

APOLLO 17

CSM SYSTEMS CHECKLIST

PART NO.

S/N

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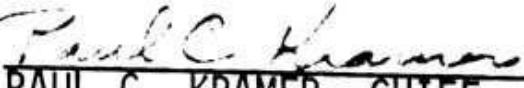
CSM SYSTEMS CHECKLIST

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PREPARED BY:


JOHN W. SAMOUCE
BOOK MANAGER

APPROVED BY:


PAUL C. KRAMER, CHIEF
FLIGHT PROCEDURES BRANCH
CREW PROCEDURES DIVISION

It is requested that any organization having comments, questions, or suggestions concerning this document contact John W. Samouce, Flight Procedures Branch, CG44, Building 4, room 250, telephone 483-2651.

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EPS (OVER)

LM INTERFACE

SYSTEMS MANAGEMENT

SYSTEMS MANAGEMENT

PROPULSION SYSTEM CHECKS1 SPS MONITORING CHECK

SPS PRPLNT TK TEMP ind - +45 to +75°F

*IF<45°F, SPS LINE HTRS - A *

IF>75°F, SPS LINE HTRS - off (ctr)

SPS PRESS IND - He, N2 A, & N2 B

He PRESS 3900 psia max

N2 A&B PRESS (2) - 2900 psia max

SPS PRESS IND - He

SPS PRESS IND (2) - 1 (verify)

SPS FUEL & OXID PRESS ind (2) - 170 to 195 psia

SPS PRESS IND (2) - 2 (If AOS Cue STDN)

SPS FUEL & OXID PRESS ind (2) - 170-195 psia

SPS PRESS IND (2) - 1

SPS ENG INJ VLVS (4) - CLOSE

SPS OXID, FUEL & UNBAL QTY

OXID FLOW VLV - PRIM

SPS He VLV (1&2) - AUTO, tb - bp

2 SM RCS MONITORING CHECK

SM RCS PRPLNT tb (8) - gray

SM RCS He 1 & 2 tb (8) - gray

SM RCS IND - He TK TEMP

RCS IND sel - SM A, B, C, D

PKG TEMP - 115°-175°F (C/W 75°-205°)

He PRESS - record 4000, 3950, 3850, 3950

MANF PRESS - 178-192 psia (C/W 145-215 psia)

He TK TEMP - record 86, 73, 72, 72

PRPLNT QTY - record 92, 90, 92, 93

When MANF PRESS <150 psia

RCS SEC FUEL PRESS A (B, C, D) - OPEN

3 CM RCS MONITORING CHECK

CM RCS PRPLNT tb (2) - gray

RCS IND - CM 1,2

He TEMP - 60-90°F

He PRESS - 4100-4200 psia 4050, 4025

MANF PRESS - 80-105 psia (before activation)

287-302 psia (after activation)

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COVER JETT

EPS (OVER)

LM INTERFACE

SYSTEMS MANAGEMENT

EPS MANAGEMENT1 Cryogenic Pressure - Quantity Check

CRYO PRESS IND - 1/2

CRYO H2 PRESS ind (2) - 225-260 psia

CRYO O2 PRESS ind (2) - 865-935 psia

CRYO PRESS IND - SRG/3

CRYO H2 PRESS 3 ind - 225-260 psia

CRYO O2 PRESS ind (2) - 865-935 psia

CRYO QTY IND - 2

CRYO H2 QTY ind (2) - record

CRYO O2 QTY ind (2) - record

CRYO QTY IND - 3

CRYO H2 QTY 3 ind - record

CRYO O2 QTY 3 ind - record

2 FC Power Plant Check

FC HTRS (3) - on (up)

FC RAD tb (3) - gray

FC REACT tb (3) - gray

FC IND sel - 1, 2, 3

H2 FLOW - 0.03-0.15 lb/hr

O2 FLOW - 0.25-1.2 lb/hr

MOD SKIN TEMP - 390-440°F

MOD COND EXH TEMP - 150-175°F

FC pH HI tb - gray

FC RAD TEMP LO tb - gray

3 D-C Voltage-Amperage Check

MN BUS TIE (2) - OFF (verify)

FC MNA tb - 1 & 2 gray, 3 bp

FC MNB tb - 1 bp, 2 bp, & 3 gray

FC 1, 2, & 3 (RECORD AMPS)

MAIN BUS A, B, (26.5-31 vdc - Record)

BAT BUS A, B, & BAT C (31.5-38 vdc < 3 amp)

PYRO BAT A, B (36.5 - 37.5 vdc)

DC IND sel - MNB

SYS TEST 5B (BAT RLY BUS - 3.4-4.1 vdc)

SYS TEST 7A (BAT COMPT PRESS - <2.3 vdc)

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If >2.3: report STDN

If ≈ 0: report STDN

If LM PWR - CSM

BATT VENT vlv - closed

SYS TEST (2) - 7D (LM PWR - 0.5-3.2 vdc)

4 A-C VOLTS - 113 to 117 three phase avg.

5 Battery Charging BAT A(B,C)

MAIN BUS TIE A/C (B/C) - OFF

cb BAT BUS A & B PYRO BUS TIE - open (verify)

cb BAT C BAT BUS A & B - open (verify)

cb BAT RLY BUS BAT A(B) - open

DC IND sel - BAT CHARGER

BAT CHARGE - A(B,C)

DC VOLTS - 37.5-39.5 vdc

BAT CHARGE - OFF at 39.5 vdc or 100% recharge

cb BAT RLY BUS BAT A(B) - closed

SYS TEST - 7A (BAT COMPT PRESS - <2.3)

If >2.3 report STDN

ISN O: report STDN

SYS TEST - 5B

BATT VENT v/v- closed

6 Fuel Cell Power Plant Purging

A O2 PURGING

FC IND sw - 1(2,3)

FC PURGE 1(2,3) - 02 (2 min)

FC FLOW - 02 Flow incr 0.6 1b/hr

M/A FC 1(2,3) - On/RSET

FC PURGE - 1(2,3) - OFF

B H2 PURGING

H2 PURGE LINE HTR - ON, 20 min prior to purge

FC IND sw - 1(2,3)

FC PURGE 1(2,3) - H2 (1 min, 20 sec)

FC H2 FLOW - Flow incr 0.67 1b/hr

(will exceed C/W limit)

M/A FC 1(2,3) - On/RSET

FC PURGE - 1(2,3) - OFF

After 10 minutes:

H2 PURGE LINE HTR - OFF

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LM INTERFACE

COVER JETT

EPS (OVER)

7 FUEL CELL SHUTDOWN (APPLICABLE FC)

- FC REAC - OFF
- FC HTRS - OFF
- FC PUMPS - OFF
- cb FC PUMPS AC - open
- At Tskin <200°F
- H2 PURGE LINE HTR - ON (for 20 min)
- FC PURGE - O2
- FC PURGE - H2 (AFTER O2 PRESS STABILIZES)
- FC PURGE - OFF (AFTER H2 PRESS STABILIZES)
- H2 PURGE LINE HTR - OFF
- cb FC RAD/REACS - open

8 FUEL CELL SWITCHING

PRIOR TO DISCONNECTING, INSURE THAT AT LEAST
ONE FUEL CELL IS POWERING EACH MAIN BUS
Possible MA & FC DISCONNECT 1t

9 INVERTER CHANGEOVER

- A One inverter on each AC bus at all times (if available)
- B If all three AC bus ties for the same bus are on, inverter power to that bus may be lost
- C When switching DC power on inverter 3, pause in OFF position

10 CRYO MANUAL FAN OPERATION

CRYO FANS - ON (seq at 1 sec intervals for 1 min each)

CAUTION

If CRYO PRESS 1t on, do not turn off fan until 1t extinguishes

ECS MANAGEMENT1 ECS MONITORING CHECKCABIN ΔP - -1 to -3.5 in. H₂O

O2 FLOW - 0.2-0.45 lb/hr (after changeover)

CRYO PRESS IND - SRG/3

O2 SURGE TANK PRESS - 865-935 psia

REPRESS O2 >865 psia

PRIM RAD tb - gray

*If PRIM RAD tb - 2

* ECS RAD FLOW AUTO CONT - 1 until *

* tb gray, then AUTO *

ECS RAD TEMP PRIM IN - 67-97°F

ECS RAD TEMP PRIM OUT - -20°-63°F (coast)

- -20°-90°F (lunar orb)

PRIM GLY EVAP TEMP OUT-38-50.5°F(earth orb evap on)
-42-90°F(lunar orb evap off)
(If >75°F use RAD TEMP PRIM
OUT ind)

PRIM GLY DISCH PRESS - 40-52 psig

SUIT TEMP - 45-70°F w/o evap; 45-55°F with evap

CABIN TEMP - 70-80°F

SUIT PRESS/CABIN PRESS- 4.7-5.3 psia

PART PRESS CO₂ < 7.6 mm Hg

SUIT COMP ΔP - 0.3-0.4 psid

PRIM GLY ACCUM QTY 30-65%

*If <30% - PRIM ACCUM FILL vlv - *

* ON (Until 40-55%) *

POT H₂O QTY - 10-100%WASTE H₂O QTY - 15-85% *If >85% - Dump*2 ECS PERIODIC REDUNDANT COMPONENT CK

Suit Compressor

Sw to other compr

SUIT COMPR ΔP ind - 0.3-0.4 psid

Main O2 Regulators

MAIN REG B vlv - close

EMER CABIN PRESS sel - 1

PUSH TO TEST PB - PUSH (O2 flow inc)

MAIN REG B vlv - open

MAIN REG A vlv - close

EMER CABIN PRESS sel - 2

PUSH TO TEST pb - push (O2 flow inc)

MAIN REG A vlv - open

EMER CABIN PRESS sel - BOTH (OFF if all suited)

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LM INTERFACE

COVER JETT

EPS (OVER)

Secondary Glycol Loop
Open cool atten panel (If req'd)
EVAP H2O CONT SEC vlv - AUTO
ECS IND sw - SEC
SEC COOL LOOP PUMP - AC 1 (AC 2)
GLY DISCH SEC PRESS - 39-51 psig
ACCUM SEC QTY IND - 30-55%
SEC COOL LOOP EVAP - EVAP
After 5 min
SEC EVAP TEMP OUT - 38-50.5°F
SEC COOL LOOP EVAP - RESET for 1 min minimum,
then off (ctr)
SEC COOL LOOP PUMP - off (ctr)
ECS IND sw - PRIM

3 CO2 ABSORBER FILTER REPLACEMENT

Open CO2 Canister attenuation pn1

CAUTION

Connect ground wire when re-
moving or replacing filter
from canister or stowage

CO2 CSTR DIVERT vlv - up (or dn)

CAUTION

Apply pressure to latching
handle to allow pressure
interlock pin to withdraw
otherwise latching handle
may not disengage

CANISTER MANUAL BLEED vlv - PRESS
COVER LATCHING HANDLE - UNLOCK
Replace used filter
COVER LATCHING HANDLE - LOCK
CO2 CSTR DIVERT vlv - ctr
Close CO2 Canister attenuation pn1
SHIM Stowage - B5 & B6

- 4 DEBRIS SCREEN CHECK
 Check SUIT RET AIR vlv screen
 SUIT RET AIR vlv - CLOSE (push)
 Clean screens
 SUIT RET AIR vlv - OPEN (pull)
- 5 CM O2 SUPPLY REFILL
 CRYO PRESS IND - SRG/3
 SURGE TANK PRESS >400 psia
 CAB REPRESS vlv - OFF
 REPRESS O2 vlv - CLOSE
 REPRESS PKG vlv - FILL
 SURGE TANK PRESS - 865-935 psia
 CRYO PRESS IND - 1/2
 REPRESS PKG vlv - OFF
- 6 DOFFING PGA
 EMER CABIN PRESS vlv - BOTH
 SUIT RET AIR vlv - OPEN (pull)
 Install hose screen on return hose
 PWR - OFF
 SUIT PWR - OFF for disconnect
 AUDIO CONT - NORM
 SUIT FLOW vlv - CABIN FLOW (for unsuited crewman)
 (FULL FLOW for 3 unsuited)
- 7 DONNING PGA (with helmet & gloves)
 SUIT PWR - OFF (for comm cable connect)
 PWR - OFF
 AUDIO CONT - NORM
 Connect supply and return hoses to PGA
 Connect Comm Control Head to PGA
 SUIT FLOW vlv - FULL FLOW (for suited crewman)
 SUIT RET AIR vlv - CLOSE (push)
 EMERG CABIN PRESS vlv - OFF (if all suited)
- 8 PARTIAL SUIT CKLIST
 EMER CAB PRESS vlv - BOTH
 SUIT CKT RET vlv - OPEN (pull)
 Reverse O2 umbilicals
 Before disconnecting umbilical from head set:
 SUIT PWR - OFF
 POWER - OFF
 AUDIO CONT - NORM

LM INTERFACE

COVER JETT

EPS (OVER)

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BIOHARNESS PROCEDURES

A Bioharness Donning

Apply stomaseal tape ring and electrode sponges to biosensors

Place upper sternal EKG (blue conn) biosensor (long lead with branch electrode) 1/2 inch below sternal notch. Press firmly for 10 sec and cover with micropore disk tape (all electrodes).

Place branch ground electrode on right side upper chest

Place lower EKG (blue conn) biosensor at level of left 5th ICS at sternal border midway between MCL and MAL (see chart)

Place ZPN (yellow conn) biosensor over lower rib cage in left and right MAL at level of 7th or 8th ribs (see chart)

Route connectors through holes in undergarment
Snap biobelt in place. Verify all connectors and cavities clean and dry.

Carefully connect blue EKG conn to blue signal conditioner and yellow ZPN conn to yellow signal conditioner (white dot forward)

B Bioharness Doffing

Disconnect connectors from signal conditioners

Remove micropore tape disks. Remove biosensors by grasping stomaseal tape flange

Remove stomaseal tape rings and electrode sponges from biosensors

Clean electrode cavities

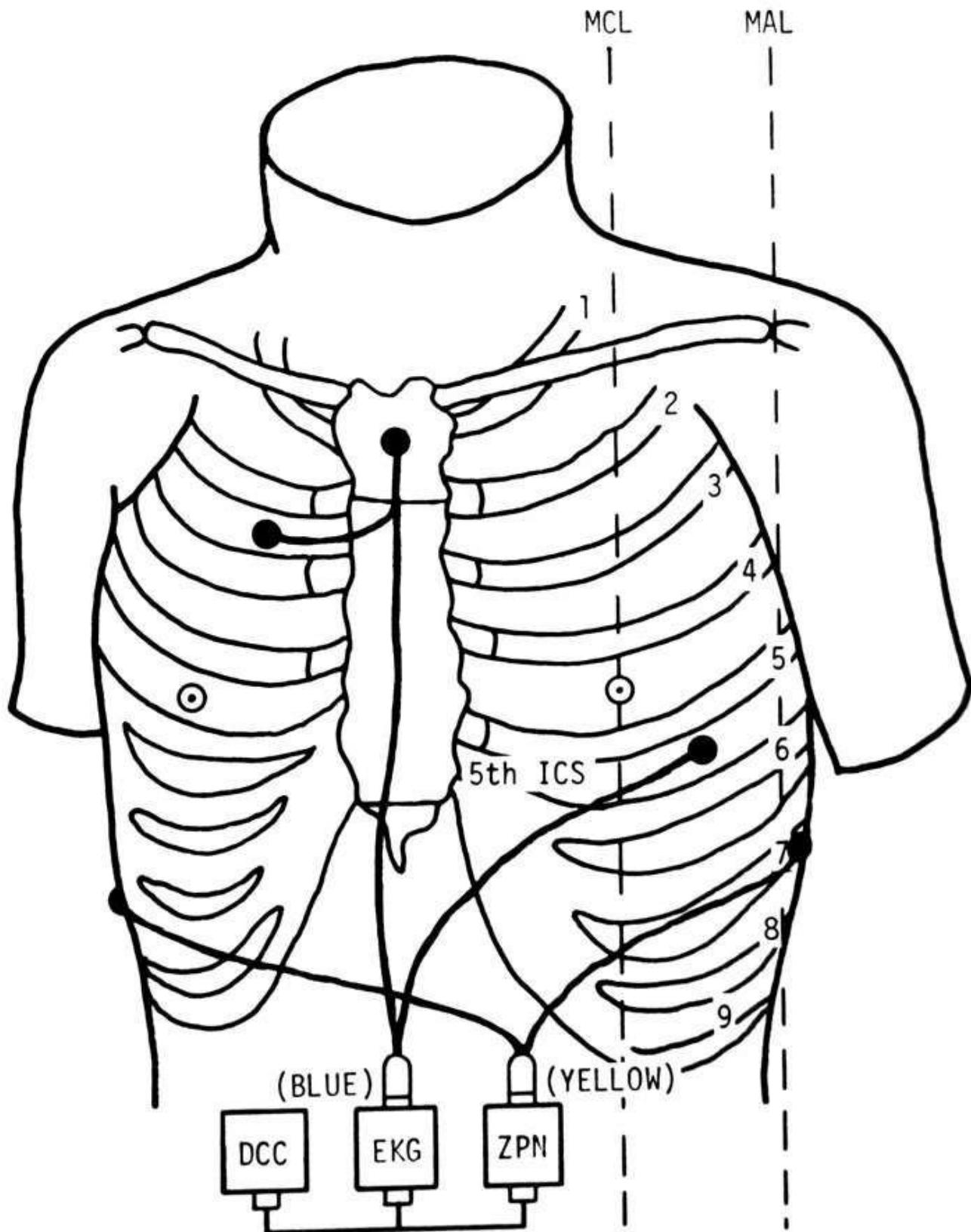
Disconnect bioharness from CWG or suit electrical harness

Install protective cap over suit bioharness

Unsnap biobelt and stow biosensor harness

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BIOSENSOR PLACEMENT CHART

EPS (OVER)

COVER JETT

LM INTERFACE

10 URINE DUMP MODES

A UCTA (IN PGA) (Dump)

Connect plumbing (pict. A)

WASTE MGT OVBD DRAIN vlv - DUMP

Disconnect urine transfer hose from PGA

Replace cap on PGA thigh QD

Connect UTS to "T" Adaptor

UTS vlv - OPEN

Purge dump line 2-5 min

WASTE MGT OVBD DRAIN vlv - OFF

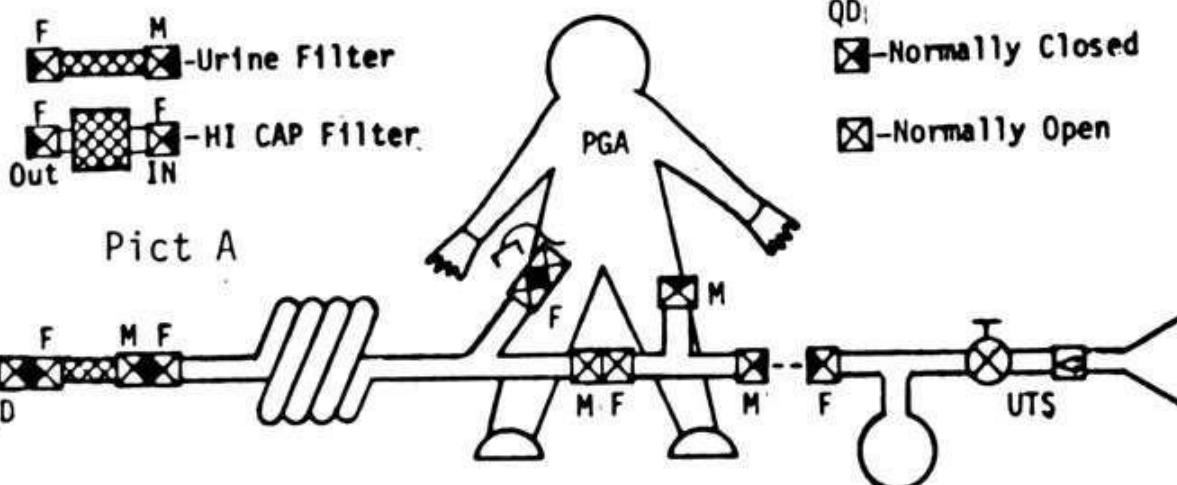
UTS vlv - CLOSED

Disconnect hose & stow

- Waste Mgmt Pnl QD

- Normally Closed

- Normally Open



B UCTA (OUT PGA) (DUMP)

Connect plumbing (pict. B)

Verify UTCA Clamp attached

UTS vlv - CLOSED (verify)

WASTE MGT OVBD DRAIN vlv - DUMP

Disconnect UCTA Adaptor from urine transfer hose

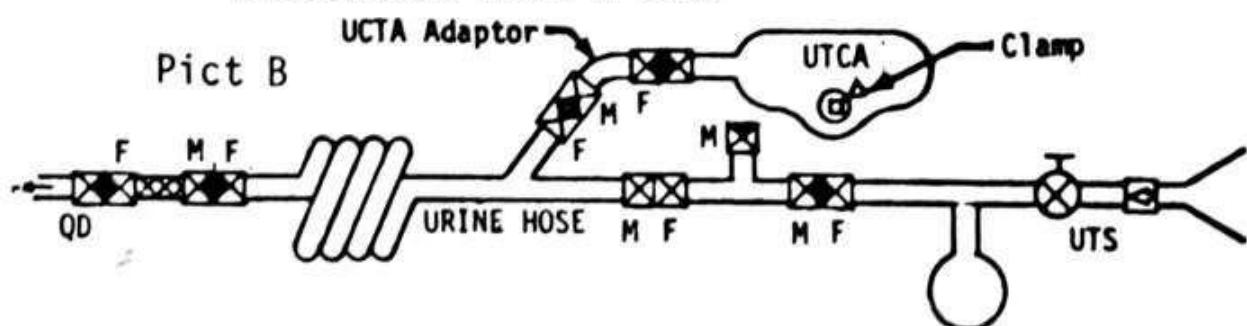
UTS vlv - OPEN

Purge dump line 2-5 min

WASTE MGT OVBD DRAIN vlv - OFF

UTS vlv - CLOSED

Disconnect hose & stow



C UTS (collection)

Obtain UTS & verify vlv - CLOSED

Attach UTS - open vlv - Perform task

UTS vlv - CLOSED

Disconnect UTS & stow

D UTS/Urine Bag (Transfer)

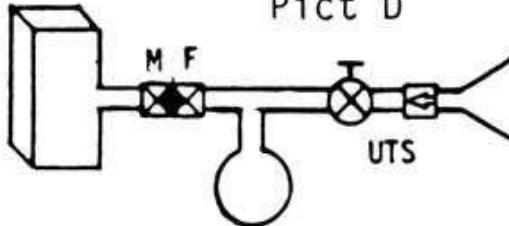
Connect UTS to Urine Bag (pict. D)

Roll UTS Bag to transfer urine

When transfer complete, disconnect

UTS from Urine Bag & stow

Pict D



E UTS (Dump)

UTS vlv - CLOSED (verify)

Connect plumbing (pict. E)

WASTE MGT OVBD DRAIN vlv - DUMP

When UTS Bag Empty, UTS vlv - OPEN

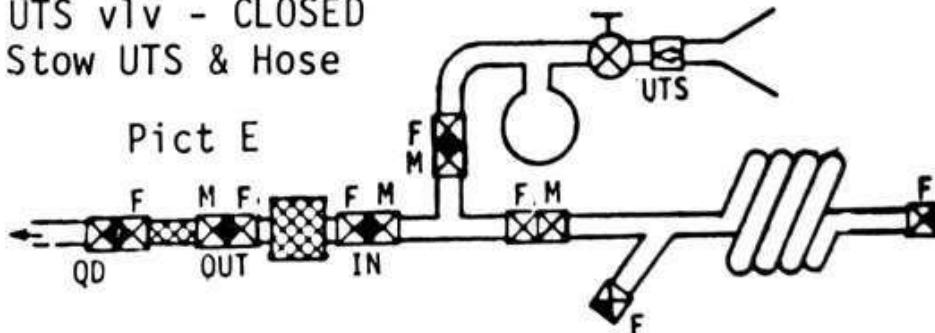
Purge lines 2-5 min

WASTE MGT OVBD DRAIN vlv - OFF

UTS vlv - CLOSED

Stow UTS & Hose

Pict E



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LM INTERFACE

COVER JETT

EPS (OVER)

F BUSS (Dump)

BUSS vlv - CLOSED (verify)

Connect plumbing (pict. F)

WASTE MGT OVBD DRAIN vlv - DUMP

When BUSS Bag Empty, BUSS vlv - OPEN

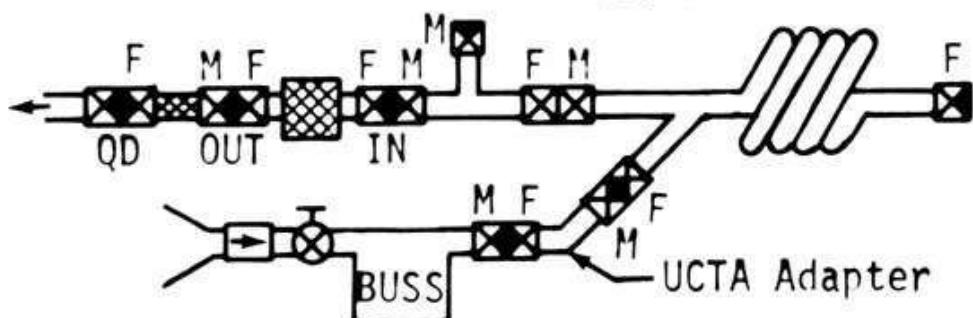
Purge lines 2-5 min

WASTE MGT OVBD DRAIN vlv - OFF

BUSS vlv - CLOSED

Stow BUSS & Hose

Pict F



G URINE STORAGE BAG (Dump)

Connect plumbing (pict. G)

WASTE MGT OVBD DRAIN vlv - DUMP

Purge urine transfer hose & filters

Disconnect urine storage bag & stow

Connect UTS to HI CAP filter

UTS vlv - OPEN

Purge 2-5 min

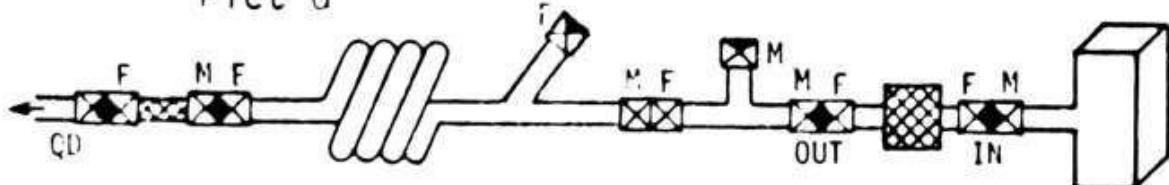
WASTE MGT OVBD DRAIN vlv - OFF

UTS vlv - CLOSED

Disconnect UTS & stow

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Pict G



11 CABIN PRESSURIZATION

A NORMAL ~21 min

CAB PRESS REL vlv (2) - NORMAL (latch on)

REPRESS PKG vlv - FILL

CRYO PRESS IND - SRG/3

REPRESS O2 vlv - OPEN

If SURGE TANK PRESS decreases to 150 psia:

* REPRESS O2 vlv - CLOSE *

CAB PRESS ind - ~3.0 psia (1 min)

REPRESS PKG vlv - OFF

CAB REPRESS vlv - OPEN (CW), Adjust to maintain
>150 psia in SURGE TANK

REPRESS O2 PRESS ind - ~0 psia

REPRESS O2 vlv - CLOSE

CAB PRESS = 4.7-5.3 psia

CAB REPRESS vlv - OFF

B ALTERNATE, ~48 min

CAB PRESS REL vlv (2) - NORMAL (Safety latch on)

EMER CAB PRESS vlv - BOTH

CAB REPRESS vlv - OPEN

MONITOR SURGE TANK PRESS

At 150 psia on SURGE TANK:

EMER CAB PRESS vlv - OFF

CAB REPRESS vlv - Adj to 150 psia on SURGE TK

WHEN CAB PRESS >4.7

CRYO PRESS IND - 1/2

CAB REPRESS vlv - OFF

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LM INTERFACE

COVER JETT

EPS (OVER)

12 SUIT CKT/PGA INTEGRITY CHECKA SUIT CKT/PGA CHECK Common:

Verify unsuited umbilicals interconnected
and SUIT FLOW vlv - OFF
DIRECT O2 vlv - close (CW)
SUIT PRESS - 4.7-5.3 psia
O2 FLOW - 0.2-0.4 lb/hr

CAUTION

SUIT TEST vlv should remain
in the PRESS position until
suit circuit pressure is sta-
bilized to preclude seal scarring.
If repositioning of SUIT TEST
v lv from PRESS is required prior
to suit pressure and O2 flow
stabilization, perform the
following:

- a. O2 DEMAND REG vlv - OFF
- b. Allow 15 sec (min)
stabilization time
- c. Reposition SUIT TEST vlv -
DEPRESS or OFF as applicable
- d. When suit pressure stabilized,
O2 DEMAND REG vlv - BOTH

SUIT TEST vlv - PRESS (DIR O2 - OPEN,
At 4.0 psig, DIR O2 - OFF)
O2 FLOW - 1.0 lb/hr (pegged)
O2 FLOW HI lt - on
M/A - ON, Reset
When SUIT PRESS ind 1.5-2.0 psig > CAB PRESS ind
SUIT CKT RET vlv - open then close
SUIT PRESS - 8.8-9.8 psia
PGA PRESS - 4.1-4.5 psig

For SUIT CKT CHECK Continue to B.
For PGA CHECK Continue to C.

B SUIT CKT CHECK Continued:

O2 FLOW HI lt - out
Allow O2 flow to stabilize 15 sec
O2 flow will remain below 0.80 lb/hr
for 30 sec after stabilization

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1-15

- *If O2 Flow >0.80 lb/hr reverify*
- * all connections and repeat *
- * 12A. Continue after recheck *
- * if O2 flow <0.92 lb/hr for *
- * 30 sec after stabilization *

SUIT TEST vlv - DEPRESS
O2 FLOW - 0.2-0.4 lb/hr
SUIT PRESS - slightly > CAB PRESS
SUIT TEST vlv - OFF
O2 DEMAND REG vlv - BOTH (verify)

C PGA CHECK Continued:

WARNING

SUIT FLOW vlv(s) may remain in OFF position for no longer than one minute or asphyxiation may result. If all SUIT FLOW vlv's are closed simultaneously the suit compressors must be shut off to prevent compressor damage due to suit loop deadheading.

SUIT FLOW vlv - OFF
Monitor for <0.5 psi/min decay
SUIT FLOW vlv - SUIT FULL FLOW
SUIT TEST vlv - DEPRESS
O2 FLOW HI lt - out
O2 FLOW - 0.2-0.4 lb/hr
SUIT PRESS - slightly > CAB PRESS
SUIT TEST vlv - OFF

13 CM PRESSURE DUMP
EMER CABIN PRESS vlv - OFF (verify)
CAB REPRESS vlv - OFF (verify)
SUIT CKT RET vlv - CLOSED (verify)
CABIN FANS (2) - OFF (verify)
DIRECT O2 vlv - close (CW)
CAB PRESS REL vlv (RH) - DUMP (latch off)
CABIN PRESS - 3.0-3.25 psia
CAB PRESS REL vlv (RH) - BOOST/ENTRY
O2 FLOW - 0.24 lb/hr
SUIT PRESS - 3.5-4.0 psia
CAB PRESS REL vlv (RH) - DUMP
CABIN PRESS - 0.0 psia (within 6 min)
CAB PRESS REL vlv (2) - NORMAL (latch on)

LM INTERFACE

" " " " "
COVER JETT

EPS (OVER)

13 SUIT CKT H₂ PURGE

DIRECT O2 vlv - OPEN for 1 min
O2 FLOW - 1.0 lb/hr (pegged)
O2 FLOW HI lt - on
MASTER ALARM pb/lt (3) - on, push
DIRECT O2 vlv - close (CW)
O2 FLOW HI lt - out
O2 FLOW - 0.2 lb/hr

14 CABIN COLD SOAK**ACTIVATE**

SUIT HT EXCH SEC GLY vlv - FLOW
EVAP H₂O CONT SEC vlv - AUTO
GLY TO RAD SEC vlv - BYPASS (verify)
SUIT CKT HT EXCH - BYPASS (20sec), then off (ctr)
ECS IND sel - SEC
SEC COOL LOOP PUMP - AC2
GLY DISCH SEC PRESS - 39-51 psig
SEC ACCUM QTY - 30-55%
SEC COOL LOOP EVAP - EVAP
SEC GLY EVAP OUT TEMP - 38-50.5°F
ECS IND - PRIM
PRIM ECS RAD OUT TEMP - >-20°F
IF <-20°F, DEACTIVATE

DEACTIVATE

SUIT CKT HT EXCH - ON (20 sec), then off (ctr)
SEC COOL LOOP EVAP - RESET 1 min, then off (ctr)
SEC COOL LOOP PUMP - off (ctr)
EVAP H₂O CONT SEC vlv - OFF (AUTO for ENTRY)

15 ACTIVATE PRIMARY EVAP

GLY EVAP H₂O FLOW - AUTO
GLY EVAP STM PRESS - AUTO

DEACTIVATE PRIMARY EVAP

GLY EVAP H₂O FLOW - off (ctr)
GLY EVAP STM PRESS AUTO - MAN
GLY EVAP STM PRESS INCR - INCR for 1 min

PRIM EVAP RESERVICE

GLY EVAP STM AUTO - MAN
GLY EVAP STM INCR - INCR
for 1 min

3/15/71

DATE

CM EVA

SAFE OF APEX
COVER JETT

STOWAGE

LM INTERFACE

Wait 15 min
GLY EVAP H2O FLOW - ON
for 2 min, then AUTO
GLY EVAP STM AUTO - AUTO

16 ACTIVATE SEC EVAP

SEC EVAP H2O CONT - AUTO
SEC COOL LOOP EVAP - EVAP
SEC COOL LOOP PUMP - AC1

DEACTIVATE SEC EVAP

SEC COOL LOOP EVAP - RESET for 1 minute
SEC EVAP H2O CONT - OFF
SEC COOL LOOP PUMP - OFF

17 POTABLE WATER CHLORINATION

POT TK IN vlv - OPEN (verify)

Check WASTE TK qty; if <15%,
no chlorination if evaporators operating.

Check POT TK qty; if >90°,
withdraw 8 oz of water

Unstow chlorination unit

Remove chlor port cap

Attach needle assembly to injection port

Insert chlorine ampoule into casing

Connect knob assembly & rotate (CW) until
piston contacts ampoule

Install ampoule assembly on needle assembly
(push & turn CW)

Rotate knob (CW) until ampoule is empty
(3 times for half empty if H2O quantity <50%)

Disconnect ampoule assembly from needle
assembly

Rotate knob CCW & stow used ampoule

Repeat above steps with buffer ampoule

Wait 10 min & remove ampoule of H2O

Replace chlor port cap

Stow chlorination unit

Do not drink for 30 min

18 WASTE WATER TANK DRAIN

BAT VENT vlv - CLOSED (verify)

H2O QTY IND - WASTE

WATER CONT PRESS REL vlv - DUMP A

- 19 WASTE WATER TANK DRAIN
BAT VENT vlv - CLOSED
H2O QTY IND - WASTE
WATER CONT PRESS REL vlv - DUMP A
Monitor WASTE H2O QTY ind - decreasing (5% per min)
If reqd to dump to 0%
 POT TK IN vlv - open (verify)
 WASTE TK IN vlv - AUTO (verify)
When WASTE H2O QTY ind - 15%
 WATER CONT PRESS REL vlv - 2
BAT VENT vlv - VENT
- 20 SIDE HATCH URINE/WATER DUMP
Remove Dump Nozzle Conn Cover
Remove Plug & Stow
Install Aux Dump Nozzle QD ASAP
Withdraw Wire Guard & Wires from slot
Install Female QD on Waste Tank Service Port
Connect cable to heater connector (crew option)
 UTIL PWR - OFF
 Connect cable to utility outlet
 UTIL PWR - ON
Connect Urine Dump Hose to Aux Dump Nozzle QD
Connect other end of UT hose to Female QD on
 Waste Tank Service Port (as req)
Dump Waste Water/Urine
If Waste Water Dump:
 WASTE TANK SERV vlv - OPEN
 until WASTE H2O QTY ind 15%, then CLOSE
 Disconnect UT hose from UTS/Waste Servicing Tank
 and Purge
 Disconnect UT Hose from Dump Nozzle & stow
 UTIL PWR - OFF (verify)
 Disconnect Cable from heater & outlet & stow
 Install plug & dump nozzle connector
- 21 CABIN WATER REMOVAL
Connect urine transfer hose-filter to urine/feces QD
Disconnect "T" adapter QD from urine transfer hose
WASTE MGT OVBD DRAIN vlv - DUMP
Collect water
After collection complete:
 Purge for 2-5 min
 WASTE MGT OVBD DRAIN vlv - OFF

- 22 WATER/GAS SEPARATOR SERVICING
 Remove separator from stowage
 Attach separator to water pistol
 Trigger water pistol in short pulses until water
 is observed at separator outlet port
 Wait 10 minutes
 CAUTION - Membrane can be damaged by pencils,
 screwdrivers, and other pointed objects
 Separator may be used on water pistol or on food
 prep unit as needed
- 23 PRE LOI SEC GLY LOOP CHECK
 ECS IND sw - SEC
 SEC GLY TO RAD vlv - NORM
 SEC COOL LOOP PUMP - AC1
 GLY DISCH SEC PRESS - 39-51 psia
 ACCUM SEC QTY ind - 30-55%
 SEC EVAP TEMP OUT - decreases (verifies flow)
 SEC COOL LOOP PUMP - off (ctr)
 SEC GLY TO RAD vlv - BYPASS
 ECS IND sw - PRIM
- 24 CONTAMINATION CONTROL
Note: If water is to be collected,
 use cabin water removal procedure.
 Unstow vac cleaner & components
 AC UTIL PWR - OFF (verify)
 Assemble components & connect pwr cable
 AC UTIL PWR - on (up)
 Vac cleaner pwr sw - ON
 If cleaner stops operating; turn off,
 remove brush & clean inlet, install
 brush & run for 30 sec
 Vacuum/brush CM interior with special
 attention to the following:
 Transfer tunnel wall and top hatch surfaces
 Open B5 and B6 cover and clean compartment
 and SRC bags surfaces
 Open A5 and clean compartment and CSC bag and
 film cassette bags surfaces
 Open R13 and clean compartment and film
 magazine bag surface
 Open food containers and clean compartment
 and helmet stowage bags surfaces

LM INTERFACE

COVER JETT

EPS (OVER)

PGA bag surfaces

Move vacuum cleaner brush into all potential "dead air" pockets to ensure thorough mixing of CM atmosphere.

Vac cleaner pwr sw - OFF

AC UTIL PWR - OFF

Disconnect pwr cable & disassemble components

Stow vac cleaner & components

C/W OPERATIONAL CHECKS

1 C/W SYSTEM OPERATIONAL CHECK

C/W LAMP TEST - 1 (LH MA & 15 lts)

C/W LAMP TEST - 2 (RH MA & 20 lts)

C/W CSM - CM (CM RCS 1t (2) - on)

C/W CSM - CSM (CM RCS 1t (2) - out)

2 ACKNOWLEDGE/RESET MASTER ALARM INDICATION

A Normal mode

MA tone/1t (3) - on

MA pb/1t (1) - push

MA tone/1t (3) - out

applicable C/W 1t remains on

B Acknowledge mode (C/W NORM in ACK)

MA tone/1t (3) - on

MA pb/1t (1) - push & hold

MA tone/1t (3) - out

applicable C/W 1t remains on for

malfuction indication

MA pb/1t - release

applicable C/W 1t - out

3 MASTER ALARM TONE HEADSET CONTROL

A Inhibit tone (PWR - AUDIO)

B Permit tone (PWR - AUDIO/TONE)

4 C/W TONE BOOSTER ASSEMBLY

A Installation

UTIL PWR - OFF

Install connector

Position sensor over MA 1t

UTIL PWR - on (up)

Install beeper on

LH (RH) girth shelf

B Operational Check

C/W LAMP TEST - 1(2) (hold)

TELECOMM PROCEDURES1 HI-GAIN ANTENNA OPERATIONA ACTIVATION

cb HI-GAIN ANT FLT BUS - closed
 cb HI-GAIN ANT AC GRP 2 - closed
 HI-GAIN ANT TRACK - MAN
 HI-GAIN ANT SERVO ELEC - PRIM
 HI-GAIN ANT BEAM - WIDE
 HI-GAIN ANT PITCH POS - -52°
 HI-GAIN ANT YAW POS - 270°
 HI-GAIN ANT PWR - POWER

B ACQUISITION

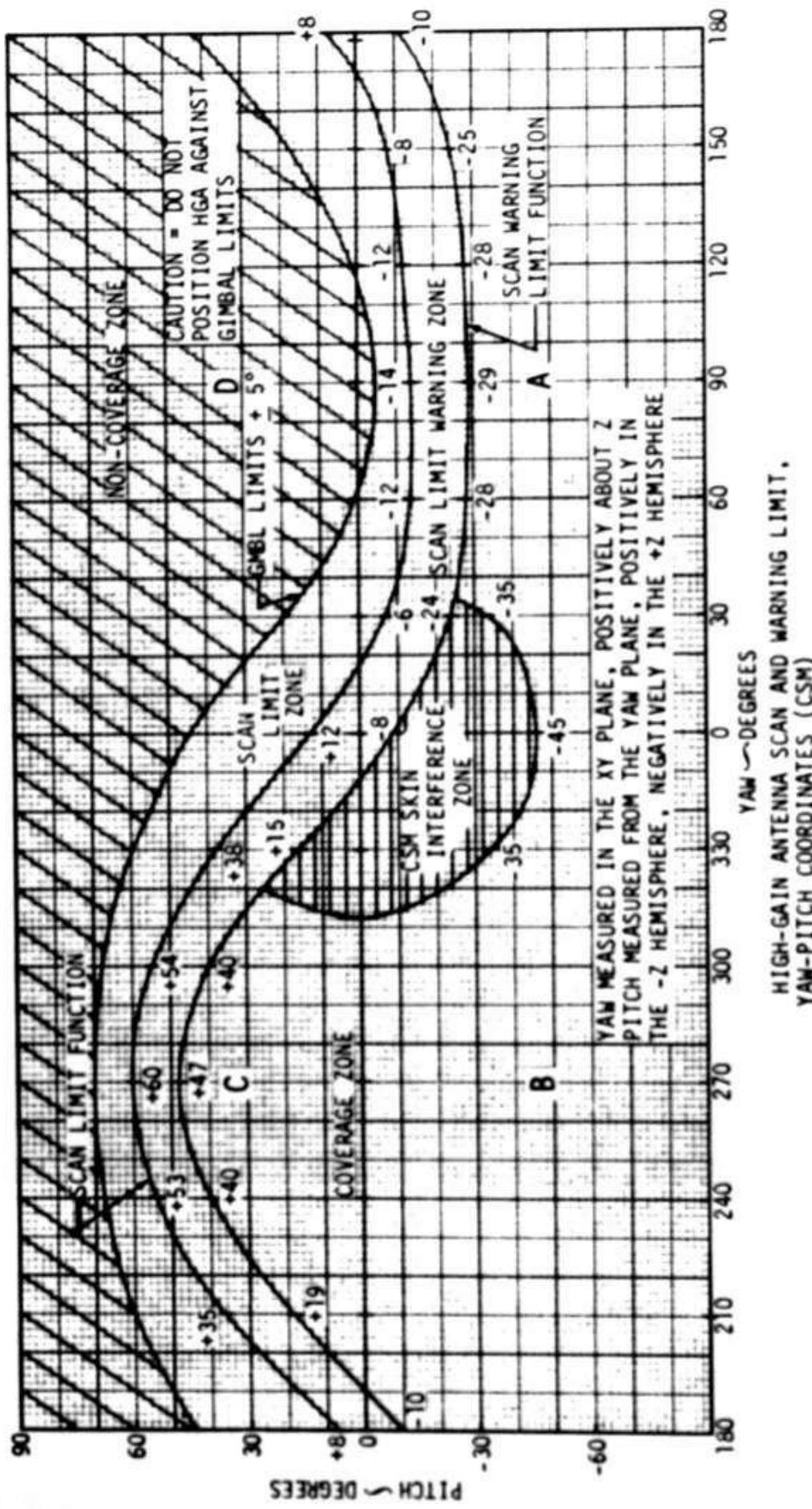
Request pointing angles from MCC or go
 to V64 HI-GAIN ANTENNA POINTING procedures
 Verify required coordinates within full
 coverage region

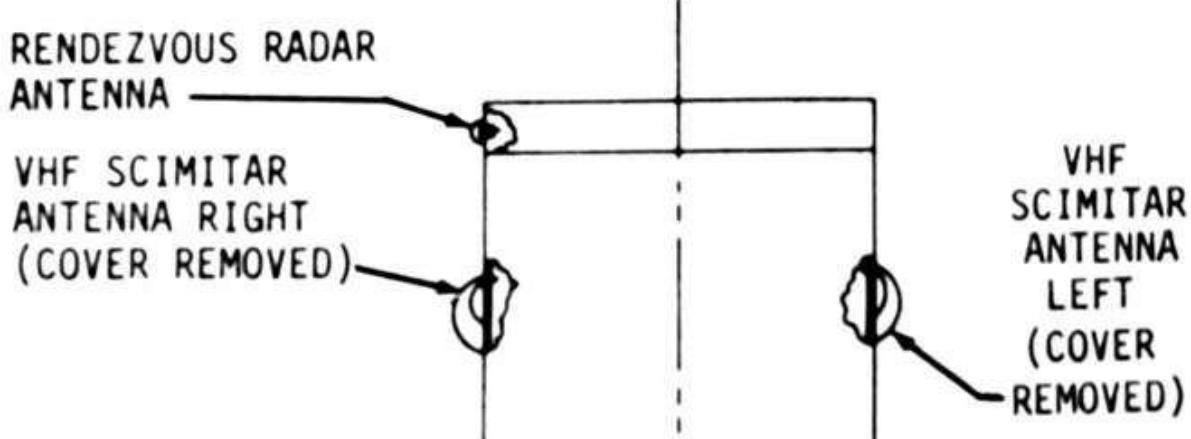
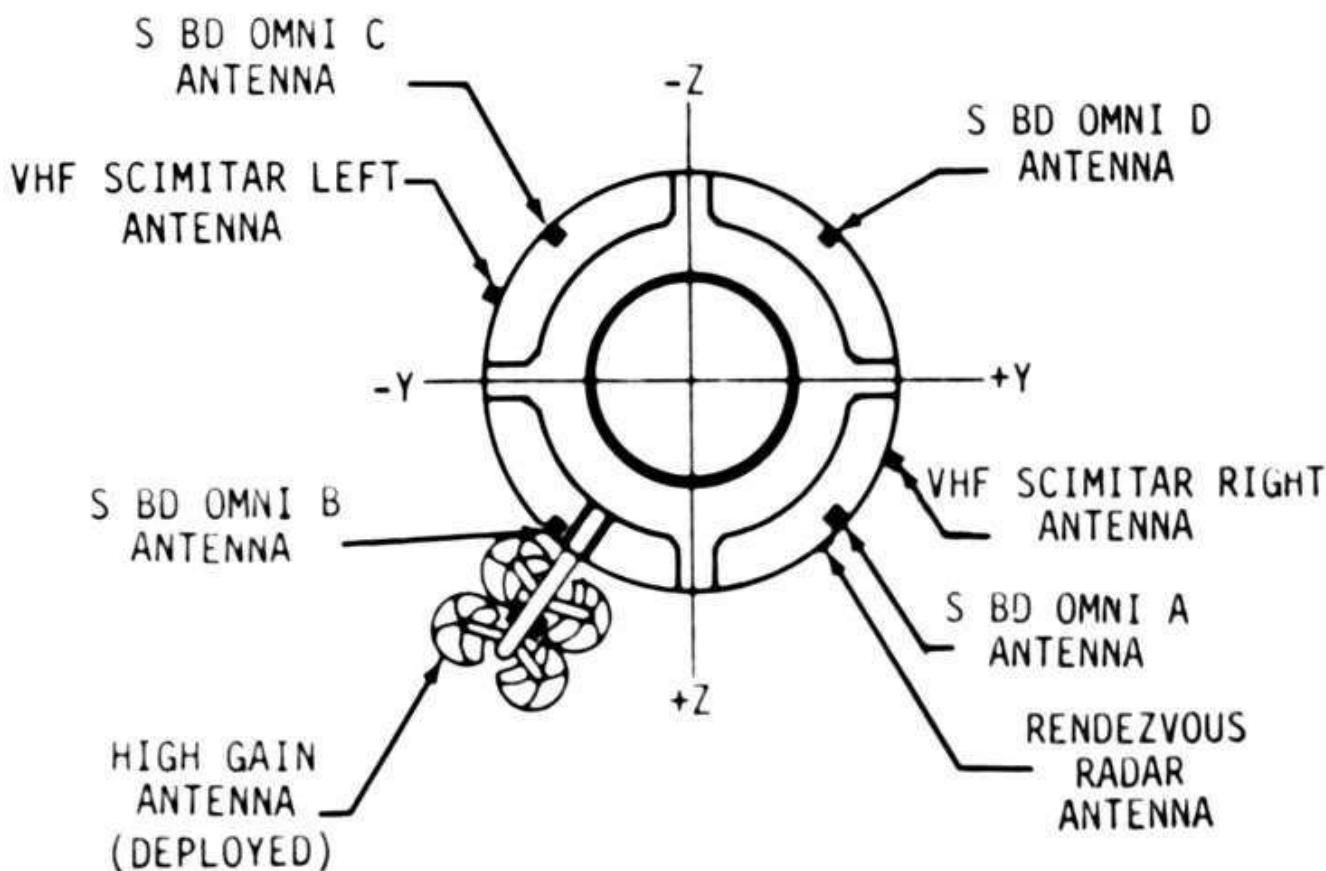
- *If required coordinates are in scan warning*
- * limit zone or skin reflection zone, one *
- * of the following may be done: *
- *a. Change CSM attitude to provide antenna *
- * coordinates in the full coverage region *
- *b. In attitude hold condition, operate in *
- * medium beam and manual mode. *
- *c. Use OMNI's *

HI-GAIN ANT TRACK - MAN
 HI-GAIN ANT BEAM - WIDE
 HI-GAIN ANT PITCH & YAW POS (2) - Set reqd coord
 If in earth orbit, S BD NORM PWR AMPL HI -
 * off (ctr)
 S BD ANT - HI GAIN
 HI-GAIN ANT S BD ANT ind - > 1/2 scale
 HI-GAIN ANT TRACK - AUTO or REACQ
 HI-GAIN ANT BEAM - as reqd depending on range
 HI-GAIN ANT S BD ANT ind - > 1/2 scale

C STOWING (OMNI Operations)

HI-GAIN ANT TRACK - MAN
 HI-GAIN ANT BEAM - WIDE
 HI-GAIN ANT PITCH POS - -52°
 HI-GAIN ANT YAW POS - 270°



DATE
8/21/72HIGH GAIN ANTENNA
(DEPLOYED)MICRO WAVE
ELECTRONICS

LM INTERFACE

COVER JETT

EPS (OVER)

2 TV CAMERA OPERATION (COLOR)

Unstow TV camera, monitor, camera cable, and monitor cable
Verify monitor power sw is in off position
Transmit/Standby sw - STANDBY
TV camera ALC sw - AVG
Set focus to 4ft, zoom control to 25, aperture control to f/44
Connect monitor cable to camera and to monitor (arrow-to-arrow)
S BD AUX TAPE - off (ctr) or DN VOICE BU
Verify S BD AUX TV - off (ctr)
Connect TV camera cable to TV camera and s/c
S BD AUX TV - TV
TV monitor power sw - ON
Rotate monitor brightness and contrast controls until monitor picture is properly adjusted
Adjust cabin lighting to full max
By using monitor, adjust camera lens aperture, zoom control, and focus control
When TV transmission to MSFN is desired:
XMIT/STANDBY sw - XMIT
(xmsn will begin immediately)
When TV operation is completed: S BD AUX TV - off (ctr)
Disassemble and stow TV camera, monitor, and cables

3 VHF RANGING OPERATION

VHF AM A - off (ctr)
VHF AM B - DUPLEX
VHF RNG - on (up)
P20 operating
V87E, TRACKER 1t - on
EMS FUNC - ΔV SET/VHF RNG
EMS MODE - BACKUP/VHF RNG

CAUTION

No VHF voice transmission for
~12 sec after VHF RNG - RESET

VHF RNG - RESET (1 sec min)

EMS RANGE ind - BBBB00

P20 operating, TRACKER 1t - out

EMS RANGE ind - BXXX XX

V83E (if desired)

R1 = RANGE

R2 = RANGE RATE

R3 = θ

V85E (if desired)

R1 = RANGE

R2 = RANGE RATE

R3 = \emptyset

4

RNDZ XPNDR ACTIVATION & SELF TEST (DECAL)

cb RNDZ XPNDR FLT BUS - close (verify)

RNDZ XPNDR - HTR for 24 min
(1 min if self test only)

RNDZ XPNDR - PWR

SYS TEST (lh) - XPNDR

SYS TEST (rh) - A (RRT XMTR OUT PWR)

SYS TEST ind - >1 vdc

SYS TEST (rh) - B (RRT AGC SIG)

RNDZ XPNDR - TEST (hold)

SYS TEST ind - >1 vdc

RNDZ XPNDR - OPERATE

SYS TEST ind - 0 - 4.5 vdc

SYS TEST (rh) - C (RRT FREQ LOCK)

SYS TEST ind - <.8 vdc unlocked, >4 vdc locked

SYS TEST - 5B (BAT RLY BUS)

DATE 8/21/72

LM INTERFACE

COVER JETT

EPS (OVER)

5

TAPE RECORDER OPERATION1 RECORD CSM & LM VOICE/DATA

PWR - AUDIO/TONE

MODE - INTERCOM/PTT

SUIT PWR - ON

INTERCOM T/R - T/R

VHF AM A&B - OFF (preferred if LM
voice/data not reqd)

If VHF AM A&B - SIMPLEX or DUPLEX

VHF AM SQUELCH A&B - noise +1

PCM BIT RATE - as desired

Comm Carrier (preferred)

If LWHS, position mike 1/2 inch from mouth

Go to step 3

2 RECORD SIM DATA

DATA SYS ON - ON

PCM BIT RATE - HIGH

Go to step 3

3 TAPE RCDR FWD - STOP then RWD

TAPE RCDR RCD - RCD

TAPE RCDR FWD - STOP then FWD

4 DUMP CSM VOICE/DATA

S-BD AUX TAPE - TAPE

TAPE RCDR PCM - PCM/ANLG

Go to step 7

5 DUMP SIM DATA & CSM VOICE/DATA

S-BD AUX TV - SCI

DATA SYS ON - ON

Go to step 7

6 DUMP LM DATA

S-BD AUX TAPE - TAPE

TAPE RCDR PCM - LM PCM

Go to step 7

7 TAPE RCDR FWD - STOP then RWD

TAPE RCDR RCD - PLAY

TAPE RCDR FWD - STOP then FWD (On MSFN cue)

6

COMM MODESAWAKE CONFIGURATION

S BD XPNDR - PRIM
S BD PWR AMPL - PRIM
S BD PWR AMPL HI - HI
S BD MODE VOICE - VOICE
S BD MODE PCM - PCM
S BD RNG - RNG
S BD AUX TAPE - off (ctr)
S BD AUX TV - SCI (TLC - off (ctr))
UP TLM DATA - DATA
UP TLM CMD - NORM
VHF AM A - off (ctr)
VHF AM B - off (ctr)
VHF RCV ONLY - off (ctr)
VHF RNG - OFF
TAPE RCDR PCM - PCM/ANLG
TAPE RCDR RCD - RCD
TAPE RCDR FWD - FWD
SCE PWR - NORM
PMP PWR - NORM
PCM BIT RATE - HIGH (TLC - LOW)
S BD SQUELCH - OFF
HI GAIN ANT PWR - PWR
HI GAIN ANT TRACK - MAN
HI GAIN ANT BEAM - WIDE
HI GAIN ANT SERVO ELEC - PRIM
DATA SYS ON - ON (TLC - OFF)

ASLEEP CONFIGURATION (AWAKE deltas)

S BD SQUELCH - ENABLE
S BD NORM MODE VOICE - off (ctr)
1 HI GAIN OPERATION:
 TLC/TEC: P,Y = +40,270 (ROLL RIGHT)
 P,Y = -40, 90 (ROLL LEFT)
 LUNAR ORB: (60x60) P,Y = -10,+25 (+X Fwd)
 (60x60) P,Y = +25,+195 (-X Fwd)
 (60x14) P,Y = +15,+190 (-X Fwd)
 HI GAIN ANT BEAM - NARROW
 HI GAIN ANT TRACK - REACQ
 S BD ANT - HI GAIN

2 OMNI OPERATIONS: (LUNAR ORB - N/A)
S BD ANT - OMNI
S BD ANT OMNI - B
TAPE RCDR FWD - off (ctr)

For the following mission phases select the AWAKE CONFIGURATION plus the specified deltas:

- A VHF RANGING, VOICE
VHF AM B - DUPLEX
VHF RNG - on (up)
- B VHF LM-CSM VOICE DATA
VHF AM A - SIMPLEX
VHF RCV ONLY - B DATA
- C CONTINGENCY
VHF AM A - SIMPLEX
VHF AM B - SIMPLEX
- D RELAY MODE (LM VOICE TO MSFN)
Voice Relay (With VHF Ranging)
MODE - VOX (Pn1 10)
VOX SENS tw - 5
S BD - OFF
INTERCOM - OFF
VHF AM - T/R
AUDIO CONT - BU
MODE - VOX (Pn1 9)
VOX SENS tw - as req
S BD MODE VOICE - RELAY
VHF AM B - DUPLEX
VHF RNG - on (up)
- Voice Relay (With LM LBR PCM record)
MODE - VOX (Pn1 10)
VOX SENS tw - 5
S BD - OFF
INTERCOM - OFF
VHF AM - T/R
AUDIO CONT - BU
MODE - VOX (Pn1 9)
VOX SENS tw - as req
S BD MODE VOICE - RELAY
VHF AM A - SIMPLEX
VHF RCV ONLY - B DATA

PRESLEEP CHECKLIST

- ✓ ONBOARD READOUTS (every other day/flt plan)
- ✓ CYCLE H2 FANS (3)
- ✓ CHLORINATE POTABLE WATER
- ✓ CLEAN SUIT CKT RET SCREEN
- VERIFY:
 - ✓ WASTE MGT OVBD DRAIN vlv - OFF
 - ✓ WASTE STOW VENT vlv - CLOSED
 - ✓ OPTICS ZERO - ZERO (Manually drive <10° of zero)
 - ✓ G&N POWER OPTICS - OFF
 - ✓ STOW OPTICS
 - ✓ INSTALL WINDOW SHADES
 - ✓ EMERGENCY CABIN PRESS - BOTH
 - ✓ SURGE TANK 02 vlv - ON
 - ✓ REPRESS PKG 02 vlv - OFF
 - ✓ CABIN PRESS RELF vlv (RH/LH) - NORMAL
 - ✓ PRESS EQUAL vlv - CLOSE
 - ✓ LM TUNNEL VENT vlv - LM/CM ΔP (LM on)
- OFF (LM off)
- After CM EVA, use OPS 02 to press cabin to 5.7 psia (see OPS QUICK BLEED DOWN, C/2-26). When OPS 02 depleted, stow OPS with OPS 02 vlv - ON (open).
- Status of Tone Booster
- Cryo Configuration
- ✓ Update Film Status Report
- CONFIGURE COMMUNICATIONS (S/1-27)

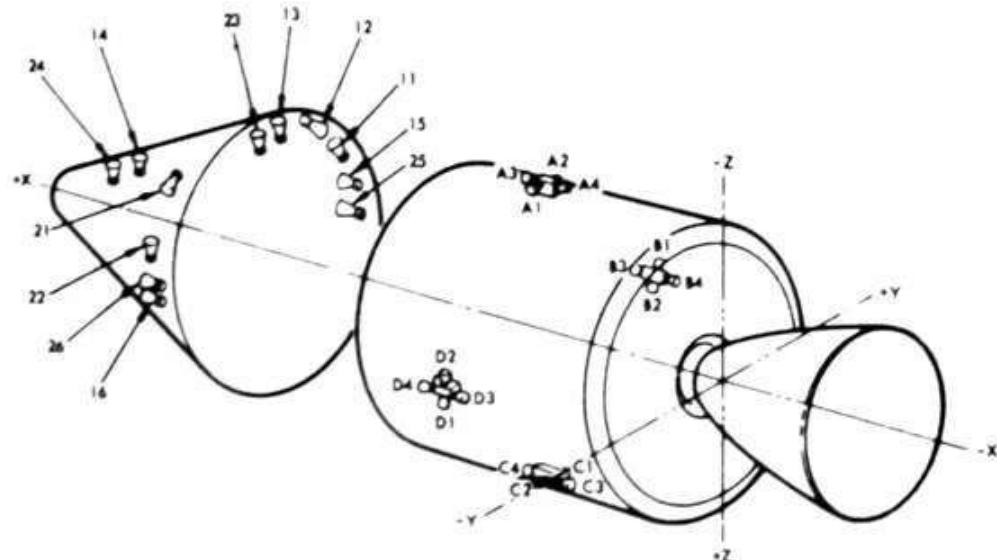
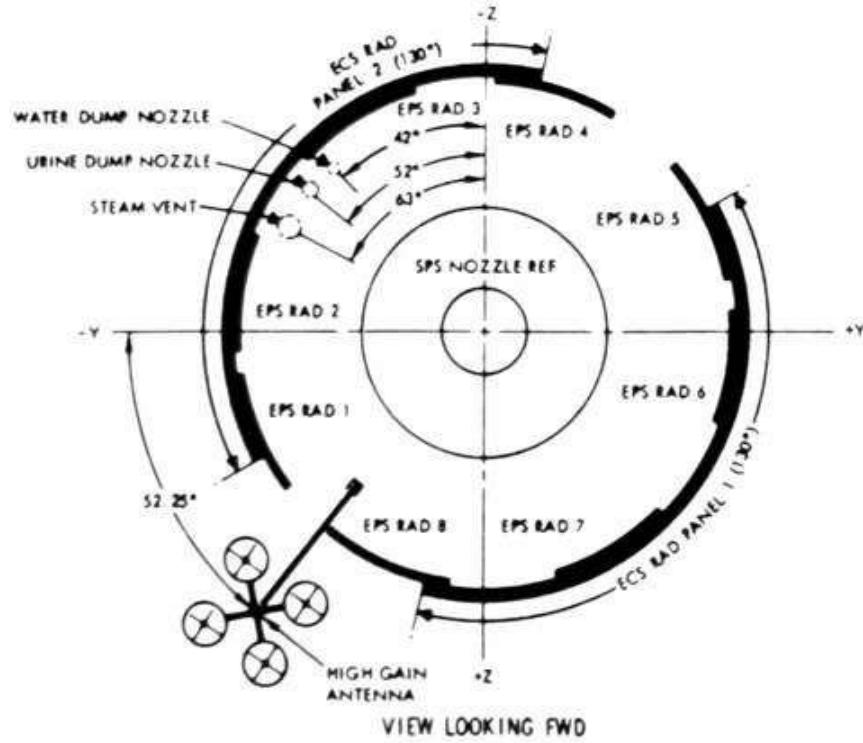
DATE 11/6/72POSTSLEEP CHECKLIST

- S-BD MODE VOICE - VOICE
- S-BD SQUELCH - OFF
- CREW STATUS REPORT (PRD, SLEEP, MED, FLUIDS, FOOD)
- CONSUMABLES UPDATE
- WIND WATCHES

LM INTERFACE

COVER AREA
COVER JETT

EPS (OVER)

CM RCS CODE

FIRST DIGIT = SYSTEM (1 OR 2)
SECOND DIGIT: 1 (+, -ROLL) 3, 4 (+, -PITCH) 5, 6 (+, -YAW)

SM RCS CODE

1 AND 2 ARE ROLL ENGINES
3 AND 4 ARE A/C PITCH OR B/D YAW ENGINES
1 AND 3 = + ROTATION, 2 AND 4 = - ROTATION

RCS Engine, Vent, and Radiator Locations

DATE 8/21/72

DATE 11/6/72

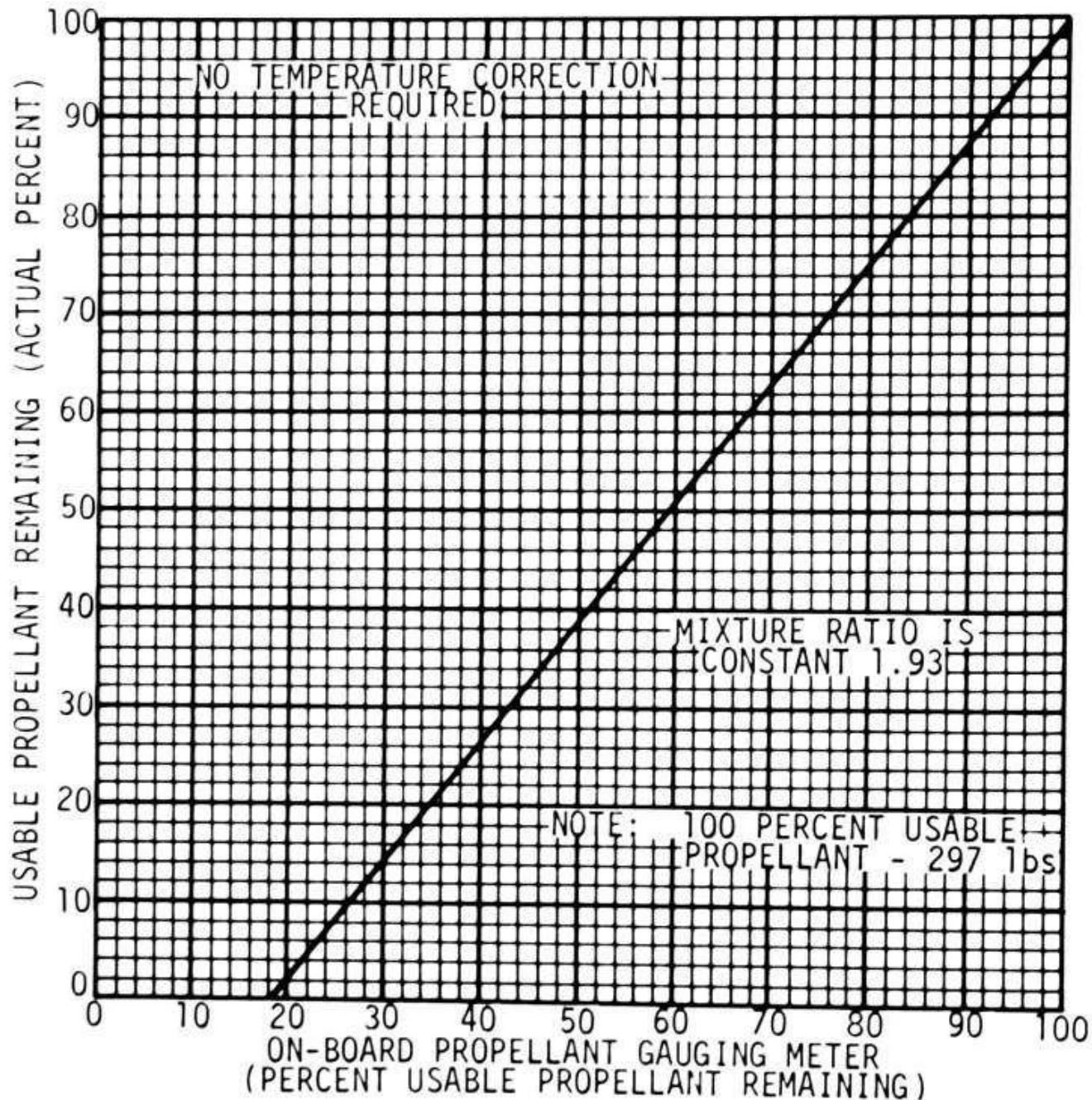
S S
System Test Indicator Conversion Chart

| SYSTEM TEST Indicator Display | Cryo 02 Htr Temp (°F) | O2, H2 Pressure (psia) | EPS Rad Out Temp (°F) | CM-RCS Oxid Vlv Temp (°F) | LM Power (amps) | SPS Temp (°F) | Battery Compartment Manifold Pressure (psia) | Battery Relay Bus (vdc) |
|-------------------------------|-----------------------|------------------------------|-----------------------|---------------------------|-----------------|---------------|--|-------------------------|
| 0.0 | -300 | 0 0 | -50 | -50 | 0 | 0 | 0.00 | 0 |
| 0.2 | -264 | 3 3 | -36 | -46 | 0.4 | 8 | 0.80 | 1.8 |
| 0.4 | -228 | 6 6 | -22 | -42 | 0.8 | 16 | 1.60 | 3.6 |
| 0.6 | -192 | 9 9 | -8 | -38 | 1.2 | 24 | 2.40 | 5.4 |
| 0.8 | -156 | 12 12 | +6 | -34 | 1.6 | 32 | 3.20 | 7.2 |
| 1.0 | -120 | 15 15 | +20 | -30 | 2.0 | 40 | 4.00 | 9.0 |
| 1.2 | -84 | 18 18 | +34 | -26 | 2.4 | 48 | 4.80 | 10.8 |
| 1.4 | -48 | 21 21 | +48 | -22 | 2.8 | 56 | 5.60 | 12.6 |
| 1.6 | -12 | 24 24 | +62 | -18 | 3.2 | 64 | 6.40 | 14.4 |
| 1.8 | +24 | 27 27 | +76 | -14 | 3.6 | 72 | 7.20 | 16.2 |
| 2.0 | +60 | 30 30 | +90 | -10 | 4.0 | 80 | 8.00 | 18.0 |
| 2.2 | +96 | 33 33 | +104 | -6 | 4.4 | 88 | 8.80 | 19.8 |
| 2.4 | +132 | 36 36 | +118 | -2 | 4.8 | 96 | 9.60 | 21.6 |
| 2.6 | +168 | 39 39 | +132 | +2 | 5.2 | 104 | 10.40 | 23.4 |
| 2.8 | +204 | 42 42 | +146 | +6 | 5.6 | 112 | 11.20 | 25.2 |
| 3.0 | +240 | 45 45 | +160 | +10 | 6.0 | 120 | 12.00 | 27.0 |
| 3.2 | +276 | 48 48 | +174 | +14 | 6.4 | 128 | 12.80 | 28.8 |
| 3.4 | +312 | 51 51 | +188 | +18 | 6.8 | 136 | 13.60 | 30.6 |
| 3.6 | +348 | 54 54 | +202 | +22 | 7.2 | 144 | 14.40 | 32.4 |
| 3.8 | +384 | 57 57 | +216 | +26 | 7.6 | 152 | 15.20 | 34.2 |
| 4.0 | +420 | 60 60 | +230 | +30 | 8.0 | 160 | 16.00 | 36.0 |
| 4.2 | +456 | 63 63 | +244 | +34 | 8.4 | 168 | 16.80 | 37.8 |
| 4.4 | +492 | 66 66 | +258 | +38 | 8.8 | 176 | 17.60 | 39.6 |
| 4.6 | +528 | 69 69 | +272 | +42 | 9.2 | 184 | 18.40 | 41.4 |
| 4.8 | +564 | 72 72 | +286 | +46 | 9.6 | 192 | 19.20 | 43.2 |
| 5.0 | +600 | 75 75 | +300 | +50 | 10.0 | 200 | 20.00 | 45.0 |
| SYS TEST sel | 1A,1B,1C | (O2)10,2A,2B (H2)2C,2D,3A | 3B,3C,3D | 5C,5D,6A 6B,6C,6D | 7J | 5A | 7A | 5B |

EPS (OVER)

COVER JETT

LM INTERFACE

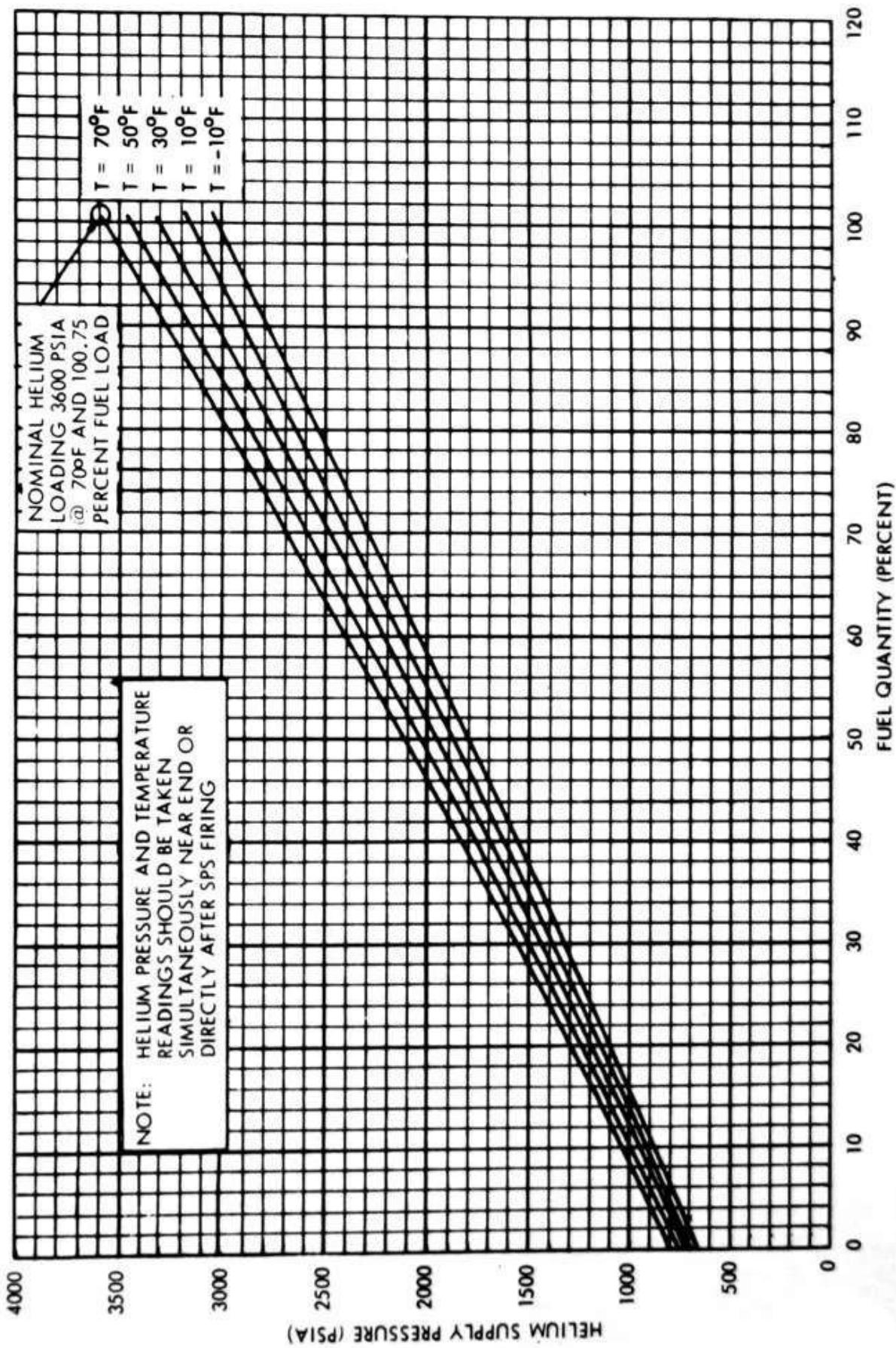


Minus Two-Sigma SM RCS On-Board Propellant
Gauging Meter Correction Nomograph

DATE 8/21/72

DATE 8/21/72

SPS Propellant Nomograph



EPS (OVER)

COVER JETT

LM INTERFACE

LM INTERFACE

IVT TO LM (CHECKOUT, TLC)

At 2 hours prior to IVT to LM:

TUNL VENT vlv - LM/CM ΔP

Verify LM/CM $\Delta P > 2.7$ psid

*LM/CM $\Delta P < 2.7$ psid *

*TUNL VENT vlv - VENT *

* till LM/CM $\Delta P > 2.7$ psid*

At least 30 min. prior to IVT to LM:

DIRECT 02 vlv - OPEN until

CAB PRESS = 5.7 psia, then close.

Couches: CDR - 0°, CMP - 0°, LMP - 180°

TUNL LTS - ON

Equalize CM/LM pressure (Decal B) (1B)

Remove tunnel hatch (Decal) (2)

Remove probe & stow (Decal) (3)

Remove drogue & stow (Decal) (4)

Read docking tunnel index angle _____

Open LM hatch

LMP Transfer to LM (5)

Transfer items per LM Activation Checklist

At LM request

LM PWR - RESET, then OFF

Report GET to MSFN - GET ____:____:____

SYS TEST - 7D

SYS TEST ind - 0 volts

Perform comm checks with LM

At LM request

LM PWR - CSM

SYS TEST - 7D

SYS TEST ind - 0.5 - 3.2 volts

LMP Transfer to CSM (6)

Close LM hatch

Install drogue (Decal) (8)

Install probe (Decal) (9)

Install tunnel hatch (Decal) (12)

TUNL VENT vlv - LM/CM ΔP

TUNL LTS - OFF

DATE 8/21/72

LM INTERFACE

COVER JETT

EPS (OVER)

IVT TO LM (UNDOCKING, PDI)Couches: CDR - 0° , CMP - 0° , LMP - 180°

TUNL LTS - on (up)

TUNL VENT vlv - LM/CM ΔP Verify LM/CM $\Delta P < 0.2$ *LM/CM $\Delta P > 0.2$

* Equalize CM/LM Pressure*

* (Decal) (1) *

Remove tunnel hatch (Decal) (2)

Remove probe & stow (Decal) (3)

Remove drogue & stow (Decal) (4)

Verify docking tunnel index angle

Open LM hatch

LMP transfer to LM (5)

At LM request,

LM PWR - RESET, then OFF

SYS TEST - 4D

SYS TEST ind - 0 volts

Transfer items per LM Activation Checklist

CDR transfer to LM (5)

Remove LM umbilicals (7)

Install drogue (Decal) (8)

Install probe (Decal) (9)

Preload probe (Decal) (10)

Perform Probe Umbilical Verification (11)

LM hatch closed

Verify CSM roll cmds inhibited

until LM/CM $\Delta P > 3.5$ psid ($> 3.5, 2$ jet; $> 4, 4$ jet)

Verify LM & CM Suit Check complete

Release docking latches (Decal) (14)

Install tunnel hatch (Decal) (12)

Perform hatch integrity check (Decal) (13)

Perform Contingency EVA Prep (optional)

FINAL IVT TO CSM

- CDR FWD DUMP vlv - AUTO (verify)
- CMP Equalize CSM/LM Pressure (LOD)(Decal) (15)
 Remove tunnel hatch (Decal) (2)
 Verify docking latches engaged (at least 3)
 Remove & temp stow probe (Decal) (3)
 Remove & temp stow drogue (Decal) (4)
 Transfer items to CDR at his request
 Receive items from LM & stow
- CDR Transfer to CSM (6)
 Transfer CSM jettison items to LM
- LMP Close LM hatch
 Transfer to CSM (6)
- CMP DIRECT O2 vlv - close (CW)
 Install tunnel hatch (Decal) (12)
 Perform hatch integrity check (Decal) (13)

SUB-CHECKLIST1 CM/LM PRESSURE EQUALIZATION (Decal)A. LM/CM ΔP <2.4 PSID

CRYO PRESS IND - SRG/3

Verify CRYO O2 PRESS 1/SRG ind - 865-935 psia

EMER CAB PRESS sel - OFF

REPRESS PKG vlv - OFF

DIRECT O2 vlv - close (CW) (verify)

PRESS EQUAL vlv - OPEN

O2 FLOW ind - 1.0 lb/hr (Pegged)

O2 FLOW HI lt - on

MASTER ALARM pb/lt (3) - ON, push

LM/CM ΔP ~0.0 psi

CAB PRESS ind ~5.0 psia

EMER CAB PRESS sel - BOTH

B. LM/CM $\Delta P > 2.4$ PSID

02 TK HTR (3) - AUTO

(Overpressurization of CM to 5.7 psia required at least 30 min. in advance)

CRYO PRESS IND - SRG/3

Verify CRYO 02 PRESS 1/SRG ind - 865-935 psia

EMER CAB PRESS sel - OFF

REPRESS PKG vlv - OFF

DIRECT 02 vlv - close (CW) (verify)

TUNL VENT vlv - LM/CM ΔP LM/CM ΔP ind - > 3.1 psid

PRESS EQUAL vlv - OPEN

(C)

LM/CM ΔP - 2.0 psid

PRESS EQUAL vlv - CLOSE

MONITOR LM/CM ΔP ind for 3 minand verify ΔP stable

PRESS EQUAL vlv - OPEN

CAB PRESS ind - 4.0 psia

REPRESS 02 vlv - OPEN

CAB PRESS ind 5.7 psia

Cycle REPRESS 02 as required

between 4.0 and 5.7 psia limits

until REPRESS 02 PRESS ind

 ~ 0.0 psia

REPRESS 02 - CLOSE

CAB PRESS ind > 4.0 psia*If CAB PRESS ind < 4.0 psia-*

* PRESS EQUAL vlv - CLOSE *

LM/CM ΔP ind - ~ 0.0 psiCAB PRESS ind - ~ 5.0 psia

EMER CAB PRESS sel - BOTH

CRYO 02 PRESS 1/SRG ind (SURGE TK) - > 400 psia

REPRESS PKG vlv - FILL to 865-935

TUNL VENT vlv - OFF

WASTE STOW vlv - VENT (until cabin purge complete at 8 hrs)

02 TK HTR (3) - as reqd

HATCH
1
(C)

- 2 TUNNEL HATCH REMOVAL (Decal)
 PRESS EQUAL vlv - open (CCW)
 ACTR HNDL - unstow, pull to stop, set to U
 - push to stop
 Verify gearbox disconnect socket - U
 ACTR HNDL SEL - stow, push handle to stow
 Remove hatch, stow

3 PROBE REMOVAL (CM Side) (Decal)

A. Translunar Docking:

Verify EXTEND LATCH engaged indicator
 (red) not visible

- *EXTEND LATCH not engaged: *
- * PRELOAD SEL LEVER-rotate CW(away from*)
- * orange stripe) *
- * PRELOAD HNDL - Torque CCW to engage *
- * extend latch (red ind. not visible)*

GN2 BLEED button (red) - press (10 sec)
 PRELOAD SEL LEVER - rotate CCW (parallel
 to orange stripe)
 PRELOAD HNDL - Torque (CW) to unload support beams

B. Lunar Orbit Docking:

NOTE: Probe may be hot from stay in Lunar orbit
 PRELOAD SEL LEVER - rotate CW(away from orange
 stripe)

PRELOAD HNDL - torque CCW to engage EXTEND LATCH
 (red indicator not visible)

GN2 BLEED button (red) - press (10 sec)

C. Both TLD & LOD:

PROBE UMBILICALS(2)(yellow) - disconnect and stow
 Elec connector covers (2)(yellow) - close
 PRELOAD HNDL - position against umbilical
 connector

PRELOAD SEL LEVER - mid position

INSTALLATION STRUT - unstow, position on tunnel
 wall (yellow marks)

CAPTURE LATCHII RLSE HNDL LOCK - Rotate CCW to un-
 lock (orange stripe visible)

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COVER JETTG&L SPS
EPS (OVER)

- S
2-6
- RATCHET HNDL - unstow to full extension
- push to first detent (red band)
- push outbd and hold to fold probe DOCK
- RATCHET HNDL - pull to full extension 1
- ratchet one stroke only
- Restow RATCHET HANDL and INSTALLATION STRUT
- CAPTURE LATCH RLSE HNDL - Pull, rotate to unlock (180° CW)
- push to recess

*Capture latches will not release: *
* Ratchet probe forward *
* Preload probe until latches release*

Remove PROBE - pull aft to release (25 lbs)

4 DROGUE REMOVAL (Decal)

LOCK LEVER - Pull, rotate 90° CCW
DROGUE - rotate CW, push clear of support,
remove from tunnel

5 CREW TRANSFER TO LM (Suited)

CDR and LMP Audio Panels:

PWR - OFF

SUIT PWR - OFF

AUDIO CONT - NORM

CDR and LMP SUIT FLOW vlv - OFF

Connect to TRANSFER UMB if desired

6 CREW TRANSFER TO CSM (Suited)

CDR and LMP Audio Panels:

Verify/set PWR - OFF

Verify/set SUIT PWR - OFF

Verify/set AUDIO CONT - NORM

Verify/set CDR and LMP SUIT FLOW vlv - OFF

Connect to TRANSFER UMB if desired

LMP transfer to CSM

7 REMOVE LM UMBILICALS (FINAL)

LM Connector Fairings (2) (orange) - open
Connectors (2) - release and remove
Fairings (2) - close
Pull lanyard on LM end of umbilical
Remove umbilicals from tunnel, stow in F1 or F2

8 INSTALL DROGUE (Decal)

DROGUE - Align Lugs with fittings,
rotate CCW to stops
LOCK LEVER - Rotate 90° CW to detent

9 INSTALL PROBE (Decal)

CAPTURE LATCH RLSE HNDL - Pull, rotate CCW to
cock pos (150°)

Push PROBE into DROGUE
CAPTURE LATCH RLSE HNDL -rotate CCW to LOCK posi-
tion (do not force)
-push to recess

Verify capture latches engaged (CDR)

INSTALLATION STRUT - unstow, position on tunnel
wall (yellow marks)

RATCHET HNDL -unstow to full extension(green band)
-ratchet probe fwd to orange hash
mark (F)

Restow RATCHET HNDL and INSTALLATION STRUT

CAUTION: For stowage, adjust PRELOAD HANDLE until
probe loose in tunnel and position at
45° to support beam.

Verify RATCHET PAWL indicator(red) flush with
housing

- *Ratchet pawl indicator not flush: *
- * Hold RATCHET HANDLE full outboard *
- * Press Pawl indicator to seat (flush)*
- * Release RATCHET HANDLE *

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EPS (OVER)

NOTE: For stowage, umbilical connection not req.

10 PRELOAD PROBE (Decal)

PRELOAD PROBE (Beav.)
PRELOAD SEL LEVER - rotate CCW(parallel to orange stripe)

PRELOAD HNDL - torque (CW) to release

Verify capture latches engaged (CDR)

PRELOAD HNDL - Push inboard to detent,
pos 45° to support bea

PRELOAD SEL LEVER - mid position

Verify CAPTURE LATCH RLSE HNDL LOCK is locked
(orange stripe not visible)

11 PROBE UMBILICAL VERIFICATION

Release Docking Latch #1 and 7 (S/2-9)

cb DOCKING PROBE (2) - close

PROBE EXTD/REL - RETR

PROBE EXTD/REL tb (2) - bp (verify)

cb DOCKING PROBE (2) - open

PROBE EXTD/REL - OFF

Verify Probe Extend Latch engaged indicator (red) not visible

12 HATCH INSTALLATION (Decal)

HATCH

Align Hatch in tunnel

2

ACTR HNDL SEL - unstow, pull to stop, set to L
push to stop

Verify gearbox disconnect socket - L

*If latches cannot be closed: *

~~*GEARBOX DISCONNECT - 180° CCW (tool B)*~~

~~*AUX LATCH DRIVE - LATCH (113° CW)~~

Verify hatch latched, remove tool B

~~*(Cannot remove hatch from LM side)~~

ACTR HNDL SEL - stow, push handle to stow
PRESS EQUAL vly - CLOSED (CW) (B)

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DATE

13 HATCH INTEGRITY CHECK (Decal)

Verify LM Hatch Closed, DUMP vlv - AUTO (CDR)

Verify CABIN PRESS ind - 4.7-5.3 psi

TUNL VENT vlv - TUNL VENT for 30 sec

- LM/CM ΔP , check ΔP

- Recycle to TUNL VENT until $\Delta P > 3.5$
(~8 1/2 min)

*Cannot vent tunnel:

* If O2 FLOW ind increases, open hatch,

* wipe seal surfaces, close hatch

* If O2 FLOW ind does not increase, dump*

* tunnel through LM during reg check *

* Monitor LM/CM ΔP & flow to check *

* integrity *

Verify LM/CM ΔP ind constant ($\pm .2$) at last value
for 2 min

Verify O2 FLOW ind - no increase

Before Undocking only:

TUNL VENT vlv - LM TUNL VENT
for 10 min, then LM/CM ΔP

Verify LM/CM $\Delta P > 4.0$ (pegged)

TUNL VENT vlv - OFF

TUNNEL LIGHTS - OFF

Before Jettison only:

TUNL VENT vlv - TUNL VENT (at least 10 min)

TUNNEL LIGHTS - OFF

14 DOCKING LATCH RELEASE (Decal)

(G) (H)

RELEASE BUTTON - depress

LATCH HNDL - pull one or two strokes until bungee
recocks

Verify LATCH HOOK rotated inboard
to clear LM RING

* Hook does not dis-engage*

* AUX REL(yellow)- push *

* Release latch *

Verify/push LATCH HNDL outboard
against LATCH HOOK

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SATE UR APPLX
COVER JETT

3R2
EPS (OVER)

15 CSM/LM PRESSURE EQUALIZATION (LOD) (Decal)

CRYO PRESS IND - SRG/3

Verify CRYO O2 PRESS 1/SRG ind - 865-935 psia

REPRESS PKG vlv - OFF

Direct O2 vlv - OPEN until CAB PRESS

5.5 psia then CLOSE until O2 FLOW

<.5 lb/hr.

- OPEN adjust O2 FLOW

0.6 lb/hr.

TUNL VENT vlv - LM/CM ΔP

LM/CM ΔP ind - +4 psid (pegged)

PRESS EQUAL vlv - OPEN until LM/CM ΔP (C)
ind ~3 psid then CLOSE

Monitor LM/CM ΔP ind for 3 min and

verify ΔP stable

PRESS EQUAL vlv - OPEN

16 DOCKING LATCH VERIFICATION (Decal)

LATCH HNDL - Pull to verify hook engaged (12 latches)

* Not Engaged - Attempt to engage *
* before releasing*

LATCH IND BUTTON (Red) - Flush (12 latches)

Power BUNGEE FAIRING - Parallel to +X

* Not parallel - Push +X end of *
* bungee before releasing*

*UNLOCKED LATCHES:

* Release Latches

* * Hook does not disengage:

* * AUX REL (yellow)-push

* * Release latch

Engage Latch - push man-release

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Verify EXTEND LATCH engaged indicator (red)
not visible

GN2 BLEED button (red) - press (10 sec)

17 LM UMBILICAL CONNECTION (Decal)

- LM connector fairings (2) (orange) - open
- LM umbilical connectors (2) - install & lock
- LM connector fairings (2)(orange) - close
- SYS Test - 7D
- LM PWR - CSM
- SYS Test ind - 0.5-3.2 volts

18 MALFUNCTION LISTDOCKINGA Positive Indication Of No Capture

- THC -X, withdraw to formation flight distance
- PROBE EXTD/REL - EXTD/REL for 5 sec - RETR
- PROBE EXTD/REL tb (2) - gray (verify)
- Attempt redocking as before
- At contact THC +X until capture or 10 sec max

A²Still Positive Indication Of No Capture

- THC -X withdraw to formation flight distance
- Attempt redocking as before and
- PROBE EXTD/REL - EXTD/REL (hold) during final phase prior to contact
- At contact THC +X until capture or 10 sec max
After 6 sec, PROBE EXTD/REL - RETR

A³Final Docking AttemptCAUTION

Docking probe may be damaged if retracted without removing pyro covers.

Damage is acceptable if subsequent use is not required.

Pyro Cover Removal (TLD only)

Unstow Tools W & 1 (A-8)

Unstow helmet shield

Unstow EMU maint kit

Apply anti-fog (A-8)

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EPS (OVER)

LV

- PGA diverter vlv - EVA (horiz)
- Don helmet & gloves (S/1-7)
- CMP don helmet shield
- Suit Ckt Integ Ck (S/1-14)
- CM Pressure Dump (S/1-15)
- Remove Tunnel Hatch (decal) (S/2-5)
- Remove probe pyro cover (Tool W & 1)
- Install Tunnel Hatch (decal) (S/2-8)
- Cabin Repress (S/1-13)
- Doff helmet & gloves
- CM O2 Supply Refill (S/1-7)
- DIRECT O2 vlv - OPEN until cabin press = 5.7, then CLOSE
- SECS PYRO ARM (2) - SAFE
- SECS LOGIC (2) - OFF
- cb SECS ARM (2) - open
- THC, RHC - locked
- Remove access pn1 below pn1 276 (Tool E)
- Unstow Aux Dump Nozzle Htr Cable (A8)
- Unstow Docking Probe Aux Harness Cable (L2)
- UTIL PWR - OFF (verify)(pn1 15)
- Connect Aux Dump Nozzle Htr Cable to UTIL PWR connector
- Route cable to RHEB & connect to Docking Probe Aux Harness Cable
- Remove cover from conn J5 on top LDEC System A box and connect Docking Probe Aux Harness Cable
- THC, RHC - unlock
- Attempt docking as before and
- At contact
 - THC +X until hard dock or 10 sec max
 - UTIL PWR - on (up) while thrusting
 - UTIL PWR - OFF, after probe retract
- After hard dock CMC MODE - FREE

TUNNEL HATCH

- B Pressure Equalization Valve Will Not Close
- Remove Hatch
 - Use Tool B In External Tool Interface For Additional Leverage

- C Pressure Equalization Valve Will Not Open For TLD: Remove vlv screen (Tool W & 4)
- Remove potting from 4 vlv yoke retaining nuts (Tool #2)
- Loosen four (4) nuts retaining valve yoke ~ 1/10 inch (Tools W & 5)
- Using Tool B as fulcrum and Tool F as lever, pry valve yoke up allowing gas flow past seal and release as required until LM/CM $\Delta P = 0$.
- Tighten four (4) valve yoke retaining nuts (Tools W & 5) after tunnel hatch re-installation
For subsequent IVT: Repeat above procedure; or TUNL VENT vlv - LM PRESS, 12 hrs in advance

PROBE

- D Do Not Get Retraction Using PRIM 1 (< 30 sec)
- Initiate retraction using bottles in the following order:
- PROBE RETRACT - PRIM 2
- If no retraction, initiate PROBE RETRACT - SEC 1
- E Both tb's Not Gray After Undocking
- PROBE EXTD/REL - EXTD/REL for 5 sec
- PROBE EXTD/REL - RETR
- PROBE EXTD/REL tb (2) - gray (verify)
- F Pushing Ratchet Handle Outboard Does Not Ratchet Probe Forward
- Push ratchet handle to first detent (red band)
- Slowly push ratchet handle outboard ~25° until audible click. (If pushed outboard past point of click, probe will release).
- Repeat until orange hash mark is visible.

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//27/22/PET

SAFE OF APEX
COVER JETT

G&L SPS
EPS (OVER)

DOCKING LATCHESG Cannot Release Docking Latch By Pulling Handle

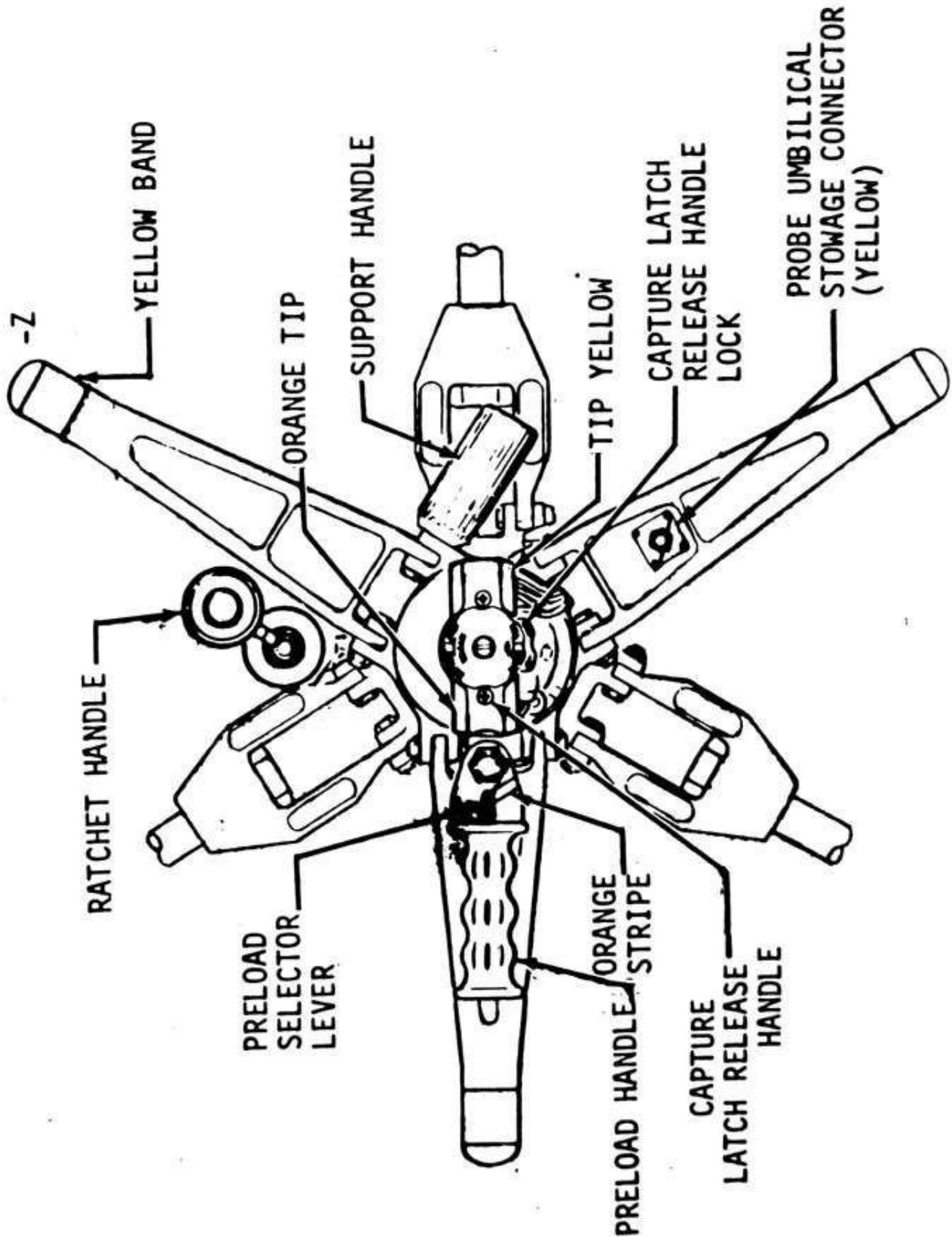
- Depress aft end of RH no-back pawl while pulling on latch handle.
- If unsuccessful, use tools E&R to depress LH no-back pawl while pulling on Latch Handle

TUNNELH High O2 Flow While Releasing Docking Latches

- Re-engage/verify 3 latches ~120° apart are engaged
- Slowly torque PRELOAD HNDL (CW) until breakout releases; repeat (3) times
- Release docking latches

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S
2-15

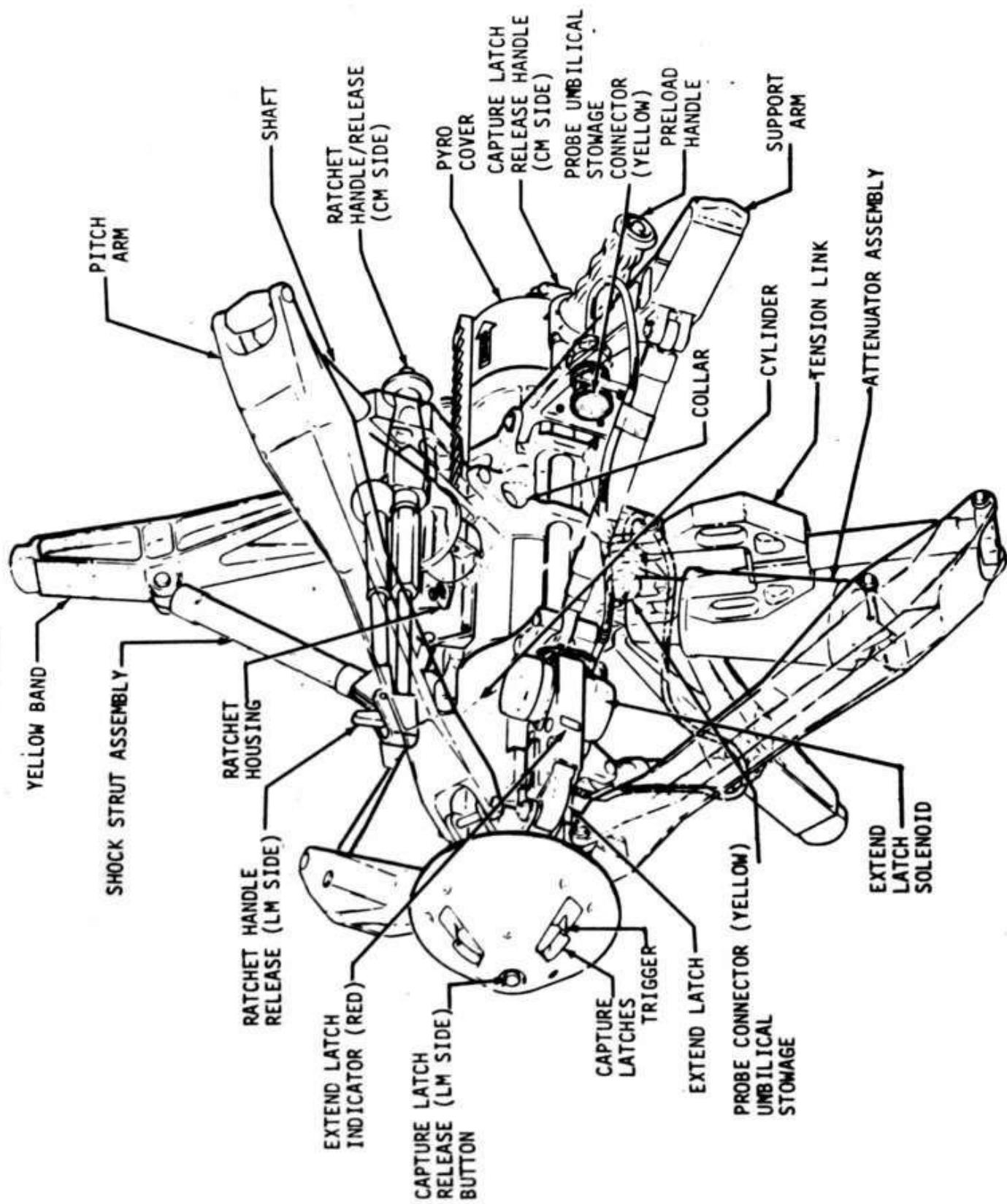


gut JPS
EPS (OVER)

SAFE OF APEX COVER JETT

LV

311 1100



SAFE OF APEX COVER JETT

If STDN NO GO For Pyro Arm Indicates Apex Cover Jettison,

SECS LOGIC (2) - OFF

cb ELS/CM-SM SEP (2) - open

SECS LOGIC (2) - ON

If STDN GO, Go To Step A

If Still Apex Cover Jettison,

cb SECS LOGIC A - open

If STDN GO, Go To Step C

If Still Apex Cover Jettison,

cb BAT A ENTRY/PL - open (Pn1 250)

If STDN GO, Go To Step E

If Still Apex Cover Jettison,

cb SECS LOGIC A - close

cb BAT A ENTRY/PL - close

cb SECS LOGIC B - open

If STDN GO, Go To Step D

If Still Apex Cover Jettison,

cb BAT B ENTRY/PL - open

If STDN GO, Go To Step F

If Still Apex Cover Jettison,

cb BAT B ENTRY/PL - close

ELS - MAN

ELS LOGIC - OFF

SECS LOGIC (2) - OFF

cb SECS LOGIC (2) - open

cb SECS ARM (2) - open

CMP To LEB

cb SEQ A&B PYRO A&B (2) - open (Pn1 250)

Verify PYRO BUS A&B voltage = 0

Remove closeout panel located beneath

pnl 276 (Tool E) (approx 10 fasteners
on panel).

Remove, or cut all wires to, conn
marked "cut" with white tag (P545). Tape
ends of any wires cut. Replace closeout pnl.

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SAFE OF APEX
COVER JETT

G&C SPS
EPS (OVER)

cb SEQ A&B PYRO A&B - close
Verify PYRO BUS A&B voltage >35 vdc
cb ELS/CM-SM SEP (2) - close
cb SECS LOGIC (2) - close
cb SECS ARM (2) - open (verify)
DO NOT ARM PYRO BUSES

Continue Normal Entry Except,

Perform CM RCS pressurization (no interconnect capability) & CM/SM Separation, Arm Pyros in the following manner:
SECS PYRO ARM (B) - SAFE (verify)
SECS PYRO ARM (A) - ARM

To Jettison Apex Cover At 24K':
SECS PYRO ARM (B) - ARM

STEP A

cb ELS/CM-SM SEP BAT A - close
cb ELS/CM-SM SEP BAT B - open (verify)
If STDN GO, Go to STEP B

If Still Apex Cover Jettison,
cb ELS/CM-SM SEP BAT B - close
cb ELS/CM-SM SEP BAT A - open
SECS LOGIC (2) - OFF, then ON

STDN confirm GO,
cb ELS/CM-SM SEP BAT A - open (verify), close
at or after apex cover jettison at 24K'
Continue normal entry

STEP B

cb ELS/CM-SM SEP BAT B - open (verify), close
at or after apex cover jettison at 24K'
Continue normal entry

STEP C

cb SECS LOGIC A - open (verify), close
at or after apex cover jettison at 24K'
Continue normal entry

STEP D

cb SECS LOGIC B - open (verify), close
at or after apex cover jettison at 24K'
Continue normal entry

STEP E

cb BAT A ENTRY/PL - open (verify)
Reconfigure Per:
Pwr Malf - Bat Bus A reconfig SSR-2
Bat Bus A Lost - Entry (EMER/1-13)

STEP F

cb BAT B ENTRY/PL - open (verify)
Reconfigure Per:
Pwr Malf - Bat Bus B reconfig SSR-2
Bat Bus B Lost - Entry (EMER/1-13)

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ECS, CRITICAL
BURNS (OVER)

G&C SPS
EPS (OVER)

LV

EMER
1-1

EMERGENCY CSM/LV SEPARATION

IF POWERED FLT

TRANS CONTR - CCW (4 SEC)

MN BUS TIES - ON

TVC SERVO PWR 1 - AC1/MNA

TVC SERVO PWR 2 - AC2/MNB

BMAG MODE (3) - ATT 1/RATE 2

GMBL MTRS (4) - ON

ΔV THRUST A - NORMAL

DIR ULLAGE & THRUST ON PB - PUSH

SPS BURN (5 SEC) - THEN ΔV THRUST (2) - OFF

SM RCS

LV

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ECS, CRITICAL
BURNS (OVER)

G&C SPS
EPS (OVER)

IF COASTING FLT

cb SECS ARM (2) (Pn1 8) - CLOSE

SECS LOGIC (2) - ON

SECS PYRO ARM (2) - ARM

ROT CONTR PWR DIR (2) - MNA/MNB

SC CONT - SCS

SEPARATE FROM LV AS APPLICABLE -

IF BEFORE DOCKING, THC CCW (4 SEC)

IF DOCKED, UMBIL NOT CONNECTED,
CSM/LM FINAL SEP (2) - ON

IF DOCKED, UMBIL CONNECTED, cb SIVB/LM SEP -
CLOSE (verify), SIVB/LM SEP - ON

TRANSLATE AWAY FROM LV & MANEUVER TO BURN ATTITUDE

Δ VCG - CSM OR LM/CSM AS APPLICABLE

MN BUS TIE (2) - ON

TVC SERVO PWR 1 - AC1/MNA

TVC SERVO PWR 2 - AC2/MNB

BMAG MODE (3) - ATT1/RATE 2

GMBL MTRS (4) - ON

Δ V THRUST A - NORMAL

DIR ULLAGE & THRUST ON PB - PUSH

SPS BURN (5) SEC - THEN Δ V THRUST (2) - OFF

SUIT COMPRESSOR LITE - CLOSED SUIT LOOP

SWITCH TO OTHER COMPRESSOR ON OTHER BUS
SEE ECS 9

02 FLOW HI + RAPID LOSS OF SURGE TK PRESS
+ CABIN PRESS <4.6 PSI

CABIN PRESS RELF v1vs (2) - CLOSE
✓ TUNNEL EQUALIZATION v1v - CLOSED
REPRESS PKG v1v - ON (WHEN SURGE TK PRESS <150 PSI)
✓ EMERG CABIN PRESS REGS - BOTH
DON SUITS

CONTAMINATION IN CM

DON 02 MASKS

CONTAMINATION IN CLOSED SUIT LOOP

CHANGE TO OTHER SUIT COMPR
DIRECT 02 v1v - FULL OPEN THEN ADJUST FOR SUIT
TO CABIN ΔP OF 2 IN OF H₂O

IF CONDITION PERSISTS

SUIT COMPR (2) - OFF
DOFF HELMETS
DIRECT 02 v1v - CLOSE
DON 02 MASKS

FIRE/SMOKE IN CM

MONITOR DC FOR HI CURRENT - REMOVE POWER
FROM ASSOCIATED INVERTER
IF CURRENT REMAINS HI - REMOVE POWER FROM
ASSOCIATED DC BUS
IF CLOSED SUIT LOOP, SWITCH SUIT COMPR TO GOOD AC BUS
IF HELMET OFF, SUIT COMPR (2) - OFF
RECONFIGURE INVERTER 3 ON LOST AC BUS
VERIFY RCS CONTROL POWER CONFIGURATION

IF HELMETS [DON 02 MASKS
OFF USE FIRE EXTINGUISHER OR H₂O GUN (OPTIONAL)]

IF CLOSED [USE FIRE EXTINGUISHER OR H₂O GUN (OPTIONAL)]
SUIT LOOP ✓ EMERG CABIN PRESS REGS - OFF
[IF FIRE PERSISTS - DUMP CABIN]

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ALARM CODES

ECS, CRITICAL
BURNS (OVER)G&C SPS
EPS (OVER)

SM RCS

G&N CRITICAL BURNS

IF NO START OR ISS LITE + PROG LITE
IF CMC LITE, PROG ALARM 1407 OR EARLY CUTOFF

SCS TVC (2) - AUTO

SC CONT - SCS

✓ ATTITUDE

SPS THRUST - DIRECT (MOMENTARY), IF REQ'd

IF ABNORMAL DYNAMICS

THC CW, control rates by MTVC
After SHUTDOWN, AUTO RCS (16) - OFF

SCS CRITICAL BURN

IF NO START OR EARLY CUTOFF

SPS THRUST - DIRECT (MOMENTARY)

IF RATE NEEDLE HARDOVER & FDAIs DIVERGE OPPOSITE

BMAG MODE (3) - RATE 1

THC - CW, use MTVC

IF ABNORMAL DYNAMICS IN AUTO MODE

THC - CW, use MTVC

BMAG MODE (3) - RATE 2

IF ABNORMAL DYNAMICS IN MTVC MODE

THC - CW

IF PROBLEM PERSISTS, SHUTDOWN
AUTO RCS (16) - OFF

SPS**IF NO CUTOFF AFTER ΔV THRUST (BOTH) - OFF**

cb SPS PILOT VLVS - open

IF EMS & N40 (R3) STILL COUNTING AFTER SHUTDOWN

SC CONT - SCS

TRANS CONT PWR - OFF

cb DIR ULLAGE (2) - open

IF CONDITION PERSISTS, AUTO RCS SEL (16) - OFF

SM RCS PRPLNT (AFFECTED QUAD) - OFF

SPS PRESS LITE

CONTINUE CRITICAL BURN

IF FUEL & OX PRESS (BOTH) > 200 PSISPS HE v1vs (2) - OFF, THEN CONTROL MANUALLY
BETWEEN 170-200 PSI**IF FUEL/OX ΔP > 20 PSI**

SPS HE v1vs (2) - ON

IF CONDITION PERSISTS, SPS HE v1vs(2)-OFF(Until $P_c < 70$)G&C (COASTING, ENTRY)**CMC LITE**

SC CONT - SCS

SEE G&N 5

ISS LITE + PROG ALARM LITE

SC CONT - SCS

SEE G&N 6

SM RCS

ALARM CODES

DATE 8/21/72

G&C SPS
EPS (OVER)

EMERGENCY POWER DOWN

CAUTION: USE BATT'S ONLY WHEN MAIN BUS VOLTS < 24.5

CONFIGURE FOR USE OF AUX BATTERY

FUEL CELL 2 MNA & MNB (2) - OFF
 cb CRYO 02 ISOL/AUX BAT - CLOSE (Pn1 226)
 SM PWR SOURCE - AUX BAT (mom) (Pn1 278)
 O2 TANK 3 ISOL - CLOSE (√TB-bp) (Pn1 278)
 FUEL CELL 2 MN A(B) - as desired

| ITEM | DC AMPS |
|---|------------|
| INSURE DSE IS RECORDING | |
| IF UNSUITED, SUIT COMP (2) - OFF | 4.0 |
| FC PUMPS (3) - OFF (Until Tskin > 475°F) | 8.7 TOTAL |
| cb G&N OPTICS MNA & MNB (2)- OPEN (Pn1 5) | 3.1 |
| G&N PWR (AC) - OFF (Pn1 5) | 0.9 |
| O2 HTRS (3) - OFF (CTR) | 17.0 |
| H2 HTRS (2) - OFF (CTR) | 1.4 EA |
| H2 FANS (3) - OFF (CTR) | 1.0 |
| C/W NORMAL - ACK | |
| LM PWR - RESET - OFF | 15.0 MAX |
| ECS RAD HTRS (2) - OFF | 17.2 EA |
| POT H2O HTR - OFF | 1.6 MAX |
| SM RCS HTRS (4) - OFF | 3.3 MAX EA |
| HGA PWR - OFF | 2.9 |
| LIGHTS - Min Rreqd | 5.3 MAX |
| EXT LTS - OFF | 4.6 |
| NON ESS BUS - OFF (SPS Burn-Damage SIM CAM) | 4 - 6 |
| VHF RANGING - OFF | 1.4 |
| S BD AUX TV - OFF (CTR) | 5.3 |
| SPS LINE HTR - OFF (CTR) | 6.2 (A/B) |
| RNDZ XPNDR PWR - OFF or HEATER (Pn1 100) | 3.0 |
| SIG CONDR/DRIVER BIAS PWR (2) - OFF | |
| SECURE ONE BMAG | 2.6 |
| SELECT SINGLE JET CONTROL | |
| EMS FUNC - OFF | |
| RHC PWR DIRECT (2) - OFF | |
| THC PWR - OFF | |
| CONFIGURE FOR SINGLE INVERTER OPERATION | |
| TURN OTHER INVERTER OFF | 4.0 MAX |
| BAT CHGR - OFF | |
| NOTE MISSION TIME | |
| cb TIMERS (2) - OPEN (Pn1 229) | |
| AC INVERTER (9) - OFF | |
| CM RCS HTRS - OFF | |
| ISOLATE FAILED FC's from MAIN BUSES | |

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| | |
|--|----------------------|
| ECS POWER DOWN | 3.7 TOTAL |
| ECS GLY PUMP sel - OFF (ISS LIMIT 2.5 HRS) | 2.6 |
| ECS RAD FLOW CONT PWR - off (CTR) | 0.7 |
| GLY EVAP TEMP IN - MAN | |
| ECS RAD HTRS (2) - OFF | |
| GLYCOL EVAP H2O FLOW - OFF | ~0.1 |
| GLYCOL EVAP STEAM PRESS - MAN | ~0.2 |
| COMM POWER DOWN | 13.0 TOTAL |
| IF VOICE DESIRED | |
| UP TLM CMD RESET - RESET then OFF | |
| S-BD AUX TAPE - DN VOICE BU | |
| S-BD MODE PCM - OFF | |
| PCM BIT RATE - HIGH | |
| S-BD PWR AMP - OFF (CTR) | 4.0 |
| TAPE RCDR - OFF (CTR) | 1.6 |
| SCE PWR - OFF (CTR) | 0.7 |
| cb INSTR ESS MNA & MNB (2) - OPEN (Pn1 5) | 4.9 |
| TELCOM GRP 1 & 2 (2) - OFF | 1.6 |
| CMC/IMU POWER DOWN | 6.0 IMU |
| COMPLETE ALIGNMENT TRANSFER | |
| CMC MODE - FREE | PROVIDES CMC MIN IMP |
| cb G&N IMU MNA & MNB (2) - OPEN (Pn1 5) | |
| V37E06E | 3.0 CMC |
| F V50 N25, 00062, CMC PWR DN | |
| PRO, HOLD (~5 SEC) UNTIL STBY LT - ON | |
| SCS POWER DOWN | 6.0 |
| ACCEPTABLE S/C ATTITUDE | |
| BMAG PWR (2) - OFF | |
| FDAI/GPI PWR - OFF | PROVIDES MIN IMP |
| SCS ELECTRONICS PWR - ECA | (REQUIRES AC1 & MNB) |
| ORDEAL PWR & LIGHTING - OFF | |
| cb SCS LOGIC BUS (4) - OPEN (Pn1 8) | 2.0 |
| SCS ELECTRONICS PWR - OFF | |
| RHC PWR NORM (2) - OFF | |

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ALARM CODES

SM RCS

LAUNCH BUS LOSS**MN BUS A LOST - LAUNCH**

EDS AUTO/OFF - OFF
TVC GMBL DR (P,Y) - 2
SCS TVC (P,Y) - RATE CMD
BMAG MODE (3) - RATE 2
FDAI SEL - 2
cb SPS PITCH 2 & YAW 2 (Pn1 8) - OPEN
(AFTER GIMBAL MOTORS ON)

AC INV 3 - MNB

AC INV 3 AC 1 - ON

AC INV 1 AC 1 - OFF

A11 F/C MNA - OFF

A11 F/C MNB - MNB (BEFORE CM/SM SEP)

cb MNA BAT BUS A (Pn1 275) - OPEN

cb MNB BAT C (Pn1 275) - CLOSED

MN BUS B LOST - LAUNCH

EDS AUTO/OFF - OFF
TVC GMBL DR (P,Y) - 1
SPS TVC (P,Y) - RATE CMD
✓BMAG MODE (3) - RATE 1
FDAI SEL - 1
cb SPS PITCH 1 & YAW 1 (Pn1 8) - OPEN
(AFTER GIMBAL MOTORS ON)

AC INV 3 - MNA

AC INV 3 AC 2 - ON

AC INV 2 AC 2 - OFF

A11 F/C MNB - OFF

A11 F/C MNA - MNA (BEFORE CM/SM SEP)

cb MNB BAT BUS B (Pn1 275) - OPEN

cb MNA BAT C (Pn1 275) - CLOSED

EARTH/POST LANDING

LV

CRITICAL BURNS

EPS

AC BUS 1 LOST - LAUNCH

B MAG MODE (3) - RATE 2
FDAI SEL - 2
TVC SERVO PWR 1 - AC2/MNB
SCS TVC PITCH, YAW - RATE CMD

AC INV 1 MNA - OFF
SUIT COMPR - AC 2
ECS GLY PUMP - AC 2
S BD NORM XPNDR - SEC
S BD NORM PWR AMP - SEC

AC BUS 2 LOST - LAUNCH

✓B MAG MODE (3) - RATE 1
FDAI SEL - 1
TVC SERVO PWR 2 - AC1/MNA
MTVC WITH THUMBWHEELS (MODE III OR IV)

AC INV 2 MNB - OFF
✓SUIT COMPR - AC 1
✓ECS GLY PUMP - AC 1

BAT BUS A LOST - LAUNCH

EDS AUTO/OFF - OFF
AUTO RCS SEL (RING 1) - OFF
IF BUS LOST BEFORE GMBL MTRS ON
TVC GMBL DR (P,Y) - 2
cb SPS P2 & Y2 (Pn1 8) - OPEN
(AFTER SEC GIMBAL MOTORS ON)
cb MNA BAT C (Pn1 275) - CLOSED

BAT BUS B LOST - LAUNCH

EDS AUTO/OFF - OFF
AUTO RCS SEL (RING 2) - OFF
IF BUS LOST BEFORE GMBL MTRS ON
TVC GMBL DR (P,Y) - 1
cb SPS P1 & Y1 (Pn1 8) - OPEN
(AFTER PRI GIMBAL MOTORS ON)
cb MNB BAT C (Pn1 275) - CLOSED

SPS BURN BUS LOSS**MN BUS A LOST - SPS BURN**

TVC GMBL DR (P,Y) - 2
 SCS TVC (P,Y) - RATE CMD
 cb SPS P2 & Y2 (Pn1 8) - OPEN
 (CRIT BURNS - AFTER GMBL MTRS ON)
 FDAI SEL - 2
 ✓FDAI SOURCE - CMC
 RHC PWR DIRECT 2 - MNB
 BMAG MODE (3) - RATE 2
 ✓ Δ V THRUST B - NORM
 AUTO RCS SEL - MNB

LV

AC INV 3 - MNB
 AC INV 3 AC 1 - ON
 AC INV 1 AC 1 - OFF
 A11 F/C MNA - OFF
 A11 F/C MNB - MNB
 cb MNA BAT BUS A (Pn1 275) - OPEN

MN BUS B LOST - SPS BURNS

SCS TVC (P,Y) - RATE CMD
 TVC GMBL DR (P,Y) - 1
 cb SPS P1 & Y1 (Pn1 8) - OPEN
 (CRIT BURNS - AFTER GMBL MTRS ON)
 FDAI SEL - 1
 ✓FDAI SOURCE - CMC
 RHC PWR DIRECT 1 - MNA
 BMAG MODE (3) - RATE 1
 ✓ Δ V THRUST A - NORM
 AUTO RCS SEL - MNA

CRITICAL BURNS

EPS

EARTH/POST LANDING

AC INV 3 - MNA
 AC INV 3 AC 2 - ON
 AC INV 2 AC 2 - OFF
 A11 F/C MNB - OFF
 A11 F/C MNA - MNA
 cb MNB BAT BUS B (Pn1 275) - OPEN

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1-11**AC BUS 1 LOST - SPS BURNS**

TVC SERVO PWR 1 - AC2/MNB
 SCS TVC (P&Y) - RATE CMD
 BMAG MODE (3) - RATE 2
 FDAI SEL - 2
 ✓FDAI SOURCE - CMC

AC INV 1 MNA - OFF
 SUIT COMPR - AC 2
 ECS GLY PUMP - AC 2
 S BD NORM XPNDR - SEC
 S BD NORM PWR AMP - SEC
 SPS GAUGING - AC 2

AC BUS 2 LOST - SPS BURNS

TVC SERVO PWR 2 - AC1/MNA
 BMAG MODE (3) - RATE 1
 SCS TVC (P&Y) - AUTO
 Δ VCG - LM/CSM
 MTVC WITH TRIM THUMBWHEELS (SCS BURN ONLY)
 FDAI SEL - 1
 ✓FDAI SOURCE - CMC

AC INV 2 MNB - OFF
 ✓SUIT COMPR - AC 1
 ✓ECS GLY PUMP - AC 1

BAT BUS A LOST - SPS BURNS

TVC GMBL DR (P,Y) - 2
 (IF BUS LOST BEFORE GMBL MTRS ON)
 cb SPS P2 & Y2 (Pn1 8) - OPEN
 (CRIT BURNS - AFTER GMBL MTRS ON)
 cb MNA BAT C (Pn1 275) - CLOSED

BAT BUS B LOST - SPS BURNS

TVC GMBL DR (P,Y) - 1
 (IF BUS LOST BEFORE GMBL MTRS ON)
 cb SPS P1 & Y1 (Pn1 8) - OPEN
 (CRIT BURNS - AFTER GMBL MTRS ON)
 cb MNB BAT C (Pn1 275) - CLOSED

ENTRY BUS LOSS**MN BUS A LOST - ENTRY**

BMAG MODE (3) - RATE 2

FDIAI SEL - 2

✓FDIAI SOURCE - CMC

AUTO RCS SEL (12) - MNB (ONLY IF BUS LOST AFTER SM SEP)

AC INV 3 - MNB

AC INV 3 AC 1 - ON

AC INV 1 AC 1 - OFF

A11 F/C MNA - OFF

A11 F/C MNB - MNB (BEFORE CM/SM SEP)

cb MNA BAT BUS A (Pn1 275) - OPEN

cb MNB BAT C (Pn1 275) - CLOSED

MN BUS B LOST - ENTRY

BMAG MODE (3) - RATE 1

FDIAI SEL - 1

✓FDIAI SOURCE - CMC

AUTO RCS SEL (12) - MNA (ONLY IF BUS LOST AFTER SM SEP)

AC INV 3 - MNA

AC INV 3 AC 2 - ON

AC INV 2 AC 2 - OFF

A11 F/C MNB - OFF

A11 F/C MNA - MNA (BEFORE CM/SM SEP)

cb MNB BAT BUS B (Pn1 275) - OPEN

cb MNA BAT C (Pn1 275) - CLOSED

AC BUS 1 LOST - ENTRY

BMAG MODE (3) - RATE 2

FDIAI SEL - 2

✓FDIAI SOURCE - CMC

AC INV 1 MNA - OFF

SUIT COMPR - AC 2

ECS GLY PUMP - AC 2

S BD NORM XPNDR - SEC

S BD NORM PWR AMP - SEC

CRITICAL BURNS
LV
EPS

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EMER
1-13

AC BUS 2 LOST - ENTRY

BMAG MODE (3) - RATE 1
FDAI SEL - 1
✓FDAI SOURCE - CMC

AC INV 2 MNB - OFF
✓SUIT COMPR - AC 1
✓ECS GLY PUMP - AC 1

BAT BUS A LOST - ENTRY

cb SCS B/D ROLL, P&Y (MNA) (3) (Pn1 8)
Before CM/SM SEP - OPEN
After RCS transfer to CM - CLOSE
cb SCS CONTR/AUTO (2) (Pn1 8) - OPEN
(AFTER APEX COVER JET)
cb MNA BAT C (Pn1 275) - CLOSED

BAT BUS B LOST - ENTRY

cb SCS B/D ROLL, P&Y (MNB) (3) (Pn1 8)
Before CM/SM SEP - OPEN
After RCS transfer to CM - CLOSE
cb SCS CONTR/AUTO (2) (Pn1 8) - OPEN
(AFTER APEX COVER JET)
cb MNB BAT C (Pn1 275) - CLOSED

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ALARM CODES

SM RCS

ALL FC'S DISCONNECTED - POWERED FLT
ATTEMPT FC RECONNECT (ONE BUS AT A TIME)

IF RECONNECT NOT SUCCESSFUL

FC 1 - MN B
FC 2 - MN B
FC 3 - MN A

IF STILL NO SUCCESS

SCE PWR - AUX
EDS AUTO/OFF - OFF
cb MNA BAT C (Pn1 275) - CLOSED
cb MNB BAT C (Pn1 275) - CLOSED

AC BUS OVERLD + AC BUS + MN BUS UNDER V LITES
AFFECTED AC BUS - OFF (REASON - AC BUS SHORT)

FC 1 (2,3) LITE

VERIFY FC 1 (2,3) REAC tb - gray

IF tb BP

FC 1 (2,3) REAC v1v - OPEN (up)

IF tb STILL BP & REAC FLOW ~0

OPEN CIRCUIT FC 1 (2,3)

EARTH/POST LANDLNG

LV

CRITICAL BURNS

EPS

EMER
1-15

SM RCS THRUSTER FAILED ON

B MAG MODE (3) - RATE 2
CHG TO OTHER SC CONT MODE
ROT CONT PWR DIR (2) - MNA/MNB
STOP SPACECRAFT RATES WITH DIRECT RCS
AUTO RCS SEL (16) - OFF

IF CONDITION PERSISTS

AUTO RCS SEL (16) - ON (AS REQ'D)
MAN ATT (3) - ACCEL CMD
STOP SPACECRAFT RATES
cb SCS DIR ULL (2)(Pn1 8) - open
ROT CONT PWR DIR (2) - OFF

IF CONDITION PERSISTS

NEUTRALIZE RHC
SM RCS PRPLNT (AFFECTED QUAD) - OFF

SM RCS LITE

SM RCS HE (2) - CLOSE
SEE RCS 1

SM RCS QUAD SECURE

SM RCS He 1 & 2 (AFFECTED QUAD) (2) - CLOSE
SM RCS PRIM PRPLNT (AFFECTED QUAD) - CLOSE
Fire one jet in affected quad - 2 sec continuously
AUTO RCS SELECT (AFFECTED QUAD) (4) - OFF (except BOOST)

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ALARM CODES

SM RCS

EMER
1-16

CM RCS FAILS TO PRESSURIZE OR FEED PRPLNT

IF NO PRESSURIZATION

- ✓cb EPS BAT BUS (2) (Pn1 229) - CLOSE
 - ✓cb PYRO A/B SEQ A/B (2) (Pn1 250) - CLOSE
 - ✓cb SECS ARM (2) (Pn1 8) - CLOSE
 - ✓SECS PYRO ARM (2) - ARM
 - ✓SECS LOGIC (2) - ON
- CM RCS - PRESS

IF NO RCS PRPLNT FEED

- ✓cb EPS GRP 1 & 3 (Pn1 229) - CLOSE
 - ✓cb SM RCS HTR A&B (Pn1 8) - CLOSE
 - ✓cb RCS PRPLNT ISOL (2) (Pn1 8) - CLOSE
- CM RCS PRPLNT - ON

IF STILL NO FEED

- cb EPS GRP 5 (Pn1 229) - CLOSE
 - cb RCS LOGIC (2) (Pn1 8) - CLOSE
 - CM RCS LOGIC - ON
- CM PRPLNT - DUMP MOMENTARILY, THEN OFF

CM RCS

LV

CRITICAL BURNS

EPS

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V05 N09 ALARM CODES

- DATE 8/21/72
- 00110 Mark reject has been entered but ignored
Continue
- 00113 No inbits (chan 16)
Continue: if alarm recurs use MDC DSKY.
- 00114 More marks made than desired
Continue
- 00115 V41 N91 keyed with OPTICS MODE not in CMC
OPTICS MODE - CMC and OPTICS ZERO - OFF
- 00116 Optics switch altered before 15 sec zero time elapsed
OPTICS ZERO - ZERO (15 sec).
- 00117 V41 N91 keyed but CMC has reserved OCDU (from start of gimbal test in P40 until termination of TVC functional allocation of the "optics" CDU Driving Output)
V41 N91 not yet available
- 00120 Optics torque has been requested but optics have not been zeroed since last FRESH START or RESTART
OPTICS ZERO - OFF then ZERO (15 sec).
- 00121 In 0.05 sec following mark, an ICDU changed by more than 0.033°
Repeat MK.
- (m)00205 PIPA saturated
Use SCS control (G&N 12).
- 00206 The IMU zero routine has been entered with both the GMBL LOCK lt and NO ATT lt on
Coarse align to 0,0,0 Reselect V40E.
- (m)00207 ISS turn-on request not present for 90 sec
Redo IMU turn on (G&N 12).
- (m)00210 The IMU is not operating
Redo IMU turn on. If alarm recurs perform fresh start (V36E).
Consult STDN. (G&N 12).

CM RCS

ALARM CODES

CRITICAL BURNS

EPS

- (m)00211 Coarse align error
If P51(3)/52(4) in progress record gyro
torquing angles and perform fine align
check in P52(4)
Otherwise, see G/1-24. (G&N 12).
- (m)00212 PIPA fail, but PIPA is not being used
PIPA BIAS check (G&N 6/8).
- (m)00213 IMU not operating with turn-on request
See 00210
- 00214 Program using IMU when turned OFF
See 00210 or exit program.
- (m)00217 IMU coarse align or pulse torque
difficulty has occurred
If code 211 also, perform 211 cure only
Reinitiate current program.
If alarm recurs, terminate use of
ISS (G&N 12).
- 00220 IMU orientation unknown
Align or if aligned set REFSMMAT flag
- 00401 Desired middle gimbal angle is excessive
Call N22 - maneuver if MGA < 85° or
realign IMU.
- 00402 Second MINKEY pulse torque must be done.
- 00404 Target out of view (90 deg test)
(G/3-7,3-11,6-3,7-16)
- 00405 Acceptable star pair is not available
(G/6-3,6-6)
- 00406 Rend navigation not operating
Select P20 Opt. 0 or 4 or continue.
- 00421 W-matrix overflow
Notify STDN but continue.
W-matrix automatically reinitialized at
next mark.
- 00600 No solution on first iteration in P31 or
P32/72
(G/4-6,4-8)
- 00601 Post CSI Perigee/lune alt <85nm/ 5.8nm
(G/4-6, 4-8)
- 00602 Post CDH Perigee/lune alt <85nm/ 5.8nm
(G/4-6, 4-8)
- 00603 Time from TIG (CSI) to TIG (CDH)
<10 min
(G/4-6, 4-8)

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- 00604 Time from TIG (CDH) to TIG (TPI)
<10 min
(G/4-6,4-8)
- 00605 Number of iterations exceeds loop maximum
(G/4-6,4-8,4-15,4-16)
- 00606 ΔV (CSI) has been >1000 fps for last two iterations
(G/4-6,4-8)
- 00611 No TIG for given ELEV angle
(G/4-10,4-12)
- 00612 State vector in wrong sphere of influence at TIG
(G/4-15)
- 00613 Reentry angle out of limits
(G/4-16)
- (m)00777 ISS warning caused by PIPA fail
(G&N 6).
- 01102 CMC self test error
(G/2-3)
- (m)01105 Downlink too fast
Rset. If alarm recurs DOWNLINK FAILURE.
(G&N 12).
- (m)01106 Uplink too fast
Rset. If alarm recurs UPLINK FAILURE.
(G&N 12).
- (m)01107 Phase table failure-assume erasable memory is destroyed
If Comm:
1. V74 CMC DOWNLINK
2. P27 As Necessary.
3. V48 As Necessary (V46).
4. Reestablish REFSMMAT via P51 As Necessary.
If FRESH START recurs,
CMC FAILURE (SSR-3).
If no Comm, pg G/9-1
- 01301 Arcsin or arccos input is greater than one
Notify STDN, continue.
- (m)01407 VG increasing
(G&N 12).
- 01426 IMU unsatisfactory
Realign or use SCS.

01427 IMU reversed
Note FDAI operation is inverted.

01520 V37 request not permitted at this time
Wait till COMP ACTY lt.
not on continuously - reselect V37 or if P62-67, select P00 and then desired program.

01600 Overflow in drift test
This is gnd test alarm only.

01601 Bad IMU torque abort
See 01600

01703 Insufficient time for integration.
TIG slipped
(G/5-3,5-16)

*03777 ISS warning caused by ICDU fail
(G&N 6)

*04777 ISS warning caused by ICDU & PIPA fail
(G&N 6)

*07777 ISS warning caused by IMU fail
(G&N 6)

*10777 ISS warning caused by IMU & PIPA fail
(G&N 6)

*13777 ISS warning caused by IMU & ICDU fail
(G&N 6)

*14777 ISS warning caused by IMU,ICDU & PIPA fail
(G&N 6)

*20430 Orbital integration has been terminated to avoid possible infinite loop.
Notify STDN.
Probable S.V. uplink required

*20607 No solution to conic subroutine
Reselect program.

*20610 Alt at specified TIG in P37 < 400K ft
Reselect P37 and decrease TIG.

*21204 Negative or zero time waitlist call.
If ave-g or ext. vb. on, continue.
Otherwise reselect program.

*21206 Second job attempts to go to sleep via keyboard and display program
See 21204.

- **21210 Second attempt is made to stall
Reselect program
Do not attempt use of IMU while CMC is
using it.
- **21302 SQRT called with negative argument
See 21204
- **21501 Keyboard and display alarm during
internal use
See 21204
- **21502 Illegal flashing display
See 21204
- **21521 P01 selected and P11 has already been
performed
Select correct program
- *31104 Delay routine busy
Reselect extended verb or continue with
program.
Notify STDN.
- *31201 Executive overflow - no vac area
Reselect Extended Verb and/or Continue
Program.
- *31202 Executive overflow - no core sets
See 31201
- *31203 Waitlist overflow - too many tasks
See 31201
- *31211 Illegal interrupt of extended verb
Reselect extended verb after optics
marking is completed.
(m) - Malf procedure indicated
- **(2xxxx) - Generates restart (no lt), F37 (POODOO)
- *(3xxxx) - Restart (no lt) and program
continues (i.e. attempted
recovery)(BAILOUT)
- NOTE - All **alarms act as *type if
they occur when Ave-g is on or
display type extended verb
is active.

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