Jim Burns 10-4

APOLLO 15

LUNAR ROVING VEHICLE

JANUARY 29, 1971

LUNAR TRAVERSE
PAYLOAD STOWAGE
LOCATION AND CRITERIA

PRELIMINARY

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LUNAR TRAVERSE PAYLOAD STOWAGE LOCATION AND CRITERIA

J-1 MISSION

Prepared by The Boeing Company

for

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LUNAR ROVING VEHICLE (LRV)

STOWAGE CONCEPTS

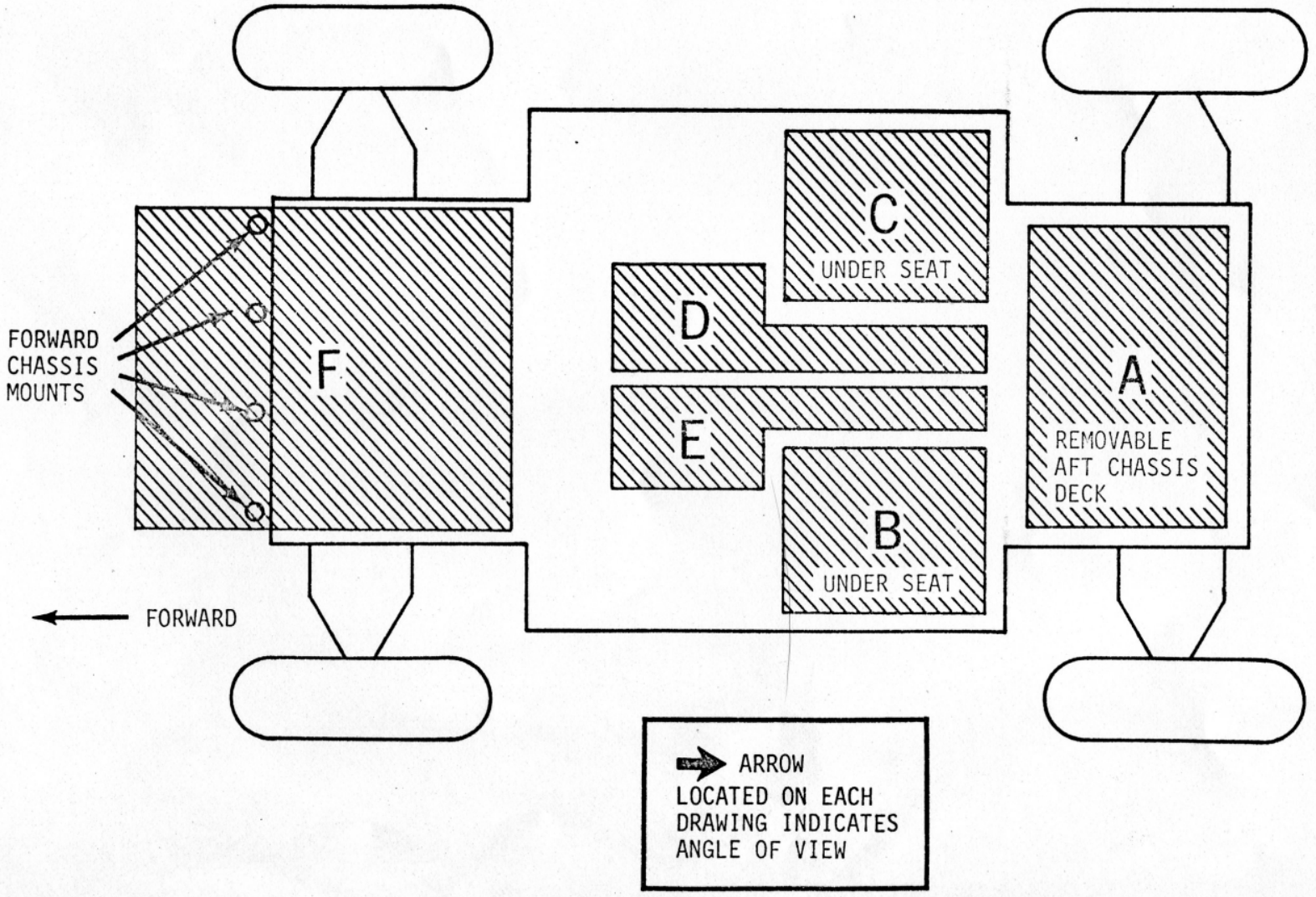
Deployment of the LRV for exploration of the lunar surface after landing will allow astronauts greater utilization of time, previously expended in walking, for further travel and sample collection.

The LRV, serving two purposes, will carry astronauts and their equipment to the designated lunar areas as well as transporting lunar samples. Reduced gravity problems have been overcome by unique design for stowage of equipment and samples.

This book illustrates the stowage location of the equipment that will be transported on the LRV. The equipment which will be stored or transported on the LRV is listed on page 1. The composite view (page 7) identifies all coded area designations and related stowed items. The illustrations on the following pages show the equipment location in relation to the LRV and how it will be stowed during lunar travel:

CODES		GENERAL AREA DESCRIPTIONS
A	=	Vehicle Areas Aft of Seat
B	=	Areas Under Left Seat
C	=	Areas Under Right Seat
D	=	Console Area Right Side
E	=	Console Area Left Side
F	=	Forward Vehicle Areas

LUNAR ROVING VEHICLE STOWAGE ZONES



REVISION NOTICE SHEET

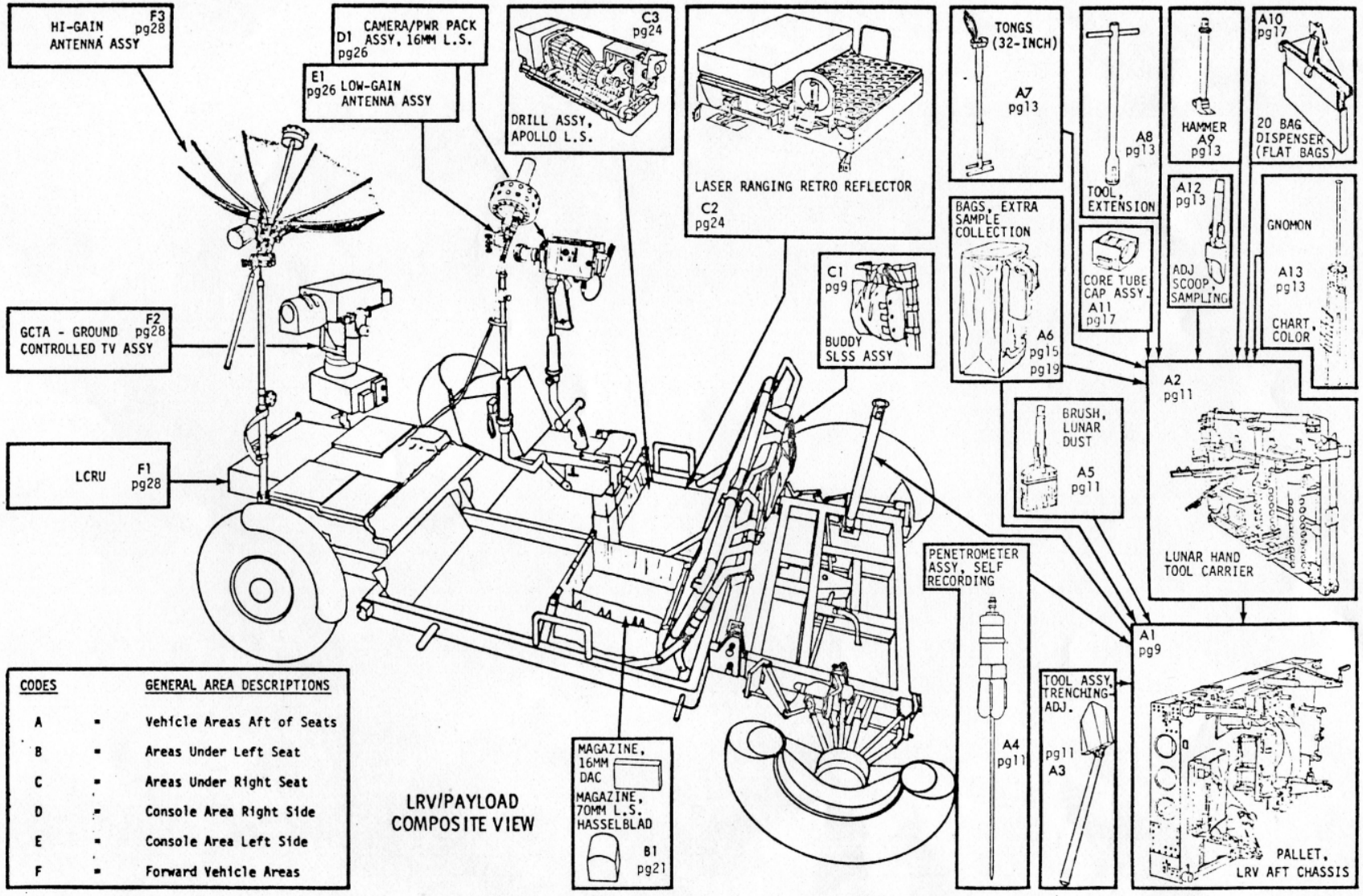
REVISION LETTER	DISCRIPTION OF CHANGE	APPROVAL SIGNATURE	DATE

MATERIALS LIST

PARTS NUMBER & DASH NUMBER OF ITEM	PART NOMENCLATURE	MAX LRV QUANTITY	PAGE NUMBER OF ILLUSTRATION	REFERENCE NUMBER FOR ILLUSTRATIONS ON COMPOSITE PAGE	LRV STOWAGE ZONE CODE	STOWAGE LIST ITEM NUMBER (REFERENCE)	REVISION LETTER
SEB33100125-204	MAGAZINE, 16MM DAC	4	pg 21	B1	B	A0101.1	
SEB33100082-217	MAGAZINE, 70MM L.S. HASSELBLAD	5	pg 21	B1	B	A0108.1	
SKB32100115-371	MAPS, LM LUNAR SURFACE	1			A	A0114.13	
2265826	GCTA - GROUND CONTROLLED TV ASSY	1	pg 8	F2	F	E1001	
2265840-501	CTV-CAMERA, COLOR TV	1	pg 28	F2	F	E1001.1	
2265825-501	TCU - TV CONTROL UNIT	1	pg 28	F2	F	E1001.2	
SEB39106050-TBD	PENETROMETER ASSY, SELF RECORDING	1	pg 11	A4	A	G4049	
TBD	CORE TUBE CAP ASSY	1	pg 17	A11			
SEB33100295-306	CAMERA/PWR PACK ASSY, 16MM L.S.	1	pg 26	D1	D	A1043	
SEB33100100-213	CAMERA, 16MM L.S.	1	pg 26	D1	D	A1043.1	
SEB33100010-303	10MM LENS, 16MM L.S.	1	pg 26	D1	D	A1043.2	
SEB33100303-302	HANDLE, 16MM L.S.	1	pg 26	D1	D	A1043.3	
SEB33100304-303	POWER PACK, 16MM L.S.	1	pg 26	D1	D	A1043.4	
SEB33100396-301	RCU BRKT, 16MM L.S.	1	pg 26	D1	D	A1043.5	
TBD	LASER RANGING RETRO REFLECTOR	1	pg 24	C1	C	G4034	
SEB33100290-302	SAFETY LINE, LUNAR SURFACE(100 FT.)	1	pg 11	A1	A	B1041	
SEB39105185-301	BRUSH, LUNAR DUST	1	pg 11	A1	A	B1045	
SEB33100214-306	BAG, LUNAR SURFACE SAFETY LINE	1	pg 11	A1	A	B1047	
SV729602-5	BUDDY SLSS ASSY	1	pg 9	C1	C	B1052	
SEB33100402-301	LENS BRUSH	2	pg 11	A1	A	B1047	
8370855-502	COMMUNICATION RELAY SYSTEM	1	pg 28	F1	F	E1002	
8370854-502	LCRU	1	pg 28	F1	F	E1002.1	
8370891-502	ANTENNA, HIGH GAIN WITH STAFF	1	pg 28	F3	F		
8670994-502	ANTENNA, LOW GAIN WITH STAFF	1	pg 26	E1	F		
SEB33100733-301	STAFF, 16MM L.S.	1	pg 26	E1	D	R1001	
SEB39105248-303 OR 304		1	pg 13	A8	A	G4008	
SEB39105667	TONGS (32 INCH)	2	pg 13	A7	A	G4009	
SEB39100317-203	GNOMON	1	pg 13	A13	A	G4012	
SEB39106130-301 OR 302	TOOL ASSY., TRENCHING-ADJ.	1	pg 11	A3	A	G4029	
TBD	LUNAR HAND TOOL CARRIER	1	pg 11	A2	A	G4035	
SEB39105725	SCOOP,SMALL(ADJUSTABLE)	1	pg 13	A12	A	G4035.2	
SEB39100319-207	HAMMER	1	pg 13	A9	A	G4035.3	
TBD	CHART, COLOR	1	pg 13	A13	A	G4035.4	
TBD	BAGS.EXTRA SAMPLE COLLECTION	3	pg 19	A6	A	G4048	
TBD	DRILL ASSY, APOLLO L.S.	1	pg 24	C3	C	G4047	
TBD	PALLET, LRV AFT CHASSIS	1	pg 9	A1	A	Ø3067	
TBD	SAMPLE COLLECTION BAGS	1	pg 15 & 19	A6	A		
TBD	20 BAG DISPENSER (FLAT BAGS)	1	pg 17	A10	A		
8670957-502	CABLE ASSY, LCRU/LRV/TV	1	pg 28		F		

MATERIALS LIST

PARTS NUMBER & DASH NUMBER OF ITEM	PART NOMENCLATURE	MAX LRV QUANTITY	PAGE NUMBER OF ILLUSTRATION	REFERENCE NUMBER FOR ILLUSTRATIONS ON COMPOSITE PAGE	LRV STOWAGE ZONE CODE	STOWAGE LIST ITEM NUMBER (REFERENCE)	REVISION LETTER
8779692-501	CABLE STOWAGE ADAPTER (L.H.)	1	pg 28		F		
8779692-502	CABLE STOWAGE ADAPTER (R.H.)	1	pg 28		F	A1042	
8671561-501	POST ASSY-LCRU (R.H.)	1	pg 28		F		
8671562-501	POST ASSY-LCRU (L.H.)	1	pg 28		F		
SEB33100770-301	BAG ASSY, L.H. PAYLOAD STOWAGE, LRV EQUIPMENT	1	pg 21		B		
SEB33100749-301	BAG ASSY, R.H. PAYLOAD STOWAGE, LRV EQUIPMENT	1	pg 22		C		



LRV/PAYLOAD COMPOSITE VIEW

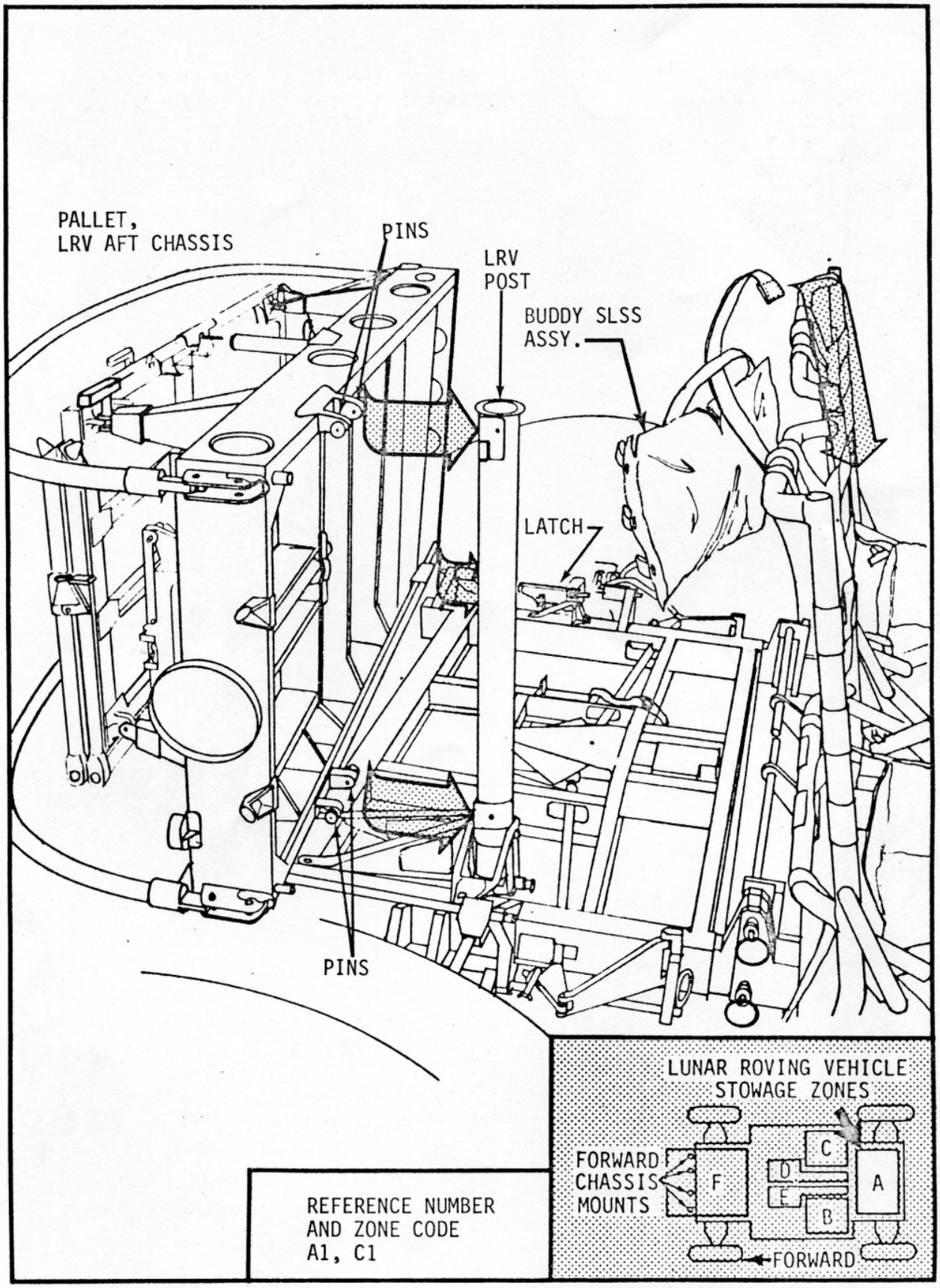
FIT CRITERIA

LRV AFT PALLET

Pallet Pins (4) seated in LRV Post Holes with lower left pallet ear against LRV latch backplate. Pallet cannot be moved aft.

BUDDY SLSS

LRV securing strap routed through B-SLSS Bag Handle and Strap Velcro Patch mated to Velcro Patch on front of LRV back rest. B-SLSS bag is loosely constrainted.


PALLET,
LRV AFT CHASSIS
PINS
LRV
POST
BUDDY SLSS
ASSY.
LATCH
PINS
LUNAR ROVING VEHICLE
STOWAGE ZONES
FORWARD
CHASSIS
MOUNTS
F
C
D
E
A
B
FORWARD
REFERENCE NUMBER
AND ZONE CODE
A1, C1

FIT CRITERIA

RECORDING PENETROMETER

Penetrometer shaft should be bottomed-out in first hole from left-hand side of LRV aft pallet, penetrometer ground plane foot pads are clear of top pallet. Velcro strap mated with velcro on pallet to provide a snug fit.

ADJUSTABLE TRENCHING TOOL

Tool handle should be bottomed-out in third hole from top left-hand side of LRV aft pallet; tool adjustment mechanism is clear of top of pallet. Velcro strap mated with velcro on pallet to provide a snug fit.

LUNAR DUST BRUSH

Brush in bag, strap over brush body for vertical restraint, velcro on strap mated with velcro on bag.

LUNAR HAND TOOL CARRIER (HTC)

A. HTC Removal

1) Remove lower right pallet launch restrain pin.

2) Pull top right pallet HTC handle up until pin clears right HTC ear.

3) Pull pip pin lanyard upward until two pins clear left HTC hinge halves (ears).

4) HTC can be removed.

B. HTC Installation

1) Left HTC hinge halves (ears) are inserted into pallet clevises, pip pins automatically engage HTC ears, pins protrude below clevis.

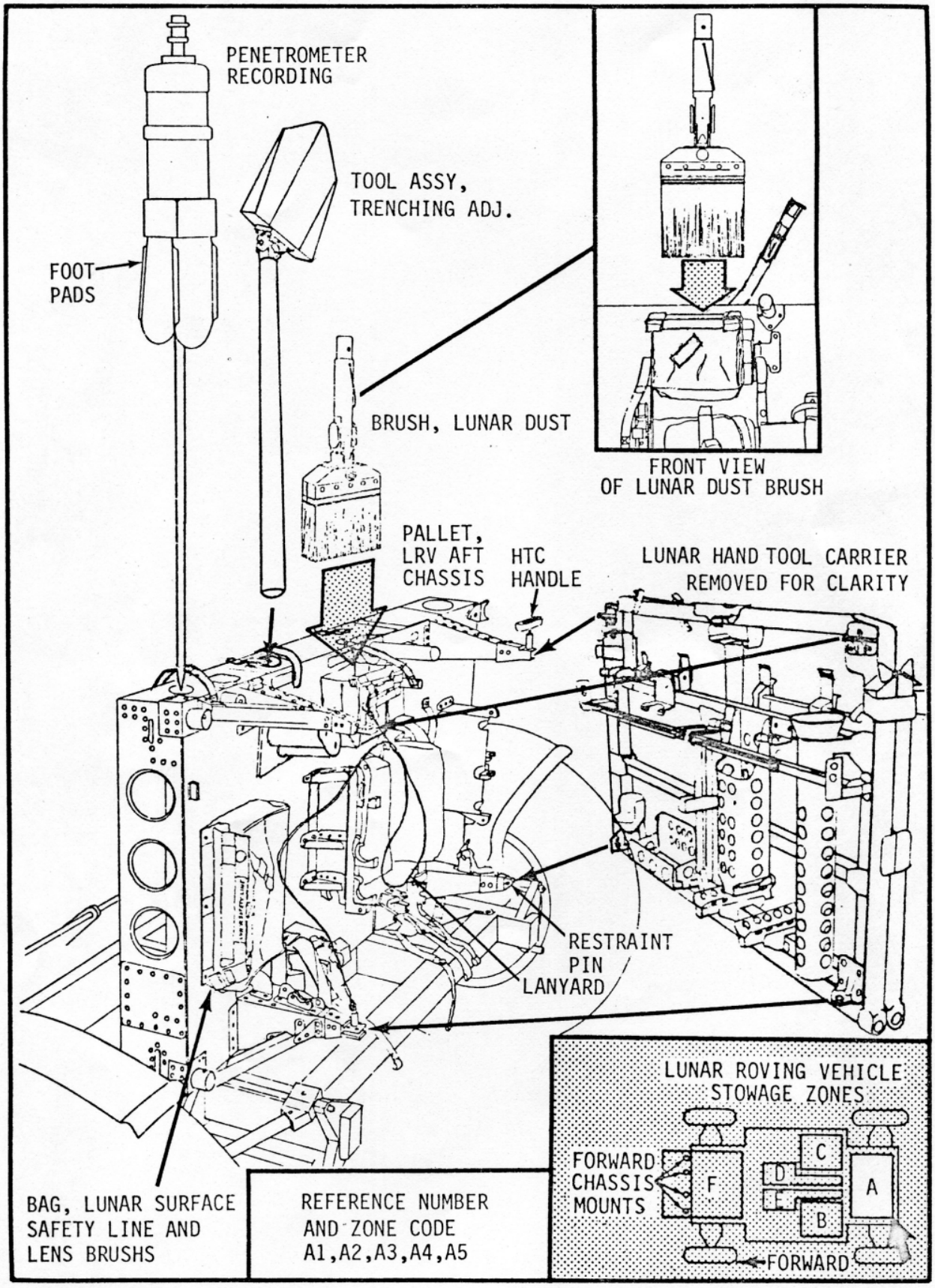
2) Top right HTC latch keeper ear is inserted into top right clevis, latch automatically engages.

3) HTC restrained in three directions.

C. HTC Pivot

1) Right pallet HTC handle is pulled upward until pin clears HTC latch keeper ear. HTC can now be swung to the left.

2) Right HTC latch keeper ear is inserted into pallet clevis, latch automatically engages. HTC restrained in three directions.


PENETROMETER
RECORDING
TOOL ASSY,
TRENCHING ADJ.
FOOT
PADS
BRUSH, LUNAR DUST
FRONT VIEW
OF LUNAR DUST BRUSH
PALLET,
LRV AFT
CHASSIS
HTC
HANDLE
LUNAR HAND TOOL CARRIER
REMOVED FOR CLARITY
RESTRAINT
PIN
LANYARD
LUNAR ROVING VEHICLE
STOWAGE ZONES
FORWARD
CHASSIS
MOUNTS
C
D
F
A
B
FORWARD
BAG, LUNAR SURFACE
SAFETY LINE AND
LENS BRUSHS
REFERENCE NUMBER
AND ZONE CODE
A1,A2,A3,A4,A5

FIT CRITERIA

EXTENSION TOOL

Extension tool is inserted as shown and is bottomed-out in Hand Tool Carrier (HTC) interim stowage retainer (tube). Loose fit.

TONGS (32 INCHES)

Tongs "T" handle is inserted into HTC tray and handle is enclosed (over-center) in HTC clip retrainer bracket slot.

ADJUSTABLE SAMPLING SCOOP

Scoop is inserted into HTC retention bucket as shown. Loose fit.

HTC RETENTION BAR (LEFT)

HTC retention bar latch pin secured by latch on HTC frame; bosses on retention bar vertically restrains tongs, extension tool, and scoop.

HAMMER

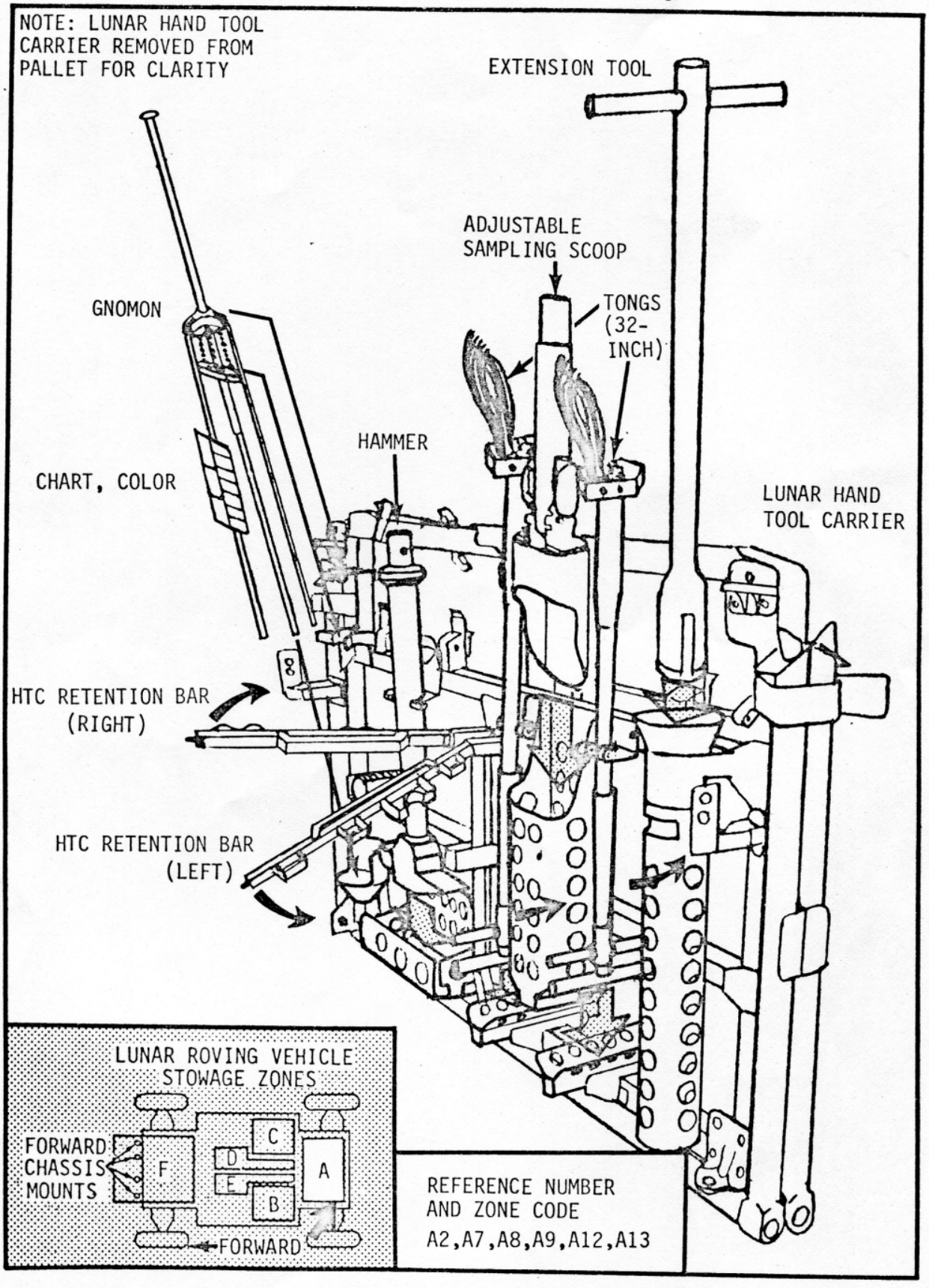
Hammer face inserted into HTC tray as shown and handle is enclosed (over-center) in HTC clip retainer bracket slot.

GNOMON

Gnomon legs are inserted into HTC cup. Gnomon tube is enclosed (over-center) in retention clips.

HTC RETENTION BAR (RIGHT)

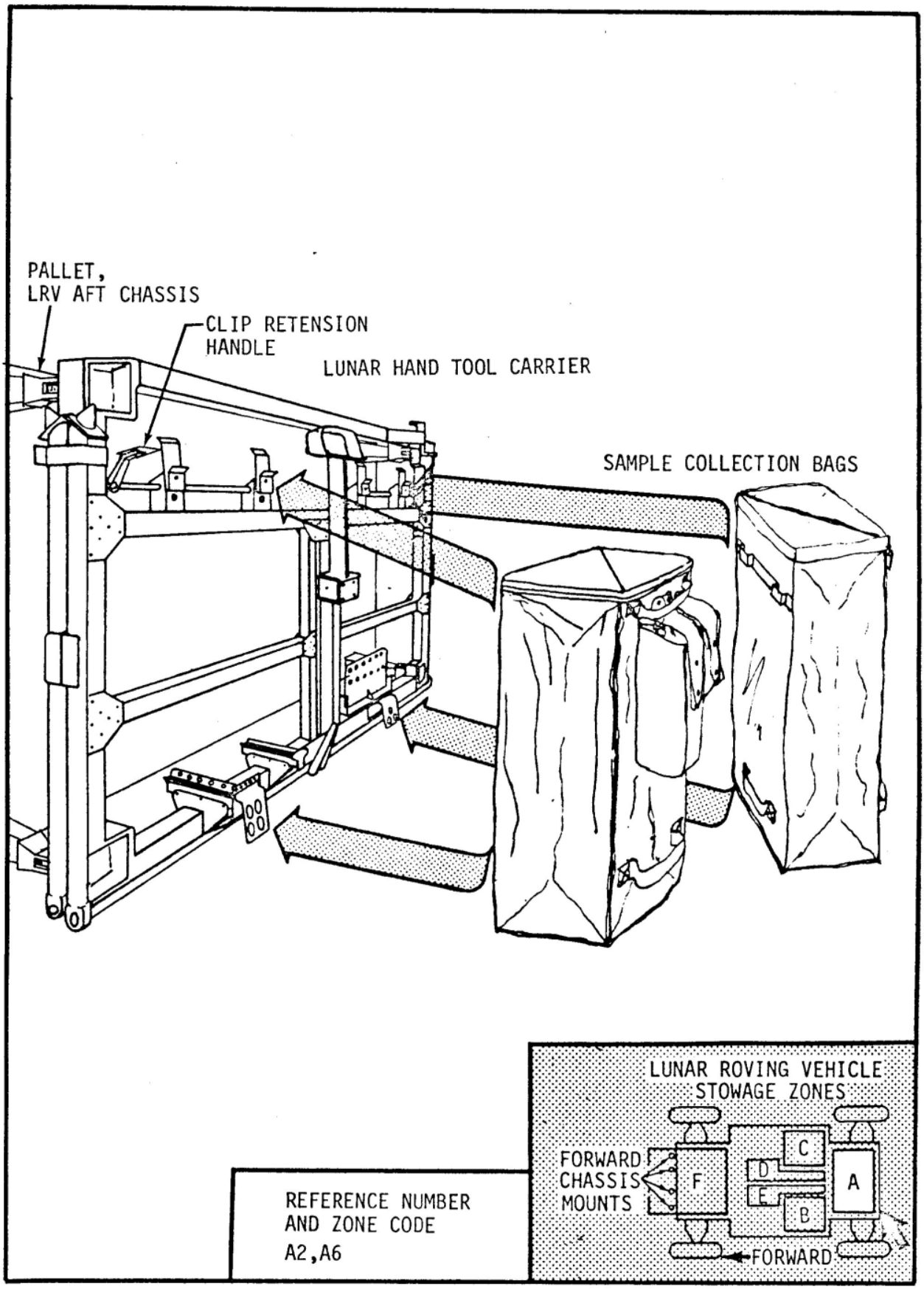
HTC retention bar latch pin secured by latch on HTC. Bossess on retention bar vertically restrains hammer and Gnomon.


NOTE: LUNAR HAND TOOL CARRIER REMOVED FROM PALLET FOR CLARITY
EXTENSION TOOL
ADJUSTABLE SAMPLING SCOOP
TONGS (32-INCH)
GNOMON
HAMMER
CHART, COLOR
LUNAR HAND TOOL CARRIER
HTC RETENTION BAR (RIGHT)
HTC RETENTION BAR (LEFT)
LUNAR ROVING VEHICLE STOWAGE ZONES
FORWARD CHASSIS MOUNTS
C
D
E
F
A
B
FORWARD
REFERENCE NUMBER AND ZONE CODE
A2,A7,A8,A9,A12,A13

FIT CRITERIA

SAMPLE COLLECTION BAGS

Bottom collection bag strap is secured to HTC prong; clip retention handle almost vertical and clip retention pin protrudes through front clip face after top of collection bag is set into clips. Collection bag is restrained in three directions.


PALLET,
LRV AFT CHASSIS
CLIP RETENSION
HANDLE
LUNAR HAND TOOL CARRIER
SAMPLE COLLECTION BAGS
LUNAR ROVING VEHICLE
STOWAGE ZONES
FORWARD
CHASSIS
MOUNTS
F
C
D
E
B
A
FORWARD
REFERENCE NUMBER
AND ZONE CODE
A2,A6

FIT CRITERIA

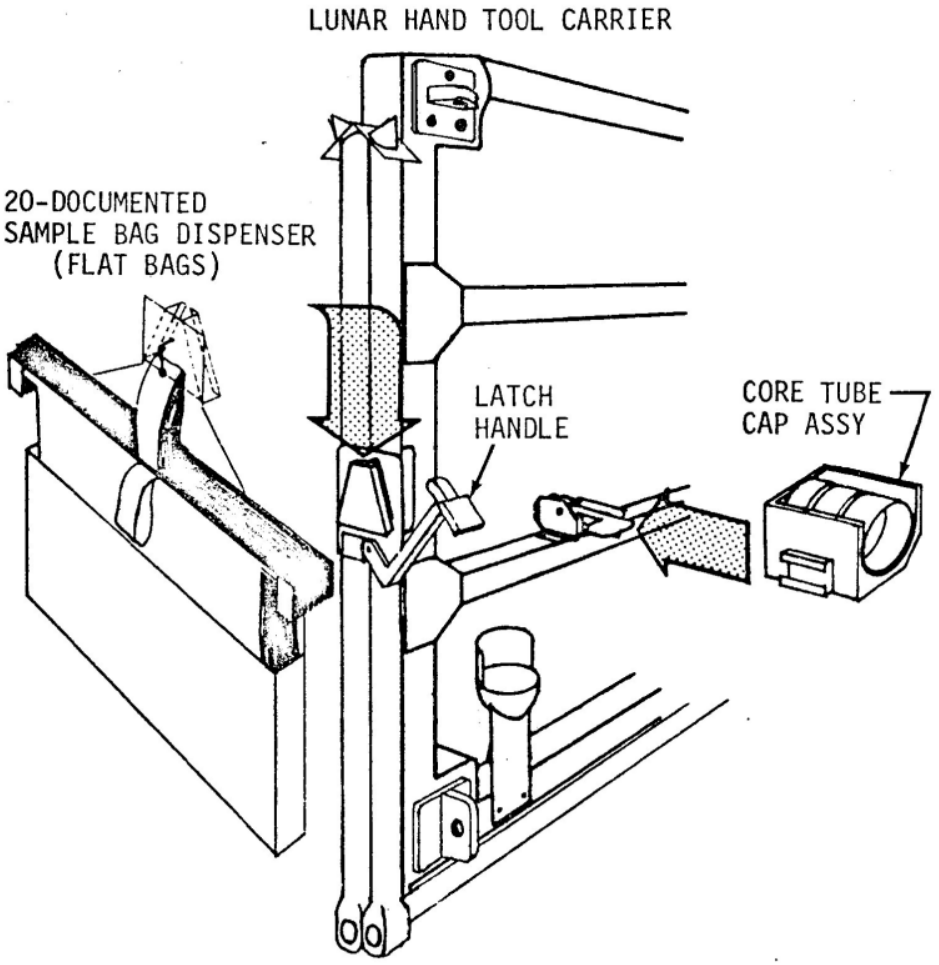
20 DOCUMENTED SAMPLE BAG DISPENSER (DSBD)

DSBD female shoe mated with HTC male shoe; latch handle upper ear latched above HTC male shoe vertically restraining DSBD.

CORE TUBE CAP ASSY

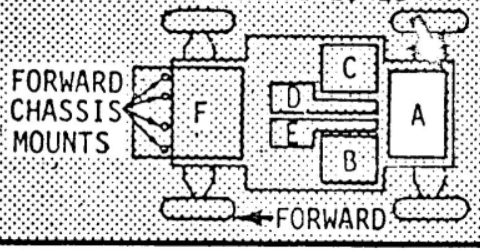
Core tube cap assy female shoe mated with HTC male shoe. HTC latch face contacts HTC male shoe restraining core tube cap assy in three directions.

NOTE:LUNAR HAND TOOL CARRIER REMOVED FROM PALLET FOR CLARITY



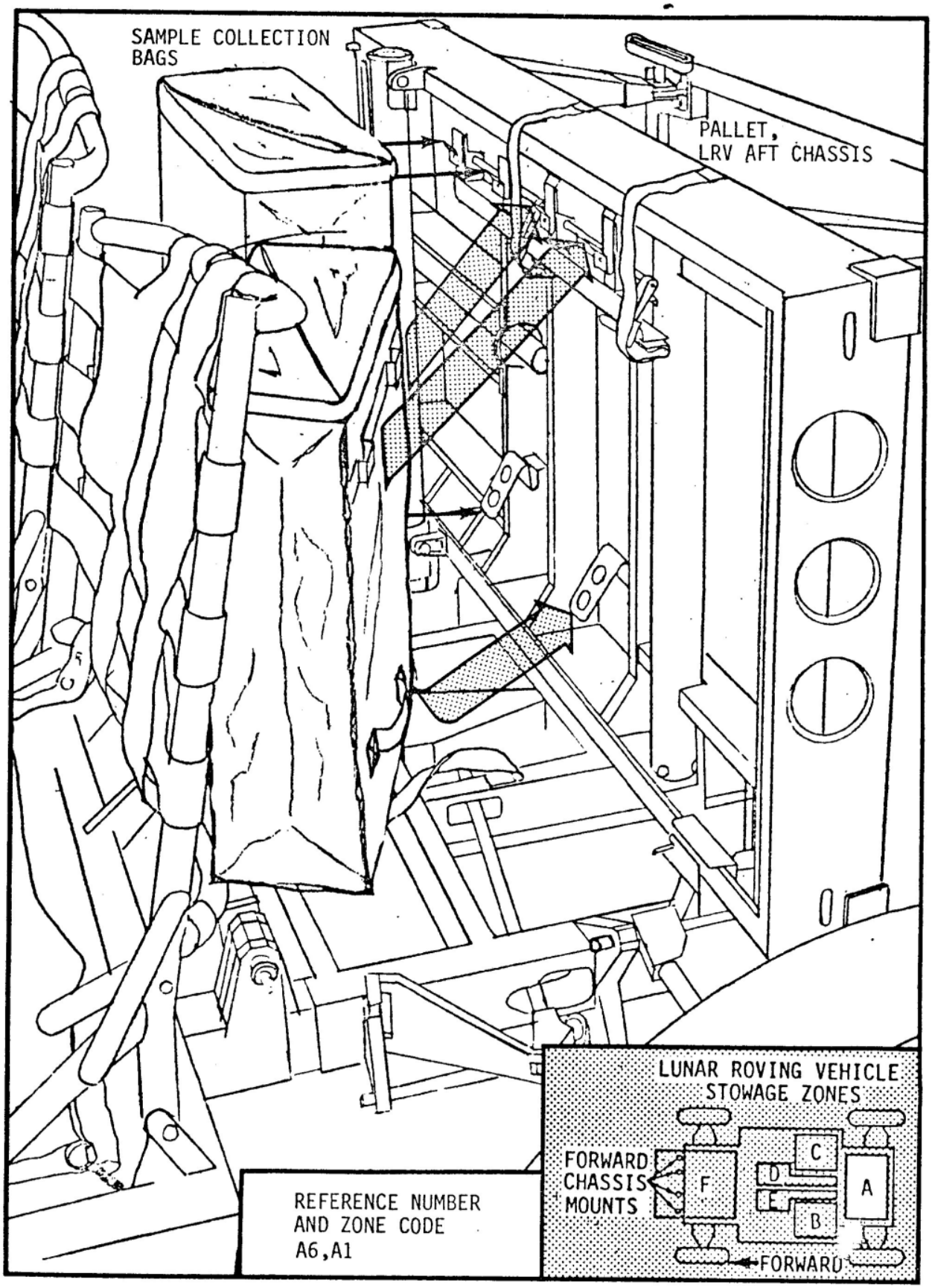
REFERENCE NUMBER AND ZONE CODE
A2,A10,A11

LUNAR ROVING VEHICLE STOWAGE ZONES



SAMPLE COLLECTION BAGS

Bottom collection bag strap is secured to pallet prong; clip retention handle rotated slightly, passed horizonally via strap. Collection bag top bar inserted into pallet clips. Clip retention handle rotated almost vertical; retention pin protrudes into front clip face. Collection bag is restrained in three directions.


SAMPLE COLLECTION BAGS
PALLET, LRV AFT CHASSIS
REFERENCE NUMBER AND ZONE CODE A6,A1
LUNAR ROVING VEHICLE STOWAGE ZONES
FORWARD CHASSIS MOUNTS
F
C
D
E
A
B
FORWARD

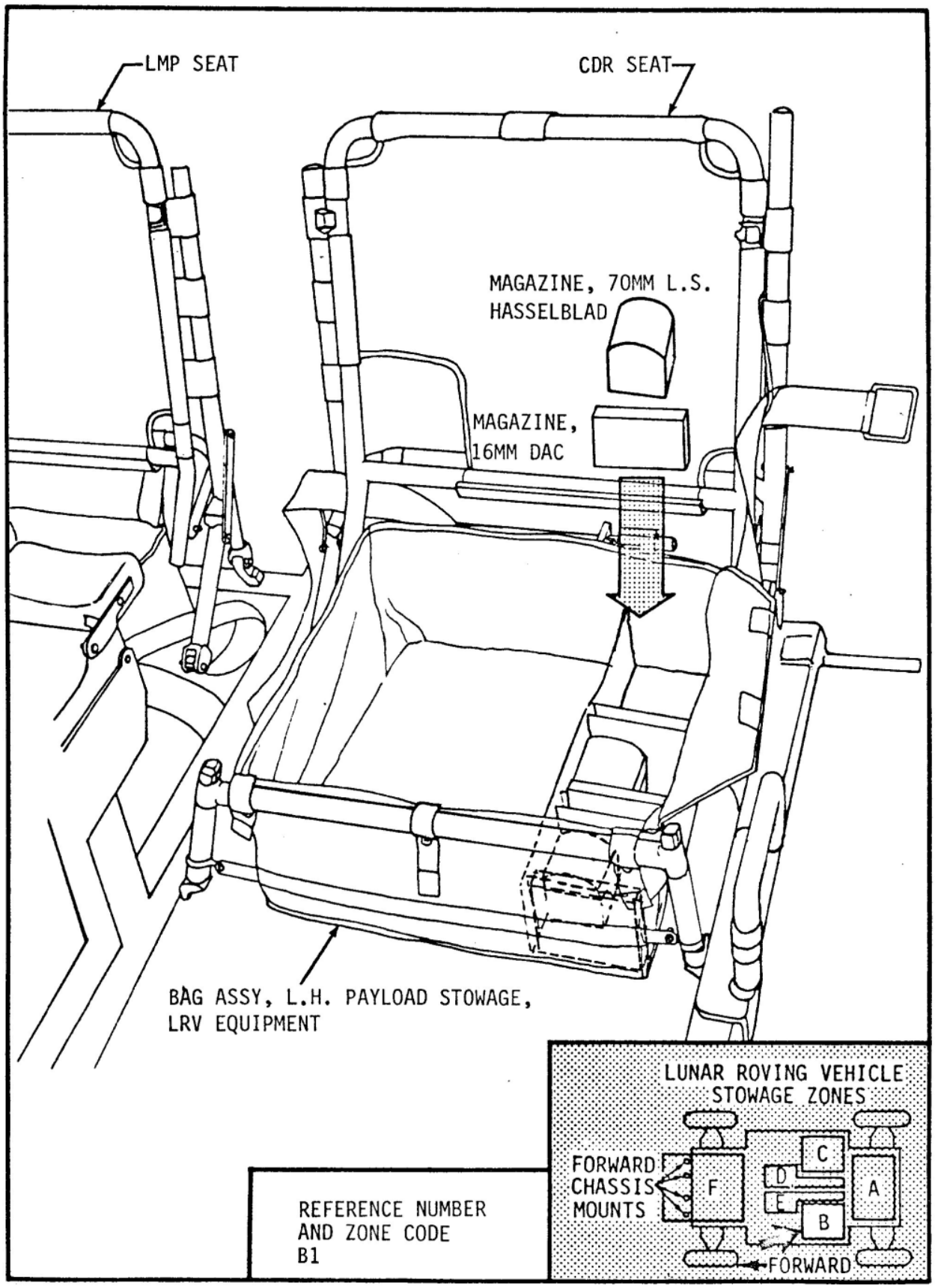
FIT CRITERIA

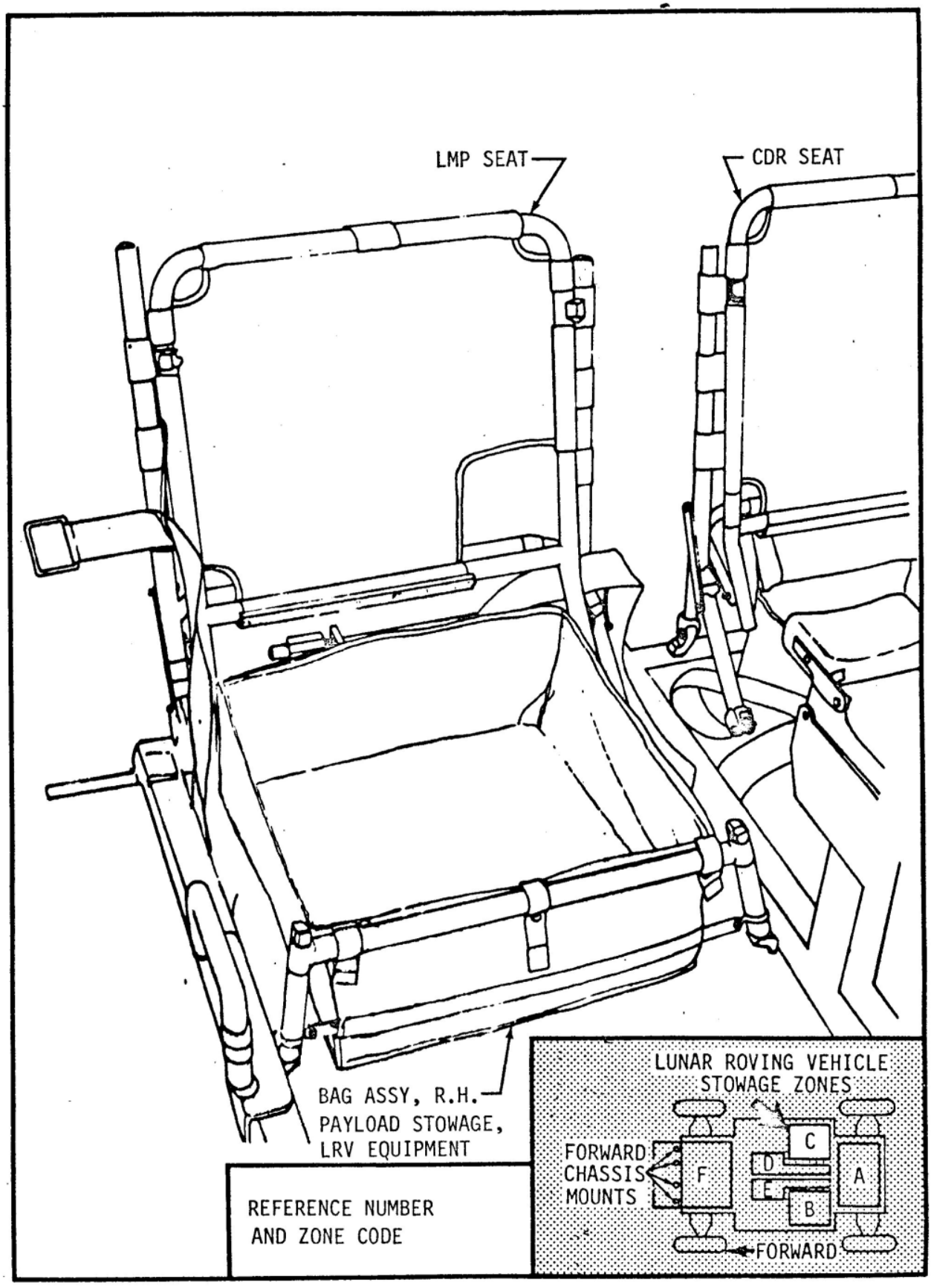
16MM DATA ACQUISITION CAMERA MAGAZINE

16mm DAC magazine long axis horizontal with 50% of magazine showing above small pocket edge. Magazine fits loosely.

70MM LUNAR SURFACE HASSELBLAD CAMERA MAGAZINE

Magazine dark slide (flat side) down in large pocket, no other preferential orientation. Magazine fits loosely.


LMP SEAT
CDR SEAT
MAGAZINE, 70MM L.S.
HASSELBLAD
MAGAZINE,
16MM DAC
BAG ASSY, L.H. PAYLOAD STOWAGE,
LRV EQUIPMENT
LUNAR ROVING VEHICLE
STOWAGE ZONES
FORWARD
CHASSIS
MOUNTS
C
D
E
F
A
B
FORWARD
REFERENCE NUMBER
AND ZONE CODE
B1


LMP SEAT
CDR SEAT
BAG ASSY, R.H.
PAYLOAD STOWAGE,
LRV EQUIPMENT
REFERENCE NUMBER
AND ZONE CODE
LUNAR ROVING VEHICLE
STOWAGE ZONES
FORWARD
CHASSIS
MOUNTS
C
D
E
F
A
B
FORWARD

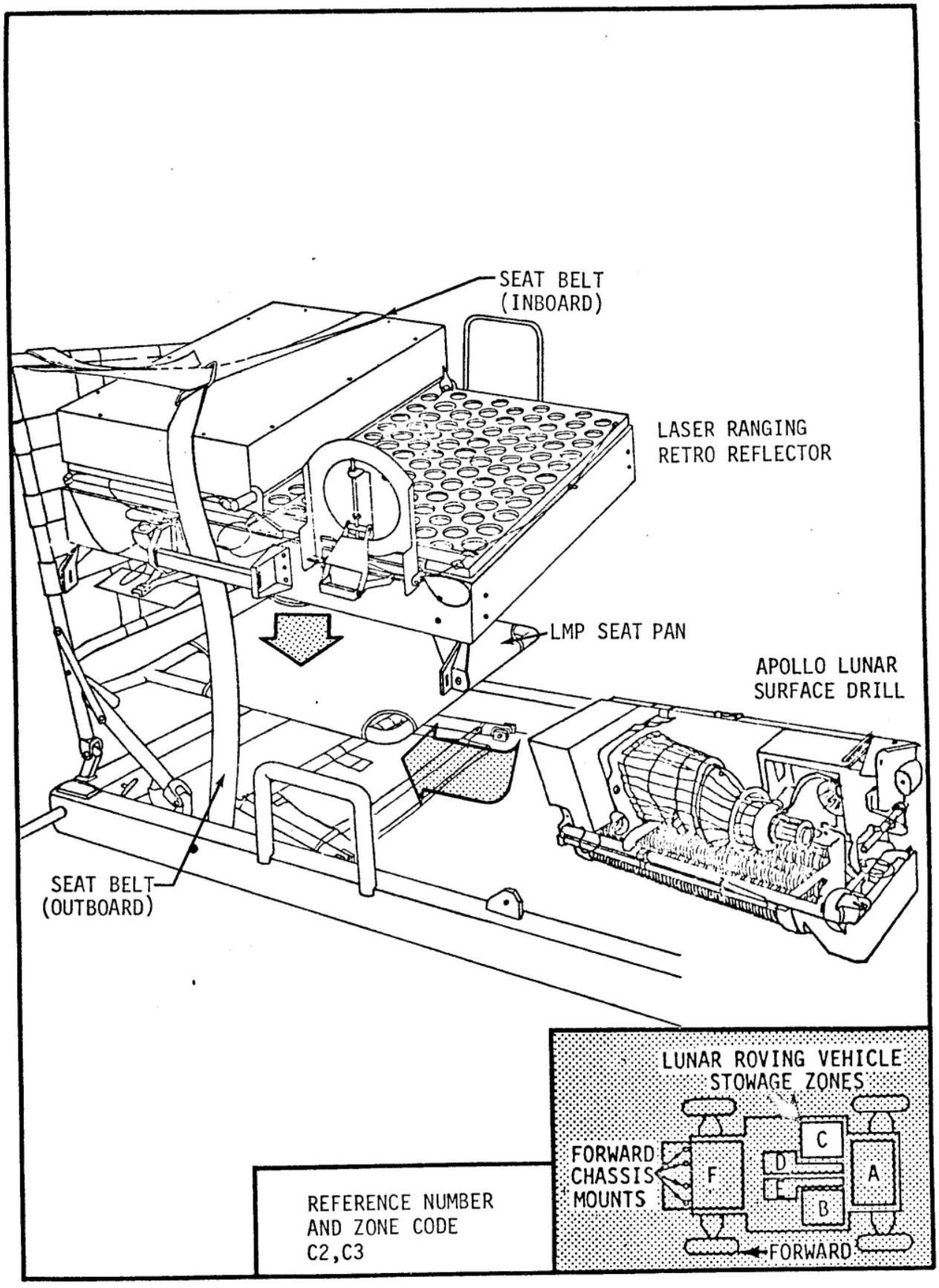
FIT CRITERIA

LASER RANGING RETRO REFLECTOR (LR^3)

LR^3 on LMP seat pan, outboard seat belt is inserted through LR^3 carry handle. Inboard seat belt is mated with outboard seat belt and is looped through seat back and Velcro areas are mated. LR^3 is loosely restrained on seat in all three directions.

APOLLO LUNAR SURFACE DRILL (ALSD)

ALSD under LMP seat pan and resting on lowered LMP front seat brace. No restraint except that provided by LRV structure.


SEAT BELT
(INBOARD)
LASER RANGING
RETRO REFLECTOR
LMP SEAT PAN
APOLLO LUNAR
SURFACE DRILL
SEAT BELT
(OUTBOARD)
LUNAR ROVING VEHICLE
STOWAGE ZONES
FORWARD
CHASSIS
MOUNTS
C
D
E
F
A
B
FORWARD
REFERENCE NUMBER
AND ZONE CODE
C2,C3

FIT CRITERIA

LOW GAIN ANTENNA (LGA)

A. LGA Staff Installation

1) LGA snaps in locked position when inserted in LRV handhold receptacle.

2) Staff cannot be removed when handhold button is not depressed.

3) Staff can be rotated freely when staff handle is pushed downward.

4) Staff handle moves up approximately 3/8" when released, preventing staff from rotating.

5) Criteria 3 and 4 shall be satisfied for any staff rotational position (17° intervals).

6) A staff can also be rotated (fine adjustment) via an internal friction clutch when staff handle is rotated.

7) Staff removes with slip fit when handhold button is depressed.

B. LGA Electrical Connections (Reference Pages 26 and 28)

1) LGA cable secured by Velcro strap at LRV console.

2) Cable inserted into two clips on front right LRV chassis.

3) Connector cannot be rotated or moved outward when mated with blue color-coded (formost) LCRU connector.

4) Cable rigging length to permit 360° aximuth rotation of LGA for anyantenna elevation angle from 0° to 90°.

16MM LS STAFF INSTALLATION

1) 16mm LS staff snaps in locked position when inserted in LRV handhold receptacle.

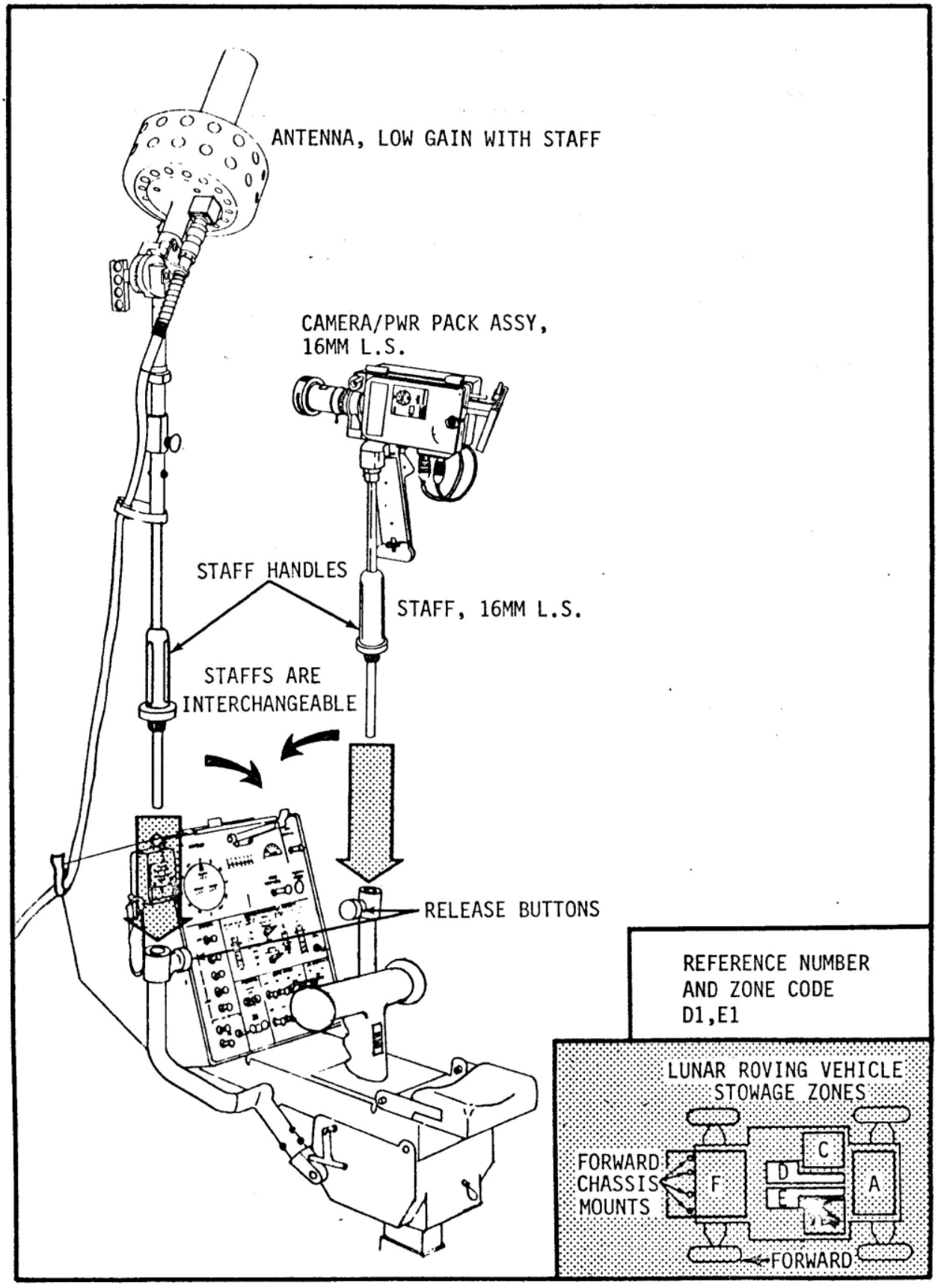
2) Staff cannot be removed when handhold button is not depressed.

3) Staff can be rotated freely when staff handle is pushed downward.

4) Staff handle moves up approximately 3/8" when released preventing staff from rotating.

5) Criteria 3 and 4 shall be satisfied for any staff rotational position (17° intervals).

6) Staff removes with slip fit when handhold button is depressed.


ANTENNA, LOW GAIN WITH STAFF
CAMERA/PWR PACK ASSY,
16MM L.S.
STAFF HANDLES
STAFF, 16MM L.S.
STAFFS ARE
INTERCHANGEABLE
RELEASE BUTTONS
REFERENCE NUMBER
AND ZONE CODE
D1,E1
LUNAR ROVING VEHICLE
STOWAGE ZONES
FORWARD
CHASSIS
MOUNTS
F
D
E
C
A
FORWARD

FIT CRITERIA

LCRU

A. LCRU Installation

LCRU mounted with radiator surface up (control panel to left side of LRV) and inserted onto LRV post with lever-latches as shown. Lever-latches as shown. Lever-latches rotated 90° horizontal aft. LCRU restrained in these directions.

B. LCRU Electrical Connections

LCRU/LRV/TV cable zero G connector (from left LRV receptacle) is mated to left rear LCRU connector. Zero G connector locking mechanism "overcenter" when handle is pushed inward toward LCRU. Cable bootie pushed inward and internal bootie Velcro mated with Velcro patch on zero G connector handle. Connector cannot be rotated or moved outward.

HIGH GAIN ANTENNA (HGA)

A. HGA Staff Installation

1) HGA staff inserted into left (outboard) LRV receptacle with HGA lock wheel pointed out board.

2) HGA staff cannot be rotated.

3) HGA staff bayonet locking coupler is pushed downward and rotated clockwise.

4) Bayonet locking coupler is locked when it cannot be rotated without applying downward force.

5) HGA staff is free of play and cannot be rotated.

B. HGA Electrical Connections

1) HGA cable routed as shown, red HGA connector mated with red rearmost LCRU connection. Cable cannot be rotated or moved outward.

GROUND COMMENDED TELEVISION ASSY (GCTA)

A. Television Control Unit (TCU) Staff Installation

1) TCU staff inserted into right (outboard) LRV receptacle with TCU crook forward.

2) TCU staff cannot be rotated.

3) TCU staff bayonet locking coupler is pushed downward and rotated clockwise.

4) Bayonet locking coupler is locked when it cannot be rotated without applying downward force.

5) TCU staff is free of play and cannot be rotated.

B. Color Television Camera Installation

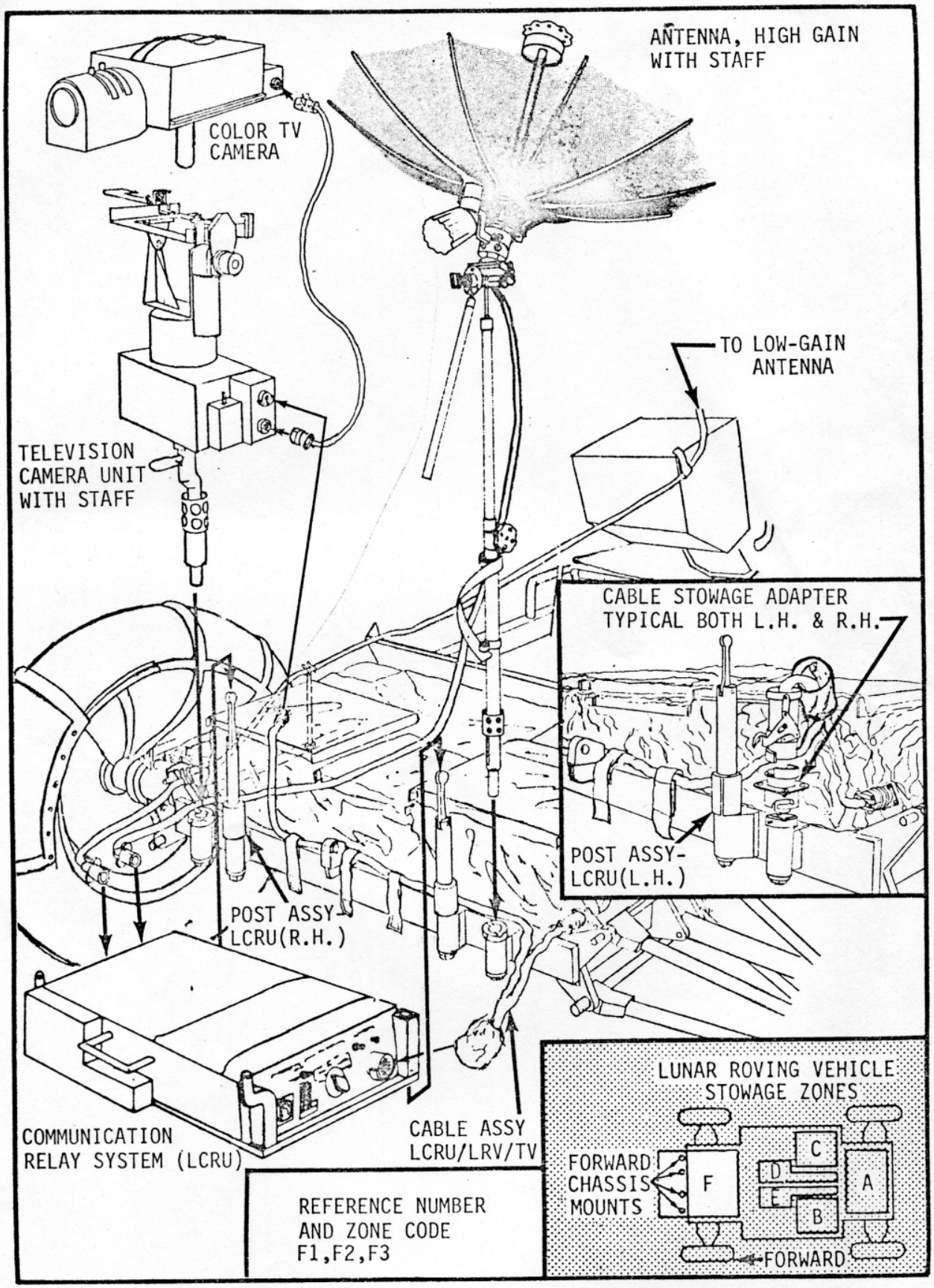
1) Left camera slide is inserted into television control unit (TCU) ears, and right lock lever is rotated down. Camera is constrained in three directions.

C. TCU Electrical Connector

1) LCRU/LRV/TV cable routed as shown, and zero G connector (from right LRV receptacle) is mated with upper TCU connector. Zero G connector locking mechanism "overcenter" when zero G connector handle is inward toward TCU. Cable connector cannot be rotated or moved outward from TCU.

D. Color TV Camera Electrical Connection

1) Color TV cable is routed as shown and mated with connector on rear of color TV camera. Zero G connector locking mechanism "overcenter" when Zero G connector handle is inward toward color TV CAMERA. Cable connector cannot be rotated or moved outward from color TV camera.


ANTENNA, HIGH GAIN
WITH STAFF
COLOR TV
CAMERA
TO LOW-GAIN
ANTENNA
TELEVISION
CAMERA UNIT
WITH STAFF
CABLE STOWAGE ADAPTER
TYPICAL BOTH L.H. & R.H.
POST ASSY-
LCRU(L.H.)
POST ASSY-
LCRU(R.H.)
COMMUNICATION
RELAY SYSTEM (LCRU)
CABLE ASSY
LCRU/LRV/TV
REFERENCE NUMBER
AND ZONE CODE
F1,F2,F3
LUNAR ROVING VEHICLE
STOWAGE ZONES
FORWARD
CHASSIS
MOUNTS
F
C
D
E
A
B
FORWARD