VERB LIST

01-05 DISPLAY OCTAL
06 DISPLAY DECIMAL
07 DP DEC DSPLY (≤N38)
11-15 MONITOR OCTAL
16 MONITOR DECIMAL
17 DP DEC MON (≤N38)
21-25 LOAD DATA
27 01 DSPLY FIXED MEMORY
30 EXECUTIVE (PRE/L N26)
31 WAITLIST (PRE/L N26)
32 RECYCLE
33 PROCEED
(REQ W/ V 21-V23)
34 TERMINATE
(EXCEPT N49,60,63,88)
35 TEST LITES (P00)
36 FRESH START
37 CHANGE PROGRAM
40 20 ZERO ICDU'S
40 72 ZERO RR CDU'S
41 20 IMU CRS ALN
41 72 RR CRS ALN
42 GYRO TORQ
43 LOAD FDAI ERROR NEEDLES (P00)
44 TERM RR DESIGNATE
47 INITIALIZE AGS
48 DAP DATA LOAD
49 CREW ATT MNVR (P00)
50 PLEASE PERFORM
52 REQST CURSOR MK
53 REQST SPIRAL MK
54 REQST X OR Y MK
55 INCRMT CLK (H,M,S)
56 TERM TRACKING
57 PERMIT LR UPDTS
58 INHIBIT LR UPDTS
59 CMD LR TO POSN 2
60 DAP ATT RTS (ERR NDLS)
61 DAP FOLLOW ATT ERROR (MODE 1 ERR NDLS)
62 TOTAL ATT ERR (N22-N20) (MODE 2 ERR NDLS)
63 RR/LR SELF-TEST
64 S-BAND ANT (06 51)
65 DISABLE U-V JETS
66 LM SV TO CSM SLOTS
67 DSPLY W-MATRIX RSS ERROR (06 99)
68 TERM TERRAIN MODEL
69 FORCE RESTART
70 LIFTOFF TIME UPDT (P27)
71 BLOCK ADRS UPDT (P27)
72 SINGLE ADRS UPDT (P27)
73 LGC CLK OCT UPDT (P27)
74 START ERASABLE DUMP
75 ENABLE U-V JETS
76 MINIMUM IMPULSE
77 RATE CMD/ATT HOLD
78 START LR SPURIOUS TEST
79 STOP LR SPURIOUS TEST
80 UPDT LM SV (P20)
81 UPDT CSM SV (P20,P22)
82 ORBIT PMTR DSPLY (16 44)
83 RDZ PMTR DSPLY (16 54)
85 DSPLY RR LOS AZ, ELEV ∡ (16 56)
89 RDZ FNL ATT MNVR (P00)
90 RDZ OUT-OF-PLANE DSPLY (06 90)
91 DSPLY BANKSUM (P00)
(BK SUM,BK,BUGGER
NEXT BANK-PRO
TERM-V34E)
93 ENABLE W-MATRIX INITIALIZATION
95 INHIBIT SV UPDTS (P20,P22)
96 STOP SV INTEGRATION
97 PERFORM ENGINE FAIL PROCEDURE
99 ENABLE ENGINE IGN

ROUTINE CROSS-REF

R03/V48	R36/V90
R04/V63	R47/V47
R05/V64	R56/V56
R30/V82	R62/V49
R31/V83	R63/V89
R33/V06N65	R77/V78

NOUN LIST

* - LEGIT LOADABLE NOUN & DATA VALID ANYTIME NOUN CALLED
V - DATA VALID ANYTIME NOUN CALLED
L - LEGIT LOADABLE NOUN
X - LEGIT LOADABLE NOUN (HR, MIN, .01S) (IF LOAD, ENTR R1, R2, R3)

01,02,03 * SPECIFIED OCT ADRS

DSPY	OCT	DEC
N01	[OCT]	[.XXXXX]
N02	[OCT]	[XXXXX.]
N03	[OCT]	[.01°]

04 GRAVITY ERR ∡ [.01°(R1)]
05 SIGHT ∡ DIFF/SV-RR LOS ∡ [.01°(R1)]
06 L OPTION CODE [OCT] (SEE P21, P22, P52, P57)
07 L ADRS/CHNL, BIT ID, ACTION [OCT] (SEE "FLAGWRD/CHNL SET/RESET")
08 V ALARM DATA [OCT] (ALMCADR, "BBCON", ERCOUNT)
09 V ALARM CODES [OCT] (1ST, 2ND, MOST RECENT ALM)
10 * SPECIFIED CHNL [OCT(R1)]
(CAN'T 34, READ 35 | CAN'T 3, 4, 7, 15 LOAD 16, 30, 31, 32
IF LOAD CH 33, RESETS BITS 15-11)
11 X T CSI OR T APOAPSIS [H, M, .01S] (0, 0, 0 = COMPUTE T APOAPSIS)
12 L OPTN CODE [OCT (0000X, 0000Y)]

	X (SPFY)	Y=1	Y=2
V82	2 (VEH)	LM	CSM
V89	3 (TK ATT)	+Z	+X
V63	4 (RADAR)	RR	LR
41 72	6 (RR FN)	LOCK	DESIG

13 X T CDH [H, M, .01S]
15 * INCREMENTED OCT ADRS [OCT(R1)]
16 X T EVENT [H, M, .01S]
(AGSK = PRSNT T IF V32E (V47)
0, 0, 0 = PRSNT T (V90))
18 AUTO MNVR FDAI ∡ - R, P, Y [.01°]
20 V PRSNT ICDU'S - Y, P, R [.01°]
21 V PIPA PULSES X, Y, Z [XXXXX.]
22 L DSRD NEW ICDU'S - Y, P, R [.01°]
24 X LGC CLK ΔT [H, M, .01S]
25 SEE "V50 CHECKLIST" [OCT(R1, R2)]
26 * PRIO/DELAY, ADRES, "BBCON" [OCT] (SEE V30, V31)
27 * SELF-TEST ON/OFF SW [OCT(R1)]
(START: 00010 (ALL) 00004 (ERAS) 00005 (FIXED) STOP: 00000 (ALSO V36, V91))
32 T FROM PERIGEE [H, M, .01S]
33 X TIG [H, M, .01S]
34 X T EVENT [H, M, .01S] (0, 0, 0 = PRSNT T)
35 TFI/TCO [H, M, .01S]
36 V LGC CLOCK TIME [H, M, .01S]
37 X T TPI [H, M, .01S]
38 V INTEG SV TIME TAG [H, M, .01S]
40 TFI/TCO, VG, ΔVM [M:S, .1FPS, .1FPS]
42 HA, HP, VG [.1NM, .1NM, .1FPS]
43 LAT, LON, ALT [.01°, .01°, .1NM] (+N, +E, + > RLS)
44 HA, HP, TFF [.1NM, .1NM, M:S] (TFF = -59 59 IF HP > 35K FT)
45 V/R1 MKS, TFI, +MGA [X., M:S, .01°]
(R3 = -00001: NOT FINAL
R3 = -00002: P7X OR FNL, NO ALN
R3 = +MGA: FNL, IMU ALN)
46 L DAP CONFG, CHANBKUP [OCT(R1, R2)]
(CONFG: SEE "DAP DATA LOAD"
CHANBKUP: IGNORE SPFY DSCRT
00001 - ABORT/ABORT STAGE
00010 - AUTO THRTL
00011 - BOTH DSCRTS)
47 * LM WT, CSM WT [LBM (R1, R2)]
48 L DPS P, R GMBL TRIM [.01°(R1, R2)]
49 ΔR, ΔV, SOURCE [.01NM, .1FPS, X.]
(X=1 RANGE X=3 SHFT
X=2 RNG RT X=4 TRUN)
51 DSRD S-BAND P, Y ∡ [.01°(R1, R2)]
52 ACT VEH CENTRL ∡ [.01°(R1)] (AVOID 170° - 190° REGION)
54 RANGE, RDOT (- CLOSE), +Z/HORZ ∡ [.01NM, .1FPS, .01°]
55 L P32: APSIS, ELEV, CODE [X., .01°, Y]
(Y=0: CDH AT APSIS SPFY BY R1
Y≠0: CDH AT (R1)x(180°))
L P34: CODE, ELEV, TRANSFER ∡ [X., .01°, .01°]
(X=0 CONIC | ELEV=0 T OPTN
X≠0 ENCKE | ELEV≠0 ∡ OPTN)
56 RR LOS AZ, ELEV [.01°(R1, R2)] (AZ +/LM Z, ELEV +/Y)
58 PREDICT POST-TPI HP, TPI ΔV, TPF ΔV [.1NM, .1FPS, .1FPS]
59 LOS ΔV VEC (FWD, RT, DN IF BORE ∢, IN-PLANE, HEADS-UP) [.1FPS]
60 V(+Z), HDOT(-/H↓), H [.1FPS, .1FPS, FT]
61 TG (AIM PT), TFI, XR (+/LS N) [M:S, M:S, .1NM]
62 VI, TFI, ΔVM [.1FPS, M:S, .1FPS]
63 ΔH (LR-PGNS), HDOT (-/H↓), H [FT, .1FPS, FT]
64 TR:LPD, HDOT(-/H↓), H [S:°, .1FPS, FT]
65 V SAMPLED LGC TIME [H, M, .01S]
(IF LGC/CMC CLK SYNC, V06N65...E, SYNC W/ CMP
V55 ΔT = CSM T - LM T)
66 V/R2 LR SR, ANT POSN [FT, X. (R1, R2)]
67 LR VX, VY, VZ [FPS]
68 RNG(+Z), TG(BRK), VI [.1NM, M:S, .1FPS]
69 L LS UPDT Z, Y, X (DN-R, XR, ALT) [FT]
70 L AOTCODE (00YXX) [OCT(R1)]
(XX = STAR ID Y = DTNT
Y=0 COAS/LPD CAL (P52 ONLY)
Y=1-6 AOT (L, F, R, RR, CL, LR)
Y=7 COAS)
71 L AOTCODE, X/CRSR, Y/SPRL CTR [OCT]
(R1 SAME AS N70 EXCPT NO DTNT 0
R2, R3 = POINTER: CTR (1-4 + LAST))
72 RR TRUN (↔), SHFT (I) [.01°(R1, R2)]
73 L DSRD RR TRUN, SHFT [.01°(R1, R2)]
74 TFI, PITCHOVR Y, P [M:S, .01°, .01°]
75 P32: CDH ΔH, CSI/CDH ΔT, CDH/TPI ΔT
P33: CDH ΔH, CDH/TPI ΔT, TPI SLIP [.1NM, M:S, M:S]
76 L DSRD VHORZ(FNL), HDOT(FNL), XR [.1FPS, .1FPS, .1NM]
77 TCO, VGY(BODY), VI [M:S, .1FPS, .1FPS]
78 RR RNG, RNG RT (- CLOSE), TFI [.01NM, .1FPS, M:S]
79 L CRSR, SPRL, DTNT [.01°, .01°, X.]
(X=1-6 AOT-L, F, R, RR, CL, LR)
80 RR SEARCH DATA IND, LOS/+Z ∡ [XXXXX., .01°(R1, R2)]
(+00000 = SEARCH; +11111 = LOCK)
81 L ΔV(LV) VEC (FWD, RT, DN) [.1FPS]
82 CDH ΔV(LV) VEC (FWD, RT, DN) [.1FPS]
83 ΔV(BODY) VEC (UP, RT, FWD) [.1FPS]
84 L ΔV(CSM LV) VEC (FWD, RT, DN) [.1FPS]
85 VG(BODY) VEC (UP, RT, FWD) [.1FPS]
86 N86 = N81
87 L COAS AZ (+RT), EL (+ UP) [.01°(R1, R2)]
88 L CELEST BODY UNIT VEC [.XXXXX]
89 L LS LAT (+N), LON/2 (+E), ALT [.001°, .001°, .01NM]
90 Y, YDOT, PSI [.01NM, .1FPS, .01°] (Y, YDOT ⊥ CSM PL; PSI = LOS/LM PL)
91 ALT, VI, FLT PATH ∡ [10NM, FPS, .01°]
92 THRTL, HDOT (-/H↓), H [%, .1FPS, FT]
93 Δ GYRO TORQ ∡ X, Y, Z [.001°]
94 VGX(BODY), HDOT (+/H↑), H [.1FPS, .1FPS, FT]
99 L W-MATRIX POSN, VEL, RR BIAS ERRS [FT, .1FPS, MILLI-RAD]

V50 CHECKLIST

R1	PLEASE PERFM	"PRO"	"E"
00013	CRS ALN	NORM	PLS TORQ
00014	ALN RECHK	RECHK	EXIT
00015	P51-ACQ STAR	CONT	CRS ALN
	P52 SPFY { PRO: PICAPAR, X/Y MK; E: MAN SPFY, X/Y MK; V32E: CRSR/SPRL MK; ROD BKUP		
00016	NOTE LGC REJ MK SETS (R2=REJ MK PRS)	CONT	REDO
00062	LGC PWR DN	CONT	
00201	RR SW - LGC	CONT	MAN ACQ (P20 ONLY)
00203	SW-PGNS/AUTO OR SW-AUTO THRTL (PGNS/AUTO, NOT STAGED)	CONT	MAN BURN MAN THRTL
00205	CSM ACQUIRE	LOCK	ATT MNVR
00500	SW LR ANT TO POSN 1 (DES, WT 10, AUTO)	CONT	LR AT POSN 1

PGNS/AGS SUMMARY CARD

(LUMINARY 210/FP-8)
REV: 1 DATE: 6/3/71

Prepared for FPRB/MSC by TRW Systems under Task ASPO 81C-3

VERB LIST

01-05 DISPLAY OCTAL
06 DISPLAY DECIMAL
07 DP DEC DSPLY (≤N38)
11-15 MONITOR OCTAL
16 MONITOR DECIMAL
17 DP DEC MON (≤N38)
21-25 LOAD DATA
27 01 DSPLY FIXED MEMORY
30 EXECUTIVE(PRE/L N26)
31 WAITLIST (PRE/L N26)
32 RECYCLE
33 PROCEED (REQ W/ V21-V23)
34 TERMINATE (EXCEPT N49,60,63,88)
35 TEST LITES (P00)
36 FRESH START
37 CHANGE PROGRAM
40 20 ZERO ICDU'S
40 72 ZERO RR CDU'S
41 20 IMU CRS ALN
41 72 RR CRS ALN
42 GYRO TORQ
43 LOAD FDAI ERROR NEEDLES (P00)
44 TERM RR DESIGNATE
47 INITIALIZE AGS
48 DAP DATA LOAD
49 CREW ATT MNVR (P00)
50 PLEASE PERFORM
52 REQST CURSOR MK
53 REQST SPIRAL MK
54 REQST X OR Y MK
55 INCRMT CLK (H,M,S)
56 TERM TRACKING
57 PERMIT LR UPDTS
58 INHIBIT LR UPDTS
59 CMD LR TO POSN 2
60 DAP ATT RTS (ERR NDLS)
61 DAP FOLLOW ATT ERROR (MODE 1 ERR NDLS)
62 TOTAL ATT ERR (N22-N20) (MODE 2 ERR NDLS)
63 RR/LR SELF-TEST
64 S-BAND ANT (06 51)
65 DISABLE U-V JETS
66 LM SV TO CSM SLOTS
67 DSPLY W-MATRIX RSS ERROR (06 99)
68 TERM TERRAIN MODEL
69 FORCE RESTART
70 LIFTOFF TIME UPDT (P27)
71 BLOCK ADRS UPDT (P27)
72 SINGLE ADRS UPDT (P27)
73 LGC CLK OCT UPDT(P27)
74 START ERASABLE DUMP
75 ENABLE U-V JETS
76 MINIMUM IMPULSE
77 RATE CMD/ATT HOLD
78 START LR SPURIOUS TEST
79 STOP LR SPURIOUS TEST
80 UPDT LM SV (P20)
81 UPDT CSM SV (P20,P22)
82 ORBIT PMTR DSPLY(16 44)
83 RDZ PMTR DSPLY (16 54)
85 DSPLY RR LOS AZ, ELEV ≤ (16 56)
89 RDZ FNL ATT MNVR(P00)
90 RDZ OUT-OF-PLANE DSPLY (06 90)
91 DSPLY BANKSUM (P00) (BK SUM,BK,BUGGER / NEXT BANK-PRO / TERM-V34E)
93 ENABLE W-MATRIX INITIALIZATION
95 INHIBIT SV UPDTS(P20,P22)
96 STOP SV INTEGRATION
97 PERFORM ENGINE FAIL PROCEDURE
99 ENABLE ENGINE IGN

NOUN LIST

* - LEGIT LOADABLE NOUN & DATA VALID ANYTIME NOUN CALLED
V - DATA VALID ANYTIME NOUN CALLED
L - LEGIT LOADABLE NOUN
X - LEGIT LOADABLE NOUN(HR, MIN, .01S) (IF LOAD, ENTR R1, R2, R3)

01, 02, 03 * SPECIFIED OCT ADRS

DSPY	OCT	DEC
N01	[OCT]	[.XXXXX]
N02	[OCT]	[XXXXX.]
N03	[OCT]	[.01°]

04 GRAVITY ERR ≤ [.01°(R1)]
05 SIGHT ≤ DIFF/SV-RR LOS ≤ [.01°(R1)]
06 L OPTION CODE[OCT] (SEE P21, P22, P52, P57)
07 L ADRS/CHNL, BIT ID, ACTION [OCT] (SEE "FLAGWRD/CHNL SET/RESET")
08 V ALARM DATA [OCT] (ALMCADR, "BBCON", ERCOUNT)
09 V ALARM CODES [OCT] (1ST, 2ND, MOST RECENT ALM)
10 * SPECIFIED CHNL [OCT(R1)]
(CAN'T 34, READ 35 | CAN'T 3, 4, 7, 15 / LOAD 16, 30, 31, 32 / IF LOAD CH 33, RESETS BITS 15-11)
11 X T CSI OR T APOAPSIS [H, M, .01S] (0,0,0 = COMPUTE T APOAPSIS)
12 L OPTN CODE [OCT (0000X, 0000Y)]

X (SPFY)	Y=1	Y=2
V82 2 (VEH)	LM	CSM
V89 3 (TK ATT)	+Z	+X
V63 4 (RADAR)	RR	LR
41 72 6 (RR FN)	LOCK	DESIG

13 X T CDH [H, M, .01S]
15 * INCREMENTED OCT ADRS [OCT(R1)]
16 X T EVENT [H, M, .01S] (AGSK = PRSNT T IF V32E (V47) (0,0,0 = PRSNT T (V90)
18 AUTO MNVR FDAI ≤ -R, P, Y [.01°]
20 V PRSNT ICDU'S - Y, P, R [.01°]
21 V PIPA PULSES X, Y, Z [XXXXX.]
22 L DSRD NEW ICDU'S - Y, P, R [.01°]
24 L LGC CLK ΔT [H, M, .01S]
25 SEE "V50 CHECKLIST" [OCT(R1, R2)]
26 * PRIO/DELAY, ADRES, "BBCON" [OCT] (SEE V30, V31)
27 * SELF-TEST ON/OFF SW [OCT(R1)] (START: 00010 (ALL), 00004(ERAS), 00005(FIXED) | STOP: 00000 (ALSO V36, V91))
32 T FROM PERIGEE [H, M, .01S]
33 X TIG [H, M, .01S]
34 X T EVENT [H, M, .01S] (0,0,0 = PRSNT T)
35 TFI/TCO [H, M, .01S]
36 V LGC CLOCK TIME [H, M, .01S]
37 X T TPI [H, M, .01S]
38 V INTEG SV TIME TAG [H, M, .01S]
40 TFI/TCO, VG, ΔVM [M:S, .1FPS, .1FPS]
42 HA, HP, VG [.1NM, .1NM, .1FPS]
43 LAT, LON, ALT [.01°, .01°, .1NM] (+N, +E, +> RLS)
44 HA, HP, TFF [.1NM, .1NM, M:S] (TFF = -59 59 IF HP > 35K FT)
45 V/R1 MKS, TFI, +MGA [X., M:S, .01°] (R3 = -00001: NOT FINAL; R3 = -00002: P7X OR FNL, NO ALN; R3 = +MGA: FNL, IMU ALN)
46 L DAP CONFG, CHANBKUP [OCT(R1,R2)] (CONFG: SEE "DAP DATA LOAD"; CHANBKUP: IGNORE SPFY DSCRT / 00001 - ABORT/ABORT STAGE / 00010 - AUTO THRTL / 00011 - BOTH DSCRTS)
47 * LM WT, CSM WT [LBM (R1, R2)]
48 L DPS P, R GMBL TRIM [.01°(R1, R2)]
49 ΔR, ΔV, SOURCE [.01 NM, .1FPS, X.] (X=1 RANGE, X=2 RNG RT, X=3 SHFT, X=4 TRUN/DSRD S-BAND P, Y ≤ [.01°(R1, R2)]
52 ACT VEH CENTRL ≤ [.01°(R1)] (AVOID 170° - 190° REGION)
54 RANGE, RDOT(-CLOSE), +Z/HORZ ≤ [.01 NM, .1FPS, .01°]
55 L P32: APSIS, ELEV, CODE [X..,01°, Y] (Y=0: CDH AT APSIS SPFY BY R1) (Y≠0: CDH AT (R1)x(180°))
L P34: CODE, ELEV, TRANSFER ≤ [X., .01°, .01°] (X=0 CONIC, X≠0 ENCKE | ELEV=0 T OPTN, ELEV≠0 ≤ OPTN)
56 RR LOS AZ, ELEV [.01°(R1, R2)] (AZ+/LM Z, ELEV+/Y)
58 PREDICT POST-TPI HP, TPI ΔV, TPF ΔV [.1NM, .1FPS, .1FPS]
59 LOS ΔV VEC (FWD, RT, DN IF BORE ≤, IN-PLANE, HEADS-UP) [.1FPS]
60 V(+Z), HDOT(-/H↑), H[.1FPS, .1FPS, FT]
61 TG (AIM PT), TFI, XR (+/LS N) [M:S, M:S, .1NM]
62 VI, TFI, ΔVM [.1FPS, M:S, .1FPS]
63 ΔH (LR-PGNS), HDOT(-/H↑), H [FT, .1FPS, FT]
64 TR: LPD, HDOT(-/H↑), H [S:°, .1FPS, FT]
65 V SAMPLED LGC TIME [H, M, .01S] (IF LGC/CMC CLK SYNC, V06N65...E, SYNC W/ CMP; V55 ΔT = CSM T - LM T)
66 V/R2 LR SR, ANT POSN [FT, X. (R1, R2)] LR VX, VY, VZ [FPS]
67 RNG(+Z), TG(BRK), VI[.1NM, M:S, .1FPS]
68 RNG(+Z), TG(BRK), VI[.1NM, M:S, .1FPS]
69 L LS UPDT Z, Y, X (DN-R, XR, ALT) [FT]
70 L AOTCODE (00YXX) [OCT(R1)] (XX = STAR ID; Y=0 COAS/LPD CAL (P52 ONLY); Y=1-6 AOT (L, F, R, RR, CL, LR); Y=7 COAS)
71 L AOTCODE, X/CRSR, Y/SPRL CTR [OCT (R1 SAME AS N70 EXCPT NO DTNT 0) R2, R3 = POINTER: CTR (1-4 + LAST)]
72 RR TRUN (↦), SHFT (1) [.01°(R1, R2)]
73 L DSRD RR TRUN, SHFT [.01°(R1, R2)]
74 TFI, PITCHOVR Y, P [M:S, .01°, .01°]
75 P32: CDH ΔH, CSI/CDH ΔT, CDH/TPI ΔT P33: CDH ΔH, CDH/TPI ΔT, TPI SLIP [.1NM, M:S, M:S]
76 L DSRD VHORZ(FNL), HDOT(FNL), XR [.1FPS, .1FPS, .1NM]
77 TCO, VGY(BODY), VI[M:S, .1FPS, .1FPS]
78 RR RNG, RNG RT(-CLOSE), TFI [.01NM, .1FPS, M:S]
79 L CRSR, SPRL, DTNT [.01°, .01°, X.] (X=1-6 AOT-L, F, R, RR, CL, LR)
80 RR SEARCH DATA IND, LOS/+Z ≤ [XXXXX., .01°(R1, R2)] (+00000 = SEARCH; +11111 = LOCK)
81 L ΔV(LV) VEC (FWD, RT, DN) [.1FPS]
82 CDH ΔV(LV) VEC (FWD, RT, DN)[.1FPS]
83 ΔV(BODY) VEC (UP, RT, FWD) [.1FPS]
84 L ΔV(CSM LV) VEC (FWD, RT, DN)[.1FPS]
85 VG(BODY) VEC (UP, RT, FWD) [.1FPS]
86 N86 = N81
87 L COAS AZ (+RT), EL (+ UP) [.01°(R1, R2)]
88 L CELEST BODY UNIT VEC [.XXXXX]
89 L LS LAT (+N), LON/2 (+E), ALT [.001°, .001°, .01NM]
90 Y, YDOT, PSI [.01NM, .1FPS, .01°]
(Y, YDOT ⊥ CSM PL; PSI = LOS/LM PL)
91 ALT, VI, FLT PATH ≤ [10NM, FPS, .01°]
92 THRTL, HDOT(-/H↑), H [%, .1FPS, FT]
93 Δ GYRO TORQ ≤ X, Y, Z [.001°]
94 VGX(BODY), HDOT(+/H↑), H [.1FPS, .1FPS, FT]
99 L W-MATRIX POSN, VEL, RR BIAS ERRS [FT, .1FPS, MILLI-RAD]

ROUTINE CROSS-REF

R03/V48	R36/V90
R04/V63	R47/V47
R05/V64	R56/V56
R30/V82	R62/V49
R31/V83	R63/V89
R33/V06N65	R77/V78

V50 CHECKLIST

R1	PLEASE PERFM	"PRO"	"E"
00013	CRS ALN	NORM	PLS TORQ
00014	ALN RECHK	RECHK	EXIT
00015	P51-ACQ STAR	CONT	CRS ALN
	P52 / SPFY: PRO: PICAPAR, X/Y MK; E: MAN SPFY, X/Y MK; V32E: CRSR/SPRL MK; ROD BKUP		
00016	NOTE LGC REJ MK SETS (R2=REJ MK PRS)	CONT	REDO
00062	LGC PWR DN	CONT	
00201	RR SW - LGC	CONT	MAN ACQ (P20 ONLY)
00203	SW-PGNS/AUTO OR SW-AUTO THRTL (PGNS/AUTO, NOT STAGED)	CONT	MAN BURN
		CONT	MAN THRTL
00205	CSM ACQUIRE	LOCK	ATT MNVR
00500	SW LR ANT TO POSN 1 (DES, WT 10, AUTO)	CONT	LR AT POSN 1

PGNS/AGS SUMMARY CARD

(LUMINARY 210/FP-8)
REV: 1 DATE: 6/3/71

Prepared for FPRB/MSC by TRW Systems under Task ASPO 81C-3

N49 ACCPT CRITERIA

PRE-DIR RDZ/CSI W-MAT	ACCPT LMTS	POST-DIR RDZ/CSI W-MAT	ACCPT LMTS
+10000	ΔR < +00200	+02000	ΔR < +00080
+00100	ΔV < +00120	+00020	ΔV < +00050
+00015		+00005	

- 06 49 IF ΔR > 2K FT (R1 > +00033) OR ΔV > 2 FPS (R2 > +00020)
- 06 49 SOURCE CODE SPFY BY R3 = +0000X: X=1 RNG, X=2 RNG RT, X=3 SHFT, X=4 TRUN
- REJ 1ST MK IF R1 OR R2 > ACCPT LMTS, BUT ACCPT 2ND MK IF IT AGREES W/ 1ST MK
- VFY DOWNWARD TREND IN MAG OF CORR (IF TREND NOT↓, CHK RR OPERATION)

P20

V37E20E
TK ATT MNVR
IF NOT PGNS, AUTO BYPASS TK ATT (N18 = DSRD FDAI)
MNVR W/O DSPLY IF POINT ERR < 15°
50 18 (AUTO) PRO, 50 18, E (MAN) MNVR, E
AUTO/SLEW/LGC SW GOVERNS LOGIC: IF "LGC" → RR AUTO; OTHER → RR MAN

RR MAN -ACQ
50 25(00201) (AUTO ACQ) RR SW - LGC, PRO → RR AUTO; E (MAN ACQ)
50 25 (00205) (NO ACQ) E → TK ATT & RTN (LOCK-ON) RR SW - LGC, PRO → UPDT
OR

RR AUTO -ACQ
IF LOS > MODE 1, 2 LMTS → TK ATT
50 72, VFY ACQ, PRO → UPDT
IF NO LOCK-ON: 05 09 (00503) (REDES) V32E → RR AUTO; (SEARCH) PRO; 16 80 [VFY LOCK] (NO ACQ) V32E → TK ATT & RTN (LOCK-ON) PRO → TK ATT → UPDT

UPDT -SV
DSKY BLANKS OR OLD DSPLY RTNS IF P20 IN BKGRND
TAKE MKS OR SEL NEW PROG AS REQ
IF EXCESSIVE UPDT: 06 49 (PART REJ) V32E, (ACCPT MK) PRO, (TOTAL REJ) V34E → UPDT
IF SV/RR LOS > 3°: 05 09 (00525), PRO; 06 05 (REDES) V32E → RR AUTO; (CONT) PRO → UPDT
IF SV/RR LOS > 30°: → TK ATT → UPDT

POSSIBLE/AVAILABLE SEE P20/P22 COMMON

P22

V37E22E
04 06 (00012, 0000X) (X=1/SAME) PRO (X=2/NEW) L, PRO; 06 33, L, PRO
IF RNG > 400NM: IF RDOT - 16 54 | IF RDOT + → F V37
IF RR MODE SW "SLEW" OR "AUTO": 50 25 (00201) SEL "LGC", PRO
IF NO LOCK-ON: 05 09 (00503) (REDES) V32E (SEARCH) PRO; 16 80 (ACQ), PRO

UPDT -SV
DSKY BLANKS TRACK CSM AS REQ
IF EXCESSIVE UPDT: 06 49 (PART REJ) V32E, (ACCPT MK) PRO, (TOTAL REJ) V34E → UPDT
IF SV/RR LOS > 3°: 05 09 (00525), PRO; 06 05 (REDES) V32E (CONT) PRO → UPDT

POSSIBLE/AVAILABLE: SEE P20/P22 COMMON

P20/P22 COMMON

P20/P22 POSSIBLE
05 09(00503,00514,00525)
05 09(00501) (P20 ONLY)
05 09(00530) (P22 ONLY)
06 49
50 18 (P20 ONLY)
PROG LITE/V05N09E
00210, 00220, 00515
00520, 00527, 31210
00526 (P20 ONLY)
20607 (P22 ONLY)

P20/P22 AVAILABLE
N18, V80 (P20 ONLY)
N38, N45, N54, N72
N78; V56, V67, V81
V93, V95

RR SELF-TEST

IF SET "NORRMON": V25N07E 101E, 10E, 1E
V63E 04 12, PRO
IF NOT PGNS, AUTO 50 25 (00201) RR SW - LGC, PRO
16 72, PRO; 16 78 (TERM) V34E (CONT) V32E → 16 72

P06

V37E06E
50 25 (00062) IMU OPR - OPEN, PRO

P12

V37E12E
06 33, L, PRO; 06 76, PRO
IF NOT PGNS, AUTO 50 25 (00203) (AUTO BURN) SET SW, PRO (MAN BURN) E
06 74; 99 74(TIG-5), PRO; 06 74(T < TIG); 06 94, ...V16N77E [16 77], KREL; 06 94; 16 94, PRO; 16 85, NULL, V82E [16 44], PRO; 16 85, PRO; 37

POSSIBLE
05 09 (0060X) X = 0 THRU 6
P20 IN BKGRND 05 09 (00525); 06 49; 50 18

AVAILABLE
97 94 (NOT ON L/O) PROG LITE/V05N09E 00210, 00220, 01703
X-AXIS OVERIDE OK AFTER P/OVR
N32(IF R30), N38, N76 N77; V60, V61, V62 V82, V83, V85(T < TIG)

P21

V37E21E
04 06 (00002, 0000X) (X=1/LM) PRO (X=2/CSM) L, PRO; 06 34, L, PRO; 06 43, N91E [06 91], KREL; 06 43 (RCYCL) V32E (T=T+10 MIN) → 06 34 (EXIT) PRO; 37

AVAILABLE
N38, N91

P25

V37E25E
IF NOT PGNS, AUTO NO ATT MNVR (N18)
MNVR W/O DSPLY IF POINT ERR < 15°
50 18 (MAN) MNVR, E (AUTO) PRO; 50 18, E [SELECT NEW PROG]
POSSIBLE
50 18
PROG LITE/V05N09E
00210, 00220
AVAILABLE
N18, N78; V56

P27

563+0 IF AGS ON
V37E00E
V7XE (X = 0, 1, 2, 3) 21 01, L; 21 02 (REVIEW) V01N01E N15E, E...E, KREL (CHANGE) ID XXE → 21 01 (ACCPT) V33E
P00

P30

V37E30E
06 33, L, PRO; 06 81, L, PRO; 06 42, PRO; 16 45, PRO; 37

P32,P72

V37E32E/V37E72E
06 11 (T APO) PRO, ON 0, 0, 0 (T CSI) L, PRO; 06 55, L, PRO; 06 37, L, PRO; 16 45 (RCYCL) V32E; 06 75, PRO; 06 81, PRO; 06 82, PRO; (FINAL) PRO; 06 75, PRO; 06 81, V90E [06 90], PRO; 06 81, L(-), PRO; 06 82, PRO; 16 45, PRO; 37

POSSIBLE
05 09 (0060X) X = 0 THRU 6
P20 IN BKGRND 05 09 (00525); 06 49; 50 18
AVAILABLE
N13; V56, V90

P33,P73

V37E33E/V37E73E
06 13, L, PRO; 16 45 (RCYCL) V32E; 06 75, PRO; 06 81, PRO; (FINAL) PRO; 06 75, PRO; 06 81, V90E [06 90], PRO; 06 81, L(-), PRO; 16 45, PRO; 37

POSSIBLE
05 09 (00611)
P20 IN BKGRND 05 09 (00525); 06 49; 50 18
AVAILABLE
N37; V56, V90

P34,P74

V37E34E/V37E74E
06 37, L, PRO; 06 55 (T OPTN) PRO (OPTN) L(R2), PRO; 16 45 (RCYCL) V32E (FINAL) PRO
IF ELEV ≤ OPTN 06 37, PRO
IF TIME OPTN 06 55, PRO; 06 58, PRO; 06 81, PRO/L, PRO
IF RCYCL → 16 45 (ABOVE); 16 45, PRO; 37

POSSIBLE
05 09 (00611)
P20 IN BKGRND 05 09 (00525); 06 49; 50 18
AVAILABLE
N52, N59; V56, V90

P35,P75

V37E35E/V37E75E
16 45, PRO
DON'T V32E(RCYCL) ON 16 45
06 81, PRO/, L, PRO; 16 45, PRO; 37

POSSIBLE
P20 IN BKGRND 05 09 (00525); 06 49; 50 18
AVAILABLE
N52, N59; V56, V90

P40,P42

V37E40E/V37E42E
50 18 (AUTO) PRO, 50 18, E (MAN) MNVR, E
IF NOT PGNS, AUTO 50 25 (00203) (AUTO BURN) SET SW, PRO (MAN BURN) E → 06 40
IF P40 BUT NOT AUTO THRTL 50 25 (00203) (AUTO) SET SW, PRO (MAN) E
06 40; 99 40(TIG-5), PRO; 06 40; 16 40, PRO; 16 85, NULL, PRO; 37

POSSIBLE
05 09 (01706), 97 40
PROG LITE/V05N09E
00210, 00220, 01407
01703
AVAILABLE
V22N46E, 10E IF AUTO THRTL DSCRT FAIL
X-AXIS OVERRIDE OK
N18, N81, N86
V60, V61, V62, V82
V65, V75(DOCK ONLY)

P34,P74

V37E41E
50 18 (AUTO) PRO, 50 18, E (MAN) MNVR, E; 16 85
F16 85, NULL, PRO; 37

POSSIBLE
PROG LITE/V05N09E
00210, 00220, 01703
AVAILABLE
IF 16 40 KEYED, 16 85 DSPLY RESTORED VIA: • N85E • LGC AT TIG-30
X-AXIS OVERRIDE OK
N18, N40, N81, N86
V60, V61, V62, V82

P41

P47

V37E47E
16 83 (RCYCL) V32E (RSET N83 = 0, 0, 0) (EXIT) PRO; 37

POSSIBLE
PROG LITE/V05N09E
00210, 00220
AVAILABLE
V82, V83

P51

V37E51E
50 25 (00015), MNVR (CRS ALN) E; 41 22 (0, 0, 0) (CONT) PRO → X/Y MK
*06 05 (REDO) V32E → 50 25 (00015) (ACCPT) PRO; 37

POSSIBLE
SEE "ALN ALARMS"
AVAILABLE
V76, V77 ONLY

P52

V37E52E
04 06 (00001, 0000X) (X=1/PREF) L, PRO (X=2/NOM) L, PRO; 06 34, L, PRO (X=3/REFS) L, PRO → 50 25 (00015) (X=4/LS) L, PRO; 06 34, L, PRO; 06 89, PRO
06 22 (V PRED MGA) (REJ) MNVR, V32E (ACCPT) PRO
50 25 (00013) (NORM) PRO (PLS TORQ) V76E, E; 16 20 (Y, Z, X); 50 25 (00014) (CONT) PRO (TERM/F V37) E
50 25 (00015) (PICAPAR) PRO → AUTO OPTICS (SPFY/NORM) E → AUTO OPTICS (CRSR/SPRL) V32E → INFLT CRSR
SELECT V32 IF ROD BACKUP

AUTO OPTICS

01 70, L, PRO
IF COAS/LPD OR COAS (DTNTS 0, 7) 06 87, L, PRO
IF PLANET 06 88, L, PRO
50 18 (AUTO) PRO; 50 18, E (MAN) MNVR, E
IF COAS/LPD CAL → 01 70 → X/Y MK

INFLT CRSR

01 70, L, PRO
IF PLANET 06 88, L, PRO
06 79 (RESEL) V32E → 01 70 (ACCPT) PRO → CRSR/SPRL MK
*06 05 (ACCPT) PRO (REJ) V32E → 50 25 (00014)
06 93 (TORQ) PRO (REJ) V32E; 50 25 (00014) (EXIT) E
IF LGC REJ MKS (R2): 50 25 (00016, 0000X) (CONT) PRO (REDO) E → 01 71
REDO IF ALL MK SETS REJ (29/28.5°)
IF PLANET 06 88, L, PRO
IF MK ON 2ND STAR REQ, → CRSR/SPRL MK; OTHERWISE → *06 05

STAR ID

00 PLANET 46 SUN
01-45 STAR 47 EARTH
50 MOON

1	ALPTZ	AKMAR	6
2	DPHDA	AKNAR	4
3	NAVI	ACRUX	25
4	AKNAR	ALDBN	11
5	POLRS	ALKAD	27
6	AKMAR	ALFRD	21
7	MNKAR	ALFKA	32
10	MRFAK	ALPTZ	1
11	ALDBN	ALTAR	40
12	RIGEL	ANTRS	33
13	CAPLA	ARCTS	31
14	CNPUS	ATRIA	34
15	SIRUS	CNPUS	14
16	PRCYN	CAPLA	13
17	REGOR	DABIH	41
20	DNCES	DENEB	43
21	ALFRD	DNBLA	23
22	RGLUS	DPHDA	2
23	DNBLA	DNCES	20
24	GIENA	ENIF	44
25	ACRUX	FMHLT	45
26	SPICA	GIENA	24
27	ALKAD	MNKAR	7
30	MNKNT	MNKNT	30
31	ARCTS	MRFAK	10
32	ALFKA	NAVI	3
33	ANTRS	NUNKI	37
34	ATRIA	PECOK	42
35	RSLHG	POLRS	5
36	VEGA	PRCYN	16
37	NUNKI	RSLHG	35
40	ALTAR	REGOR	17
41	DABIH	RGLUS	22
42	PECOK	RIGEL	12
43	DENEB	SIRUS	15
44	ENIF	SPICA	26
45	FMHLT	VEGA	36

X/Y MK

01 71, L/VFY, PRO
IF COAS (DTNT 7) 06 87, L, PRO
54 71 (MKS) ANY ORDER (UP TO 5 MK SETS) (SW REJ POINTER) E (NEW STAR) V32E → 01 71 (DONE) PRO
IF PLANET 06 88, L, PRO
1ST STAR → X/Y MK; 2ND STAR → *06 05

CRSR/SPRL MK

01 71, L/VFY, PRO
IF PLANET 06 88, L, PRO
XX 71 XX = 52 (CRSR) XX = 53 (SPRL)
(REVERSE XX) E (MKS) X, Y MK/ROD (UP TO 5 MK SETS)
YY 79 | YY | LOAD: 21 CRSR, 22 SPRL
06 79, PRO (NEW STAR) V32E → 01 71 (DONE) PRO
IF LGC REJ MKS (R2): 50 25 (00016, 0000X) (CONT) PRO (REDO) E → 01 71
REDO IF ALL MK SETS REJ (29/28.5°)
IF PLANET 06 88, L, PRO
IF MK ON 2ND STAR REQ, → CRSR/SPRL MK; OTHERWISE → *06 05

P57

V37E57E
04 06 (00001, 0000X) (X=1/PREF) L, PRO (X=2/NOM) L, PRO (X=3/REFS) PRO (X=4/LS) L, PRO; 06 34, L, PRO
05 06 (00010, R2, R3) L(R2), PRO
R2 = 0000X (A/T) X=0 REFS/STO ATT X=1 REFS + GRAV X=2 TWO STARS X=3 STAR + GRAV
R3 = 00RA0 (1 = YES/0 = NO) R = REFSMMAT A = STO ATT

A/T #0

IF TORQ ≤ > 5° 06 22, PRO
50 25 (00014), E; 37

OR

A/T #1 OR #3

"NO ATT" LITE ON, OFF (TWICE)
IF MON CRS ALN V16N20E R1 = +04200 R2 = +31800 R3 = +03526 KREL
06 04 (REDO) V32E "NO ATT" (ACCPT) PRO
IF TORQ ≤ >5° 06 22, PRO
IF A/T#1→*06 05; IF A/T#3→ CRSR/SPRL MK

OR

A/T #2

IF REFS/STO ATT & IF TORQ ≤ >5° 06 22, PRO
IF NO REFS → CRSR/SPRL MK
01 70, L, PRO
IF PLANET 06 88, L, PRO
06 79 (RESEL) V32E → 01 70 (ACCPT) → CRSR/SPRL MK
*06 05 (ACCPT) PRO (REJ) V32E → 50 25 (00014)
06 93 (TORQ) PRO (REJ) V32E; 50 25 (00014) (EXIT) E
IF A/T #2 06 89, PRO
IF A/T #2, #3 RECHK DSRD, PRO W/REFS → 01 70 W/ NO REFS → CRSR/SPRL MK
37
POSSIBLE
05 09 (00404, 00701)
SEE "ALN ALARMS"

ALN ALARMS

PROG LITE/V05N09E
00111, 00112, 00113
00115, 00210, 00211
00217, 31207, 31211
(P52: 00220, 00401)

P63

V37E63E
06 61, N33E
[06 33], KREL, PRO
50 18 (AUTO) PRO; 50 18, E (MAN) MNVR, E
IF NO PGSN 1 DSCRT 50 25 (00500) (AT POSN 1) E (AT POSN 2) LDG ANT-DES; WT 10 SEC, AUTO, PRO
IF NOT PGNS, AUTO 50 25 (00203) (AUTO BURN) SET SW, PRO (MAN BURN) E → 06 94
IF NOT AUTO THRTL 50 25 (00203) (AUTO) SET SW, PRO (MAN) E
06 94, V16N77E [16 77], KREL; 06 94; 16 94, PRO; 16 85, NULL, V82E [16 44], PRO; 16 85, PRO; 37

POSSIBLE
97 94
AVAILABLE
X-AXIS OVERRIDE OK IF H > 25K FT OR HDOT > 40 FPS
V47, V60, V61, V62
V82, V83; N76, N77

P64

P64 SELECT VIA LGC
F06 64....PRO (REDES) 06 64
P66 SELECT WHEN • CREW SELECT • A/T + RED SW • TR = 0 (REDES ΔT) (LGC AUTO SELECT)
POSSIBLE
PROG LITE/V05N09E
00511, 00520, 01406, 01410
AVAILABLE
NO X-AXIS OVERRIDE
N92; V47, V57, V58, V59
V60, V61, V62, V68

P66

CREW/LGC SELECT P66
06 60 (TOUCHDOWN) ENG STOP-PUSH PRO (OR V32E) ENG ARM-OFF (EXIT) V37E68E
P68
POSSIBLE
PROG LITE/V05N09E
00511, 00520, 01410, 01466
AVAILABLE
NO AXIS OVERRIDE WHEN IN AUTO ATT
N92; V47

P68

V37E68E
06 43, A/H, PRO
37

P70,P71

IF DPS ABORT V37E70E OR ABORT PB
OR
IF APS ABORT V37E71E OR ABORT STAGE PB
NOT PGNS, AUTO 50 25 (00203) (AUTO BURN) SET SW, PRO (MAN BURN) E → 06 94
IF P70 BUT NOT AUTO THRTL 50 25 (00203) (AUTO) SET SW, PRO (MAN) E
06 94, V16N77E [16 77], KREL; 06 94; 16 94, PRO; 16 85, NULL, V82E [16 44], PRO; 16 85, PRO; 37

POSSIBLE
97 94
AVAILABLE
X-AXIS OVERRIDE OK IF H > 25K FT OR HDOT > 40 FPS
V47, V60, V61, V62
V82, V83; N76, N77

P76

V37E76E
06 33, L, PRO
06 84, L, PRO
37

P77

V37E77E
06 33, L, PRO
06 81, L, PRO
37

IMU CRS ALN

V41N20E
21 22, L(O, I, M), PRO
41 (NO ATT LITE)

RR CRS ALN

V41N72E
21 73, L
04 12, (00006, 0000X) (X=1/ACQ) L, PRO (X=2/DESIG) PRO
41, V16N72E [16 72] (TERM DESIG VIA V44E)

LR SELF-TEST

V63E
04 12, L(R2=2), PRO
16 66, PRO
16 67 (TERM) V34E (CONT) V32E → 16 66

RDZ FNL ATT MNVR (P00)

V89E
04 12 (00003, 0000X) (X=1/+Z) PRO (X=2/+X) L, PRO
06 18 (REDO) V32E (ACCPT) PRO
50 18 (AUTO) PRO; 50 18, E (MAN) MNVR, E

ALARM CODES

P - PROCEDURAL PH - PROCEDURAL/HARDWARE
I - INPUT DATA PI - PROCEDURAL/INPUT DATA
H - HARDWARE

00111	P	NO COMPLETE MK SET	REDO MK SEQUENCE
00112	P	MK, MK REJ, ROD (BKUP) NOT LEGAL AT PRSNT T	CONT
00113	PH	UNEXPECTED MK RUPT (NO CHNL 16 INBITS)	IF P52 ROD BKUP MK, RESEL P52 W/ CRSR, SPRL MK OPTN; CHNL FAIL IF RECURRING ALM - NOTIFY MSFN
00115	P	ILLEGAL MK REJ (NO SUCH MKS PRSNT)	CONT
00206	P	DON'T ZERO ICDU'S IF GMBL LOK + CRS ALN	CRS ALN TO 0,0,0 THEN V40N20E
00207	PH	ISS TURN-ON REQST NOT PRSNT 90 SEC	PNL 11 CB (IMU OPR)-OPEN; WT 3 MIN, THEN RECLOSE; IF ALM RECURS BUT NO ISS WARN, CONT
00210	PH	IMU NOT ON (TERM VIA F V37)	PNL 11 CB (IMU OPR)-OPEN; WT 3 MIN, THEN RECLOSE; V36E NOTIFY MSFN, CONT
00211	H	CRS ALN ERR > 2°	IF P51, 41 20, REDUCE S/C DRIFT & CONT; IF P52, P57, CONT (RECRD N93) THEN DO 50 25(00014) RECHK
00212	H	PIPA FAIL BUT PIPAS NOT BEING USED	SEE ISS MALFN PROCEDURES
00213	H	TURN-ON REQST BUT NO IMU-OPR SIGNAL	SEE ALM 00210
00214	PH	IMU TURNED OFF WHILE IN USE BY PROG	TERM PROG
00217	H	BAD RETURN FROM IMU STALL	RESEL PROG; IF ALM RECURS, ISS MODE SW FAIL; SEE ALM 00211
00220	P	BAD REFSMMAT (TERM VIA F V37)	ALN IMU; IF ALIGNED, SET REFSMMAT FLAG (N07: 77E, 10000E, 1E)
00401	I	APPROACH GMBL LOK (MGA >70°); OR DSRD MGA IS EXCESSIVE	CALL N22 & MNVR TO REDUCE MGA, OR REALN IMU
00402	P	DAP STEERING LOST	SW GUID CONT - AGS
00404	I	SPFY STAR NOT VISIBLE AT ANY AOT DTNT	PRO (SPFY CRSR/SPRL) OR V32E (DIFF STAR)
00405	I	PICAPAR FAIL - TWO STARS NOT VISIBLE IN AOT FOV (DTNT 2)	PRO (CREW SPFY STAR) OR MNVR & V32E (REDO PICAPAR)
00421	I	W-MATRIX OVERFLOW	CONT (LGC RE-INIT)
00501	I	RR OUT-OF-MODE LIMITS	V32E (TK ATT MNVR) OR V34E, V56E (TERM)
00502	I	BAD RR GMBL ∡ INPUT	REPEAT 41 72
00503	I	RR ANT DESIGNATE FAIL	P20, P22: PRO(SEARCH) OR V32E(REDES); CHK MODE LMTS IF 41 72
00510	P	NO RR AUTO DSCRT DURING 40 72	RR MODE-LGC, CONT; PNL 11 CB RR(2)-CLOSE
00511	PH	NEITHER/BOTH LR ANT POSN DSCRTS PRSNT 10 SEC (20 SEC HIGATE)	LDG ANT - HOVER, NOTIFY MSFN
00514	P	REMOVED RR AUTO DSCRT WHILE IN USE	RESET RR MODE SW-LGC, OR V34E, V56E
00515	H	RR CDU FAIL DSCRT	RR-AUTO TK, AGS RR MAN; P30 (CSM/AGS)
00520	PH	UNEXPECT RADAR RUPT	CONT
00522	P	LR ANT CHANGED DURING SELF-TEST	CONT
00523	P	LR NOT IN POSN 2 (V59)	CONT
00525	I	SV/RR LOS > 3 DEG	PRO(DSPLY ERR) OR V34E, V56E (TERM)
00526	I	PREDICT RR RANGE > 400 NM	TERM P20 OR V16N54E, WT FOR RNG<400NM
00527	I	MNVR REQ(P20); LOS OUT MODE 2 LMTS(P22)	IF P20, DO TK ATT MNVR; TERM P22
00530	I	NEXT 10 MIN LOS NOT IN MODE 2 COVERAGE	PRO (TERM); RESELECT P22 AT LATER TIME
00600	I	IMAGINARY ROOTS	V32E, ADJ INPT PMTRS
00601	I	POST CSI HP < 35K FT	SEE ALM 00600
00602	I	POST CDH HP < 35K FT	SEE ALM 00600
00603	I	CSI/CDH ΔT < 10 MIN	SEE ALM 00600
00604	I	CDH/TPI ΔT < 10 MIN	SEE ALM 00600
00605	I	15 ITER & NO SOLN	SEE ALM 00600
00606	I	CSI ΔV > 1000 FPS	SEE ALM 00600
00611	I	NO TIG FOR ELEV ∡	IF P33, PRO(CONT) OR V32E (RETARG); IF P34, PRO & RESEL OPTN
00701	I	ILLEGAL ALN TECH	PRO & RESELECT A/T
00777	H	ISS WARN: PIPA FAIL	SEE ISS MALFN PROC
01102	H	LGC SELF-TEST ERROR	COPY N08, CONT
01105	H	DNLNK TOO FAST	ALM RECURS-TLM FAIL
01106	H	UPLNK TOO FAST	ALM RECURS-TLM FAIL
01107	H	RESTART FAILURE (PHASE TABLE)	DO V74, THEN P27 & V48 IF REQ; DO P51; IF ALM RECURS, LGC FAIL
01301	I	ARC SINE, ARC COSINE TOO LARGE	COPY N08, CONT
01406	I	BAD RTN-ROOTPSRS (DURING AVE-G)	CONSULT MSFN (ALM RECURS, SEL P66)
01407	P	VG INCREASING DURING BURN	TERM P40/P42 OR SW GUID CONT-AGS
01410	PI	G&N OVERFLOW	CONSULT MSFN
01412	I	NO IGN ALGORITHM	CONSULT MSFN
01466	PI	INSUFFICIENT THRTL SERVICING	SW GUID CONT-AGS SW THR CONT-MAN
01520	P	V37 NOT ALLOWED	RESELECT V37 (WT UNTIL CRS ALN, ICDU ZERO DONE)
01703	P	TIG SLIPPED	CONT; IF P63 & SMALL SLIP, MAN THRTL-UP; IF BIG SLIP, TERM PDI
01706	P	P40 SELECT BUT LM STAGED; P42 SELECT BUT LM NOT STAGED	SELECT CORR PROG IF INCORRECT; OR IF P40 RELOAD DAP (DPS); IF P42 PRO & MANUAL STAGE AT TIG-10 SEC
02001	I	JET FAIL: Y-Z TRANS	USE ALT CTRL MODE OR CHANGE QUAD ISOLATION SW
02002	I	JET FAIL: X TRANS	SEE ALM 02001
02003	I	JET FAIL: P ROTATE	SEE ALM 02001
02004	I	JET FAIL: U-V ROTATE	SEE ALM 02001
03777	H	ISS WARN: ICDU'S	SEE ISS MALFN PROC
04777	H	ISS WARN: ICDU'S, PIPAS	SEE ALM 03777
07777	H	ISS WARN: IMU	SEE ALM 03777
10777	H	ISS WARN: IMU, PIPAS	SEE ALM 03777
13777	H	ISS WARN: IMU, ICDU'S	SEE ALM 03777
14777	H	ISS WARN: IMU, PIPAS, AND ICDU'S	SEE ALM 03777

POODOO ALARMS (2XXXX)

20430	I	ORB INTEG-OVERFLOW	NOTIFY MSFN, CONT
20607	I	NO T-RADIUS OR T-THETA SOLN	RESELECT PROG
21103	I	ILLEGAL CCS BRANCH	COPY N08, CONT
21204	PI	WAITLIST-JOB/TASK W/ ZERO OR NEG ΔT	COPY N08, CONT
21302	I	SQ-ROOT W/ NEG ARG	COPY N08, CONT
21406	I	BAD RTN-ROOTPSRS (PRE-IGN ALGORITHM)	CONSULT MSFN
21501	P	ILLEGAL PINBALL	NOTIFY MSFN, CONT

BAILOUT ALARMS (3XXXX)

31104	H	DELAY ROUTINE BUSY	RESELECT EXT VERB
31201	P	EXEC-NO VAC AREAS	CONT PROG OR RESELECT EXT VERB
31202	P	EXEC-NO CORE SETS	SEE ALM 31201
31203	PI	WAITLIST-TOO MANY TASKS SCHEDULED	SEE ALM 31201
31206	P	TWO JOBS TRY TO SLEEP	SEE ALM 31201
31207	P	AOT MK-NO VAC AREAS	CONT
31210	P	TWO ROUTINES USING DEVICE AT SAME TIME (AOT, IMU, RADAR)	COPY N08; RESELECT PROG/EXT VB WHEN DEVICE NOT IN USE
31211	P	AOT MK-EXT VB ILLEGAL	CONT
31502	P	ILLEGAL FLASH DSPLY	NOTIFY MSFN, CONT
32000	P	DAP JASK STILL IN PROGRESS NEXT T5 RUPT	IF ALM RECURS, V36E, & REINITIALIZE LGC

ALARM CODES

P – PROCEDURAL PH – PROCEDURAL/HARDWARE
I – INPUT DATA PI – PROCEDURAL/INPUT DATA
H – HARDWARE

00111	P	NO COMPLETE MK SET	REDO MK SEQUENCE
00112	P	MK, MK REJ, ROD (BKUP) NOT LEGAL AT PRSNT T	CONT
00113	PH	UNEXPECTED MK RUPT (NO CHNL 16 INBITS)	IF P52 ROD BKUP MK, RESEL P52 W/ CRSR, SPRL MK OPTN; CHNL FAIL IF RECURRING ALM – NOTIFY MSFN
00115	P	ILLEGAL MK REJ (NO SUCH MKS PRSNT)	CONT
00206	P	DON'T ZERO ICDU'S IF GMBL LOK + CRS ALN	CRS ALN TO 0,0,0 THEN V40N20E
00207	PH	ISS TURN-ON REQST NOT PRSNT 90 SEC	PNL 11 CB (IMU OPR)–OPEN; WT 3 MIN, THEN RECLOSE; IF ALM RECURS BUT NO ISS WARN, CONT
00210	PH	IMU NOT ON (TERM VIA F V37)	PNL 11 CB (IMU OPR)–OPEN; WT 3 MIN, THEN RECLOSE; V36E NOTIFY MSFN, CONT
00211	H	CRS ALN ERR > 2°	IF P51, 41 20, REDUCE S/C DRIFT & CONT; IF P52, P57, CONT (RECRD N93) THEN DO 50 25(00014) RECHK
00212	H	PIPA FAIL BUT PIPAS NOT BEING USED	SEE ISS MALFN PROCEDURES
00213	H	TURN-ON REQST BUT NO IMU-OPR SIGNAL	SEE ALM 00210
00214	PH	IMU TURNED OFF WHILE IN USE BY PROG	TERM PROG
00217	H	BAD RETURN FROM IMU STALL	RESEL PROG; IF ALM RECURS, ISS MODE SW FAIL; SEE ALM 00211
00220	P	BAD REFSMMAT (TERM VIA F V37)	ALN IMU; IF ALIGNED, SET REFSMMAT FLAG (N07: 77E, 10000E, 1E)
00401	I	APPROACH GMBL LOK (MGA >70°); OR DSRD MGA IS EXCESSIVE	CALL N22 & MNVR TO REDUCE MGA, OR REALN IMU
00402	P	DAP STEERING LOST	SW GUID CONT–AGS
00404	I	SPFY STAR NOT VISIBLE AT ANY AOT DTNT	PRO (SPFY CRSR/SPRL) OR V32E (DIFF STAR)
00405	I	PICAPAR FAIL – TWO STARS NOT VISIBLE IN AOT FOV (DTNT 2)	PRO (CREW SPFY STAR) OR MNVR & V32E (REDO PICAPAR)
00421	I	W-MATRIX OVERFLOW	CONT (LGC RE-INIT)
00501	I	RR OUT-OF-MODE LIMITS	V32E (TK ATT MNVR) OR V34E, V56E (TERM)
00502	I	BAD RR GMBL ∡ INPUT	REPEAT 41 72
00503	I	RR ANT DESIGNATE FAIL	P20, P22: PRO(SEARCH) OR V32E(REDES); CHK MODE LMTS IF 41 72
00510	P	NO RR AUTO DSCRT DURING 40 72	RR MODE–LGC, CONT; PNL 11 CB RR(2)–CLOSE
00511	PH	NEITHER/BOTH LR ANT POSN DSCRTS PRSNT 10 SEC (20 SEC HIGATE)	LDG ANT – HOVER, NOTIFY MSFN
00514	P	REMOVED RR AUTO DSCRT WHILE IN USE	RESET RR MODE SW–LGC, OR V34E, V56E
00515	H	RR CDU FAIL DSCRT	RR–AUTO TK, AGS RR MAN; P30 (CSM/AGS)
00520	PH	UNEXPECT RADAR RUPT	CONT
00522	P	LR ANT CHANGED DURING SELF-TEST	CONT
00523	P	LR NOT IN POSN 2 (V59)	CONT
00525	I	SV/RR LOS > 3 DEG	PRO(DSPLY ERR) OR V34E, V56E (TERM)
00526	I	PREDICT RR RANGE > 400 NM	TERM P20 OR V16N54E, WT FOR RNG < 400 NM
00527	I	MNVR REQ(P20); LOS OUT MODE 2 LMTS(P22)	IF P20, DO TK ATT MNVR; TERM P22
00530	I	NEXT 10 MIN LOS NOT IN MODE 2 COVERAGE	PRO (TERM); RESELECT P22 AT LATER TIME
00600	I	IMAGINARY ROOTS	V32E, ADJ INPT PMTRS
00601	I	POST CSI HP < 35K FT	SEE ALM 00600
00602	I	POST CDH HP < 35K FT	SEE ALM 00600
00603	I	CSI/CDH ΔT < 10 MIN	SEE ALM 00600
00604	I	CDH/TPI ΔT < 10 MIN	SEE ALM 00600
00605	I	15 ITER & NO SOLN	SEE ALM 00600
00606	I	CSI ΔV > 1000 FPS	SEE ALM 00600
00611	I	NO TIG FOR ELEV ∡	IF P33, PRO(CONT) OR V32E (RETARG); IF P34, PRO & RESEL OPTN
00701	I	ILLEGAL ALN TECH	PRO & RESELECT A/T
00777	H	ISS WARN: PIPA FAIL	SEE ISS MALFN PROC
01102	H	LGC SELF-TEST ERROR	COPY N08, CONT
01105	H	DNLNK TOO FAST	ALM RECURS–TLM FAIL
01106	H	UPLNK TOO FAST	ALM RECURS–TLM FAIL
01107	H	RESTART FAILURE (PHASE TABLE)	DO V74, THEN P27 & V48 IF REQ; DO P51; IF ALM RECURS, LGC FAIL
01301	I	ARC SINE, ARC COSINE TOO LARGE	COPY N08, CONT
01406	I	BAD RTN–ROOTPSRS (DURING AVE–G)	CONSULT MSFN (ALM RECURS, SEL P66)
01407	P	VG INCREASING DURING BURN	TERM P40/P42 OR SW GUID CONT–AGS
01410	PI	G&N OVERFLOW	CONSULT MSFN
01412	I	NO IGN ALGORITHM	CONSULT MSFN
01466	PI	INSUFFICIENT THRTL SERVICING	SW GUID CONT–AGS SW THR CONT–MAN
01520	P	V37 NOT ALLOWED	RESELECT V37 (WT UNTIL CRS ALN, ICDU ZERO DONE)
01703	P	TIG SLIPPED	CONT; IF P63 & SMALL SLIP, MAN THRTL–UP; IF BIG SLIP, TERM PDI
01706	P	P40 SELECT BUT LM STAGED; P42 SELECT BUT LM NOT STAGED	SELECT CORR PROG IF INCORRECT; OR IF P40 RELOAD DAP (DPS); IF P42 PRO & MANUAL STAGE AT TIG–10 SEC
02001	I	JET FAIL: Y–Z TRANS	USE ALT CTRL MODE OR CHANGE QUAD ISOLATION SW
02002	I	JET FAIL: X TRANS	SEE ALM 02001
02003	I	JET FAIL: P ROTATE	SEE ALM 02001
02004	I	JET FAIL: U–V ROTATE	SEE ALM 02001
03777	H	ISS WARN: ICDU'S	SEE ISS MALFN PROC
04777	H	ISS WARN: ICDU'S, PIPAS	SEE ALM 03777
07777	H	ISS WARN: IMU	SEE ALM 03777
10777	H	ISS WARN: IMU, PIPAS	SEE ALM 03777
13777	H	ISS WARN: IMU, ICDU'S	SEE ALM 03777
14777	H	ISS WARN: IMU, PIPAS, AND ICDU'S	SEE ALM 03777

POODOO ALARMS (2XXXX)

20430	I	ORB INTEG–OVERFLOW	NOTIFY MSFN, CONT
20607	I	NO T–RADIUS OR T–THETA SOLN	RESELECT PROG
21103	I	ILLEGAL CCS BRANCH	COPY N08, CONT
21204	PI	WAITLIST–JOB/TASK W/ ZERO OR NEG ΔT	COPY N08, CONT
21302	I	SQ–ROOT W/ NEG ARG	COPY N08, CONT
21406	I	BAD RTN–ROOTPSRS (PRE–IGN ALGORITHM)	CONSULT MSFN
21501	P	ILLEGAL PINBALL	NOTIFY MSFN, CONT

BAILOUT ALARMS (3XXXX)

31104	H	DELAY ROUTINE BUSY	RESELECT EXT VERB
31201	P	EXEC–NO VAC AREAS	CONT PROG OR RESELECT EXT VERB
31202	P	EXEC–NO CORE SETS	SEE ALM 31201
31203	PI	WAITLIST–TOO MANY TASKS SCHEDULED	SEE ALM 31201
31206	P	TWO JOBS TRY TO SLEEP	SEE ALM 31201
31207	P	AOT MK–NO VAC AREAS	CONT
31210	P	TWO ROUTINES USING DEVICE AT SAME TIME (AOT, IMU, RADAR)	COPY N08; RESELECT PROG/EXT VB WHEN DEVICE NOT IN USE
31211	P	AOT MK–EXT VB ILLEGAL	CONT
31502	P	ILLEGAL FLASH DSPLY	NOTIFY MSFN, CONT
32000	P	DAP JASK STILL IN PROGRESS NEXT T5 RUPT	IF ALM RECURS, V36E, & REINITIALIZE LGC

ASCENT

VHORZ, HDOT(FNL), XR	N76
TCO, VGY(BODY), VI	N77
VGX(BODY), HDOT, H (+HDOT/H1)	N94

ORBIT/FLT PATH

HA, HP, TFF (V82)	N44
T PER (IF V82)	N32
LAT, LON, H (P21)	N43
H,VI,FLT PATH ∡ (IF P21)	N91

RAPID IMU ALIGN

V41N20E, E, E, E (CRS ALN)
FLY 0, 0, 0 ON AGS BALL
V40N20E (RELEASE IMU)
V37E51E, PRO (DFT FLG), P00
V25N07E, 77E, 10000E, 1E(REF)

RR ANTENNA

OPERATIONAL LMTS:

	MODE 1	MODE 2
TRUN(—)	305°–55°	125°–235°
SHFT(1)	290°–59°	41°–155°

RR CRS ALN 41 72
P52, P57 (0°, 283°)
DOCK (0°, 320°)
+X ACQ (180°, 270°)
+Z ACQ (0°, 0°)
TERM RR DESIG V44
RR LOS AZ, ELEV (V85) N56
(+/Z, +/Y)
PRSNT RR TRUN, SHFT ∡ N72
DSRD RR TRUN, SHFT ∡ N73

DESCENT

LS UPDT(DN–R, XR, ALT)	N69
RNG(+Z), TG(BRK), VI	N68
THRTL CMD, HDOT, H	N92
PERMIT LR UPDTS	V57
INHIBIT LR UPDTS	V58
CMD LR TO POSN 2	V59

THRUST

P40, P41, P42: TFI/TCO, VG, ΔVM	N40
VG(BODY)(UP,RT,FWD)	N85
P63, P64, P66: THRTL CMD, HDOT, H	N92
P12, P70, P71: VGX(BODY), HDOT, H	N94

ATTITUDE

PRSNT ICDU Y, P, R	N20
CREW MNVR DSRD Y,P,R	N22
DAP ATT RATES	V60
DAP FOLLOW ATT ERR	V61
TOTAL ATT ERR	V62
SET MIN IMPULSE	V76
SET RT CMD/ATT HOLD	V77
U–V JETS: YES/NO	V75/V65

RENDEZVOUS

	PGNS	AGS
RNG, RDOT, +Z/HORZ ∡	N54	317,440,277
RR RNG, RNG RT, TFI	N78	---
CDH ΔH, ΔT'S(SEE TIMES)	N75	402,372(CSI)
YDOT(TIG) (SIGN DIFF)	N90/R2	263
APSIS, ELEV ∡, TRNSFR ∡	N55	---
TPI HP, TPI ΔV, TPF ΔV	N58	402,370,371
ACT VEH CNTRL ∡	N52	---
LOS VG X, Y, Z	N59	---

TIMES

TIG	N33	T CDH	N13
T CSI	N11	T TPI	N37
TFI/TCO			N35
T FROM PER (V82)			N32
T(SV INTEG)			N38
LGC CLK T			N65
RDZ ΔT'S (R2, R3)			N75

P32: CSI/CDH, CDH/TPI
P33: CDH/TPI, TPI SLIP

CHAN BKUP

N46/R2 LOAD ANY TIME (V48 NOT REQ)

IGNORE	L(R2)
SPFY DSCRT	N46
ABORT OR	00001
ABORT STAGE	
AUTO THRTL	00010
BOTH DSCRTS	00011

NO IGN/ENG FAIL

TERM	V34E
IMPRPR CONFG	CORRECT PROBLEM (ENG STRTS), PRO
PRPR CONFG	E(REATMPT), THEN PRO (AUTO) OR E (MAN) ON F V99 (P40,P42) (P12, P7X) E→16 40 E→16 94

DAP DATA LOAD, PGNS-ATT DB/RATES

VEH	+X TRANS	ACA	ATT DB	RATES
1 ASC	0 2J/A	LM	LM ACTUAL(R, P, Y)*	0 .2°/S
2 DSC	1 2J/B	0 4°/S	0 .3° .4, .4, .3	1 .5°/S
3 DOK	2 4J	1 20°/S	1 1° 1.4, 1.4, 1.	2 2°/S
	3 4J		2 5° .7, .7, .5.	3 10°/S
		DOK	PWR 1° 2., 2., 1. (APS)	AVOID
* DAP P, R CTRL INDIRECT [CTRL AXES U'–V'(LM) OR U–V(DOK)]		0 .4°/S	1.5, 1.5, 1. (DPS)	1 10°/S I IF DOK
		1 2°/S	DOK	
			0,1,2: 1.4° 2., 2.,1.4	
			PWR 1.4° --, --,1.4(V65)	

ACCEL LEVELS (FT/SEC²)

PROPLNT LEFT (%)	DOCK/NON-STAGED FTP	40%	10%	4J/RCS	STAGED APS	4J/RCS
PRE LOI	3.1	1.3	.4	.1		
POST LOI	4.2	1.8	.6	.2		
100%	9	3.7	1.2	.3	10	1.2
75%	10	4.3	1.4	.4	12	1.3
50%	12	5.0	1.6	.5	14	1.6
25%	15	6.1	2.0	.6	16	1.8
0%	19	7.9	2.6	.8	20	2.3

ACCEL AT 10% THRUST BASED UPON FMIN (≈ 13%)

FDAI

MONITOR	ERR NDLS
V60	1.25°/S
V61, V62	5°
AGS–MAX	14.4°
AGS–MIN	1.7°
RR SHFT (P)	50°(HI)
TRUN (Y)	5°(LO)

AGS-ATT DB/RATES

VEH	DB SW	ACA (EA)	ATT DB (R, P, Y)	RATES (R, P, Y/EA)
ASC	MAX	7.5°/S	5., 5., 5.1°	30°/S
	MIN	20°/S	.3, .3, .4°	5, 10, 5°/S
DSC	MAX	17°/S	SAME	10°/S
	MIN	20°/S		5, 10, 5°/S

FLAGWRD/CHNL SET/RESET

V25N07E [OCT]
R1 = ADRS/CHNL (CHNL < 30, ≠ 7)
R2 = ABCDE
R3 (1=SET, 0=RSET)

MODIFY BIT	R2 DIGIT A	B	C	D	E	R2 L* CODE
	15	12	9	6	3	→ 4
	14	11	8	5	2	→ 2
	13	10	7	4	1	→ 1
	BIT NOT CHANGED					→ 0

*ADD L CODES IF MODIFY 2 OR 3 BITS PER DSKY DISPLAY

ORDEAL

+Z/HORZ ∡	277
RANGE	317
RDOT	440
LM ALT	337
HA, HP	315, 403

ALN/CAL

AGS/PGNS ALN	400+3
LUNAR ALN	+4
BODY–AXIS ALN (400+0, GO INERT)	+5
INFLT CAL (GYRO/ACCEL)	+6
SURF CAL (GYRO–ONLY)	+6
INFLT ACCEL CAL	+7

SELF-TEST

412+0 START TEST
412R=+1 SUCCESSFUL
[ROUTINE MONITOR OF 412 NOT REQ]
AGS CAUTION/WARN 412R (SELF-TEST FAIL)
+3 LOGIC
+4 MEMORY
+7 LOGIC, MEMORY
AGS READINESS / 574, 604, 507, 623, 612
IF 612R = +0 BUT STGD, ENTR +00020

ORB PMTRS

VI	433
H	337
HDOT	367
HA	315
HP	403

RR MAN

417 + 1
417R (+0, CONT)
[RANGE ∡, TM, N78, VHF, 415+1 316+RNG (< 30 SEC)]
[RDOT TM OR N78, 415+1 503± RDOT (< 30 SEC)]
WAIT AT LEAST 4 SEC BETWEEN UPDTS

LM/CSM

RANGE	317
RDOT (– CLOSING)	440
PREDICT TPI LOS	303
POST–TPI HP	402
LM +Z/RDOT ∡	277
PRSNT Y ERR(+S)	211
PRSNT YDOT ERR(+S)	270
YDOT ERR (TIG)	263
CSI/CDH ONLY: POST–CDH ΔH	402
ΔH(TIG)	314
PHASE ∡ (TIG)	303

TIMES

TIG	373
TFI	310
TRANSFER ΔT	307
T/RDZ [TPI]	311
NODE/RDZ ΔT	306
OFFSET ΔT	312
(306, 312 NOM +0)	
CSI/CDH ΔT	372
AGS CLK T	377

DESCENT

[ALT UPDT 223(SYNC W/ TM)]
[HDOT UPDT 360(SYNC W/ TM)]
BIAS UPDT IF ALT > 2000 FT

DEDA UPDT

411+0
[LM 240, 241, 242 (POS) 260, 261, 262 (VEL) 254 (T) 414+2]
[CSM 244, 245, 246 (POS) 264, 265, 266 (VEL) 272 (T) 414+3]

AGS/PGNS

[SET AGS CLK V16N65E 377+ ...(GET–BIAS) (ENTR AT CORR T)]
[NAV UPDT 411+0 TLM PCM SW – HI V47E, 414+1 06 16, L(BIAS), PRO 50 16, PRO]
[AGS/PGNS ALN 400+3 AFTER 414+1, NO AGS/PGNS ALN UNTIL 50 16]

ATT/STEER

[ATT HOLD 400+0]
[GUID STEER 400+1 623+0 IF YAW STEER, L 514+X, 515+Y, 516+Z 623+1]
[Z-AXIS STEER 400+2 507+ 0, CSM LOS 1, THRUST VEC]

RR AUTO

TLM PCM SW – HI
VFY P20/P20 BKGND & PRE–THRST DNLST
VFY RR ∡'S < 11.25°
417+1
417R/621R (/ +0)
411+1
FOR MAN UPDT, SET 411+0; TO RESUME AUTO, RESET 411+1
AVAILABLE
STOP AUTO 411+0
MK CTR (RRORR) 621
NEXT MK FLG 606
(+/RNG, –/RDOT)
RNG/RDOT 317, 440

ΔV MON

[VG MAG 370
BURN VG'S 500, 501, 502 (UP, RT, FWD)
SENSED VG'S 470, 471, 472 (UP, RT, FWD) RESET VIA 404, 405, 406
LV VG'S 450, 451, 452 (FWD, RT, DN)]

DEDA ADDRESS

[OCTAL]
047, 053 SINE, COSINE (LAND AZ)

[100 FT]
211R PRSNT LM Y ERR (+/SOUTH)
223 ALT UPDT INPUT [PWR DSC]
224 TERM, TARG S–MAJ AXIS [OI]
225 TERM, S–MAJ AXIS LO LMT [OI]
226 RTARG FOR 224 IF PHASE ∡ > PHASE LIMIT (305R) [OI]
231 LANDING SITE RADIUS
232 TARG ORBIT INSRT ALT [OI]
233R VERT STEER PITCHOVER H [OI]
240, 241, 242 LM EPHEMERIS POSN X, Y, Z (INERTIAL)
244, 245, 246 CSM EPHEMERIS POSN X, Y, Z (INERTIAL)

[.1 MIN]
254 LM EPOCH T (EPHEMERIS)

[.1 FPS]
260, 261, 262 LM EPHEMERIS VEL X, Y, Z (INERTIAL)
263R PREDICT LM YDOT ERR AT TIG; PRSNT YDOT ERR [OI](+/SOUTH)
264, 265, 266 CSM EPHEMERIS VEL X, Y, Z (INERTIAL)
270R PRSNT LM YDOT ERR (+/SOUTH)

[.1 MIN]
272 CSM EPOCH T (EPHEMERIS)
274 TIG BIAS T (NOM +00005) (TIG–30 SEC → "AVE–G")
275 TARG TPI TIME [CSI]

[.01°]
277R LM+Z/HORZ ∡ (0°–360°)
303R PREDICT TPI LOS AT TIG [TPI]; PRSNT LM/CSM PHASE ∡ [OI]; PREDICT LM/CSM PHASE ∡ AT TIG [CSI, CDH]
305R RTARG PHASE ∡ LIMIT [OI]

[.01 MIN]
306 NODE/INTCPT ΔT [TPI]
307 DSRD TRANSFER TIME [TPI]
310 T FROM TIG (TFI) (< 136 MIN)
311R ΔT TO INTERCEPT [TPI]
312 TARG OFFSET TIME [TPI]

[.1 NM]
314R PREDICT ΔH AT TIG [CSI, CDH]
315R PRSNT LM HA

[.01 NM]
316 RADAR RNG MANUAL INPUT (WT 4 SEC BEFORE ROOT UPDT)
317R COMPUTED RANGE (LM–CSM)

[.1 NM]
337R PRSNT LM ALT

[100 FT]
340R, 341R, 342R LM PRSNT POSN X, Y, Z (INERTIAL)
344R, 345R, 346R CSM PRSNT POSN X, Y, Z (INERTIAL)
347R PREDICT RADIUS AT TIG

[.1 FPS]
360R, 361R, 362R LM PRSNT VEL X, Y, Z (INERTIAL)
364R, 365R, 366R CSM PRSNT VEL X, Y, Z (INERTIAL)
367R PRSNT LM HDOT (– DECREASE)
370R ΔV TO BE GAINED (VG MAG)
371R PREDICT BRAKING ΔV [TPI] (NO TPI SOLN IF +60000)

[.1 MIN]
372R CSI/CDH ΔT [CSI]
373 TIG [XDV, CSI, CDH, TPI, MCC]
377 AGS CLOCK TIME

[SELECT LOGIC–OCTAL]
400+0 ATTITUDE HOLD
+1 GUIDANCE STEER (SPFY 623)
+2 Z–AXIS STEER (SPFY 507)
+3 AGS ALN TO PGNS (AFTER 414+1, WAIT FOR 50 16; AVOID CDU SW TRANSIENTS; CSM/X–Z PLANE DIFF < 10°)
+4 LUNAR ALN (GYRO/ACCEL)
+5 BODY–AXIS ALN
+6 INFLT CAL (GYRO/ACCEL) SURF CAL (GYRO–ONLY) (BAD PGNS–NO INFLT 400+6; NO 414+1 DURING SURF CAL)
+7 INFLT ACCEL–ONLY CAL

[.1 NM]
402R PREDICT POST–TPI HP [TPI] OR POST–CDH ΔH [CSI, CDH]
403R PRSNT LM HP

404, 405, 406 INITIALIZE 470, 471, 472 (SEP, PDI (NOM): –12345, +0, +0) (POST–OI (NOM): +0, +0, +0)

[SELECT LOGIC–OCTAL]
410+0 ORBIT INSERTION ROUTINE
+1 CSI ROUTINE
+2 CDH ROUTINE
+3 TPI SEARCH ROUTINE
+4 TPI EXECUTE ROUTINE
+5 EXTERNAL ΔV ROUTINE
411+0 STOP AUTO RADAR UPDATES
+1 START AUTO RADAR UPDATES
412+0 SEE "SELF–TEST"
413+1 STORE AZ & SET 604 (SURF FLG)
414+1 LM, CSM NAV UPDT VIA DNLK (SEE 400+6, 563+0, PGNS/AGS) (NO 414+1, +2, +3 IF RR AUTO)
+2 LM NAV UPDT VIA DEDA
+3 CSM NAV UPDT VIA DEDA
415+1 MANUAL RR UPDT (DIR COS)
416+1 CDH AT CSI+1/2 PERIOD [CSI]
+3 CDH AT CSI+3/2 PERIOD [CSI]
417+1 INITIALIZE RADAR FILTER [417R(+0) DONE (0–16 SEC)]

[.1 FPS]
423R DSRD FNL HDOT [OI, CSI, CDH]
427R PRSNT LM HORZ VEL
433R PRSNT LM TOTAL VEL MAG
440R COMPUTED RDOT (– CLOSING)
450, 451, 452 LOCAL VERT ΔV X, Y, Z (FWD, RT, DN)
464R PITCHOVER STEER HDOT [OI]
465 TARG INSERTION HDOT [OI]
470R, 471R, 472R SENSED BODY ΔV X, Y, Z (UP, RT, FWD)
477R HDOT AT TIG; PRSNT HDOT [OI]
500R, 501R, 502R VG(BODY) X, Y, Z (UP, RT, FWD)
503 RADAR RDOT MANUAL INPUT (WT 4 SEC BEFORE RNG UPDT)

[IF 400+2, SELECT–OCTAL]
507+0 LM +Z ALONG CSM LOS VEC
+1 LM +Z ALONG THRUST VEC

[OCTAL]
514, 515, 516 YAW STEER UNIT X, Y, Z (INERTIAL) (SEE 623+1)
534, 535, 536 ACCEL SCALE FACTOR
537 X GYRO SPIN–AXIS MASS UNBAL DRIFT COMPENSATE

[.001 FT/SEC²]
540, 541, 542 X, Y, Z ACCEL BIAS

[.01°/HR]
544, 545, 546 X, Y, Z GYRO DRIFT

[OCTAL]
547 LUNAR ALN AZ CORRECTION
550, 551, 552 X, Y, Z GYRO S.F. CORR
563+0 TERM NAV UPDT VIA DNLNK
574+0 NOT STAGED (STAGED FLAG) –X
575 A/H LOCK FLAG (ENTR 575+0 IN FOLLOW–UP DSCRT FAIL)
604+0 INFLT (LUNAR SURFACE FLAG) –X
605 TARG COTAN (TPI LOS) [CSI]
606+0 RANGE NEXT (AUTO RADAR UPDT FLAG) –X RDOT NEXT
612R STAGING SEQUENCE CTR (+0= NOT STGD; +00017 = STGD)

[COUNTS]
614R ULLAGE COUNTER (CNT/2 SEC)
616 ULL CTR LIMIT (CNT/2 SEC)
621R RADAR MK CTR (XX0YY) (XX = RNG MKS, YY = RDOT MKS)

[IF 400+1, SELECT–OCTAL]
623+0 LM +Z II TO CSM PLANE
+1 LM +Z II TO PLANE SPFY BY UNIT VEC (514, 515, 516)

[OCTAL]
634 SENSED ΔV BIAS THRESHOLD NOM: +00100 (.125 FPS/SEC) MAX: +77777 (.64 FPS/SEC)
640, 641, 642 LUNAR ROT RATE VEC X, Y, Z (INERTIAL)
647R CAL CTR (RECAL: TERM/<.00034)
662 CONST, TARG S–MAJ AXIS [OI]
673 RTARG FOR 662 IF PHASE ∡ > PHASE LIMIT (305R) [OI]

DIR RDZ

306R, 312R (✓+0)
[START RR AUTO]
410+4
307+04300
373+TIG
310R [DET–SET]
450R, 451R, 452R
370R, 371R
MKS, →AUTO BURN

MCC

[START RR AUTO]
410+4
307+TRANSFER ΔT (+02800/+01300)
373+TIG
450R, 451R, 452R
370R, 371R
MKS, →AUTO BURN

EXT ΔV

410+5
373+TIG
450+VGX(LV)
451+VGY(LV)
452+VGZ(LV)
310R [DET–SET]
370R
→AUTO BURN
(ENTR AT 404+0)

CSI

[START RR AUTO]
410+1
451+0
373+T CSI
275+T TPI
605+COT(TPI ∡) (NOM+00777)
416
↓(1/2 PER)+1
↓(3/2 PER)+3
310R [DET–SET]
MKS, →AUTO BURN

CDH

[START RR AUTO]
410+2
451+0
373R (ADJ IF REQ)
310R [DET–SET]
MKS, →AUTO BURN

TPI

[START RR AUTO]
410+3
306R, 312R (✓+0)
307+TRANSFER ΔT (NOM +04300)
310+ ...TARG TPI
303R (NOM 26.6°)
410+4 (DSRD 303R)
[IF RTARG REQ 410+3 310+...TARG TPI 303R (DSRD) 410+4 303R]
310R [DET–SET]
370R, 371R, 277R
MKS, →AUTO BURN

D.R., MCC, TPI, CSI, CDH, XDV AVAILABLE

VG 450, 451, 452
ΔV MAG 370
HDOT(TIG) 477
+Z/HORZ ∡ 277

D.R., MCC, TPI AVAILABLE

BRK ΔV 371.
TPI LOS 303
POST–TPI HP 402
ΔT TO RDZ 311

CSI, CDH AVAILABLE

PHASE ∡(TIG) 303
ΔH(TIG) 314
DSRD HDOT 423
POST–CDH ΔH 402
CSI/CDH ΔT 372

ORB INS

616+0
232+H(INSRT)
465+HDOT(INSRT)
224+S–MAJ AXIS
225+APO RAD/2
226+RTARG (224)
305–PHASE LIMIT
662–S–MAJ FACTR
673–RTARG (662)
410+0
623+0
[IF S–BAND (YAW STEER) AFT P/OVR: 514+X, 515+Y, 516+Z]
400+1
500R, 501R, 502R
[SEE BURN ✓ LIST L/O T: ABORT–STAGE]
[AFT P/OVR, S–BAND: 623+1]
[FOR NOM INSRT NULL RESIDUALS 500R, 501R, 502R (UP, RT, FWD)]
[IF EARLY APS C/O, CONT VIA RCS WHEN 500R<>00150 MODE CTRL – A/H]
[IF TWEAK/BAILOUT →"MAN BURN"]
616+ ULL CTR LMT (NOM INS +00005)

AVAILABLE

Y–POSN ERR	211
Y–DOT ERR	270
H	337
HDOT	367
PHASE ∡	303
VI	433
HDOT(INS)	423

MAN BURN

SW – AGS, A/H
404+0, 405+0, 406+0
470R, 471R, 472R
(UP, RT, FWD)

AUTO BURN

[AGS SOLN]
[IF RR AUTO ON 411+0]
450R, 451R, 452R
[IF YDOT (CSI, CDH): 263R (SAME) 451±263R (SIGN)]
370R
371R(D.R., MCC, TPI) 404+0, 405+0, 406+0
[GUID (+X) 400+1 623+0 IF YAW STR 514, 515, 516 623+1]
[Z–AXIS 400+2 507+1]
410+5
[ENTR 410+5 PRIOR TO TIG–30 SEC]
[MAN/AUTO(MIN DB) MNVR TO BURN ATT]
[IF RCS BURN, SET MODE CTRL – A/H]
[IF PGNS BURN, LOAD BEFORE TIG – 30 SEC 373+TIG 450, 451, 452 (LV VG) 500R, 501R, 502R]
[SEE BURN ✓ LIST NULL RESIDUALS 500R, 501R, 502R (UP, RT, FWD)]

LOSS OF MANUAL AND AUTO APS START

1 ENG STOP - PUSH
ENG ARM - OFF
ABORT STAGE - RESET
(STAGED IF SYS A OR B LT - OFF)
MASTER ARM - OFF (M.A. & ED RELAYS LT)

2 IF STAGED: V37E00E

3 PRESS REG A & B - CABIN
SUIT GAS DIVERTER - PULL EGRESS
CABIN GAS RETURN - EGRESS
SUIT ISOL (2) - SUIT DISC
DOFF HELMETS AND GLOVES
REVERSE O2 HOSES R/B AND B/R
PGA DIVERTER (2) - IV (HORIZ)
SUIT ISOL (2) - SUIT FLOW

4 REMOVE AND STOW RESTRAINTS
(CDR'sTO FLOOR FITTINGS)

5 IF UNSTAGED:
#1 ASC O2 - CLOSE
DES O2 - OPEN
WATER TANK SELECT - DES
ASC H2O - CLOSE
DES H2O - OPEN
CB (11) & (16) EPS: DES ECA CONT - CLOSE
DES ECA - CLOSE
ASC ECA CONT - CLOSE
DES BAT - CONNECT; TB - GRAY
LMP BAT 2 - ON; TB - GRAY
CDR BAT 4 HI-V - ON; TB - GRAY
LMP BAT 1 HI-V - ON; TB - GRAY
CDR BAT 3 SW - ON; TB - GRAY
BAT 5 NORM FEED - OFF; TB - BP
BAT 6 NORM FEED - OFF; TB - BP

6 POWER DOWN PJ45A:
CB (11) RCS SYS A: QUAD TCA (4) - OPEN
STAB/CONT: ATCA (PGNS) - OPEN
: AELD - OPEN

7 REMOVE NETTING FROM TAPED CEILLING AREA

8 ACCESS PJ45A BY CUTTING ALONG TAPED LINE & BENDING CEILING TOWARD PNL 11

9 UNSTOW CONN COUPLING PLIERS (LHMS)

10 DEMATE PJ45A BY ROTATING CONN COUPLING CCW

11 MATE P45X OF T-CABLE (LHMS) TO J45 AT +Z27 BULKHEAD USING PLIERS TO INITIATE REMATING

12 MATE J45X OF T-CABLE TO P45A

13 IF UNSTAGED:

BAT 5 NORM - ON; TB - GRAY
BAT 6 NORM - ON; TB - GRAY
CB (11) & (16) EPS: ASC ECA CONT - CLOSE
: DES H2O - CLOSE
: ASC H2O - OPEN
: WATER TANK SELECT - ASC
: DES O2 - CLOSE
: #1 ASC O2 - OPEN
PRESS REG A & B - EGRESS
SUIT GAS DIVERTER - PULL EGRESS
CABIN GAS RETURN - AUTO
SUIT CIRCUIT RELIEF - AUTO
LMP BAT 1 HI-V - OFF/RESET; TB - BP
CDR BAT 3 - OFF/RESET; TB - BP
LMP BAT 2 - OFF/RESET; TB - BP
CDR BAT 4 HI-V - OFF/RESET; TB - BP
DES BAT - DEADFACE; TB - BP
IF DEADFACE TB - BP;
CB (11) & (16) EPS: DES ECA - OPEN
: DES ECA CONT - OPEN
: ASC ECA CONT - OPEN

14 MANUALLY STAGE:

CB (11) LOGIC PWR A - CLOSE
CB (16) LOGIC PWR B - CLOSE
MASTER ARM - ON
STAGE SW - FIRE (STAGE SEQ RELAY LTS - OFF)

15 LMP BUS POWER DOWN PREP:

SUIT FAN - 1
INVERTER - 1
PNL 12: AUDIO CONT - BU
S-BAND XMTR/RCVR - SEC
S-BAND PWR AMPL - SEC
S-BAND VOICE - DN VOICE BU
S-BAND RANGE - OFF/RESET
VHF A RCVR - ON
VHF B XMTR - VOICE
BIOMED - OFF
S-BAND SEL - FWD OR AFT
S-BAND T/R - S-BAND T/R
ICS T/R - ICS T/R
MODE - ICS/PTT
VHF A - RCV
VHF B - T/R

16 POWER DOWN LMP BUS:

CB (16) EPS: CROSS TIE BUS - OPEN
: CROSS TIE BAL LOADS - OPEN
: BAT FEED TIE (2) - OPEN

17 REMOVE J166 (PNL 16) DUST CAP & MATE P166/167 (ALIGN WHITE STRIPE) OF ED ADAPTER CABLE (LHMS) TO J166

18 MATE P428 OF ED ADAPTER CABLE TO J428X OF T-CABLE

19 DRESS CABLES CLEAR OF PNL 11

20 CB (16) EPS: CROSS TIE BUS - CLOSE
: CROSS TIE BAL LOADS - CLOSE
PGA DIVERTER (2) - EV (VERT)
REVERSE O2 HOSES R/R AND B/B
DON HELMETS, GLOVES & RESTRAINTS

21 PREPARE FOR P57

CB (11) AC BUS A: RNDZ RDR - CLOSE
PGNS: RNDZ RDR - CLOSE
RR MODE - LGC
V41 N72E (+00000, +28300)
N12 R2 00002, PRO
V16 N72E
CB (11) AC BUS A: RNDZ RDR - OPEN
PGNS: RNDZ RDR - OPEN
V44E
WINDOW SHADES (3) - CLOSE
CB (11) AC BUS A: AOT LAMP - CLOSE
P57, R2 00004, PRO
N34 LOAD L.O. TIME, PRO
N06 00010
00003
00110
PRO (NO ATT LT - ON/OFF, TWICE)
N04 GRAV ERR (.01°)
V32E (NO ATT LT - ON/OFF, TWICE)
N04 GRAV ERR (.01°)
PRO
N22 ICDU ANGLES (.01°)
PRO (NO ATT LT - ON/OFF)
N71 STAR, 4 MARKS
N05 ANGLE DIFF (.01°)
PRO
N93 TORQUE ANGLES (.001°)
PRO
N25 00014, ENTR
P00E
CB (11) AC BUS A: AOT LAMP - OPEN
WINDOW SHADES (3) - OPEN
CB (11) AC BUS A: RNDZ RDR - CLOSE
PGNS: RNDZ RDR - CLOSE
V41 N72E (_____, _____)
N12 R2 00002, PRO
V16 N72E
CB (11) AC BUS A: RNDZ RDR - OPEN
PGNS: RNDZ RDR - OPEN
V44E
RR MODE - SLEW
P12E
N33 _____: _____: _____ TIG
PRO
N76 VH FINAL
H DOT FINAL
X RNG
PRO
N74 TFI, YAW, PITCH
EVENT TIMER - SET

22 LIFT OFF

CDR: ABORT STAGE - PUSH
ENG ARM - ASC
PRO ON FL99

LMP: AT T-0
CB (16) EPS: BAT FEED TIE (2) - CLOSE
WHEN TG ≤ 1 SEC,
CB (16) EPS: BAT FEED TIE (2) - OPEN

LOSS OF MANUAL AND AUTO APS START
WITH LOSS OF ONE BUS
(MANUAL STAGING HAS BEEN PERFORMED)

1 ENG STOP - PUSH
ENG ARM - OFF
ABORT STAGE - RESET
(STAGED IF SYS A OR B LT - OFF)
MASTER ARM - OFF (M.A. & ED RELAY LT)

2 IF STAGED & IF CDR BUS IS POWERED UP:
V37E 00E

3 POWER DOWN PJ45A:
CB (11) RCS SYS A: QUAD TCA (4) - OPEN
STAB/CONT: ATCA (PGNS) - OPEN
: AELD - OPEN

4 REMOVE NETTING FROM TAPED CEILING AREA

5 ACCESS PJ45A BY CUTTING ALONG TAPED LINE & BENDING CEILING TOWARD PNL 11

6 UNSTOW CONN COUPLING PLIERS (LHMS)

7 DEMATE PJ45A BY ROTATING CONN COUPLING CCW

8 MATE P45X OF T-CABLE(LHMS)TO J45 AT +Z27 BULKHEAD USING PLIERS TO INITIATE REMATING

9 MATE J45X OF T-CABLE TO P45A

10 IF CDR BUS IS POWERED UP: V37E 57E

11 PREPARE FOR LAUNCH

IF CDR BUS IS POWERED UP:
(IF LMP BUS IS POWERED UP, START WITH STEP 12)
CB 11 AC BUS A: RNDZ RDR - CLOSE
PGNS: RNDZ RDR - CLOSE
RR MODE - LGC
V41 N72E (+00000, +28300)
N12 R2 00002, PRO
V16 N72E
CB 11 AC BUS A: RNDZ RDR - OPEN
PGNS: RNDZ RDR - OPEN
V44E
WINDOW SHADES - (3) - CLOSE
CB 11 AC BUS A: AOT LAMP - CLOSE
P57, R2 00004, PRO
N34 LOAD L.O. TIME, PRO
N06 00010
00003
00110
PRO (NO ATT LT - ON/OFF, TWICE)
N04 GRAV ERR (.01°)
V32E (NO ATT LT - ON/OFF, TWICE)
N04 GRAV ERR (.01°)

PRO
N22 ICDU ANGLES (.01°)
PRO (NO ATT LT - ON/OFF)
N71 STAR, 4 MARKS,
N05 ANGLE DIFF (.01°)
PRO
N93 TORQUE ANGLES (.001°)
PRO
N25 00014, ENTR
POOE
CB (11) AC BUS A: AOT LAMP - OPEN
WINDOW SHADES - (3) - OPEN
CB (11) AC BUS A: RNDZ RDR - CLOSE
PGNS: RNDZ RDR - CLOSE
V41 N72E (_____, _____)
N12 R2 00002, PRO
V16 N72E
CB (11) AC BUS A: RNDZ RDR - OPEN
PGNS: RNDZ RDR - OPEN
V44E
RR MODE - SLEW
P12E
N33_____: _____: _____ TIG
PRO
N76 VH FINAL
H DOT FINAL
X RNG
PRO
N74 TFI, YAW, PITCH

EVENT TIMER - SET

12 PREPARE FOR LAUNCH:

IF LMP BUS IS POWERED UP:
574+0 (UNSTAGED)
604-0 (ON SURFACE)
544R_____X
545R_____Y
546R_____Z
400+6 (AGS CAL)
612R+0 (ATT HOLD AT ABORT STAGE)
307_____ΔT TRANS (+04300)
373_____TIG TPI
451+0 (ΔVY)
400R (+0 CAL COMPLETE)
544R_____X
545R_____Y
546R_____Z
400+4 LUNAR ALIGN
PNL (1): ATTITUDE MON - AGS
:MODE SEL - AGS

13 REMOVE DUST CAP FROM J166 (PNL 16) IF CDR BUS IS POWERED UP OR J167 (PNL 11) IF LMP BUS IS POWERED UP

AT COMPLETION OF NEXT STEP, P428 IS POWERED UP

14 MATE P166/167 (ALINE WHITE STRIPE FOR PNL 11 CONN OR ALIGN BLACK AND WHITE STRIPE FOR PNL 16 CONN) OF ED ADAPTER CABLE (LHMS) TO J166 OR J167

15 PGA DIVERTER - EV (VERT)
REVERSE O2 HOSES R/R AND B/B
DON HELMETS, GLOVES & RESTRAINTS

16 LIFT OFF:
IF CDR BUS IS POWERED UP:
MASTER ARM - ON
ABORT STAGE - PUSH
ENG ARM - ASC
PRO ON FL99
BRACE FOR L.O. & MATE P428 OF ED ADAPTER CABLE TO J428X OF T CABLE
IF LMP BUS IS POWERED UP:

400+1 (GUID STEER)
MASTER ARM - ON
367R
ENG ARM - ASC
ABORT STAGE - PUSH

BRACE FOR L.O. & MATE P428 OF ED ADAPTER CABLE TO J428X OF T CABLE

17 WHEN TG = 1 SEC:
DEMATE P428 OF ED ADAPTER CABLE FROM J428X OF T CABLE

LOSS OF ED SUB-SYSTEM

1 PERFORM SYSTEMS EVA PREP
2 CDR PERFORM PLSS/EVCS ELECT C/O, 1 MAN EVA
3 LMP: CONNECT TO LM O2, COMM AND H2O
PLACE GAS CONNECTOR PLUGS IN PGA
PGA DIVERTER - IV (HORIZ)
4 FINAL SYSTEMS CONFIGURATION FOR EGRESS
CB (16): LCG PUMP - CLOSE
LCG - COLD, AS REQD
CB (16) ECS: CABIN REPRESS - CLOSE (VERIFY)
: SUIT FLOW CONT - OPEN
SUIT GAS DIVERTER - PULL EGRESS (VERIFY)
CABIN GAS RETURN - EGRESS (VERIFY)
SUIT CIRCUIT RELIEF - AUTO (VERIFY)
DON HELMETS & GLOVES

5 LMP PERFORM ARS/PGA PRESSURE INTEGRITY CHECK
6 UNSTOW ED ADAPTER CABLE (20 FT)(LHMS) & REMOVE BETA BOOTIE FROM CONN P428
7 SECURE P166/167 TO THE HAND HOLD BETWEEN PNL's 12 AND 14
8 SECURE SCISSORS AND CONNECTOR COUPLING PLIERS VIA TETHERS TO PGA D-RING AND VELCRO TO EITHER SIDE OF RCU
9 ATTACH P428 OF ED ADAPTER CABLE ON PGA GLOVE UNDER VELCRO COVER
10 PERFORM CABIN DEPRESSURIZATION
11 CDR EXIT CABIN, DESCEND LADDER TO SURFACE, STOW ED ADAPTER CABLE AND APPROACH PARKED LRV; (OR, DESCEND LADDER TO LAST RUNG AND NAVIGATE ACROSS SECONDARY STRUTS TO LEFT SIDE OF QUAD IV, AFTER CUTTING MESA SUPPORT STRAP -DISREGARD STEPS 12 THROUGH 15)
12 DRIVE ~~LVR~~ LRV AND PARK ADJACENT TO LEFT HAND SIDE OF MESA
13 AT MESA FOLD BACK BLANKETS, AWAY FROM LEFT HAND SIDE

CREWMAN MUST NOT STAND ON VERTICLE MEMBERS OF THE SRC SUPPORT STRUCTURE

14 CLIMB ONTO LRV FROM LEFT HAND SEAT AND THEN ONTO LEFT HAND SIDE OF MESA

15 CLIMB UP MESA AND STAND ON INBOARD AREA OF MESA USING THE TOP OF QUAD IV AS SUPPORT

INCONEL IS SHARP AT EDGES & CAN CUT INTO PGA, CLOSE SCISSORS AFTER USE.

16 HOLDING ON TO THE TOP OF QUAD IV WITH THE RIGHT HAND, TEAR AWAY AT THE INCONEL AND THERMAL BLANKETS ON THE LEFT HAND SIDE WITH THE SCISSORS, BY STARTING AT THE 5 INCH TAPED OPENING IN THE LEFT HAND SIDE OF THE INCONEL BLANKET, EXPOSING THE ED RELAY BOX

17 VERIFY ACCESS CLEAR OF THE INCONEL BLANKET TO ED RELAY BOX

FRONT CORNER CONN MUST NOT BE DEMATED

CONN COUPLING PLIERS CAN BE UTILIZED IF REQUIRED

18 DEMATE CONNECTORS REQUIRED FOR ACCESS TO GSE DUST COVER WITHOUT DEMATING FRONT CORNER CONNECTOR

19 DEMATE GSE DUST COVER

20 REMOVE ED ADAPTER CABLE FROM PGA GLOVE

21 REMOVE DUST CAP FROM CONNECTOR P428

22 OBSERVE ALIGNMENT MARKS & MATE ED ADAPTER CABLE TO GSE CONN ON ED RELAY BOX

23 PULL THE CABLE SLIGHTLY TAUT

24 CLIMB DOWN FROM LM VIA MESA (OR NAVIGATE BACK ACROSS SECONDARY STRUTS TO LADDER)

25 CLIMB UP LADDER AND ENTER CABIN

26 POWER DOWN LMP BUS AND HOOK UP ED ADAPTER CABLE (SEE STEPS 15, 16, 17 OF LOSS OF MANUAL & AUTO APS START

27 APPLY POWER TO ED ADAPTER CABLE:

CB (16) EPS: BAT FEED TIE (2) - CLOSE

28 MANUALLY STAGE

CB (11) ED: LOGIC PWR A - CLOSE
MASTER ARM - ON
STAGE - FIRE
STAGE SEQ RELAYS LTS - OFF

29 CB (16) EPS: BAT FEED TIE (2) - OPEN
DEMATE P166/167 OF ADAPTER CABLE FROM J166 AND JETTISON
CB (16) EPS: BAT FEED TIE (2) - CLOSE

30 PERFORM CABIN REPRESSURIZATION WITH DESCENT O2 IF AVAILABLE

31 PERFORM POST-EVA SYSTEMS CONFIGURATION