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LMP CHECKLIST

LMP CHECKLIST

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SECTION 1. LMP INSERTION ACTIVITIES

1 ECS MONITORING CHECK

SUIT CAB ΔP ind - -1.0 to -3.5 in. H2O
 O2 FLOW ind - 0.2-0.45 lb/hr
 O2 PRESS IND sw - SURGE TANK
 CRYO TK 1 O2 PRESS ind - 865-935 psia
 O2 PRESS IND sw - TANK 1
 REPRESS O2 >865 psia
 ECS RAD tb - gray
 ECS IND sel - PRIM
 ECS RAD PRIM IN TEMP ind - 67-97°F
 ECS RAD PRIM OUT TEMP ind -
 -20 to +63°F
 GLY EVAP PRIM OUT TEMP ind - 40-50.5°F
 GLY EVAP PRIM STM PRESS ind -
 0.10-0.15 psia (when boiling)
 >0.16 psia (not boiling)
 GLY DISCH PRIM PRESS ind - 40-52 psig
 SUIT TEMP ind - 45-55°F
 CAB TEMP ind - 70-80°F
 CAB AUTO TEMP tw - INC/DEC as desired
 SUIT PRESS ind - 4.7-5.3 psia
 CAB PRESS ind - 4.7-5.3 psia
 PART CO2 PRESS ind - <7.6 mm Hg
 SUIT COMPR ΔP ind - 0.3-0.4 psia
 ACCUM PRIM QTY ind - 30-70%
 If quantity <30%
 PRIM ACCUM FILL vlv - ON until 40-55%
 POT H2O QTY - 10-100%
 WASTE H2O QTY - 20-85 (>85%, dump)

3 EPS MON CHECKSFC POWER PLANT CHECK

FC HTRS (all) - on (up)
 FC REACS tb (all) - gray
 FC IND sel - 1, 2, 3
 FC H2 FLOW - 0.03-0.15 lb/hr
 FC O2 FLOW - 0.25-1.2 lb/hr
 FC MOD SKIN TEMP ind - 390-450°F

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FC MOD COND EXH TEMP ind - 150-175°F

FC PH HI tb - gray

FC RAD TEMP LO tb - gray

DC VOLTAGE-AMPERAGE CHECK

MN BUS TIE (2) - OFF

FC MNA tb - 1 & 2 gray, 3 bp

FC MNB tb - 1 bp, 2 & 3 gray

FC 1, 2, & 3 (RECORD AMPS)

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

BAT BUS A, B, & BAT C (34-38 vdc <3 amp)

PYRO BAT A, B (37 VDC)

DC IND sel - MNA

SYS TEST 4B (BAT RLY BUS - 3.7-4.1 vdc)

A-C VOLTS - 113-117 ALL PHASES4 PREPARE CAMERASHASSEL CEF 368 -RING, SPOT (+11, 25°, 25') 15 (A)16mm SEQ 18/CEF 368 BK7, MIR, SPOT (+11, 25°, 25') 6 FPS (H)

CRO AOS

(____:____:____)

5 BACKUP COMM CHECK (CRO)

S-BD XPNDR - OFF (4 sec) - PRI

S-BD AUX TAPE - TAPE

PWR PMP - AUX

INITIAL CONTACT ON VHF A

S-BD VOL - UP

RECEIVE GO FOR COMM CHECK ON S-BD

S-BD NORMAL MODE - PCM

RECEIVE GO FOR BU VOICE CHECK

S-BD AUX TAPE - DB VOICE BU

PWR PMP - NORM

VOICE CHECK WITH MCCH

S-BD VOL - down

S-BD AUX TAPE - OFF

6 PHOTO R/H RENDZ WINDOW(add procedures)

FC PURGE CHECK , PG LMP/2-3

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7 C&WS Operational Check

C/W LAMP TEST - 1 (LH MA & 16 lts)
C/W LAMP TEST - 2 (RH MA & 23 lts)
C/W LAMP TEST - off (center)
C/W CSM - CM (CM RCS lt (2) - on)
C/W CSM - CSM (CM RCS lt (2) - out)
C/W PWR - OFF (C/W lt - on)
C/W PWR - 1 (C/W lt - out)

8 SPS MONITORING CHECK

SPS PRPLNT TK TEMP ind - +55 to +75°F
If $< 55^{\circ}\text{F}$, SPS LINE HTRS - A
If $> 75^{\circ}\text{F}$, SPS LINE HTRS - OFF
SPS PRESS IND sw - He, N2A, and N2B
SPS PRPLNT TK PRESS ind
He 3900 psia max
N2A 2900 psia max
N2B 2900 psia max
SPS PRESS IND sw - He
FUEL PRESS ind - 170-195 psia
OXID PRESS ind - 170-195 psia
SPS ENG INJ VLV ind (4) - CLOSE
SPS QTY % OXID ind - record
SPS QTY % FUEL ind - record
SPS QTY OXID UNBAL ind - record
OXID FLOW VLV PRIM - PRIM
SPS He vlv (2) - AUTO (tb - bp)

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SECTION 2. SYSTEMS MANAGEMENT

- 1 PROPELLION SYSTEM
- SPS MONITORING CHECK
- SPS PRPLNT TK TEMP - 55° to +75° F
SPS PRPLNT TK PRESS: He - 3900 psia max.
N2A & B - 2900 psia max.
- SPS PRESS IND sw - He
FUEL PRESS - 170-195 psia
OXID PRESS - 170-195 psia
SPS ENG INJ VLVS (4) - CLOSE
SPS OX, FUEL & UNBAL QTY - record
OXID FLOW VLV - PRIM
SPS He VLV (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 - 105°-195° F
He PRESS - record
MANF PRESS - 178-192 psia
He TK TEMP - record
PRPLNT QTY - record
When MANIF PRESS < 150 psia
RCS SEC PRPLNT A (B, C, D) - OPEN
PKG TEMP < 85°, SM RCS HTRS - SEC
- 3 CM RCS MONITORING CHECK
- CM RCS PRPLNT tb (2) - bp
RCS IND sw - CM 1,2
He TEMP - 60-90°F
He PRESS - 4000-4450 psia
MANIF PRESS - 25-105 psia
(287-302 after activation)
CM RCS HTRS - OFF (on 20 min prior to sep)

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EPS SYSTEM1 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
 Fans and Heaters as required

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 1b/hr
 O2 FLOW - 0.25-1.2 1b/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

3 D-C Voltage-Amperage Check

MN BUS TIE (2) - OFF
 FC MNA tb - 1 & 2 gray, 3 bp
 FC MNB tb - 1 BP, 2 & 3 gray
 FC 1, 2, & 3 (RECORD AMPS)
 MAIN BUS A, B, (26.5-31 vdc-Record)
 BAT BUS A, B, & BAT C (34-38 vdc < 3 amp)

CAUTION

Leave DC IND sw in PYRO position only long enough to check voltage or pyro battery will be depleted.

PYRO BAT A, B (37 VDC)

DC IND sel - MNA

SYS TEST 4B (BAT RLY BUS - 3.7-4.1 vdc)

4 A-C VOLTS - 113 - 117 all phases

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5 Battery Charging

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
CB BAT RLY BUS BAT A(B) - open
DC IND sel - BAT CHARGER
BAT CHARGE - A(B,C)
DC VOLTS - 37.5-40 vdc
DC AMPS - \approx .6 amps
BAT CHARGE - OFF at 0.4 amps
CB BAT RLY BUS BAT A(B) - closed
DC IND sel - MNA
SYS TEST 4A (BAT VENT < 1.5)
If > 1.5 : BAT VENT vlv -
VENT (5 sec) then CLOSED

6 Fuel Cell Power Plant Purging

A. O2 PURGING

FC IND sw - 1(2,3)
FC PURGE 1(2,3) - O2 (2 min.)
FC FLOW-O2 Flow incr 0.6 lb/hr
(may exceed C/W limit)
FC PURGE - 1(2,3) - OFF

B. H2 PURGING

H2 PURGE LINE HTR - ON, 20 min
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/Reset
FC PURGE - 1(2,3) - OFF
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

8 FUEL CELL SHUTDOWN (APPLICABLE FC)

CB FC REACS - close
CB FC PURGE - open
FC REAC - OFF

FC HTRS - OFF
FC PUMPS - OFF
AT T_{skin} < 200° F
H₂ PURGE LINE HTR - ON (for 30 min)
CB FC PURGE - close
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.

10 CRYO O₂ & H₂ MANUAL FAN OPERATION

H₂ & O₂ FANS - ON (seq for 1 min each)

- a. Prior to every SPS or SIVB AV
- b. If quantity = 80-100%, every 4 hrs
- c. If quantity = 50-80%, every 8 hrs
- d. If quantity < 50%, no cycling

CAUTION

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

ECS SYSTEM

1 ECS MONITORING CHECK

ECS IND set - PRIM

ECS RAD tb - gray

ECS RAD TEMP PRIM IN - 67-97°F

ECS RAD TEMP PRIM OUT - -20° to + 63°F

O₂ SURGE TANK PRESS - 865-935 psia

REPRESS O₂ > 865

GLY EVAP PRIM TEMP OUT - 40-50.5°F

GLY EVAP PRIM STEAM PRESS

.1-.15 boiling

>.16 not boiling

GLY DISCH PRIM PRESS - 40-52 psig

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SUIT TEMP - 45-55°F
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
GLY ACCUM PRIM QTY 30-70% (fill if < 30%)
POT H₂O QTY - 10-100%
WASTE H₂O QTY - 25-85% (if > 85%, dump)
CABIN ΔP - -1 to -3.5 in H₂O
O₂ FLOW - 0.2-0.45 lb/hr

2 ECS Redundant Component Check

ECS INDS sel - PRIM
SUIT COMPR - redundant compr
SUIT COMP ΔP - 0.3-0.4 psid
SUIT COMPR - Reselect Pri Compr
O₂ DEMAND REG vlv - 1
CLOSE BLEED PORT (O₂ FLOW GOES HI)
O₂ DEMAND REG vlv - 2
CLOSE BLEED PORT (O₂ FLOW GOES HI)
O₂ DEMAND REG vlv - BOTH
MAIN REG B vlv - close
EMER CABIN PRESS vlv - 1
PUSH TO TEST pb-push (O₂ FLOW INC)
O₂ press - 90-110 psig (from MSFN)
MAIN REG B vlv - open
MAIN REG A vlv - close
EMER CABIN PRESS vlv - 2
PUSH TO TEST pb - push (O₂ FLOW INC)
O₂ press - 90-110 psig (from MSFN)
MAIN REG A vlv - open
EMER CABIN PRESS vlv - BOTH (OFF if all suited)
SUIT CKT H₂O ACCUM AUTO - MAN
SUIT CKT H₂O ACCUM ON - Redund Accum
MONITOR O₂ FLOW FOR CYCLIC ACCUM STROKING
SUIT CKT H₂O ACCUM AUTO - PRIM ACCUM
Open coolant attenuation panel
EVAP WATER CONT SEC vlv - AUTO
Close coolant attenuation panel
ECS IND sel - SEC
GLY EVAP STEAM PRESS - MAN
GLY EVAP STEAM PRESS - INCR for 1 min
GLYCOL TO RAD SEC - NORMAL

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ECS RAD HTR PRIM - off (center)
ECS GLY PUMPS - OFF
SEC COOL LOOP PUMP - AC 1
GLY DISCH SEC PRESS - 39-51 psig
GLY ACCUM SEC QTY - 30-55%
SEC COOL LOOP EVAP - EVAP
ECS RAD HTR - SEC (CK amp inc)
GLY EVAP STEAM PRESS .1-.15 boiling
>.16 not boiling

After 20-30 minutes:

ECS RAD TEMP SEC IN - 60-97°F
ECS RAD TEMP SEC OUT - 40-70°F
GLY EVAP SEC TEMP OUT - 40-50.5°F
SEC COOL LOOP PUMP - AC 2
GLY DISCH SEC PRESS - 39-51 psig
SEC COOL LOOP - RESET for 1 min, THEN OFF
ECS RAD HTR SEC - OFF
GLYCOL TO RAD SEC - BYPASS
SEC COOL LOOP PUMP - off (center)
ECS IND sw - PRIM
GLY EVAP STEAM PRESS - AUTO
ECS GLY PUMPS - redundant pump
GLY DISCH PRIM PRESS - 40-52 psig
GLY ACCUM PRIM QTY - 30-70%
ECS RAD HTR - redundant PRIM heater

3 CO2 ABSORBER FILTER REPLACEMENT

CAUTION

Connect ground wire when removing or
replacing filter from canister or stowage.

Obtain unused filter
Open CO2 Canister Attenuation Panel
CO2 Cstr Divert vlv - A (or B)

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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 - Both (Ctr)
Close CO₂ Cstr Attenuation Panel
Stow used Filter & Excess Shims

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- 4 GLYCOL ACCUMULATOR REFILL (IF < 30%)
PRIM ACCUM FILL vlv - ON
GLY ACCUM PRIM QTY - 40-70%
PRIM ACCUM FILL vlv - OFF
IF OVER FILL
GLYCOL RESVR INLET - OPEN (MOMEN)

- 5 DEBRIS SCREEN CHECK
Check cabin ht exch inlet screen
Check SUIT RET AIR vlv screen
CABIN FANS (2) - OFF
SUIT RET AIR vlv - CLOSE (push)
Clean screens
SUIT RET AIR vlv - OPEN (pull)
CABIN FANS (2) - on (up)

- 6 02 REPRESS BOTTLES REFILL PROCEDURE
SURGE TK - ON
02 REPRESS PRESS - <865 psia
02 PLSS vlv - FILL
02 REPRESS PRESS - >865 psia
02 PLSS vlv - OFF

- 7 DOFFING PGA
EMER CABIN PRESS vlv - BOTH
SUIT RET AIR vlv - OPEN (pull)
Install hose screen on return hose

SUIT PWR - OFF for disconnect

PWR - OFF

SUIT FLOW vlv - CABIN FLOW (for unsuited
crewman)
(FULL FLOW for 3 unsuited)

8

DONNING PGA

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 - SUIT FULL FLOW (for suited
crewman)

SUIT RET AIR vlv - CLOSED (push)

EMERG CABIN PRESS vlv - OFF (if all suited)

9

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

10

URINE DUMP MODES

A PGA Urine Coll Bag - dump

Connect Urine transfer hose & filter
to urine feces QD.

Connect urine transfer hose to thigh QD

WASTE MGT DRAIN vlv - DUMP

Disconnect urine transfer hose from PGA

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Replace cap on PGA
Purge dump line 30 sec
WASTE MGT OVBD DRAIN vlv - CLOSED
Disconnect hose & stow - clean up

B UTS (Collection)

Obtain UTS & verify vlv - Closed
Attach UTS - open vlv - Perform task
UTS vlv - Closed & disconnect UTS
Clean up
UTS - stow (temp)

C UTS (Dump)

Connect UT hose/filter to urine/
feces QD
Attach UTS to hose
WASTE MGT OVBD DRAIN vlv - DUMP-complete-
Purge lines for 30 sec
WASTE MGT OVBD DRAIN vlv - CLOSED
Stow UTS & Hose

11

CABIN PRESSURIZATION

(NORMAL - 30 min)
CAB PRESS REL vlv (2) - NORMAL (latch on)
MONITOR SURGE TANK PRESS
PLSS vlv - FILL
REPRESS O2 vlv - OPEN
AT 500 psia ON SURGE TANK:
PLSS vlv - OFF
CABIN REPRESS vlv - ADJUST TO 500 psia on
SURGE TANK

AT ZERO psia on EMERG O2 GAUGE:

REPRESS O2 vlv - CLOSE
CAB REPRESS vlv - OPEN (CW)
WHEN CABIN PRESS >4.7
CAB REPRESS - CLOSE (CW)
CAB FAN (2) - ON
O2 PRESS ind - TANK 1

(ALTERNATE - 52 min)

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

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EMER CAB PRESS vlv - BOTH
CAB REPRESS vlv - OPEN (CW)
MONITOR SURGE TANK PRESS
AT 500 psia on SURGE TANK:
EMER CAB PRESS vlv - OFF
CAB REPRESS vlv - Adj to 500 psia on SURGE TANK
WHEN CAB PRESS > 4.7
CAB REPRESS vlv - CLOSE (CCW)
CAB FAN (2) - ON
O2 PRESS IND - TANK 1

12 SUIT CKT INTEGRITY CHECK

DIRECT O2 vlv - CLOSE (CW) Cycle Cabin Air Return
SUIT PRESS - 4.7-5.3 psia vlv At 2 psi Suit-Cabin
O2 FLOW - 0.2-0.4 1b/hr Press
SUIT TEST vlv - PRESS
O2 FLOW - 1.0 1b/hr (pegged)
O2 FLOW HI lt - on
M/A - on, Reset
SUIT PRESS - 8.8-9.8 psia
PGA PRESS (3) - 4.1-4.5 psig
O2 DEMAND REG vlv - OFF
O2 FLOW - 0.2 1b/hr (pegged)
O2 FLOW HI lt - out
PGA PRESS (3) - 0.5 psi/min decay
SUIT TEST vlv - DEPRESS
O2 FLOW - 0.2-0.4 1b/hr
SUIT PRESS - slightly CAB PRESS
SUIT TEST vlv - OFF
O2 DEMAND REG vlv - Both (O2 flow inc)

13 PGA INTEGRITY CHECK

~~DIRECT O2 vlv - CLOSE (CW)~~
SUIT PRESS - 4.7-5.3 psia
O2 FLOW - 0.2-0.4 1b/hr
SUIT TEST vlv - PRESS
O2 FLOW - 1.0 1b/hr (pegged)
O2 FLOW HI lt - ON
M/A - ON, Reset
SUIT PRESS - 8.8-9.8 psia
PGA PRESS (3) - 4.1-4.5 psig
SUIT FLOW vlv - OFF

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

- 14 CM PRESSURE DUMP
EMER CABIN PRESS vlv - OFF (verify)
CAB REPRESS vlv - OFF (verify)
SUIT RTN AIR vlv - CLOSED (verify)
CABIN FANS (2) - OFF
DIR O2 vlv - CLOSE (CW)
CAB PRESS REL vlv (RH) - DUMP
CABIN PRESS - 3.0-3.25 psia
CAB PRESS REL vlv (RH) - BOOST ENTRY
O2 FLOW - >0.2 lb/hr
SUIT PRESS - 3.5-4.0 psia
CAB PRESS REL vlv (RH) - DUMP
CABIN PRESS - 0.0 psia
CAB PRESS REL vlv (2) - NORMAL (latch on)
- 15 SUIT CKT H2 PURGE
DIRECT O2 vlv - OPEN (CCW) for 1 min
O2 FLOW - 1.0 lb/hr (pegged)
O2 FLOW HI lt -on
MASTER ALARM pb/lt (3) -on, push
DIRECT O2 vlv- close (CW)
O2 FLOW - 0.2 lb/hr
- 16 CABIN COLD SOAK
ACTIVATE
SUIT HT EXCH SEC GLY vlv - FLOW
EVAP H2O CONT SEC vlv - AUTO
GLY TO RAD SEC vlv - BYPASS
CAB TEMP - MAN
PRIM CAB TEMP vlv - C (CW)
SEC CAB TEMP vlv - OFF (CCW)
SUIT CKT HT EXCH - BYPASS (20sec), Then OFF
ECS IND sel - SEC
SEC COOL LOOP PUMP - ACT

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GLY DISCH SEC PRESS - 39-51 psig
SEC ACCUM QTY - 30-70%
SEC COOL LOOP EVAP - EVAP
SEC GLY EVAP OUT TEMP - 40-50.5°F
SEC GLY EVAP STM PRESS - 0.1-0.15 psia
ECS IND - PRIM
PRIM ECS RAD OUT TEMP - >-20°F
IF <-20°F, deactivate

DEACTIVATE

SEC CAB TEMP vlv - COOL MAX (CW)
CAB TEMP - AUTO
SUIT CKT HT EXCH - ON (20 sec), then OFF
SEC COOL LOOP EVAP - RESET for 1 min,
then OFF
SEC COOL LOOP PUMP - OFF
GLY TO RAD SEC vlv - BYPASS
EVAP H2O CONT SEC vlv - OFF

- 17 POTABLE WATER CHLORINATION
- Unstow chlorination unit
 - Remove chlor port cap
 - Attach needle assembly to injection port
 - Insert chlorine ampoule into casing
 - Connect knob assembly & rotate until
piston contacts ampoule
 - Install ampoule assembly on needle assembly
(push & turn CW)
 - Rotate knob (CW) until ampoule is empty
(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 H2O - open
 - Wait 10 min
 - Remove an ampoule of H2O
 - Replace chlor port cap
 - Stow chlorination unit
 - Don't drink for 30 min

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- 18 WASTE WATER TANK DRAIN
Used as req to maintain water level between 25 & 85%
Attach Urine Transfer Hose/Filter to Urine/Feces QD
Install Female QD on Waste Water Panel
Attach Free-end of Urine Transfer Hose to QD on Waste Water Panel
Verify htrs on
WASTE MGT DRAIN vlv - DUMP
Open waste tank servicing vlv
Monitor waste tank decreasing
Monitor potable tank quantity stable
At approximately 25% waste H2O - close waste tank svc vlv
Detach UT hose at Waste Tank QD
Install UTS on UT hose
UTS vlv - open - purge 30 sec - then closed
OVBD DRAIN vlv - CLOSE
Detach UTS & UTS & UT hose & stow
- 19 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 (optional)
Util Pwr - off
Connect cable to outlet
Util Pwr - on (wait 1 hr before dumping)
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
Disconnect UT hose from UTS/Waste Servicing Tank and Purge
Disconnect UT Hose from Dump Nozzle & stow
Util Pwr - off
Disconnect Cable from heater & outlet & stow
Install plug & dump nozzle connector

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WATER COLLECTION

Connect urine transfer hose-filter
to urine/feces QD.

Connect cabin purge QD to urine
transfer hose

WASTE MGMT DRAIN vlv - DUMP

Collect water

After collection is complete

Purge for 30 secs

WASTE MGMT DRAIN vlv - CLOSE

C/W SYSTEM

A

C/W SYSTEM OPERATIONAL CHECK

C/W LAMP TEST - 1 (LH MA & 16 lts)

C/W LAMP TEST - 2 (RH MA & 23 lts)

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

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

C/W PWR - OFF (C/W 1t - on)

C/W PWR - 1 (C/W 1t - out)

TELECOMM SYSTEM

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 START S-BAND ANTENNA 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

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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 OMNI - 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

CAUTION

HI-GAIN ANT TRACK-MAN when omni antenna
operation is selected to prevent damage
to the HGA due to jitter.

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 (XMTR pwr, self test)

SYS TEST ind - 1-5 vdc

SYS TEST (RH) - B (RCVR AGC, self test)

SYS TEST ind - 2 + 1 vdc

SYS TEST (RH) - C (frequency lockup, self test)

SYS TEST (RH) - D (RCVR AGC OPERATE)

SYS TEST ind - 0-4.5 vdc

SC POWER DOWN

CMC

POO V48E

F 04 46 LOAD R1 A=0 (NO DAP)

PRO,PRO,PRO

V46E

V37E 06E

F 50 25 00062 CMC PWR DN

PRO (HOLD until STBY lt - on)

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IMU

CMC MODE - FREE
G/N IMU PWR - OFF (ISS warning-RSET)
G/N OPTCS PWR - OFF

SCS ORDEAL PWR OFF/FDAI INERTIAL
EMS FUNCTION - OFF
EMS MODE - STBY
CMC ATT-IMU
FDAI SCALE - 5/1
FDAI SELECT - 1
FDAI SOURCE - CMC
ATT SET - IMU
MAN ATT (3) - RATE CMD
LIMIT CYCLE - ON
ATT DEADBAND - MAX
RATE - LOW
THC PWR - OFF
ROT CONT PWR NORMAL (2) - OFF
ROT CONTR PWR DIRECT (2) - OFF
SC CONT - SCS
CMC MODE - FREE
BMAG MODE (3) - RATE 2
SCS TVC (2) - RATE CMD
EMS ROLL - OFF
.05G SW - OFF
LV/SPS IND-Pc/GPI
TVC GMBL DRIVES PITCH & YAW-1
AUTO RCS(16)-OFF
EDS PWR-OFF
TVC SERVO PWR (2) - OFF
FDAI PWR - OFF
LOGIC PWR 2/3 - OFF
SCS ELEC PWR - OFF
SIG CONT/BIAS PWR-OFF
BMAG PWR(2)-WARMUP (38 watts)

SYSTEMS

FUEL CELL O2 (3) - PURGE (2 + 00)
FUEL CELL H2 - PURGE (1 + 20)(If Req'd prior to end
of sleep)

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- 2 CRYO FANS 02 and H2 - ON (3 min)
3 WASTE H2O - DUMP (if QTY will reach 85% prior to end of rest day)
4 CO2 Canister change
5 WASTE MGMT OVBD DRAIN - OFF
WASTE STOWAGE VENT v1v - CLOSED
6 S-BAND ANT - OMNI B
COMM - BASIC (DUPLEX-A, RCV ONLY-A)
7 EMERG CABIN PRESS - BOTH
SURGE TANK - ON
PLSS - OFF
8 LM TUNNEL VENT v1v - LM PRESS
SYS TEST - 4D (LM PWR)
9 Onboard Readouts to MSFN:
VOLTS: BAT C, PYRO BAT A, PYRO BAT B
Quantities: SM RCS A,B,C,D
CM RCS INJ TEMPS - SYS TEST 5C,D,6A,B,C,D
10 Primary Evap Shutdown:
GLY EVAP STM PRESS AUTO - MAN
GLY EVAP STM PRESS INCR - INCR (1 MIN)
GLY EVAP H2O FLOW - OFF

SC POWER UP

SCS

CB PANEL 8 (NC)-closed
SC CONT - CMC
AV CG - as required
LOGIC PWR 2/3 - on (up)
SIG COND/DRIVER BIAS PWR (2) - AC1
SCS ELEC PWR - GDC/ECA (170 watts)
BMAG TEMP 1t(2)-out(verify)
FDAI PWR - OFF
BMAG PWR (2) - ON (110 watts)
FDAI PWR - BOTH (104 watts)
AUTO RCS SELECT (16) - MNB
ROT CONT PWR NORMAL (2)-AC/DC

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CMC PRO (Hold until STBY lt out)
PROG,RESTART,TRACKER,CMC,ISS,PGNS,13777
F37-00E
RSET-CMC, RESTART out

IMU
1 Verify: LOGIC PWR 2/3 - ON
FDI POWER - BOTH
FDI SELECT - 1/2
CMC MODE - FREE

2 G/N IMU PWR - On
NO ATT lt - on (90 sec), TRACKER - off
NO ATT lt - out
RSET - PROG,ISS,PGNS out
Wait 20 sec

3 V37E 00E

SYSTEMS CHECKS

- 1 CMC SELF CHECK (PG-70)
2 DSKY LAMP TEST, V35
3 DAP ACTIVATION, V48,V46
4 ERASABLE DUMP, V74E
5 IN PLANE GDC ALIGN (PG-84)
6 FUEL CELL O2 PURGE (2:00)
7 CRYO O2 & H2 FANS ON (3:00)
8 WASTE H2O DUMP (if QTY will be 85% at end of day)
9 CO2 CANISTER CHANGE
10 Activate Primary Evaporator
11 Obtain Consumables update from MSFN

CMC SELF CHECK

- 1 V25 N01E, 1365E
F 21 01 E,E,E

2 V15 N01E, 1365E
F 15 01 R1 NUMBER OF ERRORS
R2 NUMBER OF TESTS STARTED
R3 NUMBER OF TESTS SUCCESSFUL

1, 1969
12, 1969

Feb.
Feb.

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- 3 V21 N27E 10E SELF TEST, FIXED & ERASABLE
(4E SELF CHECKS ERASABLE
5E SELF CHECKS FIXED)
- 4 KEY RLSE
F 15 01 TEST SUCCESSFUL WHEN R2₁3 (78 sec)
* IF PROG 1t - on *
* V05 N09E 01102 SELF *
* TEST ERROR *
- (TERM) V21 N27E 0E N8E-Record For MSFN*

IN-PLANE GDC ALIGNMENT

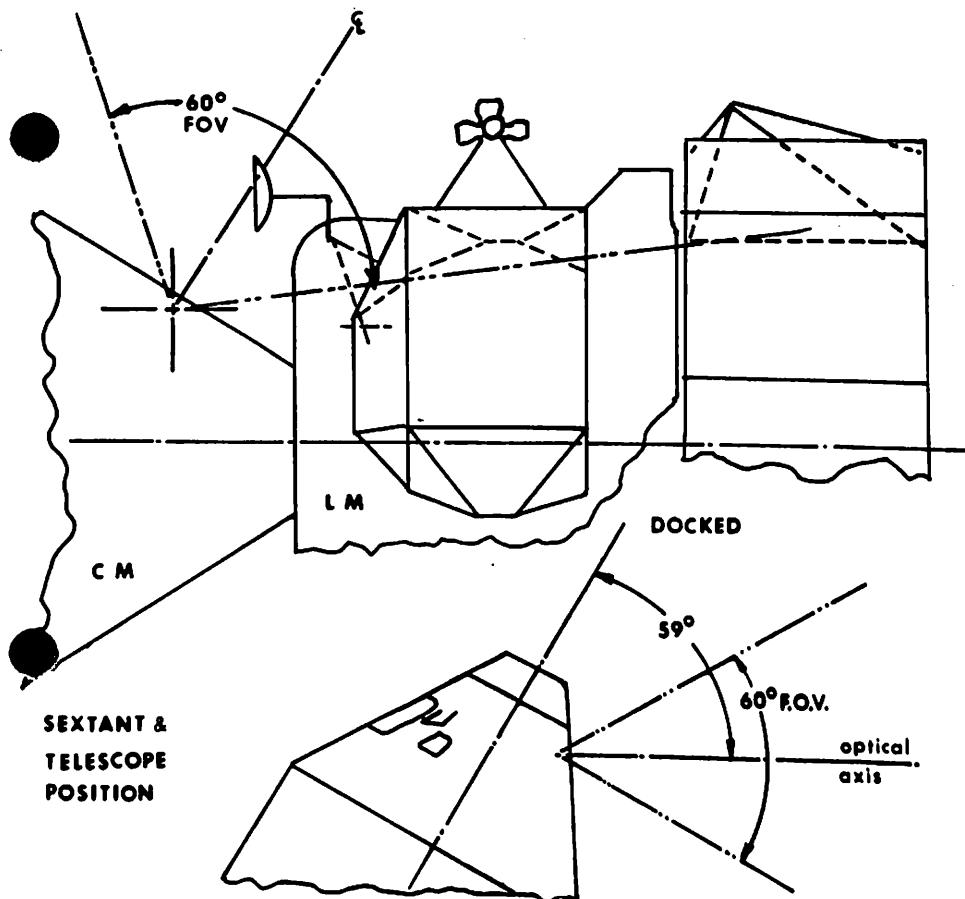
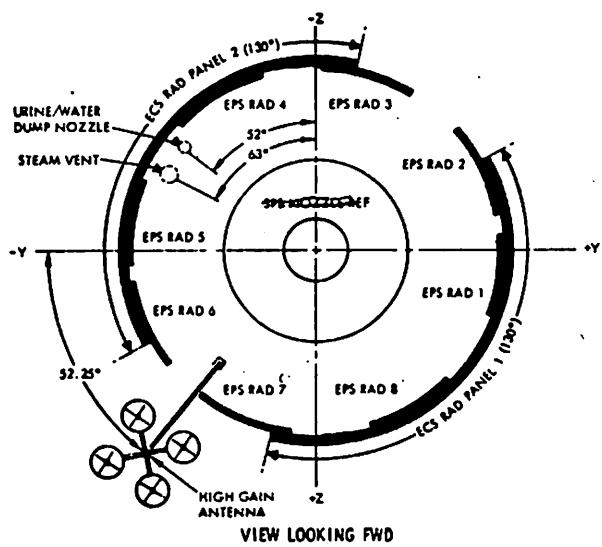
CMC - on
ISS - on
SCS - operating

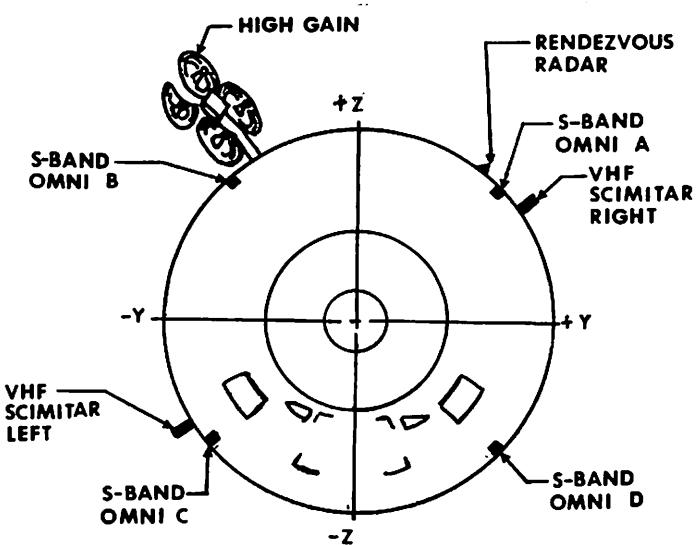
- Basic Date Feb. 1, 1969
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- 1 F 04 06 V37E 52E
00001
Load R2-00002
PRO
 - 2 F 06 34 GET ALIGN 0,0,0
PRO
 - 3 F 06 22 R,P,Y
 - 4 Set ATT SET dials to R,P,Y on DSKY
 - 5 FDAI SELECT - 1
ATT SET - GDC
GDC ALIGN - push
 - 6 V37E XXE

LMP
2-21/22

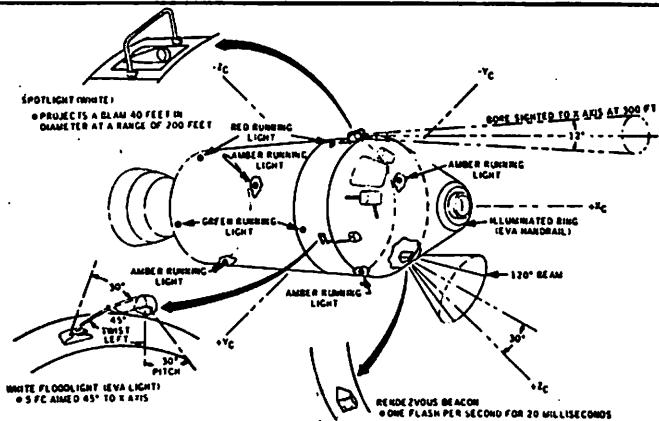
SYSTEMS TEST METER READOUTS

System Test Meter Display	O ₂ , H ₂ Pressure (PSIA)	EPS Radiator Outlet Temperature (°F)	CM-RCS Oxidizer Valve Temperature (°F)	LM Power (Amps)	SPS Temperature (°F)	Battery Manifold Pressure (PSIA)	Dry Relay Bus (VDC)
0.0	0	-50	-50	0	0	0.00	0
0.2	3	-36	-46	0.4	8	0.72	1.8
0.4	6	-22	-42	0.8	16	1.44	3.6
0.6	9	-8	-38	1.2	24	2.16	5.4
0.8	12	+6	-34	1.6	32	2.88	7.2
1.0	15	+20	-30	2.0	40	3.60	9.0
1.2	18	+34	-26	2.4	48	4.32	10.8
1.4	21	+48	-22	2.8	56	5.04	12.6
1.6	24	+62	-18	3.2	64	5.76	14.4
1.8	27	+76	-14	3.6	72	6.48	16.2
2.0	30	+90	-10	4.0	80	7.20	18.0
2.2	33	+104	-6	4.4	88	7.92	19.8
2.4	36	+118	-4	4.8	96	8.64	21.6
2.6	39	+132	0	5.2	104	9.36	23.4
2.8	42	+146	+4	5.6	112	10.08	25.2
3.0	45	+160	+10	6.0	120	10.80	27.0
3.2	48	+174	+14	6.4	128	11.52	28.8
3.4	51	+188	+18	6.8	136	12.24	30.6
3.6	54	+202	+22	7.2	144	12.96	32.4
3.8	57	+216	+26	7.6	152	13.68	34.2
4.0	60	+230	+30	8.0	160	14.40	36.0
4.2	63	+244	+34	8.4	168	15.12	37.8
4.4	66	+258	+38	8.8	176	15.84	39.6
4.6	69	+272	+42	9.2	184	16.56	41.4
4.8	72	+286	+46	9.6	192	17.28	43.2
5.0	75	+300	+50	10.0	200	18.00	45.0

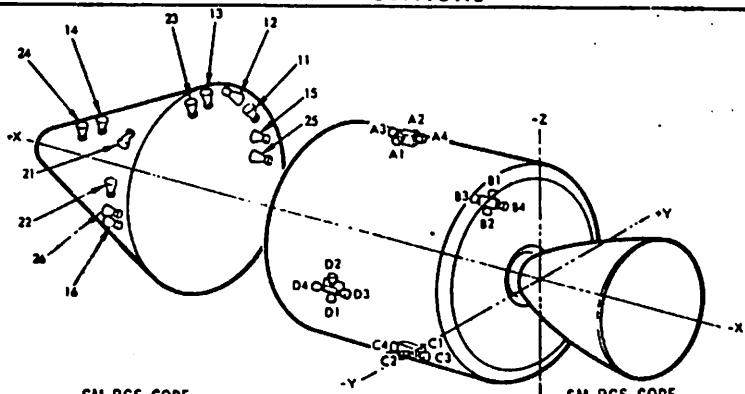




ANTENNA POSITION



LIGHT POSITIONS



FIRST DIGIT: SYSTEM (1 OR 2)

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

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

SECTION 3. FLIGHT EMERGENCY PROCEDURES

FIRE/SMOKE IN CM (CREW SUITED)

- 1 CAB FAN (2) - OFF
- 2 Monitor EPS for excessive current and remove power from affected bus
- 3 Verify suit compressor on good AC bus
- 4 Use fire extinguisher as appropriate

FIRE IS OUT

- 5 Remove smoke from cabin per "Contamination in CM" procedures before removing helmets

FIRE PERSISTS - DUMP CABIN

- 6 Verify:
SUIT CKT RET vlv - PUSH TO CLOSE
EMER CAB PRESS vlv - OFF
02 PLSS vlv - OFF
- 7 Visually check suit integrity
- 8 CAB PRESS RELF (RH) - DUMP to 3.0 psia
then to BOOST ENTRY
REMARK: Provides controlled cabin dump until suit circuit pressure is verified
- 9 Verify Suit pressure 3.5 psia
- 10 CAB PRESS RELF (RH) - DUMP
and/or Hatch Vent vlv - open
- 11 CAB PRESS ind 0.0 psia for 6 min

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- 12 CAB PRESS RELF (RH) - NORMAL
13 Hatch Vent vlv - close
14 Do not repress cabin until fire source is removed

FIRE/SMOKE IN CM (CREW UNSUITED)

- 1 CAB FAN (2) - OFF
2 SUIT COMPR (2) - OFF
3 Monitor EPS for excessive current and remove power from affected bus
4 Don emergency O2 masks
5 Use fire extinguishers as appropriate

FIRE IS OUT

FLIGHT EMERGENCY

- 6 Remove smoke from cabin per "Contamination in CM" procedure before removing O2 masks

FIRE PERSISTS - DON SUITS and DUMP CABIN

- 7 Don PGA's except helmets and verify O2 connectors (Use O2 masks as long as possible)
8 DIRECT O2 vlv - OPEN (CCW)
REMARK: Purges suit circuit of smoke and fumes
9 Don helmet
10 Suit flow vlv (3) - SUIT FULL FLOW
11 SUIT COMPR 1 (2) - AC1 (AC2)
12 DIRECT O2 vlv - CLOSE (CW)

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- 13 EMER CAB PRESS vlv - OFF
- 14 Visually check suit integrity
- 15 CAB PRESS RELF (RH) - DUMP to 3.0 psia
then to BOOST/ENTRY
- 16 Verify Suit pressure holding 3.5 psia
- 17 CAB PRESS REL (RH) - DUMP
and/or Hatch Vent vlv - open
- 18 CAB PRESS ind 0.0 psia for 6 min.
- 19 CAB PRESS RELF (RH) - NORMAL
- 20 Hatch Vent vlv - close
- 21 Do not repress cabin until fire source is removed

Contamination in CM

1 Don O2 masks and/or PGA's immediately

- 2 Evaluate contamination level (isolate & correct source of contamination if possible) and proceed with one of the following steps:
- Retain O2 masks or remain in suit and accept contamination level in cabin.

CAUTION

If in PGA's, adjust DIRECT O2 to maintain suit to cabin $\Delta P > 0.38$ psi.

- Retain O2 masks and scrub cabin atmosphere through suit loop. If initially suited, establish partially suited or shirtsleeve configuration and don O2 masks.

CAUTION

Change LiOH cartridges after scrub completed.

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- c. Retain PGA's or don PGA's
- Verify suit integrity (visually)
- Perform Cabin Dump
- Perform Cabin Repress

Contamination In Suit

1 SUIT COMPR 2 - AC1

4

2 SUIT COMPR 1 - OFF

3 DIRECT 02 vlv - OPEN (CCW) for 1 minute
then close (CW)

7

If condition persists:

4 SUIT COMPR 2 - OFF

5 DIRECT 02 vlv - OFF

6 Doff helmet

7 Don emergency 02 masks

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CMC	SC CONT-SCS, If out in 5 sec V11 N10E 33E:R1:A: if RIA \neq 0,1,4,5: C/W fail (if LEB CMC, no TVC)	G&N 5
ISS	SC CONT-SCS, G&N PWR - AC1 Both Lamps on: G&N PWR OFF, check V5N9 One lamp: V35 for lamp test	G&N 6
TEMP	RSET, If V11N10E, 30E, R1A=0,1,2,3: Temp in limits If not, 15 min available.	
TRACKER	RSET: OFF, Continue; Both ON: V11N10E 30E, RIC \neq 2,6 Output channel failed	G&N 10
SPS PRESS	FUEL/OX Δ P < 20: P $>$ 200 He vlv-OFF; <15: ON > 20: THRUST OFF Δ V	SPS 1
SPS FLANGE Temp Hi	Non Critical Burn - Δ V THRUST-OFF Non Burn: heat soak back	SPS 5
SM RCS	He 1 & 2-CLOSE; PKG TEMP <70°: QUAD AUTO RCS - OFF RCS HTRS - SEC >205°: HTRS - OFF	RCS 1
CM RCS	MANF PRESS <260, He PRESS Low:CM RCS PRPLNT - OFF	RCS 3
CYRO PRESS	Any Lo: FANS and HTRS-ON Both Hi: FANS and HTRS-OFF: Any Hi: Inst fnl	EPS CYRO 1
FC 1	Skin Temp >450°: HTRS Off, Check VI Perf <360°: Check VI Perf Con Ex Temp >200°: Open CKT, Check RAD OUT TEMPS (3B,3C,3D) <150°: Check CB FC PUMPS AC,	EPS FC 1a 1b EPS

LMP

3-6

Check T skin Hi(450°) 1c
 Rad Temp Lo :Check TCE,RAD OUT TEMPS 1d
 Ph Hi-bp :If current <5 amps, shutdown: 1e
 PUMPS-OFF 1f

POTABLE TANK INLET VLV-CLOSE

FC 02 (H2) FLOW Hi	.8(.1)	02 < (8)(H2): Cycle Purge 02 > (8)(H2): Check amps vs. flow	EPS FC 1g
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FC 02 (H2) FLOW Lo	02<(8)(H2):Check REG PRESS: 10(2C) (2>(8)(H2):Check VI perf	EPS FC 2
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AC BUS 1	RSET: < 98:Replace Inv. >128:Replace Inv. NORM:EPS Sensor Unit Out,RESET- OFF	EPS-PD 1d 1e 1b
----------	--	--------------------------

AC BUS	+ MAIN BUS UNDERVOLT	DC Volts < 26, AMPS Hi: Replace Inv.	
--------	-------------------------	---	--

BUS B UNDER	+ BUS A UNDER	+ FC 3 + FC 2	EPS 3
----------------	------------------	---------------	----------

Remove FC2 from MNB,Tie (With FC
1) MNA, Check Volts, Go to EPS-PD1

AC BUS	+ AC BUS OVERLOAD	+ MAIN BUS UNDERVOLT	EPS-PD 1
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Replace INV
If still OVERLOAD -
Disconnect 2nd INV

MAIN BUS UNDER	Volts <26, AMPS Hi: Replace Inv.	
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INV TEMP Hi	Gly Out Temp >51:SEC EVAP-ON, ECS 16 Gly Out Temp <51:AC volts, Replace INV	ECS-16 EPS-PD 2
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FC BUS DISCONNECT	1 or 3: Connect 1 to B, 3 to A 2 : Attempt Reconnect	
02 FLOW Hi	Indicator, Cabin Press, Surge OK: Waste Mgt Valve Cabin Press Rel; Direct 02; Demand Reg; Repress 02; Emerg. Reg; H2O/Gly Tank Reg. LM PRESS vlv	
SUIT COMPRESSOR	$\Delta P < .22$, other comp to other bus	ECS 9
CO2 PP Hi	$> 7.6 \text{ mm}$: Direct 02 10 sec., 02 Mask	ECS 12
GLYCOL TEMP LOW	Prim Rad Out T < -30 : ECS RAD HTR-PRIM 2 Still < 30 : RAD FLOW CONT-2	ECS 14
GLY EVAP TEMP Hi	$> 60^\circ$ Actuate Secondary Loop	

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3-8

MN Bus Voltage < 26.0, No Short
 PWR Down Until MN Bus \geq 26.5 VDC

<u>SPS BURN</u>	<u>CURRENT-AMPS</u>
1. 02 Heaters(both) Off	11.0
2. Battery C on MN A&B	
MN A Batt C cb-Close	
MN B Batt C cb-Close	
3. ECS Radiator Heaters Prim - Off	17.3
Sec - Off	17.3
4. If Unsuted	
Suit Compressor(both) - Off	8.4
5. Power Amp - Off	3.53
6. Cabin Fans(both) - Off	1.94
7. All FC pumps - Off	10.0
8. SMRCS Heaters A,B,C,D - Off	2.86 per Quad
9. Pot. H2O Heater - Off	1.6
10. H2 Heater(both) - Off	1.44
11. H2 Fans(both) - Off	0.72
12. 02 Fans(both) - Off	5.4
13. SPS Line Heater - Off	A=1.025 A/B=2.05

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<u>SPS BURN</u>	<u>CURRENT-AMPS</u>
14. Lights(as required)	
15. Tape Record Fwd/Rwd-Off	1.82
16. SPS Gauging-Off	2.95
17. ECS Glycol Pumps(both)- Off	2.77 for 1 pump
18. ECS Radiator Cont/Htr cb (both)-Open	2.69
19. Power SCE	0.65
20. Telecom Group 1&2-Off	2.2
21. Instrumentation ESS MN A/B cb-Open	4.7

BUS LOSS RECONFIGURATION

NORMAL

A. Loss of MN A

1. FC 2 - MN B only
2. FC 1 - MN B (if required)
3. Inverter 3 - MN B, AC 1
4. CB MN A Bat Bus A - Open
5. CB MN B Bat C - Closed
6. H2O Accumulator - Auto 2
7. BMAG Mode (3) - Rate 2
8. FDAI Select - 2
9. Urine Dump - HTR B
10. Waste H2O Dump - HTR B
11. ROT Contr Pwr Direct 2 - MNB
12. Auto RCS Select (16) - MNB

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13. RCS Radiator Heater - PRI 1
14. SPS Inline HTR - A/B (as required)
15. ECS Rad Flow Cont - PWR - 2
16. SCS TVC P,Y - Rate CMD

B. Loss of Main B

1. FC 2 - MN A only
2. FC 3 - MN A (if required)
3. Inverter 3 - MN A, AC 2
4. CB MN B Bat Bus B - Open
5. CB MN A Bat C - Closed
6. BMAG Mode (3) - Rate 1
7. ROT Contr Pwr Direct 1 - MNA
8. Auto RCS Select (16) - MNA
9. SCS Electronics Pwr SW - ECA
10. ECS Rad Htr's - PRI 2
11. ECS Rad Flow Cont Auto/1/2 - 1

C. Loss of Bat Bus A

1. ECS Radiator Heaters - PRI 2
2. If Main Bus Tie A/C is closed
 - a. CB MN A Bat Bus A - Open
 - b. CB MN A Bat C - Open
3. If MN Bus Tie A/C is open
 - a. CB MN B Bat Bus B - Open
 - b. CB MN A Bat C - Open
 - c. MN Bus Tie Bat B/C - On (Up)

D. Loss of Bat Bus B

1. ECS Radiator Heaters - PRI 1
2. If MN Bus Tie B/C is closed
 - a. CB MN B Bat Bus B - Open
 - b. CB MN B Bat C - Open
3. If MN Bus Tie B/C is open
 - a. CB MN A Bat Bus A - Open
 - b. CB MN B Bat C - Open
 - c. MN Bus Tie Bat A/C - On (Up)

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E. Loss of AC Bus 1

1. AC Inverter 1 MN A - Off
2. Suit Compressor 2 - AC 2
3. FDAO Select - 2
4. BMAG Mode (3) - Rate 2
5. Telcom Group 1 - AC 2
6. Fuel Cell Pump 1 - AC 2
7. ECS Glycol Pump 2 - AC 2
8. BMAG 1 Power - Off
9. G&N Power - AC 2
10. Signal Cond/Bias Power 1 - AC 2
11. Manual Control Glycol Evap Temp Inlet
(maintain above 40°F)
12. ECS Rad Flow Cont - 2
13. Bat Chg - AC 2

F. Loss of AC Bus 2

1. AC Inverter 2 MN B - Off
2. SCS Electronics Power - ECA
3. Telcom Group 2 - AC 1
4. Fuel Cell Pump 2 and 3 - AC 1
5. BMAG 2 Power - Off
6. FDAO Select - 1
7. Signal Cond/Bias Power 2 - AC 1
8. Activate Sec Coolant Loop
9. Shut down Primary Evaporator

PRE/POST SPS BURN

A. Loss of Main Bus A

1. Pre SPS Burn
 - a. Verify reconfiguration per mission phase
 - b. Perform G&N SPS maneuver with following deviations:
 - (1) CB MN B Bat C - Closed
 - (2) TVC Gimbal Drive (P,Y) - 2

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- (3) CB's SPS Pitch 1 and 2, Yaw 1 and 2 (4) - Open (after gimbal motor turn on)
- (4) SCS TVC (P,Y) - Rate CMD

2. Post SPS Burn

- a. CB's SPS Pitch 1 and 2, Yaw 1 and 2 (4) - Close (prior to gimbal motor turn off)

B. Loss of Main Bus B

1. Pre SPS Burn

- a. Verify reconfiguration per mission phase
- b. Perform G&N SPS maneuver with following deviations:
 - (1) CB Main A Bat C - Closed
 - (2) TVC Gimbal Drive (P,Y) - 1
 - (3) CB's SPS Pitch 1 and 2, Yaw 1 and 2 - Open (after gimbal motor turn on)

2. Post SPS Burn

- a. CB's SPS Pitch 1 and 2, Yaw 1 and 2 (4) - Closed (prior to gimbal motor turn off)

C. Loss of Bat Bus A

1. Pre SPS Burn

- a. CB Main A Bat Bus A - Open (Verify)
- b. CB Main B Bat Bus B - Closed(Verify)
- c. CB Main A Bat C - Closed

NOTE

If Bus Tie B/C is already closed, steps 2 and 3 should be performed when ready to tie Bats to mains.

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- d. TVC Gimbal Drive (P,Y) - 2
 - e. After Gimbal Start; CB's SPS Pitch, Yaw 1 and 2 (4) - Open
 - 2. Post SPS Burn
 - a. CB's SPS Pitch 1 and 2, Yaw 1 and 2 (4) - Closed (prior to gimbal motor turn off)

D. Loss of Bat Bus B

- 1. Pre SPS Burn
 - a. CB MN B Bat Bus B - Open (Verify)
 - b. CB MN A Bat Bus A - Closed (Verify)
 - c. CB MN B Bat C - Closed

NOTE

If Bus Tie A/C is already closed, steps 2 and 3 should be performed when ready to tie Bats to Mains.

- d. TVC Gimbal Drive (P,Y) - 1
- e. After Gimbal Start, CB's SPS Pitch, Yaw 1 and 2 (4) - Open
- 2. Post SPS Burn
 - a. CB's SPS Pitch 1 and 2, Yaw 1 and 2 (4) - Closed (prior to gimbal motor turn off)

E. Loss of AC Bus 1

- 1. AC Inverter 1 MN A - Off
- 2. S-Band Normal Pwr Amp - SEC
- 3. S-Band Normal Xponder - SEC
- 4. F/C Pump 1 - AC 2
- 5. G&N Power - AC 2
- 6. ECS Glycol Pump 2 - AC 2

7. BMAG 1 Pwr - Off
8. Signal Cond/Bias Power 1 - AC 2
9. FDAI Select - 2
10. SCS TVC - Rate CMD
11. BMAG Mode (3) - Rate 2
12. TVC Servo Power 1 - AC2/MNB
13. SPS Gauging - AC 2

F. Loss of AC Bus 2

1. AC Inverter 2 MN B - Off
2. S-Band Normal Xponder - PRI

NOTE: If post TLI TELCOM Group 2-AC 1

3. F/C Pump 2 and 3 -AC 1
4. BMAG 2 Power - Off
5. FDAI Select - 1
6. SCS Electronics Power - ECA
7. SCS TVC (2) - Rate CMD
8. BMAG Mode - Rate 1
9. TVC Servo Power 2 - AC1/MNA

DURING CRITICAL SPS BURNS

LOSS OF:

I. MAIN A

- FC 2 - MAIN B only
TVC Gimbal Drive (P,Y) - 2
CB's SPS Pitch 2, Yaw 2 - Open
AC Bus 1 Inverter 1 - Off
AC Bus 1 Inverter 2 - On
SCS TVC (2) - Rate CMD
FDAI Select 2
 ΔV Thrust B - Normal

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II. MAIN B

FC 2 - MAIN A only
CB's SPS Pitch 1, Yaw 1 - Open
TVC Gimbal Drive (P,Y) - 1
AC Bus 2 Inverter 1 - On

III. AC BUS 1

TVC Servo Power 1 - AC2/MNB
BMAG Mode (3) - Rate 2
FDAAI Select - 2
Suit Compressor 2 - AC 2 (For Launch Only)

IV. AC BUS 2

TVC Servo Power 1 - AC1/MNA
BMAG Mode Switches (3) - Rate 1
SCS TVC - Auto
Control MTVC with Trim Thumbwheels

V. BAT BUS A

CB Main A Bat C - Closed

VI. BAT BUS B

CB Main B Bat C - Closed

LOSS OF TWO FUEL CELLS

1. Power down the following:

Panel 2

O2 & H2 tank fans and heaters (4) - Off

Caution and Warning - ACK
Cabin Fans (both) - Off

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Pot H₂O Heater - Off
Glycol Evap Steam Press - Man
Glycol Evap H₂O Flow - Off
Glycol Evap Temp In - Man
ECS Rad Htr Prim - Off
ECS Rad Htr Sec - Off
Power down CMC and IMU per checklist(standby)

Panel 3

SPS Line Heater - Off
Tape Record Fwd/Fwd - Off
S-Band Normal Pwr Amp - Off
Select Single Inverter Operation
Configure remaining fuel cell to both main buses

Panel 5

ECS Radiator Htr OVLD CB (2) - Open
Failed Fuel Cell Pumps (2) - Off

Panel 7

SCS Logic Power 2/3 - Off
BMAG Pwr (2) - Off*

*Place to warmup 40 min prior
to an IMU/GDC align

FDAI/GPI - Off
SCS Electronics - Off

Panel 8

Auto RCS Select (16) - Off
SCS Logic (CB 23, 24, 62, 63) - Open

2. IGN - 2 Hours

*A. Power up CMC, IMU and optics
per checklist and perform
IMU align.

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B. After IMU align, optics - Off

If main bus voltage 26.0 VDC with CMC, IMU and optics up perform the following:

- A. If sufficient battery energy is available, place battery with highest energy on both main buses.
- B. If insufficient battery energy available perform:

SMRCS heater - Off
Glycol pump - Off to be turned back on within 1 1/2 hours

Suit compressor - Off turned back on within 1 hour
*Instrument ESS CB CB (2) - Open to be closed when the Batts on Line Lights as required

3. IGN - 1 hour
BMAG Pwr (2) - Warmup for 40 min before IMU/GDC align after warmup power up SCS per checklist.

Logic Arm
Pyro Arm
CMRCS Press
Logic Safed
Pyro Safed

4. Batts on at normal time prior to SPS de-orbit and proceed with normal entry.

*Crew Option

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LOSS OF 3 FUEL CELLS

Conditions:

1. 3 batteries supplying spacecraft power
2. G&N system is completely powered down
3. SCS system is powered down until required for entry
4. The USBE is powered down and is cycled over MSFN sites. VHF comm is available until Sep. Prior to CM/SM Sep the USBE will be turned on for ranging data.

At the loss of 3 fuel cells perform the following:

1. Tie batteries to Main Bus A & B

Panel 275

Main A / Bat C	Close
Main B / Bat C	Close

Panel 5

Main Bus Tie	Bat A/C	On
Main Bus Tie	Bat B/C	On

2. Turn off cryo heaters and fuel cell pumps. Verify cryo fans off.

Panel 5

FC pumps (all)	Off
----------------	-----

Panel 2

H2/O2 heaters (all)	Off
H2/O2 fans (all)	Verify Off

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Panel 2

Caution/Warning -	ACK
Normal/Boost/ACK	
Cabin Fans both	Off
SMRCS heaters (A,B,C,D)	Off
Pot H2O heater	Off
ECS Rad Htrs Prim	Off
ECS Rad Htrs Sec	Off

Panel 3

SPS line heaters	Off
Select single inverter operation	
Tape record Fwd/Rewind	Off
S-Band normal pwr ampl.	Off

Panel 4

Telecom - Group 1	Off
Telecom - Group 2	Off

*These will be cycled approximately 10% duty cycle over MSFN to provide telemetry monitoring.

Panel 5

Guidance & Navigation CB (all)	Open
	10

Panel 7

BMAG pwr - both	Off (if time to go > 1 hr)
Logic power 2/3	Off
FDAI/GPI	Off
SCS Electronics	Off

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Panel 8

SCS logic (CB 23, 24, 62, 63) Open
Auto RCS select 16 (all) Off

Panel 225

Flt bus (both) Open

Panel 276

Instrumentation power control Open
(CB 1, 2, 3, 4)

Panel 6, 9, 10

Audio centers as required

Panel 100

Flood fix - Off Off
LEB lights flood Off

*These will be cycled approximately 10% duty cycle over MSFN to provide telemetry monitoring.

Note: Lifetime in orbit approx. 4.75 hrs after loss of fuel cells with batteries fully charged.

3. Tig - 55 minutes

Panel 7

BMAG pwr - both Warmup

4. A. Logic & Pyro Arm
CM RCS Press

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B. Logic & Pyro Safed

5. Power up USBE to provide data and comm during deorbit.

Panel 276

Instrumentation power control Close
(CB 1, 2, 3, 4)

Panel 225

Flt bus (both) Close

Panel 4

Telecom - Group 1 AC-1
Telecom - Group 2 AC-2

6. Tig - 15 minutes
Power up SCS for auto SCS/SPS ΔV

Panel 7

Logic power 2/3 On

Panel 8

SCS logic (CB 23, 24, 62, 63) Closed

7. Tig - 5 minutes
Gimbal motors on
8. Tig - 15 sec
4.Jet ullage (+x)
9. t_0 = ignition

B_t =

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10. Gimbals Off
11. Logic and Pyro Armed
12. CM - SM SEP
Configure CMRCS Jet select for 1 ring operation

NON-DIODED/NON-SWITCHABLE LOADS

MAIN A

O2 & H2 Tank 1 Heaters
PP CO2(TLM & Onboard)
PRIM 2 Rad Htrs
SEC ECS Rad Htrs
ECS RADIATOR MAN SEL
ECS RADIATOR FLOW CONT NO. 1 & AUTO SEL Capability
ECS RADIATOR TEMP SEC Inlet & Outlet (SF0262T and SF0263T)
Auto & Simi-Auto Operation of No. 1 H2O Accum if Cyclic Accum VLV is in RMTR position
Inverter 1
16mm SEQ Camera
B, D CM1, HTRS & Iso Vlvs
 ΔV Thrust A
Pilot VLV #1 & #2
Primary Gimbal Mtrs P, Y
L Coas
Flashing Rendezvous Lights
FDAI No. 1
GDC
BMAG No. 1 (Immediately)
Direct Ullage P/B C₃ & A₄

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MAIN B

O2 & H2 Tank Heaters
PRI 1 ECS RAD Htr
ECS Rad Temp Rad In
ECS Rad Flow Control No 1
No 2 H2O Accum
Inverter 2
A, C, CM2, HTRS & Iso vlv
 ΔV Thrust B
Pilot VLV #3 & #4
Secondary Gimbal Motors P, Y
FDAI No 2
GDC - All Modes
BMAG No 2
ROT CONTR PWR DIRECT SW NO 1
Direct Ullage P/B D3 & B4
Ordeal

BAT BUS A

SECS AND ELS System A
Uprighting Compressor No 1
Uprighting Float Bag 1
EDS Voting Logic 1
Gimbal Motor Control (On-Off)
Pitch 1 + Yaw 1
Main Bus Tie A/C

BAT BUS B

SECS and ELS System B
Uprighting Compressor No 2
Uprighting Float Bag 2
EDS Voting Logic 3
Gimbal Motor Control (On-Off) Pitch 2 & Yaw 2
Main Bus Tie B/C

AC BUS 1

O2 & H2 Tank 1 Fan, Quant & Temp
Cabin Fan No 1

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LMP
3-24

ECS RAD Flow Controller No 1
Man Control Of Back Pressure Control VLV (ϕ C)
(PRI Syst)
Elect Control Of Suit HT EXCH PRI GLYCOL Cont VLV
Auto Control Of PRI Glycol Evap Inlet Temp VLV
(ϕ A)
EMS Δ V
FDAI 1
No 1 Pitch & Yaw Needles On GPI
GDC
SCS MIN Impulse & RT CMD
BMAG No 1
RHC No 1 For MTVC (ϕ A Only)

AC BUS 2

O2 & H2 Tank 2 Fan, Quan. Temp
PRI EVAP TEMP CONT UNIT (2.40) (ϕ A)
Auto Cabin Temp Control Unit (ϕ C)
Cabin Fan No 2
FDAI No 2
RSI
BMAG #2
GDC
Rate CMD
MTVC
Pitch & Yaw Needles On GPI No. 2
Ordeal

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