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```

```
#**************************************************************************
#*                                                                        *
#*          THIS AGC PROGRAM SHALL ALSO BE REFERRED TO AS:                *
#*                                                                        *
#*                                                                        *
#*                        COLOSSUS 2A                                     *
#*                                                                        *
#*                                                                        *
#*       THIS PROGRAM IS INTENDED FOR USE IN THE CM AS SPECIFIED          *
#*       IN REPORT R-577. THIS PROGRAM WAS PREPARED UNDER DSR             *
#*       PROJECT 55-23870, SPONSORED BY THE MANNED SPACECRAFT             *
#*       CENTER OF THE NATIONAL AERONAUTICS AND SPACE                     *
#*       ADMINISTRATION THROUGH CONTRACT NAS 9-4065 WITH THE              *
#*       INSTRUMENTATION LABORATORY, MASSACHUSETTS INSTITUTE OF           *
#*       TECHNOLOGY, CAMBRIDGE, MASS.                                     *
#*                                                                        *
#**************************************************************************

#         SUBMITTED:    MARGARET H. HAMILTON             DATE:  28 MAR 69
#             M.H.HAMILTON, COLOSSUS PROGRAMMING LEADER
#             APOLLO GUIDANCE AND NAVIGATION

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#             D.J.LICKLY, DIRECTOR, MISSION PROGRAM DEVELOPMENT
#             APOLLO GUIDANCE AND NAVIGATION PROGRAM

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#             FRED H. MARTIN, COLOSSUS PROJECT MANGER
#             APOLLO GUIDANCE AND NAVIGATION PROGRAM

#         APPROVED: NORMAN E.SEARS                       DATE:  28 MAR 69
#             N.E. SEARS, DIRECTOR, MISSION DEVELOPMENT
#             APOLLO GUIDANCE AND NAVIGATION PROGRAM

#         APPROVED: RICHARD H. BATTIN                    DATE:  28 MAR 69
#             R.H. BATTIN, DIRECTOR, MISSION DEVELOPMENT
#             APOLLO GUIDANCE AND NAVIGATION PROGRAM

#         APPROVED: DAVID G. HOAG                        DATE:  28 MAR 69
#             D.G. HOAG, DIRECTOR
#             APOLLO GUIDANCE AND NAVIGATION PROGRAM

#         APPROVED: RALPH R. RAGAN                       DATE:  28 MAR 69
#             R.R. RAGAN, DEPUTY DIRECTOR
#             INSTRUMENTATION LABORATORY
```

```
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	#
	#
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	#		ERASABLE ASSIGNMENTS
	#	COMAID
	#		INTERRUPT LEAD INS
	#		T4RUPT PROGRAM
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	#		FRESH START AND RESTART
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```

```
#
#               TVCEXECUTIVE
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#               EXECUTIVE
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#               PLANETARY INERTIAL ORIENTATION
#               MEASUREMENT INCORPORATION
#               CONIC SUBROUTINES
#               INTEGRATION INITIALIZATION
#               ORBITAL INTEGRATION
#               INFLIGHT ALIGNMENT ROUTINES
#               POWERED FLIGHT SUBROUTINES
#               TIME OF FREE FALL
#               STAR TABLES
#               AGC BLOCK TWO SELF-CHECK
#               PHASE TABLE MAINTENANCE
#               RESTARTS ROUTINE
#               IMU MODE SWITCHING ROUTINES
#               KEYRUPT, UPRUPT
#               DISPLAY INTERFACE ROUTINES
#               SERVICE ROUTINES
#               ALARM AND ABORT
#               UPDATE PROGRAM
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#       SYMBOL TABLE LISTING
#       UNREFERENCED SYMBOL LISTING
#       ERASABLE & EQUALS CROSS-REFERENCE TABLE
#       SUMMARY OF SYMBOL TABLE LISTINGS
#       MEMORY TYPE & AVAILABILITY DISPLAY
#       COUNT TABLE
#       PARAGRAPHS GENERATED FOR THIS ASSEMBLY
```

```
	#	OCTAL LISTING
	#	OCCUPIED LOCATIONS TABLE
	#	SUBROS CALLED & PROGRAM STATUS
```

```
# VERB LIST FOR CSM

# REGULAR VERBS

# 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 DP 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 DP 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
```

EXTENDED VERBS

40 ZERO CDU-S
41 COARSE ALIGN CDU-S
42 FINE ALIGN IMU-S
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 ROUTINE (R03)
49 REQUEST CREW DEFINED MANEUVER ROUTINE (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 + P25)
57 REQUEST RENDEZVOUS SIGHTING MARK ROUTINE (R21)
58 RESET STICK FLAG
59 PLEASE CALIBRATE
60 SET ASTRONAUT TOTAL ATTITUDE (N17) TO PRESENT ATTITUDE
61 DISPLAY DAP ATTITUDE ERROR
62 DISPLAY TOTAL ATTITUDE ERROR (WRT N22 (THETAD))
63 DISPLAY TOTAL ASTRONAUT ATTITUDE ERROR (WRT N17 (CPHIX))
64 REQUEST S-BAND ANTENNA ROUTINE
65 OPTICAL VERIFICATION OF PRELAUNCH ALIGNMENT
66 VEHICLES ARE ATTACHED. MOVE THIS VEHICLE STATE TO OTHER VEHICLE.
67
68 CSM STROKE TEST ON
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 SET PREFERRED ATTITUDE FLAG
77 RESET PREFERRED ATTITUDE FLAG
78 UPDATE PRELAUNCH AZIMUTH
79 REQUEST LUNAR LANDMARK SELECTION ROUTINE (R35)
80 UPDATE LEM STATE VECTOR
81 UPDATE CSM STATE VECTOR
82 REQUEST ORBIT PARAM DISPLAY (R30)
83 REQUEST REND PARAM DISPLAY (R31)
84 START TARGET DELTA V (R32)
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 ROUTINE (R63)
90 REQUEST RENDEZVOUS OUT OF PLANE DISPLAY ROUTINE (R36)
91 DISPLAY BANK SUM
92 OPERATE IMU PERFORMANCE TEST (P07)
93 ENABLE W MATRIX INITIALIZATION
94 PERFORM CYSLUNAR ATTITUDE MANEUVER (P23)
95 NO UPDATE OF EITHER STATE VECTOR (P20 OR P22)
96 TERMINATE INTEGRATION AND GO TO P00
97 PERFORM ENGINE FAIL PROCEDURE
98 ENABLE TRANSLUNAR INJECT
99 PLEASE ENABLE ENGINE

```
#
# IN THE FOLLOWING NOUN LIST THE :NO LOAD: RESTRICTION MEANS THE NOUN
# CONTAINS AT LEAST ONE COMPONENT WHICH CANNOT BE LOADED, I.E. OF
# SCALE TYPE L (MIN/SEC) OR PP (2 INTEGERS).
# IN THIS CASE VERBS 24 AND 25 ARE NOT ALLOWED, BUT VERBS 21, 22 OR 23
# MAY BE USED TO LOAD ANY OF THE NOUN:S COMPONENTS WHICH ARE NOT OF THE
# ABOVE SCALE TYPES.
# THE :DEC ONLY: RESTRICTION MEANS ONLY DECIMAL OPERATION IS ALLOWED ON
# EVERY COMPONENT IN THE NOUN. (NOTE THAT :NO LOAD: IMPLIES :DEC ONLY:.)

# NORMAL NOUNS                              COMPONENTS   SCALE AND DECIMAL POINT         RESTRICTIONS

# 00    NOT IN USE
# 01    SPECIFY MACHINE ADDRESS (FRACTIONAL)    3COMP   .XXXXX FOR EACH
# 02    SPECIFY MACHINE ADDRESS (WHOLE)         3COMP   XXXXX. FOR EACH
# 03    SPECIFY MACHINE ADDRESS (DEGREES)       3COMP   XXX.XX DEG FOR EACH
# 04    SPARE
# 05    ANGULAR ERROR/DIFFERENCE                1COMP   XXX.XX DEG
# 06    OPTION CODE                             2COMP   OCTAL ONLY FOR EACH
# LOADING NOUN 07 WILL SET OR RESET SELECTED BITS IN ANY ERASABLE REGISTER
# 07    ECADR OF WORD TO BE MODIFIED            3COMP   OCTAL ONLY FOR EACH
#       ONES FOR BITS TO BE MODIFIED
#       1 TO SET OR 0 TO RESET SELECTED BITS
# 08    ALARM DATA                              3COMP   OCTAL ONLY FOR EACH
# 09    ALARM CODES                             3COMP   OCTAL ONLY FOR EACH
# 10    CHANNEL TO BE SPECIFIED                 1COMP   OCTAL ONLY
# 11    TIG OF CSI                              3COMP   00XXX. HRS              DEC ONLY
#                                                       000XX. MIN              MUST LOAD 3 COMPS
#                                                       0XX.XX SEC
# 12    OPTION CODE                             2COMP   OCTAL ONLY FOR EACH
#        (USED BY EXTENDED VERBS ONLY)
# 13    TIG OF CDH                              3COMP   00XXX. HRS              DEC ONLY
#                                                       000XX. MIN              MUST LOAD 3 COMPS
#                                                       0XX.XX SEC
# 14    SPARE
# 15    INCREMENT MACHINE ADDRESS               1COMP   OCTAL ONLY
# 16    TIME OF EVENT                           3COMP   00XXX. HRS              DEC ONLY
#        (USED BY EXTENDED VERBS ONLY)                  000XX. MIN              MUST LOAD 3 COMPS
#                                                       0XX.XX SEC
# 17    ASTRONAUT TOTAL ATTITUDE                3COMP   XXX.XX DEG FOR EACH
# 18    AUTO MANEUVER BALL ANGLES               3COMP   XXX.XX DEG FOR EACH
# 19    BYPASS ATTITUDE TRIM MANEUVER           3COMP   XXX.XX DEG FOR EACH
# 20    ICDU ANGLES                             3COMP   XXX.XX DEG FOR EACH
# 21    PIPAS                                   3COMP   XXXXX. PULSES FOR EACH
# 22    NEW ICDU ANGLES                         3COMP   XXX.XX DEG FOR EACH
# 23    SPARE
# 24    DELTA TIME FOR AGC CLOCK                3COMP   00XXX. HRS.             DEC ONLY
#                                                       000XX. MIN              MUST LOAD 3 COMPS
#                                                       0XX.XX SEC
# 25    CHECKLIST                               3COMP   XXXXX. FOR EACH
#        (USED WITH PLEASE PERFORM ONLY)
```

```
# 26    PRIORITY/DELAY, ADRES, BBCON          3COMP   OCTAL ONLY FOR EACH
# 27    SELF TEST ON/OFF SWITCH               1COMP   XXXXX.
# 28    SPARE
# 29    XSM LAUNCH AZIMUTH                    1COMP   XXX.XX DEG            DEC ONLY
```

# 30	TARGET CODES	3COMP	XXXXX. FOR EACH	
# 31	TIME OF LANDING SITE	3COMP	OOXXX. HRS	DEC ONLY
#			OOOXX. MIN	MUST LOAD 3 COMPS
#			OXX.XX SEC	
# 32	TIME FROM PERIGEE	3COMP	OOXXX. HRS	DEC ONLY
#			OOOXX. MIN	MUST LOAD 3 COMPS
#			OXX.XX SEC	
# 33	TIME OF IGNITION	3COMP	OOXXX. HRS	DEC ONLY
#			OOOXX. MIN	MUST LOAD 3 COMPS
#			OXX.XX SEC	
# 34	TIME OF EVENT	3COMP	OOXXX. HRS	DEC ONLY
#			OOOXX. MIN	MUST LOAD 3 COMPS
#			OXX.XX SEC	
# 35	TIME FROM EVENT	3COMP	OOXXX. HRS	DEC ONLY
#			OOOXX. MIN	MUST LOAD 3 COMPS
#			OXX.XX SEC	
# 36	TIME OF AGC CLOCK	3COMP	OOXXX. HRS	DEC ONLY
#			OOOXX. MIN	MUST LOAD 3 COMPS
#			OXX.XX SEC	
# 37	TIG OF TPI	3COMP	OOXXX. HRS	DEC ONLY
#			OOOXX. MIN	MUST LOAD 3 COMPS
#			OXX.XX SEC	
# 38	TIME OF STATE VECTOR	3COMP	OOXXX. HRS	DEC ONLY
#			OOOXX. MIN	MUST LOAD 3 COMPS
#			OXX.XX SEC	
# 39	DELTA TIME FOR TRANSFER	3COMP	OOXXX. HRS	DEC ONLY
#			OOOXX. MIN	MUST LOAD 3 COMPS
#			OXX.XX SEC	

	MIXED NOUNS	COMPONENTS	SCALE AND DECIMAL POINT	RESTRICTIONS
40	TIME FROM IGNITION/CUTOFF	3COMP	XXBXX MIN/SEC	NO LOAD, DEC ONLY
	VG,		XXXX.X FT/SEC	
	DELTA V (ACCUMULATED)		XXXX.X FT/SEC	
41	TARGET AZIMUTH,	2COMP	XXX.XX DEG	
	ELEVATION		XX.XXX DEG	
42	APOGEE,	3COMP	XXXX.X NAUT MI	DEC ONLY
	PERIGEE,		XXXX.X NAUT MI	
	DELTA V (REQUIRED)		XXXX.X FT/SEC	
43	LATITUDE,	3COMP	XXX.XX DEG	DEC ONLY
	LONGITUDE,		XXX.XX DEG	
	ALTITUDE		XXXX.X NAUT MI	
44	APOGEE,	3COMP	XXXX.X NAUT MI	NO LOAD, DEC ONLY
	PERIGEE,		XXXX.X NAUT MI	
	TFF		XXBXX MIN/SEC	
45	MARKS (VHF - OPTICS)	3COMP	+XXBXX	NO LOAD, DEC ONLY
	TFI OF NEXT BURN		XXBXX MIN/SEC	
	MGA		XXX.XX DEG	
46	AUTOPILOT CONFIGURATION	2COMP	OCTAL ONLY FOR EACH	
47	THIS VEHICLE WEIGHT	2COMP	XXXXX. LBS	DEC ONLY
	OTHER VEHICLE WEIGHT		XXXXX. LBS	
48	PITCH TRIM	2COMP	XXX.XX DEG	DEC ONLY
	YAW TRIM,		XXX.XX DEG	
49	DELTA R	3COMP	XXXX.X NAUT MI	DEC ONLY
	DELTA V		XXXX.X FT/SEC	
	VHF OR OPTICS CODE		XXXXX.	
50	SPLASH ERROR,	3COMP	XXXX.X NAUT MI	NO LOAD, DEC ONLY
	PERIGEE,		XXXX.X NAUT MI	
	TFF		XXBXX MIN/SEC	
51	S-BAND ANTENNA ANGLES PITCH	2COMP	XXX.XX DEG	DEC ONLY
	YAW		XXX.XX DEG	
52	CENTRAL ANGLE OF ACTIVE VEHICLE	1COMP	XXX.XX DEG	
53	RANGE,	3COMP	XXX.XX NAUT MI	DEC ONLY
	RANGE RATE,		XXXX.X FT/SEC	
	PHI		XXX.XX DEG	
54	RANGE,	3COMP	XXX.XX NAUT MI	DEC ONLY
	RANGE RATE,		XXXX.X FT/SEC	
	THETA		XXX.XX DEG	
55	PERIGEE CODE	3COMP	XXXXX.	DEC ONLY
	ELEVATION ANGLE		XXX.XX DEG	
	CENTRAL ANGLE OF PASSIVE VEHICLE		XXX.XX DEG	
56	REENTRY ANGLE,	2COMP	XXX.XX DEG	DEC ONLY
	DELTA V		XXXXX. FT/SEC	
57	DELTA R	1COMP	XXXX.X NAUT MI	DEC ONLY
58	PERIGEE ALT (POST TPI)	3COMP	XXXX.X NAUT MI	DEC ONLY
	DELTA V TPI		XXXX.X FT/SEC	
	DELTA V TPF		XXXX.X FT/SEC	
59	DELTA VELOCITY LOS	3COMP	XXXX.X FT/SEC FOR EA.	DEC ONLY
60	GMAX,	3COMP	XXX.XX G	DEC ONLY

#	VPRED,		XXXXX. FT/SEC		
#	GAMMA EI		XXX.XX DEG		
# 61	IMPACT LATITUDE,	3COMP	XXX.XX DEG		DEC ONLY
#	IMPACT LONGITUDE,		XXX.XX DEG		
#	HEADS UP/DOWN		+/- 00001		
# 62	INERTIAL VEL MAG (VI),	3COMP	XXXXX. FT/SEC		DEC ONLY
#	ALT RATE CHANGE (HDOT),		XXXXX. FT/SEC		
#	ALT ABOVE PAD RADIUS (H)		XXXX.X NAUT MI		
# 63	RANGE 297,431 TO SPLASH (RTGO),	3COMP	XXXX.X NAUT MI		NO LOAD, DEC ONLY
#	PREDICTED INERT VEL (VIO),		XXXXX. FT/SEC		
#	TIME FROM 297,431 (TFE),		XXBXX MIN/SEC		
# 64	DRAG ACCELERATION,	3COMP	XXX.XX G		DEC ONLY
#	INERTIAL VELOCITY (VI),		XXXXX. FT/SEC		
#	RANGE TO SPLASH		XXXX.X NAUT MI		
# 65	SAMPLED AGC TIME	3COMP	00XXX. HRS		DEC ONLY
#	(FETCHED IN INTERRUPT)		000XX. MIN		MUST LOAD 3 COMPS
#			0XX.XX SEC		
# 66	COMMAND BANK ANGLE (BETA),	3COMP	XXX.XX DEG		DEC ONLY
#	CROSS RANGE ERROR,		XXXX.X NAUT MI		
#	DOWN RANGE ERROR		XXXX.X NAUT MI		
# 67	RANGE TO TARGET,	3COMP	XXXX.X NAUT MI		DEC ONLY
#	PRESENT LATITUDE,		XXX.XX DEG		
#	PRESENT LONGITUDE		XXX.XX DEG		
# 68	COMMAND BANK ANGLE (BETA),	3COMP	XXX.XX DEG		DEC ONLY
#	INERTIAL VELOCITY (VI),		XXXXX. FT/SEC		
#	ALT RATE CHANGE (RDOT)		XXXXX. FT/SEC		
# 69	BETA	3COMP	XXX.XX DEG		DEC ONLY
#	DL		XXX.XX G		
#	VL		XXXXX. FT/SEC		
# 70	STAR CODE,	3COMP	OCTAL ONLY		
#	LANDMARK DATA,		OCTAL ONLY		
#	HORIZON DATA		OCTAL ONLY		
# 71	STAR CODE	3COMP	OCTAL ONLY		
#	LANDMARK DATA		OCTAL ONLY		
#	HORIZON DATA		OCTAL ONLY		
# 72	DELT ANG	3COMP	XXX.XX DEG		DEC ONLY
# 73	ALTITUDE	3COMP	XXXXXB. NAUT MI		
#	VELOCITY		XXXXX. FT/SEC		
#	FLIGHT PATH ANGLE		XXX.XX DEG		
# 74	COMMAND BANK ANGLE (BETA)	3COMP	XXX.XX DEG		
#	INERTIAL VELOCITY (VI)		XXXXX. FT/SEC		
#	DRAG ACCELERATION		XXX.XX G		
# 75	DELTA ALTITUDE CDH	3COMP	XXXX.X NAUT MI		NO LOAD, DEC ONLY
#	DELTA TIME (CDH-CSI OR TPI-CDH)		XXBXX MIN/SEC		
#	DELTA TIME (TPI-CDH OR TPI-NOMTPI)		XXBXX MIN/SEC		
# 76	SPARE				
# 77	SPARE				
# 78	SPARE				
# 79	SPARE				
# 80	TIME FROM IGNITION/CUTOFF	3COMP	XXBXX MIN/SEC		NO LOAD, DEC ONLY

```
#       VG                                          XXXXX. FT/SEC
#       DELTA V (ACCUMULATED)                       XXXXX. FT/SEC
# 81    DELTA V (LV)                          3COMP XXXX.X FT/SEC FOR EACH  DEC ONLY
# 82    DELTA V (LV)                          3COMP XXXX.X FT/SEC FOR EACH  DEC ONLY
# 83    DELTA V (BODY)                        3COMP XXXX.X FT/SEC FOR EACH  DEC ONLY
# 84    DELTA V (OTHER VEHICLE)               3COMP XXXX.X FT/SEC FOR EACH  DEC ONLY
# 85    VG (BODY)                             3COMP XXXX.X FT/SEC FOR EACH  DEC ONLY
# 86    DELTA V(LV)                           3COMP XXXXX. FT/SEC FOR EACH  DEC ONLY
# 87    MARK DATA       SHAFT,                2COMP XXX.XX DEG
#                       TRUNION                     XX.XXX DEG
# 88    HALF UNIT SUN OR PLANET VECTOR        3COMP .XXXXX FOR EACH         DEC ONLY
# 89    LANDMARK        LATITUDE,             3COMP XX.XXX DEG              DEC ONLY
#                       LONGITUDE/2,                XX.XXX DEG
#                       ALTITUDE                    XXX.XX NAUT MI
# 90    Y                                     3COMP XXX.XX NM               DEC ONLY
#       Y DOT                                       XXXX.X FPS
#       PSI                                         XXX.XX DEG
# 91    OCDU ANGLES     SHAFT,                2COMP XXX.XX DEG
#                       TRUNION                     XX.XXX DEG
# 92    NEW OPTICS ANGLES       SHAFT,        2COMP XXX.XX DEG
#                               TRUNION             XX.XXX DEG
# 93    DELTA GYRO ANGLES                     3COMP XX.XXX DEG FOR EACH
# 94    NEW OPTICS ANGLES       SHAFT         2COMP XXX.XX DEG
#                               TRUNNION            XX.XXX DEG
# 95    PREFERRED ATTITUDE ICDU ANGLES        3COMP XXX.XX FOR FOR EACH
# 96    +X-AXIS ATTITUDE ICDU ANGLES          3COMP XXX.XX DEG FOR EACH
# 97    SYSTEM TEST INPUTS                    3COMP XXXXX. FOR EACH
# 98    SYSTEM TEST RESULTS AND INPUTS        3COMP XXXXX.
#                                                   .XXXXX
#                                                   XXXXX.
# 99    RMS IN POSITION                       3COMP XXXXX.FT                DEC ONLY
#       RMS IN VELOCITY                             XXXX.X FT/SEC
#       RMS OPTION                                  XXXXX.
```

```
# REGISTERS AND SCALING  FOR NORMAL NOUNS
#
# NOUN          REGISTER        SCALE TYPE
#
# 00    NOT IN USE
# 01    SPECIFY ADDRESS         B
# 02    SPECIFY ADDRESS         C
# 03    SPECIFY ADDRESS         D
# 04    SPARE
# 05            DSPTEM1         H
# 06            OPTION1         A
# 07            XREG            A
# 08            ALMCADR         A
# 09            FAILREG         A
# 10    SPECIFY CHANNEL         A
# 11            TCSI            K
# 12            OPTIONX         A
# 13            TCDH            K
# 14    SPARE
# 15    INCREMENT ADDRESS       A
# 16            DSPTEMX         C
# 17            CPHIX           D
# 18            THETAD          D
# 19            THETAD          D
# 20            CDUX            D
# 21            PIPAX           C
# 22            THETAD          D
# 23    SPARE
# 24            DSPTEM2 +1      K
# 25            DSPTEM1         C
# 26            DSPTEM1         A
# 27            SMODE           C
# 28    SPARE
# 29            DSPTEM1         D
# 30            DSPTEM1         C
# 31            DSPTEM1         K
# 32            -TPER           K
# 33            TIG             K
# 34            DSPTEM1         K
# 35            TTOGO           K
# 36            TIME2           K
# 37            TTPI            K
# 38            TET             K
# 39            T3TOT4          K
```

```
# REGISTERS AND SCALING FOR MIXED NOUNS
#
# NOUN  COMP    REGISTER        SCALE TYPE
#
# 40    1       TTOGO           L
#       2       VGDISP          S
#       3       DVTOTAL         S
# 41    1       DSPTEM1         D
#       2       DSPTEM1 +1      E
# 42    1       HAPO            Q
#       2       HPER            Q
#       3       VGDISP          S
# 43    1       LAT             H
#       2       LONG            H
#       3       ALT             Q
# 44    1       HAPOX           Q
#       2       HPERX           Q
#       3       TFF             L
# 45    1       VHFCNT          PP
#       2       TTOGO           L
#       3       +MGA            H
# 46    1       DAPDATR1        A
#       2       DAPDATR2        A
# 47    1       CSMMASS         KK
#       2       LEMMASS         KK
# 48    1       PACTOFF         FF
#       2       YACTOFF         FF
# 49    1       N49DISP         Q
#       2       N49DISP +2      S
#       3       N49DISP +4      C
# 50    1       RSP-RREC        LL
#       2       HPERX           Q
#       3       TFF             L
# 51    1       RHOSB           H
#       2       GAMMASB         H
# 52    1       ACTCENT         H
# 53    1       RANGE           JJ
#       2       RRATE           S
#       3       RTHETA          H
# 54    1       RANGE           JJ
#       2       RRATE           S
#       3       RTHETA          H
# 55    1       NN1             C
#       2       ELEV            H
#       3       CENTANG         H
# 56    1       RTEGAM2D        H
#       2       RTEDVD          P
# 57    1       DELTAR          Q
# 58    1       POSTTPI         Q
#       2       DELVTPI         S
```

```
#       3       DELVTPF         S
# 59    1       DVLOS           S
#       2       DVLOS +2        S
#       3       DVLOS +4        S
# 60    1       GMAX            T
#       2       VPRED           P
#       3       GAMMAEI         H
# 61    1       LAT(SPL)        H
#       2       LNG(SPL)        H
#       3       HEADSUP         C
# 62    1       VMAGI           P
#       2       HDOT            P
#       3       ALTI            Q
# 63    1       RTGO            LL
#       2       VIO             P
#       3       TTE             L
# 64    1       D               MM
#       2       VMAGI           P
#       3       RTGON64         LL
# 65    1       SAMPTIME        K
#       2       SAMPTIME        K
#       3       SAMPTIME        K
# 66    1       ROLLC           H
#       2       XRNGERR         VV
#       3       DNRNGERR        LL
# 67    1       RTGON67         LL
#       2       LAT             H
#       3       LONG            H
# 68    1       ROLLC           H
#       2       VMAGI           P
#       3       RDOT            UU
# 69    1       ROLLC           H
#       2       Q7              MM
#       3       VL              UU
# 70    1       STARCODE        A
#       2       LANDMARK        A
#       3       HORIZON         A
# 71    1       STARCODE        A
#       2       LANDMARK        A
#       3       HORIZON         A
# 72    1       THETZERO        H
# 73    1       P21ALT          Q (MEMORY/100 TO DISPLAY TENS N.M.)
#       2       P21VEL          P
#       3       P21GAM          H
# 74    1       ROLLC           H
#       2       VMAGI           P
#       3       D               MM
# 75    1       DIFFALT         Q
#       2       T1TOT2          L
#       3       T2TOT3          L
```

```
#
# 76    SPARE
# 77    SPARE
# 78    SPARE
# 79    SPARE
# 80    1       TTOGO           L
#       2       VGDISP          P
#       3       DVTOTAL         P
# 81    1       DELVLVC         S
#       2       DELVLVC +2      S
#       3       DELVLVC +4      S
# 82    1       DELVLVC         S
#       2       DELVLVC +2      S
#       3       DELVLVC +4      S
# 83    1       DELVIMU         S
#       2       DELVIMU +2      S
#       3       DELVIMU +4      S
# 84    1       DELVOV          S
#       2       DELVOV +2       S
#       3       DELVOV +4       S
# 85    1       VGBODY          S
#       2       VGBODY +2       S
#       3       VGBODY +4       S
# 86    1       DELVLVC         P
#       2       DELVLVC +2      P
#       3       DELVLVC +4      P
# 87    1       MRKBUF1 +3      D
#       2       MRKBUF1 +5      J
# 88    1       STARSAV3        ZZ
#       2       STARSAV3 +2     ZZ
#       3       STARSAV3 +4     ZZ
# 89    1       LANDLAT         G
#       2       LANDLONG        G
#       3       LANDALT         JJ
# 90    1       RANGE           JJ
#       2       RRATE           S
#       3       RTHETA          H
# 91    1       CDUS            D
#       2       CDUT            J
# 92    1       SAC             D
#       2       PAC             J
# 93    1       OGC             G
#       2       OGC +2          G
#       3       OGC +4          G
# 94    1       MRKBUF1 +3      D
#       2       MRKBUF1 +5      J
# 95    1       PRAXIS          D
#       2       PRAXIS +1       D
#       3       PRAXIS +2       D
# 96    1       CPHIX           D
#       2       CPHIX +1        D
```

```
#       3       CPHIX +2        D
# 97    1       DSPTEM1         C
#       2       DSPTEM1 +1      C
#       3       DSPTEM1 +2      C
# 98    1       DSPTEM2         C
#       2       DSPTEM2 +1      B
#       3       DSPTEM2 +2      C
# 99    1       WWPOS           XX
#       2       WWVEL           YY
#       3       WWOPT           C
```

NOUN SCALES AND FORMATS

-SCALE TYPE- UNITS	DECIMAL FORMAT	PRECISION --	AGC FORMAT
----------	----------	--	----------
-A-			
OCTAL	XXXXX	SP	OCTAL
-B-			-14
FRACTIONAL	.XXXXX (MAX .99996)	SP	BIT 1 = 2 UNITS
-C-			
WHOLE	XXXXX. (MAX 16383.)	SP	BIT 1 = 1 UNIT
-D-			15
CDU DEGREES	XXX.XX DEGREES (MAX 359.99)	SP	BIT 1 = 360/2 DEGREES (USES 15 BITS FOR MAGNI- TUDE AND 2-S COMP.)
-E-			14
ELEVATION DEGREES	XX.XXX DEGREES (MAX 89.999)	SP	BIT 1 = 90/2 DEGREES
-F-			14
DEGREES (180)	XXX.XX DEGREES (MAX 179.99)	SP	BIT 1 = 180/2 DEGREES
-G-			
DP DEGREES(90)	XX.XXX DEGREES	DP	BIT 1 OF LOW REGISTER = 28 360/2 DEGREES
-H-			
DP DEGREES (360)	XXX.XX DEGREES (MAX 359.99)	DP	BIT 1 OF LOW REGISTER = 28 360/2 DEGREES
-J-			15
Y OPTICS DEGREES	XX.XXX DEGREES (BIAS OF 19.775 DEGREES ADDED FOR DISPLAY, SUBTRACTED FOR LOAD.) NOTE: NEGATIVE NUM- BERS CANNOT BE LOADED.	SP	BIT 1 = 90/2 DEGREES (USES 15 BITS FOR MAGNI- TUDE AND 2-S COMP.)
-K-			

```
#
# TIME (HR, MIN, SEC)   OOXXX. HR              DP      BIT 1 OF LOW REGISTER =
#                       OOOXX. MIN                       -2
#                       OXX.XX SEC                       10   SEC
#                       (DECIMAL ONLY.
#                       MAX MIN COMP=59
#                       MAX SEC COMP=59.99
#                       MAX CAPACITY=745 HRS
#                                    39 MINS
#                                    14.55 SECS.
#                       WHEN LOADING, ALL 3
#                       COMPONENTS MUST BE
#                       SUPPLIED.)
#
# -L-
# TIME (MIN/SEC)        XXBXX MIN/SEC            DP      BIT 1 OF LOW REGISTER =
#                       (B IS A BLANK                      -2
#                       POSITION, DECIMAL                10   SEC
#                       ONLY, DISPLAY OR
#                       MONITOR ONLY. CANNOT
#                       BE LOADED.
#                       MAX MIN COMP=59
#                       MAX SEC COMP=59
#                       VALUES GREATER THAN
#                       59 MIN 59 SEC
#                       ARE DISPLAYED AS
#                       59 MIN 59 SEC.)
#
# -M-                                                    -2
# TIME (SEC)            XXX.XX SEC               SP      BIT 1 = 10   SEC
#                       (MAX 163.83)
#
# -N-
# TIME(SEC) DP          XXX.XX SEC               DP      BIT 1 OF LOW REGISTER =
#                                                          -2
#                                                        10   SEC
#
# -P-
# VELOCITY 2            XXXXX. FEET/SEC          DP      BIT 1 OF HIGH REGISTER =
#                       (MAX 41994.)                      -7
#                                                        2   METERS/CENTI-SEC
#
# -Q-
# POSITION 4            XXXX.X NAUTICAL MILES    DP      BIT 1 OF LOW REGISTER =
#                                                        2 METERS
#
# -S-
# VELOCITY 3            XXXX.X FT/SEC            DP      BIT 1 OF HIGH REGISTER =
#                                                         -7
#                                                        2   METERS/CENTI-SEC
```

```
#
# -T-                                                    -2
# G                    XXX.XX G              SP      BIT 1 = 10   G
#                      (MAX 163.83)
#
# -FF-
# TRIM DEGREES         XXX.XX DEG.           SP      LOW ORDER BIT = 85.41 SEC
#                      (MAX 388.69)                  OF ARC
#
# -GG-
# INERTIA              XXXXXBB. SLUG FT SQ   SP      FRACTIONAL PART OF
#                      (MAX 07733BB.)                 20     2
#                                                    2   KG M
#
# -II-                                                          20
# THRUST MOMENT        XXXXXBB. FT LBS       SP      FRACTIONAL PART OF 2
#                      (MAX 07733BB.)                NEWTON METER
#
# -JJ-
# POSITION5            XXX.XX NAUT MI        DP      BIT 1 OF LOW REGISTER =
#                                                    2 METERS
#
# -KK-                                                        16
# WEIGHT2              XXXXX. LBS            SP      FRACTIONAL PART OF 2   KG
#
# -LL-
# POSITION6            XXXX.X NAUT MI        DP      BIT 1 OF LOW REG =
#                                                              -28
#                                                    (6,373,338)(2(PI))X2
#                                                    ----------------------
#                                                             1852
#                                                    NAUT. MI.
#
# -MM-
# DRAG ACCELERATION    XXX.XX G              DP      BIT 1 OF LOW REGISTER =
#                      MAX (024.99)                     -28
#                                                    25X2    G
#
# -PP-
# 2 INTEGERS           +XXBYY                DP      BIT 1 OF HIGH REGISTER =
#                      (B IS A BLANK                  1 UNIT OF XX
#                      POSITION.  DECIMAL            BIT 1 OF LOW REGISTER =
#                      ONLY, DISPLAY OR               1 UNIT OF YY
#                      MONITOR ONLY. CANNOT          (EACH REGISTER MUST
#                      BE LOADED.)                   CONTAIN A POSITIVE INTEGER
#                      (MAX 99B99)                    LESS THAN 100)
#
# -UU-
# VELOCITY/2VS         XXXXX. FEET/SEC       DP      FRACTIONAL PART OF
#                      (MAX 51532.)                  2VS FEET/SEC
#                                                    (VS = 25766.1973)
```

```
#
# -VV-
# POSITION8              XXXX.X NAUT MI          DP      BIT 1 OF LOW REGISTER =
#                                                                  -28
#                                                        4 X 6,373,338 X 2
#                                                        ---------------------
#                                                              1852
#                                                        NAUT MI.
#
# -XX-
# POSITION 9             XXXXX. FEET             DP      BIT 1 OF LOW REGISTER =
#                                                         -9
#                                                        2   METERS
#
# -YY-
# VELOCITY 4             XXXX.X FEET/SEC         DP      FRACTIONAL PART OF
#                        (MAX 328.0)                     METERS/CENTI-SEC
#
# -ZZ-
# DP FRACTIONAL          .XXXXX                  DP      BIT 1 OF HIGH REGISTER =
#                                                         -14
#                                                        2    UNITS

# THAT-S ALL ON THE NOUNS.
```

```
#
#               ALARM CODES FOR 504
#
#               REPORT DEFICIENCIES TO JOHN SUTHERLAND @ MIT 617-864-6900 X1458
#
# *9            *18                                     *60                     *25  COLUMN
#
# CODE       *  TYPE                                    SET BY                  ALARM ROUTINE
#
# 00110         NO MARK SINCE LAST MARK REJECT          SXTMARK                 ALARM
# 00112         MARK NOT BEING ACCEPTED                 SXTMARK                 ALARM
# 00113         NO INBITS                               SXTMARK                 ALARM
# 00114         MARK MADE BUT NOT DESIRED               SXTMARK                 ALARM
# 00115         OPTICS TORQUE REQUESTWITH SWITCH NOT AT  EXT VERB OPTICS CDU     ALARM
#                CGC
# 00116         OPTICS SWITCH ALTERED BEFORE 15 SEC ZERO T4RUPT                  ALARM
#                TIME ELAPSED.
# 00117         OPTICS TORQUE REQUEST WITH OPTICS NOT    EXT VERB OPTICS CDU     ALARM
#                AVAILABLE (OPTIND=-0)
# 00120         OPTICS TORQUE REQUEST WITH OPTICS        T4RUPT                  ALARM
#                NOT ZEROED
# 00121         CDUS NO GOOD AT TIME OF MARK            SXTMARK                 ALARM
# 00122         MARKING NOT CALLED FOR                  SXTMARK                 ALARM
# 00124         P17 TPI SEARCH - NO SAFE PERICTR HERE.  TPI SEARCH              ALARM
# 00205         BAD PIPA READING                        SERVICER                ALARM
# 00206         ZERO ENCODE NOT ALLOWED WITH COARSE ALIGN IMU MODE SWITCHING     ALARM
#                + GIMBAL LOCK
# 00207         ISS TURNON REQUEST NOT PRESENT FOR 90 SEC T4RUPT                 ALARM
# 00210         IMU NOT OPERATING                       IMU MODE SWITCH, IMU-2, R02, P51 ALARM,VARALARM
# 00211         COARSE ALIGN ERROR - DRIVE > 2 DEGREES  IMU MODE SWITCH          ALARM
# 00212         PIPA FAIL BUT PIPA IS NOT BEING USED    IMU MODE SWITCH,T4RPT   ALARM
# 00213         IMU NOT OPERATING WITH TURN-ON REQUEST  T4RUPT                  ALARM
# 00214         PROGRAM USING IMU WHEN TURNED OFF       T4RUPT                  ALARM
# 00215         PREFERRED ORIENTATION NOT SPECIFIED     P52,P54                 ALARM
# 00217         BAD RETURN FROM STALL ROUTINES.         CURTAINS                ALARM2
# 00220         IMU NOT ALIGNED - NO REFSMMAT           R02,P51                 VARALARM
# 00401         DESIRED GIMBAL ANGLES YIELD GIMBAL LOCK IMF ALIGN, IMU-2         ALARM
# 00404         TARGET OUT OF VIEW - TRUN ANGLE > 90 DEG R52                     PRIOLARM
# 00405         TWO STARS NOT AVAILABLE                 P52,P54                 ALARM
# 00406         REND NAVIGATION NOT OPERATING           R21,R23                 ALARM
# 00407         AUTO OPTICS REQUEST TRUN ANGLE > 50 DEG. R52                     ALARM
# 00421         W-MATRIX OVERFLOW                       INTEGRV                 VARALARM
# 00430      *  INTEG. ABORT DUE TO SUBSURFACE S. V.    ALL CALLS TO INTEG      POODOO
# 00600         IMAGINARY ROOTS ON FIRST ITERATION      P32, P72                VARALARM
# 00601         PERIGEE ALTITUDE LT PMIN1               P32,P72,                VARALARM
# 00602         PERIGEE ALTITUDE LT PMIN2               P32,P72,                VARALARM
# 00603         CSI TO CDH TIME LT PMIN22               P32,P72,P33,P73         VARALARM
# 00604         CDH TO TPI TIME LT PMIN23               P32,P72                 VARALARM
# 00605         NUMBER OF ITERATIONS EXCEEDS LOOP MAXIMUM P32,P72,P37            VARALARM
# 00606         DV EXCEEDS MAXIMUM                      P32,P72                 VARALARM
# 00607      *  NO SOLN FROM TIME-THETA OR TIME-RADIUS  TIMETHET,TIMERAD         POODOO
```

# 00610	*	LAMBDA LESS THAN UNITY	P37	POODOO
# 00611		NO TIG FOR GIVEN ELEV ANGLE	P34,P74	VARALARM
# 00612		STATE VECTOR IN WRONG SPHERE OF INFLUENCE	P37	VARALARM
# 00613		REENTRY ANGLE OUT OF LIMITS	P37	VARALARM
# 00777		PIPA FAIL CAUSED ISS WARNING.	T4RUPT	VARALARM
# 01102		CMC SELF TEST ERROR		ALARM2
# 01103	*	UNUSED CCS BRANCH EXECUTED	ABORT	POODOO
# 01104	*	DELAY ROUTINE BUSY	EXEC	BAILOUT
# 01105		DOWNLINK TOO FAST	T4RUPT	ALARM
# 01106		UPLINK TOO FAST	T4RUPT	ALARM
# 01107		PHASE TABLE FAILURE. ASSUME	RESATRT	ALARM
#		ERASABLE MEMORY IS DESTROYED		
# 01201	*	EXECUTIVE OVERFLOW-NO VAC AREAS	EXEC	BAILOUT
# 01202	*	EXECUTIVE OVERFLOW-NO CORE SETS	EXEC	BAILOUT
# 01203	*	WAITLIST OVERFLOW-TOO MANY TASKS	WAITLIST	BAILOUT
# 01204	*	NEGATIVE OR ZERO WAITLIST CALL	WAITLIST	POODOO
# 01206	*	SECOND JOB ATTEMPTS TO GO TO SLEEP	PINBALL	POODOO
#		VIA KEYBOARD AND DISPLAY PROGRAM		
# 01207	*	NO VAC AREA FOR MARKS	SXTMARK	BAILOUT
# 01210	*	TWO PROGRAMS USING DEVICE AT SAME TIME	IMU MODE SWITCH	POODOO
# 01211	*	ILLEGAL INTERRUPT OF EXTENDED VERB	SXTMARK	BAILOUT
# 01301		ARCSIN-ARCCOS ARGUMENT TOO LARGE	INTERPRETER	ALARM
# 01302	*	SQRT CALLED WITH NEGATIVE ARGUMENT.ABORT	INTERPRETER	POODOO
# 01407		VG INCREASING	S40.8	ALARM
# 01426		IMU UNSATISFACTORY	P61, P62	ALARM
# 01427		IMU REVERSED	P61, P62	ALARM
# 01501	*	KEYBOARD AND DISPLAY ALARM DURING	PINBALL	POODOO
#		INTERNAL USE (NVSUB). ABORT.		
# 01502	*	ILLEGAL FLASHING DISPLAY	GOPLAY	POODOO
# 01520		V37 REQUEST NOT PERMITTED AT THIS TIME	V37	ALARM
# 01521	*	P01 ILLEGALLY SELECTED	P01, P07	POODOO
# 01600		OVERFLOW IN DRIFT TEST	OPT PRE ALIGN CALIB	ALARM
# 01601		BAD IMU TORQUE	OPT PRE ALIGN CALIB	ALARM
# 01602		BAD OPTICS DURING VERIFICATION	OPTALGN CALIB (CSM)	ALARM
# 01703		INSUF. TIME FOR INTEG., TIG WAS SLIPPED	R41	ALARM
# 03777		ICDU FAIL CAUSED THE ISS WARNING	T4RUPT	VARALARM
# 04777		ICDU , PIPA FAILS CAUSED THE ISS WARNING	T4RUPT	VARALARM
# 07777		IMU FAIL CAUSED THE ISS WARNING	T4RUPT	VARALARM
# 10777		IMU , PIPA FAILS CAUSED THE ISS WARNING	T4RUPT	VARALARM
# 13777		IMU , ICDU FAILS CAUSED THE ISS WARNING	T4RUPT	VARALARM
# 14777		IMU,ICDU,PIPA FAILS CAUSED THE ISSWNING	T4RUPT	VARALARM
#	*	INDICATES ABORT TYPE.ALL OTHERS ARE NON-ABORTIVE		

```
#               CHECKLIST CODES FOR 504

#               PLEASE REPORT ANY DEFICIENCIES IN THIS LIST TO JOHN SUTHERLAND

# *9            *17             *26  COLUMN
#
# R1 CODE          ACTION TO BE EFFECTED
#
# 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         GNCS AUTOMATIC MANEUVER
# 00203         SWITCH          TO CMC-AUTO
# 00204         PERFORM         SPS GIMBAL TRIM
# 00403         SWITCH          OPTICS TO MANUAL OR ZERO
#                                 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 FOR 504

PLEASE REPORT ANY DEFICIENCIES IN THIS LIST TO JOHN SUTHERLAND

THE SPECIFIED OPTION CODES WILL BE FLASHED IN COMPONENT R1 IN
CONJUNCTION WITH VERB04NOUN06 TO REQUEST THE ASTRONAUT TO LOAD INTO
COMPONENT R2 THE OPTION HE DESIRES.

*9 *17 *52 *11 *25 COLUMN
#

# OPTION CODE	PURPOSE	INPUT FOR COMPONENT 2	PROGRAM(S)	APPLICABILITY
# 00001	SPECIFY IMU ORIENTATION	1=PREF 2=NOM 3=REFSMMAT	P50'S	ALL
# 00002	SPECIFY VEHICLE	1=THIS 2=OTHER	P21,R30	ALL
# 00003	SPECIFY TRACKING ATTITUDE	1=PREFERRED 2=OTHER	R63	ALL
# 00004	SPECIFY RADAR	1=RR 2=LR	R04	SUNDANCE + LUMINARY
# 00005	SPECIFY SOR PHASE	1=FIRST 2=SECOND	P38	COLOSSUS + LUMINARY
# 00006	SPECIFY RR COARSE ALIGN OPTION	1=LOCKON 2=CONTINUOUS DESIG.	V41N72	SUNDANCE + LUMINARY
# 00007	SPECIFY PROPULSION SYSTEM	1=SPS 2=RCS	P37	COLOSSUS
# 00010	SPECIFY ALIGNMENT MODE	0=ANY TIME 1=REFSMMAT +G 2=TWO BODIES 3=ONE BODY + G	P57	LUMINARY
# 00011	SPECIFY SEPARATION MONITOR PHASE	1=DELTAV 2=STATE VECTOR UPDATE	P46	LUMINARY
# 00012	SPECIFY CSM ORBIT OPTION	1=NO ORBIT CHANGE 2=CHANGE ORBIT TO PASS OVER LM	P22	LUMINARY

```
# TAGS FOR RELATIVE SETLOC AND BLANK BANK CARDS

FIXED           MEMORY  120000 - 167777
                COUNT   BANKSUM

# MODULE 1 CONTAINS BANKS 0 THROUGH 5

                BLOCK   02
FFTAG1          EQUALS
FFTAG2          EQUALS
FFTAG3          EQUALS
FFTAG4          EQUALS
FFTAG7          EQUALS
FFTAG8          EQUALS
FFTAG9          EQUALS
FFTAG10         EQUALS
FFTAG12         EQUALS
P30SUBS         EQUALS
STOPRAT         EQUALS
P23S            EQUALS
                BNKSUM  02

                BLOCK   03
FFTAG5          EQUALS
FFTAG6          EQUALS
DAPS9           EQUALS
FFTAG13         EQUALS
                BNKSUM  03

                BANK    00
DLAYJOB         EQUALS
                BNKSUM  00

                BANK    01
RESTART         EQUALS
                BNKSUM  01

                BANK    4
VERB37          EQUALS
CONICS1         EQUALS
PINBALL4        EQUALS
CSI/CDH1        EQUALS
INTPRET2        EQUALS
IMUCAL1         EQUALS
```

```
STBLEORB        EQUALS
E/PROG          EQUALS
MIDDGIM         EQUALS
                BNKSUM  04

                BANK    5
FRANDRES        EQUALS
DOWNTELM        EQUALS
DAPMASS         EQUALS
CDHTAG          EQUALS
                BNKSUM  05

# MODULE 2 CONTAINS BANKS 6 THROUGH 13

                BANK    6
IMUCOMP         EQUALS
T4RUP           EQUALS
IMUCAL2         EQUALS
CSIPROG         EQUALS
                BNKSUM  06

                BANK    7
SXTMARKE        EQUALS
RO2             EQUALS
MODESW          EQUALS
XANG            EQUALS
KEYRUPT         EQUALS
CSIPROG6        EQUALS
                BNKSUM  07

                BANK    10
DISPLAYS        EQUALS
PHASETAB        EQUALS
COMGEOM2        EQUALS
SXTMARK1        EQUALS
P60S4           EQUALS
OPTDRV          EQUALS
CSIPROG8        EQUALS
                BNKSUM  10

                BANK    11
ORBITAL         EQUALS
ORBITAL1        EQUALS                  # CONSTANTS
```

```
INTVEL          EQUALS
S52/2           EQUALS
CSIPROG5        EQUALS
INTINIT1        EQUALS
                BNKSUM  11

                BANK    12
CONICS          EQUALS
CSIPROG2        EQUALS
CSI/CDH2        EQUALS
MODCHG2         EQUALS
                BNKSUM  12

                BANK    13
P76LOC          EQUALS
LATLONG         EQUALS
INTINIT         EQUALS
SR52/1          EQUALS
ORBITAL2        EQUALS
CDHTAGS         EQUALS
E/PROG1         EQUALS
MODCHG3         EQUALS
                BNKSUM  13

# SPACER

# MODULE 3 CONTAINS BANKS 14 THROUGH 21

                BANK    14
STARTAB         EQUALS
RT53            EQUALS
P50S1           EQUALS
MEASINC2        EQUALS
CSI/CDH3        EQUALS
                BNKSUM  14

                BANK    15
P50S            EQUALS
ETRYDAP         EQUALS
S52/3           EQUALS
                BNKSUM  15

                BANK    16
P40S1           EQUALS
```

```
DAPROLL         EQUALS
P5OS2           EQUALS
P23S1           EQUALS
RTE2            EQUALS
                BNKSUM  16

                BANK    17
DAPS4           EQUALS
DAPS5           EQUALS
DAPS7           EQUALS
P5OS3           EQUALS
                BNKSUM  17

                BANK    20
DAPS6           EQUALS
DAPS1           EQUALS
DAPS2           EQUALS
MANUSTUF        EQUALS
R36CM           EQUALS
VAC5LOC         EQUALS
                BNKSUM  20

                BANK    21
DAPS3           EQUALS
MYSUBS          EQUALS
KALCMON3        EQUALS
                BNKSUM  21

# MODULE 4 CONTAINS BANKS 22 THROUGH 27

                BANK    22
RTBCODES        EQUALS
RTBCODE1        EQUALS
DAPS8           EQUALS
APOPERI         EQUALS
P4OS5           EQUALS
KALCMON2        EQUALS
KALCMON1        EQUALS
CSIPROG3        EQUALS
                BNKSUM  22
```

```
                        BANK    23
        P20S2           EQUALS
        INFLIGHT        EQUALS
        COMGEOM1        EQUALS
        POWFLITE        EQUALS
        POWFLIT1        EQUALS
        RENDGUID        EQUALS
        POWFLIT2        EQUALS
        R30LOC          EQUALS
        P11FOUR         EQUALS
        CSIPROG4        EQUALS
                        BNKSUM  23

                        BANK    24
        LOADDAP         EQUALS
        P40S            EQUALS
        CSIPROG7        EQUALS
                        BNKSUM  24

                        BANK    25
        REENTRY         EQUALS
        CDHTAG1         EQUALS
                        BNKSUM  25

                        BANK    26
        INTPRET1        EQUALS
        REENTRY1        EQUALS
        P60S            EQUALS
        P60S1           EQUALS
        P60S2           EQUALS
        P60S3           EQUALS
        PLANTIN         EQUALS          # LUNAR ROT
        EPHEM           EQUALS
        P05P06          EQUALS
        26P50S          EQUALS
                        BNKSUM  26

                        BANK    27
        TOF-FF          EQUALS
        TOF-FF1         EQUALS
        MANUVER         EQUALS
        MANUVER1        EQUALS
```

```
	VECPT		EQUALS
	UPDATE1		EQUALS
	UPDATE2		EQUALS
	R22S1		EQUALS
	P60S5		EQUALS
	P40S2		EQUALS
			BNKSUM	27

	# MODULE 5 CONTAINS BANKS 30 THROUGH 35

			BANK	30
	IMUSUPER	EQUALS
	LOWSUPER	EQUALS
	FCSTART		EQUALS			# STANDARD LOCATION FOR THIS. (FOR EXTV8)
	LOPC		EQUALS
	P20S1		EQUALS
	P20S6		EQUALS
	P40S3		EQUALS
	R35A		EQUALS
			BNKSUM	30

			BANK	31
	R35		EQUALS
	RT23		EQUALS
	P30S1A		EQUALS
	R34		EQUALS
	CDHTAG2		EQUALS
	CSIPROG9	EQUALS
	R31		EQUALS
	P22S		EQUALS
	RTE3		EQUALS
			BNKSUM	31

			BANK	32
	MSGSCAN1	EQUALS
	RTE		EQUALS
	DELRSPL1	EQUALS
	IMUCAL3		EQUALS
			BNKSUM	32

			BANK	33
	TESTLEAD	EQUALS
```

```
                BANK    33

IMUCAL          EQUALS
                BNKSUM  33

                BANK    34
P11ONE          EQUALS
P20S3           EQUALS
P20S4           EQUALS
RTECON          EQUALS
                BNKSUM  34

                BANK    35
RTECON1         EQUALS
CSI/CDH         EQUALS
P30S1           EQUALS
P30S            EQUALS
P17S1           EQUALS
MEASINC3        EQUALS
INTINIT2        EQUALS
                BNKSUM  35

# MODULE 6 CONTAINS BANKS 36 THROUGH 43

                BANK    36
MEASINC         EQUALS
MEASINC1        EQUALS
P17S            EQUALS
RTE1            EQUALS
S3435LOC        EQUALS
                BNKSUM  36

                BANK    37
P20S            EQUALS
BODYATT         EQUALS
RENDEZ          EQUALS
SERVICES        EQUALS
P11TWO          EQUALS
CDHTAG3         EQUALS
                BNKSUM  37

                BANK    40
PINSUPER        EQUALS
```

```
        SELFSUPR        EQUALS
        PINBALL1        EQUALS
        R36CM1          EQUALS
                        BNKSUM  40

                        BANK    41
        PINBALL2        EQUALS
        R36LM           EQUALS
                        BNKSUM  41

                        BANK    42
        SBAND           EQUALS
        PINBALL3        EQUALS
        EXTVBS          EQUALS
        R36LM1          EQUALS
                        BNKSUM  42

                        BANK    43
        SELFCHEC        EQUALS
        EXTVERBS        EQUALS
                        BNKSUM  43

        HI6ZEROS        EQUALS  ZEROVECS                # ZERO VECTOR ALWAYS IN HIGH MEMORY
        LO6ZEROS        EQUALS  ZEROVEC                 # ZERO VECTOR ALWAYS IN LOW MEMORY
        HIDPHALF        EQUALS  UNITX
        LODPHALF        EQUALS  XUNIT
        HIDP1/4         EQUALS  DP1/4TH
        LODP1/4         EQUALS  D1/4                    # 2DEC .25
        HIUNITX         EQUALS  UNITX
        HIUNITY         EQUALS  UNITY
        HIUNITZ         EQUALS  UNITZ
        LOUNITX         EQUALS  XUNIT                   # 2DEC .5
        LOUNITY         EQUALS  YUNIT                   # 2DEC 0
        LOUNITZ         EQUALS  ZUNIT                   # 2DEC 0
        3/4LOWDP        EQUALS  3/4                     # 2DEC 3.0 B-2
                        SBANK=  LOWSUPER

# ROPE SPECIFIC ASSIGNS OBVIATING NEED TO CHECK COMPUTER FLAG IN DETVRUZVING INTEGRATION AREA ENTRIES

        OTHPREC         EQUALS  LEMPREC
        ATOPOTH         EQUALS  ATOPLEM
        ATOPTHIS        EQUALS  ATOPCSM
        MOONTHIS        EQUALS  CMOONFLG
```

```
MOONOTH         EQUALS  LMOONFLG
MOVATHIS        EQUALS  MOVEACSM
STATEST         EQUALS  V83CALL                 # * TEMPORARY
THISPREC        EQUALS  CSMPREC
THISAXIS        =       UNITX
ERASID          EQUALS  LOW10                   # DOWNLINK ERASABLE DUMP ID
DELAYNUM        EQUALS  THREE

#**************************************************************************************************

#   THE FOLLOWING ECADRS ARE DEFINED TO FACILITATE EBANK SWITCHING.  THEY ALSO MAKE IT EASIER FOR
# ERASABLE CONTROL TO REARRANGE ERASABLE MEMORY WITHOUT DISRUPTING THE PROGRAMS WHICH SET EBANKS.
# PRIOR TO ROPE RELEASE FIXED MEMORY CAN BE SAVED BY SETTING EACH EBXXXX =EBANKX (X=4,5,6,7).EBANKX OF COURSE
# WILL BE THE BANK WHERE THE ERASABLES REFERENCED IN EBXXXX WILL BE STORED.

                BANK    7
                EBANK=  MARKDOWN
EBMARKDO        ECADR   MARKDOWN
                EBANK=  MRKBUF1
EBMRKBUF        ECADR   MRKBUF1

                BANK    24
                EBANK=  DVCNTR
EBDVCNTR        ECADR   DVCNTR
                EBANK=  P40TMP
EBP40TMP        ECADR   P40TMP

                BANK    34
                EBANK=  DVCNTR
EBDVCNT         ECADR   DVCNTR
                EBANK=  QPLACES
EBQPLACE        ECADR   QPLACES

                BANK    37
                EBANK=  RN1
EBRN1           ECADR   RN1

#**************************************************************************************************
```

*** END OF MAIN PROGRAM ***