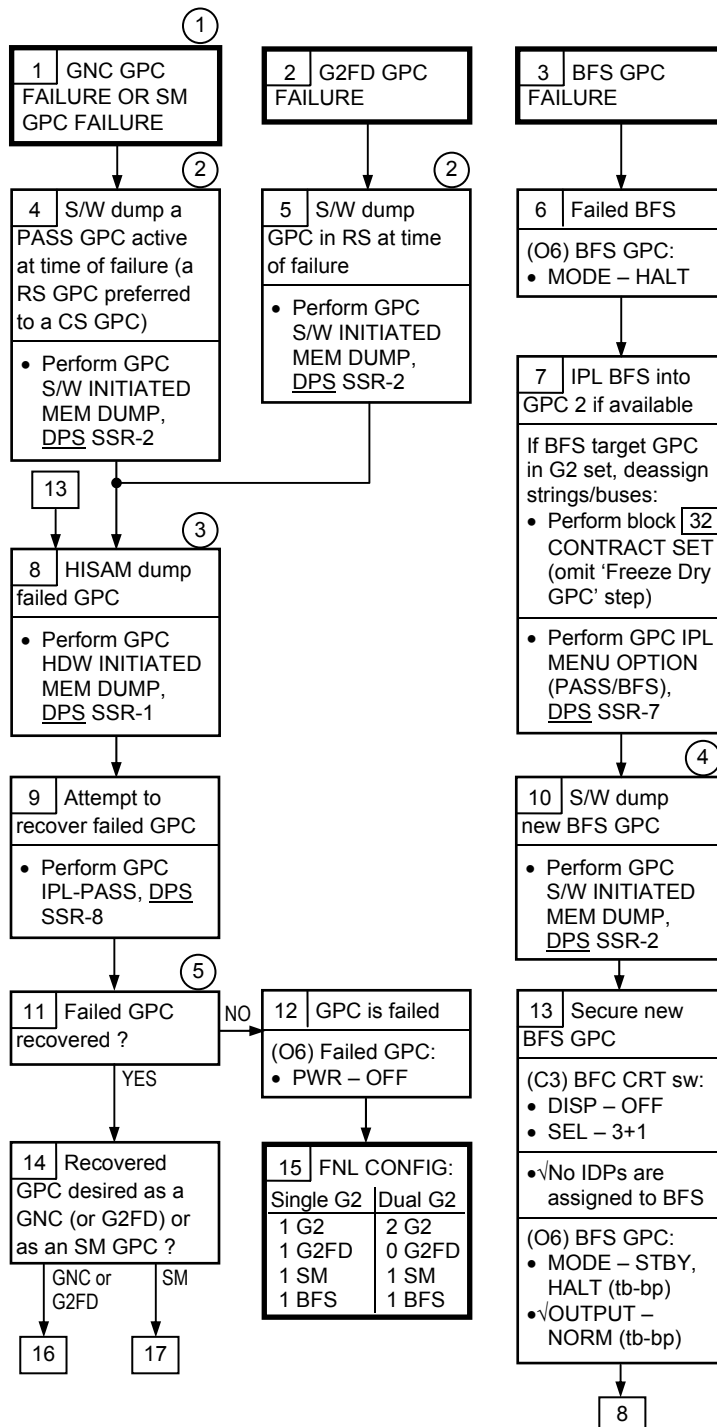
Attempt failed GPC recovery following on-orbit DPS reconfiguration via APCL, OPCL, MAL, or PI procedure. If recovered, target the 'transient' GPC as a redundant G2, G2FD, or SM based upon operational objectives. If RNDZ, EVA, or critical burn requires Dual G2 config, recovered GPC will be made G2FD

SCOPE

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

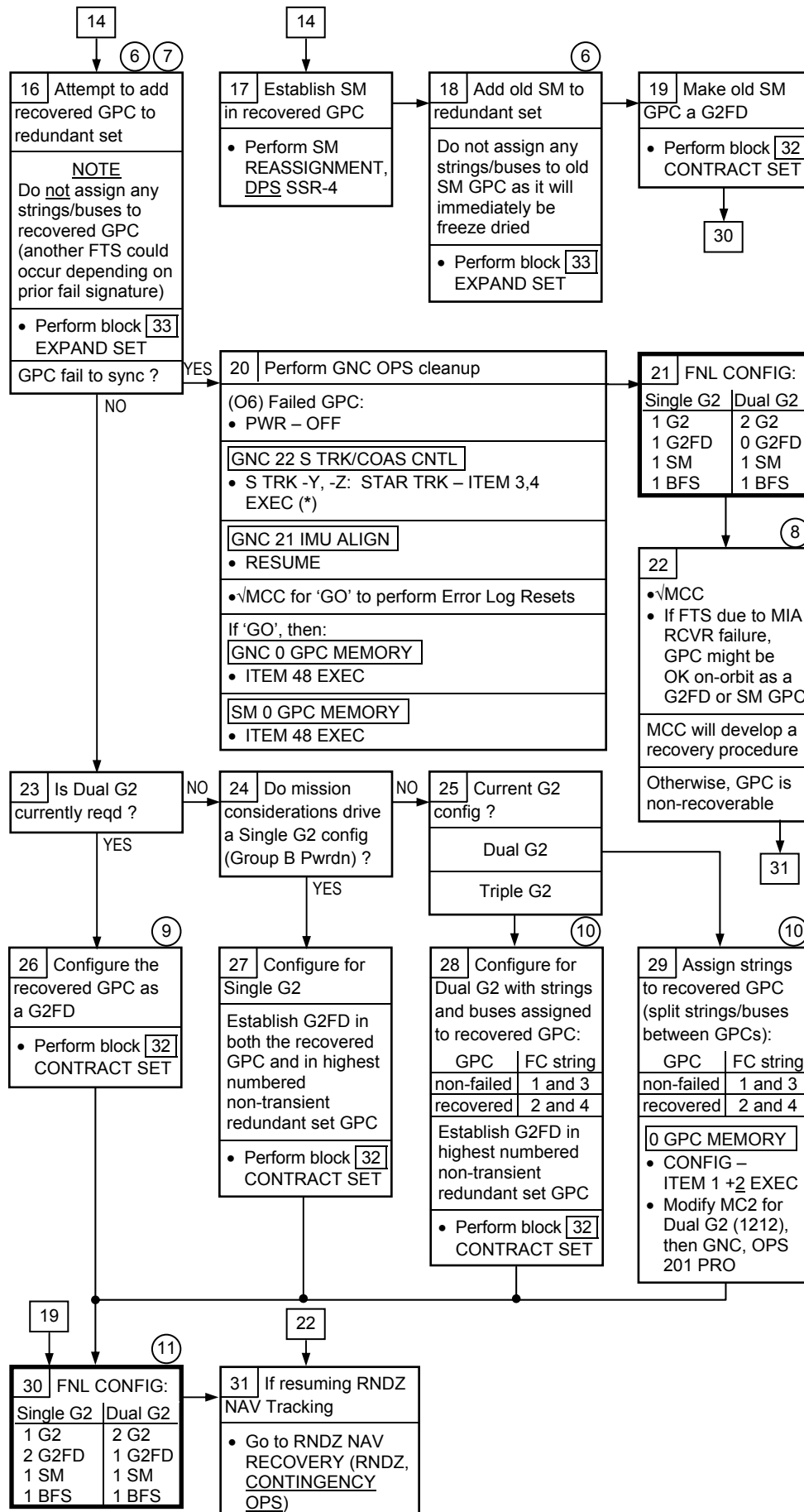
ASSUMPTIONS

If 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 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 download
- 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 G2 must 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)

GPC FRP-1 (Cont)

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

No keyboard entries or sw throws 10 sec:
Before and after moding PASS GPCs to RUN
Before OPS transition or set expansion/contraction requests until new OPS base page is displayed

- 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 GPC	2 10000	2 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

C3(A6U) (DAP setting), then
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 downlist 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

No keyboard entries or sw throws 10 sec:
Before and after moding PASS GPCs to RUN
Before OPS transition or set expansion/contraction
requests until new OPS base page is displayed

• 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 →

• OPS MODE RECALL (15)
C3(A6U) DAP: FREE
CRT GNC, OPS 201 PRO
Pause ~30 sec
(DAP settling), then
C3(A6U) DAP: as reqd

If:	Dual G2	Triple G2
CONFIG	2	2
GPC	12000	12300
STR 1	↑	↑
2		
3		
4		
PL 1/2	↓	↓
CRT 1		
2		
3		
4		
L 1	↓	↓
2		
MM 1	↓	↓
2		

(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 downlist 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)

NOTE

No keyboard entries or sw throws 10 sec:

Before and after moding PASS GPCs to RUN

Before OPS transition or set expansion/
contraction requests until new OPS base
page is displayed

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

- a. Remove GPC2 from MC3

GNC 0 GPC MEMORY

- Config – ITEM 1 +3 EXEC
- Modify MC3 per table
- GNC OPS 301 PRO (√DAP)

- b. Establish new BFS in GPC 2

- Perform GPC IPL – MENU OPTION (PASS/BFS) DPS SSR-7
- GPC OUTPUT – BKUP
- MODE – RUN

O6

GNC 50 HORIZ SIT – √PASS R/W sel

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

GPC FRP-3 (Cont)

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	1				
2	4				
3	3				
4	4				
PL 1/2	1				
CRT 1	1				
2	4				
3	3				
4	0				
L 1	0				
2	0				
MM 1	1				
2	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	1
2	4
3	3
4	5
PL 1/2	1
CRT 1	1
2	4
3	3
4	0
L 1	0
2	0
MM 1	1
2	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	1				
2	4				
3	3				
4	5				
PL 1/2	1				
CRT 1	1				
2	4				
3	3				
4	0				
L 1	0				
2	0				
MM 1	1				
2	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)
- These additional uplinks may be required after completion of the FRP ($\sqrt{\text{MCC}}$):
 - RNP GPS uplink load
 - Reapplication of GMEMs (if reqd)

NOTE

No keyboard entries or sw throws 10 sec:
 Before and after moding PASS GPCs to RUN
 Before OPS transition or set expansion/contraction
 requests until new OPS base page is displayed

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
 - d. Ensure BFS not hard assigned to any forward IDP:
 - GPC/CRT 01 EXEC
 - GPC/CRT 02 EXEC
 - GPC/CRT 03 EXEC
 - C3 e. BFC CRT DISP – OFF (BFS will default to IDPs 1 and 2)

2. If SM GPC currently active:

NOTE

Ku-Band system may be reqd to be taken to Standby to prevent exceeding radiation constraints

- a. If AOS, $\sqrt{\text{MCC}}$ for comm config and radiation constraints
 - If no comm:
 - A1U KU PWR – STBY
 - CNTL – PNL,CMD
 - If no comm, go to COMM LOST (ORB PKT, COMM) steps 7 and 8
 - b. If SM GPC OUTPUT – TERM:
 - O6 SM GPC OUTPUT – NORM
 - F7 $\sqrt{\text{FLT}}$ CNTLR PWR – ON
 - BFS ENGAGE pb – push (set engage discretes)
 - O1 c. If SM GPC self-fail CAM It on:
 - If reqd, perform PL/DPS RECONFIG (PL OPS or PL SYS or SODF: ASSY OPS):
 - 3: SM 1 DPS UTILITY
 - C2 CKPT RETRV ENA – ITEM 12 EXEC (no *)
 - O6 SM GPC MODE – STBY, then RUN
 - C2 SM, OPS 201 PRO
 - d. If SM GPC commanding IDP 4, reconfigure displays:
 - (1) BFC CRT DISP – ON
 - (2) SEL – 2+3
 - CRT Via IDP 1 (commanded by SM GPC):
 - (3) GPC/CRT 04 EXEC
 - (4) GPC/CRT 43 EXEC (BFS will continue to command IDP 3 until next step)
 - C2 (5) BFC CRT DISP – OFF
 - (6) Verify BFS commanding IDP 1 and 2, SM commanding IDP 3
 - e. 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):
 - O15 a. $\sqrt{\text{MMU}}$ 2 – ON
 - O6 b. IPL SOURCE – MMU 1(2)
 - $\sqrt{\text{GPC}}$ OUTPUT 4(3,2,1) – NORM (tb-bp)
 - $\sqrt{\text{GPC}}$ MODE 4(3,2,1) – HALT (tb-bp)
 - c. GPC PWR 4(3,2,1) – OFF,ON (clears engage discretes)
 - F7 $\sqrt{\text{FLT}}$ CNTLR PWR – ON
 - BFS ENGAGE pb – push (resets engage discretes)
 - O6 d. IPL 4(3,2,1) pb – push (tb-IPL, then bp within 30 sec)

GPC FRP-4 (Cont)

- e. When tb – bp or 30 sec:
GPC MODE 4(3,2,1) – STBY (tb-RUN within 2 min)
- f. When tb – RUN or 2 min, determine if IPL'd GPC can command IDP:
 - C2 (1) IDP/CRT 3 MAJ FUNC – PL
 - O6 (2) GPC MODE 4(3,2,1) – RUN (tb remains RUN)
 - C2 (3) 3: PL 0 GPC MEMORY driven by IPL'd GPC
- g. If GPC cannot command IDP:
 - O6 GPC MODE 4(3,2,1) – HALT
 - If first IPL attempt:
IPL SOURCE – MMU 2(1)
Go to step 3c and proceed (one time only)
 - If second IPL attempt:
GPC PWR 4(3,2,1) – OFF
Go to step 3b for next highest numbered failed GPC
 - If no GPCs recovered, √MCC
- h. IPL SOURCE SW – OFF
- 4. For first successfully IPL'd GPC, establish SM GPC:
 - SM 1 DPS UTILITY
 - a. If checkpoint previously done, CKPT RETRV ENA – ITEM 12 EXEC (*)
 - C2 b. IDP/CRT 3 MAJ FUNC – SM
 - c. SM 0 GPC MEMORY
CONFIG – ITEM 1 +4 EXEC
Assign SM GPC, PL 1/2, CRTs, LAUNCH 1, MMs
 - d. SM, OPS 201 PRO
3: SM ANTENNA
 - e. If reqd, go to PL/OPS RECONFIG, Recovery (PL SYS or SODF: ASSY OPS)
- 5. Select MET as MISSION TIME:
 - C2 3: SM 2 TIME
MISSION TIME MET – ITEM 2 EXEC
- 6. Hardware dump the remaining failed GPCs during AOS (Do not dump any post-engage IPL'd GPCs):
 - O6 a. √GPC MODE 3(2,1) – HALT
√GPC PWR 3(2,1) – ON
GPC OUTPUT 3(2,1) – TERM
 - MO42F b. GPC MEM DUMP – 3(2,1)
 - c. SM 0 GPC MEMORY
DOWNLIST GPC – ITEM 44 +3(2,1) EXEC
 - O6 d. GPC MODE 3(2,1) – STBY (starts dump)
Wait: Double dump of PASS GPC complete after 4 min
GPC MODE 3(2,1) – HALT (stops dump)
GPC OUTPUT 3(2,1) – NORM
 - MO42F e. If another hardware dump to be performed, go to step 6a for next GPC
 - f. When all dumps complete, GPC MEM DUMP – OFF
SM 0 GPC MEMORY
DOWNLIST GPC – ITEM 44 +4 EXEC
 - g. If reqd, load post dump TFL:
Perform LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)
 - F7 h. √FLT CNTLR PWR – ON
BFS ENGAGE pb – push (resets engage discretes)
- 7. Attempt recovery of each dumped GPC one at a time beginning with GPC 1:
 - a. Perform IPL:
 - (1) 3: SM (GNC,PL) 1 DPS UTILITY
√IPL SOURCE SW MASK – ITEM 38 EXEC (no *)
 - O6 (2) IPL SOURCE – MMU 1(2)
 - (3) √GPC OUTPUT 1(2,3) – NORM (tb-bp)
√GPC MODE 1(2,3) – HALT (tb-bp)
 - F7 (4) GPC PWR 1(2,3) – OFF, ON (clears engage discretes)
√FLT CNTLR PWR – ON
BFS ENGAGE pb – push (resets engage discretes)
 - O6 (5) IPL 1(2,3) pb – push (tb-IPL, then bp within 30 sec)
 - (6) When tb – bp or 30 sec:
GPC MODE 1(2,3) – STBY (tb-RUN within 2 min)
 - (7) When tb – RUN or 2 min, determine if IPL'd GPC can command IDP:
 - C2 (a) IDP/CRT 3 MAJ FUNC – PL
 - O6 (b) GPC MODE 1(2,3) – RUN (tb remains RUN)
 - (c) On PASS IDP, GPC/CRT IPL'd GPC/3 EXEC
 - C2 (d) √3: PL 0 GPC MEMORY driven by IPL'd GPC
 - (8) If GPC cannot command IDP (IDP 3 'Big X'):
 - O6 (a) GPC MODE 1(2,3) – HALT
 - C2 (b) Reconfig IDPs to make GPC 4 command IDP 3:
IDP/CRT 3 MAJ FUNC – SM
BFC/CRT DISP – ON
SEL – 2+3
On IDP 1 – GPC/CRT SM GPC/3 EXEC (BFS will retain IDP 3 until next step)
BFC/CRT DISP – OFF
√SM GPC commanding IDP 3

GPC FRP-4 (Cont)

- O6 (c) If first IPL attempt:
IPL SOURCE – MMU 2(1)
Go to step 7a(4) and proceed (one time only)
If second IPL attempt:
GPC PWR 1(2,3) – OFF
Go to step 7a(3) for next highest numbered failed GPC
- (9) If there are any dumped GPCs remaining to be IPL'd, go to step 7a(3) for next highest numbered failed GPC
- O6 (10) IPL SOURCE – OFF
(11) 3: SM (GNC,PL) 1 DPS UTILITY
IPL SOURCE SW MASK – ITEM 38 EXEC (*)
- b. Configure GPCs (Final Configuration Tables based on GPCs recovered on 5-76 through 5-82):
If only 1 PASS GPC active, go to step 8
If two, three, or four PASS GPCs active, go to step 9
8. If one PASS GPC active, config for ENTRY:
- C3 a. Perform LOAD PCMMU FORMAT (ENTRY) (ORB OPS FS, COMM/INST)
OI PCMMU FORMAT – GPC
- O6 b. Reassign SM GPC to GNC Major Function:
(1) ✓Target GPC OUTPUT – NORM
(2) If reqd, perform PL/DPS RECONFIG, secure (PL SYS or SODF: ASSY OPS)
(3) SM, OPS 000 PRO
- C2 (4) IDP/CRT 3 MAJ FUNC – GNC
3: GNC 0 GPC MEMORY
CONFIG – ITEM 1 +3 EXEC
Assign PASS GPC all FC strings, PL 1/2, CRT, and MMs
- O14, O15, O16 (5) Configure for G3 Transition:
O8 ✓RGAs 1,2,3,4 – ON
✓RJDA/RJDF (all) – ON
✓cb ADTA (four) – cl
MLS (three) – ON
- C3 (6) GNC, OPS 301 PRO:
✓3: GNC DEORB MNVR COAST
- (7) If reqd, perform PL/DPS RECONFIG, Recovery (PL SYS or SODF: ASSY OPS)
- c. Go to step 10, PASS IMU attitude reference recovery
9. If two, three, or four PASS GPCs active:
- C3 a. OI PCMMU FORMAT – FXD
- C2 b. Establish G3 config in lowest number GPC(s):
(1) IDP/CRT 3 MAJ FUNC – GNC
GPC/CRT Target GNC GPC/3 EXEC
3: GNC 0 GPC MEMORY
CONFIG – ITEM 1 +3 EXEC
Assign desired GPC(s), FC strings, CRTs, and MMs per appropriate table:

If two GPCs recovered:

	1,2 1,3 1,4	2,3 2,4	3,4
CONFIG GPC	3 10000	3 02000	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

If three GPCs recovered:

	1,2,3 1,2,4	1,3,4	2,3,4
CONFIG GPC	3 12000	3 10300	3 02300
STR 1	1	1	3
2	2	3	2
3	1	1	3
4	2	3	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

If four GPCs recovered:

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

GPC FRP-4 (Cont)

O14, O15, O16 O8	(2) Configure for G3 Transition: √RGAs 1,2,3,4 – ON √RJDA/RJDF (all) – ON √cb ADTA (four) – cl MLS (three) – ON
C3	(3) GNC, OPS 301 PRO: √3: GNC DEORB MNVR COAST
	(4) Configure for GNC Downlist 3: GNC 0 GPC MEMORY DOWNLIST GPC – ITEM 44 +X EXEC (lowest ID GNC GPC)
O14:E, O15:E O6	10. PASS IMU attitude reference recovery: a. Ensure good Star Tracker config: √cb MNA,B STAR TRKR -Z,-Y (two) – cl √S TRK PWR (two) – ON 3: 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 HUD and MATRIX alignment: c. Deselect two IMUs leaving one IMU selected: IMU DES 1(2,3) – ITEM 7(8,9) EXEC (*) d. Maneuver to attitude for subsequent HUD alignment, STAR PAIRS PAD (ORB OPS FS, PTG)
	NOTE Establish an inertial attitude which will simplify a manual maneuver to second star
C2	e. Perform BFS disengagement (if comm, wait for MCC GO): (1) Configure displays for disengage: (a) BFC CRT DISP – ON SEL – 1+2 (BFS commanding IDPs 1 and 2) √PASS GNC GPC commanding IDP 3 (b) Deassign IDP 2 from PASS Via IDP 3, GPC/CRT 02 EXEC (BFS still commanding IDP 2)
	NOTE BFS DISENGAGE can be verified by Big X/POLL FAIL on IDP 2, BFS GPC OUTPUT tb – bp (pnl O6), and BFC lt flashing (pnl F2/F4)
F6	(2) Perform BFS disengage: On MCC GO: BFC – DISENGAGE Verify BFS disengage: √BFS commanding IDP 1 <u>only</u> √BFS GPC OUTPUT tb – bp √BFC Light flashing or OFF
C3 O6	* If BFS still engaged: * * BFS, OPS 000 PRO * * GPC 5 OUTPUT – NORM * * – B/U * * Verify BFS disengage * * BFS, OPS 301 PRO *
C3 C2 F6/F8	(3) Post disengage reconfig: DAP: INRTL BFS – I/O RESET Reassign IDP 2 – GPC/CRT PASS GPC X/2 EXEC BFC CRT SEL – 3+1 (PASS commanding IDPs 1 and 2, BFS commanding IDP 3) ADI ATT (two) – REF ATT REF pb – push

GPC FRP-4 (Cont)

NOTE

'↓' will remain for accumulators not selected by GPC driving SPEC.
If TRY is not successful ('↓' by MTU ACCUM 1 time), continue with procedures and √MCC

Acquire MTU time

If SM GPC available:

SM 2 TIME

MTU ACCUM 1 TRY – ITEM 34 EXEC

NOTE

'IMU BITE/T' may be annunciated until MMREAD is performed to restore IMU gyro delta bias terms

- f. 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 MM READ:

MM READ – ITEM 19 EXEC (*)

When MM READ complete:

√MM READ – ITEM 19 (no *)

- g. Perform MATRIX (TORQUE) ALIGN USING HUD STAR DATA, GNC SSR-2 (**GNC**)

- h. Reselect all deselected IMUs

GNC 21 IMU ALIGN

IMU DES – ITEM 7(8,9) EXEC (no *)

- i. Go to step 11

If good comm and uplink CMD capability, recover IMU attitude reference utilizing Matrix Alignment using IMU data:

NOTE

The following steps assume recovery of 'operational' IMUs only.
Operational IMUs are IMUs in OPER and not previously caged

- j. Deselect two IMUs leaving best IMU selected:

√MCC for best IMU

IMU DES 1(2,3) – ITEM 7(8,9) EXEC (*)

- k. Disengagement of BFS:

- (1) Configure displays for disengage

- (a) BFC CRT DISP – ON

SEL – 1+2 (BFS commanding IDPs 1 and 2)

√PASS GNC GPC commanding IDP 3

- (b) Deassign IDP 2 from PASS

Via IDP 3, GPC/CRT 02 EXEC (BFS still commanding IDP 2)

NOTE

BFS DISENGAGE can be verified by Big X/POLL FAIL on IDP 2,
BFS GPC OUTPUT tb – bp (pnl O6), and BFC lt flashing (pnl F2/F4)

- (2) Perform BFS disengage:

On MCC GO:

BFC – DISENGAGE

Verify BFS disengage:

√BFS commanding IDP 1 only

√BFS GPC OUTPUT tb – bp

√BFC Light flashing or OFF

* If BFS still engaged:	*
* BFS, OPS 000 PRO	*
* GPC 5 OUTPUT – NORM	*
* – B/U	*
* Verify BFS disengage	*
* BFS, OPS 301 PRO	*

C2

F6

C3
O6

GPC FRP-4 (Cont)

C3

- (3) Post disengage reconfig:
DAP: INRTL
BFS – I/O RESET
Reassign IDP 2 – GPC/CRT PASS GPC X/2 EXEC
BFC CRT SEL – 3+1 (PASS commanding IDPs 1 and 2, BFS commanding IDP 3)

NOTE

'↓' will remain for accumulators not selected by GPC driving SPEC.
If TRY is not successful ('↓' by MTU ACCUM 1 time), continue with procedures and √MCC

Acquire MTU time

If SM GPC available:

SM 2 TIME

MTU ACCUM 1 TRY – ITEM 34 EXEC

NOTE

'IMU BITE/T' may be annunciated until MMREAD is performed to restore IMU gyro delta bias terms

- I. 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 MM READ:

MM READ – ITEM 19 EXEC (*)

When MM READ complete:

√MM READ – ITEM 19 (no *)

- m. Confirm with MCC that REFSMMAT uplink has been performed. Do not proceed without confirmation
- n. Recover IMU attitude reference of one of the deselected operational IMUs, utilizing Matrix Alignment, aligning the IMU to itself:

CAUTION

Each IMU being recovered must be individually matrix aligned to itself in order to incorporate the uplinked REFSMMATs

GNC 21 IMU ALIGN

Utilize as reference one of the operational IMUs currently deselected:

REF IMU – ITEM 14 + ____ EXEC

TYPE – ITEM 15 EXEC (MATRIX)

Align Reference IMU to itself:

ALIGN IMU 1(2,3) – ITEM 10(11,12) EXEC (*)

EXEC – ITEM 16 EXEC (*)

√MCC to repeat step 10n with other deselected operational IMU

C3

- o. Configure DAP:
√DAP: INRTL
DAP ROT: PULSE/PULSE/PULSE
- p. Deselect currently selected IMU (no selected IMUs):
IMU DES – ITEM 7(8,9) EXEC (*)
- q. Reselect IMU(s) aligned in step 10n:
IMU DES – ITEM 7(8,9) EXEC (no *)
- r. Configure DAP:
√DAP: INRTL
DAP ROT: DISC/DISC/DISC
- s. √MCC to repeat step 10n with remaining IMU
- t. When Matrix Align(s) using IMU data complete, reselect all recovered IMUs:
IMU DES – ITEM 7(8,9) EXEC (no *)
- u. Mnvr to acquire stars using AUTO DAP for STRK align. Only Stars 11-60 are available in OPS 3: choose appropriate star pair from pad STAR PAIRS PAD (ORB OPS FS, PTG)

GPC FRP-4 (Cont)

- v. If STAR TRKRs powered on in step 10a, configure STAR TRKRs and open doors:
 GNC I/O RESET
GNC 22 S TRK/COAS CNTL
 O6 S TRK DR CNTL SYS (two) – OP (start timer)
 √POS tb (two) – bp
 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. Perform IMU ALIGN – S TRK (ORB OPS, GNC)

11. If only one PASS GPC active, acquire MTU time in G2 and then go back to Entry config:
 a. Configure for G2:
 (1) √G2 NBAT (all FC strings, PL 1/2, CRT, and MMs assigned to target GPC)
 (2) GNC, OPS 201 PRO
 √GNC UNIV PTG

NOTE

‘↓’ will remain for accumulators not selected by GPC driving SPEC.
 If TRY is not successful (‘↓’ by MTU ACCUM 1 time), continue with procedures and √MCC

- b. Acquire MTU time:
 GNC 2 TIME
 MTU ACCUM 1 TRY – ITEM 34 EXEC
- c. Configure for G3:
 GNC, OPS 301 PRO
 BFS, GNC, OPS 000 PRO
 BFS, GNC, OPS 301 PRO
- d. Entry Config Established:
 (1) Reference Final Configuration Table Set I, 5-76
 (2) As time permits, work GPC FRP-1 to Re-IPL the BFS into GPC 5 >>

12. If two PASS GPCs active and Entry Config Desired:
 a. Perform SM CHECKPOINT INITIATE (ORB OPS, DPS)
 b. Perform LOAD PCMMU FORMAT (ENTRY) (ORB OPS FS, COMM/INST)
 OI PCMMU FORMAT – GPC
 C3 c. Configure GPCs for GNC OPS 3:
 (1) √SM GPC OUTPUT – NORM
 (2) If reqd, perform PL/DPS RECONFIG, Secure (PL SYS or SODF: ASSY OPS)
 (3) SM OPS 000 PRO
 C2 (4) IDP/CRT X MAJ FUNC – GNC
 GNC 0 GPC MEMORY
 CONFIG – ITEM 1 +3 EXEC
 Assign desired GPCs, strings, CRTs, and MMs per appropriate NBAT table

Recovered PASS GPCs

	1,2	1,3	1,4	2,3	2,4	3,4
CONFIG GPC	3 12000	3 10300	3 10040	3 02300	3 02040	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

GPC FRP-4 (Cont)

- C2 (5) IDP/CRT MAJ FUNC – GNC
 (6) GNC, OPS 301 PRO
 √ GNC DEORB MNVR COAST
 (7) BFS, GNC, OPS 000 PRO
 BFS, GNC, OPS 301 PRO
- d. Entry config established:
 (1) Reference Final Configuration Table Set II A on 5-77 and 5-78
 (2) As time permits, work GPC FRP-1 to re-IPL BFS into GPC 5 >>

If orbit configuration desired for two, three, or four PASS GPCs active:

13. Secure BFS:
 C3 √BFC CRT DISP – ON
 SEL – 3+1
 C2 BFS, GNC, OPS 000 PRO
 C3 BFC CRT DISP – OFF
 √All CRTs deassigned from BFS
 O6 BFS GPC MODE – STBY, HALT (tb-bp)
 OUTPUT – NORM
14. If two PASS GPCs active:
 a. Config GNC GPC for OPS 2:
 C2 (1) IDP/CRT X MAJ FUNC – GNC
 GNC 0 GPC MEMORY
 CONFIG – ITEM 1 +2 EXEC
 Assign desired GPC all FC strings, CRTs, and MMs
 (2) GNC, OPS 201 PRO
 √ GNC UNIV PTG
 (3) √Appropriate DAP mode selected
- C3 b. OI PCMMU FORMAT – GPC:
 Perform LOAD PCMMU FORMAT (ORBIT) (ORB OPS FS, COMM/INST)
- c. SM (GNC, PL) 1 DPS UTILITY
 UL CNTL AUTO – ITEM 35 EXEC (*)
- d. If required, perform LOAD PDI DECOM FORMAT (ORB OPS FS, COMM/INST)
- C2 e. Configure IDPs:
 GPC/CRT 03 EXEC
 GPC/CRT X/4 EXEC
 Configure MDUs as desired
 IDP/CRT 3 PWR – OFF
- O6 f. SM GPC OUTPUT – TERM
- g. Configure for Orbit:
 O14, RGAs 1,2,3,4 – OFF
 O15, RJDA/RJDF (all) – As reqd
 O16 cb ADTA (four) – op
 O8 MLS (three) – OFF
- h. Orbit config established:
 (1) Reference Final Configuration Table Set II B, 5-79 and 5-80
 (2) As time permits, work GPC FRP-1 to re-IPL the BFS into GPC 5 >>
15. If three PASS GPCs active:
 a. Config GNC GPCs for OPS 2:
 C2 (1) IDP/CRT X MAJ FUNC – GNC
 GNC 0 GPC MEMORY
 CONFIG – ITEM 1 +2 EXEC

GPC FRP-4 (Cont)

- (2) Assign desired GPCs all FC strings, CRTs, and MMs per appropriate table

Recovered 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	

- (3) GNC, OPS 201 PRO
√ GNC UNIV PTG
- (4) DAP: as reqd
- C3(A6U)
C3
- b. OI PCMMU FORMAT – GPC:
Perform LOAD PCMMU FORMAT (ORBIT) (ORB OPS FS, COMM/INST)
- c. SM (GNC,PL) 1 DPS UTILITY
UL CNTL AUTO – ITEM 35 EXEC (*)
- d. If reqd, perform LOAD PDI DECOM FORMAT (ORB OPS FS, COMM/INST)
- e. Configure IDPs:
GPC/CRT 03 EXEC
GPC/CRT X/4 EXEC
Configure MDUs as desired
IDP/CRT 3 PWR – OFF
- C2
- f. SM GPC OUTPUT – TERM
- g. Configure for Orbit:
RGAs 1,2,3,4 – OFF
RJDA/RJDF (all) – As reqd
cb ADTA (four) – op
MLS (three) – OFF
- O6
- h. If Orbit config desired, establish single G2:
(1) IDP/CRT X MAJ FUNC – GNC
GNC 0 GPC MEMORY
CONFIG – ITEM 1 + 2 EXEC
Assign desired GPC(s), all FC strings, CRTs, and MMs per table
- O14,
O15,
O16
O8
- C2,R11L

Recovered 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	

GPC FRP-4 (Cont)

- C2,R11L (2) GNC, OPS 201 PRO
 √ GNC UNIV PTG
- C3(A6U) (3) DAP: as reqd
- C2 (4) Configure OPS 0 GPC as G3FD (√SPEC 6):
 IDP/CRT X MAJ FUNC – PL
 GPC/CRT target GPC/X EXEC
 PL 0 GPC MEMORY
 CONFIG – ITEM 45 +3 EXEC
 GPC – ITEM 46 +X EXEC (X = target GPC)
 STORE – ITEM 47 EXEC
 Store complete when MC = 03
- (5) Config G3 NBAT for FD GPC per table

Recovered PASS GPCs

1,2,3 1,3,4
 1,2,4 2,3,4

CONFIG GPC	3 02000	3 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

- C2, R11L (6) √All IDPs deassigned from FD GPC
- O6 (FD GPC) GPC MODE – STBY (tb-bp)
 – HALT
 – STBY (tb-RUN)
 – HALT (tb-bp)
- i. Final Orbit config established:
 (1) Reference Final Configuration Table Set III, 5-81
 (2) As time permits work GPC FRP-1 to re-IPL the BFS into GPC 5 >>

16. If four PASS GPCs active:

- a. Config GNC GPCs for OPS 2:
- C2,R11L (1) IDP/CRT X MAJ FUNC – GNC
 GNC 0 GPC MEMORY
 √CONFIG – ITEM 1 +2 EXEC
 Assign desired GPC(s) all FC strings, CRTs, and MMs per table

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

- (2) GNC, OPS 201 PRO
 √ GNC UNIV PTG
- C3(A6U) (3) DAP: as reqd

GPC FRP-4 (Cont)

- C3 b. OI PCMMU FORMAT – GPC:
Perform LOAD PCMMU FORMAT (ORBIT) (ORB OPS FS, COMM/INST)
- c. SM (GNC,PL) 1 DPS UTILITY
UL CNTL AUTO – ITEM 35 EXEC (*)
- d. If required, perform LOAD PDI DECOM FORMAT (ORB OPS FS, COMM/INST)
- e. Configure IDPs:
GPC/CRT 03 EXEC
GPC/CRT X/4 EXEC
Configure MDUs as desired
IDP/CRT 3 PWR – OFF
- O6 f. SM GPC OUTPUT – TERM
- g. Configure for Orbit:
RGAs 1,2,3,4 – OFF
RJDA/RJDF (all) – as reqd
cb ADTA (four) – op
MLS (three) – OFF
- O14,
O15,
O16
O8 h. Config GPC3 as G3 FD:
- C2 (1) IDP/CRT X MAJ FUNC – PL
GPC/CRT 3/X EXEC
(2) PL 0 GPC MEMORY
CONFIG – ITEM 45 +3 EXEC
GPC – ITEM 46 +3 EXEC
STORE – ITEM 47 EXEC
Store complete when MC = 03
(3) Config G3 NBAT for FD GPC per table

Recovered PASS GPCs

1,2,3,4

CONFIG	3
GPC	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

- O6 (4) √All IDPs deassigned from GPC 3
GPC 3 MODE – STBY (tb-bp)
– HALT
– STBY (tb-RUN)
– HALT (tb-bp)
- i. If single GNC GPC config desired:
- C2,R11 (1) √IDP/CRT X MAJ FUNC – GNC
GNC 0 GPC MEMORY
CONFIG – ITEM 1 +2 EXEC
Assign GPC 1, all FC strings, CRTs, and MMs
per table
- C3(A6U) (2) DAP: FREE
VERN(ALT)
GNC, OPS 201 PRO
√GNC UNIV PTG
- C3(A6U) (3) Pause ~30 sec (DAP settling)
DAP: as reqd

1,2,3,4

CONFIG	2
GPC	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

GPC FRP-4 (Cont)

C2

- (4) Config GPC 2 as G2 FD:
 - IDP/CRT X MAJ FUNC – PL
 - GPC/CRT 2/X EXEC
 - PL 0 GPC MEMORY
 - CONFIG – ITEM 45 +2 EXEC
 - GPC – ITEM 46 +2 EXEC
 - STORE – ITEM 47 EXEC
 - Store complete when MC = 02
- (5) ✓All IDPs deassigned from GPC 2:
 - GPC 2 MODE – STBY (tb-bp)
 - HALT
 - STBY (tb-RUN)
 - HALT (tb-bp)

j. Orbit config established:

- (1) Reference Final Configuration Table Set IV A & B, 5-82
- (2) As time permits work GPC FRP-1 to re-IPL BFS into GPC 5 >>

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I

GPC FRP-4 (Cont)

Final Configuration Tables

I. Single PASS GPC

Final configuration for GPC 1 recovered						Final configuration for GPC 2 recovered					
GPC OPS	1 G3	2 –	3 –	4 –	5 BFS3	GPC OPS	1 –	2 G3	3 –	4 –	5 BFS3
POWER OUTPUT MODE	ON NORM RUN	OFF NORM HALT	OFF NORM HALT	OFF NORM HALT	ON BKUP RUN	POWER OUTPUT MODE	OFF NORM HALT	ON NORM RUN	OFF NORM HALT	OFF NORM HALT	ON BKUP RUN
CONFIG GPC	3 10000					CONFIG GPC		3 02000			
STR 1	1					STR 1		2			
2	1					2		2			
3	1					3		2			
4	1					4		2			
PL 1/2	1					PL 1/2		2			
CRT 1	1					CRT 1		2			
2	1					2		2			
3	1					3		2			
4	0					4		0			
L 1	0					L 1		0			
2	0					2		0			
MM 1	1					MM 1		2			
2	1					2		2			

Final configuration for GPC 3 recovered						Final configuration for GPC 4 recovered					
GPC OPS	1 –	2 –	3 G3	4 –	5 BFS3	GPC OPS	1 –	2 –	3 –	4 G3	5 BFS3
POWER OUTPUT MODE	OFF NORM HALT	OFF NORM HALT	ON NORM RUN	OFF NORM HALT	ON BKUP RUN	POWER OUTPUT MODE	OFF NORM HALT	OFF NORM HALT	OFF NORM HALT	ON NORM RUN	ON BKUP RUN
CONFIG GPC			3 00300			CONFIG GPC				3 00040	
STR 1			3			STR 1				4	
2			3			2				4	
3			3			3				4	
4			3			4				4	
PL 1/2			3			PL 1/2				4	
CRT 1			3			CRT 1				4	
2			3			2				4	
3			3			3				4	
4			0			4				0	
L 1			0			L 1				0	
2			0			2				0	
MM 1			3			MM 1				4	
2			3			2				4	

GPC FRP-4 (Cont)

Final Configuration Tables (Cont)

II. Two PASS GPCs

A. Entry Config

Final configuration for GPCs 1,2 recovered						Final configuration for GPCs 1,3 recovered					
GPC OPS	1 G3	2 G3	3 -	4 -	5 BFS3	GPC OPS	1 G3	2 -	3 G3	4 -	5 BFS3
POWER OUTPUT MODE	ON NORM RUN	ON NORM RUN	OFF NORM HALT	OFF NORM HALT	ON BKUP RUN	POWER OUTPUT MODE	ON NORM RUN	OFF NORM HALT	ON NORM RUN	OFF NORM HALT	ON BKUP RUN
CONFIG GPC	3 12000					CONFIG GPC	3 10300				
STR 1	1					STR 1	1				
2	2					2	3				
3	1					3	1				
4	2					4	3				
PL 1/2	1					PL 1/2	1				
CRT 1	1					CRT 1	1				
2	2					2	3				
3	1					3	1				
4	0					4	0				
L 1	0					L 1	0				
2	0					2	0				
MM 1	1					MM 1	1				
2	2					2	3				

Final configuration for GPCs 1,4 recovered						Final configuration for GPCs 2,3 recovered					
GPC OPS	1 G3	2 -	3 -	4 G3	5 BFS3	GPC OPS	1 -	2 G3	3 G3	4 -	5 BFS3
POWER OUTPUT MODE	ON NORM RUN	OFF NORM HALT	OFF NORM HALT	ON NORM RUN	ON BKUP RUN	POWER OUTPUT MODE	OFF NORM HALT	ON NORM RUN	ON NORM RUN	OFF NORM HALT	ON BKUP RUN
CONFIG GPC	3 10040					CONFIG GPC		3 02300			
STR 1	1					STR 1		3			
2	4					2		2			
3	1					3		3			
4	4					4		2			
PL 1/2	1					PL 1/2		3			
CRT 1	1					CRT 1		2			
2	4					2		3			
3	1					3		2			
4	0					4		0			
L 1	0					L 1		0			
2	0					2		0			
MM 1	1					MM 1		2			
2	4					2		3			

GPC FRP-4 (Cont)

Final Configuration Tables (Cont)

A. Entry Config (Cont)

Final configuration for GPCs 2,4 recovered						Final configuration for GPCs 3,4 recovered					
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				STR 1			3		
2		4				2			4		
3		2				3			3		
4		4				4			4		
PL 1/2		2				PL 1/2			3		
CRT 1		2				CRT 1			3		
2		4				2			4		
3		2				3			3		
4		0				4			0		
L 1		0				L 1			0		
2		0				2			0		
MM 1		2				MM 1			3		
2		4				2			4		

GPC FRP-4 (Cont)

Final Configuration Tables (Cont)

B. Orbit Config

Final configuration for GPCs 1,2 recovered						Final configuration for GPCs 1,3 recovered					
GPC OPS	1 G2	2 SM	3 -	4 -	5 BFS	GPC OPS	1 G2	2 -	3 SM	4 -	5 BFS
POWER OUTPUT MODE	ON NORM RUN	ON TERM RUN	OFF NORM HALT	OFF NORM HALT	ON NORM HALT	POWER OUTPUT MODE	ON NORM RUN	OFF NORM HALT	ON TERM RUN	OFF NORM HALT	ON NORM HALT
CONFIG GPC	2 10000	4 02000				CONFIG GPC	2 10000		4 00300		
STR 1	1	0				STR 1	1		0		
2	1	0				2	1		0		
3	1	0				3	1		0		
4	1	0				4	1		0		
PL 1/2	0	2				PL 1/2	1		3		
CRT 1	1	2				CRT 1	1		3		
2	1	2				2	1		3		
3	0	0				3	0		0		
4	1	2				4	1		3		
L 1	0	2				L 1	0		3		
2	0	0				2	0		0		
MM 1	1	2				MM 1	1		3		
2	1	2				2	1		3		

Final configuration for GPCs 2,3 recovered						Final configuration for GPCs 1,4 recovered					
GPC OPS	1 -	2 G2	3 SM	4 -	5 BFS	GPC OPS	1 G2	2 -	3 -	4 SM	5 BFS
POWER OUTPUT MODE	OFF NORM HALT	ON NORM RUN	ON TERM RUN	OFF NORM HALT	ON NORM HALT	POWER OUTPUT MODE	ON NORM RUN	OFF NORM HALT	OFF NORM HALT	ON TERM RUN	ON NORM HALT
CONFIG GPC		2 02000	4 00300			CONFIG GPC	2 10000			4 00040	
STR 1		2	0			STR 1	1			0	
2		2	0			2	1			0	
3		2	0			3	1			0	
4		2	0			4	1			0	
PL 1/2		0	3			PL 1/2	0			4	
CRT 1		2	3			CRT 1	1			4	
2		2	3			2	1			4	
3		0	0			3	0			0	
4		2	3			4	1			4	
L 1		0	3			L 1	0			4	
2		0	0			2	0			0	
MM 1		2	3			MM 1	1			4	
2		2	3			2	1			4	

GPC FRP-4 (Cont)

Final Configuration Tables (Cont)

B. Orbit Config (Cont)

Final configuration for GPCs 2,4 recovered						Final configuration for GPCs 3,4 recovered					
GPC OPS	1 –	2 G2	3 –	4 SM	5 BFS	GPC OPS	1 –	2 –	3 G2	4 SM	5 BFS
POWER OUTPUT MODE	OFF NORM HALT	ON NORM RUN	OFF NORM HALT	ON TERM RUN	ON NORM HALT	POWER OUTPUT MODE	OFF NORM HALT	OFF NORM HALT	ON NORM RUN	ON TERM RUN	ON NORM HALT
CONFIG GPC		2 02000		4 00040		CONFIG GPC			2 00300	4 00040	
STR 1		2		0		STR 1			3	0	
2		2		0		2			3	0	
3		2		0		3			3	0	
4		2		0		4			3	0	
PL 1/2		0		4		PL 1/2			0	4	
CRT 1		2		4		CRT 1			3	4	
2		2		4		2			3	4	
3		0		0		3			0	0	
4		2		4		4			3	4	
L 1		0		4		L 1			0	4	
2		0		0		2			0	0	
MM 1		2		4		MM 1			3	4	
2		2		4		2			3	4	

GPC FRP-4 (Cont)

Final Configuration Tables (Cont)

III. Three PASS GPCs

Final configuration for GPCs 1,2,3 recovered					
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	3(FD) 02000	4 00300		
STR 1	1	2	0		
2	1	2	0		
3	1	2	0		
4	1	2	0		
PL 1/2	0	0	3		
CRT 1	1	2	3		
2	1	2	3		
3	0	2	0		
4	1	0	3		
L 1	0	0	3		
2	0	0	0		
MM 1	1	2	3		
2	1	2	3		

Final configuration for GPCs 1,2,4 recovered					
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	3(FD) 02000		4 00040	
STR 1	1	2		0	
2	1	2		0	
3	1	2		0	
4	1	2		0	
PL 1/2	0	0		4	
CRT 1	1	2		4	
2	1	2		4	
3	0	2		0	
4	1	0		4	
L 1	0	0		4	
2	0	0		0	
MM 1	1	2		4	
2	1	2		4	

Final configuration for GPCs 1,3,4 recovered					
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		3(FD) 00300	4 00040	
STR 1	1		3	0	
2	1		3	0	
3	1		3	0	
4	1		3	0	
PL 1/2	0		0	4	
CRT 1	1		3	4	
2	1		3	4	
3	0		3	0	
4	1		0	4	
L 1	0		0	4	
2	0		0	0	
MM 1	1		3	4	
2	1		3	4	

Final configuration for GPCs 2,3,4 recovered					
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	3(FD) 00300	4 00040	
STR 1		2	3	0	
2		2	3	0	
3		2	3	0	
4		2	3	0	
PL 1/2		0	0	4	
CRT 1		2	3	4	
2		2	3	4	
3		0	3	0	
4		2	0	4	
L 1		0	0	4	
2		0	0	0	
MM 1		2	3	4	
2		2	3	4	

GPC FRP-4 (Cont)

Final Configuration Tables (Cont)

IV. Four PASS GPCs

A. Dual G2 Config

Final configuration for GPCs 1,2,3,4 recovered					
GPC OPS	1 G2	2 G2	3 G3FD	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		3(FD) 00300	4 00040	
STR 1	1		3	0	
2	2		3	0	
3	1		3	0	
4	2		3	0	
PL 1/2	0		0	4	
CRT 1	1		3	4	
2	2		3	4	
3	0		3	0	
4	2		0	4	
L 1	0		0	4	
2	0		0	0	
MM 1	1		3	4	
2	2		3	4	

B. Single G2 Config

Final configuration for GPCs 1,2,3,4 recovered					
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		3(FD) 00300	4 00040	
STR 1	1		3	0	
2	1		3	0	
3	1		3	0	
4	1		3	0	
PL 1/2	0		0	4	
CRT 1	1		3	4	
2	1		3	4	
3	0		3	0	
4	1		0	4	
L 1	0		0	4	
2	0		0	0	
MM 1	1		3	4	
2	1		3	4	

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						Initial ASCENT Config – Av Bay 2					
GPC OPS	1 –	2 G1	3 G1	4 –	5 BFS	GPC OPS	1 G1	2 –	3 G1	4 G1	5 BFS
POWER OUTPUT MODE	ON NORM HALT	ON NORM RUN	ON NORM RUN	ON NORM HALT	ON BKUP RUN	POWER OUTPUT MODE	ON NORM RUN	ON NORM HALT	ON NORM RUN	ON NORM RUN	ON NORM HALT
CONFIG GPC	1 12340					CONFIG GPC	1 12340				
STR 1	3					STR 1	1				
2	2					2	4				
3	3					3	3				
4	2					4	4				
PL 1/2	2					PL 1/2	1				
CRT 1	2					CRT 1	1				
2	2					2	4				
3	3					3	3				
4	0					4	0				
L 1	1					L 1	1				
2	2					2	2				
MM 1	2					MM 1	1				
2	3					2	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	1				
2	2				
3	4				
4	2				
PL 1/2	1				
CRT 1	1				
2	2				
3	4				
4	0				
L 1	1				
2	2				
MM 1	1				
2	2				

GPC FRP-7 (Cont)

NOTE

No keyboard entries or sw throws 10 sec:
 Before and after moding PASS GPCs to RUN
 Before OPS transition or set expansion/contraction
 requests until new OPS base page is displayed

- 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)
 • BFS GNC,OPS 000 PRO
 • 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	2	2
		02000	10000	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

- 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

- O6 • √All IDPs deassigned from BFS

- O6 • GPC MODE 3 – STBY,HALT (tb-bp)

- √OUTPUT 3 – NORM

Re-IPL GPC 5:

- O6 • Perform GPC IPL – PASS DPS SSR-8

- GPC MODE 5 – STBY (tb-bp),HALT

- – STBY (tb-RUN)

- – HALT (tb-bp)

		Av Bay	
		1	2,3
CONFIG	GPC	4	4
		00300	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

GPC FRP-7 (Cont)

f. Perform LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)

g. Config LRU switches:

<u>Av Bay 1</u>		<u>Av Bay 2</u>		<u>Av Bay 3</u>	
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 (OV103,4)
O16:A	BRAKES MNC – OFF	O16:A	BRAKES MNC – OFF		GPS 3 – OFF (OV105)
:E	cb MNC ADTA 3 – op	:E	cb MNC ADTA 4 – op		GPS 3 PRE AMPL UPPER – OFF (OV105)
O7	TACAN 1 MODE – OFF (OV103,4)	O7	TACAN 2 MODE – OFF (OV103,4)		GPS 3 PRE AMPL LOWER – OFF (OV105)
	GPS 1 – OFF (OV105)				
	GPS 1 PRE AMPL UPPER – OFF (OV105)				
	GPS 1 PRE AMPL LOWER – OFF (OV105)				
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		

h. Config IDPs:

- GPC/CRT 03 EXEC
- GPC/CRT SM GPC/4 EXEC
- IDP/CRT3 PWR – OFF
- MDU PWR – OFF (as desired)

C2

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
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	CONFIG GPC	2
	02000		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

GPC FRP-7 (Cont)

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
- SM GPC MODE – STBY (tb-bp), RUN (tb-RUN)
- GPC OUTPUT 4 – NORM
- IDP/CRT3 PWR – ON
- MDU PWR – ON (as desired)
- 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

GPC 1,4 MODE – STBY (tb-bp),HALT
– STBY (tb-RUN)
– HALT (tb-bp)

Av Bay 2

GPC 2 MODE – STBY (tb-bp),HALT
– STBY (tb-RUN)
– 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 →
- IDP/CRT3 PWR – OFF
- MDU PWR OFF as desired
- BFC CRT DISP – OFF
- √All IDPs deassigned from BFS
- 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	4
GPC	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

GPC FRP-7 (Cont)

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	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

	<u>Av Bay 1</u>	<u>Av Bay 2</u>
O6	√GPC 1 MODE – HALT 4 MODE – STBY (tb-bp), HALT – STBY (tb-RUN) – HALT (tb-bp)	√GPC 2 MODE – HALT 5 MODE – STBY (tb-bp), HALT

p. Config LRU switches:

	<u>Av Bay 1</u>	<u>Av Bay 2</u>	<u>Av Bay 3</u>
	Perform <u>PL PWRDN</u> , then: (OV105)	Perform <u>PL PWRDN</u> , then: (OV105)	
O14:A	√BRAKES MNA – OFF	O15:A	√BRAKES MNB – OFF
:E	√cb MNA ADTA 1 – op	:E	√cb MNB ADTA 2 – op
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 (OV103,4)	O7	√TACAN 2 MODE – OFF (OV103,4)
	√GPS 1 – OFF (OV105)		
	√GPS 1 PRE AMPL UPPER – OFF (OV105)		
	√GPS 1 PRE AMPL LOWER – OFF (OV105)		
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
			O13:A cb ESS 1BC C/W A – op
			O7 √TACAN 3 MODE – OFF (OV103,4)
			√GPS 3 – OFF (OV105)
			√GPS 3 PRE AMPL UPPER – OFF (OV105)
			√GPS 3 PRE AMPL LOWER – OFF (OV105)

GPC FRP-7 (Cont)

- 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
- O6
- √All IDPs deassigned from BFS
 - 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						Av Bay 2					
GPC OPS	1 G2FD	2 G2	3 SM	4 –	5 BFS	GPC OPS	1 G2	2 G2FD	3 BFS	4 SM	5 *
POWER	ON	ON	ON	ON	ON	POWER	ON	ON	ON	ON	ON
OUTPUT	NORM	NORM	TERM	NORM	NORM	OUTPUT	NORM	NORM	NORM	TERM	NORM
MODE	HALT	RUN	RUN	HALT	HALT	MODE	RUN	HALT	HALT	RUN	HALT
CONFIG GPC	2 02000	4 00300				CONFIG GPC	2 10000	4 00040			
STR 1	2	0				STR 1	1	0			
2	2	0				2	1	0			
3	2	0				3	1	0			
4	2	0				4	1	0			
PL 1/2	0	3				PL 1/2	0	4			
CRT 1	2	3				CRT 1	1	4			
2	2	3				2	1	4			
3	0	0				3	0	0			
4	2	3				4	1	4			
L 1	0	3				L 1	0	4			
2	0	0				2	0	0			
MM 1	2	3				MM 1	1	4			
2	2	3				2	1	4			

Av Bay 3					
GPC OPS	1 G2	2 G2	3 G2FD	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 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						Av Bay 2					
GPC OPS	1 G2FD	2 G2	3 SM	4 G2FD	5 BFS	GPC OPS	1 G2	2 G2FD	3 BFS	4 SM	5 G2FD
POWER OUTPUT MODE	ON NORM HALT	ON NORM RUN	ON TERM RUN	ON NORM HALT	ON NORM HALT	POWER OUTPUT MODE	ON NORM RUN	ON NORM HALT	ON NORM HALT	ON TERM RUN	ON NORM HALT
CONFIG GPC	2 02000	4 00300				CONFIG GPC	2 10000	4 00040			
STR 1	2	0				STR 1	1	0			
2	2	0				2	1	0			
3	2	0				3	1	0			
4	2	0				4	1	0			
PL 1/2	0	3				PL 1/2	0	4			
CRT 1	2	3				CRT 1	1	4			
2	2	3				2	1	4			
3	0	0				3	0	0			
4	2	3				4	1	4			
L 1	0	3				L 1	0	4			
2	0	0				2	0	0			
MM 1	2	3				MM 1	1	4			
2	2	3				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

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. SM 62 PCMMU/PL COMM If reqd, load dump TFL: LOAD PCMMU FORMAT (ORB OPS FS, <u>COMM/INST</u>)
	3. If PASS: Select failed GPC X as downlister (avoids downlist contention) SM(GNC) 0 GPC MEMORY DOWNLIST GPC – ITEM 44 + <u>X</u> EXEC
O6	4. 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
	5. If PASS: Select lowest ID GNC GPC X as downlister SM(GNC) 0 GPC MEMORY DOWNLIST GPC – ITEM 44 + <u>X</u> EXEC
MO42F	6. GPC MEM DUMP – OFF
	7. SM 62 PCMMU/PL COMM If reqd, load post dump TFL: LOAD PCMMU FORMAT (ORB OPS FS, <u>COMM/INST</u>)

DPS SSR

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. **SM 62 PCMMU/PL COMM**
If reqd, load dump TFL: LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)
 2. 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
3. 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)
 4. **SM 62 PCMMU/PL COMM**
If reqd, load post-dump TFL:
LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)

DPS SSR-3

GNC REASSIGNMENT

NOTE

No keyboard entries or sw throws 10 sec:
 Before and after moding PASS GPCs to RUN
 Before OPS transition or set expansion/contraction
 requests until new OPS base page is displayed

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 (*)

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
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
8. Using display assigned to a current redundant set GNC GPC,
 IDP/CRT MAJ FUNC – GNC
 C2,R11L ✓BFC CRT DISP – OFF
 C3
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

NOTE

No keyboard entries or sw throws 10 sec:
Before and after moding PASS GPCs to RUN
Before OPS transition or set expansion/contraction
requests until new OPS base page is displayed

A1U	1. KU PWR – STBY CNTL – PNL,CMD If no comm, go to COMM LOST (ORB PKT, <u>COMM</u>) steps 7 and 8
L1 O6	2. If target GPC MODE – HALT: √Appropriate AV BAY FAN – ON √Target GPC PWR – ON MODE – STBY (tb-RUN), RUN
	3. √Target GPC OUTPUT – NORM
	4. If target GPC not in OPS 0: <u>GNC 0 GPC MEMORY</u> 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 <u>PL/DPS RECONFIG</u> , Secure (PL SYS or SODF: ASSY OPS), then: If RMS active: <u>SM 94 PDRS CONTROL</u> Note WR range, PL ID, PL INIT ID, EE ID, SPEC 95 Overrides Perform SM CHECKPOINT INITIATE (ORB OPS, <u>DPS</u>), then: SM GPC OUTPUT – NORM MODE – STBY (tb-bp), RUN (tb-RUN)
	6. <u>SM(GNC) 1 DPS UTILITY</u> UL CNTL ENA – ITEM 36 EXEC (*) If checkpoint previously done, CKPT RETRV ENA – ITEM 12 EXEC (*)
C2 R11L	7. Desired IDP/CRT MAJ FUNC – SM If desired IDP not currently assigned to target GPC, GPC/CRT target GPC/desired IDP EXEC
	8. <u>SM 0 GPC MEMORY</u> CONFIG – ITEM 1 +4(5) EXEC Assign desired GPC, PL 1/2, CRTs, LAUNCH 1, MMs
C2	9. SM, OPS 201(401) PRO √ <u>SM ANTENNA</u>
	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 <u>DPS FRP-1</u> , then:
	11. Reload TFLs, LOAD PCMMU FORMAT (ORB OPS FS, <u>COMM/INST</u>)
	12. If RMS PWR – PRI (MCIU powered): <u>SM 94 PDRS CONTROL</u> (MA, C/W GPC DATA It on) I/O ON – ITEM 5 EXEC (*) (C/W GPC DATA It off) Update as needed: WR range, PL ID, PL INIT ID, EE ID, SPEC 95 Overrides SAFING – CANCEL (tb-bp if arm deselected)

DPS SSR-4 (Cont)

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 (*)
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

NOTE

No keyboard entries or sw throws 10 sec:
 Before and after moding PASS GPCs to RUN
 Before OPS transition or set expansion/contraction
 requests until new OPS base page is displayed

- 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. **SM 62 PCMMU/PL COMM**
If reqd, load TFL: LOAD PCMMU FORMAT (ORB OPS FS, COMM/INST)
2. 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 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 4
3. 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 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)
4. **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

No keyboard entries or sw throws 10 sec:
Before and after moding PASS GPCs to RUN
Before OPS transition or set expansion/contraction
requests until new OPS base page is displayed

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:
O14:E, √cb DDU L (two) – cl
O15:E
- F7 FLT CNTLR PWR – ON
BFS ENGAGE pb – push
FLT CNTLR PWR – OFF
O14:E, cb DDU L (two) – as reqd
O15:E
- 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)
- O6 6. When tb – bp or 2 min:
IDP LOAD 3(1,2) – LOAD
GPC MODE 1(2,3,4,5) – STBY (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

DPS SSR-7 (Cont)

- d. IPL SOURCE – OFF
 - e. Go to step 11
10. If BFS IPL desired:
- a. If orbit config:

On MCC GO, select PCMMU format
 √OI PCMMU FORMAT – GPC
 [X: SM 62 PCMMU/PL COMM]
 PCMMU FMT SEL FXD – ITEM 1 EXEC (*)
 - b. Load desired copy of BFS software from MM:
 ITEM 2(4) EXEC (*)
 - c. 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)
 - d. If 'BSL XX.X.XX.XX LOADED' appears (within 2 min),
 MSG RESET pb – push (repeat until 'MSGs STILL IN LIST' = 0)
 - e. Expect 'KSC XX.XX.X.XX.XX LOADED SET MMU SEL SW TO OFF'
 If 'KSC X.XX.X.XX.XX LOADED' appears,
 continue with procedure and notify MCC when convenient
 - f. IPL SOURCE – OFF
 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:
 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:
 All RGAs – ON
 cb ADTA (four) – cl
 MLS (three) – ON
 √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
 All RGAs – OFF
 cb ADTA (four) – op
 MLS (three) – OFF
 [GNC 22 S TRK/COAS CNTL]
 S TRK -Y,-Z: STAR TRK – ITEM 3,4 EXEC (*)
 [GNC 21 IMU ALIGN]; RESUME
 Reconfig DAP and attitude per FLIGHT PLAN
 If Group B(C) PWRDN:
 √DAP: VERN
 Primary RJD LOGIC, DRIVER (sixteen) – OFF
 RJDA 1A L2/R2 MANF DRIVER – ON
 - j. Select program PCMMU FORMAT:
 √OI PCMMU FORMAT – GPC
 [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

No keyboard entries or sw throws 10 sec:
Before and after moding PASS GPCs to RUN
Before OPS transition or set expansion/contraction
requests until new OPS base page is displayed

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)
- O14:E, O15:E 4. GPC PWR 1(2,3,4,5) – OFF, ON
If BFS engaged:
√cb DDU L (two) – cl
- F7 FLT CNTLR PWR – ON
BFS ENGAGE pb – push
FLT CNTLR PWR – OFF
O14:E, O15:E cb DDU L (two) – as reqd
- 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 (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 (*)

DPS SSR-9

DEU IPL-PASS/BFS

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)
- C2/R11L 3. When DEU LOAD msg appears on CRT, on active PASS/BFS kybd:
- 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
- C2/R11L 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)
- C2/R11L 5. When active display appears,
- 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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NOTE A

The identified MAL represents a support procedure that is entered from other procedures or on MCC call

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

'S66 CAB HX OUT TEMP'	'S66 VAC VNT N2 TEMP'
'S78 CABIN O2 CONC'	'S66 CAB AIRLK PRESS'
'SM1 SMOKE CAB L FD'	'177 EXT A/L PRESS'
'SM1 SMOKE CAB R FD'	'177 A/L VEST DP'
'SM1 SMOKE CAB HX'	'177 AL H2O LCG P1(2)'
'SM1 SMOKE BAY 1(2,3) A(B)'	'177 AL H2O XFER P'

BFS FSM INDEX

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

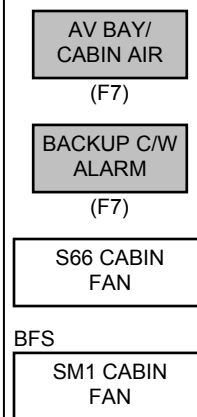
SM1 CABIN HX T
SM2 TEMP

AV BAY/
CABIN AIR

6.1

ECLS

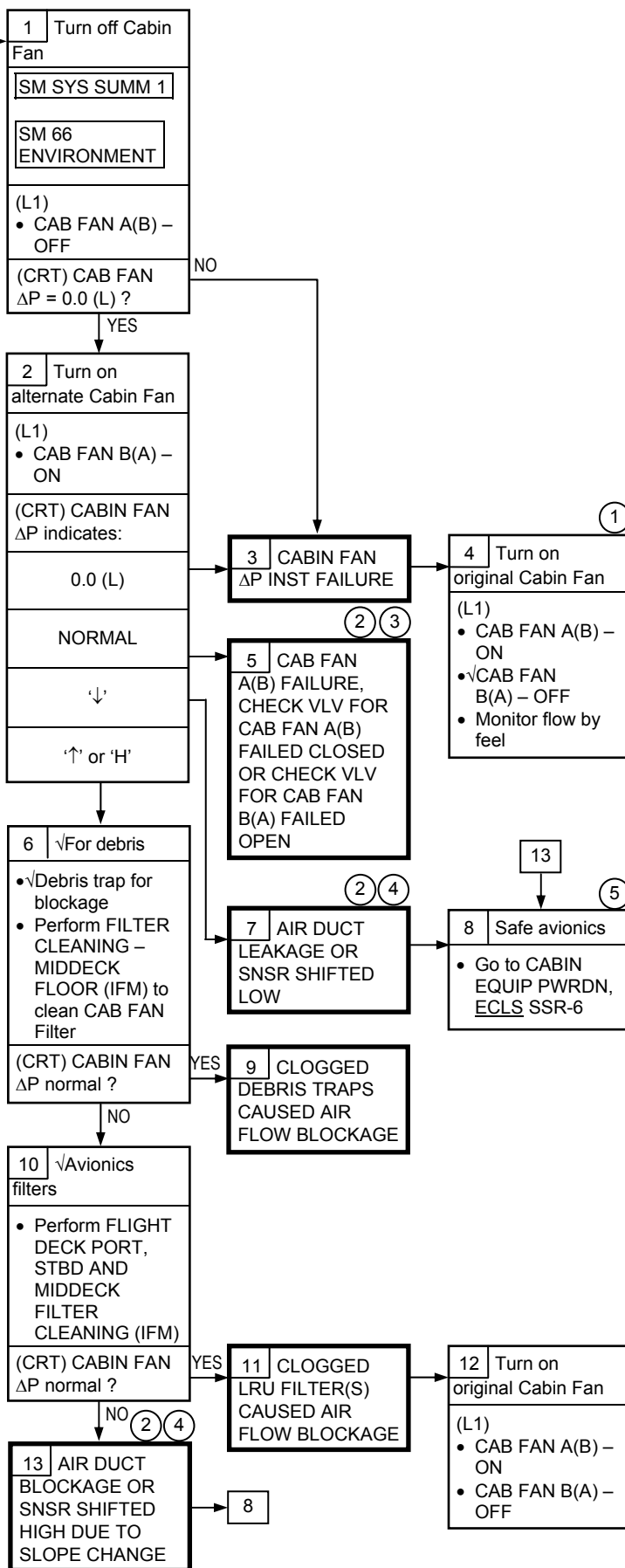
6.1a CABIN FAN ΔP



If:
CABIN FAN ΔP
< 4.2 or > 6.8
(< 2.8 or > 4.88 if
10.2 ops)

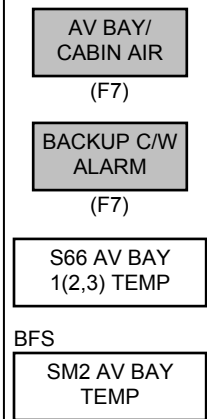
Nominal Config:

(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



- 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



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

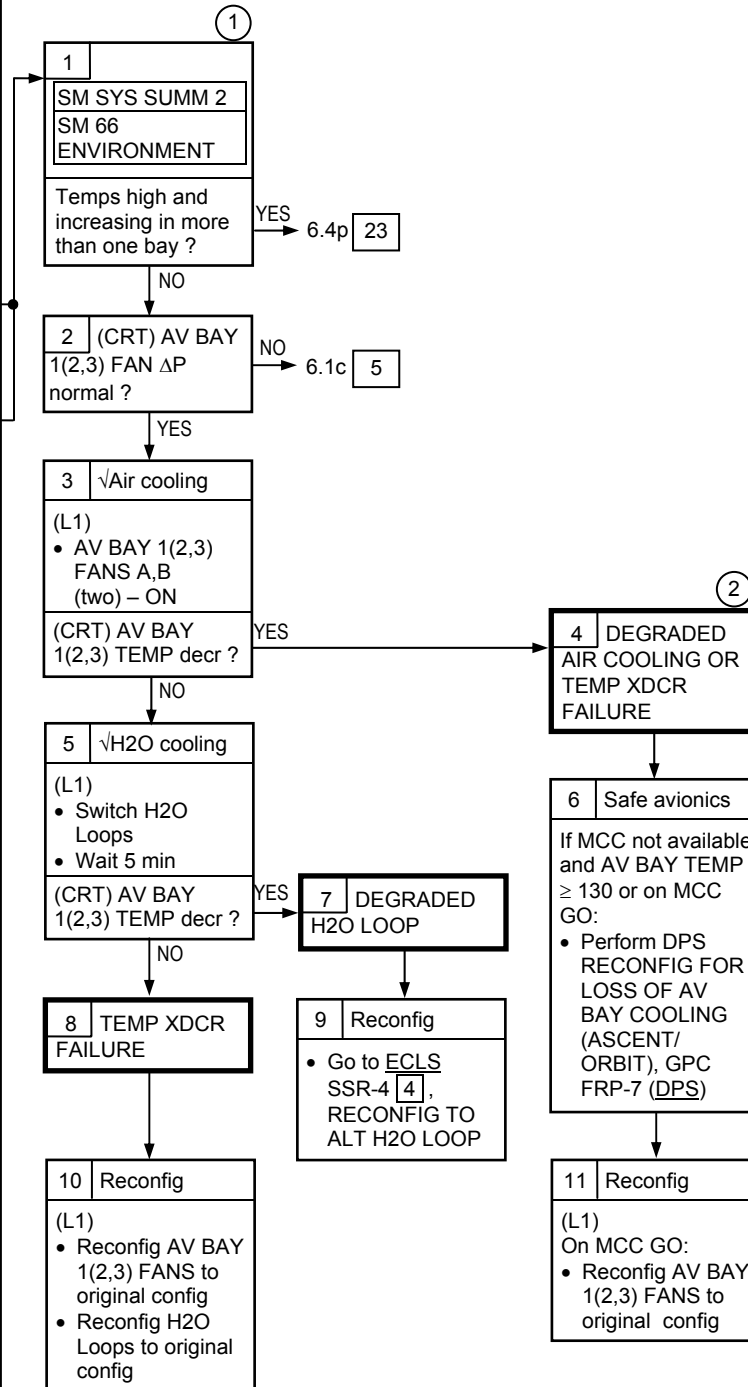
3 FAN B(A) – ON

H2O LOOP

Nominal Config:

Refer to 6.4I

6.1b AV BAY TEMP

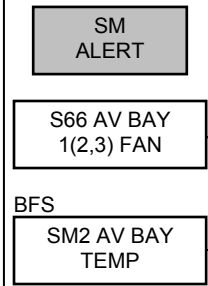


① Temps can be
read from meter on
pnl O1

② √MCC to
determine exact
failure

ECLS

6.1c AV BAY FAN ΔP

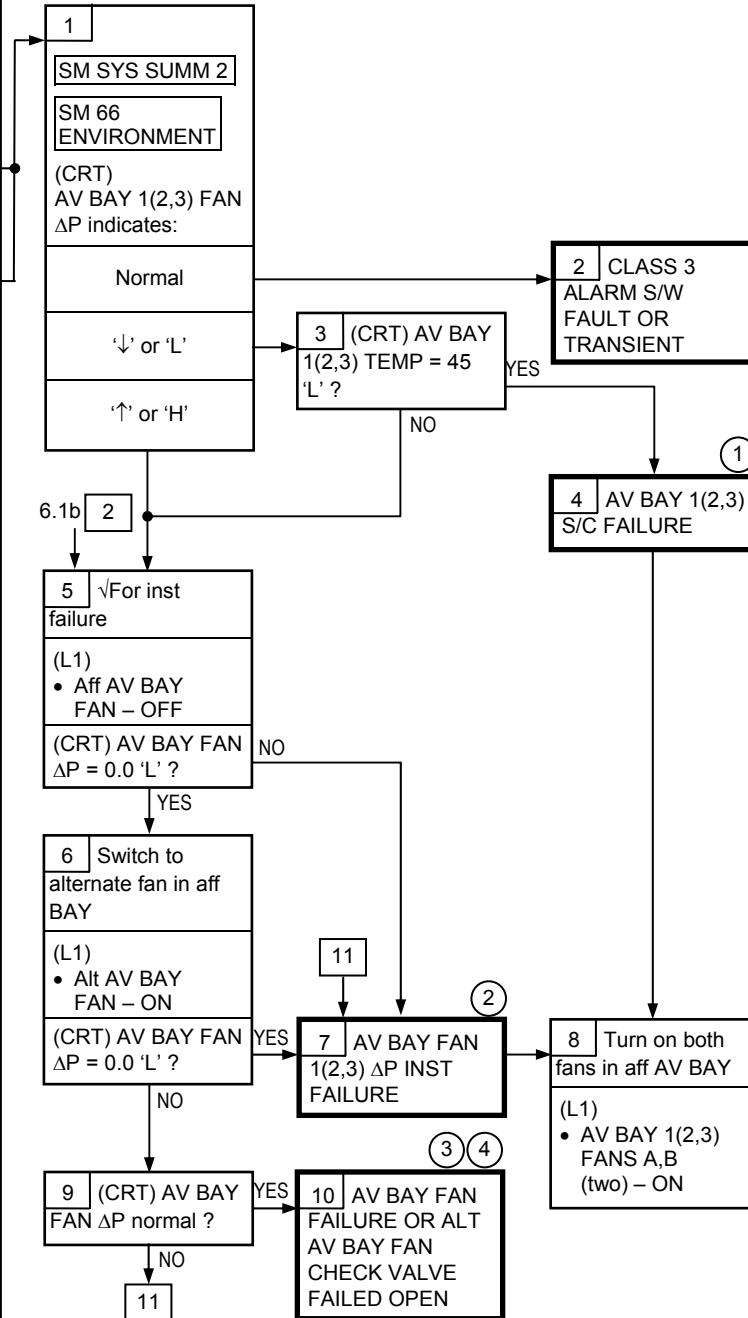


If:
AV BAY 1(2,3) FAN
 $\Delta P < 2.5$ or > 4.3
(3.3 if 10.2 ops)

If Upgraded AV BAY FAN:
 $\Delta P < 4.5$ or > 7.8
(5.9 if 10.2 ops)

Nominal Config:

(L4:G)
cb AC1 AV BAY 1
FAN A (three) – cl
cb AC2 AV BAY 1
FAN B (three) – cl
cb AC3 AV BAY 3
FAN A (three) – cl
(L4:H)
cb AC1 AV BAY 3
FAN B (three) – cl
cb AC2 AV BAY 2
FAN A (three) – cl
cb AC3 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
AV BAY 2 FAN
A(B) – ON
AV BAY 3 FAN
B(A) – ON



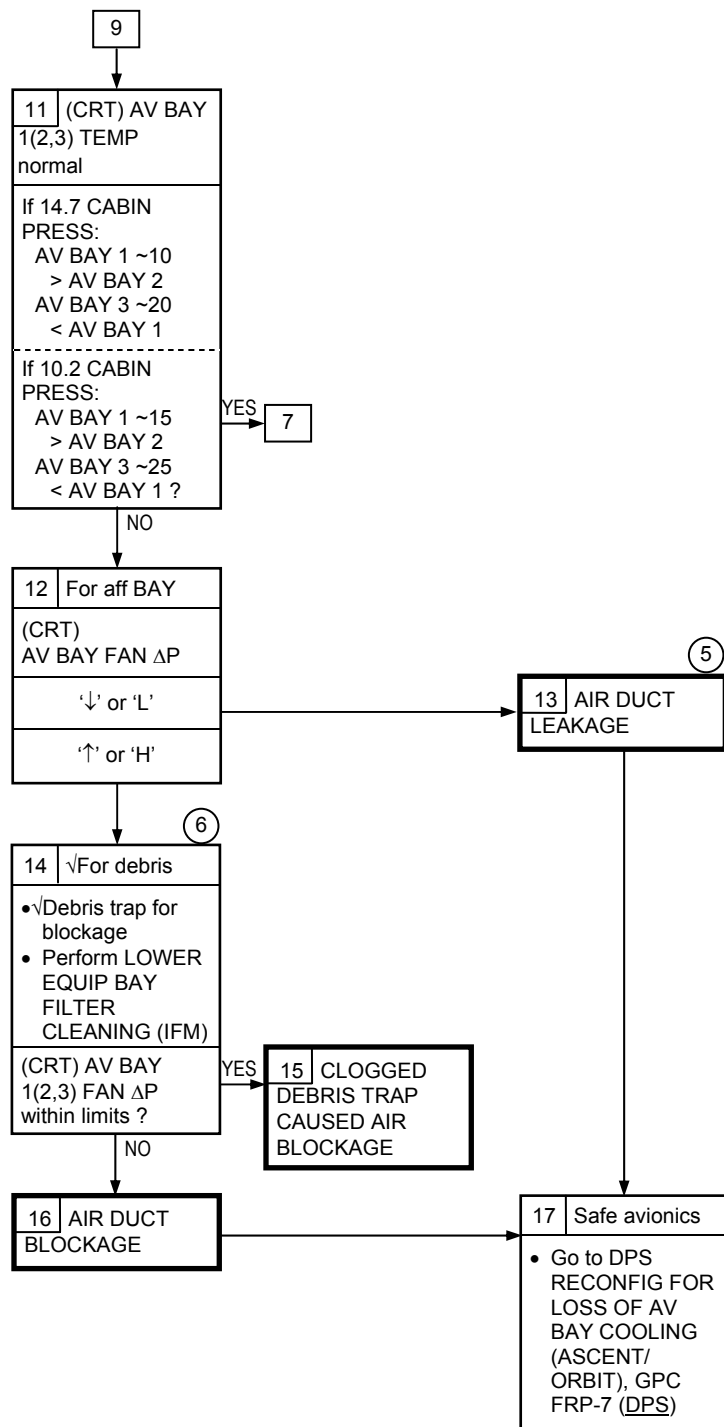
① If AV BAY 1(2,3) S/C cb is open, √MCC before attempting to reset cb

② With loss of ΔP , monitor AV BAY TEMP. If > 130 degF, there is AV BAY cooling problem. If AV BAY TEMP $\sim$ 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

ECLS 6.1c (Cont)



⑤ √MCC about checking AV BAY duct integrity after completing next step

⑥ √MCC about performing pwrn of affected bay before performing AV BAY filter cleaning

ECLS

6.1d CABIN IMU

SM ALERT

S66 IMU FN SPD A(B,C)

IMU FAN Underspeed

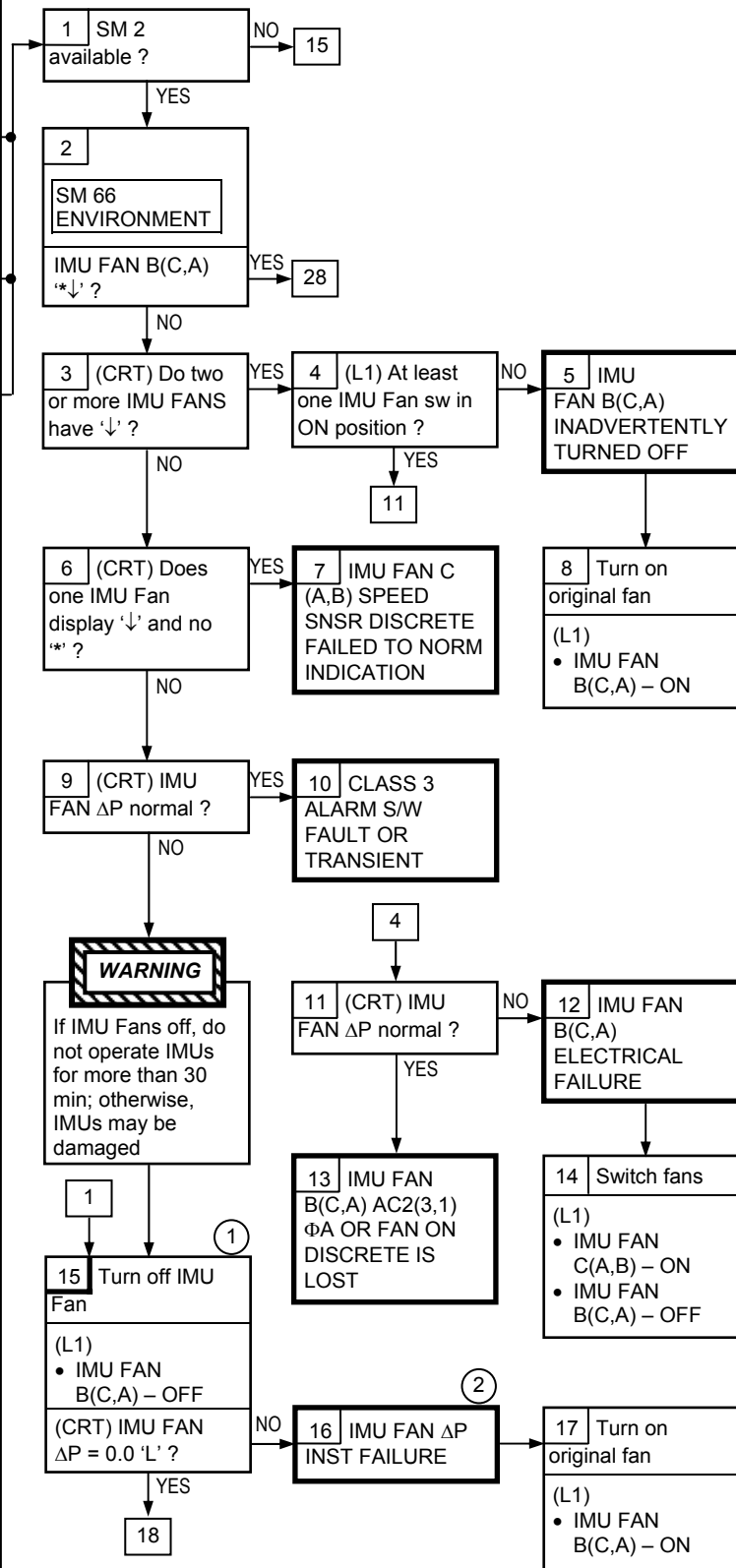
S66 IMU FAN DP

BFS

SM1 CABIN IMU

IMU FAN $\Delta P < 3.7$
(3.0 if 10.2 ops) or
> 4.95 (3.8 if 10.2 ops)

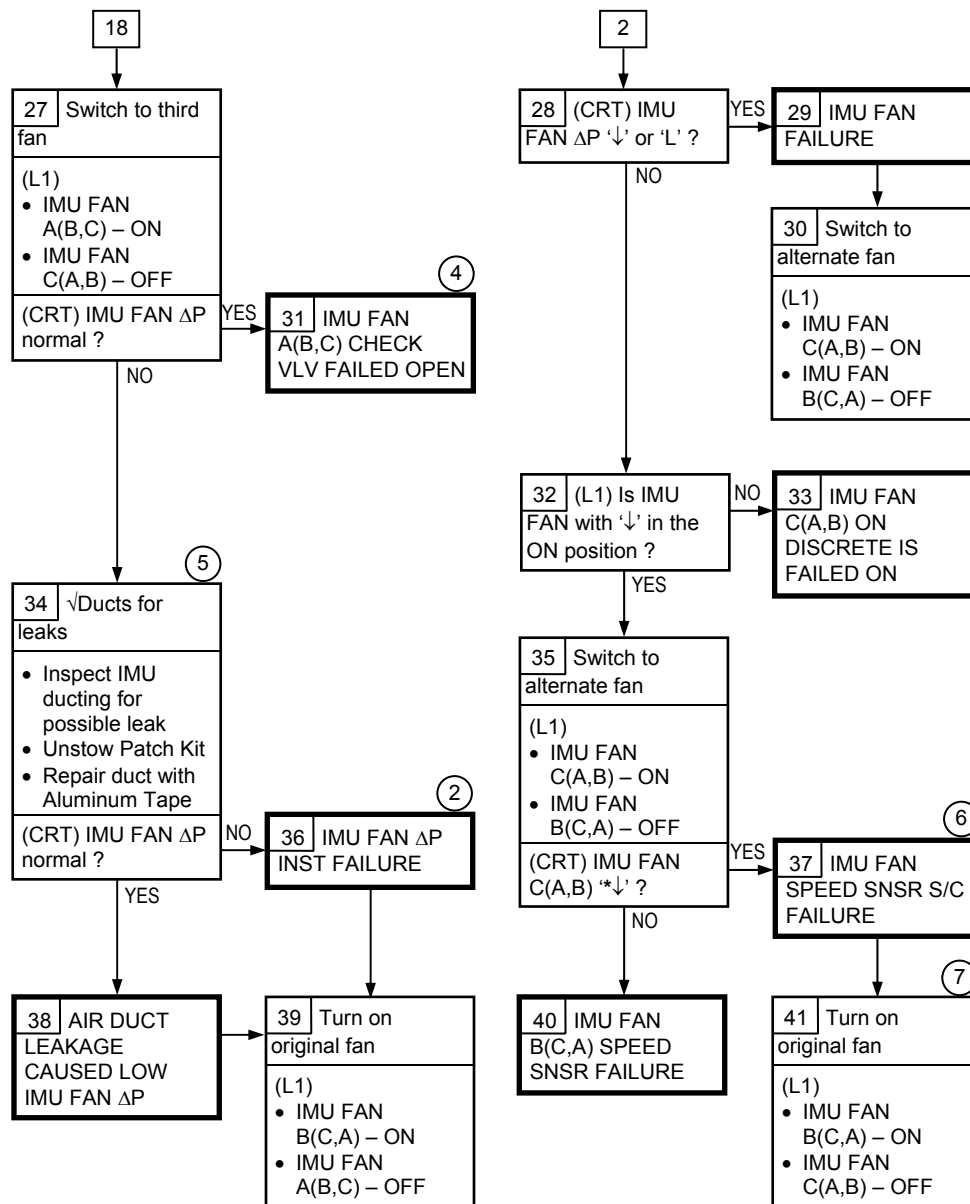
Nominal Config:
(O14:B)
cb MNA OI H2O
BYP LOOP 1
SNSR – cl
(L4:I)
cb AC1 IMU FAN A
(three) – cl
cb AC2 IMU FAN B
(three) – cl
cb AC3 IMU FAN C
(three) – cl
(L4:J)
cb AC3 Φ B SIG
CONDR IMU
FAN – cl
(L1)
IMU FAN B(C,A) – ON



① If SM 2 not available, use BFS SYS SUMM 1 to monitor IMU FAN ΔP

② Monitor Speed Snr '↓' for fan failure if IMU ΔP is lost

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

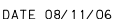
⑤ √MCC for proper IMU config and ops

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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ORBIT

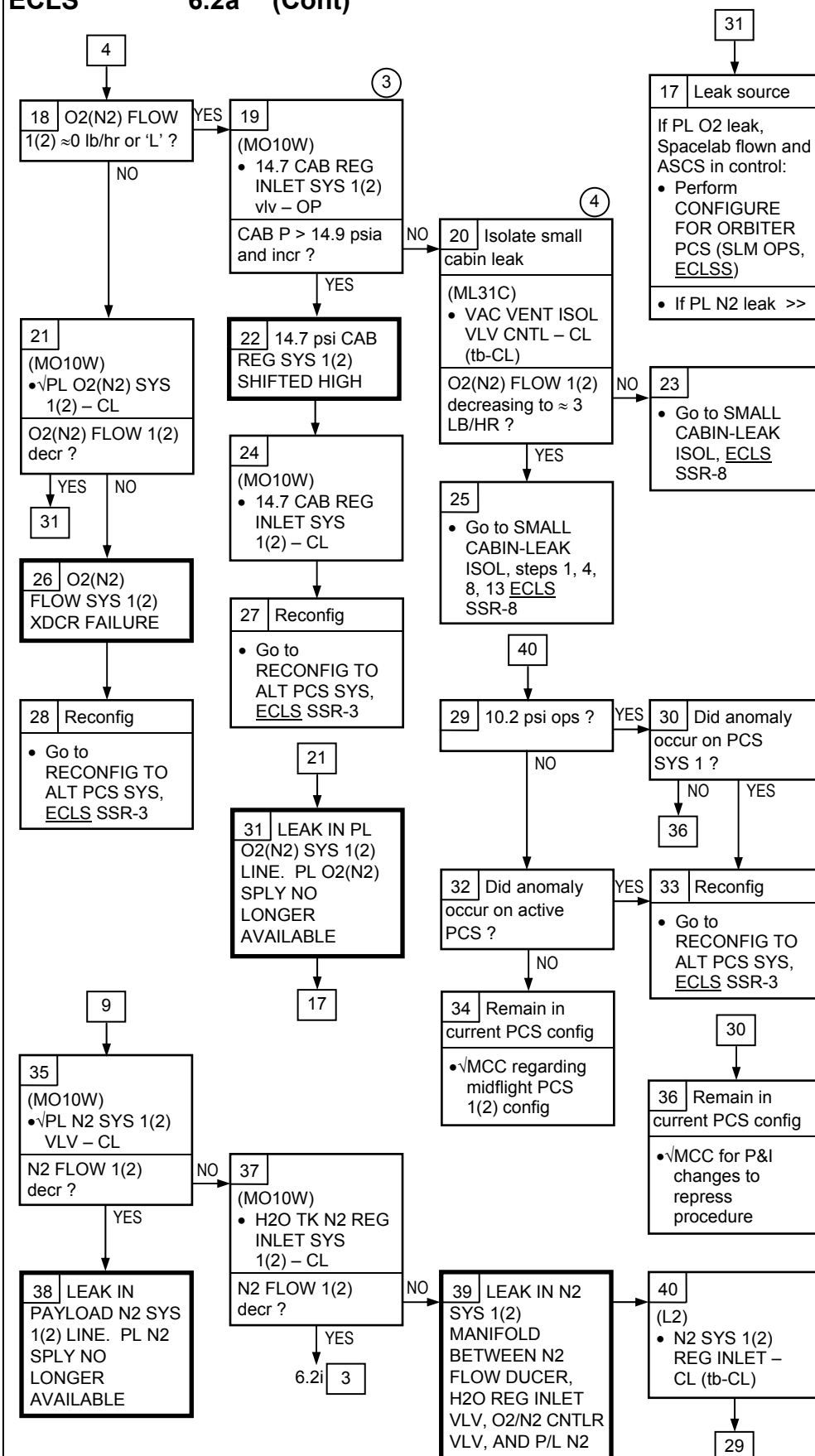


NORM = 3.2 ±.25 PSIA
EMER = 2.2 ±.25 PSIA
(NOT USED)

48027005_117. SCH 1



ECLS 6.2a (Cont)



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

CABIN ATM
(F7)

BACKUP C/W ALARM
(F7)

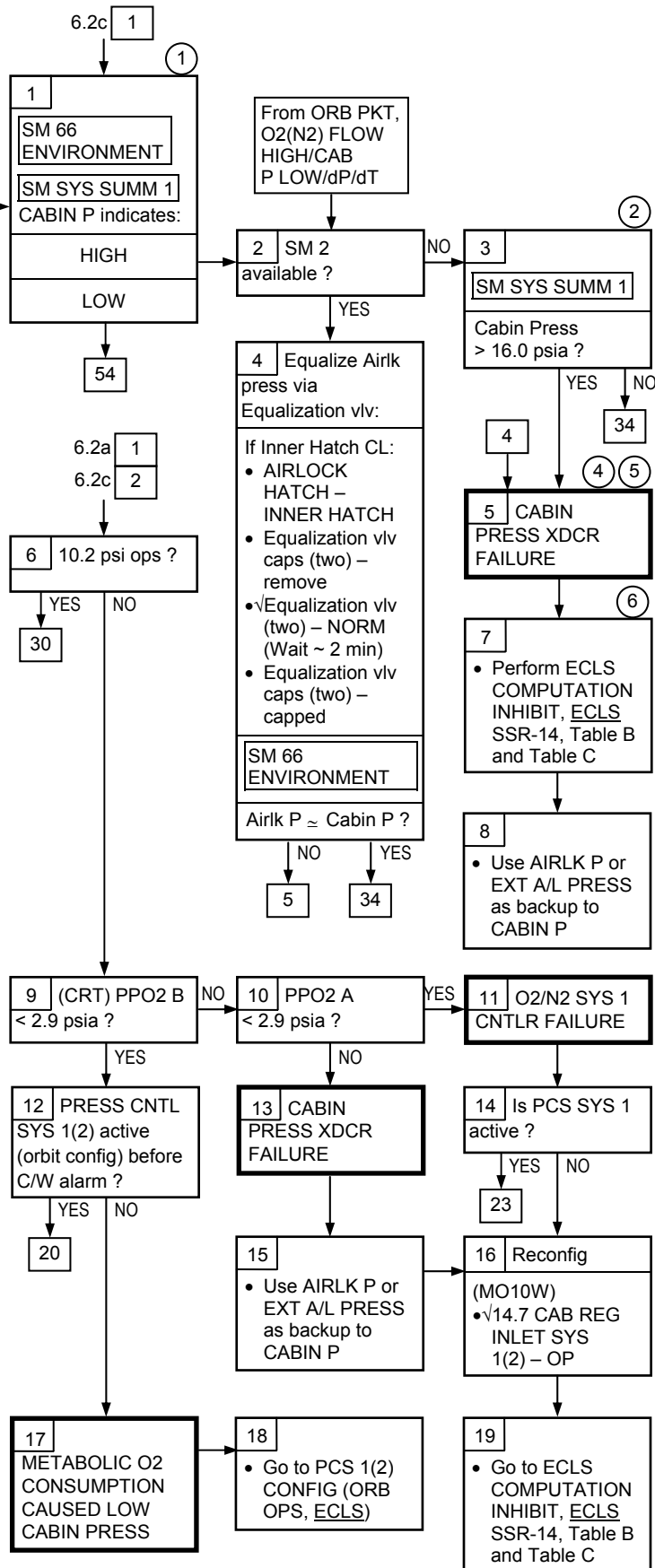
S66 CABIN PRES
(BFS)

SM1 CABIN PRES

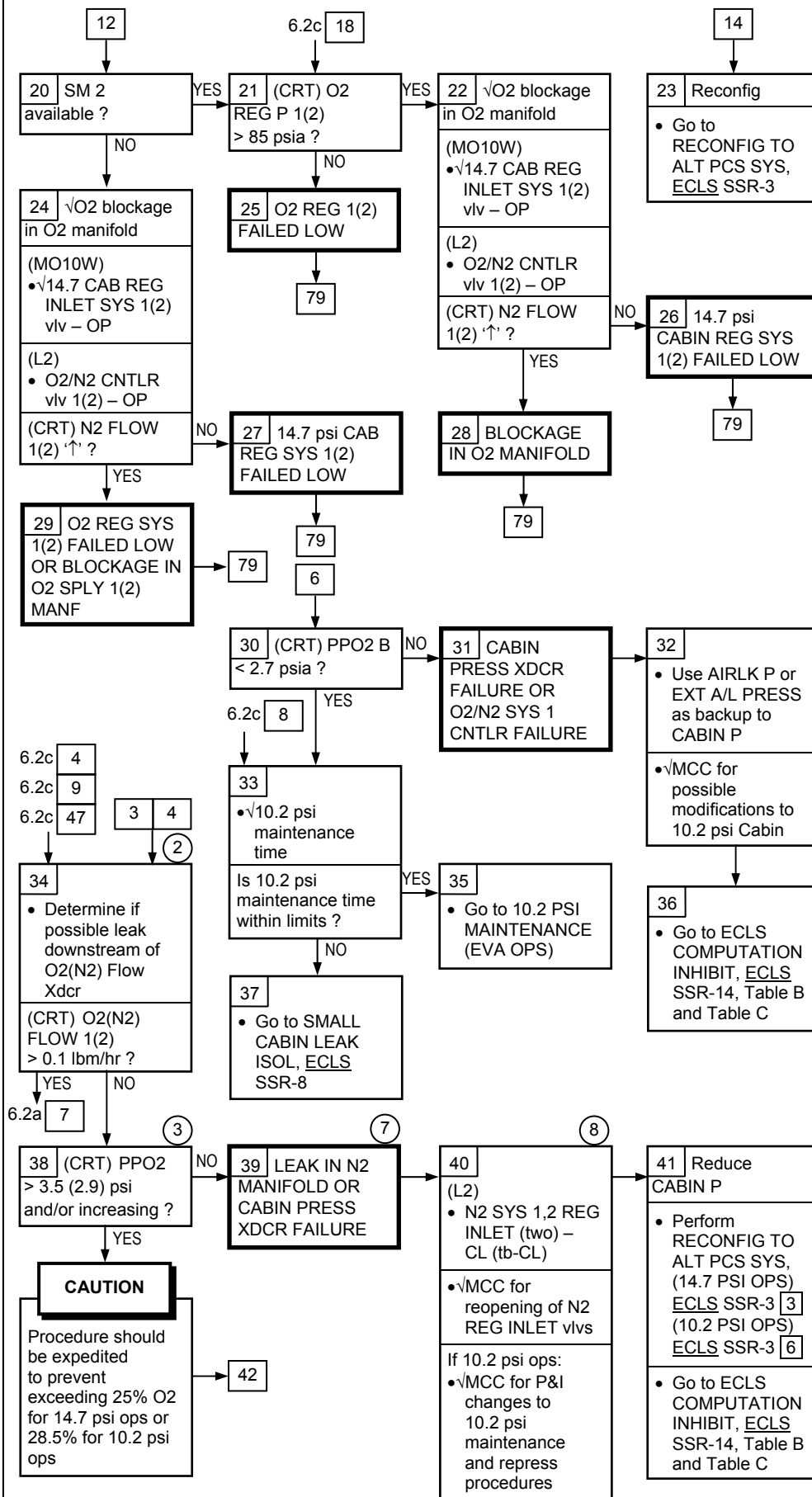
CABIN PRES (3)
< 13.8 (10.0) psia
> 15.2 (10.6) psia

Nominal Config:
(ORBIT)
Refer to 6.2a

6.2b CABIN PRES ↑↓

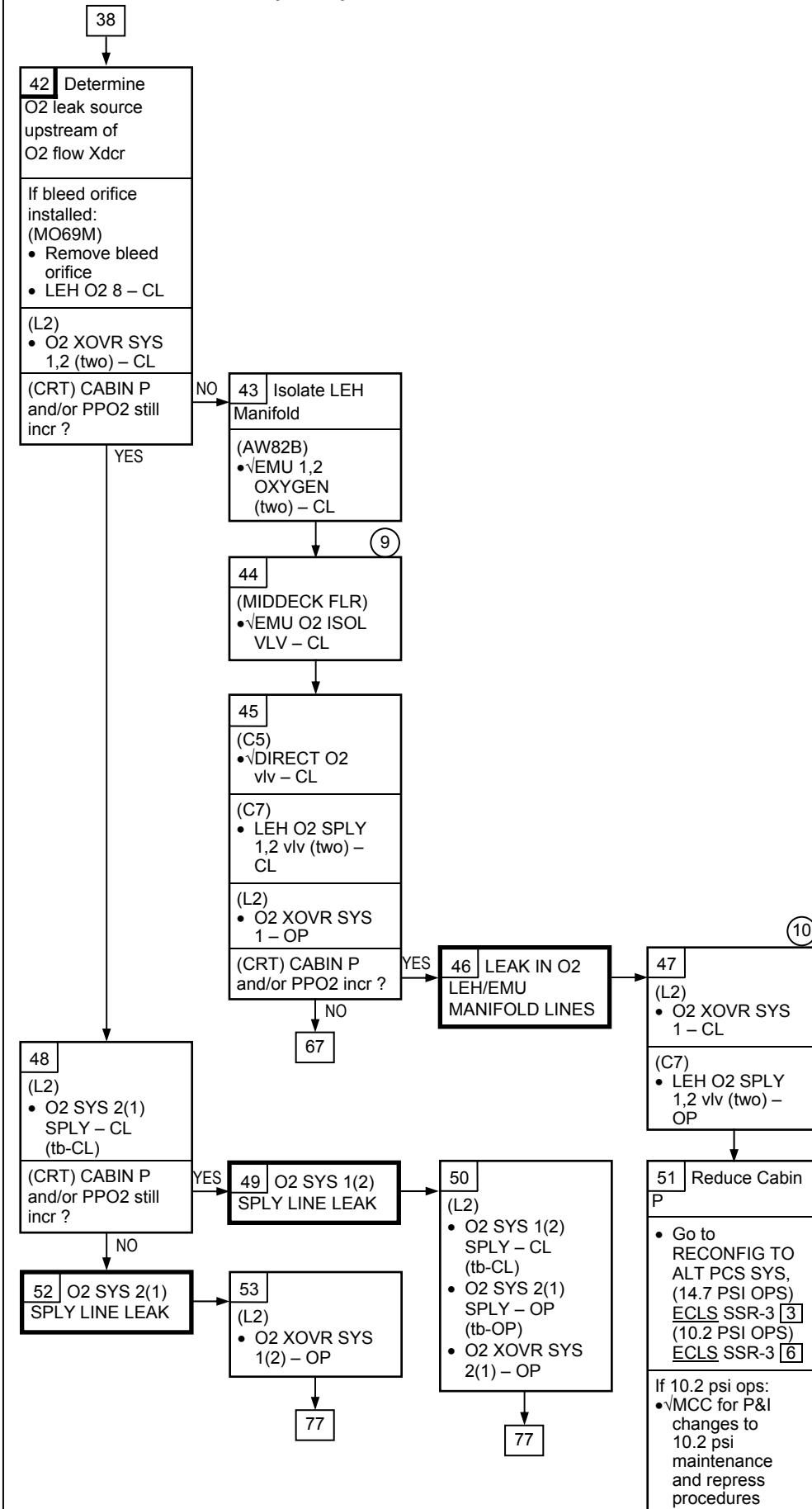


ECLS 6.2b (Cont)



- ② Cabin Press Relief vlv crack at 15.5 psid. Full flow at 16.0 psid
- ③ Use number in parenthesis for 10.2 psia cabin ops
- ⑦ If Airk P equaled Cabin P in block 4, then failure is leak in N2 Manf. If Airk 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

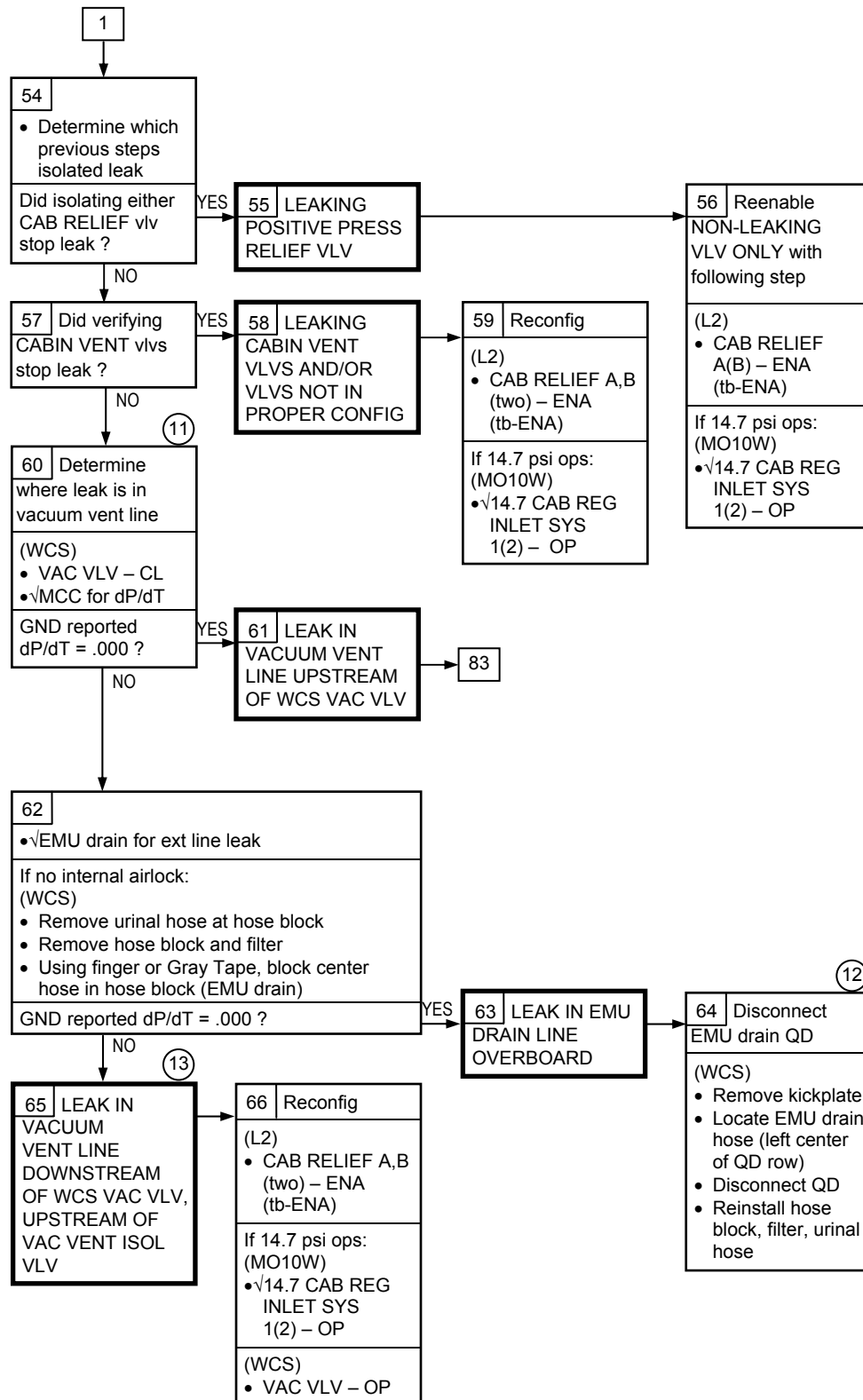
ECLS 6.2b (Cont)



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. V MCC before taking this action

ECLS 6.2b (Cont)

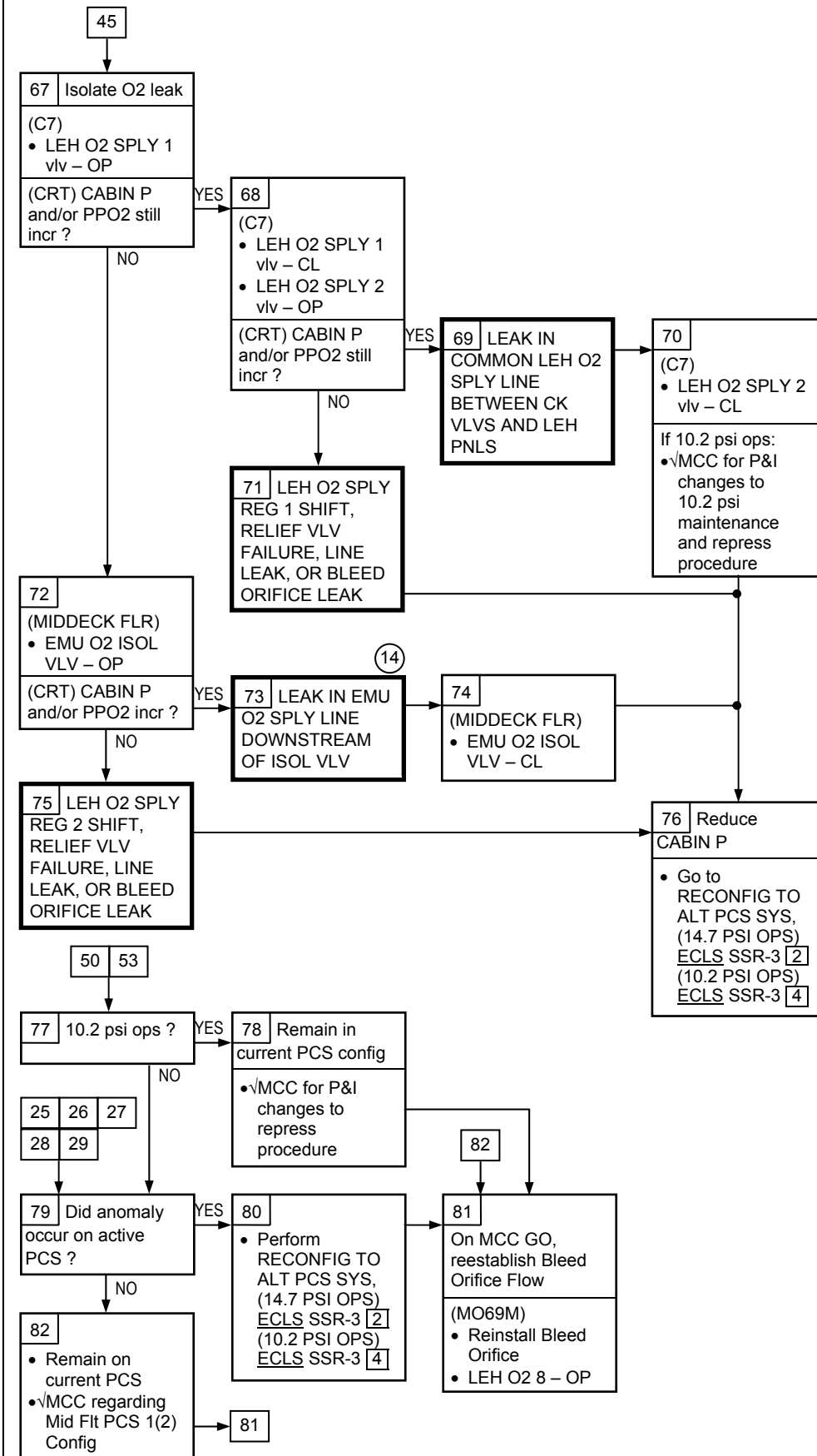


⑪ MCC is reqd to determine if leak is isolated. Leak rate thru VAC Vent Isol vlv ~3 lb/hr (dP/dT = -0.004)

⑫ EMU drain is lost

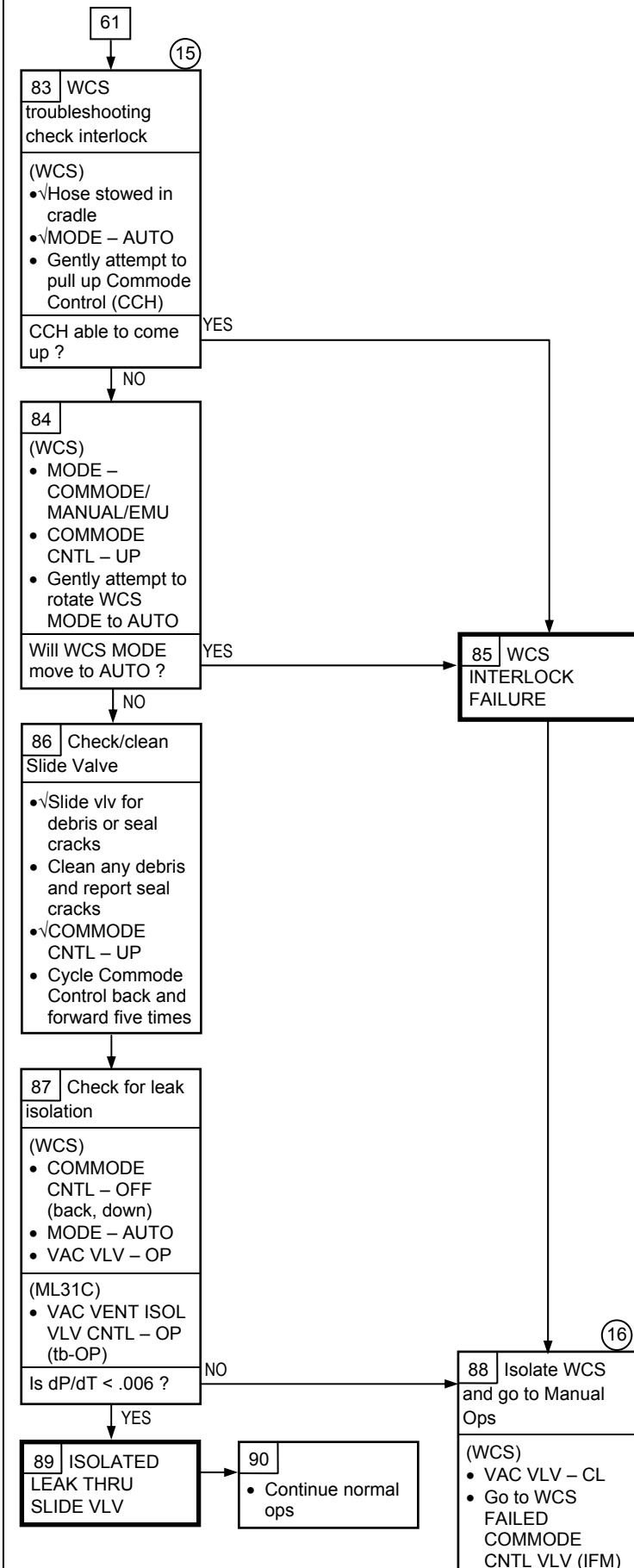
⑬ By isolating cabin leak with VAC VENT ISOL VLV CNTL, hydrogen entrapment in vacuum vent line could create hazardous condition. √MCC for impacts of leaving this vlv closed

ECLS 6.2b (Cont)



(14) Possible loss of O2 Supply to EMUs or O2 transfer to ISS

ECLS 6.2b (Cont)



15 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

16 Maintaining VAC VLV – CL to EOM may cause odor buildup due to inability to vent wet trash overboard

ECLS

CABIN
ATM
(F7)

BACKUP C/W
ALARM
(F7)

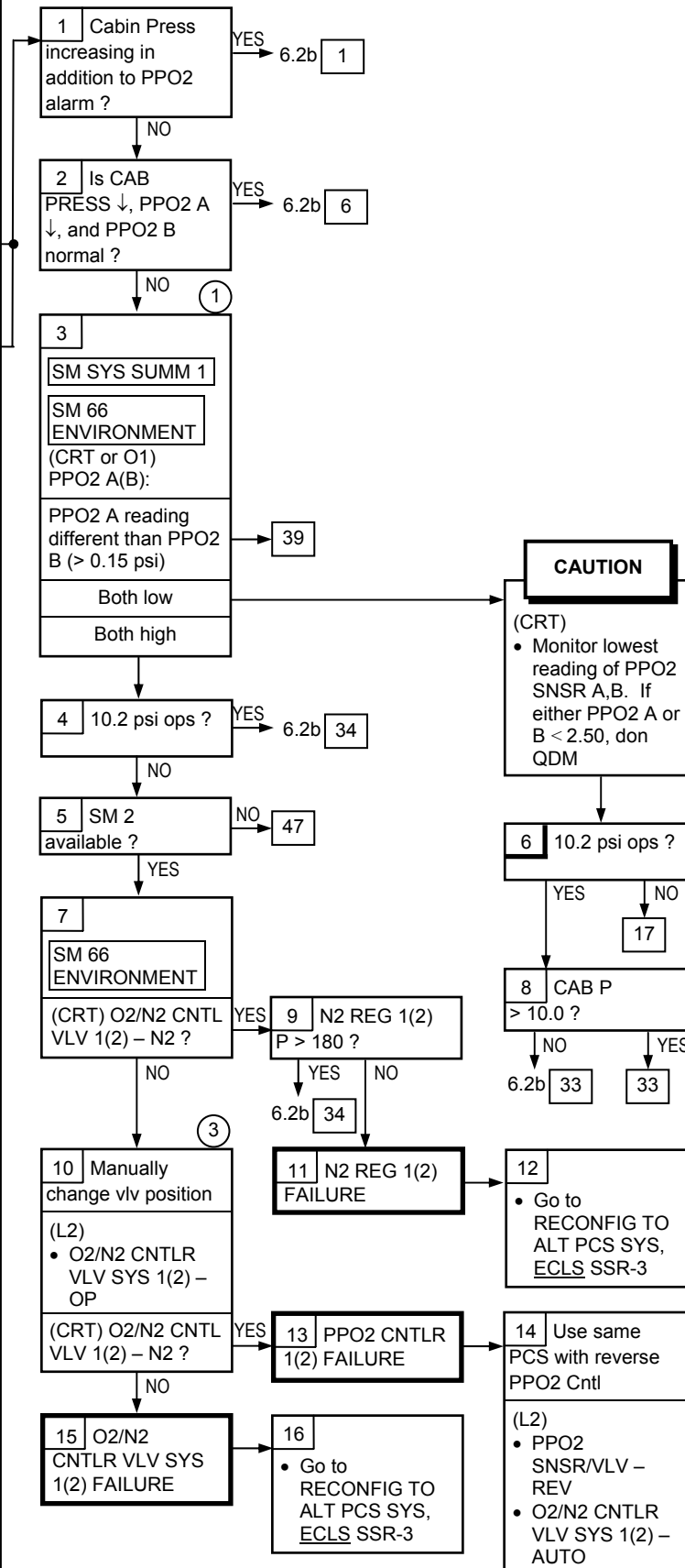
S66 CABIN
PPO2 A(B)
(BFS)

SM1 CABIN
PPO2

PPO2 A(B)
(2)
< 2.70 (2.55) psia
> 3.60 (2.90) psia

Nominal Config:
(ORBIT)
Refer to 6.2a

6.2c PPO2 ↑↓

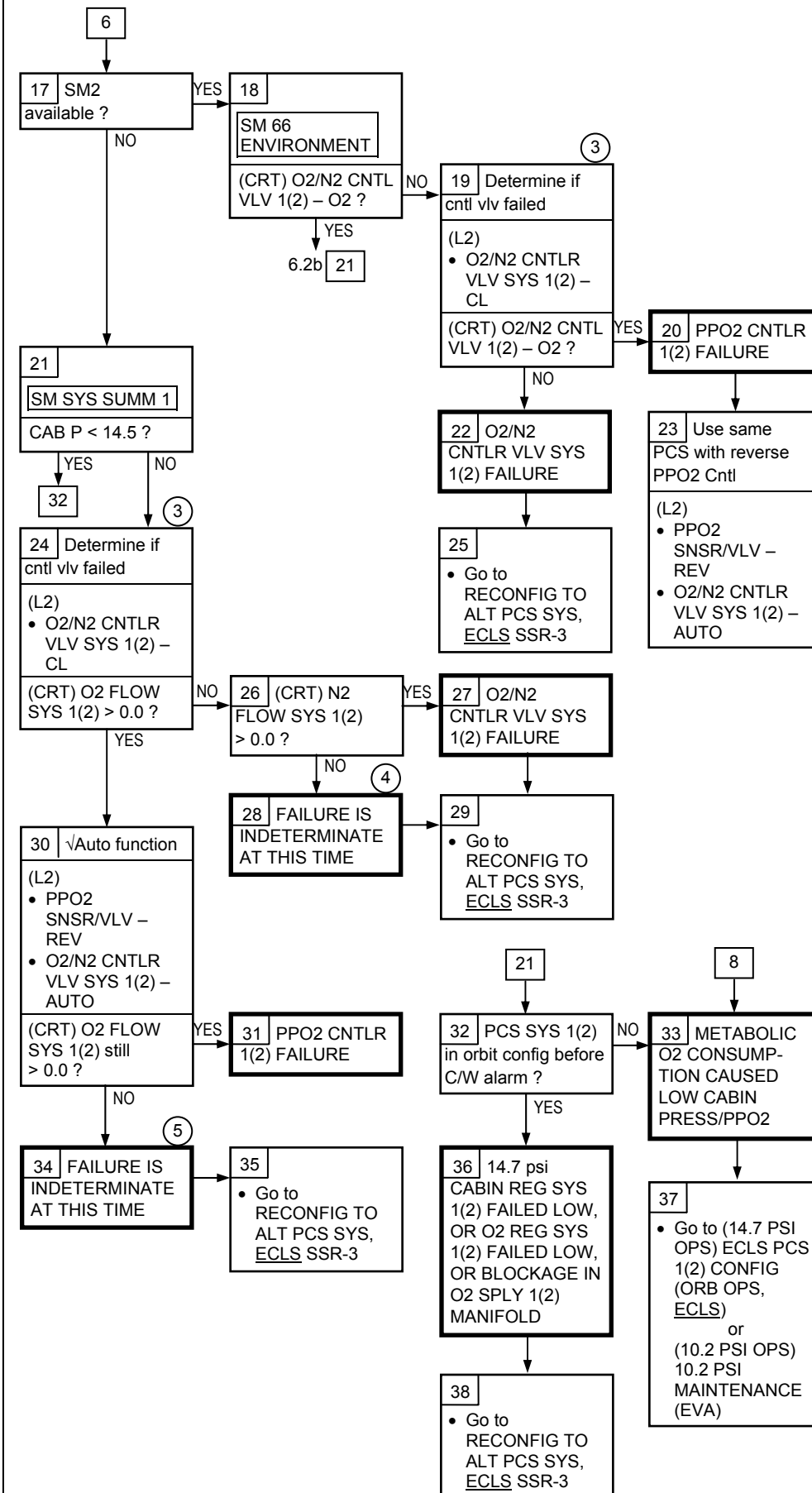


① If prior to performing on-orbit PCS config, low PPO2 could be caused by PCS 14.7 CABIN REGS – CL. After PCS config for Orbit Ops only one system active with PPO2 A tied to PCS 1 and PPO2 B tied to PCS 2. For 10.2 psi ops SYS 1 nominally configured to flow N2 and SYS 2 O2, with both 14.7 CAB REGS – 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)

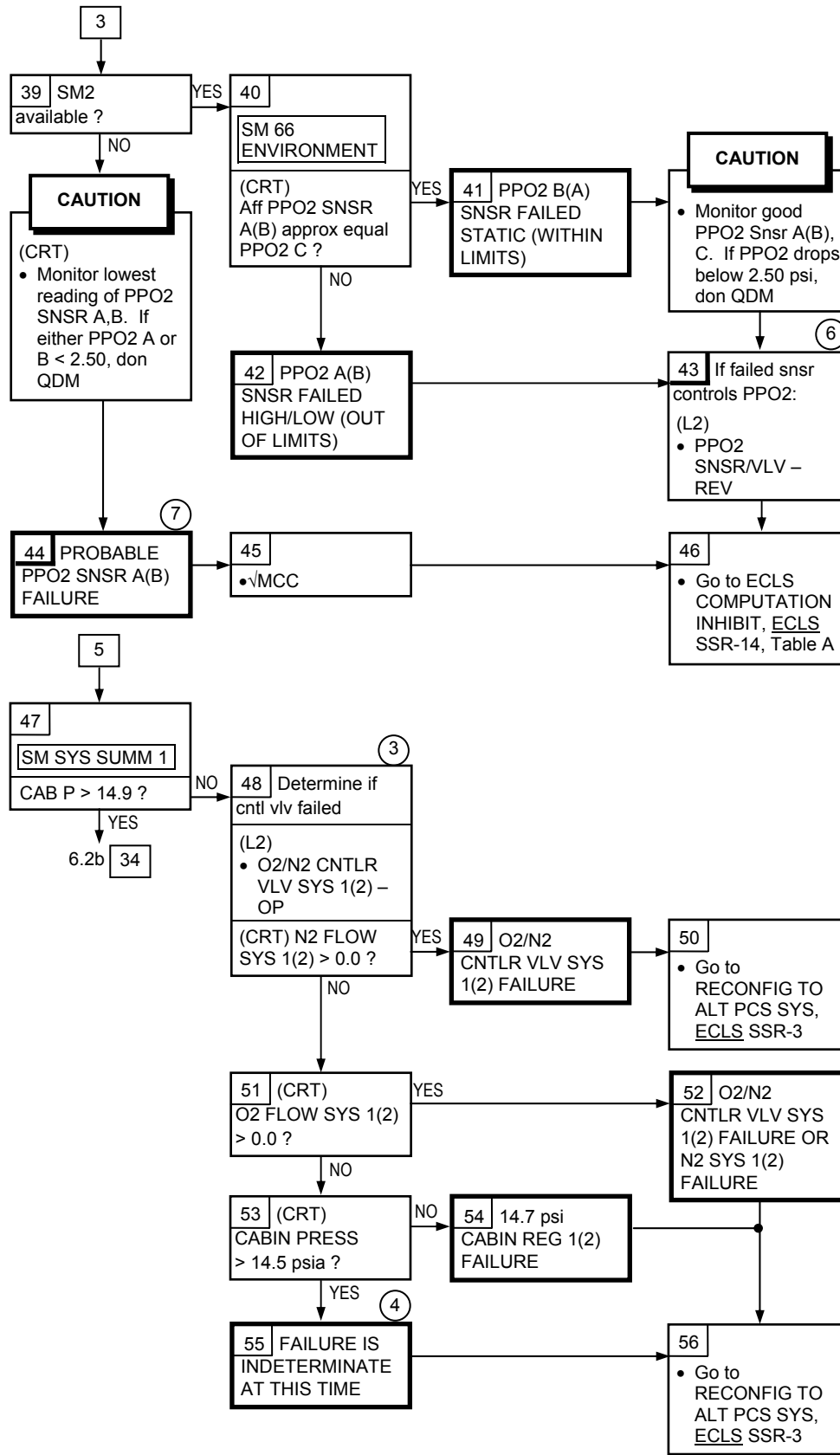


③ O2/N2 CNTLR VLV flows N2 in OP position, and O2 in CL position

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 CNTLR 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

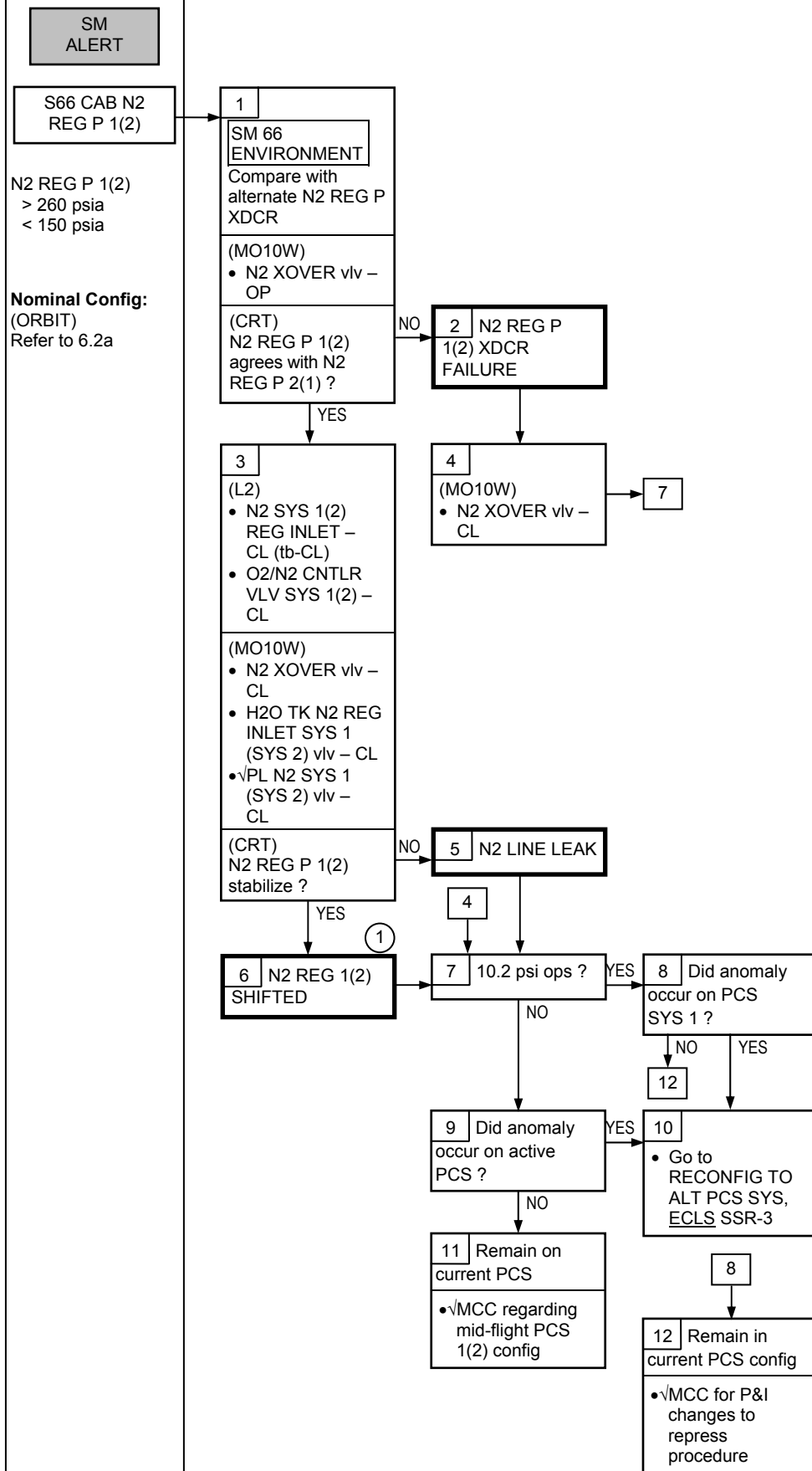
⑥ Monitor systems performance on Reverse snsr. If 10.2 psi operations, performance of snsr cannot be determined until cabin repressed and initiation of Auto PCS control. If Reverse snsr does not control PPO2 properly, √MCC regarding Manual Cabin ATM Management

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 ↑↓

① If PL N2 line in use, √MCC for further isolation



ECLS

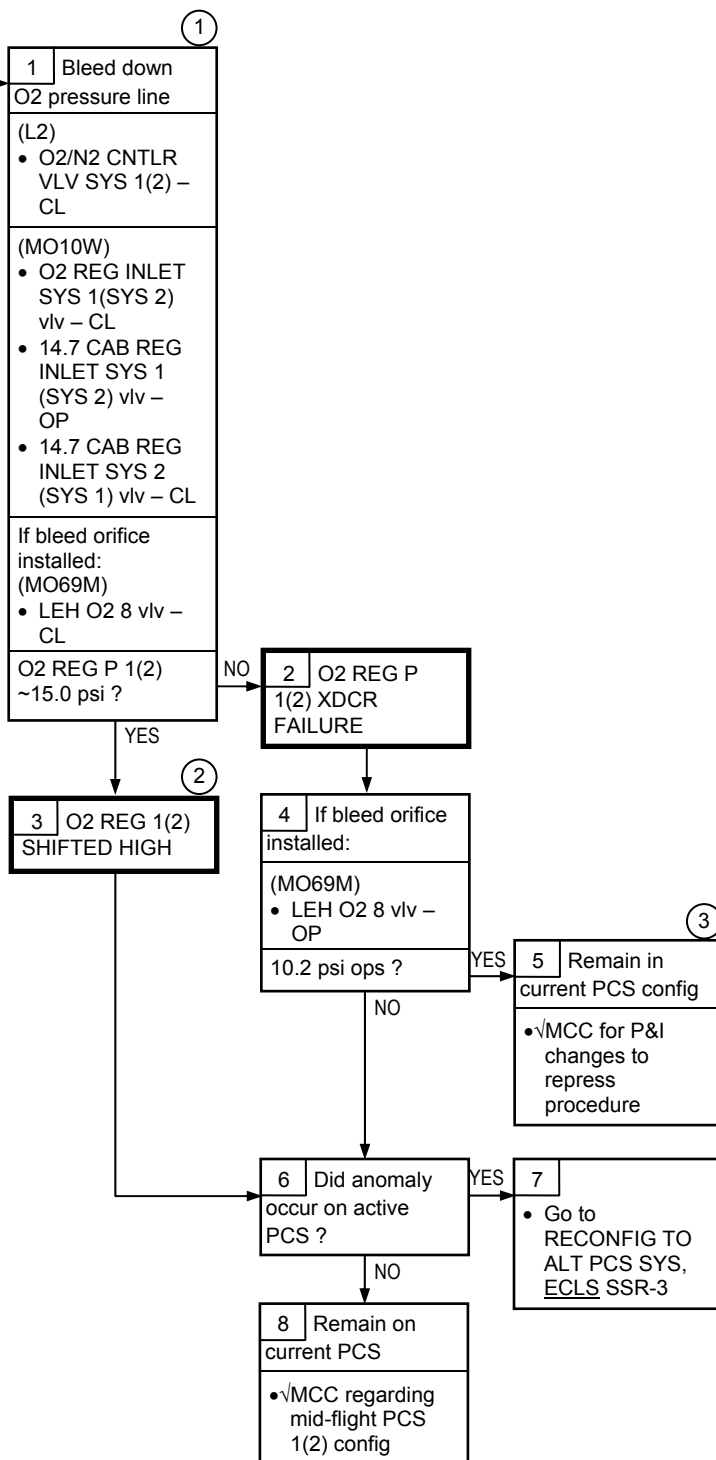
6.2e O2 REG P ↑

SM
ALERT

S66 CAB O2
REG P 1(2)

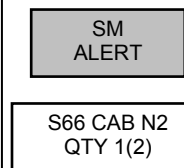
O2 REG P 1(2)
> 145 psia

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

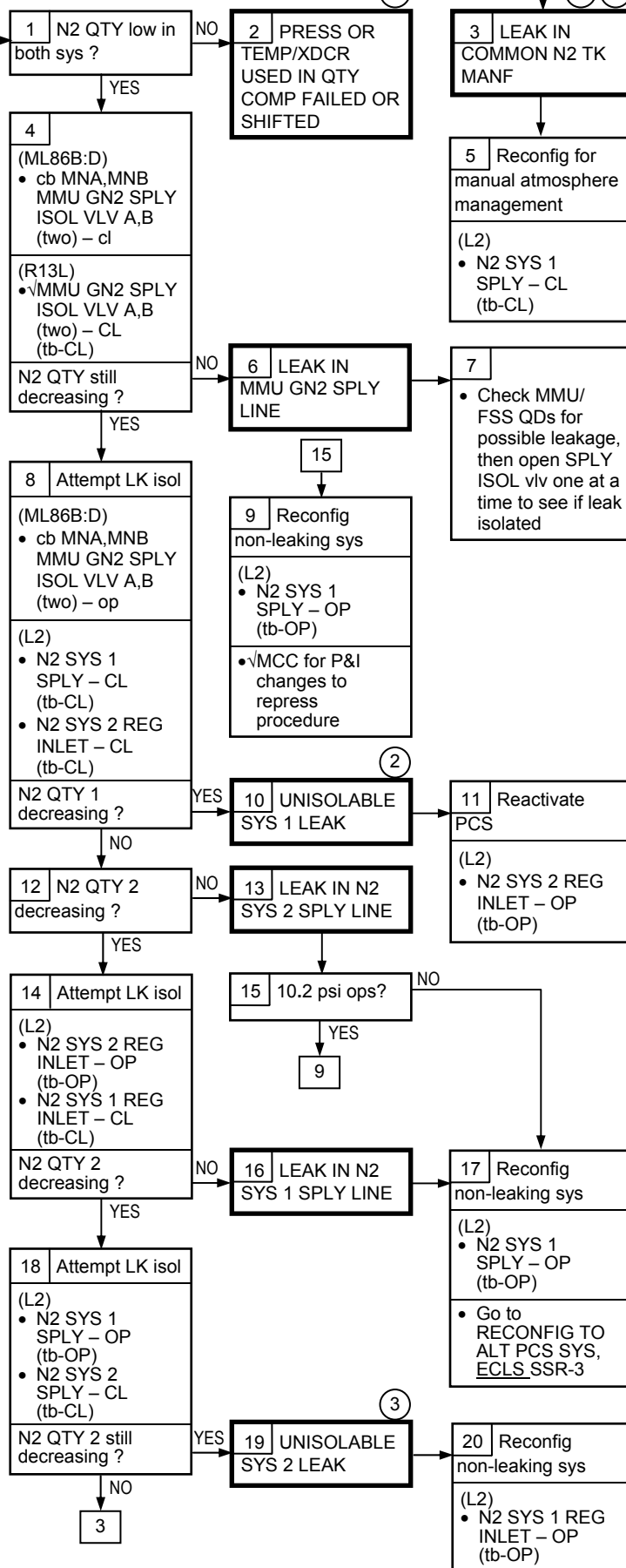
ECLS



N2 QTY SYS 1(2)
 < 100 (two tk sys)
 < 150 (three tk sys)
 < 200 (four tk sys)

Nominal Config:
 (ORBIT)
 Refer to 6.2a

6.2g N2 QTY ↓



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

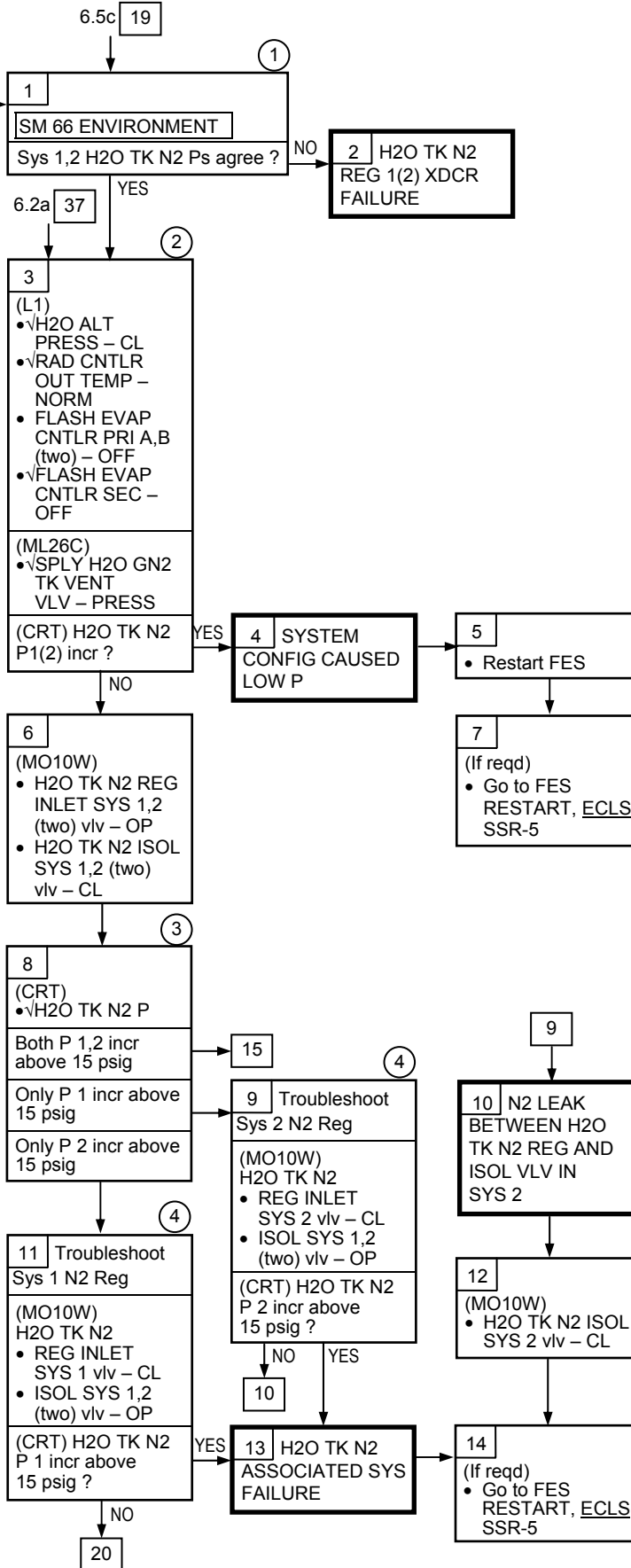
SM
ALERT

S66 CAB H2O
N2 P 1(2)

H2O TK N2 P 1(2)
< 13.0 psig

Nominal Config:
(ORBIT)
Refer to 6.2a

6.2i H2O TK N2 P ↓



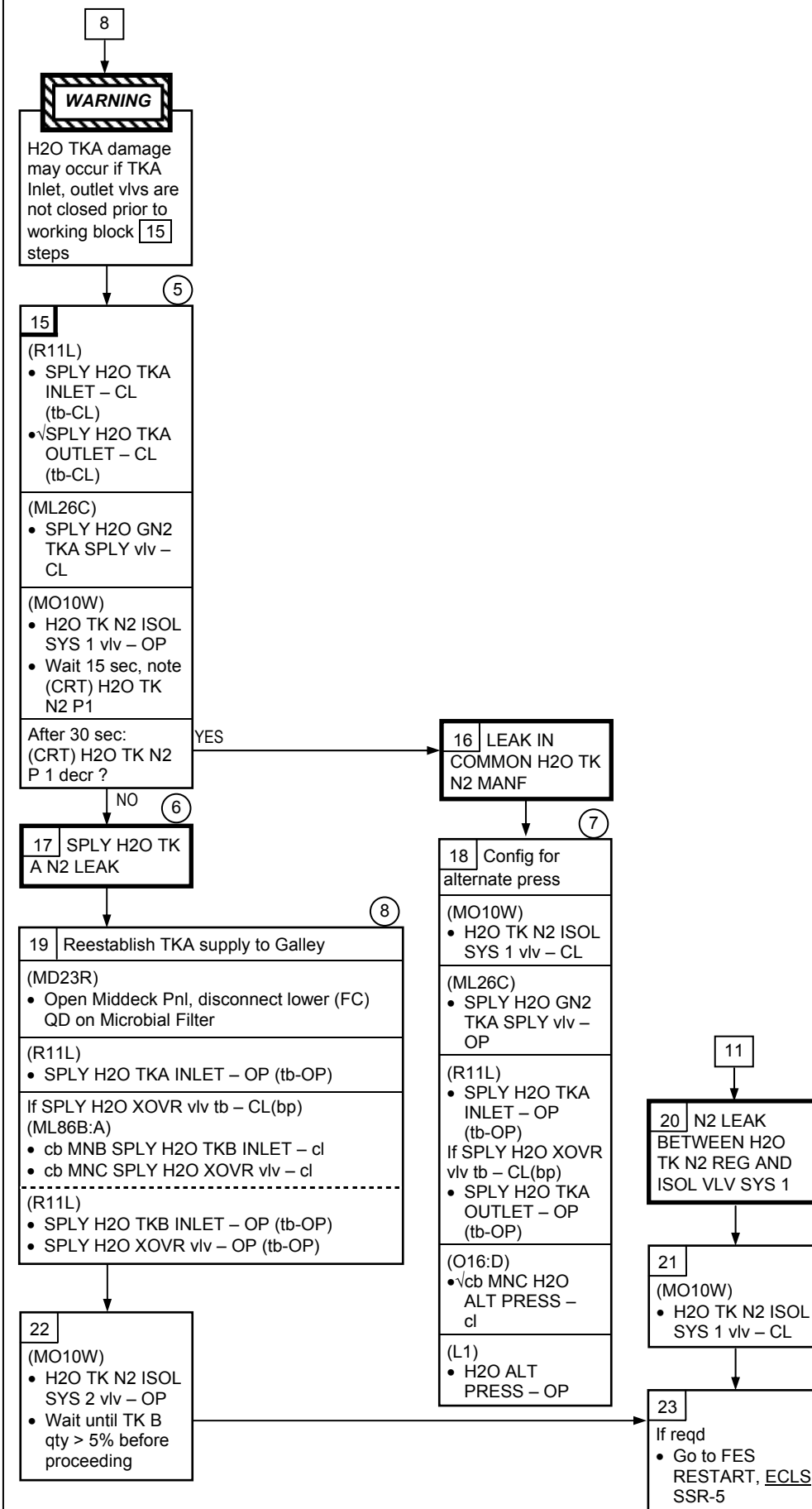
① CRT label 'H2O TK N2 P' is really H2O REG 1(2) P not actual 'TK N2 PRESS'

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

ECLS 6.2i (Cont)



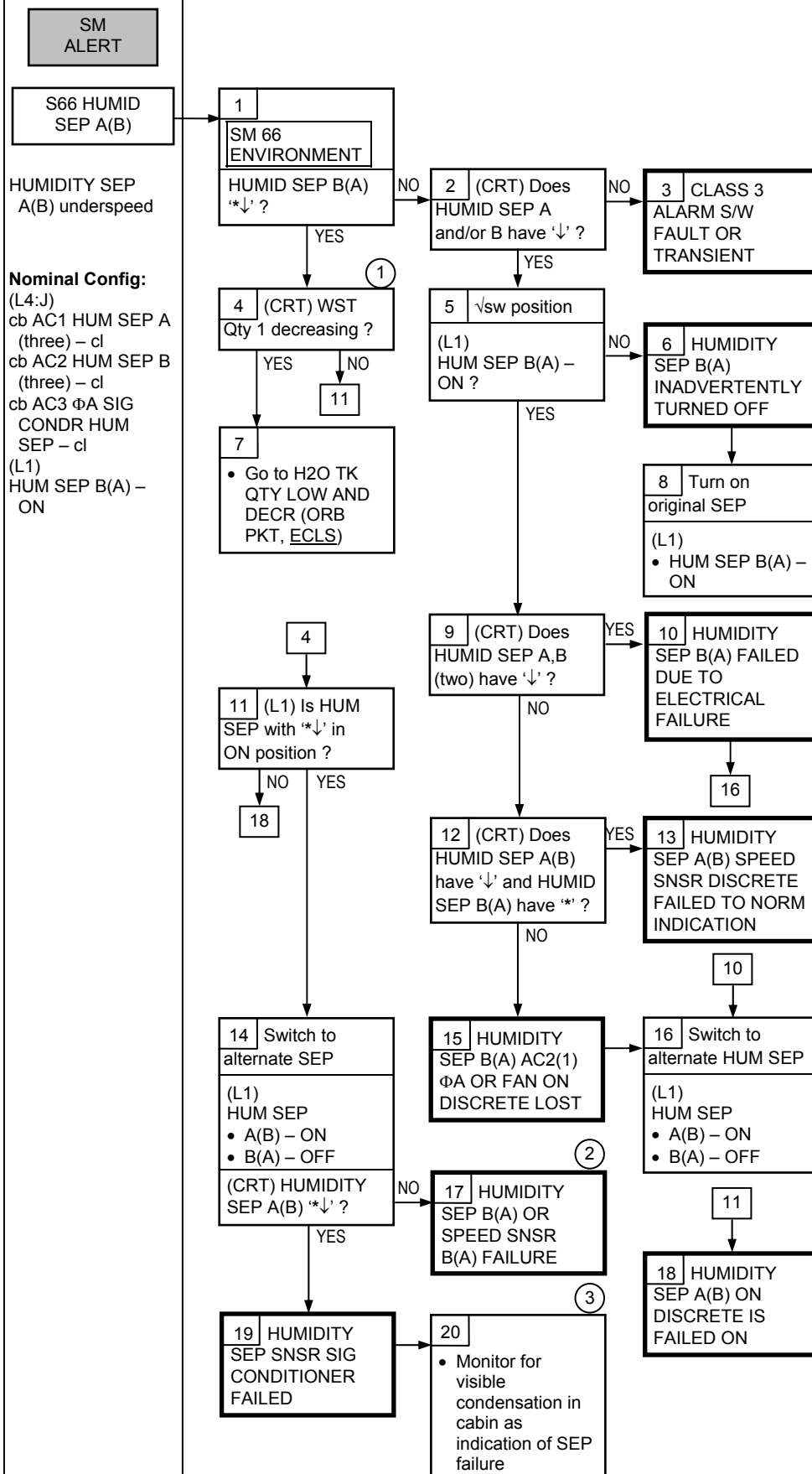
⑤ Repressurization of H2O tanks (except TK A) will cause H2O TK N2 P1 to decrease initially. If no leak in the common manifold is present, the H2O TK N2 P1 will increase until it stabilizes at 15.5 to 17.0 psig

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

6.2j HUMID SEP ↓



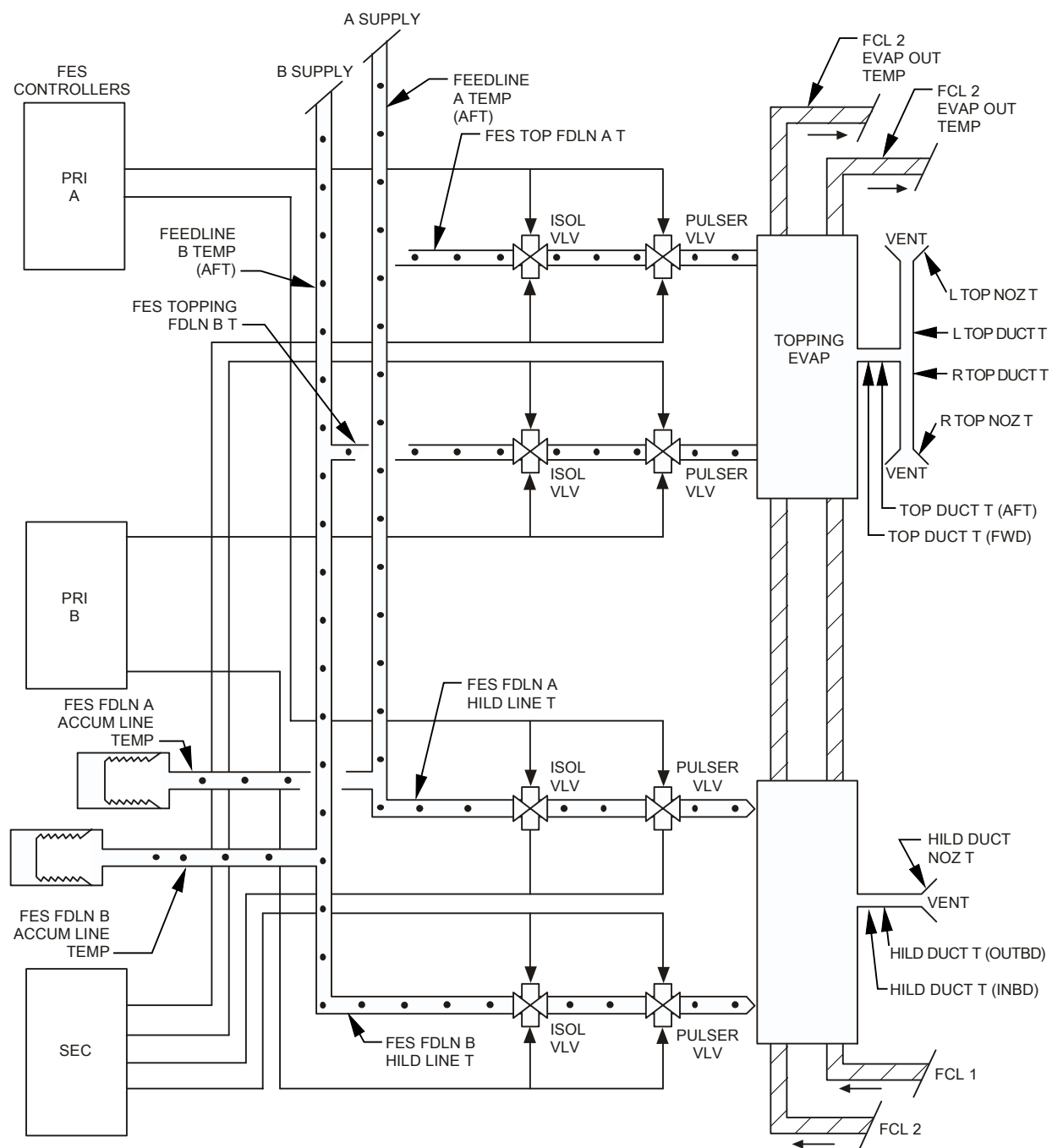
① Failed open ck
vlvs downstream of
each HUM SEP
could allow WST TK
to flood HUM SEP

② $\sqrt{MCC}$ to determine exact failure

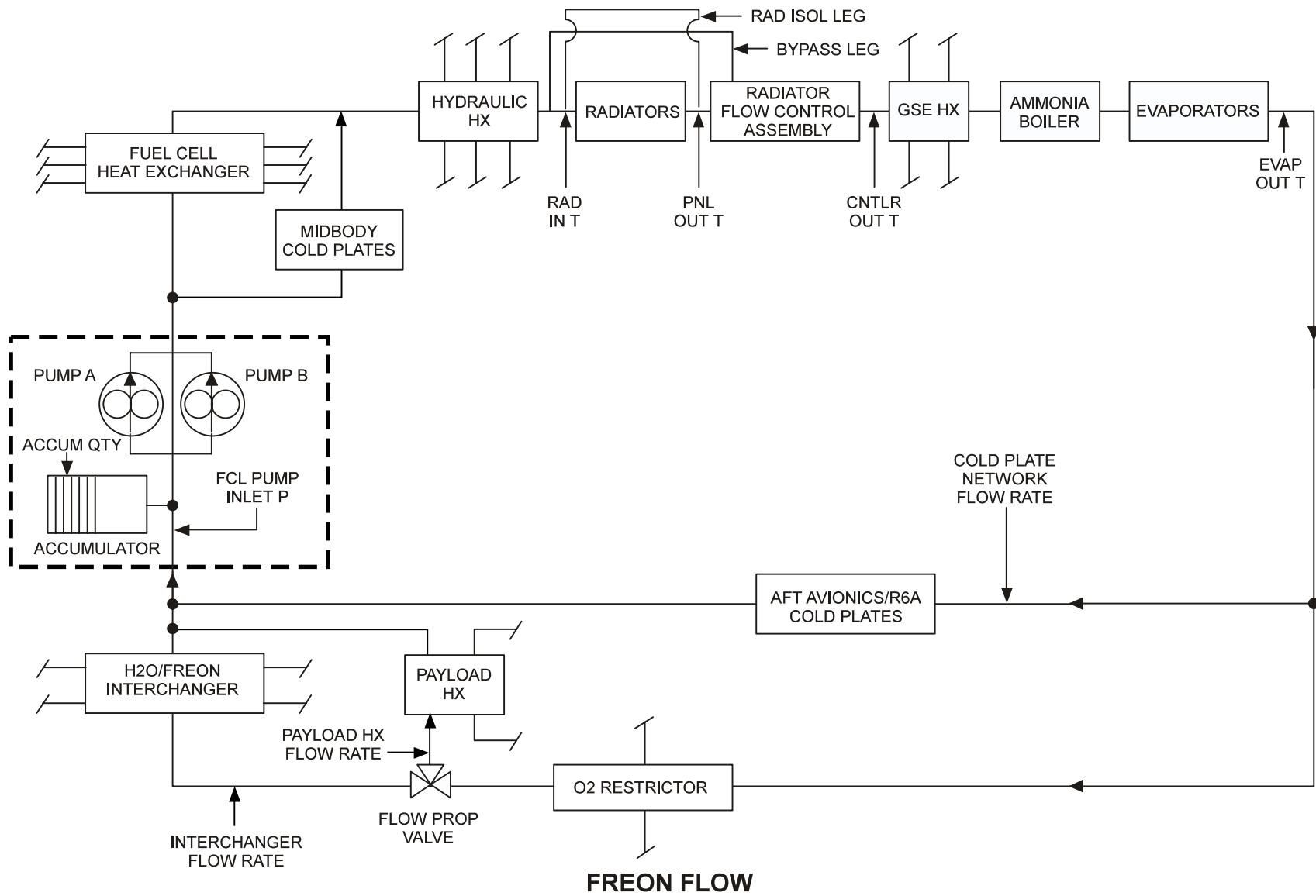
③ MCC has only indication of relative humidity

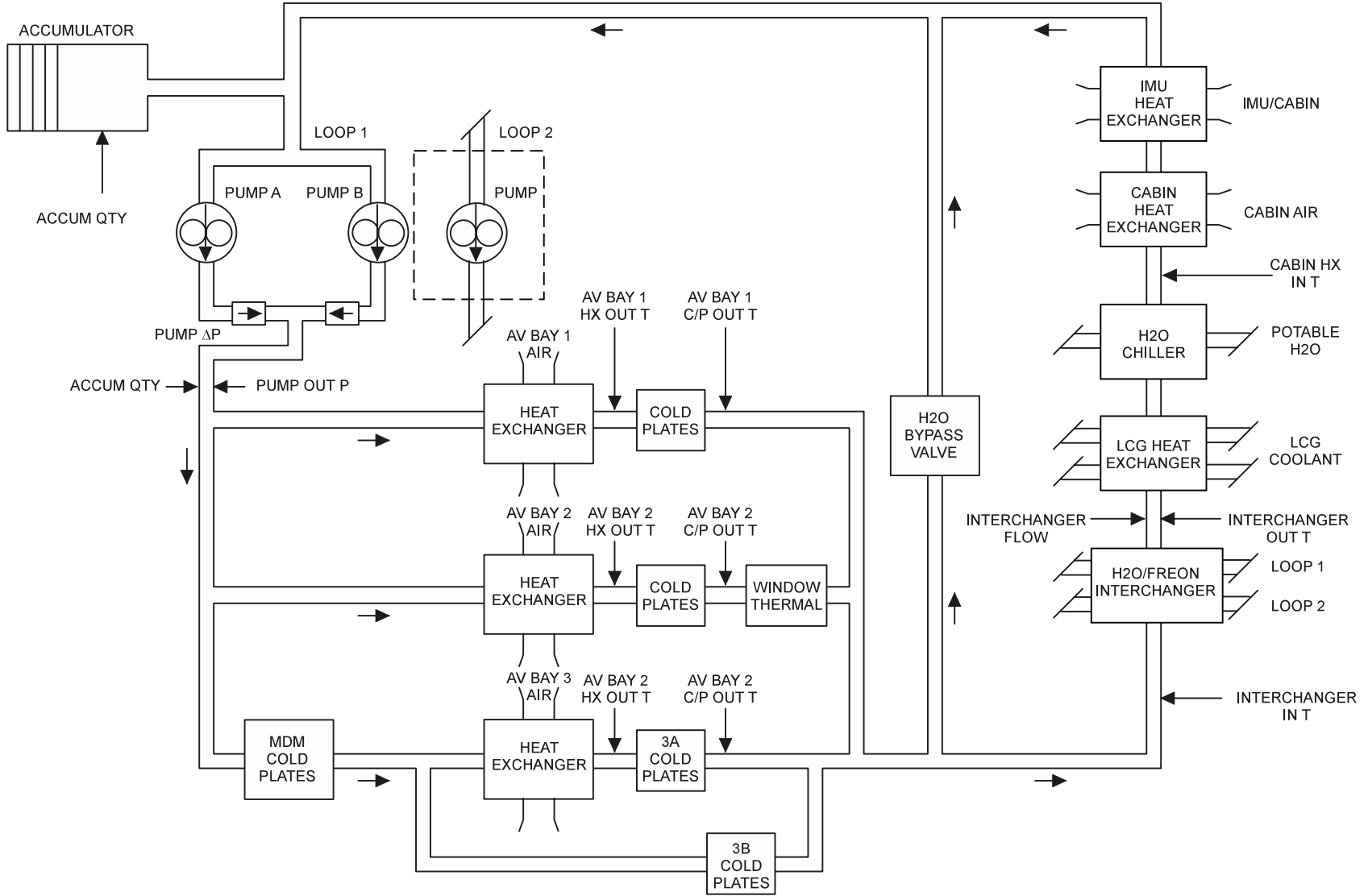
FREON/H₂O LOOP

6.4



EVAPORATORS





H2O LOOPS

ECLS

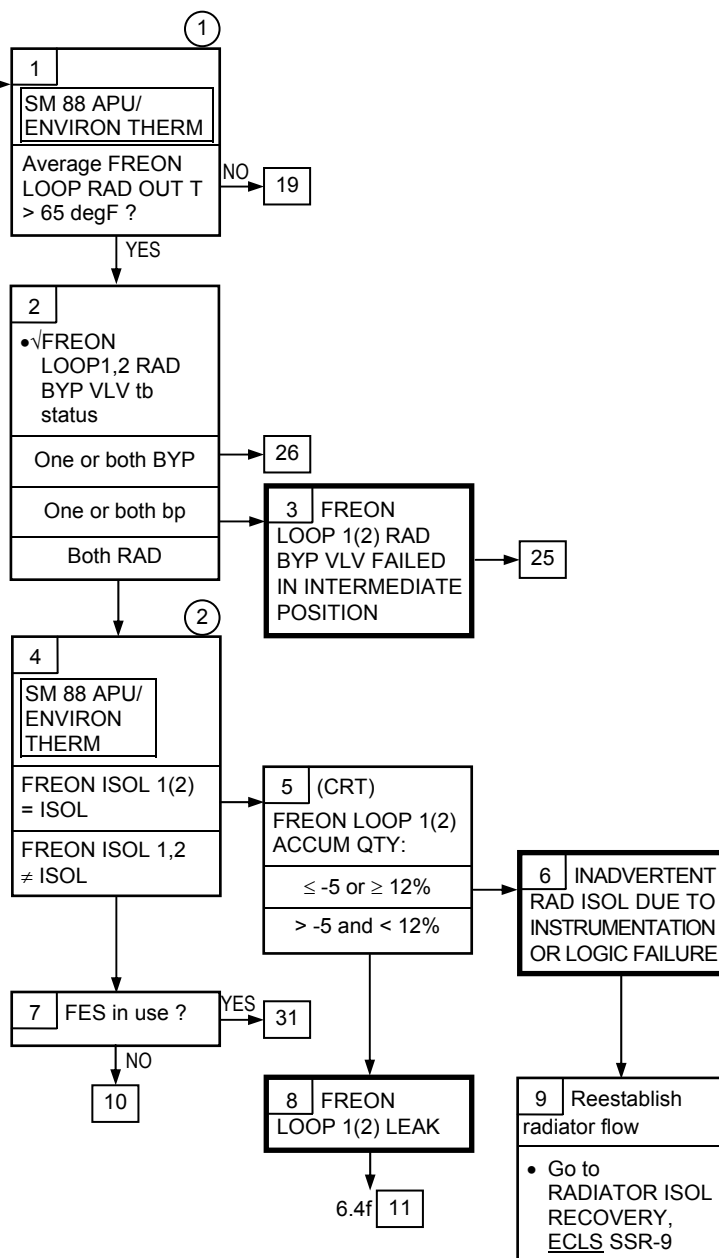
6.4a EVAP OUT T ↑↓

From ORB PKT,
EVAP OUT T
HIGH

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

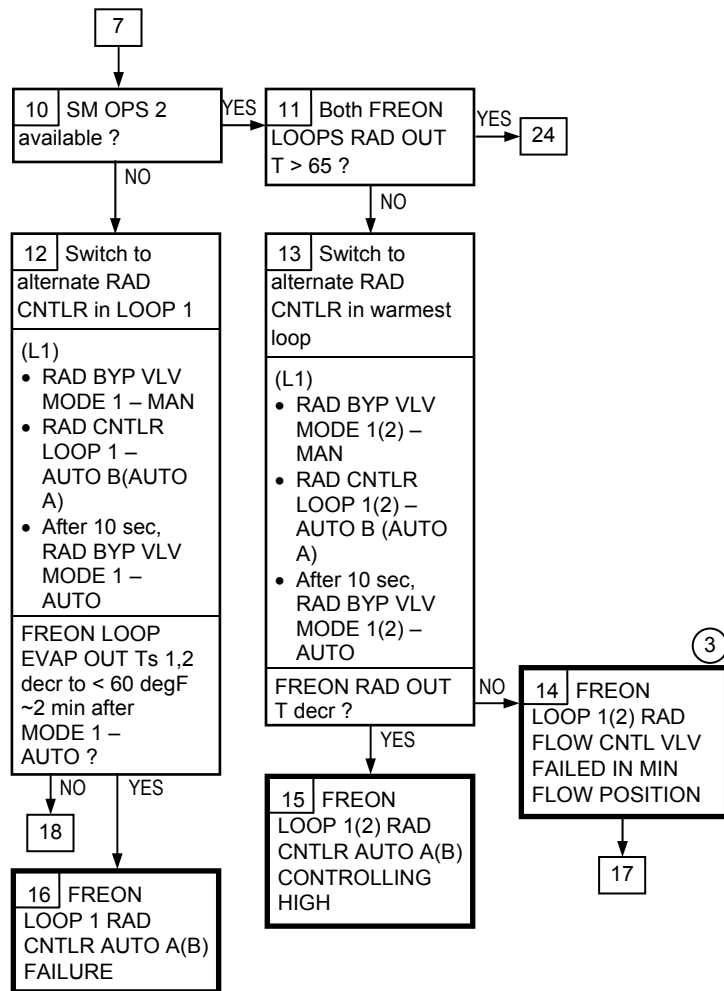
Nominal Config:

(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

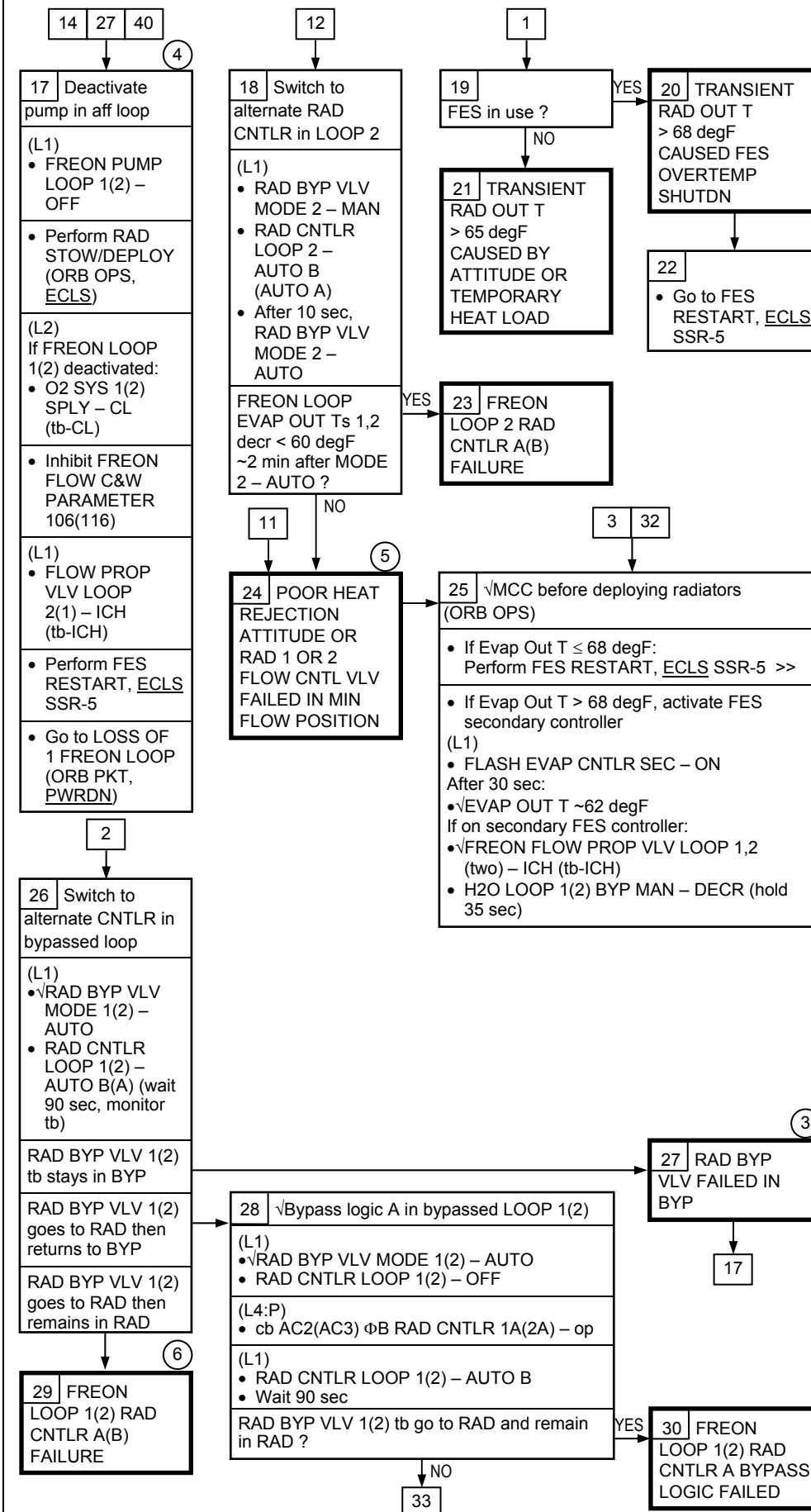
(L2)
FLASH EVAP FDLN
HTR A,B SPLY – 1(2)
FREON ISOL
MODE – AUTO
LOOP 1 – ctr
LOOP 2 – ctr

If RAD not in use:
(L1)
HI LOAD EVAP – ENA
HI LOAD EVA – DUCT HTR – A(B)



③ Loss of RFCA –
Next PLS depending
on H2O quantities

ECLS 6.4a (Cont)



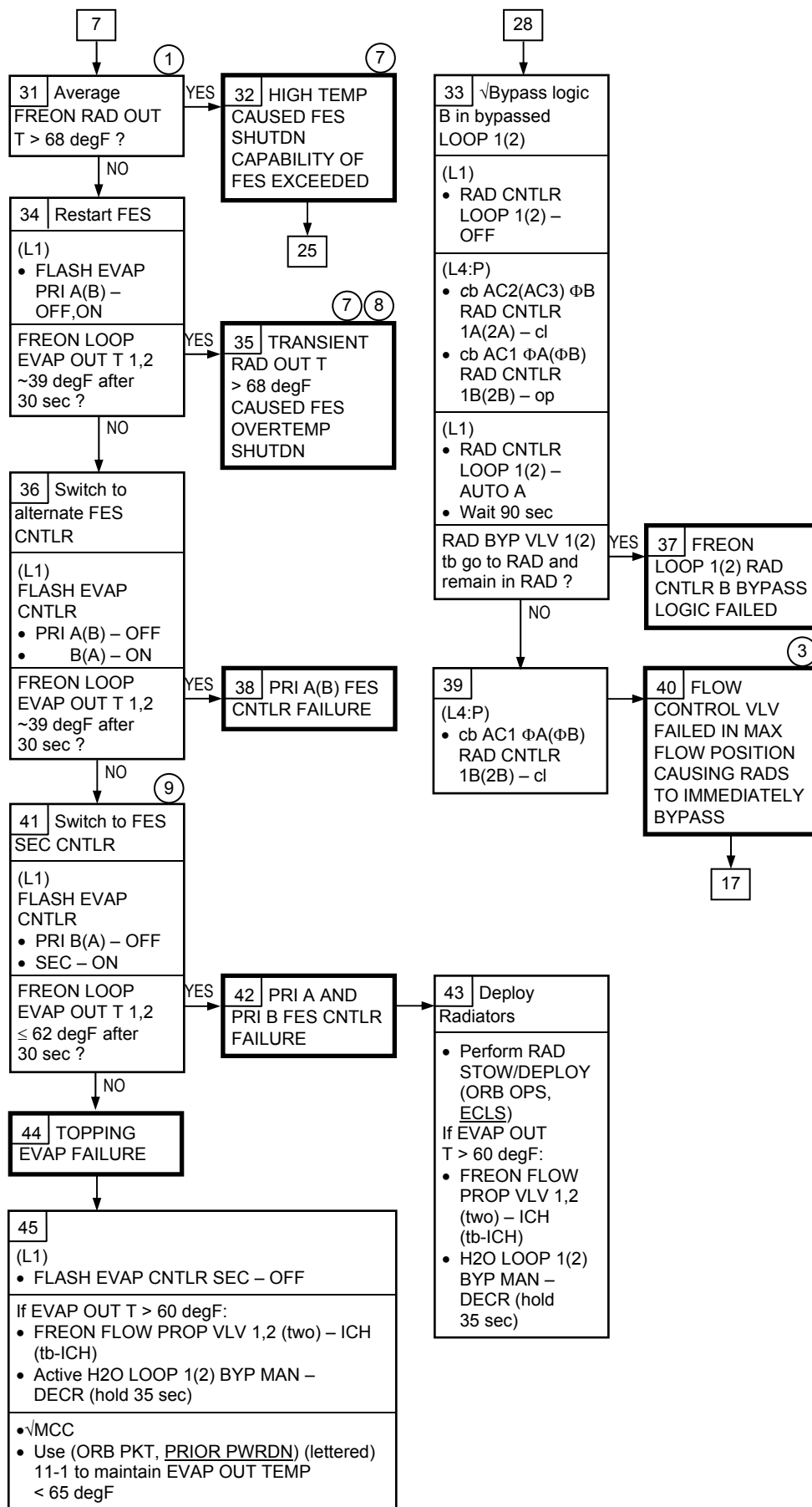
③ Loss of RFCA – Next PLS depending on H2O quantities

④ Loop will be reactivated for entry

⑤ √MCC to determine failure

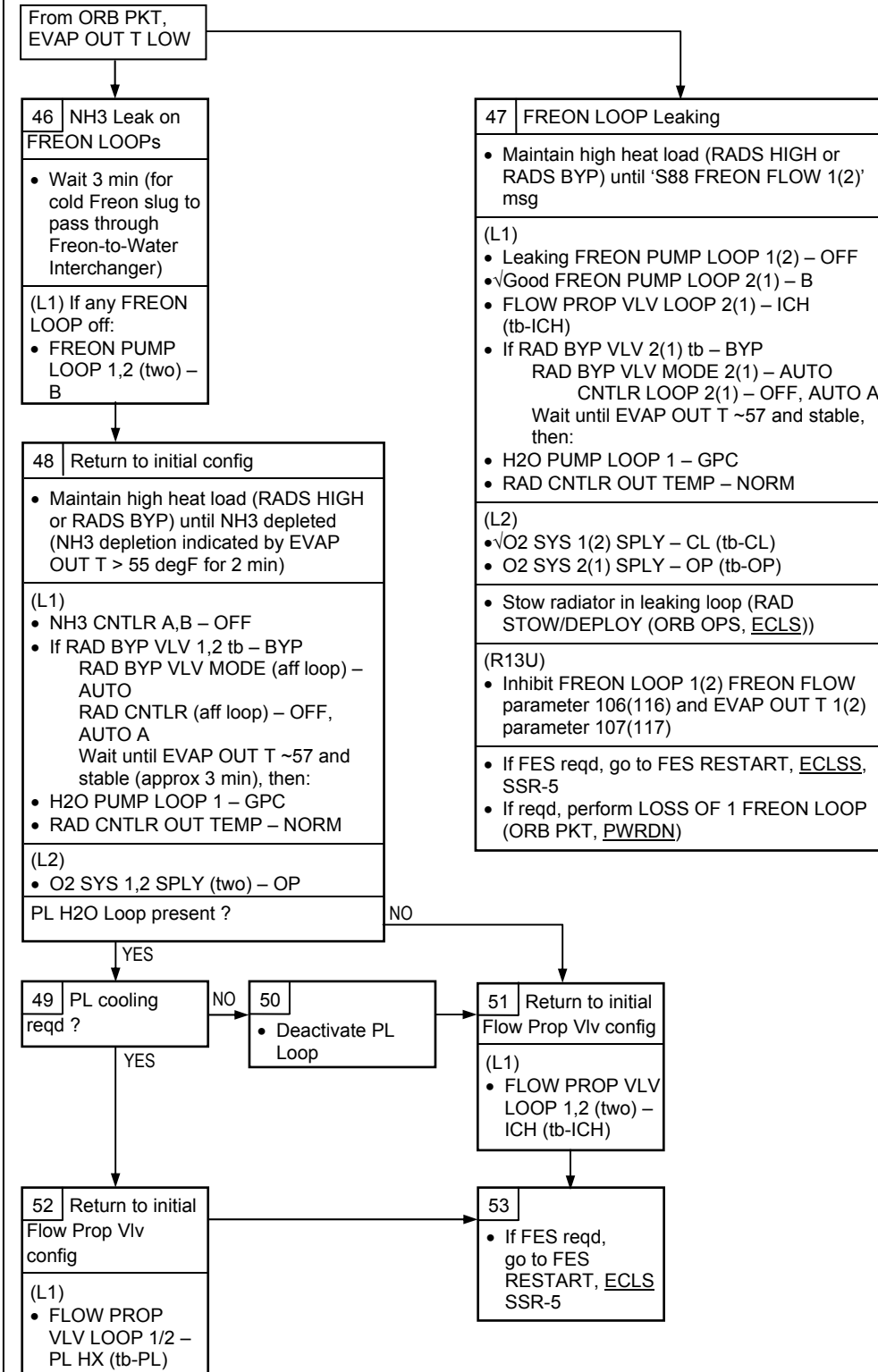
⑥ Continue to monitor RAD BYP VLV tb position. Depending upon failure mode, RAD BYP VLV may not return to BYP immediately. If RAD BYP VLV tb returns to BYP, go to block **28**

6.4a (Cont)



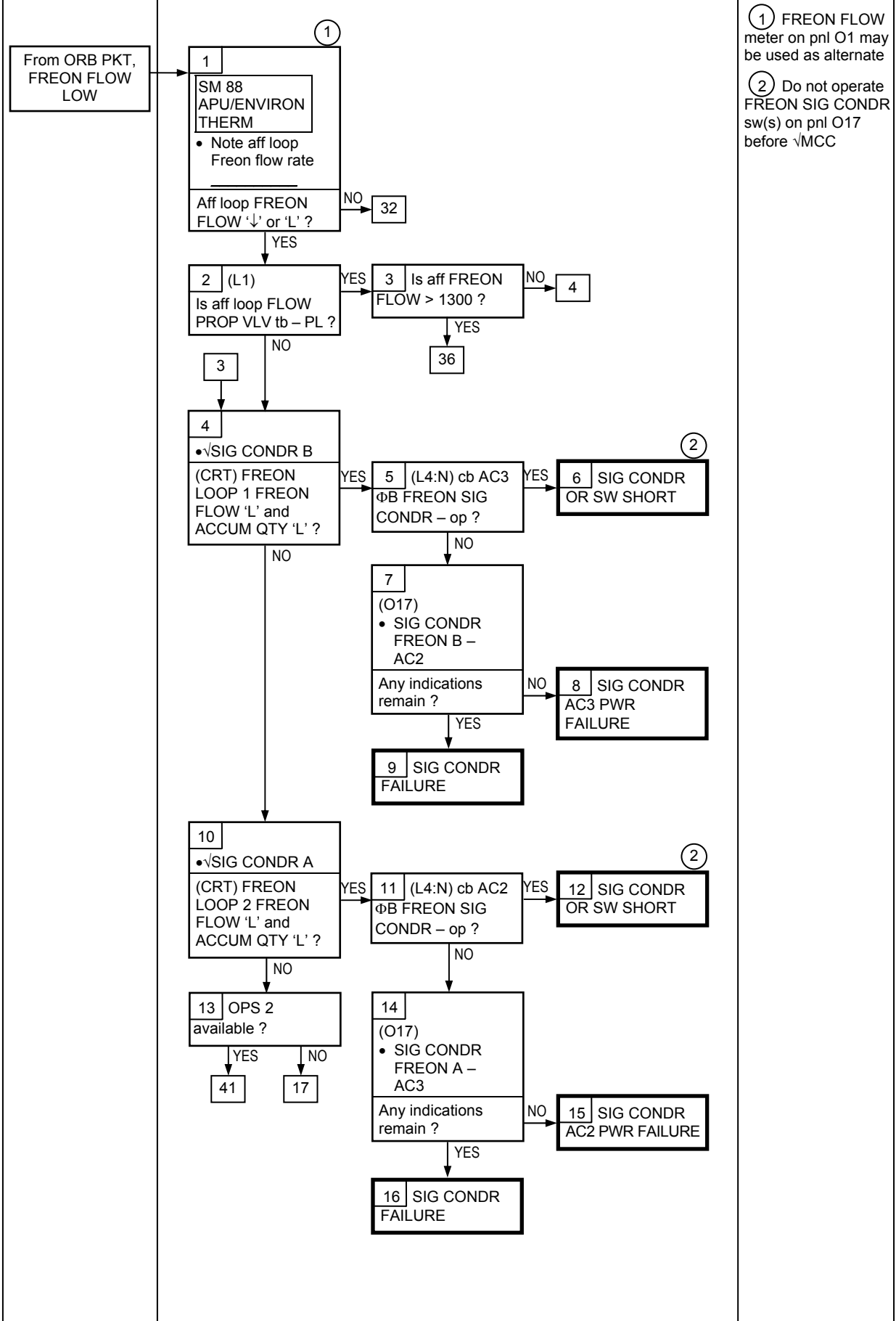
- ① If OPS 2 not available, use EVAP OUT T
- ③ Loss of RFCA – Next PLS depending on H2O quantities
- ⑦ If RAD OUT T > 65 degF not explainable by attitude, troubleshoot radiators. Go to block 13
- ⑧ Expect same transient on next daylight pass if same attitude
- ⑨ SEC CNTLR controls at 62 degF. If EVAP OUT T < 62 degF, SEC CNTLR operation cannot be verified. Further troubleshooting reqd to determine complete failure

ECLS 6.4a (Cont)

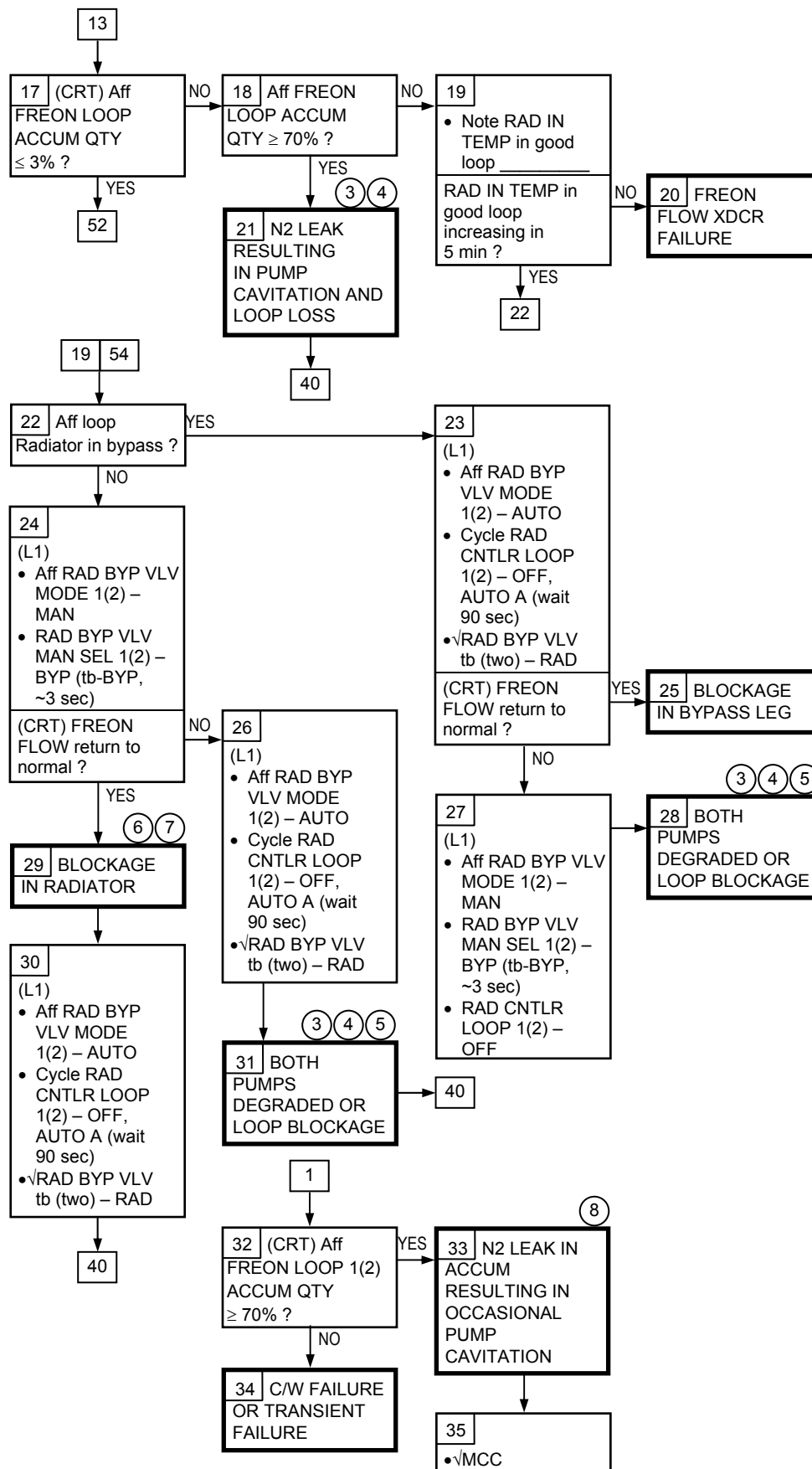


ECLS

6.4b FREON FLOW LOW

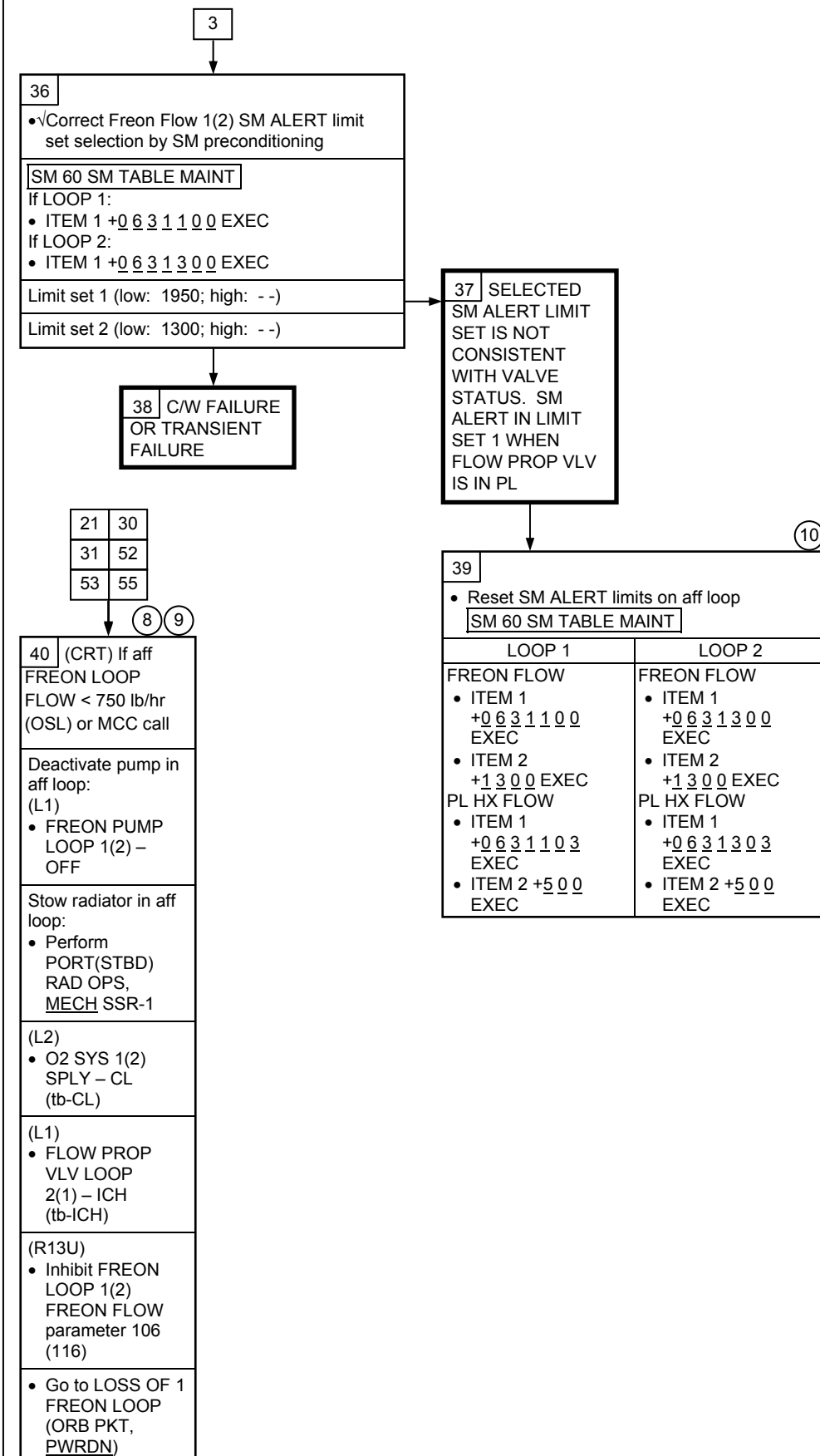


ECLS 6.4b (Cont)



- ③ Pwrn 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

ECLS 6.4b (Cont)

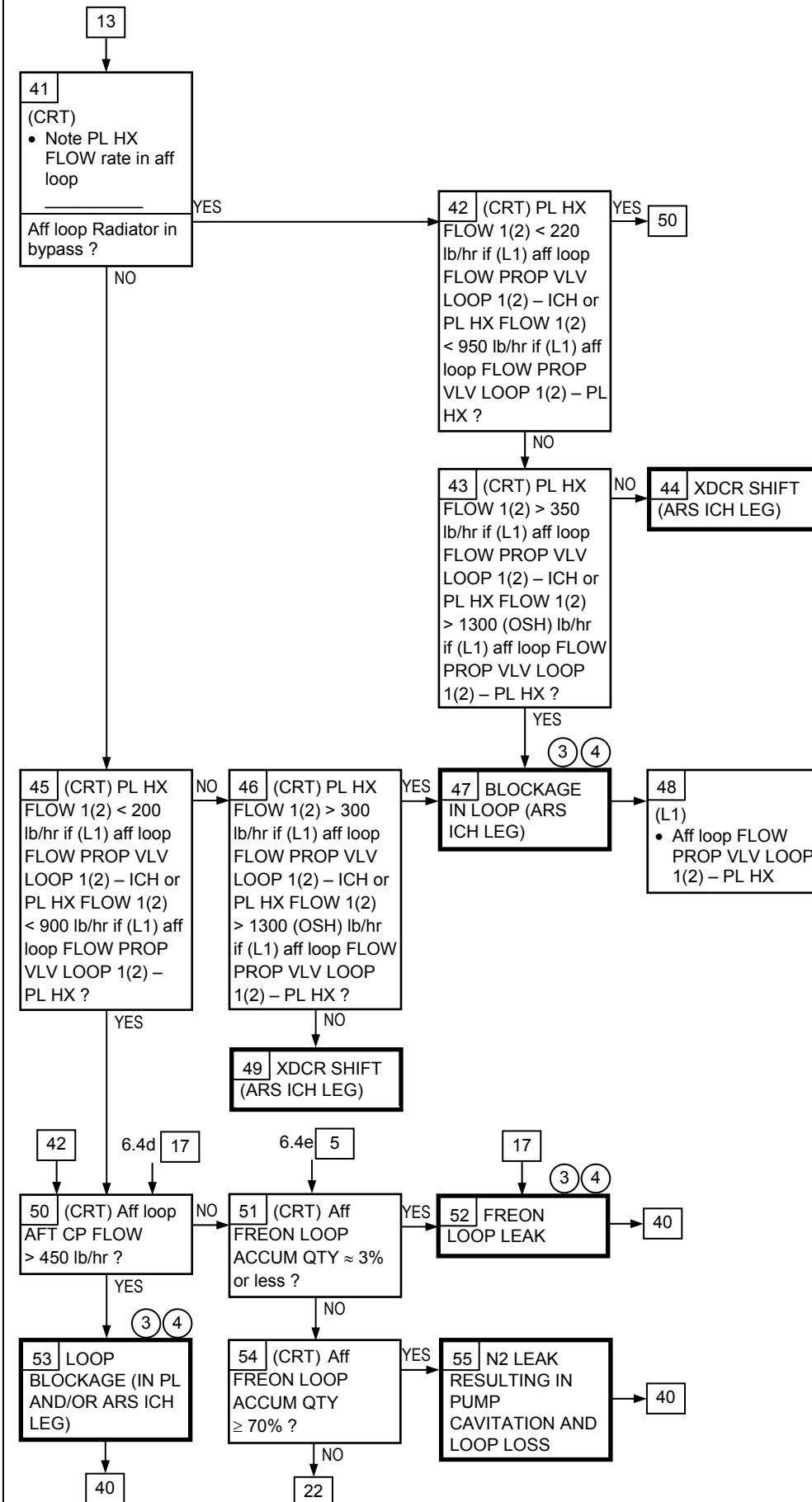


8 If cavitation occurs frequently, loop is lost

9 FCL1 – PORT
FCL2 – STBD

10 Crew may opt to have MCC manage software limits via TMBU

ECLS 6.4b (Cont)



③ Pwrnd of some equipment may be reqd depending on heat load

④ Loss of Freon Loop next PLS entry

ECLS

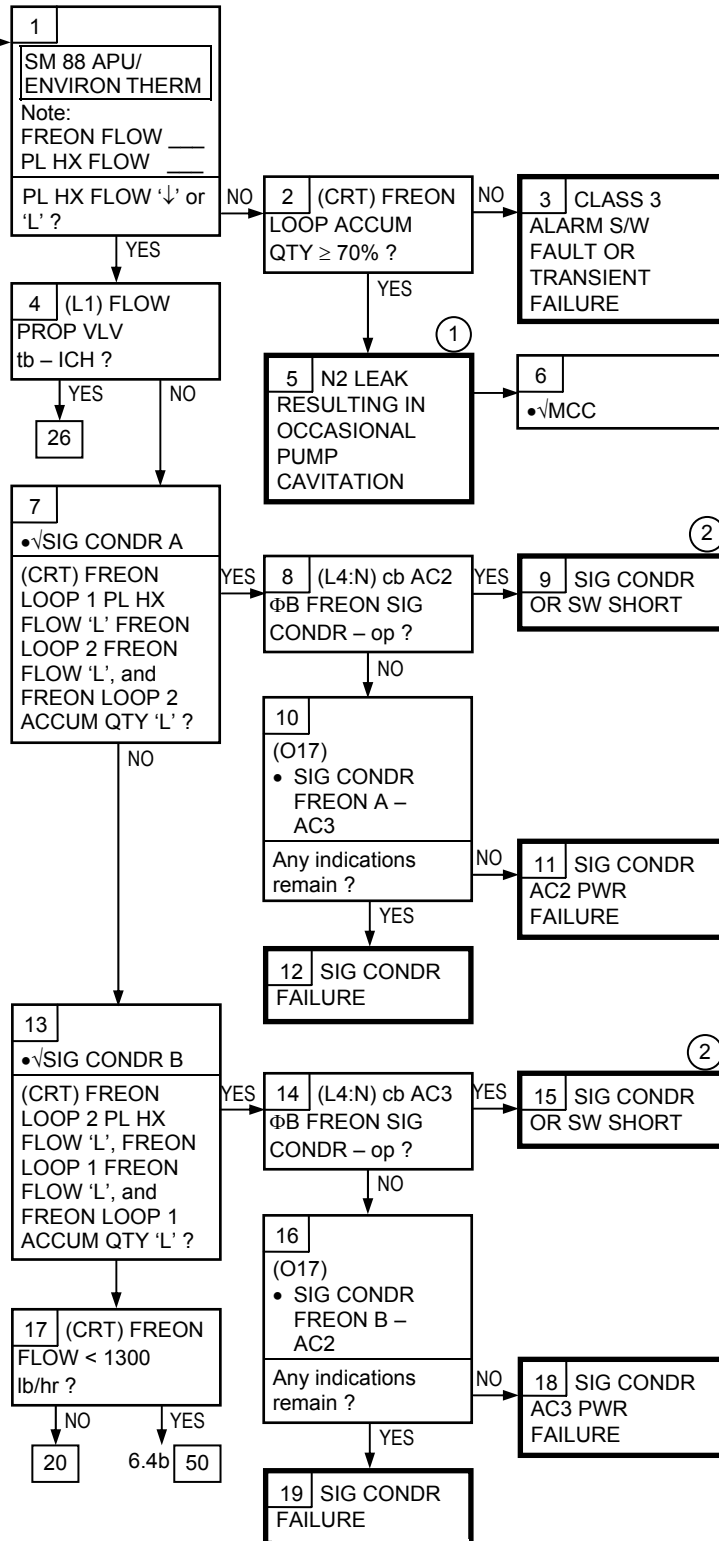
6.4d FRN FLOW PROP VLV PL HX FLOW ↓

SM ALERT

S88 FRN PL HX 1(2)

If:
(L1)
FLOW PROP VLV
LOOP 1(2) – PL
HX
PL HX FLOW
< 500 lb/hr

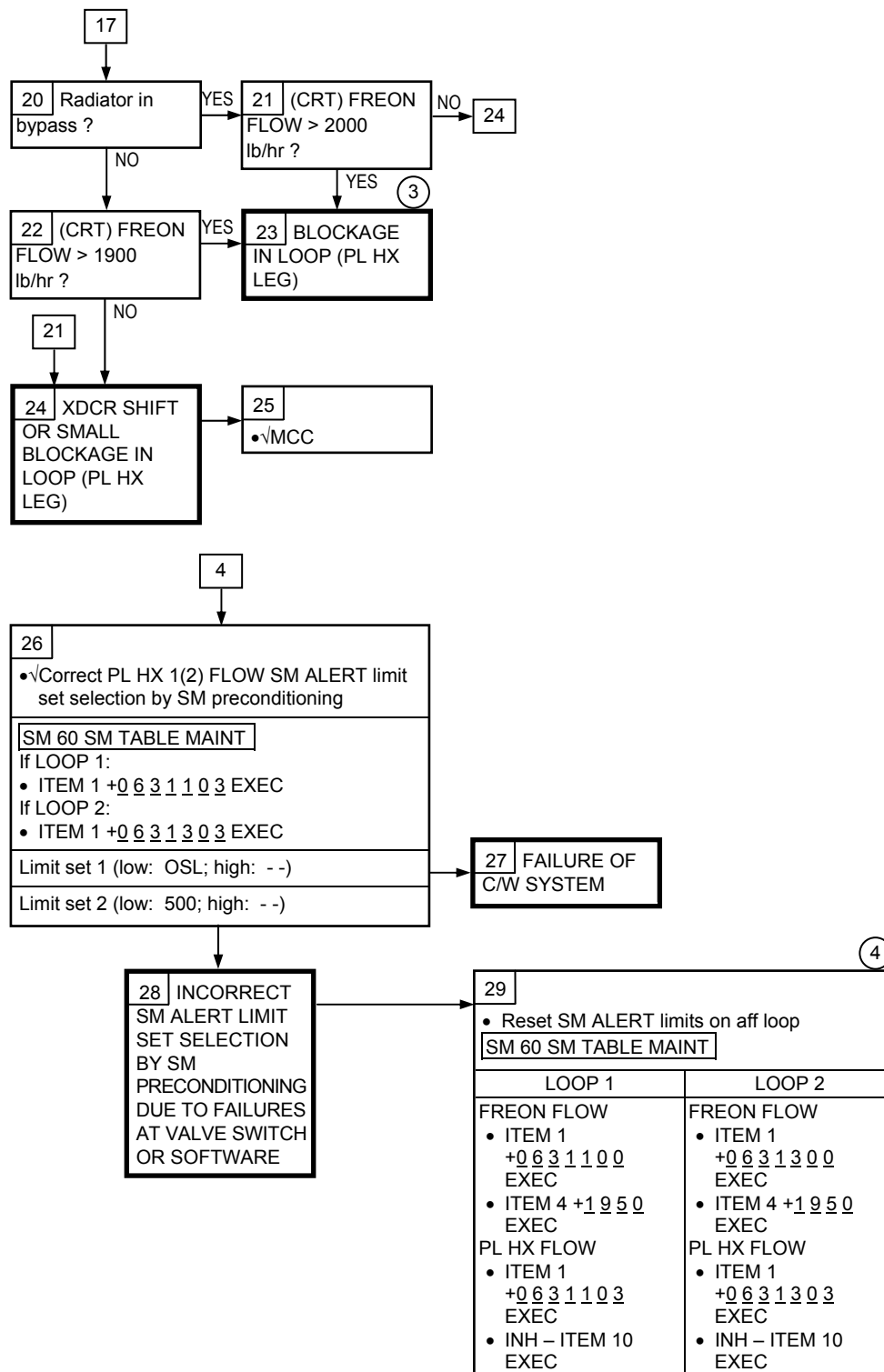
With FLOW PROP
VLV – ICH
PL HX FLOW is
TMBU – OSL



① 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 Pwrnd 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

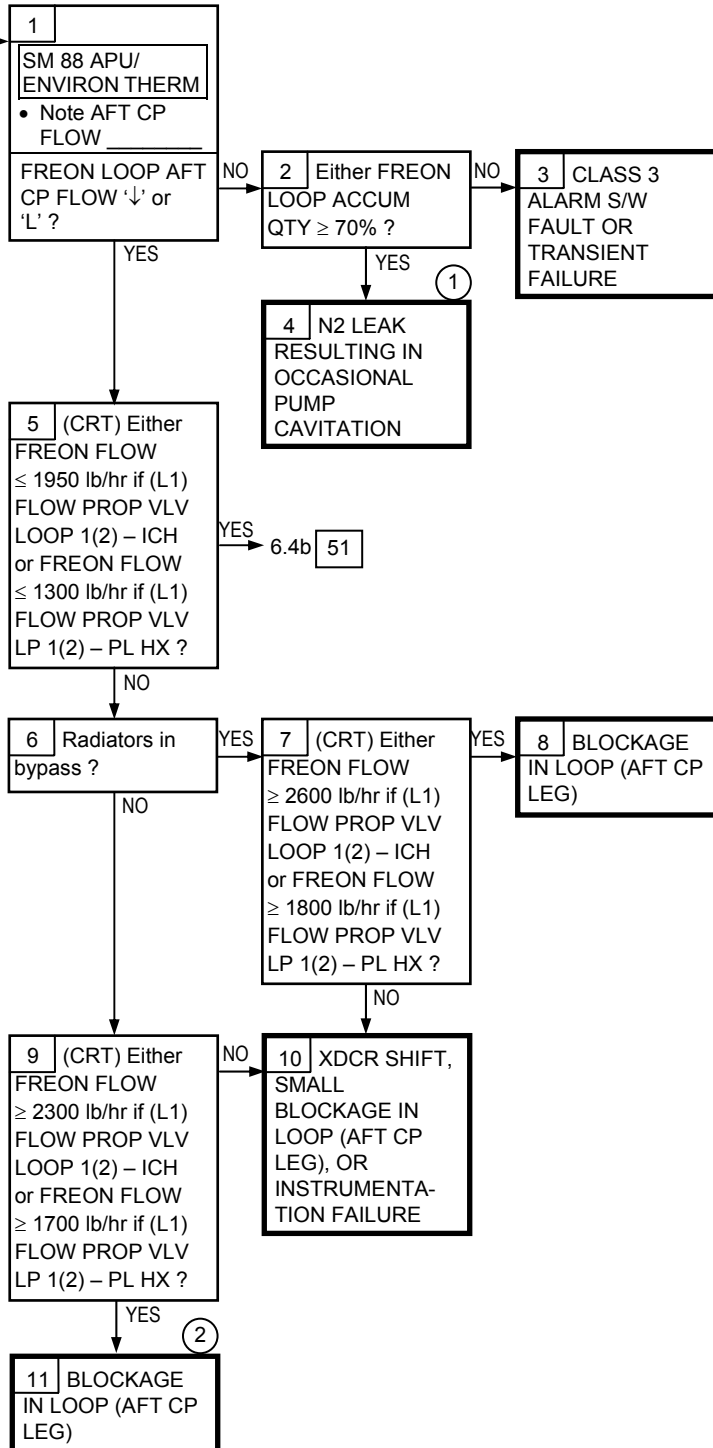
ECLS

6.4e AFT COLDPLATE FLOW ↓

SM
ALERT

S88 FRN AFT
CP 1(2)

AFT CP FLOW
< 200 lb/hr



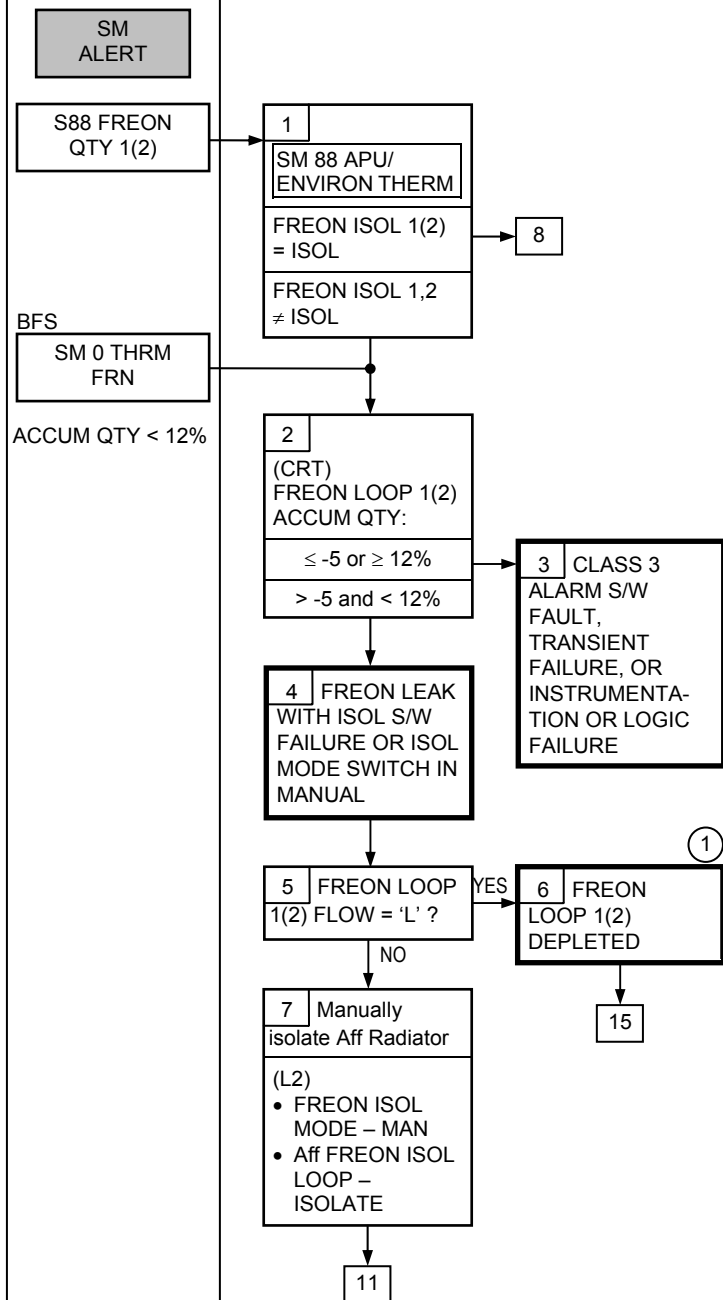
① N2 leak across
FCL ACCUM
bellows. Frequent
cavitation = loop lost

② Loss of FCL
definition next PLS
entry

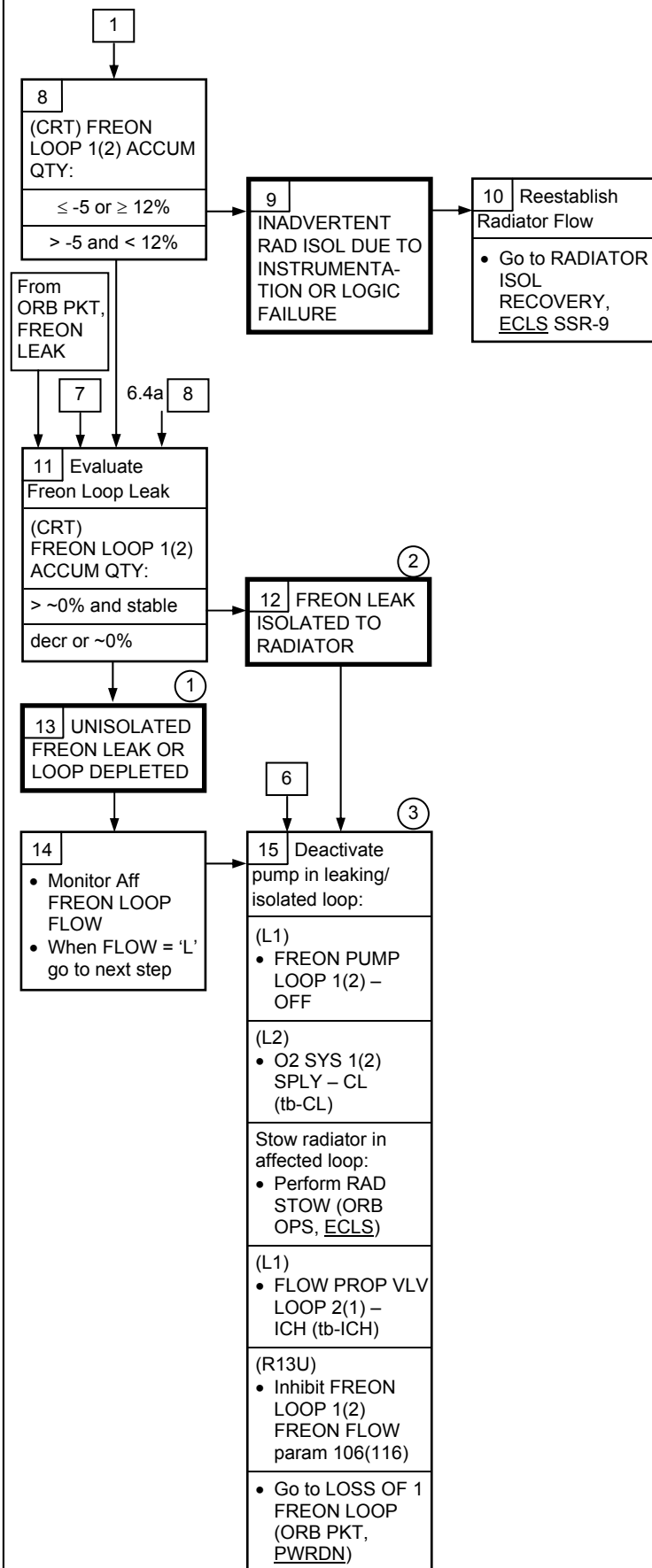
ECLS

6.4f ACCUM QTY ↓

① Loss of one FREON LOOP = next PLS Entry



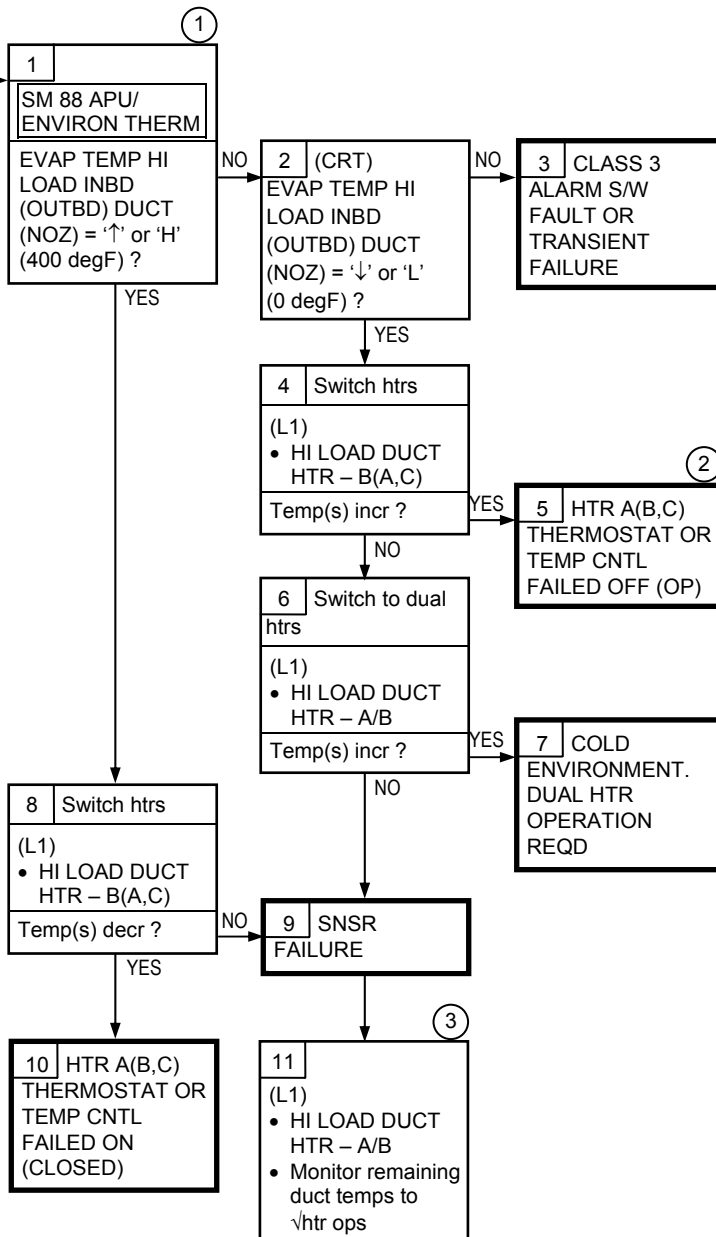
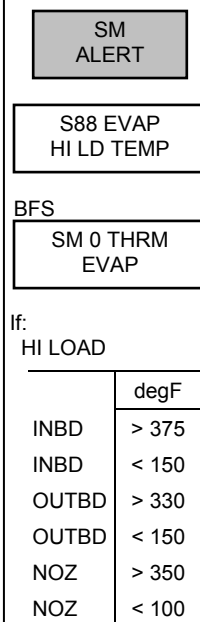
ECLS 6.4f (Cont)



- 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) ↑↓



① Upon initial activation of heaters, FDA limits are not enabled until following time has elapsed:

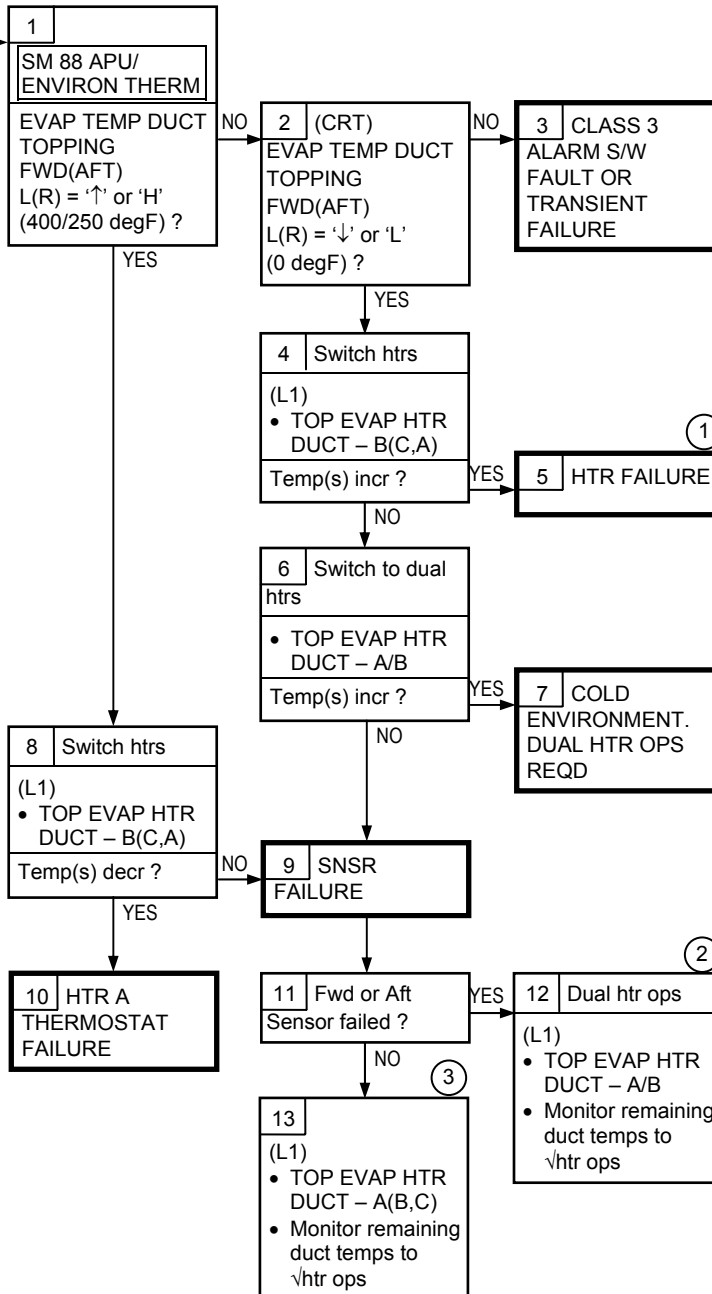
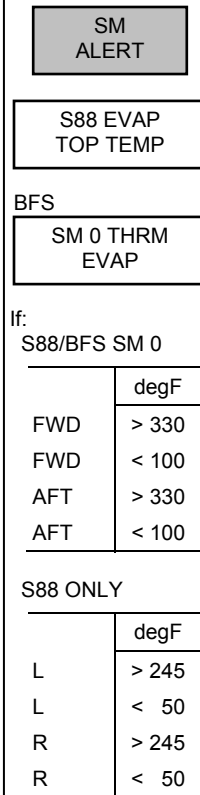
INBD T 25 min
OUTBD T 16 min
NOZ T 40 min

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) ↑↓



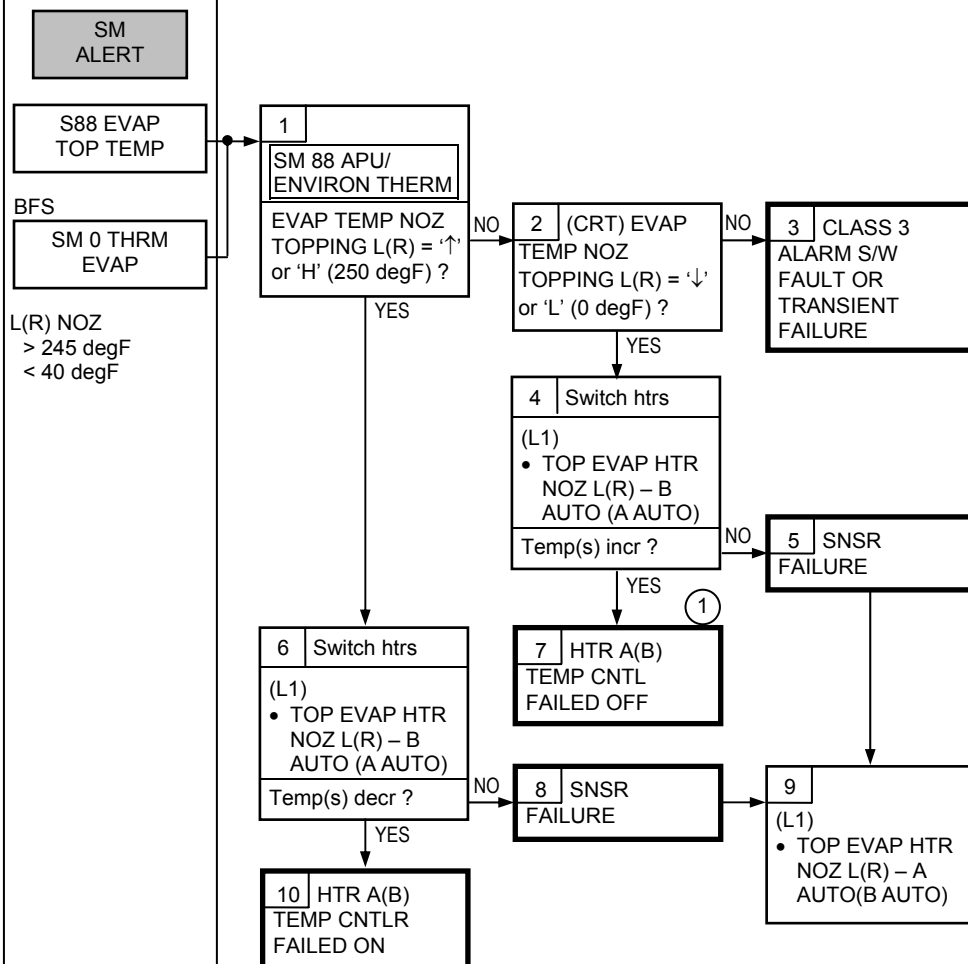
① Topping FES still operational if left, right htrs failed. Loss of fwd or aft htr could result in duct freezing and eventual loss of topping FES

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

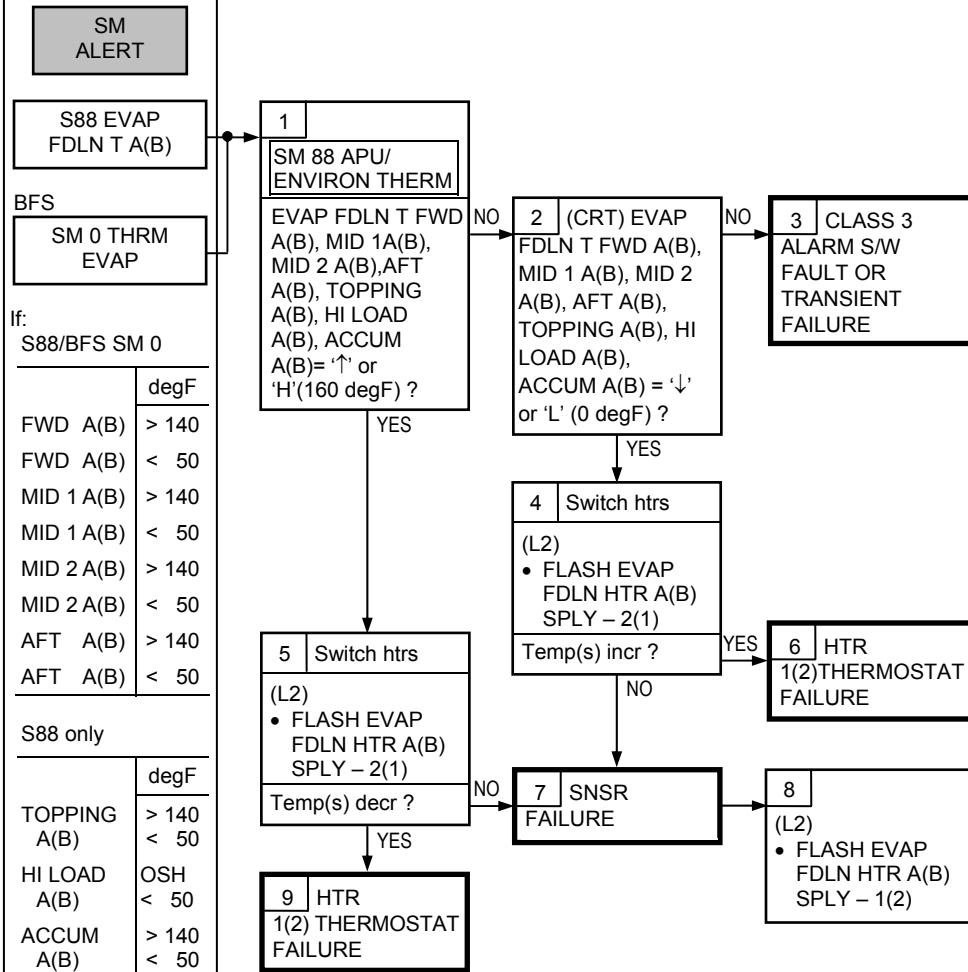
6.4i EVAP TOPPING L(R) NOZ ↑↓



① Topping FES still operational with Noz Htr failed off as long as fwd and aft duct htrs are operational

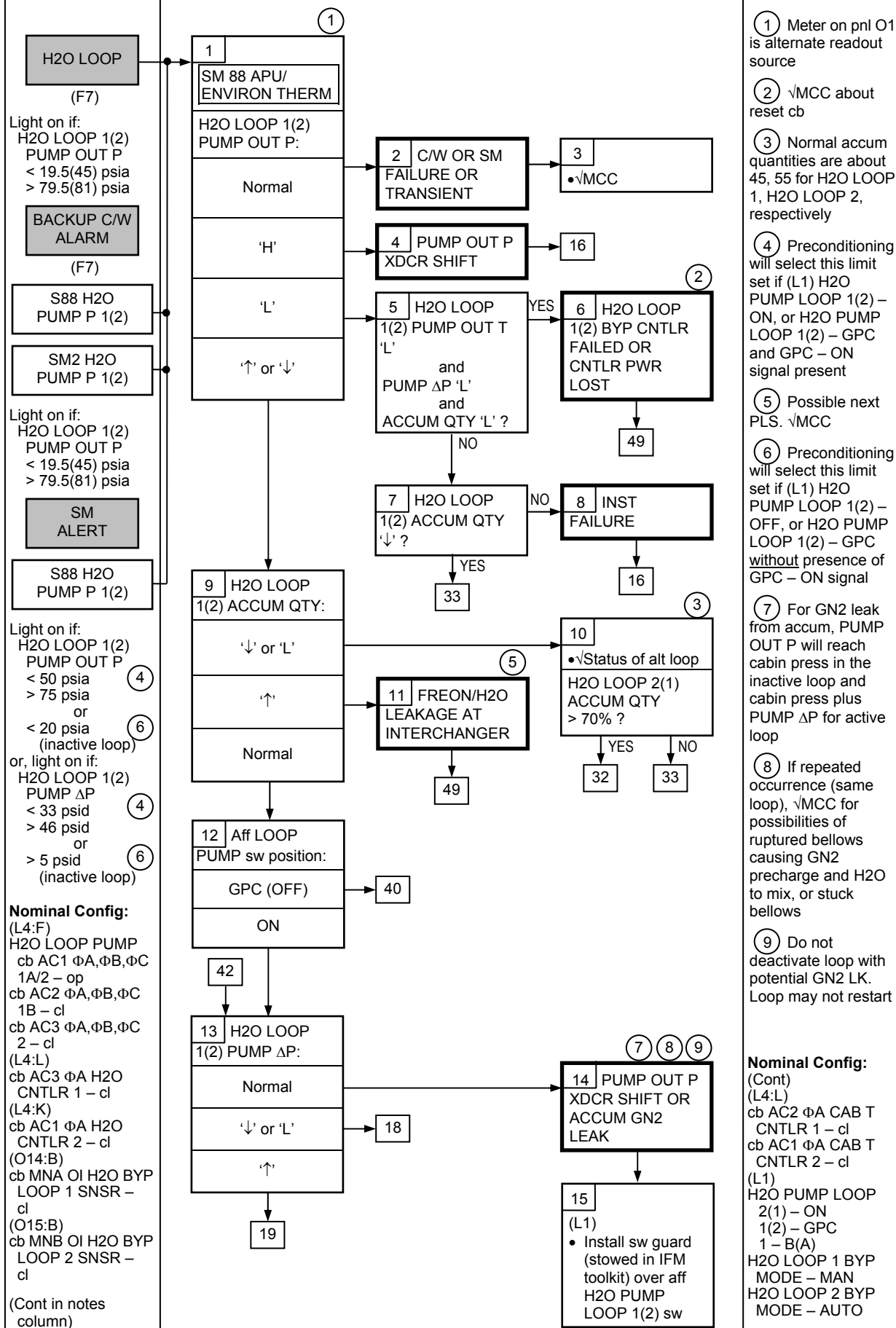
ECLS

6.4j EVAP FDLN TEMP FWD (MID,AFT, TOP, HI LOAD, ACCUM) ↑↓

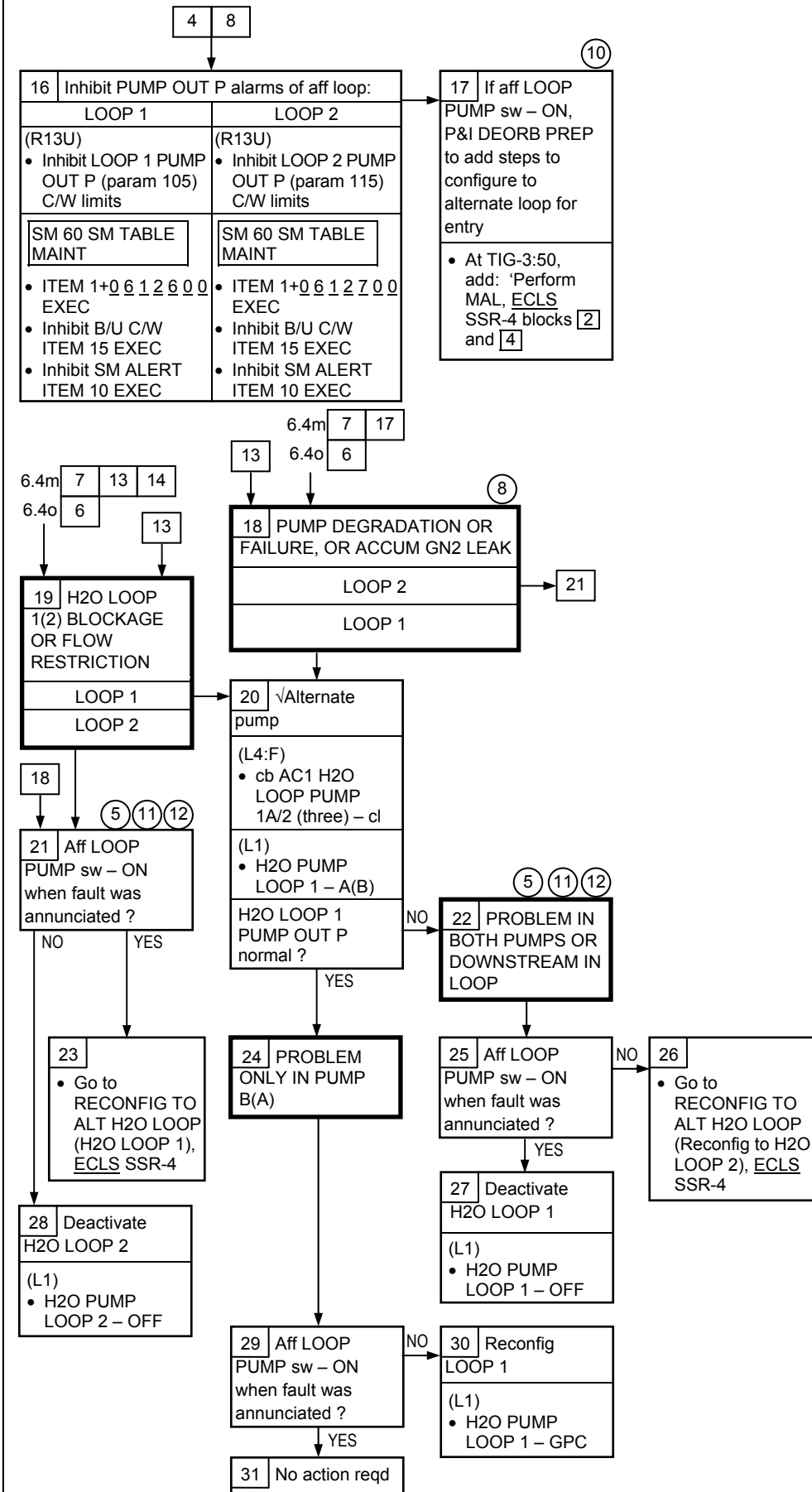


ECLS

6.4I H2O PUMP P 1(2) ↑↓



ECLS 6.4I (Cont)



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

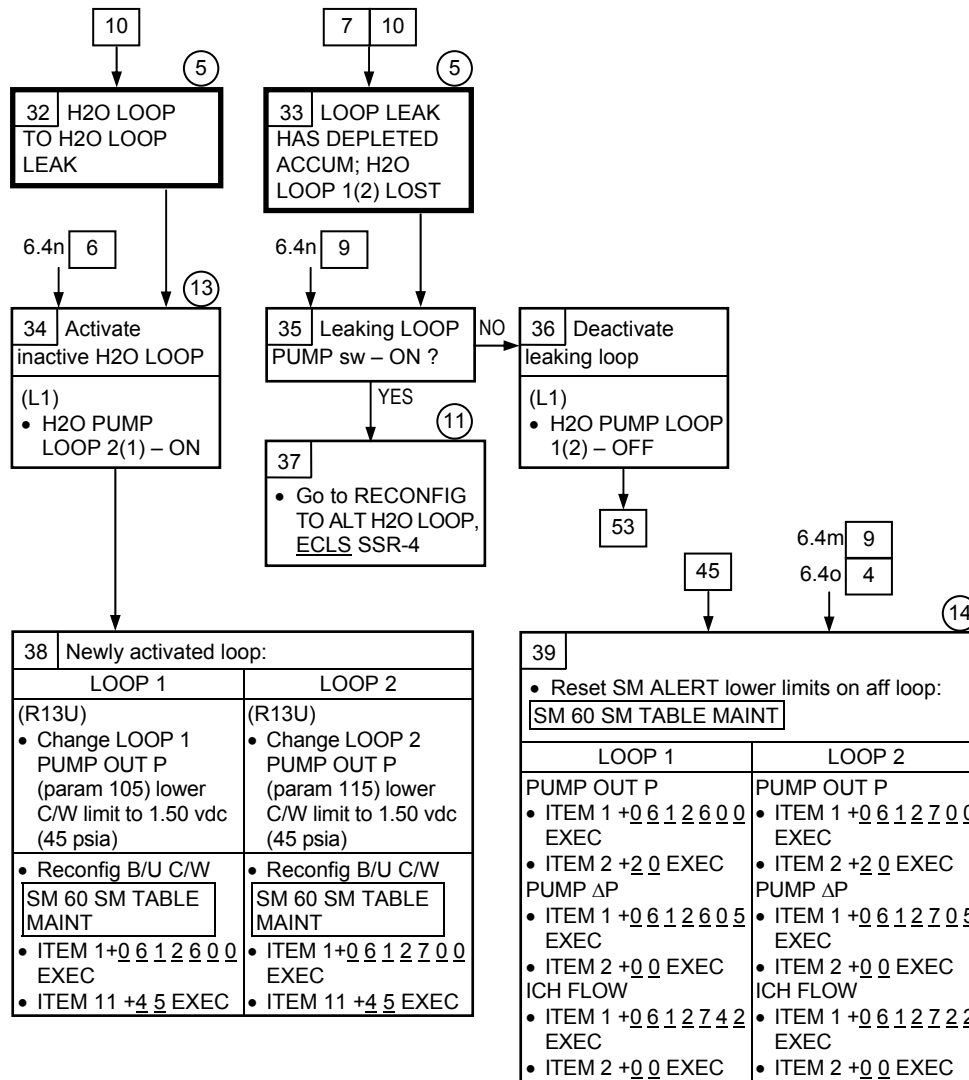
⑩ Only PUMP OUT P is available on board while in BFS

⑪ If both loops are failed:

(L1)
H2O PUMP LOOP 1,2 – OFF, then go to LOSS OF 2 H2O LOOPS (ORB PKT, PWRDN)

⑫ As pumps utilize H2O flow for active cooling, extreme or total blockage will result in overheating and failure of the pump within min

ECLS 6.4I (Cont)



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

⑪ If both loops are failed:
(L1)
H2O PUMP LOOP 1,2 – OFF, then go to LOSS OF 2 H2O LOOPS (ORB PKT, PWRDN)

⑬ Operation of both H2O loops will prevent loss of H2O to alt loop

⑭ Crew may opt to have MCC manage software limits via TMBU

ECLS

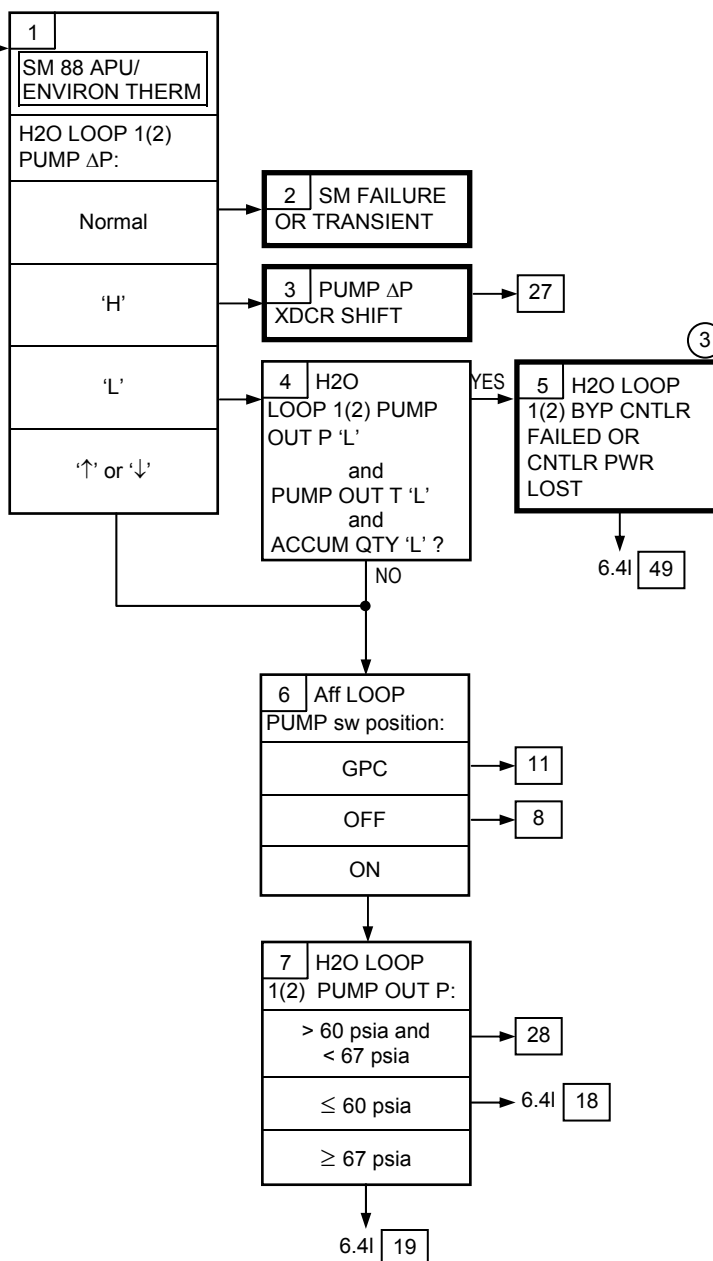
6.4m H2O PUMP ΔP 1(2) ↑↓

SM ALERT

S88 H2O PUMP P 1(2)

Light on if:
H2O LOOP 1(2)
PUMP ΔP
< 33 psid (1)
> 46 psid (2)
or
> 5 psid (2)
(inactive loop)
or, light on if:
H2O LOOP 1(2)
PUMP OUT P
< 50 psia (1)
> 75 psia (2)
or
< 20 psia (2)
(inactive loop)

Nominal Config:
Refer to 6.4I

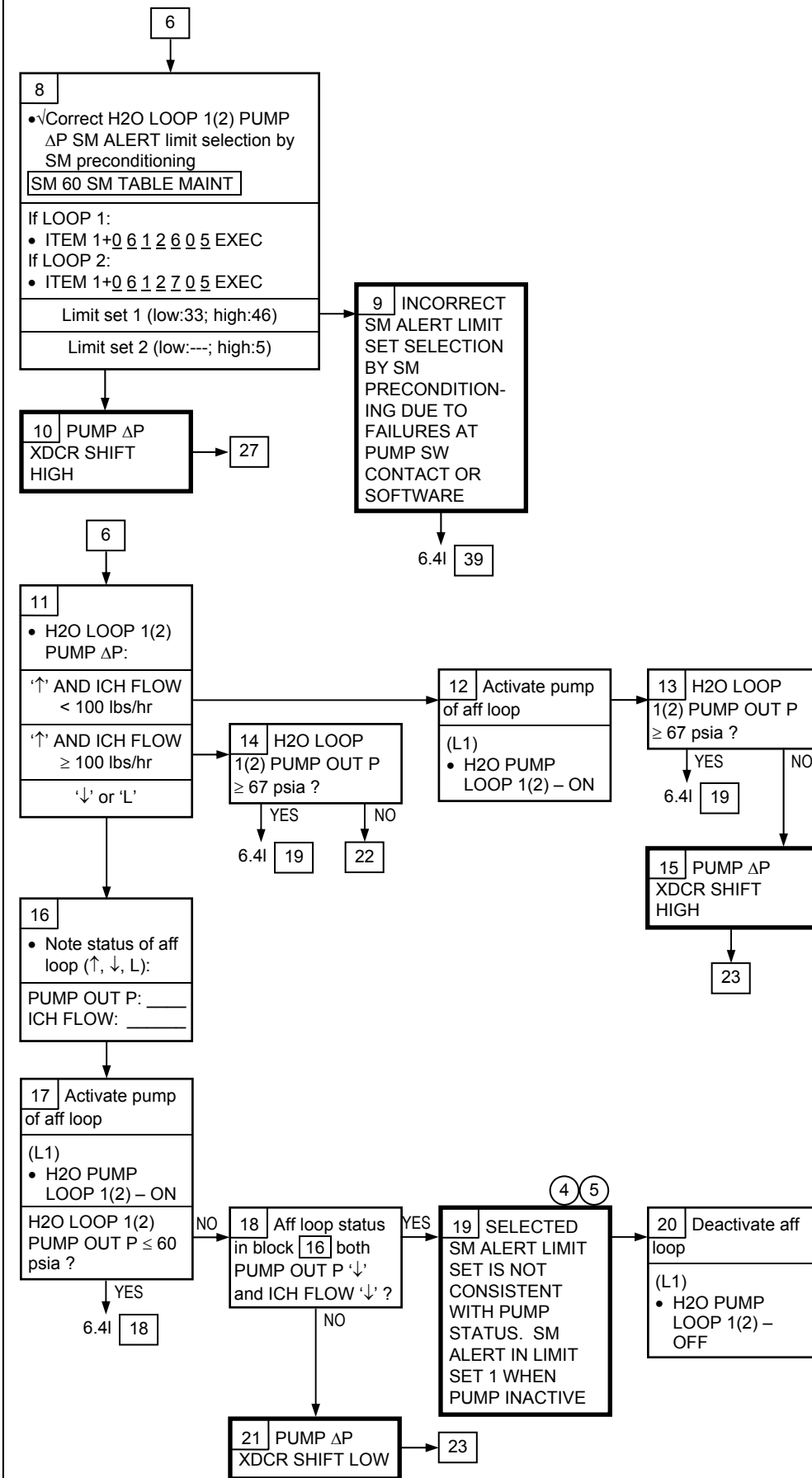


(1) Preconditioning will select this limit set if (L1) H2O PUMP LOOP 1(2) – ON, or H2O PUMP LOOP 1(2) – GPC and GPC – ON signal present

(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

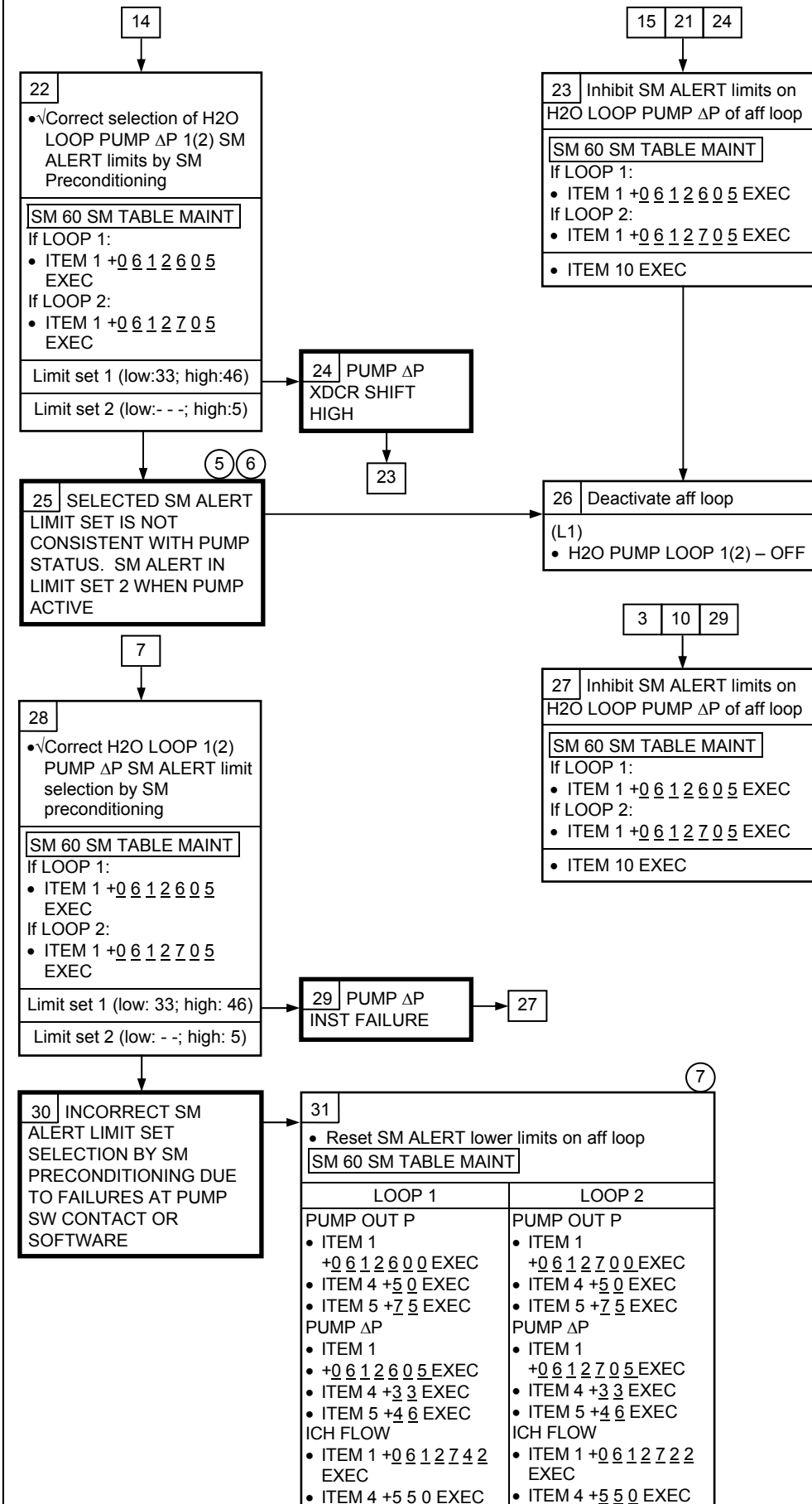
(3) √MCC about reset cb

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)



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

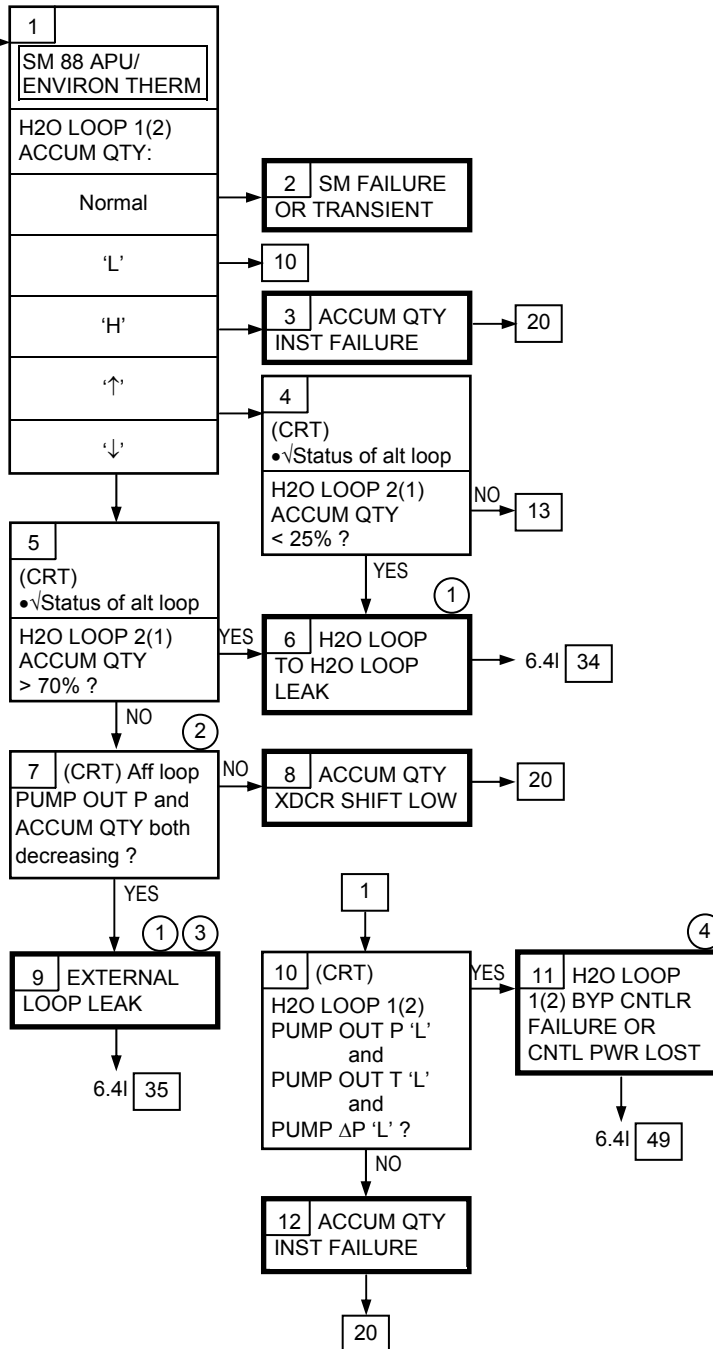
6.4n H2O ACCUM QTY 1(2) ↑↓

SM
ALERT

S88 H2O
LOOP 1(2) QTY

H2O LOOP 1(2)
ACCUM QTY
< 20%
> 80%

Nominal Config:
Refer to 6.4l



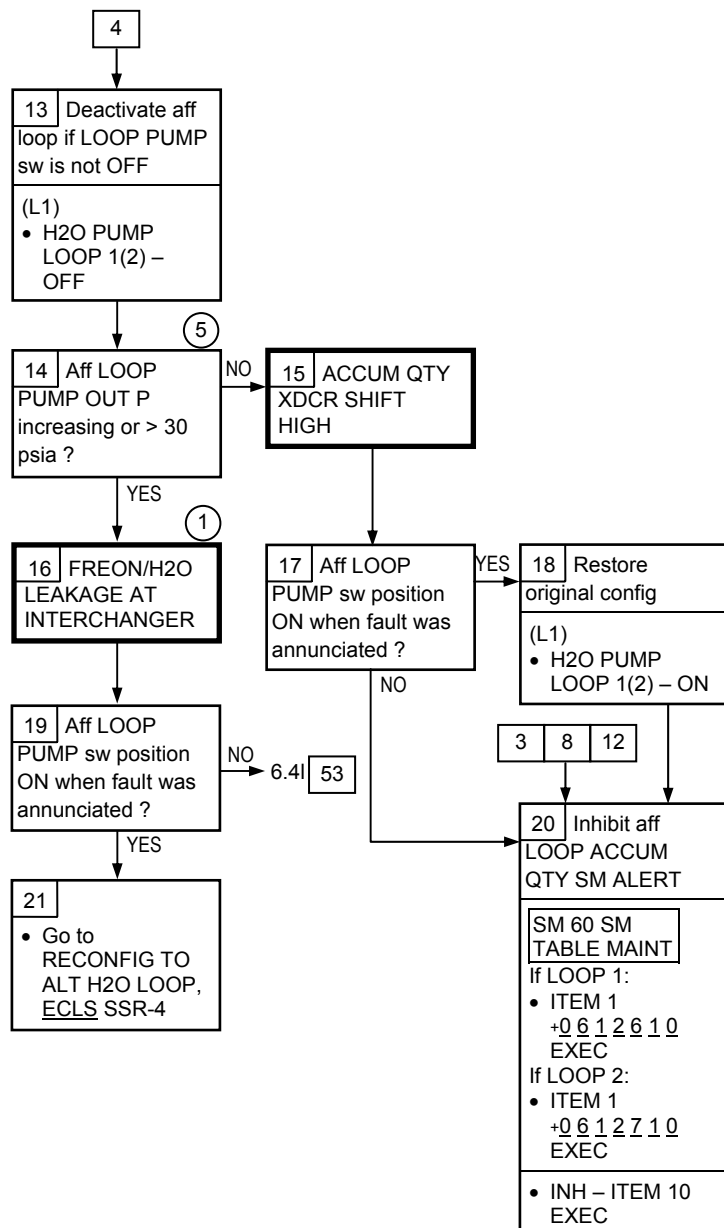
① Possible next
PLS. √MCC

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

ECLS 6.4n (Cont)



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 psi normally

ECLS

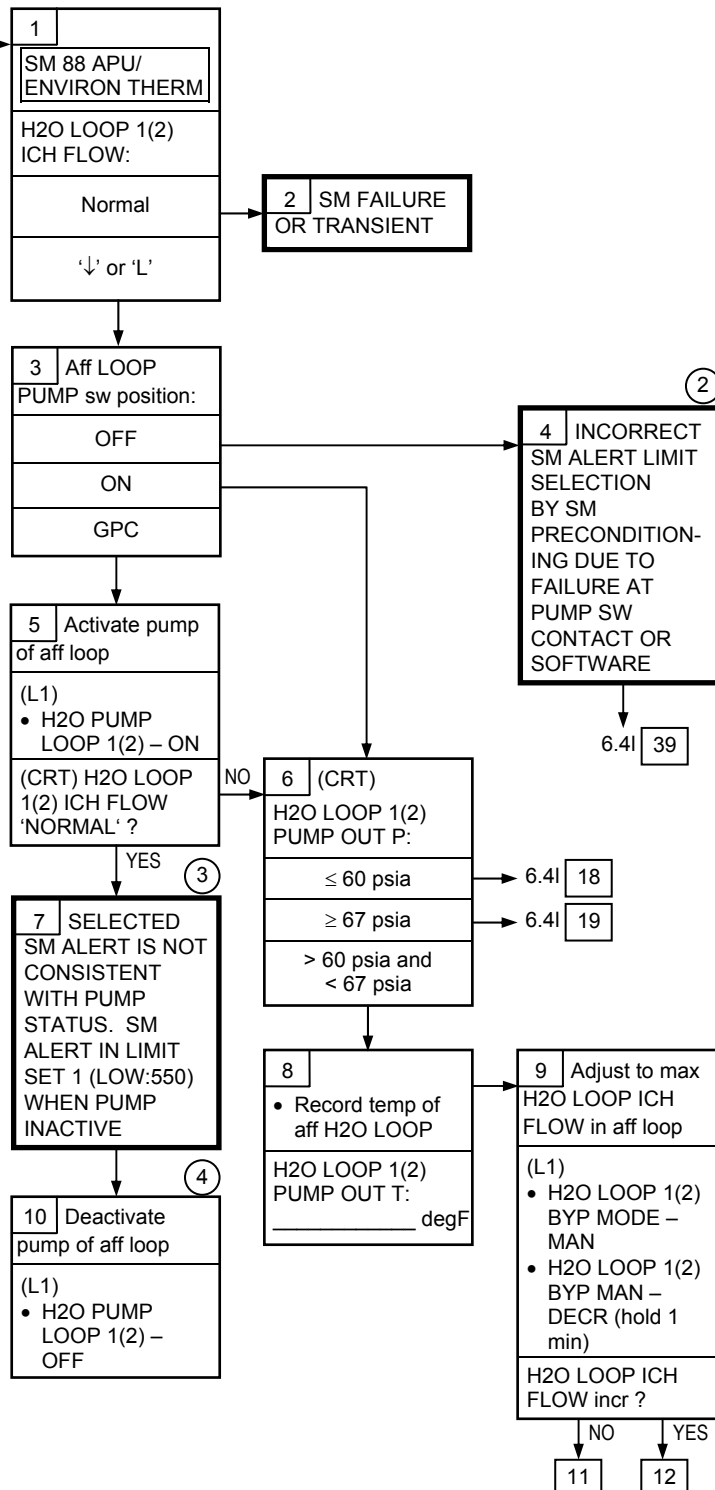
6.4o H2O ICH FLOW 1(2) ↓

SM
ALERT

S88 H2O
LOOP 1(2)
FLOW

H2O LOOP 1(2)
ICH FLOW
< 550 lb/hr ①

Nominal Config:
Refer to 6.4l



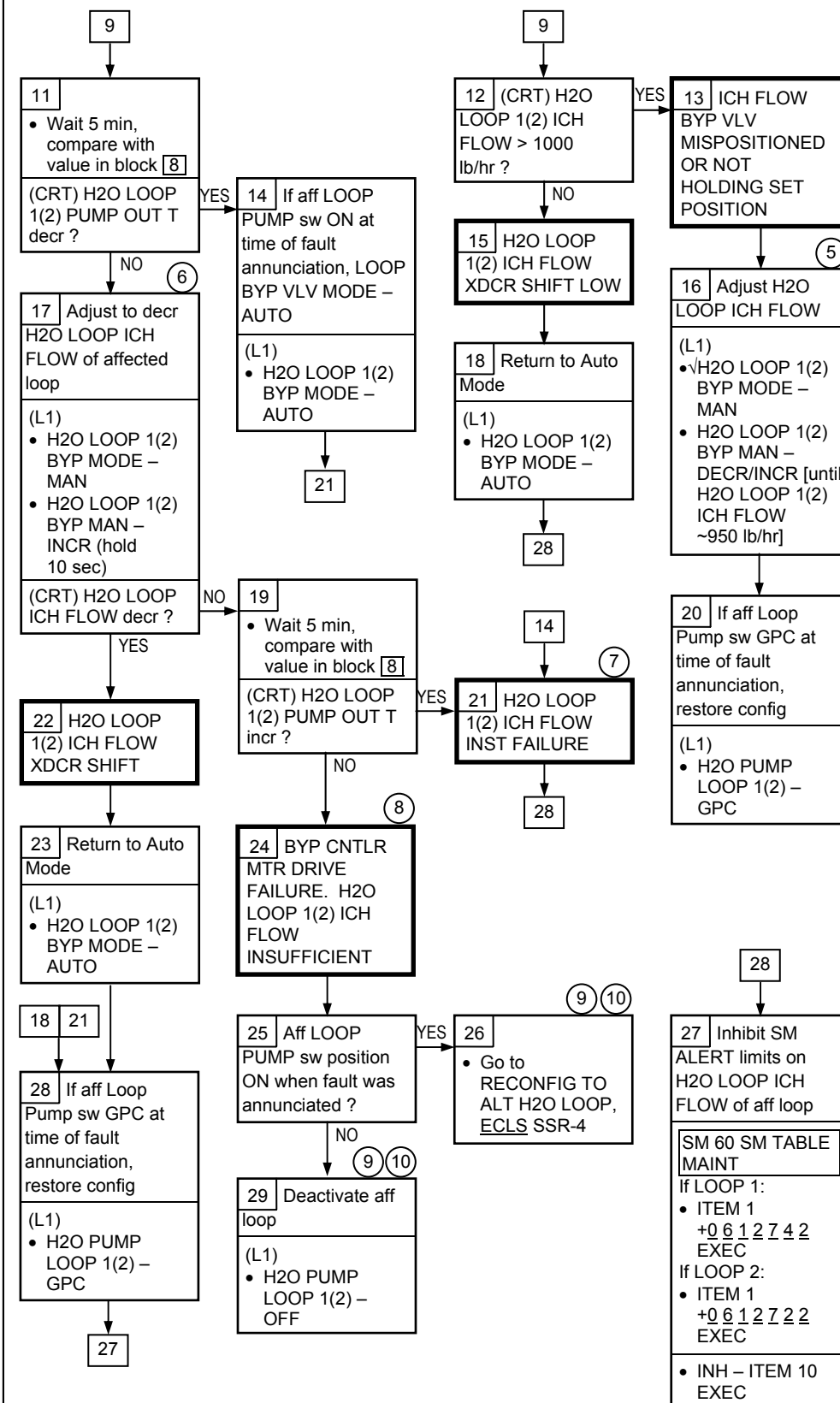
① Preconditioning will select this limit set if H2O PUMP LOOP 1(2) – ON; or H2O PUMP LOOP 1(2) – GPC and GPC – ON signal present

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 preconditioning failure (pump switch contact or software) causing selection of incorrect SM ALERT limits

④ Pump function sw ON position still available

ECLS 6.4o (Cont)



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

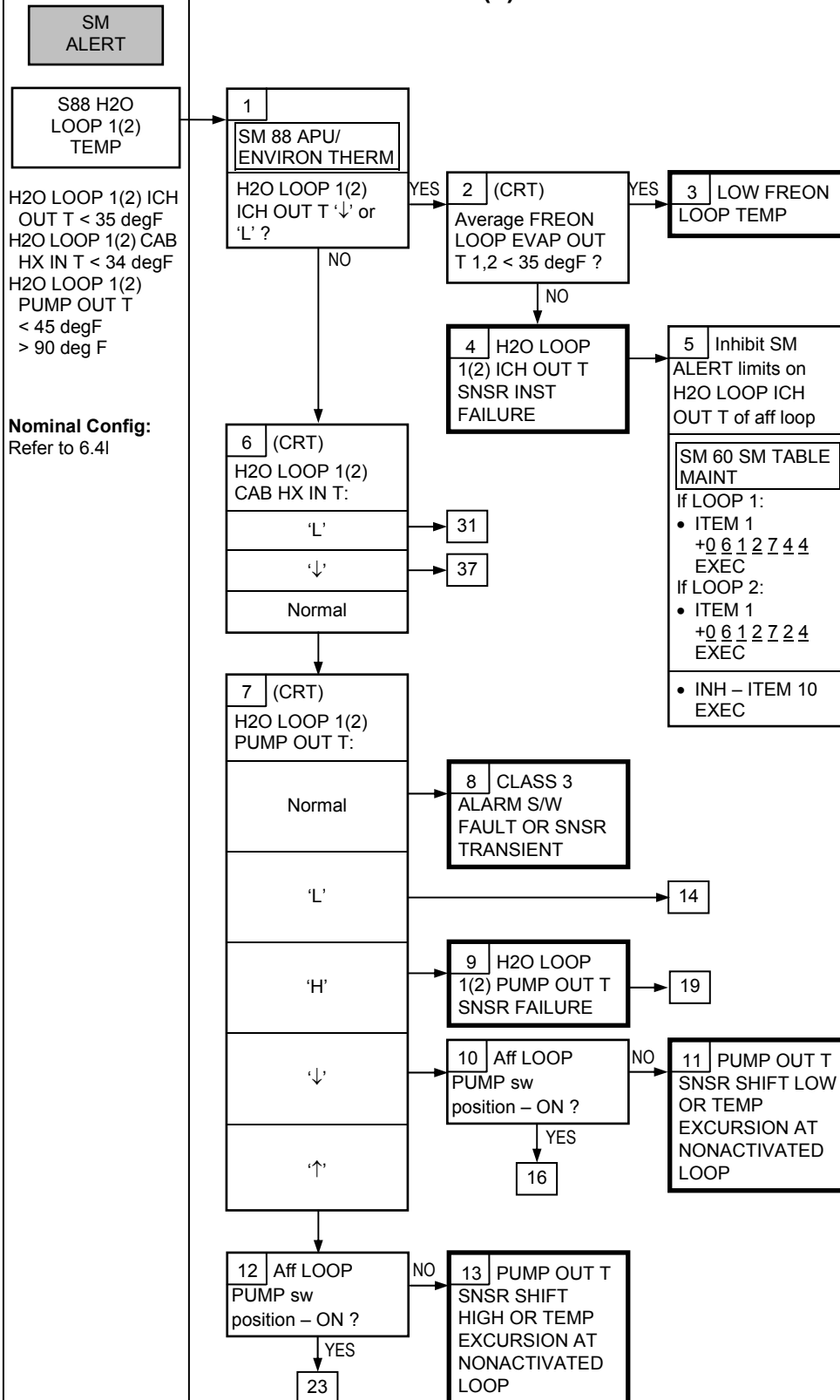
⑧ Manual override adjustment may still be available. √MCC for possible IFM

⑨ Possible next PL. √MCC

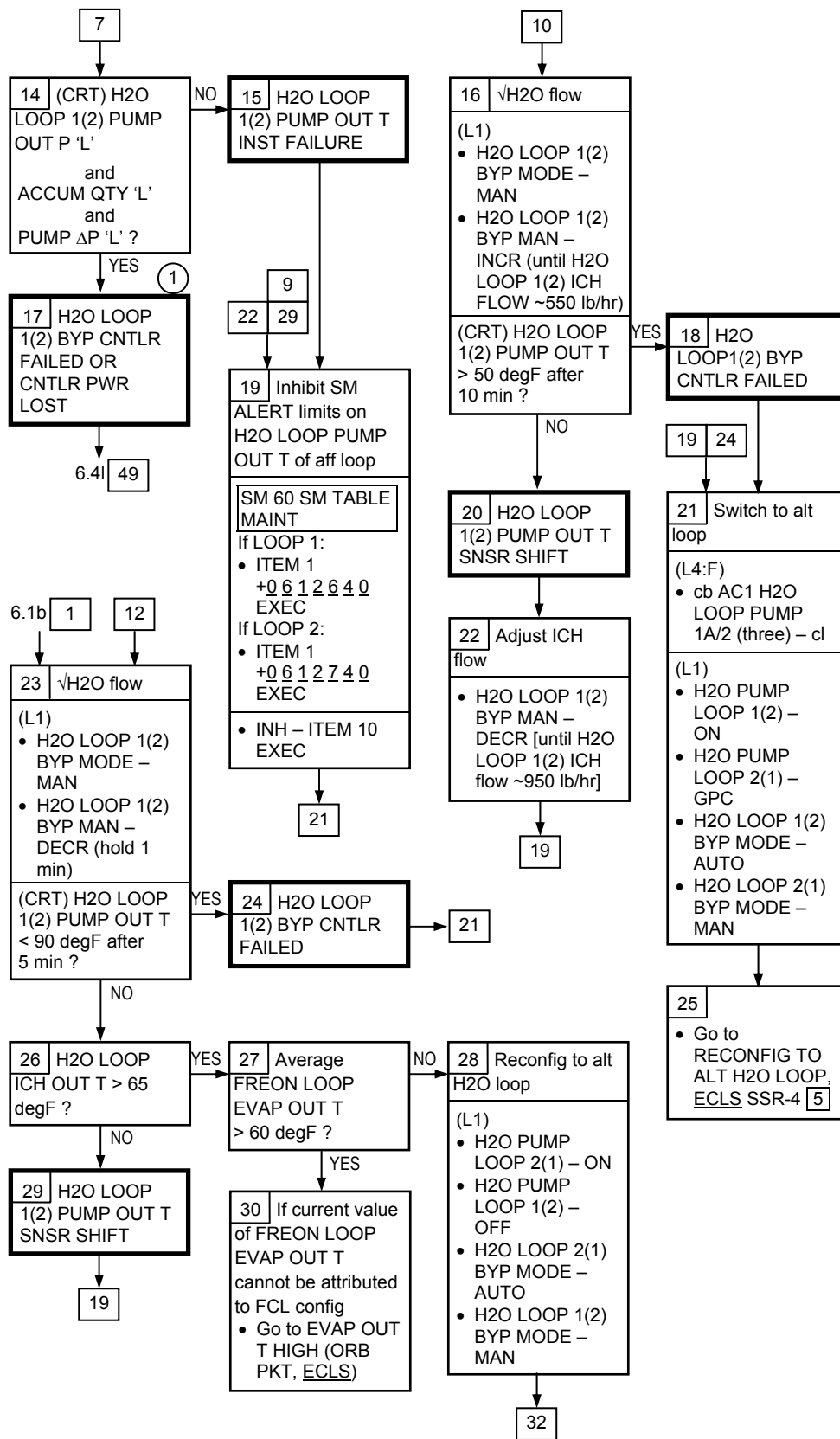
⑩ If BYP vlv drive control on both loops failed, activate both H2O LOOPS

ECLS

6.4p H2O ICH OUT T 1(2) ↓ CAB HX IN T 1(2) ↓ PUMP OUT T 1(2) ↑↓



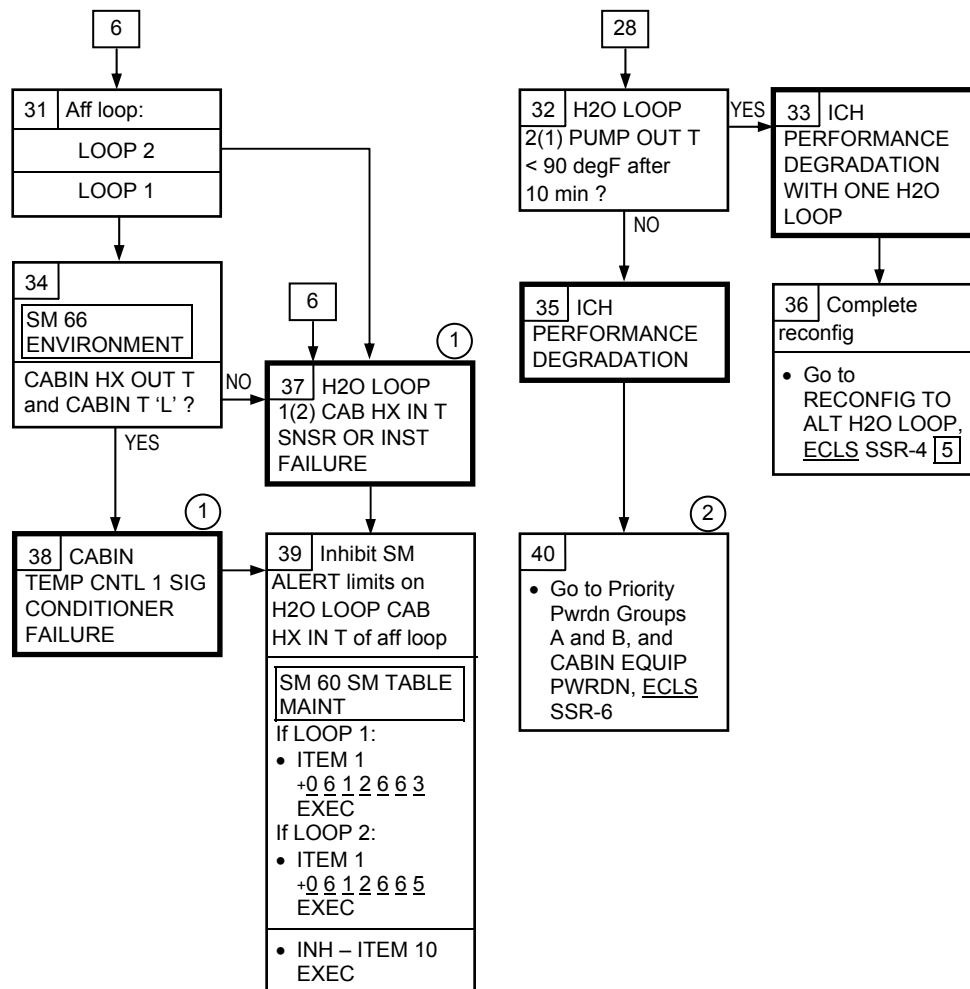
ECLS 6.4p (Cont)



```

(1) √MCC to reset
cb (pnl L4)
LOOP 1:
  cb AC3 ΦA H2O
  CNTLR 1
LOOP 2:
  cb AC1 ΦA H2O
  CNTLR 2

```



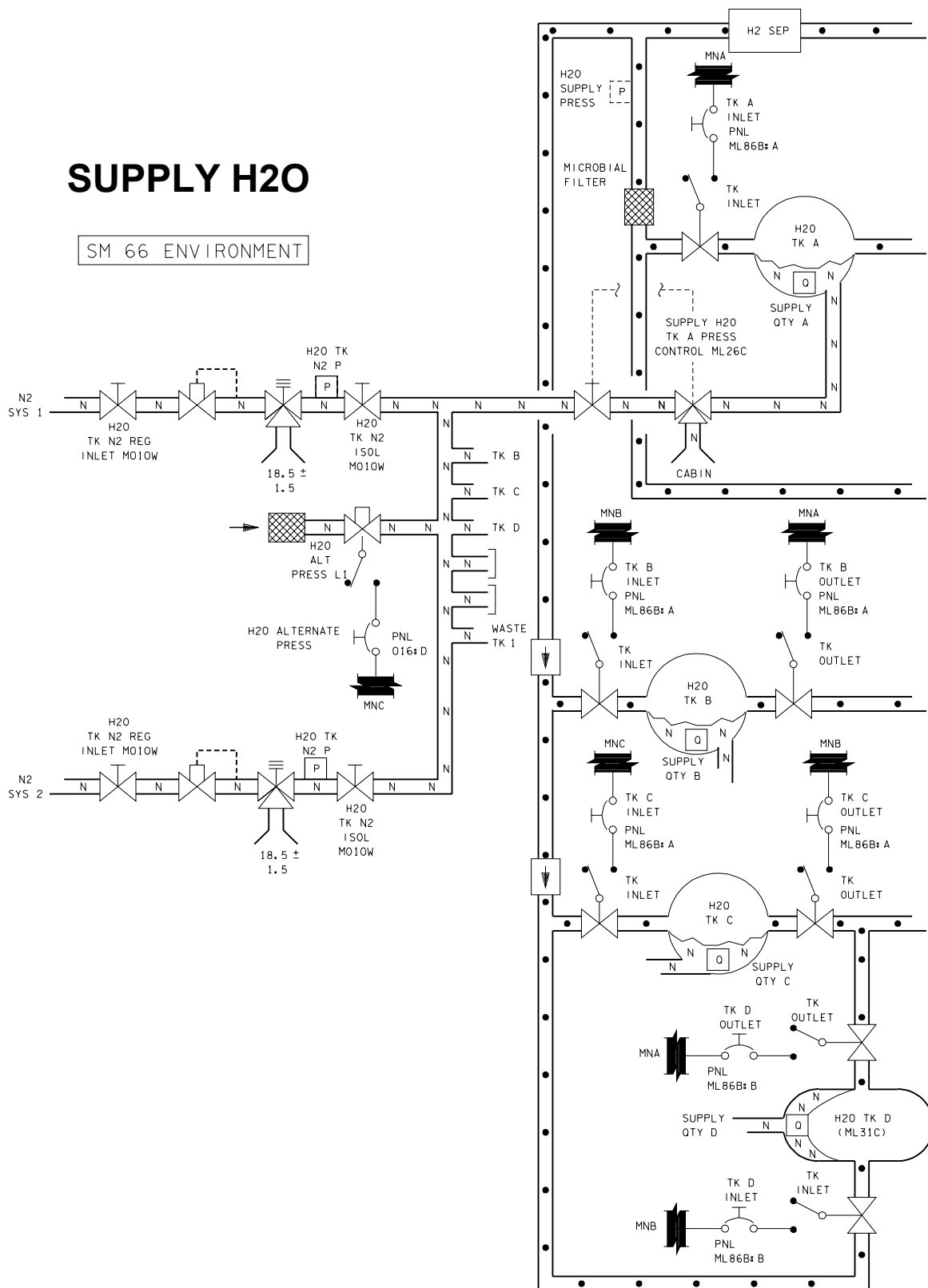
① √MCC to reset
LOOP 1:
(L4:L) cb AC2 ΦA
CAB T CNTLR 1
LOOP 2:
(L4:L) cb AC1 ΦA
CAB T CNTLR 2

② √MCC for
further pwrdsn
reqd and H2O
loop flowrate
management

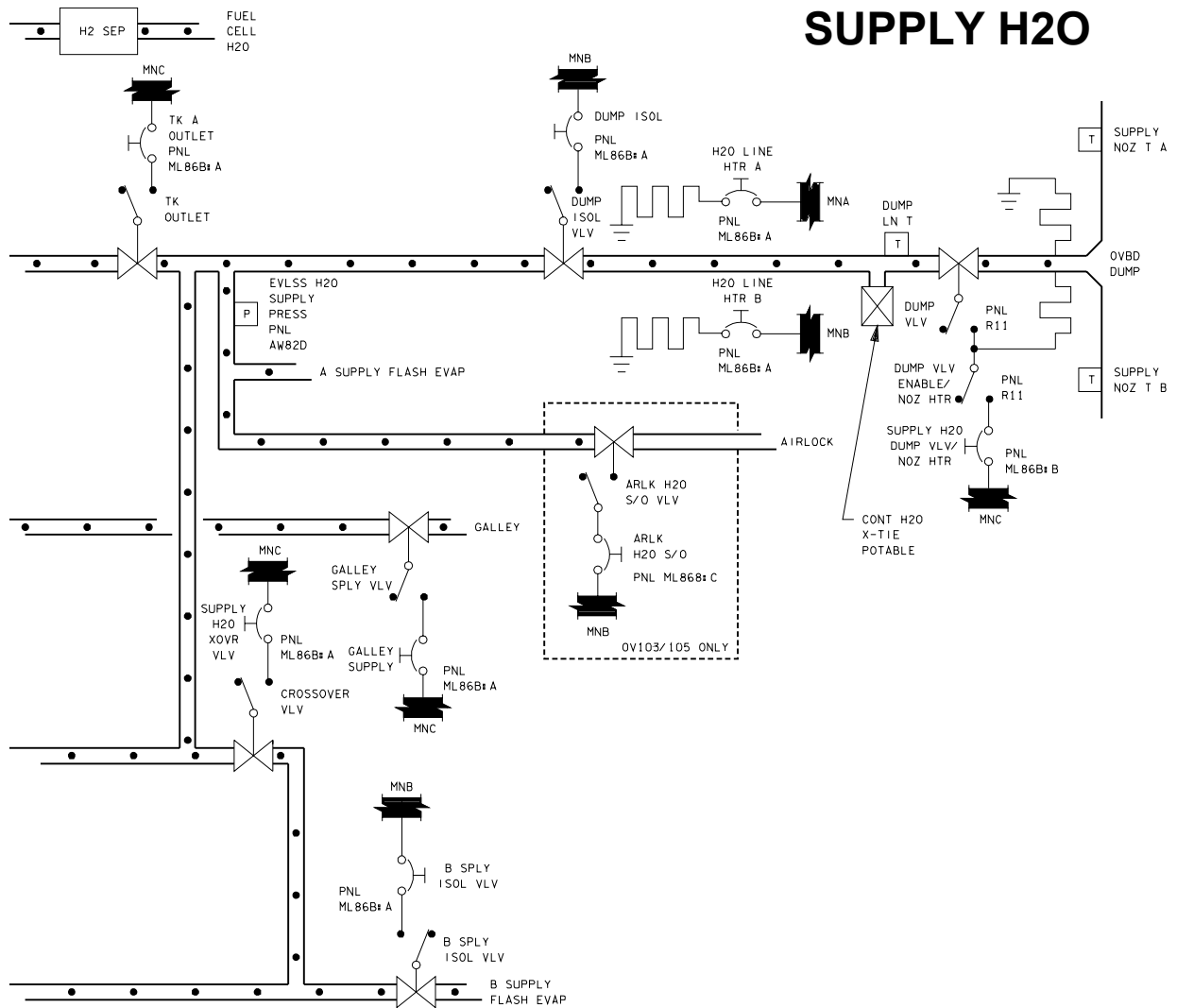
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SUPPLY H2O

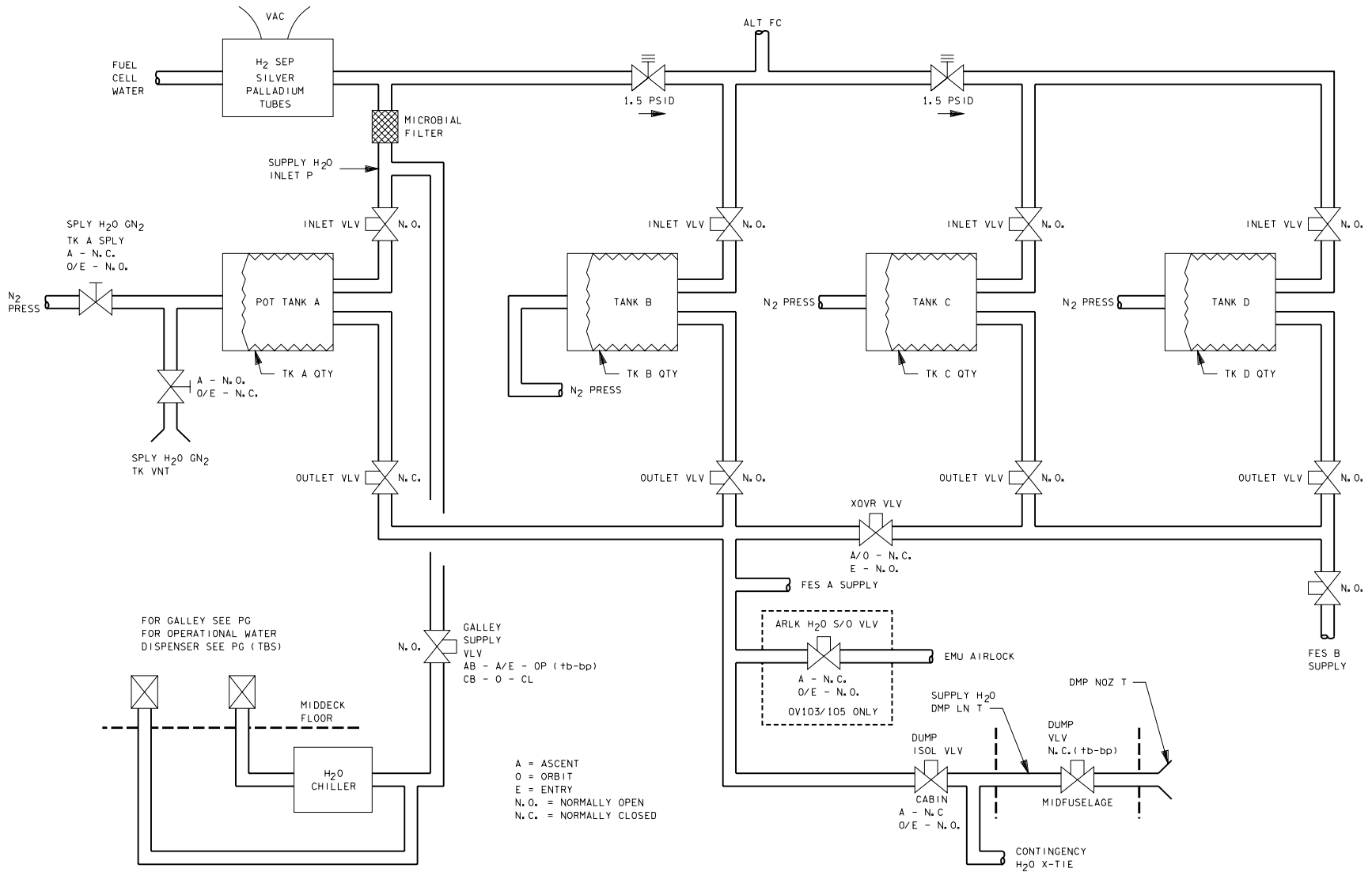
SM 66 ENVIRONMENT



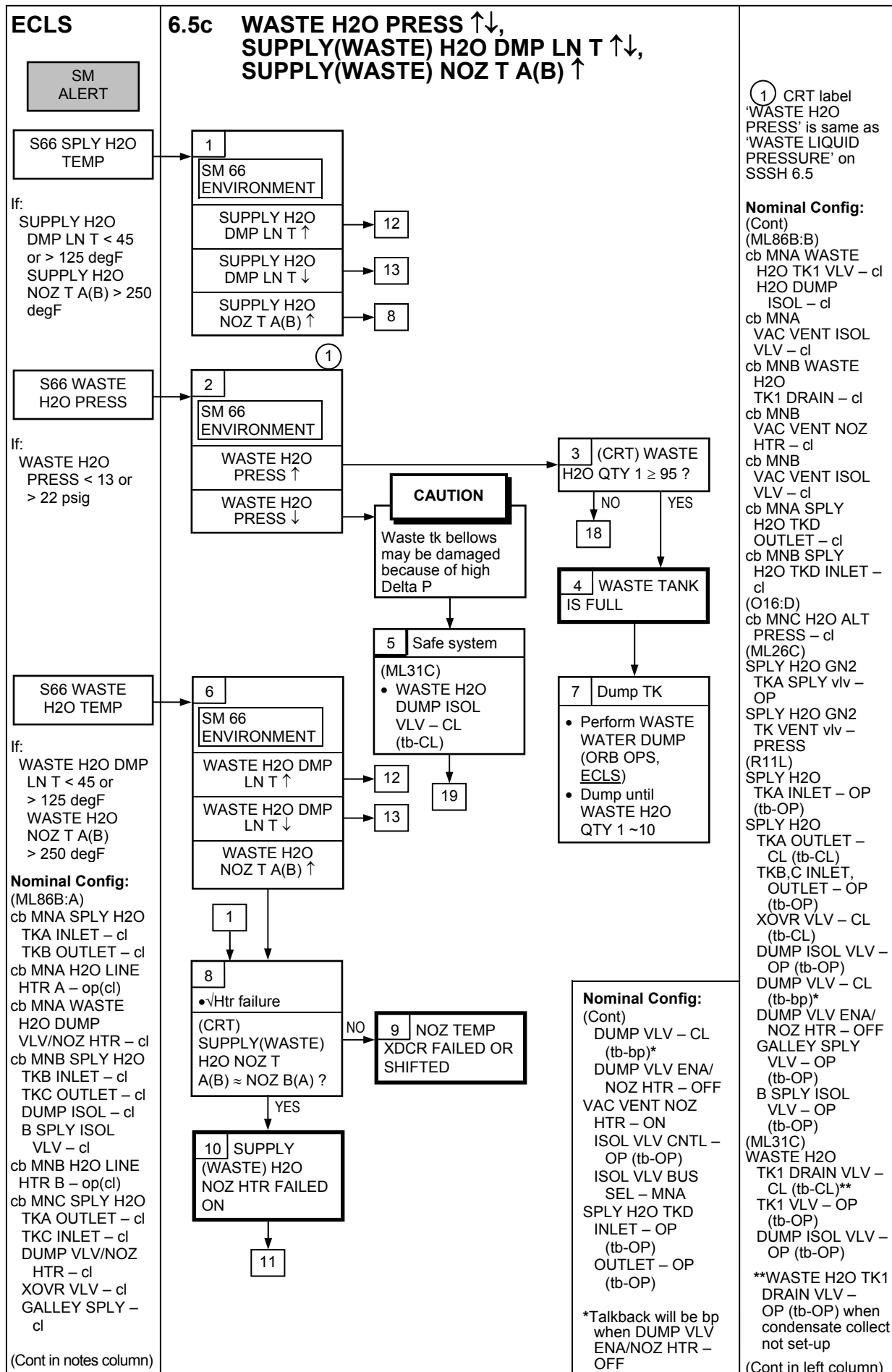
48027003_117. SCH# 1



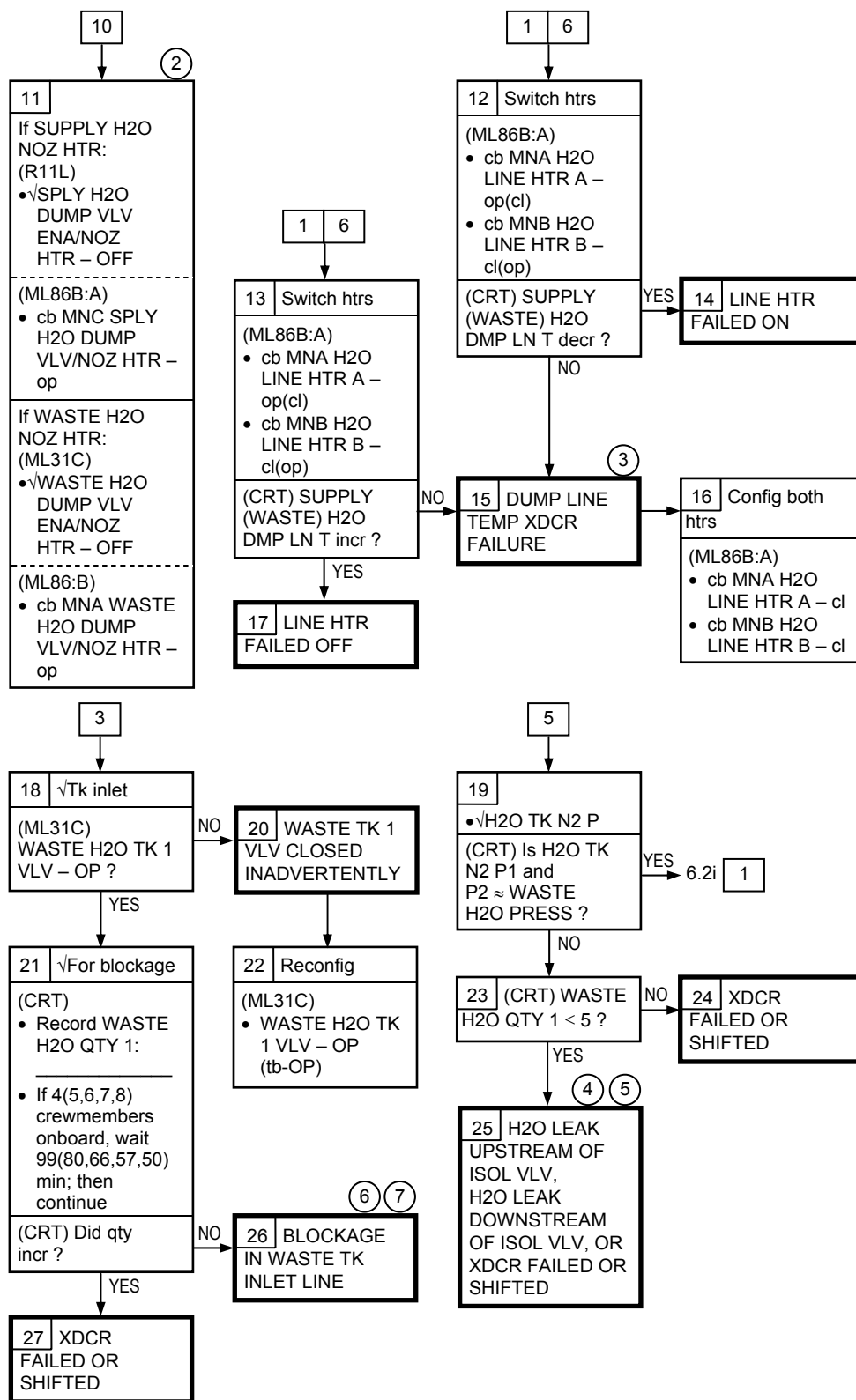
48027002_117. SCH: 1



SUPPLY H2O STORAGE



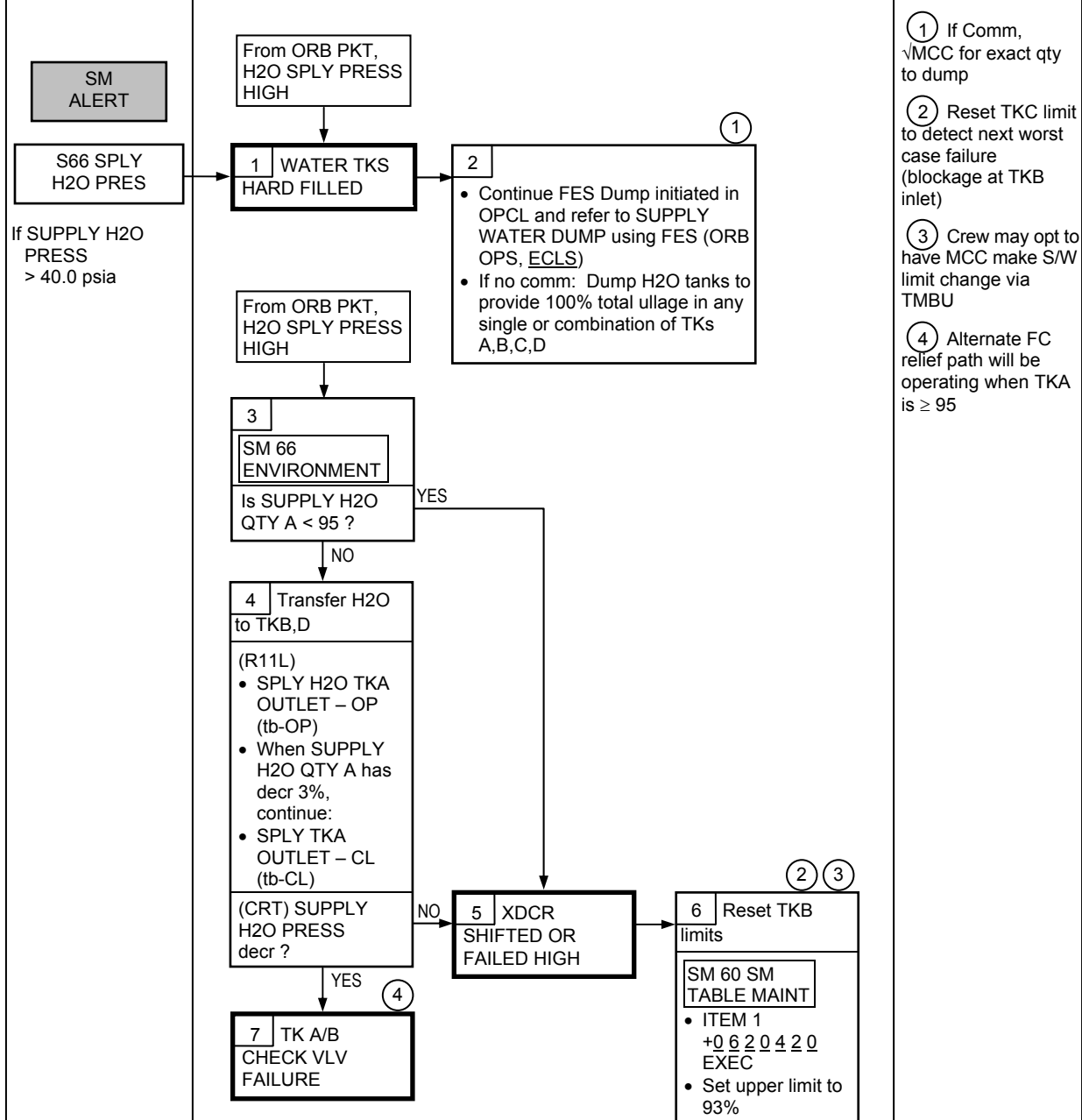
ECLS 6.5c (Cont)



- 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 ↓↑



EXT A/L

6.7

ECLS

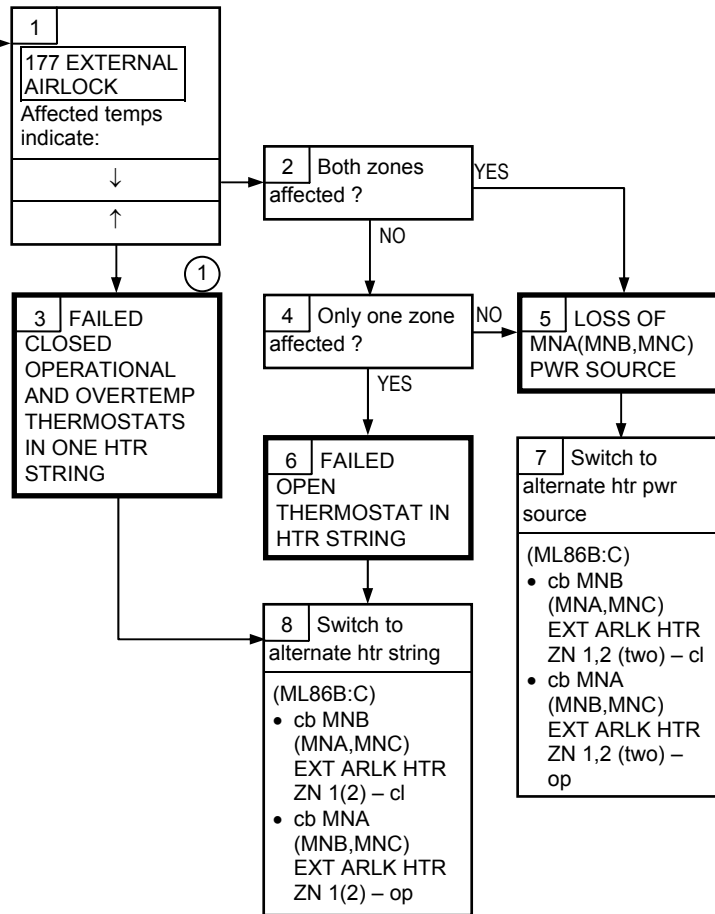
6.7a EXT A/L H2O LN T ↑↓

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 LINE 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 If both zone temps are indicating high, √MCC. Possible external heat load due to attitude is causing high temps

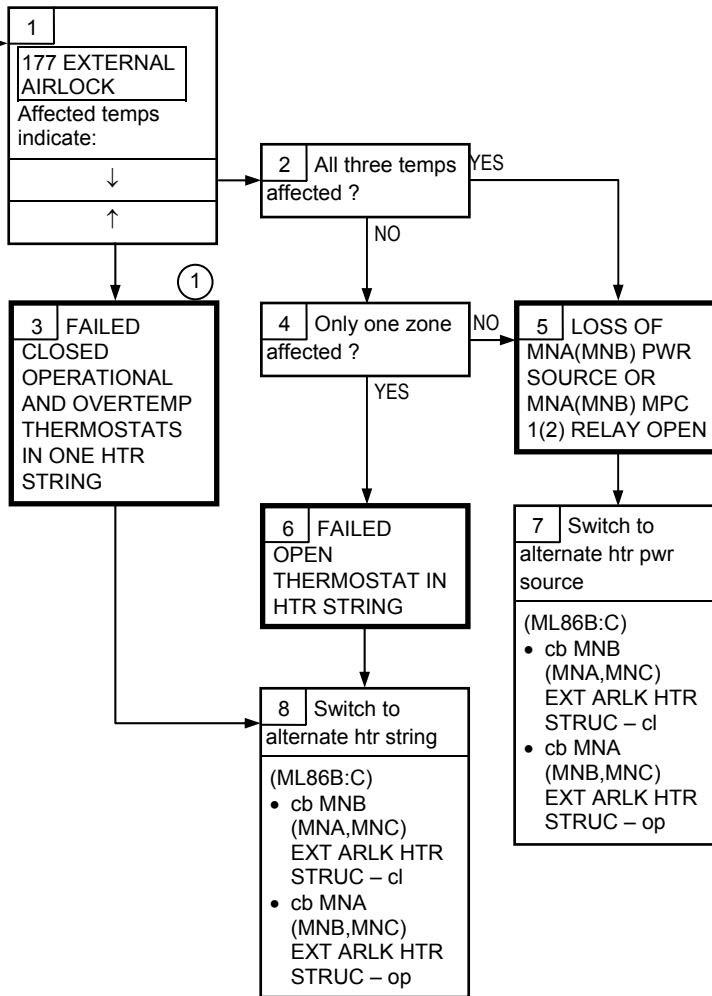
ECLS

6.7b EXT A/L STRUC T ↑↓

177 A/L
STRUC T

INTERNAL TEMP:
UPR (LWR) BKHD
T < 40
UPR (LWR) BKHD
T > 113
EXTERNAL TEMP:
AFT STRUC T < 40
AFT STRUC T
> 113

Nominal Config:
(ML86B:C)
cb MNA EXT ARLK
HTR STRUC –
cl(op)
cb MNB EXT ARLK
HTR STRUC –
op(cl)



① If two or more temps are indicating high, √MCC.
Possible external heat load due to attitude is causing high temps

CO2

6.8

6.8a RESERVED

CO₂

6.8

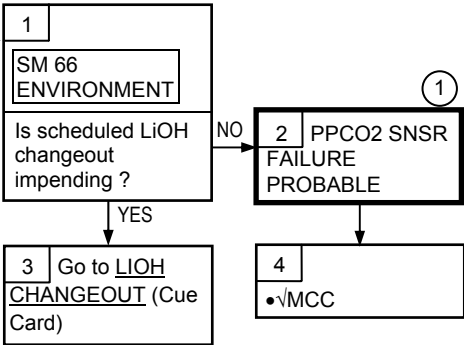
ECLS

6.8b PPCO2 ↑

SM
ALERT

S66 CAB
PPCO2

If:
Orbiter CO2
partial press
> 7.6mm Hg



① Only MCC can
determine exact
failure. Suspect sns
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

ECLS SSR

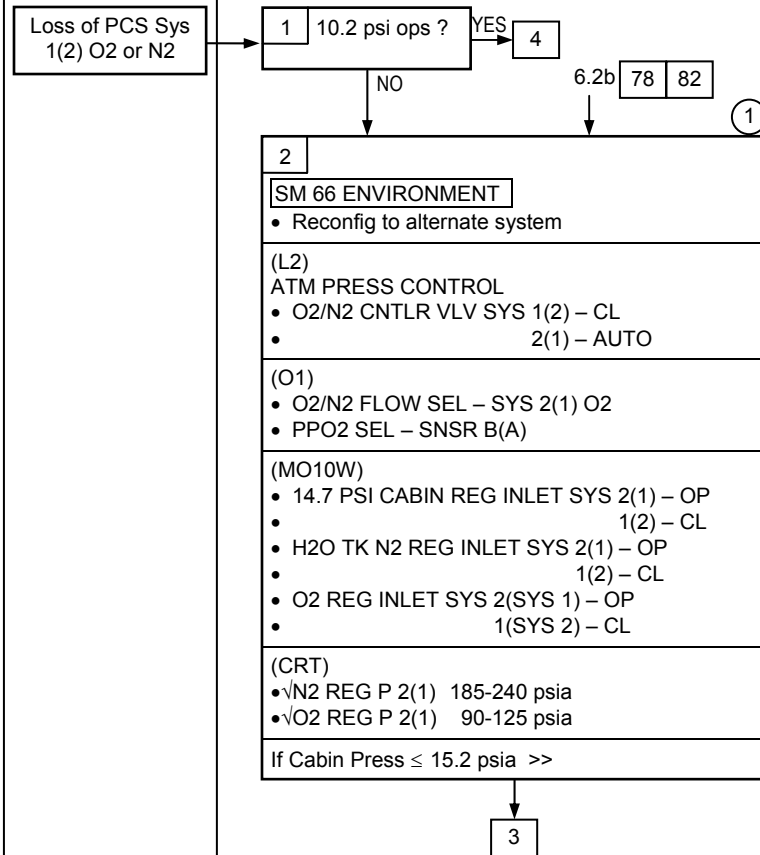
ECLS SSR-2 (Cont)

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)

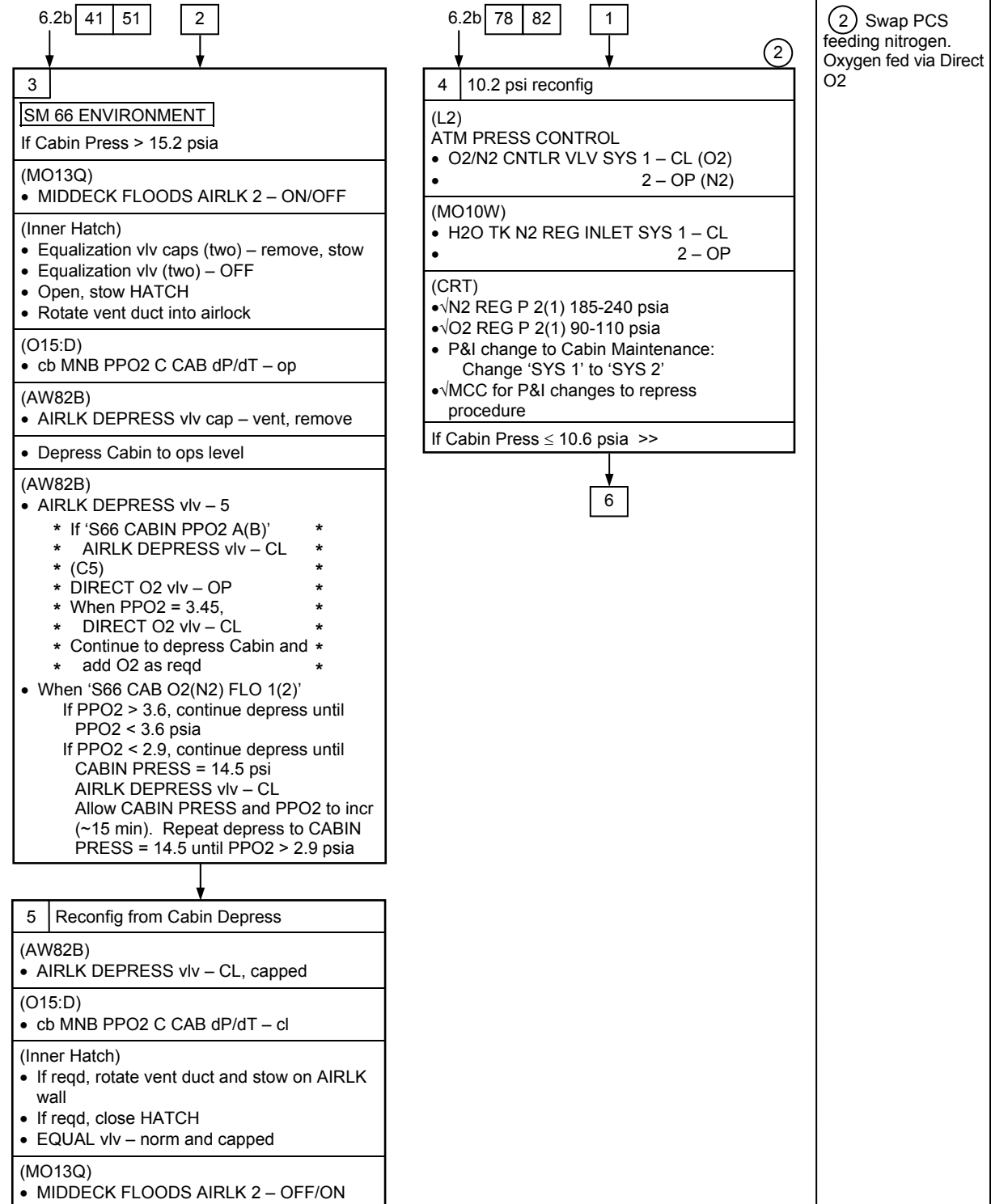
ECLS

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)



ECLS SSR-3 (Cont)

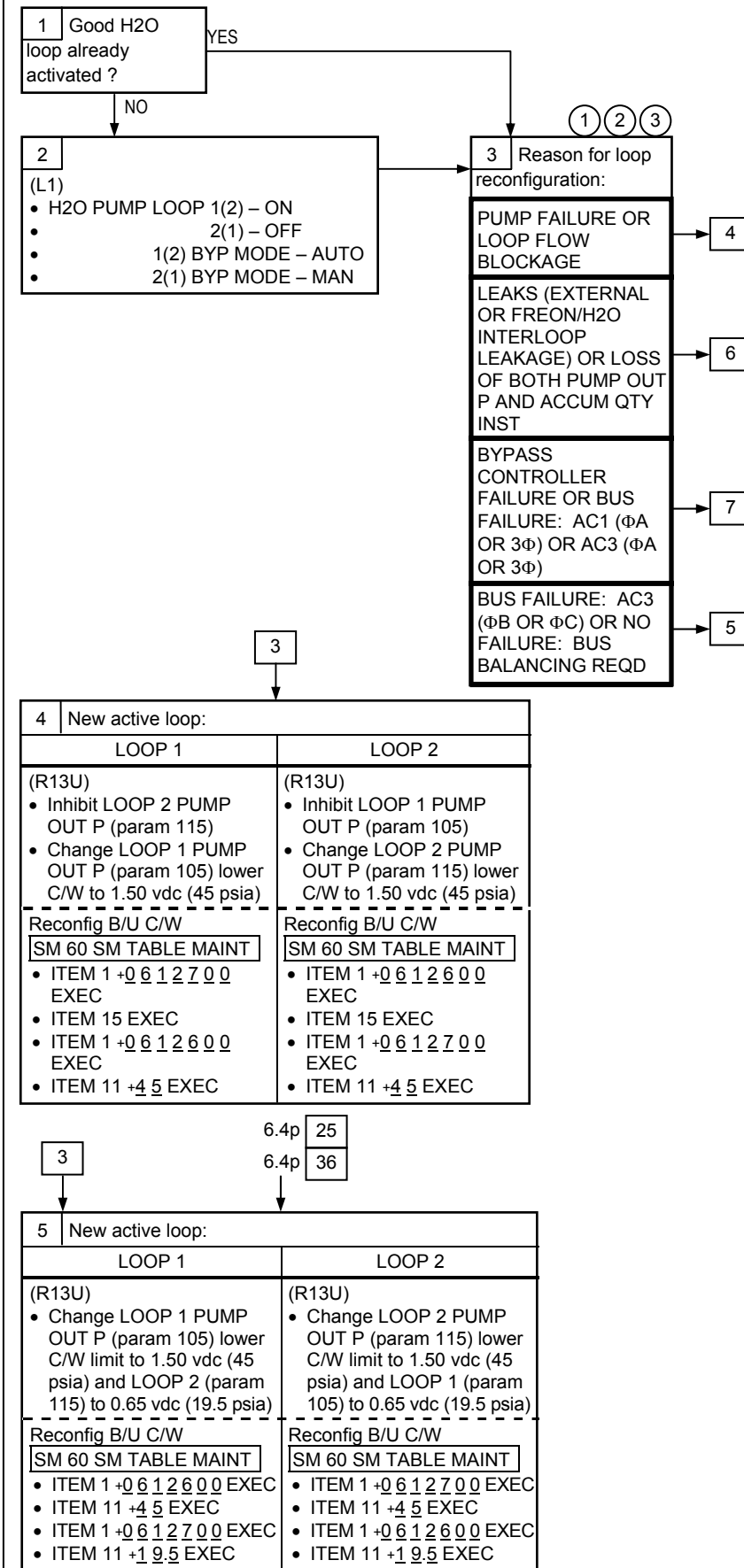
6.2b 41 51

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



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)

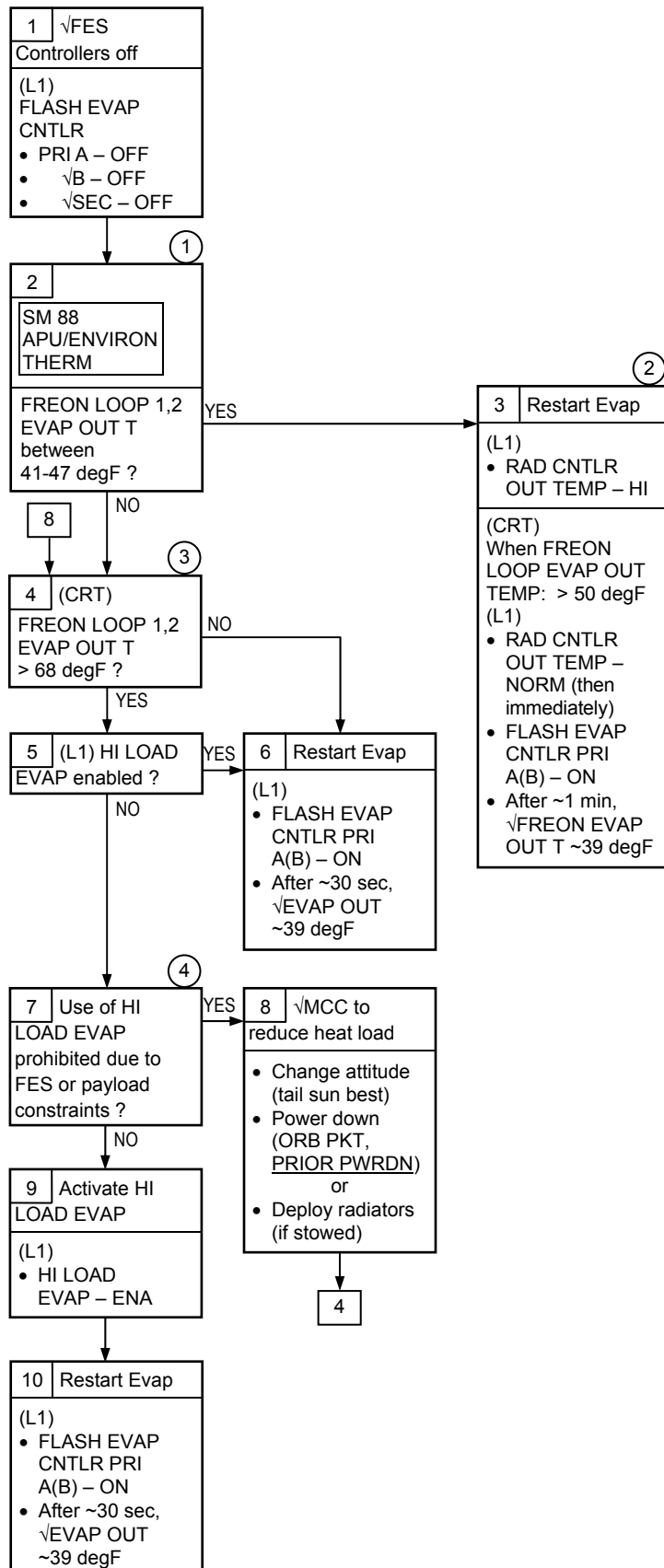
3

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	Reconfig B/U C/W SM 60 SM TABLE MAINT
	• ITEM 1 +0612600 EXEC • ITEM 11 +45 EXEC • ITEM 1 +0612700 EXEC • ITEM 15 EXEC	• ITEM 1 +0612700 EXEC • ITEM 11 +45 EXEC • ITEM 1 +0612600 EXEC • ITEM 15 EXEC
	Inhibit LOOP 2 SM ALERTS • ITEM 10 EXEC • ITEM 1 +0612710 EXEC • ITEM 10 EXEC	Inhibit LOOP 1 SM ALERTS • ITEM 10 EXEC • ITEM 1 +0612610 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	Reconfig B/U C/W SM 60 SM TABLE MAINT
	• ITEM 1 +0612600 EXEC • ITEM 11 +45 EXEC • ITEM 1 +0612700 EXEC • ITEM 15 EXEC	• ITEM 1 +0612700 EXEC • ITEM 11 +45 EXEC • ITEM 1 +0612600 EXEC • ITEM 15 EXEC
	Inhibit LOOP 2 SM ALERTS • ITEM 10 EXEC • ITEM 1 +0612710 EXEC • ITEM 10 EXEC • ITEM 1 +0612740 EXEC • ITEM 10 EXEC • ITEM 1 +0612705 EXEC • ITEM 10 EXEC	Inhibit LOOP 1 SM ALERTS • ITEM 10 EXEC • ITEM 1 +0612610 EXEC • ITEM 10 EXEC • ITEM 1 +0612640 EXEC • ITEM 10 EXEC • ITEM 1 +0612605 EXEC • ITEM 10 EXEC

ECLS SSR-5 FES RESTART



① Prior flight experience has demonstrated that FES shutdwns 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 Itg
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

- L1
 - a. √Rad flow, PLBD opened
 - 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)
- ML31C
 - √B SPLY ISOL VLV – OP (tb-OP)
 - √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

ECLS SSR-7 (Cont)

- 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, $\sqrt{\text{EVAP OUT T}} \sim 39 \text{ degF} \pm 1 \text{ degF}$ |
| L1 | 6. | FLASH EVAP CNTLR PRI A – OFF |
| | | B – ON |
| CRT | | After 60 sec, $\sqrt{\text{EVAP OUT T}} \sim 39 \text{ degF} \pm 1 \text{ degF}$ |
| L1 | 7. | RAD BYP VLV LOOP 1,2 MODE (two) – AUTO |
| | | CNTLR LOOP 1,2 (two) – OFF, AUTO A(AUTO B) |
| | | After 90 sec, $\sqrt{\text{tb (two)}} \sim \text{RAD}$ |
| | 8. | After 2 min, HI LOAD EVAP – OFF |
- f. PRIMARY CNTLR A,B, TOPPING, STARTUP FROM STBY CHECKOUT
- | | | |
|-----|-----|--|
| | 1. | Perform FES RESTART, <u>ECLS</u> SSR-5, using A CNTLR |
| CRT | 2. | $\sqrt{\text{RAD OUT T}} \sim 39 \text{ degF}$ (FES to STBY) |
| | | Pwrn and/or change attitude if necessary |
| L1 | 3. | RAD CNTLR OUT T – HIGH |
| CRT | 4. | After 2 min, $\sqrt{\text{EVAP OUT T}} \sim 39 \text{ degF} \pm 1 \text{ degF}$ |
| L1 | 5. | FLASH EVAP CNTLR PRI A – OFF |
| | | B – ON |
| CRT | 6. | After 60 sec, $\sqrt{\text{EVAP OUT T}} \sim 39 \text{ degF} \pm 1 \text{ degF}$ |
| L1 | 7. | RAD CNTLR OUT T – NORM, then immediately |
| | 8. | FLASH EVAP CNTLR PRI B – OFF, ON |
| | 9. | $\sqrt{\text{RAD OUT T}} \sim 39 \text{ degF} \pm 1 \text{ degF}$ |
| | 10. | CNTLR OUT T – HIGH |
| | 11. | After 2 min, $\sqrt{\text{EVAP OUT T}} \sim 39 \text{ degF} \pm 1 \text{ degF}$ |
| | 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
L2 5. NEG PRESS RELIEF vlv covers (two) – cl (push firmly)
6. CAB RELIEF A – CL (tb-CL)
7. CAB RELIEF B – CL (tb-CL)
- MO51F 8. If flown, deactivate CO2 RMVL SYS:
CO2 RMVL SYS CNTLR 1(2) MODE – STBY (hold 3 sec)
Wait 6 sec
√CO2 RMVL SYS CNTLR 1(2) OPER It – off
√FAIL It – 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 9. √CAB PURGE VLV – CL
FLR √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)
- If SH HATCH open:
13. Perform SH CABIN LEAK ISOLATION (Cue Card)
- MIDDECK 14. A/L HATCH – CL (per decal)
Equal vlv (two) – OFF

LEAK DETECTION AND SEALING

15. Go to LEAK DETECTION – ULTRASONIC (IFM, PROCEDURES G thru L)

If reqd (On MCC Go):

16. Go to LEAK SEALING – VACUUM (IFM, PROCEDURES G thru L)

RECOVERY STEPS (On MCC call)

- L2 17. CAB RELIEF A – ENA (tb-ENA)
18. CAB RELIEF B – ENA (tb-ENA)

ECLS SSR-8 (Cont)

- ML31C 19. 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 It – 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 It – on
- WCS/
EDO
WCS 20. VAC VLV – OP
- PCS CONFIG (On MCC GO)
21. √MCC for PCS config and TIG time (if necessary)

ECLS SSR-9

RAD ISOL RECOVERY

NOTE

Procedure reestablishes radiator flow after inadvertent isolation due to 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:
 - L2 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
 - L2 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
 - L2 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 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:

L4:F
L1

If Pump A reqd:

4. cb AC1 H2O LOOP PUMP 1 A/2 (three) – cl
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

O1

8. H2O PUMP OUT PRESS – 1

If WCL 2 for continuous ops:

L4:F
L1

9. cb AC1 H2O LOOP PUMP 1 A/2 (three) – cl
10. H2O PUMP LOOP 2 – GPC

√LOOP 2 BYP MODE – AUTO
 √1 BYP MODE – MAN

O1

11. √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

12. SM OPS 000 PRO

13. SM OPS 201 PRO

S88 APU/ENVIRON THERM

L1

If H2O LOOP PUMP OUT P 1(2): 61-69

14. H2O PUMP LOOP 2(1) – OFF

If reqd:

15. **S94 PDRS CONTROL**
 I/O ON – ITEM 5 EXEC(*)
 SAFING – CANCEL

16. **SM(GNC,PL) 1 DPS UTILITY**

CKPT RETRV ENA – ITEM 12 EXEC (*)
 UL CNTL AUTO – ITEM 35 EXEC (*)

17. If reqd, perform PL/DPS RECONFIG, (PL SYS: or SODF: ASSY OPS)

18. 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 0.65 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 0.65 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 pwrn. 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,B,SEC (three) – OFF

NOTE

Have towel ready for possible release of water when mating/demating any connections

- WCS
Outbd
Wall 2. Unstow and install SPLY H2O Dumpline Purge Device into CONT H2O X-TIE POT QD (lower QD with blue Velcro and "POTABLE" label)

- ML86B:A 3. cb MNC SPLY H2O XOVR VLV – cl

If only B FDLN requires purging:

NOTE

After evacuation of B FDLN, SPLY H2O can be managed in normal fashion by using Nozzle dumps and/or Supply Water dumps with FES PRI A

- ML31C
R11L 4. SPLY H2O TKD OUTLET – CL (tb-CL)
5. TKA,TKB,TKC OUTLET – CL (tb-CL)
√B SPLY ISOL VLV – OP
XOVR VLV – OP (tb-OP)
√DUMP ISOL VLV – OP (tb-OP)
- L1
O1 6. RAD CNTLR OUT TEMP – HI
7. When EVAP OUT T > 50 degF,
FLASH EVAP CNTLR PRI B – ON
8. When FES shuts down and EVAP OUT T again > 50 degF,
FLASH EVAP CNTLR PRI B – OFF, ON
9. Repeat step 8 until EVAP OUT T remains at ~57 degF,
then FLASH EVAP CNTLR PRI B – OFF
- R11L
L2 10. SPLY H2O B SPLY ISOL VLV – CL
11. FLASH EVAP FDLN HTR B SPLY – OFF
L1 12. √CNTLR SEC – A SPLY

FDA RESET

If comm, MCC will TMBU limits as reqd

If no comm, change limits via table

SM 60 TABLE MAINT

PARAMETER NAME	PARA ID	SM ALERT	
		LOW	HIGH
EVAP TEMP FDLN T FWD (B)	0631871	-10	
EVAP TEMP FDLN T MID 1 (B)	0631873	-10	
EVAP TEMP FDLN T MID 2 (B)	0631875	-10	
EVAP TEMP FDLN T AFT (B)	0631877	-10	
EVAP TEMP FDLN T TOPPING (B)	0631893	-10	
EVAP TEMP FDLN T ACCUM (B)	0631894	-10	
EVAP TEMP FDLN T HI LOAD (B)	0631896	-10	

Continue with procedure in step 27

If only A FDLN requires purging:

NOTE

After evacuation of A FDLN, SPLY H2O can be managed using Nozzle dumps and/or Supply Water dumps with FES PRI B

- R11L 14. SPLY H2O TKA,TKB OUTLET – CL (tb-CL)
√XOVR VLV – CL (tb-CL)
√DUMP ISOL VLV – OP (tb-OP)

ECLS SSR-11 (Cont)

- L1 15. RAD CNTLR OUT TEMP – HI
 O1 16. When EVAP OUT T > 50 degF,
 FLASH EVAP CNTLR PRI A – ON
 17. When FES shuts down and EVAP OUT T again > 50 degF,
 FLASH EVAP CNTLR PRI A – OFF, ON
 18. Repeat step 17 until EVAP OUT T remains at ~57 degF,
 then FLASH EVAP CNTLR PRI A – OFF
 L2 19. FLASH EVAP FDLN HTR A SPLY – OFF
 L1 20. CNTLR SEC – B SPLY

21. FDA RESET

If comm, MCC will TMBU limits as reqd

|

If no comm, change limits via table

SM 60 TABLE MAINT

PARAMETER NAME	PARA ID	SM ALERT	
		LOW	HIGH
EVAP TEMP FDLN T FWD (A)	0631870	-10	
EVAP TEMP FDLN T MID 1 (A)	0631872	-10	
EVAP TEMP FDLN T MID 2 (A)	0631874	-10	
EVAP TEMP FDLN T AFT (A)	0631876	-10	
EVAP TEMP FDLN T TOPPING (A)	0631891	-10	
EVAP TEMP FDLN T ACCUM (A)	0631892	-10	
EVAP TEMP FDLN T HI LOAD (A)	0631895	-10	

Continue with procedure in step 27

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

- L1 22. Perform steps 4 thru 9, then:
 FLASH EVAP CNTLR PRI A – ON
 23. Perform steps 17 and 18, then:
 L2 24. FLASH EVAP FDLN HTR A,B SPLY (two) – OFF
 L1 25. TOP EVAP HTR DUCT – OFF
 NOZ L,R (two) – OFF

26. FDA RESET

If comm, MCC will TMBU limits as reqd

|

If no comm, change limits via table

SM 60 TABLE MAINT

PARAMETER NAME	PARA ID	SM ALERT	
		LOW	HIGH
EVAP TEMP TOPPING AFT	0631802	-10	
EVAP TEMP TOPPING FWD	0631801	-10	
EVAP TEMP TOPPING L DUCT	0631800	-10	
EVAP TEMP TOPPING L NOZ	0631878	-10	
EVAP TEMP TOPPING R DUCT	0631810	-10	
EVAP TEMP TOPPING R NOZ	0631879	-10	

Also update limits per steps 13 and 21

Continue with procedure in step 27

POST-PURGE RECONFIGURATION

- WCS 27. RAD CNTLR OUT TEMP – NORM
 Outbd 28. Remove, stow SPLY H2O Dumpline Purge Device from CONT H2O X-TIE POT QD
 Wall
 29. √MCC for Supply Water Tank Config
 30. √MCC for FES Config

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	Av Bay 3B
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	Av Bay 3B
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 (OV103,4)	1	2	3	
2 of 3 GPSs (OV105)	1		3	2
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
7. If recovery of the associated AC Bus, FF MDM, or FMCA is unsuccessful,
 - √MCC for vent door config. Certain failure combinations will cause multiple vent doors to remain open during entry

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 >>

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

	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:	

ECLS SSR-12 (Cont)

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
 - B(C) – 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

Only perform on MCC GO or if critical need

- 1. Isolate 3Φ bus per table

NOTE

3Φ AC UTIL PWR cbs are located on pnl L4:B

(L4,MA73C) cb – open all (3Φ,ΦA,ΦB,ΦC) on aff AC bus		
Number of cb to open:		
BUS	L4	MA73C
AC1 3Φ	1	5
	ΦA	16
	ΦB	16
	ΦC	13
AC2 3Φ	0	9
	ΦA	15
	ΦB	16
	ΦC	14
AC3 3Φ	1	7
	ΦA	15
	ΦB	16
	ΦC	13

SM 67 ELECTRIC

- O13:A(C,E) 2. cb ESS 1BC (2CA,3AB) AC1(AC2,AC3) SNSR – cl

NOTE

Expect S67 AC VOLTS msg and F7 AC VOLTAGE lt

- R1 3. Aff AC BUS SNSR – AUTO TRIP

ECLS SSR-12 (Cont)

CAUTION

Following steps should be reviewed carefully prior to their execution since affected AC system may be tied into a short

Repower Φ A:

- CRT
4. cb aff AC CONTR Φ A – cl
Aff INV PWR – ON
INV/AC BUS – ON
✓Aff AC VOLTS > 110 and < 120
✓Aff AC AMPS < 1
- If AC VOLTS, AMPS limits exceeded or F7 AC OVLD It received:
5. Aff INV/AC BUS – OFF (tb-OFF)
INV PWR – OFF (tb-OFF)
 6. cb aff AC CONTR Φ A – op
 7. Repeat steps 4 thru 6 for Φ B, then Φ C
- If no phases recovered:
- O13:A(C,E)
8. cb ESS 1BC(2CA,3AB) AC1(AC2,AC3) SNSR – op
- If only 1 or 2 Φ s recovered:
9. Inhibit aff AC VOLTAGE C/W Channel: 033 (043,053)
- If any phase recovered:
10. Aff AC BUS SNSR – OFF (1 sec)
– AUTO TRIP
 11. ✓MCC for equipment recovery

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

- O6
CRT
- If requirements not met, reactivate MDM(s) in affected bay:
MDM FF1(FF2,FF3,FF4) – ON
GNC I/O RESET

- O6
CRT
- K. PL MDM RECOVERY
MDM PL1(PL2) – ON
SM I/O RESET

L. ADTA, AA, MLS, TACAN, GPS

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 (OV103,4).
Two of three GPSs reqd for single fault tolerance (OV105)

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

- MA73C:A
- If requirement not met (confirmed by MCC):
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 PARAM 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
H2O TK N2 ISOL SYS 1, SYS 2 vlv (two) – CL
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. Go to HUM SEP AIR OUTLET H2O ABSORPTION (IFM)
- MO10W
ML26C

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

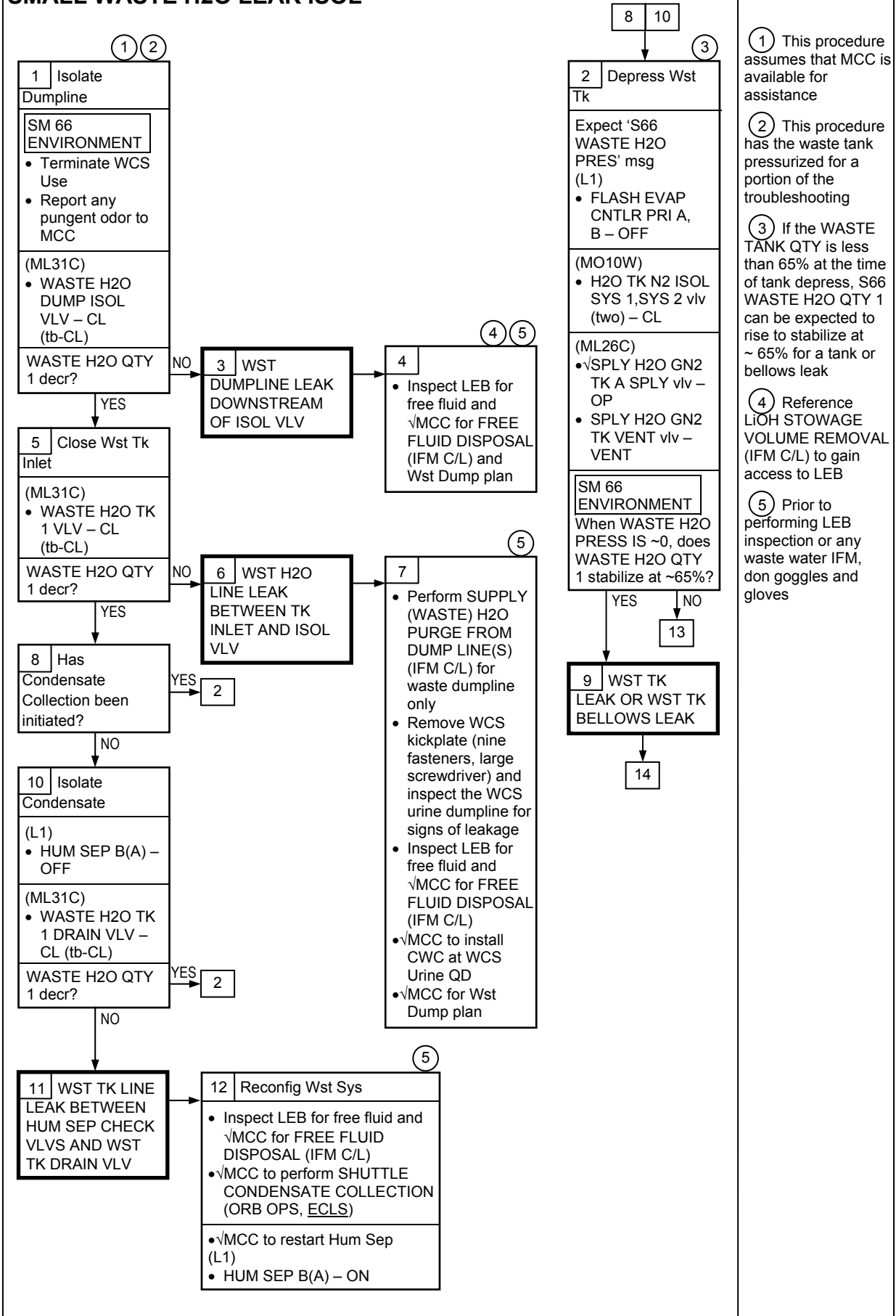
This procedure assumes that MCC is available for assistance and would inform crew of tank C leak (which is normally isolated) or dump line leak at nozzle. This procedure also assumes that tanks B, D are tied together and that tank C is isolated. Also note that Supply H2O tanks remain pressurized during 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

ECLSS SSR-19 **SMALL WASTE H2O LEAK ISOL**



① This procedure assumes that MCC is available for assistance

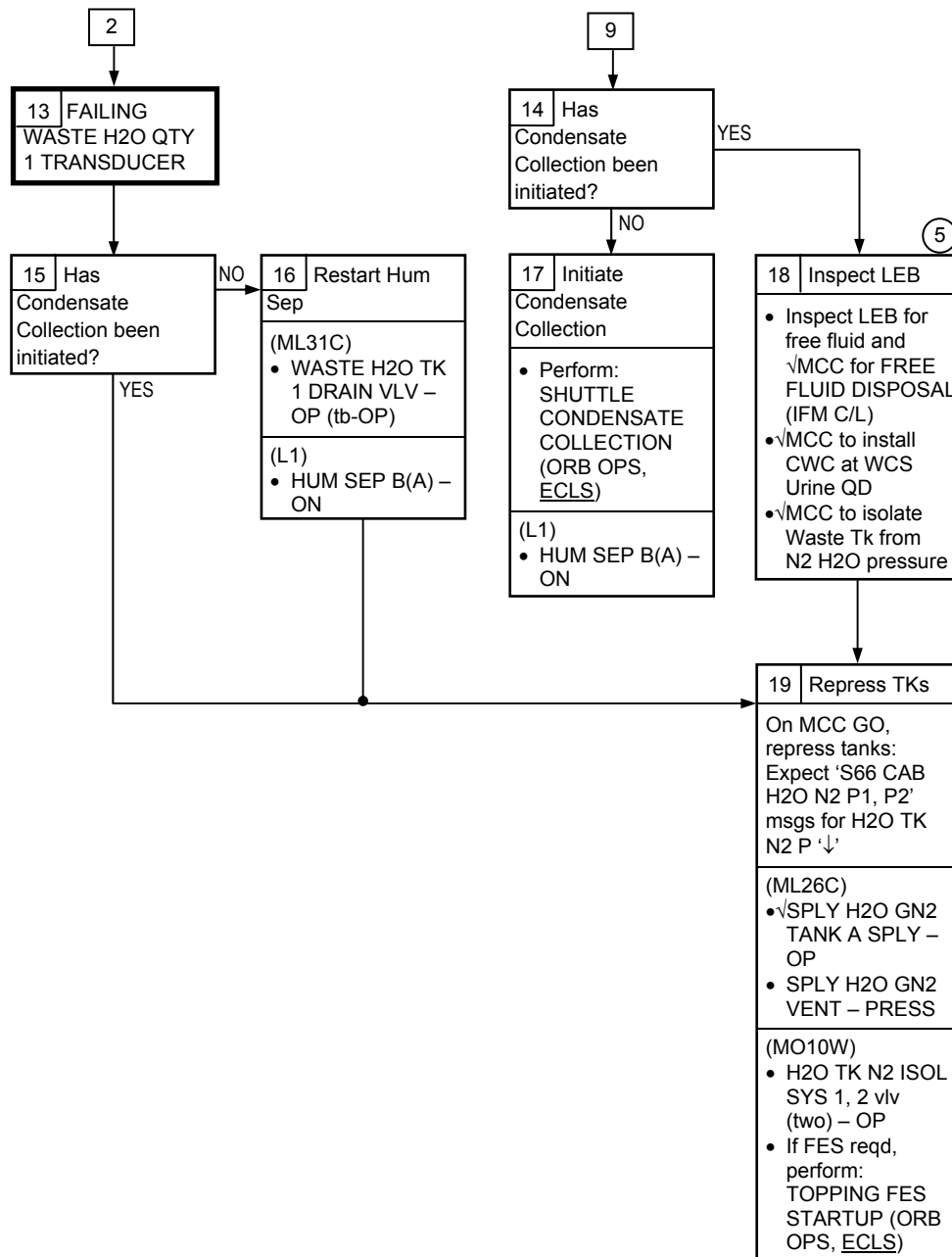
② This procedure has the waste tank pressurized for a portion of the troubleshooting

③ If the WASTE TANK QTY is less than 65% at the time of tank depress, S66 WASTE H2O QTY 1 can be expected to rise to stabilize at ~ 65% for a tank or bellows leak

④ Reference LIOH STOWAGE VOLUME REMOVAL (IFM C/L) to gain access to LEB

⑤ Prior to performing LEB inspection or any waste water IFM, don goggles and gloves

ECLSS SSR-19 (Cont) SMALL WASTE H2O LEAK ISOL



⑤ Prior to performing LEB inspection or any waste water IFM, don goggles and gloves

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 GO):

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 GO:

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 GO >>

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 GO
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):

R11L 11. Perform steps 52-55 using FES PRI B On MCC GO >>

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 GO; dump TK A to ~0%, then:

17. √MCC to restore Galley ops

18. Perform steps 51-55 using FES PRI B On MCC GO >>

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 GO; dump TK B to ~0%, then:

21. Perform steps 51-55 using FES PRI B On MCC GO >>

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 >>

ML86B:A If SPLY H2O QTY A,B not decr (leak in TK A/B Outlet Manifold):

R11L 27. cb MNB SPLY H2O TK B INLET – cl

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 GO >>

Cont next page

ECLS SSR-20 (Cont)

- D. LEAK DETERMINATION C/D SIDE
- MCC/CRT
R11L If SPLY H2O QTY C,D decr:
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 GO >>
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 GO; 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 GO; 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 GO >>
- 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 ↓

- R11L 50. SPLY H2O GN2 TK VENT vlv – VENT
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 SSR-21

MANUAL RAD BYPASS VALVE CONTROL

ECLS FRP

NOTE

This procedure shall not be attempted without MCC monitoring and assistance.
This procedure provides a method of reestablishing or maintaining radiator flow by adjusting the position of the radiator bypass valve. Expect possible 'S88 EVAP OUT T 1(2)' or 'S88 FREON RAD T 1(2)' msgs

SM 88 APU/ENVIRON THERM

- L1
 - 1. Aff RAD CNTLR LOOP – OFF
 - 2. H2O PUMP LOOP 1,2 (two) – ON
 - 3. LOOP 1,2 BYP MODE (two) – MAN
 - 4. MAN (two) – DECR (hold 30 sec)
 - 5. FLOW PROP VLV LOOP 1,2 (two) – PL HX (tb-PL)
 - 6. RAD CNTLR OUT TEMP – HI
 - 7. FLASH EVAP CNTLR PRI A,B,SEC (three) – OFF
 - 8. Aff RAD BYP VLV MODE – MAN
- If Freon Loop 1 affected:
 - L4:P | 9. cb AC2 ΦB RAD CNTLR 1A – op
- If Freon Loop 2 affected:
 - 10. cb AC3 ΦB RAD CNTLR 2A – op
- CRT 11. Adjust aff RAD OUT T to ~40°F by performing momentary (< 1 sec) switch movements:
 - L1 | Aff RAD BYP VLV MAN SEL – RAD FLOW (if too hot), and/or
 - | – BYP (if too cold)
- On MCC GO:
 - 12. FLASH EVAP CNTLR PRI B(A) – ON
- If 'S88 FREON RAD T 1(2)' msg received during next orbital cycle:
 - 13. Aff RAD BYP VLV MAN SEL – BYP (momentary) as necessary to ensure aff RAD OUT T stays ≥ 40°F
- On MCC GO:
 - 14. H2O PUMP LOOP 1 – GPC
 - 15. LOOP 2 BYP MODE – AUTO
 - 16. RAD CNTLR OUT TEMP – NORM
 - 17. FLOW PROP VLV LOOP 1,2 (two) – ICH (tb-ICH)
- If Freon Loop 1 affected:
 - L4:P | 18. cb AC2 ΦB RAD CNTLR 1A – cl
- If Freon Loop 2 affected:
 - 19. cb AC3 ΦB RAD CNTLR 2A – cl

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

SM SYS SUMM 1

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 from CSA-CP and CABIN O2 CONC from SYS SUMM 1
 - c. Report values to MCC
 - d. If HCN > 2.1 ppm replace one LiOH canister

SM SYS SUMM 1

CRT, CSA-CP	Time (MET)	CABIN O2 CONC	HCN	HCL	CO
1	: :				
2	: :				
3	: :				
4	: :				
5	: :				
6	: :				
7	: :				
8	: :				

If HCN > 2.1, HCL > 1.0, or CO > 18 ppm for any CSA-CP reading:

2. If ATCO canister not yet installed, CO > 18 and HCL < 5 ppm:
Install ATCO (in place of one LiOH canister)
3. √CAB TEMP CNTLR – OFF
√Pin Cab temp cntl act link – FULL COOL
4. √cb MNA,MNB WCS CNTLR (two) – cl
√AC1,2 WSC FAN SEP 1,2 (six) – cl
- If Av Bay 1 Fire:
 5. √HOSE BLOCK to SEP 2
 6. √FAN SEP SEL sw – 2
 7. √MODE – COMMODE/MANUAL/EMU
 8. √COMMODE CNTL – PULL UP
– √PUSH FWD
9. Continue to monitor the cabin atmosphere per step 1
10. When CO < 18 ppm, replace ATCO canister (if installed) with a 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

11. Doff visors/QDMs and changeout LiOH canister(s) per preflight schedule on MCC call
 - * If loss of communications, visors/QDMs down and continue *
 - * LiOH changeouts until all the following criteria are met: *
 - * No visible indication of smoke in cabin *
 - * Cabin smoke detector readings are < 1.2 *
 - * No symptoms of smoke inhalation *
 - * HCN < 4.0 (2.1) ppm, HCL < 2.0 (1.0) ppm, *
 - * CO < 20 (18) ppm if at 14.7 (8.0) psia *
12. If symptoms experienced prior to donning QDM/visor, QDM/visor may be doffed only if all crewmembers are symptom free for > 10 min
- CRT 13. If QDM/visor flow must continue and/or CABIN O2 CONC ≥ 25.9%, perform FIRE/HAZ SPILL O2 CONTROL, ECLS FRP-3

ECLS FRP-2 (Cont)

ON MCC CALL BACKOUT STEPS:

WCS 14. COMMODE CNTL – OFF (BACK/DN)

MD44F 15. Pin Cab temp cntl act link – PRI(SEC)

L1 16. CAB TEMP CNTLR – 1(2)

17. SMOKE DETN SNSR – RESET

18. Report used LiOH cans to MCC

When Av Bay has been purged for 7 hr:

19. Disconnect Y/Y Hose from Vacuum Vent QD

20. Remove Free Fluid Nozzle from Av Bay fire port

21. Disconnect Free Fluid Nozzle from Y/Y hose

22. Stow in Cont Hose & Cable Kit:

Free Fluid Nozzle

20-ft Y/Y Hose

Gray Tape

ECLS FRP-3 FIRE/HAZ SPILL O2 CONTROL

SM SYS SUMM 1
SM 66 ENVIRONMENT

NOTE

For Av Bay fires, ensure avionics bay purge initiated before start of cabin depress

TMAX DETERMINATION

1. Determine TMAX from Tables 1 and 2

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

a. Time to 8 psi _____ hr
(from Table 1 right)

b. Time of purge at 8 + _____ hr
(from Table 2 below)

- 1:00 hr

c. Latest TIG:
TMAX = _____ hr

TABLE 1.- TIME to 8 PSI (in HH:MM)

	Time to 8 psi in hrs	
	From 14.7 psi	From 10.2
5 crew	03:06	01:24
6 crew	02:32	01:09
7 crew	02:07	00:58
8 crew	01:49	00:51

TABLE 2.- TIME of PURGE at 8 PSIA (in HH:MM)

N2 Quantity (lbm)	Time of Purge (HH:MM)			
	5 crew	6 crew	7 crew	8 crew
100	06:38	05:28	04:38	04:01
120	08:06	06:41	05:41	04:56
140	09:34	07:55	06:55	05:51
160	11:18	09:22	07:58	06:56
180	12:46	10:36	09:01	07:51
200	14:15	11:49	10:04	08:46
220	15:59	13:17	11:19	09:51
240	17:27	14:30	12:22	10:47
260	18:55	15:43	13:25	11:42
280	20:23	16:57	14:39	12:37
300	22:07	18:24	15:42	13:42
320	23:35	19:38	16:45	14:37
340	25:04	20:51	17:48	15:32
360	26:32	22:04	19:03	16:37
380	28:16	23:32	20:06	17:32
400	29:44	24:45	21:09	18:27

NOTE

When TIG < 3 hours, install ATCO if not already performed

ECLS FRP-3 (Cont)

CABIN DEPRESS AND PURGE SETUP

- MO69M 2. Remove O2 BLEED ORIFICE, if installed
MO10W 3. 14.7 CAB REG INLET SYS 1, SYS 2 vlv (two) – CL
4. O2 REG INLET SYS 1 vlv – OP
2 vlv – CL

START CABIN DEPRESS TO 8 PSIA

WARNING

If SYS SUMM 1 O2 CONC $\geq$ 40% during cabin depress or 8 psia purge, increase the AIRLK DEPRESS vlv position so the EQ dP/dT is equal to the next larger crew size in table 3 below and recalculate TMAX per step 1

- AW82B 5. AIRLK DEPRESS vlv cap – vent, remove, stow
6. Throttle AIRLK DEPRESS vlv until desired EQ dP/dT is established as follows per Table 3 below; tape in place (dP/dT sensor response lags approx 1 min)

NOTE

The 5 position on the AIRLK DEPRESS vlv will produce a dP/dT of -0.286 psia/min at 14.7 psia and -0.198 psia/min at 10.2 psia

TABLE 3.- EQ dP/dT

	Starting from 14.7 psi	Starting from 10.2 psi
5 crew	-0.050	-0.047
6 crew	-0.062	-0.058
7 crew	-0.074	-0.070
8 crew	-0.087	-0.082

7. When Cab Press < 10.0 psia and if prior to OPS 3:
Perform LOSS OF CAB PRESS PWRDN (ORB PKT, PWRDN)

O2 MANAGEMENT DURING 8 PSIA PURGE

When Cab Press = 8 psia:

- AW82B 8. AIRLK DEPRESS vlv – CL, reinstall cap
MDDK Floor 9. CAB PURGE vlv – dial to number of crew on QDMs/visors
Near Ladder ISOL VLV – 0
L2 10. O2 XOVR SYS 1 vlv – CL
2 vlv – OP
11. O2/N2 CNTLR VLV SYS 1 – OP (N2)
2 – CL (O2)

NOTE

Maintain PPO2 between 2.8 and 3.05 psia for the duration of purge

When PPO2 $\geq$ 3.05:

12. O2/N2 CNTLR VLV SYS 1 – OP (N2)

When PPO2 $\leq$ 2.8:

13. O2/N2 CNTLR VLV SYS 1 – CL (O2)

Continue O2 mgmt per steps 12 and 13

NOTE

~82 lbm N2 reqd to repress from 8 psia to 14.7 psia

TERMINATE 8 PSIA PURGE AND INITIATE CABIN REPRESS

√MCC to terminate 8 psia purge and repress

- L2 14. O2/N2 CNTLR VLV SYS 1 – AUTO
2 – OP (N2)
MDDK Floor 15. CAB PURGE vlv – CL
Near Ladder ISOL VLV – CL
MO10W 16. 14.7 CABIN REG INLET SYS 1, SYS 2 (two) – OP
17. If avionics bay purge setup, √MCC to terminate AV Bay purge
Disconnect, stow IFM hoses and free fluid nozzle

ON MCC Go:

18. Perform backout of LOSS OF CAB PRESS PWRDN (ORB PKT, PWRDN), then:
19. Perform PCS 1(2) CONFIG (ORB OPS, ECLS) >>

ECLS FRP-3 (Cont)

PREPARE FOR ENTRY AND CABIN REPRESS

Post D/O Burn √MCC for Purge Termination and Cabin Repress

At D/O Burn + 20 min:

MDDK Floor 20. CAB PURGE ISOL VLV – CL

Near Ladder

ML31C 21. VAC VENT ISOL VLV CNTL – CL (tb-CL)

At D/O Burn + 25 min:

L2 22. O2/N2 CNTLR VLV SYS 1,SYS 2 (two) – OP (N2)

23. O2 XOVR VLV SYS 1,SYS 2 (two) – OP

MO10W 24. 14.7 CAB REG INLET SYS 1,SYS 2 (two) – OP

ECLS FRP-4 O2 LEAK CONTROL

SM SYS SUMM 1
SM 66 ENVIRONMENT

TMAX DETERMINATION

1. Determine TMAX from Tables 1 and 2

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. Calculate total time:

a. O2 Leak Size: = _____ lb/hr
(from MCC)

b. Time to 8 psi _____ hr
(from Table 1 right)

c. Time of purge: + _____ hr
(from Table 2 below)

- 1:00 hr

d. Latest TIG:
TMAX = _____ hr

TABLE 1.- TIME to 8 PSIA (in HH:MM)

O2 Leak Rate	Time to 8 psi in hrs	
	From 14.7 psi	From 10.2 psi
3 lbm/hr	12:12	06:00
6 lbm/hr	05:52	02:55
9 lbm/hr	03:42	01:50
12 lbm/hr	02:52	01:23
15 lbm/hr	02:16	01:07
18 lbm/hr	01:52	00:57
21 lbm/hr	01:34	00:49
24 lbm/hr	01:20	00:43

TABLE 2.- TIME of PURGE at 8 PSIA (in HH:MM)

N2 Quantity (lbm)	Time of Purge (HH:MM)							
	3 lb/hr	6 lb/hr	9 lb/hr	12 lb/hr	15 lb/hr	18 lb/hr	21 lb/hr	24 lb/hr
100	12:22	05:51	03:51	02:47	02:11	01:47	01:28	01:14
120	17:19	08:11	05:24	03:55	03:04	02:30	02:04	01:44
140	22:16	10:31	06:56	05:02	03:56	03:12	02:40	02:14
160	27:13	12:52	08:29	06:09	04:49	03:55	03:15	02:50
180	32:10	15:12	10:01	07:16	05:42	04:38	03:51	03:20
200	37:08	17:33	11:34	08:23	06:34	05:21	04:33	03:50
220	42:05	19:53	13:06	09:30	07:27	06:04	05:09	04:25
240	47:02	22:14	14:39	10:38	08:20	06:47	05:44	04:55
260	51:59	24:34	16:12	11:45	09:12	07:30	06:20	05:25
280	56:56	26:54	17:44	12:52	10:05	08:13	06:55	05:55
300	61:53	29:15	19:17	13:59	10:58	08:55	07:37	06:30
320	66:50	31:35	20:49	15:06	11:50	09:38	08:13	07:00
340	71:47	33:56	22:22	16:14	12:43	10:21	08:49	07:30
360	76:44	36:16	23:54	17:21	13:36	11:04	09:24	08:00
380	81:41	38:37	25:27	18:28	14:28	11:47	10:00	08:36
400	86:38	40:57	27:00	19:35	15:21	12:30	10:35	09:06

ECLS FRP-4 (Cont)

DEPRESS AND PURGE SETUP

- MO10W 3. 14.7 CAB REG INLET SYS 1, SYS 2 vlv (two) – CL
4. O2 REG INLET SYS 1 vlv – OP
2 vlv – CL

START DEPRESS TO 8 PSI

- AW82B 5. AIRLK DEPRESS vlv cap – vent, remove, stow
6. Throttle AIRLK DEPRESS vlv until desired EQ dP/dT is established as follows per table 3; tape in place (dP/dT sensor response lags approx 1 min)

NOTE

The 5 position on the AIRLK DEPRESS vlv will produce a dP/dT of -0.286 psia/min at 14.7 psia and -0.198 psia/min at 10.2 psia

TABLE 3.- EQ dP/dT

O2 Leak	EQ dP/dT	
	From 14.7 psi	From 10.2 psi
3 lbm/hr	-0.014	-0.012
6 lbm/hr	-0.029	-0.025
9 lbm/hr	-0.046	-0.040
12 lbm/hr	-0.059	-0.051
15 lbm/hr	-0.076	-0.065
18 lbm/hr	-0.093	-0.078
21 lbm/hr	-0.110	-0.094
24 lbm/hr	-0.130	-0.108

WARNING

If SYS SUMM 1 O2 CONC $\geq$ 40%, increase the AIRLK DEPRESS vlv position so the EQ dP/dT is equal to the next larger leak rate in table 3 above and recalculate TMAX per step 2

If prior to OPS 3, when Cab Press < 10.0 psia:

7. CM1 perform LOSS OF CAB PRESS PWRDN (ORB PKT, PWRDN), then:
CM2 continue with procedure

O2 MANAGEMENT DURING 8 PSIA PURGE

When Cab press = 8 psia:

8. O2/N2 CNTLR VLV SYS 1 – OP (N2)
2 – CL (O2)

NOTE

Maintain PPO2 between 2.8 and 3.05 psia for the duration of purge

When PPO2 $\geq$ 3.05:

9. O2/N2 CNTLR VLV SYS 1 – OP (N2)

When PPO2 $\leq$ 2.8:

10. O2/N2 CNTLR VLV SYS 1 – CL (O2)
Continue O2 mgmt per steps 9 and 10

NOTE

~82 lbm N2 reqd to repress from 8 psia to 14.7 psia

TERMINATE 8 PSIA PURGE AND REPRESS

- L2 $\sqrt$ MCC to terminate 8 psia purge and repress
11. O2/N2 CNTLR VLV SYS 1 – AUTO
2 – OP(N2)

- AW82B 12. AIRLK DEPRESS vlv – CL, reinstall cap
MO10W 13. 14.7 CABIN REG INLET SYS 1, SYS 2 (two) – OP

On MCC GO:

14. Perform backout of LOSS OF CAB PRESS PWRDN (ORB PKT, PWRDN), then:
15. Go to PCS 1(2) CONFIG (ORB OPS, ECLS)

ECLS FRP-4 (Cont)

PREPARE FOR ENTRY AND REPRESS

NOTE

When closing the Inner Hatch for Entry, take both Inner Hatch Equalization Valves to EMER with the caps removed to support the 8 psia purge during Entry

- For O₂ Leak ≤ 15 lb/hr, Post D/O Burn MCC for Cabin Repress
- AW82B At D/O Burn + 5 min:
16. AIRLK DEPRESS vlv – CL, reinstall cap
- L2 At D/O Burn + 10 min:
17. O₂/N₂ CNTLR VLV SYS 1, SYS 2 (two) – OP (N₂)
- MO10W 18. O₂ XOVR VLV SYS 1, SYS 2 (two) – OP
19. 14.7 CAB REG INLET SYS 1, SYS 2 (two) – OP

ECLS FRP-5

CABIN AMMONIA CONTAMINATION CLEANUP (ISS AMMONIA LEAK)

NOTE

This proc is to be performed simo by two crewmembers

- CM1
- WCS
- L1
- MD44F
- LiOH
- Box
- L1
- EXT A/L
1. INITIATE CABIN AIR SCRUBBING
 2. MODE – COMMODE/MANUAL/EMU
 3. COMMODE CNTL – PULL UP (wait 15 sec)
– PUSH FWD
 4. H2O PUMP LOOP 1 – ON
 5. LOOP 2 BYPASS MODE – MAN
 6. 1,2 BYP MAN (two) – DECR (hold 30 sec each)
 7. CAB TEMP CNTLR – OFF
Pin Cab temp cntl act link – FULL COOL
 8. Install ATCO and one fresh LiOH canister
 9. CAB FAN A, B (two) – ON
 10. Connect external A/L halo inlet flex duct to halo inlet with T-handle clamp
 11. As required, all crewmembers change into long pants and long sleeve shirts and don gloves

SM SYS SUMM 1

When 'S78 CABIN O2 CONC'

- CRT
11. If QDM flow must continue and S78 CABIN O2 CONC $\geq$ 25.9%, perform FIRE/HAZ SPILL O2 CONTROL, ECLS FRP-3

CM2

AMMONIA DETECTION KIT PREPARATION

12. Unstow AMMONIA DETECTION KIT
13. Remove both Draeger pumps and perform leak test using unbroken HI-Range Draeger tube in pump inlet.
On both pumps, ensure the bellows do not expand and flow indicator remains black with inlet ports blocked (~1 min)
14. Reset stroke counter on both pumps
15. Stow one pump back inside kit. This pump will be used to verify doffing criteria sample at the end of the procedure

WARNING

Moisture droplets will produce a false low ppm if ingested into sample. Ensure Sample area is free from moisture droplets

HI-RANGE (0.5a) DRAEGER TUBE SAMPLING

16. Obtain HI-Range (0.5a) Draeger tube. Inspect to ensure tube has not reacted (yellow with no dark blue)
17. Break both ends of glass Draeger tube (inside silicone tubing) using the end fittings for leverage
18. Insert Draeger tube into Draeger pump inlet with arrow pointing toward pump
19. Compress Draeger pump fully, release. Indicator will change from black to clear to indicate end of stroke (~6 sec)
20. Repeat for a maximum of 10 strokes or until tube saturated; record results below and report to MCC

NOTE

Pump counter should be used as a backup only

Draeger Tube will change from yellow to dark blue in presence of Ammonia

Used tubes should be placed in dry trash

21. Repeat Draeger tube sampling every 30 min or on MCC call

Sample #	1	2	3	4	5	6	7	8	9	10
MET	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :
Reading after 10 strokes										
or										
Stroke # when tube saturated										

22. When tube reads $\leq$ 0.5 (500 ppm) after 10 strokes, immediately obtain another HI-Range sample to verify result
23. If second reading $>$ 0.5 (500 ppm), repeat step 21
24. If second reading $\leq$ 0.5 (500 ppm), continue to step 25

ECLS FRP-5 (Cont)

MED-RANGE (5a) DRAEGER TUBE SAMPLING

25. Wait 30 min from last HI-Range reading, then continue
26. Obtain MED-Range (5a) Draeger tube. Inspect to ensure tube has not reacted (yellow with no dark blue)
27. Break both ends of glass Draeger tube (inside silicone tubing) using the end fittings for leverage
28. Insert Draeger tube into Draeger pump inlet with arrow pointing toward pump
29. Compress Draeger pump fully, release. Indicator will change from black to clear to indicate end of stroke (~6 sec)
30. Repeat for maximum of 10 strokes or until tube saturated; record results below and report to MCC
31. Repeat Draeger tube sampling every 30 min or on MCC call

Sample #	1	2	3	4	5	6	7	8	9	10
MET	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :
PPM after 10 strokes										
or										
Stroke # when tube saturated										
Sample #	11	12	13	14	15	16	17	18	19	20
MET	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :
PPM after 10 strokes										
or										
Stroke # when tube saturated										

32. When ppm $\leq$ 20 after 10 strokes, immediately obtain another MED-Range sample to verify result
33. If second reading $>$ 20, repeat step 31
34. If second reading $\leq$ 20, continue to step 35

NOTE

LO-Range Draeger tubes are calibrated for 5 strokes

LO-RANGE (2a) DRAEGER TUBE SAMPLING

35. Wait 15 min from last MED-Range reading, then continue
36. Obtain LO-Range (2a) Draeger tube. Inspect to ensure tube has not reacted (yellow with no dark blue)
37. Break both ends of glass Draeger tube (inside silicone tubing) using the end fittings for leverage
38. Insert Draeger tube into Draeger pump inlet with arrow pointing toward pump
39. Compress Draeger pump fully, release. Indicator will change from black to clear to indicate end of stroke (~6 sec)
40. Repeat for a maximum of 5 strokes or until tube saturated; record results below and report to MCC
41. Repeat Draeger tube sampling every 30 min or on MCC call

Sample #	1	2	3	4	5	6	7	8	9	10
MET	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :
PPM after 5 strokes										
or										
Stroke # when tube saturated										

42. When ppm $\leq$ 10 after 5 strokes, immediately obtain another LO-Range sample to verify result
43. If ppm $>$ 10, repeat step 41
44. When ppm $\leq$ 10 and on MCC GO, continue to step 45

NOTE

~82 lbm N2 reqd to repress from 8 psia to 14.7 psia

TERMINATE O2 CONTROL AND REPRESS

Exit ECLS FRP-3; terminate O2 control and repress using the following:

AW82B L2	45. $\sqrt{\text{AIRLK DEPRESS vlv}} - \text{CL}$, $\sqrt{\text{cap}}$ installed
MDDK Floor Near Ladder MO10W	46. O2/N2 CNTLR VLV SYS 1 – AUTO 2 – OP (N2)
	47. CAB PURGE vlv – 0 ISOL VLV – CL
	48. 14.7 CABIN REG INLET SYS 1, 2 (two) – OP

ECLS FRP-5 (Cont)

SM 66 ENVIRONMENT

CRT

When CABIN PRESS > 14 psi

49. Obtain alternate Draeger pump and LO-Range (2a) Draeger tube from kit. Inspect to ensure tube has not reacted (yellow with no dark blue)
50. Break both ends of glass Draeger tube (inside silicone tubing) using the end fittings for leverage
51. Insert Draeger tube into Draeger pump inlet with arrow pointing toward pump
52. Compress Draeger pump fully, release. Indicator will change from black to clear to indicate end of stroke (~6 sec)
53. Repeat for a maximum of 5 strokes or until tube saturated; record results below and report to MCC

Sample #	1	2	3	4	5	6	7	8
MET	: :	: :	: :	: :	: :	: :	: :	: :
PPM after 5 strokes								
or								
Stroke # when tube saturated								

54. If ppm > 10, repeat steps 49-53 in 15 min or MCC call

WARNING

If any crewmember exhibits adverse symptoms when QDMs doffed, have affected crewmember don QDM immediately. Symptoms could include irritation of the eyes, nose, throat, skin

Anytime emergency exposure: 100ppm
 1 hour exposure: 30ppm
 24 hour exposure: 20ppm
 7 day exposure: 10ppm

55. If ppm ≤ 10, doff QDMs per CDR directed sequence

ON MCC CALL CABIN AIR SCRUBBING BACKOUT STEPS

WCS

56. COMMODE CNTL – PULL BACK
 – PUSH DOWN

MD44F
L1

57. Pin Cab temp cntl act link – PRI(SEC)
58. CAB TEMP CNTLR – 1(2)
 SEL – as reqd
59. H2O PUMP LOOP 1 – GPC
60. H2O LOOP 2 BYPASS MODE – AUTO
61. Replace ATCO with a fresh LiOH canister

LiOH
Box
L1

62. √CAB FAN A – ON
 B – OFF

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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.....	7-15

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
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7.3f	'S69 FC H2O PRI 1(2,3)' – FUEL CELL H2O LN T ↑↓	7-31
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7.3m	'S69 DELTA AMPS 1(2,3) ↑↓' – FC DELTA AMPS ↑↓	7-39

7.4 RESERVED

7.5 AC VOLTAGE/OVLD

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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	7-51

7.6 CRYO

CRYO TABLE A – CRYO HEATER SWITCH PROCEDURAL NOMENCLATURE		7-54
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7.6b	'S68 O2(H2) CNTL P 1(2,3,4,5)' 'S68 O2(H2) TK P 1(2,3,4,5)' – CRYO O2(H2) PRES,TK P ↓↑	7-55
7.6c	RESERVED.....	not used
7.6d	'S68 O2(H2) MANF PRESS' – O2(H2) MANF P ↓.....	7-59
7.6e	RESERVED.....	not used
7.6f	'S68 H2 HTR T 1(2,3,4,5)' – H2 HTR T	7-60
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)' – O2 HTR CUR SNSR = TRIP	7-61
7.6l	'S68 O2 HTR T 1(2,3,4,5)' – O2 HTR T	7-62
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7.7b	'S179 OPCU 1(2) CH A(B) VOLT' – OPCU CH OUTPUT VOLTS ↓.....	7-65
7.7c	'S179 OPCU 1(2) CH A(B) TEMP' 'S179 APCU 1(2) TEMP' – OPCU CH TEMP ↑, APCU TEMP ↑	7-66
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	SSR-4 FC STANDBY	7-80
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	SSR-8 BUS LOADING – LRU SELECT	7-97
	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)'

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SSR-28 RESERVED	not used
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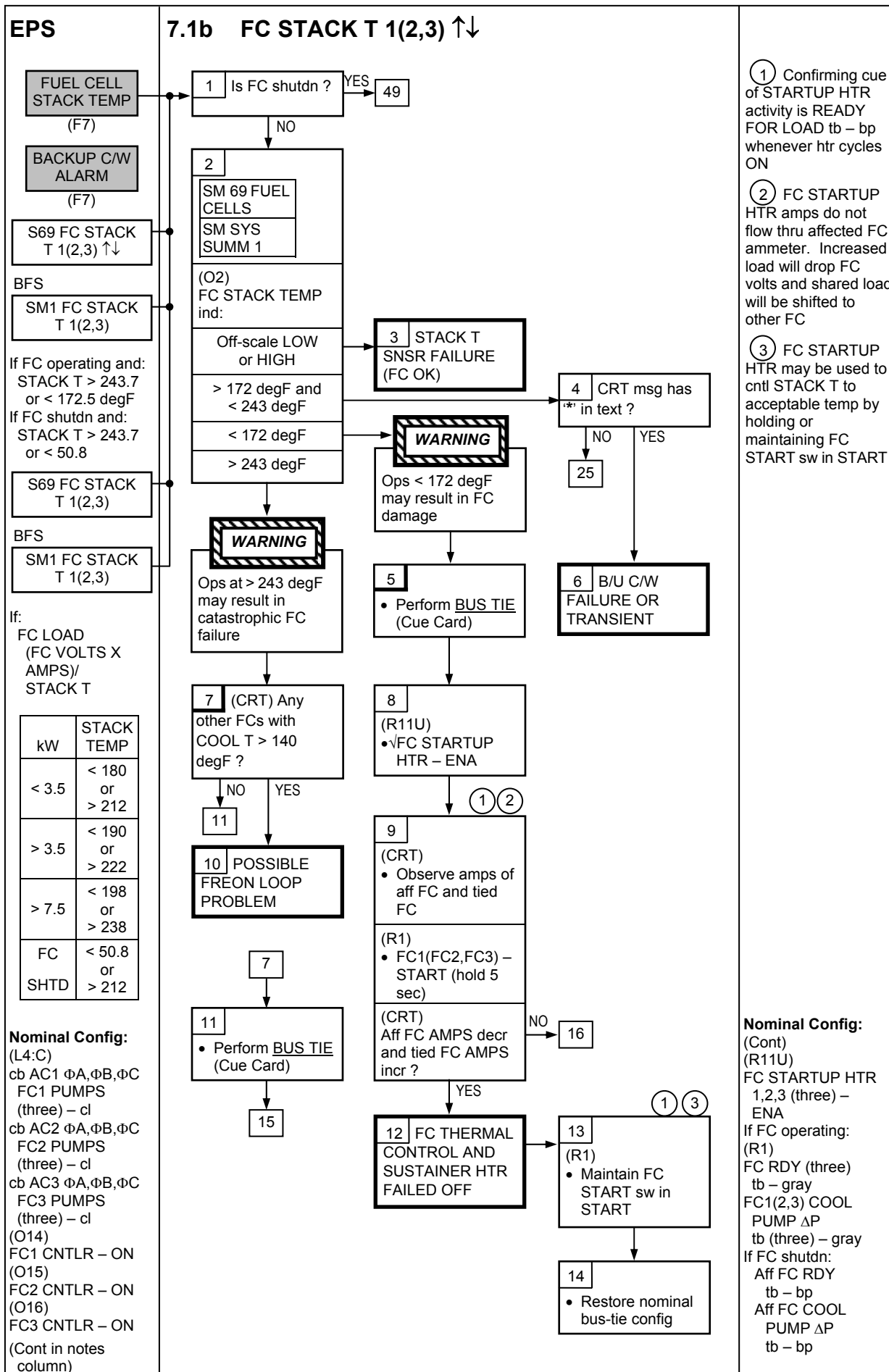
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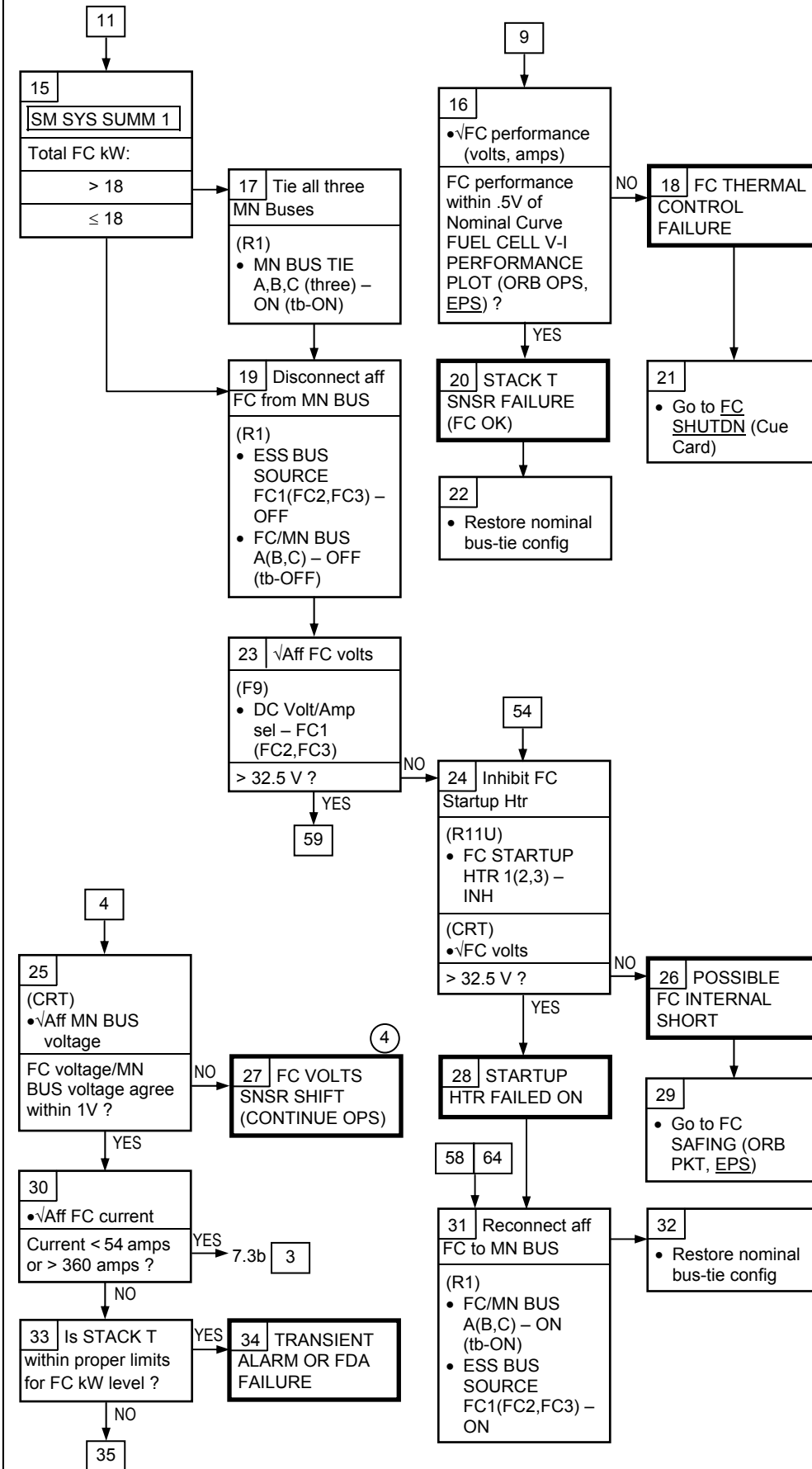
<u>7.1</u>	<u>FC REAC/PMP/STACK T</u>		
7.1b	'SM1 FC STACK T 1(2,3) ↑↓'	– FC STACK T 1(2,3) ↑↓	7-8
<u>7.3</u>	<u>FUEL CELL</u>		
7.3b	'SM1 MAIN BUS V A(B,C)' 'SM1 DC VOLT FC1(2,3)' 'SM1 FC AMPS 1(2,3)'	– FUEL CELL VOLTS ↑↓, FUEL CELL AMPS ↑↓, MAIN BUS V A(B,C) ↑↓	7-18
7.3d	'SM1 FC EXIT T 1(2,3)'	– FUEL CELL EXIT T ↑↓	7-23
7.3e	'SM1 FC COOL P 1(2,3)'	– FUEL CELL COOL P ↑↓	7-26
<u>7.5</u>	<u>AC VOLTAGE/OVLD</u>		
7.5a	'SM1 AC VOLTS 1(2,3)'	– AC VOLTS 1(2,3) ↓↑	7-42
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7.6b	'SM2 CRYO O2(H2) PRES'	– CRYO O2(H2) PRES,TK P ↓↑	7-55
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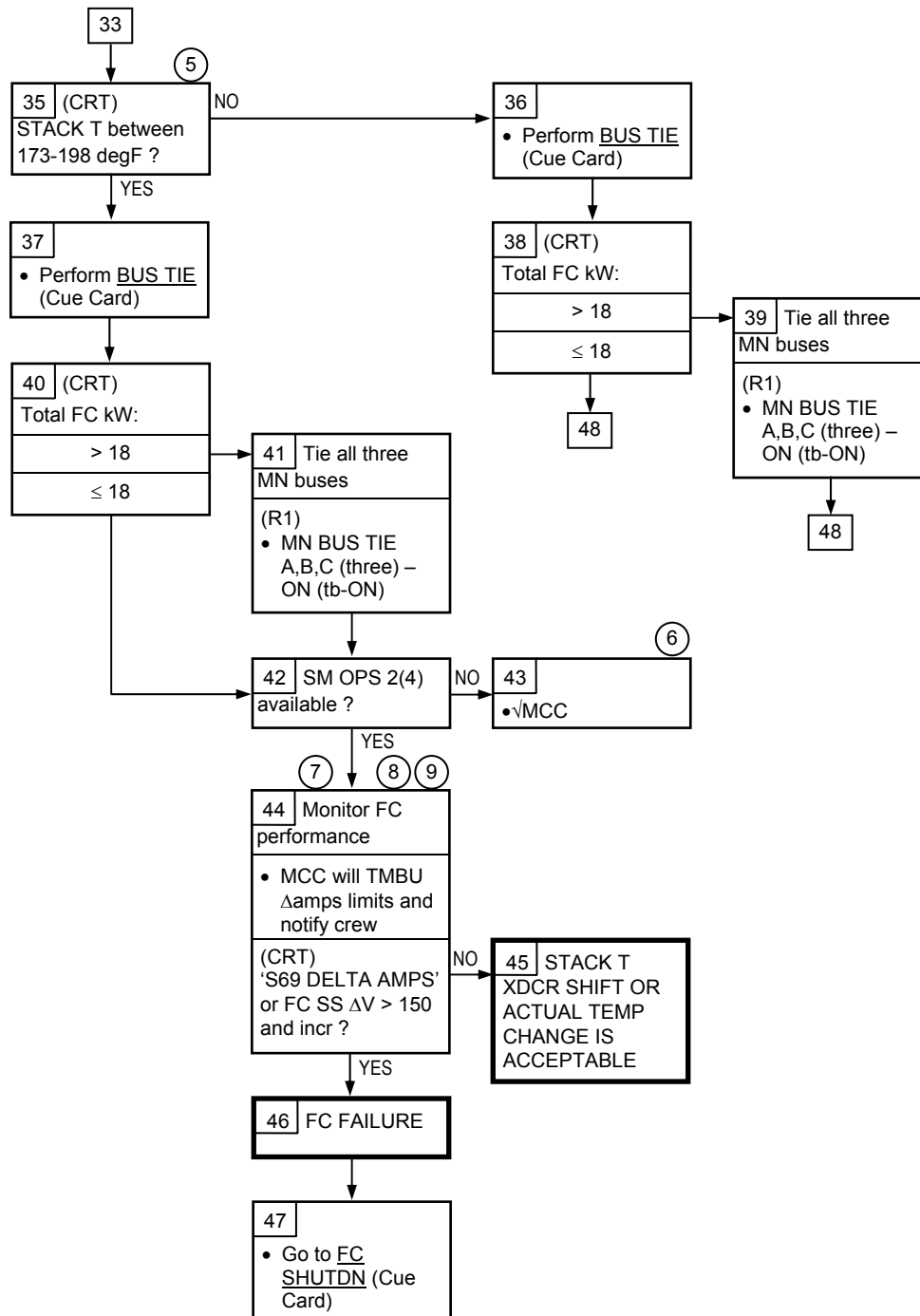


EPS

7.1b (Cont)



④ Loss of correct precondition check for STACK T FDA Class 3 limit set based on kW for this FC



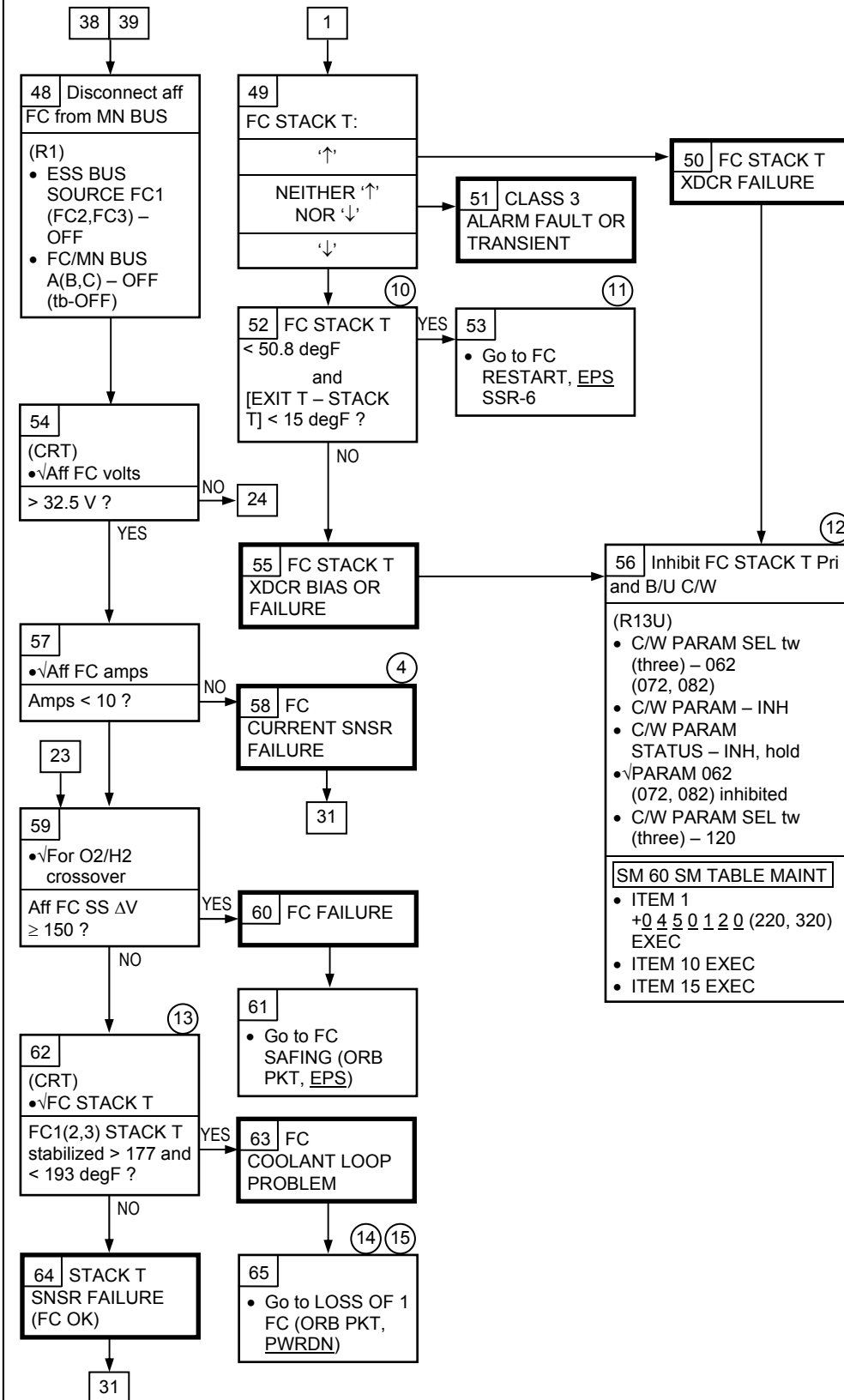
⑤ This is the temp range that could result in low stack temp SM ALERT

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 pwrnd

⑮ Leave FC in STBY mode. MCC analysis may determine later need for FC shutdn

EPS

7.1c H2 PUMP ↑↓

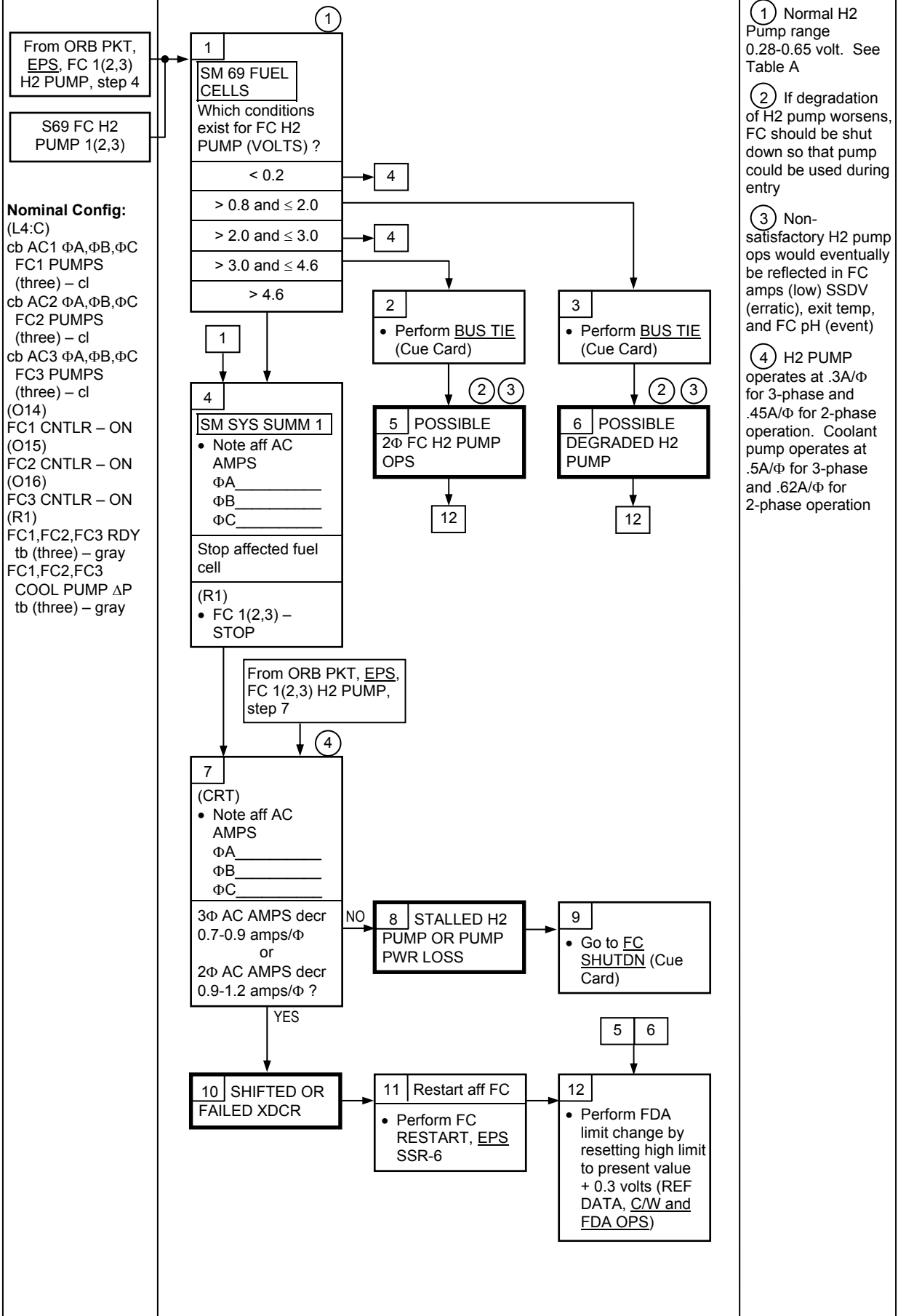


Table A

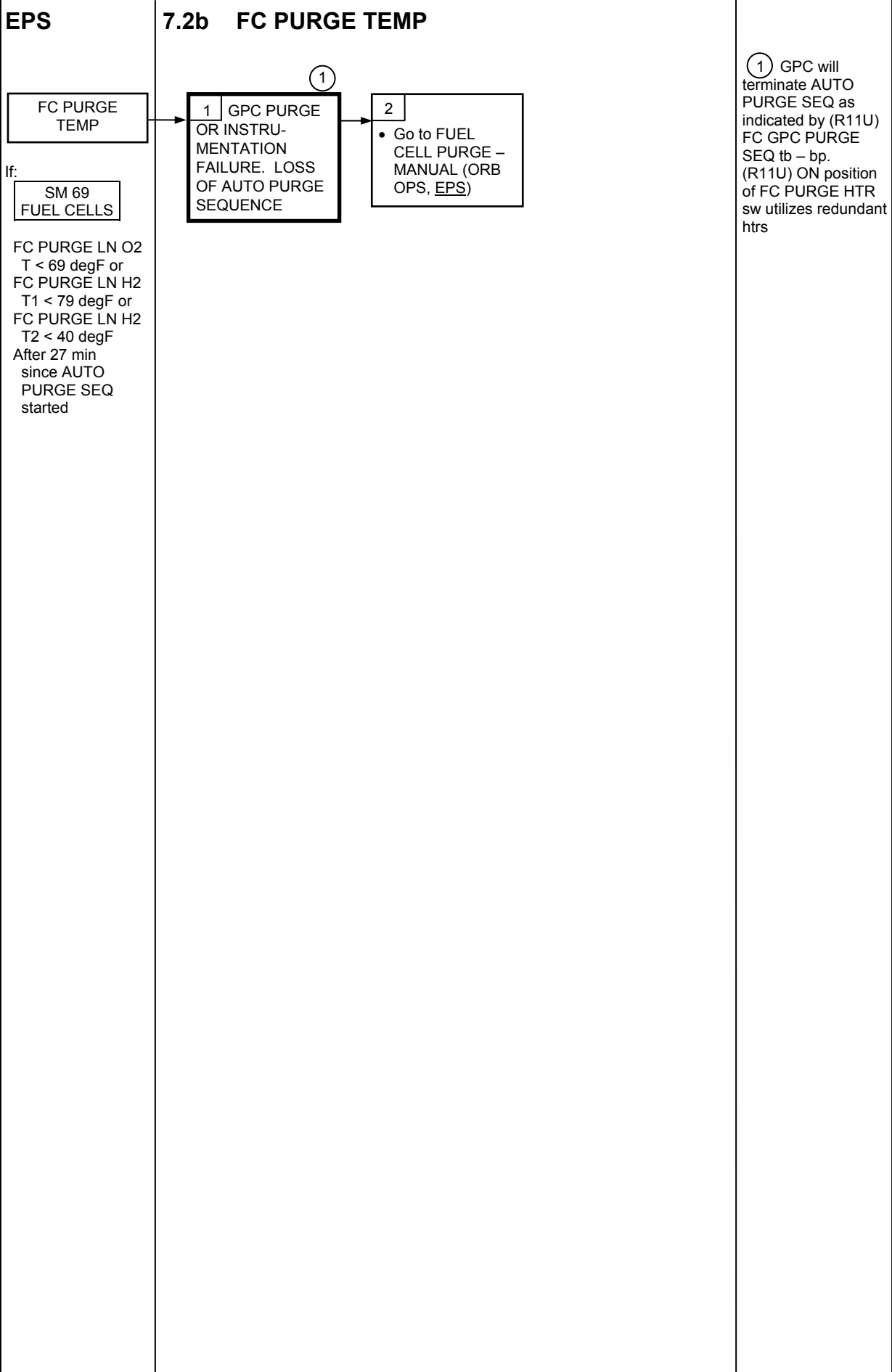
FC PUMP PACKAGE POWER RANGES

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



FC PURGE
SEQ

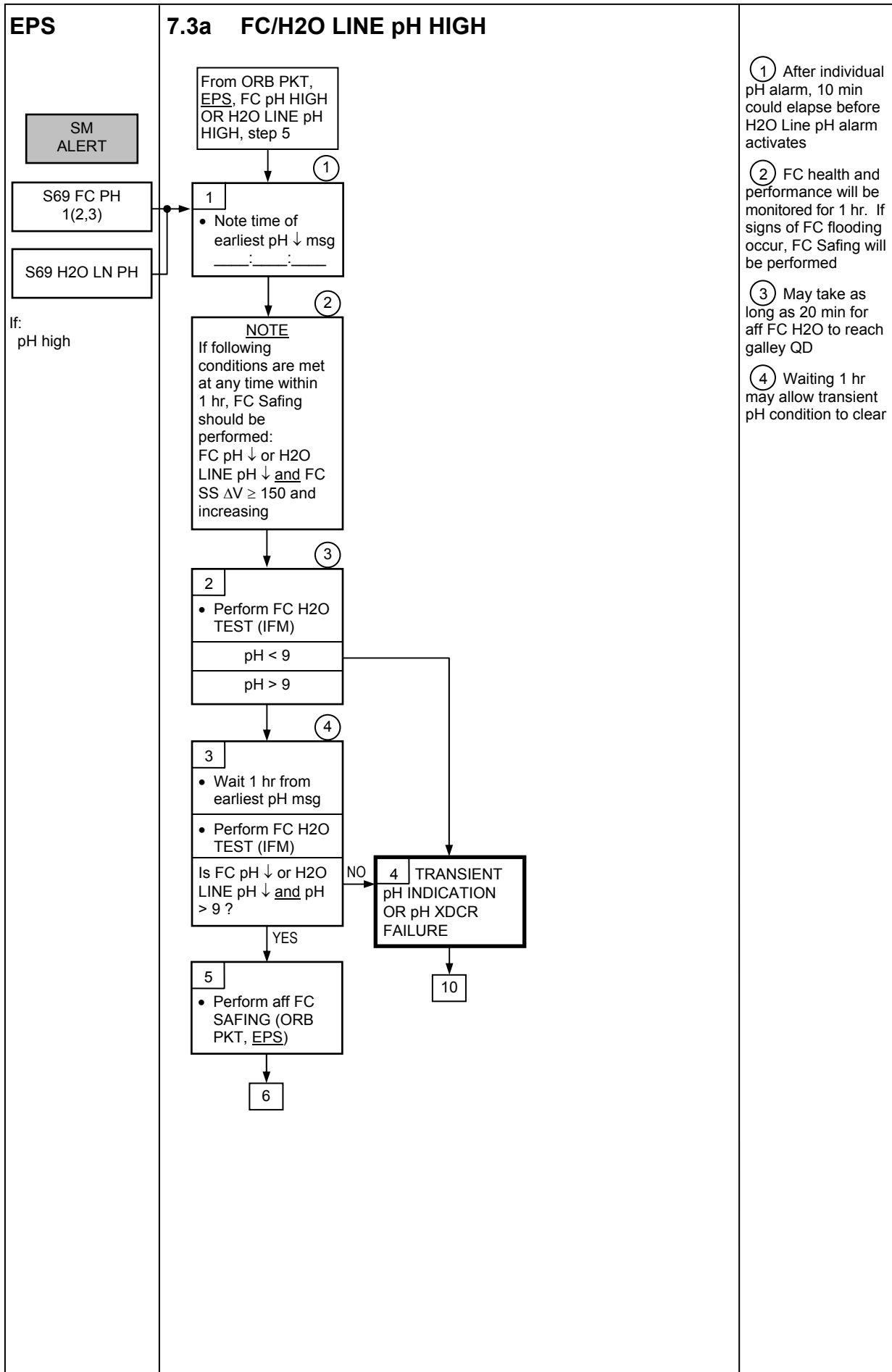
If:
S/W detects AUTO
PURGE SEQ,
purge-line htrs
ON-signal has
been lost after
GPC AUTO
PURGE SEQ
initiated

Nominal Config:
(R11U)
FC PURGE HTR –
GPC

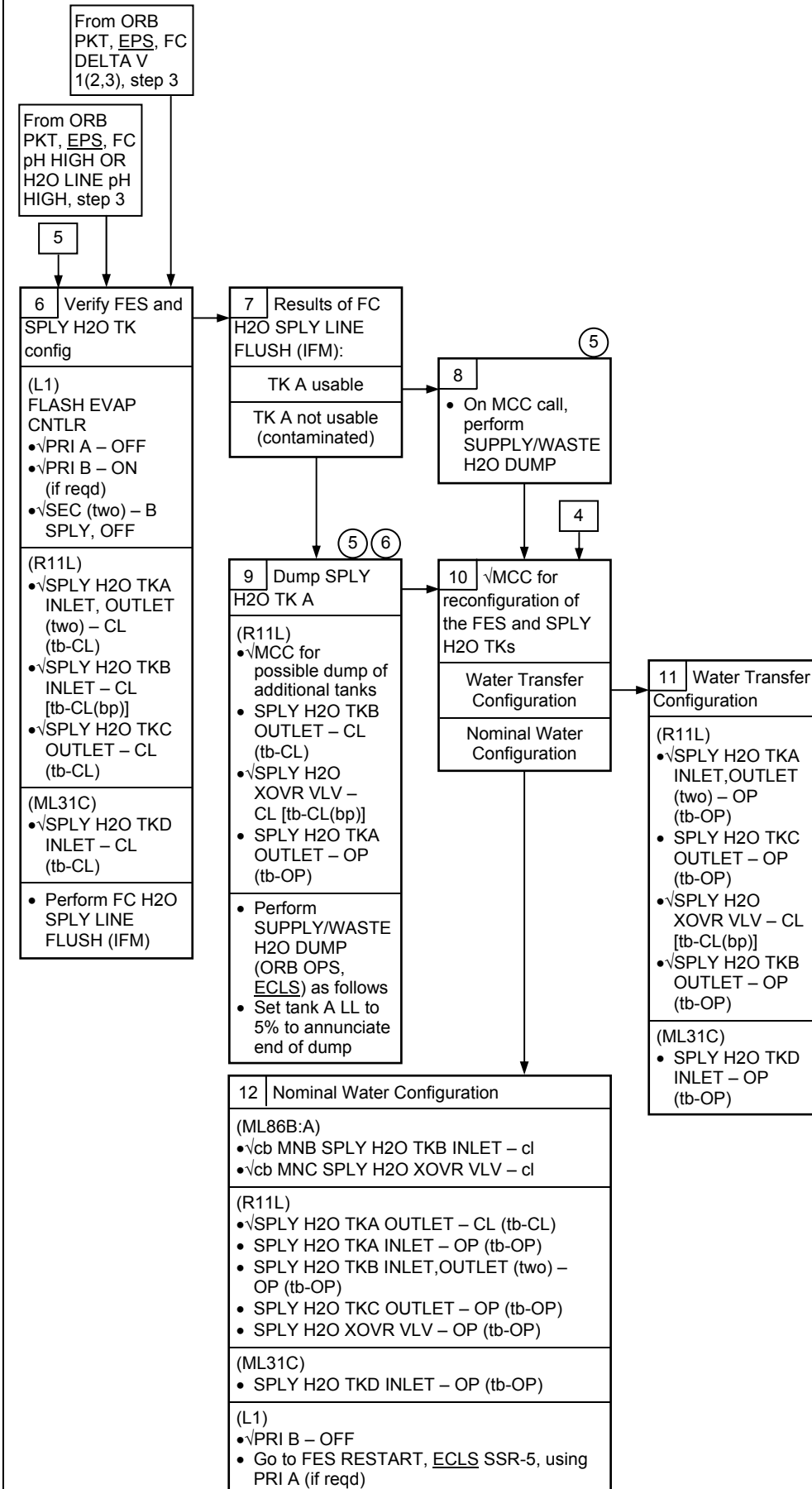
①
1 MDM
CHANNEL OR
INSTRU-
MENTATION
FAILURE. LOSS
OF AUTO PURGE
SEQUENCE

2
• Go to FUEL
CELL PURGE –
MANUAL (ORB
OPS, EPS)

① 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



EPS 7.3a (Cont)



⑤ SPLY TKC may be contaminated. TKC will be dumped and then flushed per nominal TKC management

⑥ SPLY TKA will be dumped periodically to flush pH out of system

EPS

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)

7.3b FUEL CELL VOLTS ↑↓, FUEL CELL AMPS ↑↓, MAIN BUS V A(B,C) ↑↓

From ORB PKT, EPS,
MN BUS U/V FC
VOLTS, step 22

1 Is FC shutdn ?

YES

2

FC VOLTS msg
FC AMPS msg

48
62

7.1b 30

3

SM 67
ELECTRIC

Following conditions met:

MN VOLTS	FC VOLTS	FC AMPS
		HIGH > 360
	LOW < 27.5	
LOW < 27		
HIGH > 32		
	HIGH > 32.5	
		LOW < 54
None of the above		

4 5

6 C/W FAULT
OR TRANSIENT

7 VOLTS SNSR
FAILED

9

(R13U)
• Determine which
param triggered
C/W ALARM

11

SM 69
FUEL CELLS

Does FC AMPS
(± 50) = O2 FLOW
x 47.5

or
FC AMPS (± 68) =
H2 FLOW x 377 ?

YES

7.3j 11

13 Aff Bus tied ?

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

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

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 pwr MN Bus or
FC pwr 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

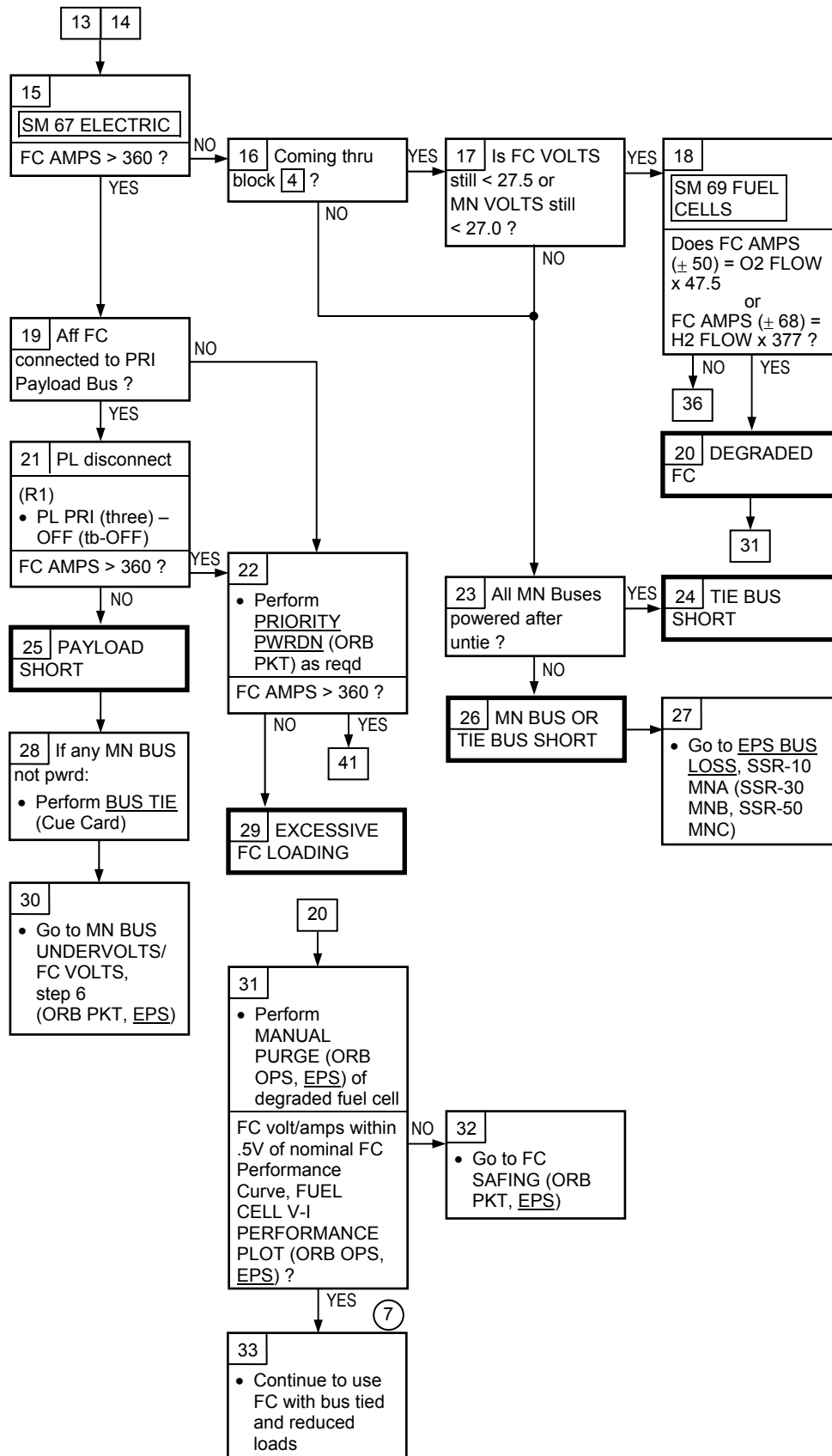
If FC shutdn:

Aff FC/MN BUS –

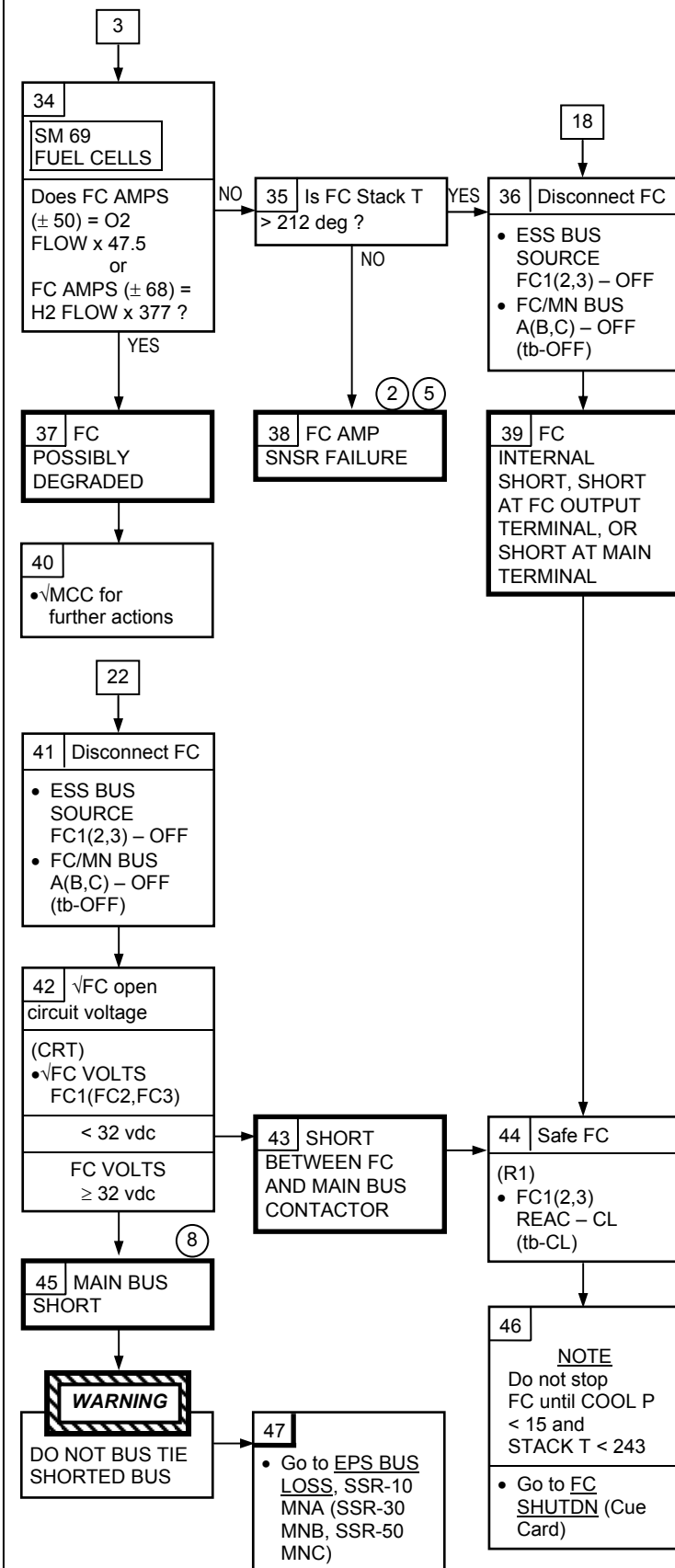
OFF (tb-OFF)

Aff FC REAC

(two) – CL



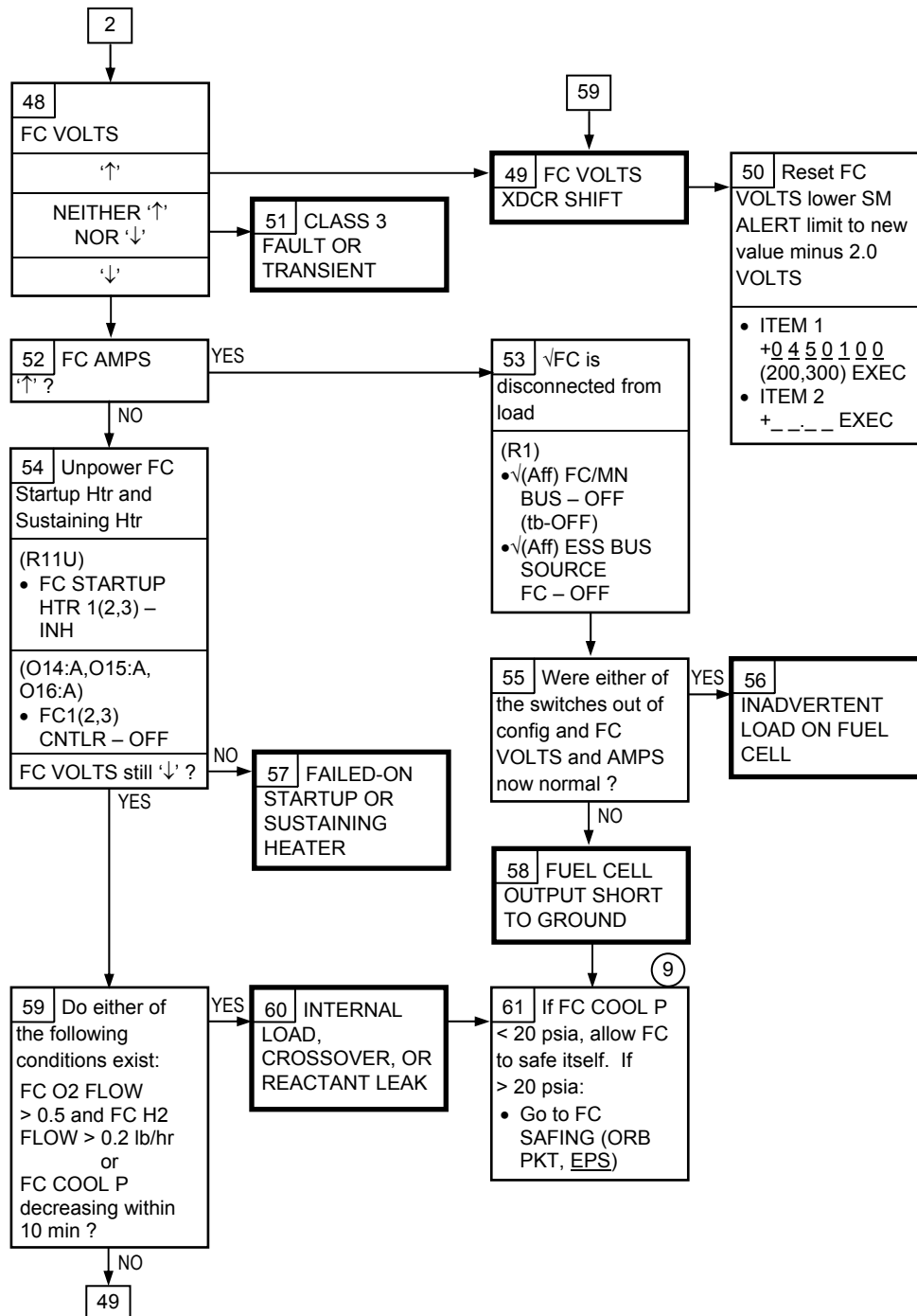
⑦ MCC analysis reqd before increasing loads on FC



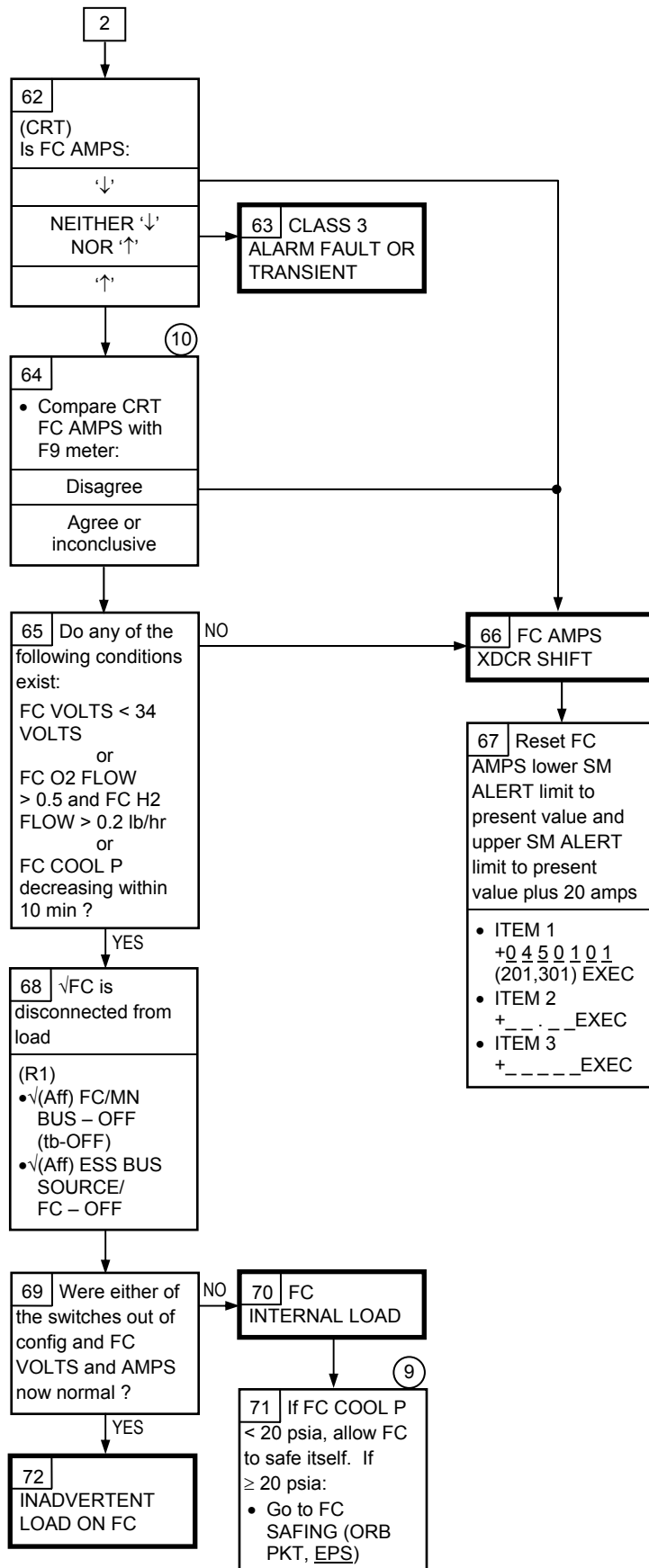
② FC Stack Temp Class 3 FDA may cause erroneous alarms and is unreliable. MCC will inhibit Class 3 FDA via TMBU. Class 2 FDA still exists

⑤ If SM OPS 2, FC amps may be approximated by utilizing Reac flows in the following equations:
 AMPS $(\pm 50) = O_2 \text{ FLOW} \times 47.5$
 AMPS $(\pm 68) = H_2 \text{ FLOW} \times 377$

⑧ Short on MN BUS causes FC loss. For loss of MNC, FC3 pumps will be pwr'd 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

EPS

7.3d FUEL CELL EXIT T ↑↓

S69 FC
EXIT T 1(2,3)

BFS

SM1 FC EXIT T
1(2,3)

If FC operating and
Exit T(condenser)
< 131 degF
> 164 degF

If FC shutdn and
Exit T > 164 degF
or
< 50.8 degF

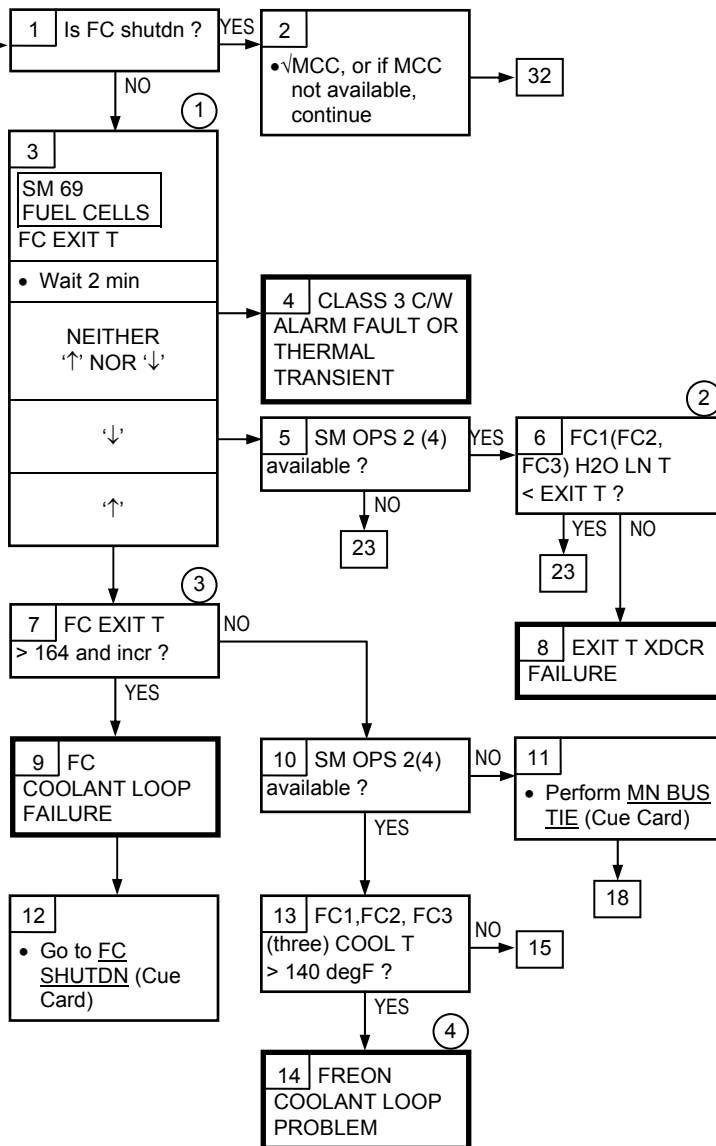
Nominal Config:

(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



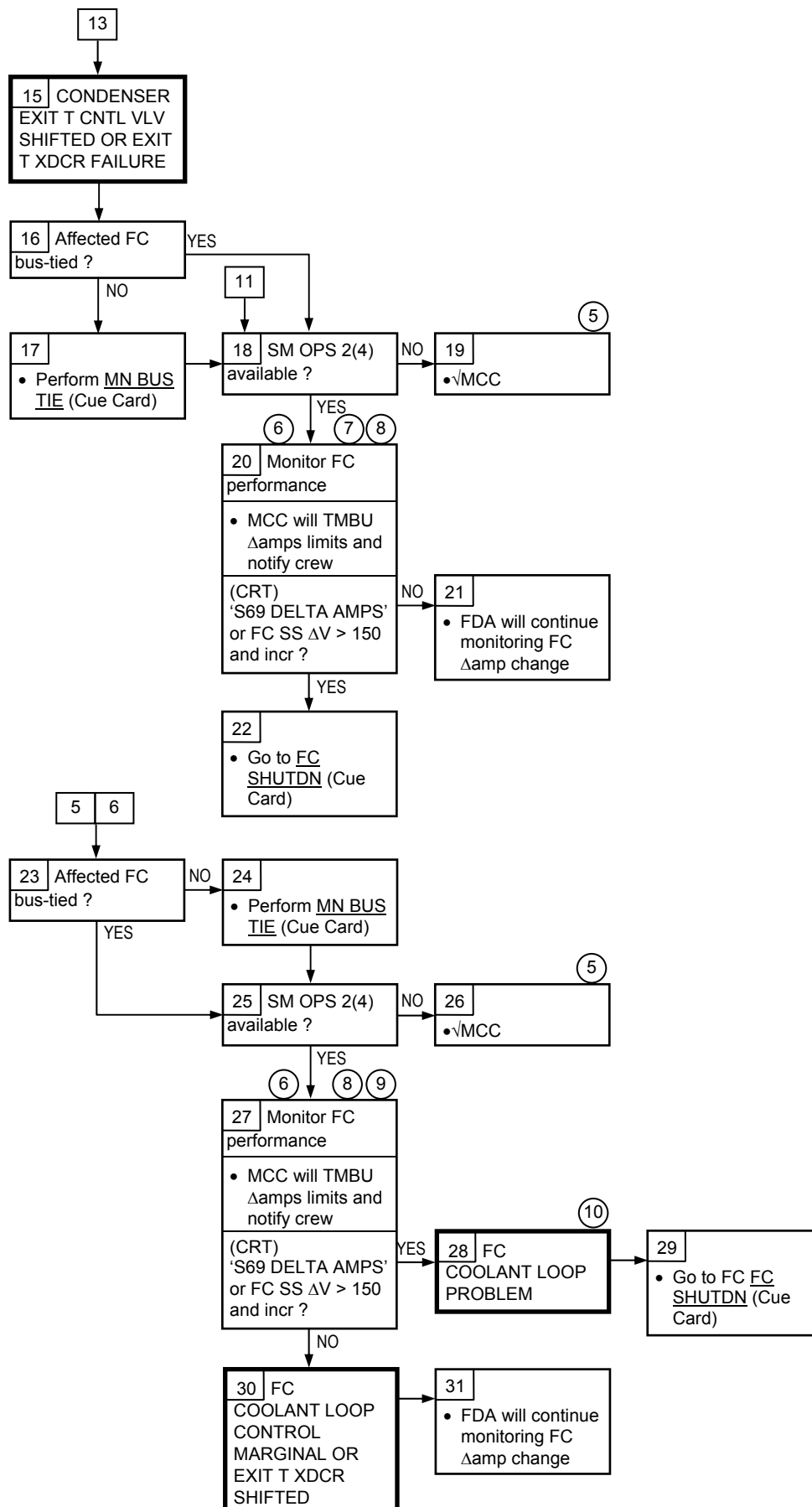
① Transient loads may cause EXIT T < LN T for up to 2 min

② Data indicates H2O LN T < EXIT T by up to 15 degF

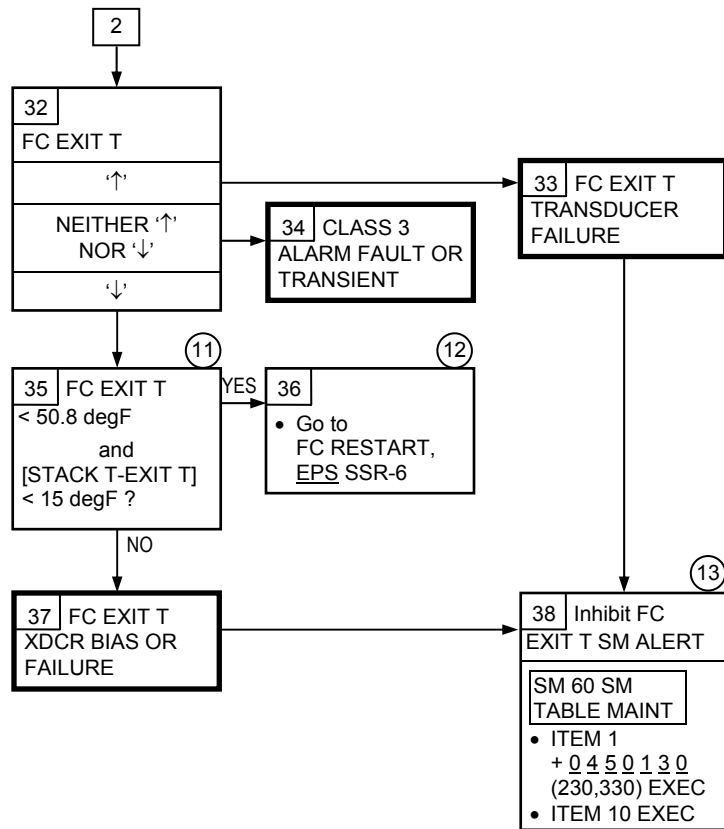
③ FC EXIT T will quickly increase to FC STACK T if CONDENSER COOLANT FLOW is stopped while H2 PUMP is operational. FC should be quickly shutdn for possible Coolant Pump failure

④ √MCC

EPS 7.3d (Cont)



- 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 ↑↓

S69 FC COOL
P 1(2,3)

BFS

SM1 FC COOL
P 1(2,3)

If FC operating and:
COOL P
< 50 psia
> 75 psia

If FC shutdn:
COOL P
< current C/W
FDA lower limit
> 75 psia

1 Is FC shutdn ? YES → 53

NO

2
SM 69
FUEL CELLS
FC COOL P is:

↓ or ↑ ?

NO → 3

YES

4
• Perform BUS TIE
(Cue Card)

YES → 5

5 Are any of the
following present ?

(R1)
• FC1(FC2,FC3)
COOL PUMP ΔP
tb – bp or
intermittent

(CRT)
• FC1(FC2,FC3)
STACK T or EXIT
T unstable
• FC1(FC2,FC3)
COOL P > 75 and
incr (but not 'H')

NO

From ORB PKT,
EPS, FC COOL
P, step 3

8
SM 69
FUEL CELLS
FC COOL P is:

↑ or 'H' → 9

↓ or 'L'

29

53

3 CLASS 3
ALARM FAULT OR
TRANSIENT

6 PRE-HTR
LEAK, FC REG
FAILURE, OR
COOLANT LOOP
LEAKAGE

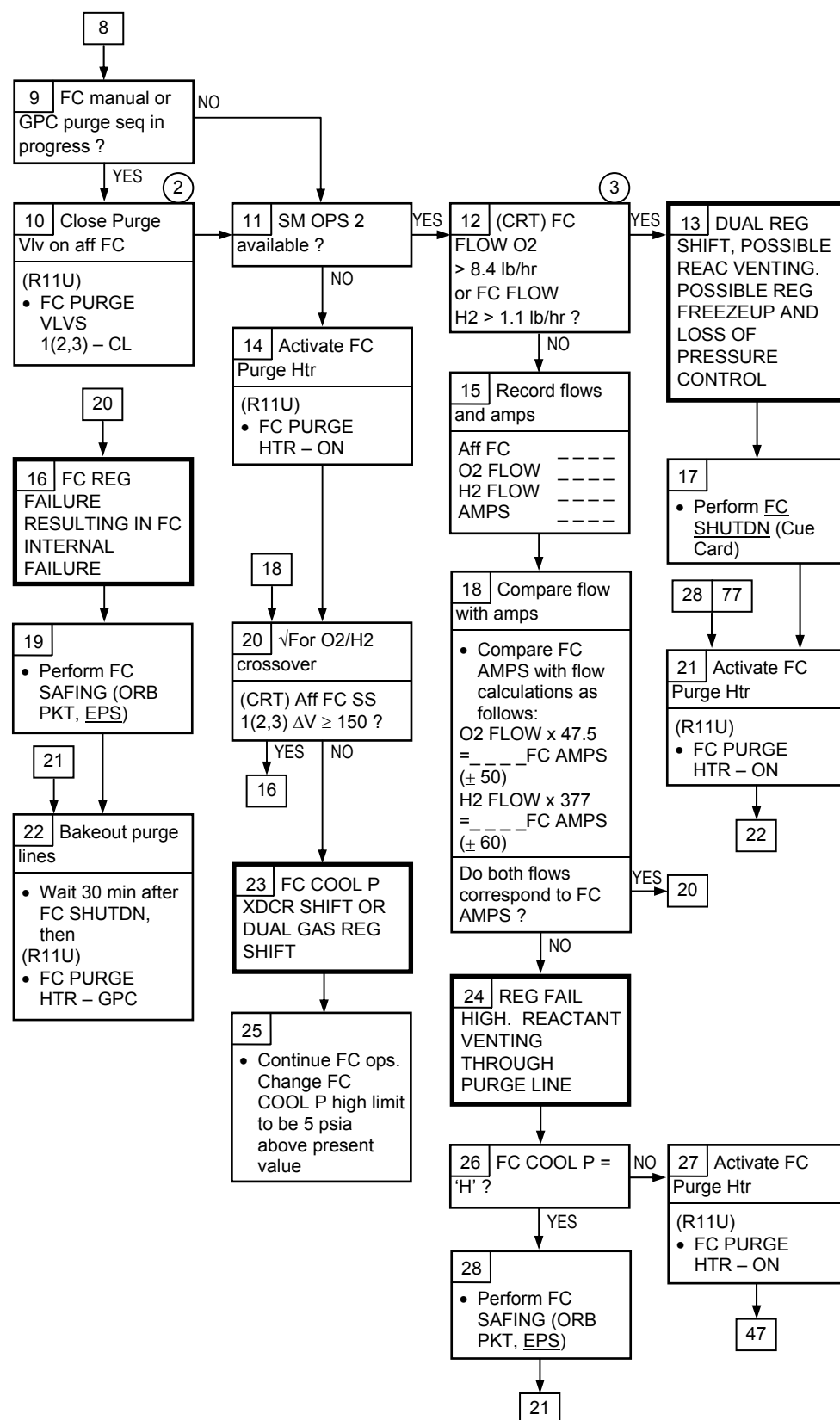
①

WARNING
Cryo pressurization
of coolant loop due
to pre-htr leakage
may cause FC HX
failure and loss of all
three FCs

7

• Go to FC
SAFING (ORB
PKT, EPS)

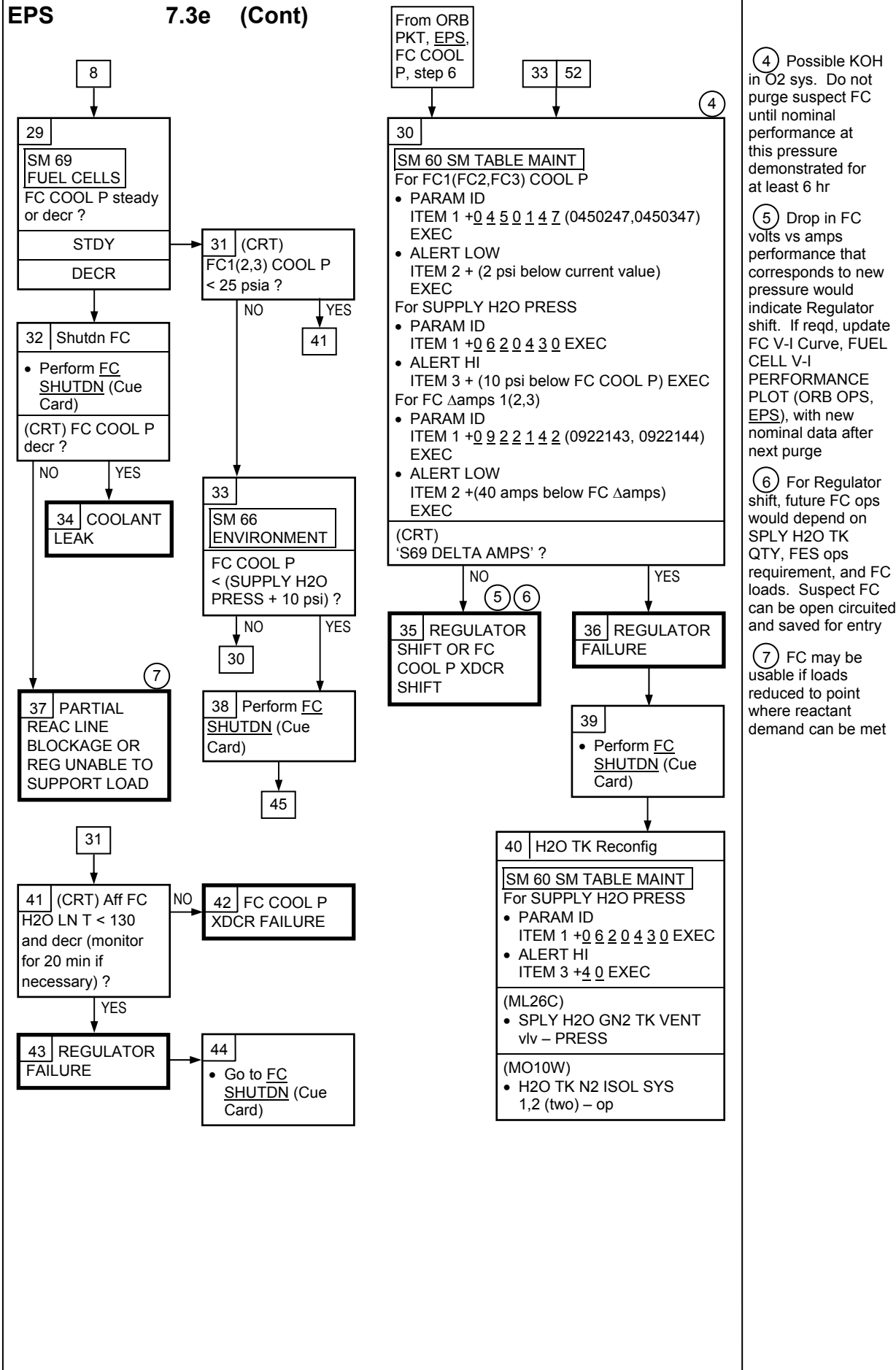
① Erratic FC
COOL T on SM 69
display may also be
indicative of pre-htr
internal leak

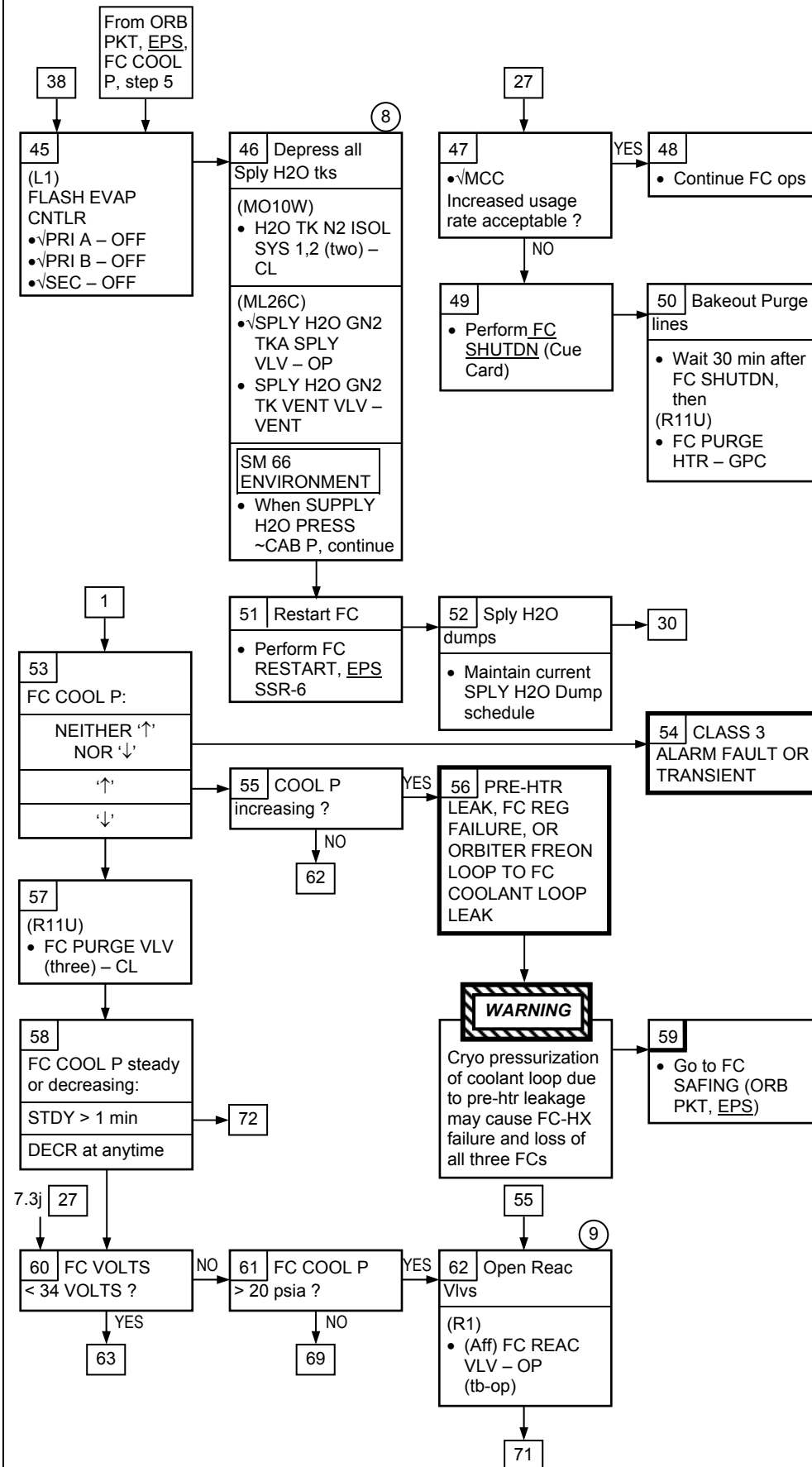


② If GPC purge seq selected, manually closing Purge Vlv stops purge and GPC will proceed with purging next FC selected for GPC purge. GPC may or may not alert crew. 'FC PURGE 1(2,3)' msg occurs depending on when Purge Vlv manually closed

③ Flows correspond to 10 kW (~350 amps) load on FC plus flow sensor accuracy

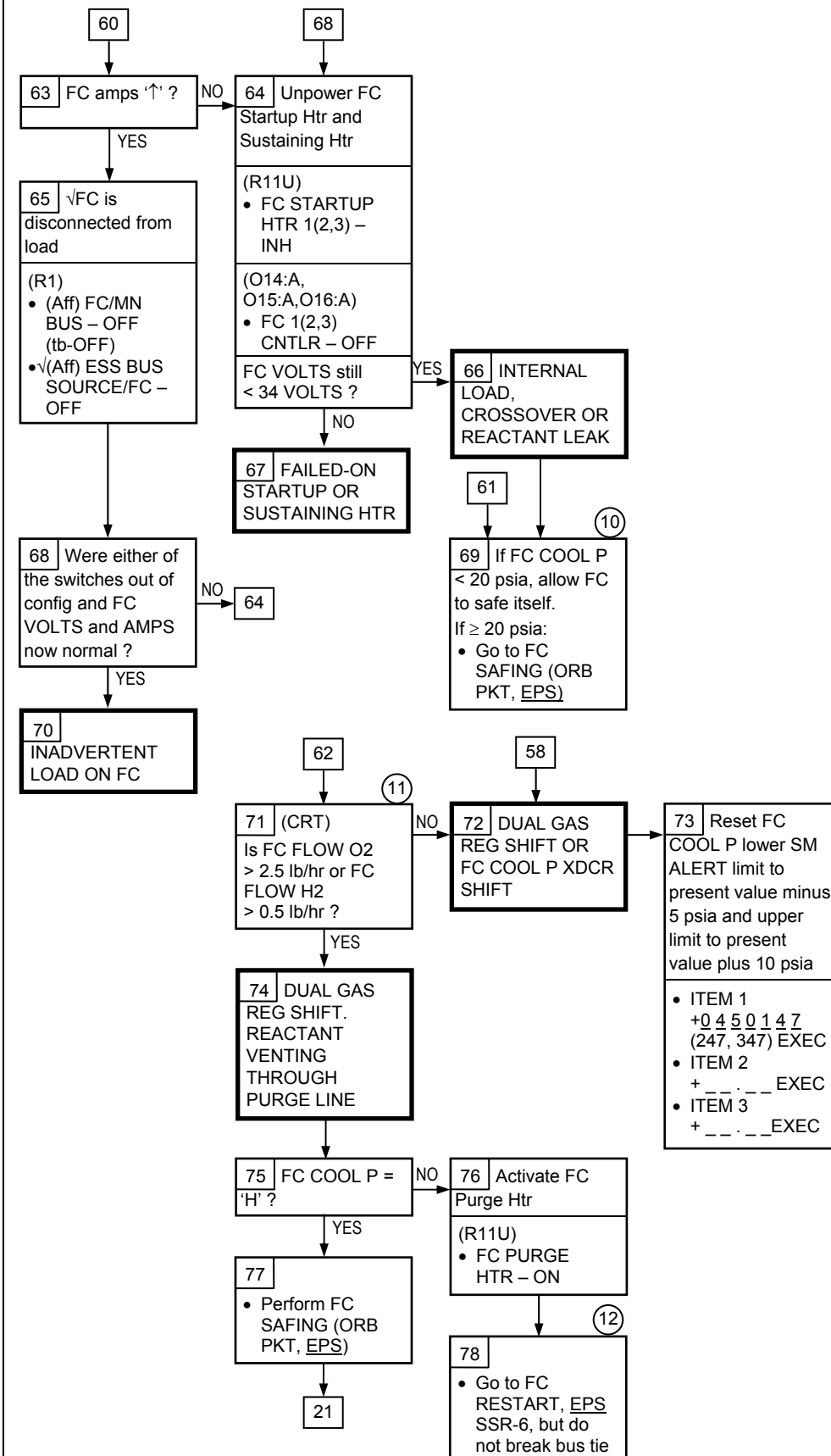
EPS 7.3e (Cont)





(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

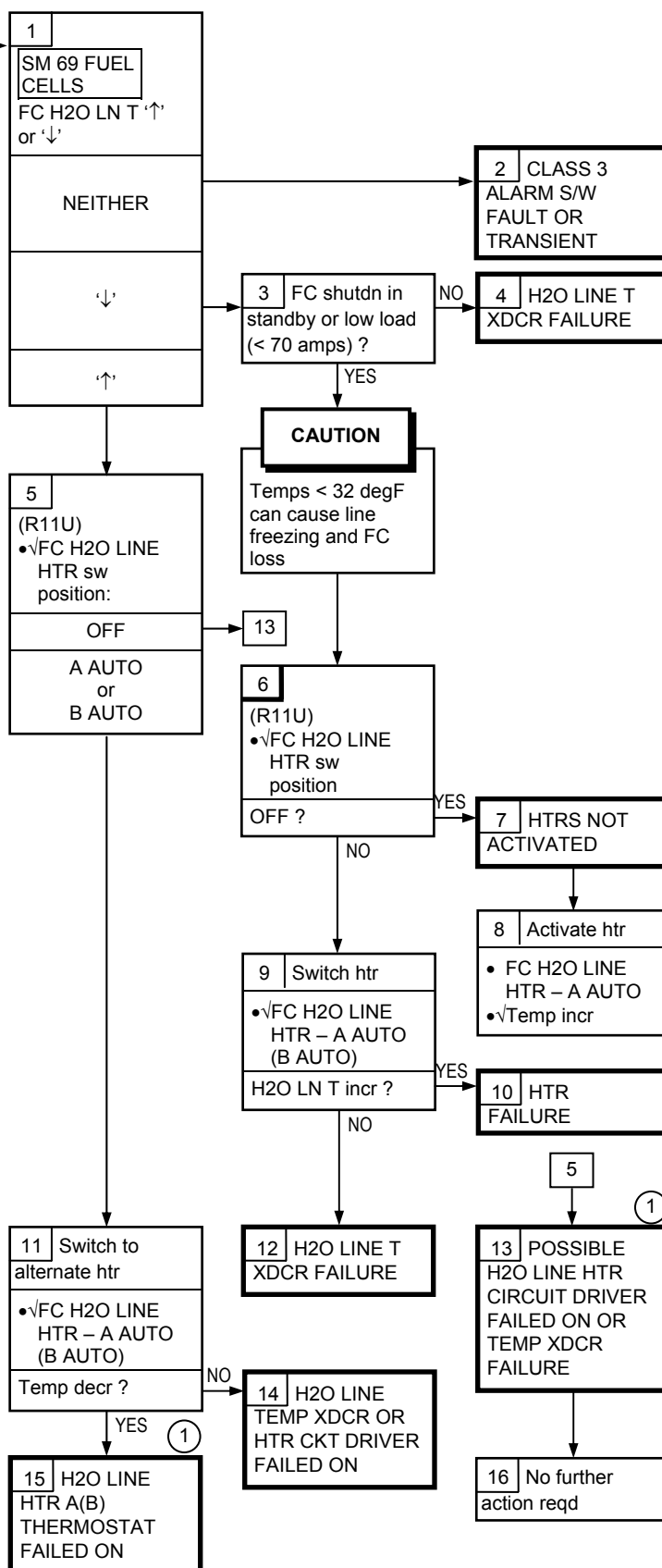
EPS

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)

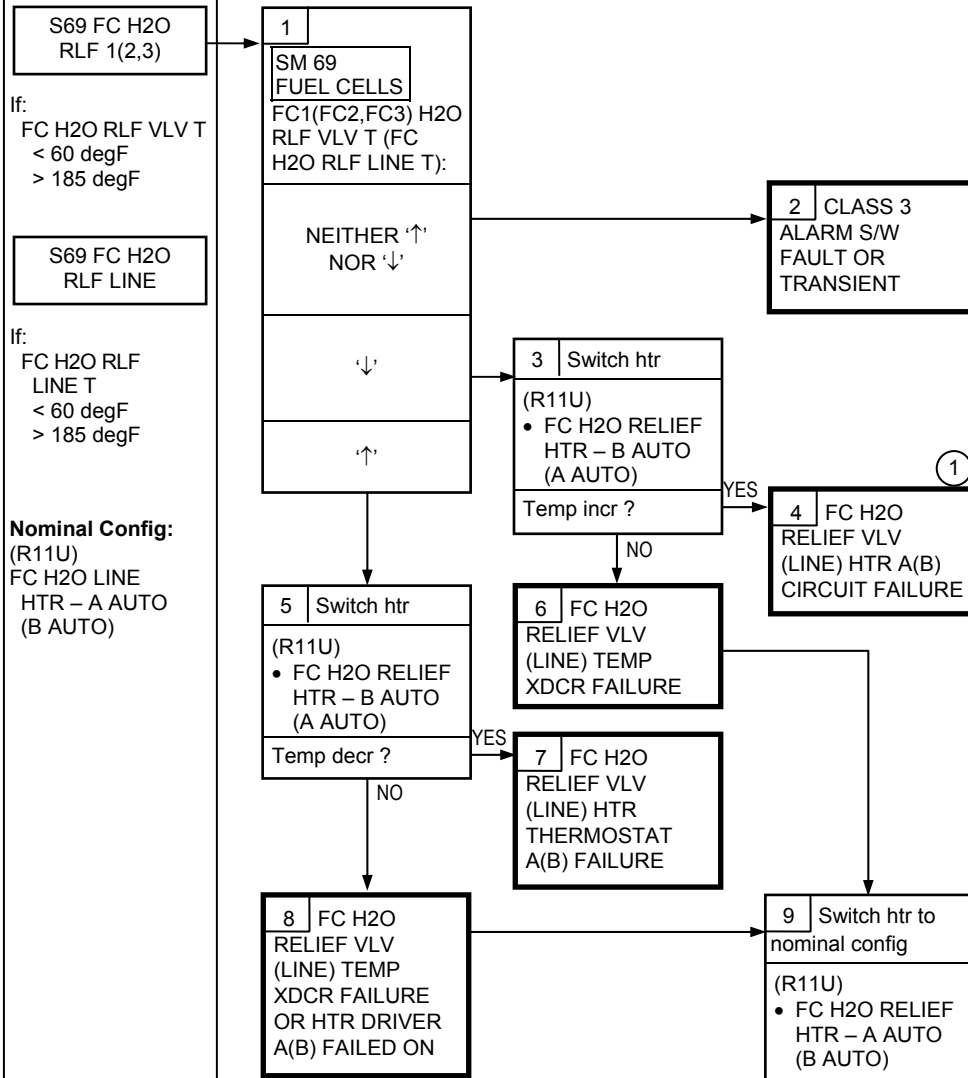


① Overtemp caused by driver or thermostat failure will only occur if FC shutdn in standby, or lightly loaded. Failure at normal loads not detectable

EPS

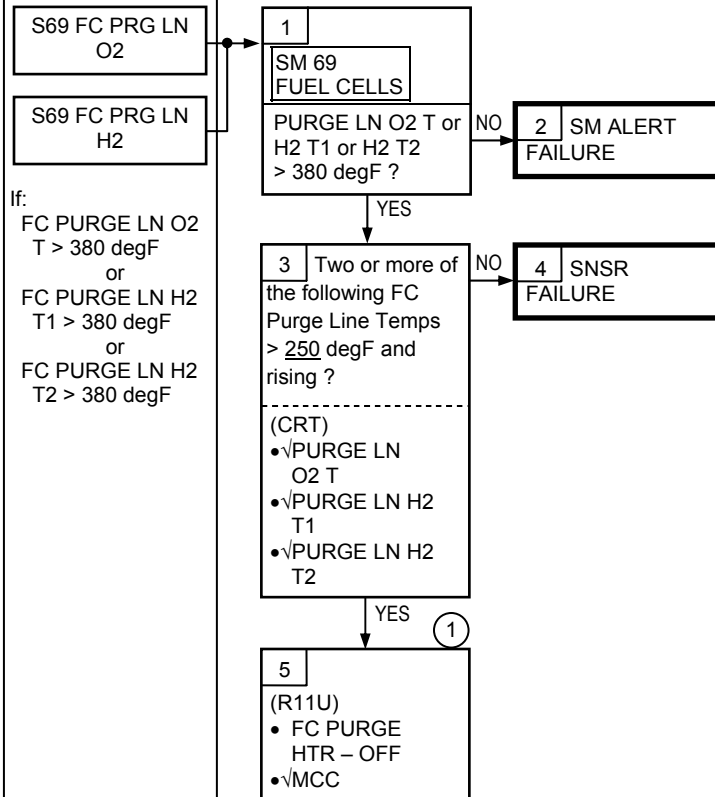
7.3g FUEL CELL H2O RLF VLV T ↑↓ FUEL CELL H2O RLF LINE T ↑↓

① Switching htrs isolated failed circuit



EPS

7.3i FUEL CELL O2(H2) PURGE LN T ↑



EPS

7.3j FUEL CELL O2(H2) FLOW ↑

S69 FC O2
FLOW 1(2,3)

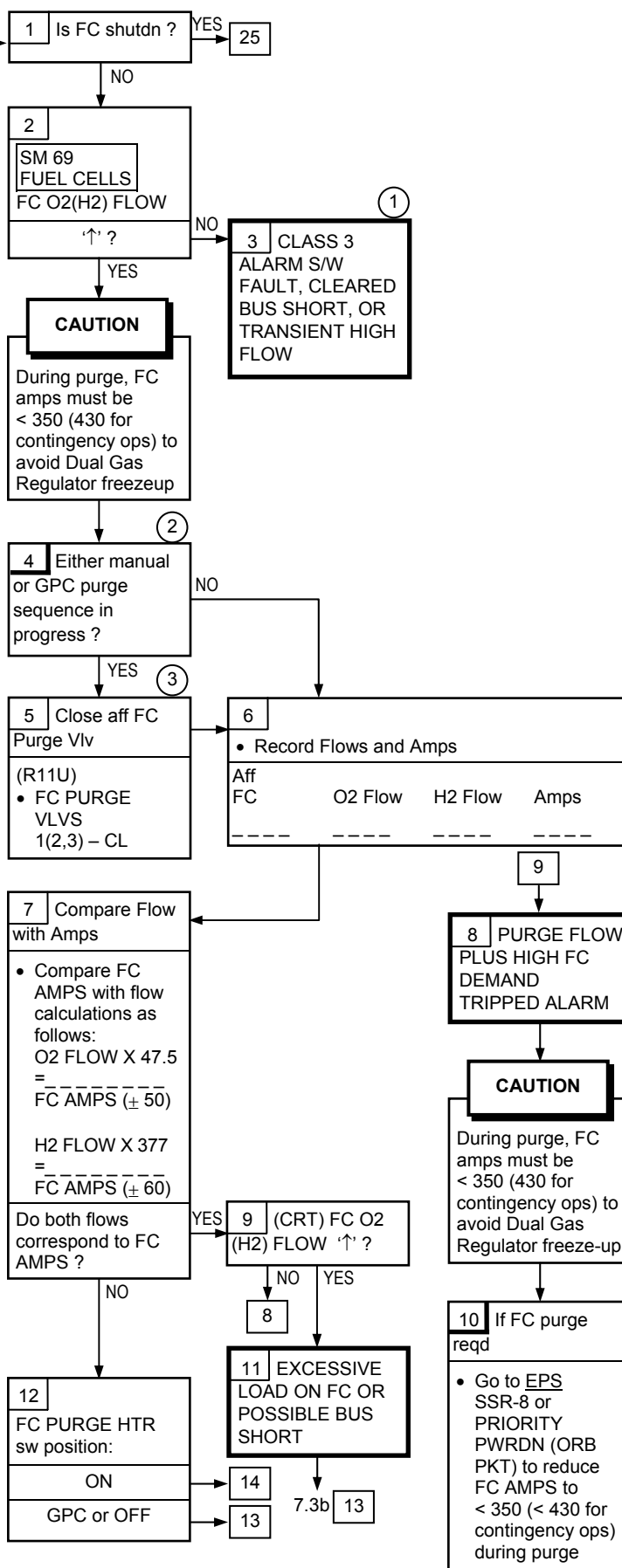
S69 FC H2
FLOW 1(2,3)

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

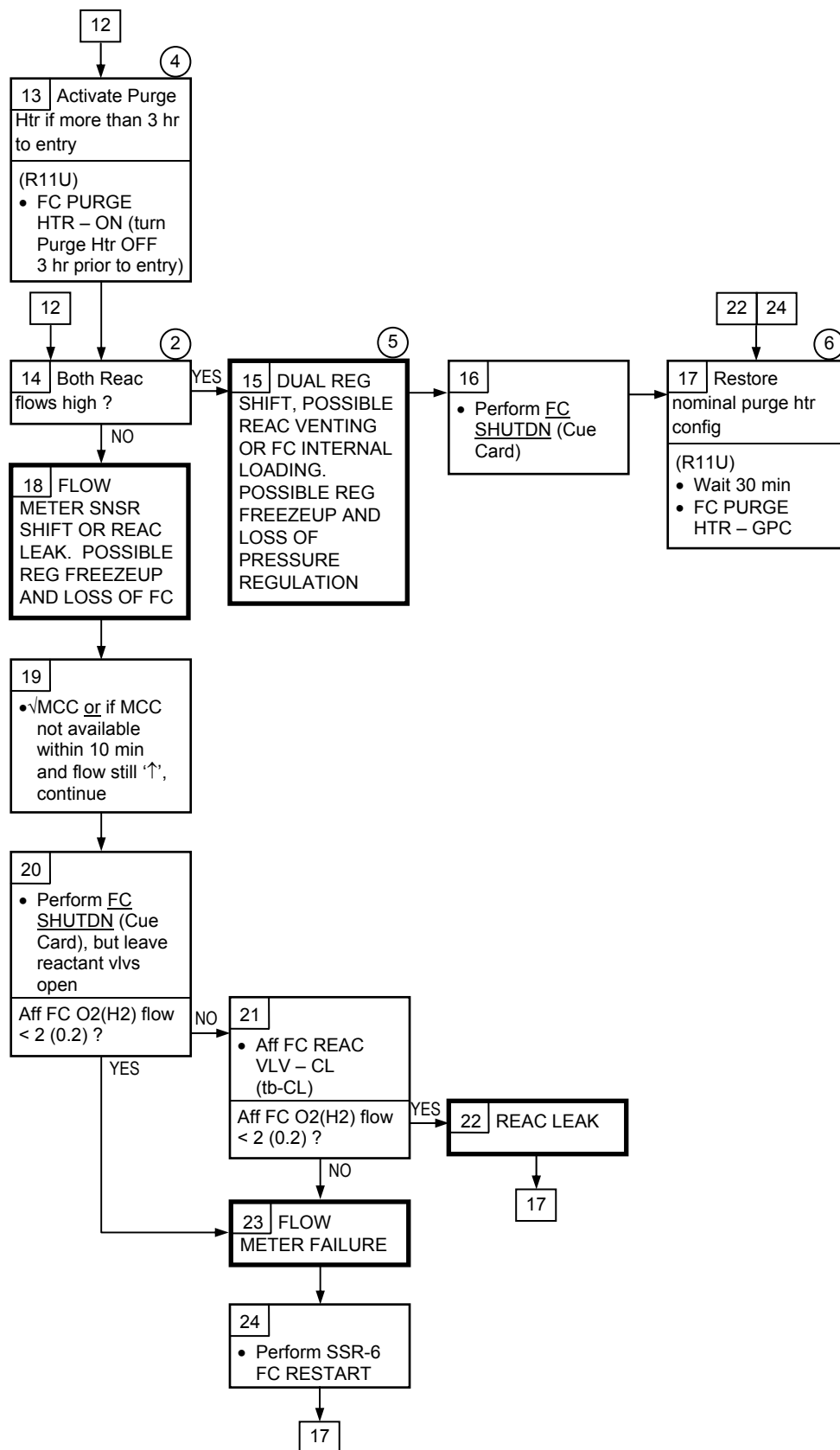
If FC shutdn and:
O2 FLOW > current
C/W FDA upper
limit
H2 FLOW > current
C/W FDA upper
limit



① 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

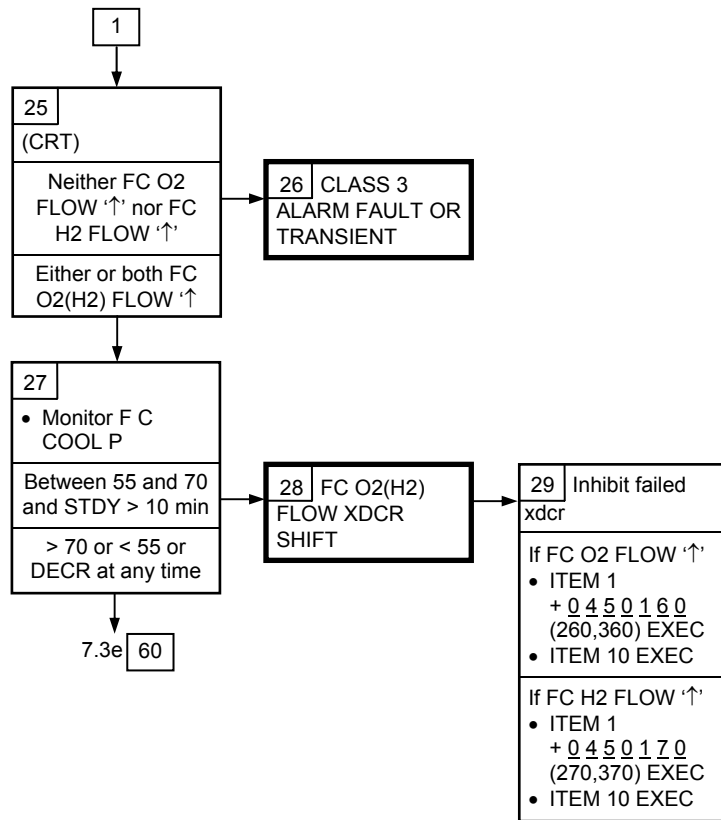


② If FC purge in progress, alarm may have tripped because of normal load plus purge flow. If one flowmeter previously failed, assume both flows high

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



EPS

7.3k FUEL CELL RELIEF HTR SW FAIL

S69 FC H2O
RLF HTR

If:

SM 69 FUEL
CELLS

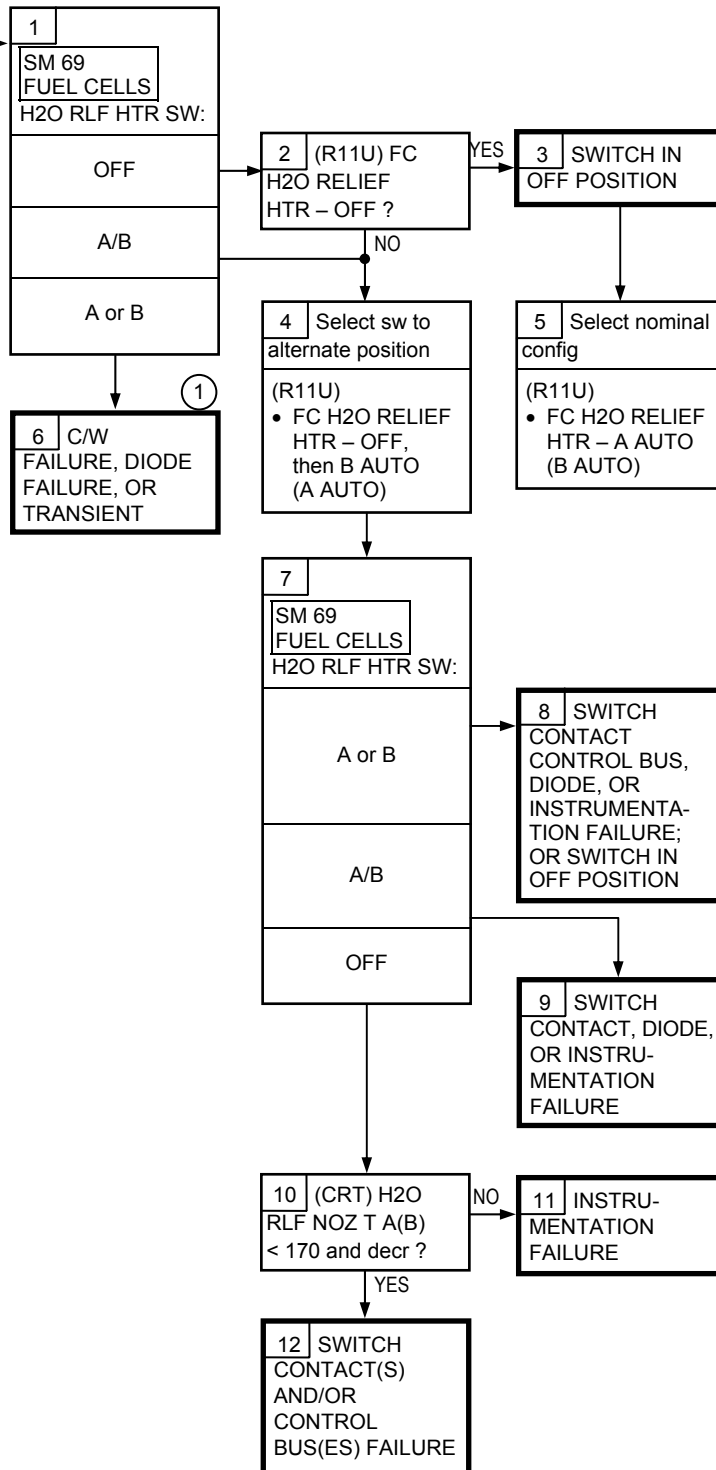
H2O RLF HTR
SW – OFF
H2O RLF HTR
SW – A/B

Nominal Config:

(R11U)

If pre-htr reconfig:
FC H2O RELIEF
HTR – A AUTO

If post-htr reconfig:
FC H2O RELIEF
HTR – B AUTO



① Diode failure would be indicated if an A/B alarm occurred during nozzle htr ops. Alt htr could be selected to eliminate alarms

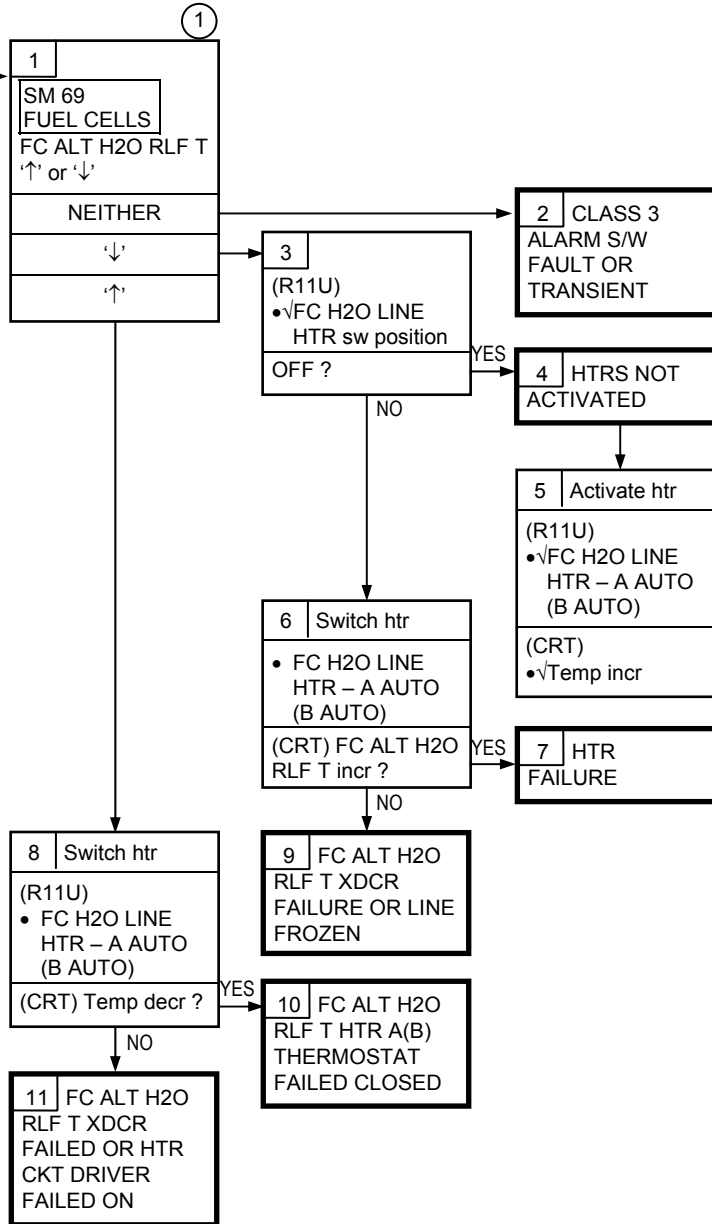
EPS

7.3I FUEL CELL ALT H2O RLF T ↑↓

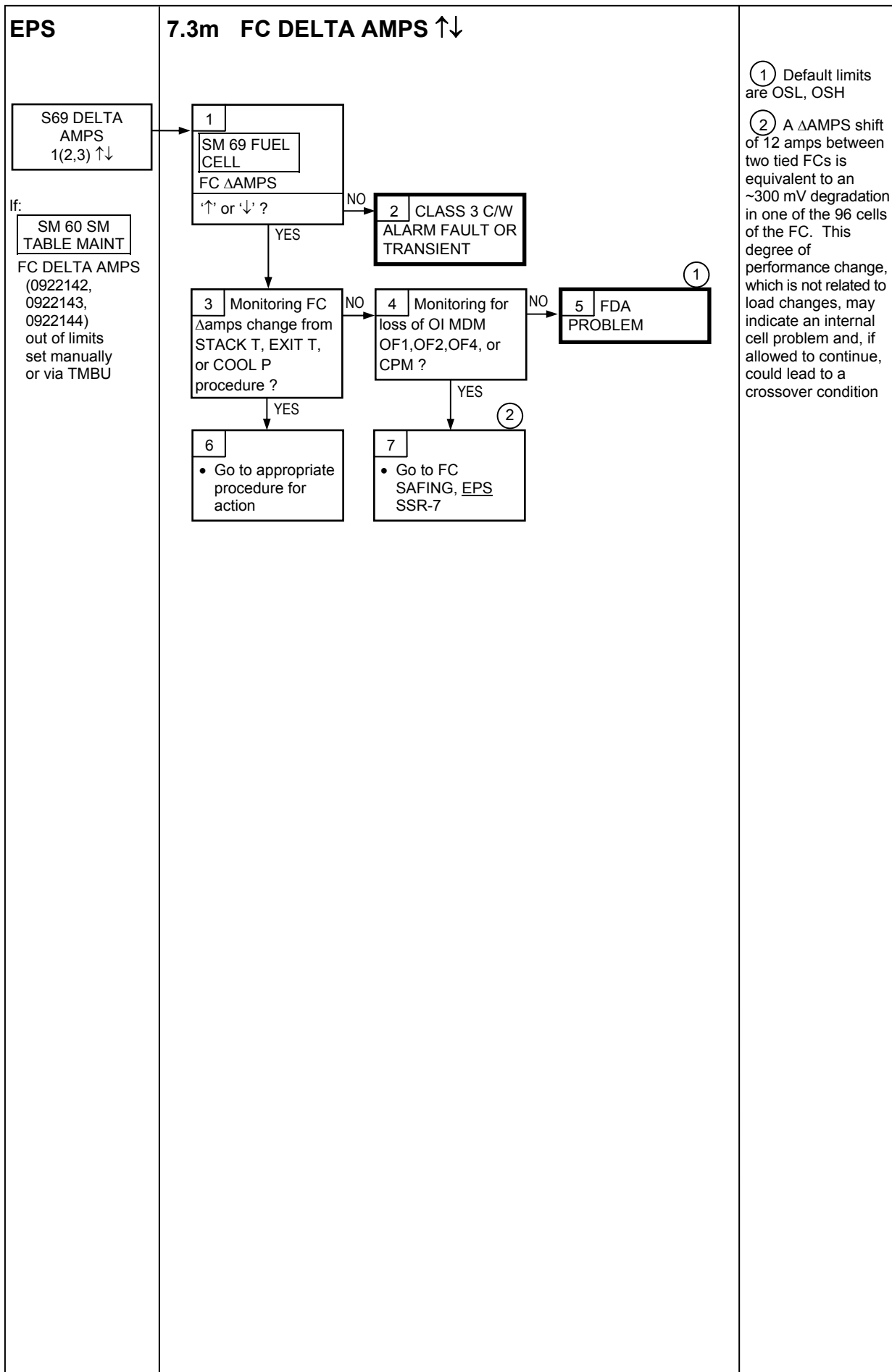
S69 FC H2O ALT

If:
FC ALT H2O RLF T
< 60 degF
> 185 degF

Nominal Config:
(R11U)
FC H2O LINE
HTR – A AUTO
(B AUTO after Htr
reconfig in ORB
OPS)



① FC ALT
H2O RLF LINE T
normally controlled
to 70-90 degF

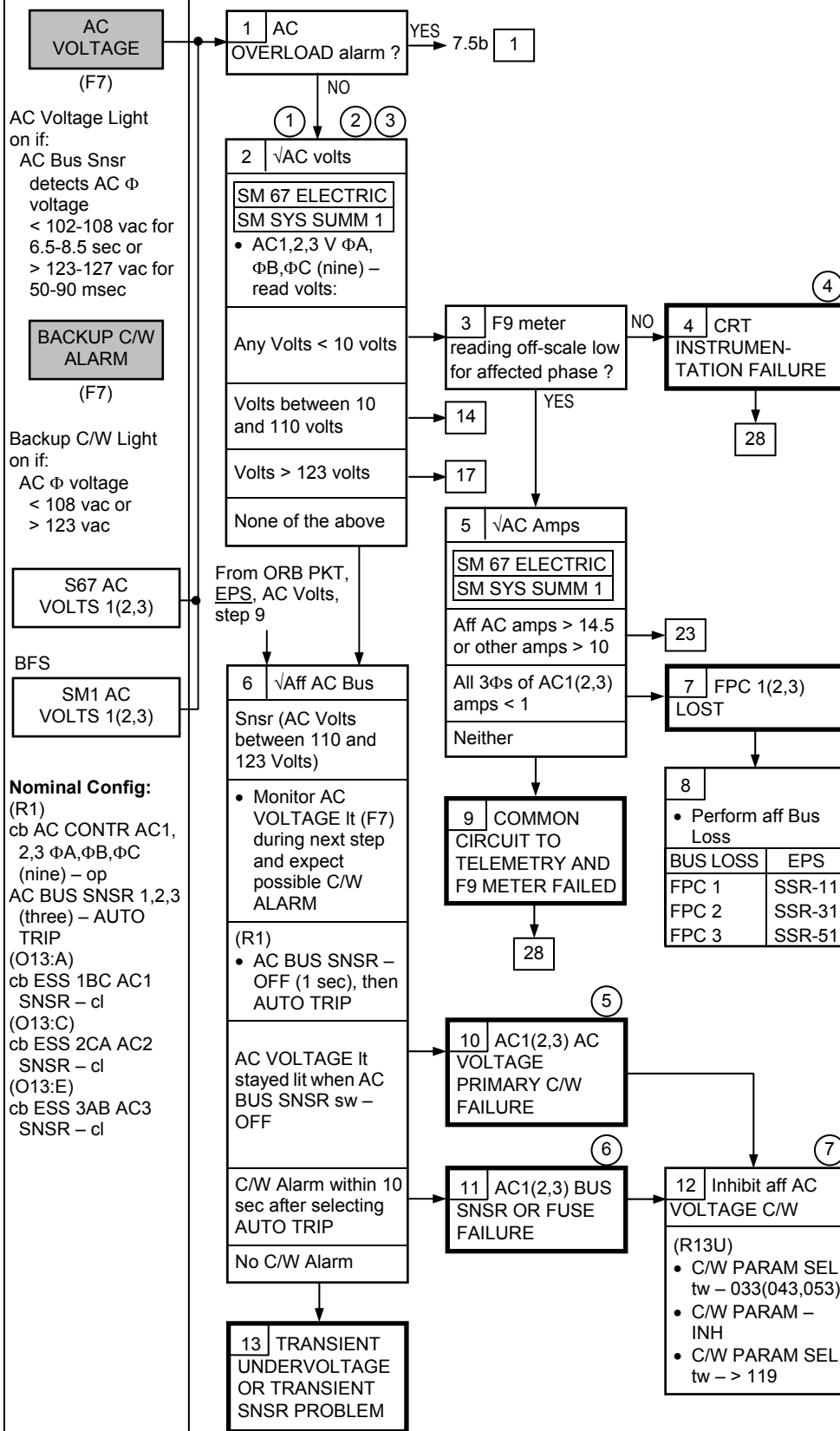


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EPS

7.5a AC VOLTS 1(2,3) ↓↑



① AC bus voltage can be read on pnl F9

② Transformer action of 3 Φ 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)

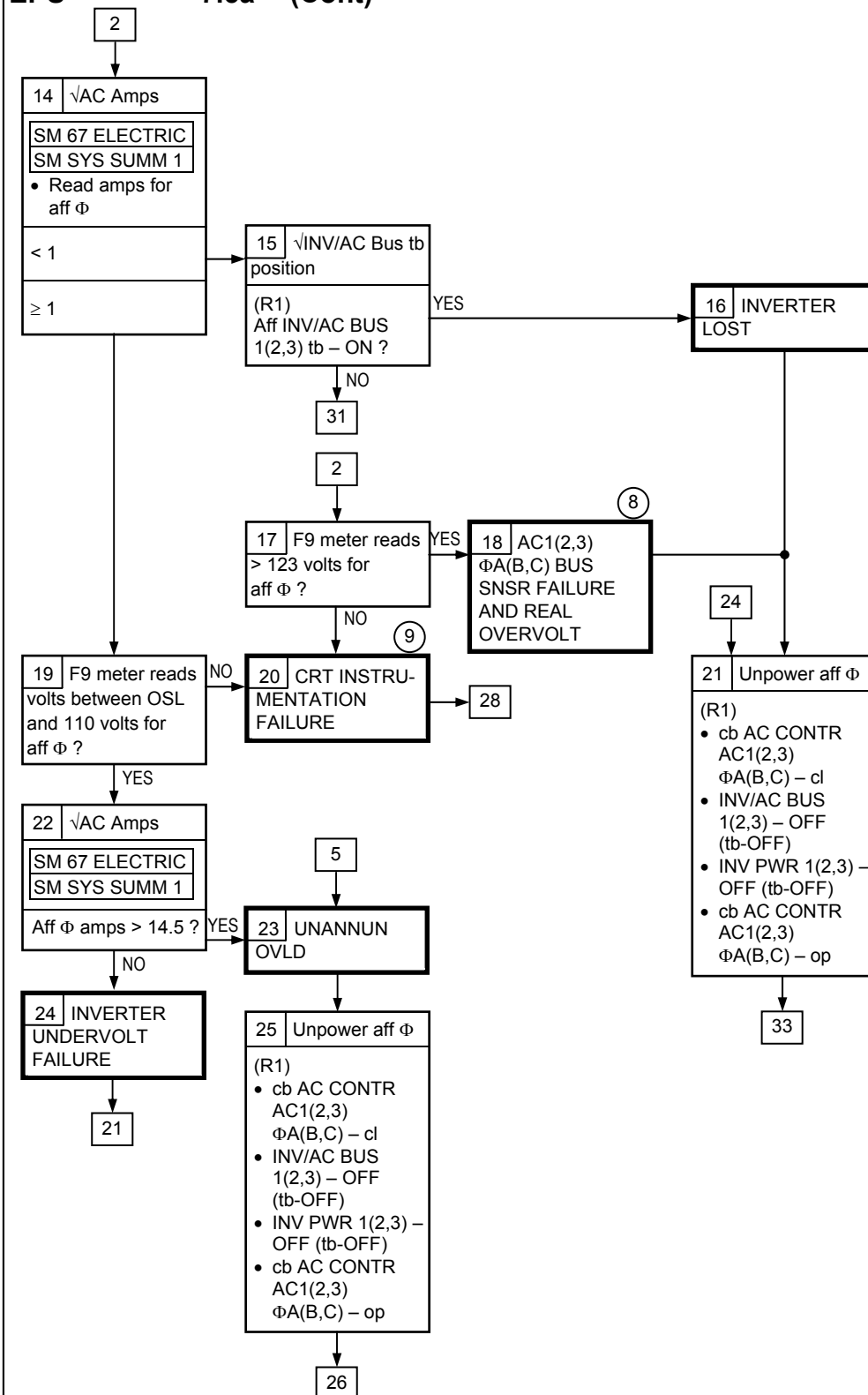
④ Primary C/W AC VOLTAGE alarm capability remains. Backup C/W lost for affected phase. F9 Meter still available

⑤ AC1(2,3) AC VOLTAGE primary C/W alarm capability lost. AUTO TRIP capability and BACKUP C/W AC VOLTAGE sensing remain

⑥ O/V U/V Detector Input Fuse. AC1(2,3) VOLTAGE primary C/W alarm capability lost. OVLD AUTO TRIP and BACKUP C/W AC VOLTAGE sensing remain

⑦ If inhibit does not extinguish light, remove bulb if desired

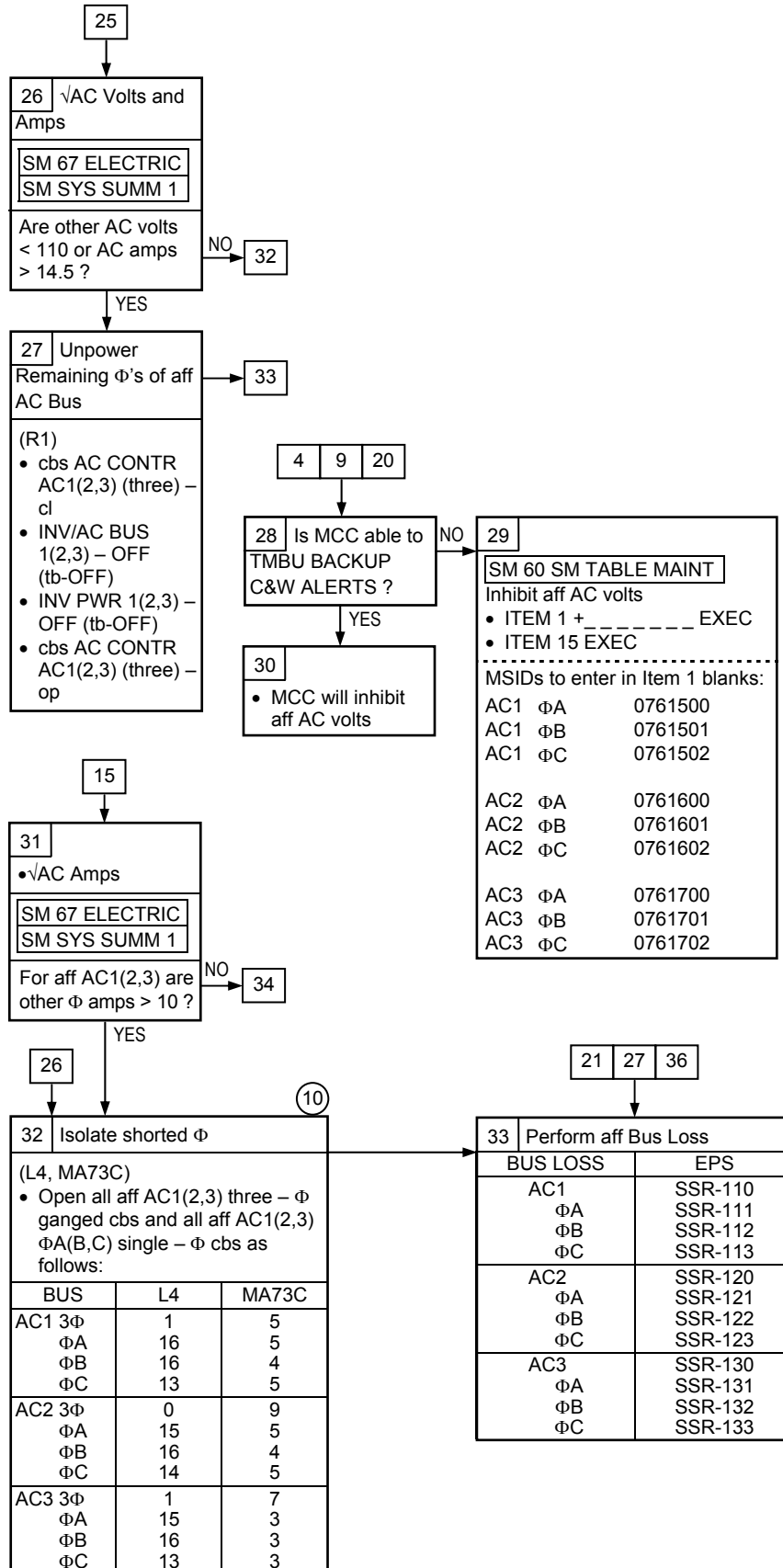
EPS 7.5a (Cont)



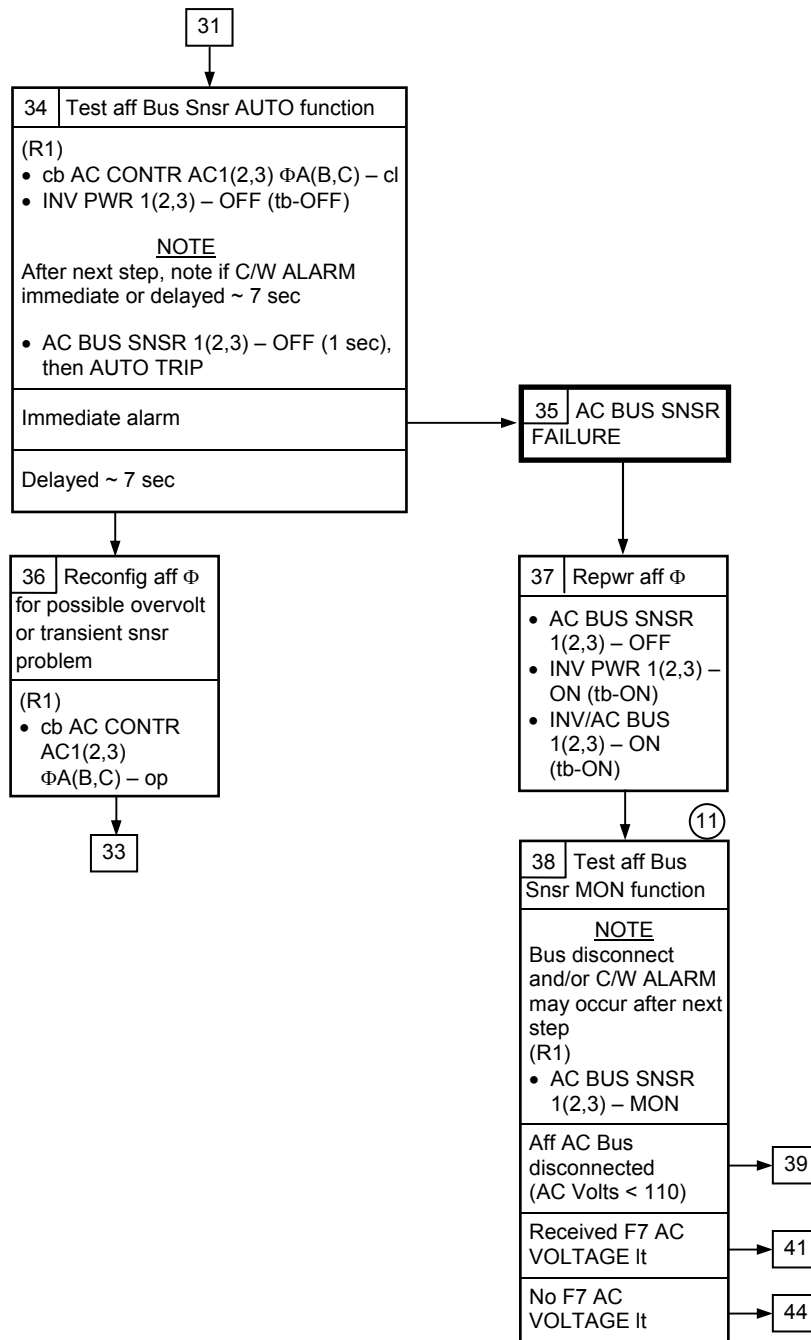
⑧ Backup C/W AC Voltage sensing exist. Auto Trip capability suspect

⑨ Still have primary C/W AC VOLTAGE alarm capability. Backup C/W lost for affected phase

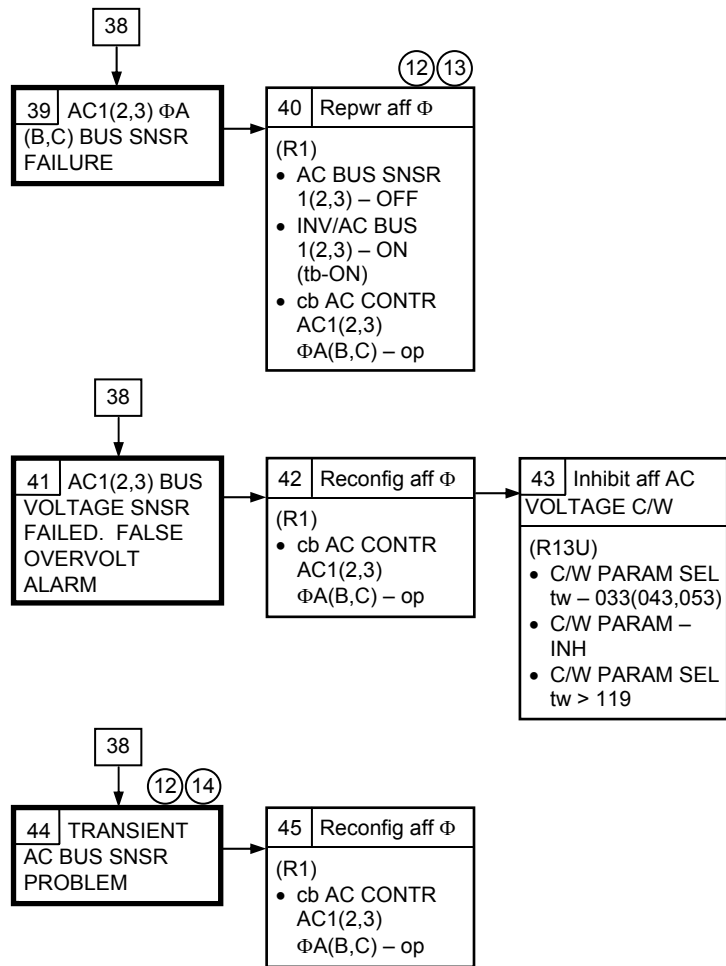
⑩ Pnl L4 cbs
UTILITY PWR are
3Φ



EPS 7.5a (Cont)



11 AC bus voltage can be read on pnl F9



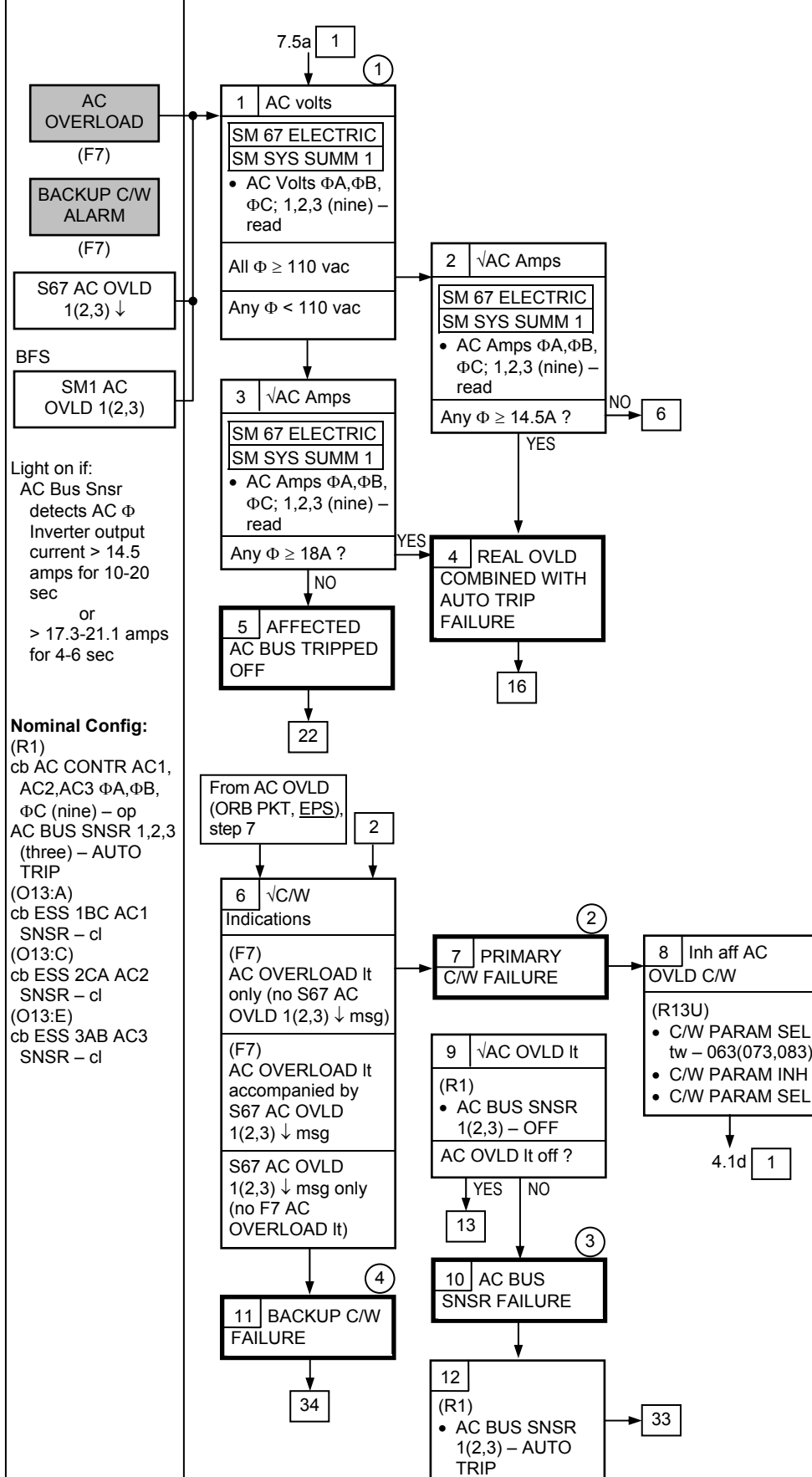
⑫ AC1(2,3) AC VOLTAGE primary C/W alarm and AUTO TRIP capability lost. Backup C/W AC VOLTAGE sensing remains

⑬ AC1(2,3) OVLD AUTO TRIP and C/W alarm capability lost

⑭ AC1(2,3) OVLD AUTO TRIP capability lost. AC OVLD primary C/W alarm remains

EPS

7.5b AC OVLD 1(2,3) ↓

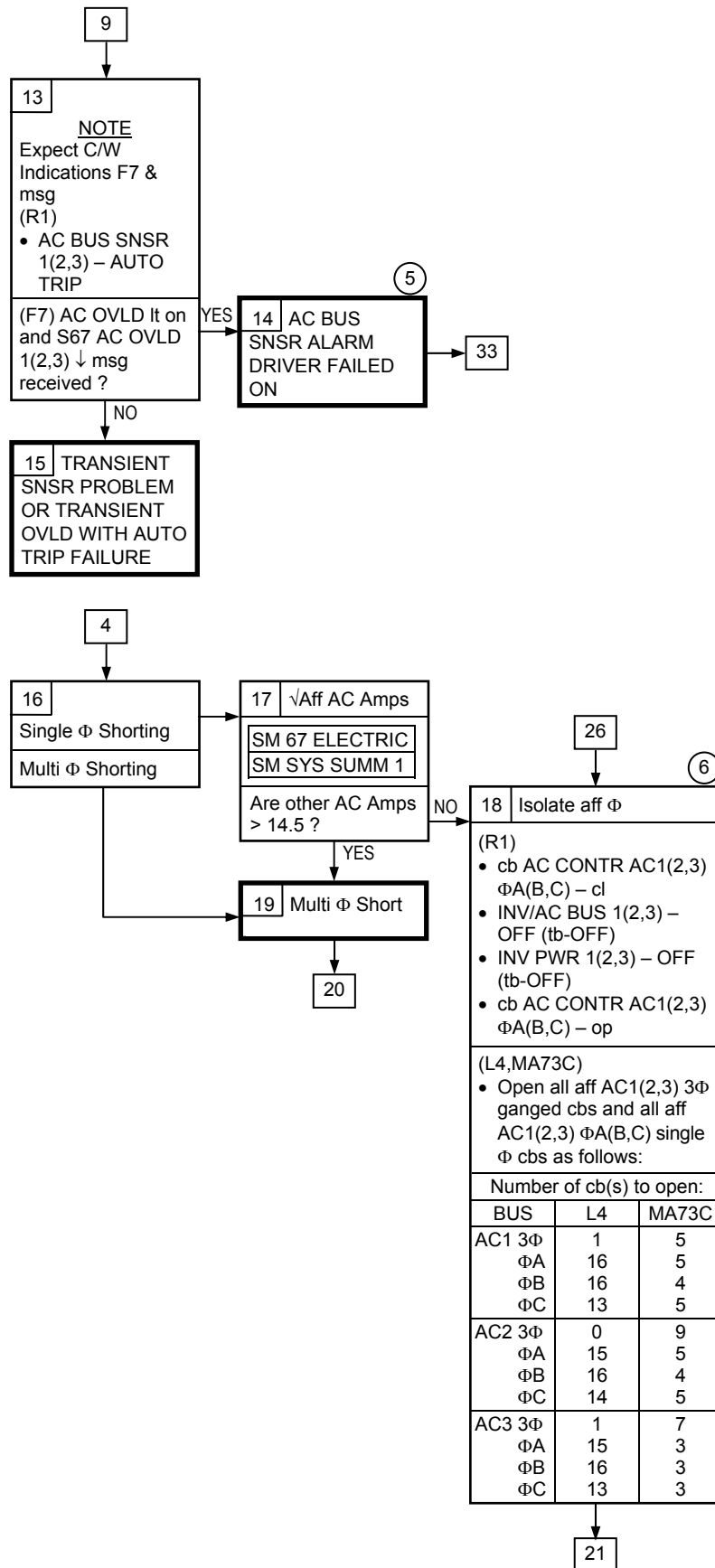


① AC volts can be read on pnl F9

② Lost AC1(2,3) Pri C/W OVLD alarm capability. B/U C/W alarm and Auto Trip capabilities remain

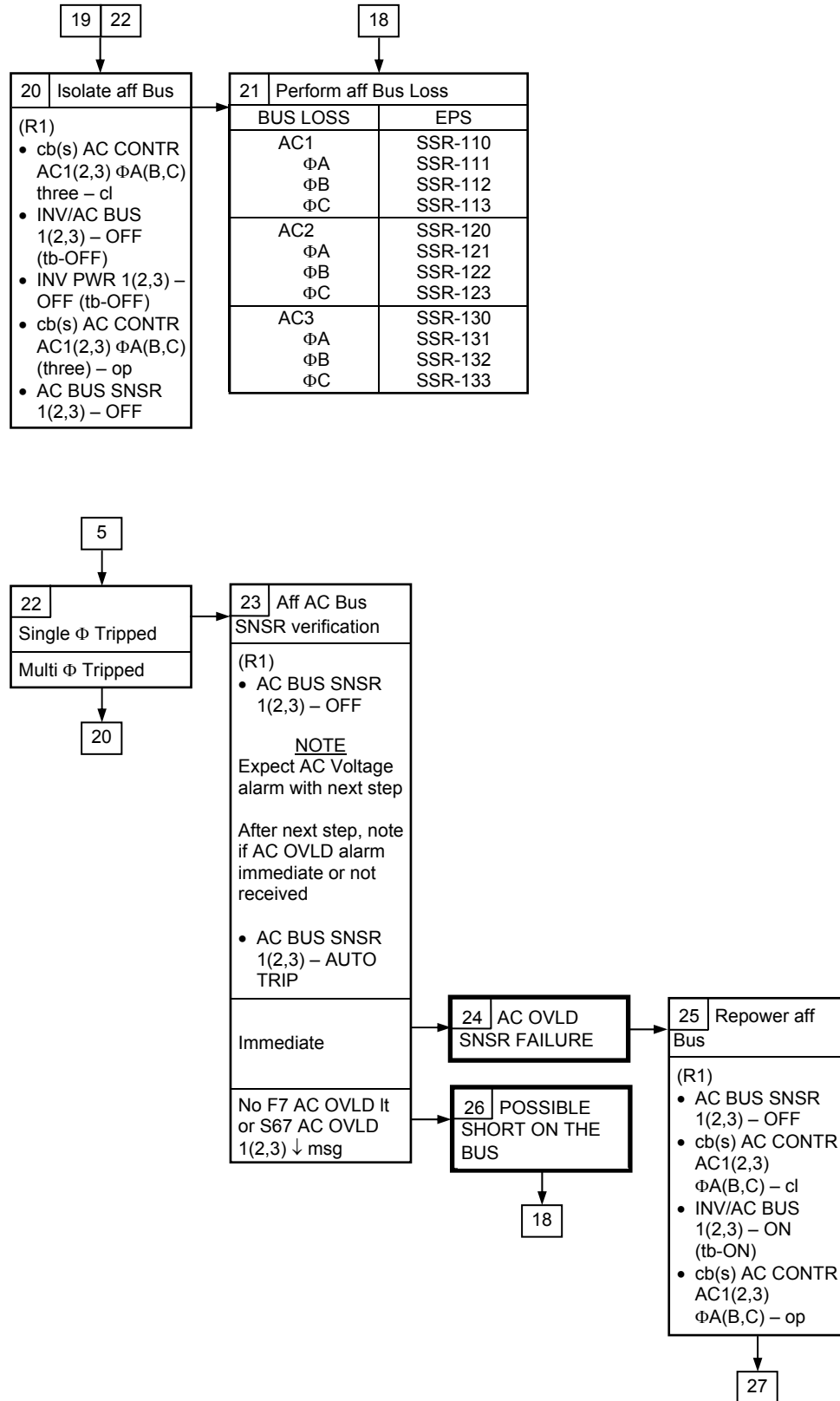
③ Lost AC1(2,3) Pri and B/U C/W OVLD alarm capability. Auto Trip capability remains

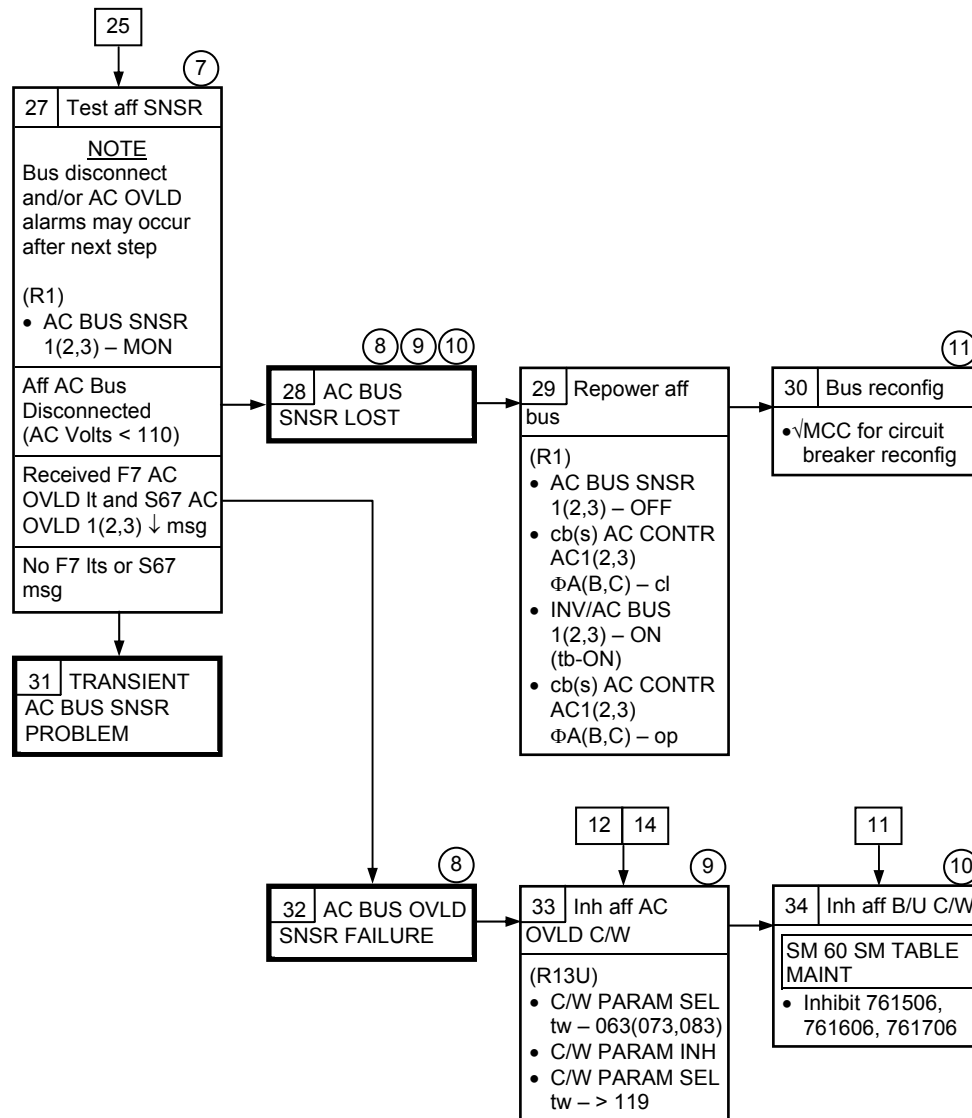
④ Lost AC1(2,3) B/U C/W OVLD alarm capability. Pri C/W alarm and Auto Trip capabilities remain



5 Lost AC1(2,3)
Pri and B/U C/W
OVLD alarm
capability. Auto Trip
capability remains

6 Pnl L4 cbs
UTILITY PWR are
3Φ

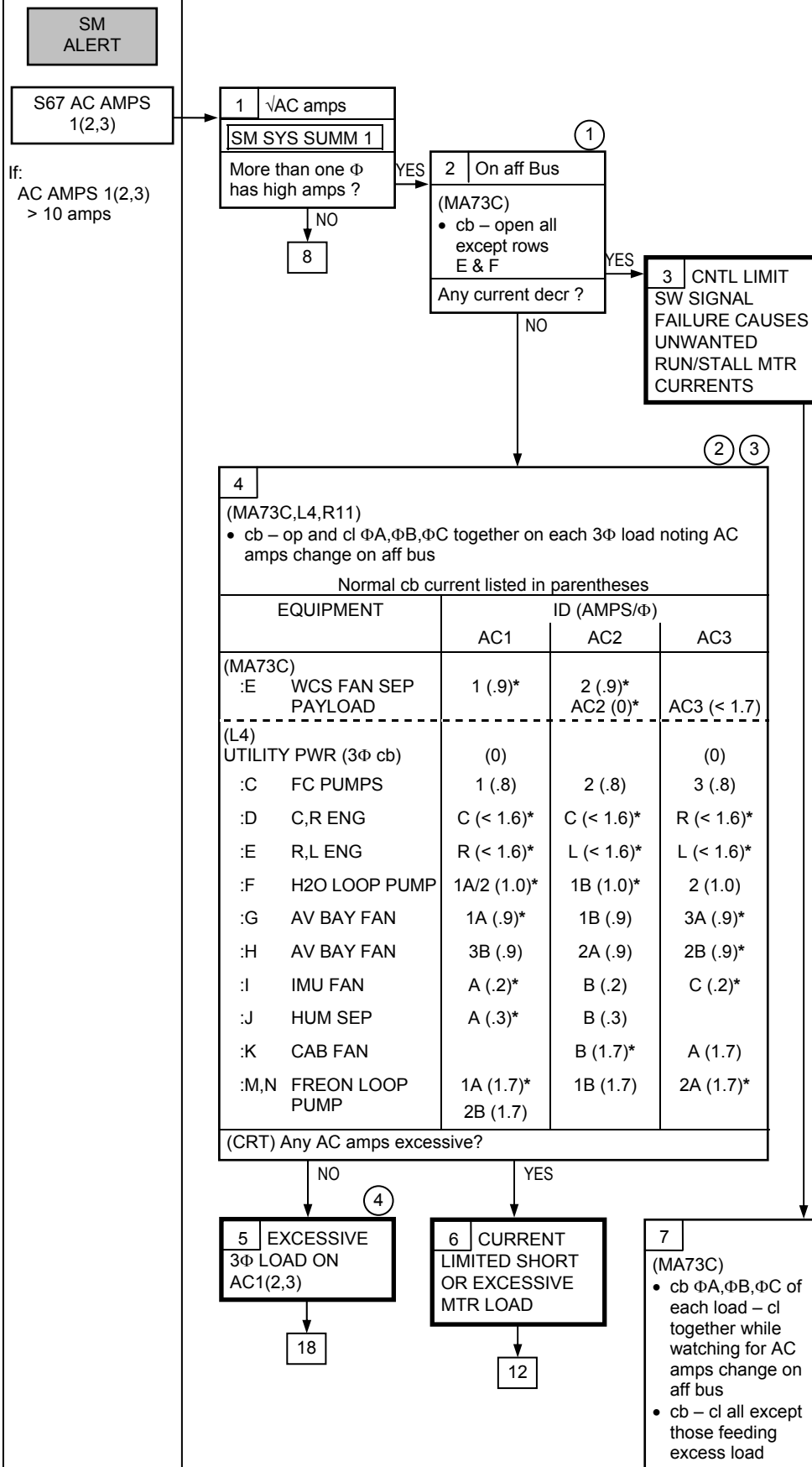




- ⑦ AC Volts can be read on pnl F9
- ⑧ Lost AC1(2,3) Auto Trip capability
- ⑨ Lost AC1(2,3) Pri C/W OVLD alarm capability. S67 AC Volts and S67 AC Amps msgs remain
- ⑩ Lost AC1(2,3) B/U C/W OVLD alarm capability
- ⑪ Affected AC cbs could have been opened in the OPCL AC OVLD or AC Volts procedures, or any of the AC Bus Loss SSRs in the MAL

EPS

7.5c AC BUS CURRENT HIGH

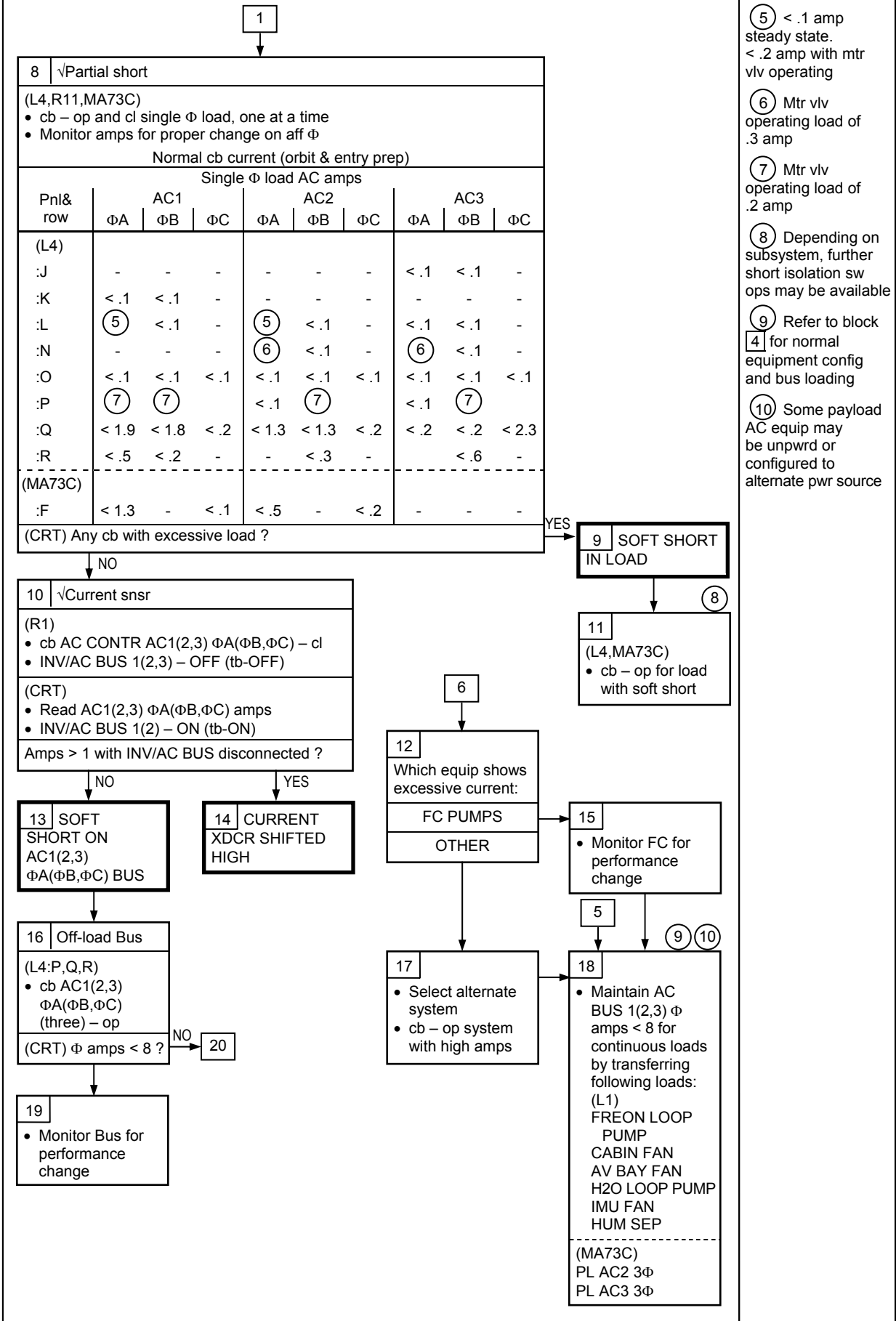


① All (MA73C) 3Φ loads are transient loads normally active as response to flight crew/GPC command. All loads are on < 2 min except row E

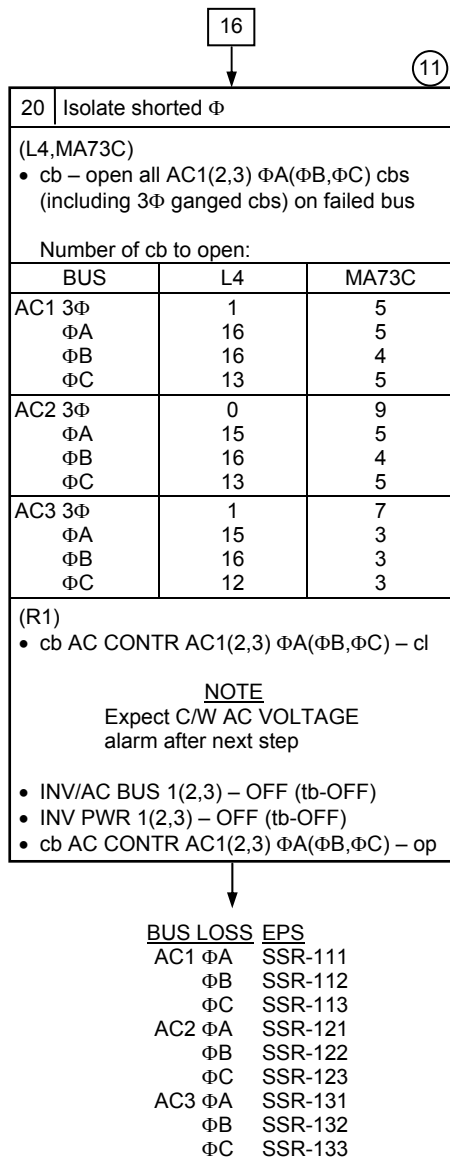
② Normally '*' not active

③ Some mtrs have thermal cutoff sw that may remove load unexpectedly. In this event, block 4 will be inconclusive

④ AC Bus Snr fused at 3 amps/Φ. AC volt meter and telemetry signal are fused at .5 amps/Φ



EPS 7.5c (Cont)



11 If shorted bus is AC2(3), CABIN FAN B(A) will not start on remaining two phases

CRYO

7.6

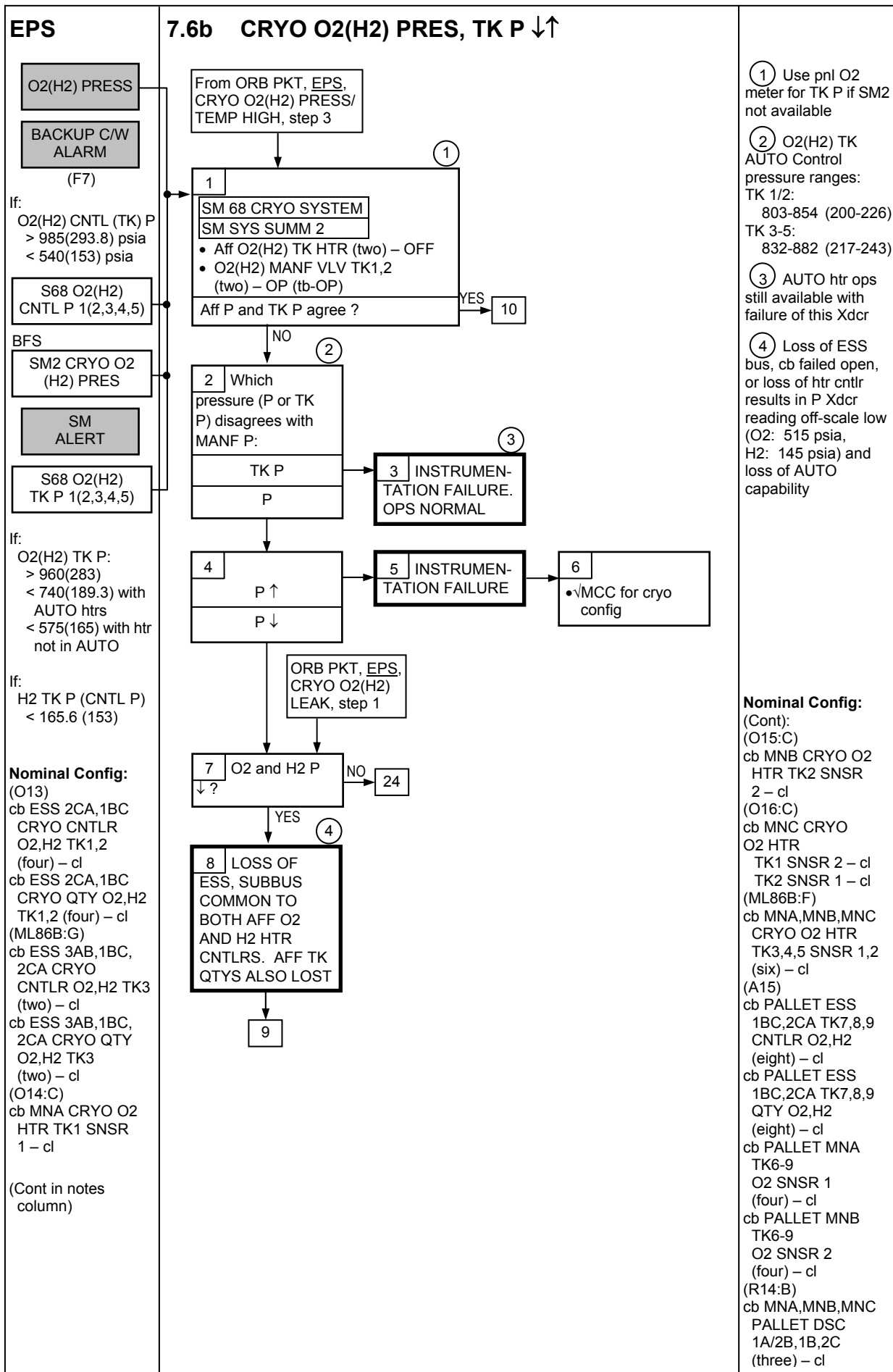
**CRYO TABLE A
CRYO HEATER SWITCH PROCEDURAL NOMENCLATURE**

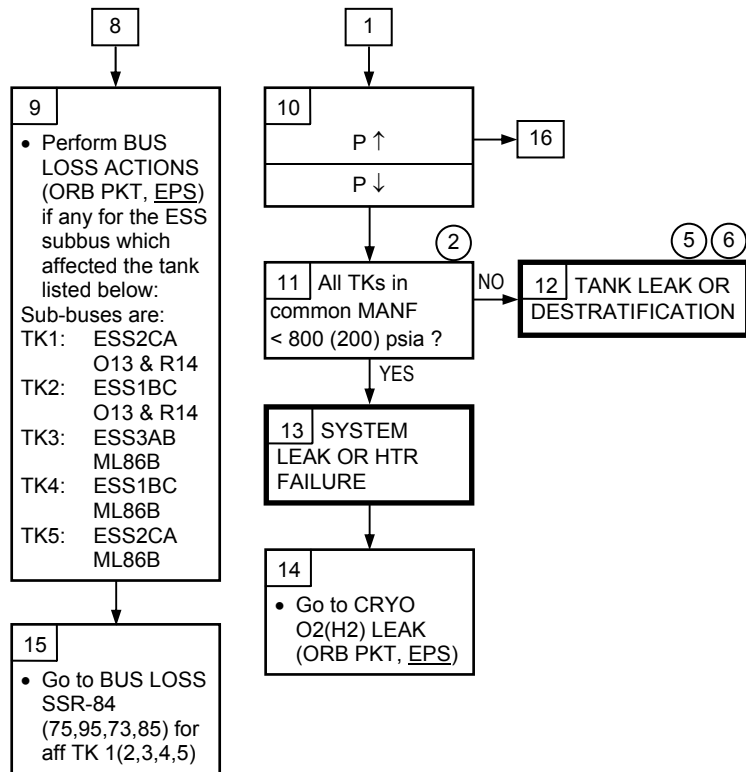
OXYGEN

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

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

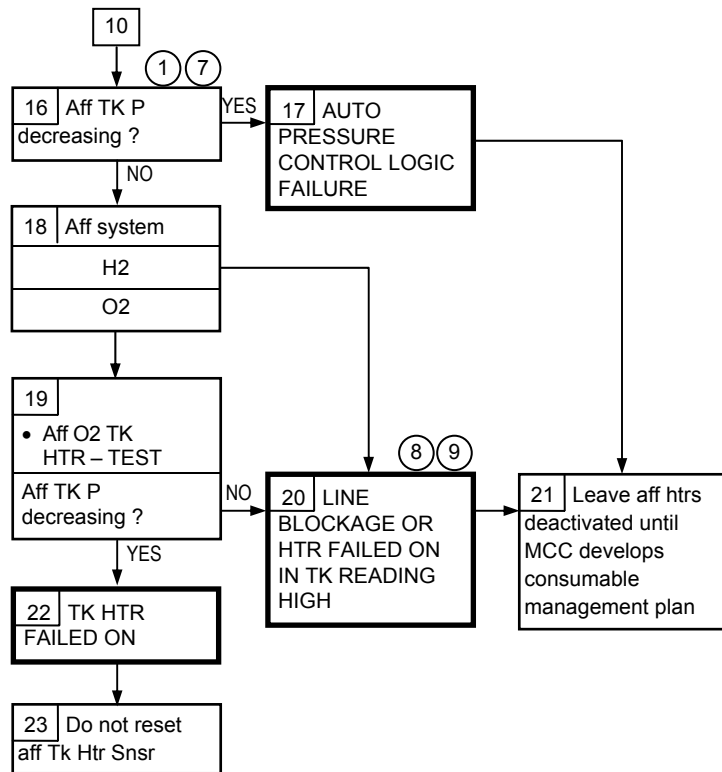




② O2(H2) TK AUTO Control pressure ranges: TK 1/2: 803-854 (200-226) TK 3-5: 832-882 (217-243)

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

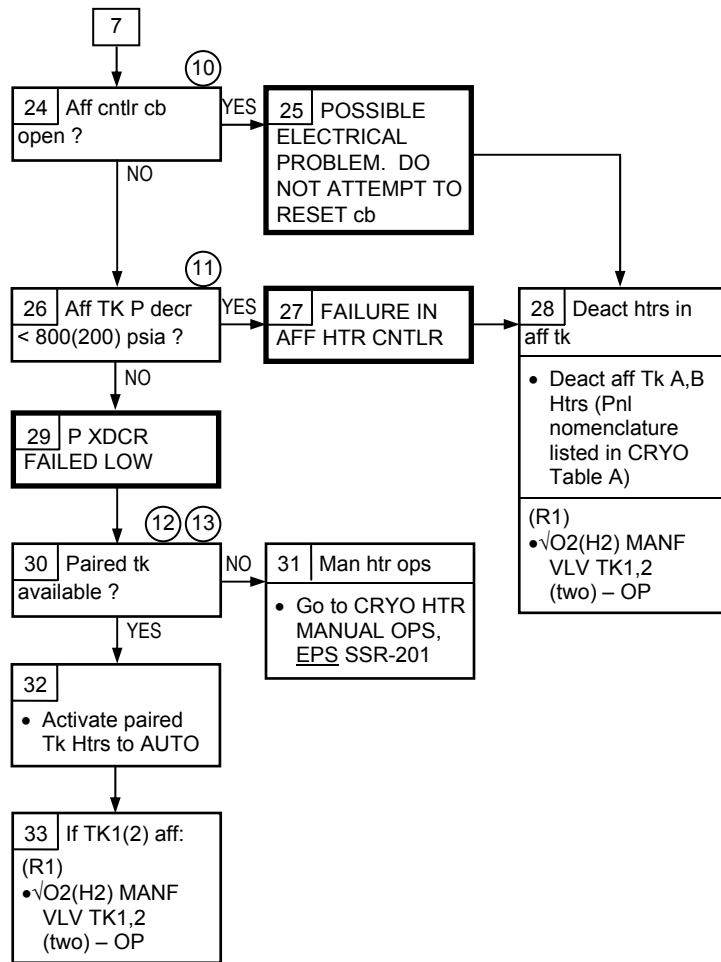


① Use pnl O2 meter for TK P if SM2 not available

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



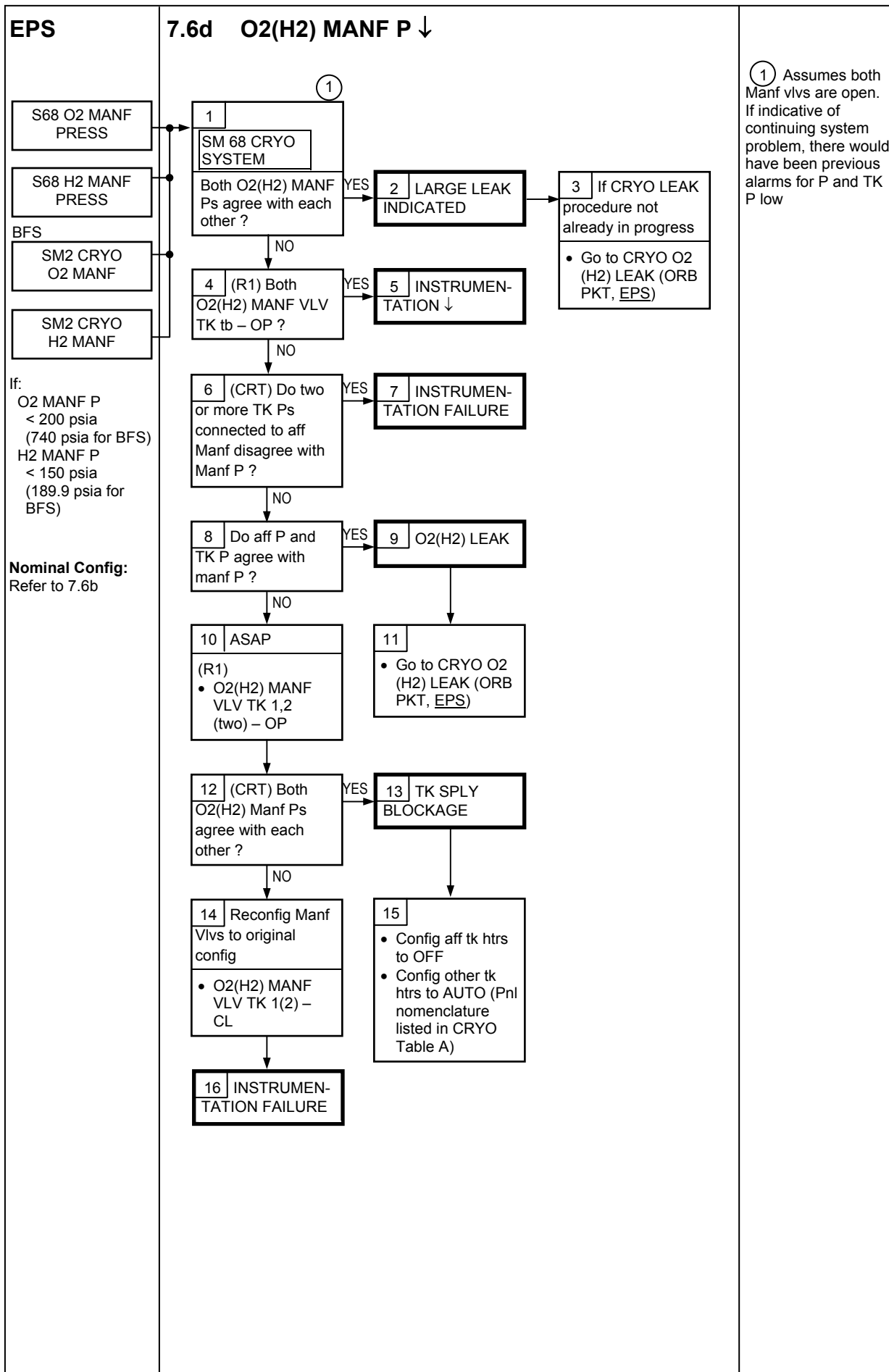
⑩ Check nominal config column for cb location

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
- TK5 not paired

⑬ TKs 1,2 cannot be operated simultaneously if a manifold vlv is closed



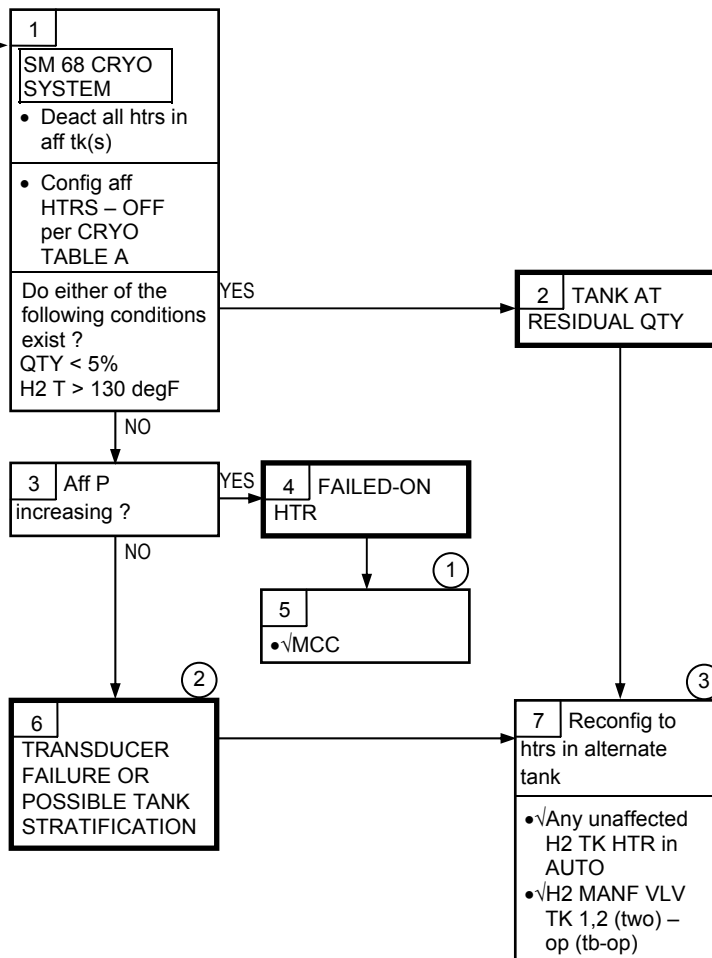
EPS

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)

If:
H2 HTR T
> 210 degF



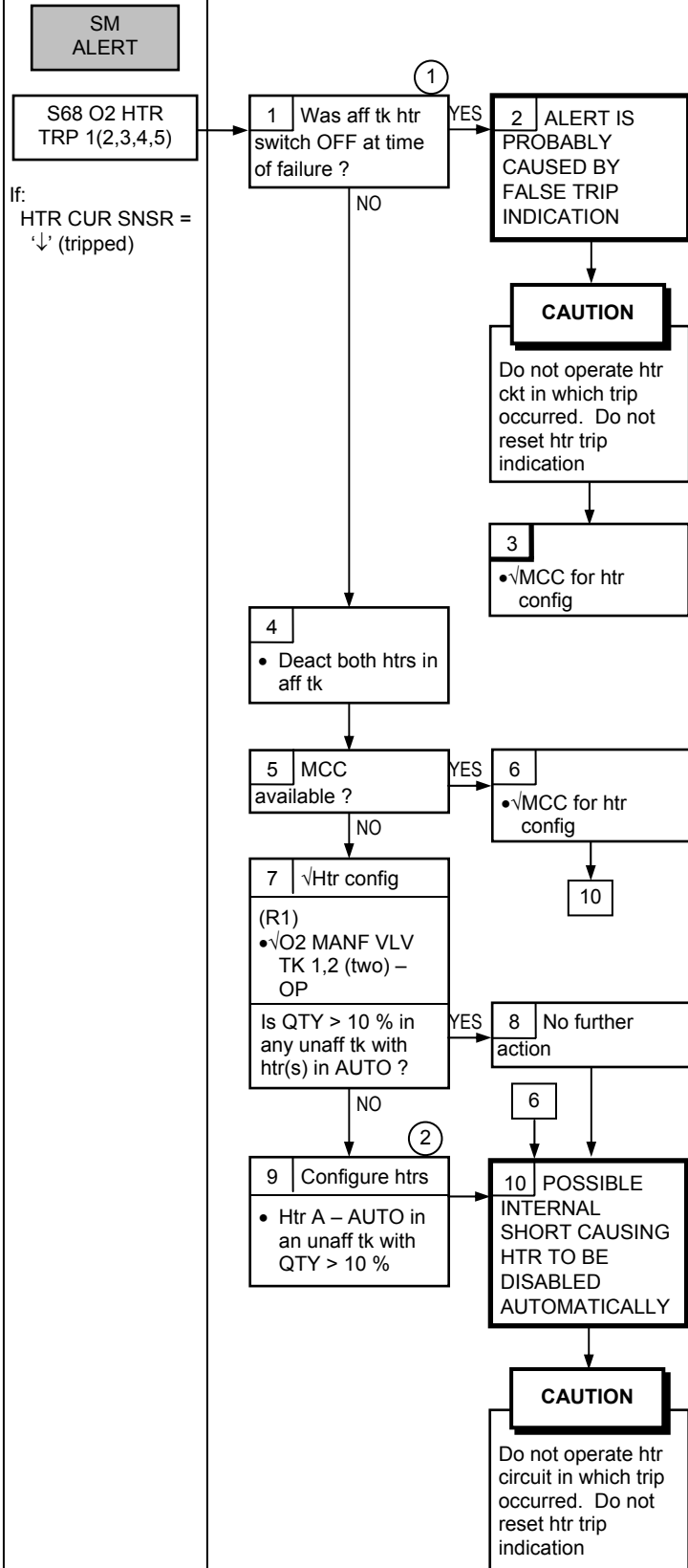
① Failed-on htr may require temporarily dropping a main bus until IFM 'CRYO TANK HEATER FUSE REMOVAL' can be performed. If pressure exceeds 300 psi, overboard relief valve may open

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



① Use CRYO Table A to determine switch nomenclature

② A single htr in an undepleted tk should support vehicle power loads. If manifold pressures cannot be maintained, additional htrs may be required

EPS

7.6I O2 HTR T

From ORB OPS,
EPS, CRYO
O2(H2) PRESS/
TEMP HIGH,
step 4

O2 HEATER
TEMP
(F7)

BACKUP C/W
ALARM
(F7)

If:
O2 HTR T
> 349 degF

S68 O2 HTR T
1(2,3,4,5)

BFS

SM2 CRYO O2
HTR

Nominal Config:
Refer to 7.6b

1
SM 68 CRYO
SYSTEM
Deact all htrs in aff
tk(s)
• Config aff
HTRS – OFF
per CRYO
TABLE A
Do either of the
following conditions
exist?
QTY < 10%
O2 T > 130 degF

2 TANK AT
RESIDUAL QTY

3 Is QTY in aff tk
< 55% and both A,B
Htrs in AUTO ?

4 INSUFFICIENT
QTY FOR DUAL
HTR OPS

5 Config for half
htrs
• (Aff) O2 TK HTR
A – AUTO

6 Are both HTR
T > 349 degF ?

7 SINGLE
HIGH TEMP IS
PROBABLY
INSTRUMENTA-
TION FAILURE

8 Aff P
increasing ?

9 PROBABLE
TANK
STRATIFICATION

10 Reconfig to
htrs in alternate
tank
•√Any unaffected
O2 TK HTR A in
AUTO
•√O2 MANF VLV
TK 1,2 (two) –
op (tb-op)

11
(R1)
• (Aff) O2 TK
HTRS – TEST
Aff TK P still
increasing ?

12 FAILED-ON
HTR

13
•√MCC

14 FAILED ON
HTR NOW
DEACTIVATED.
DO NOT RESET
TK HTR SNSR

15 Inhibit Aff TK HTR T HARDWARE C/W

HTR 1		HTR 2	
TANK 1	CH 001	TANK 1	CH 011
TANK 2	CH 021	TANK 2	CH 031
TANK 3	CH 041	TANK 3	CH 051
TANK 4	CH 061	TANK 4	CH 071
TANK 5	CH 081	TANK 5	N/A

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 has
no associated
hardware C/W

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EPS

7.7a OPCU CH AMPS ↑

SM
ALERT

S179
OPCU 1(2)
CH A(B) AMPS

If PTU 1(2) OPCU
A(B) AMPS > 75

Dual PTU Config:
(A15)
cb CNTL PWR PTU
1,2 (two) – cl
PTU/MAIN BUS A,B
(two) – ON
OPCU 1,2 CONV
(two) – ON

Single PTU Config:
(A15)
cb CNTL PWR PTU
1(2) – cl
PTU/MAIN BUS
A(B) – ON
OPCU 1(2) CONV –
ON

1 √OPCU CONV
VOLTS

SM 179 POWER
TRANSFER

Are Aff PTU 1(2)
OPCU A(B) OUT
VOLTS < 27.5 ?

NO

2 SENSOR
FAILURE

①

YES

4 POSSIBLE
SHORT ON
PTU/MAIN BUS
CABLING

3
• Continue nominal
ops

5 Deactivate aff
OPCU and
disconnect aff PTU
from MN Bus

(A15)
• OPCU 1(2)
CONV – OFF
• √cb CNTL PWR
PTU 1(2) – cl
• PTU/MAIN BUS
A(B) – OFF
(tb-OFF)

6
• √MCC

① The OPCU
output current should
not be greater than
75 unless its output
voltage is low (output
power capability
equals ~ 2kw per
channel)

EPS

7.7b OPCU CH OUTPUT VOLTS ↓

SM
ALERT

S179
OPCU 1(2)
CH A(B) VOLT

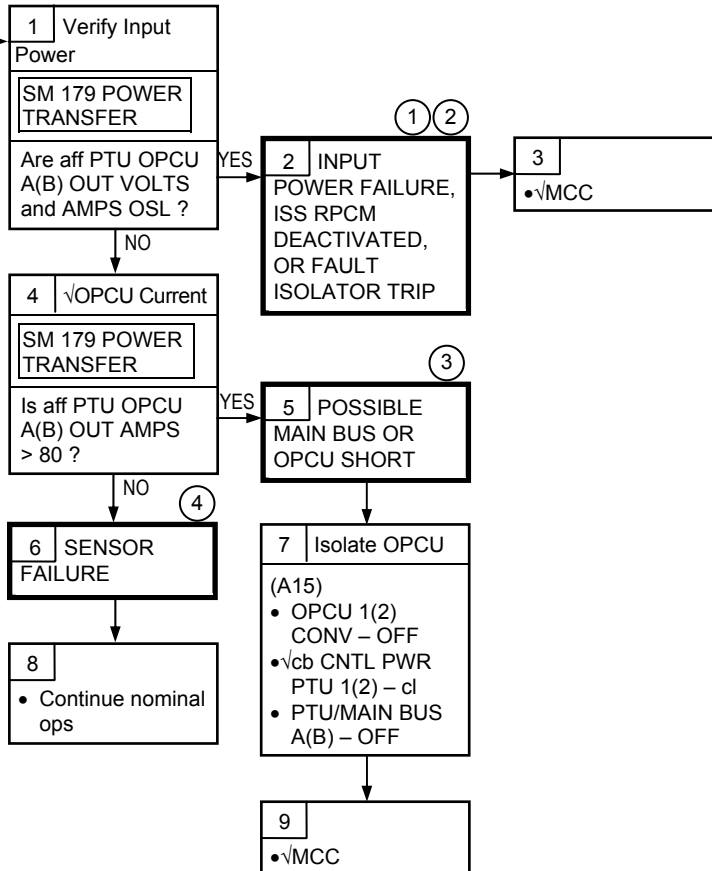
If PTU 1(2) OPCU
A(B) VOLT < 27.0

Dual PTU Config:

(A15)
cb CNTL PWR PTU
1,2 (two) – cl
PTU/MAIN BUS A,B
(two) – ON
OPCU 1,2 CONV
(two) – ON

Single PTU Config:

(A15)
cb CNTL PWR PTU
1(2) – cl
PTU/MAIN BUS
A(B) – ON
OPCU 1(2) CONV –
ON

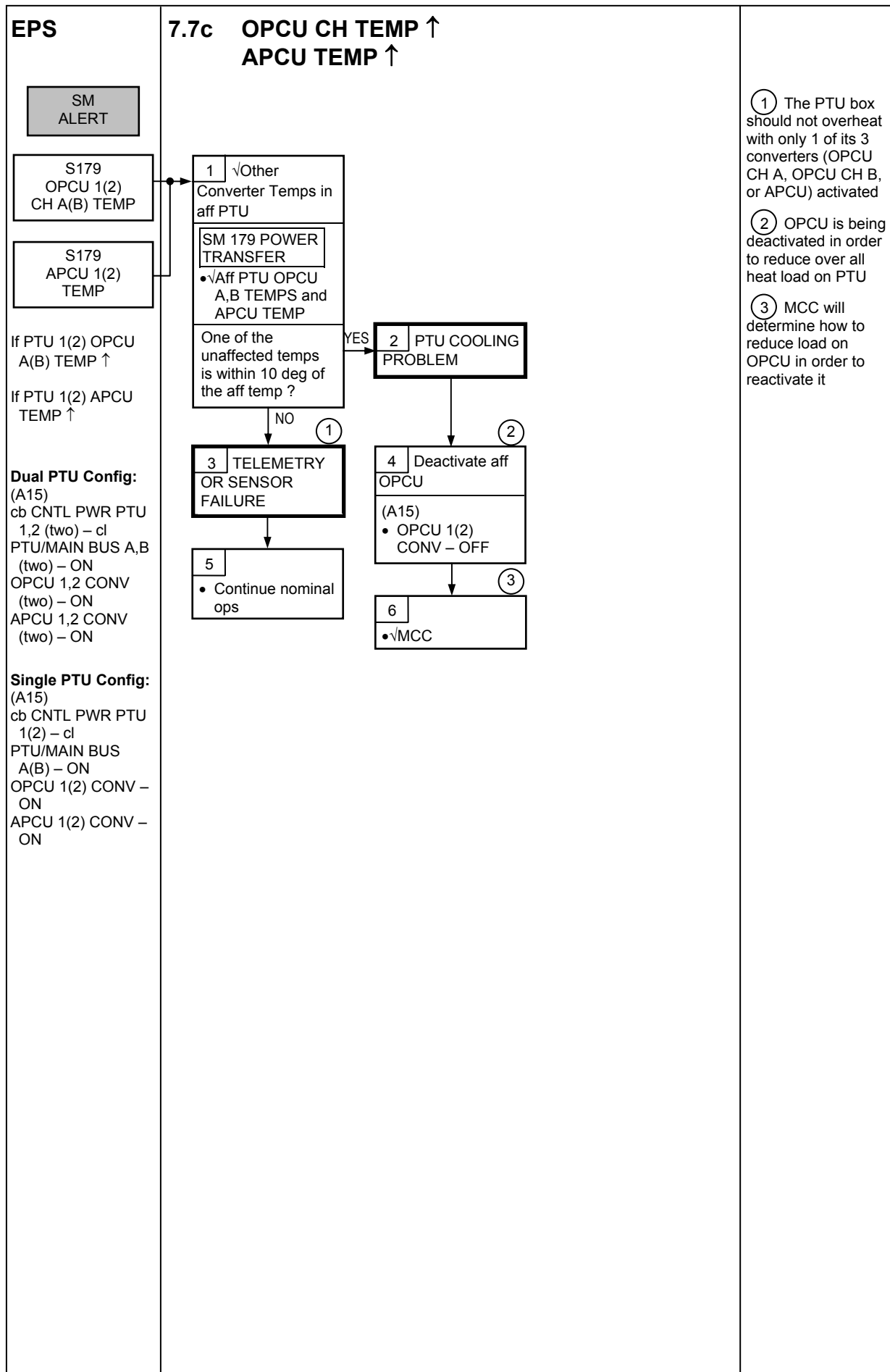


① Telemetry for each OPCU Channel requires 120 V house keeping power. If ISS Input Power removed, Telemetry will read OSL ('L')

② For Fault Isolator trip, input power (ISS RPCMs) must be cycled to reset the Fault Isolator circuit

③ If PTU connected to Main Bus, possible Main Bus SHORT

④ OPCU VOLT Class 3 FDA may cause erroneous alarms and is unreliable. MCC will inhibit Class 3 FDA via TMBU



EPS

7.7d OPCU CH OUT OVER VOLT (O OV) TRIP

SM
ALERT

S179
OPCU 1(2)
CH A(B) O OV

OPCU TRIP = OUT
OV if Output Volts
> 32 volts

Dual PTU Config:

(A15)
cb CNTL PWR PTU
1,2 (two) – cl
PTU/MAIN BUS A,B
(two) – ON
OPCU 1,2 CONV
(two) – ON

Single PTU Config:

(A15)
cb CNTL PWR PTU
1(2) – cl
PTU/MAIN BUS
A(B) – ON
OPCU 1(2) CONV –
ON

1 OPCU CONV
AMPS

SM 179 POWER
TRANSFER

• Aff PTU 1(2)
OPCU A and B
OUT AMPS > 0

• Either aff PTU
1(2) OPCU A or B
OUT AMPS > 0

• Aff PTU 1(2)
OPCU A and B
OUT AMPS = 0

2 TLM FAILURE

1

3 PROTECTION
CIRCUIT OR TLM
FAILURE

4
• Continue nominal
ops

5 Isolate aff
OPCU

If APCU 1(2)
activated:
On MCC Go:
(A15)

• APCU 2(1)
CONV – ON
• APCU 1(2)
CONV – OFF

Isolate aff OPCU

• OPCU 1(2)
CONV – OFF
• cb CNTL PWR
PTU 1(2) – cl
• PTU/MAIN BUS
A(B) – OFF
(tb-OFF)

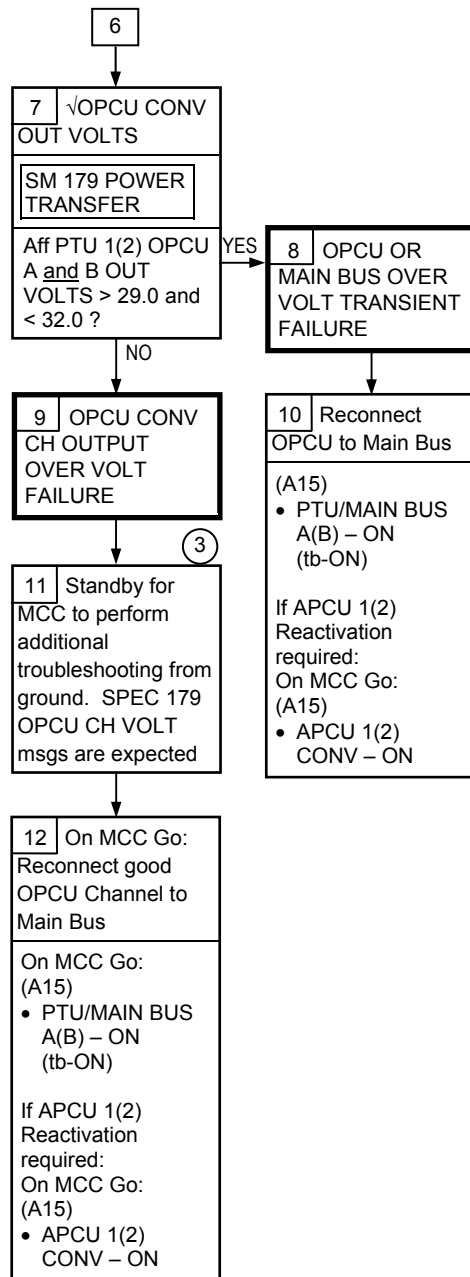
6 On MCC Go:
Reset OPCU CONV

(A15)
• OPCU 1(2)
CONV – ON

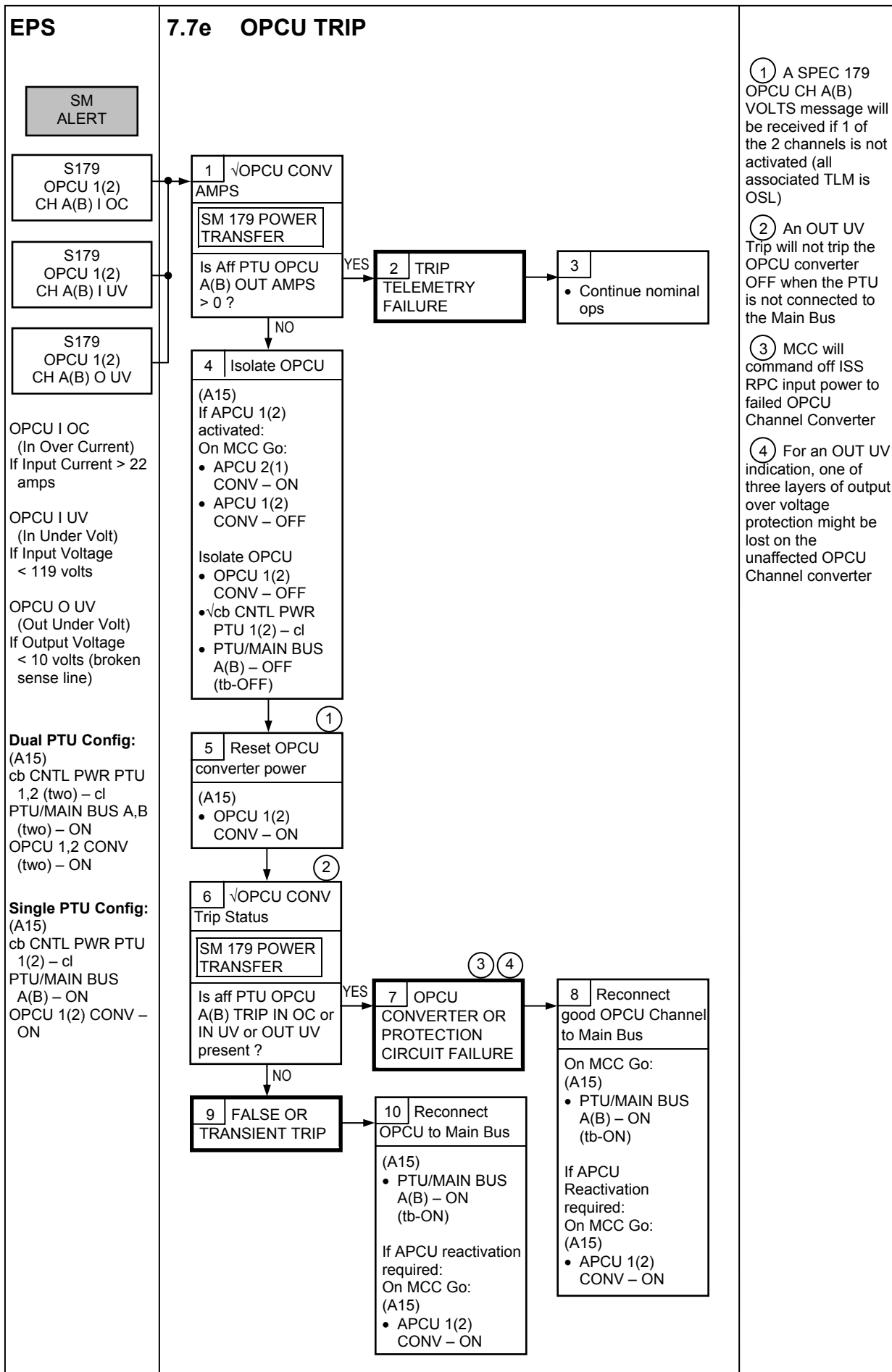
7

1 An OPCU
'Output Over
Voltage' will cause
both OPCU channels
A and B to trip. If
single OPCU
channel is failed
power transfer can
continue using other
channel

2 A SPEC 179
OPCU CH A(B)
VOLT message will
be received if 1 of
the 2 channels is not
activated (all
associated TLM is
OSL)

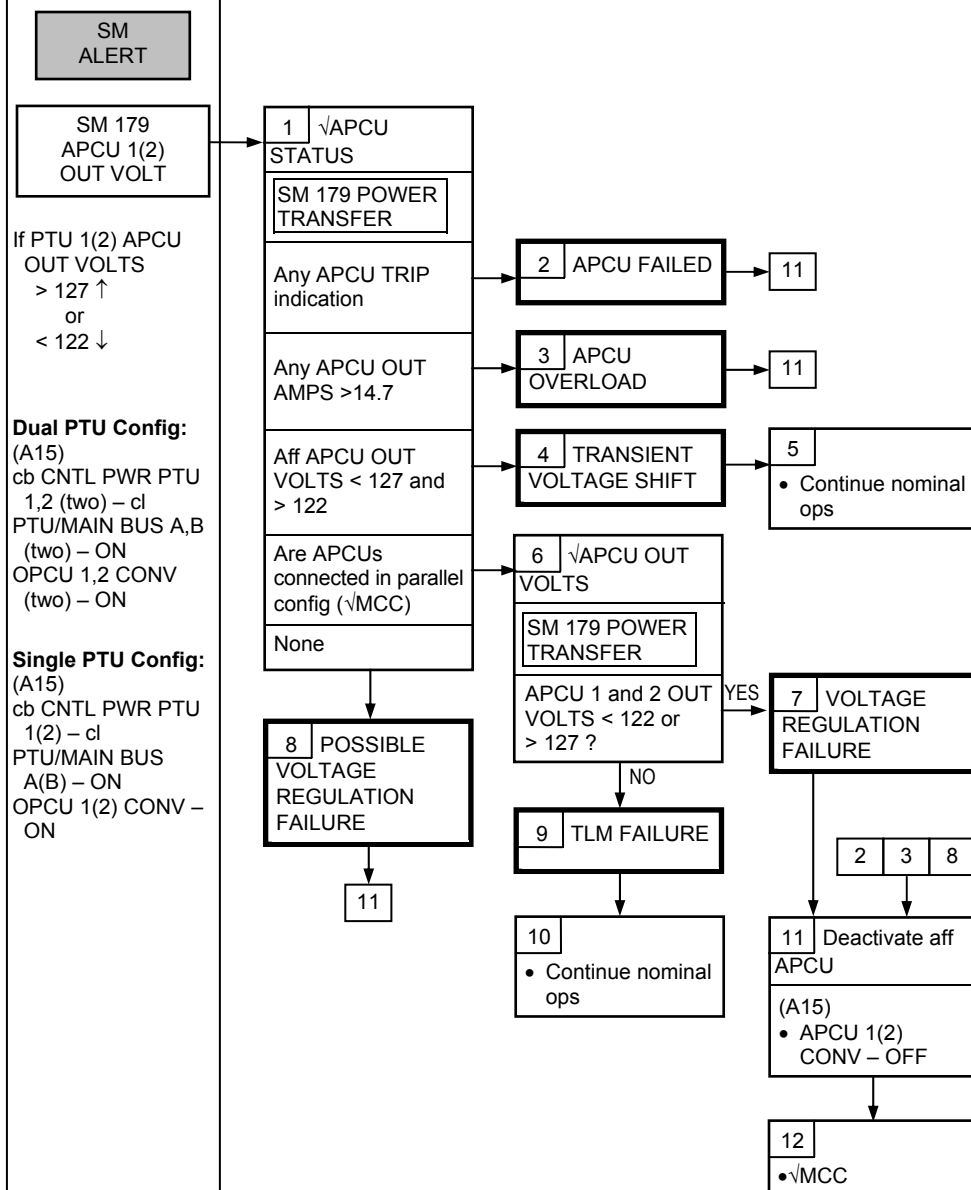


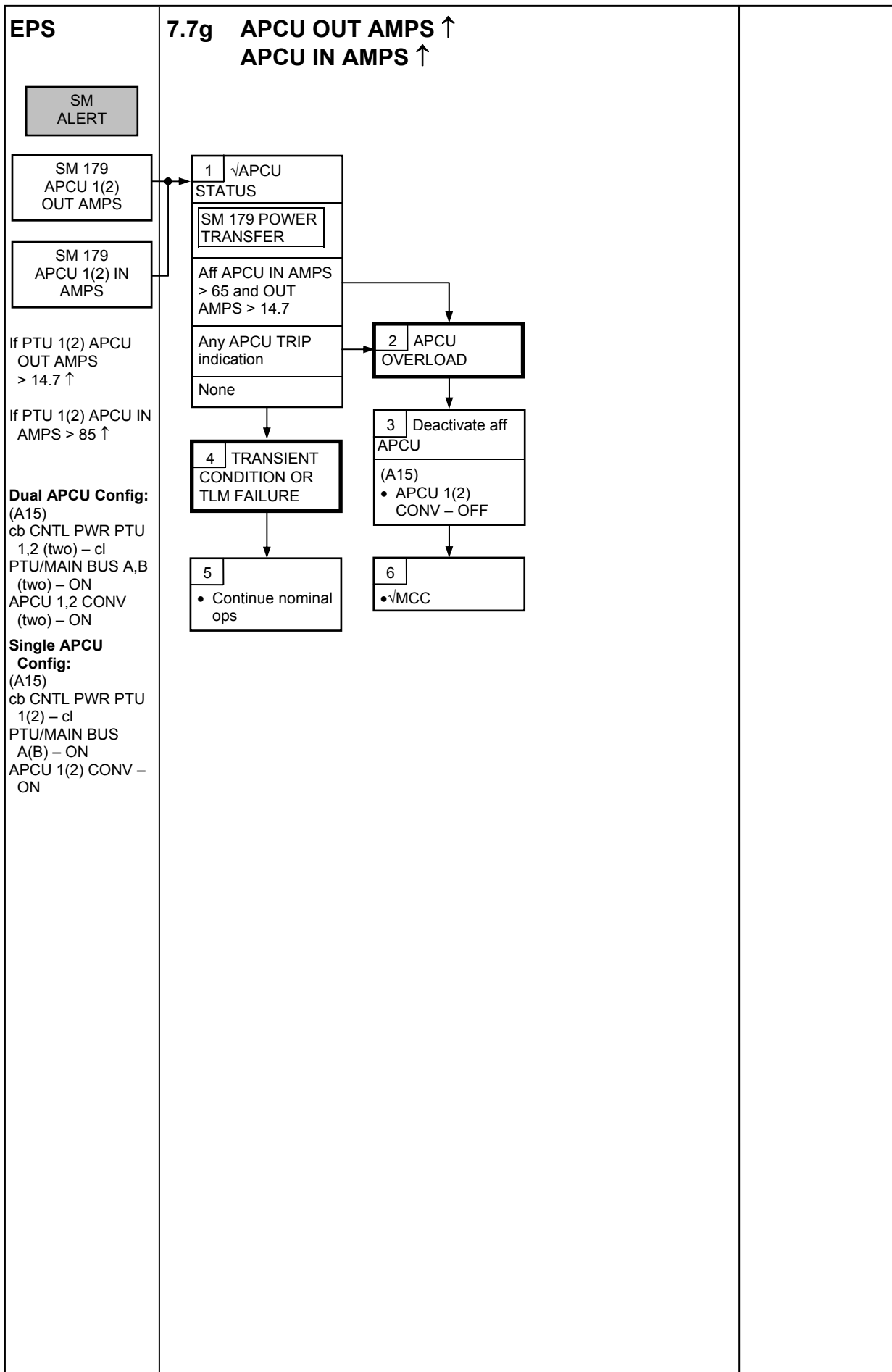
3 If both OPCU CH A and CH B converters are activated, MCC will command ISS RPC input power off one at a time to determine which OPCU converter (Channel A or B) is failed. If only one OPCU converter is activated, MCC will determine desired reconfiguration

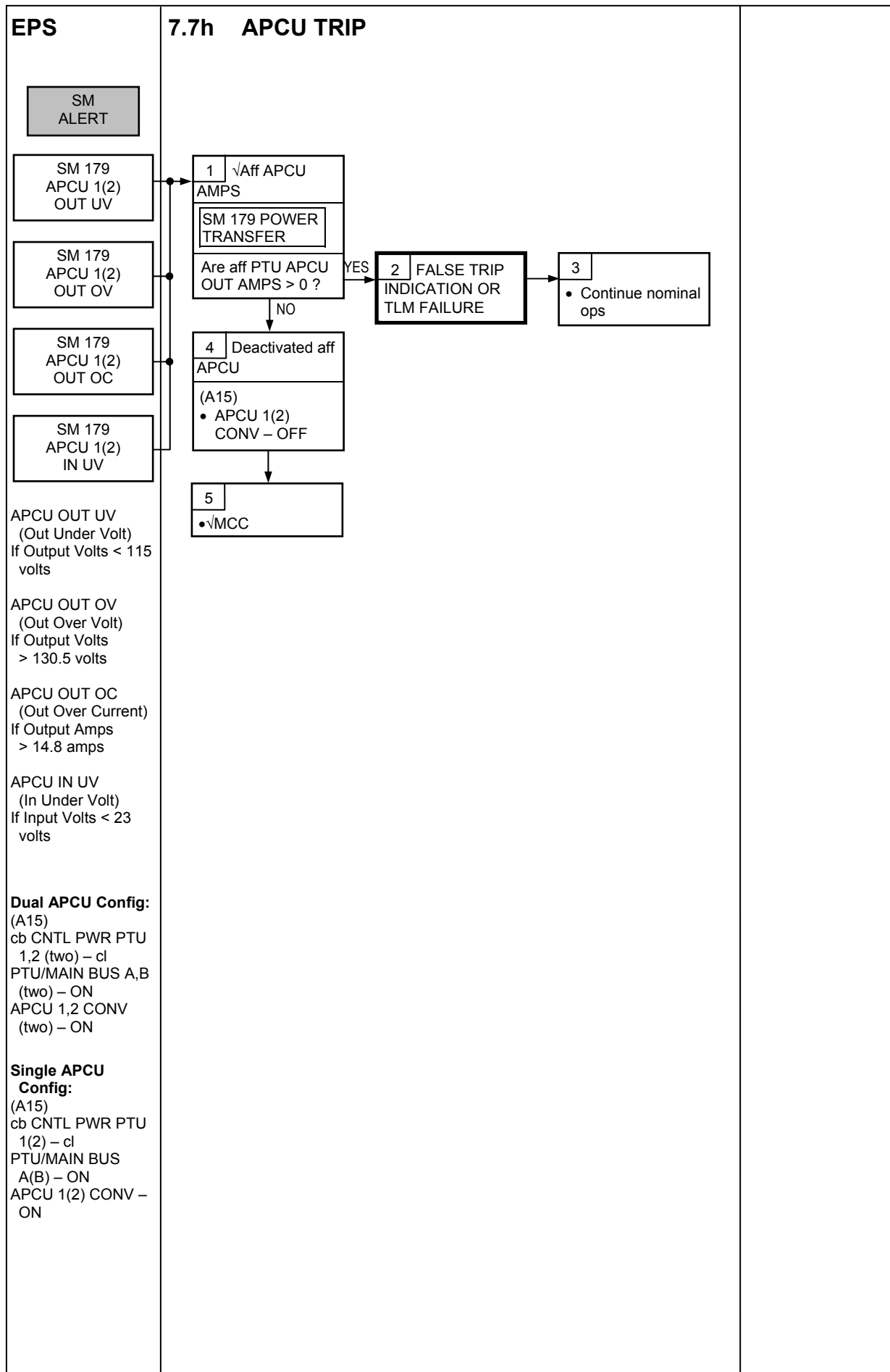


EPS

7.7f APCU 1(2) OUT VOLTS ↑↓







APCU

7.7i APCU AMPS ↑

SM
ALERT

S200 APCU 1(2)
AMPS HIGH

If any APCU CONV
AMPS ≥ 8.5

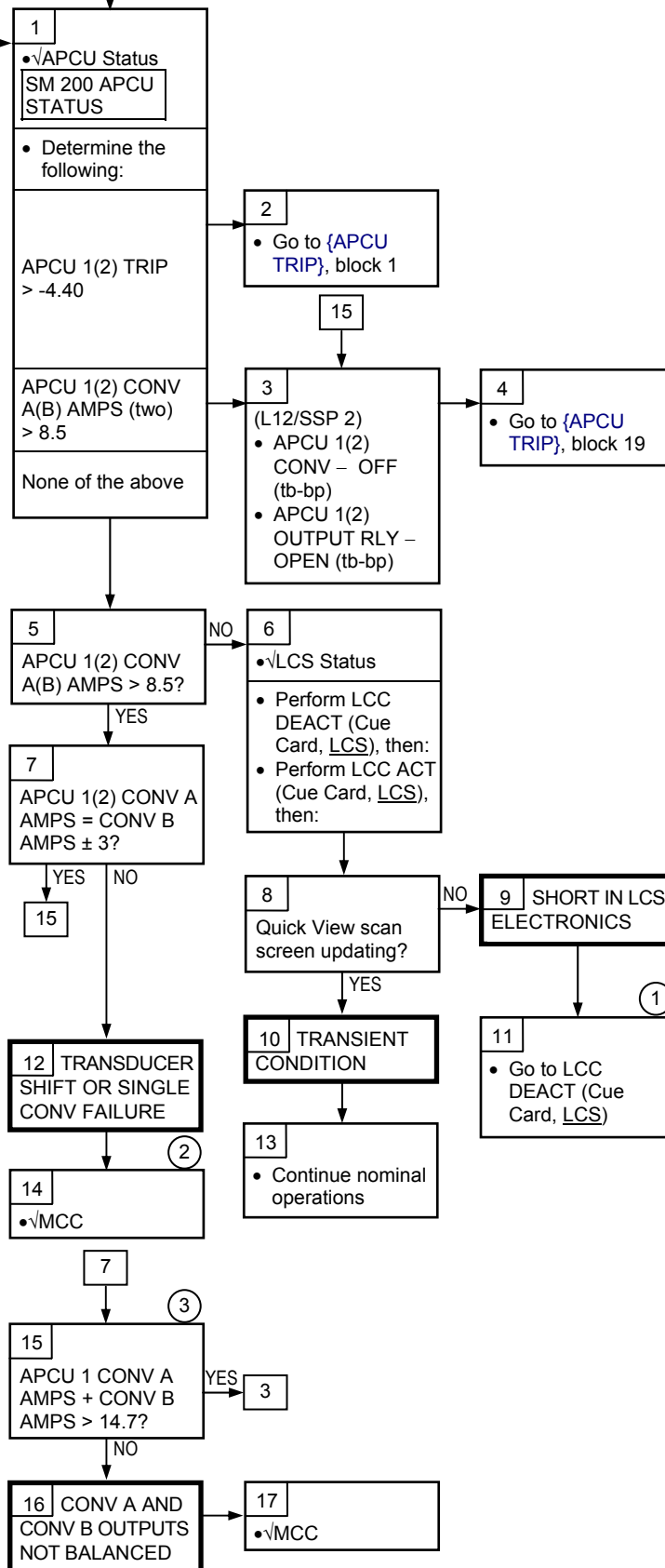
Nominal Config:

(R1)
PRI PL MNC – ON
(tb-ON)
PL CAB –
MNA(MNB)
PL AUX – ON
PL AFT MNB – ON
(L12/SSP 2)
cb SW PWR 1 – cl

Nominal APCU

Activated Config:
L12 (SSP 2)
APCU 1 CONV – ON
(tb-gray)
APCU 1 OUTPUT
RLY – CLOSE
(tb-gray)

{APCU TEMP ↓↑}, block 3
{APCU VOLTS ↓↑}, block 3



① APCU 1 and 2
provide redundant
power to LCS when
OBSS is on the RMS

② MCC will
determine between a
transducer shift and
a real circuitry failure

③ Total output for
each APCU must be
maintained less than
14.7 amps and each
CONV output must be
maintained less than
8.5 amps

APCU

SM
ALERT

S200 APCU 1(2)
VOLT LMT

If APCU VOLTS
RES HIGH ≥ 126.5
or ≤ 122

Nominal Config:

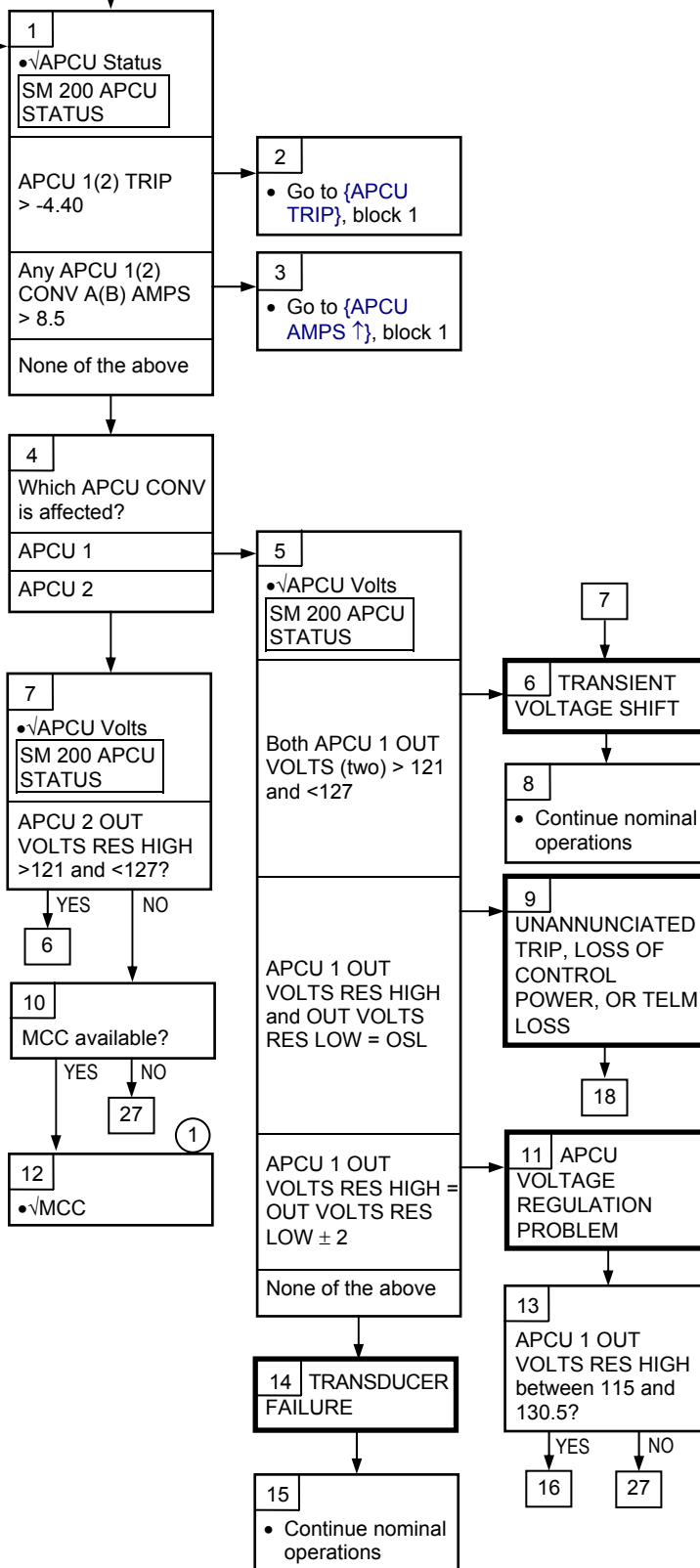
(R1)
PRI PL MNC – ON
(tb-ON)
PL CAB –
MNA(MNB)
PL AUX – ON
PL AFT MNB – ON
L12 (SSP 2)
cb SW PWR 1 –
Close

Nominal APCU Activated Config:

L12 (SSP 2)
APCU CONV 1 –
ON (tb-gray)
APCU 1 OUTPUT
RLY – CLOSE
(tb-gray)

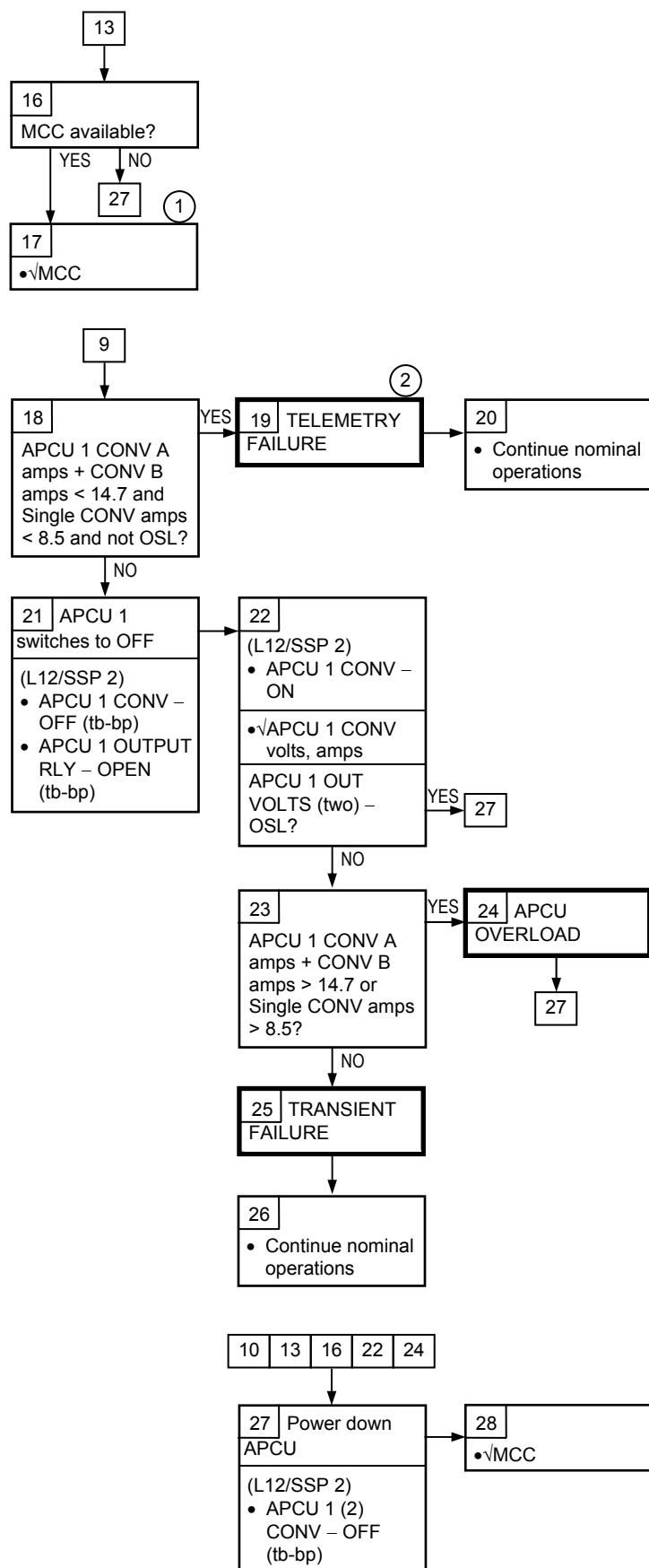
7.7j APCU VOLTS $\uparrow\downarrow$

{APCU TEMP $\uparrow\downarrow$ }, block 4



① SPEC voltage for APCU is 122 to 126.5 volts. If APCU volts are outside this range but stable and usable, consideration will be given to continuing APCU operation

APCU 7.7j (Cont)



① SPEC voltage for APCU is 122 to 126.5 volts. If APCU volts are outside this range but stable and usable, consideration will be given to continuing APCU operation

② There is a single point failure that will cause both the HIGH and LOW RES VOLTS to read low (broken wire)

APCU

7.7k APCU TEMP ↓↑

SM
ALERT

S200 APCU 1(2)
TEMP HIGH

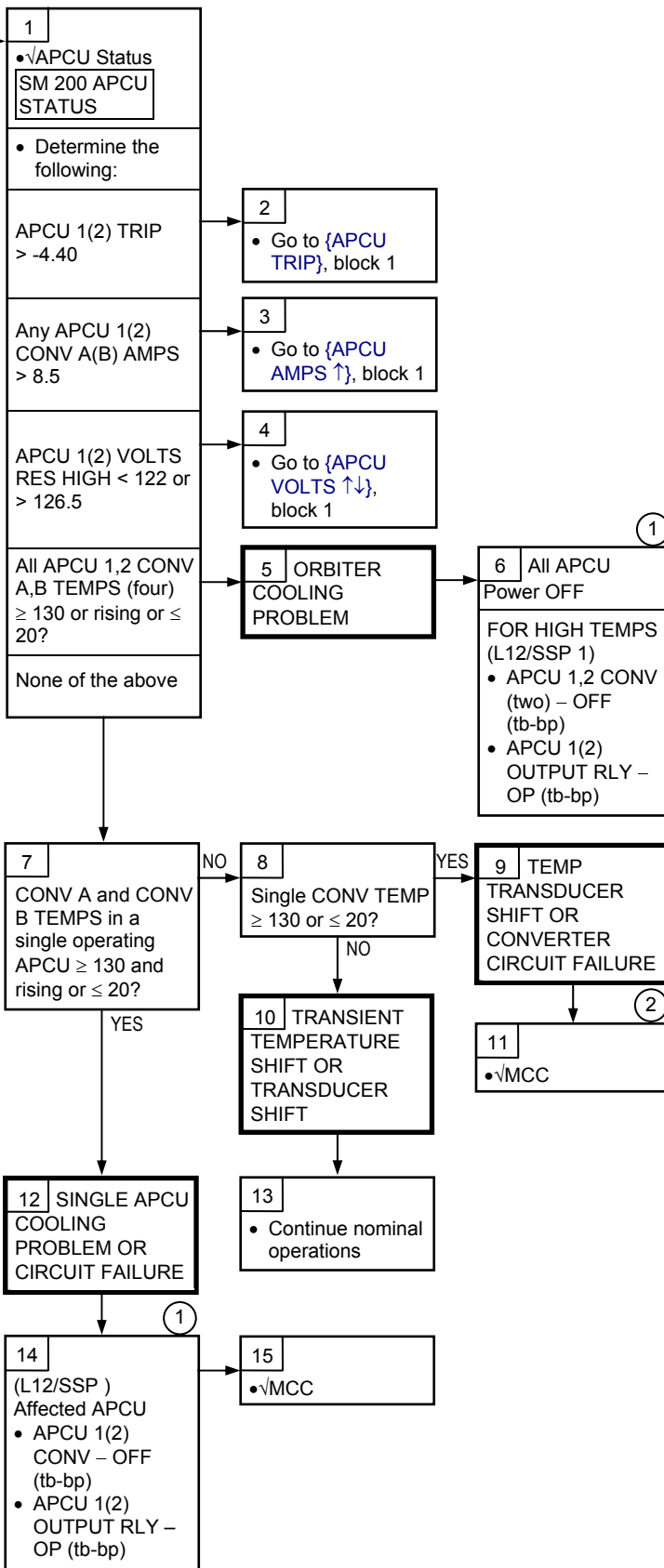
If APCU 1(2) CONV
TEMP A(B) ≤ 20 or
 ≥ 130

Nominal Config:

(R1)
PRI PL MNC – ON
(tb-ON)
PL CAB –
MNA(MNB)
PL AUX – ON
PL AFT MNB – ON
L12 (SSP 2)
cb SW PWR 1
(CB2) – Close

Nominal APCU

Activated Config:
L12 (SSP 2)
APCU 1 CONV – ON
(tb-gray)
APCU 1 OUTPUT
RLY – CLOSE
(tb-gray)

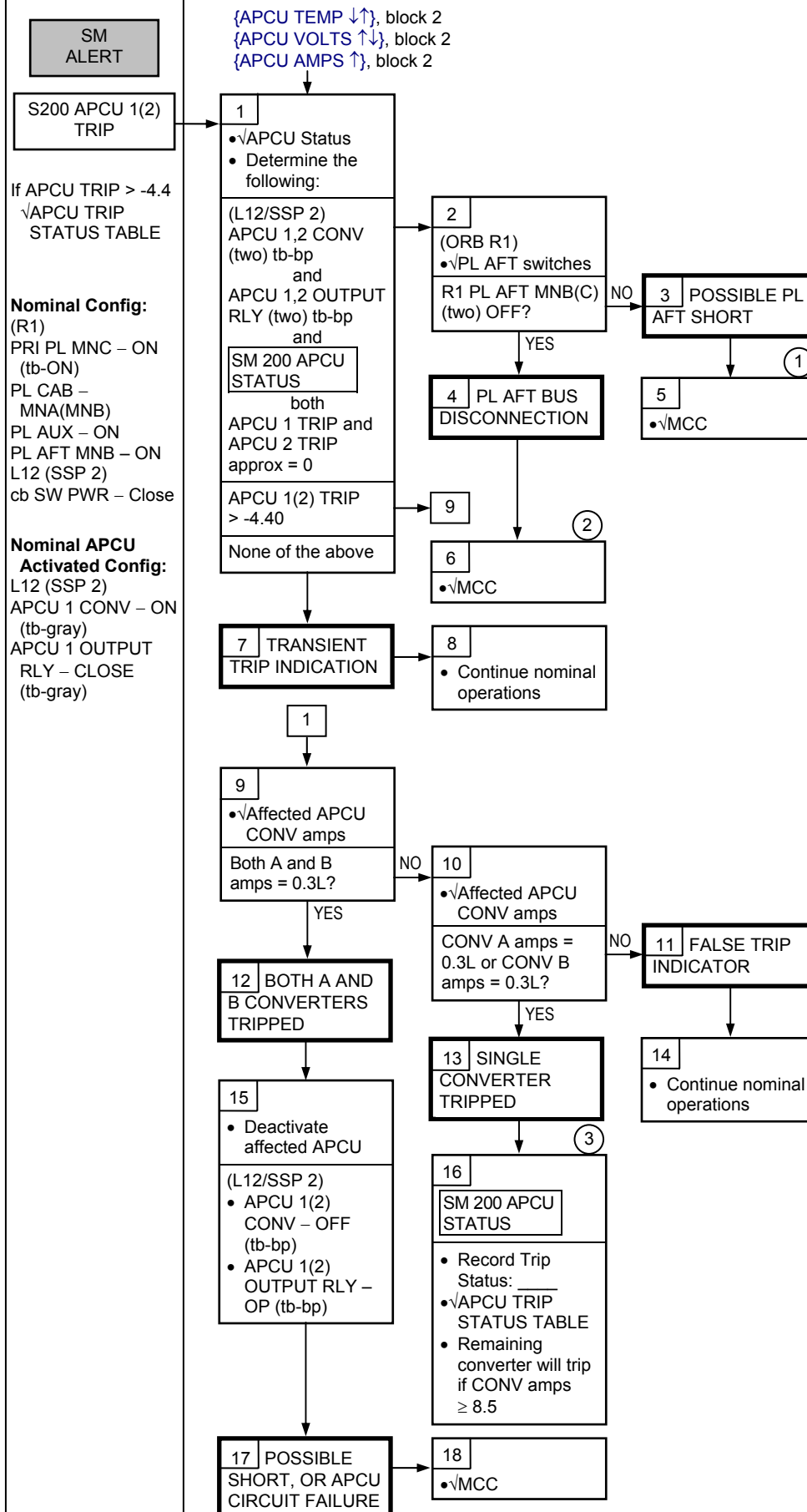


① Loss of APCU 1 or 2 results in loss of redundant 120 V power to LCS/IDC

② MCC will determine between a transducer shift and a real circuitry failure

APCU

7.71 APCU TRIP

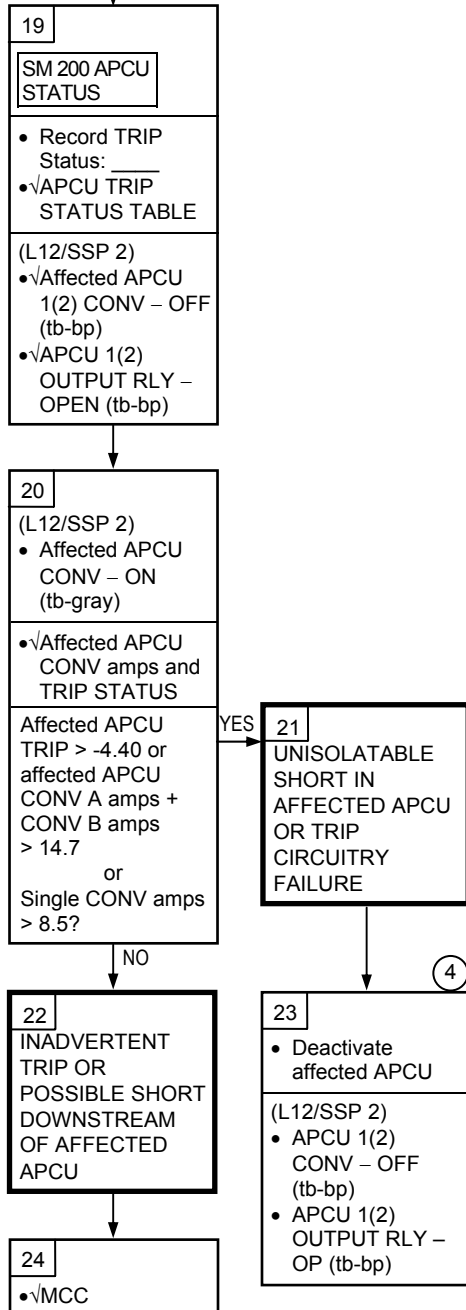


- ① MCC will determine cause of interruption of power or signal to the APCUs
- ② MCC will coordinate recovery of the PL AFT bus and equipment
- ③ LCS/IDC is redundantly powered from APCU 1 & 2

APCU

7.7I (Cont)

ON MCC GO Only: Recovery Attempt with APCU Power Cycle
 {APCU AMPS ↓↑}, block 4



④ Loss of APCU 1 or 2 results in loss of redundant 120 volt power for LCS/IDC

Table 1. APCU Trip Status

TRIP (STATUS VOLTAGE)	TRIP CAUSE(S)			
	OV	OUV	OC	IUV
+4.88	X	X	X	X
+4.23	X	X	X	
+3.59	X	X		X
+2.95	X	X		
+2.27	X		X	X
+1.62	X		X	
+0.98	X			X
+0.34	X			
-0.30		X	X	X
-0.95		X	X	
-1.59		X		X
-2.23		X		
-2.91			X	X
-3.56			X	
-4.20				X
-4.86 (no trip)				
NOTE OV: Output Overvoltage OUV: Output Undervoltage OC: Output Overcurrent IUV: Input Undervoltage Tolerance for all reported voltages is $\pm 0.20V$				

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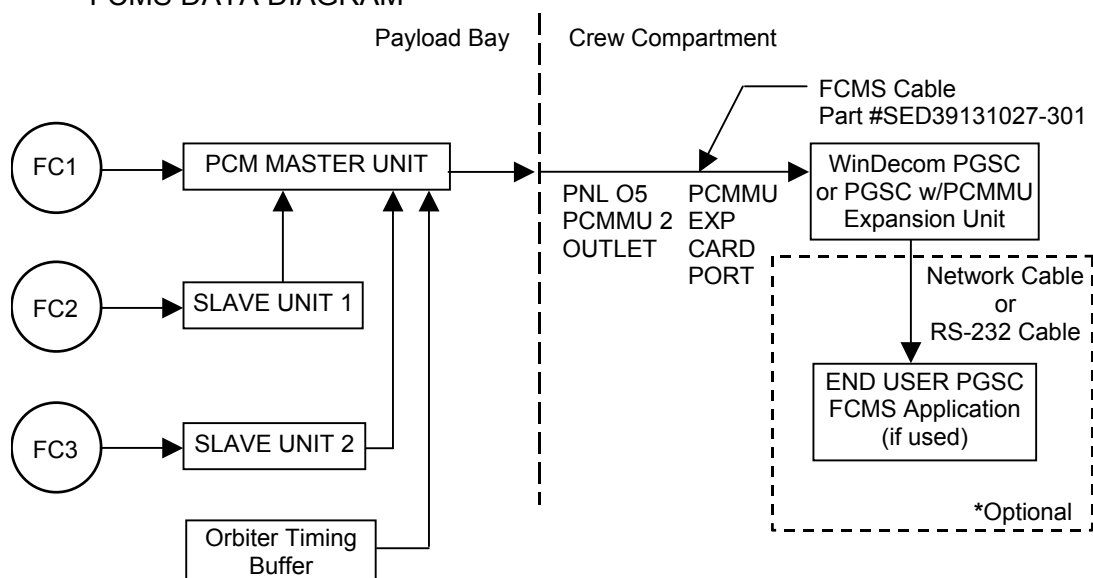
EPS SSR-1 FC MONITORING SYS (FCMS) OPS

NOTE

The FCMS application has capability to display FC single cell voltages and also to record those cell voltages in ASCII 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 format fcDDDHMM.fcv or fcDDDHMM.ZIP where "DDDHMM" references the GMT of the first data point of the file. Data files recorded 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

- WinDecom PGSC or PGSC with PCMMU Expansion Unit
- Any End User Networked PGSC using network cable
- Any End User PGSC connected to WinDecom serial port (com 1) using RS232Y Cable

ACTIVATION

- On PGSC with PCMMU Expansion Unit to be used for FCMS operations, terminate all applications using Telemetry Server, and verify Telemetry Server not active (no green "GO," yellow "TFL," or red "STOP") sign in lower right corner of PGSC display

If using WinDecom PGSC:

- Double-click 'Shuttle Apps' > 'WinDecom' > 'WinDecom shutdown'
- Sel 'OK' to shutdown Telemetry System
- Disconnect PCMMU cable from PCMMU expansion card port on WinDecom PGSC
- If reqd, disconnect PCMMU cable from pnl O5 PCMMU 2 outlet

NOTE

FCMS cable pin out is different than standard PCMMU data cable

EPS SSR-1 (Cont)

6. Connect FCMS cable from pnl O5 PCMMU 2 outlet to PCMMU expansion card port on PGSC that will run WinDecom-FCMS
- ML86B:E 7. cb MNA FC PCM – cl

Starting WinDecom-FCMS

8. Double-click 'Shuttle Apps' > 'WinDecom' > 'WinDecom-FCMS'
9. Expect TLM Monitor, TLM Pkt-net, and TLM Pkt-com windows to appear (possibly minimized). Data should be incrementing in TLM Pkt-net window

FCMS Application

10. Double-click 'Shuttle Apps' > 'Fuel Cell Monitoring'
11. Verify data being received on crew FCMS display (data updating and GMT incrementing on FCMS display, green "GO" sign in lower right hand corner of PGSC display)

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)
16. When recording is complete, notify MCC. The zip data file is in the C:\SPOCAPPS\FCMS directory

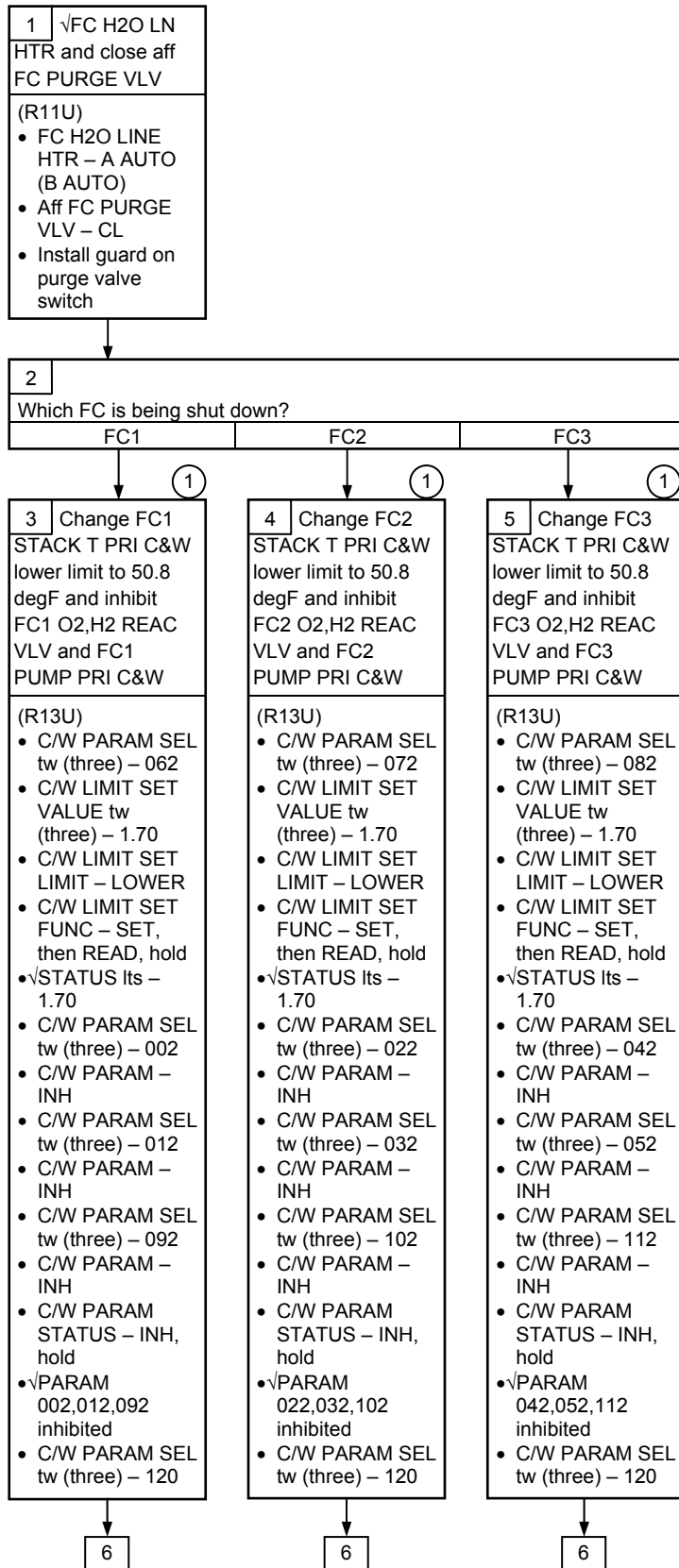
If fuel cell open circuit voltage recording was performed, on MCC GO:

17. FC/MN BUS ____ – ON
18. ESS BUS SOURCE FC ____ – ON
19. Bus Tie config per MCC

DEACTIVATION

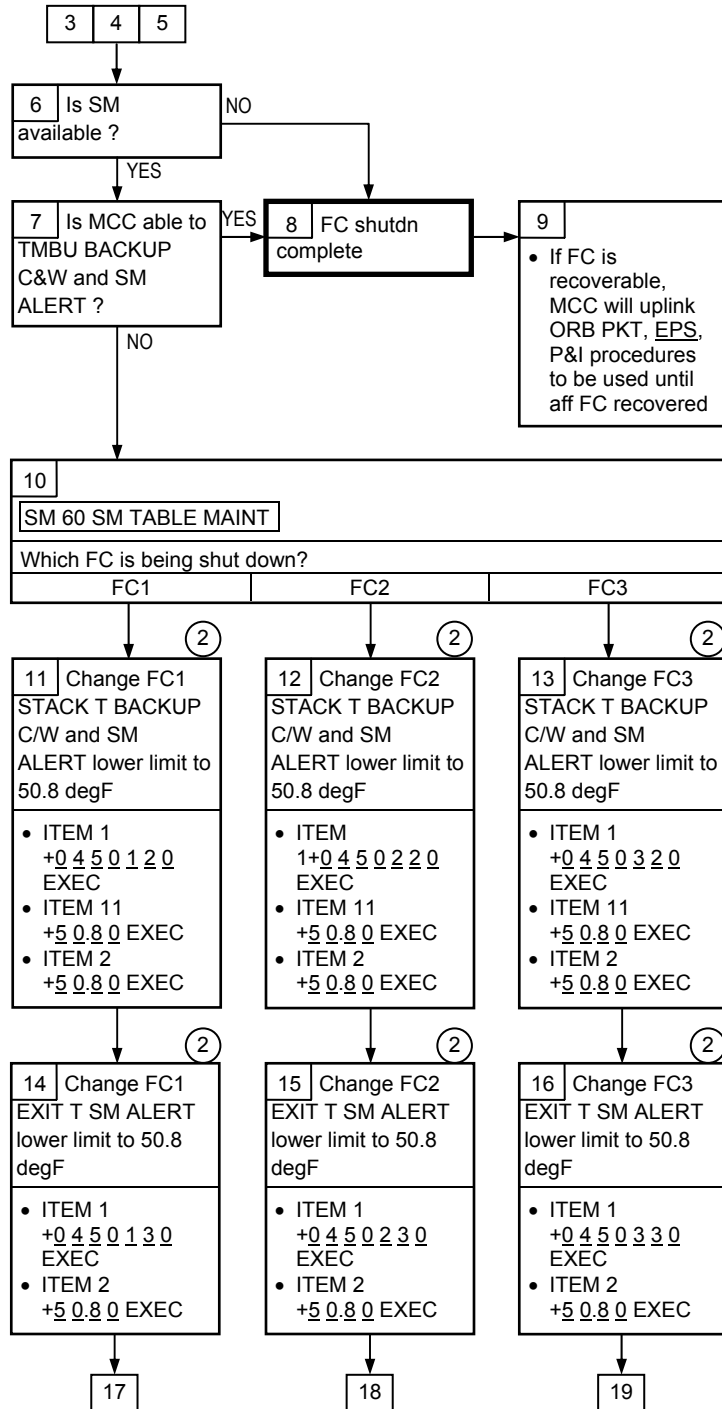
- ML86B:E 1. cb MNA FC PCM – op
2. Close FCMS application
3. Double-click 'Shuttle Apps' > 'WinDecom' > 'WinDecom Shutdown'
4. Disconnect and stow FCMS cable
5. Reconfigure WinDecom PGSC as reqd per WINDECOM OPS (ORB OPS, PGSC)

EPS SSR-3 **FC SHUTDN C&W LIMIT CHANGE**



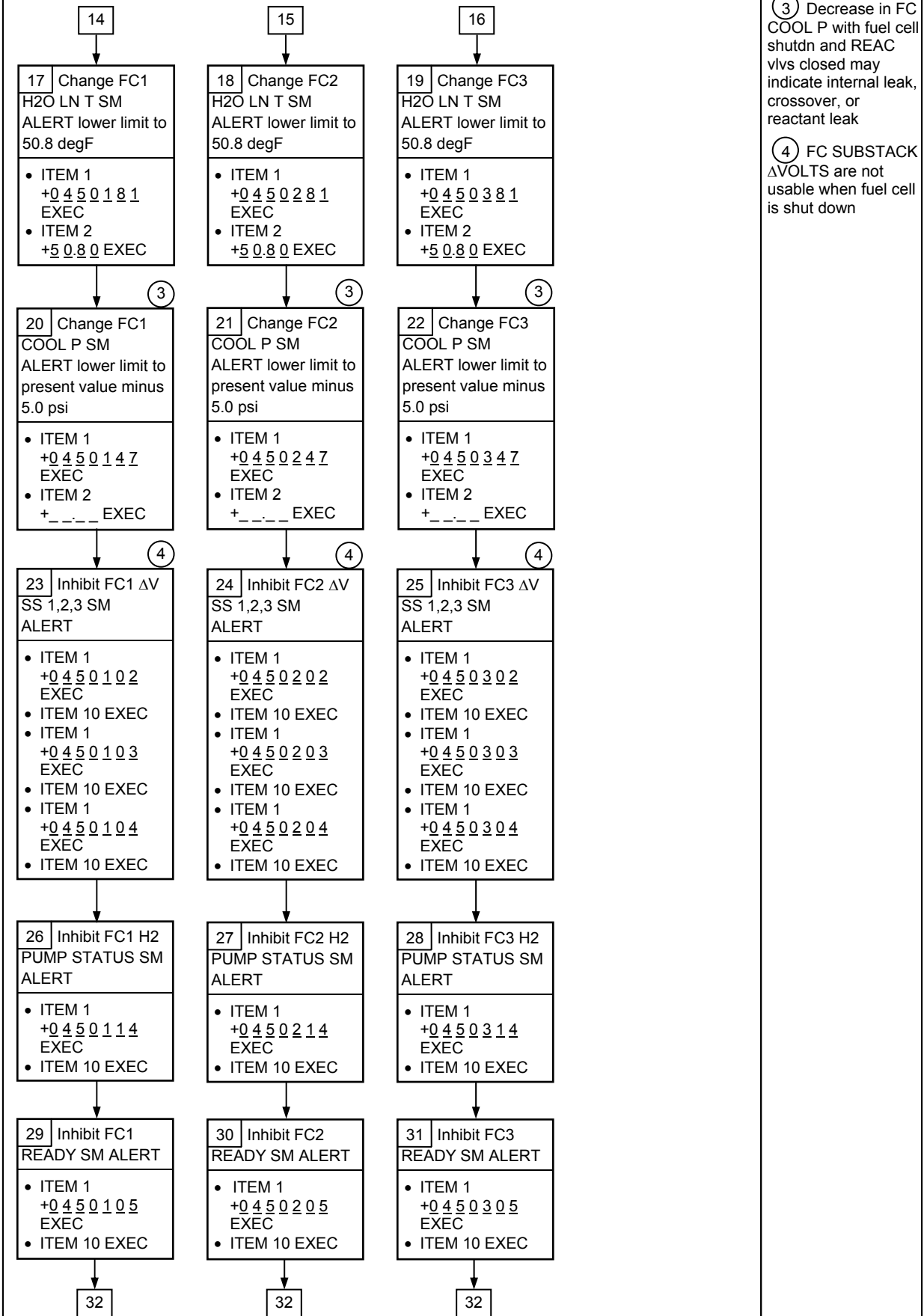
① Lower limit on FC temp during cooldown is 48 degF to protect from ice formation. Closest value > 48 degF that PRI C&W system can be set is 50.8 degF

EPS SSR-3 (Cont)

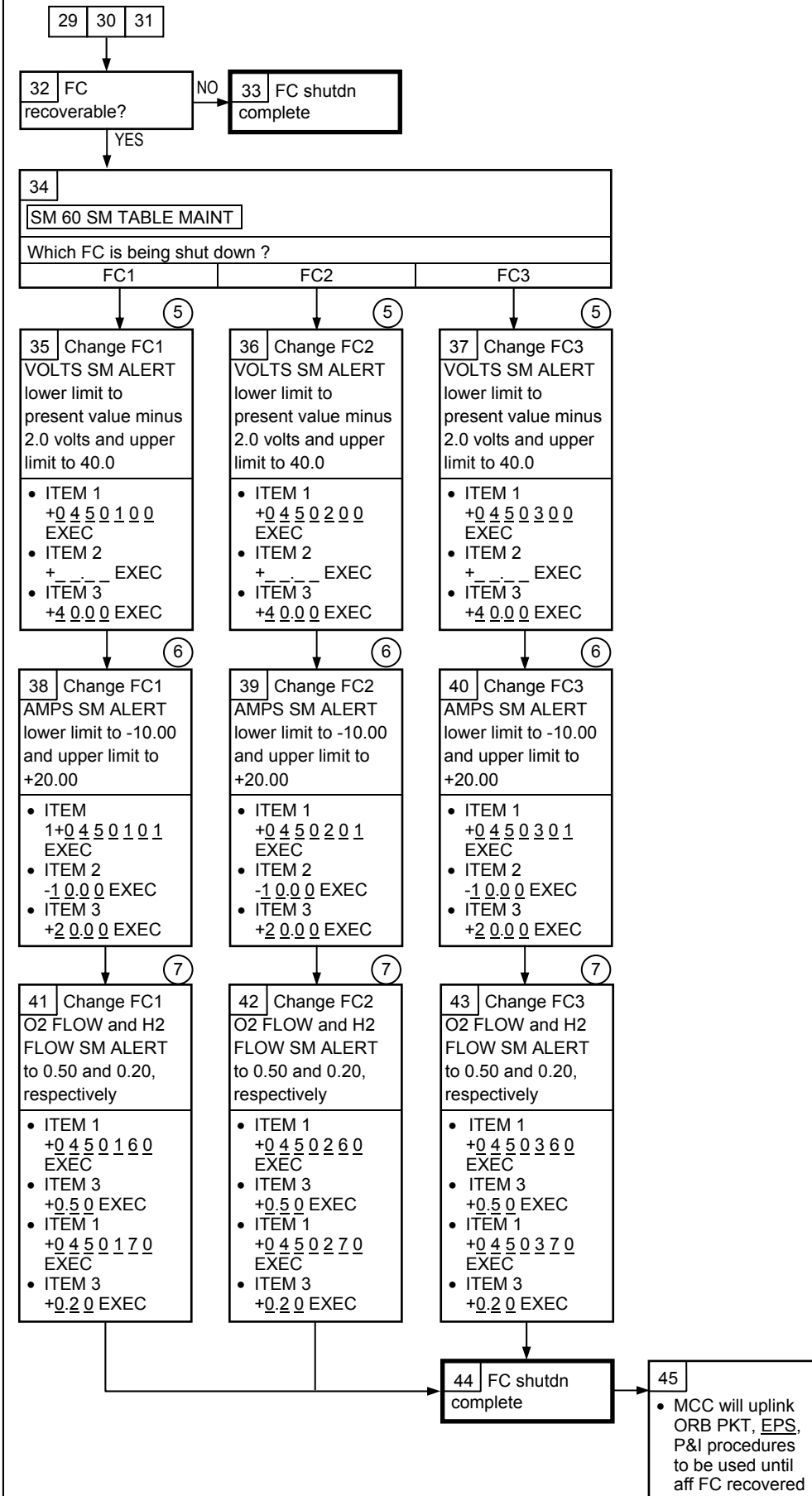


② Equal to value set in PRIMARY C&W SYSTEM. Lower limit on FC temp during cooldown is 48 degF to protect from ice formation. Closest value > 48 degF that PRI C&W system can be set is 50.8 degF

EPS SSR-3 (Cont)



EPS SSR-3 (Cont)

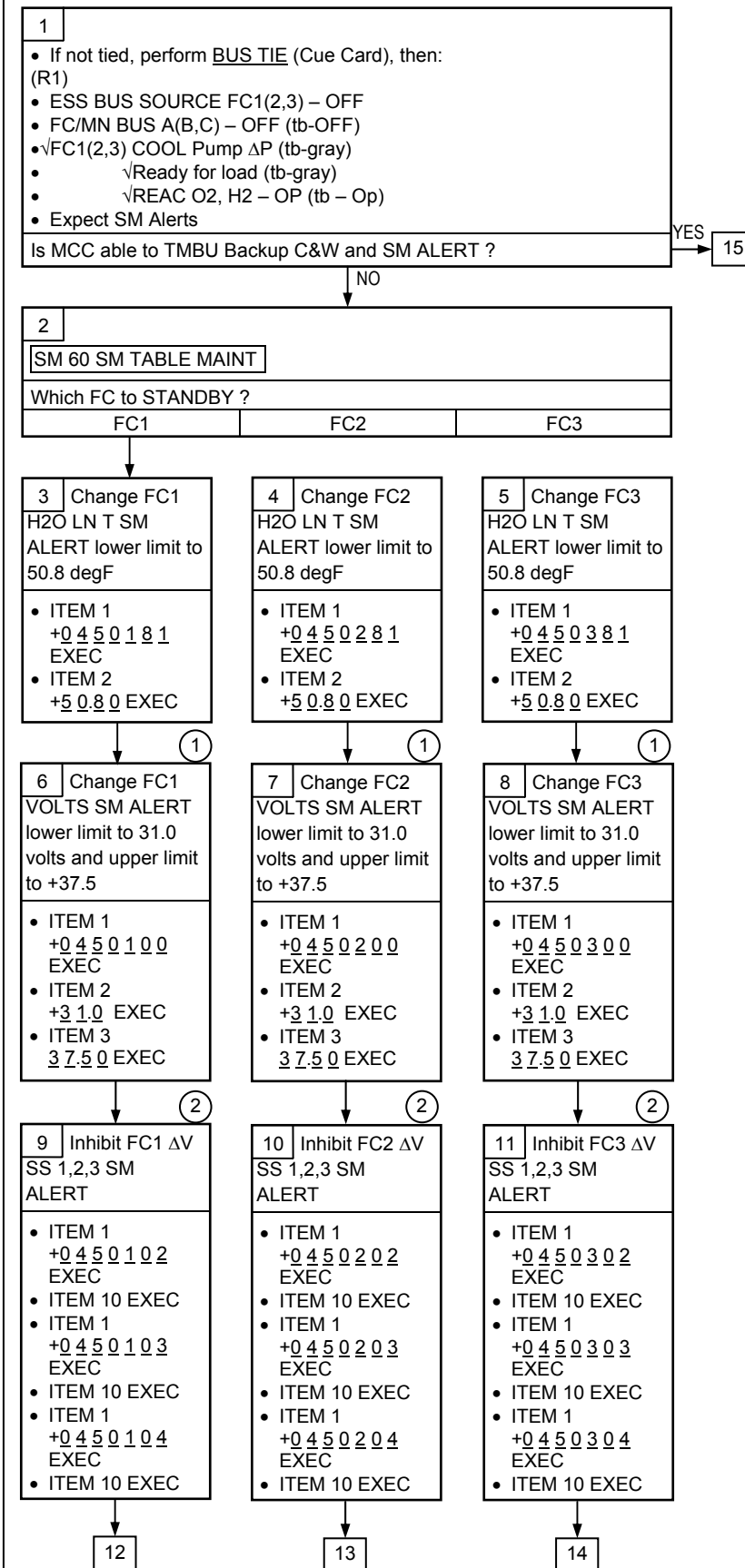


⑤ Decrease in FC VOLTS while fuel cell is shut down may indicate internal load, crossover, or reactant leak

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

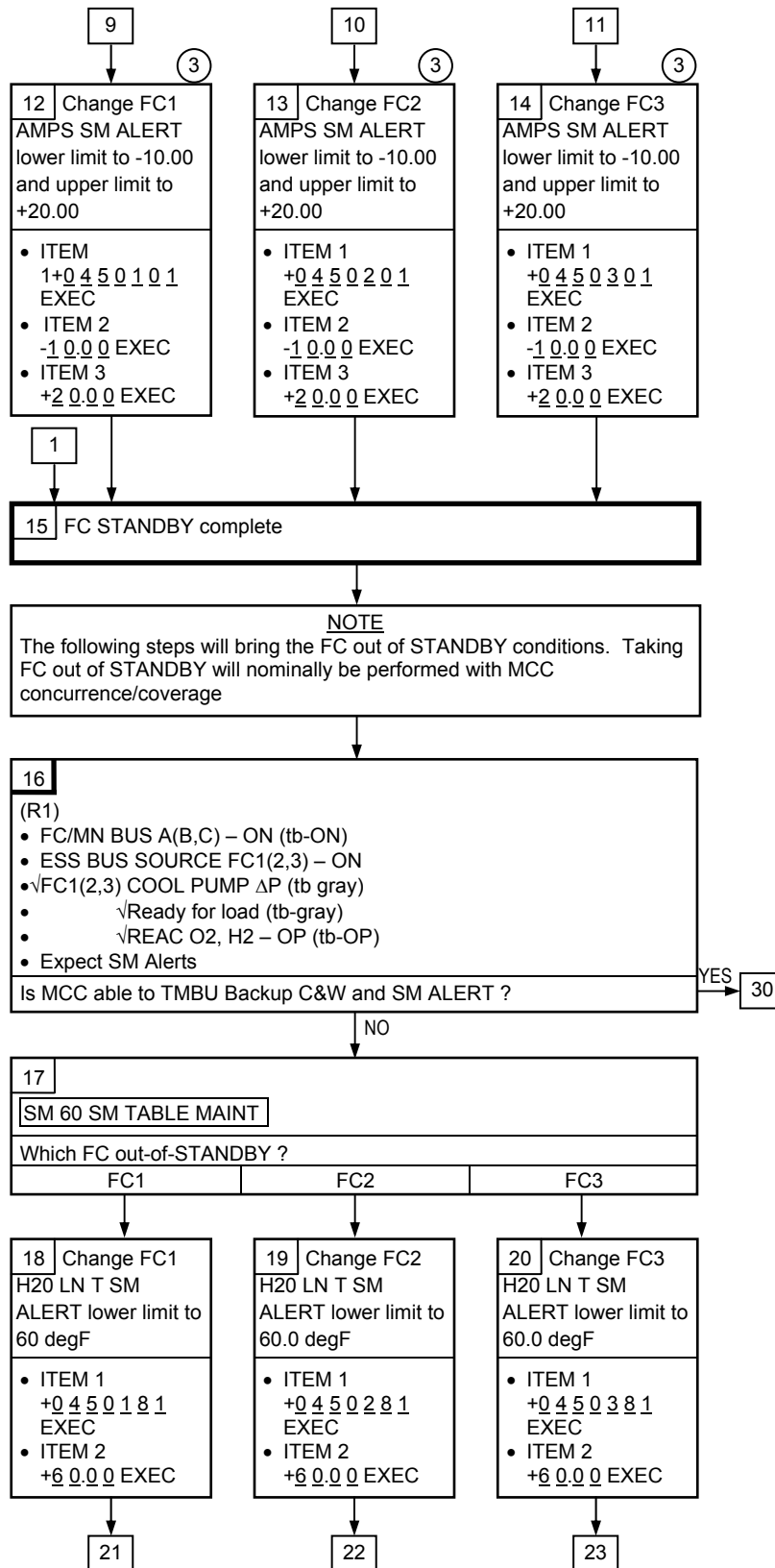
EPS SSR-4 **FC STANDBY**



① Decrease in FC VOLTS beyond FDA limit while fuel cell is in STANDBY may indicate internal load, crossover, or reactant leak

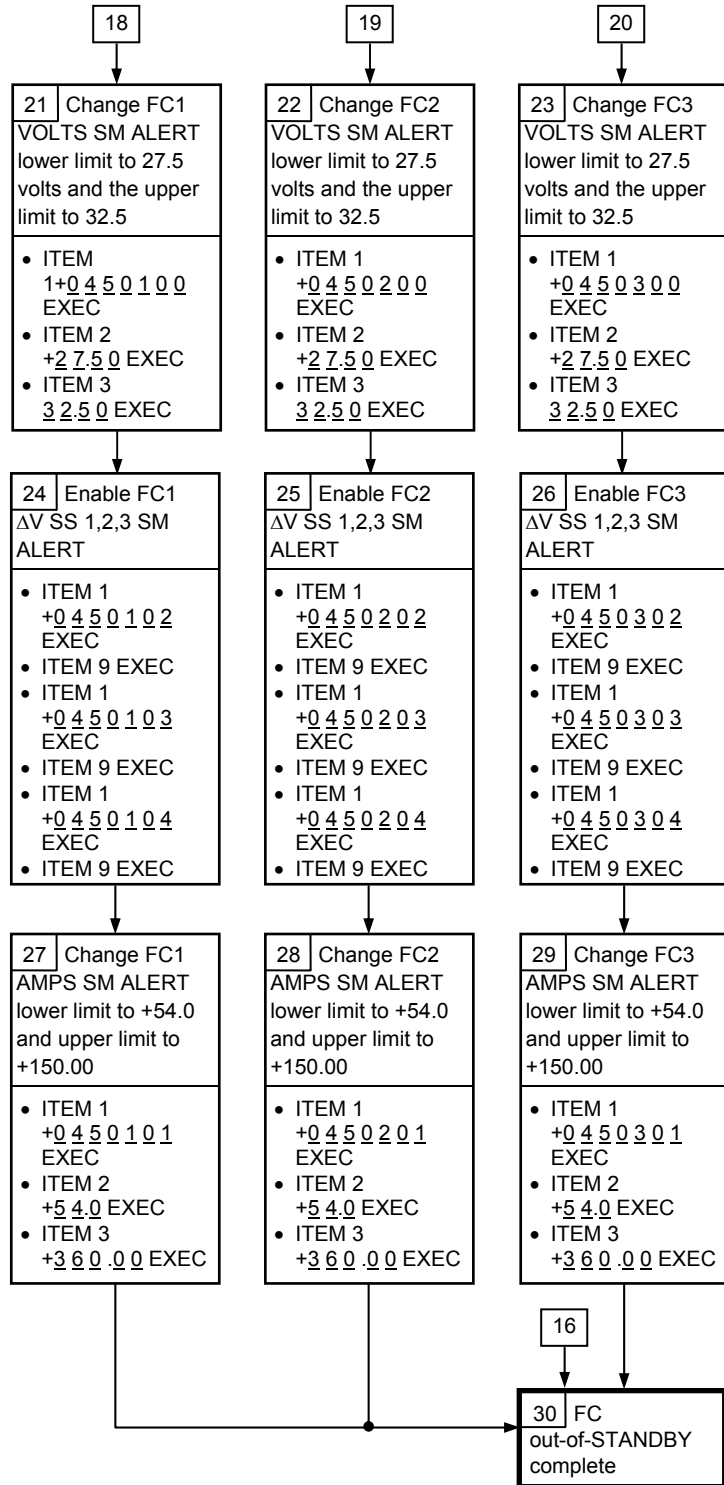
② FC SUBSTACK ΔVOLTS are not usable when fuel cell is in STANDBY

EPS SSR-4 (Cont)

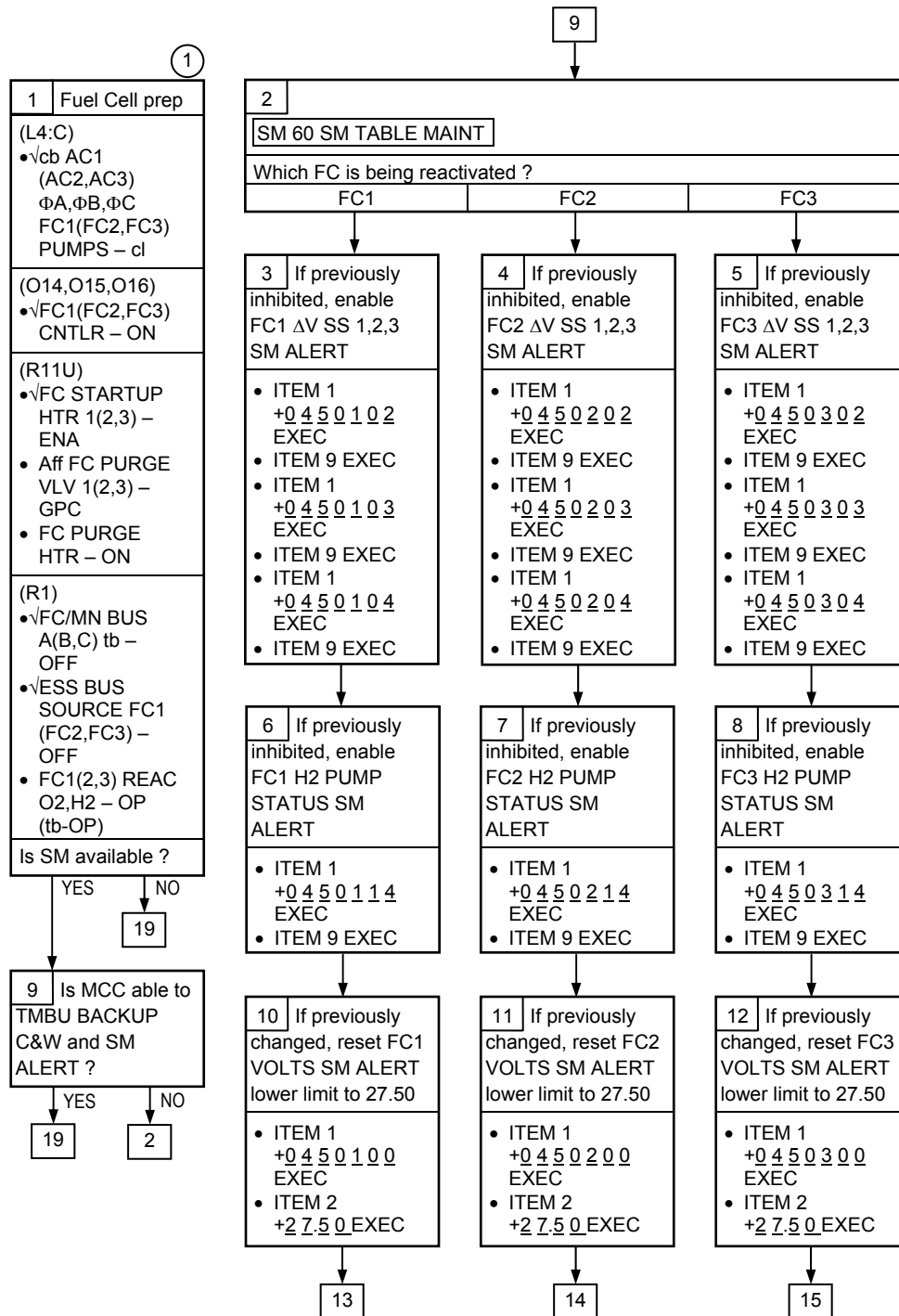


3 Increase in FC Amps beyond the FDA limit while fuel cell is in STANDBY may indicate external load on the fuel cell

EPS SSR-4 (Cont)

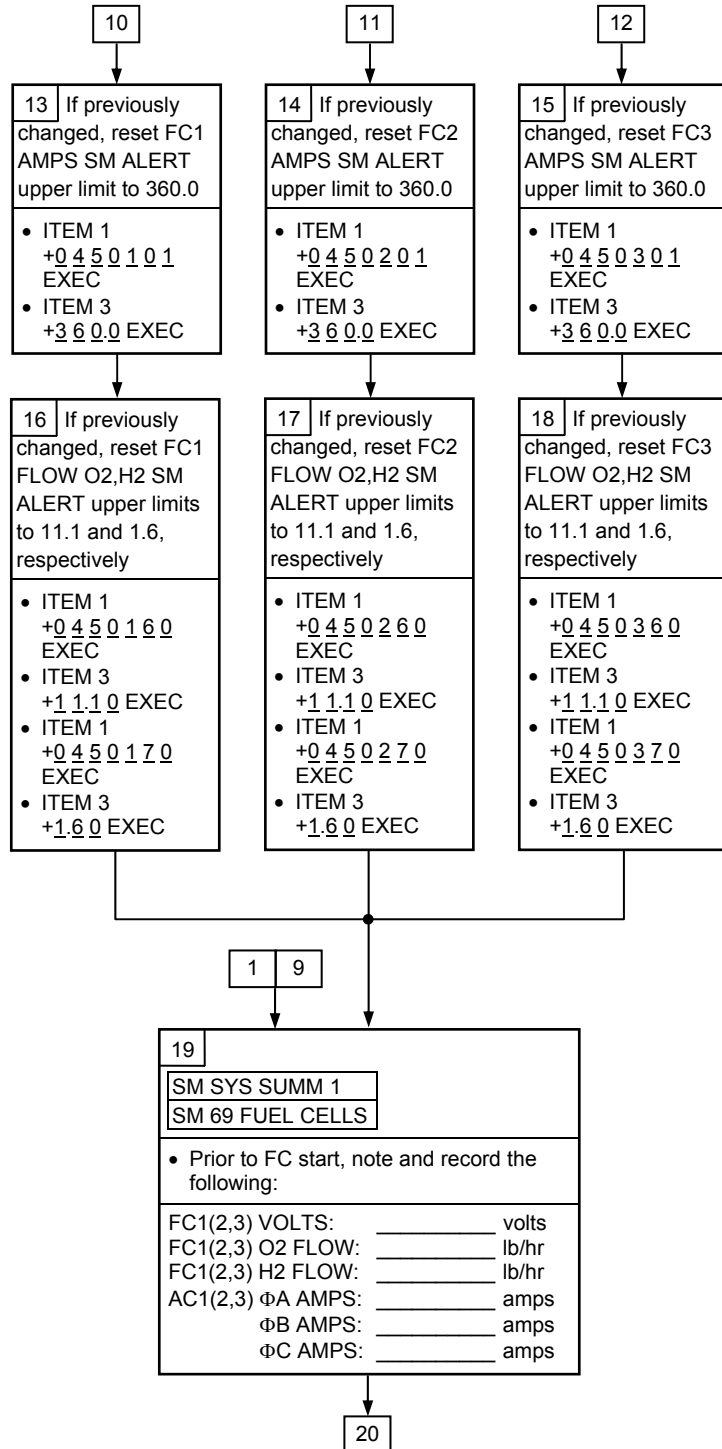


EPS SSR-6 FC RESTART

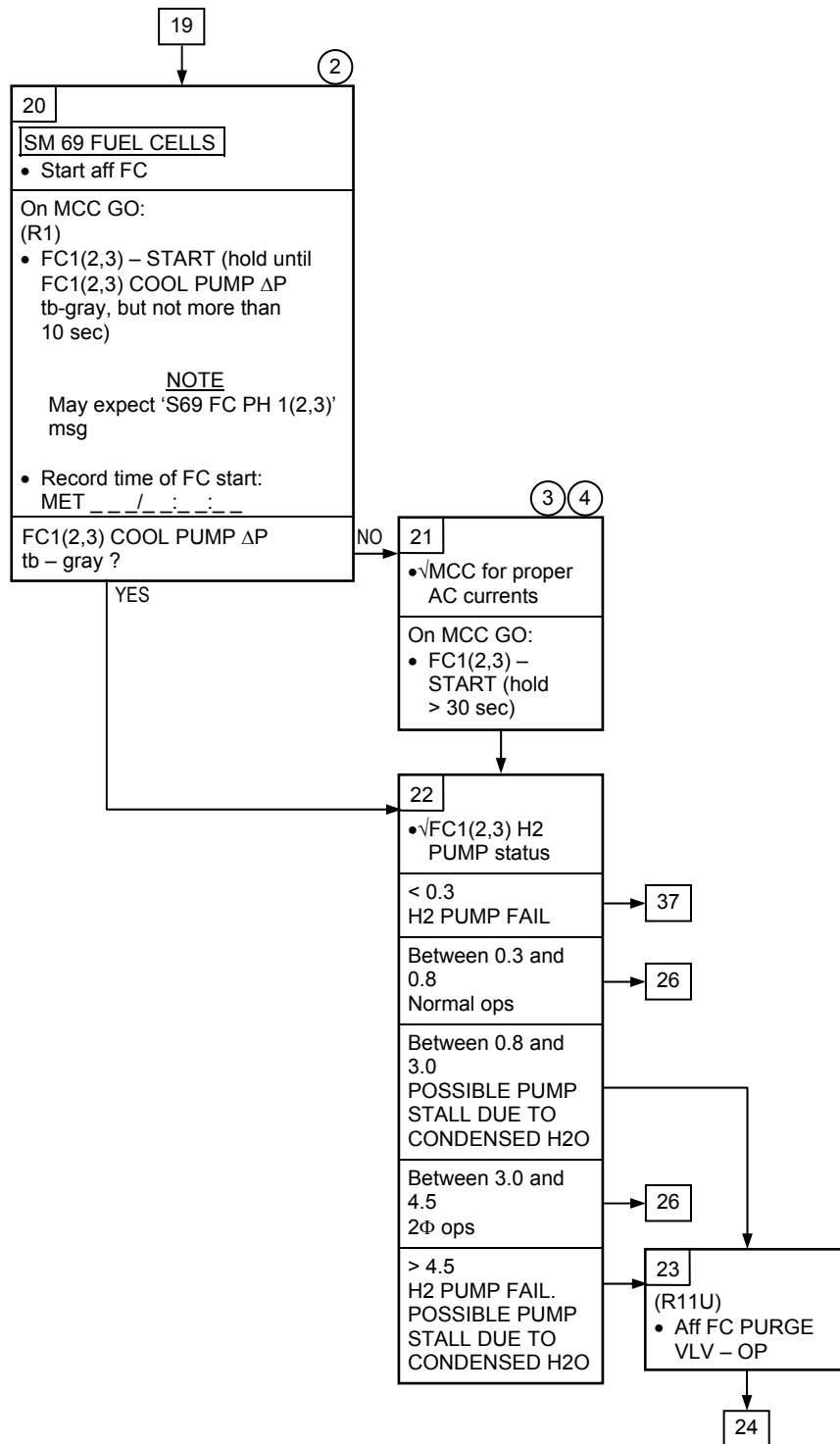


① FC may be restarted on two Φs. Loss of AC1(2,3) ΦA cb causes loss of FC1(2,3) pH sensing. Loss of AC2 ΦB cb causes loss of common pH sensing

EPS SSR-6 (Cont)



EPS SSR-6 (Cont)

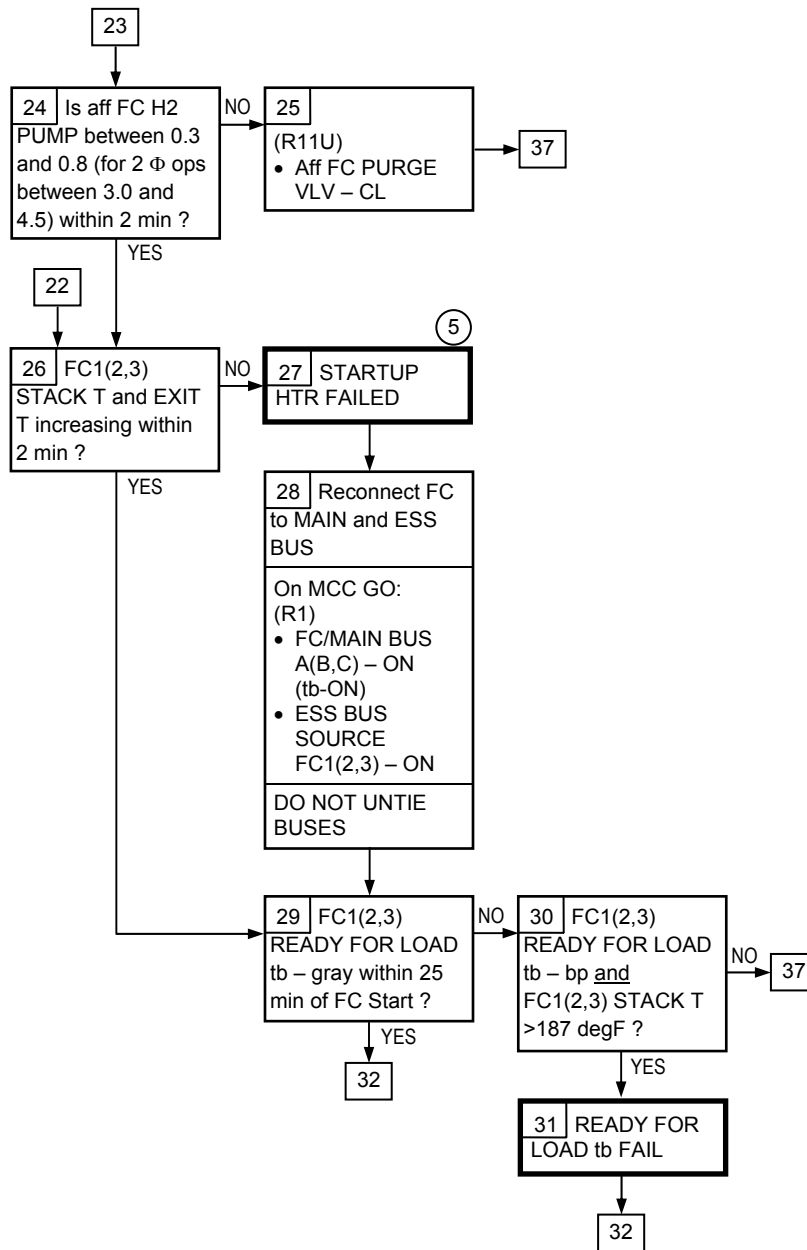


② May expect FC pH FSM when FC is started on some fuel cells due to addition of pH self-test capability

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)

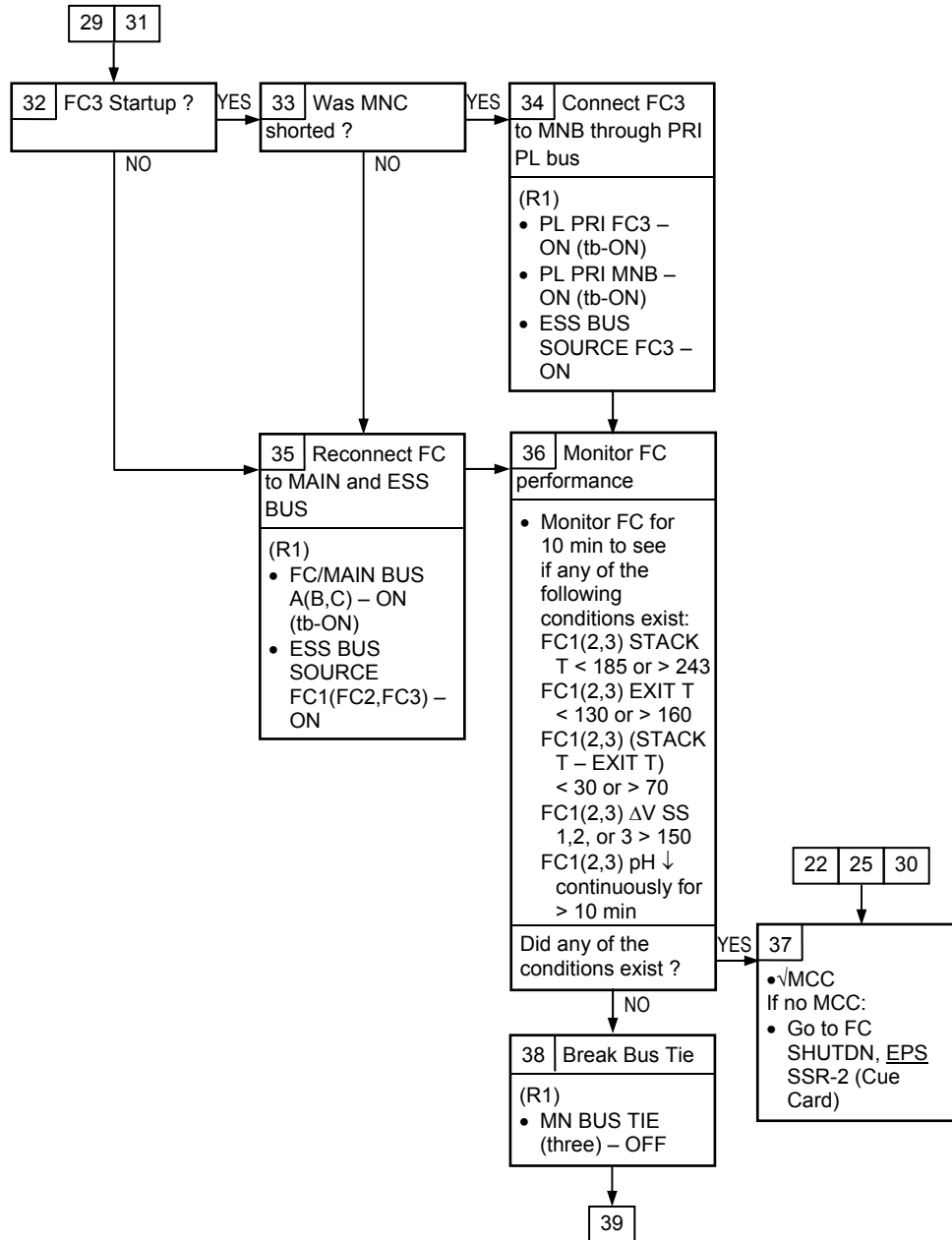
④ Failure of COOL PUMP ΔP tb will inhibit FC startup. Holding sw in START for > 30 sec will bypass Logic Timer and allow COOL PUMP and H2 mtr to run

EPS SSR-6 (Cont)

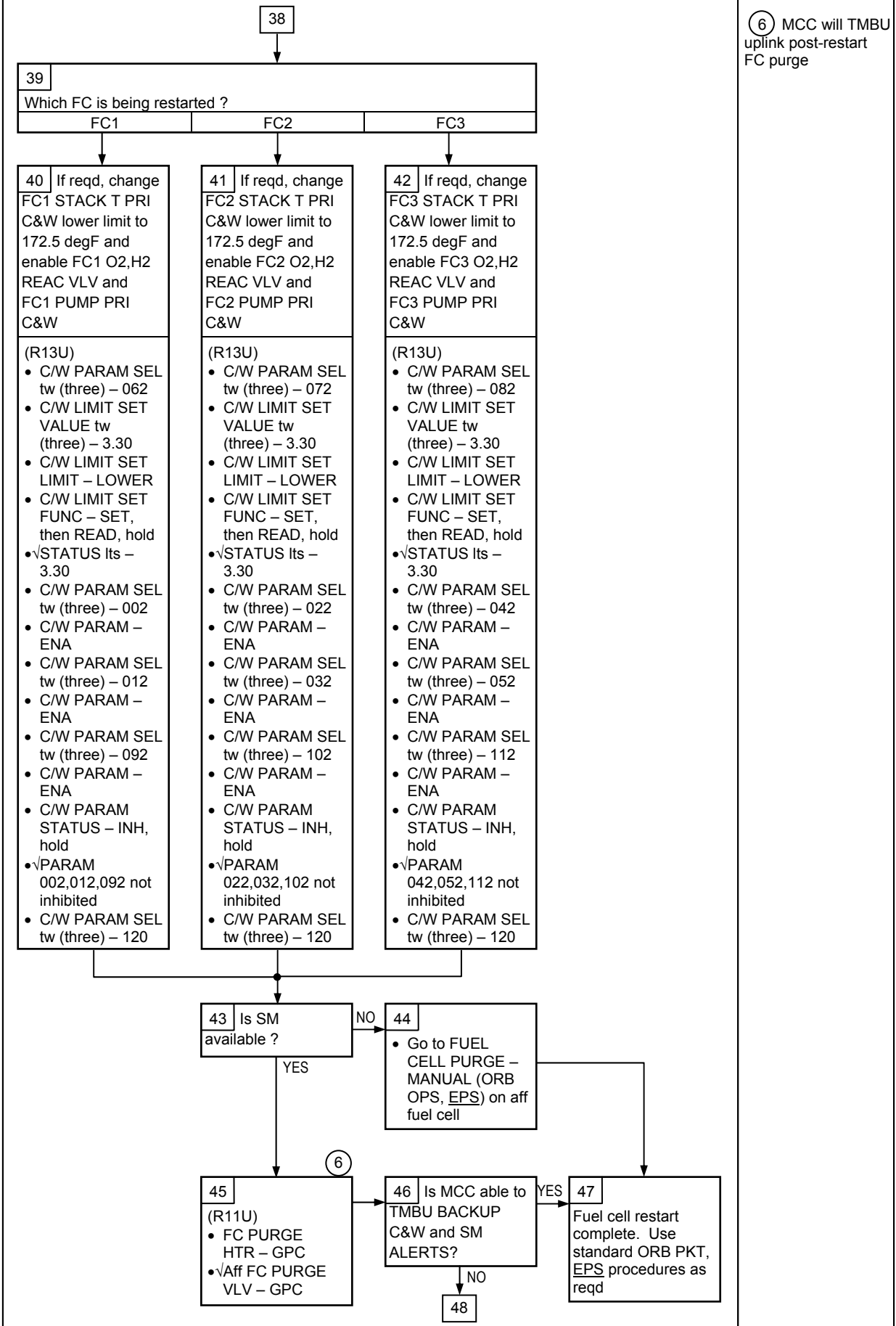


⑤ Expected indications of operating STARTUP HTR are:
 FC VOLTS ~32V
 FC O2 Flow ~1.4 lb/hr
 FC H2 FLOW ~0.2 lb/hr
 Placing FC on MAIN BUS will generate sufficient heat to raise FC temp to operating levels

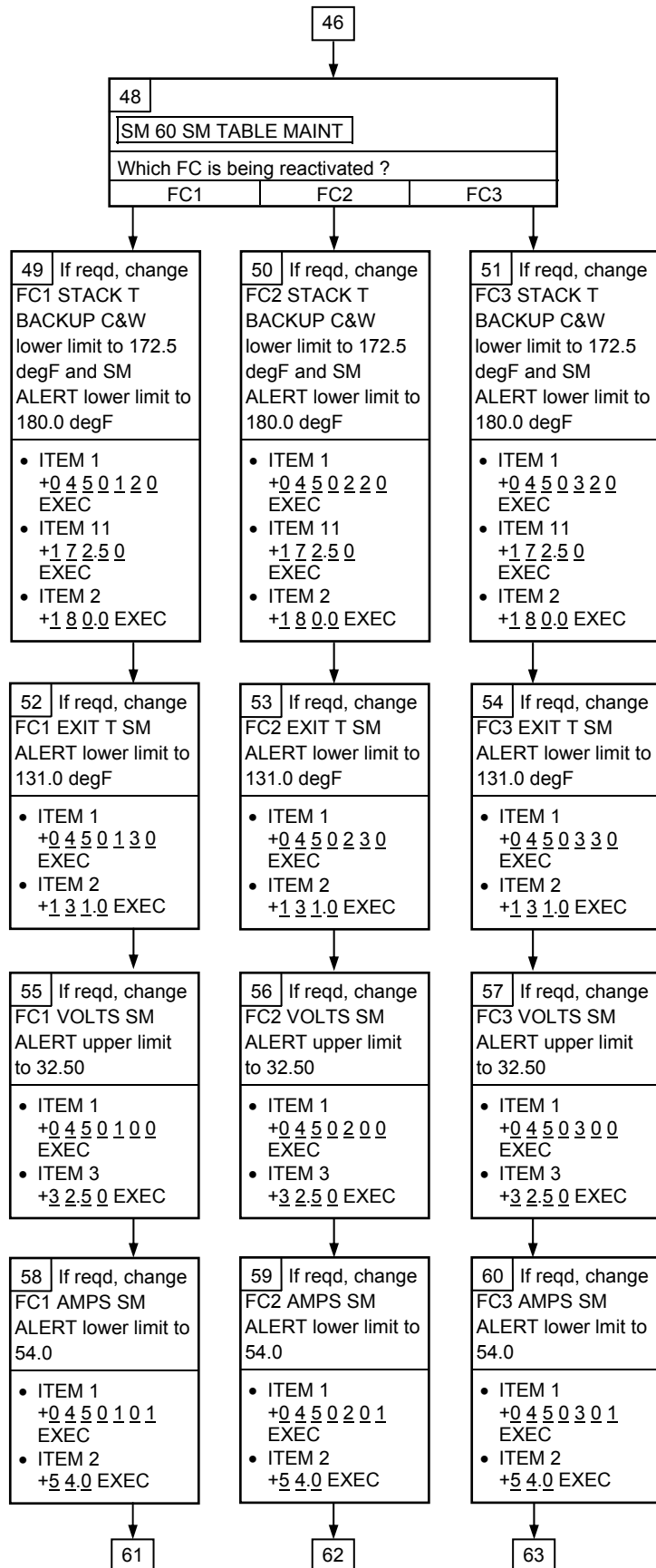
EPS SSR-6 (Cont)



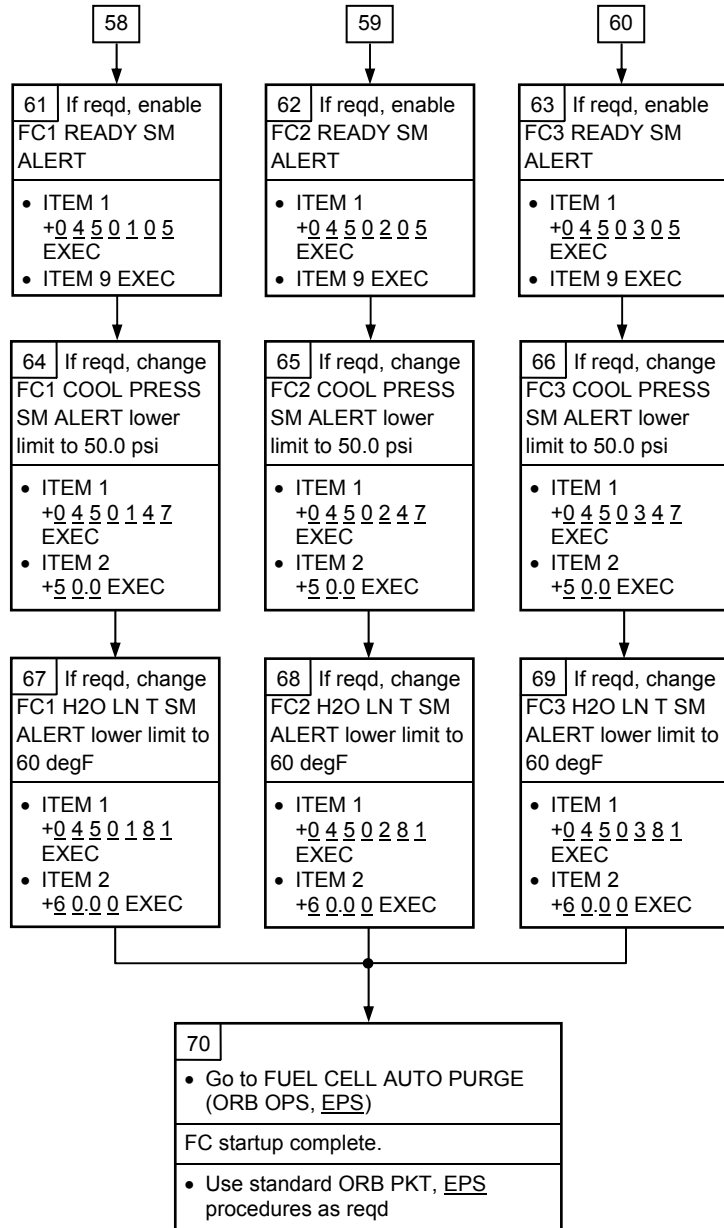
EPS SSR-6 (Cont)



EPS SSR-6 (Cont)



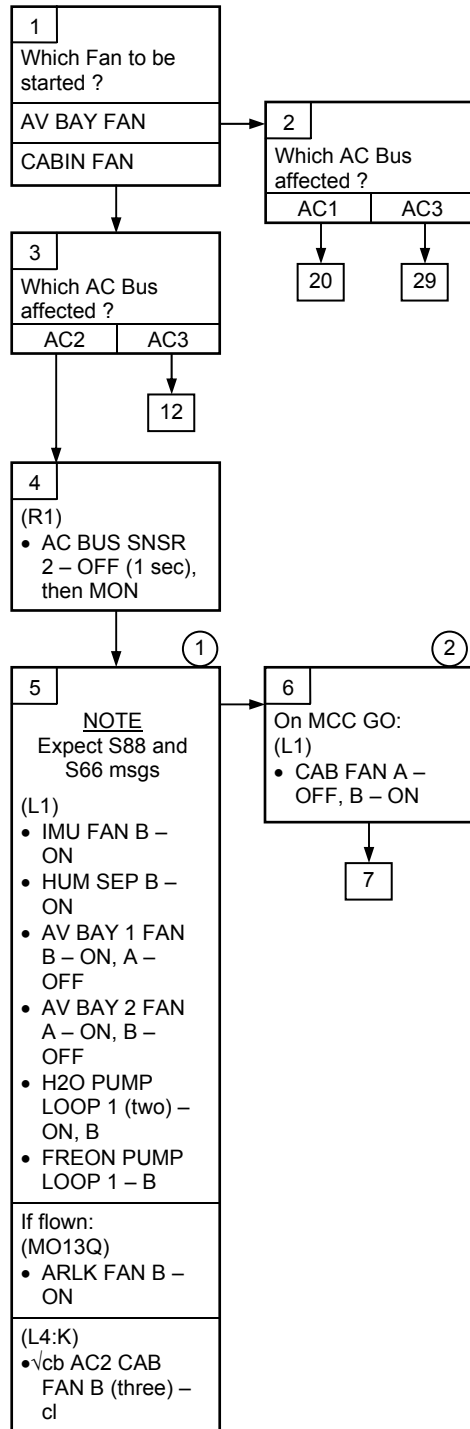
EPS SSR-6 (Cont)



EPS SSR-7 TWO-PHASE FAN START PROCEDURE

NOTE

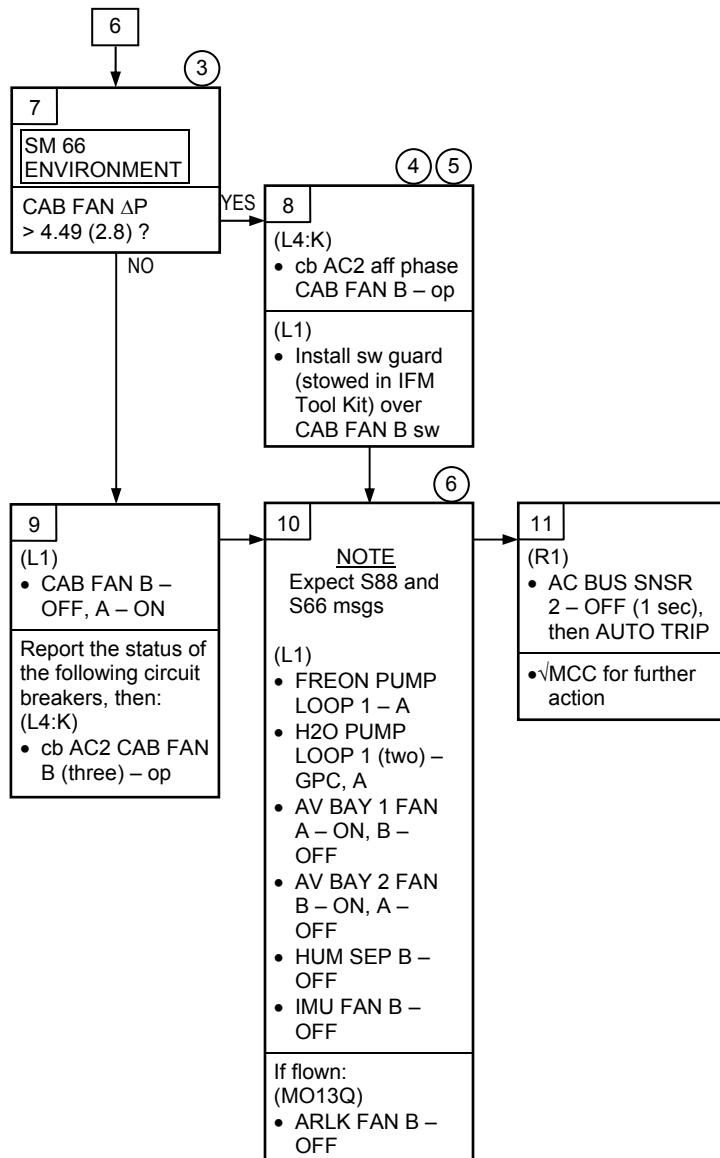
This procedure assumes the EPS MAL BUS LOSS SSR for the affected phase (not shorted) has already been completed. This procedure will be performed during MCC coverage



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)



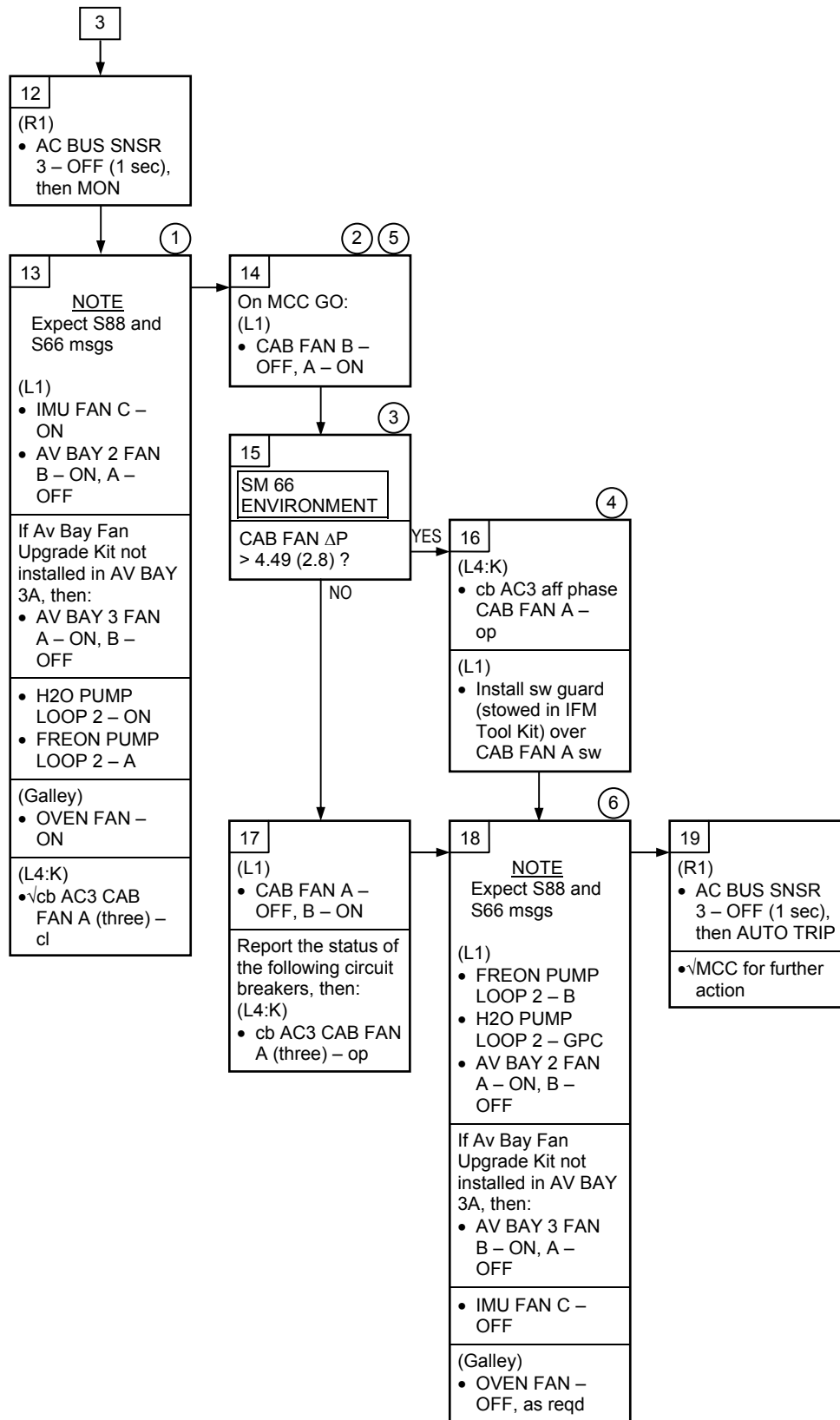
③ Value in () is the ΔP when the Cabin Press is at 10.2 psi

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

EPS SSR-7 (Cont)



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

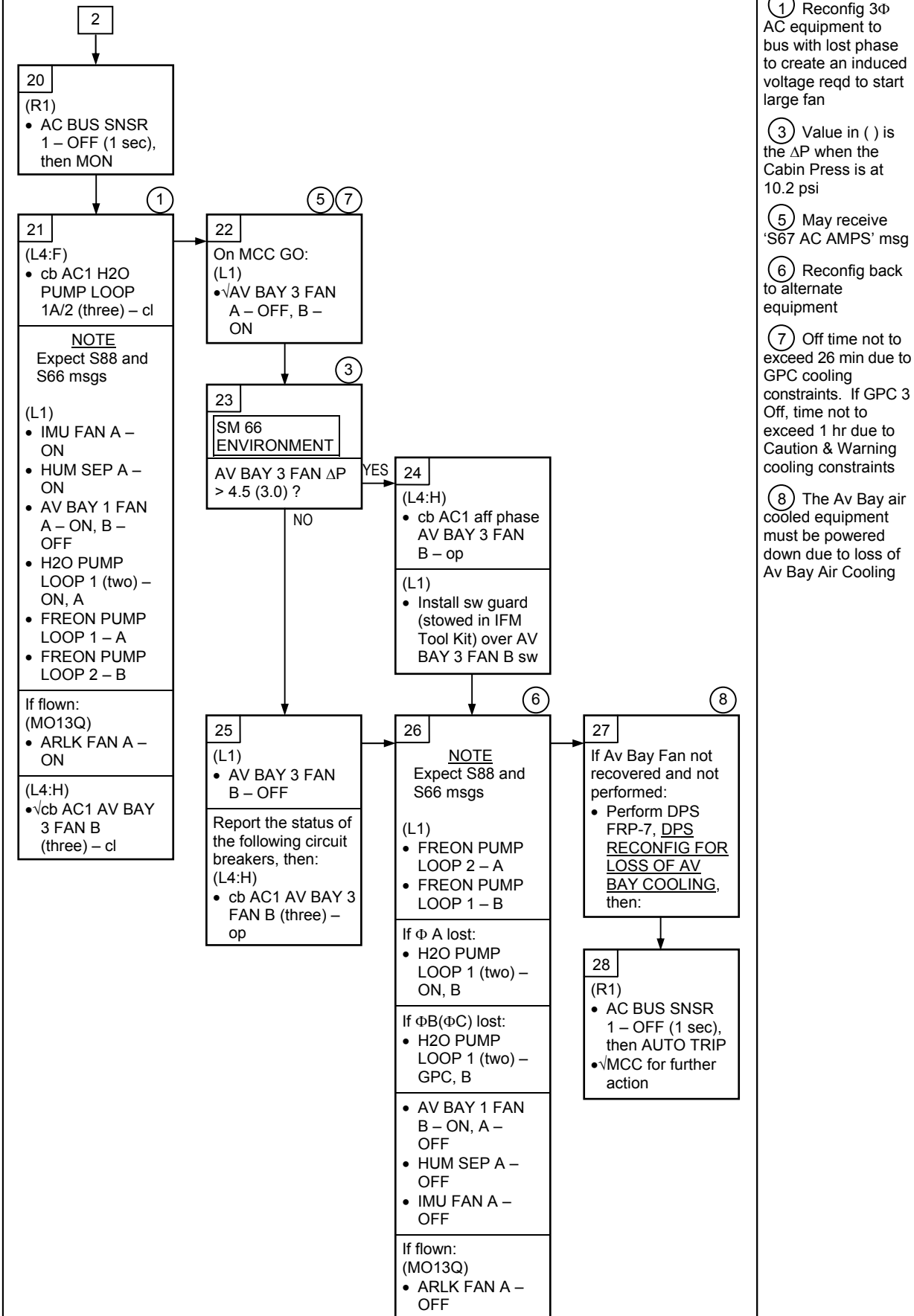
③ Value in () is the ΔP when the Cabin Press is at 10.2 psi

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

EPS SSR-7 (Cont)



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

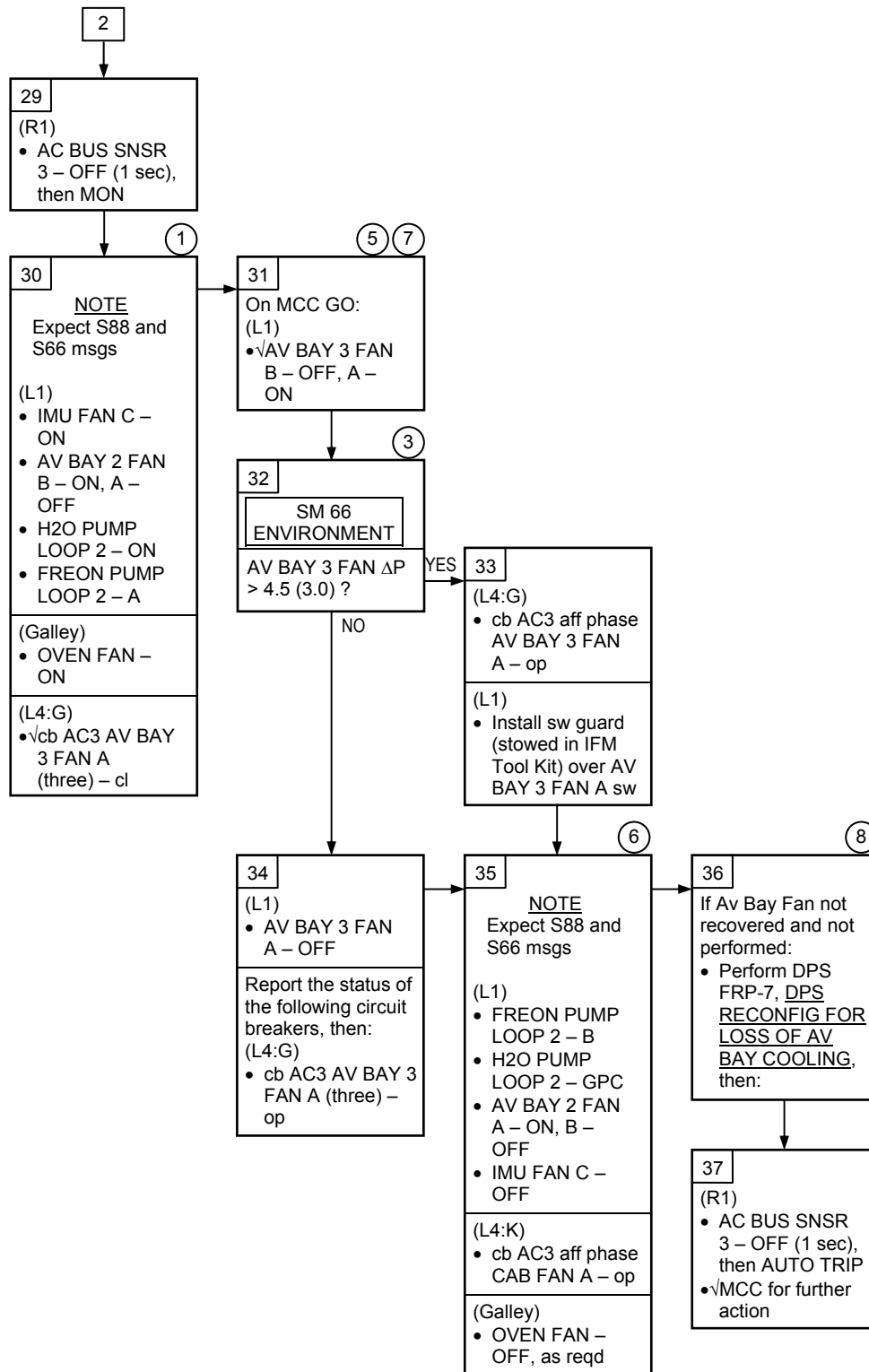
⑤ May receive 'S67 AC AMPS' msg

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

EPS SSR-7 (Cont)



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. • GAS GEN/FUEL PUMP 1 – A AUTO 10. • GAS GEN/FUEL PUMP 3 – B AUTO 11. • LUBE OIL LN 1 – A AUTO 12. • 3 – B AUTO 13. • TK/FU LN/H2O SYS 1A,3B (two) – AUTO • TK/FU LN/H2O SYS 1B,3A (two) – OFF - HYD HTR 14. • RUD SPDBK 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. • GAS GEN/FUEL PUMP 1 – B AUTO 40. • GAS GEN/FUEL PUMP 2 – A AUTO 41. • LUBE OIL LN 1 – B AUTO 42. • 2 – A AUTO 43. • TK/FU LN/H2O SYS 1B,2A (two) – AUTO • TK/FU LN/H2O SYS 1A,2B (two) – OFF - HYD HTR 44. • RUD SPDBK 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. • GAS GEN/FUEL PUMP 2 – B AUTO 69. • GAS GEN/FUEL PUMP 3 – A AUTO 70. • LUBE OIL LN 2 – B AUTO 71. • 3 – A AUTO 72. • TK/FU LN/H2O SYS 2B,3A (two) – AUTO • TK/FU LN/H2O SYS 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.

EXPLANATORY NOTES FOR BUS LOSS SSRs (Cont)

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 Snr Purge Vlv O2,H2 Flow Xdcrs Cell Perf Monitor AUX PL A Bus pwr MNA pwr to ESS2CA ESS3AB CNTLAB1,2,3 CNTLCA1,2,3	MASTER ALARM Light/ Tone – on SM ALERT Light/Tone – on (F7) MDU CRT 1 blanks (F1) MDU MFD 2 blanks (F8) MDU PLT 1 blanks (F7) C/W CABIN ATM It – on C/W FREON LOOP It – on C/W AV BAY/CAB AIR It – on C/W MN BUS UNDERVOLT It – on C/W AC VOLT It – on C/W FC PUMP It – on C/W RCS JET It – on C/W H2O LOOP It – on EVENT TIMER ind – blank (COMM LOST) MS,OS audio lost Xmit to gnd via UHF (LIGHTS LOST) L Console Floodlt Pnl Its L/Ctr (pnls L1,L2,L4, C2,C3,F2,F6,F7) Pnl Its L/OH (pnls O5,O6, O7,O13,O14,O15) Numeric Its (pnls O3, F7) Instr Its R (pnls C2,F8,F9) PS Floodlt Orbit Sta Instr Its (pnls A1,A2) Middeck Floodlts 1,8 WMC Floodlt MO13Q pnl It 2 Airlock Floodlt 1 PLB Floodlts Aft Stbd,Fwd Port, Docking TA Floodlt 2 (F9) AC1 ΦA,ΦB,ΦC AC volts ind – < 90 DC VOLTS MNA ind – OSL (FSMs) S86 HYD RSVR Q 1 SM2 HYD QTY 1 (B) S86 WSB T (2) 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	① Buses remained pwr 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 ⑤ S86 WSB T1 if in BLR CNTLR/HTR 1B. S86 WSB T3 if in BLR CNTLR/HTR 3A
Perform LOSS OF 1 FC (ORB PKT, PWRDN)			
(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 • AC1 BUS SNSR – OFF • O2,H2 MANF VLV TK1,2 (four) – OP	2 MNA pwr to CABPL 1,2,3 buses AC1 ΦA,ΦB,ΦC Inverters	3	
(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) TK3 HTR A – OFF • O2(H2) TK1 HTR A – OFF	Cryo O2,H2 Tk1 Htrs A Cryo O2,H2 Tk3 Htrs A		
(A15) If Tk5 in use: • O2(H2) TK5 HTR B – AUTO • O2(H2) TK5 HTR A – OFF	Cryo O2,H2 Tk5 Htrs A		
	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		
(A12) APU HTR 4 • GAS GEN/FUEL PUMP 1 – B AUTO 4 • GAS GEN/FUEL PUMP 3 – A AUTO • LUBE OIL LN 1 – B AUTO • LUBE OIL LN 3 – A AUTO APU HTR TK/FU LN/H2O 4 • SYS 1A – OFF 4 • 1B – AUTO 4 • 3A – AUTO 4 • 3B – OFF HYD HTR • RUD SPDBK A – OFF • B – AUTO • BDY FLP A – OFF • B – AUTO • ELEV A – OFF • B – AUTO	Brake Htrs A APU 1 GG/Fu Pump Htrs A APU 3 GG/Fu Pump Htrs B APU 1 Lube Oil Line Htrs A 3 Lube Oil Line Htrs B 1 Tk/Fu Ln Htrs A APU(1,2,3) GG Inj H2O Tk Htrs A APU 1,2 GG Inj H2O Ln Htrs A 3 GG Inj H2O Ln Htrs B 3 Tk/Fu Ln Htrs B Rud/Spd Brake Htr A Body Flap Htr A Elevon Actr Htrs A	5	
	If SSPTS: PTU 1 (OPCU 1 and APCU 1)		
(Continued)	(Continued)	(Continued)	

EPS SSR-10 (Cont)
BUS LOSS: MNA DA1

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 L RCS D,L JET RM DLMA MANF	③ Indications do not appear until jet commanded ⑥ After MET 3:30, tb already bp ⑦ Vlv holds position. N2 Sys 2 remains ⑧ Crew and ground have lost PPCO2 XDCR if Cabin Air Sig Cond'r not recovered ⑨ B/U pwr remains for RMS ops ⑩ When the OBSS is grappled by the RMS, the OBSS uses the RMS Payload power feed for all OBSS subsystem heater and operational power, except LCS ⑪ All brakes ON and safing initiated ⑫ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ⑬ APU H2O QTY 1 if in BLR 1B. APU H2O QTY 3 if in BLR 3A ⑭ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists ⑮ Vlv holds position ⑯ Vlv holds position. Man OP capability remains ⑰ Do not reconfig for reg switch or I'CNCT procedures ⑱ 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 B – OFF • If FES reqd, go to FES RESTART USING FES PRI A, ECLS SSR-5 • TOP EVAP HTR NOZ L – B AUTO • TOP EVAP HTR DUCT – B	Freon Loop 1 Rad Cntrlr B 2 Rad Cntrlr B FES Pri B Cntrlr Top Evap L Noz Htr A Top Evap Duct L,R,Fwd,Aft Htrs A Hi Load Duct Outbd,Inbd Noz Htrs A	3 If ADTA 1, MLS 1, – STAR TRKR pwr'd: 'BCE STRG 1 ADTA' (3,B) 'BCE STRG 1 MLS' (3) 'BCE STRG 1 STKR' (L2) 6 CAB VENT ISOL tb – bp 6 CAB VENT tb – bp 7 O2 SYS 1 SPLY tb – CL 7 N2 SYS 1 SPLY tb – bp 7 N2 SYS 1 REG INLET tb – bp	
If HI LOAD EVAP enabled: • HI LOAD DUCT HTR – B(C)		(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	
8 • Maintain LiOH Canister(s) changeout per cue card and FLIGHT PLAN		(O3) RCS/OMS Prplt Qty Gage blanks Mission Timer blanks	
(L2) FLASH EVAP FDLN • HTR A SPLY – 2 • B SPLY – 1 ----- • FREON ISOL MODE – OFF	FES H2O Fdln A Htrs 1 (all) B Htrs 2 (all) Auto radiator isolation function	(O4) HYD/APU HYD QTY 1 ind – 0% APU H2O QTY ind – 0%	
(A8L) • PORT RMS HTR A – OFF • PORT RMS HTR B – AUTO If OBSS berthed (A8L) • STBD RMS HTR A – OFF • STBD RMS HTR B – AUTO	RMS: 9 Primary pwr 10 Port Payload pwr 11 MCIU 12 Port Mid MRL Mtr 1 12 Port Aft MRL Mtr 2 14 Stbd Fwd MRL Mtr 2 14 Stbd Aft MRL Mtr 1 Shldr Brace Rel Port Htr A Stbd Htr A 9 D&C Primary Itg	13 (R1) FC1 COOL PUMP ΔP tb – bp (R4) 15 HYD BK ISOL VLV 1 tb – OP 15 LG EXTND ISO VLV tb – OP 15 HYD MPS/TVC ISOL VLV SYS 1 tb – CL	
(F6,F8) • HSI SEL SOURCE – other than MLS, (OV103,4) TACAN 1 or (OV105) GPS 1 • RDR ALTM – 2	MLS 1 (OV103,4) TACAN 1 (OV105) GPS 1 Radar Altm 1	(O7) 16 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)	
(O6) • ANNUN BUS SEL ACA 1 – MNB • UHF EVA STRING – 2 • For attitude control, LOSS OF VERNIER (ORB OPS, RCS)	ACA 1 MNA pwr SSOR 1 RCS Manf L5 RJD pwr (L5L,L5D) RCS Manf F1 RJD pwr (F1F,F1L,F1U,F1D)	(O8) 16 FWD RCS He PRESS A tb – bp 15 FWD RCS TK ISOL 3/4/5 tb – bp 15 FWD RCS MANF ISOL 1 tb – bp	
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 A,B • R RCS He PRESS A ----- (O8) • FWD RCS He PRESS A	16 L,R,F RCS He Pr Isol A GPC Cntl and man CL capability 18 Aft L RCS He Pr Isol B man OP capability -----	(R11L) 15 SPLY H2O TKA INLET tb – bp 15 SPLY H2O TKB OUTLET tb – bp (R13L) RAD CNTL STBD,PORT (two) tb – bp	
(Continued)	(Continued)	(Continued)	

EPS SSR-10 (Cont) **BUS LOSS: MNA DA1**

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
22	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 (O8) • If Straight Feed config, Left OMS XFEED B – OP (tb-OP). Otherwise, √MCC (C2) • L IDP/CRT SEL – 3 • GPC/CRT 01 EXEC (O16:D) cb MNC • (OV103) GPS PRE AMPL UC – cl • (OV103) GPS PRE AMPL LC – cl SM 1 DPS UTILITY (G2,G8,S2) MMU ASSIGN • GNC ITEM 1 EXEC • SM ITEM 4 EXEC • PL ITEM 6 EXEC (R11U) • FC H2O LINE HTR – B AUTO • FC H2O RELIEF HTR – B AUTO (R11L) • MS AUD CNTL – PS (L9) • √PS AUD PNL config for use (A13) • (OV103) GPS PRE AMPL UC – MNC • (OV103) GPS PRE AMPL LC – MNC (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 (ML86B:A) • cb MNB H2O LINE HTR B – cl ----- (ML86B:C) • cb MNB EXT ARLK HTR STRUC Z1/2/3 – cl • cb MNB EXT ARLK HTR LN ZN 1, ZN 2 (two) – cl If in Rendezvous or Docked: • cb MNB EXT ARLK HTR VEST Z1/2/3 – cl ----- (ML86B:D) cb MNB • MMU PORT,STBD HTR B (two) – cl (Continued)	Aft RCS L,R Jet 2 Htrs 19 OMS Eng/Xfeed Vlv Redundancy 20 IDP 1 MDU CRT 1 MDU MFD 2 MDU PLT 1 21 ADC 1A/2 A MMU 1 FC H2O Line Htrs A FC H2O Relief Htrs A 24 MS ATU, CCU & FD Spkr 25 Fwd RCS A Htrs (all) 25 L Pod A Htrs (all) 27 R Pod B Htrs (partial) 25 OMS Crsfd Ln A Htrs (all) H2O Line Htrs A: Waste Dump Line Htr A Sply Dump Line Htr A Vac Vent Line Htr A ----- Ext Arlk Htrs A: Structural Htrs A Water Line Htrs A ----- Ext Arlk Vest Htrs A ----- 25 MMU Port,Stbd Htr A (Continued)	15 (R13L) MMU GN2 SPLY ISOL VLV A tb – bp (A4) EVENT TIME ind – blank 11 (A8U) 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 (A8L) Port RMS: DPY/STO tb – bp RETEN LAT tb – bp R-F-L MID tb – bp STARBOARD RMS: DPY/STO tb – bp RETEN LAT tb – bp R-F-L AFT tb – bp SM 94 PDRS CONTROL PORT RMS Indications lost: Mid MRL Mtr 1 LAT/REL/RDY Aft MRL Mtr 2 LAT/REL/RDY STBD RMS Indications lost: Fwd MRL Mtr 2 LAT/REL/RDY Aft MRL Mtr 1 LAT/REL/RDY If cooling by FES B only: 'S88 EVAP OUT T1' 'S88 EVAP OUT T2' 15 (ML31C) WASTE H2O TK 1 VLV tb – bp 15 WASTE H2O DUMP ISOL VLV tb – bp 15 WASTE H2O DUMP VLV tb – bp 15 SPLY H2O TKD OUTLET tb – bp 26 (AW82D) EMU 2 H2O SPLY,WASTE tb (two) – CL If OMS Gmb1 Cmd Abs value > 2 deg: C/W OMS TVC It – 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 During Rad Dpy/Sto ops: (R13L) RAD LAT CNTL tbs (two) indicate single mtr ops (Continued)	(11) All brakes ON and safing initiated (15) Vlv holds position (19) Maintains deorbit capability for MNB DA2 failure (20) Loss of redundant port to the following: MDU CDR 1 (S) MDU CDR 2 (P) (21) IDP 1, IDP 2 ADC data lost. MDU port select may be reqd (22) Selecting failed MMU for GNC MF protects against GPC MMU Rcvr failure after OPS XTION prepositioning (23) Listen only capability regained when headset used on MS CCU (from PS ATU) as FD speaker is also failed (24) 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 (25) Htr B remains (26) Vlv holds position. May have to interface EMU 2 with SCU 1 to provide total H2O servicing/recharge (27) Htr A remains

EPS SSR-10 (Cont) **BUS LOSS: MNA DA1**

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	For PLBD ops: • OP/CL Drs in man mode	PLBD: C/L Lat 1-4, 5-8, 9-12 Mtrs 1 Port,Stbd Fwd Bikhnd Mtrs 1 Port Aft Bikhnd Mtr 1 Stbd Door Mtr 1 Port Door Mtr 2 CL Limit sw Stbd Door Mtr 1 OP Limit sw	If OMS GmbI Cmd Abs value > 2 deg and Sec TVC selected: C/W OMS TVC It – on 'R OMS GMBL' (3,B)	(15) Vlv holds position (28) Lost TM: GNC SYS SUMM 2
28	Save L OMS for deorbit (If reqd for on-orbit burn, √MCC)	28 L OMS GN2 Press Vlv Op TM	If Hum Sep A ON: 'S66 HUMID SEP A'	L OMS N2 P VLV: If Eng – ARM/PRESS, assume vlv OP
28	Prior to using L(R) OMS: (O8)	29 L,R OMS He Pr Isol A GPC OP Cntl	If H2O Loop 1 Pump A active: 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP' 'S88 H2O PUMP P 1'	L,R OMS ENG VLV 1: Assume Vlv 1 status same as Vlv 2
30	L(R) OMS He PRESS/VAP • ISOL A – OP • B – GPC	29 L,R OMS He Vap Isol 1 GPC OP Cntl	(O1) H2O PUMP OUT PRESS LOOP 1 ind – 20-25 psia	(29) Man Cntl remains. Redundant Isol remains
	GNC XXXXX MNVR YYYYY (3,B)		(F7) If APUs active, and using BLR CNTLR/HTR 1B or 3A: C/W APU TEMP It – on after ~ 2 min	(30) Maintains He Isol redundancy
	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 first AA failure and S/W Processing Accel data: RM FAIL ACC (3)	(31) Vlv fails closed. IFM or real-time flow test will be required. √MCC for additional direction
	If Waste H2O Dump reqd: • Perform WASTE H2O SYS BACKUP DUMP (IFM)	15 Waste H2O: Dump Vlv Cntl Noz Htr	CCTV Video and TV Annun Its lost if MNA selected for VCU CCTV Mon 1 lost	(32) O2/N2 Cntl Vlv 1 normally closed when unpowered
	If on PCS1: • Perform RECONFIG TO ALT PCS SYS, <u>ECLS</u> SSR-3	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	STAR TRKR DR POS -Y OP/CL time incr from 8 to 16 sec	(33) Not yet active on all vehicles
		15 15 15 31 32	L ADP deploy time incr from 15 to 30 sec	(34) Sys A Sec Cntl man on capability remains
		Cabin Press Snsr Emer dP/dT B/U Comp		(35) Lose Auto Temp Cntl via Cntl 2 and H2O Loop 2 Cabin Hx In Temp sns. Hx Byp vlv holds position. May be repwrd after AC Pwr Transfer Cable connected
		33 FC3 Redundant Reac Vlv Cntl on pnl C3		
	If reqd during entry (< 120K ft): (L1) • NH3 CNTLR B – PRI/GPC	34 NH3 Sys A Pri Cntl		
	(ML31C) • VAC VENT ISOL VLV BUS SEL – MNB	Vac Vent Isol Vlv MNA Cntl		
	If AC Pwr Transfer cable to be installed to regain AC: • Go to <u>EPS</u> SSR-200; otherwise, continue with Bus Loss Actions			
	If Cab Temp Cntl 2 active: (L1) • CAB TEMP CNTLR – OFF (MD44F) • Remove pin from SEC Actuator and BYP vlv linkage, connect linkage to PRI Actuator	35 Cabin Temp Cntl 2 and Hx Byp Vlv Mtr 2		
	(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			
	(Continued)	(Continued)		

EPS SSR-10 (Cont) **BUS LOSS: MNA DA1**

	ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
36	SM 60 TABLE MAINT Inhibit 0612705, 0612700, 0612740, 0612710, 0612665, 0612742			36 Inhibits H2O Loop 2 Pump ΔP, Pump Out Press, Pump Out Temp, Accum Qty, Cabin HX in T, H2O Loop 1 Ich Flow respectively
	(WCS) ✓MODE – AUTO ✓CRADLE – AUTO ✓Hose stowed in cradle ✓WCS ON It – 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		37 H2O Loop 2 Byp viv holds position
	(R2) - BLR CNTLR/HTR 1 – A 3 – B	Hyd H2O Blr Cntrlr 1B 3A		38 H2O Loop 2 Pump Out Press, Pump ΔP, Accum Qty, Pump Out Temp snsr 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 - H2O LOOP 1 BYP MODE – AUTO - 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	Humidity Sep A IMU Fan A 37 H2O Loop 2 Byp Cntrlr, Sig 38 Cond H2O Loop 2 Byp Viv pwr 2 Pump GPC Cntl 1 Pump A Av Bay 1 Fan A 39 Av Bay 2 Sig Cond, Xdcrs 40 (ECLS SC3) Av Bay 3 Fan B Freon Loop 1 Pump A 2 Pump B		39 May be repwr after AC Pwr Transfer Cable connected
41	During sleep periods: CAB FAN (two) – ON	Cabin Air Sig Cond (ECLS SC6)		40 AV Bay 2 Fan ΔP, Air Out Temp snsr lost
	(MO13Q) If Arlk/Tnl Fan active: - ARLK FAN A – OFF - B – ON	Arlk/Tnl Fan A		41 Use streamers (if flown) or monitor by feel during wake period if Cabin Air Sig Cond not recovered
	(Continued)	(Continued)		

EPS SSR-10 (Cont) **BUS LOSS: MNA DA1**

42	BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	ONLY ON MCC CALL, PERFORM			④② AC1 Bus Isolation for AC Pwr Transfer Cable Installation accomplished in MNA DA1 ACTIONS column. No additional bus isolation steps reqd
	• MDU CRT 1 PWR – OFF • MDU MFD 2 PWR – OFF • MDU PLT 1 PWR – OFF			④③ Redundant pwr source remains for equipment
	(C2) • IDP/CRT 1 PWR – OFF			④④ H2O Loop 1 Intchgr Flow rate and IMU Fan ΔP snsrst lost
	(O6) • STAR TRKR PWR -Z – OFF	-Z Star Trkr Dr OP capability Tracker		④⑤ Cabin Smoke Detector remains
	(O7) • (OV105) GPS 1 PWR – OFF • (OV105) GPS 1 PRE AMPL UPPER – OFF • (OV105) GPS 1 PRE AMPL LOWER – OFF	(OV105) GPS 1		④⑥ Current Snsr 2 remains
	(O8) • RADAR ALTM 1 – OFF • MLS 1 – OFF			④⑦ Cntrlr A remains
43	(O14:B) cb MNA • OI SIG CONDR OF 1/4 A – op			
43	• OI SIG CONDR OM 1/2 A – op			
43	• OI MDM OF 1/2 A – op			
43	• 3/4 A – op			
	• OI H2O BYP LOOP 1 SNSR – op	44 H2O Byp Loop 1 Snsr (ECLS SC11)		
	• MNC CONTR – op	Fwd Mission Timer		
	• MSN TIMER FWD – op	Aft Event Timer		
	• EVENT TIMER AFT – op			
45	(O14:C) cb MNA • (OV103,4) TACAN 1 – op	Tacan 1		
	• SMOKE DETN L/R FLT DK – op	45 L,R Flt Dk Smoke Detectors		
	• SMOKE DETN BAY 2A/3B – op	Av Bay 2 Smoke Detector A		
	• FIRE SUPPR BAY 3 – op	Av Bay 3A Smoke Detector B		
	• 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	46 Cryo O2 Tk1 Htr Current Snsr 1		
	• cb RAD ISOL CONTR – op	Auto radiator isolation function		
47	(O14:D) cb MNA • FREON RAD CNTLR 1 – op			
47	• 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		
	• (OV105) GPS 1 PRE AMPL UPPER – op			
	• (OV105) GPS 1 PRE AMPL LOWER – op			
	• (OV103) GPS PRE AMPL UC – op			
	• (OV103) GPS PRE AMPL LC – op			
	(Continued)	(Continued)		

EPS SSR-10 (Cont) **BUS LOSS: MNA DA1**

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM				④③ Redundant pwr source remains for equipment ④⑧ NWS 2 is still available ④⑨ Six vlvs fail to non-isolation position ⑤⑩ Capability to xmit to gnd from UHF degraded ⑤① GCIL also pwr'd via MNC cb ⑤② MNB pwr may be selected via TV pwr sw (pnl A7) or GCIL if reqd
43 43 48	(O14:E) cb MNA • RDR ALTM 1 – op • MLS 1 – op • ADTA 1 – op • S TRK -Z – op • ACCEL 1 – op • DDU L – op • AFT – op • NWS – op	ADTA 1 AA 1 NWS 1		
	(O14:F) • MMU 1 – OFF			
		49 ATVC 2 Isol ME		
	(R11U) • FC PURGE VLV 1 – CL • FC STARTUP HTR 1 – ENA	FC1 Startup Htr Inh capability		
43	(R14:A) • cb MNA AUD MS – op • ADC 1A/2A – op • MDU MFD 2 – op • PLT 1 – op	MS ATU FD Spkr		
	(R14:B) cb MNA cb PALLET/DSC • 1A/2B – op (EDO) • 3A – op (EDO) • UHF – op • GCILC – op • CNTL BUS BC1/2/3 – op	50 UHF Splx Pwr Amp 51 GCIL MNA pwr MNA pwr for Cntl BC1,2,3 Buses		
	(R14:C) • cb UHF EVA – op	SSOR EVA STRG 1		
	(R14:D) cb MNA TV C CAMR • CAMR/PTU – op • CAMR HTR – op • ILLUM/PTU HTR – op cb MNA TV • CONTR UNIT – op • MON 1 – op	TV C Camr and Pan-Tilt TV C Aft Bay Camr Htr TV C Camr Pan-Tilt Htr and Illum 52 Video Cntl Unit MNA pwr CTVM 1		
	(R14:E) • cb MNA PS FLOOD – op cb MNA D CAMR • CAMR/PTU – op • CAMR HTR – op • ILLUM/PTU HTR – op	PS Floodlt TV D Camr and PAN-TILT TV D Camr Htr TV D Camr PAN-TILT Htr and Illum		
	(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		
	(A6L) IF DOCKING MISSION • cb ESS 1BC DEP SYS 1 VENT ISOL – op • cb MN A DEP SYS 1 VENT – op	Vest DEP Vlv Sys 1 Vent Vent Isol		
(Continued)		(Continued)		

EPS SSR-10 (Cont) **BUS LOSS: MNA DA1**

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM			(15) Vlv holds position
(A6L) IF DOCKING MISSION cb MN A DOCK LT • TRUSS FWD – op • VEST PORT – op • SYS PWR 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 It Port Vestibule Docking It DSP SYS PWR MN A PSU PWR MN A 53 54 MNA pwr to DSP Logic buses 1,3 MNA Pyro System External Airlock Its 1,4	DSP SYS PWR SYS 1 tb – OFF	(25) Htr B remains (53) All docking mechanisms will have single mtr times (54) Logic buses 1(3) remain pwr'd via MNB(MNC)
(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	15 Sply H2O TKA Inlet Vlv Cntl 15 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	15 Waste H2O TK1 Inlet Vlv Cntl 15 Sply H2O TKD Outlet Vlv Cntl 15 Waste H2O Dump Isol Cntl		
(ML86B:C) • cb MNA EXT ARLK HTR STRUC Z1/2/3 – op • cb MNA EXT ARLK HTR LN ZN1, ZN2 (two) – op • cb MNA EXT ARLK HTR VEST Z1/2/3 – op	Ext Arlk Htrs A		
(ML86B:D) cb MNA MMU • PORT/STBD HTR A (two) – op • GN2 SPLY ISOL VLV A – op	25 MMU Port,Stbd Htr A 15 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		
(Continued)	(Continued)		

EPS SSR-10 (Cont) **BUS LOSS: MNA DA1**

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM		Ctr MPS He reg A < 680 during entry (MM303)	7 Vlv holds position. N2 Sys 2 remains 15 Vlv holds position 26 Vlv holds position. May have to interface EMU 2 with SCU 1 to provide total H2O servicing/recharge 46 Current Snr 2 remains 55 Snr 2 remains 56
(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	Middeck floodlts 1,8 WMC Floodlt, MO13Q pnl lt 2 Airlk Floodlt 1 46 Cryo O2 Tk3 Htr Current Snr 1 Cryo O2 Tk5 Htr Current Snr 1		CAUTION No purge. Wait 10 min between burns 57 Unable to confirm redundant coils 58 Redundant coils remain 59 √MCC for OMS Qtys. Aft Qtys are frozen on GNC SYS SUMM 2 60 Pwr Sply B remains. GG Bed T and GBX P ind lost when APU running 61 Vlv fails closed. Redundant vlv remains 62 Pwr Sply A remains. Turbine speed ind lost 63 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 64 Hyd Sys 2 still available for NWS 65 Mtr 2 remains 66 Htr Cntl 2 remains 67 Redundant RPC remains 68 MNB pwr select capability remains
(A15:H,I,J,K) • cb MNA TK6-TK9 O2 HTR SNSR 1 – op	55 Cryo O2 Tk 6-9 Htr Current Snr 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 56 L OMS Purge Vlv 1,2 57 L OMS Eng Pr Vlv Coil 1 58 L OMS Cntl Vlv 1,2 Coils 1 58 R OMS Eng Pr Vlv Coil 2 and Cntl Vlv 1,2 Coils 2 59 OMS Qty Gaging 60 APU 1 Cntrl Pwr Sply A 61 1 Fu Tk Vlv A 1 GBX GN2 Repress Vlv 62 3 Cntrl Pwr Sply B 61 3 Fu Tk Vlv B Hyd Rsvr 1 Qty Snr 15 TVC Hyd Sys 1 Isol Cntl 15 Hyd Brake Isol Vlv 1 Cntl 63 LG Extend Isol Vlv Vlv 1 63 Vlv 1 64 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 65 L ADP Deploy Mtr 1 66 Htr Cntl 1 67 Hyd Main Pump 1 Depress Solenoid RPC A 67 Hyd Main Pump 3 Depress Solenoid RPC B 7 Atm Press Cntl O2 Sys 1 Sply Vlv Cntl 26 EMU 2 Sply and Waste H2O Vlv Cntl 68 EMU 1,2 Pwr/Batt Chgr MNA pwr PL Reten Sys A Rel/Lat Mtrs		
	(Continued)		

EPS SSR-10 (Cont)
BUS LOSS: MNA DA1

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	MPS: 69 Ctr Eng He Intercon Outlet Vlv 61 Ctr Eng He Isol A 61 Pneu He Isol 1 70 He Sply Blowdn Vlv 1,2 71 Prplt F/D Inbd LH2 Vlv 72 ET Door Mtrs: C/L Lat Actr 1 Mtr 1 2 Mtr 1 L Dr Closure Mtr 1 Uplock Lat Mtr 1 73 Ku-Bd Jettison Sys A 73 Stbd RMS: Jett/Guil Sys A Deadface Relays 74 Freon Loop 1,2 Cntrl B Rad Byp Vlv Mtrs Ops Hyd Actr Instr		61 Vlv fails closed. Redundant vlv remains 69 Vlv fails closed 70 Vlv fails closed. Aft compartment, OMS pods, ET umbilical cavity will not be purged during entry (MM304) 71 Vlv holds position. Loss of manual capability to inert LH2 Manf 72 Redundant mtrs remain 73 Sys B remains 74 Bypass vlv holds position and Cntrl A Rad Byp Vlv Mtr remains

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), pwrdr not needed, then: (R1) • 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 • AC1 BUS SNSR – OFF	2 FC1 Pumps & pH Snsr AC1 ΦA, ΦB, ΦC Inverters	MASTER ALARM Light/Tone – on CRT 1 blanks (F7) C/W FC PUMP It – on C/W AC VOLT It – on C/W FREON LOOP It – on C/W AV BAY/CAB AIR It – on C/W H2O LOOP It – on SM ALERT Light/Tone – on EVENT TIMER ind – blank (F9) AC1 ΦA,ΦB,ΦC AC volts < 90 (LIGHTS LOST) Instr Its R (pnls C2, F8, F9) Pnl Its L/Ctr (pnls L1,L2,L4, C2,C3,F2,F6,F7) Pnl Its L/OH (pnls O5,O6, O7,O13,O14,O15) Numeric Its (pnls O3,F7) Orbit Sta Instr Its (pnls A1,A2)	① * TIME * * CRITICAL * FC1 must be shutdn within 9 min to avoid potentially hazardous condition ② Will be repwrdr after AC Pwr Transfer Cable connected ③ Crew and gnd have lost PPO2 Xdcr if Cabin Air Sig Condr not recovered ④ Do not reconfig for reg switch or l'CNCT procedures ⑤ Vlv holds position. Man OP capability remains. Isol B remains ⑥ Loss of redundant port to the following: MDU CDR 1 (S) MDU CDR 2 (P) MDU MFD 2(P) MDU PLT 1 (S) ⑦ S86 WSB T1 if in BLR CNTLR/HTR 1B. S86 WSB T3 if in BLR CNTLR/HTR 3A ⑧ Selecting failed MMU for GNC MF protects against GPC MMU Rcvr failure after OPS XTION prepositioning ⑨ Temp sensing lost ⑩ All brakes ON and safing initiated ⑪ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists. May be repwrdr after AC Pwr Transfer Cable connected ⑫ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists. May be repwrdr after AC Pwr Transfer Cable connected ⑬ APU H2O QTY 1 if in BLR CNTLR/HTR 1B. APU H2O QTY 3 if in BLR CNTLR/HTR 3A ⑭ May be repwrdr after AC Pwr Transfer Cable connected ⑮ Vlv holds position
3 • Maintain LiOH canister(s) changeout per cue card and FLIGHT PLAN Refer to OMS/RCS Slide Rule for vlv loss info			
4 Reconfig following vlv(s) only if leak isolation reqd: (O8) • FWD RCS He PRESS A (C2) • L IDP/CRT SEL – 3 On MCC GO: • GPC/CRT 01 EXEC SM 1 DPS UTILITY (G2,G8,S2) MMU ASSIGN	5 Fwd RCS He Press Isol A GPC Cntl and man CL capability RCS Manf F1 RJD Driver (F1F,F1L,F1U,F1D)	7 (FSMs) S67 FPC/FLC 1 S67 AC VOLTS 1 S86 HYD RSVR Q SM2 HYD QTY 1 (B) S86 WSB T (2) 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	
8 • GNC – ITEM 1 EXEC • SM – ITEM 4 EXEC • PL – ITEM 6 EXEC • OPS 0 – ITEM 8 EXEC (A14) • RCS/OMS HTR FWD RCS – B AUTO If EMU(s) in battery charge mode: (AW 18M) • PWR/BATT CHGR EMU 1(2) BUS SEL – MNB	6 IDP 1 MDU CRT 1 MMU 1 Fwd RCS A Htrs (all) EMU 1,2 Pwr/Batt Chgr MNA pwr		
9 (A8L) • PORT RMS HTR A – AUTO • PORT RMS HTR B – AUTO If OBSS berthed: (A8L) • STBD RMS HTR A – AUTO • STBD RMS HTR B – AUTO Pre-seat ingress: • Discharge handheld fire ext into AV BAY 3 If AC Pwr Transfer Cable to be installed to regain AC: • Go to EPS SSR-200; otherwise, continue with bus loss actions	10 RMS: MCIU 11 Port Mid MRL Mtr 1 11 Port Aft MRL Mtr 2 12 Stbd Fwd MRL Mtr 2 12 Stbd Aft MRL Mtr 1 14 Shldr Brace Release 14 D&C Primary Ltg Av Bay 3 agent discharge capability	13 (R1) FC1 COOL PUMP ΔP tb – bp HYD/APU HYD QTY 1 ind – 0% APU H2O QTY ind – 0% (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 (O3) RCS/OMS PRPLT QTY Gage and MSN TIMER ind – blank (O8) FWD RCS He PRESS A tb – bp TK ISOL 3/4/5 tb – bp MANF ISOL 1 tb – bp 5 L ADP deploy time incr from 15 to 30 sec 15	
(Continued)	(Continued)	(Continued)	

EPS SSR-11 (Cont)
BUS LOSS: MNA FPC1

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EPS SSR-11 (Cont)
BUS LOSS: MNA FPC1

23	BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	ONLY ON MCC CALL, PERFORM			(23) AC1 Bus Isolation for AC Pwr Transfer Cable installation accomplished in MNA FPC1 ACTIONS column. No additional bus isolation steps reqd
	• MDU CRT 1 PWR – OFF			(24) Mtr 2 remains
	(C2) • IDP/CRT 1 PWR – OFF			(25) Htr Cntrlr 2 remains
	(O7) • (OV105) GPS 1 PWR – OFF • (OV105) GPS 1 PRE AMPL UPPER – OFF • (OV105) GPS 1 PRE AMPL LOWER – OFF	(OV105) GPS 1		(26) 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
	(O14:C) • cb MNA FIRE SUPPR BAY 3 – op			(27) Buses remain pwr
	(O14:D) cb MNA • (OV105) GPS 1 PRE AMPL UPPER – op • (OV105) GPS 1 PRE AMPL LOWER – op			(28) Redundant mtrs remain
	(O14:F) • MMU 1 – OFF			(29) Hyd Sys 2 still available for NWS
	(MA73C:A) • MCA LOGIC MNA FWD 1 – OFF	MNA FMC1 Bus pwr		(30) Bypass vlv holds position and Cntrlr A Rad Byp Vlv Mtr remains
		CDR HUD -Y Star Trkr Dr Sys 1 OP/CL capability 24 L ADP Dpy Mtr 1 25 Htr Cntrlr 1		
		RH Vents 1,2,3,5,6 Mtrs 1 LH Vents 5,6,8,9 Mtrs 1		
		26 LG Extend Vlv 1		
		27 MNA pwr to Cntl Buses AB1, AB2,AB3,CA1,CA2,CA3		
		28 ET Door Mtrs: C/L Lat Actr 1 Mtr 1 Actr 2 Mtr 1 L Dr Closure Mtr 1 Uplock Lat Mtr 1		
		29 NWS Hyd Sys 1		
		30 Freon Loop 1,2 Cntrlr 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	FC1 Purge Vlv O2,H2 Flow Xdcrs SS ΔV Snrsrs	2	(L2) O2 SYS 1 SPLY tb – CL	① Buses are tied due to: <u>Loss of FC1 Purge capability.</u> As FC1 loses performance, tied FC will pick up load, slowing FC1 degradation. If degradation projection does not allow nominal EOM, FC1 will be shut dn. √MCC; and <u>Loss of FC1 SS ΔV Snrsrs.</u> 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 ② Vlv holds position. Sys 2 remains ③ Pwrs PL Timing Buffer and OIU 1. OIU 1 redundant pwr MNB MPC2 via CAB PL3 ④ B/U pwr remains for RMS ops. All brakes ON and safing initiated ⑤ When the OBSS is grappled by the RMS, the OBSS uses the RMS Payload power feed for all OBSS subsystem heater and operational power, except LCS ⑥ Single mtr time. One failure away from loss of two out of three MRLs. EVA or jettison capability exists ⑦ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists ⑧ 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 ⑨ Mtrs 2 will continue to drive until Sys A,B Cntl sw are taken to OFF ⑩ MNB htrs remain ⑪ FC1 Startup Htr is disconnected	
	(R1) PL CAB – MNB	3	MNA pwr to CABPL1,2,3 buses		(R13L) RAD CNTL STBD,PORT tb (two) – bp (when stowed)		
	(A8L) - PORT RMS HTR A – OFF - PORT RMS HTR B – AUTO If OBSS berthed: (A8L) - STBD RMS HTR A – OFF - STBD RMS HTR B – AUTO		RMS: 4 Primary pwr 5 Port Payload Pwr 6 Port Mid MRL Mtr 1 6 Port Aft MRL Mtr 2 7 Stbd Fwd MRL Mtr 2 7 Stbd Aft MRL Mtr 1 Port Htr A Stbd Htr A	(A8L) PORT RMS: DPY/STO tb – bp RETEN LAT tb – bp R-F-L MID tb – bp STARBOARD RMS: DPY/STO tb – bp RETEN LAT tb – bp R-F-L AFT 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		PORT RMS 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		Hi Load Duct Outbd,Inbd Htrs A		STBD RMS Indications lost: Fwd MRL Mtr 2 LAT/REL/RDY Aft MRL Mtr 1 LAT/REL/RDY		
	(R11U) FC H2O - LINE HTR – B AUTO - RELIEF HTR – B AUTO		FES H2O Fdln A Mid 2 Htr 1 B Mid 2 Htr 2		PLB Floodlts lost: Fwd Port Aft Stbd Docking		
	(MA73C:D) cb MCA PWR AC1 3Φ MID 1,3 (two) – op	8	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		SM (BFS,SM) 63 PL BAY DOORS If in <u>AUTO</u> OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG'		
	(ML86B:C) cb MNB EXT ARLK HTR STRUC – cl	10	Ext A/L Structural Htrs MNA pwr		During <u>MAN</u> PLBD OP/CL, single mtr run time noted on actuators listed at left		
	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				
			Hyd Bk Htr A				
BUS ISOLATION							
ONLY ON MCC CALL, PERFORM							
11	(R11U) - FC PURGE VLV 1 – CL - FC STARTUP HTR 1 – ENA	11	FC1 Startup Htr Inh capability				
	(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)

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(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 It Port Vestibule Docking It DSP SYS 1 Pwr PSU MNA Pwr	DSP SYS PWR SYS 1 tb – OFF	② Vlv holds position. Sys 2 remains ⑩ MNB htrs remain ⑫ All docking mechanisms will have single mtr times ⑬ Logic buses 1(3) remain pwr'd via MNB(MNC) ⑭ Buses remain pwr'd ⑮ Cntrlrs A,B Rad Byp Vlv mtrs auto cntl and Cntrlr A Rad Byp Vlv mtr remain ⑯ Snr 2 remains ⑰ Lost capability to observe and record FC single cell voltages
(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		
	14 MNA pwr to ESS2CA and ESS3AB AUX PL A Bus pwr		
	15 Freon Loop 1,2 Cntrl 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	16 Cryo O2 Tk 6-9 Htr Current Snr 1		
	FC3 Redundant Reac Vlv Close Cntl on pnl C3		
10 (ML86B:C) • cb MNA EXT ARLK HTR STRUC – op	10 Ext A/L Structural Htrs MNA pwr		
(ML86B:D) • cb MNA FC PCM – op	17 FCMS		

EPS SSR-13 **BUS LOSS: MNA APC1**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS)	2 RCS Manf L5 RJD pwr (L5L,L5D)	1 MASTER ALARM Light/Tone – on	① Indications do <u>not</u> appear until jet commanded
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	(F7) C/W RCS JET It – on	② Manf status <u>not</u> automatically declared closed. Fail-offs will occur when jets commanded
GNC 23 RCS		(FSM) L RCS D(L) JET	③ Vlv holds position. Man OP capability remains
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		If OMS GMBL cmd abs value > 2 deg: C/W OMS TVC It 'L OMS GMBL' (3,B)	④ Maintains control capability for APC6 failure
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	If OMS GMBL cmd abs value > 2 deg and Sec TVC selected: C/W OMS TVC It 'R OMS GMBL' (3,B)	⑤ Do not reconfig for reg switch or I'CNCT procedures
(A12) APU HTR TK/FU LN/H2O • SYS 1A – OFF • 1B – AUTO • 3A – AUTO • 3B – OFF HYD HTR • RUD SPDBK A – OFF • B – AUTO	7 APU 1 FU TK VLV A CL capability via APU 1 Auto Shutdn signal APU 1 GG Inj H2O Htrs A APU 3 GG Inj H2O Htrs B Rud Spd Bk Htr A		⑥ Vlv holds position. Man CL and full GPC cntl remain
(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	8 L Pod A Htrs (all) 9 R Pod B Htrs (partial) 8 OMS Crsfd Ln A Htrs (all)		⑦ In event of APU 1 auto shutdn, vlv remains OP until APU FU TK VLV – CL
10 Prior to using L(R) OMS: (O8)	11 L,R OMS He Pr A GPC Cntl		⑧ Htr B remains
12 L(R) OMS He PRESS/VAP • ISOL A – OP • B – GPC	11 L,R OMS He Vap Isol 1 GPC Cntl		⑨ Htr A remains
----- GNC XXXXX MNVR YYYYY (3,B)			⑩ Lost TM: GNC SYS SUMM 2 L,R OMS ENG BALL VLV 1: Assume Vlv 1 status same as Vlv 2
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		⑪ Vlv fails closed. Man cntl remains. Redundant Isols remain
			⑫ Maintains He Isol redundancy
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
NONE			

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 2 • PUMP 1 – B AUTO 2 • 3 – A AUTO APU HTR • LUBE OIL LINE 1 – B AUTO • LUBE OIL LINE 3 – A AUTO APU HTR TK/FU LN/H2O 2 • SYS 1A – OFF 2 • 1B – AUTO 2 • 3A – AUTO 2 • 3B – OFF HYD HTR • RUD SPD BK A – OFF • BK B – AUTO • BDY FLP A – OFF • B – AUTO • ELEVON A – OFF • B – AUTO HYD CIRC PUMP • PWR 1 – MNB • 3 – MNC	APU 1 GG/Fu Pump Htrs A 3 GG/Fu Pump Htrs B APU 1 Lube Oil Line Htr A APU 3 Lube Oil Line Htr 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 Circ Pump 1 MNA pwr 3 MNA pwr	1 MASTER ALARM Light/Tone – on (F7) C/W RCS JET It – on SM ALERT Light/Tone – on (FSMs) L RCS D(L) JET (R4) 3 HYD BRAKE ISOL VLV 1 tb – OP 4 LG EXTEND ISOL VLV tb – OP 3 HYD MPS/TVC ISOL VLV SYS 1 tb – CL (O7) AFT L RCS He PRESS A tb – bp 5 AFT R RCS He PRESS A tb – bp 6 AFT L,R RCS TK ISOL 3/4/5A tb – bp (if vlv in CL position) (F7) If APUs active, and using BLR CNTLR/HTR 1B or 3A: C/W APU TEMP It – on after ~2 min If OMS GMBL cmd abs value > 2 deg: C/W OMS TVC It L OMS GMBL (3,B) If OMS GMBL cmd abs value > 2 deg and TVC selected: C/W OMS TVC It R OMS GMBL (3,B) If cooling by FES B only: C/W FREON LOOP It 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'	① Indications do <u>not</u> 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 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 ⑤ Vlv holds position. Man OP capability remains ⑥ Full vlv capability remains. If switch in CL, vlv will continuously drive to CL position ⑦ Manf status <u>not</u> automatically declared closed. Fail-offs will occur when jet commanded ⑧ Htr B remains ⑨ Htr A remains ⑩ Do not reconfig for reg switch or I'CNCT procedures ⑪ Vlv holds position. Man CL, full GPC Cntl remains
(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)	FES Pri B Cntr Top Evap L Noz Htr A Top Evap Duct L,R Htrs A Hi Load Duct Noz Htr A	(F7) If APUs active, and using BLR CNTLR/HTR 1B or 3A: C/W APU TEMP It – on after ~2 min If OMS GMBL cmd abs value > 2 deg: C/W OMS TVC It L OMS GMBL (3,B) If OMS GMBL cmd abs value > 2 deg and TVC selected: C/W OMS TVC It R OMS GMBL (3,B) If cooling by FES B only: C/W FREON LOOP It 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'	
(L2) FLASH EVAP FDLN • HTR A SPLY – 2 • B SPLY – 1	FES H2O Fdln A Htrs 1 (all except MID 2) FES H2O Fdln B Htrs 2 (all except MID 2)	(F7) If APUs active, and using BLR CNTLR/HTR 1B or 3A: C/W APU TEMP It – on after ~2 min If OMS GMBL cmd abs value > 2 deg: C/W OMS TVC It L OMS GMBL (3,B) If OMS GMBL cmd abs value > 2 deg and TVC selected: C/W OMS TVC It R OMS GMBL (3,B) If cooling by FES B only: C/W FREON LOOP It 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'	
(R2) • BLR CNTLR/HTR 1 – A • 3 – B	Hyd H2O Blr 1 Cntr B 3 Cntr A	(F7) If APUs active, and using BLR CNTLR/HTR 1B or 3A: C/W APU TEMP It – on after ~2 min If OMS GMBL cmd abs value > 2 deg: C/W OMS TVC It L OMS GMBL (3,B) If OMS GMBL cmd abs value > 2 deg and TVC selected: C/W OMS TVC It R OMS GMBL (3,B) If cooling by FES B only: C/W FREON LOOP It 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'	
• For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS)	7 RCS Manf L5 RJD pwr (L5L,L5D)	(F7) If APUs active, and using BLR CNTLR/HTR 1B or 3A: C/W APU TEMP It – on after ~2 min If OMS GMBL cmd abs value > 2 deg: C/W OMS TVC It L OMS GMBL (3,B) If OMS GMBL cmd abs value > 2 deg and TVC selected: C/W OMS TVC It R OMS GMBL (3,B) If cooling by FES B only: C/W FREON LOOP It 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'	
(A14) RCS/OMS HTR • L POD (two) – A OFF, B AUTO • R POD (two) – B OFF, A AUTO • OMS CRSFD LINES (two) – A OFF, B AUTO	8 L Pod A Htrs (all) 9 R Pod B Htrs (partial) 8 OMS Crsfd Ln A Htrs (all)	(F7) If APUs active, and using BLR CNTLR/HTR 1B or 3A: C/W APU TEMP It – on after ~2 min If OMS GMBL cmd abs value > 2 deg: C/W OMS TVC It L OMS GMBL (3,B) If OMS GMBL cmd abs value > 2 deg and TVC selected: C/W OMS TVC It R OMS GMBL (3,B) If cooling by FES B only: C/W FREON LOOP It 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'	
Refer to OMS/RCS Slide Rule for vlv loss info 10 Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT L RCS He PRESS A,B • R RCS He PRESS A	5 Aft L,R RCS He Pr Isol A GPC Cntl and man CL capability 11 Aft L RCS He Pr Isol B man OP capability	(F7) If APUs active, and using BLR CNTLR/HTR 1B or 3A: C/W APU TEMP It – on after ~2 min If OMS GMBL cmd abs value > 2 deg: C/W OMS TVC It L OMS GMBL (3,B) If OMS GMBL cmd abs value > 2 deg and TVC selected: C/W OMS TVC It R OMS GMBL (3,B) If cooling by FES B only: C/W FREON LOOP It 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'	
If ICNCT config: (O7) 6 • 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	(F7) If APUs active, and using BLR CNTLR/HTR 1B or 3A: C/W APU TEMP It – on after ~2 min If OMS GMBL cmd abs value > 2 deg: C/W OMS TVC It L OMS GMBL (3,B) If OMS GMBL cmd abs value > 2 deg and TVC selected: C/W OMS TVC It R OMS GMBL (3,B) If cooling by FES B only: C/W FREON LOOP It 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'	
(Continued)	(Continued)		

EPS SSR-14 (Cont) **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 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	Aft RCS L,R Jet 2 Htrs		12 Maintains control capability for APC3 failure 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) (O8) • If Straight feed config, L OMS Crossfeed B – OP (tb-OP). Otherwise, √MCC	13 L OMS GN2 Press Vlv OP TM 14 Eng Pr Vlv Coil 1 15 OMS Eng/Crossfeed Vlv Redundancy		14 Unable to confirm redundant coils 15 Maintains deorbit capability for MNB DA2 failure 16 Vlv fails closed. Man cntl remains. Redundant Isols remain
17 Prior to using L(R) OMS: (O8) L(R) OMS He PRESS/VAP • ISOL A – OP • B – GPC	16 L,R OMS He Pr Isol A GPC Cntl 16 L,R OMS He Vap Isol 1 GPC Cntl 18 L OMS Eng Cntl Vlv 1,2 Coils 1 18 R OMS Eng Pr Vlv Coil 2 and Cntl Vlv 1,2 Coils 2 19 L OMS Purge Vlv 1,2 20 OMS Qty Gage		17 Maintains He Isol redundancy 18 Redundant coils remain 19 CAUTION No purge. Wait 10 min between burns
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		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 APU 1 Cntlr pwr Sply A 23 1 Fu Tk Vlv A 1 GBX GN2 Repress Vlv 24 3 Cntlr pwr Sply B 25 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 26 NWS Hyd Sys 1 27 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	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 ③⑩ 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

EPS SSR-15 **BUS LOSS: MNA FLC1**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
Refer to OMS/RCS Slide Rule for vlv loss info 2 Reconfig following vlv(s) only if leak isolation reqd: (O8) - FWD RCS He PRESS A 4 GNC 23 RCS Override F1 Manf status to CL: - RCS FWD – ITEM 1 EXEC - MANF VLVS 1 OVRD – ITEM 40 EXEC Pre-seat ingress for entry: - Discharge handheld fire ext into AV BAY 3	1 Fwd RCS He Press Isol GPC CNTL and MAN CL capability RCS Manf F1 RJD pwr (F1F,F1L,F1U,F1D) Av Bay 3 agent discharge capability	MASTER ALARM Light/Tone – on (F7) 3 C/W RCS JET It – on (FSM) 3 F RCS D(F,L,U) JET (O8) 1 FWD RCS He PRESS A tb – bp	① Vlv holds position. Man OP capability remains ② Do not reconfig for reg switch or I'CNCT procedures ③ Indications do not appear until jet commanded ④ Manf status <u>not</u> automatically declared closed. Jet fail-offs may occur ⑤ Htr Cntrlr 2 remains
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(O14:C)			
cb MNA FIRE SUPPR BAY 3 – op	5 L ADP Htr Cntrlr 1		

EPS SSR-16 **BUS LOSS: MNA ALC1**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A12) APU HTR 2 • GAS GEN/FUEL PUMP 1 – B AUTO 2 • GAS GEN/FUEL PUMP 3 – A AUTO • LUBE OIL LN 1 – B AUTO • LUBE OIL LN 3 – A AUTO APU HTR TK/FU LN/H2O 2 • SYS 1A – OFF 2 • 1B – AUTO 2 • 3A – AUTO 2 • 3B – OFF HYD HTR • BDY FLP A – OFF • B – AUTO • ELEV A – OFF • B – AUTO HYD CIRC PUMP • PWR 1 – MNB • 3 – MNC	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 3 Tk/Fu Ln Htrs B Body Flap Htr A Elevon Actr Htrs A Circ Pump 1 MNA pwr 3 MNA pwr	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 It – 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 It – on after ~2 min (F7) 1 C/W RCS JET It (FSM) 1 L RCS D(L) JET	① Indications do <u>not</u> 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 <u>not</u> 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
(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)	FES Pri B Cntlr Top Evap L Noz Htr A Top Evap Duct L,R Htrs A Hi Load Duct Noz Htr A		
(L2) FLASH EVAP FDLN HTR • A SPLY – 2 • B SPLY – 1	FES H2O Fdln A Htrs 1 (all except MID 2) FES H2O Fdln B Htrs 2 (all except MID 2)		
(R2) • BLR CNTLR/HTR 1 – A • 3 – B	6 Hyd H2O Blr 1 Cntlr 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:			
(O7) • AFT L RCS He PRESS A,B • R RCS He PRESS A	4 Aft L,R RCS He Pr Isol A GPC Cntl and man CL capability 9 Aft L RCS He Pr Isol B man OP capability		
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 6	Aft RCS L,R Jet 2 Htrs		
(Continued)	(Continued)		

EPS SSR-16 (Cont) **BUS LOSS: MNA ALC1**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
If ICNCT config: (O7) • 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	Ctr MPS He Reg A < 680 during entry (MM303)	③ Vlv holds position 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: GNS SYS SUMM 2
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		L OMS N2 P VLV: If Eng – ARM/PRESS, assume vlv OP
Prior to using OMS: (O8) L(R) OMS He PRESS/VAP • ISOL A – OP • B – GPC	14 L,R OMS He Pr Isol A GPC Cntl		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 Cntrl man on capability remains ⑯ Redundant coils remains
If reqd during entry (< 120K ft): (L1) • NH3 CNTLR B – PRI/GPC	15 NH3 Sys A Pri Cntrl & Auto sw over to Sec Cntrl		⑰
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)			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)
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 3 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		

EPS SSR-17

BUS LOSS: MNA FMC1

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(L1) • H2O PUMP LOOP 1 – B Refer to OMS/RCS Slide Rule for vlv loss info GNC 23 RCS Override F1 Manf status to OP: • RCS FWD ITEM 1 EXEC • MANF VLVS 1 OVRD ITEM 40 EXEC	H2O Loop 1 Pump A	MASTER ALARM Light/Tone – on (F7) SM ALERT Light/Tone – on (FSM) RM DLMA MANF (O8) FWD RCS 1 TK ISOL 3/4/5 tb – bp 1 MANF ISOL 1 tb – bp 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 It – 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	① Vlv holds position ② If this action taken, H2O Pump Loop 2 must be pwrd ③ Mtr 2 remains ④ Htr Cntrl 2 remains
BUS ISOLATION 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 Cntrl 1 -Y Star Trkr Dr Sys 1 OP/CL capability		

EPS SSR-18

BUS LOSS: MNA MMC1

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 (MA73C:C) • cb MCA PWR AC1 3Φ MID 1 – op For PLBD ops: • OP/CL Drs in man mode	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 PLBD: C/L Lat 9-12 Mtr 1 Port,Stbd Fwd Blkhd Lat Mtrs 1 Stbd Door Mtr 1 3 Port Door Mtr 2 CL Limit sw 4 Stbd Door Mtr 1 OP Limit sw	(R13L) RAD CNTL STBD tb – bp If PORT RAD pnl stowed: RAD CNTL PORT tb – bp 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 (A8L) PORT RMS: RETEN LAT tb – bp R-F-L MID tb – bp STARBOARD RMS: DPY/STO tb – bp SM 94 PDRS CONTROL PORT RMS Indications lost: Mid MRL Mtr 1 LAT/REL/RDY STBD RMS Indications lost: Fwd MRL Mtr 2 LAT/REL/RDY	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 ② Mtr 2 will continue to drive until Sys A Cntl sw is taken to OFF ③ Mtr 2 will continue to drive closed until PL BAY DR – STOP ④ Mtr 1 will continue to drive open until PL BAY DR – STOP ⑤ Single mtr time ⑥ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists
BUS ISOLATION ONLY ON MCC CALL, PERFORM (MA73C:A) • MCA LOGIC MNA MID 1 – OFF	MNA MMC1 Bus pwr RH Vents 3,5,6 Mtrs 1 5 Port RMS Mid MRL Mtr 1 6 Stbd RMS Fwd MRL Mtr 2		

EPS SSR-19 **BUS LOSS: MNA MMC3**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(MA73C:D) 1 • cb MCA LOGIC MCA PWR AC1 3Φ MID 3 – op For PLBD ops: • OP/CL Drs in man mode	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 Bikhds Lats Mtr 1	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 <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 (A8L) STARBOARD RMS: RETEN LAT tb – bp R-F-L AFT tb – bp SM 94 PDRS CONTROL PORT RMS Indication lost: Aft MRL Mtr 2 LAT/REL/RDY STBD RMS Indications lost: Aft MRL Mtr 1 LAT/REL/RDY	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 ④ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists
BUS ISOLATION ONLY ON MCC CALL, PERFORM (MA73C:B) • MCA LOGIC MNA MID 3 – OFF	MNA MMC3 Bus pwr LH Vents 5,6 Mtr 1 3 Port RMS Aft MRL Mtr 2 4 Stbd RMS Aft MRL Mtr 1		

EPS SSR-20
BUS LOSS: MNA AMC1

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE	LH Vent 8,9 Mtr 1	(R4) 1 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
BUS ISOLATION			② Redundant mtrs remain
ONLY ON MCC CALL, PERFORM			③ Actuators continue to operate until the Stow, Rel/Lat, or OP/CL sw is taken to GND or OFF
(MA73C:B)	MNA AMC1 Bus pwr		④ Hyd Sys 2 still available for NWS
• MCA LOGIC MNA AFT 1 – OFF	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		

EPS SSR-21 **BUS LOSS: MNA R14**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 (R11L) • MS AUD CNTL – PS (L9) • PS ATU PNL config for use (O6) • UHF EVA STRING – 2	2 MS ATU, CCU, FD Spkr SSOR 1	PS Floodlt lost MS, OS CCTV Video lost if MNA selected for VCU CCTV Mon 1 lost (F7) MDU MFD 2 blanks (F8) MDU PLT 1 blanks	① Listen only capability regained when headset used on MS CCU (from PS ATU) as FD speaker is also failed 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 pwr'd 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
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 ----- 3 (R14:B) cb PALLET/DSC • 1A/2B – op (EDO) • 3A – op (EDO) cb MNA • UHF – op • GCILC – op • CNTL BUS BC 1/2/3 – op ----- (R14:C) • cb UHF EVA – op ----- (R14:D) cb MNA TV C CAMR • CAMR/PTU – op • CAMR HTR – op • ILLUM/PTU HTR – op cb MNA TV • CONTR UNIT – op • MON 1 – op ----- (R14:E) • cb MNA PS FLOOD – op cb MNA D CAMR • CAMR/PTU – op • CAMR HTR – op • ILLUM/PTU HTR – op • MDU MFD 2 PWR – OFF • MDU PLT 1 PWR – OFF	MS ATU FD Spkr ----- 4 UHF Splx Pwr Amp 5 GCILC MNA pwr 6 MNA pwr for Cntl BC 1,2,3 Buses ----- SSOR EVA STRG 1 ----- TV C Camr and Pan-Tilt TV C Camr Htr TV C Camr Pan-Tilt Htr and Illum 7 Video Cntl Unit MNA pwr CCTV Mon 1 ----- PS Floodlt TV D STBD RMS: Camr and Pan-Tilt Camr Htr Pan-Tilt Htr ----- MDU MFD 2 MDU PLT 1 8 ADC 1A/2A		

EPS SSR-22
BUS LOSS: MNA O14&A8

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A8L) • PORT RMS HTR A – OFF • PORT RMS HTR B – AUTO If OBSS berthed: (A8L) • STBD RMS HTR A – OFF • STBD RMS HTR B – AUTO	RMS: 1 Port Primary pwr 3 Port Payload pwr 2 MCIU Port Htr A Stbd Htr A	(A8U) 2 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	① B/U drive capability remains. All brakes ON and safing initiated ② All brakes ON and safing initiated ③ When the OBSS is grappled by the RMS, the OBSS uses the RMS Payload power feed for all OBSS subsystem heater and operational power, except LCS ④ If driver sw OFF when bus failed, F1 Manf Drivers lost
BUS ISOLATION ONLY ON MCC CALL, PERFORM NONE	4 ON control for RCS Manf F1 RJD pwr (F1F,F1L,F1U,F1D)		

EPS SSR-23 **BUS LOSS: MNA O14**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(R1) 1 • MN BUS TIE C – ON (tb-ON) (L1) If RAD CNTLR LOOP 1,2 – AUTO B: • Perform ON-ORBIT RAD CNTLR SWITCH, <u>ECLS</u> SSR-13 for Freon Loop 1,2 (L2) • FREON ISOL MODE – OFF (F6,F8) • HSI SEL SOURCE – other than MLS, (OV103,4) TACAN 1 or (OV105) GPS 1 • RDR ALTM – 2 (O6) • ANNUN BUS SEL ACA 1 – MNB If on PCS 1: • Perform RECONFIG TO ALT PCS SYS, <u>ECLS</u> SSR-3 SM 60 SM TABLE MAINT 8 • Inhibit 0612405, 0612511, 0612105, 0612553, 0612869, 0612742 • Perform ECLS COMPUTATION INHIBIT, <u>ECLS</u> SSR-14 Table B (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 • Pre-seat ingress for entry: discharge hand-held fire ext into AV BAY 3 (O14:D) cb MNA • (OV105) GPS 1 PRE AMPL UPPER – op • (OV105) GPS 1 PRE AMPL LOWER – op (A13) • (OV103) GPS PRE AMPL UC – MNC • (OV103) GPS PRE AMPL LC – MNC (Continued)	Freon Loop 1,2 Rad Cntrl B Auto radiator isolation function MLS 1 (OV103,4) TACAN 1 (OV105) GPS 1 Radar Altm 1 3 ACA 1 MNA pwr 5 O2/N2 Cntl Sys 1: 5 O2/N2 Sys 1 Flow Xdcrs 5 N2 Sply Vlv 1 Cntl 6 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 Av Bay 3 agent discharge capability (Continued)	MASTER ALARM Light/Tone – on (F7) C/W CAB ATM It – on SM ALERT Light/Tone – on (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 If ADTA 1, MLS 1, -Z STAR TRKR pwr: 'BCE STRG 1 ADTA' (3,B) 'BCE STRG 1 MLS' (3) 'BCE STRG 1 STKR' (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 (O1) O2/N2 FLOW SYS 1 ind – 0 pph CAB PRESS ind – 0 psia PPO2 SNSR A ind – 0 psia (O3) MSN TIME ind – blank (A4) EVENT TIME ind – blank If first AA failure and S/W processing accel data: 'RM FAIL ACC' (3) (LIGHTS LOST) L Console Floodlt 3 If ACA 1 – MNA, lights lost: (C3) DAP lights right three columns ALL (F2) PBIs except MA If NWS 1 selected: (F3) NWS FAIL It – on	① FC3 only one failure away (loss of ESS3AB) from inability to bus tie ② H2O Loop 1 Intchgr flowrate and IMU fan ΔP snsr lost ③ ACA recovered by switching to alternate pwr ④ After MET 3:30, tb already bp ⑤ Vlv holds position ⑥ Vlv fails closed. IFM or real-time flow test will be required. √MCC for additional direction 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

EPS SSR-23 (Cont) **BUS LOSS: MNA O14**

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM				② H2O Loop 1 Intchgr flowrate and IMU fan ΔP snrs lost
(O6) • S TRK PWR -Z – OFF		-Z Star Tracker Dr OP capability -Z Star Tracker		⑩ Redundant pwr source remains for equip
(O7) • (OV105) GPS 1 PWR – OFF • (OV105) GPS 1 PRE AMPL UPPER – OFF • (OV105) GPS 1 PRE AMPL LOWER – OFF		GPS 1 (OV105)		⑪ Redundant measurement remains. FDA Alarm – BFS only; OPS 3,6
(O8) • RDR ALTM 1 – OFF • MLS 1 – OFF				⑫ Cabin Smoke Detector remains
(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 cb MNA OI • TIRE PRESS – op cb MNA • MNC CONTR – op • MSN TIMER FWD – op • EVENT TIMER AFT – op		2 H2O Byp Loop 1 Snr (ECLS SC11) 11 Tire Press Sig Cond A1,A2 Fwd Mission Timer Aft Event Timer		⑬ Current Snr 2 remains ⑭ Cntrlr A remains ⑮ NWS 2 still available
(O14:C) cb MNA 12 • (OV103,4) TACAN 1 – op 12 • SMOKE DETN L/R FLT DK – op • SMOKE DETN BAY 2A/3B – op • FIRE SUPPR BAY 3 – op • UTIL PWR O19/MO52J – op • FLOOD L CNSL – op • ANNUN FWD ACA 1 – op 13 • cb MNA CRYO O2 HTR TK1 SNSR 1 – op		Tacan 1 12 L,R Flt Dk Smoke Detectors Av Bay 2 Smoke Detector A 3A Smoke Detector B Av Bay 3 agent discharge capability MNA Utility pwr L Console Floodlt 13 Cryo O2 Tk 1 Htr Current Snr 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 • VENT ISOL – op • (OV105) GPS 1 PRE AMPL UPPER – op • (OV105) GPS 1 PRE AMPL LOWER – op		Cabin Vent Vlv Isol		
(O14:E) cb MNA • RDR ALTM 1 – op • MLS 1 – op • ADTA 1 – op • S TRK -Z – op • ACCEL 1 – op 10 • DDU L,AFT (two) – op 15 • NWS – op		ADTA 1 AA 1 10 L DDU MNA pwr 10 Aft DDU MNA pwr NWS 1		

EPS SSR-24
BUS LOSS: MNA R1A1

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE	1 MNA pwr to CNTL buses AB1,AB2,AB3,CA1,CA2, CA3 1 MNA pwr to ESS2CA, ESS3AB	NONE	① Buses remain pwr'd
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
NONE			

EPS SSR-25
BUS LOSS: MNA A6&A14

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
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	Fwd RCS Jet 1 Htrs	(A6U) PL RETEN RDY tb – bp RETEN/LAT tb – bp	① Single mtr time
		(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	
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
NONE	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		

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) 2 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.
(ML86B:D) cb MNB MMU • PORT,STBD HTR B (two) – cl	1 MMU Port,Stbd Htr A	2 (R13L) 2 MMU GN2 SPLY ISOL VLV A tb – bp	May have to interface EMU 2 with SCU 1 to provide total H2O servicing/recharge
If Waste H2O Dump reqd: • Perform WASTE WATER SYS BACKUP DUMP (IFM)	2 Waste H2O: Dump Vlv Cntl Noz Htr	2 (ML31C) 2 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	④ Without circulation, H2O will lose heat with time and never reheat to nominal temp
(ML31C) • VAC VENT ISOL VLV BUS SEL – MNB	Vac Vent Isol MNA Cntl	2 (AW82D) 3 EMU 2 H2O SPLY, WASTE (two) tb – CL	⑤ MNB and MNC line htrs remain. MNB struc and vestibule htrs remain
(WCS) • √MODE – AUTO • √CRADLE – AUTO • √Hose stowed in cradle • √WCS ON It – 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	(LIGHTS LOST) Middeck Floodlts 1,8 WMC Floodlt MO13Q pnl lt 2 Airlk Floodlt 1 TA Flood 2 (SL only)	
(GALLEY) • OVEN/RHS – OFF • √OVEN FAN: OFF • Config for backup H2O dispense per ECLS	Galley Electronics Assy Oven 4 One of six htr strips Galley Hot H2O Tk		
(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	5 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 Sply H2O TkA Inlet Vlv Cntl 2 Sply H2O Tkb,D Outlet Vlv Cntl		
(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		
(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
(ML86B:F) 6 • cb MNA CRYO O2 HTR TK3 SNSR 1 – op • cb MNA CRYO O2 HTR TK5 SNSR 1 – op	6 Cryo O2 Tk 3 Htr Current Snsr 1 Cryo O2 Tk 5 Htr Current Snsr 1		② Vlv holds position
(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 MMU Port,Stbd Htr A 2 MMU GN2 Sply Isol Vlv A 7 Ku-Bd Jettison Sys A 7 Stbd RMS: Jett/Guil Sys A Deadface Relays		③ Vlv holds position. May have to interface EMU 2 with SCU 1 to provide total H2O servicing/ recharge
(ML86B:E) cb MNA EMU 2 H2O • SPLY – op • WASTE – op cb MNA FLOOD • TNL ADAPT 2 – op	TA Floodlt 2		⑤ MNB and MNC line htrs remain. MNB struc and vestibule htrs remain
(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		⑥ Current Snsr 2 remains
	3 EMU 2 Sply H2O Vlv Cntl Waste H2O Vlv Cntl		⑦ Sys B remains
(ML86B:C) 5 • cb MNA EXT ARLK HTR LINE ZN1 – op 5 • cb MNA EXT ARLK HTR LINE ZN2 – op 5 • cb MNA EXT ARLK HTR STRUC – op 5 • cb MNA EXT ARLK HTR VEST Z1/2/3 – op	5 Ext A/L H2O and Structural Htrs MNA pwr		⑧ Lost capability to observe and record FC single cell voltages
(ML86B:D) • cb MNA FC PCM – op	8 FCMS		

EPS SSR-29
BUS LOSS: MNA A7

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE		VEST DEP VLV SYS 1 VENT ISOL tb – bp VEST DEP VLV SYS 1 VENT tb – bp 1 DSP SYS PWR SYS 1 tb – OFF	① DSP SYS 1 PWR still available to all users except MNA A7
BUS ISOLATION ONLY ON MCC CALL, PERFORM (A6L) 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	Vestibule Depress Vlv Sys 1 Vent Isol Vestibule Depress Vlv Sys 1 Vent External Airlock Its 1,4 Fwd Truss Docking It		

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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 Snr Purge Vlv O2,H2 Flow Xdcrs Cell Perf Monitor AUX PL B Bus pwr MNB pwr to ESS1BC ESS3AB CNTLAB1,2,3 CNTLBC1,2,3	MASTER ALARM Light/ Tone – on SM ALERT Light/Tone – on (F6) MDU CDR 2 blanks (F7) MDU CRT 2 blanks MDU MFD 1 blanks C/W CABIN ATM It – on C/W MN BUS UNDERVOLT It – on C/W AC VOLT It – on C/W FC PUMP It – on C/W FREON LOOP It – on C/W RCS JET It – on (COMM LOST) All S-BD A/G voice lost if Sys 1 selected Middeck Spkr audio lost (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 Bkhd Floodlt PLB Mid Port Floodlt PLB Fwd Stbd Floodlt TA Floodlt 3 (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 ----- 3 R RCS D,R JET S67 MAIN BUS V B I/O ERROR CRT 2 S67 FPC/FLC 2 -----	① Buses remain pwr ② Pwrs PL Timing Buffer, OIU 1, and OIU 2 (if flown). OIU 1 redundant pwr MNA MPC1 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
(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 • AC2 BUS SNSR – OFF • O2,H2 TK1 HTRS A – AUTO • O2,H2 TK1 HTRS B – OFF • O2,H2 MANF vlv TK1, TK2 – OP • O2,H2 TK2,3 HTRS A,B (eight) – OFF (A11) • O2,H2 TK4 HTRS A,B (four) – OFF (A15) If O2,H2 TK5 QTY > 10%: • O2,H2 TK5 HTR A (two) – AUTO	2 MNB pwr to CABPL 1,2,3 buses AC2 ΦA,ΦB,ΦC Inverters Cryo O2(H2) Tk2,3,4 Htrs A if in Auto Cryo O2,H2 Tk2,3,4 Htrs B	3	
(A12) APU HTR 4 • GAS GEN/FUEL PUMP 1 – A AUTO 4 • GAS GEN/FUEL PUMP 2 – B AUTO • LUBE OIL LN 1 – A AUTO • 2 – B AUTO APU HTR TK/FU LN/H2O 4 • SYS 1A – AUTO 4 • 1B – OFF 4 • 2A – OFF 4 • 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	Av Bay 1 Agent discharge capability 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 GG Inj H2O Tank Htrs B 1 GG Inj H2O Line Htrs B 2 GG Inj H2O Line Htrs B 1 Tk/Fu Line Htr B 2 Tk/Fu Line Htr A Rudder/Speed Brake Htr B Body Flap Htr B Elev Act Htr B Aft Fuselage Htrs A HYD BK HTR B Circ Pump 1 MNB pwr 2 MNB pwr	3	
If SSPTS: PTU 2(OPCU 2 and APCU 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 RM DLMA MANF If ADTA 2, MLS 2, -Y STAR TRKR pwrld: 'BCE STRG 2 ADTA' (3,B) 'BCE STRG 2 MLS' (3) 'BCE STRG 3 STKR'	(3) Indications do not appear until jet commanded (5) Vlv holds position (6) REACQ and PSP reconfig procedures are flight specific. If reqd, procedures are found in payload or ISS specific books
(A1L) 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 SW PL Ant capability to 2RH,2LH	(L2) 5 CAB RELIEF A tb – bp 5 O2 SYS 2 SPLY tb – CL 5 N2 SYS 2 SPLY tb – bp 5 N2 SYS 2 REG INLET tb – bp	(7) OIU CABLE SWAP (IFM PROCEDURES, IFM) will be reqd to regain OIU cmd via OIU 1 and PSP 2
7 If OIU reqd, √MCC	3 OIU 2 OIU 1 MNB Pwr	SM 212 OIU OIU 2 TEMP ≥ 140 SM 62 PCMMU/PL COMM If OIU 2, active possible msg 'S62 PDI DECOM FAIL'	(8) When gear deployed, tb does not indicate DN
(A1R) • S-BD FM PWR – 2	S-BD FM Sig Proc 1 Xmtr 1	(F6/F8) 8 LDG GEAR L, NOSE (two) tb – bp	(9) Vlv holds position. Loss of redundant hyd NLG deploy and NWS redundancy if failed closed
If no comm: (C3) • S-BD PM CNTL – PNL • – CMD		(F7) FWD EVENT TIME ind – blank	(10) May be repwrld after AC Pwr Transfer Cable connected
(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 Cntrl A FES Sec Cntrl 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	(R1) FC2 COOL PUMP ΔP tb – bp (R4) 5 HYD MPS/TVC ISOL VLV SYS 2 tb – CL 9 HYD BRAKE ISOL VLV 2 tb – OP	(11) When the OBSS is grappled by the RMS, the Cabin Payload A or B power feeds are used to pass MPC1 or MPC2 power, respectively, to the Payload Cabin 3 power bus for distribution to all OBSS equipment, except for LCS
(L2) • FLASH EVAP FDLN HTR A SPLY – 1	FES H2O Fdln A Htrs 2 (all)	If Sys 1 pwrld: 'S62 BCE BYP PSP 1' Loss of PL TLM and CMD If PDI FDA enabled: 'S62 PDI DECOM FAIL'	(12) Single mtr time. One failure away from EVA to stow MPM or from RMS/OBSS jettison
(L4:P) • cb AC3 ΦA LG SNSR 1 – cl	10 Prox Snsr Electronics Box 2	(O7) 5 AFT R RCS He PRESS B tb – bp AFT L,R RCS TK ISOL 3/4/5B tb – bp (if vlv in CL position)	(13) Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists
(A8L) • PORT RMS HTR B – OFF • PORT RMS HTR A – AUTO If OBSS berthed: (A8L) • STBD RMS HTR B – OFF • STBD RMS HTR A – AUTO	11 RMS: B/U Pwr Port Payload Cntrl Pwr B 12 Port MPM Mtr 2 12 Stbd MPM Mtr 1 13 Port Fwd MRL Mtr 1 13 Port Mid MRL Mtr 2 14 Stbd Fwd MRL Mtr 1 14 Stbd Mid MRL Mtr 1 14 Stbd Aft MRL Mtr 2 D&C B/U edge Itg 10 Port Htr B 10 Stbd Htr B	(O8) 5 FWD RCS He Press B tb – bp 5 MANF ISOL 2 tb – bp	(14) Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists
(F6) • HSI SEL SOURCE – other than MLS, (OV103,4) TACAN 2 or (OV105) GPS 2	MLS 2 (OV103,4) TACAN 2 (OV105) GPS 2	(R11L) 5 SPLY H2O 5 DUMP ISOL VLV tb – bp 5 TKB INLET tb – bp 5 TKC OUTLET tb – bp 5 B SPLY ISOL VLV tb – bp	
(F6,F8) • RDR ALTM – 1	RA 2	(R13L) 5 MMU GN2 SPLY ISOL VLV B tb – bp	
(Continued)	(Continued)	(Continued)	

EPS SSR-30 (Cont) **BUS LOSS: MNB DA2**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(O6) ANNUN BUS • SEL ACA 1 – MNA • 2/3 – MNC • For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS) Refer to OMS/RCS Slide Rule for vlv loss info	ACA 1 MNB pwr ACA 2/3 MNB pwr	(ML31C) 5 WASTE H2O TK1 DRAIN VLV tb – bp 5 SPLY H2O TKD INLET tb – bp	(5) Vlv holds position (15) Manf status <u>not</u> automatically declared closed. Fail-offs will occur when jet commanded
16 Reconfig following vlvs only if leak isolation reqd: (O7) • AFT L RCS He PRESS A • R RCS He PRESS A,B (O8) • FWD RCS He PRESS A,B	15 RCS Manf R5 RJD pwr (R5R,R5D) RCS manf F2 RJD pwr (F2F,F2R,R2U,F2D)	(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	(16) Do not reconfig for reg switch or l'CNCT procedures (17) Man CL and GPC cntl remain. Vlv holds position (18) Man OP capability remains. Vlv holds position
(C2) • R IDP/CRT SEL – 3 • GPC/CRT O2 EXEC	17 F,L,R RCS He Pr Isol A man OP capability 18 F,R RCS He Pr Isol B GPC Cntl, man CL capability	(A4) MSN and EVENT TIME ind – blank	(19) Antenna miscompare causes FSM
22 SM 1 DPS UTILITY (G2,G8,S2) MMU ASSIGN • GNC – ITEM 2 EXEC • SM – ITEM 3 EXEC • PL – ITEM 5 EXEC	20 IDP 2 MDU CRT 2 MDU CDR 2 MDU MFD 1 21 ADC 1B/2B	19 If Site AOS and using S-BD Ant Elect 1: 'ANTENNA' (2) If NSP 1 selected: 'BCE STRG 1 NSP' If Hum Sep B ON: 'S66 HUMID SEP B' If Cabin Fan B ON: C/W AV BAY/CAB AIR It – on 'S66 CABIN FAN' If IMU Fan B ON: 'S66 IMU FAN DP' 'S66 IMU FAN SPD B'	(20) Loss of redundant port to the following: MDU PLT 1 (P) MDU PLT 2 (S) MDU AFD 1 (S) (21) IDP 3, IDP 4 ADC data lost. MDU port select may be reqd (22) Selecting failed MMU for GNC MF protects against GPC MMU Rcvr failure after OPS XTION prepositioning
(A6U) • ANNUN BUS SEL – MNC	ACA 4/5 MNB pwr	If Freon Loop 1 Pump B ON: 'S88 FREON FLOW 1' 'S88 FRN AFT CP 1' 'S88 FRN PL HX 1'	(23) Htr A remains (24) Htr B remains
(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	23 Fwd RCS Htrs B (all) L Pod B Htrs (partial) 24 R Pod A Htrs (all)	If H2O Loop 1 Pump B ON: C/W H2O LOOP It 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP' 'S88 H2O PUMP P 1'	(25) O2/N2 Cntl Vlv 2 normally closed when unpowered
(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	(O1) H2O PUMP OUT PRESS LOOP 1 ind – 20-25 psia	(26) Vlv fails closed. IFM or real-time flow test will be required. √MCC for additional direction
(ML86B:C) • cb MNA EXT ARLK HTR STRUC Z1/2/3 – cl • cb MNA EXT ARLK HTR LN ZN 1, ZN 2 (two) – cl	Ext Arlk Htrs B: Structural Htrs B Water Line Htrs B	During Rad Dpy/Sto ops: (R13L) RAD CNTL tbs (four) indicate single mtr ops	
If in Rendezvous or Docked: • cb MNA EXT ARLK HTR VEST Z1/2/3 – cl	Ext Arlk Vest Htrs B	(A8L) PORT RMS: DPY/STO tb – bp RETEN LAT tb – bp R-F-L FWD tb – bp	
(ML86B:D) cb MNA MMU • PORT HTR A – cl • STBD HTR A – cl	23 MMU Port,Stbd Htr B	STARBOARD RMS: RETEN LAT tb – bp R-F-L FWD tb – bp R-F-L MID tb – bp	
• If on PCS 2: Perform RECONFIG TO ALT PCS SYS, <u>ECLS</u> SSR-3	5 O2/N2 Cntl Sys 2: 5 O2 Sply Vlv Cntl 5 N2 Sply Vlv 2 Cntl 25 Reg Inlet Vlv 2 Cntl 26 O2/N2 Cntl Vlv 2 Man Cntl O2 Xovr Vlv 2 OP capability O2/N2 Sys 2 Flow Xdcrs PPO2 Snsrs B,C	SM 94 PDRS CONTROL PORT RMS Indications lost: MPM Mtr 2 STO/DPY Fwd MRL Mtr 1 LAT/REL/RDY Mid MRL Mtr 2 LAT/REL/RDY STBD RMS Indications lost: MPM Mtr 1 STO/DPY Fwd MRL Mtr 1 LAT/REL/RDY Mid MRL Mtr 1 LAT/REL/RDY Aft MRL Mtr 2 LAT/REL/RDY	
	dP/dT Snsr		
(Continued)	(Continued)	(Continued)	

EPS SSR-30 (Cont) **BUS LOSS: MNB DA2**

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
For PLBD ops: • OP/CL Drs in man mode		PLBD: C/L Lat 13-16 Mtr 2 Stbd Aft Blkh Mtr 2 Port Door Mtr 2 Stbd Door Mtr 2 Port,Stbd Fwd Blkh Mtrs 2 Port,Stbd Door Mtr 1 CL Limit sws	If Freon sig condn 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)'	(5) Vlv holds position (27) Lost TM: [GNC SYS SUMM 2]
27	Prior to using L(R) OMS: (O8)	28 L OMS He Pr Isol B and Vap Isol 2 GPC Cntl	(O1) FREON FLOW LOOP 2(1) ind – 443 pph	L OMS ENG VLV 2: Assume VLV 2 status same as VLV 1
29	L OMS He PRESS/VAP ISOL • A – GPC • B – OP	30 R OMS He Pr Isol A, B man Cntl and Vap Isol 1,2 man A,B Cntl	CCTV video TV Annun Its lost if MNB selected for VCU CCTV Mon 2 lost (VTR input lost)	(28) Man cntl remains. Vap Isol closes. Pr Isol normally closed
31	R OMS He PRESS/VAP ISOL • A(B) – GPC • B(A) – CL		(F7) If APUs active and using BLR CNTLR/HTR 1A or 2B: C/W APU TEMP It – on after ~2 min	(29) Maintains He Isol redundancy
	(O8) • Right OMS TK ISOL A – CL (tb-CL)	32 OMS Eng/Xfeed Redundancy	[SM (BFS,SM) 63 PL BAY DOORS]	(30) GPC cntl remains. Vlv fails closed
	If Supply H2O Dump reqd and DUMP ISOL VLV failed closed: • Perform SUPPLY WATER DUMP USING FES (ORB OPS, ECLS)	5 Supply H2O Dump Isol Cntl	If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG'	(31) Prevents simultaneous opening of parallel reg paths and possibly rupturing burst disk
	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	During MAN PLBD OP/CL single mtr run time noted on actuators listed at left	(32) Maintains deorbit capability for CNTL AB1 failure
	[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 OMS Gmb1 cmd abs value > 2 deg and Sec TVC selected: OMS TVC C/W It 'L OMS GMBL' (3,B)	(33) Not yet active on all vehicles
	If CCTV reqd: (A7U) • TV PWR CONTR UNIT – MNA	Video Cntl Unit MNB pwr	If first AA failure and S/W Processing Accel data: 'RM FAIL ACC' (3)	(34) APU H2O QTY 1 ind – 0% if BLR CNTLR/HTR 1A selected. APU H2O QTY 2 ind – 0% if BLR CNTLR/HTR 2B selected
	For SSME Hyd Repress: (R4) • HYD MPS/TVC ISOL VLV SYS 1,3 (two) – OP, wait 10 sec, then CL	33 FC1 Redundant Reac Vlv Cntl on pnl C3	If first RGA failure and rates sensed: 'RM FAIL RGA' (3)	(35) Sys B Pri Cntl, auto switchover to Sec Cntl remain
	[GNC XXXXX MNVY YYYYY] Sel L OMS PRI GMBL • ITEM 28 EXEC	5 MPS/TVC Hyd Sys 2 Isol Cntl	Star Trkr Dr -Z OP/CL time and -Y CL time incr from 8 to 16 sec	
	(ML31C) • VAC VENT ISOL VLV BUS SEC – MNA	L OMS Sec TVC	L,R ADP deploy times incr from 15 to 30 sec	
	If reqd during entry (< 120 K ft): (L1) • NH3 CNTLR A(B) – PRI/GPC	Vac Vent Isol MNB Cntl	[HYD/APU] 34 APU H2O QTY 1 Ind – 0% 2 Ind – 0% HYD QTY 2 Ind – 0% APU 1 SPEED % Ind – 0	
		35 NH3 Sys B Sec Cntl Man capability		
(Continued)		(Continued)		

EPS SSR-30 (Cont) **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			36 Av Bay 3 Fan ΔP, Air Out Temp Snsrs lost 37 Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate, and Accum Qty snsrs lost 38 Freon Loop 2 P/L Hx Flow Rate, Freon Loop 1 ICH Flow Rate, and Accum Qty snsrs lost 39 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 It – 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			
(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	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) 36 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	37 Freon Sig Condr A AC2 pwr (ECLS SC 1A) 38 Freon Sig Condr B AC2 pwr (ECLS SC 1B)		
(CDRs SEAT) SEAT PWR BUS SEL – AC3	CDR Seat Adj via AC2 pwr		
(PLTs SEAT) SEAT PWR BUS SEL – AC3	PLT Seat Adj via AC2 pwr		
- If Cab Temp Cntlr 1 active: (L1) - CAB TEMP CNTLR – OFF	39 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)		

EPS SSR-30 (Cont) **BUS LOSS: MNB DA2**

	BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
40	ONLY ON MCC CALL, PERFORM			
41	(L1) • H2O PUMP LOOP 1 – OFF			④① AC2 Bus Isolation for AC Pwr Transfer Cable installation accomplished in MNB DA2 Actions column. No additional bus isolation steps reqd
	(L4:N) • cb AC2 ΦC RAD ISOL A – op	42 Freon Loop 1,2 Rad Isol Motor A		④① If this action taken, activate H2O Pump Loop 2
	• MDU CRT 2 PWR – OFF • MDU CDR 2 PWR – OFF • MDU MFD 1 PWR – OFF			④② Motor B remains
	(C2) • IDP/CRT 2 PWR – OFF			④③ Redundant pwr source remains for equipment
	(C3) • MSTR MADS PWR – OFF			④④ H2O Loop 2 ICH Flow Rate snsr lost
	(O6) • STAR TRKR PWR -Y – OFF	-Y Star Tracker		④⑤ Other detn in Av Bay remains
	(O7) • (OV105) GPS 2 PWR – OFF • (OV105) GPS 2 PRE AMPL UPPER – OFF • (OV105) GPS 2 PRE AMPL LOWER – OFF	GPS 2		④⑥ Current Snsr 1 remains
	(O8) • RADAR ALTM 2 – OFF • MLS 2 – OFF			④⑦ Cntrlr B remains
	(O15:A) • RGA 2 – OFF	RGA 2		
43	(O15:B) cb MNB OI SIG CONDR			
43	• OF 1/4 B – op			
43	• OF 2/3 A – op			
43	cb MNB			
43	• OM 1/2 B – op			
43	• OI MDM OF 1/2 B – op			
43	• OI SIG CONDR OM 3A – op			
43	• OI H2O BYP LOOP 2 SNSR – op	44 H2O Byp Loop 2 Snsr (ECLS SC12)		
	(O15:B) • cb MNA CONTR – op • MSN TIMER AFT – op • EVENT TIMER FWD – op	Aft Mission Timer Fwd Event Timer		
45	(O15:C) cb MNB			
	• (OV103) TACAN 2 – op	Tacan 2		
	• SMOKE DETN BAY 1B/3A – op	Av Bay 1 Smoke Det B, Av Bay 3 Smoke Det A		
	• FIRE SUPPR BAY 1 – op	MNB Utility pwr		
	• UTIL PWR F1/MO13Q – op			
	• 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	46 Cryo O2 Tk2 Htr Current Snsr 2		
	• (OV104,5) GPS 2 PRE AMPL UPPER – op			
	(A13) • (OV104) GPS 2 PWR - OFF	GPS 2		
	• (OV104) GPS 2 PRE AMPL UPPER - OFF			
	• (OV104) GPS 2 PRE AMPL LOWER - OFF			
	(A15:H,I,J,K) • cb MNB TK6-TK9 O2 HTR SNSR 2 – op	46 Cryo O2 Tk6-9 Htr Current Snsr 2		
47	(O15:D) cb MNB			
47	• FREON RAD CNTLR 1 – op			
	• FREON RAD CNTLR 2 – op			
	(Continued)	(Continued)		

EPS SSR-30 (Cont) **BUS LOSS: MNB DA2**

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM				① Buses remain pwr'd
48	• PPO2 C CAB dP/dT – op • (OV104,5) 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 • NWS – op	Cabin Relief Vlv A Cntl NWS – 2		⑤ Vlv holds position
43	(O15:E) cb MNB • RDR ALTM 2 – op • MLS 2 – op • (OV104) TACAN 2 – op • ADTA 2 – op • STAR TRKR -Y – op • ACCEL 2 – op • DDU L – op • R – op • DRAG CHUTE SYS 2 – op	Tacan 2 5 ADTA 2 AA2		④③ Redundant pwr source remains for equipment
43	(O15:F) • MMU 2 – OFF	49 Drag Chute, PLT Arm		④⑧ NWS 1 still available
		50 ASA 4 Isol		④⑨ CDR Arm remains
		50 ATVC 3 Isol ME		⑤⑩ Six vlvs fail to non-isolation position
		50 4 Isol ME		⑤① KU-BAND ANTENNA: CONTINGENCY STOW – W/EVA ANT GIMBAL ALIGNMENT (IFM) req'd to stow Ku-Bd. Jettison req'd if antenna cannot be positioned within GO FOR PLBD CLOSURE envelope
	(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 Middeck Spkr		
43	(R14:B) • cb MNB CNTL BUS CA 1/2/3 – op 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	Ku-Bd sys (I/F and cont Unit, RDR) 51 Sig Proc & Dpy Assy Deployed Assy Htrs		
	(R14:D) cb MNB TV A CAMR • CAMR/PTU – op • CAMR HTR – op • ILLUM/PTU HTR – op cb MNB TV • CONTR UNIT – op • MON 2 – op	TV A Camr/Pan-Tilt TV A Camr Htr TV A Camr Pan-Tilt Htr and Illum CCTV Mon 2		
	(R14:E) • cb MNB OS FLOOD – op cb MNB RMS CAMR • CAMR/PTU – op • WRIST ILLUM/CAMR HTR – op • ELB ILLUM/PTU HTR – op	OS Floodlt RMS Camr/Pan-Tilt RMS Camr Htr and Wrist Illum RMS Camr Pan-Tilt Htr and Elb Illum		
(Continued)		(Continued)		

EPS SSR-30 (Cont) **BUS LOSS: MNB DA2**

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM		DSP SYS PWR SYS 2 tb – OFF	⑤ Vlv holds position
(A7U) PL BAY FLOOD • FWD BHD – OFF • MID PORT – OFF • FWD STBD – OFF	PLB Fwd Bkhd Floodlt Mid Port Floodlt Fwd Stbd Floodlt		②③ Htr A remains
(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		⑤② All docking mechanisms will have single mtr times
(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 PSU MNB Pwr 52 53 MNB pwr to DSP Logic buses 1,2 External Airlock lts 2,3		⑤③ Logic buses 1(2) remain pwr'd via MNA(MNC)
(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		⑤④ No redundancy
(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	5 Sply H2O TKB Inlet Vlv Cntl 5 Sply H2O TKC Outlet Vlv Cntl 5 Sply H2O B Sply ISOL Vlv Cntl		⑤⑤ One failure away from loss of jettison capability
(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	54 Waste H2O Vac Vent Noz Htr 5 Tk1 Drain Vlv Cntl 5 Sply H2O TKD Inlet Vlv Cntl WCS Press Xdcr Galley H2O Htrs		
(ML86B:C) cb MNB • EXT ARLK HTR STRUC Z1/2/3 – op • EXT ARLK HTR LN ZN 1, ZN 2 (two) – op • EXT ARLK HTR VEST Z1/2/3 – op	Ext Arlk Struc Htrs B Ext Arlk H2O Ln Htrs B Ext Arlk Vest Htrs B		
(ML86B:D) cb MNB MMU • PORT,STBD HTR B – op • GN2 SPLY ISOL VLV B – op cb MNB PYRO JETT SYS A • PORT RMS – op	23 MMU Port,Stbd Htr B 5 GN2 Sply Isol Vlv B Port RMS: 55 Jett/Guil Sys A Deadface Relays		
(ML86B:E) cb MNB SEAT • L – op • R – op cb MNB FLOOD • TNL ADAPT 3 – op	TA Floodlt 3		
(Continued)	(Continued)		

EPS SSR-30 (Cont)
BUS LOSS: MNB DA2

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
46 56	(ML86B:F) cb MNB FLOODS • MIDDECK 2/6 – op • BUNK 2/4 – op	Middeck Floods 2,6 Bunk Floodlts 2/4	L MPS He reg A < 680 during entry (MM 303)	(5) Vlv holds position
	----- ONLY ON MCC CALL, PERFORM			(9) Vlv holds position. Loss of redundant hyd NLG deploy and NWS redundancy if failed closed
	• PHS – op • AIRLK 3 – op cb MNB CRYO O2 • HTR TK3 SNSR 2 – op • TK4 SNSR 1 – op	PHS Floodlt Airrk Flood 3 Cryo O2: 46 Tk 3 Htr Current Snr 2 56 4 Htr Current Snr 1		(46) Current Snr 1 remains
		57 Port,Stbd Rad Mtrs 2 Dpy capability Port,Stbd Rad Lat 1-6 Mtrs 2		(56) Current Snr 2 remains
		58 Fwd RCS Jet 2 Htrs L OMS ENG Press Vlv Coil 2, Cntl Vlv 1,2 Coil 2		(57) Mtrs 2 stow capability unaffected
		59 OMS Qty Gauging for all L OMS single engine burns		(58) Redundant coils remain
		9 Hyd Brake Isol Vlv 2 Cntl 60 APU 1 Cntrl Pwr Sply B 61 1 Fuel Tk Vlv B 62 2 Cntrl Pwr Sply A 2 Fuel Tk Vlv A APU 2 GBX GN2 Repress Vlv Hyd Rsvr 2 Qty Snr		(59) √MCC for OMS Qty
		63 Freon Loop 2 Cntrl A Rad Byp Vlv Mtr Man Cntl		(60) Pwr supply A remains. Turbine speed ind lost
		64 Freon Loop 1 Cntrl A Rad Byp Vlv Mtr		(61) Vlv fails closed. Redundant vlv remains
		5 Freon Loop 1 Flow Prop Vlv Freon Loop 1 Cold Plate Flow Xdcr		(62) Pwr supply B remains. GG Bed T and GBX P lost when APU running
		65 L,R ADP Dpy Mtrs 2 66 Htr Cntrl 2 RH Vents 1,2,6,8,9 Mtrs 2 LH Vents 1,2,3,5,8,9 Mtrs 2		(63) Cntrls A,B Rad Byp Vlv Mtrs Auto Cntl and Cntrl B Rad Byp Vlv Mtr Man Cntl remain
		NLG B/U Rel and Ext Sys 2 LMG, RMG B/U Rel Sys 2		(64) Bypass vlv holds position and Cntrl B Rad Byp Vlv Mtr remains
		-Y Star Trkr Dr OP and Sys 2 CL capability -Z Star Trkr Dr Sys 1 OP/CL capability		(65) Mtr 1 remains
		PL Reten Sys B Rel/Lat Mtrs 67 Ku Ant Sto/Dpy Mtr 2		(66) Htr Cntrl 1 remains
		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		(67) √MCC for stow reqmts
		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		(68) Vlv fails closed
		72 NWS Hyd Sys 2		(69) Vlv holds position. Loss of manual capability to inert LO2 and LH2 Manf
		9 LG Extend Vlv 2		(70) Vlv fails closed. LH2 Manf will not be pressurized with He during entry (MM304)
		Ops Hyd Actr Instr 73 Hyd Main Pump 2 Depress Solenoid RPC A		(71) Redundant mtrs remains
		73 Hyd Main Pump 1 Depress Solenoid RPC B		(72) Hyd Sys 1 still available for NWS
				(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), pwrdrn not needed, then: (R1) • 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 • AC2 BUS SNSR – OFF (L4:P) • cb AC3 ΦA LG SNSR 1 – cl Refer to OMS/RCS Slide Rule for vlv loss info Reconfig following vlv only if leak isolation reqd: (O8) 5 • FWD RCS He PRESS A,B (A1L) S-BD PM • ANT SW ELEC – 2 • XPNDR – 2 • PWR AMPL OPER – 2 • STBY – 2 • PRE AMPL – 2 • NSP • PWR – 2 If simo loss of MNA & MNB: • NSP ENCRYPTION MODE – SEL • NSP ENCRYPTION SEL – BYP 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) (A1R) • S-BD FM PWR – 2 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 (C2) • R IDP/CRT SEL – 3 On MCC GO: • GPC/CRT O2 EXEC (A14) • RCS/OMS HTR FWD RCS A AUTO (Continued)	2 FC2 Pumps and pH Snsr AC2 ΦA,ΦB,ΦC Inverters 2 Prox Snsr Electronics Box 2 3 Fwd RCS He Press Isol A man OP capability 4 Fwd RCS He Press Isol B man CL and full GPC Cntl RCS Manf F2 RJD pwr (F2F,F2R,F2U,F2D) S-BD PM Sys 1: - Xpndr 1 - Pre-Amp 1 - Pwr Amp 1 - PM, FM Ant Sw 1 - NSP 1/COMSEC 1 S-BD PL Intrg 1 PSP 1 S-BD FM Sys 1 11 IDP 2 MDU CRT 2 Fwd RCS Htrs B (all) (Continued)	MASTER ALARM Light/Tone – on CRT 2 blanks (F7) C/W FC PUMP It – on C/W AC VOLT It – on C/W FREON LOOP It – on C/W AV BAY/CAB AIR SM ALERT Light/Tone – on (F9) AC2 ΦA,ΦB,ΦC AC volts < 90 (COMM LOST) All S-BD A/G voice lost if Sys 1 selected (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 Its (pnls A2,A4) (FSMs) S67 FPC/FLC 2 S67 AC VOLTS 2 S86 HYD RSVR Q (B) SM2 HYD QTY (B) S86 WSB T (B) 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 RM DLMA MANF S88 I/O ERROR CRT 2 S66 CABIN FAN S66 IMU FAN DP S66 IMU FN SPD B (F6/F8) 7 LDG GEAR L,NOSE tb – bp [HYD/APU] 8 APU H2O QTY 1 ind – 0% 2 ind – 0% HYD QTY 2 ind – 0% (R1) 4 FC2 COOL PUMP ΔP tb – bp (O8) 10 FWD RCS He PRESS B tb – bp FWD RCS MANF ISOL 2 tb – bp (O1) AIR TEMP AV BAY 3 ind – 45 degF AIR TEMP CAB HX OUT ind – 45 degF FREON FLOW LOOP 1 ind – 578 pph (Continued)	① * TIME * * CRITICAL * FC2 must be shutdn within 9 min to avoid potentially hazardous condition ② Will be repwrdr after AC Pwr Transfer Cable connected ③ Man CL and full GPC cntl remains. Vlv holds position ④ Man OP capability remains. Vlv holds position ⑤ Do not reconfig for reg switch or I'CNCT procedures ⑥ REACQ and PSP reconfig procedures are flight specific. If reqd, procedures can be found in payload or ISS specific books ⑦ When gear deployed, tb will not indicate DN ⑧ APU H2O QTY 1 ind – 0% if BLR CNTLR/HTR 1A active. APU H2O QTY 2 ind – 0% if BLR CNTLR/HTR 2B active ⑨ OIU 2 interfaces with PSP 2 for commanding ⑩ Vlv holds position 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)

EPS SSR-31 (Cont) **BUS LOSS: MNB FPC2**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
12 DPS UTILITY (G2,G8,S2) MMU ASSIGN • GNC – ITEM 2 EXEC • SM – ITEM 3 EXEC • PL – ITEM 5 EXEC • OPS 0 – ITEM 7 EXEC If EMU(s) in battery charge mode: (AW18H) • PWR/BATT CHGR EMU 1(2) BUS SEL – MNA Pre-seat ingress for Entry: • Discharge handheld fire ext into AV BAY 1 If AC Pwr Cable to be installed to regain AC: • Go to <u>EPS SSR-200</u>; otherwise, continue with Bus Loss Actions (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 • 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 (MO13Q) If Arlk/Tnl Fan active: • ARLK FAN B – OFF • A – ON (O17:C) • SIG CONDR FREON A – AC3 • SIG CONDR FREON B – AC3 (WCS) • MODE – AUTO • CRADLE – AUTO • Hose stowed in cradle • WCS ON It – 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 (Continued)	MMU 2 EMU 1,2 Pwr/Batt Chgr MNB pwr Av Bay 1 agent discharge capability Hyd H2O Blr 1 Cntrl A 2 Cntrl B RSVR 2 Qty Snsr Humidity Sep B Cabin Fan B IMU Fan B H2O Loop 1 Pump B Av Bay 1 Fan B Av Bay 2 Fan A 14 Av Bay 3 Sig Condr, Xdcrs (ECLS SC4) Freon Loop 1 Pump B Arlk/Tnl Fan B 15 Freon Sig Condr A AC2 pwr (ECLS SC1A) 16 Freon Sig Condr B AC2 pwr (ECLS SC1B) WCS Fan/Sep 2 (Continued)	(A4) MSN and EVENT TIME ind – blank 13 L,R ADP deploy times incr from 15 to 30 sec If site AOS and using S-BD Ant Elec 1: 'ANTENNA' (2) -Y,-Z Star Trkr Drs OP/CL time incr from 8 to 16 sec If Sys 1 pwrd: 'S62 BCE BYP PSP1' Loss of PL TLM and CMD If PDI FDA Enabled: 'S62 PDI DECOM FAIL' If NSP 1 selected: 'BCE STRG 1 NSP' If Freon Loop 1 Pump B ON: 'S88 FREON FLOW 1' 'S88 FRN AFT CP 1' 'S88 FRN PL HX 1' 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)' ----- (O1) FREON FLOW LOOP 2(1) ind – 578 pph If H2O Loop 1 Pump B ON: C/W H2O LOOP It 'S88 H2O PUMP P 1' 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP' ----- (O1) H2O PUMP OUT PRESS LOOP 1 ind – 20-25 psia (F7) If APUs active and using H2O Blr Cntrl 1A(2B): C/W APU TEMP It after ~2 min During Rad Dpy/Sto ops: (R13L) RAD LAT CNTL tbs (two) indicate single mtr ops	⑫ Selecting failed MMU for GNC MF protects against GPC MMU Rcvr failure after OPS XTION prepositioning ⑬ FSM caused by antenna miscompare ⑭ AV Bay 3 Fan ΔP Air Out Temp Snrs lost ⑮ Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate and Accum Qty Snrs lost ⑯ Freon Loop 2 P/L Hx Flow Rate, Freon Loop 1 ICH Flow Rate and Accum Qty Snrs lost

EPS SSR-31 (Cont) **BUS LOSS: MNB FPC2**

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(CDR's SEAT) • CDR SEAT PWR BUS SEL – AC3		CDR Seat Adj via AC2 pwr		⑩ Vlv holds position ⑪ Lost Auto Temp Cntl via Cntl 1 and Cabin Temp, Cabin Hx Air Out Temp and H2O Loop Cabin Hx In Temp Sntrs Hx Byp Vlv holds position ⑫ Bypass vlv holds position and Cntl B Rad Byp vlv mtr remains ⑬ AC2 Bus isolation for AC Pwr Transfer Cable installation accomplished in MNB FPC2 Actions Column. No additional bus isolation steps reqd ⑭ Motor B remains
(PLT's SEAT) • PLT SEAT PWR BUS SEL – AC3		PLT Seat Adj via AC2 pwr		
If Cab Temp Cntl 1 active: (L1) • CAB TEMP CNTLR – OFF		17 Cabin Temp Cntl 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, <u>PWRDN</u>)				
		18 Freon Loop 1 Cntl A Rad Byp Vlv Mtr		
		10 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				
(O7) • (OV105) GPS 2 PWR – OFF • (OV105) GPS 2 PRE AMPL UPPER – OFF • (OV105) GPS 2 PRE AMPL LOWER – OFF		(OV105) GPS 2		
(O15:F) • MMU 2 – OFF				
(A7L) • MADS RCDR PWR – OFF		MADS Rcdr All MADS and ACIP data		
(A13) • (OV104) GPS 2 PWR – OFF • (OV104) GPS 2 PRE AMPL UPPER – OFF • (OV104) GPS 2 PRE AMPL LOWER – OFF		GPS 2		
(MA73C:A) • MCA LOGIC MNB FWD 2 – OFF		MNB FMC2 Bus pwr		
(Continued)		(Continued)		

EPS SSR-31 (Cont)
BUS LOSS: MNB FPC2

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM			
(O15:C) cb MNB • FIRE SUPPR BAY 1 – op • (OV104,5) GPS 2 PRE AMPL UPPER – op	21 MNB Pwr to CNTL Buses AB1,AB2,AB3,BC1,BC2,BC3		② Will be repwr'd after AC Pwr Transfer Cable connected ②① Buses remain pwr'd ②② Vlv holds position. Loss of redundant hyd NLG deploy and NWS hyd redundancy, if failed closed ②③ Hyd Sys 1 still available for NWS ②④ Redundant mtrs remain ②⑤ Single mtr time. One failure away from EVA to stow MPM or from RMS/OBSS jettison. May be repwr'd after AC Pwr Transfer Cable connected ②⑥ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists. May be repwr'd after AC Pwr Transfer Cable connected ②⑦ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists. May be repwr'd after AC Pwr Transfer Cable connected ②⑧ √MCC for stow reqmts
(O15:D) • (OV104,5) cb MNB GPS 2 PRE AMPL LOWER – op			
	NLG B/U Rel and Ext Sys 2 LMG,RMG B/U Rel Sys 2		
	22 LG Extend Vlv 2		
	23 NWS Hyd Sys 2		
	-Y Star Trkr Dr Sys 2 OP/CL capability -Z Star Trkr Dr Sys 1 OP/CL capability		
	L,R ADP Dpy Mtrs 2 Htr Cntrlr 2 RH Vents 1,2,6,8,9 Mtrs 2 LH Vents 1,2,3,5,8,9 Mtrs 2		
	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		
	RMS: 25 Port MPM Mtr 2 25 Stbd MPM Mtr 1 26 Port Fwd MRL Mtr 1 26 Port Mid MRL Mtr 2 27 Stbd Mid MRL Mtr 1 27 Stbd Aft MRL Mtr 2 2 D&C B/U edge Itg		
	28 Ku Ant Sto/Dpy Mtr 2		
	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 (R1) • PL CAB – MNA (A8L) • PORT RMS HTR B – OFF • PORT RMS HTR A – AUTO If OBSS berthed: (A8L) • STBD RMS HTR B – OFF • STBD RMS HTR A – AUTO (L1) • TOP EVAP HTR DUCT – A If Hi Load Evap enabled • HI LOAD DUCT HTR – A(C) (L2) • FLASH EVAP FDLN HTR A SPLY – 1 (A12) • HYD HTR AFT FUS B – AUTO • HYD HTR AFT FUS A – OFF (MA73C:C,D) 8 • cb MCA PWR AC2 3Φ MID 2 – op 8 • cb MCA PWR AC2 3Φ MID 4 – op For PLBD ops: • OP/CL Drs in man mode (R14:C) cb MNB KU • ELEC – op • ANT HTR – op • CABLE HTR – op cb MNC KU • SIG PROC – op (ML86B:C) 9 • cb MNA EXT ARLK HTR STRUC – cl If OIU reqd, √MCC: (SSP 1) • OIU PWR – OIU 1 ON ----- (AIL) • S-BD PL PWR SYS – 1 • CNTL – PNL • – CMD (Continued)	1 FC2 Purge Vlv O2,H2 Flow Xdcrs SS ΔV Snrs 3 MNB pwr to CABPL1,2,3 Buses RMS: B/U pwr 4 Port Payload Cntl Pwr B 5 Port MPM Mtr 2 5 Stbd MPM Mtr 1 6 Port Fwd MRL Mtr 1 6 Port Mid MRL Mtr 2 7 Stbd Fwd MRL Mtr 1 7 Stbd Mid MRL Mtr 2 7 Stbd Aft MRL Mtr 2 Port Htr B Stbd Htr B Top Evap Duct Fwd,Aft Htrs B Hi Load Duct Inbd,Outbd Htrs B FES H2O Fdln A Mid 2 Htr 2 Aft Fuselage Hyd Htrs A HYD BK HTR B 8 Stbd Rad Lat 1-6 Mtr 2 Limit sw 8 Port Rad Lat 1-6 Mtr 2 Limit sw 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 9 Ext A/L Structural Htrs MNB pwr 3 OIU 2 OIU 1 MNB pwr (Continued)	(L2) 2 O2 SYS 2 SPLY tb – CL (LIGHTS LOST) PLB Fwd Blkhd Floodlt Mid Port Floodlt Fwd Stbd Floodlt (A8L) PORT RMS: DPY/STO tb – bp RETEN LAT tb – bp R-F-L FWD tb – bp STARBOARD RMS: RETEN LAT tb – bp R-F-L FWD tb – bp R-F-L MID tb – bp SM 94 PDRS CONTROL PORT RMS Indications lost: MPM Mtr 2 STO/DPY Fwd MRL Mtr 1 LAT/REL/RDY Mid MRL Mtr 2 LAT/REL/RDY STBD RMS Indications lost: MPM Mtr 1 STO/DPY Fwd MRL Mtr 1 LAT/REL/RDY Mid MRL Mtr 1 LAT/REL/RDY Aft MRL Mtr 2 LAT/REL/RDY (R13L) During Rad Dpy ops: RAD CNTL tbs (two) indicate single mtr ops If in RDR/Comm Track, will break track (A1U) SIG STRENGTH – 0 SM 201 ANTENNA SIG STR – 0 Erratic antenna motion 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 S177 EXTERNAL AIRLOCK Indications lost: EXT A/L PRESS SM 212 OIU OIU 2 TEMP ≥ 140 SM 62 PCMMU/PL COMM If OIU 2 active msg, 'S62 PDI DECOM FAIL'	① Buses are tied due to: <u>Loss of FC2 Purge Capability.</u> 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 <u>Loss of FC2 SSΔV Snrs.</u> 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 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 ④ When the OBSS is grappled by the RMS, the Cabin Payload A or B power feeds are used to pass MPC1 or MPC2 power, respectively, to the Payload Cabin 3 power bus for distribution to all OBSS equipment, except for LCS ⑤ Single mtr time. One failure away from EVA to stow MPM or from RMS/OBSS jettison ⑥ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ⑦ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists ⑧ 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 ⑨ MNA htrs remain

EPS SSR-32 (Cont)
BUS LOSS: MNB MPC2

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM		DSP SYS PWR SYS 2 tb – OFF	② Vlv holds position
(R11U) • FC PURGE VLV 2 – CL • FC STARTUP HTR 2 – ENA	FC2 Startup Htr Inhibit capability		⑨ MNA htrs remain
(A7U) PL BAY FLOOD • FWD BHD – OFF • MID PORT – OFF • FWD STBD – OFF	PLB Fwd Blkhd Floodlt Mid Port Floodlt Fwd Stbd Floodlt		⑩ All docking mechanisms will have single mtr times
(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		⑪ Logic buses 1(2) remain pwr'd via MNA(MNC)
(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 10 DSP SYS 2 pwr PSU MNB pwr		⑫ Cntrlrs, A,B Rad Byp Vlv Mtrs Auto Cntl and Cntrl B Rad Byp Vlv Mtr Man Cntl remain
(A7L) • MADS PCM – OFF	11 MNB pwr to DSP Logic buses 1,2		⑬ Mtr 2 stow capability remains
(MA73C:A,B) • MCA LOGIC MNB MID (four) – OFF	External Airlock lts 2,3		⑭ Buses remain pwr'd
	MADS PCM		⑮ With an inoperative limit sw, mtr will continue to run until DPY/STO sw placed to GND position
	MNB MMC1,2,3,4 Bus pwr		⑯ KU-BAND ANTENNA: CONTINGENCY STOW – W/EVA ANT GIMBAL ALIGNMENT (IFM) req'd to stow Ku-Bd. Jettison req'd if ant cannot be positioned within GO FOR PLBD CLOSURE envelope
	12 Freon Loop 2 Cntrl A Rad Byp Vlv Mtr Man Cntl 2 Atm Press Cntl O2 Sys 2 Sply Vlv Cntl		⑰ MNC MMC2 pwr for Ku-Bd Xmit Enable signal remains
	13 Port,Stbd Rad Mtrs 2 Dpy capability LH Vent 3,5 Mtrs 2 RH Vent 6 Mtrs 2		⑱ MNC MMC2 pwr remains to supply pwr to Boom stow Enable II signal for stow mtrs
	14 MNB pwr to ESS1BC, ESS3AB AUX PL B Bus pwr		⑲ Snsr 1 remains
	15 Ku Ant Sto/Dpy Mtr 2 Sto and Dpy Limit sw		
	16 Ku-Bd Sys Deployed Assy including Htr Ckts (Rdr & Comm)		
	17 Redundant Ku-Bd Xmit Enable		
	18 Redundant Ku-Bd Boom Stow Enable II Excitation Signal		
(A15:H,I,J,K) • cb MNB TK6-TK9 O2 HTR SNSR 2 – op	19 Cryo O2 Tk 6-9 Htr Current Snsr 2		
	FC1 Redundant Reac Vlv Close Cntl on pnl C3		
(ML86B:C) 9 • cb MNB EXT ARLK HTR STRUC – op	9 Ext A/L Structural Htrs MNB pwr		

EPS SSR-33 **BUS LOSS: MNB APC2**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
Refer to OMS/RCS Slide Rule for vlv loss info 3 Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT R RCS He PRESS A,B • L RCS He PRESS A • For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS) (A12) APU HTR TK/FU LINE/H2O • SYS 1A – AUTO • 1B – OFF	1 Aft L,R RCS He Pr Isol A man OP capability 4 Aft R RCS He Pr Isol B GPC Cntl and man CL capability 5 RCS Manf R5 RJD pwr (R5R,R5D) 6 APU 1 GG Inj H2O Htrs B APU 2 Fu TK Vlv A CL capability via APU 2 Auto Shutdn Signal 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 12 Right Pod A Htrs (all) 13 Left Pod B Htrs (partial) 13 OMS Crsfd Ln B Htrs (all) L OMS Sec TVC 14 ASA 4 Isol ATVC 4 Isol ME	2 MASTER ALARM Light/ Tone – on If OMS GMBL cmd abs value > 2 deg and Sec TVC selected: C/W OMS TVC It – on 'L OMS GMBL' (3,B) (F7) 2 C/W RCS JET It – on (FSM) 2 R RCS D, R JET	① Man CL and full GPC cntl remains. Vlv holds position ② Indications do not appear until jet commanded ③ Do not reconfig for reg switch or l'CNCT procedures ④ Man OP capability remains. Vlv holds position ⑤ Manf status <u>not</u> automatically declared closed. Fail-offs will occur when jet commanded ⑥ In event of APU 2 auto shutdn, vlv remains OP until pwr removed by APU FUEL TK VLV sw throw 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
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 (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 GNC XXXXX MNVR YYYYY Sel L OMS PRI TVC: • GMBL L PRI – ITEM 28 EXEC			
BUS ISOLATION ONLY ON MCC CALL, PERFORM (R1) • PL AFT MNB – OFF			

EPS SSR-34

BUS LOSS: MNB APC5

(Includes MNB APC2, MNB ALC2, MNB AMC2)

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A12) APU HTR 2 • GAS GEN/FUEL PUMP 1 – A AUTO 2 • 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 2 • SYS 1A – AUTO 2 • 1B – OFF 2 • 2A – OFF 2 • 2B – AUTO HYD HTR • RUD SPD BK A – AUTO • B – OFF • BDY FLP A – AUTO • B – OFF • ELEV A – AUTO • B – OFF 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 APU 2 Lube Oil Line Htrs A APU 1 Tk/Fu Line Htr B GG Inj H2O Htrs B 2 Tk/Fu Line Htr A Body Flap Htr B Elev Act Htr B Rudder/Speed Brake Htr B Circ Pump 1 MNB pwr 2 MNB pwr	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 5 (O7) 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(2B): C/W APU TEMP It – on after ~ 2 min If OMS GMBL cmd abs valve > 2 deg and Sec TVC selected: C/W OMS TVC It – on 'L OMS GMBL' (3,B) If first RGA failure and rates sensed: 'RM FAIL RGA' (3) (F7) C/W RCS JET It – on (FSM) 1 R RCS D,R JET HYD/APU 7 APU H2O QTY 1 Ind – 0% 2 Ind – 0% 1 SPEED % Ind – 0	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 APU H2O QTY 1 ind – 0% if BLR CNTLR/HTR 1A selected. APU H2O QTY 2 ind – 0% if BLR CNTLR/HTR 2B selected ⑧ Manf status <u>not</u> automatically declared closed. Fail-offs will occur when jet commanded ⑨ Man CL and GPC cntl remains. Vlv holds position ⑩ Do not reconfig for reg switch or I'CNCT procedures
(L1) • 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 If Hi Load Evap enabled • HI LOAD DUCT HTR – A(C)	FES Sec Cntlr Top Evap L Noz Htr B Top Evap R Noz Htr A Top Evap Duct L,R Htrs B 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 • 2 – A	Hyd H2O Blr 1 Cntlr A 2 Cntlr B		
• For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS)	8 RCS Manf R5 RJD pwr (R5R,R5D)		
Refer to OMS/RCS Slide Rule for vlv loss info 10 Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT R RCS He PRESS A,B • L RCS He PRESS A	9 Aft L RCS He Pr Isol A man OP capability 9 Aft R RCS He Pr Isol A man OP capability 5 Aft R RCS He Pr Isol B GPC Cntl and man Cl capability		
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 • Set aft pod(s) PRI JET FAIL LIMIT to 3	Aft RCS L,R Jets 1 Htrs		
If ICNCT config: (O7) 6 • AFT L RCS TK ISOL 3/4/5 B – GPC (tb-bp) • AFT R RCS TK ISOL 3/4/5 B – GPC (tb-bp)	AFT L,R RCS TK ISOL 3/4/5 B CL microswitch feedback		
(Continued)	(Continued)		

EPS SSR-34 (Cont) **BUS LOSS: MNB APC5**

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
14	(A14) RCS/OMS HTR • R POD (two) – A OFF, B AUTO • L POD (two) – A AUTO, B OFF • CRSFD LINES A,B (two) – A AUTO, B OFF	11 R Pod A Htrs (all) 12 L Pod B Htrs (partial) 12 OMS Crsfd Ln Htrs B		3 Vlv holds position 11 B Htrs remain 12 A Htrs remain 13 Maintain deorbit capability for MNC DA3 failure 14 Maintains deorbit capability for CNTL AB1 failure 15 Maintains He Isol redundancy 16 Man cntl remains. Vap Isol closes. Primary Isol normally closed 17 Lost TM: GNC SYS SUMM 2 L OMS ENG VLV 2: Assume Vlv 2 status same as Vlv 1 18 GPC cntl remains. Vlv fails closed 19 Prevents simultaneous opening of parallel reg paths and possibly rupturing burst disk 20 Sys B Pri Cntrl, auto switchover to Sec Cntrl remain 21 Six vlvs fail to nonisolation position 22 Redundant coils remain 23 √MCC for OMS Qtys 24 Hyd Sys 1 still available for NWS 25 Vlv holds position. Loss of redundant hyd NLG deploy and NWS hyd redundancy if failed closed 26 Redundant RPC remains
	(O8) • If Straight feed config, Right OMS Crossfeed A – OP (tb-OP). Otherwise, √MCC • Right OMS TK ISOL A – CL (tb-CL)	13 OMS Engine/Crossfeed Valve Redundancy OMS Eng/XFeed Redundancy		
	Prior to using L(R) OMS: (O8)			
	15 L OMS He PRESS/VAP ISOL	16 Left OMS He Pr Isol B and Vap Isol 2 GPC Cntl		
	17 • A – GPC			
	• B – OP	18 Right OMS He Pr Isol A,B man Cntl and Vap Isol 1,2 man OP		
	19 R OMS He PRESS/VAP ISOL			
	• A(B) – GPC			
	• B(A) – CL			
	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 MNV R YYYY			
	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	20 NH3 Sys B Sec Cntrl man ON capability		
BUS ISOLATION				
ONLY ON MCC CALL, PERFORM				
(R1) • PL AFT MNB – OFF		Aft PL MNB pwr		
(O15:A) • RGA 2 – OFF		RGA 2		
		21 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		
		22 L OMS Eng Press Vlv Coil 2, Cntl Vlv 1,2 Coil 2		
		23 OMS Qty Gaging for all L OMS Single engine burns		
		24 NWS Hyd Sys 2		
		25 Hyd Brake Isol Vlv 2 Cntl		
		26 Hyd Main Pump 1 Depress Solenoid RPC B		
		26 Hyd Main Pump 2 Depress Solenoid RPC A		
		(Continued)		

EPS SSR-34 (Cont)
BUS LOSS: MNB APC5

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	Freon Loop 1 Cold Plate Flow Xdcr 27 APU 1 Cntrl Pwr Sply B 28 Fu Tk Vlv B 29 2 Cntrl Pwr Sply A 30 Fu Tk Vlv A GBX GN2 Repress Vlv MPS: 31 L Eng He Intercon Outlet Vlv 32 L Eng He Isol A Pneu He Isol 2 33 Prplt F/D Inbd LO2 Vlv 33 Outbd LH2 Vlv 34 Manf Repress LH2 Vlv 1,2 35 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 L,R DR RTL Ind 3 36 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	L MPS He Reg A < 680 during entry (MM 303)	(27) Pwr Sply A remains. Turbine speed ind lost (28) Vlv A remains (29) Pwr Sply B remains. GG Bed T and GBX P ind lost when APU running (30) Vlv B remains (31) Vlv fails closed (32) Vlv fails closed. Redundant vlv remains (33) Vlv holds position. Loss of manual capability to inert LO2 and LH2 manfs (34) Vlv fails closed. LH2 Manf will not be pressurized with He during entry (MM304) (35) Redundant mtrs and m/s remain (36) Actuators continue to operate until Stow, Rel/Lat, or OP/CL sw is taken to OFF

EPS SSR-35 **BUS LOSS: MNB FLC2**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
Refer to OMS/RCS Slide Rule for valve loss info 3 Reconfig following vlv(s) only if leak isolation reqd: (O8) - FWD RCS He PRESS A,B (A1L) S-BD PM - 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: - S-BD PL PWR SYS – 2 - CNTL – PNL – CMD 6 Reconfig PSP 6 Perform PL INTRG REACQ (if reqd) If no comm: (C3) - S-BD PM CNTL – PNL – CMD 8 If OIU reqd: (SSP) - OIU PWR – OIU 2 ON - OIU tb – DN √MCC, OIU reconfig (A1R) - S-BD FM PWR – 2 9 GNC 23 RCS Override F2 Manf status to CL: - RCS FWD – ITEM 1 EXEC - MANF VLVS 2 OVRD – ITEM 41 EXEC Pre-seat ingress: - Discharge handheld fire ext into AV BAY 1	1 Fwd RCS He Press Isol A man OP capability 4 Fwd RCS He Press Isol B man CL and GPC Cntl S-BD PM Sys 1: Xpnder 1 Pre Amp 1 Pwr Amp 1 FM, PM Auto sw 1 NSP 1 ----- S-BD PL Intrg 1 PSP 1 S-BD FM Sys 1 RCS Manf F2 RJD pwr (F2F,F2R,F2U,F2D) Av Bay 1 agent discharge capability 10 L,R ADP Htr Cntrl 2 LMG, NLG, B/U Rel 2 Fire 2, Arm	2 MASTER ALARM Light/Tone – on (F7) 2 C/W RCS JET It – on (COMM LOST) All S-BD A/G voice lost if Sys 1 selected (FSM) 2 'F RCS D(F,R,U) JET' If site AOS and using S-BD ANT ELEC 1: 5 'ANTENNA' (2) If sys 1 pwrld: 'S62 BCE BYP PSP1' Loss of PL TLM and CMD If PDI FDA enabled: 'S62 PDI DECOM FAIL' If NSP 1 selected, 'BCE STRG 1 NSP' (F6/F8) 7 LDG GEAR L,NOSE tb – bp (O8) 4 FWD RCS He PRESS B tb – bp	① Man CL and full GPC cntl remains. Vlv holds position ② Indications do not appear until jet commanded ③ Do not reconfig for reg switch or l'CNCT procedures ④ Man OP capability remains. Vlv holds position ⑤ FSM caused by antenna miscompare ⑥ REACQ and PSP reconfig procedures are flight specific. If reqd, procedure can be found in payload or ISS specific books ⑦ When gear deployed, tb will not indicate DN ⑧ OIU 2 interfaces with PSP 2 for commanding ⑨ Manf status <u>not</u> automatically declared closed. Jet fail-offs may occur ⑩ Htr Cntrl 1 remains
BUS ISOLATION ONLY ON MCC CALL, PERFORM (O15:C) cb MNB FIRE SUPPR BAY 1 – op			

EPS SSR-36 **BUS LOSS: MNB ALC2**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A12) APU HTR 2 • GAS GEN/FUEL PUMP 1 – A AUTO 2 • 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 2 • SYS 1A – AUTO • 1B – OFF • 2A – OFF 2 • 2B – AUTO HYD HTR • RUD SPD BRK A – AUTO • B – OFF • BDY FLP A – AUTO • B – OFF • ELEV A – AUTO • B – OFF 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 APU 2 Lube Oil Line Htrs A APU 1 Tk/Fu Line Htr B APU 2 Tk/Fu Line Htr A Body Flap Htr B Elev Act Htr B Rud/Spd Brake Htr B Circ Pump 1 MNB pwr 2 MNB pwr	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 It – on after ~2 min (F7) 1 C/W RCS JET It – on (FSM) 1 R RCS D,R JET HYD/APU 7 APU H2O QTY 1 ind – 0% 2 ind – 0%	① Indications do <u>not</u> 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 CI position ⑦ APU H2O QTY 1 ind – 0% if BLR CNTLR/HTR 1A selected. APU H2O QTY 2 ind – 0% if BLR CNTLR/HTR 2B selected 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 Man CL and full GPC Cntl remains. Vlv holds position ⑩ Do not reconfig for reg switch or I'CNCT procedures ⑪ Manf status <u>not</u> automatically declared closed. Fail-offs will occur when jet commanded
(L1) • FLASH EVAP CNTLR PRI A(B) – ON (if reqd) TOP EVAP HTR • NOZ L – A AUTO • R – B AUTO • DUCT – A If Hi Load Evap enabled: • HI LOAD DUCT HTR – A(C)	FES Sec Cntlr Top Evap L Noz Htr B R Noz Htr A Duct L,R Htrs B 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 • 2 – A	8 Hyd H2O Blr 1 Cntlr A 8 2 Cntlr B		
Refer to OMS/RCS Slide Rule for vlv loss info Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT R RCS He PRESS A,B • L RCS He PRESS A	9 Aft L,R RCS He Pr Isol A man OP capability 5 Aft R RCS He Pr Isol B GPC Cntl and man CL capability		
For attitude control: • Perform LOSS OF VERNIERS (ORB OPS, RCS)	11 RCS Manf R5 RJD pwr (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, etc • Set aft pod(s) PRI JET FAIL LIMIT to 6	Aft L,R RCS Jet 1 Htrs		
(A14) • RCS/OMS HTR OMS CRSFD LINES (two) – A AUTO, B OFF	OMS Crsfd Ln B Htrs (partial)		
(Continued)	(Continued)		

EPS SSR-36 (Cont) **BUS LOSS: MNB ALC2**

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
6	If ICNCT config: (O7)		L MPS He Reg A < 680 during entry (MM303)	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 CI position ⑫ Maintains deorbit capability for CNTL AB1 failure ⑬ To maintain He Isol redundancy ⑭ Man cntl remains ⑮ Sys B Pri Cntrl, auto switchover to Sec Cntrl remain ⑯ √MCC for OMS Qtys ⑰ Vlv fails closed. Redundant vlv remains ⑱ Hyd Sys 1 still available for NWS ⑲ Vlv fails closed ⑳ Vlv holds position. Loss of manual capability to inert LO2,LH2 Manfs ㉑ Vlv fails closed. LH2 Manf will not be pressurized with He during entry (MM304)
	• AFT L RCS TK ISOL 3/4/5 B – GPC (tb-bp)	6 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)			
	(O8)	12 OMS Eng/Xfeed Redundancy		
13	Prior to using L OMS: (O8)			
	L OMS He PRESS/VAP ISOL	14 L OMS He Pr Isol B GPC Cntl		
	• A – GPC			
	• B – OP			
	For SSME Hyd Repress: (R4)	4 MPS/TVC Hyd Sys 2 Isol Cntl		
	• HYD MPS/TVC ISOL VLV SYS 1,3 (two) – OP			
	• Wait 10 sec, then CL			
	If reqd during entry (< 120K ft): (L1)	15 NH3 Sys B Sec Cntrl man ON capability		
	• NH3 CNTLR A(B) – PRI/GPC			
BUS ISOLATION				
ONLY ON MCC CALL, PERFORM				
NONE				
		14 L OMS Eng Pr Vlv Coil 2 and Cntl Vlv 1,2 Coils 2		
		16 OMS Qty gauging for all L OMS single engine burns		
		17 APU 1 Fu Tk Vlv B		
		17 2 Fu Tk Vlv A		
		4 TVC Hyd Sys 2 Isol Cntl		
		3 Hyd Brake Isol 2 Cnt		
		18 NWS Hyd Sys 2		
		MPS:		
		19 L Eng He Intercon Outlet Vlv		
		17 L Eng He Isol A		
		17 Pneu He Isol 2		
		20 Prplt F/D Inbd LO2 Vlv		
		20 Outbd LH2 Vlv		
		21 Manf Repress LH2 Vlv 1,2		

EPS SSR-37

BUS LOSS: MNB FMC2

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(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	 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 Cntrl 2 1 -Y Star Trkr Dr Sys 2 OP/CL capability 1 -Z Star Trkr Dr Sys 1 OP/CL capability	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 It – 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	 ① Redundant mtr remains ② Htr Cntrl 1 remains
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(MA73C:A) • MCA LOGIC MNB FWD 2 – OFF			

EPS SSR-38

BUS LOSS: MNB MMC1

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE		NONE	
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(MA73C:A) • MCA LOGIC MNB MID 1 – OFF	MNB MMC1 Bus pwr LH Vent 5 Mtr 2		

EPS SSR-39 **BUS LOSS: MNB MMC2**

ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS		NOTES	
1	(MA73C:C) • cb MCA PWR AC2 3Φ MID 2 – op	1	Stbd Rad Lat 1-6 Mtr 2 Limit sw	SM (BFS SM 63) PL BAY DOORS		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	
	For PLBD ops: • OP/CL Drs in man mode MANUAL PLBD CLOSING (DEORBIT PREP)	2	Stbd Rad Mtr 2 Dpy capability	If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG'		② Mtr 2 stow capability remains	
			PLBD: C/L Lat 13-16 Mtr 2 Stbd Aft Bikh Lat Mtr 2 Port Door Mtr 2 Stbd Door Mtr 1 CL Limit sw	----- During MAN PLBD OP/CL, single mtr run time noted on actuators listed at left		③ Single mtr time. One failure away from EVA to stow MPM or from RMS/OBSS jettison	
				(A8L) PORT RMS: RETEN LAT tb – bp R-F-L FWD tb – bp			
				SM 94 PDRS CONTROL		④ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists	
			MNB MMC2 Bus pwr	PORT RMS Indications lost: Fwd MRL Mtr 1 LAT/REL/RDY			
		3	RMS: Port MPM Mtr 2	STBD RMS Indications lost: Aft MRL Mtr 2 LAT/REL/RDY		⑤ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists	
		3	Stbd MPM Mtr 1				
		4	Port Fwd MRL Mtr 1				
		5	Stbd Aft MRL Mtr 2				
			LH Vent 3 Mtr 2	(R13L) During RAD Dpy ops: RAD CNTL STBD tb indicates single mtr ops			

EPS SSR-40

BUS LOSS: MNB MMC3

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE		NONE	
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(MA73C:B) • MCA LOGIC MNB MID 3 – OFF	MNB MMC3 Bus pwr		

EPS SSR-41

BUS LOSS: MNB MMC4

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
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)	1 Port Rad Lat 1-6 Mtr 2 Limit sw 2 Port Rad Mtr 2 Dpy capability PLBD: Port, Stbd Fwd Bkhd Lat Mtrs 2 Stbd Door Mtr 2 Port Door Mtr1 CL Limit sw	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 (R13L) During Rad Dpy ops, RAD CNTL PORT tb indicates single mtr ops (A8L) STARBOARD RMS: RETEN LAT tb – bp R-F-L FWD tb – bp R-F-L MID tb – bp	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. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ④ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists ⑤ With inoperative limit sw, mtr will continue to run until DPY/STO sw is placed in GND position ⑥ Redundant pwr (MNC) enables Ku-Band xmit ⑦ MNC MMC2 pwr remains to supply pwr to Boom Stow Enable II signal for stow mtrs
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(MA73C:B) • MCA LOGIC MNB MID 4 – OFF	MNB MMC4 Bus pwr	SM 94 PDRS CONTROL PORT RMS Indications lost: MPM Mtr 2 STO/DPY Mid MRL Mtr 2 LAT/REL/RDY STBD RMS Indications lost: MPM Mtr 1 STO/DPY Fwd MRL Mtr 1 LAT/REL/RDY Mid MRL Mtr 1 LAT/REL/RDY	
	RH Vent 6 Mtr 2		
	RMS:		
	3 Port Mid MRL Mtr 2		
	4 Stbd Fwd MRL Mtr 1		
	4 Stbd Mid MRL Mtr 1		
	5 Ku Ant Sto/Dpy Mtr 2 Sto and Dpy Limit sw		
	6 Redundant Ku-Band Xmit Enable		
	7 Redundant Boom Stow Enable II Excitation Signal		

EPS SSR-42
BUS LOSS: MNB AMC2

ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS		NOTES	
NONE		MNB AMC2 Bus pwr LH,RH Vents 8,9 Mtrs 2		NONE		① Redundant mtrs and m/s remain ② Actuators continue to operate until the Stow, Rel/Lat, or OP/CL sw is taken to OFF	
BUS ISOLATION ONLY ON MCC CALL, PERFORM (MA73C:B) • MCA LOGIC MNB AFT 2 – OFF		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 L,R DR RTL Ind 3					
		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					

EPS SSR-43
BUS LOSS: MNB R14

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A7U) If CCTV reqd: • TV PWR CONTR UNIT – MNA	Video Cntl Unit MNB pwr	CCTV Video and TV Annun Its lost if MNB selected for VCU CCTV Mon 2 lost	① IDP3, IDP4 ADC data lost. MDU port select may be reqd
(R14:C) • cb MNC KU SIG PROC – op	MDU CDR 2 MDU MFD 1 ADC 1B/2B	OS Floodlt lost	② MNA and MNC pwr sources remain
(R12) If VPU flown • VPU PWR – OFF	VPU OSVS OUT 2A video input to VPU	(FSM) 'BCE BYP KU' (2)	③ Redundant pwr source remains for equipment
		(A2) Meters: X-PNTR will display 'OFF' flag Digital – display will blank	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
		(F6) MDU CDR 2 blanks	
		(F7) MDU MFD 1 blanks	
		OSVS OUT 2A video to ISS is lost	
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
• MDU CDR 2 PWR – OFF • MDU MFD 1 PWR – OFF	Middeck ATU Middeck Spkr		
(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 • cb PALLET/DSC • 1B – op (EDO) • 4B – op (EDO)	2 MNB pwr for CNTL CA1,2,3 Buses		
(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 CAMR • CAMR/PTU – op • CAMR HTR – op • ILLUM/PTU HTR – op cb MNB TV • CONTR UNIT – op • MON 2 – op	TV A Camr and Pan-Tilt TV A Camr Htr TV A Camr Pan-Tilt Htr and Illum CCTV Mon 2		
(R14:E) • cb MNB OS FLOOD – op cb MNB RMS CAMR • CAMR/PTU – op • WRIST ILLUM/CAMR HTR – op • ELB ILLUM/PTU HTR – op	OS Floodlt RMS: Camr/Pan-Tilt Camr Htr and Wrist Illum Camr Pan-Tilt Htr and Elb Illum		

EPS SSR-44
BUSS LOSS: MNB O15&A8

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A8L) • PORT RMS HTR B – OFF • PORT RMS HTR A – AUTO If OBSS berthed: (A8L) • STBD RMS HTR B – OFF • STBD RMS HTR A – AUTO	RMS: B/U pwr Port Htr B Stbd Htr B	NONE	① If Driver sw OFF when bus failed, F2 Manf Drivers lost
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)		

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 Snr 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, <u>ECLS</u> SSR-13 for Freon Loop 1,2	Freon Loop 1,2 Rad Cntlr A	(F7) C/W CAB ATM It SM ALERT Light/Tone – on Fwd EVENT TIME ind blank	
(F6,F8) • HSI SEL SOURCE – other than MLS, (OV103,4) TACAN 2 or (OV105) GPS 2	MLS 2 (OV103,4) TACAN 2 (OV105) GPS 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 ACA 1 MNB pwr 2 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 pwr: 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, <u>ECLS</u> SSR-3	3 O2/N2 Cntl Sys 2: N2 Sply Vlv 2 Cntl 3 N2 Reg Inlet Vlv 2 Cntl 4 O2/N2 Cntl Vlv 2 man Cntl 5 O2 Xover Vlv 2 OP capability O2/N2 Sys 2 Flow Xdcrs PPO2 Snr 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 Snr	If first AA failure and S/W processing accel data: 'RM FAIL ACC' (3)	
7 <u>SM 60 SM TABLE MAINT</u> • Inhibit 0612513, 0612205, 0612554, 0612722 • Perform ECLS COMPUTATION INHIBIT <u>ECLS</u> SSR-14 Table A		(LIGHTS LOST) L Seat/Ctr Cnsl Floodlt R Ovhd Cnsl Floodlt If ACA 1 – MNB, lights lost: (C3) DAP lights right three 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		2 If ACA 2/3 – MNB, lights lost: (C3) DAP lights left three columns ALL (F6/F8) Landing Gear ARM/DOWN (L1) Smoke detection, fire suppression ALL MO29J MIC KEY	
• 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 It – on	
		2 If ACA 4/5 – MNB, lights lost: (A6U) DAP lights ALL (A7U) Video input, output, Gamma, ALC A2 MIC KEY	
(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
(O7) • (OV105) GPS 2 PWR – OFF • (OV105) GPS 2 PRE AMPL UPPER – OFF • (OV105) GPS 2 PRE AMPL LOWER – OFF		(OV105) GPS 2		⑨ Redundant pwr source remains
(O8) • RADAR ALTM 2 – OFF • MLS 2 – OFF				⑩ H2O Loop 2 ICH Flow Rate snsr lost
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				⑪ Redundant measurement remains. FDA Alarm BFS only; OPS 3,6
		10 H2O Byp Loop 2 Snsr (ECLS SC12)		⑫ Cntrl B remains
		11 Tire Press Sig Condr A3,A4		⑬ NWS 1 still available
		Aft Mission Timer Fwd Event Timer		
		Tacan 2 Av Bay 1 Smoke Det B 3 Smoke Det A		
		MNB Utility pwr R Ovhd Console Floodlt L Seat/Ctr Cnsl Floodlts		
		6 Cryo O2 Tk2 Htr Current Snsr 2		
12 (O15:C) cb MNB • (OV103) 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 • (OV104,5) GPS 2 PRE AMPL UPPER – op				
13 (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 • NWS – op • (OV104,5) GPS 2 PRE AMPL LOWER – op				
		PPO2 Snsr C		
		3 Cabin Relief Vlv A Cntrl NWS 2		
(Continued)		(Continued)		

EPS SSR-45 (Cont)
BUS LOSS: MNB O15

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM			⑨ Redundant pwr source remains
(O15:E) cb MNB • RADAR ALTM 2 – op • MLS 2 – op • (OV104) TACAN 2 – op • ADTA 2 – op • STAR TRKR -Y – op • ACCEL 2 – op • DDU L – op • R – op • DRAG CHUTE SYS 2 – op	Tacan 2 ADTA 2 AA2 9 Left DDU MNB pwr 9 Right DDU MNB pwr 14 Drag Chute, PLT Arm		⑭ CDR Arm remains
(A13) • (OV104) GPS 2 PWR – OFF • (OV104) GPS 2 PRE AMPL UPPER – OFF • (OV104) GPS 2 PRE AMPL LOWER – OFF	GPS 2		

EPS SSR-46
BUS LOSS: MNB R1A1

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE	1 MNB pwr to CNTLAB 1,2,3 CNTLBC 1,2,3 ESS1BC ESS3AB	NONE	① Buses remain pwr
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
NONE			

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 Orbiter arm drive mtr (ODM mtr 2 – mate B, demate B, relax B) 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 ----- (ML86B:D) • cb MNA MMU • PORT,STBD HTR A (two) – cl (ML31C) • VAC VENT ISOL VLV BUS SEL – MNA (WCS) • ✓MODE – AUTO • ✓CRADLE – AUTO • ✓Hose stowed in cradle • ✓WCS ON It – 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 (CDR's SEAT) • CDR SEAT PWR BUS SEL – AC3 (dn) (PLT's SEAT) • PLT SEAT PWR BUS SEL – AC3 (dn) If Supply H2O Dump reqd and dump ISOL VLV is failed closed: • Perform SUPPLY WATER DUMP USING FES (ORB OPS, ECLS) (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	H2O Line Htr B: Waste Dump Line Sply Dump Line Vac Vent Line ----- 2 MMU Port,Stbd Htr B ----- Vac Vent Isol Vlv MNB Cntl ----- WCS Sep Fan 2 Mtr Relay ----- CDR Seat Adj via AC2 pwr ----- PLT Seat Adj via AC2 pwr ----- 1 Sply H2O Dump Isol Vlv Cntl ----- 3 Ext A/L H2O and Structural Htrs MNB pwr	(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 (R13L) 1 MMU GN2 SPLY ISOL VLV B tb – bp (ML31C) 1 WASTE H2O TK1 DRAIN VLV tb – bp 1 SPLY H2O TKD INLET tb – bp (LIGHTS LOST) Middeck Floodlts 2,6 Bunk Floodlts 2/4 PHS Floodlt Airrk Floodlt 3 TA Floodlt 3 (SL only) (MO13Q) 1 ARLK H2O S/O VLV – bp	① Vlv holds position ② Htr A remains ③ MNA,MNC line htrs remain. MNA struct htrs remain
(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 pwr'd 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 • SPLY TKC OUTLET – op • DUMP ISOL – op • SPLY H2O B SPLY ISOL VLV – op • H2O LINE HTR B – op	Sply H2O: 1 Tk B Inlet Vlv Cntl 1 Tk C Outlet Vlv Cntl 1 B Sply Isol Vlv Cntl		
(ML86B:B) cb MNB • VAC VENT NOZ HTR – op • WASTE H2O TK1 DRAIN – op • SPLY H2O TKD INLET – op • VAC VENT ISOL VLV – op • WCS CNTLR – op • GALLEY H2O HTR – op	4 Waste H2O Vac Vent NozHtr 1 Tk 1 Drain Vlv Cntl 1 Sply H2O Tk D Inlet Vlv Cntl WCS Press Xdcr 5 Galley Hot H2O Htr (Five of six htr strips lost)		
(ML86B:D) cb MNB MMU • PORT HTR B – op • STBD HTR B – op • GN2 SPLY ISOL VLV B – op cb MNB PYRO JETT SYS A • PORT RMS – op	2 MMU Port Htr B 2 Stbd Htr B 1 GN2 Sply Isol Vlv B Port RMS: 6 Jett/Guil Sys A Deadface Relays		
(ML86B:E) cb MNB SEAT • LEFT – op • RIGHT – op cb MNB FLOOD • TNL ADAPT 3 – op	TA Floodlt 3		
(ML86B:F) cb MNB FLOODS • MIDDECK 2/6 – op • BUNK 2/4 – op • PHS – op • AIRLK 3 – op cb MNB CRYO 7 • O2 HTR TK3 SNSR 2 – op 8 • O2 HTR TK4 SNSR 1 – op	Middeck Floodlts 2,6 Bunk Floodlts 2/4 PHS Floodlt Airkl Floodlt 3 7 Cryo O2 Tk 3 Htr Current Snsr 2 8 Cryo O2 Tk 4 Htr Current Snsr 1		
(ML86B:C) • cb MNB EXT ARLK HTR LINE ZN1 – op • cb MNB EXT ARLK HTR LINE ZN2 – op • cb MNB EXT ARLK HTR STRUC – op • cb MNB EXT ARLK HTR S/O VLV – op	3 Ext A/L H2O Line and Structural Htrs MNB pwr 1 A/L H2O Isol Vlv Cntl		

EPS SSR-49c
BUS LOSS: MNB A7

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE		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	① DSP SYS 2 pwr still available to all users except MNB A7
BUS ISOLATION ONLY ON MCC CALL, PERFORM (A6L) IF DOCKING MISSION • cb MNB DEP SYS 2 VENT – op • cb ESS 2CA DEP SYS 2 VENT ISOL – op • cb MNB DOCK LT AFT – op • LT TRUSS AFT – OFF	Vestibule Depress Vlv Sys 2 Vent Vestibule Depress Vlv Sys 2 Vent Isol Aft Truss Docking It		

EPS SSR-50

BUS LOSS: MNC DA3

(Includes all MNC sub-buses & AC3)

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 • Perform FC3 SHUTDN (FC SHUTDN Cue Card)	2 FC3 Pumps and pH Snsr 1 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
• Perform LOSS OF 1 FC (ORB PKT, PWRDN)	3 MNC pwr to ESS1BC ESS2CA CNTLBC1,2,3 CNTLCA1,2,3	(F6) MDU CDR 1 blanks	② May be repwr 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 BUS SNSR – OFF	AC3 ΦA,ΦB,ΦC Inverters	(F8) MDU PLT 2 blanks	③ Buses remain pwr
• O2,H2 MANF VLV TK1,2 (four) – OP • O2,H2 TK1 HTR A,B (four) – OFF • O2,H2 TK2 HTR B (two) – AUTO • O2,H2 TK2 HTR A (two) – OFF	Cryo O2,H2 Tk1 Htrs A if in Auto Cryo O2,H2 Tk1 Htrs B Tk2 Htrs A	(AFT) MDU AFD 1 blanks	④ If Aud Ctr 2 selected, all intercomm, A/G, and recorded voice lost until AUD CTR 1 selected
(A11) If Tk 4 in use: • O2,H2 TK4 HTR B (two) – AUTO • O2,H2 TK4 HTR A (two) – OFF	Cryo O2,H2 Tk4 Htrs A	(F7) C/W MN BUS UNDERVOLT It – on BACKUP C/W ALARM It – on C/W FREON LOOP It – on C/W FC PUMP It – on C/W AC VOLT It – on C/W H2O LOOP It – on MDU CRT 3,4 blank	⑤ Loss of redundant port to the following: IDP 3 MDU MFD 1 (S) MDU MFD 2 (S)
(A15) • O2,H2 TK5 HTR A,B (four) – OFF	Cryo O2,H2 Tk5 Htrs A in Auto Cryo O2,H2 Tk5 Htrs B	(COMM LOST) Comm via PS ATU & A/L 4 All S-BD A/G voice lost if Sys 2 selected	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 Its L/Ctr (pnls C2,F6,F7) MS pnl Its (pnls R10,R12) OS pnl Its (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 It 1 Bunk Floodlts 1/3 Airlock Floodlt 4 TA Floodlt 4	⑥ S86 WSB T 2 if in BLR CNTLR/HTR 2A. S86 WSB T 3 if in BLR CNTLR/HTR 3B
(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	(F9) AC3 ΦA,ΦB,ΦC AC volts ind – < 90 DC VOLTS MNC ind – OSL	⑦ REACQ and PSP reconfig procedures are flight specific. If reqd, procedures can be found in payload or ISS specific books
If PSP and/or INTRG reqd for PL or ISS ops: (A1L) • S-BD PL PWR SYS – 1 • CNTL – PNL • – CMD	S-BD PL Intrg 2 PSP 2	(FSMs) S67 CNTL RPC S67 AC VOLTS 3 S86 HYD RSVR Q 3 SM2 HYD QTY 3 (B) S86 WSB T (2) 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	⑧ OIU 1 interfaces with PSP 1 for commanding
7 • Reconfig PSP 7 • Perform PL INTRG REACQ (if reqd)		6 SM0 THRM/HYD (B) BCE STRG 3 ADTA (3,B) BCE STRG 4 ADTA (3,B) BCE STRG 3 MLS (3)	⑨
8 If OIU reqd: (SSP) • OIU PWR – OIU 1 ON • OIU tb – UP • √MCC, OIU reconfig	APU 2 GG/Fu Pump Htrs B APU 3 GG/Fu Pump Htrs A		If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
(A12) APU HTR 9 • GAS GEN/FUEL PUMP 2 – A AUTO 9 • GAS GEN/FUEL PUMP 3 – B AUTO • LUBE OIL LINE 2 – A AUTO • LUBE OIL LINE 3 – B AUTO (Continued)	APU 2 Lube Oil Ln Htr B 3 Lube Oil Ln Htr A (Continued)	(Continued)	

EPS SSR-50 (Cont) **BUS LOSS: MNC DA3**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A12) APU HTR TK/FU LN/H2O SYS 9 • 2A – AUTO 9 • 2B – OFF 9 • 3A – OFF 9 • 3B – AUTO HYD HTR • AFT FUS A – AUTO • B – OFF	APU 2 Tk/Fu Ln Htr B 3 Tk/Fu Ln Htr A APU 3 GG Inj H2O Htrs 3A, 23A Aft Fuselage Hyd Htrs B	(FSMs) I/O ERROR CRT 3 I/O ERROR CRT 4 RM DLMA MANF S67 FPC/FLC3 S67 MPC 3 S67 APC/ALC C If NSP 2 selected: BCE STRG 3 NSP If cooling by FES only: C/W FREON LOOP It – on 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'	⑨ TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp ⑩ Vlv holds position ⑪ Indicates DN when NLG down ⑫ Will <u>not</u> indicate DN when RMG down ⑬ APU H2O QTY 2 if in BLR CNTLR/HTR 2A. APU H2O QTY 3 if in BLR CNTLR/HTR 3B ⑭ Single mtr time. One failure away from EVA to stow MPM or from RMS/OBSS jettison ⑮ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ⑯ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists ⑰ Do not reconfig for reg switch or I'CNCT procedures ⑱ Man CL and GPC cntl remains ⑲ If SPLY H2O DUMP VLV ENA/NOZ HTR – OFF, tb upward and already bp
(A1R) • S-BD FM PWR – 1 If no comm: (C3) • S-BD PM CNTL – PNL • – CMD • AUD CTR – 1 (L1) • FLASH EVAP CNTLR PRI A – OFF • FLASH EVAP CNTLR PRI B(SEC) – ON (If reqd) • TOP EVAP HTR NOZ R – A AUTO • TOP EVAP HTR DUCT – A(B) If Hi Load Evap enabled: • HI LOAD DUCT HTR – A(B) (L2) • FLASH EVAP FDLN HTR B SPLY – 2	S-BD Fm Sig Proc 2, Xmtr 2 Audio Ctr 2 Flash Evap Cntlr Pri A Topping Evap R Noz Htr B Topping Evap Duct Fwd,Aft Htrs C Hi Load Duct Inbd,Outbd, Noz Htrs C FES H2O Fdln B Htrs 1 (all) Prox Snsr Electronics Box 1 Av Bay 2 Agent discharge capability RMS: 14 Port MPM Mtr 1 14 Stbd MPM Mtr 2 15 Port Fwd MRL Mtr 2 15 Port Aft MRL Mtr 1 16 Stbd Mid MRL Mtr 2 16 Stbd Fwd MRL Mtr 1 RCS Manf F5 RJD pwr (F5L,F5R) RCS Manf F4 RJD pwr (F4R,F4D) MLS 3 (OV103,4) TACAN 3 (OV105) GPS 3 ACA 2/3 MNC pwr	(L2) 10 O2 EMER tb – bp 10 CAB RELIEF B tb – bp (R1) FC3 COOL PUMP ΔP tb – bp (F6,F8) 11 NOSE LDG GEAR tb – bp 12 R LDG GEAR tb – bp [HYD/APU] 13 HYD QTY 3 ind – 0% APU H2O QTY ind – 0% If SYS 2 pwrd: 'S62 BCE BYP PSP2' Loss of PL TLM and CMD If PDI FDA enabled: 'S62 PDI DECOM FAIL' (O1) H2O PUMP OUT PRESS LOOP 1 ind – 0 psia H2O PUMP OUT PRESS LOOP 2 ind – 20-25 psia (O3) RCS/OMS PRPLT QTY display is blank R ADP deploy time incr from 15-30 sec (O7) 10 AFT L RCS He PRESS B tb – bp 10 AFT L RCS MANF ISOL 5 tb – bp 10 AFT R RCS MANF ISOL 5 tb – bp (O8) 10 FWD RCS TK ISOL 1/2 tb – bp 10 FWD RCS MANF ISOL 4 tb – bp 10 FWD RCS MANF ISOL 5 tb – bp (R4) 10 HYD BK ISOL VLV 3 tb – OP 10 HYD MPS/TVC ISOL VLV SYS 3 tb – CL (R11L) 10 SPLY H2O TKA OUTLET tb – bp 19 SPLY H2O DUMP VLV tb – bp 10 SPLY H2O XOVR VLV tb – bp	
• For attitude control, perform LOSS OF VERNIERS (ORB OPS, <u>RCS</u>) (F6,F8) • HSI SEL SOURCE – other than MLS, (OV103,4) TACAN 3 or (OV105) GPS 3 (O6) • ANNUN BUS SEL ACA 2/3 – MNB Refer to OMS/RCS Slide Rule for vlv loss info 17 Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT L RCS He PRESS B • R RCS He PRESS B	10 Aft L RCS He Press Isol B GPC Cntl, man CL capability 18 F,R RCS He Press Isol B man OP capability		
(Continued)	(Continued)	(Continued)	

EPS SSR-50 (Cont) **BUS LOSS: MNC DA3**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(O8) • FWD RCS He PRESS B		(R11L) 10 SPLY H2O GALLEY SPLY VLV tb – bp	(10) Vlv holds position
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	10 SPLY H2O TKC INLET tb – bp	(20) Lost TM: GNC SYS SUMM 2
20 Save R OMS for deorbit (if reqd for additional on-orbit burns, √MCC)	20 R OMS GN2 Press Vlv Op TM 21 Eng Pr Vlv Coil 1	(R13L) RAD CNTL STBD,PORT (two) tb – bp	R OMS ENG VLV 2: Assume VLV 2 status same as Vlv 1
20 Prior to using L(R) OMS: (O8)		(A8L) PORT RMS: DPY/STO tb – bp RETEN LAT tb – bp R-F-L AFT tb – bp STARBOARD RMS: DPY/STO tb – bp	R OMS N2 P VLV: If ENG – ARM/PRESS, assume vlv OP
22 R OMS He PRESS/VAP ISOL • A – GPC • B – OP	23 R OMS He Vap Isol 2 GPC Cntl 23 R OMS He Pr Isol B GPC Cntl	SM 94 PDRS CONTROL PORT RMS Indications lost: MPM Mtr 1 STO/DPY Fwd MRL Mtr 2 LAT/REL/RDY Aft MRL Mtr 1 LAT/REL/RDY STBD RMS Indications lost: MPM Mtr 2 STO/DPY Mid MRL Mtr 2 LAT/REL/RDY	(21) Unable to confirm redundant coil (22) Maintains He Isol redundancy
24 L OMS He PRESS/VAP ISOL • A(B) – GPC • B(A) – CL	20 L OMS He Pr/Vap Isol A,B man Cntl	(AW82D) 10 EMU 1 H2O SPLY,WASTE tb – CL	(23) Vlv norm closed. Manual cntl remains
GNC XXXXX MNV R 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	(24) Prevents simultaneous opening of parallel reg paths and possibly rupturing burst disk
(A6U) • ANNUN BUS SEL – MNB	ACA 4/5 MNC pwr	If Cabin Fan A selected: C/W AV BAY/CAB AIR It – on 'S66 CABIN FAN'	(25) FSM caused by Antenna miscompare
(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: 'ANTENNA' (2)	(26) During MAN PLBD OP/CL, single mtr run time noted on actuators
(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'	
(AW18D) • AIRLK AUD CNTL – MIDDECK	AL ATU,EMU CCU 1,2 PS ATU and CCU	If OMS Gmb l cmd abs value > 2 deg: C/W OMS TVC It – on 'R OMS GMBL' (3,B)	
(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	(F7) If APUs active and using BLR CNTLR/HTR 2A or 3B: C/W APU TEMP It – on after ~2 min	
For PLBD ops: • OP/CL Drs in man mode	26 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 first RGA failure and Rates sensed: 'RM FAIL RGA'	
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 Sply H2O Dump Vlv Cntl 10 Noz Htr Xovr Vlv Cntl	If ANNUN BUS SEL ACA 2/3 – MNC, L/R Event Seq lts lost	
(Continued)	(Continued)	(Continued)	

EPS SSR-50 (Cont) **BUS LOSS: MNC DA3**

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 If AC Pwr Transfer Cable to be installed to regain AC: - Go to EPS SSR-200; otherwise, continue with bus loss actions (R2) - BLR CNTLR/HTR 2 – B 3 – A	10 MPS/TVC Hyd Sys 3 Isol Cntl 27 NH3 Sys A Sec Cntl man ON capability 28 NH3 Sys B Pri Cntl APU/HYD Blr Cntl/Htr 2A 3B 29 FC2 Redundant Reac Vlv Cntl on pnl C3 IMU Fan C H2O Loop 2 Pump man ON capability 10 H2O Loop 1 Byp Cntl, Sig Cond 30 H2O Loop 1 Byp Vlv pwr Cabin Fan A 31 Av Bay 1 Sig Cond, Xdcrs (ECLS SC2) Av Bay 2 Fan B 3 Fan A Freon Loop 2 Pump A 32 Freon S/C A AC3 pwr (ECLS SC 1A) 33 Freon S/C B AC3 pwr (ECLS SC 1B) CDR Seat adj via AC3 pwr PLT Seat adj via AC3 pwr 34 OMS Eng/Xfeed Vlv Redundancy	SM (BFS,SM) 63 PL BAY DOORS If in AUTO OP/CL for PLBDs, sequence terminates immediately and msg '(S63) PBD CONFIG' (R13L) During Rad Dpy/Sto ops: RAD LAT CNTL tb (two) indicate single mtr ops	⑩ Vlv holds position ②⑦ Sys A Pri Cntl, auto switchover to Sec Cntl remain ②⑧ Sys B Sec Cntl man On capability remains ②⑨ Not yet active on all vehicles ③⑩ H2O Loop 1 Pump Out P, Pump ΔP, Accum Qty, Pump Out Temp snrs lost ③① Av Bay 1 Fan ΔP, Air Out Temp snrs lost ③② Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate, and Accum Qty snrs lost ③③ Freon Loop 2 P/L Hx Flow Rate, Freon Loop 1 ICH Flow Rate, and Accum Qty snrs lost ③④ Maintains deorbit capability for CNTL BC1 failure ③⑤ Inhibits H2O Loop 1 Pump ΔP, Pump Out Temp, Accum Qty, respectively
(L1) - IMU FAN B(A) – ON - C – OFF • Perform SSR-10 (H2O Loop 2 only), H2O PUMP OPS via GPC, ECLS - 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 (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) (O8) - Right OMS XFEED B – OP (tb-OP) SM 60 SM TABLE MAINT 35 • Inhibit 0612605, 0612600, 0612640, 0612610	(Continued)		

EPS SSR-50 (Cont) **BUS LOSS: MNC DA3**

36	BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	ONLY ON MCC CALL, PERFORM			(10) Vlv holds position
	• MDU CRT 3 PWR – OFF • MDU CDR 1 PWR – OFF • MDU PLT 2 PWR – OFF			(36) AC3 bus isolation for AC Pwr Transfer Cable installation accomplished in MNC DA3 ACTIONS column. No additional bus isolation steps reqd
	(C2) • IDP/CRT 3 PWR – OFF			(37) Motor A remains
	(L4:N) • cb AC3 ΦC RAD ISOL B – op	37 Freon Loop 1,2 Rad Isol Motor B		(38) Redundant pwr source remains
	(R1) • PL AFT MNC – OFF	Aft Payload C pwr		(39) Current Snr 1 remains
	(O7) • (OV105) GPS 3 PWR – OFF • (OV105) GPS 3 PRE AMPL UPPER – OFF • (OV105) GPS 3 PRE AMPL LOWER – OFF	(OV105) GPS 3		(40) Current Snr 2 remains
	(O8) • MLS 3 – OFF • R SEAT/CTR CNSL FLOOD – OFF	R Seat/Ctr Cnsl Floodlts		(41) If Emer O2 Mission Kit not flown, cb is open prelaunch
	(O16:A) • RGA 3 – OFF	RGA 3		
38	(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 • (OV103,4) 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	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	39 Cryo O2 Tk1 Htr Current Snsr 2 40 Cryo O2 Tk2 Htr Current Snsr 1	
41	(O16:D) cb MNC • H2O ALT PRESS – op • O2 EMER – op • CAB RELIEF B – op • (OV105) GPS 3 PRE AMPL UPPER – op • (OV105) GPS 3 PRE AMPL LOWER – op • (OV103) GPS PRE AMPL UC – op • (OV103) GPS PRE AMPL LC – op	10 Emer O2 Sply Vlv Cntl 10 Cabin Relief Vlv B Cntl 10 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				42 PLT Arm remains
(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		ADTA 3, 4 MLS 3 RCS/OMS Prplt Qty Gauge 42 Drag Chute, CDR Arm		43 Six vlvs fail to non-isolation position
		43 ATVC 1 Isol ME		44 Logic buses 2(3) remain pwr'd via MNB(MNA)
(A7U) PL BAY • FLOOD AFT PORT – OFF • MID STBD – OFF		PLB Aft Port Floodlt Mid Stbd Floodlt		45 Redundant pwr source remains for equipment
(A7L) IF DOCKING MISSION • PYRO PWR MNC – OFF cb MNC • LOGIC 2 – op • 3 – op		MNC Pyro system 44 MNC pwr to DSP Logic buses 2,3		46 Ku Comm and RDR function lost. KU-BAND CONT STOW – EA1 ALTERNATE POWER IFM req'd to stow antenna. Jettison req'd if antenna cannot be positioned within GO FOR PLBD CLOSURE envelope
(A13) • (OV103) GPS – OFF • (OV103) GPS PRE AMPL UC – OFF • (OV103) GPS PRE AMPL LC – OFF		GPS 2		
(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 GCILC redundant pwr MDM cmds to CCTV Sys MNC pwr for CNTLAB 1,2,3 Buses		
45 (R14:B) cb PALLET/DSC • 2A – op (EDO) • 3B/4A – op (EDO)				
(R14:C) • cb MNC KU SIG PROC – op • cb UHF EVA – op		46 Ku-Bd Sys Rdr & Comm I/F Cont Unit (EA1), Ku Comm Sig Proc SSOR EVA STRG 2		
(R14:D) cb MNC TV B CAMR • CAMR/PTU – op • CAMR HTR – op • ILLUM/PTU HTR – op • cb MNC TV CAB – op		TV B Camr/Pan-Tilt TV B Camr Htr TV B Camr Pan/Tilt Htr and Illum 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	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM			(10) Vlv holds position
(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		(39) Current Snr 1 remains (47) √MCC for Ku Ant stow reqmts (48) Redundant mtr remains (49) Htr Cntl 2 remains (50) 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 (51) SYS A remains (52) One failure away from loss of jettison capability
(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		
	47 Ku Ant Sto/Dpy Mtr 1		
	48 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 48 R ADP Dpy Mtr 1 49 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 50 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 • cb MNC SPLY H2O GALLEY SPLY – op	10 Sply H2O TK A Out Vlv Cntl 10 C In Vlv Cntl 10 Galley H2O Sply Vlv Cntl		
(ML86B:D) cb PYRO JETT SYS B • KU ANT – op • PORT RMS – op • STBD RMS – op	51 Ku-Bd Jettison Sys A 52 RMS/OBSS Jett/Guil 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 EMU 1 Waste H2O Vlv Cntl 10 Sply H2O Vlv Cntl TA Floodlt 4		
(ML86B:F) • cb MNC CRYO O2 HTR TK4 SNSR 2 – op • cb MNC CRYO O2 HTR TK5 SNSR 2 – op	39 Cryo O2 Tk4 Htr Current Snsr 2 Cryo O2 Tk5 Htr Current Snsr 2		
(Continued)	(Continued)		

EPS SSR-50 (Cont)
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 (53) Unable to confirm redundant coils (54) Redundant coils remain (55) Vlv fails closed CAUTION No purge. Wait 10 min between burns (56) √MCC for OMS Tot Qtys. Aft Qtys are found on GNC SYS SUMM 2 (57) Pwr Sply A remains. Turbine speed ind lost (58) Pwr Sply B remains. GG Bed T and GBX P ind lost when APU running (59) Vlv fails closed. Redundant vlv remains (60) Cntrlrs A,B Rad Byp Mtrs Auto Cntl and Cntrlr B Rad Byp Vlv Mtr remain (61) Bypass vlv holds position and Cntrlr B Rad Byp Vlv Mtr remains (62) Vlv fails closed (63) Vlv fails closed. LO2 manf will not be pressured with He during entry (MM304) (64) Vlv holds position. Loss of manual capability to inert LO2 manf (65) Redundant mtrs remain (66) Brake/Skid Cntl Box A,B enabled before WOW (67) Redundant RPC remain
	53 R OMS ENG Pr Vlv Coil 1 54 R OMS ENG Cntl Vlv 1,2 Coils 1 55 R OMS Purge Vlv 1,2 56 OMS QTY Gauging for all R OMS Single Engine burns Press Vlv Op Sig 57 APU 2 Cntrlr Sply B pwr 58 3 Cntrlr Sply A pwr 59 2 Fu Tk Vlv B 59 3 Fu Tk Vlv A APU 3 GBX GN2 Repress Vlv 10 HYD BK ISOL VLV 3 Cntl Hyd Rsvr 3 Qty Snsr 10 EMU 1 Waste H2O Vlv Cntl 10 Sply H2O Vlv Cntl 60 Freon Loop 1 Cntrlr A Rad Byp Vlv Mtr man Cntl 61 Freon Loop 2 Cntrlr A Rad Byp Vlv Mtr 10 Freon Loop 2 Flow Prop vlv Freon Loop 2 Cold Plate Flow Xdcr MPS: 62 R Eng He Intercon Outlet Vlv 62 L Eng He Xovr Vlv 59 R Eng He Isol A 63 Manf Repress LO2 Vlv 1,2 64 Prplt F/D Outbd LO2 Vlv 65 ET Door Mtrs: C/L Lat Actr 2 Mtr 2 L Dr Closure Mtr 2 R Dr Closure Mtr 1 Uplock Lat Mtr 1 66 No WOW Relay K9,K11,K13 67 Hyd Main Pump 3 Depress Solenoid RPC A 67 Hyd Main Pump 2 Depress Solenoid RPC B		

BUS LOSS: MNC FPC3

(Includes MNC FI C3, MNC FMC3, AC3)

ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS		NOTES	
1	Perform FC3 SHUTDN (FC SHUTDN Cue Card), pwrdsn 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 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 BUS SNSR – OFF		AC3 ΦA,ΦB,ΦC Inverters	(F7) C/W FREON LOOP It – on C/W FC PUMP It – on C/W AC VOLT It – on C/W H2O LOOP It – on SM ALERT Light/Tone – on			
	(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	(F9) AC3 ΦA,ΦB,ΦC AC volts < 90 (COMM LOST) All S-BD A/G voice lost if Sys 2 selected		② Will be repwrdr after AC Pwr Transfer Cable connected 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)	
	(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	(LIGHTS LOST) Instr Its L/Ctr (pnls C2,F6,F7) MS pnl Its (pnls R10,R12) OS pnl Its (pnls A1,A2, A6, A7,A8,A13,L9)		IDP 4 MDU AFD 1 (P) ④ S86 WSB T 2 if in BLR CNTLR/HTR 2A. S86 WSB T 3 if in BLR CNTLR/HTR 3B	
	If PSP and/or INTRG reqd for PL or ISS ops: - S-BD PL PWR SYS – 1 - CNTL – PNL – CMD		NSP 2/COM SEC 2	(FSMs) S67 PFC/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 3 SM2 HYD QTY 3 (B)		⑤ REACQ and PSP reconfig procedures are flight specific. If reqd, procedures can be found in payload or ISS specific books	
5	Reconfig PSP		S-BD PL Intrg 2 PSP 2	S86 WSB T (2) SM0 THRM HYD (B)		⑥ OIU 1 interfaces with PSP 1 for commanding	
5	Perform PL INTRG REACQ (if reqd)			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)		⑦ Vlv holds position. Do not reconfig for reg switch or I'CNCT procedures	
	(A1R) S-BD FM PWR – 1		S-BD FM Sys 2	S88 H2O PUMP P1 S88 H2O LOOP 1 TEMP S88 H2O LOOP 1 QTY		⑧ Will indicate DN when NLG down	
	If no comm: (C3) - S-BD PM CNTL – PNL – CMD			I/O ERROR CRT 3 I/O ERROR CRT 4 RM DLMA MANF		⑨ Will <u>not</u> indicate DN when RMG down	
6	If OIU reqd: (SSP) - OIU PWR – OIU 1 ON - OIU tb – UP √MCC, OIU reconfig			If CABIN FAN A selected: C/W AV BAY/CAB AIR It – on 'S66 CABIN FAN'		⑩ 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	
	(L4:P) cb AC2 ΦA LG SNSR 2 – cl		Prox Snsr Electronics Box 1	If SYS 2 pwrdr: 'S62 BCE BYP PSP 2' Loss of PL TLM and CMD If PDI FDA enabled: 'S62 PDI DECOM FAIL'		⑪ Performing DIRECT STOW, MECH SSR-5, may be reqd. √MCC	
	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	7	Fwd RCS He Press Isol B man OP capability	If NSP 2 selected: BCE STRG 3 NSP If site AOS and using S-BD Ant Elect 2: 'ANTENNA' (2)			
	For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS)		RCS Manf F5 RJD pwr (F5L,F5R)	(R1) FC3 COOL PUMP ΔP tb – bp			
			RCS Manf F4 RJD pwr (F4R,F4D)	(F6,F8) LDG GEAR NOSE tb – bp LDG GEAR R tb – bp			
11	(R14:C) cb MNC KU SIG PROC – op	10	Ku-Bd Sys Rdr & Comm I/F Cont Unit (EA1)				
	(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 12 HYD QTY 3 ind – 0% APU H2O QTY ind – 0%	⑫ APU H2O QTY 2 if in BLR CNTLR/HTR 2A. APU H2O QTY 3 if in BLR CNTLR/HTR 3B
	13 RMS: 14 Port MPM Mtr 1 14 Stbd MPM Mtr 2 15 Port Fwd MRL Mtr 2 15 Port Aft MRL Mtr 1 17 Stbd Mid MRL Mtr 2 17 Stbd Fwd MRL Mtr 1	(O8) 16 FWD RCS 16 TK ISOL 1/2 tb – bp 16 MANF ISOL 4 tb – bp 5 tb – bp	⑬ MPM and MRLS may be repwrd after AC Pwr Transfer Cable connected
If AC Pwr Transfer Cable to be installed to regain AC: • Go to <u>EPS</u> 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	⑭ Single mtr time. One failure away from EVA to stow MPM or from RMS/OBSS jettison. May be repwrd after AC Pwr Transfer Cable connected
SM 60 SM TABLE MAINT		AIR TEMP AV BAY ind – 45 degF FREON FLOW 1 ind – 578 pph	
18 • INHIBIT 0612605, 0612600, 0612640, 0612610		R ADP deploy time incr from 15 to 30 sec	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
(CDR SEAT PNL) • CDR SEAT PWR BUS SEL – AC2 (up)	CDR Seat Adj via AC3 pwr	(F7) If APUs active and using BLR CNTLR/HTR 2A or 3B: C/W APU TEMP It – on after ~2 min	
(PLT SEAT PNL) • PLT SEAT PWR BUS SEL – AC2 (up)	PLT Seat Adj via AC3 pwr	STAR TRKR DR POS -Z OP/CL time incr from 8 to 16 sec	⑯ Vlv holds position
(O17) • SIG CONDR FREON A – AC2 • SIG CONDR FREON B – AC2	19 Freon Sig Condr A AC3 pwr (ECLS SC 1A) 20 Freon Sig Condr B AC3 pwr (ECLS SC 1B)		⑰ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists. May be repwrd after AC Pwr Transfer Cable connected
(R2) • BLR CNTLR/HTR 2 – B • 3 – A	APU/HYD Blr Cntlr/Htr 2A 3B Hyd Rsvr 3 Qty Snsr		⑱ Inhibits H2O Loop 1 Pump ΔP, Pump Out Press, Pump Out Temp, Accum Qty, respectively
(L1) • IMU FAN B(A) – ON • C – OFF	IMU Fan C H2O Loop 2 Pump man ON capability 16 H2O Loop 1 Byp Cntlr, Sig 21 Condr		⑲ Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate, and Accum Qty snsr lost
• Perform (H2O Loop 2 only) H2O PUMP OPS via GPC, <u>ECLS</u> SSR-10	H2O Loop 1 Byp vlv pwr		⑳ Freon Loop 2 P/L Hx Flow Rate, Freon Loop 1 ICH Flow Rate, and Accum Qty snsr lost
• 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	22 Av Bay 1 Sig condr, Xdcrs (ECLS SC2) Av Bay 2 Fan B Av Bay 3 Fan A Freon Loop 2 Pump A		㉑ H2O Loop 1 Pump Out P, Pump ΔP, Accum Qty, Pump Out Temp snsr lost
• √FREON PUMP LOOP 2 – B			㉒ AV Bay 1 Fan ΔP, Air Out Temp snsr lost
(Continued)	(Continued)		

EPS SSR-51 (Cont) **BUS LOSS: MNC FPC3**

23	BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	ONLY ON MCC CALL, PERFORM			(16) 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
	(O7) • (OV105) GPS 3 PWR – OFF • (OV105) GPS 3 PRE AMPL UPPER – OFF • (OV105) GPS 3 PRE AMPL LOWER – OFF	(OV105) GPS 3		(26) Htr Cntrlr 2 remains
	(O16:C) • cb MNC FIRE SUPPR BAY 2 – op			(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
	• MDU CRT 4 PWR – OFF			(28) Redundant mtrs remain
	(R11L) • IDP/CRT 4 PWR – OFF			(29) Bypass vlv holds position and Cntrlr B Rad Byp Vlv Mtr remains
	(MA73C:A) • MCA LOGIC MNC FWD 3 – OFF	MNC FMC 3 Bus pwr		(30) √MCC for Ku Ant stow reqmts
	(R14:C) • cb MNB KU ELEC – op			
	(A13) • (OV103) GPS PWR – OFF • (OV103) GPS PRE AMPL UC – OFF • (OV103) GPS PRE AMPL LC – OFF	(OV103) GPS 2		
		AC3 FMC3 Bus Pwr LH Vents 1,2,3 Mtr 1 6 Mtr 2 RH Vents 8,9 Mtr 1 3,5 Mtr 2 -Z Star Trkr Dr Sys 2 OP/CL capability		
		25 R ADP Dpy Mtr 1		
		PLT HUD		
		26 R ADP Htr Cntrlr 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 Cntrlr A Rad Byp Vlv Mtr		
		16 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 13-16 Mtr 1 1-4, 5-8, 9-12 Mtr 2 Stbd Aft Blkhld Mtr 1 Port Aft Blkhld 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 (L2) • FLASH EVAP FDLN HTR B SPLY – 2 (A12) • HYD HTR AFT FUS A – AUTO • HYD HTR AFT FUS B – OFF (R11U) • FC H2O LINE HTR – A AUTO • FC H2O RELIEF HTR – A AUTO (MA73C:C,D) 2 • cb MCA PWR AC3 3Φ MID 2 – op 2 • cb MCA PWR AC3 3Φ MID 4 – op For PLBD ops: • OP/CL Drs in man mode (L1) • TOP EVAP HTR DUCT – A(B) If Hi Load Evap enabled: • HI LOAD DUCT HTR – A(B)	1 FC3 Purge Vlv O2,H2 Flow Xdcrs SS ΔV Snrsrs FES H2O Fdln B Mid 2 Htr 1 Aft Fuselage Hyd Htrs B FC H2O Line Htrs B Relief Htrs B Noz Htr 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 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 Topping Evap Duct Fwd,Aft Htr C Hi Load Duct Inbd,Outbd Htr C PLB Aft Port Floodlt Mid Stbd Floodlt MNC Pyro system 4 MNC pwr to DSP Logic buses 2,3 RGA 3 FC3 Startup Htr INH capability MNC MMC2, MNC MMC4 Bus pwr 5 MNC pwr to ESS1BC,2CA 6 Freon Loop 1 Cntrl A Rad Byp Vlv Mtr man Cntl (Continued)	(R13L) 2 RAD CNTL PORT,STBD (two) tb – bp (Lights Lost) PLB Floodlts Aft Port, Mid Stbd If first RGA failure and rates sensed: 'RM FAIL RGA' (3) 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 (A8L) PORT RMS: DPY/STO tb – bp RETEN LAT tb – bp R-F-L AFT tb – bp STARBOARD RMS: DPY/STO tb – bp SM 94 PDRS CONTROL PORT RMS Indications lost: MPM Mtr 1 STO/DPY Fwd MRL Mtr 2 LAT/REL/RDY Aft MRL Mtr 1 LAT/REL/RDY STBD RMS Indications lost: MPM Mtr 2 STO/DPY Mid MRL Mtr 2 LAT/REL/RDY	① Buses are tied due to: <u>Loss of FC3 Purge capability.</u> 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 <u>Loss of FC3 SS ΔV Snrsrs.</u> 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 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 ③ Mtrs 1 will continue to drive until Sys A,B Cntl sw are taken to OFF ④ Logic buses 2(3) remain pwr'd via MNB(MNA) ⑤ Buses remain pwr'd ⑥ Cntrlrs A,B Rad Byp Mtrs Auto Cntl and Cntrl 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 (A7L) IF DOCKING MISSION • PYRO PWR MNC – OFF cb MNC • LOGIC 2 – op • 3 – op (O16:A) • RGA 3 – OFF (R11U) • FC PURGE VLV 3 – CL • FC STARTUP HTR 3 – ENA (MA73C:A,B) • MCA LOGIC MNC MID 2,4 (two) – OFF			

EPS SSR-52 (Cont)
BUS LOSS: MNC MPC3

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	RMS: 7 Port MPM Mtr 1 7 Stbd MPM Mtr 2 8 Port Fwd MRL Mtr 2 8 Port Aft MRL Mtr 1 9 Stbd Mid MRL Mtr 2 RH Vent 3 Mtr 2 5 Mtr 2 LH Vent 3 Mtr 1 6 Mtr 2 10 Ku Ant Dpy/Sto Mtr 1 Limit sw 11 Redundant Ku Band Xmit Enable 12 Redundant Boom Stow Enable II Excitation Signal FC2 Redundant Reac Vlv Close Cntl on pnl C3		⑦ Single mtr time. One failure away from EVA to stow MPM or from RMS/OBSS jettison ⑧ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ⑨ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists ⑩ With an inop limit sw, mtr will continue to run until primary sw returned to GND ⑪ Redundant sig (MNB) enables Ku Band Xmit ⑫ MNB MMC4 pwr remains to supply pwr to Boom Stow Enable II signal for stow mtrs

EPS SSR-53 **BUS LOSS: MNC APC3**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
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) 3 Reconfig following vlv(s) only if leak isolation reqd: (O7) - AFT L RCS He PRESS B - R RCS He PRESS B (A12) APU HTR TK/FU LN/H2O SYS 3B – AUTO SYS 3A – OFF (A14) RCS/OMS HTR - L POD (two) – A AUTO, B OFF - R POD (two) – A AUTO, B OFF 5 Prior to using L,R OMS: (O8) 6 R OMS He PRESS/VAP ISOL - A – GPC - B – OP 8 L OMS He PRESS/VAP ISOL - A(B) – GPC - B(A) – CL GNC XXXXX MNVY YYYYY (3,B) Sel R OMS SEC TVC: - GMBL SEC R – ITEM 31 EXEC	2 Aft L RCS He Press Isol B GPC Cntl, man CL capability 4 Aft R RCS He Press Isol B man OP capability 2 Aft L,R RCS Manf Isol 5 Cntl APU 3 GG Inj H2O Htrs 3A,23A L,R Pod Htrs B (partial) 7 R OMS He Vap Isol 2 GPC Cntl 7 R OMS He Pr Isol B GPC Cntl 9 L OMS He Pr/Vap Isol A,B man Cntl R OMS Pri TVC Aft Payload C pwr 10 R OMS BPV 2 OP sig APU 2 Fu Tk Vlv B	If OMS GMBL cmd abs value > 2 deg: C/W OMS TVC It – on 'R OMS GMBL' (3,B)	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
BUS ISOLATION ONLY ON MCC CALL, PERFORM (R1) PL AFT MNC – OFF			

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 Cntl'r Pri A	(R4) 1 HYD BK 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
(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 If cooling by FES only: C/W FREON LOOP It – on 'S88 EVAP OUT T 1' 'S88 EVAP OUT T 2'	
[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	(F7) If APUs active and using BLR CNTLR/HTR 2A or 3B, C/W APU TEMP It – on after ~2 min If OMS Gmbl cmd abs value > 2 deg: C/W OMS TVC It – on 'R OMS GMBL' (3,B) No R MPS He usage during entry (MM304)	* TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
(R2) • BLR CNTLR/HTR 2 – B • 3 – A	APU/HYD Blr Cntl'r/Htr 2A 3B		
(A12) 5 APU HTR TK/FU LN/H2O • SYS 2A – AUTO • 2B – OFF 5 • SYS 3A – OFF • 3B – AUTO 5 APU HTR GAS GEN/FUEL • 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

[illegible]

EPS SSR-54 (Cont)
BUS LOSS: MNC APC6

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	1 Hyd Brake Isol 3 Cntl 19 R OMS Cntl Vlv 1,2 Coils 1 20 OMS Qty Gauging for all R OMS single engine burns 21 R OMS Purge Vlv 1,2 Aft RCS L,R Jet 5 Htr MPS: 22 R Eng He Intercon Outlet Vlv 23 R Eng He Isol A 22 L Eng He Xovr Vlv 24 Manf Repress LO2 Vlv 1,2 25 Prplt F/D Outbd LO2 Vlv 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 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	R MPS He reg A < 680 during entry (MM303)	① Vlv holds position ⑱ Redundant coils remain ⑳ √MCC for OMS Qty ㉑ CAUTION No purge. Wait 10 min between burns ㉒ Vlv fails closed ㉓ Vlv fails closed. Redundant vlv remains ㉔ Vlv fails closed. LO2 Manf will not be pressurized with He during entry (MM304) ㉕ Vlv holds position. Loss of manual capability to inert LO2 manf ㉖ Redundant mtrs remain

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 ----- If PSP and/or INTRG reqd for PL or ISS ops: • S-BD PL PWR SYS – 1 • CNTL – PNL • – CMD 5 • Reconfig PSP 5 • Perform PL INTRG REACQ (if reqd)	S-BD PM Sys 2: FM, PM Ant Sw 2 Xpndr 2 Pwr Ampl 2 Pre Amp 2 NSP 2 ----- S-BD PL Intrg 2 PSP 2	(COMM LOST) All S-BD A/G voice lost if Sys 2 selected (F7) 1 C/W RCS JET It – on (F6,F8) 2 LDG GEAR R tb – bp 3 LDG GEAR NOSE tb – bp (O8) 4 FWD RCS MANF ISOL 5 tb – bp (FSMs) 1 F RCS D(R) JET RM DLMA MANF If NSP 2 selected: 'BCE STRG 3 NSP' If site AOS and using S-BD ANT Elec 2: 'ANTENNA (2) 6 If Sys 2 pwrd: 'S62 BCE BYP PSP2' Loss of PL TLM and CMD If PDI FDA enabled: 'S62 PDI DECOM FAIL'	① Indications do not appear until jets commanded ② Does not indicate DN when RMG down ③ Indicates DN when Nose Gear down ④ Vlv holds position ⑤ REACQ and PSP reconfig procedures are flight specific. If reqd, procedures can be found in payload or ISS specific books ⑥ FSM caused by Antenna miscompare ⑦ OIU 1 interfaces with PSP 1 for commanding ⑧ Manf status <u>not</u> automatically declared closed. Jet fail-offs may occur when commanded ⑨ Do not reconfig for reg switch or l'CNCT procedures ⑩ Htr Cntrlr 2 remains
(A1R) • S-BD FM PWR – 1 If no comm: (C3) • S-BD PM CNTL – PNL • – CMD 7 If OIU reqd: (SSP) • OIU PWR – OIU 1 ON • OIU tb – UP • \MCC, OIU reconfig • For attitude control, perform LOSS OF VERNIERS (ORB OPS, RCS)	S-BD FM Sys 2 RCS Manf F5 RJD pwr (F5L,F5R)		
[GNC 23 RCS] 8 Override F4 Manf status to CL: • RCS FWD – ITEM 1 EXEC • MANF VLVS 4 OVRD – ITEM 43 EXEC Refer to OMS/RCS Slide Rule for vlv loss info 9 Reconfig following vlv only if leak isolation reqd: (O8) • FWD RCS He PRESS B • Pre-seat ingress for Entry, discharge hand-held fire ext into AV BAY 2	RCS Manf F4 RJD pwr (F4R,F4D) 4 Fwd RCS He Press Isol B man OP capability Av Bay 2 agent discharge capability		
BUS ISOLATION ONLY ON MCC CALL, PERFORM (O16:C) • cb MNC FIRE SUPPR BAY 2 – op	 10 R ADP Htr Cntrlr 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	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)	FES Cntrl Pri A Topping Evap R Noz Htr B Hi Load Duct Noz Htr C	(R4) 1 HYD BK 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 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
(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	④
Refer to OMS/RCS Slide Rule for bus loss info 2 Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT R RCS He PRESS B • L RCS He PRESS B	Aft R RCS He Pr Isol B man OP capability 1 Aft L RCS He Press Isol B GPC Cntl, man CL capability	(FSMs) RCS PWR FAIL If cooling by FES only: C/W FREON LOOP It – on 'S88 EVAP OUT T1' 'S88 EVAP OUT T2'	* TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp
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	(F7) If APUs active and using BLR CNTLR/HTR 2A or 3B: C/W APU TEMP It – on after ~2 min	⑤ Lost TM: GNC SYS SUMM 2 R OMS N2 P VLV If Eng – ARM/PRESS, assume vlv OP
(R2) • BLR CNTLR/HTR 2 – B • 3 – A	3 APU/HYD Blr Cntrl/Htr 2A 3 3B		⑥ Unable to confirm redundant coils ⑦ Maintains He Isol redundancy
(A12) APU HTR TK/FU LN/H2O 4 • SYS 2A – AUTO • 2B – OFF 4 • 3A – OFF • 3B – AUTO APU HTR GAS GEN/FUEL 4 • PUMP 2 – A AUTO • 3 – B AUTO 4 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		⑧ Vlv normally closed. Man cntl remains
5 Save R OMS eng for deorbit (If reqd for additional on-orbit burns, √MCC)	5 R OMS GN2 Press Vlv OP TM 6 R OMS Eng Pr Vlv Coil 1		
Prior to using R OMS: (O8) 7 R OMS He PRESS/VAP ISOL • A – GPC • B – OP	8 R OMS He Pr Isol B GPC Cntl 1 MPS/TVC Hyd Sys 3 Isol Cntl		
(Continued)	(Continued)		

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 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)	9 NH3 Sys A Sec Cntrl man ON capability 10 NH3 Sys B Pri Cntrl and Auto sw over to Sec Cntrl	R MPS He reg A < 680 during entry (MM303)	① Vlv holds position ⑨ Sys A Pri Cntrl, auto switchover to Sec Cntrl remain ⑩ Sys B Sec Cntrl 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
BUS ISOLATION ONLY ON MCC CALL, PERFORM NONE	11 R OMS Eng Cntl Vlv 1,2 Coils 1 12 OMS Qty Gauging for all R OMS Single Engine burns 13 R OMS Purge Vlv 1,2 Aft RCS L,R Jet 5 Htr 1 Hyd Brake Isol 3 Cntl 14 APU 2 Fu Tk Vlv B 14 3 Fu Tk Vlv A MPS: 15 R Eng He Intercon Outlet Vlv 14 R Eng He Isol A 15 L Eng He Xovr Vlv 16 Manf Repress LO2 Vlv 1,2 17 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 Cntrl 2 remains
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(MA73C:A) MCA LOGIC MNC FWD 3 – OFF	-Z Star Trkr Dr Sys 2 OP/CL capability 2 R ADP Deploy Mtr 1 Disc 1 3 MNC FMC3 Bus pwr R ADP Htr Cntrl 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 For PLBD Ops: - OP/CL Drs in man mode, MANUAL PLBD CLOSING (DEORBIT PREP)	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 PLBD: C/L Lat 1-4 Mtr 2 5-8 Mtr 2 Port Aft Blkhd Lat Mtr 2 MNC MMC2 Bus pwr LH Vents 3 Mtr 1 6 Mtr 2 3 Ku Ant Dpy/Sto Mtr 1 limit sw 4 Redundant Ku-Band Xmit Enable 5 Redundant Boom Stow Enable II Excitation Signal RMS: 6 Port Aft MRL Mtr 1 7 Stbd Mid MRL Mtr 2	1 (R13L) RAD CNTL PORT tb – bp If STBD RAD pnl deployed: 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 (A8L) PORT RMS: DPY/STO tb – bp RETEN LAT tb – bp R-F-L AFT tb – bp SM 94 PDRS CONTROL PORT RMS Indications lost: MPM Mtr 1 STO/DPY Fwd MRL Mtr 2 LAT/REL/RDY Aft MRL Mtr 1 LAT/REL/RDY STBD RMS Indications lost: MPM Mtr 2 STO/DPY Mid MRL Mtr 2 LAT/REL/RDY	① If AC3 MMC2 cb not opened, Lat Mtr 2 of Stbd Lat 7-12 Actuator continues to run until Sys B Lat Cntrl sw placed to OFF ② Mtr 1 will continue to drive until Sys B Cntrl sw is taken to OFF ③ With an inoperative limit switch, mtr will continue to run until stow sw returned to gnd ④ Redundant sig (MNB) enables Ku-Band Xmit ⑤ MNB MMC4 pwr remains to supply pwr to Boom Stow Enable II Signal for Stow mtrs ⑥ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ⑦ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(MA73C:A) MCA LOGIC MNC MID 2 – OFF			

EPS SSR-59 **BUS LOSS: MNC MMC4**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 (MA73C:D) • cb MCA PWR AC3 3Φ MID 4 – op	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	(R13L) RAD CNTL STBD tb – bp If PORT RAD pnl deployed: RAD CNTL PORT tb – bp	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/OBSS jettison ④ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists
For PLBD ops: • OP/CL Drs in man mode, MANUAL PLBD CLOSING (DEORBIT PREP)	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	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	
BUS ISOLATION		(A8L) STARBOARD RMS: DPY/STO tb – bp	
ONLY ON MCC CALL, PERFORM		SM 94 PDRS CONTROL PORT RMS Indications lost: Fwd MRL Mtr 2 LAT/REL/RDY	
(MA73C:B) • MCA LOGIC MNC MID 4 – OFF	MNC MMC 4 Bus pwr		
	RH Vent 5 Mtr 2 3 Mtr 2		
	RMS: 3 Port MPM Mtr 1 3 Stbd MPM Mtr 2 4 Port Fwd MRL Mtr 2		

EPS SSR-60
BUS LOSS: MNC AMC3

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE	RH Vents 8,9 Mtr 1	NONE	① Redundant mtrs remain
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(MA73C:B) • MCA LOGIC MNC AFT 3 – OFF	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		

EPS SSR-61 **BUS LOSS: MNC R14**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 (C3) • AUD CTR – 1 (AW18D) • AIRLK AUD CNTL – MIDDECK	1 Audio Center 2 A/L ATU, EMU CCU 1,2 PS ATU, CCU	MS Floodlt lost Comm via PS ATU lost 1 If Aud Ctr 2 selected, all comm lost 2 If operating Ku-Band comm, no U/L voice (F6) MDU CDR 1 blanks (F8) MDU PLT 2 blanks (AFT) MDU AFD 1 blanks	① If AUD CTR 2 selected, all intercom, A/G, recorded voice lost until AUD CTR 1 selected ② Ku comm function lost. RDR function OK ③ Redundant pwr source remains for equipment
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 (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) (R14:C) • cb MNC KU SIG PROC – op • cb UHF EVA – op (R14:D) • cb MNC TV CAB – op cb MNC TV B CAMR • CAMR/PTU – op • CAMR HTR – op • ILLUM/PTU HTR – op (R14:E) • cb MNC MS FLOOD – op • MDU CDR 1 PWR – OFF • MDU PLT 2 PWR – OFF • MDU AFD 1 PWR – OFF	MDU CDR 1 MDU PLT 2 MDU AFD 1 UHF redundant pwr GCILC redundant pwr MDM cmds to CCTV Sys MNC pwr for CNTL AB1,AB2 AB3 2 Ku Comm Sig Proc SSOR EVA STRG 2 Fit, Middeck TV Camrs, VFM's TV B Camr/Pan-Tilt TV B Camr Htr TV B Pan-Tilt Htr and Illum MS Floodlt		

EPS SSR-62

BUS LOSS: MNC O16RJD

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE	1 ON Cntl of RCS F4 Manf Drivers (F4D,F4R)		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
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
NONE			

EPS SSR-63

BUS LOSS: MNC O16

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 (R1) • BUS TIE MNB – ON (tb-ON)		(FSMs) BCE STRG 3 ADTA (3,B) 4 ADTA (3,B) 3 MLS (3)	① FC2 only one failure away (loss of ESS2CA) from inability to bus tie
(O6) • ANNUN BUS SEL ACA 2/3 – MNB	2 ACA 2/3 MNC pwr	(O3) RCS/OMS Prplt Qty Gauge blanks	② ACAs recovered by switching to alternate pwr
(F6,F8) • HSI SEL SOURCE – other than MLS, (OV103,4) TACAN 3 or (OV105) GPS 3	MLS 3 (OV103,4) TACAN 3 (OV105) GPS 3	(L2) 3 O2 EMER tb – bp CAB RELIEF B tb – bp	③ If EMER O2 Mission Kit not flown, cb is opened prelaunch
(A6U) • ANNUN BUS SEL – MNB	2 ACA 4/5 MNC pwr	Time stops updating	
(O14:D) cb MNA • (OV103) GPS PRE AMPL UC – cl • (OV103) GPS PRE AMPL LC – cl		(LIGHTS LOST) R Seat/Ctr Cnsl Floodlts If ACA 2/3 – MNC, lights lost: (C3) DAP lights left three columns ALL (F6/F8)	
(A13) • (OV103) GPS PRE AMPL UC – MNA • (OV103) GPS PRE AMPL LC – MNA		2 Landing Gear ARM/DOWN (F3) NWS FAIL It (L1) Smoke detection fire suppression ALL MO29J MIC KEY	
		If ACA 4/5 – MNC, lights lost: (A6U) 2 DAP lights ALL (A7U) Video input, output, Gamma, ALC A2 MIC KEY	

EPS SSR-63 (Cont) **BUS LOSS: MNC O16**

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		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
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(O8) • MLS 3 – OFF • R SEAT/CTR CNSL FLOOD – OFF	R Seat/Ctr Cnsl Floodlts		
(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		
(O16:C) cb MNC • (OV103,4) 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	Tacan 3 5 Cabin Smoke Detector Av Bay 1 Smoke Detector A 2 Smoke Detector B MNC Utility pwr		
(O16:D) cb MNC 3 • H2O ALT PRESS – op • O2 EMER – op • CAB RELIEF B – op • (OV105) GPS 3 PRE AMPL UPPER – op • (OV105) GPS 3 PRE AMPL LOWER – op • (OV103) GPS PRE AMPL UC – op • (OV103) GPS PRE AMPL LC – op	6 Cryo O2 Tk1 Htr Current 7 Snsr 2 Cryo O2 Tk2 Htr Current Snsr 1		
(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	8 H2O Alternate Press Vlv 9 Emer O2 Sply Vlv 9 Cabin Relief Vlv B		
	ADTA 3,4		
	4 R,Aft DDU MNC pwr		
	10 RCS/OMS Prplt Qty Gauge		
	11 Drag Chute, CDR Arm		

EPS SSR-64

BUS LOSS: MNC R1A1

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE	1 MNC pwr to CNTLBC1,2,3 and CNTLCA1,2,3 2 MNC pwr to ESS1BC, ESS2CA		① Cntl Buses remain pwrd ② ESS1BC and ESS2CA remain pwrd
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
NONE			

EPS SSR-65

BUS LOSS: MNC A14

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
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	Fwd RCS Jet 4,5 Htrs		
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
NONE			

EPS SSR-66

BUS LOSS: MNC ML86B

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(PLT SEAT PNL) • PLT SEAT PWR BUS SEL – AC2 (up)	CDR Seat Adj via AC3 pwr	(AW82D) 1 EMU 1 H2O SPLY tb – CL 1 WASTE tb – CL	① Vlv holds position ② If SPLY H2O DUMP VLV ENA/NOZ HTR – OFF, tb unpwr and already bp
(CDR SEAT PNL) • CDR SEAT PWR BUS SEL – AC2 (up)	PLT Seat Adj via AC3 pwr	(R11L) SPLY H2O 1 TKA OUTLET tb – bp 2 DUMP VLV tb – bp 1 XOVV VLV tb – bp 1 GALLEY SPLY VLV tb – bp 1 TKC INLET tb – bp	③ MNA,MNB line htrs remain
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	Supply H2O: 1 Dump Vlv Cntl 1 Noz Htr 1 Xovv Vlv Cntl	(LIGHTS LOST) Middeck Floodlts 3,4,5,7 Bunk Floodlts 1/3 Airlock Floodlt 4 MO13Q Pnl It 1 TA Floodlt 4	
(ML86B:C) • cb MNA(MNB) EXT ARLK HTR LINE ZN1 – cl • cb MNA(MNB) EXT ARLK HTR LINE ZN2 – cl	3 Ext A/L H2O Line Htrs MNC pwr		

EPS SSR-66 (Cont)
BUS LOSS: MNC ML86B

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM			① Vlv holds position
(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		③ MNA,MNB line htrs remain ④ Sys A remains ⑤ One failure away from loss of jettison capability ⑥ Current Snsr 1 remains
(ML86B:D) cb MNC PYRO JETT SYS B • KU ANT – op • PORT RMS – op • STBD RMS – op	4 Ku-BD Jettison Sys B 5 RMS/OBSS Jett/Guil 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	1 EMU 1 Waste H2O Vlv Cntl 1 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 • O2 HTR TK5 SNSR 2 – op	Middeck Floodlts 3,4,5,7 MO13Q Pnl It 1 Bunk Floodlts 1/3 Airlk Floodlt 4 6 Cryo O2 Tk4 Current Snsr 2 Cryo O2 Tk5 Current Snsr 2		
(ML86B:C) • cb MNC EXT ARLK HTR LINE ZN1 – op • cb MNC EXT ARLK HTR LINE ZN2 – op	3 Ext A/L H2O Line Htrs MNC pwr		

EPS ESS
SSR 70-95

EPS SSR-70

BUS LOSS: ESS1BC DA1

(Includes all ESS1BC sub-buses)

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 • Perform FC1 SHUTDN (FC SHUTDN Cue Card), then: 3 (R1) 4 • PL CAB – MNB (O5) 2 • L AUD CNTL – R (O6) • MTU – OSC 2 If add'l lgt reqd: (C3) • EMER LTG – ON/OFF (R1) • O2,H2 TK2 HTRS A,B (four) – OFF • O2,H2 TK1,3 HTRS A (four) – AUTO • O2,H2 MAN VLV TK2 (two) – OP (A11) • O2,H2 TK4 HTRS A,B (four) – OFF (refer to <u>EPS</u>, 7.6 CRYO TABLE A for nomenclature) 12 If GPC 1 or 4 dump reqd, attempt S/W dump in RUN 13 To release crewmember from constant monitoring requirement: 14 • Perform C&W EU CONTINGENCY POWER (IFM) Once C&W EU CONTINGENCY POWER (IFM) is completed (R13U) 15 • C/W PARAM SEL tw (three) – 010, 030, 060, 080 • C/W PARAM – INH • MEM – CLEAR • C/W PARAM SEL tw (three) – > 119 When reqd: • For FC1, perform FUEL CELL PURGE – MANUAL (ORB OPS, <u>EPS</u>) (Continued)	1 FC1 Controller and Pumps 4 FC1 Reac Vlv Cntl via pnl R1 sw 5 MNA pwr to CABPL 1,2,3 buses 2 L Audio pwr MTU Pwr Sply A/Osc 1 8 L Glareshield Floodlts via pnl O6 sw 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 Cryo Tk3 Htrs in Auto ops if Tk4 in Auto Cryo Tk4 Htrs Auto ops Cryo Tk3 O2,H2 Htrs Auto ops if O2,H2 Tk4 Htrs A(B) in AUTO Cryo Tk4 O2,H2 Htrs Auto ops 12 GPC Mode sw Halt Contacts for GPCs 1,4 (pnl O6) 12 GPC Output sw Terminate capability for GPCs 1,4 16 FC1 Auto purge capability 17 If SSPTS: OPCU 1 Voltage Adjust Capability via switch (Continued)	2 MASTER ALARM Light/Tone – on L Audio lost L Glrshld Floodlt lost (F7) 6 No C/W lts Two of four bulbs in MA lts not lt SM ALERT Light/Tone – on (R1) 7 FC/MN BUS A tb – OFF 7 MN BUS TIE A tb – OFF 9 INV/AC BUS 1 tb – OFF 4 O2 MANF VLV TK1 tb – CL 4 H2 MANF VLV TK1 tb – CL 4 FC1 REAC (two) tb – CL FC1 RDY tb – bp 11 FC1 COOL PUMP ΔP tb – bp (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 7 If SSPTS: (A15) PTU 1 tb – OFF (Continued) NOTES (Cont) 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 Inhibits Primary C/W for O2 and H2 Tk 2 and 4 Control Pressure ⑯ Caused by loss of purge vlv sw position TM ⑰ OPCU 1 Voltage Adjust Capability still exists via MCC CMDs	① TIME CRITICAL FC1 must be shut down within 9 min to avoid potentially hazardous condition ② No intercom, A/G, or recorded voice from CDR ATU. When L AUD CNTL switched to RIGHT, only listen capability restored ③ FC/MN BUS A and MN BUS TIE A sws work, but tbs are lost ④ Vlv holds position, but tb and sw lost. Redundant Reac Vlv Close Cntl on pnl C3 remains ⑤ Pwrs PL Timing Buffer, VTR, and one string of OBSS power while attached to SRMS 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 ⑦ Switch works but tb lost ⑧ Flood lts available via EMER LTG (C3,ML18F) ⑨ AC1 remains pwr'd, but tb lost. INV/AC BUS 1 sw inop. INV PWR 1 sw also inop ⑩ Vlv holds position, but tb and sw lost 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

EPS SSR-70 (Cont) **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 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 It ⑱ Disables AC1 AUTO TRIP. AC1 Voltage and OVLD c/w lost ⑲ AC1 inverters and buses remain pwr'd, but sws and tb lost. INV/AC BUS 1 sw inop. INV PWR 1 sw also inop ⑳ Vlv closes. Redundant vlv B remains
(O13:A) cb ESS 1BC 6 • C/W A – op • AC1 SNSR – op • MTU A – op	6 Pri C/W Sys, Annun pnl F7 18 AC1 Bus Snr	SM 67 ELECTRIC ESS 1BC VOLTS < 20	
(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%	
(R14:F) cb ESS 1BC • FLOOD L GLRSHLD – op • AUD L – op		Airlock Floodlt 2 lost Tnl Adapt Floodlt 1 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		
	Cryo Tk2,Tk4 Htr Snr Test/Reset sw		
	19 AC1 Inverters: Input DC pwr Cntl INV/AC Bus Cntl 3 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 (OV103,4) TACAN 1 Auto Self-Test		
	20 APU 1 Fu Tk Vlv A		
(O7) • (OV105) GPS 1 PWR – OFF • (OV105) GPS 1 PRE AMPL UPPER – OFF • (OV105) GPS 1 PRE AMPL LOWER – OFF	(OV105) GPS 1		
(O14:D) cb MNA • (OV105) GPS 1 PRE AMPL UPPER – op • (OV105) GPS 1 PRE AMPL LOWER – op			

EPS SSR-71

BUS LOSS: ESS1BC FP&LC1

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE	1 AC1 Inverters Input DC pwr Cntl	(R1) 1 INV PWR 1 tb – OFF	① Inverters remain pwr'd, but tb and sw lost
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
NONE	Capability to switch to MADS Rcdr Trk Seq 2		

EPS SSR-72

BUS LOSS: ESS1BC MPC1

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 • Perform FC1 SHUTDN 2 (FC SHUTDN Cue Card)	1 FC1 Controller and Pumps 2 FC1 Reac Vlv Cntl via pnl R1 sw	MASTER ALARM Light/Tone – on	①
BUS ISOLATION		(F7) 2 C/W FC REAC It C/W FC PUMP It SM ALERT Light/Tone	* TIME * * CRITICAL *
ONLY ON MCC CALL, PERFORM		(R1) 2 O2 MANF VLV TK1 tb – CL 2 H2 MANF VLV TK1 tb – CL 2 FC1 REAC (two) tb – CL FC1 RDY tb – bp 3 FC1 COOL PUMP ΔP tb – bp	FC1 must be shut down within 9 min to avoid potentially hazardous condition
NONE	2 Cryo O2,H2 Tk1 Manf Vlv Cntl	(FSMs) S68 H2 MANF VLV S68 O2 MANF VLV S69 FC PUMP 1 2 S69 FC REAC 1 S69 FC H2 PUMP 1	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

BUS LOSS: ESS1BC ML86B

MAL/ALL/GEN J

EPS SSR-74 **BUS LOSS: ESS1BC FD**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
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, <u>EPS</u>) (R1) - O2,H2 TK3 HTR A (two) – AUTO	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 6 OIU 1 MNA pwr 7 AUX PL A Bus pwr AC1 Inverters: Input DC Pwr Cntl Inv/AC Bus Cntl Cryo O2 Tk2,4 Htr Snsr Test/Reset sw (OV103,4) TACAN 1 Auto Self-Test 8 If SSPTS: OPCU 1 Voltage Adjust Capability via switch	MASTER ALARM Light/Tone – on (F7) C/W FC PUMP It (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	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 PL3 ⑦ AC1 inverters and buses remain pwr'd. INV PWR 1 and INV/AC BUS 1 switches and INV PWR 1 tb lost ⑧ OPCU 1 Voltage Adjust Capability still exists via MCC CMDs
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
NONE			

EPS SSR-75 **BUS LOSS: ESS1BC O13&R14**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
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 lgt reqd: (C3) • EMER LTG – ON/OFF 5 To release crewmember from constant monitoring requirement: 6 • Perform C&W EU CONTINGENCY POWER (IFM) 7 Once C&W EU CONTINGENCY POWER (IFM) is completed (R13U) • C/W PARAM SEL tw (three) – 010, 060 • C/W PARAM – INH • MEM – CLEAR • C/W PARAM SEL tw (three) – > 119 (Continued)	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)	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%	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 pwr'd. 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 ⑦ Inhibits Primary C/W for O2 and H2 Tk 2 Control Pressure

EPS SSR-75 (Cont)
BUS LOSS: ESS1BC 013&R14

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM			
(O13:A) cb ESS1BC • C/W A – op • AC1 SNSR – op • MTU A – op	2 Pri C/W Sys, Annun Pnl F7 8 AC1 Bus Snr		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
(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		⑧ Disables AC1 Auto Trip. AC1 Voltage and OVLD C/W lost
(R14:F) cb ESS1BC • FLOOD L GLRSHLD – op • AUD L – op			⑨ Switches and tbs still operate
	LG ARM/DN Reset capability		
	9 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 • Perform FC2 SHUTDN (FC SHUTDN Cue Card), then: 4 (R1) • PL CAB – MNA	1 FC2 Controller and Pumps 4 FC2 Reac Vlv Cntl via pnl R1 sw	2 All comm lost via AUD CTR 1 2 R AUDIO lost R Glareshield Floodlt lost MASTER ALARM Light/Tone – on	① TIME * CRITICAL *
(C3) 2 • AUD CTR – 2 (O9) 2 • R AUD CNTL – L	5 MNB pwr to CABPL 1,2,3 Buses 2 Audio Center 1	(F7) C/W O2 PRESS It – on C/W H2 PRESS It – on 4 C/W FC REAC It – on C/W FC PUMP It – on 6 C/W PRI C/W It – on C/W BACKUP C/W ALARM It – on Two of four bulbs in MA lts – inoperative SM ALERT It/Tone – on	FC2 must be shut down within 9 min to avoid potentially hazardous condition
(O6) • MTU – OSC 1 If add'l ltg reqd: (C3) • EMER LTG – ON/OFF	2 R Audio pwr MTU Pwr Sply B/Osc 2	(FSMs) S69 FC PUMP 2 S69 FC REAC 2 S67 ESS BUS V 2CA S68 O2 CNTL P1,5 S68 H2 CNTL P1,5 S68 H2 MANF VLV S68 O2 MANF VLV S69 FC H2 PUMP 2	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
(R1) • O2,H2 MANF VLV TK1 (two) – OP • O2,H2 TK1 HTRS A,B (four) – OFF • O2,H2 TK2,3 HTRS A (four) – AUTO • O2,H2 TK 2,3 HTRS B (four) – OFF	7 R Glareshield Floodlts via pnl O8 sw 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	If SSPTS: (A15) PTU 2 tb – OFF	③ FC/MN BUS B and MN BUS TIE B SWS work, but tbs lost
(A15) • O2,H2 TK5 HTR A,B (four) – OFF When reqd: • Perform FUEL CELL PURGE – MANUAL (ORB OPS, EPS)	Cryo Tk5 O2, H2 Htrs Auto ops 9 All FC Auto Purge capability		④ Vlv holds position, but tb and sw lost. Redundant Reac Vlv Close Cntl on pnl C3 remains
10 If GPC 2 or 5 dump reqd, attempt S/W dump in RUN	10 GPC Mode sw Halt Contacts for GPCs 2,5 (pnl O6) 10 GPC Output sw Terminate capability for GPCs 2,5 (pnl O6)		⑤ Pwrs PL Timing Buffer, VTR, and one string of OBSS power while attached to SRMS
(R13U) 11 • C/W PARAM SEL tw (three) – 000, 040, 050, 090 • C/W PARAM – INH MEM – CLEAR • C/W PARAM SEL tw (three) – > 119			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
	12 If SSPTS: OPCU 2 Voltage Adjust Capability via switch		⑦ Floodlts available via EMER LTG (C3, ML18F)
			⑧ Vlv holds position, but tb and sw lost
			⑨ Caused by loss of FC Purge Htr – GPC sw position TM pwr
			⑩ 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 pwr'd off, but pwr'd up in STBY
			⑪ Inhibits Primary C/W for O2 and H2 Tk 1 and 5 Control Pressure
			⑫ OPCU 2 Voltage Adjust Capability still avail via MCC CMDs
(Continued)	(Continued)	(Continued)	

EPS SSR-80 (Cont) **BUS LOSS: ESS2CA DA2**

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
13	To release crewmember from constant monitoring requirement:		(R1) 3 FC/MN BUS B tb – OFF 3 MN BUS TIE B tb – OFF 3 PL PRI MNB tb – OFF	③ FC/MN BUS B and MN BUS TIE B sws work, but tbs lost
14	• Perform C&W EU CONTINGENCY POWER (IFM)		15 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 16 FC2 COOL PUMP ΔP tb – bp	⑧ Vlv holds position, but tb and sw lost ⑬ 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
BUS ISOLATION			(F9) ESS2CA DC VOLTS – OSL	
ONLY ON MCC CALL, PERFORM			SM 67 ELECTRIC ESS2CA Volts < 20	
(O13:C) cb ESS 2CA		17 C/W Sys B Alarm Tones	(O2) CRYO O2,H2 QTY TK1 meters (two) ind – 0%	
17 • C/W B – op		18 AC2 Bus Snsr		
18 • AC2 SNSR – op				
• MTU B – op				
(O13:D) cb ESS 2CA		Cryo O2,H2 Tk1 Htrs Auto ops Cryo O2,H2 Tk1 Qty Xdcrs		
• 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				
(ML86B:G) cb ESS 2CA				
• CRYO CNTLR O2,H2 TK5 (two) – OP				
• CRYO QTY O2,H2 TK5 (two) – OP		Cryo O2,H2 Tk5 Qty Xdcr		
		Cryo O2 Tk1 Htr Snsr Test/ Reset sw		
		Cryo O2 Tk5 Htr Snsr Test/ Reset sw		
		AUX PL B BUS		
		15 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		
		19 MNB/PRIPL and MNC/PRIPL pwr-off capability via Spacelab Pwr-Kill Signal		
		(OV103,4) TACAN 2 Auto Self-Test		
		20 APU 2 Fu Tk Vlv A		
(O7) • (OV105) GPS 2 PWR – OFF		(OV105) GPS 2		
• (OV105) GPS 2 PRE AMPL UPPER – OFF				
• (OV105) GPS 2 PRE AMPL LOWER – OFF				
(O15:C) • (OV105) cb MNB GPS 2 PRE AMPL UPPER – op				
(O15:D) • (OV105) cb MNB GPS 2 PRE AMPL LOWER – op				

EPS SSR-81 **BUS LOSS: ESS2CA FP&LC2**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE	1 AC2 Inverters Input DC Pwr Cntl	(R1) 1 INV PWR 2 tb – OFF	① Loss of tb and sw. Inverters remain pwr'd
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
NONE			

EPS SSR-82 **BUS LOSS: ESS2CA MPC2**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 • Perform FC2 SHUTDN (FC SHUTDN Cue Card)	1 FC2 Controller and Pumps 2 FC2 Reac Vlv Cntl via pnl R1 sw	MASTER ALARM Light/Tone – on	①
BUS ISOLATION		(F7) 2 C/W FC REAC It C/W FC PUMP It SM ALERT Light/Tone	* TIME *
ONLY ON MCC CALL, PERFORM		(R1) 2 O2 MANF VLV TK2 tb – CL 2 H2 MANF VLV TK2 tb – CL 2 FC2 REAC (two) tb – CL RDY tb – bp	CRITICAL
NONE	3 Cryo O2,H2 Tk2 Manf Vlv Cntl 4 MNB/PRIPL and MNC/PRIPL pwr-off capability via Spacelab Pwr-Kill Signal	5 FC2 COOL PUMP ΔP tb – bp	FC2 must be shut down within 9 min to avoid potentially hazardous condition
		(FSMs) S69 FC PUMP 2 S69 FC REAC 2 S69 FC H2 PUMP 2 S68 H2 MANF VLV S68 O2 MANF VLV	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		EQUIP/FUNCTION LOST		CREW INDICATIONS		NOTES	
1	Perform FC2 SHUTDN (FC SHUTDN Cue Card)	1	FC2 Controller and Pumps	MASTER ALARM Light/Tone – on		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 pwr'd off, but pwr'd up in STBY ⑥ AC2 inverters and buses remain pwr'd. INV PWR 2 and INV/AC BUS 2 switches lost and INV PWR 2 tb lost ⑦ OPCU 2 Voltage Adjust Capability still avail via MCC CMDs
	(R1) PL CAB – MNA	2	MNB pwr to CABPL 1,2,3 Buses	(F7) C/W FC PUMP It			
	When reqd: Perform FUEL CELL PURGE – MANUAL (ORB OPS, <u>EPS</u>)	3	All FC Auto Purge capability	(R1) FC2 RDY tb – bp 4 FC2 COOL PUMP ΔP tb – bp			
5	If GPC 2 or 5 dump reqd, attempt S/W dump in RUN	5	GPC Mode sw Halt Contacts for GPCs 2,5 (Pnl O6)	(FSMs) S69 FC PUMP 2 S69 FUEL CELL			
	(R1) - O2,H2 TK3 HTR A (two) – AUTO - O2,H2 TK3 HTR B (two) – OFF	5	GPC Output sw Terminate capability for GPCs 2,5 (pnl O6)	(F9) ESS2CA DC VOLTS – OSL			
	If OIU reqd: (SSP 1) OIU PWR – OIU 1 ON	2	OIU 2 OIU 1 MNB pwr	SM 67 ELECTRIC ESS2CA Volts 25-32V			
	(AIL) - S-BD PL PWR SYS – 1 - CNTL – PNL – CMD			SM 62 PCMMU 'S62 PDI DECOM FAIL' S 212 OIU OIU 2 TEMP ≥ 140			
BUS ISOLATION							
ONLY ON MCC CALL, PERFORM							
NONE							
			AUX PL B Bus pwr				
		6	AC2 Inverters: Input DC Pwr Cntl Inv/AC Bus Cntl				
			(OV103,4) TACAN 2 Auto Self-Test				
			Cryo O2 Tk1 Htr Snsr Test/Reset sw				
			Cryo O2 Tk5 Htr Snsr Test/Reset sw				
		7	If SSPTS: OPCU 2 Voltage Adjust Capability via switch				

EPS SSR-84 **BUS LOSS: ESS2CA O13&R14**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 (C3) • AUD CTR – 2 (O9) 2 • 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 lgt reqd: (C3) • EMER LTG – ON/OFF 5 To release crewmember from constant monitoring requirement: 7 • Perform C&W EU CONTINGENCY POWER (IFM) 8 (R13U) • C/W PARAM SEL tw (three) – 000, 050 • C/W PARAM – INH MEM – CLEAR • C/W PARAM SEL tw (three) – > 119	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	1 All Comm lost via AUD CTR 1 selected 2 R Audio lost 3 R Glareshield Floodlt lost MASTER ALARM Light/Tone – on (F7) C/W O2 PRESS It – on C/W H2 PRESS It – on 4 C/W PRI C/W It – on C/W BACKUP C/W ALARM It – on Two of four bulbs in MA lts – inoperative (FSMs) S68 H2 CNTL P 1 S68 O2 CNTL P 1 (R1) 6 INV/AC BUS 2 tb – OFF (O2) CRYO O2,H2 QTY TK1 METER (two) – 0%	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 Floodlt 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 It. 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 pwr'd. 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 Inhibits Primary C/W for O2 and H2 Tk 1 Control Pressure ⑨ Disables AC2 Auto Trip. AC2 Voltage and OVLD C/W lost ⑩ Switches and tbs still operate
BUS ISOLATION ONLY ON MCC CALL, PERFORM (O13:C) cb ESS 2CA 4 • C/W B – op 9 • 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	4 C/W Sys B Alarm Tones 9 AC2 Bus Snr Cryo O2,H2 Tk1 Htrs Auto ops Cryo O2,H2 Tk1 Qty Xdcrs 10 ESS pwr to FC/MN BUS B and MN BUS TIE B Pwr Contactor Cntl		
(Continued)	(Continued)		

EPS SSR-85
BUS LOSS: ESS2CA ML86B

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
If Tk5 in use: (R1) • O2,H2 TK3 HTR A – AUTO • O2,H2 TK3 HTR B – OFF (A15) • O2,H2 TK5 HTR A,B (four) – OFF (R13U) 1 • C/W PARAM SEL tw (three) – 040, 090 • C/W PARAM – INH MEM – CLEAR • C/W PARAM SEL tw (three) – > 119	Cryo Tk5 O2,H2 Htrs if in Auto	MASTER ALARM Light/Tone – on (F7) C/W O2 PRESS It C/W H2 PRESS It (FSMs) S68 O2 CNTL P 5 S68 H2 CNTL P 5 (O2) CRYO O2,H2 QTY Tk5 = 0%	① Inhibits Primary C/W for O2 and H2 Tk 5 Control Pressure
BUS ISOLATION (ML86B:G) cb ESS 2CA • CRYO CNTLR O2,H2 TK5 (two) – op • CRYO QTY O2,H2 TK5 (two) – op	Cryo O2,H2 Tk5 Qty Xdcrs		

EPS SSR-90
BUS LOSS: ESS3AB DA3

ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS		NOTES	
1 2 3	Perform FC3 SHUTDN (FC SHUTDN Cue Card)	1 3	FC3 Controller and Pumps Reac Vlv Cntl via pnl R1 sw	MASTER ALARM Light/Tone – on		① TIME * CRITICAL * FC3 must be shut down within 9 min to avoid potentially hazardous condition	
	(R1) - O2,H2 MANF VLV TK1,2 (four) – OP - O2,H2 TK1,2 HTRS A (four) – AUTO - O2,H2 TK1,2 HTRS B (four) – OFF - O2,H2 TK3 HTRS A,B (four) – OFF		Cryo Tk3 O2,H2 Htrs Auto ops Cryo O2,H2 Tk4 Htr Auto ops if O2,H2 Tk3 Htrs A(B) in Auto	(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 SM ALERT lt/Tone – on		② FC/MN BUS C and MN BUS TIE C switches work, but tbs are lost	
7	If GPC 3 dump reqd, attempt S/W dump in RUN	6 7	FC GPC Purge Seq Start sw GPC Mode sw Halt Contacts for GPC 3 (pnl O6)	(R1) 4 FC/MN BUS C tb – OFF 4 MN BUS TIE C tb – OFF 5 INV/AC BUS 3 tb – OFF 4 PL PRI FC3 tb – OFF 4 PL PRI MNC tb – OFF 3 FC3 REAC (two) tb – CL FC3 RDY tb – bp 8 FC3 COOL PUMP ΔP tb – bp		③ Vlv holds position, but tb and sw lost. Redundant Reac Vlv Close Cntl on pnl C3 remains	
9	(R13U) - C/W PARAM SEL tw (three) – 020, 070 - C/W PARAM – INH MEM – CLEAR - C/W PARAM SEL tw (three) – > 119	7	GPC Output sw Terminate capability for GPC 3 (pnl O6)	(A12) 4 FC3 STRUCT RTN tb – OFF		④ Switch works, but tb lost	
BUS ISOLATION				(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		⑤ AC3 inverters and buses remain pwr. INV PWR 3 and INV/AC BUS 3 switches and tbs lost	
ONLY ON MCC CALL, PERFORM				(F9) ESS 3AB DC VOLTS ind – OSL		⑥ GPC Purge Seq Start capability remains using TMBU or SM 60 constant. MCC will normally initiate auto purge via TMBU	
10	(O13:E) cb ESS 3AB - AC3 SNSR – op - GPC STAT – op	10	AC3 Bus Snsr Computer Status Matrix (pnl O1) and CCIU	SM 67 ELECTRIC ESS 3AB Volts < 20		⑦ 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	
11	(C3) EMER LTG – OFF/ON	11	Emer Ltg capability (Middeck Floodlts 6,7,8, L,R Glrshld Floodlts, OS Floodlt)	(O1) GPC status lts lost		⑧ FC3 Coolant Pump ΔP tb lost	
11	(ML18F) EMER LTG – ON/OFF			(O2) CRYO O2,H2 QTY TK3 ind (two) – 0%		⑨ Inhibits Primary C/W for O2 and H2 Tk 3 Control Pressure	
	(ML86B:G) cb ESS 3AB - CRYO CNTLR TK3 (two) – op - CRYO QTY TK3 (two) – op		Cryo O2,H2 Tk3 Htrs Auto ops Cryo O2,H2 Tk3 Qty Xdcrs			⑩ Disables AC3 Auto Trip. AC3 Voltage and OVLD C/W lost	
		5	AC3 Inverters: Input DC Pwr Cntl INV/AC Bus Cntl			⑪ Ltg pwr remains via individual lt sws	
			Cryo O2 Tk3 Htr Snsr Test/Reset sw				
	(O7) (OV105) GPS 3 PWR – OFF (OV105) GPS 3 PRE AMPL UPPER – OFF (OV105) GPS 3 PRE AMPL LOWER – OFF		(OV105) GPS 3				
	(O16:D) cb MNC (OV105) GPS 3 PRE AMPL UPPER – op (OV105) GPS 3 PRE AMPL LOWER – op						

(Continued)

EPS SSR-90 (Cont)
BUS LOSS: ESS3AB DA3

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	12 Lost BFS select and BF engage capability to all GPCs 13 FC3/PRIPL pwr-off capability via Spacelab Pwr-Kill Signal (OV103,4) TACAN 3 Auto Self-Test 2 ESS pwr to FC/MN BUS C and MN BUS TIE C Pwr Contactor Cntl 14 APU 3 Fu Tk Vlv A		② FC/MN BUS C and MN BUS TIE C switches work, but tbs are lost ⑫ Pressing Engage button will cause all PASS GNC GPCs to go to software halt ⑬ MNB/PRIPL and MNC/PRIPL pwr-off capability of SL not affected. FC3/PRIPL sw, pnl R1 not affected ⑭ Vlv closes. Redundant vlv B remains

EPS SSR-91
BUS LOSS: ESS3AB FP&LC3

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE	1 AC3 Inverters Input DC Pwr Cntl 2 Emer Ltg capability (Middeck Floodlts 6,7,8, L,R Glareshield Floodlts, OS Floodlt)	(R1) 1 INV PWR 3 tb – OFF	① Inverters remain pwr'd, but tb and sw lost ② Ltg pwr remains via individual lt switches
BUS ISOLATION ONLY ON MCC CALL, PERFORM (C3) 2 • EMER LTG – OFF/ON (ML18F) 2 • EMER LTG – ON/OFF			

EPS SSR-92
BUS LOSS: ESS3AB MPC3

ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS		NOTES	
1	• Perform FC3 SHUTDN (FC SHUTDN Cue Card)	1	FC3 Controller and Pumps	MASTER ALARM Light/Tone – on		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	
2		2	FC3 Reac Vlv Cntl via pnl R1 sw	2 (F7) C/W FC REAC It – on C/W FC PUMP It – on			
				2 (R1) FC3 REAC (two) tb – CL FC3 RDY tb – bp 4 FC3 COOL PUMP ΔP tb – bp			
		3	FC3/PRIPL pwr-off capability via Spacelab Pwr-Kill Signal	2 (FSMs) S69 FC PUMP 3 S69 FC REAC 3 S69 FC H2 PUMP 3			
BUS ISOLATION							
ONLY ON MCC CALL, PERFORM							
NONE							

EPS SSR-93 **BUS LOSS: ESS3AB FD**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 • Perform FC3 SHUTDN (FC SHUTDN Cue Card)	1 FC3 Controller and Pumps	MASTER ALARM Light/Tone – on	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 It sws ⑥ Pressing the engage button will cause all PASS GNC GPCs to go to software halt ⑦ AC3 Inverters and Buses remain pwr'd. INV PWR 3 and INV/AC BUS 3 switches lost and INV PWR 3 tb lost
3 • If GPC 3 dump reqd, attempt S/W dump in RUN	2 FC GPC Purge Seq Start sw	(F7) C/W FC PUMP It	
	3 GPC Mode sw Halt Contact for GPC 3 (pnl O6)	(R1) FC3 RDY tb – bp	
	3 GPC Output sw Terminate capability for GPC 3 (pnl O6)	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	
	5 Emer Ltg capability (Middeck Floodlts 6,7,8, L,R Glrshld Floodlts OS Floodlt)		
	6 Lost BFS select and BFS engage capability to all GPCs		
	7 AC3 Inverters: Input DC Pwr Cntl INV/AC Bus Cntl		
	Cryo O2 Tk3 Htr Snsr Test/Reset sw		
	(OV103,4) TACAN 3 Auto Self-Test		
BUS ISOLATION ONLY ON MCC CALL, PERFORM (C3) 5 • EMER LTG – OFF/ON (ML18F) 5 • EMER LTG – ON/OFF			

EPS SSR-94

BUS LOSS: ESS3AB O13

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE	1 ESS pwr to FC/MN BUS C and MN BUS TIE C pwr Contractor Cntl	(R1) 2 INV/AC BUS 3 tb – OFF	① Switches and tbs still operate
BUS ISOLATION		(O1) GPC status lts lost	② AC1 Bus remains pwr. INV/AC BUS 3 sw works but tb lost
ONLY ON MCC CALL, PERFORM			③ Disables AC3 Auto Trip. AC3 Voltage and OVLD C/W lost
(O13:E) cb ESS 3AB 2 • AC3 SNSR – op • GPC STAT – op	3 AC3 Bus Snsr Computer Status Matrix (pnl O1) and CICU		

EPS SSR-95

BUS LOSS: ESS3AB ML86B

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(R1) • O2,H2 TK1,2 HTRS A (four) – AUTO • O2,H2 TK1,2 HTRS B (four) – OFF • O2,H2 MANF VLV TK 1,2 (four) – OP • O2,H2 TK3 HTR A,B (four) – OFF	Cryo Tk3 O2,H2 Htrs Auto ops Cryo O2,H2 Tk4 Htr Auto ops if O2,H2 Tk3 Htrs A(B) in Auto	MASTER ALARM Light/Tone – on	① Inhibits Primary C/W for O2 and H2 Tk 3 Control Pressure
(R13U) 1 • C/W PARAM SEL tw (three) – 020, 070 • C/W PARAM – INH MEM – CLEAR • C/W PARAM SEL tw (three) – > 119		(F7) C/W O2 PRESS lt C/W H2 PRESS lt	
BUS ISOLATION		(FSMs) S68 H2 CNTL P 3 S68 O2 CNTL P 3	
ONLY ON MCC CALL, PERFORM		(O2) CRYO O2,H2 QTY TK3 METER (two) ind – 0%	
(ML86B:G) cb ESS 3AB • CRYO CNTLR O2,H2 TK3 (two) – op • CRYO QTY O2,H2 TK3 (two) – op	Cryo O2,H2 Tk3 Qty Xdcrs		

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 (R4) HYD Brake Htrs A (L1A2) 3 Flash Evap Cntrlr Pri B GPC Sel capability Top Evap Duct Fwd,Aft L,R Htrs A Hi Load Duct Outbd,Inbd Noz Htrs A (L2A1) FES H2O Fdln B Htrs 1 (R2) Hyd H2O Blr 1 Cntrlr B (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 (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 8 (R13A2) PLBD: C/L Lat 9-12 Mtr 1 Port,Stbd Fwd Blkh Mtrs 1 Stbd Door Mtr 1 (O14) RCS Manf F1 RJD pwr (F1F, F1L, F1U, F1D)	CRT 1 blanks SM ALERT Light/Tone – on (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 SM 67 ELECTRIC CNTL AB1 Volts < 20 During Rad Dpy/Sto: (R13L) RAD CNTL tbs (four) indicate single mtr ops L ADP deploy time incr from 15 to 30 sec STAR TRKR DR POS -Y OP/CL time incr from 8 to 16 sec (F7) If APUs active and using BLR CNTLR/HTR 1B: C/W APU TEMP It – on after ~2 min CCTV Video TV Annun is lost if MNA selected for VCU 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	① * TIME * * CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp ② Msg occurs only if A AUTO (pnl R12U) selected for FC H2O Relief Htr ③ Pri B Man ON Sel capability remains. Pri A and Sec Cntrlr remain ④ Vlv holds position. Vlv B remains ⑤ Do not reconfig for reg switch or l'CNCT procedures ⑥ Vlv holds position ⑦ Vlv normally closed ⑧ Pwr to MCA Drivers lost through ENABLE sw
(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) (L2) • FLASH EVAP FDLN HTR B SPLY – 2 (R2) • BLR CNTLR/HTR 1 – A 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 (O8) • L OMS XFEED A • R OMS XFEED A • FWD RCS He PRESS A If AB1,2,3 unpwr'd at same time: GNC 23 RCS Override F1 Manf status to CL: • RCS FWD – ITEM 1 EXEC • MANF VLVS 1 OVRD – ITEM 40 EXEC (Continued)	(Continued)		

EPS SSR-100 (Cont) **BUS LOSS: CNTLAB1**

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
10	(C2) • L IDP/CRT SEL – 3 On MCC GO: • GPC/CRT 01 EXEC	(C2A2) MDU CRT 1 9 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 Cntrl, Auto switchover to Sec Cntrl 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
	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	(R11U) 11 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)	(R11U) 7 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	(F6A7) 12 L Trim RHC INH capability 12 Pnl ON capability (L2A1) 12 L Bdy Flp UP/DN capability		
	(A14) RCS/OMS HTR • FWD RCS – B AUTO • L POD (two) – A OFF, B AUTO	(A14) 13 Fwd RCS A Htrs (all) 13 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	(L1A2) 14 NH3 Sys A Sec Cntrl man ON capability		
	15 If AB1,2,3 unpwr'd at same time: (AIL) • NSP ENCRYPTION MODE – SEL • NSP ENCRYPTION SEL – BYP	If AB1,2,3 unpwr'd at same time: (A1A2) COMSEC 1,2 Key		
No SM GPC and LOS: (C3) • UPLK – NSP BLK				
(Continued)		(Continued)		

EPS SSR-100 (Cont) **BUS LOSS: CNTLAB1**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
If CCTV reqd: (A7U) • TV PWR CONTR UNIT – MNB			⑥ Vlv holds position ⑩ Loss of manual capability to inert LH2 Manf ⑪ Auto Cntl of these Htrs also lost if single Htr Ops and tank not paired ⑫ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ⑬ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists ⑭ Single mtr time ⑮ Vlv holds position. FC1 Redundant Reac Vlv Close Cntl on pnl C3 remains ⑯ Vlv holds position. Sys 2 remains ⑰ Cntls 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 (R14D) • cb MNA TV CONTR UNIT – op (A7U) PL BAY • FLOOD AFT STBD – OFF • FLOOD FWD PORT – OFF • FLOOD FWD BHD – OFF	(R4) 16 Prplt F/D Inbd LH2 Vlv Man OP capability (A7A1) Video Cntl Unit MNA pwr (A7A1) PLB Floodlts: Aft Stbd Fwd Port Blkhd (R1A2) 17 Man ON Cntl of Cryo O2,H2 Tk1 Htrs B, Tk3 Htrs A 6 Cryo O2,H2 Tk1 Manf Vlv Cntl (A8L) Port RMS: 18 Fwd MRL Mtr 1 18 Mid MRL Mtr 1 18 Aft MRL Mtr 2 STBD RMS: 19 Fwd MRL Mtr 2 19 Mid MRL Mtr 1 19 Aft MRL Mtr 1 ROEU 20 AC1 PBM MMC 1 pwr to: Orbiter arm drive mtr (ODM mtr 1 – mate A, demate A, relax A) 20 ODA mtr 1 latch/release (R1A2) 21 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 (L2A1) 22 Atm Press Cntl O2 Sys 1 Sply Vlv Cntl (L1A2) 23 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) 24 RJDF 1B F1 Manf Logic sw pwr (F1F,F1L,F1U,F1D) (F6A1) L ADI Att Ref Set capability (R13A2) 26 Rad Cntl Sys: Port Lat 7-12 Mtr 1 Dpy/Sto Mtr 1 Stbd Lat 1-6 Mtr 1 Dpy/Sto Mtr 2 (R2) 27 APU 1 Fu Tk Vlv A 28 Cntlr Pwr Sply A APU 1 GBX GN2 Repress Vlv 29 Hyd Main Pump 1 Depress Solenoid RPC A 29 Hyd Main Pump 3 Depress Solenoid RPC B (R4) 6 TVC Hyd Sys 1 Isol man Cntl 30 Hyd Brake Isol 1 man Cntl (F6A6,F8A5) NLG Backup Rel and Extension Sys 2 31 LMG, RMG Backup Rel Sys 2 32 LG Extend Vlv 2 32 NWS Hyd Sys 2 (FPC1/AW18H) 33 EMU 1,2 Pwr/Batt chgr MNA pwr (O6) -Y Star Trkr Dr Sys 1 OP/CL capability (C3A5) 34 L ADP Dpy Mtr 1 35 Htr Cntlr 1 (A6A1) PL Reten Sys A Rel/Lat Mtrs (R2) 26 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) 36 L OMS Arm 1, Arm/Press 1 sw Contacts 37 L OMS Eng Pr Vlv Coil 1, Cntl Vlv 1,2 Coils 1	(F3) 25 NWS fail lt (for actuator pressure sw)	6 Vlv holds position 24 WARNING Driver pwr to F1 jets lost if RJDF 1B Driver sw OFF (O14:F) 25 NWS fail light still driven by miscompare logic feedback on rollout 26 Redundant mtrs remain 27 Vlv closes. Redundant vlv remains 28 Redundant pwr sply remains. GG Bed T and GBX P ind lost when APU running 29 Redundant RPC remains 30 Vlv holds position. GPC OP capability remains during entry 31 Loss of redundant hyd NLG deploy and NWS redundancy 32 Hyd Sys 1 still available for NWS 33 MNB pwr select capability remains 34 Mtr 2 remains 35 Htr Cntlr 2 remains 36 L OMS auto shutdown if Pc < 80% and '↓' on MNVR EXEC display CAUTION No purge. Wait 10 min between burns 37 Redundant coils remain

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	(F7) 1 C/W RCS JET It – 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 It – 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 It – 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 Cntrs 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 Cntrlr 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 Bikhnd Mtr 1		
	9 (R4) LG Extend Isol Vlv man Cntl		
(Continued)	(Continued)		

EPS SSR-101 (Cont) **BUS LOSS: CNTLAB2**

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
10	(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) Manf status <u>not</u> automatically declared closed. Jet fail-offs may occur (11) Selecting failed MMU for GNC MF protects against GPC MMU Rcvr failure after OPS XTION prepositioning
	(R2) • BLR CNTLR/HTR 1 – A	(R2) Hyd H2O Blr 1 Cntlr B		(12) RM sw downmodes to 2-level for -X position (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
	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)		(14) Vlv normally closed (15) B Htrs remain
	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		
	11 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	15 Fwd RCS A Htrs (all) L Pod A Htrs (partial)		
	If SENSE – -Z: (A6U) • SENSE – -X • Wait at least 1 sec, then reposition as desired	(A6A1) 12 3-level sw RM for -X Sense		
	If AB1,2,3 unpwr'd at same time: (A1L) • NSP ENCRYPTION MODE – SEL • NSP ENCRYPTION SEL – BYP	If AB1,2,3 unpwr'd at same time: (A1A2) COMSEC 1,2 Key		
(Continued)		(Continued)		

EPS SSR-101 (Cont)
BUS LOSS: CNTLAB2

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EPS SSR-101 (Cont)
BUS LOSS: CNTLAB2

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(R2) 22 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 (C3A1) 26 L OMS ARM 2, ARM/PRESS 2 sw Contacts 27 L OMS Eng Pr Vlv Coil 2, Cntl Vlv 1,2 Coils 2 (R2) 28 APU 2 Fu TK Vlv B 29 Hyd Main Pump 1 Depress Solenoid RPC A 29 Hyd Main Pump 3 Depress Solenoid RPC B		22 Redundant mtrs remain 26 L OMS auto shutdown if Pc < 80% and '↓' on MNVR EXEC display CAUTION No purge. Wait 10 min between burns 27 Redundant coils remain 28 Vlv closes. Redundant vlv remains 29 Redundant RPC remains

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 (R2) • BLR CNTLR/HTR 1,3 (two) – B (A14) RCS/OMS HTR • OMS CRSFD LINES – A OFF, B AUTO (L1) • H2O PUMP LOOP 1 – B • TOP EVAP HTR DUCT – B If Hi Load Evap enabled: • HI LOAD DUCT HTR – B(C) Refer to OMS/RCS Slide Rule for vlv loss info (MA73C:C,D) 4 • cb MCA PWR AC1 3Φ MID 1,3 (two) – op For PLBD ops: • OP/CL Drs in man mode Do not perform if AB1,2,3 unpwr'd 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 (Continued)	(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 (R2) Hyd H2O BLR 1,3 Cntlr A (A14) OMS Crsfd Ln Htrs A (L1A2) H2O Loop 1 Pump A Top Evap Duct Fwd,Aft Htrs A Hi Load Duct Outbd,Inbd Noz Htrs A 5 (O7) Aft R RCS He Press Isol A man Cntl, GPC CL capability 4 (MA73C) Port,Stbd Rad Lat 1-6,7-12 Mtrs 1 Limit sw (MA73C) PLBD: C/L Lat 1-4,5-8,9-12 Mtrs 1 Port,Stbd Fwd Bikh'd Mtrs 1 Port Aft Bikh'd Mtr 1 Stbd Door Mtr 1 Port Door Mtr 2 CL Limit sw (F6) CDR BFS no eng capability GPC 1,2,4 no eng capability COMSEC 1 & 2 Pwr Redundancy (Continued)	SM ALERT Light/Tone – on 'S67 CNTL/ESS V' 'S88 THERMAL FRN' (2) (FSM) RM DLMA MANF (L1) 2 FLOW PROP VLV LOOP 1 tb – bp (O8) 3 FWD RCS TK ISOL 3/4/5 tb – bp 3 MANF ISOL 1 tb – bp (R13L) 4 RAD CNTL STBD tb – bp PORT tb – bp SM 67 ELECTRIC CNTL AB3 Volts < 20 LADP deploy time incr from 15 to 30 sec (F7) If APUs active and using H2O BLR CNTLR/HTR 1A or 3A: C/W APU TEMP It – on after ~2 min 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 (Continued)	① * TIME * * CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp ② Freon Loop 1 Flow Prop Vlv operation not affected ③ Vlv holds position 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 pwr'd by AC1 MMC1 and AC1 MMC3 are lost because MNA MMC1 and MNA MMC3 lost ⑤ Vlv holds position. GPC OP capability remains. Isol B remains. Auto Overpress protection lost on R RCS A reg

EPS SSR-102 (Cont) **BUS LOSS: CNTLAB3**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
6 AB1,2,3 unprwd at same time: (A1L) NSP ENCRYPTION MODE – SEL NSP ENCRYPTION SEL – BYP ----- No SM GPC or LOS: (C3) UPLK – NSP BLK	If AB 1,2,3 unprwd at same time: (A1A2) COMSEC 1,2 Key	STAR TRKR DR POS -Y OP/CL time incr from 8 to 16 sec (L1) If H2O PUMP LOOP1,A ON: C/W H2O LOOP It – 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	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
BUS ISOLATION			
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	(A8L) PORT RMS: DPY/STO tb – bp RETEN LAT tb – bp R-F-L MID tb – bp	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
NONE	(R4) 7 LG Extend Isol Vlv 7 LG Extend Vlv 1 8 NWS Hyd Sys 1	STARBOARD RMS: DPY/STO tb – bp RETEN LAT tb – bp R-F-L AFT tb – bp	⑧ Hyd Sys 2 still available for NWS ⑨ Mtr 2 remains ⑩ Htr Cntrl 2 remains
	(MA73C) LH Vents 5,6,8,9 Mtrs 1 RH Vents 1,2,3,5,6 Mtrs 1	SM 94 PDRS CONTROL PORT RMS Indications lost: Mid MRL Mtr 1 LAT/REL/RDY Aft MRL Mtr 2 LAT/REL/RDY	⑪ Vlv closes. Redundant vlv remains ⑫ Redundant pwr sply remains. Turbine speed ind lost
	(MA73C) 9 L ADP Deploy Mtr 1 Disc 1 10 Htr Cntrl 1	STBD RMS Indications lost: Fwd MRL Mtr 2 LAT/REL/RDY Aft MRL Mtr 1 LAT/REL/RDY	⑬ Use pb on Aft pnl A6 ⑭ Loss of manual capability to inert LH2 Manf
	(R2) 11 APU 3 Fu Tk Vlv B 12 Cntrl Pwr Sply B		⑮ Redundant mtrs remain
	(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		
	(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
	Port RMS: 16 Mid MRL Mtr 1 16 Aft MRL Mtr 2		①⑦ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists
	STBD RMS: 17 Fwd MRL Mtr 2 17 Aft MRL Mtr 1		

EPS SSR-103 **BUS LOSS: CNTLBC1**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A12) APU HTR 1 • GAS GEN/FUEL PUMP 1 – A AUTO 1 • GAS GEN/FUEL PUMP 2 – B AUTO • LUBE OIL LINE 2 – B AUTO APU HTR TK/FU LINE/H2O/ 1 • SYS 1A – AUTO 1 • 1B – OFF 1 • 2A – OFF 1 • 2B – AUTO HYD HTR • BDY FLP A – AUTO • B – OFF • CIRC PUMP PWR 1 – MNA • CIRC PUMP PWR 2 – MNC	(A12) APU 1 GG/Fu Pump Htrs B APU 2 GG/Fu Pump Htrs A APU 2 Lube Oil Line Htrs A APU 1 Tk/Fu Ln Htr B APU 1,2 GG Inj H2O Htrs 4B,5B APU 2 Tk/Fu Line Htr A Body Flap Htr B MNB Circ Pump 1 pwr MNB Circ Pump 2 pwr	MASTER ALARM Light/Tone – on (F7) SM ALERT Light/Tone – on SM 67 ELECTRIC CNTL BC1 Volts < 20 2 C/W RCS JET It – 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 (L1) 4 RAD BYP VLV 2 tb – bp If Site AOS and using S-BD Ant Elec 1: 5 'ANTENNA' If NSP 1 selected: 'BCE STRG 1 NSP' During Rad Dpy/Sto: (R13L) RAD CNTL STBD tb indicates single mtr ops RAD LAT CNTL tbs (two) indicate single mtr ops L,R ADP deploy time incr from 15 to 30 sec 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 pwrdr: '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 It – on after ~2 min SM (BFS,SM) 86 APU/HYD APU 1 SPEED % Ind – 0 CCTV Video and Annun is lost if MNB selected for VCU PLB FloodIts 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	① * TIME * * CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp ② Indications do <u>not</u> appear until jet commanded ③ Msg occurs only if B AUTO (pnl R12U) selected for FC H2O Relief Htr ④ Vlv still functional ⑤ FSM caused by antenna miscompare ⑥ REACQ and PSP reconfig procedures are flight specific. If reqd, procedures can be found in payload or ISS specific books ⑦ OIU 2 interfaces with PSP 2 for commanding ⑧ Pwr to MCA Drivers lost through ENABLE sw
(A1L) S-BD PM • 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: • S-BD PL PWR SYS – 2 • CNTL – PNL • – CMD 6 • Reconfig PSP 6 • Perform PL INTRG REACQ (if reqd)	(A1A2) S-BD PM Sys 1: Xpndr 1 Pre-Amp 1 Pwr Amp 1 PM Ant Sw 1 FM Ant Sw 1 NSP 1/COMSEC 1 S-BD PL INTRG 1 PSP 1	(A1A3) S-BD FM Sys 1	
(A1R) S-BD FM PWR – 2 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 • TOP EVAP HTR DUCT – A If Hi Load Evap enabled: • HI LOAD DUCT HTR – A (C)	(L1A2) Top Evap L Noz Htr A Top Evap Duct Fwd,Aft Htrs B Hi Load Duct Outbd,Inbd Noz Htrs B		
(R2) • BLR CNTLR/HTR 2 – A	(R2) Hyd H2O Blr 2 Cntr B		
	(R13A2) 8 PLBD: C/L Lat 13-16 Mtr 2 Stbd Aft Blkhd Mtr 2 Port Drive Mtr 2		
(Continued)	(Continued)		

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
Refer to OMS/RCS Slide Rule for vlv loss info Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT R RCS He PRESS B	(O8) 10 F,R,RCS He Press Isol B man CL capability		⑩ Vlv holds position. Man OP and full GPC cntl remains ⑪ Do not reconfig for reg switch or l'CNCT procedures
11 ----- (O8) • L OMS XFEED B • R OMS XFEED B • FWD RCS He PRESS B	(O8) 10 L OMS Tk Isol B man CL capability 10 L,R OMS Xfeed Vlv B man CL capability		⑫ Manf status <u>not</u> automatically declared closed. Fail-offs will occur when jet commanded
If BC1,2,3 unpwr'd at same time: <u>GNC 23 RCS</u> Override F2 Manf status to CL: • RCS FWD – ITEM 1 EXEC • MANF VLVS 2 OVRD – ITEM 41 EXEC			⑬ NOZ Htr A not wired ⑭ Vlv normally closed. GPC cntl remains. Man override of GPC OP CMD is lost
For attitude control, perform <u>RCS, LOSS OF VERNIERS</u> (ORB OPS)	(O16) 12 RCS Manf F5,L5,R5 RJD pwr (F5L,F5R,L5L,L5D,R5R,R5D)		
<u>GNC 23 RCS</u> • 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)		
13 (R11U) FC H2O • LINE HTR – A AUTO • RELIEF HTR – A AUTO	(R11U) FC H2O Line Htrs B Relief Htrs B Vent Line Htrs B Barrel Htrs B Rlf Noz Htrs B		
When reqd: • For FC2, perform FUEL CELL PURGE – AUTO (ORB OPS, <u>EPS</u>)	(R11U) 14 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	(O8) 14 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)		

EPS SSR-103 (Cont) **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 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 For SSME Hyd Repress: (R4) • HYD MPS/TVC ISOL VLV SYS 1,3 (two) – OP • Wait 10 sec, then CL	(FPC2/AW18H) EMU 1,2 Pwr/Batt Chgr MNB pwr (F6A7) 15 L Trim RHC – INH capability 15 Pnl – ON capability (L2A1) 15 L Bdy Flp Cntl (R4) 16 MPS/TVC Hyd Sys 2 Isol man Cntl		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 Cntls A, B Rad Byp Vlv Mtrs Auto Cntl and Cntlr B Rad Byp Vlv Mtr Man Cntl remain
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 (O15:A) • RGA 2 – OFF (R14:D) cb MNB • TV CONTR UNIT – op (A13) • (OV103,4) GPS PWR – OFF • (OV103,4) GPS PRE AMPL UPPER – OFF • (OV103,4) GPS PRE AMPL LOWER – OFF (A7U) PL BAY FLOOD • MID PORT – OFF • FWD STBD – OFF	(R4) 17 Prplt F/D Inbd LO2 Vlv man OP capability 17 Prplt F/D Outbd LH2 Vlv man Cntl (O15) RGA 2 (OV103,4) GPS 2 (A7A1) PLB Mid Port Floodlt Fwd Stbd Floodlt (R1A2) 18 Cryo O2,H2 Tk2,4 Htrs A man On Cntl 16 Cryo O2,H2 Tk2 Manf Vlv Cntl (R2) R MPS He isol B man Cntl (A15) Cryo O2,H2 Tk5 Htr B man On Cntl (R1A2) 19 FC2 Reac Vlv Cntl via pnl R1 sw 20 FC2 Stop capability via START/STOP sw (pnl R1) (C3) FC1 Redundant Reac Vlv Cntl (L1A2) 21 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 (F8) R HUD Rt ADI Aft Ref Set capability (C3A5) L,R ADP Dpy Mtrs 2 Probe Htr Cntlr 2 (A8L) Port RMS: 23 MPM Mtr 2 24 Fwd MRL Mtr 1 24 Mid MRL Mtr 2 STBD RMS: 23 MPM Mtr 1 25 Mid MRL Mtr 1 25 Aft MRL Mtr 2 ROEU AC2 pwr to: 24 Orbiter arm drive mtr (ODM mtr 2 – mate B, demate B, relax B) 24 ODA mtr 2 latch/ release (O6) -Y Star Trkr Dr Sys 2 CL capability -Z Star Trkr Dr Sys 1 OP/CL capability (O15) 26 RJDF 1A F2 Manf Logic pwr (F2F,F2R,F2U,F2D) (R2) 27 APU 1 Cntlr Pwr Sply B 28 Hyd Main Pump 2 Depress Solenoid RPC A 28 Hyd Main Pump 1 Depress Solenoid RPC B 29 APU 1 Fu Tk Vlv B (F6A5,F8A5) NLG Ext 2 Fire 1, Fire 2 NLG,LMG,RMG Bkup Rel 2 Fire 1 30 LG Extend Vlv 2 31 NWS Hyd Sys 2 (R4) 32 Hyd Brake Isol 2 Man Cntl (R13A2) Rad Cntl sys: Stbd Rad Lat 1-6 Mtr 2 Dpy/Sto Mtr 1 Port Rad Lat 1-6 Mtr 2 (R13A2) PL Reten Sys B Rad/Lat Mtrs 33 Ku Ant Sto/Dpy Mtr 2 Direct Stow Mtr 2 34 Redundant Stow Initiate Signal to Ku-Band (F2,F3) 35 CDR Dpy Fire 2 35 Jett Fire 2		②② Vlv holds position. Sys 1 remains ②③ Single mtr time. One failure away from EVA to stow MPM or from RMS/OBSS jettison ②④ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ②⑤ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists ②⑥ WARNING Driver pwr to F2 jets lost if RJDF 1A Driver sw OFF (pnl O15:F) ②⑦ Redundant pwr sply remains. Turbine speed ind lost ②⑧ Redundant RPC remains ②⑨ Vlv closes. Redundant vlv A remains ③⑩ Loss of redundant hyd NLG deploy and NWS redundancy ③⑪ Hyd Sys 1 still available for NWS ③⑫ Vlv holds position. GPC cntl remains. Loss of redundant hyd NLG deploy and NWS redundancy if failed closed ③⑬ Mtr 1 remains ③⑭ Redundant stow initiate sig (CNTL CA1) to Ku-Band remains ③⑮ Plt Dpy/Jett remains

EPS SSR-104 **BUS LOSS: CNTLBC2**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A1L) S-BD PM 1 • ANT SW ELEC – 1 1 • XPNDR – 1 • PWR AMP OPER – 1 • STBY – 1 • PRE AMP – 1 NSP 1 • PWR – 1 If PSP and/or INTRG reqd for PL or ISS ops: • S-BD PL PWR SYS – 1 • CNTL – PNL • – CMD 3 • Reconfig PSP 3 • Perform PL INTRG REACQ (if reqd) (A1R) • S-BD FM PWR – 1 If no comm: (C3) • S-BD PM CNTL – PNL • – CMD 5 If OIU reqd: (SSP) • OIU PWR – OIU 1 ON • OIU tb – UP • √MCC, OIU reconfig (A12) 6 APU HTR • GAS GEN/FUEL PUMP 2 – B AUTO 6 APU HTR TK/FU LINE/H2O/ 6 SYS 1A – AUTO 6 • 1B – OFF 6 • 2A – OFF 6 • 2B – AUTO HYD HTR • ELEV A – AUTO • B – OFF • CIRC PUMP PWR 2 – MNC (L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) – cl (L1) • H2O PUMP LOOP 1 – A If using Sec Cntrl: • FLASH EVAP CNTLR SEC – ON • TOP EVAP HTR DUCT – A If Hi Load Evap enabled: • HI LOAD DUCT HTR – A(C) (L2) • FLASH EVAP FDLN HTR A SPLY – 1	(A1A2) S-BD PM Sys 2: Xpndr 2 Pre Amp 2, Pwr Amp 2 PM and FM Ant sw 2 NSP 2/COM SEC 2 S-BD PL Intrg 2 PSP 2 (A1A3) S-BD FM Sys 2 (A12) APU 2 GG/Fu Pump Htrs A 1 Tk/Fu Line Htrs B APU GG Inj H2O Tank Htrs B APU 2 Tk/Fu Line Htrs A Elevon Actr Htrs B (R2) Circ Pump 2 MNB pwr (L1A2) H2O Loop 1 Pump B man ON capability 7 FES Sec Cntrl GPC Sel capability Top Evap Duct Fwd,Aft Htrs B Hi Load Duct Outbd,Inbd Noz Htrs B (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	All S-BD A/G voice lost if sys 2 selected CRT 2 blanks (F7) 2 RCS JET C/W It – on SM ALERT Light/Tone – on (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 2 F,L,R RCS(F,R,L,U,D) JET I/O ERROR CRT2 SM 67 ELECTRIC CNTL BC2 Volts < 20 4 If site AOS and using S-BD Ant Elec 2: ‘ANTENNA’ (2) (L1) If H2O PUMP LOOP 1,B active: C/W H2O LOOP It ‘S88 H2O PUMP P1’ ‘S88 H2O LOOP 1 FLOW’ ‘S88 H2O LOOP 1 TEMP’ (O1) H2O PUMP OUT PRESS LOOP 1 – 20-25 psia During Rad Dpy/Sto: (R13L) RAD LAT CNTL tbs (two) indicate single mtr ops RAD CNTL STBD tb indicates single mtr ops STAR TRKR DR POS -Y OP/CL time incr from 8 to 16 sec STAR TRKR DR POS -Z CL time incr from 8 to 16 sec (F7) If APUs active and using H2O BLR CNTLR/HTR 2B: C/W APU TEMP It – on after ~2 min If sys pwrd: ‘S62 BCE BYP PSP 2’ Loss of PL TLM and CMD If PDI FDA enabled: ‘S62 PDI DECOM FAIL’ SM (BFS SM 63) PL BAY DOORS During PLBD OP/CL, single mtr run time noted on actuators listed at left	① If S-BD PM Sys 2 being used at time of bus failure, A/G comm capabilities lost until Sys 1 selected ② Indications do not appear until jets commanded ③ REACQ and PSP reconfig procedures are flight specific. If reqd, procedures can be found in payload or ISS specific books ④ Indication appears only during site AOS for antenna miscompares ⑤ OIU 1 interfaces with PSP 1 for commanding ⑥ * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp ⑦ Sec Cntrl Man ON Sel capability remains. Pri A,B Cntrls remain ⑧ Single mtr time ⑨ Pwr to MCA Drivers lost through ENABLE sw
(Continued)	(Continued)		

EPS SSR-104 (Cont) **BUS LOSS: CNTLBC2**

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
11	Refer to OMS/RCS Slide Rule for vlv loss info	(O8)		⑩ Vlv holds position. GPC OP capability remains. Isol A remains ⑪ Do not reconfig for reg switch or I'CNCT procedures ⑫ Vlv holds position. Man OP and full GPC Cntl remains ⑬ Vlv holds position ⑭ Refer to <u>EPS</u> 7.6 CRYO TABLE A for switch nomenclature 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) ⑯ Manf status <u>not</u> automatically declared closed. Jet fail-offs may occur 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
	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 12 L OMS Tk Isol B man CL capability 12 L,R OMS Xfeed Vlv B man CL capability		
14	(R1) If Tk2 in use: O2,H2 TK2 • HTR A (two) – OFF • B (two) – AUTO	(R1A2) 13 Cryo O2,H2 Tk2 Manf Vlv Cntl Cryo O2,H2 Tk2 Htrs A		
	(A11) If Tk4 in use: O2,H2 TK4 • HTR A (two) – OFF • B (two) – AUTO	(A11) Cryo O2,H2 Tk4 Htrs A		
14				
	(R2) • BLR CNTLR/HTR 2 – A			
	(C2) • R IDP/CRT SEL – 3 On MCC GO: • GPC/CRT O2 EXEC			
16	GNC 23 RCS Override F2 Manf status to CL: • ITEM 1,41 EXEC • For attitude control, perform LOSS OF VERNIERS (ORB OPS, <u>RCS</u>)	(R2) Hyd H2O Blr 2 Cntlr B (C2A2) MDU CRT 2 15 IDP 2 (C3) FC1 Redundant Reac Vlv Close Cntl		
	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) (C3A5) 17 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

[illegible]

EPS SSR-104 (Cont)
BUS LOSS: CNTLBC2

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(O16) 25 ASA 4 Isol Driver pwr		(13) Vlv holds position
	(L2A1) 13 Atm Press Cntl O2 Sys 2 Sply Vlv Cntl		(25) Six vlvs fail to non-isolation position
	(R1A2) 26 FC2 Reac Vlv Cntl via pnl R1 sw		(26) Vlv holds position. FC2 Redundant Reac Vlv Close Cntl on pnl C3 remains
	27 FC2 STOP capability via START/STOP sw (pnl R1)		(27) Able to stop FC2 via FC2 CNTLR sw (pnl O15:A)
	(R2) C MPS He Isol B man Cntl		(28) Use Fwd pnl C3 pbs
	(A6A1) R ADI Att Ref set capability		(29) Redundant mtrs remain
	28 Aft Pnl Trans X,Y Norm and Pulse Sel capability		(30) Htr Cntlrs 1 remain
	28 Aft Pnl Trans Z High,Norm, and Pulse Sel capability		(31) Sys 1 remains
	28 Aft Pnl Trans Low Z Sel capability		(32) Hyd Sys 1 still available for NWS
	28 Aft Pnl Rot Roll,Pitch,Yaw Disc Rate, and Pulse Sel capability		(33) Loss of redundant hyd NLG deploy and NWS redundancy
	28 Aft Pnl PRI,ALT,VERN Sel capability		(34) Mtr 1 remains
	28 Aft Pnl PCT Exec capability		(35) Redundant pwr sply remains. GG Bed T and GBX P ind lost when APU running
	(R13A2) 29 Rad Cntl Sys: Port,Stbd Lat 1-6 Mtr 2 Stbd Dpy/Sto Mtr 1		(36) Redundant RPC remains
	(C3A5) 29 L,R ADP Dpy Mtrs 2 30 Htr Cntlrs 2		(37) Single mtr time. One failure away from EVA to stow MPM or from RMS/OBSS jettison
	(O6) 29 -Y Star Trkr Dr Sys 2 OP/CL capability		(38) Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists
	29 -Z Star Trkr Dr Sys 1 CL capability		(39) Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists
	(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 Cntr 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		
	(A8L) Port RMS: 37 MPM Mtr 2 38 Fwd MRL Mtr 1 38 Mid MRL Mtr 2		
	STBD RMS: 37 MPM Mtr 1 39 Mid MRL Mtr 1 39 Aft MRL Mtr 2		
	(Continued)		

EPS SSR-104 (Cont)
BUS LOSS: CNTLBC2

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
		(O17) Freon Loop 1 Cold Plate Flow Xdcr Aft PL MNB current Xdcr		④0 Vlv closes. Redundant Vlv A remains
	40	(R2) APU 2 Fu Tk Vlv B		④1 PLT Dpy/Jett remains
	41	(F2,F3) CDR Dpy Fire 1		
	41	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 1 • GAS GEN/FUEL PUMP 2 – A AUTO 1 • LUBE OIL LINE 2 – A AUTO APU HTR TK/FU LINE/H2O 1 • SYS 1A – AUTO 1 • 1B – OFF 1 • 2A – OFF 1 • 2B – AUTO HYD HTR • RUD SPD BK A – AUTO • B – OFF HYD • CIRC PUMP PWR 2 – MNB	(A12) APU 2 GG/Fu Pump Htr B 2 Lube Oil Line Htrs B 1 Tk/Fu Line Htr B APU 2 Tk/Fu Line Htr A Rud/Spd Bk Htr B Circ Pump 2 MNC pwr	SM ALERT Light/Tone – on S67 CNTL/ESS V SM 67 ELECTRIC CNTL BC3 Volts < 20 (FSM) RM DLMA MANF (O8) 2 FWD RCS MANF ISOL 2 tb – bp If H2O PUMP LOOP 1,B – ON: C/W H2O LOOP It – on 'S88 H2O PUMP P 1' 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP' (O1) H2O PUMP OUT PRESS LOOP 1 meter ind – 20-25 psia (F7) If APUs active and using H2O BLR CNTLR/HTR 1A or 2A: C/W APU TEMP It on after ~2 min During Rad Dpy ops: (R13L) RAD CNTLR tbs (two) indicate single mtr ops L,R ADP deploy time incr from 15 to 30 sec STAR TRKR DR POS (two) OP/CL time incr from 8 to 16 sec 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: DPY/STO tb – bp RETEN LAT tb – bp R-F-L FWD tb – bp STARBOARD RMS: RETEN LAT tb – bp R-F-L FWD tb – bp R-F-L MID tb – bp SM 94 PDRS CONTROL PORT RMS Indications lost: MPM Mtr 2 STO/DPY Fwd MRL Mtr 1 LAT/REL/RDY Mid MRL Mtr 2 LAT/REL/RDY STBD RMS Indications lost: MPM Mtr 1 STO/DPY Fwd MRL Mtr 1 LAT/REL/RDY Mid MRL Mtr 1 LAT/REL/RDY Aft MRL Mtr 2 LAT/REL/RDY	① * TIME * * CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp ② Vlv holds position ③ In OPS 2, FES GPC cmd is not present, but one may be sent if reqd ④ Sec Cntrl On sel capability remains. Pri A,B Cntrls remain 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 pwr'd by AC2 MMC2 and AC2 MMC4 lost because of MNB MMC2 and MNB MMC4 loss ⑥ Sys A Sec Cntrl man On capability remains
(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 3 • FLASH EVAP CNTLR SEC – GPC (if using Sec Cntrl) • TOP EVAP HTR NOZ R – B AUTO • TOP EVAP HTR DUCT – A(C) If HI LOAD EVAP enabled: • HI LOAD DUCT HTR – A(C)	(L1A2) H2O Loop 1 Pump B 4 FES Sec Cntrl man On Sel capability Top Evap R Noz Htr A Top Evap Duct Fwd,Aft L,R Htrs B Hi Load Duct Outbd,Inbd Htrs B		
(R2) • BLR CNTLR/HTR 1,2 (two) – B	(R2) Hyd H2O Blr 1,2 Cntrl A		
Refer to OMS/RCS Slide Rule for vlv loss info Do not perform if BC1,2,3 unpwr'd at same time: GNC 23 RCS Override F2 Manf status to OP: • RCS FWD – ITEM 1 EXEC • MANF VLVS 2 OVRD – ITEM 41 EXEC			
(MA73C:C,D) 5 • cb MCA PWR AC2 3φ MID 2,4 (two) – op	(MA73C) 5 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		
If reqd during entry (< 120K ft): (L1) • NH3 CNTLR B – PRI/GPC	(L1A2) 6 NH3 Sys A Pri Cntrl and Auto Swover to Sec Cntrl		
(Continued)	(Continued)		

EPS SSR-105 (Cont) **BUS LOSS: CNTLBC3**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	Port RMS: 7 MPM Mtr 2 8 Fwd MRL Mtr 1 8 Mid MRL Mtr 2 STBD RMS: 7 MPM Mtr 1 9 Fwd MRL Mtr 1 9 Mid MRL Mtr 1 9 Aft MRL Mtr 2		⑦ Single mtr time. One failure away from EVA to stow MPM or from RMS/OBSS jettison ⑧ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ⑨ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists ⑩
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) (A15) If Tk 5 in use: • O2,H2 Tk5 Htr A (two) – AUTO • O2,H2 Tk5 Htr B (two) – OFF	Cryo O2, H2 Tk5 Htr B		WARNING Driver pwr to F4/F5 Jets lost only if both RJDF 2B and L5/F5/R5 Driver sws (pnl O16:F) OFF simultaneously
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(L1) • SMOKE DETN CKT TEST – OFF	(L1A1) Smoke Detn Test capability (all dets) (O16) 10 RJDF 2B F4/F5 Manf Logic pwr (F4R,F4D,F5L,F5R) (O17) 11 TVC 3 Isol ME 11 4 Isol ME (R1A2) 12 Man ON Cntl of Cryo O2,H2 Tk 2,4 Htrs B (MA73C) L Vents 1,2,3,5,8,9 Mtrs 2 R Vents 1,2,6,8,9 Mtrs 2 (C3A6) 13 Fwd Pnl Trans X,Y Norm, Pulse, Fwd Pnl Rot Roll, Pitch,Yaw Disc Rate, Pulse Sel capability 13 Fwd Pnl Trans Low Z Sel capability 13 Fwd Pnl Trans Z High, Norm, Pulse Sel capability 13 Fwd Pnl PRI,ALT,VERN Sel capability 13 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 (MA73C) 14 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 Cntl 2 Deploy Mtrs 2 Deploy Disc 2		⑪ Six vlvs fail to non-isolation position ⑫ Auto Cntl of these Htrs also lost if single Htr Ops and tank not paired ⑬ Use pb on AFT pnl A6 ⑭ Stow capability remains
	(Continued)		

EPS SSR-105 (Cont)
BUS LOSS: CNTLBC3

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(MA73C) 15 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 (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 (MA73C) 16 Ku Ant Sto/Dpy Mtr 2 Sto and Dpy Limit sw 17 Redundant Ku-Bd Xmit Enable Signal 18 Redundant Ku-Bd Boom Stow Enable II Excitation Signal (R2) 19 APU 3 Fu Tk Vlv B		⑮ Redundant mtrs remain ⑯ With inoperative limit sw, mtr will continue to run until DPY/STO sw is placed to GND position ⑰ MNC MMC2 pwr for Ku-Bd Xmit Enable signal remains ⑱ MNC MMC2 pwr remains to supply pwr to Boom stow enable II signal for stow mtrs ⑲ Vlv closes. Redundant Vlv A remains

EPS SSR-106 **BUS LOSS: CNTLCA1**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A12) APU HTR 1 • GAS GEN/FUEL PUMP 2 – A AUTO 1 • GAS GEN/FUEL PUMP 3 – B AUTO • LUBE OIL LINE 3 – B AUTO APU HTR TK/FU LN/H2O 1 • SYS 2A – AUTO 1 • 2B – OFF 1 • 3A – OFF 1 • 3B – AUTO HYD HTR • AFT FUS A – AUTO • B – OFF HYD CIRC PUMP PWR • 2 – MNB • 3 – MNA	(A12) APU 2 GG/Fu Pump Htr B APU 3 GG/Fu Pump Htr A 3 Lube Oil Ln Htr A 2 Tk/Fu Ln Htr B APU 3 Tk/Fu Ln Htr A Aft Fuselage Htrs B Circ Pump 2 MNC pwr 3 MNC pwr	(F7) SM ALERT Light/Tone – on CRT 3 blanks (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 R ADP deploy time incr from 15 to 30 sec PLB Floodlts lost: Mid Stbd Aft Port Docking (F7) If APUs active and using BLR CNTLR/HTR 3B: C/W APU TEMP It – on after ~2 min 3 SM 88 APU/ENVIRON THERM H2O LOOP 2 PUMP ΔP↑	① * TIME CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp ② Pri A man On Sel capability remains. Pri B and Sec Cntrlrs remain ③ Wrong FDA limit set is selected by SM preconditioning software due to loss of H2O Loop 2 pump On switch scan 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) ⑤ Do not reconfig for reg switch or I'CNCT procedures
(L1) • H2O PUMP LOOP 2 – ON • H2O PUMP LOOP 1 – GPC • FLASH EVAP CNTLR PRI A – ON (if using A Cntrlr) • TOP EVAP HTR NOZ R – A AUTO If HI LOAD EVAP enabled: • HI LOAD DUCT HTR – A(B)	(L1A2) H2O Loop 2 Pump GPC Cntl 2 FES Cntrlr Pri A GPC Sel capability Topping Evap R Noz Htr 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 • R IDP/CRT SEL – 2 On MCC GO: • GPC/CRT 03 EXEC	(C2A2) MDU CRT 3 4 IDP 3		
(R2) • BLR CNTLR/HTR 3 – A • If BFS in GPC 3 or 5, move BFS • If BFS in GPC 1, 2, or 4; and if engage reqd, use pb CDR RHC	(R2) APU/HYD Blr Cntrlr/Htr 3B (F6A5) GPC 3,5 engage capability PLT BFS engage capability		
If CA1,2,3 unpwr'd 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 5 Reconfig following vlv(s) only if leak isolation reqd: (O7) • AFT L RCS He PRESS B TK 1/2 XFEED 1/2 • R RCS TK 1/2 XFEED 1/2	(O7) Aft L RCS He Press Isol B man CL capability Aft L,R RCS Tk Isol 1/2 man CL capability Aft L,R RCS Xfeed Vlv 1/2 man CL capability		
(Continued)	(Continued)		

EPS SSR-106 (Cont) **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 Cntrl, auto switchover to Sec Cntrl remain
When reqd: • For FC3, perform FUEL CELL PURGE – AUTO (ORB OPS, EPS)	(R11U) 6 FC3 Purge Vlv man Cntl		⑧ Loss of manual capability to inert LO2 Manf
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		⑨ Six vlvs fail to non-isolation position
	(R4) MPS/TVC Hyd Sys 3 Isol man Cntl		⑩ Redundant mtr remains
If reqd during entry (< 120K ft): (L1) • NH3 CNTLR A(B) – PRI/GPC	(L1A2) 7 NH3 Sys B Sec Cntrl man On capability		⑪ Htr Cntrl 2 remains
			⑫ Vlv holds position. FC3 Redundant Reac Vlv Close Cntl on pnl C3 remains
			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'NECT R – GPC	(R2) R Eng He Intercon Vlv man Cntl		
(R4) • MPS FILL/DRAIN LO2 OUTBD – GND	(R4) 8 Prplt F/D Outbd LO2 Vlv man Cntl		
(O16:A) • RGA 3 – OFF	(O16) RGA 3		
	(O17) 9 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		
If SSPTS: (A15) OPCU 2 CONV – OFF OPCU 2 V-ADJ – OFF APCU 2 CONV – OFF	If SSPTS: (A15) PTU 2 (OPCU 2 and APCU 2) Ability to change state of APCU 2's OUTPUT relay		
	(C3A5) 10 R ADP Dpy Mtr 1 11 Htr Cntrl 1		
	(R1A2) 12 FC3 Reac Vlv Cntl via pnl R1 sw 13 FC3 STOP capability via START/STOP sw		
(Continued)	(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
	(R1A2) 14 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) During PLBD OP/CL, single mtr run time noted on actuators
	14 Cryo O2,H2 Tk5 Htr A man On Cntl		(16) Pwr to MCA Drivers lost through ENABLE sw
	15 (R13A2) 16 PLBD: C/L Lat 1-4, 5-8 Mtrs 2 Port Aft Blkhd Mtr 2		(17) Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists
	(A8L) Port RMS: 17 Fwd MRL Mtr 2 17 Mid MRL Mtr 2 17 Aft MRL Mtr 1 STBD RMS: 18 Fwd MRL Mtr 1 18 Mid MRL Mtr 2 18 Aft MRL Mtr 2		(18) Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists
	19 (L1A2) Freon Loop 2 Cntrlr A Rad Byp Vlv Mtr man Cntl		(19) Cntrlrs A,B Rad Byp Vlv Mtrs Auto Cntl and Cntrlr B Rad Byp Vlv Mtr Man Cntl remain
	(A6A1) Aft ADI Att ref set capability		(20)
	20 (O16) RJDF 2A F3 Manf Logic pwr (F3L,F3D,F3U,F3F)		WARNING Driver pwr to F3 Jets lost if RJDF 2A Driver sw OFF (O16:F)
	21 (C3A1) R OMS Eng Pr Vlv Coil 1 and Cntl Vlv 1,2 Coils 1		(21) Redundant coils remain
	22 R OMS Arm 1, Arm/Press 1 sw contacts		(22) R OMS auto shdn if Pc < 80% and '↓' on MNVR EXEC display
	(R4) 23 HYD BK ISOL VLV 3 man Cntl (F6A5,F8A5)		CAUTION No purge. Wait 10 min between burns
	24 LG Extend Vlv 1		(23) Vlv holds position. GPC capability remains
	25 NWS Hyd Sys 1		(24) 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
	(O6) 10 -Z Star Trkr Dr Sys 2 OP/CL capability		(25) Hyd Sys 2 still available for NWS
	(R13A2) Rad Cntl Sys: Stbd Rad Lat 7-12 Mtr 2 Port Rad Dpy/Sto Mtr 2		
	(R2) 10 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
	(R13A2) 26 Ku Ant Sto/Dpy Mtr 1 Direct Sto Mtr 1		26 Mtr 2 remains
	(R13A2) 27 Redundant Sto Initiate Signal to Ku-Band		27 Redundant stow initiate sig (CNTL BC1) to Ku-Band remains
	(O17) Freon Loop 2 Cold Plate Flow Xdcr		28 Vlv fails closed. Redundant vlv remains
	(R2) 28 APU 1 Fu Tk Vlv B		29 Redundant RPC remains
	29 Hyd Main Pump 3 Depress Solenoid RPC A		30 CDR Dpy/Jett remains
	29 Hyd Main Pump 2 Depress Solenoid RPC B		
	(O17) Aft PL MNC current Xdcr		
	(F3,F4) 30 PLT Dpy Fire 2		
	30 Jett Fire 2		

EPS SSR-107 **BUS LOSS: CNTLCA2**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(A12) 1 • APU HTR GAS GEN/FUEL PUMP 3 – B AUTO APU HTR TK/FU LN/H2O 1 • SYS 2A – AUTO 1 • 2B – OFF 1 • 3A – OFF 1 • 3B – AUTO • HYD CIRC PUMP PWR 3 – MNA	(A12) APU 3 GG/Fu Pmp Htrs A 2 Tk/Fu Ln Htrs B APU 3 Tk/Fu Ln Htrs A APU 3 GG Inj H2O Htrs 3A,23A (R2) Circ Pump 3 MNC pwr	MASTER ALARM Light/Tone – on (F7) SM ALERT Light/Tone – on 2 C/W FREON LOOP It – on 3 C/W RCS JET It – 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 It – on after ~2 min	① * TIME * * CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp ② If FES Cntrl 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 Cntrls remain ⑥ Loss of redundant port to the following: MDU AFD 1 (P)
(R1) If TK1 in use: • O2,H2 TK1 HTR B (two) – AUTO • O2,H2 TK1 HTR A (two) – OFF If TK3 in use: • O2,H2 TK3 HTR A (two) – AUTO • O2,H2 TK3 HTR B (two) – OFF	(R1A2) Cryo O2,H2 Tk1 Htr A Cryo O2,H2 Tk3 Htr B		
(A15) If Tk5 in use: • O2,H2 TK5 HTR B (two) – AUTO • O2,H2 TK5 HTR A (two) – OFF	(A15) Cryo O2,H2 Tk5 Htr A		
(R2) • BLR CNTLR/HTR 3 – A	(R2) APU/HYD Blr Cntrlr/Htr 3B		
(L1) • FLASH EVAP CNTLR PRI A – OFF • FLASH EVAP CNTLR PRI B – ON (if reqd) • TOP EVAP HTR DUCT – A(B) If HI LOAD EVAP enabled: • HI LOAD DUCT HTR – A(B)	5 (L1A2) FES Cntrlr Pri A man ON Sel capability Topping Evap Duct Fwd,Aft Htrs C Hi Load Duct Inbd,Outbd, Noz Htrs C		
(C2) On MCC GO: • GPC/CRT 04 EXEC	6 (R12A2) IDP 4 MDU CRT 4		
	(C3) FC2 Redundant Reac Vlv Close Cntl		
(Continued)	(Continued)		

EPS SSR-107 (Cont) **BUS LOSS: CNTLCA2**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
Refer to OMS/RCS Slide Rule for vlv loss info 7 Reconfig following vlv(s) only if leak isolation reqd: (O7) - AFT L,R RCS TK 1/2 - XFEED 1/2	(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 Ovrdr of GPC CL capability		⑦ Do not reconfig for reg switch or I'CNCT procedures ⑧ Vlv normally closed ⑨ Manf status <u>not</u> automatically declared closed. Jet fail-offs may occur ⑩ RM sw downmodes to 2-level for -X position
When reqd: Perform FC3 purges in AUTO mode (ORB OPS)	(R11U) 8 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 9 Override F3 Manf status to CL: - RCS FWD – ITEM 1 EXEC - OVRD MANF VLVS STAT 3 – ITEM 42 EXEC	(O16) RCS Manf F3 RJD pwr (F3L,F3D,F3U,F3F)		
(A6U) If SENSE -Z: - SENSE – -X - Wait at least 1 sec, then reposition as desired	(A6A1) 10 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	(F8A7) 11 R Trim RHC – INH capability 11 PNL – ON capability (C3A1) 11 R Bdy Flp – UP/DN capability (R4) MPS/TVC Hyd Sys 3 Isol man Cntl (L1A2) 12 NH3 Sys A Sec Cntlr man On 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 shdn if Pc < 80% and ↓ on MNVR EXEC display
If reqd during entry (< 120K ft): (L1) • NH3 CNTLR A(B) – PRI/GPC			
BUS ISOLATION ONLY ON MCC CALL, PERFORM (F3) • TRIM RHC – ENA • PNL – OFF (R11L) • IDP/CRT4 PWR – OFF • MDU CRT 4 PWR – OFF	(O6) 13 -Z Star Trkr Dr Sys 2 CL capability (R1A2) 14 FC3 Reac Vlv Cntl via pnl R1 sw 15 FC3 STOP capability via START/STOP sw (C3A5) 13 R ADP Dpy Mtr 1 16 Htr Cntlr 1 (A6A1) 17 Aft Panel Trans X,Y, Norm, Pulse, Rot Roll, Pitch, Yaw Disc Rate, and Pulse Sel capability 17 Aft Pnl Trans Z High, Norm Pulse Sel capability 17 Aft Pnl Trans Low Z Sel capability 17 Aft Pnl PRI,ALT,VERN Sel capability 17 Aft Pnl PCT Exec capability (C3A1) 18 R OMS Eng Pr Vlv Coil 2 and Cntl Vlv 1,2 Coil 2 19 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)		

CAUTION

No purge. Wait 10 min between burns

EPS SSR-107 (Cont)
BUS LOSS: CNTLCA2

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(A8L) 20 Port RMS MPM Mtr 1 20 Stbd RMS MPM Mtr 2		(13) Redundant mtrs remain
	(R2) 13 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		(20) Single mtr time. One failure away from EVA to stow MPM or from RMS/OBSS jettison (21) Mtr 2 remains (22) Vlv closed. Redundant vlv remains
	(R13A2) 21 Ku Ant Sto/Dpy Mtr 1 Direct Sto Mtr 1		(23) Redundant pwr sply remains. Turbine speed ind lost
	(R2) 22 APU 2 Fu Tk Vlv A 23 Cntrl Pwr Sply B 24 Hyd Main Pump 3 Depress Solenoid RPC A 24 Hyd Main Pump 2 Depress Solenoid RPC B		(24) Redundant RPC remains (25) During PLBD OP/CL, single mtr times noted on actuators
	(R13A2) 25 PLBD: 26 C/L Lat 9-12 Mtr 2 13-16 Mtr 1 Stbd Aft Blkhld Mtr 1 Port Door Mtr 1		(26) Pwr to MCA Drivers lost through ENABLE sw
	(F3,F4) 27 PLT Dpy Fire 1 27 Jett Fire 1		(27) CDR Dpy/Jett remains

EPS SSR-108

BUS LOSS: CNTLCA3

(Includes MNC FMC3, MNC MMC2, MNC MMC4, MNC AMC3)

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
1 (A12) APU HTR • GAS GEN/FUEL PUMP 3 – A AUTO • LUBE OIL LINE 3 – A AUTO APU HTR TK/FU LN/H2O 1 • SYS 2A – AUTO 1 • 2B – OFF 1 • 3A – OFF 1 • 3B – AUTO HYD CIRC • PUMP PWR 3 – MNC (R1) If Tk2 in use: 4 O2, H2 TK2 • HTR A (two) – AUTO • HTR B (two) – OFF (A11) If TK4 in use: 4 O2, H2 TK4 • HTR A (two) – AUTO • HTR B (two) – OFF (R2) • BLR CNTLR/HTR 2 – B • 3 – B Refer to OMS/RCS Slide Rule for vlv loss info (MA73C:C,D) 5 • cb MCA PWR AC3 MID 2,4 (two) – op	(A12) APU 3 GG/Fu Pump Htrs B APU 3 Lube Oil Ln Htr B APU 2 Tk/Fu Ln Htr B APU 3 Tk/Fu Ln Htr A Hyd Circ Pump 3 MNA pwr (R1A2) Cryo O2,H2 Tk2 Htrs B (A11) Cryo O2,H2 TK4 Htrs B (R2) APU/HYD Blr Cntlr/Htr 2A 3A (O16) 6 RCS Manf F4 RJD pwr (F4R,F4D) (MA73C) 5 Stbd,Port Rad Lat 7-12 Mtr 2 Limit sw	MASTER ALARM Light/Tone – on (F7) SM ALERT Light/Tone – on (FSM) S67 CNTL BUS V RM DLMA MANF SM 67 ELECTRIC CNTL CA3 Volts < 20 (O8) 2 FWD RCS TK ISOL 1/2 tb – bp 2 FWD RCS MANF ISOL 3,4 tb – bp (L1) 3 RAD BYP VLV 1 tb – bp 3 FLOW PROP VLV LOOP 2 tb – bp (R13L) 5 RAD CNTL (two) 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 (F7) If APUs active, using BLR CNTLR/HTR 2A or 3A: C/W APU TEMP It – on after ~2 min	① * TIME * CRITICAL * If not done within 20 min, may freeze N2H4 and lose APU. However, SM ALERT occurs above freezing temp ② Vlv holds position ③ Vlv ops not affected ④ Refer to EPS 7.6 CRYO TABLE A for switch nomenclature 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 pwr'd by AC3 MMC2 and AC3 MMC4 is lost because of MNC MMC2 and MNC MMC4 loss ⑥ Manf 4 status automatically declared closed
(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 <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	⑦ Mtr 2 remains ⑧ Htr Cntrl 2 remains ⑨ Redundant mtrs remain ⑩ Single mtr time. One failure away from EVA to stow MPM or from RMS/OBSS jettison
(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 STARBOARD RMS: DPY/STO tb – bp	⑪ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists
BUS ISOLATION		SM 94 PDRS CONTROL PORT RMS Indications lost: MPM Mtr 1 STO/DPY Fwd MRL Mtr 2 LAT/REL/RDY Aft MRL Mtr 1 LAT/REL/RDY STBD RMS Indications lost: MPM Mtr 2 STO/DPY Mid MRL Mtr 2 LAT/REL/RDY	⑫ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists
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 Cntrl 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 (A8L) Port RMS: 10 MPM Mtr 1 11 Fwd MRL Mtr 2 11 Aft MRL Mtr 1 STBD RMS: 10 MPM Mtr 2 12 Mid MRL Mtr 2		
	(Continued)		

EPS SSR-108 (Cont)
BUS LOSS: CNTLCA3

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	(MA73C) 13 Ku Ant Sto/Dpy Mtr 1 Limit sw		⑬ With an inop limit sw, mtr will continue to run until primary sw returned to GND
	(MA73C) 14 Redundant Ku-Bd Xmit Enable Signal		⑭ MNB MMC4 pwr for Ku-Bd Xmit Enable Signal remains
	15 Redundant Boom Stow Enable II Excitation Signal		⑮ MNB MMC4 pwr remains to supply pwr to Boom stow enable II signal for stow mtrs
	(R2) 16 APU 3 FU Tk Vlv A		⑯ Vlv closed. Redundant vlv remains
	17 Cntr pwr Sply A GBX GN2 Repress Vlv		⑰ Redundant pwr sply remains

EPS SSR-109 **CONTROL BUS – PANEL WIRING MATRIX**

PANEL \ CNTL BUS									
	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) (R1) • AC1 BUS SNSR – OFF (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) – 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 (MO13Q) If Arlk/Tnl Fan active: • ARLK FAN A – OFF • B – ON	FC1 Pumps and pH Snsr Hyd H2O Blr 1 Cntlr B 3 Cntlr 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 Arlk/Tnl Fan A	MASTER ALARM Light/Tone – on (F7) EVENT TIME ind blank C/W FC PUMP It – on C/W AC VOLT It – on C/W FREON LOOP It – on C/W AV BAY/CAB AIR It – on C/W H2O LOOP It – on SM ALERT Light/Tone – on (F9) AC1 ΦA,ΦB,ΦC AC volts < 90 (LIGHTS LOST) Instr Its R (pnls C2,F8,F9) Pnl Its L/Ctr (pnls L1,L2,L4, C2,C3,F2,F6,F7) Pnl Its L/OH (pnls O5,O6, O7,O13,O14,O15) Numeric Its (pnls O3,F7) Orbit Sta Instr Its (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 (R1) FC1 COOL PUMP ΔP tb – bp HYD/APU HYD QTY 1 ind – 0% APU H2O QTY 3 ind – 0% (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 (O3) RCS/OMS PRPLT QTY Gage and MSN TIME ind blank (L1) If H2O LOOP 1 PUMP A active: 'S88 H2O PUMP P 1' 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP' ----- (O1) H2O PUMP OUT PRESS LOOP 1 ind – 20-25 psia If HUM SEP A ON: 'S66 HUMID SEP A'	①  TIME CRITICAL FC1 must be shutdn within 9 min to avoid potentially hazardous condition ② H2O Loop 2 Pump Out Press, Pump ΔP, Accum Qty, Pump Out Temp snrs lost ③ H2O Loop 2 Byp vlv holds position ④ Av Bay 2 Fan ΔP, Air Out Temp snrs 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 snrs lost ⑧ Inhibits Primary C/W for 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, and Cabin HX In Temp respectively
5 • Maintain LiOH canister(s) changeout per cue card and FLIGHT PLAN During sleep periods: (L1) 6 • CAB FAN (two) – ON (R13U) • C/W PARAM SEL tw (three) – 115, 074, 092, 062 8 • C/W PARAM – INH • MEM – CLEAR • C/W PARAM SEL tw (three) – > 119 9 SM 60 SM TABLE MAINT • Inhibits 0612705, 0612700, 0612740, 0612710, 0612665 (WCS) • √MODE – AUTO • √CRADLE – AUTO • √Hose stowed in cradle • √WCS ON It – 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 Cabin Air S/C (ECLS SC6) WCS Fan/Sep 1	(Continued)	(Continued)

EPS SSR-110 (Cont) **BUS LOSS: AC1**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
If CAB TEMP CNTLR 2 active: • CAB TEMP CNTLR – OFF (MD44F) • Remove pin from SEC ACTUATOR and BYP vlv linkage, connect linkage to PRI ACTUATOR (L1) • CAB TEMP CNTLR – 1 Refer to OMS/RCS Slide Rule for vlv loss info (use FPC1 Slide for Aft RCS and FMC1 Slide for Fwd RCS)	10 Cabin Temp Cntrlr 2, Hx Byp Vlv Mtr 2	If IMU FAN A ON: 'S66 IMU FN SPD A' 'S66 IMU FAN DP' If APUs active and using H2O BLR CNTLR/HTR 1B or 3A, then C/W APU TEMP It on after ~2 min STAR TRKR DR POS -Y OP/CL time incr from 8 to 16 sec L ADP deploy time incr from 15 to 30 sec 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 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 tbs (four) indicate single mtr ops	⑩ Lose Auto Temp Cntl via Cntrlr 2 and H2O Loop 2 Cabin Hx In Temp Snsr. Hx Byp Vlv holds position ⑪ Redundant mtr remains ⑫ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ⑬ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM (MA73C:C) cb MCA PWR • AC1 3Φ FWD 1 – op • MID 1 – op	11 AC1 FMC1 Bus pwr RH Vent 1,2 Mtr 1 -Y Star Trkr Dr Sys 1 OP/CL capability 11 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		
(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	12 RMS: Port Mid MRL Mtr 1 12 Port Aft MRL Mtr 2 13 Stbd Fwd MRL Mtr 2 13 Stbd Aft MRL Mtr 1 D&C Primary Itg 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	Arkl/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 Cntrl 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	14 Freon Loop 1 Cntrl B Rad Byp Vlv Mtr Freon Loop 2 Cntrl B Rad Byp Vlv Mtr		
(L4:Q) cb AC1 • ΦA LTG PNL L/CTR – op • ΦB LTG PNL L OVHD – op • ΦC LTG INST OS – op	Pnl Its L/Ctr Pnl Its L/OH (pnls O5,O6,O7, O13,O14,O15) Orbit Sta Instr Its		
(Continued)	(Continued)		

EPS SSR-110 (Cont)
BUS LOSS: AC1

BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM			11 Redundant mtr remains
(L4:R) cb AC1 • ΦA LG INST R – op • ΦB NUMERIC FWD – op	15 Inst Its R Numeric Its (pnls O3,F7) (RCS/OMS Prplt Qty, Gauge, Mission and Event Timers)		15 √MCC for total OMS Qtys. Aft Qtys are found on GNC SYS SUMM 2
	LH Vents 5,6 Mtrs 1 Stbd Rad 1 Lat 1-6,7-12 Mtrs 1 Stbd Rad Dpy/Sto Mtr 1		
	11 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	CREW INDICATIONS	NOTES
(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 Cntrl, Sig Condr, Byp Vlv pwr 1Φ of H2O Loop 2 Pump GPC Cntrl 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	MASTER ALARM Light/Tone – on (F7) C/W AC VOLT It – on C/W H2O LOOP It – on SM ALERT Light/Tone – on (F9) AC1 ΦA AC volts < 90 (LIGHTS LOST) Instr Its R (pnls C2,F8,F9) Pnl Its L/Ctr (pnls L1,L2,L4,C2,C3,F2,F6,F7) (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 (O1) H2O PUMP OUT PRESS LOOP 2 ind – 0 psia If H2O PUMP LOOP 1, A active: 'S88 H2O PUMP P 1' (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 It – on after ~2 min	① H2O Loop 2 Byp Vlv holds position and H2O Loop 2 Pump Out Press, Pump ΔP Accum Qty, Pump Out Temp snsrs lost ② Inhibits H2O Loop 2 Pump ΔP, Pump Out Press, Pump Out Temp, Accum Qty, and Cabin HX In Temp respectively ③ If H2O Loop 1 Pump A active, Loop 1 Pump Out Press must drop below 45 psia to trigger C/W ④ Lose Auto Temp Cntl via Cntrl 2 and H2O Loop 2 Cabin Hx In Temp snsrs. Hx Byp vlv holds position ⑤ Inhibits Primary C/W for AC1 voltage and H2O Loop 2 Pump P ⑥ 2Φ ops will result in degraded airflow. Crew actions will pwr fans thru alt pwr source with full 3Φ power
(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 Cntrl B		
2 SM 60 SM TABLE MAINT • Inhibits 0612705, 0612700, 0612740, 0612710, 0612665 • 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	3 3	
If CAB TEMP CNTLR 2 active: (L1) • CAB TEMP CNTLR – OFF	4 Cabin Temp Cntrl 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			
(R1) • AC1 BUS SNSR – OFF (1 sec) • AC1 BUS SNSR – AUTO TRIP			
(WCS) •√MODE – AUTO •√CRADLE – AUTO •√Hose stowed in cradle •√WCS ON It – 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		
(Continued)	(Continued)		

EPS SSR-111 (Cont)
BUS LOSS: AC1 ΦA

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
8 If bus shorted: - Open all AC1 ΦA cbs that pwr 3Φ loads on pnls L4: C-J,M,N (10 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)	7 1Φ of AC Utility Power Outlets at F1 and MO52J		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 For unshorted bus, perform single Φ isolation steps to prevent powering single phase loads with coupled energy from remaining two phases ⑩ Bypass vlv holds position and Cntr A Rad Byp Vlv Mtr remains
9 If bus not shorted: Perform the following BUS ISOLATION steps	8 AC1 FMC1 Bus pwr MMC1 Bus pwr MMC3 Bus pwr AMC1 Bus pwr		
9 BUS ISOLATION			
IF BUS <u>NOT</u> 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	10 Freon Loop 1 Cntr B Rad Byp Vlv Mtr		
(L4:Q) cb AC1 ΦA LTG PNL L/CTR – op	Pnl Its L/Ctr (pnls L1,L2,L4, C2,C3,F2,F6,F7)		
(L4:R) cb AC1 ΦA INST R – op	Instr Its R (pnls C2,F8,F9)		
(MA73C:F) cb AC1 RMS PRI ΦA – op	RMS: 1Φ of Port Mid MRL Mtr 1 Port Aft MRL Mtr 2 Stbd Fwd MRL Mtr 2 Stbd Aft MRL Mtr 1 D&C Primary Ltg Shldr Brace Release		
	FC1 pH Snsr		

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 Cntrl 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 It – on C/W AV BAY/CAB AIR It – on SM ALERT Light/Tone – on (F7) EVENT TIME ind blank (F9) AC1 ΦB volts < 90 (LIGHTS LOST) Pnl Its L/OH (pnls O5,O6, O7,O13,O14,O15) Numeric Its (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 It '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 snrs 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 snrs lost ⑥ Inhibits Primary C/W for AC1 voltage and Cabin Fan ΔP ⑦ 2Φ ops will result in degraded airflow. Crew actions will pwr fans thru alt pwr source with full 3Φ power ⑧ MCC will provide equipment reconfig info if reqd
(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN A – OFF • B – ON 3 • Maintain LiOH canister(s) changeout per cue card and FLIGHT PLAN During sleep periods: (L1) 4 • CAB FAN (two) – ON	 1Φ of Arlk/Tnl Fan A 4 Cab Air Sig Cond 5 (ECLS SC6)		
(R13U) • C/W PARAM SEL tw (three) – 033, 074 6 • C/W PARAM – INH MEM – CLEAR • C/W PARAM SEL tw (three) – > 119			
(R1) • AC1 BUS SNSR – OFF (1 sec) • AC1 BUS SNSR – AUTO TRIP		1 1	
(WCS) • √MODE – AUTO • √CRADLE – AUTO • √Hose stowed in cradle • √WCS ON It – 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		
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		
	8 1Φ of AC Utility Power Outlets at F1 and MO52J		
(Continued)	(Continued)		

EPS SSR-112 (Cont)

BUS LOSS: AC1 ΦB

ACTIONS	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 (10 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)	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 If bus not shorted: Perform the following BUS ISOLATION steps			⑩ For unshorted bus, perform single Φ isolation steps to prevent powering single phase loads with coupled energy from remaining two phases
BUS ISOLATION IF BUS NOT SHORTED, PERFORM			⑪ Bypass vlv holds position and Cntrl A Rad Byp Vlv Mtr remains
	RMS: 1Φ of Port Mid MRL Mtr 1 Port Aft MRL Mtr 2 Stbd Fwd MRL Mtr 2 Stbd Aft MRL Mtr 1		⑫ √MCC for total OMS Qty. Aft Qty. are found on GNC SYS SUMM 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 Cntrl B Rad Byp Vlv Mtr		
(L4:Q) • cb AC1 ΦB LTG PNL L OVHD – op	Pnl Its L/OH (pnls O5,O6,O7, O13,O14,O15)		
(L4:R) • cb AC1 ΦB NUMERIC FWD – op	12 Numeric Its (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
(L1) • √HUM SEP A – OFF √B – ON • √IMU FAN A – OFF √B(C) – ON • H2O PUMP LOOP 2 – ON	1 1Φ of Hum Sep A 1 1Φ of IMU Fan A	(F7) C/W AC VOLT It – on SM ALERT Light/Tone – on	
• H2O PUMP LOOP 1 (two) – GPC, B • FREON PUMP LOOP 1 – B 2 – A	1Φ of H2O Loop 2 Pump GPC Cntrl pwr 2 1Φ of H2O Loop 1 Pump A	(F9) AC1 ΦC AC volts < 90	
• √AV BAY 1 FAN A – OFF √B – ON • 3 FAN A – ON B – OFF	1Φ Freon Loop 1 Pump A 2 Pump B 1Φ of AV Bay 1 Fan A 1Φ of AV Bay 3 Fan A	(LIGHTS LOST) Orbit Sta Instr Its (pnls A1,A2)	② If H2O Loop 1 Pump A active, Loop 1 Pump Out Press must drop below 45 psia to trigger C/W
(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN A – OFF • B – ON	1Φ of Arlk/Tnl Fan A	(FSMs) S67 AC VOLTS 1 S69 FC H2 PUMP 1 S86 WSB T SM0 THRM HYD (B)	
		HYD/APU APU H2O QTY 3 – 0%	
(Continued)	(Continued)	(Continued)	

EPS SSR-113 (Cont) **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		2 If H2O PUMP LOOP 1, A active: C/W H2O LOOP It – 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 ③ 2Φ ops will result in degraded airflow. Crew actions will pwr fans thru alt pwr source with full 3Φ power ④ MCC will provide equipment reconfig info if reqd 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 ⑥ For unshorted bus, perform single isolation steps to prevent powering single phase loads with coupled energy from remaining two phases
(R1) • AC1 BUS SNSR – OFF (1 sec) • AC1 BUS SNSR – AUTO TRIP		If APUs active and using H2O BLR CNTLR/HTR 3A: C/W APU TEMP It – on after ~2 min	
(WCS) • √MODE – AUTO • √CRADLE – AUTO • √Hose stowed in cradle • √WCS ON It – 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		
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 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 (10 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		
If bus not shorted: • Perform the following BUS ISOLATION steps			
6 BUS ISOLATION IF BUS NOT SHORTED, PERFORM			
(L4:O) • cb AC1 ΦC BLR HYD BYP 3A – op			
(L4:Q) • cb AC1 ΦC LTG INST OS – op	Orbit Sta Instr Its (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		
	RMS: 1Φ of Port Mid MRL Mtr 1 Port Aft MRL Mtr 2 Stbd Fwd MRL Mtr 2 Stbd Aft MRL Mtr 1		

EPS SSR-114

BUS LOSS: AC1 FMC1

ACTION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE		L ADP deploy time incr from 15 to 30 sec	① Redundant mtr remains
		-Y Star Trkr OP/CL time incr from 8 to 16 sec	
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(MA73C:C) • cb MCA LOGIC MCA PWR AC1 3Φ FWD 1 – op	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		

EPS SSR-115

BUS LOSS: AC1 MMC1

ACTION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE			
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(MA73C:C) • cb MCA LOGIC MCA PWR AC1 3Φ MID 1 – op	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 RMS: 1 Port Mid MRL Mtr 1 2 Stbd Fwd MRL Mtr 2 ROEU 3 Orbiter arm drive mtr (ODM mtr 1 – mate A, demate A, relax A) 3 ODA mtr 1 latch/release	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	① Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ② Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists ③ Single mtr time

EPS SSR-116

BUS LOSS: AC1 MMC3

ACTION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE			
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(MA73C:D) • cb MCA LOGIC MCA PWR AC1 3Φ MID 3 – op	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 RMS: 1 Port Aft MRL Mtr 2 2 Stbd Aft MRL Mtr 1	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	① Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ② Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists

EPS SSR-117

BUS LOSS: AC1 AMC1

ACTION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE		NONE	① Redundant mtrs remain
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(MA73C:D) • cb MCA PWR AC1 3Φ AFT 1 – op	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		

EPS SSR-120

BUS LOSS: AC2

(Includes all AC2 sub-buses)

ACTIONS	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
(R1) • AC2 BUS SNSR – OFF		(F7) C/W FC PUMP It – on C/W AC VOLT It – on C/W FREON LOOP It – on SM ALERT Light/Tone – on C/W AV BAY/CABIN AIR It	* TIME * CRITICAL
(R2) • BLR CNTLR/HTR 1 – B 2 – A	Hyd H2O Blr 1 Cntlr A 2 Cntlr B	(F9) AC2 ΦA,ΦB,ΦC AC volts < 90	FC2 must be shut down within 9 min to avoid potentially hazardous condition
(L4:F) • cb AC1 H2O LOOP PUMP 1A/2 (three) – cl		(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)	② Av Bay 3 Fan ΔP, Air Out Temp sntrs 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 3 • FREON PUMP LOOP 1,2 (two) – A	Humidity Sep B Cabin Fan B IMU Fan B H2O Loop 1 Pump B Av Bay 1 Fan B Av Bay 2 Fan A 2 Av Bay 3 Sig Condr, Xdcrs (ECLS SC4) 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	③ Freon Loop 2 pump switched to avoid having both loops powered by AC 1
(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN B – OFF • √A – ON	Arlk/Tnl Fan B	(F6,F8) 7 LDG GEAR L,NOSE tb – bp	④ Brake/Skid Cntl Box A,B enabled before WOW
(L4:P) • cb AC3 ΦA LG SNSR 1 – cl	4 Prox Snsr Elec Box 2	HYD/APU	⑤ Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate, and Accum Qty sntrs lost
(O17:C) • SIG CONDR FREON A – AC3 • SIG CONDR FREON B – AC3	5 Freon Sig Condr A AC2 pwr (ECLS SC1A) 6 Freon Sig Condr B AC2 pwr (ECLS SC1B)	8 APU H2O QTY 1 ind – 0% APU H2O QTY 2 ind – 0% HYD QTY 2 ind – 0%	⑥ Freon Loop 2 P/L Hx Flow Rate, Freon Loop 1 ICH Flow Rate and Accum Qty sntrs lost
(CDR SEAT PNL) • CDR SEAT PWR BUS SEL – AC3 (dn)	CDR Seat Adj via AC2 pwr		⑦ When gear deployed, tb will not indicate DN
(Continued)	(Continued)	(Continued)	⑧ APU H2O QTY 1 ind – 0% if BLR CNTLR/HTR 1A active. APU H2O QTY 2 ind – 0% if BLR CNTLR/HTR 2B active

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	⑨ Inhibits Primary C/W for FC2 Stack Temp, and Pump ΔP ⑩ Inhibit Loop 1 Cabin HX In Temp ⑪ Lose Auto Temp Cntl via Cntl 1 and Cabin Temp, Cabin Hx Air Out Temp and H2O Loop 1 Cabin Hx In Temp snrs. Hx Byp Vlv holds position ⑫ Redundant mtr remains
9 (R13U) • C/W PARAM SEL tw (three) – 072,102 • 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 AIR TEMP CAB HX OUT – 45 degF	
10 SM 60 SM TABLE MAINT • Inhibit 0612663		(A4) Mission and Event Timers blank	
(WCS) • √MODE – AUTO • √CRADLE – AUTO • √Hose stowed in cradle • √WCS ON It – 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	If Freon Loop 1 Pump B ON: 'S88 FREON FLOW 1' If APU active and using H2O Blr Cntl 1A or 2B: C/W APU TEMP It – on after ~2 min	
If CAB TEMP CNTLR 1 active: (L1) • CAB TEMP CNTLR – OFF	11 Cabin Temp Cntl 1 and Hx Byp Vlv Mtr 1	If H2O Loop 1 Pump B active: H2O LOOP C/W It 'S88 H2O LOOP 1 FLOW' 'S88 H2O LOOP 1 TEMP' 'S88 H2O PUMP P1'	
(MD44F) • Remove pin from PRI ACTUATOR and BYP Vlv linkage, connect linkage to SEC ACTUATOR		(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			
ONLY ON MCC CALL, PERFORM			
(MA73C:C) cb MCA PWR • AC2 3Φ FWD 2 – op	12 AC2 FMC2 Bus pwr 12 L,R Vents 1,2 Mtrs 2 12 ADP Deploy Mtrs 2 -Y Star Trkr Dr Sys 2 OP/CL capability 12 -Z Star Trkr Dr Sys 1 OP/CL capability		
• AC2 3Φ MID 1 – op	AC2 MNC1 Bus pwr LH Vent 5 Mtr 2		
• AC2 3Φ MID 2 – op	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			
(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		⑬ √MCC for Ku Ant stow reqmts ⑭ Single mtr time. One failure away from EVA to stow MPM or from RMS/OBSS jettison ⑮ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ⑯ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists
(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 RMS: Port MPM Mtr 2 14 Stbd MPM Mtr 1 15 Port Fwd MRL Mtr 1 15 Port Mid MRL Mtr 2 16 Stbd Mid MRL Mtr 1 16 Stbd Aft MRL Mtr 2 D&C B/U edge Itg Ops Hyd Actr Inst		
(MA73C:G) IF DOCKING MISSION • cb AC2 ARLK/TNL FAN B (three) – op	Ark/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**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM			12 Redundant mtr remains
(L4:N) cb AC2 - ΦA FREON FLOW PROP 1 – op - ΦB FREON SIG CONDR – op	17 Freon Loop 1 Flow Prop Vlv		17 Flow prop vlv holds position
• cb AC2 ΦC RAD ISOL A – op	18 Freon Loop 1,2 Rad Isol Motor A		18 Motor B remains
(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		19 Bypass vlv holds position and Cntrl B Rad Byp Vlv Mtr remains
(L4:P) cb AC2 - ΦA LG SNSR 2 – op - ΦB RAD CNTLR 1A – op	19 Freon Loop 1 Cntrl A Rad Byp Vlv Mtr		20 √MCC for Reconfig
(L4:Q) cb AC2 - ΦA LTG PNL R OVHD – op - ΦB LTG PNL R – op - ΦC LTG NUMERIC OS – op	R Ovhd Pnl Its R Pnl Its OS Numeric Its		
(L4:R) • cb AC2 ΦB LTG INST OVHD – op	Ovhd Inst Its		
	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		
	20 DTV Vertical Interval Processor (VIP)		

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 ② Freon Loop 2 pump switched to avoid having both loops powered by AC1 ③ When gear deployed, tb will not indicate DN ④ APU H2O QTY 1 ind – 0% if BLR CNTLR/HTR 1A active ⑤ Brake/Skid Cntl Box A,B enabled before WOW ⑥ 2Φ ops will result in degraded airflow. Crew actions will pwr fans thru alt pwr source with full 3Φ power ⑦ Lose Auto Temp Cntl via Cntl 1 and Cabin Temp, Cabin Hx A Out Temp and H2O Loop 1 Cabin Hx In Temp snrs Hx Byp Vlv hold position
(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 2 • 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 1Φ of Freon Loop 1 Pump B	(F7) C/W AC VOLT It – on SM ALERT Light/Tone – on (F9) AC2 ΦA AC volts < 90 (LIGHTS LOST) R Ovhd pnl lts (pnls O1,O2, O3,O8,O9,O16,O17) (F6/F8) 3 LDG GEAR L,NOSE tb – bp [HYD/APU] 4 APU H2O QTY 1 ind – 0%	
(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN B – OFF • √A – ON	1Φ of Arlk/Tnl Fan B	(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	
	1Φ of Cabin Fan B	(O1) AIR TEMP CAB HX OUT ind – 45 degF	
(L4:P) • cb AC3 ΦA LG SNSR 1 – cl	5 Prox Snsr Elec Box 2	If H2O PUMP LOOP 1,B active: C/W H2O LOOP It – on 'S88 H2O PUMP P 1'	
(R2) • BLR CNTLR/HTR 1 – B	Hyd H2O Blr 1 Cntl A	(O1) 1 H2O PUMP OUT PRESS LOOP 1 ind – 40-45 psia	
(WCS) • √MODE – AUTO • √CRADLE – AUTO • √Hose stowed in cradle • √WCS ON It – 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 1Φ of WCS Fan/Sep 2	If IMU FAN B ON: 'S66 IMU FAN DP' 'S66 IMU FN SPD B'	
If Cab Temp Cntl 1 active: (L1) • CAB TEMP CNTLR – OFF	7 Cabin Temp Cntl 1, Hx Byp Vlv Mtr 1	If HUM SEP B ON: 'S66 HUMID SEP B'	
(MD44F) • Remove pin from PRI Actuator and BYP vlv linkage, connect linkage to SEC Actuator		If APUs active and using BLR CNTLR/HTR 1A: C/W APU TEMP It – on after ~2 min	
(L1) • CAB TEMP CNTLR – 2			
(Continued)	(Continued)		

EPS SSR-121 (Cont) **BUS LOSS: AC2 ΦA**

ACTIONS		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
8	(R13U) • C/W PARAM SEL tw (three) – 043 (AC2 voltage) • C/W PARAM – INH MEM – CLEAR • C/W PARAM SEL tw (three) – > 119			⑧ Inhibit Loop 1 Cabin HX In Temp ⑨ Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from two phases into short ⑩ 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 For unshorted bus, perform single Φ isolation steps to prevent pwring single phase loads with coupled energy from remaining two phases ⑫ √MCC for Reconfig ⑬ Flow prop vlv holds position
	(R1) • AC2 BUS SNSR – OFF (1 sec) • AC2 BUS SNSR – AUTO TRIP			
	SM 60 SM TABLE MAINT • Reset upper limit of 0450214 (FC2 H2 PUMP STATUS) to current value + 0.3 volts • Inhibit 0612663	1Φ of FC2 H2 Pump 1Φ of FC2 Coolant Pump		
	10 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)	9 If bus shorted: AC2 payload 3Φ Bus pwr (pwr MS, PS Patch panel) 10 AC2 FMC2 Bus pwr MMC1 Bus pwr MMC2 Bus pwr MMC3 Bus pwr MMC4 Bus pwr AMC2 Bus pwr		
	11 If bus not shorted: • Perform the following BUS ISOLATION steps			
11	BUS ISOLATION			
	IF BUS <u>NOT</u> SHORTED, PERFORM			
	(L4:L) • cb AC2 ΦA CAB T CNTLR 1 – op			
	(L4:N) • cb AC2 ΦA FREON FLOW PROP 1 – op	13 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	RMS: 1Φ of Port MPM Mtr 2 Stbd MPM Mtr 1 Port Fwd MRL Mtr 1 Port Mid MRL Mtr 2 Stbd Mid MRL Mtr 1 Stbd Aft MRL Mtr 2 D&C B/U edge Itg		
		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 ② Av Bay 3 Fan ΔP, Air Out Temp snrsrs lost ③ Freon Loop 2 pump switched to avoid having both Freon loops powered by AC1 ④ Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate, and Accum Qty snrsrs lost ⑤ Freon Loop 2 P/L Hx Flow Rate, Freon Loop 1 ICH Flow Rate, and Accum Qty snrsrs lost ⑥ 2Φ ops will result in degraded airflow. Crew actions will pwr fans thru alt pwr source with full 3Φ power
(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) 1Φ of Freon Loop 1 Pump B AV Bay 1 Fan B 1Φ of AV Bay 2 Fan A	(F7) C/W AC VOLT It C/W FREON LOOP It SM ALERT Light/Tone (F9) AC2 ΦB AC volts < 90 (LIGHTS LOST) Ovhd Instr (pnls O1,O2,O3) R pnl (pnls F4,F8,F9,R1, R2,R4) (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	
(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN B – OFF • √A – ON	1Φ of Arlk/Tnl Fan B	(A4) Mission and Event Timers blank	
(O17:C) • SIG CONDR FREON A – AC3 • SIG CONDR FREON B – AC3	1Φ of Cabin Fan B	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	4 Freon Sig Condr A AC2 pwr (ECLS SC1A) 5 Freon Sig Condr B AC2 pwr (ECLS SC1B)	(O1) AIR TEMP AV BAY 3 – 45 degF FREON FLOW LOOP 2 – 578 pph	
(R1) • AC2 BUS SNSR – OFF (1 sec) • AC2 BUS SNSR – AUTO TRIP		1 If H2O Loop 1 Pump active: C/W H2O LOOP It 'S88 H2O PUMP P1'	
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 (O1) H2O PUMP OUT PRESS LOOP 1 – 40-45 psia	
(WCS) • √MODE – AUTO • √CRADLE – AUTO • √Hose stowed in cradle • √WCS ON It – 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 1Φ of WCS Fan/Sep 2		
(Continued)	(Continued)		

EPS SSR-122 (Cont)
BUS LOSS: AC2 ΦB

ACTIONS		EQUIP/FUNCTION LOST		CREW INDICATIONS		NOTES	
7	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)	8	If bus shorted: AC2 payload 3Φ Bus pwr (pwrs MS, PS Patch panel)				⑦ 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	If bus not shorted: • Perform the following BUS ISOLATION steps	7	AC2 FMC2 Bus pwr MMC1 Bus pwr MMC2 Bus pwr MMC3 Bus pwr MMC4 Bus pwr AMC2 Bus pwr				⑧ Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into short
9	BUS ISOLATION						⑨ For unshorted bus, perform single Φ isolation steps to prevent pwring single phase loads with coupled energy from remaining two phases
	IF BUS NOT SHORTED, PERFORM						⑩ Bypass vlv holds position and Cntrl B Rad Byp Vlv Mtr remains
	(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		Hyd Rdvr 2 Qty Snsr				
	(L4:P) • cb AC2 ΦB RAD CNTLR 1A – op	10	Freon Loop 1 Cntrl A Rad Byp Vlv Mtr				
			H2O Ln pH Snsr				
	(L4:Q) • cb AC2 ΦB LTG PNL R – op		R pnl Itg (pnls F4,F8,F9,R1, R2,R4)				
	(L4:R) • cb AC2 ΦB INST OVHD – op		Ovhd Instr Itg (pnls O1,O2, O3)				
			RMS: 1Φ of Port MPM Mtr 2 Stbd MPM Mtr 1 Port Fwd MRL Mtr 1 Port Mid MRL Mtr 2 Stbd Mid MRL Mtr 1 Stbd Aft 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 APU H2O QTY 2 ind – 0% if in BLR CNTLR/HTR 2B ④ 2Φ ops will result in degraded airflow. Crew actions will pwr fans thru alt pwr source with full 3Φ power
(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 2 • 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 1Φ of Freon Loop 1 Pump B AV Bay 1 Fan B 1Φ of AV Bay 2 Fan A	(F7) C/W AC VOLT It SM ALERT Light/Tone (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) 1 If H2O Loop 1 Pump B active: C/W H2O LOOP It 'S88 H2O PUMP P 1'	
(MO13Q) If Arlk/Tnl Fan active: • ARLK FAN B – OFF • √A – ON	1Φ of Arlk/Tnl Fan B	(O1) H2O PUMP OUT PRESS LOOP 1 = 40-45 psia	
(R2) • BLR CNTRL/HTR 2 – A	1Φ of Cabin Fan B	HYD/APU If APUs active and using H2O BLR CNTLR 2B: C/W APU TEMP It 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	HYD H2O Blr 2 Cntrlr B	3 APU H2O QTY 2 ind – 0%	
(R1) • AC2 BUS SNSR – OFF (1 sec) • AC2 BUS SNSR – AUTO TRIP			
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 It – 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	4 1Φ of WCS Fan/Sep 2		
(Continued)	(Continued)		

EPS SSR-123 (Cont) **BUS LOSS: AC2 ΦC**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
5 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 cbs on pnl MA73C: C-G (9 cbs)	6 If bus shorted: AC2 payload 3Φ Bus pwr (pwrs MS, PS Patch panel) 5 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. 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 Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into short ⑦ For unshorted bus, perform single isolation steps to prevent pwring single phase loads with coupled energy from remaining two phases ⑧ Motor B remains
7 If bus not shorted: Perform the following BUS ISOLATION steps			
7 BUS ISOLATION IF BUS <u>NOT</u> SHORTED, PERFORM (L4:N) • cb AC2 ΦC RAD ISOL A – op ----- (L4:O) • cb AC2 ΦC BLR HYD BYP 2B – op ----- (L4:Q) • cb AC2 ΦC LTG NUMERIC OS – op ----- (MA73C:F) • cb AC2 OPS INST HYD ACTR ΦC – op	8 Freon Loop 1,2 Rad Isol Motor A ----- Orbit Sta Numeric Ltg (pnls A2,A4) ----- Ops Hyd Act Inst ----- RMS: 1Φ of Port MPM Mtr 2 Stbd MPM Mtr 1 Port Fwd MRL Mtr 1 Port Mid MRL Mtr 2 Stbd Mid MRL Mtr 1 Stbd Aft MRL Mtr 2 ----- 1Φ of AC2 payload 3Φ Bus pwr (pwrs MS, PS Patch pnl)		

EPS SSR-124

BUS LOSS: AC2 FMC2

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE		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	
BUS ISOLATION ONLY ON MCC CALL, PERFORM (MA73C:C) • cb MCA LOGIC MCA PWR AC2 3Φ FWD 2 – op	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		

EPS SSR-125

BUS LOSS: AC2 MMC1

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE		NONE	
BUS ISOLATION ONLY ON MCC CALL, PERFORM (MA73C:C) • cb MCA LOGIC MCA PWR AC2 3Φ MID 1 – op	AC2 MMC1 Bus pwr LH Vent 5 Mtr 2		

EPS SSR-126

BUS LOSS: AC2 MMC2

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE	RMS: 1 Port MPM Mtr 2 1 Stbd MPM Mtr 1 2 Port Fwd MRL Mtr 1 3 Stbd Aft MRL Mtr 2	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. One failure away from EVA to stow MPM or from RMS/OBSS jettison ② Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ③ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists
BUS ISOLATION ONLY ON MCC CALL, PERFORM (MA73C:C) • cb MCA LOGIC MCA PWR AC2 3Φ MID 2 – op	AC2 MMC2 Bus pwr PLBD C/L Lat 13-16 Mtr 2 Stbd Aft Bkhd Mtr 2 Port Door Mtr 2	(R13) During Rad Dpy/Sto ops, RAD LAT CNTL STBD tb indicates single mtr ops	
	Stbd Rad Lat 1-6 Mtr 2 LH Vent 3 Mtr 2		

EPS SSR-127

BUS LOSS: AC2 MMC3

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE		NONE	① Single mtr time
BUS ISOLATION ONLY ON MCC CALL, PERFORM (MA73C:D) • cb MCA LOGIC MCA PWR AC2 3Φ MID 3 – op	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		

EPS SSR-128

BUS LOSS: AC2 MMC4

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE		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 PORT tb indicates single mtr ops	① Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ② Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists ③ √MCC for Ku Ant stow reqmts
BUS ISOLATION ONLY ON MCC CALL, PERFORM (MA73C:D) • cb MCA LOGIC MCA PWR AC2 3Φ MID 4 – op	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 RMS: 1 Port Mid MRL Mtr 2 2 Stbd Mid MRL Mtr 1 3 Ku Ant Sto/Dpy Mtr 2		

EPS SSR-129

BUS LOSS: AC2 AMC2

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 AC2 3Φ AFT 2 – op	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		

BUS LOSS: AC3 (Includes all AC3 sub-buses)

(Includes all AC3 sub-buses)

MAL/ALL/GEN J

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 √MCC for Ku Ant stow reqmts
(MA73C:C) cb MCA LOGIC MCA PWR • AC3 3Φ FWD 3 – op	13 KU ANT Sto/Dpy Mtr 1 AC3 FMC3 Bus pwr 14 R ADP Dpy Mtr 1 14 -Z Star Trkr Dr Sys 2 OP/CL capability 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	SM (BFS SM 63) PL BAY DOORS During PLBD OP/CL, single mtr run time noted on actuators listed at left	⑭ Redundant mtrs remain
• AC3 3Φ MID 2 – op		During Rad Dpy/Sto ops: (R13L) RAD CNTL tbs (four) indicate single mtr ops	⑮ Hum Sep A,B Speed Norm Snrs 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		⑯ IMU Fan A,B,C Speed Norm Snrs 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	15 Hum Sep Sig Condr (ECLS SC5) 16 IMU Fan Sig Condr (ECLS SC7)		
(Continued)	(Continued)		

EPS SSR-130 (Cont)
BUS LOSS: AC3

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
ONLY ON MCC CALL, PERFORM			② Vlv holds position ⑭ Redundant mtrs remain ⑰ Motor A remains ⑱ Bypass vlv holds position and Cntrl B Rad Byp Vlv Mtr remains ⑲ Single mtr time. One failure away from EVA to stow MPM or from RMS/OBSS jettison ⑳ Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ㉑ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists
(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	17 Freon Loop 1,2 Rad Isol Motor B		
(L4:O) cb AC3 • ΦA BLR HYD BYP 2A – 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	18 Freon Loop 2 Cntrl A Rad Byp Vlv Mtr		
(L4:Q) cb AC3 • ΦA LTG COAS – op • ΦB LTG PNL MS – op • ΦC LTG PNL OS – op	Sta 1,2 COAS Itg pwr MS pnl Its (pnls R10,R12) OS pnl Its (pnls A1,A2,A6,A7,A8,A13,L9)		
(L4:R) • cb AC3 ΦB INST L/CTR – op	L/Ctr Inst Its (pnls C2,F6,F7)		
	14 ET Door Mtrs: C/L Lat Actr 2 Mtr 2 L Dr Closure Mtr 2 R Dr Closure Mtr 1 Uplock Lat Mtr 1		
	RMS: 19 Port MPM Mtr 1 19 Stbd MPM Mtr 2 20 Port Fwd MRL Mtr 2 20 Port Aft MRL Mtr 1 21 Stbd Mid MRL Mtr 2 21 Stbd Fwd MRL Mtr 1		

EPS SSR-131 **BUS LOSS: AC3 Φ A**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
(L1) • $\sqrt{}$ IMU FAN B – ON • $\sqrt{}$ C – OFF • H2O PUMP LOOP 1 (two) – ON, B • Perform (H2O Loop 2 only), H2O PUMP OPS via GPC, <u>ECLS</u> SSR-10 • FREON PUMP LOOP 2 – B • $\sqrt{}$ AV BAY 2 FAN A – ON • $\sqrt{}$ B – OFF • $\sqrt{}$ 3 FAN A – OFF • $\sqrt{}$ B – ON	1 Φ of IMU Fan C 1 1 Φ of H2O Loop 2 Pump man ON 2 H2O Loop 1 Byp Cntrl, Sig Condr 3 H2O Loop 1 Byp vlv pwr 1 Φ of Freon Loop 2 Pump A 1 Φ of AV Bay 2 Fan B 1 Φ of AV Bay 3 Fan A	MASTER ALARM Light/Tone – on (F7) C/W AC VOLT It – on 1 C/W H2O LOOP It – on (F9) AC3 Φ A AC volts < 90 (F6/F8) 4 LDG GEAR NOSE, 5 R tb – bp (O1) H2O PUMP OUT PRESS LOOP 1 meter ind – 0 psia (FSMs) S67 AC VOLTS 3 S69 FC H2 PUMP 3 S86 WSB T 2 (2) S66 HUMID SEP B S88 H2O PUMP P 1 S88 H2O LOOP TEMP S88 H2O LOOP 1 QTY SM0 THRM HYD (B) [HYD/APU] APU H2O QTY 2 ind – 0% If H2O PUMP LOOP 2 active: 'S88 H2O PUMP P 2' (O1) H2O PUMP OUT PRESS LOOP 2 ind – 40-45 psia 1 If APUs active and using BLR CNTLR/HTR 2A: C/W APU TEMP It – on after ~2 min If IMU FAN C ON: S66 IMU FAN DP S66 IMU FN SPD C	① If H2O Loop 2 Pump active, Loop 2 Pump Out Press must drop below 45 psia to trigger C/W ② H2O Loop 1 Pump Out Press, Pump Δ P, Accum Qty, Pump Out Temp snsr lost ③ H2O Loop 1 Byp Vlv holds position ④ Indicates DN when NLG down ⑤ Will <u>not</u> indicate DN when RMG down ⑥ Switch guard installed to prevent Cab Fan A from being turned off during LiOH can changeout and cabin fan filter cleaning ⑦ Brake/Skid Cntl Box A,B enabled before WOW ⑧ Inhibits H2O Loop 1 Pump Δ P, Pump Out Press, Pump Out Temp, Accum Qty, respectively ⑨ Inhibits Primary C/W for H2O Loop 1 Pump P and AC3 voltage ⑩ 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 unpwrng sub-buses: SSR-134, SSR-135, SSR-136, SSR-137 ⑪ Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into short ⑫ MCC will provide equipment reconfig info if reqd
6 Verify Cabin Fan A operation. If running, then; (L1) • Install sw guard (stowed in IFM tool kit) over Cab Fan A sw in the ON position (L4:P) • cb AC2 Φ A LG SNSR 2 – cl [SM 60 SM TABLE MAINT] 8 • Inhibit 0612605, 0612600, 0612640, 0612610 • Reset upper limit of 0450314 (FC3 H2 PUMP STATUS) to current value +0.3 volts (R2) • BLR CNTLR/HTR 2 – B (R13U) • C/W PARAM SEL tw (three) – 105, 053 • C/W PARAM – INH • C/W MEM – CLEAR • C/W PARAM SEL tw (three) – > 119 9 (R1) • AC3 BUS SNSR – OFF (1 sec) • AC3 BUS SNSR – AUTO TRIP 10 If bus shorted: • Open all AC3 Φ A cbs that pwr 3 Φ loads on pnls L4: C-I,K,M (9 cbs), MA73C: G-I (3 cbs) • Open all AC3 3 Φ ganged cbs on pnls L4:B (1 cb), MA73C: C-G (7 cbs)	7 Prox Snsr Electronics Box 1 1 Φ of Cabin Fan A 1 Φ of FC3 H2 Pump 1 Φ of FC3 Coolant Pump APY/HYD Blr Cntrl/Htr 2A 11 If bus shorted: AC3 payload 3 Φ Bus pwr (pwr MS, PS Patch panel) 10 AC3 FMC3 Bus pwr MMC2 Bus pwr MMC4 Bus pwr AMC3 Bus pwr 12 1 Φ of AC Utility Power Outlets at A15 and MO13Q		
(Continued)	(Continued)		

EPS SSR-131 (Cont)
BUS LOSS: AC3 ΦA

13	BUS ISOLATION	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
	IF BUS NOT SHORTED, PERFORM			
	(L4:J) • cb AC3 ΦA SIG CONDR HUM SEP – op	14 Hum Sep Sig Condr (ECLS SC 5)		⑬ For unshorted bus, perform single Φ isolation steps to prevent pwrng single phase loads with coupled energy from remaining two phases
	(L4:L) • cb AC3 ΦA H2O CNTLR 1 – op			⑭ Hum Sep A,B Speed Norm snrs lost
	(L4:N) • cb AC3 ΦA FREON FLOW PROP 2 – op	15 Freon Loop 2 Flow Prop Vlv		⑮ Vlv holds position
	(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		
		RMS: 1Φ of Port MPM Mtr 1 Stbd MPM Mtr 2 Port Fwd MRL Mtr 2 Port Aft MRL Mtr 1 Stbd Fwd MRL Mtr 1 Stbd Mid MRL Mtr 2		
		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 ② Av Bay 1 Fan ΔP, Air Out Temp snrsrs lost ③ Switch guard installed to prevent Cab Fan A from being turned off during LiOH can changeout and cabin fan filter cleaning ④ Freon Loop 1 P/L Hx Flow Rate, Freon Loop 2 ICH Flow Rate, and Accum Qty snrsrs lost ⑤ Freon Loop 2 P/L Hx Flow Rate Freon Loop 1 ICH Flow Rate, and Accum Qty snrsrs lost ⑥ Inhibits Primary C/W for AC3 Voltage ⑦ Sets H2O Loop 1 Pump P low limit to 45 psia and H2O Loop 2 Pump P low limit to 19.5 psia
(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 It C/W FREON LOOP It SM ALERT It C/W H2O PUMP It (F9) AC3 ΦB AC volts < 90 (FSMs) S67 AC VOLTS 3 S69 FC H2 PUMP 3 S86 HYD RSVR Q 3 SM2 HYD QTY 3 (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	
3 Verify Cabin Fan A operation. If running, then (L1) • Install sw guard (stowed in IFM tool kit) over Cab Fan A sw in the ON position		HYD/APU HYD QTY 3 – 0%	
(O17:C) • SIG CONDR FREON A – AC2 • SIG CONDR FREON B – AC2	1Φ of Cabin Fan A	(LIGHTS LOST) L/Ctr Instr Its (pnls C2,F6,F7) MS pnl Its (pnls R10,R12)	
(R13U) 6 • C/W PARAM SEL tw (three) – 053 • C/W PARAM – INH 7 • Change PRI C/W PARAM 105 low limit to 1.50 7 • Change PRI C/W PARAM 115 low limit to 0.65 • C/W MEM – CLEAR • C/W PARAM SEL tw (three) – > 119	4 Freon Sig Condr A AC3 pwr (ECLS SC1A) 5 Freon Sig Condr B AC3 pwr (ECLS SC1B)	(O1) 1 H2O PUMP OUT PRESS LOOP 2 – 40-45 psia FREON FLOW 1 – 578 pph AV Bay 1 Air Out – 45 degF	
(R1) • AC3 BUS SNSR – OFF (1 sec) • AC3 BUS SNSR – AUTO TRIP			
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		
7 Reconfig B/U C/W • 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			
(Continued)	(Continued)		

EPS SSR-132 (Cont)
BUS LOSS: AC3 ΦB

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
8 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 3Φganged cbs on pnls L4:B (1 cb), MA73C: C-G (7 cbs)	9 If bus shorted: AC3 payload 3Φ Bus pwr (pwrs MS, PS Patch panel) 8 AC3 FMC3 Bus pwr MMC2 Bus pwr MMC4 Bus pwr AMC3 Bus pwr 10 1Φ of AC Utility Power Outlets at A15 and MO13Q		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-134, SSR-135, SSR-136, SSR-137
BUS ISOLATION			
IF BUS NOT SHORTED, PERFORM			
(L4:J) • cb AC3 ΦB SIG CONDR IMU FAN – op	12 IMU Fan Sig Condr (ECLS SC7)		⑨ Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into shorts
(L4:L) • cb AC3 ΦB AV BAY 1 S/C – op			⑩ MCC will provide equipment reconfig info if reqd
(L4:N) • cb AC3 ΦB FREON SIG CONDR – op			⑪ For unshorted bus, perform single Φ isolation steps to prevent pwring single phase loads with coupled energy from remaining two phases
(L4:O) • cb AC3 ΦB HYD QTY 3 – op	Hyd Rsvr 3 Qty Snsr		
(L4:P) • cb AC3 ΦB RAD CNTLR 2A – op	13 Freon Loop 2 Cntrlr A Rad Byp Vlv Mtr		⑫ IMU Fan A,B,C Speed Norm snsr lost
(L4:Q) • cb AC3 ΦB LTG PNL MS – op	MS pnl lts (pnl R10,R12)		⑬ Bypass vlv holds position and Cntrlr B Rad Byp Vlv Mtr remains
(L4:R) • cb AC3 ΦB INST L/CTR – op	L/Ctr Inst lts (pnl C2,F6,F7)		
	RMS: 1Φ of Port MPM Mtr 1 Stbd MPM Mtr 2 Port Fwd MRL Mtr 2 Port Aft MRL Mtr 1 Stbd Fwd MRL Mtr 1 Stbd Mid MRL Mtr 2 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 ② Switch guard installed to prevent Cab Fan A from being turned off during LiOH can changeout and cabin fan filter cleaning ③ Inhibits Primary C/W for AC3 Voltage ④ Sets H2O Loop 1 Pump P low limit to 45 psia, and H2O Loop 2 Pump P low limit to 19.5 psia ⑤ Ganged cb. Isolation of shorted phase reqd to prevent coupling of energy from remaining two phases into shorts ⑥ 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 unpwrng subbuses: SSR-134, SSR-135, SSR-136, SSR-137
(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 It – on C/W FREON LOOP It – on SM ALERT It – on C/W H2O PUMP It – on (F9) AC3 ΦC AC volts < 90 (LIGHTS LOST) OS pnl Its (pnls A1,A2,A6, A7,A8,A13,L9) (FSMs) S69 FC H2 PUMP 3 S86 WSB T 3 (2) SM0 THRM HYD (B) 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 It – on after ~2 min	
2 Verify Cabin Fan A operation. If running, then: (L1) • Install sw guard (stowed in IFM tool kit) over Cab Fan A sw in the ON position			
	1Φ of Cabin Fan A		
(R2) • BLR CNTLR/HTR 3 – A	APU/HYD Blr Cntrlr/Htr 3B		
(R13U) • C/W PARAM SEL tw (three) – 053 3 • C/W PARAM – INH 4 • Change PRI C/W PARAM 105 low limit to 1.50 4 • Change PRI C/W PARAM 115 low limit to 0.65 • C/W MEM – CLEAR • C/W PARAM SEL tw (three) – > 119			
(R1) • AC3 BUS SNSR – OFF (1 sec) • AC3 BUS SNSR – AUTO TRIP			
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		
4 Reconfig B/U C/W • 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			
6 If bus shorted: • 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)	5 If bus shorted: AC3 payload 3Φ Bus pwr (pwrs MS, PS Patch panel) 6 AC3 FMC3 Bus Pwr MMC2 Bus Pwr MMC4 Bus Pwr AMC3 Bus Pwr		
(Continued)	(Continued)		

EPS SSR-133 (Cont)
BUS LOSS: AC3 ΦC

BUS ISOLATION		EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
7	IF BUS <u>NOT</u> SHORTED, PERFORM			
		8 1Φ of AC Utility Power Outlets at A15 and MO13Q		⑦ For unshorted bus, perform single Φ isolation steps to prevent pwrng 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		⑧ MCC will provide equipment reconfig info if reqd
	(L4:O) • cb AC3 ΦC BLR HYD BYP 3B – op			⑨ Motor A remains
	(L4:P)			
	(L4:Q) • cb AC3 ΦC LTG PNL OS – op	OS pnl lts (pnls A1,A2,A6, A7,A8,A13,L9)		
		RMS: 1Φ of Port MPM Mtr 1 Stbd MPM Mtr 2 Port Fwd MRL Mtr 2 Port Aft MRL Mtr 1 Stbd Fwd MRL Mtr 1 Stbd Mid MRL Mtr 2		
		1Φ of AC3 payload 3Φ Bus pwr (pwrs MS, PS Patch pnl)		

EPS SSR-134

BUS LOSS: AC3 FMC3

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE		-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	
BUS ISOLATION ONLY ON MCC CALL, PERFORM (MA73C:C) • cb MCA LOGIC MCA PWR AC3 3Φ FWD 3 – op	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		

EPS SSR-135

BUS LOSS: AC3 MMC2

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE		SM (BFS SM 63) PL BAY DOORS	① Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ② Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists ③ √MCC for Ku Ant stow reqmts
		During PLBD OP/CL, single mtr run time noted on actuators listed at left	
		(R13L) During Rad Dpy/Sto ops, RAD CNTL STBD tb (two) indicates single mtr ops	
BUS ISOLATION ONLY ON MCC CALL, PERFORM (MA73C:C) • cb MCA LOGIC MCA PWR AC3 3Φ MID 2 – op	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 RMS: 1 Port Aft MRL Mtr 1 2 Stbd Mid MRL Mtr 2 3 KU ANT Dpy/Sto Mtr 1		

EPS SSR-136
BUS LOSS: AC3 MMC4

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
NONE	RMS: 1 Port MPM Mtr 1 1 Stbd MPM Mtr 2 2 Port Fwd MRL Mtr 2 3 Stbd Fwd MRL Mtr 1	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. One failure away from EVA to stow MPM or from RMS/OBSS jettison
BUS ISOLATION 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	(R13L) During Rad Dpy/Sto ops, RAD CNTL PORT tb (two) indicates single mtr ops	② Single mtr time. One failure away from loss of two out of three MRLs. EVA or RMS jettison capability exists ③ Single mtr time. One failure away from loss of MRL latching capability. EVA or OBSS jettison capability exists

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	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
Refer to OMS/RCS Slide Rule for vlv loss info (Use FMC1 Slide for Fwd RCS)		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
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(MA73C:H) • cb AC1 FWD RCS VLV (three) – op			

EPS SSR-141**BUS LOSS: AC2 RCS/FMC2**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
Refer to OMS/RCS Slide Rule for vlv loss info (Use FMC2 Slide for Fwd RCS)		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
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(MA73C:H) • cb AC2 FWD RCS VLV (three) – op			

EPS SSR-142**BUS LOSS: AC3 RCS/FMC3**

ACTIONS	EQUIP/FUNCTION LOST	CREW INDICATIONS	NOTES
Refer to OMS/RCS Slide Rule for vlv loss info (Use FMC3 Slide for Fwd RCS)		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
BUS ISOLATION			
ONLY ON MCC CALL, PERFORM			
(MA73C:H) • cb AC3 FWD RCS VLV (three) – op			

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			

BUS LOSS: AC3 POD/AMC3

EPS SSR-146
BUS LOSS: MNA/B POD/AMC1

MAL/ALL/GEN J

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
		(O7) AFT L,R RCS TK ISOL 3/4/5 B tb – bp MANF ISOL 1 tb – bp	
		(FSMs) RCS PWR FAIL	
BUS ISOLATION ONLY ON MCC CALL, PERFORM (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
		(O7) AFT L,R RCS TK ISOL 1/2 tb – bp MANF ISOL 3,4 tb – bp XFEED 1/2 tb – bp	
		(FSMs) RCS PWR FAIL	
BUS ISOLATION ONLY ON MCC CALL, PERFORM (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)

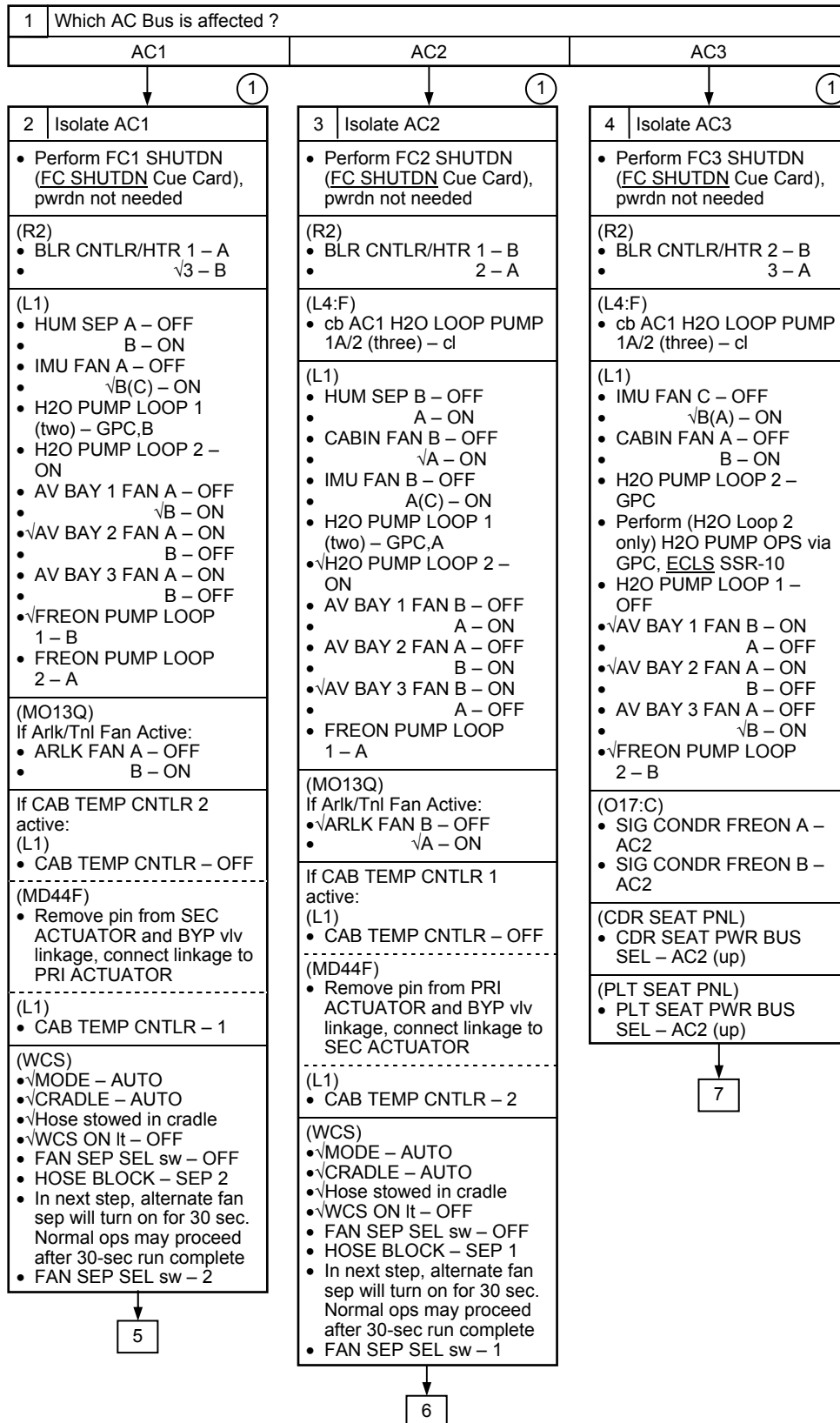
EPS SSR-200 **AC PWR TRANSFER CABLE**

NOTE

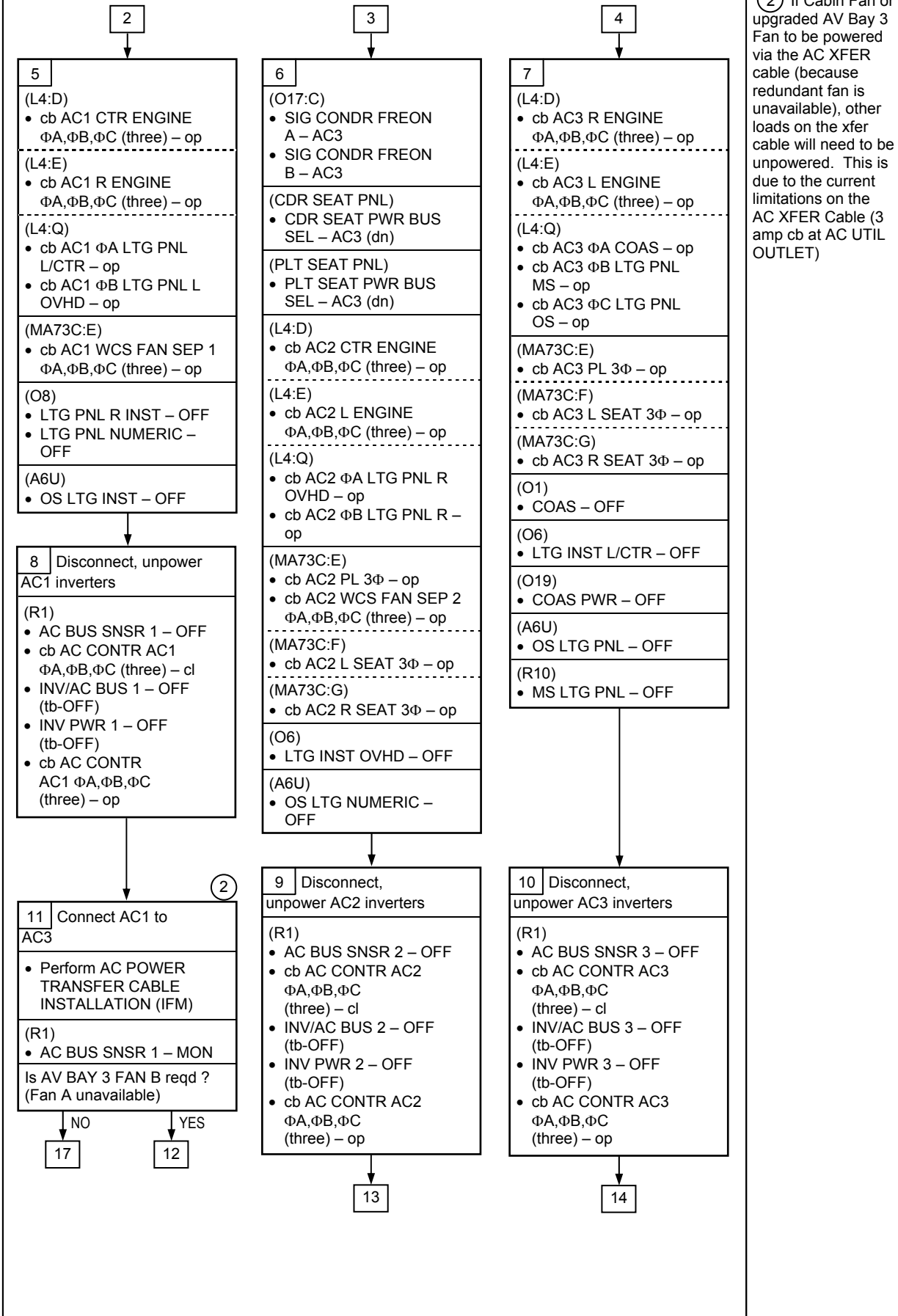
This procedure is designed to be a standalone procedure with all necessary Bus Loss Actions included. The procedure also may be entered from the MN bus or FPC Bus Loss Actions (MAL or ENT PKT)

① TIME CRITICAL

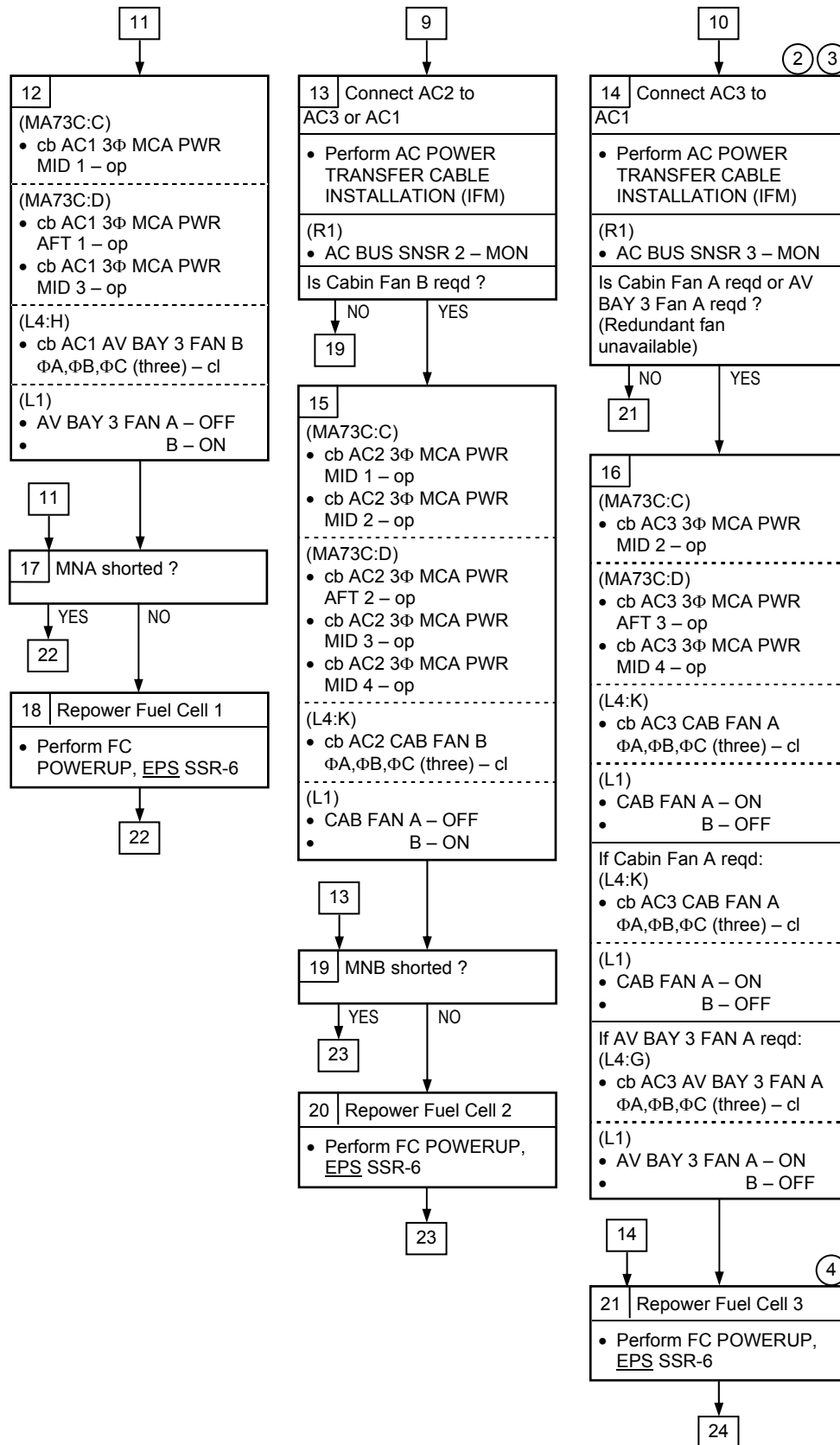
FC must be shut down within 9 min to avoid potentially hazardous condition



EPS SSR-200 (Cont)



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)

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

EPS SSR-200 (Cont)

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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

EPS SSR-200 (Cont)

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

EPS SSR-200 (Cont)

AC1 LOAD REFERENCE TABLE (Cont)

CONTINGENCY EQUIPMENT 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			
(MA73C:E) WCS FAN SEP 1	.86			
(MA73C:G) AIRLOCK TUNNEL FAN A (9)	.80			
(F1/MO52J) AC1 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

⑪ H2O LOOP 2
PUMP GPC
position pwr'd by
AC1

⑫ cb opened to prevent powering lights inadvertently

EPS SSR-200 (Cont)

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AC2 LOAD REFERENCE TABLE

5

23	CONTINUOUS EQUIPMENT	AC CURRENT (amps/phase)	AC2 CURRENT AFTER CABLE INSTALLED		
After cable installation, the following AC2 equipment will be powered CONTINUOUSLY:			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		AC CURRENT (amps/phase)	AC2 CURRENT		
After cable installation, the following equipment will be available for INTERMITTENT operation:			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 3Φ 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

EPS SSR-200 (Cont)

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

EPS SSR-200 (Cont)

AC2 LOAD REFERENCE TABLE (Cont)

CONTINGENCY EQUIPMENT		AC CURRENT (amps/phase)	AC2 CURRENT AFTER CABLE INSTALLED		
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			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: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	.86			
(MA73C:G) AIRLOCK TUNNEL FAN B		.80			
		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

EPS SSR-200 (Cont)

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AC3 LOAD REFERENCE TABLE

5

24	CONTINUOUS EQUIPMENT		AC CURRENT (amps/phase)	AC3 CURRENT AFTER CABLE INSTALLED		
After cable installation, the following AC3 equipment will be powered CONTINUOUSLY:				ΦA	ΦB	ΦC
(R1) FUEL CELL 3 PUMPS			.81	.81	.81	
(L4:J) AC3 ΦA HUM SEP S/C			.02			
(L4:J) AC3 ΦB IMU FAN S/C			.02			
(L4:L) AC3 ΦA H2O CNTLR 1 (S/C)			.06			
AC3 ΦB AV BAY 1 S/C			.02			
(L4:O) AC3 ΦB HYD QTY 3			.02			
AC3 ΦA BLR HYD BYP SENSOR 2A			.07			
AC3 ΦC BLR HYD BYP SENSOR 3B			.07		.07	
(L4:P) AC3 ΦA LG PROX SNSR 1			.07			
(15) SUBTOTAL AMPS/PHASE			1.03	.87	.87	
INTERMITTENT EQUIPMENT			AC CURRENT (amps/phase)	AC3 CURRENT		
After cable installation, the following AC3 equipment will be available for INTERMITTENT operation:				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

EPS SSR-200 (Cont)

AC3 LOAD REFERENCE TABLE (Cont)

INTERMITTENT EQUIPMENT (Cont)	AC CURRENT (amps/phase)	AC3 CURRENT AFTER CABLE INSTALLED		
		ΦA	ΦB	ΦC
(MA73C:C) (Cont) AC3 3Φ 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 3Φ 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

EPS SSR-200 (Cont)

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: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			
(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 pwr'd 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

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	

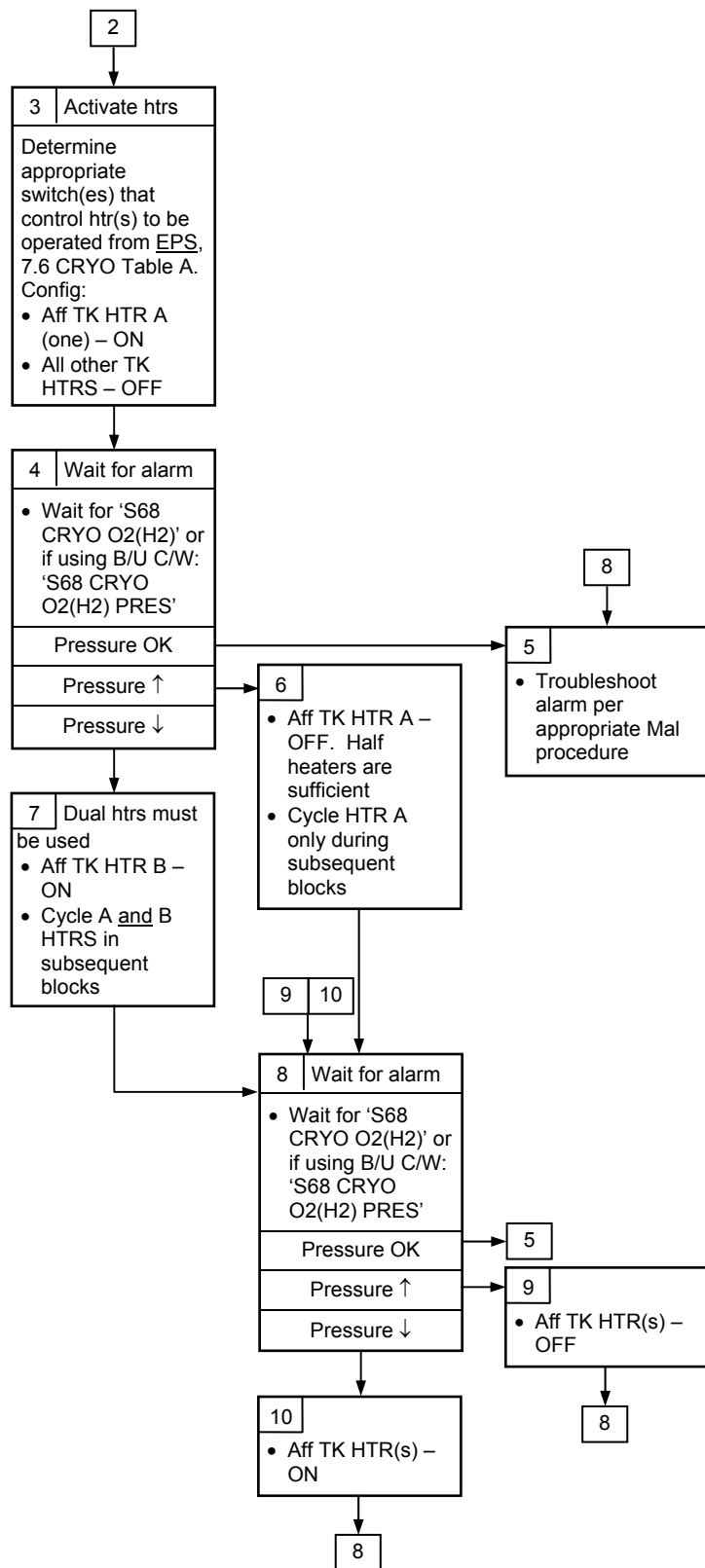
3

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

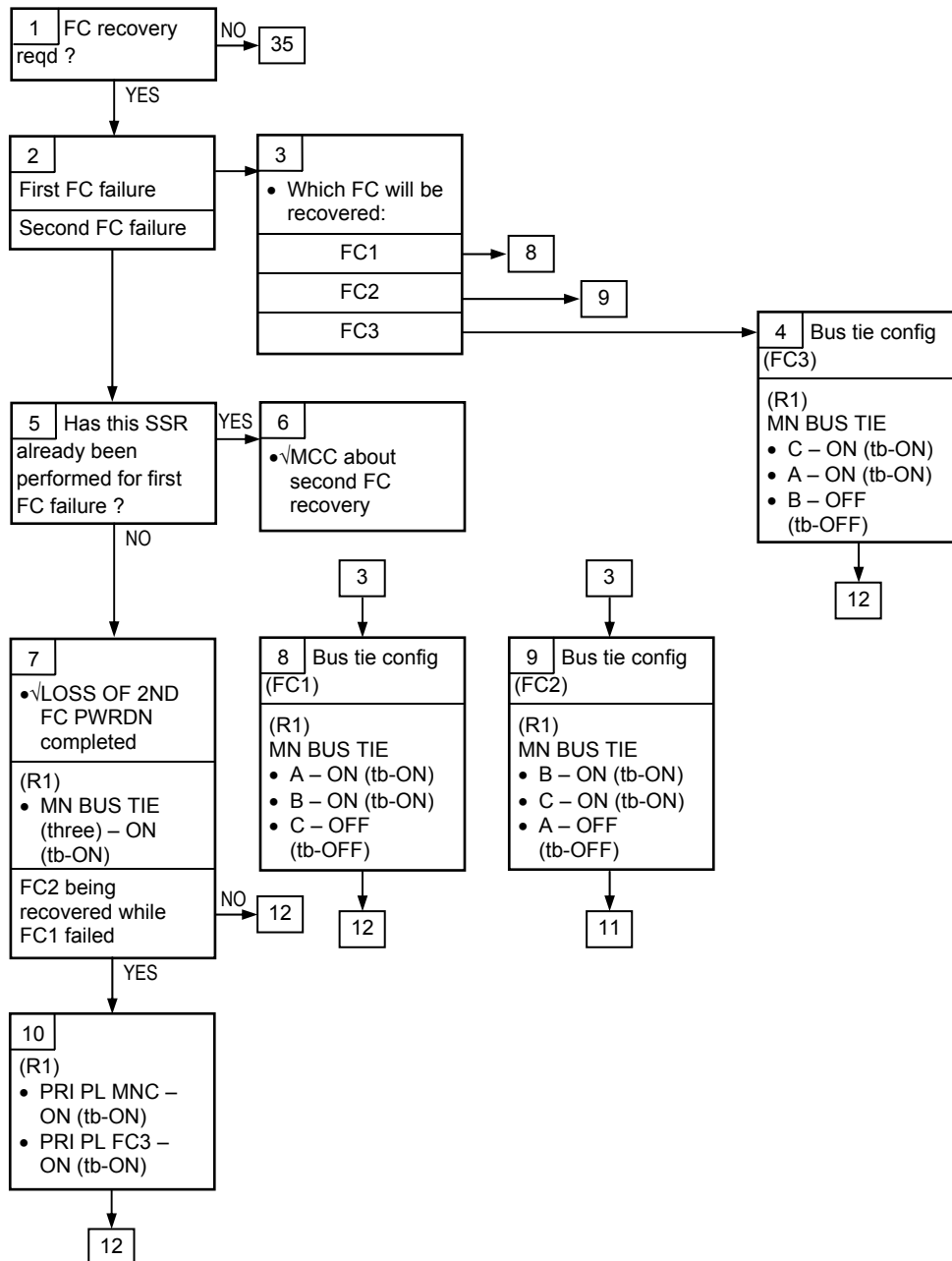
EPS SSR-201 (Cont)



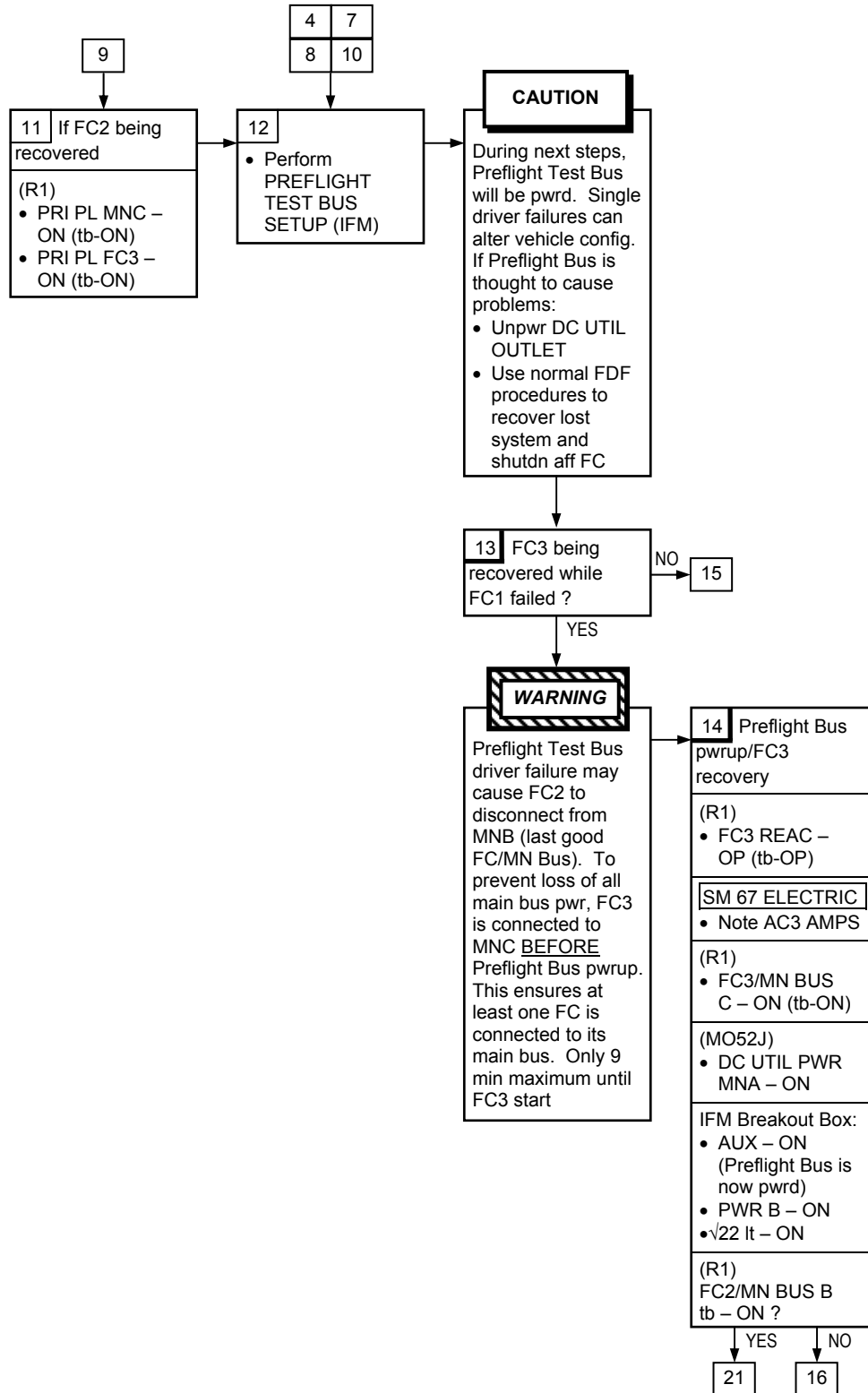
EPS SSR-202 **PREFLIGHT TEST BUS USE**

NOTE

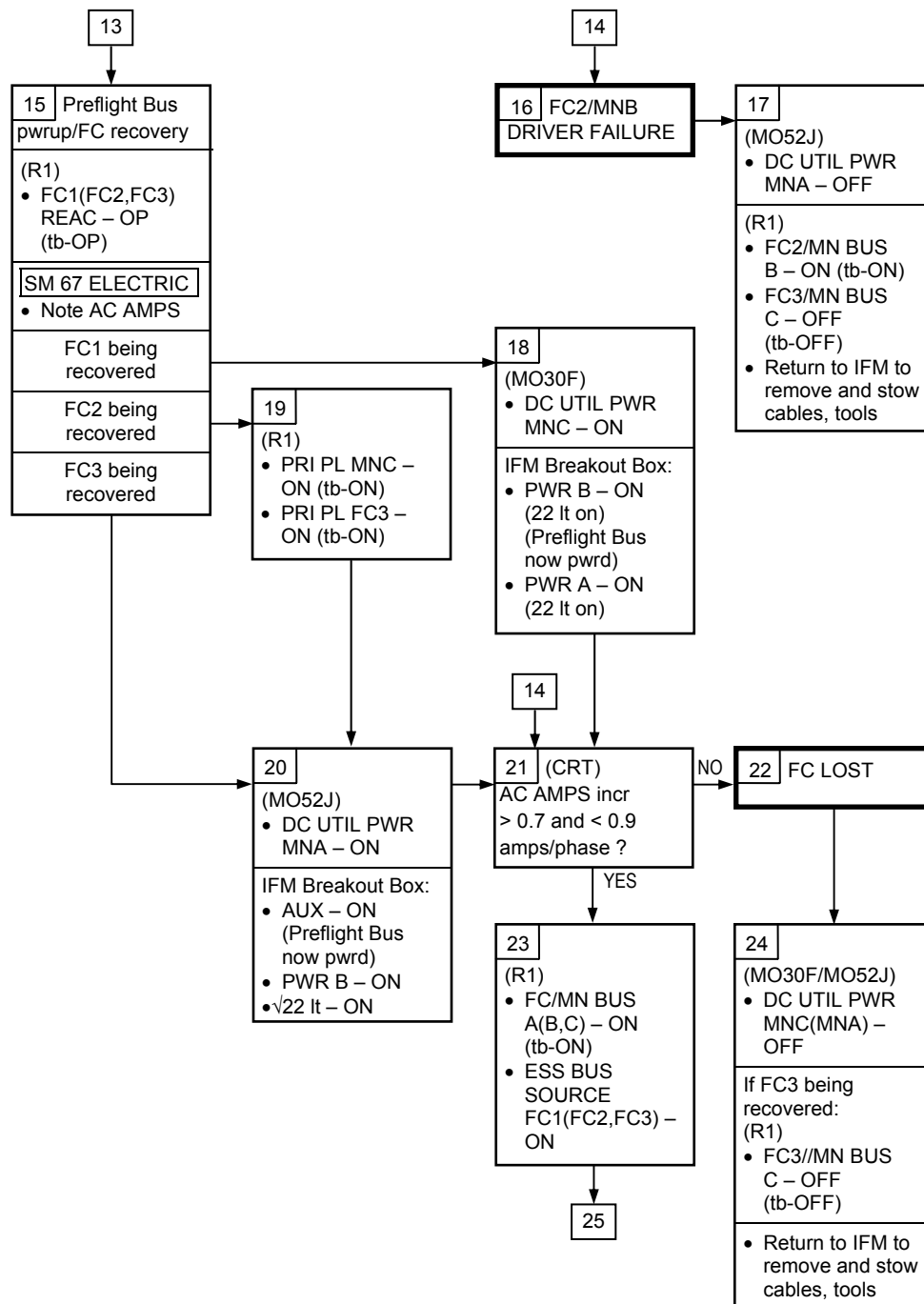
Powering Preflight Test Bus enables single string circuits that use launch MDMs and data bus normally used to operate many orbiter systems during ground turnaround. Due to design, a single driver failure could cause equipment to be inadvertently commanded whenever Preflight Test Bus is powered. See Table 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



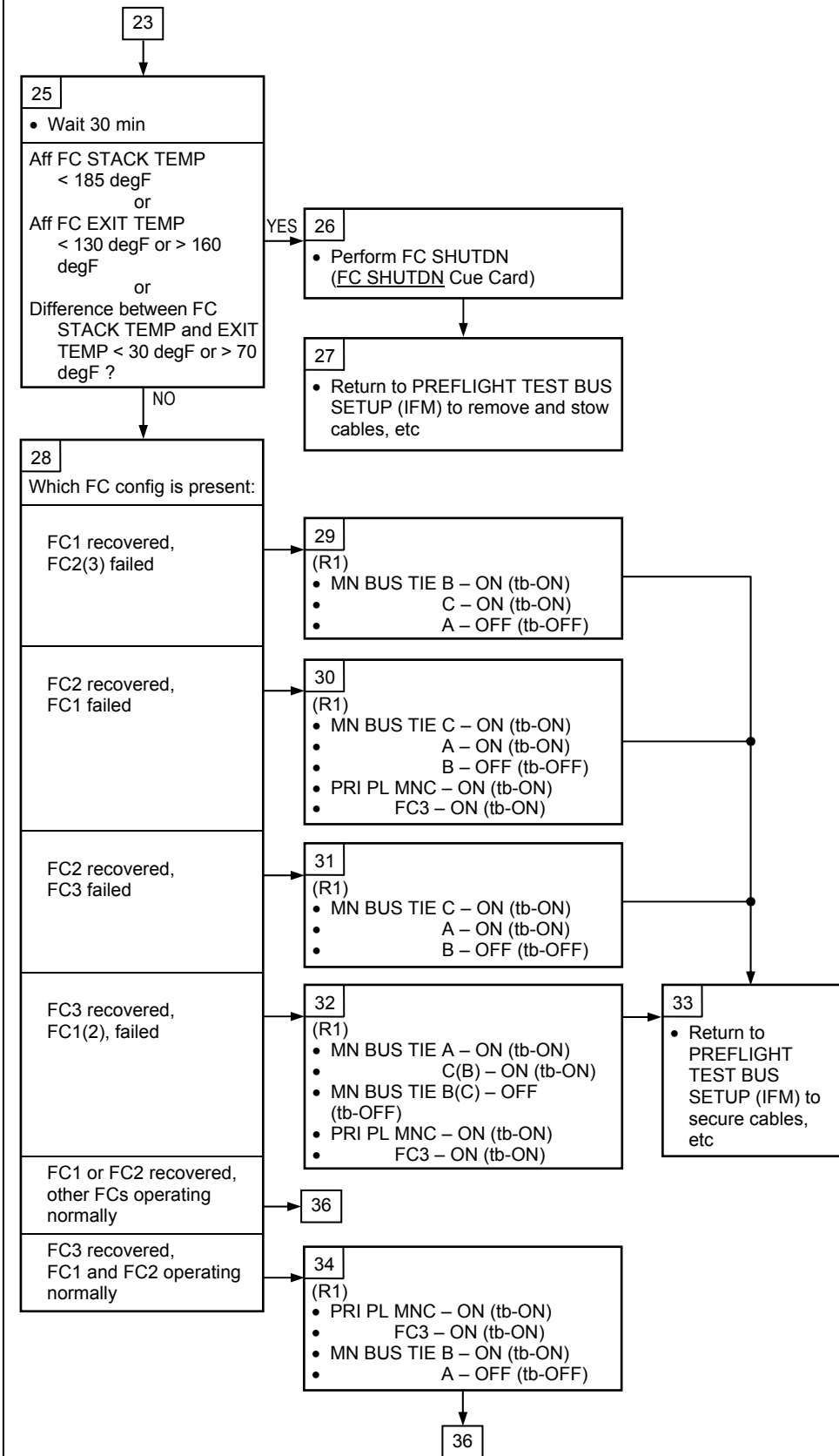
EPS SSR-202 (Cont)



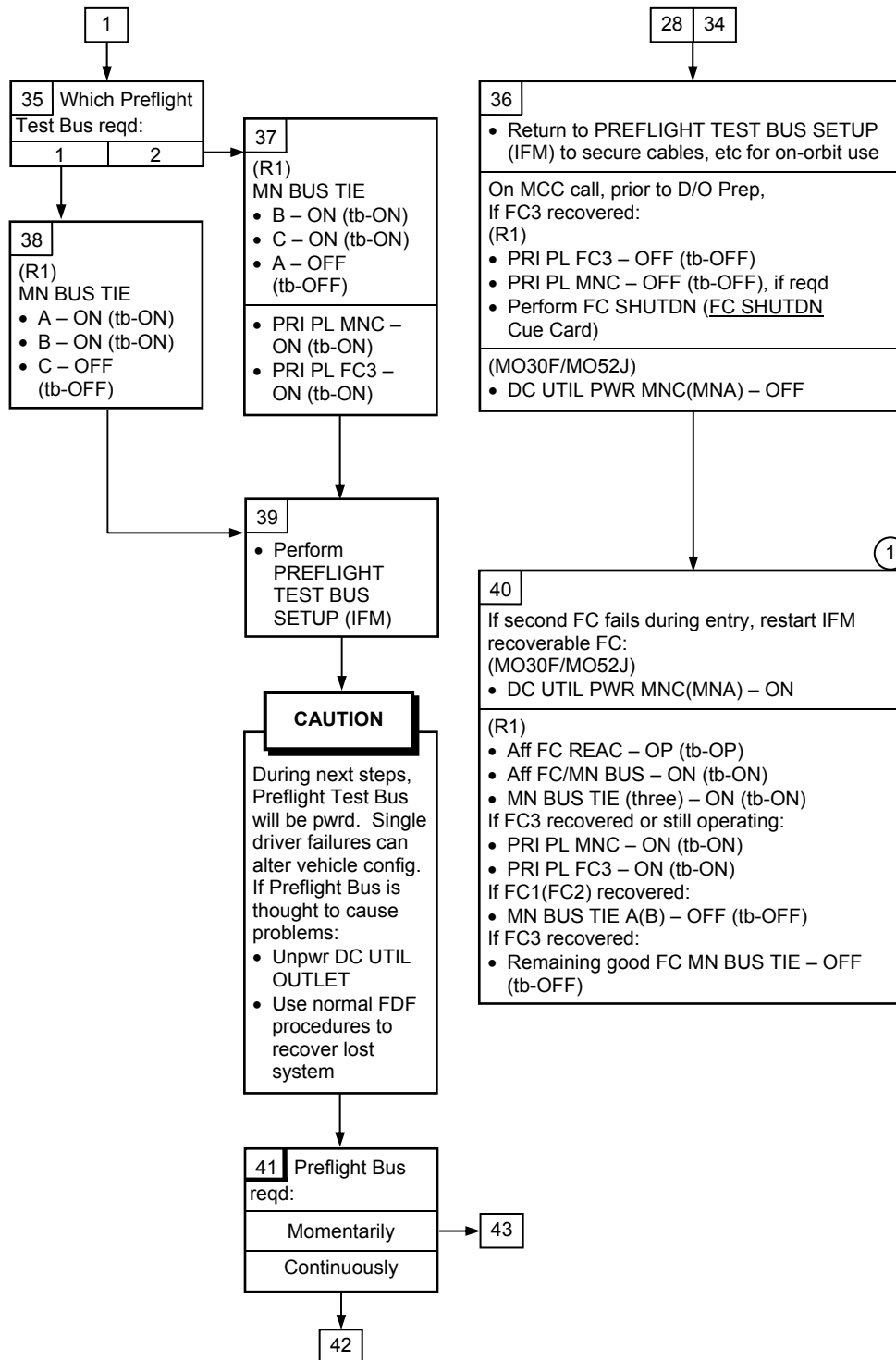
EPS SSR-202 (Cont)



EPS SSR-202 (Cont)

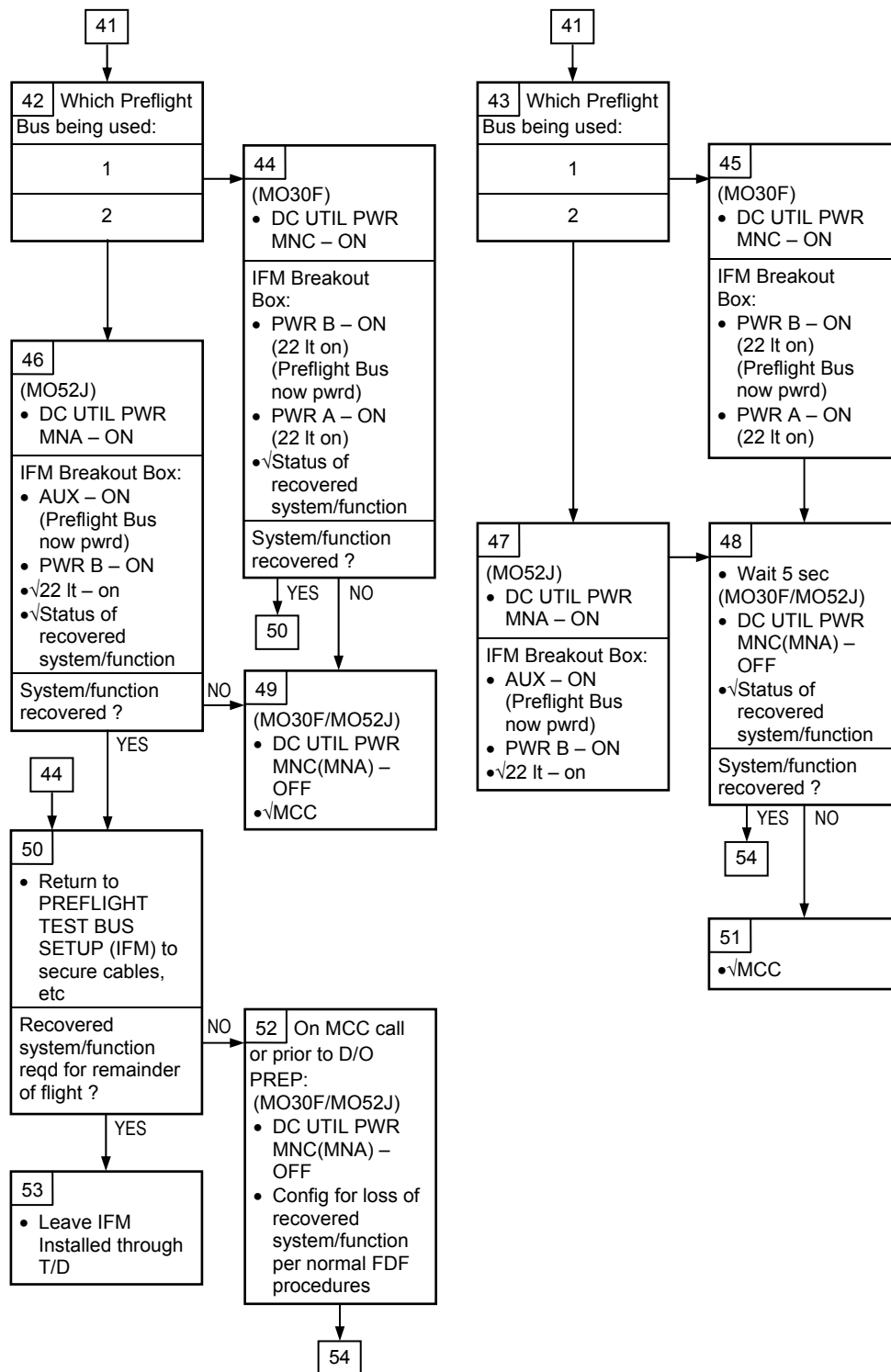


EPS SSR-202 (Cont)



1 Crewmember must be able to reach DC UTIL PWR switch while secured in seat

EPS SSR-202 (Cont)



EPS SSR-202 (Cont)

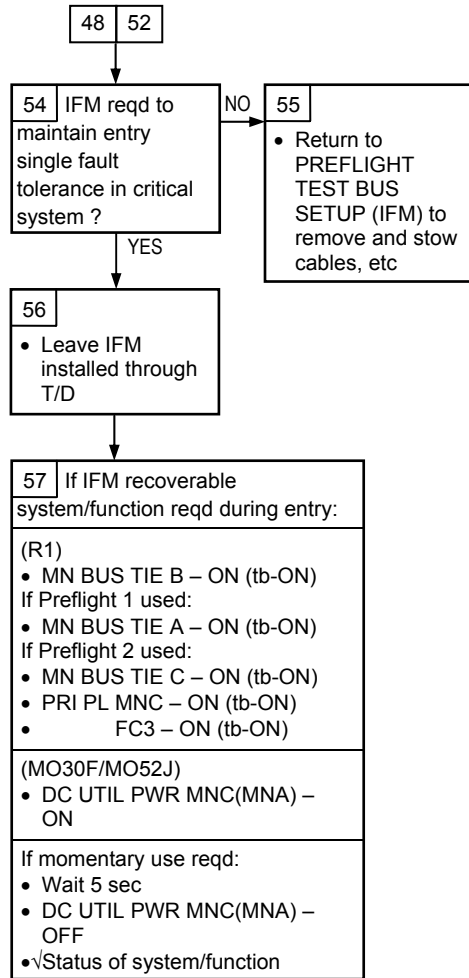


TABLE 1
POSSIBLE PREFLIGHT TEST AND DATA BUSES COMMANDS

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

FC1 PUMP POWER
AV BAY 3 FIRE SUPP INH
FC1 TO MNA ON/OFF
MNA BUS TIE ON/OFF
AC1 INV PWR ON/OFF
AC1 INV TO BUS ON/OFF
APU 1 FU VLV 1 OP (NC)
APU 1 FU VLV 2 CL (NO)
FCL PUMP 1A ON
SMOKE DETN H/W ALERT INH

Preflight Test Bus 2

FC2(3) PUMP POWER
AV BAY 1(2) FIRE SUPP INH
FC2(3) TO MNB(C) ON/OFF
MNB(C) BUS TIE ON/OFF
AC2(3) INV PWR ON/OFF
AC2(3) INV TO BUS ON/OFF
APU 2(3) FU VLV 1 OP (NC)
APU 2(3) FU VLV 2 CL (NO)
FCL PUMP 2A ON
CAB FAN A(B) ON
IMU FAN A(B,C) ON

EPS SSR-203 APCU RECOVERY

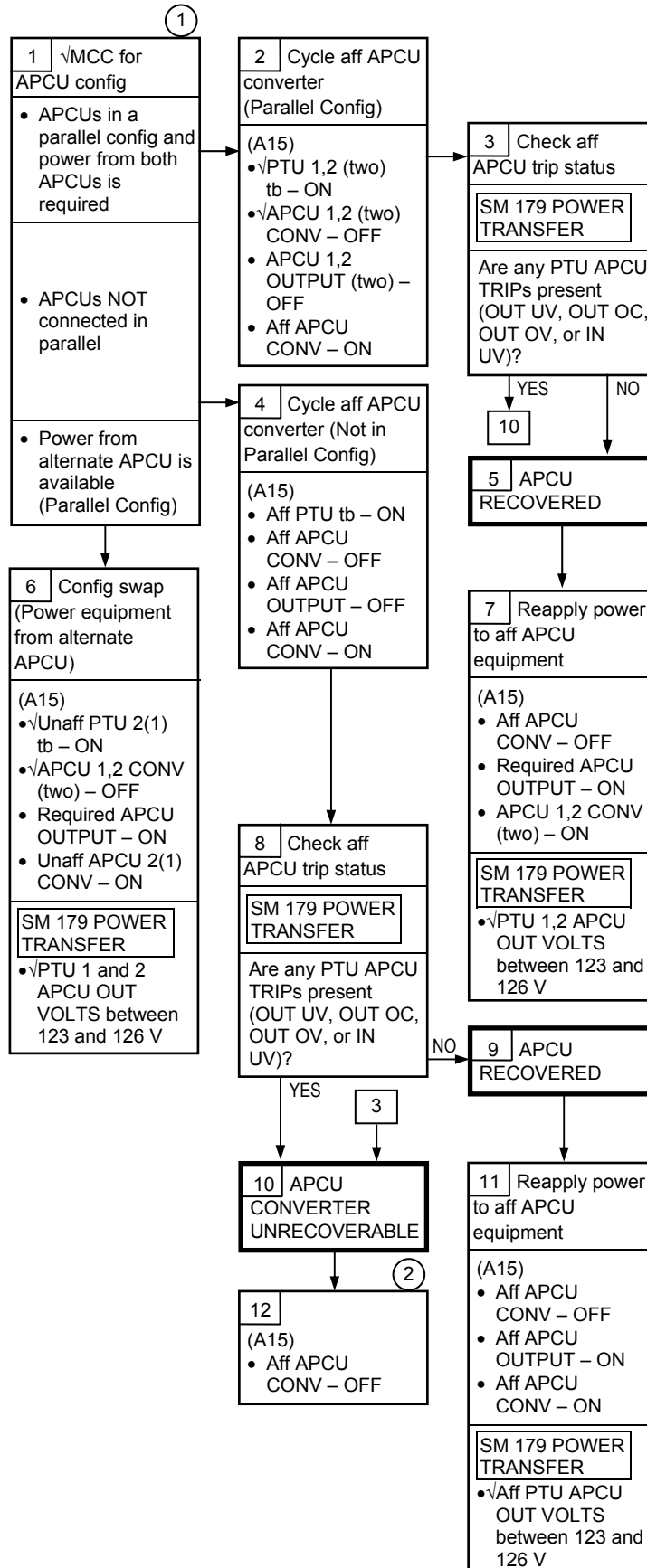
APCU TRIP Conditions:

APCU OUT UV
(Out Under Volt)
If Output Volts < 115
volts

APCU OUT OV
(Out Over Volt)
If Output Volts >
130.5 volts

APCU OUT OC
(Out Over Current)
If Output Amps >
14.8 amps

APCU IN UV
(In Under Volt)
If Input Volts < 23
volts



① If APCUs are connected in parallel and the output APCU power requirement is < 1800 watts, then alternate APCU can be used to power the equipment

② Loss of power to equipment powered from APCU

EPS SSR-204

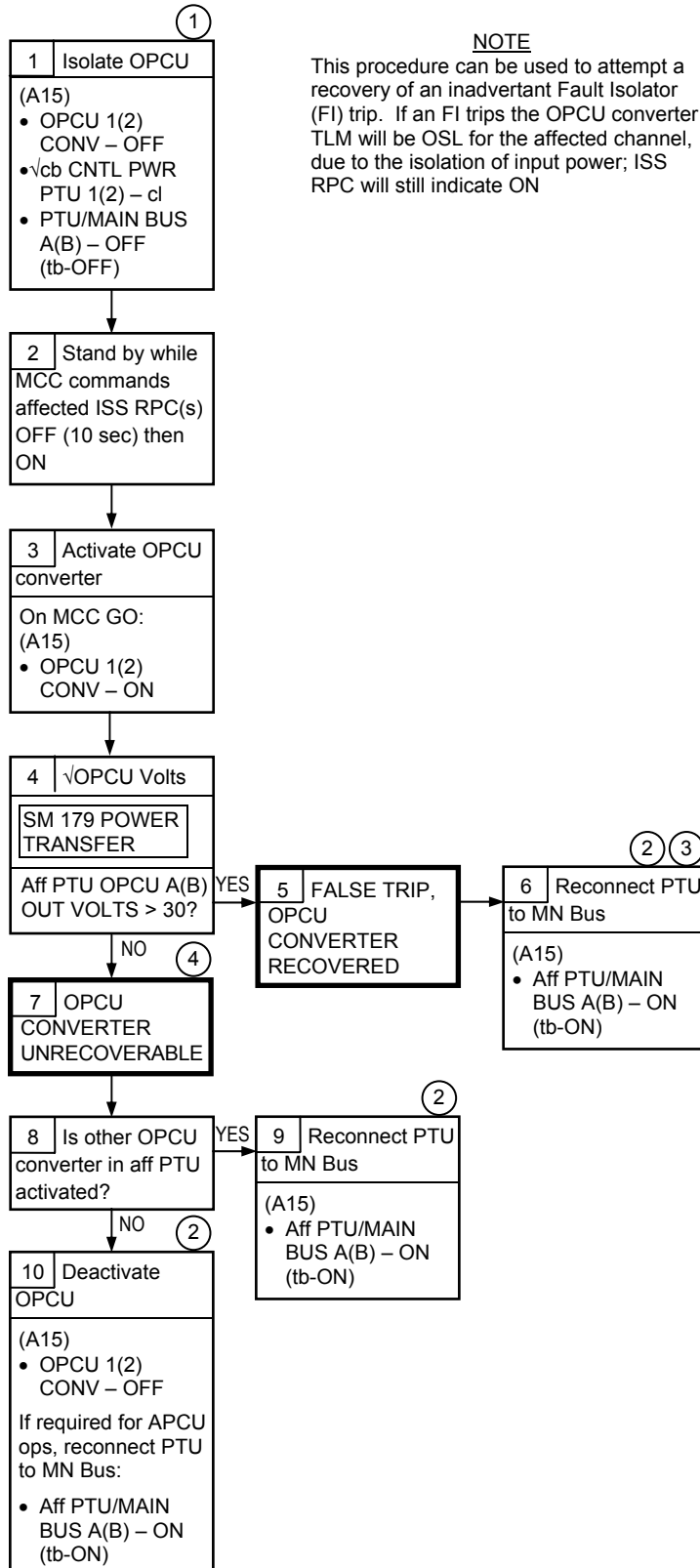
OPCU FAULT ISOLATOR TRIP RECOVERY

Dual PTU Config:

(A15)
cb CNTL PWR PTU
1,2 (two) – cl
PTU/MAIN BUS A,B
(two) – ON
OPCU 1,2 CONV
(two) – ON

Single PTU Config:

(A15)
cb CNTL PWR PTU
1(2) – cl
PTU/MAIN BUS
A(B) – ON
OPCU 1(2) CONV –
ON



① Associated APCU should be deactivated before procedure is started

② If required, APCU can be reactivated

③ Voltage will need to be adjusted on aff OPCU converter to desired setpoint

④ ISS will command off affected RPC. Other OPCU converter in affected PTU may be available

GNC

GNC FRP

GNC FRP-1	IMU REFERENCE RECOVERY AFTER GNC GPCs IPL'D.....	8-4
FRP-2	RECOVERY	8-6
FRP-3	IMU RECOVERY WITH AT LEAST ONE IMU AS GOOD REFERENCE	8-7

GNC SSR

GNC SSR-1	ACTIVATE IMU(s)	8-10
SSR-2	MATRIX (TORQUE) ALIGN USING HUD STAR DATA	8-10
SSR-3	ALIGN USING STR TRKR STAR DATA.....	8-12
SSR-4	IMU DATA.....	8-12
SSR-5	RESERVED	not used
SSR-6	RESERVED	not used
SSR-7	RESERVED	not used
SSR-8	POSITION OMS THROUGH CG.....	8-13
SSR-9	RM DESELECTION OF FAILED OPEN THC CONTACT	8-14

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

AERO DRIVE	IMU BITE/T
DAP DNMODE	RM FAIL IMU
DISPLAY SW A(L,R)	RM DLMA IMU
L(R) OMS GMBL	RHC L(R,A)
NAV EDIT	SBTC/THC L(R,A)
SEL AUTO	
SENSE SW	

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GNC FRP

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. If all IMUs have been caged, perform steps 1-7. Step 8 of the procedure assumes recovery of "operational" IMUs only. Operational IMUs are IMUs in OPER and not previously caged

- O6
1. Configure DAP
 - √DAP: INRTL
 - √DAP ROT: DISC/DISC/DISC
 2. Ensure pwr ON to both STAR TRKRs and doors open
 - √S TRK PWR (two) – ON
 - √DR POS tb (two) – OP

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. 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 *)

- O6
4. Configure DAP
 - √DAP: INRTL
 - DAP ROT: PULSE/PULSE/PULSE
 5. Deselect IMU(s) leaving one IMU selected

NOTE

RM may fail IMU(s) during deselection process

- a.

GNC 21 IMU ALIGN

 IMU DES 1(2,3) – ITEM 7(8,9) (*)
- b. Verify one operational IMU remains selected (no *)
6. Configure DAP
 - √DAP: INRTL
 - DAP ROT: DISC/DISC/DISC
7. If extended loss of comm (ZOE not included) or no uplink CMD capability:
 - a. Perform Matrix Align of IMUs 1,2,3 in MATRIX (TORQUE) ALIGN USING HUD STAR DATA GNC SSR-2
 - b. Reselect all deselected IMUs

GNC 21 IMU ALIGN

 IMU DES – ITEM 7(8,9) EXEC (no *)

NOTE

Once comm reestablished, verify with MCC uplink of REFSMMATs complete and then proceed to IMU ALIGN – S TRK (ORB OPS, GNC)

8. If comm and uplink CMD capability exists:
 - a. Confirm with MCC uplink of REFSMMATs has been performed. Do not proceed without confirmation

GNC FRP

GNC FRP-1 (Cont)

CAUTION

Each IMU being recovered must be individually matrix aligned to itself in order to incorporate the uplinked REFSMMATs

- b. Recover IMU attitude reference of a deselected operational IMU, utilizing Matrix Alignment, aligning the IMU to itself

GNC 21 IMU ALIGN

Utilize as reference one of the IMUs currently deselected

REF IMU – ITEM 14 + __ EXEC

TYPE – ITEM 15 EXEC (MATRIX)

Align Reference IMU to itself

ALIGN IMU 1(2,3) – ITEM 10(11,12) EXEC (*)

EXEC – ITEM 16 EXEC (*)

√MCC to repeat step 8b with other deselected operational IMU

- c. Configure DAP
√DAP: INRTL
DAP ROT: PULSE/PULSE/PULSE
- d. Deselect currently selected IMU (no selected IMUs)

GNC 21 IMU ALIGN

IMU DES – ITEM 7(8,9) EXEC (*)

- e. Reselect IMU(s) aligned in step 8b

GNC 21 IMU ALIGN

IMU DES – ITEM 7(8,9) EXEC (no *)

- f. √DAP: INRTL
DAP ROT: DISC/DISC/DISC

- g. √MCC to repeat step 8b with remaining IMU

- h. When Matrix Alignment(s) Using IMU Data complete, reselect all recovered IMUs:

GNC 21 IMU ALIGN

IMU DES – ITEM 7(8,9) EXEC (no *)

- i. DAP: as reqd
- j. 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, 2. Ensure pwr applied to all IMUs
O15:A, IMU 1,2,3 – ON
O16:A
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, 2. Ensure pwr applied to all IMUs
O15:A, If not, ACTIVATE IMU(s) GNC SSR-1
O16:A

NOTE

If ITEMS 4, 5, or 6 executed, wait for asterisks to appear (~90 sec)

3. Ensure all IMUs in OPERATE mode

GNC 21 IMU ALIGN

√IMUs: OPER – ITEM 4,5,6 EXEC (*)

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

4. Enable serial data link
GNC I/O RESET

NOTE

Both nonreference IMUs should be aligned to preclude possibility
of IMU RM FAIL (RM threshold reset following any align)

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)
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 (TORQUE) 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

F3 Remove L(R) HUD Cover
F6U(F8U) L(R) HUD PWR – ON
 MODE – TEST
 Wait ~15 sec for final symbology of test mode
 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

GNC SSR-2 (Cont)

√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 $> 35^\circ$ and $< 145^\circ$ 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 $1 \geq 35 \text{ deg}, \leq 145 \text{ deg}$
ERR $1 \leq .2$

√SEL – ITEM 17,18 (*)
COAS: DES – ITEM 25 EXEC (*)
F7(F8) FLT CNTLR PWR – OFF
O14:E, cb DDU L(R) (two) – as reqd
O15:E,
O16:E

GNC 21 IMU ALIGN

√IMU 1(2,3) STAT – (blank)
ALIGN IMU 1(2,3) – ITEM 10(11,12) EXEC (*)

If Matrix Align

√REF STAR, ITEM 13 – (*)
TYPE, ITEM 15 EXEC (MATRIX)
DAP: INRTL
DAP ROT: PULSE/PULSE/PULSE
CRT EXEC – ITEM 16 EXEC (*), Rcd MET ___ : ___ : ___
√EXEC – ITEM 16 (no *)
DAP: as reqd

If Torque Align

√REF STAR, ITEM 13 – (*)
√TYPE, ITEM 15 – TORQUE
√ANG 1,2,3 $\Delta X, \Delta Y, \Delta Z$: $\leq .80$
Rcd ANG 1 2 3
 ΔX () ___ . ___ () ___ . ___ () ___ . ___
 ΔY () ___ . ___ () ___ . ___ () ___ . ___
 ΔZ () ___ . ___ () ___ . ___ () ___ . ___

CAUTION
If ANG $\Delta X, \Delta Y, \Delta Z > .80$ 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)
√REF STAR, ITEM 13 – (*)
TYPE, ITEM 15 EXEC (MATRIX)
ALIGN IMU 1(2,3) – ITEM 10(11,12) EXEC (*)
EXEC – ITEM 16 EXEC (*), Rcd MET ____ : ____ : ____
√EXEC – ITEM 16 (no *)

GNC SSR-4

MATRIX ALIGN USING IMU DATA

NOTE

Procedure assumes ground knowledge of platform
orientation of at least a single IMU

GNC 21 IMU ALIGN

√IMU 1(2,3) STAT – (blank)
REF IMU – ITEM 14 + (REF IMU) EXEC
TYPE – ITEM 15 EXEC (MATRIX)
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
CRT

√OMS ENG (two) – OFF

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

C3

DAP A(B) TRANS PLS – ITEM 17(37) +0.0 1 EXEC
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
F7(A6U)

√cb DDU L(A) (two) – cl

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

F7(A6U)
O14:E,
O15:E,
O16:E

Reload DAP A(B) as reqd

DAP TRANS: as reqd

L(A) FLT CNTLR PWR – OFF

cb DDU L(A) (two) – as reqd

MECH

	RADIATOR POWER CONFIGURATION	9-2
	PLBD POWER/MDM CONFIGURATION	9-3
<u>9.1</u>	<u>PLB DOORS</u>	
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
<u>9.2</u>	<u>RADIATOR</u>	
9.2a	RAD LAT CNTL PORT(STBD) tb NOT LAT IN 60 SEC OR REL IN 30 SEC	9-18
9.2b	RAD CNTL PORT(STBD) tb NOT DPY OR STO WITHIN 50 SEC AND NO MOTION	9-20
<u>9.3</u>	<u>KU ANT</u>	
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
<u>9.4</u>	<u>MEC ROEU</u>	
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
<u>MECH SSR</u>		
MECH	SSR-1 PORT(STBD) RAD OPS	9-38
	SSR-2 CONTINGENCY PLBD CLOSURE	9-39
	SSR-3 SIMULTANEOUS PLBD CL	9-47
	SSR-4 PLBD CHECKOUT AFTER MDM CHANGEOUT	9-52
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	SSR-6 PLBD CL MICROSW FAILURE WORKAROUND	9-54
	SSR-7 KU-BAND ANTENNA DPY/STO MICROSW FAILURE	9-56
	SSR-8 RAD DPY/STO MICROSW FAILURE WORKAROUND	9-58

RADIATOR POWER CONFIGURATION

ACTUATOR	MTR	MICROSW POWER	AC POWER			MCA LOGIC			
						LAT/RAD CNTL		LOGIC PWR	
			BUS	MECH PWR 1	MECH PWR 2	SYS A	SYS B	REL/DPLY	LAT/STOW
STBD 1-6	1	MNA MMC3 (MPC1)	AC1 MMC3		AB1, CA1 AND AB2, CA2	AB1		AB1	AB1
	2	MNB MMC2 (MPC2)	AC2 MMC2	BC1 AND BC2			BC1	BC1	BC1
STBD 7-12	1	MNA MMC3 (MPC1)	AC1 MMC3		AB1, CA1 AND AB2, CA2	AB2		AB2	AB2
	2	MNC MMC2 (MPC3)	AC3 MMC2	AB1, CA1 AND AB2, CA2			CA1	CA1	CA1
STBD DRIVE	1	MNC MMC4 (MPC3)	AC1 MMC3		AB1, CA1 AND AB2, CA2		BC1 AND BC2	BC1 AND BC2	MNA MMC3 AND BC1
	2	MNA MMC1 (MPC1)	AC3 MMC2	AB1, CA1 AND AB2, CA2		AB1 AND AB2		AB1 AND AB2	MNC MMC2 AND AB2
PORT 1-6	1	MNA MMC1 (MPC1)	AC1 MMC1	AB1, CA1 AND AB2, CA2		AB2		AB2	AB2
	2	MNB MMC4 (MPC2)	AC2 MMC4		BC1 AND BC2		BC2	BC2	BC2
PORT 7-12	1	MNA MMC1 (MPC1)	AC1 MMC1	AB1, CA1 AND AB2, CA2		AB1		AB1	AB1
	2	MNC MMC4 (MPC3)	AC3 MMC4		AB1, CA1 AND AB2, CA2		CA2	CA2	CA2
PORT DRIVE	1	MNC MMC2 (MPC3)	AC1 MMC1	AB1, CA1 AND AB2, CA2		AB1 AND AB2		AB1 AND AB2	MNA MMC1 AND AB1
	2	MNA MMC3 (MPC1)	AC3 MMC4		AB1, CA1 AND AB2, CA2		CA1 AND CA2	CA1 AND CA2	MNC MMC4 AND CA2

9-2

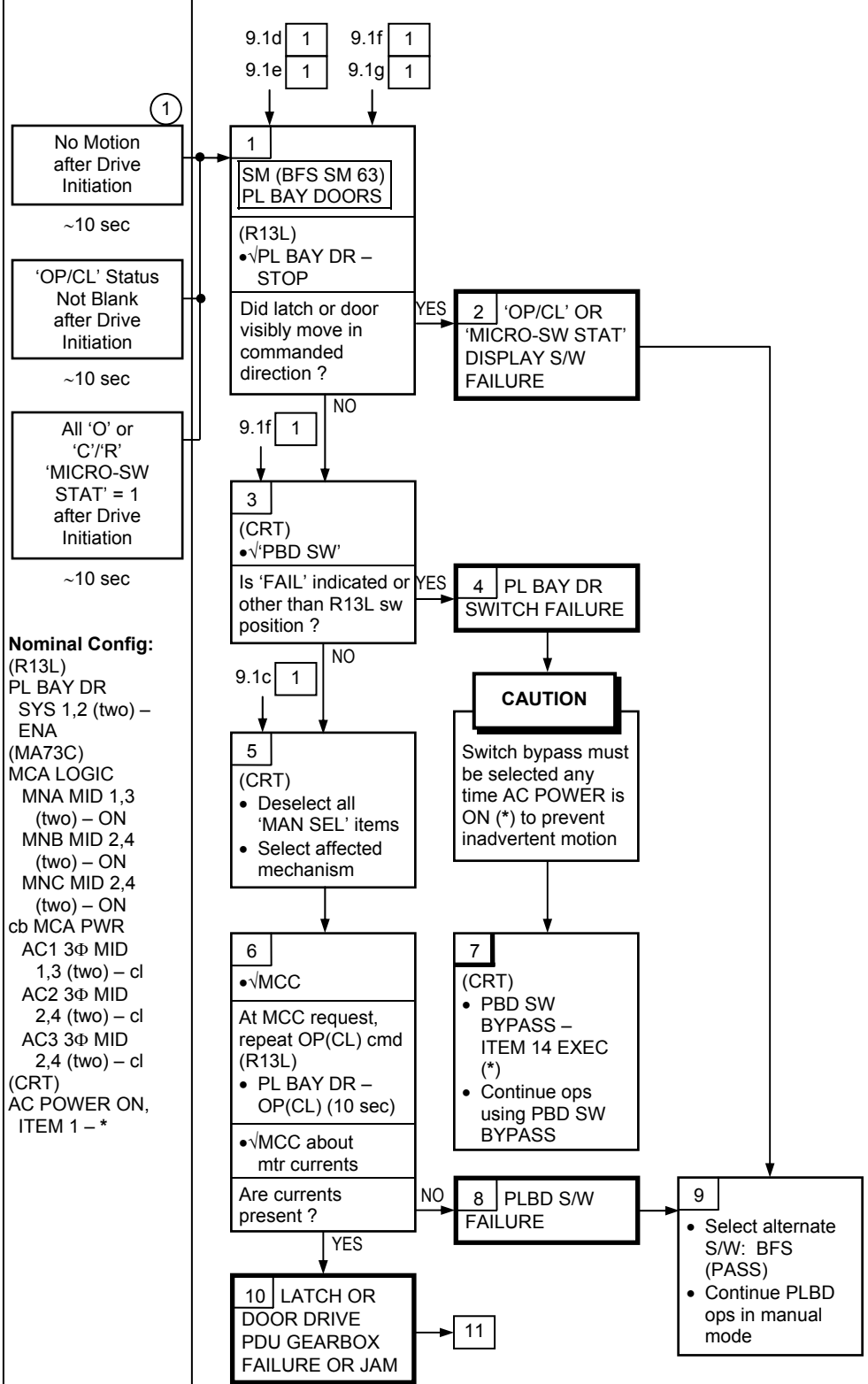
MAL/ALL/GEN J

PLBD POWER/MDM CONFIGURATION

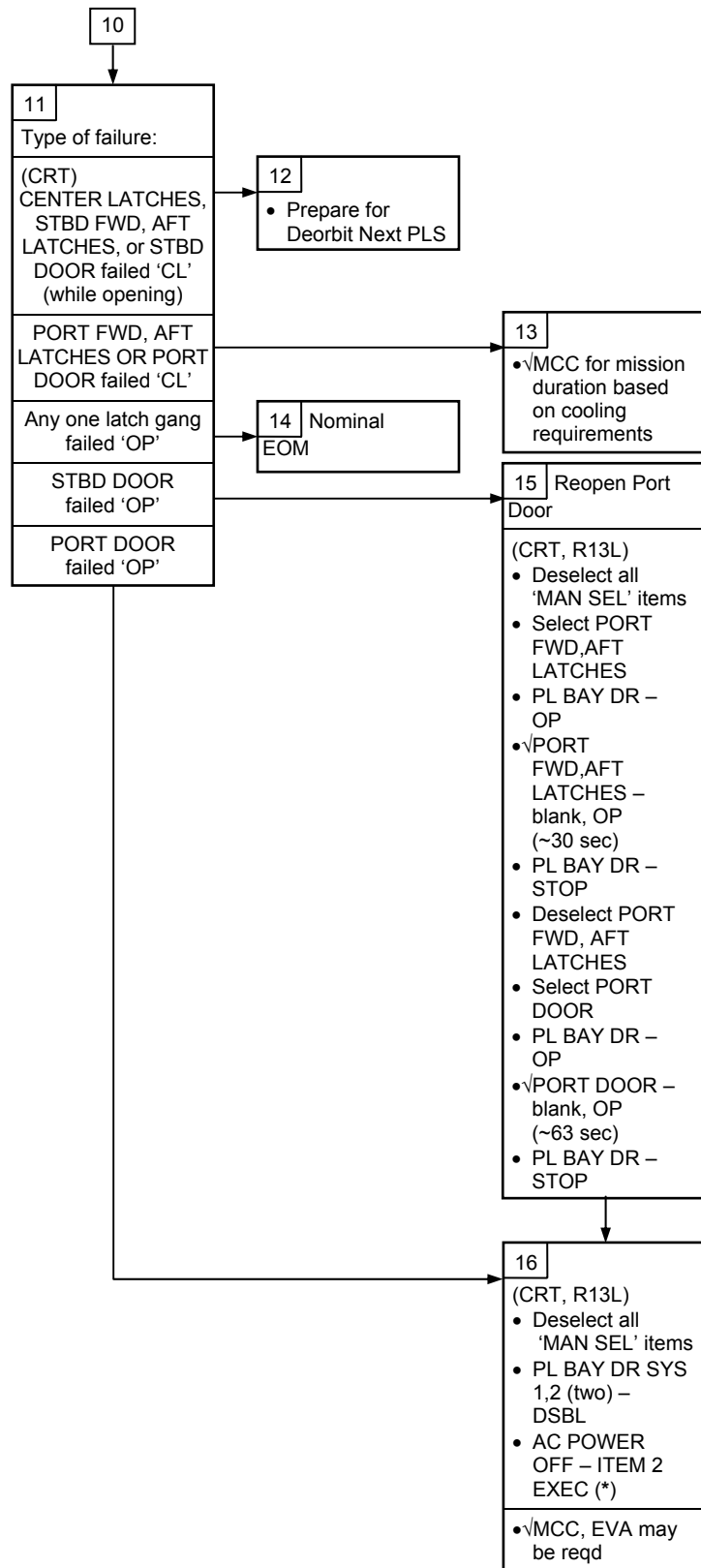
FUNCTION	PLBD CONTROL								PLBD DISPLAY PL MDM									
	Ref: MA73C: C&D for MCA (cb)																	
	MTR 1				MTR 2				C	C	O	O	C	R	R	R	O	
	AC/MCA	CNTL	MDM	SYS	AC/MCA	CNTL	MDM	SYS	A	B	A	B		A	B	C		
LATCH																		
5-8	1/MID3	AB3/AB2	PL1	2	3/MID2	CA3/CA1	PL2	1	1	2	1	2						
9-12	1/MID1	AB3/AB1	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



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

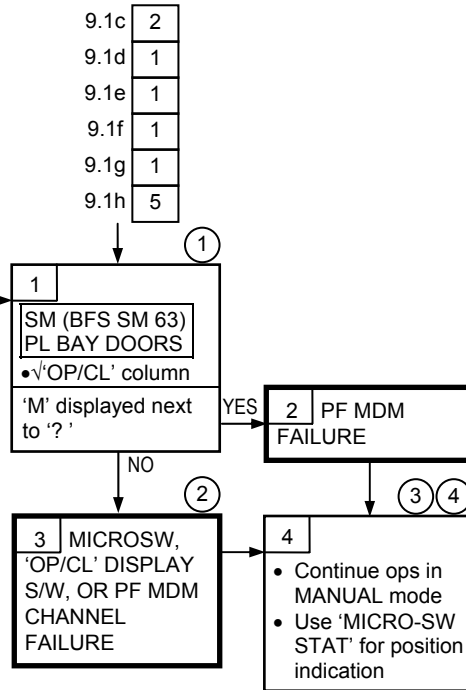


MECH

9.1b '?' DISPLAYED IN 'OP/CL' COLUMN

'?' 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)

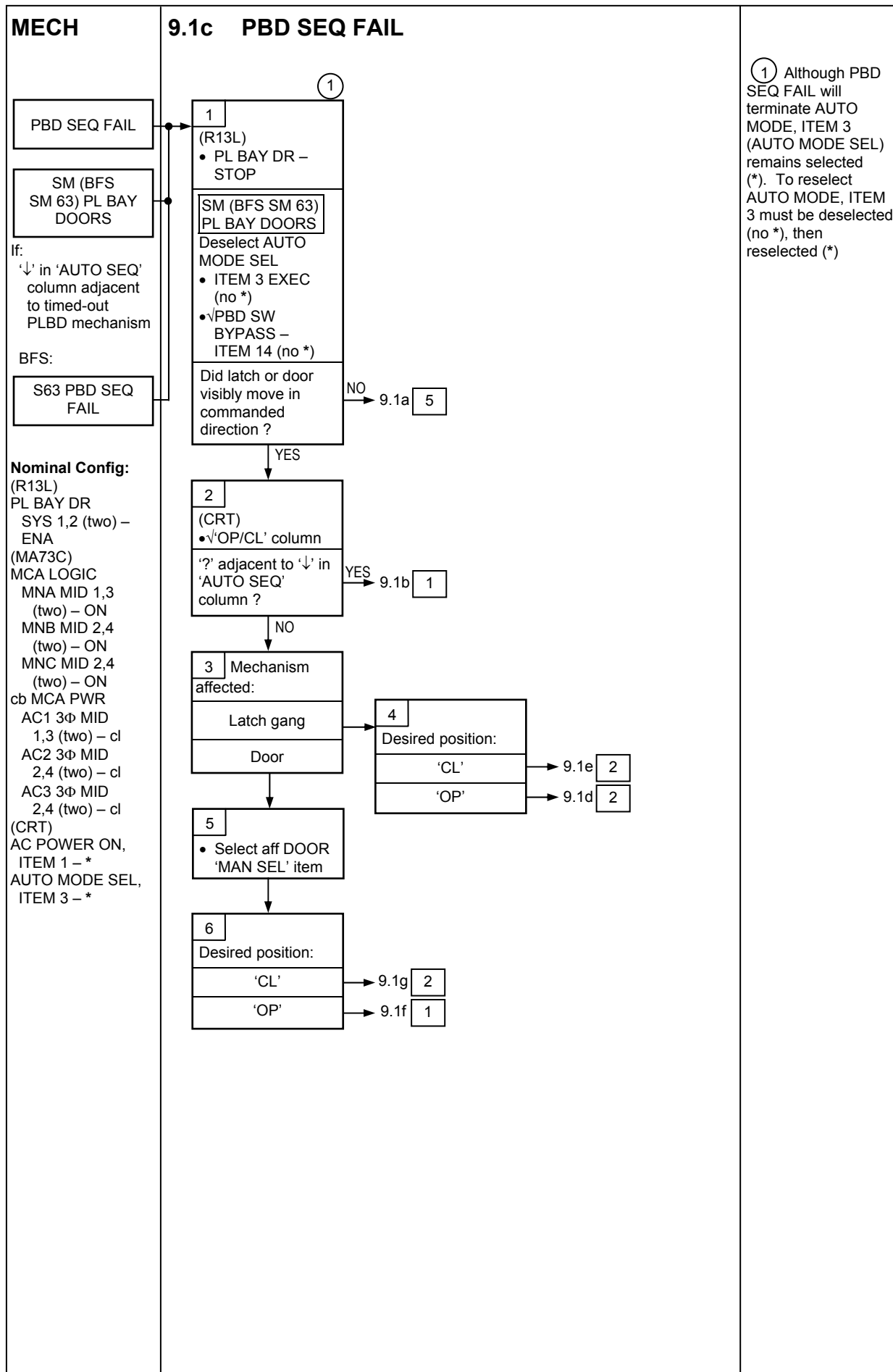
FWD and AFT 'R':
microsws

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



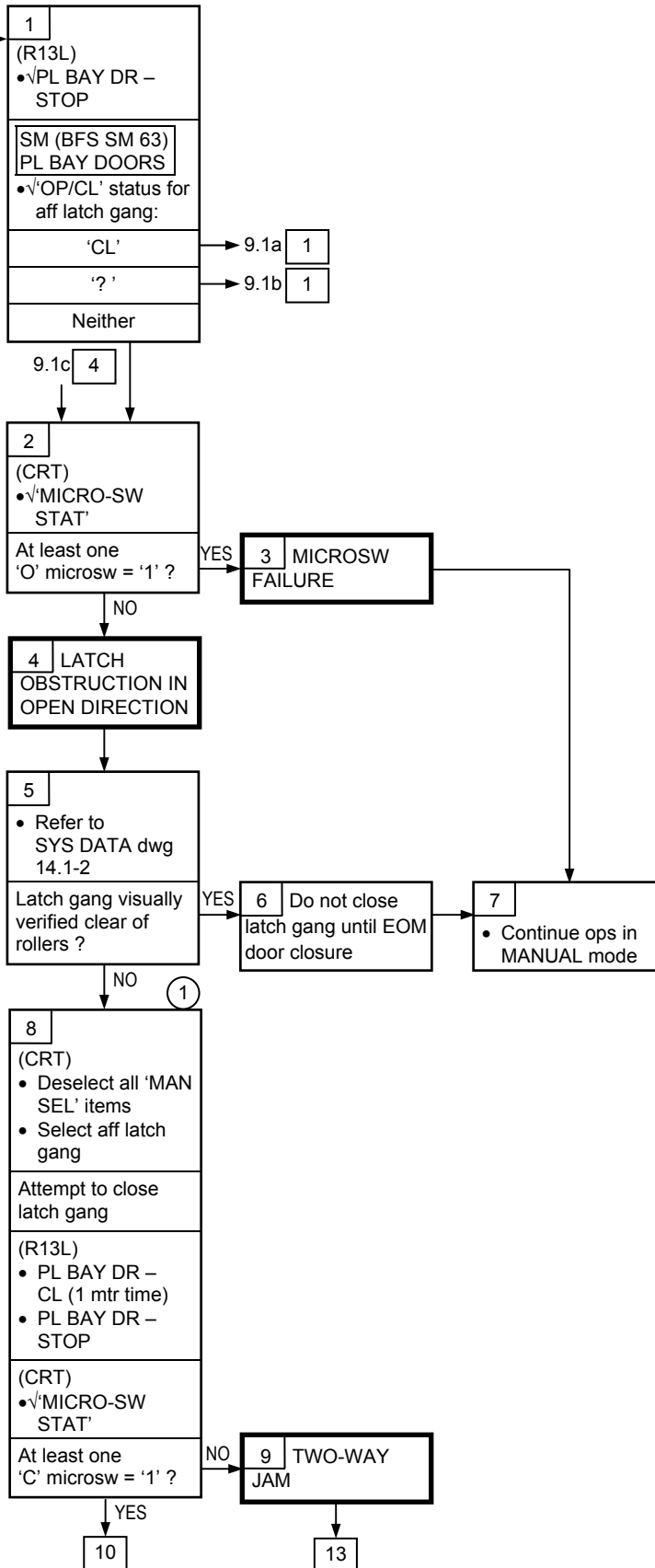
MECH

9.1d LATCH GANG NOT 'OP' IN SINGLE MTR TIME

① Latch Gang Does Not Indicate 'OP' in Single Mtr Drive Time

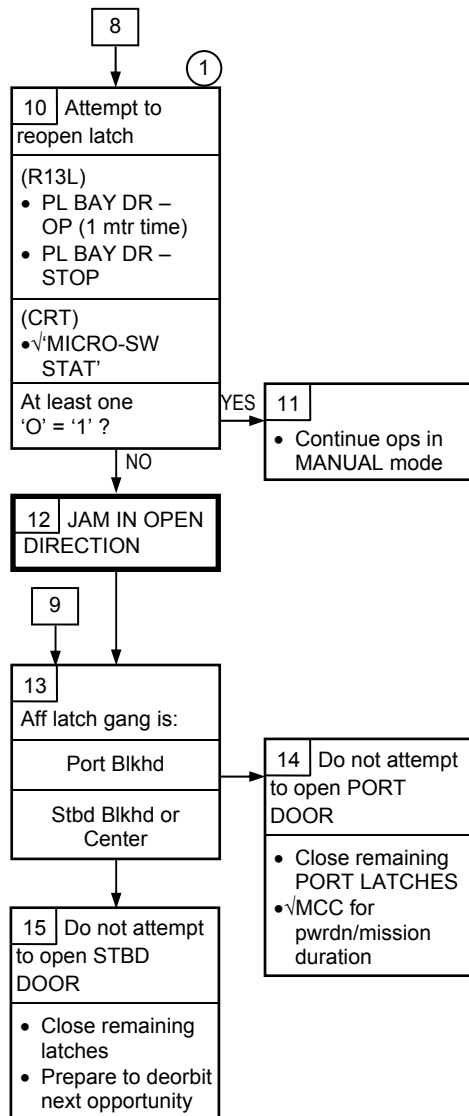
Nominal Config:

(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 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

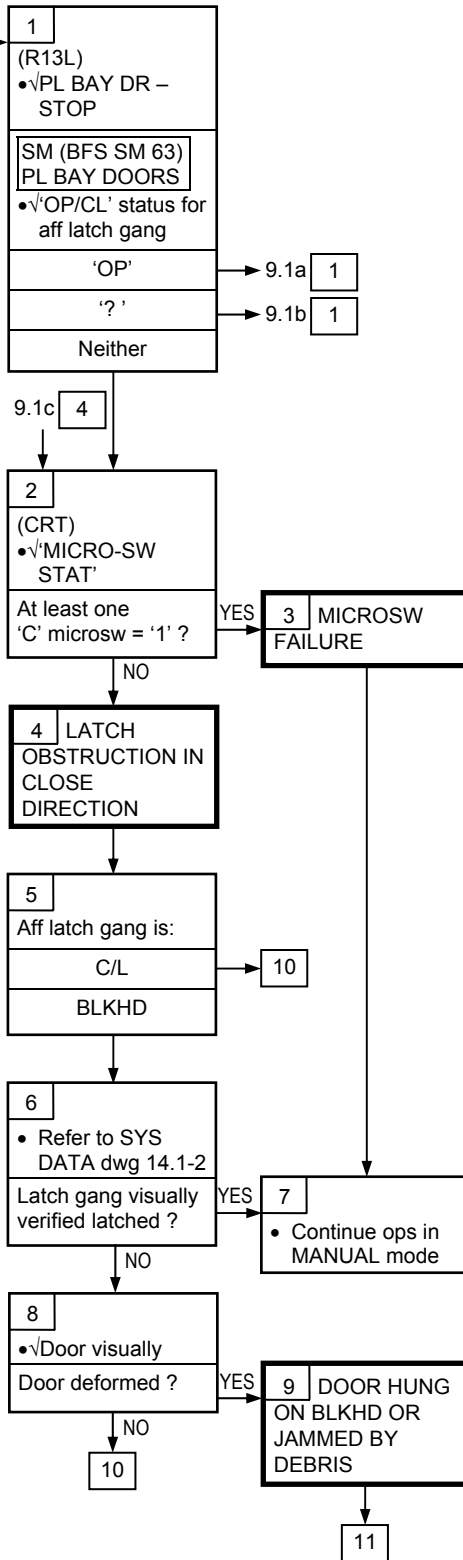
MECH

9.1e LATCH GANG NOT 'CL' IN SINGLE MTR TIME

① Latch Gang Does Not Indicate 'CL' in Single Mtr Drive Time

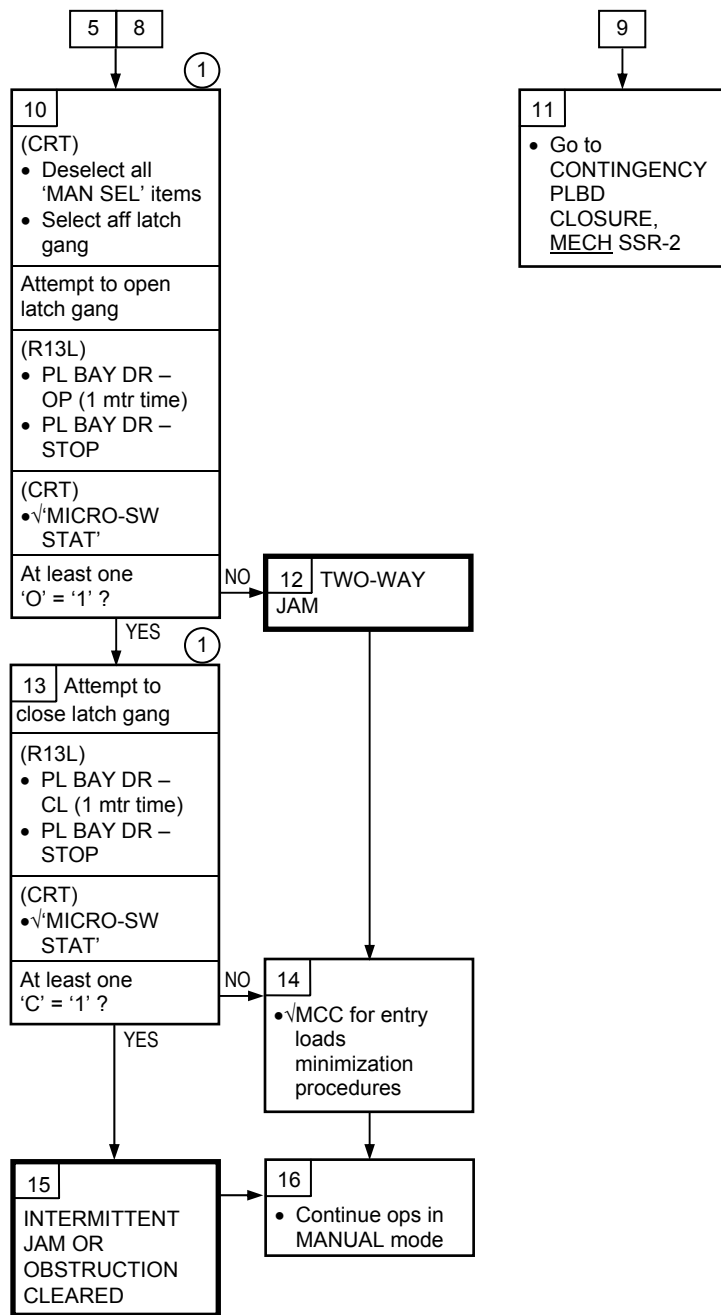
Nominal Config:

(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 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 9.1e (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
 DOOR
 2 mtrs ~63 sec
 1 mtr ~126 sec

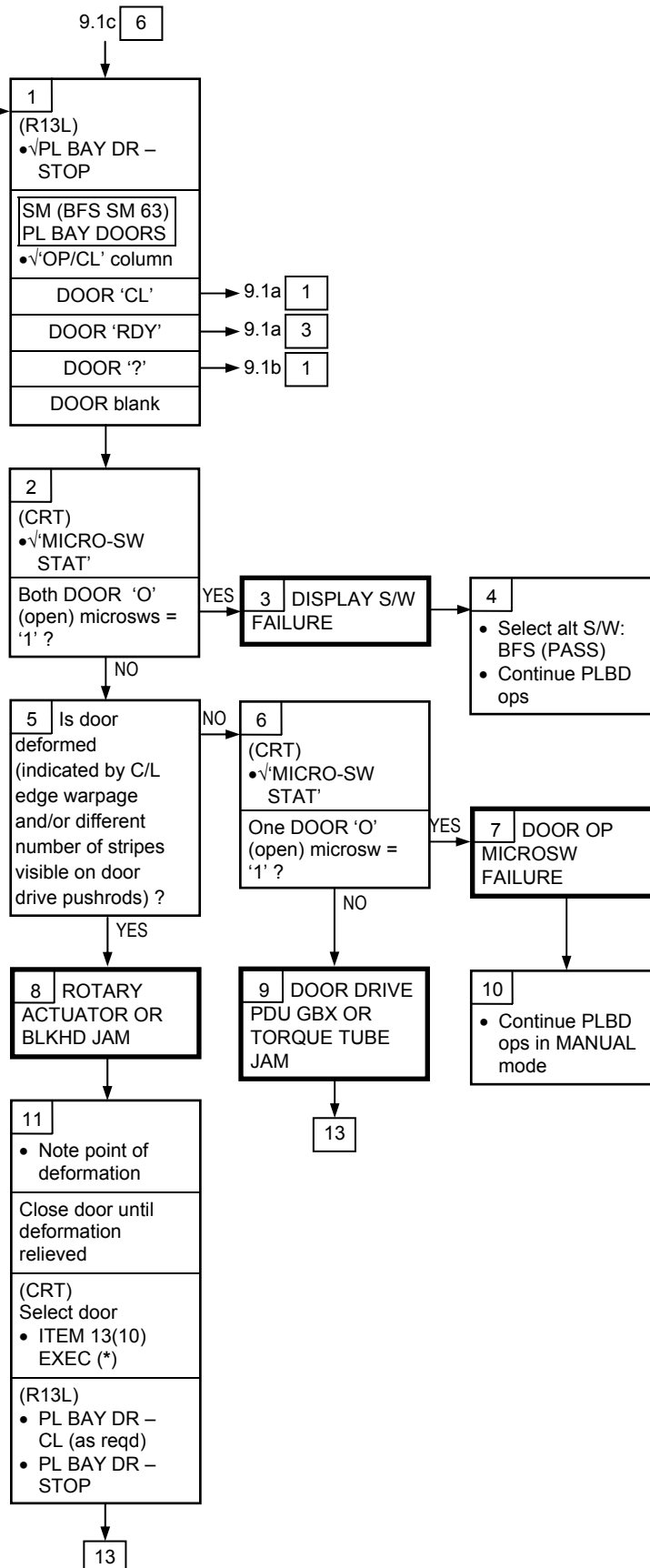
MECH

9.1f DOOR NOT 'OP' IN SINGLE MTR TIME

① Door Does Not Indicate 'OP' in Single Mtr Time

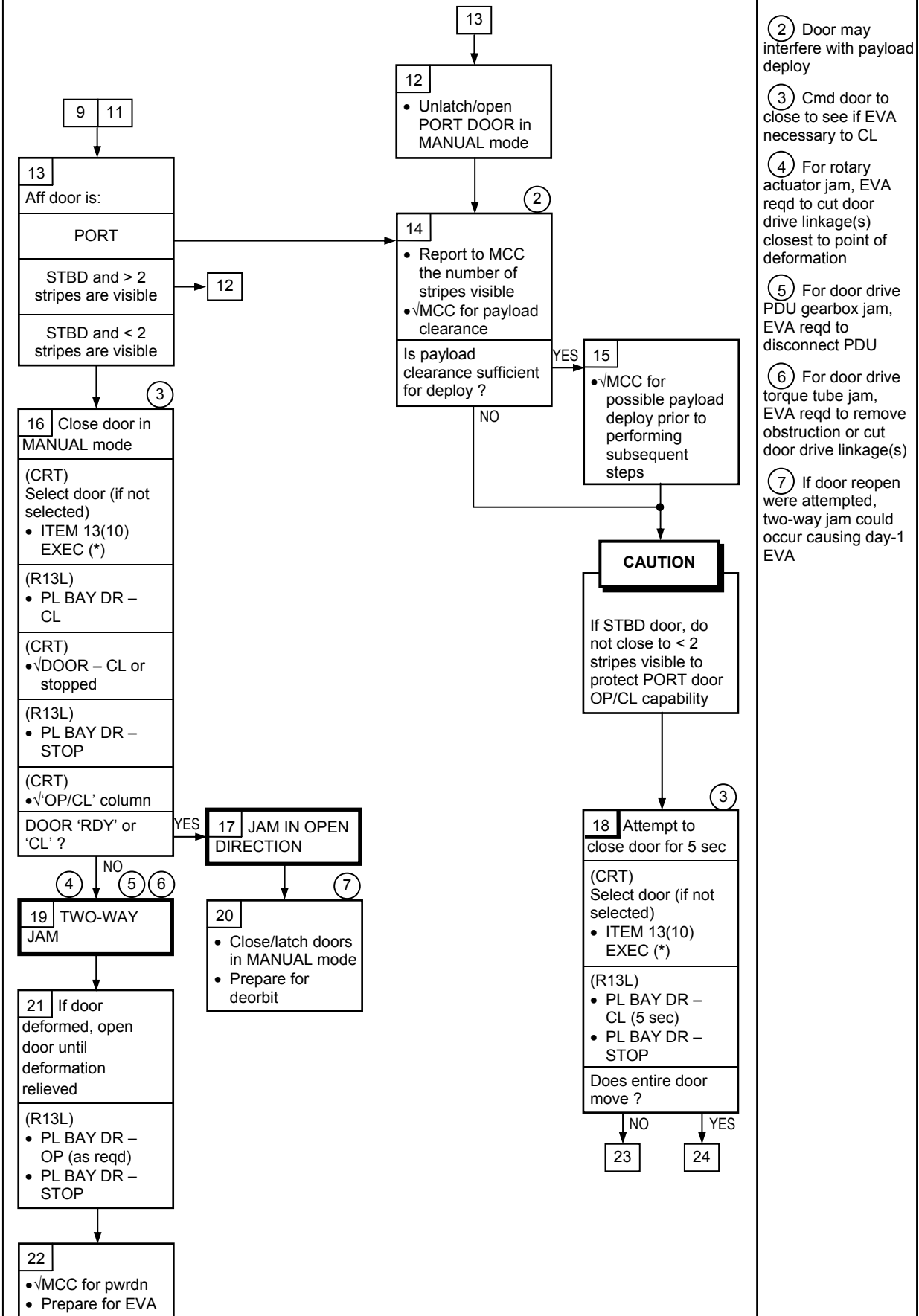
Nominal Config:

(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 – *)

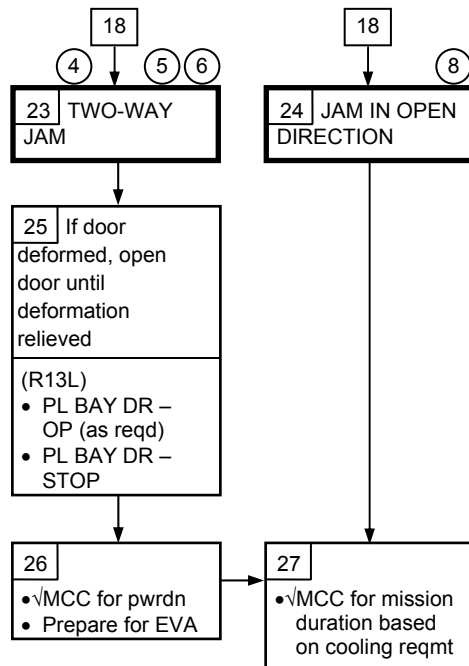


① Drive Times
CENTER LATCHES
2 mtrs ~20 sec
1 mtr ~40 sec
FWD,AFT LATCHES
2 mtrs ~30 sec
1 mtr ~60 sec
DOORS
2 mtrs ~63 sec
1 mtr ~126 sec

MECH 9.1f (Cont)



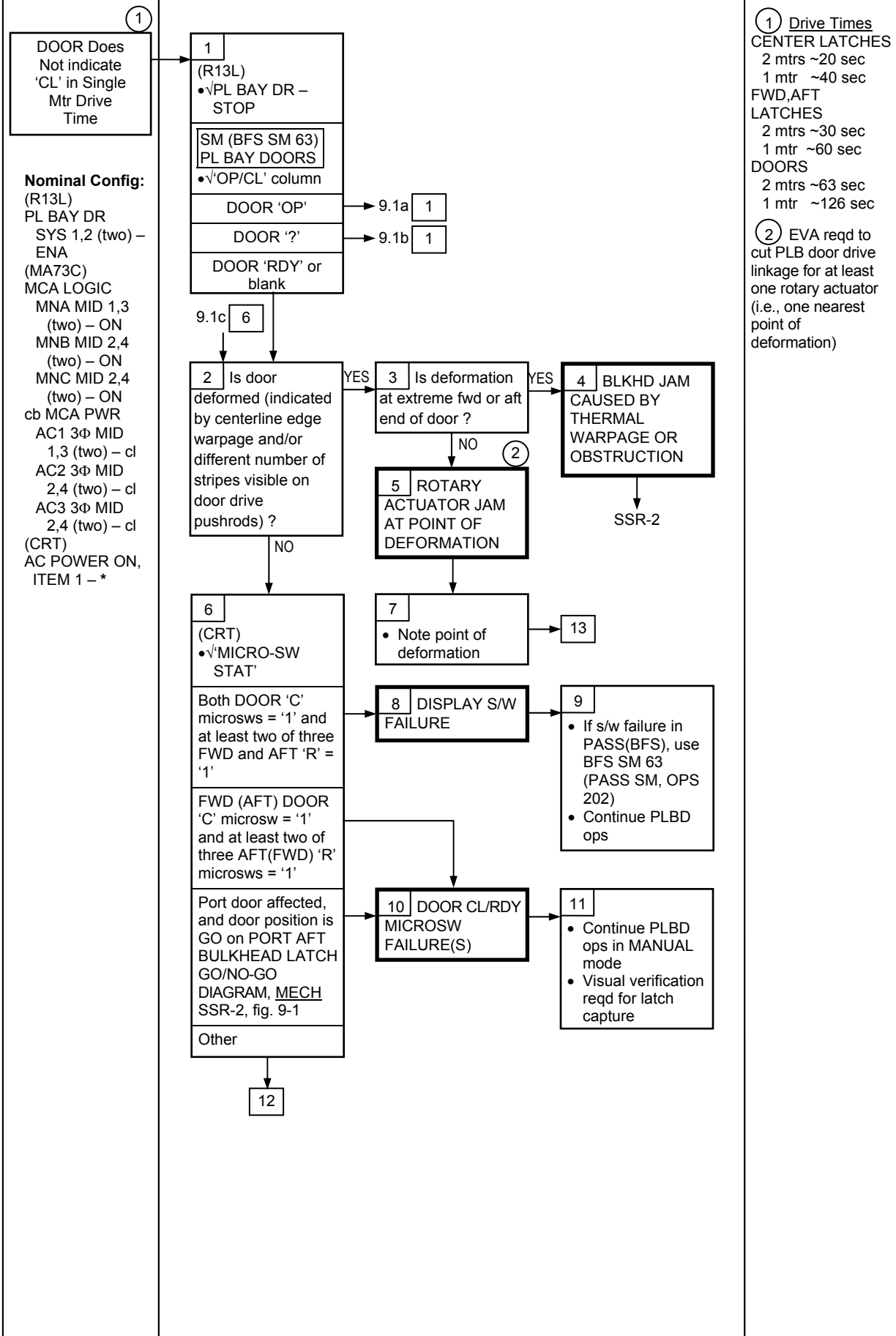
- ② Door may interfere with payload deploy
- ③ Cmd door to close to see if EVA necessary to CL
- ④ For rotary actuator jam, EVA reqd to cut door drive linkage(s) closest to point of deformation
- ⑤ For door drive PDU gearbox jam, EVA reqd to disconnect PDU
- ⑥ For door drive torque tube jam, EVA reqd to remove obstruction or cut door drive linkage(s)
- ⑦ If door reopen were attempted, two-way jam could occur causing day-1 EVA



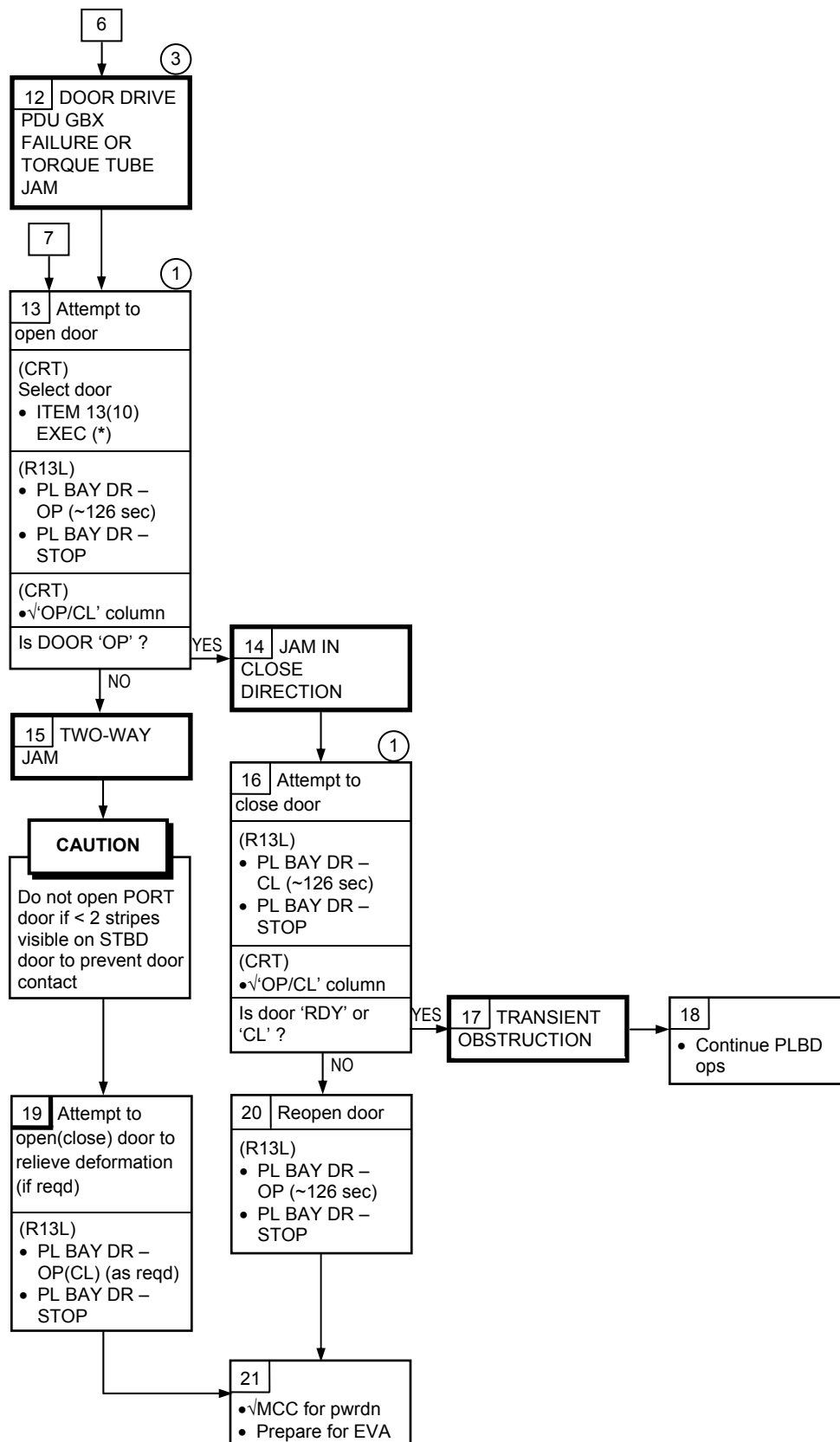
- ④ For rotary actuator jam, EVA reqd to cut door drive linkage(s) closest to point of deformation
- ⑤ For door drive PDU gearbox jam, EVA reqd to disconnect PDU
- ⑥ For door drive torque tube jam, EVA reqd to remove obstruction or cut door drive linkage(s)
- ⑧ No EVA reqd to close door

MECH

9.1g DOOR NOT 'CL' IN SINGLE MTR TIME



MECH 9.1g (Cont)



- ① Drive 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

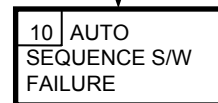
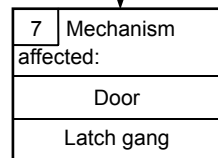
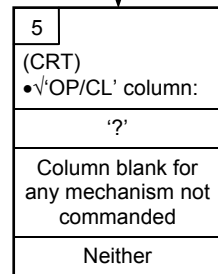
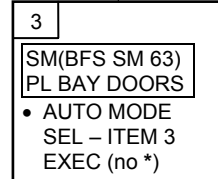
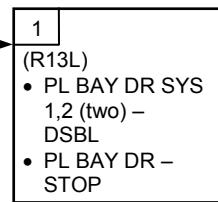
BFS

S63 PBD
CONFIG

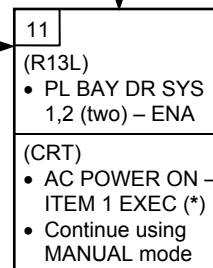
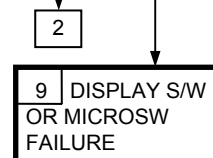
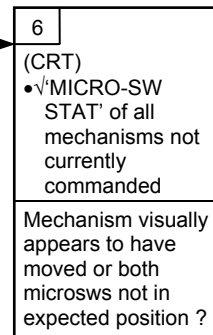
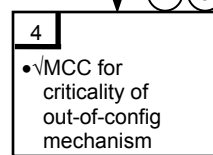
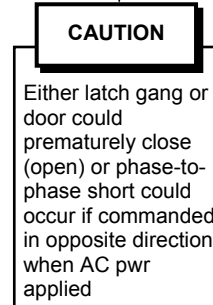
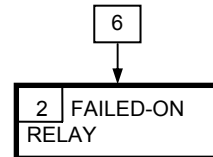
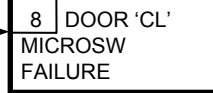
If:
Mechanism in
transit or
microsw failed
other than those
currently
commanded in
AUTO mode

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 – *



9.1b 1



① When PBD
CONFIG message
annunciated,
AC POWER ON,
ITEM 1 – (no *) will
automatically be
deselected and any
active commands are
disabled

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

RAD LAT CNTL
PORT(STBD)
tb Not LAT in
60 Sec or REL
in 30 Sec

Nominal Config:

(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

(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)

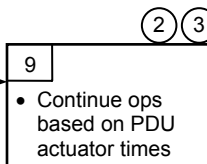
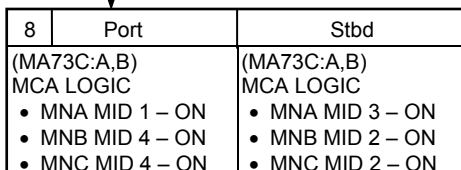
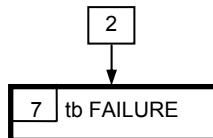
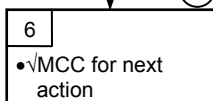
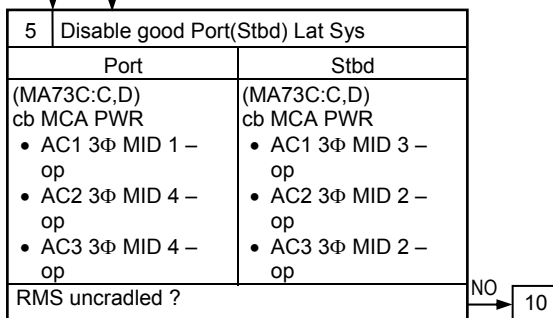
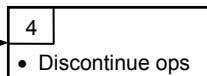
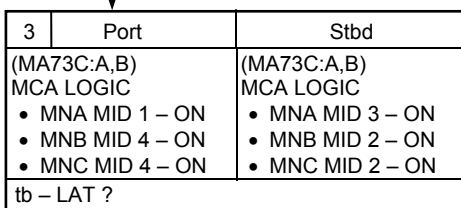
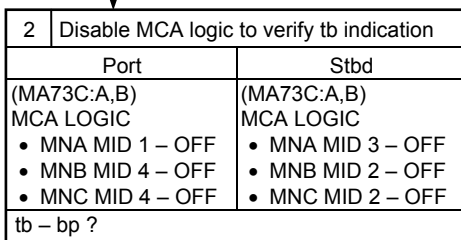
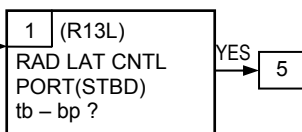
cb MCA PWR

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

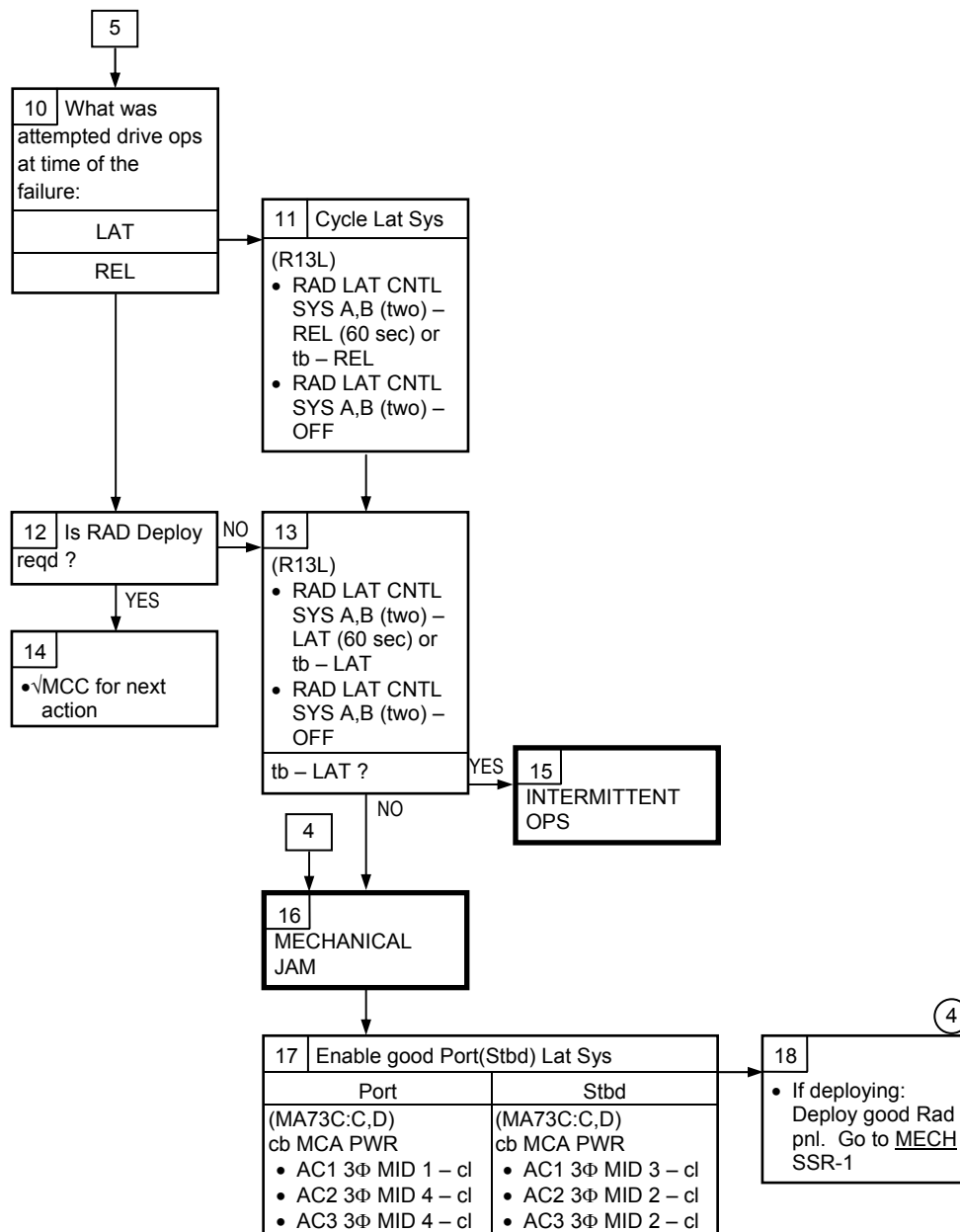
SINGLE MTR

Lat – 60 sec

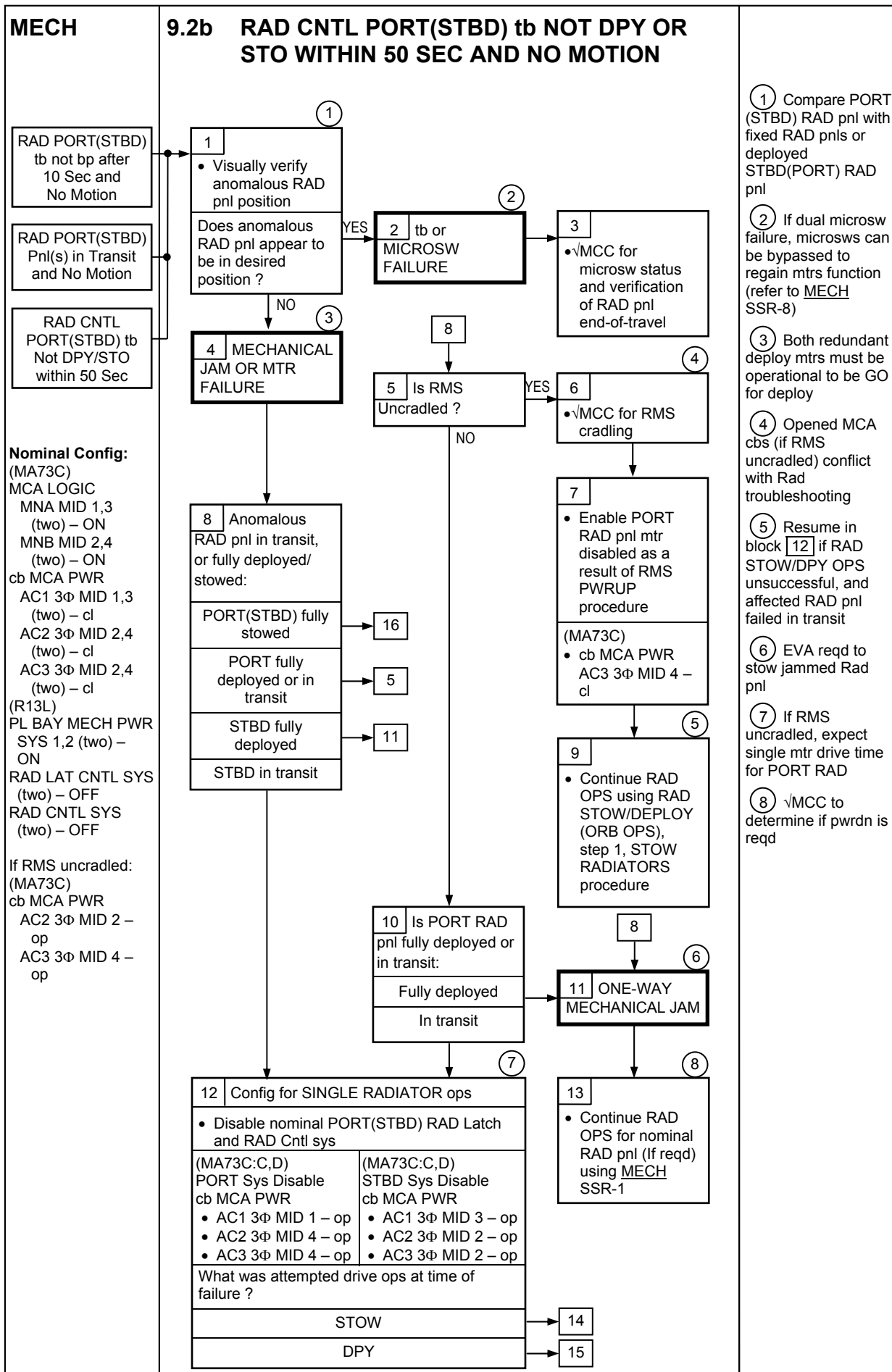
Rad – 100 sec

③ Need MCC verification of microsw status for failed tb

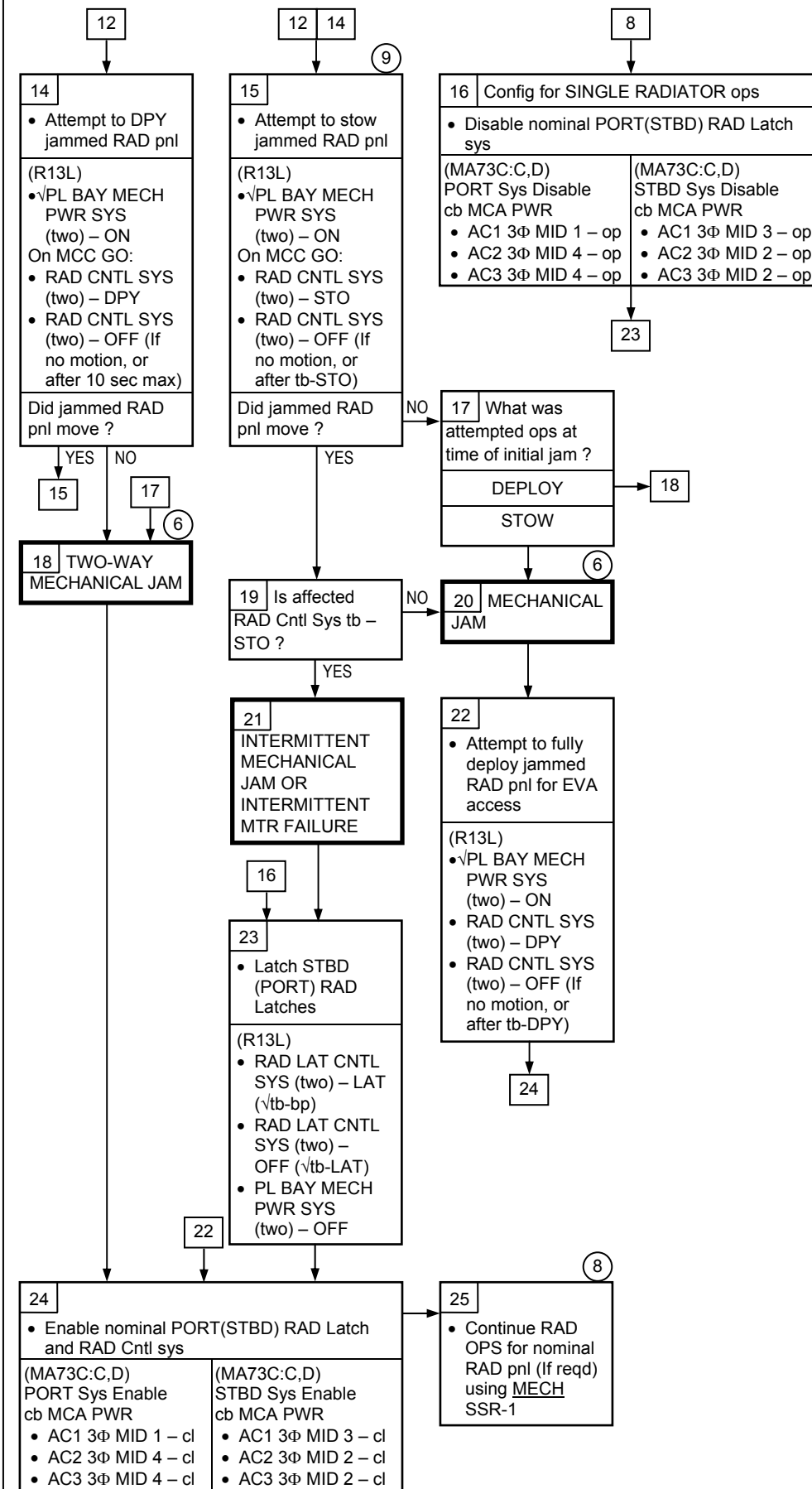
MECH 9.2a (Cont)



4 √MCC to determine pwrn reqd, if any



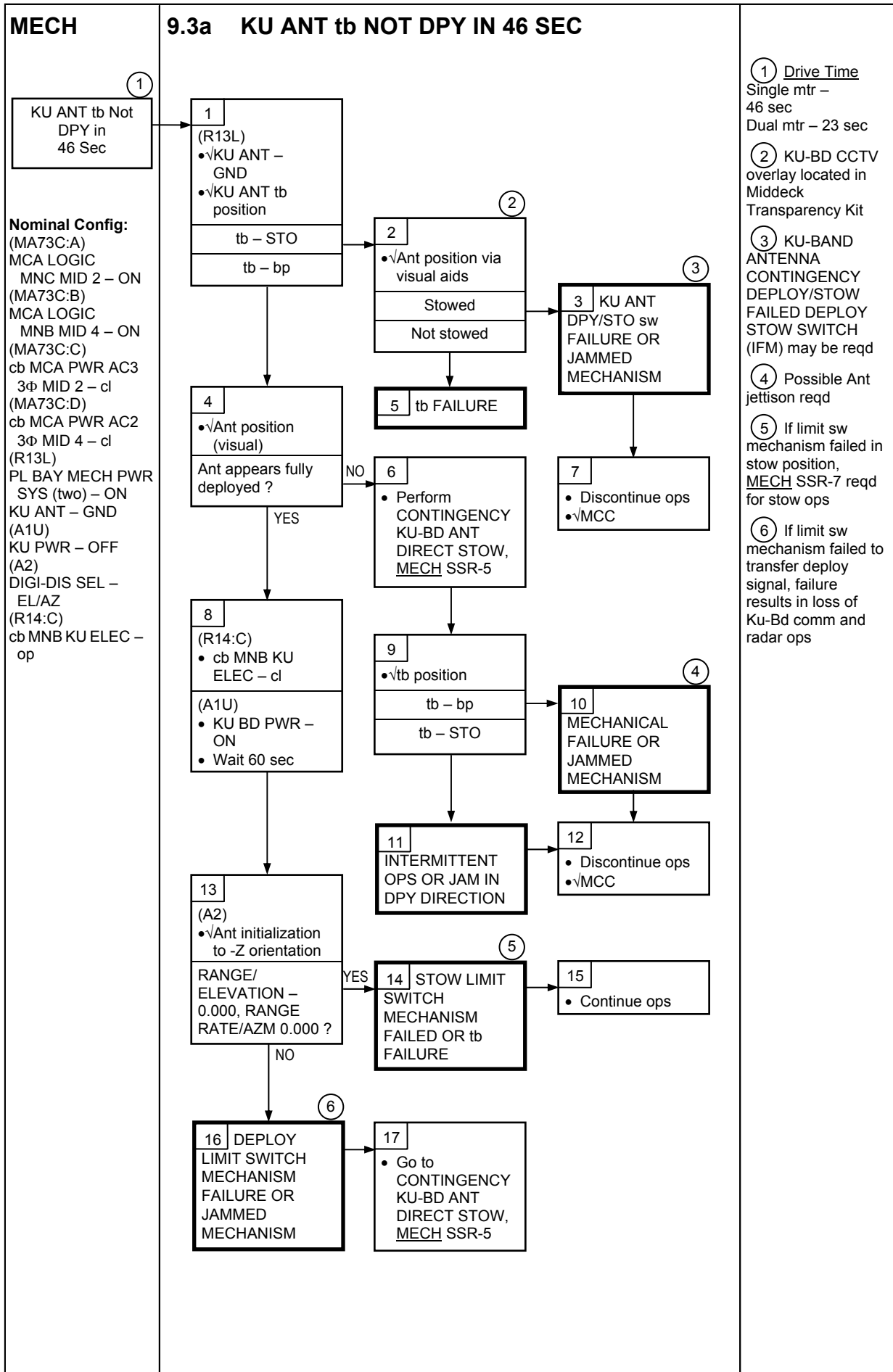
MECH 9.2b (Cont)

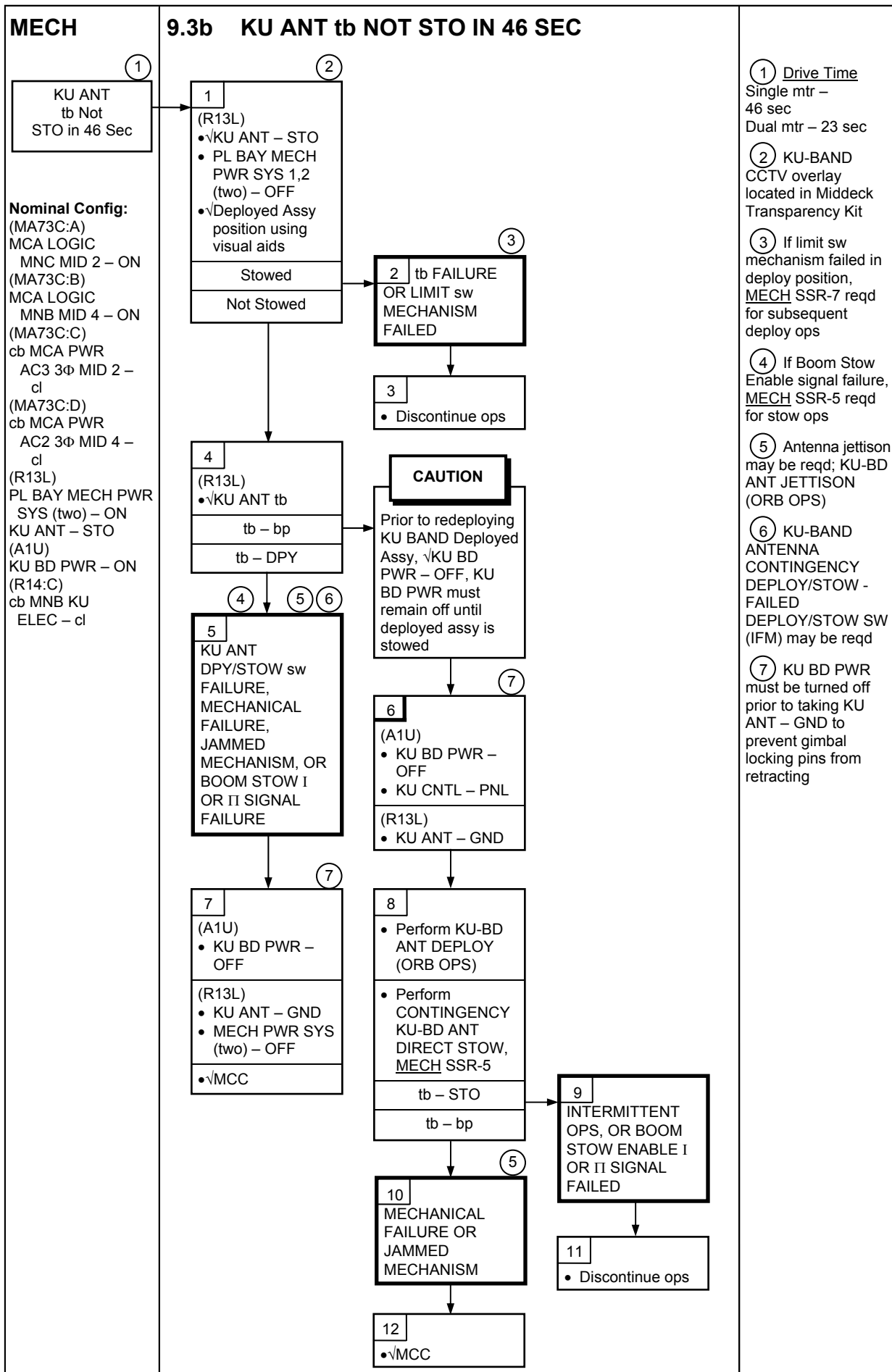


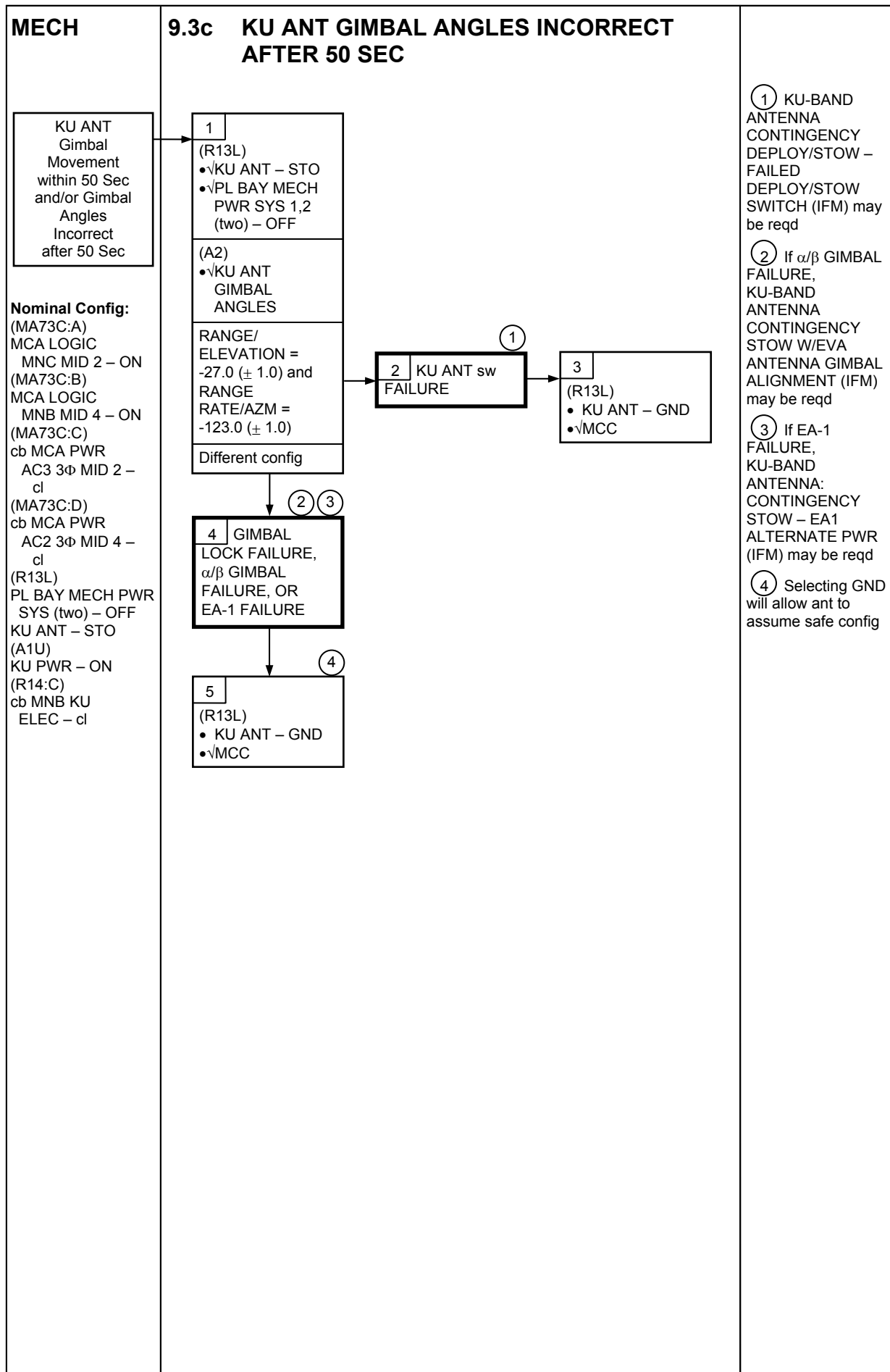
- ⑥ EVA reqd to stow jammed Rad pnl
- ⑧ √MCC to determine if pwrn is reqd
- ⑨ PDU Actuator Times
Dual Mtr
 Lat – 30 sec
 Rad – 50 sec
Single Mtr
 Lat – 60 sec
 Rad – 100 sec

KU ANT

9.3







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MEC
ROEU

9.4

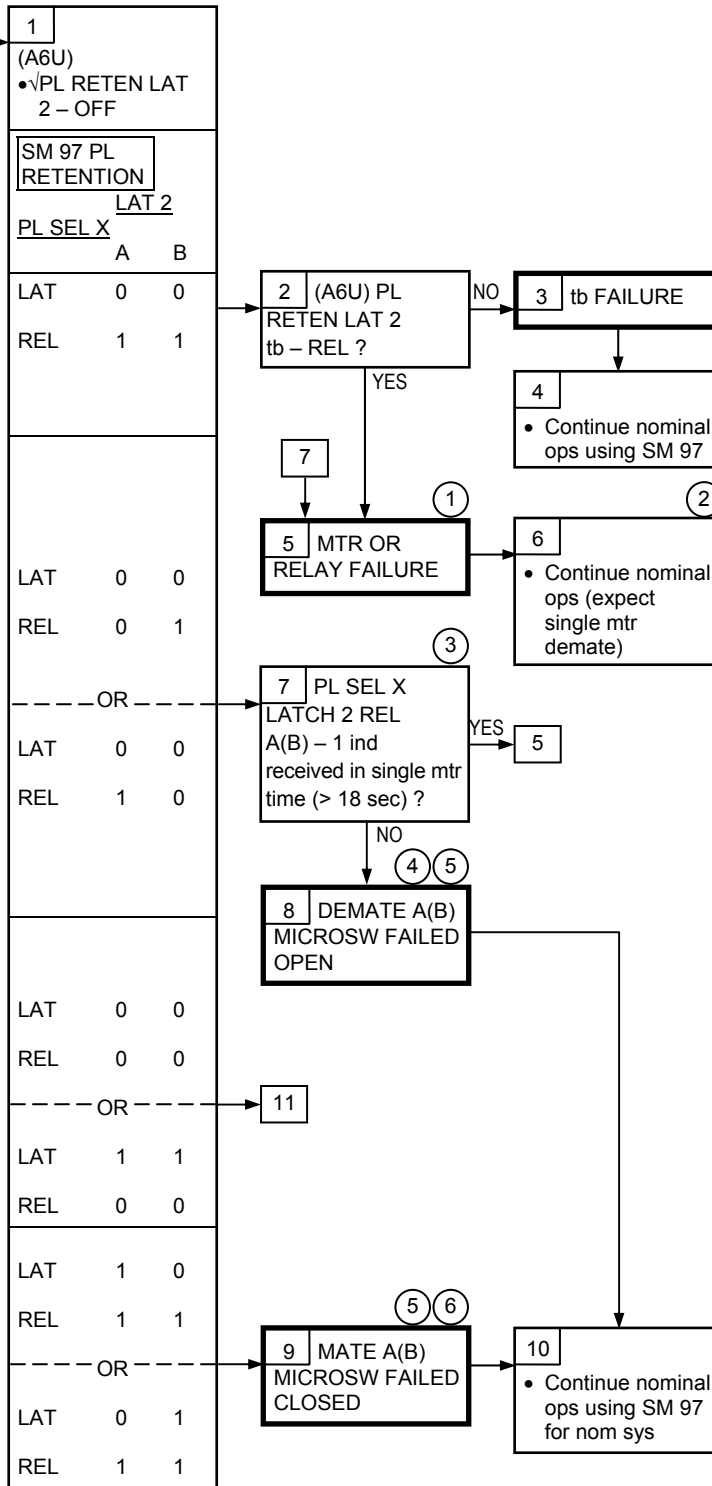
MECH

9.4a ROEU DEMATE – tb NOT REL, MICROSW IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME

Demate tb
Not Rel
or
SM 97 PL
RETENTION

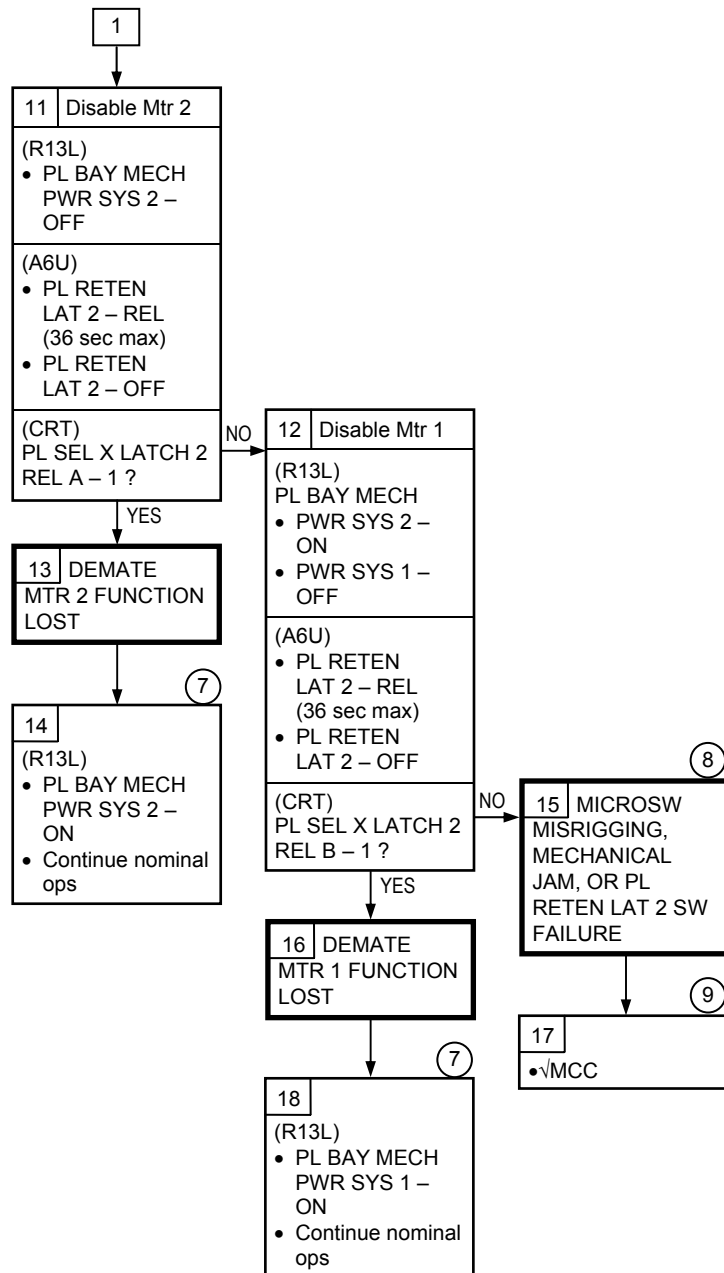
Microsw
LAT/REL Ind
Not Nominal
or
Single Mtr
Drive Time
> 18 sec

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
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 misriggered
- 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

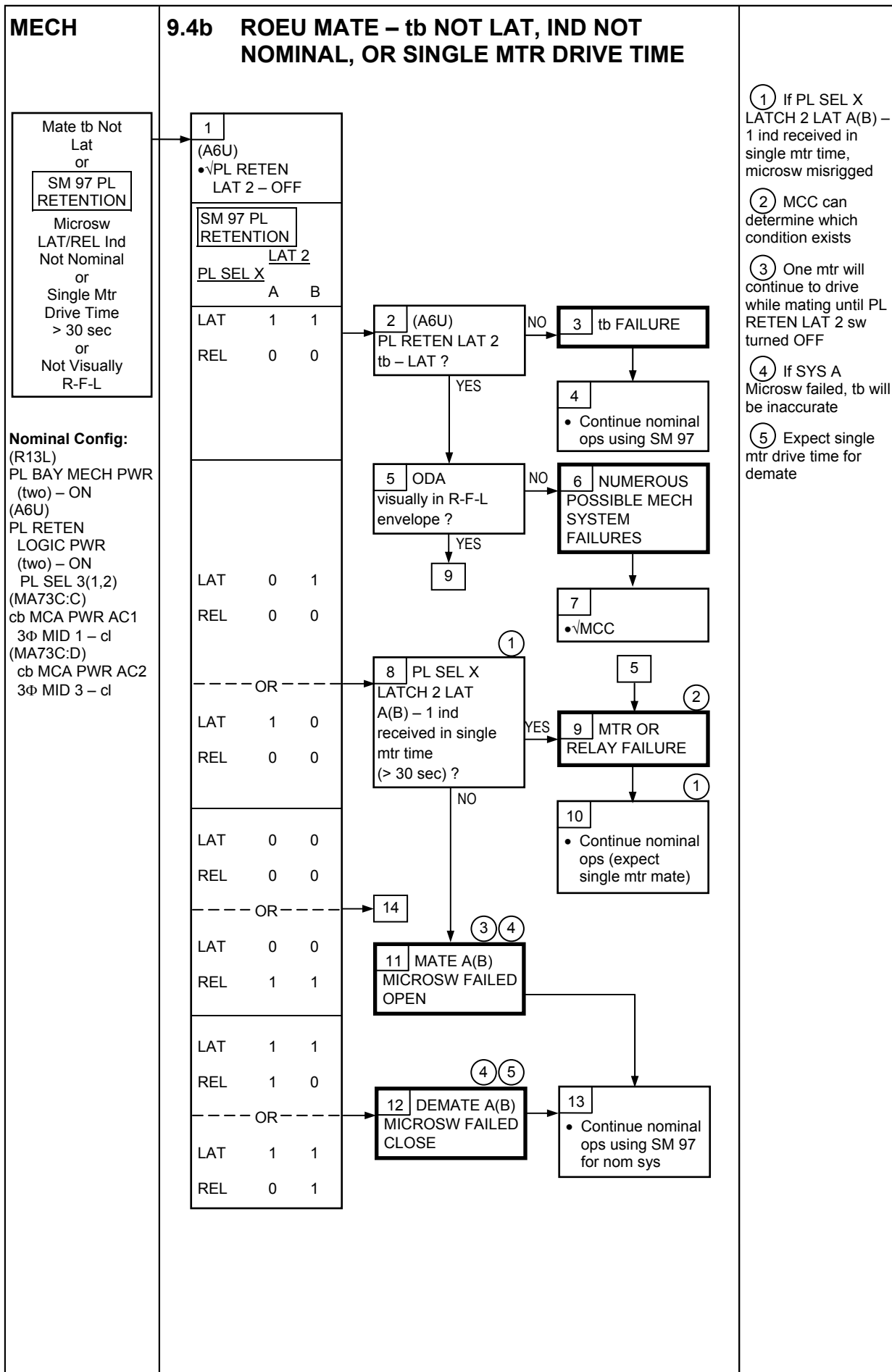
MECH 9.4a (Cont)



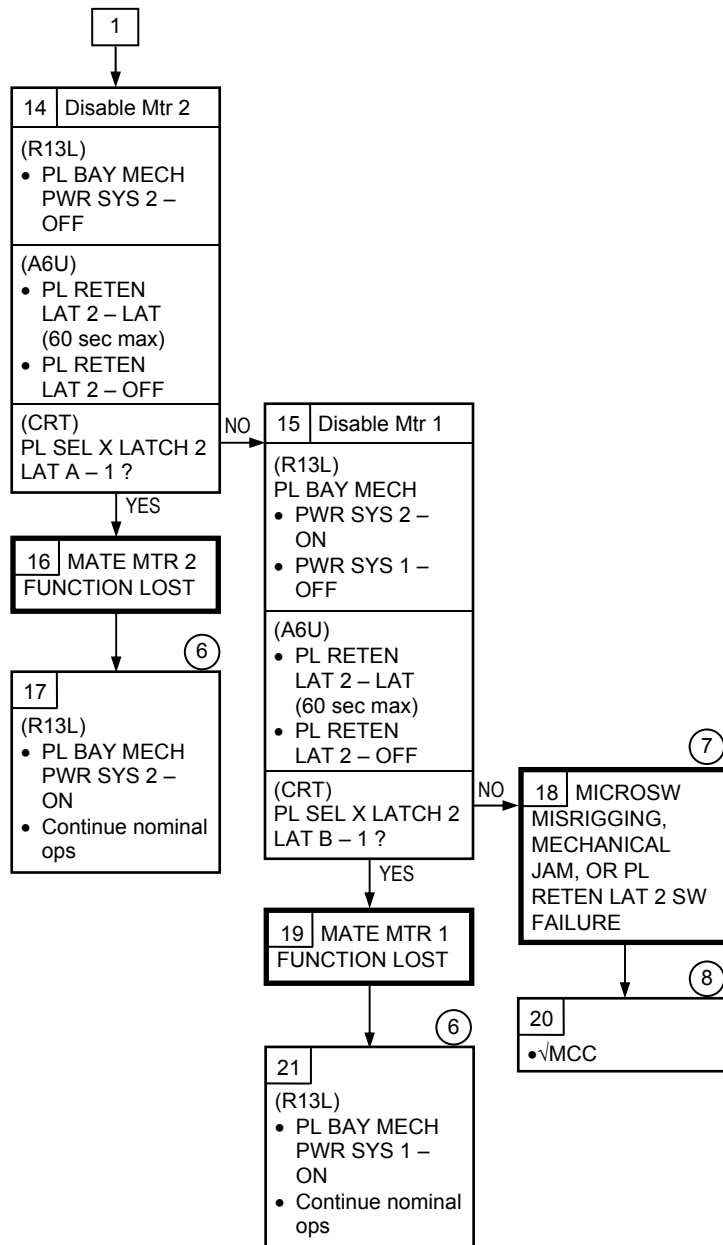
⑦ One mtr Φ lost. Good mtr will backdrive failed mtr. Subsequent mate, relax, and demate ops will be performed on single mtr. Good mtr will be isolated by turning PL BAY MECH PWR OFF for failed system

⑧ EVA capability exists to perform ROEU demate

⑨ MCC can determine if switch is failed



MECH 9.4b (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

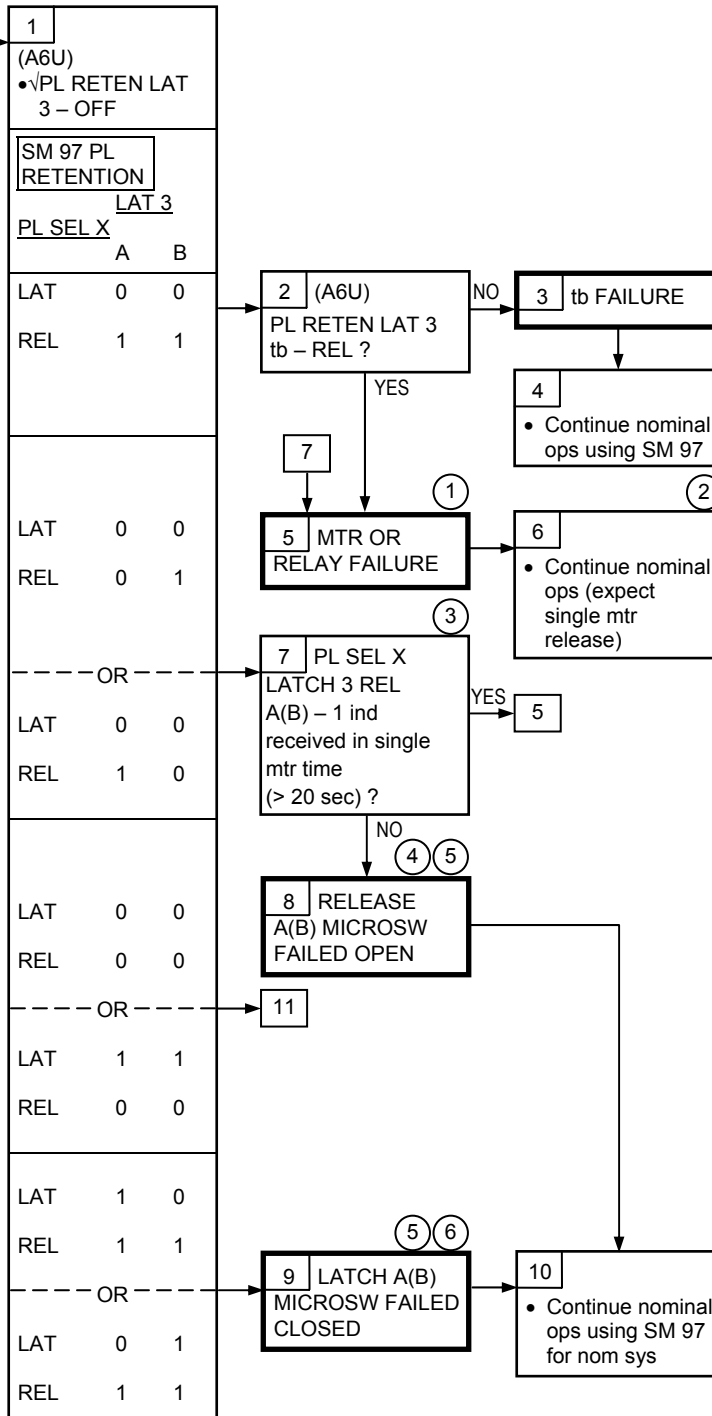
⑧ MCC can determine if switch is failed

MECH

9.4c ROEU RELEASE – tb NOT REL, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME

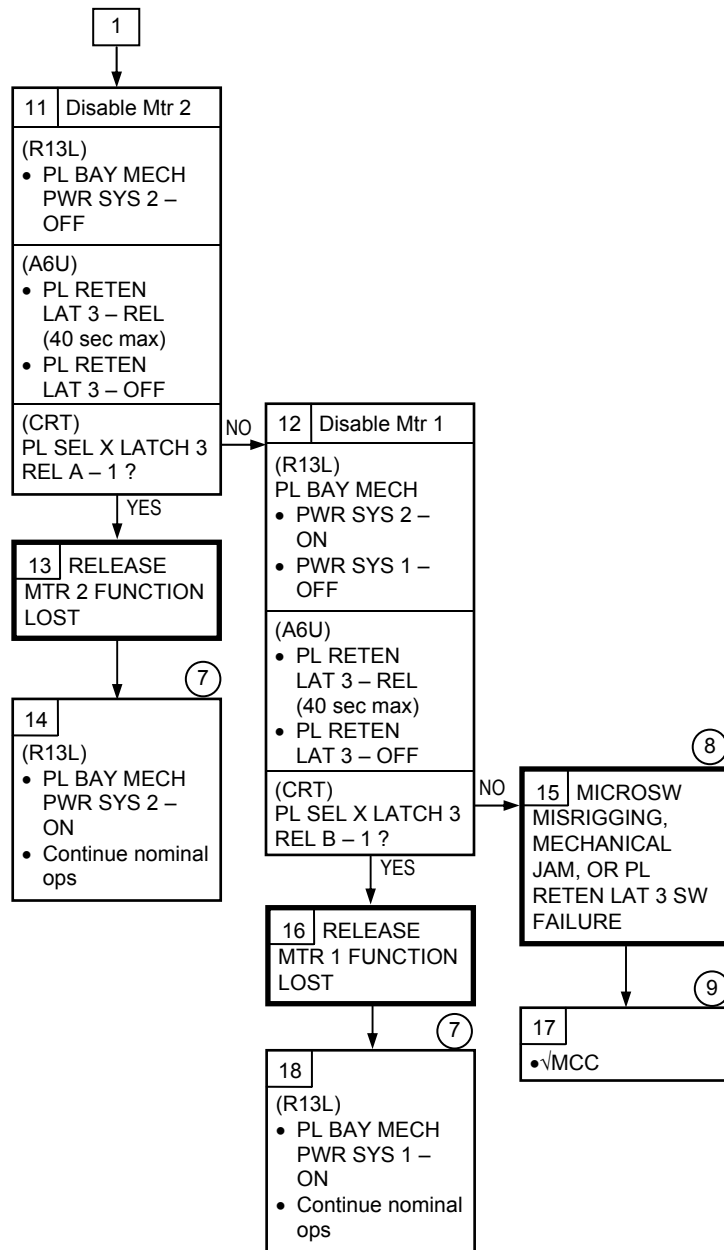
Release tb Not Rel
or
SM 97 PL RETENTION
Microsw LAT/REL Ind Not Nominal
or
Single Mtr Drive Time > 20 sec

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 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

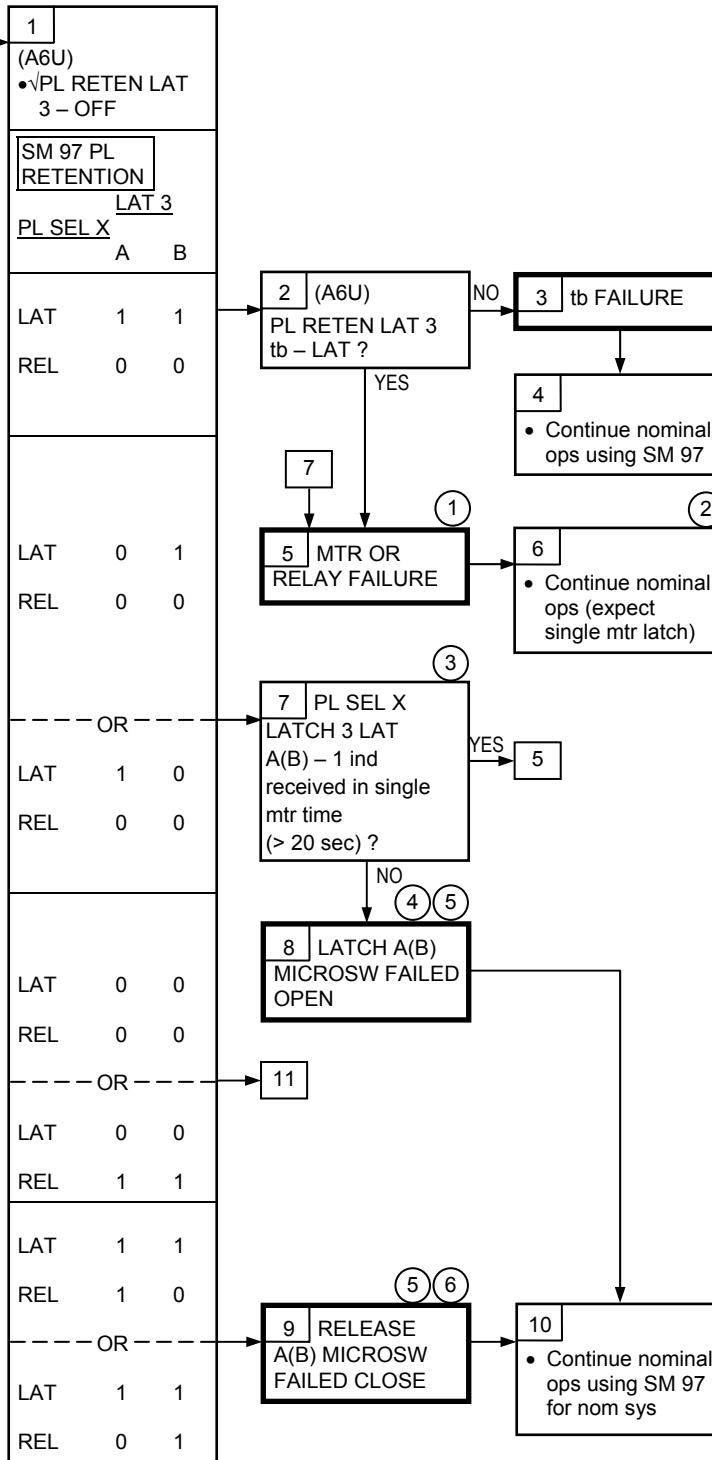
(9) MCC can determine if switch is failed

MECH

9.4d ROEU LATCH – tb NOT LAT, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME

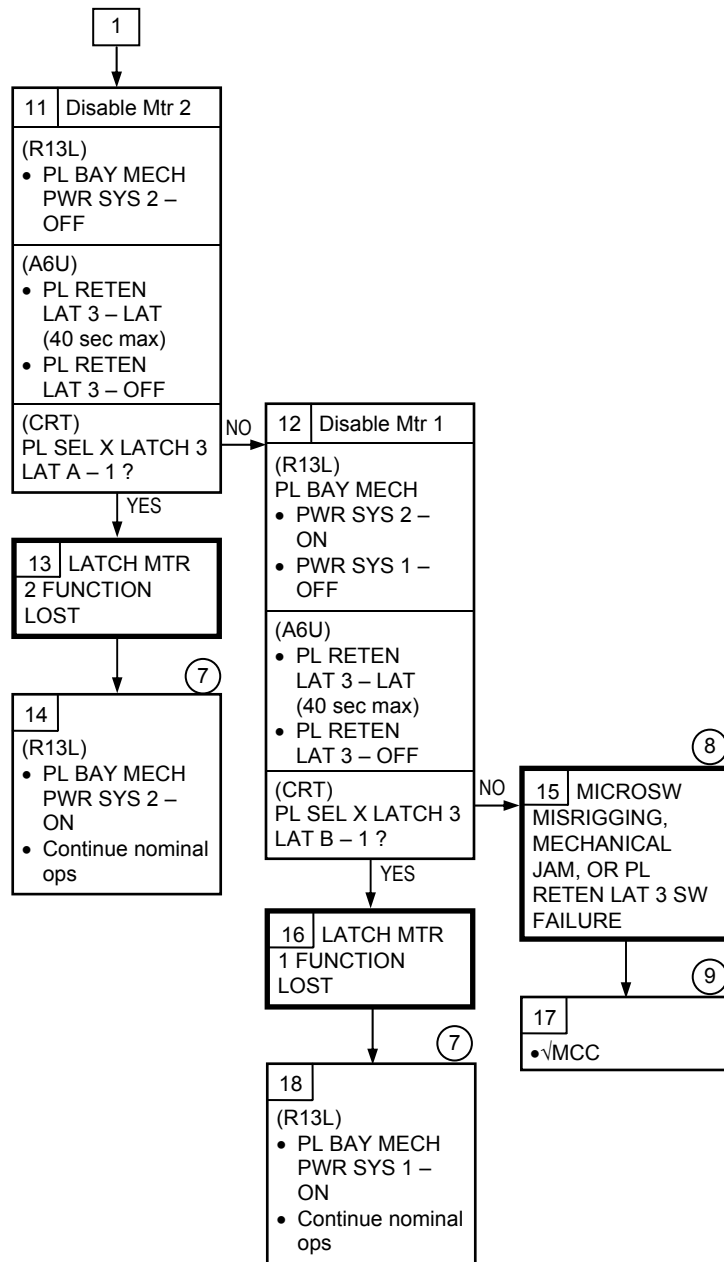
Latch tb Not Lat
or
SM 97 PL RETENTION
Microsw LAT/REL Ind Not Nominal
or
Single Mtr Drive Time > 20 sec

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 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

RELAX tb Not Nominal
or
SM 97 PL RETENTION
Microsw REL Ind Not Nominal or Single Mtr Drive Time > 12 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

If DEMATED
(A6U)
PL RETEN LAT 1 tb – REL

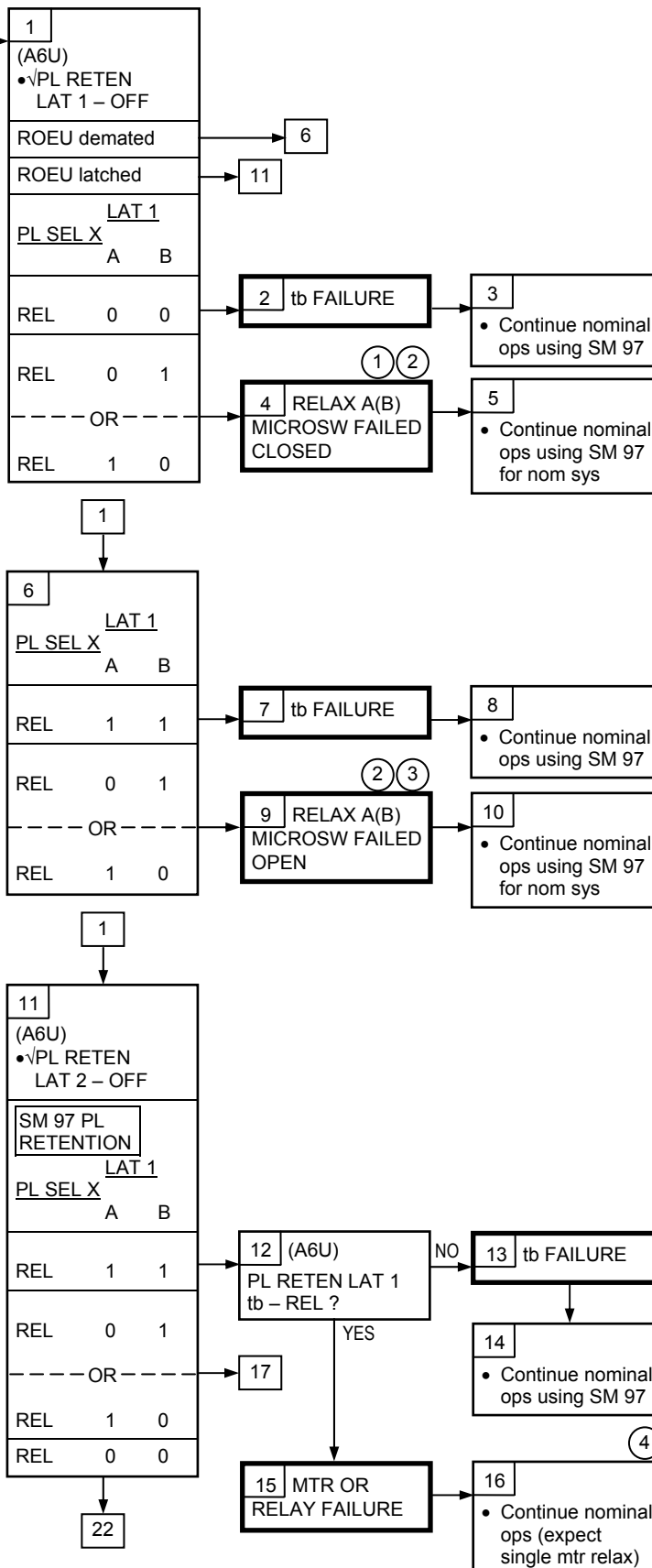
SM 97 PL RETENTION
PL SEL X LATCH 1 REL A,B – 1

If MATED and RELAXED
(A6U)
PL RETEN LAT 1 tb – REL

SM 97 PL RETENTION
PL SEL X LATCH 1 REL A,B – 1

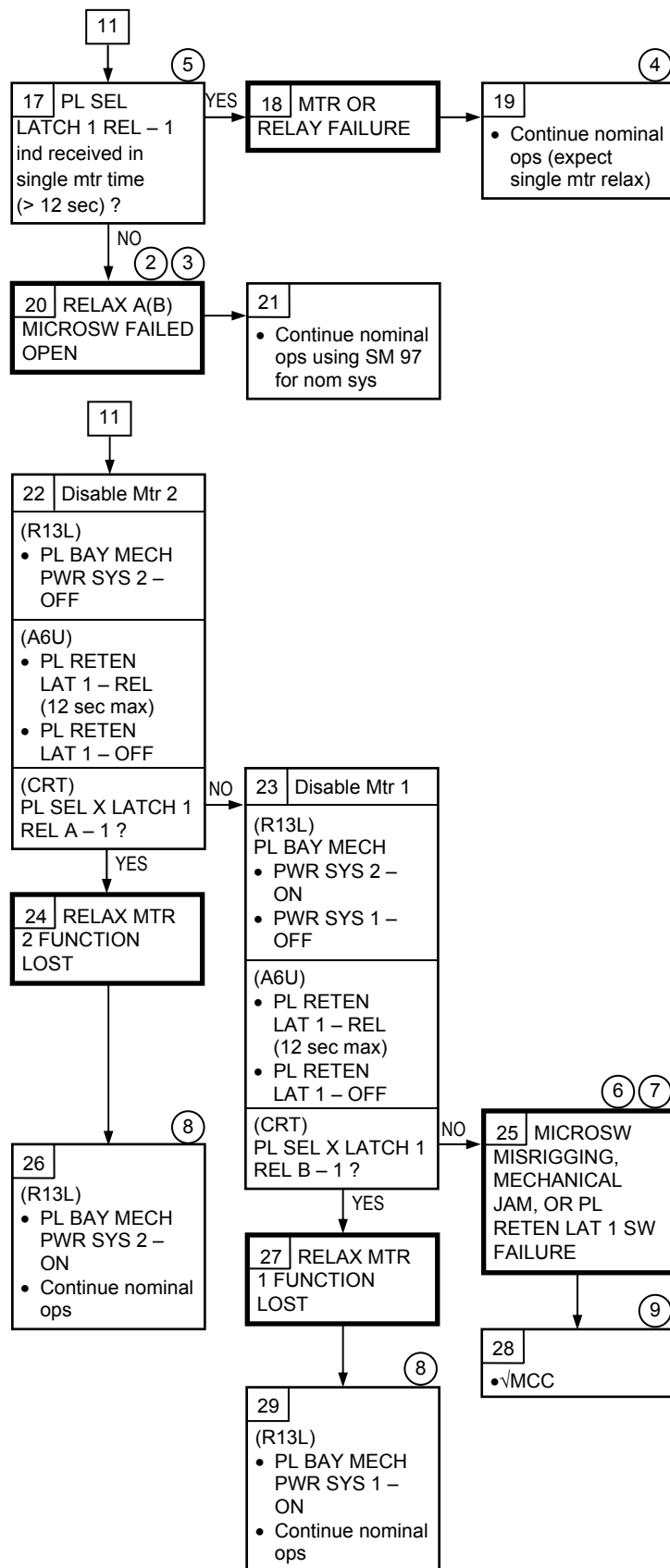
If MATED and UNLATCHED
(A6U)
PL RETEN LAT 1 tb – bp

SM 97 PL RETENTION
PL SEL X LATCH 1 REL A,B – 0



- ① Expect single mtr drive time for relax
- 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

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

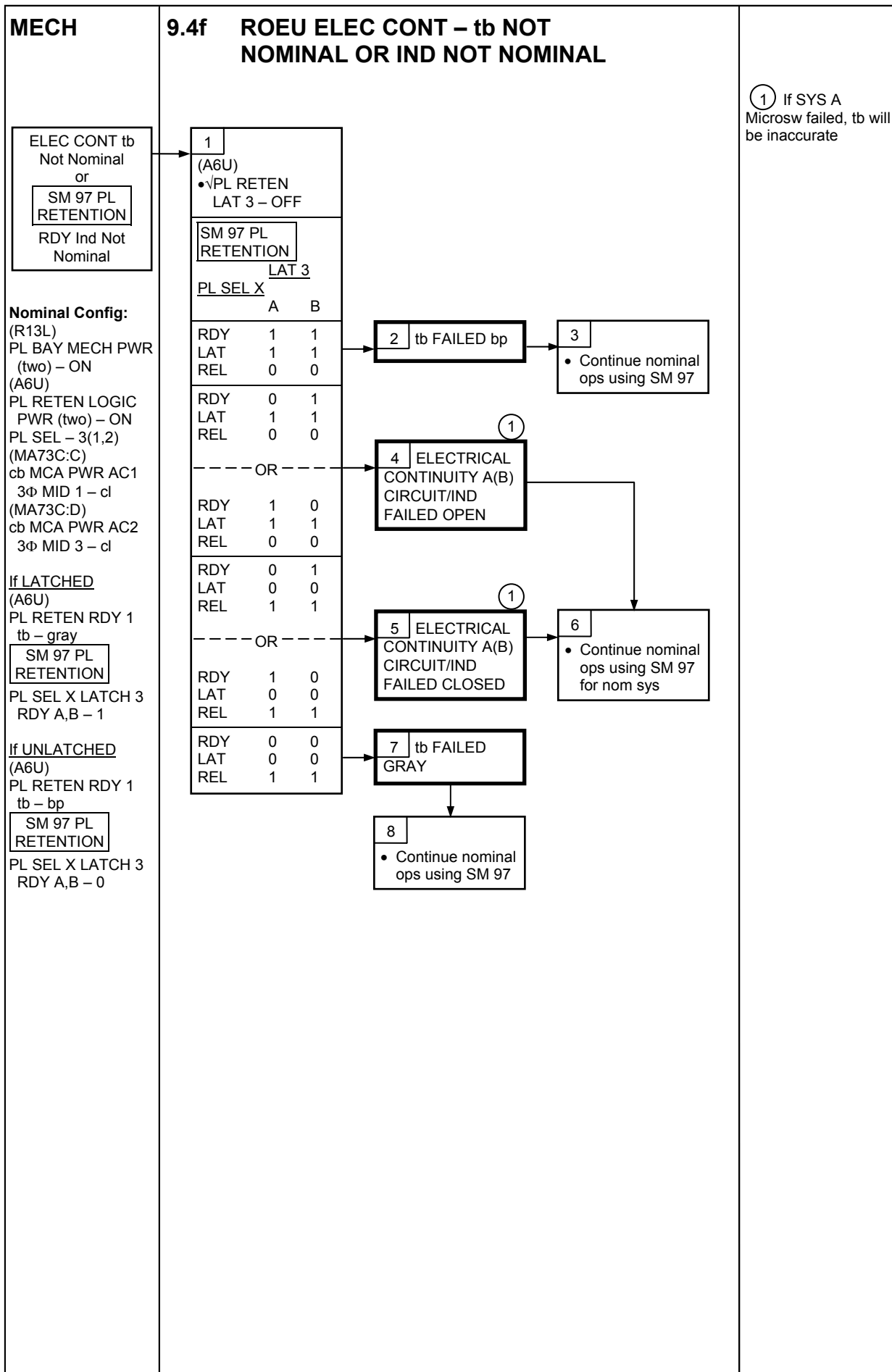
5 If PL SEL LATCH 1 REL – 1 ind received in single mtr time, microsw misrigged

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



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MECH SSR-1 PORT(STBD) RAD OPS



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)
(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
(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	

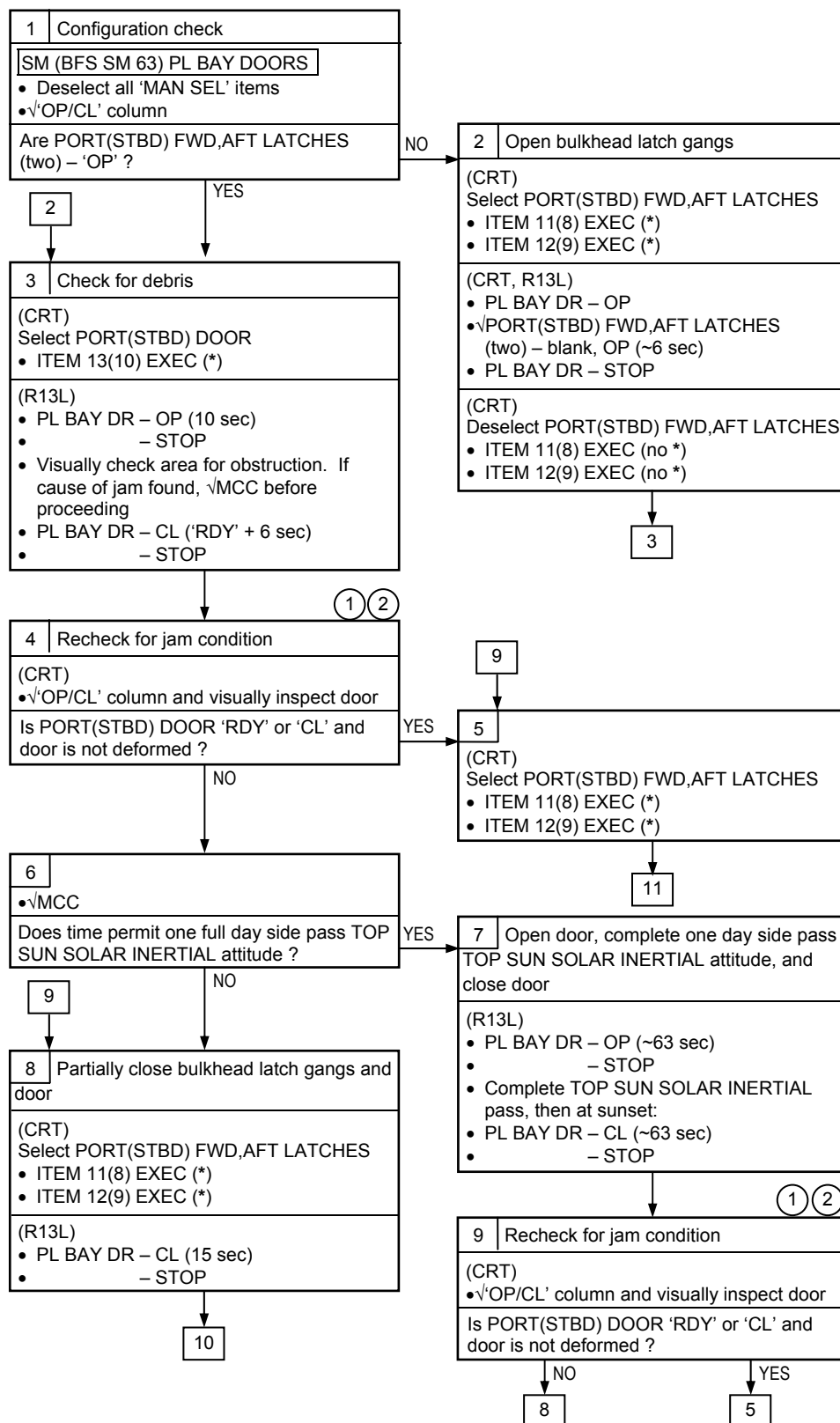
① PDU Actuator
Times Normal (2 mtr)
Lat – 30 sec
Rad – 50 sec
Single Mtr
Lat – 60 sec
Rad – 100 sec

MECH SSR

MECH SSR-2 CONTINGENCY PLBD CLOSURE

NOTE

NOTE
This procedure assumes that the door has jammed from orbiter thermal warpage or debris



- ① Aft bulkhead target line can be used to verify port aft door configuration (See Fig. 9-1, PORT AFT BULKHEAD LATCH GO/NO-GO DIAGRAM)
- ② Observe aft centerline for deflection (See Fig. 9-2, PORT AFT CENTERLINE VIEWED BY CAMERA C)

MECH SSR-2 (Cont)

```

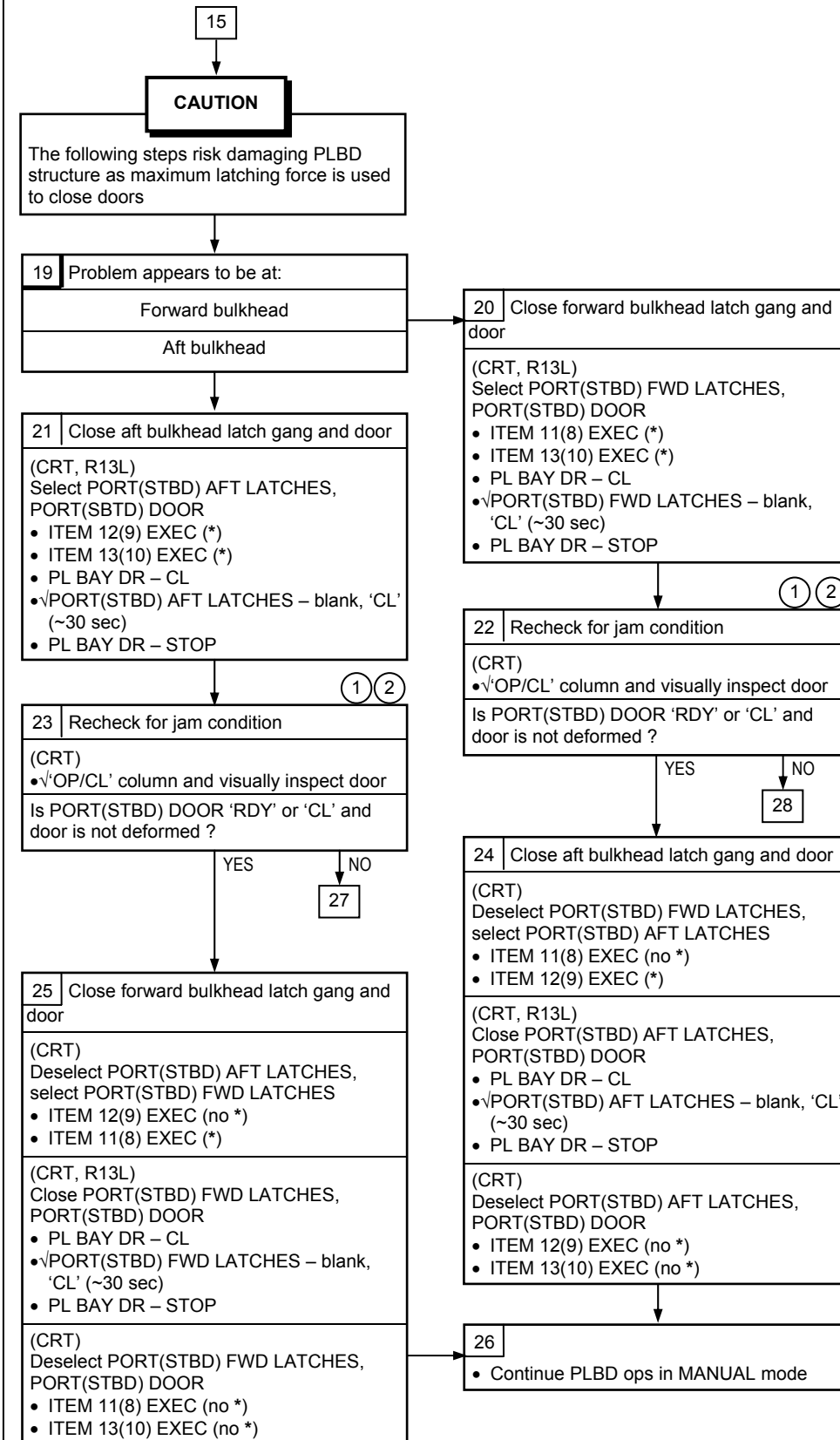
graph TD
    8[8] --> 10
    10["10 | Recheck for jam condition  
(CRT)  
• √OP/CL' column and visually inspect door  
Is PORT(STBD) DOOR 'RDY' or 'CL' and door is not deformed?"]
    10 -- YES --> 11
    10 -- NO --> 12
    12["12 | Open bulkhead latch gangs  
(CRT)  
Deselect PORT(STBD) DOOR  
• ITEM 13(10) EXEC (no *)  
(CRT, R13L)  
• PL BAY DR – OP  
• √PORT(STBD) FWD,AFT LATCHES – 'OP' (~15 sec)  
• PL BAY DR – STOP  
(CRT)  
Deselect PORT(STBD) FWD,AFT LATCHES  
• ITEM 11(8) EXEC (no *)  
• ITEM 12(9) EXEC (no *)"]
    12 --> 15
    15["15 |  
• √MCC for wave-off capability  
GO for wave-off?"]
    15 -- YES --> 16
    15 -- NO --> 19
    16["16 | Open PLBD  
(CRT)  
Select PORT(STBD) DOOR  
• ITEM 13(10) EXEC (*)  
(CRT, R13L)  
• PL BAY DR – OP  
• √PORT(STBD) DOOR – 'OP' (~63 sec)  
• PL BAY DR – STOP  
(CRT)  
Deselect PORT(STBD) DOOR  
• ITEM 13(10) EXEC (no *)  
Was port door just opened?"]
    16 -- YES --> 17
    16 -- NO --> 14
    14["14 |"]
    14 --> 17
    17["17 | Disable PLBDs  
(CRT, R13L)  
• PL BAY DR SYS 1,2 (two) – DSBL  
• AC POWER OFF – ITEM 2 EXEC (*)  
• If PASS SM, SM OPS 201 PRO  
(A7U)  
• PL BAY FLOOD (all) – OFF"]
    17 --> 18
    5[5] --> 11
    11["11 | Close, latch door  
(CRT, R13L)  
• PL BAY DR – CL  
• √PORT(STBD) FWD,AFT LATCHES – 'CL' (~15-30 sec)  
• PL BAY DR – STOP  
(CRT)  
Deselect PORT(STBD) FWD,AFT LATCHES and PORT(STBD) DOOR  
• ITEM 11(8) EXEC (no *)  
• ITEM 12(9) EXEC (no *)  
• ITEM 13(10) EXEC (no *)"]
    11 --> 13
    13["13 |  
• Continue PLBD ops in MANUAL mode"]
    13 --> 16
    16 --> 14
    14["14 | Unlatch, open port door  
(CRT)  
Select PORT FWD,AFT LATCHES  
• ITEM 11 EXEC (*)  
• ITEM 12 EXEC (*)  
(CRT, R13L)  
• PL BAY DR – OP  
• √PORT FWD,AFT LATCHES – 'OP' (~30 sec)  
• PL BAY DR – STOP  
(CRT)  
Deselect PORT FWD,AFT LATCHES  
• ITEM 11 EXEC (no *)  
• ITEM 12 EXEC (no *)  
Select PORT DOOR  
• ITEM 13 EXEC (*)  
(CRT, R13L)  
• PL BAY DR – OP  
• √PORT DOOR – 'OP' (~63 sec)  
• PL BAY DR – STOP  
(CRT)  
Deselect PORT DOOR  
• ITEM 13 EXEC (no *)"]
    14 --> 17
    17 --> 18
    18["18 |  
• Waveoff for 24 hr; remain TOP SUN SOLAR INERTIAL  
• Prepare for EVA to close doors  
• Attempt MANUAL PLBD close prior to EVA"]
  
```

Callouts:

- ① Aft bulkhead target line can be used to verify port aft door configuration (See Fig. 9-1, PORT AFT BULKHEAD LATCH GO/NO-GO DIAGRAM)
- ② Observe aft centerline for deflection (See Fig. 9-2, PORT AFT CENTERLINE VIEWED BY CAMERA C)

② Observe aft centerline for deflection (See Fig. 9-2, PORT AFT CENTERLINE VIEWED BY CAMERA C)

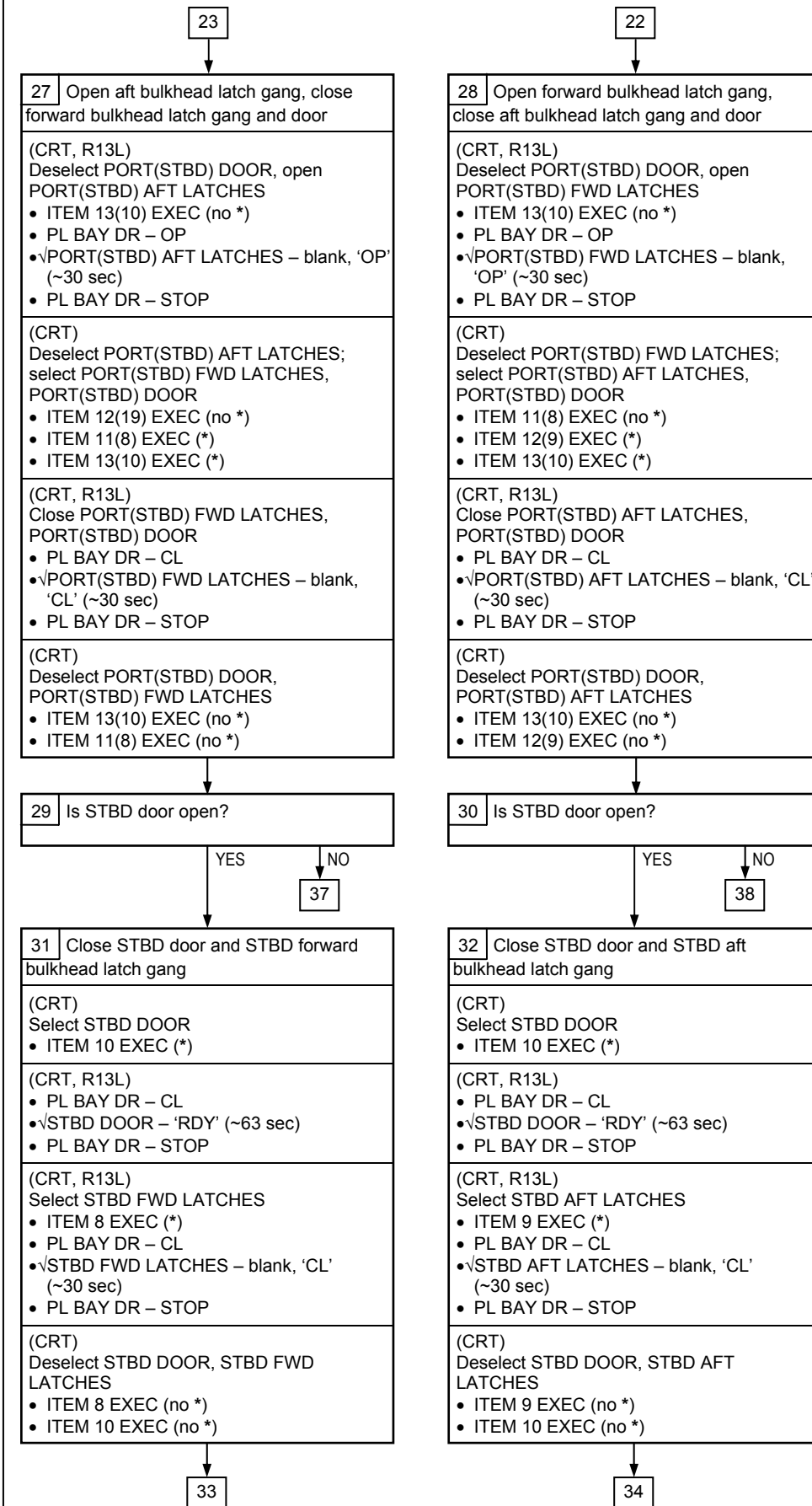
MECH SSR-2 (Cont)



① Aft bulkhead target line can be used to verify port aft door configuration (See Fig. 9-1, PORT AFT BULKHEAD LATCH GO/NO-GO DIAGRAM)

② Observe aft centerline for deflection (See Fig. 9-2, PORT AFT CENTERLINE VIEWED BY CAMERA C)

MECH SSR-2 (Cont)



MECH SSR-2 (Cont)

31

33 Close centerline latch gangs forward to aft and both doors

(CRT)

Select PORT, STBD DOOR, CENTER LATCHES 1-4

- ITEM 13 EXEC (*)
- ITEM 10 EXEC (*)
- ITEM 6 EXEC (*)

(CRT, R13L)

- PL BAY DR – CL
- ✓CENTER LATCHES 1-4 – blank, 'CL' (~20 sec)
- PL BAY DR – STOP

(CRT)

Deselect CENTER LATCHES 1-4

- ITEM 6 EXEC (no *)
- Repeat closure for CENTER LATCHES 5-8, 9-12, 13-16 in order



35 Close aft bulkhead latch gangs and doors

(CRT)

Select PORT, STBD AFT LATCHES

- ITEM 12 EXEC (*)
- ITEM 9 EXEC (*)

(CRT, R13L)

- PL BAY DR – CL
- ✓PORT, STBD AFT LATCHES – blank, 'CL' (~30 sec)
- PL BAY DR – STOP

(CRT)

Deselect PORT, STBD AFT LATCHES, PORT, STBD DOOR

- ITEM 12 EXEC (no *)
- ITEM 9 EXEC (no *)
- ITEM 13 EXEC (no *)
- ITEM 10 EXEC (no *)



41

32

34 Close centerline latch gangs aft to forward and both doors

(CRT, R13L)

Select PORT, STBD DOOR, CENTER LATCHES 13-16

- ITEM 13 EXEC (*)
- ITEM 10 EXEC (*)
- ITEM 7 EXEC (*)

(CRT, R13L)

- PL BAY DR – CL
- ✓CENTER LATCHES 13-16 – blank, 'CL' (~20 sec)
- PL BAY DR – STOP

(CRT)

Deselect CENTER LATCHES 13-16

- ITEM 7 EXEC (no *)
- Repeat closure for CENTER LATCHES 9-12, 5-8, 1-4 in order



36 Close forward bulkhead latch gangs and doors

(CRT)

Select PORT, STBD FWD LATCHES

- ITEM 11 EXEC (*)
- ITEM 8 EXEC (*)

(CRT, R13L)

- PL BAY DR – CL
- ✓PORT, STBD FWD LATCHES – blank, 'CL' (~30 sec)
- PL BAY DR – STOP

(CRT)

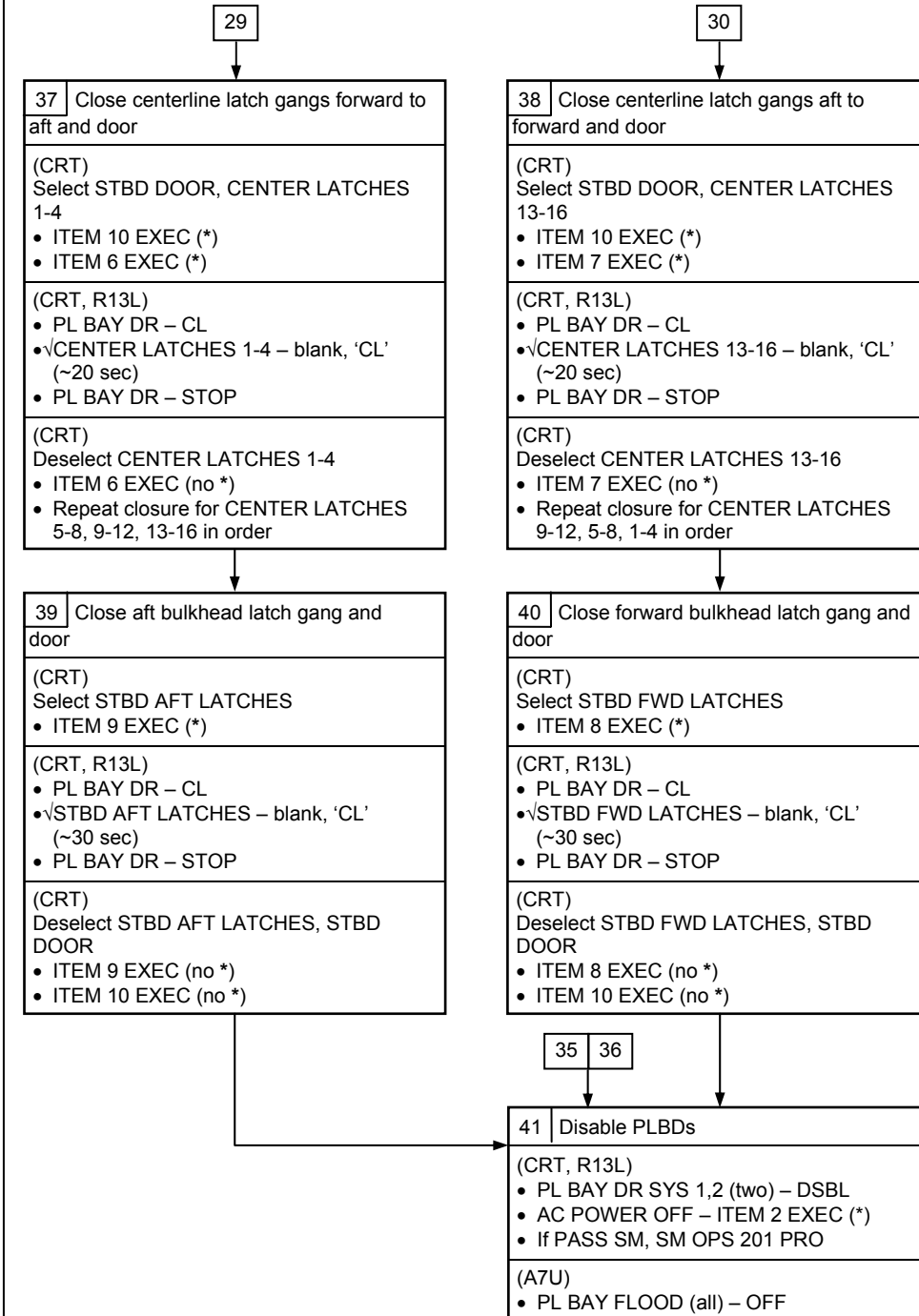
Deselect PORT, STBD FWD LATCHES, PORT, STBD DOOR

- ITEM 11 EXEC (no *)
- ITEM 8 EXEC (no *)
- ITEM 13(10) EXEC (no *)
- ITEM 10 EXEC (no *)



41

MECH SSR-2 (Cont)



MECH SSR-2 (Cont)

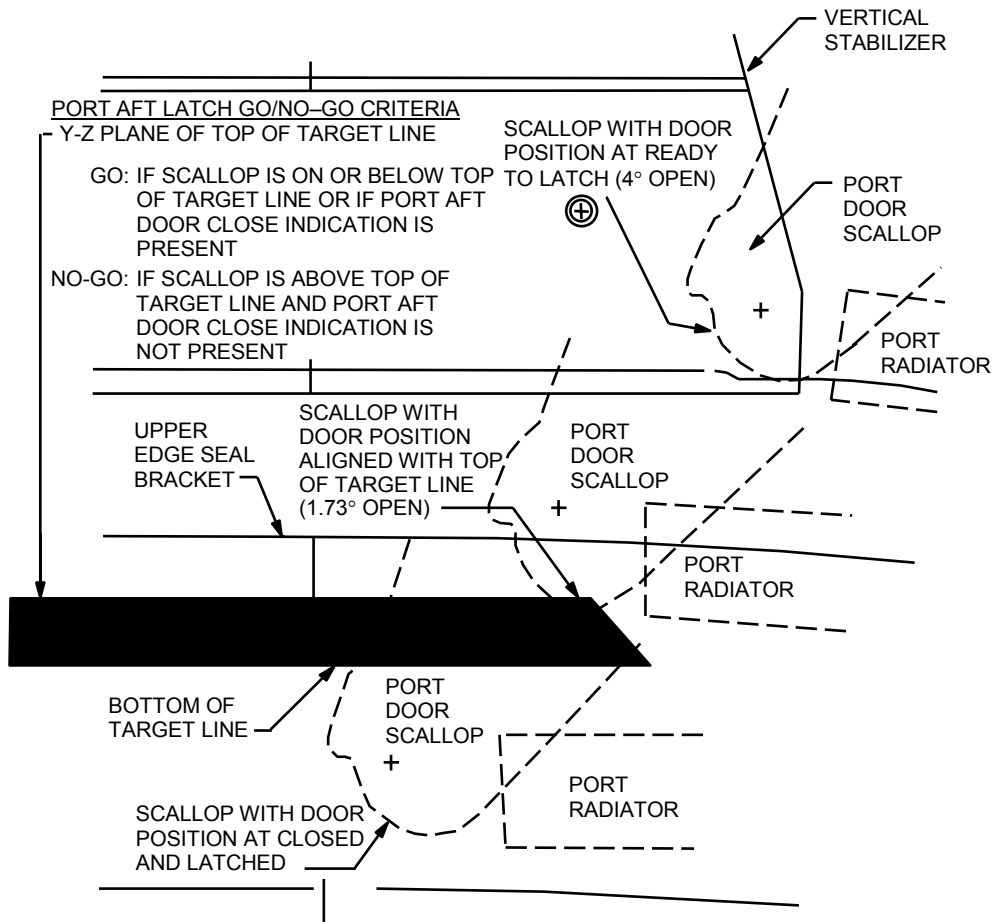
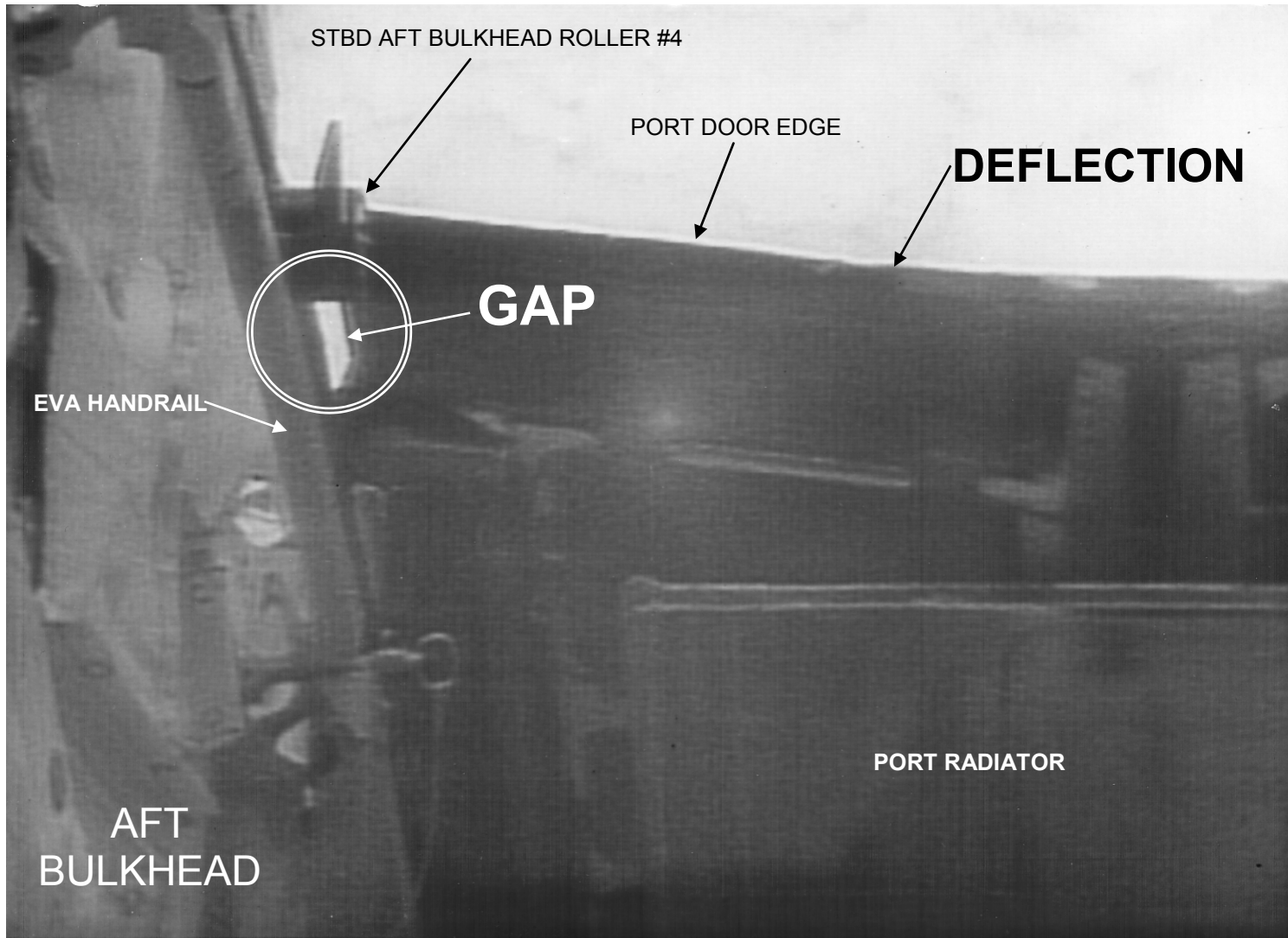


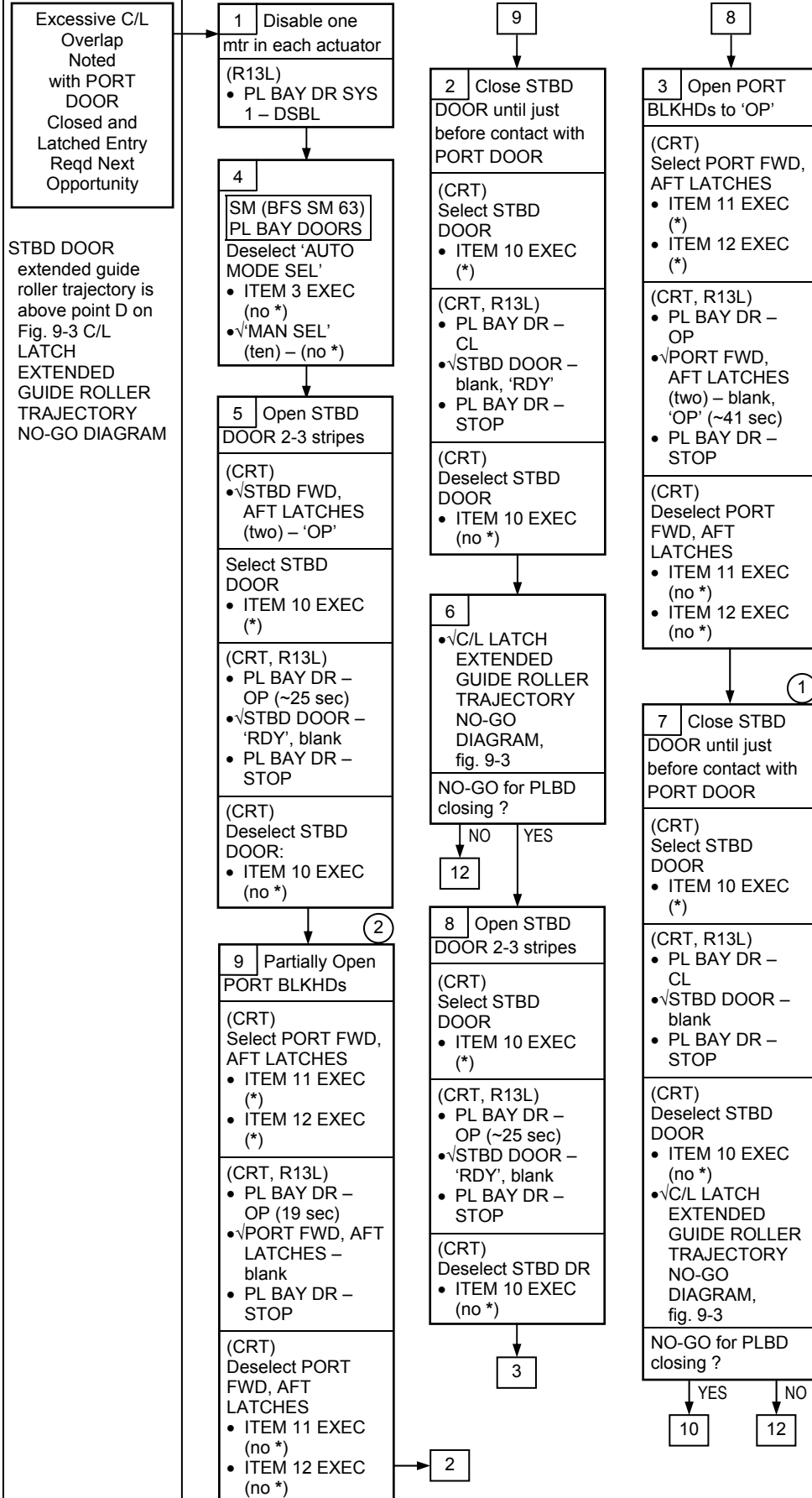
Figure 9-1.- Port aft bulkhead latch GO/NO-GO diagram.



Shows worst case upwards deflection of PLBD seen on STS-4

Figure 9-2.- Port aft centerline viewed by camera C.

MECH SSR-3 SIMULTANEOUS PLBD CL



MECH SSR-3 (Cont)

```

graph TD
    Start(( )) --> B7[7]
    B7 --> B10_14[10 | Open STBD DOOR 2-3 stripes  
(CRT)  
Select STBD DOOR  
• ITEM 10 EXEC (*)  
  
(CRT, R13L)  
• PL BAY DR – OP (~25 sec)  
• √STBD DOOR – blank  
• PL BAY DR – STOP  
  
(CRT)  
Deselect STBD DOOR  
• ITEM 10 EXEC (no *)]
    B10_14 --> B14[14 | Open PORT DOOR slightly to eliminate overlap.  
Do not move past 'RDY' position  
(CRT)  
Select PORT DOOR  
• ITEM 13 EXEC (*)  
  
(CRT, R13L)  
• PL BAY DR – OP (as reqd)  
• √PORT DOOR – 'RDY'  
• PL BAY DR – STOP  
  
(CRT)  
Deselect PORT DOOR  
• ITEM 13 EXEC (no *)]
    B14 --> B11[11]
    
    B11 --> B14_11[14 | Close STBD DOOR until just before contact is made with PORT DOOR  
(CRT)  
Select STBD DOOR  
• ITEM 10 EXEC (*)  
  
(CRT, R13L)  
• PL BAY DR – CL  
• √STBD DOOR – blank  
• PL BAY DR – STOP  
  
(CRT)  
Deselect STBD DOOR  
• ITEM 10 EXEC (no *)]
    B14_11 --> B12_15[12 | NO YES  
12 | Repeat blocks 10, 14, 11 as reqd to eliminate overlap]
    B12_15 --> B11
    
    B11 --> B6_7_11[6 | 7 | 11  
12 | √CENTER LATCHES visually for LATCH capture using C/L LATCH EXTENDED GUIDE ROLLER TRAJECTORY NO-GO DIAGRAM, fig. 9-3  
• √Extended guide rollers for CENTER LATCHES 3, 5, 7, 12 are below point B  
• √CENTER LATCHES for excessive gap. LATCH Guide Roller must be above Passive Stop  
  
• Partially close individual LATCH Gangs that pass checks  
  
(CRT)  
• Select single CENTER LATCH Gang (as reqd)  
  
(CRT, R13L)  
• PL BAY DR – CL (25 sec)  
• √CENTER LATCHES – blank  
• PL BAY DR – STOP  
  
(CRT)  
• Deselect single CENTER LATCH Gang (as reqd)  
  
• Repeat for all CENTER LATCH Gangs that pass checks]
    B6_7_11 --> B13[13]
    
    B13 --> B12_16[12 | 13 | Partially close PORT LATCHES  
(CRT)  
If not already 'CL' select PORT DOOR  
• ITEM 13 EXEC (*)  
Select PORT FWD, AFT LATCHES  
• ITEM 11 EXEC (*)  
• ITEM 12 EXEC (*)  
  
(CRT, R13L)  
• PL BAY DR – CL (~31 sec)  
• √PORT DOOR – 'CL'  
• √PORT FWD, AFT LATCHES – blank  
• PL BAY DR – STOP  
  
(CRT)  
Deselect PORT FWD, AFT LATCHES  
• ITEM 11 EXEC (no *)  
• ITEM 12 EXEC (no *)  
If reqd, deselect PORT DOOR  
• ITEM 13 EXEC (no *)]
    B12_16 --> B16[16]
    
    B16 --> B13
    
    B13 --> B13_Caut[CAUTION  
Do not close FWD, AFT LATCHES if PORT(STBD) DOOR not 'RDY' to prevent DOOR closing onto the latches]
    B13_Caut --> B13_End(( ))

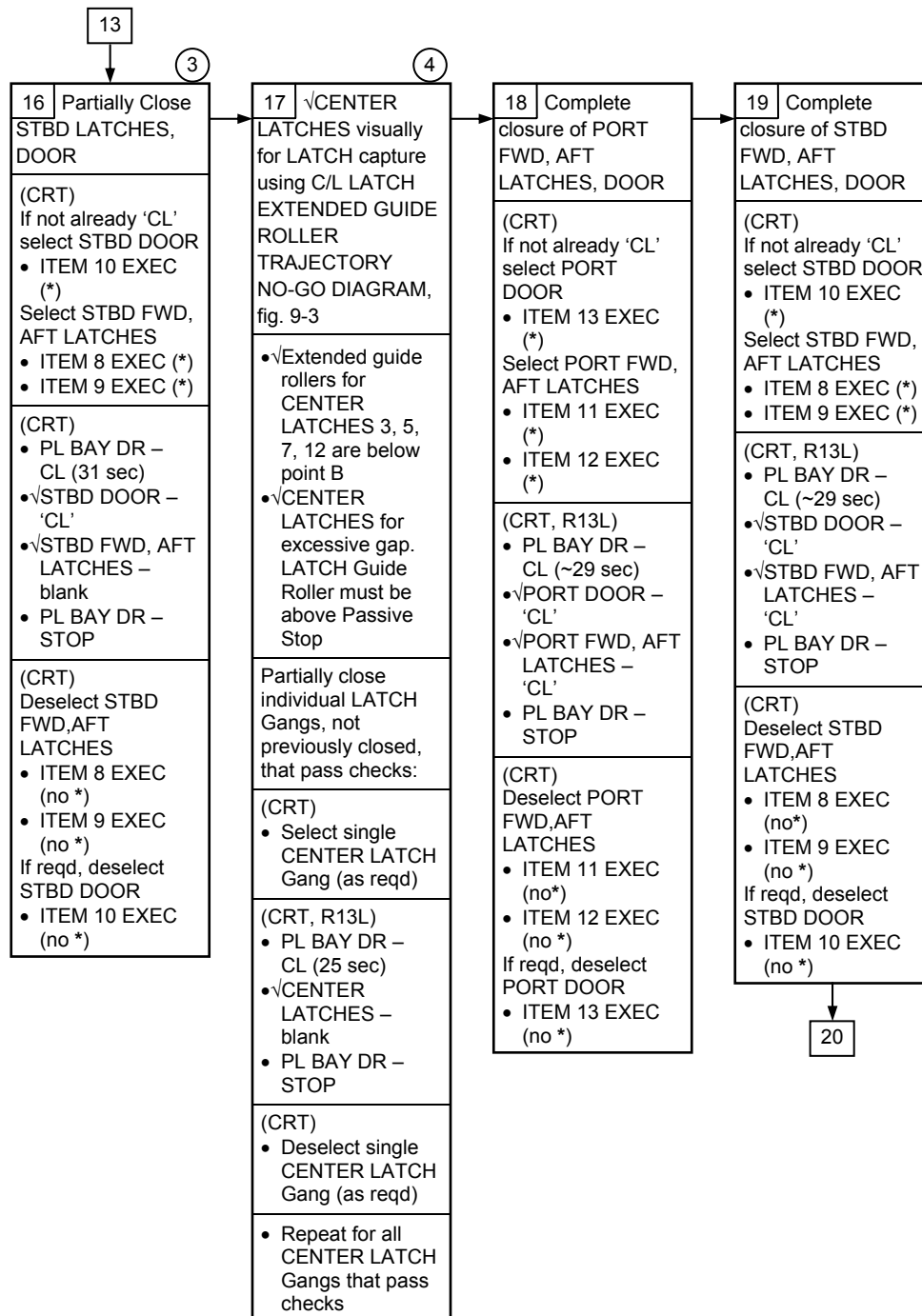
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Legend:

- ① Depending on the position of the port door, STBD DOOR may show 'RDY' instead of blank
- ③ Allows LATCHES to latch partially
- ④ The latch hangers on CENTER LATCHES 3, 5, 7, 9, and 12 are the only ones that have stripes. The stripes on 9 may not be visible due to obstruction by the passive shear roller

④ The latch hangers on CENTER LATCHES 3, 5, 7, 9, and 12 are the only ones that have stripes. The stripes on 9 may not be visible due to obstruction by the passive shear roller

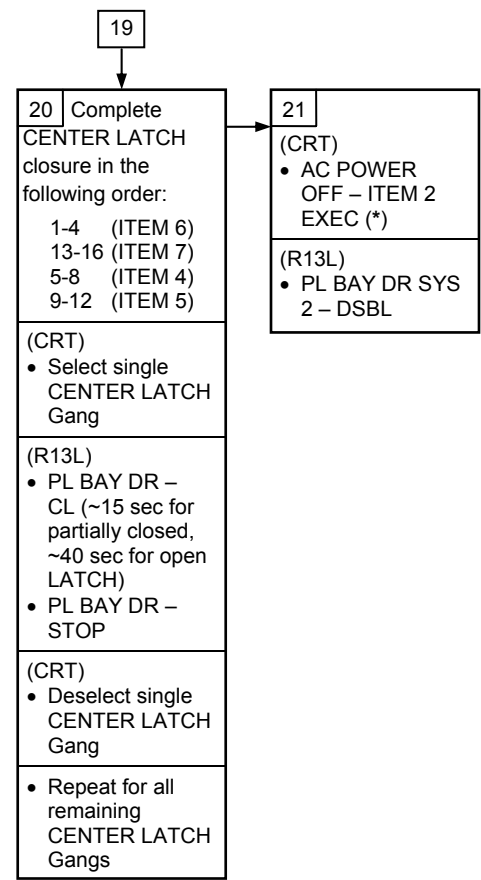
MECH SSR-3 (Cont)



3 Allows LATCHES to latch partially

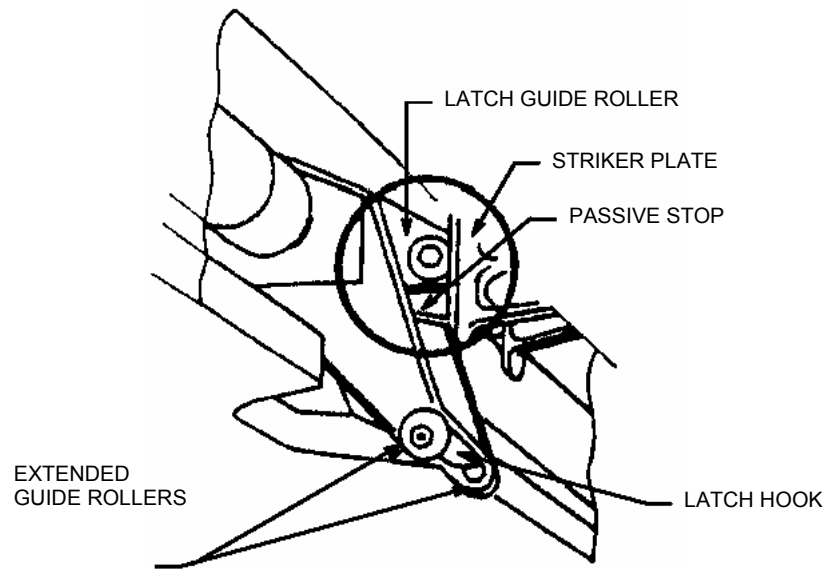
4 The latch hangers on CENTER LATCHES 3, 5, 7, 9, and 12 are the only ones that have stripes. The stripes on 9 may not be visible due to obstruction by the passive shear roller

MECH SSR-3 (Cont)



MECH SSR-3 (Cont)

NO. 1 LATCH AREA TO CHECK FOR EXCESSIVE GAP



VIEW OF NO. 1 C/L LATCH FROM PORT AFT WINDOW

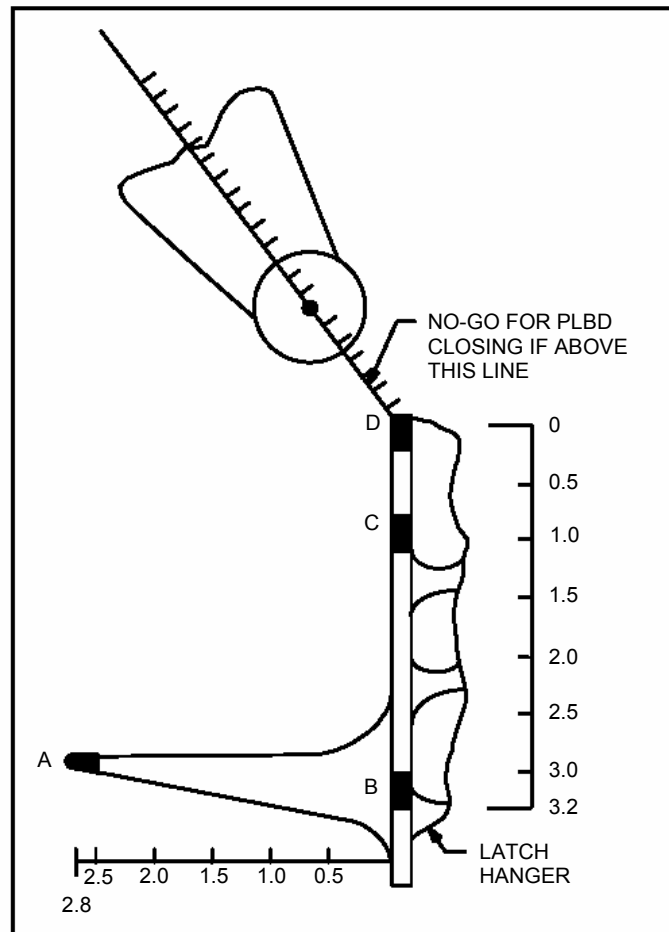


Figure 9-3.- C/L Latch Extended Guide Roller Trajectory NO-GO Diagram

MECH SSR-4

PLBD CHECKOUT AFTER MDM CHANGEOUT

- R13L 1. √PL BAY DR – STOP
 √PL BAY DR SYS (two) – DSBL
- CRT4 2. SM, OPS 202 PRO or **BFS, SM 63 PL BAY DOORS**
4: SM PL BAY DOORS
 √AC POWER OFF, ITEM 2 EXEC (*)
 √MAN SEL (ten) – (no *)
 √PBD SW BYPASS, ITEM 14 EXEC (no *)
 √OP/CL STATUS (ten) – OP

NOTE

Perform remaining steps during AOS only

- R13L 3. Select CENTER LATCHES 5-8, 9-12, 1-4, 13-16 – ITEM 4, 5, 6, 7 EXEC (*)
 4. PL BAY DR – CL
 On MCC GO:
 PL BAY DR – STOP
- CRT4 5. Deselect CENTER LATCHES 5-8, 9-12, 1-4, 13-16 – ITEM 4, 5, 6, 7 EXEC (no *)
 6. Select STBD FWD, AFT LATCHES & DOOR – ITEM 8, 9, 10 EXEC (*)
- R13L 7. PL BAY DR – CL
 On MCC GO:
 PL BAY DR – STOP
- CRT4 8. Deselect STBD FWD, AFT LATCHES & DOOR – ITEM 8, 9, 10 EXEC (no *)
 9. Select PORT FWD, AFT LATCHES & DOOR – ITEM 11, 12, 13 EXEC (*)
- R13L 10. PL BAY DR – CL
 On MCC GO:
 PL BAY DR – STOP
- CRT4 11. Deselect PORT FWD, AFT LATCHES & DOOR – ITEM 11, 12, 13 EXEC (no *)

CAUTION

Driving PLBD mechanisms out of sequence may
 create a condition that could prevent PLBD closure

- * If any OP/CL STATUS changes or any PLBD *
 * mechanism is observed to be moving: *
- R13L * PL BAY DR SYS (two) – DSBL *
- CRT4 12. AC POWER ON – ITEM 1 EXEC (*)
- R13L 13. PL BAY DR SYS (two) – ENA
 On MCC GO:
 PL BAY DR SYS (two) – DSBL
- CRT4 14. AC POWER OFF – ITEM 2 EXEC (*)

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 BD 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

NOTE

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	Check config
SM (BFS SM 63) PL BAY DOORS	
•√AC POWER ON – (*) •√AUTO MODE SEL – (no *) •√MAN SEL (ten) – (no *)	
(R13L)	
•√PL BAY DR SYS (two) – ENA •√DR – STOP	

2	Aff DOOR:
STBD	
PORT	

3	• Close,latch PORT DOOR in MANUAL mode

4	Disable pwr to microsw failed in closed state
TO ENABLE:	
MTR 1 (FWD 'C' MICRO-SW STAT – '1') (MA73C:B)	MTR 2 (AFT 'C' MICRO-SW STAT – '1') (MA73C:A)
• MCA LOGIC MNB MID 4 – OFF	• MCA LOGIC MNA MID 1 – OFF
(CRT)	(CRT)
•√PORT DOOR FWD 'C' MICRO-SW STAT – '0'	•√PORT DOOR AFT 'C' MICRO-SW STAT – '0'

5	Disable pwr to microsw failed in closed state
TO ENABLE:	
MTR 1 (FWD 'C' MICRO-SW STAT – '1') (MA73C:A)	MTR 2 (AFT 'C' MICRO-SW STAT – '1') (MA73C:B)
• MCA LOGIC MNB MID 2 – OFF	• MCA LOGIC MNC MID 4 – OFF
(CRT)	(CRT)
•√STBD DOOR FWD 'C' MICRO-SW STAT – '0'	•√STBD DOOR AFT 'C' MICRO-SW STAT – '0'

6	Close PORT DOOR
(CRT)	
Select PORT DOOR	
• ITEM 13 EXEC (*)	
(R13L)	
• PL BAY DR – CL	
(CRT)	
•√'OP/CL', 'MICRO-SW STAT' columns	
After PORT DOOR 'RDY' and one DOOR 'C' = '1', or ~126 sec:	
(R13L)	
• PL BAY DR – STOP	
(CRT)	
Deselect PORT DOOR	
• ITEM 13 EXEC (no *)	

7	PLBD fit check
(CRT)	
Select STBD DOOR	
• ITEM 10 EXEC (*)	
(R13L)	
• PL BAY DR – CL	
When STBD DOOR as close as possible to PORT DOOR before contact:	
(R13L)	
• PL BAY DR – STOP • Determine C/L Latch Clearance on C/L LATCH EXTENDED GUIDE ROLLER TRAJECTORY NO-GO DIAGRAM, <u>MECH SSR-3</u>, fig. 9-3:	
GO	NO-GO

8	Reenable MCA LOGIC pwr
MTR 1 (MA73C:B)	MTR 2 (MA73C:A)
• MCA LOGIC MNB MID 4 – ON	• MCA LOGIC MNA MID 1 – ON

11

9

12

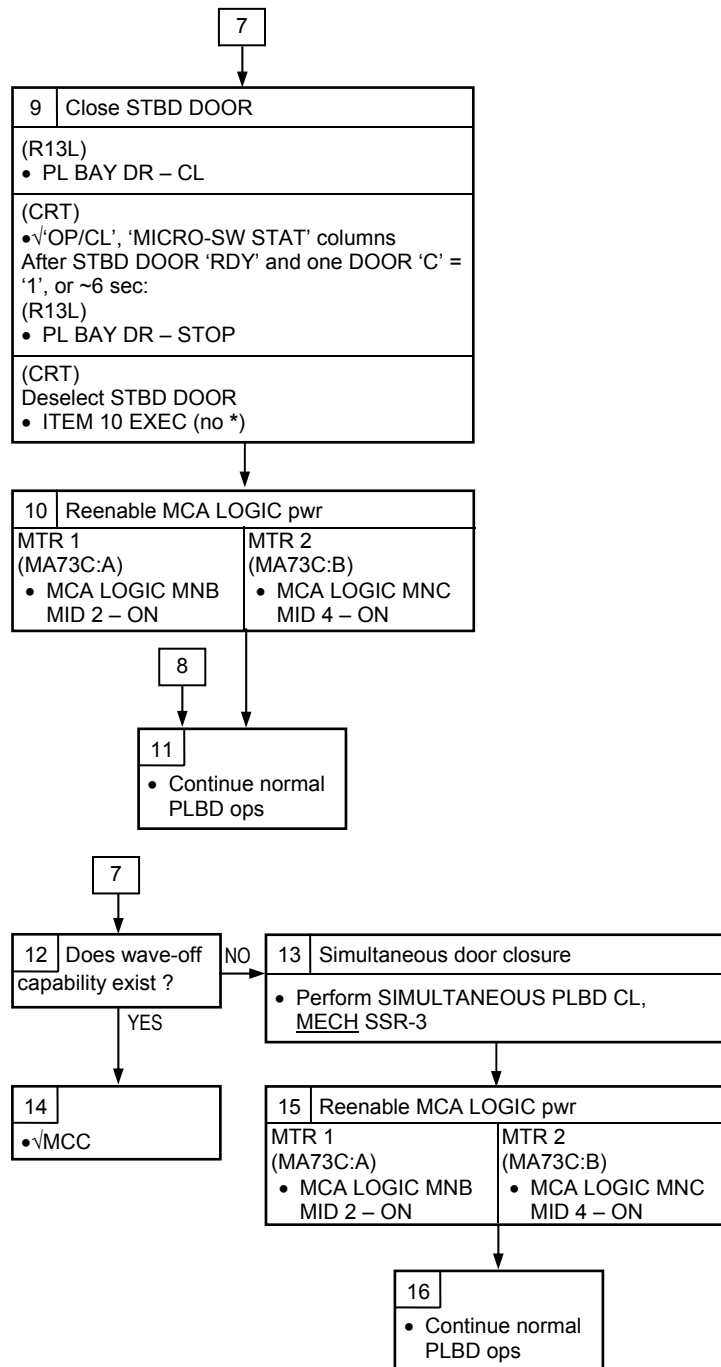
① To enable mtr 1, this step also disables pwr to:
PORT FWD BLKHD
MTR 2
STBD DOOR
MTR 2
STBD FWD BLKHD
MTR 2

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

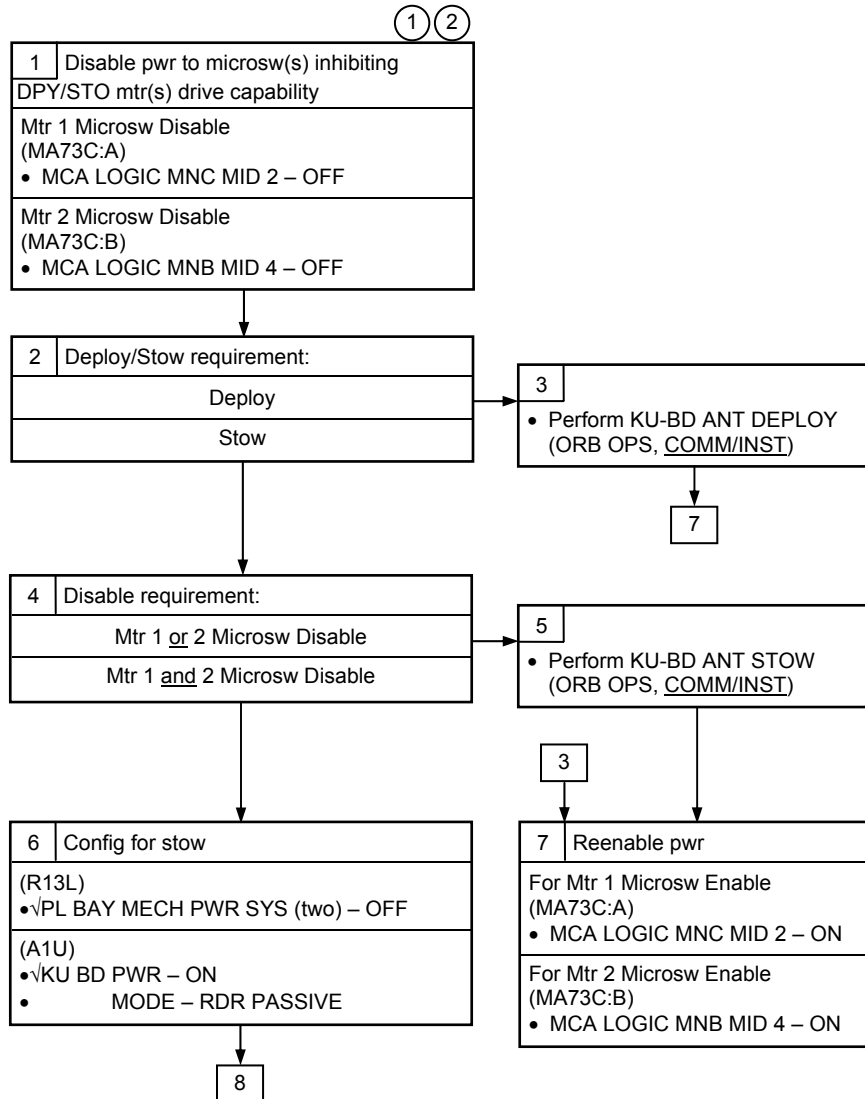
MECH SSR-6 (Cont)



MECH SSR-7 KU-BAND ANTENNA DPY/STO MICROSW FAILURE

NOTE

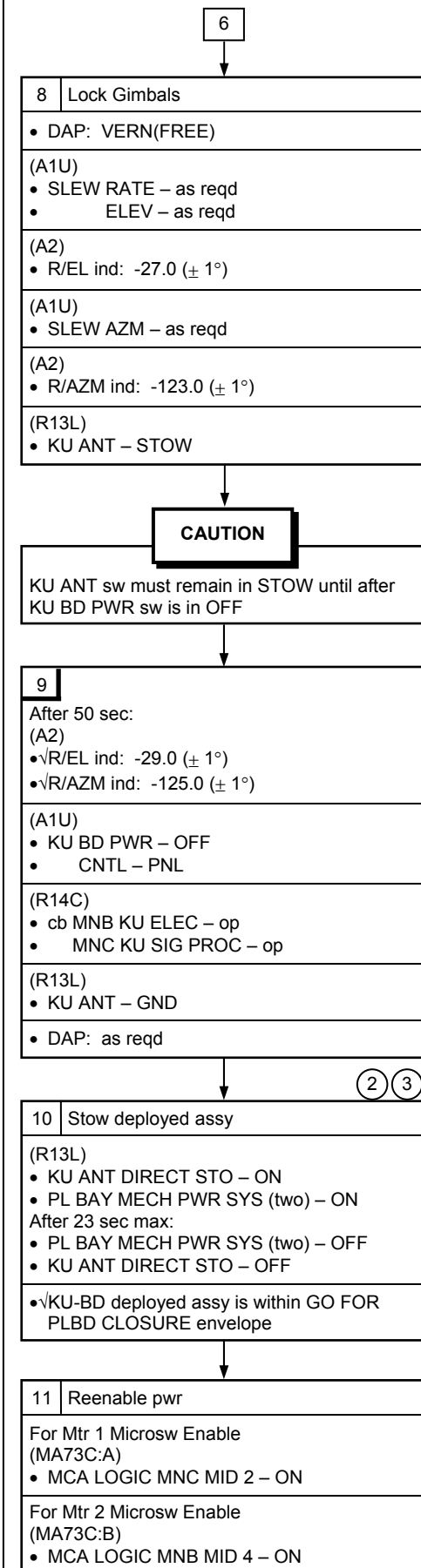
This procedure regains capability to deploy or stow antenna if (DPY/STO) microsw(s) is (are) failed on, inhibiting deploy/stow mtr ops



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

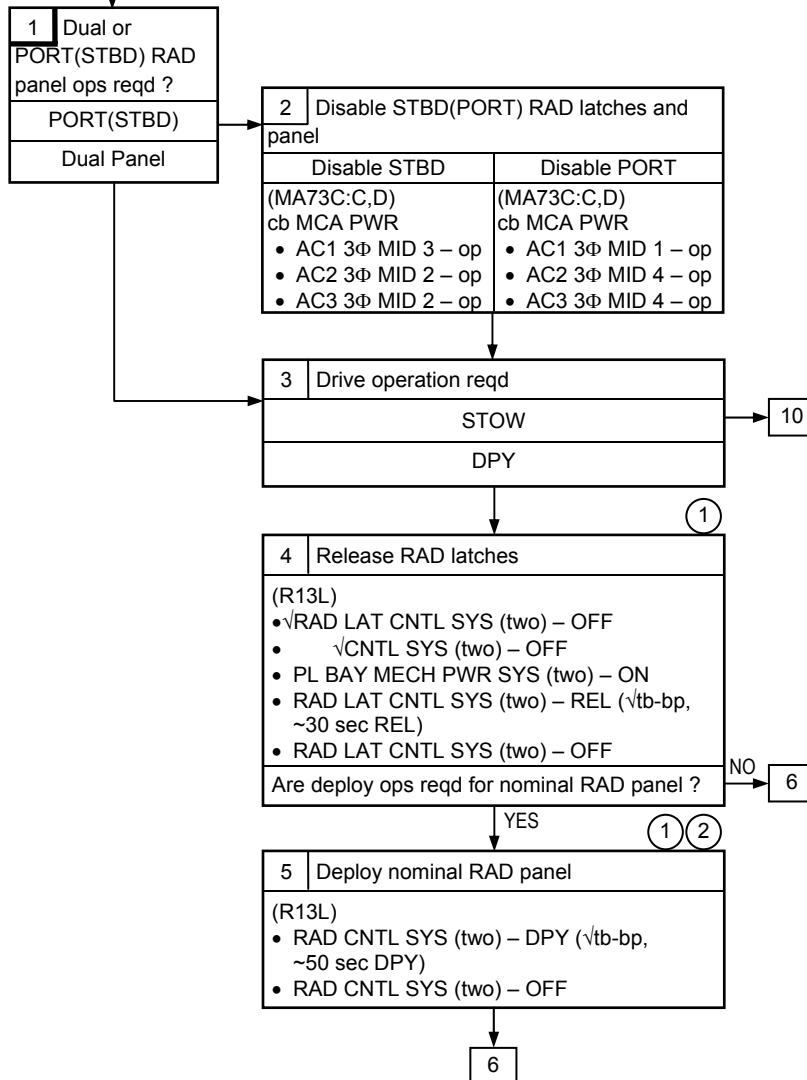
MECH SSR-8 RAD DPY/STO MICROSW FAILURE WORKAROUND

NOTE

This procedure regains radiator panel deploy or stow capability if DPY/STO microsw(s) is (are) failed on, inhibiting deploy/stow motor ops. This procedure accommodates PORT(STBD) and/or dual panel ops

WARNING

To preclude failures causing inadvertent MPM cycling, the RMS (if flown) must be cradled if PORT RAD deploy ops are required. This procedure assumes that the RMS is cradled



① Drive Times (Dual Motor)

Lat – 30 sec

Panel – 50 sec

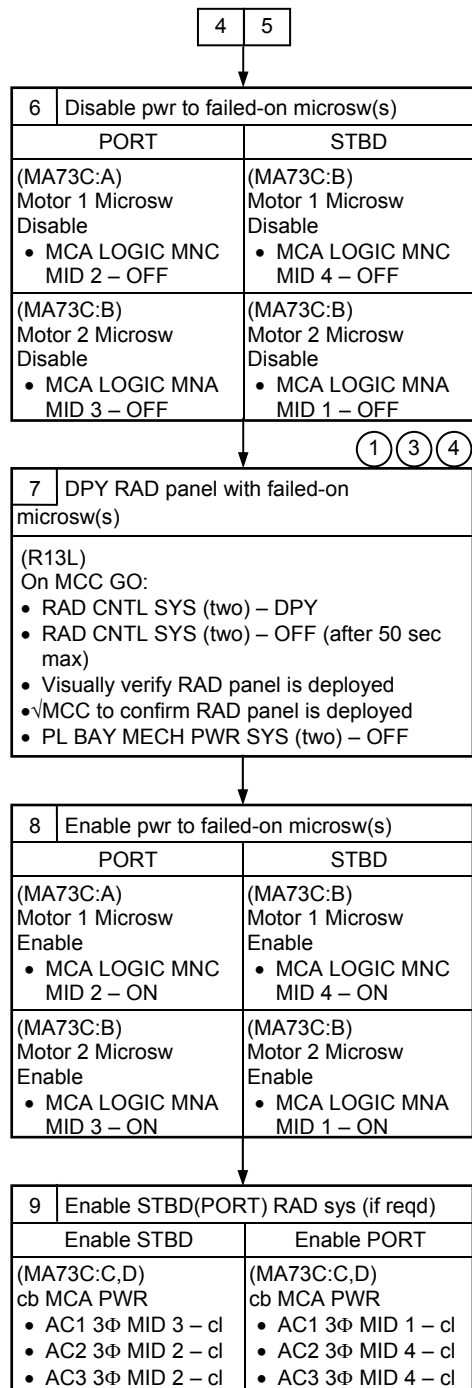
(Single Motor)

Lat – 60 sec

Panel – 100 sec

② For either a dual microsw or microsw/motor failure, failed panel will be inhibited from driving

MECH SSR-8 (Cont)



① Drive Times

(Dual Motor)

Lat – 30 sec

Panel – 50 sec

(Single Motor)

Lat – 60 sec

Panel – 100 sec

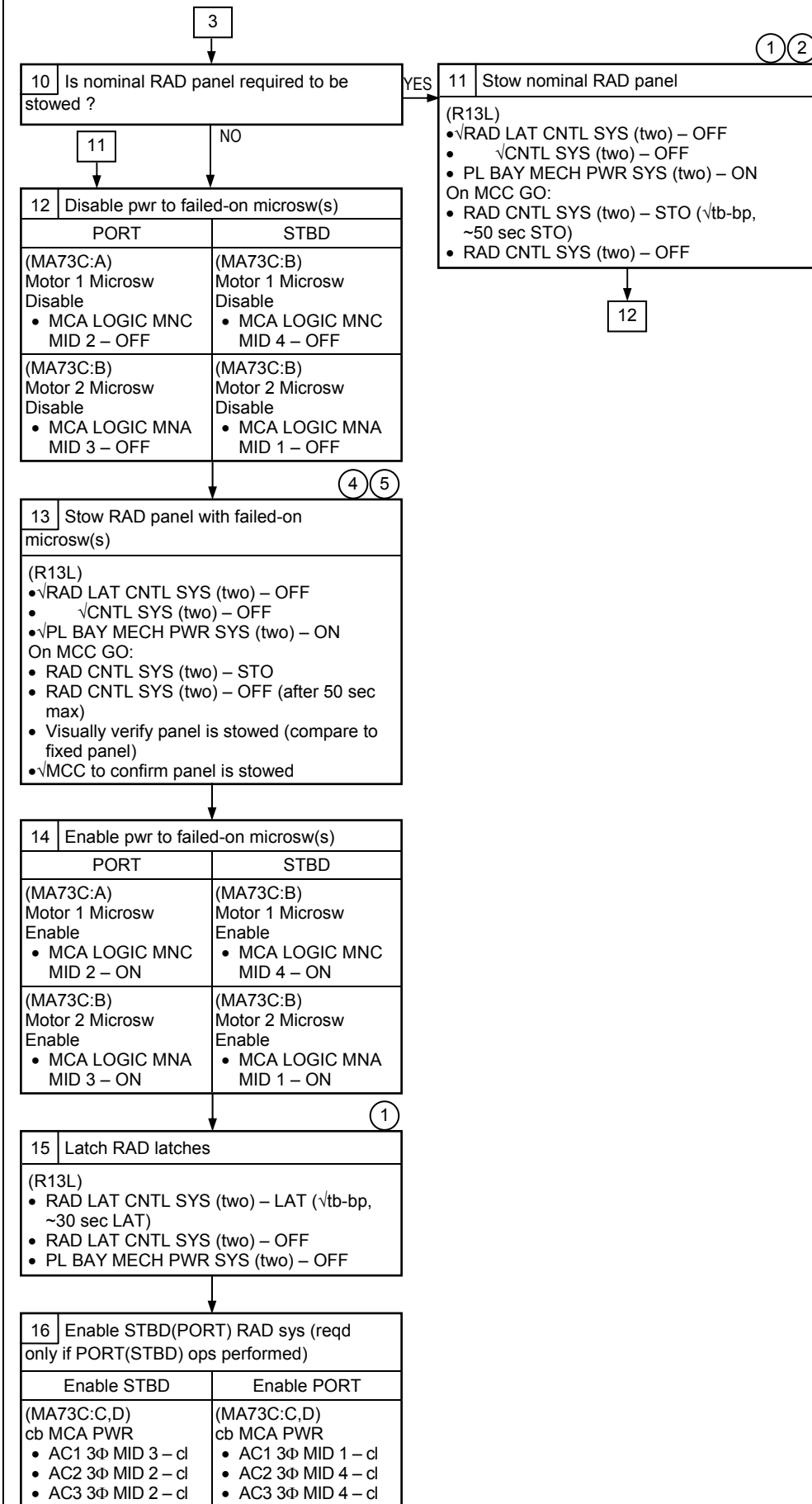
③ Only nominal

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 motor drive time. For microsw and motor failure expect single motor drive time (drive for 100 sec)

MECH SSR-8 (Cont)



① Drive Times

(Dual Motor)

Lat – 30 sec

Panel – 50 sec

(Single Motor)

Lat – 60 sec

Panel – 100 sec

② For either a dual microsw or motor failure, failed panel will be inhibited from driving

④ For dual microsw failure, expect dual motor drive time. For microsw and motor failure, expect single motor drive time (drive for 100 sec)

⑤ RAD panel tb is not operational. MCC verification of AC bus slip currents will verify mechanism end-of-travel

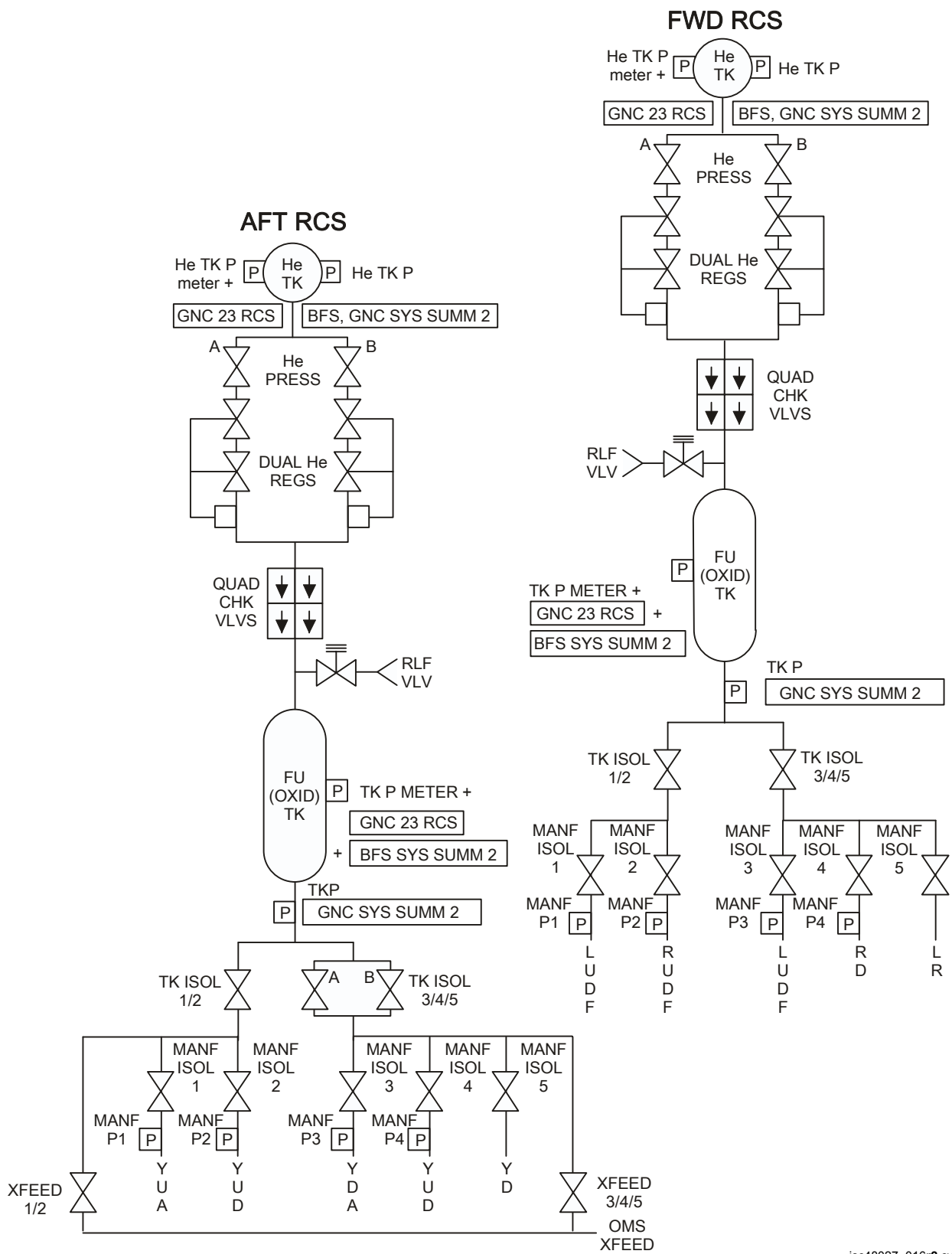
RCS

RCS SCHEMATIC	10-3
<u>10.1</u> <u>RCS JET/DLMA/PWR</u>	
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
<u>10.2</u> <u>RCS VLV MISCOMP</u>	
10.2a RCS VLV tb – bp	10-12
10.2b tb AND sw POSITION DISAGREE	10-15
<u>10.3</u> <u>RCS PRPLT THERM/SYS</u>	
10.3a 'S89 PRPLT THRM RCS'	10-16
10.3b 'G23 RCS SYSTEM F(L,R)'	10-17
<u>RCS SSR</u>	
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)

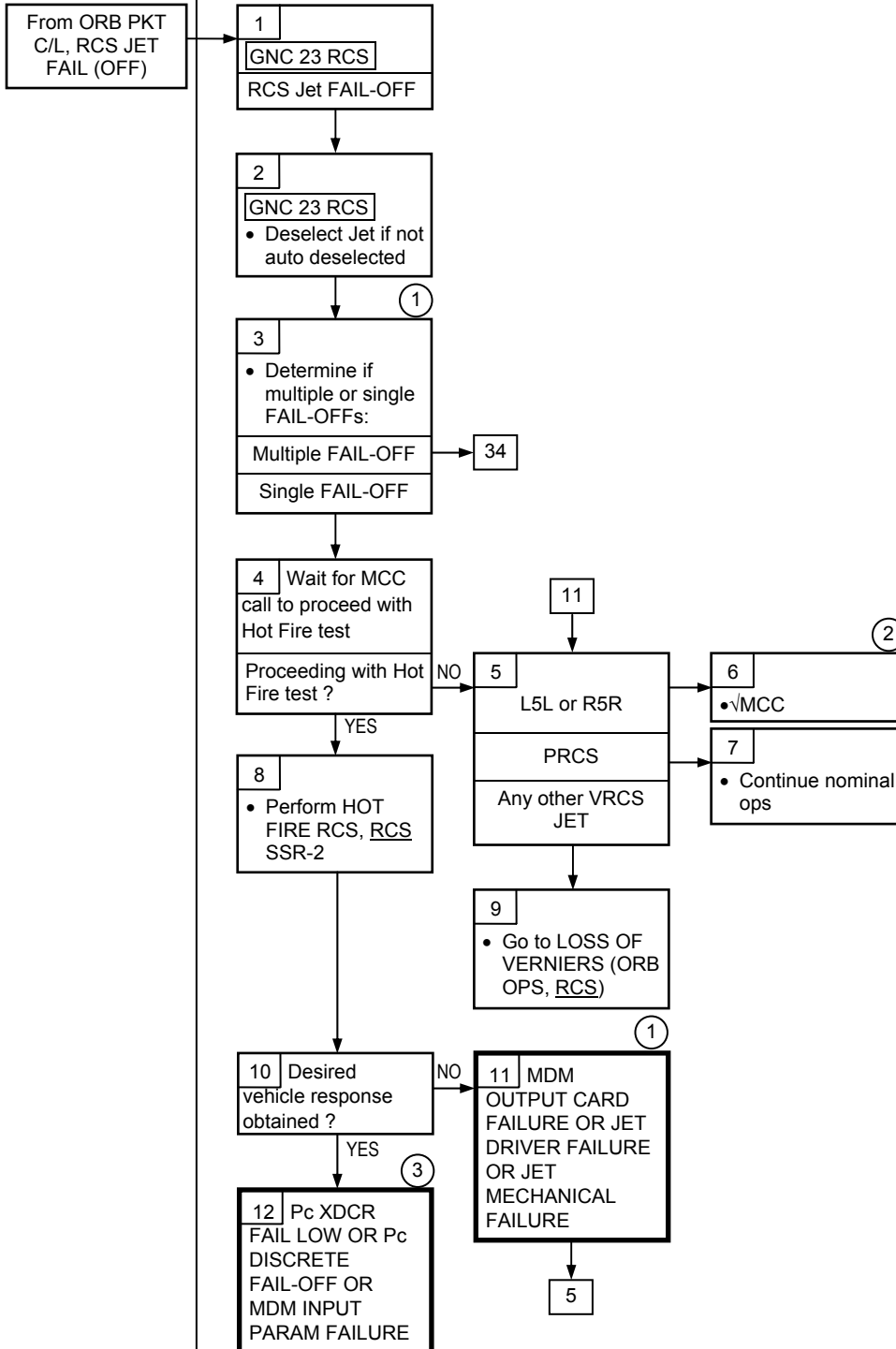
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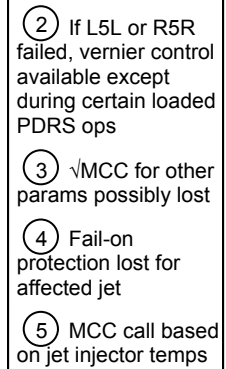
jsc48027_016r2.cvx

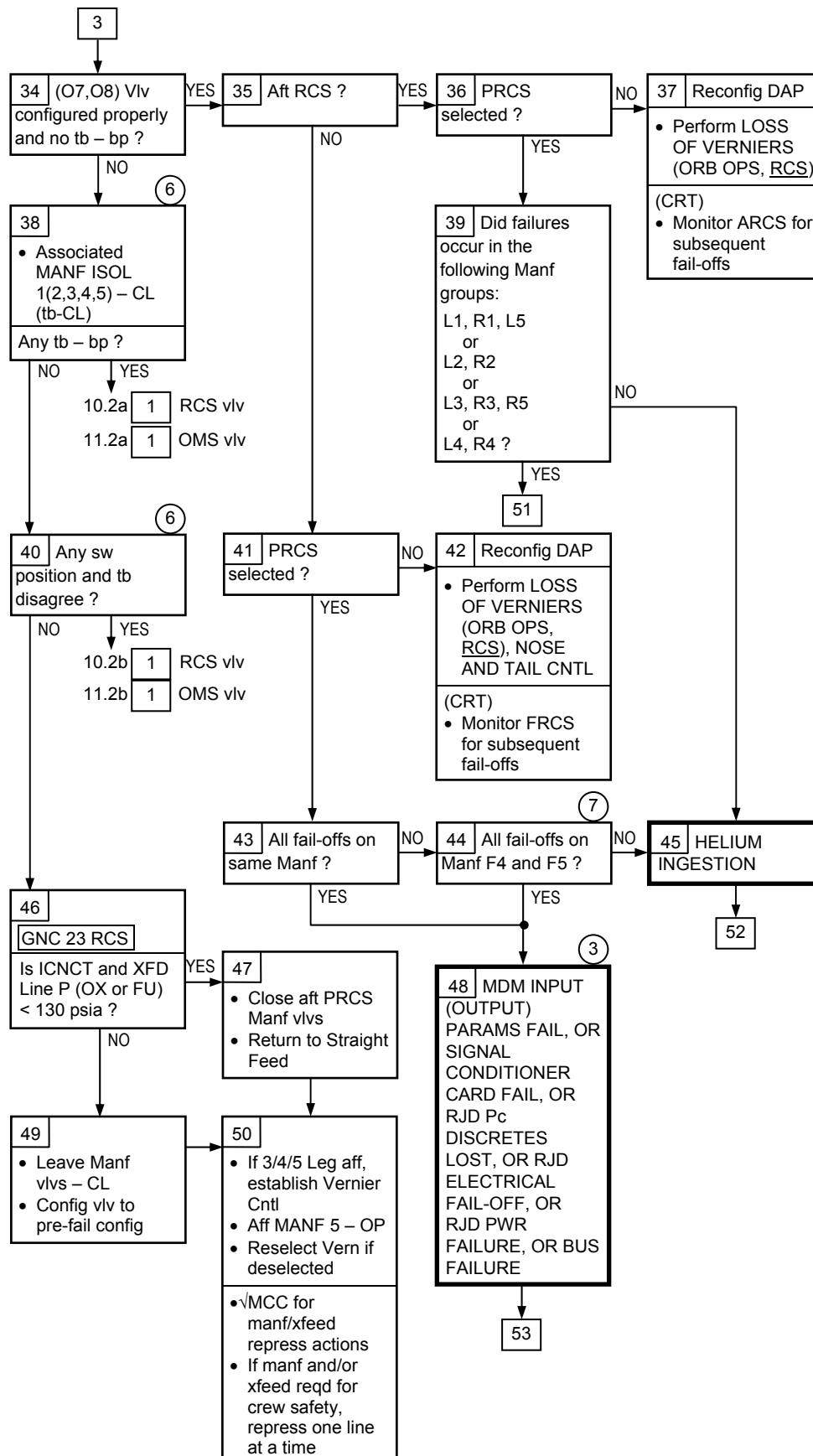
RCS

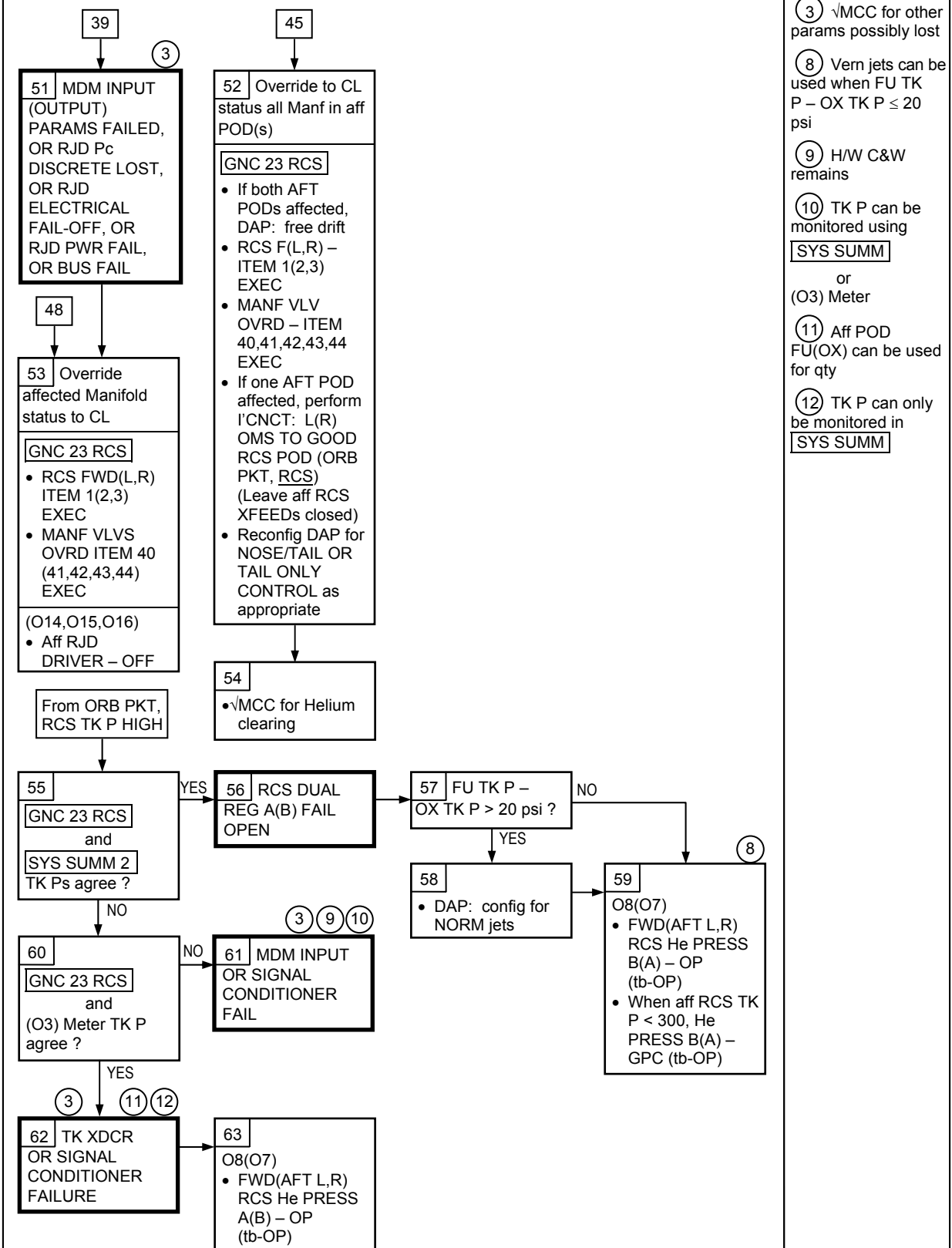
10.1a 'L(R,F) RCS (L,U,D,R,A,F) JET' 'F(L,R) RCS TK P' 'F(L,R) RCS LEAK'



10.1a (Cont)

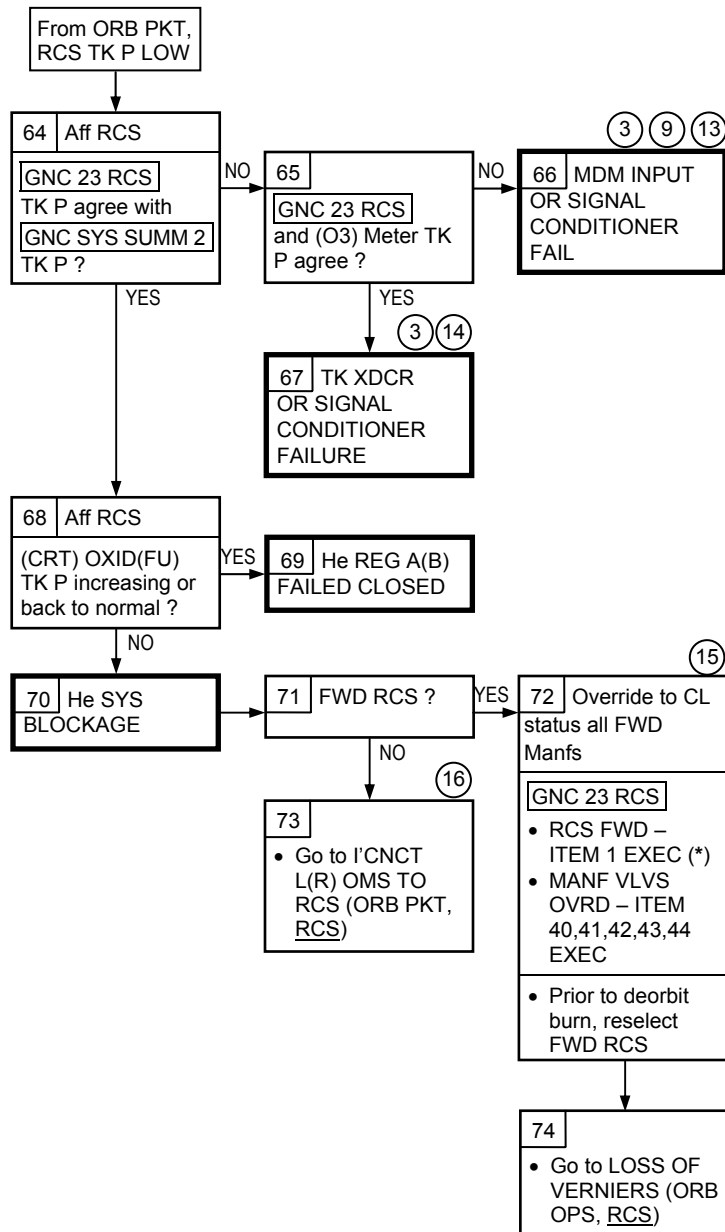






RCS

10.1a (Cont)



③ √MCC for other
params possibly lost

⑨ H/W C&W
remains

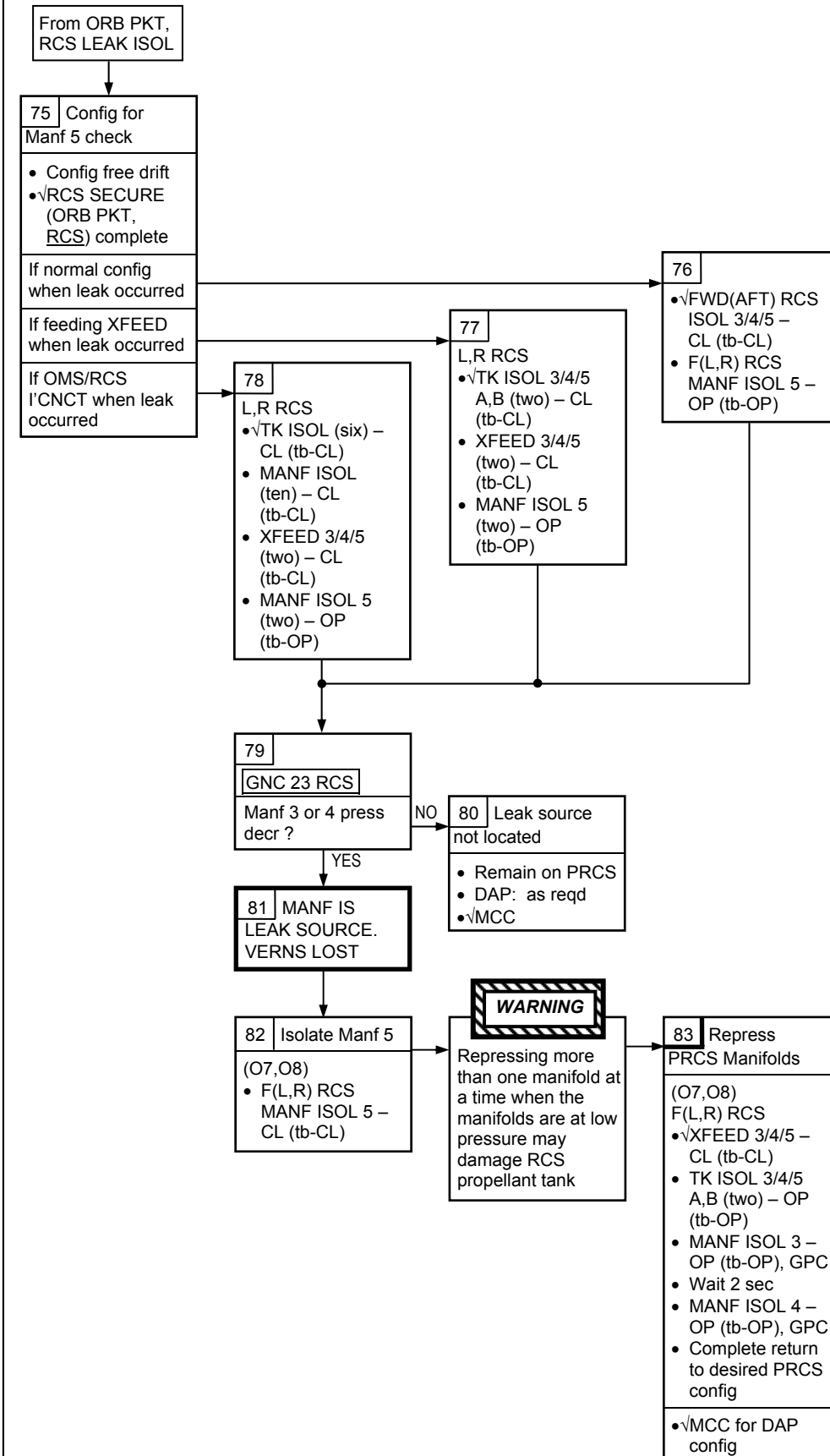
⑬ Use
SYS SUMM 2

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



RCS

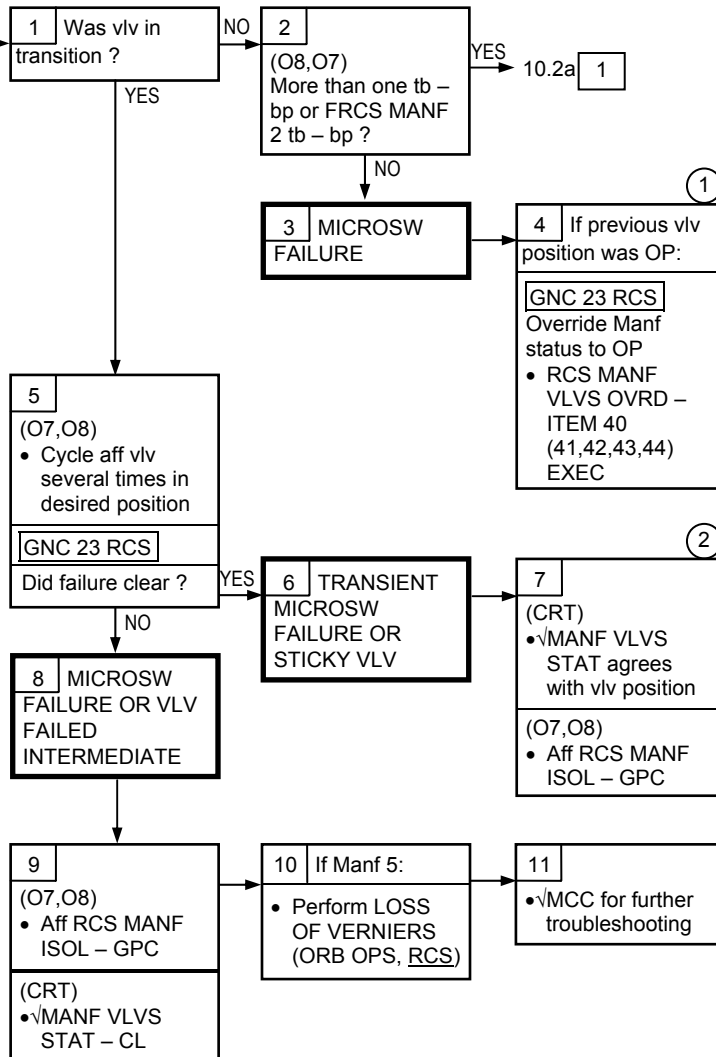
10.1b 'RM DLMA MANF'

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

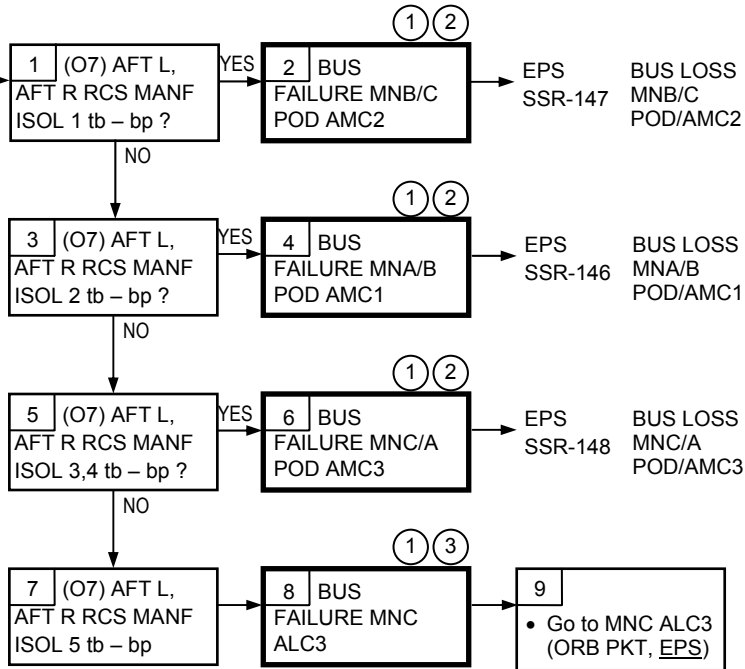
RCS PWR
FAIL

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 VLV
MISCOMP

10.2

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

33
2 Was vlv reconfig in
progress ?

NO

10.2b 5
YES

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

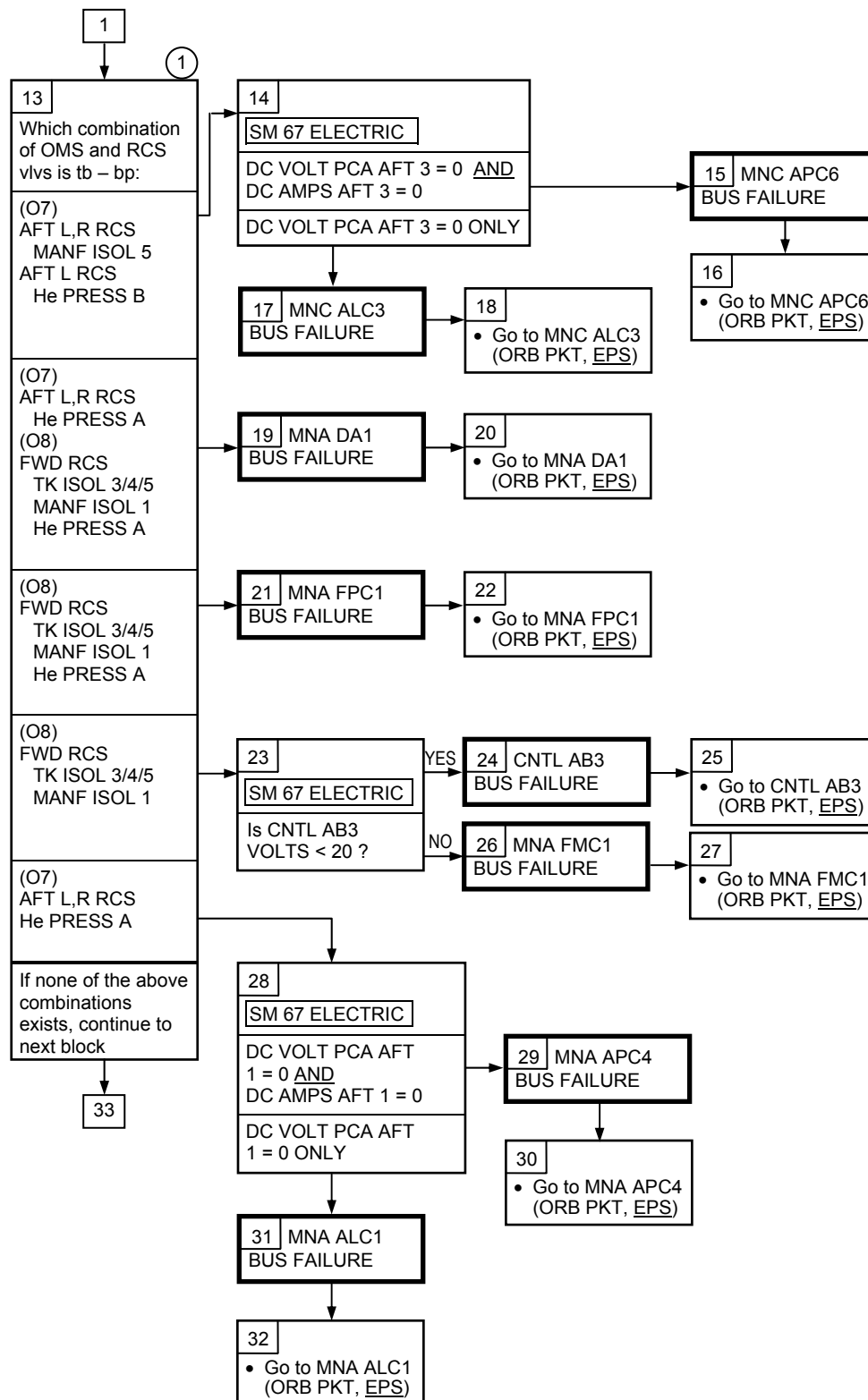
9
GNC 23 RCS
•√Aff MANF VLVS STATUS – CL
• If MANF 5, perform LOSS OF VERNIERS
(ORB OPS, RCS)

(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

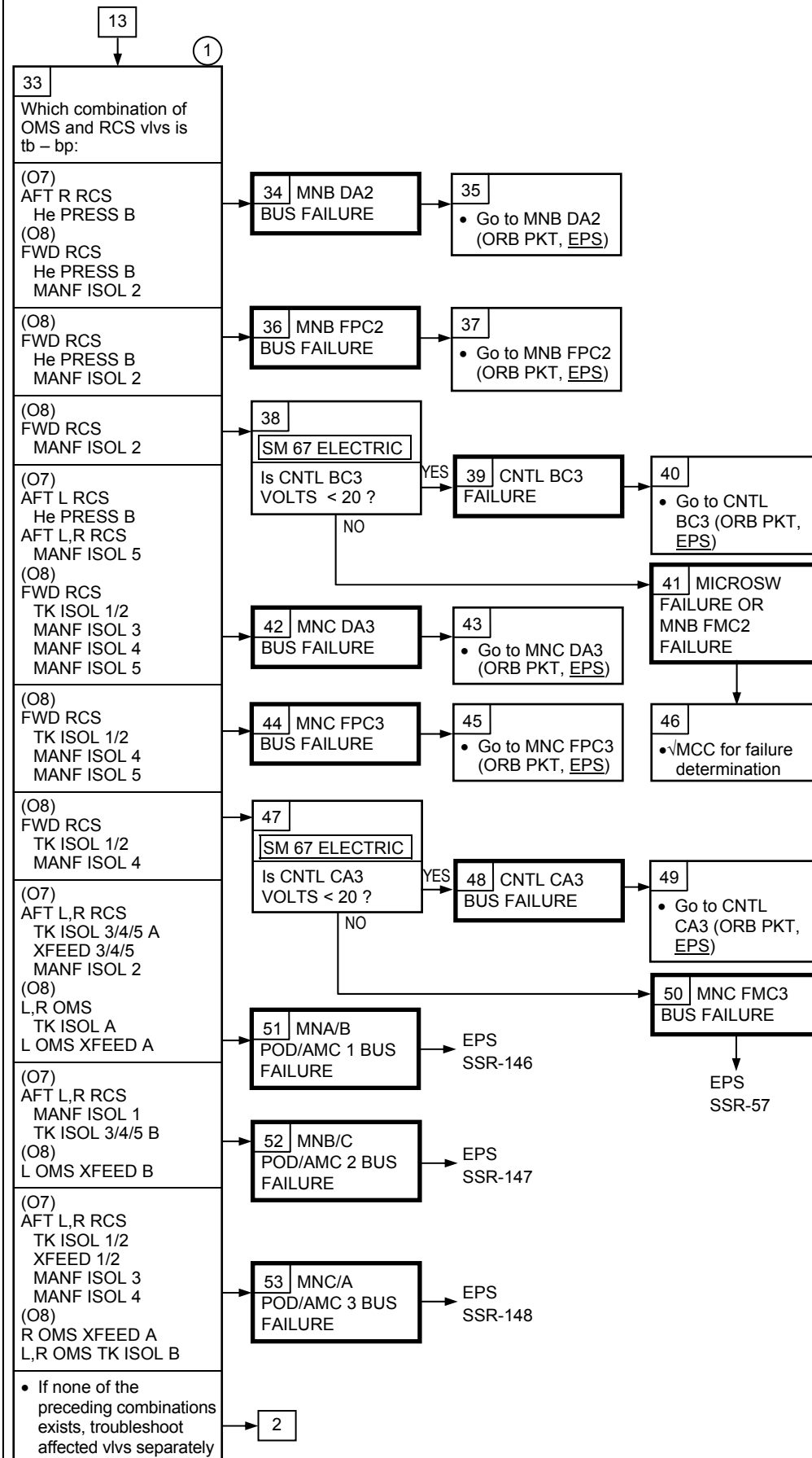
12 POTENTIAL MICROSW FAILURE.
√MCC FOR FAILURE DETERMINATION



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

10.2a (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

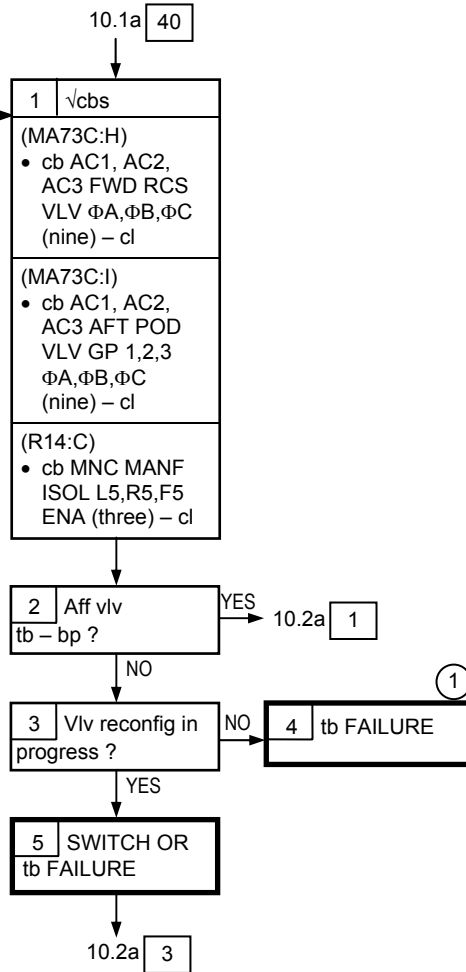
RCS

10.2b RCS VLV tb AND sw POSITION DISAGREE

① Ignore tb. Vlv in commanded position

RCS Vlv tb and sw Position Disagree

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

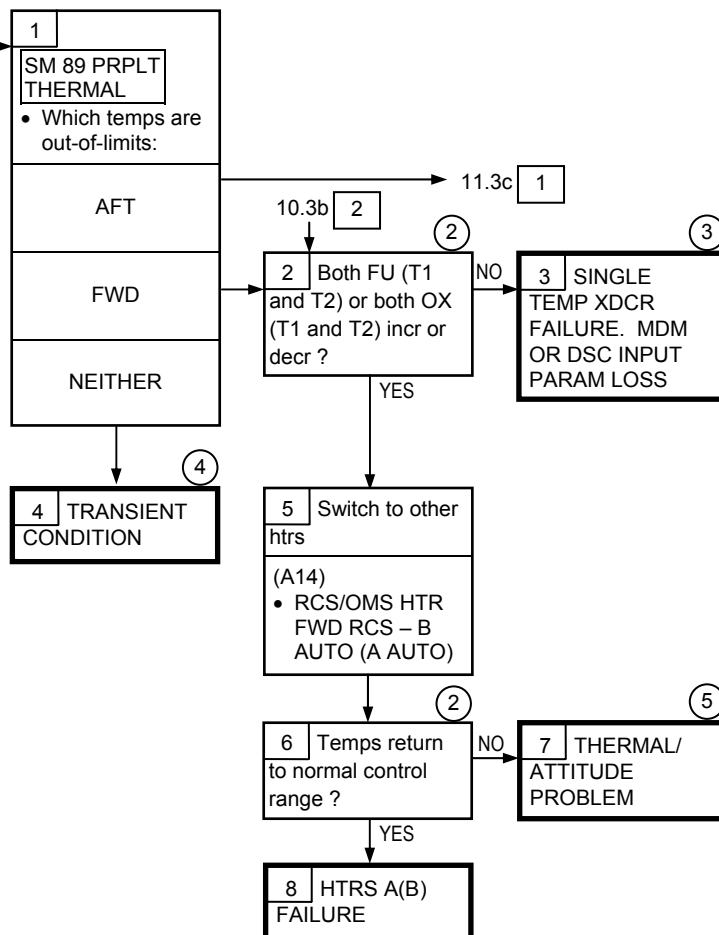
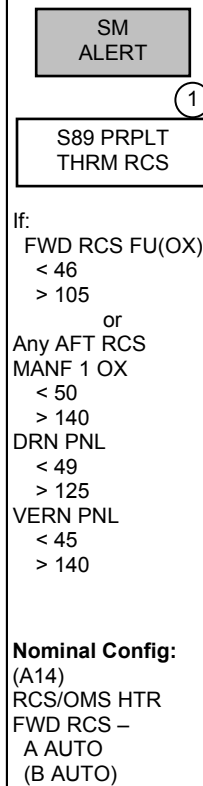


RCS PRPLT
THERM/SYS

10.3

RCS

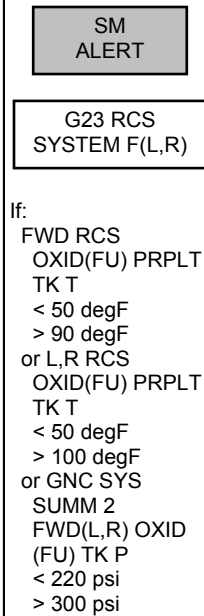
10.3a 'S89 PRPLT THRM RCS'



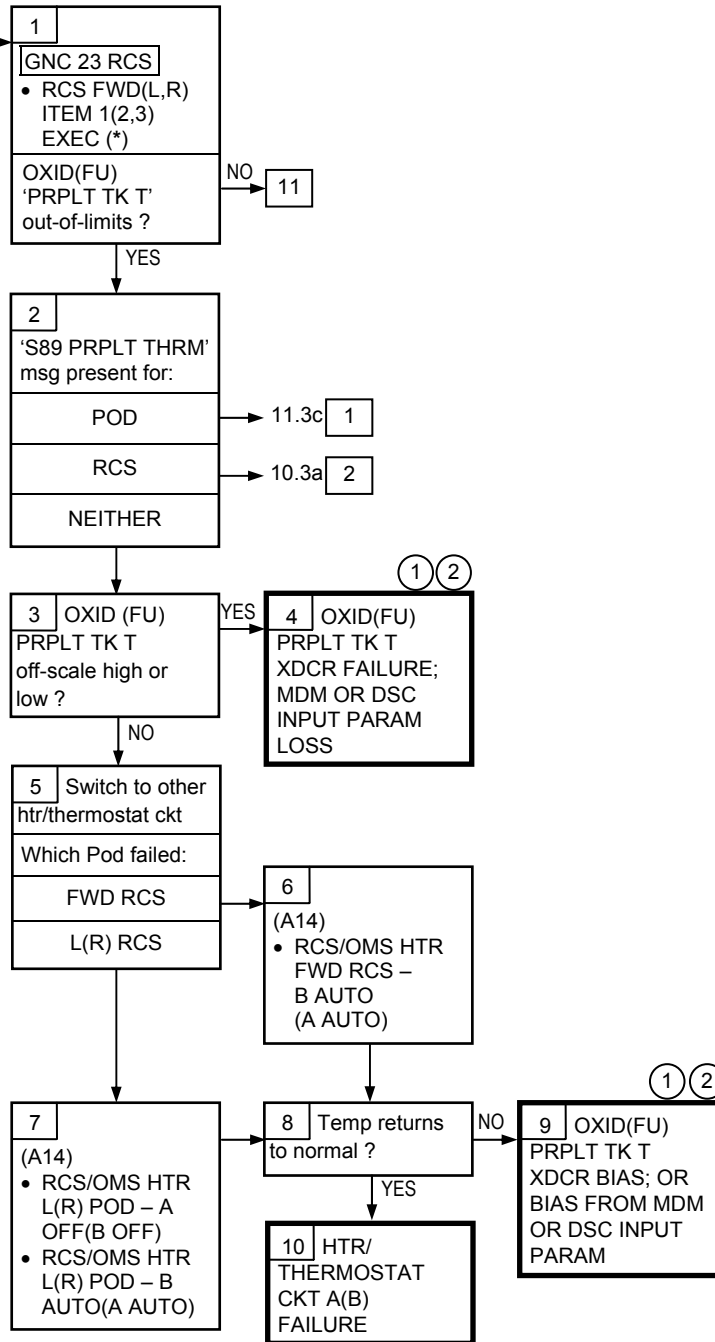
- ① Msg available in SM OPS 2 or 4 only
- ② Since FU and OX Htrs controlled by separate thermostats, both T1 and T2 FU temps normally incr or decr together. Both T1 and T2 OX temps normally incr or decr together
- ③ √MCC for other params possibly lost in same MDM or DSC Card
- ④ Htrs cycling high/low 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

RCS

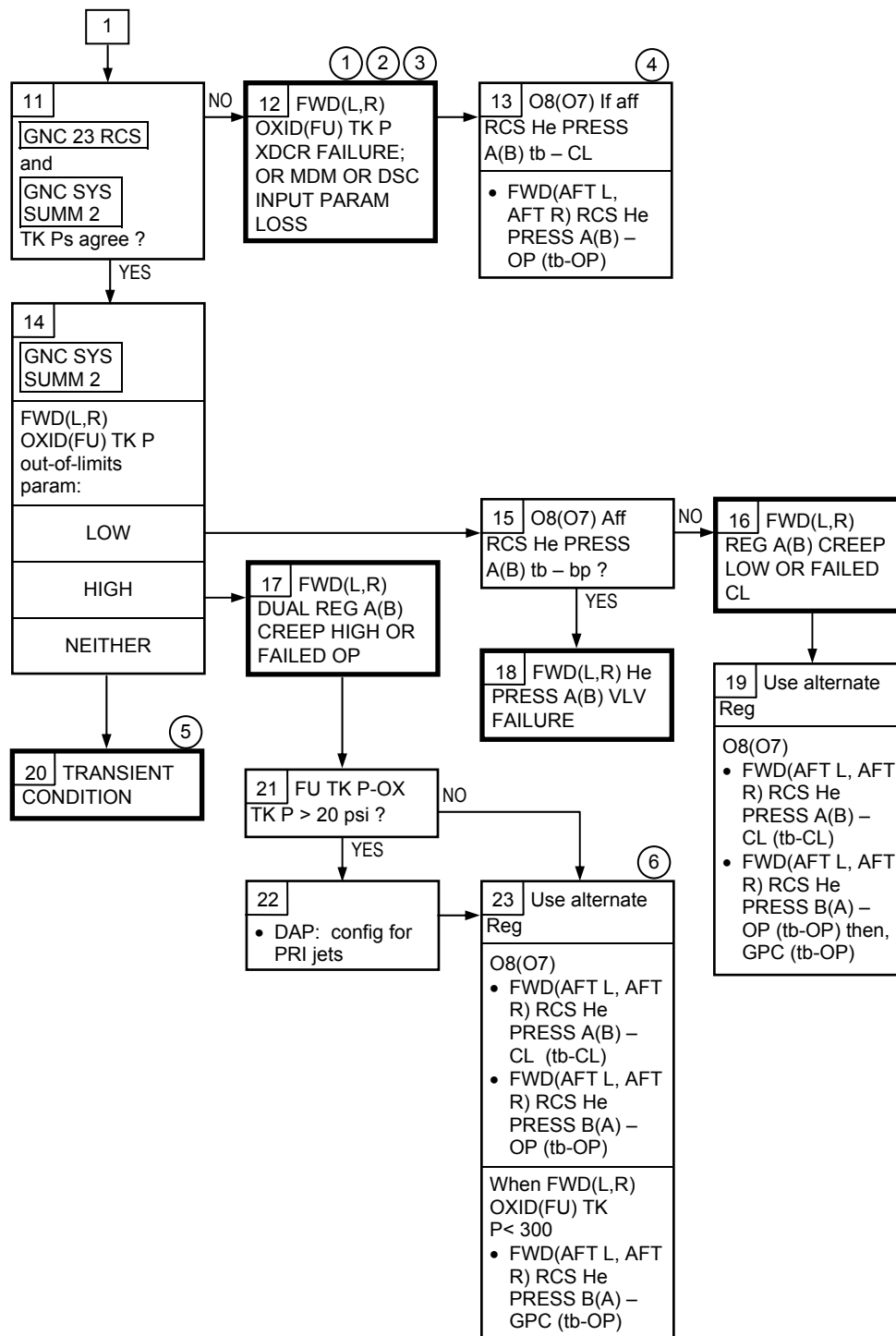
10.3b 'G23 RCS SYSTEM F(L,R)'



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 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



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RCS SSR

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 MCC. This procedure requires realtime ground verification (24 hr) prior to use

- 07 1. Check config:
- √AFT L,R RCS TK ISOL (six) – CL (tb-CL)
 - √XFEED (four) – OP (tb-OP)
- 08
- √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)

- 07 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

RCS SSR

RCS SSR-1 (Cont)

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

√P(Y) OPTION – ITEM 15(16) ALL

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
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 RHC, do not command past soft stop (no ACCEL mode)

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

RCS SSR-2 (Cont)

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

RCS SSR-2 (Cont)

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

RCS SSR-3 (Cont)

CRT * If MANF P < 130 psia: *

O8 * L(R) OMS XFEED VLV A,B – CL (tb-CL) *

O7 * 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), GPC

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)

RCS SSR-3 (Cont)

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
- 07(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), GPC one at a time
5. DAP: as reqd

RCS SSR-5

LEAKING RCS PRPLT/He BURN

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)

If AFT RCS LEAK, perform +X TRANSLATION (uses OPS 2, part C)

A. If FRCS -X TRANSLATION:

1. RCS BURN PREP

O14:F, O15:F, O16:F √Pri RJD LOGIC, DRIVER (sixteen) – ON

O14:E, O15:E, O16:E √cb DDU (six) – cl

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), GPC

GNC 55 GPS STATUS

√GPS TO NAV – INH (*)

2. MNVR TO BURN ATTITUDE

DAP: B1/AUTO/PRI

GNC UNIV PTG

TGT ID: 2

√MCC for preferred burn

If no COMM, maneuver to closest out-of-plane attitude and execute burn ASAP

If out-of-plane burn:

BODY VECTOR: 3
OM: 90 (270 for nose south)
Start TRK – ITEM 19 EXEC (CUR - *)

If retro burn (heads down):

BODY VECTOR: 5
P: 88
Y: 0
OM: 180
Start TRK – ITEM 19 EXEC (CUR - *)
GNC, OPS 202 PRO

C2

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 (no ITEM 27), ignore computed ATT, perform burn in final ATT
Go to step A3

If posi burn (heads down):

BODY VECTOR: 5
P: 92
Y: 0
OM: 0
Start TRK – ITEM 19 EXEC (CUR - *)
GNC, OPS 202 PRO

C2

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 (no ITEM 27), ignore computed ATT, perform burn in final ATT
Go to step A3

RCS SSR-5 (Cont)

3. TERMINATE CONDITIONS

Terminate RCS burn when any one of the following conditions exists:

If He LEAK:

Aff He P < 456 psia, or
CUR HP = 95 nmi, or
Burn Time from below table expired

	RCS PRPLT TO BE BURNED 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 (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
	TIME FROM BURN INITIATION (M:S)														

If PRPLT LEAK:

First RCS jet FAIL OFF or
CUR HP = 95 nmi

4. BURN EXEC

F6(F8)

ADI ERROR – MED
RATE – HI

If burning out-of-plane:

Verify burn attitude, execute burn ASAP, and ignore TIG references

If retro burn:

ADI ATT – LVLH
√ATT

Retro
Heads Down

R: 180
P: 358
Y: 000

If posi burn:

ADI ATT – LVLH
√ATT

Posi
Heads Down

R: 000
P: 178
Y: 000

GNC 20 DAP CONFIG

F7

P,Y OPTION – ITEM 35,36 EXEC (NOSE)
FLT CNTLR PWR – ON
DAP TRANS: NORM/PULSE/PULSE

TIG-0:30>

DAP: B/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)

5. POST BURN RECONFIG

F7

O14:E,
O15:E,
O16:E

FLT CNTLR PWR – OFF
√cb DDU (six) – as reqd

C2

If retro or posi burn: GNC, OPS 201 PRO
DAP TRANS: PULSE/PULSE/PULSE

GNC 20 DAP CONFIG

P,Y OPTION – ITEM 15,16 EXEC (twice) (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 Prpl leak:

Perform RCS SECURE (FWD,AFT) (ORB PKT, RCS)

O16

RJD L5/F5/R5 DRIVER – OFF

DAP: as reqd >>

RCS SSR-5 (Cont)

B. If FRCS DUMP:

- O14:F,
O15:F,
O16:F
- O8
- RCS DUMP PREP
√Pri RJD LOGIC, DRIVER (sixteen) – ON
 - TERMINATE CONDITIONS
Terminate RCS dump when any one of the following conditions exists:
If He LEAK:
Aff He P < 456 psia, 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	
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
- 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
 - 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 (twice) (TAIL)
– ITEM 35,36 EXEC (twice) (TAIL)

- O8
- If He leak:
FWD He PRESS A(B) – CL (tb-CL)
MANF ISOL 5 – OP (tb-OP), GPC
- O16
- If Prpllt leak: Perform RCS SECURE (FWD,AFT) (ORB PKT, RCS)
RJD L5/F5/R5 DRIVER – OFF
DAP: as reqd >>

C. If AFT RCS LEAK, perform +X TRANSLATION:

- XFEED FROM LEAKING RCS 1/2 LEG TO GOOD RCS 1/2 LEG
√Pri RJD LOGIC, DRIVER (sixteen) – ON
- O14:F,
O15:F,
O16:F
- O14:E,
O15:E,
O16:E
- O8
- O7
- √cb DDU (six) – cl
- √DAP: FREE
- √L,R OMS XFEED (four) – CL (tb-CL)
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), GPC
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)

RCS SSR-5 (Cont)

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

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

√MCC for preferred burn

If no COMM, maneuver to closest out-of-plane attitude and execute burn ASAP

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 (*)

Go to step C3

If posi 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. TERMINATE CONDITIONS

Terminate RCS burn when any one of the following conditions exists:

If He LEAK:

Aff He P < 456 psia, or

CUR HP = 95 nmi, or

Burn Time from below table expired

		RCS PRPLT TO BE BURNED TO ACHIEVE MAX BLOWDN CURRENT NON-LEAKING (OX OR FU)%											
		35	40	45	50	55	60	65	70	75	80	85	90
AFT +X DUMP (2 JETS)		0:00	0:15	0:31	0:46	1:02	1:17	1:33	1:48	2:02	2:19	2:34	2:50
		TIME FROM BURN INITIATION (M:S)											

If PRPLT LEAK:

First RCS jet FAIL OFF or

CUR HP = 95 nmi

RCS SSR-5 (Cont)

- F6(F8) 4. BURN EXEC
ADI ERROR – MED
RATE – HI
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
- F7 DAP B: P,Y OPTION – ITEM 35,36 EXEC (twice) (TAIL)
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 C11
- O7 5. SETUP TO CLEAR He
O8 Leaking RCS TK ISOL 1/2 – CL (tb-CL)
√L OMS TK ISOL (two) – OP (tb-OP)
XFEED B(A) – OP (tb-OP)
GNC 23 RCS
L OMS TO 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
6. SET UP DAP
GNC 20 DAP CONFIG
Change DAP A to A1
7. 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
8. 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
9. 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

RCS SSR-5 (Cont)

- F7
O14:E,
O15:E,
O16:E
10. POST He CLEAR CLEANUP
FLT CNTLR PWR – OFF
cb DDU (six) – as reqd
- 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), GPC
5 (two) – OP (tb-OP), GPC
- If Group B(C) Powerdown:
Pri RJD LOGIC, DRIVER (sixteen) – OFF
RJD A 1A L2/R2 MANF DRIVER – ON
- O14:F,
O15:F,
O16:F
- DAP: A,B as reqd >>
- F7
O14:E,
O15:E,
O16:E
11. SYSTEMS CLEANUP FOR He LEAKS
FLT CNTLR PWR – OFF
cb DDU (six) – as reqd
- O7
- DAP: FREE
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), GPC
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 TO AFT – ITEM 5 EXEC (*)
- If Group B(C) Powerdown:
Pri RJD LOGIC, DRIVER (sixteen) – OFF
RJD A 1A L2/R2 MANF DRIVER – ON
- O14:F,
O15:F,
O16:F
- DAP TRANS: as reqd
DAP: A,B as reqd

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OVS

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

S89 L(R) OVS TEMP
G23 OVS/RCS QTY
L(R) OVS GMBL
L(R) OVS VLV
L(R) OVS QTY
L(R) OVS PC

NOTE A

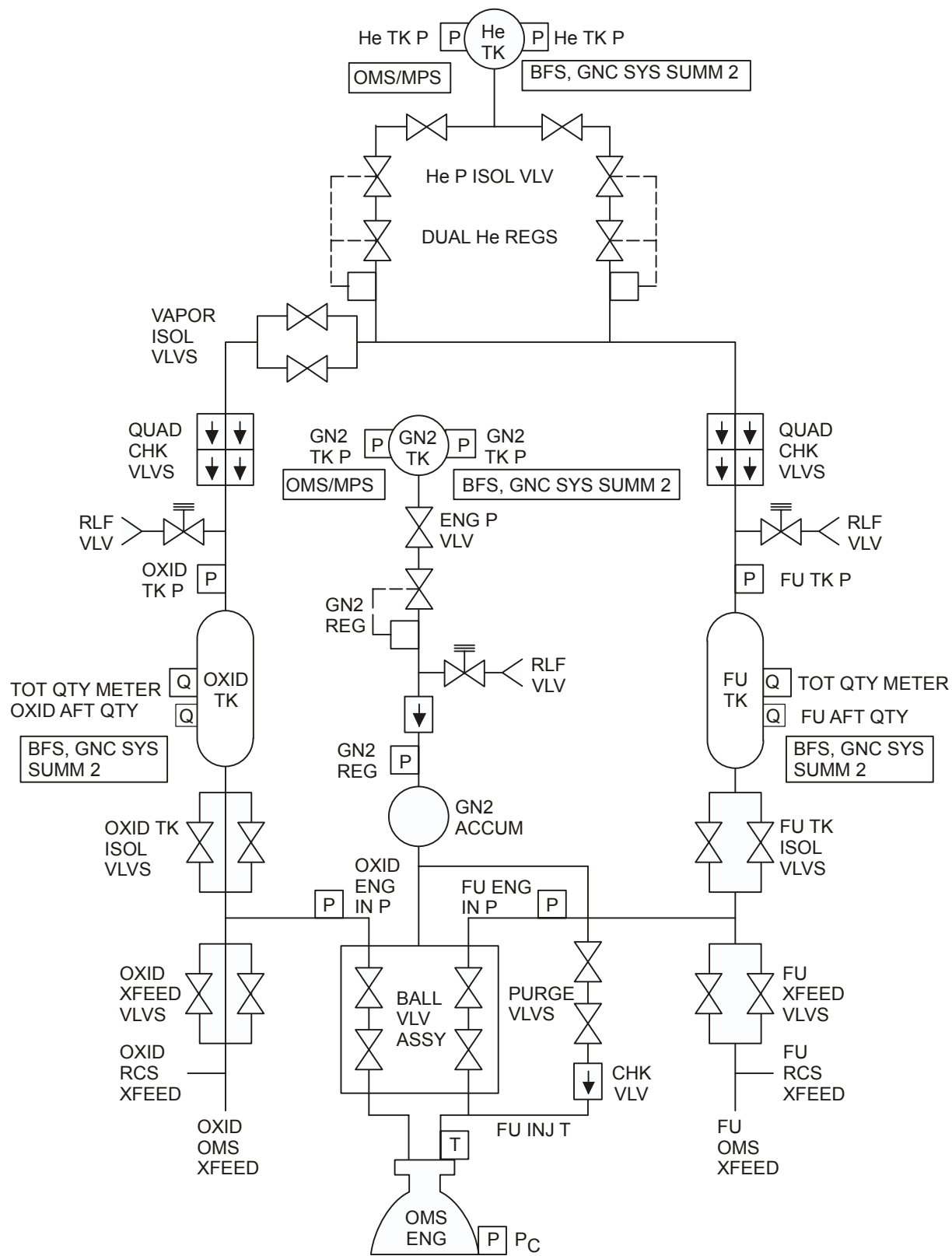
The identified MAL represents a support procedure that is entered from other procedures or on MCC call

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11.3b	'SM 0 THRM PRPLT' – THRM PRPLT	11-15

OMS

11

OMS SCHEMATIC



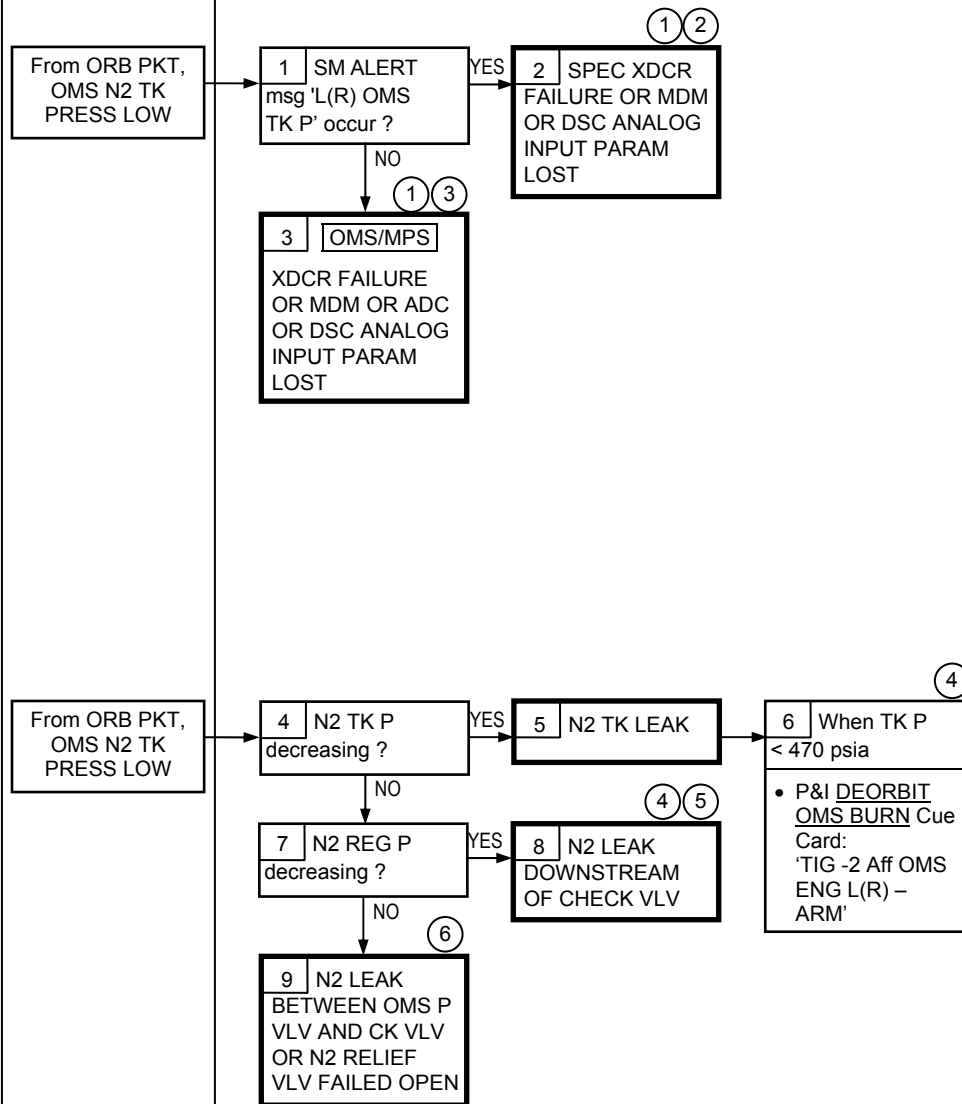
jsc48027_017r3.cvx

L(R) OMS

11.1

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

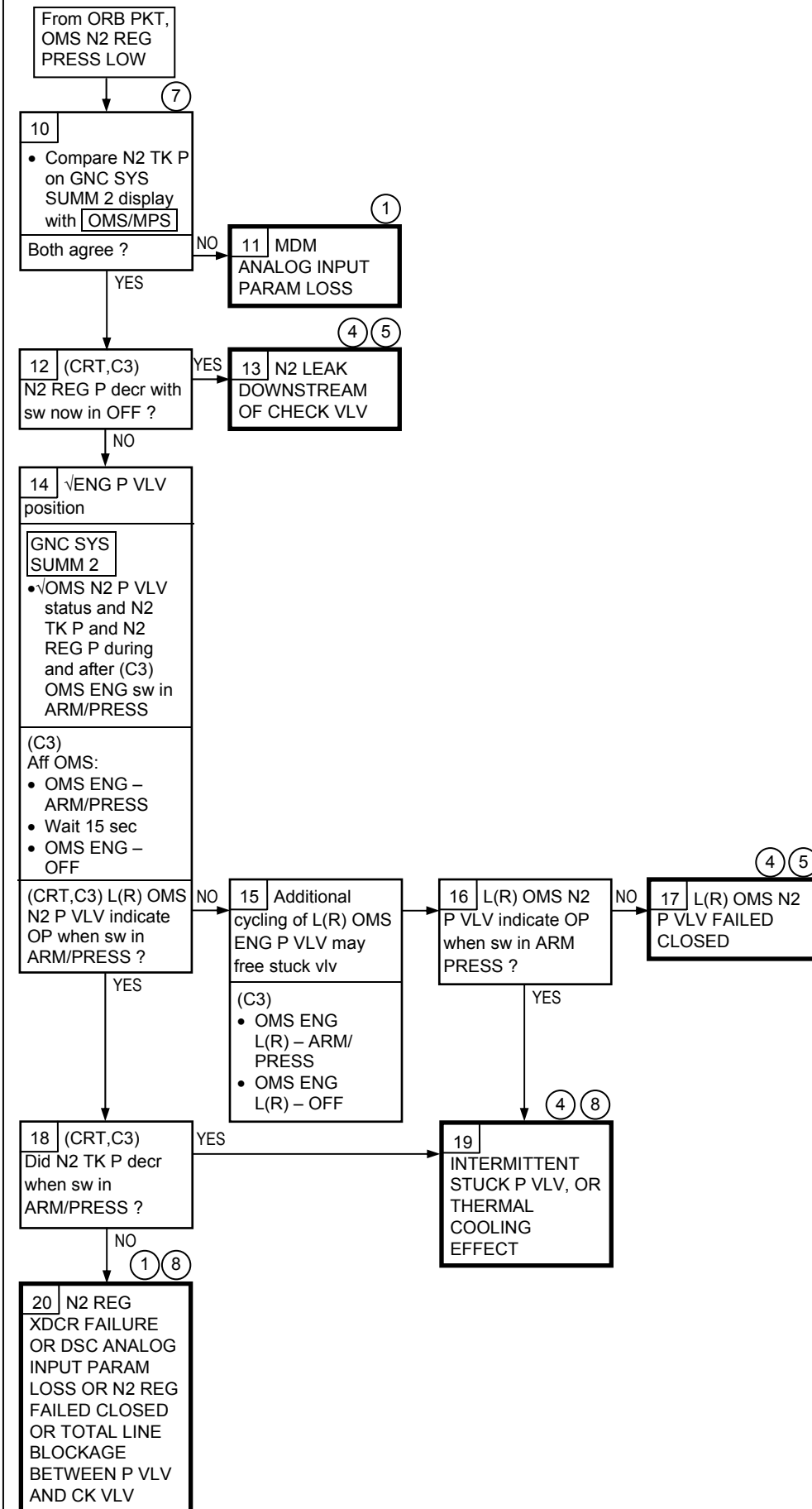
⑤ √MCC to determine if engine is usable for deorbit

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)

OMS 11.1a (Cont)



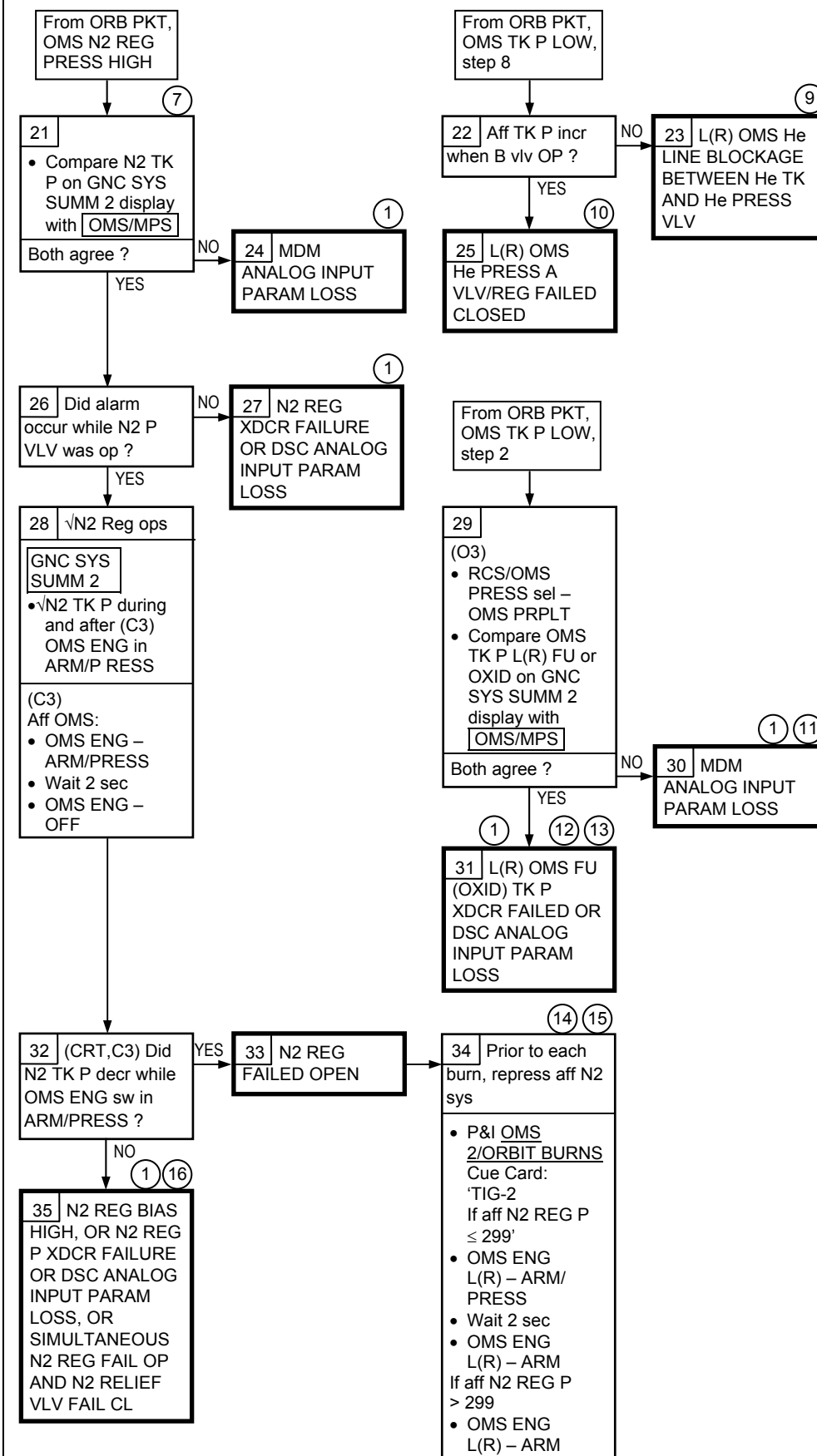
① √MCC for other params possibly lost in same MDM or DSC card

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

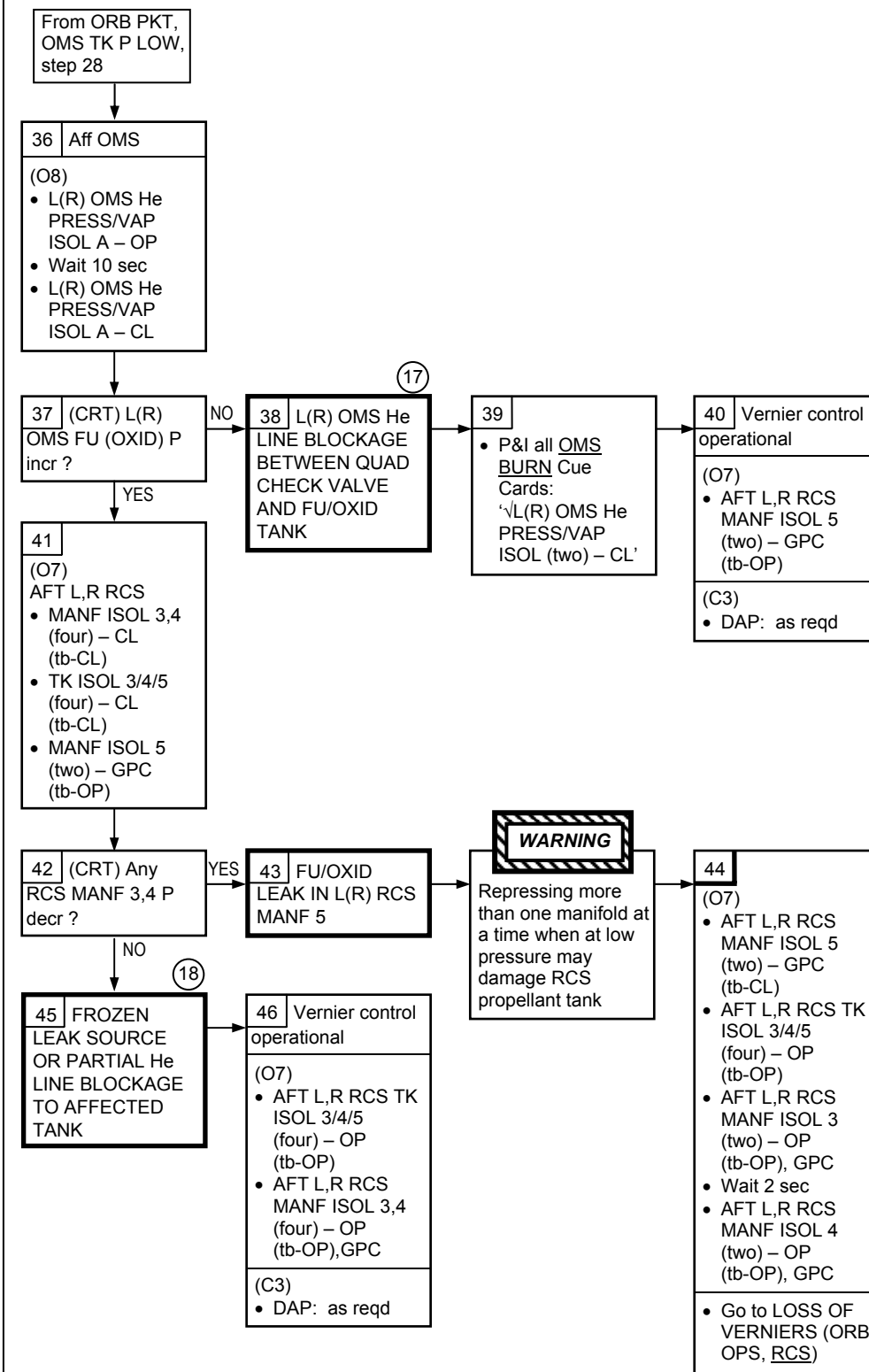
⑫ On GNC SYS SUMM 2 display, use ENG IN P as B/U to failed PRPLT TK P xdcr

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

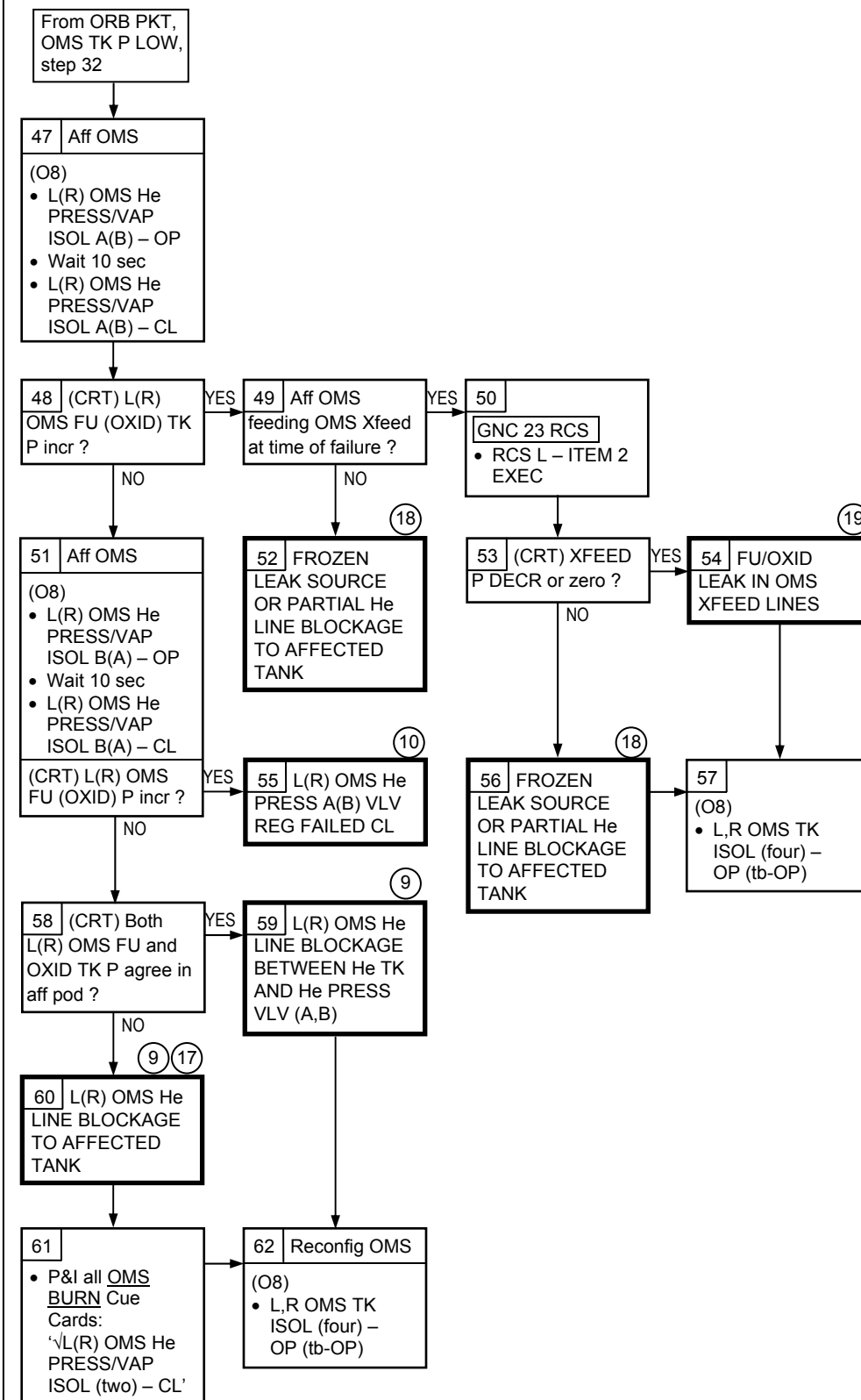
⑯ Single failure can result in N2 Reg failing OP and N2 Relief vlv failing CL (N2 Reg P > 500 psia)



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

OMS 11.1a (Cont)



⑨ √MCC for blowdown capability. If full blowdown exists, continue with nominal mission profile. If not full blowdown, save available blowdown for deorbit burn

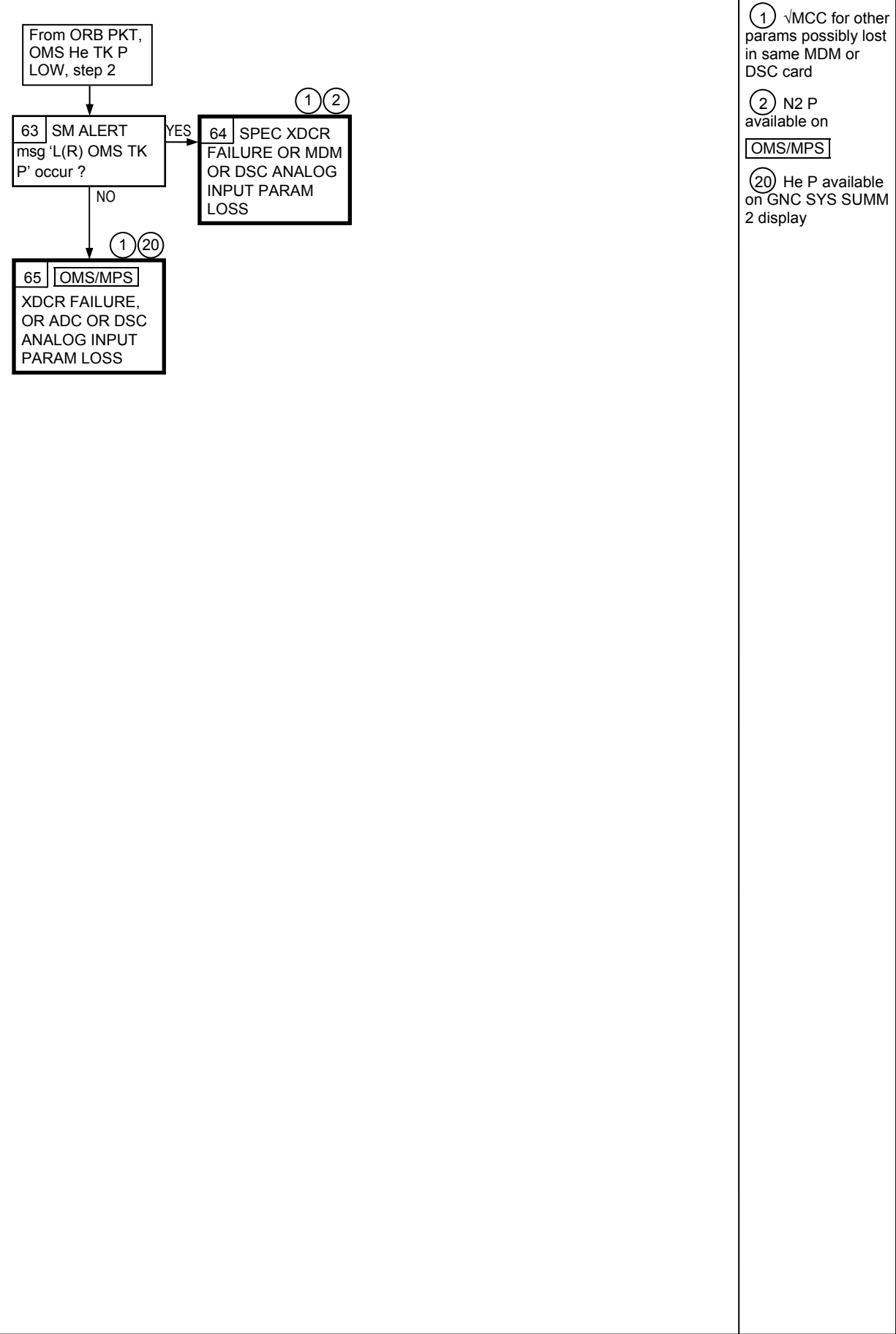
⑩ OMS and RCS operational in nominal config. When reqd or on MCC call, use (O8) L(R) OMS He PRESS VAP ISOL B to repress

⑪ Perform subsequent burns in blowdown in affected pod to prevent mixture ratio variations

⑫ √MCC on action to be taken to minimize failure effects and config for subsequent burns

⑬ OMS and RCS operational in nominal config. Do not Xfeed or i'cnct

OMS 11.1a (Cont)



OMS SW/ LV
MISCOMP

11.2

OMS

11.2a OMS VLV tb – bp

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

10.1a 38

1 (08) More
than one tb – bp ?

YES

2 Which OMS vlv
tb – bp:

(08)
L OMS TK ISOL A
and
R OMS TK ISOL A
and
L OMS XFEED A

L OMS XFEED B
and
R OMS XFEED B

L OMS TK ISOL B
and
R OMS TK ISOL B
and
R OMS XFEED A

Neither

3 POD/AMC1
BUS FAILURE

EPS
SSR-143

4 POD/AMC2
BUS FAILURE

EPS
SSR-144

5 SEPARATE
FAILURES.
TROUBLESHOOT
VLVS
INDIVIDUALLY

6 POD/AMC3
BUS FAILURE

EPS
SSR-145

7 During
reconfig, tb – bp
occurred ?

NO

8 VLV FAILURE
OR tb FAILURE
OR MICROSW
FAILURE

17

9 √AC motor
thermal overload

- Aff OMS sw – GPC
- Wait 3 min, then reposition sw to mode in which tb – bp occurred

tb – bp ?

YES

12

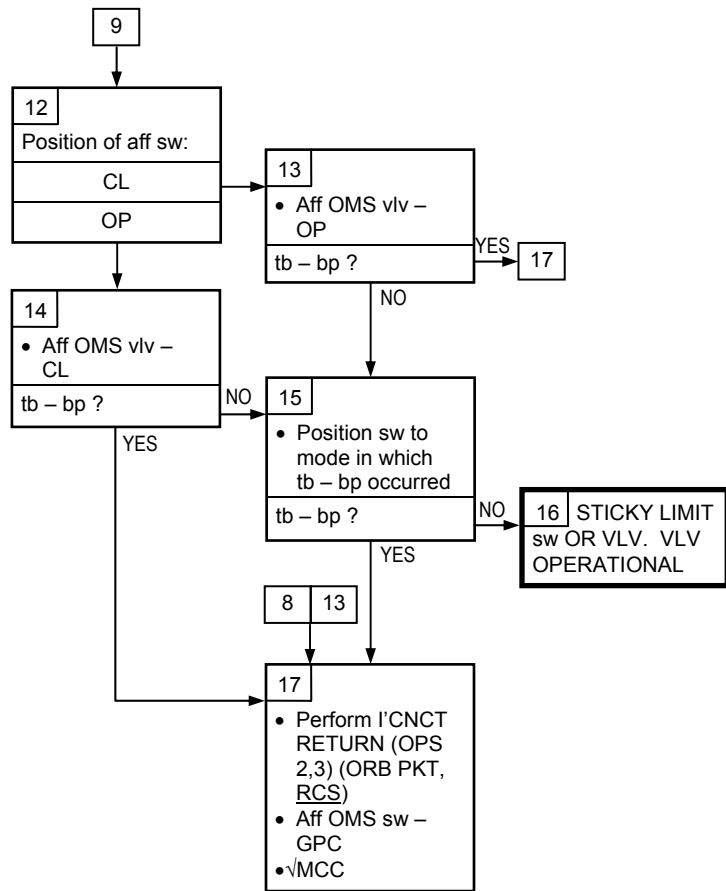
NO

10 VLV
CONTINUOUS
PWR PROBLEM.
THERMAL
OVERLOAD
RESET. VLV
OPERATIONAL

①

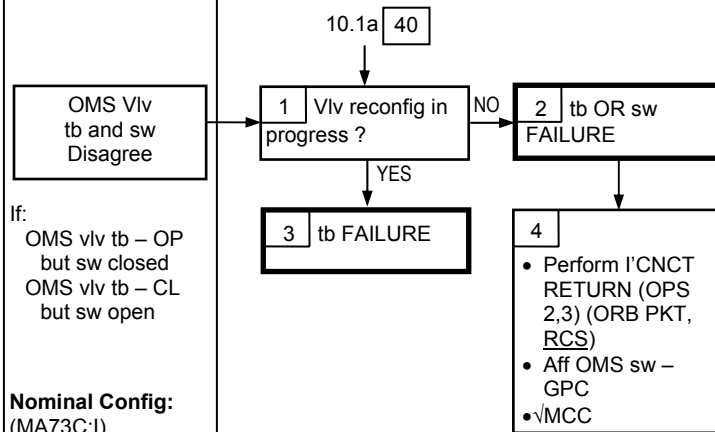
11 Aff OMS sw – GPC

① For subsequent reconfig, ignore tb – bp. After vlv commanded, wait 3 sec; then position appropriate sw to GPC



OMS

11.2b OMS VLV tb AND sw POSITION DISAGREE



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OVS PRPLT
THERMAL

11.3

OMS

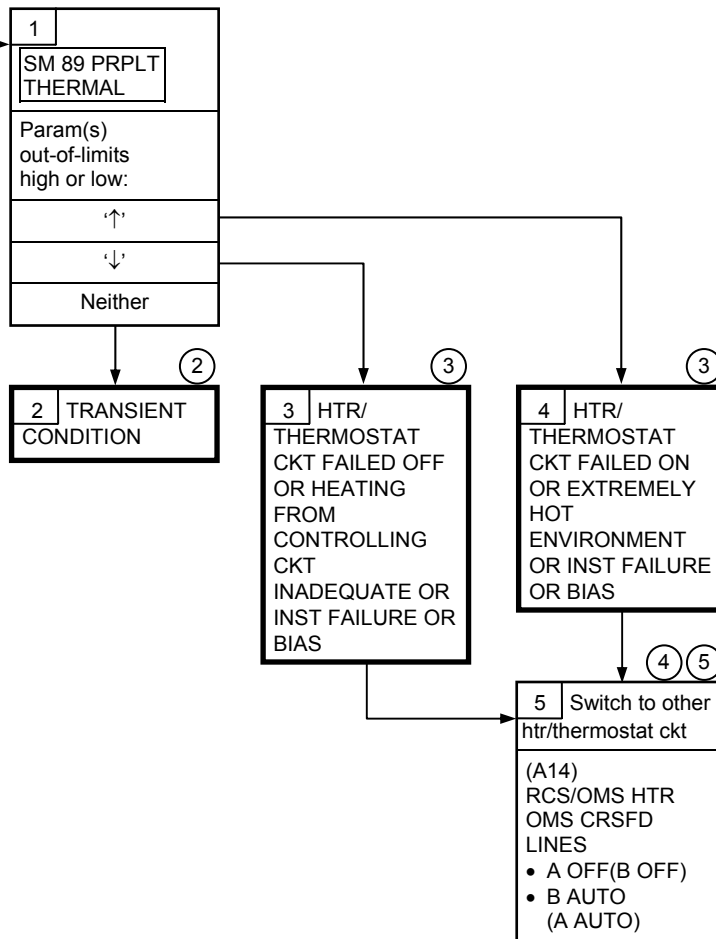
11.3a PRPLT THRM OMS

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)



OMS THERMAL LIMIT TABLE					
PARAMETER				FDA LIMIT	
				LOW	HIGH
OMS CRSFD	L	R	C		
XFD	OX	XXXS	XXXS	50	90 ⑥
	GMBL	LN	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

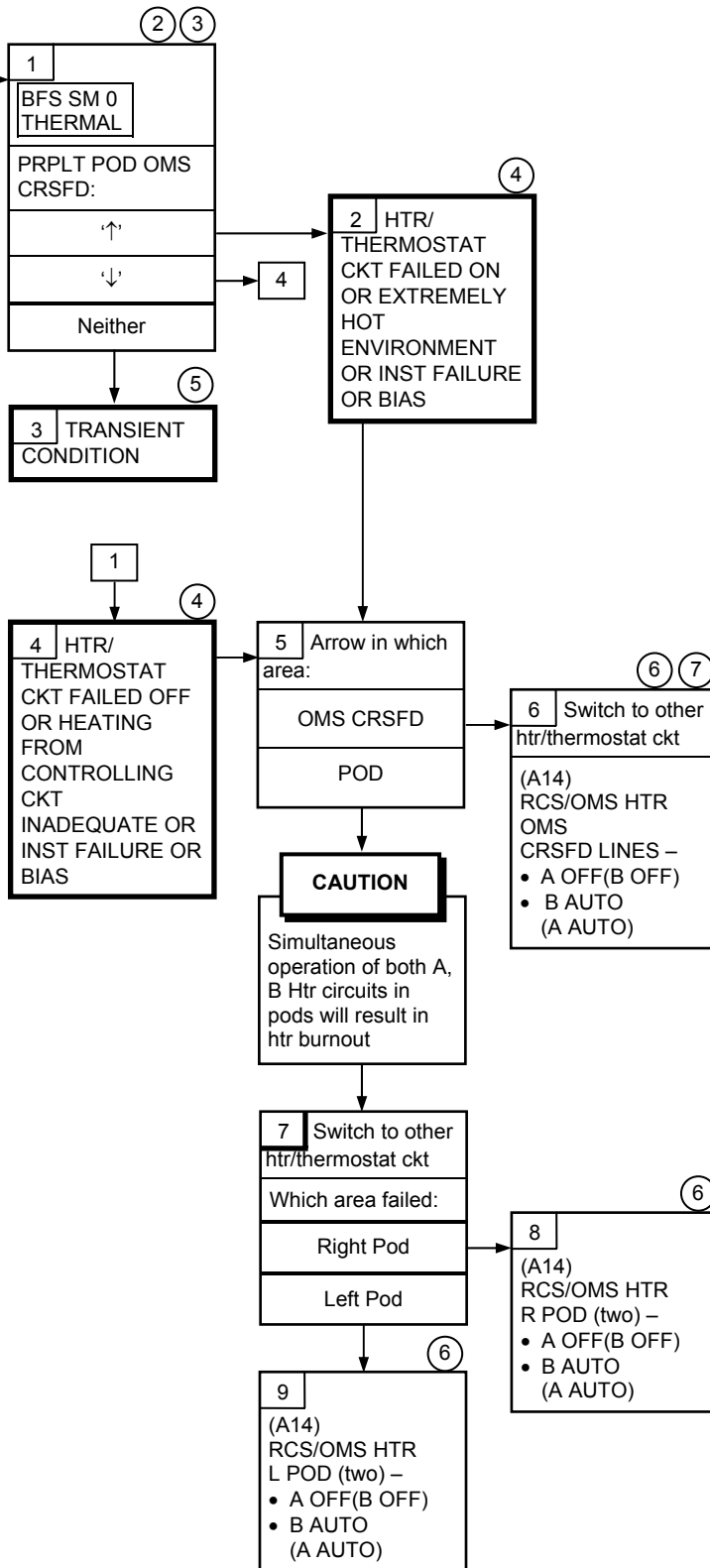
OMS

11.3b THRM PRPLT

① SM 0 THRM PRPLT

If:
Any up or down arrows displayed on PRPLT POD or PRPLT OMS CRSFD lines of BFS SM 0 THERMAL display

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)
CRSFD LINES (two) – A AUTO (B AUTO)
B OFF(A OFF)



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

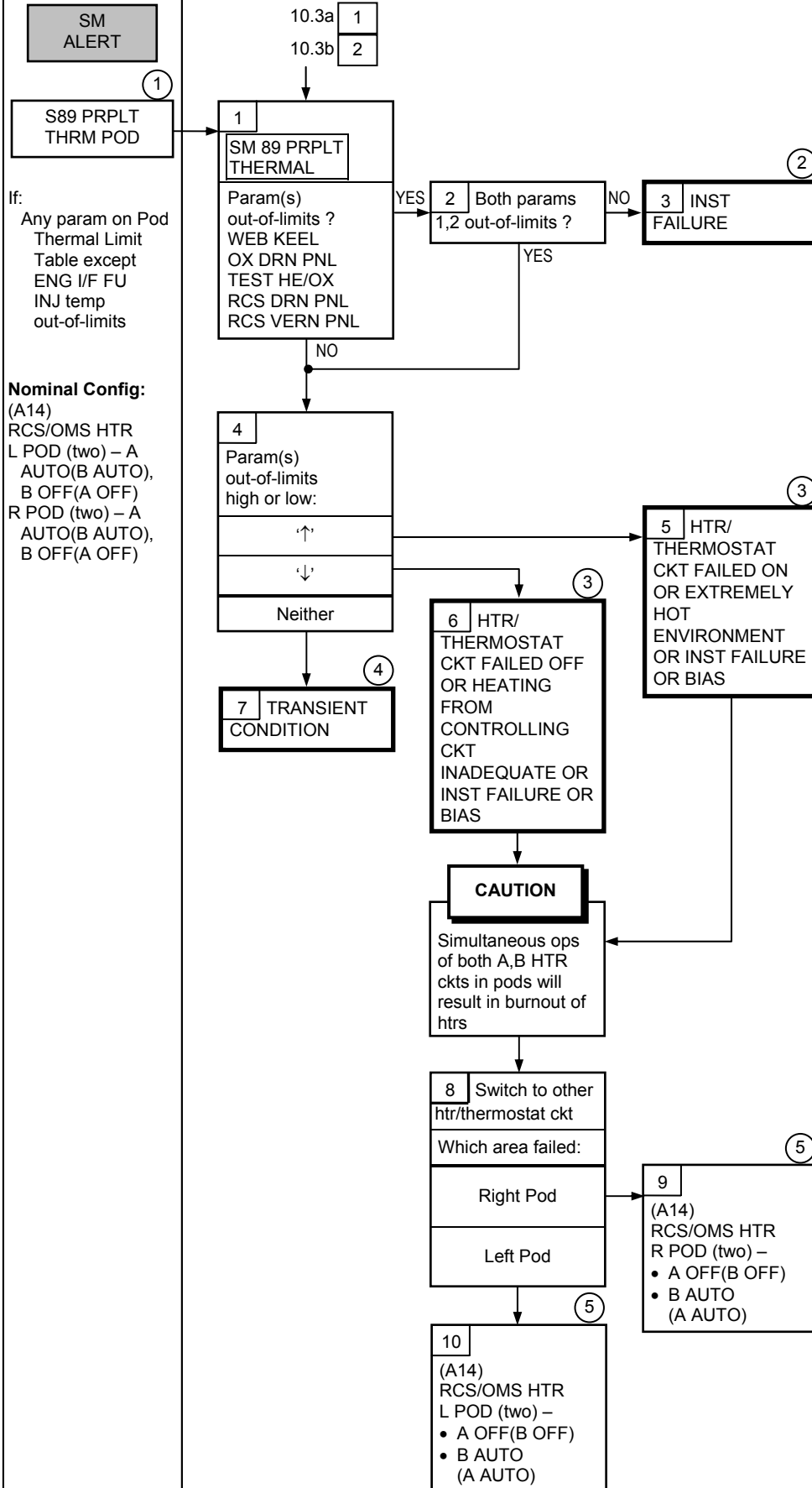
⑤ Htrs cycling high/low or intermittent xdcr failure. √MCC

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



(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

11.3c (Cont)

POD THERMAL LIMIT TABLE

PARAM					FDA LIMIT	
					LOW	HIGH
POD L R						
O M S	T K	O X	X X X S	X X X S	45	95
		F U	X X X S	X X X S	45	95
E N G	I / F	O X	X X X S	X X X S	45	110
		F U	X X X S	X X X S	45	110
		O X V L V	X X X S	X X X S	40	122
		F U I N J	X X X S	X X X S	36	260
W E B	K E E L	1	X X X S	X X X S	45	100
		2	X X X S	X X X S	45	100
	Y	O B	X X X S	X X X S	45	120
		U P	X X X S	X X X S	45	120
O X	D R N P N L	1	X X X S	X X X S	45	110
		2	X X X S	X X X S	45	110
E N G	C O V E R		X X X S	X X X S	45	
	S E R V P N L		X X X S	X X X S	45	140
G S E	S E R V P N L		X X X S	X X X S	45	120
T E S T	H E / O X	1	X X X S	X X X S	35	95
		2	X X X S	X X X S	35	95

O M S S S R

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	Dual Failures	Use Table
L OMS OX TK	4	L OMS FU TK AND R OMS OX TK	1
L OMS OX INLET	4	L OMS OX TK AND R OMS FU TK	2
L OMS FU TK	6	L OMS FU TK AND R OMS OX INLET	3
L OMS FU INLET	6	L OMS OX INLET AND R OMS FU TK	4
R OMS OX TK	3	L OMS OX TK AND R OMS FU INLET	5
R OMS OX INLET	3	L OMS FU INLET AND R OMS OX TK	6
R OMS FU TK	5	L OMS OX INLET AND R OMS FU INLET	7
R OMS FU INLET	5	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		Table A	Table B
28	_____	29	_____	_____
30	_____	31	_____	_____
32	_____	33	_____	_____
34	_____	35	_____	_____

√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		Table C
28	_____	29	_____
30	_____	31	_____
32	_____	33	_____
34	_____	35	_____

√Data values in ACTUAL column agree with Table C

WRITE – ITEM 25 EXEC

√Data values in ACTUAL column agree with DESIRED

- O8 6. During AOS, perform reconfig:
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

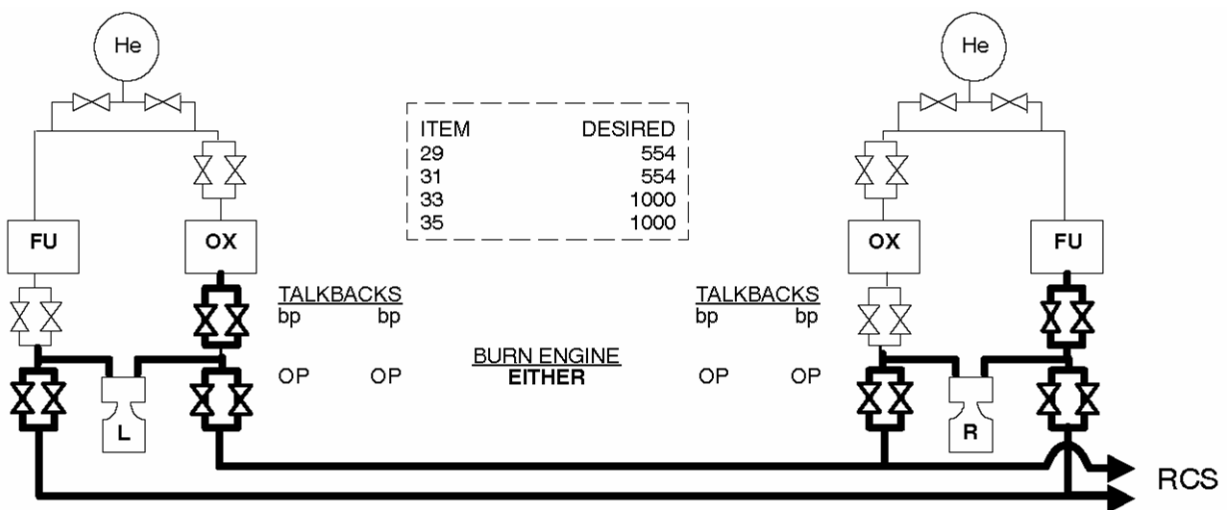


TABLE 2

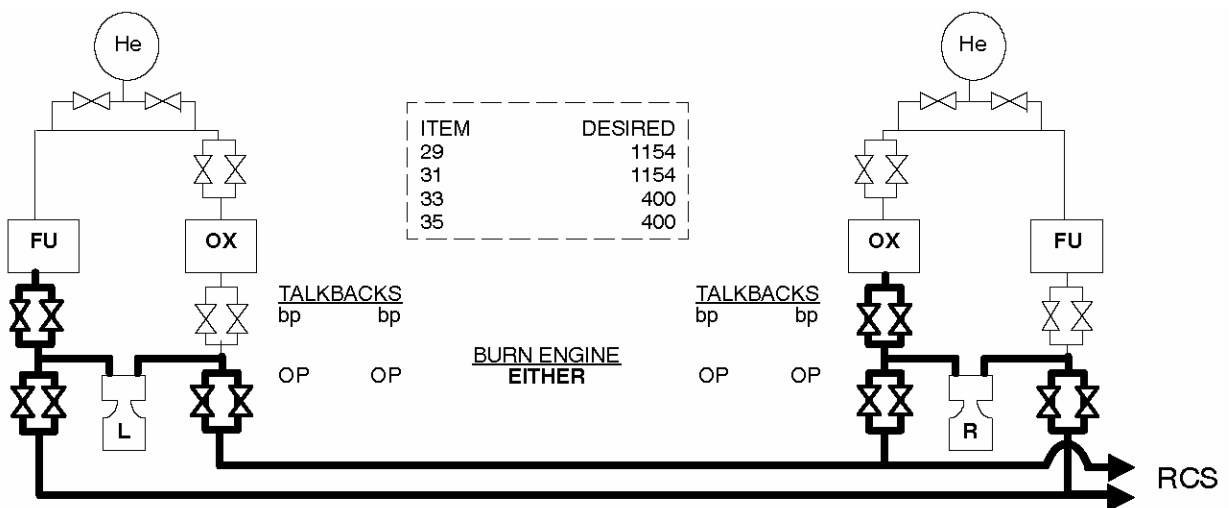


TABLE 3

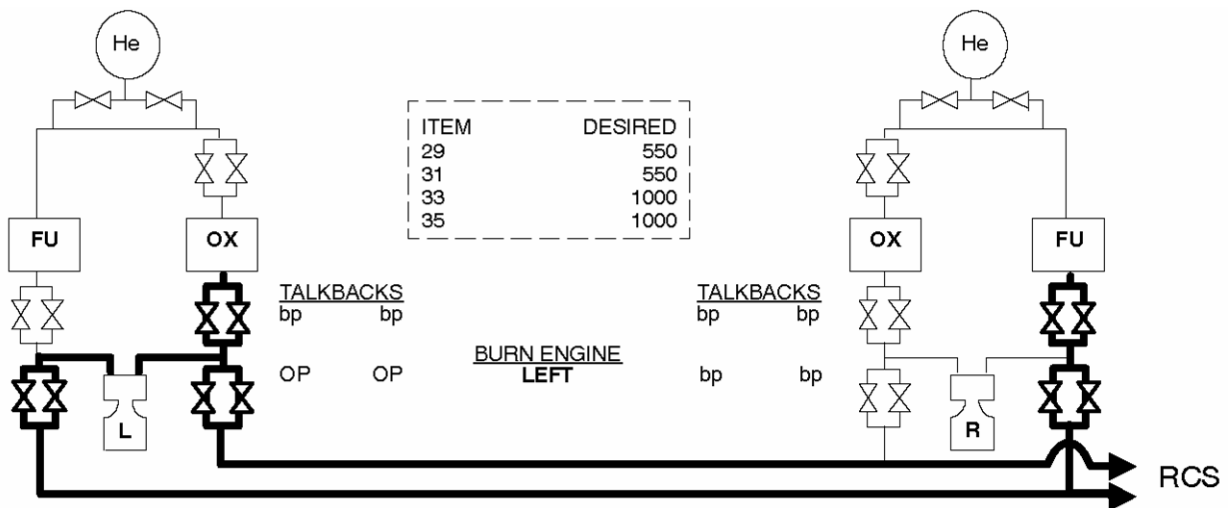


TABLE 4

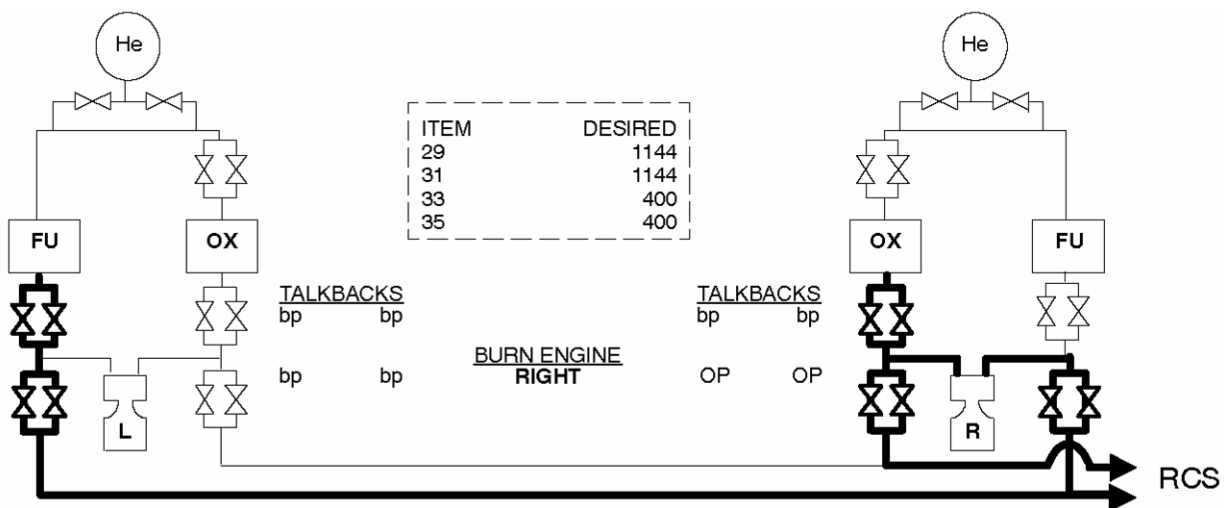


TABLE 5

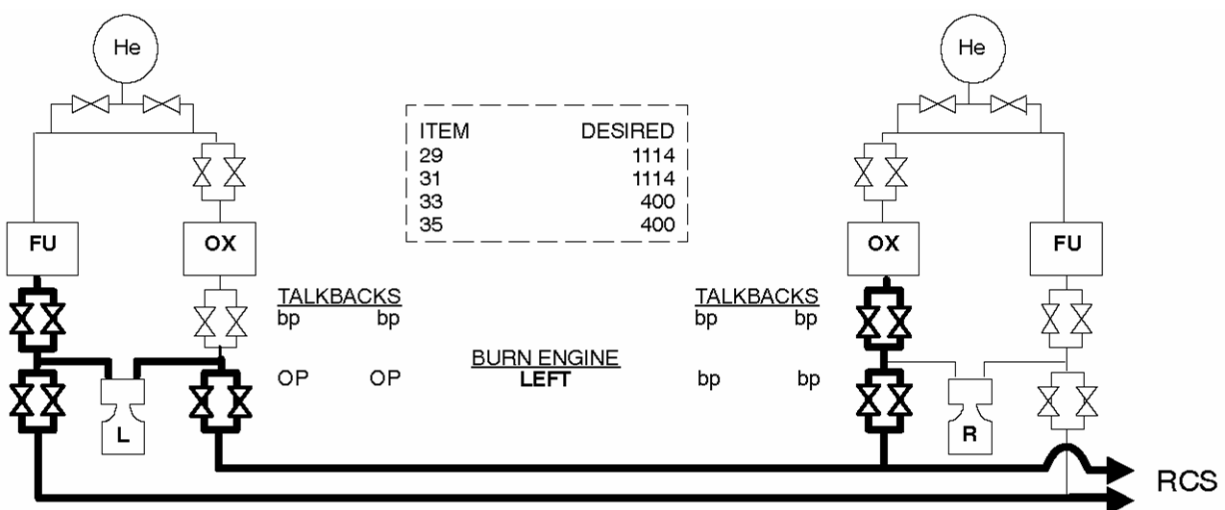


TABLE 6

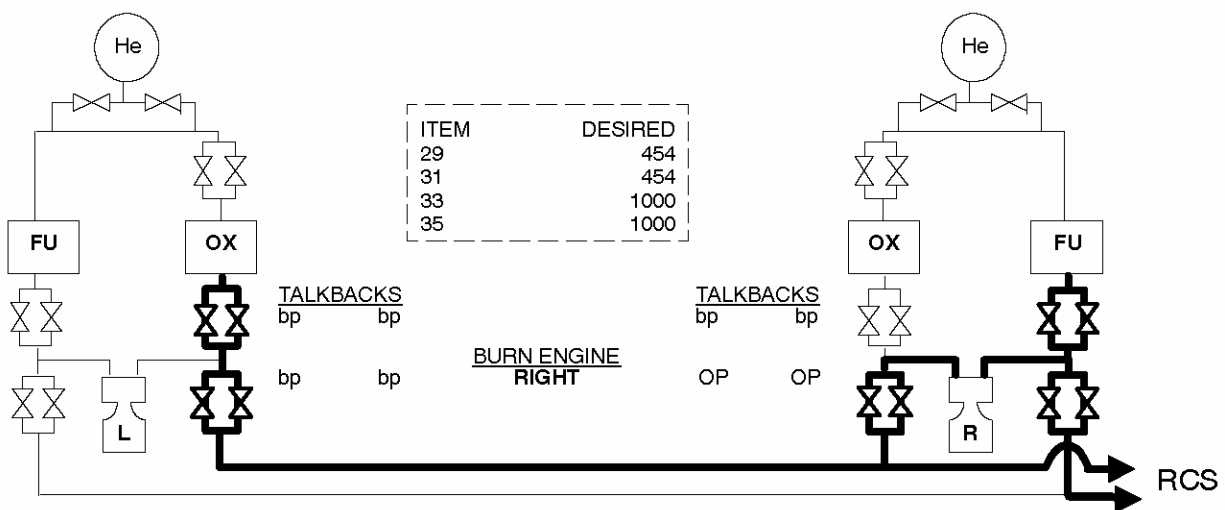


TABLE 7

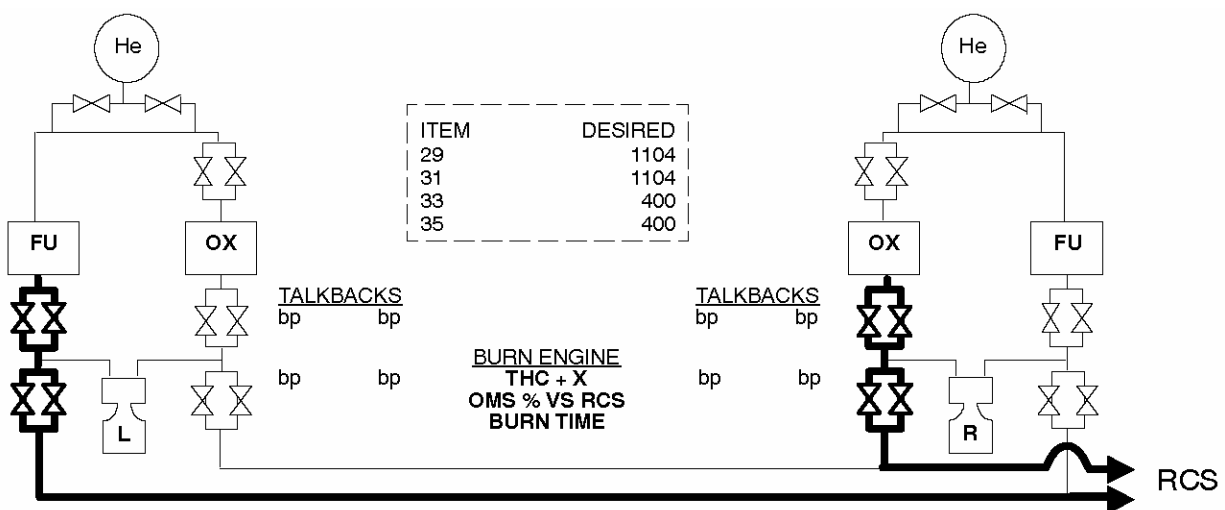
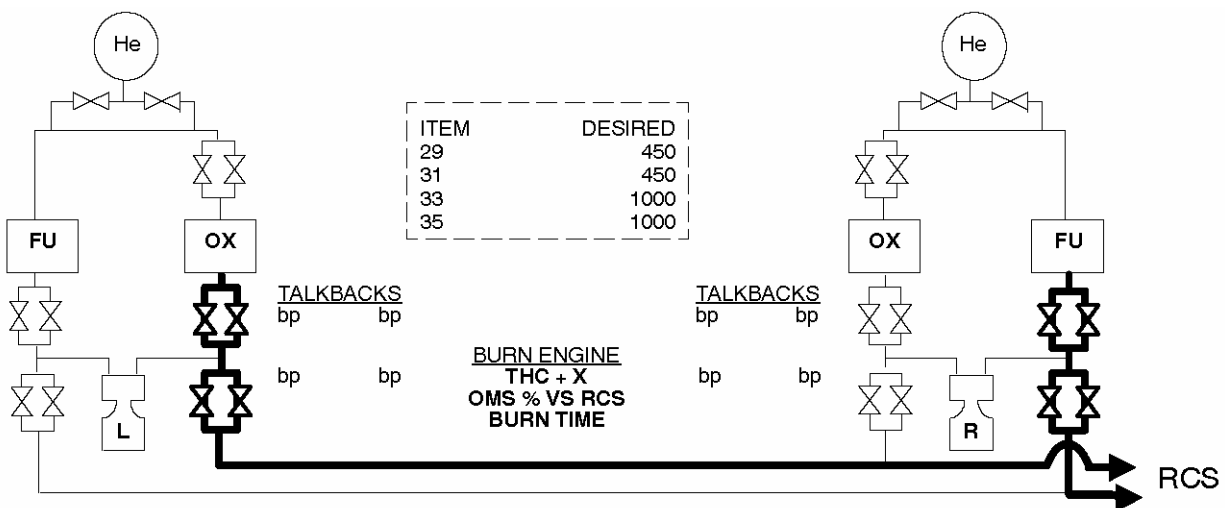


TABLE 8



PDRS

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12.3d	RESERVED.....	not used
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	SSR-3 BACKDRIVE TECHNIQUE – JOINT FREE	12-103
	SSR-4 RMS IFM D&C KIT	12-111

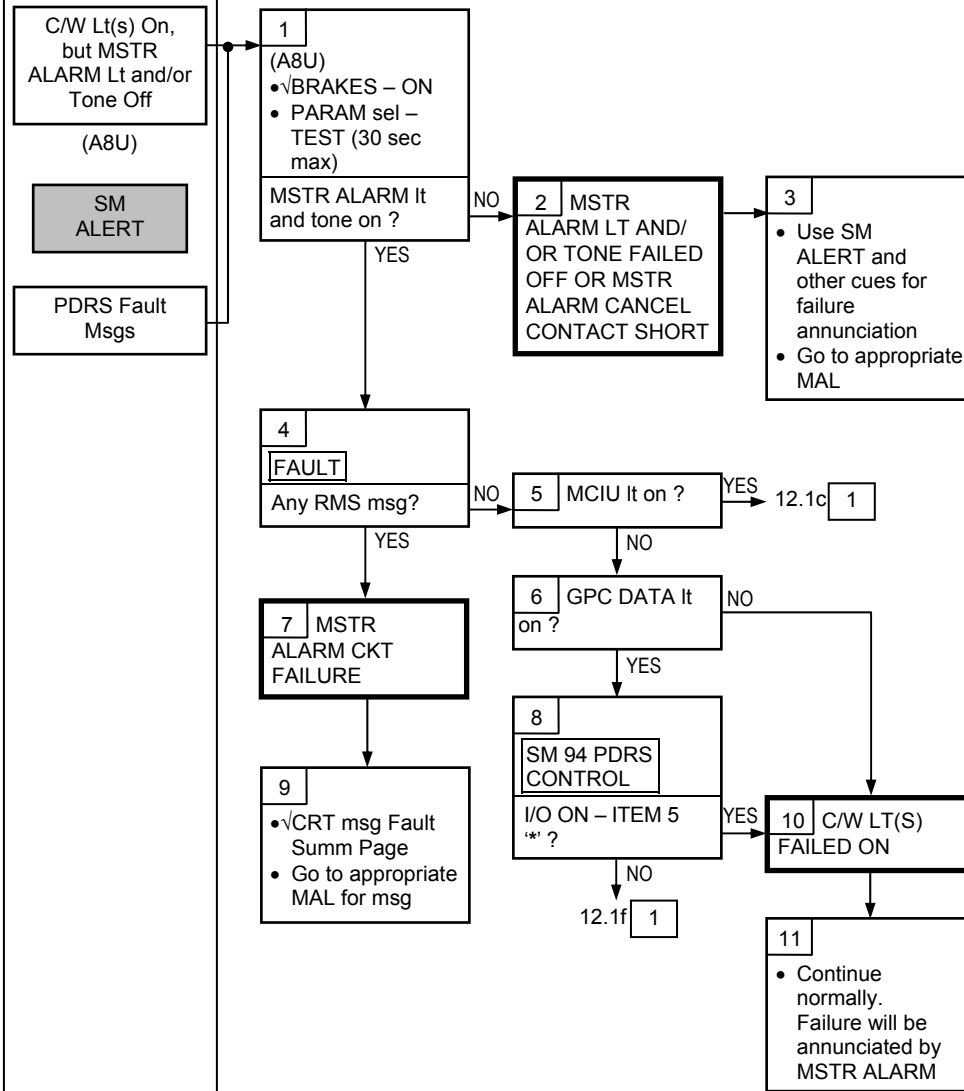
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RMS C/W

12.1

PDRS

12.1a C/W LT(S) ON, BUT RMS MSTR ALARM LT/TONE OFF

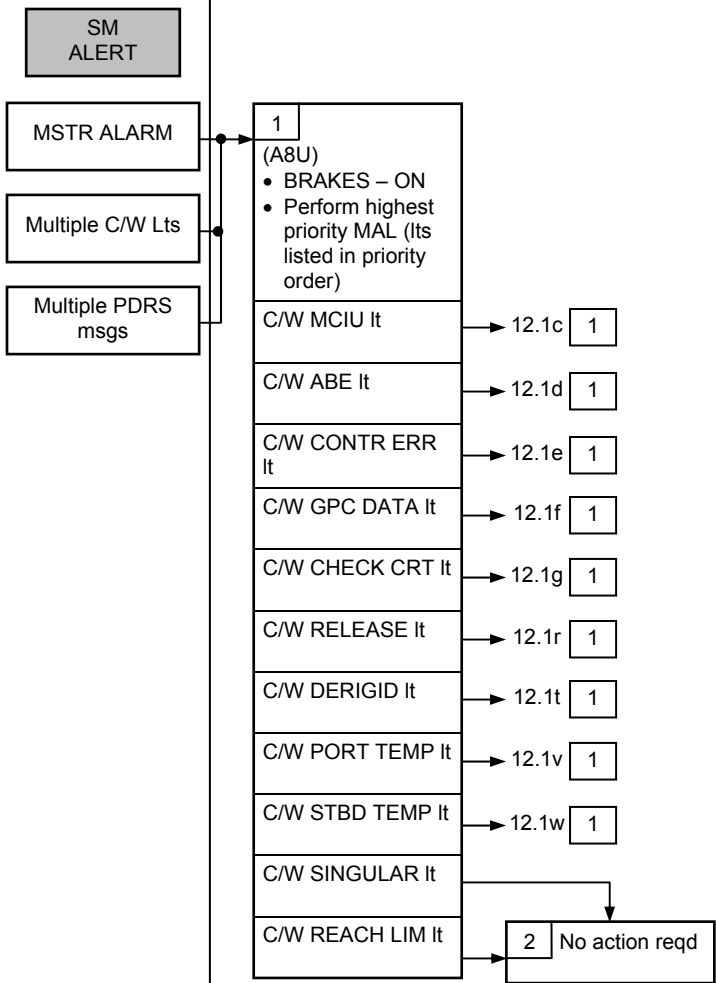


RMS C/W

12.1

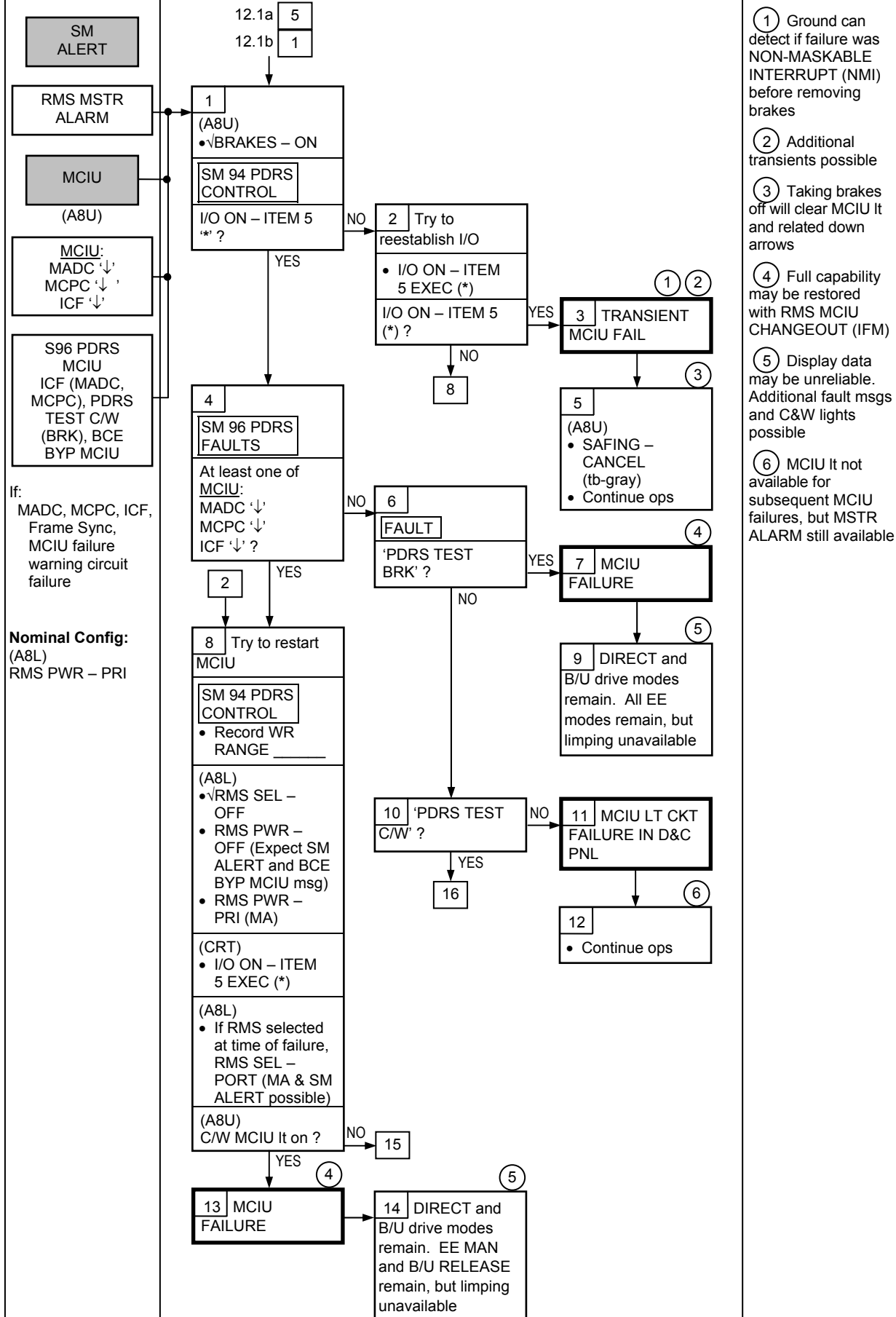
PDRS

12.1b MULTIPLE C/W LTS AND PDRS MSGS



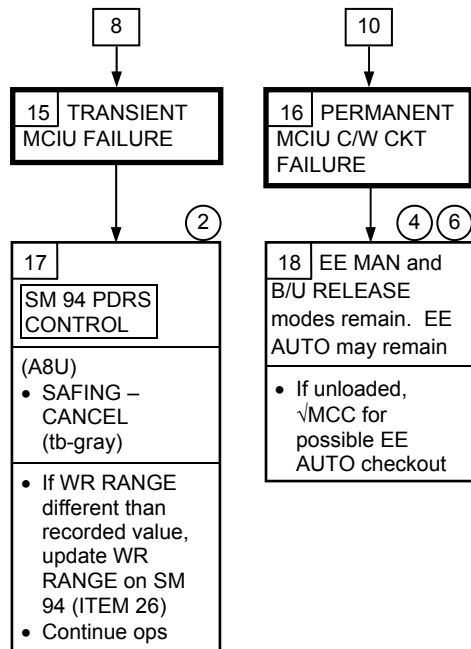
PDRS

12.1c C/W MCIU LT



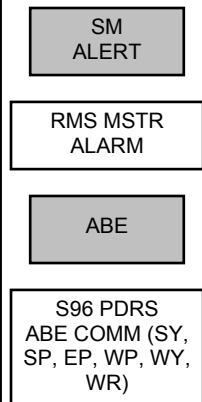
PDRS

12.1c (Cont)



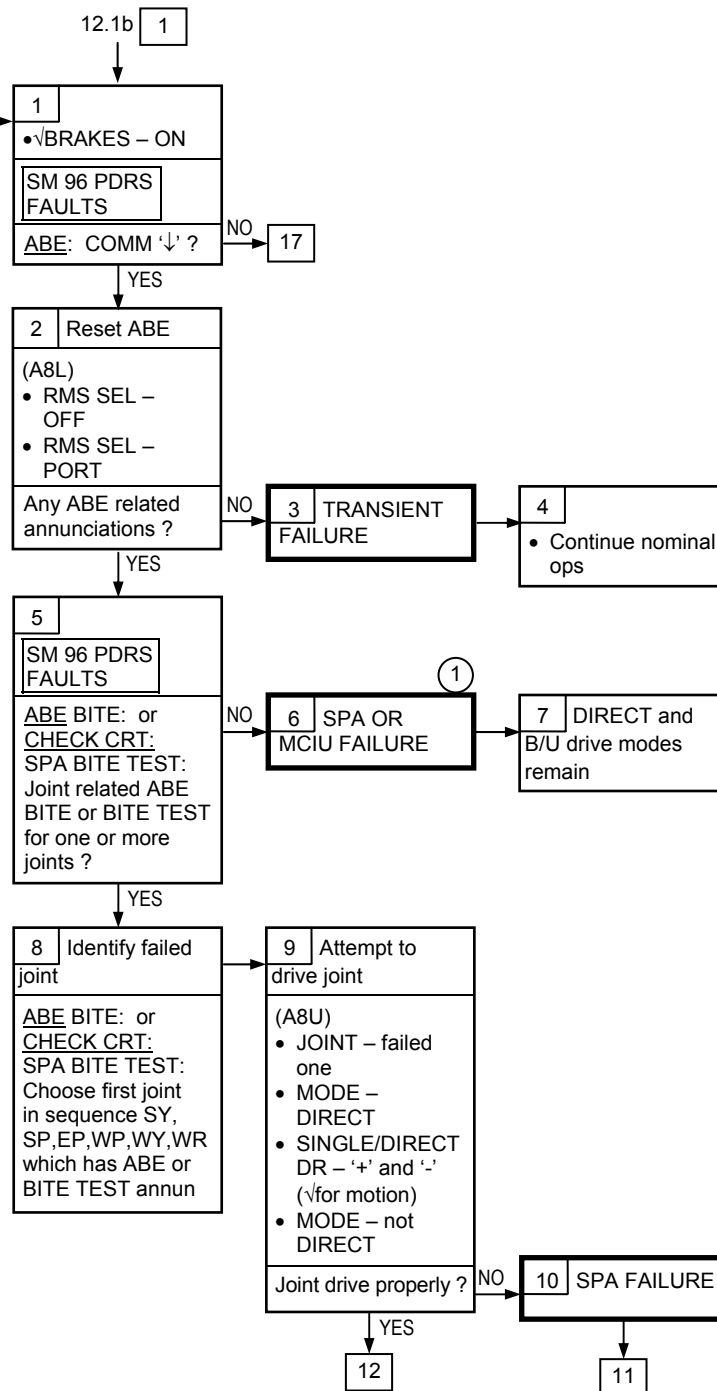
- ② Additional transients possible
- ④ Full capability may be restored with RMS MCIU CHANGEOUT (IFM)
- ⑥ MCIU It not available for subsequent MCIU failures, but MSTR ALARM still available

PDRS

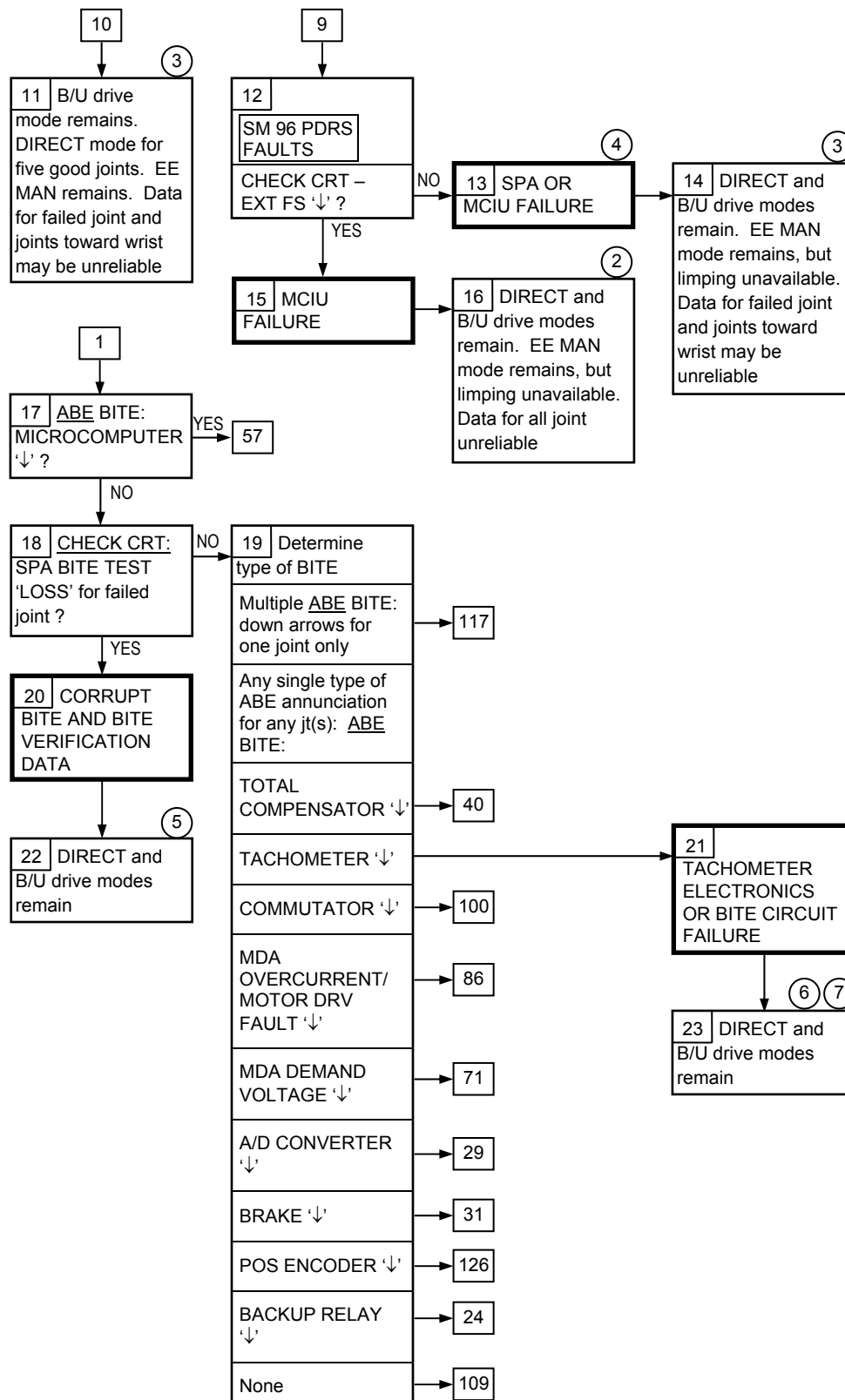


Nominal Config:
(A8L)
RMS PWR – PRI
RMS SEL – PORT
(CRT)
SM 94 I/O ON –
ITEM 5 (*)

12.1d C/W ABE LT – S96 PDRS ABE COMM (SY, SP, EP, WP, WY, WR)



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

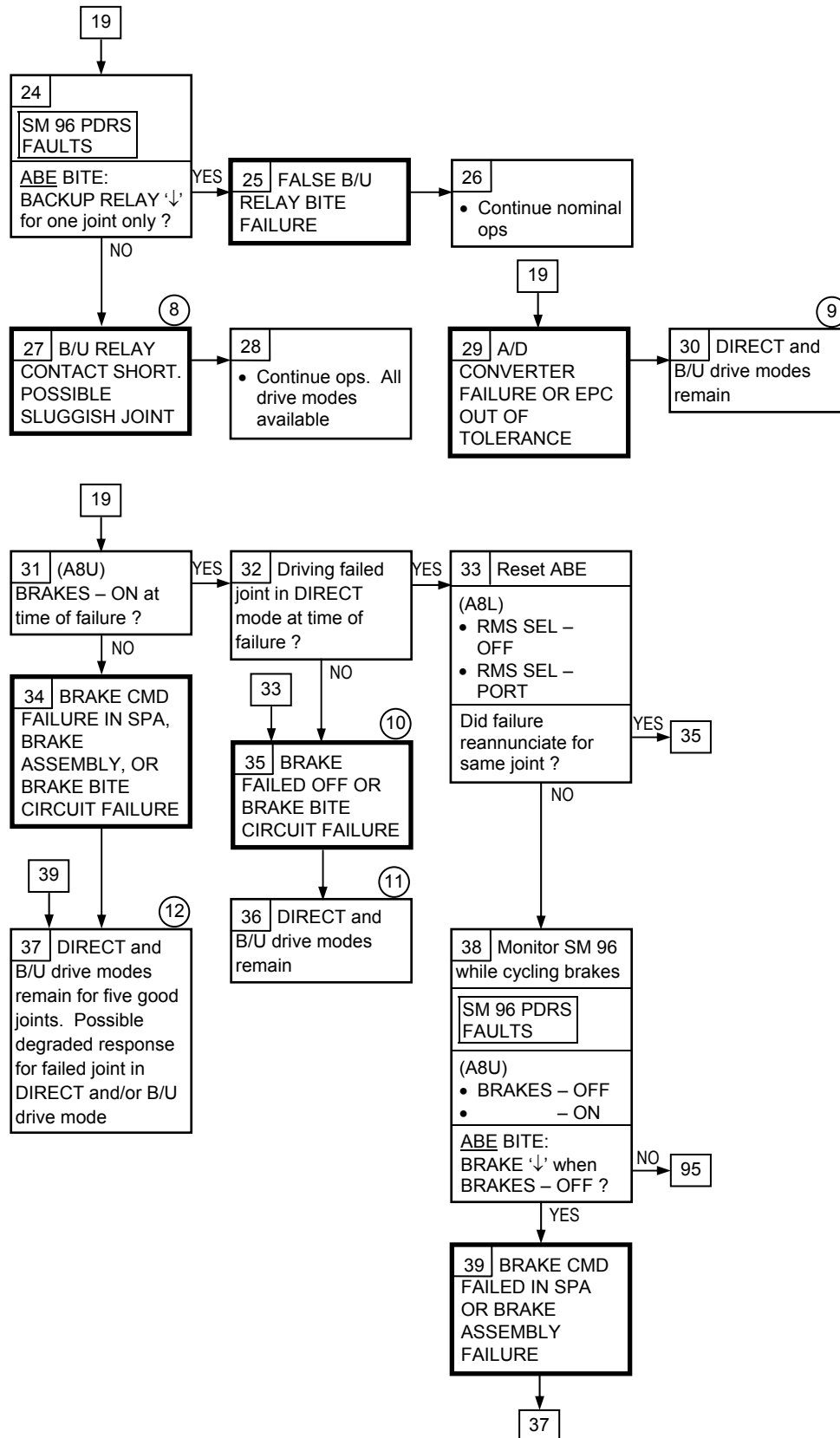
5 Computer supported modes available but subsequent SPA failure for same joint may not be annunciated or protected by autobrakes. May receive spurious SPA or EEEU annunciations

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)



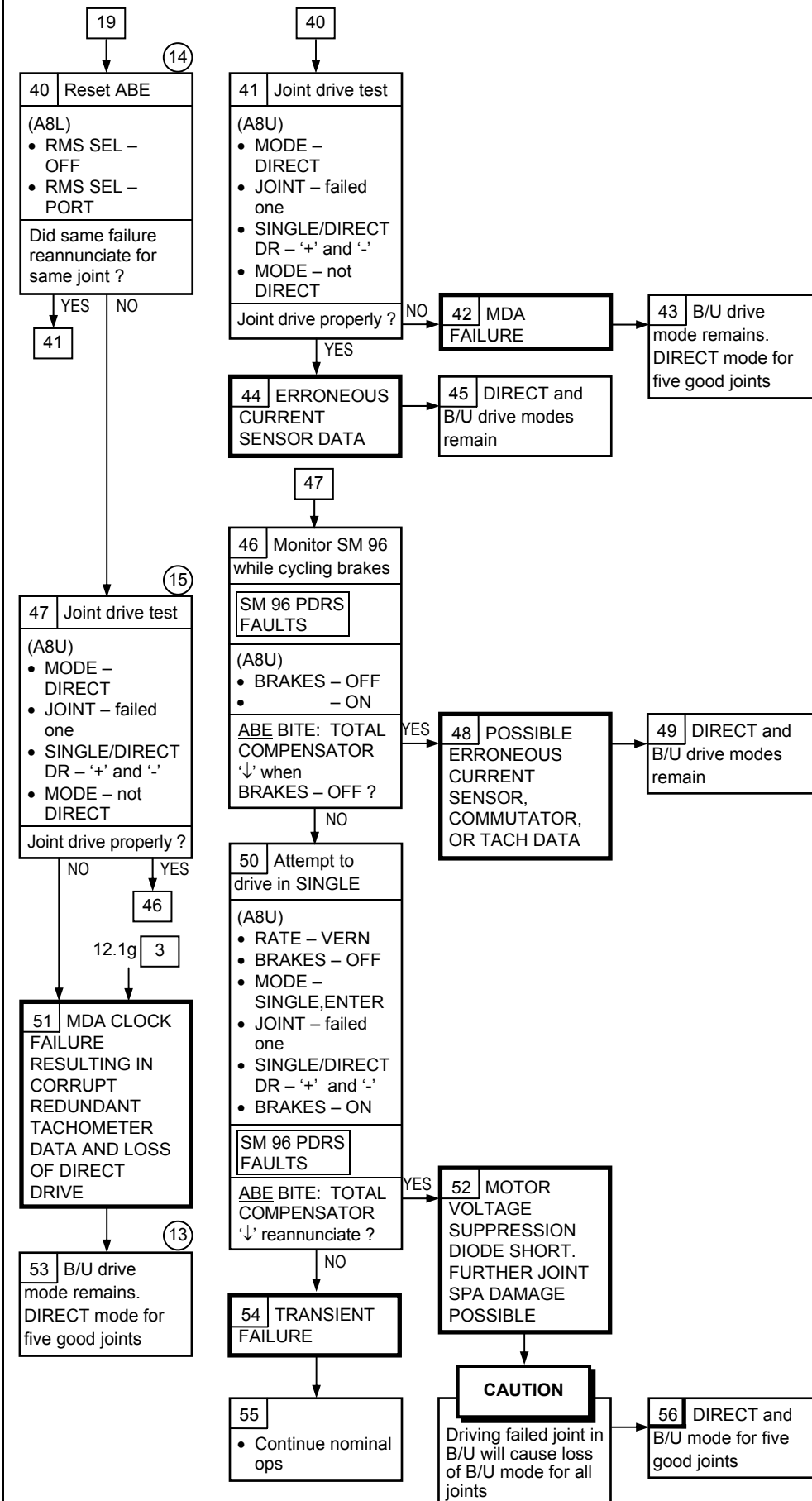
⑧ Possible TOTAL COMPENSATOR BITE for failed joint while driving. Direct Drive joint test may determine failed joint

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

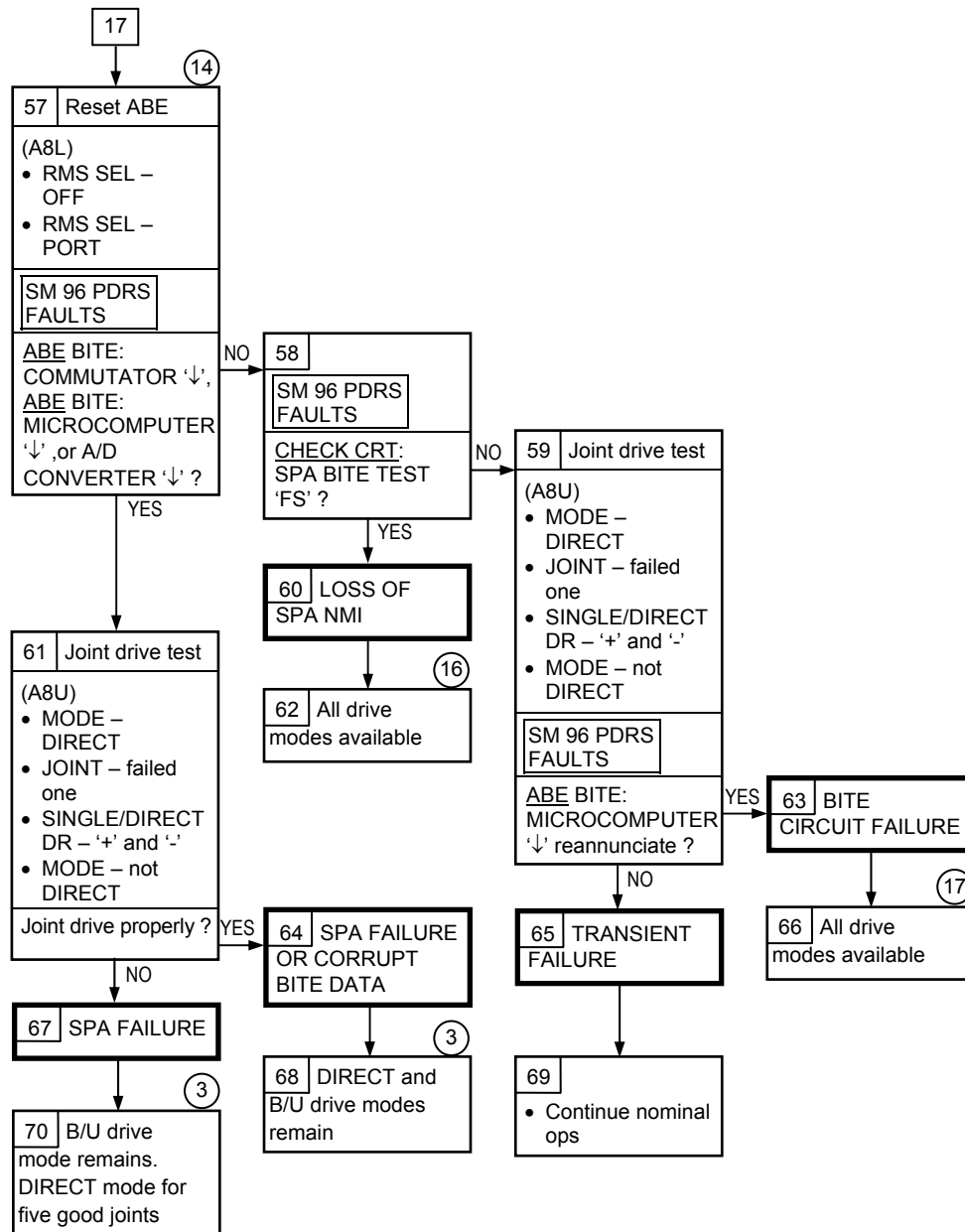


13 MCIU OVERRIDE: ABE OVRD C (ITEM 38) on SPEC 95, PDRS OVERRIDE, can be used to remove autobrakes and regain computer supported modes (on MCC GO). Subsequent failures for same joint will be annunciated by CONTR ERR and protected by autobrakes

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

PDRS 12.1d (Cont)



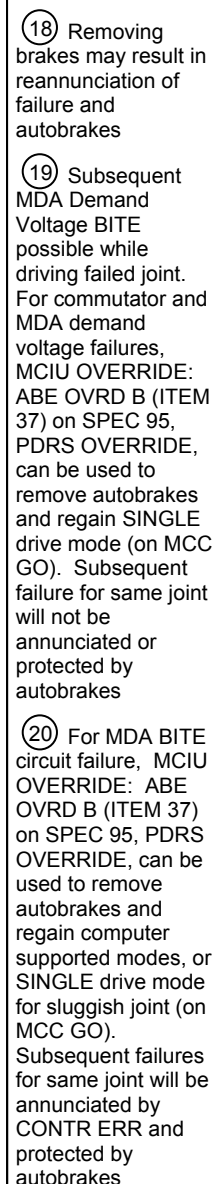
③ If any wrist joint data is unreliable, EE Auto mode may be lost

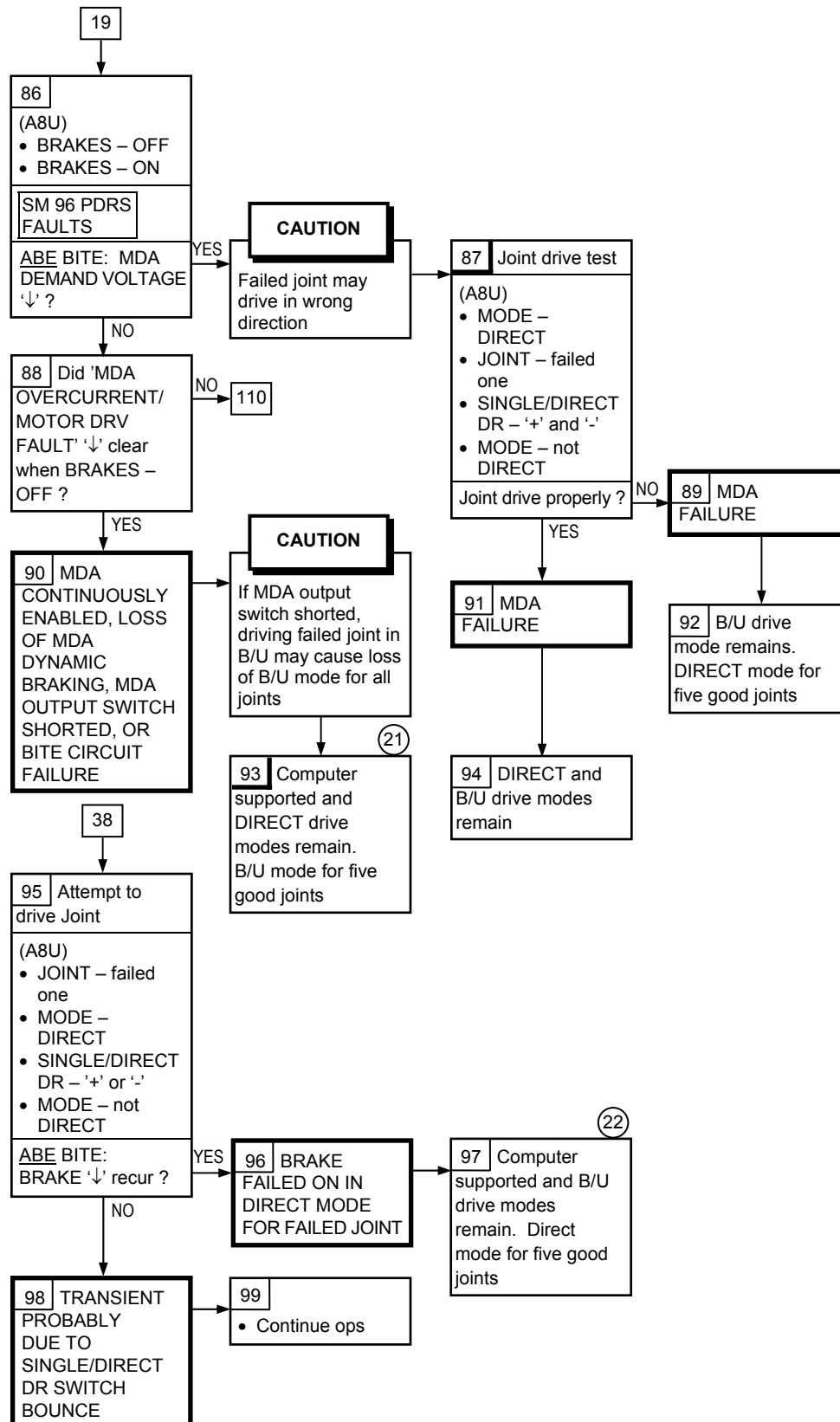
⑭ Additional annunciations may be received after ABE reset

⑮ One failure away from possible uncommanded motion, but protected by auto brakes and annunciated by CONTR ERR

⑰ When driving any joint in DIRECT, failure will reannunciate. Recycle arm select to regain computer supported modes

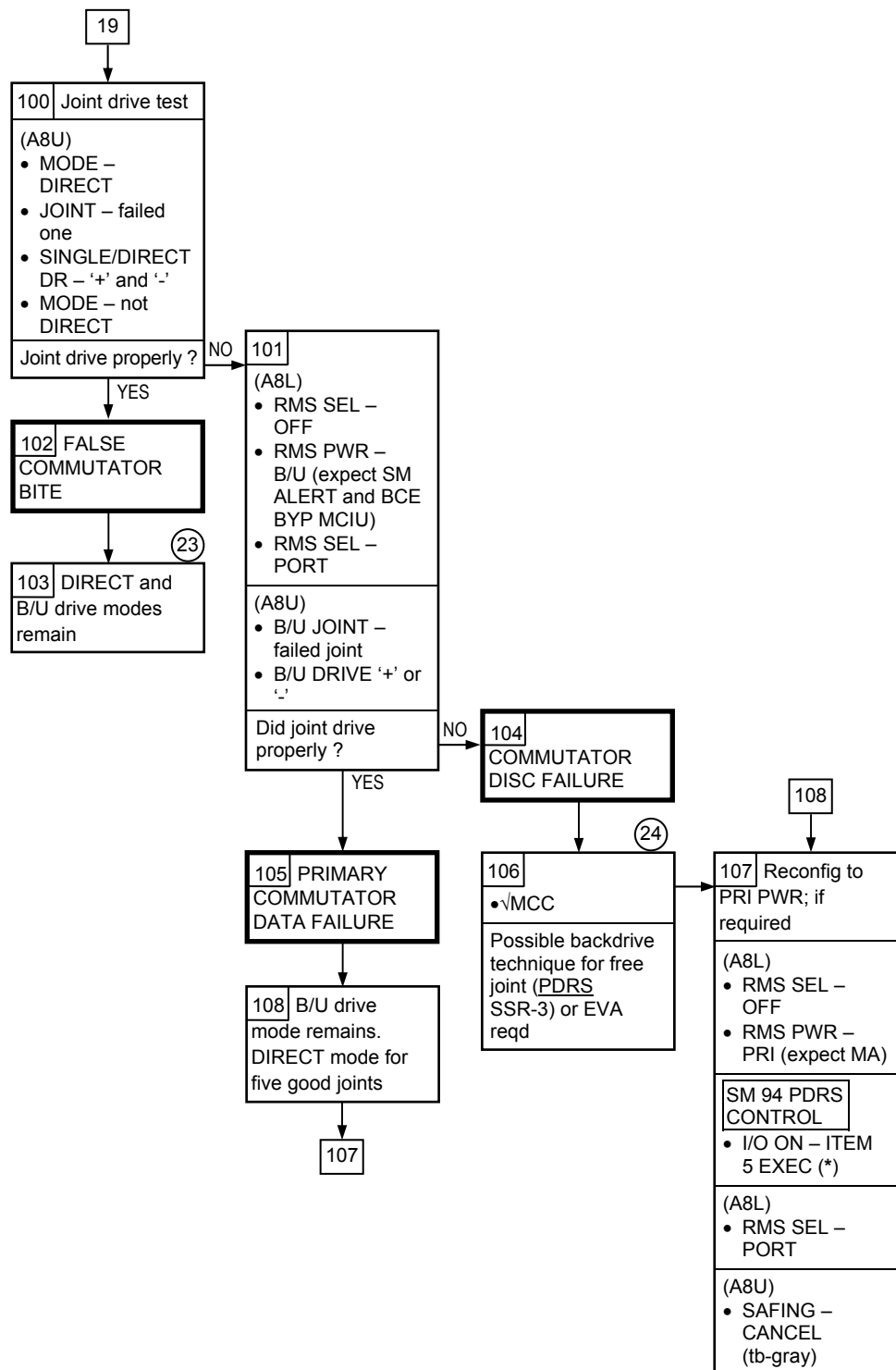
12.1d (Cont)





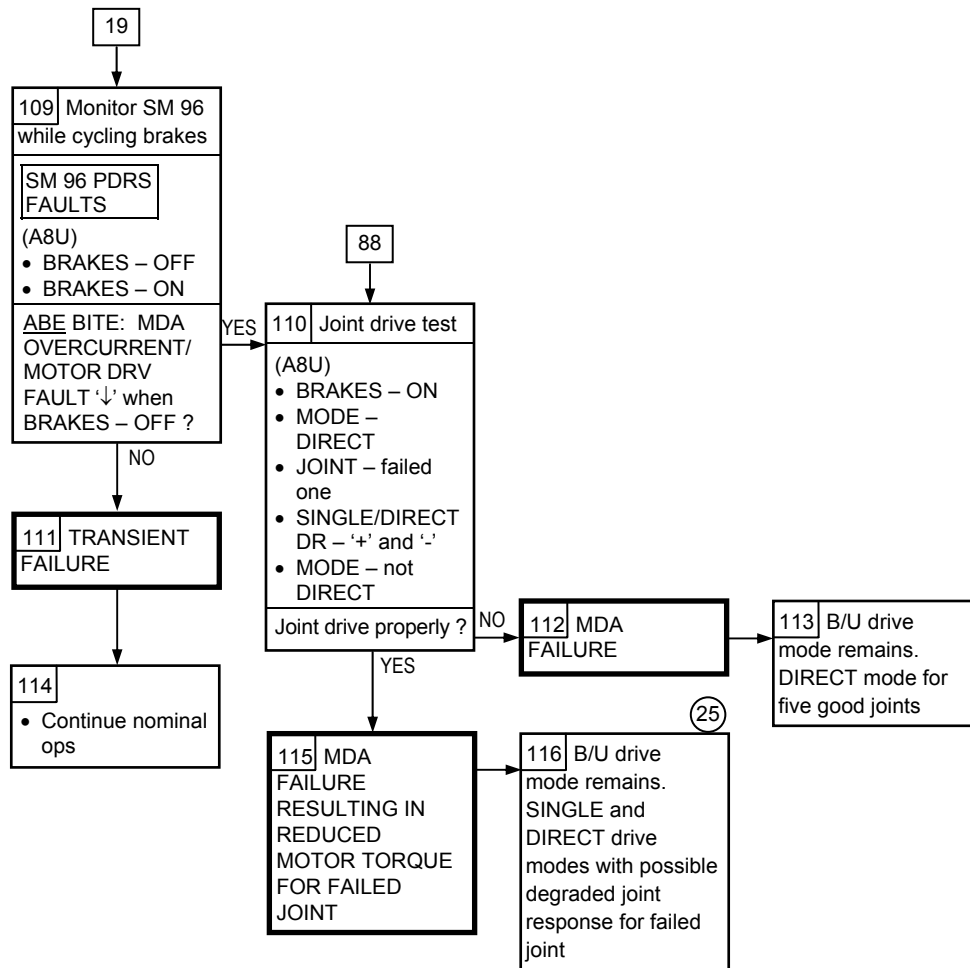
(21) For MDA continuously enabled or loss of dynamic braking, subsequent failure (runaway or failed free joint) will be annunciated but not stopped by autobrakes or dynamic braking, respectively

(22) Port RMS SEL will need to be cycled to regain computer supported modes

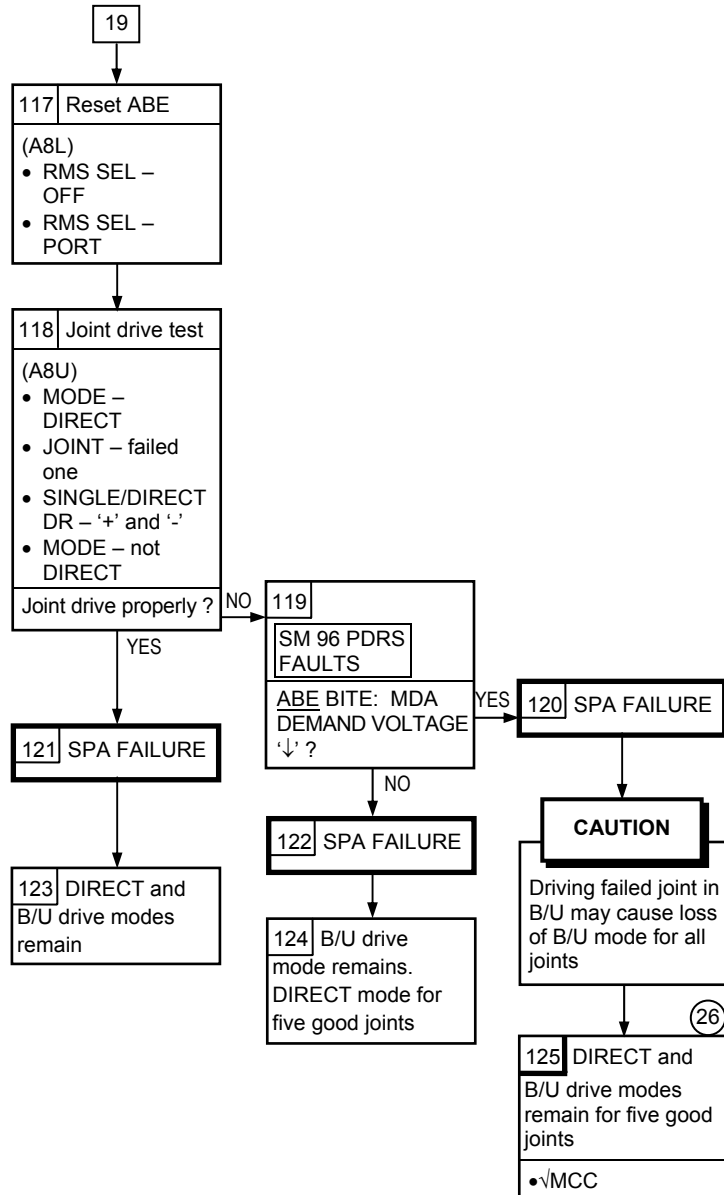


(23) MCIU OVERRIDE: ABE OVRD B (ITEM 37) on SPEC 95, PDRS OVERRIDE, can be used to remove autobrakes and regain single mode for five good joints, but the MDA is inhibited on the failed joint, and is therefore, electrically free. Brakes will stop joint motion. Override may be used with caution on MCC GO

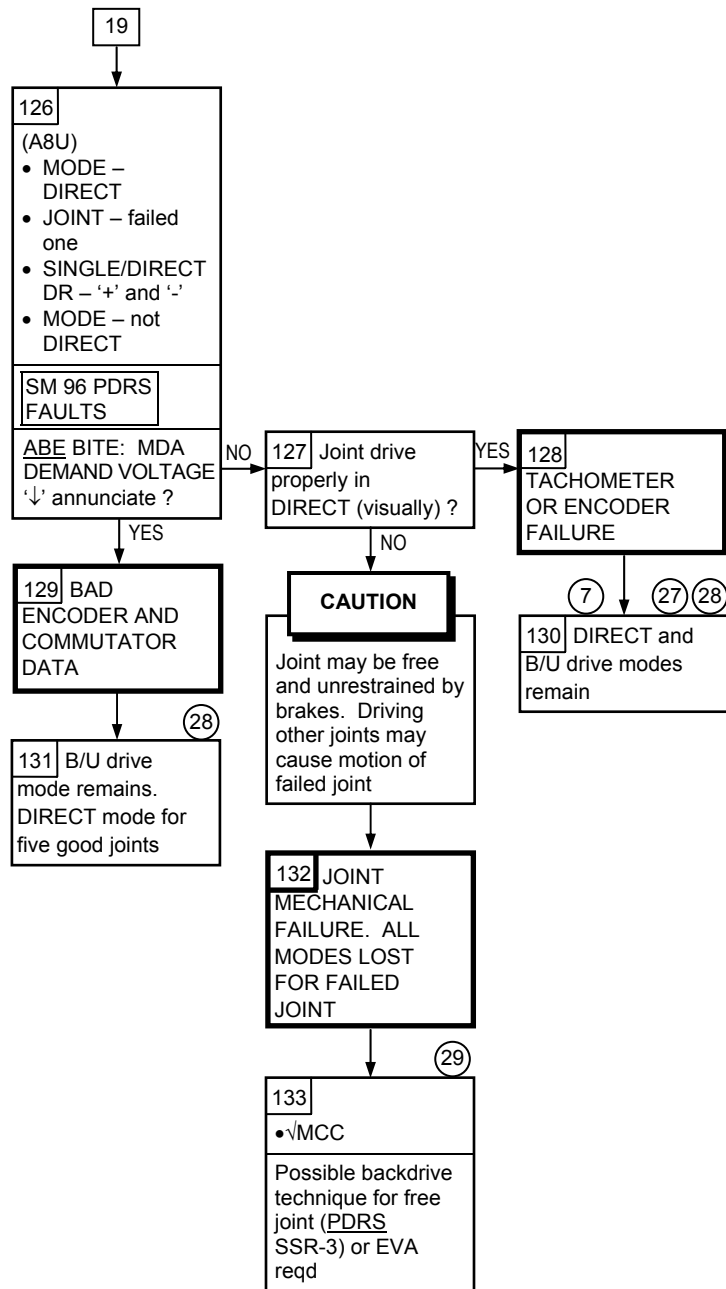
(24) MCIU OVERRIDE: ABE OVRD B (ITEM 37) on SPEC 95, PDRS OVERRIDE, required to regain computer supported modes for the backdrive technique



②⑤ Subsequent MDA Demand Voltage BITE possible while driving failed joint



②⑥ 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

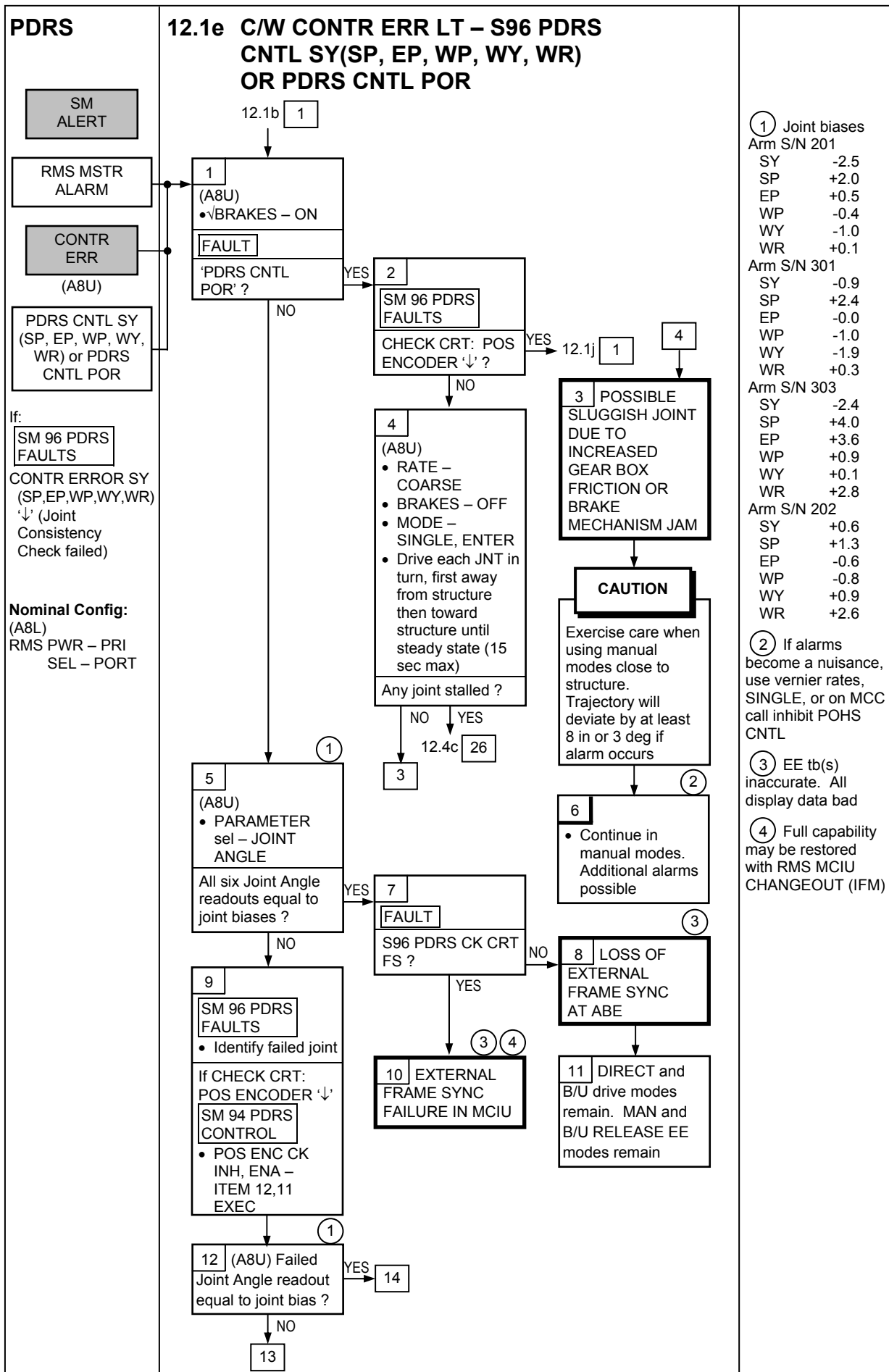


⑦ For tach failure, rate data is unreliable

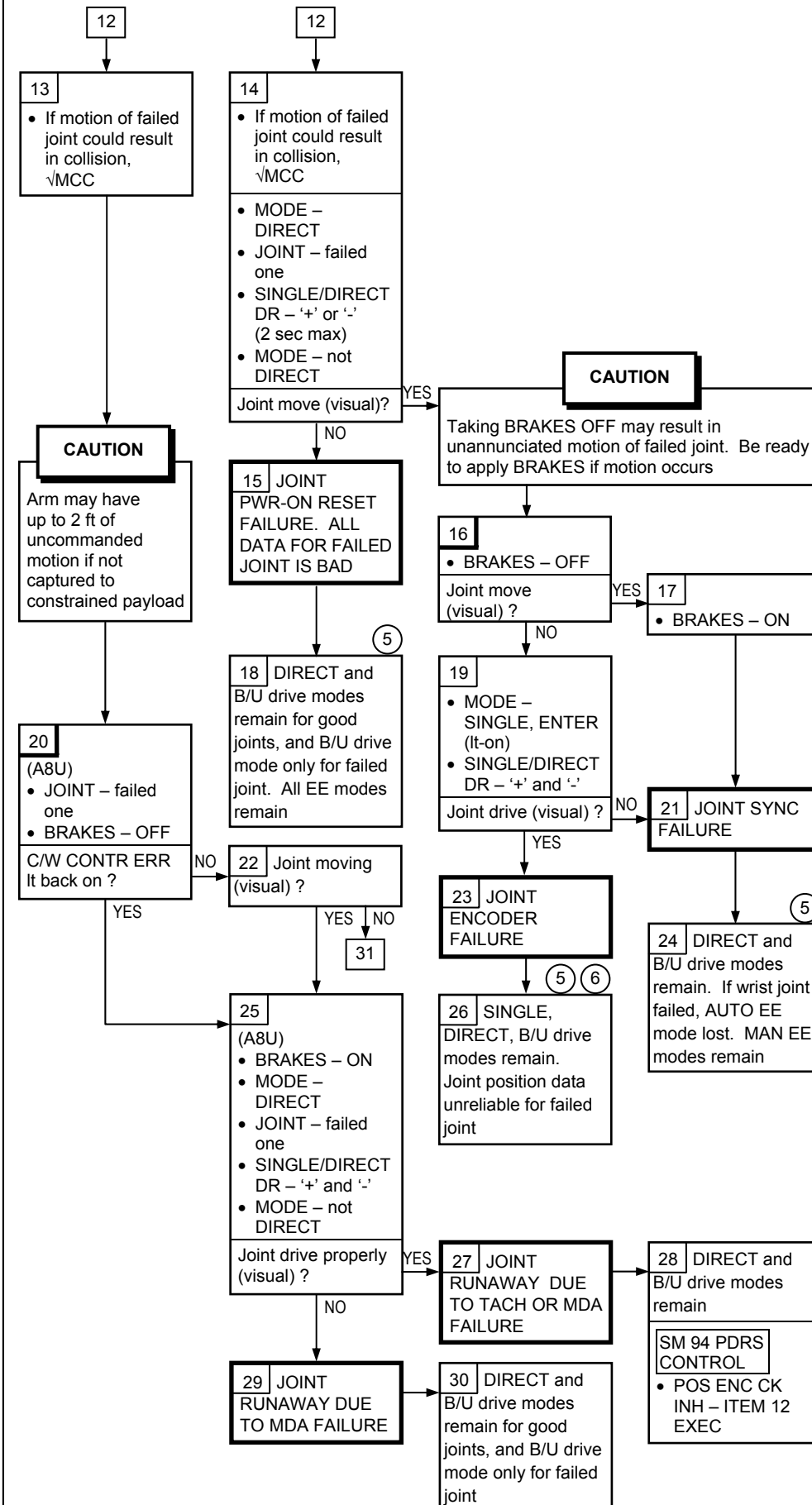
②⑦ For encoder failure, MCIU OVERRIDE: ABE OVRD A (ITEM 36) on SPEC 95, PDRS OVERRIDE, can be used to remove autobrakes and regain SINGLE mode (on MCC GO). Position hold is not functional for failed joint. Subsequent TACH failure will be annunciated by CONTR ERR or TOTAL COMPENSATOR and protected by autobrakes

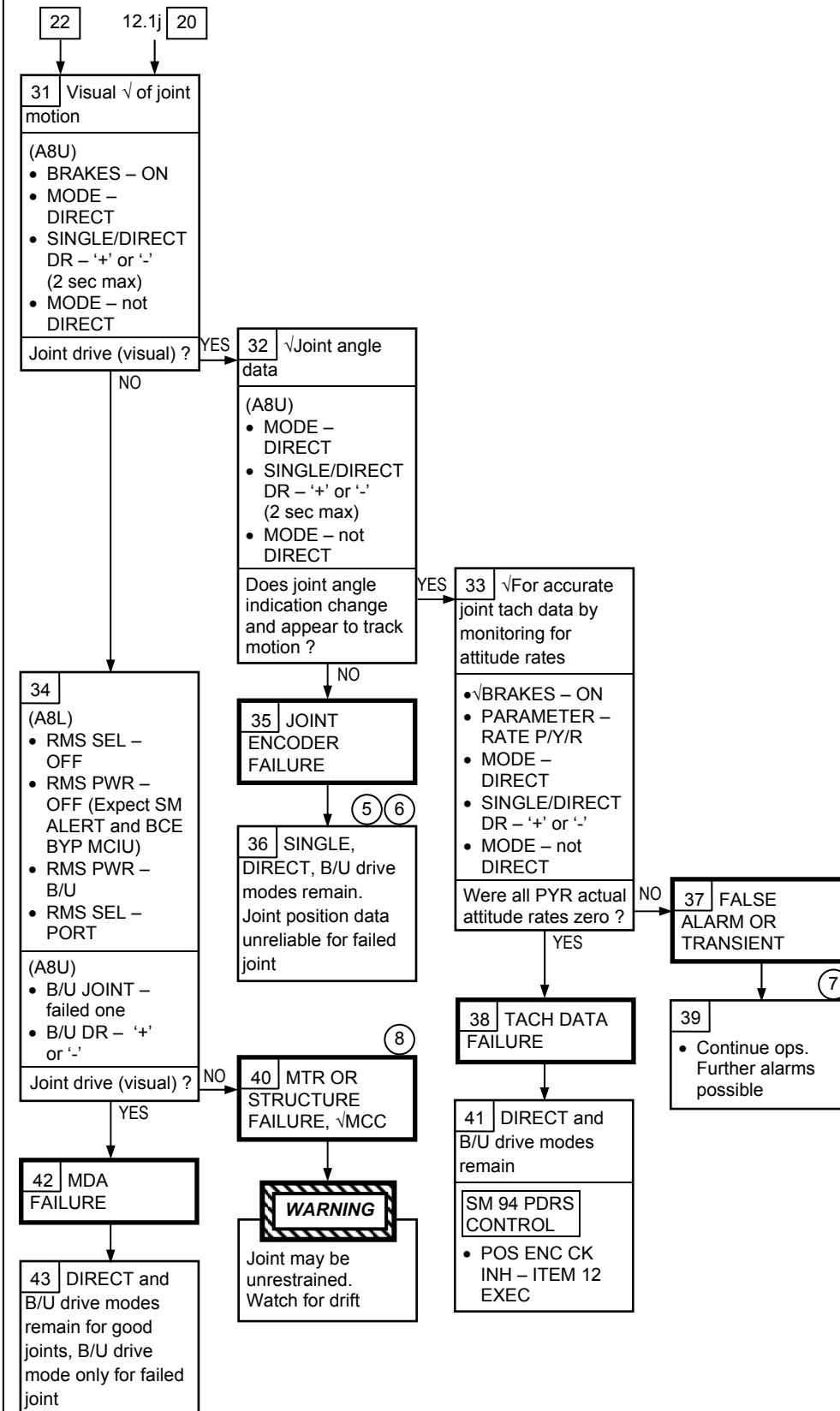
②⑧ For encoder failure, joint data is unreliable. REACH LIMIT and SOFT STOP annunciations not available for failed joint

②⑨ MCIU OVERRIDE: ABE OVRD A (ITEM 36) on SPEC 95 PDRS OVERRIDE required to regain computer supported modes for backdrive technique



PDRS 12.1e (Cont)





⑤ REACH LIMITs and SOFT STOPs annunciation not available for failed joint

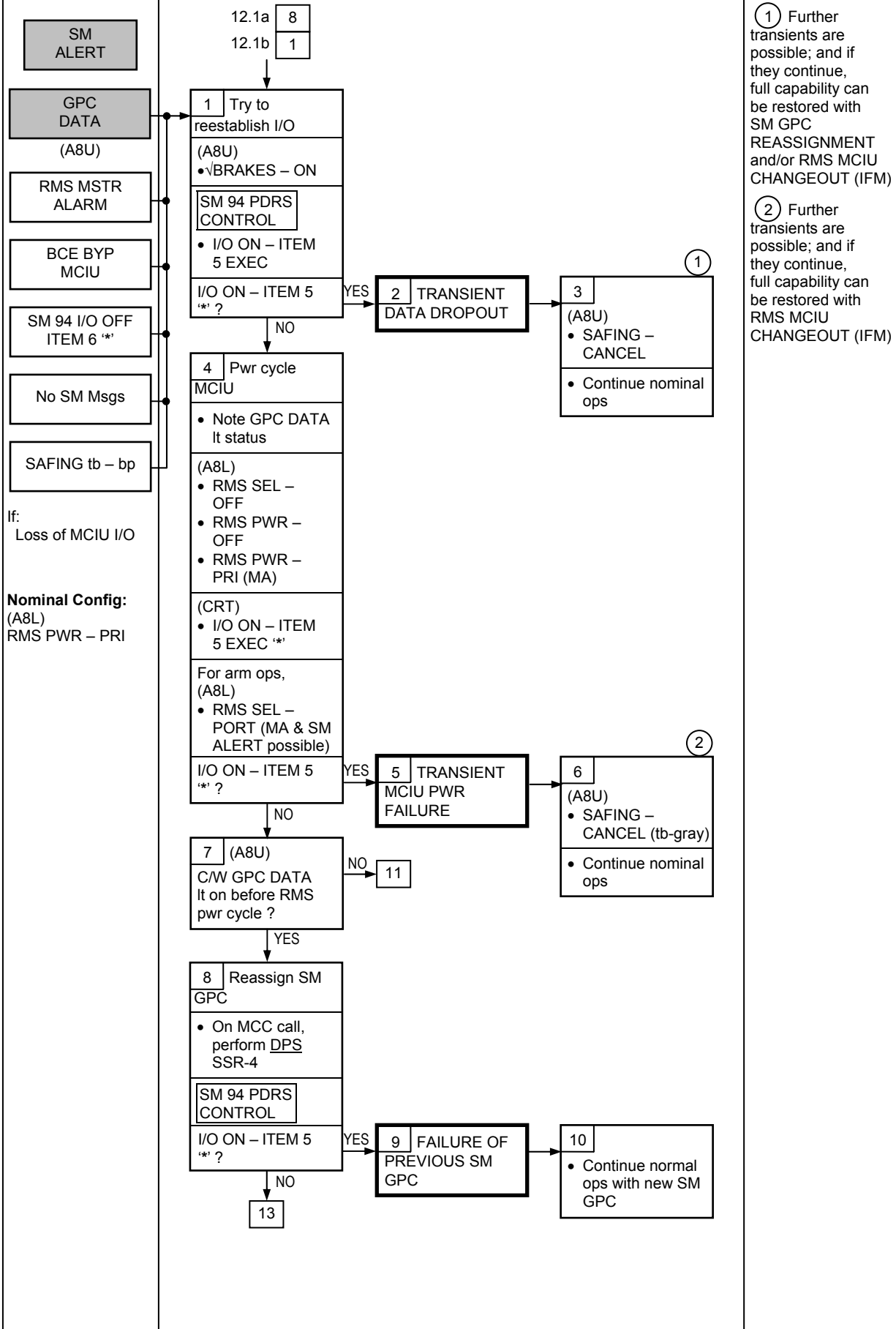
⑥ Position hold function will not work for failed joint

⑦ MCC can determine if fwd/backdrive flag failure is cause of false alarm

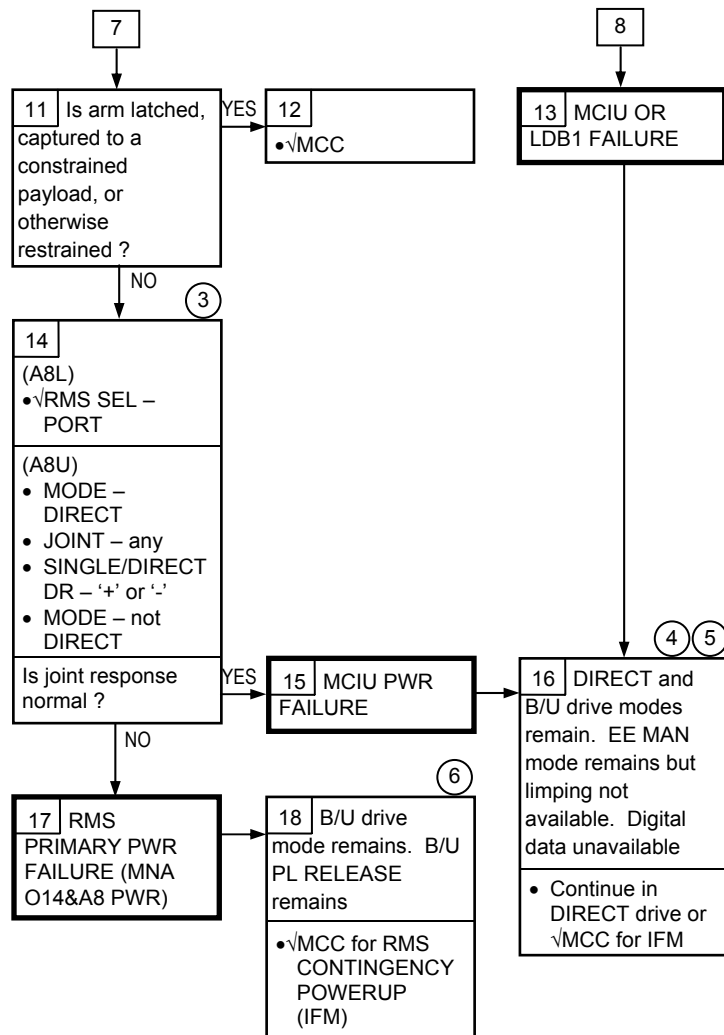
⑧ Whiplash technique or EVA may be reqd to cradle arm

PDRS

12.1f C/W GPC DATA LT OR BCE BYP MCIU



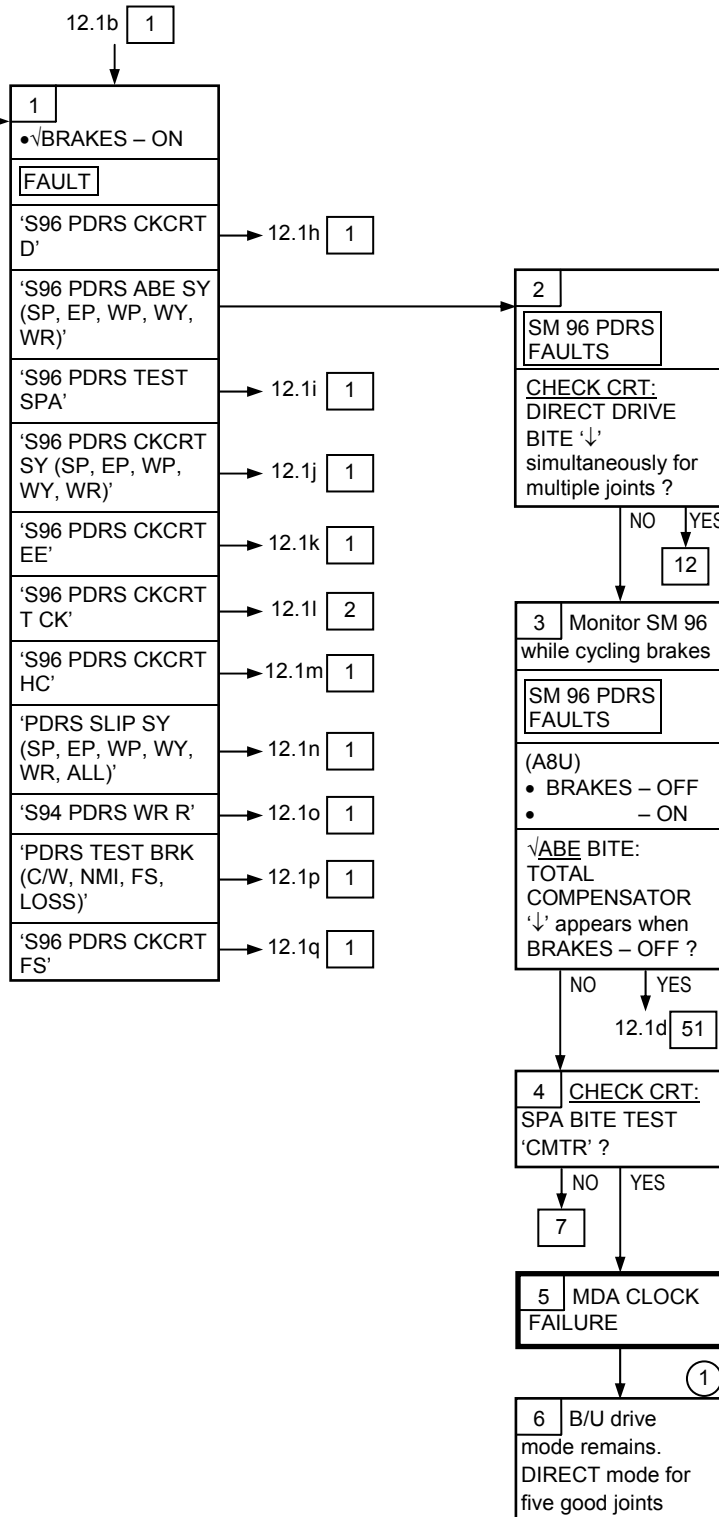
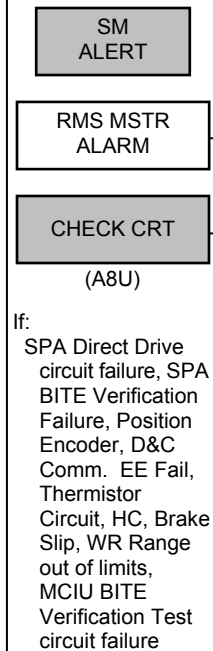
PDRS 12.1f (Cont)



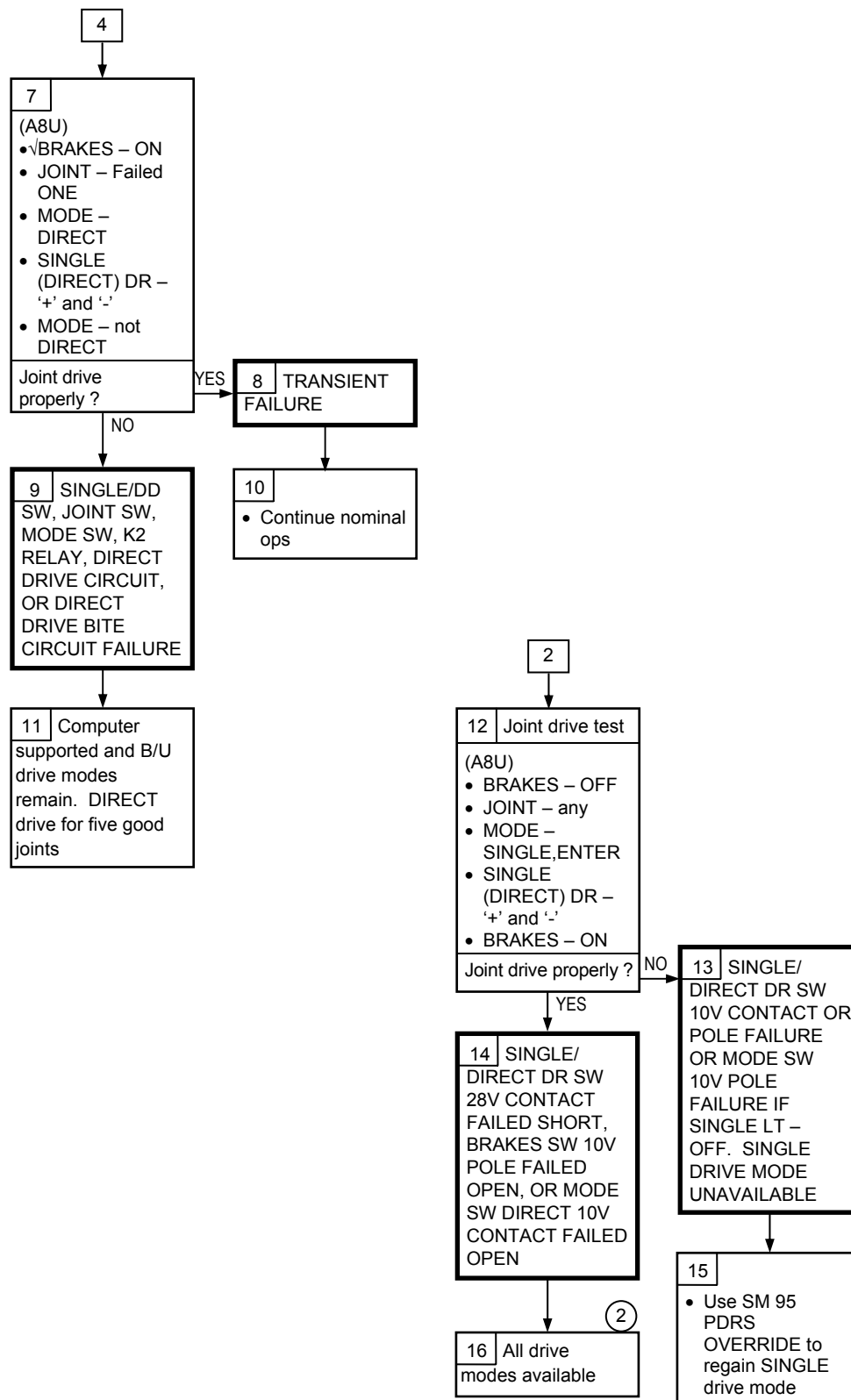
- ③ Mode It may not illuminate
- ④ Full capability may be restored with MCIU CHANGEOUT (IFM)
- ⑤ RSAD may be capable of displaying joint data
- ⑥ Primary pwr may be restored following IFM. Panel edge lighting may not be available

PDRS

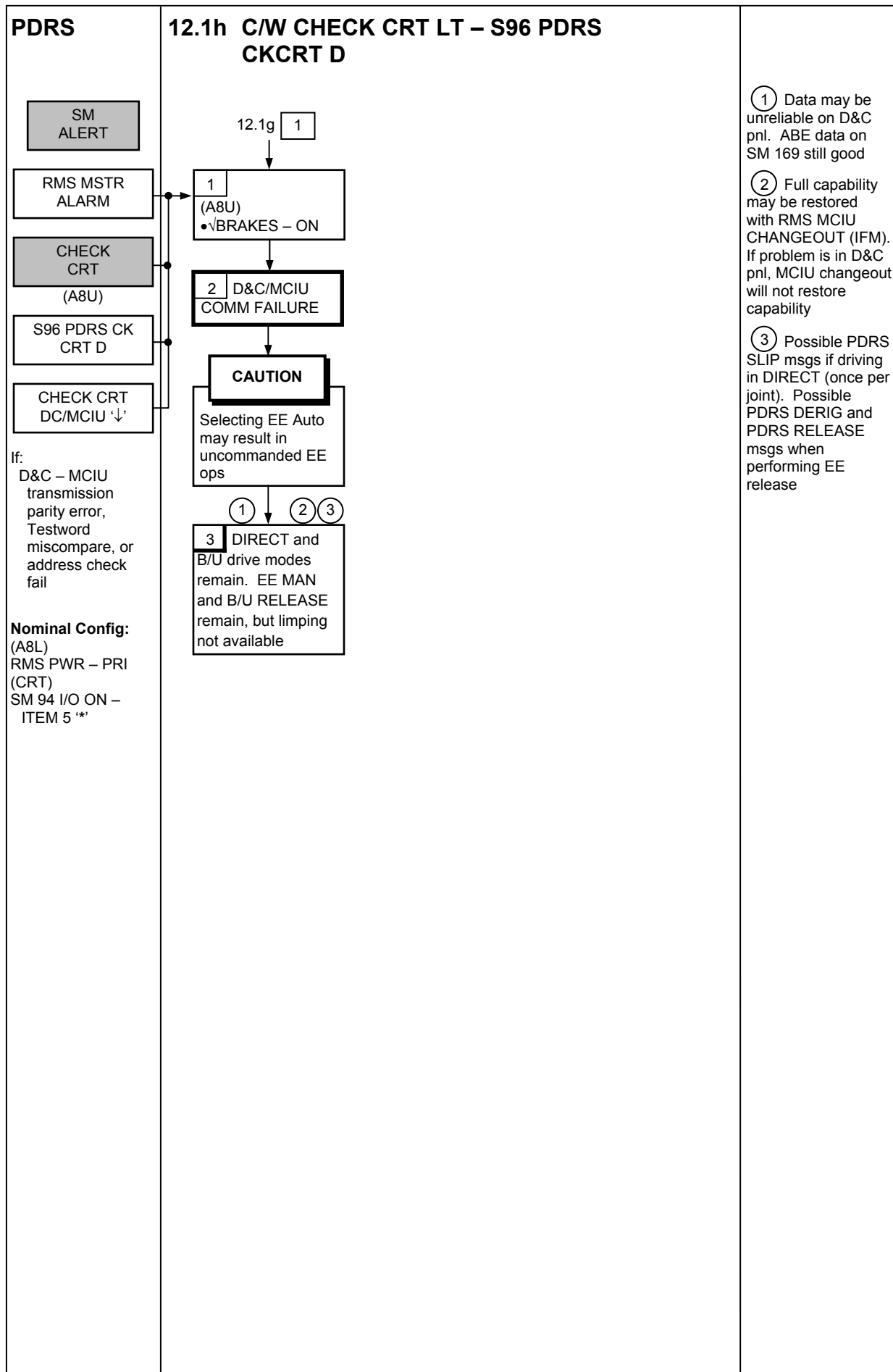
12.1g C/W CHECK CRT LT



① Computer supported modes available but subsequent commutator failure for same joint will not be annunciated or protected by autobrakes

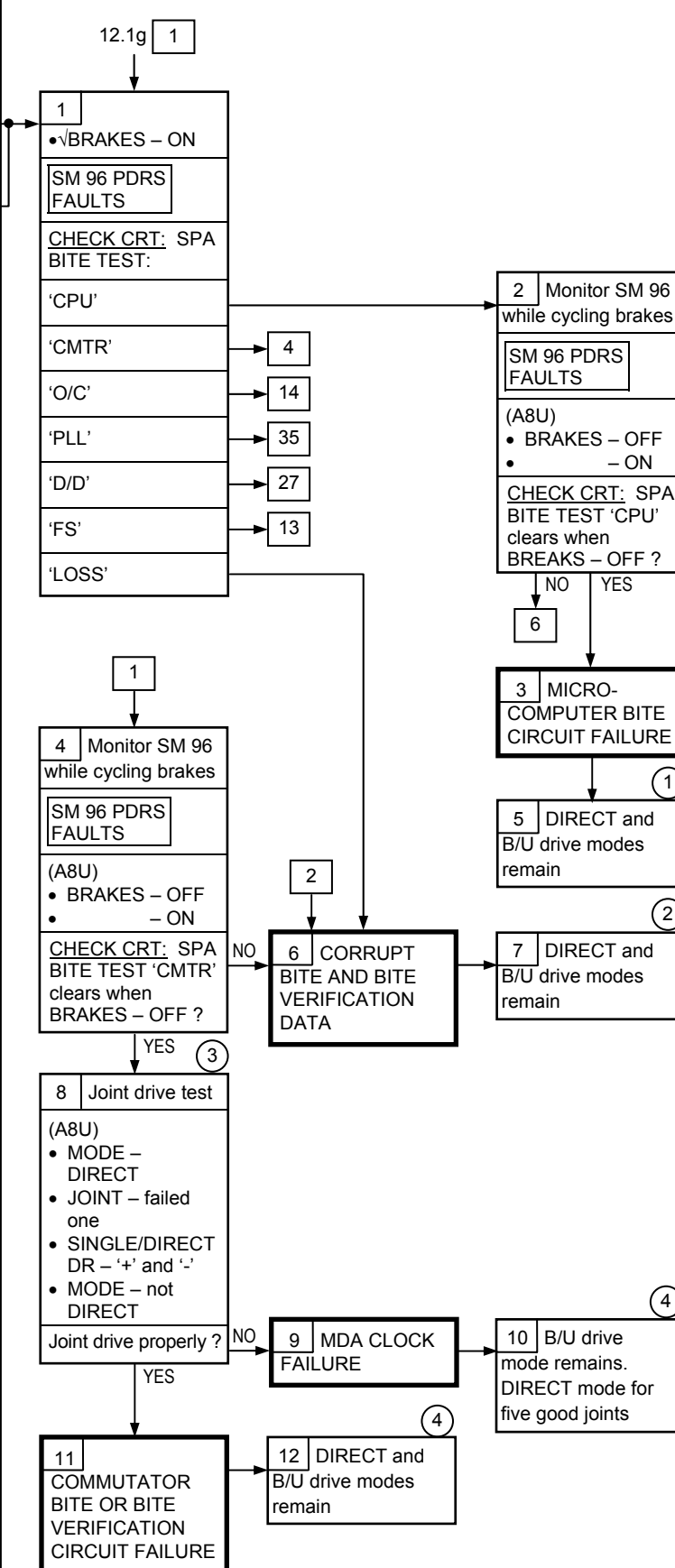
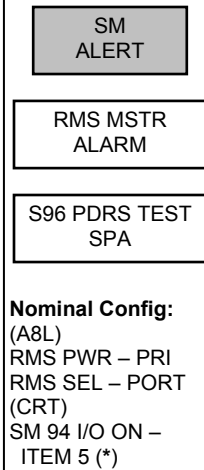


② One failure away from uncommanded joint drive in DIRECT



PDRS

12.1i C/W CHECK CRT LT – S96 PDRS TEST SPA



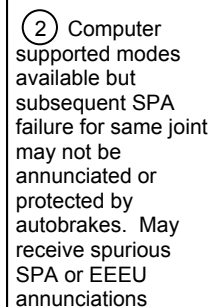
① For loss of microcomputer BITE, computer supported modes available but subsequent failure for same joint may not be annunciated or protected by autobrakes

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 It and DIRECT DRIVE BITE '↓' when driving in Direct Mode. Cycle BRAKES sw to clear failure

④ Computer supported modes available but subsequent commutator failure for same joint may not be annunciated or protected by autobrakes

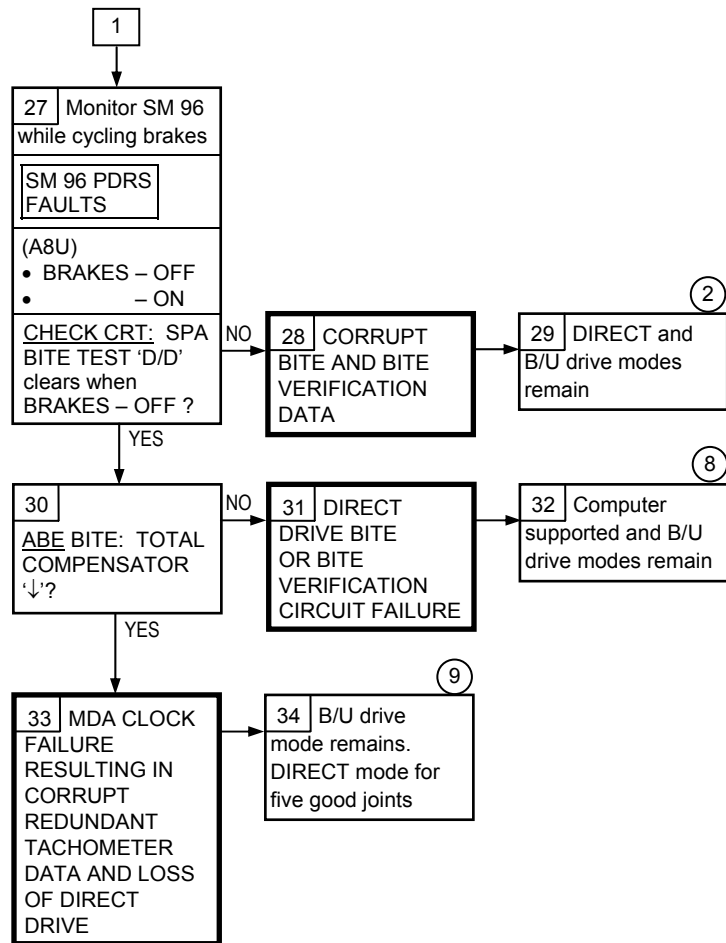
12.1i (Cont)



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

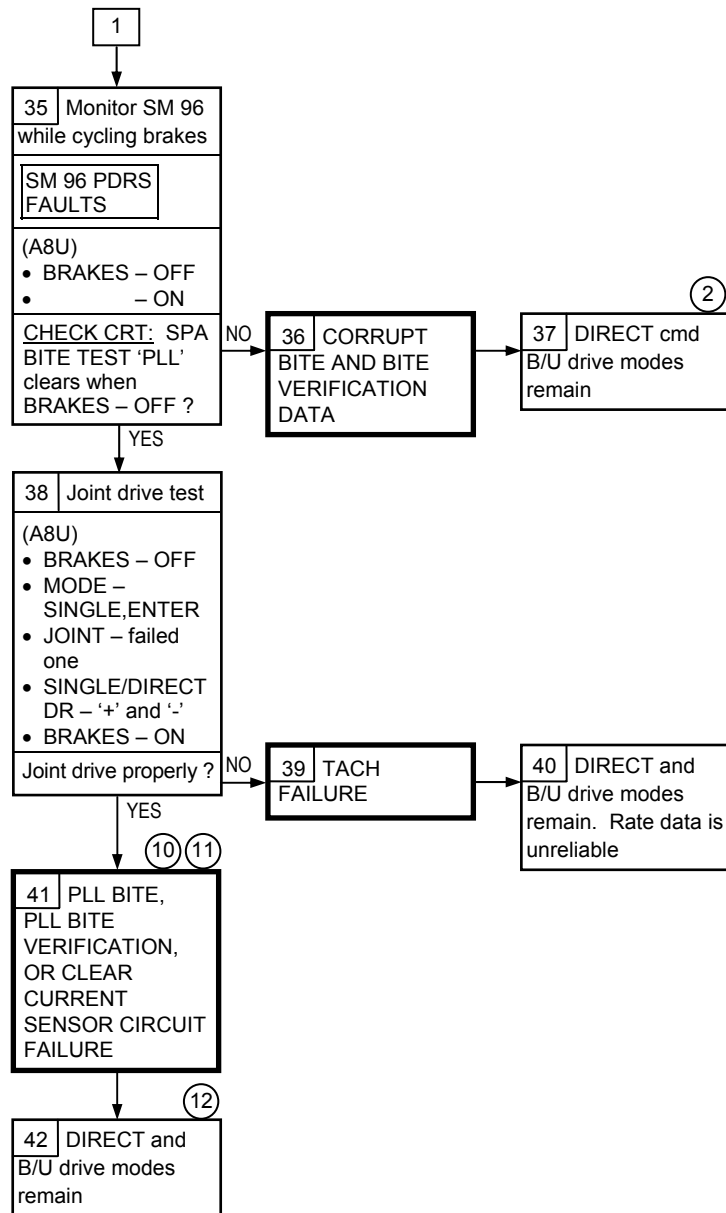
⑦ For loss of microcomputer BITE, computer supported modes available but subsequent failure for same joint will not be annunciated or protected by autobrakes



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 Failure Subsequent tachometer failure for same joint will be annunciated by ABE It and ABE BITE: POS ENCODER '↓' 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

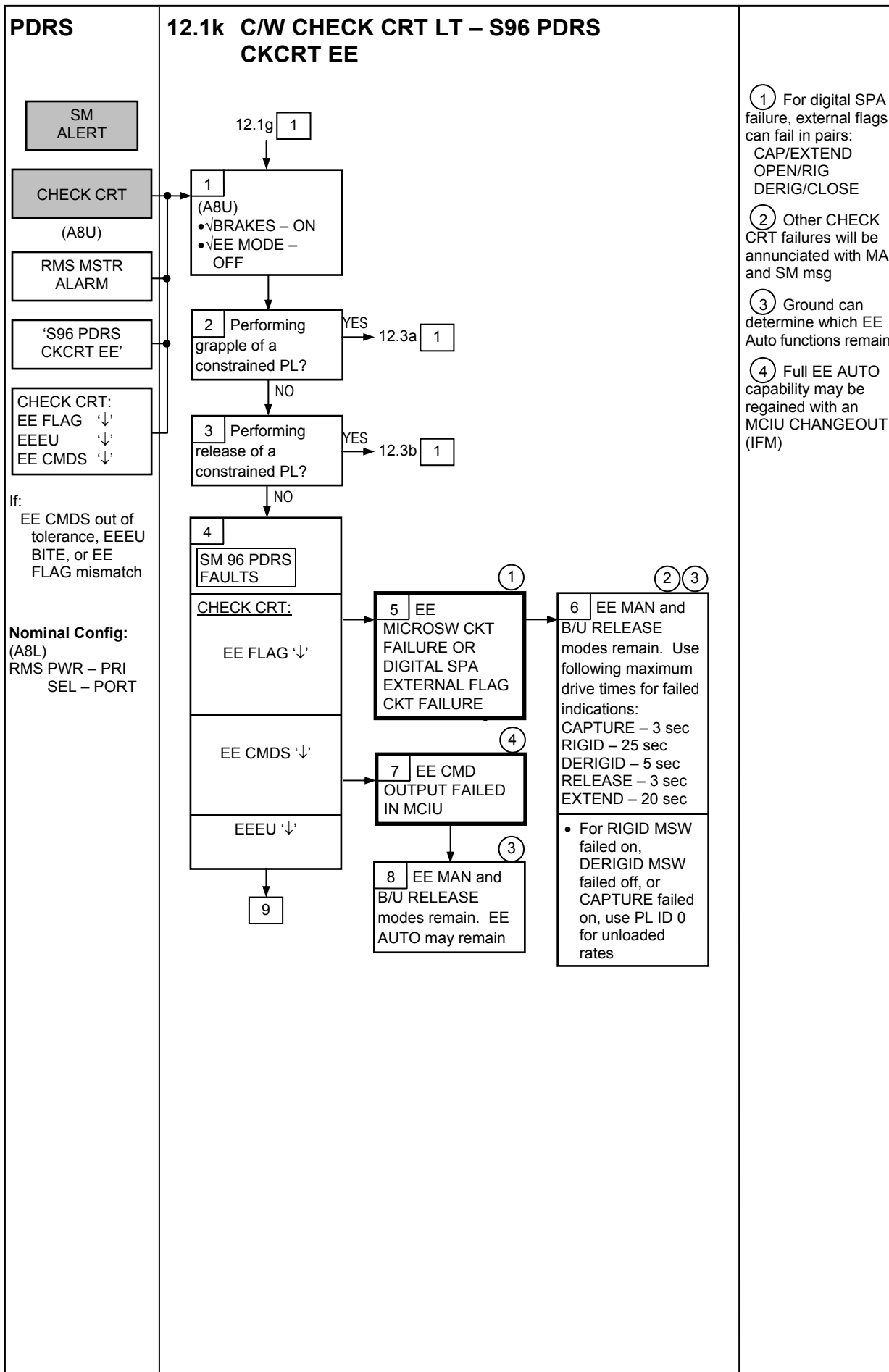
⁽¹²⁾ Computer supported modes available, but subsequent clock failure may not be annunciated or protected by autobrakes

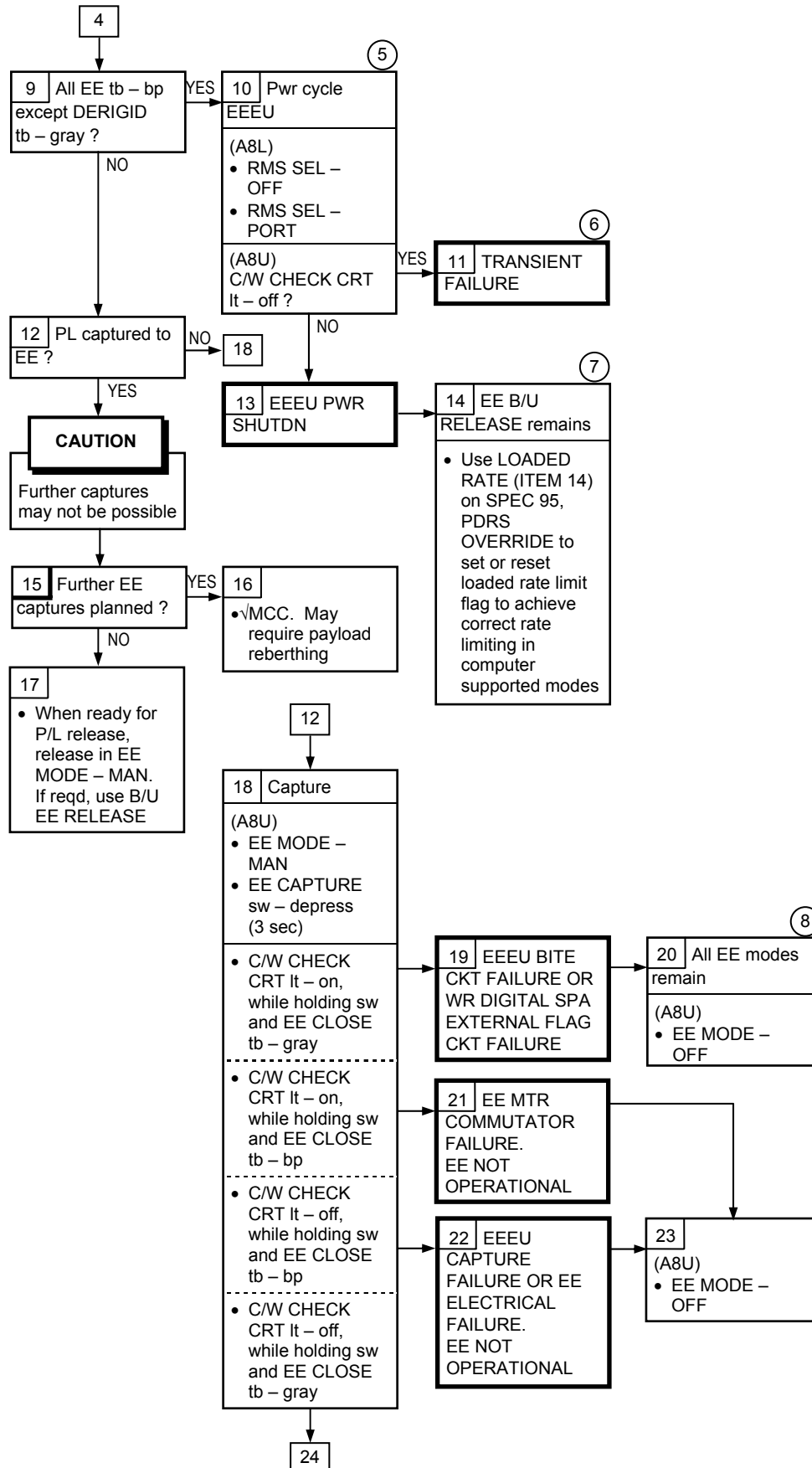
**12.1j C/W CHECK CRT LT – S96 PDRS
CKCRT SY(SP, EP, WP, WY, WR)**

12.1j (Cont)



⑤ Position hold function will not work for failed joint





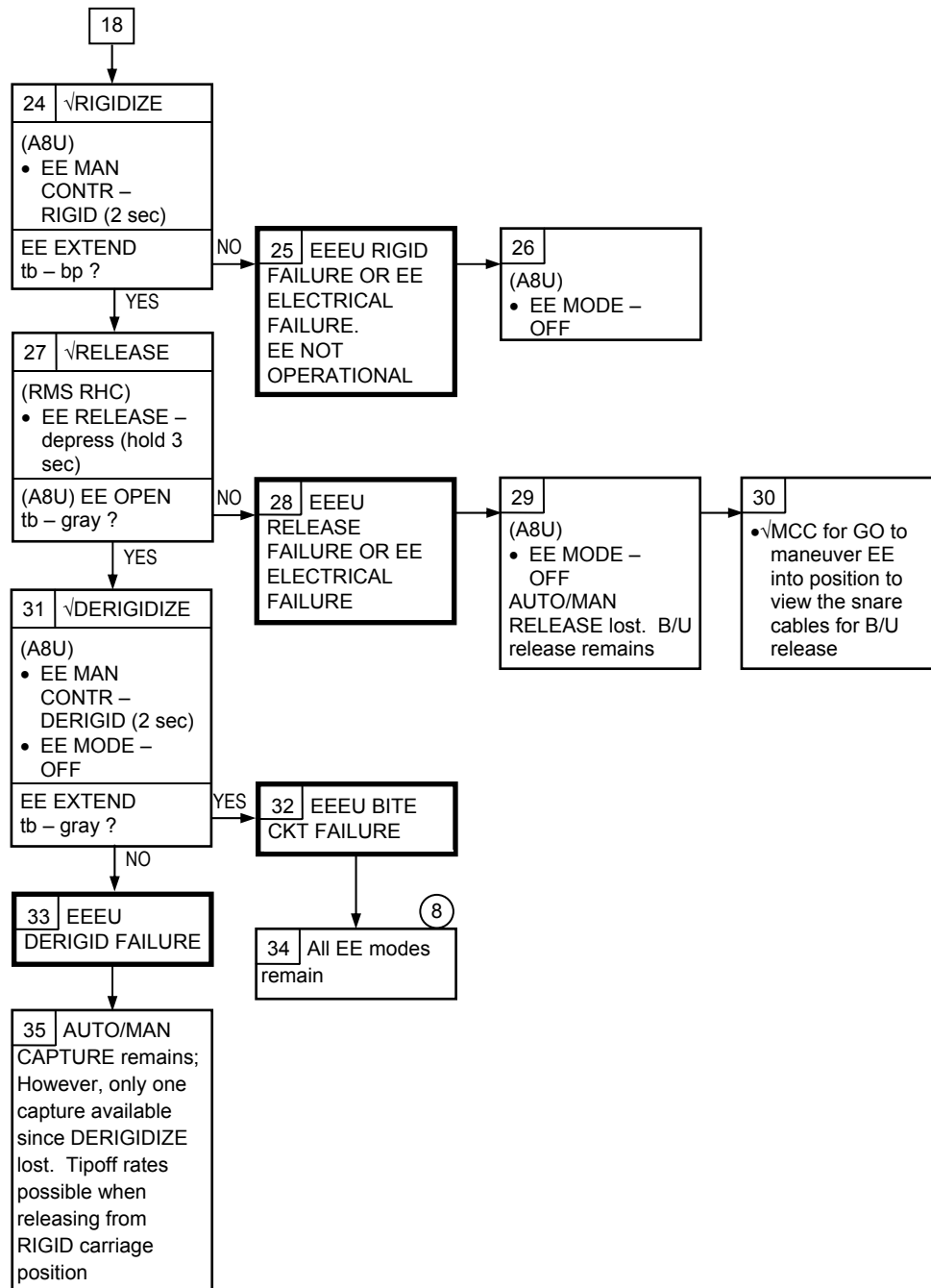
⑤ √WR roll range value. Deselecting and reselecting RMS may cause WR roll range value to be incorrect

⑥ Additional alarms possible

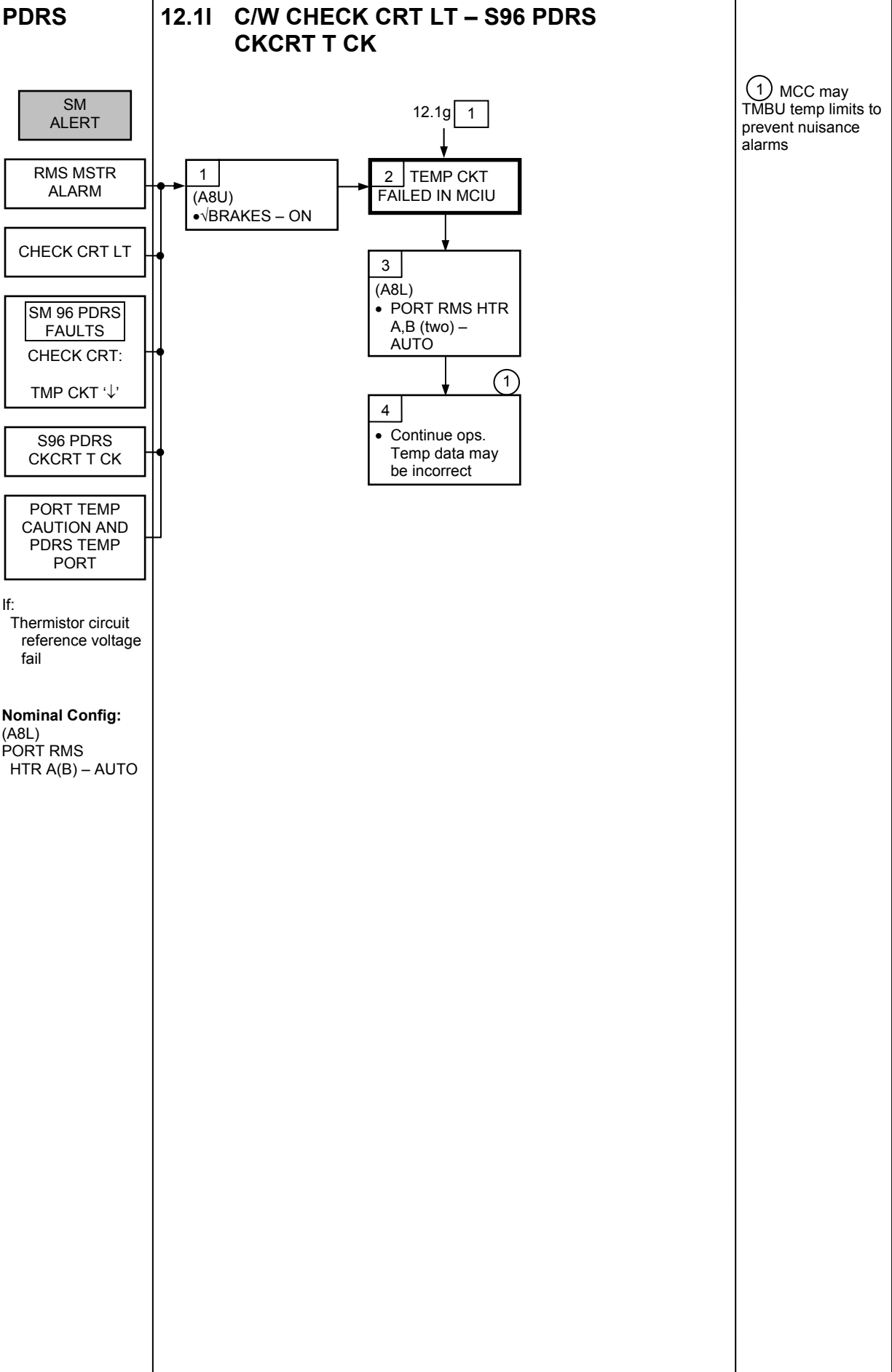
⑦ Subsequent uncommanded release or derigidization will not be annunciated

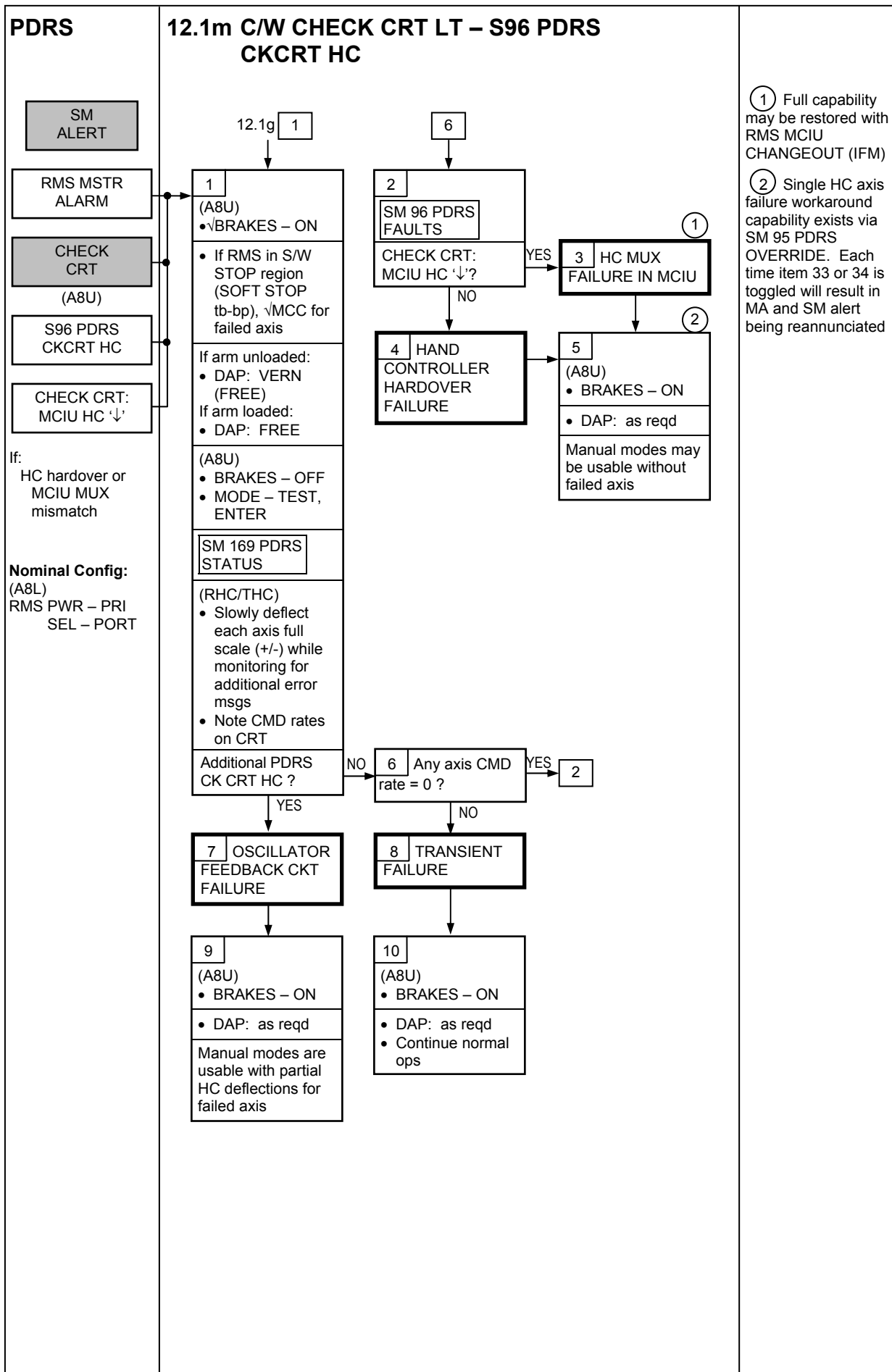
⑧ EEEU BITE checks will be masked. Other CHECK CRT failures will be annunciated with MA and SM msg

PDRS 12.1k (Cont)



⑧ EEEU BITE checks will be masked. Other CHECK CRT failures will be annunciated with MA and SM msg



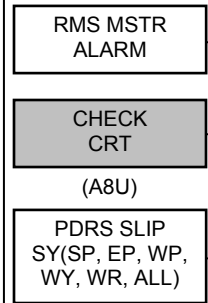


① Full capability may be restored with RMS MCIU CHANGEOUT (IFM)

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

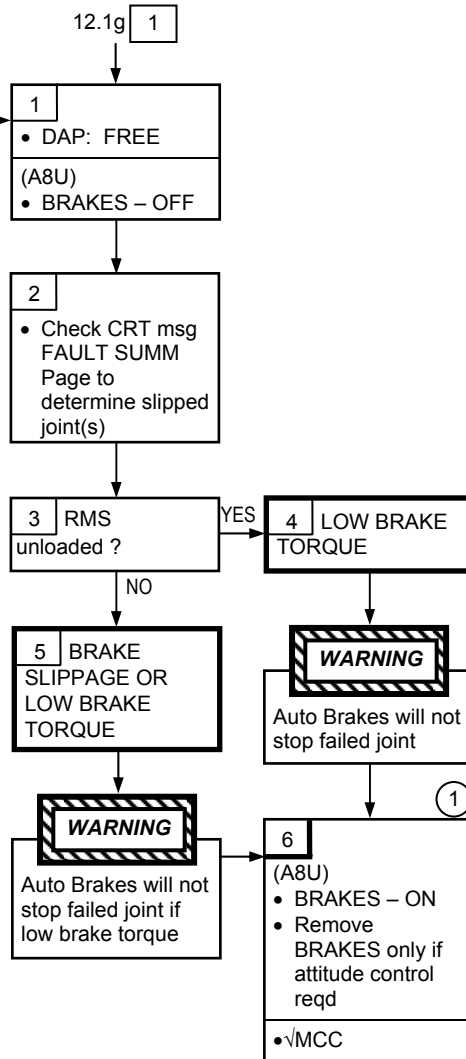
PDRS

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

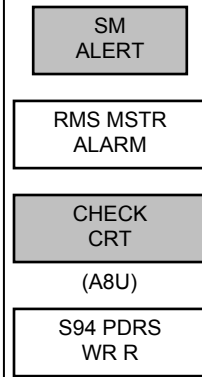
Nominal Config:
(A8U)
RMS SEL – PORT
BRAKES – ON
BRAKES tb – ON
MODE – not
DIRECT



① MCC can
attempt to correlate
jet activity with
'PDRS SLIP' msg or
may recommend a
joint drive test to
ascertain brake
health

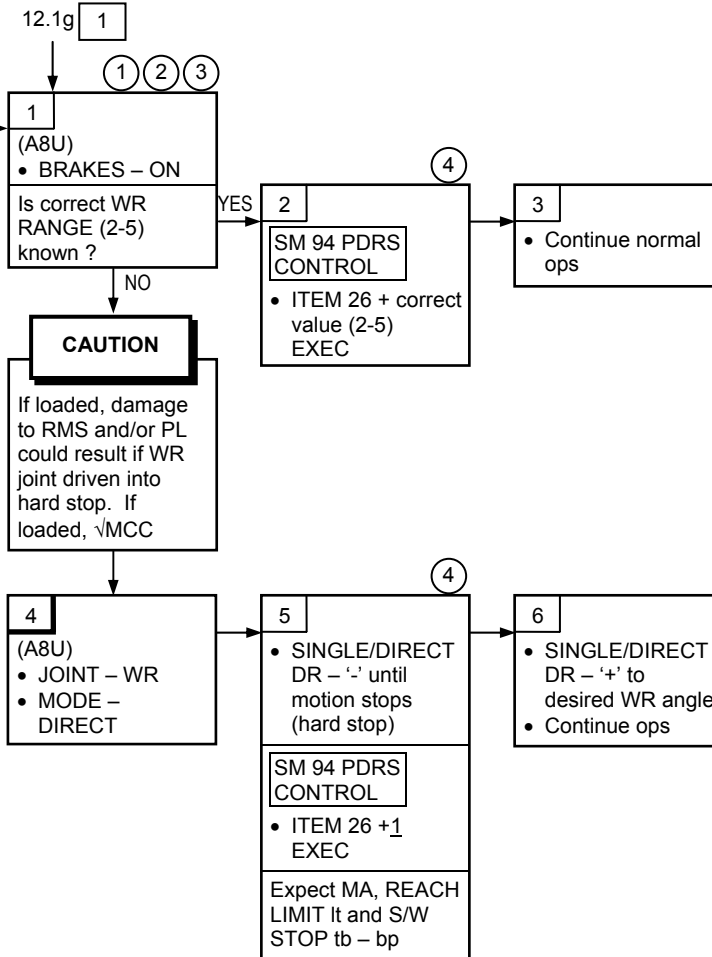
PDRS

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



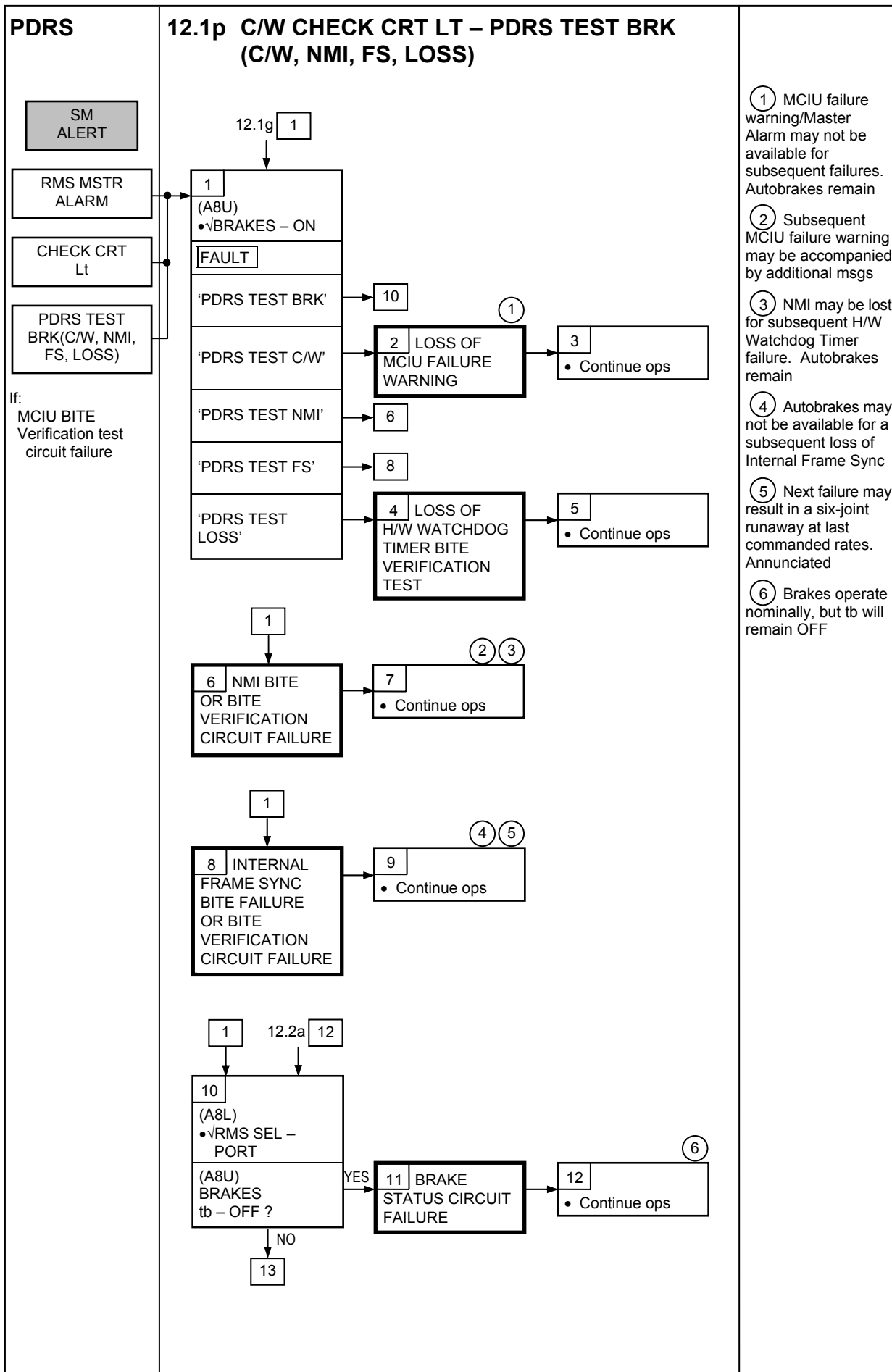
① MCC may be able to determine correct value

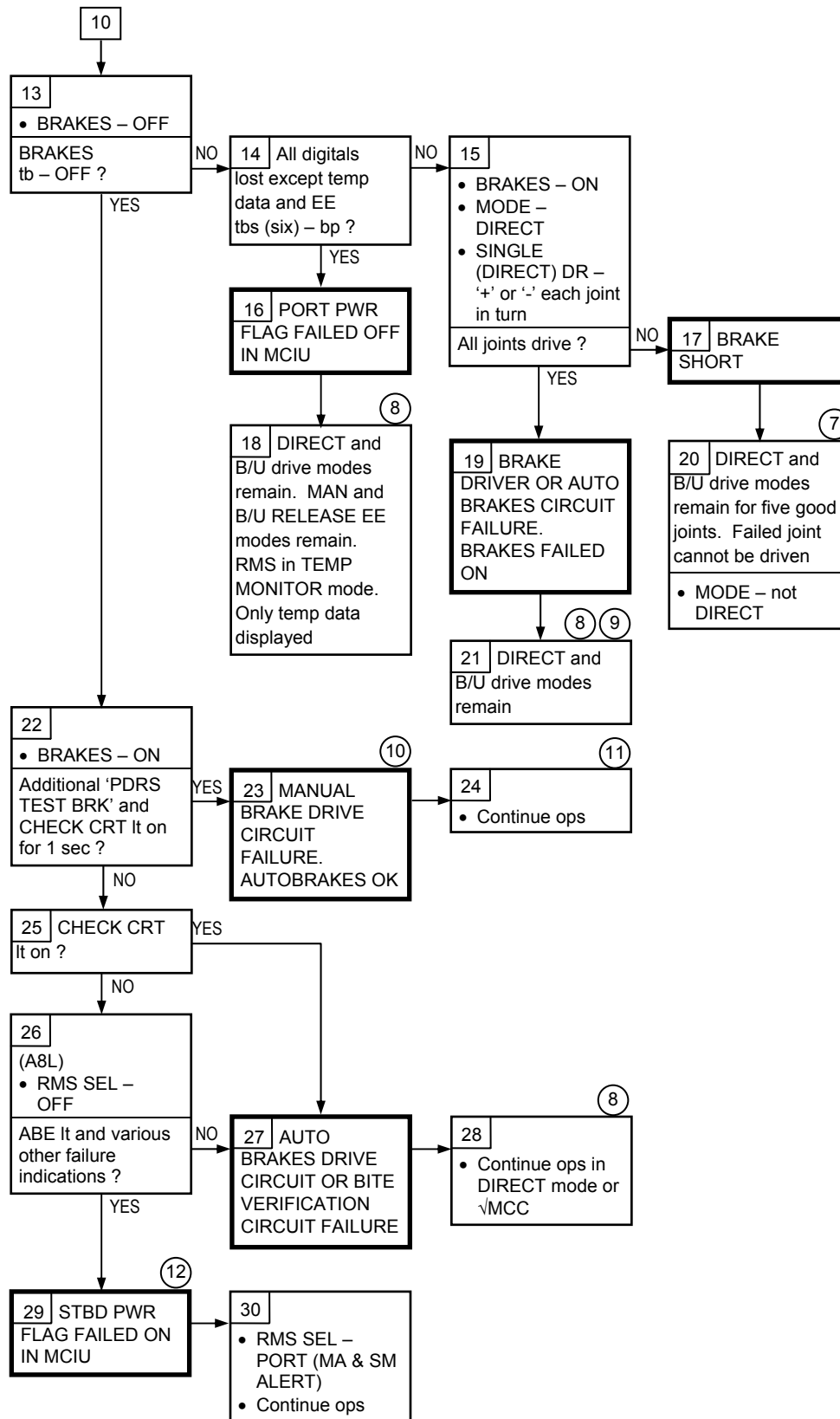
② Msg may result because of RMS deselect and reselect, driving WR in B/U, or SM major function move to another GPC

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

④ Expect CKCRT It and 'S96 PDRS CKCRT WR'. Clear with SM 94 PDRS CONTROL ITEM 12, 11





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

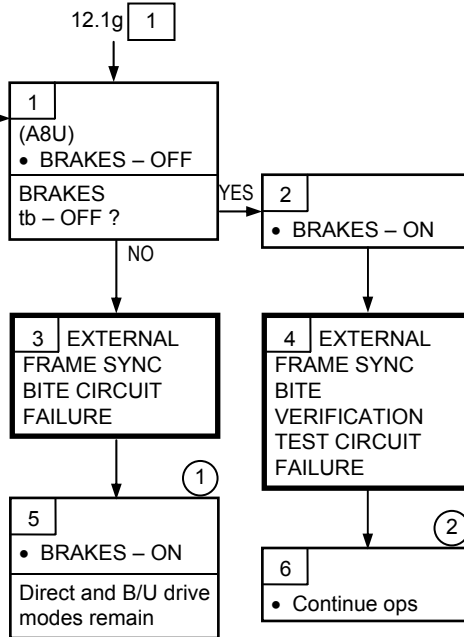
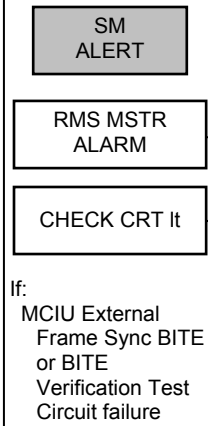
⑩ MCIU BITE verification test will apply brakes 1 sec after brake sw on

⑪ Failure will reannunciate with BRAKE sw transition from OFF to ON

⑫ RMS temperature monitor mode not available

PDRS

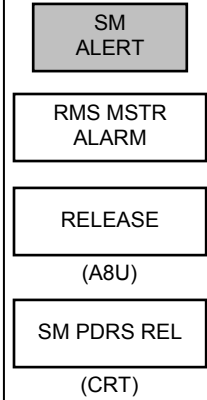
12.1q C/W CHECK CRT LT – S96 PDRS CKCRT FS



① Full capability
will be restored with
RMS MCIU
CHANGEOUT (IFM)

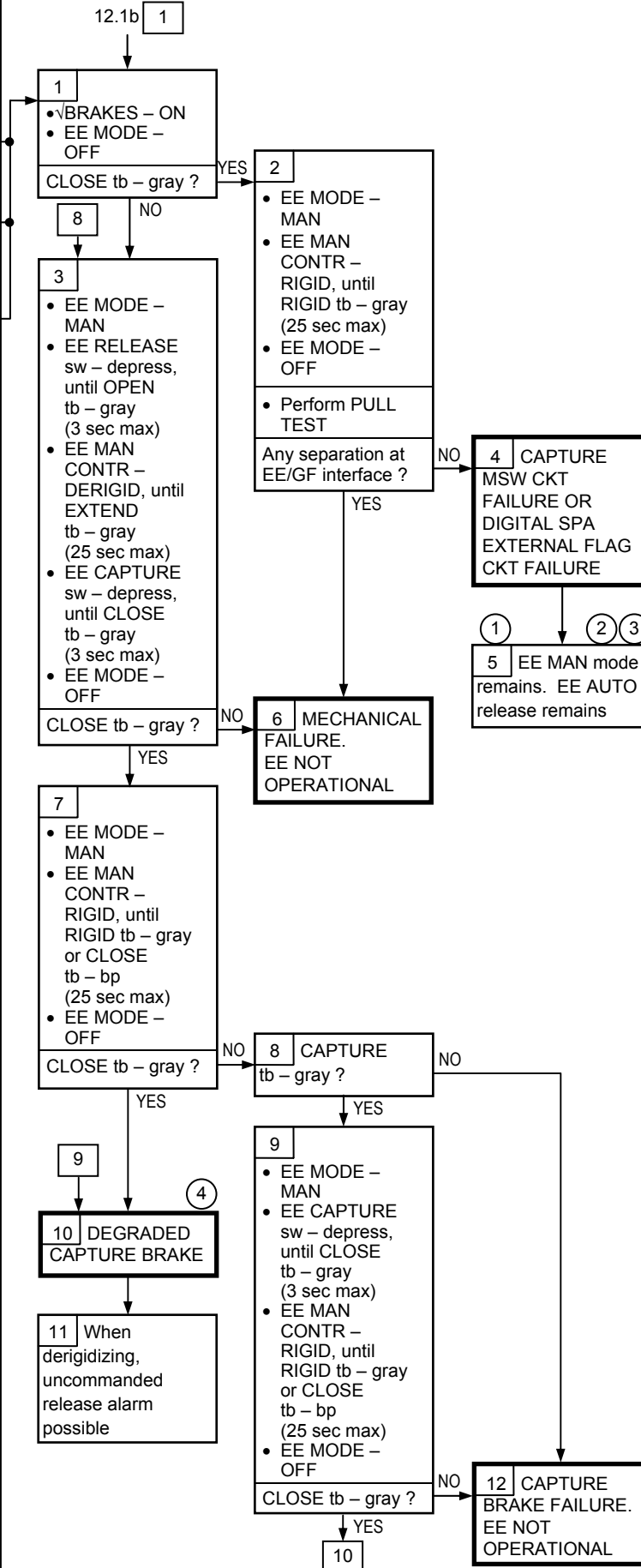
② Auto brakes
available for
subsequent loss of
External Frame Sync
due to SPA detected
loss of Frame Sync

PDRS



If:
Uncommanded
release warning

12.1r C/W RELEASE LT – PDRS REL

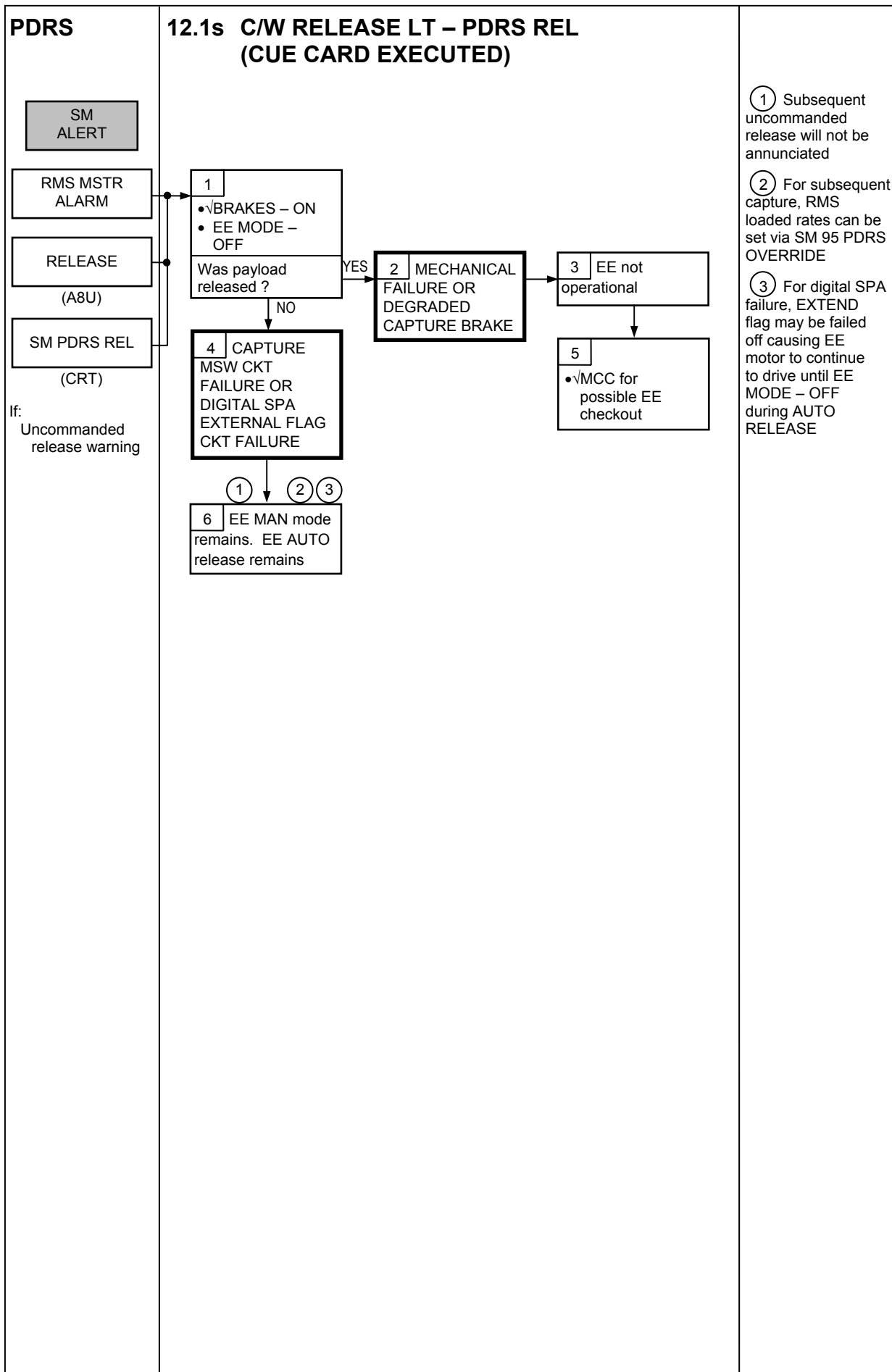


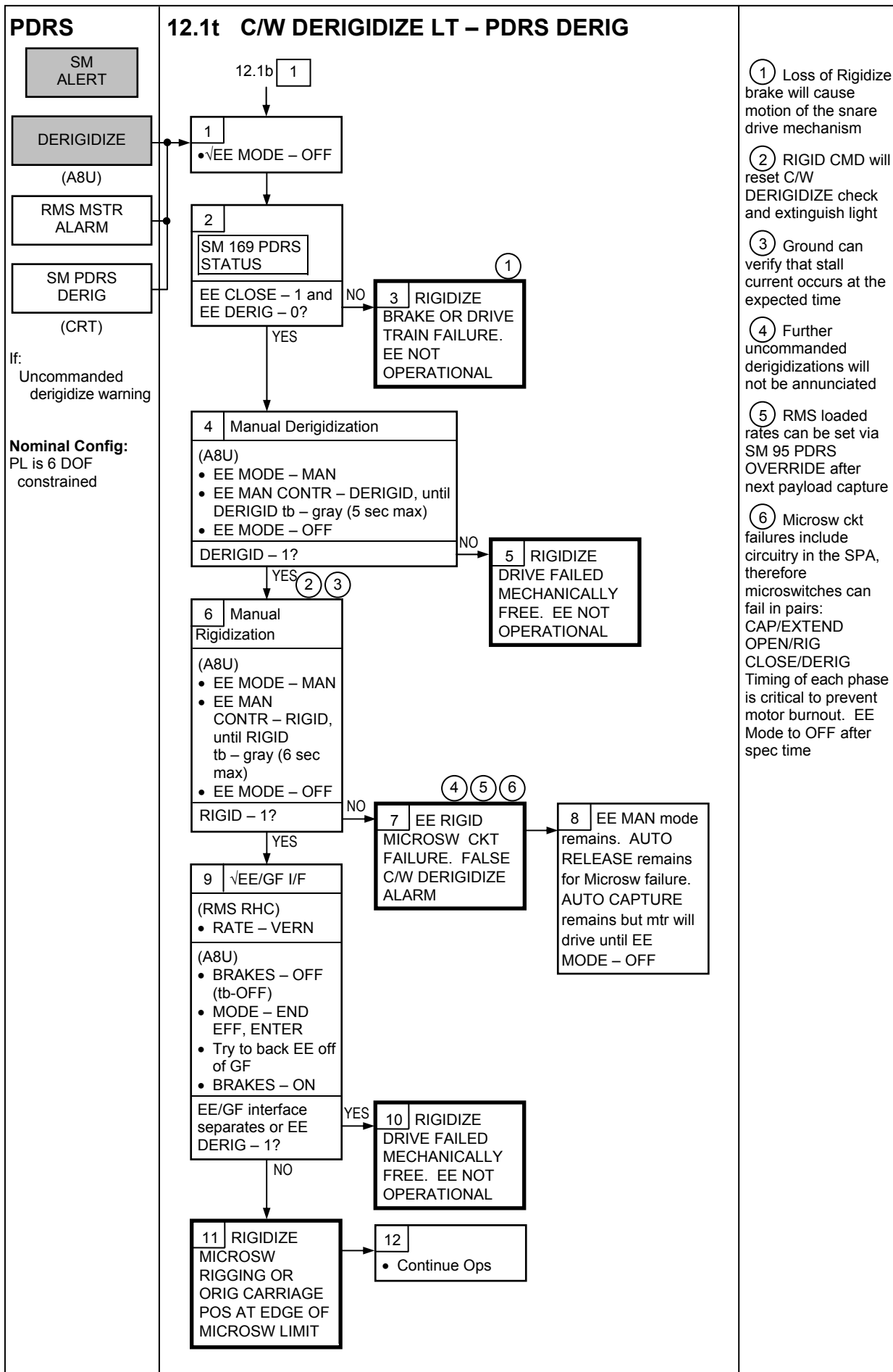
① Subsequent uncommanded release will not be annunciated

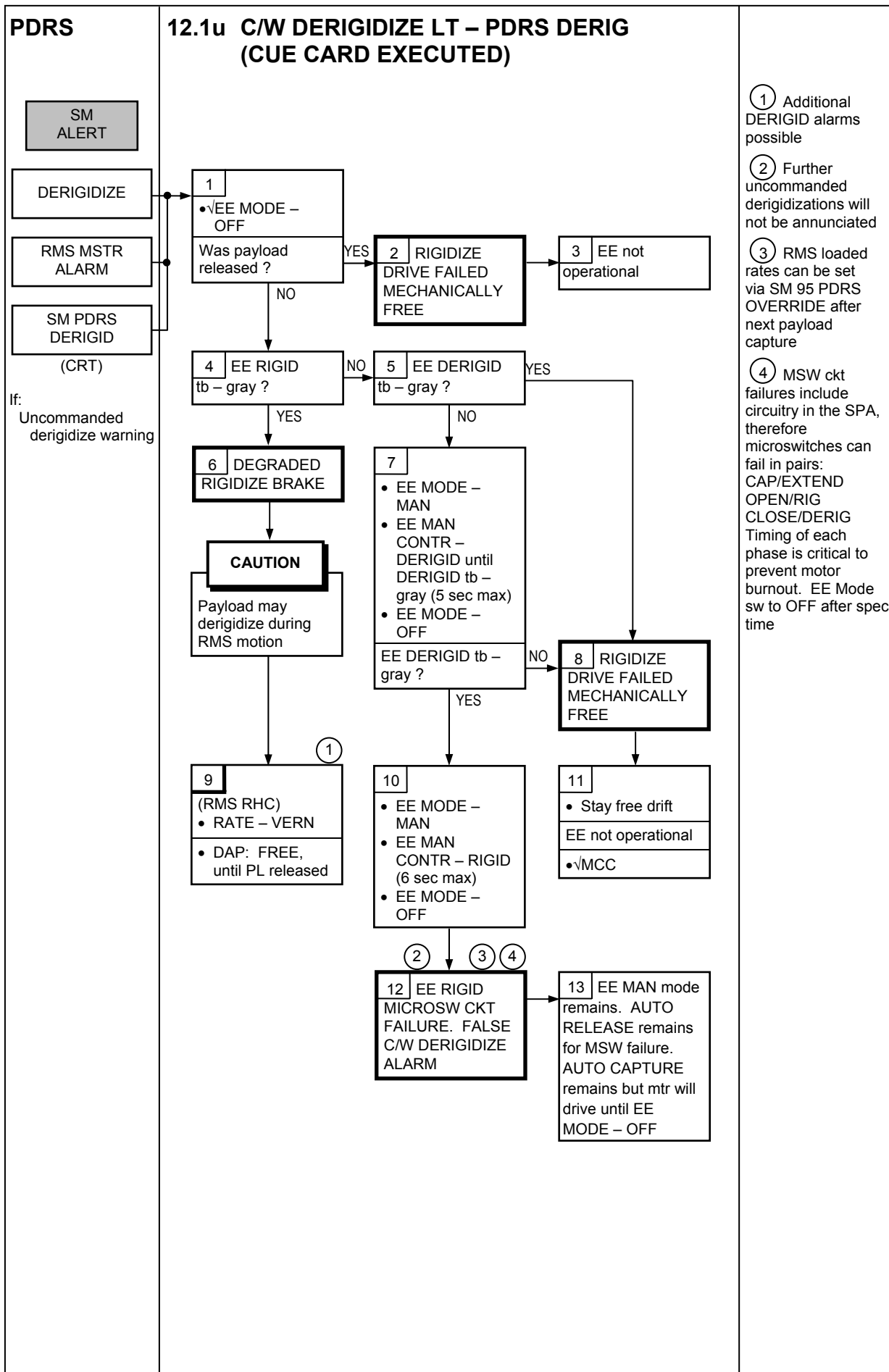
② RMS loaded rates can be set via SM 95 PDRS OVERRIDE

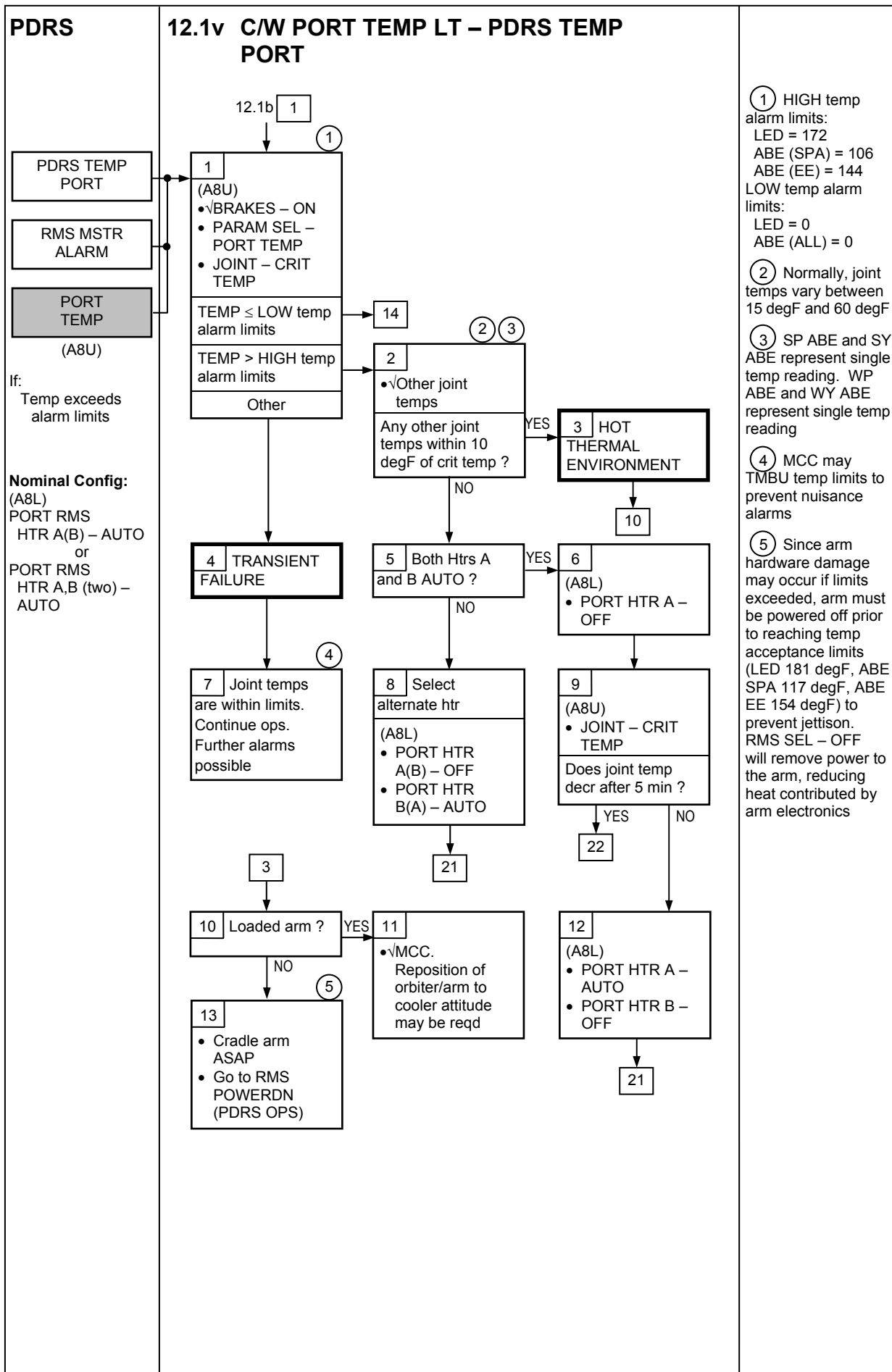
③ For digital SPA failure, EXTEND flag may be failed OFF causing EE motor to continue to drive until EE MODE – OFF during AUTO RELEASE

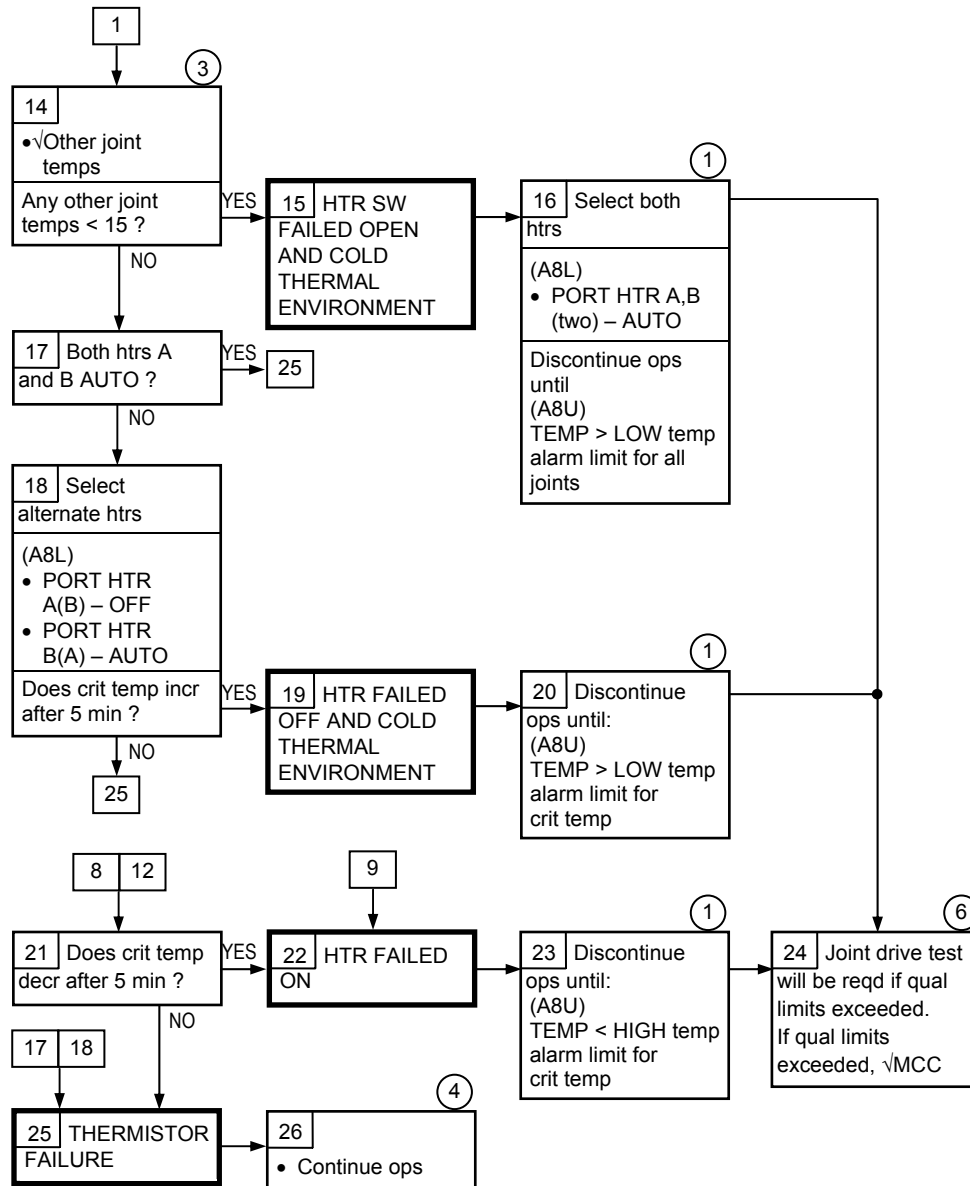
④ Rigidize brake is sufficient to hold EE drive train











① HIGH temp alarm limits:
LED = 172
ABE (SPA) = 106
ABE (EE) = 144
LOW temp alarm limits:
LED = 0
ABE (ALL) = 0

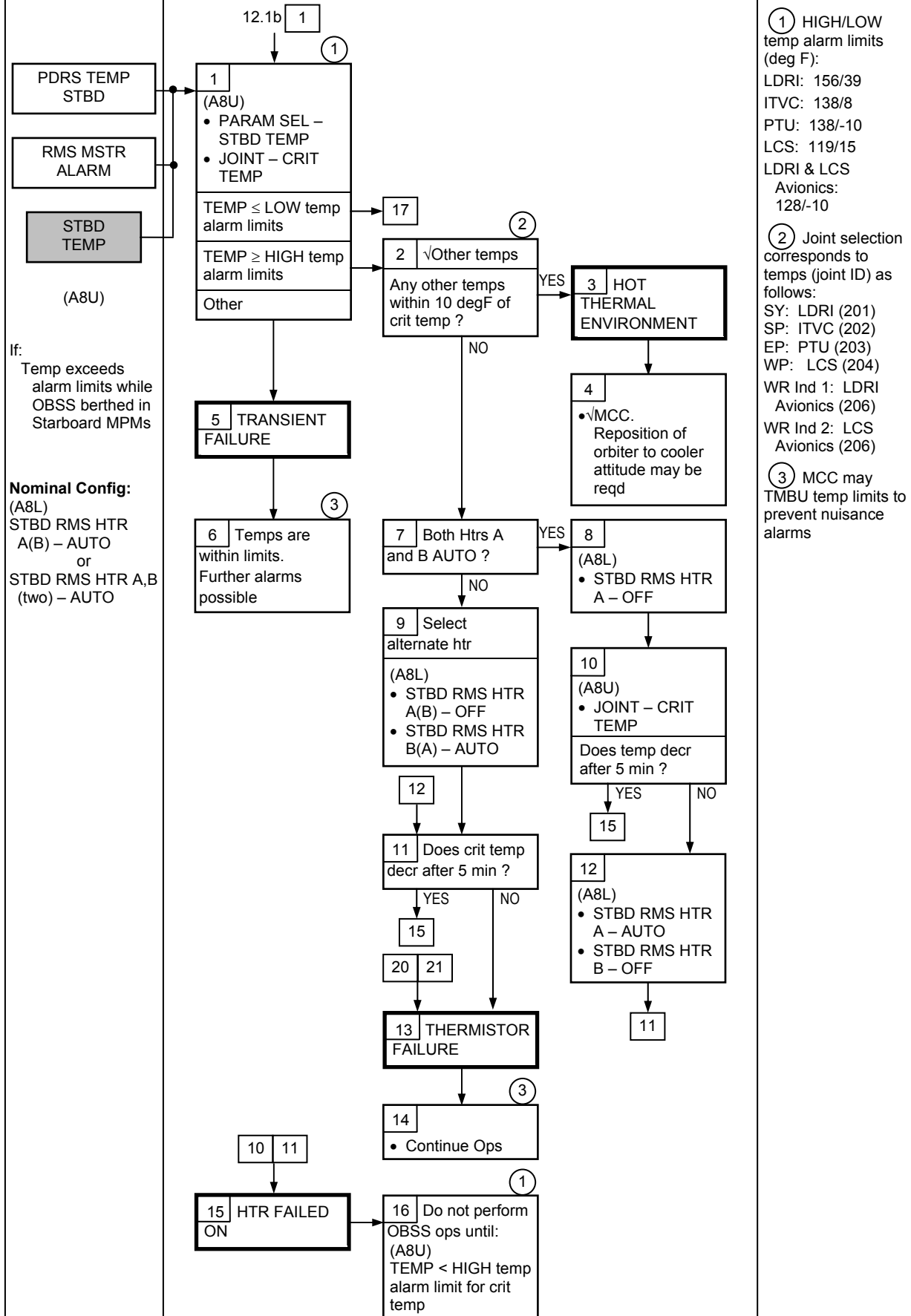
③ SP ABE and SY ABE represent single temp reading. WP ABE and WY ABE represent single temp reading

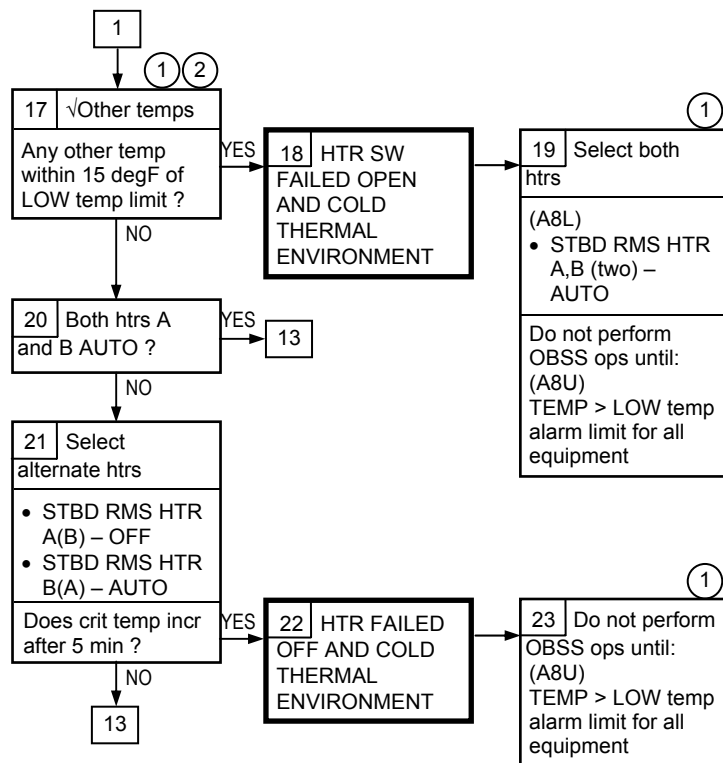
④ MCC may TMBU temp limits to prevent nuisance alarms

⑥ Arm qual temp high limits:
LED = 202
ABE (SPA) = 136
ABE (EE) = 176
Arm qual temp low limits:
LED = -10
ABE = -10

PDRS

12.1w C/W STBD TEMP LT - PDRS TEMP STBD





① HIGH/LOW temp alarm limits (deg F):

LDRI: 156/39

ITVC: 138/8

PTU: 138/-10

LCS: 119/15

LDRI & LCS

Avionics: 128/-10

② Joint selection corresponds to temps (joint ID) as follows:

SY: LDRI (201)

SP: ITVC (202)

EP: PTU (203)

WP: LCS (204)

WR Ind 1: LDRI

Avionics (206)

WR Ind 2: LCS

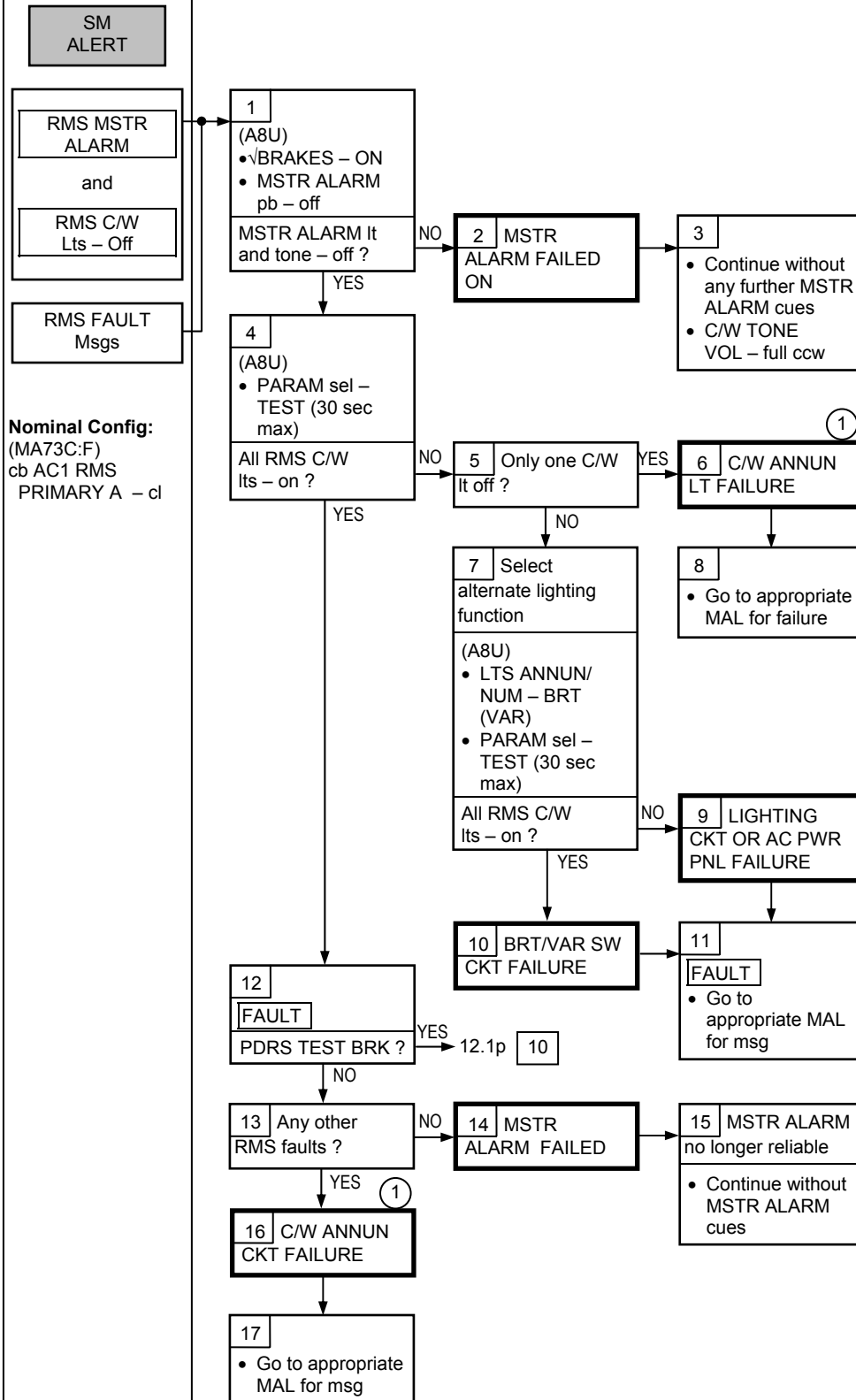
Avionics (206)

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PDRS

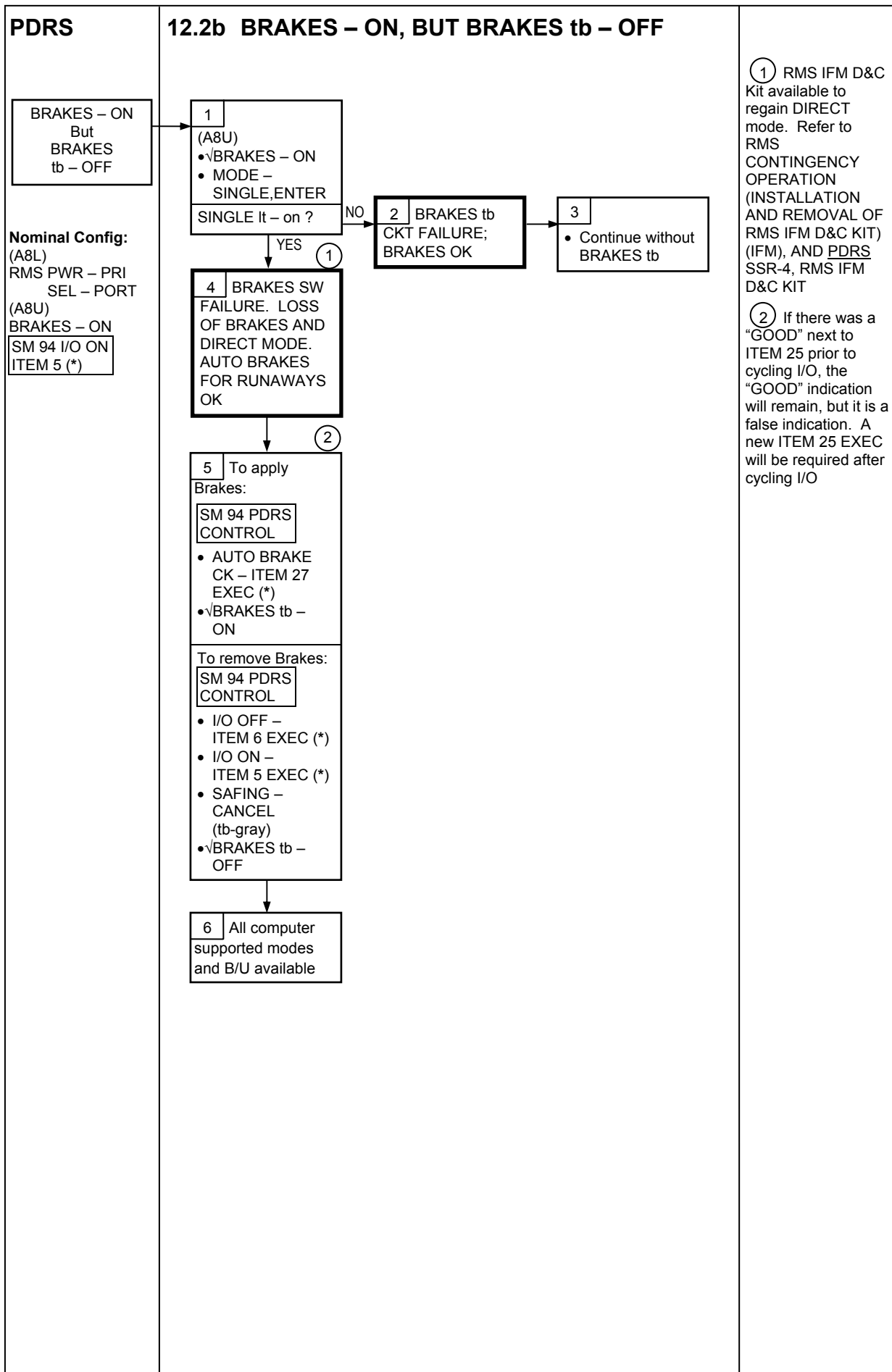
12.2a MSTR ALARM ON, BUT C/W LT(S) OFF

① C/W It associated with fault msg will not illuminate



RMS D&C

12.2

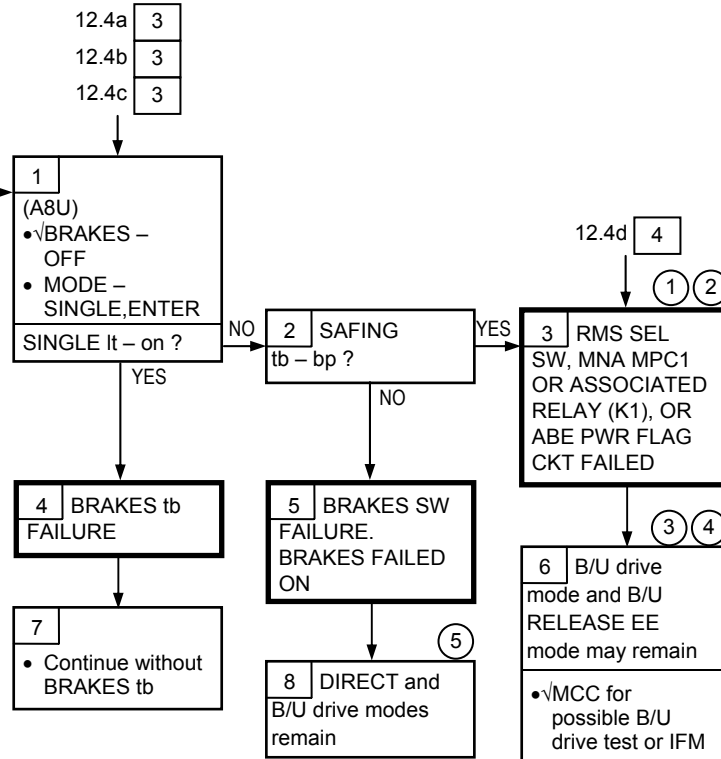


PDRS

12.2c BRAKES – OFF, BUT BRAKES tb – ON

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

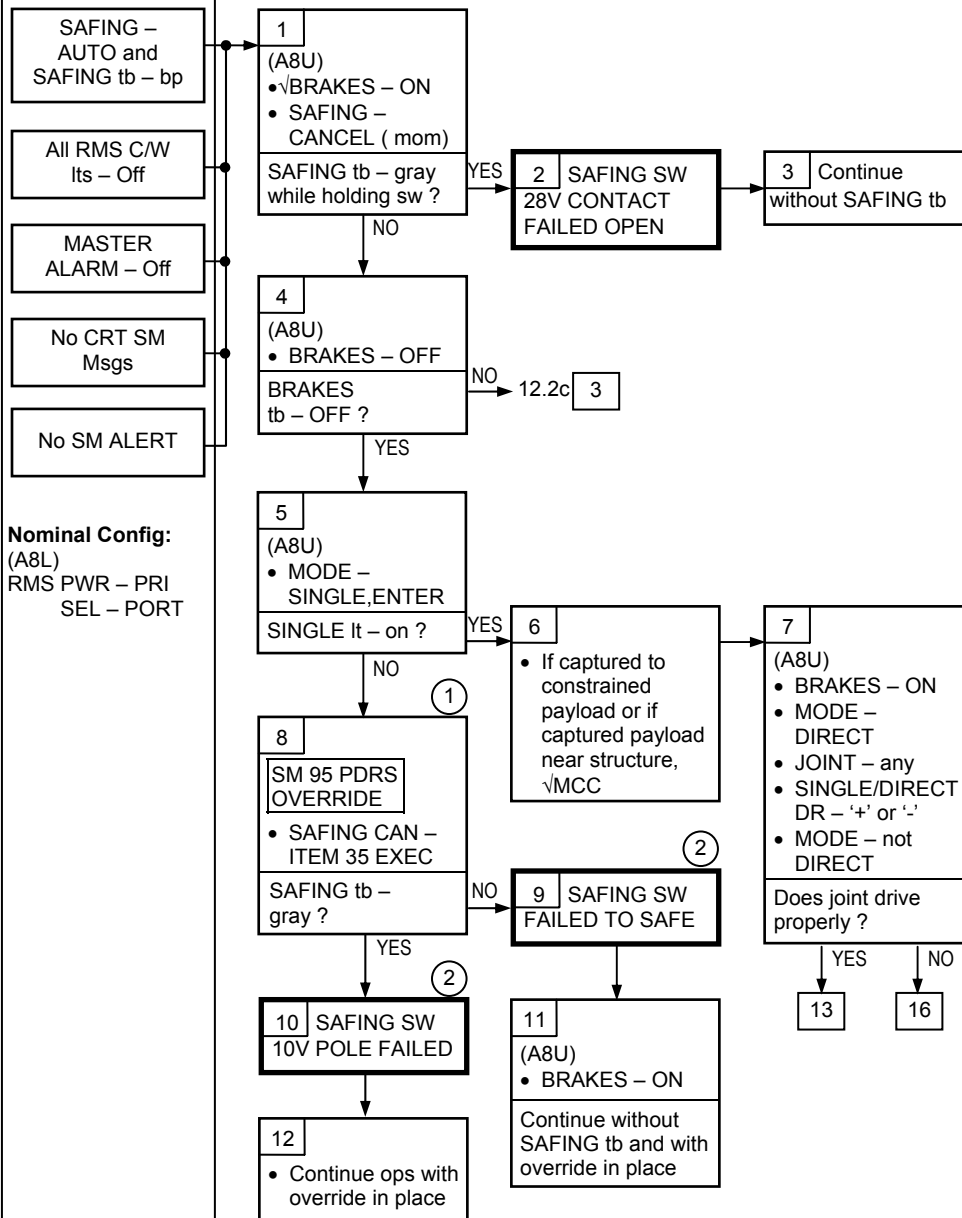
③ RMS IFM D&C KIT available to regain DIRECT mode and EE – MAN modes for ABE PWR FLAG fuse, but ABE data will be unavailable. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR-4, RMS IFM D&C KIT

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

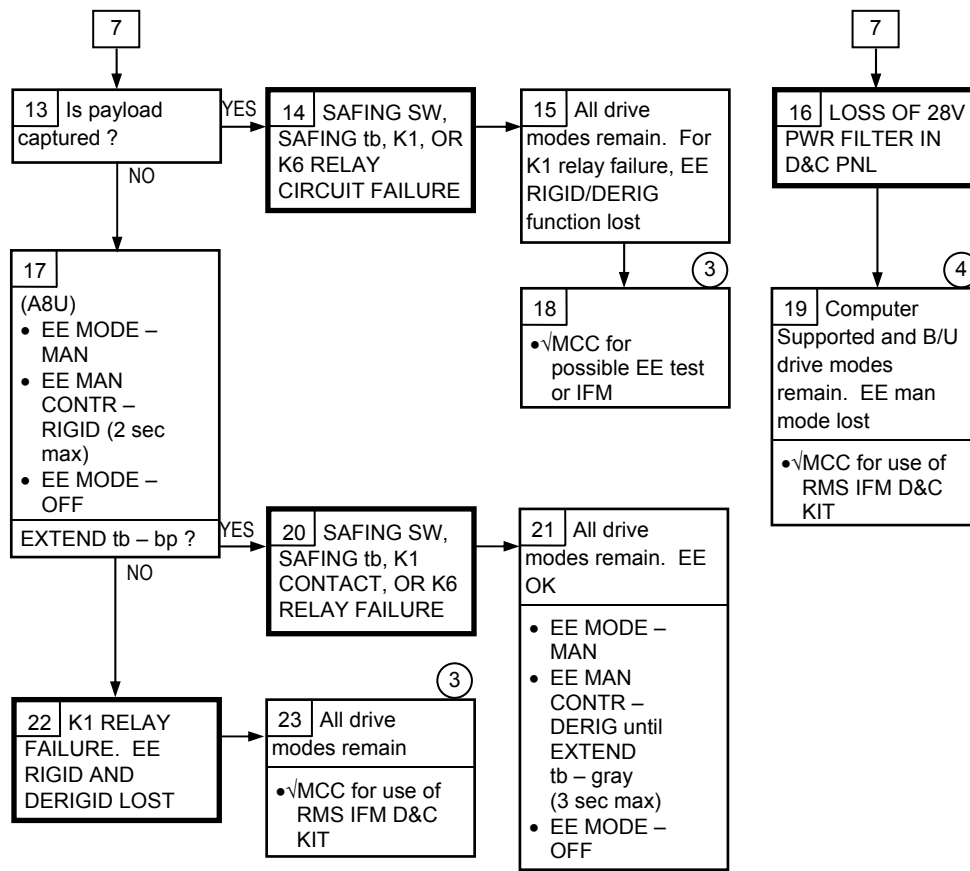
PDRS

12.2d SAFING – AUTO, BUT SAFING tb – bp



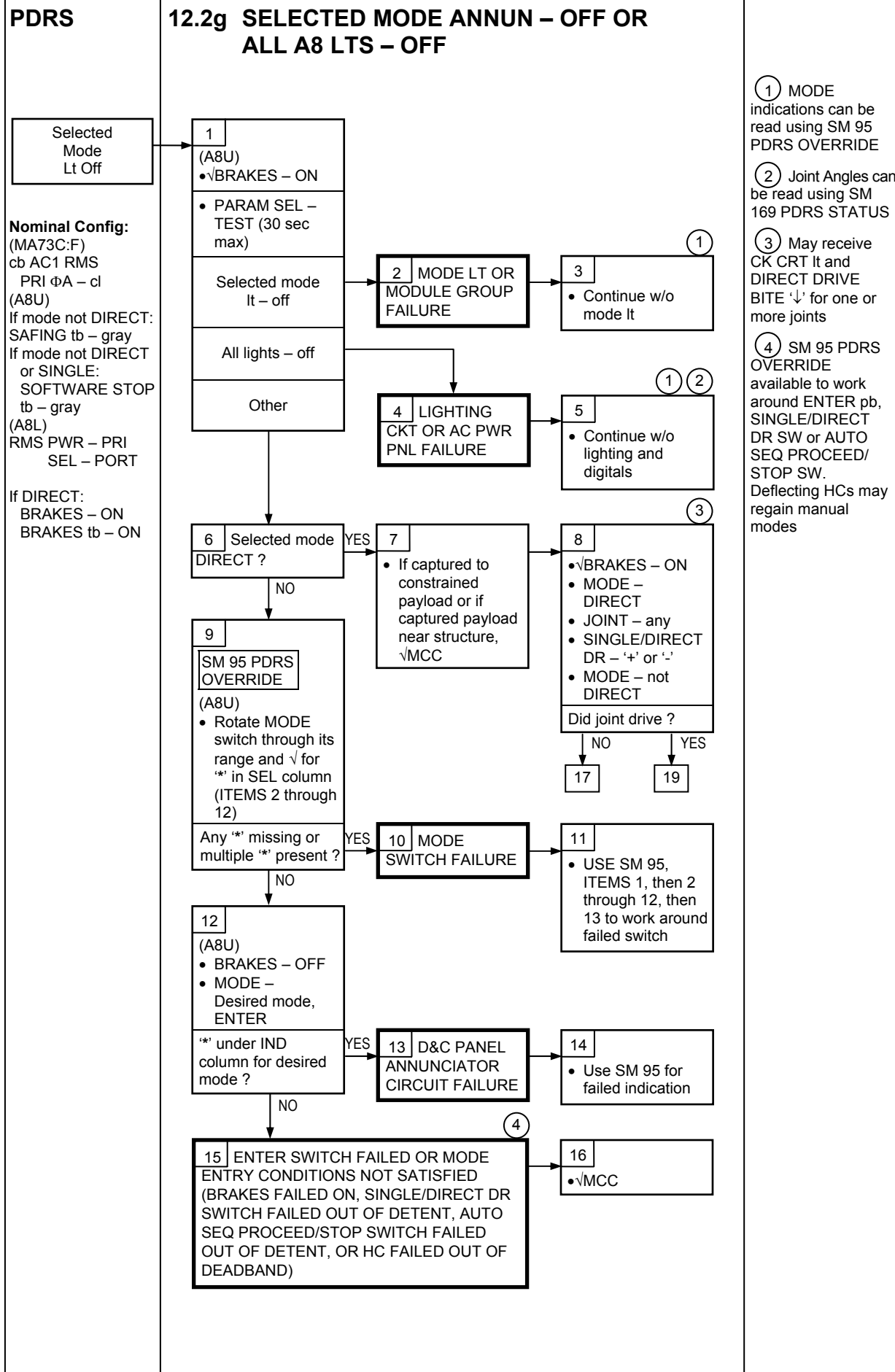
① SM 95 ITEM 35
SAFING CAN
override is a toggle.
If left in place it will
override a D&C
panel safing
command

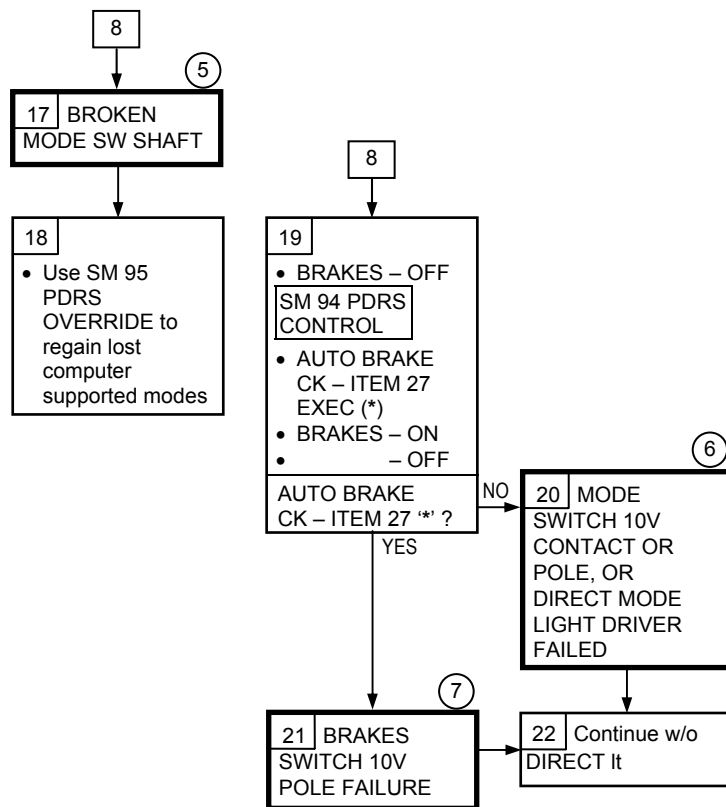
② MCIU SAFING
circuit still operational



(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

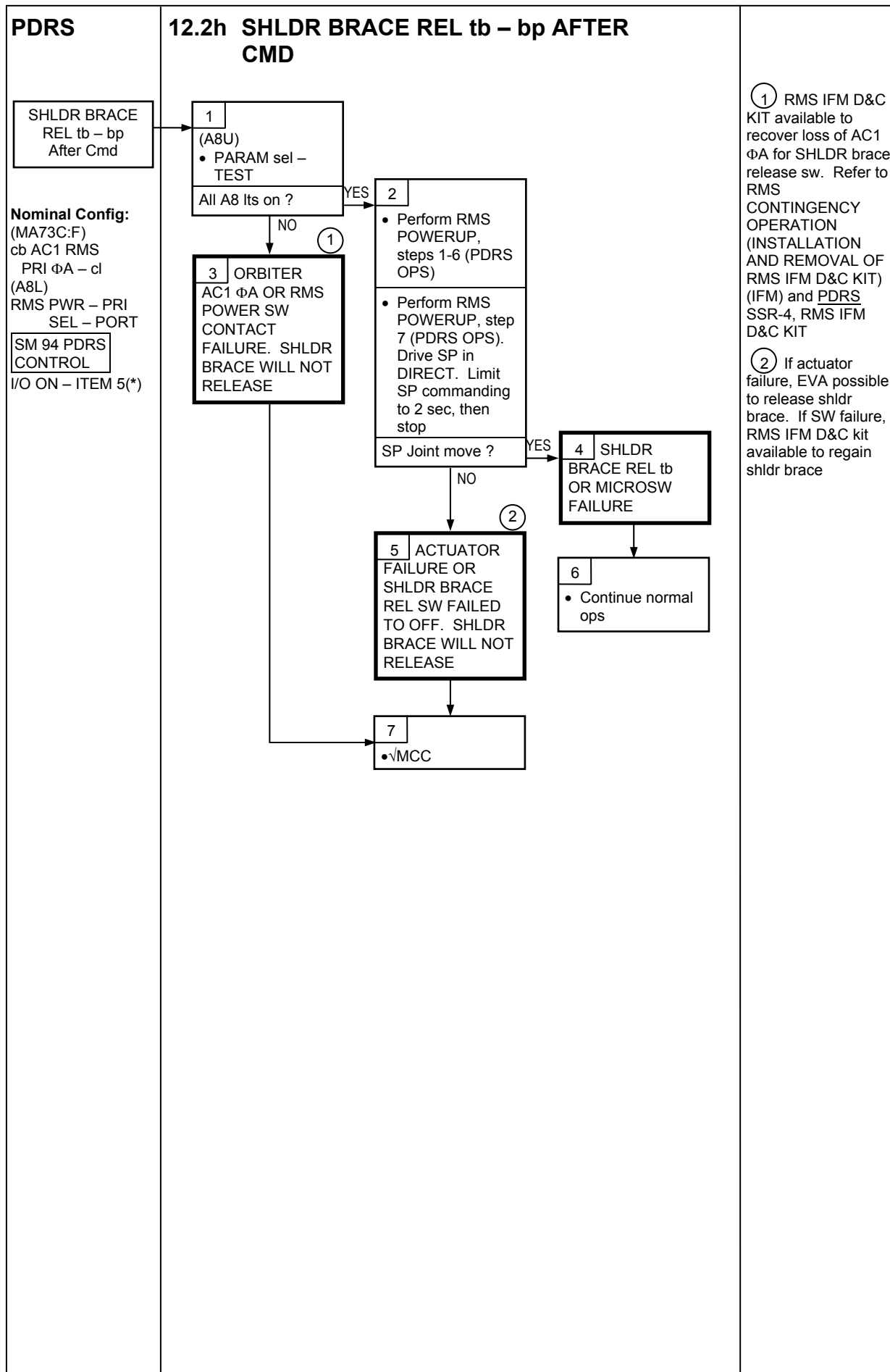




⑤ DIRECT mode can be regained with RMS IFM D&C KIT

⑥ For MODE sw pole failure, use SPEC 95 for computer supported modes

⑦ For BRAKES sw failure, auto brakes can be removed via SM 94 PDRS CONTROL, ITEM 6, ITEM 5, and SAFING – CANCEL

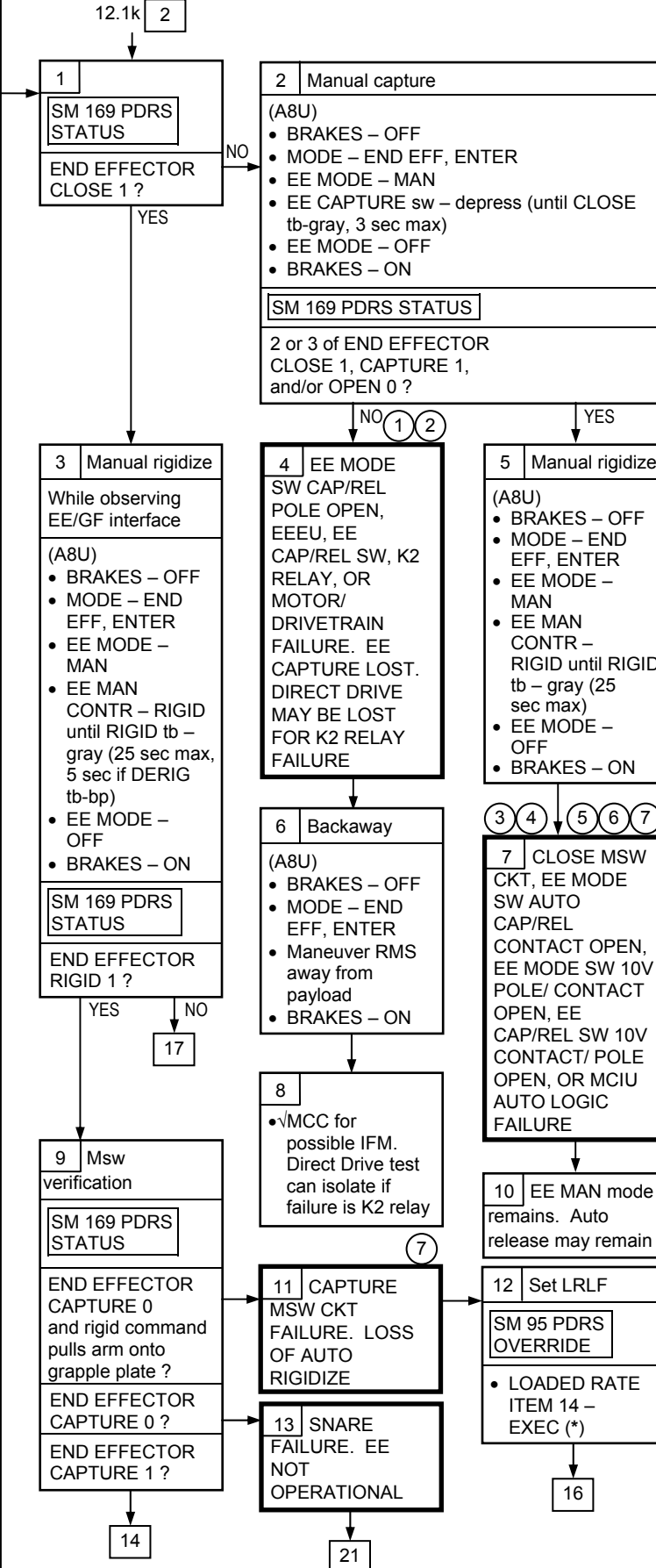


PDRS

12.3a EE FAILS TO GRAPPLE CONSTRAINED PL IN EE MODE – AUTO

If EE Failed to Capture and/or Rigidize in AUTO

Nominal Config:
DAP: VERN(FREE)



① RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE Mode sw, EE Cap/Rel 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 Gnd can detect EE Cap/Rel sw and sw may feel loose

③ Limping will not occur in EE Manual for EE MODE sw 10V contact/pole or EE Cap/Rel 10V contact/pole (snare close)

④ MCIU changeout available for MCIU auto logic failure and failure will be accompanied by 'S96 PDRS CKCRT EE' and a down arrow by EE CMDS

⑤ Gnd can detect EE MODE sw 10V pole and EE Cap/Rel sw failures

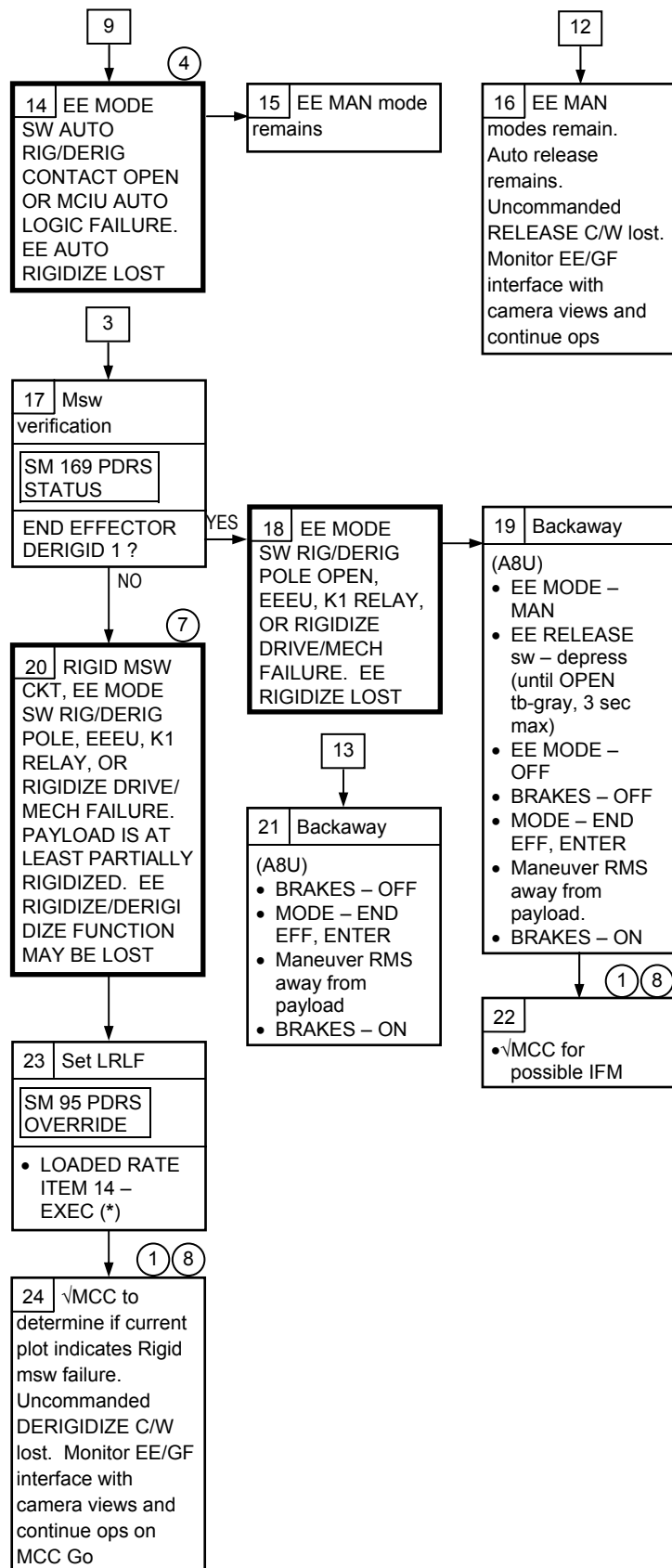
⑥ For EE Cap/Rel 10V pole failure, manual PL release will be accompanied by Uncommanded Release Warning

⑦ MSW ckt failures include circuitry in the SPA, therefore microswitches can fail in pairs:
CAP/EXTEND
OPEN/RIG
CLOSE/DERIG
Timing of each phase is critical to prevent motor burnout. EE Mode to OFF after spec time

END
EFFECTOR

12.3

PDRS 12.3a (Cont)



① RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE Mode sw, EE Cap/Rel 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 MCIU changeout available for MCIU auto logic failure and failure will be accompanied by 'S96 PDRS CKCRT EE' and a down arrow by EE CMD5

⑦ MSW ckt failures include circuitry in the SPA, therefore microswitches can fail in pairs:

CAP/EXTEND
OPEN/RIG
CLOSE/DERIG

Timing of each phase is critical to prevent motor burnout. EE Mode to OFF after spec time

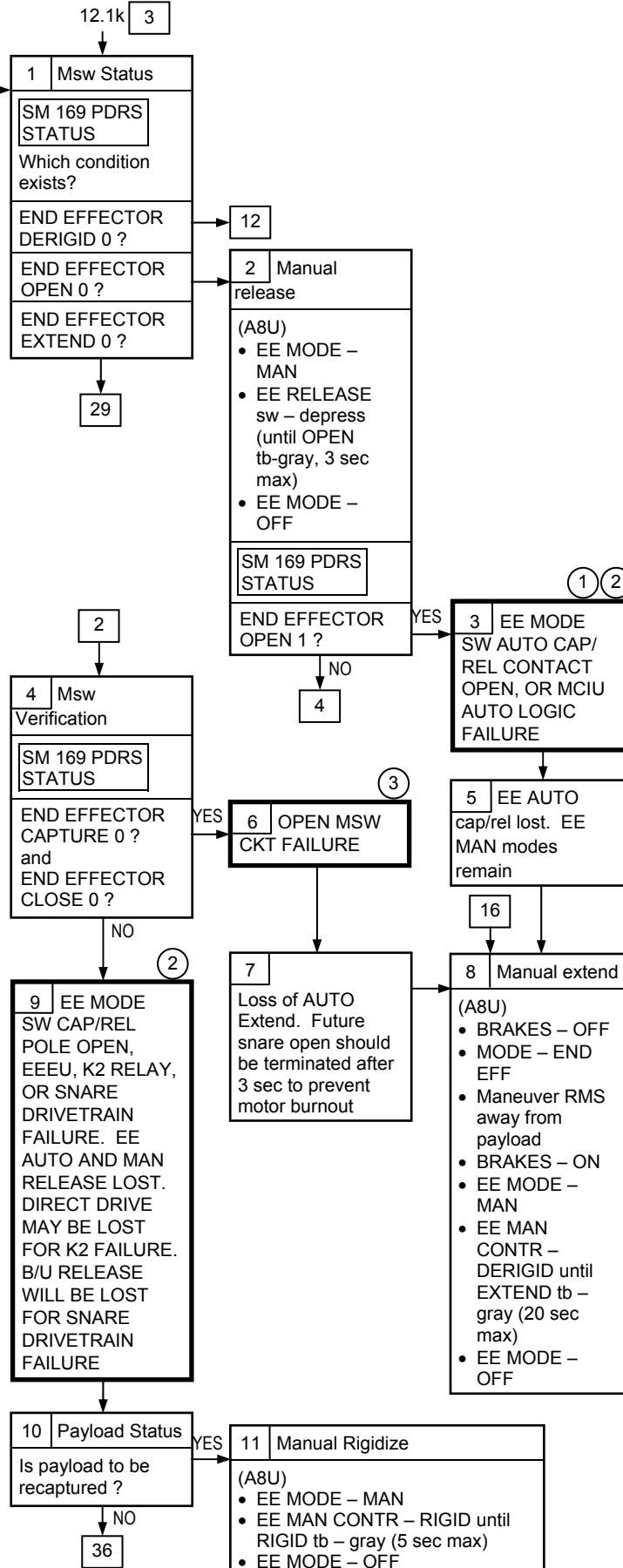
⑧ SAFING tb – bp is a good indication that K1 relay is failed

PDRS

12.3b EE FAILS TO RELEASE/DERIGIDIZE CONSTRAINED PL IN EE MODE – AUTO

If EE Failed to Release and/or Derigidize in AUTO

Nominal Config:
DAP: VERN(FREE)

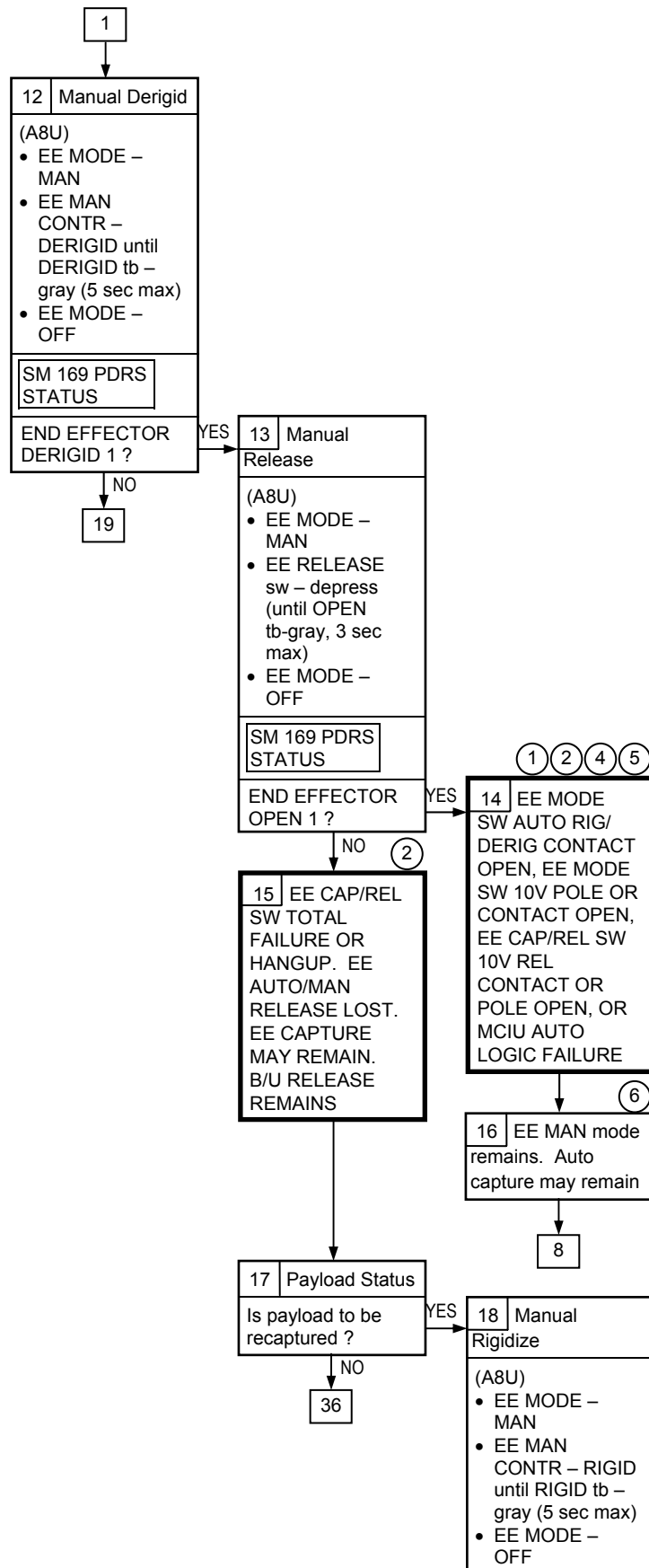


① MCIU changeout available for MCIU auto logic failure and failure will be accompanied by 'S96 PDRS CKCRT EE' and a down arrow by EE CMDs

② RMS IFM D&C KIT available to recover loss of K1 or K2 relay, EE Mode sw, EE Cap/Rel 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 MSW ckt failures include circuitry in the SPA, therefore microswitches can fail in pairs:
CAP/EXTEND
OPEN/RIG
CLOSE/DERIG
Timing of each phase is critical to prevent motor burnout. EE Mode to OFF after spec time

PDRS 12.3b (Cont)



① MCIU changeout available for MCIU auto logic failure and failure will be accompanied by 'S96 PDRS CKCRT EE' and a down arrow by EE CMDS

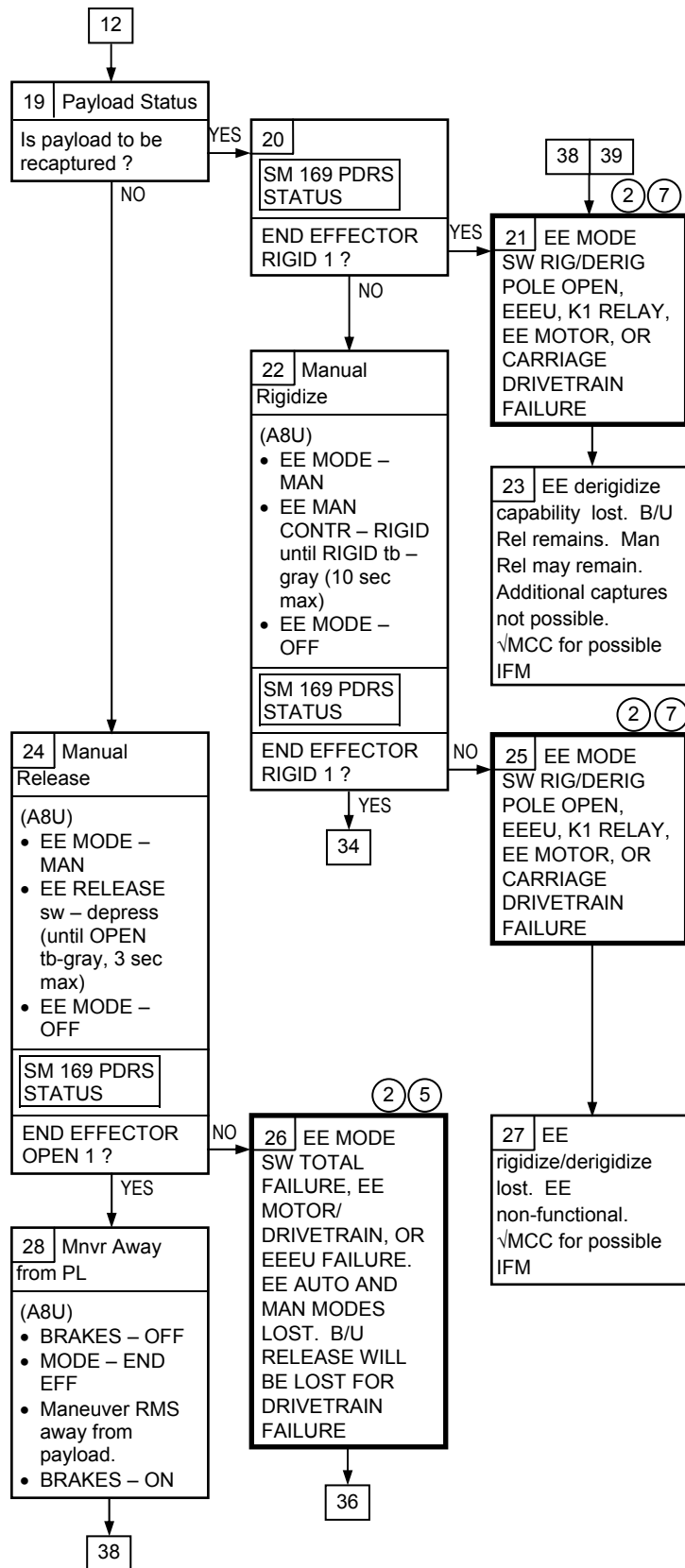
② RMS IFM D&C KIT available to recover loss of K1 or K2 relay, EE Mode sw, EE Cap/Rel sw, EE Man Contr sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT)(IFM), and PDRS SSR-4, RMS IFM D&C KIT

④ For EE Cap/Rel 10V pole failure, manual PL release is accompanied by Uncommanded Release Warning

⑤ Gnd can detect EE MODE sw 10V pole and EE Cap/Rel sw 10V failures

⑥ Limping will not occur in EE Manual for EE MODE sw 10V pole/contact failure, or during EE Manual capture for EE Cap/Rel sw pole

PDRS 12.3b (Cont)

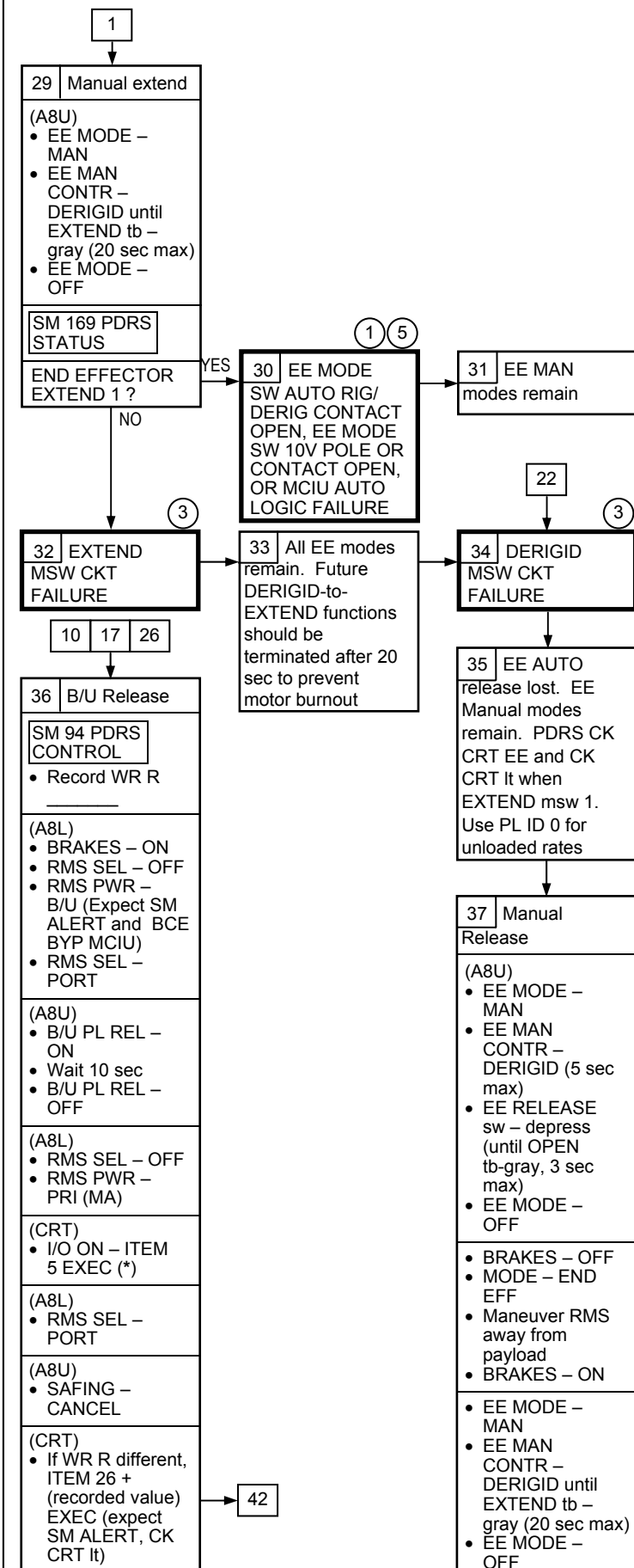


② RMS IFM D&C KIT available to recover loss of K1 or K2 relay, EE Mode sw, EE Cap/Rel sw, EE Man Contr sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT)(IFM), and PDRS SSR-4, RMS IFM D&C KIT

⑤ Gnd can detect EE MODE sw 10V pole and EE Cap/Rel sw 10V failures

⑦ SAFING tb – bp is a good indication that K1 relay is failed

PDRS 12.3b (Cont)

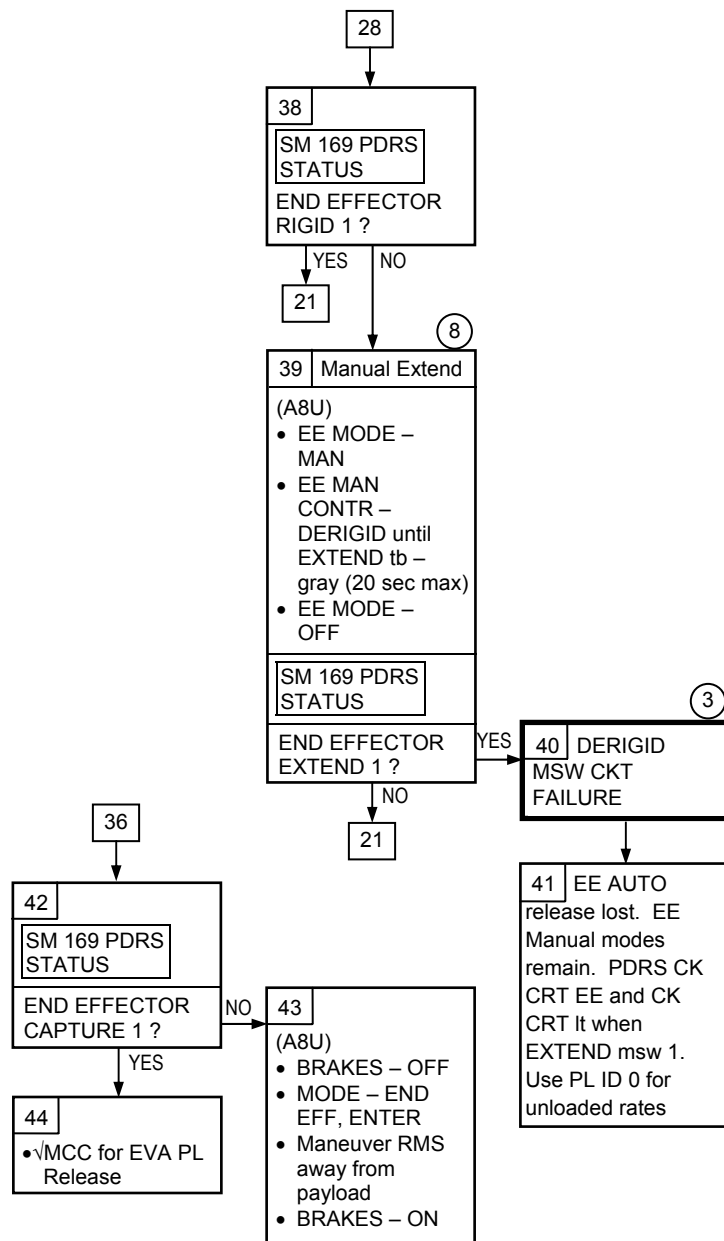


① MCIU changeout available for MCIU auto logic failure and failure will be accompanied by 'S96 PDRS CKCRT EE' and a down arrow by EE CMDS

③ MSW ckt failures include circuitry in the SPA, therefore microswitches can fail in pairs:
CAP/EXTEND
OPEN/RIG
CLOSE/DERIG

Timing of each phase is critical to prevent motor burnout. EE Mode to OFF after spec time

⑤ Gnd can detect EE MODE sw 10V pole and EE Cap/Rel sw 10V failures



③ MSW ckt failures include circuitry in the SPA, therefore microswitches can fail in pairs:

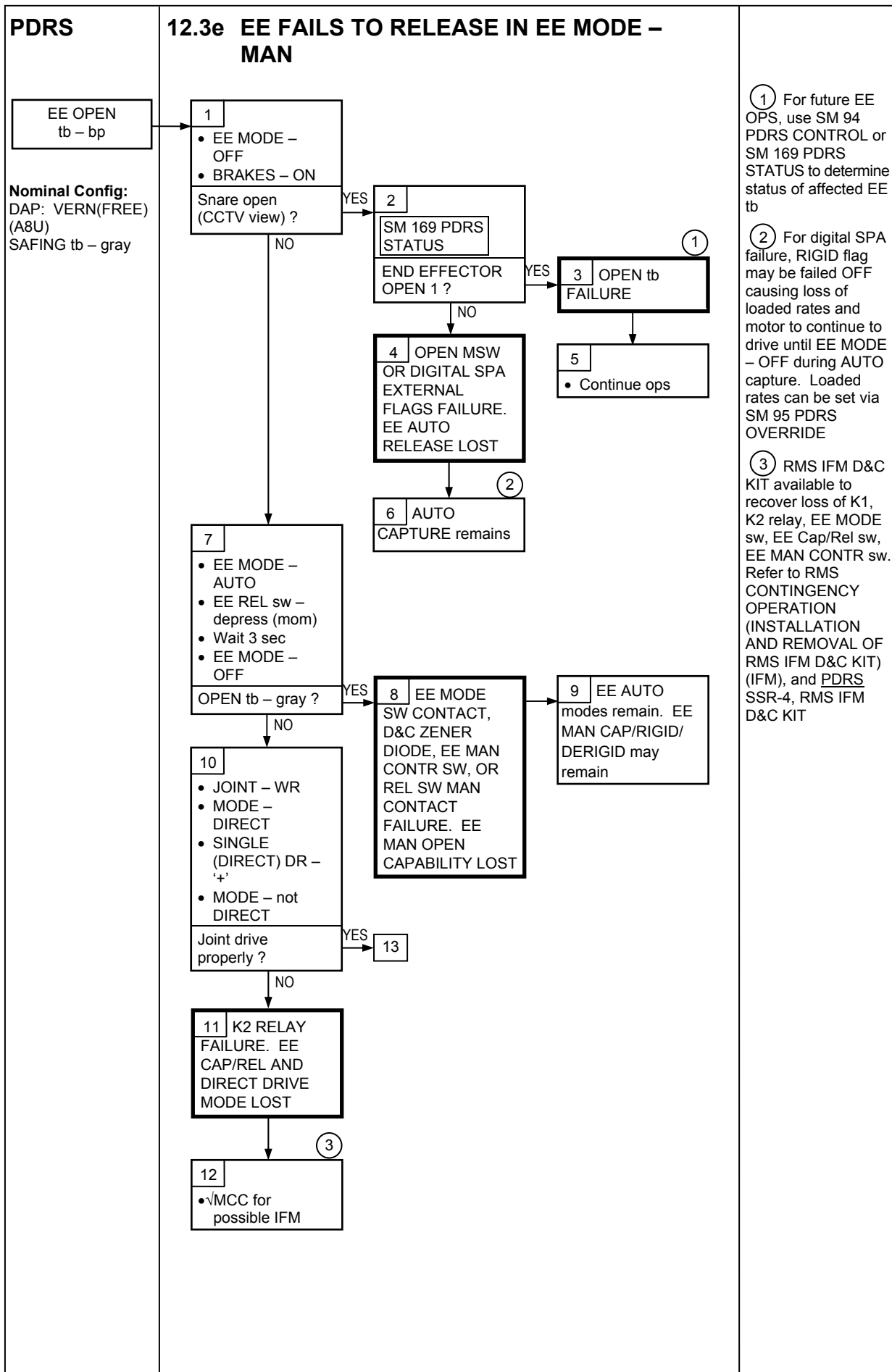
CAP/EXTEND

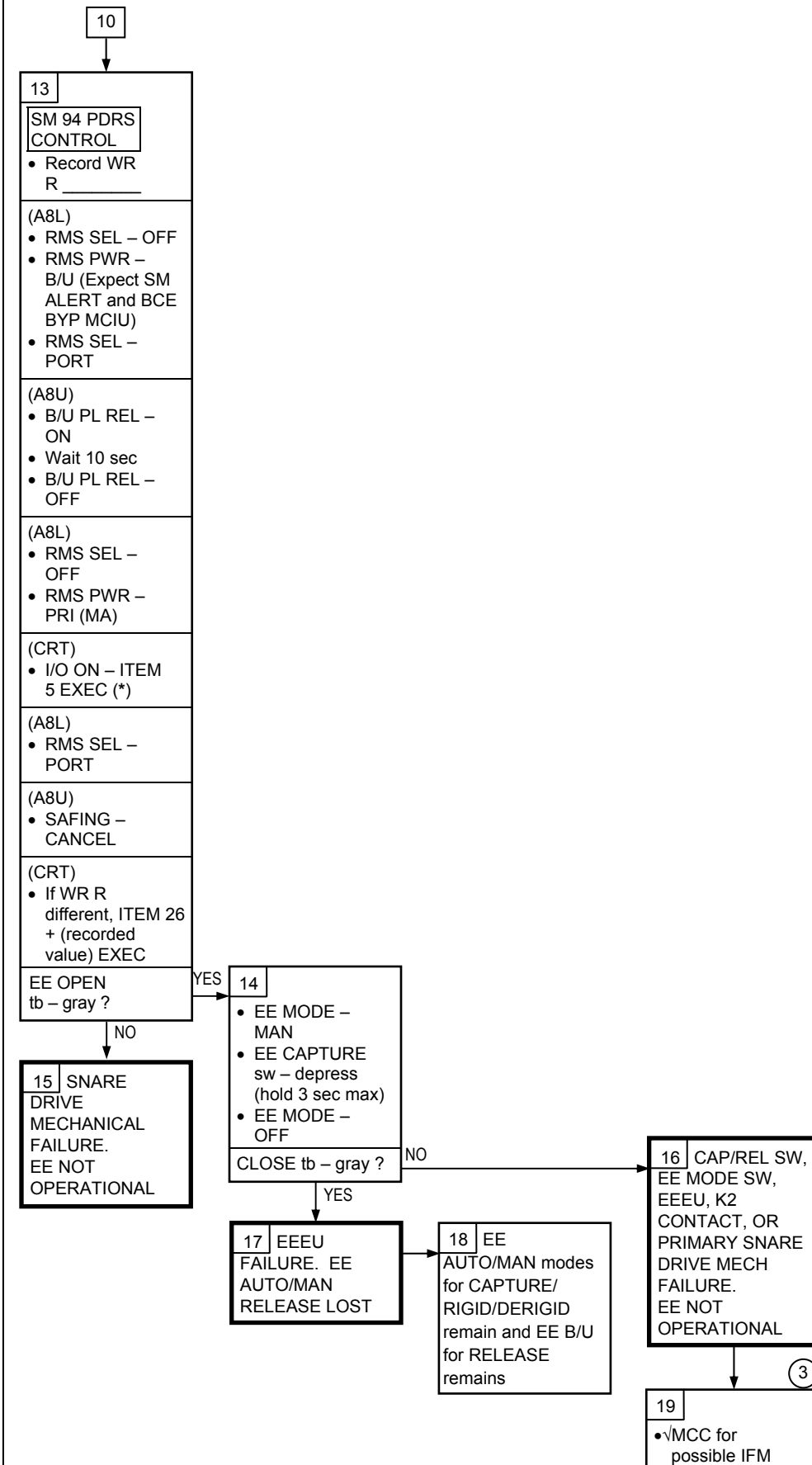
OPEN/RIG

CLOSE/DERIG

Timing of each phase is critical to prevent motor burnout. EE Mode to OFF after spec time

⑧ May receive 'S96 PDRS CKCRT EE' and down arrow by EE FLAG





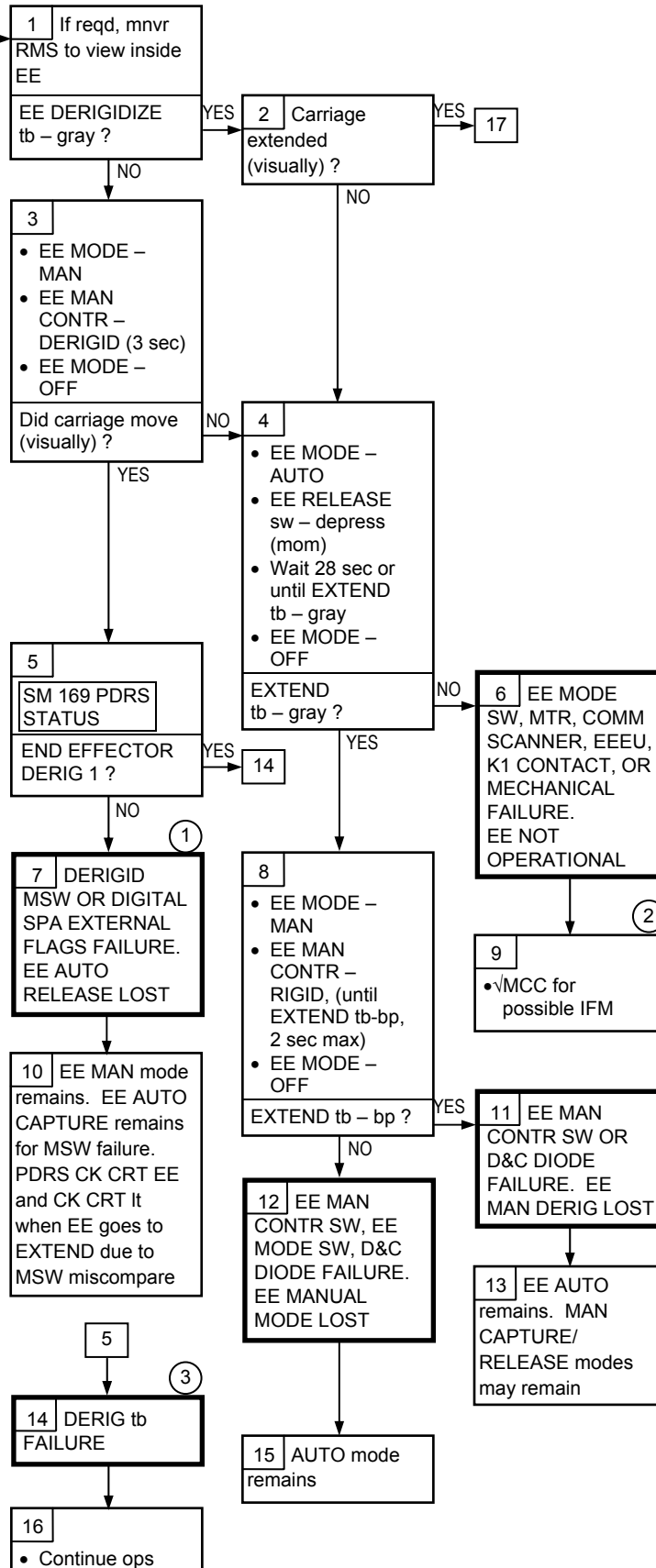
③ RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, EE Cap/Rel sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR-4, RMS IFM D&C KIT

PDRS

12.3f EE FAILS TO DERIGIDIZE/EXTEND IN MANUAL

EE Fails to Derigidize in Manual, DERIGID tb – bp, or EXTEND – bp

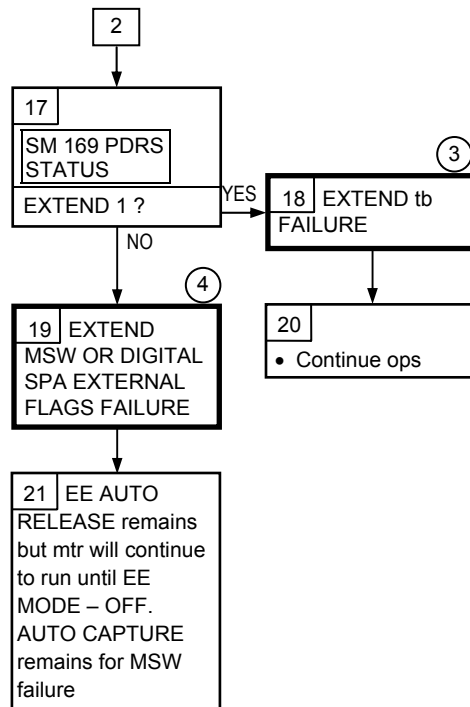
Nominal Config:
EE MODE – MAN
DAP: VERN(FREE)
(A8U)
SAFING tb – gray



① For digital SPA failure, CLOSE flag may be failed ON

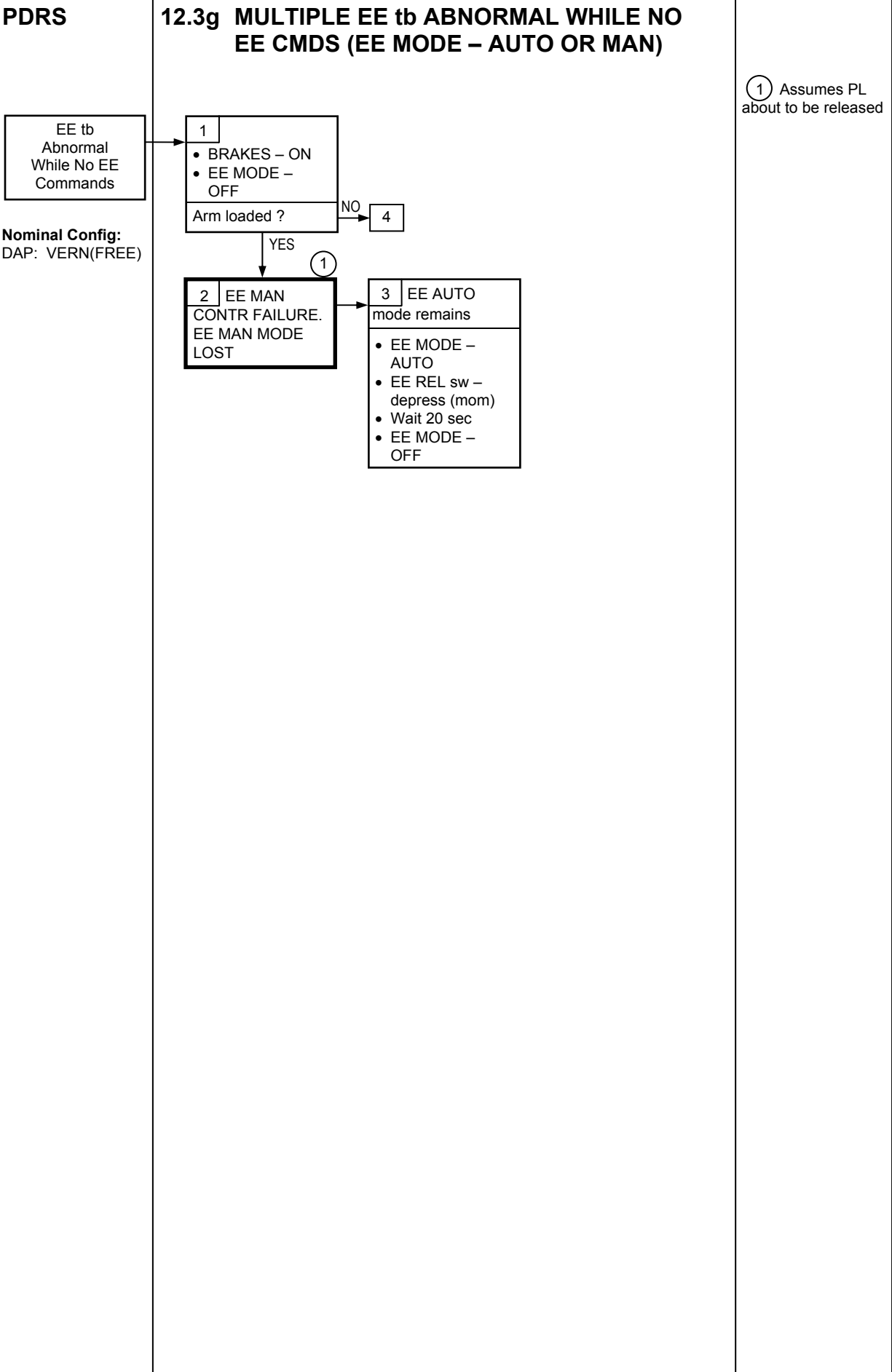
② RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, EE Cap/Rel sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR-4, RMS IFM D&C KIT

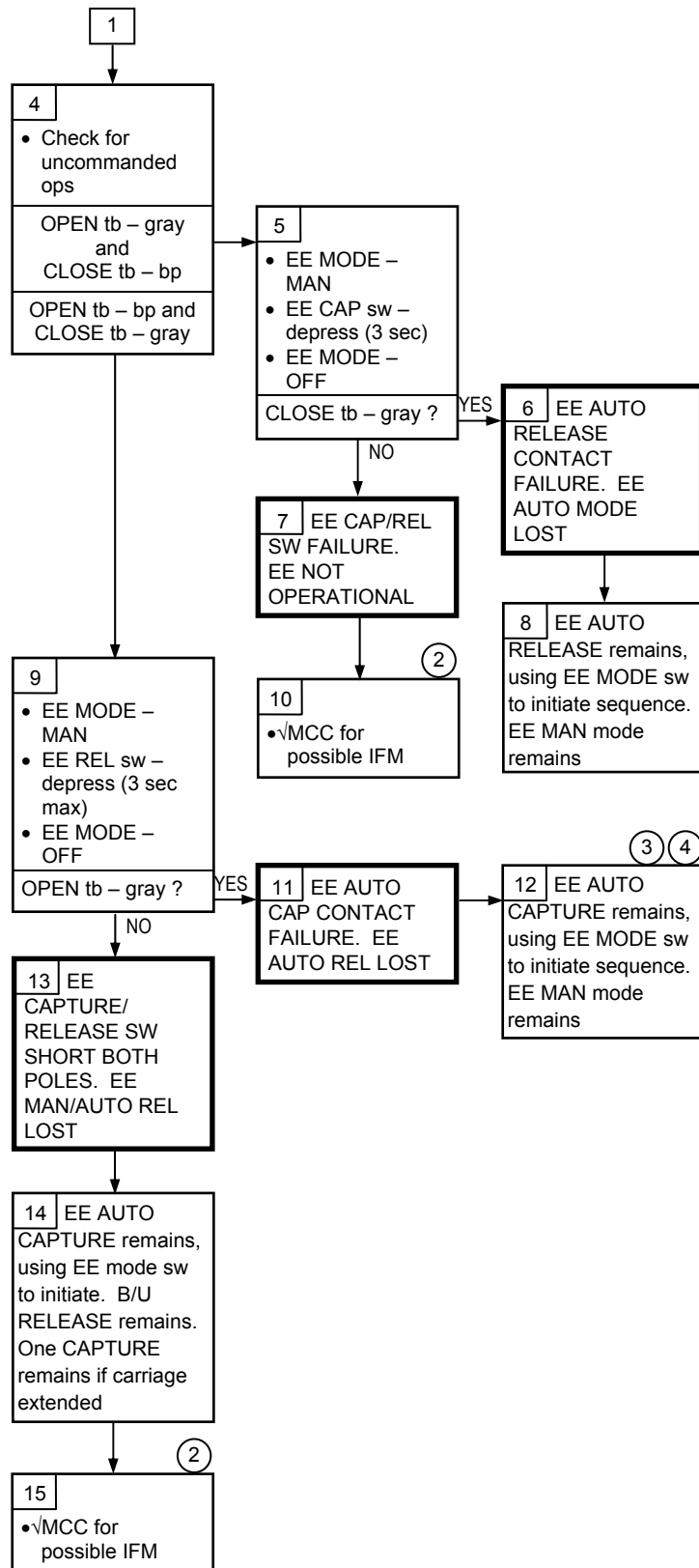
③ For future EE OPS, use SM 94 PDRS CONTROL or SM 169 PDRS STATUS to determine status of affected EE tb



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





② RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, EE Cap/Rel 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

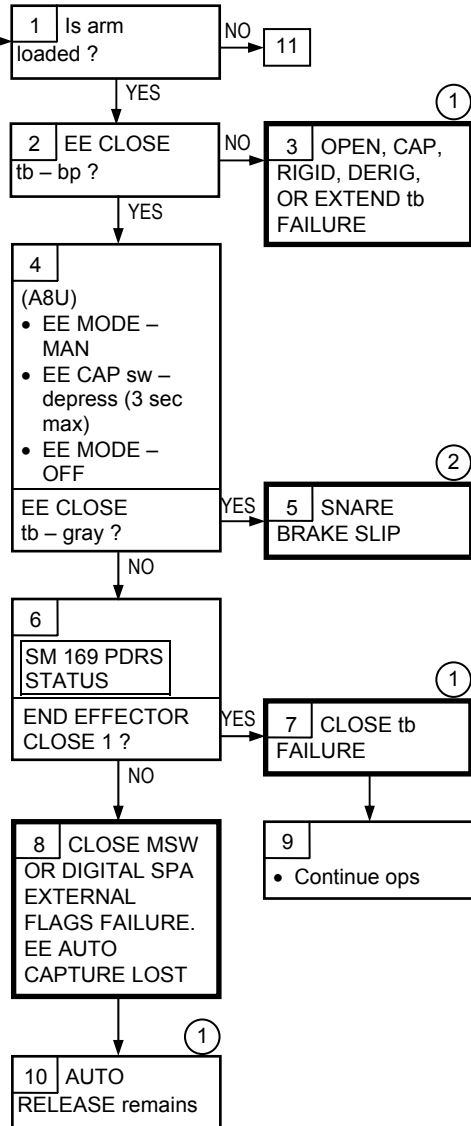
④ Uncommanded Release Warning is disabled

PDRS

12.3h EE tb ABNORMAL WHILE EE MODE OFF

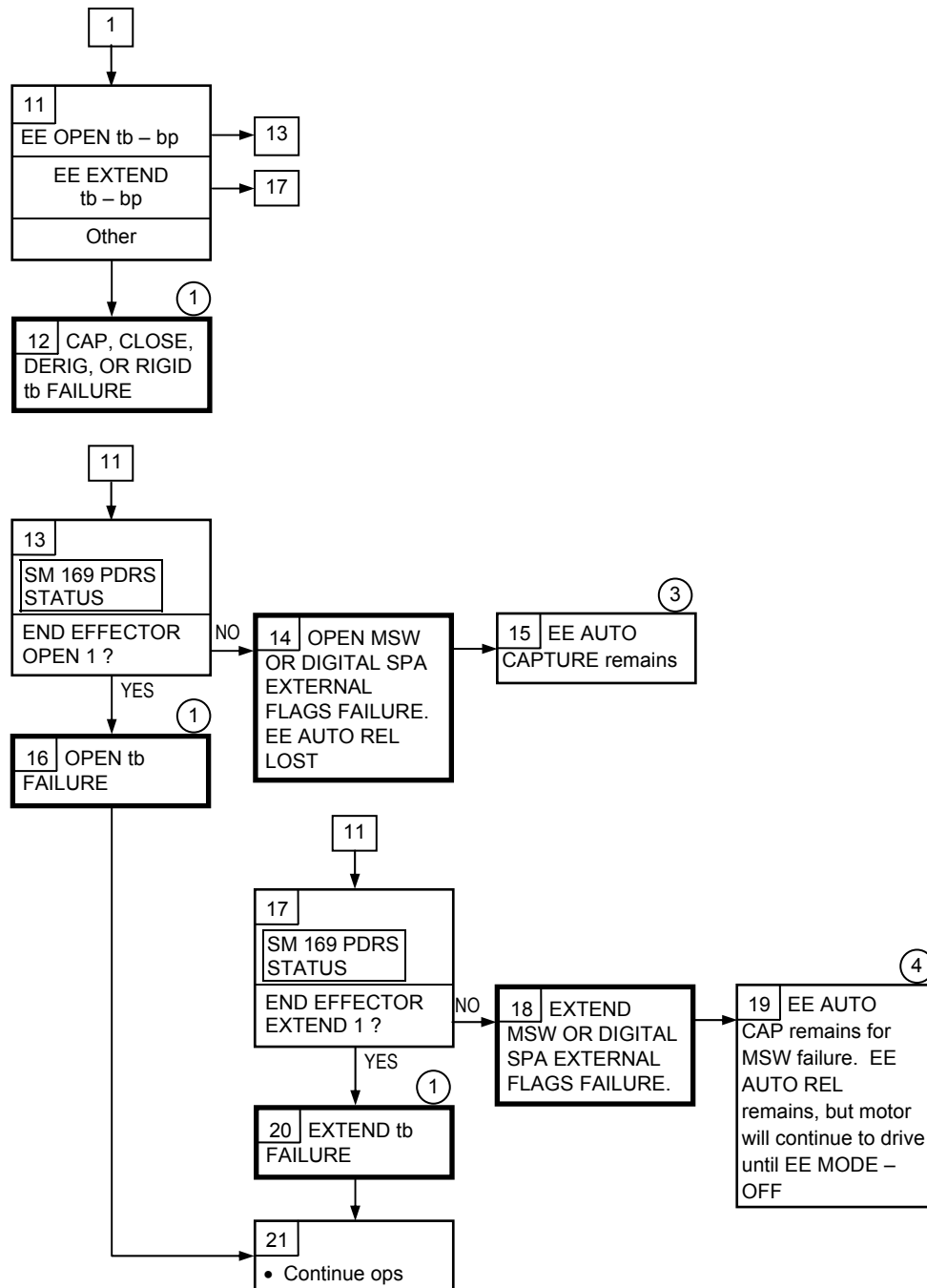
EE tb
Abnormal
While EE
MODE – OFF

Nominal Config:
DAP: VERN(FREE)



① For future EE OPS, use SM 169 PDRS STATUS to determine status of affected EE tb

② Subsequent slipping may occur



① For future EE OPS, use 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

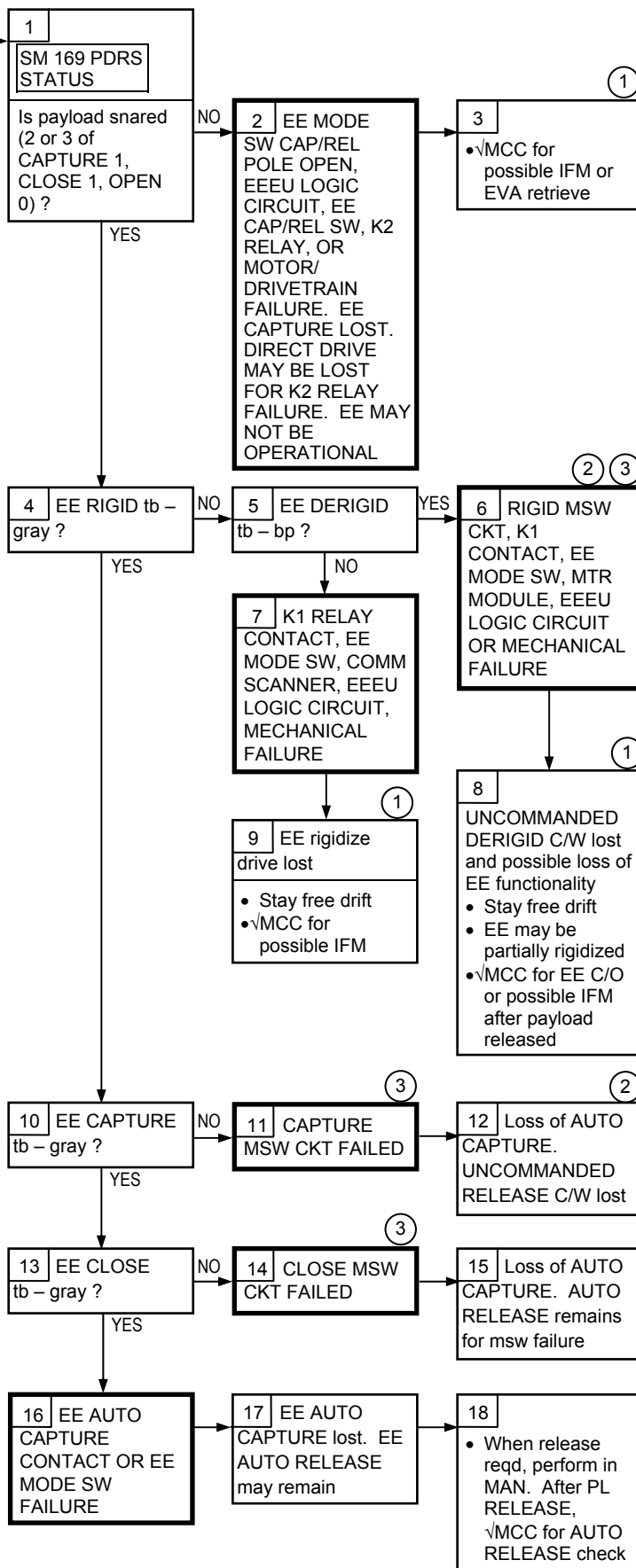
④ For digital SPA failure, CAPTURE flag may be failed OFF

PDRS

12.3i CAPTURE SEQ ABORTED (CUE CARD EXECUTED)

If EE Fails to
Capture and/or
Rigidize in AUTO

Nominal Config:
SAFING tb – gray



① RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, EE Cap/Rel 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 Arm will move at unloaded rates. RMS loaded rates can be set via SM 95 PDRS OVERRIDE

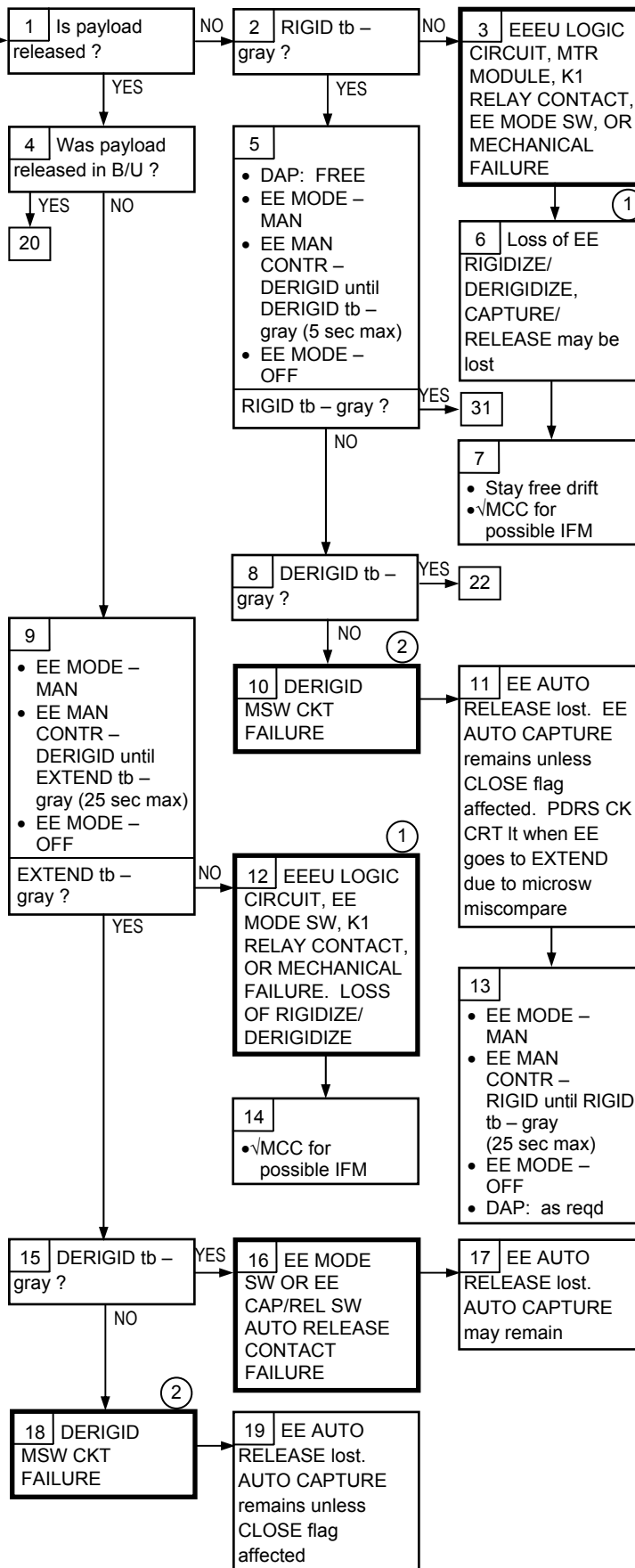
③ MSW ckt failures include circuitry in the SPA, therefore microswitches can fail in pairs: CAP/EXTEND OPEN/RIG CLOSE/DERIG Timing of each phase is critical to prevent motor burnout. EE Mode to OFF after spec time

PDRS

12.3j NO AUTO RELEASE (CUE CARD EXECUTED)

EE Fails to Derigidize or Release in AUTO

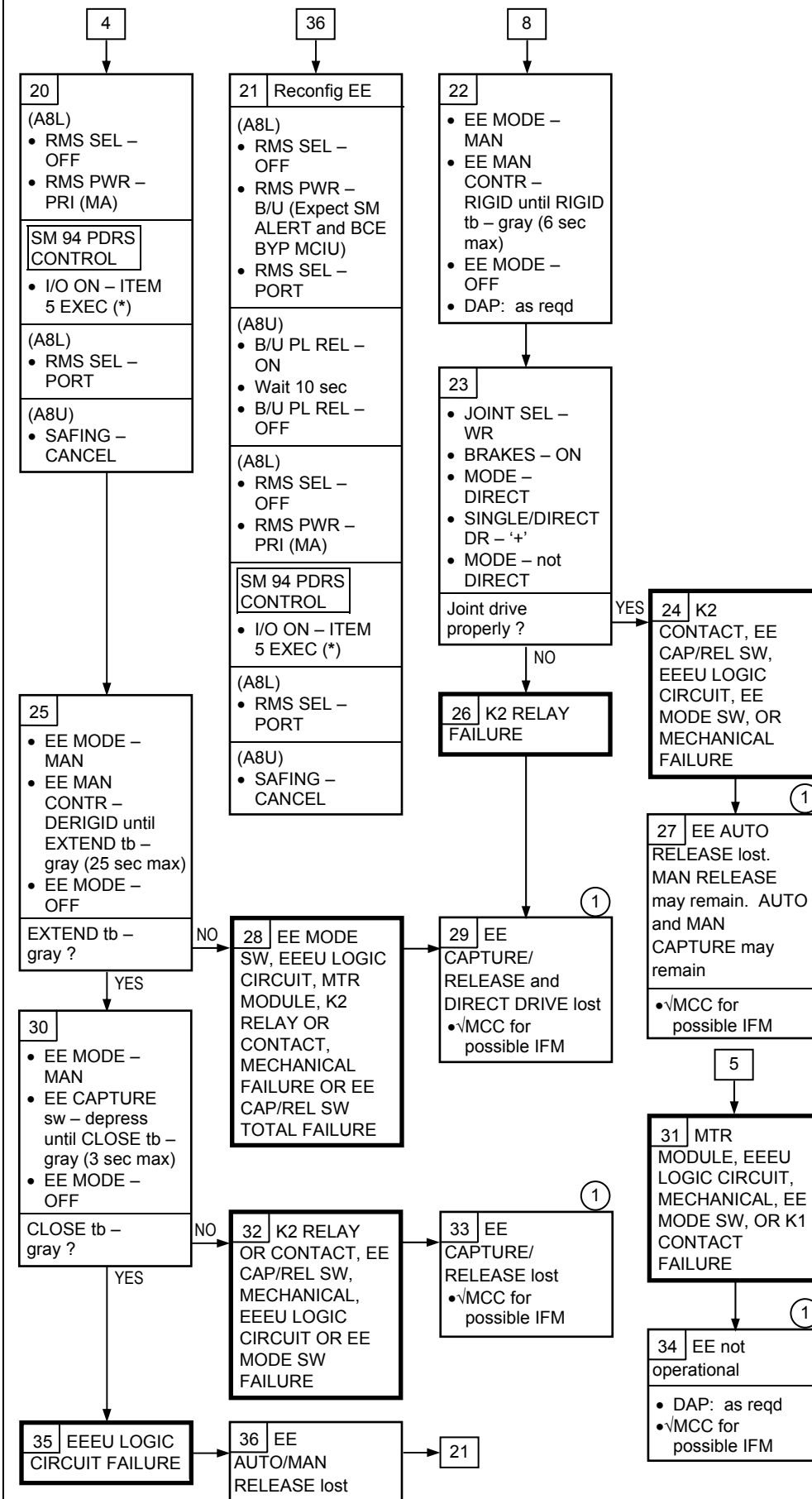
Nominal Config:
SAFING tb – gray



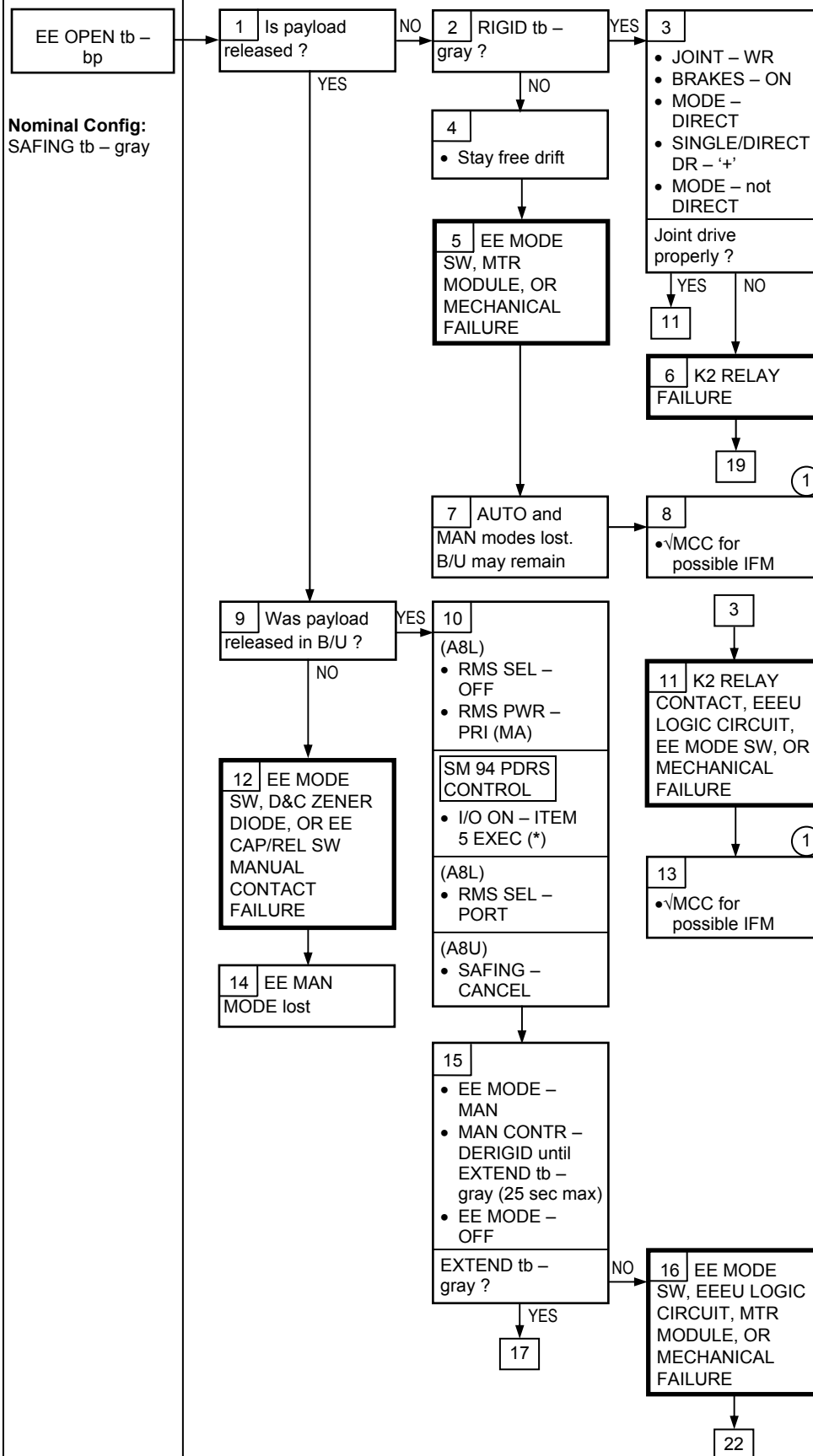
① RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, EE Cap/Rel sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR-4, RMS IFM D&C KIT

② MSW ckt failures include circuitry in the SPA, therefore microswitches can fail in pairs: CAP/EXTEND OPEN/RIG CLOSE/DERIG Timing of each phase is critical to prevent motor burnout. EE Mode to OFF after spec time

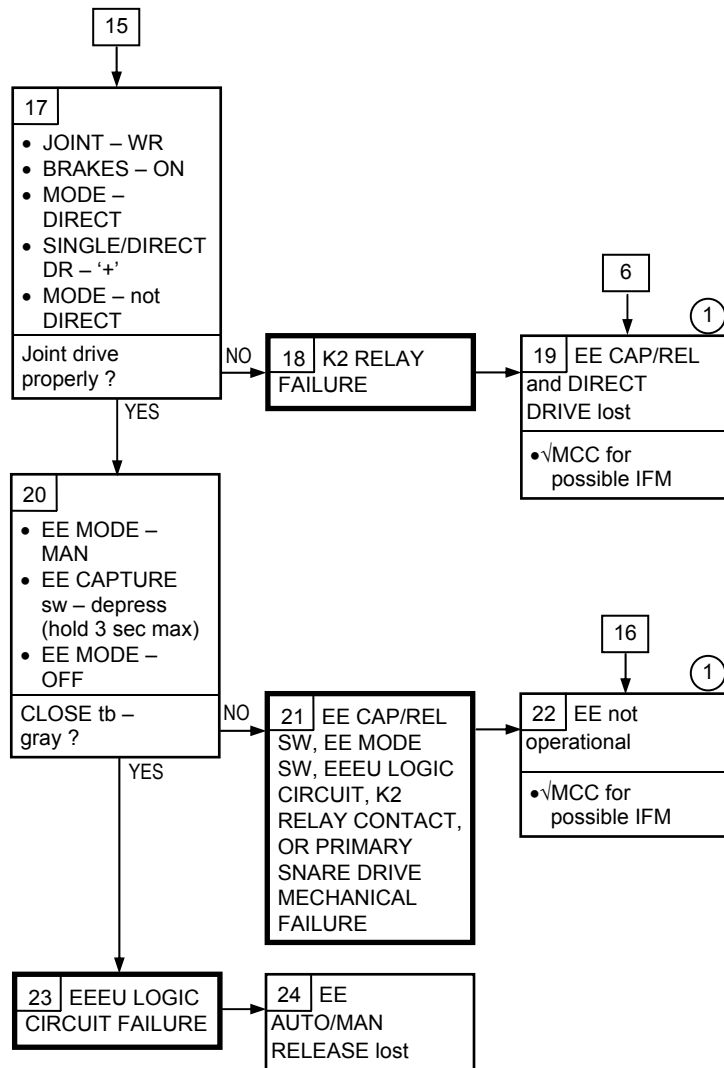
PDRS 12.3j (Cont)



**12.3k NO MANUAL RELEASE
(CUE CARD EXECUTED)**

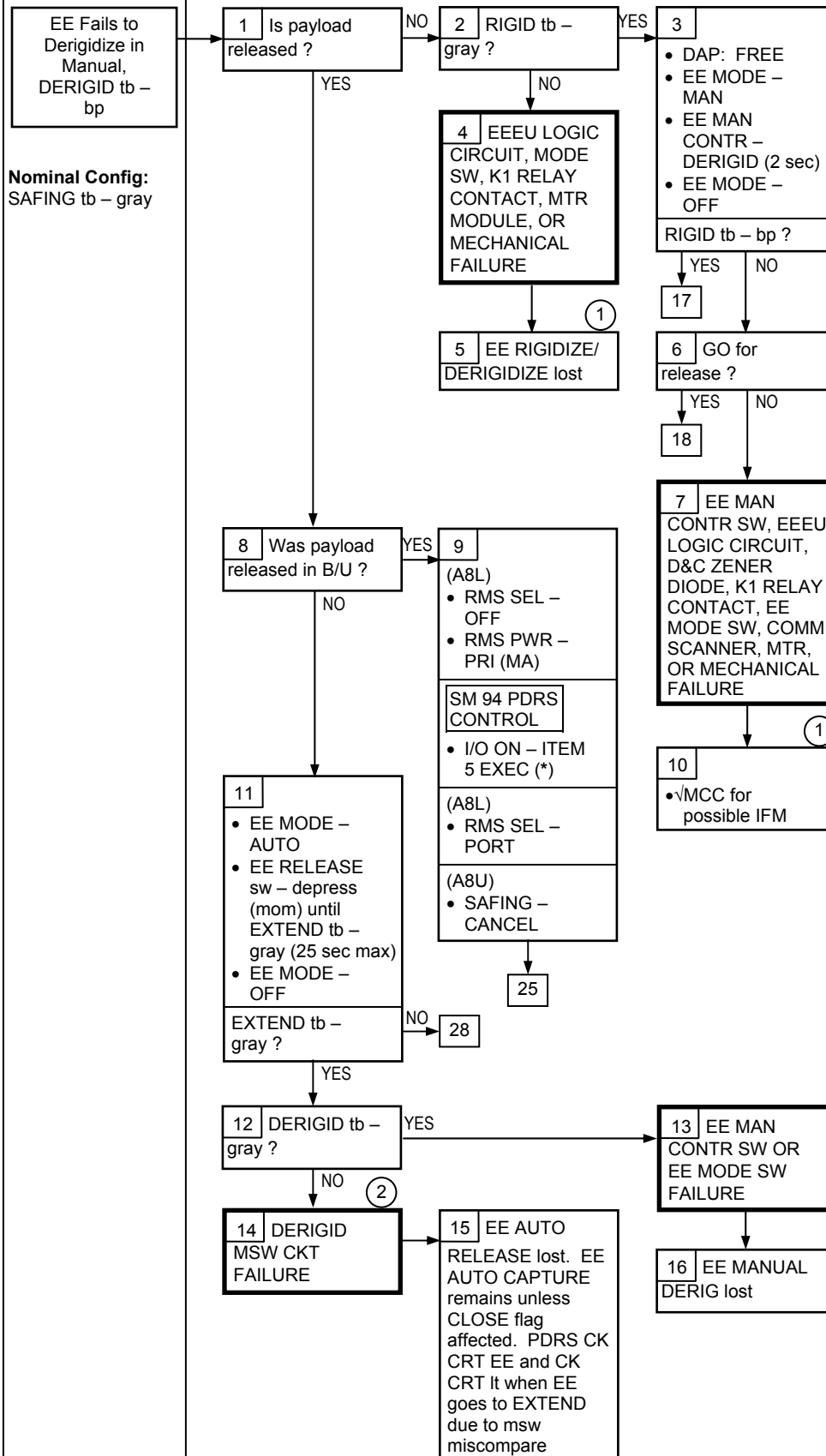


① RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, EE Cap/Rel sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR-4, RMS IFM D&C KIT



① RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, EE Cap/Rel 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

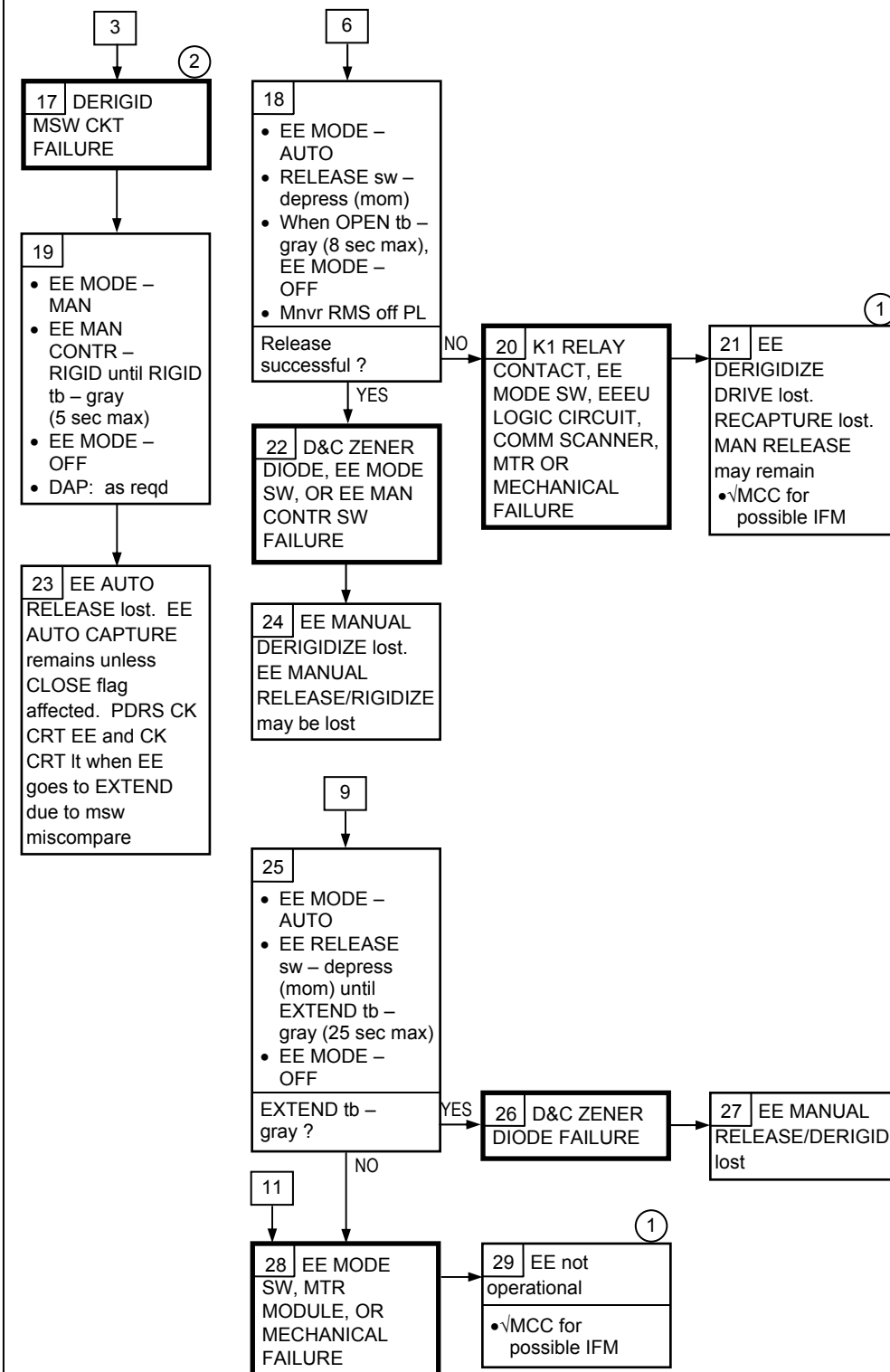
**12.3I NO MANUAL DERIGID
(CUE CARD EXECUTED)**



① RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, EE Cap/Rel 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 MSW ckt failures include circuitry in the SPA, therefore microswitches can fail in pairs:
CAP/EXTEND
OPEN/RIG
CLOSE/DERIG
Timing of each phase is critical to prevent motor burnout. EE Mode to OFF after spec time

PDRS 12.3I (Cont)



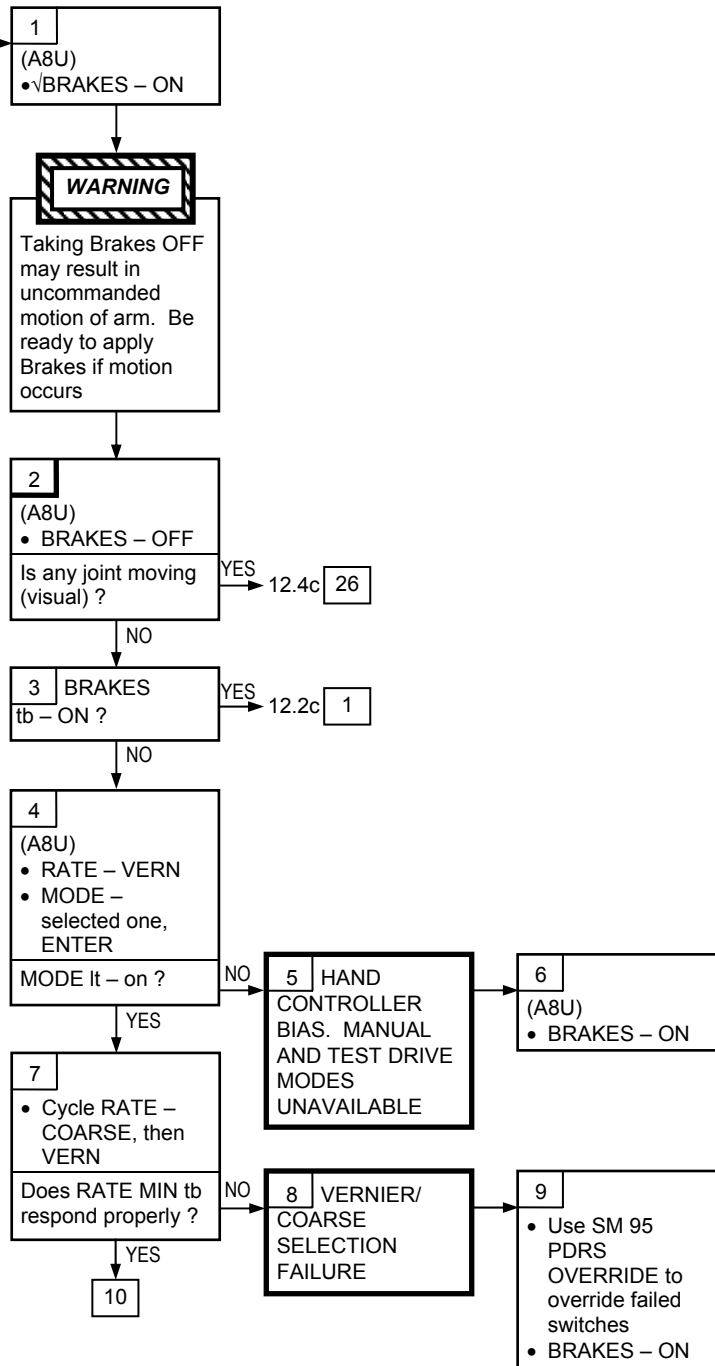
1 RMS IFM D&C KIT available to recover loss of K1, K2 relay, EE MODE sw, EE Cap/Rel sw, EE MAN CONTR sw. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR-4, RMS IFM D&C KIT

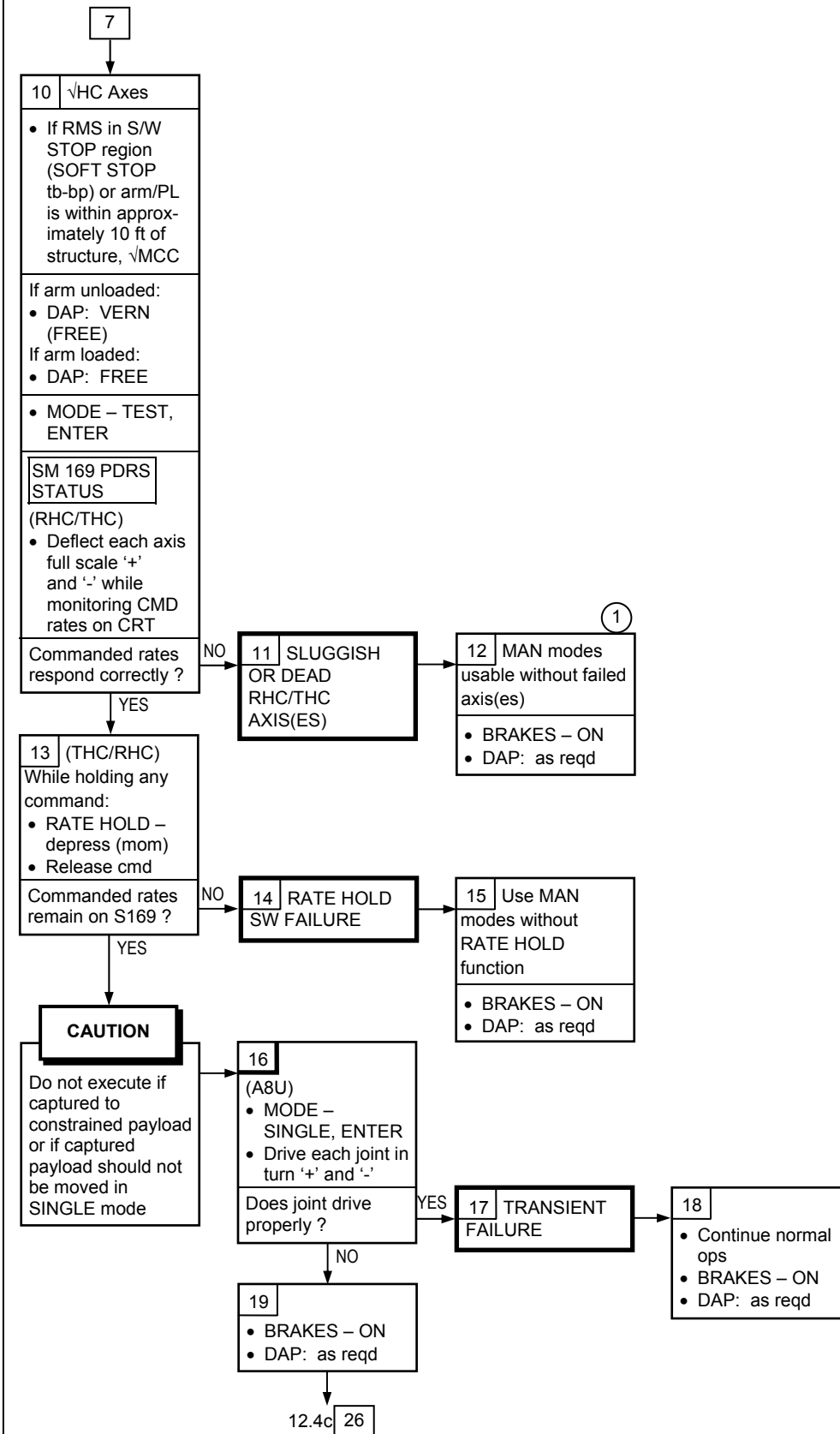
2 MSW ckt failures include circuitry in the SPA, therefore microswitches can fail in pairs: CAP/EXTEND OPEN/RIG CLOSE/DERIG Timing of each phase is critical to prevent motor burnout. EE Mode to OFF after spec time

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

PDRS

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
SOFTWARE STOP
tb – gray
EE MODE – OFF

1
(A8U)
• BRAKES – ON

WARNING

Taking Brakes OFF
may result in
uncommanded
motion of arm. Be
ready to apply
Brakes if motion
occurs

2
(A8U)
• BRAKES – OFF
Is any joint moving
(visual) ?

YES → 12.4c 26

NO

3 BRAKES
tb – ON ?

YES → 12.2c 1

NO

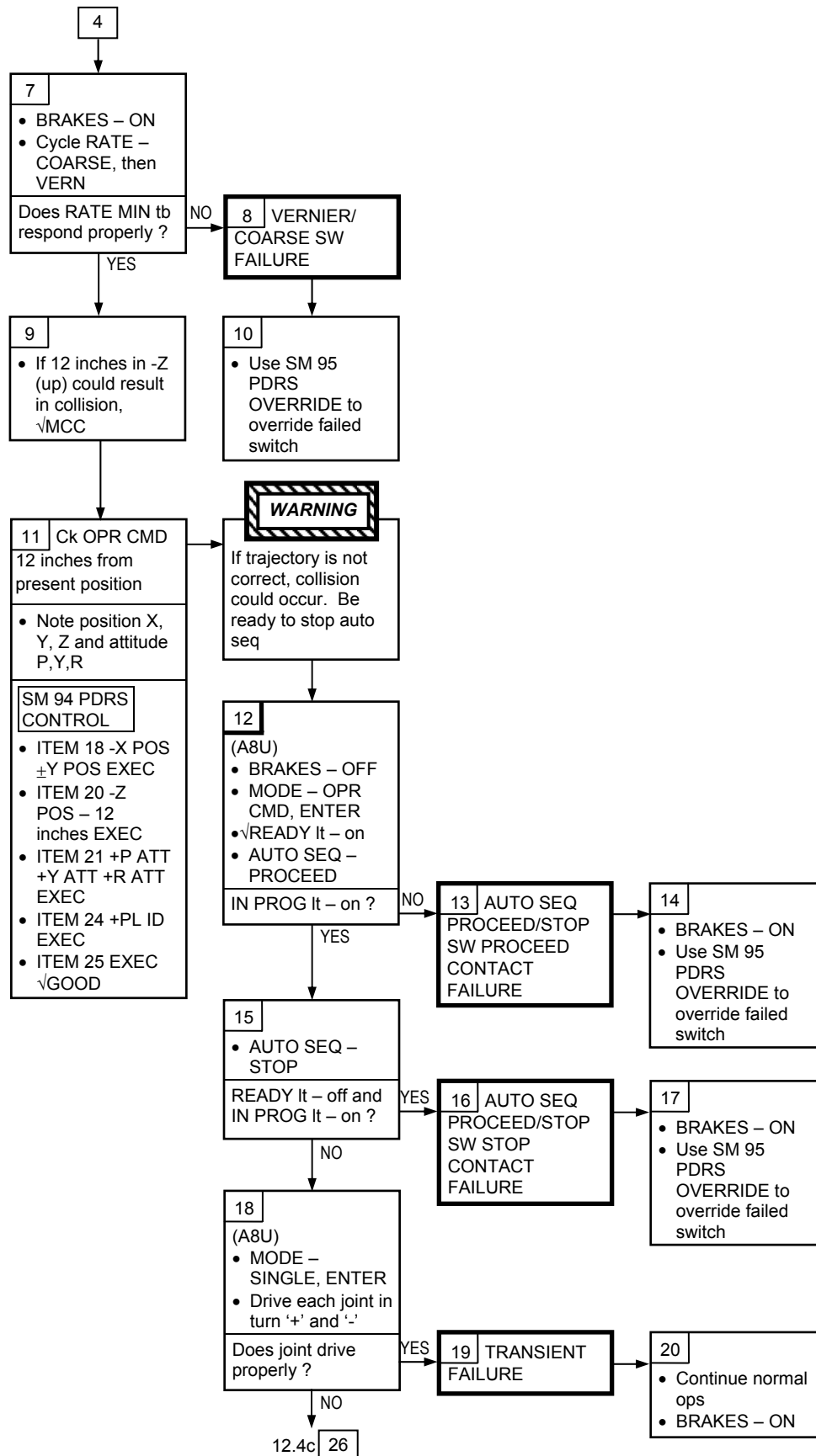
4
(A8U)
• RATE – VERN
• MODE –
selected one,
ENTER
MODE It – on ?

YES

7

NO → 5 AUTO SEQ
PROCEED/STOP
SW FAILURE

6
(A8U)
• BRAKES – ON
• Use SM 95
PDRS
OVERRIDE to
override failed
switch

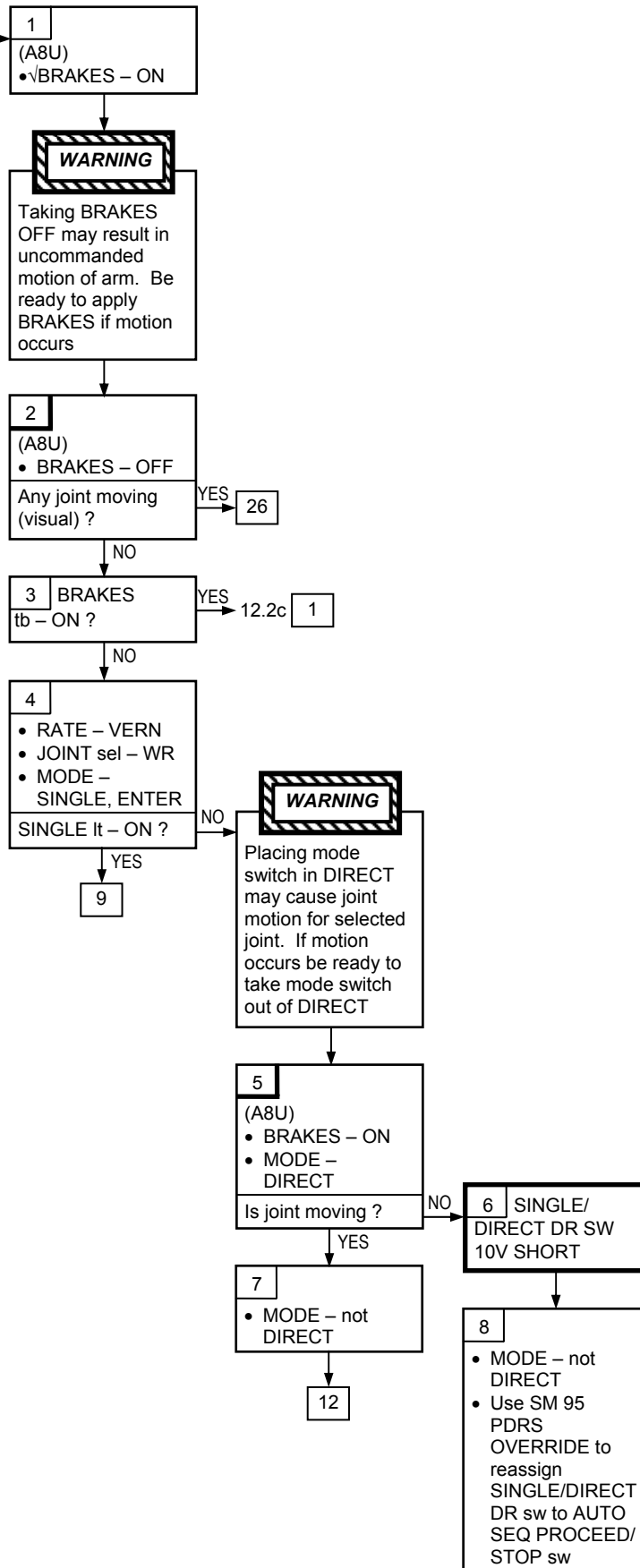


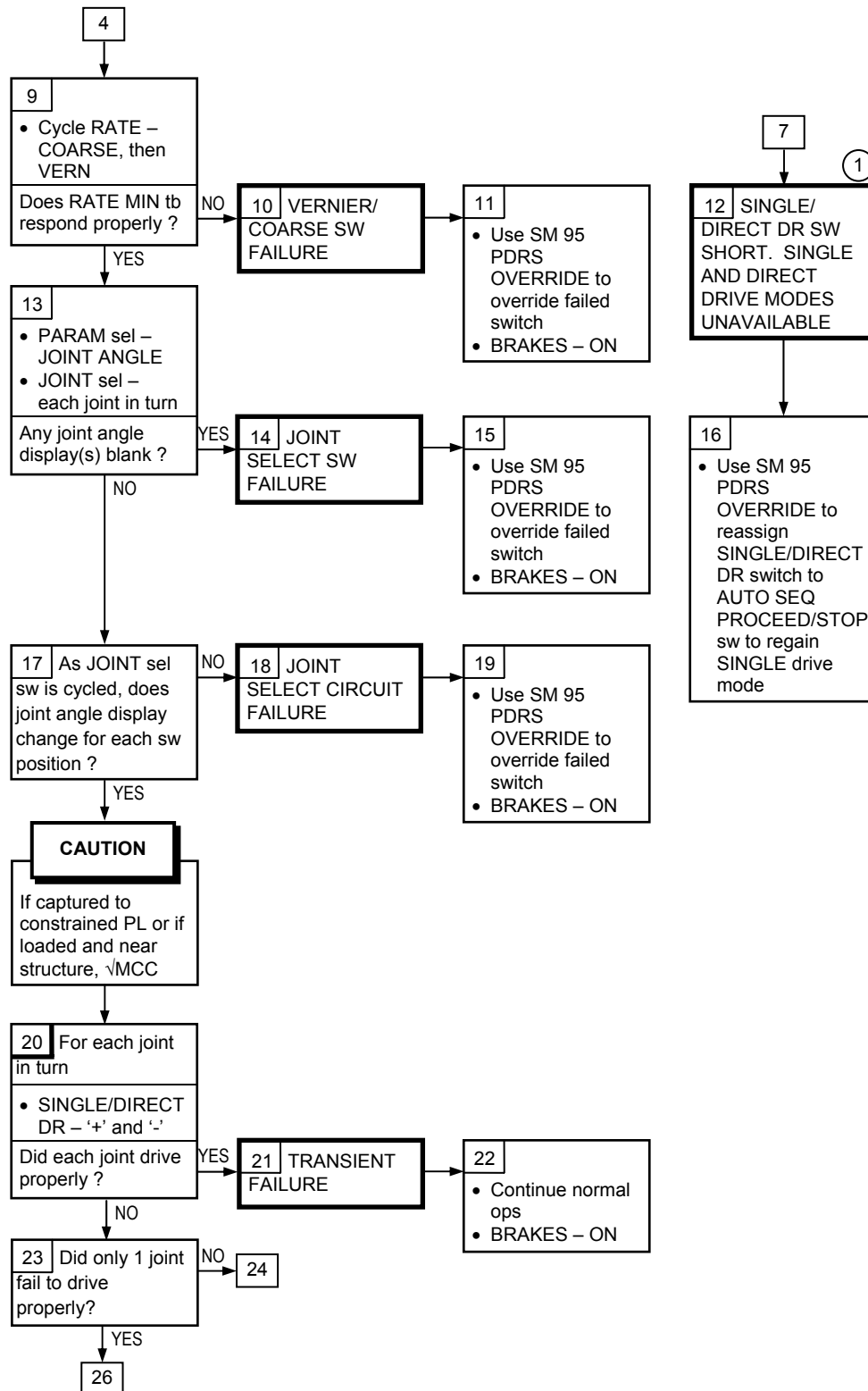
PDRS

Joint
Response Not
Normal for
Commands in
Single Mode

Nominal Config:
(A8L)
RMS PWR – PRI
SEL – PORT
(A8U)
SAFING tb – gray
EE MODE – OFF

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

[illegible]

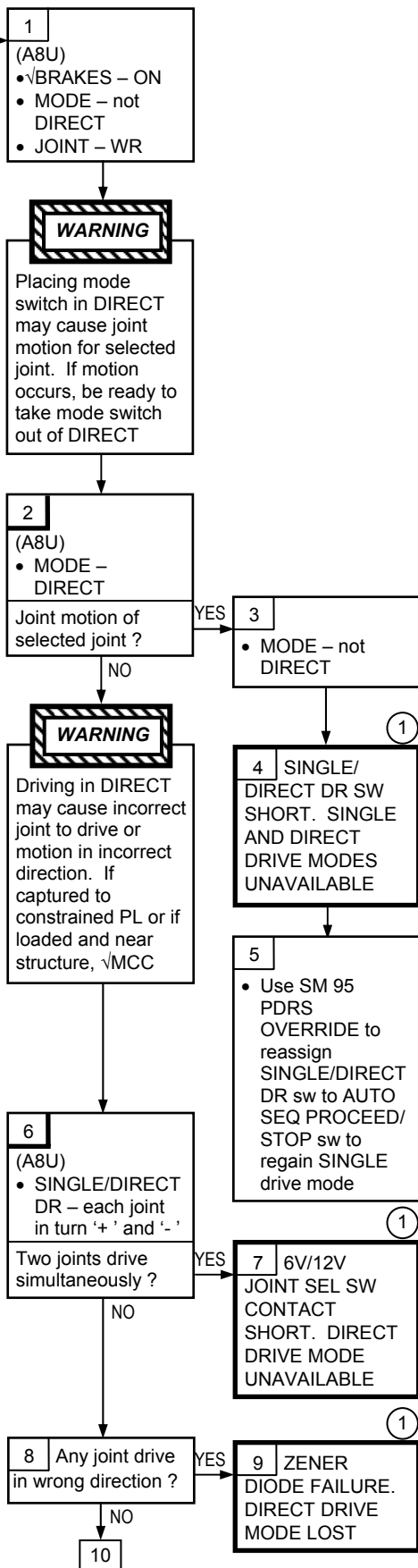
③ May receive
CK CRT It and
DIRECT DRIVE
BITE '↓' for undriven
joints

PDRS

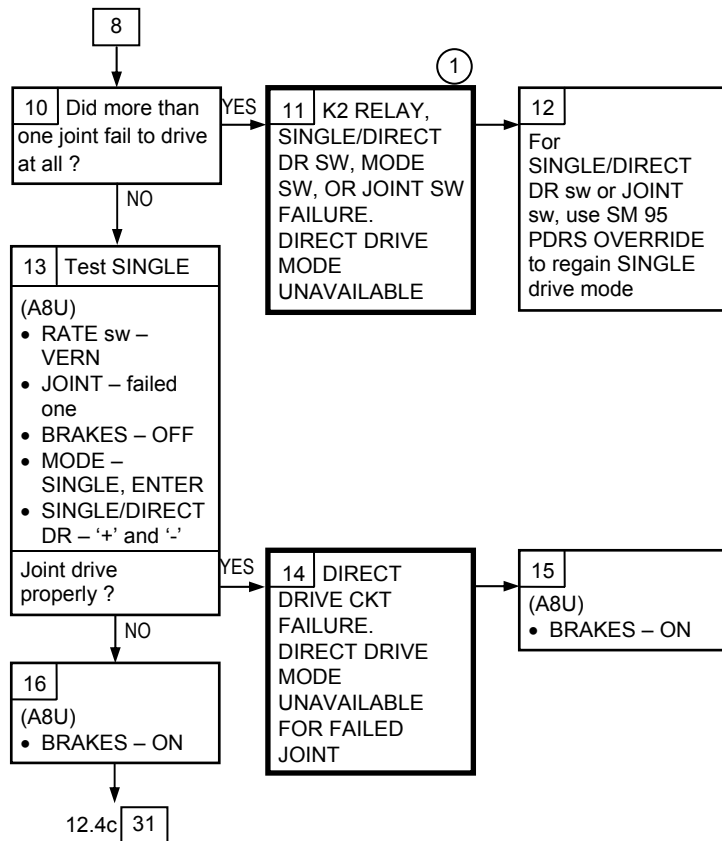
12.4d JOINT RESPONSE ABNORMAL IN DIRECT MODE

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

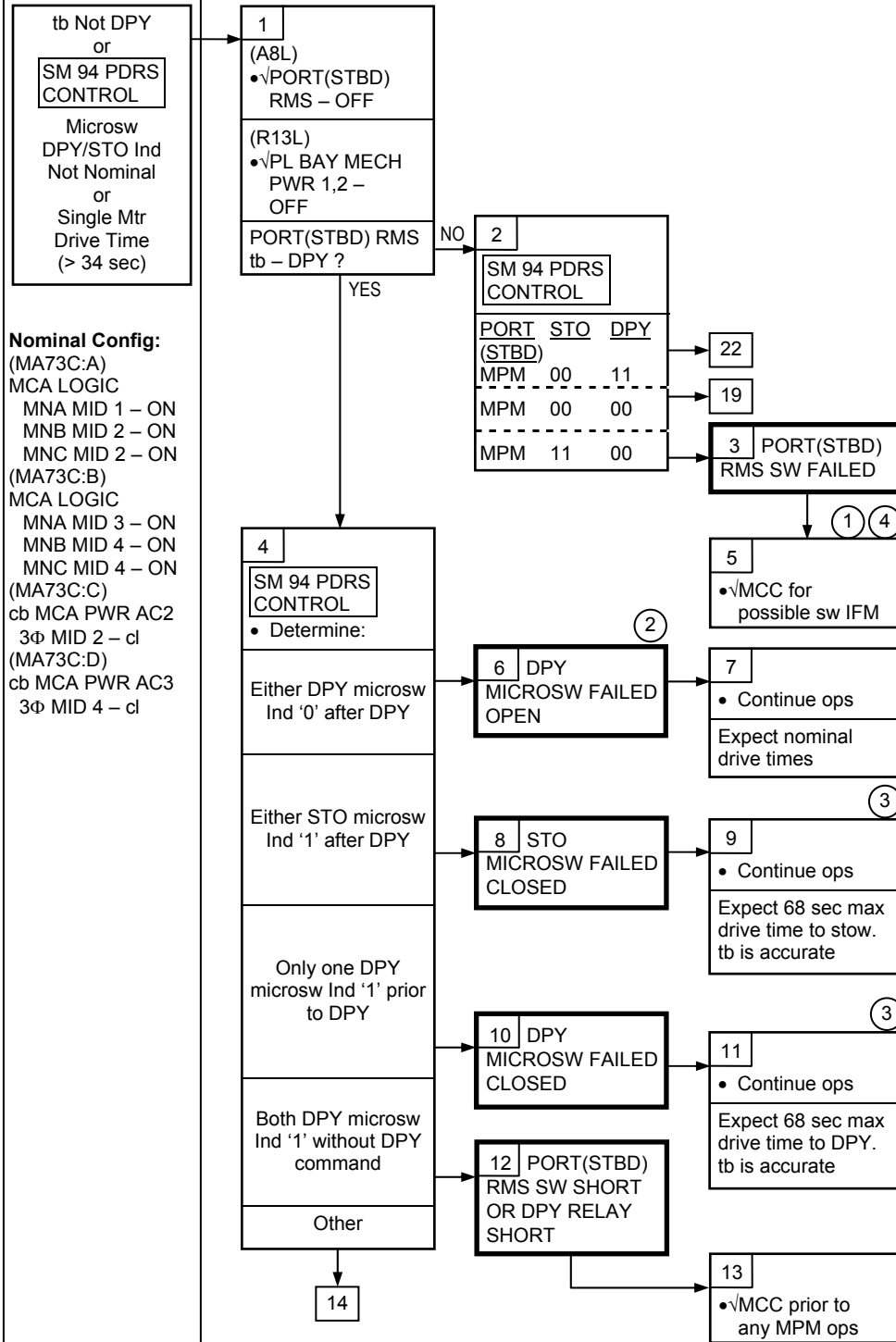


① DIRECT mode can be regained with RMS IFM D&C Kit. Refer to RMS CONTINGENCY OPERATION (INSTALLATION AND REMOVAL OF RMS IFM D&C KIT) (IFM), and PDRS SSR-4, RMS IFM D&C KIT



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

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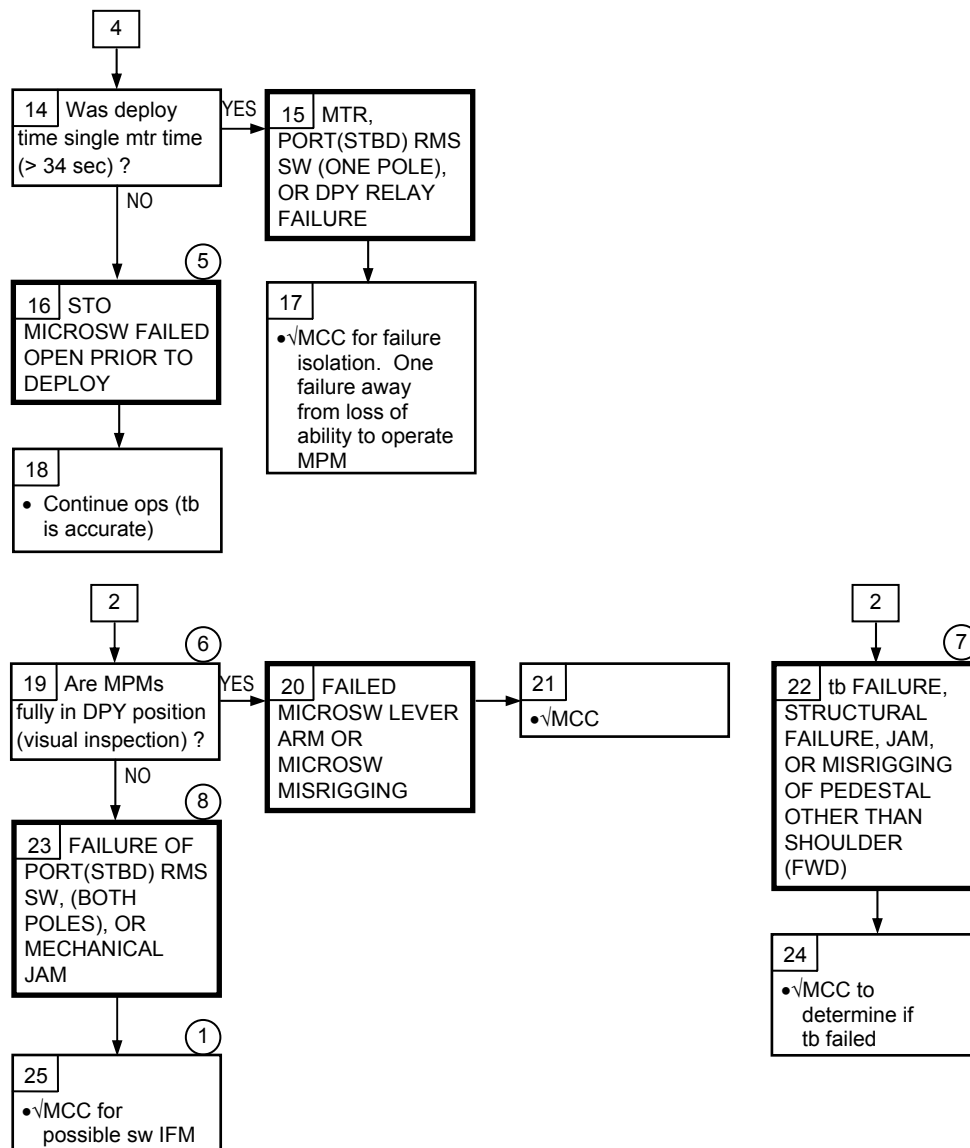
PDRS**12.5a MPM DPY – tb NOT DPY, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME**

① Refer to
RMS –
MANIPULATOR
POSITIONING
MECHANISM (MPM)
CONTINGENCY
DEPLOY/STOW
(IFM)

② One mtr will
continue to run while
deploying until
PORT(STBD) RMS
sw – OFF

③ PDRS SSR-1
MPM MTR INHIBIT
DISABLE available
to regain motor drive
in the failed direction

④ Unloaded
stowed ops can be
performed on MCC
GO. Refer to SM 95
PDRS OVERRIDE
ITEM 15



① Refer to RMS – MANIPULATOR POSITIONING MECHANISM (MPM) CONTINGENCY DEPLOY/STOW (IFM)

⑤ One mtr will continue to run while stowing until PORT(STBD) RMS sw – OFF

⑥ RMS should not be used unless shoulder linkage is overcenter locked

⑦ To trip port(stbd) tb, signals from all four (three) pedestals are required, i.e., all of SYS 1 or all of SYS 2. SM94 only shows the shoulder (fwd) indications

⑧ MCC can determine if switch is failed

PDRS

tb Not STO
or

**SM 94 PDRS
CONTROL**

 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

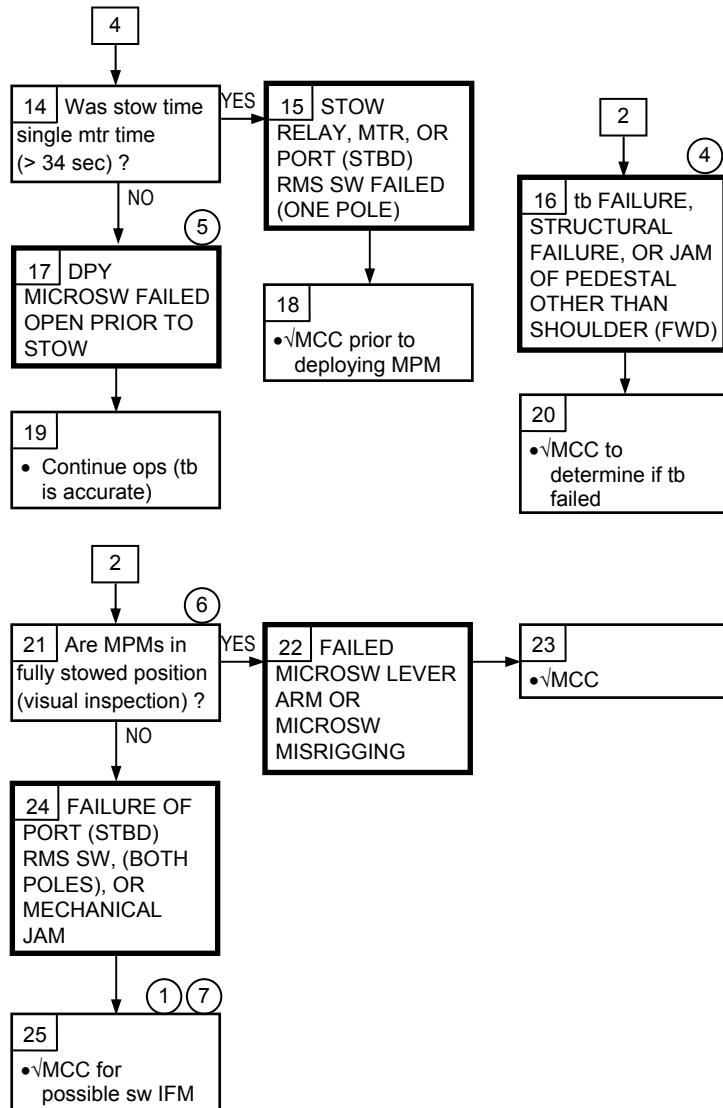
12.5b MPM STO – tb NOT STO, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME

```
graph TD
    1["1 (A8L)  
•√PORT(STBD)  
RMS – OFF"] --> 2["2 (R13L)  
•√PL BAY MECH  
PWR 1,2 – OFF"]
    2 --> Q1["PORT(STBD) RMS  
tb – STO ?"]
    Q1 -- YES --> 4["4 SM 94 PDRS  
CONTROL"]
    Q1 -- NO --> 2_2["2 SM 94 PDRS  
CONTROL"]
    2_2 --> 16["16 PORT STO DPY  
(STBD)  
MPM 11 00"]
    2_2 --> 21["21 MPM 00 00"]
    2_2 --> 3["3 PORT(STBD)  
RMS SW FAILED  
(BOTH POLES)"]
    3 --> 5["5 1  
•√MCC for  
possible sw IFM"]
    5 --> 7["7 2  
• Continue ops  
Expect nominal  
drive time"]
    4 --> 6["6 STO  
MICROSW FAILED  
OPEN"]
    4 --> 8["8 DPY  
MICROSW FAILED  
CLOSED"]
    4 --> 10["10 STO  
MICROSW FAILED  
CLOSED"]
    4 --> 12["12 PORT(STBD)  
RMS SW SHORT  
OR STO RELAY  
SHORT"]
    4 --> 14["14 Other"]
    6 --> 7
    8 --> 9["9 3  
• Continue ops  
Expect 68 sec max  
drive time to DPY.  
tb is accurate"]
    10 --> 11["11 3  
• Continue ops  
Expect 68 sec max  
drive time to STO.  
tb is accurate"]
    12 --> 13["13  
•√MCC prior to  
any MPM ops"]
```

- ① Refer to RMS – MANIPULATOR POSITIONING MECHANISM (MPM) CONTINGENCY DEPLOY/STOW (IFM)
- ② One mtr will continue to run while stowing until PORT (STBD) RMS sw – OFF
- ③ PDRS SSR-1 MPM MTR Inhibit Disable available to regain motor drive in the failed direction

PDRS

12.5b (Cont)



① Refer to RMS – MANIPULATOR POSITIONING MECHANISM (MPM) CONTINGENCY DEPLOY/STOW (IFM)

④ To trip port (stbd) tb, signals from all four (three) pedestals are required, i.e., all of SYS 1 or all of SYS 2. SM94 only shows the shoulder (fwd) indications

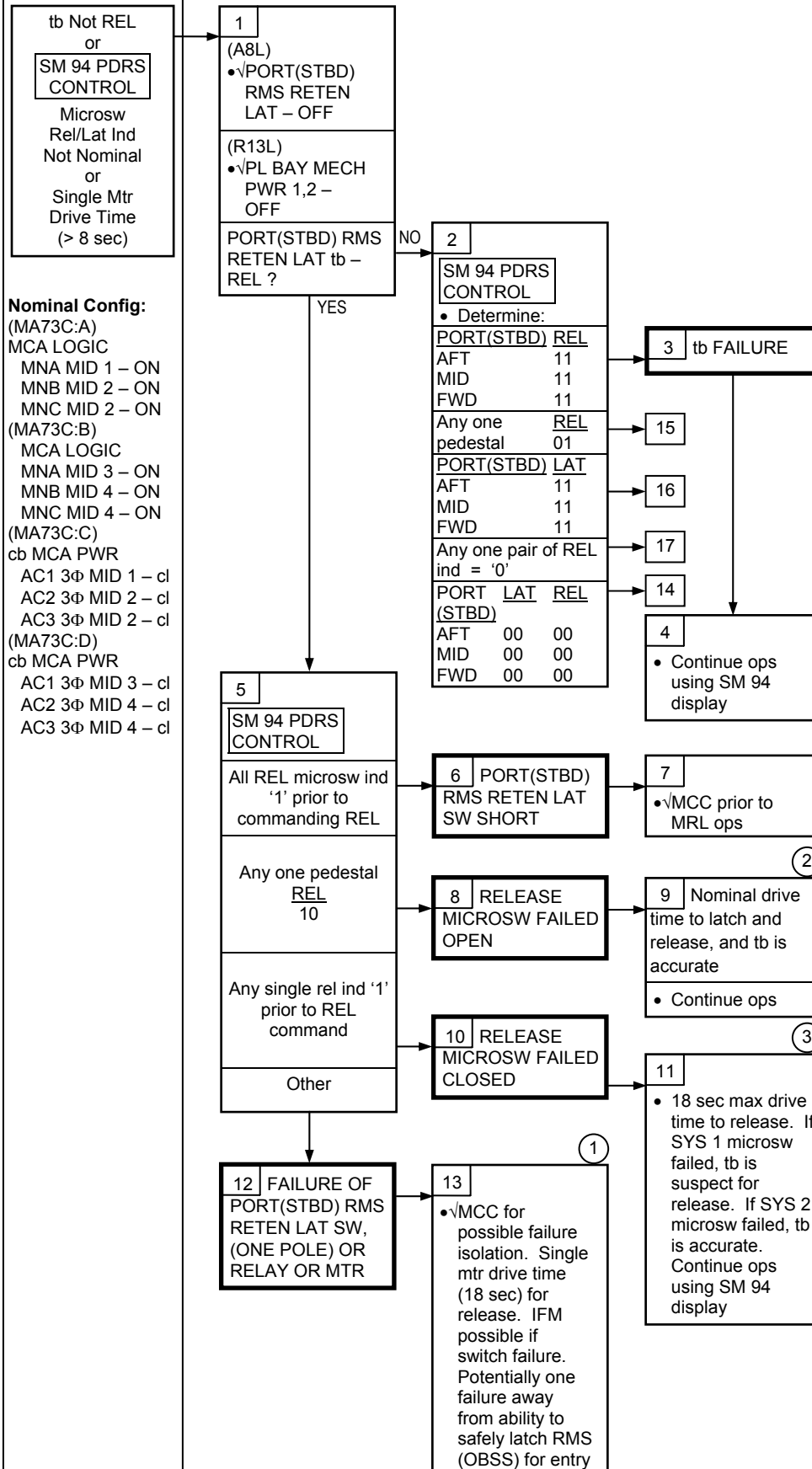
⑤ One mtr will continue to run while deploying until PORT (STBD) RMS sw – OFF

⑥ RMS should not be used unless shoulder linkage is overcenter locked

⑦ MCC can determine if switch is failed

PDRS

12.5c MRL REL – tb NOT REL, IND NOT NOMINAL, OR SINGLE MTR DRIVE TIME



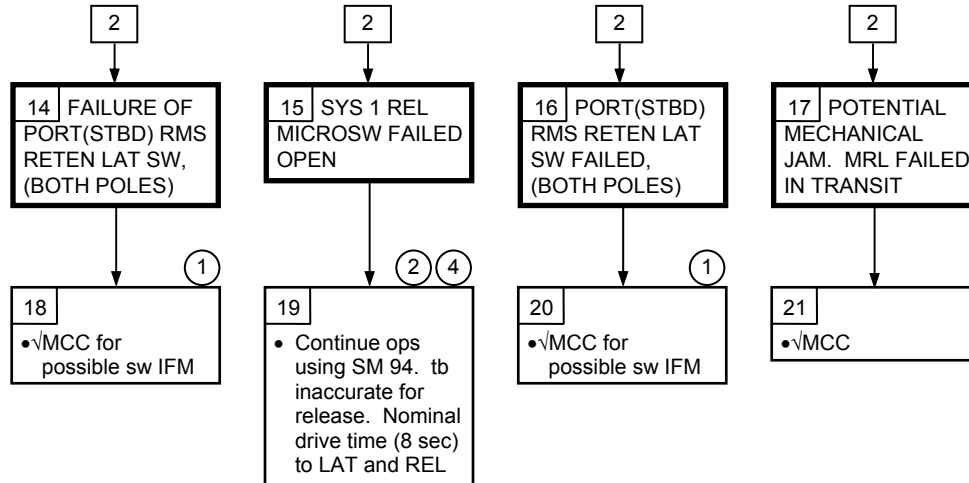
① Refer to RMS – MANIPULATOR RETENTION LATCHES (MRL) CONTINGENCY RELEASE/LATCH (IFM)

② One mtr will continue to drive when commanding release until PORT(STBD) 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)

PDRS

12.5c (Cont)



① Refer to RMS – MANIPULATOR RETENTION LATCHES (MRL) CONTINGENCY RELEASE/LATCH (IFM)

② One mtr will continue to drive when commanding release until PORT(STBD) RMS RETEN LAT – OFF

④ tb is activated by receiving all three microsw indications from SYS 1 only

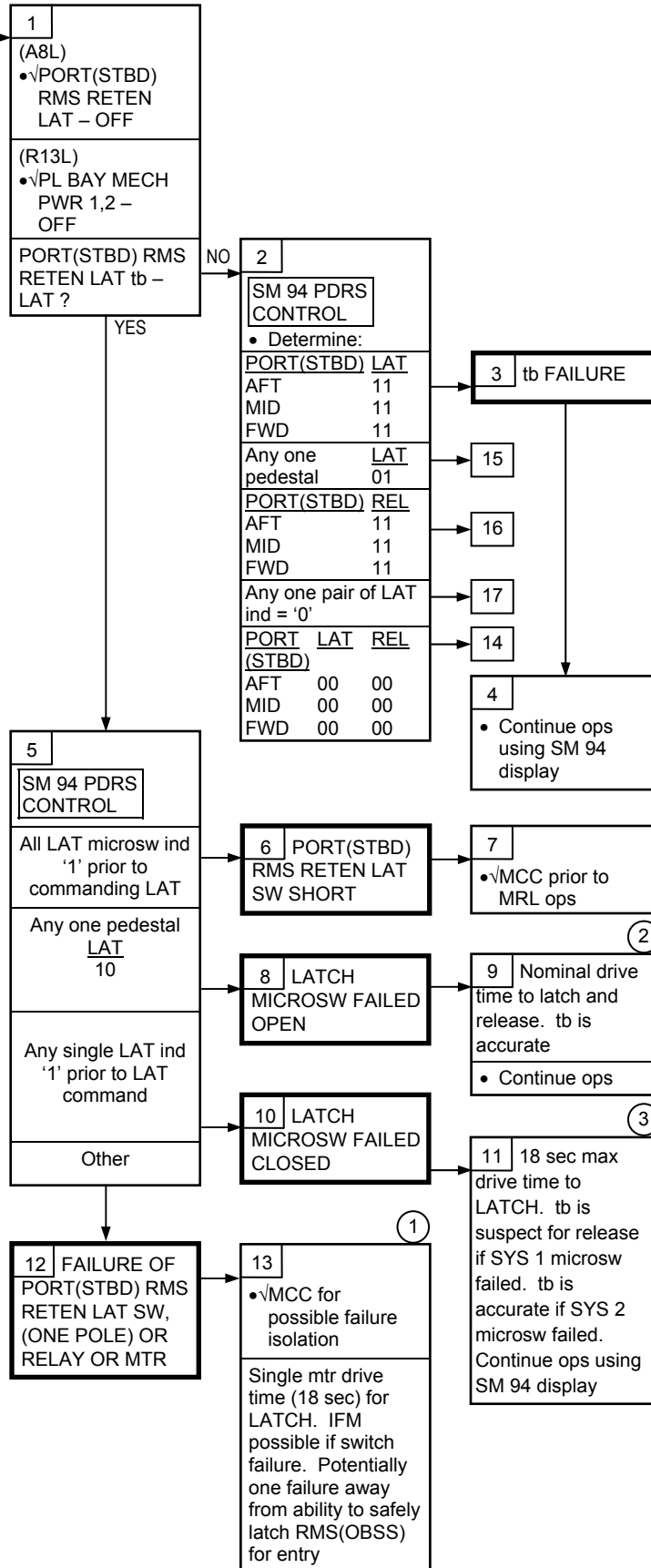
PDRS

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:

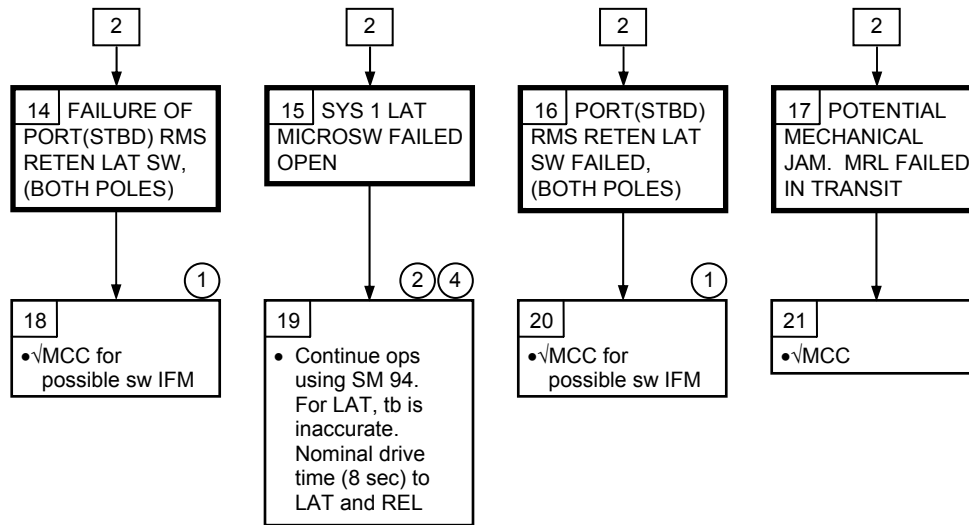
(MA73C:A)
MCA LOGIC
MNA MID 1 – ON
MNB MID 2 – ON
MNC MID 2 – ON
(MA73C:B)
MCA LOGIC
MNA MID 3 – ON
MNB MID 4 – ON
MNC MID 4 – ON
(MA73C:C)
cb MCA PWR
AC1 3Φ MID 1 – cl
AC2 3Φ MID 2 – cl
AC3 3Φ MID 2 – cl
(MA73C:D)
cb MCA PWR
AC1 3Φ MID 3 – cl
AC2 3Φ MID 4 – cl
AC3 3Φ MID 4 – cl



① Refer to RMS – MANIPULATOR RETENTION LATCHES (MRL CONTINGENCY RELEASE LATCH) (IFM)

② One mtr will continue to drive when commanding LATCH until PORT(STBD) RMS RETEN LAT – 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(STBD) RMS RETEN LAT – OFF

④ tb is activated by receiving all three microsw indications from SYS 1 only

PDRS

12.5e PORT(STBD) RMS RETEN LATCHES R-F-L tb – bp WHEN CRADLED

PORT(STBD)
RMS Reten
Latches R-F-L
tb – bp

Nominal Config:

(MA73C:A)

MCA LOGIC

MNA MID 1 – ON

MNB MID 2 – ON

MNC MID 2 – ON

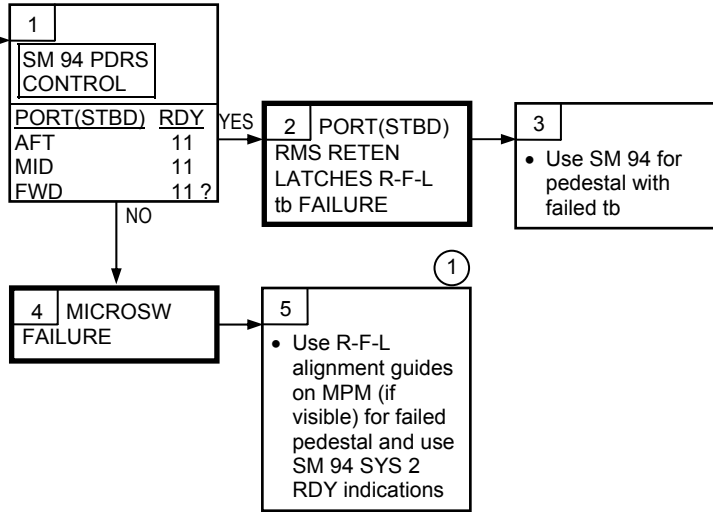
(MA73C:B)

MCA LOGIC

MNA MID 3 – ON

MNB MID 4 – ON

MNC MID 4 – ON



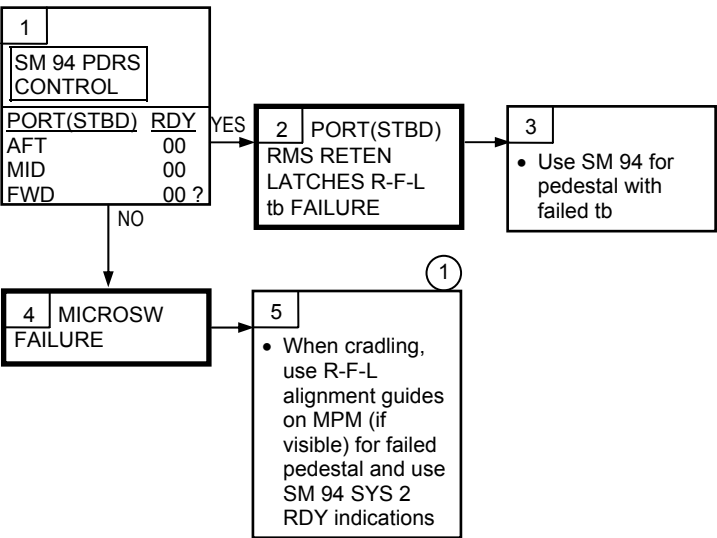
① Inaccurate tb because tb is driven by SYS 1 only

PDRS

12.5f PORT(STBD) RMS RETEN LATCHES
R-F-L tb – gray WHEN UNCRADLED

PORT(STBD)
RMS Reten
Latches R-F-L
tb – gray

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
SSR

PDRS SSR-1

MPM MTR INHIBIT DISABLE

SM 94 PDRS CONTROL

If PORT MPM STO/DPLY – 1 X 1 X (STBD MPM STO/DPLY – X 1 X 1):

MA73C:A	1. <u>INHIBIT MICROSWITCH</u> MCA LOGIC MNC MID 2 – OFF
CRT	√PORT MPM STO/DPLY – 0 X 0 X (STBD MPM STO/DPLY – X 0 X 0)
MA73C:D R13L	2. <u>STOW(DEPLOY) MPM</u> cb MCA PWR AC3 3Φ MID 4 – cl PL BAY MECH PWR SYS 2 – ON
	<u>CAUTION</u> If switch is not turned off, mtr will continue to run. Mechanical damage to mtr may result
A8L	PORT(STBD) RMS – STO(DPY) as reqd (68 sec max) – OFF
CRT	√MPM is stowed(deployed) using CRT indication (PORT RMS tb inaccurate): Stowed: PORT MPM STO/DPLY – 0 1 0 X (STBD MPM STO/DPLY – 1 0 X 0) (Deployed: PORT MPM STO/DPLY – 0 X 0 1 (STBD MPM STO/DPLY – X 0 1 0))
	MCC can verify status of FWD, MID, AFT pedestals
R13L	PL BAY MECH PWR SYS 2 – OFF
MA73C:A A8L	3. <u>ENABLE BUS</u> MCA LOGIC MNC MID 2 – ON √PORT(STBD) RMS tb – STO(DPY) >>

If PORT MPM STO/DPLY – X 1 X 1 (STBD MPM STO/DPLY – 1 X 1 X):

MA73C:B	4. <u>INHIBIT MICROSWITCH</u> MCA LOGIC MNB MID 4 – OFF
CRT	√PORT MPM STO/DPLY – X 0 X 0 (STBD MPM STO/DPLY – 0 X 0 X)
MA73C:C R13L	5. <u>STOW(DEPLOY) MPM</u> cb MCA PWR AC2 3Φ MID 2 – cl PL BAY MECH PWR SYS 1 – ON
	<u>CAUTION</u> If switch is not turned off, mtr will continue to run. Mechanical damage to mtr may result
A8L	PORT(STBD) RMS – STO(DPY) as reqd (68 sec max) – OFF
CRT	√MPM is stowed(deployed) using CRT indication: Stowed: PORT MPM STO/DPLY – 1 0 X 0 (STBD MPM STO/DPLY – 0 1 0 X) (Deployed: PORT MPM STO/DPLY – X 0 1 0 (STBD MPM STO/DPLY – 0 X 0 1))
	MCC can verify status of FWD, MID, AFT pedestals
R13L	PL BAY MECH PWR SYS 1 – OFF
MA73C:B A8L	6. <u>ENABLE BUS</u> MCA LOGIC MNB MID 4 – ON √PORT(STBD) RMS tb – STO(DPY)

PDRS SSR-3

BACKDRIVE TECHNIQUE – JOINT FREE

SP – FAILED

WARNING
PORT RADIATOR must be stowed

NOTE

Can expect CONTR 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 = $-(2 \times SP)$

Otherwise, IC = -90

MODE – DIRECT (It on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
+ 75	FREE	IC	0	0	0

MODE – not DIRECT (It off)

SM 94 PDRS CONTROL

AUTO BRAKE 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 (It on)

DIRECT DR EP to: $-(2 \times SP)$ or max -90

MODE – not DIRECT (It off)

Repeat step 2

PDRS SSR-3 (Cont)

3. RECONFIG JOINTS FOR CRADLE

CAUTION Use CCTVs to monitor proximity of RMS to orbiter

√BRAKES – ON (tb-ON)
MODE – DIRECT (It on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
CURRENT VALUE	FREE	+1	+10	0	0
0					
		-1			

MODE – not DIRECT (It 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 $EP \geq +1$ deg, reconfig EP:
MODE – DIRECT (It on)
DIRECT DR EP to: 0
MODE – not DIRECT (It off)

Repeat step 4

5. COMPLETE RMS CRADLE

√BRAKES – ON (tb-ON)
MODE – DIRECT (It on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
0	FREE	0	0	0	0

MODE – not DIRECT (It off)

√PORT RMS R-F-L tb (three) – gray

Go to step 3, RMS PWRDN (PDRS OPS) >>

PDRS SSR-3 (Cont)

EP – FAILED

NOTE

Can expect CONTR ERR and Master Alarm

1. SETUP

√BRAKES – ON (tb-ON)
PARAM sel – JOINT ANGLE

√DAP: VERN(FREE)

If EP $\geq$ -1 deg, go to step 3

Calculate IC: If EP > -65, IC = $-(2 \times \text{EP})$
Otherwise, IC = +130

MODE – DIRECT (It on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
CURRENT VALUE	IC	FREE	+5	0	0
0					

MODE – not DIRECT (It off)

SM 94 PDRS CONTROL

AUTO BRAKE 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 $\geq$ -1 deg, go to step 3

If SP < -(EP), reconfig SP:
MODE – DIRECT (It on)
DIRECT DR SP to: $-(2 \times \text{EP})$ or max +130
MODE – not DIRECT (It off)

Repeat step 2

PDRS SSR-3 (Cont)

3. RECONFIG FOR CRADLE

√BRAKES – ON (tb-ON)
MODE – DIRECT (It on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
CURRENT VALUE	+ 15	FREE	+ 10	0	0
0					

MODE – not DIRECT (It 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 (It on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
0	0	FREE	0	0	0

MODE – not DIRECT (It off)

√PORT RMS R-F-L tb (three) – gray

Go to step 3, RMS PWRDN (PDRS OPS)

PDRS SSR-3 (Cont)

WP – FAILED

NOTE

Can expect CONTR 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 $-0.1 \leq WP \leq +0.1$ 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 $-0.1 \leq WP \leq +0.1$, 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

PDRS SSR-3 (Cont)

If $-0.1 \leq WP \leq +0.1$, 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 $-0.1 \leq WP \leq +0.1$ deg

√BRAKES – ON (tb-ON)
MODE – DIRECT (lt on)

DIRECT DR to cradle:

SY	SP	EP	WP	WY	WR
0	CURRENT VALUE	<u>+ 1 MA</u>	FREE	0	<u>0</u>
	<u>0 (MA)</u>	<u>0</u>			

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

PDRS SSR-3 (Cont)

WY – FAILED

NOTE

Can expect CONTR ERR and Master Alarm. Can also expect SINGULAR if WY is between +75 and +105 degrees or if the WY is between -75 and -105 degrees

1. SETUP

- √BRAKES – ON (tb-ON)
- √DAP: VERN(FREE)
- MODE – DIRECT (It on)

DIRECT DR to:

SY	SP	EP	WP	WY	WR
0	+ 90	- 90	0	FREE	+ 19.5

MODE – not DIRECT (It off)
PARAM sel – JOINT ANGLE

SM 94 PDRS CONTROL

AUTO BRAKE INH – ITEM 10 EXEC (*)

2. BACKDRIVE OPERATION (To config $-0.1 \leq WY \leq +0.1$ 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 $WY > -2.0$ deg,

RATE sw – VERN (RATE MIN tb-ON)

√JOINT sel – WY

BRAKES – OFF (tb-OFF)

MODE – END EFF, ENTER

THC – '+Y' (Right) 1/3 to 1/2 deflection

After 2-3 sec,

THC – '-Y' (Left) full deflection

When WY joint angle is constant:

BRAKES – ON (tb-ON)

Release THC

If $-0.1 \leq WY \leq +0.1$ deg, go to step 2c

If $SP < 60$ deg or $EP > -60$ deg, go to step 3

If $WY < -0.1$ deg, repeat step 2a

If $WY > +0.1$ 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' (Left) 1/3 to 1/2 deflection

After 2-3 sec,

THC – '+Y' (Right) full deflection

When WY joint angle is constant:

BRAKES – ON (tb-ON)

Release THC

PDRS SSR-3 (Cont)

If $-0.1 \leq WY \leq +0.1$ deg, go to step 2c

If $SP < 60$ deg or $EP > -60$ deg, go to step 3

If $WY > +0.1$ deg, repeat step 2b

If $WY < -0.1$ deg, go to step 2a

2c. If $-0.1 \leq WY \leq 0.1$ deg

√BRAKES – ON (tb-ON)
MODE – DIRECT (lt on)

DIRECT DR to cradle:

SY	SP	EP	WP	WY	WR
0	CURRENT VALUE	<u>+ 1 MA</u>	<u>+ 5</u>	FREE	0
	<u>0</u>	<u>0</u>	<u>0</u>		

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 $WY < -0.1$ deg, go to step 2a

If $WY > +0.1$ deg, go to step 2b

PDRS SSR-4 RMS IFM D&C KIT

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)

2. SHOULDER BRACE RELEASE

If Shoulder Brace still engaged:
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

D&C Kit If unloaded:
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

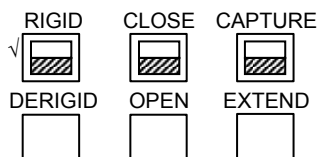
O19 DC UTIL PWR MNA – ON
√No arm/payload motion
DC UTIL PWR MNA – OFF

PDRS SSR-4 (Cont)

4. UNLOADED END EFFECTOR TEST (Reqd for End Effector ops, Direct Drive)

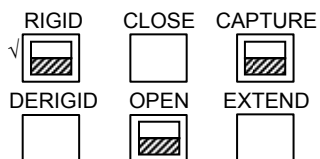
CAUTION
End Effector test must be completed within
2.5 min of DC UTIL PWR MNA sw – ON
or End Effector mtr burnout could occur

A8U ✓BRAKES – ON (tb-ON)
 ✓tb(s)



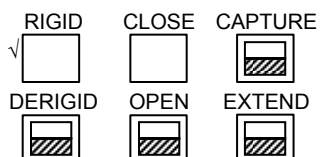
O19 DC UTIL PWR MNA – ON
 ✓No tb(s) change

D&C Kit EE CAPTURE/RELEASE sw – CAPTURE, until CLOSE tb – gray (3 sec max)



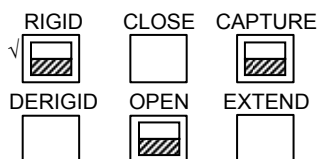
✓No tb(s) change after capture

EE RIGID/DERIGID sw – RIGID, until RIGID tb – gray (25 sec max)



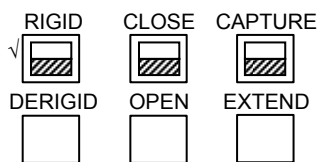
✓No tb(s) change after rigidizing

EE RIGID/DERIGID sw – DERIGID; until DERIGID,EXTEND tb – gray (25 sec max)
(MA, DERIGIDIZE It – ON)



PDRS SSR-4 (Cont)

EE CAPTURE/RELEASE sw – RELEASE, until OPEN tb – gray (3 sec max)
(Expect MA, RELEASE It – on during actual Payload Release)



O19 DC UTIL PWR MNA – OFF

To extinguish DERIGIDIZE It, take EE MAN CONTR sw to RIGID momentarily or cycle RMS SEL sw

A8U 5. DIRECT DRIVE TEST (For Direct Drive ops only)
√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 It on, 'PDRS SLIP' for driven joint, and 'S96 PDRS ABE' for five undriven joints)

For other joints:
Drive '+'
√Correct joint responses
(Expect MA, CK CRT It on, 'PDRS SLIP' for driven joint, 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

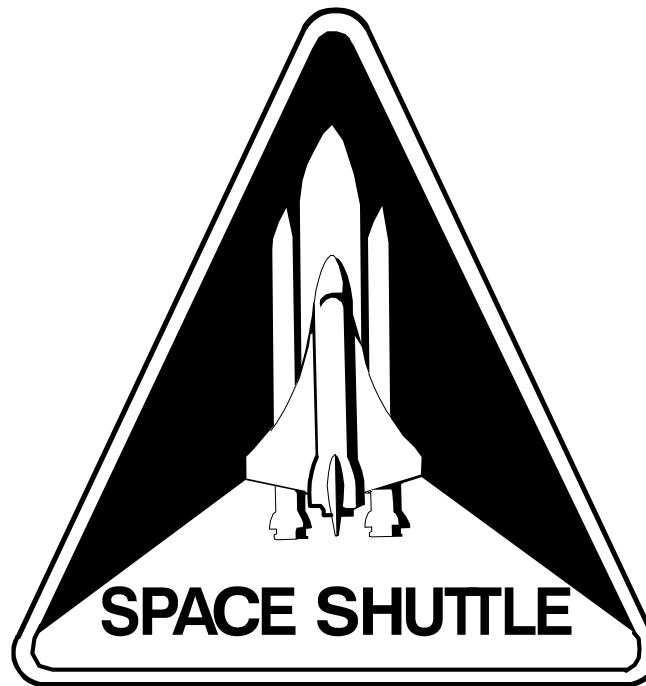
Remove RMS IFM D&C KIT, RMS CONTINGENCY OPERATION/INSTALLATION AND REMOVAL OF THE RMS IFM D&C KIT (IFM, PROCEDURES M THRU R)

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 in the nominal procedures if arm not starting at cradle)

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**MALFUNCTION
PROCEDURES**

**STS
ALL**