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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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CSM 112

DOUBLE

BASIC

CSM SYSTEMS CHECKLIST

PREPARED BY

GUIDANCE & CONTROL PROCEDURES SECTION

SYSTEMS PROCEDURES BRANCH

CREW PROCEDURES DIVISION

MANNED SPACECRAFT CENTER

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CSM SYSTEMS CHECKLIST

MARCH 15, 1971

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CSM SYSTEMS CHECKLIST

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SYSTEMS MANAGEMENT

PROPULSION SYSTEM

1 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 sw - He, N2A, & N2B

SPS PRPLNT TK PRESS ind

He 3900 psia max

N2A 2900 psia max

N2B 2900 psia max

SPS PRESS IND sw - He

FUEL & OXID PRESS ind - 170 to 195 psia

SPS ENG INJ VLVS (4) - CLOSE

SPS OXID, FUEL & UNBAL QTY - record

OXID FLOW VLV PRIM - 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

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

PKG TEMP - 115°-175°F (C/W 75°-205°)

He PRESS - record

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

He TK TEMP - record

PRPLNT QTY - record

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 sw - CM 1,2

He TEMP - 60-90°F

He PRESS - 4100-4200 psia

MANF PRESS - 80-105 psia

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EPS SYSTEM

1 Cryogenic Pressure - Quantity Check

H2 PRESS (2) - 225-260 psia
O2 PRESS (3) - 865-935 psia
SURGE TK PRESS - 865-935 psia
H2 QTY (2) - record
O2 QTY (3) - record
CRYO FANS - OFF; ON as req'd

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 4B (BAT RLY BUS - 3.4-4.1 vdc)
SYS TEST 4A (BAT COMPT PRESS - <1.5 vdc)
(NA until 1st Vent)

If >1.5: BAT VENT vlv -
VENT (to ~0) then CLOSED

If LM PWR - CSM

SYS TEST (2) - 4D (LM PWR - 0.5-3.2 vdc)

4 A-C VOLTS - 113 to 117 all phases

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- 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 - 4A (BAT VENT <1.5)
If >1.5: BAT VENT vlv -
VENT (to ~0) then CLOSED
SYS TEST - 4B

6 Fuel Cell Power Plant Purging

A O2 PURGING

FC IND sw - 1(2,3)
FC PURGE 1(2,3) - O2 (2 min)
FC FLOW - O2 Flow incr 0.6 lb/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 lb/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

- 7 H2 or O2 Quantity Balance Correction
ON LOW Tank, H2 or O2 HTRS 1(2) - OFF,
THEN AUTO, WHEN BALANCED

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- 8 FUEL CELL SHUTDOWN (APPLICABLE FC)
FC REAC - OFF
FC HTRS - OFF
FC PUMPS - OFF
cb FC PUMPS AC - open
AT T_{skin} < 200° F
H2 PURGE LINE HTR - ON (for 20 min)
FC PURGE - O2 (TIL O2 PRESS = N2 PRESS)
FC PURGE - H2 (TIL PRESS STABILIZES)
FC PURGE - OFF
H2 PURGE LINE HTR - OFF
cb FC RAD/REACS - open
- 9 FUEL CELL SWITCHING
PRIOR TO DISCONNECTING, INSURE THAT AT LEAST
ONE FUEL CELL IS POWERING EACH MAIN BUS
Possible MA & FC DISCONNECT lt
- 10 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
- 11 CRYO MANUAL FAN OPERATION
CRYO FANS - ON (seq at 1 sec intervals for 1
min each)
a. Prior to every SPS or SIVB ΔV
b. Presleep
c. Postsleep
d. Pre LM Extraction

CAUTION

If CRYO PRESS lt on, do not
turn off fan until lt ex-
tinguishes

ECS PERIODIC VERIFICATION

1 ECS MONITORING CHECK

CABIN ΔP - -1 to -3.5 in. H₂O

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

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° to +63°F (-20° to
97°F for lunar orb)

PRIM GLY EVAP TEMP OUT - 38-50.5°F

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 - 25-85%

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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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 C02 ABSORBER FILTER REPLACEMENT

Open C02 Canister attenuation pnl

CAUTION

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

C02 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

C02 CSTR DIVERT vlv - ctr

Close C02 Canister attenuation pnl

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
SURGE TANK PRESS >500 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 - CLOSED (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

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URINE DUMP MODES
USING UTS

A PGA URINE COLL BAG DUMP

Connect Urine transfer hose & filter
to urine feces QD
Remove cap from PGA thigh QD
Connect urine transfer hose to thigh QD
WASTE MGT DRAIN vlv - DUMP
Disconnect urine transfer hose from PGA
Replace cap on PGA thigh QD
Connect UTS to urine transfer hose/filter QD
UTS vlv - OPEN
Purge dump line 1 minute (min)
WASTE MGT OVBD DRAIN vlv - OFF
UTS vlv - CLOSED
Disconnect hose & stow

B UTS (Collection)

Obtain UTS & verify vlv - CLOSED
Attach UTS - open vlv - Perform task
UTS vlv - CLOSED
Disconnect UTS & stow

C UTS (Dump)

Verify UTS vlv - CLOSED
Connect UT hose/filter to urine/feces QD
Attach UTS to hose
WASTE MGT OVBD DRAIN vlv - DUMP
When UTS Bag Empty
UTS vlv - OPEN
Purge lines 1 minute (min)
WASTE MGT OVBD DRAIN vlv - OFF
UTS vlv - CLOSED
Stow UTS & Hose

USING URINE RECEPTACLE ASSY (URA)

Connect urine line filter to urine
transfer hose.
Connect urine transfer hose/filter
to urine feces QD
Connect Urine Receptacle/Plenum
Assy to urine transfer hose
URA vlv - VENT
Remove receptacle cover
WASTE MGMT DRAIN vlv - DUMP

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NOTE: Direct water stream parallel to honeycomb to prevent splash-back.
Avoid acceleration to URA during use.
Remove last drop by touching screen at top of URA.

Perform task

Flush screen and honeycomb with water gun
Replace receptacle cover after liquid has cleared from URA

URA vlv - CLOSE

Stow Urine Receptacle/Plenum Assy for next use with urine transfer hose connected and
WASTE MGMT DRAIN vlv - DUMP

For stowage prior to entry:

WASTE MGMT DRAIN vlv - OFF

Remove and stow URA, urine transfer hose, and urine filter

10 CABIN PRESSURIZATION

A NORMAL 30 min

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

REPRESS PKG vlv - FILL

CRYO PRESS IND - SRG/3

REPRESS 02 vlv - OPEN

*If SURGE TANK PRESS decreases to 150 psia

* REPRESS 02 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 02 PRESS ind - ~0 psia

REPRESS 02 vlv - CLOSE

CAB PRESS = 4.7-5.3 psia

CAB REPRESS vlv - OFF

B ALTERNATE, 52 min

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

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 TANK

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WHEN CAB PRESS >4.7
CRYO PRESS IND - 1/2
CAB REPRESS vlv - OFF

11 SUIT CKT INTEGRITY CHECK
DIRECT O2 vlv - CLOSE
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
vlv 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
O2 FLOW - 1.0 lb/hr (pegged)
O2 FLOW HI lt - on
M/A - ON, Reset
SUIT PRESS - 8.8-9.8 psia
PGA PRESS - 4.1-4.5 psig
O2 FLOW HI lt - out
Allow O2 flow to stabilize 15 sec
O2 flow will remain below 0.8 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)

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- 12 PGA INTEGRITY CHECK
DIRECT O2 vlv - CLOSE
SUIT PRESS - 4.7-5.3 psia
O2 FLOW - 0.2-0.4 lb/hr

CAUTION

see pg S/1-10

SUIT TEST vlv - PRESS
O2 FLOW - 1.0 lb/hr (pegged)
O2 FLOW HI lt - ON
M/A - ON, Reset
SUIT PRESS - 8.8-9.8 psia
PGA PRESS - 4.1-4.5 psig

WARNING

SUIT FLOW vlv(s) may remain in
OFF position for no longer than
one minute or asphyxiation may
result. If all SUIT FLOW vlvs
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
CAB PRESS REL vlv (RH) - DUMP (latch off)

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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)

14 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
O2 FLOW HI lt - out
O2 FLOW - 0.2 lb/hr

15 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 min, then off (ctr)
SEC COOL LOOP PUMP - off (ctr)
EVAP H2O CONT SEC vlv - OFF (AUTO for ENTRY)

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- 16 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 minute

PRIM EVAP RESERVICE
GLY EVAP STM AUTO - MAN
GLY EVAP STM INCR - INCR
 for 1 min
Wait 15 min
GLY EVAP H2O FLOW - ON
 for 2 min, then AUTO
GLY EVAP STM AUTO - AUTO

- 17 ACTIVATE SEC EVAP
SEC EVAP H2O CONT - AUTO
SEC COOL LOOP EVAP - EVAP
SEC COOL LOOP PUMP - ACT

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

- 18 POTABLE WATER CHLORINATION
 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

POT TK IN vlv - OPEN (verify)

Wait 10 min & remove ampoule of H2O

Replace chlor port cap

Stow chlorination unit

Do not drink for 30 min

19 WASTE WATER TANK DRAIN

H2O QTY IND - WASTE

WATER CONT PRESS REL vlv - DUMP A

Monitor H2O QTY (WASTE) ind - decreasing

When H2O QTY (WASTE) ind reads 25%:

WATER CONT PRESS REL vlv - 2

20 SIDE HATCH URINE/WATER DUMP

Remove Dump Nozzle Conn Cover

Remove Plug & Stow

Withdraw Wire Guard & Wires from slot

Install Male QD on Dump Nozzle

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 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
25%, 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 (verify)

Install plug & dump nozzle connector

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21 WATER COLLECTION

Connect urine transfer hose-filter to urine/feces
Disconnect "T" adapter QD from urine transfer hose
WASTE MANAGEMENT DRAIN vlv - DUMP
Collect water
After collection complete:
 Purge for 1 minute (min)
 WASTE MANAGEMENT DRAIN vlv - CLOSE

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 - ACT
 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

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24 CONTAMINATION CONTROL

Note: If water is to be collected,
use water collection 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

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

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

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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
malfunction 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)

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TELECOMM PROCEDURES

1 HI-GAIN ANTENNA OPERATION

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 PWR - POWER

Go to V64 HI GAIN ANTENNA POINTING procedures
Verify required coordinates within full
coverage region

- *If required coordinates are in scan limit *
- * zone or skin reflection zone, one or more *
- * of the following may be done: *
- *a.Change CSM attitude to provide antenna *
- * coordinates in the full coverage region *
- *b.Allow up to 60 seconds for the expected *
- * CSM attitude variation to alleviate the *
- * condition *
- *c.In attitude hold condition, operate in *
- * wide beam mode *
- *d.Switch to narrow beam and acquire manually *

HI-GAIN ANT PITCH & YAW POS (2) - Set in required
coordinates

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 required depending on range

HI-GAIN ANT S BD ANT ind - >1/2 scale

When omni antenna operation is desired:

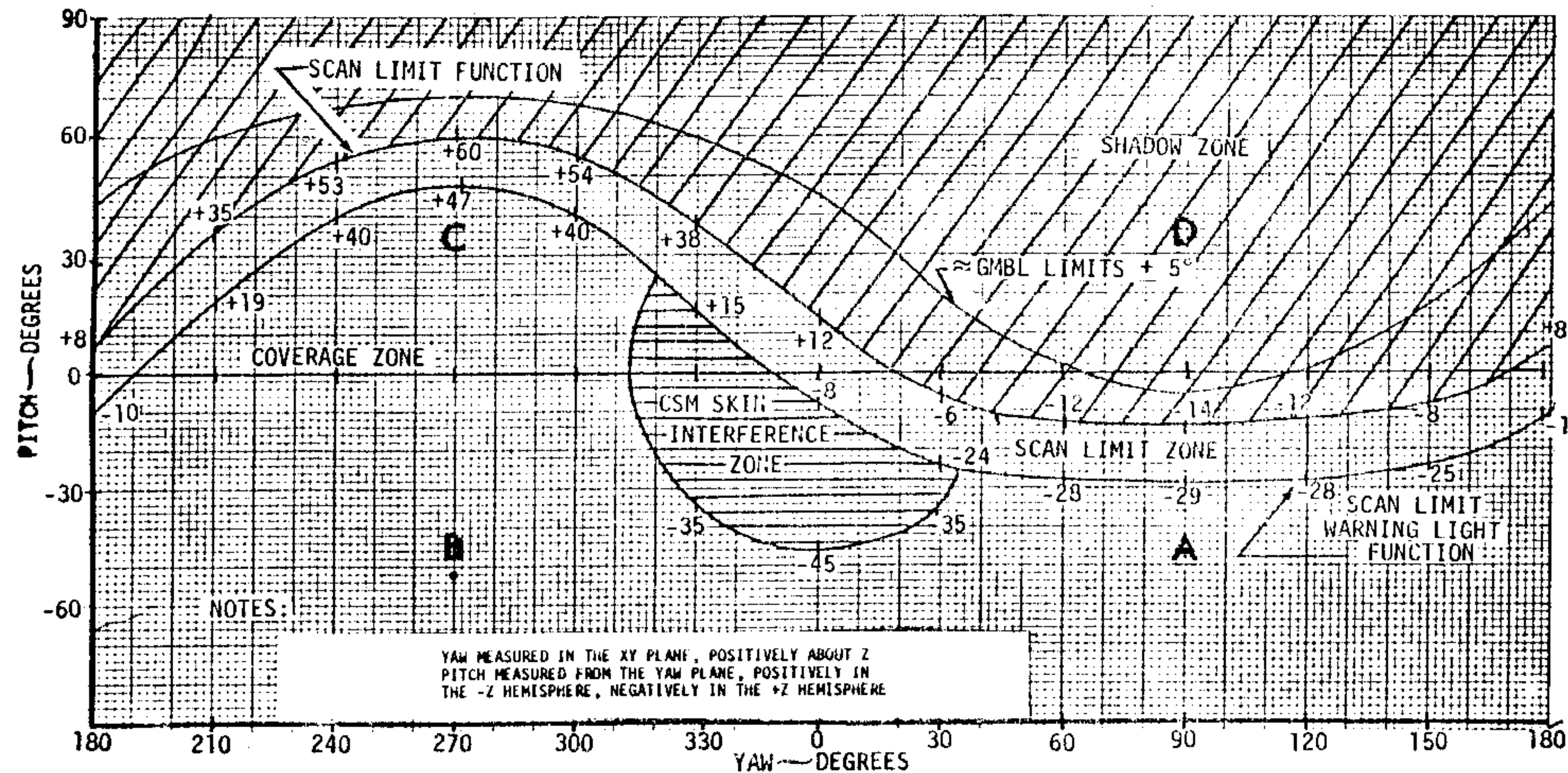
HI-GAIN ANT TRACK - MAN

HI-GAIN ANT PITCH POS - -52°

HI-GAIN ANT YAW POS - 270°

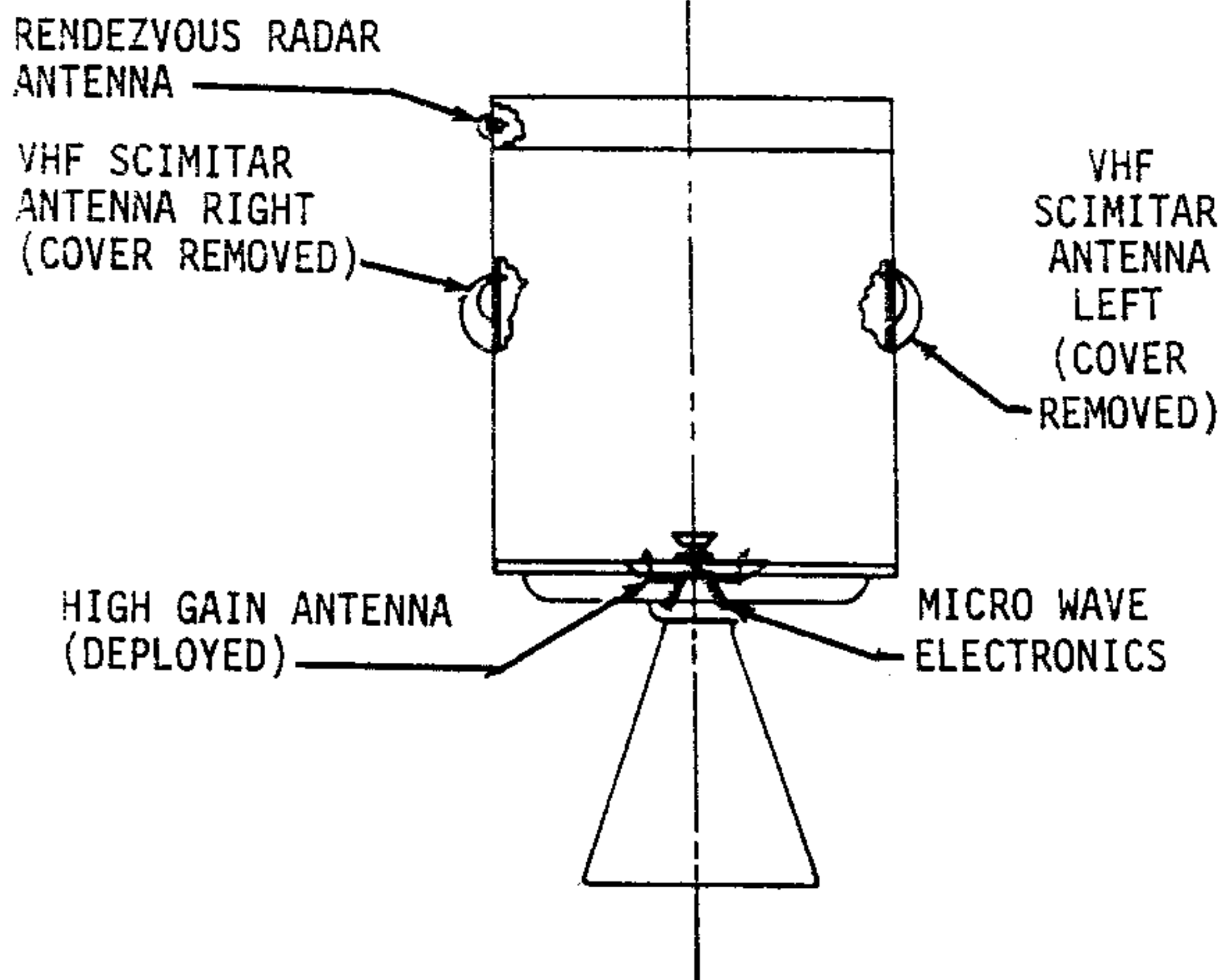
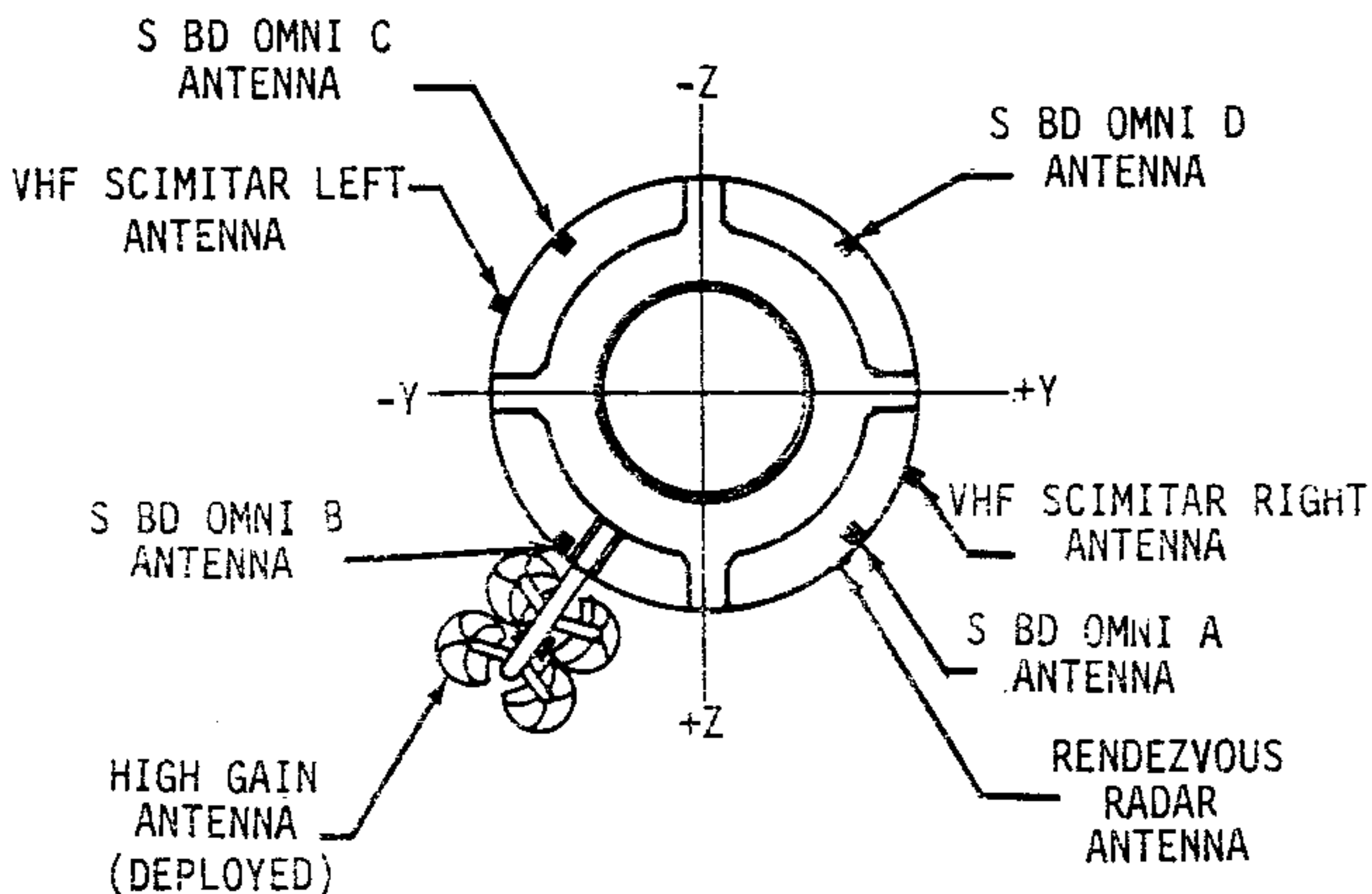
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HIGH-GAIN ANTENNA SCAN AND WARNING LIMIT,
 YAW-PITCH COORDINATES (CSM)

S
1-20



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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:
Transmit/Standby sw - XMITT
(xmsn will begin immediately)
When TV operation is completed: S BD AUX TV - off (ctr)
Disassemble and stow TV camera, monitor, and cables

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- 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 = 0
V85E (if desired)
 R1 = RANGE
 R2 = RANGE RATE
 R3 = 0

- 4 RNDZ XPNDR ACTIVATION & SELF TEST
cb RNDZ XPNDR FLT BUS - close (verify)
RNDZ XPNDR - HTR for 24 min
 (1 min if self test only)
RNDZ XPNDR - PWR
SYS TEST (1h) - 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 (rh) - B

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5 COMM MODES
NORMAL LUNAR 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 - DN VOICE BU
S BD AUX TV - 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 - 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

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For the following mission phases select the NORMAL LUNAR CONFIGURATION plus the specified deltas:

- A COAST AWAKE
S BD AUX TAPE - off (ctr)
TAPE RCDR FWD - off (ctr)
- B COAST ASLEEP
S BD SQUELCH - ENABLE
S BD AUX TAPE - off (ctr)
S BD NORM MODE VOICE - off (ctr)
1 HI GAIN OPERATION:
 P, Y = +40, 270 (ROLL RIGHT)
 P, Y = -40, 90 (ROLL LEFT)
 HI GAIN ANT BEAM - NARROW
 HI GAIN ANT TRACK - REACQ
 S BD ANT - HI GAIN
2 OMNI OPERATIONS:
 S BD ANT - OMNI
 S BD ANT OMNI - B
 TAPE RCDR FWD - off (ctr)
- C LUNAR ORBIT AWAKE
USE NORMAL LUNAR CONFIGURATION
- D LUNAR ORBIT ASLEEP
S BD SQUELCH - ENABLE
HI GAIN ANT TRACK - REACQ
HI GAIN ANT BEAM - NARROW
HI GAIN ANT P, Y, = _____, _____
- E VHF RANGINGø VOICE
VHF AM B - DUPLEX
VHF RNG - on (up)
VHF RCV ONLY - B DATA (MINIMIZES CREW SWITCHING)
- F VHF LM-CSM VOICE DATA
VHF AM A - SIMPLEX
VHF RCV ONLY - B DATA

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G CONTINGENCY

VHF AM A - SIMPLEX
VHF AM B - SIMPLEX

H RELAY MODE (LM VOICE TO MSFN)

Voice Relay (With VHF Ranging)

MODE - VOX (Pnl 10)

VOX SENS tw - 5

S BD - OFF

INTERCOM - OFF

VHF AM - T/R

AUDIO CONT - BU

MODE - VOX (Pnl 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 (Pnl 10)

VOX SENS tw - 5

S BD - OFF

INTERCOM - OFF

VHF AM - T/R

AUDIO CONT - BU

MODE - VOX (Pnl 9)

VOX SENS tw - as req

S BD MODE VOICE - RELAY

VHF AM A - SIMPLEX

VHF RCV ONLY - B DATA

I LUNAR STAY

VHF AM B - DUPLEX

VHF AM - RCV (Pnl 9)

HI GAIN ANT BEAM - NARROW

HI GAIN ANT TRACK - REACQ

HI GAIN ANT P _____, Y _____

S BD SQUELCH - ENABLE

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PRESLEEP CHECKLIST

CREW STATUS REPORT (MEDICATION)

ONBOARD READOUTS

CYCLE CRYO FANS

CHLORINATE POTABLE WATER

VERIFY:

WASTE MNGMT OVBD DRAIN - OFF

WASTE STOW VENT vlv - CLOSED

OPTICS ZERO - ZERO

G&N POWER OPTICS - OFF

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)

DIRECT 02 vlv - OPEN (Until 5.7 psia - CLOSE)

"E" MEMORY DUMP

CONFIGURE COMMUNICATIONS (S/1-24)

POSTSLEEP CHECKLIST

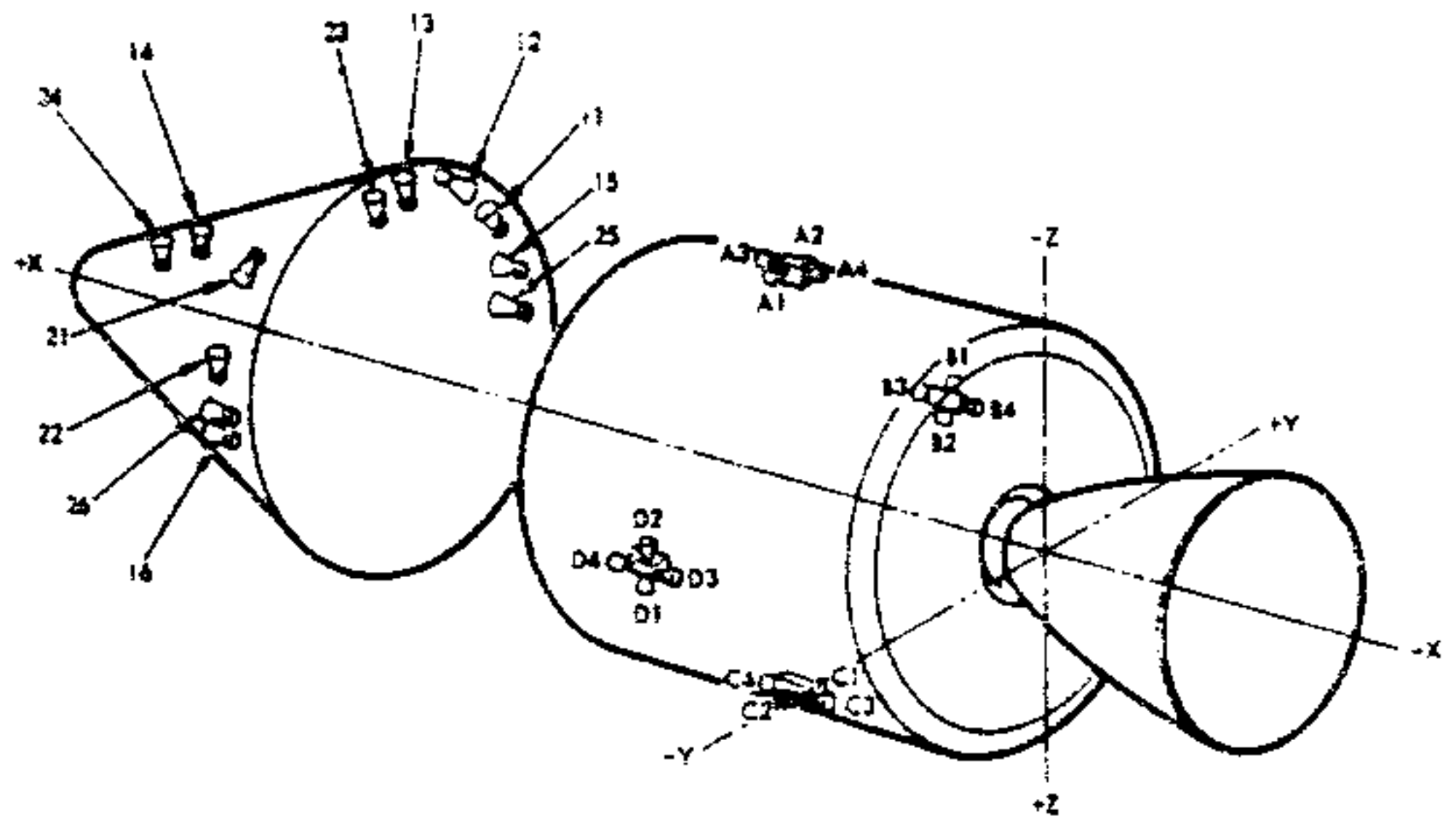
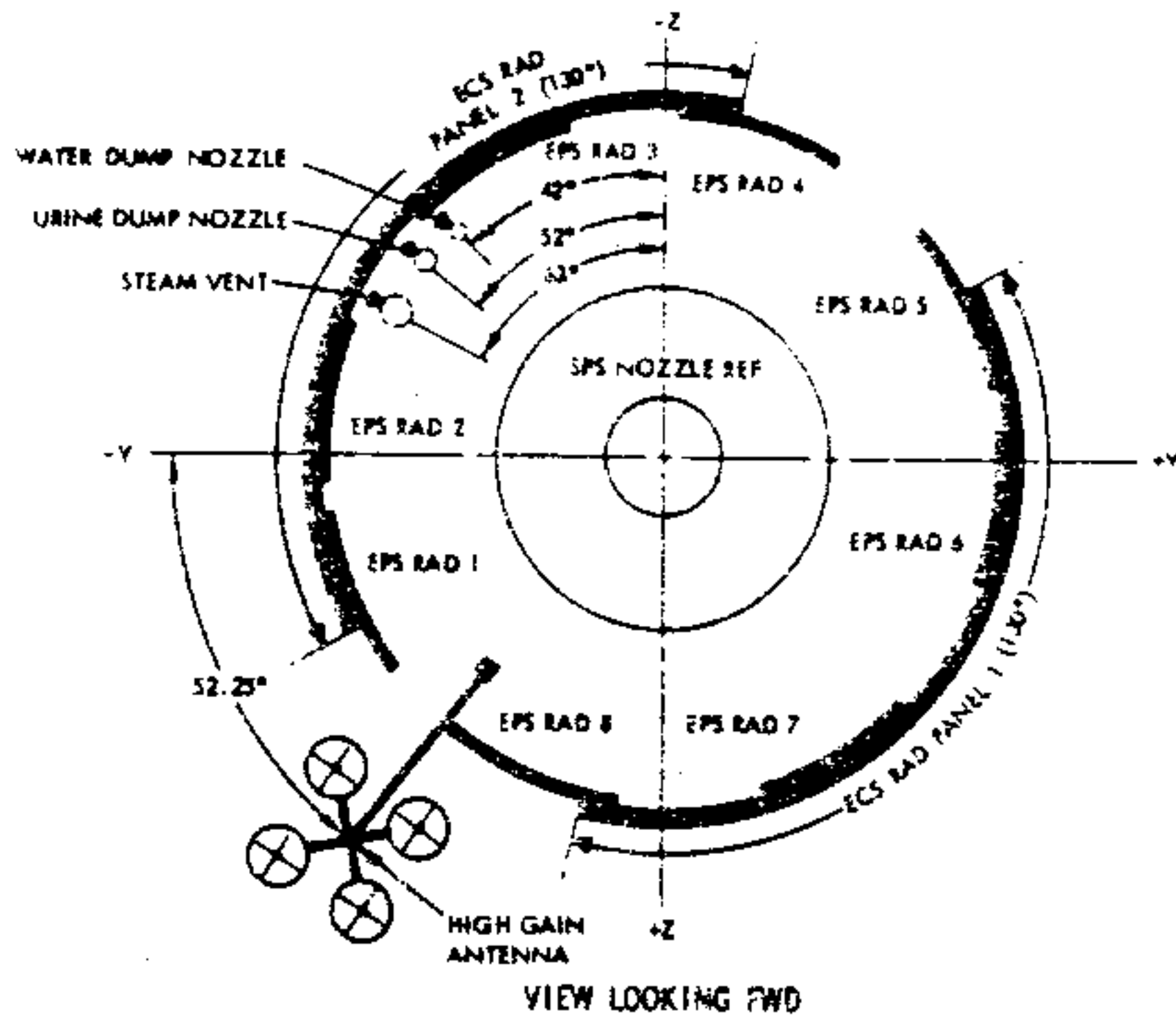
CREW STATUS REPORT (SLEEP & RADIATION)

CONSUMABLES UPDATE

CYCLE CRYO FANS

CONFIGURE COMMUNICATIONS (S/1-24)

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CM RCS CODE

FIRST DIGIT: SYSTEM (1 OR 2)
SECOND DIGIT: 1, 2 (+, -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

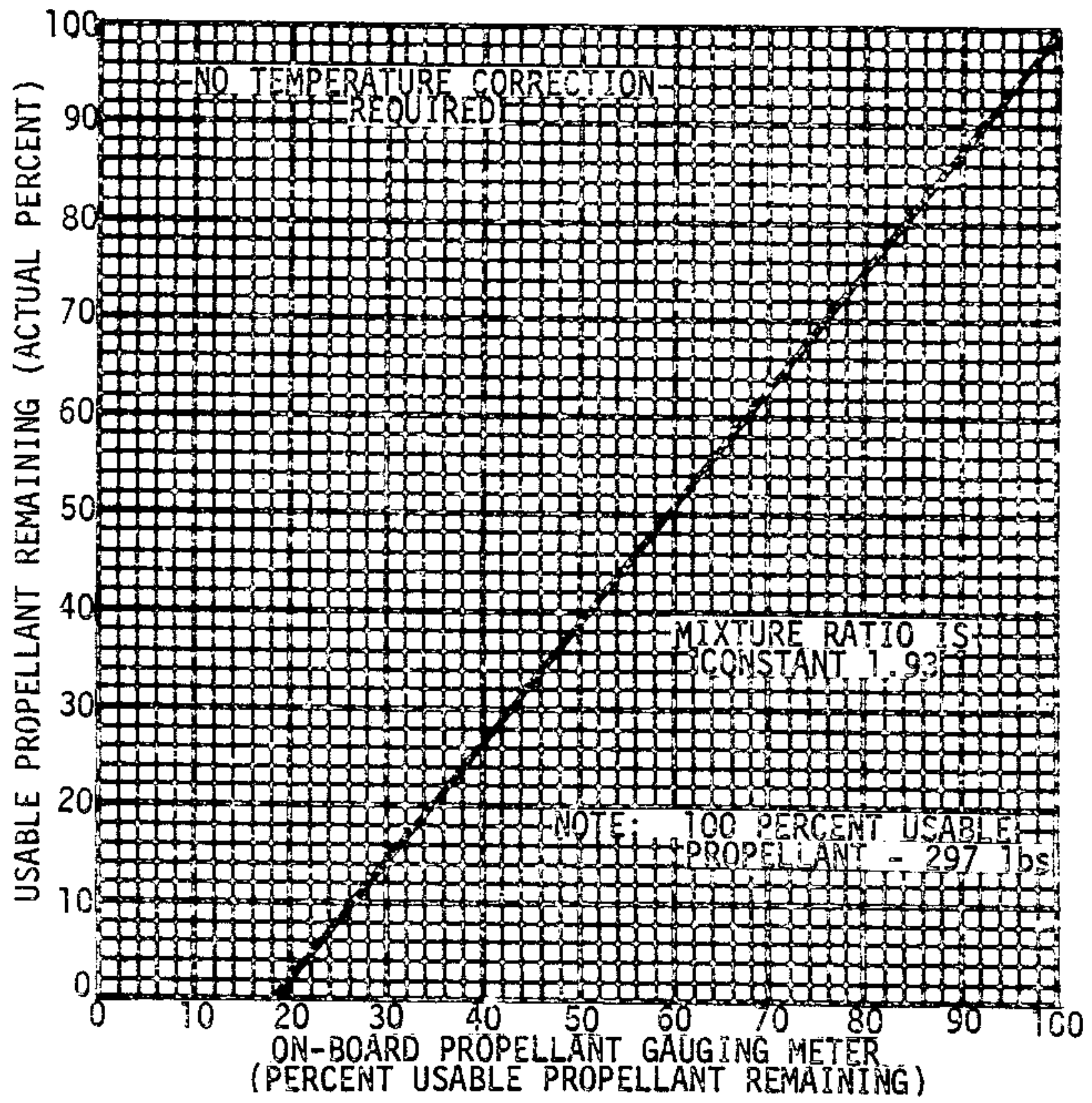
RCS Engine, Vent, and Radiator Locations

System Test Indicator Conversion Chart

SYSTEMS TEST Indicator Display	Cryo O2 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) 1D, 2A, 2B (H2) 2C, 2D, 3A	3B, 3C, 3D	5C, 5D, 6A 6B, 6C, 6D	7D	5A	7A	5B

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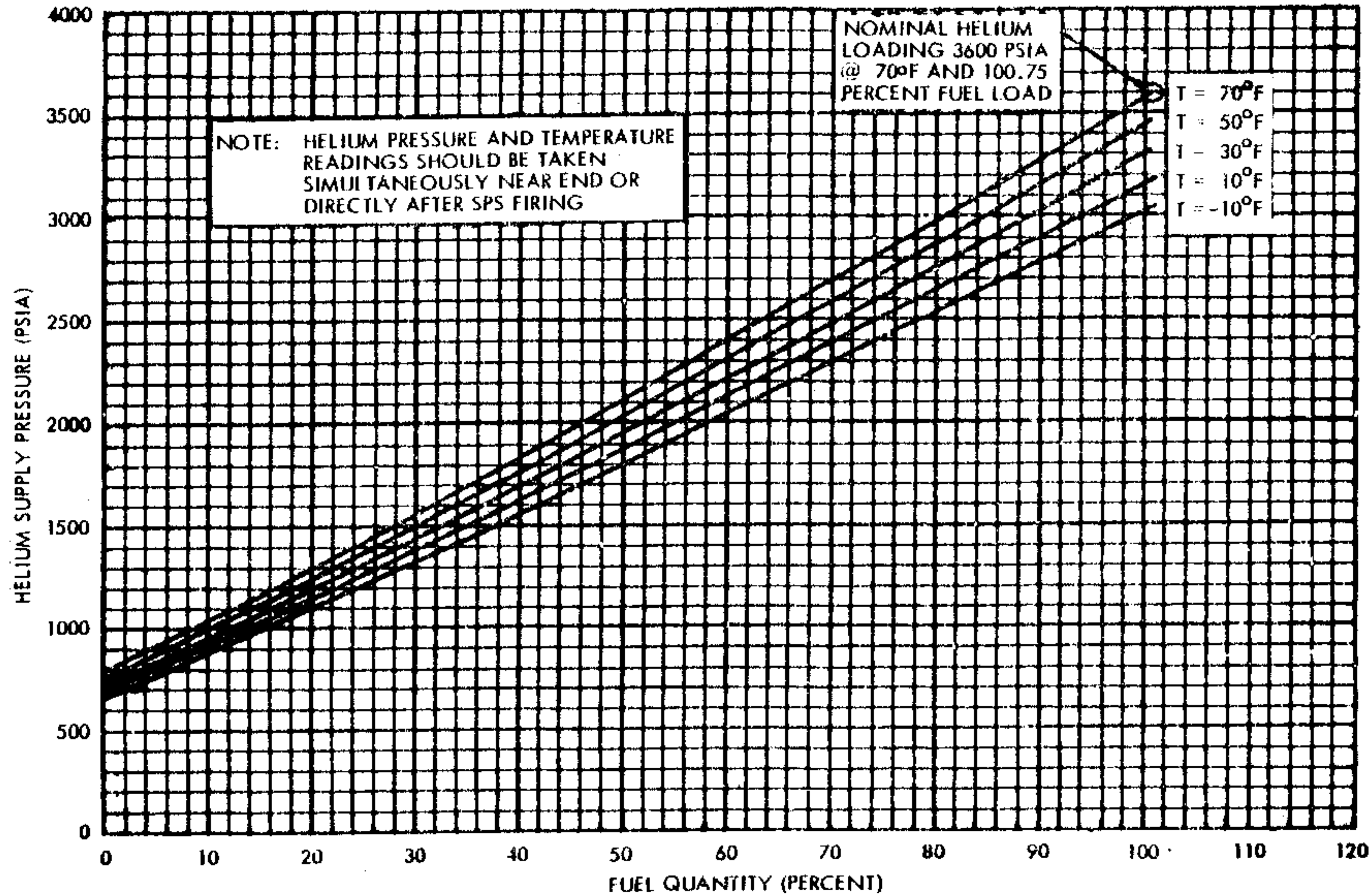
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Minus Two-Sigma SM RCS On-Board Propellant Gauging Meter Correction Nomograph

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SPS Propellant Nomograph



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SIM Experiments

- 1 Preparation - TBD
- 2 Gamma Ray Spectrometer - TBD
- 3 X-Ray Fluorescence Spectrometer - TBD
- 4 Alpha-Particle Spectrometer - TBD
- 5 Panoramic Camera - TBD
- 6 S-Band Transponder - TBD
- 7 Mass Spectrometer - TBD
- 8 Mapping Camera - TBD
- 9 Subsatellite - TBD
- 10 Laser Altimeter - TBD

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LM INTERFACE

IVT TO LM (CHECKOUT, TLC)

At 2 hours prior to IVT to LM:

TUNL VENT vlv - LM/CM ΔP

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

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

*TUNL VENT vlv - VENT *

* till LM/CM $\Delta P \geq 2.7$ 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) (11)

TUNL VENT vlv - LM/CM ΔP

TUNL LTS - OFF

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LM INTERFACE

IVT TO LM (UNDOCKING, PDI)

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

TUNL LTS - ON

TUNL VENT vlv - LM/CM ΔP

Verify LM/CM ΔP < 0.2

*LM/CM ΔP > 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 - 7D

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)

LM hatch closed

Verify CSM roll cmds inhibited

until LM/CM ΔP > 3.5 psid (> 3.5, 2 jet; > 4, 4 jet)

Release docking latches (Decal) (13)

Install tunnel hatch (Decal) (11)

Perform hatch integrity check (Decal) (12)

Perform Contingency EVA Prep (C/7-1)(optional)

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FINAL IVT TO CSM

CDR FWD DUMP vlv - AUTO (verify)
 CMP Equalize CSM/LM Pressure (LOD)(Decal) (14)
 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 02 vlv - close (CW)
 Install tunnel hatch (Decal) (11)
 Perform hatch integrity check (Decal) (12)

SUB-CHECKLIST

1 CM/LM PRESSURE EQUALIZATION (Decal)

A. LM/CM $\Delta P < 2.4$ PSID

CRYO PRESS IND - SRG/3
 Verify CRYO 02 PRESS 1/SRG ind - 865-935 ps
 EMER CAB PRESS sel - OFF
 REPRESS PKG vlv - OFF
 DIRECT 02 vlv - CLOSE (verify)
 PRESS EQUAL vlv - OPEN (C)
 02 FLOW ind - 1.0 lb/hr (Pegged)
 02 FLOW HI lt - on
 MASTER ALARM pb/lt (3) - ON, push
 LM/CM $\Delta P \sim 0.0$ psia
 CAB PRESS ind ~ 5.0 psia
 EMER CAB PRESS sel - BOTH

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

(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 (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 min

and 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 psid

CAB 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)

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

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- 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 pos
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 ba
-ratchet probe fwd to orange hash
mark (F)
Restow RATCHET HNDL and INSTALLATION STRUT

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

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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 *

Preload Shaft - push up into detent

CAPTURE LATCH RLSE HNDL - Set in detent

CAPTURE LATCH RLSE HNDL LOCK - Rotate CW to lock
(orange stripe not visible)

PROBE UMBILICALS(2)(yellow) -connect to dock ring

NOTE: For stowage, umbilical connection not req.

10 PRELOAD PROBE (Decal)

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 beam

PRELOAD SEL LEVER - mid position

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

11 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 vlv - CLOSED (CW) (B)

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12 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 $\Delta P > 3$
(~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

13 DOCKING LATCH RELEASE (Decal)

(G) (H)

RELEASE BUTTON - depress

LATCH HNDL - pull one or two strokes until bung
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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- 14 CSM/LM PRESSURE EQUALIZATION (LOD)(Decal)
CRYO PRESS IND - SRG/3
Verify CRYO 02 PRESS 1/SRG ind - 865-935 psia
REPRESS PKG vlv - OFF
Direct 02 vlv - OPEN until CAB PRESS
5.5 psia then CLOSE until 02 FLOW
<.5 lb/hr.
- OPEN adjust 02 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

- 15 DOCKING LATCH VERIFICATION (Decal)
LATCH HNDL - Pull to verify hook en-
gaged (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 dis-engage: *
* * AUX REL (yellow)-push *
* * Release latch *
Engage Latch - push man-release

Verify EXTEND LATCH engaged indicator (red)
not visible
GN2 BLEED button (red) - press (10 sec)

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16 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

17 MALFUNCTION LIST

DOCKING

- A 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

TUNNEL HATCH

- B Pressure Equalization Valve Will
Not Close
- Remove Hatch
 - Use Tool B In External Tool Inter-
face For Additional Leverage
- C Pressure Equalization Valve Will
Not Open For TLD:
- Vent CM
 - Perform Tunnel Operations
 - Repress CM

For Subsequent IVT
TUNL VENT vlv - LM PRESS
(May require up to 12 hrs
to equalize pressure)

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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 EXTND/REL - EXTND/REL for 5 sec
 - PROBE EXTND/REL - RETR
 - PROBE EXTND/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.

DOCKING LATCHES

- G 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

TUNNEL

- H 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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CM EVA

- 1 CM EVA Prep - TBD
- 2 EVA Operations - TBD
- 3 Post EVA Procedures - TBD

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S
3-2

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S
4-1

John K. Kelly - 4371

SAFE OF APEX COVER JETT

*Apex cover is only cover which can
occur and be treated on one basis
due to power & circuit.*

If MSFN 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 MSFN GO, Go To Step A

If Still Apex Cover Jettison,

cb SECS LOGIC A - open

If MSFN GO, Go To Step C

If Still Apex Cover Jettison,

cb SECS LOGIC A - close

cb SECS LOGIC B - open

If MSFN GO, Go To Step D

If Still Apex Cover Jettison,

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

Use Tool E, (5/32 allen head) to remove

closeout panel located beneath panel

276 (approx 10 fasteners on panel).

Remove, or cut all wires to, connector

marked "cut" with white tag (P545). Tape

ends of any wires cut. Replace closeout

panel.

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

*(check the power on nearby case
isolated wire bundle not really
related to this case)*

Continue Normal Entry Except,

SAFE OF APEX

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4-2

Perform CM RCS pressurization & CM/SM
Separation together at which time ARM
PYRO's 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 MSFN 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

MSFN 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

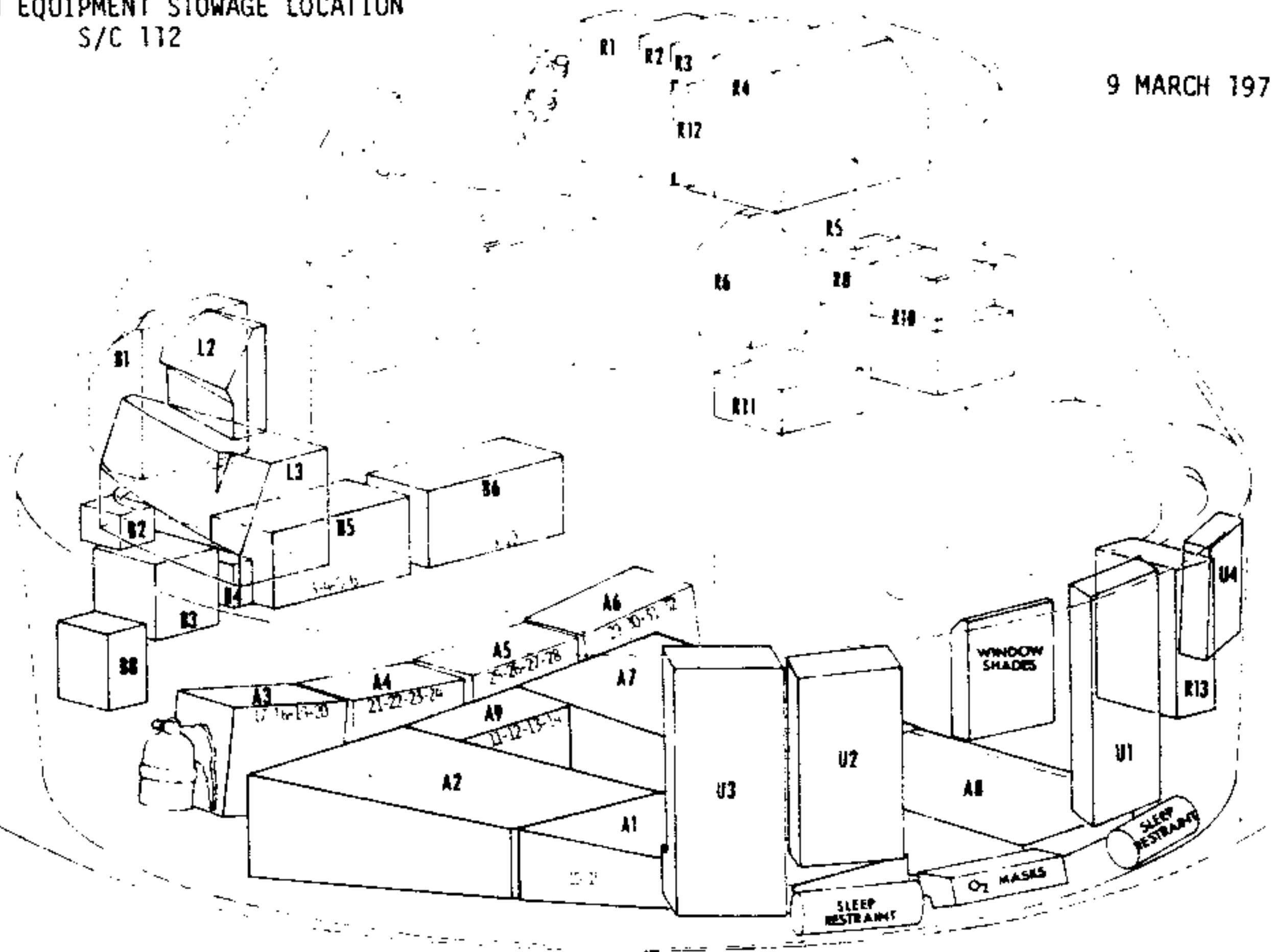
cb SECS LOGIC B - open (verify), close
at or after apex cover jettison at 24K'
Continue normal entry

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CREW EQUIPMENT STOWAGE LOCATION
S/C 112

9 MARCH 1971



A-1

16MM Mags-7 in 2 Bags
70MM Mags-2 in Bag
Interval Timer
Voice Recorder
Remote Control Cable W/Strap
TV Camera & Zoom Lens
TV Monitor
TV Monitor Cable W/Strap
TV 15' Cable W/Strap
TV Ringsight
TV Mounting Brkt
16MM Camera Sext Adapt
70MM Camera Adapt
UV Camera Mounting Brkt
UV Filter Assy
70MM UV Mag
CO₂ Absorber-2

A-2

PPK-3
Tissue Dispenser-8
FCS-3 (2*)
Headrest Pads-3
Pel Rest 3 Pr in Bag
Jet Stowage Bag (1*)(2**)
EV Gloves (CMP)

A-2 Cont

Tiedown Ropes-5 in Bag
Panel 603 Gauge
EVA Equipment Container
Pressure Cont Vlv
PGA Adapter
Tether IV Crewman
Waist Tether
A7 Straps-3
OPS PGA Attach Straps-4

Top of A-2

ISA Decontamination Bag
Cont Lunar Sample Ret
Decom Ctr
SRC Decon Bags-3
Lunar Sample Ret Decom
Bag
70MM Decom Bags-2
16MM Decom Bag
Penetrometer Drum Decom
Bag

A-3

Fire Ext (Side of A-3)
CO₂ Absorbers-4

A-4

CO₂ Absorbers-4

A-5

CO₂ Absorbers-4

A-6

CO₂ Absorbers-4

A-7

Food Package **
Fecal Col Assy in Bag-12
Fecal Col Assy in Bag-12

Side of A-7

EVA Umbilical in Bag

A-8

70MM Mags-3 in Bag
Inflight Exerciser
CM Towel (RWB)-3 Ea
CWG-9
EMU Maint Kit
Tape Cassette Kit
CWG Elect Adapt-4 in Bag
Relief Recep in Bag W/St
H2 Gas Separator in Bag
Lightweight Headset-3 (2

* LM TRANSFER ITEM
** LM TRANSFER AFTER FINAL DOCK

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A-8 Cont

Tool Kit
PLV Ducts-3 in Bag
Urine Filter Assy-3 in Bag
PGA O2 Interconn-3 in Bag (1**)
Snag Line in Bag W/Strap
Tone Booster in Bag
16MM Mag-2 in Bag

WMS Backup Bag

WMS Water Panel QD
Water Panel Coupling Assy
WMS Power Cable
WMS QD Pressure Cap

Side of A-8 in Bag

Vacuum Hose Brush
Urine Hose W/Adpt & 2 Straps
EVA Guards, L, Ctr, R
Unipod Pole Assy

A-9

CO² Absorbers-4

B-1

Food & Hygiene Items **

B-2

35MM Camera W/55MM Lens
& Film Cassette Plus
(3) 35MM Film Cassettes
in Bag

B-3

16MM Camera & Mag
18MM Lens
75MM Lens
10MM Lens
16MM Power Cable W/Strap
Right Angle Mirror
70MM Cam & Mag
Spotmeter

B-5

CO² Absorber-4

B-6

CO² Absorber-4

B-5/B-6 Closeout Curtain

Stowage Pouch-2
Data Ret Snap
6-Short 6-Long
Data Ret Hook
2-Short 2-Long
Clamps-8
Clips-8

B-8

Chlor & Buffer Ampules-32
In (2) Bags

L-2

CCU Cont Head in Bag
CCU Cable-Spare W/Strap
Tool "E" W/Strap
Ground Cable
70MM PCM Cable W/Strap
16MM PCM Cable W/Strap

L-3

Food Package
Cont feeding system

R-1

Flight Data File

R-2

Flight Data File

R-3

Flight Data File
LM XFR Data Card Kit*
LM Data File*

Data Card Kit

Meter Covers-2
16MM Cam Fuse
Data File Clips-6
Eyepatch
Ctr R-12 W/Books

R-4

Survival Kits #1/#2

R-5

Gen use Ret Straps-7
Couch Straps-2
Probe Stg Straps-2
Utility Straps-6

R-6

Tape
OUA Sunfilters-2
Penlights-5 in Bag
Chlor Syringe Bag with:
Knob, Casing, Needle

R-8

Med Kit

R-11

Urine Transfer Sys-3
Urine Rec Spare
Roll-on-cuff (RWB)

R-13

16MM Mag W/Dos-6 in Bag*
16MM Mag-2 in Bag*
70MM Mag-4 in Bag*
70MM Mag-3 in Bag*

U-1

LCG (2*)
Temp Stg Bag-3
Rad Dos-Hze (Sewn in Ctr)

U-2

Helmet Stg Bag-3
ACC Bag-3
ICG W/Eartube-3
Cabin Fan Filter in Bag

U-3

Coas Filter
Coas Bulb
16MM Cam Brkt
LM Docking Target
Docking Target Adapter

U-4

Tape Recorder Cass-4
Tape Rec Batteries-4
Monocular*
Intervalometer (70MM)
250MM Lens

PGA BAG

UCTA Clamps-3
Helmet Phot Shield
Elect Conn Covers-3
O2 Hose Screen Caps-3
Urine Bag-2
Water Bag Assy
Fecal Bag XFR Bag

LH FEB

Water Gun
CCU Cables-3

UEB

Window Shades-5
S-178 Shade
UV Shade in Bag
Panel 603 EVA Guard

AFT UEB

O2 Mask & Hose W/Strap
(3) in Bag
Sleep Rest-3

LEB

Radiation Survey Meter
G&N Handholds-2
Above L/H Window
COAS

* LM TRANSFER ITEM
** LM TRANSFER AFTER FINAL DOCK

ENTRY STOWAGE CHANGES FROM EARTH LAUNCH

A. LM to CM XFER (ADDITIONS)

<u>QTY</u>	<u>NOMENCLATURE</u>	<u>CM STOWAGE LOCATION</u>
3	LM PPK	A8 (In Decontam. Comp.)
1	Flag Kit	A8
1	DSEA	A8
1	SRC #1	B6
1	SRC #2	B5
1	SRC #3	A9
1	ISA	Top A2
1	Surface Ret Bag	Top A7
1	Cont. Ret Bag	R13

B. CM TO LM XFER (Final Docking Off Load)

<u>QTY</u>	<u>NOMENCLATURE</u>	<u>CM STOWAGE LOCATION</u>
1	B5 Container W/4 CO2 Absorber	From B5
1	B6 Container W/4 CO2 Absorbers	From B6
1	A9 Container W/4 CO2 Absorbers	From A9
1	Jettison Bag (full)	From A2
2	FCS	From A2
1	Food Package	From A7
1	O2 Interconnect	From A8
1	Fecal Coll. Assy.	From A7

C. Relocations - For Re-Entry

<u>QTY</u>	<u>NOMENCLATURE</u>	<u>LAUNCH STOW</u>	<u>RE-ENTRY STOW</u>
3	Helmet Bag	3 - U2	3 - On Helme
3	Accessory Bag	3 - U2	2 - PGA 1 - RH Sleep Restrain
3	ICG W/Eartube	3 - U2	3 - On Crew

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5-4

3	Headrest Pad	3 - A2	3 - On Couch
3	Heel Restraint	3 - A2	3 - On Crew
3	CWG Elect. Adapter	3 - A8	3 - On Crew
3	PGA	3 - On Crew	2 - PGA Bag
			1 - Top A7
2	Helmet	2 - On Crew	2 - PGA Bag
			1 - Top A7
3	O2 Interconnect	3 - A8	2 - CCU (1-LM)
1	EVA Eqpt. Ctr	1 - A2	1 - A7
3	Gloves, IV	3 - On Crew	2 - PGA Bag
			1 - Top A7
1	Gloves, EV	1 - A2	1 - RH Sleep Restraint
5	Ropes	5 - A2	Over PGA Bag & Over RH Sleep Restraint
3	PGA Elect. Covers	3 - PGA Bag	3 - On PGA
1	RH Sleep Rest.	1 - UEB (RH)	1 - Top A7
1	C Sleep Rest.	1 - UEB (RH)	1 - UEB (LH)
TBD	Decontam. Bag	TBD - TBD	2 - W/Hassel Mag, R13
		TBD - TBD	1 - SRC #1-B6
			1 - SRC #2-B5
			1 - SRC #3-A9
			1 - ISA, Top A2
			1 - 16mm, R13
			1 - Cont Ret Bag, R13
			1 - Surface Ret Bag, Top A7
			1 - Cabin Fan Filter Bag, Top A1
3	LM PPK	3 - LM	3 - A8 (In de-contam. Comp)
1	Flag Kit	1 - LM	1 - A8
1	DSEA	1 - LM	1 - A8
1	OPS	1 - LM	1 - A7
1	LM Helmet Stg Bag	1 - LM	1 - PGA Bag
1	24" Pan Mag	1 - SM	1 - A2
1	3" Map Mag	1 - SM	1 - B1

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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

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EMER
1-2

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, 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

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EMER
1-3

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 vlv (2) - CLOSE

✓TUNNEL EQUALIZATION vlv - CLOSED

REPRESS PKG vlv - 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 vlv - 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 vlv - CLOSE

DON 02 MASKS

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EMER
1-4

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 O2 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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EMER
1-5

G&C

CMC LITE

SC CONT - SCS
SEE G&N 5

ISS LITE + PROG ALARM LITE

SC CONT - SCS
SEE G&N 6

ABNORMAL DYNAMICS - CRITICAL SPS BURN

THC - CW
DAMP RATES USING RATE NEEDLES
AFTER SHUTDOWN, AUTO RCS SEL (16) - OFF
SEE G&C 1

SPS

PREMATURE SHUTDOWN - CRITICAL SPS BURN

✓ Δ V THRUST (BOTH) - NORMAL
SC CONT - SCS
SPS THRUST - DIRECT

SPS PRESS LITE - CRITICAL SPS BURN

CONTINUE CRITICAL BURN

IF FUEL & OX PRESS (BOTH) > 200 PSI

SPS HE v1vs (2) - OFF, THEN CONTROL MANUALLY
BETWEEN 170-200 PSI

IF FUEL/OX Δ P > 20 PSI

SPS HE v1vs (2) - ON
IF CONDITION PERSISTS, SPS HE v1vs(2)-OFF(Until Pc <70

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EMERGENCY POWER DOWN

CAUTION USE BATTS 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 (Pnl 226)	
SM PWR SOURCE - AUX BAT (mom) (Pnl 278)	
02 TANK 3 ISOL - CLOSE (✓TB-bp) (Pnl 278)	
FUEL CELL 2 MN A(B) - as desired	

INSURE DSE IS RECORDING	DC AMPS
IF UNSUITED, SUIT COMP (2) - OFF	4.0
FC PUMPS (3) - OFF (Until Tskin > 475°F)	8.7 TOTAL
ALL SW'S, Pnl 181 (5) - OFF	
NON ESS BUS - OFF	5.1
cb G&N OPTICS MNA & MNB (2)- OPEN (Pnl 5)	3.1
G&N PWR (AC) - OFF (Pnl 5)	0.9
02 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 Reqd	5.3 MAX
EXT LTS - OFF	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 (Pnl 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 (Pnl 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 (Pnl 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 (Pnl 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 (Pnl 8)	2.0
SCS ELECTRONICS PWR - OFF	
RHC PWR NORM (2) - OFF	

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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 vlv - OPEN (up)

IF tb STILL BP & REAC FLOW ~0

OPEN CIRCUIT FC 1 (2,3)

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
✓FDAI SOURCE - CMC
AC INV 3 - MNB
AC INV 3 AC 1 - ON
AC INV 1 AC 1 - OFF
All F/C MNA - OFF
ALL F/C MNB - MNB (BEFORE CM/SM SEP)
cb MNA BAT BUS A (Pn1 275) - OPEN
cb MNB BAT C (Pn1 275) - CLOSED

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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
✓FDAI SOURCE - CMC
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 - LAUNCH

BMAG MODE (3) - RATE 2
AC INV 1 MNA - OFF
FDAI SEL - 2
✓FDAI SOURCE - CMC
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

BMAG MODE (3) - RATE 1
AC INV 2 MNB - OFF
FDAI SEL - 1
✓FDAI SOURCE - CMC
✓SUIT COMPR - AC 1
✓ECS GLY PUMP - AC 1

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BAT BUS A LOST - LAUNCH

EDS AUTO/OFF - OFF
AUTO RCS SEL (RING 1) - OFF
TVC GMBL DR (P,Y) - 2
(IF BUS LOST BEFORE GMBL MTRS ON)
cb MNA BAT C (Pn1 275) - CLOSED

BAT BUS B LOST - LAUNCH

EDS AUTO/OFF - OFF
AUTO RCS SEL (RING 2) - OFF
TVC GMBL DR (P,Y) - 1
(IF BUS LOST BEFORE GMBL MTRS 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
ΔV THRUST B - NORM
cb SPS P2 & Y2 (Pn1 8) - OPEN
(CRIT BURNS - AFTER GMBL MTRS ON)
BMAG MODE (3) - RATE 2
FDAI SEL - 2
✓FDAI SOURCE - CMC
AC INV 3 - MNB
AC INV 3 AC 1 - ON
AC INV 1 AC 1 - OFF
A11 F/C MNA - OFF
ALL F/C MNB - MNB
cb MNA BAT BUS A (Pn1 275) - OPEN

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MN BUS B LOST - SPS BURNS

TVC GMBL DR (P,Y) - 1
✓SPS TVC (P,Y) - RATE CMD
ΔV THRUST A - NORM
cb SPS P1 & Y1 (Pn1 8) - OPEN
(CRIT BURNS - AFTER GMBL MTRS ON)
BMAG MODE (3) - RATE 1
FDAI SEL - 1
✓FDAI SOURCE - CMC
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

AC BUS 1 LOST - SPS BURNS

TVC SERVO PWR 1 - AC 2/MNB
✓SCS TVC (P&Y) - RATE CMD
BMAG MODE (3) - RATE 2
AC INV 1 MNA - OFF
FDAI SEL - 2
✓FDAI SOURCE - CMC
SUIT COMPR - AC 2
ECS GLY PUMP - AC 2
S BD NORM XPNDR - SEC
S BD NORM PWR AMP - SEC

AC BUS 2 LOST - SPS BURNS

TVC SERVO PWR 2 - AC 1/MNA
SCS TVC (P&Y) - AUTO
ΔVCG - LM/CSM
MTVC WITH TRIM THUMBWHEELS (SCS)
BMAG MODE (3) - RATE 1
AC INV 2 MNB - OFF
FDAI SEL - 1
✓FDAI SOURCE - CMC
✓SUIT COMPR - AC 1
✓ECS GLY PUMP - AC 1

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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

cb SCS B/D ROLL, P&Y (MNB) (3) (Pn1 8) - CLOSED
BMAG MODE (3) - RATE 2
FDAI SEL - 2
✓FDAI SOURCE - CMC
AC INV 3 - MNB
AC INV 3 AC 1 - ON
AC INV 1 AC 1 - OFF
All F/C MNA - OFF
ALL F/C MNB - MNB (BEFORE CM/SM SEP)
cb MNA BAT BUS A (Pn1 275) - OPEN
cb MNB BAT C (Pn1 275) - CLOSED

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MN BUS B LOST - ENTRY

✓cb SPS B/D ROLL, P&Y (MNA) (3) (Pn1 8) - CLOSED
BMAG MODE (3) - RATE 1
FDAI SEL - 1
✓FDAI SOURCE - CMC
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
AC INV 1 MNA - OFF
FDAI SEL - 2
✓FDAI SOURCE - CMC
SUIT COMPR - AC 2
ECS GLY PUMP - AC 2
S BD NORM XPNDR - SEC
S BD NORM PWR AMP - SEC

AC BUS 2 LOST - ENTRY

BMAG MODE (3) - RATE 1
AC INV 2 MNB - OFF
FDAI SEL - 1
✓FDAI SOURCE - CMC
✓SUIT COMPR - AC 1
✓ECS GLY PUMP - AC 1

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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 B/D ROLL, P&Y (MNB) (3) (Pn1 8) - CLOSED
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 B/D ROLL, P&Y (MNA) (3) (Pn1 8) - CLOSED
cb SCS CONTR/AUTO (2) (Pn1 8) - OPEN
(AFTER APEX COVER JET)
cb MNB BAT C (Pn1 275) - CLOSED

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SM RCS THRUSTER FAILED ON

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)(Pnl 8) - open
ROT CONT PWR DIR (2) - OFF

IF CONDITION PERSISTS

NEUTRALIZE RHC
SM RCS PRPLNT (AFFECTED AXIS) - 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 BOC

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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

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V05 N09 ALARM CODES

- 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
It and NO ATT It on
Coarse align to 0,0,0 Reselect V40.
- (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 MSFN. (G&N 12).

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- (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/1-25. (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/3-6,3-10,6-3)
- 00405 Acceptable star pair is not available
(G/6-3,6-6)
- 00406 Rend navigation not operating
Select P20 or continue.
- 00421 W-matrix overflow
Notify MSFN but continue.
W-matrix automatically reinitialized at
next mark.
- 00600 No solution on first iteration in
P32/72
(G/4-2)
- 00601 Post CSI Perigee/lune alt <85nm/ 5.8nm
(G/4-2)
- 00602 Post CDH Perigee/lune alt <85nm/ 5.8nm
(G/4-2)
- 00603 Time from TIG (CSI) to TIG (CDH)
<10 min
(G/4-2)

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- 00604 Time from TIG (CDH) to TIG (TPI)
<10 min
(G/4-2)
- 00605 Number of iterations exceeds loop
maximum
(G/4-2,4-7,4-8)
- 00606 ΔV (CSI) has been >1000 fps for last
two iterations
(G/4-2)
- 00611 No TIG for given ELEV angle
(G/4-4,4-5)
- 00612 State vector in wrong sphere of influence
at TIG
(G/4-7)
- 00613 Reentry angle out of limits
(G/4-8)
- (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 MSFN, continue.
- (m)01407 VG increasing
(G/5-6,L/7-6) (G&N 12).
- 01426 IMU unsatisfactory
Realign or use SCS.

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01427 IMU reversed
Note FDAI operation is inverted.

01520 V37 request not permitted at this time
Wait till COMP ACTY 1t.
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/5-4,5-14,L/7-5)

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

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

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

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

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

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

**20430 Orbital integration has been
terminated to avoid possible
infinite loop.
Notify MSFN.
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 on, continue.
Otherwise reselect program.

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

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- **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 MSFN.
- *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, F37 (no 1t)(POOD00)
- *(3xxxx) - Restart (no 1t) and program
continues (i.e. attempted
recovery)(BAILOUT)
- NOT - All **alarms act as *type if
they occur when Ave-g is on or
display type extended verb
is active.

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