APOLLO 13	
CSM SYSTEMS CHECKLIST	
PART NO.	S / N
SKB32100082 – 311	1001

APOLLO 13

CSM SYSTEMS CHECKLIST

APRIL 3, 1970

Basic Date 3/9/70
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CSM 109

APOLLO FLIGHT DATA FILE

CSM SYSTEMS CHECKLIST

Basic Date 3/9/70 Change 4/3/70

LIST OF EFFECTIVE PAGES

* INDICATES CURRENT CHANGE

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*S/2-11 thru S/2-12	4/3/70
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S/4-1 thru S/4-2	Basic
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*EMER/1-8	4/3/70
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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

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

2 FC Power Plant Check

FC HTRS (3) - on (up)
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 - 390-450°F
  MOD COND EXH TEMP - 150-175°F
  FC pH HI tb - gray
  FC RAD TEMP LO tb - gray
  FC REACS & RAD cb (6) - out, all others in(verify)

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 lst 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)

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 02 PURGING
FC IND sw - 1(2,3)
FC PURGE 1(2,3) - 02 (2 min)
FC FLOW - 02 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 02 Quantity Balance Correction

ON LOW Tank, H2 or 02 HTRS 1(2) - OFF,
THEN AUTO, WHEN BALANCED

8 FUEL CELL SHUTDOWN (APPLICABLE FC)

cb FC REACS - close
FC REAC - OFF
FC HTRS - OFF
FC PUMPS - OFF
cb FC PUMPS AC - open
AT Tskin $\leq$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 PURGE - 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 O2 & H2 MANUAL FAN OPERATION

H2 & O2 FANS - ON (seq at 1 sec intervals for 1 min each)
a. Prior to every SPS or SIVB ΔV
b. Presleep
c. Postsleep

CAUTION
If CRYO PRESS lt on, do not turn off fan until lt extinguishes

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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 CO2 ABSORBER FILTER REPLACEMENT

Open CO2 Canister attenuation pnl

CAUTION

Connect ground wire when removing 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 pnl
SHIM Stowage - B5 & B6

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4 DEBRIS SCREEN CHECK
Check SUIT RET AIR v1v screen
SUIT RET AIR v1v - CLOSE (push)
Clean screens
SUIT RET AIR v1v - OPEN (pull)

5 CM 02 SUPPLY REFILL
SURGE TANK PRESS ≥500 psia
CAB REPRESS v1v - OFF
REPRESS 02 v1v - CLOSE
REPRESS PKG v1v - FILL
SURGE TANK PRESS - 865-935 psia
02 PRESS IND - TANK 1
REPRESS PKG v1v - OFF

6 DOFFING PGA
EMER CABIN PRESS v1v - BOTH
SUIT RET AIR v1v - OPEN (pull)
Install hose screen on return hose
PWR - OFF
SUIT PWR - OFF for disconnect
AUDIO CONT - NORM
SUIT FLOW v1v - 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 v1v - FULL FLOW (for suited crewman)
SUIT RET AIR v1v - CLOSED (push)
EMERG CABIN PRESS v1v - OFF

8 PARTIAL SUIT CKLIST
EMER CAB PRESS v1v - BOTH
SUIT CKT RET v1v - OPEN (pull)
Reverse 02 umbilicals
Before disconnecting umbilical from head set:
SUIT PWR - OFF
POWER - OFF
AUDIO CONT - NORM

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9 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
UTS vlv - OPEN
Purge lines 1 minute (min)
WASTE MGT OVBD DRAIN vlv - OFF
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
02 PRESS ind - SURGE TK
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 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

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CAB REPRESS vlv - Adj to 150 psia on SURGE TK
WHEN CAB PRESS $\geq$4.7
02 PRESS ind - TANK 1
CAB REPRESS vlv - OFF

11 SUIT CKT INTEGRITY CHECK
DIRECT 02 vlv - CLOSE
SUIT PRESS - 4.7-5.3 psia
02 FLOW - 0.2-0.4 lb/hr

CAUTION

SUIT TEST vlv should remain in the PRESS position until suit circuit pressure is stabilized to preclude seal scarring. If repositioning of SUIT TEST vlv from PRESS is required prior to suit pressure and 02 flow stabilization, perform the following:
a. 02 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, 02 DEMAND REG vlv - BOTH

SUIT TEST vlv - PRESS
02 FLOW - 1.0 lb/hr (pegged)
02 FLOW HI lt - on
M/A - ON, Reset
SUIT PRESS - 8.8-9.8 psia
PGA PRESS - 4.1-4.5 psig
02 FLOW HI lt - out
Allow 02 flow to stabilize 15 sec
02 flow will remain below 0.8 lb/hr for 30 sec after stabilization
SUIT TEST vlv - DEPRESS
02 FLOW - 0.2-0.4 lb/hr
SUIT PRESS - slightly > CAB PRESS
SUIT TEST vlv - OFF
02 DEMAND REG vlv - BOTH (verify)

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
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
SEC COOL LOOP EVAP - RESET 1 min min, then OFF
SEC COOL LOOP PUMP - OFF
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 - AC1

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 H20 quantity <50%)

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Disconnect ampoule assembly from needle assembly
Rotate knob CCW & stow used ampoule
Repeat above steps with buffer ampoule
POT TK IN v1v - 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 sw - WASTE
WATER CONT PRESS REL v1v - DUMP A
Monitor H2O QTY (WASTE) ind - decreasing
When H2O QTY (WASTE) ind reads 25%:
WATER CONT PRESS REL v1v - 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
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 UTS/ Waste Servicing Tank (as req)
Dump Waste Water/Urine
If Waste Water Dump:
WASTE TANK SERV v1v - 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 QD
Connect cabin purge QD to 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 post
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 water collection procedure.

SUIT CKT RET vlv - close
DEMAND REG - OFF
ALL FLOW vlvs - FULL FLOW
Install interconnect on L 02 red hose
Install vacuum cleaner brush on R 02 red hose
Install screen on C 02 red hose
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 scrubbing of CM atmosphere by LiOH canisters

Change routing of hoses to establish new 02 flow pattern in CM for next 24-hour period
SUIT CKT RET vlv - OPEN
DEMAND REGS - BOTH

C/W SYSTEM

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 lt (2) - on)
C/W CSM - CSM (CM RCS lt (2) - out)

2 ACKNOWLEDGE/RESET MASTER ALARM INDICATION

A Normal mode
MA tone/lt (3) - on
MA pb/lt (1) - push
MA tone/lt (3) - out
applicable C/W lt remains on

B Acknowledge mode (C/W NORM in ACK)
MA tone/lt (3) - on
MA pb/lt (1) - push & hold
MA tone/lt (3) - out
applicable C/W lt remains on for malfunction indication
MA pb/lt - release
applicable C/W lt - 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 lt
UTIL PWR - on (up)
Install beeper on LH (RH) girth shelf

B Operational Check
C/W LAMP TEST - 1(2) (hold)

TELECOMM PROCEDURES

1 HI-GAIN ANTENNA OPERATION

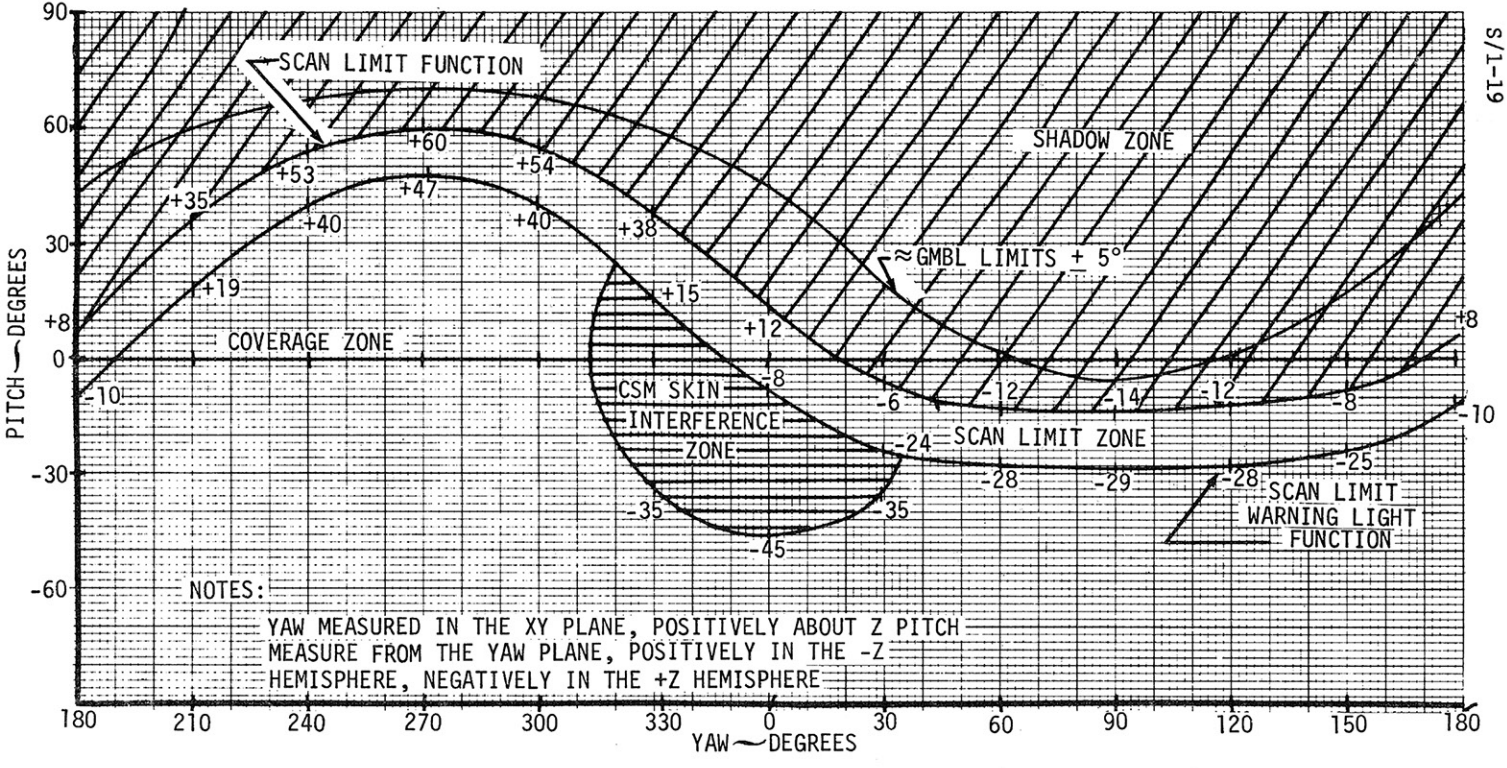
cb HI-GAIN ANT FLT BUS - closed
cb HI-GAIN ANT ac GRP 2 - closed
HI-GAIN ANT TRACK - MAN
HI-GAIN ANT SERVO ELEC - PRIM
HI-GAIN ANT BEAM - WIDE
HI-GAIN ANT PWR - POWER
Go to V64 HI GAIN ANTENNA POINTING procedures
Verify required coordinates within full coverage region

*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 *

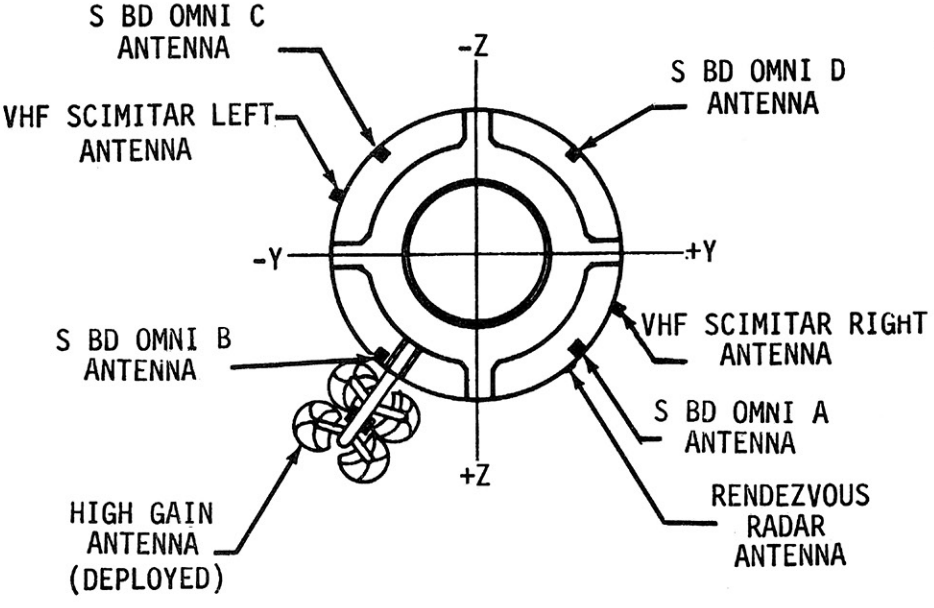
HI-GAIN ANT PITCH & YAW POS (2) - Set in required coordinates
If in earth orbit, S BD NORM PWR AMPL HI-off(ctr)
S BD ANT - HI GAIN
HI-GAIN ANT S BD ANT ind - >1/2 scale
HI-GAIN ANT TRACK - AUTO or REACQ
HI-GAIN ANT BEAM - as required depending on range
HI-GAIN ANT S BD ANT ind - >1/2 scale
When omni antenna operation is desired:
HI-GAIN ANT TRACK - MAN
HI-GAIN ANT PITCH POS - -52°
HI-GAIN ANT YAW POS - 270°

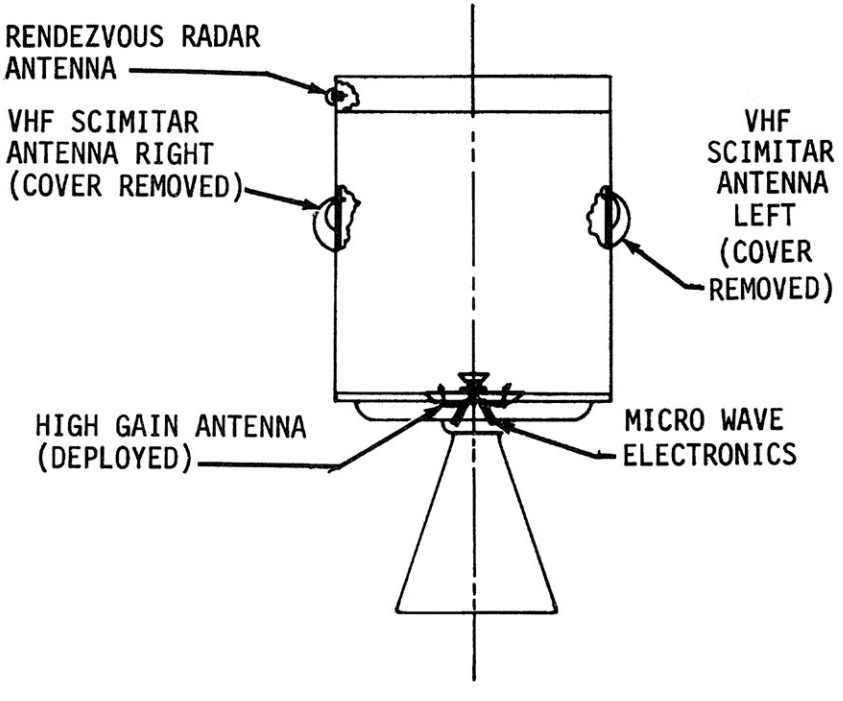
Basic Date 3/9/70
Changed

CSM 109



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





Basic Date 3/9/70
Changed

CSM 109

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 4 ft, 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

3 VHF RANGING OPERATION

VHF AM A - off (ctr)
VHF AM B - DUPLEX
VHF RNG - on (up)
P20 operating
V87E, TRACKER lt - 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 - 000 00
P20 operating, TRACKER lt - out
EMS RANGE ind - XXX XX
V83E (if desired)
R1 = RANGE
R2 = RANGE RATE
R3 = θ
V85E (if desired)
R1 = RANGE
R2 = RANGE RATE
R3 = Ø

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 (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 (rh) - B

Basic Date 3/9/70
Changed

CSM 109

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

Basic Date 3/9/70
Changed

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 RANGING, 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

Basic Date 3/9/70
Changed

CSM 109

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

Basic Date 3/9/70
Changed

GENERAL

PRESLEEP CHECKLIST

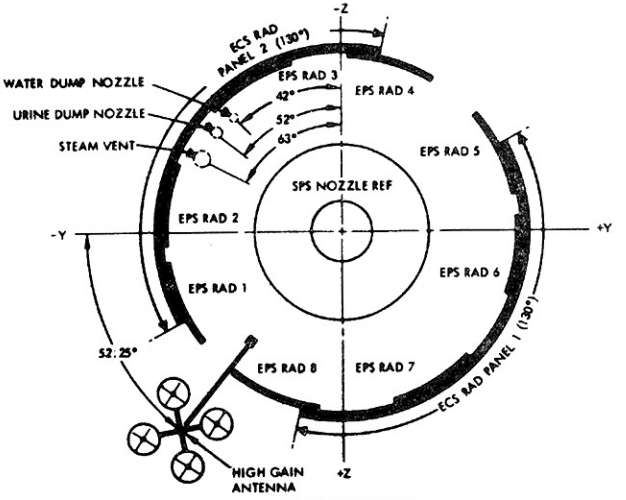
- CREW STATUS REPORT (MEDICATION)
- ONBOARD READOUTS
- CYCLE O2 & H2 FANS
- CHLORINATE POTABLE WATER
- VERIFY:
  - WASTE MNGMT OVBD DRAIN - OFF
  - WASTE STOW VENT v1v - CLOSED
  - EMERGENCY CABIN PRESS - BOTH
  - SURGE TANK O2 v1v - ON
  - REPRESS PKG O2 v1v - OFF
  - LM TUNNEL VENT v1v - LM/CM ΔP
  - "E" MEMORY DUMP
- CONFIGURE COMMUNICATIONS (S/1-24)

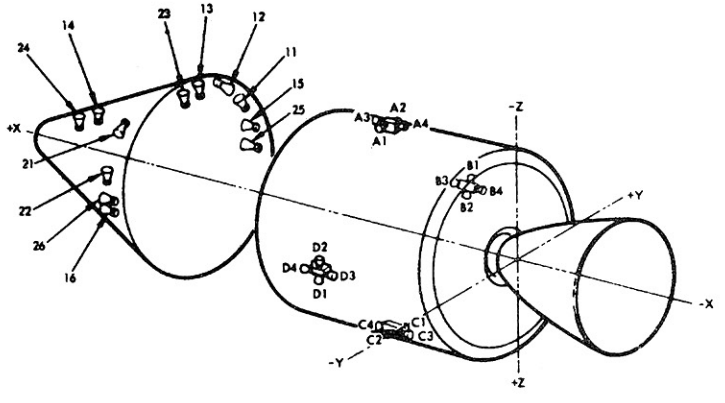
POST SLEEP CHECKLIST

- CREW STATUS REPORT (SLEEP & RADIATION)
- CONSUMABLES UPDATE
- CYCLE O2 & H2 FANS
- CONFIGURE COMMUNICATIONS (S/1-24)

Basic Date 3/9/70
Changed

CSM 109





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

Basic Date 3/9/70
Changed

CSM 109

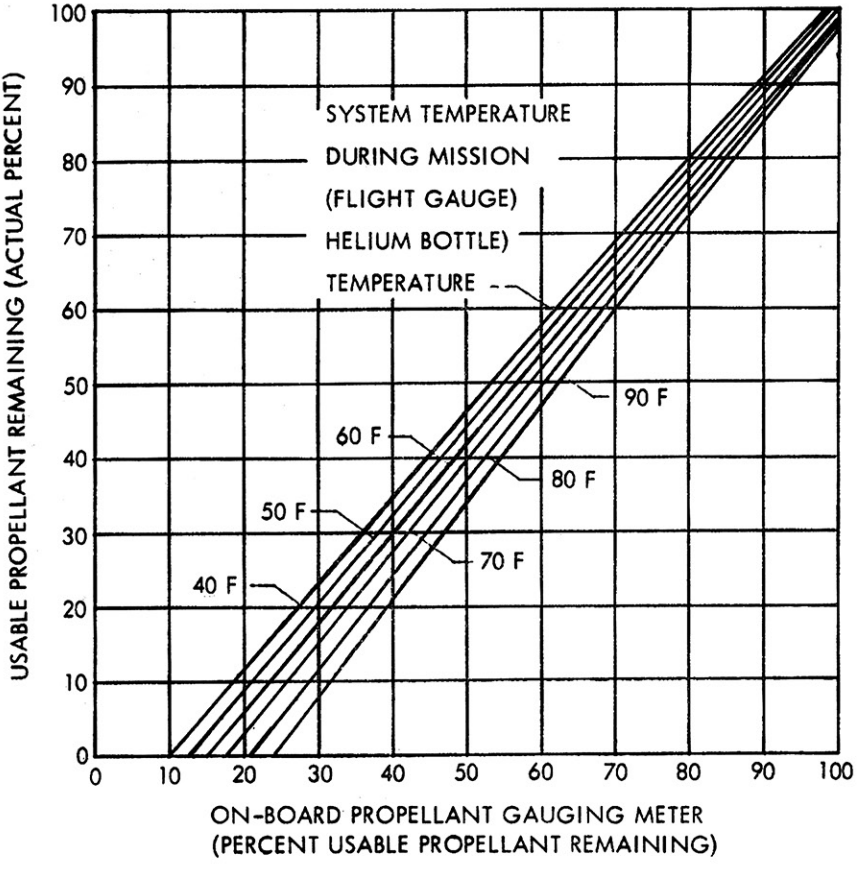
RCS Engines, Vent, and Radiator Location

SYSTEMS TEST Indicator Display	N2, O2, H2 Pressure (psia)			EPS Radiator Outlet Temperature (°F)	CM-RCS Oxidizer Valve Temperature (°F)	LM Power (amps)	SPS Temperature (°F)	Battery Compartment Manifold Pressure (psia)	Battery Relay Bus (vdc)
0.0	0	0	0	-50	-50	0	0	0.00	0
0.2	3	3	3	-36	-46	0.4	8	0.80	1.8
0.4	6	6	6	-22	-42	0.8	16	1.60	3.6
0.6	9	9	9	-8	-38	1.2	24	2.40	5.4
0.8	12	12	12	+6	-34	1.6	32	3.20	7.2
1.0	15	15	15	+20	-30	2.0	40	4.00	9.0
1.2	18	18	18	+34	-26	2.4	48	4.80	10.8
1.4	21	21	21	+48	-22	2.8	56	5.60	12.6
1.6	24	24	24	+62	-18	3.2	64	6.40	14.4
1.8	27	27	27	+76	-14	3.6	72	7.20	16.2
2.0	30	30	30	+90	-10	4.0	80	8.00	18.0
2.2	33	33	33	+104	-6	4.4	88	8.80	19.8
2.4	36	36	36	+118	-2	4.8	96	9.60	21.6
2.6	39	39	39	+132	+2	5.2	104	10.40	23.4
2.8	42	42	42	+146	+6	5.6	112	11.20	25.2
3.0	45	45	45	+160	+10	6.0	120	12.00	27.0
3.2	48	48	48	+174	+14	6.4	128	12.80	28.8
3.4	51	51	51	+188	+18	6.8	136	13.60	30.6
3.6	54	54	54	+202	+22	7.2	144	14.40	32.4
3.8	57	57	57	+216	+26	7.6	152	15.20	34.2
4.0	60	60	60	+230	+30	8.0	160	16.00	36.0
4.2	63	63	63	+244	+34	8.4	168	16.80	37.8
4.4	66	66	66	+258	+38	8.8	176	17.60	39.6
4.6	69	69	69	+272	+42	9.2	184	18.40	41.4
4.8	72	72	72	+286	+46	9.6	192	19.20	43.2
5.0	75	75	75	+300	+50	10.0	200	20.00	45.0

Systems Test Indicator Conversion Chart

CSM 109

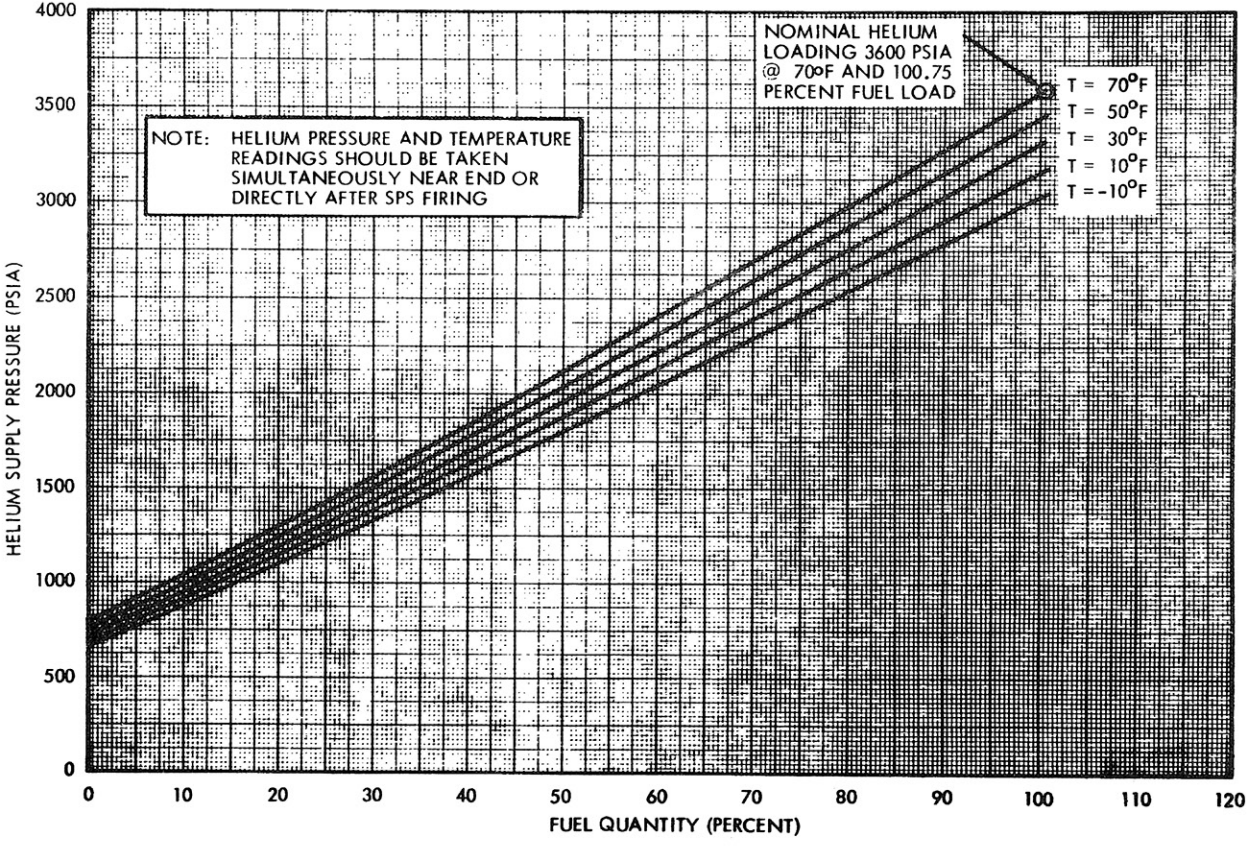
Basic Date 3/9/70
Changed _____



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

Basic Date 3/9/70
Changed

SPS PROPELLANT NOMOGRAPH



CSM 109

Basic Date 3/9/70

Changed _____

LM INTERFACE

1 IVT TO LM (CHECKOUT, TLC)

At 2 hours prior to IVT to LM:
TUNL VENT v1v - LM/CM ΔP
Verify LM/CM ΔP ≥1.7 psid
*LM/CM ΔP <1.7 psid *
*TUNL VENT v1v - VENT *
* till LM/CM ΔP ≥1.7 psid*
Couches: CDR - 0°, CMP - 0°, LMP - 180°
TUNL LTS - ON
Equalize CM/TUNL pressure (Decal)
Verify LM/CM ΔP <.02

Remove hatch & stow (Decal) (3)
Remove probe & stow (Decal) (4)
Remove drogue & stow (Decal) (5)
Read docking tunnel index angle _____
Open LM hatch
Transfer the following to LM:
Box of tissues A1
Vacuum brush, hose and suit hose interconnect A8
16mm magazines (8) R13/A8
70mm magazines HBW (3) R13
70mm magazines HCEX (2) R13
LMP Transfer to LM (6)
At LM request
LM PWR - RESET, then OFF
SYS TEST - 4D
SYS TEST ind - 0 volts
Perform comm checks with LM
At LM request
LM PWR - CSM
SYS TEST - 4D
SYS TEST ind - 0.5 - 3.2 volts
LMP Transfer to CSM (6A)
Close LM hatch
Install drogue (Decal) (8)
Install probe (Decal) (9)
Install CM hatch (Decal) (11)
TUNL VENT v1v - LM/CM ΔP
TUNL LTS - OFF

16mm L.S. Camera System

Basic Date 3/9/70
Changed 3/23/70

CSM 109

2 IVT TO LM (UNDOCKING, ~~DOI~~ PDI)

Couches: CDR - 0°, CMP - 0°, LMP - 180°
CDR don LCG & PGA
Don helmet protective shield (if req'd)
Suit Integrity Ck (if req'd)
TUNL LTS - ON
TUNL VENT vlv - LM/CM ΔP
Verify LM/CM ΔP <0.2
*LM/CM ΔP >0.2 *
* Equalize CM/TUNL Pressure*
*(DECAL) *

Remove tunnel hatch (Decal) (3)
Remove & stow probe (Decal) (4)
Remove & stow drogue (Decal) (5)
Verify docking tunnel index angle
Open LM hatch

LMP transfer to LM (6)
At LM request,
LM PWR - RESET, then OFF
SYS TEST - 4D
SYS TEST ind - 0 volts

CDR transfer to LM (6)
LMP transfer to CSM (6A)
LMP don LCG & PGA
LMP transfer to LM (6)
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)
Cock docking latches (Decal) (13)

Install tunnel hatch (Decal) (11)
Perform hatch integrity check (Decal) (12)
Remove center couch and stow

LM INTERFACE

Basic Date 3/9/70
Changed 3/23/70

CSM 109

Install docking target
DOCKING TARGET - BRIGHT
Receive target alignment verification from LM
Configure side hatch for EVT
ACTR HANDLE SEL - N (neutral)
GN2 VLV HANDLE - pull (inboard)
GN2 PRESS ind - minimum

HATCH 1 (D)

3 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 to stow
Remove hatch, stow

4 PROBE REMOVAL (CM Side) (Decal)
NOTE: Probe may be hot from stay in Lunar orbit
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 HANDLE - 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) unload support beams
B Lunar Orbit Docking:
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

Basic Date 3/9/70
Changed

CSM 109

INSTALLATION STRUT - unstow, position on tunnel wall (yellow marks)
CAPTURE LATCH RLSE HNDL LOCK - Rotate CCW to unlock (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 HNDL 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)

5 DROGUE REMOVAL (Decal)
LOCK LEVER - Pull, rotate 90° CCW
DROGUE - rotate CW, push clear of support
- remove from tunnel

6 CREW TRANSFER TO LM
CDR and LMP Audio Panels:
PWR - OFF
SUIT PWR - OFF
AUDIO CONT - NORM
CDR and LMP SUIT FLOW v1v - OFF
Connect to TRANSFER UMB if desired

6A CREW TRANSFER TO CSM
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 v1v - OFF
Connect to TRANSFER UMB if desired
LMP transfer to CSM

Basic Date 3/9/70
Changed

CSM 109

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 position (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(G)
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 *

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 required.

Basic Date 3/9/70
Changed

CSM 109

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 2
Align Hatch in tunnel
ACTR HNDL SEL - unstow, 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 to stow
PRESS EQUAL vlv - CLOSED (CW) (C)

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 ΔP>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 *

Basic Date 3/9/70
Changed

CSM 109

Verify LM/CM ΔP ind constant (±.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 ΔP >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) (H) (I)
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 release *
* AUX REL(yellow)- push*
* cock latch *
Verify/push latch hndl outboard against latch hook

14 SOFT UNDOCKING
PROBE EXTD/REL - EXTD/REL (momentarily)
Verify probe is extended and LM attached
Allow motion to damp (5 sec)
PROBE EXTD/REL - EXTD/REL and hold (<20sec)
After 2 sec:
Thrust -X (4 jet) for 4 sec
After probe/drogue disengaged:
PROBE EXTD/REL - OFF

15 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

Basic Date 3/9/70
Changed 3/23/70

CSM 109

B One tb does not indicate bp but capture attained (refer to malfunction procedures, DOCK 2)

TUNNEL HATCH

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

D 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)

Basic Date 3/9/70
Changed

PROBE

E Do not get retraction using PRIM 1 (within 30 sec)
- Initiate retraction using bottles in the following order:
- PROBE RETRACT PRIM 2
- If no retraction, initiate PROBE RETRACT - SEC 1

F 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)

G Pushing ratchet handle outboard does not ratchet probe forward
- Push ratchet handle to first detent (red band)
- Slowly push ratchet hndl outboard ~25° until audible click. (If pushed outboard past point of click, probe will release.)
- Repeat until orange hash mark is visible

CSM 109

DOCKING LATCHES

H Cannot Cock 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

I High O2 Flow While Cocking Docking Latches
- Re-engage/verify 3 latches ∿120° apart are engaged
- Slowly torque PRELOAD HNDL (CW) until breakout releases; repeat (3) times
- Disengage docking latches

SIDE HATCH

J Cannot latch side hatch (frozen gearbox)
- The Following tools are required: Tool B, Tool F, (3) jackscrews
- Install (3) jackscrews to restrain hatch in closed position
- Use tool B to remove (2) clevis pins connecting linkage to gearbox and (1) clevis pin from linkage in corner above gearbox.
- Tighten jackscrews to close hatch as far as possible
- Use tool F on flats of latch bellcrank to drive latch to over-center closed position (Apply tool F to upper latch on hinge side to drive the lower and hinge side linkage closed. Apply tool F to center latch to drive upper linkage closed. Gearbox side linkage may not close if gearbox is in full open position.
- Install (2) clevis pins in threaded holes in linkage bell cranks at upper gearbox side and lower hinge side. (Clevis pins installed when approx half the threads are visible.)

Basic Date 3/9/70
Changed

CSM 109

17 LM JETTISON

1 FINAL IVT TO CSM

CDR Verify FWD DUMP vlv - AUTO

CMP O2 PRESS IND sw - SURGE TK
Verify CRYO O2 PRESS 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 ind - ~3 psid then CLOSE
Monitor LM/CM ΔP ind for 3 min and verify ΔP stable
PRESS EQUAL vlv - OPEN
Remove hatch and stow (Decal) (3)
Verify docking latches (at least 3)
Remove & temp stow PROBE & DROGUE (Decal)
Transfer to CDR at his request:
- Probe
- Drogue
- Helmet Stowage bags
- Glove bags
- Decontamination bags

Receive from LM & stow:

Item		CM Stowage Location
Helmets (gloves inside)	(2)	Upper Equip Bay
SRC's	(2)	B5, B6
Hasselblad magazines	(5)	R13
ISA		A1
Tote bag		A7/A11
Lunar Surface Hasselblad		A8
16 mm mags	(6)	R13
CSRC		B1 (in B1 bag)
CSCC		B1 (in B1 bag)
16 mm mags (2)		B1 (in B1 bag)

Transfer B5 & B6 containers to LM

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2 POO, V49, Load LM jett attitude:
F 06 22: R_____, P_____, Y_____
SC CONT - CMC
CMC MODE - AUTO
BMAG MODE (3) - RATE 2
PRO
PRO (Auto mnvr to jett att)

CDR transfer to CM
CM Jettison articles to LM
WARNING
No Urine/Feces
All opened food must be treated and stored in Beta bag

LMP Close LM hatch
Transfer to CSM
CMP DIRECT 02 vlv - close (CW)
Unstow & install forward hatch(DECAL)(11)
Perform hatch integrity check(DECAL) (12)

cb SECS ARM (2) - close
SECS LOGIC (2) - on (up)
Obtain GO from MSFN
SECS PYRO ARM (2) - ARM

3 At Jett Attitude:
ENTR
EMS FUNC - ΔV SET/VHF RNG
EMS ΔV ctr - +100 fps
EMS FUNC - ΔV
BMAG MODE (3) - ATT 1/RATE 2
ATT DB- MIN
RATE - LOW
SC CONT - SCS
Load DAP N46:
R1= 10102, R2= 01111
(-01:00m) V37E 47E
EMS MODE - NORMAL

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4 CSM/LM FINAL SEP (2) - ON (.4 fps sep)
SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
cb SECS ARM (2) - open
SC CONT - CMC
BMAG MODE (3) - RATE 2
MNVR (180°, 90° ORDEAL, 0°)

5 SEP (2 jet +Z 1.0 fps)
PRO (P00)

6 EMS MODE - STBY
EMS FUNCT - OFF
SC CONT - SCS
MAN ATT (3) - MIN IMP
~~Track LM~~ Go ORB RATE (P ~ 93° ORDEAL)
~~P20, V77 at 1 mile~~

7 Empty PGA (2) pockets
Move watch (2) from PGA to arm
Stow PGA (2)
All wash hands thoroughly

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CONTINGENCY EVA

CM PREP FOR CONTINGENCY EVA

1 C & R SUIT FLOW - OFF
2 C & R 02 hoses interconnected with A-1 interconnects
3 Center hoses stowed in tunnel, right hoses secured to tunnel MDC hand straps
4 EVA Stabilizer Strut installed
5 TSB's installed on R&L Girth Ring and LEB
6 Jackscrews (A-1) Fully opened/ Tool Kit
7 Tool Kit (A-1) Snapped to RH Girth Ring
8 Hatch Counterbalance (Engage/Disengaged) (Pull Pip Pin, stow in TSB)
9 MDC Ingress Bar (Stowed/Unstowed)

FINAL CABIN PREP

1 Depress tunnel, if req'd
2 Stow optics
3 Stow COAS
4 Stow cameras and bkt in TSB
5 Set up comm panels
6 PGA Bag - Remove/Secure (tie side straps to fwd straps)
7 Unstow couch straps - (2) PGA Bag
8 Center couch - Remove/Stow under LH couch
9 Marmon Clamps - Closed and locked
10 Stow Hand Controllers (Translation to Y-Y Strut, Rotation to Translation Strut, Rotation to RH TSB)
11 L and R Couch - Stow foot, leg, and seat pans
12 LH X-X Strut - Connected/Disconnect and tie off

SYSTEM PREPARATION FOR DEPRESS

CABIN FAN (Both) - OFF
REPRESS PKG vlv - FILL
Verify REPRESS 02 press 865-935 psi
EMERG 02 vlv - CLOSED
Verify REPRESS 02 vlv - CLOSED
Verify SURGE TANK vlv - ON
02 PRESS IND sw - SURGE TK
Verify surge tank pressure 865-935 psi
Select attitude control mode and maneuver spacecraft to EVT attitude
Check status of LM prep for egress

Stow loose items

NOTE: Perform PLSS Comm check if required
On request by LM,
VHF AM A - DUPLEX
VHF AM B - off (ctr)(Verify)
VHF RANGING - OFF (Verify)
Verify Comm with,
2 PLSS - CDR (EVCS #1) and then
LMP (EVCS #2)
or
1 PLSS - EVCS #1 or #2

FINAL SYSTEMS PREP FOR DEPRESS

Verify surge tank pressure 865-935 psi
EXT LTS - RUN/EVA - on (up) (IF REQ'D)
EXT LTS - RNDZ/SPOT - off (ctr)

PREP FOR CABIN DEPRESS

Verify L 02 hoses connected Red/Red, Blue/Blue, Locked
PGA flow diverter valve (horizontal/vertical)
Verify PGA Zipper - Lock-Lock
Unstow helmet
Verify feed port cover installed and locked, wipe helmet with anti-fog (EMU KIT, A-8)
Verify PGA comm lead inside PGA and clear of suit neck ring
Place helmet attaching neck ring in the "ENGAGE" position
Position mike, don helmet (with shield) and lock
Secure helmet stowage bag
Place suit wrist disconnects to "ENGAGE" position

Don gloves and lock
SUIT CKT RET v1v - close (push)
EMERG CAB PRESS sel - OFF
Check all PGA connections and verify locked. (Helmet, Wrist, 02 Hoses, Comm, Feedport)
Ingress LH couch

PRESS INTEGRITY CHECK (DECAL)

1 DIRECT 02 - CLOSE (CW)
2 SUIT PRESS ind - 4.7-5.3 psia
3 02 FLOW ind - 0.2-0.4 LB/HR
4 SUIT TEST v1v - PRESS (DIR 02 - OPEN
At 4.0 psig, DIR 02 - OFF)
5 02 FLOW ind - 1.0 LB/HR (pegged)
6 02 FLOW HI LT - ON
7 MASTER ALARM PB/LT (3) - ON (PUSH)
8 CYCLE SUIT CKT RET AIR v1v OPEN and CLOSE At SUIT PRESS of 1.5-2.0 psig
9 SUIT PRESS ind -8.8-9.8 psia
10 PGA PRESS ind - 4.1-4.5 psig
11 02 FLOW HI LT - OUT
12 Allow 02 FLOW To Stabilize 15 sec
13 02 FLOW Shall Remain Below 0.8 LB/HR For 30 sec After Stabilization
14 SUIT TEST v1v - DEPRESS
15 02 FLOW ind - 0.2-0.4 LB/HR
16 SUIT PRESS ind - Slight > CABIN PRESS ind
17 SUIT TEST v1v - OFF
18 Verify DEMAND REG SEL - BOTH

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CABIN DEPRESS
Egress LH couch and transfer to hatch
Adjust RH strut mirror to read cabin pressure

CABIN DEPRESS (DECAL)

1 CABIN FAN (2) - OFF
2 REPRESS PKG 02 v1v - FILL
3 REPRESS 02 v1v - CLOSE (verf)
4 CAB PRESS REL v1v (2) - NORMAL
5 SIDE HATCH DUMP v1v - OPEN
(02) FLOW HI WARNING LT May Come On Prior To CABIN PRESS REG LOCK UP
6 At 3.25 psia, SIDE HATCH DUMP v1v - CLOSE
7 02 FLOW ind - LESS THAN 0.5 LB/HR

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8 CABIN PRESS 3.25 psia
9 SUIT CKT PRESS STABLE 3.5 - 4.0
10 SIDE HATCH DUMP vlv - OPEN
11 CABIN PRESS ind - 0

HATCH OPENING (DECAL)
1 GN2 vlv HANDLE - PULL
2 GAGE READS - MIN
3 LOCK PIN RELEASE KNOB - UNLOCK
4 LOCK PIN INDICATOR RELEASED
5 GEAR BOX SEL - UNLATCH
6 ACTR HANDLE SEL-U
7 UNSTOW ACTR HANDLE
8 UNLOCK HATCH
9 ACTR HANDLE SEL-L
10 STOW ACTR HANDLE
11 GEAR BOX SEL-LATCH
12 OPEN HATCH
13 START ELAPSE TIME WHEN OPS ACTIVATED

AUTO RCS SELECT - undocked transfer
A/C ROLL - A1, A2 - OFF
PITCH - A3 - OFF
YAW - B3 - OFF
AUTO RCS SELECT - Docked transfer
A11 - OFF

CM POST CONTINGENCY EVA
EVT (DOCKED)
Give GO for TRANSFER TO OPS & EVT
Start elapse time when OPS activated

EVT (UNDOCKED, STABLE)
Maneuver CSM apex to LM forward hatch
Give GO for transfer to OPS & EVT
Start elapse time when OPS activated

EVT (UNDOCKED, UNSTABLE)
Maneuver CSM to LM
Give GO for transfer to OPS & EVT
Start elapse time when OPS activated
After CDR & LMP push away from LM, maneuver
apex to CDR and LMP

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2 OPS EVT

INGRESS

CDR Ingress CM, head first, face toward MDC
and move to LEB
Retrieve C 02 hoses and elec umbilical
CMP Connect C electrical umbilical to CDR
CDR Audio panel sws - as desired
Secure position in LEB and manage
lifeline for LMP
LMP Ingress CM, feet first, face toward MDC
and assume position in center couch area
CDR Connect R electrical umbilical to LMP
CMP Close hatch

VAC TRANSFER TO CM ECS

(If 25 minutes elapsed from
OPS start time, perform the following)
C and R SUIT FLOW vlvs - OFF
Remove interconnects
Connect 02 hoses (Red/Red, Blue/Blue)
C to CDR, R to LMP
Close Purge vlv
SUIT FLOW vlv - adjust for comfort
OPS 02 shutoff vlv - OFF

HATCH CLOSING (DECAL) (J, pg S/2-9)

1 CLOSE HATCH
2 LOCK HATCH
3 Verify LOCK PIN Dropped in
4 STOW ACTR HANDLE
5 ACTR HANDLE SELECT-N
6 GEAR BOX SEL-LATCH (verify)

Basic Date 3/9/70
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CABIN REPRESS (DECAL)

1 SIDE HATCH DUMP vlv - CLOSE
2 REPRESS 02 vlv - OPEN (10 sec)
Then CLOSE
3 CABIN PRESS Approx - 1.0 PSIA
4 CABIN PRESS ind - Monitor for Gross Leakage (30 sec)
5 REPRESS 02 vlv - OPEN
6 Control Surge Tank Press >150 psia
7 REPRESS PKG vlv - OFF
8 CABIN PRESS ind - 3.0 psia
9 REPRESS 02 vlv - CLOSE
10 Dump OPS into cabin (if avail)
11 CABIN REPRESS vlv - OPEN (CW)
12 Maintain surge tank press >150 psia

TRANSFER TO ECS
(3.0 PSIA CABIN)

B Remove LEVA'S From Helmets
CDR Verify cabin pressure above 3.0 psia
Verify C and R SUIT FLOW vlv - OFF

-CDR-

Remove interconnect from C 02 hoses
CDR OPS 02 shutoff vlv - OFF
As PGA press equalizes with cabin
Connect hoses to PGA (red to red, blue to blue)
No flow condition, remove helmet at safe cabin press
C SUIT FLOW vlv - adjust for comfort
L SUIT FLOW vlv - increase for comfort
Close Purge vlv

-LMP-

Remove interconnect from R 02 hoses
LMP OPS 02 shutoff vlv - OFF
As PGA press equalizes with cabin
Connect hoses to PGA
(red to red, blue to blue)
No flow condition, remove helmet at safe cabin press
CDR SUIT FLOW vlv (3) - FULL FLOW
LMP Close Purge vlv

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POST EVA SYSTEMS CONFIGURATION

CMP CAB PRESS ind - 4.7-5.3 psia
02 PRESS IND sw - TK 1
CDR CAB REPRESS vlv - OFF (CCW)
Doff gloves, helmets, and LEVA's, if req'd
If helmets and gloves doffed:
EMERG CAB PRESS sel - BOTH
SUIT CKT RET vlv - open (pull)

OPS DOFFING

Remove waist tethers, lifeline, and stow in TSB
Remove purge valves and stow in TSB
Verify PLSS antenna stowed
Verify OPS 02 shutoff vlv - OFF
Verify OPS 02 actuator stowed
Disconnect OPS 02 hose and stow
Secure thermal cover
Doff OPS and PLSS straps
Secure OPS with PLSS straps
Stow interconnects in A-1
Secure transfer TSB

END OF 2 OPS EVT
(Go to FINAL SYSTEMS CONFIG)

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PLSS - OPS EVT

INGRESS (CDR-OPS, LMP-PLSS)

CDR Ingress CM, head first, face toward MDC
and move to LEB
Retrieve C O2 hoses and electrical umbilical
CMP Connect C electrical umbilical to CDR
CDR Audio panel sws - as desired
Secure position in LEB and manage lifeline for LMP
LMP Ingress CM, feet first, face toward MDC
CMP Connect R electrical umbilical to LMP
LMP PLSS FEEDWATER - CLOSE
CMP Close hatch

VAC TRANSFER TO CM ECS

(If 25 minutes elapsed from OPS start time, perform the following)

-CDR (OPS)-

CDR Verify C SUIT FLOW vlv - OFF
Remove interconnect and hand C O2 hoses to CMP
CMP Connect C O2 hoses to CDR PGA (red to red, blue to blue)
CDR Close purge vlv
C SUIT FLOW vlv - adjust for comfort
OPS O2 shutoff vlv - OFF

-LMP (PLSS)-

CDR Verify R SUIT FLOW vlv - OFF
Remove interconnect and hand R O2 hoses to CMP
CMP Connect R O2 hoses to LMP PGA (red to red, blue to blue)
CDR SUIT FLOW vlv (3) - FULL FLOW
LMP Verify flow
PLSS O2 vlv - OFF
PLSS PUMP - OFF
PLSS FAN - OFF
PLSS MODE SEL - O

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HATCH CLOSING (DECAL) (J, pg S/2-9)

1 CLOSE HATCH
2 LOCK HATCH
3 Verify LOCK PIN Dropped in
4 STOW ACTR HANDLE
5 ACTR HANDLE SELECT-N
6 GEAR BOX SEL - LATCH (verify)

CABIN REPRESS (DECAL)

1 SIDE HATCH DUMP vlv - CLOSE
2 REPRESS 02 vlv - OPEN (10 sec)
Then CLOSE
3 CABIN PRESS approx - 1.0 psia
4 CABIN PRESS ind - monitor for
gross leakage (30 sec)
5 REPRESS 02 vlv - OPEN
6 Control Surge Tank PRESS >150 psia
7 REPRESS PKG vlv - OFF
8 CABIN PRESS ind - 3.0 psia
9 REPRESS 02 vlv - CLOSE
10 Dump OPS into Cabin (if avail)
11 CABIN REPRESS vlv - OPEN (CW)
12 Maintain Surge Tank Press >150 psia

TRANSFER TO ECS (3.0 PSIA CABIN)

Remove LEVA's from helmets
Verify cabin pressure above 3.0 psia
Verify C and R SUIT FLOW vlv - OFF

-CDR (OPS)-

Remove interconnect from C 02 hoses
CDR OPS 02 shutoff vlv - OFF
As PGA press equalizes with cabin
Connect hoses to PGA (red to red, blue to blue)
No flow condition, remove helmet at safe cabin press
C SUIT FLOW vlv - adjust for comfort
L SUIT FLOW vlv - increase for comfort
Close Purge vlv

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-LMP (PLSS)-

Remove interconnect from
R 02 hoses
LMP PLSS 02 vlv - OFF
Connect Hoses to PGA
(red/red, blue,blue)
For no flow condition, avoid negative pressure,
remove helmet at safe cabin press
To depress suit remove PLSS blue hose
Depress blue 02 connector
CDR SUIT FLOW vlv (3) - FULL FLOW
PLSS PUMP - OFF
PLSS FAN - OFF
PLSS MODE SEL - POS 0

POST EVA SYSTEMS CONFIGURATION
CMP CAB PRESS ind - 4.7-5.3 psia
02 PRESS IND sw - TK 1
CDR CAB REPRESS vlv - OFF (CCW)
Doff gloves, helmets, and LEVA's, if req'd
If helmets and gloves doffed - EMERG CAB PRESS
SEL - BOTH
SUIT CKT RET vlv - open (pull)

OPS DOFFING
Remove waist tethers, lifeline, and stow in TSB
Remove purge valves and stow in TSB
Verify PLSS antenna stowed
Verify OPS 02 shutoff vlv - OFF
Verify OPS 02 actuator stowed
Disconnect OPS 02 hose and stow
Secure thermal cover
Doff OPS and PLSS straps
Secure OPS with PLSS straps
Stow interconnects in A-1
Secure transfer TSB

PLSS/DOFFING

Remove waist tethers, lifeline, and stow in TSB
All RCU ELEC CNTLS - OFF (Verify)
Disconnect RCU stow in TSB
Disconnect PLSS 02 and H20 hoses
Disconnect lower then upper PLSS straps-Doff PLSS
Stow PLSS-02, H20, and COMM umbilicals
Temp stow PLSS

END OF PLSS - OPS EVT
(Go To FINAL SYSTEMS CONFIG)

2 PLSS/OPS EVT

INGRESS

CDR Ingress CM, head first, face toward MDC and move to LEB
CDR Secure position in LEB and manage lifeline for LMP
LMP Ingress CM, feet first, face toward MDC and assume position in center couch area
B PLSS FEEDWATER - CLOSE
CMP Close hatch

VAC TRANSFER TO CM ECS

Verify C and R SUIT FLOW vlv - OFF
Remove interconnects
Remove OPS 02 hose and Purge vlv
Connect 02 hoses to PGA (red/red, blue/blue)
C-CDR, R-LMP
SUIT FLOW vlv - adjust for comfort
PLSS 02 vlv - OFF
PLSS PUMP - OFF
PLSS FAN - OFF

CONNECT TO CM COMM, IF REQ'D

PLSS MODE SEL - POS 0
Disconnect PLSS COMM
Connect electrical umbilical (C-CDR, R-LMP)
Audio panel sws - as desired

HATCH CLOSING (DECAL) (J, pg S/2-9)

1 CLOSE HATCH
2 LOCK HATCH
3 Verify LOCK PIN Dropped in
4 STOW ACTR HANDLE
5 ACTR HANDLE SELECT-N
6 GEAR BOX SEL - LATCH (verify)

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CABIN REPRESS (DECAL)

1 SIDE HATCH DUMP vlv - CLOSE
2 REPRESS 02 vlv - OPEN (10 sec)
Then CLOSE
3 CABIN PRESS approx - 1.0 psia
4 CABIN PRESS ind - monitor for
gross leakage (30 sec)
5 REPRESS 02 vlv - OPEN
6 Control Surge Tank PRESS >150 psia
7 REPRESS PKG vlv - OFF
8 CABIN PRESS ind - 3.0 psia
9 REPRESS 02 vlv - CLOSE
10 Dump OPS into Cabin (if avail)
11 CABIN REPRESS vlv - OPEN (CW)
12 Maintain Surge Tank Press >150 psia

TRANSFER TO ECS (3.0 PSIA CABIN)

-CDR-

Remove LEVA's from helmets
Verify cabin pressure above 3.0 psia
Verify C and R SUIT FLOW vlv - OFF
Remove interconnect from C 02 hoses
CDR PLSS 02 vlv - OFF
Open Purge vlv to equalize press
No flow condition, avoid negative press,
remove helmet at safe cabin press
Remove OPS hose and Purge vlv
Connect hoses to PGA (red/red, blue/blue)
C SUIT FLOW vlv - adjust for comfort
L SUIT FLOW vlv - increase for comfort
PLSS PUMP - OFF
PLSS FAN - OFF

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-LMP-

Remove interconnect from R 02 hoses
LMP PLSS 02 vlv - OFF
Open Purge vlv to equalize press
No flow condition, avoid negative press,
remove helmet at safe cabin press
Remove OPS hose and Purge vlv
Connect hoses to PGA connectors
(red/red, blue/blue)
CDR SUIT FLOW vlv (3) - FULL FLOW
LMP PLSS PUMP - OFF
PLSS FAN - OFF

CONNECT TO COMM

Verify SUIT PWR - OFF
Verify PWR sw - OFF
Verify AUDIO CONT - NORM
PLSS MODE SEL - POS 0
Disconnect PLSS COMM
Connect electrical umbilical to PGA
Audio panel sws - as desired

POST EVA SYSTEMS CONFIGURATION

CMP CAB PRESS ind - 4.7-5.3 psia
02 PRESS IND sw - TK 1
CDR CAB REPRESS vlv - OFF (CCW)
Doff gloves, helmets, and LEVA's, if req'd
If helmets and gloves doffed - EMERG CAB PRESS
SEL - BOTH
SUIT CKT RET vlv - open (pull)

PLSS/OPS DOFFING

Remove waist tethers, lifeline, and stow in TSB
All RCU ELEC CNTLS - OFF
Disconnect RCU stow in TSB
Disconnect PLSS 02 and H20 hoses
Disconnect lower then upper PLSS straps-Doff PLSS
Stow PLSS-02, H20, and COMM umbilicals
Stow OPS-02 Actuator and 02 hose
Temp stow PLSS/OPS

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FINAL SYSTEM CONFIGURATION
O2 PRESS IND sw - SURGE TK
CRYO O2 PRESS 1 ind - 500 psia
Verify CAB REPRESS vlv - OFF (CCW)
Verify REPRESS O2 - CLOSE
REPRESS PKG vlv - FILL
Verify Repress O2 press increasing
CRYO O2 PRESS 1 ind - 865-935 psia
O2 PRESS IND sw - TK 1
REPRESS PKG vlv - OFF

CM EQUIPMENT JETTISON
Inspect PGA zipper-verify lock-lock

SYSTEMS PREPARATION FOR DEPRESS
SUIT FLOW vlv - SUIT FULL FLOW
SUIT CKT RET vlv - open (pull)
EMER CAB PRESS sel - BOTH
Verify Repress O2 pressure 865-935 psi
EMERGENCY O2 vlv - CLOSED
REPRESS O2 vlv - CLOSED
Verify SURGE TANK vlv - ON
O2 PRESS IND sw - SURGE TANK
Verify surge tank pressure 865-935 psi

EQUIPMENT PREPARATION FOR DEPRESS
Stow loose items
Prepare all equipment to be
  jettisoned and secure
    PLSS (1-2)
    RCU (1-2)
    OPS (1-2)
    PURGE VALVE (1-2)
    LIFELINE (1)
    LEVA's (2)
    WAIST TETHERS (2)

PREP FOR CABIN DEPRESS

Verify 02 hoses connected (red/red, blue/blue)
PGA diverter valves- horizontal/vertical
Unstow helmet
Verify feed port cover installed and locked,
  wipe helmet with anti-fog
Position mikes, don helmet and "lock"
Secure helmet stowage bags
Don gloves and lock
SUIT CKT RET vlv - close (push)
EMER CAB PRESS sel - OFF
Check all PGA connections and verify
  lock-lock (Helmet, Wrist, 02 Hoses, Comm, Feedport)

PRESSURE INTEGRITY CHECK (DECAL)

1 DIRECT 02 - CLOSE (CW)
2 SUIT PRESS ind - 4.7-5.3 psia
3 02 FLOW ind - 0.2-0.4 LB/HR
4 SUIT TEST vlv - PRESS (DIR 02 - OPEN,
  At 4.0 psig, DIR 02 - OFF)
5 02 FLOW ind - 1.0 LB/HR (pegged)
6 02 FLOW HI LT - ON
7 MASTER ALARM PB/LT (3) - ON (PUSH)
8 CYCLE SUIT CKT RET AIR vlv OPEN and
  CLOSE At SUIT PRESS of 1.5-2.0 psig
9 SUIT PRESS ind - 8.8-9.8 psia
10 PGA PRESS ind -4.1-4.5 psig
11 02 FLOW HI LT - OUT
12 Allow 02 FLOW To Stabilize 15 sec
13 02 FLOW Shall Remain Below 0.8 LB/HR
  For 30 sec After Stabilization
14 SUIT TEST vlv - DEPRESS
15 02 FLOW ind - 0.2-0.4 LB/HR
16 SUIT PRESS ind - Slight > CABIN
  PRESS ind
17 SUIT TEST vlv - OFF
18 Verify DEMAND REG SEL - BOTH

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CABIN DEPRESS (DECAL)

1 CABIN FAN (2) - OFF
2 REPRESS PKG 02 v1v - FILL
3 REPRESS 02 v1v - CLOSE (verf)
4 CAB PRESS REL v1v (2) - NORMAL
5 SIDE HATCH DUMP v1v - OPEN
(02) FLOW HI WARNING LT May Come On Prior To CABIN PRESS REG LOCK UP)
6 At 3.25 psia, SIDE HATCH DUMP v1v - CLOSE
7 02 FLOW ind - LESS THEN 0.5 LB/HR
8 CABIN PRESS 3.25 psia
9 SUIT CKT PRESS STABLE 3.5-4.0
10 SIDE HATCH DUMP v1v - OPEN
11 CABIN PRESS ind - 0

HATCH OPENING (DECAL)

1 GN2 v1v HANDLE - PULL
2 GAG READS - MIN
3 LOCK PIN RELEASE KNOB - UNLOCK
4 LOCK PIN INDICATOR RELEASED
5 GEAR BOX SEL - UNLATCH
6 ACTR HANDLE SEL-U
7 UNSTOW ACTR HANDLE
8 UNLOCK HATCH
9 ACTR HANDLE SEL-L
10 STOW ACTR HANDLE
11 GEAR BOX SEL-LATCH
12 OPEN HATCH

EQUIPMENT JETTISON

JETTISON EQUIPMENT -
PLSS (1-2)
RCU (1-2)
OPS (1-2)
PURGE VALVE (1-2)
LIFELINE (1)
LEVA's (2)
WAIST TETHERS (2)

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Changed

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HATCH CLOSING (DECAL) (J, pg S/2-9)

1 CLOSE HATCH
2 LOCK HATCH
3 Verify LOCK PIN Dropped in
4 STOW ACTR HANDLE
5 ACTR HANDLE SELECT-N
6 GEAR BOX SEL - LATCH (verify)

CABIN REPRESS (DECAL)

1 SIDE HATCH DUMP vlv - CLOSE
2 REPRESS 02 vlv - OPEN (10 sec)
Then CLOSE
3 CABIN PRESS approx - 1.0 PSIA
4 CABIN PRESS ind - monitor for
gross leakage (30 sec)
5 REPRESS 02 vlv - OPEN
6 Control Surge Tank Press >150 psia
7 REPRESS PKG vlv - OFF
8 CABIN PRESS ind - 3.0 psia
9 REPRESS 02 vlv - CLOSE
10 Dump OPS into cabin (if avail)
11 CABIN REPRESS vlv - OPEN (CW)
12 Maintain Surge Tank Press >150 psia

SYSTEM CONFIGURATION

CAB PRESS ind - 4.7 - 5.3 psia
02 PRESS IND sw - TANK 1
CAB REPRESS vlv - OFF (CCW)
Doff gloves and helmets, if req'd
If helmets and gloves doffed -
EMERG CAB PRESS sel - BOTH
SUIT CKT RET vlv - open (pull)

POST EVA CABIN CONFIGURATION

EXT LTS - RUN/EVA - OFF (down)
Perform as desired
(a) Recharge Repress Pkg
(b) Change crew stations
(c) Restow tool B & jack screws
(d) Unstow & install PGA bag
(e) Reinstall center couch
(f) Connect counterbalance (Pip Pin in TSB)

EVT EQUIPMENT STOWAGE FOR ENTRY

I. CM reentry without suits:

ITEM	STOWAGE LOCATION FOR REENTRY
a. OPS (2)	In PGA
b. Purge Valve (2)	In PGA
c. Life Line	In PGA Bag
d. EV Gloves	On PGA
e. LEVA (2)	2 on helmet attached to suits, in RH & LH sleep restraints
f. Waist tether (2)	In PGA Bag
g. CSRC	Inside helmet in B1
h. Tote Bag	In PGA Bag toward LEB/or Decom Bag on top of A1
i. Suits	1 Suit with OPS's in PGA Bag w/tie down rope
	2 Suits in sleep restraint under LH & RH couch w/tie down rope
j. Helmets	2 On suits with LEVA 1 In B1

Basic Date 3/9/70
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II. CM reentry with suits:

ITEM	STOWAGE LOCATION FOR REENTRY
a. OPS (2)	LH & RH sleep restraint in PGA Bag w/tie down rope
b. Tote Bag/CSRC	In sleep restraint with OPS's
c. Purge Valve (2)	LH & RH sleep restraint in PGA Bag w/tie down rope
d. Life Line/Waist Tether (2)	In PGA Bag
e. EV Gloves	On PGA
f. LEVA (2)	PGA Bag(or B1 or L3 if avail)

III. The following equipment may be transferred in PGA pockets during the EV transfer:

ITEM	STOWAGE LOCATION
a. Film Magazines	Vol R13, A8
b. Log Books	Vol R1, R2 and R3

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SAFE OF APEX COVER JETT

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 (Pnl 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

Continue Normal Entry Except,

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

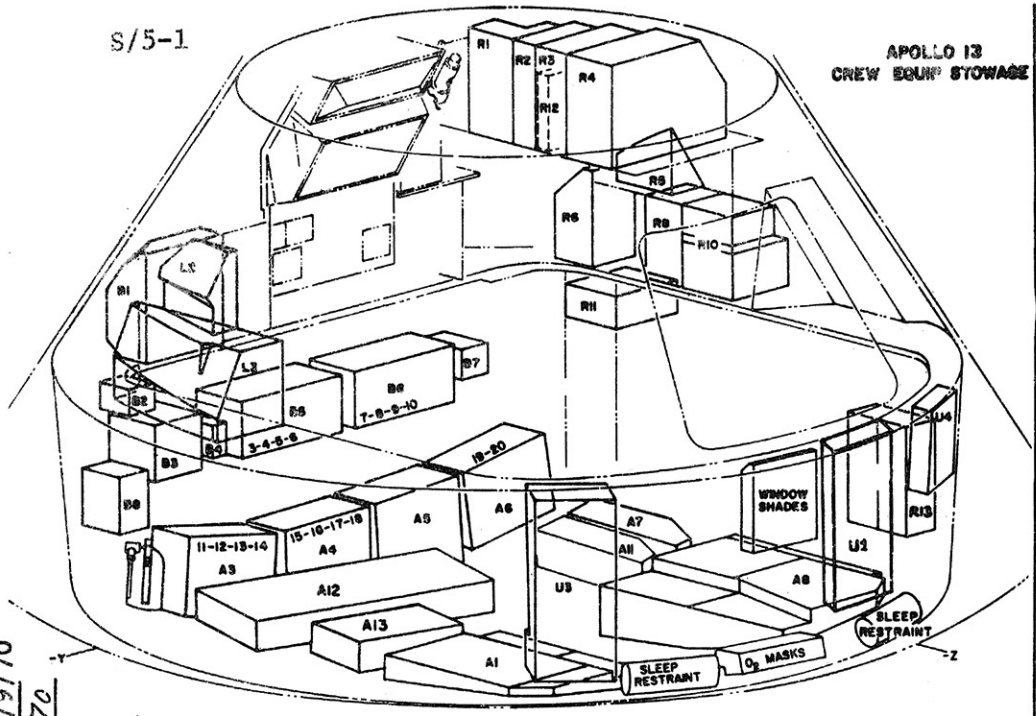
STEP D

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

SAFE OF APEX COVER JETT

Basic Date 3/9/70
Changed

CSM 109



Basic Date 3/9/70
Changed 3/23/70

CSM 109

1	Cabin Fan Filter Bag	PGA Bag
1	Cabin Vent QD	R6
1	CCU Cable, Spare	L2
1	CCU Control Head, Spare	L2
1	Chlorination Equipment	B4, B8, A1
1	COAS	Above LH Window
	2 Bulbs	U3
	1 Filer	U3
20	CO_2 Absorbers	A3 4-[illegible], 4-A4, 2-A6, 4-B5, 4-B6, 2-ECU
1	CO_2 Absorber Ground Cable	L2
3	CWG	A8
4	CWG Elect. Adapters	A8
1	Camera, 16mm L.S. W/Mag, Lens, Handle, Battery Pack, RCU Bracket & Spare Mag	A8 (LM Xfr)
1	Camera, 16mm W/Mag	B3
	10 Mag	5-B2, 5-B8
	6 Mag	R-13 (LM Xfr)
	1 Power Cable	B3
	1 ea Lens, 5mm, 18mm, 75mm	B3
	1 Mirror	B3
	1 Bracket	U3
	1 Sextant Adapter	A5
	1 Fuse, Spare	R3 (Data Kit)
1	Camera, 70mm Reseau, Mag & Spare Mag	A13
1	Camera, 70mm W/Mag	B3
	6 Mag	1-A8, 5-A13
	5 Mag	R-13, (LM Xfr)
	1 Bracket, 80/250	A1
	1 Bracket, 500	A11
	1 Lens, 250	U4
	1 Lens, 500	A11
	1 Remote Cable	A11
	1 Intervalometer	U4
	1 PCM Cable	L2
1	Camera Hycon (CTC) W/Mag	A12
	1 Mag	A13
	1 Control Box	A13
	2 Cables	A12

STOWAGE

1	Camera, TV & Ringsight	A7
	1 Monitor	A6
	2 Cables	A6
	1 Bracket	A6
2	Data Card Kit	R3 (1-Xfr to LM)
	1 Eyepatch	Data Kit
	6 Data Clips	Data Kit
	2 Meter Covers	Data Kit
11	Decontamination Bags	A8, U1
3	Dispers (FCS)	A8
1	Docking Target	U3
1	Exerciser	A8
30	Fecal Bags	R10
1	Flight Data File	R1, R2, R3
1	Fire Extinguisher	A3
2	Food	B1, L3
1	Gas Separator	A1
4	Glare Shades	R1
3	Helmet & Accessory Bags	R6
2	Handhold, G&N	R1
3	Headrest Pads	A5
3	Heel Restraints	A5
1	Helmet Shield	PGA Bag
3	Inflight Coveralls	PGA Bag
1	Jettison Bag	R13
2	Liquid Cooled Garments	U1
3	Lightweight Headsets	A8
1	Maintenance Kit	A8
1	Medical Kit	R8
1	Monocular	U4
3	O_2 Screen Caps	PGA Bag
3	O_2 Mask	Under Repress Rack
3	O_2 Interconnect	2-A1, 1-side A8
2	Penlight	A1
3	PGA Elect Covers	PGA Bag
3	PLV Ducts	A1
3	PPK	A8
1	Radiation Meter	G&N Panel
3	Roll-on-cuff	R11
5	Rope	A5
1	Side Hatch Dump Equipment	R10
3	Sleep Restraint	UEB
1	Snag Line	A1
1	Spotmeter	A5
2	Sun Filters, G&N	R1
1	S-178 Shade	Window Shade Bag
1	Sea Dye Marker	A1
32	Springs, Snaps, Clips	Curtain in front B5, B6
2	Survival Kits	R4
3	Strap, Couch	PGA Bag
6	Strap, Utility	R5
2	Strap, Probe	A1
1	Tone Booster	Under A3
1	Tape	R5
1	Tape Recorder	B8
4	Tape Cassettes & Batteries	U4
	Tape Cassettes & Batteries (pre-recorded)	
3	Temporary Stowage Bags	A1
1	Timer	A5
7	Tissue Dispenser	5-A1, 2-A8
1	Tool "E"	L2
1	Tool Kit	A1
3	Towels	A1
3	UCTA Clamps	PGA Bag
1	Urine Hose & Suit Adapter	Under A6
3	Urine Transfer System	R11
3	Urine Filters	R5
1	UTS Receiver, Spare	R11
1	Urine Receptacle	A8
1	Vacuum Hose, 2 Brushes, & Interconnect	Side A8
5	Window Shades	On Repress Rack

Basic Date 3/9/70
Changed

CSM 109

ENTRY STOWAGE CHANGES FROM EARTH LAUNCH

A. (LM to CM XFER) ADDITIONS

QTY	NOMENCLATURE	CM STOWAGE LOCATION/VOLUME
1	PPK, 1 Flag Kit	A13 (In Cabin Fan Filter Bag)
2	PPK's	R13
1	DSEA	R13
1	SRC #1	B6 (In Decontam. Bag From A8)
1	SRC #2	B5 (In Decontam. Bag From A8)
	NOTE: Solar Wind 1 Ea. and Weigh Bag 1 Ea. IN SRC	
1	Contingency Sample	B1 (In Decontam. Bag From A8)
1	CSC Cassette	B1 (In Decontam. Bag From A8)

B. (CM to LM XFER) - Final Docking - Off Load

QTY	NOMENCLATURE	CM STOWAGE LOCATION/VOLUME
1	B5 Container W/4 CO_2 Absorbers	From B5
1	B6 Container W/4 CO_2 Absorbers	From B6
1	Docking Probe	From Tunnel
1	Jettison Stowage Bag	From R13

Basic Date 3/9/70
Changed 3/23/70

C. Relocations - For Re-Entry

QTY	NOMENCLATURE	LAUNCH STOW	RE-ENTRY STOW
3	Helmet Stowage Bags	3 Ea. R6	1 Ea. R6/B1/L3
3	Accessory Bags	3 Ea. R6	1 Ea. R6/B1/L3
3	ICG	PGA Container	3 Ea. On Crew
3	Headrest Pad	3 Ea. A5	3 Ea. On Couch
3	Heel Restraint	3 Ea. A5	3 Ea. On Crew
4	CWG Elect. Adapter	4 Ea. A8	3 Ea. On Crew 1 Ea. A8
3	CWG Elect. Adapter Cover	3 Ea. PGA Cont.	3 Ea. On PGA
1	Panel Indicator/ Noun List	1 Ea. Installed	1 Ea. Data Card Kit
2	PGA-EV	2 Ea. On Crew	2 Ea. PGA Container

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QTY	NOMENCLATURE	LAUNCH STOW	RE-ENTRY STOW
2	Helmet	2 Ea. On Crew	2 Ea. in Helmet Bags 1-B1/1-L3
1	PGA-IV	1 Ea. On Crew	1 Ea. RH Sleep Restraint
1	Helmet	1 Ea. On Crew	1 Ea. RH Sleep Restraint
1	Gloves, IV-Pr.	1 Ea. On Crew	1 Ea. RH Sleep Restraint
11	Decontamination Bags	10 Ea. A8 1 Ea. U1	1 Ea. W/70MM Mag. R13 1 Ea. W/70MM Mag. R13 1 Ea. Conting. Sample B1 1 Ea. CSC Cassette B1 1 Ea. SRC #1-B6 1 Ea. SRC #2-B5 1 Ea. ISA On top A1 1 Ea. Tote On top A7/ A11 1 Ea. 16mm R13 1 Ea. 70mm A8 1 Ea. Rtn. Equip. B1

NASA — MSC

Basic Date 3/9/70
Changed

CSM 109

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

Basic Date 3/9/70
Changed

IF COASTING FLT

cb SECS ARM (2) (Pnl 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

ΔVCG - 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

ΔV THRUST A - NORMAL

DIR ULLAGE & THRUST ON PB - PUSH

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

LV

Basic Date 3/9/70
Changed

CSM 109

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 vlvs (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 H20

IF CONDITION PERSISTS

SUIT COMPR (2) - OFF

DOFF HELMETS

DIRECT 02 vlv - 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 OFF
- DON O2 MASKS
- USE FIRE EXTINGUISHER OR H2O GUN (OPTIONAL)

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

Basic Date 3/9/70
Changed

EMERGENCY POWER DOWN	AMPS	
HYCON CAMERA - OFF	5.1	
02 HTRS (2) - OFF (CTR)	11.1	
02 FANS (2) - OFF (CTR)	5.4	
H2 HTRS (2) - OFF (CTR)	1.4	
H2 FANS (2) - OFF (CTR)	0.7	
G&N OPT PWR - OFF	3.1	
POT H20 HTR - OFF	1.6	MAX
ECS RAD HTRS (2) - OFF	17.2	EA
SPS LINE HTR - OFF (CTR)	6.2	(A/B)
SPS GAUGING - OFF	3.0	
GMBL MTRS P2 & Y2 - OFF (NOT LAUNCH)	10.0	
cb SPS P1 & Y1 (Pnl 3) - OPEN		
TVC GMBL DR (P&Y) - 1		
IF UNSUITED, SUIT COMP - OFF	4.0	
FC PUMPS (3) - OFF (UNTIL TSKIN >460°F)	3.7	TOTAL
SM RCS HTRS (4) - OFF	2.9	EA MAX
(ELECTRICALLY ISOLATE IF QUAD <55°F)		
BMAG #2 - OFF	2.6	from ON
	1.9	from WARMUP
LIGHTS - MIN REQD	1.6	
S BD PWR AMP - OFF (CTR)	4.0	
TAPE RCDR - OFF (CTR)	1.6	
ECS PRI GLY PUMP - OFF (G&N LIMIT 2.5 HRS)	2.6	
SEC COOL EVAP - RESET (58 SEC), THEN OFF	4.3	
SEC COOL PUMP - OFF (CTR)		
cb ECS RAD CONT/HTRS (2) (Pnl 5) - OPEN		
CMC POWERDOWN	6.3	
CMC MODE - FREE		
G&N IMU PWR - OFF		
V48E		
F V04 N46 LOAD 0 (NO DAP) IN LEFT DIGIT OF R1		
PRO,PRO,PRO		
V46E		
V37E06E		
F V50 N25, 00062 CMC PWR DN		
PRO REPEATEDLY UNTIL STBY LT - ON		
G&N PWR - OFF	1.5	
SCE PWR - OFF (CTR)	0.7	
C/W NORMAL - ACK		
VHF AM (2) - OFF (CTR)	0.2	EA
HGA PWR - OFF	1.9	
TELECOM GRP 1&2 - OFF	1.8	
cb INSTR ESS MN A&B (Pnl 5) - OPEN	4.9	

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Changed

CSM 109

EPS

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 (Pnl 275) - CLOSED
cb MNB BAT C (Pnl 275) - CLOSED

AC BUS OVERLD + AC BUS + MN BUS UNDER V LITES

AFFECTED AC BUS - OFF (REASON - AC BUS SHORT)

MN BUS A LOST - LAUNCH, SPS BURN OR ENTRY

LAUNCH ONLY
- EDS AUTO/OFF - OFF

SPS BURNS ONLY
- TVC GMBL DR (P,Y) - 2
- ✓ SCS TVC (P,Y) - RATE CMD
- ΔV THRUST B - NORM
- cb SPS P2 & Y2 (Pnl 8) - OPEN
  (CRIT BURNS - AFTER GMBL MTRS ON)

ENTRY ONLY
- cb SCS B/D ROLL, P&Y (MNB)(3)(Pnl 8) - CLOSED
- BMAG MODE (3) - RATE 2
- FDAI SEL - 2
- ✓ FDAI SOURCE - CMC

ALL
- 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 (Pnl 275) - OPEN
- cb MNB BAT C (Pnl 275) - CLOSED
  (LAUNCH & ENTRY)

MN BUS B LOST - LAUNCH, SPS BURNS OR ENTRY

LAUNCH ONLY
- EDS AUTO/OFF - OFF

SPS BURNS ONLY
- TVC GMBL DR (P,Y) - 1
- ✓ SPS TVC (P,Y) - RATE CMD
- ΔV THRUST A - NORM
- cb SPS P1 & Y1 (Pnl 8) - OPEN
  (CRIT BURNS - AFTER GMBL MTRS ON)

ENTRY ONLY
- ✓ cb SPS B/D ROLL, P&Y (MNA)(3)(Pnl 8) - CLOSED

ALL
- 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
- All F/C MNB - OFF
- All F/C MNA - MNA (BEFORE CM/SM SEP)
- cb MNB BAT BUS B (Pnl 275) - OPEN
- cb MNA BAT C (Pnl 275) - CLOSED
  (LAUNCH & ENTRY)

AC BUS 1 LOST - LAUNCH, SPS BURNS OR ENTRY

SPS BURNS ONLY
- TVC SERVO PWR 1 - AC 2/MNB
- ✓ SCS TVC (P&Y) - RATE CMD

ALL
- 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
- SBD NORM XPNDR - SEC
- SBD NORM PWR AMP - SEC

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Changed

AC BUS 2 LOST - LAUNCH, SPS BURNS OR ENTRY

SPS BURNS ONLY
- TVC SERVO PWR 2 - AC 1/MNA
- SCS TVC (P&Y) - AUTO
- ΔVCG - LM/CSM
- MTVC WITH TRIM THUMBWHEELS (SCS)

ALL
- 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

BAT BUS A LOST - LAUNCH, SPS BURNS OR ENTRY

LAUNCH ONLY
- EDS AUTO/OFF - OFF
- AUTO RCS SEL (RING 1) - OFF

SPS BURNS ONLY
- TVC GMBL DR (P,Y) - 2
  (IF BUS LOST BEFORE GMBL MTRS ON)
- cb SPS P2 & Y2 (Pnl 8) - OPEN
  (CRIT BURNS - AFTER GMBL MTRS ON)

ENTRY ONLY
- cb B/D ROLL, P&Y (MNB)(3)(Pnl 8) - CLOSED
- cb SCS CONTR/AUTO (2)(Pnl 8) - OPEN
  (AFTER APEX COVER JET)

ALL
- cb MNA BAT C (Pnl 275) - CLOSED

cb SCS B/D ROLL, P&Y MNA (3)(Pnl 8)
Before CM/SM SEP - open
After manual RCS Transfer to CM - close

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BAT BUS B LOST - LAUNCH, SPS BURNS OR ENTRY

LAUNCH ONLY
- EDS AUTO/OFF - OFF
- AUTO RCS SEL (RING 2) - OFF

SPS BURNS ONLY
- TVC GMBL DR (P,Y) - 1
  (IF BUS LOST BEFORE GMBL MTRS ON)
- cb SPS P1 & Y1 (Pnl 8) - OPEN
  (CRIT BURNS - AFTER GMBL MTRS ON)

ENTRY ONLY
- ✓ cb SCS B/D ROLL, P&Y (MNA)(3)(Pnl 8) - CLOSED
- cb SCS CONTR/AUTO (2)(Pnl 8) - OPEN
  (AFTER APEX COVER JET)

ALL
- cb MNB BAT C (Pnl 275) - CLOSED

cb SCS B/D ROLL, P&Y MNB (3)(Pnl 8)
Before CM/SM SEP - open
After manual RCS transfer to CM - close

CSM 109

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

Basic Date 3/9/70
Changed

SPS

PREMATURE SHUTDOWN - CRITICAL SPS BURN

✓ ΔV 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 vlvs (2) - OFF, THEN CONTROL MANUALLY BETWEEN 170-200 PSI

IF FUEL/OX ΔP >20 PSI

SPS HE vlvs (2) - OFF
IF CONDITION PERSISTS, SPS HE vlvs (2) - ON

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

Basic Date 3/9/70
Changed

CM RCS FAILS TO PRESSURIZE OR FEED PRPLNT

IF NO PRESSURIZATION

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

IF NO RCS PRPLNT FEED

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

IF STILL NO FEED

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

V05 N09 ALARM CODES

00110 Mark reject has been entered but ignored
Continue

00112 Mark reject with no marks being accepted
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.

00122 Marking not called for
Continue.

00124 P17 (77) TPI search unsuccessful
(G/3-1)

(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 V40 N20E.

(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).

(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
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.

00404 Target out of view (90 deg test)
(G/3-6,6-3)

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)

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
Copy N08, notify MSFN, continue.

Basic Date 3/9/70
Changed

(m)01407 VG increasing
(G/5-6,L/7-6) (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

01602 Bad optics during verification
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.

**21103 Unused CCS branch executed
Copy N08, notify MSFN, initiate V36 recovery

**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.

**21210 Second attempt is made to stall
Reselect program
Do not attempt use of device 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 V92 keyed (P07) during P00 or P01 selected and P11 has already been performed
See 21204

*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

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*31207 No vac area for marks
Rset
Reselect program
If alarm recurs, consult MSFN.
*31211 Illegal interrupt of extended verb
Reselect extended verb after optics marking is completed.
(m) - Malf procedure indicated
**(2xxxx) - Generates restart, F37 (no lt)
*(3xxxx) - Restart (no lt) and program continues (i.e. attempted recovery)
NOTE - All **alarms act as *type if they occur when Ave-g is on

APOLLO 12

Basic Date OCTOBER 20, 1969
Changed _____

TIME	REMARKS

CREW LOG

CREW LOG

TIME	REMARKS

APOLLO 12

NASA — MSC

Basic Date OCTOBER 20, 1969
Changed _____

APOLLO 12

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APOLLO 12

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