

## CHAPTER 4

### GENERAL MAINTENANCE

#### Section I. GENERAL

##### 34. Scope

This chapter contains general maintenance information pertaining to the repair of the launcher, launching-handling rail, side truss, loading rack support, launcher transport modification kit, launcher sub-surface four-rack modification kit, CONUS C launching section modification kit, CONUS C modified launching section modification kit, CONUS D launching section modification kit, USARAL launching section modification kit, USAREUR launching section modification kit, SAC launching section modification kit, mobile launching section modification kit, and launcher basic accessory kit. Refer to TM 9-1400-250-35 for other general maintenance procedures applicable to the

NIKE-HERCULES Air Defense Guided Missile System.

##### 35. Use

The maintenance information in the latter chapters of this manual is based on the assumption that personnel are familiar with the general maintenance procedures covered in this chapter as well as those in TM 9-1400-250-35. That is, specific references will not be made to individual general maintenance procedures except where danger to equipment or personnel is involved. These references are omitted because they would be too numerous. In view of this, it is especially important that personnel using this manual be familiar with the content of this chapter and TM 9-1400-250-35.

#### Section II. GENERAL MAINTENANCE PROCEDURES

##### 36. Mechanical

*a. Scribing Metal Parts.* As each part is removed, its position in relation to the assembly should be established by suitably scribed reference marks if it is necessary to return it to its exact original position.

*b. Cementing Gaskets.* The procedures required for cementing gaskets on plates, doors, and access covers are described in (1) through (4) below.

- (1) Apply a brush coat of primer cement 8040-281-1976 to cover, and allow to dry until tack free.
- (2) Apply a thin, even coat of adhesive 8004-034-7955 to both fitting surfaces.
- (3) Allow to dry until quite tacky, but no longer transfers to the finger when lightly touched.
- (4) Carefully position the parts before allowing fitting surfaces to contact.

Press the cemented parts together using maximum hand pressure.

*c. Hoisting of Launching-Handling Rail.* It is necessary to hoist the rail when performing maintenance on any idler wheel (fig. 218), hook, or driver wheel assembly (fig. 241) on the rail. This procedure is described in (1) and (2) below.

- (1) *Removal from side trusses* (fig. 56).
  - (a) Move the rail to the end of the side trusses against the loading rack stops.
  - (b) Position the two lifting slings, capable of lifting a minimum of 3200 pounds, around the rail near the outriggers.
  - (c) Attach the slings to the hoist hook of a hoisting device capable of lifting a minimum of 3200 pounds.
  - (d) Elevate the hook far enough to take up the slack in the slings.

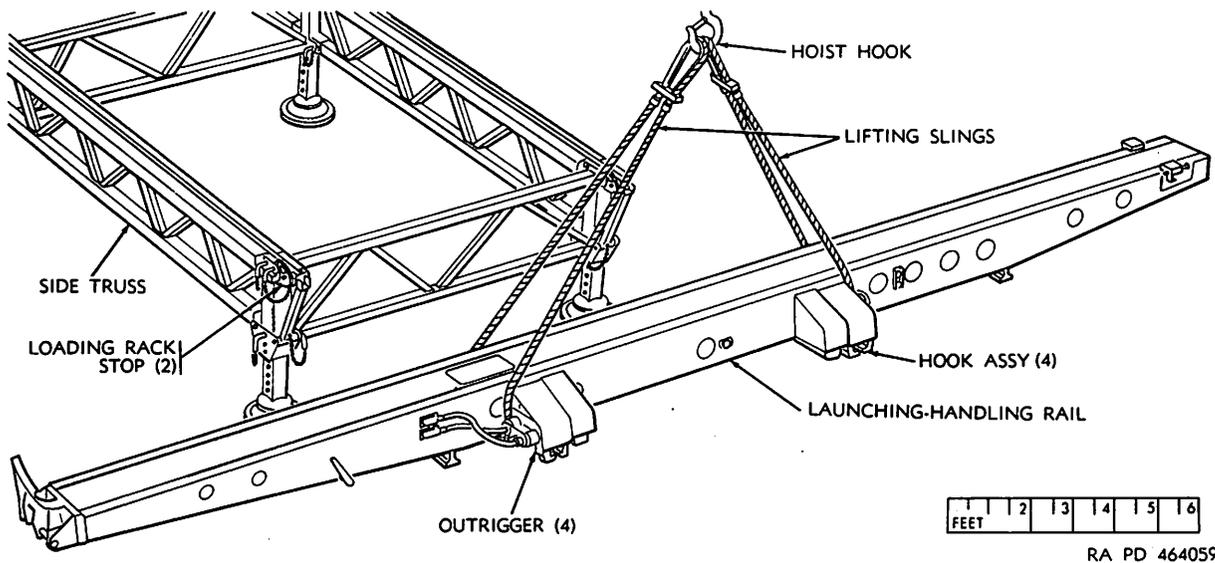


Figure 56. Launching-handling rail – sling attachment for hoisting.

**Warning:** To avoid injury by hoisted rail, personnel should stand near side trusses on the launcher side of the rail when performing the following step.

- (e) Depress rack stops and move the rail off loading racks.
- (f) Perform required maintenance on rail.

(2) *Installation on side trusses.*

- (a) Move rail into position and engage hook assemblies on tracks of the side trusses.
- (b) Move launching-handling rail onto tracks and beyond the loading rack stops.
- (c) Disconnect lifting slings from hoist hook and remove slings.

*d. Use of Erecting Beam Support* (fig. 57). The erecting beam support – 9029892 is a special tool used to hold the launcher erecting beam at a 12-degree angle of elevation. It provides easier access to components both inside and underneath the beam.

(1) *Installation.*

- (a) Raise the beam as described in paragraph 44 sufficiently to allow

support to be placed upright under beam.

**Warning:** Failure to properly position the support under the beam before lowering the beam onto the support may result in injury to personnel and damage to equipment. To avoid this, make certain support is not tilted and that base of support is flat against ground surface.

- (b) Aline two 1½-inch diameter holes in support with two indexing pins in underside of beam.
- (c) Lower beam as described in paragraph 44 onto support, making certain pins in beam fully engage holes in support.

(2) *Removal.*

- (a) Raise beam as described in paragraph 44 sufficiently to disengage pins from holes in support.
- (b) Remove support.
- (c) Lower beam to down-and-locked position as described in paragraph 44.

*e. Orientation when Performing Maintenance.* In maintenance chapters whenever the

terms "front", "rear", "left", or "right" are used to orient personnel, it is always when standing at the rear of the launcher, facing forward.

### 37. Hydraulic

a. In temperate zones use only hydraulic fluid—9150-252-6383 (1 quart), 9150-223-4134 (1 gal), or 9150-265-9408 (55 gal) (MIL-H-5606) for cleaning, lubricating, and servicing the hydraulic system or its components. In arctic zones use Golden Bear hydraulic fluid—9150-698-3822 (1 gal) or 9150-698-3823 (5 gal) for these same applications.

b. Replace all preformed packings, rings, gaskets, and seals during repair or replacement of hydraulic components.

c. Exercise extreme care in handling hydraulic components to prevent contamination from dirt, lint, water, or other hydraulic oils. Hydraulic tube assemblies and hoses should be capped when disconnected from components to be removed.

d. When installing hydraulic components, torque coupling nuts to values shown in table V, or as specifically indicated in the maintenance chapters.

Table V. Recommended Coupling Nut Torque Values

Tubing od (inches)	Hexagon coupling nut size (inches)	Torque values (pound-inches)	
		Aluminum alloy, brass, and bronze	Steel
1/4	9/16	50	150
5/16	5/8	78	200
3/8	11/16	112	300
1/2	7/8	200	500
5/8	1	312	700
3/4	1 1/4	450	1000
1	1 1/2	600	1450

e. To close a valve, turn the valve handle clockwise. To open a valve, turn the handle counterclockwise. Unless otherwise indicated, these conditions prevail when operating any hydraulic valve.

f. Perform an operational check as described in TM 9-1440-250-12 after completing any hydraulic or electrical system maintenance.

### 38. Electrical

a. *Wiring Diagrams.* Refer to TM 9-1440-250-35 for information pertaining to cable locations and wiring connections.

b. *Schematics.* Refer to TM 9-1440-251-20 for electrical circuit schematics.

c. *Protecting Cable Assemblies.* Wrap all rubber-covered cable assemblies which are exposed to the rocket motor cluster blast as described in (1) through (4) below.

- (1) Wrap the entire length of the cable assembly with 1/8 x 3 insulation tape—9029984, overlapping each turn by one-half the width of the tape (fig. 58).

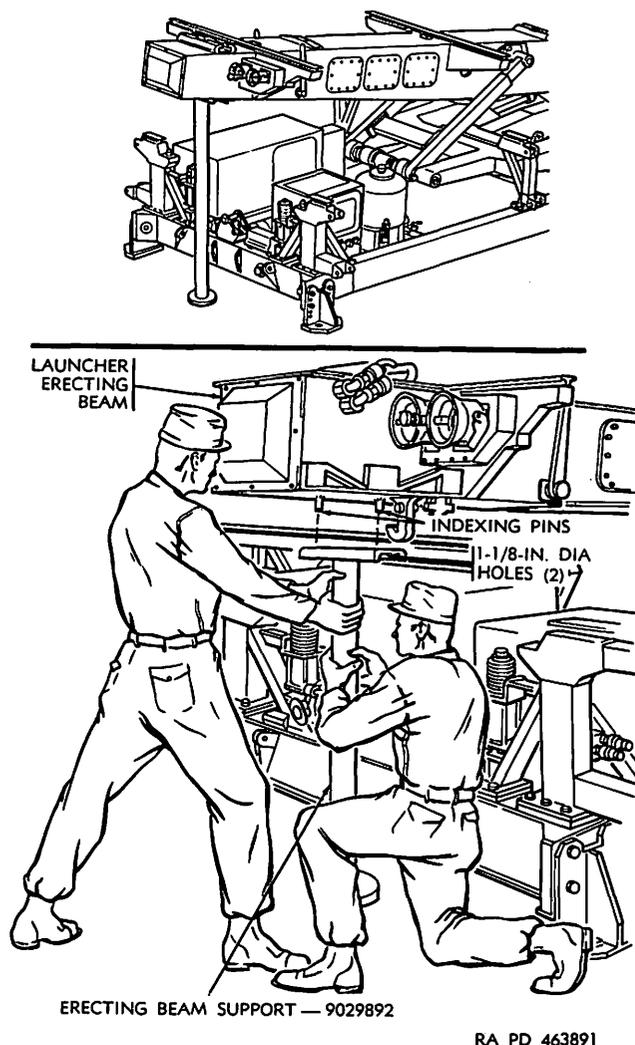
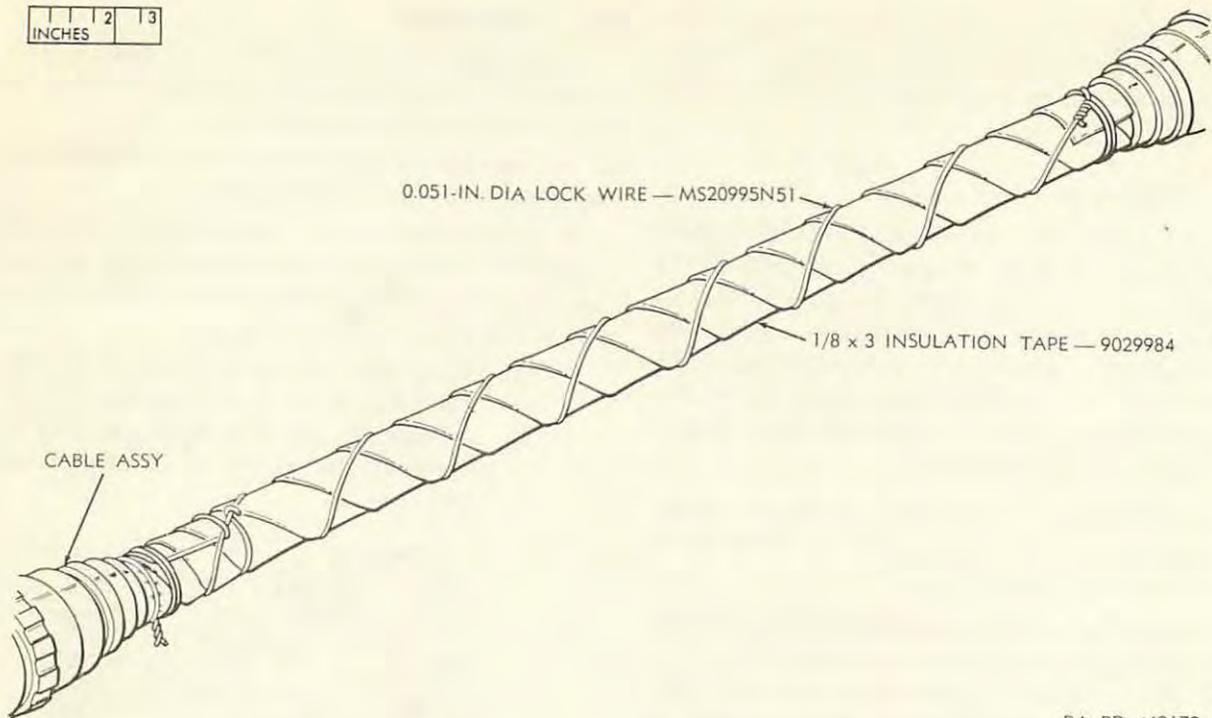
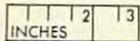


Figure 57. Erecting beam support—removal and installation.



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Figure 58. Cable assembly protective wrapping — typical.

- (2) Tie the tape to the ends of the cable assembly with 0.051-inch diameter lockwire — MS20995N51.
  - (3) Wrap the cable assembly and tape with the lockwire, allowing four complete turns of lockwire per foot of cable assembly.
  - (4) Secure the lockwire to each end of the cable assembly as described in (a) through (d) below.
    - (a) Make two complete turns of lockwire around the end of the cable assembly.
    - (b) Pass the lockwire over the two turns and under the spiral wrapped lockwire.
    - (c) Pull the lockwire down tight and pass it around the cable assembly in the opposite direction and under the loop.
    - (d) Pull the lockwire tight; cut off the excess and bend the end back.
- d. Cable Assembly Terminal Connections.* Whenever any cable assembly is disconnected from a terminal board or any similar terminal connection, it is necessary to disconnect, tag, and identify each wire to correspond with its connecting terminal. When wisely used in performing less complicated wire removals, this procedure will serve to avoid repeated reference to wiring diagrams. Maintenance personnel should avoid attempting to tag and identify after disconnecting several wires. In order to avoid confusion, personnel should tag and identify after disconnecting each wire.
- (1) Disconnecting spade terminals. Before attempting to disconnect any wire with a spade terminal, it is necessary to loosen the locking screw which holds the clip on the terminal block.

This permits easy removal and prevents unnecessary strain on the clip.

- (2) Connecting spade terminals. Before connecting any spade terminal wire, loosen the locking screw sufficiently to insert terminal into clip. Tighten screw until wire and spade terminal is held finger-tight against clip.

*e. Dust Covers.* Some cable assemblies and electrical components have plugs or receptacles which have dust covers attached on chains. Whenever these plugs or receptacles are exposed after disconnection, they should be capped with the covers to prevent contamination by foreign matter.

### 39. Lubrication

*a.* The lubrication of parts during maintenance must be in accordance with the lubrication charts in TM 9-1440-250-20.

**Caution:** In order to avoid damage to equipment, do not lubricate electrical components.

*b.* Precision parts which must be temporarily stored should be covered with a light film of oil or rust preventive.

### 40. Pneumatic Precharge Procedures

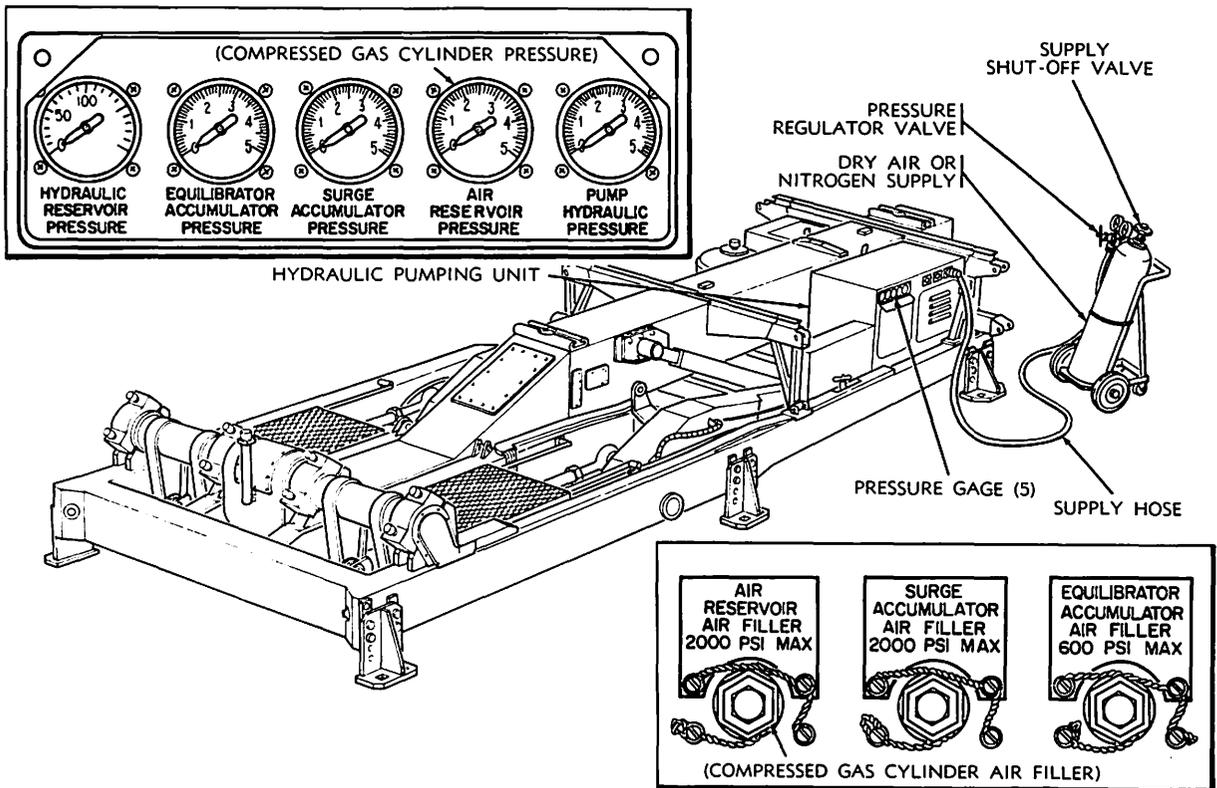
Pneumatic precharge or pressurization is required for the equilibrator accumulator (fig. 2), the hydraulic surge accumulator (fig. 121), and the compressed gas cylinder (fig. 120). Dry air or nitrogen is used to accomplish this precharge. Equilibrator accumulator and surge accumulator precharge procedures are similar and are described in *a* below. Precharge of the gas cylinder is described in *b* below.

*a. Accumulator Precharge Procedures.* Perform steps (1) through (12) below only when precharging both accumulators. If only precharge of the equilibrator accumulator is required, perform steps (1) and (3) through (12) below. If only precharge of the surge accumulator is required, perform steps (2) through (12) below.

- (1) Release the equilibrator accumulator hydraulic pressure as described in paragraph 41*a*.

- (2) Release the surge accumulator hydraulic pressure as described in paragraph 41*b*.
- (3) Remove valve cap (fig. 61) from the air filler valve under placard of AIR RESERVOIR, SURGE ACCUMULATOR, or EQUILIBRATOR ACCUMULATOR AIR FILLER (fig. 59) of component requiring precharge.
- (4) Connect the supply hose to filler valve.
- (5) Adjust the pressure regulator valve as follows:
  - (*a*) When precharging the equilibrator or surge accumulator, adjust the regulator valve to 600 psi.
  - (*b*) When precharging the gas cylinder, adjust the regulator valve to 2000 psi.
- (6) Open the supply shut-off valve.
- (7) Turn the swivel nut (fig. 61) a three-quarter turn counterclockwise.
- (8) When the pressure specified in step (5) above has been reached, as indicated on the appropriate hydraulic pumping unit pressure gage (fig. 59), close the shut-off valve.
- (9) Tighten the swivel nut (fig. 61) and torque to  $60 \pm 10$  pound-inches.
- (10) Disconnect the supply hose (fig. 59) from the filler valve.
- (11) Install the valve cap (fig. 61).
- (12) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) or the SYSTEM BY-PASS valve opened in (1) or (2) above.

*b. Compressed Gas Cylinder Precharge Procedures* (fig. 59). Precharge of the compressed gas cylinder does not require release of any hydraulic pressure. Perform steps *a* (3) through (11) above for precharge of the gas cylinder.



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Figure 59. Pneumatic precharge procedure.

#### 41. Hydraulic Pressure Release and Pneumatic Depressurization

a. *Equilibrator Accumulator Hydraulic Pressure Release.* Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60). This releases the hydraulic pressure in the equilibrator accumulator (fig. 2).

b. *Hydraulic Surge Accumulator Hydraulic Pressure Release.* Open the SYSTEM BY-PASS valve (fig. 60). This releases the hydraulic pressure in the hydraulic surge accumulator (fig. 121).

c. *Hydraulic Oil Reservoir Pneumatic Depressurization.* Turn the handle of the plug cock (fig. 60) to the VENT position and hold until the hydraulic oil reservoir air pressure is discharged.

d. *Equilibrator Accumulator, Hydraulic Surge Accumulator, and Compressed Gas Cylinder Pneumatic Depressurization* (fig. 61). The pneumatic depressurization procedures for

the equilibrator accumulator, the hydraulic surge accumulator, and the compressed gas cylinder are similar. In this procedure, the valve core of the air filler valve is removed to allow quicker depressurization. The following method is a typical depressurization procedure:

- (1) Remove the valve cap and the valve core from the air filler valve under placard indicating component requiring depressurization.

**Warning:** To avoid bodily injury resulting from escaping pressure, do not stand in front of the air filler valve when performing the following step.

- (2) Open the valve by turning the swivel nut a three-quarter turn counterclockwise. Keep the valve open until all the compressed air has escaped.
- (3) Close the valve by tightening the swivel nut. Torque the nut to  $60 \pm 10$  pound-inches.

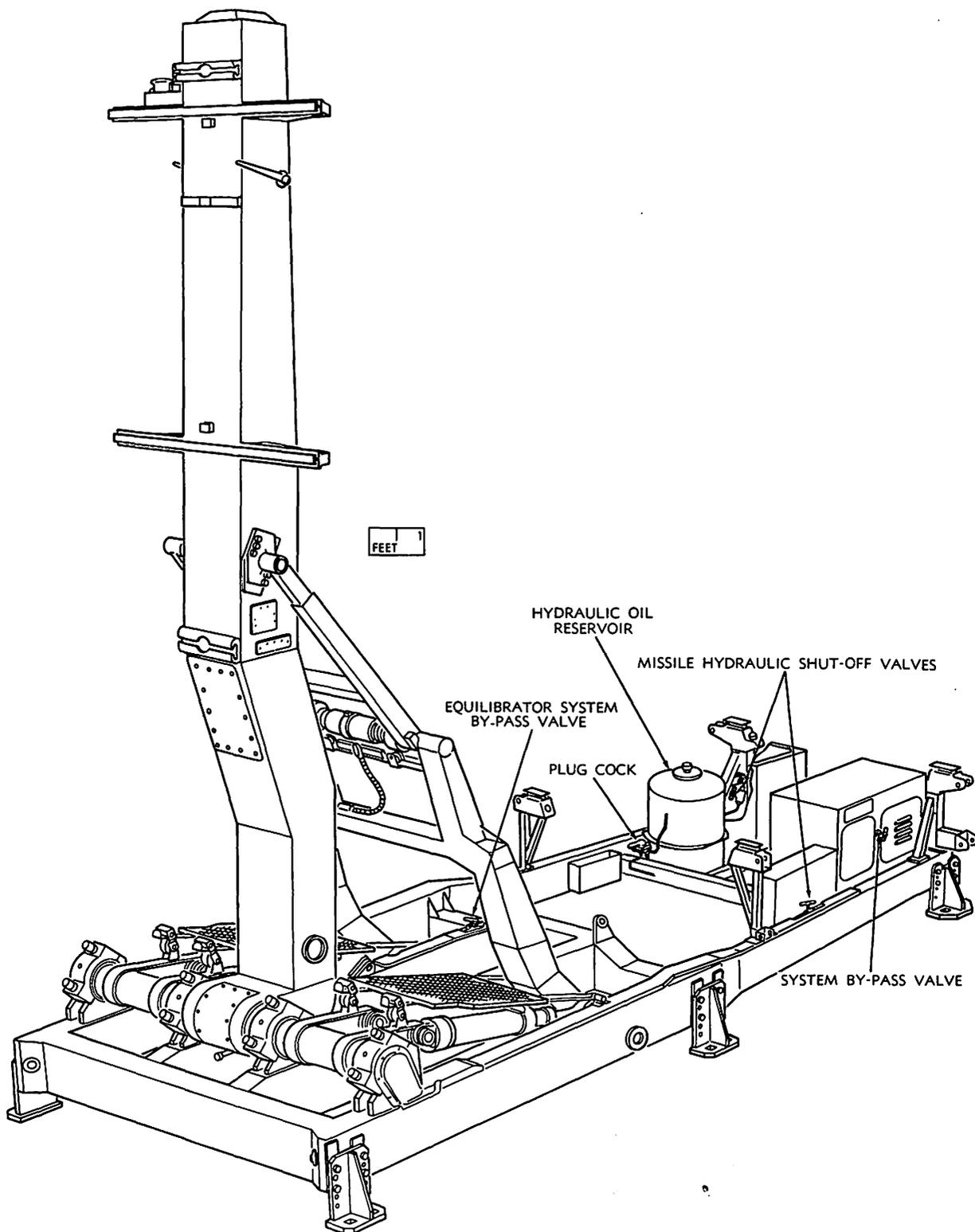
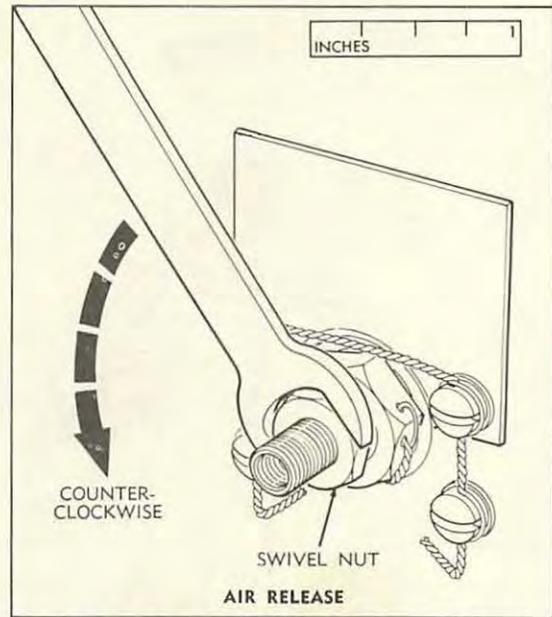
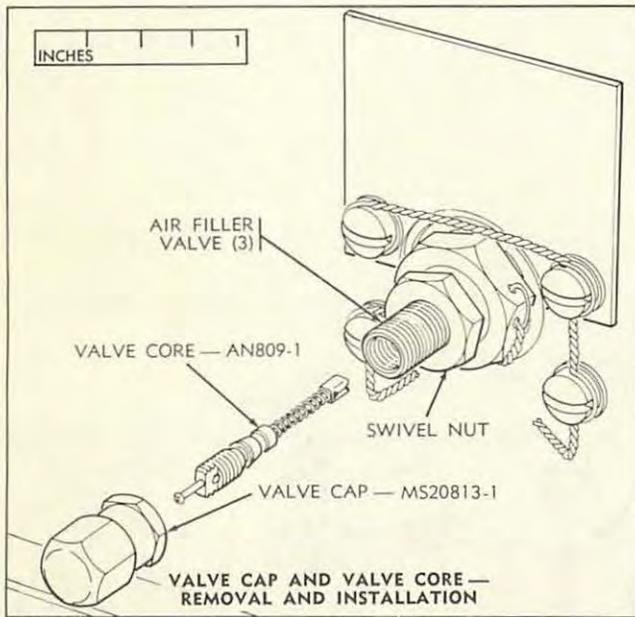
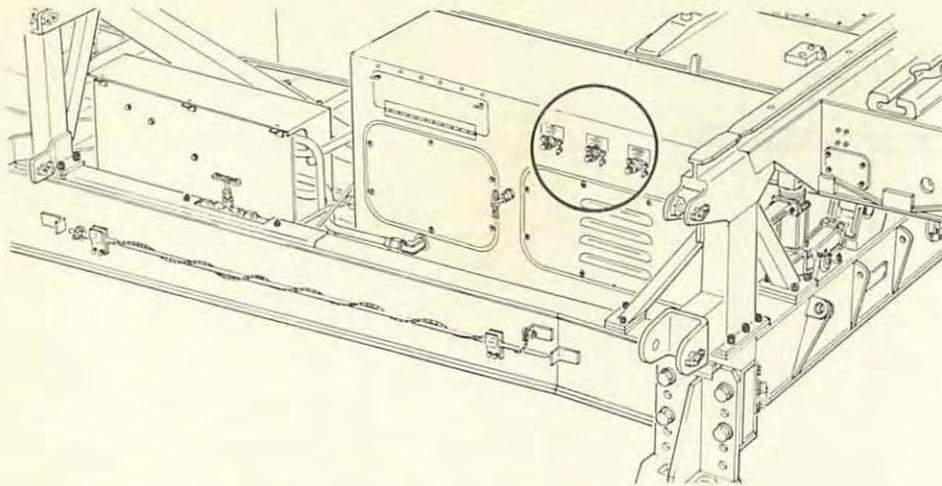


Figure 60. Manually operated hydraulic and pneumatic valves.

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Figure 61. Pneumatic depressurization procedure — typical.

(4) Install the valve core and cap.

#### 42. Launcher Erecting Beam Emergency Lowering and Locking Wedge Release

Emergency procedures are provided to lower the launcher erecting beam or release the locking wedges, for use when a power failure occurs. The hydraulic system must be bled of all dry air or nitrogen after the emergency lowering of the beam or locking wedge release pro-

cedure is performed. This bleed procedure is described in paragraph 43.

##### a. Theory of Operation.

(1) *Launcher erecting beam emergency lowering.*

(a) An external dry air or nitrogen supply provides the emergency power source. A supply at 2000 to 3250 psi is needed to lower the

beam without a launching-handling rail and missile installed. A supply of at least 1500 psi is needed to lower the beam with a missile and a rail installed.

- (b) The beam is lowered by the two power cylinders and by its own weight. The two equilibrator cylinders are used only to retard the decent of the beam.
- (c) The nitrogen supply is connected to the hydraulic tube assembly leading to the rear ports of the power cylinders and to the hydraulic up-lock (fig. 10). When pressure from the nitrogen supply enters the launcher hydraulic system, it unlocks the up-lock and extends the actuating rods of the two power cylinders. The hydraulic fluid on the front side of the pistons of these two cylinders is forced out through the internal dashpots and restrictor check valves inside the cylinders. From the cylinders, this pressure is directed through a speed control valve in hydraulic panel. The pressure then passes through port 2 of the up-down solenoid valve and returns to the hydraulic oil reservoir. The hydraulic fluid on the front side of the pistons of the two equilibrator cylinders is forced out through the internal dashpots and restrictor check valves of the cylinders and into the reservoir through the open EQUILIBRATOR SYSTEM BY-PASS valve. The fluid restrictions permit the beam to descend slowly.

(2) *Locking wedge release.*

- (a) To unlock the two locking wedges, the nitrogen supply is connected to the hydraulic tube assembly leading to the rear ports of the two locking wedge hydraulic cylinders.
- (b) When pressure from the nitrogen supply enters the hydraulic system,

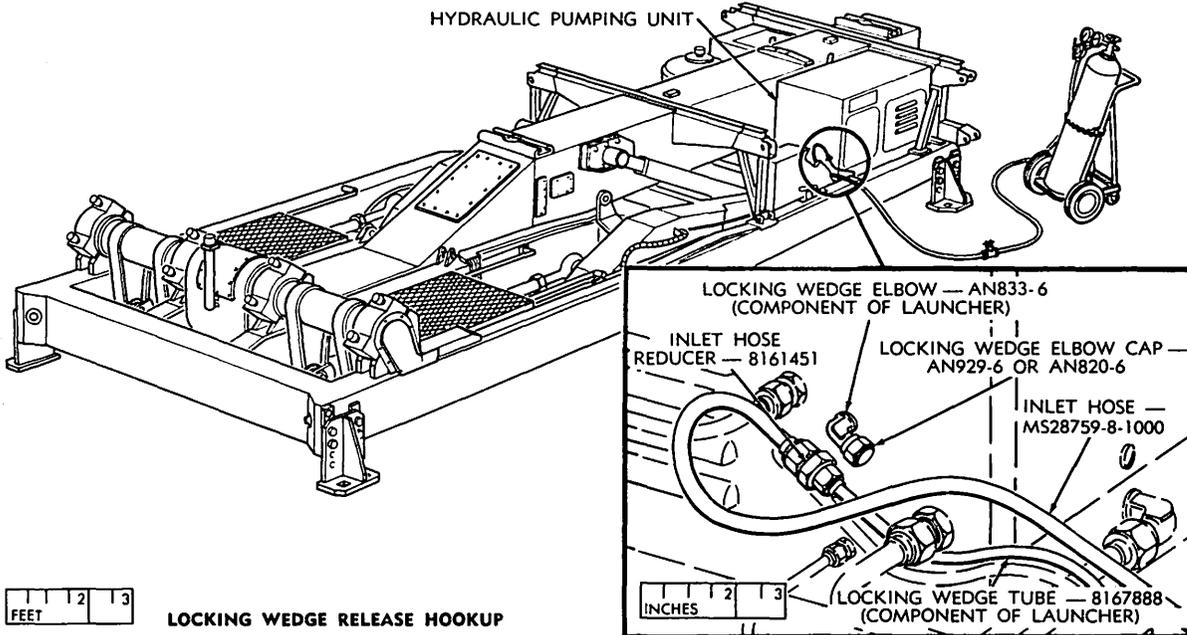
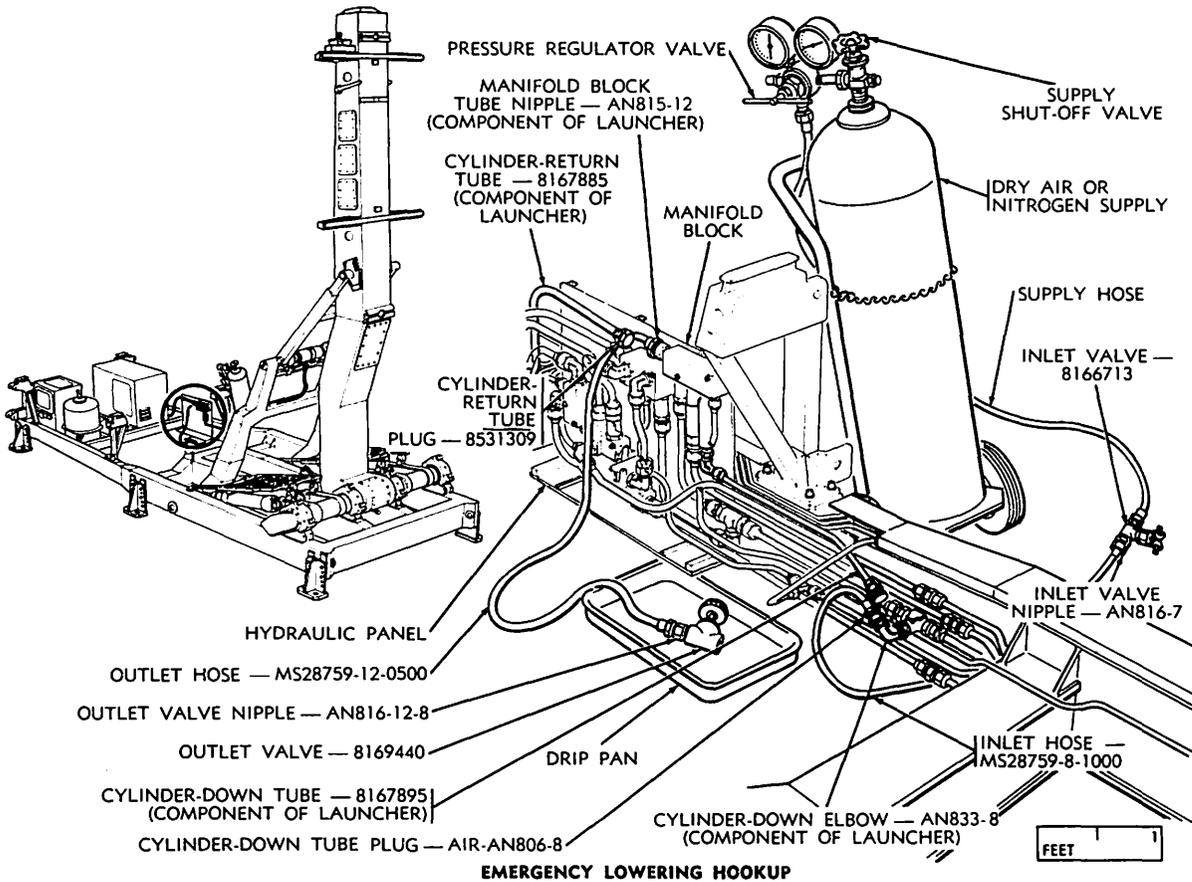
it extends the actuating rods of the hydraulic cylinders, moves the wedges toward the front of the beam, and lowers the locking wedge adjusters (fig. 41). The fluid on the front side of the hydraulic cylinder pistons flows through port 1 (fig. 10) of the locking wedge solenoid valve to the reservoir.

*b. Emergency Lowering Procedure.* Procedures for emergency lowering of the beam require using an external dry air or nitrogen supply, together with certain other parts necessary for a proper hookup. Refer to table VI for a list of these parts.

*Table VI. Parts Required for Launcher Erecting Beam Emergency Lowering and Locking Wedge Release Hookups*

Part No.	Nomenclature	Quantity
8531309 -----	Cylinder-return tube plug	1
AIR-AN806-8 --	Cylinder-down tube plug	1
AN816-12-8 ----	Outlet valve nipple -----	1
AN816-7 -----	Inlet valve nipple -----	1
8161451 -----	Inlet hose reducer -----	1
MS28759-12-0500	Outlet hose -----	1
MS28759-8-1000	Inlet hose -----	1
8166713 -----	Inlet valve -----	1
8169440 -----	Outlet valve -----	1

- (1) Observe the general precautions described in paragraph 58 *a* and *b*.
- (2) Release the equilibrator accumulator hydraulic pressure by opening the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60).
- (3) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (4) Place a drip pan (fig. 62) under the cylinder-down elbow and disconnect the cylinder-down tube from this elbow.
- (5) Install the cylinder-down tube plug on the cylinder-down tube.
- (6) Install the inlet valve nipple on the inlet valve.



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Figure 62. Launcher erecting beam emergency lowering and locking wedge release-hookups.

- (7) Connect the inlet hose to the cylinder-down elbow and to the inlet valve.
- (8) Connect the inlet valve to the supply hose.

**Warning:** Use a dry air or nitrogen supply only. Any other external supply may result in an explosion.

- (9) Close the inlet valve.
- (10) Remove panel cover (fig. 154).
- (11) Place a drip pan under the manifold block (fig. 62) in the hydraulic panel and disconnect the cylinder-return tube from the manifold block tube nipple.
- (12) Install the cylinder-return tube plug on the cylinder-return tube.
- (13) Connect the outlet hose to the manifold tube nipple and to the outlet valve. Use the outlet valve nipple to connect the outlet valve to the outlet hose.
- (14) Close the outlet valve. Place the valve inside the pan to prevent contamination of valve.
- (15) Adjust the pressure regulator valve as follows:
  - (a) When a missile and rail are installed on the launcher, adjust the regulator valve to 1500 psi.
  - (b) When the launcher has neither a missile nor rail installed, adjust the regulator valve between 2000 and 3250 psi.
- (16) Open the supply shut-off valve.

**Warning:** The beam will descend when the following step is performed. To avoid injury, personnel should stand clear of the beam.

- (17) Open the inlet valve and observe the descending beam. Close the inlet valve when the beam is halfway down.
- (18) Close the supply shut-off valve and inlet valve when the beam is down and locked.

- (19) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock (fig. 60) to the VENT position and holding until all pressure is discharged.
- (20) Open the outlet valve and release the nitrogen trapped in the hydraulic lines (fig. 62).
- (21) Disconnect the supply hose from the inlet valve.
- (22) Open the inlet valve to release the trapped nitrogen in the inlet hose.
- (23) Disconnect the inlet hose from the cylinder-down elbow.
- (24) Remove the cylinder-down tube plug and connect this tube to the cylinder-down elbow.
- (25) Torque coupling nut of the cylinder-down tube to 500 pound-inches.
- (26) Disconnect the outlet hose from the manifold tube nipple.
- (27) Remove the cylinder-return tube plug and connect this tube to the manifold tube nipple.
- (28) Torque coupling nut of the cylinder-return tube to 1000 pound-inches.
- (29) Install the panel cover (fig. 154).
- (30) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock (fig. 60) to the AIR position.
- (31) Close the EQUILIBRATOR SYSTEM BY-PASS valve.
- (32) Perform the air bleed procedure as described in paragraph 43.

*c. Locking Wedge Release Procedure.*

- (1) Observe the general precautions described in paragraph 58 *a* and *b*.
- (2) Relieve hydraulic and pneumatic pressures as described in paragraph 41, *a*, *b*, and *c*.

*Note.* Two identical externally-mounted elbows are located near each other on the rear of the hydraulic pumping unit. The upper one is the locking wedge elbow (fig. 62). Locate this elbow before performing the following step.

- (3) Place a drip pan under the locking wedge elbow and disconnect the locking wedge tube from the elbow.
- (4) Install the locking wedge elbow cap on the elbow.
- (5) Connect the inlet hose to the locking wedge tube with the inlet hose reducer.
- (6) Connect the inlet hose to the inlet valve and connect the inlet valve to the supply hose.

**Warning:** Use a dry air or nitrogen supply only. Any other external supply may result in an explosion.

- (7) Adjust the pressure regulator valve between 2000 and 3250 psi.

**Warning:** To avoid injury, personnel should keep hands clear of area around locking wedges when performing the following step.

- (8) Open the inlet valve and supply shut-off valve. The wedges will unlock.
- (9) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock (fig. 60) to the VENT position and holding until all pressure is discharged.
- (10) Close both the inlet valve (fig. 62) and supply shut-off valve.
- (11) Disconnect the inlet hose and the inlet hose reducer from the locking wedge tube.
- (12) Remove the wedge elbow cap.
- (13) Connect the wedge tube to the elbow. Torque the coupling nuts to 300 pound-inches.

- (14) Open the inlet valve and release the trapped nitrogen in the supply hose.
- (15) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (16) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (17) Perform the air bleed procedure as described in TM 9-1440-250-20.

#### 43. (Deleted)

*Figures 63 and 64 (Deleted)*

#### 44. Launcher Erecting Beam Raising and Lowering Procedures

Raise or lower the erecting beam as described in TM 9-1440-250-12.

*Note.* Use of a launching-handling rail for raising or lowering the erecting beam to perform maintenance is optional. If it is preferred not to use a rail, the two AJAX indexing pins (10, fig. 64) must be depressed as a substitute for a rail. Perform the following steps when this procedure is desired.

##### a. Raising.

- (1) Depress the two AJAX indexing pins (fig. 64) in the front and rear outriggers with  $\frac{1}{4}$  x 6 steel rods.
- (2) Raise the erecting beam to the up-and-locked position as described in TM 9-1440-250-12/1.
- (3) Perform the required maintenance.

##### b. Lowering.

- (1) Lower the beam to the down-and-locked position as described in TM 9-1440-250-12/1.
- (2) Remove both steel rods.

*a.3. (USARAL) Theory of Operation.*

- (1) These air bleed procedures are for bleeding air from the hydraulic lines of the twelve hydraulic test stations and from the test station hydraulic pumping unit. Test stations No. 1 through No. 12

are

connected to the test station hydraulic pumping unit

- (2) Whenever the test stations are connected to the test station hydraulic pumping unit system through any of the open missile hydraulic shutoff valves, it is first necessary to bleed the test stations. Axial piston pump pressure is used to force the air in the test station hydraulic lines into the test station hydraulic pumping unit.

*a.4. (USAREUR).* Paragraph *a.3* above is applicable except that there are nine test stations connected to the test station hydraulic pumping unit

*a.5. (SAC).* Paragraph *a* above is not applicable.

*b. Launcher No. 3 Hydraulic Test Stations Air Bleed Procedure (fig. 63).*

- (1) Observe the hydraulic precautions described in paragraph 58b.
- (2) Close test station valves at stations No. 1 and No. 2.
- (3) Open test station valve at station No. 3.
- (4) Open launcher No. 3 MISSILE HYDRAULIC SHUT-OFF valve and launcher No. 3 globe valve.

- (5) Turn the launcher control-indicator No. 3 MISSILE HYDR switch to ON.
- (6) Wait one minute for circulation of hydraulic fluid.
- (7) Open test station valve at station No. 2.
- (8) Wait one minute for circulation of hydraulic fluid.
- (9) Open test station valve at station No. 1.
- (10) Wait one minute for circulation of hydraulic fluid.
- (11) Turn the control-indicator No. 3 MISSILE HYDR switch to OFF.
- (12) Close test station valves at stations No. 1, No. 2, and No. 3.
- (13) Close launcher No. 3 MISSILE HYDRAULIC SHUT-OFF valve and launcher No. 3 globe valve.
- (14) Perform the launcher hydraulic system air bleed procedure on launcher No. 3 as described in *d* below.

***b.1. (USARAL) Test Stations Air Bleed Procedure.***

*Note.* During the following procedure check the reservoir hydraulic fluid level after each step is performed. Fill reservoir as required to maintain correct fluid level.

- (1) Observe the hydraulic precautions described in paragraph 58b.
- (2) Close test station valves at stations No. 1 through No. 11
- (3) Open test station valve at station No. 12
- (4) Energize the test station hydraulic pumping unit
- (5) Wait one minute for circulation of hydraulic fluid.
- (6) Open test station valve at station No. 11
- (7) Wait one minute for circulation of hydraulic fluid.

- (8) Continue the procedure of opening a test station valve and circulating the fluid for one minute until all 12 test station valves have been opened.
- (9) Deenergize the test station hydraulic pumping unit
- (10) Close test station valves No. 1 through No. 12

***b.2. (USAREUR) Test Stations Air Bleed Procedure.***

*Note.* During the following procedure check the reservoir hydraulic fluid level after each step is performed. Fill reservoir as required to maintain correct fluid level.

- (1) Observe the hydraulic precautions described in paragraph 58b.
- (2) Close test station valves at stations No. 1 through No. 8
- (3) Open test station valve at station No. 9
- (4) Energize the test station hydraulic pumping unit
- (5) Wait one minute for circulation of hydraulic fluid.
- (6) Open test station valve at station No. 8
- (7) Wait one minute for circulation of hydraulic fluid.
- (8) Continue the procedure of opening a test station valve and circulating the fluid for one minute until all nine test station valves have been opened.
- (9) Deenergize the test station hydraulic pumping unit
- (10) Close test station valves No. 1 through No. 9

***b.3. (SAC).*** Paragraph *b* above is not applicable.

***c. Launcher No. 2 Hydraulic Test Stations Air Bleed Procedure (fig. 63).***

- (1) Observe the hydraulic precautions described in paragraph 58b.

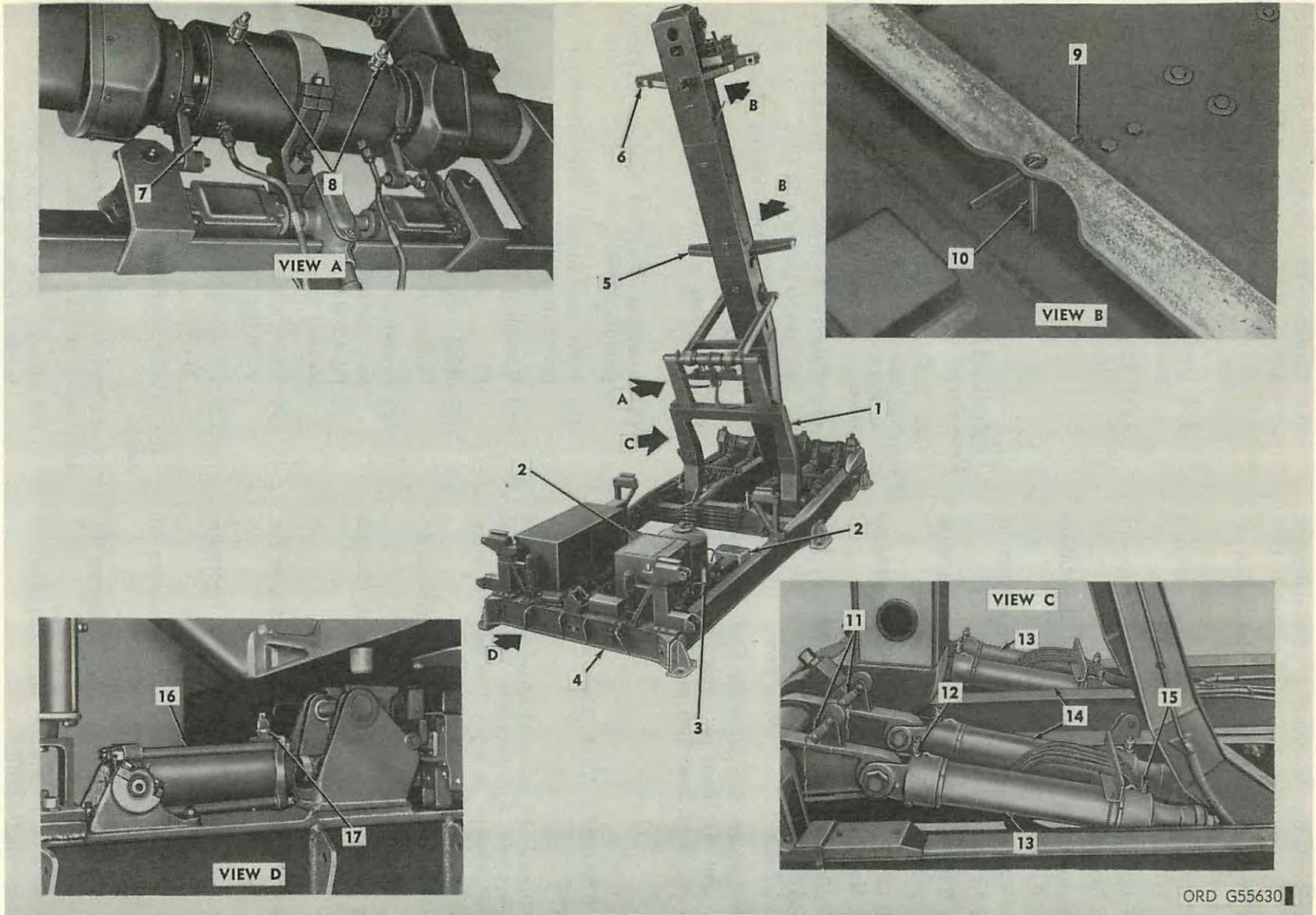


Figure 64. Air bleed and launcher erecting beam raising and lowering procedures.

- (2) Close test station valves at stations No. 4 through No. 8.
- (3) Open test station valve at station No. 9.
- (4) Open launcher No. 2 MISSILE HYDRAULIC SHUT-OFF valve and launcher No. 2 globe valve.
- (5) Turn launcher control-indicator No. 2 MISSILE HYDR switch to ON.
- (6) Wait one minute for circulation of hydraulic fluid.
- (7) Open test station valve at station No. 8.
- (8) Wait one minute for circulation of hydraulic fluid.
- (9) Continue the procedure of opening a test station valve and circulating the fluid for one minute until all six test station valves have been opened.
- (10) Turn the launcher control-indicator No. 2 MISSILE HYDR switch to OFF.
- (11) Close test station valves at stations No. 4 through No. 9, the launcher No. 2 MISSILE HYDRAULIC SHUT-OFF valve, and the launcher No. 2 globe valve.
- (12) Perform the launcher hydraulic system air bleed procedure on launcher No. 2 as described in *d* below.

*c.1. (CONUS C).* Paragraph *c* above is applicable except that test stations 7 through 9 are not installed in a Hercules CONUS C launching section.

*c.2. (CONUS C-Modified).* Paragraph *c* above is applicable except that test stations 7 through 9 are not installed in a CONUS C-modified launching section.

*c.3. (USARAL).* Paragraph *c* above is not applicable.

*c.4. (USAREUR).* Paragraph *c* above is not applicable.

*c.5. (SAC).* Paragraph *c* above is not applicable.

*Note.* The key numbers shown in parentheses in *d* below refer to figure 64 unless otherwise indicated.

*d. Launcher Hydraulic System Air Bleed Procedure.*

- (1) Observe the electrical and hydraulic precautions described in paragraph 58a and b.
- (2) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
- (3) Provide access to the front and rear bleeder valves (15 and 12) on the power and equilibrator cylinders (14 and 13) by removing the two launcher rack assemblies (fig. 68) as described in paragraph 61a (1) and (2).
- (4) Tilt the four safety devices (11) to the rear and tie them in this position to prevent damage to them.
- (5) Check that the EQUILIBRATOR ACCUMULATOR PRESSURE gage (fig. 59) reads 600 psi, SURGE ACCUMULATOR PRESSURE gage reads 2000 psi, and HYDRAULIC RESERVOIR PRESSURE gage reads 20 psi. The liquid sight indicator (3) must read FULL.
- (6) Bleed the equilibrator cylinder (13) on the right at the front bleeder valve (15) as follows.
  - (a) Place a drip pan under the valve (15).

1—Launcher strut  
 2—Shoring  
 3—Liquid sight indicator  
 4—Hercules monorail launcher  
 5—Rear outrigger  
 6—Front outrigger  
 7—Hydraulic up-lock  
 8—Bleeder valve (2)  
 9— $\frac{1}{4}$  x 6 steel rod (2)

10—Nike-Ajax indexing pin (2)  
 11—Safety device (4)  
 12—Rear bleeder valve  
 13—Equilibrator cylinder  
 14—Power cylinder  
 15—Front bleeder valve  
 16—Hydraulic down-lock  
 17—Bleeder valve

Figure 64. Air bleed and launcher erecting beam raising and lowering procedures—legend.

- (b) Remove cap and loosen valve seat of front bleeder valve (15) until fluid flows.
- (c) Allow fluid to flow until it runs clear without air or foam; tighten valve seat and install cap of front bleeder valve (15).

*Note.* If the fluid level remains at or above half full, as indicated on the liquid sight indicator (3) proceed with step (7) below. If the fluid level drops below the halfway point during the bleed procedures, stop the procedure and perform steps (d) through (f) below before proceeding with step (7). If the fluid level should drop below the liquid sight indicator (3), stop the procedure and perform steps (g) through (j) below.

- (d) Depressurize the reservoir (fig. 60) by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
- (e) Fill the reservoir to the FULL mark with hydraulic fluid as specified in paragraph 37a.
- (f) Pressurize the reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (g) Repeat steps (d) through (f) above.
- (h) (Deleted)
- (i) (Deleted)
- (j) Repeat steps (5) and (6) and proceed with step (7).
- (7) Bleed the equilibrator cylinder (13) on the left at the front bleeder valve (15) by performing the valve-bleed instructions described in step (6) (a) through (c) above.
- (8) Bleed the hydraulic up-lock (7) at both bleeder valves (8) by performing the valve-bleed instructions described in step (6) (a) through (c) above.
- (9) Close the SYSTEM BY-PASS valve (fig. 60).
- (10) Raise the erecting beam to the up-

and-locked position as described in paragraph 44.

*Warning:* Shoring (2) is used to prevent the erecting beam from descending low enough to hinder personnel during the bleeding of the hydraulic down-lock (16) in step (18) below. To avoid injury to personnel, shoring (2) should be placed so that the launcher strut (1) would come to rest on the shoring (2) and prevent the beam hook from engaging the hydraulic down-lock (16).

- (11) Position shoring (2) under the front ends of the launcher strut (1).
- (12) Bleed the power cylinder (14) on the right at the rear bleeder valve (12) by performing the valve-bleed instructions described in step (6) (a) through (c) above.
- (13) Bleed the power cylinder (14) on the left at the rear bleeder valve (12) by performing the valve-bleed instructions described in step (6) (a) through (c) above.
- (14) Bleed the equilibrator cylinder (13) on the right at the rear bleeder valve (12) by performing the valve-bleed instructions described in step (6) (a) through (c) above.
- (15) Bleed the equilibrator cylinder (13) on the left at the rear bleeder valve (12) by performing the valve-bleed instructions described in step (6) (a) through (c) above.
- (16) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60).
- (17) Lower the erecting beam as described in paragraph 44 to  $65 \pm 10$  degrees.

*Note.* The weight of the erecting beam in its erected position is used to supply hydraulic pressure for air bleeding a portion of the system. In the remaining steps the beam may, depending upon the amount of hydraulic fluid lost, descend as bleeding proceeds. It is therefore important that the erecting beam should not come to rest on the shoring (10). If the erecting beam should rest on the shoring at any time during performance of steps (18) through (20) below, the erecting beam should again be raised as described in paragraph 44 to  $65 \pm 10$  degrees and the bleeding step continued.

- (18) Bleed the hydraulic down-lock (12).
- (19) Bleed the power cylinder (14) on the right at the front bleeder valve (15) by performing the valve-bleed instructions described in step (6) (a) through (c) above.
- (20) Bleed the power cylinder (14) on the left at the front bleeder valve (15) by performing the valve-bleed instructions described in step (6) (a) through (c) above.
- (21) Raise the erecting beam to the up-and-locked position as described in paragraph 44.
- (22) Remove all shoring (10).
- (23) Lower the erecting beam to the down-and-locked position.
- (24) Depressurize the reservoir by turning the handle of the plug cock (fig. 60) to the VENT position and holding until all pressure is discharged.
- (25) Fill the reservoir to the FULL mark with hydraulic fluid as specified in paragraph 37a.
- (26) Pressurize the reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
- (27) Check the launcher hydraulic system for freedom from air contamination by raising and lowering the erecting beam at least three times at three-minute intervals.
- (28) If the erecting beam operation is erratic, repeat the complete launcher hydraulic system air bleed procedure.

- (29) Lower the erecting beam to the down-and-locked position.
- (30) (Deleted)
- (31) (Deleted)
- (32) Install launcher rack assemblies (fig. 68) as described in paragraph 61b (5) and (6).

#### 44. Launcher Erecting Beam Raising and Lowering Procedures

Raise or lower the erecting beam as described in TM 9-1440-250-12.

*Note.* Use of a launching-handling rail for raising or lowering the erecting beam to perform maintenance is optional. If it is preferred not to use a rail, the two Nike-Ajax indexing pins (10, fig. 64) must be depressed as a substitute for a rail. Perform the following steps when this procedure is desired.

##### a. Raising.

- (1) Depress the two Nike-Ajax indexing pins (10, fig. 64) in the front and rear outriggers (6 and 5, fig. 64) with  $\frac{1}{4}$  x 6 steel rods (9, fig. 64).
- (2) Raise the erecting beam to the up-and-locked position as described in TM 9-1440-250-12.
- (3) Perform required maintenance.

##### b. Lowering.

- (1) Lower beam to down-and-locked position as described in TM 9-1440-250-12.
- (2) Remove both steel rods (9, fig. 64).