LEFT SW C/B PANEL

1. JAX CNTL (V_{CC}) (1.6.1)
   Enables UHF Whip Coax SW to select desired ant thru Ant Sel SW

2. AUDIO & UHF T/R NO. 1 (V_{M}) (1.6.2)
   a. PWRs UHF T/R NO. 1
   b. PWRs the left mike amplifier for each astro
   c. PWRs the left headset amplifier for each astro

3. AUDIO & UHF T/R NO. 2 (V_{M}) (1.6.2)
   a. PWRs UHF T/R NO. 2
   b. PWRs the RT mike amplifier for each astro
   c. PWRs the RT headset amplifier for each astro

4. UHF RELAY (V_{CC}) (1.6.2)
   a. Enables keying of UHF T/R thru UHF SELECT SW & AUDIO MODE SW
   b. Enables routing of T/R NO. 1 or NO. 2 signal to & from quadriplexer thru UHF T/R SELECT SW

5. TONE VOX/CLK LT (V_{M}) (1.6.2)
   a. PWRs 2 voice operated relays (VOX)
   b. PWRs tone generator thru mode SW in HF/DF
   c. PWRs voice tape recorder thru record SW in cont & mom
   d. PWRs time correlation buffer
   e. PWRs RCDR TAPE LIGHT
   f. PWRs digital clock and its red post light

6. HF/T/R (V_{M}) (1.6.2)
   PWRs HF reentry T/R (need HF whip antennas C/B closed for keying)

7. ANT CNTL (V_{CC}) (1.6.1)
   a. PWRs descent ant coax SW thru R & R SEP relays
   b. Enables PWR of ACQ aid beacon at SEP SPCFT via Boost Insert CNTL 1 or 2 C/B's

8. HF Whip Antennas (V_{CC}) (1.6.1)
   a. Enables keying of HF T/R thru HF select SW
   b. Enables selection of reentry HF T/R signal to either ant (thru HF select switch)
   c. Enables extension or retraction of reentry HF whip ant & extension of adapt HF whip ant thru HF ant SW & landing SW

9. UHF Whip Antennas (V_{CC}) (1.6.1)
   PWRs cover release solenoids of:
   UHF whip ant in retro adapter via SEP SPCFT SW & boost insert CNTL 1 or 2 C/B's

10. Diplex Whip Antennas (V_{CC}) (1.6.1)
    a. PWRs cover release solenoid of UHF whip ant in equip adapter via SEP SPCFT SW & boost insert CNTL 1 & 2 C/B's
    b. Enables C-RNTY beacon CNTL SW to PWR RNTY C-BAND BEACON VIA DCS RELAY

11. ELECT TIMER (V_{M}) (1.5.2)
    a. PWRs electronic timer
    b. PWRS EVENT TIMER VIA LIFTOFF RELAY
    c. EMER PWR TO START ELECTRONIC TIMER THRU EVENT TIMER

12. EVENT TIMER (V_{M}) (1.5.2)
    a. PWRs event timer
    b. PWRs event timer via lift-off relay
    c. EMER PWR TO START ELECTRONIC TIMER THRU EVENT TIMER

13. BOOST CUT-OFF 1 (V_{BIAcc}) (1.9.2)
    a. PWRs flight control S/O circuits thru sec guidance SW
    b. PWRs booster shutdown motor driven switch to enable shutdown via abort handle

14. BOOST CUT-OFF 2 (V_{BIAcc}) (1.9.2)
    a. PWRs booster shutdown motor driven SW to enable shutdown via abort handle
    b. Sends PWR to comp to provide sec signal during secondary guidance
15. AUTO RETRO \( V_{RCC} \) (1.1.3)
   a. PWRS ARM AUTO RETRO SW
   b. ENABLES ABORT HANDLE TO
      SALVO FIRE RETRO ROCKETS IN
      CONJUNCTION WITH RETRO SEQ
      CNTL 1, RCS SQUIB 1, & BOOST-
      INSERT CNTL 1 C/B'S
   c. PWRs 45 SEC TD RELAY WHICH
      ENABLES JETT RETRO AMBER LT
   d. ENABLES MAN FIRE RETRO SW TO
      START COMPUTER
   e. PWRs 45 SEC TD RELAY WHICH
      ENABLES JET RETRO AMBER LT

16. MAN RETRO \( V_{RCC} \) (1.1.3)
   a. PWRs MAN FIRE RETRO SW
   b. ENABLES ABORT HANDLE TO
      SALVO FIRE RETRO ROCKETS
   c. ENABLES PROGRAMMED T,-30
      SIGNAL FROM TRS WHICH IN TURN
      ENABLES ILLUMINATION OF SEP
      OAMS LINES, SEP ELECT, SEP
      ADAPT, & ARM AUTO RETRO T/LT
      SWS. SEQ LTS PWR C/B ALSO
      NEEDED.
   d. ENABLES MAN FIRE RETRO SW TO
      START COMPUTER
   e. PWRs 45 SEC TD RELAY WHICH
      ENABLES JET RETRO AMBER LT

17. \( T_{R-256} (V_{CC}) \) (1.1.2)
   ENABLES PROGRAMMED \( T_{R-256} \) SIGNAL
   FROM TRS TO ILLUMINATE AMBER IND
   RETRO ATT, BTRY PWR, & RCS T/LT
   SEQ LTS PWR C/B AND ELECT
   TIMER C/B'S ALSO NEEDED.

18. ECS IND LTS \( V_{M} \) (1.3.2)
   a. PWRs PRI A & B & SEC A & B
      COOLANT PUMP AMBER MALFUNCTION
      LTS THRU MAG REED VLV'S
   b. PWRs PRI & SEC RES LO AMBER
      LTS THRU LO LEVEL SWS
   c. PWRs EVAP PRESS AMBER LT
   d. PWRs T/M OF PRI A & B & SEC
      A & B COOLANT PUMPS "ON".

19. IND LT TEST \( V_{M} \) (1.2.3)
   a. PWRs TEST CIRCUIT OF ALL
      INSTRUMENT PANEL IND LTS
      THRU SEQ LTS TEST SW
   b. ENABLES T/M OF \( V_{M} \) VOLTAGE

20. SEQ LTS PWR \( V_{M} \) (1.1.4)
   a. PWRs SEQ T/LTS THRU SEQ LTS
   BRIGHT/DIM SW
   b. PWRs 40K & 10.6K AMBER LTS
      THRU BAROSTATS. PARA CNTL
      C/B ALSO NEEDED.

21. SEQ LTS CNTL \( V_{CC} \) (1.2.4)
   a. ENABLES GREEN BTRY T/LT THRU
      MAIN BATTERY SW WHEN ALL
      SWS ARE ON
   b. CONTROLS T/M OF \( V_{CC} \) VOLTAGE

22. PARA CNTL \( V_{CC} \) (1.1.4)
   ENABLES 40K & 10.6K AMBER LTS
   THRU BAROSTATS. SEQ LTS PWR
   C/B ALSO NEEDED.

23. ATT IND CNTL RETRO \( V_{RCC} \) (1.1.2)
   a. PWRs IND RETRO ATT T/LT SW
   b. DISABLES 16 PITCH DOWN BIAS
      TO FD1'S VIA JETT RETRO SW
   c. CAUSES THE IMU ROLL AND YAW
      SIGNALS TO FD1'S TO REVERT
      TO ORIGINAL PHASING.
   d. ENABLES MIX MODE FOR ROLL
      CHANNEL OF FD1'S. RETRO SEQ
      CNTL C/B ALSO NEEDED.

24. ATT IND CNTL LDG \( V_{CC} \) (1.5.1)
   a. PWRs HORIZON SCAN IGNORE
      RELAY (ALLOWS SCANNER IGNORE
      SIGNAL TO IMU & ACE) SCAN
      HTR C/B ALSO NEEDED
   b. ENABLES ASC SCALE FACTOR
      LT & RT FD1'S (THRU COMPUT
      MODEL SW IN ASC POS) UNTIL
      S/C SEP
   c. PWRs IMU H/S IGNORE CIRCUIT
      (7SEC T.D.) WHICH CONTROLS
      IGNORE LT AND PLAT SLAVING.

25. BOOST-INSERT CNTL 1 & 2
    \( V_{BIAQ1&2} \) (1.1.2)
    EACH C/B PWRs:
    a. SEP SPCFT T/LT SW
    b. JETT FAIRING SW
    c. SEP S/C LIMIT SWS
    d. ABORT HANDLE (ABORT POS)

26. RETRO-SEQ CNTL 1 & 2 \( V_{RQ1&2} \)
    (1.1.3)
    EACH C/B ENABLES ABORT HANDLE TO:
    a. PWR SEP OAMS LINE, SEP ELECT, & SEP ADAPT SWS IN CONJUNCTION
       WITH BOOST-INSERT CNTL 1 & 2 & RCS SQUIB C/B'S
    b. DISABLE PLAT MODE SW IN CONJUNCTION WITH boost-INSERT
       CNTL 2, RCS SQUIB 2, RETRO
       SEQ CNTL 2, & MAN RETRO C/B'S
Each C/B PWRS:
- SEP OAMS LINE T/LT SW
- SEP ELECT T/LT SW
- SEP ADAPT T/LT SW
- JETT RETRO T/LT SW
- EQUIPMENT ADAPT SEP LIMIT SW

27. Landing Seq Cntl 1 & 2
(V Ref & 2) (1.1.4)
Each C/B PWRS:
- DROGUE SW
- PARA SW
- EMERG PREMAIN SW
- LDG ATT SW
- PARA JETT SW

Overshead SW C/B Panel

1. ACME Cntl 1 (VCC) (1.4.1)
PWRS:
- ACME BIAS PWR SW (SEC POS ONLY)
- OAMS CNTL PWR SW
- OAMS ATT SOLENOID VALVE DRIVERS
- RCS RING A CNTL PWR SW
- RELAY ENABLING RCS GREEN T/LT & DISABLES AMBER T/LT (RELAY ENABLED VIA ANY ONE OF FOUR RCS SQUIB FIRE RELAYS (SEQ LTS C/B)

2. ACME Cntl 2 (VCC) (1.4.1)
PWRS:
- ATT DRIVERS SW
- PITCH ACME LOGIC SW
- ROLL ACME LOGIC SW
- YAW ACME LOGIC SW
- RCS RING B CNTL PWR SW

3. OAMS Cntl Prop (VCC) (1.4.3)
- PWRS MOTOR VLVS IN OAMS FUEL & OXID LINES THRU OAMS PROP SW
- ENABLES FIRING OF NORMALLY CLOSED SQUIB VALVE IN OAMS REG BY-PASS LINE THRU OAMS REG SW IN SQUIB POS
- ENABLES PULSE POSITION OF OAMS REG SWITCH

4. OAMS Cntl REG 1 (VOAMS 1) (1.4.3)
PWRS AUTO AND/OR MANUAL OPERATION OF OAMS REG FAIL OPEN RELAYS (THRU OAMS REG SW OR AUTO PRESSURE SW) ENABLES FIRING OF NORMALLY OPEN SQUIB VALV TO OAMS REG

5. OAMS Cntl REG 2 (VOAMS 2) (1.4.3)
PWRS AUTO AND/OR MANUAL OPERATION OF OAMS REG FAIL OPEN RELAYS (REDUNDANT FUNCTION OF OAMS CNTL REG 1 ABOVE)

6. RCS SQUIB 1 (VRQ1) (1.4.4)
- ENABLES RCS T/LT AND ABORT HANDLE TO REDUNDANTLY FIRE THE 3 RCS SQUIBS NECESSARY TO ACTIVATE THE 2 RCS RINGS
- PWRS RETRO ABORT INTERLOCK RELAY NO. 1 FOR SEQUENTIAL FUNCTIONS IN MODE II ABORT

7. RCS SQUIB 2 (VRQ2) (1.4.4)
- ENABLES RCS T/LT AND ABORT HANDLE TO REDUNDANTLY FIRE THE 3 RCS SQUIBS NECESSARY TO ACTIVATE THE 2 RCS RINGS
- PWRS RETRO ABORT INTERLOCK RELAY NO. 2 FOR SEQUENTIAL FUNCTIONS IN MODE II ABORT

8. Maneuver Thrusters 9-16 (VCC) (1.4.2)
PWRS SOLENOIDS WHICH ENABLES OPENING OF OAMS MANEUVER FUEL & OXIDIZER VALVES IN APPROPRIATE THRUSTERS. OAMS CNTL PWR SW POWERS C/B'S

9. ATT Thrusters 1-8 (VCC) (1.4.1)
PWRS SOLENOIDS WHICH ENABLES OPENING OF OAMS ATT FUEL & OXIDIZER SOLENOID VALVES. OAMS CNTL PWR SW POWERS C/B'S

10. RCS A1 (VCC) (1.4.1)
- PWRS 4 PITCH THRUSTERS (1, 2, 5, 6) IN RING A
- PWRS RING A MOTOR VALVES THROUGH RCS PROP MOTOR VALVE SWITCH
11. RCS A2 (VCC) (1.4.1)
   a. PWRS YAW LT THRUSTERS (7, 8) IN RING A
   b. PWRS 8 ACE RELAY & RELAY DRIVER CIRCUITRY FOR RING A

12. RCS A3 (VCC) (1.4.1)
   PWRS YAW RT THRUSTERS (3, 4) IN RING A

13. RCS B1 (VCC) (1.4.1)
   a. PWRS 4 PITCH THRUSTERS (1, 2, 5, 6) IN RING B
   b. PWRS RING B MOTOR VALVES THRU RCS PROP MOTOR VALVE SW

14. RCS B2 (VCC) (1.4.1)
   a. PWRS YAW LT THRUSTERS (7, 8) IN RING B
   b. PWRS 8 ACE RELAYS & RELAY DRIVER CIRCUITRY FOR RING B

15. RCS B3 (VCC) (1.4.1)
   PWRS YAW RT THRUSTERS (3, 4) IN RING B

16. O₂ RATE CNTL (VCC) (1.3.1)
   a. PWRS O₂ HI RATE SW IN O₂ HI RATE POS
   b. PWRS MANUAL O₂ HIGH RATE SW
   c. ENABLES ABSOLUTE PRESSURE SW'S TO INITIATE O₂ HIGH RATE
   d. ENABLES T/M OF O₂ HIGH RATE THRU MANUAL O₂ HIGH RATE & SEQ INST C/B

17. PRI COOL VLVS (VCC) (1.3.2)
   a. PWRS PRI LOOP EVAP FLOW SOLENOID THRU EVAP FLOW SW
   b. PWRS PRI LOOP RADIATOR FLOW SOLENOID THRU RAD FLOW SW

18. SEC COOL VLVS (VCC) (1.3.2)
   a. PWRS SEC LOOP EVAP FLOW SOLENOID THRU EVAP FLOW SW
   b. PWRS SEC LOOP RADIATOR FLOW SOLENOID THRU RAD FLOW SW
   c. PWRS URINE SOLENOID VALVE THRU URINE DUMP SW IN FLUSH POSITION

19. EVAP HTR (Vₘ) (1.3.4)
   PWRS EVAP HTR THRU EVAP HTR SW OAMS

20. OAMS HTRS (Vₘ) (1.4.3)
    PWRS OAMS OX LINE, OX VALVE & BACKUP OX VALVE HTRS WITH THERMOSTAT CNTL

21. CABIN LIGHTS (Vₘ) (1.8.3)
    PWRS CABIN LIGHTS, EVA LIGHTS & DOCKING LIGHTS (THRU RESPECTIVE LT SW'S)
    RHEOSTAT TO REG INTENSITY OF CABIN LTS

22. ATT IND LIGHTS (Vₘ) (1.5.1)
    PWRS BACK LIGHTING FOR ATT DISP UNITS (C/B USED AS SW)

23. SUIT FAN 1 (Vₘ) (1.3.1)
    PWRS SUIT FAN 1:
    a. THRU SUIT FAN SW
    b. THRU SUIT FAN & INLET SNORKEL SW DURING DESCENT IF O₂ HI RATE IS INITIATED

24. SUIT FAN 2 (Vₘ) (1.3.1)
    PWRS SUIT FAN 2:
    a. THRU SUIT FAN SW
    b. THRU SUIT FAN & INLET SNORKEL DURING DESCENT IF O₂ HI RATE IS INITIATED

25. ELSS PWR (Vₘ) (1.11.1)
    PWRS ELSS

26. H₂O HTRS (Vₘ) (1.3.4)
    PWRS THE PARALLEL CONNECTED H₂O DRINK, H₂O TANK, & H₂O WASTE LINE HTRS (C/B USED AS SW)

27. STBY XMTR CNTL (VCC) (1.7.1)
    ENABLES POWERING OF STBY T/M TRANSMITTER VIA DCS OR TM CONTROL STBY SW STBY XMTR'S PWR C/B ALSO NEEDED
<table>
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<td>PWRS STBY T/M TRANSMITTER VIA DCS OR T/M CONTROL STBY SW</td>
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<td>PWRS R/T TRANSMITTER VIA DCS OR T/M CONTROL T/M SW</td>
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<td>COOLANT PUMPS (V_M)</td>
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<td>PWRS O2 &amp; H2 ONBOARD &amp; T/M QUANTITY READOUTS THRU QTY SELECTOR SWITCH</td>
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<td>PWR TO LEFT &amp; RIGHT OUTLETS IN CABIN FOR ASTRO USE</td>
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<td>ACQ BEACONS (V_M)</td>
<td>1.6.1</td>
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<tr>
<td>PWRS ACQ AID BEACON THRU D/T XMTR &amp; ACQ AID BEACON DISABLE RELAY (OTHER C/B NEEDED: ANT CNTL, BOOST-INSERT CNTL 1 OR 2 AND TAPE RCDR CNTL)</td>
<td></td>
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<tr>
<td>RESC BEACONS (V_M)</td>
<td>1.6.1</td>
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<td>PWRS UHF RESCUE BEACON THRU RESCUE BEACON CONTROL SW</td>
<td></td>
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<tr>
<td>C-BEACONS (V_M)</td>
<td>1.6.1</td>
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<tr>
<td>PWRS ADPT C-BAND BEACON THRU C-BEACON CONTROL SW IN CONT &amp; C-ADPT BEACON CONTROL SW IN CMD &amp; DCS (DCS PWR C/B NEEDED IN CMD)</td>
<td></td>
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</tbody>
</table>

**DC-DC Conv (V_M) (1.7.1)**

PWRS DC-DC CONVERTERS THRU DC-DC CONVERTER SW

**RIGHT SW C/B PANEL**

1. **AUX TAPE (V_M) (1.5.1)**
   - PWRS AUX TAPE MEMORY
   - ENABLES AUX TAPE SW

2. **SEQ INST (V_CC) (1.1.1)**
   - PROVIDES T/M OF:
     - ASTRO ACTUATED ABORT
     - GLV/SC SEP
     - BOOSTER CUT-OFF CMD
     - EQUIP SECTION SEP
     - EMER RETRO SALVO RELAY
     - AUTO RETROFIRE INITIATION
     - MANUAL RETRO FIRE INITIATION
     - RETRO ROCKET NO. 2 FIRE
     - RETRO ROCKET NO. 3 FIRE
     - RETRO ROCKET NO. 4 FIRE
     - DROGUE CHUTE DEPLOYED
     - PILOT CHUTE DEPLOYED
     - DROGUE CHUTE RELEASED
     - PARACHUTE JETTISON
     - LEFT & RIGHT EJECT SEATS GONE
     - O2 HIGH RATE
     - IGS PITCH, ROLL, & YAW ATTITUDES
     - BOOST INSERT CNTL 1 AND/OR 2 AND BOOST CUT-OFF 1 AND/OR 2 C/B'S ALSO NEEDED FOR a, b & c.

3. **CALIB (V_CC) (1.7.1)**
   - PWRS CALIBRATION OF SIGNAL CONDITIONING PACKAGES THRU TM CONTROL CALIB SW OR DCS
4. BIO MED INST (V_M) (1.8.2)
   a. PWRs BIO MED PWR SUPPLY
   b. PWRs BIO MED TAPE RCDR 1 & 2
      THRU THE BIO MED RCDR 1 & 2 SWS

5. DCS PWR (V_M) (1.6.3)
   PWRs DCS

6. CRYO O_2 & H_2 REG (V_C) (1.2.2)
   a. ENABLES XOVER SW TO PWR O_2
      & H_2 CROSSOVER VALVES
   b. ENABLES H_2 TANK VAC SW TO
      FIRE DUAL-H_2 SQUIB THRU
      BUS ARM SW IN EXP POSITION

7. CRYO O_2 & H_2 HTR (V_M) (1.2.2)
   a. PWRs CRYO O_2 & H_2 HTRS
   b. PWRs URINE DUMP HTR & LT

8. SCAN HTR (V_M) (1.5.1)
   a. ENABLES AUTO HTRS IN HOR
      SENSOR ELECTRONICS (HTRS
      ON 10 F + 5 OFF 20 F + 5)
   b. PWR FOR SCAN IGNORE LTS
   c. PWRs PHASING LOGIC IN PLAT
      FOR FDI'S & ACME

9. AGENA CONTROL PWR (V_M) (1.8.1)
   a. PWR PITCH & YAW ION SENSOR
      ELECTRONICS
   b. PWR BREMSSTRAHLUNG SPECTROMETER
   c. PWR MAGNETOMETER ELECTRONICS
      UNIT
   d. PWR ENCDR PWR SW

10. AGENA CONTROL SQUIB 1 & 2
      (VOAMSQ 1 & 2) (1.8.1)
    a. EACH C/B SUPPLIES PWR
       TO: (THRU AGENA BUS
       ARM SW)
       1. OAMS RSV SW
       2. EMERG REL SW
       3. POD EJECT - INDEX
          EXTEND SW
       4. ION SENSOR SEQ1/SEQ2 SW

11. AGENA CONTROL CNTL (V_C) (1.8.1)
    a. TDA CNTL RIGID/STOP SW
    b. TDA CNTL UNDOCK SW
    c. AGENA CONTROL ENGINE
       ARM/STOP SW

12. RADAR PWR (V_M) (1.5.3)
    ENABLES RADAR MODE SW TO PWR
    RADAR & HOLD ON STBY (400 CPS
    FROM SEP SOURCE).

13. ACME INV (V_M) (1.5.1)
    PWRs ACME INVERTER THRU AC POWER
    SW IN ACME

14. RCS HTR A & B (V_M) (1.4.4)
    a. PWRs AUTO HTRS IN RCS SYSTEM
       THRU RCS HTRS SW
    b. ENABLES RCS HTR LT FOR RING
       A & B THRU RCS HTR SW
       NOTE: EACH C/B CONTROLS ONE
       RCS RING.

15. TAPE RCDR PWR (V_{+24V}) (1.7.1)
    PWRs INSTR TAPE RCDR FROM DC-DC
    CONV
    DC CONV C/B ALSO NEEDED

16. TAPE RCDR CNTL (V_C) (1.7.1)
    a. PWRs INSTR TAPE PLYBK CMD
       (THRU TAPE PLYBK SW OR DCS)
    b. PWRs ACQ AID & D/T TM COAX SW
       THRU T/M CONTROL T/M SW OR DCS
    c. ENABLES SELECTION OF EITHER
       ACQ AID BEACON OR D/T TRANS-
       MITTER FOR UHF DIPLEXER THRU
       THE TM CONTROL TM SW OR DCS

17. FUEL CELL CNTL 1 (V_C) (1.2.1)
    a. ENABLES SECT #1 PWR SW AND
       1A, 1B, & 1C STACK CNTL SWS
       TO PWR V_M FROM STACKS 1A, 1B,
       AND 1C
    b. ENABLES SECT #1 PURGE SWITCH
       TO PURGE O_2 & H_2 IN SECT #1

18. FUEL CELL CNTL 2 (V_C) (1.2.1)
    a. ENABLES SECT #2 PWR SW AND
       2A, 2B, & 2C STACK CNTL SWS
       TO PWR V_M FROM STACKS 2A, 2B,
       AND 2C
    b. ENABLES SECT #2 PURGE SWITCH
       TO PURGE O_2 & H_2 IN SECT #2

19. FC_{ΔP} (V_M) (1.2.2)
    a. ENABLES POWERING OF FC_{ΔP}
       LTS
    b. ENABLES T/M OF ΔP LIGHTS.
ELECTRICAL SYSTEM NORMAL PROCEDURES

1. NORMAL PURGE

1. VERIFY ALL STACK CURRENTS NORMAL (DO NOT PURGE IF STACK CURRENT IS BELOW NORMAL BEFORE CONFERRING WITH GROUND.)

2. XOVER SW - ON (UNLESS ΔP METER READINGS, H₂O TO O₂ AND/OR H₂ TO O₂, OF EITHER SECTION ARE NOT WITHIN NORMAL RANGE OR A FC ΔP LIGHT IS ILLUMINATED UNTIL NOTIFYING GROUND). (EXCEPT WITH ONE SECTION IN WARM-UP.)

3. SECTION #1 PURGE SW - H₂ FOR 13 SECS, THEN RELEASE
   (VERIFY FC ΔP SW IN PROPER H₂ POSITION).

4. CHECK FC ΔP METER READINGS RETURN TO NORMAL AND LTS GO OUT (IF NOT, ACCOMPLISH PROCEDURE FOR H₂ PURGE VLV FAILED OPEN).

5. REPEAT STEPS 3 & 4 FOR SECTION 2

6. SECTION #1 PURGE SW - O₂ FOR 2 MINS, THEN RELEASE

7. REPEAT STEP 6 FOR SECTION #2

8. FC ΔP SW - OFF

9. XOVER SW - OFF

2. CONTINGENCY PURGE (SINGLE STACK) (USE ONLY AFTER CONFERRING WITH GROUND)

1. XOVER SW - OFF

2. MAIN BATTERIES SWS (4) - ON

3. VERIFY FC ΔP SW IN PROPER POSITION

4. STACK SWS B & C (APPLICABLE SECTION) - OFF

5. PURGE SW - H₂ (13 SECS), THEN RELEASE
   (VERIFY O₂;H₂ ΔP RECOVERS TO NORMAL (0.5 + 0.18) AND FC ΔP'LT GOES OUT).

6. STACK SW B - ON

7. STACK SW A - OFF

8. PURGE SW - H₂ (13 SECS), THEN RELEASE
   (VERIFY O₂;H₂ ΔP RECOVERS TO NORMAL (0.5 + 0.18) AND FC ΔP'LT GOES OUT).

9. STACK SW C - ON

10. STACK SW B - OFF

11. PURGE SW - H₂ (13 SECS), THEN RELEASE
    (VERIFY O₂;H₂ ΔP RECOVERS TO NORMAL (0.5 + 0.18) AND FC ΔP'LT GOES OUT).

12. STACK SWS A & B - ON

13. MAIN BATTERIES SWS (4) - OFF

14. VERIFY FC ΔP SW IN PROPER H₂O POSITION

15. PURGE SW - O₂ (2 MINS), THEN RELEASE

3. CONTINGENCY PURGE (ONE SECTION OPEN CIRCUITED VIA THE SECTION PWR SW IN WARMUP)

1. XOVER SHOULD BE LEFT OFF FOR NORMAL OPERATION. THIS PREVENTS A SINGLE REGULATOR FAILURE FROM FAILING BOTH FC SECTIONS.

2. PERFORM NORMAL FC PURGING ON BOTH SECTIONS.
### Electrical Malfunction Index

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<tr>
<td>AMPS</td>
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- Reduced or zero current on any one stack ammeter
- Rapid drop of all stack currents within a section
- Cryo meter remains constant when either O₂ or H₂ is selected
- Cryo O₂:H₂ pressure differential does not return to normal or FCΔP light remains on after H₂ purge

- O₂&H₂ quant meters indicate continuous high usage - FC O₂:H₂ΔP and/or O₂:H₂0ΔP greater than nominal FCΔP lite on
- FC H₂ venting

4. Electrical power down checklist for minimum life support
5. Stack failure - ammeter failure - stack open circuit failure
6. Section failure
7. Cryo qty meter or circuitry failure
8. FC H₂ purge failed open
9. Cryo O₂ or H₂ leak or cryogenics venting over-board
10. Excessive heat leak
ELECTRICAL SYSTEM MALFUNCTION PROCEDURES

3A. EQUIPMENT OR MAIN BUS SHORT (FAULT CURRENT GREATER THAN 30 AMPS)

1. PREPARE FOR IMMEDIATE RE-ENTRY (UNLESS ON ONE STACK - SHUT DOWN STACK AND REPORT TO GROUND)

   **NOTE:** IF MAIN BUS CURRENT IS ABOVE 100 AMPS AND CANNOT BE RESOLVED RE-ENTER NEXT PLA.

3B. EQUIPMENT OR MAIN BUS SHORT (FAULT CURRENT GREATER THAN 10 AMPS BUT LESS THAN 30 AMPS) POWER DOWN LARGER POWER USERS

1. PRI AND SEC COOL PUMPS B - OFF
2. PRI AND SEC COOL PUMPS A - ON
3. PRI O₂ HTR SW - AUTO
4. AC POWER SW - OFF
5. OAMS HTR C/B - OFF
6. CONTINUE MISSION - CONFER WITH GROUND
7. IF FAULT ISOLATED, LEAVE APPROPRIATE SWITCH OFF AND PWR UP AGAIN

3C. EQUIPMENT OR MAIN BUS SHORT (FAULT CURRENT 10 AMPS OR LESS)

1. FOLLOW PROCEDURE 3B ABOVE
2. IF FAULT NOT ISOLATED CONTINUE POWER DOWN.
3. CRYO O₂ & H₂ HTR SW - AUTO
4. SUIT FAN SW - NO 1
5. EVAP HTR SW - OFF
6. RADAR SW - OFF
7. CABIN LTS - CYCLE SW
8. URINE DUMP SW - OFF
9. IF FAULT NOT ISOLATED CONTINUE MISSION AS CONFIGURED

4. ELECTRICAL POWER DOWN CHECKLIST FOR MINIMUM LIFE SUPPORT (14 AMPs WITH 2 FUEL CELL SECTIONS)

1. AC TM SW - OFF
2. CENTER LT SW - OFF
3. DC-DC CONV SW - PRI
4. ACME BIAS PWR SW - OFF
5. SUIT FAN SW - NO. 1
6. CRYO O₂ AND H₂ HTRS - AUTO
7. UHF T/R SW - NO. 1 (OR NO. 2)
8. AUDIO MODE SELECTOR SW - INT
9. HF T/R SW - OFF  
10. C-ADAPT BEACON CONTROL SW - CMD  
11. C-RNTY BEACON CONTROL SW - CMD  
12. TM CONTROL TM SW - CMD  
13. TAPE PLYBK SW - CMD  
14. RADAR SW - OFF  
15. PLATFORM MODE SW - OFF  
16. SCANNER SW - OFF  
17. RATE GYROS SW (3) - OFF  
18. COMPUTER PWR SW - OFF  
19. PRI PUMP A SW - OFF  
20. PRI PUMP B SW - ON  
21. SEC PUMP A SW - OFF  
23. OAMS ATT CONTL PWR SW - ON  
24. EVENT TIMER - STOP  
25. ATT IND LTS C/B - OPEN  
26. H₂O HTRS C/B - CLOSED  
27. LEFT AUX RECP SW - OFF  
28. AC POWER SW - OFF  
29. BIO-MED INSTRU C/B - CLOSED  
30. BOTH BIO-MED RCDR SWS - OFF  
31. OAMS HTRS C/B - CLOSED  
32. RCS HTRS A & B C/B'S - CLOSED  
33. RCS HTRS SW - ON (IF REQUIRED)  
34. EXT LTS SW - AUX HTRS  
35. RIGHT AUX RECP SW - OFF  
36. BUS ARM SW - SAFE  
37. DCS PWR C/B - OPEN  
38. SECT #1 & #2 PWR SWS - ON (SEE REMARK FOR 9 ABOVE)  
39. ALL STACK SWS - ON  
40. LEFT AND RIGHT CABIN LT SW-OFF  
41. TONE VOX C/B - CLOSED  
42. DIGITAL CLOCK - STOP  

5. STACK FAILURE--AMMETER FAILURE--STACK OPEN CIRCUIT FAILURE (REDUCED OR ZERO CURRENT ON ANY ONE STACK AMMETER)  

1. VERIFY STACK SW - ON  
2. PLACE VOLTMETER SELECTOR SW TO AFFECTED STACK POSITION OR WIRING  
   A. NOMINAL VOLTAGE INDICATES AMMETER FAILURE. ACCOMPLISH STEPS 3 & 4.  
   B. IF ZERO VOLTS (OPEN CIRCUIT STACK FAILURE OR VOLTMETER FAILURE IN THAT POSITION) OR OFF SCALE HI VOLTS (OPEN CIRCUIT BETWEEN STACK AND BUS), ACCOMPLISH STEP 5.
3. VERIFY STACK AMPS WITH GROD IF POSSIBLE
4. PERIODICALLY MONITOR AFFECTED STACK VOLTAGE
   (VERIFY WITH GROD).
5. SHUT DOWN AFFECTED STACK WHILE MONITORING OTHER
   STACK AMMETERS
   A. IF OTHER STACK AMMETER READINGS INCREASE, TURN
      STACK ON AND CONTINUE MISSION.
   B. IF NO CHANGE OCCURS IN OTHER STACK AMMETERS OR
      VOLTAMETER, LEAVE STACK SWITCH OFF FOR REMAINDER
      OF MISSION (DOES NOT AFFECT SUBSEQUENT PURGES).

7. SECTION FAILURE (RAPID DROP OF ALL STACK CURRENTS WITHIN
   A SECTION)

1. VERIFY CORRESPONDING COOLANT LOOP OPERATION
2. THREE CORRESPONDING STACK SW - OFF
3. CHECK AFFECTED STACK VOLTAGES. IF ALL READ
   BELOW 30 VOLTS AND/OR ARE NOT STABLE, ACCOM-
   PLISH STEPS 4 - 5 (DO NOT PURGE SECTION WHEN
   VOLTAGE & CURRENT ARE ABNORMAL BEFORE CONSULTING
   GROUND)
4. AFFECTED SECT PWR SW - OFF (SECTION WILL REMAIN
   OFF FOR MISSION DURATION).
5. IF SECTION 2 HAS FAILED, SECONDARY COOLANT LOOP
   OFF (DO NOT USE XOVER SW FOR SUBSEQUENT PURGES).

NOTE: FOR LOSS OF BOTH FC SECTIONS PRIOR TO RENDEZVOUS,
PLAN REENTRY FOR -3 AREA

FOR LOSS OF BOTH FC SECTIONS POST RENDEZVOUS, PLAN
REENTRY FOR -1 OR -4 AREAS

8. CRYO QUANTITY METER OR CIRCUITRY FAILURE (METER REMAINS
   CONSTANT WHEN EITHER O₂ OR H₂ IS SELECTED)

1. VERIFY CRY QTY C/B - CLOSED
2. VERIFY INTEGRITY OF SELECTOR SW AND METER BY
   SELECTING OTHER PARAMETERS. INABILITY TO SELECT
   OTHER PARAMETERS INDICATES SELECTOR SWITCH FAILURE.
   NORMAL SELECTOR SWITCH AND TM CALIBRATE OPERATION
   INDICATES PROBABLE SENSOR (OR RELATED CIRCUITRY)
   FAILURE.
3. ATTEMPT TM CALIBRATION. INABILITY TO CALIBRATE
   TM QUANTITY INDICATES A DC TO AC INVERTER FAILURE.
4. MONITOR AFFECTED CRYOGENIC PRESSURE CLOSER
5. OBTAIN CALCULATED QUANTITY FROM GROUND. TM OF
   MASS QUANTITY MAY ALSO FAIL.
10. **FC $H_2$ PURGE VALVE FAILED OPEN (CRYO $O_2:H_2$ PRESSURE DIFFERENTIAL DOES NOT RETURN TO NORMAL OR FC $\Delta P$ LIGHT REMAINS ON AFTER $H_2$ PURGE)**

- $0.5 + 0.18$ NORMAL

1. VERIFY FC $\Delta P$ SW IN PROPER $H_2$ POSITION.
2. PURGE SW (AFFECTED SECTION - $H_2$/RELEASE (PERFORMS 3 OR 4 TIMES).
3. MONITOR $O_2:H_2$ PRESSURE DIFFERENTIAL. IF $O_2:H_2$ $\Delta P$ DOES NOT RECOVER TO NORMAL, CONTINUE TO STEP 4.
4. TURN OFF ONE STACK IN AFFECTED SECTION.
5. MONITOR $O_2:H_2$ $\Delta P$. IF $O_2:H_2$ $\Delta P$ STILL DOES NOT CHANGE, RETURN THE STACK SW TO ON AND ACCOMPLISH STEP 6. IF $O_2:H_2$ $\Delta P$ DOES CHANGE, LEAVE THE STACK SW OFF FOR THE REMAINDER OF THE MISSION. MONITOR FC $O_2$ PERIODICALLY ON CRYO QUANTITY METER AND WITH GROUND.
6. PERFORM STEPS 4 & 5 FOR EACH REMAINING STACK. IF FC $\Delta P$ DOES NOT CHANGE AFTER STEPS 4 & 5 HAVE BEEN PERFORMED FOR ALL THREE STACKS, VERIFY READING WITH GROUND AND AWAIT INSTRUCTIONS.

11. **CRYO $O_2$ OR $H_2$ LEAK OR CRYOGENICS VENTING OVERBOARD**

- ($O_2$ & $H_2$ QUANT METERS INDICATE CONTINUOUS HIGH USAGE)
- ($FC O_2:H_2$ $\Delta P$ AND/OR $O_2:H_2O$ $\Delta P$ GREATER THAN NOMINAL)
- ($FC \Delta P$ LITE ON)

1. VERIFY $O_2$ & $H_2$ HEATERS - OFF
2. CHECK $O_2:H_2$ AND $O_2:H_2O$ $\Delta P$'S, REPORT ABNORMAL $\Delta P$'S TO GROUND.
   A. VENTING AT REGULATOR OR LEAK DOWNSTREAM WILL PROBABLY CAUSE ABNORMAL $O_2:H_2$ AND/OR $O_2:H_2O$ PRESSURE DIFFERENTIALS. THE $FC \Delta P$ LIGHTS MAY ALSO ILLUMINATE.
   B. FC $\Delta P$ LIGHTS NOT ILLUMINATED AND NOMINAL $O_2:H_2$ AND $O_2:H_2O$ $\Delta P$'S INDICATE PROBABLE VENTING IS AT CRYOGENIC BOTTLE RELIEF VALVE.
3. GRD MAKES DECISION TO CONTINUE MISSION ON 1 OR 2 SECTIONS AND FIGURES NEW MISSION TERMINATION TIME.

12. **EXCESSIVE HEAT LEAK (FC $H_2$ VENTING)**

- WHEN DIRECTED BY GROUND,
  1. BUS ARM - EXP
  2. $O_2$ & $H_2$ REG C/B - CLOSED
  3. $H_2$ TANK VAC SW - OPEN (THEN CLOSED)
  4. BUS ARM SW - SAFE
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0. PRESS GAGE READS BELOW 665 PSIG & DROPPING WHILE QTY SENSOR SHOWS NORMAL USAGE RATE

SUIT WILL NOT HOLD 3.5 PSI

H₂O CANNOT BE DUMPED THRU URINE OVBD LINE

26. O₂ AUTO HTR FAILURE

27. SUIT OR DOWNSTREAM PLUMBING LEAK

28. OVBD LINE FROZEN OR SOLENOID FAILED CLOSED

SCHEMATIC: ENVIRONMENTAL WATER MANAGEMENT

(14)
ECS MALFUNCTION PROCEDURES

1A. CABIN PRESSURE DROPPING RAPIDLY
1. ACTUATE O₂ HI-RATE
2. VERIFY SUIT CLOSED
3. CABIN AIR RECIRC VALVE - DOWN (CLOSED)
4. VERIFY INLET SNORKEL - UP (CLOSED)
5. O₂ HI - RATE - RECOCK
6. WATER SEAL - DOWN (CLOSED)
   IF CABIN PRESSURE DOES NOT STABILIZE,
7. WATER SEAL - UP (OPEN)
8. VERIFY CABIN VENT - UP (CLOSED)
9. VERIFY CABIN VENT REDUNDANT SEAL - IN (CLOSED)
10. CHECK WITH GROUND FOR POSSIBLE RE-ENTRY

1B. CABIN PRESS REG FAIL CLOSED OR CABIN LEAK
(CABIN PRESSURE DROPPING SLOWLY)
1. PERFORM STEPS 3, 4, AND 6 THROUGH 10 ABOVE.
2. USE REPRESS OR O₂ HI-RATE AS NECESSARY TO MAINTAIN CABIN PRESSURE.

   NOTE: IF CABIN PRESSURE IS BELOW 3.5 PSID & SUIT CIRCUIT AT OR ABOVE 3.5 PSIA [AFTER REPRESS ATTEMPT, CABIN WILL NOT MAINTAIN AT LEAST 4.0 PSID], PLAN RE-ENTRY BASED ON EXISTING CONDITIONS & PROXIMITY TO NEXT G0/NO GO PLA.

2. PRIMARY O₂ SYSTEM LEAK (ABNORMAL DECREASE IN O₂ QUANTITY)
1. VERIFY REPRESS VALVE - OFF
2. CYCLE O₂ HI-RATE ON, THEN OFF (O₂ HI-RATE VALVE MAY BE LEAKING)
IF CONDITION PERSISTS THEN SEE A OR B:

A. CABIN PRESSURE SLIGHTLY HIGH OR INCREASING
   IF PRESSURE EXCEEDS 6.0 PSIA:
1. CABIN VENT REDUNDANT SEAL CABLE - PULL AND LOCK
2. CABIN VENT - DOWN (OPEN) AS REQUIRED TO MAINTAIN PRESSURE BELOW 6.0 PSIA.
3. CONTACT GROUND FOR POSSIBLE RE-ENTRY.

B. CABIN PRESSURE NORMAL
   MONITOR LEAK RATE. CONTACT GROUND FOR POSSIBLE RE-ENTRY.
5. **LEAK IN RIGHT SECONDARY O₂ SYSTEM (DECREASE IN RIGHT SECONDARY O₂ BOTTLE QUANTITY WHILE USING PRIMARY SYSTEM)**

1. RIGHT SECONDARY O₂ BOTTLE SHUTOFF HANDLE - CLOSED
2. LEFT SECONDARY O₂ BOTTLE SHUTOFF HANDLE - OPEN
   IF RIGHT BOTTLE LEAKING CONTINUES:
3. RIGHT SECONDARY O₂ BOTTLE SHUTOFF HANDLE - OPEN
4. LEFT SECONDARY O₂ BOTTLE SHUTOFF HANDLE - CLOSED
   (TO INSURE HAVING O₂ FOR RE-ENTRY). IF LEFT SEC O₂ QUANTITY BEGINS TO DECREASE (AFTER STEPS 1 & 2).
   SEE NEXT FAILURE.

6. **PRIMARY O₂ SYSTEM PRESSURE REGULATOR FAILURE (REGULATOR FAILURE CONFIRMED BY LOW OR ZERO PRI O₂ CONSUMPTION)**

1. LEFT AND RIGHT SECONDARY O₂ BOTTLE SHUTOFF HANDLES - SHUT
2. MANUAL O₂ HIGH RATE HANDLE - PULL
   - IF NO HI FLOW RATE:
3. O₂ HIGH RATE REOCK HANDLE - DOWN
4. LEFT AND RIGHT SECONDARY O₂ BOTTLE SHUTOFF HANDLES - OPEN
   - IF HI RATE WORKS:
5. O₂ HIGH RATE REOCK HANDLE - DOWN
6. LEFT AND RIGHT SECONDARY O₂ BOTTLE SHUTOFF HANDLES - SHUT. USE SEC O₂ WHEN NECESSARY TO MAINTAIN SUIT AND CABIN PRESSURE, CHECK WITH GROUND FOR POSSIBLE MISSION TERMINATION.

7. **LEAK IN LEFT SECONDARY O₂ BOTTLE (ABNORMAL DECREASE IN LEFT SEC O₂ BOTTLE WHILE USING PRIMARY O₂ SYSTEM OR SUBNORMAL PRIMARY O₂ CONSUMPTION)**

1. RIGHT SECONDARY O₂ BOTTLE SHUTOFF HANDLE - CLOSED
2. LEFT SECONDARY O₂ BOTTLE SHUTOFF HANDLE - OPEN
3. VERIFY GAGE READING WITH GROUND

10. **CABIN AIR RECIRC VALVE FAILED CLOSED (UNABLE TO OPEN VALVE)**

1. OPEN VISORS
2. REMOVE SUIT OUTLET HOSES

11. **INLET SNORKEL FAILED OPEN**
    CABIN AIR RECIRC HANDLE - DOWN (CLOSED)

12. **INLET SNORKEL FAILED CLOSED**

1. ACTUATE O₂ HI RATE. MONITOR CABIN PRESSURE; DO NOT EXCEED 3 PSI ABOVE AMBIENT.
15. CABIN VENT FAILED CLOSED

A. FOR DECOMPRESSION IN ORBIT:
   1. ACTUATE O₂ HI RATE
   2. SUIT FAN SWITCH - OFF
   3. CABIN AIR RECIRC - UP (OPEN)
   4. INLET SNORKEL - DOWN (OPEN)

WHEN CABIN IS DEPRESSURIZED:
   5. CABIN AIR RECIRC - DOWN (CLOSED)
   6. INLET SNORKEL - UP (CLOSED)
   7. O₂ HI RATE - RECOCK

B. FOR RE-ENTRY PERFORM STEPS 1 THROUGH 4 ABOVE.

16. WATER SEAL FAILED OPEN (CABIN LEAKS AFTER LANDING)

1. VERIFY O₂ HI RATE
2. INLET SNORKEL HANDLE - UP (CLOSED)
3. CABIN VENT HANDLE - UP (CLOSED)
4. REFER TO EMERGENCY EGRESS CHECKLIST
5. CLOSE AND LOCK HATCHES TO MAKE S/C AIR TIGHT
   THUS PREVENTING WATER FROM ENTERING.
6. DEPRESS S/C BEFORE SWIMMERS OPEN HATCH

19. COOLING SYSTEM MALFUNCTION (CABIN TEMP ABOVE 100°F)

1. PRI & SEC A COOLANT PUMPS - ON
2. SUIT TEMP CNTL - MAX COOL
3. CABIN AIR RECIRC - OPEN FULL
4. SUIT FAN SW - 1 & 2
5. POWER DOWN IF NECESSARY

NOTE: FOR LOSS OF BOTH COOLANT LOOPS, REENTER NEXT PLANE.

20. SINGLE COOLANT PUMP FAILURE (AMBER LIGHT ON)

1. ALTERNATE COOLANT PUMP C/B - VERIFY CLOSED
2. AFFECTED PUMP SWITCH - OFF
3. ALTERNATE PUMP SWITCH - ON
   ALTERNATE PUMP MUST BE SELECTED WITHIN APPROXIMATELY
   2 MINS TO PREVENT FREEZING OF COOLANT IN BOTH LOOPS BY
   CRYOGENICS. PUMP B LOW COOLANT FLOW REQUIRES THAT S/C
   ELECTRICAL LOAD BE MINIMIZED.

NOTE: FOR LOSS OF ONE COOLANT LOOP & ONE PUMP IN OTHER
   COOLANT LOOP, REENTER NEXT GO/NO GO AREA

21. COOLANT LEAK (AMBER LIGHT INDICATION OF LOW COOLANT
    RESERVOIR--RISE IN CABIN & SUIT TEMPS--AMBER PUMP MALF
    LIGHT)

1. AFFECTED COOLANT LOOP PUMP SW - OFF
2. ALTERNATE COOLANT LOOP PUMP A - ON
3. AFFECTED FUEL CELL SECTION PWR SW - OFF
22. **O₂ AUTOMATIC HEATER PRESSURE SWITCH FAILED CLOSED**

(O₂ PRESS GAGE READS ABOVE 875 PSI ONBD)

1. O₂ HEATER SWITCH - OFF
2. O₂ HEATER SWITCH - PERIODICALLY ON OR AUTO TO KEEP PRESSURE WITHIN NORMAL RANGE.

23. **RELIEF VALVE FAILED (O₂ PRESSURE ABOVE 875 PSI ONBD)**

1. RIGHT SEC O₂ SHUTOFF - CLOSED
2. RAD SWITCH 2 BY-PASS IF REPRESS IS OPEN LONGER THAN 2 MINS.
3. REPRESS VALVE - OPEN AS NECESSARY. RELIEVE EXCESS PRESSURE.

24. **(CO₂ PRESSURE GAGE READS ABOVE NOMINAL [0 TO 5 MM HG])**

TO DETERMINE FAILURE:

1. RIGHT SEC O₂ SHUTOFF - CLOSED (WHILE REPRESS IS OPEN)
2. RAD SWITCH 2 BY-PASS (IF REPRESS VALVE IS OPEN LONGER THAN 2 MINS)
3. PLACE SUIT OUTLET HOSE OVER OPENED REPRESS VALVE.
   IF GAGE READING DECREASES, SEE PROCEDURE B. IF GAGE READING DOES NOT, THEN:

   A. **CO₂ GAGE FAILURE:**
   1. DC-DC CONV C/B - VERIFY CLOSED
   2. IF ONLY S/C GAGE HAS FAILED, MONITOR CO₂ PRESSURE FROM GROUND.

   B. **CO₂ CANNISTER FAILURE**
   SUITS CLOSED:
   1. MANUAL O₂ HIGH RATE HANDLE - PULL
   2. AFTER 3 MINUTES, O₂ HIGH RATE RECOCK - PULL
   3. REPEAT STEPS 1 & 2 WHEN CO₂ LEVEL BUILDS BACK UP TO 5MM HG.

    VISORS OPEN:
   4. RIGHT SEC O₂ SHUTOFF - CLOSED
   5. RAD SWITCH 2 BY - PASS
   6. PLACE SUIT OUTLET HOSE OVER REPRESS VALVE FOR 8 MINS.
      THIS WILL PURGE THE ENTIRE CABIN.
   7. REPEAT WHEN CO₂ LEVEL BUILDS BACK UP TO 5MM HG.

25. **URINE OVERBOARD LINE FROZEN OR SOLENOID FAILED CLOSED**

(COLLECTOR DOES NOT COLLAPSE)

1. SEC COOL VALVE C/B - CLOSED
2. RAD HTR C/YR - CLOSED CRYO O₂ & H₂ HTR C/B - CLOSED
3. LEAVE URINE DUMP SWITCH IN DUMP POSITION SO THAT HEATER WILL DEFROST LINE. HEATER ON-TIME SHOULD NOT EXCEED 5 MINUTES.
   -IF THIS DOES NOT WORK-
   4. H₂O VALVE - NORM
   5. CONDENSATE VALVE - NORM
   6. URINE VALVE - EVAP
   7. SELECTOR VALVE - DUMP
26. **O₂ AUTO HTR FAILURE (O₂ PRESS GAGE READS BELOW 665 PSIG & DROPPING-QTY SENSOR SHOWS NORMAL USAGE RATE)**

   **O₂ HEATERS SWITCH - ON, UNTIL PRESSURE IS BETWEEN 665 AND 770 PSIG, THEN OFF.**

   **CAUTION: MANUAL HEATER MAX. ON-TIME IS 30 MINUTES. ALLOW 10 MINS OFF.**

27. **SUIT OR DOWNSTREAM PLUMBING LEAK (SUIT WILL NOT HOLD 3.5 PSI)**

   1. **REMOVE SUIT OUTLET HOSE (OUTLET SEALS AUTOMATICALLY).**
   2. **ACTUATE O₂ HI-RATE (O₂ HI-RATE WILL REPRESS 'CABIN IF HATCHES AND CABIN VENT ARE CLOSED).**
   3. **VERIFY CABIN VENT - UP (CLOSED)**
   4. **VERIFY CABIN VENT REDUNDANT SEAL CABLE - IN (CLOSED)**

   **NOTE:** **IF CABIN PRESSURE IS BELOW NORMAL & ONE OR BOTH SUIT CIRCUITS CANNOT BE MAINTAINED AT OR ABOVE 3.5 PSIA, REENTER ASAP**

28. **OVERBOARD LINE FROZEN OR SOLENOID FAILED CLOSED (H₂O CANNOT BE DUMPED THROUGH URINE OVERBOARD LINE)**

   1. **SEC COOL VALVE C/B - CLOSED**
   2. **PRI O₂ HTR C/B - CLOSED CRYO O₂ & H₂ HTR C/B - CLOSED**
   3. **LEAVE URINE DUMP SWITCH IN DUMP POSITION SO THAT HEATER WILL DEFROST LINE. HEATER ON-TIME SHOULD NOT EXCEED 5 MINUTES.**

   **-IF THIS DOES NOT WORK-**

   4. **URINE DUMP SWITCH - OFF**
   5. **H₂O VALVE - NORM**
   6. **CONDENSATE VALVE - NORM**
   7. **CONNECT URICEPTACLE & DRINK NOZZLE**
   8. **URINE VALVE - EVAP**
   9. **SELECTOR VALVE - BY-PASS**
   10. **DRINK NOZZLE VALVE - PUSH (0.5 OZ PER PUSH)**
   11. **WATCH FOR EVAP ΔP LIGHT**
CONTROL SYSTEM NORMAL PROCEDURES

2. ONBOARD PROP GAGE INDICATES 50 PSI BELOW NORMAL
   REGULATED PRESSURE READINGS CONFIRMED BY GROUND
   INDICATING MAIN FUEL TANK IS EMPTY

1. BUS ARM SW - EXP
2. AGENA CNTL SQUIB 1 & 2 C/B'S - CLOSED
3. OAMS RESVR SW - SQUIB
4. VERIFY ONBOARD GAGE READING INCREASES TO NORMAL
   REGULATED PRESSURE OF 295 ± 15 PSI.
5. OAMS RESVR SW - SAFE
6. BUS ARM SW - SAFE
<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>FAILURE</th>
<th>PG</th>
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<tr>
<td>EXCESS TUMBLE RATES DURING SLEEP PERIOD UNDOCKED</td>
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<td>UNCOMMANDED ATTITUDE RATES WHILE DOCKED</td>
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<td>22</td>
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<tr>
<td>UNCOMMANDED RATES, UNCOMMANDED THRUST, OR IMPROPER OAMS CONTROL RESPONSE</td>
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<tr>
<td>S/C RATES BECOME INTOLERABLE</td>
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<td>DEGRADED ATTITUDE CONTROL</td>
<td>6A. MALFUNCTIONING ATTITUDE THRUSTER ISOLATION</td>
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<td>ABNORMAL DECREASE IN OAMS SOURCE PRESSURE</td>
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<td>LOW OAMS REGULATED PRESSURE</td>
<td>9. REGULATOR FAILED CLOSED</td>
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<td>AUTOMATIC PRESSURE SWITCH HAD CLOSED N.O.S.V. AND OAMS USAGE HAS DECREASED THE REGULATED PRESSURE</td>
<td>10. REGULATOR FAILED OPEN</td>
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<td>HIGH OAMS REGULATED PRESSURE (ABOVE 380 PSI)</td>
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<td>UNCOMMANDED RATE, UNCOMMANDED THRUST OR DEGRADED CONTROL WITH RCS</td>
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</table>
CONTROL SYSTEM MALFUNCTION PROCEDURES

1. EXCESS TUMBLE RATES DURING SLEEP PERIOD (NOT DOCKED)

1. RATE GYRO SW'S (3) - PRI (30 SEC SPIN UP FOR SPEC. PERFORMANCE)
2. AC POWER - ACME
3. VERIFY ATTITUDE CONTROL - RATE CMD
4. OAMS CNTL PWR SW - ON (REMOVE WINDOW CURTAINS)
5. CONTROL S/C

2. EXCESS TUMBLE RATES DURING SLEEP PERIOD (DOCKED)

1. COMMAND AGENA - OFF (400)
2. RATE GYRO SW'S (3) - PRI (30 SEC SPIN UP FOR SPEC. PERFORMANCE)
3. AC POWER - ACME
4. VERIFY ATTITUDE CONTROL - RATE CMD
5. OAMS CNTL PWR SW - ON (REMOVE WINDOW CURTAIN)
6. CONTROL S/C

IF UNCOMMANDED THRUSTS CONTINUE AND ARE UNACCEPTABLE

7. MANEUVER CONTROLLER - ON
8. TDA CONTROL UNDOCK SW - UNDOCK
9. THRUST TO CLEAR AGENA (AS SOON AS DOCKING LATCHES RELEASE)
10. MAINTAIN VISUAL CONTACT WITH AGENA.

3. UNCOMMANDED ATTITUDE RATES WHILE DOCKED WITH AGENA

DURING EVA, PILOT WILL REENTER S/C AT FIRST INDICATION OF FAILURE

1. COMMAND AGENA OFF (400)
2. VERIFY ATTITUDE CONTROL - RATE CMD
3. OAMS PWR SW - ON
4. CONTROL S/C (DURING EVA, MAINTAIN CONTROL WITH OAMS SYSTEM UNTIL PILOT REENTERS S/C PRIOR TO UNDOCKING)

IF UNCOMMANDED THRUSTS CONTINUE AND ARE UNACCEPTABLE

5. MANEUVER CONTROLLER - ON
6. TDA CONTROL UNDOCK SW - UNDOCK
7. THRUST TO CLEAR AGENA (AS SOON AS DOCKING LATCHES RELEASE)
8. MAINTAIN VISUAL CONTACT WITH AGENA

4. UNCOMMANDED RATES UNCOMMANDED THRUST OR IMPROPER CONTROL RESPONSE

WARNING: DURING EVA, PILOT WILL REENTER S/C AS SOON AS POSSIBLE AFTER DETECTION OF MALFUNCTION. ACCOMPLISH ONLY STEPS NECESSARY FOR PILOT TO REENTER S/C OR
SECURE TO THE S/C FOR TROUBLESHOOTING. PILOT REMAIN IN SIGHT OF CMD PILOT.

NOTE: TO IDENTIFY AND ISOLATE FAILURES DURING EVA OPERATION, INSURE THE PROP GAGE IS SET FOR OAMS SOURCE PRESSURE, THE IVI'S ARE ON, AND THE COMPUTER IS IN NAV. PRIOR TO EVA, SWITCH TO PRE LN AND BACK TO NAV. (THIS ZEROS THE IVI'S.) ENTER ZEROS IN ADDRESSES 25, 26, AND 27. PUSH START COMP.

WHEN IN AN AUTOMATIC MODE (HOR SCAN, RATE CMD, OR PLAT), HIGH RATES (ABOVE 1°/SEC) OR OSCILLATIONS OF S/C ARE NOTED:

1. ATTITUDE CONTROL - DIRECT
2. CONTROL S/C

WHEN IN DIRECT OR PULSE MODE, OR WHEN RATES ARE LOW (OR HAVE BEEN CONTROLLED IN DIRECT), OR MANY THRUSTERS ARE FIRING, OR CONTROL DEGRADED (I.E., NO DANGEROUS RATES), OMIT STEPS 1 AND 2.

3. OAMS CNTL PWR SW - OFF

IF THE IVI'S ARE COUNTING UP AT THIS TIME AND MANEUVER CONTROL IS NECESSARY, DETERMINE FAILED THRUSTER(S), OPEN C/B'S, AND MANEUVER AS REQUIRED (OAMS CNTL PWR SW ON FOR MANEUVER, THEN OFF).

4. RATE GYROS (3) - PRI (30 SEC SPIN UP FOR SPEC. PERFORMANCE IF OFF)
5. VERIFY:
   \[\text{RATITION SW/\ D66\ COMPUTER SW/\ D66\ AC POWER - AMCE}\]
6. FDM - RATES
7. ATTITUDE CONTROL - DIRECT
8. ALL (16) OAMS C/B'S - OPEN (NOTE ANY POPPED C/B'S)
9. DETERMINE FAILED THRUSTER.

FROM DIRECTION OF RATE, DETERMINE FAILED THRUSTER MOST LIKELY TO BE FAILED WITH THRUST ON. (USE IVI INDICATIONS TO HELP ISOLATE MANEUVER THRUSTER FAILURES.)

IF ROLL LEFT - CLOSE OAMS C/B'S EXCEPT 2, 4, 6 AND 8
IF ROLL RIGHT - CLOSE OAMS C/B'S EXCEPT 1, 3, 5 AND 7
IF PITCH UP - CLOSE OAMS C/B'S EXCEPT 5, 6 AND 10
IF PITCH DOWN - CLOSE OAMS C/B'S EXCEPT 1, 2 AND 9
IF YAW LEFT - CLOSE OAMS C/B'S EXCEPT 7, 8 AND 11
IF YAW RIGHT - CLOSE OAMS C/B'S EXCEPT 3, 4 AND 12
10. OAMS CNTL PWR SW - ON
11. REDUCE RATES
12. VALVE DRIVERS AND BIAS POWER SW'S TO PRIMARY.
   CHECK RELATED C/B'S CLOSED, AND ROLL JETS SW -
   YAW.
13. CLOSE REMAINING C/B'S ONE AT A TIME TO IDENTIFY
    MALFUNCTIONING ENGINE.

IF IDENTIFIED: (PRIMARY MODE) (IF NOT, PROCEED TO
STEP 17.)

14. AFFECTED C/B'S - OPEN
15. SWITCH ROLL JETS SW TO PITCH AND ALL REDUNDANT
   CONTROL SYSTEM SW'S TO SECONDARY
16. AFFECTED C/B'S - CLOSED

IF NOT IDENTIFIED (OR CORRECTED ABOVE): (TO CHECK
SECONDARY MODE)

17. SWITCH ROLL JETS SW, VALVE DRIVERS, AND BIAS
    POWER ONE AT A TIME TO IDENTIFY MALFUNCTION.

IF IDENTIFIED IN DIRECT MODE, REMAIN ON OPERATIONAL
PART OF REDUNDANT SYSTEM OR WITH THRUSTER C/B'S OPEN
AS REQUIRED. CHECK DIRECT MODE IN ALL THREE AXES.
IF MALFUNCTION IS DETERMINED TO BE A THRUSTER(S)
FAILED CLOSED, REFER TO PROCEDURE 6 AND CHART 6A.

IF FAILURE NOT IDENTIFIED IN DIRECT MODE:

18. VERIFY ACME LOGIC IN PRIMARY.
   ATTITUDE CONTROL - RATE CMD
19. VERIFY OPERATION IN ALL THREE AXES.

IF MALFUNCTION EVIDENT:

20. AFFECTED THRUSTER C/B'S - OPEN
21. SELECT SECONDARY ACME LOGIC AND CLOSE C/B'S-

IF FAILURE IDENTIFIED AND CLEARED - CONTINUE MISSION.

IF NOT IDENTIFIED:

22. RATE GYROS - SEC

IF FAILURE IDENTIFIED - CONTINUE MISSION

IF FAILURE EVIDENT BUT NOT IDENTIFIED - OPEN C/B'S
OR SELECT OTHER MODE (FAILURE IN RATE CMD)

IF NOT IDENTIFIED (IF PLATFORM ON AT START OF
MALFUNCTION):
23. AC POWER - IGS (IF PLATFORM ON AT START OF MALFUNCTION)

24. ATTITUDE CONTROL - PLAT

IF MALFUNCTION EVIDENT - CONTINUE MISSION IN OTHER MODE

IF FAILURE NOT IDENTIFIED:

25. ATTITUDE CONTROL - PULSE
26. VERIFY OPERATION IN ALL THREE AXES

IF FAILURE IDENTIFIED - CONTINUE MISSION IN OTHER MODE

IF FAILURE NOT IDENTIFIED:

27. ATTITUDE CONTROL - HOR SCAN

IF FAILURE IDENTIFIED:

28. SCANNER SW - SEC
29. VERIFY OPERATION OF PULSE MODE IN YAW AXIS

5. ANYTIME S/C RATES BECOME INTOLERABLE

WARNING: ONLY AFTER UNDOCKING

1. OAMS CNTL PWR SW - OFF
2. OAMS PROP MOTOR VALVE SW - CLOSED
3. ACTIVATE RCS
4. VERIFY ATTITUDE CONTROL - DIRECT
5. CONTROL S/C
6. VERIFY RCS POWER - DIRECT

NOTE: WITH HAND CONTROLLER INOPERATIVE, GO TO PLAT MODE AND POWER UP IGS.

NOTE: ONCE RCS SQUIBS ARE BLOWN, PLAN REENTRY FOR NEXT BEST PLA.

6. DEGRADED ATTITUDE CONTROL

1. OAMS PROP MOTOR VALVE SW - CLOSED (ONLY WITH GROUND'S APPROVAL)
2. ATTITUDE CONTROL HANDLE - ACTUATE ALTERNATELY TO ENERGIZE AND DE-ENERGIZE MALFUNCTIONING THRUSTER.

NOTE: THIS HELPS TO RELIEVE PRESSURE IN PROPELLANT LINES WITH POSSIBLE CORRECTION TO MALFUNCTIONING SOLENOID VALVE.

3. OAMS PROP MOTOR VALVE SW - OPEN
4. ATTITUDE CONTROL HANDLE - ACTUATE IN MALFUNCTIONING AXIS.
NOTE: IF THRUSTER FIRES, MALFUNCTION IS CORRECTED. IF THRUSTER DOES NOT FIRE, ACCOMPLISH STEPS 5 THROUGH 7.

5. ATTITUDE CONTROL MODE SW - RATE CMD
6. IF A PITCH THRUSTER HAS FAILED, ROLL JETS SW - YAW (AND VICE VERSA)
7. ACCOMPLISH ATTITUDE CHANGES BY COMBINATIONS OF PITCH, ROLL, AND YAW COMMANDS. AN ALTERNATE MEANS OF CONTROL FOR PITCH OR YAW CAN BE ACCOMPLISHED BY USING ONLY ONE OF THE TWO AFT OR TWO FORWARD MANEUVER THRUSTERS RESPECTIVELY. THIS MUST BE DONE IN DIRECT MODE.
6A. MALFUNCTIONING ATTITUDE THRUSTER ISOLATION

<table>
<thead>
<tr>
<th>COMMAND</th>
<th>REACTION</th>
<th>THRUSTER FAILED CLOSED (WILL NOT FIRE)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PITCH DOWN</td>
<td>PITCH DOWN &amp; ROLL LEFT</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PITCH DOWN &amp; ROLL RIGHT</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>PITCH UP</td>
<td>PITCH UP &amp; ROLL LEFT</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PITCH UP &amp; ROLL RIGHT</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>YAW RIGHT</td>
<td>YAW RIGHT &amp; ROLL LEFT</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>YAW RIGHT &amp; ROLL RIGHT</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>YAW LEFT</td>
<td>YAW LEFT &amp; ROLL LEFT</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>YAW LEFT &amp; ROLL RIGHT</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>ROLL RIGHT</td>
<td>ROLL RIGHT &amp; PITCH UP</td>
<td>1</td>
<td>IF ROLL JETS SW - PITCH</td>
</tr>
<tr>
<td></td>
<td>ROLL RIGHT &amp; PITCH DOWN</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ROLL RIGHT &amp; YAW LEFT</td>
<td>3</td>
<td>- YAW</td>
</tr>
<tr>
<td></td>
<td>ROLL RIGHT &amp; YAW RIGHT</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>ROLL LEFT</td>
<td>ROLL LEFT &amp; PITCH UP</td>
<td>2</td>
<td>IF ROLL JETS SW - PITCH</td>
</tr>
<tr>
<td></td>
<td>ROLL LEFT &amp; PITCH DOWN</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ROLL LEFT &amp; YAW LEFT</td>
<td>4</td>
<td>- YAW</td>
</tr>
<tr>
<td></td>
<td>ROLL LEFT &amp; YAW RIGHT</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>
7. **ABNORMAL DECREASE IN OAMS SOURCE PRESSURE**

**IF PRESSURE DECREASE SLOW:**

1. ATTITUDE CONTROL - RATE CMD

**AFTER S/C STABLE:**

2. OAMS CNTL PWR SW - OFF

3. NOTE RATE (OR NO RATE)

**NOTE:** IF SOLENOID VALVE FAILED OPEN, RATE BUILD UP MAY INDICATE FAILURE.

**IF PRESSURE DECREASE RAPID:**

4. OMIT STEPS 1, 2 AND 3

5. OAMS PROP MOTOR VALVE SW - CLOSED

**NOTE:** VALVE REQUIRES 5 SEC TO CLOSE. IF LEAK DOES NOT STOP, IT IS UPSTREAM OF MOTOR VALVES, AND THIS PROCEDURE WILL NOT CORRECT MALFUNCTION. SEE STEP 10. IF LEAK STOPS COMPLETE PROCEDURE THROUGH STEP 9.

6. OAMS CNTL PWR SW - ON

7. MANEUVER CONTROLLER SW - ON

8. ACTUATE ATTITUDE CONTROL HANDLE AND MANEUVER CONTROLLER IN ALL AXES.

**NOTE:** THIS MAY CORRECT THE MALFUNCTION SINCE PRESSURE IS RELIEVED IN THE MANIFOLD. FURTHER, IT WILL BLEED THE MANIFOLD THROUGH THE SOLENOID VALVES AND DECREASE (IN THE EVENT OF A MANIFOLD LEAK) LEAKAGE INTO THE ADAPTER SECTION.

9. OAMS CNTL PWR SW - OFF

10. MANEUVER CONTROLLER SW - OFF

**NOTE:** SINCE IT IS NOT POSSIBLE TO DETERMINE IF LEAK HAS BEEN STOPPED WITHOUT POSSIBLE FUEL OR OXIDIZER LOSS, THE OAMS PROP MOTOR VALVE SW SHOULD BE LEFT CLOSED UNTIL THE OAMS IS REQUIRED FOR ORBIT ADJUSTMENT, ETC.

**NOTE:** ANYTIME THE PROP MOTOR VALVE IS RE-OPENED YAW FULL LEFT UNTIL THRUSTER FIRES AND ACTUATE ALL THRUSTERS TO INSURE MANIFOLD FULLY PRESSURIZED.
LEAK UPSTREAM OF PROP MOTOR VALVE.

10. OAMS PROP MOTOR VALVE SW -OPEN
11. VERIFY OAMS CNTL REG 1 & 2 C/B'S - CLOSED
12. OAMS CNTL PROP C/B - OPEN

NOTE: THIS ALLOWS NORMALLY OPEN SQUIB VALVE TO CLOSE AND CUT-OFF SOURCE PRESSURE TO REGULATOR - WITHOUT OPENING THE NORMALLY CLOSED SQUIB VALVE BY PASSING REGULATOR. OAMS CNTL PROP C/B MUST BE CLOSED TO OPERATE PULSE POSITION OF OAMS REG SW AND OAMS PROP MOTOR VALVES.

13. OAMS REG SW - SQUIB
14. OAMS CNTL PROP C/B - CLOSED

NOTE: DO NOT USE SQUIB POSITION OF OAMS REG SW UNLESS NECESSARY TO BYPASS REGULATOR.

15. SUPPLY PRESSURE TO REGULATOR WITH PULSE.

NOTE: ONLY SUPPLY SOURCE PRESSURE WHEN REQUIRED FOR THRUSTING.

16. AFTER THRUSTING CLEAR LINES AS IN STEPS 7-9 AND NOTES.

NOTE: IF OAMS REGULATED PRESSURE WILL NOT INCREASE WITH PULSE; SEE PROCEDURES 9, 10, AND 11.
10. OAMS REG SW - SQUIB
11. CONTROL PRESSURE MANUALLY WITH PULSE

8. ABNORMAL DECREASE IN RCS RING A OR B SOURCE PRESSURE (SYSTEM ACTIVATED)

1. AFFECTED RCS PROP MOTOR VALVE SW - CLOSED
2. AFFECTED RCS ATTITUDE CONTROL SW - ON

NOTE: IF LEAK DOES NOT STOP, IT IS UPSTREAM OF MOTOR VALVES, AND THERE IS NO CORRECTION.

3. ACTUATE ATTITUDE CONTROL HANDLE IN ALL AXES.

NOTE: THIS MAY POSSIBLY CORRECT MALFUNCTION SINCE PRESSURE IS RELIEVED FROM THE MANIFOLD. FURTHER, IT WILL BLEED THE MANIFOLD THROUGH THE SOLENOID VALVES AND DECREASE (IN EVENT OF A LEAKING MANIFOLD) LEAKAGE INTO THE R & R SECTION.

4. AFFECTED RCS ATTITUDE CONTROL SW - OFF

NOTE: AFFECTED POWER AND PROPELLANT SWITCHES SHOULD REMAIN OFF EXCEPT WHEN THE SYSTEM IS NEEDED FOR RETROFIRE AND REENTRY.

NOTE: FOR SUSTAINED DECREASE IN EITHER RCS RING SOURCE PRESSURE, NOT ATTRIBUTABLE TO CREW USAGE OR TEMP EFFECTS, PLAN REENTRY FOR NEXT BEST PLA

9. REGULATOR FAILED CLOSED (LOW OAMS REGULATED PRESSURE)

1. VERIFY:
   OAMS CNTL PROP C/B - CLOSED
   OAMS CNTL REG 1 & 2 C/B'S - CLOSED
2. OAMS REG SWITCH - PULSE

NOTE: IF PRESSURE RISES, SYMPTOM WAS DUE TO AN OVERPRESSURE FAILURE OF THE REGULATOR. SEE NEXT FAILURE. IF PRESSURE DOES NOT RISE AND IT IS ASCERTAINED THAT THE MAIN TANK IS NOT EMPTY, ACCOMPLISH STEPS 3 & 4.

3. OAMS REG SWITCH - SQUIB
4. OAMS REG SWITCH - PULSE

NOTE: MAINTAIN PRESSURE AT APPROXIMATELY 295 PSI AS REQUIRED. DO NOT EXCEED 340 PSIA.

10. REGULATOR FAILED OPEN (AUTOMATIC PRESSURE SWITCH HAD CLOSED N.O.S.V. AND OAMS USAGE HAS DECREASED THE PRESSURE (LOW OAMS REGULATED PRESSURE)
1. OAMS REG SWITCH - PULSE (AS REQUIRED)

NOTE: USE PULSE POSITION AS REQUIRED TO MAINTAIN PRESSURE AT APPROXIMATELY 295 PSI AS REQUIRED. DO NOT EXCEED 340 PSIA.

11. Clogged Line Filter(s) (Low OAMS Regulated Pressure)

The RCS system will not be activated and used after OAMS pressure is depleted unless designated by the ground. OAMS system will be lost when pressure is depleted.

12. High OAMS Regulated Pressure (Above 380 PSI)

1. OAMS REG SWITCH - SQUIB
2. OAMS REG SWITCH - PULSE

NOTE: MAINTAIN PRESSURE AT APPROXIMATELY 295 PSI AS REQUIRED. DO NOT EXCEED 340 PSI.

13. Uncommanded Rate, Uncommanded Thrust or Degraded Control with RCS

With low rates (not above 5°/SEC) during retrofire or below 400K (Critical Phase)

1. Attitude Control - Rate CMD/Rate CMD(RE-ENT)
2. RCS CNTL PWR SW's A & B - ACME
3. Control S/C

NOTE: USING THIS PROCEDURE, AN EXCESSIVE AMOUNT OF PROPELLANT WILL BE USED; THEREFORE, AT THE TERMINATION OF RETROFIRE, THE MALFUNCTION SHOULD BE ISOLATED AND CORRECTED BY USING THE FOLLOWING PROCEDURES.

With high rates (above 5°/SEC) or unacceptable oscillations of S/C when in RCS ACME during critical phase, or during non-critical phase (orbit to 400K except retrofire) ACME or DIRECT.

4. Affected RCS CNTL PWR SW’s - DIRECT

NOTE: USE OAMS IF AVAILABLE.

5. Control S/C

IF FAILURE CORRECTED:
BELOW 400K USE DIRECT TO COMPLETE REENTRY

IF FAILURE NOT CORRECTED OR ABOVE 400K (EXCEPT DURING RETROFIRE)
6. ALL RCS C/B'S - OPEN (CLOSED ONE AT A TIME TO ISOLATE FAILURE)

   IF FAILURE IDENTIFIED, CONTINUE WITH AFFECTED C/B'S OPEN.

   IF FAILURE NOT EVIDENT OR IDENTIFIED IN RCS DIRECT AND AUTOMATIC OPERATION DESIRED, TROUBLE SHOOT ACME. (CHECK RINGS A & B ONE AT A TIME FOR EACH PROCEDURE.)

7. RATE GYROS (3) - PRI (30 SEC SPIN UP FOR SPEC. PERFORMANCE IF OFF)
8. AC POWER - VERIFY IGS
9. FDM - RATE
10. ATTITUDE CONTROL SW - DIRECT
11. RCS A & B (6) C/B'S - OPEN (NOTE ANY OPEN C/B'S)
12. RCS CNTL SW - ACME
13. ACME BIAS PWR - PRI
14. CLOSE RCS C/B’S ONE AT A TIME. VERIFY OPERATION IN ALL AXES (3).

   IF IDENTIFIED:

15. AFFECTED C/B'S - OPEN
16. ACME BIAS PWR - SEC
17. AFFECTED C/B'S - CLOSED

   VERIFY OPERATION IN ALL AXES (3) IF NOT IDENTIFIED (OR CORRECTED ABOVE).

   IF IDENTIFIED IN DIRECT MODE, REMAIN ON OPERATIONAL PART OF REDUNDANT SYSTEM OR WITH THRUSTER C/B'S OPEN AS REQUIRED. (C/B 2 WILL DISABLE ALL RELAY DRIVERS IN AFFECTED RING).

   IF FAILURE NOT IDENTIFIED IN DIRECT MODE:

18. ACME BIAS PWR - PRI
19. ACME LOGIC PRIMARY
20. ATTITUDE CONTROL - RATE CMD (PERFORM SAME PROCEDURE FOR RATE CMD (RE-ENT)

   IF MALFUNCTION EVIDENT:

21. AFFECTED THRUSTER C/B’S - OPEN
22. SELECT SECONDARY ACME LOGIC AND CLOSE C/B'S.

   IF FAILURE IDENTIFIED AND CLEARED, CONTINUE MISSION.

   IF NOT IDENTIFIED:

23. RATE GYROS - SEC
IF FAILURE IDENTIFIED, CONTINUE MISSION.

IF FAILURE EVIDENT BUT NOT IDENTIFIED, OPEN C/B'S OR SELECT OTHER MODE (FAILURE IN RATE CMD).

IF NOT IDENTIFIED:

24. AC POWER - IGS
25. ATTITUDE CONTROL - PLAT

IF MALFUNCTION EVIDENT, CONTINUE IN OTHER MODE.

IF FAILURE NOT IDENTIFIED:

26. ATTITUDE CONTROL - PULSE
27. VERIFY OPERATION IN ALL AXES (3)

NOTE: IF THRUSTERS FIRE CONTINUOUS WITH CONTROL HANDLE DEFLECTION (SHORT CIRCUIT OF GROUND SWITCH) USE OTHER MODE.

IF FAILURE IDENTIFIED, CONTINUE IN OTHER MODE.

IF FAILURE NOT IDENTIFIED:

28. ATTITUDE CONTROL - HOR SCAN

IF FAILURE EVIDENT:

29. SCANNER SW - SEC (IF APPLICABLE)
30. VERIFY OPERATION OF PULSE MODE IN YAW AXIS.
<table>
<thead>
<tr>
<th>NORMAL PROCEDURE</th>
<th>SYMPTOM/FAILURE</th>
<th>MALFUNCTION PROCEDURE</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOTE: COMPUTER MALF OR ATM ERROR LIGHT (OR BOTH) MAY ILLUMINATE AT ANY TIME. IF THEY ILLUMINATE IN AUTOMATIC OR MANUAL PROCEDURE, COMPLETE THE FOLLOWING STEPS:</td>
<td></td>
<td>ATM - STDBY&lt;br&gt;ATM PWR - OFF&lt;br&gt;COMPUTER PWR - OFF&lt;br&gt;RETURN TO STEP 1 OF APPLICABLE PROCEDURE.</td>
<td></td>
</tr>
<tr>
<td>1. ATM POWER UP AND AUTOMATIC OPERATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. VERIFY SWITCH POSITIONS.&lt;br&gt;AC PWR - IGS&lt;br&gt;COMPUTER - PRE LN&lt;br&gt;COMPUTER PWR - ON&lt;br&gt;MDIU PWR - ON&lt;br&gt;ATM MODE - STDBY&lt;br&gt;ATM PWR - OFF&lt;br&gt;VERIFY AUX TAPE&lt;br&gt;C/B - ON.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. ATM PWR - ON/RESET</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. VERIFY COMP RUNNING LIGHT - ON</td>
<td>3.(a) COMP RUNNING LIGHT NOT ON.</td>
<td>3.(a) ACCOMPLISH IGS PWR UP PROCEDURE.</td>
<td></td>
</tr>
<tr>
<td>NORMAL PROCEDURE</td>
<td>SYMPTOM/FAILURE</td>
<td>MALFUNCTION PROCEDURE</td>
<td>REMARKS</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>4. INSERT ATM INSTRUCTION IN MDIU: ADDRESS 62 - INSERT IN ACCORDANCE WITH THE FOLLOWING FORMAT:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPW (TAPE POSITION WORD)</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>OPERATION CODE</th>
<th>01-PROGRAM</th>
<th>02-VERIFY</th>
<th>03-PROGRAM</th>
<th>TPW</th>
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<tbody>
<tr>
<td>PRE LN &amp; CONTROL PROGRAM</td>
<td>IA</td>
<td>1</td>
<td>004</td>
<td>037</td>
</tr>
<tr>
<td>CATCHUP, RENDEZVOUS, RELATIVE MOTION</td>
<td>IIIA</td>
<td>3</td>
<td>047</td>
<td>076</td>
</tr>
<tr>
<td>ORBIT PREDICTION (PRED NAV)</td>
<td>VIA</td>
<td>6</td>
<td>090</td>
<td>120</td>
</tr>
<tr>
<td>ORBIT NAVIGATION (NAV)</td>
<td>VIA</td>
<td>4</td>
<td>133</td>
<td>158</td>
</tr>
<tr>
<td>ORBIT DETERMINATION</td>
<td>IVA</td>
<td>5</td>
<td>176</td>
<td>206</td>
</tr>
<tr>
<td>TOUCHDOWN PREDICT, REENTRY</td>
<td>IVA</td>
<td>2</td>
<td>219</td>
<td>250</td>
</tr>
<tr>
<td>ASCENT, CATCHUP, RENDEZVOUS</td>
<td>VB</td>
<td>3</td>
<td>309</td>
<td>338</td>
</tr>
<tr>
<td>ASCENT, ASCENT/ABORT-REENTRY CATCHUP (NO RADAR INTERFACE)</td>
<td>IIB</td>
<td>6</td>
<td>352</td>
<td>382</td>
</tr>
<tr>
<td>REDUNDANT IA</td>
<td>IB</td>
<td>4</td>
<td>395</td>
<td>420</td>
</tr>
<tr>
<td>REDUNDANT IIIA</td>
<td>IIB</td>
<td>5</td>
<td>438</td>
<td>468</td>
</tr>
<tr>
<td>REDUNDANT VIA</td>
<td>IIIB</td>
<td>2</td>
<td>481</td>
<td>512</td>
</tr>
<tr>
<td>NORMAL PROCEDURE</td>
<td>SYMPTOM/FAILURE</td>
<td>MALFUNCTION PROCEDURE</td>
<td>REMARKS</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------</td>
<td>-----------------------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>5. ATM MODE - AUTO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. VERIFY COMP RUNNING LIGHT OFF</td>
<td>6.(a) COMP RUNNING LIGHT DOES NOT GO OUT.</td>
<td>6.(a)(1) COMPLETE THE FOLLOWING STEPS: ATM - STBY ATM PWR - OFF COMPUTER PWR-OFF RETURN TO STEP 1</td>
<td>6. COMP RUNNING LIGHT OFF INDICATES COMPUTER ENTRY INTO ATM READ PROGRAM.</td>
<td></td>
</tr>
<tr>
<td>7. VERIFY FORE-AFT AND RIGHT-LEFT IVI'S GO TO ZERO.</td>
<td>7.(a) IVI'S FAIL TO ZERO.</td>
<td>7.(a)(1) ZERO IVI'S MANUALLY.</td>
<td>7. IF THE IVI'S ARE NOT ZEROED WITHIN 20 SEC, COMPUTER TERMINATES ZEROING EFFORT &amp; PROCEEDS WITH THE PROGRAM.</td>
<td></td>
</tr>
</tbody>
</table>

**NORMAL PROCEDURE**

4. (a) UNABLE TO INSERT INSTRUCTION VIA MDIU.

| (1) MDIU OR COMPUTER FAILURE |

**SYMPTOM/Failure**

4. (a)(1) CLEAR AND RE-INSERT.

| (2) IF STILL UNABLE TO INSERT VIA MDIU GO TO MANUAL PROCEDURE |

**MALFUNCTION PROCEDURE**

4. (a) ALL ZEROS IN MDIU WINDOWS INDICATE A PROCEDURAL ERROR.

<p>| (b) IF A DELAY OF GREATER THAN 10 MIN OCCURS BETWEEN STEPS 4 &amp; 5 OF THE NORMAL PROCEDURE, RETURN TO STEP 4. |</p>
<table>
<thead>
<tr>
<th>NORMAL PROCEDURE</th>
<th>SYMPTOM/FAILURE</th>
<th>MALFUNCTION PROCEDURE</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c)</td>
<td>COMP RUNNING LT BLINKS AT 4 CPS.</td>
<td>(c)(1)</td>
<td>COMPLETE THE FOLLOWING STEPS: ATM - STBY ATM PWR - OFF COMPUTER PWR-OFF RETURN TO STEP 1.</td>
</tr>
<tr>
<td>(1)</td>
<td>ATM DID NOT POWER UP</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LOST POWER, OR THE ATM MODE SW MOVED OUT OF AUTO.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1) LAMP FAILURE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) ATM FAILURE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. VERIFY ATM RUNNING LIGHT ON.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.(a)</td>
<td>ATM RUNNING LT FAILS TO COME ON WITHIN 25 SEC OF SWITCHING TO AUTO.</td>
<td>8.(a)(1)</td>
<td>LAMP TEST IF LAMP IS DEFECTIVE, PROCEED TO STEP 9. IF GOOD, GO TO (2) BELOW.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8. ATM RUNNING LIGHT MAY GO OFF AND ON AS COMPUTER SEARCHES FOR CORRECT TAPE POSITION. RUNNING LT WILL REMAIN ON AFTER SEARCH IS COMPLETED.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8. ATM RUNNING LIGHT MAY GO OFF AND ON AS COMPUTER SEARCHES FOR CORRECT TAPE POSITION. RUNNING LT WILL REMAIN ON AFTER SEARCH IS COMPLETED.</td>
</tr>
<tr>
<td>NORMAL PROCEDURE</td>
<td>SYMPTOM/Failure</td>
<td>MALFUNCTION PROCEDURE</td>
<td>REMARKS</td>
</tr>
<tr>
<td>------------------</td>
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<td>---------</td>
</tr>
<tr>
<td>12. MONITOR THE COMP RUNNING LIGHT.</td>
<td>12.(a) COMP RUNNING LT FAILS TO GO OUT (FOR 16 SEC) OR THE IVI DISPLAY IS INCORRECT. &lt;br/&gt; (1) COMPUTER OR ATM FAILURE.</td>
<td>12.(a)(1) COMPLETE THE FOLLOWING STEPS: &lt;br/&gt; ATM MODE - STBY &lt;br/&gt; ATM PWR - OFF &lt;br/&gt; COMPUTER PWR-OFF &lt;br/&gt; RETURN TO STEP 1</td>
<td>12. FOR OPERATION CODE 01 02, OR AFTER THE VERIFICATION PORTION OF OPERATION CODE 03, THE COMP RUNNING LIGHT WILL GO OUT FOR 16 SEC AND THE RIGHT-LEFT IVI WILL DISPLAY THE LAST TPW. FOR OPERATION CODE 03, THE RIGHT-AFT IVI WILL ZERO. THE PROGRAM WILL REVERT TO STEP 7, EXCEPT THE FORE-AFT IVI WILL NOT ZERO.</td>
</tr>
</tbody>
</table>
### TABLE I
COMPUTER - ATM HARDWARE FAILURES AND REMEDIAL PROCEDURES

<table>
<thead>
<tr>
<th>Symptom/Failure</th>
<th>Malfunction Procedure</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (a) Verification of MDIU inserted instruction not received. or</td>
<td>1. Attempt desired operation using ATM manual mode.</td>
<td>1. An MDIU failure inhibits proper operation of the ATM automatic mode.</td>
</tr>
<tr>
<td>(b) Module selected from tape by computer not the desired module. or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) No module selected from tape by computer. or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) ATM read process not initiated after positioning ATM mode switch to AUTO.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e) MDIU is physically inoperable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) MDIU failure.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Computer Failure.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. (a) FWD-AFT IVI displays incorrect program ID while RIGHT-LEFT IVI displays correct TFW's</td>
<td>2. Continue operation while monitoring RIGHT-LEFT IVI and computer COMP light for proper indications.</td>
<td>2. If the computer COMP light comes on with the proper TFW displayed on the RIGHT-LEFT IVI, the desired module is being read from the tape.</td>
</tr>
<tr>
<td>(1) FWD-AFT IVI channel failure.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. (a) RIGHT-LEFT IVI displays incorrect TFW's while FWD-AFT IVI displays proper program ID.</td>
<td>3. Continue operation while monitoring FWD-AFT IVI and computer COMP light for proper operation.</td>
<td>3. If the computer COMP light comes on when the FWD-AFT IVI displays the correct program ID, the desired module is being read from the tape.</td>
</tr>
<tr>
<td>(1) RIGHT-LEFT IVI channel failure.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. (a) Both RIGHT-LEFT and FWD-AFT IVI's display incorrect data or IVI is totally inoperable.</td>
<td>4. Position tape at BQT by using ATM REWIND mode then perform ATM automatic mode to carry out desired operation while monitoring ATM RUN light and computer COMP light.</td>
<td>4. An IVI failure does not affect the ATM automatic mode operation, only the verification display. The following procedure can be used as an alternate verification of ATM.</td>
</tr>
<tr>
<td>Component</td>
<td>Action</td>
<td>Comments</td>
</tr>
<tr>
<td>-----------</td>
<td>--------</td>
<td>----------</td>
</tr>
<tr>
<td>Electrical Circuit Breakers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Modes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logic Choices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comm MAIF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The table is incomplete and the text is not legible. The information seems to be about the operation of electrical circuit breakers and related components, but the specific details are not clear due to the handwriting and missing lines.
operation: About 30 seconds after the tape comes off of BOT, the ATM RUN light will go OFF for 5 seconds and then ON. It will remain ON for about (TFW-10) seconds while the tape winds to the module to be loaded, where TFW is the value inserted via the MDIU. Thus the time duration will verify that the proper module has been positioned for the load. About one minute later, the COMP light will come ON. Both the ATM RUN and COMP lights will then go OFF after the module has been loaded. Since each module requires a specified time to load, the time duration the COMP light is ON is an additional indication that the desired module has been loaded properly. The time duration equals the last TFW-FIRST TFW of the module program time (8 sec/ft). If Module LA is to be loaded, the COMP light will come ON about 30 seconds after the tape comes off of BOT and will remain ON until the module is loaded. The ATM RUN light will be ON from the time the tape motion has started until the COMP light goes out.

5. (a) ATM RUN light does not come ON or go OFF at expected times.
      
5. Allow operation to continue while monitoring COMP light and IVI's for proper response.

5. Desired operation will be performed if COMP light and IVI's indicate expected responses.
<table>
<thead>
<tr>
<th></th>
<th>(1) ATM Run light failure.</th>
<th>(2) ATM failure.</th>
<th>6. Allow operation to continue while monitoring ATM RUN light and IVI's for proper response.</th>
<th>6. Desired operation will be performed if ATM RUN light and IVI's indicate expected responses.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6(a)</td>
<td>Computer COMP light does not come ON or go OFF at expected times.</td>
<td>(1) Computer COMP light failure.</td>
<td>(2) Computer failure.</td>
<td></td>
</tr>
<tr>
<td>NORMAL PROCEDURE</td>
<td>SYMPTOM/FAILURE</td>
<td>MALFUNCTION PROCEDURE</td>
<td>REMARKS</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>--------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>13. VERIFY ATM RUN LIGHT OFF.</td>
<td>13.(a) ATM RUN LIGHT FAILS TO GO OFF.</td>
<td>13.(a)(1) ATM MODE - STBY</td>
<td>13. ATM RUN LIGHT GOES OFF WHEN OPERATION IS COMPLETE.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1) ATM OR COMPUTER FAILURE.</td>
<td></td>
<td>(a) THE RELOAD PROGRAM HAS BEEN COMPLETED.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>THE INDICATED FAILURE WILL NOT AFFECT THE COMPLETED OPERATION.</td>
<td></td>
</tr>
<tr>
<td>14. VERIFY COMP RUNNING LIGHT COMES ON 16 SEC AFTER GOING OUT.</td>
<td>14.(a) COMP RUNNING LIGHT DOES NOT COME ON.</td>
<td>14.(a) ACCOMPLISH IGS POWER UP PROCEDURE.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. ATM - STBY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. ATM PWR - OFF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Normal Procedure

<table>
<thead>
<tr>
<th>Normal Procedure</th>
<th>Symptom/Failure</th>
<th>Malfunction Procedure</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>II. ATM Manual Operation</strong></td>
<td></td>
<td></td>
<td><strong>1. Manual Operation Procedure</strong> will only be used after a failure in Auto Mode.</td>
</tr>
<tr>
<td>1. Verify Switch Positions or Accomplish in Accordance with IGS Power Up Procedure.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC Power - IGS Computer - Pre LN Computer Pwr - On ATM Mode - STBY ATM Pwr - Off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Computer Pwr - Off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. ATM Pwr - On/Reset</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. ATM Mode - Rewind</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Verify ATM Run Light On.</td>
<td><strong>5.(a) ATM Run Light Fails to Come On</strong></td>
<td><strong>5.(a)(1) Switch To Wind For 10 Sec And Verify That Run Light Will Come On. Then Rewind To Bot (Run Lt Will Go Out At Bot).</strong></td>
<td><strong>5. ATM Run Light Will Go Off When Tape Reaches Bot.</strong> (a)(1) Normal ATM Operation.</td>
</tr>
<tr>
<td></td>
<td><strong>(1) ATM Tape At Beginning Of Tape (Bot).</strong></td>
<td></td>
<td><strong>(2) Lamp Test: If Lamp Is Defective Go To Rewind For 10 Min. If Good, Go To (3) Below.</strong></td>
</tr>
</tbody>
</table>
### Normal Procedure

<table>
<thead>
<tr>
<th>Module</th>
<th>Wind Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA</td>
<td>0</td>
</tr>
<tr>
<td>IIIA</td>
<td>39 sec</td>
</tr>
<tr>
<td>VIA</td>
<td>1 min 22 sec</td>
</tr>
<tr>
<td>IVA</td>
<td>2 min 05 sec</td>
</tr>
<tr>
<td>VA</td>
<td>2 min 48 sec</td>
</tr>
<tr>
<td>IIA</td>
<td>3 min 31 sec</td>
</tr>
<tr>
<td>IB</td>
<td>4 min 18 sec</td>
</tr>
<tr>
<td>IIB</td>
<td>5 min 01 sec</td>
</tr>
<tr>
<td>VIB</td>
<td>5 min 44 sec</td>
</tr>
<tr>
<td>IVB</td>
<td>6 min 27 sec</td>
</tr>
<tr>
<td>VB</td>
<td>7 min 10 sec</td>
</tr>
<tr>
<td>IIB</td>
<td>7 min 53 sec</td>
</tr>
</tbody>
</table>

6. **Determine Wind Time**

7. **Atm Mode - Wind**
   (Time Wind Operation)

8. **Atm Mode - Stby**
   (At End of Predetermined Wind Time)

9. **Verify Atm Run Light Off.**
   9.(a) **Atm Run Light Does Not Go Off.**

10. **Depress and Hold Start Comp & Turn Computer Pwr On.**

### Symptom/Failure

- (3) ATM Failure

### Malfunction Procedure

- (3) Go to Rewind for 10 min and then proceed to Step 6.

### Remarks

- 7. ATM Running Light WILL BE ON WHILE TAPE IS MOVING.
- 9.(a) ATM Pwr - Off
- 9.(a) ATM Pwr - On/Reset
- Verify That ATM Run Light Does Not Come On.
<table>
<thead>
<tr>
<th>NORMAL PROCEDURE</th>
<th>SYMPTOM/FAILURE</th>
<th>MALFUNCTION PROCEDURE</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. VERIFY FWD-AFT AND RIGHT-LEFT IVI'S GO TO ZERO.</td>
<td>11.(a) IVI'S FAIL TO ZERO.</td>
<td>11.(a)(1) ZERO IVI'S MANUALLY.</td>
<td>11. EACH IVI MUST INITIALLY BE AT ZERO BEFORE ANY ATM ASSOCIATED DISPLAY WILL BE MADE.</td>
</tr>
<tr>
<td>12. ATM MODE - PROG.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. VERIFY ATM RUN LIGHT ON.</td>
<td>13.(a) ATM RUN LIGHT DOES NOT COME ON.</td>
<td>13.(a)(1) LAMP TEST: IF LAMP IS DEFECTIVE PROCEED TO STEP 14. IF GOOD, GO TO (2) BELOW.</td>
<td></td>
</tr>
<tr>
<td>14. VERIFY THE RIGHT-LEFT IVI DISPLAYS CORRECT TPW'S.</td>
<td>14.(a) WRONG TPW'S DISPLAYED.</td>
<td>14.(a)(1) RETURN TO STEP 2</td>
<td>14. TPW'S MUST BE WITHIN TPW'S OF MODULE FOR PROGRAM PRECEDING THE DESIRED MODULE.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) ATM FAILURE</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) STEP 7 OR 8 NOT SATISFACTORY PERFORMED.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3) IVI FAILURE</td>
<td></td>
</tr>
<tr>
<td>15. VERIFY COMP RUNNING LIGHT ON.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) RETURN TO STEP 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3) PROCEED TO STEP 15 FOR VERIFICATION OF PROPER SYSTEM OPERATION</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3) IVI FAILURE</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3) PROCEED TO STEP 15 FOR VERIFICATION OF PROPER SYSTEM OPERATION</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3) IVI FAILURE</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3) PROCEED TO STEP 15 FOR VERIFICATION OF PROPER SYSTEM OPERATION</td>
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<tr>
<td></td>
<td></td>
<td>(3) PROCEED TO STEP 15 FOR VERIFICATION OF PROPER SYSTEM OPERATION</td>
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<tr>
<td></td>
<td></td>
<td>(3) PROCEED TO STEP 15 FOR VERIFICATION OF PROPER SYSTEM OPERATION</td>
<td></td>
</tr>
<tr>
<td>NORMAL PROCEDURE</td>
<td>SYMPTOM/FAILURE</td>
<td>MALFUNCTION PROCEDURE</td>
<td>REMARKS</td>
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<tr>
<td>------------------</td>
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</tr>
<tr>
<td>15. CONT.</td>
<td>(a) COMP RUNNING LT DOES NOT COME ON (1) LAMP FAILURE (2) COMPUTER FAILS TO RECOGNIZE ID NUMBER.</td>
<td>(a)(1) LAMP TEST: IF LAMP IS DEFECTIVE, THE IVI'S MUST BE USED TO MONITOR CORRECT SYSTEM OPERATION. PROCEED TO STEP 16. IF LAMP IS GOOD, PROCEED TO STEP (2) BELOW. (2) RETURN TO STEP 2</td>
<td></td>
</tr>
<tr>
<td>16. VERIFY THAT FWD-AFT IVI DISPLAYS THE CORRECT PROGRAM ID NUMBER.</td>
<td>16.(a) WRONG PROGRAM ID NUMBER DISPLAYED 16.(a)(1) PROCEED TO STEP 17.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. VERIFY THAT THE COMP RUNNING LIGHT GOES OFF WHEN THE LAST TPW OF DESIRED MODULE IS DISPLAYED ON THE IVI.</td>
<td>17.(a) COMP RUNNING LT FAILS TO GO OUT OR THE IVI DISPLAY IS INCORRECT (1) COMPUTER OR ATM FAILURE</td>
<td>17.(a)(1) RETURN TO STEP 217. THE RIGHT-LEFT IVI WILL CONTINUE TO INCREMENT UNTIL STEP 18 IS PERFORMED.</td>
<td></td>
</tr>
<tr>
<td>18. ATM MODE - STBY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. VERIFY COMP RUNNING LT COMES BACK ON IN 16 SEC.</td>
<td>19.(a) COMP RUNNING LT DOES NOT COME ON</td>
<td>19.(a) ACCOMPLISH IGS POWER UP PROCEDURE.</td>
<td></td>
</tr>
<tr>
<td>20. ATM PWR - OFF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADDRESS</td>
<td>SYMBOL</td>
<td>PARAMETER</td>
<td>DCS</td>
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<tr>
<td>---------</td>
<td>--------</td>
<td>-----------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>00</td>
<td>T&lt;sub&gt;x&lt;/sub&gt;</td>
<td>CLEAR MDIU DISPLAY</td>
<td>NO</td>
</tr>
<tr>
<td>01</td>
<td>T&lt;sub&gt;r&lt;/sub&gt;</td>
<td>TIME TO RESET</td>
<td>NO</td>
</tr>
<tr>
<td>02</td>
<td>T&lt;sub&gt;r&lt;/sub&gt;</td>
<td>TIME-TO-GO-TO RETROFIRE</td>
<td>NO</td>
</tr>
<tr>
<td>03</td>
<td>X&lt;sub&gt;ER&lt;/sub&gt;</td>
<td>SEE NOTE 1</td>
<td>YES</td>
</tr>
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1. **VALUES OF TR LESS THAN 128 SECONDS CAN NOT BE INSERTED.**

2. **MDIU FORMAT OF RELATIVE COMPONENTS USED WITH ADDRESSES 13-18 AND 73-78 ARE XXXX.X NAUTICAL MILES AND XXXX.X FT/SEC.**

3. **MDIU READ ONLY (NO DCS) FOR ASC, REL MOT, AND RNDZ MODES.**

4. **SEXTANT INPUT ANGLE MAY BE INSERTED AND DISPLAYED PRIOR TO SECOND DEPRESSION OF START COMP DURING A MEASUREMENT. ANGLE RESIDUAL MAY BE READ FOLLOWING SECOND DEPRESSION OF START COMP BUTTON.**

5. **ADDRESS 99 MULTIPLEXED LOGIC CHOICES;**

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<td>- onboard generated IC's</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+* Spacecraft IC's</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 relative or both (inserted)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- target vehicle IC's or displayed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCM5</td>
<td>+ Normal T.D. Pred IC's</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0* Relative Initial IC's</td>
<td></td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>- Desired relative state vector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCM6</td>
<td>+* Star-Horizon measurement</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 Star-Local Vertical</td>
<td></td>
<td>VI</td>
</tr>
<tr>
<td></td>
<td>- Star-Horizon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCM7</td>
<td>+* New Time Base (org pred)</td>
<td></td>
<td>VI</td>
</tr>
<tr>
<td></td>
<td>0 New Time Base (org pred)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Old Time Base</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCM8</td>
<td>+* Restart a Measurement Set</td>
<td></td>
<td>VI</td>
</tr>
<tr>
<td></td>
<td>0 Restart a Measurement Set</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Continue present measurement set</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Set nominally in mode initialisation. MDIU format 99 X X X X X

6. The selected combination of orbit, retro-time, retro-grade, and L/D ratio must be such that the total peak acceleration does not exceed 256 FT/SEC^2 during simulated reentry.
### 7. Certain Addresses are Used Only for Qualitative Data, Recognized by the Computer As Either +, -, or 0. Respective MDIU Inserts for These Conditions are 11111, -99999 or 00000. Effects of Each Input are as follows:

<table>
<thead>
<tr>
<th>Address</th>
<th>11111 Allows</th>
<th>-9999 Allows</th>
<th>00000 Allows</th>
</tr>
</thead>
<tbody>
<tr>
<td>55 LCA</td>
<td>VELOCITY UPDATES ON X CHANNEL ONLY.</td>
<td>VELOCITY UPDATES ON X CHANNEL ONLY.</td>
<td>SEQUENTIAL UPDATES ON X, Y, Z CHANNELS</td>
</tr>
<tr>
<td>55 LCFT1</td>
<td>USE OF AFT FIRING THRUSTERS.</td>
<td>USE OF FORWARD FIRING THRUSTERS.</td>
<td>USE OF AFT FIRING THRUSTERS.</td>
</tr>
<tr>
<td>88 A/R</td>
<td>ACCEPTANCE OF PRESENT DATA.</td>
<td>REJECTION OF PRESENT DATA.</td>
<td>STANDBY UNTIL 11111 OR -9999 IS SELECTED.</td>
</tr>
<tr>
<td>91 LCS</td>
<td>NORMAL PROGRAM, NO TEST.</td>
<td>SELF TEST.</td>
<td>IN ASC OR RE-ENT, TEST WITH INSERTABLE INITIAL CONDITIONS, IN RNDZ, NOT USED.</td>
</tr>
<tr>
<td>92 RLO</td>
<td>&quot;REJECTION OF RADAR DATA&quot;</td>
<td>REJECTION OF RADAR ANGLE NORMAL PROGRAM.</td>
<td></td>
</tr>
<tr>
<td>132 LC31</td>
<td>FLIGHT SIMULATION.</td>
<td>ACCEPTANCE TEST.</td>
<td>NOT USED.</td>
</tr>
</tbody>
</table>

### 8. The Parameter Transmitted in the Multiplexed MDIU/DCS Parameters in the Prelaunch DAS Transmission for this Address (and All Other Addresses That Have Two or More Terms Associated with It) Will be the Parameter Currently Defined by the Module in Memory. The Spacecraft State Vector Will Be Transmitted in Addresses 13-18 and 73-78. Syllable Two Check Sum Error Flags and Go-No-Go Error Flags Will Be Transmitted on Addresses 60 and 61 Respectively. A Binary Representation of the ATM Auto Read Command Will Be Transmitted on Address 62.

### 9. Modules Listed are Those Where MDIU Capability Can be Used.
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<td>5-6. LEFT &amp; RIGHT MIKE AMPLIFIER FAILURE OR VOX FAILURE</td>
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</tr>
<tr>
<td></td>
<td>(53) CONTINGENCY MANEUVER UPDATE</td>
<td>61</td>
</tr>
</tbody>
</table>
COMMUNICATIONS MALFUNCTION PROCEDURES

1. UHF T/R FAILURE (NO. 1)
   1. AUDIO & UHF T/R 1 AND 2 C/B'S - VERIFY CLOSED
   2. UHF RELAY C/B - VERIFY CLOSED
   3. UHF T/R SW - VERIFY NO. 2
   4. CHECK OPERATION
   5. IF FAILURE NOT CORRECTED: ANT SEL - RNTY

2a. UHF QUADREPLEXER WHIP ANTENNA FAILURE DURING DOCKING OPERATION
   1. UHF T/R SW - OFF
   2. LANDING SW - VERIFY SAFE
   3. HF ANT SW - EXT/OFF
   4. HF SELECT SW - RNTY
   5. T/M CONTROL T/M SW - R/T - D/T
   6. R/T XMT R C/B - OPEN
   7. AUDIO MODE SELECTOR SW - HF CHECK OPERATION. USE HF FOR VOICE COMMUNICATION.
   8. IF THIS DOES NOT CORRECT THE FAILURE, USE UHF.

3. HF ADAPTER ANTENNA OR T/R FAILURE (ORBIT)
   1. HF T/R REENTRY C/B - CLOSED
   2. HF WHIP ANTENNA C/B - CLOSED
   3. LANDING SW - SAFE
   4. HF ANT SW - EXT/OFF
   5. HF T/R SW - RNTY
   6. CHECK OPERATION
   7. IF THIS DOES NOT CORRECT THE FAILURE, USE UHF. USE OF REENTRY HF ANTENNA NOT RECOMMENDED FOR ORBIT PHASE.

4. HF TRANSMISSION AND RECEIPTION FAILURE (AFTER LANDING)
   1. HF T/R REENTRY C/B - CLOSED
   2. HF WHIP ANTENNA C/B - CLOSED
   3. LANDING SW - ARM HF ANT SW - EXT/OFF
   4. VERIFY MAIN BATT SW - ON
   5. VERIFY SQUIB BATT NO. 3 SW - ON
   6. CHECK OPERATION
   7. IF THIS DOES NOT CORRECT THE FAILURE, USE UHF.
5, 6. LEFT AND RIGHT MIKE AMPLIFIER FAILURE OR VOX FAILURE
(ONE ASTRO CANNOT KEY XMITTER WHILE IN VOX)

1. TONE VOX C/B - VERIFY CLOSED
2. AUDIO & UHF NO. 1 & 2 C/B'S - VERIFY CLOSED
3. ATTEMPT TO TRANSMIT
   IF THERE IS NO AUDIO,
4. KEYING SW - PTT
   A. IF PTT CORRECTS FAILURE, VOX HAS FAILED. LEAVE
      TONE VOX C/B CLOSED FOR OTHER FUNCTIONS.
   B. IF PTT DOES NOT CORRECT FAILURE, ASTRO MUST USE
      LIGHTWEIGHT HEADSET FOR COMMUNICATIONS.

9. PTT FAILURE (CLOSED) (HF OR UHF KEYS CONTINUOUSLY)

1. NO. 1 AND NO. 2 AUDIO MODE SW - INT (THIS DISABLES
   CONTINUOUSLY KEYING THE TRANSMITTERS. HOWEVER,
   INTERCOM WILL BE CONTINUOUSLY KEYED DUE TO THE FAIL-
   URE).
2. RECEPTION IS ENABLED VIA THE UHF OR HF SELECT SW'S.
   TO TRANSMIT, SELECT UHF OR HF ON THE AUDIO MODE SW
   (TRANSMITTER KEYING IS EFFECTIVELY CONTROLLED BY
   THE AUDIO MODE SW'S. SELECTION OF VOX ON THE KEYING
   SW WILL NOT REMEDY FAILURE).

10, 11. FAILURE OF CMD OR CONT CAPABILITY OF ADAPTER C-BAND
        BEACON

1. C BEACONS C/B - VERIFY CLOSED
2. DCS PWR C/B - VERIFY CLOSED
3. C-ADPT BEACON CONTROL SW - ALTERNATE POSITION
4. USE RNTY C-BAND BEACON IF C-ADAPT BEACON FAILED

12, 13. FAILURE OF CMD OR CONT CAPABILITY OF REENTRY C-BAND
        BEACON

1. C BEACONS C/B - VERIFY CLOSED
2. DCS PWR C/B - VERIFY CLOSED
3. DIPLEX WHIP ANTENNAS C/B - CLOSED (NEEDED FOR DCS CMD)
4. C-RNTY BEACON CONTROL SW - ALTERNATE POSITION
5. USE ADAPTER C-BAND BEACON IF C-RNTY BEACON FAILED.

14. DCS FAILURE (NO DCS LT WHEN UPDATE RECEIVED)

1. DCS PWR C/B - VERIFY CLOSED
2. UPDATE TR AND COMPUTER USING MDU (GROUND FURNISHES
   UPDATE INFORMATION VIA UHF).
3. R/T & D/T TM, C-BAND BEACONS, & INSTRUMENTATION CALIBRATION WILL HAVE TO BE CONTROLLED MANUALLY BY THE CREW.

NOTE: WHEN MANUALLY CONTROLLING D/T TM, CREW WILL NOT POSITION THE TAPE PLYBK SW TO CONT UNTIL GROUND INDICATES NORMAL D/T TM CARRIER IS BEING RECEIVED.

15. DCS RELAY NO. 1 FAILURE (CANNOT COMMAND R/T TM ON VIA STBY XMITTER)

1. VERIFY THE FOLLOWING:
   - STBY XMTR PWR C/B - CLOSED
   - STBY XMTR CNTL C/B - CLOSED

   IF GROUND INDICATES MALFUNCTION IS NOT CORRECTED, THEN FOR EACH DESIRED TRANSMISSION.

2. AT AOS, TM CONTROL STBY TM SW - R/T
3. AT LOS, TM CONTROL STBY TM SW - OFF

16. DCS RELAY NO. 2 FAILURE (CANNOT COMMAND D/T TM ON VIA STBY XMITTER)

1. VERIFY THE FOLLOWING:
   - STBY XMTR PWR C/B - CLOSED
   - STBY XMTR CNTL C/B - CLOSED
   - TAPE RCDR CNTL C/B - CLOSED
   - TAPE RCDR PWR C/B - CLOSED

   IF GROUND INDICATES MALFUNCTION IS NOT CORRECTED, THEN FOR EACH DESIRED TM DUMP.

2. TM CONTROL STBY TM SW - D/T
3. UPON D/T TM CARRIER RECEPTION, GROUND COMMANDS TAPE PLYBK ON VIA DCS CHANNEL 5.
4. AS DIRECTED BY GROUND, OR AT LOS:
   - TM CONTROL STBY TM SW - OFF

17. DCS RELAY NO. 3 FAILURE (CANNOT COMMAND R/T TM ON VIA R/T XMITTER)

1. VERIFY:
   - R/T XMTR C/B - CLOSED
   - STBY XMTR PWR C/B - CLOSED
   - STBY XMTR CNTL C/B - CLOSED
   - TM CONTROL STBY TM SW - OFF

   IF MALFUNCTION IS NOT CORRECTED,

2. GROUND COMMANDS R/T TM ON VIA THE STANDBY TRANSMITTER.
18. DCS RELAY NO. 4 FAILURE (CANNOT COMMAND D/T TM ON VIA D/T XMITTER)
   1. VERIFY THE FOLLOWING:
      D/T XMT C/B - CLOSED
      STBY XMT PWR C/B - CLOSED
      STBY XMT CNTL C/B - CLOSED

      IF MALFUNCTION IS NOT CORRECTED, GROUND CMDs D/T TM ON VIA THE STANDBY XMITTER (DCS RELAY NO. 2).
      (GROUND SENDS DCS CHANNEL 5 AFTER D/T TM CARRIER RECEPTION VIA CHANNEL 2)

19. DCS RELAY NO. 5 FAILURE (CANNOT COMMAND TAPE PLBK)
   1. VERIFY THE FOLLOWING:
      TAPE RCDR PWR C/B - CLOSED
      TAPE RCDR CNTL C/B - CLOSED

      IF MALFUNCTION IS NOT CORRECTED, ACCOMPLISH STEPS 2 & 3 WHEN DIRECTED BY GROUND.
   2. TAPE PLYBK SW - CONT
   3. TAPE PLYBK SW - CMD

20. DCS RELAY NO. 6 FAILURE (CANNOT COMMAND C-ADAPT ON)
   1. VERIFY:
      C BEACONS C/B - CLOSED & DIPLEX WHP ANT C/B - CLOSED

      IF MALFUNCTION IS NOT CORRECTED, ACCOMPLISH STEPS 2 & 3 WHEN DIRECTED BY GROUND.
   2. C-ADPT BEACON CONTROL SW - CONT
   3. C-ADPT BEACON CONTROL SW - CMD

21. DCS RELAY NO. 7 FAILURE (CANNOT COMMAND C-RNTY ON)
   1. VERIFY C BEACONS C/B - CLOSED AS DIRECTED BY GROUND:
   2. C-RNTY BEACON CONTROL SW - CONT
   3. C-RNTY BEACON CONTROL SW - CMD

22. DCS RELAY NO. 9 FAILURE (CANNOT COMMAND INSTRUMENTATION CALIBRATION)
   1. VERIFY CALIB C/B - CLOSED

      IF MALFUNCTION IS NOT CORRECTED, ACCOMPLISH STEPS 2 & 3 WHEN DIRECTED BY GROUND.
   2. TM CONTROL CALIB SW - NO. 1
   3. TM CONTROL CALIB SW - OFF
23. **DCS RESET CAPABILITY FAILURE (CANNOT COMMAND EQUIPMENT OFF)**

1. TAPE PLYBK SW - RESET (RESETS ALL DCS RELAYS EXCEPT INST CALIB & ABORT LIGHT).
2. IF CALIBRATION WAS COMMANDED ON CALIB C/B - OPEN
3. TAPE PLYBK SWITCH - CMD
4. CALIB C/B WHEN DIRECTED BY GROUND - CLOSED (WHEN AGAIN NEEDED).

ALL RELAYS EXCEPT ABORT CAN BE RESET BY A RESET COMMAND (TX) FROM THE TRS.

24. **A SINGLE DCS RELAY FAILED IN ENERGIZED POSITION (CANNOT BE RESET BY DCS OR MANUALLY)**

1. TURN OFF AFFECTED EQUIPMENT BY OPENING ASSOCIATED C/B (OPEN ONLY THE ONE C/B THAT RELATED TO THE AFFECTED DCS RELAY FAILURE).

<table>
<thead>
<tr>
<th>FAILED RELAY</th>
<th>CONTROLLING C/B</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. R/T TM VIA STBY XMITTER</td>
<td>a. STBY XMTR CNTL - OPEN</td>
</tr>
<tr>
<td>b. D/T TM VIA STBY XMITTER</td>
<td>b. STBY XMTR CNTL - OPEN</td>
</tr>
<tr>
<td>c. R/T TM VIA R/T XMITTER</td>
<td>c. R/T XMTR C/B - OPEN</td>
</tr>
<tr>
<td>d. D/T TM VIA D/T XMITTER</td>
<td>d. D/T XMTR C/B - OPEN</td>
</tr>
<tr>
<td>e. TAPE PLAYBACK</td>
<td>e. TAPE RCDR CNTL C/B - OPEN</td>
</tr>
<tr>
<td>f. ADAPTER C-BAND</td>
<td>f. C BEACON C/B - OPEN</td>
</tr>
<tr>
<td>g. REENTRY C-BAND</td>
<td>g. DIPLEX WHIP ANT C/B - OPEN</td>
</tr>
<tr>
<td>h. INSTRUMENTATION CALIBRATION</td>
<td>h. CALIB C/B</td>
</tr>
<tr>
<td>i. ABORT LIGHT</td>
<td>i. DO NOT ATTEMPT TO CORRECT (PWR IS THRU DCS PWR C/B)</td>
</tr>
</tbody>
</table>

2. AFFECTED C/B MUST BE CLOSED WHEN EQUIPMENT IS NEEDED AGAIN.
LOSS OF ONE WAY VOICE COMMUNICATION

For loss of communication from Spacecraft to ground the crew will use the Quantity Read Switch to indicate yes and no. Place the Quantity Read Switch to \( O_2 \) and Off one time will mean Yes. Cycling to \( O_2/\text{Off} \) twice will mean No.

For loss of communication from ground to Spacecraft the Abort Light will be used to indicate yes and no. Abort Light On then Off will mean Yes. Abort Light cycled On/Off twice will mean No. After contact has been established in this method, the following procedure will be used to accomplish maneuver updates.

2. Ground Transmit Maneuver Load (MDU address 25, 26, 27) - crew reset DCS Light.
3. Ground Transmit Rendezvous Load (MDU address 53, 54, 24) - crew reset DCS Light.
4. Read Out Address 54 - copy truncated GETB (truncated GETB - time with ten digit of hour character omitted; i.e., GETB 14:20:10 would readout of address 54 as 4:20:10.
5. Reinsert nominal or updated \( R_f \) via MDU address 54.
6. Perform maneuver at appropriate time.
7. Subsequent maneuvers will be initiated by same procedure. DCS Light On will be cause for crew to query ground.
LOSS OF ALL VOICE COMMUNICATION

This procedure will be used to update $T_R$ and transmit Pre Retro load for next GO/NO GO PLA.

1. Illumination of DCS light - Reset.

2. Second illumination of DCS Light shortly after first - Reset.

   This indicates $T_R$ has been transmitted.

3. Abort Light On for 5 seconds - $T_R$ is valid.

   If $T_R$ cannot be loaded, the abort light will not be transmitted. A truncated $T_R$ will be sent to Address 54.

4. Load Module IV into computer. (IF $T_R$ VALID)

5. Next ground command site transmit TX reset DCS Light.

6. Module IV loaded and verified - cycle Quantity Read Switch to $O_2$ three times.

7. Ground transmit Pre Retro load (MDU address 03 through 12) and verify.

8. Valid Pre Retro load transmitted will be followed by Abort Light On for five seconds.

   If ground cannot verify Pre Retro load, Abort will be transmitted twice (Abort Light On for five seconds each time).

   The crew will then fly open loop reentry. A new $T_R$, for open loop reentry, will be entered using the procedure of 3 above.
CONTINGENCY MANEUVER UPDATE

If air-to-ground communications with the Gemini spacecraft are lost, the following procedure will be used to accomplish maneuver updates:

1. The Guidance Office will load the appropriate DCS site with a maneuver load (DCS cores 139-141) and a rendezvous load (DCS cores 143-145). The remote site CAPCOM will GREEN CLEAR cores 143 and 145. Core 144 ($RT$) actually contains a Truncated GETB. The flight crew, after receiving the two loads, will readout MDIU address 54 to get the GETB and perform the maneuver at the appropriate time.

2. The command site following the burn will reinsert the correct value of $RT$ in the S/C computer via the DCS.

NOTE

A truncated GETB means that the ten's of hours character will not be present; i.e., GETB of 14:20:10 would be uplinked to the $RT$ core as 4:20:10.

This procedure will not be used unless at least one command site is available after the maneuver update to reinsert the correct $RT$ prior to terminal phase initiate.
TRANSMITTER MALFUNCTION PROCEEDURES

1. If TXR INTR (C) - verify closed...
2. TXR CONNECTIONS OK, BUT NO TXR COM.
3. TXR DOES NOT CONNECT TO TXR FUNCTION. CHECK TXR CONNECTIONS TO TXR FUNCTION.
4. TXR CONTACTS TO TXR FUNCTION OK.
5. TXR CONTACTS TO TXR FUNCTION OK.
6. TXR CONTACTS TO TXR FUNCTION OK.
7. TXR CONTACTS TO TXR FUNCTION OK.

TRANSMITTER MALFUNCTION PROCEEDURES

1. If TXR INTR (C) - verify closed...
2. TXR CONNECTIONS OK, BUT NO TXR COM.
3. TXR DOES NOT CONNECT TO TXR FUNCTION. CHECK TXR CONNECTIONS TO TXR FUNCTION.
4. TXR CONTACTS TO TXR FUNCTION OK.
5. TXR CONTACTS TO TXR FUNCTION OK.
6. TXR CONTACTS TO TXR FUNCTION OK.
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TRANSMITTER MALFUNCTION PROCEEDURES

1. If TXR INTR (C) - verify closed...
2. TXR CONNECTIONS OK, BUT NO TXR COM.
3. TXR DOES NOT CONNECT TO TXR FUNCTION. CHECK TXR CONNECTIONS TO TXR FUNCTION.
4. TXR CONTACTS TO TXR FUNCTION OK.
5. TXR CONTACTS TO TXR FUNCTION OK.
6. TXR CONTACTS TO TXR FUNCTION OK.
7. TXR CONTACTS TO TXR FUNCTION OK.

TRANSMITTER MALFUNCTION PROCEEDURES

1. If TXR INTR (C) - verify closed...
2. TXR CONNECTIONS OK, BUT NO TXR COM.
3. TXR DOES NOT CONNECT TO TXR FUNCTION. CHECK TXR CONNECTIONS TO TXR FUNCTION.
4. TXR CONTACTS TO TXR FUNCTION OK.
5. TXR CONTACTS TO TXR FUNCTION OK.
6. TXR CONTACTS TO TXR FUNCTION OK.
7. TXR CONTACTS TO TXR FUNCTION OK.
INSTRUMENTATION MALFUNCTION PROCEDURES

2. R/T TM FAILURE
   1. R/T XMTR C/B - VERIFY CLOSED
   2. TM CONTROL TM SW - RT & ACQ (IF IN CMD)
   3. IF THIS DOES NOT CORRECT MALFUNCTION, STBY TM
      CONTROL SW - R/T (GROUND SENDS CHANNEL 1).
   4. T/M CONTROL TM SW - CMD
   5. AS DIRECTED BY GROUND ONLY
      STBY TM CONTROL SW - R/T

4. DC-DC CONVERTER FAILURE
   1. DC-DC CONV C/B - VERIFY CLOSED
   2. DC-DC CONV SW - SEC

5. R/T TM TRANSMITTER FAILURE
   ABSENCE OF R/T TM BUT PRESENCE OF ACQ INDICATES
   TRANSMITTER FAILURE.
   1. R/T XMTR C/B - VERIFY CLOSED
   2. T/M CONTROL TM SW - CMD
   GROUND COMMANDS R/T XMTR ON VIA CHANNEL 3 OF DCS.
   NO R/T TURN ON WHEN COMMANDED BY GROUND INDICATES
   TRANSMITTER FAILURE.
   IF FAILURE IS NOT CORRECTED:
   3. T/M CONTROL STBY T/M SW - R/T

6. SWITCH MALFUNCTION IN RT & ACQ POSITION
   1. R/T XMTR C/B - VERIFY CLOSED
   2. T/M CONTROL TM SW TO CMD. GROUND COMMANDS R/T
      XMTR ON VIA CHANNEL 3 OF DCS OR:
   3. T/M CONTROL STBY T/M SWITCH - R/T

7, 8. D/T TM TRANSMITTER FAILURE OR SWITCH MALFUNCTION IN
   R/T - D/T POSITION
   1. D/T XMTR C/B - VERIFY CLOSED
   2. TAPE RCDR CNTL C/B - VERIFY CLOSED
   3. T/M CONTROL TM SW - CMD
   GROUND COMMANDS D/T XMTR ON VIA CHANNEL 4 OF DCS.
   NO D/T TURN ON WHEN COMMANDED BY GROUND INDICATES
   TRANSMITTER FAILURE. IN THIS EVENT, GROUND COM-
   MANDS ON D/T TM VIA STBY TRANSMITTER.

9. TAPE RECORDER FAILURE
   1. TAPE RCDR PWR AND CNTL C/B'S - VERIFY CLOSED
   2. IF TAPE RECORDER FAILS WITH TAPE PLYBK SW IN CMD,
      USE CONT POSITION OVER GROUND STATIONS AND VICE
      VERSA. TAPE PLYBK COMMAND VIA DCS CHANNEL 5.
<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>FAILURE</th>
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<td>RED MAIN LIGHT - ON:</td>
<td>1. FUEL PRESSURE 3 + 2 PSI OVER OXIDIZER PRESSURE.</td>
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<td>NOT DURING PPS BURN</td>
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<tr>
<td>DURING PPS BURN</td>
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<td>3. FUEL TANK PRESS LO--OXIDIZER TANK PRESS LO--RESIDUAL HYDRAULIC PRESS</td>
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<td>RIGID (AMBER LIGHT) - OFF AFTER RIGIDIZE COMMAND</td>
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<td>ARMED LIGHT WILL NOT COME ON WITH ENGINE SW. (Docked)</td>
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<td>POWER (GREEN LIGHT) - OFF</td>
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<td>ALL AGENA STATUS DISPLAY LIGHTS OFF</td>
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<td>SEC HI AND SEC LO LIGHT - OFF</td>
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<td>(FOR OTHER THAN NORMAL OPERATION)</td>
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<td>5. MOTOR DRIVEN ACTUATORS IN THE DOCKING CONE HAVE NOT DRIVEN TO THEIR LIMITS.</td>
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<td>6. TDA DID NOT COMPLETELY RIGIDIZE.</td>
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<td>7. SWITCH OR CIRCUIT FAILURE.</td>
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<td>8. LOSS OF ANY OF THE FOLLOWING: +28 V-DC REGULATED; -28 V-DC REGULATED; 115V, 400 CPS SINGLE PHASE; 115V, 400 CPS, THREE PHASE; 28V UNREGULATED.</td>
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<td>9. COMPLETE LOSS OF AGENA ELECTRICAL POWER.</td>
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<td>10. MAIN OR SEC CLOCK FAILURE.</td>
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<td>16. AGENA 16# THRUSTERS ARE NO GO (63)</td>
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</table>
1. NOT DURING PPS BURN FUEL PRESSURE 3 + 2 PSI OVER OXIDIZER PRESSURE. (RED MAIN LIGHT - ON)
   1. OAMS CNTL PWR SW - ON.
   2. MANEUVER CONTROLLER - UNSTOW
   3. MANEUVER CONTROLLER - ON
   4. SEND CMD 071 (L BAND BEACON ON).
   5. TDA CONTROL SW - UNDOCK.
   6. SEPARATE TO 1500 FT.
      (RDR-STBY ASAP)
   7. CONTACT GROUND.

DURING PPS BURN, FUEL PRESSURE 3 + 2 PSI OVER OXIDIZER PRESSURE---HIGH PRESSURE HYDRAULIC SYSTEM DROPS BELOW 1500 PSI OR DOES NOT BUILD UP---TURBINE SPEED ABOVE 27,000 RPM(RED MAIN LIGHT-ON)

1. ENGINE SW - STOP
2. SEND CMD 500 (PPS CUTOFF)
   IF RED MAIN LIGHT GOES OUT CONTACT GROUND.
   IF RED MAIN DOES NOT GO OUT, CONTINUE PROCEDURE.
3. OAMS CNTL PWR SW - ON
4. MANEUVER CONTROLLER - UNSTOW
5. MANEUVER CONTROLLER - ON
6. SEND CMD 071 (L BAND BEACON ON)
7. TDA CONTROL SW - UNDOCK
8. SEPARATE TO 1500 FT. (RDR-STBY ASAP)
9. CONTACT GROUND.

2. DURING EVA, FUEL PRESSURE 3 + 2 PSI OVER OXIDIZER PRESSURE (RED MAIN LIGHT - ON)
   1. EVA PILOT REENTER S/C. (UMBILICAL IN S/C) DO NOT CLOSE HATCHES.
   2. UNDOCK USING PROCEDURE 1.1 FOR RED MAIN LIGHT ON.

3. FUEL TANK PRESS LO---OXIDIZER TANK PRESS LO---RESIDUAL HYDRAULIC PRESS LO(GREEN MAIN LIGHT - OUT)
   1. ENGINE SW - STOP (REQUIRED IF DURING BURN)
   2. OAMS CNTL PWR SW - ON
   3. RADAR SW - STBY
   4. SEND CMD 071 (L BAND BEACON ON)
   5. SEND CMD 231 (UHF ENABLE)
   6. MANEUVER CONTROLLER - UNSTOW
   7. MANEUVER CONTROLLER - ON
   8. EXT LTS - DOCK
   9. TDA CONTROL SW - UNDOCK
   10. SEPARATE TO 50 FT.
   11. STATION KEEP AND CONTACT GROUND.
4. **FAILURE TO SAFE AGENA BEFORE DOCKING.**
   (ARMED LIGHT - ON)
   1. TRANSMIT SAFE/ARREST CMD (CMD 130/131)
   2. IF TROUBLE NOT CORRECTED CONTACT GROUND.

5. **MOTOR DRIVEN ACTUATORS IN THE DOCKING CONE HAVE NOT DRIVEN TO THEIR LIMITS.**
   (DOCK [GREEN LIGHT] OFF. [PRIOR TO DOCKING]).
   1. DO NOT DOCK.
   2. CYCLE RIGIDIZE/UNRIGIDIZE CMDS. (CMD 221/220)
   3. VISUALLY INSPECT LATCHES, DOCK IF LIGHT ILLUMINATES OR IF LATCHES APPEAR TO BE NORMAL AND DOCKING CONE IS UNRIGIDIZED.

6. **TDA DID NOT COMPLETELY RIGIDIZE.**
   (RIGID [AMBER LIGHT] - OFF [AFTER RIGIDIZE COMMAND]).
   1. TDA CONTROL SW - STOP UNLESS DOCK LIGHT HAS RE-ILLUMINATED.
   2. CONTACT GROUND.

7. **SWITCH OR CIRCUIT FAILURE.**
   (ARMED LIGHT WILL NOT COME ON WITH ENGINE SW. [DOCKED]).
   1. ENGINE SW - STOP
   2. VERIFY AGENA CONTROL CNTL C/B - CLOSED
   3. ENGINE SW - ARM
      IF ARMED LIGHT DOES NOT COME ON PROCEED TO STEP 4.
   4. ENGINE SW - STOP
   5. SEND CMD 201/211 (STATUS DISPLAY BRIGHT DIM).
      IF STATUS DISPLAY CHANGES AND/OR A MSG ACPT LIGHT IS RECEIVED CONTACT THE GROUND.
      IF NO STATUS DISPLAY CHANGE OR DCS LIGHT IS RECEIVED PROCEED TO STEP 6.
   6. TDA CONTROL SW - UNDOCK
   7. TDA CONTROL SW - DOCK
   8. ENGINE SW - ARM
      IF ARMED LIGHT IS STILL NOT RECEIVED PLACE ENGINE SW TO STOP AND CONTACT GROUND.

8. **LOSS OF ANY OF THE FOLLOWING:**
   +28 V-DC REGULATED;
   -28 V-DC REGULATED; 115V, 400 CPS SINGLE PHASE;
   115V, 400 CPS, THREE PHASE; 28V UNREGULATED (POWER [GREEN LIGHT] - OFF).
   1. TRANSMIT STATUS DISPLAY BRIGHT/DIM COMMANDS. (CMD 201/211).
   2. IF TROUBLE IS CORRECTED CONTINUE MISSION. IF NOT CORRECTED CONTACT GROUND.

9. **COMPLETE LOSS OF AGENA ELECTRICAL POWER.**
   (ALL AGENA STATUS DISPLAY LIGHTS - OFF)
   1. CYCLE STATUS DISPLAY BRIGHT/DIM COMMAND (CMD 201/211)
      (MAY REQUIRE EMERGENCY PYROTECHNIC SEPARATION PROCEDURE TO UNDOCK).
2. DISCONTINUE DOCKING OPERATION.
3. CONTACT GROUND.

10. MAIN OR SEC CLOCK FAILURE
    CONTACT GROUND FOR AGENA T/M DATA PRIOR TO AN AGENA MANEUVER

11. AGENA ATTITUDE CONTROL SYSTEM FAILURE (ATT [GREEN LIGHT] - OFF WITHOUT SENDING COMMAND 400)
    1. ENGINE STOP SW - STOP (IF DURING PPS BURN)
    2. SEND CMD 400 (ACS OFF)
    3. OAMS CNTL PWR SW - ON
    4. ASSUME ATTITUDE CNTL WITH S/C OAMS.
    5. CONTACT GROUND.

12. GAUGE FAILURE OR GAS LEAK. (ATT GAS LOW/HIGH)
    1. CONTACT GROUND.
    2. MONITOR REMAINING GAS QUANTITY. IF ACS CNTL GAS IS DEPLETED PROCEED TO STEP 3.
    3. OAMS CNTL PWR SW - ON
    4. ASSUME ATTITUDE CONTROL WITH S/C.

13. UNEXPLAINED SPS PRESSURIZATION FAILURE. (SEC HI AND SEC LO LIGHT - OFF [FOR OTHER THAN NORMAL OPERATION])
    CONTACT GROUND FOR AGENA T/M DATA.
15. S/C OAMS ULLAGE FOR AGENA PPS TRANSLATION (AGENA 16# AND 200# THRUSTERS ARE NO GO)

1. SET EVENT TIMER TO 58:00 & STBY.

2. AT SEQUENCE INITIATE MINUS 2 MINUTES PERFORM THE FOLLOWING AT THE INDICATED TIMES:
   (58:00)  
   EVENT TIMER - UP  
   MANEUVER CONTROLLER - UNSTOW  
   MANEUVER CONTROLLER - ON  
   ATTITUDE CONTROL - DIRECT  
   OAMS CNT PWR - ON  
   201 - SDP BRIGHT  
   (59:00)  
   START COMP - PUSH  
   571 - HYD GAIN DK  
   041 - RECORD DATA  
   450 - D/B NARROW  
   521 - V M ENABLE  
   ENGINE - ARM  
   (00:00)  
   501 - PPS ON  
   (00:10)  
   550 - SPS 16# OFF  
   (00:51)  
   TRANSLATE AFT (FWD FIRING THRUSTERS)  
   (01:06)  
   READ ADDRESS 80  
   NOTE: MINIMUM $\Delta V$ OF 4.2 FT/SEC REQUIRED TO ALLOW TRANSLATION TO CONTINUE

3. THE FOLLOWING EVENTS OCCUR @ THE INDICATED TIMES:  
   01:20 - PPS RDY  
   01:24 - PPS INITIATE  
   01:25 - PPS DISPLAY ON

4. @$01:25$ STOP TRANSLATING

5. PERFORM THE FOLLOWING NORMAL PPS START SEQ C EVENTS @ THE INDICATED TIMES:  
   (V.M.C.O.)  
   WHEN F/A IVI'S ZERO:  
   ENGINE-STOP  
   (V.M.C.O. + 2 SEC)  
   500 - PPS OFF  
   451 - D/B WIDE  
   READ AND COPY ADDRESSES 80, 81 & 82.  
   (V.M.C.O. + 01:00)  
   520 - V M DISABLE  
   340 - GYROCOMPASSING ON  
   030 - T/M OFF  
   021 - T/M - ON
16. UNIT II (200#) ULLAGE FOR AGENA PPS TRANSLATION
(AGENA 16# THRUSTERS ARE NO GO)

1. NORMAL PPS START C SEQUENCE UNTIL AFTER PPS ON CMD.
   A. SET EVENT TIMER TO 58:00 & STBY.
   B. AT SEQUENCE INITIATE MINUS 2 MINUTES PERFORM THE FOLLOWING @ THE INDICATED TIMES
      (58:00) EVENT TIMER - UP
      201 - SDP BRIGHT
      (59:00) START COMP - PUSH
      571 - HYD GAIN DK
      041 - RECORD DATA
      450 - D/B NARROW
      521 - V/M ENABLE
      ENGINE-ARM
      (00:00) 501 - PPS ON

2. PERFORM THE FOLLOWING ADDITIONAL EVENTS @ THE INDICATED TIMES.
   (00:10) 550 - SPS 16# OFF
   (00:48) 561 - SPS ROY
   (01:04) 560 - SPS 200# ON
   (01:19) READ ADDRESS 80
   NOTE: MINIMUM ΔV OF 6.5 FT/SEC REQUIRED TO ALLOW TRANSLATION TO CONTINUE

3. THE FOLLOWING AGENA PPS START SEQ C EVENTS OCCUR @ THE INDICATED TIMES.
   01:20 - PPS RDY
   01:24 - PPS INITIATE
   01:25 - PPS DISPLAY ON
   01:26 - SPS C.O.
   V.M.C.O.

4. PERFORM THE FOLLOWING NORMAL PPS START SEQ C EVENTS @ THE INDICATED TIMES:
   (V.M.C.O.) WHEN FWD/AFT IVI'S ZERO:
   ENGINE-STOP
   (V.M.C.O. + 2 SEC)
   500 - PPS OFF
   451 - D/B WIDE
   READ AND COPY ADDRESSES 80, 81, & 82
   (V.M.C.O. + 01:00)
   520 - V/M DISABLE
   340 - GYROCOMPASS ON
   030 - T/M OFF
   021 - T/M ON

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O₂ USAGE CURVE

Usable O₂ - 95.92 lb.

Cabin Leakage - .075 #/hr.
Normal (Metabolic Usage) - .1666#/hr.
Umbilical EVA Usage - .2416 #/hr.
Refress - 2.5 #
F.C. Usage - Varies with Load (ELECT)

TIME - HOURS FROM LIFT-OFF