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APOLLO 13

CSM SYSTEMS CHECKLIST

APRIL 3, 1970

PREPARED BY: Denis L. Dahms
DENIS L. DAHMS
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SPACECRAFT SYSTEMS BRANCH

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This document is under the configuration control of the Crew Procedures Control Board (CPCB). All proposed changes should be submitted to the Apollo Flight Data File Manager, Mr. T. W. Holloway, CF62, Building 4, Room 230, telephone 483-4271.

Distribution of this document is controlled by Mr. J. W. O'Neill, Chief, Flight Planning Branch, Flight Crew Support Division.
# APOLLO FLIGHT DATA FILE

## CSM SYSTEMS CHECKLIST

**Basic Date 3/9/70**

**Change 4/3/70**

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TELECOMM PROCEDURES

1. HI-GAIN ANT OPN
   HGA SCAN LIMIT GRAPH
   ANTENNA LOCATION CHART
2. TV CAMERA OPN (COLOR)
3. VHF RANGING OPN
4. RNDZ XPNDR ACT & SELF TEST
5. COMM MODES

GENERAL

PRESLEEP C/L
POSTSLEEP C/L
RCS ENGINE, VENT, & RAD LOC
SYSTEM TEST CHART
PRPLNT GAUGING METER NOMOGRAPH
SPS PRPLNT NOMOGRAPH

2. LM INTERFACE

1. IVT to LM (CHECKOUT, TLC)
2. IVT to LM (UNDOCKING, PDI)
3. Tunnel Hatch Removal
4. Probe Removal (CM side)
5. Drogue Removal
6. Crew Transfer to LM
6A. Crew Transfer to CSM
7. Remove LM Umbilicals (FINAL)
8. Install Drogue
9. Install Probe
10. Preload Probe
11. Hatch Installation
12. Hatch Integrity Check
13. Docking Latch Release
14. Soft Undocking
15. Malfunction List
16. LM JETTISON

3. CONTINGENCY EVA

4. SAFE OF APEX COVER JETT
5. STOWAGE 5-1

6. EMERGENCY PROCEDURES EMER/1-1
   Launch Vehicle 1-1
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   RCS 1-11
   Alarm Codes 1-13

7. CREW LOG
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
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 1st Vent)
     *If >1.5: BAT VENT vlv -*
     *VENT (to u0) 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**
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

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

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

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

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 1t on, do not turn off fan until 1t extinguishes
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
SUITS TEMP = 45-70°F w/o evap; 45-55°F with evap
CABIN TEMP = 70-80°F
SUITS PRESS/CABIN PRESS = 4.7-5.3 psia
PART PRESS CO₂ < 7.6 mm Hg
SUITS COMP ΔP = 0.3-0.4 psid
PRIM GLY ACCUM QTY 30-65%
* If <30% - PRIM ACCUM FILL vlvd *
* 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
SUITS COMPR ΔP ind = 0.3-0.4 psid
Main O₂ Regulators
MAIN REG B vlvd = close
EMER CABIN PRESS sel = 1
PUSH TO TEST PB = PUSH (O₂ FLOW INC)
MAIN REG B vlvd = open
MAIN REG A vlvd = close
EMER CABIN PRESS sel = 2
PUSH TO TEST PB = PUSH (O₂ FLOW INC)
MAIN REG A vlvd = open
EMER CABIN PRESS sel = BOTH (OFF if all suited)
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 re-
moving or replacing filter
from canister or stowage

CO2 CSTR DIVERT vlv - up (or dn)

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

CANISTER MANUAL BLEED vlv - PRESS
COVER LATCHING HANDLE - UNLOCK
Replace used filter
COVER LATCHING HANDLE - LOCK
CO2 CSTR DIVERT vlv - ctr
Close CO2 Canister attenuation 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
O2 PRESS IND - TANK 1
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

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
URINE DUMP MODES

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 RECEPIACLE 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
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
S
1-10

CAB REPRESS v1v - Adj to 150 psia on SURGE TK
WHEN CAB PRESS >4.7
O2 PRESS ind = TANK 1
CAB REPRESS v1v - 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)
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)
CABIN PRESS - 3.0-3.25 psia
  CAB PRESS REL vlv (RH) - BOOST/ENTRY
  02 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 02 vlv - OPEN for 1 min
    02 FLOW - 1.0 lb/hr (pegged)
    02 FLOW HI 1t - on
    MASTER ALARM pb/1t (3) - on, push
    DIRECT 02 vlv - CLOSE
    02 FLOW HI 1t - out
    02 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 (20 sec), 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)
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 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 sw - 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
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 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
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
CONTAMINATION CONTROL

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

SUIT CKT RET vlv - close
DEMAND REG - OFF
ALL FLOW vlv - 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°
NOTES:
YAW MEASURED IN THE XY PLANE, POSITIVELY ABOUT Z PITCH
MEASURE FROM THE YAW PLANE, POSITIVELY IN THE -Z
HEMISPHERE, NEGATIVELY IN THE +Z HEMISPHERE.

HIGH-GAIN ANTENNA SCAN AND WARNING LIMIT,
YAW-PITCH COORDINATES (CSM)
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 (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
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
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 RANCING, 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
CONTINGENCY
VHF AM A - SIMPLEX
VHF AM B - SIMPLEX

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

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
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 vl v - CLOSED
  EMERGENCY CABIN PRESS - BOTH
  SURGE TANK O2 vl v - ON
  REPRESS PKG O2 vl v - OFF
  LM TUNNEL VENT vl v - LM/CM AP
  "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)
RCS Engines, Vent, and Radiator Location

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
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<th>SYSTEMS TEST Indicator</th>
<th>N2, O2, H2 Pressure (psia)</th>
<th>EPS Radiator Outlet Temperature (°F)</th>
<th>CM-RCS Oxidizer Valve Temperature (°F)</th>
<th>IM Power (amps)</th>
<th>SPS Temperature (°F)</th>
<th>Battery Compartment Manifold Pressure (psia)</th>
<th>Battery Relay Bus (vdc)</th>
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**Systems Test Indicator Conversion Chart**

**Basic Date**: 3/9/70

**Changed**: 

**CSM 109**
Minus Two-Sigma Service Module RCS
On-Board Propellant Gauging Meter
Correction Nomograph
SPS PROPellant NOmograph

Note: Helium pressure and temperature readings should be taken simultaneously near end or directly after SPS firing.

Nominal helium loading 3600 psia @ 70°F and 100.75 percent fuel load.

T = 70°F
T = 50°F
T = 30°F
T = 10°F
T = -10°F

Helium supply pressure (psia)

Fuel quantity (percent)

CSM 109
Basic Date 3/9/70
Changed
1 IVT TO LM (CHECKOUT, TLC)

At 2 hours prior to IVT to LM:
TUNL VENT vlv - LM/CM ΔP
Verify LM/CM ΔP > 1.7 psid
*LM/CM ΔP < 1.7 psid
* TUNL VENT vlv - 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 A8
suit hose interconnect
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 vlv - LM/CM ΔP
TUNL LTS - OFF
IVT TO LM (UNDOCKING, 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
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

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

HATCH

1

(D)

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
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
RATCHET HNDL
- pull to full extension
- 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 vlv - 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 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 Fl 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.
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)  
   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
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:
  4
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
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)

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
DOCKING LATCHES

- 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

- 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

- 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.)
1. **FINAL IVT TO CSM**
   
   **CDR** Verify FWD DUMP vlv - AUTO
   
   **CMP** 02 PRESS IND sw - SURGE TK
   
   Verify CRYO 02 PRESS ind - 865-935 psia
   
   REPRESS PKG vlv - OFF
   
   DIRECT 02 vlv - OPEN until CAB PRESS 5.5 psia
   
   then CLOSE until 02 FLOW < .5
   
   1 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 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**
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Helmets (gloves inside) (2)</td>
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<tr>
<td>SRC's (2)</td>
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<tr>
<td>Hasselblad magazines (5)</td>
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<tr>
<td>ISA</td>
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<tr>
<td>Tote bag</td>
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<tr>
<td>Lunar Surface Hasselblad</td>
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<tr>
<td>16 mm mags (6)</td>
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<tr>
<td>CSRC</td>
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<tr>
<td>CSCC</td>
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<tr>
<td>16 mm mags (2)</td>
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</tbody>
</table>
   
   Transfer B5 & B6 containers to LM
2 P00, 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 = 181102, R2 = 01111
(-01:00m) V37E 47E
EMS MODE - NORMAL
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 (POO)

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
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 vlv - close (push)
EMERG CAB PRESS sel - OFF
Check all PGA connections and verify locked. (Helmet, Wrist, O2 Hoses, Comm, Feedport)
Ingress LH couch

PRESS INTEGRITY CHECK (DECAL)
1 DIRECT O2 - 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 O2 - OPEN
   At 4.0 psig, DIR O2 - 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

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 O2 vlv - FILL
3 REPRESS O2 vlv - CLOSE (verf)
4 CAB PRESS REL vlv (2) - NORMAL
5 SIDE HATCH DUMP vlv - OPEN
   (02) FLOW HI WARNING LT May Come On
   Prior To CABIN PRESS REG LOCK UP
6 At 3.25 psia, SIDE HATCH DUMP vlv - CLOSE
7 02 FLOW ind - LESS THAN 0.5 LB/HR
CABIN PRESS 3.25 psia
SUIT CKT PRESS STABLE 3.5 - 4.0
SIDE HATCH DUMP vlv - OPEN
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
INGRESS
CDR Ingress CM, head first, face toward MDC and move to LEB
Retrieve C O2 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 O2 hoses (Red/Red, Blue/Blue)
C to CDR, R to LMP
Close Purge vlv
SUIT FLOW vlv - adjust for comfort
OPS O2 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)
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
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)
PLSS - OPS EVT

INGRESS (CDR-OPS, LMP-PLSS)

CDR Ingress CM, head first, face toward MDC
   and move to LEB
   Retrieve C 02 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 02
   hoses to CMP
CMP Connect C 02 hoses to CDR PGA (red to red, blue to
   blue)
CDR Close purge vlv
   C SUIT FLOW vlv - adjust for comfort
   OPS 02 shutoff vlv - OFF

   -LMP (PLSS)-

CDR Verify R SUIT FLOW vlv - OFF
   Remove interconnect and hand R 02 hoses to CMP
CMP Connect R 02 hoses to LMP PGA (red to red, blue to
   blue)
CDR SUIT FLOW vlv (3) - FULL FLOW
LMP Verify flow
   PLSS 02 vlv - OFF
   PLSS PUMP - OFF
   PLSS FAN - OFF
   PLSS MODE SEL - 0
HATCH CLOSING (DECAL)  
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  
ress  
C SUIT FLOW vlv - adjust for comfort  
L SUIT FLOW vlv - increase for comfort  
Close Purge vlv
-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 O2 and H2O hoses
Disconnect lower then upper PLSS straps-Doff PLSS
Stow PLSS-02, H2O, and COMM umbilicals
Temp stow PLSS

END OF PLSS - OPS EVT
(Go To FINAL SYSTEMS CONFIG)
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)
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 O2 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 VGA (red/red, blue/blue)
C SUIT FLOW vlv - adjust for comfort
L SUIT FLOW vlv - increase for comfort
PLSS PUMP - OFF
PLSS FAN - OFF
-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
FINAL SYSTEM CONFIGURATION
02 PRESS IND sw - SURGE TK
CRYO 02 PRESS 1 ind - 500 psia
Verify CAB REPRESS vlv - OFF (CCW)
Verify REPRESS O2 - CLOSE
REPRESS PKG vlv - FILL
Verify Repress 02 press increasing
CRYO 02 PRESS 1 ind - 865-935 psia
02 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 02 pressure 865-935 psi
EMERGENCY 02 vlv - CLOSED
REPRESS O2 vlv - CLOSED
Verify SURGE TANK vlv - ON
02 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)
P GA 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

3/9/70
CABIN DEPRESS (DECAL)
1 CABIN FAN (2) - OFF
2 REPRESS PKG 02 vlv - FILL
3 REPRESS 02 vlv - CLOSE (verf)
4 CAB PRESS REL vlv (2) - NORMAL
5 SIDE HATCH DUMP vlv - OPEN
   (02) FLOW HI WARNING LT May Come On
   Prior To CABIN PRESS REG LOCK UP)
6 At 3.25 psia, SIDE HATCH DUMP vlv - 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 vlv - OPEN
11 CABIN PRESS ind - 0

HATCH OPENING (DECAL)
1 GN2 vlv 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)
HATCH CLOSING (DECAL)  
(1, 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:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>STOWAGE LOCATION FOR REENTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. OPS (2)</td>
<td>In PGA</td>
</tr>
<tr>
<td>b. Purge Valve (2)</td>
<td>In PGA</td>
</tr>
<tr>
<td>c. Life Line</td>
<td>In PGA Bag</td>
</tr>
<tr>
<td>d. EV Gloves</td>
<td>On PGA</td>
</tr>
<tr>
<td>e. LEVA (2)</td>
<td>2 on helmet attached to suits, in RH &amp; LH sleep restraints</td>
</tr>
<tr>
<td>f. Waist tether (2)</td>
<td>In PGA Bag</td>
</tr>
<tr>
<td>g. CSRC</td>
<td>Inside helmet in Bl</td>
</tr>
<tr>
<td>h. Tote Bag</td>
<td>In PGA Bag toward LEB/or Decom Bag on top of Al</td>
</tr>
<tr>
<td>i. Suits</td>
<td>1 Suit with OPS's in PGA Bag w/tie down rope</td>
</tr>
<tr>
<td></td>
<td>2 Suits in sleep restraint under LH &amp; RH couch w/tie down rope</td>
</tr>
<tr>
<td>j. Helmets</td>
<td>2 On suits with LEVA</td>
</tr>
<tr>
<td></td>
<td>1 In Bl</td>
</tr>
</tbody>
</table>
II. CM reentry with suits:

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

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

<table>
<thead>
<tr>
<th>ITEM</th>
<th>STOWAGE LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Film Magazines</td>
<td>Vol R13, A8</td>
</tr>
<tr>
<td>b. Log Books</td>
<td>Vol R1, R2 and R3</td>
</tr>
</tbody>
</table>
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
1 Camera Fan Filter Bag
1 Cabin Vent QD
1 CCU Cable, Spare
1 CCU Control Head, Spare
1 Chlorination Equipment
1 COAS
  2 Bulbs
  1 Filer
20 CO2 Absorbers
1 CO2 Absorber Ground Cable
6 CWG
4 CWG Elect. Adapters
1 Camera, 16mm L.S. W/Mag, Lens, Handle, Battery Pack, RCU Bracket & Spare Mag
1 Camera, 16mm W/Mag
  10 Mag
  6 Mag
  1 Power Cable
  1 ea Lens, 5mm, 18mm, 75mm
  1 Mirror
  1 Bracket
  1 Sextant Adapter
  1 Fuse, Spare
1 Camera, 70mm Reasenu, Mag & Spare Mag
1 Camera, 70mm W/Mag
  6 Mag
  5 Mag
  1 Bracket, 80/250
  1 Bracket, 500
  1 Lens, 250
  1 Lens, 500
  1 Remote Cable
  1 Intervalometer
  1 PCM Cable
1 Camera Hycon (CTC) W/Mag
  1 Mag
  1 Control Box
  2 Cables

PGA Bag
R6
L2
L2
B4, B6, A1
Above LH Window
U3
U3

A3
4-A4, 2-A6, 4-B5, 4-B6, 2-ECU
L2
A8
U6

A8 (IM Xfr)
B3
5-B2, 5-B6
R-13 (IM Xfr)
B3
B3
U3
A5
R3 (Data Kit)
A13
A13
B3
1-A8, 5-A13
R-13, (IM Xfr)
A11
U4
A11
U4
L2
A12
A13
A13
A12
<table>
<thead>
<tr>
<th>Item Number</th>
<th>Item Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Camera, TV &amp; Ringsight</td>
</tr>
<tr>
<td></td>
<td>1 Monitor</td>
</tr>
<tr>
<td></td>
<td>2 Cables</td>
</tr>
<tr>
<td></td>
<td>1 Bracket</td>
</tr>
<tr>
<td>2</td>
<td>Data Card Kit</td>
</tr>
<tr>
<td></td>
<td>1 Eyepatch</td>
</tr>
<tr>
<td></td>
<td>6 Data Clips</td>
</tr>
<tr>
<td></td>
<td>2 Meter Covers</td>
</tr>
<tr>
<td>11</td>
<td>Decontamination Bags</td>
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<tr>
<td>3</td>
<td>Dispers (FGS)</td>
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<tr>
<td>1</td>
<td>Docking Target</td>
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<tr>
<td>1</td>
<td>Exerciser</td>
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<tr>
<td>30</td>
<td>Fecal Bags</td>
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<td>1</td>
<td>Flight Data File</td>
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<tr>
<td>1</td>
<td>Fire Extinguisher</td>
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<td>2</td>
<td>Food</td>
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<td>Gas Separator</td>
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<tr>
<td>4</td>
<td>Gloves Shades</td>
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<tr>
<td>3</td>
<td>Helmet &amp; Accessory Bags</td>
</tr>
<tr>
<td>2</td>
<td>Headhold, G&amp;N</td>
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<tr>
<td>3</td>
<td>Headrest Pads</td>
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<tr>
<td>3</td>
<td>Heel Restraints</td>
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<td>Helmet Shield</td>
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<td>3</td>
<td>Inflight Coveralls</td>
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<td>Jettison Bag</td>
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<td>Liquid Cooled Garments</td>
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<td>Lightweight Headsets</td>
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<td>1</td>
<td>Maintenance Kit</td>
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<td>Medical Kit</td>
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<td>Monocular</td>
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<tr>
<td>3</td>
<td>O₂ Screen Caps</td>
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<td>3</td>
<td>O₂ Mask</td>
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<td>O₂ Interconnect</td>
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<td>Penlight</td>
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<td>PIA Elect Covers</td>
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<td>3</td>
<td>PLV Ducts</td>
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<tr>
<td>3</td>
<td>PFK</td>
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<tr>
<td>1</td>
<td>Radiation Meter</td>
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<tr>
<td>3</td>
<td>Roll-on-cuff</td>
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<tr>
<td>5</td>
<td>Rope</td>
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<tr>
<td>3</td>
<td>Side Hatch Dump Equipment</td>
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<tr>
<td>3</td>
<td>Sleep Restraint</td>
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<tr>
<td>1</td>
<td>Snag Line</td>
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<tr>
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<td>Spotmeter</td>
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<td>Sun Filters, G&amp;N</td>
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<tr>
<td>1</td>
<td>S-178 Shade</td>
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<tr>
<td>1</td>
<td>Sea Dye Marker</td>
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<td>32</td>
<td>Springs, Snaps, Clips</td>
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<tr>
<td>2</td>
<td>Survival Kits</td>
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<tr>
<td>3</td>
<td>Strap, Couch</td>
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<td>6</td>
<td>Strap, Utility</td>
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<td>3</td>
<td>Strap, Probe</td>
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<tr>
<td>1</td>
<td>Tone Booster</td>
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<tr>
<td>1</td>
<td>Tape Recorder</td>
</tr>
<tr>
<td>4</td>
<td>Tape Cassettes &amp; Batteries (pre-recorded)</td>
</tr>
<tr>
<td>3</td>
<td>Temporary Stowage Bags</td>
</tr>
<tr>
<td>1</td>
<td>Timer</td>
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<tr>
<td>7</td>
<td>Tissue Dispenser</td>
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<tr>
<td>1</td>
<td>Tool &quot;E&quot;</td>
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<tr>
<td>1</td>
<td>Tool Kit</td>
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<tr>
<td>3</td>
<td>Towels</td>
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<tr>
<td>3</td>
<td>UTCA Clamps</td>
</tr>
<tr>
<td>1</td>
<td>Urine Hose &amp; Suit Adapter</td>
</tr>
<tr>
<td>3</td>
<td>Urine Transfer System</td>
</tr>
<tr>
<td>3</td>
<td>Urine Filters</td>
</tr>
<tr>
<td>1</td>
<td>UTH Receiver, Spares</td>
</tr>
<tr>
<td>1</td>
<td>Urine Receptacle</td>
</tr>
<tr>
<td>1</td>
<td>Vacuum Hose, 2 Brushes, &amp; Interconnect</td>
</tr>
<tr>
<td>5</td>
<td>Window Shades</td>
</tr>
</tbody>
</table>

"A7" "A6" "A5" "R3 (1-Xfr to LM)
Data Kit
Data Kit
Data Kit
A8, U1
A8
U3
A8
R10
R1, R2, R3
A3
E1, L3
A1
R1
R6
A5
A5
PGA Bag
PGA Bag
R13
U1
A8
A8
U4
PGA Bag
Under Repress Rack
2-A1, 1-side A8
A1
PGA Bag
A1
A8
G&M Panel
R11
A5
R10
UEB
A1
A5
R1
Window Shade Bag
A1
Curtain in front B5, B6
R4
PGA Bag
R5
A1
Under A3
R5
B8
U4
A1
A5
5-A1, 2-A8
L2
A1
A1
PGA Bag
Under A6
R11
R5
A8
Side A8
On Repress Rack
ENTRY STOWAGE CHANGES FROM EARTH LAUNCH

A. (LM to CM XFER) ADDITIONS

<table>
<thead>
<tr>
<th>QTY</th>
<th>NOMENCLATURE</th>
<th>CM STOWAGE LOCATION/VOLUME</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>PPK, I Flag Kit</td>
<td>A13 (In Cabin Fan Filter Bag)</td>
</tr>
<tr>
<td>2</td>
<td>PPK's</td>
<td>R13</td>
</tr>
<tr>
<td>1</td>
<td>DSEA</td>
<td>R13</td>
</tr>
<tr>
<td>1</td>
<td>SRC #1</td>
<td>B6 (In Decontam. Bag From A8)</td>
</tr>
<tr>
<td>1</td>
<td>SRC #2</td>
<td>B5 (In Decontam. Bag From A8)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>QTY</th>
<th>NOMENCLATURE</th>
<th>CM STOWAGE LOCATION/VOLUME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B5 Container W/4 CO₂ Absorbers</td>
<td>From B5</td>
</tr>
<tr>
<td>1</td>
<td>B6 Container W/4 CO₂ Absorbers</td>
<td>From B6</td>
</tr>
<tr>
<td>1</td>
<td>Docking Probe</td>
<td>From Tunnel</td>
</tr>
<tr>
<td>1</td>
<td>Jettison Stowage Bag</td>
<td>From R13</td>
</tr>
</tbody>
</table>

C. Relocations - For Re-Entry

<table>
<thead>
<tr>
<th>QTY</th>
<th>NOMENCLATURE</th>
<th>LAUNCH STOW</th>
<th>RE-ENTRY STOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Helmet Stowage Bags</td>
<td>3 Ea. R6</td>
<td>1 Ea. R6/B1/L3</td>
</tr>
<tr>
<td>3</td>
<td>Accessory Bags</td>
<td>3 Ea. R6</td>
<td>1 Ea. R6/B1/L3</td>
</tr>
<tr>
<td>3</td>
<td>ICG</td>
<td>PGA Container</td>
<td>3 Ea. On Crew</td>
</tr>
<tr>
<td>3</td>
<td>Headrest Pad</td>
<td>3 Ea. A5</td>
<td>3 Ea. On Couch</td>
</tr>
<tr>
<td>3</td>
<td>Heel Restraint</td>
<td>3 Ea. A5</td>
<td>3 Ea. On Crew</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 Ea. A8</td>
</tr>
<tr>
<td>3</td>
<td>CWG Elect. Adapter Cover</td>
<td>3 Ea. PGA Cont.</td>
<td>3 Ea. On PGA</td>
</tr>
<tr>
<td>1</td>
<td>Panel Indicator/ Noun List</td>
<td>1 Ea. Installed</td>
<td>1 Ea. Data Card Kit Container</td>
</tr>
<tr>
<td>QTY</td>
<td>NOMENCLATURE</td>
<td>LAUNCH STOW</td>
<td>RE-ENTRY STOW</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------</td>
<td>------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>2</td>
<td>Helmet</td>
<td>2 Ea. On Crew</td>
<td>2 Ea. in Helmet Bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1-B1/1-L3</td>
</tr>
<tr>
<td>1</td>
<td>PGA-IV</td>
<td>1 Ea. On Crew</td>
<td>1 Ea. RH Sleep Restraint</td>
</tr>
<tr>
<td>1</td>
<td>Helmet</td>
<td>1 Ea. On Crew</td>
<td>1 Ea. RH Sleep Restraint</td>
</tr>
<tr>
<td>1</td>
<td>Gloves, IV-Pr.</td>
<td>1 Ea. On Crew</td>
<td>1 Ea. RH Sleep Restraint</td>
</tr>
<tr>
<td>11</td>
<td>Decontamination Bags</td>
<td>10 Ea. A8</td>
<td>1 Ea. W/70MM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mag. R13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>W/70MM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mag. R13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Conting. Sample B1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CSC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cassette B1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SRC #1-B6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SRC #2-B5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ISA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>On top A1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tote</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>On top A7/ A11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>R13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>70mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Rtn. Equip. B1</td>
</tr>
</tbody>
</table>
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
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
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 H2O

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 COMPRESSOR TO GOOD AC BUS
   IF HELMET OFF, SUIT COMPRESSOR (2) – OFF

RECONFIGURE INVERTER 3 ON LOST AC BUS

VERIFY RCS CONTROL POWER CONFIGURATION

IF HELMETS OFF
   DON 02 MASKS
   USE FIRE extinguisher OR H20 GUN (OPTIONAL)

IF CLOSED SUIT LOOP
   USE FIRE extinguisher OR H20 GUN (OPTIONAL)
   ✓ EMERG CABIN PRESS REGS – OFF
   IF FIRE PERSISTS – DUMP CABIN
<table>
<thead>
<tr>
<th>Command</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYCON CAMERA - OFF</td>
<td>5.1</td>
</tr>
<tr>
<td>02 HTRS (2) - OFF (CTR)</td>
<td>11.1</td>
</tr>
<tr>
<td>02 FANS (2) - OFF (CTR)</td>
<td>5.4</td>
</tr>
<tr>
<td>H2 HTRS (2) - OFF (CTR)</td>
<td>1.4</td>
</tr>
<tr>
<td>H2 FANS (2) - OFF (CTR)</td>
<td>0.7</td>
</tr>
<tr>
<td>G&amp;N OPT PWR - OFF</td>
<td>3.1</td>
</tr>
<tr>
<td>POT H2O HTR - OFF</td>
<td>1.6 MAX</td>
</tr>
<tr>
<td>ECS RAD HTRS (2) - OFF</td>
<td>17.2 EA</td>
</tr>
<tr>
<td>SPS LINE HTR - OFF (CTR)</td>
<td>6.2 (A/B)</td>
</tr>
<tr>
<td>SPS GAUGING - OFF</td>
<td>3.0</td>
</tr>
<tr>
<td>GMBL MTRs P2 &amp; Y2 - OFF (NOT LAUNCH)</td>
<td>10.0</td>
</tr>
<tr>
<td>cb SPS PL &amp; Y1 (Pn1 3) - OPEN</td>
<td></td>
</tr>
<tr>
<td>TVC GMBL DR (P&amp;Y) - 1</td>
<td></td>
</tr>
<tr>
<td>IF UNSUITED, SUIT COMP - OFF</td>
<td>4.0</td>
</tr>
<tr>
<td>FC PUMPS (3) - OFF (UNTIL TSKIN &gt;460°F)</td>
<td>3.7 TOTAL</td>
</tr>
<tr>
<td>SM RCS HTRS (4) - OFF</td>
<td>2.9 EA MAX</td>
</tr>
<tr>
<td>(ELECTRICALLY ISOLATE IF QUAD &lt;55°F)</td>
<td></td>
</tr>
<tr>
<td>BMAG #2 - OFF</td>
<td>2.6 from ON</td>
</tr>
<tr>
<td></td>
<td>1.9 from WARMUP</td>
</tr>
<tr>
<td>LIGHTS - MIN REQD</td>
<td>1.6</td>
</tr>
<tr>
<td>S BD PWR AMP - OFF (CTR)</td>
<td>4.0</td>
</tr>
<tr>
<td>TAPE RCDR - OFF (CTR)</td>
<td>1.6</td>
</tr>
<tr>
<td>ECS PRI GLY PUMP - OFF (G&amp;N LIMIT 2.5 HRS)</td>
<td>2.6</td>
</tr>
<tr>
<td>SEC COOL EVAP - RESET (58 SEC), THEN OFF</td>
<td>4.3</td>
</tr>
<tr>
<td>SEC COOL PUMP - OFF (CTR)</td>
<td></td>
</tr>
<tr>
<td>cb ECS RAD CONT/HTRS (2) (Pn1 5) - OPEN</td>
<td></td>
</tr>
<tr>
<td>CMC POWERDOWN</td>
<td>6.3</td>
</tr>
<tr>
<td>CMC MODE - FREE</td>
<td></td>
</tr>
<tr>
<td>G&amp;N IMU PWR - OFF</td>
<td></td>
</tr>
<tr>
<td>V48E</td>
<td></td>
</tr>
<tr>
<td>F V04 N46 LOAD 0 (NO DAP) IN LEFT DIGIT OF R1 PRO, PRO, PRO</td>
<td></td>
</tr>
<tr>
<td>V46E</td>
<td></td>
</tr>
<tr>
<td>V37EO6E</td>
<td></td>
</tr>
<tr>
<td>F V50 N25, 00062 CMC PWR DN</td>
<td></td>
</tr>
<tr>
<td>PRO REPEATEDLY UNTIL STBY LT - ON</td>
<td></td>
</tr>
<tr>
<td>G&amp;N PWR - OFF</td>
<td>1.5</td>
</tr>
<tr>
<td>SCE PWR - OFF (CTR)</td>
<td>0.7</td>
</tr>
<tr>
<td>C/W NORMAL - ACK</td>
<td></td>
</tr>
<tr>
<td>VHF AM (2) - OFF (CTR)</td>
<td>0.2 EA</td>
</tr>
<tr>
<td>HGA PWR - OFF</td>
<td>1.9</td>
</tr>
<tr>
<td>TELECOM GRP 1&amp;2 - OFF</td>
<td>1.8</td>
</tr>
<tr>
<td>cb INSTR ESS MN A&amp;B (Pn1 5) - OPEN</td>
<td>4.9</td>
</tr>
</tbody>
</table>
EMER
1-6

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 OVERLDP + 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
TVC GMBL DR (P,Y) - 2
√ SCS TVC (P,Y) - RATE CMD
Av THRUST B - NORM
cb SPS P2 & Y2 (Pn1 8) - OPEN
(CRIT BURNS - AFTER GMBL MTRS ON)

SPS BURNS ONLY

ENTRY ONLY

cb SCS B/D ROLL, P&Y (MNB) (3) (Pn1 8) - CLOSED

BMAG MODE (3) - RATE 2
FDAO SEL - 2
√ FDAO SOURCE - CMC
AC INV 3 - MNB
AC INV 3 AC 1 - ON
AC INV 1 AC 1 - OFF
11 F/C MNA - OFF
11 F/C MNB - MNB (BEFORE CM/SM SEP)

cb MNA BAT BUS A (Pn1 275) - OPEN
cb MNB BAT C (Pn1 275) - CLOSED
(LAUNCH & ENTRY)
MN BUS B LOST – LAUNCH, SPS BURNS OR ENTRY

LAUNCH ONLY
- EDS AUTO/OFF - OFF
- TVC GMBL DR (P,Y) - 1
- ΔV THRUST A - NORM
- cb SPS P1 & Y1 (Pn1 8) - OPEN
  (CRIT BURNS - AFTER GMBL MTRS ON)
ENTRY ONLY
- 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

ALL
- 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 (Pn1 275) - OPEN
- cb MNA BAT C (Pn1 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
- BMAG MODE (3) - RATE 2
- AC INV 1 MNA - OFF
- FDAI SEL - 2

ALL
- FDAI SOURCE - CMC
- SUIT COMPR - AC 2
- ECS GLY PUMP - AC 2
- SBD NORM XPNDR - SEC
- SBD NORM PWR AMP - SEC
EMER
1-8

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)
- BMAG MODE (3) – RATE 1
- AC INV 2 MNB – OFF

ALL

- FDAI SEL – 1
- FDAI SOURCE – CMC
- SUIT COMPRESSOR – 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
- TVC GMBL DR (P,Y) – 2
  (IF BUS LOST BEFORE GMBL MTRS ON)

SPS BURNS ONLY

- cb SPS P2 & Y2 (Pn1 8) – OPEN
  (CRIT BURNS – AFTER GMBL MTRS ON)
- cb B/D ROLL, P&Y (MNB)(3)(Pn1 8)
  – CLOSED

ENTRY ONLY

- cb SCS CONTR/AUTO (2)(Pn1 8) – OPEN
  (AFTER APEX COVER JET)

ALL

- cb MNA BAT C (Pn1 275) – CLOSED
- cb SCS B/D ROLL, P&Y (MNA)(3)(Pn1 8)
  Before CM/SM SEP – OPEN
  After manual RCS transfer to CM – close

BAT BUS B LOST – LAUNCH, SPS BURNS OR ENTRY

LAUNCH ONLY

- EDS AUTO/OFF – OFF
- AUTO RCS SEL (RING 2) – OFF
- TVC GMBL DR (P,Y) – 1
  (IF BUS LOST BEFORE GMBL MTRS ON)

SPS BURNS ONLY

- cb SPS P1 & Y1 (Pn1 8) – OPEN
  (CRIT BURNS – AFTER GMBL MTRS ON)
- cb SCS B/D ROLL, P&Y (MNA)(3)(Pn1 8)
  – CLOSED

ENTRY ONLY

- cb SCS CONTR/AUTO (2)(Pn1 8) – OPEN
  (AFTER APEX COVER JET)

ALL

- cb MNB BAT C (Pn1 275) – CLOSED
- cb SCS B/D ROLL, P&Y MNB(3)(Pn1 8)
  Before CM/SM SEP – OPEN
  After manual RCS transfer to CM – close
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
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 v1vs (2) - OFF, THEN CONTROL MANUALLY BETWEEN 170-200 PSI

IF FUEL/OX ΔP >20 PSI

SPS HE v1vs (2) - OFF
IF CONDITION PERSISTS, SPS HE v1vs (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)(Pn1 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
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
EMER
1-13

V05 NO9 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
1t and NO ATT 1t 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).
EMER
1-14

(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
Reinitialize 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 Arccosin or arccos input is greater than one
Copy N08, notify MSFN, continue.
EMER
1-16

(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 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

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
*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
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Basic Date: OCTOBER 20, 1969
Changed

Apollo 12