TORQUE GYROS EXTENDED VERB (V42) LOGIC REV 04 11/27/68

PURPOSE: (1) TO FINE ALIGN THE STABLE MEMBER BY TORQUING THE GYROS.

(2) TO TERMINATE THE COARSE ALIGN MODE AND ENTER THE INERTIAL MODE.

ASSUMPTIONS: (1) THE PROCESS IS CREW SELECTED BY DSKY ENTRY.

(2) THE PROCESS MAY BE SELECTED ONLY WHEN NO OTHER EXTENDED VERB IS ACTIVE.

(3) THE PROCESS IS INTENDED PRIMARILY FOR USE ON THE GROUND.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | | | DO I DESIRE TO LOAD A DELTA GYRO ANGLE GREATER THAN +99.999 DEGREES? - | | | |
| | | | .Y .N | | | |
| | | | THE ASTRONAUT MUST LOAD THE THREE DOUBLE PRE- CISION OGC REGISTERS: | | | #10 |
| | | | KEY V21N02E | | | |
| | | | 02757E | | | |
| | | | XXXXXE | | | |
| | | | N15E | | | #20 |
| | | | XXXXXEE | | | |
| | | | YYYYYEE | | | |
| | | | YYYYYEE | | | |
| | | | ZZZZZEE | | | |
| | | | ZZZZZE | | | |
| | | | BIT 14 OF THE HIGH ORDER RE- PRESENTS 180 DEGREES; BIT 13, 90 DEGREES; ETC. | | | #30 |
| | | | THE MAXIMUM NE- GATIVE GYRO TORQUING ANGLE | | | |
| | | | | V42/COLOSSUS) | | |

IS 37777, 37743; THE MAXIMUM POSITIVE GYRO TORQUING ANGLE IS 40000, 40034. ANY ANGLE OF GREATER MAGNITUDE THAN THE GIVEN MAXIMUM WILL RESULT IN A COMMANDED TORQUING ANGLE OF ZERO. #40

(NOTE: THE LOADING OF TORQUING ANGLES GREATER THAN 90 DEGREES SHOULD NOT BE PERFORMED DURING FLIGHT. THIS PROCEDURE IS INTENDED FOR USE ON THE GROUND.) #50 #60

KEY V42E

START CREW INITIATED FINE ALIGN #70

IS ANOTHER EXTENDED VERB ACTIVE?

.N .Y #80

IS THE IMU BEING INITIALIZED?

.N .Y

#90

```
                 ------------
                 TURN ON
                 OPR ERR LIGHT
                 ------------
++
+04
+
+
+04
++
 EDIT
                        ...
                         .
                       EXIT
```

#100

#110

```
              -------------------
              FLASH VERB-NOUN TO
HOLD  .       REQUEST LOAD OF
......        DELTA GYRO ANGLES
      .          V21N93
                 R1-XGYRO
                 R2-YGYRO
                 R3-ZGYRO

              ALL REGISTERS
              INITIALLY BLANK

              DELTA GYRO ANGLES -
              THE ANGLES THROUGH
              WHICH EACH GYRO MUST
              BE TORQUED TO COM-
              PLETE THE FINE
              ALIGNMENT. ALL ANG-
              LES IN DEGREES TO
              NEAREST .001 DEGREES
              -------------------
                        .
                        .
                        .
              -------------------
              WAIT FOR KEYBOARD
              ENTRY
```

```
                  -------------------
                  MONITOR DSKY:
                    OBSERVE VERB-NOUN
                  FLASH REQUESTING
                  LOAD OF DELTA GYRO
                  ANGLES
                  -------------------
```

#120

```
                  -------------------
                  DID I LOAD THE GYRO
                  TORQUING REGISTERS
                  BEFORE KEYING V42E?
                  -------------------
```

#130

```
                    .Y            .N
                    .             .
                    .             .
                    .             .
                    .             .
                    .             .
                    .             .
                    .             .
                    .             .
                  --------        .
                  KEY IN          .
                  PROCEED         .
                  --------        .
                    .             .
                    .             .
                    .             .
                    .             .
```

#140

LOAD DESIRED
DELTA GYRO
ANGLES

TERMINATE FLASH UPON
RECEIPT OF PROCEED
OR DATA

DISPLAY FINE ALIGN
V42

MONITOR DSKY:
OBSERVE DISPLAY
OF FINE ALIGN VERB

EXIT

ENTER FINE ALIGN
MODE

TURN OFF NO ATT
LIGHT

WAIT 2 SEC

PULSE IRIGS THROUGH
DESIRED ANGLES

++
+04
++
EDIT

655



```
.
.
.
.
.
.
...
.
EXIT
```

CHANGE CONTROL NOTES

REV 03  PCR 206
    04  EDITORIAL

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LOAD FDAI ERROR NEEDLES EXTENDED VERB (V43) LOGIC REV 04 11/27/68

PURPOSE: (1) TO LOAD ASTRONAUT SPECIFIED ANGLES INTO THE FDAI ERROR NEEDLES.

ASSUMPTIONS: (1) THE PROCESS IS CREW SELECTED BY DSKY ENTRY.

(2) IF LIFTOFF HAS OCCURRED, THE PROCESS MAY BE SELECTED ONLY WHEN NO OTHER EXTENDED VERB IS ACTIVE. IF LIFTOFF HAS NOT OCCURRED, ANY OTHER EXTENDED VERB IN PROCESS WILL BE OVERRIDDEN.

(3) THE PROCESS MAY NOT BE SELECTED IF THE IMU IS IN THE COARSE ALIGN OR ZERO ICDU MODE.

(4) THE PROCESS IS INTENDED PRIMARILY FOR USE ON THE GROUND.

(5) THE MAXIMUM ERROR ANGLE WHICH MAY BE LOADED IS +/- 16.88 DEGREES. ANY VALUE GREATER THAN THIS MAXIMUM WILL BE INTERPRETED AS =16.88 DEGREES. THE ASTRONAUT SHOULD SELECT THE FDAI SCALE APPROPRIATE TO THE ERROR ANGLES HE WISHES DISPLAYED. THE MAXIMUM ANGLES WHICH MAY BE SHOWN ON THE ERROR NEEDLES ARE: PITCH AND YAW -15 DEGREES; ROLL -50 DEGREES.

(6) THE PROCESS MAY BE SELECTED ONLY IN P00.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | | | CREW PROG. SELECTION | | | |
| | START CREW INITIATED LOAD IMU ATTITUDE ERROR NEEDLES | | KEY IN V43E | | | #10 |
| | IS THE CMC IDLING PROGRAM (P00) IN PROCESS? | | | | | #20 |
| | | | | | V43/COLOSSUS | |

```
                 .      .
                 .      .
                 .      .
                 .      .
                 .      .
            ---------------.
            IS THE IMU MODE .
            COARSE ALIGN?   .
            ---------------.
               .N        .Y .
               .          . .
               .          . .
            -----------.   .
            IS THE ZERO .   .
            CDU BIT SET? .   .
            -----------.   .
               .N     .Y .   .
               .      . .   .
               .      . .   .
            --------. .   .
            HAS LIFT- .   .
            OFF TAKEN .   .
            PLACE?    .   .
            --------. .   .
            N. .Y     .   .
         ..... .      .   .
         .     .      .   .
         .     .      .   .
         .  --------. .   .
         .  IS ANOTH- .   .
         .  ER EXTEN- .   .
         .  DED VERB  .   .
         .  ACTIVE?   .   .
         .  --------. .   .
         .     .N  .Y .   .
         .     .   . . .   .
         .     .   . . .   .
         .     .   ------------
         .     .   TURN ON
         .     .   OPR ERR
         .     .   LIGHT
         .     .   ------------
         .     .             .
         .     .             .
         .     .             .
++       .     .             .
+04      .     .             .
+        .     .             .
+        .     .             .
+04      .     .             .
++       .     .             .
 EDIT    .     .             .
         .     .            ...
         .     .             .
         ..... .            EXIT
             . .
             . .
             . .
             . .
             . .
             . .
             . .
             . .
             . .
```

#30

#40

#50

#60

#70

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          . .                                  .
          . .                                  .
          . .                                  .
          . .                                  .
          . .                                  .
          . .                                  .
          -------------------                  .
          RESET ERROR COUNTER                  .
          ENABLE                               .
          -------------------                  .
                    .                          .
                    .                          .
                    .                          .
          -------------------                  .
HOLD .    FLASH VERB-NOUN TO                   -------------------
........  REQUEST LOAD OF                  .   MONITOR DSKY:
      .   ERROR ANGLES                     ..... OBSERVE VERB-NOUN
           V21 N22                         .   FLASH REQUESTING
           R1- ROLL                            LOAD OF ERROR
           R2- PITCH                           ANGLES
           R3- YAW                             -------------------
                                                       .
          ALL REGISTERS INITI-                         .
          ALLY BLANK                                   .
                                                       .
          ERROR ANGLES-                                .
          THE ANGLES TO BE                             .
          LOADED IN THE ISS                            .
          ERROR COUNTERS.                              .
          MAXIMUM ANGLE                                .
          +16.88 DEGREES.                              .
          -                                            .
          ALL ANGLES IN                                .
          DEGREES TO NEAREST                           .
          .01 DEG                                      .
          -------------------                          .
                    .                                  .
                    .                                  .
                    .                                  .
          -------------------                  -------------------
          WAIT FOR KEYBOARD                .   LOAD DESIRED
          ENTRY                            ..... ERROR ANGLES
                                           .   -------------------
          TERMINATE FLASH UPON                         .
          RECEIPT OF DATA                              .
          -------------------                          .
                    .                                  .
                    .                                  .
                    .                                 ...
          -------------------                          .
                                                      EXIT
          WAIT 20 MILLISECONDS
          -------------------
                    .
                    .
                    .
          -------------------
          LOAD ISS ERROR
          COUNTERS
          -------------------
                    .
                    .
                    .
                    .
```

#80

#90

#100

#110

#120

#130

```
          .
          .
          .
          .
          .
          .
         ...
          .
        EXIT
```

CHANGE CONTROL NOTES

```
LOGIC REV 03   PCR MIT 66
          04   EDITORIAL
```

SET SURFACE FLAG EXTENDED VERB 44 LOGIC REV 01 11/27/68

PURPOSE: (1) TO SET THE SURFACE FLAG

ASSUMPTIONS: (1) THE PROCESS IS CREW SELECTED BY DSKY ENTRY.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | START CREW INITIATED SET SURFACE FLAG PROCESS | | KEY IN V44E | | | |
| | SET SURFACE FLAG | | | | | #10 |
| | EXIT | | | | | |

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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RESET SURFACE FLAG EXTENDED VERB 45 LOGIC REV 01 11/27/68

PURPOSE: (1) TO RESET THE SURFACE FLAG

ASSUMPTIONS: (1) THE PROCESS IS CREW SELECTED BY DSKY ENTRY.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | START CREW INITIATED RESET SURFACE FLAG PROCESS | | KEY IN V45E | | | |
| | RESET SURFACE FLAG | | | | | #10 |
| | EXIT | | | | | |

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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ESTABLISH G+C CONTROL EXTENDED VERB 46 LOGIC REV 01 11/27/68

PURPOSE: (1) TO ACTIVATE THE DAP.

ASSUMPTIONS: (1) THE PROCESS IS CREW SELECTED BY V46E.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | START CREW INITIATED ESTABLISHMENT OF G+C CONTROL | | KEY IN V46E | | | |
| | IS TVC DAP ON? | | | | | #10 |
| | .N: TURN ON OPERATOR ERROR LIGHT → EXIT | | | | | #20 |
| | DETERMINE VEHICLE CONFIGURATION | | | | | #30 |
| | INITIALIZE APPROPRIATE DAP | | | | | #40 |

```
.
.
.
.
.
...
.
EXIT
```

CHANGE CONTROL NOTES

LOGIC REV 01  PCN 515

MOVE OTHER VEHICLE STATE VECTOR TO THIS VEHICLE STATE VECTOR (V47) LOGIC REV 01 11/27/68

PURPOSE: (1) TO TRANSFER THE LM STATE VECTOR INFORMATION TO THE CSM STATE VECTOR.

ASSUMPTIONS: (1) THIS TRANSFER OF THE STATE VECTOR INFORMATION MAY BE ACCOMPLISHED AT ANY TIME.

(2) THE PROCESS IS CREW SELECTED BY DSKY ENTRY.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | START CREW INITIATED STATE VECTOR TRANSFER. (LM TO CM) | | KEY IN V47E | | | |
| | IS INTEGRATION IN PROCESS? | | | | | #10 |
| | COMPLETE INTEGRATION | | | | | #20 |
| | TRANSFER OTHER VEHICLE STATE VECTOR TO THIS VEHICLE STATE VECTOR. | | | | | #30 |

```
          .
          .
          .
          .
          .
        EXIT
```

#40

CHANGE CONTROL NOTES

LOGIC REV 01  PCN 515

NOTE: THIS EXTENDED VERB IS USED TO CALL ROUTINE R03. SEE R03 FOR SPECIFICATION LOGIC FLOW FOR LOADING DAP DATA.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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START CREW DEFINED MANEUVER LOGIC REV 01 11/27/68
EXTENDED VERB 49

NOTE: THIS EXTENDED VERB IS USED TO CALL ROUTINE R62. SEE R62 FOR THE SPECIFICATION LOGIC FLOW FOR A CREW DEFINED MANEUVER.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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PLEASE PERFORM EXTENDED VERB 50 LOGIC REV 01 11/27/68

PURPOSE: (1) TO INTERRUPT A PROGRAM OR ROUTINE TO ALLOW THE ASTRONAUT TO MANUALLY ACCEPT OR REJECT THE INFORMATION DISPLAYED ON THE DSKY.

ASSUMPTIONS (1) PRESSING PROCEED ON DSKY INDICATES REQUESTED ACTION HAS BEEN PERFORMED.

(2) EXECUTION OF ENTER INDICATES THE REQUESTED ACTION IS NOT DESIRED.

(3) THIS VERB ALWAYS APPEARS FLASHING ON THE DSKY.

(4) THIS VERB IS INTERNALLY INITIATED BY THE PROGRAM AND SHOULD NOT BE SELECTED BY THE CREW.

NOTE: THIS VERB IS COMPLETELY DESCRIBED IN SECTION 4.2.2.7

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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PLEASE MARK V51 LOGIC REV 01 11/27/68

PURPOSE: (1) TO ALLOW THE ASTRONAUT TO OBTAIN OPTICAL SIGHTING DATA BY USE OF THE SXT, SCT, AND THE MARK BUTTON.

ASSUMPTIONS: (1) OPTICS IS ON AND OPERATIONAL.

(2) THIS VERB IS USED IN P03, R21, AND R53. REFER TO THOSE PURPOSES AND ASSUMPTIONS FOR ADDITIONAL RESTRICTIONS.

(3) THIS VERB IS INTERNALLY INITIATED BY THE PROGRAM AND SHOULD NOT BE SELECTED BY THE CREW.

NOTE: THIS VERB IS COMPLETELY DESCRIBED IN SECTION 4.2.2.8.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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MARKED ON OFFSET LANDING SITE V52 LOGIC REV 01 11/27/68

PURPOSE: (1) TO SET THE INDEX OF THE OFFSET DESIGNATOR EQUAL TO THE VALUE OF THE MARK COUNTER.

ASSUMPTIONS: (1) V52E MUST BE KEYED IN BY THE ASTRONAUT AFTER MARKING ON THE OFFSET LANDING SITE.

(2) THIS VERB IS ONLY MEANINGFUL IN PROGRAM P22 THEREFORE REFER TO THE ASSUMPTIONS, PURPOSES, AND LOGIC FLOW OF P22 FOR FURTHER INSTRUCTIONS.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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PLEASE MARK ALTERNATE LCS V53 LCGIC REV 01 11/27/68

PURPOSE: (1) TO ALLOW THE ASTRONAUT TO OBTAIN OPTICAL SIGHTING DATA BY USE OF ANY DESIGNATED ALTERNATE LINE OF SIGHT.

ASSUMPTIONS: (1) THIS VERB IS USED IN R23 AND R56 ONLY.
REFER TO THE PURPOSES AND ASSUMPTIONS OF THESE ROUTINES FOR ADDITIONAL RESTRUCTIONS.

(2) THIS VERB IS INTERNALLY GENERATED BY THE PROGRAM AND SHOULD NOT BE SELECTED BY THE CREW.

NOTE: THIS VERB IS COMPLETELY DESCRIBED IN SECTION 4.2.2.8.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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START RENDEZVOUS BACKUP SIGHTING MARK
EXTENDED VERB 54



NOTE: THIS EXTENDED VERB IS USED TO CALL ROUTINE R23. SEE R23 FOR THE SPECIFICATION LOGIC FLOW FOR RENDEZVOUS BACKUP SIGHTING MARK PROCESS.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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INCREMENT CMC TIME EXTENDED VERB (V55) LOGIC REV 03 03/05/68

PURPOSE (1) TO CHANGE THE CMC CLOCK TIME USING INCREMENTS ( OR DECREMENTS) LOADED BY THE ASTRONAUT.

ASSUMPTIONS: (1) THE PROCESS MAY BE SELECTED ONLY WHEN NO OTHER EXTENDED VERB IS ACTIVE.

(2) THE PROCESS IS CREW SELECTED BY V55E.

```
 PROG                                                                                                  TOTAL
 CONT                                                                                                   TIME

                                                   .CREW
                                                   PROGRAM
                                                  SELECTION
                                                   ...
++        -------------------                    -------------------
+03       START CREW INITIATED   .               KEY IN V55E
+03       CHANGE OF CMC CLOCK  ..................  -------------------
++        -------------------   .                       .
                   .                                    .
                   .                                    .                                                  #10
                   .                                    .
                   .                                    .
          -------------                                 .
          IS ANOTHER EX-                                .
          TENDED VERB                                   .
          ACTIVE?                                       .
          -------------                                 .
           .N        .Y                                 .
           .         .                                  .
           .         .                                  .                                                  #20
           .       -----------                          .
           .       TURN ON OPR                          .
           .       ERR LAMP                             .
           .       -----------                          .
           .            .                               .
           .            .                               .
           .            .                               .
           .           ...                              .
           .            .                               .
           .           EXIT                             .                                                  #30
           .                                            .
           .                                            .
           .                                            .
           .                                            .
           .                                            .                                   V55/COLOSSUS
           .                                            .
```

```
           .                                                .
           .                                                .
           .                                                .
           .                                                .
           .                                                .
          --------------------                              .
          ESTABLISH EXTENDED                                .
          VERB ACTIVITY INTER-                              .
          LOCK                                              .
          --------------------                              .
                    .                                       .
                    .                                       .
                    .                                       .
          --------------------                      --------------------
HOLD  .   FLASH VERB-NOUN TO                        MONITOR DSKY:
......... REQUEST LOAD OF                             OBSERVE FLASH OF
      .   DELTA TIME                                VERB-NOUN REQUESTING
            V21 N24                                 LOAD OF DELTA CLOCK
            R1-HOURS                                TIME
            R2-MINUTES                              --------------------
            R3-SECONDS                                      .
                                                            .
          TIME TO NEAREST .01                               .
          SECONDS                                   --------------------
          --------------------                      DO I DESIRE TO LOAD
                    .                               DELTA CLOCK TIME?
                    .                               --------------------
                    .                                  .Y           .N
          --------------------                         .            .
          WAIT FOR KEYBOARD                            .            .
          ENTRY                                        .            .
                                                       .            .
                                 .                  ----------------.
                             ...................... LOAD DESIRED    .
                                 .                  TIME INCREMENTS .
                                                    ----------------.
                                                       .            .
                                                       .            .
++                                                     .            .
+03       TERMINATE FLASH UPON                         .         -------
+         RECEIPT OF DATA V34E   .                     .         KEY IN
+03       OR PROCEED           ................................. PRO OR
++        --------------------   .                     .         V34E
                   .PRO    .D                          .         -------
                   .OR     .A                          .            .
                   .V34E   .T                          .            .
                   .       .A                          .            .
                   .       .                           .           ...
                   .       .                           .            .
                   .       .                           .           EXIT
          --------------   .                           .
          REMOVE EXTEND-   .                          ...
          ED VERB ACTIV-   .                           .
          ITY INTERLOCK    .                          EXIT
          --------------   .
                   .       .
                   .       .
                   .       .
                  ...      .
                   .       .
                   .       .
                   .       .
                   .       .
                   .       .
```

```
          .       .
          .       .
          .       .
          .       .
          .       .
          .       .
        EXIT      .
                  .
                  .
```

#90

```
-------------------
ADD LOADED DELTA
TIME TO CMC CLOCK
TIME
-------------------
          .
          .
          .
-------------------
REMOVE EXTENDED VERB
ACTIVITY INTERLOCK
-------------------
          .
          .
          .
         ...
          .
         EXIT
```

#100

#110

CHANGE CONTROL NOTES

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TERMINATE TRACKING EXTENDED VERB 56 LOGIC REV 01 11/27/68

PURPOSE: (1) CLEAR RENDEZVOUS, UPDATE AND TRACK FLAGS.

(2) TERMINATE PROGRAM P20.

ASSUMPTIONS: (1) PROCESS IS CREW SELECTED BY DSKY ENTRY.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | START CREW INITIATED TERMINATE TRACKING PROCESS | | KEY IN V56E | | | |
| | CLEAR RNDVZFLG, UPDATFLG, AND TRACKFLG | | | | | #10 |
| | IS P20 THE PRESENT MAJOR MODE? | | | | | |
| | Y. DO ROUTINE R00 | N. | | | | #20 |
| | | CONTINUE IN PRESENT MAJOR MODE | | | | #30 |

```
        .         .
        .         .
        .         .
        .         .
        .         .
        .         .
      EXIT      EXIT
```



CHANGE CONTROL NOTES

LOGIC REV 01  PCN 515

START RENDEZVOUS SIGHTING MARK
EXTENDED VERB 57

LOGIC REV 01 11/27/68

NOTE: THIS EXTENDED VERB IS USED TO CALL ROUTINE R21. SEE R21 FOR THE SPECIFICATION LOGIC FLOW FOR STARTING THE RENDEZVOUS SIGHTING MARK PROCESS.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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691

RESET STICK FLAG EXTENDED VERB 58 LOGIC REV 01 11/27/68

PURPOSE: (1) RESET THE STICK FLAG

(2) ENABLE AUTOMATIC MANEUVERING

ASSUMPTIONS: (1) PROCESS IS CREW INITIATED BY DSKY ENTRY

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | START CREW INITIATED STICK FLAG RESET PROCESS | | KEY IN V58E | | | |
| | RESET STICK FLAG | | | | | #10 |
| | EXIT | | | | | |

CHANGE CONTROL NOTES

LOGIC REV 01 PGN EXE

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PLEASE MARK (OPTICS CALIBRATION) V59 LOGIC REV 01 11/27/68

PURPOSE: (1) TO ALLOW THE ASTRONAUT TO OBTAIN OPTICAL SIGHTING DATA BY USE OF THE SXT AND THE MARK BUTTON.

ASSUMPTIONS: (1) THE OPTICS IS ON AND OPERATIONAL.

(2) THIS VERB IS USED IN ROUTINE R57 ONLY.

REFER TO R57 PURPOSE AND ASSUMPTIONS FOR ADDITIONAL RESTRICTIONS.

(3) THIS VERB IS INTERNALLY INITIATED BY THE PROGRAM AND SHOULD NOT BE SELECTED BY THE CREW.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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SET N17=N20 EXTENDED VERB (V60) LOGIC REV 01 04/02/68

```
+>
+01
PURPOSE:      (1)  TO SET THE ASTRONAUT TOTAL ATTITUDE REGISTERS (N17) EQUAL TO THE PRESENT ATTITUDE (N20) (PROVIDE AN "ATTITUDE SET
++            FOR MODE III).

ASSUMPTIONS:  (1)  THE PROCESS IS CREW SELECTED BY V60E.
```

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | | | CREW PROG. SELECTION | | | |
| ++ | | | | | | |
| +01 | START CREW INITIATED SETTING OF N17=N20 | ..... | KEY IN V60E | | | #10 |
| + | | | | | | |
| + | | | | | | |
| + | | | | | | |
| + | | | | | | |
| + | SET THE REGISTERS ASSOCIATED WITH NOUN 17 EQUAL TO THE REGISTERS ASSOCIATED WITH NOUN 20. | | | | | #20 |
| +01 | | | | | | |
| ++ | | | | | | |
| | EXIT | | EXIT | | | |
| | | | | | | #30 |

CHANGE CONTROL NOTES

REV 01 PCR MIT 35 00053000

696

SELECT MODE 1 EXTENDED VERB (V61) LOGIC REV 02 12/20/67

PURPOSE: (1) TO DISPLAY ON THE FDAI ERROR NEEDLES THE DIFFERENCE BETWEEN THE CURRENT CDU ANGLES AND THE DAP COMMANDED ANGLES.

ASSUMPTIONS: (1) THE PROCESS IS CREW SELECTED BY DSKY ENTRY.

(2) THIS PROCESS MAY BE SELECTED AT ANY TIME.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | | | CREW PROG. SELECTION | | | |
| | START CREW INITIATED MODE 1 ERROR DISPLAY | | KEY IN V61E | | | #10 |
| | RESET NEEDLEFLG | | | | | |
| | EXIT | | EXIT | | | #20 |

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SELECT MODE 2 EXTENDED VERB (V62) LOGIC REV 01 12/20/67

PURPOSE: (1) TO DISPLAY THE TOTAL ATTITUDE ERROR (N22-N20) ON THE FDAI ERROR NEEDLES.

ASSUMPTIONS: (1) THE PROCESS IS CREW SELECTED BY DSKY ENTRY.

(2) THIS PROCESS MAY BE SELECTED AT ANY TIME.

```
PROG                                                                                          TOTAL
CONT      CMC                 GROUND              CREW                    CHECKLIST     TIME   TIME

                                                CREW PROG.
                                                SELECTION
                                                    .
                                                    .
                                                    .
                                                   ...
                                                    .
          -------------------   .             -------------
          START CREW INITIATED ..................KEY IN V62E                                     #10
          MODE 2 ERROR DISPLAY  .             -------------
          -------------------                       .
                    .                               .
                    .                               .
                    .                               .
          -------------------                       .
          SET NEEDLEFLG                             .
          -------------------                       .
                    .                               .
                    .                               .                                           #20
                    .                               .
          -------------------                       .
          SET BIT 6 IN FLAG                         .
          WORD 9                                    .
          -------------------                       .
                    .                               .
                    .                               .
                    .                               .
                   ...                             ...
                    .                               .                                           #30
                  EXIT                            EXIT
```

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SELECT MODE 3 EXTENDED VERB (V63) LOGIC REV 02 12/20/67

PURPOSE: (1) TO DISPLAY TOTAL ASTRONAUT ATTITUDE ERROR (N17-N20) ON THE FDAI ERROR NEEDLES.

ASSUMPTIONS: (1) THE PROCESS IS CREW SELECTED BY DSKY ENTRY.

(2) THIS PROCESS MAY BE SELECTED AT ANY TIME.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | | | CREW PROG. SELECTION<br>.<br>.<br>.<br>...<br>. | | | |
| | START CREW INITIATED MODE 3 ERROR DISPLAY | ..... | KEY IN V63E | | | #10 |
| | .<br>.<br>. | | | | | |
| | SET NEEDLEFLG | | | | | |
| | .<br>.<br>. | | | | | #20 |
| | RESET BIT6 IN FLAG-WORD 9 | | | | | |
| | .<br>.<br>.<br>...<br>. | | | | | |
| | EXIT | | | | | #30 |

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START S-BAND ANTENNA CALCULATIONS
EXTENDED VERB 64



NOTE: THIS EXTENDED VERB IS USED TO CALL ROUTINE R05. SEE R05 FOR THE SPECIFICATION LOGIC FLOW FOR STARTING THE S-BAND ANTENNA CALCULATIONS.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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START OPTICAL VERIFICATION OF PRELAUNCH ALIGNMENT EXTENDED VERB 65

LOGIC REV 01 11/27/68

NOTE: THIS EXTENDED VERB IS USED TO CALL PROGRAM P03. SEE PROGRAM P03 FOR THE SPECIFICATION LOGIC FLOW FOR STARTING THE PRELAUNCH ALIGNMENT OPTICAL VERIFICATION.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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MOVE THIS VEHICLE STATE VECTOR
TO OTHER VEHICLE STATE VECTOR (V66)

LOGIC REV 01 11/27/68

PURPOSE: (1) TO TRANSFER THE CSM STATE VECTOR INFORMATION TO THE LM STATE VECTOR

ASSUMPTIONS: (1) THE TRANSFER OF THE STATE VECTOR INFORMATION MAY BE ACCOMPLISHED AT ANY TIME SUBJECT TO THE NORMAL PROGRAM RESTRICTIONS

(2) THE PROCESS IS CREW SELECTED BY DSKY ENTRY.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | START CREW INITIATED STATE VECTOR TRANSFER (CM TO LM) | | KEY IN V66E | | | |
| | IS INTEGRATION IN PROCESS (Y / N) | | | | | #10 |
| | COMPLETE INTEGRATION | | | | | #20 |
| | TRANSFER THIS VEHICLE STATE VECTOR TO OTHER VEHICLE STATE VECTOR | | | | | #30 |

V66/COLOSSUS

```
        .
        .
        .
        .
        .
       ...
        .
      EXIT
```

#40

CHANGE CONTROL NOTES

LOGIC REV 01  PCN 515

W-MATRIX RMS ERROR DISPLAY (V67) LOGIC REV 02 11/29/68

PURPOSE: (1) TO PROVIDE A MEANS OF DISPLAYING W MATRIX INFORMATION AND REINITIALIZING THE W MATRIX IF DESIRED.

ASSUMPTIONS: (1) NO OTHER EXTENDED VERBS ARE ACTIVE.

(2) THIS PROCESS IS CREW SELECTED BY DSKY ENTRY.

(3) IF NEW VALUES OF RMS POSITION AND VELOCITY ERRORS ARE LOADED IN THIS ROUTINE, W MATRIX INITIALIZATION OCCURS THE NEXT TIME A MEASUREMENT IS MADE.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | | | .CREW<br>.EXTENDED<br>.VERB<br>.SELECTION<br>.<br>...<br>. | | | |
| | START EXTENDED VERB 67 ROUTINE | ..... | KEY IN V67E | | | #10 |
| | IS EXTENDED VERB ACTIVITY FLAG SET? | | | | | |
| | .N .Y | | | | | #20 |
| | TURN ON OPERATOR ERROR LIGHT | ..... | MONITOR DSKY: DOES OPERATOR ERROR LIGHT COME ON INDICATING ANOTHER EXTENDED VERB IS IN PROCESS? | | | #30 |
| | EXIT | | .N .Y | | | |
| | | | | V67/COLOSSUS | | |

COMPLETE THE ACTIVE EXTENDED VERB ROUTINE, RESET OPERATOR ERROR LIGHT, THEN RESELECT THIS ROUTINE BY KEYING IN V67E

EXIT

SET EXTENDED VERB ACTIVITY INTERLOCK

RESET V67 FLAG

CALCULATE RMS POSITION AND VELOCITY ERRORS.

HOLD

SNAP

FLASH VERB-NOUN TO REQUEST RESPONSE AND DISPLAY:
V06 N99
R1 POS ERR
R2 VEL ERR
R3 OPTION CODE

R1 - POS ERR - RMS VALUE OF POSITION ERROR IN NM TO NEAREST .01 NM.

R2 - VEL ERR - RMS VALUE OF VELOCITY ERROR IN F.P.S. TO NEAREST .1 F.P.S.

++
+02
++
EDIT

R3 - OPTION CODE
00001 = RENDEZVOUS
00002 = ORBITAL
00003 = CISLUNAR

MONITOR DSKY:
OBSERVE VERB-NOUN FLASH TO REQUEST RESPONSE AND DISPLAY OF W MATRIX RMS VALUES OF POSITION AND VELOCITY ERRORS.

DO I WISH TO INITIALIZE THE W-MATRIX?

N Y



210

```
DEFINES WHICH PROC-
ESS WILL BE INITIAL-
IZED IF THIS DIS-
PLAY IS CHANGED.                                                    #90
-------------------
          .
          .
          .
-------------------
WAIT FOR KEYBOARD          .          -------
ENTRY.                  ..........    KEY IN
                           .          PROCEED                       #100
                                      -------
TERMINATE FLASH UPON
RECEIPT OF PROCEED,        .              --------------
OR NEW DATA             ..........        KEY IN V25E AND
                           .              LOAD NEW DATA.
-------------------                       BE SURE R3
      .P      .NEW                        CORRESPONDS TO
      .R      .DATA                       TO THE TYPE OF
      .O      .                           NAVIGATION I                #110
      .C      .                           WISH TO HAVE
      .E -----------                      INITIALIZED
      .E STORE NEW                        WITH THIS DATA
      .D DATA                             --------------
      .  -----------                            .
      .       .                                 .
      .       .                                 .
      .       .                                 .
      . ------------                            .....
      . SET V67 FLAG                                                  #120
      . ------------
      .       .
      .       .
      .       .
      .       ............
      .
-------------------
IS THE V67 FLAG SET?
-------------------                                                   #130
 N.             Y.
  .              .
  .              .
 ...             .
  .              .
GO TO            .
 "A"             .
BELOW            .
                 .
                 .                                                    #140
                 .
                 .
                 .
                 .
                 .
```

```
                    .
                    .
                    .
                    .
                    .
--------------------
IS THE ASTRONAUT
LOADED OPTION CODE
= 1?
--------------------
  .Y              .N
  .               .
  .               .
---------------   .
STORE INITIAL-    .                                          #150
IZATION PARA-     .
METERS FOR REND-  .
EZVOUS NAVI-      .
GATION            .
---------------   .
 .                .
 .                .
 .                .
 . -----------------
 . IS THE ASTRONAUT                                           #160
 . LOADED OPTION   .
 . CODE = 2?
 . -----------------
 .   .Y           .N
 .   .            .
 .   .            .
 . -------------  .
 . STORE INITIA-  .
 . LIZATION       .
 . PARAMETERS     .                                           #170
 . FOR ORBIT      .
 . NAVIGATION     .
 . -------------  .
 .   .            .
 .   .            .
 .   .            .
 .   . -------------
 .   . STORE INITIA-
 .   . LIZATION PAR-
 .   . AMETERS FOR                                            #180
 .   . CISLUNAR
 .   . NAVIGATION
 .   . -------------
 .   .            .
 .   .            .
 .   .            .
--------------------
RESET RENDWELAG AND
ORBWELAG
--------------------                                         #190
          .
          .
          .
          .
          .
          .
          .
          .
          .
```

```
          .
          .
          .
          .
          .
          .
   "AN    .
   FROM   .
  ABOVE   .
    .     .
    .     .
    .     .
   ...    .
    .     .
--------------------
RESET EXTENDED VERB
ACTIVITY FLAG
--------------------
          .
          .
          .
         ...
          .
         EXIT
```

#200

#210

CHANGE CONTROL NOTES

LOGIC REV 01 PCR-MET-103
02 EDITORIAL

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CSM STROKE TEST ON EXTENDED VERB (V68) — LOGIC REV 01 11/27/68

PURPOSE: (1) TO GENERATE A WAVEFORM IN THE PITCH AXIS DESIGNED TO EXCITE BENDING.

ASSUMPTIONS: (1) THE PROCESS IS CREW SELECTED BY DSKY ENTRY.

(2) SECTION 3.3.9 OF R577 IS THE CONTROLLING SPECIFICATION. EXCERPTS FROM THAT SECTION ARE WRITTEN INTO THIS ASSUMPTION FOR INFORMATION ONLY.

IF THE PROCESS IS SELECTED PRIOR TO IGNITION PLUS 6 SECONDS, THE STROKE TEST WILL BE DELAYED UNTIL IGNITION PLUS 10 SECONDS.

THE WAVE FORM WILL CONSIST OF 4 SETS OF BURSTS WITH EACH SET BEING DEFINED BY THE NUMBER OF REVERSALS IN THAT SET, THE AMPLITUDE OF THE WAVE IN THE SET IN TERMS OF THE NUMBER OF BURSTS IN EACH HALF AMPLITUDE, AND THE PULSE BURST SIZE (A PAD LOADED PARAMETER ). THE BURST SIZE IS THE SAME IN ALL SETS AND IS DEFINED IN TERMS OF BIT LENGTH WHERE EACH BIT IS SCALED AT 85.41 ARCSEC.

THE 4 SETS ARE DEFINED AS FOLLOWS:

SET 1 .... 10 BURSTS PER HALF AMPLITUDE WITH 4 REVERSALS
SET 2 .... 6 BURSTS PER HALF AMPLITUDE WITH 6 REVERSALS
SET 3 .... 5 BURSTS PER HALF AMPLITUDE WITH 10 REVERSALS
SET 4 .... 4 BURSTS PER HALF AMPLITUDE WITH 10 REVERSALS

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | | | CREW SELECTION | | | |
| | START CREW INITIATED STROKE TEST | | KEY V68E | | | #10 |
| | IS TVC DAP ON? | | | | | |
| | .Y: TURN ON CPR ERR LIGHT | | .N | | | #20 |

```
        .      .
        .      .
        .      .
        .      .
        .      .
        .      .
        .      .
        .      .
        .     ...
        .      .
        .     EXIT
        .
        .
------------------
INITIALIZE STROKE
TEST PARAMETERS FCR
FIRST SET
------------------
          .
          .
          .
------------------
HAS LM-CN SWITCHOVER
OCCURRED?
------------------
   .Y          .N
   .           .
   .           .
   .      ----------
   .      WAIT FOR
   .      SWITCHOVER
   .      ----------
   .           .
   .           .
   .           .
   .      ----------
   .      WAIT 4
   .      SECONDS
   .      ----------
   .           .
   .           .
   .           .
   .           .  .......
   .           .  .     .
   .           .  .     .
   .           .  .... .
   .           .  .. .  .
   .           .  .. .  .
------------------   .  .
LCAD PULSE BURST     .  .
SIZE INTO TVC PITCH  .  .
ERROR COUNTER        .  .
------------------   .  .
          .          .  .
          .          .  .
          .          .  .
          .          .  .
          .          .  .
          .          .  .
          .          .  .
          .          .  .
          .          .  .
          .          .  .
          .          .  .
```



7/6

```
          .          .  .
          .          .  .
          .          .  .
          .          .  .
          .          .  .
          .          .  .
--------------------  .  .
SEND TVC PITCH COUNT  .  .
TO SPS GIMBAL         .  .                                  #80
--------------------  .  .
          .          .  .
          .          .  .
          .          .  .
--------------------  .  .
COUNT DOWN NUMBER     .  .
OF BURSTS ON THIS     .  .
SLOPE                 .  .
--------------------  .  .
          .          .  .                                  #90
          .          .  .
          .          .  .
--------------------  .  .
HAS THIS SLOPE BEEN   .  .
COMPLETED?            .  .
--------------------  .  .
          .Y    N.   .  .
          .      .   .  .
          .      .   .  .
          .      .....  .                                  #100
          .             .
          .             .
--------------------    .
IS THIS THE LAST        .
REVERSAL OF THIS        .
SET?                    .
--------------------    .
 .Y             .N      .
 .              .       .
 .              .       .                                  #110
 .  ---------------     .
 .  IS THIS THE NEXT     .
 .  TO LAST REVERSAL     .
 .  OF THIS SET?         .
 .  ---------------     .
 .   .N           .Y    .
 .   .            .     .
 .   .            .     .
 .   .            .     .
 .   .            .     .                                  #120
 .   . -------------    .
 .   . INDICATE NEXT    .
 .   . REVERSAL IS      .
 .   . LAST             .
 .   . -------------    .
 .   .          .       .
 .   .          .       .
 .   .          .       .
 .   .          .       .
 .   .          .       .                                  #130
 .   .          .       .
 .   .          .       .
 .   .          .       .
```

```
SET NUMBER OF
BURSTS FOR
1/2 AMPLITUDE

DECREMENT
REVERSAL
COUNTER                                                    #140

SET NUMBER
OF BURSTS
FOR FULL
AMPLITUDE                                                  #150

CHANGE SIGN OF
SLOPE
                                                           #160

DECREMENT SET
COUNTER                                                    #170

HAVE ALL SETS BEEN
COMPLETED?
 .Y        .N
                                                           #180
...
 .
EXIT
```

```
          .              .
          .              .
          .              .
          .              .
          .              .
          .              .
          .              .
-------------------      .
INITIALIZE PARAME-       .
TERS FOR THIS SET        .
-------------------      .
          .              .
          .              .
          ................
```



CHANGE CONTROL NOTES

LOGIC REV 01  PCN 515

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RESTART EXTENDED VERB (V69) LOGIC REV 05 07/09/68

PURPOSE: (1) TO CAUSE A COMPUTER RESTART.

ASSUMPTIONS: (1) THE RESTART IS CREW INITIATED BY DSKY ENTRY.

(2) V69E DOES NOT DIRECTLY SELECT RESTART PROCESSING. IT CAUSES A SITUATION WHICH SATISFIES ONE OF THE CONDITIONS FOR AN AUTOMATIC RESTART, I.E. TOO MANY CONSECUTIVE TC INSTRUCTIONS.

(3) THIS PROCESS MAY BE SELECTED AT ANY TIME.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | | | CREW PROG SELECTION | | | |
| | START CREW INITATED COMPUTER RESTART | | KEY IN V69E | | | #10 |
| | BRANCH (TC) TO SELF | | MONITOR DSKY: DOES PROGRAM ALARM LIGHT COME ON INDICATING COMPUTATIONAL DIFFICULTIES? | | | #20 |
| ++ +05 ++ | | | | | | |

.Y .N

```
                                          .       .
                                          .       .
                                          .       .
                                          .       .
                                          .       .
                                          .       .
                                          .      ...
                                          .       .
                                          .      EXIT
                                          .
                                          .
                                  --------------------
                                  KEY V05N09E TO DIS-
                                  PLAY ALARM CODE:
                                  01107-BAD PHASE
                                  TABLE
                                  --------------------
                                          .
                                          .
                                          .
                                  --------------------
                                  GO TO R00
                                  --------------------
                                          .
                                          .
                                          .
                                         ...
                                          .
                                         EXIT

          --------------------
          NOTE: THE LOGIC FROM
          THIS POINT IS NOT
          UNIQUELY ASSOCIATED
          WITH V69. IT IS THE
          PROCESSING WHICH
          TAKES PLACE WITH ANY
          HARDWARE INITIATED
          RESTART. THE CONDI-
          TION CAUSED BY V69E
          AND SENSED BY THE
++        COMPUTER HARDWARE
+05       WHICH INITIATES A
+         RESTART IS TO TRAP-
+         TOO MANY CONSECUTIVE
+         TC'S
+         --------------------
+
+
+
+
+
+05
++

          --------------------
          INCREMENT RESTART
          COUNTER
          --------------------
                    .
                    .
                    .
          --------------------
          TURN ON RESTART
          LIGHT
          --------------------
                    .
                    .
                    .
          --------------------
          ZERO OUTBIT CHANNELS
          5 (RCS PITCH AND
          YAW) AND 6 (RCS
          ROLL)
          --------------------
                    .
                    .
                    .
          --------------------
          SET TIME 3 = 37777
              TIME 4 = 37775
              TIME 5 = 37774
          --------------------
                    .
                    .
                    .
                    .
                    .
```

#30

#40

#50

#60

#70

#80

```
          .
          .
          .
          .
          .
          .
          .
          .
--------------------
ZERO OUTBIT CHANNELS
11 (EXCEPT ENGINE
ON, OFF AND ISS
WARNING); 12 (EXCEPT
COARSE ALIGN ENABLE,                                    #90
ZERO IMU CDU'S AND
ENABLE IMU ERROR
COUNTER); 13 (EXCEPT
TELEMETRY BITS, RESET
TRAP BITS AND T6RUPT
BIT); AND 14 (EXCEPT
GYRO ENABLE)
--------------------
          .
          .                                             #100
          .
--------------------
TERMINATE WAITLISTED
TASKS
--------------------
          .
          .
          .
--------------------
CLEAR ALL EXECUTIVE                                     #110
REGISTER SETS
--------------------
          .
          .
          .
--------------------
INDICATE NO ACTIVE
JOBS
--------------------
          .                                             #120
          .
          .
--------------------
MAKE ALL VAC AREAS
AVAILABLE
--------------------
          .
          .
          .
--------------------
BLANK DSKY REGISTERS                                    #130
(PROGRAM, VERB,
NOUN, R1, R2, R3)
--------------------
          .
          .
          .
          .
          .
          .
```

```
          .
          .
          .
          .
          .
  --------------------
  RESET DISPLAY/ASTRO-
  NAUT INTERFACE FLAGS                                    #140
  --------------------
          .
          .
          .
  --------------------
  DO CONTROL REGISTERS
  HAVE DEFICIENT DATA?
  --------------------
   .Y               .N
   .                .                                      #150
   .                .
  ---------------   .
  WAS AN ERASABLE   .
  MEMORY CHECK IN   .
  PROCESS WHEN THE  .
  RESTART OCCUPR-   .
  ED?               .
  ---------------   .
    .Y      .N      .
    .       .       .                                     #160
    .       .       .
    . ----------------
    . HAS THERE BEEN
    . AN OSCILLATOR
    . FAIL?
    . ----------------
    .  .Y            .N
    .  .             .
    .  .             .
    . -------------  .                                    #170
    . IS THE AGC     .
    . WARNING ON?    .
    . -------------  .
    .  .Y         .N .
    .  .          . .
    .  .          . .
    .  . -------------
    .  . HAVE BOTH THE
    .  . MARK REJECT
    .  . AND ERROR                                        #180
    .  . RESET BUTTONS
    .  . BEEN PRESSED?
    .  . -------------
    .  .    .Y       .N
    .  .    .        .
    .  .    .        .
....  .    .        .
.  .  .    .        .
.  .  .    .        .
.  .  .    .        .                                     #190
.  .  .    .        .
.  .  .    .        .
.  .  .    .        .
.  .  .    .        .
.  .  .    .        .
.  .  .    .        .
.  .  .    .        .
```

```
                 . . .   .
                 . . .   .
                 . . .   .
                 . . .   .
                 . . .   .
                 ----------------
                 CLEAR SELF CHECK
++               ERROR REGISTERS,
+05              AND MODE REGISTER
++               ----------------
                      .
                      .
                      .
                 ----------------
                 ZERO OUTBIT                                    #200
                 CHANNELS: 11
                 ("A" RELAYS); 12
                 (GNC); 13 (AGC);
                 AND 14 (ISS)
                 ----------------
                      .
                      .
                      .
                 ----------------
                 INITIALIZE DOWN-                               #210
                 LINK WITH POO
                 DOWNLIST
                 ----------------
                      .
                      .
                      .
                 ----------------
                 CLEAR PHASE TABLE
                 ----------------                               #220
                      .
                      .
                      .
                 ----------------
                 INITIALIZE IMU
                 (INHIBIT IMU FAIL
                 FOR 5 SECONDS)
                 ----------------
                      .
                      .                                         #230
                      .
                 ----------------
                 TURN OFF NO ATT
                 LIGHT
                 ----------------
                      .
                      .
                      .
                 ----------------
                 TERMINATE OPTICS                               #240
                 COARSE ALIGN
                 ----------------
                      .
                      .
                      .
                      .
                      .
                      .
```

```
INITIALIZE OPTICS

INITIALIZE PIPA                                          #250
AND TELEMETRY
FAIL FLAGS

RESET ALL FLAG-                                          #260
WORDS (EXCEPT
IDLEFLAG- BIT 7
FLAGWORD 7 AND
COMPUTER FLAG-
BIT 8 FLAGWORD 5

RESET UPSVFLAG                                           #270

EXIT                                                     #280

SCHEDULE T5RUPT FOR
DAP PROGRAM

                                                         #290
RESET DSKYFLAG
```

```
INITIALIZE OPTICS                                   #300

INITIALIZE IMU

TURN OFF DSKY DIS-                                  #310
CRETE LIGHTS EXCEPT
PROG, GIMBAL LOCK
AND NO ATT.

IS NO ATT LIGHT ON?                                 #320
 .N              .Y
 .               .
 .               .
 . ----------------
 . RETURN ISS TO
 . COARSE ALIGN
 . ----------------
 .               .
 .               .                                  #330
 .               .
IS ENGONFLG SET?
.N               .Y
.                .
.                .
.  ----------------
.  TURN ENGINE ON
.  (BIT 13 CHANNEL                                  #340
.  11)
.  ----------------
.                .
.                .
.                .
TEST PHASE TABLE.
IS IT CORRECT?
 .N              .Y                                 #350
 .               .
 .               .
 .               .
 .               .
```

```
.   .           .
.   .           .
.   .           .
.   .           .
.   .           .
.   .           .
.   ------------.
.   TURN ON PROC .
.   ALARM AND    .
.   STORE ALARM  .
.   CODE 1107    .
.   ------------.
.   .           .
.   .           .
.   .           .
.....           .
                .
                .
                .
   -------------------
   DISPLAY PROGRAM
   -------------------
            .
            .
            .
   -------------------
   WAS P20 IN PROCESS
   WHEN RESTART
   OCCURRED?
   -------------------
        .Y      .N
        .       .
        .       .
   -----------.
   GO TO REDO  .
   P20         .
   -----------.
        .       .
        .       .
        .       .
       ...      .
        .       .
       EXIT     .
                .
                .
     -----------------
     WERE ANY PHASES
     ACTIVE?
     -----------------
        .Y      .N
        .       .
        .       .
++      . -------------
+05     . GO TO ROUTINE
++      . R00
        . -------------
        .           .
        .           .
        .           .
        .           .
        .           .
       ...         ...
        .           .
        .           .
        .           .
        .           .
```

#360

#370

#380

#390

#400

```
EXIT      EXIT
```

CHANGE CONTROL NOTES

REV 04  PCR MIT 66
REV 05  PCR 206

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UPDATE LIFT OFF TIME EXTENDED VERB 70 LOGIC REV 01 11/27/68

NOTE: THIS EXTENDED VERB IS USED BY UPDATE PROGRAM P27 ONLY. SEE P27 FOR THE SPECIFICATION LOGIC FLOW FOR UPDATING THE LIFT OFF TIME.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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NOTE: THIS EXTENDED VERB IS USED BY UPDATE PROGRAM P27 ONLY. SEE P27 FOR THE SPECIFICATION LOGIC FLOW FOR A BLOCK ADDRESS UNIVERSAL UPDATE.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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735



NOTE: THIS EXTENDED VERB IS USED WITH UPDATE PROGRAM P27 ONLY. SEE P27 FOR THE SPECIFICATION LOGIC FLOW SINGLE ADDRESS UNIVERSAL UPDATE.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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UPDATE CMC TIME (OCTAL)
EXTENDED VERB 73



NOTE: THIS EXTENDED VERB IS USED BY THE UPDATE PROGRAM P27 ONLY. SEE P27 FOR THE SPECIFICATION LOGIC FLOW FOR THE OCTAL UPDATE OF CMC TIME.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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INITIALIZE ERASABLE DUMP VIA DOWNLINK EXTENDED VERB (V74) — LOGIC — REV 03 — 11/27/68

PURPOSE: (1) TO DUMP ALL EIGHT BANKS OF ERASABLE MEMORY VIA DOWNLINK.

ASSUMPTIONS:
(1) THE PROCESS IS CREW SELECTED BY DSKY ENTRY.
++ (2) 4, 2, OR 1 COMPLETE DUMPS MAY BE CALLED BY THE ASTRONAUT BY LOADING 20000, 10000, OR 04000
+03 RESPECTIVELY IN LOCATION 0333(DUMPCNT). THIS MAY BE DONE BEFORE OR AFTER KEYING V74E.
+
+ (3) THE DUMP OF EACH BANK IS PRECEDED BY AN ID WORD, SYNCH BITS, ECADR AND TIME.
+
+ (4) THE E BANKS ARE DUMPED IN ORDER, STARTING WITH E BANK ZERO.
+03
++ (5) THE TIME REQUIRED FOR 4 COMPLETE DUMPS IS 83.2 SECONDS (100 WORDS PER SEC BIT RATE).
EDIT

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | | | CREW PROG. SELECTION | | | |
| | START CREW INITIATED DOWNLINK ERASABLE DUMP | | KEY IN V74E | | | #10 |
| ++ +03 + + + + + + + + + + + + + + + | | | | | | #20 |
| | | | | | V74/COLOSSUS | |

```
+
+
+
+
+
+
+
+
+
+
+
+
+
+
+
+
+
+
+
+03
++
PCN
586
```

```
SPECIFY NUMBER
OF DUMPS DESIRED BY
LOADING THE FOUR
HIGH ORDER BITS OF
LOCATION 0333.
KEY V21N01E
     0333E
     XX000E

XX-20 FOR 4 DUMPS
   10 FOR 2 DUMPS
   04 FOR 1 DUMP
```

#30

```
EXIT
```

#40

```
TERMINATE CURRENT
DOWNLIST
```

```
SET E BANK COUNTER,
WORD COUNTER, AND
DUMP COUNTER=0
```

#50

```
INITIALIZE E BANK
DUMP. DUMP ID, SYNCH
BITS, ECADP AND
TIME1.
```

#60

```
DUMP E BANK
```

#70

```
.                 .
.                 .
.                 .
.                 .
.                 .
.                 .
.     -------------------
.     INCREMENT E BANK
.     COUNTER AND SET WORD
.     COUNTER=0.
.     -------------------
.                 .
.                 .
.                 .
.     -------------------
.     ALL 8 BANKS DUMPED?                                          #80
.     -------------------
.      .N         .Y
.      .          .
.      .          .
.......           .
.                 .
.                 .
.     -------------------
.     INCREMENT DUMP COU-
.     NTER AND SET E BANK                                          #90
.     COUNTER=0
.     -------------------
.                 .
.                 .
.                 .
.     -------------------
.     DUMP COUNTER=
.     REQUIRED DUMP COUNT
.     (DUMPCNT)?
.     -------------------                                         #100
.      .N         .Y
.      .          .
.      .          .
.......           .
                  .
                  .
      -------------------
      RESTORE INTERRUPTED
      DOWNLIST
      -------------------                                         #110
                  .
                  .
                  .
                 ...
                  .
                 EXIT
```

CHANGE CONTROL NOTES

```
LOGIC REV 02  PCR MIT 66                                    00165000
LOGIC REV 03  PCN 586                                       00165001
```

SET LIFTOFF FLAG EXTENDED VERB 75 LOGIC REV 01 11/27/68

PURPOSE: (1) SET LIFTOFF BACK-UP FLAG.

ASSUMPTION: (1) THE PROCESS IS CREW SELECTED BY V75E

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | START CREW INITIATED SET LIFTOFF FLAG PROCESS | | KEY IN V75E | | | |
| | . . . . | | | | | #10 |
| | SET LIFTOFF BACK-UP FLAG | | | | | |
| | . . . . . EXIT | | | | | #20 |

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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SET PREFERRED ATTITUDE FLAG EXTENDED VERB 76 LOGIC REV 01 11/27/68

PURPOSE: (1) TO SET PREFERRED ATTITUDE FLAG

ASSUMPTION: (1) PROCESS IS CREW SELECTED BY DSKY ENTRY.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | INITIATE PREFERRED ATTITUDE FLAG SET PROCESS | | KEY IN V76E | | | |
| | SET PREFERRED ATTITUDE FLAG | | | | | #10 |
| | EXIT | | | | | #20 |

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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RESET PREFERRED ATTITUDE FLAG EXTENDED VERB 77 LOGIC REV 01 11/27/68

PURPOSE: (1) TO RESET PREFERRED ATTITUDE FLAG

ASSUMPTION: (1) PROCESS IS CREW SELECTED BY DSKY ENTRY.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | INITIATE PREFERRED ATTITUDE FLAG RESET PROCESS | | KEY IN V77E | | | |
| | RESET PREFERRED ATTITUDE FLAG | | | | | #10 |
| | EXIT | | | | | #20 |

CHANGE CONTROL NOTES

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CHANGE GYRO COMPASS LAUNCH AZIMUTH — LOGIC — REV 01 — 11/27/68
VERB 78

PURPOSE: (1) TO PROVIDE THE PROPER STABLE MEMBER ORIENTATION FOR LAUNCH.

ASSUMPTIONS: (1) THE PROCESS HAS THE CAPABILITY TO CHANGE THE LAUNCH AZIMUTH OF THE STABLE MEMBER WHILE GYRO COMPASSING (P02)

(2) PROCESS IS CREW SELECTED BY KEYBOARD ENTRY V78F

(3) THE PROCESS MAY BE SELECTED ONLY DURING PRELAUNCH OR SERVICE-GYRO COMPASSING PROGRAM (P02)

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | START GYRO COMPASS LAUNCH AZIMUTH CHANGE | | KEY IN V78E | | | |
| | IS THE CURRENT PROGRAM P02? | | | | | #10 |
| | TURN ON OPERATOR ERROR LIGHT | | MONITOR DSKY: DOES OPERATOR ERROR LIGHT COME ON INDICATING THAT THIS ROUTINE CAN NOT BE SELECTED AT THIS TIME? | | | #20 |
| | EXIT | | N. / Y. | | | |

V78/COLOSSUS

IN ORDER TO TURN THIS PROCESS ON SELECT PRELAUNCH OR SERVICE INITIALIZATION PROGRAM (P01) BY KEYING IN V37E01E AND RESELECTING THIS PROCESS OR BY KEYING IN V34E ON MARK DISPLAY IN P03.

EXIT

FLASH VERB-NOUN TO REQUEST PROCEED AND DISPLAY STORED LAUNCH AZIMUTH
V06N29
R1 XSM LAUNCH AZIMUTH
R2 BLANK
R3 BLANK

XSM LAUNCH AZIMUTH MEASURED CLOCKWISE FROM TRUE NORTH IN DEGREES TO THE NEAREST .01 DEGREES.

HOLD
SNAP

MONITOR DSKY:
OBSERVE VERB NOUN FLASH TO REQUEST PROCEED AND DISPLAY OF XSM LAUNCH AZIMUTH

AM I SATISFIED WITH XSM LAUNCH AZIMUTH

Y — KEY IN PROCEED

N

WAIT FOR KEYBOARD ENTRY

```
                                                  .   .
                                                  .   .
                                                  .   .
                                                  .   .
                                                  .   .
                                                  .   .
                                 --------------   .
                                 KEY IN V21E AND  .
                                 LOAD NEW LAUNCH  .
                                 AZIMUTH          .
                                 --------------   .
TERMINATE FLASH UPON                              .
RECEIPT OF PROCEED                                .
OR NEW DATA                                       .
-------------------                               .
   .P          .NEW                               .
   .R          .DATA                              .
   .O          .                                  .
   .C          .                                  .
   .E       ---------                             .
   .E       STORE NEW                             .
   .D       DATA                                  .
   .        ---------                             .
   .           .                                  .
  ...          .                                  .
   .           .                                  .
 EXIT          .                                  .
               .                                  .
               .                                  .
               .                                  .
               ...........
```

#80

#90

CHANGE CONTROL NOTES

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START LUNAR LANDMARK SELECTION
EXTENDED VERB 79

LOGIC REV 01 11/27/68

NOTE: THIS EXTENDED VERB CALLS ROUTINE 35. SEE R35 FOR THE SPECIFICATION LOGIC FLOW FOR STARTING THE LUNAR LANDMARK SELECTION.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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UPDATE LM STATE VECTOR EXTENDED VERB 80 LOGIC REV 01 11/27/68

PURPOSE: (1) TO CAUSE THE RENDEZVOUS DATA PROCESSING RESULTS TO UPDATE THE LM STATE VECTOR

ASSUMPTION: (1) PROCESS IS CREW SELECTED BY V80E

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | START CREW INITIATED LM STATE VECTOR UP-DATE PROCESS | | KEY IN V80E | | | |
| | RESET VEHICLE UPDATE FLAG | | | | | #10 |
| | EXIT | | | | | #20 |

CHANGE CONTROL NOTES

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UPDATE CSM STATE VECTOR EXTENDED VERB 81 LOGIC REV 01 11/27/68

PURPOSE: (1) TO CAUSE THE RENDEZVOUS DATA PROCESSING RESULTS TO UPDATE THE CSM STATE VECTOR.

ASSUMPTION: (1) PROCESS IS CREW SELECTED BY V81E.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | START CREW INITIATED CSM STATE VECTOR UPDATE PROCESS | | KEY IN V81E | | | |
| | SET VEHICLE UPDATE FLAG | | | | | #10 |
| | EXIT | | | | | #20 |

CHANGE CONTROL NOTES

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NOTE: THIS EXTENDED VERB CALLS ROUTINE 30. SEE R30 FOR THE SPECIFICATION LOGIC FLOW FOR REQUESTING ORBIT PARAMETER DISPLAY.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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REQUEST RENDEZVOUS PARAMETER
DISPLAY #1 EXTENDED VERB 83



NOTE: THIS EXTENDED VERB CALLS ROUTINE 31. SEE
R31 FOR THE SPECIFICATION LOGIC FLOW FOR
REQUESTING RENDEZVOUS PARAMETER DISPLAY #1

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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REQUEST RENDEZVOUS PARAMETER
DISPLAY #2 EXTENDED VERB 85



NOTE: THIS EXTENDED VERB CALLS ROUTINE 34. SEE R34 FOR THE SPECIFICATION LOGIC FLOW FOR REQUESTING RENDEZVOUS PARAMETER DISPLAY #2.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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REJECT RENDEZVOUS BACK-UP SIGHTING MARK V86 — LOGIC — REV 01 — 11/27/68

PURPOSE: (1) IN THE EVENT OF AN UNSATISFACTORY SIGHTING MARK TAKEN DURING THE RENDEZVOUS BACK-UP SIGHTING MARK ROUTINE, V86E MAY BE USED TO ERASE THE MARK DATA (IF ANY) IN POSITION 1.

ASSUMPTIONS: (1) PROCESS IS CREW SELECTED BY V86E

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | START CREW INITIATED REJECT OF RENDEZVOUS BACK-UP SIGHTING MARK PROCESS. | | KEY IN V86E | | | |
| | ERASE MARK DATA (IF ANY) IN POSITION #1 | | | | | #10 |
| | RECYCLE TO PERFORM ALTERNATE LOS SIGHTING MARK | | | | | #20 |
| | EXIT | | | | | #30 |

CHANGE CONTROL NOTES

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SET VHF RANGE FLAG EXTENDED VERB 87 LOGIC REV 01 11/27/68

PURPOSE: (1) TO SET THE VHF RANGE FLAG

ASSUMPTION: (1) PROCESS IS CREW SELECTED BY DSKY ENTRY

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | INITIATE VHF RANGE FLAG SET PROCESS | | KEY IN V87E | | | |
| | SET VHF RANGE FLAG | | | | | #10 |
| | EXIT | | | | | #20 |

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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RESET VHF RANGE FLAG EXTENDED VERB 88 LOGIC REV 02 11/27/68

PURPOSE: (1) TO RESET THE VHF RANGE FLAG.

ASSUMPTION: (1) PROCESS IS CREW SELECTED BY DSKY ENTRY.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | INITIATE VHF RANGE FLAG RESET PROCESS | ..... | KEY IN V88E | | | |
| ++ +02 + +02 ++ | SHUT OFF TRACKER LIGHT | | | | | #10 |
| | RESET VHF RANGE FLAG | | | | | #20 |
| | EXIT | | | | | #30 |

CHANGE CONTROL NOTES

REV 01 PCR 515
REV 02 PCR 225

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START RENDEZVOUS FINAL ATTITUDE
MANEUVER ROUTINE EXTENDED VERB 89



NOTE: THIS EXTENDED VERB CALLS ROUTINE 63. SEE R63 FOR THE SPECIFICATION LOGIC FLOW TO START RENDEZVOUS FINAL ATTITUDE MANEUVER.

CHANGE CONTROL NOTES

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REQUEST RENDEZVOUS CUT OF PLANE DISPLAY ROUTINE LOGIC REV 01 11/27/68
EXTENDED VERB 90

NOTE: THIS EXTENDED VERB CALLS ROUTINE 36. SEE
R36 FOR THE SPECIFICATION LOGIC FLOW OF THE
REQUEST FOR RENDEZVOUS CUT OF PLANE DISPLAY.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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DISPLAY ON DSKY THE SUM OF EACH BANK
EXTENDED VERB 91

LOGIC REV 01 11/27/68

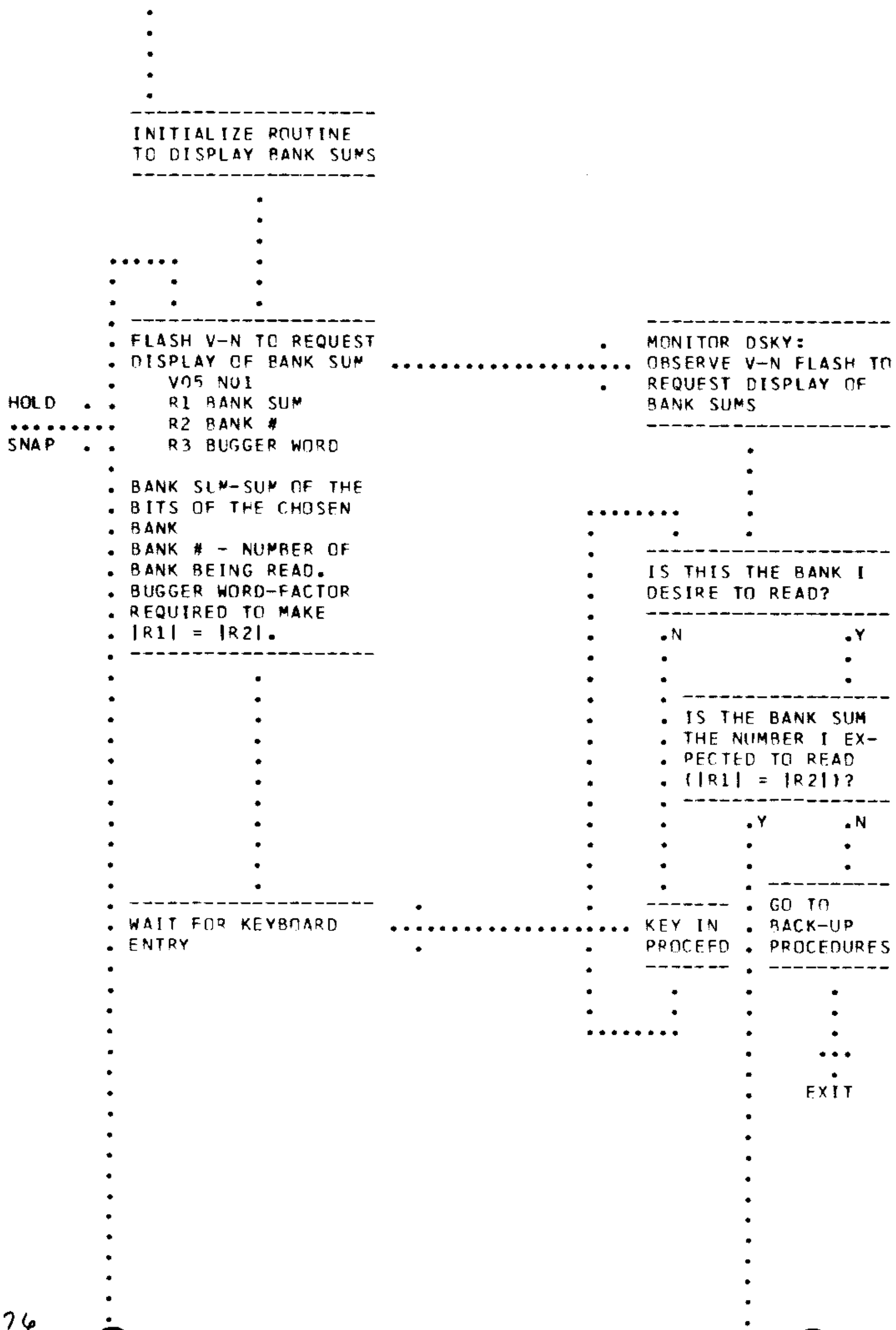
PURPOSE: (1) DISPLAY THE SUM OF EACH BANK FOR COMPARISON.

ASSUMPTION: (1) POC IS OPERATING.

(2) NO OTHER EXTENDED VERB IS ACTIVE.

(3) PROCESS IS CREW SELECTED BY DSKY ENTRY

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | START CREW INITIATED DISPLAY OF THE SUM OF EACH BANK | | KEY IN V91E | | | |
| | IS PROGRAM POO OPERATING? | | | | | #10 |
| | IS ANOTHER EXTENDED VERB ACTIVE | | | | | #20 |
| | TURN ON OPR ERR LIGHT | | | | | #30 |
| | EXIT | | | | | |


INITIALIZE ROUTINE TO DISPLAY BANK SUMS
FLASH V-N TO REQUEST DISPLAY OF BANK SUM
V05 N01
R1 BANK SUM
R2 BANK #
R3 BUGGER WORD
BANK SUM-SUM OF THE BITS OF THE CHOSEN BANK
BANK # - NUMBER OF BANK BEING READ.
BUGGER WORD-FACTOR REQUIRED TO MAKE |R1| = |R2|.
HOLD
SNAP
MONITOR DSKY: OBSERVE V-N FLASH TO REQUEST DISPLAY OF BANK SUMS
IS THIS THE BANK I DESIRE TO READ?
N
Y
IS THE BANK SUM THE NUMBER I EXPECTED TO READ (|R1| = |R2|)?
Y
N
WAIT FOR KEYBOARD ENTRY
KEY IN PROCEED
GO TO BACK-UP PROCEDURES
EXIT

```
TERMINATE FLASH ON
RECEIPT OF PROCEED
OR TERMINATE
-------------------
      .     .T
      .     .E
.......     .R
PROCEED     .M
            .I
            .N
            .A
            .T
            .E
            .
            .
           ...
            .
          EXIT

                        ------------
                        KEY IN TERMI-
                        NATE V34E
                        ------------
```

#90

#100

CHANGE CONTROL NOTES

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START IMU PERFORMANCE TEST EXTENDED LOGIC REV 01 11/27/68
VERB 92

NOTE: EXTENDED VERB 92 IS USED TO START THE IMU PERFORMANCE TESTS. PROGRAM P07. A DESCRIPTION OF THIS PROGRAM MAY BE FOUND IN SECTION 1 OF R577.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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ENABLE W MATRIX INITIALIZATION EXTENDED LOGIC REV 04 11/27/68
VERB (V93)

PURPOSE: (1) TO REQUEST REINITIALIZATION OF THE W MATRIX.

ASSUMPTIONS: (1) THE PROCESS IS CREW SELECTED BY DSKY ENTRY.

(2) THIS PROCESS RESETS THE RENDWFLG AND THE ORBWFLG INDICATING THAT THE W MATRIX IS NOT VALID AND MUST BE REINITIALIZED BEFORE BEING USED. THE RENDWFLG AND THE ORBWFLAG ARE AUTOMATICALLY SET FOLLOWING W MATRIX INITIALIZATION OR REINITIALIZATION.

(3) THIS PROCESS MAY BE SELECTED AT ANY TIME.

```
 PROG          CMC              GROUND            CREW                          CHECKLIST          TIME     TOTAL
 CONT                                                                                                        TIME

                                                 CREW
                                                 PROGRAM
                                                 SELECTION
                                                     .
                                                     .
                                                     .
                                                    ...
                                                     .
        --------------------   .              --------------
++      START CREW INITIATED ..................... KEY IN V93E                                              #10
+04     W MATRIX               .              --------------
++      INITIALIZATION
        --------------------
                  .
                  .
                  .
        --------------------
        RESET RENDWFLG AND
        ORBWFLG                                                                                             #20
        --------------------
                  .
                  .
                  .
                 ...
                  .
                 EXIT
```

CHANGE CONTROL NOTES

LOGIC REV 03  PCR MIT 66  00058000
LOGIC REV 04  PCR 206 EDIT  00058000

782

CISLUNAR TRACKING EXTENDED VERB 94 LOGIC REV 01 11/27/68

PURPOSE: (1) USED DURING THE CISLUNAR NAVIGATION PROGRAM (P23) TO ALLOW THE ASTRONAUT TO RECYCLE THE PROGRAM BACK TO THE CALCULATIONS OF OR POINTING THE LLOS AT THE DESIGNATED LANDMARK/HORIZON.

ASSUMPTIONS: (1) THIS EXTENDED VERB IS USABLE ONLY DURING THE PERIOD IN P23 FOLLOWING THE TURN ON OF THE AUTOMATIC OPTICS POSITIONING ROUTINE (R52) AND PRIOR TO THE ACCEPTANCE OF THE MARK.

(2) THE SELECTION OF THIS EXTENDED VERB WILL TERMINATE THE AUTOMATIC OPTICS POSITIONING ROUTINE AND THE SIGHTING MARK ROUTINE.

(3) IF THE ASTRONAUT SELECTS THIS EXTENDED VERB AFTER MAKING A MARK BUT PRIOR TO ACCEPTING IT THE MARK DATA WILL BE LOST.

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | | | .CREW .SELECTION . . ... . | | | |
| | RECEIVE VERB 94 | ..... | KEY IN V94E | | | |
| | . . . | | | | | #10 |
| ++ +01 ++ EDIT PCR 206 | IS V94 FLAG SET? .Y .N | | | | | |
| | IS THE CURRENT PROGRAM 23? .Y .N | | | | | #20 |
| | | | | V94/COLOSSUS | | |

```
++
+01        ----------
+          RESET V94
+01        FLAG
++         ----------
PCN
571
```

#30

```
           ----------------                    --------------------
           TURN ON OPERATOR                  .  OBSERVE OPERATOR
           ERROR LIGHT       ................... ERROR LIGHT ON INDI-
           ----------------                  .  CATING THAT THIS
                                                EXTENDED VERB IS NOT
                                                ALLOWED
                                                --------------------
           --------------------
           TERMINATE R52 AND
           R53.
           --------------------
```

#40

```
                    .
                    .
                    .
                   ...
                    .
                 GO TO
                   "C"
                 IN P23
```

#50

CHANGE CONTROL NOTES

LOGIC REV 00  PCR MIT 33
LOGIC REV 01  PCN 571

TERMINATE INTEGRATION
EXTENDED VERB 96

LOGIC REV 03 11/26/68

PURPOSE: (1) TO PROVIDE A MEANS OF SUSPENDING STATE VECTOR INTEGRATION.

ASSUMPTIONS: (1) IF THE COASTING INTEGRATION ROUTINE IS IN OPERATION, IT IS TERMINATED AT THE END OF THE CURRENT TIME STEP.

(2) THE CURRENT PROGRAM IS TERMINATED

(3) THE CMC IDLING PROGRAM IS ACTIVATED.

++
+02 (4) NO STATE VECTOR INTEGRATION OCCURS UNTIL THE RESELECTTION OF ANY PROGRAM OR EXTENDED VERB. NO POO INTEGRATION
+ OCCURS UNTIL THE RESELECTION OF POO.
+
+AND (5) THIS ROUTINE DOES NOT MAINTAIN STATE VECTOR OR W-MATRIX SYNCHRONIZATION.
+
+03 (6) RESELECTION OF A NEW PROGRAM WILL REINITIALIZE THE NORMAL TIMING OF STATE VECTOR INTEGRATION.
++
EDIT

| PROG CONT | CMC | GROUND | CREW | CHECKLIST | TIME | TOTAL TIME |
|---|---|---|---|---|---|---|
| | | | .CREW<br>.EXTENDED<br>.VERB<br>.SELECTION<br>.<br>.<br>...<br>. | | | |
| | START STATE VECTOR TERMINATION ROUTINE. | . ..... | KEY IN V96E | | | #10 |
| | . . . | | | | | |
| | SET QUIT FLAG | | | | | |
| | . . . . . | | | | | #20 |
| | | | | V96/COLOSSUS<br>V96/SUNDANCE | | |

```
          .
          .
          .
          .
          .
  --------------------
  GO TO IDLING PROGRAM
  (P00) VIA ROUTINE
  (R00)
  --------------------
          .
          .
          .
          .
         ...
          .
       GO TO "A"
       IN R00
```

#30

CHANGE CONTROL NOTES

LOGIC REV 01  PCR MIT 15
LOGIC REV 02  PCR 507

NOTE: EXTENDED VERB 97 IS USED IN THE SPS THRUST FAIL ROUTINE R40. SEE R40 FOR THE SPECIFICATION LOGIC FLOW FOR DISPLAY OF THRUST FAIL.

THIS VERB IS INTERNALLY INITIATED BY THE PROGRAM AND SHOULD NOT BE SELECTED BY THE CREW.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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ENABLE ENGINE IGNITION EXTENDED LOGIC REV 01 11/27/68
VERB 99

NOTE: EXTENDED VERB 99 IS USED IN THE SPS PROGRAM P40. SEE P40 FOR THE SPECIFICATION LOGIC FLOW TO ENABLE ENGINE IGNITION.

THIS VERB IS INTERNALLY INITIATED BY THE PROGRAM AND SHOULD NOT BE SELECTED BY THE CREW.

CHANGE CONTROL NOTES

LOGIC REV 01 PCN 515

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4.5 THIS LIST REPRESENTS THE VERBS USED IN PROGRAM COLOSSUS REV 01 11/05/68

4.5.1 REGULAR VERBS

00 NOT IN USE

01 DISPLAY OCTAL COMP 1 IN R1

02 DISPLAY OCTAL COMP 2 IN R1

03 DISPLAY OCTAL COMP 3 IN R1

04 DISPLAY OCTAL COMP 1,2 IN R1,R2

05 DISPLAY OCTAL COMP 1,2,3 IN R1,R2,R3

06 DISPLAY DECIMAL IN R1 OR R1,R2 OR R1,R2,R3

07 DISPLAY DP DECIMAL IN R1,R2

08 SPARE

09 SPARE

10 SPARE

11 MONITOR OCTAL COMP 1 IN R1

12 MONITOR OCTAL COMP 2 IN R1

13 MONITOR OCTAL COMP 3 IN R1

14 MONITOR OCTAL COMP 1,2 IN R1,R2

15 MONITOR OCTAL COMP 1,2,3 IN R1,R2,R3

16 MONITOR DECIMAL IN R1 OR R1,R2 OR R1,R2,R3

17 MONITOR DP DECIMAL IN R1,R2

18 SPARE

19 SPARE

20 SPARE

21 LOAD COMPONENT 1 INTO R1

22 LOAD COMPONENT 2 INTO R2

23 LOAD COMPONENT 3 INTO R3

24 LOAD COMPONENT 1,2 INTO R1,R2

25 LOAD COMPONENT 1,2,3 INTO R1,R2,R3

26 SPARE

27 DISPLAY FIXED MEMORY

28 SPARE

29 SPARE

30 REQUEST EXECUTIVE

31 REQUEST WAITLIST

32 RECYCLE

33 PROCEED

34 TERMINATE

35 TEST LIGHTS

36 REQUEST FRESH START

37 CHANGE PROGRAM

38 SPARE

39 SPARE

4.5.2 EXTENDED VERBS

40 ZERO CDU (W N20)

41 COARSE ALIGN CDU (W N20,N91)

42 PULSE TORQUE GYRO

43 LOAD FDAI ATT ERROR NEEDLES (TEST ONLY)

44 SET SURFACE FLAG

45 RESET SURFACE FLAG

46 ACTIVATE DAP

47 SET LM STATE VECTOR INTO CSM STATE VECTOR

48 LOAD DAP DATA (R03)

49 START CREW DEFINED MANEUVER (R62)

50 PLEASE PERFORM

51 PLEASE MARK

52 MARKED ON OFFSET LANDING SITE

53 PLEASE MARK ALTERNATE LOS

54 START REND BACK UP SIGHTING MARK (R23)

55 INCREMENT CMC TIME (DECIMAL)

56 TERMINATE TRACKING

57 START REND SIGHTING MARK (R21)

58 RESET STICK FLAG

59 PLEASE MARK (OPTICS CALIBRATION)

60 SET ATTITUDE ERROR REFERENCE TO PRESENT ATTITUDE.

61 SELECT MODE 1 (DISPLAY DAP ATTITUDE ERROR)

62 SELECT MODE 2 (DISPLAY TOTAL ATTITUDE ERROR (N22-N20))

63 SELECT MODE 3 (DISPLAY TOTAL ASTRONAUT ATTITUDE ERROR (N17-N20))

64 START S-BAND ANT CALC (R05)

65 START OPTICAL VERIFICATION OF PRELAUNCH ALIGNMENT (P03)

66 SET CSM STATE VECTOR INTO LM STATE VECTOR

67 START W-MATRIX RMS ERROR DISPLAY

68 CSM STROKE TEST ON

69 RESTART

70 UPDATE LIFTOFF TIME (P27)

71 UNIVERSAL UPDATE-PLOCK ADR (P27)

72 UNIVERSAL UPDATE-SINGLE ADR (P27)

73 UPDATE CMC TIME (OCTAL) (P27)

74 INITIALIZE ERASABLE DUMP VIA DOWNLINK

75 BACKUP LIFTOFF

76 SET PREFERRED ATTITUDE FLAG

77 RESET PREFERRED ATTITUDE FLAG

78 UPDATE PRELAUNCH AZIMUTH

79 START LUNAR LANDMARK SELECTION (R35)

80 UPDATE LM STATE VECTOR

81 UPDATE CSM STATE VECTOR

82 REQUEST ORBIT PARAM DISPLAY (R30)

83 REQUEST REND PARAM DISPLAY #1 (R31)

84 SPARE

85 REQUEST REND PARAM DISPLAY #2 (R34)

86 REJECT REND BACK UP SIGHTING MARK

87 SET VHF RANGE FLAG

88 RESET VHF RANGE FLAG

89 START REND FINAL ATTITUDE MANEUVER (R63)

90 REQUEST REND CUT OF PLANE DISPLAY (R36)

91 BANKSUM

92 START IMU PERFORMANCE TEST (P07)

93 ENABLE W MATRIX INITIALIZATION

94 ENABLE CISLUNAR TRACKING RECYCLE

95 SPARE

96 TERMINATE INTEGRATION AND GO TO P00

97 THRUST FAIL DISPLAY

98 SPARE

99 ENABLE ENGINE IGNITION

4.6 THIS LIST REPRESENTS THE NOUNS USED IN PROGRAM COLOSSUS.

| | | | |
|---|---|---|---|
| 00 | NOT IN USE | | |
| 01 | SPECIFY ADDRESS (FRAC) | (L) | .XXXXX FRAC<br>.XXXXX FRAC<br>.XXXXX FRAC |
| 02 | SPECIFY ADDRESS (WHOLE) | (L) | XXXXX. INTEG<br>XXXXX. INTEG<br>XXXXX. INTEG |
| 03 | SPECIFY ADDRESS (DEGREE) | (L) | XXX.XX DEG<br>XXX.XX DEG<br>XXX.XX DEG |
| 04 | SPARE | | |
| 05 | ANGULAR ERROR/DIFFERENCE | | XXX.XX DEG |
| 06 | OPTION CODE | (L) | OCT<br>OCT |
| 07 | FLAGWORD OPERATOR | | OCT<br>OCT<br>OCT |
| 08 | ALARM DATA | | OCT<br>OCT<br>OCT |
| 09 | ALARM CODES | | OCT<br>OCT<br>OCT |

| | | | |
|---|---|---|---|
| 10 | CHANNEL TO BE SPECIFIED (L-EXCEPT CHAN 7) | | OCT |
| 11 | SPARE | | |
| 12 | OPTION CODE | | OCT<br>OCT |
| 13 | SPARE | | |
| 14 | SPARE | | |
| 15 | INCREMENT ADDRESS (L-W N01,N02,N03,N10) | | OCT |
| 16 | TIME OF EVENT (USED BY EXT VERB ONLY) | (L) | 00XXX. HRS<br>000XX. MIN<br>0XX.XX SEC |
| 17 | ASTRONAUT TOTAL ATTITUDE<br>(USED IN MODE 3 NEEDLES (V63)) | (L) | XXX.XX DEG<br>XXX.XX DEG<br>XXX.XX DEG |
| 18 | BALL ANGLES AUTO MANEUVER | | R XXX.XX DEG<br>P XXX.XX DEG<br>Y XXX.XX DEG |
| 19 | SPARE | | |
| 20 | PRESENT ICDU ANGLES | | R XXX.XX DEG<br>P XXX.XX DEG<br>Y XXX.XX DEG |
| 21 | PIPAS | | X XXXXX. PULSES<br>Y XXXXX. PULSES<br>Z XXXXX. PULSES |
| 22 | NEW ICDU ANGLES | (L) | R XXX.XX DEG<br>P XXX.XX DEG<br>Y XXX.XX DEG |
| 23 | SPARE | | |
| 24 | DELTA TIME FOR CMC CLOCK | (L) | 00XXX. HRS<br>000XX. MIN<br>0XX.XX SEC |
| 25 | CHECKLIST (USED WITH V50) | | XXXXX. |
| 26 | PRIO/DELAY,ADRES,PRCON (L-W V30,V31) | | OCT<br>OCT<br>OCT |
| 27 | SELF TEST ON/OFF SWITCH | (L) | XXXXX. |
| 28 | SPARE | | |

| | | | |
|---|---|---|---|
| 29 | XSM LAUNCH AZ | | XXX.XX DEG |
| 30 | TARGET CODE<br>(GYROCOMPASSING<br>VERIFICATION) | | XXXXX.<br>XXXXX.<br>XXXXX. |
| 31 | TIME OF LANDING SITE | | 00XXX. HRS<br>000XX. MIN<br>0XX.XX SEC |
| 32 | TIME FROM PERIGEE | | 00XXX. HRS<br>000XX. MIN<br>0XX.XX SEC |
| 33 | GETI | (L) | 00XXX. HRS<br>000XX. MIN<br>0XX.XX SEC |
| 34 | TIME OF EVENT | (L) | 00XXX. HRS<br>000XX. MIN<br>0XX.XX SEC |
| 35 | TIME FROM EVENT | | 00XXX. HRS<br>000XX. MIN<br>0XX.XX SEC |
| 36 | TIME OF CMC CLOCK | (L) | 00XXX. HRS<br>000XX. MIN<br>0XX.XX SEC |
| 37 | GETI(TPI) | (L) | 00XXX. HRS<br>000XX. MIN<br>0XX.XX SEC |
| 38 | TIME OF STATE VECTOR | | 00XXX. HRS<br>000XX. MIN<br>0XX.XX SEC |
| 39 | DELTA TIME FOR TRANSFER | | 00XXX. HRS<br>000XX. MIN<br>0XX.XX SEC |
| 40 | TFI/TFC<br>VG<br>DELTA V (ACCUMULATED) | | XXBXX M-S<br>XXXX.X FPS<br>XXXX.X FPS |
| 41 | TARGET AZIMUTH<br>TARGET ELEVATION<br>TARGET IDENTIFIER (PASTE FROM N30) | (L) | XXX.XX DEG<br>XX.XXX DEG<br>0000X |
| 42 | APO ALT<br>PER ALT<br>DELTA V (REQUIRED) | | XXXX.X NM<br>XXXX.X NM<br>XXXX.X FPS |

| | | | |
|---|---|---|---|
| 43 | LATITUDE (+ NORTH) | | XXX.XX DEG |
| | LONGITUDE (+ EAST) | | XXX.XX DEG |
| | ALTITUDE | | XXXX.X NM |
| 44 | APO ALT | | XXXX.X NM |
| | PER ALT | | XXXX.X NM |
| | TFF | | XXBXX M-S |
| 45 | MARKS (VHF-OPTICS) | | XXBXX |
| | TFI (NEXT BURN) | | XXBXX M-S |
| | MGA | | XXX.XX DEG |
| 46 | DAP CONFIG | (L) | OCT |
| | | | OCT |
| 47 | THIS VEHICLE WEIGHT | (L) | XXXXX. LBS |
| | OTHER VEHICLE WEIGHT | | XXXXX. LBS |
| 48 | GIMBAL PITCH TRIM | (L) | XXX.XX DEG |
| | GIMBAL YAW TRIM | | XXX.XX DEG |
| 49 | DELTA R | | XXXX.X NM |
| | DELTA V | | XXXX.X FPS |
| | SOURCE CODE | | 0000X. |
| 50 | SPLERROR | | XXXX.X NM |
| | PERIGEE | | XXXX.X NM |
| | TFF | | XXBXX M-S |
| 51 | RHO | | XXX.XX DEG |
| | GAMMA | | XXX.XX DEG |
| 52 | CENTRAL ANGLE OF ACTIVE VEHICLE | | XXX.XX DEG |
| 53 | RANGE | | XXX.XX NM |
| | RANGE RATE | | XXXX.X FPS |
| | PHI | | XXX.XX DEG |
| 54 | RANGE | | XXX.XX NM |
| | RANGE RATE | | XXXX.X FPS |
| | THETA | | XXX.XX DEG |
| 55 | PER CODE | (L) | XXXXX. |
| | ELEVATION ANGLE (E) | | XXX.XX DEG |
| | CENTRAL ANGLE OF PASSIVE VEHICLE | | XXX.XX DEG |
| 56 | REENTRY ANGLE | | XXX.XX DEG |
| | DELTA V | | XXXXX. FPS |
| 57 | DELTA R (SOR) (+ PASS VEH LEADS) | (L) | XXXX.X NM |
| 58 | PER ALT (POST TPI OR SOR) | | XXXX.X NM |
| | DELTA V (TPI OR SOR) | | XXXX.X FPS |
| | DELTA V (TPF OR SOR FINAL) | | XXXX.X FPS |

| | | | |
|---|---|---|---|
| 59 | DELTA V LOS 1 | | XXXX.X FPS |
| | DELTA V LOS 2 | | XXXX.X FPS |
| | DELTA V LOS 3 | | XXXX.X FPS |
| 60 | G MAX | | XXX.XX G |
| | V PRED | | XXXXX. FPS |
| | GAMMA EI (+ UP) | | XXX.XX DEG |
| 61 | IMPACT LATITUDE | (L) | XXX.XX DEG |
| | IMPACT LONGITUDE | | XXX.XX DEG |
| | HEADS UP/DOWN (+ UP) | | 00001. |
| 62 | VI ,INERTIAL VEL MAG | | XXXXX. FPS |
| | HDOT ,ALT RATE | | XXXXX. FPS |
| | H ,ALT ABOVE PAD RADIUS | | XXXX.X NM |
| 63 | RTGO ,RNG FROM E.I. TO SPLASH | | XXXX.X NM |
| | VIO ,PREDICTED INERT VEL | | XXXXX. FPS |
| | TFE ,TIME FROM FROM E.I. | | XXBXX M-S |
| 64 | DRAG ACCELERATION | | XXX.XX G |
| | VI ,INERTIAL VELOCITY | | XXXXX. FPS |
| | R TO TARG (+ OVSHT) | | XXXX.X NM |
| 65 | SAMPLED CMC TIME | | 00XXX. HRS |
| | (FETCHED IN INTERRUPT) | | 000XX. MIN |
| | | | 0XX.XX SEC |
| 66 | BETA, CMD BANK ANGLE | | XXX.XX DEG |
| | CROSS RANGE ERROR (+ TGT RT) | | XXXX.X NM |
| | DOWN RANGE ERROR (+ OVSHT) | | XXXX.X NM |
| 67 | R TO TARG (+ OVSHT) | | XXXX.X NM |
| | LAT ,PRESENT POSITION (+ NORTH) | | XXX.XX DEG |
| | LONG ,PRESENT POSITION (+ EAST) | | XXX.XX DEG |
| 68 | BETA, CMD BANK ANGLE | | XXX.XX DEG |
| | VI ,INERTIAL VELOCITY | | XXXXX. FPS |
| | HDOT ,ALT RATE | | XXXXX. FPS |
| 69 | BETA | | XXX.XX DEG |
| | DL | | XXX.XX G |
| | VL | | XXXXX. FPS |
| 70 | CELESTIAL BODY CODE (BEFORE MARK) | (L) | OCT |
| | LANDMARK DATA | | OCT |
| | HORIZON DATA | | OCT |
| 71 | CELESTIAL BODY CODE (AFTER MARK) | (L) | OCT |
| | LANDMARK DATA | | OCT |
| | HORIZON DATA | | OCT |

| | | | |
|---|---|---|---|
| 72 | DELT ANG (+ ACT VEH LEADS) | (L) | XXX.XX DEG |
| | DELT ALT (+ PASS VEH ABOVE) | | XXXX.X NM |
| | SEARCH OPTION | | XXXXX. |
| 73 | SPARE | | |
| 74 | SPARE | | |
| 75 | SPARE | | |
| 76 | SPARE | | |
| 77 | SPARE | | |
| 78 | SPARE | | |
| 79 | SPARE | | |
| 80 | TIME TO IGNITION/CUT OFF | | XXBXX M-S |
| | VG | | XXXXX. FPS |
| | DELTA V (ACCUMULATED) | | XXXXX. FPS |
| 81 | DELTA VX (LV) | (L) | XXXX.X FPS |
| | DELTA VY (LV) | | XXXX.X FPS |
| | DELTA VZ (LV) | | XXXX.X FPS |
| 82 | SPARE | | |
| 83 | DELTA VX(CONT) | | XXXX.X FPS |
| | DELTA VY(CONT) | | XXXX.X FPS |
| | DELTA VZ(CONT) | | XXXX.X FPS |
| 84 | DELTA VX(O VEH) | (L) | XXXX.X FPS |
| | DELTA VY(O VEH) | | XXXX.X FPS |
| | DELTA VZ(O VEH) | | XXXX.X FPS |
| 85 | VGX (CONT) | | XXXX.X FPS |
| | VGY (CONT) | | XXXX.X FPS |
| | VGZ (CONT) | | XXXX.X FPS |
| 86 | DELTA VX | | XXXXX. FPS |
| | DELTA VY | | XXXXX. FPS |
| | DELTA VZ | | XXXXX. FPS |
| 87 | MARK DATA: OPTICS SHAFT ANGLE | | XXX.XX DEG |
| | OPTICS TRUNNION ANGLE | | XX.XXX DEG |
| 88 | PLANET 1/2 UNIT POSITION VECTOR X | (L) | .XXXXX |
| | Y | | .XXXXX |
| | Z | | .XXXXX |
| 89 | LANDMARK LATITUDE (+ NORTH) | (L) | XX.XXX DEG |
| | LANDMARK LONGITUDE/2 (+ EAST) | | XX.XXX DEG |
| | LANDMARK ALTITUDE | | XXX.XX NM |

| | | | | |
|---|---|---|---|---|
| 90 | REND OUT OF PLANE PARAMETERS | Y | | XXX.XX NM |
| | | Y DOT | | XXXX.X FPS |
| | | PSI | | XXX.XX DEG |
| 91 | PRESENT OCDU ANGLES - SHAFT | | | XXX.XX DEG |
| | - TRUN | | | XX.XXX DEG |
| 92 | NEW OCDU ANGLES- SHAFT | | (L) | XXX.XX DEG |
| | TRUN | | | XX.XXX DEG |
| 93 | DELTA GYRO ANGLES | | (L) | X XX.XXX DEG |
| | | | | Y XX.XXX DEG |
| | | | | Z XX.XXX DEG |
| 94 | ALTERNATE LOS - SHAFT | | (L) | XXX.XX DEG |
| | TRUN | | | XX.XXX DEG |
| 95 | PREF ATT FDAI ANGLES | | | R XXX.XX DEG |
| | | | | P XXX.XX DEG |
| | | | | Y XXX.XX DEG |
| 96 | +X AXIS ATT FDAI ANGLES | | | R XXX.XX DEG |
| | | | | P XXX.XX DEG |
| | | | | Y XXX.XX DEG |
| 97 | SYSTEM TEST INPUTS | | (L) | XXXXX. |
| | | | | XXXXX. |
| | | | | XXXXX. |
| 98 | SYSTEM TEST RESULTS | | (L) | XXXXX. |
| | AND INPUTS | | | .XXXXX |
| | | | | XXXXX. |
| 99 | RMS VALUE OF POSITION ERROR | | (L) | XXX.XX NM |
| | RMS VALUE OF VELOCITY ERROR | | | XXXX.X NM |
| | OPTION CODE | | | XXXXX |

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THIS LIST REPRESENTS THE CHECKLIST REFERENCE CODES USED WITH V50N25 FOR PROGRAM COLOSSUS.

| R1 CODE | ACTION TO BE EFFECTED |
|---|---|
| 00014 | PERFORM FINE ALIGNMENT |
| 00015 | PERFORM CELESTIAL BODY ACQUISITION |
| 00016 | TERMINATE MARK SEQUENCE |
| 00041 | SWITCH CM/SM SEPARATION TO UP |
| 00062 | KEY CMC TO STANDBY |
| 00202 | PERFORM GNCS AUTOMATIC MANEUVER |
| 00203 | SWITCH TO CMC-AUTO |
| 00204 | PERFORM SPS GIMBAL TRIM |

SWITCH-DENOTES CHANGE POSITION OF A CONSOLE SWITCH

PERFORM-DENOTES START OR END OF A TASK

KEY IN-DENOTES KEY IN OF DATA THRU THE DSKY

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4.8 THIS LIST REPRESENTS THE OPTION CODES USED WITH V04N06 FOR PROGRAM COLOSSUS. REV 01 11/14/68

THE SPECIFIED OPTION CODES WILL BE DISPLAYED IN R1
IN CONJUNCTION WITH EL V04 N06 TO REQUEST THE ASTRONAUT
TO LOAD INTO R2 THE OPTION HE DESIRES.

| R1 OPTION CODE | PURPOSE | INPUT FOR R2 |
|---|---|---|
| 00001 | SPECIFY IMU ORIENTATION | 1=PREF 2= NOMINAL 3=REFSMMAT 4=LANDING SITE |
| 00002 | SPECIFY VEHICLE | 1=THIS VEHICLE 2=OTHER VEHICLE |
| 00003 | SPECIFY TRACKING ATTITUDE | 1=PREFERRED 2=+X-AXIS |
| 00005 | SPECIFY SOR PHASE | 1=FIRST 2=SECOND |
| 00007 | SPECIFY PROPULSION SYSTEM | 1=SPS 2=RCS |

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4.9 THIS LIST REPRESENTS THE ALARM CODES USED WITH V05N09 FOR PROGRAM COLOSSUS.

R1

| CODE | PURPOSE | SET BY |
|---|---|---|
| 00110 | NO MARK SINCE LAST MARK REJECT | SXTMARK |
| 00112 | MARK NOT BEING ACCEPTED | SXTMARK |
| 00113 | NO INRITS | SXTMARK |
| 00114 | MARK MADE BUT NOT DESIRED | SXTMARK |
| 00115 | OPTICS TORQUE REQUEST WITH SWITCH NOT AT CMC | EXT VERB OPTICS CDU |
| 00116 | OPTICS SWITCH ALTERED BEFORE 15 SEC ZERO TIME ELAPSED | T4RUPT |
| 00117 | OPTICS TORQUE REQUEST WITH OPTICS NOT AVAILABLE (OPTIND=-0) | EXT VERB OPTICS CDU |
| 00120 | OPTICS TORQUE REQUEST WITH OPTICS NOT ZEROED | T4RUPT |
| 00121 | CDU'S NOT GOOD AT TIME OF MARK | SXTMARK |
| 00122 | MARKING NOT CALLED FOR | SXTMARK |
| 00124 | P17 TPI SEARCH-NO SAFE PERICTR HERE | TPI SEARCH |
| 00205 | BAD PIPA READING | SERVICER |
| 00206 | ZERO ENCODE NOT ALLOWED WITH COARSE ALIGN + GIMBAL LOCK | IMU MODE SWITCH IMU 2 |
| 00207 | ISS TURNON REQUEST NOT PRESENT FOR 90 SEC | T4RUPT |
| 00210 | IMU NOT OPERATING | IMU MODE SWITCH, IMU 2, R02, P51, |
| 00211 | COARSE ALIGN ERROR-DRIVE >2 DEGREES | IMU MODE SWITCH |
| 00212 | PIPA FAIL BUT PIPA IS NOT BEING USED | IMU MODE SWITCH, T4RUPT |
| 00213 | IMU NOT OPERATING WITH TURN-ON REQUEST | T4RUPT |
| 00214 | PROGRAM USING IMU WHEN TURNED OFF | T4RUPT |
| 00215 | PREFERRED ORIENTATION SELECTED BUT NOT SPECIFIED | P52, P54 |
| 00217 | BAD RETURN FROM STALL ROUTINES | CURTAINS |

1A

| | | | |
|---|---|---|---|
| 00220 | | IMU NOT ALIGNED (BAD REESMMAT) | R02, P51 |
| 00401 | | DESIRED GIMBAL ANGLES YIELD GIMBAL LOCK | INE ALIGN, IMU2 |
| 00404 | | TARGET OUT OF VIEW (TRUN. ANGLE > 90 DEG) | R52 |
| 00405 | | TWO STARS NOT AVAILABLE | P52,P54 |
| 00406 | | RENDO NAVIGATION NOT OPERATING | P21, P23 |
| 00407 | | TARGET OUT OF VIEW (TRUN. ANGLE > 50 DEG) | R52 |
| 00421 | | W-MATRIX OVER FLOW | INTEGRV |
| 00605 | | NUMBER OF ITERATIONS EXCEEDS LOOP MAXIMUM | P32, P72 |
| 00611 | | NO TIG FOR GIVEN FLEV ANGLE | P34,P74 |
| 00612 | | STATE VECTOR IN WRONG SPHERE OF INFLUENCE | P37 |
| 00613 | | REENTRY ANGLE OUT OF LIMITS | P37 |
| 01102 | | CMC SELF TEST ERROR | SELF CHECK |
| 01103 | P * | UNUSED CCS BRANCH EXECUTED | ABORT |
| 01104 | P * | DELAY ROUTINE BUSY | EXEC |
| 01105 | | DOWNLINK TOO FAST | T4RUPT |
| 01106 | | UPLINK TOO FAST | T4RUPT |
| 01107 | | PHASE TABLE FAILURE. ASSUME ERASABLE MEMORY IS DESTROYED | RESTART |
| 01201 | P * | EXECUTIVE OVERFLOW-NO VAC AREAS | EXEC |
| 01202 | P * | EXECUTIVE OVERFLOW-NO CORE SETS | EXEC |
| 01203 | P * | WAITLIST OVERFLOW-TOO MANY TASKS | WAITLIST |
| 01206 | P * | SECOND JOB ATTEMPTS TO GO TO SLEEP VIA KEYBOARD AND DISPLAY PROGRAM | PINBALL |
| 01207 | P * | NO VAC AREA FOR MARKS | SXT MARK |
| 01210 | P * | TWO PROGRAMS USING DEVICE AT SAME TIME | IMU MODE SWITCH |
| 01211 | P * | ILLEGAL INTERRUPT OF EXTENDED VERB | SXTMARK |

| | | | |
|---|---|---|---|
| 01301 | PCN 588 | ARCSIN-ARCCOS INPUT ANGLE TOO LARGE | INTERPRETER |
| 01302 | P * | SQRT CALLED WITH NEGATIVE ARGUMENT | INTERPRETER |
| 01407 | | VG INCREASING | S40.8 |
| 01426 | | IMU UNSATISFACTORY | P61,P62 |
| 01427 | | IMU REVERSED | P61, P62 |
| 01501 | P * | KEYBOARD AND DISPLAY ALARM DURING INTERNAL USE (NVSUB) | PINBALL |
| 01502 | P * | ILLEGAL FLASHING DISPLAY | GOPLAY |
| 01520 | | V37 REQUEST NOT PERMITTED AT THIS TIME | V37 |
| 01600 | | OVERFLOW IN DRIFT TEST | OPT PRE ALIGN CALIB |
| 01601 | P * | BAD IMU TORQUE | OPT PRE ALIGN CALIB |
| 01703 | | INSUFFICIENT TIME FOR INTEG., TIG WAS SLIPPED. | P41 |
| 01706 | | STAGE VERIFY DISCRETE DOES NOT AGREE | R03 |
| 01707 | | CHECKLIST 203 NOT PERFORMED | R61 |
| 03777 | | ICDU FAIL CAUSED THE ISS WARNING | T4RUPT |
| 04777 | | ICDU, PIPA FAILS CAUSED THE ISS WARNING | T4RUPT |
| 07777 | | IMU FAIL CAUSED THE ISS WARNING | T4RUPT |
| 10777 | | IMU, PIPA FAILS CAUSED THE ISS WARNING | T4RUPT |
| 13777 | | IMU ICDU FAILS CAUSED THE ISS WARNING | T4RUPT |
| 14777 | | IMU, ICDU, PIPA FAILS CAUSED THE ISS WARNING | T4RUPT |

* INDICATES ABORT TYPE. ALL OTHERS ARE NON-ABORTIVE.
P * INDICATES A GO TO PROGRAM 00 TYPE ABORT ← (Unless AVERAGE G is on, then P* becomes B*)
B * INDICATES A BAIL OUT TYPE ABORT

**1A**

NOTE: FOR VOS N09 DISPLAYS:
R1-XXXXX (FIRST ALARM TO OCCUR AFTER LAST RESET).
R2-XXXXX (SECOND ALARM TO OCCUR AFTER LAST RESET).
R3-XXXXX (ALARM WHICH OCCURRED LAST)

CHANGE CONTROL NOTES

LOGIC REV 02 PCN 620
REV 03 PCN 588

COLOSSUS
Section 4 (Rev 5)

Internal:

Adler, P. (2)
Bairnsfather, R.
Battin, R.
Beals, C.
Blanchard, E.
Cooper, W.
Copps, E.
Copps, S.
Cox, G.
Davis, S.
Day, W.
DeCain, F.
Denniston, E.
Deutsch, S.
DeWolf, D.
Dimock, G.
Drake, L.
Drane, L.
Dunbar, J.
Dunbar, V.
Edmonds, G.
Eliassen, S.
Engel, A. (2)
Felleman, P.
Fleming, J.
Gediman, L. (20)
Glendenning, J.
Glick, K.
Goldberger, S.
Goodwin, K.
Grace, E.
Greene, K.
Griggs, K.
Hamilton, M.
Haslam, R.
Heinemann, P.
Henize, J.
Hoag, D.
Hsiung, D.
Hughes, E.
Ireland, B.
Issacs, T.
Johnson, I.
Johnson, L. B.
Johnson, M.
Johnston, M.
Keene, D.
Kernan, J.
Kiburz, R.
Kido, K.
*Kingston, J.
Klumpp, A.
Kosmala, A.
Kossuth, G.
Kupfer, W.
Laats, A.
Larson, L.
Larson, R.
Lawrence, J.
Leone, F.
Levine, G.
Lickly, D. (3)
Lones, R.
Marscher, W.
Martin, F.
McOuat, H.
Megna, V.
Metzinger, R.
Millard, D.
Miller, J.E.
Miller, J.S.
Mimno, P.
Morse, J. (10)
Morth, R.
Muller, E.
Nevins, J.
O'Connor, J.
Ostanek, W.
Parr, T.
Philliou, P.
Plender, P. (6)
Pope, G.
Pu, C.
Ragan, R.
Riebesell, K.
Robertson, W.
Rye, P. (3)
Sapanaro, J. (4)
Sarda, P.
Savatsky, S.
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Schroeder, S.
Schulenberg, C.
Schulte, R.
Sears, N.
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Sokkappa, B.
Sprague, D.
Stameris, W.
Stubbs, G.
Suomala, J.
Sutherland, J.
Tanner, W.
Tinkham, R.
Turnbull, J.
Vincent, K.
Vittek, J.
Volante, P.
Weatherbee, R.
Wenk, C.
Werner, R.
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| NASA/HDQ | NASA Headquarters<br>600 Independence Avenue SW<br>Washington, D.C. 20546<br>Attn: MAP-2<br>Attn: Mission Director, Code MA<br>Attn: Robert Aller, Code MAO | <br><br><br>(4)<br>(1)<br>(1) | (6) |
| NASA/LEWIS | National Aeronautics and Space Administration<br>Lewis Research Center<br>Cleveland, Ohio<br>Attn: Library | | (2) |
| NASA/FRC | National Aeronautics and Space Administration<br>Flight Research Center<br>Edwards AFB, California<br>Attn: Research Library | | (1) |
| NASA/LRC | National Aeronautics and Space Administration<br>Langley Research Center<br>Langley AFB, Virginia<br>Attn: Mr. A. T. Mattson | | (2) |
| NASA/GSFC | National Aeronautics and Space Administration<br>Goddard Space Flight Center<br>Greenbelt, Maryland<br>Attn: Mr. Paul Pashby, Code 813 | | (2) |
| GAEC | Grumman Aircraft Engineering Corporation<br>Bethpage, Long Island, New York<br>Attn: Mr. J. Marino<br>Mr. R. Pratt | <br><br>(1)<br>(1) | (2) |
| NAR | North American Rockwell Inc.<br>Space and Information Systems Division<br>12214 Lakewood Boulevard<br>Downey, California 90241<br>Attn: Apollo Data Requirements<br>Dept. 096-340<br>Building 3, CA 99 | | (1 + 1R) |

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| NASA/RASPO GAEC | National Aeronautics and Space Administration<br>Resident Apollo Spacecraft Program Officer<br>Grumman Aircraft Engineering Corporation<br>Bethpage, Long Island, New York | | (1) |
| NASA/RASPO ACED | National Aeronautics and Space Administration<br>Resident Apollo Spacecraft Program Officer<br>AC Electronics Division<br>General Motors Corporation<br>Milwaukee, Wisconsin 53201<br>Attn: Mr. W. Swingle | | (1) |
| NASA/WSMR: | National Aeronautics and Space Administration<br>Post Office Drawer MM<br>Las Cruces, New Mexico<br>Attn: RH4 Documentation | | (2) |
| NASA/MSFC: | National Aeronautics and Space Administration<br>George C. Marshall Space Flight Center<br>Huntsville, Alabama | | (23) |
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| | A. McNair I-MO-R | (1) | |
| | D. Germany I-I/IB-E | (1) | |
| | R. Barraza I-V-E | (1) | |
| | W. Chubb R-ASTR/NG | (1) | |
| | J. McCullough I-VE/T | (1) | |
| NASA/MSC | National Aeronautics and Space Administration<br>Manned Spacecraft Center<br>Apollo Document Control Group (PA 2)<br>Houston, Texas 77058<br>Attn: A. Alber, FS5 (letter of transmittal only) | | 300 + 2R |
| BELLCOMM: | Bellcomm, Inc.<br>1100 17th Street N.W.<br>Washington, D.C. 20036<br>Attn: Info. Analysis Section | | (6) |
| LINK: | LINK Group, GPSI SIMCOM<br>1740 A NASA Boulevard<br>Houston, Texas 77058<br>Attn: Mr. D. Klingbell | | (3) |
| TRW: | Gilbert H. Friedman<br>Building 82 Rm 2067<br>TRW System Group<br>One Space Park<br>Redondo Beach, California 90278 | | (5) |