

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

APOLLO

GUIDANCE AND NAVIGATION

R-507

G&N SYSTEM OPERATIONS PLAN
MISSION AS-204A

SECTION IV ONLY

JUNE 1966

MIT

CAMBRIDGE 39, MASSACHUSETTS

**INSTRUMENTATION
LABORATORY**

R. LARSON

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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COPY # _____

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

PROGRAM - ROUTINE INDEX

REV 6

6/28/66

MISSION 204-AGC PROGRAMS

PHASE	PROGRAM NUMBER	REV-DATE	PROGRAM TITLE	CONTAINS ROUTINES	
	00	4-5/17	AGC IDLING		#10
PRE-LAUNCH	01		PRELAUNCH INITIALIZATION		
AND	02		GYRO COMPASSING		#20
SERVICE	03		OPTICAL VERIFICATION OF AZIMUTH		
	04	12-5/26	INERTIAL REFERENCE		
	05	15-6/16	G+N START UP		
	06	6-6/16	G+N POWER DOWN		
	07	0-6/27	SYSTEMS TEST (LIMITED USE IN FLIGHT)		#30
BOOST	11	12-6/16	PRE LET JETTISON		
MONITOR	12	12-5/26	POST LET JETTISON	R24, R34	
	13		-----*		
	14		-----*		
	15		-----*		#40
	16		-----*		
	17	7-5/25	LET ABORT		
COAST	21		-----*		
	22	14-6/16	LANDMARK TRACKING	R28, R27	
	23	11-6/16	STAR-LANDMARK NAVIGATION MEASUREMENT		#50
	24	4-6/16	GOUND TRACK DETERMINATION		
	25		-----*		

M 204 PROG

	26		-----*		
	27	10-5/26	AGC UPDATE		
PRE-	31	16-6/17	ORBIT CHANGE	R35, R1, R21	#60
THRUST- ING	32	14-6/28	RETURN TO EARTH	R36, R1, R21	
	33	12-6/28	SPS MINIMUM IMPULSE	R33, R31, R1, R21	
	34		-----*		
	35		-----*		
	36		-----*		#70
	37		-----*		
THRUSTING	41	11-6/28	ORBIT CHANGE	R2, R37, R24, R34, R31, R22	
	42	10-6/17	RETURN TO EARTH	R2, R37, R24, R34, R31, R22	
	43	8-6/17	SPS MINIMUM IMPULSE	R2, R37, R24, R34, R31	#80
	44		-----*		
	45		-----*		
	46		-----*		
	47		-----*		
INFLIGHT ALIGNMENT	51	8-6/17	IMU ORIENTATION DETERMINATION	R27, R29	#90
	52	9-6/28	SIVB/IMU ALIGN	R4, R25, R28, R27, R29, R30	
	53	9-6/20	CSM/IMU ALIGN	R1, R25, R21, R4, R30, R29, R27, R28	
	54	5-6/28	IMU REALIGNMENT	R30, R29, R27	
	55		-----*		
	56		-----*		#100
	57		-----*		
ENTRY	61	9-6/20	MANEUVER TO CM/SM SEPARATION ATTITUDE	R1, R21	
	62	9-6/20	CM/SM SEPARATION AND PRE-ENTRY MANEUVER	R3, R21	
	63	8-6/20	INITIALIZATION		
	64	4-6/20	POST 0.05G		#110

M 204 PRUG

65		-----*			
66		-----*			
67	3-6/20	FINAL PHASE			
CSM ABORT	71	10-6/20	FIRST ABORT BURN	R24	
	72	-----*			#120
	73	-----*			
	74	-----*			
	75	-----*			
	76	-----*			
	77	-----*			#130

* THIS PROGRAM DOES NOT EXIST FOR MISSION 204

MISSION 204 AGC ROUTINES

#140

ROUTINE NUMBER	REV-DATE	ROUTINE TITLE	CONTAINS ROUTINES	INCLUDED IN PROGRAM OR ROUTINE
1	6-6/20	ATTITUDE CONTROL MODE CHECK	R22	P31,P32,P33,P53, P61, #150
2	5-6/20	THRUST CONTROL MODE CHECK	R22, R1, R21	P41,P42,P43
3	8-6/2	ENTRY CONTROL MODE CHECK	R22	P62
4	7-6/3	FINE ALIGNMENT	R25, R28, R27, R29, R30	P52, P53
5		-----*		
6		-----*		
7		-----*		
8		-----*		
9		-----*		

M 204 PRUG

			M 204 PROG
10		-----*	
11		-----*	#170
12		-----*	
13		-----*	
14		-----*	
15		-----*	
16		-----*	#180
17		-----*	
18		-----*	
19		-----*	
20		-----*	
21	8-6/20	ATTITUDE MANEUVER	P31,P32,P33,P53,P61,P62,R2
22	8-6/20	SCS DISCRETE MONITOR	P41, P42
23		-----*	
24	7-6/20	DELTA V MONITOR	P12,P41,P42,P43,P71
25	7-6/20	COARSE ALIGNMENT	P53, R4, P52
26		-----*	#200
27	12-6/20	SIGHTING MARK	R4, P22, P52, P53, P54
28	6-6/20	AUTO OPTICS POSITIONING	R4, P22, P52, P53
29	7-6/20	STAR DATA TEST	R4, P51, P52, P53, P54
30	9-6/20	GYRO TORQUING	R4, P52, P53, P54
31	8-6/20	BACK JP DELTA V COUNTER	P41, P42, P43 #210
32		-----*	
33	5-6/20	PRE-THRUST SPS MINIMUM IMPULSE DATA LOAD	P33
34	7-6/20	ORBIT PARAMETER DISPLAY	P12, P41, P42, P43
35	7-6/20	PRETHRUST-ORBIT CHANGE DATA LOAD	P31
36	8-6/20	PRETHRUST-RETURN TO EARTH DATA LOAD	P32 #220
37	10-6/20	SPS ENGINE IGNITION R38	P41, P42, P43
			M 204 PROG

4

38 10-6/20 SPS ENGINE THRUST FAIL

R37

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

204 PROGRAM INTER-RELATIONSHIP

REV 2

6/28/66

FOLLOWING PROGRAMS ENABLE PROGRAM ENABLES FOLLOWING PROGRAMS

01-	24-A(10)	43-M(9)	00(5)	01-MU	31-M	71-M	#10
02-	27-A	51-A(11)		05-M	32-M		
03-M	31-M(10)	52-A(11)		06-M	33-M		
05-A OR M	32-M(10)	53-M(11)		07-M	51-M		
06-A	33-M(10)	54-A		22-M	52-M		
07-M	41-M(9)	67-M		23-M	54-M		
12-M	42-M(9)	71-M(9)		24-M(7)			
22-A(10)				27-MU(12)			
23-A							
00-MU			01	00-M, 00-A			#20
01-A, 03-M			02	03-M, 04-A(2), 11-A(3)			
02-M			03	00-M, 02-M			
02-A(2)			04	11-A(3)			
00-M, 22-A, 31-A, 32-A, 33-A, 51-A			05	00-A OR M			
00-M			06	00-A			#30
00-M			07	00-M			
02-A(3), 04-A(3)			11	12-A, 17-A(1)			
11-A			12	00-M, 61-M, 62-M, 71-A(4) OR M			
11-A(1)			17	NONE			
00-M, 53-A			22	00-A(10), 05-M, 51-A, 52-M, 53-M			#40
00-M			23	00-A			
00-M(7)			24	00-A(10)			
00-MU(12)			27	00-A			
00-M			31	00-M(10), 05-A, 41-M(8), 51-A, 53-M			
00-M			32	00-M(10), 05-A, 42-M(8), 51-A, 53-M			#50
00-M			33	00-M(10), 05-A, 43-M(8), 51-A, 53-M			
31-M(8), 53-M(8)			41	00-M(9), 53-M			

PROG RELATION

PROG RELATION

32-M(8), 53-M(8)	42	00-M(9), 61-M, 62-M	
33-M(8), 53-M(8)	43	00-M(9)	
00-M 32-A	51	00-A(11), 05-A	#60
22-A 33-A			
31-A 54-M			
00-M, 22-M	52	00-A(11)	
22-M, 31-M, 32-M, 33-M, 41-M	53	00-M(11), 22-A, 41-M(8), 42-M(8), 43-M(8)	
00-M	54	00-A, 51-M	
12-M, 42-M, 71-M	61	62-A	#70
12-M, 42-M, 61-M, 71-M	62	63-A	
62-A	63	64-A	
63-A	64	67-A	
64-A	67	00-M	
00-M, 12-A(4) OR M	71	00-M(9), 61-M, 62-M	#80

U - UPLINK SELECTION

M - MANUAL SELECTION (V37E --E)

A - AGC AUTOMATIC SELECTION

(1) - BY CM/SM SEP DISCRETE

#90

(2) - BY GRD REF RELEASE DISCRETE

(3) - BY LIFTOFF DISCRETE OR BY V75E

(4) - BY SIVB/CSM SEP DISCRETE OR MANUAL SELECTION BACKUP

(5) - P00 IS AUTOMATICALLY SELECTED WHEN AGC MODE SWITCH IS SET TO ON

(7) - CALLED BY V65E, V66E, OR V67E

*100

(8) - IF EQUIVALENT PRETHRUSTING PROGRAM HAS NOT BEEN DONE SINCE LAST BURN, CHECK FAIL RESULTS

(9) - THE SELECTION OF P00 WILL NOT BE ENABLED DURING SPS THRUSTING OR DURING ENTRY

(10) - AGC SELECTION OF P00 BY DSKY REQUEST DURING THIS PROGRAM MAY BE DELAYED UP TO SEVEN (7) SECONDS WHEN CERTAIN CALCULATIONS ARE IN PROCESS

PROG RELATION

PROG RELATION

(11)- SELECTION OF P00 BEFORE COMPLETION OF THESE PROGRAMS MAY DESTROY REFSMAT IN THE AGC REQUIRING MANDATORY COMPLETION OF P51
PRIOR TO ANY PROGRAM REQUIRING REFSMAT #110
(12)- SELECT P27 FOR DESIRED DATA LOADING BY KEYING IN V72E, V73E, V74E, V76E, OR V77E

NOTE: 1. TO RESELECT A PROGRAM ALREADY IN PROCESS IT IS NECESSARY TO FIRST SELECT P00 AND THEN RESELECT THE PROGRAM.
2. ORBIT PARAMETER DISPLAY ROUTINE (R34) MAY BE CALLED BY KEYING IN V64E DURING P00.

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

204

VERB-NOUN LIST AND CHECKLIST CODES

REV 1

6/28/66

1. VERB LIST

01 DISP UCT COMPNT 1 (R1)
05 DISP UCT COMPNT 1, 2, 3
06 DISP DECIMAL
15 MONITOR OCTAL COMPNT. 1,2,3
16 MONITOR DECIMAL
21 LOAD COMPNT 1 (R1)
22 LOAD COMPNT 2 (R2)
23 LOAD COMPNT 3 (R3)
24 LOAD COMPNT 1, 2
25 LOAD COMPNT 1, 2, 3
33 PRU W/O DATA
34 TERMINATE PROG
36 FRESH START
37 CHANGE PROG
42 FINE ALIGN IMU
44 SET IMU TO ATT CONTROL
50 PLEASE PERFORM
51 PLEASE MARK
52 REJECT MARK
57 SYSTEM TEST
64 CALC URBL PARMTS
65 CALC T OF ARR AT LONG
66 CALC LAT LONG AT SPEC T
67 CALL MAX DEC. T OF ARR
70 MAN ATT MANEUVER

V/N LIST

V/N LIST

- 71 MTVC TAKEOVER
- 72 MIN IMP AIM PT UPDATE
- 73 RET-EARTH AIM PT UPDATE
- 74 ORB CHGE AIM PT UPDATE
- 75 MANUAL LIFTOFF
- 76 R, V, T UPDATE (STATE VEC)
- 77 TIME UPDATE

II. NOUN LIST

- 00 NOT IN USE
- 01 SPECIFY MACHINE ADDRESS (FRACT) .XXXXX
- 02 SPECIFY MACHINE ADDRESS (WHOLE) XXXXX.
- 03 SPARE
- 04 SPARE
- 05 ANGULAR ERROR XXX.XX DEG
- 06 SPARE
- 07 CHANGE OF PROGRAM (PERFORM) OCTAL
- 10 SPARE
- 11 ENGINE ON ENABLE (PERFORM)
- 12 GIMBAL ANGLES ROLL XXX.XX DEG
 PITCH XXX.XX DEG
 YAW XXX.XX DEG
- 13 DELTA V MEASURED XXXXX. FT/SEC
- 14 DELTA V COUNTER SETTING XXXXX. FT/SEC
- 15 FOR NON-FLIGHT USE
- 16 AGC CLOCK TIME 00XXX. HRS
 000XX. MIN
 0XX.XX SEC
- 17 FINAL ICDU ANGLES ROLL XXX.XX DEG
 PITCH XXX.XX DEG
 YAW XXX.XX DEG

V/N LIST

20	PRESENT ICDO ANGLES	ROLL PITCH YAW	XXX.XX DEG XXX.XX DEG XXX.XX DEG
21	FOR NON-FLIGHT USE		
22	NEW ANGLES I	X Y Z	XXX.XX DEG XXX.XX DEG XXX.XX DEG
23	FOR NON-FLIGHT USE		
24	DELTA TIME FOR AGC CLOCK		00XXX. HRS 000XX. MIN 0XX.XX SEC
25	CHECKLIST (PLEASE PERFORM)		XXXXX.
26	FOR NON-FLIGHT USE		
27	FOR NON-FLIGHT USE		
30	STAR NUMBER		XXXXX.
31	FAILURE INFO	FAIL REG SFAIL ERCOUNT	OCTAL OCTAL OCTAL
32	SPARE		
33	TIME OF IGNITION		00XXX. HRS 000XX. MIN 0XX.XX SEC
34	EVENT TIME		00XXX. HRS 000XX. MIN 0XX.XX SEC
35	DELTA EVENT TIME		00XXX. HRS 000XX. MIN 0XX.XX SEC
36	DELTA EVENT TIME		
37	FOR NON-FLIGHT USE		
40	GAMMA, INERTIAL VELOCITY (VI), ALTITUDE ABOVE LAUNCH PAD (HPAD)		XXX.XX DEG XXXXX. FT/SEC XXXX.X NAUT MI
41	MAX ACCELERATION (GMAX), PERIGEE ALTITUDE (HP) FREE-FALL TIME (TFF)		XXX.XX G XXXX.X NAUT MI XXBXX MIN/SEC

42	MISS DISTANCE (DELTA R), PERIGEE ALTITUDE (HP), FREE-FALL TIME (TFF)	XXXX.X NAUT MI XXXX.X NAUT MI XXBXX MIN/SEC
43	APOGEE ALTITUDE (HA), PERIGEE ALTITUDE (HP), FREE-FALL TIME (TFF)	XXXX.X NAUT MI XXXX.X NAUT MI XXBXX MIN/SEC
44	LATITUDE, LONGITUDE, ALTITUDE (ABOVE FISCHER ELLIPSOID)	XXX.XX DEG XXX.XX DEG XXXX.X NAUT MI
45	APOGEE ALTITUDE (HA) PERIGEE ALTITUDE (HP), DELTA VELOCITY REQUIRED (DELTA VREQ)	XXXX.X NAUT MI XXXX.X NAUT MI XXXXX. FT/SEC
46	TIME TO EVENT, VELOCITY TO BE GAINED (VG), PERIGEE ALTITUDE (HP)	XXBXX MIN/SEC XXXXX. FT/SEC XXXX.X NAUT MI
47	GAMMA AT EI, MISS DISTANCE (DELTA R), INERTIAL VELOCITY (VI AT EI)	XXX.XX DEG XXXX.X NAUT MI XXXXX. FT/SEC
50	TIME TO EVENT, DELTA TIME BURN DELTA V MEASURED	XXBXX MIN/SEC XXBXX MIN/SEC XXBXX MIN/SEC
51	TIME TO EVENT VELOCITY TO BE GAINED (VG), MEASURED VELOCITY CHANGE ALONG XSC	XXBXX MIN/SEC XXXXX. FT/SEC XXXXX. FT/SEC
52	TIME TO EVENT VELOCITY TO BE GAINED (VG) FREE-FALL TIME (TFF)	XXBXX MIN/SEC XXXXX. FT/SEC XXBXX MIN/SEC
53	MAX ACCELERATION (GMAX), GAMMA EI FREE-FALL TIME (TFF)	XXX.XX G XXX.XX DEG XXBXX MIN/SEC
54	COMMAND ROLL ANGLE (BETA) PRESENT ACCELERATION (G), RANGE TO TARG	XXX.XX DEG XXX.XX G XXXX.X NAUT MI
55	OCDU X (SHAFT), Y (TRUNNION)	XXX.XX DEG XX.XXX DEG
56	MARK DATA X (SHAFT), Y (TRUNNION)	XXX.XX DEG XX.XXX DEG
57	FOR NON-FLIGHT USE	
60	FOR NON-FLIGHT USE	
61	FOR NON-FLIGHT USE	

62	IMPACT LATITUDE, IMPACT LONGITUDE, HEADS UP/DOWN	XXX.XX DEG XXX.XX DEG +/- 00001
63	LATITUDE, LONGITUDE/2, ALTITUDE (ABOVE THE FISCHER ELLIPSOID)	XX.XXX DEG XX.XXX DEG XXX.XX NAUT MI
64	IMPACT LATITUDE, IMPACT LONGITUDE, FREE-FALL TIME (TFF)	XXX.XX DEG XXX.XX DEG XXBXX MIN/SEC
65	FOR NON-FLIGHT USE	
66	FOR NON-FLIGHT USE	
67	DELTA GYRO ANGLES X Y Z	XX.XXX DEG XX.XXX DEG XX.XXX DEG
70	PITCH TRIM, YAW TRIM DELTA TIME TAIL-OFF	XXX.XX DEG XXX.XX DEG XXX.XX DEG
71	COMMAND ROLL ANGLE (BETA), PRESENT ACCELERATION (G), PREDICTED RANGE-RANGE TO TARG	XXX.XX DEG XXX.XX G XXXX.X NAUT MI
72	FOR NON-FLIGHT USE	
73	FOR NON-FLIGHT USE	
74	DELTA VELOCITY ALLOWABLE, DELTA TIME TAIL-OFF	XXXXX. FT/SEC XXX.XX SEC
75	DELTA POSITION MAGNITUDE, DELTA VELOCITY MAGNITUDE MULTIPLE MARK COUNTER	XXXX.X NAUT MI XXXXX. FT/SEC XXXXX.
76	SPARE	
77	SPARE	

III. CHECKLIST CODES

00001 SCS MODE - G+N ATT CONT
 00002 SCS MODE - G+N DELTA V
 00003 SCS MODE - G+N ENTRY
 00004 SCS MODE - SCS ATT CONT

V/N LIST

00007 ATT TRIM MANEUVR ENABLE
00011 AUTO OPTICS POS
00012 TARGET DATA ENTRY
00013 SW OSS TO COMP CONT
00014 FINE ALIGN CHECK
00015 PERFORM STAR ACQ
00016 TERMINATE MARK SEQUENCE
00031 ENGINE ON
00035 PREP AGC FOR THRUST
00036 THRUST TERMINATE
00041 CM/SM SEP
00051 FINAL IMU/FINAL VEHICLE
00052 INTERIM IMU/FINAL VEHICLE
00053 FINAL IMU/INTERIM VEHICLE
00054 INTERIM IMU/INTERIM VEHICLE
00060 IMU TURN ON
00061 IMU POWER DOWN
00062 AGC POWER DOWN

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

PROGRAM LOGIC FLOW CHART

REV 4

6/28/66

THE PROGRAM LOGIC FLOW CHART IS SEPARATED INTO THREE CATEGORIES AS FOLLOWS:

I PRELAUNCH-BOOST MONITOR-CSM ABORT

INCLUDES:

P00	P61
P01	P62
P02	P63
P03	P64
P04	P67
P05	P71
P11	
P12	
P17	

#10

II NAVIGATION

#20

INCLUDES:

P00
P05
P06
P07
P22
P23
P24
P51
P52
P53
P54

#30

III GUIDANCE

#40

INCLUDES:

P00	P51
P05	P53
P06	P54
P27	P61
P31	P62
P32	P63
P33	P64
P41	P67
P42	
P43	

#50

1. DEFINITION OF PROGRAM STARTS:

M 204 LOGIC

A - AUTOMATIC AGC SELECTION OF NEXT PROGRAM
M - MANUAL CREW SELECTION OF NEXT PROGRAM

#60

I PRELAUNCH-BOOST MONITOR-CSM ABORT

AGC STANDBY SWITCH
TO ON

•
•A
•••
•

#70

P 00
AGC IDLING

•
•M
•

#80

P 05
PRELAUNCH OR
SERVICE-G+N START JP

•
•A
•

P 00
AGC IDLING

#90

•
•M
•

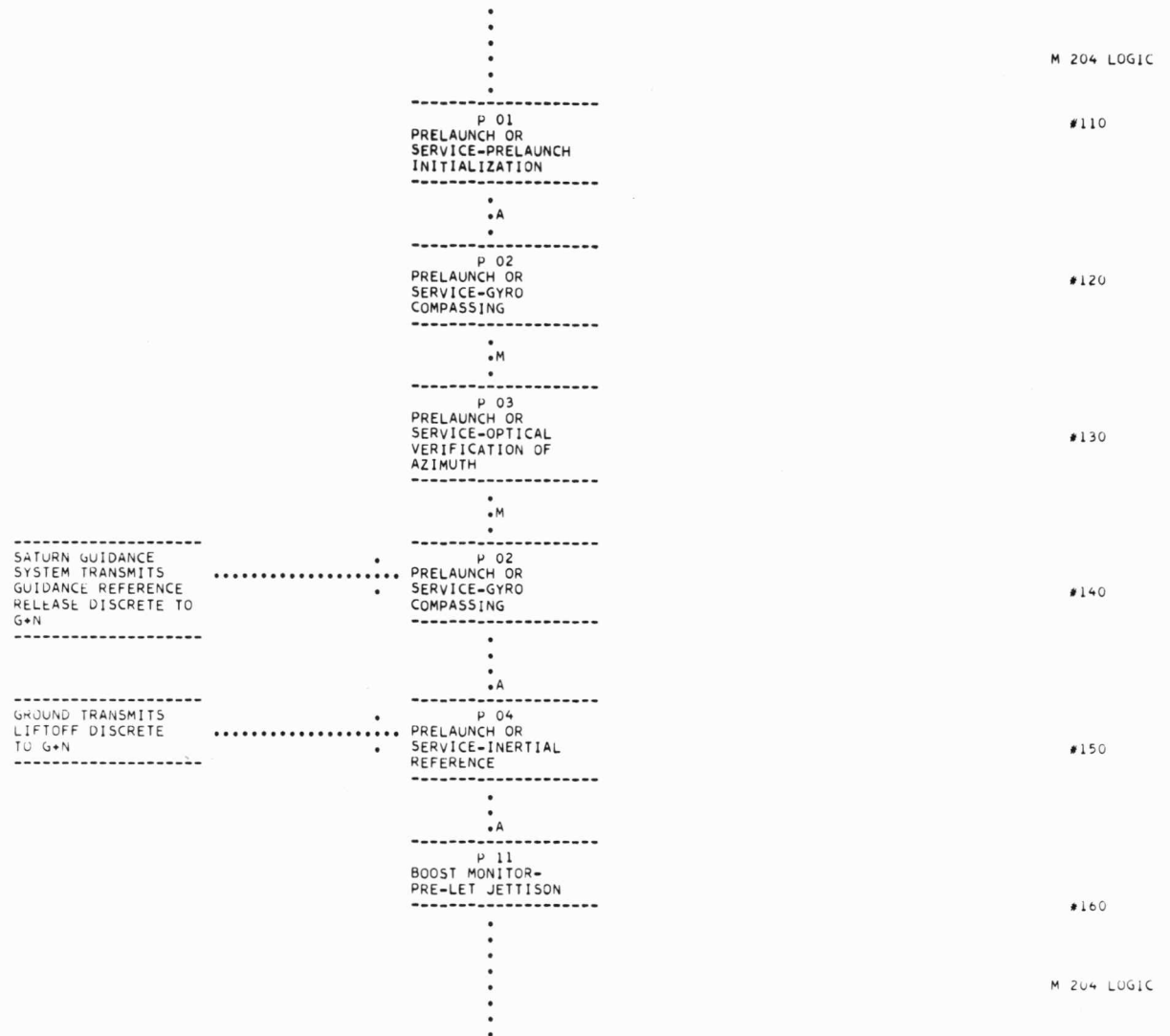
P 07
SYSTEM TEST

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•M
•

#100

P 00
AGC IDLING

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•M
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M 204 LOGIC

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•

IS BOOST SATIS-
FACTORY

•N Y•
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#170

MISSION EVENTS
SEQUENCE CONTROLLER
TRANSMITS CM/SM
SEPARATION DISCRETE
TO G+N.



TWIST TRANSLATION
CONTROL CCW

P 17
BOOST MONITOR
LET ABORT

#180

•
•
•
•
•
•
A

(LIFTOFF + 171 SEC)

P 12
BOOST MONITOR-
POST-LET JETTISON

#190

•
•
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•
•

IS BOOST SATIS-
FACTORY

#200

•N Y•
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M

P 00 AGC IDLING

#210

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M 204 LOGIC

M 204 LOGIC

MISSION EVENTS
SEQUENCE CONTROLLER
TRANSMITS SIVB/CSM
SEPARATE (ABORT)
DISCRETE TO G+N

.....
TWIST TRANSLATION
CONTROL CCW

.....
P 71
CSM ABORT-
FIRST ABORT BURN

#220

.....
ARE ENTRY PROGRAMS
DESIRED

.....
N Y
M
P00
AGC IDLING
M

#230

.....
P 61
ENTRY-
MANEUVER TO CM/SM
SEPARATION
ATTITUDE

#240

.....
P 62
ENTRY-
CM/SM SEPARATION
AND PRE-ENTRY
MANEUVER

#250

.....
P 63
ENTRY-
INITIALIZATION

#260

M 204 LOGIC

GROUND TRANSMITS
AIM PARAMETERS
VIA AGC
UPLINK TO AGC

.....
DOES THE GROUND WISH
TO LOAD/RE-LOAD THE
AIM PARAMETERS

.....Y.....N.....
.....
.....A.....

.....P 27.....
.....COAST - AGC.....
.....UPDATE.....

.....A.....

.....P00.....
.....AGC IDLING.....

.....DOES THE
.....GROUND WISH
.....TO HAVE THE
.....CREW LOAD/
.....RE-LOAD THE
.....AIM PARA-
.....METERS
.....CALCULATED
.....ON THE
.....GROUND

.....Y.....N.....
.....
.....

.....RECORD
.....AIM
.....PARA-
.....METERS
.....FOR
.....MANUAL
.....ENTRY
.....INTO
.....THE AGC

GROUND TRANSMITS
AIM PARAMETERS
VIA VOICE LINK
TO THE CREW

M 204 LOGIC

#530

#540

#550

#560

#570

M 204 LOGIC

M 204 LOGIC

.M
P 27
COAST-
AGC
UPDATE

#580

.A
P00
AGC
IDLING

#590

DOES THE GROUND WISH
TO UPDATE/RE-UPDATE
THE VEHICLE POSITION
AND VELOCITY AND
TIME IN THE AGC.

#600

.Y .N
.A

GROUND TRANSMITS
R.V.T. UPDATE
VIA AGC UPLINK
TO AGC

P 27
COAST - AGC
UPDATE

#610

.A

P00
AGC IDLING

#620

DOES THE
GROUND WISH
TO HAVE THE
CREW UPDATE
/RE-UPDATE
THE VEHICLE
POSITION

M 204 LOGIC

GROUND TRANSMITS
R.V.T. UPDATE
VIA VOICE LINK TO
THE CREW

AND VELOCITY
AND TIME IN
THE AGC

.Y .N

RECORD
R.V.T.
UPDATE
FOR
MANUAL
ENTRY
INTO
THE AGC

.M

P 27
COAST -
AGC
UPDATE

.A

P00
AGC
IDLING

.M M . M . M . M . M

P31 OR P32 OR P33
PRETHRUSTING - ORBIT
CHANGE, RETURN TO
EARTH OR SPS
MINIMUM IMPULSE

M 204 LOGIC

#630

#640

#650

#660

#670

M 204 LOGIC

M 204 LOGIC

IS A GROUND STATION
AVAILABLE TO CONFIRM
THE AGC COMPUTED
THRUSTING PARAMETERS

#680

.Y .N

DOES THE CREW WISH
TO CONTINUE WITH-
OUT GROUND CON-
FIRMATION

#690

.Y .N

WAIT UNTIL
GROUND COM-
MUNICATION IS
ESTABLISHED

#700

.M
POO
AGC IDLING

#710

ARE THE AGC
COMPUTED
THRUSTING PARA-
METERS SATIS-
FACTORY TO
GROUND AND
CREW

#720

.N .Y

ARE AGC
COMPUTED
THRUSTING
PARAMETERS
SATISFACTORY
TO THE CREW

#730

.Y .N

M 204 LOGIC

M 204 LOGIC

#790

IS ISS ON?

N . Y

.A

P 05
PRELAUNCH AND
SERVICE-
G+N STARTUP

#800

.A

P00
AGC IDLING

#810

.M .A

P51
INFLIGHT ALIGNMENT-
IMU ORIENTATION
DETERMINATION

#820

.A

IS THE RESULTANT
MIDDLE GIMBAL ANGLE
GREATER THAN 15 DEG
AS DETERMINED BY
THE PROGRAM

P00
AGC IDLING

#830

.N .Y

#840

M 204 LOGIC

. . .
. . .
. . .
. . .

SHALL I USE PRESENT
IMU ORIENTATION
FOR THRUSTING
MANEUVER?
CONSIDER TIME SINCE
LAST FINE ALIGN-
MENT, FUEL
LIMITATIONS, TIME
LIMITATIONS,
GROUND CONCURRENCE.

.Y .N
. . .
. . .
.M .M

P53
INFLIGHT ALIGNMENT-
CSM/IMU ALIGN

.M .M

P41 OR P42 OR P43
THRUSTING - ORBIT
CHANGE, RETURN TO
EARTH OR SPS MINIMUM
IMPULSE. (THRUSTING
PROGRAM SELECTED MUST
CORRESPOND TO PRE-
VIOUS PRETHRUSTING
PROGRAM SELECTED).

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. .

IS BURN PERFORMED
SATISFACTORILY?

.Y .N
. . .

WAS THE
THRUSTING
MANEUVER FOR
RETURN TO
EARTH?

.N .Y
. . .
. . .
. . .
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. . .
. . .

M 204 LOGIC

#850

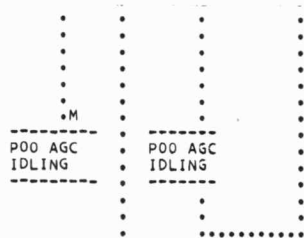
#860

#870

#880

#890

M 204 LOGIC



M 204 LOGIC

#900

```

-----
P 61
ENTRY-
MANEUVER TO
CM/SM SEP-
ARATION
ATTITUDE.
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. A
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#910

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P 62
ENTRY - CM/SM
SEPARATION
AND PRE ENTRY
MANEUVER
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. A
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#920

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P 63
ENTRY-
INITIALIZATION
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. A
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#930

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P 64
ENTRY-
POST 0.05G
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. A
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#940

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P 67
ENTRY -
FINAL PHASE
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#950

M 204 LOGIC

M 204 LOGIC

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•
•M

P00
AGC IDLING

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

AGC IDLING PROGRAM (P 00)

REV 5

6-27-66

PURPOSE:

- (1) TO PROVIDE A PROGRAM TO FULFILL THE FOLLOWING REQUIREMENTS:
- (A) PROVIDE AN INDICATION TO THE CREW THAT THE AGC IS ENGAGED IN NO CONTROL OR COMPUTATIONAL OPERATIONS WHICH MIGHT REQUIRE CONSIDERATION FOR COORDINATION WITH OTHER CREW TASKS IN PROGRESS.
 - (B) TO MAINTAIN THE G+N IN A CONDITION WHERE RANDOM MANUAL ATTITUDE MANEUVERS CAN BE MADE BY THE CREW WITH MINIMAL CONCERN FOR THE G+N (SEE ASSUMPTION 3).
 - (C) MAINTAIN THE INERTIAL SUB-SYSTEM IN A CONDITION OF READINESS (I. E. FINE ALIGN) FOR RAPID G+N ACQUISITION OF S/C ATTITUDE CONTROL IF REQUESTED BY THE CREW (V 44 E).
 - (D) MAINTAIN THE AGC IN A CONDITION OF READINESS FOR ENTRY INTO ANY PROGRAM THAT NEED NOT BE PRECEDED BY ANOTHER SPECIFIC PROGRAM.

ASSUMPTIONS:

- (1) THE AGC IS ON.
- (2) THE IMU MAY OR MAY NOT BE ON. IF ON THE IMU IS INERTIALLY STABILIZED BUT NOT NECESSARILY ALIGNED TO AN ORIENTATION WHICH IS KNOWN TO THE AGC.
- (3) IF NON-G+N CONTROLLED ATTITUDE MANEUVERS ARE MADE BY THE CREW, CARE MUST BE TAKEN TO AVOID IMU GIMBAL LOCK. THE IMU GIMBAL ANGLES MAY BE MONITORED BY OBSERVING THE ICDUS (ISS IS IN FINE ALIGN MODE) OBSERVING A DSKY DISPLAY OF THE ICDUS (V16 N20) OR BY MONITORING THE FDAI BALL (THE ONLY NON G+N CONTROL MODE IN THE SCS WHERE THE FDAI BALL REPEATS IMU ANGLES IS THE MONITOR MODE. GIMBAL ANGLES COULD BE MONITORED BY PERIODIC SELECTION OF THIS MODE).
- (4) DURING THIS PROGRAM THE AGC ERASABLE STORAGE MAY BE INITIALIZED BY KEYING IN V36E (FRESH START). THIS WOULD BE DONE ONLY AT INITIAL G+N STARTUP (SEE P05) OR WHEN THE CONTENT OF THE AGC ERASABLE STORAGE IS IN QUESTION. IF THIS ENTRY IS PERFORMED THE AGC'S KNOWLEDGE OF THE PRESENT STATE VECTOR AND THE PRESENT IMU ORIENTATION IS INVALIDATED.
- (5) THE PROGRAM MAY BE MANUALLY SELECTED BY THE ASTRONAUT BY DSKY ENTRY OR AUTOMATICALLY SELECTED BY SPECIFIC PROGRAMS (05, 06, 22, 23, 24, 27, 51, 52, 54).

PRUG CONT	AGC	GROUND	CREW	CHECKLIST	TIME	TOTAL TIME
--------------	-----	--------	------	-----------	------	---------------

TERMINATE AVERAGE G

#60

TERMINATE SCS
DISCRETE MONITOR
ROUTINE (R22)

#70

.....

COMMAND ISS TO FINE
ALIGN MODE

.....

OBSERVE FINE ALIGN
MODE LIGHT ON

* II CHECK FINE ALIGN MODE LIGHT ON

NOTE:

ISS FINE
ALIGN MODE
PRESENT

SHOULD G+N ATTITUDE HOLD BE DESIRED
KEY IN V44E AND SELECT G+N ATT CONT
MODE IN THE SCS. AGC WILL FLASH V21
N22 FOR PERFORM LOAD OF FIRST
COMPONENT OF DESIRED ICDU ANGLES.
(THEN V22, V23 FOR OTHER
COMPONENTS) LOAD DESIRED ICDU
ANGLES TO NEAREST .01 DEG. THE ISS
WILL BE COMMANDED TO THE ATTITUDE
CONTROL MODE AND G+N WILL HOLD
DESIRED ATTITUDE. TO RESUME ISS
FINE ALIGN MODE.
KEY IN V42E

#80

#90

IS G+N ATT HOLD
DESIRED?

* III SELECT NEXT PROGRAM

1. KEY IN NEW PROGRAM WHEN DESIRED
V37E --E

Y. N

* 2. CHECK AGC DISPLAYS SELECTED
PROGRAM IF PROGRAM IS ALLOWED

#100

WAIT FOR KEYBOARD
ENTRY

SELECT G+N ATT
CONT
KEY IN V44E

GO TO PROGRAM
SELECTED OR COMMAND
ATT CONT MODE

KEY IN
DESIRED
PROGRAM
V37E --E

#110

NEW V44
PROGRAM

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

PRELAUNCH OR SERVICE-INERTIAL REFERENCE PROGRAM (P04) REV 12

5-26-66

PURPOSE: (1) TO INDICATE TO THE ASTRONAUT THAT THE AGC HAS RECEIVED THE GUIDANCE REFERENCE RELEASE DISCRETE FROM THE SATURN GUIDANCE SYSTEM, HAS TERMINATED GYROCOMPASSING AND HAS MADE THE IMU INERTIAL.

ASSUMPTIONS: (1) SCS IS IN THE MONITOR MODE
 (2) ISS IS IN THE FINE ALIGN MODE UNDER THE CONTROL OF THE GYROCOMPASSING COMPUTATIONS.
 (3) V75 WILL BE KEYED IN AND DISPLAYED ON DSKY PRIOR TO THIS PROGRAM TO PERMIT CREW BACKUP OF LIFTOFF DISCRETE BY KEYING IN "ENTER" ONLY.
 (4) THE PROGRAM IS NORMALLY AUTOMATICALLY SELECTED BY THE PRE LAUNCH-GYROCOMPASSING PROGRAM (P 02) WHEN THE AGC RECEIVES THE GUIDANCE REFERENCE RELEASE DISCRETE FROM THE SIVB IU.
 (5) IF THE AGC DOES NOT RECEIVE THE GUIDANCE REFERENCE RELEASE DISCRETE (IE DOES NOT PERFORM THIS PROGRAM) THE NECESSARY FUNCTIONS OF THIS PROGRAM WILL BE PERFORMED BY THE BOOST MONITOR-PRE LET JETTISON PROGRAM (P11) AT LIFTOFF.

PRG CONT	AGC	GROUND	CREW	CHECKLIST	TIME	TOTAL TIME
-------------	-----	--------	------	-----------	------	---------------

*1. FOLLOWING SWITCH POSITIONS AT MDC ARE ASSUMED:

PANEL 8

- | | |
|-----------------------------------|-----|
| 1. DIRECT RCS - ON | |
| 2. LIMIT CYCLE - ON | *10 |
| 3. ATTITUDE DEADBAND - MAX | |
| 4. .05G ENTRY - OFF | |
| 5. LOCAL VERTICAL - OFF | |
| 6. DELTA V - ON | |
| 7. G+N/SCS - G+N | *20 |
| 8. ATTITUDE/MONITOR/ENTRY-MONITOR | |
| 9. AGC ROLL CHANNEL - ON | |

P 04

- 10. B+D ROLL CHANNEL - ON
- 11. PITCH CHANNEL - ON
- 12. YAW CHANNEL - ON #30
- 13. ROLL RATE GYRO - NORMAL
- 14. PITCH RATE GYRO - NORMAL
- 15. YAW RATE GYRO - NORMAL

PANEL 25 #40

- 1. FDAI LTG - AC1
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED
- 5. GROUP 2-AC2 - CLOSED #50
- 6. GROUP 1-MNA - CLOSED
- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED
- 9. GROUP 2-MNB - CLOSED
- 10. DIRECT CONTROL-MNA - CLOSED #60
- 11. DIRECT CONTROL-MNB - CLOSED
- 12. A6C ROLL-MNA - CLOSED
- 13. A6C ROLL-MNB - CLOSED
- 14. B6D ROLL-MNA - CLOSED
- 15. B6D ROLL-MNB - CLOSED #70
- 16. PITCH-MNA - CLOSED
- 17. PITCH-MNB - CLOSED
- 18. YAW-MNA - CLOSED
- 19. YAW-MNB - CLOSED
- 20. G6N SYNC - OFF #80

- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED
- 23. GIMBAL MOTOR CONTROL PITCH 1
BAT A - CLOSED
- 24. GIMBAL MOTOR CONTROL PITCH 2
BAT B - CLOSED
- 25. GIMBAL MOTOR CONTROL YAW 1
BAT A - CLOSED
- 26. GIMBAL MOTOR CONTROL YAW 2
BAT B - CLOSED

#90

MISCELLANEOUS

#100

- 1. TRANSLATION CONTROLS - LOCKED
- 2. ROTATION CONTROLS - UNPINNED

PANEL 6

- 1. ATTITUDE SET - OFF

#110

PANEL 7

- 1. NORMAL/OFF/DIRECT ON - OFF

PANEL 2

#120

- 1. FDAI SELF TEST - OFF
- 2. FDAI BRIGHTNESS - SET
- 3. FCSM - AUTO/OVERRIDE - OVERRIDE
- 4. FCSM - ON/OFF/RESET - OFF

#130

PANEL 24

- 1. SCS POWER - AC1
- 2. RATE GYRO POWER - AC1

- 3. BMAG POWER - AC2
- 4. ROTATION CONTROL POWER-AC2 #140
- 5. TVC 1 POWER - AC1
- 6. TVC 2 POWER - AC2

PANEL 3

- 1. PITCH GIMBAL MOTOR 1 - OFF #150
- 2. PITCH GIMBAL MOTOR 2 - OFF
- 3. YAW GIMBAL MOTOR 1 - OFF
- 4. YAW GIMBAL MOTOR 2 - OFF
- 5. INJECT PREVALVE A - ON
- 6. INJECT PREVALVE B - ON #160

PANEL 14

- 1. UPTL - BLOCK
- 2. DSKY BRIGHTNESS - SET

#170

PANEL 22

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED
- 3. IMU-MNA - CLOSED
- 4. IMU-MNB - CLOSED #180
- 5. COMPUTER-MNA - CLOSED
- 6. COMPUTER-MNB - CLOSED
- 7. OPTICS-MNA - OPEN
- 8. OPTICS-MNB - OPEN
- 9. AC POWER-AC1 - CLOSED #190
- 10. AC POWER-AC2 - CLOSED

11. G6N-AC POWER - AC1

*II. FOLLOWING SWITCH POSITIONS AT NAV STATION ARE ASSUMED:

- 1. FLOODLIGHT CONTROL PRIMARY - OFF #200
- 2. FLOODLIGHT CONTROL SECONDARY - OFF
- 3. IMU TRANSFER - COMPUTER
- 4. OPTICS SLAVE TELESCOPE - STAR LOS
- 5. OPTICS MODE - ZERO OPTICS #210
- 6. OPTICS HOLD - OFF
- 7. OPTICS CONTROLLER SPEED - HI
- 8. OPTICS CONTROLLER MODE - DIRECT
- 9. PANEL BRIGHTNESS CONTROL - MAX DIM
- 10. IMU TEMP. MODE - AUTO OVERRIDE #220
- 11. ATTITUDE IMPULSE ENABLE - OFF
- 12. CONDITION LAMPS - OFF
- 13. AGC MODE - ON
- 14. AGC BRIGHTNESS CONTROL - MAX DIM

#230

#240

* III MONITOR PRELAUNCH AND SERVICE

SCS-G+N
MONITOR
PRESENT

ISS FINE
ALIGN MODE
PRESENT

- AGC PROG.
- SELECTION
-
-
-
-

 START PRELAUNCH AND
 SERVICE INERTIAL
 REFERENCE PROGRAM
 (P 04)

LIFTOFF
FROM
SIVB
I U

WAIT FOR LIFTOFF
DISCRETE

SEND NOTIFICATION
OF LIFTOFF

WAIT FOR NOTIFICA-
TION OF LIFTOFF
FROM GROUND

* 3. RECEIVE NOTIFICATION OF LIFT-OFF
FROM GROUND.

#300

TERMINATE P04 AND
GO TO BOOST MONITOR-
PRE-LET JETTISON
PROGRAM (P 11)

MONITOR DSKY:
IS AGC RECEIPT OF
LIFTOFF DISCRETE
CONFIRMED BY DISPLAY
OF P 11?

* 4. CHECK AGC DISPLAYS PROGRAM 11 TO
INDICATE RECEIPT OF LIFTOFF
DISCRETE

#310

Y N

EXIT P 04

#320

PRESS ENTER
TO INITIATE
P 11

NAV:
* 5. KEY IN ENTER IF LIFT-OFF DISCRETE
DOES NOT INITIATE P11

#330

ISS FINE
ALIGN MODE
PRESENT

SCS-G*N
MUNITOR
PRESENT

EXIT P 04

EXIT P 04

#340

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

PRE-LAUNCH OR SERVICE-G+N STARTUP PROGRAM (P05)

REV 15

6/16/66

PURPOSE: (1) TO TRANSFER THE IMU/AGC FROM THE STANDBY TO THE OPERATE CONDITION.

ASSUMPTIONS: (1) THIS PROGRAM IS APPLICABLE ONLY IN FLIGHT.

(2) THE NORMAL CONDITION OF READINESS OF THE G+N WHEN NOT IN USE IS STANDBY. IN THIS CONDITION THE IMU HEATER POWER IS ON (IMU HTR MNA-ON AND IMU HTR MNB-ON), THE IMU OPERATE POWER IS OFF (IMU MNA-OFF AND IMU MNB-OFF), THE COMPUTER POWER IS ON (COMPUTER MNA-ON AND COMPUTER MNB-ON), THE OPTICS POWER IS OFF (OPTICS MNA-OFF AND OPTICS MNB-OFF) AND THE AGC MODE STANDBY-ON SWITCH IS AT STANDBY.

(3) A POSSIBLE CONDITION OF READINESS OF THE G+N WHEN NOT COMPLETELY ON IS THE SAME AS STANDBY, (2) ABOVE, EXCEPT THE AGC MODE STANDBY-ON SWITCH IS AT ON. IN THIS CONFIGURATION THE AGC IS RUNNING FOR COMPUTATIONAL PURPOSES THAT DO NOT REQUIRE THE IMU OR OPTICS.

(4) THIS PROGRAM DOES NOT INCLUDE TURN ON OF THE OPTICS. THESE PROCEDURES ARE LISTED IN THOSE PROGRAMS WHERE OPTICS USE IS REQUIRED.

(5) ONLY IN CASES OF EMERGENCY SHOULD THE G+N BE POWERED DOWN BEYOND THE "STANDBY" CONDITION BY SWITCHING IMU HEATER POWER OFF (IMU HTR MNA-OFF AND IMU HTR MNB-OFF) AND ALSO SWITCHING COMPUTER POWER OFF (COMPUTER MNA-OFF AND COMPUTER MNB-OFF). IF THIS BECOMES NECESSARY THEN G+N STARTUP, CHECKOUT AND SUBSEQUENT USE ARE SUBJECT TO BACKUP PROCEDURES.

(6) THE PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY.

PRG CUNT	AGC	GROUND	CREW	CHECKLIST	TIME	TOTAL TIME
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* I CONFIRM OR SELECT FOLLOWING POSITIONS AT MDC

PANEL 8

- 1. G+N/SCS - SCS
- 2. ATTITUDE/MONITOR/ENTRY-MONITOR OR ATTITUDE #10

PANEL 22

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED

P 05

- | | |
|-------------------------------|-----|
| 3. IMU-MNA - OPEN | #20 |
| 4. IMU-MNB - OPEN | |
| 5. COMPUTER-MNA - CLOSED | |
| 6. COMPUTER-MNB - CLOSED | |
| 7. OPTICS-MNA - OPEN | #30 |
| 8. OPTICS-MNB - OPEN | |
| 9. AC POWER-AC1 - OPEN | |
| 10. AC POWER-AC2 - OPEN | |
| 11. G+N-AC POWER - AC1 OR AC2 | |

* II CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT NAV STATION #40

- | | |
|--------------------------------------|-----|
| 1. FLOODLIGHT CONTROL PRIMARY - SET | |
| 2. FLOODLIGHT CONTROL SECONDARY- SET | |
| 3. IMU TRANSFER - COMPUTER | #50 |
| 4. OPTICS SLAVE TELESCOPE - STAR LOS | |
| 5. OPTICS MODE - ZERO OPTICS | |
| 6. OPTICS HOLD - OFF | |
| 7. OPTICS CONTROLLER SPEED - HI | #60 |
| 8. OPTICS CONTROLLER MODE - DIRECT | |
| 9. PANEL BRIGHTNESS CONTROL-SET | |
| 10. IMU TEMP. MODE-AUTO OVERRIDE | |
| 11. ATTITUDE IMPULSE ENABLE - OFF | |
| 12. CONDITION LAMPS - ON | #70 |
| 13. AGC MODE - ON OR STANDBY | |
| 14. AGC BRIGHTNESS CONTROL-SET | |

PERFORM RESTART PUT AGC IN OPERATE
MODE

* III SELECT AGC OPERATE MODE

1. SET AGC MODE SWITCH TO ON. #80

CAUTION:

THE IMU MUST NOT BE PUT IN THE OPERATE CONDITION BEFORE THE AGC IS IN THE OPERATE CONDITION. TO DO SO WILL RESULT IN LARGE CHANGES IN THE ACCELEROMETER BIASES AND SCALE FACTORS.

#90

DISPLAY PROGRAM 00 OBSERVE AGC DISPLAYS
PROGRAM 00

.....
PRESS ALARM RESET

.....
MONITOR DSKYS AND
G+N ALARM DISPLAYS
CHECK ALL G+N ALARMS
TO BE CLEAR

#100

.....
*CREW PROG
SELECTION
.....

SCS-SCS
MONITOR OR
ATTITUDE
PRESENT

IS PROGRAM ALLOWED?
*Y *N
.....
.....
.....

* IV SELECT COAST/G+N STARTUP PROGRAM (P05) #110

1. ENTER COAST-G+N STARTUP PROGRAM (P05) V37E 05E

NOTE:

POSSIBLE CHECK FAIL. IF PRESENT PROGRAM DOES NOT ALLOW SELECTION OF P05 THE CHECK FAIL LIGHT WILL ILLUMINATE AND THE OLD PROGRAM DISPLAY WILL REMAIN.

#120

.....
COMMAND CHECK
FAIL ALARM OBSERVE CHECK FAIL
LIGHT ON

OBSERVE:

CHECK FAIL LIGHT ON (LEB)
PGNS LIGHT ON (LEB)
COMP FAIL LIGHT ON (MDC)

#130

.....
RESET CHECK
FAIL ALARM PRESS ALARM RESET TO
TURN OFF CHECK FAIL
LIGHT

47

..... KEY IN ENTER

TERMINATE FLASH UPON
RECEIPT OF ENTER OR
NEW PROGRAM

#240

E.
N.
T.
E.
R.

.....
TERMINATE P05
AND GO TO AGC
IDLING PROGRAM
(P00)

.....
MONITOR DSKY:
OBSERVE TERMINATION
OF P05 AND DISPLAY
OF P00

#250

.....
EXIT P05

.....
EXIT P05

#260

.....
RESET IMU ORIENTA-
TION KNOWN FLAG
(REFSMFLG)

#270

.....
COMMAND ISS TO
COARSE ALIGN

.....
FLASH VERB-NOUN
TO REQUEST LOAD OF
REQUIRED ICDU DELTA
ANGLES TO PREVENT
GIMBAL LOCK.
V25 N23

.....
MONITOR DSKY:
OBSERVE FLASHING
VERB-NOUN TO REQUEST
LOAD OF REQUIRED
ICDU DELTA ANGLES TO
PREVENT GIMBAL LOCK.

#280

* VI. CHECK AGC FLASHES VERB-NOUN TO RE-
QUEST LOAD OF REQUIRED ICDU DELTA
ANGLES TO PREVENT GIMBAL LOCK:
V25 N23

1. READ THE PRESENT ICDU ANGLES FROM THE ICDU DIALS
2. IF ALL ICDU ANGLES ARE LESS THAN 0 DEGREES PLUS OR MINUS 10 DEGREES

50

#340

* VII. CHECK CDU ZERO MODE LIGHT ON (35 SEC)

ISS ZERO
ENC MODE
PRESENT

COMMAND ZERO CDU
MODE IN ISS

.....

OBSERVE ISS SWITCH
TO CDU ZERO MODE FOR
35 SEC.

WAIT 35 SEC

#350

ZERO CDU REGISTERS

SET ISS ZERO FLAG

#360

COMMAND FINE ALIGN
MODE IN ISS

.....

OBSERVE ISS TO
SWITCH TO FINE ALIGN
MODE FOR 10 SEC.

* VIII. CHECK FINE ALIGN MODE LIGHT ON (10 SEC)

ISS FINE
ALIGN MODE
PRESENT

WAIT 10 SECONDS

#370

COMMAND ATTITUDE
CONTROL MODE IN ISS.

.....

OBSERVE ISS TO
SWITCH TO ATTITUDE
CONTROL MODE FOR 2
SECONDS.

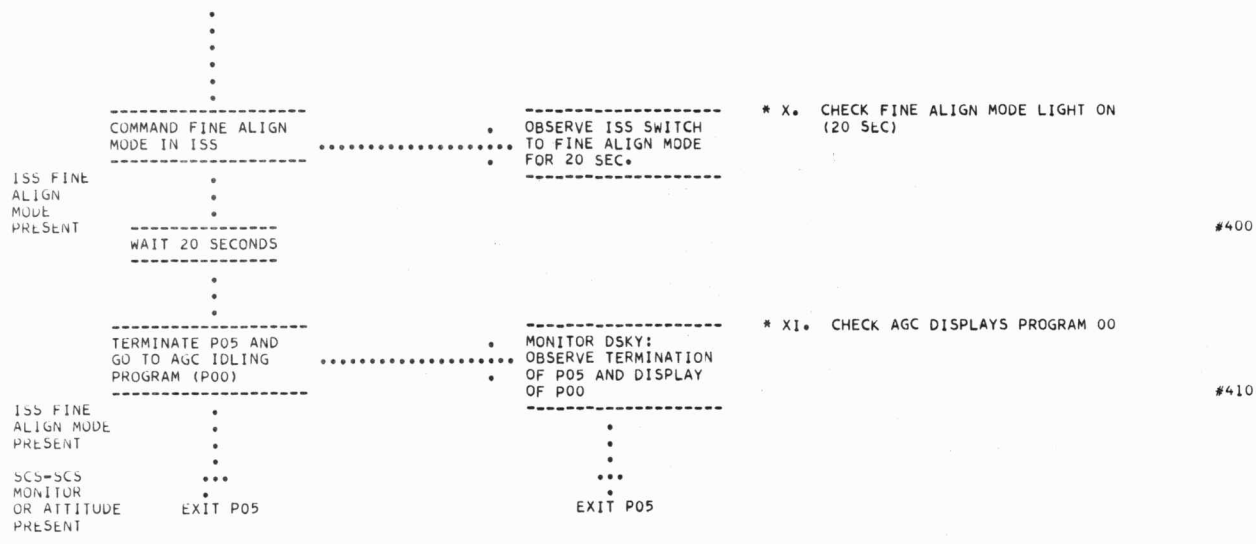
* IX. CHECK ATTITUDE CONTROL MODE LIGHT ON (2 SEC)

ISS ATT
CONTROL
MODE
PRESENT

DRIVE ICDUS FOR
2 SECONDS

#380

#390



APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

PRELAUNCH OR SERVICE-G+N POWER DOWN PROGRAM (P06)

REV 6

6/16/66

PURPOSE: (1) TO TRANSFER THE IMU-AGC FROM THE OPERATE TO THE STANDBY CONDITION

ASSUMPTIONS: (1) THIS PROGRAM IS APPLICABLE ONLY IN FLIGHT.

(2) THE NORMAL CONDITION OF READINESS OF THE G+N WHEN NOT IN USE IS STANDBY. IN THIS CONDITION THE IMU HEATER POWER IS ON (IMU HTR MNA-ON AND IMU HTR MNB-ON), THE IMU OPERATE POWER IS OFF (IMU MNA-OFF AND IMU MNB-OFF), THE COMPUTER POWER IS ON (COMPUTER MNA-ON AND COMPUTER MNB-ON), THE OPTICS POWER IS OFF (OPTICS MNA-OFF AND OPTICS MNB-OFF) AND THE AGC MODE STANDBY-ON SWITCH IS AT STANDBY.

(3) A POSSIBLE CONDITION OF READINESS OF THE G+N WHEN NOT COMPLETELY ON IS THE SAME AS STANDBY, (2) ABOVE, EXCEPT THE AGC MODE STANDBY-ON SWITCH IS AT ON. IN THIS CONFIGURATION THE AGC IS RUNNING FOR COMPUTATIONAL PURPOSES THAT DO NOT REQUIRE THE IMU OR OPTICS.

(4) THIS PROGRAM DOES NOT INCLUDE TURN OFF OF THE OPTICS. THESE PROCEDURES ARE LISTED IN THOSE PROGRAMS WHERE OPTICS USE IS REQUIRED.

(5) ONLY IN CASES OF EMERGENCY SHOULD THE G+N BE POWERED DOWN BEYOND THE "STANDBY" CONDITION BY SWITCHING IMU HEATER POWER OFF (IMU HTR MNA-OFF AND IMU HTR MNB-OFF) AND ALSO SWITCHING COMPUTER POWER OFF (COMPUTER MNA-OFF AND COMPUTER MNB-OFF). IF THIS BECOMES NECESSARY THEN G+N STARTUP, CHECKOUT AND SUBSEQUENT USE ARE SUBJECT TO BACKUP PROCEDURES.

(6) THE PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY.

PRG CUNT	AGC	GROUND	CREW	CHECKLIST	TIME	TOTAL TIME
-------------	-----	--------	------	-----------	------	---------------

* I CONFIRM OR SELECT FOLLOWING POSITIONS AT MDC

PANEL 8

1. G+N/SCS - SCS

2. SCS ATTITUDE/MONITOR/ENTRY-MONITOR OR ATTITUDE

*10

PANEL 22

P 06

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED
- 3. IMU MNA - CLOSED *or OPEN* #20
- 4. IMU MNB - CLOSED
- 5. COMPUTER MNA - CLOSED
- 6. COMPUTER MNB - CLOSED
- 7. OPTICS MNA - OPEN
- 8. OPTICS MNB - OPEN #30
- 9. AC POWER AC 1 - CLOSED
- 10. AC POWER AC 2 - CLOSED - ? *how did it get on*
- 11. G*N - AC POWER-AC1 OR AC2

* II CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT NAV STATION: #40

- 1. FLOODLIGHT CONTROL PRIMARY - SET
- 2. FLOODLIGHT CONTROL SECONDARY-SET
- 3. IMU TRANSFER - COMPUTER
- 4. OPTICS SLAVE TELESCOPE - STAR LOS #50
- 5. OPTICS MODE - ZERO OPTICS
- 6. OPTICS HOLD - OFF
- 7. OPTICS CONTROLLER SPEED - HI
- 8. OPTICS CONTROLLER MODE - DIRECT
- 9. PANEL BRIGHTNESS CONTROL-OFF #60
- 10. IMU TEMP. MODE-AUTO OVERRIDE
- 11. ATTITUDE IMPULSE ENABLE - OFF
- 12. CONDITION LAMPS - ON
- 13. AGC MODE - ON
- 14. AGC BRIGHTNESS CONTROL - SET #70

55

CS-SCS
UNITOR
OR ATTITUDE
PRESENT

CREW PROG
SELECTION
.
.
.
.
.

IS PROGRAM ALLOWED?

V37E 06E

.Y .N
.
.

COMMAND CHECK
FAIL ALARM

OBSERVE CHECK
FAIL LIGHT ON

RESET CHECK
FAIL ALARM

PRESS ALARM RESET
TO TURN OFF CHECK
FAIL LIGHT

HOLD FOR NEW
PROGRAM

CONSULT BACKUP
PROCEDURES

SELECTION

GO TO PROGRAM
SELECTED

KEY IN PROGRAM
SELECTION AS
DESIRED
V37E --E

EXIT P--

EXIT P--

* III SELECT G+N POWER DOWN PROGRAM (P06) #80

1. ENTER PRELAUNCH - G+N POWER DOWN
PROGRAM (P06)
V37E 06E

NOTE:

POSSIBLE CHECK FAIL IF PRESENT
PROGRAM DOES NOT ALLOW SELECTION OF
P06 THE CHECK FAIL LIGHT WILL
ILLUMINATE AND THE OLD PROGRAM
DISPLAY WILL REMAIN

OBSERVE:

CHECK FAIL LIGHT ON (LEB)
PGNS LIGHT ON (LEB)
COMP FAIL LIGHT ON (MDC)

GO TO BACKUP PROCEDURES AND SELECT
A PROGRAM WHICH IS ALLOWED

#90

#100

#110

#120

.....

START PRE-LAUNCH
G+N POWER DOWN
PROGRAM (P06)
DISPLAY PROGRAM 06

.....

MONITOR DSKY:
OBSERVE DISPLAY
OF PROGRAM 06

2. CHECK AGC DISPLAYS PROGRAM 06

#130

.....

RESET IMU ORIENTA-
TION KNOWN FLAG
(REFSMFLG)

#140

.....

RESET ISS ZERO FLAG

.....

SET STANDBY FLAG

#150

.....

STORE AGC CLOCK TIME

#160

CHECK DISCRETES.
IS IMU OFF?

* IV IF IMU IS NOW IN OPERATE CONDITION
DO THE FOLLOWING:

Y. .N
.....

SWITCH ISS TO
FINE ALIGN MODE

.....

OBSERVE FINE ALIGN
MODE LIGHT ON FOR
20 SECONDS

* 1. CHECK FINE ALIGN MODE LIGHT ON
(20 SEC)

#170

ISS-FINE
ALIGN MODE
REMOVED

#180

WAIT 20 SECONDS

SWITCH ISS TO
COARSE ALIGN MODE

OBSERVE COARSE ALIGN
MODE LIGHT ON

* 2. CHECK COARSE ALIGN MODE LIGHT ON
(45 SEC)

ISS-COARSE
ALIGN MODE
PRESENT

COMMAND ICDUS
TO ZERO

OBSERVE ICDUS DRIVE
TO ZERO

* 3. CHECK ICDUS DRIVE TO ZERO

#190

NOTE:

IF LEB NOT IN USE, CREW MAY
UTILIZE SCS MONITOR MODE AND USE
FDAI CHECK FOR ICDUS ZEROES

WAIT 45 SECONDS

#200

POSS
.....
HOLD

FLASH VERB-NOUN
TO REQUEST
PLEASE PERFORM
IMU POWER DOWN
V50 N25
R1-00061

MONITOR DSKY:
OBSERVE VERB-NOUN
FLASH TO REQUEST
PLEASE PERFORM IMU
POWER DOWN

* 4. CHECK AGC FLASHES VERB-NOUN TO
REQUEST PLEASE PERFORM IMU POWER
DOWN

V50 N25
R1-00061

#210

POWER DOWN IMU

* 5. POWER DOWN IMU:
PANEL 22
SET IMU-MNA - OPEN
SET IMU-MNB - OPEN
VIEWER AC1 - OPEN
VIEWER AC2 - OPEN

WAIT FOR KEY-
BOARD ENTRY

PRESS ENTER

* 6. PRESS ENTER

#220

CAUTION:

THE IMU MUST BE POWERED DOWN BEFORE
THE AGC IS POWERED DOWN. FAILURE TO
DO SO RESULTS IN LARGE BIAS AND

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

PRE-LAUNCH OR SERVICE - SYSTEM TEST PROGRAM (P07)

REV 0

6-27-66

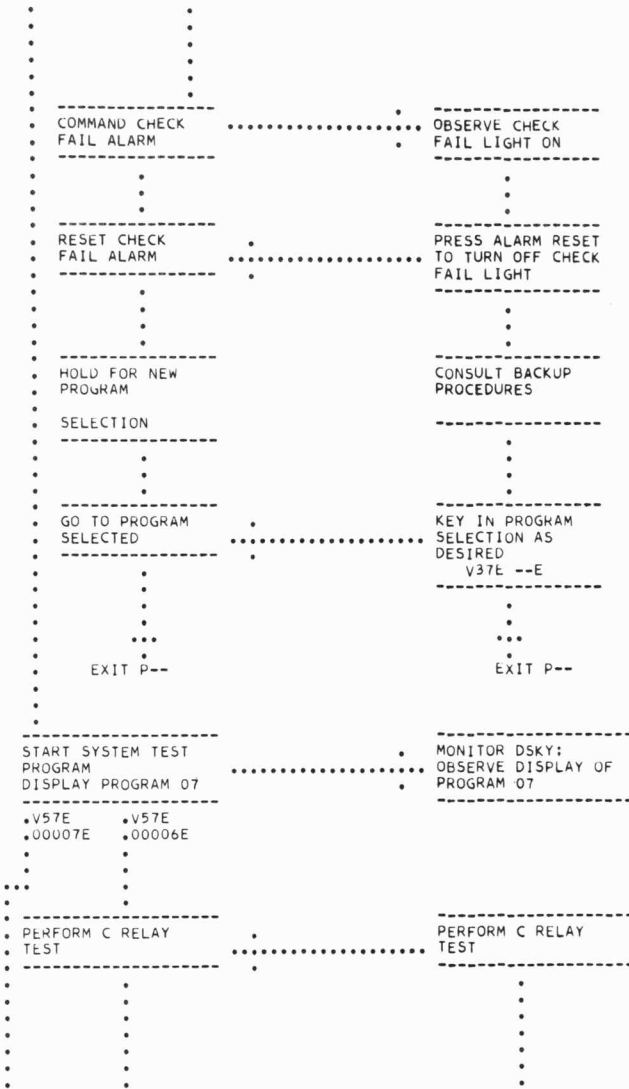
- PURPOSE: (1) TO PROVIDE A TEST OF THE DSKY LIGHT OPERATION.
 (2) TO PROVIDE A TEST OF THE DSKY "C" RELAYS.

- ASSUMPTIONS: (1) THE AGC IS ON.
 (2) THE IMU MAY OR MAY NOT BE ON.
 (3) THE PROGRAM IS MANUALLY SELECTED BY THE ASTRONAUT BY DSKY ENTRY.

initial conditions
 ↓

PRUG CONT	AGC	GROUND	CREW	CHECKLIST	TIME	TOTAL TIME
			*CREW *PROGRAM *SELECTION * * * ----- SELECT THE DESIRED TEST FROM THE FOLLOWING: 1-"C" RELAY TEST 2-DSKY TEST (1) . (2) . . . ----- IS PROGRAM ALLOWED? ----- KEY IN V57E 00006E ----- . . ----- KEY IN V57E 00007E ----- . . ----- Y. .N	* I SELECT SYSTEM TEST PROGRAM (P07) 1. C RELAY TEST A. PLACE IMU TRANSFER SWITCH AT MANUAL #10 B. KLY IN V37E R1-00006 OR 2. DSKY TEST #20 A. KLY IN V37E R1-00007 V57E V57E		
						#30
						PU7

60



NOTE:

POSSIBLE CHECK FAIL IF PRESENT PROGRAM DOES NOT ALLOW SELECTION OF P07 THE CHECK FAIL LIGHT WILL ILLUMINATE AND THE OLD PROGRAM DISPLAY WILL REMAIN

#40

OBSERVE:

CHECK FAIL LIGHT ON (LEB)
PGNS LIGHT ON (LEB)
COMP FAIL LIGHT ON (MDC)
GO TO BACKUP PROCEDURES AND SELECT A PROGRAM WHICH IS ALLOWED

#50

#60

3. CHECK AGC DISPLAYS PROGRAM 07

#70

* II PERFORM C RELAY TESTS (1 MIN REWD)

#80

THIS TEST EXERCISES EACH OF 33 RELAYS CONTROLLED BY OUT 0 REGISTER OF THE AGC. IMU TRANSFER SWITCH MUST BE AT MANUAL AND ISS IN FINE

62

PU7

ALIGN MODE.

- * 1. KEY IN V15 N01E R1-00722 #90

TO DISPLAY CONTENTS OF REGISTERS FOR MONITORING TEST.

- * 2. R3, R2 AND R1 WILL, IN TURN, DISPLAY FOLLOWING SEQUENCE: #100
 - 00001
 - 00002
 - 00004
 - 00010
 - 00020
 - 00040
 - 00100
 - 00200
 - 00400
 - 01000
 - 02000

EACH RELAY AND ITS ASSOCIATED DISPLAY WILL BE ON FOR 1.28 SEC. #110

- * 3. THE FOLLOWING CONDITION LAMPS WILL ILLUMINATE CORRESPONDING TO THE ON STATE OF THE APPROPRIATE RELAY: #120
 - ZERO ENCODER (R1) 00020
 - CDU FAIL (R1) 00040
 - ACCEL FAIL (R1) 00100
 - IMU FAIL (R1) 00200
 MASTER ALARM LAMPS WILL ILLUMINATE WITH THE LATER THREE CONDITION LAMPS-CREW SHOULD BE MADE AWARE OF THE TEST.

- * 4. ANY MALFUNCTION THAT OCCURS DURING THE TEST WILL TERMINATE THE TEST, LIGHT PROG ALARM LAMP AND DISPLAY: #130
 - V01 N31
 - R1-01103
 PRESS ERROR RESET TO RESET PROG ALARM LAMP

- * 5. A SUCCESSFUL TEST IS INDICATED BY FOLLOWING DISPLAY:
 - V01 N31
 - R1-10000 (NOT IMPORTANT)

- * 6. PLACE IMU TRANSFER SWITCH AT COMPUTER

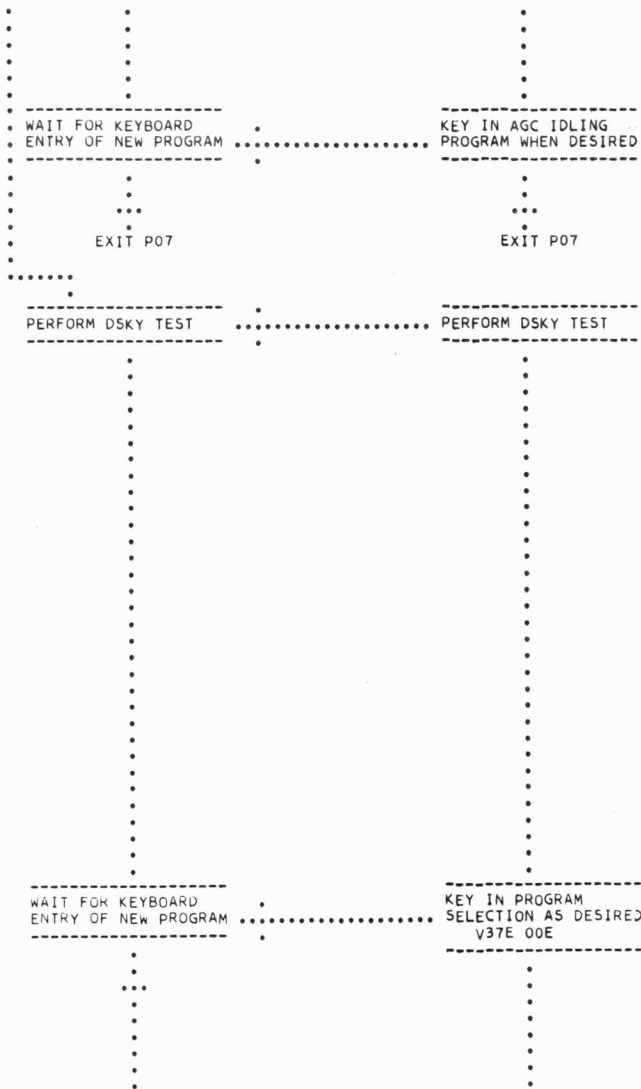
PU7

7 SOS

H0110

62

I SS relay mod check



PU7

#140

* 7. KEY IN V37E 00E

#150

* III. PERFORM DSKY TEST (2MIN. REQD)

1. CHECK UPTL LAMP ON
2. CHECK EACH OF THE 21 CHARACTER DISPLAY ALL 95 SEQUENTIALLY DOWN TO ALL 05, EACH SET BEING DISPLAYED APPROX. 10 SEC.
3. CHECK ALL CHARACTERS BLANKED (10 SEC.)
4. CHECK THE 3 MINUS SIGNS ON (10 SEC)
5. CHECK THE 3 PLUS SIGNS ON (10 SEC) AND THE FOLLOWING LAMPS:
 PROGRAM ALARM
 TM FAIL
 KEY RELEASE
 CHECK FAIL

#160

LEB #170
 FAIL > MDC

NOTE:

COMP ACTIVITY LAMP MAY COME ON MOMENTARILY.

6. CHECK UPTL LAMP OFF
7. PRESS ERROR RESET PB TO EXTINGUISH ERROR LAMPS AND KEY RELEASE PB TO EXTINGUISH KEY RELEASE LAMP.
8. KEY IN V37E 00E

#180

#190

PU7

•
•
•
•
•
EXIT P07

•
•
•
•
•
•
EXIT P07

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

BOOST MONITOR-PRE LET JETTISON PROGRAM (P 11)

REV 12

6/16/66

- PURPOSE: (1) TO INDICATE TO THE ASTRONAUT THAT THE AGC HAS RECEIVED THE LIFTOFF DISCRETE.
 (2) TO GENERATE AN ATTITUDE ERROR INDICATION ON THE FDI BASED UPON THE DIFFERENCE BETWEEN THE CURRENT VEHICLE ATTITUDE AND THE AGC COMPUTATION OF THIS VEHICLE ATTITUDE BASED UPON STORED POLYNOMIALS.
 (3) TO DISPLAY AGC COMPUTED TRAJECTORY PARAMETERS.
- ASSUMPTIONS: (1) SCS IS IN THE MONITOR MODE.
 (2) ISS IS IN THE FINE ALIGN MODE.
 (3) THE IMU IS INERTIAL AT THE LAUNCH ORIENTATION.
 (4) IF THE AGC HAD NOT RECEIVED THE GUIDANCE REFERENCE RELEASE DISCRETE PRIOR TO ITS RECEIPT OF LIFTOFF (I.E. P11 AND ENTERED DIRECTLY FROM P02 WITHOUT HAVING MADE THE IMU INERTIAL IN P04) THIS PROGRAM WILL PERFORM THE NECESSARY FUNCTIONS OF P04 BEFORE CONTINUING.
 (5) THE PROGRAM IS NORMALLY AUTOMATICALLY SELECTED BY THE PRELAUNCH-INERTIAL REFERENCE PROGRAM (P 04) WHEN THE AGC RECEIVES THE LIFTOFF DISCRETE FROM THE SIVB. IN THE BACKJP CASE IT MAY BE SELECTED BY KEYING IN ENTER AS NOTED IN P04 AND P04.

PROG CONT	AGC	GROUND	CREW	CHECKLIST	TIME	TOTAL TIME
ISS-FINE ALIGN MODE PRESENT	• AGC PROG • SELECTION • • • • • • • •					
SCS-G+N MONITOR PRESENT						
	----- START BOOST MONITOR- PRE LET JETTISON PROGRAM (P 11)					•10

DISPLAY PROGRAM 11

.
.
.

SEND EFFECTIVE TIME
OF LIFTOFF ON
DOWNLINK

.
.

START MONITOR OF
CM/SM SEP DISCRETE.

UPON RECEIPT OF
CM/SM SEP DISCRETE
FROM MESC WHICH IS
CONTROLLING LES
ABORT SEQUENCE.
GO TO LES ABORT
PROGRAM (P 17).
SEQUENCE MAY BE
INITIATED AUTOMATIC-
ALLY BY THE EDS OR
MANUALLY BY THE CREW
BY TWISTING THE
TRANSLATION CONTROL
TO THE ABORT
POSITION (CCW)

.
ABORT
.

TERMINATE P 11
AND GO TO BOOST
MONITOR-LET
ABORT PROGRAM
(P 17)

EXIT P 11

MONITOR DSKY:
OBSERVE DISPLAY OF
PROGRAM 11 AS CON-
FIRMATION OF AGC
RECEIPT OF LIFTOFF

VERIFY AUTOMATIC
START OF DIGITAL
EVENT TIMER

* I CHECK AGC DISPLAYS PROGRAM 11 TO
INDICATE RECEIPT OF LIFTOFF
DISCRETE OR RECEIPT OF V75 DURING
P02 OR P04.

1. IF PROGRAM IS AUTOMATICALLY
SELECTED BY LIFTOFF DISCRETE:

- A. PRESS VERB BUTTON
- B. PRESS KEY RELEASE

* II CHECK AUTOMATIC START OF DIGITAL
EVENT TIMER.

* NOTE:

MOMENTARILY PLACE DET START-STOP Sw
IN START IF NO AUTOMATIC START
OCCURS.

* NOTE:

IN EVENT OF EDS INITIATED ABORT
DURING THIS PROGRAM CHECK THE AGC
DISPLAYS PROGRAM 17

#20

#30

#40

#50

#60

#70

IS GUIDANCE
REFERENCE RELEASE
FLAG SET

N. Y.

TERMINATE GYRO-
COMPASSING
IN G+N

SEND EFFECTIVE
TIME OF GUIDANCE
RELEASE ON
DOWNLINK

CALL AVERAGE
G INTEGRATION
WITH DELTA V
INTEGRATION

SET ISS ZERO
FLAG

SET IMU ORIEN-
TATION KNOWN FLAG
(REFSMFLG)

67

#80

#90

#100

#110

#120

ISS ATT
CONT MODE
PRESENT

CUMMAND ISS TO
ATTITUDE CONTROL
MODE

DRIVE CDUS TO
SATURN PROGRAMMED
ANGLES IN IMU GIMBAL
COORDINATES (FROM
STORED BOOST POLY-
NOMIAL)

DISPLAY ON DSKY:
V16 N40
R1 - GAMMA
R2 - VI
R3 - H

GAMMA - INERTIAL
FLIGHT PATH ANGLE;
ANGLE BETWEEN INER-
TIAL VELOCITY AND
THE LOCAL HORIZONTAL
IN DEGREES TO
NEAREST .01 DEGREE

V1-INERTIAL VELO-
CITY IN FT/SEC. TO
NEAREST FT/SEC.

H - VEHICLE ALTITUDE
ABOVE THE LAUNCH
PAD. IN NAUTICAL
MILES TO NEAREST
.1 NM

MONITOR:
(A) FDAI:
ATT ERRORS LESS
THAN -- DEG
ATT RATES LESS
THAN --DEG/SEC

BALL INDICATES
INITIAL VEHI-
CLE ROLLOUT
AND THEN GRAD-
UAL PITCHOVER.

(B) DSKY:
R1-GAMMA STARTS
AT ZERO
INCREASES TO --
DEGREES AND THEN
DECREASES TO --
DEGREES

R2-V1 INCREASING
R3=H INCREASING

* III MONITOR DISPLAYS AND SET CONTROLS

* 1. MONITOR FDAI

A.	ERROR	P+Y RATE	ROLL RATE	
T TO	5 DEG	3 DEG/ SEC	20 DEG/ SEC	#140
0				
T +25				
0				
T +25 TO	10 DEG	5 DEG/ SEC	20 DEG/ SEC	
0				
OECO				
GECO TO	15 DEG	15 DEG/ SEC	28 DEG/ SEC	#150
SIVB ECO				

B. ATTITUDE: BALL INDICATES INITIAL
VEHICLE ROLLOUT AND THEN GRADUAL
PITCHOVER.
PITCH: (58.3 DEG TO ZERO TO 310.5
DEG)
YAW: (9.7 DEG TO ZERO DEG)
ROLL: (164.8 DEG TO 180 DEG)

* 2. MONITOR DSKY

V16 N40
R1 - GAMMA
R2 - VI
R3 - H

GAMMA - INERTIAL FLIGHT
PATH ANGLE: ANGLE BETWEEN
INERTIAL VELOCITY AND THE
LOCAL HORIZONTAL. IN
DEGREES TO NEAREST .01
DEGREE

VI - INERTIAL VELOCITY.
IN FT/SEC. TO NEAREST FT/
SEC.

#130

#160

#170

68

H - VEHICLE ALTITUDE ABOVE THE LAUNCH PAD IN NAUTICAL MILES TO NEAREST .1 NM

#180

R1-GAMMA STARTS AT ZERO, INCREASES TO 31 DEG AT TO +80 SEC AND DECREASES TO 19 DEG AT TO +171 SEC (LET JET)

R2-VI INCREASING PER CLIMB PROFILE FROM 1342 FPS AT TO

#190

R3-H INCREASING PER CLIMB PROFILE

AT STORED TIME OF T ZERO + 136 TERMINATE CDU DRIVE AND HOLD CDU'S IN ACCORDANCE WITH BOOST POLYNOMIALS

IS BOOST SATISFACTORY

N. Y.

TWIST TRANSLATION CONTROL TO ABORT POSITION (CCW)

MONITOR DSKY: OBSERVE TERMINATION OF P 11 AND DISPLAY OF P 17

EXIT P 11

NOTE:

IF BOOST IS UNSATISFACTORY AND ABORT IS DESIRED BUT NOT INITIATED BY THE EDS, TWIST TRANSLATION CONTROL TO ABORT POSITION (CCW). CHECK AGC DISPLAYS PROGRAM 17

* 3. AT 01 01 ON DET SET ABORT SYSTEM -OX DUMP SW TO RCS CMD AUTO POSITION #210

4. AT 01 50 ON DET SET L/V AQA/SPS PC SW TO SPS PC POSITION

5. AT APPROX 02 10 ON DET (JUST PRIOR TO S1B/S1VB SEP) TURN ABORT SYSTEM- 2 ENG OUT SW TO OFF

#220

WARNING:

STEP MUST BE COMPLETED BETWEEN 02 16 AND 02 26.

6. AT 02 16 ON DET SET SPS GIMBAL MONITOR CONTROLS

PITCH 1 SW - START (MOM)

RELEASE TO ON

PITCH 2 SW - START (MOM)

RELEASE TO ON

YAW 1 SW - START (MOM)

RELEASE TO ON

#230

YAW 2 SW - START (MOM)
RELEASE TO ON

7. VERIFY GIMBAL POSITION INDICATORS
REMAIN AS FOLLOWS:
A. PITCH + 0.4 DEG (NOMINAL) #240
B. YAW + 3.6 DEG (NOMINAL)
8. SET ABORT SYSTEM - L/V RATES SW TO
OFF
9. AT 02 20 ON DET VERIFY 5, 6, 7, 8,
L/V ENGINE LIGHTS ILLUMINATE
10. AT 02 26 ON DET VERIFY 1, 2, 3, 4 #250
L/V ENGINE LIGHTS ILLUMINATE
11. AT 02 33 ON DET (APPROX) VERIFY
L/V ENGINE LIGHTS OUT
12. AT 02 34 ON DET VERIFY L/V ENGINE
1 LIGHT ILLUMINATES
13. TURN ABORT SYSTEM - EDS SW TO OFF #260
14. AT 02 51 ON DET SET ABORT SYSTEM
-MODE TO TWR JETT SPS MOVE

* IV CHECK AGC DISPLAYS PROGRAM 12

#270

VERIFY SIB CUTOFF,
SIB/SIVB SEPARATION,
AND SIVB IGNITION AT
ABOUT 146 SEC ON THE
DIGITAL EVENT TIMER

AT +171 SEC ON THE
DIGITAL EVENT
TIMER MANUALLY JET-
TISON THE LET

AT T ZERO +171 SEC
(STORED TIME OF LET
JETTISON) TERMINATE
MONITOR OF CM/SM SEP
DISCRETE

TERMINATE P 11 AND
GO TO BOOST MONITOR
POST-LET JETTISON
PROGRAM (P 12)

MONITOR DSKY:
OBSERVE TERMINATION
OF P 11 AND DISPLAY
OF P 12

ISS-ATT
CONT MODE
PRESENT

SCS-G+N
MONITOR
PRESENT

EXIT P 11

EXIT P 11

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

BOOST MONITOR-POST LET JETTISON PROGRAM (P12)

REV 12

5-26-66

PURPOSE: (1) TO DISPLAY AGC CALCULATED TRAJECTORY PARAMETERS.
 (2) TO PREPARE G+N SYSTEM FOR POSSIBLE BOOST ABORT.

ASSUMPTIONS: (1) SCS IS IN MONITOR MODE.
 (2) ISS IS IN ATTITUDE CONTROL MODE.
 (3) THE CDUS ARE STILL UNDER THE CONTROL OF THE BOOST POLYNOMIALS STARTED IN PROGRAM 11. THIS CONTROL IS CONTINUED FOR THE FIRST 5 SECONDS OF THIS PROGRAM.
 (4) THE PROGRAM IS NORMALLY AUTOMATICALLY SELECTED BY THE BOOST MONITOR-PRE LET JETTISON PROGRAM (P 11)

PRUG CONT	AGC	GROUND	CREW	CHECKLIST	TIME	TOTAL TIME
ISS - ATT CONT MODE PRESENT						
SCS-G+N MONITOR PRESENT	<ul style="list-style-type: none"> • AGC PROG • SELECTION • • 					
----- START BOOST MONITOR- POST LET JETTISON PROGRAM (P 12)					#10	
DISPLAY PROGRAM 12			<ul style="list-style-type: none"> • ----- • MONITOR DSKY: • OBSERVE DISPLAY OF • PROGRAM 12 • ----- 	* I CHECK AGC DISPLAYS PROGRAM 12	
----- START MONITOR OF S1VB/CSM SEPARATION (ABORT) DISCRETE	<ul style="list-style-type: none"> • • • • 				#20	

UPON RECEIPT OF
SIVB/CSM SEPARATION
(ABORT) DISCRETE
FROM MSC GO
TO CSM ABORT-
FIRST ABORT BURN
PROGRAM (P 71). THE
MSC CONTROLS AN ABORT
SIVB/CSM SEPARATION
SEQUENCE. THIS
SEQUENCE MUST BE
INITIATED MANUALLY
BY THE CREW BY
TWISTING THE TRANS-
LATION CONTROL TO
THE ABORT POSITION
(CCW)

· ABORT
·
·

· TERMINATE
· DELTA V
· MONITOR
· ROUTINE
· (R 24)

·
·

· TERMINATE
· P 12 AND
· GO TO CSM
· ABORT-
· FIRST
· ABORT BURN
· PROGRAM
· (P 71)

·
·
·
·

· EXIT P12
·

SELECT SIVB
THRESHOLD FOR USE
BY DELTA V MONITOR
ROUTINE (R-24)

·
·
·
·

P 12

#30

#40

#50

#60

#70

#80

P 12

73

CALL DELTA V MONITOR
ROUTINE (R=24)

#90

DISPLAY ON DSKY:
V16 N41
R1 - G MAX
R2 - PERIGEE ALT
R3 - TFF

G MAX-MAX PRE-
DICTED G FOR
FREE FALL AND
ENTRY AT BANK
ANGLE OF
60 DEGREES
(L/D MAX=.34) IN
GS TO NEAREST
.01 G

PERIGEE ALT - ALTI
TUDE OF PERIGEE
ABOVE THE MEAN
EQUATORIAL
RADIUS. IN
NAUTICAL MILES
TO NEAREST .1 NM

TFF - TIME OF FREE
FALL TO 300,000
FT. ABOVE MEAN
EQUATORIAL
RADIUS. IN MIN.
AND SEC. TO
NEAREST SEC.
MAX READING IS
59 59. IF
PERIGEE ALT IS
GREATER THAN
300,000 FT THE
DISPLAY WILL
READ 59 59.

MONITOR DISPLAYS

(A) FDAI:
ATT ERRORS EQUAL
TO ZERO (ONLY
AFTER ISS IS IN
FINE ALIGN MODE
AFTER LET JET
+ 5 SEC)

ATT RATES LESS
THAN OR EQUAL TO
--DEGREES/SEC

BALL INDICATES
GRADUAL VEHICLE
PITCHOVER

(B) WINDOW:
OBSERVE VEHICLE
PITCHOVER W.R.T.
HORIZON

(C) DSKY:
R1 - G MAX LESS
THAN OR EQUAL TO
---G
R2-PERIGEE ALT
INCREASING
R3 - TFF GREATER
THAN OR EQUAL TO
---SEC.

* II MONITOR DISPLAYS

* 1. MONITOR FDAI

- A. ATTITUDE ERRORS EQUAL TO ZERO (ONLY AFTER ISS IN FINE ALIGN MODE AFTER LET JET + 5 SEC)
- B. ATTITUDE RATES LESS THAN--DEG/SEC
- C. ATTITUDE BALL INDICATES GRADUAL SC PITCHOVER

#100

* 2. MONITOR WINDOW
OBSERVE SC PTICHOVER W. R. T.
HORIZON

#110

* 3. MONITOR DSKY
V16 N41
R1-GMAX
R2-PERIGEE ALT
R3-TFF

G MAX-MAX PREDICTED G FOR
FREE FALL AND ENTRY AT BANK
ANGLE OF 60 DEGREES (L/D
MAX=.34). IN GS TO NEAREST
.01 G

#120

PERIGEE ALT-ALTITUDE
OF PERIGEE ABOVE THE MEAN
EQUATORIAL RADIUS. IN NAUT-
ICAL MILES TO NEAREST .1 NM

TFF - TIME OF FREE FALL TO
300,000 FT. ABOVE MEAN
EQUATORIAL RADIUS. IN MIN.
AND SEC TO NEAREST SEC. MAX
READING IS 59 59. IF
PERIGEE ALT IS GREATER THAN
300,000 FT THE DISPLAY WILL
READ 59 59.

#130

G MAX - SHOULD BE LESS THEN
--G

#140

PERIGEE ALT - SHOULD BE
INCREASING

TFF SHOULD BE GREATER THAN
--SEC.

#150

IS BOOST
SATISFACTORY

.Y .N

ISS ATT
CONT MODE
REMOVED

COMMAND ISS
TO FINE ALIGN MODE

ISS FINE
ALIGN MODE
PRESENT

#160

* NOTE:

IF BOOST IS UNSATISFACTORY AND
ABORT IS DESIRED TWIST TRANSLATION
CONTROL TO ABORT POSITION (CCW)
CHECK AGC DISPLAYS PROGRAM 71

#170

GO TO CSM ABORT
-FIRST ABORT
BURN PROGRAM
(P 71) BY TWIST-
ING TRANSLATION
CONTROL TO ABORT
POSITION (CCW)

#180

MONITOR DSKY AND
OBSERVE TERMINA-
TION OF P 12 AND
DISPLAY OF P 71

EXIT P 12

DELTA V MONITOR
ROUTINE (R-24)
DETECTS SHUTDOWN OF
SIVB

VERIFY SHUTDOWN OF
SIVB

* III VERIFY SHUTDOWN OF SIVB

#190

1. VERIFY L/V ENGINE - 1 LIGHT
ILLUMINATES

NOTE:

OCCURES AT APPROX 10 07

UPDATE ORBITAL
COMPUTATION

#200

FLASH VERB-NOUN TO
REQUEST PROCEED AND
DISPLAY:
HOLD

V16 N42
R1 - DELTA R
R2 - PERIGEE ALT
R3 - TFF

MONITOR DSKY:
OBSERVE VERB-NOUN
FLASH AND DISPLAY
OF:

R1 - DELTA R
VERY LARGE
R2 - PERIGEE ALT
SHOULD BE
GREATER THAN
80 NM.
R3 - TFF SHOULD
READ 59 59

* IV MONITOR DSKY:

1. CHECK AGC FLASHES VERB-NOUN TO
REQUEST PROCEED AND DISPLAYS:

#210

V16 N42
R1-DELTA R
R2-PERIGEE ALT
R3-TFF

DELTA R - MISS
DISTANCE ALONG
GROUND TRACK FROM
DISCRETE RECOVERY
AREA FOR FREE FAL
AND ENTRY. ASSUMES
UP LIFT EQUAL
TO .17 TIMES DRAG
AND NO OUT OF
PLANE FORCE DURING
ENTRY. POLARITY
INDICATES OVER-
SHOOT (+) OR
UNDERSHOOT (-) OF
RECOVERY AREA. IN
NAUTICAL MILES TO
NEAREST .1 NM.

DELTA R - MISS DISTANCE
ALONG GROUND TRACK FROM
DISCRETE RECOVERY AREA FOR
FREE FALL AND ENTRY.
ASSUMES UP LIFT EQUAL TO
.17 TIMES DRAG AND NO OUT
OF PLANE FORCE DURING ENTRY
POLARITY INDICATES OVER-
SHOOT (+) OR UNDERSHOOT (-)
OF RECOVERY AREA IN
NAUTICAL MILES TO M
NAUTICAL MILES TO NEAREST
.1 NM.

#220

DELTA R - SHOULD BE LARGE

#230

PERIGEE ALT-SHOULD BE
GREATER THAN 80 NM
TFF - SHOULD BE 59 59

WAIT FOR KEYBOARD
ENTRY

KEY IN PROCEED TO
TERMINATE DISPLAY
V 33 E

2. KEY IN PROCEED (V 33 E) TO
TERMINATE DISPLAY

#240

TERMINATE FLASH UPON
RECEIPT OF PROCEED

TRANSMIT
ORBITAL
INSERTION
CONFIRMATION
TO CREW

RECEIVE ORBITAL
INSERTION CONFIRMA-
TION FROM GROUND

* V RECEIVE ORBITAL INSERTION CON-
FIRMATION FROM GROUND

#250

* VI SET THE FOLLOWING SWITCHES:

- 1. EDS POWER - OFF
- 2. SPS INJECT PREVALVE A - OFF
- 3. SPS INJECT PREVALVE B - OFF
- 4. SPS GIMBAL MOTOR, PITCH 1-OFF
- 5. SPS GIMBAL MOTOR, PITCH 2-OFF
- 6. SPS GIMBAL MOTOR, YAW 1-OFF
- 7. SPS GIMBAL MOTOR, YAW 2-OFF

#260

- 8. SPS GIMBAL MOTOR CKT BKR:
1 PITCH 2 - BAT A - OPEN
1 YAW 2 - BAT A -OPEN

#270

DO ORBITAL PARAMETER
DISPLAY ROUTINE
(R 34)

DO ORBITAL PARAMETER
DISPLAY ROUTINE
(R 34)

* VII PERFORM ORBITAL PARAMETER DISPLAY
ROUTINE (R 34)

#280

* VIII

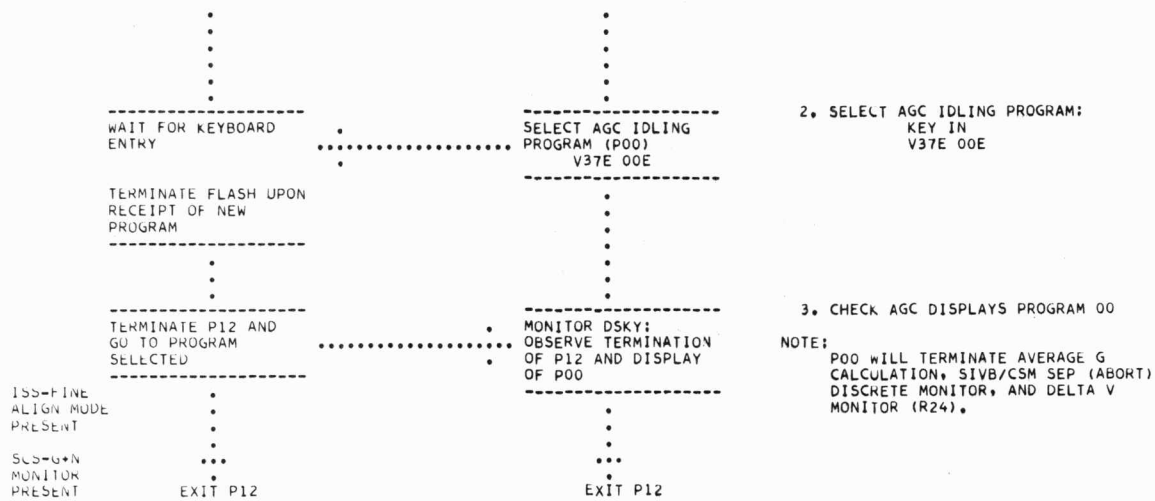
- 1. CHECK AGC FLASHES VERB-NOUN TO
REQUEST PLEASE PERFORM SELECTION OF
AGC IDLING PROGRAM (P00)
V50 N07
R1-00000

#290

FLASH VERB-NOUN
TO REQUEST PLEASE
PERFORM SELECTION
OF AGC IDLING PRO-
GRAM (P00)
V50 N07
R1-00000

MONITOR DSKY:
OBSERVE VERB-NOUN
FLASH TO REQUEST
PLEASE PERFORM
SELECTION OF P00

.....
HOLD



#300

#310

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

BOOST MONITOR - LET ABORT PROGRAM (P 17)

REV 7

5-25-66

PURPOSE: (1) TO PROVIDE AN INERTIAL REFERENCE FOR THE FDAI DURING LET ABORTS.
 (2) TO REDUCE THE G+N GENERATED ATTITUDE ERRORS TO THE FDAI AS THEY CANNOT BE GENERATED WITH ANY MEANING BY G+N DURING LET ABORTS.

ASSUMPTIONS: (1) AFTER LET ABORT THE CREW WILL CONTROL CM ATTITUDE USING THE ROTATION CONTROL AND THE FDAI BALL. THE ATTITUDE ERRORS ON THE FDAI WILL NOT BE VALID FOR ATTITUDE CONTROL.
 (2) THE PROGRAM IS NORMALLY AUTOMATICALLY SELECTED BY THE BOOST MONITOR-PRE JETTISON PROGRAM (P11) WHEN THE AGC RECEIVES THE CM/SM SEPARATION DISCRETE. THIS DISCRETE IS ORIGINATED BY THE MSC UPON RECEIPT OF A BOOST ABORT REQUEST FROM THE CREW OR FROM THE EMERGENCY DETECTION SYSTEM

PRG CONT	AGC	MESC	CREW	CHECKLIST	TIME	TOTAL TIME
ISS-ATT CONT MODE PRESENT						
SCS-G+N MONITOR PRESENT			<ul style="list-style-type: none"> • CREW PROG • SELECTION • ••• 			
-----	-----	-----	-----	* I INITIATE ABORT		
CM/SM SEPARATION DISCRETE MONITOR ESTABLISHED BY BOOST MONITOR-PRE LET JETTISON PROGRAM (P 11) WAITS FOR DISCRETE	START LES ABORT SEQU- ENCE	•••••	WHEN BOOST ABORT IS DESIRED TWIST TRANSLATION CONTROL TO ABORT POSITION (CCW)	1. WHEN ABORT IS INITIATED BY EDS OR WHEN BOOST ABORT IS DESIRED TWIST TRANSLATION CONTROL TO ABORT POSITION (CCW)		*10
	1. SEPARATE CM/SM		-----	2. SET REACTION CONTROL SYS C/M PRESS/OFF SW TO C/M PRESS		
	•••••	2. SEND CM/SM SEPARATION DISCRETE TO G+N		3. SET C/M-S/M SEP A AND B SWS TO UP		*20
	•••••	3. FIRE LET MOTOR	•••••			
-----	-----	-----	-----	* II VERIFY AUTOMATIC RESET OF DET		
•				NOTE:		
•						
•						
•						
•						
•						
•						
•						
•						
•						
•						
•						
•						

78

START BOOST MONITOR-
LET ABORT PROGRAM
(P 17)

IF DET NOT RESET TO ZERO AND
STARTED, SET DIGITAL EVENT TIMER-
RESET/UP/DOWN SW TO RESET THEN UP

* III OBSERVE LET MOTOR IGNITION #30

DISPLAY PROGRAM 17

MONITOR DSKY:
OBSERVE DISPLAY OF
PROGRAM 17

* IV CHECK AGC DISPLAYS PROGRAM 17 #40

COMMAND ISS TO FINE
ALIGN MODE

ISS FINE
ALIGN MODE
PRESENT

DISPLAY ON DSKY:
V16 N40
R1 - GAMMA
R2 - VI
R3 - H

MONITOR DSKY:
OBSERVE DISPLAY OF
GAMMA, VI AND H

* V CHECK AGC DISPLAYS: #50
V16 N40
R1-GAMMA
R2-VI
R3-H

GAMMA - INERTIAL
FLIGHT PATH ANGLE:
ANGLE BETWEEN
INERTIAL VELOCITY
AND THE LOCAL HOR-
IZONTAL. IN
DEGREES TO NEAR-
EST .01 DEGREE.

GAMMA - INERTIAL FLIGHT PATH ANGLE:
ANGLE BETWEEN INERTIAL VELOCITY
AND THE LOCAL HORIZONTAL. IN
DEGREES TO NEAREST .01 DEGREE.

VI - INERTIAL VEL-
OCITY. IN FT/SEC
TO NEAREST FT/SEC.

VI - INERTIAL VELOCITY. IN FT/SEC TO
NEAREST FT/SEC. #60

H - VEHICLE ALTITUDE
ABOVE THE LAUNCH
PAD. IN NAUTICAL
MILES TO NEAREST
.1 NM.

H - VEHICLE ALTITUDE ABOVE THE LAUNCH
PAD. IN NAUTICAL MILES TO NEAREST
.1 NM.

PROCEED WITH LET
ABORT PROCEDURES
USING FDAI BALL AS
AN ATTITUDE REFER-
ENCE AND MONITOR
DSKY AS DESIRED.

* VI WHEN CM PROPORTIONAL RATE CONTROL
IS DESIRED: #70

- 1. SET THE FOLLOWING SWITCH POSITION
- A. ATTITUDE/MONITOR/ENTRY - ENTRY

* VII PROCEED WITH LET ABORT PROCEDURES
USING FDAI BALL AS AN ATTITUDE
REFERENCE AND MONITOR DSKY AS
DESIRED #80

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•
•
UNDEFINED

CAUTION:

ATTITUDE ERROR INDICATORS WILL NOT
BE VALID FOR ATTITUDE CONTROL

P 17

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

COAST - LANDMARK TRACKING NAVIGATION MEASUREMENT PROGRAM (P22)

REV 14

6-16-66

PURPOSE

- (1) TO LOCATE AND TRACK A LANDMARK SUITABLE FOR NAVIGATION PURPOSES. THIS MAY BE DONE BY THE AGC WITH THE OPTICS AUTOMATICALLY POINTED AT A "KNOWN" (SEE ASSUMPTIONS BELOW) LANDMARK WHOSE LONGITUDE, LATITUDE, AND ALTITUDE HAVE BEEN KEYED INTO THE DSKY BY THE ASTRONAUT. IT MAY ALSO BE DONE BY THE ASTRONAUT WITH THE OPTICS MANUALLY POINTED AT A "KNOWN" LANDMARK PREDETERMINED BY THE ASTRONAUT OR A "KNOWN" OR "UNKNOWN" (SEE ASSUMPTIONS BELOW) LANDMARK SELECTED AT WILL DURING SEARCH FOR TARGETS OF OPPORTUNITY.
- (2) TO OBTAIN A SIGHTING MARK ON THE CHOSEN LANDMARK.
- (3) TO CALCULATE THE ORBITAL PARAMETER CHANGES GENERATED BY THE LANDMARK SIGHTING.
- (4) TO DISPLAY THE ORBITAL PARAMETER CHANGES GENERATED, FOR DECISION AS TO THEIR VALIDITY BY THE ASTRONAUT/GROUND BEFORE THEIR INCORPORATION INTO THE AGC CALCULATION OF SC POSITION AND VELOCITY.

ASSUMPTIONS:

- (1) THERE ARE TWO TYPES OF LANDMARK TRACKING METHODS:
 - (A) "KNOWN" LANDMARK TRACKING-THE TRACKING OF A LANDMARK IDENTIFIED TO THE AGC BY LATITUDE, LONGITUDE, AND ALTITUDE AFTER THE MARKS ARE COMPLETE.
 - (B) "UNKNOWN" LANDMARK TRACKING- THE TRACKING AND MARKING OF A LANDMARK OR SURFACE FEATURE IDENTIFIED TO THE AGC ONLY AS AN UNKNOWN LANDMARK.
- (2) DURING THIS PROGRAM THE G+N SYSTEM WILL HAVE NO RESPONSIBILITY FOR ATTITUDE CONTROL OF THE VEHICLE. POSSIBLE ATTITUDE CONTROL METHODS MIGHT BE AS FOLLOWS (IN ALL CASES CARE MUST BE TAKEN TO MONITOR POSSIBLE IMPENDING G+N GIMBAL LOCK).
 - (A) MANUAL CONTROL BY THE PILOT OR NAVIGATOR WITH THE ROTATION CONTROL.
 - (B) MANUAL RATE CONTROL BY THE NAVIGATOR WITH THE MINIMUM IMPULSE CONTROL.
- (3) THE PROGRAM MAY BE PERFORMED WITH SIVB ATTACHED IF THE SIVB IS IN A SUITABLE ATTITUDE FOR LANDMARK TRACKING. THE SIVB WILL BE CONTROLLING S/C ATTITUDE IN ONE OF TWO MODES:
 - (A) IMU ALIGNMENT MODE-THE CSM + Z AXIS IS POINTED AWAY FROM THE EARTH AND THE CSM + X AXIS IS ALONG THE LOCAL HORIZONTAL IN THE DIRECTION OF FLIGHT.
 - (B) LANDMARK TRACKING MODE-THE SIVB IS ROLLED 180 DEGREES AND PITCHED 20 DEGREES NOSE DOWN FROM THE IMU ALIGNMENT ATTITUDE TO ENABLE SIGHTING OF LANDMARKS. THE VEHICLE WILL NORMALLY BE IN THE IMU ALIGNMENT MODE WITH THE LANDMARK TRACKING MODE COMMANDED PERIODICALLY FOR A FIXED TIME BY THE SIVB ATTITUDE CONTROL SYSTEM.
- (4) THE G+N STARTUP AND CHECKOUT PROGRAM (P05) AND THE INFLIGHT ALIGNMENT-IMU ORIENTATION DETERMINATION PROGRAM (P51) MUST BE COMPLETED BEFORE THE COMPLETION OF THIS PROGRAM.

THE ISS MAY BE:

 - (A) OFF (STANDBY)
 - (B) ON, AND NOT ALIGNED SINCE TURN ON.
 - (C) ON AND AT AN INERTIAL ORIENTATION KNOWN ONLY INACCURATELY BY THE AGC, I.E. HAVING BEEN ALIGNED AT LEAST ONCE SINCE TURN ON BUT NOT WITHIN THE LAST 3* HOURS.

(D) ON AND AT AN INERTIAL ORIENTATION KNOWN ACCJURATELY BY THE AGC, I.E. HAVING BEEN ALIGNED WITHIN THE LAST 3 HOURS.

IF (A) IS TRUE AND P22 IS SELECTED, THE AGC WILL AUTOMATICALLY SELECT P05.
 IF (B) IS TRUE AND P22 IS SELECTED, THE AGC WILL AUTOMATICALLY SELECT P51.
 IF (C) IS TRUE THE AGC MAY OR MAY NOT HAVE A SATISFACTORY INERTIAL REFERENCE TO COMPLETE THE PROGRAM.
 IF (D) IS TRUE THE AGC HAS A SATISFACTORY INERTIAL REFERENCE.

(5) THE GROUND TRACK DETERMINATION PROGRAM P 24 IS AVAILABLE TO AID THE CREW IN THE SELECTION OF APPROPRIATE LANDMARKS PRIOR TO THE SELECTION OF P22 AND TO PROVIDE UPDATED GROUND TRACK INFORMATION AFTER THE COMPLETION OF P22.

(6) THE PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY.

* 25 MINUTES FOR UNKNOWN LANDMARK

PRUG CONT	AGC	GROUND	CREW	CHECKLIST	TIME	TOTAL TIME
--------------	-----	--------	------	-----------	------	---------------

* I CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT MDC IF SIVB NOT SEPARATED

PANEL 8

- | | |
|-----------------------------------|-----|
| 1. DIRECT RCS - OFF | |
| 2. LIMIT CYCLE - OFF | #10 |
| 3. ATTITUDE DEADBAND - MAX | |
| 4. .05G ENTRY - OFF | |
| 5. LOCAL VERTICAL - OFF | |
| 6. DELTA V - OFF | #20 |
| 7. G+N/SCS - SCS | |
| 8. ATTITUDE/MONITOR/ENTRY-MONITOR | |
| 9. A+C ROLL CHANNEL - OFF | |
| 10. B+D ROLL CHANNEL - OFF | |
| 11. PITCH CHANNEL - OFF | #30 |
| 12. YAW CHANNEL - OFF | |

- 13. ROLL RATE GYRO - BMAG
- 14. PITCH RATE GYRO - BMAG
- 15. YAW RATE GYRO - BMAG

PANEL 25

#40

- 1. FDAI LTG - AC1
(OPTIONAL - FOR FDAI CHECK OF
GIMBAL ANGLES)
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED
- 5. GROUP 2-AC2 - CLOSED
- 6. GROUP 1-MNA - CLOSED
- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED
- 9. GROUP 2-MNB - CLOSED
- 10. DIRECT CONTROL-MNA - CLOSED
- 11. DIRECT CONTROL-MNB - CLOSED
- 12. A&C ROLL-MNA - CLOSED
- 13. A&C ROLL-MNB - CLOSED
- 14. B&D ROLL-MNA - CLOSED
- 15. B&D ROLL-MNB - CLOSED
- 16. PITCH-MNA - CLOSED
- 17. PITCH-MNB - CLOSED
- 18. YAW-MNA - CLOSED
- 19. YAW-MNB - CLOSED
- 20. G&N SYNC - OFF
- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED

#50

#60

#70

#80

23. GIMBAL MOTOR CONTROL 1 PITCH 2
BAT A - OPEN #90

24. GIMBAL MOTOR CONTROL 1 PITCH 2
BAT B - OPEN

25. GIMBAL MOTOR CONTROL 1 YAW 2
BAT A - OPEN

26. GIMBAL MOTOR CONTROL 1 YAW 2
BAT B - OPEN #100

MISCELLANEOUS

1. TRANSLATION CONTROLS - LOCKED
2. ROTATION CONTROLS - PINNED

PANEL 6 #110

1. ATTITUDE SET - OFF

PANEL 7

1. NORMAL/OFF/DIRECT ON - OFF #120

PANEL 2

1. FDAI SELF TEST - OFF
2. FDAI BRIGHTNESS - SET
3. FCSM - AUTO/OVERRIDE - OVERRIDE
4. FCSM - ON/OFF/RESET - OFF #130

PANEL 24

1. SCS POWER - AC1
(OPTIONAL - FOR FDAI CHECK OF
GIMBAL ANGLES) #140
2. RATE GYRO POWER - AC1
3. BMAG POWER - AC2

- 4. ROTATION CONTROL POWER - AC2
- 5. TVC 1 POWER - OFF
- 6. TVC 2 POWER - OFF

#150

PANEL 3

- 1. PITCH GIMBAL MOTOR 1 - OFF
- 2. PITCH GIMBAL MOTOR 2 - OFF
- 3. YAW GIMBAL MOTOR 1 - OFF
- 4. YAW GIMBAL MOTOR 2 - OFF
- 5. INJECT PREVALVE A - OFF
- 6. INJECT PREVALVE B - OFF

#160

PANEL 14

- 1. UPTL - BLOCK
- 2. DSKY BRIGHTNESS - SET

#170

PANEL 22

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED
- 3. IMU-MNA - CLOSED
- 4. IMU-MNB - CLOSED
- 5. COMPUTER-MNA - CLOSED
- 6. COMPUTER-MNB - CLOSED
- 7. OPTICS-MNA - CLOSED
- 8. OPTICS-MNB - CLOSED
- 9. AC POWER-AC1 - CLOSED
- 10. AC POWER-AC2 - CLOSED
- 11. G+N - AC POWER - AC1

#180

#190

#200

*II. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT MDC IF SIVB SEPARATED

PANEL 8

- 1. DIRECT RCS - OFF #210
- 2. LIMIT CYCLE - ON
- 3. ATTITUDE DEADBAND - MAX
- 4. .05G ENTRY - OFF
- 5. LOCAL VERTICAL - OFF
- 6. DELTA V - OFF
- 7. G+N/SCS - SCS #220
- 8. ATTITUDE/MONITOR/ENTRY-ATTITUDE
- 9. A+C ROLL CHANNEL - ONE OFF, ONE ON (SWITCH FOR FULLEST QUAD LEFT ON)
- 10. B+D ROLL CHANNEL - ONE OFF, ONE ON (SWITCH FOR FULLEST QUAD LEFT ON) #230
- 11. PITCH CHANNEL - ON
- 12. YAW CHANNEL - ON
- 13. ROLL RATE GYRO - NORMAL
- 14. PITCH RATE GYRO - BMAG
- 15. YAW RATE GYRO - NORMAL #240

PANEL 25

- 1. FDAI LTG - AC1
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED #250
- 5. GROUP 2-AC2 - CLOSED
- 6. GROUP 1-MNA - CLOSED

86

- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED
- 9. GROUP 2-MNB - CLOSED #260
- 10. DIRECT CONTROL-MNA - CLOSED
- 11. DIRECT CONTROL-MNB - CLOSED
- 12. A+C ROLL-MNA - ONE CLOSED FOR FULLEST QUAD, OTHERS OPEN
- 13. A+C ROLL-MNB - ONE CLOSED FOR FULLEST QUAD, OTHERS OPEN #270
- 14. B+D ROLL-MNA - ONE CLOSED FOR FULLEST QUAD, OTHERS OPEN
- 15. B+D ROLL-MNB - ONE CLOSED FOR FULLEST QUAD, OTHERS OPEN
 - A. QUAD - A+C MNA
 - B. QUAD - B+D MNA
 - C. QUAD - A+C MNB
 - D. QUAD - B+D MNB
 #280
- 16. PITCH-MNA - ONE OPEN, ONE CLOSED
- 17. PITCH-MNB - ONE OPEN, ONE CLOSED
- 18. YAW-MNA - ONE OPEN, ONE CLOSED
- 19. YAW-MNB - ONE OPEN, ONE CLOSED
- 20. G&N SYNC - OFF #290
- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED
- 23. GIMBAL MOTOR CONTROL 1 PITCH 2
BAT A - OPEN
- 24. GIMBAL MOTOR CONTROL 1 PITCH 2 #300
BAT B - OPEN
- 25. GIMBAL MOTOR CONTROL 1 YAW 2
BAT A - OPEN
- 26. GIMBAL MOTOR CONTROL 1 YAW 2
BAT B - OPEN
- MISCELLANEOUS #310

- 1. TRANSLATION CONTROLS - LOCKED
- 2. ROTATION CONTROLS - UNPINNED

PANEL 6

- 1. ATTITUDE SET - OFF

#320

PANEL 7

- 1. NORMAL/OFF/DIRECT ON - OFF

PANEL 2

- 1. FDAI SELF TEST - OFF
- 2. FDAI BRIGHTNESS - SET
- 3. FCSM - AUTO/OVERRIDE - OVERRIDE
- 4. FCSM - ON/OFF/RESET - OFF

#330

#340

PANEL 24

- 1. SCS POWER - AC1
- 2. RATE GYRO POWER - AC1
- 3. BMAG POWER - AC2
- 4. ROTATION CONTROL POWER - AC2
- 5. TVC 1 POWER - OFF
- 6. TVC 2 POWER - OFF

#350

PANEL 3

- 1. PITCH GIMBAL MOTOR 1 - OFF
- 2. PITCH GIMBAL MOTOR 2 - OFF
- 3. YAW GIMBAL MOTOR 1 - OFF
- 4. YAW GIMBAL MOTOR 2 - OFF

#360

- 5. INJECT PREVALVE A - OFF #370
- 6. INJECT PREVALVE B - OFF

PANEL 14

- 1. UPTL - BLOCK
- 2. DSKY BRIGHTNESS - SET #380

PANEL 22

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED
- 3. IMU-MNA - CLOSED #390
- 4. IMU-MNB - CLOSED
- 5. COMPUTER-MNA - CLOSED
- 6. COMPUTER-MNB - CLOSED
- 7. OPTICS-MNA - CLOSED
- 8. OPTICS-MNB - CLOSED
- 9. AC POWER-AC1 - CLOSED #400
- 10. AC POWER-AC2 - CLOSED
- 11. G+N-AC POWER - AC1

*III. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT NAV STATION #410

- 1. FLOODLIGHT CONTROL PRIMARY - SET
- 2. FLOODLIGHT CONTROL SECONDARY - SET
- 3. IMU TRANSFER - COMPUTER
- 4. OPTICS SLAVE TELESCOPE - STAR LOS
- 5. OPTICS MODE - ZERO OPTICS #420
- 6. OPTICS HOLD - OFF

- 7. OPTICS CONTROLLER SPEED - HI
- 8. OPTICS CONTROLLER MODE - DIRECT
- 9. PANEL BRIGHTNESS CONTROL - SET
- 10. IMU TEMP. MODE - AUTO OVERRIDE #430
- 11. ATTITUDE IMPULSE ENABLE - OFF
- 12. CONDITION LAMPS - ON
- 13. AGC MODE - ON
- 14. AGC BRIGHTNESS CONTROL - SET

#440

SCS-SCS
MONITOR
PRESENT (IF SIVB NOT SEPARATED)

SCS-SCS
ATTITUDE
PRESENT (IF SIVB SEPARATED)

ISS-FINE
ALIGN MODE
PRESENT

• CREW PROG.
• SELECTION
•••

#450

IS PROGRAM ALLOWED

•Y •N

KEY IN LANDMARK
TRACKING NAVIGATION
MEASUREMENT PROGRAM
(P22)
V 37 E 22 E

* IV SELECT AGC PROGRAM FOR LANDMARK
TRACKING NAV. MEASUREMENT SELECT
PROGRAM AT AN APPROPRIATE TIME
PRIOR TO DESIRED LANDMARK
ACQUISITION.

- 1. ENTER LANDMARK TRACKING NAV.
MEASUREMENT PROGRAM (P22)
V37E 22E

#460

COMMAND CHECK
FAIL ALARM

OBSERVE CHECK FAIL
LIGHT ON

NOTE:

POSSIBLE CHECK FAIL. IF PRESENT
PROGRAM DOES NOT ALLOW SELECTION
OF P22 THE CHECK FAIL LIGHT WILL
ILLIMINATE AND THE OLD PROGRAM
DISPLAY WILL REMAIN

RESET CHECK
FAIL ALARM

PRESS ALARM RESET TO
TURN OFF CHECK FAIL
LIGHT

OBSERVE:

CHECK FAIL LIGHT ON (LEB)
PGNS LIGHT ON (LEB)
COMP FAIL LIGHT ON (MDC)

#470

GO TO BACKUP PROCEDURES AND SELECT
A PROGRAM WHICH IS ALLOWED

EXIT P22

TERMINATE P22
AND GO TO IMU
ORIENTATION
DETERMINATION
PROGRAM (P51)

MONITOR DSKY;
OBSERVE TERMINATION
OF P22 AND DISPLAY
OF P51

NOTE:

IF IMU HAS NOT BEEN ALIGNED SINCE
TURN ON, AGC WILL DISPLAY P51. AFTER
P51 AGC RETURNS TO P00, CREW THEN
RESELECTS P22.

#540

EXIT P22

EXIT P22

#550

HOLD FLASH VERB-NOUN TO
REQUEST PLEASE
PERFORM SELECTION OF
P53

V50N07
R1-00053

MONITOR DSKY;
OBSERVE VERB-NOUN
FLASH FOR PLEASE
PERFORM SELECTION OF
P53

* V CHECK AGC FLASHES VERB-NOUN TO
REQUEST PLEASE PERFORM SELECTION OF
P53

V50 N07
R1-00053

#560

HAS THE ISS BEEN
ALIGNED WITHIN THE
LAST 3 HOURS?

.N .Y
.....

NOTE:

IF THE IMU HAS NOT BEEN ALIGNED IN
THE PAST 3 HRS, AND/OR THE
POSSIBILITY OF GIMBAL LOCK EXISTS
THE CREW/GROUND MUST DECIDE IF
REALIGNMENT CAN BE BYPASSED

#570

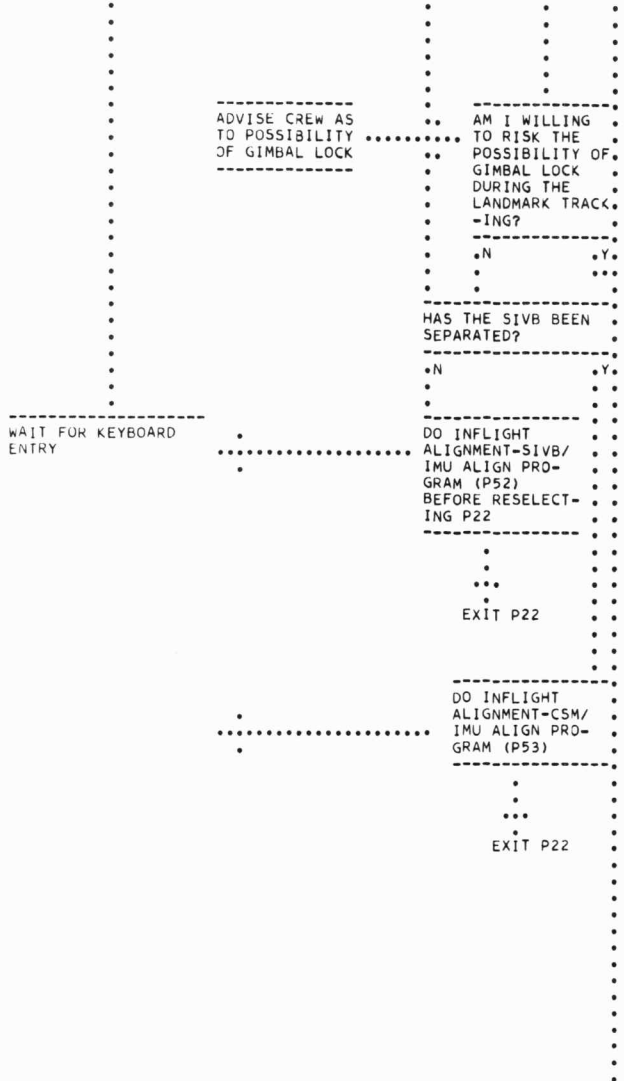
ADVISE CREW AS
TO ANTICI-
PATED G+N
ERRORS AND
SUBSEQUENT
PROCEDURES.

SHALL I ATTEMPT TO
BYPASS IMU
ALIGNMENT

.N .Y
.....

1. IF IMU IS NOT SATISFACOTRILY
ALIGNED SELECT P53 (IF SIVB
SEPARATED) OR P52 (IF SIVB NOT
SEPARATED) AFTER P53, AGC RETURNS
TO P22, AFTER P52, AGC RETURNS TO

#580



P00 AND CREW MUST RESELECT P22.

P 22

#590

#600

#610

#620

#630

P 22

TERMINATE FLASH UPON
RECEIPT OF PROCEED
OR NEW PROGRAM

KEY IN PROCEED
V33E

.P .NEW
.R .PROG
.D .
.C .
.E EXIT P22
.E .
.D .
. .

COMMAND ISS
TO FINE ALIGN MODE.

OBSERVE ISS
SWITCH TO FINE ALIGN
MODE.

ISS FINE
ALIGN MODE
PRESENT

ESTABLISH ATTITUDE
CONTROL OF THE
VEHICLE BY SOME
MEANS OTHER THAN G&N

2. IF IMU IS SATISFACTORILY ALIGNED;
KEY IN PROCEED
V33E

#640

* VI CHECK FINE ALIGN MODE LIGHT ON.

#650

* VII ESTABLISH ATTITUDE CONTROL OF THE
VEHICLE

1. IF SIVB SEPARATED, PIOLET OR NAV.
USES ROTATION CONTROL TO MANEUVER

#660

S/C TO POINT OPTICS SHAFT AXIS
AT LANDMARK TARGET AREA. MINIMUM
IMPULSE CONTROL CAN BE ENABLED AND
USED BY NAV. TO CONTROL FINAL
S/C RATES.

* VIII IDENTIFY KNOWN LANDMARK ON
APPHOPRIATE LANDMARK CHART

* IX PERFORM AGC ASSISTED OR MANUAL
ACQUISITION OF THE LANDMARK

#670

FLASH VERB-NOUN TO
REQUEST PLEASE PER-
FORM AUTO OPTICS
POSITIONING:
V50 N25
R1 - 00011

MONITOR DSKY!
OBSERVE VERB-NOUN
FLASH TO REQUEST
PLEASE PERFORM
AUTO OPTICS
POSITIONING

HOLD

DO I WISH TO POSIT-
ION OPTICS AUTO-
MATICALLY?

#680

* 1. CHECK AGC FLASHES VERB-NOUN TO
REQUEST PLEASE PERFORM AUTO OPTICS
POSITIONING:
V50 N25
R1-00011

.....

.....

.....
GO TO
SIGHTING
MARK
ROUTINE
(R27)
BELOW

P 22

#750

DO I WISH TO
CONTINUE
EFFORT TO
TRACK A LAND-
MARK

.....
Y N
.....

#760

SELECT
NEW PRO-
GRAM AS
DESIRED

#770

.....
EXIT P22

DO AUTO OPTICS
POSITIONING ROUTINE
(R 28)

DO AUTO OPTICS
POSITIONING ROUTINE
(R 28)

* 2. PERFORM AUTO OPTICS POSITIONING
ROUTINE (R28) FOR AGC ASSISTED
LANDMARK ACQUISITION OR PROCEED TO

#780

(SEE ABOVE)

#790

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.....
.....
.....
.....
.....
.....
.....
.....

P 22

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. .
. .
. .
. .
-----
SET TARGET FLAG TO
LANDMARK FOR USE BY
SIGHTING MARK
ROUTINE (R27)
-----
.

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#800

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-----
SET MARK INDEX TO 5
FOR USE BY THE SIGHT-
ING MARK ROUTINE
(R27)
-----
.

```

(SEE ABOVE)

#810

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-----
DO SIGHTING MARK
ROUTINE (R 27)
-----
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-----
DO SIGHTING MARK
ROUTINE (R 27)
-----
.

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* 3. PERFORM SIGHTING MARK ROUTINE (R27)

#820

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-----
IS OPTICS POINTING
COMPUTATION IN
PROCESS?
-----
.Y .N

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-----
TERMINATE
COMPUTATION.
-----
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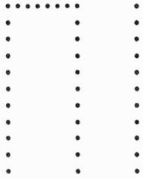
#830

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-----
SELECT FIRST SIGHT-
ING MARK DATA
-----
.

```

#840



97

. . .
. . .
. . .
. . .
. . .

CALCULATE ORBITAL
PARAMETER CHANGES AS
A RESULT OF THIS
LANDMARK SIGHTING
MARK.

#850

. . .
. . .
. . .

FLASH VERB-NOUN TO
REQUEST PROCEED AND
DISPLAY ORBITAL
PARAMETER CHANGES:
V06 N75
R1 - DELTA R
R2 - DELTA V
R3 - MULT MARK CTR

HOLD

. . .
DELTA R - MAGNITUDE
OF THE DIFFERENCE
BETWEEN THE POSI-
TION STATE VECTOR
BEFORE AND AFTER
INCORPORATION OF
THE LANDMARK
SIGHTING DATA.
IN N.M. TO NEAREST
0.1 N.M.

. . .
DELTA V - MAGNITUDE
OF THE DIFFERENCE
BETWEEN THE VELO-
CITY STATE VECTOR
BEFORE AND AFTER
INCORPORATION OF
THE LANDMARK
SIGHTING DATA.
IN FT/SEC TO
NEAREST FT/SEC

. . .
MULT MARK CTR -
FIRST AND SECOND
CHARACTERS - ZERO
THIRD CHARACTER -
DESIGNATES IF THIS
IS 1ST OR 2ND
DATA DISPLAY FOR
MARK BEING PRO-
CESSED

MONITOR DSKY:
OBSERVE VERB-NOUN
FLASH AND DISPLAY OF
ORBITAL PARAMETER
CHANGES

* X

CHECK AGC FLASHES VERB-NOUN TO RE-
QUEST PROCEED AND DISPLAYS ORBITAL
PARAMETER CHANGES.

V06 N75
R1 - DELTA R
R2 - DELTA V
R3 - MULT MARK CTR

#860

. . .
DELTA R - MAGNITUDE OF THE
DIFFERENCE BETWEEN THE
POSITION STATE VECTOR
BEFORE AND AFTER INCORPORA-
TION OF THE LANDMARK
SIGHTING DATA. IN N.M. TO
NEAREST 0.1 NM.

#870

. . .
DELTA V - MAGNITUDE OF THE
DIFFERENCE BETWEEN THE
VELOCITY STATE VECTOR
BEFORE AND AFTER THE INCOR-
PORATION OF THE LANDMARK
SIGHTING DATA. IN FT/SEC TO
NEAREST FT/SEC.

. . .
MULT MARK CTR -
FIRST AND SECOND CHARAC-
TERS - ZERO
THIRD CHARACTER - DESIG-
NATES IF THIS IS 1ST OR 2ND
DATA DISPLAY FOR MARK BEING
PROCESSED
FOURTH CHARACTER - DESIG-
NATES THE NUMBER OF THE
MARK NOW BEING PROCESSED
FIFTH CHARACTER - DESIG-
NATES HOW MANY MARKS WERE
MADE IN THIS SEQUENCE

#880

#890

FOURTH CHARACTER-
DESIGNATES THE
NUMBER OF THE
MARK NOW BEING
PROCESSED
FIFTH CHARACTER-
DESIGNATES HOW
MANY MARKS WERE
MADE IN THIS
SEQUENCE

WAIT FOR DSKY ENTRY

TERMINATE FLASH UPON
RECEIPT OF PROCEED
OR TERMINATE

•P T.
•R E.
•O R.
•C M.
•E
•E
•D

UPDATE AGC DETER-
MINATION OF
POSITION AND
VELOCITY

ARE ORBITAL
PARAMETER CHANGES
ACCEPTABLE FOR IN-
SERTION INTO AGC
CALCULATION OF
POSITION AND
VELOCITY

•Y N.
•
•

KEY IN PROCEED
V 33 E

KEY IN TERMINATE
V34 E

- * 1. NAV ACCEPTS DATA FOR UPDATE OF
POSITION AND VELOCITY IN AGC:
KEY IN PROCEED
V33E
- * 2. NAV REJECTS DATA:
KEY IN TERMINATE
V34E

NOTE:
IF THE LANDMARK WAS A "KNOWN"
LANDMARK THE AGC WILL DISPLAY DELTA
P AND DELTA V TWICE FOR EACH OF THE
FIRST FIVE MARKS (UNREJECTED MARKS)
"UNKNOWN" LANDMARK THE AGC WILL

#900

#910

#920

#930

#940

P 22

DISPLAY DELTA P AND DELTA V ONCE FOR THE FIRST TWO MARKS (UNREJECTED MARKS). THE NAV MUST ACCEPT OR REJECT THE DATA IN EACH DISPLAY.

#950

IS THIS A "KNOWN" LANDMARK

Y N

HAVE THE ORBITAL PARAMETER CHANGES BEEN COMPUTED TWICE FOR THIS MARK

N Y

HAVE ALL THE MARKS BEEN PROCESSED

N Y

SELECT THE DATA FROM THE NEXT SIGHTING MARK

#960

#970

#980

TERMINATE P22 AND GO TO AGC IDLING PROGRAM (P 00)

MONITOR DSKY: OBSERVE TERMINATION OF P 22 AND DISPLAY OF P 00

#990

* XI CHECK AGC DISPLAYS PROGRAM 00

ISS-FINE ALIGN MODE PRESENT

SCS-SCS MONITOR OR ATTITUDE PRESENT

EXIT P 22

EXIT P 22

#1000

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

COAST-STAR-LANDMARK NAVIGATION MEASUREMENT PROGRAM (P23)

REV 11

6/16/66

PURPOSE: (1) TO OBTAIN THE ANGLE BETWEEN A NAVIGATION STAR AND AN EARTH/LUNAR LANDMARK OR THE EARTH/LUNAR HORIZON FOR NAVIGATION PURPOSES. FOR MISSION 204 THIS PROGRAM WILL BE AN ABBREVIATED SEQUENCE FOR EXPERIMENTAL ANALYSIS ONLY. IT WILL BE DONE ONLY FOR THE STAR/LUNAR HORIZON CASE OR THE STAR/LUNAR LANDMARK CASE.

ASSUMPTIONS: (1) THIS PROGRAM DOES NOT REQUIRE THAT THE ISS BE ON.
 (2) THE VEHICLE POSITION, TIME OF MARKS, AND THE OPTICS ANGLES WILL BE ON THE AGC DOWNLINK. IF THE PROGRAM IS NOT CONDUCTED OVER A GROUND STATION THE NAV MUST RECORD THE OPTICS ANGLES AND TIME FOR EACH MARK.
 (3) THE PROGRAM MAKES NO PROVISION FOR VEHICLE ATTITUDE CONTROL AND IS INDEPENDENT OF THE METHOD USED.
 (4) THE PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY.

PRUG
CONT

AGC

GROUND

CREW

CHECKLIST

TIME

TOTAL
TIME

*1. CONFIRM OR SELECT FOLLOWING POSITIONS
AT MDC

PANEL 8

- | | |
|------------------------------------|-----|
| 1. DIRECT RCS - OFF | |
| 2. LIMIT CYCLE - ON | #10 |
| 3. ATTITUDE DEADBAND - MAX | |
| 4. .05G ENTRY - OFF | |
| 5. LOCAL VERTICAL - OFF | |
| 6. DELTA V - OFF | |
| 7. G+N/SCS - SCS | #20 |
| 8. ATTITUDE/MONITOR/ENTRY-ATTITUDE | |
| 9. A6C ROLL CHANNEL - ON | |
| 10. B6D ROLL CHANNEL - ON | |
| 11. PITCH CHANNEL - ON | |

P 23

- 12. YAW CHANNEL - ON #30
- 13. ROLL RATE GYRO - NORMAL
- 14. PITCH RATE GYRO - NORMAL
- 15. YAW RATE GYRO - NORMAL

PANEL 25 #40

- 1. FDAI LTG - OFF
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED
- 5. GROUP 2-AC2 - CLOSED #50
- 6. GROUP 1-MNA - CLOSED
- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED
- 9. GROUP 2-MNB - CLOSED
- 10. DIRECT CONTROL-MNA - CLOSED #60
- 11. DIRECT CONTROL-MNB - CLOSED
- 12. A&C ROLL-MNA - CLOSED
- 13. A&C ROLL-MNB - CLOSED
- 14. B&D ROLL-MNA - CLOSED
- 15. B&D ROLL-MNB - CLOSED #70
- 16. PITCH-MNA - CLOSED
- 17. PITCH-MNB - CLOSED
- 18. YAW-MNA - CLOSED
- 19. YAW-MNB - CLOSED
- 20. G6N SYNC - OFF #80
- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED

102

- 23. GIMBAL MOTOR CONTROL PITCH 1
BAT A - CLOSED
- 24. GIMBAL MOTOR CONTROL PITCH 2
BAT B - CLOSED #90
- 25. GIMBAL MOTOR CONTROL YAW 1
BAT A - CLOSED
- 26. GIMBAL MOTOR CONTROL YAW 2
BAT B - CLOSED

- MISCELLANEOUS #100
- 1. TRANSLATION CONTROLS - LOCKED
 - 2. ROTATION CONTROLS - UNPINNED

- PANEL 6
- 1. ATTITUDE SET - OFF #110

- PANEL 7
- 1. NORMAL/OFF/DIRECT ON - OFF

- PANEL 2 #120
- 1. FDAI SELF TEST - OFF
 - 2. FDAI BRIGHTNESS - OFF
 - 3. FCSM - AUTO/OVERRIDE - OVERRIDE
 - 4. FCSM - ON/OFF/RESET - OFF

- PANEL 2* #130
- 1. SCS POWER - AC1 OR AC2
 - 2. RATE GYRO POWER - AC1 OR AC2
 - 3. BMAU POWER - OFF
 - 4. ROTATION CONTROL POWER-AC1 OR AC2 #140

- 5. TVC 1 POWER - OFF
- 6. TVC 2 POWER - OFF

PANEL 3

- 1. PITCH GIMBAL MOTOR 1 - OFF #150
- 2. PITCH GIMBAL MOTOR 2 - OFF
- 3. YAW GIMBAL MOTOR 1 - OFF
- 4. YAW GIMBAL MOTOR 2 - OFF
- 5. INJECT PREVALVE A - OFF
- 6. INJECT PREVALVE B - OFF #160

PANEL 14

- 1. UPTL - BLOCK
- 2. DSKY BRIGHTNESS - SET

#170

PANEL 22

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED
- 3. IMU-MNA - OPEN
- 4. IMU-MNB - OPEN #180
- 5. COMPUTER-MNA - CLOSED
- 6. COMPUTER-MNB - CLOSED
- 7. OPTICS-MNA - CLOSED
- 8. OPTICS-MNB - CLOSED
- 9. AC POWER-AC1 - CLOSED #190
- 10. AC POWER-AC2 - CLOSED
- 11. G+N-AC POWER - AC1

OSS ZERO
OPT MODE
REMOVED

WAIT FOR MARK

PERFORM SIGHTING
MARK

LANDMARK IN THE TELESCOPE

* V. ACQUIRE TARGET STAR IN SEXTANT FOV

1. SELECT STAR CHART WHICH CONTAINS A TARGET STAR USEABLE WITH THE SELECTED LANDMARK. IDENTIFY TARGET STAR ON STAR CHART AND NOTE CODE NUMBER. #310
2. PLACE OPTICS MODE SWITCH IN MANUAL
3. CENTER STAR IN TELESCOPE FOV
 - A. CENTER STAR IN SCT FOV WITH OPTICS CONTROLLER BY FIRST DRIVING SHAFT AXIS TO PLACE STAR ON R LINE AND THEN DRIVING TRUNNION AXIS TO CENTER THE STAR. USE LO OR MED OPTICS SPEED AND RESOLVED MODE FOR FINAL CENTERING AS REQUIRED. #320
 - B. IF STAR IS OUTSIDE OF 60 DEGREES FOV, PLACE THE TELESCOPE SLAVE SWITCH IN OFFSET 25 DEGREES AND DRIVE SHAFT AXIS TO PLACE STAR ON R LINE. RETURN TO STAR LOS POSITION AND DRIVE TRUNNION AXIS TO CENTER THE STAR. USE LO OR MED OPTICS SPEED AND RESOLVED MODE FOR FINAL CENTERING AS REQUIRED. #330

* VI. PERFORM SIGHTING MARK

1. CHECK LANDMARK AND TARGET STAR ARE IN SEXTANT FOV. #340
2. PLACE OPTICS CONTROLLER MODE SWITCH AT RESOLVED POSITION TARGETS NEAR CENTER OF FOV OR ON THE R LINE TO MINIMIZE SIGHTING ERROR.

NOTE:

IF DESIRED ENABLE MINIMUM IMPULSE CONTROLLER AND USE CONTROLLER TO CONTROL SPACECRAFT DRIFT RATE AND TO POSITION LANDMARK NEAR CENTER OF FOV.

4. PRESS MARK BUTTON

T MARK-TIME OF MARK
(GET). IN HRS. MIN
AND SEC TO NEAREST
.01 SEC.

.....
.....
.....
.....

WAIT FOR KEYBOARD
ENTRY
TERMINATE FLASH
UPON RECEIPT OF
PROCEED

.....
.....

TERMINATE P23 AND GO
TO AGC IDLING (P00)

.....
.....
.....

EXIT P23

SCS-SCS
ATTITUDE
PRESENT

.....
.....
.....

COORDINATE RECEIPT
OF THIS DATA BY THE
GROUND
IS DATA ACKNOWLEDGED

N. Y.
.....
.....

RECORD DISPLAY
DATA IN FLIGHT
DATA BOOK

.....
.....

KEY IN PROCEED
V 33 E

.....

MONITOR DSKY!
OBSERVE TERMINATION
OF P23 AND DISPLAY
OF P00

.....
.....
.....

EXIT P23

T MARK - THE TIME OF MARK
(GET). IN HRS. MIN AND SEC
TO NEAREST .01 SEC.

#410

* X COORDINATE DATA WITH MSFN

- 1. CHECK WITH MSEN TO CONFIRM RECEIPT
OF DATA. IF GROUND DOES NOT
ACKNOWLEDGE DSTA RECORD IN FLIGHT
DATA BOOK

#420

- 2. KEY IN PROCEED
V33E

#430

* XI CHECK AGC DISPLAYS PROGRAM 00

#440

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

COAST - GROUND TRACK DETERMINATION PROGRAM (P 24)

REV 4

6/16/66

PURPOSE: (1) TO PROVIDE THE ASTRONAUT DETAILS OF HIS GROUND TRACK WITHOUT THE NEED FOR GROUND COMMUNICATION.

ASSUMPTIONS: (1) THE PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY.
 (2) THIS PROGRAM CAN ONLY BE ENTERED FROM PROGRAM 00

PRUG CONT	AGC	GROUND	CREW	CHECKLIST	TIME	TOTAL TIME
			*CREW *PROGRAM *SELECTION * * * ----- SELECT THE DESIRED DATA DISPLAY FROM THE FOLLOWING:		#10	
			1-ASTRONAUT PROVIDES LONGITUDE AND EARLI- EST PERMISSIBLE TIME FOR NEXT ARRIVAL AT THAT LONGITUDE, AGC PROVIDES TIME OF NEXT ARRIVAL AT THAT LONGITUDE WITHIN THE ABOVE CONSTRAINT		#20	
			2-ASTRONAUT PROVIDES TIME, AGC PROVIDES LATITUDE, LONGITUDE AND ALTITUDE OF VEHICLE POSITION AT THAT TIME.			

3-ASTRONAUT PROVIDES
EARLIEST PERMISS-
IBLE TIME OF ORBIT
MAXIMUM DECLINATION,
AGC PROVIDES NEXT
MAXIMUM DECLINATION
OF ORBIT AND TIME OF
NEXT ARRIVAL AT THAT
MAXIMUM WITHIN THE
ABOVE CONSTRAINT.

#30

(1) (2) (3)

#40

IS PROGRAM ALLOWED?

KEY IN V65E
KEY IN V66E
KEY IN V67E

- * 1. SELECT DESIRED DATA DISPLAY:
- A. TIME OF ARRIVAL AT A SPECIFIED LONG
- OR B. LAT=LONG AND ALTITUDE OF SC AT A SPECIFIED TIME
- OR C. MAX DEC OF ORBIT AND TIME TO NEXT MAX DEC OF ORBIT

#50

Y. N.

#60

COMMAND CHECK
FAIL ALARM

OBSERVE CHECK
FAIL LIGHT ON

NOTE:
POSSIBLE CHECK FAIL. IF PRESENT PROGRAM DOES NOT ALLOW SELECTION OF P24 (ENTRY OF V65, V66 OR V67) THE CHECK FAIL LIGHT WILL ILLUMINATE AND THE OLD PROGRAM DISPLAY WILL REMAIN

#70

RESET CHECK
FAIL ALARM

PRESS ALARM RESET
TO TURN OFF CHECK
FAIL LIGHT

OBSERVE:
CHECK FAIL LIGHT (LEB)
PGNS LIGHT (LEB)
COMP FAIL LIGHT (MDC)

HOLD FOR NEW
PROGRAM SELECTION

CONSULT BACKUP
PROCEDURES

GO TO BACKUP PROCEDURES AND SELECT A PROGRAM WHICH IS ALLOWED

#80

///

GO TO PROGRAM
SELECTED

EXIT P--

START GROUND TRACK
DETERMINATION
PROGRAM (P24)
DELAY AND UPDATE
STATE VECTOR TO
PRESENT TIME

DISPLAY PROGRAM 24

V67E V66E V65E

POSS
.....
HOLD

FLASH VERB-
NOUN TO RE-
QUEST LOAD OF
T PERM LONG:
V25N34

WAIT FOR KEY-
BOARD ENTRY
TERMINATE
FLASH UPON
RECEIPT OF
DATA

KEY IN PROGRAM
SELECTION AS
DESIRED
V37E --E

EXIT P--

MONITOR DSKY:
OBSERVE DISPLAY OF
PROGRAM 24

MONITOR DSKY:
OBSERVE VERB-NOUN
FLASH TO REQUEST
LOAD OF T PERM LONG

LOAD DESIRED
T PERM LONG
R1- TPERM LONG-HRS
R2- TPERM LONG-MINS
R3- TPERM LONG-SECS

T PERM LONG-EARLIEST
PERMISSIBLE TIME
(GET) OF NEXT
ARRIVAL AT THE
SPECIFIED LONGI-
TUDE IN HRS, MIN,
SEC, TO NEAREST
.01 SEC.

#90

#100

#110

#120

#130

#140

- * A. TO DETERMINE TIME OF ARRIVAL AT A SPECIFIED LONGITUDE
- * (1) KEY IN V65E
- * (2) CHECK AGC DISPALYS PROGRAM 24 AFTER STATE VECTOR IS UPDATED

- * (3) CHECK AGC FLASHES VERB-NOUN TO REQUEST LOAD OF T PERM LONG
V25 N34

- * (4) LOAD DESIRED T PERM LONG
R1 - T PERM LONG-HRS
R2 - T PERM LONG-MINS
R3 - T PERM LONG-SECS

T PERM LONG - EARLIEST PERMISSIBLE TIME (GET) OF NEXT ARRIVAL AT THE SPECIFIED LONGITUDE. IN HRS, MIN, SEC TO NEAREST .01 SEC

PUSH .
.....
HOLD .

FLASH VERB-
NOUN TO
REQUEST LOAD
OF LONG:
V22N44

MONITOR DSKY:
OBSERVE VERB-NOUN
FLASH TO REQUEST
LOAD OF LONGITUDE.

(5) CHECK AGC FLASHES VERB-NOUN TO
REQUEST LOAD OF LONGITUDE:
V22N44

*

WAIT FOR
KEYBOARD ENT-
RY TERMINATE
FLASH UPON
RECEIPT OF
DATA.

LOAD DESIRED LONG
R2- LONG
LONG-LONGITUDE, PLUS IS
EAST, IN DEGREES
TO NEAREST .01
DEGREE.

(6) LOAD DESIRED LONGITUDE
R2 - LONG
LONG - LONGITUDE, PLUS IS
EAST, IN DEGREES TO NEAREST
.01 DEGREE

*

#150

#160

CALCULATE
TIME OF NEXT
ARRIVAL AT
THAT
LONGITUDE
INCLUDING
T PERM
CONSTRAINT

#170

PUSH .
.....
HOLD .

FLASH VERB-
NOUN TO REQ-
UEST PROCEED
AND DISPLAY:
V06 N34
R1-T LONG-HRS
R2-T LONG-MIN
R3-T LONG-SEC

MONITOR DSKY:
OBSERVE VERB-NOUN
FLASH TO REQUEST
PROCEED AND DISPLAY
OF T LONG

(7) CHECK AGC FLASHES VERB-NOUN
TO REQUEST PROCEED AND
DISPLAYS:
V06 N34
R1 - T LONG - HRS
R2 - T LONG - MINS
R3 - T LONG - SECS

*

#180

T LONG - TIME
(GET) AT
WHICH VEHICLE
WILL BE AT
SPECIFIED
LONGITUDE, IN
HRS, MINS, SECS
TO NEAREST
.01 SEC.

T LONG - TIME (GET) AT
WHICH VEHICLE WILL BE AT
SPECIFIED LONGITUDE, IN
HRS, MINS, SECS TO NEAREST
.01 SEC.

#190



WAIT FOR KEYBOARD
ENTRY
TERMINATE FLASH UPON
RECEIPT OF PROCEED

WHEN FINISHED WITH
DISPLAY KEY IN
PROCEED
V 33 E

(6) WHEN FINISHED WITH DISPLAY
KEY IN PROCEED
V33E

#420

HOLD
FLASH VERB-NOUN TO
REQUEST PROCEED AND
DISPLAY LATITUDE
(MAX DEC) LONGITUDE
AND ALTITUDE
V06 N44
R1 - LAT (MAX DEC)
R2 - LONG
R3 - ALT

MONITOR DSKY:
OBSERVE FLASH VERB-
NOUN TO REQUEST
PROCEED AND DISPLAYS
LATITUDE (MAX DEC)
LONGITUDE AND
ALTITUDE

(7) CHECK AGC FLASHES VERB-NOUN
TO REQUEST PROCEED AND
DISPLAYS:
V06 N44
R1 - LAT (MAX DEC)
R2 - LONG
R3 - ALT

#430

LAT-LATITUDE OF
VEHICLE. + IS NORTH.
IN DEGREES TO NEAR-
EST .01 DEGREE. MAX
DEC IS THE FIRST
MAXIMUM DECLINATION
OF THE ORBIT AFTER A
SPECIFIED TIME (GET)

LAT - LATITUDE OF VEHICLE.
+ IS NORTH. IN DEGREES TO
NEAREST .01 DEGREE. MAX DEC
IS THE MAXIMUM DECLINATION
OF THE ORBIT AFTER A
SPECIFIED TIME (GET).

#440

LONG-LONGITUDE OF
VEHICLE. + IS EAST.
IN DEGREES TO NEAR-
EST .01 DEGREE.

LONG - LONGITUDE OF VEHICLE
+ IS EAST. IN DEGREES TO
NEAREST .01 DEGREE.

#450

ALT-ALTITUDE OF
VEHICLE ABOVE THE
FISCHER ELLIPSOID.
IN NAUTICAL MILES TO
NEAREST .1 NM.

ALT - ALTITUDE OF VEHICLE
ABOVE THE FISCHER ELLIPSOID
IN NAUTICAL MILES TO
NEAREST .1 NM.

#460

WAIT FOR KEYBOARD
ENTRY
TERMINATE FLASH UPON
RECEIPT OF PROCEED

WHEN FINISHED WITH
DISPLAY KEY IN
PROCEED
V 33 E

(8) WHEN FINISHED WITH DISPLAY
KEY IN PROCEED
V33E

.....

GO TO AGC IDLING
PROGRAM (P00)

.....
EXIT P24

.....

MONITOR DSKY:
OBSERVE DISPLAY OF
P00

.....
EXIT P24

*

(9) CHECK AGC DISPLAYS PROGRAM 00

P24

#470

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

COAST-AGC UPDATE PROGRAM (P 27)

REV 11

6/9/66

PURPOSE: (1) TO INSERT INFORMATION INTO THE COMPUTER VIA THE DIGITAL UPLINK BY TRANSMISSION FROM THE GROUND OR VIA THE DSKY KEYBOARD BY CREW MANUAL INPUT.

ASSUMPTIONS: (1) THE AGC MUST BE IN THE "OPERATE" CONDITION. THE IMU MAY BE IN "STANDBY" OR "OPERATE" CONDITION.

(2) AGC UPDATES ARE OF FIVE CATEGORIES:
 (A) AIM PARAMETERS FOR A MINIMUM IMPULSE THRUSTING MANEUVER (V72).
 (B) AIM PARAMETERS FOR A RETURN TO EARTH (ENTRY) THRUSTING MANEUVER (V73).
 (C) AIM PARAMETERS FOR AN ORBIT CHANGE THRUSTING MANEUVER (V74).
 (D) VEHICLE POSITION AND VELOCITY AND TIME (RVT) (V76).
 (E) TIME UPDATE (V77).

(3) A COMPLETE DESCRIPTION OF THE AGC UPLINK FORMAT IS INCLUDED IN SECTION 3.3 OF R 507.

(4) THE PROGRAM IS NORMALLY MANUALLY SELECTED BY THE ASTRONAUT BY DSKY ENTRY OR BY THE GROUND BY UPLINK TRANSMISSION. THE ABILITY OF THE AGC TO RECEIVE UPLINK TRANSMISSIONS HOWEVER IS CONTINGENT UPON THE CREW PLACING THE UPTEL SWITCH IN THE 'ACCEPT' POSITION. THE PROGRAM CAN ONLY BE ENTERED FROM POO AND, WHEN TERMINATED, AUTOMATICALLY RETURNS TO POO.

PROG CONT	AGC	GROUND	CREW	CHECKLIST	TIME	TOTAL TIME
			• CREW • PROG • SELECTION • • •			
		----- CONFIRM UPDATE PARAMETERS AND XMISSION TIME PREPARE PARA- METERS AT NECES- SARY GROUNJ STATION. -----	----- REQUEST AGC UPDATE. SPECIFY PARAMETERS AND COORDINATE TIME OF XMISSION. ENSURE AGC WILL BE ABLE TO ACCEPT. -----	* I REQUEST AGC UPDATE OR RECEIVE REQUEST FROM GROUND FOR AGC UPDATE		#10
		• • • • • • • • GROUND • PROG • SELECTION • •	• • • • • • • •			#20
		• • •	• • •			P 27

/20

IS PROGRAM
ALLOWED?

TRANS-
MIT
V72E

SELECT THE DESIRED
TYPE OF UPDATE:
1. MIN IMP V 72
2. ENTRY V 73
3. ORBIT CHANGE V74
4. RVT V 76
5. TIME V77

1. 2. 3. 4. 5.

TRANS-
MIT
V73E

TRANS-
MIT
V74E

TRANS-
MIT
V76E

TRANS-
MIT
V77E

KEY IN
V72E

KEY IN
V73E

KEY IN
V74E

E. KEY IN V 77 E FOR TIME UPDATE

P 27

#80

#90

#100

#110

#120

#130

P 27

START COAST-
AGC UPDATE
PROGRAM (P27)
DISPLAY PROGRAM 27

MONITOR DSKY;
OBSERVE DISPLAY
OF PROGRAM 27

- 1. CHECK AGC DISPLAYS PROGRAM 27 AND LIGHTS UPTTEL ACTIVITY LIGHT

#190

CHANGE DOWNLINK
LIST

#200

MAKE DOWNLINK
COUNTER ONE

#210

GET ADDRESS OF
FIRST BUFFER
STORAGE REGISTER
AND PUT IN UPADR
(DEFINED BELOW)



FLASH VERB-NOUN
TO REQUEST LOAD
OF DATA IN
MACHINE ADDRESS
SPECIFIED IN R3
AND DISPLAY:
V21 N01
R1-BLANK
R2-UNCHANGED
R3-UPADR

MONITOR DOWNLINK;
OBSERVE VERB-NOUN
FLASH AND DISPLAY
OF UPADR

MONITOR DSKY;
OBSERVE VERB-NOUN
FLASH TO REQUEST
LOAD OF DATA AND
DISPLAY OF UPADR

- * 2. CHECK AGC FLASHES VERB-NOUN TO REQUEST DATA LOAD AND DISPLAYS:
V21 N01
R1 - BLANK
R2 - UNCHANGED
R3 - UPADR

#220

HOLD

UPADR-THE ADDRESS
OF AN ERASABLE
MEMORY LOCATION
TO BE USED FOR
TEMPORARY
STORAGE OF THE
DATA WORD NEXT

DO I WISH TO
TERMINATE

Y. N.

UPADR - THE ADDRESS OF AN ERASABLE MANOEY LOCATION TO BE USED FOR TEMPORARY STORAGE OF THE WORD NEXT LOADED.

#230

NOTE:

124

INCREMENT
UPADR AND
DOWNLINK
COUNTER

#300

SELECT NEW LOCATION
FOR UPADR FOR
POSSIBLE IDENTIFIER
OF UPDATED INFORM-
ATION TO BE CORRECT-
ED

#310

FLASH VERB-NOUN
TO REQUEST LOAD
OF OCTAL IDENTIFIER
IN MACHINE ADDRESS
SPECIFIED IN R3
AND DISPLAY:
V21 NO2
R1 - BLANK
R2 - UNCHANGED
R3 - UPADR

MONITOR DSKY:
OBSERVE VERB-NOUN
FLASH TO REQUEST
LOAD OF OCTAL
IDENTIFIER

* V COMPLETE DATA LOAD CORRECTIONS.

* 1. CHECK AGC FLASHES VERB-NOUN TO
REQUEST LOAD OF OCTAL IDENTIFIER
AND DISPLAYS:
V21 NO2
R1 - BLANK
R2 - UNCHANGED
R3 - UPADR

#320

* 2. ACCEPT OR CORRECT DATA (FOR MANUAL
CONTROL)

#330

A. NAV ACCEPTS DATA:
KEY IN PROCEED
V33E

OR B. NAV WISHES TO CHANGE DATA
LOADED:

(1) KEY IN OCTAL IDENTIFIER OF
REGISTER TO BE CHANGED.
OBSERVE DATA LOADED TO BE
DISPLAYED IN R1.
R1 - XXE

#340

(2) REPEAT DATA LOADING PROCEDURE
AS IN II AND III ABOVE UNTIL
REQUIRED CHANGES IN DATA LOAD
HAVE BEEN MADE.

HOLD

WAIT FOR KEYBOARD
ENTRY, DISPLAY OCTAL
IDENTIFIER IN R1 AS
IT IS LOADED.

DO I WISH TO
TERMINATE

Y. N.

DO I WISH TO
TERMINATE

Y. N.

TRANSMIT
TERMINATE

```

V 34 E
-----
KEY IN TERMINATE
V 34 E
-----
DO I WISH TO
CHANGE DATA
LOADED?
N. Y
:
:
:
DO I WISH TO CHANGE
DATA LOADED
N. Y
:
:
:
TRANSMIT
FINAL
PROCEED
V 33 E
-----
KEY IN FINAL
PROCEED
V 33 E
-----
TRANSMIT OCTAL
IDENTIFIER OF
REGISTER TO BE
CHANGED
X X E
-----
TERMINATE FLASH
UPON RECEIPT
OF TERMINATE
PROCEED, OR XXE
-----
KEY IN OCTAL IDENTI-
FIER OF REGISTER TO
BE CHANGED
XXE
OBSERVE IDENTIFIER
TO BE DISPLAYED IN
R1.
-----
T X P
E X R
R E O
M C
I E
N E
A D
T
E

```

(3) KEY IN PROCEED
V33E

#350

#360

#370

#380

#390

#400

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

PRE THRUSTING-ORBIT CHANGE PROGRAM (P 31)

REV 16

6/16/66

- PURPOSE:
- (1) TO CALCULATE THE REQUIRED VEHICLE VELOCITY (VR), FOR AN ORBIT CHANGE THRUSTING MANEUVER, GIVEN:
 - (A) A TIME OF IGNITION.
 - (B) THE LATITUDE AND LONGITUDE OF A GROUND POINT ON THE DESIRED TRACK AND THE ALTITUDE OF THE DESIRED ORBIT OVER THE MEAN EQUATORIAL RADIUS AT THIS GROUND POINT.
 - (C) THE PERIOD OF THE DESIRED ORBIT.
 - (2) TO MAKE THIS CALCULATION BASED UPON MANEUVER DATA APPROVED, AND KEYED INTO THE AGC, BY THE ASTRONAUT, OR GROUND.
 - (3) TO DISPLAY TO THE ASTRONAUT AND THE GROUND CERTAIN SPECIFIC DEPENDENT VARIABLES (ORBITAL PARAMETERS) ASSOCIATED WITH THE CALCULATED VR AND TIGN FOR FINAL APPROVAL BY THE ASTRONAUT/GROUND.
 - (4) TO COMPUTE A PREFERRED IMU ORIENTATION AND A REQUIRED VEHICLE ATTITUDE FOR THRUSTING. THIS ORIENTATION AND ATTITUDE WILL BE USED BY THE INFLIGHT ALIGNMENT PROGRAM(S) TO ALIGN THE IMU AND CSM WHEN:
 - (A) THE IMU ALIGNMENT IS NOT SUFFICIENTLY ACCURATE.
 - (B) A MIDDLE GIMBAL ANGLE GREATER THAN 15 DEGREES WILL EXIST AT THE THRUSTING ATTITUDE.
 - (5) TO DO THE CSM MANEUVER TO THE THRUSTING ATTITUDE WITHOUT IMU REALIGNMENT IF DESIRED.

- ASSUMPTIONS:
- (1) BEFORE STARTING THIS PROGRAM THE GROUND CAN UPDATE THE NAVIGATION STATE VECTOR OR INSERT AIM PARAMETERS. THIS IS DONE BY DOING COAST-AGC UPDATE PROGRAM (P27).
 - (2) THE PROGRAM MUST BE DONE OVER A TRACKING STATION FOR REAL TIME GROUND PARTICIPATION IN AGC DATA INPUT AND OUTPUT. HOWEVER AIM PARAMETERS MAY BE SENT UP FROM THE GROUND AND STORED FOR FUTURE AGC COMPUTATION. LIKEWISE AGC COMPUTED VARIABLES MAY BE STORED FOR LATER VERIFICATION BY THE GROUND. THESE STORAGE CAPABILITIES ARE LIMITED ONLY TO THE PARAMETERS FOR ONE THRUSTING MANEUVER AT A TIME.
 - (3) THE ISS MAY BE IN STANDBY OR OPERATE. THE G+N START JP AND CHECK OUT PROGRAM (P05) AND THE INFLIGHT ALIGNMENT-IMU ORIENTATION DETERMINATION PROGRAM (P51) SHOULD BE COMPLETED BEFORE THE SELECTION OF THIS PROGRAM UNLESS THIS PROGRAM IS SELECTED ONLY FOR DATA LOADING AND THRUSTING PARAMETER COMPUTATION. TIME AND RCS FUEL MAY BE SAVED, AND SUBSEQUENT IMU ALIGNMENT DECISIONS GREATLY SIMPLIFIED IF P51 IS PERFORMED IN SUCH A WAY AS TO LEAVE THE IMU INERTIALLY STABILIZED AT AN ORIENTATION AS CLOSE AS POSSIBLE TO THE OPTIMUM ORIENTATION DEFINED BY THIS PROGRAM. THE ISS THUS MAY BE:
 - (A) OFF (STANDBY).
 - (B) ON, AND NOT ALIGNED SINCE TURN ON
 - (C) ON AND AT AN INERTIAL ORIENTATION KNOWN ONLY INACCURATELY BY THE AGC, I.E. HAVING BEEN ALIGNED AT LEAST ONCE SINCE TURN ON BUT NOT WITHIN THE LAST --HRS
 - (D) ON AND AT AN INERTIAL ORIENTATION KNOWN ACCURATELY BY THE AGC, I.E. HAVING BEEN ALIGNED WITHIN THE LAST --HRS

P 31

IF (A) IS TRUE PROGRAM 05 AND 51 MUST BE PERFORMED BEFORE THIS PROGRAM CAN BE COMPLETED.
 IF (B) IS TRUE PROGRAM 51 MUST BE PERFORMED BEFORE THIS PROGRAM CAN BE COMPLETED.
 IF (C) IS TRUE THE AGC MAY OR MAY NOT HAVE A SATISFACTORY INERTIAL REFERENCE TO ACCURATELY COMPLETE THE PROGRAM.
 IF (D) IS TRUE THE AGC HAS A SATISFACTORY INERTIAL REFERENCE TO ACCURATELY COMPLETE THE PROGRAM. CASES (B), (C) AND (D) HOWEVER ARE FURTHER SUBJECT TO THE CONSTRAINT OF LARGE MIDDLE GIMBAL ANGLE, I.E. THE EXISTING INERTIAL ORIENTATION MAY CAUSE A MIDDLE GIMBAL ANGLE GREATER THAN 15 DEGREES AT THE THRUSTING ORIENTATION OF THE CSM, WHICH IS UNSATISFACTORY AND WILL BE INDICATED BY PROGRAM ALARM.

(4) IT IS NORMALLY REQUIRED THAT THE ISS BE ON FOR 1 HOUR PRIOR TO A THRUSTING MANEUVER.

(5) THIS PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY AT LEAST -- MIN BEFORE THE ESTIMATED TIME OF THE THRUSTING MANEUVER IGNITION.

PRUG CONT	AGC	GROUND	CREW	CHECKLIST	TIME	TOTAL TIME
			. CREW PROG. . SELECTION			
	----- IS PROGRAM ALLOWED? -----	----- -----	----- KEY IN PRETHRUSTING- ORBIT CHANGE PROGRAM (P31) V37E 31E -----	* I SELECT PRETHRUSTING-ORBIT CHANGE PROGRAM (P31) 1. ENTER PRETHRUSTING ORBIT CHANGE PROGRAM: V37E 31E	#10	
	. Y N		NOTE: POSSIBLE CHECK FAIL. IF PRESENT PROGRAM DOES NOT ALLOW SELECTION OF P31 THE CHECK FAIL LIGHT WILL ILLUMINATE AND THE OLD PROGRAM DISPLAY WILL REMAIN	#20	
	----- COMMAND CHECK FAIL ALARM -----	----- -----	----- OBSERVE CHECK FAIL LIGHT ON -----	OBSERVE: CHECK FAIL LIGHT ON (LEB) PGNS LIGHT ON (LEB) COMP FAIL LIGHT ON (MDC)		
	----- RESET CHECK FAIL ALARM -----	----- -----	----- PRESS ALARM RESET TO TURN OFF CHECK FAIL LIGHT -----			
			
			
			
			
			
			
			
			
			
			
			

/3/

.....
CLEAR STORAGE AREA
FOR THRUSTING MANEU-
VER PARAMETERS AND
STORE RESULTS OF
ABOVE COMPUTATION.

#90

.....
PUT AIM PARAMETERS
AND PERIGEE ALT,
APOGEE ALT AND DELTA
V REQUIRED ON AGC
DOWNLINK TO REMAIN
THERE UNTIL TERMINA-
TION OF THE PROGRAM.

#100

.....
HOLD FLASH VERB-NOUN TO
REQUEST PROCEED AND
DISPLAY THRUSTING
PARAMETERS:
V06 N45
R1-APOGEE ALT
R2-PERIGEE ALT
R3-DELTA V REQ.

MONITOR DSKY:
OBSERVE VERB-NOUN
FLASH AND DISPLAY OF
THRUSTING PARAMETERS

* III. EVALUATE THE THRUSTING PARAMETERS

* 1. CHECK AGC FLASHES VERB-NOUN TO RE-
QUEST PROCEED AND DISPLAYS THRUST-
ING PARAMETERS:

#110

V06 N45
R1-APOGEE ALT
R2-PERIGEE ALT
R3-DELTA V REQUIRED

APOGEE ALT - ALTITUDE OF
APOGEE ABOVE FISCHER
ELLIPSOID . IN NAUTICAL
MILES TO NEAREST .1 NM.

#120

PERIGEE ALT - ALTITUDE OF
PERIGEE ABOVE FISCHER ELLIP-
-SOID. IN NAUTICAL MILES TO
NEAREST .1 NM.

DELTA V REQUIRED - SPS
DELTA V REQUIRED TO ACCOM-
PLISH MANEUVER. IN FT/SEC
TO NEAREST FT/SEC.

#130

APOGEE ALT - ALTITUDE
OF APOGEE ABOVE
FISCHER ELLIPSOID
IN NAUTICAL
MILES TO
NEAREST .1 NM.

PERIGEE ALT - ALTITUDE
OF PERIGEE ABOVE
FISCHER ELLIPSOID.
IN NAUTICAL
MILES TO
NEAREST .1 NM.

DELTA V REQUIRED -
SPS DELTA V RE-
QUIRED TO ACCOM-
PLISH MANEUVER,
IN FT/SEC TO
NEAREST FT/SEC.

.....
IS A GROUND STATION
AVAILABLE FOR CON-
FIRMATION OF THESE
PARAMETERS?

#140

Y. N

MONITOR AGC COORDINATE
DOWNLINK TELE- EVALUATION OF
METRY OF APOGEE THE AGC COMPU-
ALT, PERIGEE ALT. TED PARAMETERS
AND DELTA V RE- WITH THE
QUIRED, COORDI- GROUND
NATE EVALUATION
OF AGC COMPUTED
PARAMETERS WITH
ASTRONAUT

#150

* 2. COORDINATE EVALUATION OF THE AGC
COMPUTED PARAMETERS WITH THE
GROUND

#160

.....
SELECT ONE OF THE
FOLLOWING FIVE
ALTERNATIVES:

#170

- (1) IF THE CALCJ-
LATED DATA IS
SATISFACTORY,
PERFORM THE THRJ-
STING MANEUVER
USING THE AGC
CALCULATED PARA-
METERS WITHOUT
GROUND CONFIRMA-
TION.
- (2) IF THE CALCJ-
LATED DATA IS NOT
SATISFACTORY AD-
JUST THE CALCULA-
TED PARAMETERS BY
RESELECTING P 31
AS NECESSARY AND
CHANGING THE
LOADED AIM PARA-
METERS UNTIL AGC
COMPUTED PARAMET-
ERS ARE SATISFAC-
TORY. THEN

#180

WAIT FOR KEYBOARD
ENTRY.

(1) ADJUST THE
CALCULATED PARA-
METERS BY RESEL-
ECTING P 31 AS
NECESSARY AND
CHANGING THE
LOADED AIM PARA-
METERS UNTIL AGC
COMPUTED PARA-
METERS ARE
SATISFACTORY.
(2) OBTAIN NEW
AIM PARAMETERS
FROM THE GROUND
BY VOICE LINK,
RESELECT P 31,
KEY IN NEW DATA,
ETC.
(3) SELECT THE
COAST-AGC UPDATE
PROGRAM (P 27).
LOAD NEW AIM
PARAMETERS FROM
THE GROUND VIA
THE AGC UPLINK,
OR BY CREW
DSKY INPUT.
OBSERVE NEW AIM
PARAMETERS,ETC.
(4) TERMINATE
P 31 BY SELECT-
ING A NEW PRO-
GRAM AS DESIRED
AND PERFORM THR-
USTING MANEUVER
USING BACKUP
PROCEDURES.

1.
2.
3.
4.

KEY IN PROGRAM
SELECTION AS
DESIRED
V37E--E

* A. NAV REJECTS PARAMETERS:

- (1) RESELECT P31 AND LOAD DESIRED
DATA
OR (2) SELECT P27 (SEE P27 CHECK
LIST) AND LOAD DESIRED DATA
BY AGC UPLINK OR VOICE LINK.
RESELECT P31.

P 31

#240

#250

#260

#270

#280

#290

P 31

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EXIT P 31
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OR (3) SELECT NEW PROGRAM AND PERFORM THRUSTING WITH BACKUP PROCEDURES

TERMINATE FLASH UPON RECEIPT OF PROCEED OR NEW PROGRAM.

KEY IN PROCEED V 33 E

* B. NAV ACCEPTS PARAMETERS: KEY IN PROCEED V 33 E

#300

```

P.      . NEW
R.      . PROGRAM
O.      .
C.      .
E.      .
E.      .
D.      .
GO TO PROGRAM
SELECTED.

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#310

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.
EXIT P 31
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.

```

COMPUTE:

(1) INITIAL THRUST DIRECTION.

#320

(2) PREFERRED IMU INERTIAL ORIENTATION.

X = UNIT (X)
-SM -SC

Y =UNIT (X X R)
-SM -SC -

#330

Z =UNIT (X X Y)
-SM -SM -SM

WHERE:

X = THE DIRECTION OF THE SPACE-CRAFT +X AXIS AT TIGN.

#340

R = THE EARTH CENTERED POSITION RADIUS VECTOR AT TIGN.

(3) ITI = TIME TO GO TO SPS IGNITION.

(4) INITIAL VALUE OF VG VECTOR.

#350

STORE (1)(2)(3) AND (4) FOR USE BY SUBSEQUENT COMPUTATIONS.

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.....
HOLD . FLASH VERB-NOUN TO REQUEST PROCEED AND DISPLAY:
V16 N35
R1-TTI - HRS
R2-TTI - MIN
R3-TTI - SEC

TTI - TIME TO GO TO SPS IGNITION. IN HRS, MIN, SEC TO NEAREST .01 SEC.

.....
MONITOR DSKY: OBSERVE VERB-NOUN FLASH AND DISPLAY OF TTI.
.....
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.
.

.....
SET TTE CLOCKS (MDC+LEB)
.....
.
.
.

* IV SET UP TTE CLOCKS FOR TTI

#360

- * 1. CHECK AGC FLASHES VERB-NOUN TO REQUEST PROCEED AND DISPLAYS TTI:
V16 N35
R1-TTI - HRS
R2-TTI - MIN
R3-TTI - SEC

TTI - TIME TO GO TO SPS IGNITION IN HRS, MIN, SEC TO NEAREST .01 SEC

#370

* 2. SET CLOCKS

PILOT:

- A. SET DIGITAL EVENT TIMER START/STOP SW AT STOP
- B. SET DET RESET/UP/DOWN/ SW AT RESET
- C. ADJUST DET SEC SW TO ADVANCE TIMER TO POINT OF SYNCHRONIZATION
- D. ADJUST DET MIN SW TO ADVANCE TIMER TO POINT OF SYNCHRONIZATION
- E. SET DET RESET/UP/DOWN SW AT DOWN
- F. SET DET START/STOP SW TO START AT SYNC TIME
- G. NAV CONFIRM LEB CLOCK SET KEY IN PROCEED
V 33 E

#380

#390

NAV:

- A. RESET TTE CLOCK AT LEB TO ZERO
- B. SET TTE CLOCK FOR TIME DISPLAYED

#400

#460

```

-----
COMPUTE GIMBAL
ANGLES AT INITIAL
S/C THRUST ORIENTA-
TION IF THE PRESENT
IMU ORIENTATION IS
HELD.
-----

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#470

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-----
FLASH VERB-NOUN TO
REQUEST PROCEED AND
DISPLAY THE GIMBAL
ANGLES THAT WILL
EXIST AT THE INITIAL
S/C THRUST ORIENTA-
TION IF THE PRESENT
IMU ORIENTATION IS
HELD:
V06 N17
R1 - OG ROLL
R2 - IG PITCH
R3 - MG YAW
ALL GIMBAL ANGLES IN
DEGREES TO NEAREST
.01 DEGREE.
-----

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-----
MONITOR DSKY;
OBSERVE VERB-NOUN
FLASH AND DISPLAY OF
GIMBAL ANGLES AT THE
THRUST ORIENTATION.
-----

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* V. CHECK AGC FLASHES VERB-NOUN TO
REQUEST PROCEED AND DISPLAYS GIMBAL
ANGLES THAT WILL EXIST AT THE
S/C THRUST ORIENTATION IF THE
PRESENT IMU ORIENTATION IS HELD:
V06 N17
R1 - OG ROLL
R2 - IG PITCH
R3 - MG YAW
ALL GIMBAL ANGLES IN DEGREES TO
NEAREST .01 DEGREE.

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#480

#490

```

-----
WAIT FOR KEYBOARD
ENTRY
-----

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```

-----
IS MIDDLE GIMBAL
ANGLE GREATER THAN
15 DEGREES?
-----

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```

* 1. IF THE MIDDLE GIMBAL ANGLE
DISPLAYED IS GREATER THAN 15
DEGREES, SELECT THE FOLLOWING IN
ORDER:
A. INFLIGHT ALIGNMENT-CSM/IMU ALIGN
PROGRAM (P53)
KEY IN
V37E 53E
B. THRUSTING-ORBIT CHANGE PROGRAM
(P41)
KEY IN
V37E 41E

```

#500

#510

```

-----
DO INFLIGHT ALI-
GNMENT CSM-IMU
ALIGN PROGRAM
(P53).
KEY IN
V37E 53E
WHEN ABOVE PRO-
GRAM IS COMPLETE
SELECT THRUSTING
-ORBIT CHANGE
PROGRAM (P41).
-----

```

EXIT P31

ADVISE CREW
WITHIN
GROUND
CAPABILITY.

DO I WISH TO MAKE
THE THRUSTING MANE-
EUVER WITH THE PRE-
SENT IMU ORIENTATION
CONSIDER:
(A) THE TIME SINCE
THE LAST FINE
ALIGNMENT OF THE
IMU
(B) IS TIME
CRITICAL?
(C) IS RCS
FUEL CRITICAL?

(D) DOES THE
GROUND CONCUR WITH
THE THRUSTING
MANEUVER AT THIS
IMU ORIENTATION?

.....N.....Y.....
.....
.....

.....
DO INFLIGHT ALI-
GNMENT IMU/CSM
ALIGN PROGRAM
(P53).
KEY IN
V37E 53E

WHEN THE ABOVE
PROGRAM IS COM-
PLETE SELECT
THRUSTING-ORBIT
CHANGE PROGRAM
(P41)

.....
EXIT P31

* 2. IF THE MIDDLE GIMBAL ANGLE
DISPLAYED IS LESS THAN 15 DEGREES:

A. REALIGN THE IMU IF DESIRED AFTER
CONSIDERING THE FOLLOWING:

- (1) TIME SINCE LAST FINE ALIGN-
MENT OF THE IMU
- (2) IS TIME CRITICAL?
- (3) IS RCS FUEL CRITICAL
- (4) DOES GROUND CONCUR WITH
THRUSTING WITH PRESENT IMU
ORIENTATION?

SELECT INFLIGHT ALIGNMENT-CSM/IMU
ALIGN PROGRAM (P53)
KEY IN
V37E 53E
AGC REQUESTS SELECTION OF P41
AFTER P53 IS COMPLETED.

OR B. ACCEPT PRESENT IMU ORIENTATION
FOR THRUSTING AFTER CONSIDERING
(1)-(4) ABOVE. CONTINUE BELOW

* 3. CONFIRM OR SELECT FOLLOWING SWITCH
POSITIONS AT MDC:

PANEL 8

- 1. DIRECT RCS - OFF
- 2. LIMIT CYCLE - OFF
- 3. ATTITUDE DEADBAND - MAX
- 4. .05G ENTRY - OFF
- 5. LOCAL VERTICAL - OFF
- 6. DELTA V - OFF
- 7. G*N/SCS - G*N

#520

#530

#540

#550

#560

#570

- 8. ATTITUDE/MONITOR/ENTRY-MONITOR
- 9. A6C ROLL CHANNEL - OFF
- 10. B6D ROLL CHANNEL - ON
- 11. PITCH CHANNEL - ON
- 12. YAW CHANNEL - ON
- 13. ROLL RATE GYRO - NORMAL
- 14. PITCH RATE GYRO - NORMAL
- 15. YAW RATE GYRO - NORMAL

#580

PANEL 25

#590

- 1. FDAI LTG - AC1
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED
- 5. GROUP 2-AC2 - CLOSED
- 6. GROUP 1-MNA - CLOSED
- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED
- 9. GROUP 2-MNB - CLOSED
- 10. DIRECT CONTROL-MNA - CLOSED
- 11. DIRECT CONTROL-MNB - CLOSED
- 12. A6C ROLL-MNA - CLOSED
- 13. A6C ROLL-MNB - CLOSED
- 14. B6D ROLL-MNA - CLOSED
- 15. B6D ROLL-MNB - CLOSED
- 16. PITCH-MNA - CLOSED
- 17. PITCH-MNB - CLOSED
- 18. YAW-MNA - CLOSED

#600

#610

#620

- 19. YAW-MNB - CLOSED #630
- 20. G6N SYNC - OFF
- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED
- 23. GIMBAL MOTOR CONTROL PITCH 1
BAT A - CLOSED
- 24. GIMBAL MOTOR CONTROL PITCH 2 #640
BAT B - CLOSED
- 25. GIMBAL MOTOR CONTROL YAW 1
BAT A - CLOSED
- 26. GIMBAL MOTOR CONTROL YAW 2
BAT B - CLOSED

MISCELLANEOUS #650

- 1. TRANSLATION CONTROLS - LUCKED
- 2. ROTATION CONTROLS - PINNED

PANEL 6

- 1. ATTITUDE SET - OFF #660

PANEL 7

- 1. NORMAL/OFF/DIRECT ON - OFF

PANEL 2 #670

- 1. FDAI SELF TEST - OFF
- 2. FDAI BRIGHTNESS - SET
- 3. FCSM - AUTO/OVERRIDE - OVERRIDE
- 4. FCSM - ON/OFF/RESET - OFF #680

PANEL 24

- 1. SCS POWER - AC1
- 2. RATE GYRO POWER - AC1
- 3. BMAG POWER - AC2
- 4. ROTATION CONTROL POWER - AC2
- 5. TVC 1 POWER - OFF
- 6. TVC 2 POWER - OFF

#690

PANEL 3

- 1. PITCH GIMBAL MOTOR 1 - OFF
- 2. PITCH GIMBAL MOTOR 2 - OFF
- 3. YAW GIMBAL MOTOR 1 - OFF
- 4. YAW GIMBAL MOTOR 2 - OFF
- 5. INJECT PREVALVE A - OFF
- 6. INJECT PREVALVE B - OFF

#700

#710

PANEL 14

- 1. UPTL - BLOCK
- 2. DSKY BRIGHTNESS - SET

#720

PANEL 22

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED
- 3. IMU-MNA - CLOSED
- 4. IMU-MNB - CLOSED
- 5. COMPUTER-MNA - CLOSED
- 6. COMPUTER-MNB - CLOSED
- 7. OPTICS-MNA - OPEN
- 8. OPTICS-MNB - OPEN

#730

- 9. AC POWER-AC1 - CLOSED
- 10. AC POWER-AC2 - CLOSED
- 11. G6N-AC POWER - AC1

#740

* 4. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT NAV STATION

#750

- 1. FLOODLIGHT CONTROL PRIMARY - OFF
- 2. FLOODLIGHT CONTROL SECONDARY - OFF
- 3. IMU TRANSFER - COMPUTER
- 4. OPTICS SLAVE TELESCOPE - STAR LOS
- 5. OPTICS MODE - ZERO OPTICS
- 6. OPTICS HOLD - OFF
- 7. OPTICS CONTROLLER SPEED - HI
- 8. OPTICS CONTROLLER MODE - DIRECT
- 9. PANEL BRIGHTNESS CONTROL - OFF
- 10. IMU TEMP. MODE - AUTO OVERRIDE
- 11. ATTITUDE IMPULSE ENABLE - OFF
- 12. CONDITION LAMPS - OFF
- 13. AGC MODE - ON
- 14. AGC BRIGHTNESS CONTROL - OFF

#760

#770

#780

* 5. KEY IN PROCEED V33E

#790

 TERMINATE FLASH UPON
 RECEIPT OF PROCEED
 OR NEW PROGRAM

 KEY IN PROCEED
 V 33 E

SCS-G+N
 MONITOR
 PRESENT

P. .NEW
 R. .PROGRAM
 O.
 C.
 E. GO TO PROGRAM
 E. SELECTED.
 D. -----

.
 .
 .
 .
 .

145

EXIT P31

#800

 SELECT FINAL VEHICLE
 ATTITUDE FOR USE BY
 ATTITUDE MANEUVER
 ROUTINE.

#810

 DO ATT CONTROL MODE
 CHECK ROUTINE (R 1).

 DO ATT CONTROL MODE
 CHECK ROUTINE (R 1).

* VI PERFORM ATT CONTROL MODE
 CHECK ROUTINE (R1)

 DO ATTITUDE MANEUVER
 ROUTINE (R 21).

 DO ATTITUDE MANEUVER
 ROUTINE (R 21).

* VII PERFORM ATTITUDE MANEUVER
 ROUTINE (R21)

#820

.....
 HOLD
 FLASH VERB-NOUN TO
 REQUEST PLEASE PER-
 FORM SELECTION OF
 THRUSTING-ORBIT
 CHANGE PROGRAM (P41);
 V50 N07
 R1-00041

 MONITOR DSKY:
 OBSERVE VERB-NOUN
 FLASH TO REQUEST
 PLEASE PERFORM
 SELECTION OF P41.

* VIII CHECK AGC FLASHES VERB-NOUN TO
 REQUEST PLEASE PERFORM SELECTION
 OF P41;
 V50 N07
 R1-00041

#830

 WAIT FOR KEYBOARD
 ENTRY.

 KEY IN REQUEST FOR
 THRUSTING-ORBIT
 CHANGE PROGRAM (P41)
 V37E 41E

1. WHEN READY TO COMMENCE THRUSTING-
 ORBIT CHANGE PROGRAM (P41)
 KEY IN
 V37E 41E

#840

 TERMINATE FLASH UPON
 RECEIPT OF NEW PRO-
 GRAM.

OR 2. SELECT NEW PROGRAM AS DESIRED

#850



APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

PRETHRUSTING - RETURN TO EARTH PROGRAM (P 32)

REV 14

6/28/66

PURPOSE:

(1) TO CALCULATE THE REQUIRED VEHICLE VELOCITY (VR), AND TIME OF IGNITION (T IGN) FOR A RETURN TO EARTH SPS THRUSTING MANEUVER TO A SPECIFIED LANDING POINT GIVEN:

(A) LATITUDE AND LONGITUDE OF THE LANDING POINT.

(B) ALLOWABLE DELTA V.

(2) TO MAKE THIS CALCULATION BASED UPON MANEUVER DATA APPROVED, AND KEYED INTO THE AGC, BY THE ASTRONAUT OR GROUND.

(3) TO DISPLAY TO THE ASTRONAUT AND THE GROUND CERTAIN SPECIFIC DEPENDANT VARIABLES (ORBITAL PARAMETERS) ASSOCIATED WITH THE CALCULATED VR AND TIGN FOR FINAL APPROVAL BY THE ASTRONAUT/GROUND.

(4) TO COMPUTE A PREFERRED IMU ORIENTATION AND A REQUIRED VEHICLE ATTITUDE FOR THRUSTING. THIS ORIENTATION AND ATTITUDE WILL BE USED BY THE INFLIGHT ALIGNMENT PROGRAM(S) TO ALIGN THE IMU AND CSM WHEN:

(A) THE ISS IS NOT SUFFICIENTLY ACCURATELY ALIGNED.

(B) A MIDDLE GIMBAL ANGLE GREATER THAN 15 DEGREES WILL EXIST AT THE THRUSTING ATTITUDE.

(5) TO DO THE CSM MANEUVER TO THE THRUSTING ATTITUDE WITHOUT IMU REALIGNMENT IF DESIRED.

ASSUMPTIONS:

(1) BEFORE STARTING THIS PROGRAM THE GROUND CAN UPDATE THE NAVIGATION STATE VECTOR OR INSERT AIM PARAMETERS. THIS IS DONE BY DOING COAST - AGC UPDATE PROGRAM (P 27).

(2) THE PROGRAM MUST BE DONE OVER A TRACKING STATION FOR REAL TIME GROUND PARTICIPATION IN AGC DATA INPUT AND OUTPUT. HOWEVER AIM PARAMETERS MAY BE SENT UP FROM THE GROUND AND STORED FOR FUTURE AGC COMPUTATION. LIKEWISE AGC COMPUTED VARIABLES MAY BE STORED FOR LATER VERIFICATION BY THE GROUND. THESE STORAGE CAPABILITIES ARE LIMITED ONLY TO THE PARAMETERS FOR ONE THRUSTING MANEUVER AT A TIME.

(3) THE ISS MAY BE IN STANDBY OR OPERATE. THE G+N START JP AND CHECK OUT PROGRAM (P05) AND THE INFLIGHT ALIGNMENT-IMU ORIENTATION DETERMINATION PROGRAM (P51) SHOULD BE COMPLETED BEFORE THE SELECTION OF THIS PROGRAM UNLESS THIS PROGRAM IS SELECTED ONLY FOR DATA LOADING AND THRUSTING PARAMETER COMPUTATION. TIME AND RCS FUEL MAY BE SAVED, AND SUBSEQUENT IMU ALIGNMENT DECISIONS GREATLY SIMPLIFIED IF P51 IS PERFORMED IN SUCH A WAY AS TO LEAVE THE IMU INERTIALLY STABILIZED AT AN ORIENTATION AS CLOSE AS POSSIBLE TO THE OPTIMUM ORIENTATION DEFINED BY THIS PROGRAM. THE ISS THUS MAY BE:

(A) OFF (STANDBY).

(B) ON, AND NOT ALIGNED SINCE TURN ON

(C) ON AND AT AN INERTIAL ORIENTATION KNOWN ONLY INACCURATELY BY THE AGC, I.E. HAVING BEEN ALIGNED AT LEAST ONCE SINCE TURN ON BUT NOT WITHIN THE LAST --HRS

(D) ON AND AT AN INERTIAL ORIENTATION KNOWN ACCURATELY BY THE AGC, I.E. HAVING BEEN ALIGNED WITHIN THE LAST --HRS

P 32

IF (A) IS TRUE PROGRAM 05 AND 51 MUST BE PERFORMED BEFORE THIS PROGRAM CAN BE COMPLETED.
 IF (B) IS TRUE PROGRAM 51 MUST BE PERFORMED BEFORE THIS PROGRAM CAN BE COMPLETED.
 IF (C) IS TRUE THE AGC MAY OR MAY NOT HAVE A SATISFACTORY INERTIAL REFERENCE TO ACCURATELY COMPLETE THE PROGRAM.
 IF (D) IS TRUE THE AGC HAS A SATISFACTORY INERTIAL REFERENCE TO ACCURATELY COMPLETE THE PROGRAM. CASES (B), (C) AND (D) HOWEVER ARE FURTHER SUBJECT TO THE CONSTRAINT OF LARGE MIDDLE GIMBAL ANGLE, I.E. THE EXISTING INERTIAL ORIENTATION MAY CAUSE A MIDDLE GIMBAL ANGLE GREATER THAN 15 DEGREES AT THE THRUSTING ORIENTATION OF THE CSM, WHICH IS UNSATISFACTORY AND WILL BE INDICATED BY PROGRAM ALARM.

(4) IN ANY CASE WHERE G+N IS RESPONSIBLE FOR ENTRY CONTROL, THE PROGRAM SHOULD BE PERFORMED TO CALCULATE AND STORE THE PREFERRED IMU ORIENTATION. THIS APPLIES WHETHER OR NOT THE DE-ORBIT THRUSTING MANEUVER IS CONTROLLED BY G+N.

(5) IT IS NORMALLY REQUIRED THAT THE ISS BE ON FOR 1 HOUR PRIOR TO A THRUSTING MANEUVER.

(6) THIS PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY AT LEAST --MIN BEFORE THE ESTIMATED TIME OF THE THRUSTING MANEUVER IGNITION.

PRUG CUNT	AGC	GROUND	CREW	CHECKLIST	TIME	TOTAL TIME
			.CREW PROG. .SELECTION . . .			
-----			-----	* I SELECT PRETHRUSTING-RETURN TO EARTH PROGRAM (P32)		
IS PROGRAM ALLOWED?	.		KEY IN PRETHRUSTING-RETURN TO EARTH PROGRAM (P32)			
.Y	N		V37E 32E	1. ENTER PRETHRUSTING-RETURN TO EARTH PROGRAM: V37E 32E		*10
.....			-----	NOTE:		
				POSSIBLE CHECK FAIL. IF PRESENT PROGRAM DOES NOT ALLOW SELECTION OF P32 THE CHECK FAIL LIGHT WILL ILLUMINATE AND THE OLD PROGRAM DISPLAY WILL REMAIN.		*20
-----			-----	OBSERVE:		
COMMAND CHECK FAIL ALARM			OBSERVE CHECK FAIL LIGHT ON	CHECK FAIL LIGHT ON (LEB) PGNS LIGHT ON (LEB) COMP FAIL LIGHT ON (MDC)		
.....			-----			
RESET CHECK FAIL ALARM			PRESS ALARM RESET TO TURN OFF CHECK FAIL LIGHT			*30
.....			-----			
						P 32

149


```

      .
      .
      .
      .
      .
-----
CLEAR STORAGE AREA
FOR THRUSTING MANEU-
VER PARAMETERS AND
STORE RESULTS OF
ABOVE COMPUTATION.
-----

```

#90

```

      .
      .
      .
      .
      .
-----
PUT AIM PARAMETERS
AND TIG, GAMMA (EI)
AND DELTA R ON AGC
DOWNLINK TO REMAIN
THERE UNTIL TERMINA-
TION OF THE PROGRAM.
-----

```

#100

```

.....
HOLD .
FLASH VERB-NOUN TO
REQUEST PROCEED AND
DISPLAY:
V06 N33
R1-TIG-HRS
R2-TIG-MIN
R3-TIG-SEC

```

```

TIG - TIME OF SPS
IGNITION (GET) IN
HRS, MIN, SEC, TO
NEAREST .01 SEC.
-----

```

```

-----
WAIT FOR KEYBOARD
ENTRY.
TERMINATE FLASH UPON
RECEIPT OF PROCEED.
-----

```

```

-----
MONITOR DSKY:
OBSERVE VERB NOUN
FLASH AND DISPLAY
OF TIG.
-----

```

* III. EVALUATE THE THRUSTING PARAMETERS

- * 1. CHECK AGC FLASHES VERB-NOUN TO REQUEST PROCEED AND DISPLAYS TIG:
 - V06 N33
 - R1-TIG HRS
 - R2-TIG MIN
 - R3-TIG SEC

#110

```

TIG - TIME OF SPS IGNITION
(GET) IN HRS, MIN, SEC, TO
NEAREST .01 SEC.

```

#120

```

-----
EVALUATE THE
DISPLAYED TIG. WHEN
COMPLETE KEY IN
PROCEED
V 33 E
-----

```

- * 2. EVALUATE THE DISPLAYED TIG. WHEN COMPLETE KEY IN PROCEED
 - V 33 E

#130

.....

 HOLD

 FLASH VERB-NOUN TO
 REQUEST PROCEED AND
 DISPLAY THRUSTING
 PARAMETERS:
 V06 N47
 R1-GAMMA (EI)
 R2-DELTA R
 R3-VI (EI)

GAMMA (EI):
 FLIGHT PATH ANGLE:
 ANGLE BETWEEN INERTIAL
 VELOCITY AND THE
 LOCAL HORIZONTAL AT
 THE ENTRY INTERFACE
 ALTITUDE (300,00 FT).
 IN DEGREES TO NEAR-
 EST .01 DEGREE.

DELTA R - MISS DIS-
 TANCE BETWEEN
 DESIRED SPLASH POINT
 AND THE CALCULATED
 SPLASH POINT FOR A
 THRUSTING MANEUVER
 WITH NO OUT-OF-PLANE
 THRUST. ASSUMES
 UP LIFT EQUAL TO .17
 TIMES DRAG AND NO
 OUT OF PLANE FORCE
 DURING ENTRY.
 POLARITY INDICATES
 OVERSHOOT (+) OR
 UNDERSHOOT (-) OF THE
 DESIRED SPLASH POINT
 IN NAUTICAL MILES TO
 NEAREST .1 NM.

VI (EI) - INERTIAL
 VELOCITY AT THE
 ENTRY INTERFACE
 ALTITUDE (300,000
 FT). IN FT/SEC TO
 NEAREST FT/SEC.

 MONITOR DSKY:
 OBSERVE VERB-NOUN
 FLASH AND DISPLAY OF
 THRUSTING PARAMETERS

* 3. CHECK AGC FLASHES VERB-NOUN TO
 REQUEST PROCEED AND DISPLAYS:
 V06 N47
 R1 - GAMMA (EI)
 R2 - DELTA R
 R3 - VI (EI)

#140

GAMMA (EI) - FLIGHT PATH
 ANGLE:
 ANGLE BETWEEN INERTIAL
 VELOCITY AND THE LOCAL
 HORIZONTAL AT THE ENTRY
 INTERFACE ALTITUDE (300,000
 FT). IN DEGREES TO NEAREST
 .01 DEGREE.

#150

DELTA R - MISS DISTANCE
 BETWEEN DESIRED SPLASH
 POINT AND THE CALCULATED
 SPLASH POINT FOR A THRUST-
 ING MANEUVER WITH NO OUT-OF-
 PLANE THRUST. ASSUMES UP
 LIFT EQUAL TO .17 TIMES
 DRAG AND NO OUT OF PLANE
 FORCE DURING ENTRY.
 POLARITY INDICATES OVER-
 SHOOT (+) OR UNDERSHOOT (-)
 OF THE DESIRED SPLASH POINT
 IN NAUTICAL MILES TO
 NEAREST .1 NM.

#160

VI - INERTIAL VELOCITY AT
 THE ENTRY INTERFACE
 ALTITUDE (300,000 FT.). IN
 FT/SEC TO NEAREST FT/SEC.

#170

NOTE:

THE G+N ENTRY EQUATIONS WILL AIM
 FOR THE DESIRED SPLASH POINT (CO-
 ORDINATES LOADED IN R36) NOT THE
 CALCULATED SPLASH POINT. THUS THE
 ENTRY EQUATIONS WILL ATTEMPT TO
 DRIVE DELTA R TO ZERO.

#180

152

IS A GROUND STATION
AVAILABLE FOR CON-
FIRMATION OF THESE
PARAMETERS?

Y. N

#190

MONITOR AGC
DOWNLINK TELE- .
METRY OF TIG, .
GAMMA (EI) .
DELTA R AND VI .
(EI) COORDINATE
EVALUATION OF
AGC COMPUTED
PARAMETERS WITH
ASTRONAUT.

COORDINATE
EVALUATION OF
THE AGC COMPU-
TED PARAMETERS
WITH THE
GROUND.

* 4. COORDINATE EVALUATION OF THE AGC
COMPUTED PARAMETERS WITH THE
GROUND

#200

SELECT ONE OF
THE FOLLOWING
FIVE ALTERNA-
TIVES:

(1) IF THE CALCJ-
LATED DATA IS
SATISFACTORY,
PERFORM THE THRJ-
STING MANEUVER
USING THE AGC
CALCULATED PARA-
METERS WITHOUT
GROUND CONFIRMA-
TION.

#210

(2) IF THE CALCJ-
LATED DATA IS NOT
SATISFACTORY, AD-
JUST THE CALCULA-
TED PARAMETERS BY
RESELECTING P 32
AS NECESSARY AND
CHANGING THE
LOADED AIM PARA-
METERS UNTIL AGC
COMPUTED PARAMET-
ERS ARE SATISFAC-
TORY. THEN
PERFORM THE THRJ-
STING MANEUVER.
(3) REMAIN AT

#220

#230

159


```

METERS UNTIL AGC
COMPUTED PARA-
METERS ARE
SATISFACTORY.
(2) OBTAIN NEW
AIM PARAMETERS
FROM THE GROUND
BY VOICE LINK,
RESELECT P 32,
KEY IN NEW DATA,
ETC.
(3) SELECT THE
COAST-AGC UPDATE
PROGRAM (P 27),
LOAD NEW AIM
PARAMETERS FROM
THE GROUND VIA
THE AGC UPLINK
OR BY CREW
DSKY INPUT,
RESELECT P 32,
OBSERVE NEW AIM
PARAMETERS ETC.
(4) TERMINATE
P 32 BY SELECT-
ING A NEW PRO-
GRAM AS DESIRED
AND PERFORM THR-
USTING MANUEVER
USING BACKUP
PROCEDURES
-----

```

#290

#300

#310

```

1.
2.
3.
4.
.....

```

#320

```

-----
WAIT FOR KEYBOARD
ENTRY.

```

```

-----
KEY IN PROGRAM
SELECTION AS
DESIRED.
V37E--E
-----

```

- ```

*
A. NAV REJECTS PARAMETERS;
(1) RESELECT P32 AND LOAD DESIRED
DATA
OR (2) SELECT P27 (SEE P27 CHECK
LIST) AND LOAD DESIRED DATA
BY AGC UPLINK OR VOICE LINK.
RESELECT P32.
OR (3) SELECT NEW PROGRAM AND

```

#330

EXIT P 32

TERMINATE FLASH UPON  
RECEIPT OF PROCEED  
OR NEW PROGRAM.

-----  
P. . . . . NEW  
R. . . . . PROGRAM  
O. . . . .  
C. . . . .  
E. . . . .  
E. . . . .  
D. GO TO PROGRAM  
SELECTED  
-----  
. . . . .  
. . . . .  
. . . . .  
. . . . .  
. . . . .  
EXIT P 32  
-----

-----  
COMPUTE:  
(1) INITIAL THRUST  
DIRECTION.  
  
(2) PREFERRED IMU  
INERTIAL  
ORIENTATION.  
  
X = UNIT (-X )  
-SM -SC  
  
Y = UNIT (X X R)  
-SM -SC -  
  
Z = UNIT (X X Y )  
-SM -SM -SM  
  
WHERE:  
  
X = THE DIRECTION  
-SC OF THE  
SPACECRAFT  
+X AXIS AT  
TIGN.  
  
R = THE EARTH  
- CENTERED  
POSITION  
RADIUS VEC-  
TOR AT TIGN.

-----  
KEY IN PROCEED  
V 33 E  
-----

PERFORM THRUSTING WITH  
BACKUP PROCEDURES.  
  
\* B. NAV ACCEPTS PARAMETERS:  
KEY IN PROCEED  
V 33 E

P 32  
#340

#350

#360

#370

#380

#390

P 32





G. NAV CONFIRMS LEB CLOCK SET

NAV:

A. RESET TTE CLOCK AT LEB TO ZERO

B. SET TTE CLOCK FOR TIME DISPLAYED ON DSKY (SYNC TO NEAREST MINUTE)

#460

C. START TTE CLOCK AT SYNC TIME

#470

IS THE ISS ORIENTATION KNOWN FLAG SET? (CHECK REFSMFLG)

.Y .N

IS ISS ZERO FLAG SET?

.Y .N

TERMINATE P-- AND GO TO G+N STARTUP PROGRAM (P05)

EXIT P32

MONITOR DSKY: OBSERVE TERMINATION OF P-- AND DISPLAY OF P05

EXIT P32

TERMINATE P-- AND GO TO IMU ORIENTATION DETERMINATION PROGRAM (P51)

EXIT P32

MONITOR DSKY: OBSERVE TERMINATION OF P-- AND DISPLAY OF P51

EXIT P32

NOTE:

IF IMU IS ON STANDBY, AGC WILL DISPLAY P05. AFTER P05 THE AGC SELECTS P00. CREW THEN SELECTS P51. AFTER P51 AGC RETURNS TO P22. CREW MUST RESELECT P32

#480

NOTE:

IF IMU HAS NOT BEEN ALIGNED SINCE TURN ON AGC WILL DISPLAY P51. AFTER P51 AGC RETURNS TO P00. CREW MUST RESELECT P32

#490

#500

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COMPUTE GIMBAL
ANGLES AT INITIAL
THRUST ORIENTATION
IF THE PRESENT IMU
ORIENTATION IS HELD.

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#510

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.
.

FLASH VERB-NOUN TO
REQUEST PROCEED AND
DISPLAY THE GIMBAL
ANGLES THAT WILL
EXIST AT THE INITIAL
THRUST ORIENTATION
IF THE PRESENT IMU
ORIENTATION IS HELD:
V06 N17
R1-OG ROLL
R2-IG PITCH
R3-MG YAW
ALL GIMBAL ANGLE
IN DEGREES TO
NEAREST .01 DEG.

.
```

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MONITOR DSKY:
OBSERVE VERB-NOUN
FLASH AND DISPLAY OF
GIMBAL ANGLES AT THE
INITIAL THRUST
ORIENTATION.

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```

```

* V CHECK AGC FLASHES VERB-NOUN TO
REQUEST PROCEED AND DISPLAYS GIMBAL
ANGLES THAT WILL EXIST AT THE S/C
THRUST ORIENTATION IF THE PRESENT
IMU ORIENTATION IS HELD:
V06 N17
R1 - OG ROLL
R2 - IG PITCH
R3 - MG YAW
ALL GIMBAL ANGLES IN DEGREES TO
NEAREST .01 DEGREE

```

#520

#530

```

IS MIDDLE GIMBAL
ANGLE GREATER THAN
15 DEGREES?

.Y .N
.
```

```

* 1. IF THE MIDDLE GIMBAL ANGLE DISPLAY
IS GREATER THAN 15 DEGREES, SELECT
THE FOLLOWING IN ORDER:
```

#540

```

A. INFLIGHT ALIGNMENT-CSM/IMU ALIGN
PROGRAM (P53)
KEY IN
V37E53E
```

```

B. THRUSTING-RETURN TO EARTH
PROGRAM (P42)
KEY IN
V37E 42E
```

#550

```

WAIT FOR KEYBOARD
ENTRY
```

```

DO INFLIGHT
ALIGNMENT
IMU/CSM ALIGN
PROGRAM (P53)

.
```

```

.
.
.
EXIT P32

.
```

#560

-----  
ADVISE CREW  
WITHIN  
GROUND  
CAPABILITY  
-----

-----  
DO I WISH TO MAKE  
THE THRUSTING  
MANEUVER WITH THE  
PRESENT IMU ORIENTA-  
TION  
CONSIDER:

- (A) THE TIME SINCE THE LAST FINE ALIGNMENT OF THE IMU.
- (B) IS TIME CRITICAL?
- (C) IS RCS FUEL CRITICAL?
- (D) DOES THE GROUND CONCUR WITH THE THRUSTING MANEUVER AT THIS ORIENTATION?

-----  
•N •Y  
•  
•

-----  
DO IMU/CSM ALIGN  
PROGRAM  
(P 53) • KEY IN  
V 37 E 53 E  
WHEN ABOVE PRO-  
GRAM IS COMPLETE  
SELECT THRUSTING  
-RETURN TO EARTH  
PROGRAM (P42)  
-----

•  
•••  
•  
EXIT P32

- \* 2. IF THE MIDDLE GIMBAL ANGLE DISPLAYED IS LESS THAN 15 DEGREES:
  - A. REALIGN THE IMU IF DESIRED AFTER CONSIDERING THE FOLLOWING:
    - (1) TIME SINCE LAST FINE ALIGNMENT OF THE IMU #570
    - (2) IS TIME CRITICAL?
    - (3) IS RCS FUEL CRITICAL?
    - (4) DOES GROUND CONCUR WITH THRUSTING WITH PRESENT IMU ORIENTATION?
  - SELECT IMFLIGHT ALIGNMENT-CSM/IMU ALIGN PROGRAM (P53) #580  
KEY IN  
V37E 53E
  - OR B. ACCEPT PRESENT IMU ORIENTATION FOR THRUSTING AFTER CONSIDERING (1)-(4) ABOVE. CONTINUE BELOW.

#590

#600

- \* 3. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT MDC:
  - PANEL B #610
  - 1. DIRECT RCS - OFF
  - 2. LIMIT CYCLE - OFF
  - 3. ATTITUDE DEADBAND - MAX
  - 4. .05G ENTRY - OFF



- 5. LOCAL VERTICAL - OFF #620
- 6. DELTA V - OFF
- 7. G+N/SCS - G+N
- 8. ATTITUDE/MONITOR/ENTRY-MONITOR
- 9. A&C ROLL CHANNEL - OFF
- 10. B&D ROLL CHANNEL - ON #630
- 11. PITCH CHANNEL - ON
- 12. YAW CHANNEL - ON
- 13. ROLL RATE GYRO - NORMAL
- 14. PITCH RATE GYRO - NORMAL
- 15. YAW RATE GYRO - NORMAL #640

PANEL 25

- 1. F&AI LTG - AC1
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED #650
- 5. GROUP 2-AC2 - CLOSED
- 6. GROUP 1-MNA - CLOSED
- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED #660
- 9. GROUP 2-MNB - CLOSED
- 10. DIRECT CONTROL-MNA - CLOSED
- 11. DIRECT CONTROL-MNB - CLOSED
- 12. A&C ROLL-MNA - CLOSED
- 13. A&C ROLL-MNB - CLOSED #670
- 14. B&D ROLL-MNA - CLOSED
- 15. B&D ROLL-MNB - CLOSED

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.....

P 32

- 16. PITCH-MNA - CLOSED
- 17. PITCH-MNB - CLOSED
- 18. YAW-MNA - CLOSED
- 19. YAW-MNB - CLOSED #680
- 20. G6N SYNC - OFF
- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED
- 23. GIMBAL MOTOR CONTROL PITCH 1  
BAT A - CLOSED #690
- 24. GIMBAL MOTOR CONTROL PITCH 2  
BAT B - CLOSED
- 25. GIMBAL MOTOR CONTROL YAW 1  
BAT A - CLOSED
- 26. GIMBAL MOTOR CONTROL YAW 2  
BAT B - CLOSED #700

MISCELLANEOUS

- 1. TRANSLATION CONTROLS - LOCKED
- 2. ROTATION CONTROLS - PINNED

PANEL 6 #710

- 1. ATTITUDE SET - OFF

PANEL 7

- 1. NORMAL/OFF/DIRECT ON - OFF #720

PANEL 2

- 1. FDA1 SELF TEST - OFF
- 2. FDA1 BRIGHTNESS - SET
- 3. FCSM - AUTO/OVERRIDE - OVERRIDE #730

P 32

- 4. FC5M - ON/OFF/RESET - OFF

PANEL 24

- 1. SCS POWER - AC1
- 2. RATE GYRO POWER - AC1
- 3. BMAG POWER - AC2
- 4. ROTATION CONTROL POWER - AC2
- 5. TVC 1 POWER - OFF
- 6. TVC 2 POWER - OFF

#740

PANEL 3

- 1. PITCH GIMBAL MOTOR 1 - OFF
- 2. PITCH GIMBAL MOTOR 2 - OFF
- 3. YAW GIMBAL MOTOR 1 - OFF
- 4. YAW GIMBAL MOTOR 2 - OFF
- 5. INJECT PREVALVE A - OFF
- 6. INJECT PREVALVE B - OFF

#750

#760

PANEL 14

- 1. UPTL - BLOCK
- 2. DSKY BRIGHTNESS - SET

#770

PANEL 22

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED
- 3. IMU-MNA - CLOSED
- 4. IMU-MNB - CLOSED
- 5. COMPUTER-MNA - CLOSED

#780

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.....

- 6. COMPUTER-MNB - CLOSED
- 7. OPTICS-MNA - OPEN
- 8. OPTICS-MNB - OPEN
- 9. AC POWER-AC1 - CLOSED
- 10. AC POWER-AC2 - CLOSED
- 11. G6N-AC POWER - AC1

#790

\*4. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT NAV STATION

#800

- 1. FLOODLIGHT CONTROL PRIMARY - OFF
- 2. FLOODLIGHT CONTROL SECONDARY - OFF
- 3. IMU TRANSFER - COMPUTER
- 4. OPTICS SLAVE TELESCOPE - STAR LOS
- 5. OPTICS MODE - ZERO OPTICS
- 6. OPTICS HOLD - OFF
- 7. OPTICS CONTROLLER SPEED - HI
- 8. OPTICS CONTROLLER MODE - DIRECT
- 9. PANEL BRIGHTNESS CONTROL - OFF
- 10. IMU TEMP. MODE - AUTO OVERRIDE
- 11. ATTITUDE IMPULSE ENABLE - OFF
- 12. CONDUTION LAMPS - OFF
- 13. AGC MODE - ON
- 14. AGC BRIGHTNESS CONTROL - OFF

#810

#820

#830

SCS-G+N  
MONITOR  
PRESENT

TERMINATE FLASH UPON  
RECEIPT OF PROCEED  
OR NEW PROGRAM

KEY IN PROCEED  
V 33 E

\* 5. KEY IN PROCEED  
V33E

#840

P. . . . . NEW  
R. . . . . PROGRAM  
O.  
C. GO TO PROGRAM  
E. SELECTED  
E.  
D.

EXIT P 32

#850

SELECT FINAL VEHICLE  
ATTITUDE FOR USE BY  
ATTITUDE MANEUVER  
ROUTINE.

#860

DO ATT CONTROL MODE  
CHECK ROUTINE (R 1).

DO ATT CONTROL MODE  
CHECK ROUTINE (R 1).

\* VI PERFORM ATT CONTROL MODE CHECK  
ROUTINE (R1)

#870

DO ATTITUDE MANEUVER  
ROUTINE (R 21).

DO ATTITUDE MANEUVER  
ROUTINE (R 21).

\* VII PERFORM ATTITUDE MANEUVER ROUTINE  
(R21)

FLASH VERB-NOUN TO  
REQUEST PLEASE PER-  
FORM SELECTION OF  
THRUSTING-RETURN TO  
EARTH PROGRAM (P 42):  
V50 N07  
R1-00042

MONITOR DSKY:  
OBSERVE VERB-NOUN  
FLASH TO REQUEST  
PLEASE PERFORM  
SELECTION OF P42.

\* VIII CHECK AGC FLASHES VERB-NOUN TO  
REQUEST PLEASE PERFORM SELECTION  
OF P42.  
V50 N07  
R1-00042

#880

HOLD

165





P 32

#890

1. WHEN READY TO COMMENCE THRUSTING-RETURN TO EARTH PROGRAM (P42) KEY IN V 37 E 42 E

- OR 2. SELECT NEW PROGRAM AS DESIRED

#900

3. OBSERVE DISPLAY OF PROGRAM SELECTED.

#910

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

PRE-THRUSTING - SPS MINIMUM IMPULSE PROGRAM (P 33)

REV 12

6/28/66

PURPOSE:

- (1) TO CALCULATE, FOR USE BY THE INFLIGHT ALIGNMENT PROGRAM, THE PREFERRED IMU ORIENTATION AND REQUIRED VEHICLE ATTITUDE FOR AN SPS MINIMUM IMPULSE THRUSTING MANEUVER GIVEN:
- (A) A TIME OF IGNITION.
  - (B) THE LATITUDE AND LONGITUDE OF A GROUND POINT ON THE DESIRED TRACK AND THE ALTITUDE OF THE DESIRED ORBIT OVER THE MEAN EQUATORIAL RADIUS AT THIS GROUND POINT.
  - (C) THE PERIOD OF THIS DESIRED ORBIT.
- TO COMPUTE THIS IMU ORIENTATION AND VEHICLE ATTITUDE FOR USE WHEN:
- (A) THE ISS IS NOT SUFFICIENTLY ACCURATELY ALIGNED.
  - (B) THE ISS MUST BE RE-ALIGNED BECAUSE OF A MIDDLE GIMBAL ANGLE GREATER THAN 15 DEGREES AT THRUSTING ATTITUDE.
- (2) TO MAKE THIS CALCULATION BASED UPON MANEUVER DATA APPROVED, AND KEYED INTO THE AGC, BY THE ASTRONAUT, OR GROUND.
- (3) TO DISPLAY TO THE ASTRONAUT AND THE GROUND CERTAIN SPECIFIC DEPENDANT VARIABLES (ORBITAL PARAMETERS) ASSOCIATED WITH THE CALCULATED VR AND TIGN FOR FINAL APPROVAL BY THE ASTRONAUT/GROUND.
- (4) TO OBTAIN FOR THE AGC THE DESIRED TIME OF SPS BURN FROM THE ASTRONAUT OR THE GROUND.
- (5) TO DO THE CSM MANEUVER TO THE THRUSTING ATTITUDE WITHOUT IMU REALIGNMENT IF DESIRED.

ASSUMPTIONS:

- (1) BEFORE STARTING THIS PROGRAM THE GROUND CAN UPDATE THE NAVIGATION STATE VECTOR OR INSERT AIM PARAMETERS, THIS IS DONE BY DOING COAST-AGC UPDATE PROGRAM (P27).
- (2) THE PROGRAM MUST BE DONE OVER A TRACKING STATION FOR REAL TIME GROUND PARTICIPATION IN AGC DATA INPUT AND OUTPUT. HOWEVER AIM PARAMETERS MAY BE SENT UP FROM THE GROUND AND STORED FOR FUTURE AGC COMPUTATION. LIKEWISE AGC COMPUTED VARIABLES MAY BE STORED FOR LATER VERIFICATION BY THE GROUND. THESE STORAGE CAPABILITIES ARE LIMITED ONLY TO THE PARAMETERS FOR ONE THRUSTING MANEUVER AT A TIME.
- (3) THE ISS MAY BE IN STANDBY OR OPERATE. THE G+N START UP AND CHECK OUT PROGRAM (P05) AND THE INFLIGHT ALIGNMENT-IMU ORIENTATION DETERMINATION PROGRAM (P51) SHOULD BE COMPLETED BEFORE THE SELECTION OF THIS PROGRAM UNLESS THIS PROGRAM IS SELECTED ONLY FOR DATA LOADING AND THRUSTING PARAMETER COMPUTATION. TIME AND RCS FUEL MAY BE SAVED, AND SUBSEQUENT IMU ALIGNMENT DECISIONS GREATLY SIMPLIFIED IF P51 IS PERFORMED IN SUCH A WAY AS TO LEAVE THE IMU INERTIALLY STABILIZED AT AN ORIENTATION AS CLOSE AS POSSIBLE TO THE OPTIMUM ORIENTATION DEFINED BY THIS PROGRAM. THE ISS THUS MAY BE:
- (A) OFF (STANDBY).
  - (B) ON, AND NOT ALIGNED SINCE TURN ON
  - (C) ON AND AT AN INERTIAL ORIENTATION KNOWN ONLY INACCURATELY BY THE AGC, I.E. HAVING BEEN ALIGNED AT LEAST ONCE SINCE TURN ON BUT NOT WITHIN THE LAST --HRS

(D) ON AND AT AN INERTIAL ORIENTATION KNOWN ACCURATELY BY THE AGC, I.E. HAVING BEEN ALIGNED WITHIN THE LAST --HRS

IF (A) IS TRUE PROGRAM 05 AND 51 MUST BE PERFORMED BEFORE THIS PROGRAM CAN BE COMPLETED.  
 IF (B) IS TRUE PROGRAM 51 MUST BE PERFORMED BEFORE THIS PROGRAM CAN BE COMPLETED.  
 IF (C) IS TRUE THE AGC MAY OR MAY NOT HAVE A SATISFACTORY INERTIAL REFERENCE TO ACCURATELY COMPLETE THE PROGRAM.  
 IF (D) IS TRUE THE AGC HAS A SATISFACTORY INERTIAL REFERENCE TO ACCURATELY COMPLETE THE PROGRAM. CASES (B), (C) AND (D) HOWEVER ARE FURTHER SUBJECT TO THE CONSTRAINT OF LARGE MIDDLE GIMBAL ANGLE, I.E. THE EXISTING INERTIAL ORIENTATION MAY CAUSE A MIDDLE GIMBAL ANGLE GREATER THAN 15 DEGREES AT THE THRUSTING ORIENTATION OF THE CSM, WHICH IS UNSATISFACTORY AND WILL BE INDICATED BY PROGRAM ALARM.

(4) IT IS NORMALLY REQUIRED THAT THE G+N ISS BE ON FOR 1 HOUR PRIOR TO A THRUSTING MANEUVER.

(5) THIS PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY AT LEAST -- MIN BEFORE THE ESTIMATED TIME OF THE THRUSTING MANEUVER IGNITION.

| PRG<br>CONT | AGC                                                                                    | GROUND | CREW                                                                                            | CHECKLIST                                                                                                                                                                  | TIME | TOTAL<br>TIME |
|-------------|----------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|
|             |                                                                                        |        | .CREW PROG.<br>.SELECTION<br>.<br>.<br>.                                                        |                                                                                                                                                                            |      |               |
|             | -----<br>IS PROGRAM ALLOWED?<br>-----<br>.Y . . . . .N .<br>.<br>.<br>.<br>.<br>.<br>. |        | -----<br>KEY IN PRETHRUSTING-<br>SPS MINIMUM IMPULSE<br>PROGRAM (P33)<br>V37E 33E<br>-----      | * I. SELEC1 PRETHRUSTING-SPS MINIMUM<br>IMPULSE PROGRAM (P33)<br>1. ENTER PRETHRUSTING-SPS MINIMUM<br>IMPULSE PROGRAM:<br>V37E 33E                                         |      | *10           |
|             | -----<br>COMMAND CHECK<br>FAIL ALARM<br>-----<br>.<br>.<br>.<br>.<br>.                 |        | -----<br>OBSERVE CHECK FAIL<br>LIGHT ON<br>-----<br>.<br>.<br>.<br>.<br>.                       | NOTE:<br>POSSIBLE CHECK FAIL. IF PRESENT<br>PROGRAM DOES NOT ALLOW SELECTION OF<br>P33 THE CHECK FAIL LIGHT WILL<br>ILLUMINATE AND THE OLD PROGRAM<br>DISPLAY WILL REMAIN. |      | *20           |
|             | -----<br>RESET CHECK<br>FAIL ALARM<br>-----<br>.<br>.<br>.<br>.<br>.                   |        | -----<br>PRESS ALARM RESET TO<br>TURN OFF CHECK FAIL<br>LIGHT<br>-----<br>.<br>.<br>.<br>.<br>. | OBSERVE:<br>CHECK FAIL LIGHT ON (LEB)<br>PGNS LIGHT ON (LEB)<br>COMP FAIL LIGHT ON (MDC)<br>GO TO BACKUP PROCEDURES AND                                                    |      |               |
|             |                                                                                        |        |                                                                                                 |                                                                                                                                                                            |      |               |
|             |                                                                                        |        |                                                                                                 |                                                                                                                                                                            |      |               |
|             |                                                                                        |        |                                                                                                 |                                                                                                                                                                            |      |               |
|             |                                                                                        |        |                                                                                                 |                                                                                                                                                                            |      |               |
|             |                                                                                        |        |                                                                                                 |                                                                                                                                                                            |      |               |
|             |                                                                                        |        |                                                                                                 |                                                                                                                                                                            |      |               |
|             |                                                                                        |        |                                                                                                 |                                                                                                                                                                            |      |               |
|             |                                                                                        |        |                                                                                                 |                                                                                                                                                                            |      |               |

168



SELECT A PROGRAM WHICH IS ALLOWED. #30

2. CHECK AGC DISPLAYS PROGRAM 33

\* II PERFORM PRETHRUSTING-SPS MINIMUM IMPULSE DATA LOAD ROUTINE (R-33)

169

-----  
CLEAR STORAGE AREA  
FOR THRUSTING MANEU-  
VER PARAMETERS AND  
STORE RESULTS OF  
ABOVE COMPUTATION.  
-----

#90

-----  
PUT AIM PARAMETERS  
AND APOGEE ALT,  
PERIGEE ALT AND  
DELTA V REQUIRED,  
ON AGC DOWNLINK  
TO REMAIN THERE  
UNTIL TERMINATION OF  
THE PROGRAM.  
-----

#100

\* III EVALUATE THE THRUSTING PARAMETERS

.....  
HOLD . . . . . FLASH VERB/NOUN TO  
REQUEST PROCEED AND  
DISPLAY THRUSTING  
PARAMETERS:  
V06 N45  
R1-APOGEE ALT  
R2-PERIGEE ALT  
R3-DELTA V  
REQUIRED

-----  
MONITOR DSKY;  
OBSERVE VERB-NOUN  
FLASH AND DISPLAY OF  
THRUSTING PARAMETERS  
-----

- \* 1. CHECK AGC FLASHES VERB-NOUN TO  
REQUEST PROCEED AND DISPLAYS  
THRUSTING PARAMETERS:  
V06 N45  
R1 - APOGEE ALT  
R2 - PERIGEE ALT  
R3 - DELTA V REQUIRED

#110

.....  
APOGEE ALT-ALTITUDE  
OF APOGEE ABOVE  
FISCHER ELLIPSOID.  
IN NAUTICAL MILES  
TO NEAREST .1 NM.

-----  
IS A GROUND STATION  
AVAILABLE FOR CON-  
FIRMATION OF THESE  
PARAMETERS?  
-----

APOGEE ALT - ALTITUDE OF  
APOGEE ABOVE FISCHER  
ELLIPSOID. IN NAUTICAL  
MILES TO NEAREST .1 NM.

#120

.....  
PERIGEE ALT-ALTITUDE  
OF PERIGEE ABOVE  
FISCHER ELLIPSOID.  
IN NAUTICAL MILES  
TO NEAREST .1 NM.

PERIGEE ALT - ALTITUDE OF  
PERIGEE ABOVE FISCHER  
ELLIPSOID. IN NAUTICAL  
MILES TO NEAREST .1 NM.

.....  
DELTA V REQUIRED-SPS  
DELTA V REQUIRED  
TO ACCOMPLISH  
MANEUVER, IN FT/SEC  
TO NEAREST FT/SEC.  
-----

DELTA V REQUIRED - SPS  
DELTA V REQUIRED TO ACCOM-  
PLISH MANEUVER. IN FT/SEC  
TO NEAREST FT/SEC.

#130

```

MONITOR AGC COORDINATE
DOWNLINK TELE- EVALUATION OF
METRY OF APOGEE THE AGC COMPU-
ALT, PERIGEE TED PARAMETERS
ALT AND DELTA V WITH THE
REQUIRED. GROUND.
COORDINATE EVAL-
JATION OF AGC
COMPUTED PARA-
METERS WITH
ASTRONAUT.

```

#140

2. COORDINATE EVALUATION OF THE AGC  
COMPUTED PARAMETERS WITH THE  
GROUND.

#150

```

SELECT ONE OF
THE FOLLOWING
FIVE ALTERNATIVES

```

#160

```

(1) IF THE CALCJ-
LATED DATA IS
SATISFACTORY,
PERFORM THE THRJ-
STING MANEUVER
USING THE AGC
CALCULATED PARA-
METERS WITHOUT
GROUND CONFIRMA-
TION.

```

#170

```

(2) IF THE CALCJ-
LATED DATA IS NOT
SATISFACTORY AD-
JUST THE CALCULA-
TED PARAMETERS BY
RESELECTING P 33
AS NECESSARY AND
CHANGING THE
LOADED AIM PARA-
METERS UNTIL AGC
COMPUTED PARAMET-
ERS ARE SATISFAC-
TORY, THEN

```

#180

```

PERFORM THE THRJ-
STING MANEUVER.
(3) REMAIN AT
THIS POINT IN THE
AGC PROGRAM UNTIL
GROUND CO-ORDINA-
TION IS AVAILABLE
(4) SELECT A NEW
PROGRAM AS DE-

```

#190

SIREN UNTIL  
GROUND CO-ORDINA-  
TION IS AVAILABLE  
THEN RESELECT  
P 33, LEAVE AIM  
PARAMETERS  
UNCHANGED ETC.  
(5) SELECT A NEW  
PROGRAM AS DE-  
SIREN AND PERFORM  
THRUSTING MANEU-  
VER USING BACKUP  
PROCEDURES.

#200

3 2.1  
4  
5

#210

ARE THESE  
PARAMETERS  
SATISFACTORY  
FOR USE BY THE  
AGC FOR  
THE THRUSTING  
MANEUVER?

#220

N. Y.

SELECT ONE OF  
THE FOLLOWING  
FOUR ALTERNA-  
TIVES:

#230

(1) ADJUST THE  
CALCULATED PARA-  
METERS BY RESEL-  
ECTING P 33 AS  
NECESSARY AND  
CHANGING THE  
LOADED AIM PARA-  
METERS UNTIL AGC  
COMPUTED PARA-  
METERS ARE  
SATISFACTORY.  
(2) OBTAIN NEW  
AIM PARAMETERS

#240

FROM THE GROUND  
BY VOICE LINK,  
RESELECT P 33,  
KEY IN NEW DATA,  
ETC.

(3) SELECT THE  
COAST-AGC UPDATE  
PROGRAM (P 27),  
LOAD NEW AIM  
PARAMETERS FROM  
THE GROUND VIA  
THE AGC UPLINK,  
OR BY CREW  
DSKY INPUT.

RESELECT P 33,  
OBSERVE NEW AIM  
PARAMETERS,ETC.

(4) TERMINATE  
P 33 BY SELECT-  
ING A NEW PRO-  
GRAM AS DESIRED  
AND PERFORM THR-  
USTING MANEUVER  
USING BACKUP  
PROCEDURES.

- 1.
- 2.
- 3.
- 4.

KEY IN PROGRAM  
SELECTION AS  
DESIRED  
V 37E --E

EXIT P 33

WAIT FOR KEYBOARD  
ENTRY.

#250

#260

#270

\* A. NAV REJECTS PARAMETERS;

- (1) RESELECT P33 AND LOAD DESIRED DATA
- OR (2) SELECT P27 (SEE P27 CHECK LIST) AND LOAD DESIRED DATA BY AGC UPLINK OR VOICE LINK. RESELECT P33

- OR (3) SELECT NEW PROGRAM AND PERFORM THRUSTING WITH BACKUP

#280

#290



TERMINATE FLASH UPON  
RECEIPT OF PROCEED  
OR NEW PROGRAM.

-----  
KEY IN PROCEED  
V 33 E  
-----

PROCEDURES  
\* B. NAV ACCEPTS PARAMETERS:  
KEY IN PROCEED  
V33E

-----  
P.           . NEW  
R.           . PROGRAM  
O.           .  
C.           -----  
E.           GO TO PROGRAM  
E.           SELECTED.  
D.           -----

#300

.  
.           .  
.           .  
.           .  
.           .  
.           .  
.           .  
.           .  
.           .  
.           .  
.           .  
-----

#310

COMPUTE:

(1) INITIAL THRUST  
DIRECTION.

(2) PREFERRED IMU  
INERTIAL  
ORIENTATION.

#320

X = UNIT (+X )  
-SM           -SC

Y = UNIT (X X R)  
-SM           -SC -

Z = UNIT (X X Y )  
-SM           -SC -SM

#330

WHERE:

X = THE DIRECTION  
-SC OF THE  
SPACECRAFT  
+X AXIS AT  
TIGN.

R = THE EARTH  
- CENTERED  
POSITION  
RADIUS VEC-  
TOR AT TIGN.

#340





P 33

NAV:

- A. RESET THE CLOCK AT LEB TO ZERO
- B. SET THE CLOCK FOR TIME DISPLAYED ON DSKY (SYNC TO NEAREST MINUTE)
- C. START THE CLOCK AT SYNC TIME

#410

#420

#430

NOTE:

IF IMU IS ON STANDBY, AGC WILL DISPLAY P05. AFTER P05 THE AGC SELECTS P00. CREW THEN SELECTS P51. AFTER P51 AGC RETURNS TO P00. CREW MUST RESELECT P33

#440

NOTE:

IF IMU HAS NOT BEEN ALIGNED SINCE TURN ON AGC WILL DISPLAY P51. AFTER P51 AGC RETURNS TO P00. CREW MUST RESELECT P33

P 33

#450

```

TERMINATE P--
AND GO TO IMU
ORIENTATION
DETERMINATION
PROGRAM (P51)

```

```

MONITOR DSKY:
OBSERVE TERMINATION
OF P-- AND DISPLAY
OF P51

```

EXIT P33

EXIT P33

#460

```

COMPUTE GIMBAL
ANGLES AT INITIAL
S/C THRUST ORIENTA-
TION IF THE PRESENT
IMU ORIENTATION IS
HELD.

```

#470

```

FLASH VERB-NOUN TO
REQUEST PROCEED AND
DISPLAY THE GIMBAL
ANGLES THAT WILL
EXIST AT THE INITIAL
S/C THRUST ORIENTA-
TION IF THE PRESENT
IMU ORIENTATION IS
HELD:
V06 N17
R1 - OG ROLL
R2 - IG PITCH
R3 - MG YAW
ALL GIMBAL ANGLES IN
DEGREES TO NEAREST
.01 DEGREE.

```

```

MONITOR DSKY:
OBSERVE VERB-NOUN
FLASH AND DISPLAY OF
GIMBAL ANGLES AT THE
THRUST ORIENTATION.

```

```

* V CHECK AGC FLASHES VERB-NOUN TO
REQUEST PROCEED AND DISPLAYS GIMBAL
ANGLES THAT WILL EXIST AT THE
S/C THRUST ORIENTATION IF THE
PRESENT IMU ORIENTATION IS HELD:
V06 N17
R1 - OG ROLL
R2 - IG PITCH
R3 - MG YAW

```

#480

```

ALL GIMBAL ANGLES IN DEGREES TO
NEAREST .01 DEGREE.

```

#490

```

IS MIDDLE GIMBAL
ANGLE GREATER THAN
15 DEGREES?

```

```

* 1. IF THE MIDDLE GIMBAL ANGLE
DISPLAYED IS GREATER THAN 15
DEGREES, SELECT THE FOLLOWING IN
ORDER:

```

#500

```

A. INFLIGHT ALIGNMENT-CSM/IMU ALIGN
PROGRAM (P53)

```

177



DO INFLIGHT ALI-  
GNMENT IMU/CSM  
ALIGN PROGRAM  
(P53)  
KEY IN  
V37E 53E  
WHEN ABOVE PRO-  
GRAM IS COMPLETE  
SELECT THRUSTING  
SPS MINIMUM IM-  
PULSE PROGRAM  
(P43)

EXIT P33

- \* 3. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT MDC #560

PANEL 8

- 1. DIRECT RCS - OFF
- 2. LIMIT CYCLE - OFF
- 3. ATTITUDE DEADBAND - MAX #570
- 4. .05G ENTRY - OFF
- 5. LOCAL VERTICAL - OFF
- 6. DELTA V - OFF
- 7. G+N/SCS - G+N
- 8. ATTITUDE/MONITOR/ENTRY-MONITOR #580
- 9. A6C ROLL CHANNEL - OFF
- 10. B6D ROLL CHANNEL - ON
- 11. PITCH CHANNEL - ON
- 12. YAW CHANNEL - ON
- 13. ROLL RATE GYRO - NORMAL #590
- 14. PITCH RATE GYRO - NORMAL
- 15. YAW RATE GYRO - NORMAL

PANEL 25

- 1. FDAI LTG - AC1 #600
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED
- 5. GROUP 2-AC2 - CLOSED

- 6. GROUP 1-MNA - CLOSED #610
- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED
- 9. GROUP 2-MNB - CLOSED
- 10. DIRECT CONTROL-MNA - CLOSED
- 11. DIRECT CONTROL-MNB - CLOSED #620
- 12. A&C ROLL-MNA - CLOSED
- 13. A&C ROLL-MNB - CLOSED
- 14. B&D ROLL-MNA - CLOSED
- 15. B&D ROLL-MNB - CLOSED
- 16. PITCH-MNA - CLOSED
- 17. PITCH-MNB - CLOSED #630
- 18. YAW-MNA - CLOSED
- 19. YAW-MNB - CLOSED
- 20. G&N SYNC - OFF
- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED #640
- 23. GIMBAL MOTOR CONTROL PITCH 1  
BAT A - CLOSED
- 24. GIMBAL MOTOR CONTROL PITCH 2  
BAT B - CLOSED
- 25. GIMBAL MOTOR CONTROL YAW 1  
BAT A - CLOSED #650
- 26. GIMBAL MOTOR CONTROL YAW 2  
BAT B - CLOSED

MISCELLANEOUS

- 1. TRANSLATION CONTROLS - LUCKED #660
- 2. ROTATION CONTROLS - PINNED

180



PANEL 6

- 1. ATTITUDE SET - OFF

PANEL 7

- 1. NORMAL/OFF/DIRECT ON - OFF

#670

PANEL 2

- 1. FDAI SELF TEST - OFF
- 2. FDAI BRIGHTNESS - SET
- 3. FCSM - AUTO/OVERRIDE - OVERRIDE
- 4. FCSM - ON/OFF/RESET - OFF

#680

PANEL 24

- 1. SCS POWER - AC1
- 2. RATE GYRO POWER - AC1
- 3. BMAG POWER - AC2
- 4. ROTATION CONTROL POWER - AC2
- 5. TVC 1 POWER - OFF
- 6. TVC 2 POWER - OFF

#690

#700

PANEL 3

- 1. PITCH GIMBAL MOTOR 1 - OFF
- 2. PITCH GIMBAL MOTOR 2 - OFF
- 3. YAW GIMBAL MOTOR 1 - OFF
- 4. YAW GIMBAL MOTOR 2 - OFF
- 5. INJECT PREVALVE A - OFF
- 6. INJECT PREVALVE B - OFF

#710

PANEL 14



#720

- 1. UPTL - BLOCK
- 2. DSKY BRIGHTNESS - SET

PANEL 22

#730

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED
- 3. IMU-MNA - CLOSED
- 4. IMU-MNB - CLOSED
- 5. COMPUTER-MNA - CLOSED

#740

- 6. COMPUTER-MNB - CLOSED
- 7. OPTICS-MNA - OPEN
- 8. OPTICS-MNB - OPEN
- 9. AC POWER-AC1 - CLOSED
- 10. AC POWER-AC2 - CLOSED

#750

- 11. G6N-AC POWER - AC1

\* 4. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT NAV STATION

#760

- 1. FLOODLIGHT CONTROL PRIMARY - OFF
- 2. FLOODLIGHT CONTROL SECONDARY - OFF
- 3. IMU TRANSFER - COMPUTER
- 4. OPTICS SLAVE TELESCOPE - STAR LCS
- 5. OPTICS MODE - ZERO OPTICS
- 6. OPTICS HOLD - OFF
- 7. OPTICS CONTROLLER SPEED - HI
- 8. OPTICS CONTROLLER MODE - DIRECT
- 9. PANEL BRIGHTNESS CONTROL - OFF
- 10. IMU TEMP. MODE - AUTO OVERRIDE

#770

188-

- 11. ATTITUDE IMPULSE ENABLE - OFF
- 12. CONDITION LAMPS - OFF
- 13. AGC MODE - ON
- 14. AGC BRIGHTNESS CONTROL - OFF

#780

- \* 5. KEY IN PROCEED  
V33E

#790

TERMINATE FLASH UPON  
RECEIPT OF PROCEED  
OR NEW PROGRAM

KEY IN PROCEED  
V 33 E

SCS-G+N  
MONITOR  
PRESENT

P.                    NEW  
R.                    PROGRAM  
O.  
C.  
E.                    GO TO PROGRAM  
E.                    SELECTED.  
D.

EXIT P33

#800

SELECT FINAL VEHICLE  
ATTITUDE FOR USE BY  
ATTITUDE MANEUVER  
ROUTINE.

#810

DO ATT CONTROL MODE  
CHECK ROUTINE (R 1).

DO ATT CONTROL MODE  
CHECK ROUTINE (R 1).

- \* VI PERFORM ATT CONTROL MODE  
CHECK ROUTINE (R 1)

#820

DO ATTITUDE MANEUVER  
ROUTINE (R 21).

DO ATTITUDE MANEUVER  
ROUTINE (R 21).

- \* VII PERFORM ATTITUDE MANEUVER  
ROUTINE (R 21)

.....  
 -----  
 FLASH VERB-NOUN TO  
 REQUEST PLEASE PER-  
 FORM SELECTION OF  
 SPS MINIMUM IMPULSE  
 THRUSTING PROGRAM (P43):  
 V50 N07  
 R1-00043  
 -----

.....  
 -----  
 MONITOR DSKY:  
 OBSERVE VERB-NOUN  
 FLASH TO REQUEST  
 PLEASE PERFORM  
 SELECTION OF P43.  
 -----

#830  
 \* VIII CHECK AGC FLASHES VERB-NOUN TO  
 REQUEST PLEASE PERFORM SELECTION OF  
 P43.  
 V50 N07  
 R1 - 00043

.....  
 -----  
 WAIT FOR KEYBOARD  
 ENTRY.  
 -----  
 TERMINATE FLASH UPON  
 RECEIPT OF NEW  
 PROGRAM.  
 -----

.....  
 -----  
 KEY IN REQUEST FOR  
 THRUSTING - SPS  
 MINIMUM IMPULSE  
 PROGRAM (P 43)  
 V37E 43E  
 -----

#840  
 \* 1. WHEN READY TO COMMENCE THRUSTING-  
 SPS MINIMUM IMPULSE PROGRAM (P43)  
 KEY IN  
 V37E 43E

.....  
 -----  
 NEW  
 PROGRAM  
 -----

#850  
 \* OR2. SELECT NEW PROGRAM AS DESIRED

.....  
 -----  
 TERMINATE P 33 AND  
 GO TO PROGRAM  
 SELECTED.  
 -----

.....  
 -----  
 MONITOR DSKY:  
 OBSERVE TERMINATION  
 OF P 33 AND DISPLAY  
 OF PROGRAM SELECTED.  
 -----

#860  
 \* 3. OBSERVE DISPLAY OF PROGRAM  
 SELECTED

SCS-G+N  
 ATTITUDE  
 PRESENT  
 -----  
 ISS-ATT  
 CNT MODE  
 PRESENT

EXIT P 33

EXIT P 33

#870

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

THRUSTING-ORBIT PROGRAM (P 41)

REV 10

6/17/66

PURPOSE: (1) TO PREPARE THE G+N SYSTEM TO COUNTDOWN, TO INITIATE, TO CONTROL, TO MONITOR, AND TO TERMINATE AN ORBIT CHANGE THRUSTING MANEUVER UNDER CONTROL OF G+N.

ASSUMPTIONS: (1) THIS PROGRAM HAS BEEN PRECEDED BY PROGRAM 31 AND THE INFLIGHT ALIGNMENT PROGRAM(S) IF REQUIRED. THEREFORE:

- (A) VR AND T IGNITION HAVE BEEN CALCULATED AND STORED IN THE AGC.
- (B) THE IMU AND THE CSM ARE BOTH AT A SATISFACTORY INERTIAL ORIENTATION FOR THE THRUSTING MANEUVER CONCURRENT WITH THE AGC STORED VR AND T IGNITION.
- (C) THE DET WILL HAVE BEEN SET TO COUNT TO ZERO AT T IGNITION.
- (D) THE SCS SYSTEM IS IN THE G+N ATTITUDE CONTROL MODE (THE SCS DISCRETE MONITOR ROUTINE IS MONITORING THIS DISCRETE) AND THE ISS IS IN THE ATTITUDE CONTROL MODE.

(2) ALL SEQUENCES ARE COMPLETED IN A TIMELY MANNER TO ACCOMPLISH SPS IGNITION AT T IGNITION (- 0 + 15 SEC).

(3) IN THE EVENT OF A MANJAL TAKEOVER OF THE G+N CONTROLLED THRUSTING MANEUVER THE AGC MUST BE SO NOTIFIED BY A MANUAL DSKY ENTRY (V 71 E). UPON RECEIPT OF THIS ENTRY THE AGC WILL COMMAND THE FINE ALIGN MODE IN THE ISS AND RETAIN THE ENGINE ON COMMAND UNTIL DELTA V MONITOR DETECTS MANUAL ENGINE SHUTDOWN.

(4) THE PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY WHEN THE IMU AND THE CSM ARE SATISFACTORILY ORIENTED FOR THE THRUST MANEUVER AND BY AT LEAST T IGNITION ---MIN AS INDICATED ON THE DET.

| PROG<br>CONT | AGC | GROUND | CREW | CHECKLIST | TIME | TOTAL<br>TIME |
|--------------|-----|--------|------|-----------|------|---------------|
|--------------|-----|--------|------|-----------|------|---------------|

\*I. CONFIRM OR SELECT FOLLOWING POSITIONS AT MDC

PANEL 8

- 1. DIRECT RCS - OFF
- 2. LIMIT CYCLE - OFF \*10
- 3. ATTITUDE DEADBAND - MAX
- 4. .05G ENTRY - OFF
- 5. LOCAL VERTICAL - OFF

P 41

- 6. DELTA V - OFF
- 7. G+N/SCS - G+N #20
- 8. ATTITUDE/MONITOR/ENTRY-ATTITUDE
- 9. A+C ROLL CHANNEL - OFF
- 10. B+D ROLL CHANNEL - ON
- 11. PITCH CHANNEL - ON
- 12. YAW CHANNEL - ON #30
- 13. ROLL RATE GYRO - NORMAL
- 14. PITCH RATE GYRO - NORMAL
- 15. YAW RATE GYRO - NORMAL

PANEL 25 #40

- 1. FDAI LTG - AC1
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED
- 5. GROUP 2-AC2 - CLOSED #50
- 6. GROUP 1-MNA - CLOSED
- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED
- 9. GROUP 2-MNB - CLOSED
- 10. DIRECT CONTROL-MNA - CLOSED #60
- 11. DIRECT CONTROL-MNB - CLOSED
- 12. A&C ROLL-MNA - CLOSED
- 13. A&C ROLL-MNB - CLOSED
- 14. B&D ROLL-MNA - CLOSED
- 15. B&D ROLL-MNB - CLOSED #70
- 16. PITCH-MNA - CLOSED

- 17. PITCH-MNB - CLOSED
- 18. YAW-MNA - CLOSED
- 19. YAW-MNB - CLOSED
- 20. G6N SYNC - OFF #80
- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED
- 23. GIMBAL MOTOR CONTROL PITCH 1  
BAT A - CLOSED
- 24. GIMBAL MOTOR CONTROL PITCH 2  
BAT B - CLOSED #90
- 25. GIMBAL MOTOR CONTROL YAW 1  
BAT A - CLOSED
- 26. GIMBAL MOTOR CONTROL YAW 2  
BAT B - CLOSED

MISCELLANEOUS #100

- 1. TRANSLATION CONTROLS - LOCKED
- 2. ROTATION CONTROLS - PINNED

PANEL 6

- 1. ATTITUDE SET - OFF #110

PANEL 7

- 1. NORMAL/OFF/DIRECT ON - OFF

PANEL 2 #120

- 1. FDAI SELF TEST - OFF
- 2. FDAI BRIGHTNESS - SET
- 3. FCSM - AUTO/OVERRIDE - OVERRIDE
- 4. FCSM - ON/OFF/RESET - OFF

#130

PANEL 24

- 1. SCS POWER - AC1
- 2. RATE GYRO POWER - AC1
- 3. BMAG POWER - AC2
- 4. ROTATION CONTROL POWER - AC2
- 5. TVC 1 POWER - AC1
- 6. TVC 2 POWER - AC1

#140

PANEL 3

- 1. PITCH GIMBAL MOTOR 1 - OFF
- 2. PITCH GIMBAL MOTOR 2 - OFF
- 3. YAW GIMBAL MOTOR 1 - OFF
- 4. YAW GIMBAL MOTOR 2 - OFF
- 5. INJECT PREVALVE A - OFF
- 6. INJECT PREVALVE B - OFF

#150

#160

PANEL 14

- 1. UPTL - BLOCK
- 2. DSKY BRIGHTNESS - SET

#170

PANEL 22

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED
- 3. IMU-MNA - CLOSED
- 4. IMU-MNB - CLOSED
- 5. COMPUTER-MNA - CLOSED
- 6. COMPUTER-MNB - CLOSED

#180

- 7. OPTICS-MNA - OPEN
- 8. OPTICS-MNB - OPEN
- 9. AC POWER-AC1 - CLOSED #190
- 10. AC POWER-AC2 - CLOSED
- 11. G+N - AC POWER - AC1

\*II. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT NAV STATION #200

- 1. FLOODLIGHT CONTROL PRIMARY - OFF
- 2. FLOODLIGHT CONTROL SECONDARY - OFF
- 3. IMU TRANSFER - COMPUTER
- 4. OPTICS SLAVE TELESCOPE - STAR LOS
- 5. OPTICS MODE - ZERO OPTICS #210
- 6. OPTICS HOLD - OFF
- 7. OPTICS CONTROLLER SPEED - HI
- 8. OPTICS CONTROLLER MODE - DIRECT
- 9. PANEL BRIGHTNESS CONTROL - OFF
- 10. IMU TEMP. MODE - AUTO OVERRIDE #220
- 11. ATTITUDE IMPULSE ENABLE - OFF
- 12. CONDITION LAMPS - OFF
- 13. AGC MODE - ON
- 14. AGC BRIGHTNESS CONTROL - OFF

#230

.CREW PROG.  
.SELECTION

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- .
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- .
- .
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- .

ISS-ATT  
CONT MODE  
PRESENT

SCS-G+N  
ATTITUDE  
PRESENT



|                                                                                                                           |    |       |                                                      |
|---------------------------------------------------------------------------------------------------------------------------|----|-------|------------------------------------------------------|
| -----                                                                                                                     |    | .     | -----                                                |
| IS PROGRAM ALLOWED                                                                                                        | .  | ..... | KEY IN THRUSTING-ORBIT CHANGE PROGRAM (P41)          |
| .Y                                                                                                                        | .N | .     | V37E 41E                                             |
| -----                                                                                                                     |    | .     | -----                                                |
| HAS CORRESPOND-<br>ING PRETHRUSTING<br>PROGRAM FOR THIS<br>THRUSTING PRO-<br>GRAM BEEN SELECTED<br>SINCE THE LAST<br>BURN | .  | ..... |                                                      |
| .Y                                                                                                                        | .N | .     |                                                      |
| -----                                                                                                                     |    | .     | -----                                                |
| COMMAND CHECK<br>FAIL ALARM                                                                                               | .  | ..... | OBSERVE CHECK FAIL<br>LIGHT ON                       |
| -----                                                                                                                     |    | .     | -----                                                |
| RESET CHECK<br>FAIL ALARM                                                                                                 | .  | ..... | PRESS ALARM RESET TO<br>TURN OFF CHECK FAIL<br>LIGHT |
| -----                                                                                                                     |    | .     | -----                                                |
| HOLD FOR NEW<br>PROGRAM<br>SELECTION                                                                                      | .  | ..... | CONSULT BACKUP<br>PROCEDURES                         |
| -----                                                                                                                     |    | .     | -----                                                |
| GO TO PROGRAM<br>SELECTED                                                                                                 | .  | ..... | KEY IN PROGRAM<br>SELECTION AS DESIRED<br>V37E--E    |
| -----                                                                                                                     |    | .     | -----                                                |
| EXIT P--                                                                                                                  | .  | ..... | EXIT P--                                             |

P 41

\* III. SELECT THRUSTING-ORBIT CHANGE PROGRAM (P41)

#240

1. ENTER THRUSTING - ORBIT CHANGE PROGRAM V37E 41E

#250

NOTE:

POSSIBLE CHECK FAIL. IF PRESENT PROGRAM DOES NOT ALLOW SELECTION OF P41 THE CHECK FAIL LIGHT WILL ILLUMINATE AND THE OLD PROGRAM DISPLAY WILL REMAIN.

#260

OBSERVE:

CHECK FAIL LIGHT ON (LEB)  
PGNS LIGHT ON (LEB)  
COMP FAIL LIGHT ON (MDC)

#270

GO TO BACKUP PROCEDURES AND SELECT A PROGRAM WHICH IS ALLOWED.

#280

#290

P 41

190

START THRUSTING-  
ORBIT CHANGE  
PROGRAM (P41)

MONITOR DSKY:  
OBSERVE DISPLAY  
OF PROGRAM 41

2. CHECK AGC DISPLAYS PROGRAM 41

#300

INHIBIT SCS DISCRETE  
MONITOR ROUTINE  
(R 22)

#310

FLASH VERB-NOUN TO  
REQUEST PROCEED AND  
DISPLAY PRESENT  
ICDU/GIMBAL COMMANDS  
V16 N20  
R1-OG ROLL  
R2-IG PITCH  
R3-MG YAW

MONITOR DSKY:  
OBSERVE VERB-NOUN  
FLASH AND DISPLAY OF  
PRESENT ICDU GIMBAL  
COMMANDS

NOTE:

NAV RETURNS TO CENTER COUCH AND  
ASSISTS P AND/OR MONITORS  
PROCEDURES

#320

ALL ANGLES IN DEGREES  
TO NEAREST .01 DEG

\* IV ALIGN AGCU AND FDAI

PILOT:

A. CHECK AGC FLASHES VERB-NOUN TO  
REQUEST PROCEED AND DISPLAYS  
ICDU ANGLES.  
V16 N20  
R1 - OG ROLL  
R2 - IG PITCH  
R3 - MG YAW

#330

ALL ANGLES IN DEGREES TO  
NEAREST .01 DEG

B. SET ATTITUDE SET THUMBWHEELS TO  
SET ATTITUDE SET DIALS TO VALUES  
DISPLAYED ON DSKY

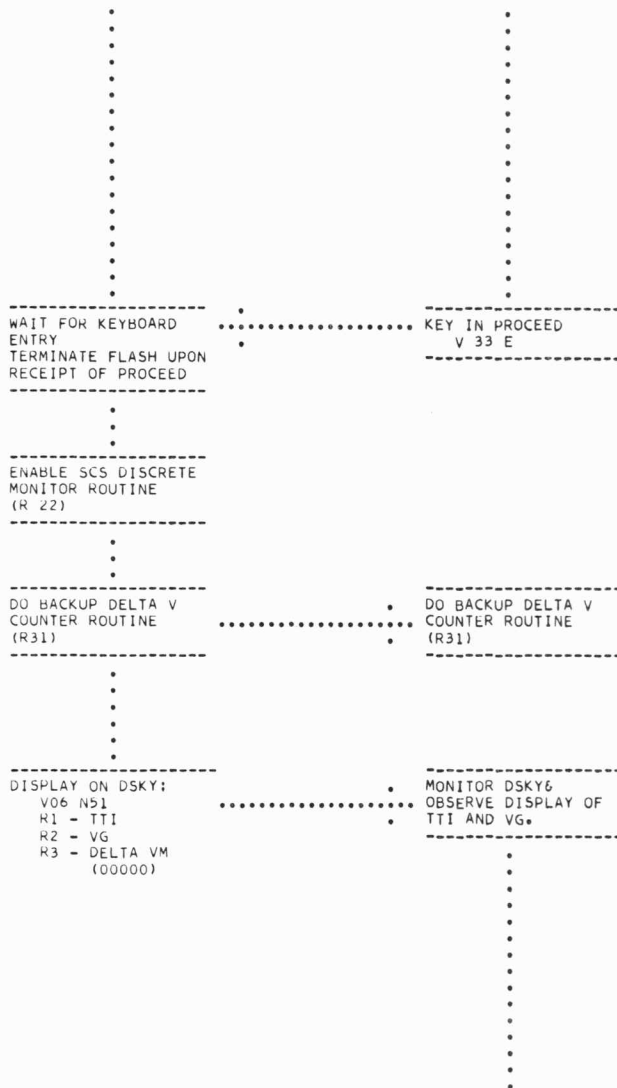
C. SET G+N/SCS SW TO SCS

#340

D. SET ATT SET/OFF SW TO ATT SET

E. HOLD FDAI ALIGN PB IN UNTIL FDAI  
STOPS DRIVING AND ERROR NEEDLES  
NULLED

F. CHECK ANGLES DISPLAYED UNDER NAV  
AXIS SYMBOL AGREE WITH DSKY



DISPLAY

P 41  
#350

- G. SET ATT SET/OFF SW TO OFF
- H. SET G+N/SCS SW TO G+N

NOTE:

CHECK NO ATTITUDE CHANGE ON FDAI

- I. KEY IN PROCEED V33E #360

#370

- \* V PERFORM BACKUP DELTA V COUNTER ROUTINE (R31) #380

- \* VI PREPARE MDC FOR THRUSTING

- \* 1. CHECK AGC DISPLAYS (AT TTI=APPROX 6 MIN)

V06 N51  
R1 - TTI  
R2 - VG  
R3 - DELTA VM (00000)

#390

TTI - TIME TO GO TO SPS IGNITION.  
IN MIN, SEC TO NEAREST SEC.

VG. - MAGNITUDE OF THE VELOCITY TO  
BE GAINED BY THRUSTING

P 41

TTI - TIME TO GO TO  
SPS IGNITION. IN  
MIN, SEC TO NEAR-  
EST SEC.

VG - MAGNITUDE OF THE  
VELOCITY TO BE  
GAINED BY THRUSTING  
MANEUVER. IN FT/SEC  
TO NEAREST FT/SEC.

DELTA VM-MEASURED  
DELTA V ALONG S/C  
+ X AXIS DUE TO  
ULLAGE. IN FT/SEC  
TO NEAREST FT/SEC

-----  
UPDATE DIGITAL  
EVENT TIMER  
-----

MANEUVER. IN FT/SEC TO NEAR-  
EST FT/SEC.

DELTA VM - MEASURED DELTA V ALONG  
S/C + X AXIS DUE TO ULLAGE. IN  
FT/SEC TO NEAREST FT/SEC. #400

NOTE:

DELTA VM (R3) WILL BE ZERO UNTIL  
PIPA INTEGRATION IS ENABLED AT  
TTI EQUALS 30 SEC. #410

- \* 2. UPDATE DIGITAL EVENT TIMER FOR  
TTI IF REQUIRED

PILOT:

- A. SET DIGITAL EVENT TIMER  
START/STOP SW AT STOP
- B. SET RESET/UP/DOWN SW AT RESET #420
- C. ADJUST DET MIN SW TO ADVANCE  
TIMER TO POINT OF SYNCHRONIZA-  
TION
- D. ADJUST DET SEC SW TO ADVANCE  
TIMER TO POINT OF SYNCHRONIZA-  
TION
- E. SET RESET/UP/DOWN SW AT DOWN #430
- F. SET DIGITAL EVENT TIMER  
START/STOP SW TO START AT  
SYNC TIME

- \* 3. DETERMINE STATUS OF C/W LAMPS IF  
DESIRED

CREW:

- A. SET C/W LAMP TEST SW TO 1 (SE) #440
- B. CHECK ALL LEFT HAND C/W LAMPS  
AND ALL MASTER ALARM LAMPS  
ILLUMINATED
- C. SET C/W LAMP TEST SW TO OFF
- D. CHECK ALL C/W LAMPS AND MASTER  
ALARM LAMPS OFF #450
- E. SET C/W LAMP TEST SW TO 2

.....

---

AT TTI = 5 MIN  
DO THRUST CONTROL  
MODE CHECK  
ROUTINE (R 2)

---

.....

.....

---

DO THRUST CONTROL  
MODE CHECK  
ROUTINE (R 2)

---

.....

.....

---

RECALL DISPLAY ON  
DSKY OF V06 N51  
R1 - TTI  
R2 - VG  
R3 - DELTA VM

---

.....

.....

---

ACTIVATE AND TEST  
SPS GIMBAL DRIVE

---

.....

.....

---

VERIFICATION/TEST/CONFIRMATION  
OF THRUST CONTROL/SPS  
GIMBAL DRIVE

---

.....

.....

---

ACTIVATE AND TEST  
SPS GIMBAL DRIVE

---

.....

.....

---

RECALL DISPLAY ON  
DSKY OF V06 N51  
R1 - TTI  
R2 - VG  
R3 - DELTA VM

---

.....

.....

---

VERIFY CRITICAL  
CONTROL/DISPLAY  
POSITIONS

---

.....

F. CHECK ALL RIGHT HAND C/W LAMPS  
ILLUMINATED

G. SET C/W LAMP TEST SW TO OFF

H. CHECK ALL C/W LAMPS OFF

P 41

\* VII PERFORM THRUST CONTROL MODE  
CHECK ROUTINE ( R 2) #460

\* VIII CONTINUED MDC PREPARATION

1. ACTIVATE AND TEST SPS GIMBAL DRIVE

A. SET (COARSE) GIMBAL TRIM  
THUMBWHEELS: #470  
PITCH +4 DEG  
YAW +6 DEG

B. ACTIVATE SPS GIMBAL MOTORS:  
PITCH 2 SW MOMENTARY START THEN  
ON  
YAW 2 SW MOMENTARY START THEN ON

C. CONFIRM TRIM ANGLES ON GIMBAL  
POSITION INDICATOR #480

D. SET:  
PITCH 1 SW MOMENTARY START THEN  
ON  
YAW 1 SW MOMENTARY START THEN ON

E. AFTER TRANSIENTS, FINE ADJUST  
PITCH AND YAW TRIM ANGLES

2. CONFIRM OR SELECT CRITICAL SWITCH  
POSITIONS #490

\* A. DIRECT RCS SW-OFF

\* B. LIMIT CYCLE SW - OFF

\* C. ATT DEADBAND SW - MIN

\* D. 0.05 G ENTRY SW - OFF

\* E. LCL VERT SW - OFF

\* F. DELTA V SW - ON

#500

P 41

- \* G. G6N/SC5 SW - G6N #510
- \* H. ATTITUDE/MONITOR/ENTRY SW - ATTITUDE
- \* I. RATE GYRO SWITCHES - NORMAL
- \* J. A+C ROLL SW - OFF
- \* K. B+D ROLL SW - ON
- \* L. PITCH SW - ON #520
- \* M. YAW SW - ON
- \* N. NORMAL/OFF/DIRECT ON SW - OFF
- \* O. SPS GIMBAL MOTORS PITCH 1 SW-ON
- \* P. SPS GIMBAL MOTORS PITCH 2 SW-ON
- \* Q. SPS GIMBAL MOTORS YAW 1 SW-ON #530
- \* R. SPS GIMBAL MOTORS YAW 2 SW-ON
- \* S. INJECT PRE-VALVES A SW-OFF
- \* T. INJECT PRE-VALVES B SW-OFF
- \* U. FCSM AUTO/OVERRIDE SW-AUTO
- \* V. FCSM-ON/OFF/RESET SW-OFF #540
- \* W. TVC 1 POWER-AC1
- \* X. TVC 2 POWER-AC2

-----  
 MONITOR SYSTEM  
 STATUS UNTIL TIGN-2  
 MIN  
 -----

- \* IX MONITOR SYSTEM STATUS UNTIL TIGN - 2 MINUTES #550
- PILOT:
- 1. CHECK FDAI ATTITUDE ERROR AND RATE IND. NORMAL
- 2. MONITOR DIGITAL EVENT TIMER UNTIL TIGN - 2 MINUTES
- 3. CHECK DSKY DISPLAYS TTI UNTIL TIGN - 2 MINUTES

-----  
 PERFORM FINAL  
 PREPARATIONS  
 -----

- \* X PERFORM FINAL PREPARATIONS #560
- PILOT:
- 1. REPORT FINAL 2 MINUTES OF COUNT-

DOWN TO N AND SE

- \* 2. SET INJECT PRE-VALVE A SW TO ON
- \* 3. SET INJECT PRE-VALVE B SW TO ON
- \* 4. UNLOCK PRIME TRANSLATION CONTROL #570
- \* 5. UNPIN ROTATION CONTROL
- \* 6. SET FCSSM ON/OFF/RESET SWITCH TO ON
- \* ~~7. SET NORMAL/OFF/DIRECT ON SW TO NORMAL~~ #580

\* XI PERFORM SPS ENGINE IGNITION ROUTINE (R-37)

#590

\* XII AT SPS ENGINE ON CHECK AGC CHANGES TTI DISPLAY TO TG IN R1:

- V06 N51
- R1 - TG
- R2 - VG
- R3 - DELTA VM

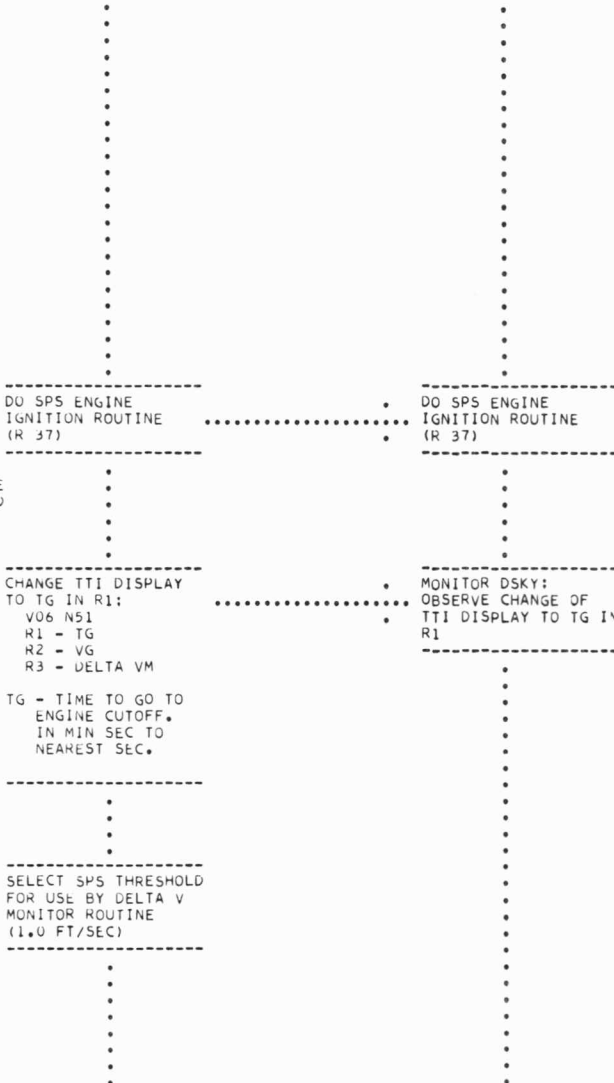
#600

TG - TIME TO GO TO ENGINE CUTOFF. IN MIN SEC TO NEAREST SEC.

#610

NOTE:

IF MVVC IS DESIRED KEY IN V71E AND



G+N ENGINE ON COMMAND PRESENT

DO SPS ENGINE IGNITION ROUTINE (R 37)

DO SPS ENGINE IGNITION ROUTINE (R 37)

CHANGE TTI DISPLAY TO TG IN R1:  
V06 N51  
R1 - TG  
R2 - VG  
R3 - DELTA VM

MONITOR DSKY:  
OBSERVE CHANGE OF TTI DISPLAY TO TG IN R1

TG - TIME TO GO TO ENGINE CUTOFF. IN MIN SEC TO NEAREST SEC.

SELECT SPS THRESHOLD FOR USE BY DELTA V MONITOR ROUTINE (1.0 FT/SEC)

CALL DELTA V  
MONITOR ROUTINE  
(R 24)

MONITOR SPS  
THRUSTING:

1. DSKY:  
R1-TG SHOULD BE DECREASING  
R2-VG SHOULD BE DECREASING  
R3-DELTA VM SHOULD BE INCREASING
2. DELTA V COUNTER IN SCS SHOULD BE DECREASING.
3. FDAI-ATT. ERROR SHOULD BE LESS THAN OR EQUAL TO --DEGREE BUT SHOULD INCREASE GRADUALLY AS CENTER OF GRAVITY SHIFTS. ATT RATES SHOULD BE LESS THAN OR EQUAL TO -- DEGREE/SEC.
4. SPS CHAMBER PRESSURE (PC) SHOULD BE LESS THAN OR EQUAL TO -- LB/SQ IN.
5. CHECK PITCH AND YAW GPI INDICATES NORMAL.

N. Y

TWIST TRANSLATION CONTROL TO Cw STOP, WHEN THRUST OFF IS DESIRED SET NORMAL/OFF/DIRECT ON SW TO OFF.

P 41

#620

\* XIII MONITOR SPS THRUSTING

1. DSKY:  
R1 - TG SHOULD BE DECREASING  
R2 - VG SHOULD BE DECREASING  
R3 - DELTA VM SHOULD BE INCREASING
2. DELTA V COUNTER IN SCS SHOULD BE DECREASING.
3. FDAI-ATT. ERROR SHOULD BE LESS THAN OR EQUAL TO --DEGREE BUT SHOULD INCREASE GRADUALLY AS CENTER OF GRAVITY SHIFTS. ATT RATES SHOULD BE LESS THAN OR EQUAL TO--DEGREE/SEC.
4. SPS CHAMBER PRESSURE (PC) SHOULD BE LESS THAN OR EQUAL TO--LB/SQ IN.

#630

#640

#650

NOTE:  
THIS INDICATES PRESSURIZATION AT IGNITION AND DEPRESSURIZATION AT CUT OFF AS WELL AS STATUS DURING FIRING.

5. CHECK PITCH AND YAW GPI INDICATES NORMAL.

#660

NOTE:  
THIS IS DONE TO CHECK FOR FAILURES IN THE TVC LOOPS.

NOTE:  
KEEP LEFT HAND ON TRANSLATION CONTROL TO CHANGE TO MTVC. IF THRUSTING IS UNSATISFACTORY:

#670

1. IF MTVC IS DESIRED:

P 41





KEY IN V71E AND TWIST TRANSLATION CONTROL TO CW STOP

WHEN THRUST OFF IS DESIRED SET NORMAL/OFF/DIRECTION SW TO OFF.

2. IF MTVC IS NOT DESIRED GO TO BACKUP PROCEDURES #680

#690

#700

\* XIV MONITOR ENGINE CUTOFF

NAV:

\* 1. PLACE LEFT HAND IN POSITION TO BACKUP THRUST OFF WITH NORMAL/OFF/DIRECT ON SW #710

PILOT:

- \* 2. CHECK DELTA V COUNTER REACHES ZERO
- \* 3. CHECK THRUST ON ILPB IS OUT #720
- \* 4. CHECK SPS PC DECREASE
- \* 5. REPORT ENGINE OFF

19B

TERMINATE DELTA V  
MONITOR ROUTINE  
(R 24)

PUT THRUST SWITCH  
IN OFF POSITION

\* 6. SET NORMAL/OFF/DIRECT ON SW TO OFF #730

NAV:

\* 7. MONITOR DSKY R1 FOR TG DECREASING TO ZERO

\* 8. MONITOR DSKY R2 FOR VG DECREASING TO ZERO #740

UPDATE ORBITAL  
COMPUTATION

.....  
HOLD .....  
FLASH VERB-NOUN TO  
REQUEST PROCEED.  
HOLD DISPLAY OF TG  
AND VG AT THEIR  
VALUES AT ENGINE  
CUTOFF.  
V16 N51  
R1 - TG  
R2 - VG  
R3 - DELTA VM

MONITOR DSKY;  
OBSERVE VERB-NOUN  
FLASH AND DISPLAY OF  
TG, VG AND DELTA VM  
OBSERVE THESE VALUES  
AS DESIRED

\* 9. AT ENGINE CUT-OFF CHECK AGC  
FLASHES VERB-NOUN TO REQUEST  
PROCEED AND DISPLAYS:  
V16 N51  
R1 - TG  
R2 - VG  
R3 - DELTA VM

TG AND VG WILL HOLD VALUES AT  
ENGINE CUTOFF. DELTA VM WILL  
INCREASE WITH TAILOFF VELOCITY. #760

WAIT FOR KEYBOARD  
ENTRY  
TERMINATE FLASH UPON  
RECEIPT OF PROCEED

KEY IN PROCEED  
V 33 E

\* 10. KEY IN PROCEED V33E #770

SECURE MDC

\* XV SECURE MDC AFTER SPS ENGINE TAILOFF

\* 1. SET B+D SW TO OFF

\* 2. SET PITCH SW TO OFF

\* 3. SET YAW SW TO OFF #780

NOTE:

ENABLE SWITCHES MUST BE OFF FOR 10 MIN MINIMUM TO ALLOW SPS PROPELLANT SLOSH DAMPING.

- \* 4. SET SPS GIMBAL MOTORS PITCH 1 SW TO OFF #790
- \* 5. SET SPS GIMBAL MOTORS PITCH 2 SW TO OFF
- \* 6. SET SPS GIMBAL MOTORS YAW 1 SW TO OFF
- \* 7. SET SPS GIMBAL MOTORS YAW 2 SW TO OFF #800
- \* 8. SET INJECT PRE VALVE A SW TO OFF
- \* 9. SET INJECT PRE VALVE B SW TO OFF
- \* 10. SET TVC 2 POWER SW TO OFF
- \* 11. SET TVC 1 POWER SW TO OFF
- \* 12. SET DELTA V SW TO OFF #810
- \* 13. SECURE ROTATION CONTROL
- \* 14. LOCK TRANSLATION CONTROL
- \* 15. SET GIMBAL MOTOR CONTROL 1-PITCH-2 BAT A CKT BKR TO OPEN
- \* 16. SET GIMBAL MOTOR CONTROL 1-YAW-2 BAT A CKT BKR TO OPEN #820
- \* 17. SET FCSM ON/OFF/RESET SW TO OFF
- \* 18. ATT DEADBAND SW-MAX
- \* 19. READ AND RECORD SPS PROPELLANT QUANTITY REMAINING
- \* XVI RECEIVE ORBITAL PARAMETER DATA FROM GROUND #830

-----  
 TRANSMIT ORBITAL.....RECEIVE ORBITAL DATA  
 DATA TO CREW            FROM GROUND  
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DO ORBITAL PARAMETER DISPLAY ROUTINE (R 34) DO ORBITAL PARAMETER DISPLAY ROUTINE (R 34)

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\* XVII PERFORM ORBITAL PARAMETER DISPLAY ROUTINE (R34)

#840

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FLASH VERB=NOUN TO REQUEST PLEASE PERFORM SELECTION OF AGC IDLING PROGRAM (P00) MONITOR DSKY: OBSERVE VERB=NOUN FLASH TO REQUEST PLEASE PERFORM SELECTION OF P00
 V50 N07
 R1-00000

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\* XVIII

1. CHECK AGC FLASHES VERB=NOUN TO REQUEST PLEASE PERFORM SELECTION OF AGC IDLING PROGRAM (P00)  
V50 N07  
R1-00000

#850

```

WAIT FOR KEYBOARD ENTRY KEY IN REQUEST FOR AGC IDLING PROGRAM (P00)
 V37E 00E

TERMINATE FLASH UPON RECEIPT OF NEW PROGRAM
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2. KEY IN DESIRED PROGRAM  
KEY IN  
V37E 00E

#860

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 .NEW PROGRAM
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 .

TERMINATE P41 AND GO TO PROGRAM SELECTED MONITOR DSKY: OBSERVE TERMINATION OF P41 AND DISPLAY OF P00

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3. CHECK AGC DISPLAYS PROGRAM 00

#870

SCS-G+N  
DELTA V  
REMOVED

ISS-ATT  
CONT MODE  
PRESENT

SCS-G+N  
ATTITUDE  
PRESENT

#880

#890

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•  
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EXIT.P 41

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•  
EXIT.P 41

P 41

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

THRUSTING-RETURN TO EARTH PROGRAM (P42)

REV 11

6/28/66

PURPOSE: (1) TO PREPARE THE G+N SYSTEM TO COUNTDOWN, TO INITIATE, TO CONTROL, TO MONITOR, AND TO TERMINATE A RETURN TO EARTH THRUSTING MANEUVER UNDER CONTROL OF G+N.

ASSUMPTIONS: (1) THIS PROGRAM HAS BEEN PRECEDED BY PROGRAM 32 AND THE INFLIGHT ALIGNMENT PROGRAM(S) IF REQUIRED. THEREFORE:

(A) VR AND T IGNITION HAVE BEEN CALCULATED AND STORED IN THE AGC.

(B) THE IMU AND THE CSM ARE BOTH AT A SATISFACTORY INERTIAL ORIENTATION FOR THE THRUSTING MANEUVER CONCURRENT WITH THE AGC STORED VR AND T IGNITION.

(C) THE DET WILL HAVE BEEN SET TO COUNT TO ZERO AT T IGNITION.

(D) THE SCS SYSTEM IS IN THE G+N ATTITUDE CONTROL MODE (THE SCS DISCRETE MONITOR ROUTINE IS MONITORING THIS DISCRETE) AND THE ISS IS IN THE ATTITUDE CONTROL MODE.

(2) ALL SEQUENCES ARE COMPLETED IN A TIMELY MANNER TO ACCOMPLISH SPS IGNITION AT T IGNITION (- 0 + 15 SEC).

(3) IN THE EVENT OF A MANUAL TAKEOVER OF THE G+N CONTROLLED THRUSTING MANEUVER THE AGC MUST BE SO NOTIFIED BY A MANUAL DSKY ENTRY (V 71 E). UPON RECEIPT OF THIS ENTRY THE AGC WILL COMMAND THE FINE ALIGN MODE IN THE ISS AND RETAIN THE ENGINE ON COMMAND UNTIL DELTA V MONITOR DETECTS MANUAL ENGINE SHUTDOWN.

(4) THE PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY WHEN THE IMU AND THE CSM ARE SATISFACTORILY ORIENTED FOR THE THRUST MANEUVER AND BY AT LEAST T IGNITION ---MIN AS INDICATED ON THE DET.

PROG  
CUNT

AGC

GROUND

CREW

CHECKLIST

TIME

TOTAL  
TIME

\*I. CONFIRM OR SELECT FOLLOWING POSITIONS  
AT MDC

PANEL 8

1. DIRECT RCS - OFF

2. LIMIT CYCLE - OFF

3. ATTITUDE DEADBAND - MAX

4. .05G ENTRY - OFF

5. LOCAL VERTICAL - OFF

#10

P 42

- 6. DELTA V - OFF
- 7. G+N/SCS - G+N #20
- 8. ATTITUDE/MONITOR/ENTRY-ATTITUDE
- 9. A+C ROLL CHANNEL - OFF
- 10. B+D ROLL CHANNEL - ON
- 11. PITCH CHANNEL - ON
- 12. YAW CHANNEL - ON #30
- 13. ROLL RATE GYRO - NORMAL
- 14. PITCH RATE GYRO - NORMAL
- 15. YAW RATE GYRO - NORMAL

PANEL 25 #40

- 1. FDAI LTG - AC1
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED
- 5. GROUP 2-AC2 - CLOSED #50
- 6. GROUP 1-MNA - CLOSED
- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED
- 9. GROUP 2-MNB - CLOSED
- 10. DIRECT CONTROL-MNA - CLOSED #60
- 11. DIRECT CONTROL-MNB - CLOSED
- 12. A&C ROLL-MNA - CLOSED
- 13. A&C ROLL-MNB - CLOSED
- 14. B&D ROLL-MNA - CLOSED
- 15. B&D ROLL-MNB - CLOSED #70
- 16. PITCH-MNA - CLOSED

- 17. PITCH-MNB - CLOSED
- 18. YAW-MNA - CLOSED
- 19. YAW-MNB - CLOSED
- 20. G6N SYNC - OFF #80
- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED
- 23. GIMBAL MOTOR CONTROL PITCH 1  
BAT A - CLOSED
- 24. GIMBAL MOTOR CONTROL PITCH 2  
BAT B - CLOSED #90
- 25. GIMBAL MOTOR CONTROL YAW 1  
BAT A - CLOSED
- 26. GIMBAL MOTOR CONTROL YAW 2  
BAT B - CLOSED

MISCELLANEOUS #100

- 1. TRANSLATION CONTROLS - LOCKED
- 2. ROTATION CONTROLS - PINNED

PANEL 6

- 1. ATTITUDE SET - OFF #110

PANEL 7

- 1. NORMAL/OFF/DIRECT ON - OFF

PANEL 2 #120

- 1. FDAI SELF TEST - OFF
- 2. FDAI BRIGHTNESS - SET
- 3. FCSM - AUTO/OVERRIDE - OVERRIDE
- 4. FCSM - ON/OFF/RESET - OFF

#130



PANEL 24

- 1. SCS POWER - AC1
- 2. RATE GYRO POWER - AC1
- 3. BMAG POWER - AC2
- 4. ROTATION CONTROL POWER - AC2 #140
- 5. TVC 1 POWER - AC1
- 6. TVC 2 POWER - AC1

PANEL 3

- 1. PITCH GIMBAL MOTOR 1 - OFF #150
- 2. PITCH GIMBAL MOTOR 2 - OFF
- 3. YAW GIMBAL MOTOR 1 - OFF
- 4. YAW GIMBAL MOTOR 2 - OFF
- 5. INJECT PREVALVE A - OFF
- 6. INJECT PREVALVE B - OFF #160

PANEL 14

- 1. UPTL - BLOCK
- 2. DSKY BRIGHTNESS - SET #170

PANEL 22

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED
- 3. IMU-MNA - CLOSED
- 4. IMU-MNB - CLOSED #180
- 5. COMPUTER-MNA - CLOSED
- 6. COMPUTER-MNB - CLOSED

7. OPTICS-MNA - OPEN

8. OPTICS-MNB - OPEN

#190

9. AC POWER-AC1 - CLOSED

10. AC POWER-AC2 - CLOSED

11. G+N - AC POWER - AC1

\*II. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT NAV STATION

#200

1. FLOODLIGHT CONTROL PRIMARY - OFF

2. FLOODLIGHT CONTROL SECONDARY - OFF

3. IMU TRANSFER - COMPUTER

4. OPTICS SLAVE TELESCOPE - STAR LOS

5. OPTICS MODE - ZERO OPTICS

#210

6. OPTICS HOLD - OFF

7. OPTICS CONTROLLER SPEED - HI

8. OPTICS CONTROLLER MODE - DIRECT

9. PANEL BRIGHTNESS CONTROL - OFF

10. IMU TEMP. MODE - AUTO OVERRIDE

#220

11. ATTITUDE IMPULSE ENABLE - OFF

12. CONDITION LAMPS - OFF

13. AGC MODE - ON

14. AGC BRIGHTNESS CONTROL - OFF

#230

ISS-ATT  
CONT MODE  
PRESENT

SCS-G+N  
ATTITUDE  
PRESENT

.CREW PROG.  
.SELECTION

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IS PROGRAM ALLOWED  
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.Y .N  
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HAS CORRESPOND-  
ING PRETHRUSTING  
PROGRAM FOR THIS  
THRUSTING PRO-  
GRAM BEEN SELECTED  
SINCE THE LAST  
BURN  
.....

.Y .N  
.....

COMMAND CHECK  
FAIL ALARM  
.....

RESET CHECK  
FAIL ALARM  
.....

HOLD FOR NEW  
PROGRAM  
SELECTION  
.....

GO TO PROGRAM  
SELECTED  
.....

EXIT P--

.....  
KEY IN THRUSTING-  
RETURN TO EARTH  
PROGRAM (P42)  
V 37 E 42 E  
.....

.....  
OBSERVE CHECK FAIL  
LIGHT ON  
.....

.....  
PRESS ALARM RESET TO  
TURN OFF CHECK FAIL  
LIGHT  
.....

.....  
CONSULT BACKUP  
PROCEDURES  
.....

.....  
KEY IN PROGRAM  
SELECTION AS DESIRED  
V37E--E  
.....

EXIT P--

\* III. SELECT THRUSTING--RETURN TO EARTH  
PROGRAM (P42)

P 42

#240

1. ENTER THRUSTING--RETURN TO EARTH  
PROGRAM V37E 42E

#250

NOTE:

POSSIBLE CHECK FAIL. IF PRESENT  
PROGRAM DOES NOT ALLOW SELECTION OF  
P42 THE CHECK FAIL LIGHT WILL  
ILLUMINATE AND THE OLD PROGRAM  
DISPLAY WILL REMAIN.

#260

OBSERVE:

CHECK FAIL LIGHT ON (LEB)  
PGNS LIGHT ON (LEB)  
COMP FAIL LIGHT ON (MDC)

#270

GO TO BACKUP PROCEDURES AND SELECT  
A PROGRAM WHICH IS ALLOWED.

#280

#290

P 42

START THRUSTING-  
RETURN TO EARTH  
PROGRAM (P42)

MONITOR DSKY;  
OBSERVE DISPLAY  
OF PROGRAM 42

2. CHECK AGC DISPLAYS PROGRAM 42

#300

INHIBIT SCS DISCRETE  
MONITOR ROUTINE  
(R 22)

NOTE:

NAV RETURNS TO CENTER COUCH AND  
ASSISTS P AND/OR MONITORS  
PROCEDURES

#310

FLASH VERB-NOUN TO  
REQUEST PROCEED AND  
DISPLAY PRESENT  
ICDU/GIMBAL COMMANDS  
V16 N20  
R1-OG ROLL  
R2-1G PITCH  
R3-MG YAW

MONITOR DSKY;  
OBSERVE VERB-NOUN  
FLASH AND DISPLAY OF  
PRESENT ICDU GIMBAL  
COMMANDS

\* IV ALIGN AGCU AND FDAI

PILOT:

#320

A. CHECK AGC FLASHES VERB-NOUN TO  
REQUEST PROCEED AND DISPLAYS  
ICDU ANGLES.  
V16 N20  
R1 - OG ROLL  
R2 - 1G PITCH  
R3 - MG YAW

ALL ANGLES IN DEGREES  
TO NEAREST .01 DEG

ALL ANGLES IN DEGREES TO  
NEAREST .01 DEG

#330

B. SET ATTITUDE SET THUMBWHEELS TO  
SET ATTITUDE SET DIALS TO  
VALUES DISPLAYED ON DSKY

C. SET G\*N/SCS SW TO SCS

D. SET ATT SET/OFF SW TO ATT SET

E. HOLD FDAI ALIGN PB IN UNTIL FDAI  
STOPS DRIVING AND ERROR NEEDLES  
NULLED

#340

F. CHECK ANGLES DISPLAYED UNDER NAV  
AXIS SYMBOL AGREE WITH DSKY  
DISPLAY

G. SET ATT SET/OFF SW TO OFF

H. SET G+N/SCS SW TO G+N #350

NOTE:

CHECK NO ATTITUDE CHANGE ON FDAI

I. KEY IN PROCEED  
V33E #360

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WAIT FOR KEYBOARD ENTRY
TERMINATE FLASH UPON RECEIPT OF PROCEED

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ENABLE SCS DISCRETE MONITOR ROUTINE (R 22)

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DO BACKUP DELTA V COUNTER ROUTINE (R31)

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KEY IN PROCEED V 33 E

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#370

\* V PERFORM BACKUP DELTA V COUNTER ROUTINE (R31)

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DO BACKUP DELTA V COUNTER ROUTINE (R31)

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DO BACKUP DELTA V COUNTER ROUTINE (R31)

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#380

\* VI PREPARE MDC FOR THRUSTING

\* 1. CHECK AGC DISPLAYS (AT TTI=APPROX 6 MIN)

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DISPLAY ON DSKY:
V16 N51
R1 - TTI
R2 - VG
R3 - DELTA VM (00000)

TTI - TIME TO GO TO SPS IGNITION. IN MIN, SEC TO NEAREST SEC.

VG - MAGNITUDE OF THE VELOCITY TO BE GAINED BY THRUSTING MANEUVER. IN FT/SEC TO NEAREST FT/SEC.

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MONITOR DSKY& OBSERVE DISPLAY OF TTI AND VG.

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UPDATE DIGITAL EVENT TIMER

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#390

TTI - TIME TO GO TO SPS IGNITION. IN MIN, SEC TO NEAREST SEC.

VG. - MAGNITUDE OF THE VELOCITY TO BE GAINED BY THRUSTING MANEUVER. IN FT/SEC TO NEAREST FT/SEC.

#400

DELTA VM-MEASURED  
DELTA V ALONG S/C  
+ X AXIS DUE TO  
ULLAGE. IN FT/SEC  
TO NEAREST FT/SEC

DELTA VM - MEASURED DELTA V ALONG  
S/C + X AXIS DUE TO ULLAGE. IN  
FT/SEC TO NEAREST FT/SEC.

NOTE:

DELTA VM (R3) WILL BE ZERO UNTIL  
PIPA INTEGRATION IS ENABLED AT  
TTI EQUALS 30 SEC.

- \* 2. UPDATE DIGITAL EVENT TIMER FOR TTI IF REQUIRED

#410

PILOT:

- A. SET DIGITAL EVENT TIMER START/STOP SW AT STOP
- B. SET RESET/UP/DOWN SW AT RESET
- C. ADJUST DET MIN SW TO ADVANCE TIMER TO POINT OF SYNCHRONIZATION
- D. ADJUST DET SEC SW TO ADVANCE TIMER TO POINT OF SYNCHRONIZATION
- E. SET RESET/UP/DOWN SW AT DOWN
- F. SET DIGITAL EVENT TIMER START/STOP SW TO START AT SYNC TIME

#420

#430

- \* 3. DETERMINE STATUS OF C/W LAMPS IF DESIRED

CREW:

- A. SET C/W LAMP TEST SW TO 1 (SE)
- B. CHECK ALL LEFT HAND C/W LAMPS AND ALL MASTER ALARM LAMPS ILLUMINATED
- C. SET C/W LAMP TEST SW TO OFF
- D. CHECK ALL C/W LAMPS AND MASTER ALARM LAMPS OFF
- E. SET C/W LAMP TEST SW TO 2
- F. CHECK ALL RIGHT HAND C/W LAMPS ILLUMINATED
- G. SET C/W LAMP TEST SW TO OFF

#440

#450

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CHECK STATUS OF C/W  
LAMPS  
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ATTITUDE

- \* I. RATE GYRO SWITCHES - NORMAL
- \* J. A+C ROLL SW - OFF
- \* K. B+D ROLL SW - ON
- \* L. PITCH SW - ON #520
- \* M. YAW SW - ON
- \* N. NORMAL/OFF/DIRECT ON SW - OFF
- \* O. SPS GIMBAL MOTORS PITCH 1 SW-ON
- \* P. SPS GIMBAL MOTORS PITCH 2 SW-ON #530
- \* Q. SPS GIMBAL MOTORS YAW 1 SW-ON
- \* R. SPS GIMBAL MOTORS YAW 2 SW-ON
- \* S. INJECT PRE-VALVES A SW-OFF
- \* T. INJECT PRE-VALVES B SW-OFF
- \* U. FCSM AUTO/OVERRIDE SW-AUTO
- \* V. FCSM-ON/OFF/RESET SW-OFF #540
- \* W. TVC 1 POWER-AC1
- \* X. TVC 2 POWER-AC2
- \* IX MONITOR SYSTEM STATUS UNTIL TIGN-2 MINUTES

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 MONITOR SYSTEM  
 STATUS UNTIL TIGN-2  
 MIN  
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PILOT:

- 1. CHECK FDAI ATTITUDE ERROR AND RATE IND. NORMAL #550
- 2. MONITOR DIGITAL EVENT TIMER UNTIL TIGN - 2 MINUTES
- 3. CHECK DSKY DISPLAYS TTI UNTIL TIGN - 2 MINUTES

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 PERFORM FINAL  
 PREPARATIONS  
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- \* X PERFORM FINAL PREPARATIONS #560

PILOT:

- \* 1. REPORT FINAL 2 MINUTES OF COUNT-DOWN TO N AND SE
- \* 2. SET INJECT PRE-VALVE A SW TO ON



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 DO SPS ENGINE  
 IGNITION ROUTINE  
 (R 37)  
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 CHANGE VERB-NOUN  
 AND CHANGE DELTA  
 VM DISPLAY TO TFF  
 IN R 3  
 V16 N52  
 R1 - TG  
 R2 - VG  
 R3 - TFF  
 -----

TG - TIME TO GO TO  
 ENGINE CUTOFF.  
 IN MIN SEC TO  
 NEAREST SEC.

TFF-TIME OF FREE  
 FALL TO 300,000  
 FT. ALTITUDE  
 ABOVE FISCHER  
 ELLIPSOID.  
 IN MIN AND SEC  
 TO NEAREST SEC.  
 MAX READING IS  
 59 59. IF  
 PERIGEE ALT  
 IS GREATER  
 THAN 300,000  
 FT. THE TFF  
 DISPLAY WILL  
 READ 59 59  
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 DO SPS ENGINE  
 IGNITION ROUTINE  
 (R 37)  
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 MONITOR DSKY;  
 OBSERVE CHANGE IN  
 VERB-NOUN AND  
 DISPLAY OF TG, VG  
 AND TFF  
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- \* 3. SET INJECT PRE-VALVE B SW TO ON
- \* 4. UNLOCK PRIME TRANSLATION CONTROL
- \* 5. UNPIN ROTATION CONTROL
- \* 6. SET FCMS ON/OFF/RESET SWITCH TO ON
- \* ~~7. SET NORMAL/OFF/DIRECT ON SW TO NORMAL~~

\* XI PERFORM SPS ENGINE IGNITION ROUTINE (R-37)

\* XII AT SPS ENGINE ON CHECK AGC CHANGES VERB-NOUN AND CHANGES DELTA VM DISPLAY TO TFF IN R3.  
 V06 N52  
 R1 - TG  
 R2 - VG  
 R3 - TFF

TG - TIME TO GO TO ENGINE CUTOFF  
 IN MIN SEC TO NEAREST SEC

TFF - TIME OF FREE FALL TO 300,000  
 FT. ALTITUDE ABOVE FISCHER  
 ELLIPSOID. IN MIN AND SEC TO  
 NEAREST SEC. MAX READING IS  
 59 59. IF PERIGEE ALT IS  
 GREATER THAN 300,000 FT. THE  
 TFF DISPLAY WILL READ 59 59.

#570

#580

#590

#600

#610

#620

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-----  
SELECT SPS THRESHOLD  
FOR USE BY DELTA V  
MONITOR ROUTINE  
(1.0 FT/SEC)  
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.....

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CALL DELTA V  
MONITOR ROUTINE  
(R 24)  
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MONITOR SPS  
THRUSTING:

- 1. DSKY:  
R1-TG  
SHOULD BE  
DECREASING
- R2-VG SHOULD BE  
DECREASING
- R3-TFF SHOULD  
REMAIN ABOVE  
--MIN--SEC.

2. DELTA V COUNTER  
IN SCS SHOULD BE  
DECREASING.

3. FDAI-ATT. ERROR  
SHOULD BE LESS THAN  
OR EQUAL TO --DEGREE  
BUT SHOULD INCREASE  
GRADUALLY AS CENTER  
OF GRAVITY SHIFTS.  
ATT RATES SHOULD BE  
LESS THAN OR EQUAL  
TO -- DEGREE/SEC.

4. SPS CHAMBER  
PRESSURE (PC)  
SHOULD BE LESS THAN  
OR EQUAL TO --  
LB/SQ IN.

\* XIII MONITOR SPS THRUSTING

- 1. DSKY:  
R1 - TG SHOULD BE DECREASING  
R2 - VG SHOULD BE DECREASING  
R3 - TFF SHOULD REMAIN ABOVE  
--MIN --SEC.

2. DELTA V COUNTER IN SCS SHOULD  
BE DECREASING.

3. FDAI-ATT. ERROR SHOULD BE LESS  
THAN OR EQUAL TO--DEGREE BUT  
SHOULD INCREASE GRADUALLY AS  
CENTER OF GRAVITY SHIFTS. ATT  
RATES SHOULD BE LESS THAN OR  
EQUAL TO--DEGREE/SEC.

4. SPS CHAMBER PRESSURE (PC) SHOULD  
BE LESS THAN OR EQUAL TO--LB/SQ  
IN.

NOTE:

THIS INDICATES PRESSURIZATION AT  
IGNITION AND DEPRESSURIZATION AT  
CUTOFF AS WELL AS STATUS DURING  
FIRING.

- 5. CHECK PITCH AND YAW GPI  
INDICATES NORMAL.

NOTE:

#630

#640

#650

#660

#670

5. CHECK PITCH AND YAW GPI INDICATES NORMAL.

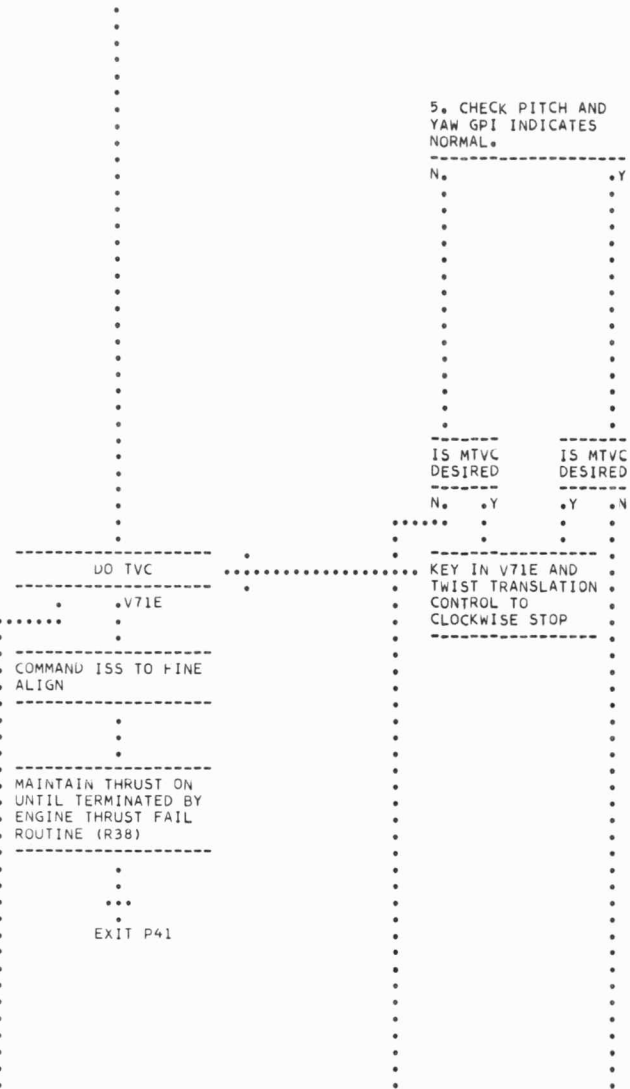
THIS IS DONE TO CHECK FOR FAILURES IN THE TVC LOOPS

NOTE:

KEEP LEFT HAND ON TRANSLATION CONTROL TO CHANGE TO MTVC. IF THRUSTING IS UNSATISFACTORY: #680 00:00

1. IF MTVC IS DESIRED: KEY IN V71E AND TWIST TRANSLATION CONTROL TO CW STOP WHEN THRUST OFF IS DESIRED SET NORMAL/OFF/DIRECTION SW TO OFF #690

2. IF MTVC IS NOT DESIRED GO TO BACKUP PROCEDURES



#700 #710 #720

G+N ENGINE  
UN COMMAND  
REMOVED

MONITOR DSKY:  
AS TG AND VG GO TO  
ZERO THRUST ON  
LIGHT SHOULD GO OFF  
AND SPS ENGINE  
SHOULD STOP.

GO TO BACKUP  
PROCEDURES

PUT THRUST SWITCH  
IN OFF POSITION

TERMINATE DELTA V  
MONITOR ROUTINE  
(R 24)

UPDATE ORBITAL  
COMPUTATION

FLASH VERB-NOUN TO  
REQUEST PROCEED.  
HOLD DISPLAY OF TG  
AND VG AT THEIR  
VALUES AT ENGINE  
CUTOFF.  
V16 N52  
R1 - TG  
R2 - VG

MONITOR DSKY:  
OBSERVE VERB-NOUN  
FLASH AND DISPLAY OF  
TG AND VG AT CUTOFF  
AND TFF

\* XIV MONITOR ENGINE CUTOFF

#730

NAV:

- \* 1. PLACE LEFT HAND IN POSITION TO BACKUP THRUST OFF WITH NORMAL/OFF/DIRECT ON SW

PILOT:

- \* 2. CHECK DELTA V COUNTER REACHES ZERO
- \* 3. CHECK THRUST ON ILPB IS OUT
- \* 4. CHECK SPS PC DECREASE
- \* 5. REPORT ENGINE OFF

#740

- \* 6. SET NORMAL/OFF/DIRECT ON SW TO OFF

#750

NAV:

- \* 7. MONITOR DSKY R1 FOR TG DECREASING TO ZERO
- \* 8. MONITOR DSKY R2 FOR VG DECREASING TO ZERO

#760

- \* 9. AT ENGINE CUTOFF CHECK AGC FLASHES VERB-NOUN TO REQUEST PROCEED AND HOLDS DISPLAY OF TG AND VG

#770

V16 N52  
R1 - TG  
R2 - VG  
R3 - TFF

#780

R3 - TFF  
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-----  
WAIT FOR KEYBOARD  
ENTRY  
TERMINATE FLASH UPON  
RECEIPT OF PROCEED  
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.....  
-----  
OBSERVE THESE VALUES  
AS DESIRED  
-----

.....  
-----  
KEY IN PROCEED  
V 33 E  
-----

-----  
SECURE MDC  
-----

\* 10. KEY IN PROCEED V33E #790

\* XV SECURE MDC AFTER SPS ENGINE TAILOFF #800

- \* 1. SET B+D SW TO OFF
- \* 2. SET PITCH SW TO OFF
- \* 3. SET YAW SW TO OFF

NOTE: #810  
ENABLE SWITCHES MUST BE OFF FOR  
10 MIN MINIMUM TO ALLOW SPS  
PROPELLANT SLOSH DAMPING.

- \* 4. SET SPS GIMBAL MOTORS PITCH 1 SW TO OFF
- \* 5. SET SPS GIMBAL MOTORS PITCH 2 SW TO OFF
- \* 6. SET SPS GIMBAL MOTORS YAW 1 SW TO OFF #820
- \* 7. SET SPS GIMBAL MOTORS YAW 2 SW TO OFF

- \* 8. SET INJECT PRE VALVE A SW TO OFF
- \* 9. SET INJECT PRE VALVE B SW TO OFF #830
- \* 10. SET TVC 2 POWER SW TO OFF
- \* 11. SET TVC 1 POWER SW TO OFF
- \* 12. SET DELTA V SW TO OFF
- \* 13. SECURE ROTATION CONTROL

- \* 14. LOCK TRANSLATION CONTROL #840
- \* 15. SET GIMBAL MOTOR CONTROL 1-PITCH-2  
BAT A CKT BKR TO OPEN
- \* 16. SET GIMBAL MOTOR CONTROL 1-YAW-2  
BAT A CKT BKR TO OPEN
- \* 17. SET FCSM ON/OFF/RESET SW TO OFF
- \* 18. ATT DEADBAND SW-MAX #850
- \* 19. READ AND RECORD SP5 PROPELLANT  
QUANTITY REMAINING
- \* XVI RECEIVE ORBITAL PARAMETER DATA  
FROM GROUND

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 TRANSMIT ORBITAL DATA TO CREW ..... RECEIVE ORBITAL DATA  
 FROM GROUND  
 -----

-----  
 DO ORBITAL PARAMETER DISPLAY ROUTINE (R 34) ..... DO ORBITAL PARAMETER  
 DISPLAY ROUTINE (R 34)  
 -----

- \* XVII PERFORM ORBITAL PARAMETER DISPLAY  
ROUTINE (R34) #860

.....  
 HOLD

-----  
 FLASH VERB-NOUN TO  
 REQUEST PLEASE  
 PERFORM SELECTION  
 OF ENTRY-MANEUVER  
 TO CM/SM SEPARATION  
 ATTITUDE PROGRAM  
 (P 61)  
 V50 N07  
 R1 - 00061  
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-----  
 MONITOR DSKY  
 OBSERVE VERB-NOUN  
 FLASH TO REQUEST  
 PLEASE PERFORM  
 SELECTION OF P 61  
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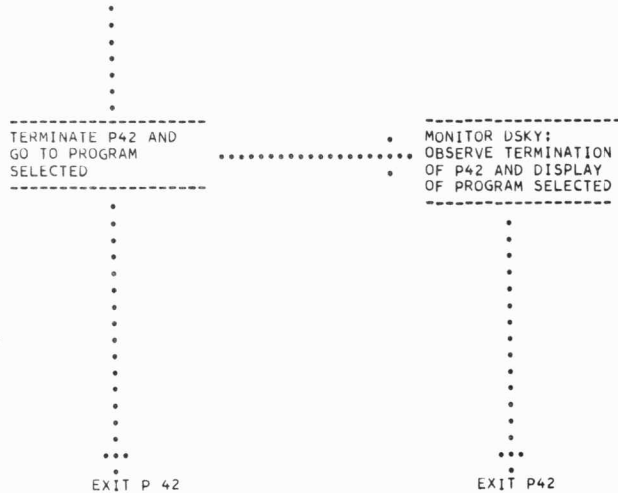
- \* XVIII #870

1. CHECK AGC FLASHES VERB-NOUN TO  
REQUEST PLEASE PERFORM SELECTION  
OF ENTRY-MANEUVER TO CM/SM  
SEPARATION ATTITUDE PROGRAM (P61)  
V50 N07  
R1 - 00061
2. KEY IN DESIRED PROGRAM #880  
KEY IN  
V37E --E
3. CHECK AGC DISPLAYS PROGRAM  
SELECTED

-----  
 WAIT FOR KEYBOARD  
 ENTRY  
 TERMINATE FLASH  
 UPON RECEIPT OF  
 NEW PROGRAM  
 -----

-----  
 KEY IN PROGRAM  
 DESIRED  
 V37E --E  
 -----

#890



#900

#910

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

THRUSTING - SPS MINIMUM IMPULSE PROGRAM (P 43)

REV 8

6-17-66

PURPOSE: (1) TO PREPARE THE G+N SYSTEM TO COUNTDOWN, TO INITIATE, TO MONITOR AND TO TERMINATE AN SPS THRUSTING MANEUVER OF A PREDETERMINED SMALL TIME DURATION WITH THE INTENT OF VERIFYING THE MINIMUM IMPULSE CAPABILITY OF THE SPS.

ASSUMPTIONS: (1) THIS PROGRAM HAS BEEN PRECEDED BY PROGRAM 33 AND THE INFLIGHT ALIGNMENT PROGRAM(S) IF REQUIRED. THEREFORE:

(A) VR AND T IGNITION HAVE BEEN CALCULATED AND STORED IN THE AGC.

(B) THE IMU AND THE CSM ARE BOTH AT A SATISFACTORY INERTIAL ORIENTATION FOR THE THRUSTING MANEUVER CONCURRENT WITH THE AGC STORED VR AND T IGNITION.

(C) THE DET WILL HAVE BEEN SET TO COUNT TO ZERO AT T IGNITION

(D) THE SCS SYSTEM IS IN THE G+N ATTITUDE CONTROL MODE (THE SCS DISCRETE MONITOR ROUTINE IS MONITORING THIS DISCRETE) AND THE ISS IS IN THE ATTITUDE CONTROL MODE.

(2) ALL SEQUENCES ARE COMPLETED IN A TIMELY MANNER TO ACCOMPLISH SPS IGNITION AT T IGNITION (- 0 + 15 SEC).

(3) THE PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY WHEN THE IMU AND THE CSM ARE SATISFACTORILY ORIENTED FOR THE THRUST MANEUVER AND BY AT LEAST T IGNITION--MIN AS INDICATED ON THE DET.

PRUG  
CONT

AGC

GROUND

CREW

CHECKLIST

TIME

TOTAL  
TIME

\*I. CONFIRM OR SELECT FOLLOWING POSITIONS  
AT MDC

PANEL 8

1. DIRECT RCS - OFF
2. LIMIT CYCLE - OFF
3. ATTITUDE DEADBAND - MAX
4. .05G ENTRY - OFF
5. LOCAL VERTICAL - OFF
6. DELTA V - OFF
7. G+N/SCS - G+N

#10

#20

P 43



8. ATTITUDE/MONITOR/ENTRY-ATTITUDE

- 9. A+C ROLL CHANNEL - OFF
- 10. B+D ROLL CHANNEL - ON
- 11. PITCH CHANNEL - ON
- 12. YAW CHANNEL - ON
- 13. ROLL RATE GYRO - NORMAL
- 14. PITCH RATE GYRO - NORMAL
- 15. YAW RATE GYRO - NORMAL

#30

PANEL 25

#40

- 1. FDAI LTG - AC1
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED
- 5. GROUP 2-AC2 - CLOSED
- 6. GROUP 1-MNA - CLOSED
- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED
- 9. GROUP 2-MNB - CLOSED
- 10. DIRECT CONTROL-MNA - CLOSED
- 11. DIRECT CONTROL-MNB - CLOSED
- 12. A6C ROLL-MNA - CLOSED
- 13. A6C ROLL-MNB - CLOSED
- 14. B6D ROLL-MNA - CLOSED
- 15. B6D ROLL-MNB - CLOSED
- 16. PITCH-MNA - CLOSED
- 17. PITCH-MNB - CLOSED
- 18. YAW-MNA - CLOSED

#50

#60

#70

- 19. YAW-MNB - CLOSED #80
- 20. G6N SYNC - OFF
- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED
- 23. GIMBAL MOTOR CONTROL PITCH 1  
BAT A - CLOSED
- 24. GIMBAL MOTOR CONTROL PITCH 2  
BAT B - CLOSED #90
- 25. GIMBAL MOTOR CONTROL YAW 1  
BAT A - CLOSED
- 26. GIMBAL MOTOR CONTROL YAW 2  
BAT B - CLOSED

MISCELLANEOUS #100

- 1. TRANSLATION CONTROLS - LOCKED
- 2. ROTATION CONTROLS - PINNED

PANEL 6

- 1. ATTITUDE SET - OFF #110

PANEL 7

- 1. NORMAL/OFF/DIRECT ON - OFF

PANEL 2

- 1. FDAI SELF TEST - OFF #120
- 2. FDAI BRIGHTNESS - SET
- 3. FCSM - AUTO/OVERRIDE - OVERRIDE
- 4. FCSM - ON/OFF/RESET - OFF #130

PANEL 24

1. SCS POWER - AC1
2. RATE GYRO POWER - AC1
3. BMA<sub>6</sub> POWER - AC2
4. ROTATION CONTROL POWER - AC2
5. TVC 1 POWER - AC1
6. TVC 2 POWER - AC1

#140

PANEL 3

1. PITCH GIMBAL MOTOR 1 - OFF
2. PITCH GIMBAL MOTOR 2 - OFF
3. YAW GIMBAL MOTOR 1 - OFF
4. YAW GIMBAL MOTOR 2 - OFF
5. INJECT PREVALVE A - OFF
6. INJECT PREVALVE B - OFF

#150

#160

PANEL 14

1. UPT<sub>EL</sub> - BLOCK
2. DSKY BRIGHTNESS - SET

#170

PANEL 22

1. IMU HTR-MNA - CLOSED
2. IMU HTR-MNB - CLOSED
3. IMU-MNA - CLOSED
4. IMU-MNB - CLOSED
5. COMPUTER-MNA - CLOSED
6. COMPUTER-MNB - CLOSED
7. OPTICS-MNA - OPEN
8. OPTICS-MNB - OPEN

#180

- 9. AC POWER-AC1 - CLOSED
- 10. AC POWER-AC2 - CLOSED
- 11. G+N - AC POWER - AC1

#190

\*II. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT NAV STATION

#200

- 1. FLOODLIGHT CONTROL PRIMARY - OFF
- 2. FLOODLIGHT CONTROL SECONDARY - OFF
- 3. IMU TRANSFER - COMPUTER
- 4. OPTICS SLAVE TELESCOPE - STAR LOS
- 5. OPTICS MODE - ZERO OPTICS
- 6. OPTICS HOLD - OFF
- 7. OPTICS CONTROLLER SPEED - HI
- 8. OPTICS CONTROLLER MODE - DIRECT
- 9. PANEL BRIGHTNESS CONTROL - OFF
- 10. IMU TEMP. MODE - AUTO OVERRIDE
- 11. ATTITUDE IMPULSE ENABLE - OFF
- 12. CONDITION LAMPS - OFF
- 13. AGC MODE - ON
- 14. AGC BRIGHTNESS CONTROL - OFF

#210

#220

#230

ISS-ATT  
 CONT MODE  
 PRESENT

SCS-G+N  
 ATTITUDE  
 PRESENT

•CREW PROG.  
 •SELECTION

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#25

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IS PROGRAM ALLOWED
.Y .N
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KEY IN THRUSTING
-SPS MINIMUM IM-
PULSE PROGRAM (P43)
V 37 E 43 E

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- \* III. SELECT AGC PROGRAM FOR THRUSTING-SPS MINIMUM IMPULSE PROGRAM (43) #240
- 1. ENTER THRUSTING - SPS MINIMUM IMPULSE PROGRAM V37 E 43 E

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HAS CORRESPOND-
ING PRETHRUSTING
PROGRAM FOR THIS
THRUSTING PRO-
GRAM BEEN SELECTED
SINCE THE LAST
BURN
.Y .N
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#250

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COMMAND CHECK
FAIL ALARM
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OBSERVE CHECK FAIL
LIGHT ON
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#260

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RESET CHECK
FAIL ALARM
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PRESS ALARM RESET TO
TURN OFF CHECK FAIL
LIGHT
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NOTE:

POSSIBLE CHECK FAIL. IF PRESENT PROGRAM DOES NOT ALLOW SELECTION OF P43 THE CHECK FAIL LIGHT WILL ILLUMINATE AND THE OLD PROGRAM DISPLAY WILL REMAIN.

OBSERVE:

CHECK FAIL LIGHT ON (LEB)  
PGNS LIGHT ON (LEB)  
COMP FAIL LIGHT ON (MDC)

GO TO BACKUP PROCEDURES AND SELECT A PROGRAM WHICH IS ALLOWED.

#270

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HOLD FOR NEW
PROGRAM
SELECTION
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CONSULT BACKUP
PROCEDURES
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#280

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GO TO PROGRAM
SELECTED
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KEY IN PROGRAM
SELECTION AS DESIRED
V37E--E
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EXIT P--

EXIT P--

#290

START THRUSTING-SPS  
MINIMUM IMPULSE  
PROGRAM (P43)  
DISPLAY PROGRAM 43

MONITOR DSKY:  
OBSERVE DISPLAY  
OF PROGRAM 43

2. CHECK AGC DISPLAYS PROGRAM 43

#300

INHIBIT SCS DISCRETE  
MONITOR ROUTINE (R22)

#310

HOLD . . . . .  
FLASH VERB-NOUN TO  
REQUEST PROCEED AND  
DISPLAY PRESENT  
ICDU/GIMBAL COMMANDS  
V16 N20  
R1-OG ROLL  
R2-IG PITCH  
R3-MG YAW

MONITOR DSKY:  
OBSERVE VERB-NOUN  
FLASH AND DISPLAY OF  
PRESENT ICDU GIMBAL  
COMMANDS

NOTE:

NAV RETURNS TO CENTER COUCH AND  
ASSISTS P AND/OR MONITORS  
PROCEDURES

\* IV ALIGN AGCU AND FDAI

PILOT:

#320

- A. CHECK AGC FLASHES VERB-NOUN TO  
REQUEST PROCEED AND DISPLAYS  
ICDU ANGLES  
V16 N20  
R1 - OG ROLL  
R2 - IG PITCH  
R3 - MG YAW

ALL ANGLES IN DEGREES  
TO NEAREST .01 DEGREE

ALL ANGLES IN DEGREES TO  
NEAREST .01 DEGREE.

#330

- B. SET ATTITUDE SET THUMBWHEELS  
TO SET ATTITUDE SET DIALS TO  
VALUES DISPLAYED ON DSKY

- C. SET G&N/SCS SW TO SCS

- D. SET ATT SET/OFF SW TO ATT SET

#340

- E. HOLD FDAI ALIGN PB IN UNTIL  
FDAI STOPS DRIVING AND ERROR  
NEEDLES NULLED

- F. CHECK ANGLES DISPLAYED UNDER  
NAV AXIS SYMBOL AGREE WITH  
DSKY DISPLAY

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WAIT FOR KEYBOARD ENTRY
TERMINATE FLASH UPON
RECEIPT OF PROCEED
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ENABLE SCS DISCRETE
MONITOR ROUTINE
(R22)
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DO BACKUP DELTA V
COUNTER ROUTINE
(R31)
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-----|
DISPLAY ON DSKY:
V06 N50
R1 - TTI
R2 - DELTA T BURN
R3 - DELTA VM
 (00000)
TTI - TIME TO GO TO
SPS IGNITION. IN
MIN, SEC TO NEAR-
EST SEC.
DELTA T BURN - DES-
IRED SPS BURN TIME.
IN MIN-SEC TO
NEAREST SECOND.
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KEY IN PROCEED
V 33 E
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DO BACKUP DELTA V
COUNTER ROUTINE
(R31)
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MONITOR DSKY:
OBSERVE DISPLAY OF
TTI AND DELTA T BURN
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UPDATE DIGITAL
EVENT TIMER
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- G. SET ATT SET/OFF SW TO OFF #350
- H. SET G&N/SCS SW TO G&N

NOTE:  
CHECK NO ATTITUDE CHANGE ON FDAI  
I. KEY IN PROCEED  
V33E

#360

#370

- \* V PERFORM BACKUP DELTA V COUNTER ROUTINE (R31)

#380

- \* VI PREPARE MDC FOR THRUSTING
- \* 1. CHECK AGC DISPLAYS (AT TTI = APPROX 6 MIN)  
V06 N50  
R1 - TTI  
R2 - DELTA T BURN  
R3 - DELTA VM (00000)

#390

TTI - TIME TO GO TO SPS IGNITION. IN MIN, SEC TO NEAREST SEC.  
DELTA T BURN - DESIRED SPS BURN TIME. IN MIN-SEC TO NEAREST SECOND.

NOTE:

DELTA VM-MEASURED  
DELTA V ALONG S/C +  
X AXIS DUE TO ULL-  
AGE. IN FT/SEC TO  
NEAREST FT/SEC.

CHECK STATUS OF C/W  
LAMPS

IF DELTA T BURN LOADED IN R33 WAS  
LESS THAN .5 SECONDS R2 WILL READ  
ZERO

DELTA VM-MEASURED DELTA V ALONG  
S/C + X AXIS DUE TO ULLAGE.  
IN FT/SEC TO NEAREST FT/SEC.

NOTE:

DELTA VM (R3) WILL BE ZERO UNTIL  
PIPA INTEGRATION IS ENABLED AT TTI  
EQUALS 30 SEC

- \* 2. UPDATE DIGITAL EVENT TIMER IF  
REQUIRED

PILOT:

- A. SET DIGITAL EVENT TIMER  
START/STOP SW AT STOP
- B. SET RESET/UP/DOWN SW AT RESET
- C. ADJUST DET MIN SW TO ADVANCE  
TIMER TO POINT OF SYNCHRONIZA-  
TION
- D. ADJUST DIGITAL EVENT TIMER  
SEC SW TO SEC TO ADVANCE  
TIMER TO POINT OF SYNCHRON-  
IZATION
- E. SET RESET/UP/DOWN SW AT DOWN
- F. SET DIGITAL EVENT TIMER  
START/STOP SW TO START AT  
SYNC TIME

- \* 3. DETERMINE STATUS OF C/W LAMPS IF  
DESIRED

CREW:

- A. SET C/W LAMP TEST SW TO 1 (SE)
- B. CHECK ALL LEFT HAND C/W LAMPS  
AND ALL MASTER ALARM LAMPS  
ILLUMINATED
- C. SET C/W LAMP TEST SW TO OFF
- D. CHECK ALL C/W LAMPS AND MASTER  
ALARM LAMPS OFF



AT TTI = 5 MIN  
DO THRUST CONTROL  
MODE CHECK  
ROUTINE (R 2)

DO THRUST CONTROL  
MODE CHECK  
ROUTINE (R 2)

ACTIVATE AND TEST  
SPS GIMBAL DRIVE

RECALL DISPLAY ON  
DSKY OF:  
V06 N50  
R1 - TTI  
R2 - DELTA T BURN  
R3 - DELTA VM  
(00000)

VERIFY CRITICAL  
CONTROL/DISPLAY  
POSITIONS

P 43

- E. SET C/W LAMP TEST SW TO 2
- F. CHECK ALL RIGHT HAND C/W LAMPS ILLUMINATED
- G. SET C/W LAMP TEST SW TO OFF
- H. CHECK ALL C/W LAMPS OFF

#460

\* VII PERFORM THRUST CONTROL MODE CHECK ROUTINE (R2)

#470

\* VIII CONTINUE MDC PREPARATION

\* 1. ACTIVATE AND TEST SPS GIMBAL DRIVE

- A. SET (COARSE) GIMBAL TRIM THUMBWHEELS:  
PITCH +4 DEG  
YAW +6 DEG
- B. ACTIVATE SPS GIMBAL MOTORS:  
PITCH 2 SW MOMENTARY START THEN ON  
YAW 2 SW MOMENTARY START THEN ON
- C. CONFIRM TRIM ANGLES ON GIMBAL POSITION INDICATOR
- D. SET:  
PITCH 1 SW MOMENTARY START THEN ON  
YAW 1 SW MOMENTARY START THEN ON

#480

#490

E. AFTER TRANSIENTS, FINE ADJUST PITCH AND YAW TRIM ANGLES

\* 2. CONFIRM OR SELECT CRITICAL SWITCH POSITIONS

#500

- \* A. DIRECT RCS SW-OFF
- \* B. LIMIT CYCLE SW - OFF
- \* C. ATT DEADBAND SW - MIN

#510

P 43

- \* D. 0.05 G ENTRY SW - OFF
- \* E. LCL VERT SW - OFF
- \* F. DELTA V SW - ON
- \* G. G6N/SCS SW - G6N #520
- \* H. ATTITUDE/MONITOR/ENTRY SW - ATTITUDE
- \* I. RATE GYRO SWITCHES - NORMAL
- \* J. A+C ROLL SW - OFF
- \* K. B+D ROLL SW - ON
- \* L. PITCH SW - ON #530
- \* M. YAW SW - ON
- \* N. NORMAL/OFF/DIRECT ON SW - OFF
- \* O. SPS GIMBAL MOTORS PITCH 1 SW-ON
- \* P. SPS GIMBAL MOTORS PITCH 2 SW-ON
- \* Q. SPS GIMBAL MOTORS YAW 1 SW-ON #540
- \* R. SPS GIMBAL MOTORS YAW 2 SW-ON
- \* S. INJECT PRE-VALVES A SW-OFF
- \* T. INJECT PRE-VALVES B SW-OFF
- \* U. FCSM AUTO/OVERRIDE SW-AUTO
- \* V. FCSM-ON/OFF/RESET SW-OFF #550
- \* W. TVC 1 POWER-AC1
- \* X. TVC 2 POWER-AC2

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 MONITOR SYSTEM  
 STATUS UNTIL  
 TIGN - 2 MIN  
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- \* IX MONITOR SYSTEM STATUS UNTIL TIGN-2 MINUTES

#560

PILOT:

1. CHECK FDAI ATTITUDE ERROR AND RATE IND. NORMAL
2. MONITOR DIGITAL EVENT TIMER UNTIL TIGN - 2 MINUTES

PERFORM FINAL PREPARATIONS

3. CHECK DSKY DISPLAYS TTI UNTIL TIGN - 2 MINUTES

#570

\* X PERFORM FINAL PREPARATIONS

PILOT:

- \* 1. REPORT FINAL 2 MINUTES OF COUNTDOWN TO N AND SE
- \* 2. SET INJECT PRE-VALVE A SW TO ON
- \* 3. SET INJECT PRE-VALVE B SW TO ON
- \* 4. UNLOCK PRIME TRANSLATION CONTROL
- \* 5. UNPIN ROTATION CONTROL
- \* 6. SET FCMS ON/OFF/RESET SWITCH TO ON

#580

\* ~~7. SET NORMAL/OFF/DIRECT ON SW TO NORMAL~~

#590

\* XI PERFORM SPS ENGINE IGNITION ROUTINE (R-37)

DO SPS ENGINE IGNITION ROUTINE (R 37)

DO SPS ENGINE IGNITION ROUTINE (R 37)

G+N ENGINE ON COMMAND PRESENT

#600

MONITOR SPS MINIMUM IMPULSE THRUSTING:

\* XII MONITOR SPS THRUSTING

PILOT:

- 1. DELTA V COUNTER IN SCS SHOULD DECREASE TO ZERO
- 2. FDAI-ATT. ERROR SHOULD BE LESS THAN OR EQUAL TO --DEGREE ATT RATES SHOULD BE LESS THAN OR EQUAL TO -- DEGREE/SEC.
- 3. CHECK PITCH AND YAW GPI INDICATORS NORMAL

1. DELTA V COUNTER IN SCS SHOULD DECREASE TO ZERO

#610

2. FDAI-ATT. ERROR SHOULD BE LESS THAN OR EQUAL TO --DEGREE ATT RATES SHOULD BE LESS THAN OR EQUAL TO --DEGREE/SEC.

3. CHECK PITCH AND YAW GPI INDICATORS NORMAL

NOTE:

THIS IS DONE TO CHECK FOR FAILURES IN THE TVC LOOPS

#620

NOTE:

KEEP LEFT HAND ON TRANSLATION CONTROL TO CHANGE TO SCS MODE IF

N. Y

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 SECURE MDC  
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#680

\* XIV SECURE MDC AFTER SPS ENGINE  
 TAILOFF

\* 1. SET B+D SW TO OFF

\* 2. SET PITCH SW TO OFF

#690

\* 3. SET YAW SW TO OFF

## NOTE:

ENABLE SWITCHES MUST BE OFF FOR  
 10 MIN MINIMUM TO ALLOW SPS  
 PROPELLANT SLOSH DAMPING.

\* 4. SET SPS GIMBAL MOTORS PITCH 1 SW  
 TO OFF

#700

\* 5. SET SPS GIMBAL MOTORS PITCH 2 SW  
 TO OFF

\* 6. SET SPS GIMBAL MOTORS YAW 1 SW TO  
 OFF

\* 7. SET SPS GIMBAL MOTORS YAW 2 SW TO  
 OFF

#710

\* 8. SET INJECT PRE VALVE A SW TO OFF

\* 9. SET INJECT PRE VALVE B SW TO OFF

\* 10. SET TVC 2 POWER SW TO OFF

\* 11. SET TVC 1 POWER SW TO OFF

\* 12. SET DELTA V SW TO OFF

#720

\* 13. SECURE ROTATION CONTROL

\* 14. LOCK TRANSLATION CONTROL

\* 15. SET GIMBAL MOTOR CONTROL 1-PITCH-2  
 BAT A CKT BKR TO OPEN

\* 16. SET GIMBAL MOTOR CONTROL 1-YAW-2  
 BAT A CKT BKR TO OPEN

#730

\* 17. SET FCSM ON/OFF/RESET SW TO OFF

\* 18. ATT DEADBAND SW-MAX



SCS-G+N  
DELTA V  
REMOVED

ISS-ATT  
CONT MODE  
PRESENT

SCS-G+N  
ATTITUDE  
PRESENT

235

\* 19. READ AND RECORD SPS PROPELLANT QUANTITY REMAINING

\* XV PERFORM ORBITAL PARAMETER DISPLAY ROUTINE (R34)

#740

1. CHECK AGC FLASHES VERB-NOUN TO REQUEST PLEASE PERFORM SELECTION OF AGC IDLING PROGRAM (P00)  
V50 N07  
R1-00000

#750

2. KEY IN DESIRED PROGRAM  
KEY IN  
V37E 00E

#760

3. CHECK AGC DISPLAYS PROGRAM 00

#770

#780

#790

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EXIT P43

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•  
EXIT P43

P 43

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

INFLIGHT ALIGNMENT-IMU ORIENTATION DETERMINATION PROGRAM (P51)

REV 8 6/17/66

PURPOSE: (1) THE ISS MAY BE:

- (A) OFF (STANDBY)
- (B) ON, BUT NOT ZEROED

IF (A) OR (B) IS TRUE P51 WILL AUTOMATICALLY SELECT THE G+N STARTUP PROGRAM (P05)

ASSUMPTIONS: (1) THE G+N IS ENERGIZED AND THE IMU IS INERTIAL BUT THE INERTIAL ORIENTATION OF THE IMU IS NOT KNOWN BY THE AGC.  
(2) THE SIVB MAY OR MAY NOT HAVE BEEN SEPARATED.

(3) TIME AND RCS FUEL MAY BE SAVED, AND SUBSEQUENT IMU ALIGNMENT DECISIONS GREATLY SIMPLIFIED IF THIS PROGRAM IS PERFORMED IN SUCH A WAY AS TO LEAVE THE IMU INERTIALLY STABILIZED AT AN ORIENTATION AS CLOSE AS POSSIBLE TO THE OPTIMUM ORIENTATION REQUIRED BY FUTURE AGC PROGRAMS.

(4) THE OPTICS EYE PIECES, WORK TABLE, AND ROTATION CONTROL ARE IN POSITION FOR USE. THE OPTICS DOOR IS OPEN.

(5) THE PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY.

| PRG<br>CONT | AGC | GROUND | CREW | CHECKLIST | TIME | TOTAL<br>TIME |
|-------------|-----|--------|------|-----------|------|---------------|
|-------------|-----|--------|------|-----------|------|---------------|

\*1. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT MDC IF SIVB ATTACHED

PANEL 8

- |                                   |     |
|-----------------------------------|-----|
| 1. DIRECT RCS - OFF               | #10 |
| 2. LIMIT CYCLE - OFF              |     |
| 3. ATTITUDE DEADBAND - MAX        |     |
| 4. .05G ENTRY - OFF               |     |
| 5. LOCAL VERTICAL - OFF           |     |
| 6. DELTA V - OFF                  | #20 |
| 7. G+N/SCS - G+N                  |     |
| 8. ATTITUDE/MONITOR/ENTRY-MONITOR |     |

P 51



- 9. A6C ROLL CHANNEL - OFF
- 10. B6D ROLL CHANNEL - OFF
- 11. PITCH CHANNEL - OFF
- 12. YAW CHANNEL - OFF
- 13. ROLL RATE GYRO - NORMAL
- 14. PITCH RATE GYRO - NORMAL
- 15. YAW RATE GYRO - NORMAL

#30

PANEL 25

#40

- 1. FDAI LTG - AC1 OR AC2
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED
- 5. GROUP 2-AC2 - CLOSED
- 6. GROUP 1-MNA - CLOSED
- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED
- 9. GROUP 2-MNB - CLOSED
- 10. DIRECT CONTROL-MNA - CLOSED
- 11. DIRECT CONTROL-MNB - CLOSED
- 12. A6C ROLL-MNA - CLOSED
- 13. A6C ROLL-MNB - CLOSED
- 14. B6D ROLL-MNA - CLOSED
- 15. B6D ROLL-MNB - CLOSED
- 16. PITCH-MNA - CLOSED
- 17. PITCH-MNB - CLOSED
- 18. YAW-MNA - CLOSED
- 19. YAW-MNB - CLOSED

#50

#60

#70

- 20. G6N SYNC - OFF #80
- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED
- 23. GIMBAL MOTOR CONTROL PITCH 1  
BAT A - CLOSED
- 24. GIMBAL MOTOR CONTROL PITCH 2 #90  
BAT B - CLOSED
- 25. GIMBAL MOTOR CONTROL YAW 1  
BAT A - CLOSED
- 26. GIMBAL MOTOR CONTROL YAW 2  
BAT B - CLOSED

MISCELLANEOUS #100

- 1. TRANSLATION CONTROLS - LOCKED
- 2. ROTATION CONTROLS - PINNED

PANEL 6

- 1. ATTITUDE SET - OFF #110

PANEL 7

- 1. NORMAL/OFF/DIRECT ON - OFF

PANEL 2

- 1. FDA1 SELF TEST - OFF
- 2. FDA1 BRIGHTNESS - SET
- 3. FC5M - AUTO/OVERRIDE - OVERRIDE
- 4. FC5M - ON/OFF/RESET - OFF #120

PANEL 24

- 1. SCS POWER - AC1 OR AC2

(OPTIONAL-FOR FDAI CHECK OF  
GIMBAL ANGLES)

- 2. RATE GYRO POWER - OFF #140
- 3. BMAG POWER - OFF
- 4. ROTATION CONTROL POWER - OFF
- 5. TVC 1 POWER - OFF
- 6. TVC 2 POWER - OFF

## PANEL 3 #150

- 1. PITCH GIMBAL MOTOR 1 - OFF
- 2. PITCH GIMBAL MOTOR 2 - OFF
- 3. YAW GIMBAL MOTOR 1 - OFF
- 4. YAW GIMBAL MOTOR 2 - OFF #160
- 5. INJECT PREVALVE A - OFF
- 6. INJECT PREVALVE B - OFF

## PANEL 14

- 1. UPTL - BLOCK #170
- 2. DSKY BRIGHTNESS - SET

## PANEL 22

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED
- 3. IMU-MNA - CLOSED #180
- 4. IMU-MNB - CLOSED
- 5. COMPUTER-MNA - CLOSED
- 6. COMPUTER-MNB - CLOSED
- 7. OPTICS-MNA - CLOSED #190
- 8. OPTICS-MNB - CLOSED

- 9. AC POWER-AC1 - CLOSED
- 10. AC POWER-AC2 - CLOSED
- 11. G6N-AC POWER - AC1 OR AC2

\*II. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT MDC IF SIVB SEPARATED #200

PANEL 8

- 1. DIRECT RCS - OFF
- 2. LIMIT CYCLE - ON
- 3. ATTITUDE DEADBAND - MAX #210
- 4. +05G ENTRY - OFF
- 5. LOCAL VERTICAL - OFF
- 6. DELTA V - OFF
- 7. G+N/SCS - G+N #220
- 8. ATTITUDE/MONITOR/ENTRY-MONITOR
- 9. A6C ROLL CHANNEL - ON
- 10. B6D ROLL CHANNEL - ON
- 11. PITCH CHANNEL - ON
- 12. YAW CHANNEL - ON
- 13. ROLL RATE GYRO - NORMAL #230
- 14. PITCH RATE GYRO - NORMAL
- 15. YAW RATE GYRO - NORMAL

PANEL 25

- 1. FDAI LTG - AC1 OR AC2 #240
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED

|                                                    |      |
|----------------------------------------------------|------|
| 5. GROUP 2-AC2 - CLOSED                            | #250 |
| 6. GROUP 1-MNA - CLOSED                            |      |
| 7. GROUP 1-MNB - CLOSED                            |      |
| 8. GROUP 2-MNA - CLOSED                            |      |
| 9. GROUP 2-MNB - CLOSED                            |      |
| 10. DIRECT CONTROL-MNA - CLOSED                    | #260 |
| 11. DIRECT CONTROL-MNB - CLOSED                    |      |
| 12. A6C ROLL-MNA - CLOSED                          |      |
| 13. A6C ROLL-MNB - CLOSED                          |      |
| 14. B6D ROLL-MNA - CLOSED                          |      |
| 15. B6D ROLL-MNB - CLOSED                          | #270 |
| 16. PITCH-MNA - CLOSED                             |      |
| 17. PITCH-MNB - CLOSED                             |      |
| 18. YAW-MNA - CLOSED                               |      |
| 19. YAW-MNB - CLOSED                               |      |
| 20. G6N SYNC - OFF                                 | #280 |
| 21. EVENT TIMER MNA - CLOSED                       |      |
| 22. EVENT TIMER MNB - CLOSED                       |      |
| 23. GIMBAL MOTOR CONTROL PITCH 1<br>BAT A - CLOSED |      |
| 24. GIMBAL MOTOR CONTROL PITCH 2<br>BAT B - CLOSED | #290 |
| 25. GIMBAL MOTOR CONTROL YAW 1<br>BAT A - CLOSED   |      |
| 26. GIMBAL MOTOR CONTROL YAW 2<br>BAT B - CLOSED   |      |
| MISCELLANEOUS                                      |      |
| 1. TRANSLATION CONTROLS - LUCKED                   | #300 |
| 2. ROTATION CONTROLS - UNPINNED                    |      |

PANEL 6

1. ATTITUDE SET - OFF

#310

PANEL 7

1. NORMAL/OFF/DIRECT ON - OFF

PANEL 2

1. FDAI SELF TEST - OFF
2. FDAI BRIGHTNESS - SET
3. FCSM - AUTO/OVERRIDE - OVERRIDE
4. FCSM - ON/OFF/RESET - OFF

#320

PANEL 24

1. SCS POWER - AC1 OR AC2
2. RATE GYRO POWER - AC1 OR AC2
3. BMAG POWER - AC1 OR AC2
4. ROTATION CONTROL POWER - AC1 OR AC2
5. TVC 1 POWER - OFF
6. TVC 2 POWER - OFF

#330

#340

PANEL 3

1. PITCH GIMBAL MOTOR 1 - OFF
2. PITCH GIMBAL MOTOR 2 - OFF
3. YAW GIMBAL MOTOR 1 - OFF
4. YAW GIMBAL MOTOR 2 - OFF
5. INJECT PREVALVE A - OFF

#350

6. INJECT PREVALVE B - OFF

#360

PANEL 14

- 1. UPTTEL - BLOCK
- 2. DSKY BRIGHTNESS - SET

#370

PANEL 22

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED
- 3. IMU-MNA - CLOSED
- 4. IMU-MNB - CLOSED
- 5. COMPUTER-MNA - CLOSED
- 6. COMPUTER-MNB - CLOSED
- 7. OPTICS-MNA - CLOSED
- 8. OPTICS-MNB - CLOSED
- 9. AC POWER-AC1 - CLOSED
- 10. AC POWER-AC2 - CLOSED
- 11. G6N-AC POWER - AC1 OR AC2

#380

#390

\*III. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT NAV STATION

- 1. FLOODLIGHT CONTROL PRIMARY - SET
- 2. FLOODLIGHT CONTROL SECONDARY - SET
- 3. IMU TRANSFER - COMPUTER
- 4. OPTICS SLAVE TELESCOPE - STAR LOS
- 5. OPTICS MODE - ZERO OPTICS
- 6. OPTICS HOLD - OFF
- 7. OPTICS CONTROLLER SPEED - HI
- 8. OPTICS CONTROLLER MODE - DIRECT

#400

#410







P 51

#470

#480

2. CHECK AGC DISPLAYS PROGRAM 51

NOTE:

IF THE ISS IS NOT ON AND ZEROED, THE AGC WILL AUTOMATICALLY SELECT THE G+N STARTUP PROGRAM (P05). COMPLETE P05 AND RESELECT P51.

#490

#500

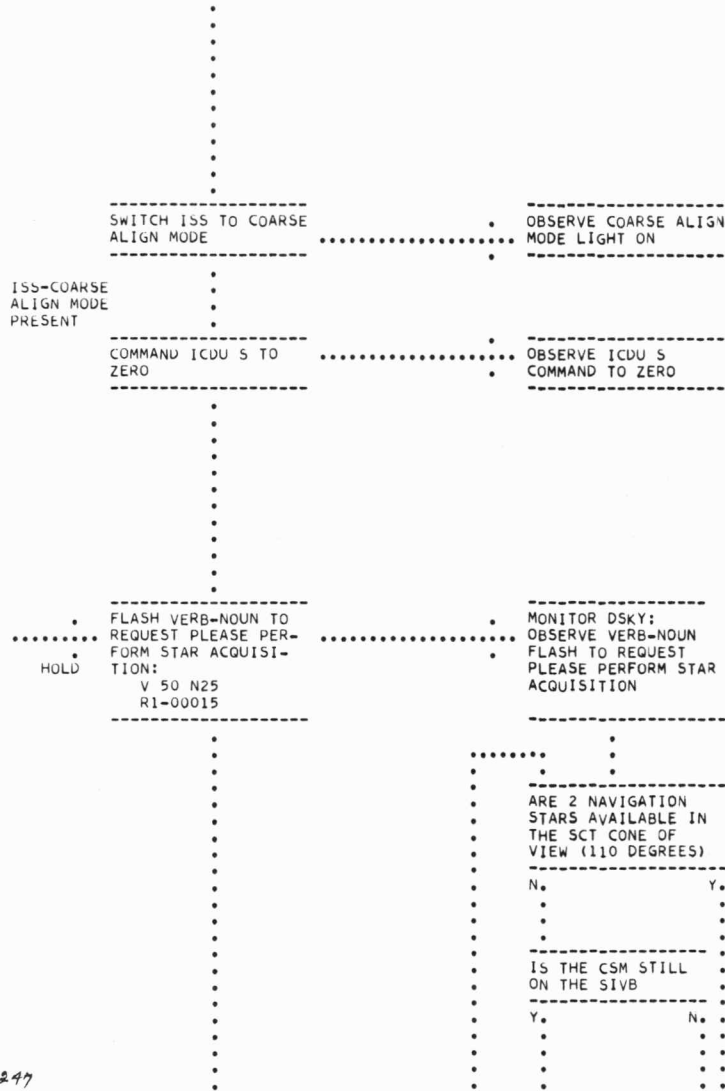
#510

3. CHECK FINE ALIGN MODE LIGHT - ON (20 SEC)

#520

P 51

296



\*V MONITOR COURSE ALIGNMENT OF IMU TO CAGED POSITION

#530

1. CHECK COARSE ALIGN MODE LIGHT ON (45 SEC MINIMUM)

#540

2. CHECK ICDU S DRIVE TO ZERO (45 SEC MAX)
3. CHECK IMU-CDU DIFFERENCE INDICATOR AT ZERO (PLUS OR MINUS 1.5 DEGREES)

PILOT:

#550

4. CHECK FDAI ATTITUDE ANGLES ZEROED

\* VI ACQUIRE STAR #1 IN SCT

- \* 1. CHECK AGC FLASHES VERB-NOUN TO REQUEST PLEASE PERFORM STAR ACQUISITION:  
V 50 N25  
R1-00015

#560

#570

#580

247



-----  
DO SIGHTING MARK  
ROUTINE (R 27) FOR  
STAR #1  
-----

.....

-----  
DO SIGHTING MARK  
ROUTINE (R 27) FOR  
STAR #1  
-----

\*VII PERFORM SIGHTING MARK ROUTINE  
(R 27) FOR STAR #1

#640

.....

-----  
DO SIGHTING MARK  
ROUTINE (R 27) FOR  
STAR #2  
-----

.....

-----  
DO SIGHTING MARK  
ROUTINE (R 27) FOR  
STAR #2  
-----

\*VIII PERFORM SIGHTING MARK ROUTINE  
(R 27) FOR STAR #2

#650

.....

-----  
SET SIGHTING FLAG  
TO INITIAL  
-----

.....

-----  
DO STAR DATA TEST  
ROUTINE (R 29)  
-----

.....

-----  
DO STAR DATA TEST  
ROUTINE (R 29)  
-----

\*IX PERFORM STAR DATA TEST ROUTINE  
(R 29)

#660

#670

.....

-----  
GET PRESENT IMU  
ORIENTATION W.R.T.  
VEHICLE FROM ICPU  
ANGLES STORED DUR-  
ING TWO PREVIOUS  
SIGHTING MARK TASKS  
-----

.....

-----  
GET STAR # 1 AND # 2  
VECTORS W.R.T.  
VEHICLE FROM OCPU  
ANGLES STORED DUR-  
ING TWO PREVIOUS  
SIGHTING MARK TASKS  
-----

.....

#680

#690

.....

P 51

P 51

-----  
CALCULATE IMU INERTIAL  
ORIENTATION W.R.T.  
CELESTIAL COORDIN-  
ATES AS DEFINED BY  
STAR # 1 AND # 2 .  
STORE AS PRESENT  
PLATFORM ORIENTATION  
(MATRIX A)  
-----

#700

.....  
-----  
SET "IMU ORIENTATION  
KNOWN" FLAG  
(REFSMFLG)  
-----

#710

.....  
-----  
TERMINATE P 51 AND  
GO TO AGC  
IDLING PROGRAM  
(P 00)  
-----

.....

-----  
MONITOR DSKY:  
OBSERVE TERMINATION  
OF P 51 AND DISPLAY  
OF P 00  
-----

\* XI CHECK AGC DISPLAYS PROGRAM 00

#720

ISS-FINE  
ALIGN MODE  
PRESENT  
.....  
SCS-G+N  
MONITOR  
PRESENT  
.....

EXIT P 51

.....  
EXIT P 51

#730

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

INFLIGHT ALIGNMENT-SIVB/IMU ALIGN PROGRAM (P52)

REV 9

6/28/66

PURPOSE: (1) WHEN THE CSM IS ON THE SIVB, TO ALIGN THE IMU TO A DESIRED INERTIAL ORIENTATION SPECIFIED BY A PREVIOUS PROGRAM.

ASSUMPTIONS: (1) THE CSM WILL BE ON THE SIVB.

(2) THE IMU IS STABILIZED AT AN INERTIAL ORIENTATION KNOWN BY THE AGC. THE IMU MAY REQUIRE A LARGE OR SMALL ORIENTATION CHANGE TO THE DESIRED ORIENTATION, REQUIRING COARSE AND FINE ALIGNMENT OR ONLY FINE ALIGNMENT. THIS ALIGNMENT MAY BE A RE-ALIGNMENT WHEN THE IMU HAS DEVIATED FROM THE PRELAUNCH ORIENTATION ONLY DUE TO DRIFT ERRORS. IT MAY ALSO BE A COMPLETE ALIGNMENT OF THE IMU FROM A RANDOM AGC-KNOWN ORIENTATION INHERITED FROM P51 AFTER AN IMU SHUTDOWN. OR IN THE CASE OF AN IMU RE-ALIGNMENT INVOLVING GIMBAL ANGLE CHANGES LARGER THAN THE COARSE ALIGNMENT CRITERIA, COARSE ALIGNMENT WILL AUTOMATICALLY BE DONE, AND THE ORIGINAL PLATFORM ERROR WILL NOT BE DISPLAYED. IF A DISPLAY OF PLATFORM DRIFT IS DESIRED INFLIGHT ALIGNMENT-IMU RE-ALIGNMENT PROGRAM (P54) SHOULD BE PERFORMED INSTEAD OF THIS PROGRAM.

(3) THE SIVB WILL BE CONTROLLING S/C ATTITUDE IN ONE OF TWO MODES:

(A) IMU ALIGNMENT MODE-THE CSM + Z AXIS IS POINTED AWAY FROM THE EARTH AND THE CSM + X AXIS IS ALONG THE LOCAL HORIZONTAL IN THE DIRECTION OF FLIGHT.

(B) LANDMARK TRACKING MODE-THE SIVB IS ROLLED 180 DEGREES AND PITCHED 20 DEGREES NOSE DOWN FROM THE IMU ALIGNMENT ATTITUDE BY STORED PROGRAM TO ENABLE SIGHTING OF LANDMARKS. THE VEHICLE WILL NORMALLY BE IN THE IMU ALIGNMENT MODE WITH THE LANDMARK TRACKING MODE COMMANDED PERIODICALLY FOR A FIXED TIME BY THE SIVB ATTITUDE CONTROL SYSTEM.

(4) THE DESIRED IMU INERTIAL ORIENTATION (I.E. THE PRELAUNCH IMU INERTIAL ORIENTATION) IS STORED IN THE AGC. THIS ORIENTATION WILL NOT RESULT IN GIMBAL LOCK FOR ANY OF THE PREPROGRAMMED SIVB ATTITUDES EITHER IN LOCAL VERTICAL MODE OR SIGHTING ATTITUDE MODE.

(5) THE PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY.

| PRUG<br>CONT | AGC | GROUND | CREW | CHECKLIST | TIME | TOTAL<br>TIME |
|--------------|-----|--------|------|-----------|------|---------------|
|--------------|-----|--------|------|-----------|------|---------------|

\*1. CONFIRM OR SELECT FOLLOWING POSITIONS  
AT MDC

PANEL 8

1. DIRECT RCS - OFF
2. LIMIT CYCLE - OFF

#10

P 52

- 3. ATTITUDE DEADBAND - MAX
- 4. .05G ENTRY - OFF
- 5. LOCAL VERTICAL - OFF
- 6. DELTA V - OFF
- 7. G+N/SC5 - G+N #20
- 8. ATTITUDE/MONITOR/ENTRY-MONITOR
- 9. A6C ROLL CHANNEL - OFF
- 10. B6D ROLL CHANNEL - OFF
- 11. PITCH CHANNEL - OFF
- 12. YAW CHANNEL - OFF #30
- 13. ROLL RATE GYRO - NORMAL
- 14. PITCH RATE GYRO - NORMAL
- 15. YAW RATE GYRO - NORMAL

PANEL 25 #40

- 1. FDAI LTG - AC1 OR AC2
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED
- 5. GROUP 2-AC2 - CLOSED #50
- 6. GROUP 1-MNA - CLOSED
- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED
- 9. GROUP 2-MNB - CLOSED
- 10. DIRECT CONTROL-MNA - CLOSED #60
- 11. DIRECT CONTROL-MNB - CLOSED
- 12. A6C ROLL-MNA - CLOSED
- 13. A6C ROLL-MNB - CLOSED

- 14. B&D ROLL-MNA - CLOSED
- 15. B&D ROLL-MNB - CLOSED #70
- 16. PITCH-MNA - CLOSED
- 17. PITCH-MNB - CLOSED
- 18. YAW-MNA - CLOSED
- 19. YAW-MNB - CLOSED
- 20. G&N SYNC - OFF #80
- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED
- 23. GIMBAL MOTOR CONTROL PITCH 1  
BAT A - CLOSED
- 24. GIMBAL MOTOR CONTROL PITCH 2  
BAT B - CLOSED #90
- 25. GIMBAL MOTOR CONTROL YAW 1  
BAT A - CLOSED
- 26. GIMBAL MOTOR CONTROL YAW 2  
BAT B - CLOSED

MISCELLANEOUS #100

- 1. TRANSLATION CONTROLS - LOCKED
- 2. ROTATION CONTROLS - PINNED

PANEL 6

- 1. ATTITUDE SET - OFF #110

PANEL 7

- 1. NORMAL/OFF/DIRECT ON - OFF

PANEL 2

- 1. FDAI SELF TEST - OFF #120



- 2. FDAI BRIGHTNESS - SET
- 3. FCSM - AUTO/OVERRIDE - OVERRIDE
- 4. FCSM - ON/OFF/RESET - OFF

#130

PANEL 24

- 1. SCS POWER - AC1 OR AC2  
(OPTIONAL-FOR FDAI CHECK OF  
GIMBAL ANGLES)
- 2. RATE GYRO POWER - OFF
- 3. BMA6 POWER - OFF
- 4. ROTATION CONTROL POWER - OFF
- 5. TVC 1 POWER - OFF
- 6. TVC 2 POWER - OFF

#140

PANEL 3

- 1. PITCH GIMBAL MOTOR 1 - OFF
- 2. PITCH GIMBAL MOTOR 2 - OFF
- 3. YAW GIMBAL MOTOR 1 - OFF
- 4. YAW GIMBAL MOTOR 2 - OFF
- 5. INJECT PREVALVE A - OFF
- 6. INJECT PREVALVE B - OFF

#150

#160

PANEL 14

- 1. UPTL - BLOCK
- 2. DSKY BRIGHTNESS - SET

#170

PANEL 22

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED

#180

- 3. IMU-MNA - CLOSED
- 4. IMU-MNB - CLOSED
- 5. COMPUTER-MNA - CLOSED
- 6. COMPUTER-MNB - CLOSED
- 7. OPTICS-MNA - CLOSED #190
- 8. OPTICS-MNB - CLOSED
- 9. AC POWER-AC1 - CLOSED
- 10. AC POWER-AC2 - CLOSED
- 11. G6N-AC POWER - AC1 OR AC2

\*II. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT NAV STATION #200

- 1. FLOODLIGHT CONTROL PRIMARY - SET
- 2. FLOODLIGHT CONTROL SECONDARY - SET
- 3. IMU TRANSFER - COMPUTER
- 4. OPTICS SLAVE TELESCOPE - STAR LOS #210
- 5. OPTICS MODE - ZERO OPTICS
- 6. OPTICS HOLD - OFF
- 7. OPTICS CONTROLLER SPEED - HI
- 8. OPTICS CONTROLLER MODE - DIRECT
- 9. PANEL BRIGHTNESS CONTROL - SET #220
- 10. IMU TEMP. MODE - AUTO OVERRIDE
- 11. ATTITUDE IMPULSE ENABLE - OFF
- 12. CONDITION LAMPS - ON
- 13. AGC MODE - ON
- 14. AGC BRIGHTNESS CONTROL - SET #230

SCS-G\*H  
MONITOR  
PRESENT

255

ISS-FINE  
ALIGN MODE  
PRESENT

CREW PROG  
SELECTION

#240

IS PROGRAM ALLOWED?

KEY IN SIVB IMU  
ALIGN PROGRAM (P 52)  
V37 E 52 E

\* III SELECT SIVB-IMU ALIGN PROGRAM (P52)

- 1. ENTER SIVB-IMU ALIGN PROGRAM  
V37E 52E

#250

NOTE:

POSSIBLE CHECK FAIL. IF PRESENT  
PROGRAM DOES NOT ALLOW SELECTION OF  
P52 THE CHECK FAIL LIGHT WILL  
ILLUMINATE AND THE OLD PROGRAM  
DISPLAY WILL REMAIN.

.Y .N

COMMAND CHECK  
FAIL ALARM

OBSERVE CHECK FAIL  
LIGHT ON

OBSERVE:

CHECK FAIL LIGHT ON (LEB)  
PGNS LIGHT ON (LEB)  
COMP FAIL LIGHT ON (MDC)

#260

RESET CHECK  
FAIL ALARM

PRESS ALARM RESET TO  
LIGHT ON

GO TO BACKUP PROCEDURES AND  
SELECT A PROGRAM WHICH IS ALLOWED.

#270

HOLD FOR NEW  
PROGRAM  
SELECTION

CONSULT BACKUP  
PROCEDURES

GO TO PROGRAM  
SELECTED

KEY IN PROGRAM  
SELECTION AS DESIRED  
V37E --E

#280

EXIT P--

EXIT P--



.....  
.....  
.....  
.....  
.....  
.....

-----  
GO TO AGC IDLING  
PROGRAM (P 00)  
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.....  
.....  
.....  
.....  
.....  
.....

EXIT P52

-----  
DESIGNATE THESE  
STARS AS # 1 AND # 2  
-----

.....  
.....  
.....

-----  
STORE STAR CODES  
# 1 AND # 2  
-----

.....  
.....  
.....

-----  
OBTAIN THE PREFERRED  
IMU INERTIAL ORIEN-  
TATION FROM STORAGE  
(REFSMAT) DEFINED  
AS FOLLOWS WHERE ALL  
DIRECTIONS REFER TO  
THE LAUNCH PAD AT  
TIME OF LAUNCH T :  
O

X = DOWN RANGE IN  
-SM PLANE OF LAUNCH  
TRAJECTORY

Y = COMPLETES ORTH-  
-SM OGONAL TRIAD  
(SOUTHERLY)

Z = DOWN ALONG THE  
-SM LOCAL VERTICAL  
-----

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.....  
.....  
.....  
.....  
.....

.....  
.....  
.....  
.....  
.....  
.....

-----  
MONITOR DSKY:  
OBSERVE TERMINA-  
TION OF P52 AND  
DISPLAY OF P00  
-----

.....  
.....  
.....  
.....  
.....  
.....

EXIT P52

P 52

#350

#360

#370

#380

#390

P 52

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 .  
 .  
 .  
 .  
 -----  
 SELECT THIS FINAL  
 IMU INERTIAL ORIEN-  
 TATION FOR USE BY  
 THE COARSE ALIGNMENT  
 ROUTINE (R25) AND  
 THE FINE ALIGNMENT  
 ROUTINE (R04).  
 -----  
 .  
 .  
 .

#400

-----  
 DO COARSE ALIGNMENT  
 ROUTINE (R25)  
 -----  
 .  
 .  
 .

-----  
 DO COARSE ALIGNMENT  
 ROUTINE (R25)  
 -----  
 .  
 .  
 .

\* IV PERFORM COARSE ALIGNMENT ROUTINE (R25)

#410

-----  
 DO FINE ALIGN-  
 MENT ROUTINE (R 4)  
 -----  
 .  
 .  
 .

-----  
 DO FINE ALIGN-  
 MENT ROUTINE (R 4)  
 -----  
 .  
 .  
 .

\* V PERFORM FINE ALIGNMENT ROUTINE (R04)

#420

-----  
 TERMINATE P 52 AND  
 GO IDLING PROGRAM  
 (P 00)  
 -----  
 .  
 .  
 .

-----  
 OBSERVE TERMINATION  
 OF P 52 AND DISPLAY  
 OF P 00  
 -----  
 .  
 .  
 .

\* VI CHECK AGC DISPLAYS PROGRAM 00

#430

SCS-G+N  
MONITOR  
PRESENT

ISS-FINE  
ALIGN MODE  
PRESENT

EXIT P 52

EXIT P 52

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

INFLIGHT ALIGNMENT - CSM/IMU ALIGN PROGRAM (P 53)

REV 9

6/20/66

PURPOSE: (1) TO ALIGN THE IMU AND THE CSM TO DESIRED INERTIAL ORIENTATIONS SPECIFIED BY A PREVIOUS PROGRAM.

ASSUMPTIONS: (1) THE CSM AND THE SIVB HAVE BEEN SEPARATED.

(2) THE IMU IS STABILIZED AT AN INERTIAL ORIENTATION (A)\* KNOWN BY THE AGC. THE IMU MAY REQUIRE A LARGE OR SMALL ORIENTATION CHANGE TO THE FINAL ORIENTATION, REQUIRING EITHER COARSE AND FINE ALIGNMENT OR ONLY FINE ALIGNMENT RESPECTIVELY.

(3) A G+N PROGRAM SHOULD HAVE BEEN PREVIOUSLY SELECTED WHICH HAS SPECIFIED AND STORED IN THE AGC:

(A) DESIRED FINAL IMU INERTIAL ORIENTATION (D)\*.

(B) DESIRED FINAL VEHICLE INERTIAL ATTITUDE (3)\*.

(4) AN INTERIM VEHICLE ATTITUDE (2)\* MAY BE NECESSARY BETWEEN THE INITIAL (1)\* AND FINAL (3)\* ATTITUDES TO ALLOW STAR SIGHTINGS TO BE MADE FOR THE FINAL IMU ALIGNMENT.

(5) AN INTERIM IMU ORIENTATION (B)\* MAY BE NECESSARY BETWEEN THE INITIAL (A)\* AND FINAL (C)/(D)\* ORIENTATIONS IF A COMBINATION OF IMU ORIENTATION AND VEHICLE ATTITUDE WOULD RESULT IN GIMBAL LOCK.

(6) STAR SIGHTINGS MUST BE TAKEN WHEN THE IMU HAS BEEN COARSE ALIGNED TO ORIENTATION (C)\* WHICH IS SLIGHTLY IN ERROR FROM (D)\* DUE TO THE INACCURACIES OF THE COARSE ALIGNMENT PROCEDURE. THESE SIGHTINGS WILL BE USED TO FINE ALIGN THE IMU TO FINAL ORIENTATION (D)\*.

(7) THIS PROGRAM ALONE IS NOT SATISFACTORY TO REALIGN THE IMU TO A DESIRED INERTIAL ORIENTATION WHEN THE IMU HAS DEVIATED FROM THAT ORIENTATION DUE TO DRIFT ERRORS. THERE ARE TWO WAYS TO ACCOMPLISH THIS.

(A) SELECT AND COMPLETE THE APPROPRIATE PRETHRUSTING MODE WHICH DEFINES THE DESIRED IMU INERTIAL ORIENTATION, THEN SELECT THIS PROGRAM (P53). THE RESULT WILL BE THE IMU REALIGNED TO THE DESIRED ORIENTATION AS WELL AS THE VEHICLE ALIGNED TO THE ATTITUDE SPECIFIED IN THE PRETHRUSTING MODE. IF THE REALIGNMENT INVOLVED GIMBAL ANGLE CHANGES LARGER THAN THE COARSE ALIGNMENT CRITERIA, COARSE ALIGNMENT WILL AUTOMATICALLY BE DONE, AND THE ORIGINAL PLATFORM ERROR WILL NOT BE DISPLAYED. IF A DISPLAY OF PLATFORM DRIFT IS DESIRED SEE (B) BELOW.

(B) SELECT AND COMPLETE THE INFLIGHT ALIGNMENT-IMU REALIGN PROGRAM (P54). THE RESULT WILL BE THE IMU REALIGNED TO THE PREFERRED IMU INERTIAL ORIENTATION ALREADY "KNOWN" BY THE AGC (REFSMAT) AND A RANDOM VEHICLE ATTITUDE WHICH RESULTS FROM CREW MANEUVERING

(8) THE PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY.

\* REFER TO FIGURE 4-3 R-507

| PRG<br>CONT | AGC | GROUND | CREW | CHECKLIST | TIME | TOTAL<br>TIME |
|-------------|-----|--------|------|-----------|------|---------------|
|-------------|-----|--------|------|-----------|------|---------------|

\* I. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT MDC:

PANEL 8

- 1. DIRECT RCS - OFF #10
- 2. LIMIT CYCLE - ON
- 3. ATTITUDE DEADBAND - MAX
- 4. .05G ENTRY - OFF
- 5. LOCAL VERTICAL - OFF
- 6. DELTA V - OFF
- 7. G+N/SCS - G+N #20
- 8. ATTITUDE/MONITOR/ENTRY-MONITOR
- 9. A&C ROLL CHANNEL - ON
- 10. B&D ROLL CHANNEL - ON
- 11. PITCH CHANNEL - ON
- 12. YAW CHANNEL - ON #30
- 13. ROLL RATE GYRO - NORMAL
- 14. PITCH RATE GYRO - NORMAL
- 15. YAW RATE GYRO - NORMAL

PANEL 25

- 1. FDAI LTG - AC1 OR AC2 #40
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED
- 5. GROUP 2-AC2 - CLOSED #50
- 6. GROUP 1-MNA - CLOSED
- 7. GROUP 1-MNB - CLOSED



|                                                    |      |
|----------------------------------------------------|------|
| 8. GROUP 2-MNA - CLOSED                            |      |
| 9. GROUP 2-MNB - CLOSED                            |      |
| 10. DIRECT CONTROL-MNA - CLOSED                    | #60  |
| 11. DIRECT CONTROL-MNB - CLOSED                    |      |
| 12. A6C ROLL-MNA - CLOSED                          |      |
| 13. A6C ROLL-MNB - CLOSED                          |      |
| 14. B6D ROLL-MNA - CLOSED                          |      |
| 15. B6D ROLL-MNB - CLOSED                          | #70  |
| 16. PITCH-MNA - CLOSED                             |      |
| 17. PITCH-MNB - CLOSED                             |      |
| 18. YAW-MNA - CLOSED                               |      |
| 19. YAW-MNB - CLOSED                               | #80  |
| 20. G6N SYNC - OFF                                 |      |
| 21. EVENT TIMER MNA - CLOSED                       |      |
| 22. EVENT TIMER MNB - CLOSED                       |      |
| 23. GIMBAL MOTOR CONTROL PITCH 1<br>BAT A - CLOSED |      |
| 24. GIMBAL MOTOR CONTROL PITCH 2<br>BAT B - CLOSED | #90  |
| 25. GIMBAL MOTOR CONTROL YAW 1<br>BAT A - CLOSED   |      |
| 26. GIMBAL MOTOR CONTROL YAW 2<br>BAT B - CLOSED   |      |
| MISCELLANEOUS                                      | #100 |
| 1. TRANSLATION CONTROLS - LOCKED                   |      |
| 2. ROTATION CONTROLS UNPINNED                      |      |
| PANEL 6                                            |      |
| 1. ATTITUDE SET - OFF                              | #110 |

PANEL 7

- 1. NORMAL/OFF/DIRECT ON - OFF

PANEL 2

#120

- 1. FDAI SELF TEST - OFF
- 2. FDAI BRIGHTNESS - SET
- 3. FCSM - AUTO/OVERRIDE - OVERRIDE
- 4. FCSM - ON/OFF/RESET - OFF

#130

PANEL 24

- 1. SCS POWER - AC1 OR AC2
- 2. RATE GYRO POWER - AC1 OR AC2
- 3. BMAG POWER - AC1 OR AC2
- 4. ROTATION CONTROL POWER - AC1 OR AC2
- 5. TVC 1 POWER - OFF
- 6. TVC 2 POWER - OFF

#140

PANEL 3

#150

- 1. PITCH GIMBAL MOTOR 1 - OFF
- 2. PITCH GIMBAL MOTOR 2 - OFF
- 3. YAW GIMBAL MOTOR 1 - OFF
- 4. YAW GIMBAL MOTOR 2 - OFF
- 5. INJECT PREVALVE A - OFF
- 6. INJECT PREVALVE B - OFF

#160

PANEL 14

- 1. UPTL - BLOCK

2. DSKY BRIGHTNESS - SET #170

PANEL 22

1. IMU HTR-MNA - CLOSED  
 2. IMU HTR-MNB - CLOSED  
 3. IMU-MNA - CLOSED #180

4. IMU-MNB - CLOSED  
 5. COMPUTER-MNA - CLOSED  
 6. COMPUTER-MNB - CLOSED  
 7. OPTICS-MNA - CLOSED  
 8. OPTICS-MNB - CLOSED #190

9. AC POWER-AC1 - CLOSED  
 10. AC POWER-AC2 - CLOSED  
 11. G6N-AC POWER - AC1 OR AC2

\*II. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT NAV STATION #200

1. FLOODLIGHT CONTROL PRIMARY - SET  
 2. FLOODLIGHT CONTROL SECONDARY - SET  
 3. IMU TRANSFER - COMPUTER  
 4. OPTICS SLAVE TELESCOPE - STAR LOS #210  
 5. OPTICS MODE - ZERO OPTICS  
 6. OPTICS HOLD - OFF

7. OPTICS CONTROLLER SPEED - HI  
 8. OPTICS CONTROLLER MODE - DIRECT  
 9. PANEL BRIGHTNESS CONTROL - SET #220  
 10. IMU TEMP. MODE - AUTO OVERRIDE  
 11. ATTITUDE IMPULSE ENABLE - OFF





```

.
.
.

DO ATTITUDE CONTROL
MODE CHECK ROUTINE
(R 1)

```

```

DO ATTITUDE CONTROL
MODE CHECK ROUTINE
(R 1)

```

\* IV. PERFORM ATTITUDE CONTROL MODE  
CHECK ROUTINE (R1)

#340

```

.
.

GET FINAL DESIRED
VEHICLE ATTITUDE (3)
FROM STORAGE.

```

#350

```

.
.

CAN OPTICS ACQUIRE
2 NAVIGATION STARS
FROM THIS FINAL
VEHICLE ATTITUDE (3)

```

```

. N . Y .
.
.
.

```

#360

```

SET INTERIM
VEHICLE FLAG

```

#370

```

CALCULATE INTERIM
VEHICLE ATTITUDE
(2) TO FULFILL
THE FOLLOWING
CONSTRAINTS:

```

```

(1) UTILIZE MIN-
IMUM VEHICLE MANEU-
VER (HIGHEST
PRIORITY TO ROLL
MANEUVER ONLY)
FROM FINAL VEHICLE
ATTITUDE (3).

```

#380

```

(2) ENABLE
OPTICS ACQUISITION
OF TWO NAVIGATION
STARS.

```

267

#390

(3) NO GIMBAL  
LOCK OCCURS WHEN  
IMU IS AT ITS  
FINAL INERTIAL  
ORIENTATION (D)  
(ORIGINATED BY  
PREVIOUS PROGRAM)

#400

-----  
DESIGNATE THESE  
STARS AS # 1 AND # 2  
-----

#410

-----  
STORE STAR CODES  
FOR # 1 AND # 2 AND  
THE INTERIM VEHICLE  
ATTITUDE (2) IF  
CALCULATED  
-----

#420

-----  
HEAD PRESENT VEHICLE  
ATTITUDE (1) FROM  
CDU'S (ASSUMES AGC  
ATTITUDE CONTROL)  
-----

#430

-----  
CALCULATE IF THE  
PRESENT VEHICLE  
ATTITUDE (1) AND  
FINAL IMU INERTIAL  
ORIENTATION (D) WILL  
RESULT IN GIMBAL  
LOCK.  
-----

#440

```

 .Y .N
 . .
 . .

 . IS INTERIM
 . VEHICLE FLAG
 . SET?

 .Y .N
 . .
 . .
 . .
 . .
 . .
 . .
 . .
 . .
 . .
 . .

```





00052-INTERIM  
IMU ORIENTA-  
TION AND  
FINAL  
VEHICLE  
ATTITUDE  
REQUIRED.

P 53

#500

DISPLAY ON  
DSKY:  
V01 N25  
R1-00054  
00054-INTERIM  
IMU ORIENTA-  
TION AND  
INTERIM  
VEHICLE  
ATTITUDE  
REQUIRED.

#510

CALCULATE AN  
INTERIM IMU  
INERTIAL  
ORIENTATION(B)  
WHICH DOES NOT  
CAUSE GIMBAL  
LOCK WHEN VEH-  
ICLE IS AT  
ITS INTERIM  
ATTITUDE (2)

#530

CALCULATE AN  
INTERIM IMU  
INERTIAL  
ORIENTATION(B)  
WHICH DOES NOT  
CAUSE GIMBAL  
LOCK WHEN VEH-  
ICLE IS AT  
ITS FINAL  
ATTITUDE (3)

#540

#550

P 53



```

SELECT INTERIM
VEHICLE ATTITUDE (2) FOR
ATTITUDE
MANEUVER
ROUTINE (R21).

```

#610

```

SELECT FINAL
VEHICLE ATTITUDE
(3) FOR ATTITUDE
MANEUVER ROUTINE
(R21).

```

#620

```

DO ATTITUDE MANEUVER
ROUTINE (R 21)

```

```

DO ATTITUDE MANEUVER
ROUTINE (R 21)

```

\* VIII. PERFORM ATTITUDE MANEUVER ROUTINE (R21)

#630

```

IS INTERIM PLATFORM
FLAG SET?

```

```

Y. N.

```

```

RESET INTERIM
PLATFORM FLAG

```

```

SELECT FINAL IMU
ORIENTATION (D)
FOR USE BY COARSE
ALIGNMENT ROUTINE

```

```

DID PREVIOUS DSKY
DISPLAY INDICATE
THAT AN INTERIM IMJ
ORIENTATION WAS
REQUIRED.

```

```

Y. N.

```

\* IX.

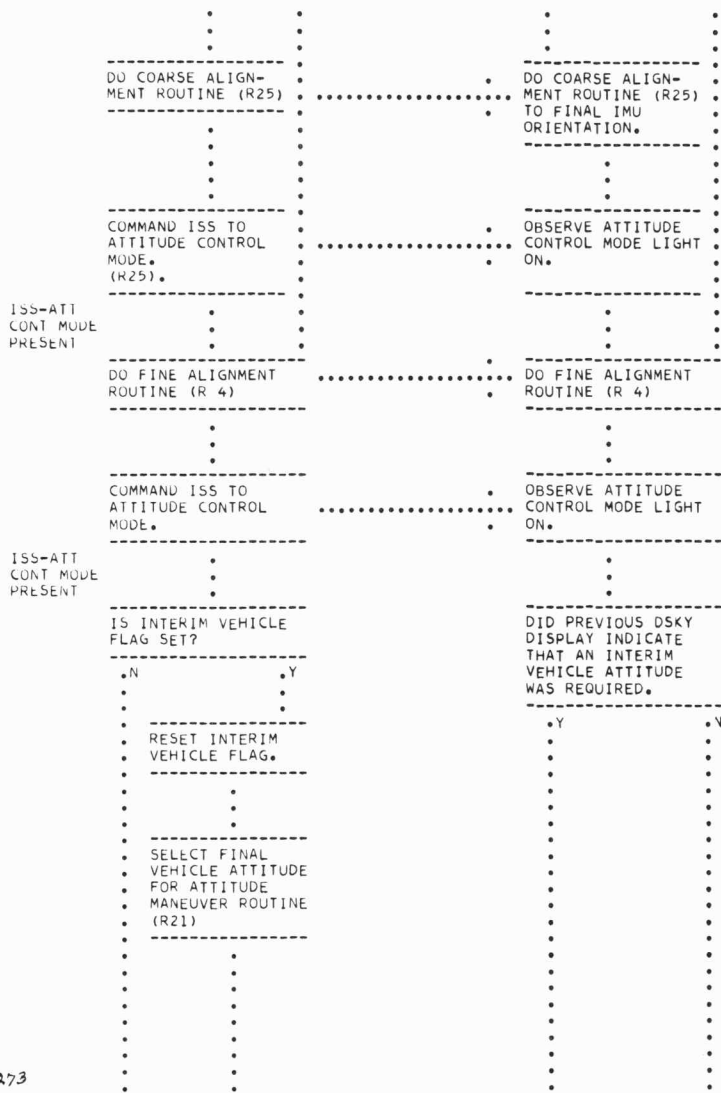
1. IF DSKY DISPLAY OF V (ABOVE) INDICATED THAT AN INTERIM IMU ORIENTATION WAS REQUIRED. (R1-00052 OR 00054):

#640

A. PERFORM COARSE ALIGN ROUTINE (R25) TO FINAL IMU ORIENTATION.

B. CHECK ATTITUDE CONTROL MODE LIGHT ON.

#650



#660

#670

#680

#690

#700

#710

\* 2. IF DSKY DISPLAY OF V (ABOVE) INDICATED THAT A FINAL IMU ORIENTATION WAS REQUIRED (R1-00051 OR 00053):

A. PERFORM FINE ALIGNMENT ROUTINE (R4).

B. CHECK ATTITUDE CONTROL MODE LIGHT ON.

\* 3. IF DSKY DISPLAY OF V (ABOVE) INDICATED THAT AN INTERIM VEHICLE ATTITUDE WAS REQUIRED (R1-00053 OR 00054): PERFORM ATTITUDE MANEUVER ROUTINE (R21) TO FINAL VEHICLE ATTITUDE.

\* 4. IF DSKY DISPLAY OF V ABOVE INDICATED THAT A FINAL VEHICLE ATTITUDE WAS REQUIRED (R1-00051 OR 00052); GO TO X BELOW.

```

 .
 .
 .

DO ATTITUDE MANEUVER ROUTINE (R21)

 .
 .
 .

WAS PREVIOUS PROGRAM P22?

.N .Y
 .
 .

GO TO P22

 .
 .
 .
EXIT P53

```

#720

#730

#740

```

.....
HOLD
.....
DEPENDING UPON THE ORIGINAL PROGRAM CALLING P53 FLASH VERB-NOUN TO REQUEST PLEASE PERFORM SELECTION OF ---- PROGRAM (P--).
V50 N07
R1-000--

MONITOR DSKY:
OBSERVE FLASHING VERB-NOUN TO REQUEST SELECTION OF PROGRAM APPROPRIATE TO ORIGINAL PROGRAM CALLING FOR INFLIGHT ALIGNMENT

```

\* X

- 1. IF P53 WAS CALLED BY P22 CHECK AGC RETURNS TO P22 #750
- OR 2. CHECK AGC FLASHES VERB-NOUN TO REQUEST SELECTION OF PROGRAM ---

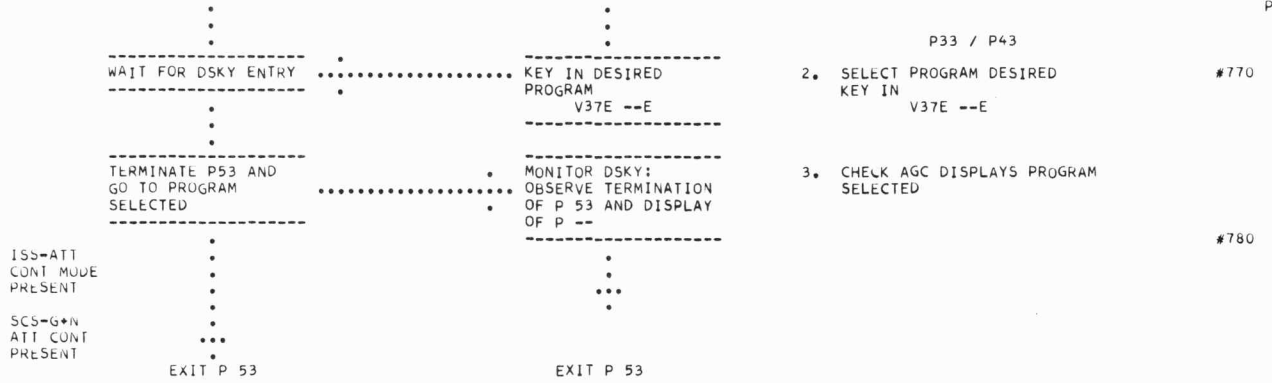
V50 N07  
R1-000--

THE PROGRAM REQUESTED WILL BE BASED UPON THE PROGRAM ORIGINALLY CALLING FOR IN-FLIGHT ALIGNMENT AS FOLLOWS. #760

ORIG / REQUESTED  
-----

P31 / P41  
P32 / P42

RELATIONSHIP OF ORIGINAL PROGRAM TO REQUESTED PROGRAM IS AS FOLLOWS:  
P31/P41  
P32/P42  
P33/P43



APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

INFLIGHT ALIGNMENT - IMU REALIGNMENT PROGRAM (P54)      REV 5      6-28-66

PURPOSE: (1) TO REALIGN THE IMU TO A DESIRED INERTIAL ORIENTATION SPECIFIED BY A PREVIOUS PROGRAM, WHEN THE IMU HAS DEVIATED FROM THE ORIENTATION ONLY DUE TO DRIFT ERRORS.

- ASSUMPTIONS:
- (1) THE CSM AND THE SIVB HAVE BEEN SEPARATED.
  - (2) THE "PRESENT" IMU INERTIAL ORIENTATION IS STORED IN THE AGC. THE "PRESENT" ORIENTATION IS THAT TO WHICH THE IMU WAS LAST ALIGNED.
  - (3) THIS PROGRAM MAKES NO PROVISION FOR ATTITUDE MANEUVERS, EITHER TO ACQUIRE NAVIGATIONAL STARS OR TO RETURN THE VEHICLE TO A SPECIFIC ATTITUDE. ALL NECESSARY MANEUVERS ASSOCIATED WITH THE USE OF THIS PROGRAM THEREFORE MUST BE DONE MANUALLY.
  - (4) THE PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY.

| PRG<br>CNT | AGC | GROUND | CREW | CHECKLIST | TIME | TOTAL<br>TIME |
|------------|-----|--------|------|-----------|------|---------------|
|------------|-----|--------|------|-----------|------|---------------|

\* I. CONFIRM OR SELECT FOLLOWING SWITCH POSITIONS AT MDC:

PANEL B

- |                                        |     |
|----------------------------------------|-----|
| 1. DIRECT RCS - OFF                    |     |
| 2. LIMIT CYCLE - ON                    |     |
| 3. ATTITUDE DEADBAND - MIN             | *10 |
| 4. .05G ENTRY - OFF                    |     |
| 5. LOCAL VERTICAL - OFF                |     |
| 6. DELTA V - OFF                       |     |
| 7. G+N/SCS - G+N                       |     |
| 8. ATTITUDE/MONITOR/ENTRY<br>-ATTITUDE | *20 |
| 9. A+C ROLL CHANNEL - UN               |     |
| 10. B+D ROLL CHANNEL - ON              |     |
| 11. PITCH CHANNEL - ON                 |     |
| 12. YAW CHANNEL - ON                   | *30 |
| 13. ROLL RATE GYRO - NORMAL            |     |

P 54

- 14. PITCH RATE GYRO - NORMAL
- 15. YAW RATE GYRO - NORMAL

PANEL 25

- 1. FDAI LTG - AC1 OR AC2
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED
- 5. GROUP 2-AC2 - CLOSED
- 6. GROUP 1-MNA - CLOSED
- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED
- 9. GROUP 2-MNB - CLOSED

#40

- 10. DIRECT CONTROL-MNA - CLOSED
- 11. DIRECT CONTROL-MNB - CLOSED
- 12. A+C ROLL-MNA - CLOSED
- 13. A+C ROLL-MNB - CLOSED
- 14. B+D ROLL-MNA - CLOSED
- 15. B+D ROLL-MNB - CLOSED

#50

#60

- 16. PITCH-MNA - CLOSED
- 17. PITCH-MNB - CLOSED
- 18. YAW-MNA - CLOSED
- 19. YAW-MNB - CLOSED

#70

- 20. G+N SYNC - OFF
- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED

#80

- 23. GIMBAL MOTOR CONTROL PITCH 1  
BAT A - CLOSED



- 24. GIMBAL MOTOR CONTROL PITCH 2  
BAT B - CLOSED #90
- 25. GIMBAL MOTOR CONTROL YAW 1  
BAT A - CLOSED
- 26. GIMBAL MOTOR CONTROL YAW 2  
BAT B - CLOSED

MISCELLANEOUS #100

- 1. TRANSLATION CONTROLS - LOCKED
- 2. ROTATION CONTROLS UNPINNED

PANEL 6

- 1. ATTITUDE SET - OFF #110

PANEL 7

- 1. NORMAL/OFF/DIRECT ON - OFF

PANEL 2

- 1. FDAI SELF TEST - OFF #120
- 2. FDAI BRIGHTNESS - SET
- 3. FCSM - AUTO/OVERRIDE  
-OVERRIDE
- 4. FCSM - ON/OFF/RESET - OFF #130

PANEL 24

- 1. SCS POWER - AC1 OR AC2
- 2. RATE GYRO POWER - AC1 OR AC2
- 3. BMAG POWER - AC1 OR AC2
- 4. ROTATION CONTROL POWER  
-AC1 OR AC2 #140
- 5. TVC 1 POWER - OFF

6. TVC 2 POWER - OFF

PANEL 3

#150

1. PITCH GIMBAL MOTOR 1 - OFF
2. PITCH GIMBAL MOTOR 2 - OFF
3. YAW GIMBAL MOTOR 1 - OFF
4. YAW GIMBAL MOTOR 2 - OFF
5. INJECT PREVALVE A - OFF
6. INJECT PREVALVE B - OFF

#160

PANEL 14

1. UPTL - BLOCK
2. DSKY BRIGHTNESS - SET

#170

PANEL 22

1. IMU HTR-MNA - CLOSED
2. IMU HTR-MNB - CLOSED
3. IMU-MNA - CLOSED
4. IMU-MNB - CLOSED
5. COMPUTER-MNA - CLOSED
6. COMPUTER-MNB - CLOSED
7. OPTICS-MNA - CLOSED
8. OPTICS-MNB - CLOSED
9. AC POWER-AC1 - CLOSED
10. AC POWER-AC2 - CLOSED
11. G+N-AC POWER - AC1 OR AC2

#180

#190

\* 11. CONFIRM OR SELECT FOLLOWING SWITCH #200

POSITIONS AT NAV STATION.

- 1. FLOODLIGHT CONTROL PRIMARY -SET
- 2. FLOODLIGHT CONTROL SECONDARY - SET
- 3. IMU TRANSFER - COMPUTER #210
- 4. OPTICS SLAVE TELESCOPE - STAR LOS
- 5. OPTICS MODE - ZERO OPTICS
- 6. OPTICS HOLD - OFF
- 7. OPTICS CONTROLLER SPEED - HI #220
- 8. OPTICS CONTROLLER MODE -DIRECT
- 9. PANEL BRIGHTNESS CONTROL -SET
- 10. IMU TEMP. MODE - AUTO OVERRIDE
- 11. ATTITUDE IMPULSE ENABLE - OFF #230
- 12. CONDITION LAMPS - ON
- 13. AGC MODE - ON
- 14. AGC BRIGHTNESS CONTROL - SET

- \* III. IF A RETURN TO THE PRESENT DESIRED S/C ATTITUDE IS REQUIRED RECORD THE PRESENT ICPU ANGLES FOR USE DURING ANY MANUAL ATTITUDE MANEUVERS. #240
- \* IV. SELECT IMU RE-ALIGNMENT PROGRAM (P54)
  - 1. ENTER IMU RE-ALIGNMENT PROGRAM (P54) V37 E 54E #250

NOTE:

POSSIBLE CHECK FAIL. IF PRESENT PROGRAM DOES NOT ALLOW SELECTION OF P54 THE CHECK FAIL LIGHT WILL

SCS-G+IN  
ATT CONT  
MODE PRESENT

ISS-FINE  
ALIGN MODE  
PRESENT

CREW PROG  
SELECTION

-----  
IS PROGRAM ALLOWED?  
-----

.Y .N

.....

-----  
COMMAND CHECK  
FAIL ALARM  
-----

.....

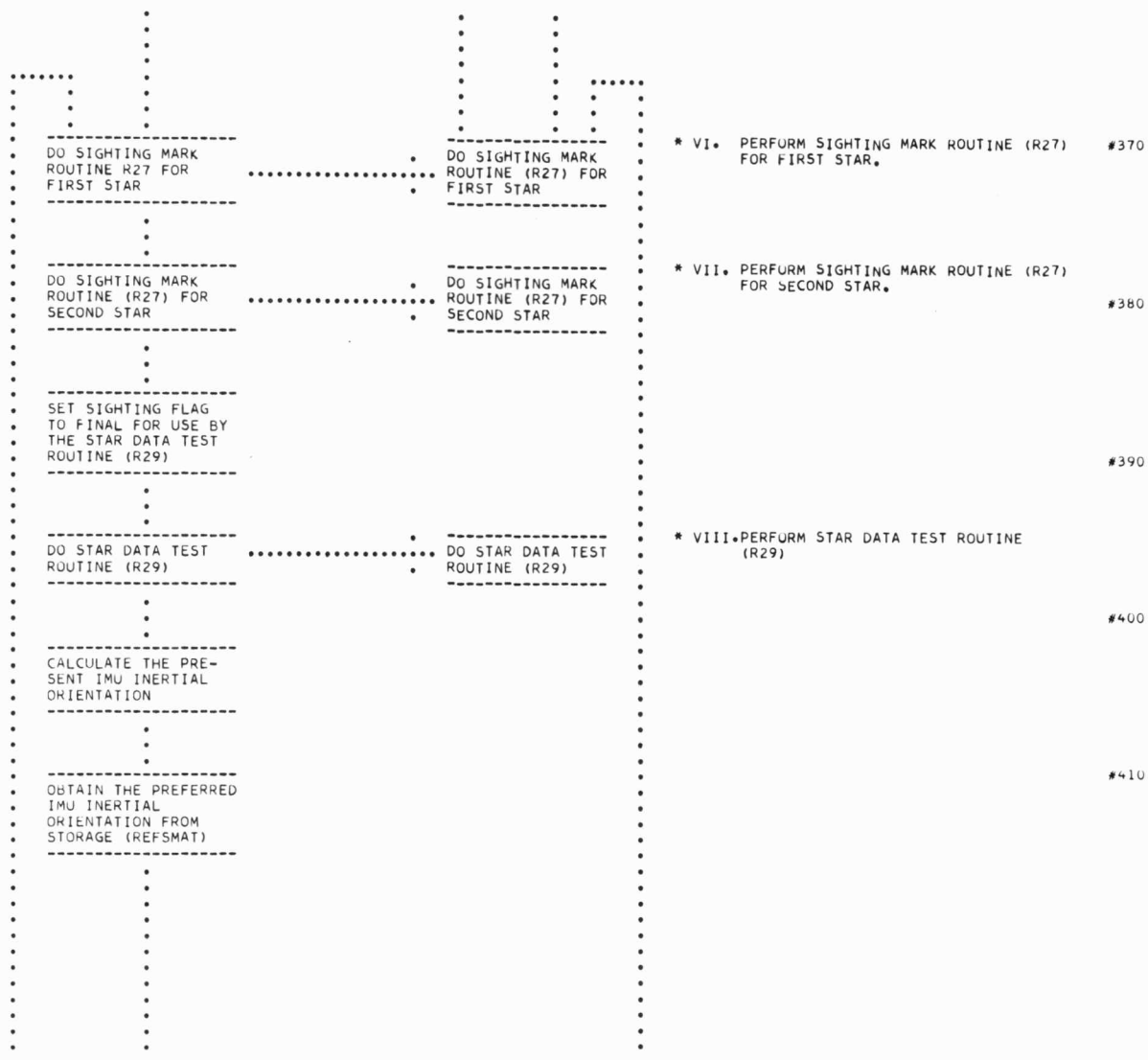
-----  
KEY IN IMU REALIGN-  
MENT PROGRAM (P54)  
V37E 54E  
-----

-----  
OBSERVE CHECK FAIL  
LIGHT ON  
-----

.....







\* VI. PERFORM SIGHTING MARK ROUTINE (R27) FOR FIRST STAR. #370

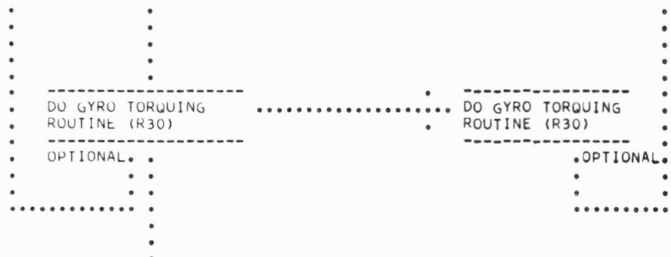
\* VII. PERFORM SIGHTING MARK ROUTINE (R27) FOR SECOND STAR. #380

#390

\* VIII. PERFORM STAR DATA TEST ROUTINE (R29)

#400

#410



\* IX. PERFORM GYRO TORQUING ROUTINE (R30)  
RETURN TO VI ABOVE FOR FINE ALIGN  
CHECK IF DESIRED. #420



\* X. CHECK AGC DISPLAYS PROGRAM 00 #430

SCS-G+N  
ATTITUDE  
PRESENT

#440

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

ENTRY - MANEUVER TO CM/SM SEPARATION ATTITUDE PROGRAM (P61)

REV 9

6-20-66

PURPOSE: (1) TO ORIENT THE CSM TO THE CORRECT ATTITUDE FOR CM/SM SEPARATION.

ASSUMPTIONS: (1) THE PROGRAM IS ENTERED WITH ADEQUATE FREE FALL TIME TO COMPLETE THE MANEUVERS FROM A WORST CASE STARTING ATTITUDE.  
 (2) THE PROGRAM IS NORMALLY SELECTED BY THE ASTRONAUT BY DSKY ENTRY FOLLOWING THRUST-RETURN TO EARTH PROGRAM (P 42).

| PROG<br>CUNT | AGC | GROUND | CREW | CHECKLIST | TIME | TOTAL<br>TIME |
|--------------|-----|--------|------|-----------|------|---------------|
|--------------|-----|--------|------|-----------|------|---------------|

\*I. CONFIRM OR SELECT FOLLOWING POSITIONS  
 AT MDC  
 NOTE: FOR ABORT CASE GO TO STEP III

PANEL 8

- |                                    |     |
|------------------------------------|-----|
| 1. DIRECT RCS - OFF                | #10 |
| 2. LIMIT CYCLE - ON                |     |
| 3. ATTITUDE DEADBAND - MAX         |     |
| 4. .05G ENTRY - OFF                |     |
| 5. LOCAL VERTICAL - OFF            |     |
| 6. DELTA V - OFF                   | #20 |
| 7. G+N/SCS - G+N                   |     |
| 8. ATTITUDE/MONITOR/ENTRY-ATTITUDE |     |
| 9. A+C ROLL CHANNEL - OFF          |     |
| 10. B+D ROLL CHANNEL - ON          |     |
| 11. PITCH CHANNEL - ON             | #30 |
| 12. YAW CHANNEL - ON               |     |
| 13. ROLL RATE GYRO - NORMAL        |     |
| 14. PITCH RATE GYRO - NORMAL       |     |



15. YAW RATE GYRO - NURMAL

PANEL 25

- 1. FDA1 LTG - AC1
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED
- 5. GROUP 2-AC2 - CLOSED
- 6. GROUP 1-MNA - CLOSED
- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED
- 9. GROUP 2-MNB - CLOSED
- 10. DIRECT CONTROL-MNA - CLOSED
- 11. DIRECT CONTROL-MNB - CLOSED
- 12. A6C ROLL-MNA - CLOSED
- 13. A6C ROLL-MNB - CLOSED
- 14. B6D ROLL-MNA - CLOSED
- 15. B6D ROLL-MNB - CLOSED
- 16. PITCH-MNA - CLOSED
- 17. PITCH-MNB - CLOSED
- 18. YAW-MNA - CLOSED
- 19. YAW-MNB - CLOSED
- 20. G6N SYNC - OFF
- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED
- 23. GIMBAL MOTOR CONTROL PITCH 1  
BAT A - OPEN
- 24. GIMBAL MOTOR CONTROL PITCH 2  
BAT B - CLOSED

#40

#50

#60

#70

#80

#90

- 25. GIMBAL MOTOR CONTROL YAW 1  
BAT A - OPEN
- 26. GIMBAL MOTOR CONTROL YAW 2  
BAT B - CLOSED

MISCELLANEOUS

#100

- 1. TRANSLATION CONTROLS - UNLOCKED
- 2. ROTATION CONTROLS - UNPINNED

PANEL 6

#110

- 1. ATTITUDE SET - OFF

PANEL 7

- 1. NORMAL/OFF/DIRECT ON - OFF

PANEL 2

#120

- 1. FDA1 SELF TEST - OFF
- 2. FDA1 BRIGHTNESS - SET
- 3. FCSM - AUTO/OVERRIDE - AUTO
- 4. FCSM - ON/OFF/RESET - OFF

#130

PANEL 24

- 1. SCS POWER - AC1
- 2. RATE GYRO POWER - AC1
- 3. BMAG POWER - AC2
- 4. ROTATION CONTROL POWER - AC2
- 5. TVC 1 POWER - OFF
- 6. TVC 2 POWER - OFF
- 7. MESL PYRO - SAFE

#140

8. MESC LOGIC - OFF #150

PANEL 3

- 1. PITCH GIMBAL MOTOR 1 - OFF
- 2. PITCH GIMBAL MOTOR 2 - OFF
- 3. YAW GIMBAL MOTOR 1 - OFF #160
- 4. YAW GIMBAL MOTOR 2 - OFF
- 5. INJECT PREVALVE A - OFF
- 6. INJECT PREVALVE B - OFF

PANEL 14

- 1. UPTL - BLOCK #170
- 2. DSKY BRIGHTNESS - SET

PANEL 22

- 1. IMU HTR-MNA - CLOSED #180
- 2. IMU HTR-MNB - CLOSED
- 3. IMU-MNA - CLOSED
- 4. IMU-MNB - CLOSED
- 5. COMPUTER-MNA - CLOSED
- 6. COMPUTER-MNB - CLOSED #190
- 7. OPTICS-MNA - OPEN
- 8. OPTICS-MNB - OPEN
- 9. AC POWER-AC1 - CLOSED
- 10. AC POWER - AC2 - OPEN
- 11. G+N - AC POWER - AC1 #200
- 12. MESC ARM A - OPEN
- 13. MESC ARM B - OPEN

- 14. MESC LOGIC A - OPEN
- 15. MESC LOGIC B - OPEN

PANEL 11

#210

- 1. CAUT/WARN MODE - CSM

PANEL 16

- 1. C/M-S/M SEP - OFF

#220

ISS-ATT  
CONT MODE  
PRESENT

SCS-G+N  
ATTITUDE  
PRESENT

•AGC PROG  
•SELECTION

•CREW PROG  
•SELECTION

-----  
IS PROGRAM ALLOWED

Y. . . . . N

-----

• COMMAND CHECK  
• FAIL ALARM

-----

• RESET CHECK  
• FAIL ALARM

-----

• HOLD FOR NEW  
• PROGRAM SELECTION

-----

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-----  
KEY IN ENTRY-MANEU-  
VER TO CM/SM SEPARA-  
TION ATTITUDE PRO-  
GRAM (P61)  
V37E 61E

-----  
OBSERVE COMP  
FAIL LIGHT ON

-----

-----  
PRESS ALARM RESET  
TO TURN OFF COMP  
FAIL LIGHT

-----

-----

-----  
CONSULT BACKUP  
PROCEDURES

-----

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\* II SELECT ENTRY MANEUVER TO CM/SM  
SEPARATION ATTITUDE PROGRAM (P61)

- 1. KEY IN PROGRAM 61  
V37E 61E

\* NOTE:

IF PRESENT PROGRAM DOES  
NOT ALLOW SELECTION OF  
P61 THE COMP FAIL LIGHT  
WILL ILLUMINATE AND THE  
OLD PROGRAM DISPLAY WILL  
REMAIN

GO TO BACKUP PROCEDURES  
AND SELECT A PROGRAM  
WHICH IS ALLOWED





GAMMA EI - FLIGHT  
PATH ANGLE. ANGLE  
BETWEEN INERTIAL  
VELOCITY AND THE  
LOCAL HORIZONTAL  
AT THE ENTRY INTER-  
FACE ALTITUDE  
(300,000 FT) IN  
DEGREES TO NEAREST  
.01 DEG.

GAMMA EI - FLIGHT PATH ANGLE.  
ANGLE BETWEEN INERTIAL VEL-  
OCITY AND THE LOCAL HORI-  
ZONTAL AT THE ENTRY INTERFACE  
ALTITUDE (300,000 FT) IN  
DEGREES TO NEAREST .01 DEG.

#370

TFF - TIME OF FREE  
FALL TO 300,000 FT.  
ABOVE FISCHER  
ELLIPSOID. IN MIN  
AND SEC TO NEAREST  
SEC. MAX DISPLAY  
IS 59 59.

TFF - TIME OF FREE FALL TO 300,000  
FT. ABOVE FISCHER ELLIPSOID  
IN MIN AND SEC TO NEAREST SEC.  
MAX DISPLAY IS 59 59.

#380

SET TFF INTO DIGITAL  
EVENT TIMER

\* 2. SET DIGITAL EVENT TIMER FOR TFF

#390

- A. SET DIGITAL EVENT TIMER START/  
STOP SWITCH AT STOP
- B. SET RESET/UP/DOWN SW AT RESET
- C. ADJUST DIGITAL EVENT TIMER MIN.  
SW TO ADVANCE TIMER TO POINT  
OF SYNCHRONIZATION
- D. ADJUST DIGITAL EVENT TIMER  
SEC. SW TO ADVANCE TIMER TO  
POINT OF SYNCHRONIZATION
- E. SET DIGITAL EVENT TIMER RESET/  
UP/DOWN SW AT DOWN
- F. SET DIGITAL EVENT TIMER START/  
STOP SWITCH TO START AT SYNC  
TIME

#400

#410

WAIT FOR KEYBOARD  
ENTRY

KEY IN PROCEED  
V 33 E

3. KEY IN PROCEED

V 33 E

4. SET LIMIT CYCLE SW TO OFF

#420

```

 .
 .
 .

DO ATT. CONT. MODE
CHECK ROUTINE (R 1)

 .
 .
 .

DO ATT. CONT. MODE
CHECK ROUTINE (R 1)

```

\* IV PERFORM ATT. CONT. MODE  
CHECK ROUTINE (R 1)

NOTE: AT START OF ROUTINE R1 THE  
TFF DISPLAY IS NO LONGER UP-  
DATED ALTHOUGH IT REMAINS IN  
R3.  
THE DISPLAY SHOULD BE IGNORED  
AND THE DET USED AS THE TFF  
REFERENCE.

#430

```

SELECT CSM ORIENTA-
TION W.R.T. EARTH
FOR CM/SM SEPARA-
TION FROM STORAGE

```

```

CALCULATE CSM INER-
TIAL ORIENTATION FOR
CM/SM SEPARATION AND
STORE FOR USE BY
ATTITUDE MANEUVER
ROUTINE (R 21)

```

#440

```

DO ATTITUDE MANEUVER
ROUTINE (R 21)

```

```

DO ATTITUDE MANEUVER
ROUTINE (R 21)

```

\* V PERFORM ATTITUDE MANEUVER ROUTINE  
(R21)

#450

```

TERMINATE PROGRAM
61 AND GO ON TO
ENTRY - CM/SM SEP-
ARATION AND PRE-
ENTRY MANEUVER
PROGRAM (P 62)

```

```

MONITOR DSKY:
OBSERVE TERMINATION
OF P 61 AND DISPLAY
OF P 62

```

\* VI CHECK AGC DISPLAYS PROGRAM 62

#460

```

ISS-ATT
CONT MODE
PRESENT
.
.
SCS-G6N
ATTITUDE
PRESENT
.
.
.

```

EXIT P 61

EXIT P 61

#470



APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

ENTRY- CM/SM SEPARATION AND PRE-ENTRY MANEUVER PROGRAM ( P62)

REV 9

6-20-66

PURPOSE: (1) TO NOTIFY CREW WHEN G+N IS PREPARED FOR CM/SM SEPARATION.

(2) TO SWITCH THE G+N SYSTEM AND SCS INTO THE CORRECT MODES FOR ENTRY AND TO ORIENT THE CSM TO THE CORRECT ATTITUDE FOR ATMOSPHERIC ENTRY.

ASSUMPTIONS: (1) THE PROGRAM IS ENTERED WITH ADEQUATE FREE FALL TIME TO ACCOMPLISH CM/SM SEPARATION AND TO COMPLETE THE MANEUVER FROM A WORST CASE STARTING ATTITUDE.

(2) THE IMU IS SATISFACTORILY ALIGNED FOR ENTRY.

(3) THE PROGRAM IS AUTOMATICALLY SELECTED BY THE ENTRY MANEUVER TO CM/SM SEPARATION ATTITUDE PROGRAM (P61) OR IT MAY BE SELECTED MANUALLY.

| PRUG<br>CONT | AGC | MESC | CREW | CHECKLIST | TIME | TOTAL<br>TIME |
|--------------|-----|------|------|-----------|------|---------------|
|--------------|-----|------|------|-----------|------|---------------|

\*I. CONFIRM OR SELECT FOLLOWING POSITIONS  
AT MDC  
NOTE: FOR ABORT CASE GO TO STEP III

PANEL 8

- |                                    |  |  |  |  |  |     |
|------------------------------------|--|--|--|--|--|-----|
| 1. DIRECT RCS - OFF                |  |  |  |  |  |     |
| 2. LIMIT CYCLE - ON                |  |  |  |  |  | *10 |
| 3. ATTITUDE DEADBAND - MAX         |  |  |  |  |  |     |
| 4. .05G ENTRY - OFF                |  |  |  |  |  |     |
| 5. LOCAL VERTICAL - OFF            |  |  |  |  |  |     |
| 6. DELTA V - OFF                   |  |  |  |  |  | *20 |
| 7. G+N/SCS - G+N                   |  |  |  |  |  |     |
| 8. ATTITUDE/MONITOR/ENTRY-ATTITUDE |  |  |  |  |  |     |
| 9. A+C ROLL CHANNEL - OFF          |  |  |  |  |  |     |
| 10. B&D ROLL CHANNEL - ON          |  |  |  |  |  |     |
| 11. PITCH CHANNEL - ON             |  |  |  |  |  | *30 |

P 62

- 12. YAW CHANNEL - ON
- 13. ROLL RATE GYRO - NORMAL
- 14. PITCH RATE GYRO - NORMAL
- 15. YAW RATE GYRO - NORMAL

PANEL 25

#40

- 1. FDAI LTG - AC1
- 2. GROUP 1-AC1 - CLOSED
- 3. GROUP 1-AC2 - CLOSED
- 4. GROUP 2-AC1 - CLOSED
- 5. GROUP 2-AC2 - CLOSED
- 6. GROUP 1-MNA - CLOSED
- 7. GROUP 1-MNB - CLOSED
- 8. GROUP 2-MNA - CLOSED
- 9. GROUP 2-MNB - CLOSED
- 10. DIRECT CONTROL-MNA - CLOSED
- 11. DIRECT CONTROL-MNB - CLOSED
- 12. A6C ROLL-MNA - CLOSED
- 13. A6C ROLL-MNB - CLOSED
- 14. B6D ROLL-MNA - CLOSED
- 15. B6D ROLL-MNB - CLOSED
- 16. PITCH-MNA - CLOSED
- 17. PITCH-MNB - CLOSED
- 18. YAW-MNA - CLOSED
- 19. YAW-MNB - CLOSED
- 20. G6N SYNC - OFF
- 21. EVENT TIMER MNA - CLOSED
- 22. EVENT TIMER MNB - CLOSED

#50

#60

#70

#80

23. GIMBAL MOTOR CONTROL PITCH 1  
BAT A - OPEN

24. GIMBAL MOTOR CONTROL PITCH 2 #90  
BAT B - CLOSED

25. GIMBAL MOTOR CONTROL YAW 1  
BAT A - OPEN

26. GIMBAL MOTOR CONTROL YAW 2  
BAT B - CLOSED

MISCELLANEOUS #100

1. TRANSLATION CONTROLS - UNLOCKED

2. ROTATION CONTROLS - UNPINNED

PANEL 6

1. ATTITUDE SET - OFF #110

PANEL 7

1. NORMAL/OFF/DIRECT ON - OFF

PANEL 2 #120

1. FDAI SELF TEST - OFF

2. FDAI BRIGHTNESS - SET

3. FCSM - AUTO/OVERRIDE - AUTO

4. FCSM - ON/OFF/RESET - OFF

#130

PANEL 24

1. SCS POWER - AC1

2. RATE GYRO POWER - AC1

3. BMAG POWER - AC2

4. ROTATION CONTROL POWER - AC2

#140

- 5. TVC 1 POWER - OFF
- 6. TVC 2 POWER - OFF
- 7. MESC PYRO - SAFE
- 8. MESC LOGIC - OFF

#150

PANEL 3

- 1. PITCH GIMBAL MOTOR 1 - OFF
- 2. PITCH GIMBAL MOTOR 2 - OFF
- 3. YAW GIMBAL MOTOR 1 - OFF
- 4. YAW GIMBAL MOTOR 2 - OFF
- 5. INJECT PREVALVE A - OFF
- 6. INJECT PREVALVE B - OFF

#160

PANEL 14

- 1. UPTL - BLOCK
- 2. DSKY BRIGHTNESS - SET

#170

PANEL 22

- 1. IMU HTR-MNA - CLOSED
- 2. IMU HTR-MNB - CLOSED
- 3. IMU-MNA - CLOSED
- 4. IMU-MNB - CLOSED
- 5. COMPUTER-MNA - CLOSED
- 6. COMPUTER-MNB - CLOSED
- 7. OPTICS-MNA - OPEN
- 8. OPTICS-MNB - OPEN
- 9. AC POWER-AC1 - CLOSED
- 10. AC POWER - AC2 - OPEN

#180

#190

- 11. G+N - AC POWER - AC1
- 12. MESC ARM A - OPEN
- 13. MESC ARM B - OPEN
- 14. MESC LOGIC A - OPEN
- 15. MESC LOGIC B - OPEN

#200

PANEL 11

#210

- 1. CAUT/WARN MODE - CSM

PANEL 16

- 1. C/M-S/M SEP - OFF

#220

ISS+ATT  
CONT MODE  
PRESENT

SCS+G+N  
ATTITUDE  
PRESENT

•AGC PROG  
•SELECTION

•

•

•

•

•CREW PROG  
•SELECTION

•

•

•

•

IS PROGRAM ALLOWED?

Y.

N.

-----

KEY IN ENTRY:  
CM/SM SEPARATION AND  
PRE-ENTRY MANEUVER  
PROGRAM (P62)  
V37E 62E

-----

\* II SELECT ENTRY CM/SM SEPARATION AND  
PRE-ENTRY MANEUVER PROGRAM (P62)

#230

- 1. KEY IN PROGRAM 62  
V37E 62E

NOTE:

POSSIBLE CHECK FAIL. IF PRESENT  
PROGRAM DOES NOT ALLOW SELECTION OF  
P62 THE COMP FAIL LIGHT WILL  
ILLUMINATE AND THE OLD PROGRAM  
DISPLAY WILL REMAIN.

#240

-----

COMMAND CHECK  
FAIL ALARM

-----

-----

OBSERVE COMP  
FAIL LIGHT ON

-----

-----

RESET CHECK  
FAIL ALARM

-----

-----

PRESS ALARM RESET  
TO TURN OFF COMP  
FAIL LIGHT

-----

#250



GO TO BACKUP PROCEDURES AND RESELECT A PROGRAM WHICH IS ALLOWED.

P 62

#260

#270

2. CHECK AGC DISPLAYS PROGRAM 62

#280

#290

#300

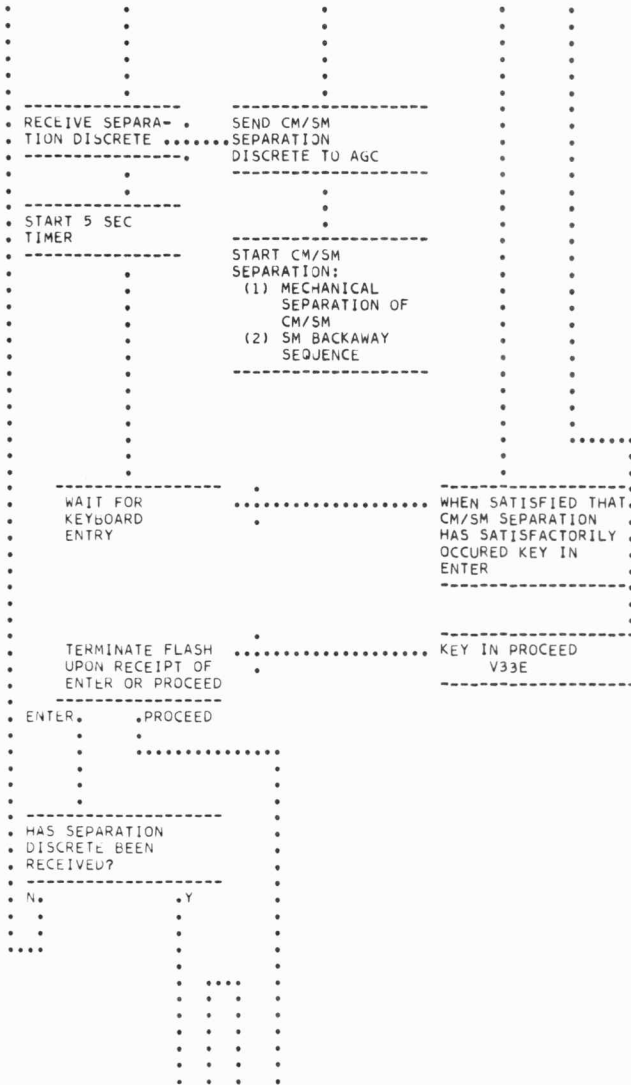
NOTE:  
 POSSIBLE PROGRAM ALARM, IF AVERAGE G IS NOT RUNNING AT THIS TIME DSKY WILL DISPLAY:  
 V05 N31

P 62









#420

#430

#440

#450

\* 7. IF V50 N25 FLASH CONTINUES AGC HAS NOT RECEIVED SEP DISCRETE, WHEN SATISFIED THAT SEPARATION HAS OCCURED;  
KEY IN PROCEED V33E

#460

#470

```

HAS TIMER
REACHED 5 SEC?

```

Y . N .

Y .

N .

Y .

Y .

Y .

```

SET HEADS DOWN/LIFT
UP
-00001

```

·

·

```

COMPUTE CM
INERTIAL ATTITUDE
NECESSARY TO GIVE
THE CORRECT ANGLE
OF ATTACK (ALPHA)
AT ENTRY INTO
THE ATMOSPHERE

```

·

·

```

STORE CM ATTITUDE
REQUIRED FOR USE
BY ATTITUDE
MANEUVER
ROUTINE

```

·

·

```

CALL ATTITUDE
MANEUVER ROUTINE
(R 21)

```

```

DO ATTITUDE
MANEUVER ROUTINE
(R 21)

```

\* VI PERFORM ATTITUDE MANEUVER ROUTINE (R21)

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#480

#490

#500

#510

#520

IS LIFT UP/DOWN  
SET TO LIFT UP  
(-00001)

Y. N

CHANGE CM ATTITUDE REQUIRED TO LIFT DOWN FOR USE BY THE ATTITUDE MANEUVER ROUTINE

CALL ATTITUDE MANEUVER ROUTINE (R21)

DO ATTITUDE MANEUVER ROUTINE (R21)

\* VII IF LIFT DOWN WAS KEYED IN PERFORM ATTITUDE MANEUVER ROUTINE (R21)

TERMINATE PROGRAM 62 AND GO TO ENTRY-INITIALIZATION PROG. (P 63)

MONITOR DSKY: OBSERVE TERMINATION OF P 62 AND DISPLAY OF P 63

\* VIII CHECK AGC DISPLAYS PROGRAM 63

ISS-ENTRY  
MODE  
PRESENT  
SCS-G6N  
ENTRY  
PRESENT

EXIT P 62

EXIT P 62

#530

#540

#550

#560

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

ENTRY - INITIALIZATION PROGRAM (P63)

REV 8

6/20/66

- PURPOSE:
- (1) TO INITIALIZE THE ENTRY EQUATIONS AS DESCRIBED IN SECTION 5.4 R-507.
  - (2) TO CONTINUE TO HOLD THE CM TO THE CORRECT ATTITUDE WITH RESPECT TO THE ATMOSPHERE FOR THE ONSET OF ENTRY DECELERATION.
  - (3) TO ESTABLISH ENTRY DSKY DISPLAYS.
  - (4) TO SENSE .05G AND DISPLAY THIS EVENT TO THE CREW BY SELECTING THE ENTRY-POST 0.05G PROGRAM (P64).

ASSUMPTIONS: (1) THE PROGRAM IS NORMALLY AUTOMATICALLY SELECTED BY THE ENTRY-CM/SM SEPARATION AND PRE-ENTRY MANEUVER PROGRAM (P62).

| PROG<br>CONT                 | AGC                                                                                     | GROUND | CREW | CHECKLIST                                                  | TIME | TOTAL<br>TIME |
|------------------------------|-----------------------------------------------------------------------------------------|--------|------|------------------------------------------------------------|------|---------------|
| ISS ENTRY<br>MODE<br>PRESENT | .AGC PROG<br>.SELECTION                                                                 |        |      |                                                            |      |               |
|                              | .                                                                                       |        |      |                                                            |      |               |
|                              | .                                                                                       |        |      |                                                            |      |               |
| SCS-G&N<br>ENTRY<br>PRESENT  | ...                                                                                     |        |      |                                                            |      |               |
|                              | .                                                                                       |        |      |                                                            |      |               |
| -----                        |                                                                                         |        |      |                                                            |      |               |
|                              | START ENTRY -<br>INITIALIZATION<br>PROGRAM (63)<br>DISPLAY PROGRAM 63                   | .....  | .    | -----<br>MONITOR DSKY:<br>OBSERVE DISPLAY OF<br>PROGRAM 63 |      | #10           |
|                              | .                                                                                       |        | .    | * I. CHECK AGC DISPLAYS PROGRAM 63                         |      |               |
|                              | .                                                                                       |        |      | -----                                                      |      |               |
|                              | .                                                                                       |        |      |                                                            |      |               |
| -----                        |                                                                                         |        |      |                                                            |      |               |
|                              | PERFORM ENTRY<br>INITIALIZATION<br>ROUTINE (SEE SECTION<br>5.4 R507) WHICH<br>INCLUDES: |        |      |                                                            |      | #20           |

A-CONTINUE CALCULATION OF INITIAL ROLL ANGLE AS A FUNCTION OF INERTIAL VELOCITY AND FLIGHT PATH ANGLE. (ALWAYS RESULTS IN ROLL=0 DEGREE OR LIFT UP FOR MISSION 204).

#30

B-CONTINUE CALCULATION OF DESIRED S/C PITCH AND YAW ATTITUDE AS DETERMINED BY THE VEHICLES POSITION AND VELOCITY W.R.T. THE ATMOSPHERE. PRIOR TO .05G THIS ATTITUDE IS ZERO SIDESLIP AND ANGLE OF ATTACK NEAR TRIM VALUE.

#40

•  
•

#50

•  
•  
•  
•

MAINTAIN CM ATTITUDE FOR LIFT VECTOR UP/DOWN ZERO SIDESLIP AND TRIM ANGLE OF ATTACK

•  
•

II. CHECK AGC DISPLAYS BETA AND G

#60

V16 N54  
R1 - BETA  
R2 - G  
R3 - R TO TARG

DISPLAY ON DSKY:  
V16 N54  
R1-BETA  
R2-G  
R3-R TO TARG

.....

MONITOR DSKY!  
OBSERVE DISPLAY OF  
BETA,G AND R TO TARG

•  
•

BETA-COMMANDED BANK ANGLE. IN DEGREES TO NEAREST .01 DEGREE.

#70

G - PRESENT G. IN G'S TO NEAREST .01 G.

BETA-COMMANDED BANK ANGLE IN DEGREES TO NEAREST .01 DEGREE.

MONITOR G+N CONTROL OF PRE - .05G CM ATTITUDE:  
(1) DSKY:

R TO TARG - RANGE TO GO TO THE DESIRED SPLASH POINT ASSUMING SPLASH POINT LOCATED AT CALCULATED IMPACT TIME. IN NAUTICAL MILES TO NEAREST .1 NM.

G - PRESENT G. IN G'S TO NEAREST .01 G

```

R TO TARG - RANGE TO
GO TO THE DESIRED
SPLASH POINT
ASSUMING SPLASH
POINT LOCATED AT
CALCULATED IMPACT
TIME, IN NAUTICAL
MILES TO NEAREST .1NM

```

.  
.  
.  
.  
.  
.  
.  
.  
.  
.  
.  
.  
.  
.  
.  
.  
.

```

WAIT FOR .05G
INDICATION

```

.  
.

```

ENTRY LOGIC DETECTS
.05G

```

.  
.

```

TERMINATE P63 AND GO
TO ENTRY-POST 0.05G
PROGRAM (P64)

```

.  
.  
.  
.  
.  
.

```

R1-BETA REMAINS AT
180 DEG. FOR LIFT
DOWN/HEADS UP OR AT
0 DEG FOR LIFT UP/
HEADS DOWN DEPENDING
UPON ATTITUDE REQ-
UESTED BY CREW IN
P61

```

```

R2-G INCREASES TO
.05

```

```

R3-R TO TARG-
DECREASING

```

```

(2) FDAI:
ATTITUDE RATES
LESS THAN--DEG./
SEC.

```

```

ATTITUDE ERRORS
LESS THAN --DEG.

```

```

BALL: ROLL= DEG
CORRESPONDING TO
BETA IN R1 DSKY
DISPLAY

```

```

PITCH= 272 DEG

```

```

YAW= 0 DEG

```

.....

```

MONITOR DSKY:
OBSERVE TERMINATION
OF P63 AND DISPLAY
OF P64

```

```

.Y .N .
. . .
. . .
. . .
. . .
. . .

```

\* III. MONITOR G+N ATTITUDE CONTROL

\* A. MONITOR DSKY DISPLAY:

```

R1-BETA REMAINS AT 180 DEG FOR
LIFT DOWN/HEADS UP OR AT 0 DEG
LIFT UP/HEADS DOWN DEPENDING
UPON ATTITUDE REQUESTED BY
CREW IN P62

```

```

R2-G OBSERVE G INCREASE TO .05

```

```

R3-R TO TARG-DECREASING

```

\* B. MONITOR FDAI:

```

ATTITUDE RATES LESS THAN --DEG/SEC

```

```

ATTITUDE ERRORS LESS THAN --DEG

```

```

BALL: ROLL=ANGLE SHOULD CORRESPOND
TO BETA IN R1 DSKY DISPLAY

```

```

PITCH=272 DEG

```

```

YAW=0 DEG

```

\* IV WHEN R2 DISPLAYS .05G CHECK AGC DISPLAYS PROGRAM 64

```

DETERMINE S/C HAS PASSED THROUGH
.05 G BY:

```



APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

ENTRY-POST 0.05 G PROGRAM (P 64)

REV 4

6/20/66

- PURPOSE:
1. TO START ENTRY GUIDANCE AT .05G AND CONTINUE IT TO .2G. (APPROX 10 SEC)
  2. TO ESTABLISH THE 0.05 G MODE IN THE SCS.
  3. TO SENSE .2G AND THEREUPON TO SELECT THE ENTRY-FINAL PHASE PROGRAM (P67)
  4. TO CONTINUE ENTRY DSKY DISPLAYS

ASSUMPTIONS: (1) THE PROGRAM IS NORMALLY AUTOMATICALLY SELECTED BY THE ENTRY INITIALIZATION PROGRAM (P 63).

| PRUG CONT              | AGC                                                      | GROUND | CREW                                                                  | CHECKLIST                                               | TIME | TOTAL TIME |
|------------------------|----------------------------------------------------------|--------|-----------------------------------------------------------------------|---------------------------------------------------------|------|------------|
| ISS-ENTRY MODE PRESENT | .AGC PROG.<br>.SELECTION<br>.                            |        |                                                                       |                                                         |      |            |
| SCS-G6N ENTRY PRESENT  | ...                                                      |        |                                                                       |                                                         |      |            |
|                        | -----<br>START ENTRY-POST 0.05 G PROGRAM (P 64)<br>----- |        |                                                                       |                                                         | #10  |            |
|                        | DISPLAY PROGRAM 64                                       | .....  | .                                                                     |                                                         |      |            |
|                        |                                                          |        | -----<br>MONITOR DSKY:<br>OBSERVE DISPLAY OF PROGRAM 64<br>-----<br>. | * I. CHECK AGC DISPLAYS PROGRAM 64                      |      |            |
|                        |                                                          |        | -----<br>SET 0.05 G ENTRY SWITCH ON SCS CONTROL PANEL TO ON<br>-----  | * II. PILOT:<br>PANEL 8<br>SET .05G ENTRY SWITCH TO ON. | #20  |            |
|                        | .                                                        |        |                                                                       |                                                         |      |            |
|                        | .                                                        |        |                                                                       |                                                         |      |            |
|                        | .                                                        |        |                                                                       |                                                         |      |            |
|                        | .                                                        |        |                                                                       |                                                         |      |            |
|                        | .                                                        |        |                                                                       |                                                         |      |            |
|                        | .                                                        |        |                                                                       |                                                         |      |            |
|                        | .                                                        |        |                                                                       |                                                         |      |            |
|                        | .                                                        |        |                                                                       |                                                         |      |            |
|                        | .                                                        |        |                                                                       |                                                         |      |            |
|                        | .                                                        |        |                                                                       |                                                         |      |            |
|                        | .                                                        |        |                                                                       |                                                         |      |            |
|                        | .                                                        |        |                                                                       |                                                         |      |            |
|                        | .                                                        |        |                                                                       |                                                         |      |            |
|                        | .                                                        |        |                                                                       |                                                         |      |            |



-----  
CONTINUE THE DSKY  
DISPLAY ESTABLISHED  
IN P 63.

V16 N54  
R1-BETA  
R2-G  
R3-R TO TARG

BETA-COMMANDED BANK  
ANGLE. IN DEGREES  
TO NEAREST .01  
DEGREE

G-PRESENT G. IN GS  
TO NEAREST .01G

R TO TARG - RANGE TO  
GO TO THE DESIRED  
SPLASH POINT ASSUMING  
SPLASH POINT  
LOCATION AT CALCUL-  
ATED IMPACT TIME.  
IN NAUTICAL MILES TO  
NEAREST .1NM.

-----  
COMMAND CM ATTITUDE  
IN ACCORDANCE WITH  
AGC ENTRY LOGIC (SEE  
SECTION 5.4, R 507)

-----  
FOR A NOMINAL MISSION  
204 ENTRY (EITHER  
FROM ORBIT OR BOOST  
ABORT) THE AGC WILL  
GO DIRECTLY FROM P 64  
TO P 67 WHEN G = .2

-----  
MONITOR G+N CONTROL  
OF ENTRY:

(A) FDAI:  
ATT ERRORS LESS  
THAN --DEG  
ATT RATES LESS  
THAN --DEG/SEC

BALL INDICATES  
LIFT VECTOR  
DIRECTION COR-  
RELATION WITH  
BETA

(B) DSKY:  
R1-BETA VARIES  
TO LIMIT G AND  
CONTROL LIFT  
VECTOR

R2-G SHOULD BE  
INCREASING

R3-R TO TARG IS  
CONTINUALLY  
DECREASING

\* III. MONITOR G+N CONTROL OF ENTRY

#30

\* 1. CHECK AGC DISPLAYS:

V16 N54  
R1-BETA  
R2-G  
R3-R TO TARG

BETA - COMMAND BANK ANGLE  
IN DEGREES TO NEAREST .01  
DEGREE

G - PRESENT G. IN GS TO  
NEAREST .01 G

R TO TARG - RANGE TO GO TO  
THE DESIRED SPLASH POINT  
ASSUMING SPLASH CALCULATED  
IMPACT TIME. IN NAUTICAL  
MILES TO NEAREST .1 NM.

#40

#50

A. FDAI:  
ATT ERRORS LESS THAN --DEG  
PITCH + YAW RATES LESS THAN + OR  
- 2 DEG/SEC  
BALL INDICATES LIFT VECTOR  
DIRECTION CORRELATED WITH BETA

B. DSKY:  
R1-BETA VARIES TO LIMIT  
G AND CONTROL LIFT VECTOR  
R2-G SHOULD BE INCREASING  
R3-R TO TARG IS CONTINUALLY  
DECREASING

#60

#70

\* IV. WHEN R2 DISPLAY INDICATES .2G CHECK  
AGC DISPLAYS PROGRAM 67.

#80

-----  
MONITOR DSKY:  
WHEN R2 DISPLAY  
INDICATES .2G  
OBSERVE TERMINATION  
OF P 64 AND DISPLAY  
OF P 67

```

--
TERMINATE P 64 AND GO
TO ENTRY-FINAL PHASE
PROGRAM (P 67)

ISS-ENTRY
MODE
PRESENT
.
.
.
SCS-G6N
ENTRY
PRESENT
.
.
.
EXIT P 64

```

```

.Y .N
.
.
.
GO TO BACKJP
PROCEDURES

.
.
.
.
.
.
.
EXIT P 64

```

#90

END OF RUN

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

ENTRY - FINAL PHASE PROGRAM (P 67)

REV 3

6/20/66

PURPOSE: (1) TO CONTINUE ENTRY GUIDANCE AFTER .2G UNTIL TERMINATION OF STEERING WHEN THE CM VELOCITY WRT EARTH = 1000 FT/SEC (ALTITUDE ABOVE THE FISCHER ELLIPSOID IS APPROXIMATELY 65,000 FT.).  
 (2) TO CONTINUE ENTRY DSKY DISPLAYS.

ASSUMPTIONS: (1) THE PROGRAM IS AUTOMATICALLY SELECTED BY THE ENTRY-POST 0.05G PROGRAM (P64).

| PROG<br>CONT                                                                                                                                      | AGC                                                    | GROUND | CREW                                                                                                                       | CHECKLIST                                                                                                                                               | TIME | TOTAL<br>TIME |
|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|--------|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|
| ISS-ENTRY<br>MODE<br>PRESENT<br><br>SCS-G+N<br>ENTRY<br>PRESENT                                                                                   | .AGC PROG.<br>.SELECTION<br>.<br>.<br>.<br>.<br>.<br>. |        |                                                                                                                            |                                                                                                                                                         |      |               |
| -----<br>START ENTRY-FINAL<br>PHASE PROGRAM (P 67)                                                                                                |                                                        |        |                                                                                                                            |                                                                                                                                                         |      | #10           |
| DISPLAY PROGRAM 67                                                                                                                                | .....                                                  |        | MONITOR DSKY:<br>OBSERVE DISPLAY OF<br>PROGRAM 67                                                                          | * I. CHECK AGC DISPLAYS PROGRAM 67                                                                                                                      |      |               |
| -----                                                                                                                                             |                                                        |        |                                                                                                                            |                                                                                                                                                         |      | #20           |
| CONTINUE DSKY DIS-<br>PLAYS OF P64 EXCEPT<br>CHANGE R3 FROM R TO<br>GO TO R PRED-R TO TARG<br>V16-N71<br>R1-BETA<br>R2-G<br>R3-RPRED-R TO<br>TARG | .....                                                  |        | MONITOR G+N CONTROL<br>OF ENTRY:<br><br>(A)FDAI;<br>ATT ERRORS LESS<br>THAN --DEG<br><br>ATT RATES LESS<br>THAN --DEG/SEC. | * II. MONITOR G+N CONTROL OF ENTRY:<br><br>* 1. CHECK AGC DISPLAYS:<br>V16-N71<br>R1-BETA<br>R2-G<br>R3-R PRED - R TO TARG<br><br>BETA - COMMANDED BANK |      | #30           |

BETA-COMMANDED BANK ANGLE. IN DEGREES TO NEAREST .01 DEGREE

G-PRESENTG. IN GS TO NEAREST .01G

R PRED-R TO TARG -THE ENTRY STEERING ERROR SIGNAL. THE RANGE TO THE PREDICTED SPLASH POINT MINUS RANGE TO GO TO THE DE- DESIRED SPLASH POINT BASED ON PRESENT POSITION AND VELOCITY. IN NAUTICAL MILES TO NEAREST .1 NM.

.....

COMMAND CM ATTITUDE IN ACCORDANCE WITH AGC ENTRY LOGIC (SEE SECTION 5.4, R507)

.....

WHEN CM VELOCITY WRT EARTH = 1000 FPS FLASH VERB-NOUN

.....

BALL INDICATES LIFT VECTOR DIRECTION CORRELATION WITH BETA

(B) DSKY: R1-BETA VARIES

TO LIMIT G AND CONTROL LIFT VECTOR.

R2-G SHOULD REMAIN LESS THAN 10 G.

R3-RPRED-R TO TARG SHOULD REMAIN AT ZERO

.....

MONITOR DSKY; OBSERVE VERB-NOUN FLASH

.....

ANGLE. IN DEGREES TO NEAREST .01 DEGREE

G - PRESENT G. IN GS TO NEAREST .01G

R PRED - R TO TARG - THE ENTRY STEERING ERROR SIGNAL. THE RANGE TO THE PREDICTED SPLASH POINT MINUS RANGE TO GO TO THE DESIRED SPLASH POINT BASED ON PRESENT POSITION AND VELOCITY. IN NAUTICAL MILES TO NEAREST .1 NM.

#40

#50

(A) FDAI: ATT ERRORS LESS THAN --DEG

PITCH + YAW ATT RATES LESS THAN + OR - 2 DEG/SEC.

BALL INDICATES LIFT VECTOR DIRECTION CORRELATION WITH BETA.

#60

(B) DSKY: R1 - BETA VARIES TO LIMIT G AND CONTROL LIFT VECTOR

R2 - G SHOULD REMAIN LESS THAN 10 G.

R3 - R PRED-R TO TARG SHOULD REMAIN AT ZERO.

#70

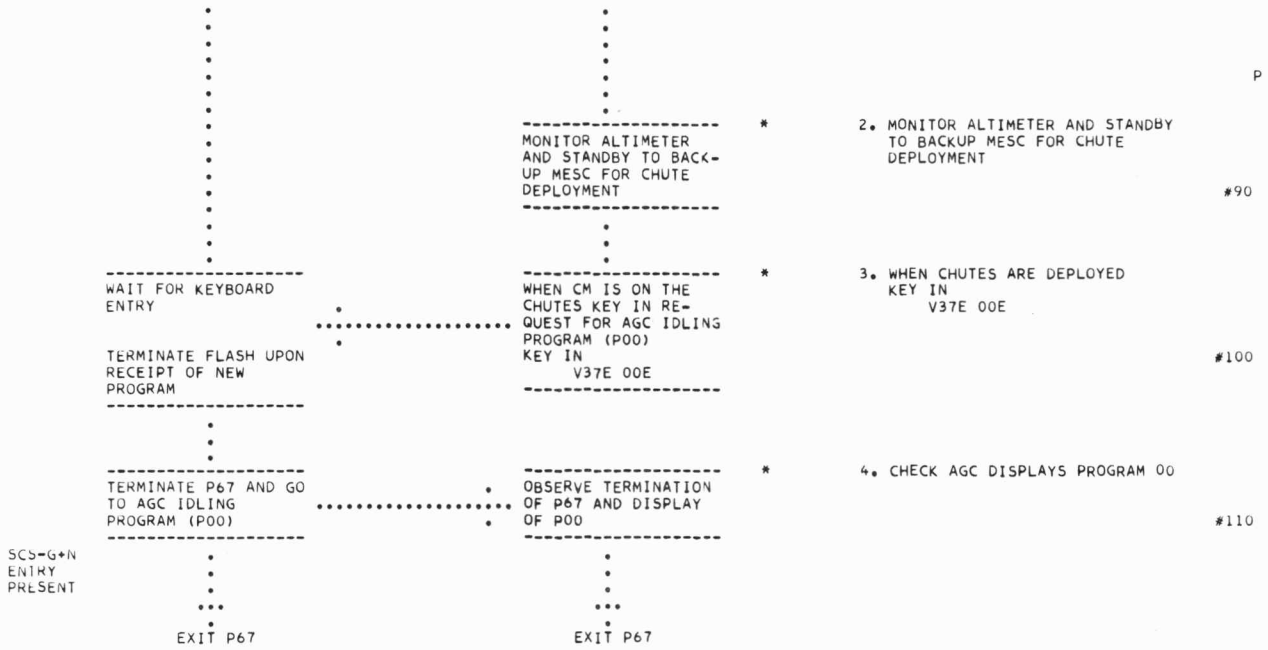
\* III.

\*

1. WHEN CM VELOCITY WRT EARTH = 1000 FPS OBSERVE VERB-NOUN FLASH

#80

HOLD. ....



APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

CSM ABORT-1ST ABORT BURN PROGRAM (P 71)

REV 10

6/20/66

PURPOSE: (1) UPON THE OCCURENCE OF A BOOST ABORT (WITH OR WITHOUT TUMBLING) TO:

- A. MONITOR SEPARATION OF THE SIVB/CSM
- B. MONITOR FIRST SPS ABORT BURN

ASSUMPTIONS: (1) THE SCS IS IN THE G+N MONITOR MODE AT THE INITIATION OF THE ABORT.

(2) THE ISS IS IN THE FINE ALIGN MODE, EXCEPT FOR AN ABORT IN THE FIRST 5 SECONDS OF BOOST MONITOR-POST LET JETTISON PROGRAM (P 12) AT WHICH TIME THE ISS IS IN THE ATTITUDE CONTROL MODE.

(3) THE SPS GIMBAL MOTORS ARE ON AND THE GIMBALS ARE AT THE TRIM POSITIONS COMMANDED BY THE SPS MOTOR GIMBAL TRIM DIALS WHICH WERE PRESET ON THE PAD FOR THE CSM FUEL LOADING CONDITIONS AT LAUNCH.

(4) THE DSKY DISPLAYS ESTABLISHED DURING BOOST MONITOR-POST LET JETTISON PROGRAM (P 12) ARE RETAINED WHEN THIS PROGRAM IS SELECTED:

V16 N41  
R1 - G MAX  
R2 - PERIGEE ALT  
R3 - TFF

WHERE:

G MAX-MAXIMUM PREDICTED G FOR FREE FALL AND ENTRY AT A BANK ANGLE OF 60 DEGREES (L/D MAX = 0.34). IN G'S TO NEAREST .01G.

PERIGEE ALT-ALTITUDE OF PERIGEE ABOVE FISCHER ELLIPSOID. IN NAUTICAL MILES TO NEAREST .1 N.M.

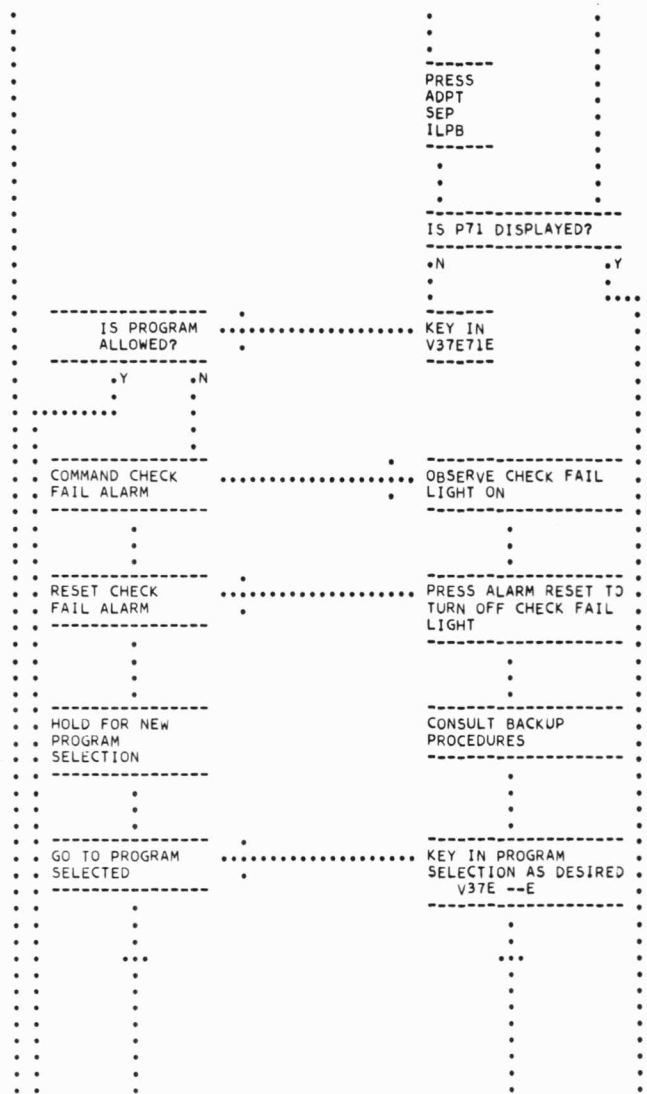
TFF-TIME OF FREE FALL TO 300,000 FT. ALTITUDE ABOVE FISCHER ELLIPSOID. IN MIN, SEC TO NEAREST SEC. MAXIMUM READING IS 59 59 (IF PERIGEE ALT IS GREATER THAN 300,000 FT. THE TFF DISPLAY WILL READ 59 59).

(5) THE PROGRAM IS NORMALLY AUTOMATICALLY SELECTED BY THE BOOST MONITOR-POST LET JETTISON PROGRAM (P12) WHEN THE CREW INITIATES A BOOST ABORT AND THE AGC RECEIVES THE SIVB/CSM SEPARATION (ABORT) DISCRETE.

| PROG<br>CONT | AGC | MESC | CREW | CHECKLIST | TIME | TOTAL<br>TIME |
|--------------|-----|------|------|-----------|------|---------------|
|--------------|-----|------|------|-----------|------|---------------|







#60

#70

#80

#90

#100

NOTE: POSSIBLE CHECK FAIL. IF PRESENT PROGRAM DOES NOT ALLOW SELECTION OF P71 THE CHECK FAIL LIGHT WILL ILLUMINATE AND THE OLD PROGRAM DISPLAY WILL REMAIN.

OBSERVE: CHECK FAIL LIGHT ON (LEB)  
PGNS LIGHT ON (LEB)  
COMP FAIL LIGHT ON (MDC)

GO TO BACKUP PROCEDURES AND SELECT A PROGRAM WHICH IS ALLOWED.



DELTA R - MISS  
DISTANCE ALONG  
GROUND TRACK FROM  
DISCRETE RECOVERY  
AREA FOR FREE FALL  
AND ENTRY. ASSUMES  
UP LIFT EQUAL  
TO .17 TIMES DRAG  
AND NO OUT OF  
PLANE FORCE DURING  
ENTRY. POLARITY  
INDICATES OVER-  
SHOOT (+) OR  
UNDERSHOOT (-) OF  
RECOVERY AREA. IN  
NAUTICAL MILES TO  
NEAREST .1 NM.

PERIGEE ALT - ALTI-  
TITUDE OF PERIGEE  
ABOVE THE MEAN  
EQUATORIAL RADIUS .  
IN NAUTICAL MILES  
TO NEAREST .1 NM.

TFF - TIME OF FREE  
FALL TO 300,000  
FT. ABOVE MEAN  
EQUATORIAL RADIUS.  
IN MIN. AND SEC. TO  
NEAREST SEC.  
MAX READING IS  
59 59. IF  
PERIGEE ALT IS  
GREATER THAN  
300,000 FT THE  
DISPLAY WILL READ  
59 59.

-----  
          .  
          .  
-----  
IS ISS IN FINE ALIGN  
MODE

-----  
Y              .N  
          .  
          .  
-----  
  COMMAND ISS TO  
  FINE ALIGN MODE  
-----

          .  
          .  
          .  
          .  
          .  
          .  
          .  
          .  
          .  
          .

DELTA R - MISS DISTANCE  
ALONG GROUND TRACK FROM  
DISCRETE RECOVERY AREA FOR  
FREE FALL AND ENTRY. #160  
ASSUMES UP LIFT EQUAL TO  
.17 TIMES DRAG AND NO OUT  
OF PLANE FORCE DURNIG ENTRY  
POLARITY INDICATES OVER-  
SHOOT (+) OR UNDERSHOOT (-)  
OF RECOVERY AREA IN  
NAUTICAL MILES TO NEAREST  
.1 NM.

PERIGEE ALT - ALTITUDE  
OF PERIGEE ABOVE THE MEAN  
EQUAROTIAL RADIUS. IN NAUT-  
ICAL MILES TO NEAREST .1NM. #170

TFF - TIME OF FREE FALL TO  
300,000 FT. ABOVE MEAN  
EQUATORIAL RADIUS. IN MIN.  
AND SEC. TO NEAREST SEC. #180  
MAX READING IS 59 59. IF  
PERIGEE ALT IS GREATER THAN  
300,000 FT THE DISPLAY WILL  
READ 59 59.

#190

#200

#210

```

WHEN EVENT CLOCK
INDICATES TA + 6.0
SECONDS, PUT THRUST
SWITCH IN DIRECT ON
POSITION.

```

- \* III. TURN ON 1ST SPS IGNITION AND MONITOR RATES
- 1. WHEN EVENT CLOCK INDICATES TA + 6.0 SECONDS, PLACE THRUST SWITCH TO DIRECT/ON

#220

```

ARE VEHICLE RATES
ABOVE -- DEG/SEC ON
ANY AXIS
Y. N.
: :
: :
: :

```

- 2. RETURN TRANSLATION CONTROL TO CENTER AFTER IGNITION OF SPS TO TERMINATE DIRECT ULLAGE
- 3. UNLOCK TRANSLATION CONTROL

#230

```

MONITOR DAMPING OF
RATES BY REFERENCE
TO FDAI RATE
NEEDLES AND OUT
THE WINDOWS

```

- 4. CHECK DAMPING OF RATES BY REFERENCE TO FDAI RATE NEEDLES AND LOOKING OUT WINDOW

#240

```

WAIT UNTIL WAIT
VEHICLE UNTIL --
RATES ARE SEC HAVE
BELOW -- ELAPSED
DEG/SEC SINCE
----- IGNITION

```

- \* IV. TERMINATE THRUSTING

#250

```

PUT THRUST SWITCH IN
OFF POSITION.

```

```

WHEN RATES ARE BELOW --DEG/SEC OR
WHEN -- SEC HAVE ELAPSED SINCE
IGNITION PLACE THRUST SWITCH TO OFF

```

```

WAIT FOR KEYBOARD
ENTRY

```

```

SELECT NEW PROGRAM
V37E --E

```

- \* V. SELECT NEW PROGRAM  
SELECT P00, P61, OR P62.  
KEY IN  
V37E --E

#260

CAUTION:

·  
·  
-----  
TERMINATE P71 AND  
GO TO PROGRAM  
SELECTED  
-----  
·  
·  
·  
·  
EXIT P71

·  
-----  
·  
··········  
·  
MONITOR DSKY:  
OBSERVE DISPLAY OF  
PROGRAM SELECTED  
-----  
·  
·  
·  
·  
EXIT P71

P61 OR P62 CANNOT BE SELECTED AFTER  
P00 IS SELECTED BECAUSE P00  
TERMINATES AVERAGE G COMPUTATION.  
\* VI. CHECK AGC DISPLAYS PROGRAM SELECTED

#270

END OF RUN

323

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

ATTITUDE CONTROL MODE CHECK ROUTINE (R 1)

REV 6

6-20-66

PURPOSE: (1) TO ENSURE THE ESTABLISHMENT OF THE G+N ATTITUDE CONTROL MODE IN THE SCS AND OF THE ISS ATTITUDE CONTROL MODE PRIOR TO AN AGC CONTROLLED ATTITUDE MANEUVER. THE AGC ESTABLISHES AN SCS DISCRETE MONITOR TO ASSURE CONTINUITY OF THE SCS MODE. FOR BACKUP CASES, THE ASTRONAUT MAY BYPASS THE SETTING OF THE G+N CONTROL MODE ALTHOUGH THE AGC STILL ASSUMES THAT IT HAS BEEN SET

ASSUMPTIONS: (1) THE AGC IS GIVEN ONLY ONE DISCRETE AS A REFERENCE FOR IT TO IDENTIFY ANY GIVEN G+N CONTROL MODE IN THE SCS. THERE ARE HOWEVER MANY SWITCHES IN THE SCS WHICH WILL INHIBIT G+N CONTROL WHILE THE DISCRETE IS STILL PROVIDED TO THE AGC. ASSUMING THAT IT IS NOT DESIRABLE TO PROVIDE A DISCRETE TO THE AGC FOR EACH OF THESE SWITCHES, THE ONE DISCRETE PROVIDED MUST REPRESENT THE CORRECT POSITION OF THE BLOCK OF ALL NECESSARY SWITCHES. THE OBLIGATION IS THUS UPON THE CHECKLIST PROCEDURES TO ENSURE THAT THE DISCRETE IS ONLY PROVIDED THE AGC AFTER ALL APPROPRIATE SWITCHES HAVE BEEN PLACED IN THE CORRECT POSITIONS.

(2) THE ROUTINE IS NORMALLY AUTOMATICALLY SELECTED BY THE PROGRAM REQUIRING AGC ATTITUDE CONTROL.

| PRUG<br>CONT                                                                          | AGC | GROUND | CREW | CHECKLIST | TIME | TOTAL<br>TIME |
|---------------------------------------------------------------------------------------|-----|--------|------|-----------|------|---------------|
| AGC<br>ROUTINE<br>SELECTION<br>.....                                                  | .   |        |      |           |      |               |
| -----<br>START ATT CONTROL<br>MODE CHECK ROUTINE<br>(R 1)                             | .   |        |      |           |      | #10           |
| .....<br>TERMINATE SCS DIS-<br>CRETE MONITOR<br>ROUTINE (R 22)                        | .   |        |      |           |      |               |
| -----<br>.....<br>IS THE SCS IN THE<br>G AND N ATT. CONT.<br>MODE (CHECK<br>DISCRETE) | .   | .....  | .    |           |      | #20           |
| -----<br>.Y          N.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.        | .   | .      | .    |           |      | R 01          |

327

IS THE SCS IN THE  
G+N DELTA V MODE  
OR THE G+N ENTRY  
MODE

#30

.Y .N

IS THE ISS IN  
THE ATT CONT  
MODE

#40

.Y .N

IS ISS IN  
FINE ALIGN

#50

.Y .N

COMMAND ISS  
TO FINE ALIGN

OBSERVE ISS  
SWITCH TO FINE ALIGN  
MODE FOR 20 SEC IF  
THE SCS IS NOT IN  
THE G+N ATT CONT  
MODE AND THE G+N  
DOES NOT HAVE ATTITUDE CONTROL OF THE  
S/C AND IF THE ISS  
IS NOT IN THE FINE  
ALIGN MODE

#60

WAIT 20 SEC

POSS .  
.....  
HOLD .

FLASH VERB-NOUN TO  
REQUEST PLEASE PER-  
FORM G AND N ATT.  
CONT. MODE SELECTION  
IN SCS.  
V50 N25  
R1-00001

MONITOR DSKY:  
OBSERVE VERB-NOUN  
FLASH TO REQUEST  
PLEASE PERFORM G AND  
N ATT. CONT. MODE  
SELECTION IN SCS.

- \* 1. IF SCS IS NOT IN G+N ATT CONTROL  
CHECK AGC FLASHES VERB-NOUN TO  
REQUEST PLEASE PERFORM G AND N ATT  
CONT. MODE SELECTION  
V50 N25  
R1-00001

#70

DOES THERE APPEAR TO  
BE ANY REASON I CAN-  
NOT SELECT G AND N  
ATT. CONT.

- \* A. PILOT ACCEPTS REQUEST:
- \* (1) SET ATTITUDE/MONITOR/ENTRY  
SWITCH TO MONITOR

#80

N. Y.



SCS-G+N  
ATTITUDE  
PRESENT

-----  
WAIT FOR KEY-  
BOARD ENTRY

-----  
TERMINATE FLASH  
UPON RECEIPT OF  
ENTER, PROCEED  
OR NEW PROGRAM

-----  
P NEW E  
R PROG N  
O T  
C E  
E R  
E  
D

-----  
GO TO PROGRAM  
SELECTED

-----  
EXIT R1 AND P--

-----  
SET SCS CONTROL  
SWITCHES PER  
CHECK LIST.

-----  
KEY IN ENTER

-----  
I HAVE THE FOLLOW-  
ING ALTERNATIVES:

-----  
1. BYPASS THE MODE  
CHECK  
KEY IN PROCEED  
V33 E

-----  
2. TERMINATE PROGRAM  
AND USE BACKUP  
PROCEDURES. KEY IN  
DESIRED PROGRAM  
V37E--E

- \* (2) SET G6N/SCS SWITCH TO G6N
- \* (3) SET DELTA V SWITCH TO OFF
- \* (4) CHECK FDAI ERROR NEEDLES NULL.
- \* (5) SET ATTITUDE/MONITOR/ENTRY SWITCH TO ATTITUDE
- \* (6) KEY IN ENTER

- \* B. PILOT REJECTS REQUEST:
- \* (1) BYPASS THE MODE CHECK AND PROCED. KEY IN PROCEED V33 E
- \* (2) TERMINATE PROGRAM. KEY IN DESIRED PROGRAM V37E--E

R 01

#90

#100

#110

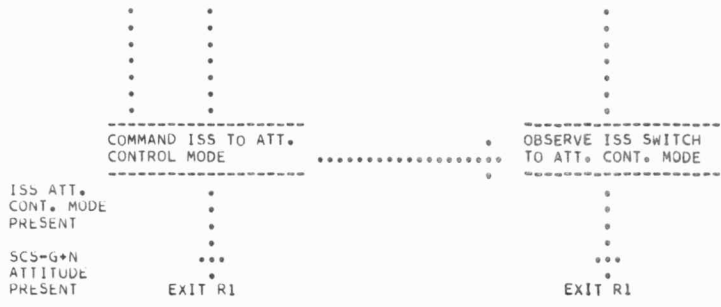
#120

#130

R 01



R 01



\* 2. CHECK ATT. CONT. MODE LIGHT ON  
NOTE: ISS MAY REMAIN IN FINE ALIGN  
MODE FOR 20 SEC PRIOR TO  
THIS MODE.

#200

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

THRUST CONTROL MODE CHECK ROUTINE (R 2)

REV 5

6-20-66

PURPOSE: (1) TO ENSURE THE ESTABLISHMENT OF THE G+N DELTA V MODE IN THE SCS SYSTEM AND OF THE ISS ATTITUDE CONTROL MODE PRIOR TO AN AGC CONTROLLED THRUSTING MANEUVER. THE AGC ESTABLISHES AN SCS DISCRETE MONITOR TO ASSURE CONTINUITY OF THE SCS MODE. FOR BACKUP CASES THE ASTRONAUT MAY BYPASS THE SETTING OF THE CORRECT MODE IN THE SCS ALTHOUGH THE AGC MUST ASSUME IT HAS CONTROL OF THE THRUSTING MANEUVER

ASSUMPTIONS: (1) THE AGC IS GIVEN ONLY ONE DISCRETE AS A REFERENCE FOR IT TO IDENTIFY ANY GIVEN G+N CONTROL MODE IN THE SCS. THLKE ARE HOWEVER MANY SWITCHES IN THE SCS WHICH WILL INHIBIT G+N CONTROL WHILE THE DISCRETE IS STILL PROVIDED TO THE AGC. ASSUMING THAT IT IS NOT DESIRABLE TO PROVIDE A DISCRETE TO THE AGC FOR EACH OF THESE SWITCHES, THE ONE DISCRETE PROVIDED MUST REPRESENT THE CORRECT POSITION OF THE BLOCK OF ALL NECESSARY SWITCHES. THE OBLIGATION IS THUS UPON THE CHECKLIST PROCEDJRES TO ENSURE THAT THE DISCRETE IS ONLY PROVIDED THE AGC AFTER ALL APPROPRIATE SWITCHES HAVE BEEN PLACED IN THE CORRECT POSITIONS.

(2) THE ROUTINE IS NORMALLY AUTOMATICALLY SELECTED BY THE PROGRAM REQUIRING AGC THRUST CONTROL.

| PRUG<br>CONT | AGC                                                                                                       | GROUND | CREW | CHECKLIST | TIME | TOTAL<br>TIME |
|--------------|-----------------------------------------------------------------------------------------------------------|--------|------|-----------|------|---------------|
|              | •AGC<br>•ROUTINE<br>•SELECTION<br>•<br>•<br>•<br>•••<br>•                                                 |        |      |           |      | #10           |
|              | -----<br>START THRUST CONTROL<br>MODE CHECK ROUTINE<br>(R 2)                                              |        |      |           |      |               |
|              | TERMINATE SCS<br>DISCRETE MONITOR<br>ROUTINE (R 22)<br>-----<br>•<br>•<br>•                               |        |      |           |      | #20           |
|              | -----<br>IS THE SCS IN THE<br>G+N DELTA V MODE<br>(CHECK DISCRETE)<br>-----<br>Y.                      •N |        |      |           |      |               |
|              | •<br>•<br>•<br>•                                                                                          |        |      |           |      | R 02          |

329

#30

IS THE SCS IN THE G+N ATT CONT MODE OR THE G+N ENTRY MODE

Y. .N

#40

IS THE ISS IN ATT CONT MODE

Y. .N

#50

DO ATTITUDE CONTROL MODE CHECK ROUTINE (R1)

IF G+N DOES NOT HAVE ATTITUDE CONTROL OF THE VEHICLE:

- \* 1. IF G+N DOES NOT HAVE ATTITUDE CONTROL OF THE VEHICLE:
  - A. PERFORM ATTITUDE CONTROL MODE CHECK ROUTINE (R1)

(A) DO THE ATTITUDE CONTROL MODE CHECK ROUTINE (R1)

#60

ISS ATT CONT MODE PRESENT

FLASH VERB=NOUN TO REQUEST PLEASE PERFORM G+N DELTA V MODE SELECTION IN SCS V50 N25 R1=00002

MONITOR DSKY: OBSERVE FLASHING VERB=NOUN TO REQUEST PLEASE PERFORM G+N DELTA V MODE SELECTION IN SCS

- \* 2. CHECK AGC FLASHES VERB=NOUN TO REQUEST PLEASE PERFORM G+N DELTA V MODE SELECTION IN SCS V 50 N 25 R1 - 00002

#70

PUSH . . . . . HOLD .

DOES THERE APPEAR TO BE ANY REASON I CANNOT SELECT G+N DELTA V MODE ?

N. .Y

- \* 3. PILOT ACCEPTS REQUEST:
  - A. SET DELTA V SW TO DELTA V

#80

SCS - G6N  
DELTA V  
PRESENT

-----  
WAIT FOR KEY-  
BOARD ENTRY

-----  
SET SCS  
CONTROL  
SWITCHES  
PER CHECK  
LIST  
-----

-----  
KEY IN  
ENTER  
-----

-----  
I HAVE THE FOLLOWING  
ALTERNATIVES:

(1) BYPASS THE MODE  
CHECK  
-----  
KEY IN PROCEED  
V 33 E

(2) TERMINATE THE  
PROGRAM AND USE  
BACKUP PROCEEDURES  
KEY IN DESIRED  
PROGRAM  
-----  
V37E--E

-----  
TERMINATE FLASH  
UPON RECEIPT OF  
ENTER, PROCEED OR  
NEW PROGRAM  
-----

P. .NEW .E  
R. .PROG.N  
O. .T  
C. .E  
E. .R  
D. .

-----  
GO TO  
PROGRAM  
SELECTED  
-----

\* B. KEY IN ENTER

\* 4. PILOT REJECTS REQUEST:

\* A. BYPASS THE MODE CHECK.  
KEY IN PROCEED  
V 33 E  
OR

\* B. TERMINATE PROGRAM  
KEY IN DESIRED PROGRAM  
V37E--E

33/

R 02

#90

#100

#110

#120

#130

R 02



APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

ENTRY CONTROL MODE CHECK ROUTINE (R 3)

REV 8

6/02/66

PRUPOSE:

(1) TO ENSURE THE ESTABLISHMENT OF THE G+N ENTRY MODE IN THE SCS SYSTEM AND OF THE ISS ENTRY MODE PRIOR TO AN AGC CONTROLLED ENTRY. THE AGC ESTABLISHES AN SCS DISCRETE MONITOR TO ASSURE CONTINUITY OF THE CORRECT MODE IN THE SCS. FOR BACKUP CASES THE ASTRONAUT MUST EXIT FROM G+N CONTROL AND USE BACKUP MEANS.

ASSUMPTIONS:

(1) THE AGC IS GIVEN ONLY ONE DISCRETE AS A REFERENCE FOR IT TO IDENTIFY ANY GIVEN G+N CONTROL MODE IN THE SCS. THERE ARE HOWEVER MANY SWITCHES IN THE SCS WHICH WILL INHIBIT G+N CONTROL WHILE THE DISCRETE IS STILL PROVIDED TO THE AGC. ASSUMING THAT IT IS NOT DESIRABLE TO PROVIDE A DISCRETE TO THE AGC FOR EACH OF THESE SWITCHES, THE ONE DISCRETE PROVIDED MUST REPRESENT THE CORRECT POSITION OF THE BLOCK OF ALL NECESSARY SWITCHES. THE OBLIGATION IS THUS UPON THE CHECKLIST PROCEDURES TO ENSURE THAT THE DISCRETE IS ONLY PROVIDED THE AGC AFTER ALL APPROPRIATE SWITCHES HAVE BEEN PLACED IN THE CORRECT POSITIONS.

(2) THE COMMAND OF THE ENTRY MODE IN THE G+N SYSTEM INVOLVES SWITCHING THE OUTER GIMBAL (OG) 1X RESOLVER OUTPUTS FROM THE OG-CDU 1X RESOLVER TO THE OG-CDU 16X RESOLVER. THIS COULD RESULT IN A LARGE ATTITUDE ERROR COMMAND IN ROLL UNLESS THE OG-CDU 16X RESOLVER IS BROUGHT TO THE SAME CORRESPONDING ANGLE AS THE OG-CDU 1X RESOLVER BEFORE THE ENTRY MODE IS COMMANDED. THE COMMAND OF G+N ENTRY MODE IN THE SCS SWITCHES ROLL ATTITUDE CONTROL FROM THE OUTPUT OF THE OG-CDU 1X RESOLVER TO THE OUTPUT OF THE OG-CDU 16X RESOLVER. BEFORE THE ENTRY MODE IS SWITCHED INTERNALLY IN THE G+N SYSTEM HOWEVER THE INPUT TO THE OG-CDU 16X RESOLVER IS FROM THE OG 16X RESOLVER AND AFTER THIS MODE IS SWITCHED IN THE G+N INPUT TO THE OG-CDU 1X IS OPEN (SEE FIGURE 3-1, R507). BECAUSE OF THESE MODING RELATIONSHIPS IT IS NECESSARY TO REMOVE G+N ATTITUDE CONTROL OF THE VEHICLE WHEN SWITCHING TO G+N ENTRY MODE IN THE SCS AND ISS ENTRY MODE.

(3) THE ROUTINE IS NORMALLY AUTOMATICALLY SELECTED BY THE ENTRY-CM/SM SEPARATION AND PRE-ENTRY MANEUVER PROGRAM (P 62)

| PROG<br>CONT                     | AGC                                                                   | GRJND | CREW | CHECKLIST | TIME | TOTAL<br>TIME   |
|----------------------------------|-----------------------------------------------------------------------|-------|------|-----------|------|-----------------|
| SCS-G+N<br>ATTITUDE<br>PRESENT   |                                                                       |       |      |           |      |                 |
|                                  | • AGC ROUTINE<br>• SELECTION<br>•<br>•                                |       |      |           |      |                 |
| ISS-ATT<br>CONT. MODE<br>PRESENT |                                                                       |       |      |           |      |                 |
|                                  | -----<br>START ENTRY CONTROL<br>MODE CHECK ROUTINE<br>(R 3)<br>-----  |       |      |           |      | #10             |
|                                  | -----<br>TERMINATE SCS<br>DISCRETE MONITOR<br>ROUTINE (R 22)<br>----- |       |      |           |      |                 |
|                                  | •<br>•<br>•<br>•<br>•<br>•<br>•                                       |       |      |           |      | #20<br><br>R 03 |





```

 .
 .
 .

READ OG-CDU REGISTER
AND COMPUTE DES-
IRED OG-CDU ANGLE
FOR NEAREST ATT.
ERROR NULL FROM THE
16X RESOLVER

```

#80

```

 .
 .
 .

CALL CDU DRIVE FOR
OG-CDU ONLY

```

#90

```

 .
 .
 .

COMMAND ISS SWITCH
TO ENTRY MODE

```

```

ISS-ENTRY
MODE
PRESENT

```

#100

```

 .
 .
 .

IS THE SCS IN THE
G&N ENTRY MODE
(CHECK DISCRETE)

```

```

Y. .N

```

#110

```

POSS .
.....
HOLD .

```

```

 .
 .
 .

FLASH VERB-NOUN
TO REQUEST PLEASE
PERFORM G+N
ENTRY MODE
SELECTION IN SCS
V50 N25
R1-00003

```

```

 .
 .
 .

MONITOR DSKY:
OBSERVE VERB-NOUN
FLASH TO REQUEST
PLEASE PERFORM G+N
ENTRY MODE SELECTION
IN SCS

```

```

4. CHECK AGC FLASHES VERB-NOUN TO
REQUEST PLEASE PERFORM G+N ENTRY
MODE SELECTION IN SCS
V50 N25
R1-00003

```

```

A. DEPRESS FDAI ALIGN PB FOR
APPROX 10 SEC.

```

#120

```

B. OPEN FOLLOWING CKT BKRS
(MDC-25):

```

- A+C ROLL - MNA
- A+C ROLL - MNB
- B+D ROLL - MNB
- PITCH - MNB
- YAW - MNB

```

C. SET ATT SET DIALS

```

#130

R 03

R - 0  
P - 0  
Y - 152 DEG

D. SET DIRECT RCS SW TO  
DIRECT RCS

5. PILOT ACCEPTS REQUEST:

#140

A. SET G+N/SCS SW. TO G+N

B. SET ATTITUDE/MONITOR/ENTRY SW  
TO ENTRY

STOP AT MONITOR MOMENTARILY TO  
CONFIRM ATT ERRORS ARE NULLED

#150

C. KEY IN ENTER

#160

6. PILOT REJECTS REQUEST:

#170

A. BYPASS THE MODE CHECK.  
KEY IN PROCEED  
V 33 E  
UR  
B. TERMINATE PROGRAM.  
KEY IN DESIRED PROGRAM  
V 37 E -- E

R 03

SCS-G+N  
ENTRY  
PRESENT

WAIT FOR KEY-  
BOARD ENTRY

-----  
DOES THERE APPEAR  
TO BE ANY REASON  
I CANNOT SELECT  
G6N ENTRY MODE  
-----

N. . . . . Y

-----  
SET SCS  
CONTROL  
SWITCHES  
PER CHECK  
LIST  
-----

-----  
KEY IN  
ENTER  
-----

-----  
I HAVE THE FOLLOWING  
ALTERNATIVES:  
-----

(1) BYPASS THE MODE  
CHECK  
KEY IN PROCEED  
V 33 E

(2) TERMINATE THE  
PROGRAM AND USE  
BACKUP PROCEEDURES

TERMINATE FLASH  
UPON ENTRY

•P •NEW •E  
•R •PROG •N  
•O •T  
•C •E  
•E •R  
•D .....

GO TO DESIRED  
PROGRAM

EXIT R3 AND P--

EXIT R3

KEY IN DESIRED  
PROGRAM  
V 37 E -- E

DID I SET THE SCS  
CHANNEL SWITCHES  
OFF.

•N •Y  
•  
•  
• SET THEM TO ON  
• AS PER CHECK-  
• LIST  
•  
•  
•  
•  
•  
•

7. IF THE SCS CHANNEL SWITCHES WERE  
SET TO OFF IN STEP 3, SET THEM AS  
FOLLOWS:

- A. SET A AND C ROLL SW. TO  
A&C ROLL
- B. SET B AND D ROLL SW. TO  
B&D ROLL
- C. SET YAW SW. TO YAW

R 03

#180

#190

#200

#210

#220

R 03

•  
•  
•  
•  
•  
•

-----  
CALL SCS DISCRETE  
MONITOR ROUTINE  
(R 22)  
-----

ISS-ENTRY  
MODE  
PRESENT  
  
SCS-G+N  
ENTRY  
PRESENT

•  
•  
•  
•  
•  
•••  
•  
EXIT R3

•  
EXIT R3

R 03

#230

#240



ISS  
FINE  
ALIGN  
MODE  
PRE-  
SENT

SET MARK INDEX TO 1  
FOR USE BY THE  
SIGHTING MARK  
ROUTINE (R27).

DO SIGHTING MARK  
ROUTINE (R 27) FOR  
STAR #1

IS THE OPTICS  
POINTING COMPUTATION  
IN PROCESS?

.Y .N

TERMINATE  
COMPUTATION

IS THE AGC IN THE  
SIVB/IMU ALIGN  
PROGRAM (P52)?

.N .Y

COMMAND ISS  
TO ATTITUDE  
CONTROL MODE

ISS  
ATT  
CONT  
MODE  
PRE-  
SENT  
(IF  
NOT  
P52)

SELECT STAR #2 FOR  
AUTO OPTICS POS-  
ITIONING ROUTINE

DO SIGHTING MARK  
ROUTINE (R 27) FOR  
STAR #1

2. PERFORM SIGHTING MARK ROUTINE  
(R 27) FOR STAR #1

R 04

R 04

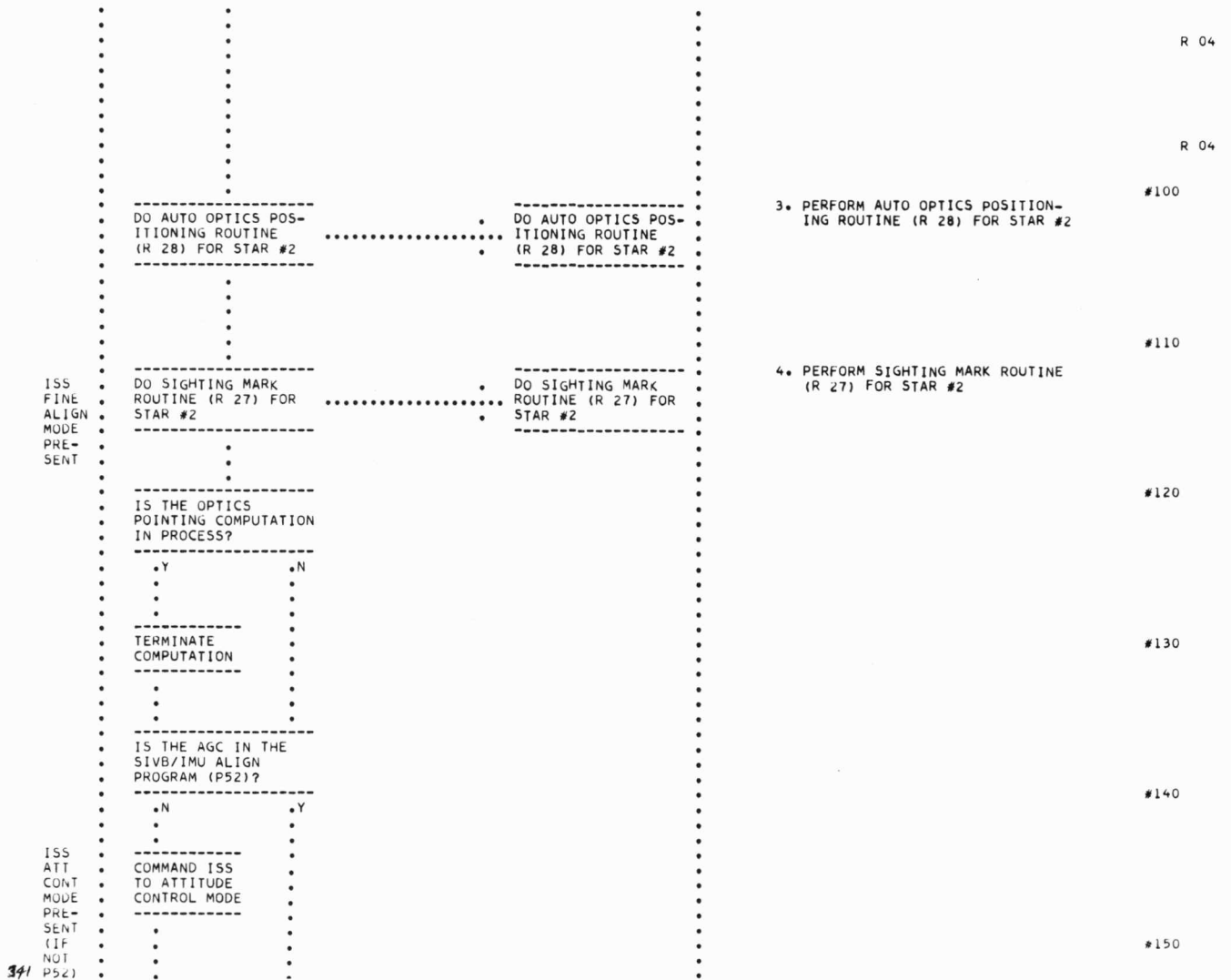
#50

#60

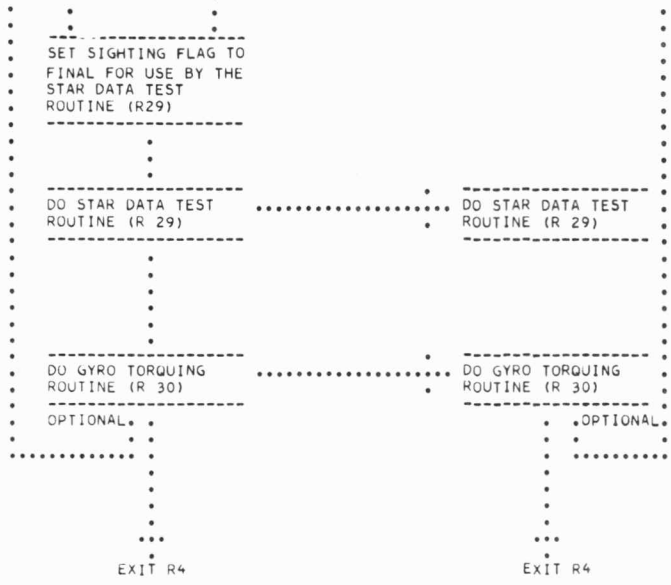
#70

#80

#90







R 04

5. PERFORM STAR DATA TEST ROUTINE (R 29)

#160

6. PERFORM GYRO TORQUING ROUTINE (R 30). RETURN TO 1 ABOVE FOR FINE ALIGN CHECK IF DESIRED.

#170

#180

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

ATTITUDE MANEUVER ROUTINE (R21)

REV 8

6-20-66 9

PURPOSE: (1) TO MANEUVER THE S/C TO AN ATTITUDE SPECIFIED BY THE PROGRAM IN PROGRESS. MANEUVER MAY BE PERFORMED BY AGC OR PERFORMED MANUALLY WITH FINAL AGC TRIM MANEUVER.

ASSUMPTIONS: (1) THE FINAL ATTITUDE DESIRED HAS BEEN STORED BY THE CALLING PROGRAM.  
 (2) THE ROUTINE IS NORMALLY AUTOMATICALLY SELECTED BY THE PROGRAM REQUIRING AGC TO HAVE ATTITUDE CONTROL.

| PRG<br>CONT                     | AGC                                                                                                                                                                       | GROUND | CREW | CHECKLIST | TIME    | TOTAL<br>TIME |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|-----------|---------|---------------|
| SCS-G+N<br>ATTITUDE<br>PRESENT  | •AGC<br>•ROUTINE<br>•SELECTION<br>•<br>•<br>•                                                                                                                             |        |      |           |         |               |
| ISS-ATT<br>CONT MODE<br>PRESENT | •••<br>•                                                                                                                                                                  |        |      |           |         |               |
|                                 | -----<br>START ATTITUDE<br>MANEUVER ROUTINE<br>(R 21)<br>-----<br>OBTAIN DESIRED ATT-<br>ITUDE FROM THE<br>CALLING PROGRAM<br>-----<br>•<br>•<br>•                        |        |      |           | 00: #10 |               |
|                                 | -----<br>READ PRESENT VEHICLE<br>ATTITUDE FROM ICDUS<br>(ASSUMES AGC HAS<br>ATTITUDE CONTROL OF<br>SPACECRAFT)<br>-----<br>•<br>•<br>•                                    |        |      |           |         | #20           |
|                                 | -----<br>IS THIS P61 OR P62?<br>-----<br>N•                    Y•<br>•                    •<br>•                    •<br>•                    •<br>•                    • |        |      |           |         | #30           |
|                                 |                                                                                                                                                                           |        |      |           |         | R 21          |

393

#40

IF THIS IS AN ABORT OR P61 OR P62  
PROCEED TO STEP C.

#50

\* A. IF DESIRED ALIGN AGCU AND FDAI

PILOT:  
(1) CHECK AGC FLASHES VERB=NOUN TO  
REQUEST PROCEED AND DISPLAYS  
PRESENT IMU ANGLES  
V16 N20  
R1 - OG ROLL  
R2 - IG PITCH  
R3 - MG YAW

#60

ALL ANGLES IN DEGREES TO  
NEAREST .01 DEGREE.

(2) SET ATTITUDE SET THUMBWHEELS  
TO VALUES DISPLAYED ON DSKY

(3) SET G6N/SCS SW AT SCS

#70

(4) SET ATT SET/OFF SW AT ATT SET

(5) HOLD FDAI ALIGN PB IN  
UNTIL FDAI STOPS DRIVING AND  
ERROR NEEDLES NULLED

#80

INHIBIT SCS  
DISCRETE MONITOR  
ROUTINE (R-22)

PUSH . . . . .  
HOLD . . . . .  
FLASH VERB=NOUN TO  
REQUEST PROCEED AND  
DISPLAY PRESENT  
CDU/GIMBAL ANGLES

V16 N20  
R1=OG ROLL  
R2=IG PITCH  
R3=MG YAW

ALL ANGLES IN  
DEGREES TO NEAREST  
.01 DEGREE

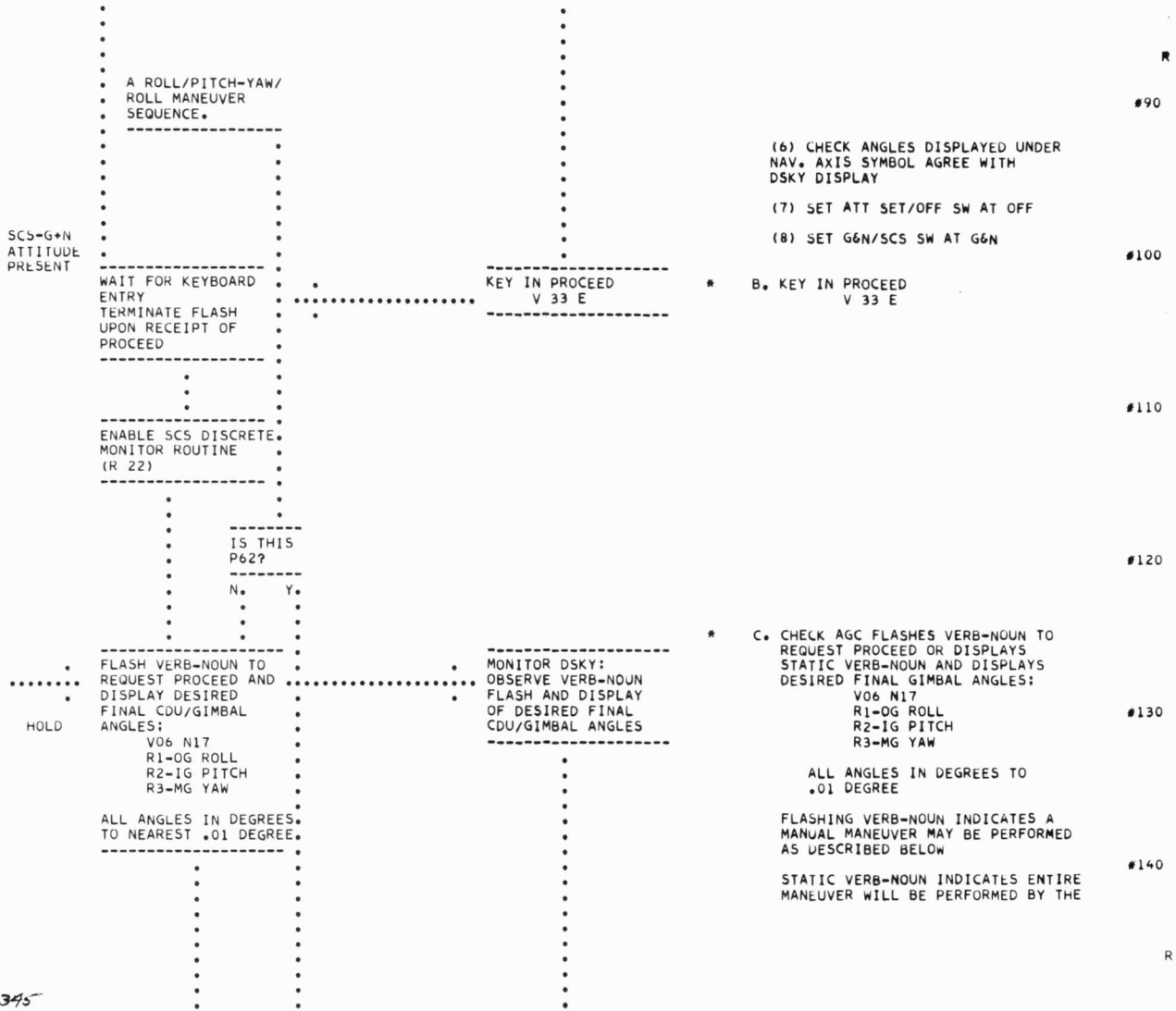
MONITOR DSKY:  
OBSERVE VERB=NOUN  
FLASH AND DISPLAY OF  
PRESENT CDU/GIMBAL  
ANGLES

IF DESIRED ALIGN  
AGCU AND FDAI TO  
PREPARE ARS

CALL MANEUVER  
CALCULATION TO  
AVOID GIMBAL LOCK.  
THIS MAY INVOLVE A  
ROLL/PITCH-YAW/ROLL  
MANEUVER SEQUENCE.

SCS-G+N  
ATTITUDE  
REMOVED

CALL MANEUVER  
CALCULATION TO  
AVOID GIMBAL LOCK.  
THIS MAY INVOLVE



#90

#100

#110

#120

#130

#140

AGC

\* D. IF DESIRED SET ATTITUDE SET THUMBWHEELS TO VALUES DISPLAYED ON DSKY\*

THUMBWHEELS ARE SET TO PROVIDE A BACKUP REFERENCE IN THE EVENT OF G+N SYSTEM MALFUNCTION

#150

NOTE: IF SCS IS SWITCHED TO SCS ATT CONT, AND ATT SET SW IS SET TO ATT SET THE ARS WILL DISPLAY ATT, ERRORS ON THE FDAI WHICH IF NULLED BY THE ASTRO-NAUT WITH HIS ROTATION CONTROL WILL BRING THE SC TO THE SAME FINAL ATT, WHICH THE G AND N WOULD HAVE COMMANDED.

#160

\* E. PERFORM OR MONITOR S/C MANEUVER

#170

(1) IF VERB-NOUN DISPLAY IS STATIC MONITOR AGC CONTROLLED MANEUVER AS IN (2) (B)-(E) BELOW

#180

IF DESIRED SET ATTITUDE SET DIALS TO PREPARE ARS FOR A BACKUP OR MANUAL ATTITUDE CONTROL SITUATION. WHEN SWITCHED TO SCS ATT. CONT. THE ARS WILL DISPLAY ATT, ERRORS ON THE FDAI WHICH IF NULLED BY THE ASTRO-NAUT WITH HIS MANUAL ROTATION CONTROL WILL BRING THE SC TO THE SAME FINAL ATT. WHICH THE G AND N WOULD HAVE COMMANDED. IT MUST BE NOTED THAT UNLESS THE ASTRONAUT EXERCISES CARE TO AVOID IMU GIMBAL LOCK, (BY OBSERVING THE RED AREAS ON THE FDAI BALL) THE IMU INERTIAL REFERENCE MAY BE LOST.

DO I WISH TO DO THE MANEUVER MANUALLY

.N .Y

WAIT FOR KEYBOARD ENTRY

KEY IN PROCEED V 33 E

TERMINATE FLASH UPON RECEIPT OF PROCEED OR V 70 E

KEY IN V 70 E

P. V70E  
R.  
O.  
C.  
E.  
E.  
D.

#190

IS THIS P61?

.N .Y

SET CDU DRIVE TO 1/2 DEG/SEC SET CDU DRIVE TO 4 DEG/SEC SET CDU DRIVE TO 4 DEG/SEC

DO CDU DRIVE UNDER CONTROL OF ATTITUDE MANEUVER CALCULATION

IS THIS P62?

.N .Y

EXIT R21

COMMAND ISS TO FINE ALIGN MODE

MONITOR DRIVE OF CDU'S TO THE DESIRED ANGLES. INTERMEDIATE GIMBAL ANGLES MAY OCCUR DUE TO POSSIBLE ROLL/PITCH-YAW/ROLL MANEUVER SEQUENCE. OBSERVE FDAI BALL TO CONFIRM AVOIDANCE OF GIMBAL LOCK (RED AREAS ON BALL).

EXIT R21

MONITOR FDAI: OBSERVE ATTITUDE ERRORS TO GO TO ZERO

#200

#210

#220

(2) IF VERB-NOUN IS FLASHING AND IF G+N CONTROLLED MANEUVER IS DESIRED:

- (A) KEY IN PROCEED V33E
(B) CHECK ICDUS ARE DRIVEN AND SC FOLLOWS
(C) CHECK ICDUS STOP AT REQUIRED ANGLES
(D) CHECK IMU-CDU DIFFERENCE INDICATOR INDICATES RANDOM SC MOTION WITHIN DEADBAND

#230

PILOT:

- (E) CHECK FDAI ATTITUDE CHANGES SLOWLY TO ICDU ANGLES DISPLAYED ON DSKY. RATE NEEDLES INDICATE SC IS DRIVEN AT APPROX. 1/2 DEG/SEC IF THIS IS NOT P61, P62 OR AN ABORT PROGRAM OTHERWISE AT 4 DEG/SEC

#240

#250

(3) IF VERB-NOUN IS FLASHING AND

347

ISS-FINE  
ALIGN MODE  
PRESENT

-----  
WAIT 20 SEC  
-----

.....  
HOLD .....  
FLASH VERB-NOUN TO  
REQUEST PLEASE PER-  
FORM ATTITUDE TRIM  
MANEUVER ENABLE  
V50 N25  
R1-00007  
-----

-----  
WAIT FOR KEYBOARD  
ENTRY  
TERMINATE FLASH  
UPON RECEIPT OF  
ENTER  
-----

-----  
READ PRESENT VEHICLE  
ATTITUDE FROM ICDUS  
-----

.....  
MANUALLY ROTATE S/C  
TO THE DESIRED  
ATTITUDE INDICATED  
ON THE DSKY DISPLAY.  
MONITOR FDAI BALL  
FOR TOTAL ATTITUDE  
INDICATION AND G+N  
GIMBAL LOCK AVOID-  
ANCE. FDAI ERROR  
NEEDLES WILL NOT  
INDICATE CORRECT  
ATTITUDE ERROR.  
-----

.....  
MONITOR DSKY:  
OBSERVE VERB-NOUN  
FLASH TO REQUEST  
PLEASE PERFORM ATTI-  
TUDE TRIM MANEUVER  
-----

.....  
COMPLETE MANUAL  
ATTITUDE MANEUVER  
-----

.....  
KEY IN ENTER  
-----

.....  
EXIT R21  
.....

IF MANUAL ATTITUDE MANEUVER IS  
DESIRED:

- (A) MEMORIZE OR RECORD  
R1-OG ROLL ANGLE
- (B) KEY IN V70E #260
- (C) CHECK FDAI ERROR NEEDLES  
GO TO ZERO
- (D) USE ROTATION CONTROL TO  
MANEUVER SC UNTIL FDAI  
ATTITUDE AGREES WITH DSKY  
DISPLAY. FDAI ERROR  
NEEDLES SHOULD REMAIN  
NEAR ZERO. #270
- (E) MONITOR FDAI FOR GIMBAL  
LOCK AVOIDANCE
- (F) CHECK AGC FLASHES VERB-  
NOUN TO REQUEST PLEASE  
PERFORM ATTITUDE TRIM  
MANEUVER ENABLE  
V50 N25  
R1-00007 #280
- (G) WHEN READY TO RETURN TO  
G+N ATTITUDE CONTROL:  
KEY IN ENTER

NOTE: IN THE CASE WHERE  
THE DESIRED OG  
CDU ANGLE IN  
R1 IS USURPED BY THE  
PLEASE PERFORM DISPLAY  
THE DESIRED IG CDU AND  
CDU ANGLES REMAIN IN R2  
AND R3. #290

- (H) MONITOR ATTITUDE TRIM  
MANEUVER AS IN (2) ABOVE. #300

R 21

R 21

```

:
:
:
:-----:
: COMMAND ISS TO
: ATTITUDE CONTROL
: MODE
:-----:
ISS-ATT :
CONT MODE :
PRESENT :
:
:-----:
: CALCULATE MANEUVER
: REQUIRED TO DESIRED
: FINAL ATTITUDE
: AVOIDING GIMBAL
: LOCK.
:-----:
:
:
:-----:
: IS ABORT FLAG
: SET OR IS THIS
: P61
:-----:
: .N .Y
: : :
: : :
:-----:
: SET CDU SET CDU
: DRIVE DRIVE
: TO 1/2 TO 4
: DEGREE/ DEGREES/
: SEC SEC
:-----:
:
:-----:
: DO CDU DRIVE UNDER
: CONTROL OF ATTITUDE
: MANEUVER CALCULATION
:-----:
ISS-ATT :
CONT MODE :
PRESENT :
:
:-----:
:
:-----:
MONITOR DRIVE OF
: ICDU'S TO THE FINAL
: DESIRED ANGLES.
: INTERMEDIATE
: ANGLES MAY OCCUR
: DUE TO POSSIBLE
: ROLL/PITCH-YAW/ROLL
: MANEUVER SEQUENCE.
: OBSERVE FDAI BALL
: TO CONFIRM
:-----:

```

R 21

#310

#320

#330

#340

#350

#360

R 21



R 21

SCS-G+N  
ATTITUDE  
PRESENT

AVOIDANCE OF GIMBAL  
LOCK (RED AREAS  
ON BALL).

EXIT R 21

EXIT R21

#370

FLASH VERB-NOUN TO  
REQUEST PROCEED  
AND DISPLAY STORED  
DATA

MONITOR DSKY:  
OBSERVE VERB-NOUN  
FLASH TO REQUEST  
LOAD OF S/C ENTRY  
ROLL ATTITUDE

#380

V06 N62  
R1-IMPACT LAT  
R2-IMPACT LONG  
R3-HEADS UP/DOWN

F. IF THIS IS P62 CHECK AGC FLASHES  
VERB-NOUN TO REQUEST PROCEED AND  
DISPLAYS:

V06 N62  
R1 - IMPACT LAT  
R2 - IMPACT LONG  
R3 - HEADS UP/DOWN

#390

IMPACT LAT-LATTI-  
TUDE OF DESIRED  
IMPACT POINT, IN  
DEGREES TO NEAREST  
.01 DEG. + IS  
NORTH

IMPACT LAT - LATTITUDE OF  
DESIRED IMPACT POINT. IN  
DEGREES TO NEAREST .01  
DEGREE. + IS NORTH

IMPACT LONG-LONG-  
ITUDE OF DESIRED  
IMPACT POINT. IN  
DEGREES TO NEAREST  
.01 DEG. + IS EAST

IMPACT LONG - LONGITUDE OF  
DESIRED IMPACT POINT. IN  
DEGREES TO NEAREST .01  
DEG. + IS EAST

#400

HEADS UP/DOWN  
DEFINES ENTRY ROLL  
ATTITUDE  
+00001 FOR HEADS  
UP/LIFT DOWN  
-00001 FOR HEADS  
DOWN/LIFT UP

HEADS UP/DOWN - DEFINES  
ENTRY ROLL ATTITUDE  
+00001 FOR HEADS UP/LIFT  
DOWN  
-00001 FOR HEADS DOWN/LIFT  
UP

AM I SATISFIED WITH  
THESE VALUES?

#410

.Y .N

R 21

350



APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

MISSION 204      SCS DISCRETE MONITOR ROUTINE (R 22)      REV 8      6/20/66

PURPOSE: (1) TO MAINTAIN A MONITOR OF AN SCS MODE WHICH THE AGC MUST ASSUME TO BE SET TO CORRECTLY CONTROL AN ATTITUDE MANEUVER, THRUSTING MANEUVER OR ENTRY MANEUVER AND TO WARN THE CREW IF THE MODE DISCRETE TO THE AGC IS LOST.

ASSUMPTIONS: (1) THE AGC IS GIVEN ONLY ONE DISCRETE AS A REFERENCE FOR IT TO IDENTIFY ANY GIVEN G+N CONTROL MODE IN THE SCS. THERE ARE HOWEVER MANY SWITCHES IN THE SCS WHICH WILL INHIBIT G+N CONTROL WHILE THE DISCRETE IS STILL PROVIDED TO THE AGC. ASSUMING THAT IT IS NOT DESIRABLE TO PROVIDE A DISCRETE TO THE AGC FOR EACH OF THESE SWITCHES, THE ONE DISCRETE PROVIDED MUST REPRESENT THE CORRECT POSITION OF THE BLOCK OF ALL NECESSARY SWITCHES. THE OBLIGATION IS THUS UPON THE CHECKLIST PROCEDURES TO ENSURE THAT THE DISCRETE IS ONLY PROVIDED THE AGC AFTER ALL APPROPRIATE SWITCHES HAVE BEEN PLACED IN THE CORRECT POSITIONS.

(2) THERE WILL NEVER BE MORE THAN ONE SCS MODE DISCRETE SENT TO THE AGC AT ANY TIME.

(3) UPON THE DETECTION OF THE REMOVAL OF AN SCS MODE DISCRETE THE AGC WILL DISPLAY ONLY THE PROGRAM ALARM LIGHT AND ASSOCIATED DISPLAYS BUT WILL NOT INTERRUPT THE PROGRAM IN PROCESS.

(4) THE ROUTINE IS NORMALLY AUTOMATICALLY SELECTED BY ENTERING V37, THE ATTITUDE CONTROL MODE CHECK ROUTINE, THE THRUST CONTROL MODE CHECK ROUTINE, OR THE ENTRY CONTROL MODE CHECK ROUTINE AND IS TERMINATED BY THE AGC IDLING PROGRAM (P00).

| PRG<br>CONT | AGC                                                                              | GROUND | CREW | CHECKLIST | TIME | TOTAL<br>TIME |
|-------------|----------------------------------------------------------------------------------|--------|------|-----------|------|---------------|
|             | •AGC<br>•ROUTINE<br>•SELECTION<br>•<br>•••                                       |        |      |           |      |               |
|             | -----<br>START SCS DISCRETE<br>MONITOR ROUTINE<br>-----<br>•<br>•                |        |      |           |      | #10           |
|             | -----<br>SET DESIRED SCS MODE<br>BIT IN DESSCSSET<br>REGISTER<br>-----<br>•<br>• |        |      |           |      | #20           |
|             | •••••<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•                               |        |      |           |      | R 22          |

352













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•  
•  
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•

-----  
READ PRESENT IMU  
ORIENTATION W.R.T.  
THE VEHICLE.  
(CDU/GIMBAL ANGLES)  
-----

•  
•

-----  
SELECT PRESENT IMU  
INERTIAL ORIENTATION  
FROM STORAGE  
-----

•  
•

-----  
CALCULATE THE  
INERTIAL ORIENTA-  
TION OF THE VEHICLE  
-----

•  
•

-----  
SELECT DESIRED IMU  
INERTIAL ORIENTATION  
FROM STORAGE (PRO-  
VIDED BY CALLING  
PROGRAM).  
-----

•  
•

-----  
CALCULATE REQUIRED  
FINAL CDU/GIMBAL AN-  
GLES (W.R.T. VEHICLE)  
TO GIVE DESIRED IMU  
INERTIAL ORIENTATION  
-----

•  
•

-----  
ARE ALL REQUIRED  
GIMBAL ANGLES LESS  
THAN OR EQUAL TO  
5 DEGREES  
-----

N • Y  
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• •  
• •

R 25

#40

#50

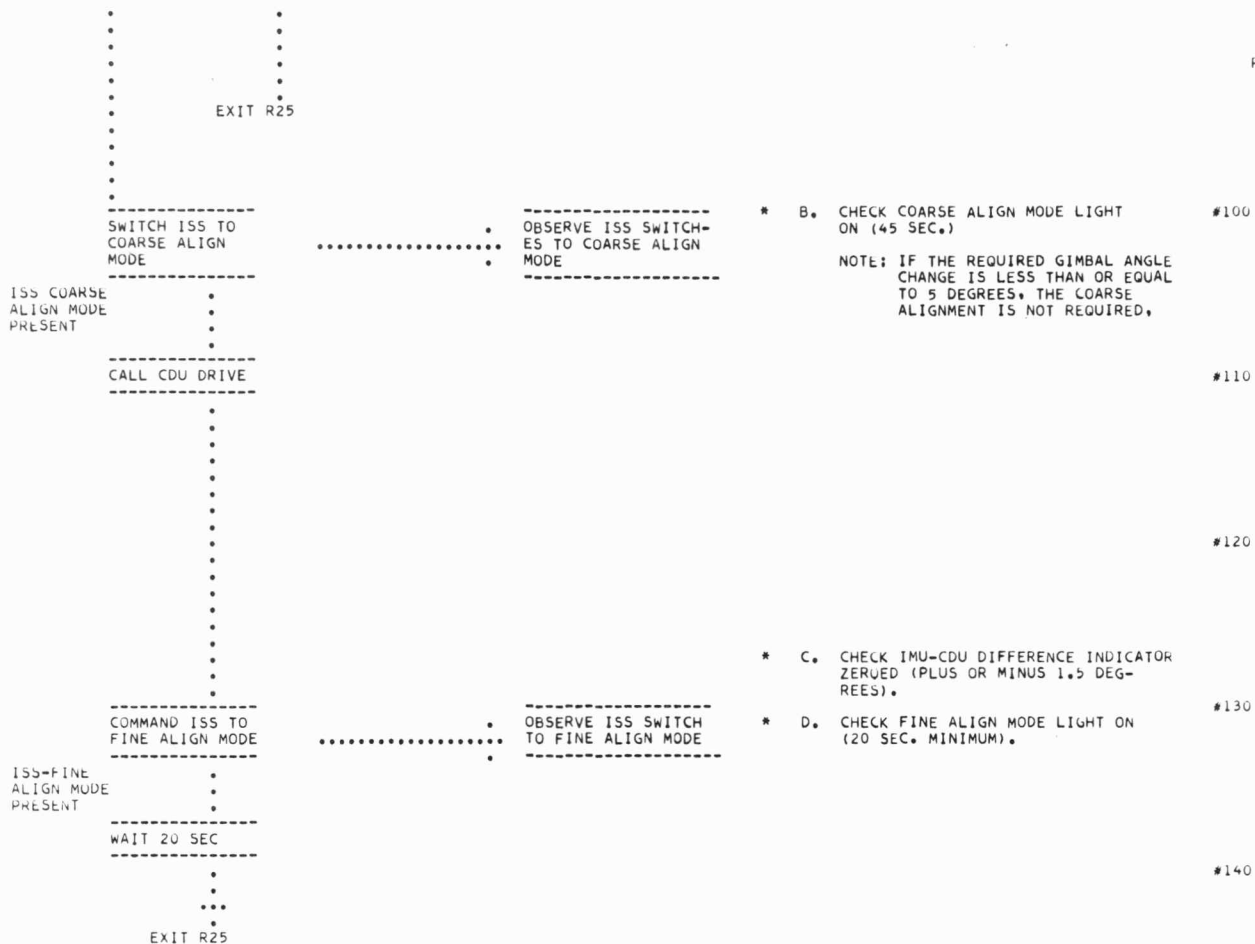
#60

#70

#80

#90

R 25



APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

SIGHTING MARK ROUTINE (R 27)

REV 12

6/20/66

PURPOSE: (1) TO PERFORM A SATISFACTORY NUMBER OF OPTICAL SIGHTING MARKS FOR THE REQUESTING PROGRAM (OR ROUTINE).

ASSUMPTIONS: (1) SIGHTINGS ARE MADE WITH EITHER SCT OR SXT AS REQUIRED.  
 (2) SIGHTINGS MAY BE MADE ON A STAR OR EARTH LANDMARK.  
 (3) WHEN THE AGC ACCEPTS A MARK IT RECORDS AND STORES 5 ANGLES (3 ICDUS AND 2 OCDUS) AND THE TIME OF THE MARK.  
 (4) MAXIMUM UNREJECTED-MARK THRESHOLDS ARE ESTABLISHED UTILIZING A MARK COUNTER. THIS MARK COUNTER WILL INCREMENT EACH TIME A MARK IS MADE AND DECREMENT EACH TIME A MARK REJECT IS MADE. THE MARK COUNTER WILL BE COMPARED AGAINST A MARK INDEX. THE MAGNITUDE OF THIS INDEX WILL BE SELECTED BY THE PROGRAM (OR ROUTINES) SELECTING THE SIGHTING MARK AS FOLLOWS:

- (A) STAR - 1
- (B) LANDMARK - 5

IN ADDITION MINIMUM UNREJECTED-MARK THRESHOLDS ARE ESTABLISHED IN THE PROCESSING LOGIC AS FOLLOWS:

- (A) STAR - 1
- (B) LANDMARK (KNOWN) - 1
- (C) LANDMARK (UNKNOWN) - 2

- (5) THE IMPULSE CONTROLLER MAY BE USED AS REQUIRED TO REDUCE THE S/C DRIFT RATE.
- (6) THE ROUTINE IS AUTOMATICALLY SELECTED BY THE PROGRAM OR THE ROUTINE REQUIRING THE SIGHTING.

| PRUG<br>CUNT | AGC | GROUND | CREW | CHECKLIST | TIME | TOTAL<br>TIME |
|--------------|-----|--------|------|-----------|------|---------------|
|--------------|-----|--------|------|-----------|------|---------------|

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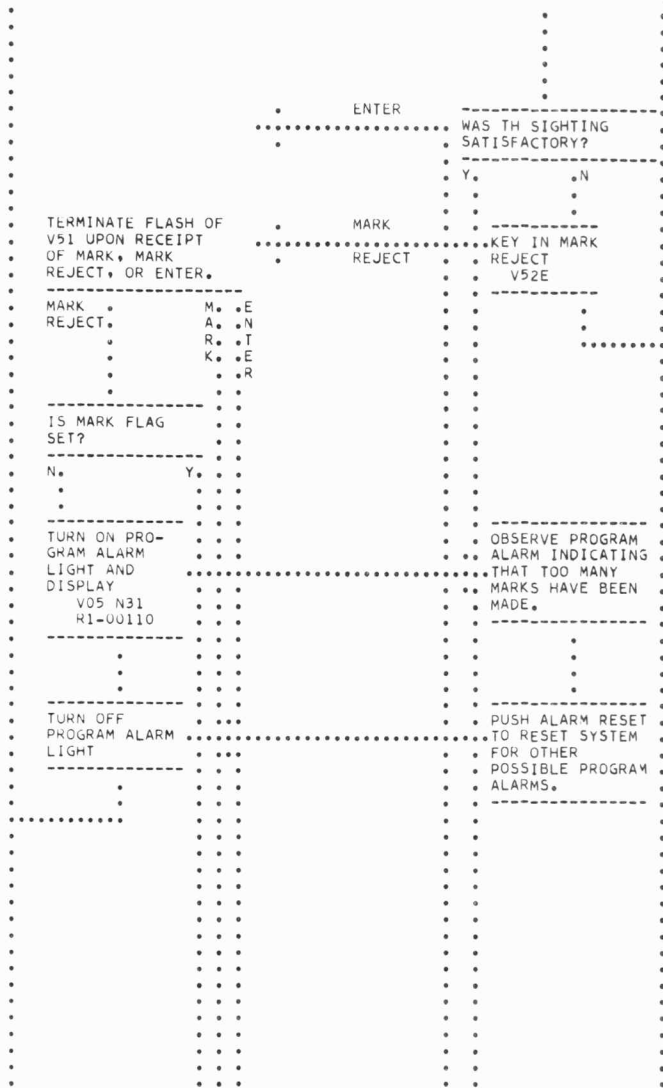
 .AGC ROUTINE
 .SELECTION
 .
 .
 .

 START SIGHTING MARK
 ROUTINE (R 27)

```

R 27





RECENTER AND RE-MARK.

NOTE: "MARK REJECT" WILL ONLY REJECT MARK DATA IF A "MARK" HAS BEEN MADE AND ONCE SUCH A REJECTION HAS BEEN MADE THE AGC WILL NOT REJECT FURTHER "MARK" DATA UNTIL ANOTHER "MARK" HAS BEEN MADE.

R 27

#70

#80

#90

#100

#110

R 27



R 27

HOLD

FLASH VERB NOUN TO  
REQUEST PLEASE  
PERFORM TERMINATE  
MARK SEQUENCE:  
V50 N25  
R1-00016

MONITOR DSKY:  
OBSERVE FLASHING  
VERB-NOUN TO REQUEST  
PLEASE PERFORM  
TERMINATE MARK  
SEQUENCE

#170

WAIT FOR KEYBOARD  
ENTRY.

WAS LAST MARK  
SATISFACTORY?

#180

.N .Y

MARK  
REJECT

KEY IN MARK  
REJECT  
V52E

#190

ENTER

KEY IN  
ENTER

TERMINATE FLASH UPON  
RECEIPT OF ENTER,  
MARK, OR MARK REJECT

SURPLUS  
MARK

SURPLUS  
MARK

#200

ENTER

MARK  
REJECT

SURPLUS  
MARK

#210

TURN ON PROGRAM  
ALARM LIGHT AND  
DISPLAY:  
V05 N31  
R1-00120

OBSERVE PROGRAM  
ALARM INDICATING  
THAT TOO MANY MARKS  
HAVE BEEN MADE

\*

(4) IF MARKS ARE GREATER THAN THE  
MAXIMUM ALLOWED THE AGC WILL  
DISPLAY:  
V05 N31  
R1 - 00120  
AND TURN ON PROG ALM (LEB),  
PGNS (LEB) AND COMP FAIL (MDC)  
PRESS ALARM RESET

R 27

```

. . .
. . .
. . .

TURN OFF PROGRAM
ALARM LIGHT
. . .
. . .
. . .

```

```

. . .
. . .
. . .

PUSH ALARM RESET TO
RESET SYSTEM FOR
OTHER POSSIBLE
PROGRAM ALARMS

```

PRESS ENTER

NOTE: MAXIMUM MARKS ARE:  
 STAR - 1  
 LANDMARK - 5

R 27

#220

```

RESET MARK FLAG

```

#230

```

IS MARK COUNTER ZERO

```

```

.N .Y
. . .
. . .

```

```

TURN ON PROGRAM
ALARM LIGHT AND
DISPLAY:
V05 N31
R1-00121

```

```

DOES PROGRAM ALARM
INDICATE THAT AGC
HAS RECEIVED IN-
SUFFICIENT MARKS?

```

(5) IF MARKS ARE EQUAL TO THE  
 MAXIMUM ALLOWED THE AGC WILL  
 FLASH VERB-NOUN TO REQUEST  
 ENTER:

V50 N25  
 R1 - 00016

#240

KEY IN ENTER

NOTE: IF ENTER IS KEYED IN  
 PRIOR TO OBTAINING  
 ANY MARKS AGC WILL  
 DISPLAY  
 V05 N31  
 R1 - 00121  
 AND TURN ON PROG ALM,  
 PGNS AND COMP FAIL.  
 GO TO BACKUP PROCEDURES.

#250

```

IS SIGHTING FLAG
STAR OR LANDMARK?

```

```

.STAR .LMK
. . .
. . .

```

```

GO TO BACKUP
PROCEDURES.

```

#260

```

. . .
. . .
EXIT P--
GO TO P00

```

#270

R 27



POSS  
.....  
HOLD

FLASH VERB-NOUN  
TO REQUEST LOAD  
OF LMK  
IDENTIFICATION.  
V21 N37  
R1 - BLANK

WAIT FOR KEY-  
BOARD ENTRY.

TERMINATE FLASH  
UPON RECEIPT OF  
ENTER.

.1(KN) .0(UKN)

.WAS ONLY 1  
.MARK RECEIVED

.Y .N  
.....

IS THE TARGET A STAR  
OR LANDMARK?

.LMK STAR.

MONITOR DSKY:  
OBSERVE FLASH-  
ING VERB-NOUN TO  
REQUEST LOAD OF  
LMK  
IDENTIFICATION.

LOAD SIGHTING  
IDENTIFICATION.  
R1-SIGHTING  
IDENTIFICA-  
TION

A. KNOWN LAND-  
MARK:  
KEY IN  
1 ENTER

B. UNKNOWN  
LANDMARK:  
KEY IN  
0 ENTER.

WAS SIGHTING AN  
UNKNOWN LANDMARK

.Y N.

#280

\* C. ENTER TARGET IDENTIFICATION.

\* (1) KNOWN LANDMARK:

(A) OBSERVE AGC FLASHES VERB-  
NOUN TO REQUEST TARGET  
IDENTIFICATION:  
V21 N37

#290

(B) KEY IN  
1 E

(C) OBSERVE FLASH OF V21 N63

(D) LOAD LANDMARK IDENTIFICA-  
TION:  
R1 - LAT  
R2 - LONG/2  
R3 - ALT

#300

LAT - LATITUDE OF LANDMARK. IN  
DEGREES TO NEAREST .001  
DEGREE. + IS NORTH.

LONG/2 - LONGITUDE OF LANDMARK  
DIVIDED BY TWO. IN DE-  
GREES TO NEAREST .001  
DEGREE. + IS EAST.

#310

ALT - ALTITUDE OF LANDMARK  
ABOVE THE FISCHER  
ELLIPSOID. IN NAUTICAL  
MILES TO NEAREST .01 N.M.

#320



LONG/2 - LONGI-  
TUDE OF  
LANDMARK  
DIVIDED BY  
TWO. IN DE-  
GREES TO  
NEAREST  
\*001 DE-  
GREE. + 15  
EAST.

ALT - ALTITUDE  
OF LAND-  
MARK ABOVE  
THE FISCHER  
ELLIPSOID.  
IN NAUTICAL  
MILES TO  
NEAREST  
\*01 N.M.

TERMINATE FLASH  
UPON RECEIPT  
OF ENTER.

EXIT R27

MONITOR DSKY:  
OBSERVE FLASHING  
VERB-NOUN TO REQUEST  
LOAD OF STAR CODE.

LOAD STAR CODE:  
R1-STAR CODE

STAR CODE - STAR  
DESIGNATION FROM  
CARRY ON DATA.

WAIT FOR KEYBOARD  
ENTRY.

TERMINATE FLASH UPON  
RECEIPT OF ENTER.

EXIT R27

EXIT R27

(3) STAR:

(A) OBSERVE AGC FLASH VERB-  
NOUN TO REQUEST STAR IDENTI-  
FICATION.  
V21 N30

(B) KEY IN STAR CODE  
R1 - STAR CODE

#380

#390

#400

#410

#420

#430

POSS  
.....  
HOLD

FLASH VERB-NOUN  
TO REQUEST LOAD  
OF STAR CODE.  
V21 N30

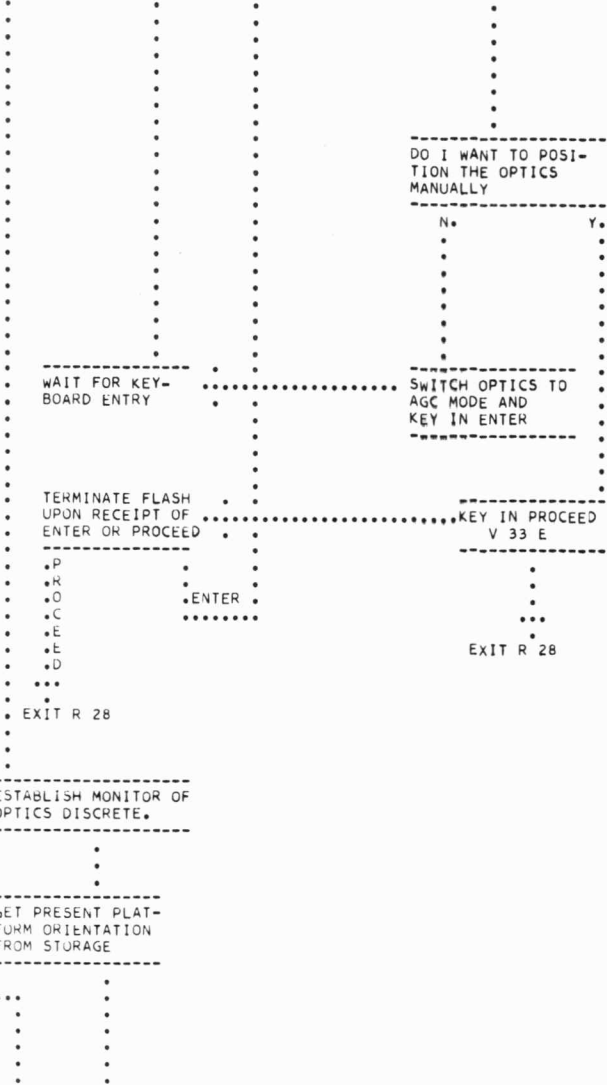
ISS-FINE  
ALIGN MODE  
PRESENT







USS MODE  
SW AGC  
CNTRL



R 28

#140

#150

(A) NAV ACCEPTS REQUEST:

PLACE OPTICS MODE SW TO  
COMPUTER AND KEY IN ENTER

#160

(B) NAV REJECTS REQUEST:

KEY IN PROCEED V33E AND  
POSITION OPTICS MANUALLY

#170

#180

#190

R 28

.....  
.....  
.....  
.....  
.....

R 28

-----  
READ PRESENT VEHI-  
CLE ATTITUDE FROM  
ICDUS (ASSUME G AND  
N HAS ATTITUDE CON-  
TROL OF THE VEHICLE  
OR ISS IS IN FINE  
ALIGN MODE)  
-----

#200

.....  
.....  
-----  
CALCULATE THE RE-  
QUIRED OPTICS ANGLES  
TO ACQUIRE THE  
TARGET  
-----

#210

.....  
.....  
-----  
IS REQUIRED TRUNNION  
ANGLE GREATER THAN  
OPTIC LOS LIMIT  
-----

N\*     .Y  
.....  
.....  
-----  
TURN ON PROGRAM  
ALARM LIGHT.  
.....  
.....  
.....  
.....  
.....  
.....  
EXIT P--

-----  
OBSERVE DSKY;  
PROGRAM ALARM  
INDICATES THAT TAR-  
GET IS BEYOND DRIVE  
LIMITS OF OPTICS  
-----

NOTE:  
POSSIBLE PROGRAM ALARM. INDICATES  
TARGET IS BEYOND OPTICS TRUNNION  
DRIVE LIMIT.  
SELECT NEW TARGET OR MANEUVER S/C  
IF PRACTICAL. RESELECT PROGRAM  
WHICH CALLED R28.

#220

.....  
.....  
-----  
MANEUVER VEHICLE  
UNTIL OPTICS CAN  
ACQUIRE THE DESIRED  
TARGET  
-----

#230

.....  
.....  
.....  
.....  
RESELECT P--

#240

R 28



-----  
DISPLAY ON DSKY:  
V16 N55  
R1 - SHAFT  
R2 - TRUNNION  
-----

SHAFT-  
OPTICS SHAFT ANGLE.  
IN DEGREES TO NEAR-  
EST .01 DEGREE.

TRUNNION-  
OPTICS TRUNNION  
ANGLE. IN DEGREES  
TO NEAREST .001  
DEGREE. MAX DIS-  
PLAY IS 89.999  
-----

-----  
CALL OPTICS CDU  
DRIVE.  
-----

-----  
CONTINUE CDU DRIVE  
AND OPTICS ANGLE DIS-  
PLAY UNTIL TERMI-  
NATE IS RECEIVED  
FROM CALLING ROUTINE  
-----

-----  
MONITOR DSKY:  
OBSERVE DISPLAY OF  
REQUIRED OPTICS  
ANGLES  
-----

-----  
OBSERVE OPTICS BEING  
DRIVEN TO ANGLES  
DISPLAYED  
-----

\* U. CHECK AGC DISPLAYS RE-  
QUIRED SHAFT ANGLE AND  
TRUNNION ANGLE  
V16 N55  
R1 - SHAFT  
R2 - TRUNNION

SHAFT-OPTICS SHAFT ANGLE.  
IN DEGREES TO NEAREST .01  
DEGREE.

TRUNNION-OPTICS TRUNNION ANGLE.  
IN DEGREES TO NEAREST .001  
DEGREE.

\* E. CHECK OCDUS AND TELESCOPE  
COUNTERS ARE DRIVEN TO  
OPTICS ANGLES DISPLAYED ON  
DSKY

\* F. IDENTIFY TARGET IN  
TELESCOPE FOV

#250

#260

#270

#280

.....  
OSS MODE  
SW AGC  
CNTRL

.....  
EXIT R 28

.....  
EXIT R 28

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

STAR DATA TEST ROUTINE (R 29)

REV 7

6/20/66

PURPOSE: (1) TO TEST THE ACCURACY OF A PAIR OF STAR SIGHTINGS

ASSUMPTIONS: (1) THE ROUTINE IS NORMALLY AUTOMATICALLY SELECTED BY THE INFLIGHT ALIGNMENT-IMU ORIENTATION DETERMINATION PROGRAM (P 51) OR SIVB/IMU ALIGN PROGRAM (P 52), OR CSM/IMU ALIGN PROGRAM (P 53), OR IMU REALIGNMENT PROGRAM (P54) VIA THE COMMON ALIGNMENT ROUTINE.

| PRG<br>CONT | AGC                                                                                                                                                                                                                    | GROUND | CREW | CHECKLIST                                                                                             | TIME | TOTAL<br>TIME |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|-------------------------------------------------------------------------------------------------------|------|---------------|
|             | <ul style="list-style-type: none"> <li>•AGC</li> <li>•ROUTINE</li> <li>•SELECTION</li> <li>•••</li> </ul>                                                                                                              |        |      |                                                                                                       |      |               |
|             | -----<br>START STAR DATA TEST<br>ROUTINE (R 29)<br>-----                                                                                                                                                               |        |      |                                                                                                       |      |               |
|             | CALCULATE ANGLE BE-<br>TWEEN TWO STARS<br>USING STORED EPHEM-<br>ERIS DATA (ACTUAL)<br>-----<br>•<br>•<br>•                                                                                                            |        |      | A. MONITOR STAR DATA TEST                                                                             |      | #10           |
|             |                                                                                                                                                                                                                        |        |      | NOTE:<br>AGC NOW DOES STAR DATA TEST BY<br>COMPARING OPTICS ANGLES WITH STORED<br>STAR EPHEMERIS DATA |      |               |
|             | CALCULATE ANGLE BE-<br>TWEEN TWO STARS<br>USING STAR VECTORS<br>DERIVED FROM MARK<br>ANGLES (INDICATED)<br>-----<br>•<br>•<br>•                                                                                        |        |      |                                                                                                       |      | #20           |
|             | -----<br>IS THIS P51?<br>-----                                                                                                                                                                                         |        |      |                                                                                                       |      | #30           |
|             | •Y            •N<br>•            •<br>•            •<br>•            •<br>•            •<br>•            •<br>•            •<br>•            •<br>•            •<br>•            •<br>•            •<br>•            • |        |      |                                                                                                       |      |               |
|             |                                                                                                                                                                                                                        |        |      |                                                                                                       |      | R 29          |





APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

MISSION 204 GYRO TORQUING ROUTINE (R 30)

REV 9

6/20/66

PURPOSE: (1) TO CALCULATE GYRO TORQUING ANGLES FOR FINAL (FINE) ALIGNMENT OF THE INERTIAL PLATFORM DURING AN INFLIGHT ALIGNMENT. TO DISPLAY THESE ANGLES AND TO TORQUE THE GYROS.

ASSUMPTIONS: (1) THE ROUTINE IS NORMALLY AUTOMATICALLY SELECTED BY THE FINE ALIGNMENT ROUTINE (R 4).

| PRUG<br>CUNT                      | AGC                                                                                                                                                               | GROUND | CREW                                                                                            | CHECKLIST                                                                                                                            | TIME | TOTAL<br>TIME |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------|---------------|
| ISS-FINE<br>ALIGN MODE<br>PRESENT | •AGC<br>•ROUTINE<br>•SELECTION<br>•••<br>•                                                                                                                        |        |                                                                                                 |                                                                                                                                      |      |               |
|                                   | -----<br>START GYRO TORQUING<br>ROUTINE<br>-----                                                                                                                  |        |                                                                                                 |                                                                                                                                      |      |               |
|                                   | -----<br>CALCULATE REQUIRED<br>TORQUING ANGLES FOR<br>EACH GYRO<br>-----                                                                                          |        |                                                                                                 | A. MONITOR GYRO TORQUING ANGLE TEST                                                                                                  | #10  |               |
|                                   | •<br>•<br>•                                                                                                                                                       |        |                                                                                                 | NOTE: AGC NOW DOES TORQUING<br>ANGLE TEST BY COMPARING<br>REQUIRED TORQUING ANGLES<br>WITH STORED MAXIMUM<br>CRITERIA                |      |               |
|                                   | -----<br>IS ANY ANGLE GREATER<br>THAN 5 DEGREES<br>-----                                                                                                          |        |                                                                                                 |                                                                                                                                      | #20  |               |
|                                   | •Y •N<br>• •<br>• •                                                                                                                                               |        |                                                                                                 | * (1). DATA GOOD:                                                                                                                    |      |               |
|                                   | -----<br>• DISPLAY ON DSKY:<br>• GYRO TORQUING<br>• ANGLES<br>• V06 N67<br>• R1-X GYRO<br>• R2-Y GYRO<br>• R3-Z GYRO<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>• | •<br>• | -----<br>MONITOR DSKY:<br>OBSERVE STATIC<br>VERB-NOUN AND<br>DISPLAY OF GYRO<br>TORQUING ANGLES | CHECK AGC DISPLAYS STATIC VERB-<br>NOUN AND DISPLAYS GYRO TORQUING<br>ANGLES<br>V06 N67<br>R1 - X GYRO<br>R2 - Y GYRO<br>R3 - Z GYRO | #30  |               |

R 30

```

.
.
.
.
.
GYRO TORQUING
. ANGLES-THE ANGLE
. THRU WHICH EACH
. GYRO MUST BE
. TORQUED TO COM-
. PLETE THE FINE
. ALIGNMENT. ALL
. ANGLES IN DEGREES
. TO NEAREST .001
. DEGREE.

.

```

OR

```

POSS . FLASH VERB-NOUN
..... TO REQUEST PROCEED
HOLD . AND DISPLAY
 V06 N67
 R1-X GYRO
 R2-Y GYRO
 R3-Z GYRO

```

```

. OBSERVE VERB-NOUN
. FLASH TO REQUEST
. PROCEED AND DISPLAY
. OF GYRO TORQUING
. ANGLES

```

```

. FLASHING STATIC.
. VERB-NOUN VERB-
. NOUN
.

```

```

SHALL I PERMIT
TORQUING

```

```

N. Y.
.
.
.

```

```

WAIT FOR KEYBOARD
ENTRY

```

```

. KEY IN
. TERMINATE
. V 34 E
.

```

```

.
.
.
EXIT P--

```

GYRO TORQUING ANGLES - THE ANGLE THRU WHICH EACH GYRO MUST BE TORQUED TO COMPLETE THE FINE ALIGNMENT. IN DEGREES TO NEAREST .001 DEGREE.

R 30

#40

(2). DATA BAD;

IF GYRO TORQUING ANGLES ARE GREATER THAN 5 DEG. CHECK AGC FLASHES VERB-NOUN TO REQUEST PROCEED AND DISPLAYS TORQUING ANGLES

```

VU6 N67
R1 - X GYRO
R2 - Y GYRO
R3 - Z GYRO

```

#50

#60

\* (3). NAV. REJECTS DATA:

```

KEY IN TERMINATE
V 34 E

```

CHECK AGC DISPLAYS P00

#70

R 30

TERMINATE FLASH  
UPON RECEIPT OF  
PROCEED OR TERMIN-  
ATE

T.  
E.  
R.  
M.  
.  
.  
-----  
TERMINATE  
PROGRAM  
GO TO AGC  
IDLING  
PROGRAM  
(P00)  
-----  
.  
.  
.  
EXIT P--

-----  
KEY IN PROCEED  
V 33 E  
-----

\* (4) NAV ACCEPTS DATA:  
KEY IN PROCEED  
V 33 E

R 30  
#80

-----  
PULSE IRIGS THROUGH  
DESIRED ANGLES  
-----

-----  
MONITOR PLATFORM  
MOTION ON CDU DIALS  
-----

\* B. MONITOR ICPU CHANGE AS AGC TORQUES  
PLATFORM

#90

#100

#110

.....  
HOLD  
FLASH VERB-NOUN TO  
REQUEST PLEASE  
PERFORM FINE ALIGN  
CHECK:  
V50 N25  
R1 - 00014

-----  
MONITOR DSKY:  
OBSERVE VERB-NOUN  
FLASH TO REQUEST  
PLEASE PERFORM FINE  
ALIGN CHECK  
-----

\* C. CHECK AGC FLASHES VERB-NOUN TO RE-  
QUEST PLEASE PERFORM FINE ALIGN  
CHECK  
V50 N25  
R1 - 00014

#120

-----  
DO I WANT TO CHECK  
THE FINE ALIGNMENT  
-----

N. Y.  
.  
.  
.

#130

-----  
WAIT FOR KEYBOARD  
ENTRY

-----  
KEY IN PROCEED  
V33 E  
-----

\* (1) NAV. REFUSES FINE ALIGN CHECK  
KEY IN PROCEED  
V 33 E

R 30

EXIT R 30

TERMINATE FLASH UPON  
RECEIPT OF ENTER  
OR PROCEED

KEY IN ENTER

P. ENTER  
R.  
O.  
C.

IS THIS THE  
INFLIGHT  
ALIGNMENT-  
IMU REALIGN-  
MENT PRO-  
GRAM (P54)

N Y

GO TO AUTO-  
OPTICS POS-  
ITIONING  
ROUTINE  
(R 28) FOR  
STAR #1

ISS FINE  
ALIGN MODE  
PRESENT

GO TO  
SIGHTING  
MARK  
ROUTINE  
(R27)  
FOR FIRST  
STAR

EXIT EXIT EXIT  
R30 R30 R30

IS THIS THE INFLIGHT  
ALIGNMENT-IMU  
REALIGNMENT PROGRAM  
(P54)?

N Y

GO TO AUTO  
OPTICS POSITION-  
ING ROUTINE  
(R 28) FOR STAR  
#1

GO TO  
SIGHTING  
MARK ROU-  
TINE (R27)  
FOR FIRST  
STAR

EXIT EXIT  
R30 R30

(2) NAV. REQUESTS FINE ALIGN CHECK  
KEY IN ENTER

(A) IF THIS PROGRAM IS SIVB/IMU  
ALIGN (P52) OR CSM/IMU ALIGN  
(P53) RETURN TO AUTO OPTICS  
POSITIONING ROUTINE (R28) FOR  
STAR #1.

(B) IF THIS PROGRAM IS IMU  
REALIGNMENT (P54) RETURN TO  
SIGHTING MARK ROUTINE (R27) FOR  
STAR #1.

#140

#150

#160

#170

#180



APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

BACKUP DELTA V COUNTER DISPLAY ROUTINE (R 31)

REV 8

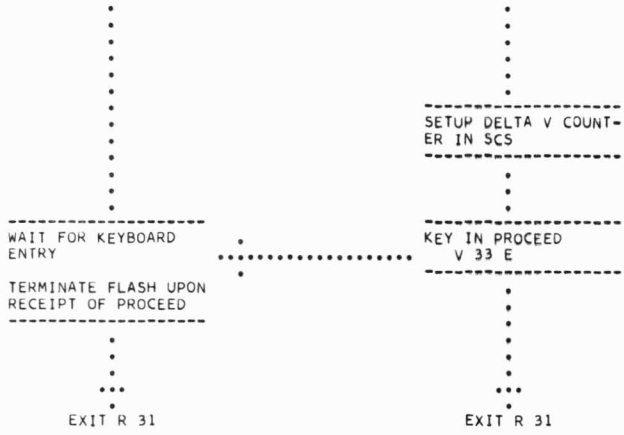
6-20-66

PROPOSE: (1) TO CALCULATE AND DISPLAY THE CORRECT VALUE OF DELTA V FOR THE DELTA V COUNTER IN THE SCS, FOR USE SHOULD THE SCS BE USED IN A BACKJP CONFIGURATION FOR A G+N CONTROLLED THRUSTING MANEUVER.

ASSUMPTIONS: (1) THE ROUTINE IS NORMALLY AUTOMATICALLY SELECTED BY THE THRUSTING PROGRAMS.

| PROG<br>CUNT   | AGC                                                                                                                                                                                                                    | GROUND | CREW                                                                                                                          | CHECKLIST                                                                                                                                                                                                                                                                                                                              | TIME  | TOTAL<br>TIME                          |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------------------|
|                | .<br>. AGC ROUTINE<br>. SELECTION<br>. . . .                                                                                                                                                                           |        |                                                                                                                               |                                                                                                                                                                                                                                                                                                                                        |       |                                        |
|                | -----<br>START BACKUP DELTA V<br>COUNTER DISPLAY<br>ROUTINE<br>-----                                                                                                                                                   |        |                                                                                                                               |                                                                                                                                                                                                                                                                                                                                        | 00:00 |                                        |
|                | ---<br>OBTAIN THE VELOCITY<br>TO BE GAINED FOR<br>THE MANEUVER FROM<br>THE PROGRAM<br>-----<br>.<br>.<br>.<br>.<br>.                                                                                                   |        |                                                                                                                               |                                                                                                                                                                                                                                                                                                                                        |       | #10                                    |
|                | .<br>FLASH VERB-NOUN TO<br>REQUEST PROCEED AND<br>DISPLAY VG<br>V06 N14<br>R1 - VG<br>-----<br>VG -<br>MAGNITUDE OF THE<br>VELOCITY TO BE<br>GAINED. IN FT/SEC TO<br>NEAREST FT/SEC.<br>-----<br>.<br>.<br>.<br>.<br>. |        | .<br>MONITOR DSKY:<br>OBSERVE VERB-NOUN<br>FLASH TO REQUEST<br>PROCEED AND DISPLAY<br>OF VG<br>-----<br>.<br>.<br>.<br>.<br>. |                                                                                                                                                                                                                                                                                                                                        |       |                                        |
| HOLD . . . . . |                                                                                                                                                                                                                        |        |                                                                                                                               | PILOT:<br>* A. ENTER DELTA V (SCS) INTO DELTA V<br>REMAINING COUNTER<br><br>(1) CHECK AGC FLASHES VERB-NOUN TO<br>REQUEST PROCEED AND DISPLAYS<br>VG:<br>V06 N14<br>R1 - VG<br><br>VG - MAGNITUDE OF THE VELOCITY<br>TO BE GAINED. IN FT/SEC<br>TO NEAREST FT/SEC.<br><br>(2) OBTAIN DELTA V (SCS) TO BE<br>SET INTO DELTA V REMAINING |       | #20<br><br><br><br><br><br><br><br>#30 |
|                |                                                                                                                                                                                                                        |        |                                                                                                                               |                                                                                                                                                                                                                                                                                                                                        |       | R 31                                   |

382



- R 31
- COUNTER FROM CHART.
- (3) SET TVC 1 POWER - AC 1
  - (4) USE DELTA V SLEW SWITCH TO ENTER DELTA V (SCS) #40
  - (5) KEY IN PROCEED V33E #50

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

PRETHRUSTING-SPS MINIMUM IMPULSE DATA LOAD ROUTINE (R 33)

REV 5

6-20-66

PURPOSE: (1) TO LOAD, VIA ASTRONAUT DSKY ENTRY, THE MANEUVER DATA REQUIRED FOR AGC COMPUTATION FOR AN SPS MINIMUM IMPULSE THRUSTING MANEUVER.  
 (2) TO INSPECT SPS MINIMUM IMPULSE MANEUVER DATA PREVIOUSLY LOADED IN THE AGC OR CHANGE IT BY MANUAL DSKY INPUT. THE DATA LOAD MAY ALSO BE CHANGED BY AGC UPLINK BY SELECTING COAST-AGC UPDATE PROGRAM (P27) AND THEN RESELECTING THE PRETHRUSTING PROGRAM.

ASSUMPTIONS: (1) THE ROUTINE IS NORMALLY AUTOMATICALLY SELECTED BY THE PRETHRUSTING-SPS MINIMUM IMPULSE PROGRAM (P 33).

| PRG<br>CONT | AGC                                                                                                                          | GROUND | CREW                                                                                                              | CHECKLIST                                                                                                                                             | TIME | TOTAL<br>TIME |
|-------------|------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|
|             | • AGC ROUTINE<br>• SELECTION<br>•<br>•                                                                                       |        |                                                                                                                   |                                                                                                                                                       |      |               |
|             | -----<br>START PRETHRUSTING<br>CHANGE DATA LOAD<br>ROUTINE<br>-----                                                          |        |                                                                                                                   |                                                                                                                                                       |      |               |
|             | FLASH VERB-NOUN TO<br>REQUEST PROCEED AND<br>DISPLAY STORED TIG<br>V06 N33<br>R1-TIG-HRS<br>R2-TIG-MIN<br>R3-TIG-SEC<br>HOLD |        | -----<br>MONITOR DSKY:<br>OBSERVE VERB-NOUN<br>FLASH TO REQUEST<br>PROCEED AND DISPLAY<br>OF STORED TIG.<br>----- | * A. CHECK AGC FLASHES VERB-NOUN TO RE-<br>QUEST PROCEED AND DISPLAYS STORED<br>TIG.<br>V06 N33<br>R1 - TIG - HRS<br>R2 - TIG - MIN<br>R3 - TIG - SEC | #10  |               |
|             | TIG-TIME OF SPS<br>IGNITION (GET).<br>IN HRS, MIN, SEC<br>TO NEAREST .01 SEC.<br>-----                                       |        | -----<br>AM I SATISFIED WITH<br>THESE VALUES?<br>-----                                                            | TIG - TIME OF SPS IGNITION (GET). IN<br>HRS, MINS, SECS TO NEAREST .01 SEC.                                                                           | #20  |               |
|             | •<br>•<br>•                                                                                                                  |        | Y • N                                                                                                             |                                                                                                                                                       |      |               |
|             | -----<br>WAIT FOR KEYBOARD<br>ENTRY                                                                                          |        | -----<br>KEY IN PROCEED<br>V 33 E<br>-----                                                                        | * (1) NAV ACCEPTS DATA:<br>KEY IN PROCEED<br>V 33 E                                                                                                   | #30  |               |

TERMINATE FLASH UPON  
RECEIPT OF PROCEED  
OR NEW DATA

P. . . . . NEW  
R. . . . . DATA  
O. . . . .  
C. . . . .  
E. . . . . DISPLAY AND  
E. . . . . STORE DATA  
D. . . . . LOAD

KEY IN V25 N33 AND  
LOAD THE DESIRED  
TIG.

\* (2) NAV REJECTS DATA:  
KEY IN V25 N33 AND LOAD THE  
DESIRED TIG.

#40

HOLD . . . . .  
FLASH VERB-NOUN TO  
REQUEST PROCEED AND  
DISPLAY STORED PARA-  
METERS FOR A GROUND  
POINT ON THE DESIRED  
ORBITAL TRACK  
V06 N44  
R1 - LAT  
R2 - LONG  
R3 - ALT

LAT-LATITUDE. + IS  
NORTH. IN DEGREES  
TO NEAREST .01  
DEGREE.

LONG-LONGITUDE. + IS  
EAST. IN DEGREES  
TO NEAREST .01  
DEGREE.

ALT-ALTITUDE OF DE-  
SIRED ORBIT ABOVE  
THE FISCHER  
ELLIPSOID AT THE  
SPECIFIED GROUND  
POINT. IN NAUTICAL  
MILES TO NEAREST .1  
NM. THIS VALUE  
SHOULD BE ZERO IF  
CIRCULAR ORBIT IS  
DESIRED.

MONITOR DSKY:  
OBSERVE VERB-NOUN  
FLASH TO REQUEST  
PROCEED AND DISPLAY  
OF STORED PARAMETERS  
FOR A GROUND POINT  
ON THE DESIRED  
ORBITAL TRACK

AM I SATISFIED WITH  
THESE VALUES

Y. . . . . N

\* B. CHECK AGC FLASHES VERB-NOUN TO RE-  
QUEST PROCEED AND DISPLAY STORED  
PARAMETERS FOR A GROUND POINT ON  
THE DESIRED ORBITAL TRACK.

V06 N44  
R1 - LAT  
R2 - LONG  
R3 - ALT

LAT - LATITUDE. + IS NORTH. IN  
DEGREES TO NEAREST .01 DEGREE.

LONG - LONGITUDE. + IS EAST. IN  
DEGREES TO NEAREST .01 DEGREE.

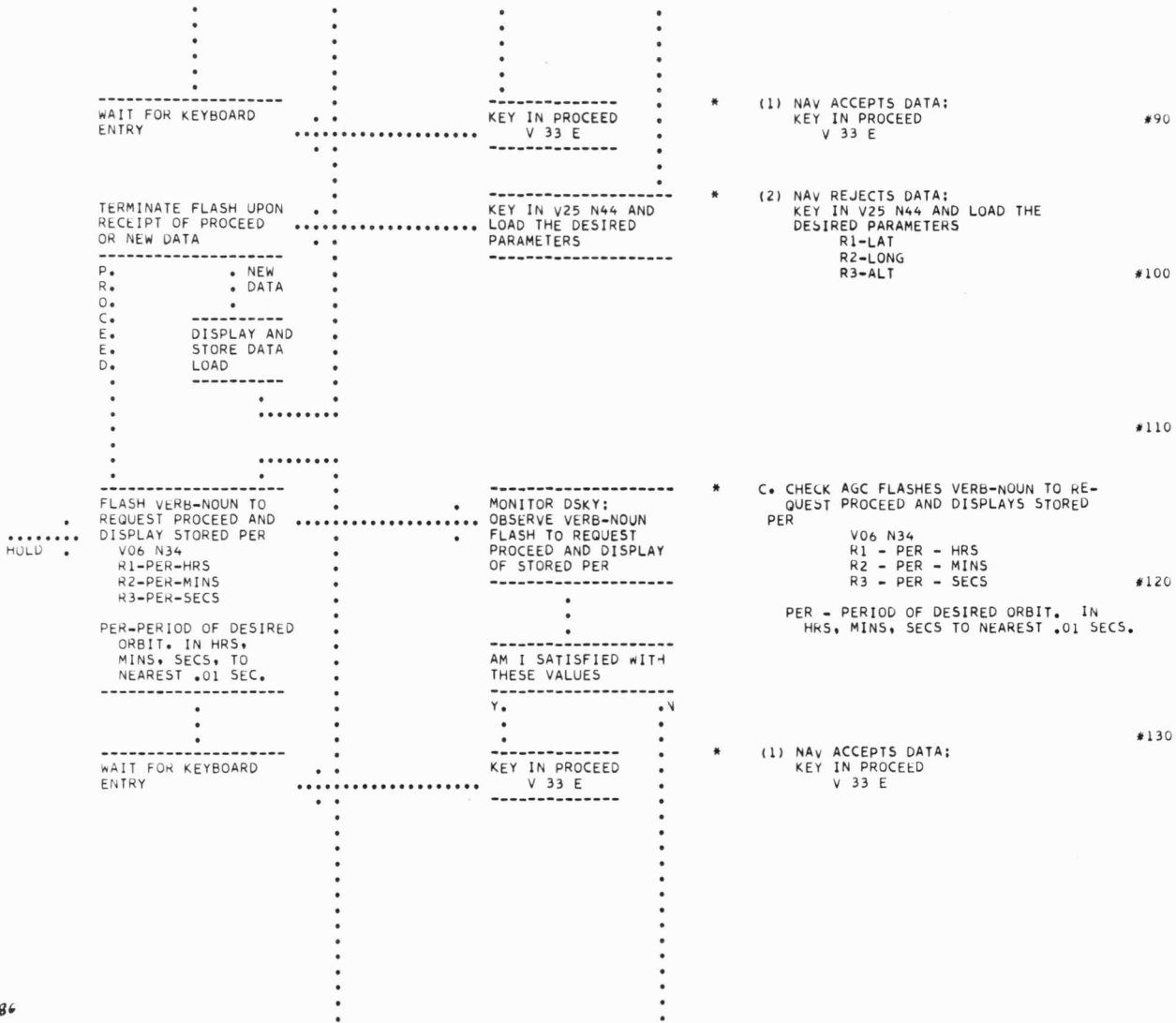
ALT-ALTITUDE OF DESIRED ORBIT  
ABOVE THE FISCHER ELLIPSOID AT  
THE SPECIFIED GROUND POINT. IN  
NAUTICAL MILES TO NEAREST .1NM.  
THIS VALUE SHOULD BE ZERO IF  
CIRCULAR ORBIT IS DESIRED

#50

#60

#70

#80



TERMINATE FLASH UPON  
RECEIPT OF PROCEED  
OR NEW DATA

KEY IN V25 N34 AND  
LOAD THE DESIRED PER

\* (2) NAV REJECTS DATA:  
KEY IN V25 N34 AND LOAD THE DE-  
SIRED PER

#140

P. NEW  
R. DATA  
O.  
C.  
E. DISPLAY AND  
E. STORE DATA  
D. LOAD

FLASH VERB-NOUN TO  
REQUEST PROCEED AND  
DISPLAY STORED SPS  
ENGINE PARAMETERS:  
V06 N70  
R1-PITCH TRIM  
R2-YAW TRIM  
R3-DELTA T TAILOFF

PITCH TRIM AND YAW  
TRIM-SPS ENGINE BELL  
TRIM ANGLES AT  
IGNITION FROM DATA  
TAKEN FROM FUEL  
LOADING CHARTS AND  
VEHICLE FUEL GAUGES.  
IN DEGREES TO  
NEAREST .01 DEGREE.

DELTA T TAILOFF -  
TIME OF FULL SPS  
THRUST EQUIVALENT  
TO SPS THRUST  
AFTER ENGINE OFF  
COMMAND. IN SECONDS  
TO NEAREST .01 SEC.

WAIT FOR KEYBOARD  
ENTRY

MONITOR DSKY:  
OBSERVE VERB-NOUN  
FLASH TO REQUEST  
PROCEED AND DISPLAY  
OF STORED PARAMETERS

AM I SATISFIED WITH  
THESE VALUES

Y. N

KEY IN PROCEED  
V 33 E

\* D. CHECK AGC FLASHES VERB-NOUN TO RE-  
QUEST PROCEED AND DISPLAYS STORED  
SPS ENGINE PARAMETERS:  
V06 N70  
R1 - PITCH TRIM  
R2 - YAW TRIM  
R3 - DELTA T TAILOFF

PITCH TRIM AND YAW TRIM - SPS  
ENGINE BELL TRIM ANGLES AT IGNI-  
TION FROM DATA TAKEN FROM FUEL  
LOADING CHARTS AND VEHICLE FUEL  
GAUGES. IN DEGREES TO NEAREST  
.01 DEGREE.

DELTA T TAILOFF - TIME OF FULL SPS  
THRUST EQUIVALENT TO SPS THRUST  
AFTER ENGINE OFF COMMAND. IN  
SECONDS TO NEAREST .01 SEC.

NOTE: DELTA T TAILOFF SHOULD BE  
ALL ZEROES AS THIS  
PARAMETER IS NOT NECES-  
SARY FOR SPS MINIMUM IM-  
PULSE BURNS.

\* (1) NAV ACCEPTS DATA:  
KEY IN PROCEED  
V 33 E

#150

#160

#170

#180

#190

TERMINATE FLASH UPON  
RECEIPT OF PROCEED  
OR NEW DATA

P. . . . . NEW  
R. . . . . DATA  
O. . . . .  
C. . . . .  
E. . . . .  
E. . . . . DISPLAY AND  
D. . . . . STORE DATA  
          LOAD

-----  
KEY IN V25 N70 AND  
LOAD THE DESIRED  
PARAMETERS  
-----

\* (2) NAV REJECTS DATA;  
KEY IN V25 N70 AND LOAD THE  
DESIRED PARAMETERS

#200

.....  
FLASH VERB-NOUN TO  
REQUEST PROCEED AND  
HOLD . . . . . DISPLAY STORED DELTA  
T BURN  
V06 N35  
R1-DELTA T BURN-HRS  
R2-DELTA T BURN-MINS  
R3-DELTA T BURN-SECS

DELTA T BURN-DESIRED  
SP5 BURN TIME. IN  
HRS, MINS, SEC TO  
NEAREST .01 SEC.

-----  
MONITOR DSKY;  
OBSERVE FLASHING  
VERB-NOUN TO REQUEST  
PROCEED AND DISPLAY  
OF STORED DELTA T  
BURN  
-----

\* E. CHECK AGC FLASHES VERB-NOUN TO RE-  
QUEST PROCEED AND DISPLAYS STORED  
DELTA T BURN  
V06 N35  
R1-DELTA T BURN-HRS  
R2-DELTA T BURN-MINS  
R3-DELTA T BURN-SECS

#210

DELTA T BURN - DESIRED SPS BURN  
TIME. IN HRS, MINS, SECS TO  
NEAREST .01 SEC.

#220

-----  
AM I SATISFIED WITH  
THIS VALUE  
-----

Y. . . . . N  
          .

-----  
WAIT FOR KEYBOARD  
ENTRY

-----  
KEY IN PROCEED  
V 33 E  
-----

\* (1) NAV ACCEPTS DATA;  
KEY IN PROCEED  
V 33 E

#230

TERMINATE FLASH UPON  
RECEIPT OF PROCEED  
OR NEW DATA

P. . . . . NEW  
R. . . . . DATA  
O. . . . .  
C. . . . .

-----  
KEY IN V25 N35 AND  
LOAD THE DESIRED  
DELTA T BURN  
-----

\* (2) NAV REJECTS DATA;  
KEY IN V25 N35 AND LOAD THE  
DESIRED DELTA T BURN

#240





APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

ORBIT PARAMETER DISPLAY ROUTINE (R 34)

REV 7

6-20-66 9

PURPOSE: (1) TO PROVIDE THE ASTRONAUT PERTINENT ORBITAL PARAMETERS COMPUTED BY THE AGC TO SUPPLEMENT ORBITAL INFORMATION PROVIDED HIM BY THE GROUND.

ASSUMPTIONS: (1) THE ROUTINE IS NORMALLY MANUALLY SELECTED BY THE ASTRONAUT BY DSKY ENTRY OR AUTOMATICALLY SELECTED BY THE PARTICULAR PROGRAM IN PROCESS AT THE END OF S1VB AND SPS THRUSTING MANEUVERS.

| PRUG<br>CONT | AGC                                                                               | GROUND | CREW                                                                                                                         | CHECKLIST                                                                                                                                                 | TIME | TOTAL<br>TIME |
|--------------|-----------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|
|              | .AGC<br>.ROUTINE<br>.SELECTION<br>.<br>.<br>.                                     |        | .CREW<br>.ROUTINE<br>.SELECTION<br>.<br>.<br>.                                                                               |                                                                                                                                                           |      |               |
|              | START ORBIT PARAMETER<br>DISPLAY ROUTINE (R34)                                    |        | KEY IN V 64 E                                                                                                                | * A. IF CREW SELECTION OF R34 IS DESIR-<br>ED KEY IN V64 E                                                                                                | #10  |               |
|              | IS THIS THRUSTING-<br>RETURN TO EARTH<br>PROGRAM (P 42)                           |        | IS AGC IN THRUSTING-<br>RETURN TO EARTH<br>PROGRAM (P 42)                                                                    |                                                                                                                                                           |      |               |
|              | N. .Y                                                                             |        | .N .Y                                                                                                                        |                                                                                                                                                           |      |               |
|              |                                                                                   |        |                                                                                                                              | * B. IF AGC IS NOT IN THRUSTING-RETURN<br>TO EARTH PROGRAM (P 42):                                                                                        | #20  |               |
| POSS .       | FLASH VERB-NOUN TO<br>REQUEST PROCEED AND<br>HOLD . DISPLAY ORBIT PARA-<br>METERS |        | MONITOR DSKY:<br>OBSERVE VERB-NOUN<br>FLASH TO REQUEST<br>PROCEED AND DIS-<br>PLAYS OF APOGEE<br>ALT, PERIGEE ALT<br>AND TFF | * (1) CHECK AGC FLASHES VERB-NOUN<br>TO REQUEST PROCEED AND DIS-<br>PLAYS ORBITAL PARAMETERS:<br>V16 N43<br>R1 - APOGEE ALTITUDE<br>R2 - PERIGEE ALTITUDE | #30  |               |
|              | V16 N43<br>R1-APOGEE ALT<br>R2-PERIGEE ALT<br>R3-TFF                              |        |                                                                                                                              |                                                                                                                                                           |      |               |
|              |                                                                                   |        |                                                                                                                              |                                                                                                                                                           |      | R 34          |

APOGEE ALT-ALTITUDE OF APOGEE ABOVE THE FISCHER ELLIPSOID. IN NAUTICAL MILES TO NEAREST .1 NM.

PERIGEE ALT-ALTITUDE OF PERIGEE ABOVE THE FISCHER ELLIPSOID. IN NAUTICAL MILES TO NEAREST .1 NM.

TFF-TIME OF FREE FALL TO 300,000 FT. ALTITUDE ABOVE THE FISCHER ELLIPSOID IN MIN, SEC TO NEAREST SEC. MAX READING IS 59 59 (EXCEPT IF PERIGEE ALT IS GREATER THAN 300,000 FT. THE TFF DISPLAY WILL READ 59 59.)

WAIT FOR KEYBOARD ENTRY TERMINATE FLASH UPON RECEIPT OF PROCEED

IS PERIGEE ALTITUDE LESS THAN OR EQUAL TO 300,000 FT.

.Y .N

EXIT R 34

R3 - TFF

APOGEE ALT - ALTITUDE OF APOGEE ABOVE THE FISCHER ELLIPSOID. IN NAUTICAL MILES TO NEAREST .1 NM.

PERIGEE ALT - ALTITUDE OF PERIGEE ABOVE THE FISCHER ELLIPSOID. IN NAUTICAL MILES TO NEAREST .1 NM.

TFF - TIME OF FREE FALL TO 300,000 FT. ALTITUDE ABOVE THE FISCHER ELLIPSOID. IN MINUTES AND SECONDS TO NEAREST SECOND. MAX READING IS 59 59 (EXCEPT IF PERIGEE ALT IS GREATER THAN 300,000 FT. THE TFF DISPLAY WILL READ 59 59.)

#40

#50

#60

\* (2) WHEN FINISHED WITH DISPLAY KEY IN PROCEED V 33 E

WHEN FINISHED WITH DISPLAY KEY IN PROCEED V 33 E

WAS PERIGEE ALT DISPLAYED ABOVE LESS THAN OR EQUAL TO 300,000 FT.

.Y .N

EXIT R 34

#70

#80

R 34

IS THIS AGC IDLING PROGRAM (POU)?

N. . . . . Y

FLASH VERB-NOUN TO REQUEST PROCEED AND DISPLAY T PERIGEE V06 N35 R1-T PERIGEE-HRS R2-T PERIGEE-MIN R3-T PERIGEE-SEC

MONITOR DSKY: OBSERVE FLASHING VERB-NOUN TO REQUEST PROCEED AND DISPLAY OF T PERIGEE

PUSH

HOLD

T PERIGEE - TIME TO PERIGEE (FROM V64E ENTRY) IN HOURS, MINS, SECS TO NEAREST .01 SEC.

WAIT FOR KEYBOARD ENTRY TERMINATE FLASH UPON RECEIPT OF PROCEED.

WHEN FINISHED WITH DISPLAY KEY IN PROCEED

EXIT R34

FLASH VERB-NOUN TO REQUEST PROCEED AND DISPLAY T PERIGEE: V16 N35 R1-T PERIGEE-HRS R2-T PERIGEE-MIN R3-T PERIGEE-SEC

MONITOR DSKY: OBSERVE FLASHING VERB-NOUN TO REQUEST PROCEED AND DISPLAY OF T PERIGEE

(3) IF PERIGEE ALT DISPLAYED ABOVE WAS NOT LESS THAN OR EQUAL TO 300,000 FT. CHECK AGC FLASHES VERB-NOUN TO REQUEST PROCEED AND DISPLAYS T PERIGEE: V16 N35 R1 - T PERIGEE - HRS R2 - T PERIGEE - MIN

#90

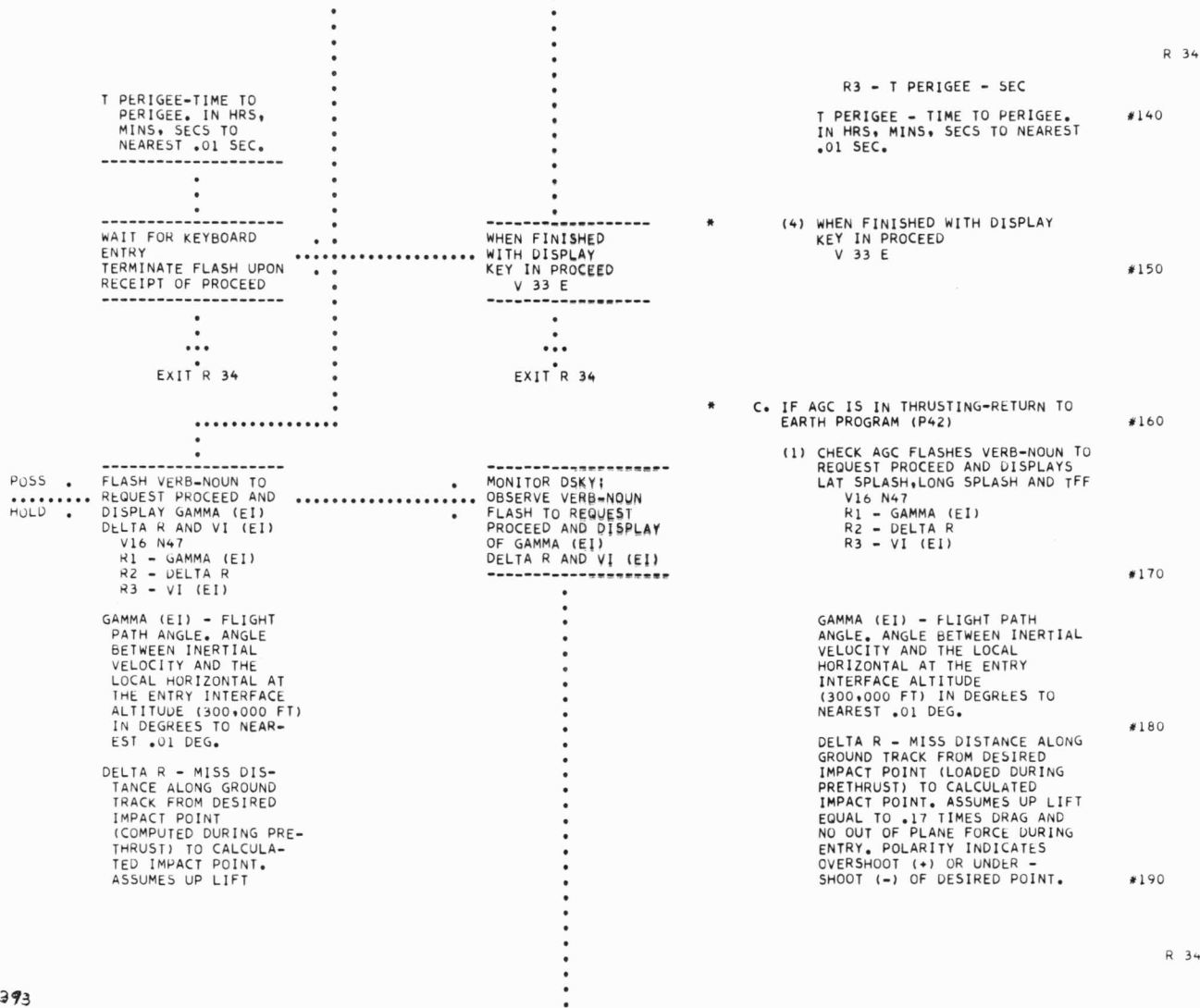
#100

#110

#120

#130

R 34



T PERIGEE-TIME TO PERIGEE, IN HRS, MINS, SECS TO NEAREST .01 SEC.

R3 - T PERIGEE - SEC  
T PERIGEE - TIME TO PERIGEE, IN HRS, MINS, SECS TO NEAREST .01 SEC.

R 34

#140

WAIT FOR KEYBOARD ENTRY  
TERMINATE FLASH UPON RECEIPT OF PROCEED

WHEN FINISHED WITH DISPLAY  
KEY IN PROCEED  
V 33 E

\* (4) WHEN FINISHED WITH DISPLAY  
KEY IN PROCEED  
V 33 E

#150

EXIT R 34

EXIT R 34

\* C. IF AGC IS IN THRUSTING-RETURN TO EARTH PROGRAM (P42)

#160

POSS . . . . .  
HOLD . . . . .  
FLASH VERB-NOUN TO REQUEST PROCEED AND DISPLAY GAMMA (EI) DELTA R AND VI (EI)  
V16 N47  
R1 - GAMMA (EI)  
R2 - DELTA R  
R3 - VI (EI)

MONITOR DSKY;  
OBSERVE VERB-NOUN  
FLASH TO REQUEST PROCEED AND DISPLAY OF GAMMA (EI) DELTA R AND VI (EI)

(1) CHECK AGC FLASHES VERB-NOUN TO REQUEST PROCEED AND DISPLAYS LAT SPLASH, LONG SPLASH AND TFF  
V16 N47  
R1 - GAMMA (EI)  
R2 - DELTA R  
R3 - VI (EI)

#170

GAMMA (EI) - FLIGHT PATH ANGLE, ANGLE BETWEEN INERTIAL VELOCITY AND THE LOCAL HORIZONTAL AT THE ENTRY INTERFACE ALTITUDE (300,000 FT) IN DEGREES TO NEAREST .01 DEG.

GAMMA (EI) - FLIGHT PATH ANGLE, ANGLE BETWEEN INERTIAL VELOCITY AND THE LOCAL HORIZONTAL AT THE ENTRY INTERFACE ALTITUDE (300,000 FT) IN DEGREES TO NEAREST .01 DEG.

#180

DELTA R - MISS DISTANCE ALONG GROUND TRACK FROM DESIRED IMPACT POINT (COMPUTED DURING PRETHRUST) TO CALCULATED IMPACT POINT. ASSUMES UP LIFT

DELTA R - MISS DISTANCE ALONG GROUND TRACK FROM DESIRED IMPACT POINT (LOADED DURING PRETHRUST) TO CALCULATED IMPACT POINT. ASSUMES UP LIFT EQUAL TO .17 TIMES DRAG AND NO OUT OF PLANE FORCE DURING ENTRY. POLARITY INDICATES OVERSHOOT (+) OR UNDER SHOOT (-) OF DESIRED POINT.

#190

R 34

EQUAL TO .17 TIMES  
DRAG AND NO OUT OF  
PLANE FORCE DURING  
ENTRY. POLARITY  
INDICATES OVERSHOOT  
(+) OR UNDERSHOOT  
(-) OF DESIRED POINT.  
IN NAUTICAL MILES  
TO NEAREST .1 NM.

VI (EI) - INERTIAL  
VELOCITY AT THE  
ENTRY INTERFACE  
ALTITUDE (300,000 FT)  
IN FT/SEC TO NEAR-  
EST FT/SEC.

-----  
: :  
: :  
-----  
WAIT FOR KEYBOARD  
ENTRY  
TERMINATE FLASH UPON  
RECEIPT OF PROCEED

EXIT R 34

-----  
: :  
: :  
-----  
WHEN FINISHED WITH  
THE DISPLAY  
KEY IN PROCEED  
V 33 E

EXIT R 34

IN NAUTICAL MILES TO NEAREST  
.1 NM.

VI (EI) - INERTIAL VELOCITY  
AT THE ENTRY INTERFACE  
ALTITUDE (300,000 FT) IN  
FT/SEC TO NEAREST FT/SEC.

NOTE:

LAT SPLASH AND LONG SPLASH ARE THE  
RESULT OF THE PRETHRUSTING  
CALCULATIONS IN RESPONSE TO LOADED  
DESIRED VALUES OF THESE PARAMETERS.  
THEY REFLECT THE RESULT OF  
CALCULATING THE THRUSTING MANEUVER  
TO OCCUR WITH NO OUT-OF-PLANE  
THRUST.

(2) WHEN FINISHED WITH DISPLAY  
KEY IN PROCEED  
V 33 E

R 34

#200

#210

#220

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

PRETHRUSTING-ORBIT CHANGE DATA LOAD ROUTINE (R 35)

REV 7

6-20-66

PURPOSE: (1) TO LOAD, VIA ASTRONAUT DSKY ENTRY, THE MANEUVER DATA REQUIRED FOR AGC COMPUTATION FOR AN ORBIT CHANGE THRUSTING MANEUVER.  
 (2) TO DISPLAY ORBIT CHANGE MANEUVER DATA PREVIOUSLY LOADED IN THE AGC AND TO CHANGE IT IF DESIRED BY MANUAL DSKY INPUT. THE DATA LOAD MAY ALSO BE CHANGED BY AGC UPLINK BY SELECTING COAST-AGC UPDATE PROGRAM (P27) AND THEN RESELECTING THE PRETHRUSTING PROGRAM.

ASSUMPTIONS: (1) THE ROUTINE IS NORMALLY AUTOMATICALLY SELECTED BY THE PRETHRUSTING-ORBIT CHANGE PROGRAM (P 31).

| PROG<br>CONT | AGC                                                                                                                  | GROUND | CREW                                                                                           | CHECKLIST                                                                                                                                            | TIME | TOTAL<br>TIME |
|--------------|----------------------------------------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|
|              | AGC ROUTINE<br>SELECTION                                                                                             |        |                                                                                                |                                                                                                                                                      |      |               |
|              | START PRETHRUSTING-<br>ORBIT CHANGE DATA<br>LOAD ROUTINE                                                             |        |                                                                                                |                                                                                                                                                      |      |               |
|              | FLASH VERB-NOUN TO<br>REQUEST PROCEED AND<br>DISPLAY STORED TIG<br>V06 N33<br>R1-TIG-HRS<br>R2-TIG-MIN<br>R3-TIG-SEC |        | MONITOR DSKY:<br>OBSERVE VERB-NOUN<br>FLASH TO REQUEST<br>PROCEED AND DISPLAY<br>OF STORED TIG | * A. CHECK AGC FLASHES VERB-NOUN TO RE-<br>QUEST PROCEED AND DISPLAYS STORED<br>TIG<br>V06 N33<br>R1 - TIG - HRS<br>R2 - TIG - MIN<br>R3 - TIG - SEC | #10  |               |
| HOLD         | TIG-TIME OF SPS<br>IGNITION (GET).<br>IN HRS, MIN, SEC<br>TO NEAREST .01 SEC.                                        |        | AM I SATISFIED WITH<br>THESE VALUES<br>Y. N                                                    | TIG-TIME OF SPS IGNITION (GET).<br>IN HRS,MIN,SECS TO NEAREST<br>.01 SEC.                                                                            | #20  |               |
|              | WAIT FOR KEYBOARD<br>ENTRY                                                                                           |        | KEY IN PROCEED<br>V 33 E                                                                       | * (1) NAV ACCEPTS DATA:<br>KEY IN PROCEED<br>V 33 E                                                                                                  | #30  |               |
|              |                                                                                                                      |        |                                                                                                |                                                                                                                                                      |      | R 35          |

TERMINATE FLASH UPON  
RECEIPT OF PROCEED  
OR NEW DATA

KEY IN V25 N33 AND  
LOAD THE DESIRED TIG

\* (2) NAV REJECTS DATA:  
KEY IN V25 N33 AND LOAD THE  
DESIRED TIG.

P. NEW  
R. DATA  
O.  
C.  
E. DISPLAY  
E. AND STORE  
D. DATA LOAD

#40

FLASH VERB-NOUN TO  
REQUEST PROCEED AND  
DISPLAY STORED PARA-  
METERS FOR A GROUND  
POINT ON THE DESIRED  
ORBITAL TRACK

MONITOR DSKY;  
OBSERVE VERB-NOUN  
FLASH TO REQUEST  
PROCEED AND DISPLAY  
OF STORED PARAMETERS  
FOR A GROUND POINT  
ON THE DESIRED  
ORBITAL TRACK

\* B. CHECK AGC FLASHES VERB-NOUN TO REQ-  
-UEST PROCEED AND DISPLAY STORED  
PARAMETERS FOR A GROUND POINT ON  
THE DESIRED ORBITAL TRACK.

#50

V06 N44  
R1 - LAT  
R2 - LONG  
R3 - ALT

V06 N44  
R1 - LAT  
R2 - LONG  
R3 - ALT

#60

LAT-LATITUDE. + IS  
NORTH. IN DEGREES  
TO NEAREST .01  
DEGREE.

LAT - LATITUDE. + IS NORTH. IN  
DEGREES TO NEAREST .01 DEGREE.

LONG-LONGITUDE. + IS  
EAST. IN DEGREES  
TO NEAREST .01  
DEGREE.

LONG - LONGITUDE. + IS EAST. IN  
DEGREES TO NEAREST .01 DEGREE.

#70

ALT-ALTITUDE OF DE-  
SIRED ORBIT ABOVE  
THE FISCHER ELLIP-  
SOID AT THE  
SPECIFIED GROUND  
POINT. IN NAUTICAL  
MILES TO NEAREST .1  
NM. THIS VALUE

AM I SATISFIED WITH  
THESE VALUES

ALT-ALTITUDE OF DESIRED ORBIT  
ABOVE THE FISCHER ELLIPSOID AT  
THE SPECIFIED GROUND POINT. IN  
NAUTICAL MILES TO NEAREST .1  
NM. THIS VALUE SHOULD BE ZERO  
IF CIRCULAR ORBIT IS DESIRED

#80

SHOULD BE ZERO IF  
CIRCULAR ORBIT IS  
DESIRED.

WAIT FOR KEYBOARD  
ENTRY

TERMINATE FLASH UPON  
RECEIPT OF PROCEED  
OR NEW DATA

P. . . . . NEW  
R. . . . . DATA  
O. . . . .  
C. . . . .  
E. . . . . DISPLAY  
E. . . . . AND STORE  
D. . . . . DATA LOAD

HOLD

FLASH VERB=NOUN TO  
REQUEST PROCEED AND  
DISPLAY STORED PER  
V06 N34  
R1=PER-HRS  
R2=PER-MINS  
R3=PER-SECS

PER=PERIOD OF DESIRED  
ORBIT. IN HRS,  
MINS, SECS, TO  
NEAREST .01 SEC.

WAIT FOR KEYBOARD  
ENTRY

KEY IN PROCEED  
V 33 E

KEY IN V25 N44 AND  
LOAD THE DESIRED  
PARAMETERS

MONITOR DSKY;  
OBSERVE VERB=NOUN  
FLASH TO REQUEST  
PROCEED AND DISPLAY  
OF STORED PER

AM I SATISFIED WITH  
THESE VALUES

KEY IN PROCEED  
V 33 E

\* (1) NAV ACCEPTS DATA:  
KEY IN PROCEED  
V 33 E

\* (2) NAV REJECTS DATA:  
KEY IN V25 N44 AND LOAD THE  
DESIRED PARAMETERS  
R1-LAT  
R2-LONG  
R3-ALT

\* C. CHECK AGC FLASHES VERB=NOUN TO REQ  
-UEST PROCEED AND DISPLAYS STORED  
PER  
V06 N34  
R1 - PER - HRS  
R2 - PER - MINS  
R3 - PER - SECS

PER - PERIOD OF DESIRED ORBIT. IN  
HRS, MINS, SECS TO NEAREST .01  
SECS.

\* (1) NAV ACCEPTS DATA:  
KEY IN PROCEED  
V 33 E

#90

#100

#110

#120

#130

#140



TERMINATE FLASH UPON  
RECEIPT OF PROCEED  
OR NEW DATA

KEY IN V25 N34 AND  
LOAD THE DESIRED PER

\* (2) NAV REJECTS DATA:  
KEY IN V25 N34 AND LOAD THE  
DESIRED PER

P. . . . . NEW  
R. . . . . DATA  
O. . . . .  
C. . . . .  
E. . . . .  
E. . . . . DISPLAY  
D. . . . . AND STORE  
DATA LOAD

#150

#160

FLASH VERB-NOUN TO  
REQUEST PROCEED AND  
DISPLAY STORED SPS  
ENGINE PARAMETERS  
V06 N70  
R1-PITCH TRIM  
R2-YAW TRIM  
R3-DELTA T TAILOFF

MONITOR DSKY:  
OBSERVE VERB-NOUN  
FLASH TO REQUEST  
PROCEED AND DISPLAY  
OF STORED PARAMETERS

\* D. CHECK AGC FLASHES VERB-NOUN TO REQ-  
-UEST PROCEED AND DISPLAYS STORED  
SPS ENGINE PARAMETERS  
V06 N70  
R1 - PITCH TRIM  
R2 - YAW TRIM  
R3 - DELTA T TAILOFF

#170

PITCH TRIM AND YAW  
TRIM-SPS ENGINE BELL  
TRIM ANGLES AT  
IGNITION FROM DATA  
TAKEN FROM FUEL  
LOADING CHARTS AND  
VEHICLE FUEL GAUGES.  
IN DEGREES TO  
NEAREST .01 DEGREE.

AM I SATISFIED WITH  
THESE VALUES

PITCH TRIM AND YAW TRIM - SPS ENG-  
INE BELL TRIM ANGLES AT IGNITION  
FROM DATA TAKEN FROM FUEL LOAD-  
ING CHARTS AND VEHICLE FUEL  
GAUGES. IN DEGREES TO NEAREST  
.01 DEGREE.

#180

DELTA T TAILOFF -  
TIME OF FULL SPS  
THRUST EQUIVALENT TO  
SPS THRUST AFTER  
ENGINE OFF COMMAND.  
IN SECONDS TO NEAREST  
.01 SEC.

DELTA T TAILOFF - TIME OF FULL SPS  
THRUST EQUIVALENT TO SPS THRUST  
AFTER ENGINE OFF COMMAND. IN  
SECONDS TO NEAREST .01 SEC.

#190



R 35

\* (1) NAV ACCEPTS DATA:  
KEY IN PROCEED  
V 33 E

#200

\* (2) NAV REJECTS DATA:  
KEY IN V25 N70 AND LOAD THE  
DESIRED PARAMETERS

#210

#220

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

PRETHRUSTING-RETURN TO EARTH DATA LOAD ROUTINE (R 36) REV 8

6-20-66

- PURPOSE:
- (1) TO LOAD, VIA ASTRONAUT DSKY ENTRY, THE MANEUVER DATA REQUIRED FOR AGC COMPUTATION FOR A RETURN TO THE EARTH THRUSTING MANEUVER.
  - (2) TO DISPLAY RETURN TO EARTH MANEUVER DATA PREVIOUSLY LOADED IN THE AGC AND TO CHANGE IT IF DESIRED BY MANUAL DSKY INPUT. THE DATA LOAD MAY ALSO BE CHANGED BY AGC UPLINK BY SELECTING COAST-AGC UPDATE PROGRAM (P27) AND THEN RESELECTING THE PRETHRUSTING PROGRAM.

ASSUMPTIONS: (1) THIS ROUTINE IS NORMALLY AUTOMATICALLY SELECTED BY THE PRETHRUSTING-RETURN TO EARTH PROGRAM (P 32).

| PRG<br>CONT | AGC                                                                                                                                                                                                                          | GROUND | CREW                                                                                                                                                                                                                                               | CHECKLIST                                                                                                                                                                                                                                                                                                                                                                                                                                    | TIME | TOTAL<br>TIME |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|
|             | <ul style="list-style-type: none"> <li>. AGC ROUTINE</li> <li>. SELECTION</li> <li>. . . . .</li> </ul>                                                                                                                      |        |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |               |
|             | -----<br>START PRETHRUSTING-<br>RETURN TO EARTH DATA<br>LOAD ROUTINE (R 36)<br>-----<br>FLASH VERB-NOUN TO<br>REQUEST PROCEED AND<br>DISPLAY STORED LAT<br>HOLD . . . . .                                                    |        | -----<br>MONITOR DSKY:<br>OBSERVE VERB-NOUN<br>FLASH TO REQUEST<br>PROCEED AND DISPLAY<br>OF STORED LAT<br>SPLASH, LONG SPLASH<br>AND ALT SPLASH<br>-----<br>.<br>.<br>.<br>-----<br>AM I SATISFIED WITH<br>THESE VALUES<br>-----<br>Y . . . . . N | * A. CHECK AGC FLASHES VERB-NOUN TO<br>REQUEST PROCEED AND DISPLAYS:<br><br>V06 N44<br>R1 - LAT SPLASH<br>R2 - LONG SPLASH<br>R3 - ALT SPLASH<br><br>LAT SPLASH - LATITUDE OF DESIRED<br>SPLASH POINT. IN DEGREES TO<br>NEAREST .01 DEGREE. + IS<br>NORTH<br><br>LONG SPLASH - LONGITUDE OF DE-<br>SIRED SPLASH POINT. IN DE-<br>GREES TO NEAREST .01 DEGREE.<br>+ IS EAST<br><br>ALT SPLASH - ALTITUDE OF DESIRED<br>SPLASH POINT ABOVE THE |      | #10           |
|             | LAT SPLASH - LATITUDE<br>OF DESIRED SPLASH<br>POINT. IN DEGREES<br>TO NEAREST .01<br>DEGREE. + IS NORTH<br><br>LONG SPLASH - LONGI-<br>TUDE OF DESIRED<br>SPLASH POINT. IN<br>DEGREES TO NEAREST<br>.01 DEGREE. + IS<br>EAST |        |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                              | #20  |               |
|             |                                                                                                                                                                                                                              |        |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                              | #30  |               |
|             |                                                                                                                                                                                                                              |        |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                              |      | R 36          |

700

ALT SPLASH - ALTITUDE  
OF DESIRED SPLASH  
POINT ABOVE THE  
FISCHER ELLIPSOID  
IN NAUTICAL MILES  
TO NEAREST .1NM  
(AGC SET TO 00000)

FISCHER ELLIPSOID. IN NAUTICAL  
MILES TO NEAREST .1 NM.  
(AGC SET TO 00000)

R 36

-----  
WAIT FOR KEYBOARD  
ENTRY

-----  
KEY IN PROCEED  
V 33 E  
-----

\* (1). NAV ACCEPTS DATA:  
KEY IN PROCEED  
V 33 E

#40

-----  
KEY IN V25 N44 AND  
LOAD DESIRED PARA-  
METERS  
-----

\* (2). NAV REJECTS DATA:  
KEY IN V25 N44 AND LOAD THE  
DESIRED PARAMETERS

#50

-----  
TERMINATE FLASH UPON  
RECEIPT OF PROCEED  
OR NEW DATA  
-----

P. . NEW  
R. . DATA  
O. .  
C. .  
E. .  
E. .  
D. .  
. .  
. .

#60

-----  
. DISPLAY AND STORE  
. DATA LOAD  
-----

#70

.....  
HOLD .  
FLASH VERB-NOUN TO  
REQUEST PROCEED AND  
DISPLAY STORED SPS  
ENGINE PARAMETER:  
V06 N74  
R1-DELTA V ALLOW  
R2-DELTA T TAILOFF

-----  
MONITOR DSKY:  
OBSERVE VERB-NOJN  
FLASH TO REQUEST  
PROCEED AND DISPLAY  
OF STORED SPS ENGINE  
PARAMETER.  
-----

\* B. CHECK AGC FLASHES VERB-NOUN TO RE-  
QUEST PROCEED AND DISPLAYS:

V06 N74  
R1 - DELTA V ALLOW  
R2 - DELTA T TAILOFF

#80

R 36

401

DELTA V ALLOW:  
MAXIMUM AMOUNT OF  
DELTA V TO BE USED.  
IN FT/SEC TO NEAR-  
EST FT/SEC.

DELTA T TAILOFF -  
TIME OF FULL SPS  
THRUST EQUIVALENT  
TO SPS THRUST  
AFTER ENGINE OFF  
COMMAND IN SECONDS  
TO NEAREST .01 SEC.

WAIT FOR KEYBOARD  
ENTRY

TERMINATE FLASH UPON  
RECEIPT OF PROCEED  
OR NEW DATA

P. .NEW  
R. .DATA  
O. .  
C. .  
E. .  
D. .  
DISPLAY  
AND STORE  
DATA LOAD

FLASH VERB-NOUN TO  
REQUEST PROCEED AND  
DISPLAY STORED SPS  
ENGINE PARAMETERS:  
V06 N70  
R1-PITCH TRIM  
R2-YAW TRIM  
R3-DELTA T TAILOFF

AM I SATISFIED WITH  
THIS VALUE

Y. .N

KEY IN PROCEED  
V 33 E

KEY IN V24 N74 AND  
LOAD THE DESIRED  
PARAMETER.

MONITOR DSKY:  
OBSERVE VERB-NOUN  
FLASH TO REQUEST  
PROCEED AND DISPLAY  
STORED SPS ENGINE  
PARAMETERS

DELTA V ALLOW - MAXIMUM AMOUNT  
OF DELTA V TO BE USED. IN FT/SEC  
TO NEAREST FT/SEC.

DELTA T TAILOFF - TIME OF FULL SPS  
THRUST EQUIVALENT TO SPS THRUST  
AFTER ENGINE OFF COMMAND. IN  
SECONDS TO NEAREST .01 SEC.

(1) NAV ACCEPTS DATA:  
KEY IN PROCEED  
V 33 E

(2) NAV REJECTS DATA:  
KEY IN V24 N74 AND LOAD THE  
DESIRED PARAMETER

C. CHECK AGC FLASHES VERB-NOUN TO RE-  
QUEST PROCEED AND DISPLAYS STORED  
SPS PARAMETERS  
V06 N70  
R1 - PITCH TRIM  
R2 - YAW TRIM  
R3 - DELTA T TAILOFF

R 36

#90

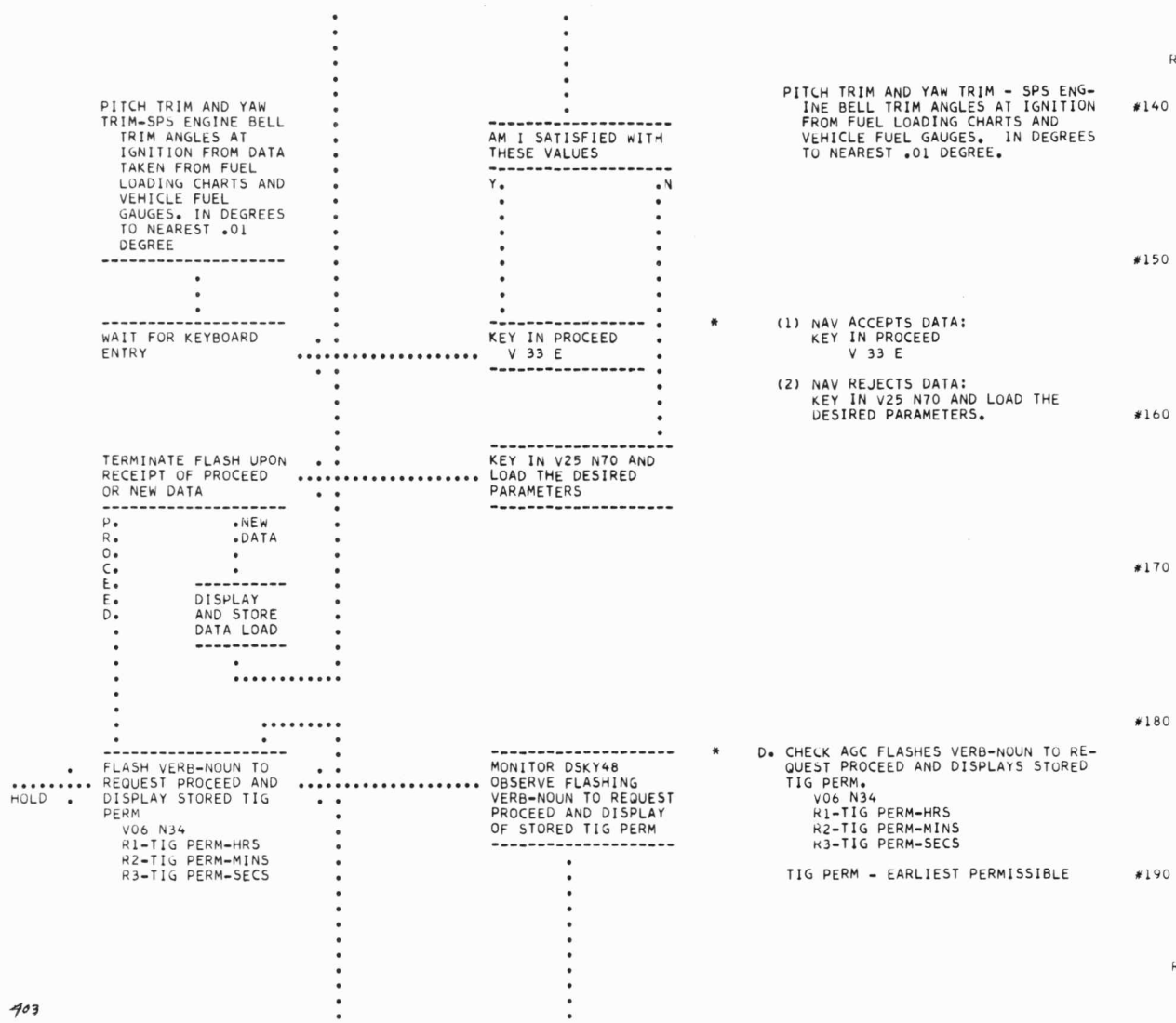
#100

#110

#120

#130

R 36



R 36

PITCH TRIM AND YAW TRIM - SPS ENGINE BELL TRIM ANGLES AT IGNITION FROM FUEL LOADING CHARTS AND VEHICLE FUEL GAUGES. IN DEGREES TO NEAREST .01 DEGREE. #140

#150

\* (1) NAV ACCEPTS DATA: KEY IN PROCEED V 33 E  
 (2) NAV REJECTS DATA: KEY IN V25 N70 AND LOAD THE DESIRED PARAMETERS. #160

#170

#180

\* D. CHECK AGC FLASHES VERB-NOUN TO REQUEST PROCEED AND DISPLAYS STORED TIG PERM.  
 V06 N34  
 R1-TIG PERM-HRS  
 R2-TIG PERM-MINS  
 R3-TIG PERM-SECS  
 TIG PERM - EARLIEST PERMISSIBLE #190

R 36

403

TIG PERM - EARLIEST  
 PERMISSIBLE TIME  
 (GET) OF SPS  
 IGNITION. IN HRS,  
 MINS, SECS TO  
 NEAREST .01 SEC.

WAIT FOR KEYBOARD  
 ENTRY

TERMINATE FLASH UPON  
 RECEIPT OF PROCEED  
 OR NEW DATA

P. .NEW  
 R. .DATA  
 O. .  
 C. .  
 E. .  
 E. .  
 D. .  
 . .  
 . .  
 . .  
 . .

EXIT R 36

AM I SATISFIED WITH  
 THESE VALUES

Y. .N

KEY IN PROCEED  
 V 33 E

KEY IN V25 N34 AND  
 LOAD DESIRED TIG  
 PERM

TIME (GET) OF SPS IGNITION. (IN  
 HRS, MINS, SECS TO NEAREST .01  
 SEC).

(1) NAV REJECTS DATA:  
 KEY IN PROCEED  
 V 33 E

(2) NAV REJECTS DATA:  
 KEY IN V25 N34 AND LOAD THE  
 DESIRED TIG PERM

R 36

#200

#210

#220





R 37

NORMAL WHEN DELTA VM IS GREATER  
THAN OR EQUAL TO --FT/SEC

-----  
GO TO BACKUP  
PROCEDURES  
-----

#40

-----  
START +X TRANSLATION  
AT TTI = 15 SEC  
-----

#50

-----  
MONITOR DSKY  
WAIT UNTIL DELTA VM  
DISPLAYED IS GREATER  
THAN OR EQUAL TO--  
FT/SEC  
-----

#60

-----  
SET NORMAL/OFF/  
DIRECT ON SW  
TO NORMAL  
-----

-----  
IS THIS P43  
-----

.N . Y.  
-----

TEMP .  
.....  
HOLD .

-----  
AT TTI = 5 SEC  
CHANGE VERB-NOUN  
BUT RETAIN PRESENT  
DISPLAYS IN R1,  
R2, R3, FLASH  
VERB-NOUN TO RE-  
QUEST PLEASE  
PERFORM ENGINE ON  
ENABLE:  
V50 N11  
R1 - TTI  
R2 - DELTA T  
BURN  
R3 - DELTA VM  
-----

-----  
MONITOR DSKY:  
IS V50 N11 FLASHING  
-----

- \* D. AT TTI = 5 SEC CHECK AGC FLASHES  
NEW VERB-NOUN TO REQUEST PLEASE  
PERFORM ENGINE ON ENABLE BUT  
RETAINS R1, R2, R3  
V50 N11  
R1 - TTI  
R2 - VG (OR DELTA T BURN  
IF P43)  
R3 - DELTA VM

#70

#80

R 37

TEMP .  
HOLD .

-----  
AT TTI = 5 SEC  
CHANGE VERB-NOUN BUT  
RETAIN PRESENT DIS-  
PLAYS IN R1, R2, R3.  
FLASH VERB-NOUN TO  
REQUEST PLEASE  
PERFORM ENGINE ON  
ENABLE:  
V50 N11  
R1 - TTI  
R2 - VG  
R3 - DELTA VM  
-----

-----  
LET T1 EQUAL TO  
PRESENT TIME  
-----

-----  
IS T1 GREATER  
THAN OR EQUAL  
TO TIGN + 15  
SEC.  
-----

.N .Y  
.  
.  
.

-----  
TERMINATE VERB-  
NOUN FLASH.  
CHANGE VERB-  
NOUN BACK TO  
V16 N51 (N50 IF  
THIS IS P43)  
AND RETAIN  
PRESENT DISPLAYS  
IN R1, R2, R3  
-----

-----  
.N .Y  
.  
.  
.  
.  
.  
.  
.

407

R 37

#90

#100

#110

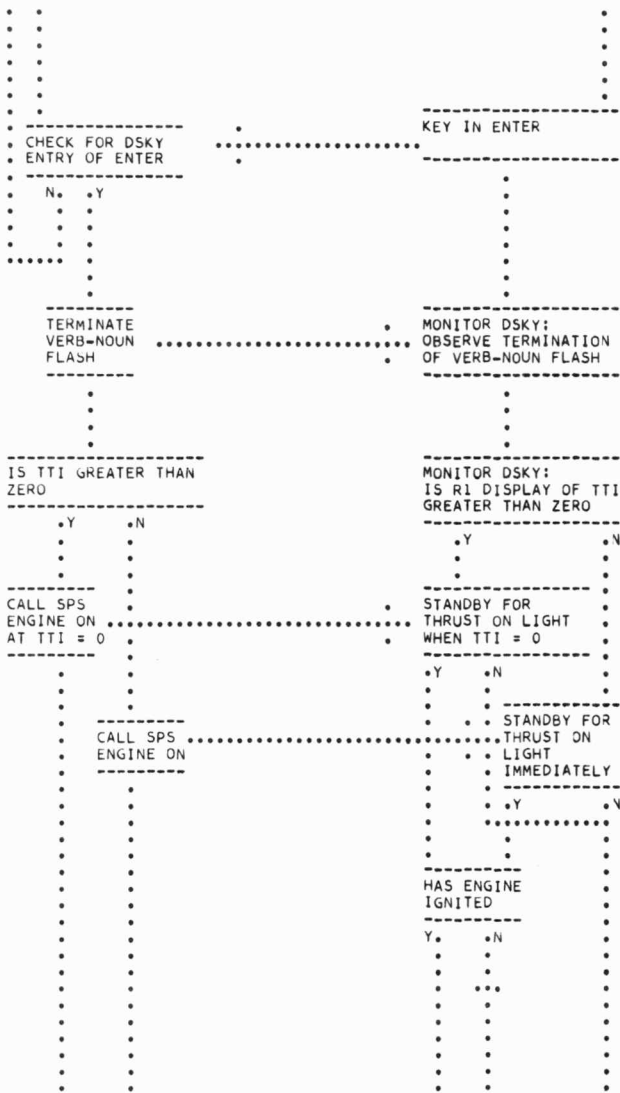
#120

#130

#140

R 37





#200

#210

#220

\* F. CHECK THRUST ON LIGHT ILLUMINATES WHEN TTI = 0 OR AT TIME OF PRESSING ENTER IF ENTER IS PRESSED AFTER TTI = 0

CAUTION:

#230

IF THRUST ON LIGHT DOES NOT ILLUMINATE GO TO BACKUP PROCEDURES. IF THRUST ON LIGHT ILLUMINATES BUT ENGINE DOES NOT IGNITE GO TO SPS ENGINE THRUST FAIL ROUTINE (R38)

#240

\* G. TERMINATE +X TRANSLATION WITH TRANSLATION CONTROL.

#250

.....  
.....  
.....  
.....  
.....

.....

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

EXIT R37

.....  
.....  
.....  
.....  
.....  
.....

GO TO SPS  
ENGINE  
THRUST  
FAIL ROUT-  
INE (R38)

-----

TERMINATE  
+X TRANS-  
LATION  
WITH  
TRANSLAT-  
ION CON-  
TROL

.....  
.....  
.....  
.....  
.....

EXIT R 37

-----  
GO TO BACKUP  
PROCEDURES.  
-----

R 37

#260

#270

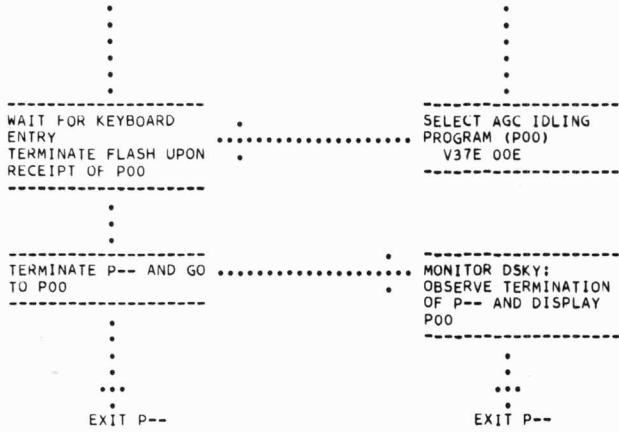












R 36  
#190

#200

#210

415

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE  
VERB-NOUN AND CHECKLIST CODES

I. VERB LIST

01 DISP OCT COMPNT 1 (R1)  
05 DISP OCT COMPNT 1, 2, 3  
06 DISP DECIMAL  
15 MONITOR OCTAL COMPNT 1, 2, 3  
16 MONITOR DECIMAL  
21 LOAD COMPNT 1 (R1)  
22 LOAD COMPNT 2 (R2)  
23 LOAD COMPNT 3 (R3)  
24 LOAD COMPNT 1, 2  
25 LOAD COMPNT 1, 2, 3  
33 PRO W/O DATA  
34 TERMINATE PROG  
36 FRESH START  
37 CHANGE PROG  
42 FINE ALIGN IMU  
44 SET IMU TO ATT CONTROL  
50 PLEASE PERFORM  
51 PLEASE MARK  
52 REJECT MARK  
57 SYSTEM TEST  
64 CALC ORBL PARMTS  
65 CALC T OF ARR AT LONG  
66 CALC LAT LONG AT SPEC T  
67 CALC MAX DEC, T OF ARR  
70 MAN ATT MANEUVER  
72 MIN IMP AIM PT UPDATE  
71 MTVC TAKEOVER  
73 RET-EARTH AIM PT UPDATE  
74 ORB CHGE AIM PT UPDATE  
75 MANUAL LFTOFF  
76 R, V, T UPDATE (STATE VEC)  
77 TIME UPDATE

II. NOUN LIST

00 NOT IN USE  
01 SPECIFY MACHINE ADDRESS (FRACT) .XXXXX  
02 SPECIFY MACHINE ADDRESS (WHOLE) XXXXX.  
03 SPARE  
04 SPARE  
05 ANGULAR ERROR XXX.XX DEG  
06 SPARE  
07 CHANGE OF PROGRAM (PERFORM) OCTAL  
10 SPARE  
11 ENGINE ON ENABLE (PERFORM)  
12 GIMBAL ANGLES ROLL XXX.XX DEG  
PITCH XXX.XX DEG  
YAW XXX.XX DEG  
13 DELTA V MEASURED XXXXX. FT/SEC  
14 DELTA V COUNTER SETTING XXXXX. FT/SEC  
15 FOR NON-FLIGHT USE  
16 AGC CLOCK TIME 00XXX. HRS  
000XX. MIN  
0XX.XX SEC  
17 FINAL ICDU ANGLES ROLL XXX.XX DEG  
PITCH XXX.XX DEG  
YAW XXX.XX DEG  
20 PRESENT ICDU ANGLES ROLL XXX.XX DEG  
PITCH XXX.XX DEG  
YAW XXX.XX DEG  
21 FOR NON-FLIGHT USE  
22 NEW ANGLES I X XXX.XX DEG  
Y XXX.XX DEG  
Z XXX.XX DEG  
23 FOR NON-FLIGHT USE  
24 DELTA TIME FOR AGC CLOCK 00XXX. HRS  
000XX. MIN  
0XX.XX SEC  
25 CHECKLIST (PLEASE PERFORM)  
26 FOR NON-FLIGHT USE  
27 FOR NON-FLIGHT USE  
30 STAR NUMBER XXXXXX.  
31 FAILURE INFO OCTAL OCTAL OCTAL  
FAIL REG  
SFALL  
ERCOUNT  
32 SPARE  
33 TIME OF IGNITION 00XXX. HRS  
000XX. MIN  
0XX.XX SEC  
34 EVENT TIME 00XXX. HRS  
000XX. MIN  
0XX.XX SEC

35 DELTA EVENT TIME 00XXX. HRS  
000XX. MIN  
0XX.XX SEC  
36 DELTA EVENT TIME  
37 FOR NON-FLIGHT USE  
40 GAMMA, XXX.XX DEG  
INERTIAL VELOCITY (VI), XXXXX. FT/SEC  
ALTITUDE ABOVE LAUNCH PAD (HPAD) XXXX.X NAUT MI  
41 MAX ACCELERATION (GMAX), XXX.XX G  
PERIGEE ALTITUDE (HP) XXXX.X NAUT MI  
FREE-FALL TIME (TFF) XXXXX MIN/SEC  
42 MISS DISTANCE (DELTA R), XXXX.X NAUT MI  
PERIGEE ALTITUDE (HP), XXXX.X NAUT MI  
FREE-FALL TIME (TFF) XXXXX MIN/SEC  
43 APOGEE ALTITUDE (HA), XXXX.X NAUT MI  
PERIGEE ALTITUDE (HP), XXXX.X NAUT MI  
FREE-FALL TIME (TFF) XXXXX MIN/SEC  
44 LATITUDE, XXX.XX DEG  
LONGITUDE, XXX.XX DEG  
ALTITUDE (ABOVE FISCHER ELLIPSOID) XXXX.X NAUT MI  
45 APOGEE ALTITUDE (HA) XXXX.X NAUT MI  
PERIGEE ALTITUDE (HP) XXXX.X NAUT MI  
DELTA VELOCITY REQUIRED (DELTA VREQ) XXXXX. FT/SEC  
46 TIME TO EVENT, XXXXX. FT/SEC  
VELOCITY TO BE GAINED (VG), XXXXX. FT/SEC  
PERIGEE ALTITUDE (HP) XXXX.X NAUT MI  
47 GAMMA AT EI, XXX.XX DEG  
MISS DISTANCE (DELTA R), XXXX.X NAUT MI  
INERTIAL VELOCITY (VI AT EI) XXXXX. FT/SEC  
50 TIME TO EVENT, XXXXX. FT/SEC  
DELTA TIME BURN XXXXX. FT/SEC  
DELTA V MEASURED XXXXX. FT/SEC  
51 TIME TO EVENT XXXXX. FT/SEC  
VELOCITY TO BE GAINED (VG), XXXXX. FT/SEC  
MEASURED VELOCITY CHANGE ALONG XSC  
52 TIME TO EVENT XXXXX. FT/SEC  
VELOCITY TO BE GAINED (VG) XXXXX. FT/SEC  
FREE-FALL TIME (TFF) XXXXX. FT/SEC  
53 MAX ACCELERATION (GMAX), XXX.XX G  
GAMMA EI XXX.XX DEG  
FREE-FALL TIME (TFF) XXXXX MIN/SEC  
54 COMMAND ROLL ANGLE (BETA) XXX.XX DEG  
PRESENT ACCELERATION (G), XXX.XX G  
RANGE TO TARG XXXX.X NAUT MI  
55 OCDU X (SHAFT), XXX.XX DEG  
Y (TRUNNION) XX.XXX DEG  
56 MARK DATA X (SHAFT), XXX.XX DEG  
Y (TRUNNION) XX.XXX DEG  
57 FOR NON-FLIGHT USE  
60 FOR NON-FLIGHT USE  
61 FOR NON-FLIGHT USE  
62 IMPACT LATITUDE, XXX.XX DEG  
IMPACT LONGITUDE, XXX.XX DEG  
HEADS UP/DOWN +/- 00001  
63 LATITUDE, XX.XXX DEG  
LONGITUDE/2, XX.XXX DEG  
ALTITUDE (ABOVE THE FISCHER ELLIPSOID) XXX.XX NAUT MI  
64 IMPACT LATITUDE XXX.XX DEG  
IMPACT LONGITUDE, XXX.XX DEG  
FREE-FALL TIME (TFF) XXXXX MIN/SEC  
65 FOR NON-FLIGHT USE  
66 FOR NON-FLIGHT USE  
67 DELTA GYRO ANGLES X XX.XXX DEG  
Y XX.XXX DEG  
Z XX.XXX DEG  
70 PITCH TRIM, XXX.XX DEG  
YAW TRIM XXX.XX DEG  
71 DELTA TIME TAIL-OFF XXX.XX DEG  
COMMAND ROLL ANGLE (BETA), XXX.XX DEG  
PRESENT ACCELERATION (G), XXX.XX G  
PREDICTED RANGE-RANGE TO TARG XXXX.X NAUT MI  
72 FOR NON-FLIGHT USE  
73 FOR NON-FLIGHT USE  
74 DELTA VELOCITY ALLOWABLE, XXXXX. FT/SEC  
DELTA TIME TAIL-OFF XXX.XX SEC  
75 DELTA POSITION MAGNITUDE, XXXX.X NAUT MI  
DELTA VELOCITY MAGNITUDE XXXXX. FT/SEC  
MULTIPLE MARK COUNTER XXXXXX.  
76 SPARE  
77 SPARE

III. CHECKLIST CODES

00001 SCS MODE - G&N ATT CONT  
00002 SCS MODE - G&N DELTA V  
00003 SCS MODE - G&N ENTRY  
00004 SCS MODE - SCS ATT CONT  
00007 ATT TRIM MANEUV ENABLE  
00011 AUTO OPTICS POS  
00012 TARGET DATA ENTRY  
00013 SW OSS TO COMP CONT  
00014 FINE ALIGN CHECK  
00015 PERFORM STAR ACQ  
00016 TERMINATE MARK SEQUENCE  
00031 ENGINE ON  
00035 PREP AGC FOR THRUST  
00036 THRUST TERMINATE  
00041 CM/SM SEP  
00051 FINAL IMU/FINAL VEHICLE  
00052 INTERIM IMU/FINAL VEHICLE  
00053 FINAL IMU/INTERIM VEHICLE  
00054 INTERIM IMU/INTERIM VEHICLE  
00060 IMU TURN-ON  
00061 IMU POWER DOWN  
00062 AGC POWER DOWN

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

204 PROGRAM INTER-RELATIONSHIP

REV 2 6/28/66

| FOLLOWING PROGRAMS ENABLE          |          |          | PROGRAM | ENABLES FOLLOWING PROGRAMS                |
|------------------------------------|----------|----------|---------|-------------------------------------------|
| 01-                                | 24-A(10) | 43-M(9)  | 00(5)   | 01-MU 31-M                                |
| 02-                                | 27-A     | 51-A(11) |         | 05-M 32-M                                 |
| 03-M                               | 31-M(10) | 52-A(11) |         | 06-M 33-M                                 |
| 05-A or M                          | 32-M(10) | 53-M(11) |         | 07-M 51-M                                 |
| 06-A                               | 33-M(10) | 54-A     |         | 22-M 52-M                                 |
| 07-M                               | 41-M(9)  | 67-M     |         | 23-M 54-M                                 |
| 12-M                               | 42-M(9)  | 71-M(9)  |         | 24-M(7) 71-M                              |
| 22-A(10)                           |          |          |         | 27-MU(12)                                 |
| 23-A                               |          |          |         |                                           |
| 00-MU                              |          |          | 01      | 00-M, 00-A                                |
| 01-A, 03-M                         |          |          | 02      | 03-M, 04-A(2), 11-A(3)                    |
| 02-M                               |          |          | 03      | 00-M, 02-M                                |
| 02-A(2)                            |          |          | 04      | 11-A(3)                                   |
| 00-M, 22-A, 31-A, 32-A, 33-A, 51-A |          |          | 05      | 00-A or M                                 |
| 00-M                               |          |          | 06      | 00-A                                      |
| 00-M                               |          |          | 07      | 00-M                                      |
| 02-A(3), 04-A(3)                   |          |          | 11      | 12-A, 17-A(1)                             |
| 11-A                               |          |          | 12      | 00-M, 61-M, 62-M, 71-A(4) or M            |
| 11-A(1)                            |          |          | 17      | NONE                                      |
| 00-M, 53-A                         |          |          | 22      | 00-A(10), 05-M, 51-A, 52-M, 53-M          |
| 00-M                               |          |          | 23      | 00-A                                      |
| 00-M(7)                            |          |          | 24      | 00-A(10)                                  |
| 00-MU(12)                          |          |          | 27      | 00-A                                      |
| 00-M                               |          |          | 31      | 00-M(10), 05-A, 41-M(8), 51-A, 53-M       |
| 00-M                               |          |          | 32      | 00-M(10), 05-A, 42-M(8), 51-A, 53-M       |
| 00-M                               |          |          | 33      | 00-M(10), 05-A, 43-M(8), 51-A, 53-M       |
| 31-M(8), 53-M(8)                   |          |          | 41      | 00-M(8), 53-M                             |
| 32-M(8), 53-M(8)                   |          |          | 42      | 00-M(8), 61-M, 62-M                       |
| 33-M(8), 53-M(8)                   |          |          | 43      | 00-M(9)                                   |
| 00-M 32-A                          |          |          | 51      | 00-A(11), 05-A                            |
| 22-A 33-A                          |          |          |         |                                           |
| 31-A 54-M                          |          |          |         |                                           |
| 00-M, 22-M                         |          |          | 52      | 00-A(11)                                  |
| 22-M, 31-M, 32-M, 33-M, 41-M       |          |          | 53      | 00-M(11), 22-A, 41-M(8), 42-M(8), 43-M(8) |
| 00-M                               |          |          | 54      | 00-A, 51-M                                |
| 12-M, 42-M, 71-M                   |          |          | 61      | 62-A                                      |
| 12-M, 42-M, 61-M, 71-M             |          |          | 62      | 63-A                                      |
| 62-A                               |          |          | 63      | 64-A                                      |
| 63-A                               |          |          | 64      | 67-A                                      |
| 64-A                               |          |          | 67      | 00-M                                      |
| 00-M, 12-A(4) or M                 |          |          | 71      | 00-M(9), 61-M, 62-M                       |

U - UPLINK SELECTION

M - MANUAL SELECTION (V37E -- E)

A - AGC AUTOMATIC SELECTION

(1) - BY CM/SM SEP DISCRETE

(2) - BY GRD REF RELEASE DISCRETE

(3) - BY LIFTOFF DISCRETE OR BY V75E

(4) - BY SIVB/CSM SEP DISCRETE OR MANUAL SELECTION BACKUP

(5) - P00 IS AUTOMATICALLY SELECTED WHEN AGC MODE SWITCH IS SET TO ON

(7) - CALLED BY V65E, V66E, or V67E

(8) - IF EQUIVALENT PRETHRUSTING PROGRAM HAS NOT BEEN DONE SINCE LAST BURN, CHECK FAIL RESULTS

(9) - THE SELECTION OF P00 WILL NOT BE ENABLED DURING SPS THRUSTING OR DURING ENTRY

(10) - AGC SELECTION OF P00 BY DSKY REQUEST DURING THIS PROGRAM MAY BE DELAYED UP TO SEVEN (7) SECONDS WHEN CERTAIN CALCULATIONS ARE IN PROCESS

(11) - SELECTION OF P00 BEFORE COMPLETION OF THESE PROGRAMS MAY DESTROY REFSMAT IN THE AGC REQUIRING MANDATORY COMPLETION OF P51 PRIOR TO ANY PROGRAM REQUIRING REFSMAT

(12) - SELECT P27 FOR DESIRED DATA LOADING BY KEYING IN V72E, V73E, V74E, V76E, OR V77E

NOTE: 1. TO RESELECT A PROGRAM ALREADY IN PROCESS IT IS NECESSARY TO FIRST SELECT P00 AND THEN RESELECT THE PROGRAM.  
2. ORBIT PARAMETER DISPLAY ROUTINE (R34) MAY BE CALLED BY KEYING IN V64E DURING P00.

APOLLO COMPUTER LOGIC CHECKLIST INTERFACE

PROGRAM - ROUTINE INDEX

REV 6

6/28/66

MISSION 204-AGC PROGRAMS

| PHASE              | PROGRAM NUMBER | REV-DATE | PROGRAM TITLE                           | CONTAINS ROUTINES                    |
|--------------------|----------------|----------|-----------------------------------------|--------------------------------------|
|                    | 00             | 4-5/17   | AGC IDLING                              |                                      |
| PRE-LAUNCH         | 01             |          | PRELAUNCH INITIALIZATION                |                                      |
| AND SERVICE        | 02             |          | GYRO COMPASSING                         |                                      |
|                    | 03             |          | OPTICAL VERIFICATION OF AZIMUTH         |                                      |
|                    | 04             | 12-5/26  | INERTIAL REFERENCE                      |                                      |
|                    | 05             | 15-6/16  | G&N START UP                            |                                      |
|                    | 06             | 6-6/16   | G&N POWER DOWN                          |                                      |
|                    | 07             | 0-6/27   | SYSTEMS TEST (LIMITED USE IN FLIGHT)    |                                      |
| BOOST MONITOR      | 11             | 12-6/16  | PRE LET JETTISON                        |                                      |
|                    | 12             | 12-5/26  | POST LET JETTISON                       | R24, R34                             |
|                    | 13             |          | *****                                   |                                      |
|                    | 14             |          | *****                                   |                                      |
|                    | 15             |          | *****                                   |                                      |
|                    | 16             |          | *****                                   |                                      |
|                    | 17             | 7-5/25   | LET ABORT                               |                                      |
| COAST              | 21             |          | *****                                   |                                      |
|                    | 22             | 14-6/16  | LANDMARK TRACKING                       | R28, R27                             |
|                    | 23             | 11-6/16  | STAR-LANDMARK NAVIGATION MEASUREMENT    |                                      |
|                    | 24             | 4-6/16   | GROUND TRACK DETERMINATION              |                                      |
|                    | 25             |          | *****                                   |                                      |
|                    | 26             |          | *****                                   |                                      |
|                    | 27             | 10-5/26  | AGC UPDATE                              |                                      |
| PRE-THRUSTING      | 31             | 16-6/17  | ORBIT CHANGE                            | R35, R1, R21                         |
|                    | 32             | 14-6/28  | RETURN TO EARTH                         | R36, R1, R21                         |
|                    | 33             | 12-6/28  | SPS MINIMUM IMPULSE                     | R33, R31, R1, R21                    |
|                    | 34             |          | *****                                   |                                      |
|                    | 35             |          | *****                                   |                                      |
|                    | 36             |          | *****                                   |                                      |
|                    | 37             |          | *****                                   |                                      |
| THRUSTING          | 41             | 10-6/17  | ORBIT CHANGE                            | R2, R37, R24, R34, R31, R22          |
|                    | 42             | 11-6/28  | RETURN TO EARTH                         | R2, R37, R24, R34, R31, R22          |
|                    | 43             | 8-6/17   | SPS MINIMUM IMPULSE                     | R2, R37, R24, R34, R31               |
|                    | 44             |          | *****                                   |                                      |
|                    | 45             |          | *****                                   |                                      |
|                    | 46             |          | *****                                   |                                      |
|                    | 47             |          | *****                                   |                                      |
| INFLIGHT ALIGNMENT | 51             | 8-6/17   | IMU ORIENTATION DETERMINATION           | R27, R29                             |
|                    | 52             | 9-6/28   | SIVB/IMU ALIGN                          | R4, R25, R28, R27, R29, R30          |
|                    | 53             | 9-6/20   | CSM/IMU ALIGN                           | R1, R25, R21, R4, R30, R29, R27, R28 |
|                    | 54             | 5-6/28   | IMU REALIGNMENT                         | R30, R29, R27                        |
|                    | 55             |          | *****                                   |                                      |
|                    | 56             |          | *****                                   |                                      |
|                    | 57             |          | *****                                   |                                      |
| ENTRY              | 61             | 9-6/20   | MANEUVER TO CM/SM SEPARATION ATTITUDE   | R1, R21                              |
|                    | 62             | 9-6/20   | CM/SM SEPARATION AND PRE-ENTRY MANEUVER | R3, R21                              |
|                    | 63             | 8-6/20   | INITIALIZATION                          |                                      |
|                    | 64             | 4-6/20   | POST 0.05G                              |                                      |
|                    | 65             |          | *****                                   |                                      |
|                    | 66             |          | *****                                   |                                      |
| CSM ABORT          | 67             | 3-6/20   | FINAL PHASE                             |                                      |
|                    | 71             | 10-6/20  | FIRST ABORT BURN                        | R24                                  |
|                    | 72             |          | *****                                   |                                      |
|                    | 73             |          | *****                                   |                                      |
|                    | 74             |          | *****                                   |                                      |
|                    | 75             |          | *****                                   |                                      |
|                    | 76             |          | *****                                   |                                      |
|                    | 77             |          | *****                                   |                                      |

MISSION 204 AGC ROUTINES

| ROUTINE NUMBER | REV-DATE | ROUTINE TITLE                            | CONTAINS ROUTINES       | INCLUDED IN PROGRAM OR ROUTINE   |
|----------------|----------|------------------------------------------|-------------------------|----------------------------------|
| 1              | 6-6/20   | ATTITUDE CONTROL MODE CHECK              | R22                     | P31, P32, P33, P53, P61, R2      |
| 2              | 5-6/20   | THRUST CONTROL MODE CHECK                | R22, R1, R21            | P41, P42, P43                    |
| 3              | 8-6/2    | ENTRY CONTROL MODE CHECK                 | R22                     | P62                              |
| 4              | 7-6/3    | FINE ALIGNMENT                           | R25, R28, R27, R29, R30 | P52, P53                         |
| 5-20           |          | *****                                    |                         |                                  |
| 21             | 8-6/20   | ATTITUDE MANEUVER                        |                         | P31, P32, P33, P53, P61, P62, R2 |
| 22             | 8-6/20   | SCS DISCRETE MONITOR                     |                         | P41, P42                         |
| 23             |          |                                          |                         |                                  |
| 24             | 7-6/20   | DELTA V MONITOR                          |                         | P12, P41, P42, P43, P71          |
| 25             | 7-6/20   | COARSE ALIGNMENT                         |                         | P53, R4, P52                     |
| 26             |          |                                          |                         |                                  |
| 27             | 12-6/20  | SIGHTING MARK                            |                         | R4, P22, P52, P53, P54           |
| 28             | 6-6/20   | AUTO OPTICS POSITIONING                  |                         | R4, P22, P52, P53                |
| 29             | 7-6/20   | STAR DATA TEST                           |                         | R4, P51, P52, P53, P54           |
| 30             | 9-6/20   | GYRO TORQUING                            |                         | R4, P52, P53, P54                |
| 31             | 8-6/20   | BACK UP DELTA V COUNTER                  |                         | P41, P42, P43                    |
| 32             |          | *****                                    |                         |                                  |
| 33             | 5-6/20   | PRE-THRUST SPS MINIMUM IMPULSE DATA LOAD |                         | P33                              |
| 34             | 7-6/20   | ORBIT PARAMETER DISPLAY                  |                         | P12, P41, P42, P43               |
| 35             | 7-6/20   | PRETHRUST-ORBIT CHANGE DATA LOAD         |                         | P31                              |
| 36             | 8-6/20   | PRETHRUST-RETURN TO EARTH DATA LOAD      |                         | P32                              |
| 37             | 10-6/20  | SPS ENGINE IGNITION                      | R38                     | P41, P42, P43                    |
| 38             | 10-6/20  | SPS ENGINE THRUST FAIL                   |                         | R37                              |

\*THIS PROGRAM DOES NOT EXIST FOR MISSION 204