

CMC PROGRAMS

<u>PHASE</u>	<u>NO</u>	<u>TITLE</u>
PRELAUNCH AND SERVICE	00	CMC IDLING
	01	PRELAUNCH OR SERVICE-INITIALIZATION
	02	PRELAUNCH OR SERVICE-GYRO COMPASSING
	03	PRELAUNCH OR SERVICE-OPTICAL VERIFICATION OF GYRO COMPASSING
	06	CMC POWER DOWN
	07	SYSTEM TEST
BOOST	11	EARTH ORBIT INSERTION MONITOR
COAST	17	TPI SEARCH
	20	RENDEZVOUS NAVIGATION
	21	GROUND TRACK DETERMINATION
	22	ORBITAL NAVIGATION
PRE- THRUSTING	23	CISLUNAR MIDCOURSE NAVIGATION
	27	CMC UPDATE
	30	EXTERNAL DELTA V
	31	LAMBERT AIM POINT GUIDANCE
	32	CO-ELLIPTIC SEQUENCE INITIATION (CSI)
	33	CONSTANT DELTA ALT. (CDH)
	34	TRANSFER PHASE INITIATION (TPI)
	35	TRANSFER PHASE (MIDCOURSE)
	37	RETURN TO EARTH
	38	STABLE ORBIT RENDEZVOUS (SOR)
THRUSTING	39	STABLE ORBIT MIDCOURSE (SOM)
	40	SPS
	41	RCS
ALIGNMENT	47	THRUST MONITOR
	51	IMU ORIENTATION DETERMINATION
	52	IMU REALIGN
	53	BACK-UP IMU ORIENTATION DETERMINATION
	54	BACK-UP IMU REALIGN
ENTRY	61	ENTRY - MANEUVER TO CSM/SM SEPARATION ATTITUDE
	62	ENTRY - CM/SM SEPARATION AND PRE-ENTRY MANEUVER
	63	ENTRY - INITIALIZATION
	64	ENTRY - POST 0.05G
	65	ENTRY - UPCONTROL
	66	ENTRY - BALLISTIC
PRE-THRUSTING (OTHER VEHICLE)	67	ENTRY - FINAL PHASE
	72	LM CO-ELLIPTIC SEQUENCE INITIATION (CSI)
	73	LM CONSTANT DELTA ALT. (CDH)
	74	LM TRANSFER PHASE INITIATION (TPI) TARGETING
	75	LM TRANSFER PHASE (MIDCOURSE) TARGETING
	76	TARGET DELTA-V
	77	LM TPI SEARCH
	78	LM STABLE ORBIT RENDEZVOUS (SOR) TARGETING
	79	LM STABLE ORBIT MIDCOURSE (SOM) TARGETING

CMC ROUTINES

<u>NO</u>	<u>TITLE</u>
00	FINAL AUTOMATIC REQUEST TERMINATE
02	IMU STATUS CHECK
03	DIGITAL AUTOPILOT DATA LOAD
05	S-BAND ANTENNA
21	RENDEZVOUS TRACKING SIGHTING MARK
22	RENDEZVOUS TRACKING DATA PROCESSING
23	BACKUP RENDEZVOUS TRACKING SIGHTING MARK
30	ORBIT PARAMETER DISPLAY
31	RENDEZVOUS PARAMETER DISPLAY ROUTINE NO. 1
33	CMC/LGC CLOCK SYNCHRONIZATION
34	RENDEZVOUS PARAMETER DISPLAY ROUTINE NO. 2
36	RENDEZVOUS OUT OF PLANE DISPLAY ROUTINE
40	SPS THRUST FAIL
41	STATE VECTOR INTEGRATION (MID TO AVE)
50	COARSE ALIGN
52	AUTOMATIC OPTICS POSITIONING
53	SIGHTING MARK
54	SIGHTING DATA DISPLAY
55	GYRO TORQUING
56	ALTERNATE LOS SIGHTING MARK
57	OPTICS CALIBRATION
60	ATTITUDE MANEUVER
61	TRACKING ATTITUDE
62	CREW-DEFINED MANEUVER
63	RENDEZVOUS FINAL ATTITUDE
64	BARBECUE MODE ROUTINE

VERB CODES

REGULAR VERBS

01 DISP OCT COMP 1 IN (R1)
 02 DISP OCT COMP 2 IN (R1)
 03 DISP OCT COMP 3 IN (R1)
 04 DISP OCT COMP 1,2 IN (R1,R2)
 05 DISP OCT COMP 1,2,3 IN (R1,R2,R3)
 06 DISPLAY DECIMAL
 07 DISP DP DECIMAL (R1,R2)(TEST ONLY)
 08) SPARES
 10) SPARES
 11 MON OCT COMP 1 IN (R1)
 12 MON OCT COMP 2 IN (R1)
 13 MON OCT COMP 3 IN (R1)
 14 MON OCT COMP 1,2, IN (R1,R2)
 15 MON OCT COMP 1,2,3 (R1,R2,R3)
 16 MONITOR DECIMAL
 17 MON DP DEC (R1,R2)(TEST ONLY)
 18) SPARES
 19) SPARES
 20) SPARES
 21 LOAD COMP 1 INTO (R1)
 22 LOAD COMP 2 INTO (R2)
 23 LOAD COMP 3 INTO (R3)
 24 LOAD COMP 1,2 INRO (E1,R2)
 25 LOAD COMP 1,2,3 INTO (R1,R2,R3)
 26) SPARE
 27 DISP LAY FIXED MEMORY
 28) SPARES
 29) SPARES
 30 REQUEST EXECUTIVE
 31 REQUEST WAITLIST
 32 RECYCLE PROGRAM (DO NOT USE WITH LOAD, PERFORM, OR MARK VERBS)
 33 PROCEED WITHOUT DSKY INPUT
 34 TERMINATE FUNCTION
 35 TEST LIGHTS
 36 REQUEST FRESH START
 37 CHANGE PROGRAM (MAJOR MODE)
 38) SPARES
 39) SPARES

EXTENDED VERBS

40 ZERO CDUS (USED WITH N20 ONLY)
 41 COARSE ALIGN CDU (USED WITH N20 OR N91 ONLY)
 42 FINE ALIGN IMUS
 43 LOAD IMU ATT ERROR METERS (TEST ONLY)
 44 SET SURFACE FLAG
 45 RESET SURFACE FLAG
 46 ESTABLISH G&C CONTROL
 47 MOVE LM STATE VECT INTO CM STATE VECTOR
 48 LOAD DAP DATA (R03)
 49 START CREW DEFINED MANEUVER (R62)
 50 PLEASE PERFORM
 51 PLEASE MARK
 52 MARK ON OFFSET LANDING SITE

53 PLEASE PERFORM ALT LOS MARK (COAS)
 54 START REND BACKUP SIGHT MARK ROUTINE (R23)(R21 BACKUP)
 55 INCREMENT CMC TIME (DEC)
 56 TERMINATE TRACKING (P20+P25)
 57 START REND SIGHT MARK ROUTINE (R21)
 58 ENABLE AUTO MANEUVER IN P20
 59 PLEASE MARK (OPTICS CALB)
 60 SET ASTRO TOTAL ATT TO PRESENT ATT (N17)
 61 DISPLAY DAP ATT ERROR (MODE 1)
 62 DISPLAY TOTAL ATT ERROR (MODE 2)
 63 DISPLAY ASTRO ATT ERROR (MODE 3)
 64 START S-BAND ANT CALC (R05)
 65 VERIFY PRELAUNCH ALIGN OPTICS (P03)
 66 VEHICLES ARE ATTACHED-MOVE THIS VEH STATE VECT TO OTHER VEH STATE VECT
 67 DISPLAY W-MATRIX RMS ERROR
 68 CSM STROKE TEST ON
 69 CAUSE RESTART
 70 UPDATE LIFTOFF TIME (P27)
 71 UNIVERSAL UPDATE-BLACK ADDR. (P27)
 72 UNIVERSAL UPDATE-SINGLE ADDR. (P27)
 73 UPDATE CMC TIME (OCTAL)(P27)
 74 INITIALIZE ERASABLE DUMP VIA DOWNLINK
 75 BACKUP LIFTOFF
 76 SET PREF ATT FLAG - DRIVE TO PREFERRED
 77 RESET PREF ATT FLAG-DRIVE TO + AXIS ATT
 78 UPDATE PRELAUNCH AZIMUTH
 79 START BARBECUE MODE ROUTINE (R64)
 80 UPDATE IN STATE VECTOR
 81 UPDATE CSM STATE VECTOR
 82 REQUEST ORBIT PARAM DISP (R30)
 83 REQUEST REND PARAM DISP #1 (R31)
 84) SPARE
 85 REQUEST REND PARAM DISP #2(R34)
 86 REJECT REND BACKUP SIGHTING MARK
 87 SET VHF RANGE FLG
 88 RESET VHF RANGE FLG
 89 START REND FINAL ATT ROUT (R63)
 90 REQ REND OUT-OF-PLANE DISP (R36)
 91 DISPLAY BANK SUM- BANK SUM
 92 OPERATE IMU PERF TEST (P07)
 93 ENABLE W MATRIX INITIALIZATION
 94 PERFORM CISELUNAR ATTITUDE MANEUVER (P23)
 95 SPARE
 96 TERMINATE INTEGRATION AND GO TO POO
 97 PERFORM ENGINE FAIL PROCEDURE
 98) SPARE
 99 PLEASE ENABLE ENGINE IGNITION

NOUN FORMATS

<u>DESCRIPTION</u>	<u>SCALE AND FORMAT</u>	<u>UNIT</u>	<u>RESTRICTIONS</u>
<u>NORMAL NOUNS</u>			
01 SPECIFY ADDRESS (FRAC)	1 .XXXXX	FRACTION	
	2 .XXXXX	FRACTION	
	3 .XXXXX	FRACTION	
02 SPECIFY ADDRESS (WHOLE)	1 XXXXX.	INTEGR	
	2 XXXXX.	INTEGR	
	3 XXXXX.	INTEGR	
03 SPECIFY ADDRESS (DEGREE)	1 XXX.XX	DEGREE	
	2 XXX.XX	DEGREE	
	3 XXX.XX	DEGREE	
04) SPAFE			
05 ANGULAR ERROR/DIFFERENCE	1 XXX.XX	DEGREE	
06 OPTION CODE	1 OCTAL		
	2 OCTAL		
07 FLAGWORD OPER ECADR	1 OCTAL		
BITID	2 OCTAL		
ACTION	3 OCTAL		
08 ALARM DATA ADRES	1 OCTAL		
BBAND	2 OCTAL		
ERCOUNT	3 OCTAL		
09 ALARM CODES FIRST	1 OCTAL		
SECOND	2 OCTAL		
LAST	3 OCTAL		
10 CHANNEL TO BE SPECIFIED	1 OCTAL		
11 TIG OF CSI	1 0000X.	HRS	DEC ONLY
	2 000XX.	MIN	MUST LOAD
	3 0XX.XX	SEC	3 COMPS
12 OPTION CODE (USED BY EXTENDED VERBS ONLY)	1 OCTAL		
	2 OCTAL		
13 TIG OF CDH	1 0000X.	HRS	DEC ONLY
	2 000XX.	MIN	MUST LOAD
	3 0XX.XX	SEC	3 COMPS
14) SPAFE			
15 INCREMENT ADDRESS	1 OCTAL		
16 TIME OF EVENT (WITH EXT'D VERBS ONLY)	1 00000X.	HRS	DEC ONLY
	2 000X.	MIN	MUST LOAD
	3 0XX.XX	SEC	3 COMPS
17 ASTRONAUT TOTAL	1 XXX.XX	DEG	
	2 XXX.XX	DEG	
	3 XXX.XX	DEG	
18 AUTO MANEUVER BALL ANGLES	1 XXX.XX	DEG	DEC ONLY
	2 XXX.XX	DEG	MUST LOAD
	3 XXX.XX	DEG	COMPS
19 BYPASS ATTITUDE TRIM MANEUVER	1 XXX.XX	DEG	
	2 XXX.XX	DEG	
	3 XXX.XX	DEG	
20 ICDU ANGLE X OG ROLL	1 XXX.XX	DEG	
Y IG PITCH	2 XXX.XX	DEG	
Z MG YAW	3 XXX.XX	DEG	
21 PIPA X	1 XXXXX.	PULSES	
Y	2 XXXXX.	PULSES	
Z	3 XXXXX.	PULSES	
22 NEW ICDU ANGLE OG	1 XXX.XX	DEG	
IG	2 XXX.XX	DEG	
MG	3 XXX.XX	DEG	
23) SPAFE			
24 TIME FOR AGC CLOCK (USED WITH V55)	1 0000X.	HRS	DEC ONLY
	2 0000X.	MIN	MUST LOAD
	3 0XX.XX	SEC	3 COMPS
25 CHECKLIST (USED WITH V50)	1 XXXXX.		
	2 XXXXX.		
	3 XXXXX.		

NOUN FORMATS

<u>DESCRIPTION</u>	<u>SCALE AND FORMAT</u>	<u>UNITS</u>	<u>RESTRICTIONS</u>
26 PRIO/DELAY,ADRES,BBOON	1 OCTAL 2 OCTAL 3 OCTAL		
27 SELF TEST SWITCH	1 XXXXX.		
28 SPARE			
29 XSM LAUNCH AZIMUTH	1 XXX.XX	DEC	DEC ONLY
30 TARGET CODES	1 XXXXX. 2 XXXXX. 3 XXXXX.		
31 TIME OF LANDING SITE	1 OOOXX. 2 OOOXX. 3 OXX.XX	HRS MIN SEC	DEC ONLY MUST LOAD 3 COMPS
32 TIME TO PERIGEE	1 OOOXX. 2 OOOXX. 3 OXX.XX	HRS MIN SEC	DEC ONLY MUST LOAD 3 COMPS
33 TIME TO IGNITION	1 OOOXX. 2 OOOXX. 3 OXX.XX	HRS MIN SEC	DEC ONLY MUST LOAD 3 COMPS
34 TIME OF EVENT	1 OOOXX. 2 OOOXX. 3 OXX.XX	HRS MIN SEC	DEC ONLY MUST LOAD 3 COMPS
35 TIME FROM EVENT	1 OOOXX. 2 OOOXX. 3 OXX.XX	HRS MIN SEC	DEC ONLY MUST LOAD 3 COMPS
36 TIME OF CMC CLOCK	1 OOOXX. 2 OOOXX. 3 OXX.XX	HRS MIN SEC	DEC ONLY MUST LOAD 3 COMPS
37 TIG OF TPI	1 OOOXX. 2 OOOXX. 3 OXX.XX	HRS MIN SEC	DEC ONLY MUST LOAD 3 COMPS
38 TIME OF STATE VECT	1 OOOXX. 2 OOOXX. 3 OXX.XX	HRS MIN SEC	DEC ONLY MUST LOAD 3 COMP
39 Δ TIME TO TRANSFER	1 OOOXX. 2 OOOXX. 3 OXX.XX	HRS MIN SEC	DEC ONLY MUST LOAD 3 COMPS
<u>MIXED NOUNS</u>			
40 TIME OF IGNITION/CUTOFF	1 XXBX	MIN/SEC	NO LOAD
VG	2 FPS	DEC ONLY	DEC ONLY
Δ V (ACCUMULATED)	3 XXXX.X	FPS	
41 TARGET AZIMUTH	1 XXX.XX	DEG	
ELEVATION	2 XX.XXX	DEG	
TARGET IDENTIFIER	3 OOOXX		
42 APOGEE	1 XXXX.X	NM	DEC ONLY
PERIGEE	2 XXXX.X	NM	
Δ V (REQUIRED)	3 XXXX.X	FPS	
43 LATITUDE	1 XXX.XX	DEG	DEC ONLY
LONGITUDE	2 XXX.XX	DEG	
ALTITUDE	3 XXXX.X	NM	
44 APOGEE	1 XXXX.X	NM	NO LOAD
PERIGEE	2 XXXX.X	NM	DEC ONLY
TFF	3 XXBX	MIN,SEC	
45 MARKS (VHF-OPTICS)	1 XXBX		NO LOAD
TFI OF NEXT BURN	2 XXBX	MIN,SEC	DEC ONLY
MGA	3 XXX.XX	DEG	
46 AUTOPILOT CONFIGURATION	1 OCTAL 2 OCTAL		
47 THIS VEH WEIGHT	1 XXXXX.	LBS	DEC ONLY
OTHER VEH WEIGHT	2 XXXXX.	LBS	

NOUN FORMATS (CONT.)

DESCRIPTION	SCALE AND FORMAT	UNITS	RESTRICTIONS
<u>MIXED NOUNS</u>			
48 PITCH TRIM	1 XXX.XX	DEG	DEC ONLY
YAW TRIM	2 XXX.XX	DEG	
49 Δ R	1 XXXX.X	NM	
Δ V	2 XXXX.X	FPS	DEC ONLY
SOURCE CODE (VHF OR OPTICS)	3 XXXXX.		
50 SPLASH ERROR (+OVSH)	1 XXXX.X	NM	NO LOAD
PERIGEE	2 XXXX.X	NM	DEC ONLY
TFP	3 XXXXX	MIN,SEC	
51 S BAND ANT ANG PITCH	1 XXX.XX	DEG	DEC ONLY
YAW	2 XXX.XX	DEG	
52 CENTRAL ANG OF ACT VEH	1 XXX.XX	DEG	
53 RANGE	1 XXX.XX	NM	DEC ONLY
RANGE RATE	2 XXXX.X	FPS	
PHI (LCL HOR/SLOS +=UP)	3 XXX.XX	DEG	
54 RANGE	1 XXX.XX	NM	DEC ONLY
RANGE RATE	2 XXXX.X	FPS	
THETA (LCL HOR/CSM+X+-UP)	3 XXX.XX	DEG	
55 PERIGEE CODE	1 XXXXX.		DEC ONLY
ELEVATION ANGLE	2 XXX.XX	DEG	
CENTRAL ANGLE OF PASS VEHICLE	3 XXX.XX	DEG	
56 REENTRY ANGLE	1 XXX.XX	DEG	DEC ONLY
DELTA V	2 XXXXX.	FPS	
57 Δ R (SOR)	1 XXXX.X	NM	DEC ONLY
58 PERIGEE ALT (POST TPI)	1 XXXX.X	NM	DEC ONLY
Δ V TPI	2 XXXX.X	FPS	
Δ V TPF	3 XXXX.X	FPS	
59 Δ V LOS 1	1 XXXX.X	FPS	DEC ONLY
Δ V LOS 2	2 XXXX.X	FPS	NO LOAD
Δ V LOS 3	3 XXXX.X	FPS	
60 GMAX	1 XXX.XX	G	DEC ONLY
VPRED	2 XXXXX.	FPS	
GAMMA EI (LCL HOR/VI +=UP)	3 XXX.XX	DEG	
61 IMPACT LATITUDE	1 XXX.XX	DEG	DEC ONLY
LONGITUDE	2 XXX.XX	DEG	
HEADS UP/DOWN (+UP)	3 0000X.		
62 VI, INERTIAL VEL MAG	1 XXXXX.	FPS	DEC ONLY
HDOT, ALT RATE CHANGE	2 XXXXX.	FPS	
H, ALT ABOVE PAD RADIUS	3 XXXX.X	NM	
63 RTGO, RNG FROM E.I. TO SPLASH	1 XXXX.X	NM	DEC ONLY
VLO, PREDICTED INERT VEL	2 XXXXX.	FPS	NO LOAD
TFE, TIME FROM E.I.	3 XXXXX	MIN/SEC	
64 DRAG ACCELERATION	1 XXX.XX	G	DEC ONLY
INERTIAL VELOCITY (VI)	2 XXXXX.	FPS	
RANGE TO SPLASH (+OVSH)	3 XXXX.X	NM	
65 SAMPLED CMC TIME	1 0000X.	HRS	DEC ONLY
(FETCHED IN INTERRUPT)	2 0000X.	MIN	MUST LOAD
	3 0XX.XX	SEC	3 COMPS
66 BETA, CMD BANK ANGLE	1 XXX.XX	DEG	DEC ONLY
CROSS RANGE ERROR (+TGT RT)	2 XXXX.X	NM	
DOWN RANGE ERROR (+ OVSH)	3 XXXX.X	NM	
67 RANGE TO TARGET (+ OVSH)	1 XXXX.X	NM	DEC ONLY
PRESENT LATITUDE (+ NORTH)	2 XXX.XX	DEG	
PRESENT LONGITUDE (+ EAST)	3 XXX.XX	DEG	
68 BETA, CMD BANK ANGLE	1 XXX.XX	DEG	DEC ONLY
VI, INERTIAL VELOCITY	2 XXXXX.	FPS	
RDOT, ALT RATE CHANGE	3 XXXXX.	FPS	

NOUN FORMATS (CONT.)

MIXED NOUNS	SCALE AND FORMAT	UNITS	RESTRICTIONS
69 BETA	1 XXX.XX	DEC	DEC ONLY
DL	2 XXX.XX	G	
VL	3 XXXXX.	FPS	
70 CELESTIAL BODY CODE (BEFORE MARK)	1 OCTAL		
LANDMARK DATA	2 OCTAL		
HORIZON DATA	3 OCTAL		
71 CELESTIAL BODY CODE (AFTER MARK)	1 OCTAL		
LANDMARK DATA	2 OCTAL		
HORIZON DATA	3 OCTAL		
72 Δ ANGLE (+ACT VEH LEADS)	1 XXX.XX	DEG	DEC ONLY
Δ ALT (+ACT VEH ABOVE)	2 XXXX.X	NM	
SEARCH OPTION	3 XXXXX.		
73 ALTITUDE	1 XXXXX.	NM	DEC ONLY
VELOCITY	2 XXXXX.	FPS	
FLIGHT PATH ANGLE	3 XXX.XX	DEG	
74 BETA, CMD BANK ANGLE	1 XXX.XX	DEG	
VI, INERTIAL VELOCITY	2 XXXXX.	FPS	
G, DRAG ACCEL	3 XXX.XX	G	
75 Δ ALTITUDE CDH	1 XXXXX.X	NM	
Δ TIME (CDH-CSI/TPI-CDH)	2 XXXXX	MIN/SEC	NO LOAD
Δ TIME (TPI-CDH/TPI-NOMTPI)	3 XXXXX	MIN/SEC	DEC ONLY
76)			
77) SPARES			
78)			
79 RATE (+ INCR CDU)	1 X.XXXXX	DEG/SEC	
DEADBAND	2 XXX.XX	DEG	
AXIS CODE	3 XXXXX.		
80 TIME TO IGNITION/CUTOFF	1 XXXXX	MIN/SEC	NO LOAD
VG	2 XXXXX.	FPS	DEC ONLY
DELTA V (ACCUMULATED)	3 XXXXX.	FPS	
81 Δ VX (LV)	1 XXXX.X	FPS	DEC ONLY
Δ VY (LV)	2 XXXX.X	FPS	
Δ VZ (LV)	3 XXXX.X	FPS	
82 Δ VX (LV)	1 XXXX.X	FPS	DEC ONLY
Δ VY (LV)	2 XXXX.X	FPS	
Δ VZ (LV)	3 XXXX.X	FPS	
83 Δ VX (CONT)	1 XXXX.X	FPS	DEC ONLY
Δ VY (CONT)	2 XXXX.X	FPS	
Δ VZ (CONT)	3 XXXX.X	FPS	
84 Δ VX (OTHER VEHICLE)	1 XXXX.X	FPS	DEC ONLY
Δ VY (OTHER VEHICLE)	2 XXXX.X	FPS	
Δ VZ (OTHER VEHICLE)	3 XXXX.X	FPS	
85 VGX (CONT)	1 XXXX.X	FPS	DEC ONLY
VGY (CONT)	2 XXXX.X	FPS	
VGZ (CONT)	3 XXXX.X	FPS	
86 Δ VX (LV)	1 XXXXX.	FPS	DEC ONLY
Δ VY (LV)	2 XXXXX.	FPS	
Δ VZ (LV)	3 XXXXX.	FPS	
87 MARK DATA - SHAFT TRUNNION	1 XXX.XX	DEG	
	2 XX.XXX	DEG	
88 PLANET-UNIT POS. VECTOR X	1 .XXXXX		DEC ONLY
Y	2 .XXXXX		
Z	3 .XXXXX		

NOUN FORMATS (CONT.)

MIXED NOUNS	SCALE AND FORMAT	UNITS	RESTRICTIONS
89 LANDMARK LATITUDE	1 XX.XXX	DEG	DEC ONLY
LONGITUDE/2	2 XX.XXX	DEG	
ALTITUDE	3 XXX.XX	NM	
90 REND OUT OF PLANE-Y	1 XXX.XX	NM	DEC ONLY
-Y DOT	2 XXXX.X	FPS	
-PSI	3 XXX.XX	DEG	
91 PRESENT OCDU ANGLES, SHAFT	1 XXX.XX	DEG	
TRUNNION	2 XX.XXX	DEG	
92 NEW OCDU ANGLES, SHAFT	1 XXX.XX	DEG	
TRUNNION	2 XX.XXX	DEG	
93 DELTA GYRO ANGLES X OG	1 XX.XXX	DEG	
Y IG	2 XX.XXX	DEG	
Z MG	3 XX.XXX	DEG	
94 NEW OPTICS ANGLES, SHAFT	1 XXX.XX	DEG	
TRUNNION	2 XX.XXX	DEG	
95 PREF. ATT. OCDU ANGLES			
ROLL	1 XXX.XX	DEG	
PITCH	2 XXX.XX	DEG	
YAW	3 XXX.XX	DEG	
96 + X-AXIS ATT. FDAI ANGLES			
ROLL	1 XXX.XX	DEG	
PITCH	2 XXX.XX	DEG	
YAW	3 XXX.XX	DEG	
97 SYSTEM TEST INPUTS	1 XXXXX.		
	2 XXXXX.		
	3 XXXXX.		
98 SYSTEM TEST RESULTS AND INPUTS	1 XXXXX.		
	2 .XXXXX		
	3 XXXXX.		
99 POSITION ERROR, RMS	1 XXXXX.	RMS FT	DEC ONLY
VELOCITY ERROR, RMS	2 XXXX.X	RMS FPS	
OPTION CODE (1-REND, 2-ORBITAL, 3-CISLUNAR)	3 XXXXX.		

ALARM CODES (RESPONSE TO V05N09E)

<u>CODE</u>	<u>PURPOSE</u>	<u>SET BY</u>
00110	NO MARK SINCE LAST MARK REJECT	SXTMARK
00112	MARK NOT BEING ACCEPTED	SXTMARK
00113	NO INBITS	SXTMARK
00114	MARK MADE BUT NOT DESIRED	SXTMARK
00115	OPTICS TORQUE REQUEST WITH SWITCH NOT AT CMC	EXT VERB OPTICS CDU
00116	OPTICS SWITCH ALTERED BEFORE 15 SEC ZERO TIME ELAPSED	T4RUPT
00117	OPTICS TORQUE REQUEST WITH OPTICS NOT AVAILABLE (OPTIND=-0)	EXT VERB OPTICS CDU
00120	OPTICS TORQUE REQUEST WITH OPTICS NOT ZEROED	T4RUPT
00121	CDUS NO GOOD AT TIME OF MARK	SXTMARK
00122	MARKING NOT CALLED FOR	SXTMARK
00124	TPI SEARCH - NO SAFE PERICENTER HERE	P17,P77
00205	BAD PIPA READING	SERVICER
00206	ZERO ENCODE NOT ALLOWED WITH COARSE ALIGN & GIMBAL LOCK	IMU MODE SWITCHING
00207	ISS TURNON REQUEST NOT PRESENT FOR 90 SEC	T4RUPT
00210	IMU NOT OPERATING	IMU MODE SWITCH, IMU/2, R02, P51
00211	COARSE ALIGN ERROR DRIVE >2 DEG.	IMU MODE SWITCH
00212	PIPA FAIL BUT PIPA IS NOT BEING USED	IMU MODE SWITCH, T4RUPT
00213	IMU NOT OPERATING WITH TURN-ON REQUEST	T4RUPT
00214	PROGRAM USING IMU WHEN TURNED OFF	T4RUPT
00217	BAD RETURN FROM STALL ROUTINES	CURTAINS
00220	BAD REFSMAT	R02
00401	DESIRED GIMBAL ANGLES YIELD GIMBAL LOCK	INF. ALIGN, IMU 2
00404	TARGET OUT OF VIEW (90 DEG TEST)	R52
00405	TWO STARS NOT AVAILABLE	P52, P54
00406	REND NAVIGATION NOT OPERATING	R21, R23
00407	TRUN ANGLE >50 DEG - TARGET OUT OF VIEW	R52
00421	W-MATRIX OVERFLOW	INTEGRV
00600	IMAGINARY ROOTS ON FIRST ITERATION	P32, P72
00601	PERIGEE ALT LT PMIN1	P32, P72
00602	PERIGEE ALT LT PMIN2	P32, P72
00603	CSI TO CDH TIME LT PMIN22	P32, P72, P33, P73
00604	CDH TO TPI TIME LT PMIN23	P32, P72
00605	NUMBER OF ITERATIONS EXCEEDS LOOP MAXIMUM	P32, P72, P37
00606	ΔV EXCEEDS MAXIMUM	
00611	NO TIG FOR GIVEN ELEV ANGLE	P34, P74, P33, P73
00612	STATE VECTOR IN WRONG SPHERE OF INFLUENCE	P37
00613	REENTRY ANGLE OUT OF LIMITS	P37
00777	PIPA FAIL CAUSED ISS WARNING	T4RUPT
01102	CMC SELF TEST ERROR	SELF CHECK
01105	DOWNLINK TOO FAST	T4RUPT
01106	UPLINK TOO FAST	T4RUPT
01107	PHASE TABLE FAILURE, ASSUME ERASABLE MEMORY IS DESTROYED	RESTART
01301	ARCSIN-ARCCOS INPUT ANGLE TOO LARGE	INTERRUPTOR
01407	VG INCREASING	S40.8
01426	IMU UNSATISFACTORY	P61, P62
01427	IMU REVERSED	P61, P62
01520	V37 REQUEST NOT PERMITTED AT THIS TIME	V37
01600	OVERFLOW IN DRIFT TEST	OPT PREALIGN CALIB
01601	BAD IMU TORQUE	OPT PREALIGN CALIB
01602	BAD OPTICS DURING VERIFICATION	OPTALGN CALIB (CSM)
01703	INSUF TIME FOR INTEG. TIG WAS SLIPPED	R41
03777	ICDU FAIL CAUSED ISS WARNING	T4RUPT
04777	ICDU, PIPA FAIL CAUSED ISS WARNING	T4RUPT
07777	IMU FAIL CAUSED ISS WARNING	T4RUPT
10777	IMU, PIPA FAIL CAUSED ISS WARNING	T4RUPT
13777	IMU, ICDU FAIL CAUSED ISS WARNING	T4RUPT
14777	IMU, ICDU, PIPA FAIL CAUSED ISS WARNING	T4RUPT

ALARM CODES (RESPONSE TO V05N09E) CONT.

<u>CODE</u>	<u>PURPOSE</u>	<u>SET BY</u>
20430	*INTEG. ABORT DUE TO SUB-SURFACE S.V.	ALL CALLS TO INTEG.
20607	*NO SOLUTION FROM TIME-THETA OR TIME RADIUS	ALL CALLS TO ROUTINE
20610	*LAMBDA LESS THAN UNITY	P37
21103	*UNUSED CCS BRANCH EXECUTED	CCSHOLE
21204	*NEG. OR ZERO WAITLIST CALL	WAITLIST
21206	*SECOND JOB ATTEMPTS TO GO TO SLEEP VIA KEYBOARD AND DISPLAY PROGRAM	PINBALL
21210	*TWO PROGRAMS USING DEVICE AT SAME TIME	IMU MODE SWITCH
21302	*SQRT CALLED WITH NEG. ARGUMENT	INTERPRETER
21501	*KEYBOARD AND DISPLAY ALARM DURING INTERNAL USE (NVSUB).	PINBALL
21502	*ILLEGAL FLASHING DISPLAY	GOPLAY
21521	*P01 OR P07 ILLEGALLY SELECTED	P01,P07
31104	*DELAY ROUTINE BUSY	SERVICE ROUTINES
31201	*EXECUTIVE OVERFLOW-NO VAC AREAS	EXECUTIVE
31202	*EXECUTIVE OVERFLOW-NO CORE SETS	EXECUTIVE
31203	*WAITLIST OVERFLOW-TOO MANY TASKS	WAITLIST
31207	*NO VAC. AREAS FOR MARKS	SXTMARK
31211	*ILLEGAL INTERRUPT OF EXTENDED VERBS	SXTMARK

*INDICATES ABORT TYPE. ALL OTHERS ARE NON-ABORTIVE.
 2XXXX INDICATES A GO TO ROUTINE OO TYPE ABORT
 3XXXX INDICATES A BAIL OUT TYPE ABORT

NOTE: FOR V05N09 DISPLAY

R1-XXXXX (FIRST ALARM AFTER ERROR RESET)
 R2-XXXXX (SECOND ALARM AFTER ERROR RESET)
 R3-XXXXX (MOST RECENT ALARM)

ERROR RESET WILL SET R1 AND R2 TO ZERO, BUT NOT EFFECT R3

CHECKLIST REFERENCE CODES (V50N25)

R1

CODE

ACTION TO BE EFFECTED

00013	PERFORM	COARSE ALIGNMENT
00014	KEY IN	FINE ALIGNMENT OPTION
00015	PERFORM	CELESTIAL BODY ACQUISITION
00016	KEY IN	TERMINATE MARK SEQUENCE
00041	SWITCH	CM/SM SEPARATION TO UP
00062	SWITCH	AGC POWER DOWN
00202	PERFORM	GNC'S AUTOMATIC MANEUVER
00204	PERFORM	SPS GIMBAL TRIM

SWITCH - DENOTES CHANGE POSITION OF A CONSOLE SWITCH
 PERFORM - DENOTES START OR END OF A TASK
 KEY IN - DENOTES KEY IN OF DATA THRU THE DSKY

OPTION CODES

THE SPECIFIED OPTION CODES VO4NO6 WILL BE FLASHED IN COMPONENT R1 IN CONJUNCTION WITH VO4NO6 TO REQUEST THE ASTRONAUT TO LOAD INTO COMPONENT R2 THE OPTION HE DESIRES.

OPTION
CODE

PURPOSE

INPUT FOR COMPONENT R2

00001	SPECIFY IMU ORIENTATION	1=REF 2=NOM 3=REFSMAT
00002	SPECIFY VEHICLE	1=THIS 2=OTHER
00003	SPECIFY TRACKING ATTITUDE	1=PREFERRED 2=X-AXIS
00005	SPECIFY SOR PHASE	1=FIRST 2=SECOND
00007	SPECIFY PROPULSION SYSTEM	1=SPS 2=RCS

FLAGWORD 0

<u>FLAG WORD</u>	<u>BIT</u>	<u>MNEMONIC</u>	<u>SET</u>	<u>RESET</u>
0		FLAGWRDO = STATE +0 (0074)		
0	15	CPHIFLAG	OUTPUT OF CALCGA IS CPHIX	OUTPUT OF CALCGA IS THETAD
0	14	JSWITCH	INTEGRATION OF W MATRIX .	INTEGRATION OF STATE VECTOR
0	13	MIDFLAG	INTEGRATION WITH SOLAR PERTURBATIONS	INTEGRATION WITHOUT SOLAR PERTURBATIONS
0	12	MOONFLAG	MOON IS SPHERE OF INFLUENCE	EARTH IS SPHERE OF INFLUENCE
0	11	NORPHOR	FAR HORIZON	NEAR HORIZON
0	10	ZMEASURE	MEASUREMENT PLANET AND PRIMARY PLANET DIFFERENT	MEASUREMENT PLANET AND PRIMARY PLANET SAME
0	9	NEEDFLG	TOTAL ATTITUDE ERROR DISPLAYED	A/P FOLLOWING ERROR DISPLAYED
0	8	IMUSE	IMU IN USE	IMU NOT IN USE
0	7	RNDVZFLG	P20 RUNNING (RADAR IN USE)	P20 NOT RUNNING (RADAR IN USE)
0	6	R53FLAG	V51 INITIATED	V51 NOT INITIATED
0	5	F2RTE	IN TIME CRITICAL MODE	NOT IN TIME CRITICAL MODE
0	4	TRUNFLAG	DRIVING OF TRUNNION ALLOWED	DRIVING OF TRUNNION NOT ALLOWED
0	3	FREEFLAG	(TEMPORARY FLAG USED IN MANY ROUTINES)	
0	2	AMOOONFLG	STATE VECTOR IN LUNAR SPHERE AT MIDTOAVE	STATE VECTOR IN EARTH SPHERE AT MIDTOAVE
0	1	KFLAG	SEARCH SECTOR LESS THAN 180 DEGREES	SEARCH SECTOR MORE THAN 180 DEGREES

FLAGWORD 1

<u>FLAG WORD</u>	<u>BIT</u>	<u>MNEMONIC</u>	<u>SET</u>	<u>RESET</u>
1		FLAGWORD1 =STATE +1 (0075)		
1	15	NJETSFLG	TWO JET RCS BURN	FOUR JET RCS BURN
1	14	STKFLG	RHC CONTROL	CMC CONTROL
1	13	ERADFLG	COMPUTE REARTH FISCHER ELLIPSOID	USE CONSTANT REARTH PAD RADIUS
1	12	NODOPO1	PO1 NOT ALLOWED	PO1 ALLOWED
1	11	ENG2FLG	RCS BURN	SPS BURN
1	10	TARG1FLG	SIGHTING LEM	NOT SIGHTING LEM
1	9	TARG2FLG	SIGHTING LANDMARK	SIGHTING STAR
1	9	R23FLG	R23 COAS MARKING	R21 COAS MARKING
1	8	VEHUPFLG	CSM STATE VECTOR BEING UPDATED	LEM STATE VECTOR BEING UPDATED
1	7	UPDATFLG	UPDATING BY MARKS ALLOWED	UPDATING BY MARKS NOT ALLOWED
1	6	IDLEFAIL	INHIBIT R41	ENABLE R41
1	5	TRACKFLG	TRACKING ALLOWED	TRACKING NOT ALLOWED
1	4	TRMO3FLG	REQUEST TO TERMINATE PO3 HAS BEEN ENTERED	NO REQUEST TO TERMINATE PO3 HAS BEEN ENTERED
1	3	SLOPESW	ITERATE WITH BIAS METHOD	ITERATE WITH REGULAR FALSI METHOD
1	2	GUESSW	NO STARTING VALUE FOR ITERATION	STARTING VALUE FOR ITERATION EXISTS
1	1	AVEGFLG	AVERAGEG (SERVICE) TO CONTINUE	AVERAGEG (SERVICER) TO CEASE

FLAGWORD 2

<u>FLAG WORD</u>	<u>BIT</u>	<u>MNEMONIC</u>	<u>SET</u>	<u>RESET</u>
2		FLAGWRD2 = STATE +2 (0076)		
2	15	DRIPFLG	TRUPT CALLS GYRO COMPENSATION	TRUPT DOES NOT CALL GYRO COMPENSATION
2	14	R21MARK	OPTION ONE FOR MARKRUPT	OPTION TWO FOR MARKRUPT
2	13	22DSPLG	DISPLAY DR,DV	DO NOT DISPLAY DR,DV
2	12	P21FIAG	SUCCEEDING PASS THRU P21, USE BASE VECTOR FOR CALC.STEERING TO BE DONE	1ST PASS THRU P21 CALCULATE BASE VECTOR STEERING OMITTED
2	11	STEERSW	STEERING TO BE DONE	STEERING OMITTED
2	10	SKIPVHF	DISREGARD RADAR READ BECAUSE OF SPTWRE OR HWRE RESTART	RADAR READ TO PROCEED NORMALLY
2	9	IMPULSW	MINIMUM IMPULSE BURN (CUTOFF TIME SPECIFIED)	STEERING BURN = NO CUTOFF TIME YET AVAILABLE
2	8	XDELVFLG	EXTERNAL DELTAV VG COMPUTATION	LAMBERT (AIMPOINT) VG COMPUTATION
2	7	ETPIFLAG	ELEVATION ANGLE SUPPLIED FOR P34,74	TPI TIME SUPPLIED FOR P34,74
2	7	FIRSTFLG	FIRST PASS THRU S40.9	SUCCEEDING PASS THRU S40.9
2	7	OPTNSW	SOI PHASE P38/P78	SOR PHASE OF P38/P78
2	6	FINALFLG	LAST PASS THROUGH RENDEZVOUS PROGRAM COMPUTATIONS	INTERIM PASS THROUGH RENDEZVOUS PROGRAM COMPUTATIONS
2	5	AVFLAG	LEM IS ACTIVE VEHICLE	CSM IS ACTIVE VEHICLE
2	4	PFRATFLG	PREFERRED ATTITUDE COMPUTED	PREFERRED ATTITUDE NOT COMPUTED
2	3	NOT USED		
2	2	CALCMAN2	PERFORM MANEUVER STARTING PROCEDURE	BYPASS STARTING PROCEDURE
2	1	NODOFLAG	V37 NOT PERMITTED	V37 PERMITTED

FLAGWORD 3

<u>FLAG WORD</u>	<u>BIT</u>	<u>MNEMONIC</u>	<u>SET</u>	<u>RESET</u>
3		FLAGWORD3 = STATE +3 (0077)		
3	15	V50N18FL	ENABLE R60 ATT. MANEUVER	INHIBIT R60 ATT. MANEUVER
3	14	GLOKFAIL	GIMBAL LOCK HAS OCCURRED	NOT IN GIMBAL LOCK
3	13	REFSMAT	REFSMAT GOOD	REFSMAT NO GOOD
3	12	LUNAFIAG	LUNAR LAT-LONG	EARTH LAT-LONG
3	11	P22MFLG	P22 DNLINK MARK DATA JUST TAKEN	P22 DNLINK MARK DATA NOT JUST TAKEN
3	10	VFLAG	LESS THAN TWO STARS IN FIELD OF VIEW	TWO STARS IN FIELD OF VIEW
3	9	POOFLAG	INHIBIT BACKWARDS INTEGRATION	ALLOW BACKWARDS INTEGRATION
3	8	PRECIPLG	CSMPREC OR LEMPREC OR INTEGRVS CALLED	INTEGRV CALLED
3	7	CULTFLAG	STAR OCCULTED	STAR NOT OCCULTED
3	6	ORWFLAG	W MATRIX VALID FOR ORBITAL NAVIGATION	W MATRIX INVALID FOR ORBITAL NAVIGATION
3	5	STATEFLG	PERMANENT STATE VECTOR UPDATED	PERMANENT STATE VECTOR NOT UPDATED
3	4	INTYPLG	CONIC INTEGRATION	ENCKE INTEGRATION
3	3	VINTYPLG	CSM STATE VECTOR BEING INTEGRATED	LEM STATE VECTOR BEING INTEGRATED
3	2	D6OR9FLG	DIMENSION OF W IS 9 FOR INTEGRATION	DIMENSION OF W IS 6 FOR INTEGRATION
3	1	DIMOFIAG	W MATRIX IS TO BE USED	W MATRIX IS NOT TO BE USED

FLAGWORD

<u>FLAG WORD</u>	<u>BIT</u>	<u>MNEMONIC</u>	<u>SET</u>	<u>RESET</u>
4		FLAGWRDO = STATE +4 (0100)		
4	15	MRKIDFLG	MARK DISPLAY IN ENDDLE	NO MARK DISPLAY IN ENDDLE
4	14	PRIODFLG	PRIORITY DISPLAY IN ENDDLE	NO PRIORITY DISPLAY IN ENDDLE
4	13	NRMIDFLG	NORMAL DISPLAY IN ENDDLE	NO NORMAL DISPLAY IN ENDDLE
4	12	PDSPFLAG	CAN'T INTERRUPT PRIORITY DISPLAY	
4	11	MWAITFLG	HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED	NO HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED
4	10	NWAITFLG	HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED	NO HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED
4	9	MRKNVFLG	ASTRONAUT USING KEYBOARD WHEN MARK DISPLAY INITIATED	ASTRONAUT NOT USING KEYBOARD WHEN MARK DISPLAY INITIATED
4	8	NRMNVFLG	ASTRONAUT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED	ASTRONAUT NOT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED
4	7	PRONVFLG	ASTRONAUT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED	ASTRONAUT NOT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED
4	6	PINBRFLG	ASTRONAUT HAS INTERFERED WITH EXISTING DISPLAY	ASTRONAUT HAS NOT INTERFERED WITH EXISTING DISPLAY
4	5	MRUPTFLG	MARK DISPLAY INTERRUPTED BY PRIORITY DISPLAY	MARK DISPLAY NOT INTERRUPTED BY PRIORITY DISPLAY
3	4	NRUPTFLG	NORMAL DISPLAY INTERRUPTED BY PRIORITY OR MARK DISPLAY	NORMAL DISPLAY NOT INTERRUPTED BY PRIORITY OR MARK DISPLAY
4	3	MKOVFLG	MARK DISPLAY OVER NORMAL	NO MARK DISPLAY OVER NORMAL
4	2	NOT USED		
4	1	XDSPFLAG	MARK DISPLAY NOT TO BE INTERRUPTED	NO SPECIAL MARK INFORMATION

FLAGWORD 5

<u>FLAG WORD</u>	<u>BIT</u>	<u>MNEMONIC</u>	<u>SET</u>	<u>RESET</u>
5		FLAGWRD5 =STATE +5 (0101)		
5	15	DSKYFLAG	DISPLAYS SENT TO DSKY	NO DISPLAYS TO DSKY
5	14	RETROFLAG	P37 PREMANEUVER ORBIT IS RETROGRADE	ORBIT NOT RETROGRADE
5	13	SLOWFLG	P37 TRANSEARTH COAST SLOW DOWN IS DESIRED	SLOW DOWN IS NOT DESIRED
5	12	V59FLAG	CALIBRATION FOR P23	NORMAL MARKINGS FOR P23
5	11	INCORFLG	FIRST INCORPORATION	SECOND INCORPORATION
5	10	PRFTRKAT	PERFER TRACK ATT	+X AXIS TRACK ATT
5	9	IMENFLG	DIMENSION OF W IS 9 FOR INCORPORATION	DIMENSION OF W IS 6 FOR INCORPORATION
5	8	COMPUTER	COMPUTER IS CMC	COMPUTER IS LGC
5	7	ENGONFLG	ENGINE TURNED ON	ENGINE TURNED OFF
5	6	3AXISFLG	MANEUVER SPECIFIED BY THREE AXES	MANEUVER SPECIFIED BY ONE AXES
5	5	GRRBKFLG	BACKUP GRR RECEIVED	BACKUP GRR NOT RECEIVED
5	4	NOT USED		
5	3	SOLNSW	LAMBERT DOES NOT CONVERGE OR TIME-RADIUS NEARLY CIRCULAR	LAMBERT CONVERGES OR CIRCULAR
5	2	MGLVFLAG	LOCAL VERTICAL COORDINATES COMPUTED	MIDDLE GIMBAL ANGLE COMPUTED
5	1	RENDWFLG	W MATRIX VALID FOR RENDEZVOUS NAVIGATION	W MATRIX INVALID FOR RENDEZVOUS NAVIGATION

FLAGWORD 6

<u>FLAG WORD</u>	<u>BIT</u>	<u>MNEMONIC</u>	<u>SET</u>	<u>RESET</u>
6		FLAGWRD6 =STATE +6 (0102)		
*6	15	DAPBIT1	1 SATURN 1 TVC	0 RCS 0 NO
*6	14	DAPBIT2	1 A/P 0 A/P	1 A/P 0 A/P
6	13	STRULLSW	DO STEERULL	DO ULLAGE OFF ONLY
6	13	ENTRYDSP	DO ENTRY DISPLAY VIA ENTRYVN	OMIT ENTRY DISPLAY
6	12	CMAPARM	ALLOW ENTRY FIRINGS AND CALCULATIONS	INHIBIT ENTRY FIRINGS AND CONTROL FUNCTION
6	11	GAMDIPSW	CALCULATE GAMDOT	GAMDOT NOT TO BE CALCULATED
6	10	GONEPAST	LATERAL CONTROL CALCULATIONS TO BE OMITTED	LATERAL CONTROL CALCULATIONS TO BE DONE
6	9	RELVELSW	TARGETING USES EARTH - RELATIVE VELOCITY	TARGETING USES INERTIAL VELOCITY
6	8	EGSW	IN FINAL PHASE	NOT IN FINAL PHASE
6	8	KNOWNFLG	LANDMARK KNOWN	LANDMARK UNKNOWN
6	8	R57FLAG	DO NOT DO R57 TRUNION BIAS HAS BEEN OBTAINED	DO R57, TRUNION BIAS NEEDED
6	7	NOSWITCH	LATERAL ROLL MANEUVER INHIBITED IN ENTRY	LATERAL ROLL MANEUVER PERMITTED IN ENTRY
6	6	HIND	ITERATING HUNTEST CALCULATIONS TO BE DONE AFTER RANGE PREDICTION	ITERATING OF HUN- TEST CALCULATIONS TO BE OMITTED AFTER RANGE PREDICTION
6	5	INRLSW	INITIAL ROLL V(LV) ATTITUDE NOT HELD	INITIAL ROLL V(LV) ATTITUDE HELD
6	4	LATSW	DOWNLIFT NOT INHIBITED	DOWNLIFT INHIBITED
6	3	.05GSW	DRAG OVER .05G	DRAG LESS THAN .05G
6	2	CM/DSTBY	ENTRY DAP ACTIVATED	ENTRY DAP NOT ACTIVATED
6	1	GYMDIPSW	CDU DIFFERENCES AND BODY RATES COMPUTED	CDU DIFFERENCES AND BODY RATES NOT COMPUTED

*FLAGWRD 6 BITS 15,14

00	T51DLOC
01	REDORCS
10	REDOTVC
11	REDOSAT

FLAGWORD 7

<u>FLAG WORD</u>	<u>BIT</u>	<u>MNEMONIC</u>	<u>SET</u>	<u>RESET</u>
7		FLAGWRD7 =STATE +7 (0103)		
7	15	TERMIPLG	TERMINATE R-52	DO NOT TERMINATE R52
7	14	ITSWITCH	ACCEPT NEXT LAMBERT TPI SEARCH SOLUTION	TEST LAMBERT ANSWER AGAINST LIMITS
7	13	IGNFLAG	TIG HAS ARRIVED	TIG HAS NOT ARRIVED
7	12	ASTNFLAG	ASTRONAUT HAS OKAYED IGNITION	ASTRONAUT HAS NOT OKAYED IGNITION
7	11	TDMRFLAG	CLOKTASK OPERATING	CLOKTASK INOPERATIVE
7	10	NORMSW	UNIT NORMAL INPUT TO LAMBERT	LAMBERT COMPUTE ITS OWN UNIT NORMAL
7	9	RVSW	DO NOT COMPUTE STATE VECTOR DURING TIME-THETA	COMPUTE STATE VECTOR DURING TIME-THETA
7	8	GONEBY	PASSED TARGET	APPROACHING TARGET
7	7	NOT USED		
7	6	V37FLAJ	AVERAGEG (SERVICER) RUNNING	AVERAGEG (SERVICER) OFF
7	5	NOT USED		
7	4	UPLCKFL	K-KBAR-K FAIL	NO K-KBAR-K FAIL
7	3	VERIFLAG	CHANGED WHEN V33E OCCURS AT END OF P27	
7	2	ATTCHFLG	LM,CM ATTACHED	LM,CM NOT ATTACHED
7	1	TFFSW	CALCULATE TPERIGEE	CALCULATE TFF

FLAGWORD 8

<u>FLAG WORD</u>	<u>BIT</u>	<u>MNEMONIC</u>	<u>SET</u>	<u>RESET</u>
8		FLAGWRD 8 =STATE +8D		
8	15	RPQFLAG	RPQ NOT COMPUTED	RPQ COMPUTED
8	14	NOT USED		
8	13	NEWIFLG	FIRST PASS THROUGH INTEGRATION	SUCCESSING INTER- ATION OF INTEGRA- TION
8	12	CMOONFLG	PERMANENT CSM STATE IN LUNAR SPHERE	PERMANENT CSM STATE IN EARTH SPHERE
8	11	LMOONFLG	PERMANENT LM STATE IN LUNAR SPHERE	PERMANENT LM STATE IN EARTH
8	10	ADVTRK	ADVANCE GROUND TRACK SIGHTING WANTED	NOT ADVANCED GROUND TRACK
8	9	P39/79 SW	P39/79 OPERATING	P38/78 OPERATING
8	8	SURFFLAG	LM ON LUNAR SURFACE	LM NOT ON LUNAR SURFACE
8	7	INFINFLG	NO CONIC SOLUTION	CONIC SOLUTION EXISTS
8	6	ORDERSW	ITERATOR USES 2ND ORDER MINIMUM MODE	ITERATOR USES 1ST ORDER STANDARD MODE
8	5	APSESW	R DESIRED OUTSIDE PERICENTER-APOCENTER RANGE IN TIME-RAD	R DESIRED INSIDE PERICENTER-APOCENTER RANGE IN TIME-RADIUS
8	4	COGAFLAG	NO CONIC SOLUTION TO CLOSE TO RECTILINEAR	CONIC SOLUTION EXISTS
8	3	V96ONFLG	POO INTEGRATION HAS BEEN INHIBITED BY V96	POO INTEGRATION IS PROCEEDING REGULARLY
8	2	NOT USED		
8	1	360SW	TRANSFER ANGLE NEAR 360 DEGREES	TRANSFER ANGLE NOT NEAR 360 DEGREES

FLAGWORD 9

<u>FLAG WORD</u>	<u>BIT</u>	<u>MNEMONIC</u>	<u>SET</u>	<u>RESET</u>
9		FLAGWRD9 =STATE +9D (0105)		
9	15	SWTOVER	SWITCHOVER HAS OCCURRED	NO SWITCHOVER YET
9	14	NOT USED		
9	13	V82EMFLAG	MOON VICINITY	EARTH VICINITY
9	12	MAXDBFLG	MAX DB SELECTED	MIN DB SELECTED
9	11	V94FLAG	V94 ALLOWED DURING P23	V94 NOT ALLOWED
9	10	SAVECFLG	P23 DISPLAY AND DATA STORAGE AFTER MARK IS DONE	P23 DISPLAY AND DATA STORAGE BEFORE MARK IS DONE
9	9	VHFRFLAG	ALLOW R22 TO ACCEPT RANGE DATA	STOP ACCEPTANCE OF RANGE DATA
9	8	SOURCFLG	SOURCE OF INPUT DATA IS FROM VHF RADAR	SOURCE OF INPUT DATA IS FROM OPTICS MARK
9	7	NOT USED		
9	6	N22ORN17	COMPUTE TOTAL ATTITUDE ERRORS WRT N22 (v62)	COMPUTE TOTAL ATTITUDE ERRORS WRT N17 (v63)
9	5	QUITFLAG	TERMINATE AND EXIT FROM INTEGRATION	CONTINUE INTEGRATION
9	4	R31FLAG	R31 SELECTED (v83)	R34 SELECTED (v85)
9	3	MID1FLAG	INTEGRATE TO TDEC	INTEGRATE TO THE THEN-PRESENT TIME
9	2	MIDAVFLG	INTEGRATION ENTERED FROM ONE OF MIDTOAV PORTALS	INTEGRATION HAS NOT ENTERED VIA MIDTOAV
9	1	AVEMIDSW	AVETOMID CALLING FOR W. MATRIX INEGR DONT WRITE OVER RN, VN, PIPTIME	NO AVETOMID W INTEGR ALLOW SET UP RN, VN PIPTIME

FLAGWORD 10

<u>FLAG WORD</u>	<u>BIT</u>	<u>MNEMONIC</u>	<u>SET</u>	<u>RESET</u>
10		FLAGWORD 10 =STATE + 10		
10	15	NOT USED		
10	14	INTFLAG	INTEG IN PROCESS	INTEG NOT IN PROCESS
10	13	NOT USED		
10	12	NOT USED		
10	11	NOT USED		
10	10	NOT USED		
10	9	NOT USED		
10	8	NOT USED		
10	7	REINTFLG	INTEG ROUTINE TO BE RESTARTED	INTEG ROUTINE NOT TO BE RESTARTED
10	6	NOT USED		
10	5	NOT USED		
10	4	NOT USED		
10	3	NOT USED		
10	2	NOT USED		
10	1	NOT USED		

FLAGWORD 11

<u>FLAG WORD</u>	<u>BIT</u>	<u>MNEMONIC</u>	<u>SET</u>	<u>RESET</u>
11		FLAGWORD 11 =STATE +11		
11	15	S32.1F1	DELTA AT CSI TIME ONE EXCEEDS MAX	DVT1 LESS THAN MAX
11	14	S32.1F2	FIRST PASS OF NEWTON INTEGRATION	REITERATION OF NEWTON
11	13	S32.1F3A	BIT 13 AND BIT 12 FUNCTION AS AN ORDERED PAIR (13,12) INDICATING THE POSSIBLE OC- CURRENCE OF 2 NEWTON ITERATIONS FOR S32.1 IN THE PROGRAM IN THE FOLLOWING ORDER: (0,1)(I.E. BIT 13 RESET, BIT 12 SET) = FIRST NEWTON ITERATION BEING DONE (0,0)= FIRST PASS OF 2ND NEWTON ITER. (1,1)= REMAINDER OF 2ND NEWTON ITER. (1,0)= REMAINDER OF 2ND NEWTON ITER.	
11	12	S32.1F3B		
11	11-1	NOT USED		

BASIC CMC INSTRUCTIONS

<u>AGC OP-CODE</u>	<u>INSTRUC- TION</u>	<u>DESCRIPTION</u>	<u>BANK 0 LOCATION₈</u>	<u>PAGE REF.</u>
00.0000	TC 0	TRANSFER CONTROL TO A	22000	C-7
00.0002	TC 2	TRANSFER CONTROL TO Q	24000	C-8
00.0003	TC 3	RELINT	26000	C-10
00.0004	TC 4	INHINT	30000	C-11
00.0005	TC 5	TRANSFER CONTROL TO Z	32000	C-12
00.0006	TC 6	EXTEND	34000	C-13
00.0007	TC 7	TRANSFER CONTROL TO ZERO	36000	C-14
00.20000	TC E	TRANSFER CONTROL TO GENERAL E	20000	C-16
00.2 00.4 OR 00.6	TC F	TRANSFER CONTROL TO GENERAL F	20040	C-17
01.0000	CCS 0	COUNT, COMPARE, AND SKIP ON A	22100	C-20
01.0002	CCS 2	COUNT, COMPARE, AND SKIP ON Q	24100	C-21
01.0006	CCS 3	COUNT, COMPARE, AND SKIP ON EBANK	26100	C-22
01.0004	CCS 4	COUNT, COMPARE, AND SKIP ON FBANK	30100	C-23
01.005	CCS 5	COUNT, COMPARE, AND SKIP ON Z	32100	C-24
01.0006	CCS 6	COUNT, COMPARE, AND SKIP ON BBANK	34100	C-26
01.0007	CCS 7	COUNT, COMPARE, AND SKIP ON ZERO	36100	C-27
01.0	CCS E	COUNT, COMPARE, AND SKIP ON E	20100	C-28
01.2; 01.4; 01.6	TCF	TRANSFER CONTROL TO FIXED MEMORY	20140	C-30
02.0000	DAS 0	PSEUDO TC TRAP	22200	C-33
02.0002	DAS 2	DOUBLE ADD TO Q AND L	24200	C-34
02.0003	DAS 3	DOUBLE ADD TO EBANK AND Q	26200	C-35
02.0004	DAS 4	DOUBLE ADD TO FBANK AND EBANK	30200	C-37
02.0005	DAS 5	DOUBLE ADD TO Z AND FBANK	32200	C-38
02.0006	DAS 6	DOUBLE ADD TO BBANK AND Z	34200	C-39

BASIC CMC INSTRUCTIONS
(CONT.)

<u>AGC OP-CODE</u>	<u>INSTRUC- TIONS</u>	<u>DESCRIPTION</u>	<u>BANK 0 LOCATION₈</u>	<u>PAGE REF.</u>
02.0007	DAS 7	DOUBLE ADD TO ZERO AND BBANK	36200	C-40
02.0	DAS E	DOUBLE ADD TO E AND E-1	20200	C-41
02.2000	LXCH 0	EXCHANGE L AND A	22220	C-43
02.2002	LXCH 2	EXCHANGE L AND Q	24220	C-44
02.2003	LXCH 3	EXCHANGE L AND EBANK	26220	C-45
02.2004	LXCH 4	EXCHANGE L AND FBANK	30220	C-47
02.2005	LXCH 5	EXCHANGE L AND Z	32220	C-48
02.0006	LXCH 6	EXCHANGE L AND BBANK	34220	C-49
02.0007	LXCH 7	EXCHANGE L AND ZERO	36220	C-50
02.2	LXCH E	EXCHANGE L AND E	20220	C-41
02.4000	INCR 0	INCREMENT A	22240	C-53
02.4002	INCR 2	INCREMENT Q	24240	C-54
02.4003	INCR 3	HAS NO PURPOSE	26240	C-55
02.4004	INCR 4	HAS NO PURPOSE	30240	C-56
02.4005	INCR 5	INCREMENT Z	32240	C-57
02.4006	INCR 6	INCREMENT BBANK	32240	C-58
02.4007	INCR 7	HAS NO PURPOSE	36240	C-60
02.4	INCR E	INCREMENT E	20240	C-61
02.6000	ADS 0	ADD TO STORAGE A	22260	C-63
02.6002	ADS 2	ADD TO STORAGE Q	24260	C-64
02.6003	ADS 3	ADD TO STORAGE EBANK	26260	C-65
02.6004	ADS 4	ADD TO STORAGE FBANK	30260	C-55
02.6005	ADS 5	ADD TO STORAGE Z	32260	C-68
02.6006	ADS 6	ADD TO STORAGE BBANK	34260	C-69
02.6007	ADS 7	HAS NO PURPOSE	36260	C-70
02.6	ADS E	ADD TO STORAGE E	20260	C-71
03.0000	CA 0	NO OPERATION	22300	C-73
03.0002	CA 2	CLEAR AND ADD Q	24300	C-74

BASIC CMC INSTRUCTIONS
(CONT.)

<u>AGC OP-CODE</u>	<u>INSTRUC- TION</u>	<u>DESCRIPTION</u>	<u>BANK 0 LOCATION₈</u>	<u>PAGE REF.</u>
03.0003	CA 3	CLEAR AND ADD EBANK	26300	C-75
03.004	CA 4	CLEAR AND ADD FBANK	30300	C-76
03.005	CA 5	CLEAR AND ADD BBANK	34300	C-79
03.007	CA 7	CLEAR AND ADD ZERO	36300	C-80
3.0	CA E	CLEAR AND ADD E	20300	C-81
03.2; 03.4; 03.6	CA F	CLEAR AND ADD F	20340	C-82
04.0000	CS 0	CLEAR AND SUBTRACT A	22400	C-84
04.0002	CS 2	CLEAR AND SUBTRACT Q	24400	C-85
04.0003	CS 3	CLEAR AND SUBTRACT EBANK	26400	C-86
04.0004	CS 4	CLEAR AND SUBTRACT FBANK	30400	C-87
04.0005	CS 5	CLEAR AND SUBTRACT Z	32400	C-88
04.0006	CS 6	CLEAR AND SUBTRACT BBANK	34400	C-90
04.0007	CS 7	CLEAR AND SUBTRACT ZERO	36400	C-91
04.0	CS E	CLEAR AND SUBTRACT E	20400	C-92
04.2; 04.4; 04.6	CS F	CLEAR AND SUBTRACT F	20440	C-93
05.0000	NDX 0	INDEX NEXT BASIC INSTRUCTION WITH A	22500	C-95
05.0002	NDX 2	INDEX NEXT BASIC INSTRUCTION WITH Z	24500	C-96
05.0003	NDX 3	INDEX NEXT BASIC INSTRUCTION WITH EBANK	26500	C-97
05.00004	NDX 4	INDEX NEXT BASIC INSTRUCTION WITH FBANK	30500	C-99
05.0005	NDX 5	INDEX NEXT BASIC INSTRUCTION WITH Z	32500	C-100
05.0006	NDX 6	INDEX NEXT BASIC INSTRUCTION WITH BBANK	34500	C-101
05.0007	NDX 7	HAS NO PURPOSE	36500	C-102
05.0017	NDX 17	RESUME	20510	C-103

BASIC CMC INSTRUCTIONS
(CONT.)

<u>AGC OP-CODE</u>	<u>INSTRUC- TION</u>	<u>DESCRIPTION</u>	<u>BANK 0 LOCATION₈</u>	<u>PAGE REF</u>
05.0	NDX E	INDEX NEXT BASIC INSTRUCTION WITH E	20500	C-104
05.2000	DSCH 0	RETURN FROM FAKE JIN	22520	C-106
05.2002	DXCH 2	DOUBLE EXCHANGE Q AND L	24520	C-107
05.2003	DXCH 3	DOUBLE EXCHANGE EBANK AND Q	26520	C-109
05.2004	DXCH 4	DOUBLE EXCHANGE FBANK AND EBANK	30520	C-110
05.2005	DXCH 5	DOUBLE EXCHANGE Z AND FBANK	32520	C-111
05.2006	DXCH 6	DOUBLE EXCHANGE BBANK AND Z	34520	C-112
05.2007	DXCH 7	DOUBLE EXCHANGE ZERO AND BBANK	36520	C-113
05.2	DXCH E	DOUBLE EXCHANGE E AND E-1	20520	C-115
05.4000	TS 0	OVERFLOW SKIP ON A	22540	C-117
05.4002	TS 2	TRANSFER TO STORAGE Q	24540	C-118
05.4003	TS 3	TRANSFER TO STORAGE EBANK	26540	C-119
05.4004	TS 4	TRANSFER TO STORAGE FBANK	30540	C-121
05.4005	TS 5	TRANSFER TO STORAGE Z	32540	C-122
05.4006	TS 6	TRANSFER TO STORAGE BBANK	34540	C-123
05.4007	TS 7	RESET A AND SKIP ON OVERFLOW	36540	C-124
05.4	TS E	TRANSFER TO STORAGE E	20540	C-125
05.6000	XCH 0	HAS NO PURPOSE	22560	C-127
06.6002	XCH 2	EXCHANGE A AND Q	24560	C-128
05.6003	XCH 3	EXCHANGE A AND EBANK	26560	C-129
05.6004	XCH 4	EXCHANGE A AND FBANK	30560	C-130
05.6005	SCH 5	EXCHANGE A AND Z	32560	C-132
05.6006	XCH 6	EXCHANGE A AND BBANK	34560	C-133
05.6007	XCH 7	EXCHANGE A AND ZERO	36560	C-134
05.6	XCH E	EXCHANGE A AND E	20560	C-135
06.0000	AD 0	ADD A TO A	22600	C-137
06.0002	AD 2	ADD Q TO A	24600	C-138

BASIC CMC INSTRUCTIONS
(CONT.)

<u>AGC OP-CODE</u>	<u>INSTRUC- TION</u>	<u>DESCRIPTION</u>	<u>BANK 0 LOCATION_g</u>	<u>PAGE REF</u>
06.0003	AD 3	ADD EBANK TO A	26600	C-139
06.0004	AD 4	ADD FBANK TO A	30600	C-140
06.0006	AD 6	ADD BBANK TO A	34600	C-143
06.0007	AD 7	HAS NO PURPOSE	36600	C-144
06.0	AD E	ADD E TO A	20600	C-145
06.2; 06.4; 06.6	AD F	ADD F TO A	20640	C-146
07.0000	MSK 0	HAS NO PURPOSE	22700	C-148
07.0002	MSK 2	MASK A WITH Q	24700	C-149
07.0003	MSK 3	MASK A WITH EBANK	26700	C-150
07.0004	MSK 4	MASK A WITH FBANK	30700	C-151
07.0005	MSK 5	MASK A WITH Z	32700	C-153
07.0006	MSK 6	MASK A WITH BBANK	34700	C-154
07.0007	MSK 7	MASK A WITH ZERO	36700	C-155
07.0	MSK E	MASK A WITH E	20700	C-156
07.2; 07.4; 07.6	MSK F	MASK A WITH F	20740	C-157
10.0001	READ 1	READ L	23001	C-159
10.0002	READ 2	READ Q	25001	C-160
10.0003	READ 3	READ T2	27001	C-161
10.0004	READ 4	READ T1	31001	C-163
10.0005	READ 5	READ RCS CHANNEL 05 _g	33001	C-164
10.0006	READ 6	READ RCS CHANNEL 06 _g	35001	C-165
10.0007	READ 7	READ FEKT-CHANNEL	37001	C-167
10.0	READ H	READ CHANNEL H	CHART 1	C-168
10.1001	WRITE 1	WRITE L	23011	C-170
10.1002	WRITE 2	WRITE Q	25011	C-171
10.1003	WRITE 3	HAS NO PURPOSE	27011	C-172

BASIC CMC INSTRUCTIONS
(CONT.)

<u>AGC OP-CODE</u>	<u>INSTRUC- TION</u>	<u>DESCRIPTION</u>	<u>BANK 0 LOCATION₈</u>	<u>PAGE REF</u>
10.1004	WRITE 4	HAS NO PURPOSE	31011	C-173
10.1007	WRITE 7	WRITE FEXT-CHANNEL	37011	C-175
10.1010	WRITE	CHANNEL 10	21010	C-176
10.1011	WRITE	CHANNEL 11	23010	C-177
10.1014	WRITE	CHANNEL 14	31010	C-180
10.1	WRITE	CHANNELS 15 THROUGH 32	CHART 1	C-182
10.1033	WRITE	CHANNEL 33	21011	C-183
10.2001	RAND 1	LOGICAL AND OF L WITH A	23021	C-185
10.2002	RAND 2	LOGICAL AND OF Q WITH A	25021	C-186
10.2003	RAND 3	LOGICAL AND OF SCALER 2 TO A	27021	C-187
10.2004	RAND 4	LOGICAL AND OF SCALER 1 TO A	31021	C-188
10.2005	RAND 5	READ AND AND OF RCS CHANNEL 05 ₈	33021	C-190
10.2006	RAND 6	READ AND AND OF RCS CHANNEL 06 ₈	35021	C-191
10.2007	RAND 7	LOGICAL AND OF 7 TO A	37021	C-192
10.2	RAND H	LOGICAL AND OF CHANNEL H WITH A	CHART 1	C-193
10.3001	WAND 1	AND AND WRITE L	23031	C-195
10.3002	WAND 2	AND AND WRITE Q	25031	C-196
10.3003	WAND 3	AND SCALER 2 TO A	27031	C-197
10.3004	WAND 4	AND SCALER 1 TO A	31031	C-198
10.3007	WAND 7	AND AND WRITE FEXT-CHANNEL	37031	C-200
10.3	WAND	CHANNELS 11 ₈ THROUGH 14 ₈ AND 33 ₈	CHART 1	C-201
10.3	WAND	CHANNELS 15 ₈ THROUGH 32 ₈	CHART 1	C-203
10.4001	ROR 1	LOGICAL OR OF A WITH L	23041	C-205
10.4002	ROR 2	LOGICAL OR OF A WITH Q	25041	C-206
10.4003	ROR 3	LOGICAL OR OF A AND SCALER 2	27041	C-207
10.4004	ROR 4	LOGICAL OR OF A AND SCALER 1	31041	C-208

BASIC CMC INSTRUCTIONS
(CONT.)

<u>AGC OP-CODE</u>	<u>INSTRUC- TION</u>	<u>DESCRIPTION</u>	<u>BANK 0 LOCATION₈</u>	<u>PAGE REF</u>
10.4005	ROR 5	LOGICAL OR OF A AND RCS CHANNEL 05 ₈	33041	C-210
10.4006	ROR 6	LOGICAL OR OF A AND RCS CHANNEL 06 ₈	35041	C-211
10.4007	ROR 7	LOGICAL OR OF A AND FEXT- CHANNEL	37041	C-212
10.4	ROR H	LOGICAL OR OF A AND CHANNEL H	CHART 1	C-213
10.5001	WOR 1	OR AND WRITE L	23050	C-215
10.5002	WOR 2	OR AND WRITE Q	25051	C-216
10.5003	WOR 3	OR SCALER 2	27051	C-217
10.5004	WOR 4	OR SCALER 1	31051	C-218
10.5007	WOR 7	OR AND WRITE FEXT- CHANNEL	37051	C-220
10.5	WOR	CHANNELS 10 ₈ THROUGH 14 ₈ AND 33 ₈	CHART 1	C-221
10.5	WOR	CHANNELS 15 ₈ THROUGH 32 ₈	CHART 1	C-223
10.6001	RXOR 1	READ AND EXCLUSIVE OR OF L	23061	C-225
10.6002	RXOR 2	READ AND EXCLUSIVE OR Q	25061	C-226
10.6003	RXOR 3	READ AND EXCLUSIVE OR OF SCALER 2	27061	C-227
10.6004	RXOR 4	READ AND EXCLUSIVE OR OF SCALER 1	31061	C-228
10.6005	RXOR 5	READ AND EXCLUSIVE OR OF RCS CHANNEL 05 ₈	33061	C-230
10.6006	RXOR 6	READ AND EXCLUSIVE OR OF RCS CHANNEL 06 ₈	35061	C-231
10.6007	RXOR 7	READ AND EXCLUSIVE OR OF FEXT-CHANNEL	37061	C-232
10.6	RXOR H	READ AND EXCLUSIVE OR OF CHANNEL H	CHART 1	C-233

BASIC CMC INSTRUCTIONS
(CONT.)

<u>AGC OP CODE</u>	<u>INSTRUC- TION</u>	<u>DESCRIPTION</u>	<u>BANK 0 LOCATION₈</u>	<u>PAGE REF.</u>
10.7	EDRUPT	ENTER INTERRUPT LEVEL 0 AT THE OP CODE IN A	CHART 1	C-235
11.0000	DV 0	DIVIDE A,L BY Q	23100	C-237
11.0002	DV 2	DIVIDE A,L BY Q	25100	C-241
11.0003	DV 3	RESULTS IN A HALT	27100	C-244
11.0004	DV 4	RESULTS IN A HALT	31100	C-245
11.0005	DV 5	RESULTS IN A HALT	33100	C-246
11.0006	DV 6	RESULTS IN A HALT	35100	C-247
11.0007	DV 7	DIVIDE BY ZERO	37100	C-248
11.0	DV 8	DIVIDE A,L BY E	21100	C-252
11.2; 11.4; 11.6	BZF F	BRANCH ON ZERO TO FIXED	21140	C-265
12.0000	MSU 0	MODULAR SUBTRACT A	23200	C-267
12.0002	MSU 2	MODULAR SUBTRACT Q	25200	C-268
12.0003	MSU 3	RESULTS IN A HALT	27200	C-269
12.0004	MSU 4	RESULTS IN A HALT	31200	C-270
12.0005	MSU 5	RESULTS IN A HALT	33200	C-271
12.0006	MSU 6	RESULTS IN A HALT	35200	C-272
12.0007	MSU 7	MODULAR SUBTRACT ZERO	37200	C-274
12.0	MSU E	MODULAR SUBTRACT E	21200	C-275
12.2000	QXCH 0	EXCHANGE Q AND A	23220	C-277
12.2002	QXCH 2	HAS NO PURPOSE	25220	C-278
12.2003	QXCH 3	EXCHANGE A AND EBANK	27220	C-279
12.2004	QXCH 4	EXCHANGE Q AND FBANK	31220	C-280
12.2005	QXCH 5	EXCHANGE Q AND Z	33220	C-281
12.2006	QXCH 6	EXCHANGE Q AND BBANK	35220	C-283
12.2007	QXCH 7	CLEAR THE Q-REGISTER	37220	C-284
12.2	ZXCH E	EXCHANGE Q AND E	21200	C-285

BASIC CMC INSTRUCTIONS
(CONT.)

<u>AGC OP-CODE</u>	<u>INSTRUC- TION</u>	<u>DESCRIPTION</u>	<u>BANK O LOCATION</u> ₀	<u>PAGE REF.</u>
12.2003	QXCH 3	EXCHANGE Q AND EBANK	27220	C-279
12.2004	QXCH 4	EXCHANGE Q AND FBANK	31220	C-280
12.2005	QXCH 5	EXCHANGE Q AND Z	33220	C-281
12.2006	QXCH 6	EXCHANGE Q AND BBANK	35220	C-283
12.2007	QXCH 7	CLEAR THE Q-REGISTER	37220	C-284
12.2	QXCH E	EXCHANGE Q AND E	21220	C-285
12.4000	AUG 0	AUGMENT A	23240	C-287
12.4002	AUG 2	AUGMENT Q	25240	C-288
12.4003	AUG 3	HAS NO PURPOSE	27240	C-289
12.4004	AUG 4	HAS NO PURPOSE	31240	C-290
12.4005	AUG 5	HAS NO PURPOSE	33240	C-291
12.4006	AUG 6	AUGMENT BBANK	35240	C-293
12.4007	AUG 7	HAS NO PURPOSE	37240	C-294
12.4	AUG E	AUGMENT E	21240	C-295
12.6000	DIM 0	DIMINISH A	23260	C-297
12.6002	DIM 2	DIMINISH Q	25260	C-298
12.6003	DIM 3	HAS NO PURPOSE	27260	C-299
12.6004	DIM 4	HAS NO PURPOSE	31260	C-300
12.6005	DIM 5	HAS NO PURPOSE	33260	C-302
12.6006	DIM 6	DIMISH BBANK	35260	C-303
12.6007	DIM 7	HAS NO PURPOSE	37260	C-304
12.6	DIM E	DIMINISH E	21260	C-305
13.0000	DCA 0	RESULTS IN A HALT	23300	C-307
13.0002	DCA 2	DOUBLE CLEAR AND ADD Q AND L	25300	C-308
13.0003	DCA 3	DOUBLE CLEAR AND ADD EBANK AND Q	27300	C-310
13.0004	DCA 4	DOUBLE CLEAR AND ADD FBANK AND EBANK	31300	C-311
13.0005	DCA 5	DOUBLE CLEAR AND ADD Z AND FBANK	33300	C-312

BASIC CMC INSTRUCTIONS
(CONT.)

<u>AGC OP-CODE</u>	<u>INSTRUC- TION</u>	<u>DESCRIPTION</u>	<u>BANK 0 LOCATION</u>	<u>PAGE REF.</u>
13.0006	DCA 6	DOUBLE CLEAR AND ADD BBANK AND Z	35300	C-313
13.0007	DCA 7	DOUBLE CLEAR AND ADD ZERO AND BBANK	37300	C-314
13.0	DCA E	DOUBLE CLEAR AND ADD E AND E-1	21300	C-316
13.2; 13.4; 13.6	DCA F	DOUBLE CLEAR AND ADD F AND F-1	21340	C-317
14.0000	DCS 0	RESULTS IN A HALT	23400	C-319
14.0002	DCS 2	DOUBLE CLEAR AND SUBTRACT Q AND L	25400	C-320
14.0003	DCS 3	DOUBLE CLEAR AND SUBTRACT EBANK AND Q	27400	C-321
14.0004	DCS 4	DOUBLE CLEAR AND SUBTRACT FBANK AND EBANK	31400	C-323
14.0005	DCS 5	DOUBLE CLEAR AND SUBTRACT Z AND FBANK	33400	C-324
14.0006	DCS 6	DOUBLE CLEAR AND SUBTRACT EBANK AND Z	35400	C-325
14.0007	DCS 7	DOUBLE CLEAR AND SUBTRACT ZERO AND BBANK	37400	C-326
14.0	DCS E	DOUBLE CLEAR AND SUBTRACT E AND E-1	21400	C-328
14.2; 14.4; 14.6	DCS F	DOUBLE CLEAR AND SUBTRACT F AND F-1	21440	C-329
15.0000	INDEX 0	INDEX NEXT EXTRA CODE WITH A	23500	C-331
15.0002	INDEX 2	(INDEX NEXT EXTRA CODE WITH Q)	25500	C-332
15.0003	INDEX 3	INDEX NEXT EXTRA CODE WITH EBANK	27500	C-333
15.004	INDEX 4	INDEX NEXT EXTRA CODE WITH FBANK	31500	C-335
15.005	INDEX 5	INDEX NEXT EXTRA CODE WITH Z	33500	C-336

BASIC CMC INSTRUCTIONS
(CONT.)

<u>AGC OP-CODE</u>	<u>INSTRUC- TION</u>	<u>DESCRIPTION</u>	<u>BANK 0 LOCATION</u> ⁸	<u>PAGE REF.</u>
15.0006	INDEX 6	INDEX NEXT EXTRA CODE WITH BBANK	35500	C-337
15.0007	INDEX 7	INDEX NEXT EXTRA CODE WITH ZERO	37500	C-338
15.0	INDEX E	INDEX NEXT EXTRA CODE WITH E	20500	C-339
15.2; 15.4; 15.6	INDEX F	INDEX NEXT EXTRA CODE WITH F	21540	C-340
16.0000	SU 0	SUBTRACT A	23600	C-342
16.0002	SU 2	SUBTRACT Q	25600	C-343
16.0003	SU 3	SUBTRACT EBANK	27600	C-344
16.0004	SU 4	SUBTRACT FBANK	31600	C-345
16.0005	SU 5	SUBTRACT Z	33600	C-346
16.0006	SU 6	SUBTRACT BBANK	35600	C-348
16.0007	SU 7	SUBTRACT ZERO	37600	C-349
16.0	SU E	SUBTRACT E	21600	C-350
16.2; 16.4; 16.6	BZMF F	BRANCH ON ZERO OR MINUS TO FIXED	21640	C-352
17.0000	MP 0	MULTIPLY BY A	23700	C-354
17.0002	MP 2	MULTIPLY BY Q	25700	C-355
17.0003	MP 3	RESULTS IN A HALT	27700	C-358
17.0004	MP 4	RESULTS IN A HALT	31700	C-359
17.0005	MP 5	RESULTS IN A HALT	33700	C-361
17.0006	MP 6	RESULTS IN A HALT	35700	C-362
17.0007	MP 7	CLEAR A AND L	37700	C-363
17.0	MP E	MULTIPLY BY E	21700	C-364
17.2; 17.4; 17.6	MP F	MULTIPLY BY F	21740	C-367

BASIC CMC INSTRUCTION

OP CODE								
CHANNEL NUMBER	READ (10.0)	WRITE (10.1)	RAND (10.2)	WAND (10.3)	ROR (10.4)	WOR (10.5)	RXOR (10.6)	RUPT (10.7)
1	23001	23011	23021	23031	23041	23051	23061	23071
2	25001	25011	25021	25031	25041	25051	25061	25071
3	27001	27011	27021	27031	27041	27051	27061	27071
4	31001	31011	31021	31031	31041	31051	31061	31071
5	33001	33011	33021	33031	33041	33051	33061	33071
6	35001	35011	35021	35031	35041	35051	35061	35071
7	37001	37011	37021	37031	37041	37051	37061	37071
10	21000	21010	21020	21030	21040	21050	21060	21070
11	23000	23010	23020	23030	23040	23050	23060	23070
12	25000	25010	25020	25030	25040	25050	25060	25070
13	27000	27010	27020	27030	27040	27050	27060	27070
14	31000	31010	31020	31030	31040	31050	31060	31070
15	33000	33010	33020	33030	33040	33050	33060	33070
16	35000	35010	35020	35030	35040	35050	35060	35070
17	37000	37010	37020	37030	37040	37050	37060	37070
0,20,UP	21001	21011	21021	21031	21041	21051	21061	21071

CHART 1

SPECIAL ISCMC DAP II INSTRUCTIONS

<u>INSTRUCTION</u>	<u>MNEMONIC</u>	<u>OP-CODE</u>
COMPLEMENT STORE	CST	14
SPECIAL STORE INDEX	SIN	26
SPECIAL ADD	SAD	33
SPECIAL STORE	SST	37
JUMP INTERPRETIVE	JIN	76
TRANSFER INDEX	TRX	51030
DOUBLE-CARRY-PROPAGATE	DCP	51032
SPECIAL SHIFT LEFT	SSL	51034
COMPLEMENT "A" BY ONES	CAO	51036

ISCMC INTERRUPT

<u>TRAP AND JUMP LOCS.</u>	<u>OCP OR CLOCK</u>	<u>*INT. LINE</u>	<u>INCR. LOC.</u>	<u>DESCRIPTION</u>
20,21	27050	L00		STORE FCN.
22,23	27051	L01		HAND COVER. RUPTS
24,25	27052	L02		UPRUPT
26,27	27053	L03		RADARUPT
30,31	20 MSEC.	L04		DOWNRUPT
32,33	27054	L05		KEY2RUPT
34,35	27055	L06		KEYRUPT1
36,37	T1	L07	54025	
40,41	T4	L10	54027	T4RUPT
42,43	T3	L11	54026	T3RUPT
44,45	T5	L12	54030	T5RUPT
46,47	T6	L13	54031	T6RUPT
50,51	50 MSEC.	L14		
52,53	27056	L15		CMS MODE CHANGE

(T1,T3,T4,T5 CLOCKS AT 10 MSEC. RATE)

(T6 CLOCK AT 625 MSEC. RATE)

INTERRUPTS ARE GENERATED WHEN THE RESPECTIVE REGISTER OVERFLOWS.

ASSOCIATED WITH ISCMC "JIN" INSTRUCTION ARE THE FOLLOWING SPECIAL OCP CODES:

OCP 34004 - SETS THE SIMULATED "EXTEND" FLIP-FLOP.

OCP 1000X - SETS THE SIMULATED "FEXT" FLIP-FLOPS.
("X" RANGES FROM 0 THRU 4)

CMC IMODES 30 - CHANNEL 30 CORRELATION

IMODES 30		CHANNEL 30 (INVERTED LOGIC)	
BIT	DESCRIPTION	BIT	DESCRIPTION
1	PIPA FAIL INHIBIT (ISS WARNING)		
2	TURN-ON DELAY SEQUENCE FAIL		
3	ICDU FAIL INHIBIT		
4	IMU FAIL INHIBIT		
5	PIPA FAIL INHIBIT (PROG. CAUTION)		
6	IMU BEING INITIALIZED		
7	FIRST TURN-ON SAMPLE		
8	SECOND TURN-ON SAMPLE		
9	IMU OPERATING	9	IMU OPERATE
10	PIPA FAIL		
11	IMU CAGE	11	IMU CAGE
12	ICDU FAIL	12	ICDU FAIL
13	IMU FAIL	13	IMU FAIL
14	ISS TURN ON REQUEST	14	ISS TURN ON REQUEST
15	ISS TEMP IN LIMITS	15	ISS TEMP IN LIMITS

CMC IMODES 33 - CHANNEL 32 & 33 CORRELATION

IMODES 33		CHANNELS 32 & 33 (INVERTED LOGIC)		
BIT	DESCRIPTION	BIT	CHAN	DESCRIPTION
1	LAMP TEST IN PROGRESS			
5	IMU IN ZEROING ROUTINE			
6	ENABLE DAP			
11	UPLINK TOO FAST	11	33	UPLINK TOO FAST
12	DOWNLINK TOO FAST	12	33	DOWNLINK TOO FAST
13	PIPA FAIL	13	33	PIPA FAIL
14	PROCEED KEY PRESSED	14	32	PROCEED KEY PRESSED

CMC OPTIMODES - CHANNEL 30 CORRELATION

OPTIMODES		CHANNEL 30 (INVERTED LOGIC)	
BIT	DESCRIPTION	BIT	DESCRIPTION
1	ENDZOPT TASK WORKING		
2	OCDU FAIL INHIBIT		
3	ZERO OPTICS PROCESSING		
4	ZERO OPTICS		
5	CMC CONTROL		
7	OCDU FAIL	7	OCDU FAIL
8	COARSE ALIGN PROCESSING		
9	CA SINCE LAST F'START		
10	OPT ZEROED SINCE LAST F'START		

CMC OPTIMODES - CHANNEL 33 CORRELATION

OPTIMODES		CHANNEL 33 (INVERTED LOGIC)	
BIT	DESCRIPTION	BIT	DESCRIPTION
4	ZERO OPTICS	4	ZERO OPTICS
5	CMC CONTROL	5	CMC CONTROL

ISCMC OCP CODES & SKS CODES

OCP CODE	FUNCTION
00076	ENABLE PARALLEL CHANNEL FOR DMA
00346	ENABLE WFB 4 FOR CHAR./WORD OUTPUT
00347	ENABLE WFB 4 FOR CHAR./WORD INPUT
01010	REQUEST RUN/STORE OR RUN TO FREEZE INTERRUPT
01011	REQUEST HAND CONTROLLER INTERRUPT
01012	REQUEST UP-TELEMETRY INTERRUPT
01013	REQUEST RADAR INTERRUPT
01014	REQUEST DSKY (LEB) INTERRUPT
01015	REQUEST DSKY (MDC) INTERRUPT
01022	REQUEST T4 CLOCK INTERRUPT
01023	REQUEST T3 CLOCK INTERRUPT
01024	REQUEST T5 CLOCK INTERRUPT
01025	REQUEST T6 CLOCK INTERRUPT
02301	ENABLE PRINTER BUFFER FOR WORD MODE
02302	PRINT ONE LINE ON PRINTER
02310	EJECT ONE PAGE ON PRINTER
02317	ADVANCE ONE LINE ON PRINTER
02400	START CARD READER MOTION (HOLLERITH)
06000	ENABLE DMA
06040	ENABLE CLOCK MASK
06041	START T6 CLOCK, IF ENABLED
06042	STOP T6 CLOCK
06043	INHIBIT ALL LEVEL L13 INTERRUPTS (AND BELOW)
06044	REMOVE THE ABOVE INHIBIT
06045	ENABLE THE DSKY OUTPUT CHANNEL
06050	START THE 3200 CPS READABLE INPUT COUNTER AND ENABLE ITS CHANNEL
06051	STOP SAME AND DISCONNECT ITS CHANNEL
07061	TURN ON DSKY "COMPUTER ACTIVITY" LAMP
07062	TURN OFF DSKY "COMPUTER ACTIVITY" LAMP
10000 THRU 10003	FEXT-CHANNEL BITS ARE NORMAL F-MEMORY ADDRESSES
10004 THRU 10007	FEXT-CHANNEL BITS OPEN SUPER BANKS
20000	START READ MOTION ON MTU 1 AND 3
20001	START READ MOTION ON MTU 2 AND 4
20200	START WRITE MOTION ON MTU 1 AND 5
20201	START WRITE MOTION ON MTU 2 AND 4
20400	WRITE EOF ON MTU 1 AND 3
20401	WRITE EOF ON MTU 2 AND 4
26160	SELECT TMU 1
26161	DESELECT TMU 1
26162	SELECT TMU 2
26163	DESELECT TMU 2
30000	BACKSPACE 1 RECORD ON MTU 1 AND 3
30001	BACKSPACE 1 RECORD ON MTU 2 AND 4
34000	INHIBIT INDIRECT ADDRESSING - OPEN UPPER BANK
34001	ENABLE INDIRECT ADDRESSING - CLOSE UPPER BANK
34004	SET THE EXTEND FLIP-FLOP
SKS CODE	SKIP IF
10001	A-REGISTER BIT 9 ≠ BIT 10 (SIMULATED AGC OVERFLOW)
10002	A-REGISTER BIT 9 = BIT 10 (SIMULATED AGC NO-OVERFLOW)
10004	A-REGISTER BIT 2 = 0 (SIMULATED AGC POSITIVE NUMBER)
10010	A-REGISTER BIT 2 = 1 (SIMULATED AGC NEGATIVE NUMBER)

ISCM MODING DISCRETES

<u>DESCRIPTION</u>	<u>CORE LOC</u>
RUN	60000
FREEZE	60001
STORE	60002
STEP-AHEAD	60006
TAPE RESET	60007
CORE RESET	60010
WRITE RESET	60011
TAPE POSITION	60012
ISCM POWER ON	60020
ISCM STANDBY	60021
RESTART	60022
DATA RECORD	60025
REAL-TIME PRINT	60027
REAL-TIME PRINT FETCH TABLE	60030
REAL-TIME PRINT RETURN BUFFER	60031
DSKY GATING	60061
ISCM TLM TABLE BASE	60406

CMC CHANNEL AND COUNTER MALFUNCTION

"N" - NUMBER OF MALFUNCTION DISPLAY

"GC" - SYSTEM SELECT CODE FOR CMC

PROCEDURE:

N → BXX

B = 0 - CHANNEL
B = 1 - COUNTER
XX = NUMBER OF "B" IN OCTAL

N+1 → AYY

A = 4 - FAIL TO ZERO
A = 5 - FAIL TO ONE
A = 6 - TOGGLE
A = 7 - ONE SHOT TO A ONE
YY = BIT NUMBER IN OCTAL
YY = 00 - ALL BITS ZERO

CMC COUNTER INTERRUPTS

CMC MEMORY LOCATION (COUNTER)	NAME	REMARKS
(TIME COUNTERS)		
0024	TIME 2	STORES MOST SIGNIFICANT TIME WORD. INCREMENTS EACH 163.84 SEC. OVERFLOWS EACH 31D, 1H, 39M, 14.56 S.
0025	TIME 1	STORES LEAST SIGNIFICANT TIME WORD. INCREMENTS EACH 0.01 SEC. OVERFLOWS EACH 163.84 SEC.
0026	TIME 3	TIME COUNTER FOR PROGRAM WAITLIST. INCREMENTED EACH 10 MS.
0027	TIME 4	TIME COUNTER FOR T4 RUPT. INCREMENTED EACH 10 MS.
0030	TIME 5	TIME COUNTER FOR THRUST VECTOR CONTROL. INCREMENTED EACH 10 MS.
0031	TIME 6	TIME COUNTER FOR REACTION CONTROL. DECREMENTED EACH 0.625 MS.
(INPUT COUNTERS)		
0032	ICDU X	COUNTS $\pm \Delta \theta$ PULSES FROM X INERTIAL CDU. (39.55 ARC SEC/COUNT)
0033	ICDU Y	COUNTS $\pm \Delta \theta$ PULSES FROM Y INERTIAL CDU. (39.55 ARC SEC/COUNT)
0034	ICDU Z	COUNTS $\pm \Delta \theta$ PULSES FROM Z INERTIAL CDU. (39.55 ARC SEC/COUNT)
0035	OCDU T	COUNTS $\pm \Delta \theta$ PULSES FROM OPTICS TRUNNION CDU. (9.89 ARC SEC/COUNT)
0036	OCDU S	COUNTS $\pm \Delta \theta$ PULSES FROM OPTICS SHAFT CDU. (39.55 ARC SEC/COUNT)
0037	PIPA X	COUNTS $\pm \Delta v$ PULSES FROM X PIPA. (5.85 CM/SEC/COUNT (CM ONLY))

CMC MEMORY LOCATION	NAME	REMARKS
0040	PIPA Y	COUNTS $\pm \Delta V$ PULSES FROM Y PIPA. (5.85 CM/SEC/COUNT (CM ONLY)).
0041	PIPA Z	COUNTS $\pm \Delta V$ PULSES FROM Z PIPA. (5.85 CM/SEC/COUNT (CM ONLY))
0042	BMAG X	COUNTS $\pm \Delta \theta$ PULSES FROM THE X BMAG. (360 ARC SEC/COUNT)
0043	BMAG Y	COUNTS $\pm \Delta \theta$ PULSES FROM THE Y BMAG. (360 ARC SEC/COUNT)
0044	BMAG Z	COUNTS $\pm \Delta \theta$ PULSES FROM THE Z BMAG. (360 ARC SEC/COUNT)
0045	INLINK	CONVERTS SERIAL UPLINK DATA INTO PARALLEL INFORMATION
0046	RNRAD	1 BIT = .01 NM
----- (OUTPUT COUNTERS) -----		
0047	GYRO D	CONTROL PULSES BURSTS WHICH DRIVE THE GYROS. (0.625 ARC SEC/COUNT)
0050	X CDU D	CONTROLS PULSE BURSTS WHICH DRIVE THE X CDU (158.2 ARC SEC/COUNT)
0051	Y CDU D	CONTROLS PULSE BURSTS WHICH DRIVE THE Y CDU. (158.2 ARC SEC/COUNT)
0052	Z CDU D	CONTROLS PULSE BURSTS WHICH DRIVE THE Z CDU. (158.2 ARC SEC/COUNT)
0053	TRUN	CONTROLS PULSE BURSTS WHICH DRIVE THE OPTICS TRUNNION CDU, (39.55 ARC SEC/COUNT) OR SPS ENG. YAW GIMBAL (85.2 ARC SEC/COUNT)
0054	SHAFT CDU D	CONTROLS PULSE BURST WHICH DRIVE THE OPTICS SHAFT CDU, (158.2 ARC SEC/COUNT) OR SPS ENG. PITCH GIMBAL. (85.2 ARC SEC/COUNT)

NOTE: THESE ARE ARRANGED IN ORDER OF PRIORITY.

DAPDATA CODES

DAPDATR 1

DAPDATR 1 IS PACKED WITH 5 OCTAL DIGITS OF INFORMATION AS FOLLOWS:

BITS	15-13	12-10	9-7	6-4	3-1
	CONFIG	XTAC	XTBD	DB	RATE

CONFIG: CONFIGURATION

- 0 - NO DAP OR ENTRY DAP
- 1 - CSM
- 2 - CSM/IM
- 3 - CSM/SIVB
- 6 - CSM/IM ASCENT STAGE ONLY

XTAC: X-TRANSLATION USING QUADS AC

- 0 - NO AC
- 1 - USE AC

XTBD: X-TRANSLATION USING QUADS BD

- 0 - NO BD
- 1 - USE BD

DB: DEADBAND

- 0 - \pm 0.5 DEGREES
- 1 - \pm 5.0 DEGREES

RATE: RESPONSE TO RHC, AUTOMATIC MANEUVERS

- 0 - 0.05 DEGREE/SECOND
- 1 - 0.2 DEGREE/SECOND
- 2 - 0.5 DEGREE/SECOND
- 3 - 2.0 DEGREES/SECOND

DAPDATR 2

DAPDATR 2 IS PACKED WITH 5 OCTAL DIGITS OF INFORMATION AS FOLLOWS:

BITS	15-13	12-10	9-7	6-4	3-1
	AC-ROLL	QUAD A	QUAD B	QUAD C	QUAD D

AC-ROLL: ROLL JET SELECTION

- 0 - USE BD ROLL
- 1 - USE AC ROLL

A,B,C,D QUAD FAILED

- 0 - QUAD FAILED
- 1 - QUAD OK

CMC MEMORY

ECADR Conversion Table - Switched E Memory

	14XX	15XX	16XX	17XX
E0	00XX	01XX	02XX	03XX
E1	04XX	05XX	06XX	07XX
E2	10XX	11XX	12XX	13XX
E3	14XX	15XX	16XX	17XX
E4	20XX	21XX	22XX	23XX
E5	24XX	25XX	26XX	27XX
E6	30XX	31XX	32XX	33XX
E7	34XX	35XX	36XX	37XX

CADR Conversion Table - Common Fixed Memory

	2XXX	3XXX		2XXX	3XXX
00	00XXX	01XXX	20	40XXX	41XXX
01	02XXX	03XXX	21	42XXX	43XXX
02	04XXX	05XXX	22	44XXX	45XXX
03	06XXX	07XXX	23	46XXX	47XXX
04	10XXX	11XXX	24	50XXX	51XXX
05	12XXX	13XXX	25	52XXX	53XXX
06	14XXX	15XXX	26	54XXX	55XXX
07	16XXX	17XXX	27	56XXX	57XXX
10	20XXX	21XXX	30	60XXX	61XXX
11	22XXX	23XXX	31	62XXX	63XXX
12	24XXX	25XXX	32	64XXX	65XXX
13	26XXX	27XXX	33	66XXX	67XXX
14	30XXX	31XXX	34	70XXX	71XXX
15	32XXX	33XXX	35	72XXX	73XXX
16	34XXX	35XXX	36	74XXX	75XXX
17	36XXX	37XXX	37	76XXX	77XXX

Note: X's represent any octal digits and remain unchanged in the conversion.

Memory References

UNSWITCHED	E			
Bank	0	C(S) =	0000-0377	
Bank	1	C(S) =	0400-0777	
Bank	2	C(S) =	1000-1377	
SWITCHED	E			
Banks	0-7	C(S) =	1400-1777	C(EBANK) = 0-7
FIXED	F			
Bank	02	C(S) =	4000-5777	
Bank	03	C(S) =	6000-7777	
COMMON	F			
Banks	00-27	C(S) =	2000-3777	C(FBANK) = 00-27
Banks	30-37	C(S) =	2000-3777	C(FBANK) = 30-37
				C(FEXT) = 0XX
Banks	40-43	C(S) =	2000-3777	C(FBANK) = 30-33
				C(FEXT) = 100

IN: INPUT/OUTPUT CHANNEL BIT ASSIGNMENTS

CHANNEL	ISCM CORE LOC	NAME	BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1		
CP	1	60101	L								CP REGISTER L, BITS 16-1								
	2	60102	Q								CP REGISTER Q, BITS 16-1								
	3	60103	HISCALAR								HIGH-ORDER SCALAR CHANNEL, BITS 14-1								
	4	60104	LISCALAR								LOW-ORDER SCALAR CHANNEL, BITS 14-1								
OUT	5	60105	PIJETS						S/M → +X-YW C/M → -YW-X+P S/M → +Y-R C/M → -Y-R	-X-YW +Y-X-P -Y-R	-X-YW +Y-X-P -Y-R	+X-YW +Y-X+P +Y-R	+X-P +P-Z +Z-R	+X-P +P-X-YW -Z-R	-X-P -Z-R -R-YW+Z	-X-P -Z-R +R+YW+Z	+X+P +P-X+YW +Z+R +R+YW+Z		
	6	60106	ROLLPETS																
CP	7	60107	SUPERBANK								FE7	FE6	FE5						
OUT	10	60110	OUTO	RELAY ADRS 4	RELAY ADRS 3	RELAY ADRS 2	RELAY ADRS 1	RELAY BIT 11	RELAY BIT 10	RELAY BIT 9	RELAY BIT 8	RELAY BIT 7	RELAY BIT 6	RELAY BIT 5	RELAY BIT 4	RELAY BIT 3	RELAY BIT 2	RELAY BIT 1	
	11	60111	DSALMOUT			SPS ENGINE ON			CAUTION RESET	TEST CONNECTOR OUTHIT		OPERATOR ERROR LAMP	VN FLASH	KEY REL LAMP	TEMP CAUTION LAMP	UPLINK ACTY LAMP	COMP ACTY LAMP	INS WARNING	
	12	60112	CHAN12	ISS TURNON DELAY COMPLETE	SIV B CUTOFF	SIV B INJ. SEQ. START		DISABLE OPTICS DAC	ZERO OPTICS	SIV B TAKEOVER ENABLE	TVC ENABLE		ENABLE DMU ERROR COUNTER	ZERO DMU ERROR CDU'S	COARSE ALIGN ENABLE		ENABLE OPT ERROR COUNTER	ZERO OPTICS CDU'S	
	13	60113	CHAN13	ENABLE TGRUPT	RESET TRAP 32	RESET TRAP 31B	RESET TRAP 31A	ENABLE STANDBY DRIVE CDU T	TEST ALARMS	GYRO ACTY	**GYRO a	EMAJ CTR ENABLE	UNLINK NO ORD	BLOCK INLINK	INHIBIT COPLINK	RNG. UNIT ACTY.	RNG. UNIT SEL. A	RNG. UNIT SEL. B	RNG. UNIT SEL. C
	14	60114	CHAN14	DRIVE CDUX	DRIVE CDUY	DRIVE CDUZ													
	15	60115	MKEY1N																
	16	60116	NAVKEY1N																
	IN	30	60130	*CHAN30	TEMP REQUEST	ISS TURNON IN LIMITE	DMU FAIL	ICDU FAIL	DMU GAGE	S/C CONTROL OF SAT	DMU OPERATE		OPTICS CDU FAIL	BULD RELEASE SIGNAL	LIFTTOPP	SIV B SEPARATE, OR ABORT	SPS READY	SM/CM SEPARATE	ULLAGE THRUST PRESENT
		31	60131	*CHAN31	C & N AUTOPILOT CONTROL	FREE	HOLD	-Z TRANS	+Z TRANS	-Y TRANS	+Y TRANS	-X TRANS	+X TRANS	RHC -ROLL	RHC +ROLL	RHC -YAW	RHC +YAW	RHC -PITCH	RHC +PITCH
		32	60132	*CHAN32		PROCEED			IM ATTACHED					MNIM -ROLL	MNIM +ROLL	MNIM -YAW	MNIM +YAW	MNIM -PITCH	MNIM +PITCH
33	60133	*CHAN33	OSC ALARM	COMPUTER WARNING	PIPA FAIL	UNLINK TOO FAST	UPLINK TOO FAST	BLACK UPLINK				STAR PRESENT	STAR TREK	CMC CTR OPTICS	ZERO OPTICS		RNG DATA GOOD		
OUT	34	60134	DVFM1						FIRST OF TWO WORDS										
	35	60135	DVFM2						SECOND OF TWO WORDS										
				15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	

* INVERTED LOGIC USED

GYRO SELECT							
a	b	c	GYRO	a	b	c	GYRO
0	0	0/1	No Axis	0	1	1	-X
0	1	0	+X	1	0	1	-Y
1	0	0	+Y	1	1	1	-Z
1	1	0	+Z				