GM

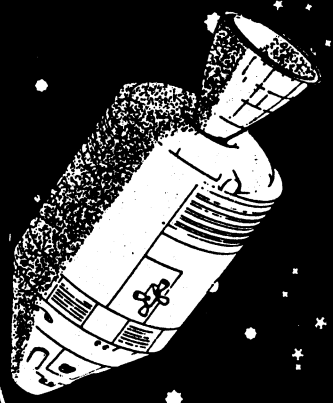
Bsb 79-63

Apollo GUIDANCE AND NAVIGATION

Apollo 15

(COLOSSUS 3)

CMC Data Cards



APRIL 1971

DELCO ELECTRONICS
DIVISION OF GENERAL MOTORS CORPORATION
MILWAUKEE, WISCONSIN 53201

FOR TRAINING USE ONLY

VERB CODES

00 NOT IN USE
01 DISPLAY OCTAL COMP 1 IN R1
02 DISPLAY OCTAL COMP 2 IN R1
03 DISPLAY OCTAL COMP 3 IN R1
04 DISPLAY OCTAL COMP 1,2 IN R1, R2
05 DISPLAY OCTAL COMP 1,2,3 IN R1, R2, R3
06 DISPLAY DECIMAL IN R1 OR R1, R2 OR R1, R2, R3
07 DISPLAY DOUBLE PREC DECIMAL IN R1, R2 (TEST ONLY)
08
09
10
11 MONITOR OCTAL COMP 1 IN R1
12 MONITOR OCTAL COMP 2 IN R1
13 MONITOR OCTAL COMP 3 IN R1
14 MONITOR OCTAL COMP 1,2 IN R1, R2
15 MONITOR OCTAL COMP 1,2,3 IN R1, R2, R3
16 MONITOR DECIMAL IN R1 OR R1, R2 OR R1, R2, R3
17 MONITOR DOUBLE PREC DECIMAL IN R1, R2 (TEST ONLY)
18
19
20
21 LOAD COMPONENT 1 INTO R1
22 LOAD COMPONENT 2 INTO R2
23 LOAD COMPONENT 3 INTO R3
24 LOAD COMPONENT 1,2 INTO R1, R2
25 LOAD COMPONENT 1,2,3 INTO R1, R2, R3
26
27 DISPLAY FIXED MEMORY
28
29
30 REQUEST EXECUTIVE
31 REQUEST WAITLIST
32 RECYCLE PROGRAM
33 PROCEED WITHOUT DSKY INPUTS
34 TERMINATE FUNCTION
35 TEST LIGHTS
36 REQUEST FRESH START
37 CHANGE PROGRAM (MAJOR MODE)
38
39
40 ZERO CDU'S
41 COARSE ALIGN CDU'S
42 FINE ALIGN IMU
43 LOAD IMU ATT ERROR METERS
44 SET SURFACE FLAG
45 RESET SURFACE FLAG
46 ESTABLISH G & C CONTROL
47 MOVE LM STATE VECTOR INTO CM STATE VECTOR
48 REQUEST DAP DATA LOAD (R03)
49 REQUEST CREW DEFINED MANEUVER (R62)
50 PLEASE PERFORM
51 PLEASE MARK
52 MARK ON OFFSET LANDING SITE
53 PLEASE PERFORM ALTERNATE LOS MARK
54 REQUEST RENDEZVOUS BACKUP SIGHTING MARK ROUTINE (R23)
55 INCREMENT AGC TIME (DECIMAL)
56 TERMINATE TRACKING (P20)
57 DISPLAY UPDAT STATE OF FULTKFLG
58 ENABLE AUTO MANEUVER IN P20
59 PLEASE CALIBRATE
60 SET ASTRONAUT TOTAL ATTITUDE (N17) TO PRESENT ATTITUDE
61 DISPLAY DAP ATTITUDE ERROR
62 DISPLAY TOTAL ATTITUDE ERROR WRT N22
63 DISPLAY TOTAL ASTRONAUT ATTITUDE ERROR WRT N17
64 REQUEST S-BAND ANTENNA ROUTINE
65 OPTICAL VERIFICATION OF PRELAUNCH ALIGNMENT
66 VEHICLES ATTACHED. MOVE THIS VEHICLE STATE VECTOR TO OTHER VEHICLE STATE VECTOR
67 DISPLAY W MATRIX
68
69 CAUSE RESTART
70 UPDATE LIFTOFF TIME
71 UNIVERSAL UPDATE - BLOCK ADR
72 UNIVERSAL UPDATE - SINGLE ADR
73 UPDATE AGC TIME (OCTAL)
74 INITIALIZE ERASABLE DUMP VIA DOWNLINK
75 BACKUP LIFTOFF
76
77
78 UPDATE PRELAUNCH AZIMUTH
79
80 UPDATE LM STATE VECTOR
81 UPDATE CSM STATE VECTOR
82 REQUEST ORBITAL PARAMETER DISPLAY (R30)
83 REQUEST RENDEZVOUS PARAMETER DISPLAY (R31)
84
85 REQUEST RENDEZVOUS PARAMETER DISPLAY NO. 2 (R34)
86 REJECT RENDEZVOUS BACKUP SIGHTING MARK
87 SET VHF RANGE FLAG
88 RESET VHF RANGE FLAG
89 REQUEST RENDEZVOUS FINAL ATTITUDE (R63)
90 REQUEST RENDEZVOUS OUT OF PLANE DISPLAY (R36)
91 DISPLAY BANK SUM
92 OPERATE IMU PERFORMANCE TEST (P07)
93 ENABLE W MATRIX INITIALIZATION
94 PERFORM CISLUNAR ATTITUDE MANEUVER (P23)
95
96 TERMINATE INTEGRATION AND GO TO P00
97 PERFORM ENGINE FAIL PROCEDURE
98
99 PLEASE ENABLE ENGINE

BLOCK II BASIC INSTRUCTIONS

INSTRUCTION	ORDER CODE	DESCRIPTION	INSTRUCTION	ORDER CODE	DESCRIPTION
INHINT	00, 0004	INHIBIT INTERRUPT	ZQ	13, 2007	ZERO Q; QXCH ZERO
			ZL	02, 2007	ZERO L; LXCH ZERO
INDEX K	15,	INDEX NEXT EXTRA-CODE INSTRUCTION WITH K	XCH E	05, 6	EXCHANGE A AND E
INDEX E	05, 0	INDEX NEXT BASIC INSTRUCTION WITH E	WRITE H	10, 1	WRITE H
INCR E	02, 4	INCREMENT E	WOR H	10, 5	WRITE AND "OR" H
EXTEND	0, 0006	EXTEND	WAND H	10, 3	WRITE AND "AND" H
EDOP	, 0023	EDIT OPERATOR	TS E	05, 4	TRANSFER TO STORAGE E
DXCH E	05, 2	DOUBLE EXCHANGE A AND E	TCR K	00,	TC K
DV E	11, 0	DIVIDE BY E	TCF P	01, 2 01, 4 01, 6	TRANSFER CONTROL TO FIXED F
DTCB	05, 2005	DP TRANSFER CONTROL BOTH BANKS			
DOUBLE	06, 0000	DOUBLE A	TC K	00,	TRANSFER CONTROL TO K
DIM E	12, 6	DIMINISH E	TCAA	05, 4005	TRANSFER CONTROL TO ADDRESS IN A; TS Z
DDOUBL	02, 0000	DP DOUBLE	SU E	16, 0	SUBTRACT E
DCOM	14, 0000	DP COMPLEMENT	SR	, 0021	SHIFT RIGHT
DCS K	14,	DOUBLE CLEAR AND SUBTRACT K	RXOR H	10, 6	READ AND EXCLUSIVE "OR" H
DCA K	13,	DOUBLE CLEAR AND ADD K	ROR H	10, 4	READ AND "OR" H
DAS E	02, 0	DOUBLE ADD TO STORAGE E	RETURN	00, 0002	RETURN; TCQ
CYR	, 0020	CYCLE RIGHT	RESUME	05, 0017	RESUME INTERRUPTED PROGRAM
CYL	, 0022	CYCLE LEFT	RELINT	00, 0003	RELEASE INHIBIT INTERRUPT
CS K	04,	CLEAR AND SUBTRACT K	READ H	10, 0	READ H
CONI	04, 0000	COMPLEMENT A	RAND H	10, 2	READ AND "AND" H
CCS E	01, 0	COUNT, COMPARE, AND SKIP ON E	QXCH E,	12, 2	EXCHANGE Q AND E
CAF F	03,	CLEAR AND ADD F	OVSK	05, 4000	OVERFLOW SKIP; TS A
CAE E	03,	CLEAR AND ADD E	NOOP	TCF P+1	NO OPERATION (F)
CA K	03,	CLEAR AND ADD K	NOOP	03, 0000	NO OPERATION (E)
BZMF F	16, 2 16, 4 11, 6 16, 6	BRANCH ON ZERO OR MINUS TO FIXED F	NDX K	15,	INDEX K
			NDX E	05, 0	INDEX E
BZF F	11, 2 11, 4	BRANCH ON ZERO TO FIXED F	MSU E	12, 0	MODULAR SUBTRACT E
AUG E	12, 4	AUGMENT E	MSK K	07,	MASK K
ADS E	02, 6	ADD TO STORAGE E	MP K	17,	MULTIPLY K
AD K	06,	ADD K	MASK K	07,	MASK WITH K
			LXCH E	02, 2	EXCHANGE L AND E

NOUN CODES(CONT.)

	MIXED NOUNS	COMPONENTS & SCALING		
40	TIME FROM IGNITION/CUTOFF	3 COMP	XXBXX	MIN/SEC
	VG,		XXXX.X	FT/SEC
	DELTA V (ACCUMULATED)		XXXX.X	FT/SEC
41	TARGET AZIMUTH,	2 COMP	XXX.XX	DEG
	TARGET ELEVATION		XX.XXX	DEG
42	APOGEE,	3 COMP	XXXX.X	NAUT MI
	PERIGEE,		XXXX.X	NAUT MI
	DELTA V (REQUIRED)		XXXX.X	FT/SEC
43	LATITUDE,	3 COMP	XXX.XX	DEG
	LONGITUDE,		XXX.XX	DEG
	ALTITUDE		XXXX.X	NAUT MI
44	APOGEE,	3 COMP	XXXX.X	NAUT MI
	PERIGEE,		XXXX.X	NAUT MI
	TFF		XXBXX	MIN/SEC
45	MARKS (VHF - OPTICS)	3 COMP	+XXBXX	
	TFI OF NEXT BURN		XXBXX	MIN/SEC
	MGA		XXX.XX	DEG
46	AUTOPILOT CONFIGURATION	2 COMP	OCTAL ONLY FOR EACH	
47	THIS VEHICLE WEIGHT	2 COMP	XXXXX.	LBS
	OTHER VEHICLE WEIGHT		XXXXX.	LBS
48	PITCH TRIM	2 COMP	XXX.XX	DEG
	YAW TRIM,		XXX.XX	DEG
49	DELTA R	3 COMP	XXXX.X	NAUT MI
	DELTA V		XXXX.X	FT/SEC
	VHF OR OPTICS CODE		XXXXX.	
50	SPLASH ERROR,	3 COMP	XXXX.X	NAUT MI
	PERIGEE,		XXXX.X	NAUT MI
	TFF		XXBXX	MIN/SEC
51	S-BAND ANTENNA ANGLE PITCH	2 COMP	XXX.XX	DEG
	S-BAND ANTENNA ANGLE YAW		XXX.XX	DEG
52	CENTRAL ANGLE OF ACTIVE VEHICLE	1 COMP	XXX.XX	DEG
53	RANGE,	3 COMP	XXX.XX	NAUT MI
	RANGE RATE,		XXXX.X	FT/SEC
	PHI		XXX.XX	DEG
54	RANGE,	3 COMP	XXX.XX	NAUT MI
	RANGE RATE,		XXXX.X	FT/SEC
	THETA		XXX.XX	DEG
55	PERIGEE CODE	3 COMP	XXXXX.	
	ELEVATION ANGLE		XXX.XX	DEG
	CENTRAL ANGLE OF PASSIVE VEHICLE		XXX.XX	DEG
56	REENTRY ANGLE,	2 COMP	XXX.XX	DEG
	DELTA V		XXXXX.	FT/SEC
57				
58	PERIGEE ALT (POST TPI)	3 COMP	XXXX.X	NAUT MI
	DELTA V TPI		XXXX.X	FT/SEC
	DELTA V TPF		XXXX.X	FT/SEC
59	DELTA VELOCITY LOS	3 COMP	XXXX.X	FT/SEC FOR EA.
60	GMAX,	3 COMP	XXX.XX	G
	VPRED,		XXXXX.	FT/SEC
	GAMMA EI		XXX.XX	DEG
61	IMPACT LATITUDE,	3 COMP	XXX.XX	DEG
	IMPACT LONGITUDE,		XXX.XX	DEG
	HEADS UP/DOWN		+/-00001	
62	INERTIAL VEL MAG (VI),	3 COMP	XXXXX.	FT/SEC
	ALT RATE CHANGE (HDOT),		XXXXX.	FT/SEC
	ALT ABOVE PAD RADIUS (H)		XXXX.X	NAUT MI
63	RANGE 297,431 TO SPLASH (RTGO)	3 COMP	XXXX.X	NAUT MI
	PREDICTED INERT VEL (VIO),		XXXXX.	FT/SEC
	TIME FROM 297,431 (TFE)		XXBXX	MIN/SEC
64	DRAG ACCELERATION,	3 COMP	XXX.XX	G
	INERTIAL VELOCITY (VI),		XXXXX.	FT/SEC
	RANGE TO SPLASH		XXXX.X	NAUT MI
65	SAMPLED AGC TIME	3 COMP	00XXX.	HRS
	(FETCHED IN INTERRUPT)		000XX.	MIN
			0XX.XX	SEC
66	COMMAND BANK ANGLE (BETA),	3 COMP	XXX.XX	DEG
	CROSS RANGE ERROR,		XXXX.X	NAUT MI
	DOWN RANGE ERROR		XXXX.X	NAUT MI
67	RANGE TO TARGET,	3 COMP	XXXX.X	NAUT MI
	PRESENT LATITUDE,		XXX.XX	DEG
	PRESENT LONGITUDE		XXX.XX	DEG
68	COMMAND BANK ANGLE (BETA),	3 COMP	XXX.XX	DEG
	INERTIAL VELOCITY (VI),		XXXXX.	FT/SEC
	ALT RATE CHANGE (RDOT)		XXXXX.	FT/SEC
69	BETA	3 COMP	XXX.XX	DEG
	DL		XXX.XX	G
	VL		XXXXX.	FT/SEC

NOUN CODES

	NORMAL NOUNS	COMPONENTS & SCALING		
00				
01	SPECIFY MACHINE ADDRESS (FRACTIONAL)	3 COMP	.XXXXX	FOR EACH
02	SPECIFY MACHINE ADDRESS (WHOLE)	3 COMP	XXXXX.	FOR EACH
03	SPECIFY MACHINE ADDRESS (DECREES)	3 COMP	XXX.XX	DEG FOR EACH
04				
05	ANGULAR ERROR/DIFFERENCE	1 COMP	XXX.XX	DEG
06	OPTION CODE	2 COMP	OCTAL ONLY FOR EACH	
	LOADING NOUN OF WILL SET OR RESET SELECTED BITS IN ANY ERASABLE LOCATION			
07	SCAN OF WORD TO BE MODIFIED	3 COMP	OCTAL ONLY FOR EACH	
	ONES FOR BITS TO BE MODIFIED			
	1 TO SET OR 0 TO RESET SELECTED BITS			
08	ALARM DATA	3 COMP	OCTAL ONLY FOR EACH	
09	ALARM CODES	3 COMP	OCTAL ONLY FOR EACH	
10	CHANNEL TO BE SPECIFIED	1 COMP	OCTAL ONLY	
11	TIG OF CSI	3 COMP	00XXX. HRS	
			0XX.XX SEC	
			000XX. MIN	
12	OPTION CODE	2 COMP	OCTAL ONLY FOR EACH	
	(USED BY EXTENDED VERBS ONLY)		0XX.XX SEC	
			000XX. MIN	
13	TIG OF CDH	3 COMP	00XXX. HRS	
			0XX.XX SEC	
			000XX. MIN	
14	INERTIAL VEL MAG AT TLI CUTOFF	1 COMP	XXXXX. FT/SEC	
15	INCREMENT MACHINE ADDRESS	1 COMP	OCTAL ONLY	
16	TIME OF EVENT	3 COMP	00XXX. HRS	
	(USED BY EXTENDED VERBS ONLY)		0XX.XX SEC	
			000XX. MIN	
17	ASTRONAUT TOTAL ATTITUDE	3 COMP	XXX.XX DEG FOR EACH	
18	AUTO MANEUVER BALL ANGLES	3 COMP	XXX.XX DEG FOR EACH	
19				
20	ICDU ANGLES	3 COMP	XXX.XX DEG FOR EACH	
21	PIPAS	3 COMP	XXXXX. PULSES FOR EACH	
22	NEW ICDU ANGLES	3 COMP	XXX.XX DEG FOR EACH	
23				
24	DELTA TIME FOR AGC CLOCK	3 COMP	00XXX. HRS	
			0XX.XX SEC	
			000XX. MIN	
25	CHECKLIST	3 COMP	XXXXX. FOR EACH	
26	PRIORITY/DELAY, ADRES, BRCON	3 COMP	OCTAL ONLY FOR EACH	
	(USED WITH PLEASE PERFORM ONLY)			
27	SELF TEST ON/OFF SWITCH	1 COMP	XXXXX.	
28				
29	XSM LAUNCH AZIMUTH	1 COMP	XXX.XX DEG	
30	TARGET CODES	3 COMP	XXXXX. FOR EACH	
31	TIME OF W INITIALIZATION	3 COMP	00XXX. HRS	
			0XX.XX SEC	
			000XX. MIN	
32	TIME FROM PERIGEE	3 COMP	00XXX. HRS	
			0XX.XX SEC	
			000XX. MIN	
33	TIME OF IGNITION	3 COMP	00XXX. HRS	
			0XX.XX SEC	
			000XX. MIN	
34	TIME OF EVENT	3 COMP	00XXX. HRS	
			0XX.XX SEC	
			000XX. MIN	
35	TIME FROM EVENT	3 COMP	00XXX. HRS	
			0XX.XX SEC	
			000XX. MIN	
36	TIME OF AGC CLOCK	3 COMP	00XXX. HRS	
			0XX.XX SEC	
			000XX. MIN	
37	TIG OF TPI	3 COMP	00XXX. HRS	
			0XX.XX SEC	
			000XX. MIN	
38	TIME OF STATE VECTOR	3 COMP	00XXX. HRS	
			0XX.XX SEC	
			000XX. MIN	
39	DELTA TIME FOR TRANSFER	3 COMP	00XXX. HRS	
			0XX.XX SEC	
			000XX. MIN	

NOUN STORAGE REGISTER NAMES

CODE	REGISTER(S)
00	
01	(SPECIFY ADDRESS)
02	(SPECIFY ADDRESS)
03	(SPECIFY ADDRESS)
04	
05	DSPTEM1
06	OPTION1,+1
07	XREG
	YREG
	ZREG
08	ALMCADR,+1,+2
09	FAILREG,+1,+2
10	(SPECIFY CHANNEL)
11	TCSI,+1
12	OPTIONX,+1
13	TCDH,+1
14	VC/O
15	(INCREMENT ADDRESS)
16	DSPTEMX,+1
17	CPHIX,+1,+2
18	THETAD,+1,+2
19	
20	CDUX,Y,Z
21	PIPAX,Y,Z
22	THETAD,+1,+2
23	
24	DSPTEM2,+1
25	DSPTEM1,+1,+2
26	N26/PRI,+1,+2
27	SMODE
28	
29	DSPTEM1
30	DSPTEM1,+1,+2
31	AGEOFW,+1
32	-TPER,+1
33	TIG,+1
34	DSPTEM1,+1
35	TTOGO,+1
36	TIME2,+1
37	TTPI,+1
38	TET,+1
39	T3T0T4,+1
40	TTOGO
	VGDISP
	DVTOTAL
41	DSPTEM1,+1
42	HAPO
	HPER
	VGDISP
43	LAT
	LONG
	ALT
44	HAPOX
	HPERX
	TFF
45	VHFCNT
	TTOGO
	+MGA
46	DAPDATR1
	DAPDATR2
47	CSMMASS
	LEMMASS
48	PACTOFF
	YACTOFF
49	N49DISP,+2,+4
50	RSP-RREC
	HPERX
	TFF
51	RHOSB
	GAMMASB
52	ACTCENT
53	RANGE
	RRATE
	RTHETA

CODE	REGISTER(S)
54	RANGE
	RRATE
	RTHETA
55	NN1
	ELEV
	CENTANG
56	RTEGAM2D
	RTEDVD
57	DELTAR
58	POSTTPI
	DELVTPI
	DELVTPF
59	DVLOS,+2,+4
60	GMAX
	VPRED
	GAMMAEI
61	LAT(SPL)
	LNG(SPL)
	HEADSUP
62	VMAGI
	HDOT
	ALT I
63	RTGO
	VIO
	TTE
64	D
	VMAGI
	RTGON64
65	SAMPTIME,+1
66	ROLLC
	XRNGERR
	DNRNGERR
67	RTGON67
	LAT
	LONG
68	ROLLC
	VMAGI
	RDOT
69	ROLLC
	Q7
	VL
70	STARCODE
	LANDMARK
	HORIZON
71	STARCODE
	LANDMARK
	HORIZON
72	
73	P21ALT
	P21VEL
	P21GAM
74	ROLLC
	VMAGI
	D
75	DIFFALT
	T1TOT2
	T2TOT3
76	
77	
78	UTAW
	UTPIT
	AZIMUTH
79	RATEPTC
	DBPTC
80	TTOGO
	VGDISP
	DVTOTAL
81	DELVLVC,+2,+4
82	DELVLVC,+2,+4
83	DELVIMU,+2,+4
84	DELVOV,+2,+4
85	VGBODY,+2,+4
86	DELVLVC,+2,+4

CODE	REGISTER(S)
87	MRKBUFF1+3,+5
88	STARSAV3,+2,+4
89	LANDLAT
	LANDLONG
	LANDALT
90	YCSM
	YDOTC
	YDOTL
91	CDUS
	CDUT
92	SAC
	PAC
93	OGC,+2,+4
94	MRKBUF1+3,+5
95	TTOGO
	VGTLI
	VNOW
96	RANGE
	RRATE
	RRATE2
97	DSPTEM1,+1,+2
98	DSPTEM2,+1,+2
99	WWPOS
	WWVEL
	WWOPT

NOUN CODES(CONT.)

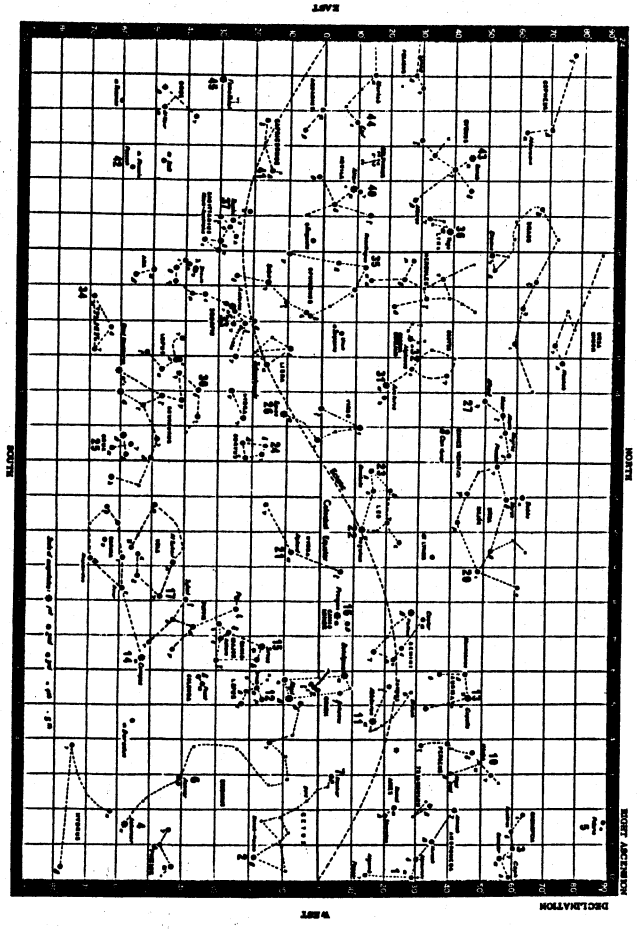
MIXED NOUNS (CONT)	COMPONENTS & SCALING		
70	STAR CODE,	3 COMP	OCTAL ONLY
	LANDMARK DATA,		OCTAL ONLY
	HORIZON DATA		OCTAL ONLY
71	STAR CODE	3 COMP	OCTAL ONLY
	LANDMARK DATA		OCTAL ONLY
	HORIZON DATA		OCTAL ONLY
72			
73	ALTITUDE	3 COMP	XXXXX, NAUT MI
	VELOCITY		XXX.XX DEG
	FLIGHT PATH ANGLE		XXXXX, DEG
74	COMMAND BANK ANGLE (BETA)	3 COMP	XXXXX, DEG
	DRAG ACCELERATION		XXX.XX G
	INERTIAL VELOCITY (VI)		XXXXX, FT/SEC
75	DELTA ALTITUDE CDH	3 COMP	XXXX.X NAUT MI
	DELTA TIME (CDH-CSI OR TPI-CDH)		XXBXX MIN/SEC
	DELTA TIME (TPI-CDH or TPI-NOMTPI)		XXBXX MIN/SEC
76			
77			
78	YAW ANGLE FOR P20		XXX.XX DEG
	PITCH ANGLE FOR P20		XXX.XX DEG
	AZIMUTH CONSTRAINT FOR P20		XXX.XX DEG
79	P20 ROTATION RATE	3 COMP	X.XXXX DEG/SEC
	P20 ROTATION DEADBAND		XXX.XX DEG
80	TIME FROM IGNITION/CUTOFF	3 COMP	XXBXX MIN/SEC
	VG		XXXXX, FT/SEC
	DELTA V (ACCUMULATED)		XXXXX, FT/SEC
81	DELTA V (LV)	3 COMP	XXXX.X FT/SEC FOR EACH
82	DELTA V (LV)	3 COMP	XXXX.X FT/SEC FOR EACH
83	DELTA V (BODY)	3 COMP	XXXX.X FT/SEC FOR EACH
84	DELTA V (OTHER VEHICLE)	3 COMP	XXXX.X FT/SEC FOR EACH
85	VG (BODY)	3 COMP	XXXXX, FT/SEC FOR EACH
86	DELTA V (LV)	3 COMP	XXX.XX DEG
87	MARK DATA SHAFT	3 COMP	XXX.XX DEG
	MARK DATA TRUNNION		XX.XXX DEG
88	HALF UNIT SUN OR PLANET VECTOR	3 COMP	.XXXXX FOR EACH
89	LANDMARK LATITUDE,	3 COMP	XX.XXX DEG
	LONGITUDE/2,		XX.XXX DEG
	ALTITUDE		XXX.XX NAUT MI
90	Y ACTIVE VEHICLE	3 COMP	XXX.XX NM
	Y DOT ACTIVE VEHICLE		XXXX.X FPS
	Y DOT PASSIVE VEHICLE		XXXX.X FPS
91	OCDU ANGLE SHAFT	3 COMP	XXX.XX DEG
	OCDU ANGLE TRUNNION		XX.XXX DEG
92	NEW OPTICS ANGLE SHAFT	3 COMP	XXX.XX DEG
	NEW OPTICS ANGLE TRUNNION		XX.XXX DEG
93	DELTA OPNO ANGLES	3 COMP	XX.XXX DEG FOR EACH
94	NEW OPTICS ANGLE SHAFT	3 COMP	XXX.XX DEG
	NEW OPTICS ANGLE TRUNNION		XX.XXX DEG
95	TIME FROM IGNITION/CUTOFF	3 COMP	XXBXX MIN/SEC
	VG		XXXXX, FT/SEC
	DELTA V (LVLH)		XXXXX, FT/SEC
96	INERTIAL VELOCITY MAG	3 COMP	XXXXX, NAUT MI
	Y CM		XXXX.X FT/SEC
	Y DOT CM		XXXX.X FT/SEC
	Y DOT LM		XXXX.X FT/SEC
97	SYSTEM TEST INPUTS	3 COMP	XXXXX, FOR EACH
98	SYSTEM TEST RESULTS AND INPUTS	3 COMP	XXXXX,
			XXXXX,
99	RMS IN POSITION	3 COMP	XXXXX, FT
	RMS IN VELOCITY		XXXX.X FT/SEC
	RMS OPTION		XXXXX,

COMPUTER ROUTINES

NUMBER	NAME	CALLED OR INITIATED BY
R00	FINAL AUTOMATIC REQUEST TERMINATE	GO TO POOH
R01	ERASABLE AND CHANNEL MODIFICATION ROUTINE	V25N07
R02	IMU STATUS CHECK	P20, P22, P40, P47, P52, P54 P61, P62, R05, R63
R03	DIGITAL AUTOPILOT DATA LOAD	V48
R05	S-BAND ANTENNA ANGLES	V64
R21	RENDEZVOUS TRACKING SIGHTING MARK	V57
R22	RENDEZVOUS TRACKING DATA PROCESSING	P20
R23	BACKUP RENDEZVOUS TRACKING SIGHTING MARK	V54
R30	ORBIT PARAMETER DISPLAY	V82
R31	RENDEZVOUS PARAMETER DISPLAY NUMBER ONE	V83
R33	CMC/LGC CLOCK SYNCHRONIZATION	V06N65
R34	RENDEZVOUS PARAMETER DISPLAY NUMBER TWO	V85
R36	RENDEZVOUS OUT-OF-PLANE DISPLAY	V90
R40	SPS TRUST FAIL	P40
R41	STATE VECTOR INTEGRATION (MID TO AVE)	P40, P41, P47, P61
R50	COARSE ALIGN	P52, P54
R51	FINE ALIGN	P52, P54
R52	AUTOMATIC OPTICS POSITIONING	P20, P22, P23, R51
R53	SIGHTING MARK	P23, P51, R52
R54	SIGHTING DATA DISPLAY	P51, R51
R55	GYRO TORQUING	R51
R56	ALTERNATE LOS SIGHTING MARK	P53, R51
R57	OPTICS CALIBRATION	P23
R60	ATTITUDE MANEUVER	P23, P40, R61, R62, V89
R61	TRACKING ATTITUDE	P20, R52
R62	CREW DEFINED MANEUVER	V49
R63	RENDEZVOUS FINAL ATTITUDE	R61, V89
R64	BARBECUE MODE ROUTINE	V79
R67	UNIVERSAL POINTING	P20

COMPUTER PROGRAMS

PHASE	PROGRAM NUMBER	PROGRAM TITLE
PRE-LAUNCH	00	CMC IDLING
	01	PRELAUNCH OR SERVICE-INITIALIZATION AND
SERVICE	02	PRELAUNCH OR SERVICE-GYRO COMPASSING
	03	PRELAUNCH OR SERVICE-OPTICAL VERIFICATION OF GYRO COMPASSING
	06	GNCS POWER DOWN
	07	SYSTEMS TEST
BOOST	11	EARTH ORBIT INSERTION MONITOR (EOI)
	16	TLI INITIATE/CUTOFF
COAST	20	UNIVERSAL TRACKING
	21	GROUND TRACK DETERMINATION
	22	ORBITAL NAVIGATION
	23	CISLUNAR MIDCOURSE NAVIGATION
	24	RATE-AIDED OPTICS (LANDMARK TRACKING)
	27	CMC UPDATE
PRE-THRUST	29	TIME-TO-LONGITUDE
	30	EXTERNAL DELTA V
	31	HEIGHT ADJUSTMENT MANEUVER (HAM)
TARGETING	32	CO-ELLIPTIC SEQUENCE INITIATION (CSI)
	33	CONSTANT DELTA ALTITUDE (CDH)
	34	TRANSFER PHASE INITIATION (TPI)
	35	TRANSFER PHASE (TPF)
	36	PLANCE CHANCE (PCM)
	37	RETURN TO EARTH (RTE)
THRUSTING	40	SPS
	41	RCS
ALIGNMENT	47	THRUST MONITOR
	51	IMU ORIENTATION DETERMINATION
	52	IMU REALIGN
ENTRY	53	BACK-UP IMU ORIENTATION DETERMINATION
	54	BACK-UP IMU REALIGN
	61	ENTRY - PREPARATION
	62	ENTRY-CM/SM SEPARATION AND PRE-ENTRY MANEUVER
	63	ENTRY INITIALIZATION
	64	ENTRY-POST 0.05G
	65	ENTRY-UP CONTROL
	66	ENTRY-BALLISTIC
	67	ENTRY-FINAL PHASE
PRE-THRUSTING OTHER VEHICLE	73	LM CO-ELLIPTIC SEQUENCE INITIATION (CSI) TARGETING
	73	LM CONSTANT DELTA ALTITUDE (CDH) TARGETING
	74	LM TRANSFER PHASE INITIATION (TPI) TARGETING
	75	LM TRANSFER PHASE (MIDCOURSE) TARGETING
	76	LM TARGET DELTA V
	77	CSM TARGET DELTA V
	79	RENDEZVOUS FINAL PHASE



STAR/PLANET LIST

OCTAL STAR CODE	NAME	VIS. MAG.	RIGHT ASCENSION (HR. MIN.)		DECLINATION (DEG.	MIN.)
1	ALPHA ANDROMEDAE (ALPHERATZ)	2.1	0	06	+28	53
2	BETA CETI (DIPHDA)	2.2	0	42	-18	11
3	GAMMA CASSIOPEIAE (NAVI)	2.2	0	54	+60	27
4	ALPHA ERIDANI (ACHERNAR)	0.6	1	36	-57	25
5	ALPHA URSAE MINORIS (POLARIS)	2.1	1	58	+89	06
6	THETA ERIDANI (ACAMAR)	3.4	2	57	-40	26
7	ALPHA CETI (MENKAR)	2.8	3	00	+03	56
10	ALPHA PERSEI (MIRFAK)	1.9	3	22	+49	44
11	ALPHA TAURI (ALDEBARAN)	1.1	4	34	+16	26
12	BETA ORIONIS (RIGEL)	0.3	5	12	-08	15
13	ALPHA AURIGAE (CAPELLA)	0.2	5	13	+45	57
14	ALPHA CARINAE (CANOPUS)	-0.9	6	23	-52	40
15	ALPHA CANIS MAJORIS (SIRIUS)	-1.6	6	44	-16	40
16	ALPHA CANIS MINORIS (PROCYON)	0.5	7	37	+05	19
17	GAMMA VELORIUM (REGOR)	1.9	8	08	-47	14
20	IOTA URSAE MAJORIS (DNOCES)	3.1	8	50	+48	30
21	ALPHA HYDRAE (ALPHARD)	2.2	9	26	-08	30
22	ALPHA LEONIS (REGULUS)	1.3	10	06	+12	09
23	BETA LEONIS (DENEBOLA)	2.2	11	47	+14	46
24	GAMMA CORVI (GIENAH)	2.8	12	13	-17	20
25	ALPHA CRUCIS (ACRUX)	1.6	12	24	-62	49
26	ALPHA VIRGINIS (SPICA)	1.2	13	23	-10	58
27	ETA URSAE MAJORIS (ALKAID)	1.9	13	46	+49	30
30	THETA CENTAURI (MENKENT)	2.3	14	04	-36	11
31	ALPHA BOOTIS (ARCTURUS)	0.2	14	14	+19	22
32	ALPHA CORONAE BOREALIS (ALPHECCA)	2.3	15	33	+26	50
33	ALPHA SCORPII (ANTARES)	1.2	16	27	-26	21
34	ALPHA TRIANGULI AUSTR. (ATRIA)	1.9	16	43	-68	56
35	ALPHA OPHIUCHI (RASALHAGUE)	2.1	17	33	+12	35
36	ALPHA LYRAE (VEGA)	0.1	18	36	+38	45
37	SIGMA SAGITTARII (NUNKI)	2.1	18	53	-26	20
40	ALPHA AQUILAE (ALTAIR)	0.9	19	49	+08	46
41	BETA CAPRICORNI (DABIH)	3.2	20	19	-14	54
42	ALPHA PAVONIS (PEACOCK)	2.1	20	23	-56	51
43	ALPHA CYGNI (DENEB)	1.3	20	40	+45	09
44	EPSILON PEGASI (ENIF)	2.5	21	42	+09	42
45	ALPHA PICIS AUSTRINUS (FOMALHAUT)	1.3	22	56	-29	49
46	SUN					
47	EARTH					
50	MOON					
00	PLANET					

STAR	NO.	STAR	NO.	STAR	NO.
ACAMAR	6	CANOPUS	14	MIRFAK	10
ACHERNAR	4	CAPELLA	13	NAVI	3
ACRUX	25	DABIH	41	NUNKI	37
ALDEBARAN	11	DENEB	43	PEACOCK	42
ALKAID	27	DENEBOLA	23	PROCYON	16
ALPHARD	21	DIPHDA	2	POLARIS	5
ALPHECCA	32	DNOCES	20	RASALHAGUE	35
ALPHERATZ	1	ENIF	44	REGOR	17
ALTAIR	40	FOMALHAUT	45	REGULUS	22
ANTARES	33	GIENAH	24	RIGEL	12
ARCTURUS	31	MENKAR	7	SIRIUS	15
ATRIA	34	MENKENT	30	SPICA	26
				VEGA	36

FLAGWORD BITS-ALPHABETICAL LIST(CONT)

R67FLAG	B2	FW8
RANGFLAG	B9	FW10
REFSMFLG	B13	FW3
REINTFLG	B7	FW10
REJCTFLG	B12	FW10
RELVELSW	B9	FW6
RENDWFLG	B1	FW5
RETROFLG	B14	FW5
RNDVZFLG	B7	FW0
RPQFLAG	B15	FW8
RVSW	B9	FW7
S32.1F1	B15	FW11
S32.1F2	B14	FW11
S32.1F3A	B13	FW11
S32.1F3B	B12	FW11
SAVECFLG	B10	FW9
SKIPVHF	B10	FW2
SLOPESW	B3	FW1
SLOWFLG	B13	FW5
SOLNSW	B3	FW5
SOURCFLG	B8	FW9
STATEFLG	B5	FW3
STEERSW	B11	FW2
STIKFLAG	B14	FW1
STRULLSW	B13	FW6
SURFFLAG	B6	FW8
SWTOVER	B15	FW9
TARG1FLG	B10	FW1
TARG2FLG	B9	FW1
TERMIFLG	B15	FW7
TFFSW	B1	FW7
TIMRFLAG	B11	FW7
TPIMNFLG	B3	FW10
UPDATFLG	B7	FW1
UPLOCKFL	B4	FW7
V37FLAG	B6	FW7
V50N18FL	B15	FW3
V59FLAG	B12	FW5
V82EMFLG	B13	FW9
V94FLAG	B11	FW9
V96ONFLG	B3	FW8
VEHUPFLG	B6	FW1
VERIFLAG	B3	FW7
VFLAG	B10	FW3
VHFRFLAG	B9	FW9
VINTFLAG	B3	FW3
XDELVFLG	B6	FW2
XDSPFLAG	B1	FW4
ZMEASURE	B10	FW0

FLAGWORD BITS-ALPHABETICAL LIST

22DSPFLG	B13	FW2
3AXISFLG	B6	FW5
360SW	B1	FW6
ADVTRK	B10	FW8
AMOONFLG	B2	FW0
APSESW	B6	FW8
ASTNFLAG	B12	FW7
ATTCHFLG	B2	FW7
AUTOSEQ	B7	FW10
AVEGTFLG	B1	FW1
AVEMIDSW	B1	FW9
AVFLAG	B6	FW8
AZIMFLAG	B6	FW11
BURNFLAG	B10	FW10
CALCMAN2	B2	FW2
CNDAPARM	B12	FW6
CNOONFLG	B12	FW6
CM/DSTBY	B2	FW6
COGAFLAG	B4	FW8
COMPUTER	B6	FW5
CSMFLAG	B6	FW11
CULTFLAG	B7	FW3
CYC61FLG	B4	FW0
D60M9FLG	B2	FW3
DAPBIT1	B15	FW6
DAPBIT2	B14	FW6
DIM0FLAG	B1	FW3
DNENFLG	B9	FW6
DNITFLG	B15	FW2
DSKYFLAG	B15	FW6
E60SW	B6	FW6
ENG2FLAG	B11	FW1
ENOONFLAG	B7	FW6
ENTRYDSP	B13	FW6
ERADFLAG	B13	FW1
ETPIFLAG	B7	FW2
FINALFLG	B6	FW2
FRSTFLG	B7	FW2
FREEFLAG	B3	FW0
FULTKFLG	B2	FW10
GAMDIFSW	B11	FW6
GYMDIFSW	B1	FW6
GUESSW	B2	FW1
GRRBKFLG	B6	FW5
GONEPAST	B10	FW6
GONEBY	B6	FW7
GLOKFAIL	B14	FW3
HAFLAG	B7	FW11
HDSUPFLG	B11	FW10
HIND	B6	FW6
IDLEFAIL	B6	FW1
IGNFLAG	B13	FW7
IMPULSW	B9	FW2
INUSE	B6	FW0
INCORFLG	B11	FW3
INFINFLG	B7	FW8
INHLSW	B6	FW6
INTFLAG	B14	FW10
INTYPFLG	B14	FW2
ITSWICH	B14	FW3
JSWITCH	B14	FW3
KNOWNFLAG	B6	FW8
LATSW	B4	FW8
LMOONFLG	B11	FW8
LUNAFLAG	B12	FW8
MANUFLG	B6	FW1
MARKFLG	B4	FW1
MAXDBFLG	B12	FW1
MCLVFLG	B2	FW1
MIDAVFLG	B2	FW1
MIDFLAG	B13	FW1
MIDPFLAG	B2	FW1
MKOVFLAG	B3	FW1
MOONFLAG	B12	FW1
MRKDFLG	B15	FW1
MRKOVFLG	B9	FW1
MRUPTFLG	B5	FW1
MWAITFLG	B11	FW1
N220RN17	B6	FW1
NEEDLFLG	B9	FW1
NEWIFLG	B13	FW1
NEWLMFLG	B14	FW1
NEWTFLAG	B10	FW1
NJETSFLG	B15	FW1
NODOFLG	B1	FW2
NODOP01	B12	FW2
NORHOR	B11	FW2
NORMSW	B10	FW2
NOSWITCH	B7	FW2
NRMDDFLG	B13	FW2
NRMNVFLG	B6	FW2
NRUPTFLG	B4	FW2
NWAITFLG	B10	FW2
ORBWFLAG	B6	FW2
ORDERSW	B6	FW2
P21FLAG	B12	FW3
P22MKFLG	B11	FW3
P24FLAG	B14	FW3
P24MKFLAG	B3	FW3
P29FLAG	B1	FW3
P35	B6	FW3
PCFLAG	B1	FW3
PCMANFLG	B15	FW3
PDSPFLAG	B12	FW4
PFRATFLG	B4	FW3
PINBRFLG	B6	FW4
POOFLAG	B9	FW4
PRECISFLG	B8	FW4
PRODFLG	B14	FW4
PRONVFLG	B7	FW4
PTV39FLG	B4	FW4
QUITFLAG	B6	FW4
R11MARK	B14	FW3
R22CAFLG	B7	FW4
R31FLAG	B4	FW4
R53FLAG	B6	FW4

FLAGWORD BIT ASSIGNMENTS(CONT.)

FLAGWORD AND BIT	NAME	SET	RESET
FW1 B13	ERADFLG	EARTH - COMPUTE FISCHER ELLIPSOID RADIUS. MOON - USE FIXED RADIUS	EARTH - USE FIXED RADIUS MOON - USE RLS FOR LUNAR RADIUS
FW1 B14	STIKFLAG	RHC CONTROL	CMC CONTROL
FW1 B15	NJETSFLG	TWO JET RCS BURN	FOUR JET RCS BURN
FW2 B1	NODOFLAG	V37 NOT PERMITTED	V37 PERMITTED
FW2 B2	CALCMAN3	PERFORM MANEUVER STARTING PROCEDURE	BYPASS MANEUVER STARTING PROCEDURE
FW2 B3	P24MKFLAG	P24 MARKING	P24 NOT MARKING
FW2 B4	PFRATFLG	PREFERRED ATTITUDE COMPLETED	PREFERRED ATTITUDE NOT COMPUTED
FW2 B5	AVFLAG	LM IS ACTIVE VEHICLE	CSM IS ACTIVE VEHICLE
FW2 B6	FINALFLG	LAST PASS THROUGH RENDEZVOUS PROGRAM COMPUTATIONS	INTERIM PASS THROUGH RENDEZVOUS PROGRAM COMPUTATIONS
FW2 B7	ETPIFLAG	ELEVATION ANGLE SUPPLIED FOR P34, P74	TPI TIME SUPPLIES FOR P34, P74
FW2 B7	FIRSTFLAG	FIRST PASS THROUGH S40.9	SUCCEEDING PASS THROUGH S40.9
FW2 B8	XDELVFLG	EXTERNAL DELTA V VG COMPUTATION	LAMBERT (AIMPOINT) VG COMPUTATION
FW2 B9	IMPULSW	MINIMUM IMPULSE BURN (CUTOFF TIME SPECIFIED)	STEERING BURN (NO CUTOFF TIME YET AVAILABLE)
FW2 B10	SKIPVHF	DISREGARD RADAR READ BECAUSE OF SFTWRE OR HRDWRE RESTART	RADAR READ TO PROCEED NORMALLY
FW2 B11	STEERSW	STEERING TO BE DONE	STEERING OMITTED
FW2 B12	P21FLAG	SUCCEEDING PASS THRU P21, USE BASE VECTOR FOR CALC.	1ST PASS THRU P21. CALCULATE BASE VECTOR
FW2 B13	22DSPFLG	DISPLAY DR, DV	DO NOT DISPLAY DR, DV
FW2 B14	R21MARK	OPTION ONE FOR MARKRUPT	OPTION TWO FOR MARKRUPT
FW2 B15	DRIFTFLG	T3RUPT CALLS GYRO COMPENSA-	T3RUPT DOES NO GYRO COMPENSATION
FW3 B1	DIMOFLAG	W MATRIX IS TO BE USED	W MATRIX IS NOT TO BE USED
FW3 B2	D6OR9FLG	DIMENSION OF W IS 9 FOR INTEGRATION	DIMENSION OF W IS 6 FOR INTEGRATION
FW3 B3	VINTFLAG	CSM STATE VECTOR BEING INTEGRATED	LM STATE VECTOR BEING INTEGRATED

FLAGWORD BIT ASSIGNMENTS

FLAGWORD AND BIT	NAME	SET	RESET
FW0 B1	P29FLAG	P29 RUNNING, 1ST PASS IN PROGRESS	P29 FINISHED WITH 1ST PASS
FW0 B2	AMOONFLG	STATE VECTOR IN LUNAR AT MIDTOVAE	STATE VECTOR IN EARTH SPHERE AT MIDTOVAE
FW0 B3	FREEFLAG	(TEMPORARY FLAG USED IN MANY ROUTINES)	
FW0 B4	CYC61FLG	KALCMAN 3 TO RETURN KALCMAN 3 TO DO TO M61 AFTER COM- PUTING TM	MANEUVER
FW0 B5	FREFTE	IN TIME CRITICAL MODE	NOT IN TIME CRITICAL MODE
FW0 B6	R63FLAG	V61 INITIATED	V61 NOT INITIATED
FW0 B7	RNDVZFLG	P20 RUNNING	P20 NOT RUNNING
FW0 B8	INUSE	IMU IN USE	IMU NOT IN USE
FW0 B9	NEEDLFLG	TOTAL ATTITUDE ERROR DISPLAYED	A/P FOLLOWING ERROR DISPLAYED
FW0 B10	ZMEASURE	MEASUREMENT PLANET AND PRIMARY PLANET DIFFERENT	MEASUREMENT PLANET AND PRIMARY PLANET SAME
FW0 B11	NORFHOR	FAR HORIZON	NEAR HORIZON
FW0 B12	MOONFLAG	MOON IS SPHERE OF INFLUENCE	EARTH IS SPHERE OF INFLUENCE
FW0 B13	MIDFLAG	INTEGRATION WITH SOLAR PERTURBA- TIONS	INTEGRATION WITHOUT SOLAR PERTURBA- TIONS
FW0 B14	JSWITCH	INTEGRATION OF W MATRIX	INTEGRATION OF STATE VECTOR
FW0 B15	CPHIFLAG	OUTPUT OF CALCGA IS CPHIX	OUTPUT OF CALCGA IS THETAD
FW1 B1	AVEGFLAG	AVERAGEG(SERVICER) TO CONTINUE	AVERAGEG(SERVICER) TO CEASE
FW1 B2	GUIDSW	NO STARTING VALUE FOR ITERATION	STARTING VALUE FOR ITERATION EXISTS
FW1 B3	SLOPESW	ITERATE WITH BIAS METHOD IN INTEGRATOR	ITERATE WITH REQUIRED FASI METHOD IN ITERATOR
FW1 B4	MARKFLG	A MARK HAS BEEN ACCEPTED, ALLOW MARK REJECT	NO MARK HAS BEEN ACCEPTED, DO NOT MARK REJECT
FW1 B5	TRACKFLG	TRACKING ALLOWED	TRACKING NOT ALLOWED
FW1 B6	IDLEFAIL	INHIBIT R61	ENABLE R61 (ENGFAIL)
FW1 B7	UPDATFLG	UPDATING BY MARKS ALLOWED	UPDATING BY MARKS NOT ALLOWED
FW1 B8	VEHUPFLG	CSM STATE VECTOR BEING UPDATED	LM STATE VECTOR BEING UPDATED
FW1 B9	R35FLG	R23 MARKING	R31 MARKING
FW1 B10	TARGIFLG	SIGHTING LM	NOT SIGHTING LM
FW1 B9	TARGSFLG	SIGHTING LANDMARK	SIGHTING STAR
FW1 B11	ENGSFLG	RCS BURN	SPS BURN
FW1 B12	NODOP01	P01 NOT ALLOWED	P01 ALLOWED

FLAGWORD BIT ASSIGNMENTS(CONT.)

FLAGWORD AND BIT	NAME	SET	RESET
FW4 B11	MWAITFLG	HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED	NO HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY INITIATED
FW4 B12	PDSPFLAG	CAN'T INTERRUPT PRIORITY DISPLAY	
FW4 B13	NRMIDFLG	NORMAL DISPLAY IN ENDIDLE	NO NORMAL DISPLAY IN ENDIDLE
FW4 B14	PRIODFLG	PRIORITY DISPLAY IN ENDIDLE	NO PRIORITY DISPLAY IN ENDIDLE
FW4 B15	MRKIDFLG	MARK DISPLAY IN ENDIDLE	NO MARK DISPLAY IN ENDIDLE
FW5 B1	RENDWFLG	W MATRIX VALID FOR RENDEZVOUS NAVIGATION	W MATRIX INVALID FOR RENDEZVOUS NAVIGATION
FW5 B2	MGLVFLAG	LOCAL VERTICAL COORDINATES COMPUTED	MIDDLE GIMBAL ANGLE COMPUTED
FW5 B3	SOLNSW	LAMBERT DOES NOT CONVERGE, OR TIME-RADIUS NEARLY CIRCULAR	LAMBERT CONVERGES OR TIME-RADIUS NON CIRCULAR
FW5 B4			
FW5 B5	GRRBKFLG	BACKUP GRR RECEIVED	BACKUP GRR NOT RECEIVED
FW5 B6	3AXISFLG	MANEUVER SPECIFIED BY THREE AXES	MANEUVER SPECIFIED BY ONE AXIS
FW5 B7	ENGONFLG	ENGINE TURNED ON	ENGINE TURNED OFF
FW5 B8	COMPUTER	COMPUTER IS CMC	COMPUTER IS LGC
FW5 B9	DMENFLG	DIMENSION OF W IS 9 FOR INCORPORATION	DIMENSION OF W IS 6 FOR INCORPORATION
FW5 B10	NEWTFLAG	RETURN TO P29 SKIP-PING LONGITUDE DISPLAY	NORMAL OPERATION
FW5 B11	INCORFLG	FIRST INCORPORATION	SECOND INCORPORATION
FW5 B12	V59FLAG	CALIBRATING FOR P23	NORMAL MARKING FOR P23
FW5 B13	SLOWFLG	P37 TRANSEARTH COAST SLOWDOWN IS DESIRED	SLOWDOWN IS NOT DESIRED
FW5 B14	RETROFLG	P37 PREMANEUVER ORBIT IS RETROGRADE	ORBIT NOT RETROGRADE
FW5 B15	DSKYFLAG	DISPLAY SENT TO DSKY	NO DISPLAY TO DSKY
FW6 B1	GYMDIFSW	CDU DIFFERENCES AND BODY RATES COMPUTED	CDU DIFFERENCES AND BODY RATES NOT COMPUTED
FW6 B2	CM/DSTBY	ENTRY DAP ACTIVATED	ENTRY DAP NOT ACTIVATED
FW6 B3	.05GSW	DRAG OVER .05G	DRAG LESS THAN 0.5G

FLAGWORD BIT ASSIGNMENTS(CONT.)

FLAGWORD AND BIT	NAME	SET	RESET
FW4 B10	NWAITFLG	HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED	NO HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED
FW4 B9	NRMIDFLG	ASTRONAUT USING KEYBOARD WHEN MARK DISPLAY INITIATED	ASTRONAUT NOT USING KEYBOARD WHEN MARK DISPLAY INITIATED
FW4 B8	NRMIDFLG	ASTRONAUT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED	ASTRONAUT NOT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED
FW4 B7	PRIODFLG	ASTRONAUT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED	ASTRONAUT NOT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED
FW4 B6	PINBRFLG	ASTRONAUT HAS INTERFERED WITH EXISTING DISPLAY	ASTRONAUT HAS NOT INTERFERED WITH EXISTING DISPLAY
FW4 B5	MRUPTFLG	MARK DISPLAY INTERRUPTED BY PRIORITY DISPLAY	MARK DISPLAY NOT INTERRUPTED BY PRIORITY DISPLAY
FW4 B4	NRUPTFLG	NORMAL DISPLAY INTERRUPTED BY PRIORITY OR MARK DISPLAY	NORMAL DISPLAY NOT INTERRUPTED BY PRIORITY OR MARK DISPLAY
FW4 B3	MKOVFLAG	MARK DISPLAY OVER NORMAL	NO MARK DISPLAY OVER NORMAL
FW4 B2			
FW4 B1	XDSPFLAG	MARK DISPLAY NOT TO BE INTERRUPTED	NO SPECIAL MARK INFORMATION
FW3 B15	V50N18FL	ENABLE R60 ATTITUDE MANEUVER	INHIBIT R60 ATTITUDE MANEUVER
FW3 B14	GLOKFAIL	GIMBAL LOCK HAS OCCURRED	NOT IN GIMBAL LOCK
FW3 B13	REFSMFLG	REFSMMAT GOOD	REFSMMAT NO GOOD
FW3 B12	LUNARFLG	LUNAR LAT-LONG	EARTH LAT-LONG
FW3 B11	P22MKFLG	P22 DOWNLINKED MARK DATA WAS JUST TAKEN	P22 DOWNLINK MARK DATA NOT JUST TAKEN
FW3 B10	V71FLAG	LESS THAN TWO STARS IN FIELD OF VIEW	TWO STARS IN FIELD OF VIEW
FW3 B9	POOFLAG	INHIBIT BACKWARDS INTEGRATION	ALLOW BACKWARDS INTEGRATION
FW3 B8	PRECISFLG	CSM PREC, LMPREC OR INTEGRYS CALLED	INTEGRY CALLED
FW3 B7	CULTFLAG	STAR OCCULTED	STAR NOT OCCULTED
FW3 B6	ORSWFLAG	W MATRIX VALID FOR ORBITAL NAVIGATION	W MATRIX INVALID FOR ORBITAL NAVIGATION
FW3 B5	STATEFLG	PERMANENT STATE VECTOR UPDATED	PERMANENT STATE VECTOR NOT UPDATED
FW3 B4	INTYPFLG	CONIC INTEGRATION	ENCKE INTEGRATION

FLAGWORD BIT ASSIGNMENTS(CONT.)

FLAGWORD AND BIT	NAME	SET	RESET
FW7 B10	NORMSW	UNIT NORMAL INPUT TO LAMBERT	LAMBERT COMPUTE ITS OWN UNIT NORMAL
FW7 B11	TIMRFLAG	CLOKTASK OPERATING	CLOKTASK INOPERATIVE
FW7 B12	ASTNFLAG	ASTRONAUT HAS OKAYED IGNITION	ASTRONAUT HAS NOT OKAYED IGNITION
FW7 B13	IGNFLAG	TIG HAS ARRIVED	TIG HAS NOT ARRIVED
FW7 B14	ITSWICH	ACCEPT NEXT LAMBERT TPI SEARCH SOLUTION	TEST LAMBERT ANSWER AGAINST LIMITS
FW7 B15	TERMIFLG	TERMINATE R52	DO NOT TERMINATE R52
FW8 B1	360SW	TRANSFER ANGLE NEAR 360 DEGREES	TRANSFER ANGLE NOT NEAR 360 DEGREES
FW8 B2	R67FLAG	R67 CALLING R60	NOT R67 CALLING R60
FW8 B3	V96ONFLG	P00 INTEGRATION HAS BEEN INHIBITED BY V96	P00 INTEGRATION IS PROCEEDING REGULARLY
FW8 B4	COGAFLAG	NO CONIC SOLUTION; TOO CLOSE TO RECTILINEAR (COGA OVERFLOWS)	CONIC SOLUTION EXISTS (COGA DOES NOT OVERFLOW)
FW8 B5	APSESW	R DESIRED OUTSIDE PERICENTER - APOCENTER RANGE IN TIME-RADIUS	R DESIRED INSIDE PERICENTER - APOCENTER RANGE IN TIME-RADIUS
FW8 B6	ORDERSW	ITERATOR USES 2ND ORDER MINIMUM MODE	ITERATOR USES 1ST ORDER STANDARD MODE
FW8 B7	INFINFLG	NO CONIC SOLUTION (CLOSURE THROUGH INFINITY REQUIRED)	CONIC SOLUTION EXISTS
FW8 B8	SURFFLAG	LM ON LUNAR SURFACE	LM NOT ON LUNAR SURFACE
FW8 B9			
FW8 B10	ADVTRK	ADVANCE GROUND TRACK SIGHTING WANTED	NOT ADVANCED GROUND TRACK
FW8 B11	LMOONFLG	PERMANENT LM STATE VECTOR IN LUNAR SPHERE	PERMANENT LM STATE VECTOR IN EARTH SPHERE
FW8 B12	CMOONFLG	PERMANENT CSM STATE VECTOR IN LUNAR SPHERE	PERMANENT CSM STATE VECTOR IN EARTH SPHERE
FW8 B13	NEWIFLG	FIRST PASS THROUGH INTEGRATION	SUCCEEDING ITERATION OF INTEGRATION
FW8 B14	NEWLMFLG	NEW LANDMARK COORD	OLD LANDMARK COORD
FW8 B15	RPQFLAG	RPQ NOT COMPUTED	RPQ COMPUTED

FLAGWORD BIT ASSIGNMENTS(CONT.)

FLAGWORD AND BIT	NAME	SET	RESET
FW6 B4	LATSW	DOWNLIFT NOT INHIBITED	DOWNLIFT INHIBITED
FW6 B5	INRLSW	INITIAL ROLL ATTITUDE NOT HELD	INITIAL ROLL ATTITUDE HELD
FW6 B6	HIND	INTERRATING HUNTEST CALCULATIONS TO BE DONE AFTER RANGE PREDICTION	ITERATING OF HUNTEST CALCULATIONS TO BE OMITTED AFTER RANGE PREDICTION
FW6 B7	NOSWITCH	LATERAL ROLL MANEUVER INHIBITED DURING ENTRY	LATERAL ROLL MANEUVER PERMITTED DURING ENTRY
FW6 B8	KNOWNFLG	LANDMARK KNOWN	LANDMARK UNKNOWN
FW6 B9	EOSW	IN FINAL PHASE	NOT IN FINAL PHASE
FW6 B10	GONEPAST	LATERAL CONTROL CALCULATIONS TO BE OMITTED	LATERAL CONTROL CALCULATIONS TO BE DONE
FW6 B11	GAMDIFSW	CALCULATE GAMDOT	GAMDOT NOT TO BE CALCULATED
FW6 B12	CMDAPARM	ALLOW ENTRY FIRING AND CALCULATIONS	INHIBIT ENTRY FIRING AND CONTROL FUNCTION
FW6 B13	ENTRYDSP	DO ENTRY DISPLAY VIA ENTRYAN	OMIT ENTRY DISPLAY
FW6 B13	STRULLSW	DO STEER ROLL	DO ULLAGEOFF ONLY
FW6 B14	DAPBIT2	BIT 14: A/P = 0, NONE = 0, RCS = 1, TVC = 0, STATUS = 1	
FW6 B15	DAPBIT1	BIT 15: A/P = 0, NONE = 0, RCS = 0, TVC = 1, STATUS = 1	
FW7 B1	TFFSW	CALCULATE TIME OF PERIGEE	CALCULATE TIME OF FREE FALL
FW7 B2	ATTCHFLG	LM, CM ATTACHED	LM, CM NOT ATTACHED
FW7 B3	VERIFLAG	CHANGES STATE WHEN V32E OCCURS AT END OF P27	
FW7 B4	UPLOCKFL	K-KBAR-K FAIL	NO K-KBAR-K FAIL
FW7 B5			
FW7 B6	V37 FLAG	AVERAGE G(SERVICER) RUNNING	AVERAGED (SERVICER) OFF
FW7 B7			
FW7 B8	GONESBY	PASSED TARGET	APPROACHING TARGET
FW7 B9	RVSW	DO NOT COMPUTE FINAL STATE VECTOR IN TIME-THETA	COMPUTE FINAL STATE VECTOR IN TIME-THETA

FLAGWORD BIT ASSIGNMENTS(CONT.)

FLAGWORD AND BIT	NAME	SET	RESET
FW10 B9	RANGFLAG	RANGE < 328 N.M.	RANGE > 328 N.M.
FW10 B10	BURNFLAG	CSM DID BURN	LM DID BURN
FW10 B11	HDSUPFLG	HEADS UP ATTITUDE	HEADS DOWN ATTITUDE
FW10 B12	REJCTFLG	MARK TO BE REJECTED IN R22	NO MARK REJECTED BY R22
FW10 B13	REINTBIT	INTEGRATION ROUTINE TO BE RESTARTED	INTEGRATION ROUTINE NOT TO BE RESTARTED
FW10 B14	INTFLAG	INTEGRATION IN PROGRESS	INTEGRATION NOT IN PROGRESS
FW10 B15	PCMANFLG	P20 MANEUVER AT PLANE CHANGE	NOT P20 PLANE CHANGE MANEUVER
FW11 B1			
FW11 B2			
FW11 B3			
FW11 B4			
FW11 B5			
FW11 B6	CSIFLAG	MULTIPLE CSI	NOT MULTIPLE CSI
FW11 B7	HAFLAG	HEIGHT ADJUST MANEUVER PROGRAM	NOT HEIGHT ADJUST
FW11 B8	AZIMFLAG	3-AXIS UT	VECPOINT UT
FW11 B9			
FW11 B10			
FW11 B11			

FW11 B12	S32.1F3A	1	0	1	0
FW11 B13	S32.1F3B	0	0	1	1
		FIRST NEWTON ITERATION BEING DONE	FIRST PASS OF 2ND NEWTON ITERATION	50 FPS STAGE OF 2ND NEWTON ITERATION	REMAINDER OF 2ND NEWTON ITERATION

FW11 B14	S32.1F2	FIRST PASS OF NEWTON ITERATION	REITERATION OF NEWTON
FW11 B15	S32.1F1	DELTAN AT CSI TIME ONE EXCEEDS MAX	DVTI LESS THAN MAX

FLAGWORD BIT ASSIGNMENTS(CONT.)

FLAGWORD AND BIT	NAME	SET	RESET
FW9 B1	AVEXMDSW	AVEZTOMID CALLING FOR W MATRIX INTEGRATION, DON'T WRITE OVER RN, VN, PIPTIME	NO AVEZTOMID FOR W MATRIX, ALLOW SET UP RN, VN, PIPTIME
FW9 B2	MIDAVFLG	INTEGRATION ENTERED FROM ONE OF MIDTOAV PORTALS	INTEGRATION WAS NOT ENTERED VIA MIDTOAV
FW9 B3	MIDIFLAG	INTEGRATE TO TDEC	INTEGRATE TO THE TIME - PRESENT TIME
FW9 B4	R31FLAG	R31 SELECTED, VERB 83	R34 SELECTED VERB 83
FW9 B5	QUITFLAG	TERMINATE AND EXIT FROM INTEGRATION	CONTINUE INTEGRATION
FW9 B6	N22ONLY	COMPUTE TOTAL ATTITUDE ERRORS WRT N22, VERB 62	COMPUTE TOTAL ATTITUDE ERRORS WRT N17, VERB 63
FW9 B7	R22CAFLG	R22 CALCULATIONS ARE GOING ON	R22 CALCULATIONS NOT GOING ON
FW9 B8	SOURCFLG	SOURCE OF INPUT DATA IS VHF	SOURCE OF INPUT DATA IS OPTICS MARK
FW9 B9	VHFRFLAG	ALLOW R22 TO ACCEPT RANGE DATA	STOP ACCEPTANCE OF RANGE DATA
FW9 B10	SAVECFLG	P22 DISPLAY AND DATA STORAGE AFTER MARK IS DONE	P22 DISPLAY AND DATA STORAGE BEFORE MARK IS DONE
FW9 B11	V94FLAG	V94 ALLOWED DURING R23	V94 NOT ALLOWED
FW9 B12	MAXDBFLG	MAX DEADBAND SELECTED	MIN DEADBAND SELECTED
FW9 B13	V82EMFLG	MOON VICINITY	EARTH VICINITY
FW9 B14	P24FLAG	P24 RUNNING	P24 NOT RUNNING
FW9 B15	SWTOVER	SWITCHOVER HAS OCCURRED	NO SWITCHOVER YET
FW10 B1	PCFLG	PLANE CHANGE TARGETTING	NO PLANE CHANGE
FW10 B2	FULTKFLG	ONLY OPTICS OR VHF MARKS BEING TAKEN	OPTICS AND VHF MARKS TAKEN
FW10 B3	TPIMNFLG	TPI MANEUVER HAS BEEN DONE	
FW10 B4	PTV93FLG	V93 TO BE DONE AFTER MANEUVER	MANEUVER AND V93 DONE
FW10 B5	MANEUFLG	MANEUVER, P14, OR PLANNED MANEUVER	MARK INCORPORATED
FW10 B6	AUTOSEQ	AUTOMATIC RENDEZ-VOUS SEQUENCE IS RUNNING	AUTOMATIC RENDEZ-VOUS NOT RUNNING
FW10 B7	P35FLAG	MCC TARGETTING DONE	NO YET MCC

OPTMODES (CM)

BIT	DESCRIPTION
1	
2	OCDU FAIL INHIBIT
3	ZERO OPTICS PROCESSING
4	$\overline{\text{ZERO OPTICS}}$
5	$\overline{\text{CMC CONTROL}}$
6	
7	$\overline{\text{OCDU FAIL}}$
8	COARSE ALIGN PROCESSING
9	COARSE ALIGN SINCE LAST FRESH START
10	OPT ZEROED SINCE LAST FRESH START
11	
12	
13	
14	
15	

CM AUTOPILOT CONFIGURATION DATA (NOUN 46)

DAP DATA LOADED INTO COMPONENTS R1 & R2 UPON REQUEST BY FLASHING V 04 N 46

R1 = ABCDE (DAPDATR1)

R2 = ABCDE (DAPDATR2)

	VEHICLE CONFIGURATION	X-TRANSLATION FOR QUAD A/C	X-TRANSLATION FOR QUAD B/D	ATTITUDE DEADBAND	MANEUVER RATE
R1	0 = NO DAP 1 = CSM 2 = CSM & LM 3 = CSM & SIVB 6 = CSM & LM (ASCENT STG ONLY)	0 = DISABLE A/C 1 = USE A/C	0 = DISABLE B/D 1 = USE B/D	0 = ±0.5 DEG 1 = ±5.0 DEG	0 = 0.05 DEG/SEC 1 = 0.2 DEG/SEC 2 = 0.5 DEG/SEC 3 = 2.0 DEG/SEC
	ROLL QUAD SELECT	QUAD A STATUS	QUAD B STATUS	QUAD C STATUS	QUAD D STATUS
R2	0 = USE B/D 1 = USE A/C	0 = DISABLE 1 = USE	0 = DISABLE 1 = USE	0 = DISABLE 1 = USE	0 = DISABLE 1 = USE
	DIGIT A	DIGIT B	DIGIT C	DIGIT D	DIGIT E

IMODES30 (CM)

BIT	DESCRIPTION
1	PIPA FAIL INHIBIT (RS WARNING)
2	TURN ON DELAY SEQUENCE FAIL
3	ICDU FAIL INHIBIT
4	IMU FAIL INHIBIT
5	PIPA FAIL INHIBIT (PROGRAM CAUTION)
6	IMU BEING INITIALIZED
7	FIRST TURN ON SAMPLE
8	SECOND TURN ON SAMPLE
9	IMU OPERATING
10	$\overline{\text{PIPA FAIL}}$
11	$\overline{\text{IMU CAGE}}$
12	$\overline{\text{ICDU FAIL}}$
13	$\overline{\text{IMU FAIL}}$
14	$\overline{\text{RS TURN ON REQUEST}}$
15	$\overline{\text{RS TEMP IN LIMITS}}$

IMODES33 (CM)

BIT	DESCRIPTION
1	$\overline{\text{LAMP TEST IN PROGRESS}}$
2	
3	
4	
5	IMU IN ZEROING ROUTINE
6	$\overline{\text{ENABLE DAP}}$
7	
8	
9	
10	
11	$\overline{\text{UPLINK TOO FAST}}$
12	$\overline{\text{DOWNLINK TOO FAST}}$
13	$\overline{\text{PIPA FAIL}}$
14	$\overline{\text{PROCEED KEY DEPRESSED}}$
15	

CHANNEL BIT ASSIGNMENTS(CONT.)

OUTPUT CHANNEL 10

BIT POSITION	CHANNEL OUTPUT SIGNAL	CM	LM
1	RLYB01	RELAY BIT 1	*Same as CM
2	RLYB02	RELAY BIT 2	*
3	RLYB03	RELAY BIT 3	*
4	RLYB04	RELAY BIT 4	*
5	RLYB05	RELAY BIT 5	*
6	RLYB06	RELAY BIT 6	*
7	RLYB07	RELAY BIT 7	*
8	RLYB08	RELAY BIT 8	*
9	RLYB09	RELAY BIT 9	*
10	RLYB010	RELAY BIT 10	*
11	RLYB011	RELAY BIT 11	*
12	RYWD12	RELAY ADDRESS 1	*
13	RYWD13	RELAY ADDRESS 2	*
14	RYWD14	RELAY ADDRESS 3	*
15	RYWD15	RELAY ADDRESS 4	*

OUTPUT CHANNEL 11

BIT POSITION	CHANNEL OUTPUT SIGNAL	CM	LM
1	ISSWAR	ISS WARNING	*SAME AS CM
2	COMACT	LIGHT COMPUTER ACTIVITY LAMP	*
3	UPLACT	LIGHT UPLINK ACTIVITY LAMP	*
4	TMPOUT	LIGHT TEMP CAUTION LAMP	*
5	KYRLS	LIGHT KEY RELEASE LAMP FLASH	*
6	VNFLSH	FLASH VERB AND NOUN LAMPS	*
7	OPERCR	LIGHT OPERATOR ERROR LAMP (FL)	*
8	OT1108		*
9	OT1109	TEST CONNECTOR OUTBIT	*
10	OT1110	CAUTION RESET	*
11	OT1111		
12	OT1112		
13	OT1113	ENGINE ON/OFF	ENGINE ON
14	OT1114		ENGINE OFF
15	OT1115		

CHANNEL BIT ASSIGNMENTS

CHANNEL 00

NOT USED

CHANNEL 01

IDENTICAL TO TIME L REG.

CHANNEL 02

IDENTICAL TO TIME Q REG.

CHANNEL 03

BITS 1-14: CONTAINS TIME HIGH ORDER SCALERS; 13.3 MIN = MAX. CAPACITY IN INCREMENTS OF 0.13 SEC

CHANNEL 04

BITS 1-14: CONTAINS TIME LOW ORDER SCALERS; 0.13 SEC = MAX. CAPACITY IN INCREMENTS OF 1/3200 SEC

OUTPUT CHANNEL 05

BIT POSITION	CHANNEL OUTPUT SIGNAL	SM	CM	LM
1	IMU + X + P	01 MCS + X + P	01 MCS - P - X + TW	01 MCS 4U
2	IMU - X - P	04 MCS - X - P	04 MCS - P + Z - R	02 MCS 4D
3	IMU - X - P	02 MCS - X + P	02 MCS + P - X - TW	02 MCS 3U
4	IMU + X - P	08 MCS + X - P	08 MCS - P + Z + R	04 MCS 3D
5	IMU + X + T	08 MCS + X + TW	08 MCS + TW - X + P	08 MCS 3U
6	IMU - X - T	08 MCS - X - TW	08 MCS - TW - X - P	010 MCS 3D
7	IMU + X + Y	07 MCS - X + TW	07 MCS + TW - X - P	012 MCS 1U
8	IMU - X - Y	06 MCS + X - TW	06 MCS - TW - X + P	014 MCS 1D

OUTPUT CHANNEL 06

BIT POSITION	CHANNEL OUTPUT SIGNAL	SM	CM	LM
1	IMU + Z + R	09 MCS + Z + R	09 MCS + R + TW + Z	07 MCS 3F
2	IMU - Z - R	013 MCS - Z - R	013 MCS - R - TW - Z	05 MCS 4F
3	IMU - Z + R	011 MCS - Z + R	011 MCS + R + TW + Z	016 MCS 1F
4	IMU + Z - R	010 MCS + Z - R	010 MCS - R - TW +Z	011 MCS 3F
5	IMU + Y + R	012 MCS + Y + R		013 MCS 2E
6	IMU - Y - R	016 MCS - Y - R		09 MCS 3E
7	IMU + Y - R	014 MCS + Y - R		06 MCS 1E
8	IMU - Y + R	015 MCS - Y + R		015 MCS 1F

CHANNEL 07

BITS 8-1: CONTAINS TIME SUPERBANK DESIGNATION BITS

CHANNEL BIT ASSIGNMENTS(CONT.)

OUTPUT CHANNEL 14

BIT POSITION	CM	LM
1		ALTITUDE RATE SELECTION
2		ALTITUDE METER ACTIVITY
3		
4		THRUST DRIVE
5		
6	GYRO ENABLE	*SAME AS CM
7	GYRO SELECTION b	•
8	GYRO SELECTION a	•
9	GYRO SIGN MINUS	•
10	GYRO ACTIVITY	•
11	DRIVE OCDU SHAFT	•
12	DRIVE OCDU TRUNNION	•
13	DRIVE IMU CDU Z	•
14	DRIVE IMU CDU Y	•
15	DRIVE IMU CDU X	•

GYRO SELECTION		GYRO
a	b	
0	0	NONE
0	1	DRIVE X GYRO
1	0	DRIVE Y GYRO
1	1	DRIVE Z GYRO

INPUT CHANNEL 15

BIT POSITION	CHANNEL INPUT SIGNAL	CM	LM	TRAP	RUPT
1	MKEY1	KEY 1M	*SAME AS CM	15	5
2	MKEY2	KEY 2M	•	15	5
3	MKEY3	KEY 3M	•	15	5
4	MKEY4	KEY 4M	•	15	5
5	MKEY5	KEY 5M	•	15	5

INPUT CHANNEL 16

BIT POSITION	CHANNEL INPUT SIGNAL	CM	LM	TRAP	RUPT
1	NKEY1	KEY1		16A	6
2	NKEY2	KEY2		16A	6
3	NKEY3	KEY3	MARK X	16A	6
4	NKEY4	KEY4	MARK Y	16A	6
5	NKEY5	KEY5	MARK REJECT	16A	6
6	MARK	MARK	DESCENT +	16B	6
7	MRKREJ	MARK REJECT	DESCENT -	16B	6

OUTPUT CHANNEL 13

BIT POSITION	CHANNEL OUTPUT SIGNAL	CM	LM
1	ZOPCDU	ZERO OPTICS CDU	ZERO RR CDU
2	ENEROP	ENABLE OPTICS ERR CTR	ENABLE RR ERR CTR
3	ETAMON		HORIZ VELOCITY LO SCALE
4	COARSE	COARSE ALIGN ENABLE	
5	ZIMCDU	ZERO IMU CDU'S	*SAME AS CM
6	ENEIMU	ENABLE IMU ERR CTR	•
7			
8	TVCMAN	TVC ENABLE	DISPLAY INERTIAL DATA
9	ASPTAK	ENABLE RCS TAKE OVER	+PITCH GIMBAL TRIM
10	ZEROPT	ZERO OPTICS	-PITCH GIMBAL TRIM
11	DSEMAC	DESHADE OPTICS DAC	+ROLL GIMBAL TRIM
12	MANOUT		-ROLL GIMBAL TRIM
13	MANSEQ	RCS DAP SEQ START	LM POS COMMAND
14	ASOFF	RCS CUTOFF	RR ENABLE AUTO TRACK
15	SETDO	RR TURN ON DELAY COMPLETED	•

OUTPUT CHANNEL 13

BIT POSITION	CM	LM
	RADAR SELECTION a b c	MODE
1	RADAR MODE SELECTION c	RADAR MODE SELECTION c
2	RADAR MODE SELECTION b	RADAR MODE SELECTION b
3	RADAR MODE SELECTION a	RADAR MODE SELECTION a
4	VHF ACTIVITY	RADAR ACTIVITY
5	INHIBIT UPLINK, ENABLE XLINK	
6	BLOCK UPLINK	*SAME AS CM
7	DOWNLINK WORD ORDER	•
8	ENABLE RNAD COUNTER	RNG COUNTER ENABLE
9	⁄⁄⁄	START RNG READ
10	TEST ALARMS	•
11	ENABLE STANDBY	•
12	RESET TRAP 31-A	•
13	RESET TRAP 31-B	•
14	RESET TRAP 32	•
15	ENABLE TRUPT	•

RADAR SELECTION			MODE
a	b	c	
0	0	0	NONE
0	0	1	VHF CM RR RANGE
0	1	0	RR RANGE RATE
0	1	1	NONE
1	0	0	LM X VELOCITY
1	0	1	LM Y VELOCITY
1	1	0	LM Z VELOCITY
1	1	1	LM RANGE

CHANNEL BIT ASSIGNMENTS(CONT.)

INPUT CHANNEL 32 (INVERTED LOGIC)

BIT POSITION	CHANNEL INPUT SIGNAL	CM	LM
1	MNIM+P	+PITCH MIN IMPULSE	THRUSTER 3-4 FAIL
2	MNIM-P	-PITCH MIN IMPULSE	THRUSTER 5-8 FAIL
3	MNIM+Y	+YAW MIN IMPULSE	THRUSTER 1-3 FAIL
4	MNIM-Y	-YAW MIN IMPULSE	THRUSTER 6-7 FAIL
5	MNIM+R	+ROLL MIN IMPULSE	THRUSTER 14-16 FAIL
6	MNIM-R	-ROLL MIN IMPULSE	THRUSTER 13-15 FAIL
7	TRST9		THRUSTER 9-12 FAIL
8	TRST10		THRUSTER 10-11 FAIL
9	PCHOOF		GIMBAL OFF
10	ROLOOF		APPARENT GIMBAL FAIL
11	LEMATT	LEM ATTACHED	
12	IN3213		
13	IN3213		
14	IN3214	PROCEED	*SAME AS CM
15	IN3216		

INPUT CHANNEL 33 (INVERTED LOGIC)

BIT POSITION	CHANNEL INPUT SIGNAL	CM	LM
1			
2	RRPONA	VHF DATA GOOD	RR POWER ON/AUTO
3	RRRLSC		RR RANGE LOW SCALE
4	ZEROP	ZERO OPTICS	RR DATA GOOD
5	OPMSW2	AGC CONTROL	LR DATA GOOD
6	OPMSW3		LR POSITION 1
7	STRPR8		LR POSITION 2
8	LVDAGD		LANDING VEL DATA GOOD
9	LRRLSC		LR RANGE LOW SCALE
10	BLKUPL	BLOCK UPLINK INPUT	*SAME AS CM
11	NO NAME 3	UPLINK TOO FAST	*
12	NO NAME 4	DOWNLINK TOO FAST	*
13	PIPAFL 2	PIPA FAIL	*
14	AGCW AR 2	COMPUTER WARNING	*
15	OSCALM 2	OSCILLATOR ALARM	*

CHANNELS 34 AND 35
CONTAIN DOWNLINK WORDS 1 AND 2

RESTART MONITOR CHANNEL 77

BIT POSITION	CM	LM
1	PARITY FAIL (BOTH)	* SAME AS CM
2	PARITY FAIL (E-MEM)	*
3	TC TRAP FAIL	*
4	RUPTLOC FAIL	*
5	NITE WATCHMAN FAIL	*
6	VOLTAGE FAIL	*
7	COUNTER FAIL	*
8	SCALAR FAIL	*
9	SCALAR DOUBLE FREQ	*

CHANNEL BIT ASSIGNMENTS(CONT.)

CHANNELS 17 AND 30-37

NOT USED

INPUT CHANNEL 30 (INVERTED LOGIC)

BIT POSITION	CHANNEL INPUT SIGNAL	CM	LM
1	ULLTRN	ULLAGE THRUST PRESENT	ABORT STAGE VENTILATION ENGINE ARMED
2	ENGSTM	SM SEPARATE	
3	SPREDY	SPS READY	
4	SCSRAB	SCS SEPARATE, ABORT	ABORT STAGE AUTO THROTTLE DISPLAY INERTIAL DATA
5	LFTOFF	LIFT OFF SCS	
6	GUIDEL	GUIDANCE REF RELEASE	
7	OPCDFL	OPTICS CDU FAIL	RR CDU FAIL
8	IMUOPR	IMU OPERATE	*SAME AS CM
9	IMU888		
10	GTLSAT	S/C CONTROL OF SAT	G&N CONTROL OF S/C
11	IMUCAG	IMU CAGE	
12	CDUFAL	IMU CDU FAIL	
13	IMUFAL	IMU FAIL	
14	SATCH	ISS TURN ON REQUEST	
15	TEMPIN	TEMP IN LIMITS	

INPUT CHANNEL 31 (INVERTED LOGIC)

BIT POSITION	CHANNEL INPUT SIGNAL	CM	LM
1	MANM+P	+PITCH MAN MOT	+EL (LPD), +PMI
2	MANM-P	-PITCH MAN MOT	-EL (LPD), -PMI
3	MANM+Y	+YAW MAN MOT	+YMI
4	MANM-Y	-YAW MAN MOT	-YMI
5	MANM+Z	+NOL MAN MOT	+AZ (LPD), +NMI
6	MANM-Z	-NOL MAN MOT	-AZ (LPD), -NMI
7	TRAN+X	+X TRANSLATION	*SAME AS CM
8	TRAN-X	-X TRANSLATION	*
9	TRAN+Y	+Y TRANSLATION	*
10	TRAN-Y	-Y TRANSLATION	*
11	TRAN+Z	+Z TRANSLATION	*
12	TRAN-Z	-Z TRANSLATION	*
13	HOLFUN	HOLD FUNCTION	ΔATTITUDE HOLD
14	FREFUN	FREE FUNCTION	AUTO STABILIZATION
15	GCAPCL	G&N AUTO PILOT CONTROL	ATTITUDE CONTROL OUT OF DETENT

NOTES