APOLLO 9	
PROCEDURES	
PART NO	S/N
SKB 32100041-201	1004

DOCKED P52's

For each Docked P52 record:

1. Control Mode used
2. Star Codes
3. Star Angle Difference
4. Gyro Torqueing Angles
5. Comments on controls and Displays and any visibility problems

Docked P52's are nominally scheduled for G.E.T.'s of:

00:45	24:20	48:40	90:25
05:10	27:20	53:10	
21:20	42:50	71:05	

ALIGNMENT CHECKS

1. May be performed after either P51 of P52
2. Do after at least two alignments
3. Three checks required per alignment
   Two new stars per check are most desirable.
   Three combinations of the same three stars are acceptable.

For each check record the following:

1. Star Codes
2. Star Angle Difference
3. Gyro torqueing Angles

Alignment checks are nominally scheduled for G.E.T.'s of

05:20 21:30

IMU ALIGNMENTS AND CHECKS

GET				
CONTROL MODE				
STAR CODE	1			
	2			
STAR ANGLE DIFFERENCE	05			
GYRO TORQUE ANGLES	X			
	Y			
	93 Z			
COMMENTS: CONTROLS, DISPLAYS & STAR VISIBILITY				
GET				
CONTROL MODE				
STAR CODE	1			
	2			
STAR ANGLE DIFFERENCE	05			
GYRO TORQUE ANGLES	X			
	Y			
	93 Z			
COMMENTS: CONTROLS DISPLAYS & STAR VISIBILITY				

IMU ALIGNMENTS AND CHECKS

GET		
CONTROL MODE		
STAR CODE 1 2		
STAR ANGLE 05 DIFFERENCE		
GYRO TORQUE X ANGLES Y 93 Z		
COMMENTS: CONTROLS, DISPLAYS & STAR VISIBILITY		
GET		
CONTROL MODE		
STAR CODE 1 2		
STAR ANGLE 05 DIFFERENCE		
GYRO TORQUE X ANGLES Y 93 Z		
COMMENTS: CONTROLS DISPLAYS & STAR VISIBILITY		

IMU ALIGNMENTS AND CHECKS

SPS1

GET		
CONTROL MODE		
STAR CODE 1 2		
STAR ANGLE 05 DIFFERENCE		
GYRO TORQUE X ANGLES Y 93 Z		
COMMENTS: CONTROLS, DISPLAYS & STAR VISIBILITY		
GET		
CONTROL MODE		
STAR CODE 1 2		
STAR ANGLE 05 DIFFERENCE		
GYRO TORQUE X ANGLES Y 93 Z		
COMMENTS: CONTROLS DISPLAYS & STAR VISIBILITY		

SPS1

SPS NO. 1

GENERAL:

1. In-Plane Posigrade
2. R = 0 P = 1.0 Y = -0.7 (L/V)
3. TIG @ sunrise + 27
4. DAP 21102 58856 + 00100 B/D Roll - OFF
   11111 31995 - 00028
5. NO ULLAGE
6. BANK A ONLY

SPECIAL REQS:

Log or voice record comments on vehicle vibrations

POSTBURN PARAMS:

RCS % IS NOMOGRAPH CORRECTED
SPS % ± 1% ; NOMINAL ENGINE PERFORMANCE

HA = 127.9 HP = 110.2 ΔVTO = 3.0
RCS = 89.1 % SPS = 88.2 %

RESIDUALS:

VX		VY		VZ		VC	

NOMINAL PAD:

33 TIG = 06:01:40
81 ΔVX = +36.8 ΔVY = 0.0 ΔVZ = 0.0
42 ΔVR = 36.8 ΔVC = 33.4
   BT = 4.6
47 WT = 58856
48 PTRM = +0.96 YTRM = -0.21
   SXTS = 21 (Alphard) SFT = 230.9 TRUN = 26.3
43 NAV CK @ TIG - 30 (+N, +E):
   ϕ = -23.09, λ = +96.11, h = 108.5

STAR COUNT METHODS

DAY STAR CK

With some practice, a star count can be completed in about one minute. As will be seen, precise timing and rapidity are slightly more important than accurate counting. The counting should begin with a few seconds of the time given by the updated sunrise time and the completion time should be recorded. Counting by quadrants, starting with the upper right and going counterclockwise, is the recommended procedure. In this way, if the field is obliterated by stray light during the count, the quadrant counts will be salvaged.

During the star counts, and especially at sunrise, notice any visible changes in brightness or color of the field of view. A transition period of greyness after the spacecraft enters the sunlight has been reported earlier. Several minutes later, the background again appears black, as the eye becomes light adapted.

Color, or slight tinting, of the field should be classified as being red (large particle scattering) or blue (molecular scattering). The answer here should resolve questions about the size of the scattering particle if a debris cloud is found.

DAY
STAR
CK

DAYLIGHT STAR CHECK

CMC Powered up R=_____
ISS Powered Up
SCS Powered Up P=_____
OPTICS Powered Up Y=_____
CSM/LM at star observation attitude
IMU realignment precedes observations
DET - Set to 45:00 and UP

1. Position SCT
Key V41N91E
FLV21N92
Load SA | 1 8 0.0 0 | DEG

FLV22N92
Load TA | 0 1 2.0 0 | DEG

SR-15:00

2. GET=_____:_____:_____, DET-START
Begin dark adaption

SR 00:00

3. a. Count visible stars
b. Record No. of stars
c. Comment on star visibility & earth cloud cover.

SR + 05:00

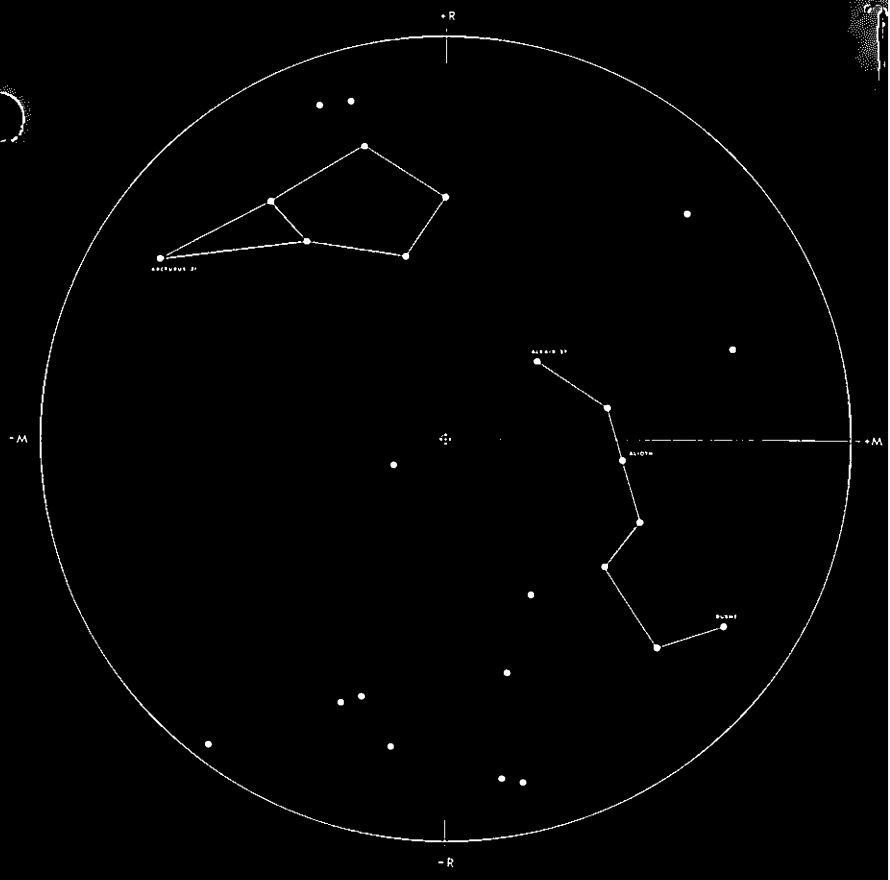
4. Count, record & comment

SR + 10:00

5. Count, record & comment

6. Power down optics

NOTE:
If number of stars ≥50, a count is not required


+R
-M
+M
-R
ARCTURUS 1ST
ALKAID 2ND
ALIOTH
MIZAR

STAR COUNT @ SUNRISE	
REMARKS: VISIBILITY & CLOUD COVER	
STAR COUNT @ SUNRISE +5	
REMARKS: VISIBILITY & CLOUD COVER	
STAR COUNT @ SUNRISE +10	
REMARKS: VISIBILITY & CLOUD COVER	

SPS2
3&4

SPS2
3&4

SPS NO. 2

GENERAL:

1. Out-of-Plane north
2. R = 0 P = +1.8 Y = -83.7 (L/V)
3. TIG @ sunrise + 20
4. DAP 21102 58459 + 00101 A/C Roll - OFF
   01111 31995 - 00028
5. NO ULLAGE
6. START W/BANK A; BANK B @ TIG+3

SPECIAL REQS: FDAI-5/1

STROKER: 3012E:2 (40%)
Initiate @ ET 59:00 (V68E)

If rates >1°/s: TERMINATE BURN
If rates >.4°/s: no stroker on SPS NO. 3

Log or voice record comments on vehicle vibrations

POSTBURN PARAMS:

HA = 188.4 HP = 110.5 ΔVTO = 3.3
RCS = 85.6 % SPS = 69.6%

RESIDUALS:

VX [ ] VY [ ] VZ [ ] VC [ ]

NOMINAL PAD:

33 TIG = 22:12:00
81 ΔVX = 102.1 ΔVY = -843.8 ΔVZ = -14.4
42 ΔVR = 850.1 , ΔVC = 846.2
BT = 1:51.0
47 WT = 58459
48 PTRM = +0.97 YTRM = -0.22
SXTS = 21 (Alphard) SFT = 213.5, TRUN = 32.3
43 NAV CK @ TIG - 30 (+N, +E):
ϕ = -29.80, λ = -173.65, h = 126.3

SPS NO. 3

GENERAL:

1. Out-of-Plane north
2. R = 0 P = +1.4 Y = -90.3 (L/V)
3. TIG @ sunrise + 28
4. DAP 21102 51104 + 00123 B/D Roll - OFF
   11111 31195 - 00034
5. NO ULLAGE
6. Start W/BANK A; BANK B @ TIG+3

SPECIAL REQS: FDAI-5/1
SCS TVC P&Y-Rate Cmd

CROSSOVER @TIG+≈80

1. STROKER: V21 N01E 30012E:5E (100%)
   Initiate @ ET = 59:00

   If rates >1°/s: TERMINATE BURN

2. MTVC w/ S/C CONT - SCS
EMS ~~MANUAL~~ CUTOFF: Initiate @ ET = 56:06 (TGO=45 SEC)

3. Log or voice record comments on:
   (a) Vehicle vibrations
   (b) Handling characteristics during MTVC
   (c) Visual cues used during MTVC

POSTBURN PARAMS:

HA = 268.1 HP = 112.4 ΔVTO = 4.2
RCS = 84.6% SPS = 22.6%

RESIDUALS:

VX [ ] VR [ ] VZ [ ] VC [ ]

NOMINAL PAD:

33 TIG = 25:18:30
81 ΔVX = +13.9 ΔVY = -2549.1 ΔVZ = -16.7
42 ΔVR = 2549.1, ΔVC = 2544.0
BT = 4:39.7
47 WT = 51104
48 PTRM = +1.20 YTRM = -0.28
SXTS = 23 (Denebola), SFT = 317.6, TRUN = 20.7
43 NAV CK @ TIG - 30 (+N, +E):
ϕ = -21.47, λ = +168.51, h = 159.3

SPS No.3 NOTES:

1. Sequence of events for SPS No. 3:
   TIG + 1 + 00 (or after start transients have damped): initiate full amplitude stroker (V68); T_{GO} = 45 seconds, MTVC takeover in Rate Command using the spacecraft control switch to SCS, utilizing DAP error needles for manual attitude information, and EMS ΔV counter for auto shutdown.
2. Sequence of pitch rate needle deflections during full amplitude stroker:
   1 sec: + .2°/s step
   2 sec: + .2°/s step
   3 to 5 sec: stable at 0°/s
   5 to 12 sec: -.2 ± .2°/s oscillation damping to zero at about 15 sec., alternately coupling to yaw of same damped amplitude at about 1 cycle/3 sec.
   The initial pitch GPI deflection is ± 1° about + 1.5° trim.
3. Cues:

   (1) Position feedback open: GPI freezes at zero, slow attitude oscillation.

   (2) Tach feedback open: GPI oscillation (~4 cps ± 1°)
   (controllable without takeover)

   (3) Gimbal hardover: GPI pegged.

   (4) Rate BMAG open during MTVC: loss of rate damping, rate needle nulled (controllable without takeover).

   (5) Rate BMAG hardover during MTVC: GPI pegged, rate needle pegged opposite to rate input, gimbal hardover.

SPS NO. 4

GENERAL:

1. Out-of-Plane north
2. R = 0 P = +0.7 Y = -90.2 (L/V)
3. TIG @ sunrise + 36
4. DAP 21102 32467 + 00141 A/C Roll - OFF
   01111 31195 - 00086
5. 4 jet, 18 sec ULLAGE, ΔV = 3.6
6. Start W/BANK A; BANK B @ TIG+3

POSTBURN PARAMS:

HA = 268.2 HP = 112.2 ΔVTO = 4.3
RCS = 81.9% SPS = 17.7 %

RESIDUALS:

VX [ ] VY [ ] VZ [ ] VC [ ]

NOMINAL PAD:

33 TIG = 28:28:00
81 ΔVX = -0.6 ΔVY = -300.0 ΔVZ = +1.2
42 ΔVR = 300.0 ΔVC = 295.0
   BT = 27.7
47 WT = 32467
48 PTRM = +1.37 YTRM = -0.80
   SXTS = 26 (Spica) , SFT = 222.3, TRUN = 17.9
43 NAV CK @ TIG - 30 (+N, +E):
   ϕ = -12.14, λ = +147.79, h = 191.8

LM EVAL

IVT DATA

1. TUNNEL CLEARING - 3 Crewmen in CM

GET START (hatch unlatch)	: :
GET STOP (drogue stowed) in CM)	: :

2. CREW TRANSFER - LMP to LM

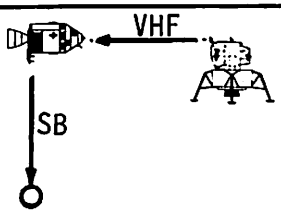
GET START (LMP ingress tunnel)	: :
GET STOP (LMP @ LM station)	: :

3. TUNNEL REINSTALLATION - 2 Crewmen in LM
1 in CM

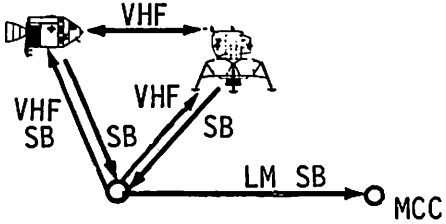
GET START (drogue unstow)	: :
GET STOP (hatch latch)	: :

COMM MODES

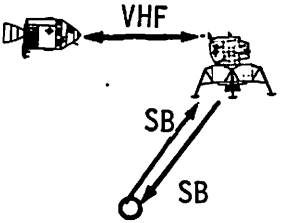
CSM One Way Relay



LM One Way Relay

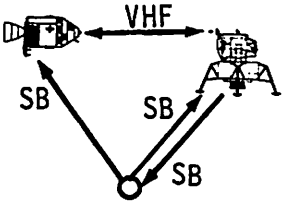


LM 2-Way Relay
TEX-Single



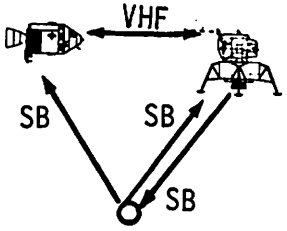
TV & LM 2-Way Relay

MILA-Dual



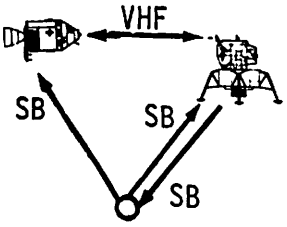
CSM SB Vol DN to verify relay

Lunar Stay, LM 2-Way Relay
BDA



SB Vol DN

Lunar Stay BU w/2Way Relay



SB Vol DN

DOCKED DPS

GENERAL:

1. Out-of-Plane north
2. R = 0 P = +0.3 Y = -91.9 (L/V)
3. TIG @ sunrise + 29
4. DAP N.A. 30585 N.A. A/C Roll
   N.A. 31195 N.A.

POSTBURN PARAMS:

HA = 266.9 HP = 112.1
RCS = 80.0% SPS = 17.7%

RESIDUALS:

VX [ ] VY [ ] VZ [ ] VC [ ]

NOMINAL PAD:

33 TIG = 49:43:00
81 ΔVX = -57.2 ΔVY = -1714.1 ΔVZ = +9.2
42 ΔVR = 1722.3
   BT = 6:07.0
47 WT = 30585
48 PTRM = N.A. YTRM = N.A.
   SXTS = (____), SFT = ____, TRUN = ____
43 NAV CK @ TIG - 30 (+N, +E):
   ϕ = -20.28, λ = +168.53, h = 223.0

DOCKED DPS MONITOR

1 Load DAP: 21111 +30353 +00115
01111 +32487 -00091

2 Load LM PAD - P30
P40, P52 Option 1

3 P00
V49 Mnvr To Burn Att (300, 180, 0)(hold in 5.° d.b.)
MAN ATT(3) - MIN IMP

4 TIG - 6 Min: SSCS
S/C CONT - ~~CMC~~, CMC Mode - Free (on LM call)
VHF DUPLEX A, RCV ONLY - A
V48: N46 OK
N47: (CM MASS - 800)X 2
(LM MASS - 800)X 2
N48 OK

5 V21N1E 110 E,E (Set $\dot{M}$=0, so CMC will not reduce weight estimate)
V21N1E 1353, E, 10E (ΔV THRESH=small to reduce poss of V97)
(now 2 ft/s per sample for V97)

6 P40, Bypass 5018
V50N25 204: Reload PROPER masses by V48 Enter

7 EMS FUNC - OFF - ΔV (ΔV=0)
EMS MODE - AUTO
HIGH GAIN ANT - POWER
HIGH GAIN ANT - SERV ELEC - PRIM
ΔV THRUST NORMAL - OFF
CB SPS PILOT VLV(2) - OPEN
TVC SERVO POWER 1 - AC 1 MNA
TVC SERVO POWER 2 - AC 2 MNB

8 V99N40 - PRO (If V97: PRO)

9 Needles no go, TGO, VG, ΔVM OK
Monitor Throttle Change With TGO
TGO Good At 100% Throttle, Not At 40 or 25%
Cutoff On LGC = 4 TGO, CMC = 0 To Go
Attitude Excursions Up To 7° In 40% and 25% Throttle, 0 At 100%
Error Needles Full Left Yaw Down Pitch
V82 To Monitor Hp

10 ECO: TVC SERVO POWER(2) - OFF
HIGH GAIN ANT POWER - OFF, SERVO ELEC - OFF
Load V48: postburn.LM wt., P TRIM, Y TRIM
V21N1E, 110E, 1144E (M=63 #/sec)
V21N1E, 1353E, 620E (ΔV THRESH=2 ft/s)

11 CHF AM - SIMPLEX A, RCV ONLY - B DATA
CB SPS PILOT VLV(2) - Closed

12 Residuals

				EMS	
VX		ATT		ΔV	
VY				HA	
VZ				HP	

IVT DATA

1. TUNNEL CLEARING - 2 Crewmen in LM
1 in CM

GET START (hatch unlatch)	:	:
GET STOP (drogue stowed in CM)	:	:

2. CREW TRANSFER - LMP to CM

GET START (LMP lv LM station)	:	:
GET STOP (LMP egress tunnel to CM)	:	:

3. Log or Record Comments on Tunnel Components, Stowage Provisions, and Adequacy of Procedures for each of these Activities.

SPS NO. 5

GENERAL: CIRCULARIZE

1. Out-of-Plane north
2. R = 0 P = -37.5 Y = -120.3)L/V)
3. TIG @ sunrise + 39
4. DAP 21102 30585 + 00117 B/D Roll - OFF
   11111 21769 - 00094
5. 4 jet, 18 sec ULLAGE , ΔV = 4.5
6. Start W/BANK A; BANK B @ TIG+3
7. If BT >4 sec restart within 30 minutes with NO ULLAGE ~~using early shutdown MCC pad~~ OVER MSFN

REMAIN IN P40, IGNITE ON FLV07 AT SAME ATTITUDE. MAX CUMUL. BURN TIME = 43 SEC

SPS6

POSTBURN PARAMS:

HA = 130.4 HP = 129.8 ΔVTO = 5.5
RCS = 77.3 % SPS = 10.8 %

RESIDUALS:

VX [ ] VY [ ] VZ [ ] VC [ ]

NOMINAL PAD:

33 TIG = 54:26:19
81 ΔVX = -208.3 ΔVY = -366.9 ΔVZ = +357.1
42 ΔVR = 552.7 , ΔVC = 546.3
BT = 41.1
47 WT = 30585 (CSM), 21769 (LM)
48 PTRM = +1.11 YTRM = -0.87
SXTS = 24 (Geinah), SFT = 64.3, TRUN = 24.8
43 NAV CK @ TIG - 30 (+N, +E):
ϕ = -4.18, λ = +129.90, h = 178.1

SPS NO. 6

GENERAL: LOWER PERIGEE

1. In-Plane retrograde

2. R = 0 P = +19.5 Y = +180.0 (L/V)

3. TIG @ sunset + 23

4. DAP 10102 27482 - 00700 A/C Roll - OFF
   01111 00000 - 00136

5. 2 jet, 18 sec ULLAGE, ΔV = 4.3

6. BANK A ONLY

SPS6

POSTBURN PARAMS:

HA = 126.9 HP = 92.8 ΔVTO = 9.8
RCS = 65.2% SPS = 10.2%

RESIDUALS:

VX [ ] VY [ ] VZ [ ] VC [ ]

NOMINAL PAD:

33 TIG = 121:58:48
81 ΔVX = -59.9 ΔVY = 0.0 ΔVZ = -19.2
42 ΔVR = 62.9 ΔVC = 51.3
BT = 2.5
47 WT = 27482
48 PTRM = -1.01 YTRM = -1.23
SXTS = 11 (Aldebaran), SFT = 83.8 , TRUN = 14.9
43 NAV CK @ TIG - 30 (+N, +E):
ϕ = +1.98, λ = -2.10, h = 127.4

S065
MULTISPECTRAL PHOTOGRAPHY

The following are required:

1. 4 ganged H-blads w/bracket
2. Remote control cable
3. DET - 00:00/UP
4. Jet ~~B3~~ A3 Disabled

(1) Unstow camera unit less magazines.

(2) Check camera setting against decals and install in hatch window.

S065

(3) Attach remote control cable.

(4) Actuate system less magazines to verify operation of all four camera bodies.

(5) Unstow 4 film mags.

(6) Advance film mags 1 frame, i.e., until white dot reappears. (This step required for first unstowage of magazines only.)

(7) Leave film advance tabs turned out.

(8) Attach each magazine to proper color-coded camera body.

(9) Remove dark slides from all mags.

(10) Actuate system one cycle and verify operation by observing film advance tab rotation.

(11) At GET
(5 minutes prior to first site)

(a) Disable Jet ~~B3~~ A3

(b) Orient S/C per update

(c) Set up ORB RATE or ATT HOLD

(12) For each site (or area), perform the following:

(a) Begin exposures at GET START and simultaneously start DET - 00:00/UP

(b) Take 4 exposures at 6 second intervals.

(c) Log or voice record (if different from update):

GET of exp #1

No. of exposures

(13) At end of each pass terminate ORB RATE or ATT HOLD.

(14) At end of final pass of the day enable jet ~~B3~~ A3 PITCH

LDMK TRACK

LDMK TRACK

LANDMARK TRACKING

1. Use YAW/ROLL technique
2. Minimum of four marks per landmark
3. Minimum of 15 sec between marks
4. Landmarks a maximum of 45^{o} off track
5. Realign IMU during each night pass

For each landmark record the following:

1. Control Mode used
2. Time required to acquire and identify each landmark
3. Comments on ease of co-ordinating optics and spacecraft motion
4. Comments on usefulness of landmarks, maps, and photos

Landmark tracking is nominally scheduled for Day 7, REVS 91 through 94 (G.E.T. 142:40 - 148:10)

PROGRAM 22 FLOW

1 G&N PWR OPTICS - ON

2 OPTICS - Zero

3 OPTICS MODE - As desired

4 Platform aligned with VXR Vector - Zero roll
posigrade = HEADS UP

5 MNVR TO TRACKING ATTITUDE
If landmark N./S. of GRND TRK:
Roll left/right 90° (from 0° roll)
Pitch up 55°-65°
Roll right/left until zero optics LOS is near horizon
Maintain attitude using primarily roll. Yaw and pitch may also be used taking care to avoid gimbal lock.
Acquire landmark with optics (AUTO or MANUAL

6 Once target is acquired with optics, approx 45-60 seconds are available for marking in near earth orbits

V37E 22E

7 FL V06 N45
R_3 = Max MGA
XXX.XX Deg
Should be < 60°
If not select P52

ACCEPT
PRO

8 FL V06 N89 (Lndmk Coordinates)
R_1 = Lat .XXX (+N)
R_2 = Long/2 .XXX (+E)
R_3 = Lndmk alt .XX

NOTE: These coordinates are loaded to enable AUTO OPTICS to find target. Analagous to

loading star code in P52.
Load new data if desired

Known
Unknown ← or unknown
landmark ?

Unknown

Known

Optics Zero - OFF
Optics Mode = MANUAL

Optics
Zero ← Zero or Off?

PRO on
FL V06 N89

PRO on
FL V06 N89

OFF

Optics Mode
MANUAL CMC or MANUAL?

Go To 10

CMC
PRO on
FL V06 N89

9 V06 N92
R_1 = Shaft .XX
R_2 = Trunnion .XXX

NOTE: Possible prog alarms occur at this point

00404 (Trun > 90°)
Maneuver to acquire LNDMK and PRO or
V34E = TERMINATE P22

00407 (Trun > 50°)
KEY V16 N92
Mnvr S/C until Trun < 50° or monitor
N92 until Trun < 50° and RESET ALARM

AUTO OPTICS Slews to LNDMK. After target acquisition, OPTICS MODE to MANUAL. Establish proper roll rate for tracking. To regain AUTO OPTICS, OPTICS MODE to CMC. If desired, key V16 N92.

10 FL V51 PLEASE MARK

DO NOT DO V34E ON THIS DISPLAY

↓

MARK ON TARGET
After sufficient marks, PRO or after five marks

↓

11 FL V50 N25
R_1 = 00016
(TERMINATE MARKS)
PRO

↓

12 FL V05 N71
R_2 = ABCDE
A = 1, known lndmk
A = 2, unknown lndmk
B = Index of offset designator
= 0 for earth orbit
C = Not used = 0
DE = Lndmk I.D. number = 00 or 01 for earth orbit

NOTE: 01 indicates stored lndmk. Only one lndmk can be stored at any one time in earth orbit

↓

ACCEPT, PRO
REJECT, LOAD NEW DATA

↓

For earth orbit is the FL V05 N71 load 10000 or 10001 or 20000?

20000 or 10001 unknown or known stored ←

↓

Go To 14

10000 (known, unstored)

↓

13 FL V06 N89
R_1 = Lat .XXX
R_2 = Long/2 .XXX
R_3 = Alt .XX
Enables crewman to recheck what was previously loaded

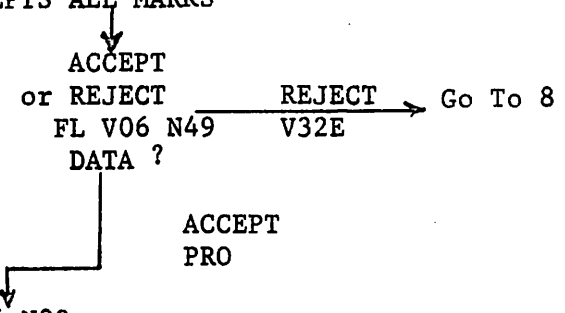
ACCEPT, PRO
REJECT, RELOAD

14 FL V06 N49

R_1 = ΔR .X

R_2 = ΔV .X

This display is based on first mark of mark sequence. Acceptance, ACCEPTS ALL MARKS



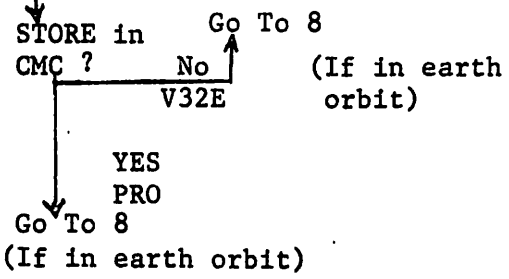
15 FL V06 N89

R_1 = Lat .XXX

R_2 = Long/2 .XXX

R_3 = Alt .XX

NOTE: This display will show shift in lndmk coordinates due to mark incorporation



NOTE: Program 22 can be terminated by keying a V34E on any flashing verb-noun display except the FL V51 display.

LANDMARK TRACKING DATA

LDMK ID		
CONTROL MODE		
TIME REQ'D TO ACQUIRE & IDENTIFY		
COMMENTS: 1. COORDINATION OF OPTICS & S/C MOTION 2. MAPS		
LDMK ID		
CONTROL MODE		
TIME REQ'D TO ACQUIRE & IDENTIFY		
COMMENTS: 1. COORDINATION OF OPTICS & S/C MOTION 2. MAPS		

SPS NO. 7

GENERAL: RAISE APOGEE

1. In-Plane posigrade

2. R = 0 P = +27.5 Y = +0.6 (L/V)

3. TIG @ sunrise + 27

4. DAP 10102 27157 - 00070 B/D Roll - OFF
   11111 00000 - 00140

5. 2 jet, 18 sec ULLAGE, ΔV = 4.3

6. BANK A ONLY

POSTBURN PARAMS:

HA = 207.3 HP = 90.5 ΔVTO = 10.0
RCS = 58.6% SPS = 8.5%

RESIDUALS:

VX [ ] VY [ ] VZ [ ] VC [ ]

NOMINAL PAD:

33 TIG = 169:47:54
81 ΔVX = +211.0 ΔVY = 0.0 ΔVZ =-140.4
42 ΔVR = 253.4 ΔVC = 241.3
BT = 9.4
47 WT = 27201
48 PTRM = -1.00 YTRM = -1.27
SXTS = 14(Canopus) , SFT = 117.2, TRUN = 29.1
43 NAV CK @ TIG - 30 (+N, +E):
ϕ = -2.60, λ = +163.05, h = 118.1

LANDMARK TRACKING DATA

LDMK ID		
CONTROL MODE		
TIME REQ'D TO ACQUIRE & IDENTIFY		
COMMENTS: 1. COORDINATION OF OPTICS & S/C MOTION 2. MAPS		
LDMK ID		
CONTROL MODE		
TIME REQ'D TO ACQUIRE & IDENTIFY		
COMMENTS: 1. COORDINATION OF OPTICS & S/C MOTION 2. MAPS		

LANDMARK TRACKING DATA

LDMK ID		
CONTROL MODE		
TIME REQ'D TO ACQUIRE & IDENTIFY		
COMMENTS: 1. COORDINATION OF OPTICS & S/C MOTION		
2. MAPS		
LDMK ID		
CONTROL MODE		
TIME REQ'D TO ACQUIRE & IDENTIFY		
COMMENTS: 1. COORDINATION OF OPTICS & S/C MOTION		
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SPS7

LANDMARK TRACKING DATA

LDMK ID		
CONTROL MODE		
TIME REQ'D TO ACQUIRE & IDENTIFY		
COMMENTS: 1. COORDINATION OF OPTICS & S/C MOTION		
2. MAPS		
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CONTROL MODE		
TIME REQ'D TO ACQUIRE & IDENTIFY		
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LANDMARK TRACKING DATA

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COMMENTS: 1. COORDINATION OF OPTICS & S/C MOTION		
2. MAPS		
LDMK ID		
CONTROL MODE		
TIME REQ'D TO ACQUIRE & IDENTIFY		
COMMENTS: 1. COORDINATION OF OPTICS & S/C MOTION		
2. MAPS		

SPS7

LANDMARK TRACKING DATA

LDMK ID		
CONTROL MODE		
TIME REQ'D TO ACQUIRE & IDENTIFY		
COMMENTS: 1. COORDINATION OF OPTICS & S/C MOTION		
2. MAPS		
LDMK ID		
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TIME REQ'D TO ACQUIRE & IDENTIFY		
COMMENTS: 1. COORDINATION OF OPTICS & S/C MOTION		
2. MAPS		

SPS7

SPS NO. 7

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4. DAP 10102 27157 - 00070 B/D Roll - OFF
   11111 00000 - 00140
5. 2 jet, 18 sec ULLAGE, ΔV = 4.3
6. BANK A ONLY

POSTBURN PARAMS:

SPS7

HA = 207.3 HP = 90.5 ΔVTO = 10.0
RCS = 58.6% SPS = 8.5%

RESIDUALS:

VX | VY | VZ | VC

NOMINAL PAD:

33 TIG = 169:47:54
81 ΔVX = +211.0 ΔVY = 0.0 ΔVZ =-140.4
42 ΔVR = 253.4 ΔVC = 241.3
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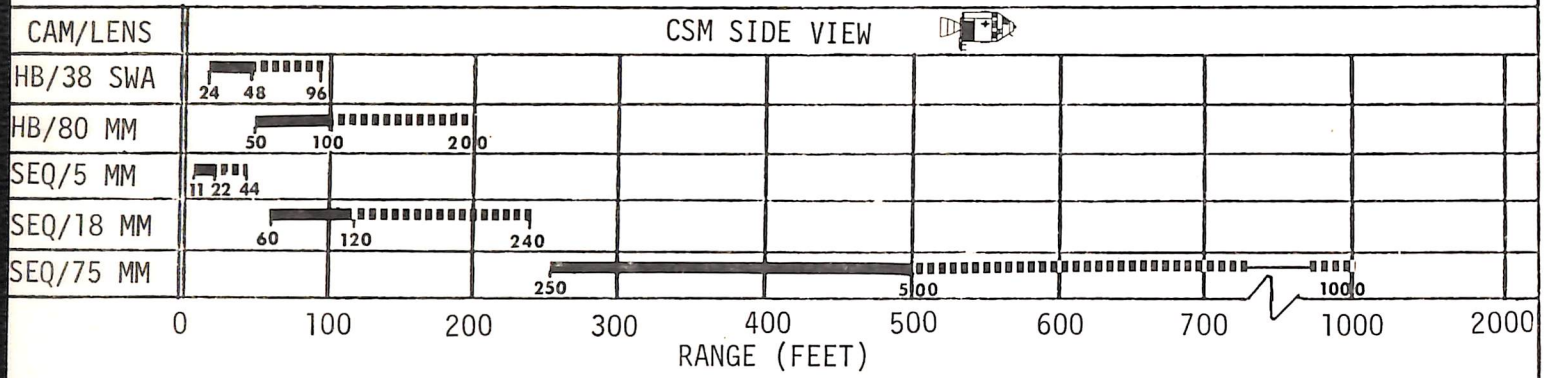
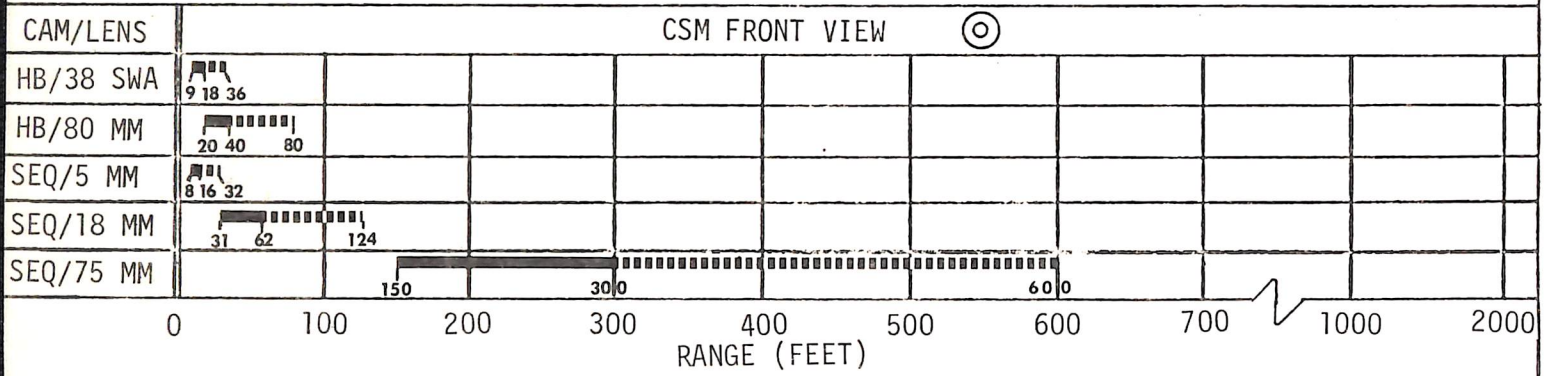
SXTS = 14(Canopus) , SFT = 117.2, TRUN = 29.1
43 NAV CK @ TIG - 30 (+N, +E):
ϕ = -2.60, λ = +163.05, h = 118.1

PHOTO OPS

CAMERA FIELD OF VIEW

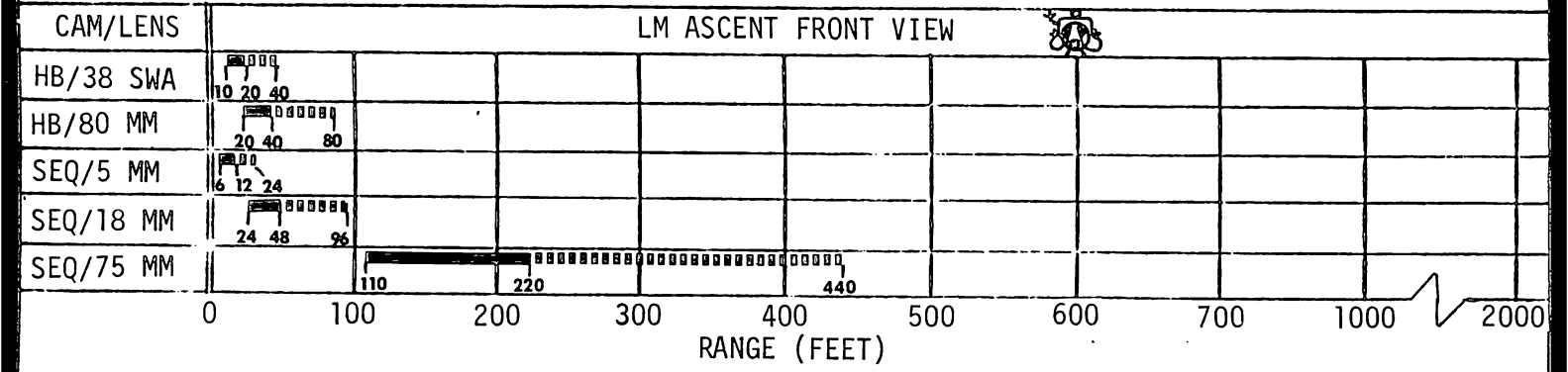
KEY: Full to ½ frame
½ to ¼ frame

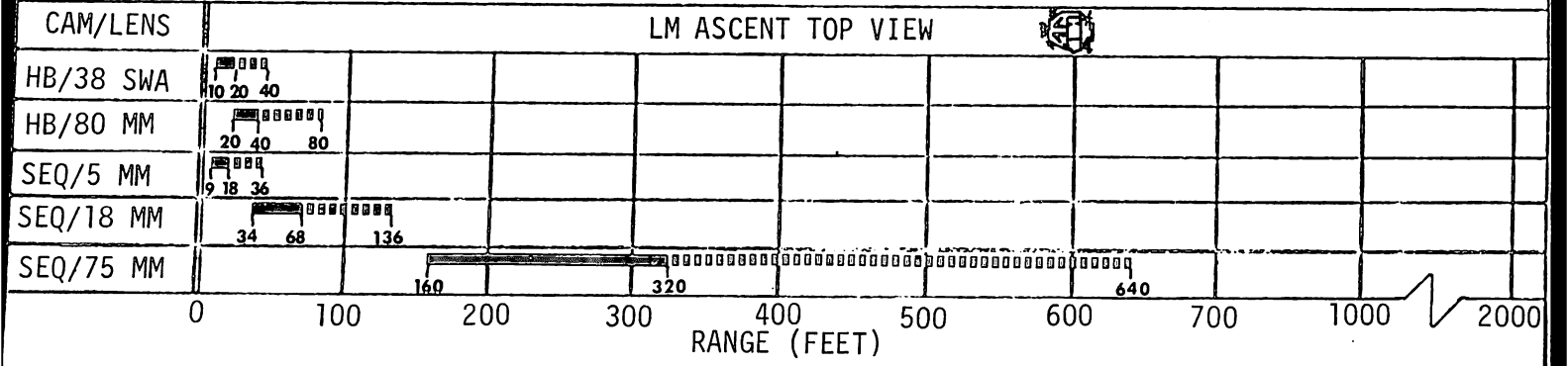




CAMERA FIELD OF VIEW

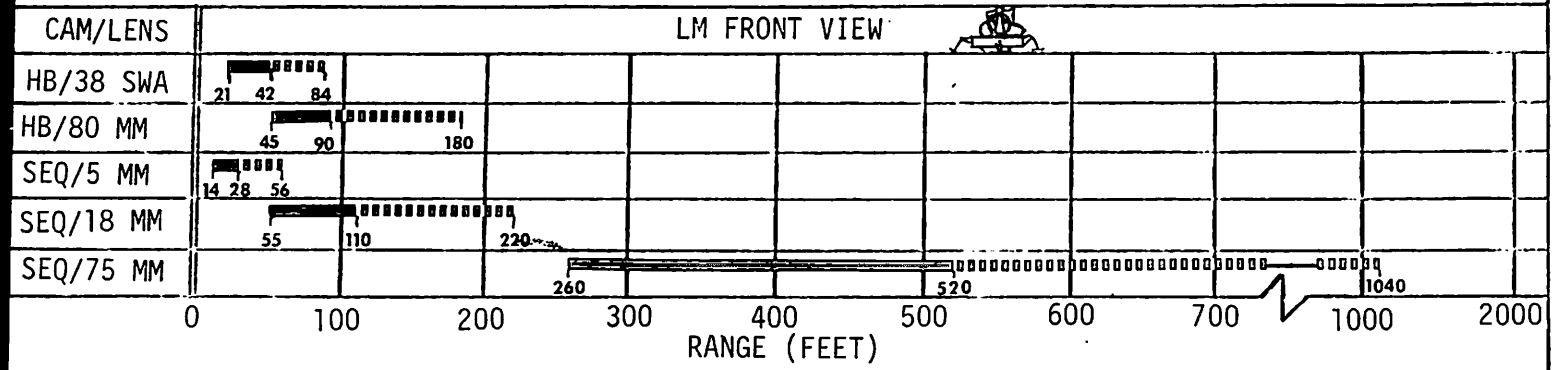
KEY: Full to ½ frame
½ to ¼ frame





CAMERA FIELD OF VIEW

KEY: Full to ½ frame
½ to ¼ frame



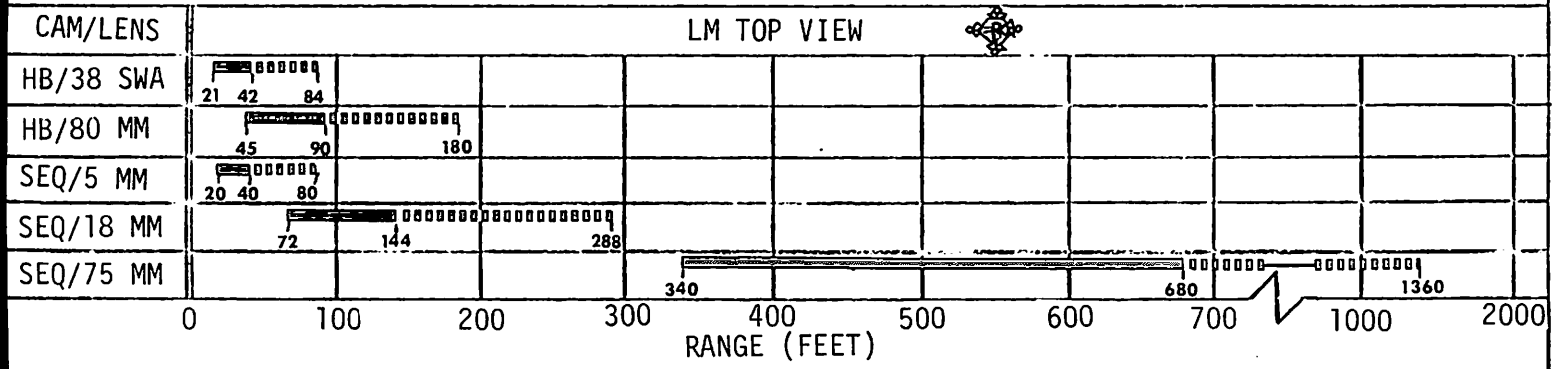
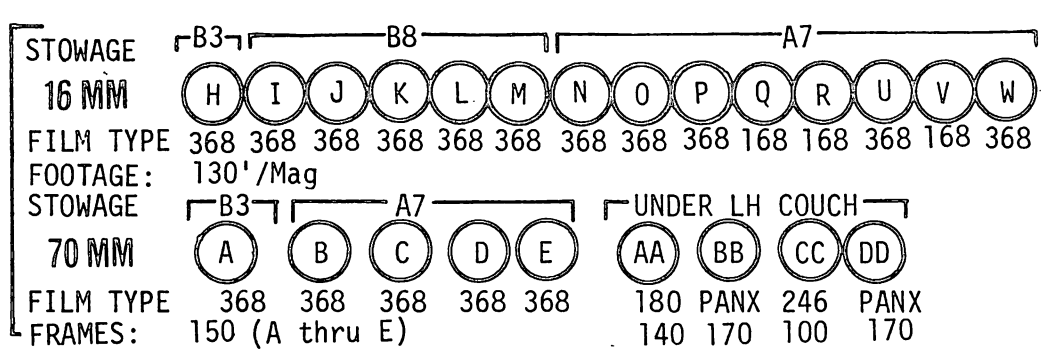


PHOTO
PLAN

CODE



DAY	CAM LOC	PLAN
1	LH WINDOW	CSM Active Docking (02:50) SEQ/18/CEX368-BRKT,MIR,SPOT(f11,250,25') 6 FPS,1mag (H) HB/CEX368-RING,SPOT(f11,250,25')15 (A)
	RH WINDOW & HAND HOLD IN HATCH	LM Ejection (04:05) SEQ/18/CEX368-BRKT,MIR(f11,250,25')12FPS,1MAG (I)
2	LH WINDOW	STROKER TEST,SPS 3 (25:18) SEQ/18/CEX368-BRKT,MIR(f11,250,10')24FPS (U)

DAY	CAM LOC	PLAN
3		Transfer to LM: SEQ CAM w/MAG (R) 18mmLENS 5mmLENS CAM HANDLE Photos of Drogue after Removal from Tunnel (42:00) HB/CEX368-SPOT(S,60,3')5 (A) DROGUE SHOULD BE SUNLIT THRU WINDOW Sequence Photos of CDR's IVT (50:15) SEQ/5/CIN168-(f2.0,60,-)6FPS, PARTIAL MAG (Q)
4		Transfer to LM: SEQ CAM w/MAG (P) 5mm LENS EVA CAM BRKT REMOTE CAB SWA H-BLAD w/MAG (E) CAM HNDL MAG R (if film remains) Sequence Photos of EVT (73:25) SEQ/5/CEX368-BRKT, REMOTE CAB (f11,250,-)6FPS,2MAGS (J) (K) Sequence Photos LMP during EVA
	HAND HOLD	HB/CEX368-RING(f11,250,10)10 (A)

DAY	CAM LOC	PLAN
5		Transfer to LM: SEQ CAM w/MAG (L) 5mm LENS CAM HNDL
	LH WINDOW	Undocking (92:40) SEQ/18/CEX368-BRKT/LH WIN,MIR(f11,250,25') (M) 24FPS,UNDOCK 5SEC to UNDOCK+10SEC 6FPS,UNDOCK+10SEC to END OF LM PITCH MNVR 6FPS,LM 360° YAW MNVR 6FPS,SEP for 3min(focus ∞) HB/CEX368-RING(f11,250,VAR)45 (A)
	LH WINDOW	LM Active Docking (98:35) SEQ/75/CEX368-BRKT(f11,250,∞) (N) 6FPS,LM BRAKING/5min 18 24FPS,20'SEP to CAPTURE/RETRACT(focus 20') HB/CEX368-RING,SPOT(f11,250,VAR)35 (A)

DAY	CAM LOC	PLAN
	LH WINDOW	LM JETTISON (101:25) SEQ/18/CEX368-BRKT,MIR(f11,250,25') (O) 24FPS,UNDOCK-5SEC to UNDOCK+10SEC 6FPS,CSM POSITION MNVR/3min 6FPS,SEP MNVR/3min(focus ∞) HB/CEX368-RING,SPOT(f11,250,VAR)15 (A)
	LH WINDOW	APS Burn to Depletion (101:58) CM/SEQ/75/CEX368-BRKT/MIR,(f11,250,∞)24FPS,END OF MAG (O)
6 7 9 10	HATCH WINDOW	S065 EL/CIR-BRKT,15FIL(f8,250,50')140 (AA) " /BW - " ,58BFIL(f4,125,∞)170 (BB) " /BWIR- " ,89BFIL(f16,250,33')100 (CC) " /BW - " ,25AFIL(f4,250,∞)170 (DD) TARGETS OF OPPORTUNITY CM Interior Photos SEQ/5/CIN168-SPOT(S,60,-)6FPS (Q) (V) HB/CEX368(F2.8,30,3') (B) (C) (D) (E) RCS Residue HB/CEX368-SPOT(S,250,VAR)10 (A) Earth Terrain HB/CEX368-RING(NOM EXP,250,∞) Earth Weather SW/CEX368- (NOM EXP,250,∞) 685 (B) (C) (D) (E) (F) (G)

EXPOSURE TABLES

SUBJECT	ASA 64 f/SHUTTER
Terrain General	11/250
Terrain Desert	16/250
Vehicle to Vehicle (Day)	11/250
Vehicle to Vehicle (Night)	2.4/125
CM & LM Interiors (Full S/C Lighting)	2.8/30
CM & LM Interior Sun Lit Object	8/250
ENTRY PHOTOS	16/250

SUN ELEVATION	ASA 64 f/SHUTTER
90° - 30°	11/250
30° - 15°	8/250
15° - 0°	5.6/125

S-BD HI GAIN

HIGH ALTITUDE CONDITIONS (~25000 feet)	ASA 64 f/SHUTTER
Daylight over clouds	16/250
Daylight over terrain or water	11/250
Sunlight on another spacecraft	8/250

CSM HIGH GAIN ANTENNA TEST

NOTE: This test is currently not a DTO, and is not nominally scheduled. This procedure is supplied for contingency only.

LMP 1. VERIFY BASIC SWITCH CONFIGURATION (LMP 2-14)

CDR 2. MANEUVER TO ATTITUDE SUPPLIED BY MSFN

LMP 3. HI GAIN ANT TRACK - MAN 2

4. HI GAIN ANT BEAM - WIDE 2

5. HI GAIN ANT SERVO ELEC - PRIM 2

*6. HI GAIN ANT PWR - POWER 2

7. HI GAIN ANT PITCH & YAW POS (2) 2
Set in required antenna angles.
ANT P = -45° Y = 90°

8. S BD PWR AMPL - OFF (center) 3

9. S BD ANT OMNI - HI GAIN AT 193+06+05 3
HI GAIN ANT TRACK - RE ACQ

10. HI GAIN ANT S BD ind - 2
AT ACQ >1/2 SCALE

11. LOG

GET LOCKON	: :

S-BD HI GAIN

12. Manually adjust pitch and yaw (2) for maximum signal strength.

13. Log

GET	: :		
P		Y	

14. S BD ANT OMNI - OMNI 3

STOP here

15. Manually slew pitch and yaw (2) control to scan limit.
Observe pitch, yaw indicator-light and tone warning signals.

16. S BD ANT OMNI - HI GAIN 3

17. Manually adjust yaw and pitch for maximum signal strength.

18. Manually sweep pitch and yaw through maximum signal strength twice.

19. HI GAIN ANT BEAM - MED 2

20. Manually sweep pitch and yaw (2) through maximum signal strength twice.

21. HI GAIN ANT BEAM - NARROW 2

22. Manually sweep pitch and yaw through maximum signal strength twice.

23. HI GAIN ANT BEAM - WIDE 2

*24. HI GAIN ANT SERVO ELEC - SEC 2
Note: Advise MSFN to change comm mode - Wait for MSFN concurrence.

25. REPEAT steps 17 thru 23
Note: After repeating steps 17 thru 23, advise MSFN to change comm mode - Wait for MSFN concurrence.

*26. HI GAIN ANT SERVO ELEC-PRIM 2

27. HI GAIN ANT BEAM - MED 2

28. HI GAIN ANT TRACK - AUTO 2

29. MONITOR meter for maximum signal strength 2

30. HI GAIN ANT BEAM - WIDE

31. HI GAIN ANT TRACK - MAN 2

32. Manually misalign pitch and yaw-antenna signal strength drops a detectable amount

33. At signal strength drop

Log

GET	: :
P	Y

34. HI GAIN ANT TRACK - AUTO

@

GET START	: :

35. At first display of signal strength change; Stop Time

Δt	
P	Y

36. Monitor auto track for one minute;

Log

GET	: :
P	Y

37. HI GAIN ANT BEAM - MED 2
Monitor ≈ one minute.

38. HI GAIN ANT BEAM - NARROW 2
Monitor ≈ one minute.

39. S BD ANT OMNI - OMNI 3
Wait 45 sec

40. S BD ANT OMNI - HI GAIN

41. Observe ant track on pitch and yaw indicator, and note change on signal strength meter 3

42. HI GAIN SERVO ELEC - SEC 2
Note: Advise MSFN to change comm mode - Wait for concurrence monitor ≈ one minute

43. HI GAIN ANT BEAM - MED 2
Monitor ≈ one minute

44. HI GAIN ANT BEAM - WIDE 2
Monitor ≈ one minute
Note: Advise MSFN to change comm mode - Wait for concurrence after monitoring

*45. HI GAIN SERVO ELEC - PRIM 2

46. Obtain antenna pitch and yaw angle for next MSFN station

P		Y	

47. HI GAIN ANT: Pitch and yaw positions - set required angles prior to reaching present scan limits

48. HI GAIN ANT TRACK - REACQ 2

LOG	GET	: :

49. Monitor signal strength meter for scan limit.*

LOG	GET	: :	
	P		Y

50. When new MSFN station first acquired (signal increase)

LOG	GET	: :	
	P		Y

51. HI GAIN ANT TRACK - AUTO 2
S BD ANT OMNI - OMNI 3
HI GAIN ANT PWR - OFF 2
S BD PWR AMPL - HIGH 3

*Malfunction Light and warning tone come on