CHAPTER 6
MAINTENANCE OF HERCULES
MONORAIL LAUNCHER

Section I. GENERAL

56. Scope

This chapter contains maintenance information covering the Hercules monorail launcher that is within the scope of field maintenance personnel. The scope of field maintenance is determined by the listing of field maintenance parts in TM 9-1440-250-35P and the listing of special tools for field maintenance personnel in Department of the Army Supply Manual 9-4-4935-J29-4.

57. References

Organizational maintenance of the Hercules monorail launcher is covered in TM 9-1440-250-20. Schematic diagrams are furnished in TM 9-1440-251-20 and wiring diagrams are provided in TM 9-1440-250-35. General maintenance procedures are given in chapter 4.

58. General Precautions

Before performing any maintenance on the Hercules monorail launcher, the electrical and hydraulic precautions in a through c below must be observed.

a. Electrical Precautions.

(1) Set the main power switch on the power distribution box to OFF.

(2) Shut down the launching section generator.

(3) Disconnect the cable assemblies from receptacles J6A, J69B, and J69C on the front of the power distribution box.

(4) Place the launching section generator in operation if power is required for other equipment.

b. Hydraulic Precautions.

(1) Do not move piston rods in removed hydraulic cylinders until all hydraulic fluid has been drained.

(2) Use only the specific hydraulic fluid required by prevailing local environment. Refer to paragraph 37a for type of hydraulic fluid to be used in temperate and arctic zones.

(3) Locknuts on tube tees, elbows, and other hydraulic fittings permit these fittings to be adjusted for an easy connection with the attaching pipe assembly. After installing a hydraulic component having fittings attached with locknuts, rotate fitting for easiest connection of pipe assembly and tighten locknut.

(4) Hydraulic fluid is flammable. Precautions should be taken to prevent spillage. Fire protection measures should be employed.

c. Pressurized Pneumatic and Hydraulic Systems. Whenever a tube or fitting of a pressurized system is to be loosened or removed, make certain to depressurize the system in accordance with paragraph 41.
Section II. MAINTENANCE OF LAUNCHER BASE ASSEMBLY

59. General

This section covers the maintenance of the two shock struts assemblies, two launcher rack assemblies, four safety device assemblies, and four launcher strut caps. The general precautions given in paragraph 58 must be observed whenever any maintenance is performed.

60. Shock Strut Assembly

The two shock strut assemblies (fig. 65) are attached to the support assembly on the launcher base assembly.

a. Removal.

(1) Raise the erecting beam to the up-and-locked position as described in paragraph 44.

(2) Remove shock strut assembly.

b. Disassembly (fig. 66).

(1) Remove the four hexagon nuts, lock-washers, and hexagon-head bolts.

(2) Remove base, preformed packing, and metering pin.

(3) Disassemble the remainder of the assembly.

c. Assembly.

(1) Install preformed packing and filler plug on piston, and torque to 15 ±5 pound-feet.

(2) Install compression spring and rubber bellows on piston.

(3) Install preformed packing inside and on bottom of the end.

(4) Install piston ring, plate, spring tension washer, and retaining ring on piston head.

(5) Position piston on end, compress spring, and install piston on piston head, and torque to 30 ±10 pound-feet.

Note. Make certain spring and bellows are properly seated on end.

(6) Install piston, ¼-inch fiber gasket, and ¼-28 x ¾ fillister-head overflow screw on cylinder.

(7) Install preformed packing and metering pin on base.

(8) Position cylinder properly between the end and base, and torque to 8 ±1 pound-feet.

(9) Aline the holes in the end with the holes in the base, and assemble remaining parts of shock strut assembly.

(10) Torque four ¼-28 x 6¾ hexagon-head bolts to 4 pound-feet.

d. Inspection and Test.

(1) Perform a visual inspection of shock strut assembly (fig. 67) for completeness of assembly and for nicks, scratches, or other damage.

(2) Place strut assembly in sink of hydraulic test stand — 8523711.

(3) Prior to testing, warm up the test stand as described in TEST SET OPERATION, Instruction Card 2001.

(4) Remove overflow screw (fig. 65) from side of cylinder, and remove filler plug from top of strut assembly.

(5) With strut assembly in extended position, fill cylinder with hydraulic fluid as specified in paragraph 37a, to bottom of overflow screw (fig. 66) hole.

(6) Install overflow screw.
(7) Use tube nipple—AN815–4 (fig. 67) as an adapter between the strut assembly and hose assembly—AN6292–4–72 by installing the tube nipple in the filler plug port. Torque the tube nipple to 15 ±5 pound-feet.

(8) With the strut assembly in the vertical position, install the hose assembly to the tube nipple and apply 15 ±5 pound-feet of torque to the coupling nut.

(9) Connect the other end of the hose assembly to one port of bleed valve assembly—8169439.

(10) Using hose assembly—8169536, connect the other port of the valve assembly to coupling half—8168948.

(11) Connect the coupling half to PRESSURE of the MOTOR PUMP SYSTEM.

(12) Position the controls and perform the leakage test as prescribed in table X.

(13) Open the valve assembly and allow the fluid in the hose to drain into the sink of the test stand.

(14) Install the filler plug (fig. 65) and apply 15 ±5 pound-feet of torque. Secure it with lockingwire.

e. Installation.

(1) Install the shock strut assembly on the launcher base assembly.

(2) Lower the erecting beam to the down-and-locked position as described in paragraph 44.

61. Launcher Rack Assembly and Safety Device Assembly

The two launcher rack assemblies (fig. 68) are located on each side of the launcher base assembly. Two safety device assemblies supporting the rack feet are installed on the trunnion extensions.

a. Removal.

(1) Remove the outside sleeve bearing.

Figure 65. Shock strut assembly—removal and installation—typical.
Figure 66. Shock strut assembly—disassembly and assembly.
(7) Use tube nipple — AN815-4 (fig. 67) as an adapter between strut assembly and hose assembly — 8169283 by installing tube nipple in filler plug port. Torque tube nipple to 15 ±5 pound-feet.

(8) With strut assembly in vertical position, install hose assembly to the tube nipple and torque coupling nut to 15 ±5 pound-feet.

(9) Connect the other end of the hose assembly to one port of bleed valve assembly — 8169439.

(10) Using hose assembly — 8169536, connect the other port of the valve assembly to the coupling half—8168948.

(11) Connect coupling half to PRESSURE of the MOTOR PUMP SYSTEM.

(12) Position controls and perform leakage test as prescribed in table X.

(13) Open valve assembly and allow fluid in hose to drain into sink of test stand.

(14) Install filler plug (fig. 65) and torque to 15 ±5 pound-feet.

e. Installation.

(1) Install shock strut assembly on launcher base assembly.

(2) Lower the erecting beam to the down-and-locked position as described in paragraph 44.

61. Launcher Rack Assembly and Safety Device Assembly

The two launcher rack assemblies (fig. 68) are located on each side of the launcher base assembly. Two safety device assemblies supporting the rack feet are installed on the trunnion extensions.

a. Removal.

(1) Remove outside sleeve bearing.

Figure 65. Shock strut assembly — removal and installation — typical.
Figure 66. Shock strut assembly — disassembly and assembly.
Figure 67. Shock strut assembly - leakage test.

(2) Slide rack arm from inside sleeve bearing and remove rack assembly.

(3) Remove sleeve bearing.

(4) Remove safety device assembly.

b. Installation.

(1) Assemble each roller assembly between two safety device spacers, insert sleeve bearing, and position on trunnion extension.
Figure 68. Launcher rack assembly and safety device assembly—removal and installation—typical.
(2) Slide rack arm from inside sleeve bearing and remove rack assembly.

(3) Remove sleeve bearing.

(4) Remove safety device assembly.

b. Installation.

(1) Assemble each roller assembly between two safety device spacers, insert sleeve bearing, and position on trunnion extension.
LAUNCHER RACK ASSY — 8167011 (RIGHT SIDE) 8167012 (LEFT SIDE)

SAFETY DEVICE ASSY — 8525093 (2)

INSIDE SLEEVE BRG — 8167811, 5/16-18 HEX NUT — 120375 (4), 5/16-IN. LOCK WASHER — MS35338-26 (4)

5/8-18 SLTD HEX NUT — 8176328 (2)

9/64 x 1-1/2 PIN — 590190 (2)

5/8-18 x 2-7/8 HEX-HD BOLT — 9033804 (2)

OUTSIDE SLEEVE BRG — 8167942

5/16-IN. LOCK WASHER — MS35338-26 (2)

ROLLER ASSY — 8525168

SAFETY DEVICE SPACER — 8167751

SLEEVE BRG — 8525169

TRUNNION EXTENSION (2)

RACK ARMS

RACK FEET

LAUNCHER BASE ASSY

Figure 68. Launcher rack assembly and safety device assembly — removal and installation — typical.
(2) Position the safety device assembly on the sleeve bearing and secure it and the stop with a 5/8–18 x 2 7/8 hexagon–head bolt, a 5/8–18 slotted hexagon nut, and a 9/64 x 1 1/2 cotter pin. 

Note. If the stop is not present, fabricate it in accordance with figure 68.1.

(3) With both safety device assemblies installed, install the rack feet through the safety device assemblies.

(4) Install the inside sleeve bearing with four 5/16-inch lockwashers and 5/16–18 hexagon nuts.

(5) Attach the rack arm to the inside sleeve bearing.

(6) Position the outside sleeve bearing with the other rack arm and install the outside sleeve bearing and the rack assembly with two 5/16-inch lockwashers and 5/16–18 hexagon nuts.

62. Launcher Strut Cap

Four launcher strut caps (fig. 69) are installed on the launcher base assembly to cover each end of the two strut pins. The strut caps provide for lubrication of the pins through lubrication fittings.

a. Removal. Remove the strut cap and lubrication fitting.

b. Installation. Install the launcher strut cap and lubrication fitting.
Table 10. Shocks Strut Assembly Leakage Test within Hydraulic Test Stand—8528711

<table>
<thead>
<tr>
<th>Control</th>
<th>Position</th>
<th>Reading/Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. GAGE A SHUT-OFF</td>
<td>Close</td>
<td></td>
</tr>
<tr>
<td>2. GAGE B SHUT-OFF</td>
<td>Open</td>
<td></td>
</tr>
<tr>
<td>3. PRESSURE TO MANIFOLD—MANIFOLD TO RESERVOIR</td>
<td>Open</td>
<td></td>
</tr>
<tr>
<td>4. RELIEF VALVE</td>
<td>Depress START pushbutton</td>
<td></td>
</tr>
<tr>
<td>5. PUMP MOTOR</td>
<td>Adjust slowly</td>
<td></td>
</tr>
<tr>
<td>6. RELIEF VALVE</td>
<td>Open</td>
<td></td>
</tr>
<tr>
<td>7. RELIEF VALVE</td>
<td>MANIFOLD TO RESERVOIR</td>
<td></td>
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<tr>
<td>8. PRESSURE TO MANIFOLD—MANIFOLD TO RESERVOIR</td>
<td>Close</td>
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</tr>
<tr>
<td>9. GAGE B SHUT-OFF</td>
<td>Depress STOP pushbutton</td>
<td></td>
</tr>
<tr>
<td>10. PUMP MOTOR</td>
<td>PRESSURE TO MANIFOLD</td>
<td></td>
</tr>
<tr>
<td>11. GAGE A SHUT-OFF</td>
<td>Open</td>
<td></td>
</tr>
<tr>
<td>12. PRESSURE TO MANIFOLD—MANIFOLD TO RESERVOIR</td>
<td>Depress START pushbutton</td>
<td></td>
</tr>
<tr>
<td>13. RELIEF VALVE</td>
<td>Adjust slowly</td>
<td></td>
</tr>
<tr>
<td>14. PUMP MOTOR</td>
<td>Open</td>
<td></td>
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<tr>
<td>15. RELIEF VALVE</td>
<td>MANIFOLD TO RESERVOIR</td>
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<tr>
<td>16. RELIEF VALVE</td>
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</tr>
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<td>17. PRESSURE TO MANIFOLD—MANIFOLD TO RESERVOIR</td>
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<td>18. PUMP MOTOR</td>
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<tr>
<td>19. GAGE A SHUT-OFF</td>
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</tbody>
</table>

Section III. MAINTENANCE OF LAUNCHER ELECTRICAL SYSTEM

63. General

This section describes the removal and installation of the components of the launcher electrical system allocated for direct and general support maintenance. The components of the system are divided into four general groups, referred to as the power distribution box, the launcher base electrical components, the launcher erecting beam electrical components, and the hydraulic pumping unit electrical components. The electrical precautions described in paragraph 58a must be observed whenever any electrical system maintenance is performed.

64. Power Distribution Box

The power distribution box (fig. 2) is installed on all HERCULES monorail launchers.

Note. The key numbers shown in parentheses in a and b below refer to figure 70.
(2) Position safety device assembly on sleeve bearing and install with %18 x 2% hexagon-head bolt, %-18 slotted hexagon nut, and %6 x 1½ cotter pin.

(3) With both safety device assemblies installed, install rack feet through safety device assemblies.

(4) Install inside sleeve bearing with four %6-inch lockwashers and %6-18 hexagon nuts.

(5) Attach rack arm to inside sleeve bearing.

(6) Position outside sleeve bearing with other arm and install outside sleeve bearing and rack assembly with two %6-inch lockwashers and %6-18 hexagon nuts.

62. Launcher Strut Cap

Four launcher strut caps (fig. 69) are installed on the launcher base assembly to cover each end of the two strut pins. The strut caps provide for lubrication of the pins through lubrication fittings.

a. Removal. Remove the strut cap and lubrication fitting.

b. Installation. Install the launcher strut cap and lubrication fitting.

Table X. Shock Strut Assembly Leakage Test with Hydraulic Test Stand – 8523711

<table>
<thead>
<tr>
<th>Control</th>
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<th>Reading/Indication</th>
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</thead>
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<tr>
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<td></td>
</tr>
<tr>
<td>2. GAGE B SHUT-OFF</td>
<td>Open</td>
<td></td>
</tr>
<tr>
<td>3. PRESSURE TO MANIFOLD – MANIFOLD TO RESERVOIR</td>
<td>PRESSURE TO MANIFOLD</td>
<td></td>
</tr>
<tr>
<td>4. RELIEF VALVE</td>
<td>Open</td>
<td></td>
</tr>
<tr>
<td>5. PUMP MOTOR</td>
<td>Depress START pushbutton</td>
<td></td>
</tr>
</tbody>
</table>
Table X. Shock Strut Assembly Leakage Test with Hydraulic Test Stand – 8523711 – Continued

<table>
<thead>
<tr>
<th>Control</th>
<th>Position</th>
<th>Reading Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. RELIEF VALVE</td>
<td>Adjust slowly</td>
<td>To read 800 (±50) psi on GAGE B and hold for 20 seconds. Leakage is permitted only around overflow screw. If leakage occurs elsewhere, disassemble shock strut and replace defective component.</td>
</tr>
<tr>
<td>7. RELIEF VALVE</td>
<td>Open</td>
<td></td>
</tr>
<tr>
<td>8. PRESSURE TO MANIFOLD – MANIFOLD TO RESERVOIR</td>
<td>MANIFOLD TO RESERVOIR</td>
<td></td>
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<tr>
<td>9. GAGE B SHUT-OFF</td>
<td>Close</td>
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</tr>
<tr>
<td>10. PUMP MOTOR</td>
<td>Depress STOP pushbutton</td>
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<td></td>
</tr>
<tr>
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<td>Depress START pushbutton</td>
<td></td>
</tr>
<tr>
<td>15. RELIEF VALVE</td>
<td>Adjust slowly</td>
<td></td>
</tr>
<tr>
<td>16. RELIEF VALVE</td>
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</tr>
<tr>
<td>17. PRESSURE TO MANIFOLD – MANIFOLD TO RESERVOIR</td>
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<td></td>
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<tr>
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Section III. MAINTENANCE OF LAUNCHER ELECTRICAL SYSTEM

63. General

This section describes removal and installation of the components of the launcher electrical system allocated for field maintenance. The components of the system are divided into four general groups, referred to as the power distribution box, the launcher base electrical components, the launcher erecting beam electrical components, and the hydraulic pumping unit electrical components. The electrical precautions described in paragraph 58a must be observed whenever any electrical system maintenance is performed.

64. Power Distribution Box

The power distribution box (fig. 2) is installed on all Hercules monorail launchers.

Note. The key numbers shown in parentheses in a and b below refer to figure 70.
a. Access Door Assembly.

(1) Removal. Release stud assemblies (6), remove headless straight pin (2) from access door assembly (3) and remove access door assembly (3).

(2) Disassembly.

(a) Remove 11 split washers (5) and stud assemblies (6).

(b) Remove rubber gasket (7).

(3) Assembly.

(a) Install rubber gasket (7) on plate (4) as described in paragraph 36b.

(b) Install 11 stud assemblies (6) and split washers (5) on plate (4) using sealant—5030-275-8110 as described in TM 9-1400-250-35.

(4) Installation.

(a) Position access door assembly (3) on power distribution box (1) and install headless straight pin (2).

(b) Peen ends of headless straight pin (2) and close access door assembly (3).

b. Cover Assembly.

(1) Removal.

(a) Remove 14 button-head screws (8) from cover assembly (9).

(b) Disconnect relay rack wiring harness assembly (10).

(c) Remove cover assembly (9).

(2) Disassembly.

(a) Remove five hexagon nuts (11), lockwashers (12), and round-head screws (13) from cover angle (14).

(b) Remove relay rack assembly (15).

(c) Remove rubber-cork gasket (16) from cover plate (17).

(3) Assembly.

(a) Install rubber-cork gasket (16) on cover plate (17) as described in paragraph 36b.

(b) Install relay rack assembly (15) on cover angle (14).

(4) Installation.

(a) Connect relay rack wiring harness assembly (10) to relay rack assembly (15) and position cover assembly (9) on power distribution box (1).

(b) Install cover assembly (9).

c. (Deleted)

d. (Deleted)

f. Terminal Board Group.

(1) Removal.

(a) Remove cover assembly (9, fig. 70) as described in b(1) above.

(b) Disconnect cable assemblies and wiring harness assemblies (figs. 73, 75, and 76) attached to terminal board group (fig. 73).

(c) Remove board group.

(2) Disassembly. Disassemble the board group as required.

(3) Assembly. Assemble the terminal board group.

(4) Installation.

(a) Position and install board group.

(b) Install clamp around relay rack wiring harness assembly.

(c) Refer to TM 9-1440-250-35 and make proper wiring connections to board group.

(d) Install cover assembly (9, fig. 70) as described in b(4) above.

g. Hydraulic Pumping Unit Power Wiring Harnesses.

(1) Removal.

(a) Remove cover assembly (9, fig. 70) as described in b(1) above.

(b) Remove wiring harness assembly (1 or 2, fig. 74).

(2) Installation.

(a) Apply class B sealant—EC1608 (9020050) or equivalent between...
Figure 70. Power distribution box access door assembly, cover assembly, and relay rack wiring harness assembly—removal and installation.
connector assembly and wall of distribution box (5, 6, fig. 74) as described in TM 9-1400-250-35.

(b) Install wiring harness assembly (1 or 2, fig. 74).

(c) Refer to TM 9-1440-250-35 and make proper wiring connections.

(d) Install cover assembly (9, fig. 70) as described in b(4) above.

h. Internal Cable Assemblies. Receptacles of 11 internal cable assemblies and wiring harness assemblies are located on the front, left, and rear of the power distribution box assembly (figs. 73 and 75). These receptacles are externally secured by either of two ways: with four screws attaching the cable assembly to panel of distribution box assembly, or with a single nut retaining the cable assembly from the outside. Another wiring harness assembly (fig. 77) connects to a receptacle on the back of the circuit breaker panel assembly on distribution box assemblies of launcher units 1250 and subsequent. Removal and installation procedures for both of these types of receptacles and their cable assemblies are described in (1) and (2) below.

(1) Removal.

(a) Remove cover assembly (9, fig. 70) as described in b(1) above.

(b) Remove or disconnect cover or cover assembly on receptacle of cable assembly (figs. 75, 76, and 77) or wiring harness assembly requiring maintenance.

(c) Remove mounting hardware as required to disconnect cable assembly or wiring harness assembly from panel of distribution box.

Note. Refer to figure 77 when removing cable assemblies through clamps on bracket.

(d) Remove cable assembly or wiring harness assembly (figs. 75, 76 and 77) requiring maintenance.

(2) Installation.

(a) Position cable assembly or wiring harness assembly (figs. 75, 76, and 77) through its appropriate mounting hole.

(a.1) Apply class B sealant—EC1608 (9020050) or equivalent between receptacle of cable assembly and wall of power distribution box, as prescribed in TM 9-1400-250-35, for wiring harnesses or cable assemblies (9, 12, 21 and 22, fig. 75; 7, 8, 11, and 12, fig. 76).

(b) Install receptacle of cable assembly or wiring harness assembly with mounting hardware.

(c) Install clamp (4 or 5, fig. 77).

(d) Refer to TM 9-1440-250-35 and make proper wiring connections.

(e) Install cover assembly (9, fig. 70) as described in b(4) above.

h.1. Shutoff Cock.

(1) Removal.

(a) Remove cover assembly (9, fig. 70) as described in b(1) above.

(b) Remove shutoff cock (24, fig. 75).

(2) Installation.

(a) Install shutoff cock (24, fig. 75).

(b) Install cover assembly (9, fig. 70) as described in b(4) above.

i. (Deleted)

Note. The key numbers in parentheses in j below refer to figure 78 unless otherwise indicated.
Figure 78. Terminal board group — removal and installation.
j. Erecting Beam Power Cable Assembly.

(1) Removal.

(a) Check that wiring harnesses (1 and 2, fig. 74) are disconnected from receptacle connectors (3, fig. 74).

(b) Check that erecting beam power cable assembly (9) is disconnected.

(c) Remove power distribution box (3).

(d) Remove cover assembly as described in b(1) above.

(e) Remove adapter assembly (4) and conduit outlet cover (8).

(f) Remove erecting beam power cable assembly (9).

(2) Installation.

(a) Position adapter assembly (4) and conduit outlet cover (8) on erecting beam power cable assembly (9).

(b) Position erecting beam power cable assembly (9) electrical leads in power distribution box (3).

(c) Apply class B sealant—EC1608 (9020050) or equivalent to attaching surface of conduit outlet cover (8) and power distribution box (3) as prescribed in TM 9-1400-250-35.

(d) Install conduit outlet cover (8).

(e) Refer to TM 9-1440-250-35 and connect wire leads of erecting beam power cable assembly (9).

(f) Install adapter assembly (4).

(g) Install cover assembly as described in b(4) above.

(h) Install power distribution box (3).

k. Relay Rack Wiring Harness Assembly.

(1) Removal.

(a) Remove cover assembly (9, fig. 70) as described in b(1) above.

(b) Remove wiring harness assembly (fig. 73).

(c) Remove wiring harness assembly from cover assembly (9, 10, fig. 70).

(2) Installation.

(a) Refer to TM 9-1440-250-35 and make proper wiring connections to terminal board group (fig. 73).

(b) Install relay rack wiring harness assembly in clamp (fig. 73).

(c) Install cover assembly (9, fig. 70) as described in b(4) above.
Figure 75. Internal cable assemblies, wiring harness assemblies, and shutoff cock—removal and installation.
Figure 76. Internal cable assemblies and wiring harness assemblies—removal and installation.

1—No. 8-32 hexagon nut—MS20865-1032A
2—% inch flat washer—446161
3—No. 10-32 x % round-head screw—155203
4—Clamp—MS21919H16
5—Clamp—MS21919H20
6—Wiring harness assembly—9032775
7—Figure 77. Internal cable assemblies and wiring harness assemblies—removal and installation—Continued.
8—Bracket
9—Cable assembly—8167550
10—Cable assembly—8167548

Figure 77. Internal cable assemblies and wiring harness assemblies—removal and installation—Continued.
65. Launcher Base Electrical Components

The launcher base electrical components (fig. 79) are the launcher-base cable assembly, down-lock cable assembly, up-lock cable assembly, up-lock limit switch group, and the telephone-jack extension cable assembly. An up-lock limit switch mechanical linkage (fig. 89) is located on each side of the limit switch group.

Note. The key numbers shown in parentheses in a below refer to figure 80 unless otherwise indicated.

a. Launcher-Base Cable Assembly. Removal and installation of the launcher-base cable assembly (5) also provides for maintenance of box connector assembly (4) in the knee of the launcher erecting-beam assembly (27) and the adapter assembly (15) which routes the cable assembly from the launcher base assembly (24) into the beam assembly.

   (1) Removal.

   (a) Install the erecting-beam support as described in paragraph 36d.

   (b) Remove the shield (fig. 82) from the left end of the trunnion.

   Caution: To prevent damage to the auxiliary jack in mobile installations, loosen the strap that secures the jack to the launcher base, and shift the position of the jack before performing step (c) below.

   (c) Remove the erecting-beam trunnion dust cover (fig. 82).

   (d) Remove the beam center cover (fig. 82).

   (e) Remove the three gasket cover assemblies (fig. 83).

   (f) Disconnect the cable assembly from the terminal board assembly (fig. 90).

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Figure 78. Erecting-beam power cable assembly—removal and installation.
1—Up-lock limit switch group
2—Launcher strut (2)
3—Launcher base
4—Up-lock cable assembly
5—Launcher-base cable assembly
6—Power distribution box
7—Telephone-jack extension cable assembly
8—Down-lock cable assembly
9—Launcher erecting beam

Figure 79. Launcher-base electrical components—location.
(g) Remove clamp (2) on terminal board assembly (3).

(h) Attach a 6-foot pullthrough line to terminal end, without connector (fig. 84), of cable assembly as described in 1 through 4 below.

1. Tape one end of line to cable assembly approximately 18 inches back from first wire of cable assembly break-out point.

   Note. This short pullthrough line will be used as an end on which additional pullthrough lines will be attached as each line is to be installed. This accommodation prevents repeated tapping of lines on end of cable assembly each time line is installed.

2. Tie line in half-hitches around cable assembly three or four times, spacing half-hitches approximately three inches apart.

3. Tape line to cable assembly after last half-hitch.

4. Tape all terminals to line so as to form a long taper.

(i) Tie a 14-foot pullthrough line (fig. 85) to the free end of line attached to cable assembly and tape knot to form tapers.

(j) Tie free end of pullthrough line to any convenient part of launcher erecting beam to prevent accidental pullthrough.

(k) Loosen packing nut (4A) and pull cable assembly (5) through box connector assembly (4) center conduit (fig. 85) and out through beam center cover hole.

(k.1) Remove tape (7), if tube binds when pulling cable assembly (5) through conduit (26) and box connector assembly (4).

(l) Separate 14-foot pullthrough line and cable assembly line, leaving pullthrough line in erecting beam.

(m) Tie a 10-foot pullthrough line to cable assembly line and tape knot as before, securing free end of line to prevent accidental pullthrough.

(n) Pull cable assembly through rear conduit and out through trunnion dust cover hole.

(o) Separate pullthrough line and cable assembly line, leaving pullthrough line in erecting beam.

(p) Tie a 6-foot pullthrough line to cable assembly line, securing free end and taping knot as before.

(q) Remove clamp (11) securing cable assembly (5) to left end of trunnion (12).

(r) Remove lockwire (13) securing insulation tape (14) to cable assembly near
Figure 80. Launcher base cable assembly—removal and installation.
1—No. 10-32 x ⅛ round-head screw—155203
2—Clamp—MS21919G30
3—Terminal board
4—Box connector assembly—8527587
   A—Packing nut—15235-5478B
   B—Gland washer—15235-8858A
   C—Rubber bushing—15235-BUSH913
   D—Gasket—15235-830
   E—Body—15235-16595B
   F—Nut—15235-12307-A
   G—Adapter—15235-16255A
   H—Grip ring seat—15235-16245A
   J—Grip ring—15235-13373A
5—Launcher base cable assembly—8167948
6—Bushing insulator—8526258
7—Tape—18355-8167182-11
8—Rubber tube—18355-8167182-9
9—No. 10-32 hexagon nut—MS20365-1032A
10—No. 10-32 x ½ round-head screw—155193
11—Clamp—MS21919G30
12—Trunnion

13—0.051-inch lockwire—MS20995N51 (10 feet)
14—⅛ x 3 insulation tape—9029984 (6 feet)
15—Adapter assembly—8528516
   A—Packing nut—15235-NUT913
   B—Washer—15235-8858A
   C—Rubber bushing—15235-BUSH913
   D—Body—15235-5474B
16—Bushing insulator—8526258
17—5⅛-18 x ⅛ cross-recessed flat-head screw—156431 (4)
18—Support—9027445
19—Rubber and cork gasket—9027138
20—⅜-20 x ½ cap screw—MS35447-35 (6)
21—⅜-inch lockwasher—MS35338-25 (6)
22—5⅛ in. x ¾ in. flat washer—MS15795-211 (4)
23—Chassis
24—Launcher base assembly
25—1½ in. x 0.045 thick x 400 long insulation sleeving—18355-8167182-3
26—Conduit
27—Launcher erecting beam assembly

Figure 80. Launcher base cable assembly—removal and installation—legend.

Figure 81. (Deleted)
Figure 82. Launcher base and launcher erecting beam access covers — removal and installation.
Figure 83. Launcher base and launcher erecting beam access covers – removal and installation – Continued.
Figure 84. Pullthrough line—method of attachment.
(t) Separate pullthrough line and cable lines, leaving pullthrough line in trunnion (fig. 85).

(u) (Deleted.)

(v) Loosen adapter assembly (15) and remove support (18) and rubber and cork gasket (19).

(w) Tie a 20-foot pullthrough line (fig. 85) to cable line, securing free end and taping knot as before.

(x) Remove cap screws (20) lock-washers (21), and flat washers (22) securing chassis (23) to launcher base assembly (24).

(y) Remove cable assembly (5).

(z) Separate pullthrough line and cable line, leaving pullthrough line in launcher base (fig. 85).
(aa) Remove insulation sleeving (25) from cable assembly (5).

Caution: Use care not to damage tube and sleeving as it will be used when reinstalling cable assembly.

(2) Installation.

(a) Install 1½ id x 0.045 thick x 400 long insulation sleeving (25) on launcher base cable assembly (5).

(b) Attach a 6-foot pullthrough line to terminal end of cable assembly (5) as described in (1) (h) above and tie to 20-foot pullthrough line (fig. 85) in launcher base.

(c) Pull cable assembly through launcher base conduit, assisting feed from input end.

(d) Separate pullthrough lines.

(e) Install chassis (28) on launcher base assembly (24).

(f) Wrap cable assembly (5) between support (18) and trunnion with insulation tape (14) and secure tape with lockwire (18) as described in paragraph 38c.

(g) Install rubber and cork gasket (19), support (18), and adapter assembly (15).

(h) (Deleted)

(i) Tie the 6-foot pullthrough line (fig. 85) in trunnion to line of cable assembly and tape knot as before.

Caution: Failure to exercise care when installing cable assembly through clamps (11) and other clamps inside trunnion (12) in following step may result in damage to clamps. Replacement of any damaged clamp is unusually difficult due to their inaccessibility inside the trunnion (12).

(j) Pull cable assembly through clamps inside trunnion (12) and out trunnion dust cover hole (fig. 85), assisting cable feed from input end.

Note. If clamps are broken during this operation, remove clamps as described in paragraph 89c (1) through (10). Install clamps as described in paragraph 89f (4) through (10).

(k) Install clamp (11) at left end of trunnion.

(l) Separate pullthrough lines and tie 10-foot pullthrough line (fig. 85) to line of cable assembly, taping knot as before.

(m) Pull line and cable assembly through rear conduit and out beam center cover hole.

(n) Separate pullthrough lines.

(o) Tie 14-foot pullthrough line to line of cable assembly and tape knot as before.

(p) Pull cable assembly through center and front conduits (fig. 85) and box connector assembly (4).

(q) Install box connector assembly (4). (q.1) Insert rubber tube (8) 6 inches into conduit (26) and around cable assembly (5), sufficient to prevent chafing at outlet of conduit (26).

(q.2) Wrap and rubber tie tube (8) to cable assembly (5) with tape (7).

(r) Remove pullthrough lines (fig. 85).

(s) Refer to TM 9-1440-250-35 and make proper wiring connections to terminal board (3).

(t) Install clamp (2).

(u) Install three gasket cover assemblies (fig. 88).

(v) Install beam center cover, (fig. 82) trunnion dust cover, and shield.

(w) Remove the erecting beam support—9029892 as described in paragraph 36d.

b. Down-Lock Cable Assembly (Including Switch Assembly).

(1) Removal.

(a) Install the erecting beam support—9029892 as described in paragraph 36d.

(b) Disconnect cable assembly from receptacle connector J85A (fig. 86) on power distribution box assembly.
Figure 86. Down-lock cable assembly — removal and installation.
(c) Remove electrical switch cover and cable assembly from support.

(2) Disassembly. Disassemble down-lock limit switch assembly and adapter assembly.

(3) Assembly.
(a) Position adapter assembly on cable.
(b) Refer to TM 9-1440-250-35, make proper wiring connections, and install down-lock limit switch assembly on cable.
(c) Install neoprene gasket and cover on switch assembly.

(4) Installation.
(a) Install cable assembly on support.
(b) Install electrical switch cover.
(c) Connect cable assembly to receptacle connector J85A.
(d) Remove the erecting beam support—9029892 as described in paragraph 36d.

(5) Inspection, test, and adjustment.
Adjust switch assembly as described in TM 9-1440-250-20.

c. Up-Lock Cable Assembly.
(1) Removal.
(a) Install the erecting beam support—9029892 as described in paragraph 36d.
(b) Remove cover (fig. 87) and rubber gasket on outlet.
(c) Remove covers and gaskets from both up-lock limit switch assemblies.
(d) Pull disconnected wires out through opening of conduit and tie a 3-foot pullthrough line, (fig. 84), to the wires as described in a (1) (h) 1 through 4 above.
(e) Tie a 5-foot pullthrough line (fig. 88) to line attached to cable assembly and tape knot to form tapers.
(f) Tie free end of line to any convenient object to prevent accidental pullthrough.

(g) Remove conduit outlet cover (fig. 87) and rubber gasket from cross-member of launcher strut at lower end of upper flexible conduit assembly.

(h) Pull cable assembly through flexible conduit assembly and separate pullthrough line and cable assembly line, leaving line in flexible conduit assembly.

(i) Tie a 12-foot pullthrough line (fig. 88) to cable assembly line, securing free end and taping knot as before.

(j) Remove strap (view A, fig. 87), conduit outlet cover, and rubber gasket.

(k) Bend lower flexible conduit assembly and pull cable assembly out of conduit in strut.

(l) Separate lines, leaving pullthrough line in conduit (fig. 88).

(m) Tie a 5-foot pullthrough line to cable assembly line, securing free end and taping knot as before.

(n) Disconnect lower flexible conduit assembly (view A, fig. 87) from base conduit.

(o) Pull cable assembly out through flexible conduit assembly and separate lines, leaving pullthrough line in flexible conduit assembly.

(p) Tie a 15-foot pullthrough line to cable assembly line, securing free end and taping knot as before.

(q) Loosen adapter assembly (fig. 87) at end of base conduit and disconnect connector from receptacle connector J84A.

(r) Pull cable assembly out through conduit and separate lines, leaving pullthrough line (fig. 88) in conduit.

(s) Replace straps (fig. 87) on conduit as required.

(2) Installation.
(a) Attach a 3-foot pullthrough line to
Figure 87. Up-lock cable assembly — removal and installation.
terminal end of up-lock cable assembly as described in a (1) (h) 1 through 4 above.

(b) Tie the 15-foot pullthrough line (fig. 88) in launcher base conduit to line of cable assembly and tape knot to form tapers.

(c) Connect connector (fig. 87) to receptacle connector J84A.

(d) Pull cable assembly through base conduit.

(e) Separate pullthrough line and line of cable assembly, and tie 5-foot pullthrough line to line of cable assembly as before.

(f) Pull cable assembly through lower flexible conduit assembly (fig. 87).

(g) Separate pullthrough line and line of cable assembly, and tie 12-foot pullthrough line (fig. 88) in launcher strut (fig. 87) to line of cable assembly as before.

(h) Pull cable assembly through conduit of launcher strut and out through hole in crossmember of strut.

(i) Separate pullthrough line and line of cable assembly and tie pullthrough line in upper flexible conduit to line of cable assembly as before.

(j) Pull cable assembly through flexible conduit and out the outlet.

(k) Remove lines and tape from cable assembly and feed wires of cable assembly through nipples to appropriate limit switch assembly.
(l) Refer to TM 9-1440-250-35 and make proper wire connections.

(m) Install rubber gaskets and covers.

(n) Pull slack from cable assembly through end of upper flexible conduit, through lower flexible conduit, and through base conduit.

(o) Install adapter assembly and tighten packing nut.

(p) Install strap (view A) to lower flexible conduit.

(q) Install rubber gaskets, cover, and conduit outlet cover at upper and lower flexible conduits.

(r) Install rubber gasket and cover on outlet.

(s) Install connector on receptacle connector J84A.

(t) Remove the erecting beam support—9029892 as described in paragraph 36d.

d. Up-lock Limit Switch Group. The up-lock limit switch group consists of two up-lock limit switches (fig. 89) and two up-lock limit switch mechanical linkages between the limit switches and the hydraulic up-lock assembly. Maintenance of the limit switches is described in (1) below, while a typical removal and installation of a mechanical linkage is described in (2) below.

(1) Up-lock limit switch.

(a) Removal.

1. Install the erecting beam support—9029892 as described in paragraph 36d.

2. Open the EQUILIBRATOR SYSTEM BYPASS valve (fig. 60) and system bypass valve.

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. Remove clamp (fig. 199) and two tube assemblies attached to hydraulic up-lock assembly and cap exposed lines.

5. Remove covers (fig. 89) and rubber gaskets from limit switches.

6. Remove cover and rubber gasket from conduit outlet.

7. Remove both switches from crossmember.

8. Remove switches.

(b) Installation.

1. Install up-lock limit switches on left and right nipples.

2. Refer to TM 9-1440-250-35 and make proper wire connections.

3. Install rubber gaskets and covers on both switches and the conduit outlet.

4. Remove caps and install clamp (fig. 199) and two tube assemblies. Torque coupling nuts of two tube assemblies to 200 pound-inches.

5. Close the EQUILIBRATOR SYSTEM BYPASS valve (fig. 60) and system bypass valve.

6. Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

7. Perform air bleed procedures as described in paragraph 43.

8. Adjust limit switch levers (fig. 89) as described in TM 9-1440-250-20.

9. Remove the erecting beam support—9029892 as described in paragraph 36d.

(2) Up-lock limit switch mechanical linkage.

(a) Removal.

1. Install the erecting beam support—9029892 as described in paragraph 36d.

2. Remove mechanical linkage group (fig. 89).
Figure 89. Up-lock limit switch group — removal and installation.
1—Telephone-jack extension cable assembly 9978888
2—Receptacle connector J3B
3—Power distribution box
4—No. 8–32 x ½ pan-hd screw MS35206–42
5—No. 8–32 self-lkg hex. nut MS21044N08
6—Clamp MS21919DG4
7—Clamp MS21919DG6
8—Tube assembly 8167874
9—No. 10–32 x ½ pan-hd screw MS35207–57 (2)
10—No. 10 fl washer AN960–30 (1)
11—Bracket 9978889
12—Rack support assembly 8525185
13—No. 6–32 x ½ pan-hd screw MS35206–28
14—No. 6–32 self-lkg hex. nut MS21044N06
15—No. 6 fl washer AN960–6
16—Clamp MS21919DG4
17—Cover 8176471
18—1–32 mounting nut (p/o telephone-jack extension cable assembly 9978888)
19—Receptacle connector J3C (p/o telephone-jack extension cable assembly 9978888)

*Figure 89.1. Telephone-jack extension cable assembly—removal and installation.*

(b) Installation.
1. Install the mechanical linkage.
3. Remove the erecting-beam support as described in paragraph 36d.

(e) Telephone-Jack Extension Cable Assembly.

Note. The key numbers shown in parentheses in (1) and (2) below refer to figure 89.1.

(1) Removal.
(a) Install the erecting-beam support as described in paragraph 36d.
(b) Disconnect the telephone-jack extension cable assembly (1) from receptacle connector J3B (2) on the side of the power distribution box (3).
(c) Remove the clamps (6 and 7) that secure the cable assembly to the tube assembly (8).

(d) Remove the bracket (11) from the rack support assembly (12).

(e) Remove the clamp (16) that secures the cable assembly to the bracket, and remove the cover (17).

(f) Remove the mounting nut (18) and remove receptacle connector J3C (19) from the bracket.

(2) Installation.

(a) Remove the mounting nut (18) from receptacle connector J3C (19) and position the connector through the hole in the bracket (11). Secure the connector with the mounting nut.

(b) Install the cover (17) on the connector and the clamp (16) on the telephone-jack extension cable assembly (1). Secure the cover and the clamp to the bracket.

(c) Install the bracket on the rack support assembly (12).

(d) Secure the cable assembly to the tube assembly (8) with the clamps (6 and 7).

(e) Connect the cable assembly to receptacle connector J3B (2) on the side of the power distribution box (3).

(f) Remove the erecting beam support as described in paragraph 36d.
66. Launcher Erecting-Beam Electrical Components

The major electrical components of the launcher erecting beam (fig. 90) are the erecting-beam power output cable assembly, HERCULES squib cable assembly, forward-locking-wedge cable assemblies, rear-locking-wedge cable assemblies, front AJAX rail-lock cable assembly, rear AJAX rail-lock cable assembly, squib test wiring harness, and the terminal board assemblies.

a. Erecting-Beam Power Output Cable Assembly.

(1) Removal.

(a) Install the erecting-beam support as described in paragraph 36d.

(b) Remove the three gasket cover assemblies (fig. 83) and the access cover plate.

(c) Disconnect the cable assembly (fig. 91) from the terminal board.
Figure 91. Erecting beam power output cable assembly — removal and installation.
(d) Attach an 8-foot pullthrough line to terminal end of cable assembly as described in paragraph 65a (1) (h) 1 through 4.

(e) Tie free end of pullthrough line to any convenient part of terminal board (fig. 91) to prevent accidental pullthrough.

(f) Remove clamp on terminal board group.

(g) Remove clamp securing cable assembly to inside bottom of erecting beam.

(h) Loosen packing nuts.

Note. On launcher models 1021 through 1252, the connectors are held on to the bulkhead with a locknut. It must be removed and installed during removal and installation of the cable assemblies.

(i) Support weight of bracket; remove bracket and pull cable assembly clear.

(j) Detach cable assembly from pullthrough line.

(k) Pull cable assembly clear of bracket.

(2) Installation.

(a) Attach the pullthrough line to terminal end of cable assembly as described in paragraph 65a (1) (h) 1 through 4.

(b) Insert cable assembly through bracket and secure to bracket.

(c) Install bracket with twelve ½-20 x ¾ hexagon-head cap screws and ¼-inch lockwashers.

(d) Secure cable assembly with clamp.

(e) Install box connector assemblies and tighten packing nuts.

(f) Secure cable assembly to terminal boards with clamp.

(g) Remove pullthrough line.

(h) Refer to TM 9-1440-250-35 and make proper wire connections.

(i) Install three gasket cover assemblies (fig. 83) and access cover plate.

(j) Remove the erecting beam support—9029892 as described in paragraph 36d.

b. Hercules Squib Cable Assembly.

(1) Removal.

(a) Install the erecting beam support—9029892 as described in paragraph 36d.

(b) Remove three gasket cover assemblies (fig. 83).

(c) Detach cable assembly (fig. 92) from side of launcher erecting beam.

(d) Loosen packing nut on connector (on launcher units 1253 and subsequent).

Note. For launcher serial numbers 1021 through 1252, loosen adapter assembly (fig. 93) remove shell, and rubber gasket. For serial numbers 1161 through 1252 remove bushing in addition to above.

(e) Remove clamp (fig. 92) securing cable assembly to bulkhead.

(f) Attach an 8-foot pullthrough line to terminal end of cable assembly as described in paragraph 65a (1) (h) 1 through 4.

(g) Tie free end of pullthrough line to any convenient part of erecting beam assembly to prevent accidental pullthrough.

(h) Remove cable assembly and untie pullthrough line.

(2) Installation.

(a) Attach the pullthrough line in launcher erecting beam assembly to terminal end of cable assembly as described in paragraph 65a (1) (h) 1 through 4.

(b) Pull cable assembly through box connector assembly. Refer to TM...
Figure 92. Hercules squib cable assembly—removal and installation.
Figure 93. Erecting beam bulkhead electrical connectors (1021 through 1252).
9-1440-250-35, and make proper wire connections.

(c) Attach cable assembly to beam assembly.

(d) Tighten packing nut on connector assembly (on launcher units 1253 and subsequent).

Note. For launcher serial numbers 1021 through 1160 install shell (fig. 93) adapter assembly, and rubber gasket. For serial numbers 1161 through 1252 install bushing in addition to above.

(e) Install clamp (fig. 92).

(f) Install three gasket cover assemblies (fig. 83).

(g) Remove the erecting beam support—9029892 as described in paragraph 36d.

c. Resistor Cable Assembly Bracket Group.

(1) Removal.

(a) Install the erecting beam support—9029892 as described in paragraph 36d.

(b) Remove three gasket cover assemblies (fig. 83).

(c) Remove resistor cable assembly bracket group (fig. 94).

(2) Disassembly. Disassemble bracket group.

(3) Assembly. Assemble bracket group.

(4) Installation.

(a) Install the bracket group.

(b) Install three gasket cover assemblies (fig. 83).

(c) Remove the erecting beam support—9029892 as described in paragraph 36d.

d. Forward Locking Wedge Lock Cable Assembly. Removal and installation of the forward locking wedge lock cable assembly (fig. 95) provides for maintenance of the attached switch assembly and all configurations of the box connector assembly.

(1) Removal.

(a) Install the erecting beam support—9029892 as described in paragraph 36d.

(b) Remove gasket cover assemblies (fig. 83) at the front and center, and front end cover.

(c) Remove switch (fig. 95) from erecting beam assembly by removing four hexagon-head screws and lockwashers.

(d) Disconnect clamps (fig. 96) that secure lock cable assembly to terminal board.

(e) Attach a 10-foot pullthrough line to terminal end of cable assembly as described in paragraph 65a(1) (h) 1 through 4.

(f) Tie free end of pullthrough line to any convenient part of erecting beam assembly to prevent accidental pullthrough.

(g) Loosen bondnut (fig. 95), packing nut, and bushing on connector assembly; and detach shell and rubber gasket from bulkhead (for launcher units 1021 through 1252).

(h) Loosen packing nut and locknut on connector assembly at bulkhead (for launcher units 1253 and subsequent).

(i) Pull lock cable assembly from erecting beam assembly and remove pullthrough line from cable assembly.

(2) Disassembly. Disassemble lock cable assembly.

(3) Assembly. Refer to TM 9-1440-250-35, make proper wire connections, and assemble lock cable assembly.

(4) Installation.

(a) Attach the pullthrough line to lock cable assembly as described in paragraph 65a (1) (h) 1 through 4.
Figure 94. Resistor cable assembly bracket group – removal and installation.
Figure 95. Forward locking wedge cable assemblies — removal and installation.
Figure 96. Rear locking wedge cable assemblies—removal and installation.
(b) Pull lock cable assembly through launcher erecting beam assembly, and detach pullthrough line.

(e) Refer to TM 9-1440-250-35 and make proper wiring connections to terminal board.

(d) Install clamps (fig. 96) that secure lock cable assembly (fig. 95).

(e) Install switch assembly on erecting beam assembly with four ¼-20 x 2¼ hexagon-head screws and ¼-inch lockwashers.

(f) Install front end erecting beam cover (fig. 83) and gasket cover assemblies.

(g) Remove the erecting beam support -9029892 as described in paragraph 36d.


(e) Remove clamps that secure lock cable assembly to terminal board.

(f) Attach 14-foot pullthrough-line to terminal end of lock cable assembly as described in paragraph 65a(1) (h) 1 through 4.

(g) Tie free end of pullthrough line to any convenient part of erecting beam assembly to prevent accidental pullthrough.

(h) Loosen packing nut on box connector assembly.

(i) Pull lock cable assembly from erecting beam assembly and remove pullthrough line.

(2) Installation.

(a) Attach the pullthrough line to terminal end of lock cable assembly as described in paragraph 65a (1) (h) 1 through 4.

(b) Pull lock cable assembly through launcher erecting beam assembly and untie pullthrough line.

(c) Refer to TM 9-1440-250-35 and make proper wire connections.

(d) Install clamps that secure lock cable assembly to terminal board group.

(e) Install box connector assembly and tighten packing nut.

(f) Install switch assembly with four ¼-20 x 2¼ hexagon-head screws and ¼-inch lockwashers.

(g) Install beam center cover (fig. 82).

(h) Install three gasket cover assemblies (fig. 83).

(i) Remove the erecting beam support -9029892 as described in paragraph 36d.

(3) Adjustment. Adjust switch assembly as described in TM 9-1440-250-20.

(g) Rear Locking Wedge Unlock Cable Assembly. Removal and installation of the rear locking wedge unlock cable assembly (fig. 96) provides for maintenance of the attached switch assembly and box connector assembly.

(1) Removal.

(a) Install the erecting beam support -9029892 as described in paragraph 36d.

(b) Remove three gasket cover assemblies (fig. 83).

(c) Remove beam center cover (fig. 82).

(d) Remove switch assembly (fig. 96) from erecting beam assembly by removing four hexagon-head screws and lockwashers.
assembly and box connector assembly. Maintenance procedures are the same as those described in f above.

h. Front Ajax Rail Lock Cable Assembly. Removal and installation of the front Ajax rail lock cable assembly (fig. 97) provides for maintenance of the attached switch assembly and connector assembly.

1. Removal.
   (a) Install the erecting beam support—9029892 as described in paragraph 36d.
   (b) Remove gasket cover assemblies (fig. 83) at the front and center.
   (c) Remove clamp (fig. 97) securing cable assembly to terminal board.
   (d) Disconnect connector assembly from bulkhead.
   (e) Remove cable assembly.


4. Installation.
   (a) Install switch assembly with four ¼-20 x 2¾ hexagon-head cap screws, ¼-inch flat washers, ¼-inch lockwashers, and ¼-20 hexagon nuts.
   (b) Install connector assembly on cable assembly, secure connector assembly to bulkhead with locknut, and tighten packing nut.
   (c) Install clamp.
   (d) Refer to TM 9-1440-250-35 and make proper wire connections.
   (e) Install gasket cover assemblies (fig. 83).
   (f) Remove the erecting beam support—9029892 as described in paragraph 36d.

i. Rear Ajax Rail Lock Cable Assembly. Removal and installation of the rear Ajax rail lock cable assembly (fig. 98) also provides for maintenance of the attached switch assembly, connector assembly, and the rubber grommet.

1. Removal.
   (a) Install the erecting beam support—9029892 as described in paragraph 36d.
   (b) Remove three gasket cover assemblies (fig. 83).
   (c) Remove three clamps (fig. 96) securing cable assembly to terminal board.
   (d) Remove clamp (fig. 98) securing cable assembly to flange.
   (e) Disconnect connector assembly from front bulkhead.
   (f) Detach switch assembly from erecting beam assembly.
   (g) Pull cable assembly through connector assembly, rubber grommet, hole in rear bulkhead, and out through access hole in left side of erecting beam assembly.
   (h) Remove rubber grommet.

2. Disassembly. Disassemble cable assembly (fig. 97).


4. Installation.
   (a) Install rubber grommet (fig. 98) in rear bulkhead.
   (b) Position wires of cable assembly through hole at top of rear bulkhead and pull cable assembly down through rubber grommet.
   (c) Install connector assembly and make proper wire connections as described in TM 9-1440-250-35.
   (d) Install switch assembly in beam assembly with four ¼-20 x 2¾ hexagon-head cap screws, ¼-inch flat washers, ¼-inch lockwashers, and ¼-20 hexagon nuts.
Figure 97. Front Ajax rail lock cable assembly – removal and installation.
Figure 98. Rear Ajax rail lock cable assembly — removal and installation.
(e) Install clamps (figs. 96 and 98) as required.

(f) Tighten packing nut (fig. 98) on connector assembly.

(g) Install three gasket cover assemblies (fig. 83).

(h) Remove the erecting beam support-9029892 as described in paragraph 36d.

Figure 99. (Deleted)

j. Squib Test Wiring Harness.

Note. The key numbers shown in parentheses in (1) and (2) below refer to figure 100.

(1) Removal.

(a) Install erecting beam support—9029892 as described in paragraph 36d.

(b) Remove three gasket cover assemblies (fig. 83).

(c) (Deleted)

(d) Remove clamps (fig. 96) securing cable assembly to terminal board.

(e) Loosen packing nut (10A).

(f) Remove squib test wiring harness (11D or 12H).

(2) Installation.

(a) Install squib test wiring harness (11D or 12H).

(b) Install box connector assembly (10) and tighten packing nut (10A).

(c) Install clamps (fig. 96) as required.

(d) Refer to TM 9-1440-250-35 and make proper wire connections.

(e) Install three gasket cover assemblies (fig. 83).

(f) Remove the erecting beam support—9029892 as described in paragraph 36d.
Figure 100. Squib test wiring harness—removal and installation.
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
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<td>No. 6 lockwasher</td>
<td>MS35337-41</td>
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<td>7</td>
<td>No. 6 flat washer</td>
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<td>15235-8855A</td>
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<td>C</td>
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<td>D</td>
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<td>AN960-6 (4)</td>
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<td>C</td>
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<td>C</td>
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<td>AN3-6A (2)</td>
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<td>No. 6-32 hexagon nut</td>
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<td>E</td>
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*Figure 100. Squib test wiring harness—removal and installation—legend.*
**j.l. Relay Bracket Assembly.**

(1) **Removal.**

(a) Install the erecting beam support—9029892 as described in paragraph 36d.

(b) Remove cover assembly gaskets (fig. 83).

(c) Remove relay bracket assembly (3, fig. 100.1).

(2) **Disassembly.** Disassemble relay bracket assembly (3, fig. 100.1).

(3) **Assembly.** Assemble relay bracket assembly (3, fig. 100.1).

(4) **Installation.**
Figure 101. Terminal board assembly – removal and installation.
(a) Install relay bracket assembly (3, fig. 100.1).
(b) Install cover assembly gaskets (fig. 83).
(c) Remove erecting beam support—9029892 as described in paragraph 36d.

k. Terminal Board Assembly.
(1) Removal.
(a) Install the erecting beam support—9029892 as described in paragraph 36d.
(b) Remove three gasket cover assemblies (fig. 83).
(c) Disconnect cables assemblies from terminal board assembly (fig. 101) to be replaced.
(d) Remove terminal board assembly.
(2) Disassembly. Disassemble board assembly.
(3) Assembly. Assemble terminal board assembly.
(4) Installation.
(a) Install terminal board assembly.
(b) Refer to TM 9-1440-250-35 and make proper wire connections.
(c) Install three gasket cover assemblies (fig. 83).
(d) Remove the erecting beam support—9029892 as described in paragraph 36d.

67. Hydraulic Pumping Unit Electrical Components

Note. The key numbers shown in parentheses in this paragraph refer to figure 102 unless otherwise indicated.

The hydraulic pumping unit electrical components are the valve cable assembly (13), motor cable assembly (16), and ac motor (24).

a. Valve Cable Assembly (13).
(1) Removal.
(a) Remove hydraulic unit door assembly (fig. 123), ventilatory cover assembly, and access cover assembly.
(b) Disconnect wiring harness assembly (Z, fig. 122) from receptacle J85B on hydraulic pumping unit (C, fig. 122).
(c) Disconnect connectors of valve cable assembly (13) from the locking wedge solenoid valve (1), the up-down solenoid valve (2), and the missile hydraulic solenoid valve (3).
(d) Disconnect valve cable assembly (13) from side of hydraulic pumping unit (4).
(e) Remove four clamps (7 and 10) securing valve cable assembly (13) to hydraulic pumping unit (4).

(2) Installation.
(a) Position valve cable assembly (13) in hydraulic pumping unit (4).
(b) Secure valve cable assembly (13) to hydraulic pumping unit (4) above the locking wedge solenoid valve (1) with clamp (7).
(c) Secure valve cable assembly (13) with three clamps (10).
(c.1) Apply class B sealant—EC1608 (9020050) or equivalent between receptacle of valve cable assembly (13) and side of hydraulic pumping unit (4) as prescribed in TM 9-1400-250-35.
(d) Secure receptacle of valve cable assembly (13) on side of hydraulic pumping unit (4).
(e) Connect plug connectors of valve cable assembly (13) to locking wedge solenoid valve (1), up-down solenoid valve (2), and missile hydraulic solenoid valve (3).
(f) Connect wiring harness assembly (Z, fig. 122) to receptacle connector J85B of hydraulic pumping unit (C, fig. 122).
(g) Install hydraulic unit door assembly (fig. 123), ventilatory cover assembly, and access cover assembly.

b. Motor Cable Assembly (R).
(1) Removal.
(a) Remove hydraulic unit door assembly (fig. 123), ventilatory cover assembly and, access cover assembly.
(b) Disconnect cable assembly (AA, fig. 122) from receptacle connector J71A on hydraulic pumping unit (C, fig. 122).
(c) Remove plug connector to motor cable assembly (16) from ac motor (24).

(d) Disconnect motor cable assembly (16) from side of hydraulic pumping unit (4).

(e) Remove two clamps (19).

(f) Remove motor cable assembly (16) from hydraulic pumping unit (4).

(2) Installation.

(a) Position motor cable assembly (16) in hydraulic pumping unit (4).

(b) Secure motor cable assembly (16) to side and top of hydraulic pumping unit (4) with two clamps (19).

(b.1) Apply class B sealant—EC1608 (9020050) or equivalent between receptacle of motor cable assembly (16) and side of hydraulic pumping unit (4) as prescribed in TM 9-1400-250-35.

(c) Secure receptacle of motor cable assembly (16) to side of hydraulic pumping unit (4).

(d) Connect plug connector of motor cable assembly (16) to receptacle connector of AC motor (24).

(e) Connect cable assembly (AA, fig. 122) to receptacle connector J71A of hydraulic pumping unit (C, fig. 122).

(f) Install hydraulic unit door assembly (fig. 128), ventilatory cover assembly, and access cover assembly.

c. AC Motor.

(1) Removal.

(a) Install erecting beam support—9028982 as described in paragraph 36d.

(b) Remove hydraulic unit door assembly (fig. 128), ventilatory cover assembly, and access cover assembly.

(c) Disconnect the plug connector of motor cable assembly (16) from ac motor (24).

(d) Remove AC motor (24) from axial pistons pump (21).

(2) Partial disassembly and inspection (fig. 103).

Note. The inspection and servicing described in (a) through (d), and (3) below must be performed after every 60 hours of motor assembly operation or at 1-year intervals, whichever occurs first. Only a check for proper servicing with the specified lubricant is necessary when installing a new motor assembly.

(a) Remove end bell and motor rotating group.

Note. Flat washers may be installed between the ball bearing and the end bell. Retain all washers.

(b) Remove gear case group.

(c) Remove lubricant and clean interior of gear case group and gear shaft.

(d) Inspect gear shaft and ball bearing for excessive wear, damage, or roughness.

Caution: Do not attempt to lubricate ball bearing.

Note. Any ball bearing noise or roughness, or excessively worn gear shaft shall be cause for rejection of motor assembly.

1—Locking wedge solenoid valve
2—Up-down solenoid valve
3—Missile hydraulic solenoid valve
4—Hydraulic pumping unit
5—No. 8-32 hexagon nut—MS20365-832A
6—No. 8-32 x % pan-head screw—155043
7—Clamp—8131950
8—No. 8-32 hexagon nut—MS20365-832A
9—No. 8-32 x % pan-head screw—155043
10—Clamp—8177005 (3)
11—No. 8-32 hexagon nut—MS20365-832A (4)
12—No. 8-32 x % round-head screw—155048 (4)
13—Valve cable assembly—8167119
14—No. 10-32 hexagon nut—MS20365-1032 (4)
15—No. 10-32 x % round-head screw—155198 (4)
16—Motor cable assembly—8167120
17—No. 10-32 hexagon nut—MS20365-1032A
18—No. 10-32 x % round-head screw—155198
19—Clamp—8166638
20—¾-24 hexagon nut—MS20365-624C (6)
21—Axial pistons pump—8167219
22—¾-20 hexagon nut—503267 (4)
23—¾-20 x 1½ hexagon-head screw—121913 (4)
24—AC motor—8525163

Figure 102. Hydraulic pumping unit ac motor and cable assemblies—removal and installation—legend.
(a) Install relay bracket assembly (3, fig. 100.1).
(b) Install cover assembly gaskets (fig. 83).
(c) Remove erecting beam support—9029892 as described in paragraph 36d.

k. Terminal Board Assembly.
   (1) Removal.
      (a) Install the erecting beam support—9029892 as described in paragraph 36d.
      (b) Remove three gasket cover assemblies (fig. 83).
      (c) Disconnect cable assemblies from terminal board assembly (fig. 101) to be replaced.
      (d) Remove terminal board assembly.
   (2) Disassembly. Disassemble board assembly.
   (3) Assembly. Assemble terminal board assembly.
   (4) Installation.
      (a) Install terminal board assembly.
      (b) Refer to TM 9-1440-250-35 and make proper wire connections.
      (c) Install three gasket cover assemblies (fig. 83).
      (d) Remove the erecting beam support—9029892 as described in paragraph 36d.

67. Hydraulic Pumping Unit Electrical Components

Note. The key numbers shown in parentheses in this paragraph refer to figure 102 unless otherwise indicated.

The hydraulic pumping unit electrical components are the valve cable assembly (13), motor cable assembly (16), and ac motor (24).

a. Valve Cable Assembly (13).
   (1) Removal.
      (a) Remove hydraulic unit door assembly (fig. 123), ventilatory cover assembly, and access cover assembly.
      (b) Disconnect wiring harness assembly (Z, fig. 122) from receptacle J85B on hydraulic pumping unit (C, fig. 122).
   (c) Disconnect connectors of valve cable assembly (13) from the locking wedge solenoid valve (1), the up-down solenoid valve (2), and the missile hydraulic solenoid valve (3).
   (d) Disconnect valve cable assembly (13) from side of hydraulic pumping unit (4).
   (e) Remove four clamps (7 and 10) securing valve cable assembly (13) to hydraulic pumping unit (4).
   (2) Installation.
      (a) Position valve cable assembly (13) in hydraulic pumping unit (4).
      (b) Secure valve cable assembly (13) to hydraulic pumping unit (4) above the locking wedge solenoid valve (1) with clamp (7).
      (c) Secure valve cable assembly (13) with three clamps (10).
      (c.1) Apply class B sealant—EC1608 (9020050) or equivalent between receptacle of valve cable assembly (13) and side of hydraulic pumping unit (4) as prescribed in TM 9-1400-250-35.
      (d) Secure receptacle of valve cable assembly (13) on side of hydraulic pumping unit (4).
      (e) Connect plug connectors of valve cable assembly (13) to locking wedge solenoid valve (1), up-down solenoid valve (2), and missile hydraulic solenoid valve (3).
      (f) Connect wiring harness assembly (Z, fig. 122) to receptacle connector J85B of hydraulic pumping unit (C, fig. 122).
      (g) Install hydraulic unit door assembly (fig. 123), ventilatory cover assembly, and access cover assembly.

b. Motor Cable Assembly (R).
   (1) Removal.
      (a) Remove hydraulic unit door assembly (fig. 123), ventilatory cover assembly and, access cover assembly.
      (b) Disconnect cable assembly (AA, fig. 122) from receptacle connector J71A on hydraulic pumping unit (C, fig. 122).
(c) Remove plug connector to motor cable assembly (16) from ac motor (24).

(d) Disconnect motor cable assembly (16) from side of hydraulic pumping unit (4).

(e) Remove two clamps (19).

(f) Remove motor cable assembly (16) from hydraulic pumping unit (4).

(2) Installation.

(a) Position motor cable assembly (16) in hydraulic pumping unit (4).

(b) Secure motor cable assembly (16) to side and top of hydraulic pumping unit (4) with two clamps (19).

(b.1) Apply class B sealant—EC1608 (9020050) or equivalent between receptacle of motor cable assembly (16) and side of hydraulic pumping unit (4) as prescribed in TM 9-1400-250-35.

(c) Secure receptacle of motor cable assembly (16) to side of hydraulic pumping unit (4).

(d) Connect plug connector of motor cable assembly (16) to receptacle connector of ac motor (24).

(e) Connect cable assembly (AA, fig. 122) to receptacle connector J71A of hydraulic pumping unit (C, fig. 122).

(f) Install hydraulic unit door assembly (fig. 123), ventilatory cover assembly, and access cover assembly.

c. AC Motor.

(1) Removal.

(a) Install erecting beam support—9029892 as described in paragraph 36d.

(b) Remove hydraulic unit door assembly (fig. 123), ventilatory cover assembly, and access cover assembly.

(c) Disconnect the plug connector of motor cable assembly (16) from ac motor (24).

(d) Remove ac motor (24) from axial pistons pump (21).

(2) Partial disassembly and inspection (fig. 103).

Note. The inspection and servicing described in (a) through (d), and (3) below must be performed after every 170 hours of motor assembly operation or at 3-year intervals, whichever occurs first. Only a check for proper servicing with the specified lubricant is necessary when installing a new motor assembly.

(a) Remove end bell and motor rotating group.

Note. Flat washers may be installed between the ball bearing and the end bell. Retain all washers.

(b) Remove gear case group.

(c) Remove lubricant and clean interior of gear case group and gear shaft.

(d) Inspect gear shaft and ball bearing for excessive wear, damage, or roughness.

Caution: Do not attempt to lubricate ball bearing.

Note. Any ball bearing noise or roughness, or excessively worn gear shaft shall be cause for rejection of motor assembly.

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Figure 102. Hydraulic pumping unit ac motor and cable assemblies—removal and installation—legend.
Figure 102. Hydraulic pumping unit ac motor and cable assemblies—removal and installation.
Figure 103. AC motor assembly — partial disassembly and assembly.
(3) **Assembly.**

(a) Install the end bell and the motor rotating group in the motor housing group.

*Note.* Reinstall exactly the same flat washers between the ball bearing and end bell as were removed. If they require replacing, replace them with flat washers of exactly the same size.

(b) Fill the gear case group and the motor housing group with grease 9150–223–4014.

(c) Install the gear case group.

(4) **Installation.**

(a) Engage the ac motor (24) and the spline of the axial pistons pump (21), and secure the pump to the motor.

(b) Install the motor.

(c) Connect the motor cable assembly (16) to the motor.

(d) Install the hydraulic unit door assembly (fig. 123), the ventilatory cover assembly, and the access cover assembly.

(e) Remove the erecting beam support as described in paragraph 36d.

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**Section IV. MAINTENANCE OF THE LAUNCHER ERECTING BEAM ASSEMBLY**

68. **General**

This section covers maintenance of the NIKE–AJAX launching and handling rail lock switch linkage, the erecting beam hook and switch trip latch, the erecting indexing pin and link index, the gasket cover assemblies, the forward and rear wedge groups with locking wedge adjusters, and the two locking wedge hydraulic cylinders. The general precautions prescribed in paragraph 58 must be observed when any maintenance is performed on the launcher erecting beam assembly.

69. **NIKE–AJAX Launching and Handling Rail Lock Switch Linkage** (fig. 104)

Linkages for the two rail lock switches are located inside the launcher erecting beam assembly at the rear of each T-track.

*Note.* In mobile installations, a jumper wire allows the launcher erecting beam to be raised during deflector emplacement without a launching-handling rail on the launcher. Remove the jumper wire in accordance with TM 9–1440–251–10 prior to elevating a NIKE–AJAX launching and handling rail.

a. **Removal.**

1. Install the erecting beam support as described in paragraph 36d.

2. Disconnect and remove the spring.

(3) Remove the two flat-head screws and external-teeth lockwashers securing the switch linkage to the beam assembly.

(4) Remove the switch linkage.

b. **Disassembly.** Disassemble the switch linkage.

c. **Assembly.** Assemble the switch linkage.

d. **Installation.**

1. Position the switch linkage inside the beam assembly and insert the eye bolt through the hole in the T-track.

2. Install the switch linkage.

3. Connect the spring.

4. Remove the erecting beam support as described in paragraph 36d.

70. **Erecting Beam Hook and Switch Trip Latch** (fig. 105)

The erecting beam hook and switch trip latch are installed at the front and underneath the launcher erecting beam assembly.

a. **Removal.**

1. Install the erecting beam support as described in paragraph 36d.

2. Remove the beam hook and the trip latch.
Figure 103. AC motor assembly – partial disassembly and assembly.
Section IV. MAINTENANCE OF LAUNCHER ERECTING BEAM ASSEMBLY

68. General

This section covers maintenance of the Nike-Ajax launching and handling rail lock switch linkage, the erecting beam hook and switch trip latch, the erecting indexing pin and link index, the gasket cover assemblies, the forward and rear wedge groups with locking wedge adjusters, and the two locking wedge hydraulic cylinders. The general precautions prescribed in paragraph 58 must be observed when any maintenance is performed on the launcher erecting beam assembly.

69. Nike-Ajax Launching and Handling Rail Lock Switch Linkage (fig. 104)

Linkages for the two Nike-Ajax launching and handling rail lock switches are located inside the launcher erecting beam assembly at rear of each T-track.

a. Removal.

(1) Install the erecting beam support—9029892 as described in paragraph 36d.

(2) Disconnect and remove spring.

(3) Remove two flat-head screws and external-teeth lock washers securing switch linkage to beam assembly.

(4) Remove switch linkage.

(b) Engage motor assembly (X) and spline of pump assembly (V) and secure pump assembly to motor assembly.

(b) Install motor assembly.

(c) Connect plug connector of motor cable assembly (R) to receptacle connector of motor assembly (X).

(d) Install hydraulic unit door, assembly (fig. 123), ventilatory cover assembly, and access cover assembly.

(e) Remove erecting beam support—9029892 as described in paragraph 36d.

70. Erecting Beam Hook and Switch Trip Latch

The erecting beam hook (fig. 105) and switch trip latch are installed at the front and underneath the launcher erecting beam assembly.

a. Removal.

(1) Install the erecting beam support—9029892 as described in paragraph 36d.

(2) Remove beam hook and trip latch.
Figure 104. Nike-Ajax launching and handling rail lock switch linkage – removal and installation – typical.
b. Installation.

(1) Install erecting beam hook inside hook clevis with curved end to the right.
(2) Install switch trip latch on trip plate clevis with the slanted surface towards down-lock limit switch.
(3) Test hook and latch for freedom of movement.
(4) Adjust limit switch, if necessary, as described in TM 9-1440-250-20.
(5) Remove the erecting beam support—9029892 as described in paragraph 36d.

71. Erecting Indexing Pin and Link Index

The erecting indexing pin (fig. 106) and link index are located inside the launcher erecting beam assembly at the rear of the front outriggers.

a. Removal.

(1) Install the erecting beam support—9029892 as described in paragraph 36d.
(2) Remove the erecting indexing pin and link index.

b. Installation.

(1) Assemble helical compression spring on erecting indexing pin and insert pin through top of launcher erecting beam assembly.
(2) Install link index.
(3) Check pin and link index for freedom of movement and proper operation.
(4) Remove the erecting beam support—9029892 as described in paragraph 36d.

72. Gasket Cover Assembly

Three gasket cover assemblies (fig. 107), providing access inside the launcher erecting beam assembly, are located on the left side of the beam assembly.

a. Removal.

(1) Install the erecting beam support—9029892 as described in paragraph 36d.
Figure 106. Erecting indexing pin and link index — removal and installation.
73. Forward Locking Wedge Group and Locking Wedge Adjuster Assembly

The forward locking wedge group and locking wedge adjuster assembly (fig. 108) are located in the front of the launcher erecting beam assembly.

Note. The key numbers shown in parentheses in a below refer to figure 108 unless otherwise indicated.

a. Removal.

(1) Remove three access cover plates (view A, fig. 180) and front end cover from launcher erecting beam assembly (10).

(2) Open EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.

(3) Depressurize hydraulic oil reservoir by turning handle of plug cock to VENT position and holding until all pressure is discharged.

(4) Disconnect tube assembly (1) from rear of forward locking wedge group (11) and cap exposed line.

(5) Disconnect tube assembly (2.1) from tee group (2). Remove tee group (2) from tube nipple (3). Cap exposed line.

(6) Remove tube nipple (3) and preformed packing (4). Discard preformed packing.

(7) Remove one of the four flat-head screws (12A) from the locking wedge adjuster assembly (12) and replace it with a hexagon-head bolt (5). Use this long bolt as a handle to hold and prevent the locking wedge adjuster assembly (12) from falling and becoming damaged when the forward locking wedge group (11) is removed.

(8) Remove six hexagon-head cap screws (6 and 8) securing the forward locking wedge group (11) to the launcher erecting beam assembly (10).

(9) Remove forward locking wedge group (11) by moving wedge group (11) forward until it slides free of locking wedge adjuster assembly (12).

(10) Remove locking wedge adjuster assembly (12).

(11) Remove wedge group (11) from beam assembly (10).
Figure 108. Forward locking wedge group and locking wedge adjuster assembly—removal and installation.
(6) Remove tube nipple (3) and preformed packing (4). Discard preformed packing (4).

(7) Remove one of the four flat-head screws (12, A) from the locking wedge adjuster assembly (12) and replace it with a 1/4-20 hexagon-head bolt (5). Use this long bolt as a handle to hold and prevent the locking wedge adjuster assembly (12) from falling and becoming damaged when the forward locking wedge group (11) is removed.

(8) Remove six hexagon-head cap screws (6 and 8) securing the forward locking wedge group (11) to the launcher erecting beam assembly (10).

Note. On launcher units 1253 and subsequent, shims (13) are installed beneath the wedge group. These shims are to be installed in their same positions upon installation of the wedge group in d below.

(9) Remove the forward locking wedge group (11) by moving wedge group (11) forward until it slides free of the locking wedge adjuster assembly (12).

(10) Remove the locking wedge adjuster assembly (12).

(11) Remove wedge group (11) from beam assembly (10).
Figure 108. Removal and installation of the forward locking wedge group and locking wedge adjuster assembly.

1. Tube assembly 9977629
2. Tee group
2.1. Tube assembly 9977628
3. Tube nipple AN832-6
4. Preformed packing 8034446
5. ¼-20 hexagon-head bolt (used only during removal or installation of locking wedge adjuster assembly)
6. ⅜-24 x 1¼ hexagon-head cap screw 121615 (4)
7. ¾-inch lockwasher MS35338-27 (4)
8. ⅜-24 x 1½ hexagon-head cap screw 123512 (2)
9. ¾-inch lockwasher MS35338-27 (2)
10. Launcher erecting beam assembly
11. Forward locking wedge group
12. Locking wedge adjuster assembly 9032777
   A. ¼-20 x ¾ flat-head screw 156253 (4)
   B. Hydraulic locking wedge 9032778
   C. Lubrication fitting MS15001-1
   D. Hydraulic ram 9032779
13. Shim 8525201
1. 3/4-24 x 3/4 hexagon-head bolt AN176-7A
2. 3/4-inch lockwasher MS35338-27
3. Erecting beam locking wedge base 8525104
4. Locking wedge assembly 8167295 (1021 through

Figure 109. Disassembly and assembly of the forward locking wedge group.

Note. On launcher units 1253 and subsequent, shims (13) are installed, as required, beneath the wedge group (11). These shims are to be installed in their same position upon installation of the wedge group in d below.

(12) Remove shims (13).

Note. The key numbers shown in parentheses in b below refer to figure 109 unless otherwise indicated.

b. Disassembly.

(1) Remove erecting beam locking wedge base (3) from locking wedge assembly (4).
(2) Remove tube elbow (6) from locking wedge assembly.

Note. Tighten flat-point setscrew. (1, fig. 110) to prevent rotation of actuating shaft (4, fig. 110) while performing step (3) below.

(3) Disconnect locking wedge hydraulic cylinder group (6, fig. 110) from locking wedge (5, fig. 110).

(4) Loosen setscrew (1, fig. 110) and remove locking wedge hydraulic cylinder group (6, fig. 110).
(5) Disassemble locking wedge (fig. 111) as required.
(6) Remove plate (4, fig. 112) from locking wedge hydraulic cylinder assembly (3, fig. 112).
(7) Disassemble cylinder assembly (fig. 113) as required.

c. Assembly.

(1) Assemble locking wedge hydraulic cylinder assembly (3, fig. 112).
(2) Test cylinder assembly using hydraulic test stand 8523711 (fig. 49) in conjunction with Instruction Card 2010.
(3) Install plate (4, fig. 112) on locking wedge hydraulic cylinder assembly (3, fig. 112).
(4) Assemble wedge assembly (fig. 111).
(5) Assemble locking wedge (5, fig. 110) and locking wedge hydraulic cylinder group (6, fig. 110).

*Note.* Tighten flat-point setscrew (1, fig. 110) to prevent actuating shaft (4, fig. 110) from rotating while securing the locking wedge (5, fig. 110) to actuating shaft (4, fig. 110); loosen setscrew (1, fig. 110) after locking wedge (5, fig. 110) and locking wedge hydraulic cylinder group (6, fig. 110) have been assembled.

(6) Assemble erecting beam locking wedge base (3, fig. 109) and locking wedge assembly (4, fig. 109).

(7) Install new preformed packing (7, fig. 109) and tube elbow (6, fig. 109) on locking wedge assembly (4, fig. 109).

*Note.* The key numbers shown in parentheses in *d* below refer to figure 108 unless otherwise indicated.

d. *Installation.*

(1) Install hexagon-head bolt (5) in locking wedge adjuster assembly (12), and position adjuster assembly in launcher erecting beam assembly (10), (1.1) Position forward locking wedge group (11) in forward end of erecting beam assembly (10), and aline key slot in lower portion of adjuster assembly (12) with erecting beam

---

1 — No. 10-32 x ⅝ flat-point setscrew NAS1081-3A12
2 — Nut and washer group (1253 and subsequent)
   A — ⅝-18 hexagon nut MS35691-1022
   B — ⅝-18 hexagon nut AN315-10R
   C — ⅝-inch flat washer 446248
3 — Nut and washer group (1021 through 1252)
4 — Actuating shaft
5 — Locking wedge 8167086
6 — Locking wedge hydraulic cylinder group

**Figure 110.** Disassembly and assembly of locking wedge assembly.

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A — ⅝ x 1⅞ cotter pin 583272
B — ⅝-18 hexagon nut 225832
C — ⅝-inch flat washer 446248

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Figure 111. Disassembly and assembly of the locking wedge.

locking key (3, fig. 111) of locking wedge assembly (4, fig. 109).

Note. On launcher units 1523 and subsequent, if installing wedge group (11) removed in a (11) above, install shims (13) in their original position. If installing a new wedge group, install shims, as required, to insure vertical positioning of the locking wedge adjuster assembly.

(2) Install necessary shims (13) and secure wedge group (11) to erecting beam assembly (10).

(3) Install preformed packing (4) and tube nipple (3) underneath wedge group (11).

(3.1) Install tee group (2) on tube nipple (3). Connect tube assembly (2.1) to tee group. Torque coupling nuts of tube assembly and tee group to 300 pound-inches.

(3.2) Connect tube assembly (1) at rear of wedge group (11). Torque coupling nuts of tube assembly to 300 pound-inches.

(4) Remove hexagon-head bolt (5) from adjuster assembly (12) and install flat-head screw (12A).

(5) Close EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.

(6) Bleed air from lines as prescribed in paragraph 89b (2) through (3.9).
1—\(\frac{3}{8}\)-24 x 1\(\frac{1}{8}\) hexagon-head cap screw 181641 (4) (1021 through 1252) or \(\frac{3}{8}\)-24 x 1-\(\frac{3}{8}\) hexagon-head bolt AN6H11A (4) (1253 and subsequent)
2—\(\frac{3}{8}\)-inch lockwasher MS35338-27 (4) (1021 through 1252) or 138489 (4) (1253 and subsequent)
3—Locking wedge hydraulic cylinder assembly 8167841
4—Plate 9032500

**Figure 112.** Disassembly and assembly of the locking wedge hydraulic cylinder group.

(7) Adjust unlock switch and lock switch (fig. 95) as described in TM 9-1440-250-20.

(8) Install three access cover plates (view A, fig. 180) and front end cover.

74. Rear Locking Wedge Group and Locking Wedge Adjuster Assembly

The rear locking wedge group and locking wedge adjuster assembly (fig. 114) are located in the center section of the launcher erecting beam.

*Note.* The key numbers shown in parentheses in a through d below refer to figure 114 unless otherwise indicated.

a. Removal.

(1) Remove beam center cover (fig. 82).
(2) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
(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) Remove tube assembly (1) from rear locking wedge group and cap open line.
(5) Remove tube nipple (2) and preformed packing (3). Discard preformed packing.
(6) Disconnect tube assembly (4) at rear of locking wedge group (10) and cap open line.
(7) Remove one of the four flat-head screws (12A, fig. 108) from the locking wedge adjuster assembly (11)
(8) Remove six hexagon-head cap screws (6 and 8) securing the locking wedge group (10) to the launcher erecting beam (13).

(9) Remove the locking wedge group (10) by moving it to the rear until it slides free of the wedge adjuster assembly (11).

Note. On launcher units 1253 and subsequent, shims (12) are installed beneath the
1 - Tube assembly 8167809
2 - Tube nipple AN832-6
3 - Preformed packing 8034446
4 - Tube assembly 8167808
5 - \( \frac{1}{4} \)-20 hexagon-head bolt (used only during removal or installation of locking wedge adjuster assembly)
6 - \( \frac{3}{8} \)-24 x 1\( \frac{1}{4} \) hexagon-head cap screw 123512 (2)
7 - \( \frac{3}{8} \)-inch lockwasher MS35338-27 (2)
8 - \( \frac{3}{8} \)-inch x 1\( \frac{1}{4} \) hexagon-head cap screw 121615 (4)
9 - \( \frac{3}{8} \)-inch lockwasher MS35338-27 (4)
10 - Rear locking wedge group
11 - Locking wedge adjuster assembly 9032777
12 - Shim 8525201 (1253 and subsequent)
13 - Launcher erecting beam

**Figure 114. Removal and installation of the rear locking wedge group and locking wedge adjuster assembly.**

Locking wedge group (10). These shims are to be installed in their same position upon installation of the locking wedge group in step (9.1).

(9.1) Remove shims (12).
(10) Remove locking wedge adjuster assembly (11) from erecting beam (13).

b. Disassembly. Disassemble rear locking wedge group (10) as described in paragraph 73b.

c. Assembly. Assemble rear locking wedge group (10) as described in paragraph 73c.

d. Installation.

(1) Install hexagon-head bolt (5) in locking wedge adjuster assembly (11), and position adjuster assembly in launcher erecting beam (13).

(1.1) Position rear locking wedge group (10) in erecting beam and align key slot in lower portion of adjuster assembly (11) with erecting beam locking key (3, fig. 111).

Note. On launcher units 1523 and subsequent, if installing wedge group (10) removed in a (9) above, install shims (12) in their original position. If installing a new wedge group, install shims, as required, to insure vertical positioning of the locking wedge adjuster assembly.

(2) Install necessary shims (12) and secure locking wedge group (10) to erecting beam (13).

(3) Install new preformed packing (3), tube nipple (2), and tube assembly (1) underneath rear locking wedge group (10). Connect tube assemblies (1 and 4) and torque coupling nuts to 300 pound-inches.

(4) Remove hexagon-head bolt (5) from adjuster assembly (11), and install flat-head screws (12A, fig. 108).

(5) Close EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.

(6) Bleed air from lines as prescribed in paragraph 89b (2) through (3.9).

(7) Adjust switch assemblies (fig. 96) as described in TM 9-1440-250-20.

(8) Install beam center cover (fig. 82).

74.1 Aiming Circle Mount Tube

Note. The key numbers shown in parentheses in a and b below refer to figure 114.1.

a. Removal.

(1) Loosen thumbscrew (1) and remove cap assembly (4).

(2) Loosen setscrew (5).

(3) Remove aiming circle mount tube (7).

(4) Remove plug (8) and lockwasher (9).

b. Installation.

(1) Install lockwasher (9), plug (8), and aiming circle mount tube (7).

(2) Tighten setscrew (5).

(3) Install cap assembly (4) and tighten thumbscrew (1).
Section V. MAINTENANCE OF ERECTING STRUT FORK AND STRUT ARMS

75. General
This section covers the field maintenance of the angle of elevation adjustment group, the sleeve bushings in the erecting strut assemblies, and the two launcher plate locks on the strut assemblies. The general precautions prescribed in paragraph 58 must be observed when any maintenance is performed.

76. Angle of Elevation Adjustment Group
The angle of elevation adjustment group (fig. 116) is located where the erecting strut assemblies connect to the launcher erecting beam assembly.

a. Removal.

(1) Place two automotive jacks (fig. 115), capable of lifting a minimum of three tons, under the launcher strut. Raise the jacks until they are equally snug under the struts.

(2) Remove the cup-point hexagon-socket setscrew (fig. 116) from each adjusting beam strut bearing on both sides of the beam assembly.

(3) Remove the three cotter pins, castellated hexagon nuts, flat washers, and hexagon-head bolts from the strut assembly.

(4) Remove the snap retainer and thrust washer from each end of the headless grooved shaft.

(5) Slide grooved shaft into beam assembly far enough to disconnect strut assembly.

Note. Sliding the shaft only part way through the beam assembly permits the shaft to hold the strut assembly on the opposite side of the beam assembly and to prevent the arms from dropping.

(6) Remove bearing thrust washer and retract extended part of strut assembly.

(7) Remove lubrication fitting.

(8) Remove six internal-wrenching bolts and remove strut bearing.

b. Installation.

(1) Refer to TM 9-1440-250-20 for angle of elevation requirements and position and install adjusting beam strut bearing on launcher erecting beam assembly at specified angle of elevation.
(2) Lockwire the six \( \frac{3}{4}-16 \times 2\frac{1}{4} \) internal-wrenching bolts with 0.051-inch steel lockwire.

(3) Install remaining parts of adjustment group.

(4) Torque three \( \frac{3}{4}-16 \) castellated hexagon nuts to 300 pound-inches and install three \( \frac{3}{4} \times 2 \) cotter pins.

(5) Remove automotive jacks (fig. 115) from under launcher strut.

77. **Sleeve Bushings**

One sleeve bushing (fig. 117) is located in each of the two strut arm assemblies where they connect to the launcher strut.

a. **Removal.**

   (1) Remove the hydraulic up-lock assembly (D, fig. 216) as described in paragraph 102a.

   (2) Remove crossmember arm (fig. 117).

   **Note.** The strut arm assemblies (fig. 117) and the crossmember arm, and the strut arm assemblies and crossmember arm (D, E, and F, fig. 118) have either a two-hole or a four-hole pattern on launcher units 1253 through 1891. Since these parts have the same respective part numbers, the two-hole or four-hole configuration should be specified when ordering any of these three parts within this effectivity.

   (3) Remove erecting strut fork or strut arm assembly (fig. 117).

b. **Disassembly.**

   (1) Remove the lubrication fittings (fig. 117; and A1, D1, and E1, fig. 118), as required.

   (2) Remove the sleeve bushing (fig. 117; and A2, D2, and E2, fig. 118), as required.

c. **Assembly.**

   (1) Press fit and stake sleeve bushing in strut arm assembly (fig. 117; and D and E, fig. 118) or erecting strut fork (A, fig. 118).

   (2) Install lubrication fittings (fig. 117; and A2, D2, and E2, fig. 118).

d. **Installation.**

   (1) Refer to TM 9-1440-250-20 for angle of elevation requirements and position and install strut fork (fig. 117) or strut arm assembly at specified angle of elevation.

   (2) Torque three \( \frac{3}{4}-16 \) castellated hexagon nuts to 300 pound-inches and install three \( \frac{3}{4} \times 2 \) cotter pins.

   (3) Install crossmember arm.
Figure 116. Angle of elevation adjustment group – removal and installation – typical.
(4) Install the hydraulic up-lock assembly (D, fig. 216) as described in paragraph 102e.

78. Launcher Plate-Lock (1021 through 1252)

A launcher plate-lock (fig. 119) is bolted to each arm of the erecting strut fork (fig. 117) on launcher units 1021 through 1252. On launcher units 1253 and subsequent, the erecting strut assemblies are redesigned to incorporate the function of the launcher plate-locks (fig. 119).

a. Removal.

(1) Remove the hydraulic up-lock assembly (D, fig. 216) as described in paragraph 102a.

(2) Remove launcher plate-lock (fig. 119).

b. Installation.

(1) Position and install plate-lock.

(2) Lockwire ½-20 castellated hexagon nuts with 0.051-inch lockwire.

(3) Install hydraulic up-lock assembly (D, fig. 216) as described in paragraph 102e.
Section VI. MAINTENANCE OF LAUNCHER HYDRAULIC SYSTEM

79. General

This section describes the maintenance of the hydraulic pumping unit assembly, the hydraulic panel, the hydraulic oil reservoir assembly, and the equilibrator accumulator. Coverage is also provided for the tube and pipe assembly and fitting networks for the hydraulic precharge system, axial pistons pump system, locking wedge hydraulic system, down-lock hydraulic system, erecting hydraulic system, equilibrator hydraulic system, up-lock hydraulic system, and the missile hydraulic system. The general precautions prescribed in paragraph 58 must be observed whenever any hydraulic system maintenance is performed.

80. Hydraulic Pumping Unit

The hydraulic pumping unit (fig. 3) is located on the right side of the launcher base. Major components of the pumping unit are shown on figures 120 and 121. Maintenance of the pumping unit consists of replacement of the hydraulic pumping unit assembly (C, fig. 122) and maintenance of individual components of the pumping unit assembly.

Note. The key letters shown in parentheses in a below refer to figure 122.

a. Hydraulic Pumping Unit Assembly.

Note. The extent of maintenance required on the hydraulic pumping unit assembly (C) determines whether it is necessary to remove it from the launcher base assembly (H).
Caution: Be careful not to damage tube or pipe assemblies or their mating parts when removing or installing the pumping unit assembly.

(1) Removal.

(a) Raise the erecting beam to the up-and-locked position as described in paragraph 44.

(b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(c) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(d) Depressurize the equilibrator accumulator, the hydraulic surge accumulator, and the compressed gas cylinder as described in paragraph 41d.

(e) Disconnect cable assembly (AA), wiring harness assembly (Z), and all pipe and tube assemblies from the pumping unit assembly.
(f) Remove the clamps (V and W) securing pipe assemblies.

(g) Remove the four hexagon-head cap screws (B).

(h) Attach a lifting sling (D) capable of lifting a minimum of 200 pounds, to D-rings (E) and remove pumping unit assembly from launcher base assembly (H).

(i) Cap all open hydraulic lines.

(2) Troubleshooting. Perform troubleshooting procedures for pumping unit assembly as described in section V, chapter 5.

(3) Installation.

(a) Install the hydraulic pumping unit assembly by placing it in position in the launcher base assembly with the lifting sling (D).
Figure 122. Hydraulic pumping unit assembly — removal and installation.
(b) Install the four \( \frac{7}{16} \)-in lockwashers (A), the \( \frac{7}{16} \)-14 x 1 hexagon-head cap screws (B), connect the cable assembly (AA), the wiring harness assembly (Z), and all tube and pipe assemblies. Torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube and pipe assemblies</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>500</td>
</tr>
<tr>
<td>K</td>
<td>1000</td>
</tr>
<tr>
<td>L</td>
<td>300</td>
</tr>
<tr>
<td>M</td>
<td>1000</td>
</tr>
<tr>
<td>N</td>
<td>300</td>
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<tr>
<td>P</td>
<td>150</td>
</tr>
<tr>
<td>Q</td>
<td>300</td>
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<tr>
<td>R</td>
<td>1450</td>
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<tr>
<td>X</td>
<td>500</td>
</tr>
<tr>
<td>Y</td>
<td>1000</td>
</tr>
<tr>
<td>BB</td>
<td>150</td>
</tr>
</tbody>
</table>

(c) Precharge the compressed gas cylinder, the hydraulic surge accumulator, the equilibrator accumulator, and the hydraulic oil reservoir as described in paragraph 40.

(d) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

(e) Perform launcher hydraulic system air bleed procedure as described in paragraph 43d.

b. Hydraulic Pumping Unit Assembly Access Covers (fig. 123).

(1) Removal.

(a) Raise the erecting beam to the up-and-locked position as described in paragraph 44.

(b) Remove three access covers from hydraulic pumping unit assembly.

(2) Disassembly. Remove the rubber gaskets from the access cover assembly, the ventilatory cover assembly, and the hydraulic unit door assembly.

(3) Assembly. Cement rubber gaskets to their respective covers as described in paragraph 36b.

(4) Installation.

(a) Position the access covers on the pumping unit assembly and secure them in position.

(b) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

(c) Pressure Gage Access Door Assembly.

(1) Removal.

(a) Remove hydraulic unit door assembly (fig. 123).

(b) Release the two studs (fig. 124) that secure pressure gage access door assembly.

(c) Remove the four round-head screws and hexagon nuts attaching door assembly and remove door assembly.

(2) Disassembly.

(a) Remove pin, two springs, and hinge butt leaf.

(b) Remove the studs by removing split washers.

(3) Assembly.

(a) Install and secure studs with split washers.

(b) Position the hinge butt leaf, springs, and plate group and insert pin.

(c) Peen the hinge of the pressure gage access door assembly on both ends to retain the pin.

(4) Installation.

(a) Install door assembly.

(b) Secure door assembly with two studs.

(c) Install hydraulic unit door assembly (fig. 123).


(1) Removal.

(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
Figure 123. Hydraulic pumping unit assembly — access covers — removal and installation.
Figure 124. Pressure gage access door assembly – removal and installation.
(b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(c) Remove the ventilatory cover assembly (fig. 123) and the hydraulic unit door assembly.

(d) Disconnect the four tube assemblies from the axial pistons pump group (fig. 125).

(e) Remove the pump group by removing the six hexagon nuts attaching pump group to the ac motor; cap all open hydraulic lines.

(2) Disassembly.

(a) Drain all oil from the pump assembly.

(b) Remove the two tube nipples and two preformed packings from the pistons pump assembly.

(c) Remove the socket-head cap screw (L, fig. 126) and remove spur gear shaft assembly (M, fig. 126).

(d) Remove preformed packing (M2, fig. 126) from the spur gear-shaft (M1, fig. 126).

(e) Remove the pump cover and inspection plug (fig. 127).

(f) Remove the link pin retaining ring (R, fig. 128).

(g) Insert a No. 4-40NC screw into the tapped, headless grooved pin (S, fig. 128) and pull out pin to disengage the linkage of the swivel yoke (J, fig. 126) from the pistons control group (T, fig. 128).

Caution: Maintain a tight grip on the pistons control group while removing the mounting hexagon nuts (U, fig. 128). A heavy compression spring within the control group may cause the parts to fly apart if not kept under control.
A — RETAINING RING — 8526475
B — SPRING RETAINER — VKR-176054
C — NO. 10-32 x 7/8 SOCKET-HD CAP SCREW — VKR-175894 (10)
D — SWIVEL YOKE PLATE — VKR-478712
E — COMPRESSION SPRING — 8526505
F — PACKING RETAINER — VKR-176075 (4)
G — PREFORMED PACKING — VKR-151551 (4)
H — SLEEVE BUSHING — VKR-176078 (4)
J — SWIVEL YOKE — VKR-176062
K — NO. 10-32 HEX NUT — VKR-3X92215 (12)
L — NO. 10-32 x 3/4 SOCKET-HD CAP SCREW — 8526472 (PART OF SPUR GEARSHAFT ASSY — VKR-151298)
M — SPUR GEARSHAFT ASSY — VKR-151298
1 — SPUR GEARSHAFT — VKR-112550
2 — PREFORMED PACKING — MS28784-111
N — PREFORMED PACKING — VKR-174612
P — SEALING SCREW — 8526574
Q — ROTATING AND RETAINER GROUP
1 — ROTATING GROUP — VKR-188631
2 — PREFORMED PACKING — 8527108
3 — SHAFT SEAL 8526549
4 — PREFORMED PACKING — MS28784-334
5 — BEARING AND OIL SEAL RETAINER — 8526551
R — HOUSING ASSY — VKR-193800

Figure 126. Axial pistons pump assembly — disassembly and assembly.
(h) Stand the pump assembly on its mounting flange end, remove the four hexagon nuts (U, fig. 128) and lift control group out of the pump assembly.

1. Disassembly of the control group.
Disassemble control group.

2. Assembly of the control group. Assemble control group.

(i) Remove the hexagon nuts (K, fig. 126) from bearing and oil seal retainer (Q5, fig. 126).

Note. Do not attempt to remove the oil seal retainer at this time.

(j) Insert a No. 10-24 NC screw (A, fig. 129) into the threaded cylinder bearing pin and remove the retaining ring.

Caution: A seal between two finely machined surfaces must be broken in the following step. If this seal is not broken, the piston cylinder manifold may adhere to the yoke plate and become disengaged from the remainder of the rotating and retainer group, resulting in damage to the pistons.

(k) Break the seal between the piston cylinder manifold (fig. 130), the yoke plate (D, fig. 126), and face...
Figure 128. Axial pistons pump assembly – disassembly and assembly – Continued
of swivel yoke (J, fig. 126) by holding the cylinder bearing pin (B, fig. 129) down while removing the yoke plate.

(l) Remove the swivel yoke plate (D, fig. 126).

**Caution:** Do not tilt the bearing and oil seal container (Q5, fig. 126) in the sleeve of the housing assembly (R, fig. 126) during removal in the following step.

(m) Remove the rotating and retainer group (B, fig. 129) by lifting the housing while holding the rotating and retainer group down with the thumbs.

**Caution:** Do not tilt oil seal retainer or rotating group when performing the following step.

(n) Separate the rotating group (Q1, fig. 126) from the oil seal retainer (Q5, fig. 126).

**Note.** If disassembly of the rotating group is necessary, perform steps (o) through (ag) below. If this disassembly is not required, omit steps (o) through (ag) and proceed with step (ah).

**Caution:** The following operation must be done with care in order to keep the pistons from becoming damaged by stroking against each other.

(o) Hold the rotating group (Q1, fig. 126) firmly (shaft end down), grasp the piston cylinder manifold (fig. 130) and gently pull it straight up and off the shaft, piston, and bearing group.

(p) Separate the knuckle link and pins group and the floating bearing.
Figure 130. Rotating group — disassembly and assembly.

from the bore of the shaft, piston, and bearing group.

(q) Remove the four knuckles from the connecting link.

(r) Compress the retainer ring and remove the connecting link retainer from the piston cylinder manifold; remove retainer ring from link retainer.

(s) Remove the cylinder bearing pin and bearing assembly, the cylinder block bearing spring retainer, and the cylinder block bearing spring from the piston cylinder manifold. This can be done by placing the end of the cylinder bearing pin and bearing on a smooth surface and applying a slight downward pressure on the piston cylinder manifold.

(t) Clean, inspect, and lubricate as prescribed in (3), (4) (d), and (5) below.
Caution: Before continuing disassembly of the pump assembly, reassemble the rotating group as described in (u) through (ag) below. This will prevent possible damage to internal parts of the rotating group during disassembly of the pump assembly in (ah) through (an) below.

(u) Place two small wood blocks about ½-inch apart. Lay the piston cylinder manifold down so that the central bore (fig. 130) of the manifold (valving-face down) is over the space between the wooden blocks.

(v) Drop the spring into the central bore and follow it by the spring retainer, recessed end first.

(w) Insert the cylinder bearing pin and bearing assembly in the bore, pin first, so that the pin protrudes through the face of the manifold.

(x) Install the retainer ring around the recess in the connecting link retainer, with the ears of the retainer ring against the flat surface of the link retainer.

(y) Compress the retainer ring and place the link retainer in the central bore of the manifold so that the ears of the manifold hold the retainer ring in place.

(z) Lock the link retainer in the manifold by pushing the link retainer down with a twisting motion and seating it solidly between the ears of the manifold.

(aa) Assemble the four knuckles to the connecting link and position them on their respective grooved pins with the grooved ends of the knuckles facing toward the link ends.

(ab) Holding the link at an angle, slide one of the knuckles into its slot in the drive shaft retainer. Repeat for the other knuckle.

(ac) Holding the manifold over this partial assembly, carefully insert number one piston into number one cylinder bore.

Note. The number one piston is the piston which alines with both slots of the drive shaft retainer. The number one cylinder bore is the bore which alines with both slots of the connecting link retainer.

(ad) Continue inserting pistons into their respective cylinder bores alternately on either side of number one piston and bore.

(ae) When only two pistons remain outside of their bores, spread the pistons apart and, holding the manifold at an angle, guide knuckles of the universal link and pins subassembly into the connecting link retainer, with the grooved ends of the knuckles facing the manifold.

#af) Insert the remaining two pistons in their bores.

Caution: While performing the tests described in the following step, do not allow the knuckles to slip out of slots of link retainer.

(ag) After the rotating group is completely assembled, check it for freedom of movement and smoothness of operation. Push the manifold downward several times and allow it to return to its original position by action of the bearing spring. Move the manifold around in a circle while holding the flange of the shaft, piston and bearing group firmly in one hand. The action should be smooth and without binding of any kind.

(ah) Press the shaft seal (Q3, fig. 126) from the bearing and oil seal retainer (Q5) and remove preformed packings (Q2 and Q4).

Note. The key letters shown in parentheses in (ai) through (an) below refer to figure 128.

(ai) Remove the four hexagon nuts (K)
and flat washers (J), and remove the inlet flange (L).

Caution: Extreme care should be used when handling the sleeve bushing in the following step, to prevent damage to its lapped face.

(a) Remove the sleeve bushing (H) and finger washer spring (Q).

(ak) Remove the spring tension washer (G) and flat washer (F).

(al) Grasp the housing firmly in both hands and shake the 22 ball bearings (E) out of the pintle bearing race (D).

(am) Remove the race (D) and the pintle bearing retainer (C).

(an) Removal of the outlet flange (A) is identical to removal of the inlet flange (L). To remove the outlet flange, repeat steps (ai) through (am) above.

(3) Cleaning. After the pump has been disassembled, wash all parts, except packings, gaskets, and preformed packings in clean dry-cleaning solvent——6850-227-1860. Rinse all parts carefully and blow out all passages with compressed air, filtered to remove moisture.

(4) Inspection.

(a) Housing assembly (R, fig. 126).
1. Check all flanges and mounting bosses for damage or distortion.
2. Check all studs and tapped holes for stripped threads.
3. Check the pump cover (fig. 127) to make sure it is flat and undistorted.

(b) Flanges (fig. 128).
1. Inspect the finger washer springs (Q) for damage or deformation.
2. Make certain the ball bearings (E) are round, clean, and in good condition.
3. Check that the seating surfaces of the inlet flange (L) and outlet flange (A) are smooth and flat.

(c) Bearing and oil seal retainer (Q5, fig. 126).
1. Inspect the inside and outside diameters of the collar of the retainer for damage.
2. Check the gasket recess of the retainer for smoothness.

(d) Rotating group (Q1, 126).

Note. Any irreparable damage to the manifold (fig. 130) or the pistons requires replacement of the complete rotating group. This is because each piston is individually fitted to its respective cylinder bore and the parts are, therefore, not interchangeable.

1. Inspect the pistons for scratches, nicks, or scores.
2. Make certain the connecting rods of the pistons turn freely.
3. Check each piston for the absence of end play by pushing it back and forth. There must be no end play.
4. Insert any piston into its corresponding bore in the manifold. While holding a finger on the port of the manifold, pull the piston out of the bore with a quick movement. A definite “pop” should be heard which indicates acceptable tolerances for proper operation.

5. Inspect the manifold for scored or out-of-round cylinder bores.

(e) Knuckle link and pins group (fig. 130).
1. Inspect the grooved pins to assure that they are in line and parallel to one another.
2. With the four knuckles installed on the grooved pins, make certain the knuckles rotate freely with no evidence of play on the pins.
3. Inspect the knuckles for wear or roughness.
4. Inspect the connecting link retainer for signs of wear.

5. With the connecting link, four knuckles, link retainer and drive shaft retainer assembled, turn the link retainer to check for the absence of play. There must be no play.

6. Inspect the connecting link bearing and floating bearing for an out-of-round condition.

(f) Miscellaneous parts. Check the remaining miscellaneous parts of the pump assembly for general condition and replace any damaged parts.

(5) Lubrication. After the component parts of the pump assembly have been thoroughly cleaned, inspected, and repaired or replaced, they should be rinsed in clean hydraulic fluid as specified in paragraph 37a prior to reassembly. This serves to protect and lubricate the parts.

(6) Assembly.

Note. The key letters shown in parentheses in (a) through (g) below refer to figure 126.

(a) Make certain the spring retainer (B) is properly seated in the eccentric grooves around the sides of the swivel yoke plate (D).

(b) Assemble the sleeve bushings (H), preformed packings (G), and packing retainers (F) on the swivel yoke (J) and position the swivel yoke plate (D) on the swivel yoke with the bearing shaft of the rotating group (Q1) through the swivel yoke plate.

(c) Install swivel yoke plate with ten No. 10-32 x ½ socket-head cap screws (C), tightening screws alternately to assure even seating of plate, and lockwire with 0.025-inch lockwire.

(d) Assemble the parts of the rotating and retainer group (Q) and make certain the rotating group (Q1) is firmly seated in the bearing and oil seal retainer (Q5).

(e) Grasp the housing assembly (R) and lower it over the rotating and retainer group (Q) so that the outside of the rotating and retainer group will slip into the sleeve inside the housing assembly.

Caution: The shaft, piston, and bearing group (fig. 130) fits tightly in the sleeve. Be extremely careful not to allow the bearing group to become tilted. If it does, remove the bearing group and start over again. Do not use force.

(f) Keeping the piston cylinder manifold (fig. 130) in position on the pistons of the bearing group, slide the housing assembly (R) down around the rotating and retainer group (Q) until the preformed packing (Q4) around the seal retainer (Q5) offers some resistance.

(g) Apply enough weight to the housing assembly (R) to overcome the resistance of the preformed packing (Q4), and seat the seal retainer (Q5) in the housing assembly.

Note. Do not secure the seal retainer to the housing assembly at this time.

(h) Insert a No. 10-24NC screw (A, fig. 129) into the end of the cylinder bearing pin.

(i) Pull up on the screw, insert the retaining ring, and remove the screw.

(j) Install the rotating and retainer group (Q, fig. 126) with No. 10-32 hexagon nuts (K, fig. 126).

(k) Install the pistons control group (T, fig. 128).

(l) Holding the control group down tightly, start the No. 10-32 hexagon nuts (U, fig. 128) and secure
them alternately so as to seat the control group evenly in the housing assembly.

*Note.* Make certain the control group is installed so that the link of the pressure control cylinder assembly (T8, fig. 128) is adjacent to the arm of the swivel yoke (J, fig. 126) and on the side of the arm away from the hole for the inspection plug (fig. 127).

(m) Insert a No. 4-40NC screw into the tapped, headless grooved pin (S, fig. 128).

(n) Aline the link of the pressure control cylinder assembly (T8, fig. 128) and arm holes of the swivel yoke (J, fig. 126) and insert the pin through the swivel yoke and link.

*Note.* The key letters shown in parentheses in (o) through (x) below refer to figure 128 unless otherwise indicated.

(o) Secure the pin (S) in the swivel yoke with the link pin retaining ring (R) and remove screw.

(p) Install the pump cover (fig. 127) and cover gasket. Tighten the No. 10-32 hexagon nuts equally to avoid distorting the pump cover.

(q) Install the pintle bearing retainer (C), being careful not to tilt retainer.

(r) Gently tap the pintle bearing race (D) into the retainer, making sure it bottoms firmly.

(s) Install the 22 ball bearings (E) into the bearing race.

(t) Install the flat washer (F) and spring tension washer (G), respectively, over the ball bearings.

*Caution:* The outer faces of the pintles on the swivel yoke (J, fig. 126) and the sleeve bushing (H) are lapped to form leakproof seals with each other. Use caution not to damage these sealing surfaces.

(u) Insert preformed packing (N) in the inlet flange (L).

(v) Install the finger washer spring (Q) followed by the packing retainer (P).

(w) Install preformed packing (M) and install inlet flange (L).

(x) Assemble and install the outlet flange (A) by repeating steps (q) through (w) above.

(y) Apply graphite grease—9150-223-4001 to the inner (small) end of the spur gear shaft assembly (M, fig. 126).

(z) Install preformed packing (M2, fig. 126) and insert the gear shaft assembly in the inner end of the rotating and retainer group (Q, fig. 126).

(aa) Install No. 10-32 x ¼ socket-head cap screw (L, fig. 126).

(ab) Install plugs, machine thread plug, and inspection plug on the pump assembly (fig. 127).

(ac) Install tube nipples on the pump assembly (fig. 125).

(7) Installation.

(a) Prime and lubricate the pump group by pouring hydraulic fluid specified in paragraph 37a into the IN port and the case drain port of the pump group.

(b) Attach the pump group to the ac motor with six %-24 hexagon nuts.

(c) Connect the tube assemblies to the pump group and torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8525015</td>
<td>300</td>
</tr>
<tr>
<td>8167861</td>
<td>1000</td>
</tr>
<tr>
<td>8167860</td>
<td>1450</td>
</tr>
<tr>
<td>8525010</td>
<td>150</td>
</tr>
</tbody>
</table>

(d) Close the EQUILIBRATOR SYSTEM BYPASS valve (fig. 60).
(e) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(f) Place the launcher control-indicator MISSILE HYDR switch to the ON position and operate the axial pistons pump assembly for one minute.

(g) Place the MISSILE HYDR switch to the OFF position and close the SYSTEM BY-PASS valve.

(8) Inspection and test.

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly (fig. 125) as described in (1) below.

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

(c) Replace all defective parts and install tube assembly as described in (7) (c) through (g) above.

(d) Install the ventilatory cover assembly fig. 123 and the hydraulic unit door assembly.

e. Up-Down Solenoid Valve Group.

(1) Removal.

(a) Raise the erecting beam to the up-and-locked position as described in paragraph 44.

(b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(c) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(d) Remove access cover assembly (fig. 123).

(e) Disconnect cable assembly from up-down solenoid valve group (fig. 131).

(f) Disconnect and cap four attaching tube assemblies.

(g) Remove valve group by removing four hexagon nuts, flat washers, and hexagon-head bolts.

(2) Disassembly.

(a) Disassemble the valve group.

(b) Disassemble the valve assembly.

(3) Assembly.

(a) Assemble the up-down solenoid valve assembly.

(b) Assemble the up-down solenoid valve group.

(4) Installation.

(a) Install valve group.

(b) Connect four attaching tube assemblies and torque coupling nuts to 1000 pound-inches.

(c) Connect cable assembly.

(d) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(e) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(f) Perform the launcher hydraulic system air bleed procedure as described in paragraph 43.

(5) Inspection and test.

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly (fig. 131) as described in (1) below.

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

(c) Replace all defective parts and install tube assembly as described in (2) below.

(d) Install access cover assembly (fig. 123).
Figure 131. Up-down solenoid valve group—removal and installation.
(e) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

f. Locking Wedge Solenoid Valve Group.

(1) Removal.

(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(c) Remove hydraulic unit door assembly (fig. 123).

(d) Disconnect cable assembly (fig. 132).

(e) Disconnect and cap four attaching tube assemblies.

(f) Remove solenoid valve group.

(2) Disassemble (fig. 133).

(a) Loosen tube fitting locknut and remove tube elbow, nonmetallic washer, preformed packing and locknut.

(b) Remove tube reducers, tube nipple, and preformed packings.

Caution: Plug to be removed in the following step is under spring tension. Do not release plug until spring tension has been expended.

(c) Remove plug, packing retainer, preformed packings, valve spring retainers, spring, and shuttle and sleeve assembly.

(d) Remove bushing, solenoid coil, and associated parts.

(e) Remove connector receptacle.

(3) Assembly.

(a) Assemble locking wedge solenoid valve assembly and valve group.

(b) Refer to TM 9-1440-250-35 and make proper wiring connections between solenoid coil and connector receptacle.

(4) Installation.

(a) Install valve group (fig. 132) on mounting bracket.

(b) Connect cable assembly.

(c) Connect four attaching tube assemblies and torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167866</td>
<td>500</td>
</tr>
<tr>
<td>8167867</td>
<td>300</td>
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<td>8167868</td>
<td>300</td>
</tr>
<tr>
<td>8525000</td>
<td>500</td>
</tr>
</tbody>
</table>

(d) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(e) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) Inspection and test.

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly (fig. 132) as described in (1) below.

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

(c) Replace all defective parts and install tube assembly as described in (2) below.

(d) Install hydraulic unit door assembly (fig. 123).

g. Missile Hydraulic Solenoid Valve Group.

(1) Removal.

(a) Raise the erecting beam to the up-and-locked position as described in paragraph 44.

(b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
Figure 132. Locking wedge solenoid valve group - removal and installation.
(c) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(d) Remove the access cover assembly (fig. 123).

(e) Disconnect cable assembly (fig. 134) from receptacle.

(f) Disconnect and cap six attaching tube assemblies.

(g) Remove missile hydraulic solenoid valve group.

(2) Disassembly. Disassemble the valve group (fig. 135) and valve assembly.

(3) Assembly.

(a) Assemble the missile hydraulic solenoid valve assembly and valve group.

(b) Lockwire four screws with 0.032-inch steel lockwire (fig. 134).

(4) Installation.

(a) Install valve group on mounting bracket.

(b) Connect cable assembly.

(c) Connect six attaching tube assemblies and torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167865</td>
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<tr>
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<tr>
<td>8525013</td>
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</tr>
<tr>
<td>8167864</td>
<td>1000</td>
</tr>
<tr>
<td>8525011</td>
<td>500</td>
</tr>
</tbody>
</table>

Figure 133. Locking wedge solenoid valve group—disassembly and assembly.
Figure 191. Missile hydraulic solenoid valve group - removal and installation.
**Figure 135.** Missile hydraulic solenoid valve group—disassembly and assembly.
(d) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(e) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) Inspection and test.

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly (fig. 134) as described in w(1) below.

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

(c) Replace all defective parts and install tube assembly as described in w(2) below.

(d) Install access cover assembly (fig. 123).

(e) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

h. System Safety Relief Valve Group.

(1) Removal.

(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(c) Remove the hydraulic unit door assembly (fig. 123).

(d) Disconnect and cap two attaching tube assemblies (fig. 136).

(e) Remove system safety relief valve group.

(2) Disassembly. Disassemble valve group.

(3) Assembly. Assemble system safety relief valve group.

(4) Installation.

(a) Position and install valve group on mounting brackets.

(b) Connect two attaching tube assemblies and torque coupling nuts to 1000 pound-inches.

(c) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(e) Perform the launcher hydraulic system air bleed procedure as described in paragraph 43.

(5) Inspection and test.

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly (fig. 136) as described in w(1) below.

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

(c) Replace all defective parts and install tube assembly as described in w(2) below.

(d) Install the hydraulic unit door assembly (fig. 123).

i. Air Pressure Regulating Valve Group.

(1) Removal.

(a) Remove ventilatory cover assembly (fig. 123).

(b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

Warning: To prevent possible injury to personnel from pressure escaping from compressed gas cylinder assembly, make certain the following step is performed:
Figure 196. System safety relief valve group—removal and installation.
Figure 137. Removal and installation of the air pressure regulating valve group.
(c) Disconnect the tube coupling nut assembly (fig. 138) from the compressed gas cylinder assembly as shown in the main view of figure 138.

(d) Disconnect three tube assemblies (fig. 137) attached to air pressure regulating valve group.

(e) Remove valve group and cap open hydraulic lines.

(2) **Disassembly.** Disassemble the valve group and valve assembly.

**Note.** If the air pressure regulating valve assembly fails to operate satisfactorily after the application of MWO ORD Y75-W74, the probable cause is a defective valve seat in check valve 9151405. Replace the valve seat with valve seat 8428158 as prescribed in (2.1) below.

(2.1) **Valve seat replacement.**

(a) If check valve 9151405 has not been torque striped, make a pencil mark across the check valve and the air pressure regulating valve body to aid in assembling the valve.

(b) Remove the check valve from the air pressure regulating valve assembly (fig. 137).

(c) Using an allen wrench, remove the retainer.

(d) Insert a rod of suitable length and diameter into the valve from the end opposite the retainer and through the spring. Without compressing the spring, push the valve seat out of the valve.

(e) Using the same rod as in (d) above, insert new seat 8428158 into the valve.

**Note.** The valve seat should be installed with the ink marks facing outward. If no marks are visible, closely observe the edges of the center hole. On one side of the valve seat the periphery of the hole will be sharply defined and clean cut. The valve seat should be installed with this side toward the ball in the valve.

(f) Install the retainer removed in (c) above, and install the check valve in the air pressure regulating valve assembly.

(3) **Assembly.** Assemble the air pressure regulating valve assembly and valve group.

(4) **Installation.**

(a) Install valve group on mounting bracket.

(b) Connect three attaching tube assemblies to valve group and torque coupling nuts to 150 pound-inches.

(c) Connect the tube coupling nut assembly (fig. 138) to cylinder assembly and torque coupling nut assembly to 150 pound-inches.
Note. When the tube coupling nut assembly (fig. 138) is tightened against the air outlet, gas will flow from the gas cylinder assembly to the valve group (fig. 137).

(d) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(5) Inspection and test.
(a) Check all connections for air leakage; if there are any leaks, remove attaching tube assembly (fig. 137) as described in w (1) below.
(b) Check the tube and coupling nut and the mating part which attaches to tube assembly for damage or deformation.
(c) Replace all defective parts and install tube assembly as described in w (2) below.
(d) Install ventilatory cover assembly (fig. 123).

j. Compressed Gas Cylinder Assembly.
(1) Removal.
(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
(b) Depressurize the compressed gas cylinder assembly as described in paragraph 41d.
(c) Remove ventilatory cover assembly (fig. 123).

Warning: The compressed gas cylinder assembly (fig. 138) may still contain compressed gas. To prevent bodily injury to personnel by escaping gas, do not stand in front of bleed plug when releasing the air from the gas cylinder in (a) below.
(a) Loosen the bleed plug (A9) a three-quarter turn.
(b) Disconnect the bleed plug assembly (A9) from compressed gas cylinder (D).
(c) Disassemble bleed plug assembly (A).

(3) Assembly.
(a) Assemble check valve assembly (A).
(b) Assemble preformed packing (B) and metal hose assembly (C) on valve assembly.
(c) Install valve assembly on cylinder (D).

(4) Installation.
(a) Install retaining straps (fig. 138) and compressed gas cylinder assembly.
(b) Connect tube assembly to tube coupling nut assembly, connect coupling nut assembly to gas cylinder assembly, and torque coupling nut assembly to 150 pound-inches.
(c) Precharge the gas chamber assembly as described in paragraph 40.
(d) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(5) Inspection and test.
(a) Check all connections for air leakage; if there are any leaks, remove attaching tube assembly (fig. 138) as described in w(1) below.
(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.
(c) Replace all defective parts and install tube assembly as described in w(2) below.
(d) Install ventilatory cover assembly (fig. 123).

k. Missile Hydraulic Pressure Fluid Filter and Pressure Reducer Valve Group.
(1) Removal.
(a) Raise the erecting beam to the up-and-locked position as described in paragraph 44.
(b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
(c) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
(d) Remove ventilatory cover assembly (fig. 123) and access cover assembly.
Figure 139. Compressed gas cylinder assembly — disassembly and assembly.
Figure 140. Missile hydraulic pressure fluid filter and pressure reducer valve group – removal and installation.

(e) Disconnect and cap three attaching tube assemblies (fig. 140).

(f) Remove missile hydraulic pressure fluid filter and pressure reducer valve group.

(2) Disassembly.

(a) Disassemble fluid filter and pressure reducer valve group (fig. 141).

(b) Disassemble pressure reducer valve assembly.

(c) Disassemble pressure fluid filter assembly (fig. 142).

(3) Assembly.

(a) Assemble pressure fluid filter assembly.

(b) Assemble pressure reducer valve assembly (fig. 141).

(c) Assemble missile hydraulic pressure fluid filter and pressure reducer valve group.

Note. To avoid damage to filter element (fig. 142) when filter assembly is installed, make certain flow indicating arrow points away from valve subassembly (fig. 141).

(4) Installation.

(a) Install fluid filter and pressure reducer valve group (fig. 140) between mounting brackets.

(b) Connect three attaching tube assemblies. Torque coupling nuts of tube assemblies – 85205011 and 8525012 to 500 pound-inches, and coupling nut of tube assembly – 8524747 to 300 pound-inches.

(c) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) Inspection and test.

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly (fig. 141) as described in (1) below.

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.
Figure 141. Missile hydraulic pressure fluid filter and pressure reducer valve group—disassembly and assembly.
(c) Replace all defective parts and install tube assembly as described in paragraph 2 below.

(d) Install ventilatory cover assembly and access cover assembly (fig. 123).

(e) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.


   (1) Removal.

      (a) Raise the erecting beam to the up-and-locked position as described in paragraph 44.

      (b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(2) Depressurize the hydraulic fluid reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(d) Depressurize the hydraulic surge accumulator as described in paragraph 41d.

(e) Remove hydraulic unit door assembly (fig. 123), ventilatory cover assembly, and access cover assembly.

(f) Disconnect the tube assemblies (fig. 143) attached to the hydraulic surge accumulator and launcher pressure fluid filter group.

(g) Remove retaining straps, and remove accumulator and fluid filter group; cap all open hydraulic lines.
Figure 143. Hydraulic surge accumulator and launcher pressure fluid filter group - removal and installation.
(2) **Disassembly.**

(a) Disassemble accumulator and fluid filter group (fig. 144).

(b) Remove the two externally threaded rings (fig. 145) on hydraulic surge accumulator assembly.

(c) Disassemble surge accumulator assembly.

(d) Disassemble pressure fluid filter assembly (fig. 142).

(3) **Assembly.**

(a) Install three preformed packings (fig. 145) on piston subassembly and install piston subassembly in hydraulic accumulator cylinder.

(b) Assemble preformed packing on shell end cap -- 8526381 and install end cap to face the curved side of piston subassembly.

(c) Assemble backup ring and preformed packing on shell end cap -- 8526382 and install end cap to face the flat side of piston subassembly.

(d) Install the two externally threaded rings.

(e) Assemble the hydraulic surge accumulator and launcher pressure fluid filter group (fig. 144).

(4) **Installation.**

(a) Install retaining straps (fig. 143) and accumulator and launcher pressure fluid filter group.

(b) Connect four attaching tube assemblies and torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167863</td>
<td>1000</td>
</tr>
<tr>
<td>8167864</td>
<td>1000</td>
</tr>
<tr>
<td>8525016</td>
<td>150</td>
</tr>
<tr>
<td>8525009</td>
<td>300</td>
</tr>
</tbody>
</table>

(c) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 144) and the SYSTEM BY-PASS valve.

(d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(e) Precharge the hydraulic surge accumulator as described in paragraph 40.

(5) **Inspection and test.**

(a) Check all connections for fluid and air leakage; if there are any leaks, remove attaching tube assembly (fig. 144) as described in w(1) below.

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

(c) Replace all defective parts and install tube assembly as described in w(2) below.

(d) Install hydraulic unit door assembly (fig. 123), ventilatory cover assembly, and access cover assembly.

(e) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

m. **SYSTEM BY-PASS Valve Group.**

(1) **Removal.**

(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(c) Remove hydraulic unit door assembly (fig. 123) and the ventilatory cover assembly.

(d) Disconnect two tube assemblies (fig. 146) attached to valve group.

(e) Remove two hexagon nuts, handle, packing nut and lockwasher from valve group.
Figure 114. Hydraulic surge accumulator and launcher pressure fluid filter group – disassembly and assembly.
Figure 145. Hydraulic surge accumulator assembly — disassembly and assembly.

(f) Remove valve group and cap two open hydraulic lines.

(2) Disassembly.
   (a) Disassemble valve group.
   (b) Disassemble globe valve assembly (fig. 147).

(3) Assembly.
   (a) Assemble globe valve assembly.
   (b) Assemble SYSTEM BY-PASS valve group (fig. 146).

(4) Installation.

(a) Position valve group between coupling nuts of tube assemblies and pull threaded stem of the valve group through hole in panel of hydraulic pumping unit assembly.

(b) Connect two attaching tube assemblies and torque coupling nuts to 300 pound-inches.

(c) Install lockwasher, hexagon nut, handle, and hexagon nut.

(d) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
Figure 146. SYSTEM BY-PASS valve group – removal and installation.
(e) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(f) Perform the launcher hydraulic system air bleed procedure as described in paragraph 43.

(5) Inspection and test.

(a) Check the hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly (fig. 146) as described in \( w(1) \) below.

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage of deformation.

(c) Replace all defective parts and install tube assembly as described in \( w(2) \) below.

(d) Install hydraulic unit door assembly (fig. 123) and ventilatory cover assembly.

\( n. \) Dial Indicating Pressure Gage Group (HYDRAULIC RESERVOIR PRESSURE).

(1) Removal.

(a) Depressurize the hydraulic oil reservoir (fig. 60) by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(b) Remove hydraulic unit door assembly (fig. 123) and open door group (fig. 148).

(c) Disconnect the tube assembly.

(d) Remove dial indicating pressure gage group and cap tube assembly.
(2) Disassembly. Disassemble gage group.

(3) Assembly. Assemble dial indicating pressure gage group.

(4) Installation.

(a) Install gage group and torque coupling nut of tube assembly to 150 pound-inches.

(b) Precharge the equilibrator accumulator assembly as described in paragraph 40.

(5) Inspection and test.

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly as described in w(1) below.

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

(c) Replace all defective parts and install tube assembly as described in w(2) below.

(d) Install hydraulic unit door assembly (fig. 123) and close door group (fig. 148).

p. Dial Indicating Pressure Gage Group (SURGE ACCUMULATOR PRESSURE).

(1) Removal.

(a) Depressurize the equilibrator accumulator as described in paragraph 41d.

(b) Remove hydraulic unit door assembly (fig. 123) and open door group (fig. 148).

(c) Disconnect the tube assembly.

(d) Remove dial indicating pressure gage group and cap tube assembly.

(2) Disassembly. Disassemble gage group.

(3) Assembly. Assemble dial indicating pressure gage group.

(4) Installation.

(a) Install gage group and torque coupling nut of tube assembly to 150 pound-inches.
Figure 148. Dial indicating pressure gage group – removal and installation – typical.
(b) Precharge the hydraulic surge accumulator as described in paragraph 40.

(5) *Inspection and test.*

(a) Check all connections for air leakage; if there are any leaks, remove attaching tube assembly as described in \( w(1) \) below.

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

(c) Replace all defective parts and install tube assembly as described in \( w(2) \) below.

(d) Install hydraulic unit door assembly (fig. 123) and close door group (fig. 148).

q. *Dial Indicating Pressure Gage Group (AIR RESERVOIR PRESSURE).*

(1) *Removal.*

(a) Depressurize the compressed gas cylinder as described in paragraph 41d.

(b) Remove hydraulic unit door assembly (fig. 123) and open door group (fig. 148).

(c) Disconnect the tube assembly.

(d) Remove dial indicating pressure gage group and cap tube assembly.

(2) *Disassembly.* Disassemble gage group.

(3) *Assembly.* Assemble dial indicating pressure gage group.

(4) *Installation.*

(a) Install gage group and torque coupling nut of tube assembly to 150 pound-inches.

(b) Precharge the compressed gas cylinder as described in paragraph 40.

(5) *Inspection and test.*

(a) Check all connections for air leakage; if there are any leaks, remove attaching tube assembly as described in \( w(1) \) below.

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

(c) Replace all defective parts and install tube assembly as described in \( w(2) \) below.

(d) Install hydraulic unit door assembly (fig. 123) and close door group (fig. 148).

r. *Dial Indicating Pressure Gage Group (PUMP HYDRAULIC PRESSURE).*

(1) *Removal.*

(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(c) Remove hydraulic unit door assembly (fig. 123) and open door group (fig. 148).

(d) Disconnect the tube assembly.

(e) Remove dial indicating pressure gage group and cap tube assembly.

(2) *Disassembly.* Disassemble gage group.

(3) *Assembly.* Assemble dial indicating pressure gage group.

(4) *Installation.*

(a) Install gage group and torque coupling nut of tube assembly to 150 pound-inches.

(b) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(c) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
(5) **Inspection and test.**

- **(a)** Check all hydraulic connections for fluid leakage; if there are any leaks, remove attaching tube assembly, as described in *w(1)* below.
- **(b)** Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.
- **(c)** Replace all defective parts and install tube assembly as described in *w(2)* below.
- **(d)** Install hydraulic unit door assembly (fig. 123) and close door group (fig. 148).

**s. Pneumatic Tank Valve Assembly (AIR RESERVOIR AIR FILLER 2000 PSI MAX.) and Air Filler Manifold Group.**

- **(1) Removal.**
  - **(a)** Depressurize the compressed gas cylinder as described in paragraph *41d.*
  - **(b)** Remove ventilatory cover assembly (fig. 123).
  - **(c)** Disconnect two tube assemblies (fig. 149).
  - **(d)** Remove pneumatic tank valve assembly.
  - **(e)** Remove air filler manifold group by removing four fillister-head screws and flat washers.
  - **(f)** Remove rubber and cork gasket and identification plate; cap two tube assemblies.

- **(2) Disassembly.** Disassemble air filler manifold group.

- **(3) Assembly.** Assemble air filler manifold group.

- **(4) Installation.**
  - **(a)** Position rubber and cork gasket between manifold group and panel of hydraulic pumping unit assembly.

- **(b)** Position identification plate on outside of pumping unit assembly.
- **(c)** Install manifold group, gasket, and plate, and safety four No. 10-32 x \(\frac{7}{16}\) fillister-head screws with 0.051-inch steel lockwire.
- **(d)** Connect tube assemblies and torque coupling nuts to 150-pound-inches.
- **(e)** Precharge the compressed gas cylinder as described in paragraph *40.*

(5) **Inspection and test.**

- **(a)** Check all connections for air leakage; if there are any leaks, remove attaching tube assembly as described in *w(1)* below.
- **(b)** Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.
- **(c)** Replace all defective parts and install tube assembly as described in *w(2)* below.
- **(d)** Install ventilatory cover assembly (fig. 123).

**t. Pneumatic Tank Valve Assembly (SURGE ACCUMULATOR AIR FILLER 2000 PSI MAX.) and Air Filler Manifold Group.**

- **(1) Removal.**
  - **(a)** Depressurize the hydraulic surge accumulator as described in *41d.*
  - **(b)** Remove ventilatory cover assembly (fig. 123).
  - **(c)** Disconnect two tube assemblies (fig. 149).
  - **(d)** Remove pneumatic tank valve assembly.
  - **(e)** Remove air filler manifold group by removing four fillister-head screws and flat washers.
  - **(f)** Remove rubber and cork gasket and identification plate; cap two tube assemblies.
Figure 149. Pneumatic tank valve assembly and air filler manifold group — removal and installation — typical.
(2) **Disassembly.** Disassemble air filler manifold group.

(3) **Assembly.** Assemble air filler manifold group.

(4) **Installation.**

(a) Position rubber and cork gasket between manifold group and panel of hydraulic pumping unit assembly.

(b) Position identification plate on outside of pumping unit assembly.

(c) Install manifold group, gasket, and plate, and safety four No. 10-32 x \( \frac{7}{16} \) fillister-head screws with 0.051-inch steel lockwire.

(d) Connect tube assemblies and torque coupling nuts to 150 pound-inches.

(e) Precharge the hydraulic surge accumulator as described in paragraph 40.

(5) **Inspection and test.**

(a) Check all connections for air leakage; if there are any leaks, remove attaching tube assembly as described in \( w(1) \) below.

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

(c) Replace all defective parts and install tube assembly as described in \( w(2) \) below.

(d) Install ventilatory cover assembly (fig. 123).

**v. Pneumatic Tank Valve Assembly (EQUILIBRATOR ACCUMULATOR AIR FILLER 600 PSI MAX.) and Air Filler Manifold Group.**

(1) **Removal.**

(a) Depressurize the equilibrator accumulator as described in paragraph 41d.

(b) Remove the ventilatory cover assembly (fig. 123).

(e) Disconnect two tube assemblies (fig. 149).

(d) Remove pneumatic tank valve assembly.

(e) Remove air filler manifold group by removing four fillister-head screws and flat washers.

(f) Remove rubber and cork gasket and identification plate; cap two tube assemblies.

(2) **Disassembly.** Disassemble air filler manifold group.

(3) **Assembly.** Assemble air filler manifold group.

(4) **Installation.**

(a) Position rubber and cork gasket between manifold group and panel of hydraulic pumping unit assembly.

(b) Position identification plate on outside of pumping unit assembly.

(c) Install manifold group, gasket, and plate, and safety four No. 10-32 x \( \frac{7}{16} \) fillister-head screws with 0.051-inch steel lockwire.

(d) Connect tube assemblies and torque coupling nuts to 150 pound-inches.

(e) Precharge the equilibrator accumulator as described in paragraph 40.

(5) **Inspection and test.**

(a) Check all connections for air leakage; if there are any leaks; remove attaching tube assembly as described in \( w(1) \) below.

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

(c) Replace all defective parts and install tube assembly as described in \( w(2) \) below.

(d) Install ventilatory cover assembly (fig. 123).

**v. External Tube Fittings.** A typical removal and installation of an external tube fitting at-
tached to the hydraulic pumping unit (fig. 3) is described in (1) through (3) below:

(1) Removal.

(a) Raise the erecting beam to the up-and-locked position, if necessary, to provide ease of maintenance, as described in paragraph 44.

(b) Perform the depressurization required before removal of fitting as described in table XI.

Note. Orientation in table XI with respect to “left,” “right,” or “rear” of the hydraulic pumping unit is always when standing at the rear of the Hercules monorail launcher, facing forward.

<table>
<thead>
<tr>
<th>Table XI. Hydraulic Pumping Unit Assembly External Tube Fittings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fitting</strong></td>
</tr>
<tr>
<td>Tube tee – AN804-6 (fig. 150)</td>
</tr>
<tr>
<td>Tube elbow—AN833-6 (two tube elbows, fig. 150)</td>
</tr>
<tr>
<td>Tube elbow – AN833-12 (on right side of pumping unit, fig. 150)</td>
</tr>
<tr>
<td>Tube elbow – AN833-12 (on left side of pumping unit, fig. 151)</td>
</tr>
<tr>
<td>Tube elbow – AN833-16 (fig. 151)</td>
</tr>
<tr>
<td>Tube elbow – AN833-8 (fig. 150)</td>
</tr>
<tr>
<td>Tube elbow—AN833-12 (on rear side of pumping unit, fig. 150)</td>
</tr>
<tr>
<td>Nipple – AN832-4 (fig. 151)</td>
</tr>
<tr>
<td>Tube elbow – AN833-4 (fig. 150)</td>
</tr>
</tbody>
</table>

(c) Remove the required hydraulic pumping unit assembly access covers (fig. 123).

(d) Disconnect internal and external tube assemblies from tube fitting to be removed (figs. 150 and 151).

(e) Remove tube fitting and cap open lines.

(2) Installation.

(a) Install tube fitting.

Note. When installing any tube fitting having a flat washer, place washer against shoulder of tube fitting and install hexagon nut or locknut on opposite side of mounting hole.
(b) Connect tube assemblies and torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Fitting</th>
<th>Tube Assembly torque values (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube elbow –</td>
<td></td>
</tr>
<tr>
<td>AN833-12 (figs. 150 and 151)</td>
<td>1000 (6 places)</td>
</tr>
<tr>
<td>Tube elbow –</td>
<td></td>
</tr>
<tr>
<td>AN833-4 (fig. 150)</td>
<td>150 (2 places)</td>
</tr>
<tr>
<td>Nipple –</td>
<td></td>
</tr>
<tr>
<td>AN832-4 (fig. 151)</td>
<td>150 (2 places)</td>
</tr>
<tr>
<td>Tube elbow –</td>
<td></td>
</tr>
<tr>
<td>AN833-6 (two tube elbows, fig. 150)</td>
<td>300 (2 places on each elbow)</td>
</tr>
</tbody>
</table>

(c) Perform the pressurization required after installation of fitting as described in table XI.

(d) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

(e) Perform the launcher hydraulic system air bleed procedure as described in paragraph 43d.

Note. No air bleed procedure is necessary for the removal and installation of tube elbow – AN833-4 (fig. 150) and nipple – AN832-4 (fig. 151).

(3) Inspection and test.

(a) Check the tubing connections for fluid and air leakage; if there are any leaks, perform 1 through 3 below.

1. Remove the tube assembly (figs. 152 and 153) as described in w(1) below.

2. Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

3. Replace all defective parts and install tube assembly as described in w(2) below.

(b) Install hydraulic unit door assembly (fig. 123), ventilatory cover assembly, and access door assembly.

(c) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

w. Hydraulic Pumping Unit Assembly Network. The hydraulic pumping unit assembly network (figs. 152 and 153) consists of a net-
work of tube assemblies and their fittings, required to provide system interconnection between components inside the pumping unit assembly. Typical removal and installation procedures for a tube assembly or fitting of the network are provided in (1) and (2) below.

(1) Removal.

(a) Raise the erecting beam to the up-and-locked position, if necessary, to provide ease of maintenance, as described in paragraph 44.

(b) Remove hydraulic unit door assembly (fig. 123), ventilatory cover assembly.

(c) Perform the depressurization required before removal of component as described in table XII.

Table XII. Hydraulic Pumping Unit Assembly Network — Pressurization and Torque Value Requirements

<table>
<thead>
<tr>
<th>Component</th>
<th>Part No.</th>
<th>Torque value (pound-inches)</th>
<th>Fig. No.</th>
<th>Depressurization required before removal</th>
<th>Pressurization required after installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube assembly</td>
<td>8167860</td>
<td>1450</td>
<td>152</td>
<td>Open the EQUILIBRATOR SYSTEM</td>
<td>Close the EQUILIBRATOR SYSTEM</td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8167864</td>
<td>1000</td>
<td>152</td>
<td>BY-PASS valve</td>
<td>BY-PASS valve (fig. 60)</td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8167865</td>
<td>1000</td>
<td>152</td>
<td>(fig. 60) and the SYSTEM BY-PASS valve.</td>
<td>and the SYSTEM BY-PASS valve.</td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8167866</td>
<td>500</td>
<td>152</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8167869</td>
<td>1000</td>
<td>152</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Component</td>
<td>Part No.</td>
<td>Torque value (pound-inches)</td>
<td>Fig. No.</td>
<td>Depressurization required before removal</td>
<td>Pressurization required after installation</td>
</tr>
<tr>
<td>----------------------------</td>
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<td>----------------------------</td>
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<td>----------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8524747</td>
<td>300</td>
<td>152</td>
<td>Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.</td>
<td>Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.</td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8525001</td>
<td>1000</td>
<td>152</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8525003</td>
<td>1000</td>
<td>152</td>
<td></td>
<td></td>
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<tr>
<td>Tube assembly</td>
<td>8525013</td>
<td>300</td>
<td>152</td>
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</tr>
<tr>
<td>Tube assembly</td>
<td>8525014</td>
<td>1000</td>
<td>152</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8525015</td>
<td>300</td>
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<td></td>
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</tr>
<tr>
<td>Tube elbow</td>
<td>8526151</td>
<td></td>
<td>152</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube tee</td>
<td>8526145</td>
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<tr>
<td>Check valve</td>
<td>8170445</td>
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<td>Deloader valve assembly</td>
<td>9033138</td>
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<tr>
<td>Tube assembly</td>
<td>8167861</td>
<td>1000</td>
<td>153</td>
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<tr>
<td>Tube assembly</td>
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<td>Tube assembly</td>
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<tr>
<td>Tube assembly</td>
<td>8525008</td>
<td>300</td>
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<td>Tube assembly</td>
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<td>Tube assembly</td>
<td>8525017</td>
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<td>Tube assembly</td>
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<td>Tube assembly</td>
<td>9034305</td>
<td>1000</td>
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</tr>
<tr>
<td>Tube tee</td>
<td>8525061</td>
<td></td>
<td>153</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8525010</td>
<td>150</td>
<td>152</td>
<td>OPEN the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.</td>
<td>Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.</td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8525011</td>
<td>500</td>
<td>152</td>
<td></td>
<td>Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.</td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8525012</td>
<td>500</td>
<td>152</td>
<td></td>
<td>Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.</td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8525016</td>
<td>50</td>
<td>152</td>
<td>Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.</td>
<td>Precharge the hydraulic surge accumulator as described in paragraph 41d.</td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8525022</td>
<td>150</td>
<td>153</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table XII. Hydraulic Pumping Unit Assembly Network—Pressurization and Torque Value Requirements—Continued

<table>
<thead>
<tr>
<th>Component</th>
<th>Part No.</th>
<th>Torque value (pound-inches)</th>
<th>Fig. No.</th>
<th>Depressurization required before removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube assembly</td>
<td>8525019</td>
<td>150</td>
<td>152</td>
<td>Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.</td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8525023</td>
<td>150</td>
<td>153</td>
<td>Depressurize the equilibrator accumulator as described in paragraph 41d.</td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8525018</td>
<td>150</td>
<td>153</td>
<td>Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.</td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8525020</td>
<td>150</td>
<td>153</td>
<td>Depressurize the compressed gas cylinder as described in paragraph 41d.</td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8525021</td>
<td>150</td>
<td>153</td>
<td>Precharge the equilibrator accumulator as described in paragraph 40.</td>
</tr>
<tr>
<td>Tube assembly</td>
<td>8525025</td>
<td>150</td>
<td>153</td>
<td>Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.</td>
</tr>
</tbody>
</table>

(3) Inspection and test.

(a) Check the tubing connections for fluid and air leakage; if there are any leaks, perform 1 through 3 below.

1. Remove the tube assembly (figs. 152 and 153) as described in (1) above.

2. Check the tube end and coupling nut and the mating part which attaches to tube assembly for damage or deformation.

3. Replace all defective parts and install tube assembly as described in (2) above.

(b) Install hydraulic unit door assembly (fig. 128), ventilatory cover assembly, and access door assembly.

(c) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

81. Hydraulic Panel

The hydraulic panel (fig. 3) is located on the
Figure 152. Hydraulic pumping unit assembly network – removal and installation.
Figure 153. Hydraulic pumping unit assembly network – removal and installation – Continued.
right side of the launcher base, behind the hydraulic pumping unit.

a. Panel Cover (fig. 154).
   (1) Removal. Remove panel cover.
   (2) Installation. Install panel cover.

   (1) Removal.
      (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
      (b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
      (c) Remove the panel cover (fig. 154).
      (d) Disconnect five tube assemblies (fig. 155) attached to manifold group.
      (e) Remove manifold group and cap all open lines.
   (2) Disassembly. Disassemble manifold group.
   (3) Assembly. Assemble hydraulic storage manifold group.
   (4) Installation.
      (a) Install manifold group.
      (b) Connect five attaching tube assemblies and torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167885</td>
<td>1000</td>
</tr>
<tr>
<td>8167894</td>
<td>500</td>
</tr>
<tr>
<td>8167924</td>
<td>1000</td>
</tr>
<tr>
<td>8525035</td>
<td>1000</td>
</tr>
<tr>
<td>8525039</td>
<td>1000</td>
</tr>
</tbody>
</table>

(5) Inspection and test.
   (a) Check all hydraulic connections for fluid leakage; if there are any leaks, perform 1 and 2 below.
      1. Open valves and depressurize as described in (1) (a) and (b) above.
      2. Remove attaching tube assembly (figs. 155 and 179).
   (b) Check the tube end and coupling nut and the mating part which attaches to tube assembly (fig. 155) for damage or deformation.
   (c) Replace all defective parts and install tube assembly (figs. 155 and 179) as described in (4) (b) through (d) above.
   (d) Install panel cover (fig. 154).

   (1) Removal.
      (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
      (b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
      (c) Remove the panel cover (fig. 154).
      (d) Disconnect five tube assemblies (fig. 156) attached to up-lock manifold group.
      (e) Remove manifold group and cap all open lines.
   (2) Disassembly. Disassemble manifold group.
   (3) Assembly.
      (a) Install check valve with arrow toward manifold block.
      (b) Install speed control valve with hexagon nut of the valve downward.
Figure 154. Panel cover – removal and installation.
Figure 155. Hydraulic storage manifold group — removal and installation.

(c) Install tube nipple on speed control valve.

(d) Install priority valve assembly with RELIEF FLOW (largest) arrow pointing away from the block.

(e) Install remaining parts of up-lock manifold group.

(4) Installation.

(a) Position and install manifold group on hydraulic panel.
Figure 156. Up-lock manifold group—removal and installation.
(b) Connect five attaching tube assemblies and torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167885</td>
<td>1000</td>
</tr>
<tr>
<td>8167885</td>
<td>500</td>
</tr>
<tr>
<td>8167886</td>
<td>1000</td>
</tr>
<tr>
<td>8167888</td>
<td>500</td>
</tr>
<tr>
<td>8167895</td>
<td>1000</td>
</tr>
</tbody>
</table>

(c) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) Inspection and test.

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, perform 1 and 2 below.

1. Open valves and depressurize as described in (1) (a) and (b) above.

2. Remove attaching tube assembly (figs. 156, 196, and 200).

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly (fig. 156) for damage or deformation.

(c) Replace all defective parts and install tube assembly (figs. 155, 196, and 200) as described in (4) (b) through (d) above.

(d) Install panel cover (fig. 154).

d. Down-Lock Tee Group.

(1) Removal.

(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(c) Remove the panel cover (fig. 154).

(d) Disconnect three tube assemblies (fig. 157) attached to downlock tee group.
(e) Remove tee group and cap all open lines.

(2) Disassembly. Disassemble tee group.

(3) Assembly. Assemble down-lock tee group.

(4) Installation.

(a) Position and install tee group by connecting three attaching tube assemblies. Torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167897</td>
<td>1000</td>
</tr>
<tr>
<td>8525034</td>
<td>1000</td>
</tr>
<tr>
<td>8525035</td>
<td>1000</td>
</tr>
</tbody>
</table>

(b) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(c) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) Inspection and test.

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, perform 1 and 2 below.

1. Open valves and depressurize as described in (1) (a) and (b) above.

2. Remove attaching tube assembly.

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly (fig. 157) for damage or deformation.

(c) Replace all defective parts and install tube assembly as described in (4) (a) through (c) above.

(d) Install panel cover (fig. 154.)

e. Down-Lock Manifold Group.

(1) Removal.

(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(c) Remove the panel cover (fig. 154).

(d) Disconnect pipe and tube assemblies (fig. 158) attached to down-lock manifold group.

(e) Remove manifold group and cap all open lines.

(2) Disassembly. Disassemble manifold group.

(3) Assembly. Assemble down-lock manifold group.

(4) Installation.

(a) Position and install manifold group.

(b) Connect three attaching pipe and tube assemblies and torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube or pipe assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167880</td>
<td>500</td>
</tr>
<tr>
<td>8167884</td>
<td>1000</td>
</tr>
<tr>
<td>8525037</td>
<td>1000</td>
</tr>
</tbody>
</table>

(c) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) Inspection and test.

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, perform 1 and 2 below.

1. Open valves and depressurize as described in (1) (a) and (b) above.

2. Remove attaching pipe or tube assembly (figs. 158 and 187).

(b) Check the pipe or tube end and coupling nut and the mating part which attaches to pipe or tube assembly (fig. 158) for damage or deformation.
(c) Replace all defective parts and install pipe or tube assembly (figs. 158 and 187) as described in (4) (b) through (d) above.

(d) Install panel cover (fig. 154).


(1) Removal.

(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(e) Remove the panel cover (fig. 154).

(d) Disconnect five tube assemblies (fig. 159) attached to down-lock and accumulator manifold group.

(e) Remove manifold group and cap all open lines.

(2) Disassembly. Disassemble manifold group.

(3) Assembly. Assemble down-lock and accumulator manifold group.

(4) Installation.

(a) Position and install manifold group.

(b) Connect five attaching tube assem-
Figure 159. Down-lock and accumulator manifold group — removal and installation.
blies and torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167882</td>
<td>1000</td>
</tr>
<tr>
<td>8167893</td>
<td>1000</td>
</tr>
<tr>
<td>8167924</td>
<td>1000</td>
</tr>
<tr>
<td>8525039</td>
<td>1000</td>
</tr>
<tr>
<td>9031015</td>
<td>500</td>
</tr>
</tbody>
</table>

(c) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM PY-PASS valve.

(d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) Inspection and test.

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, perform 1 and 2 below.

1. Open valves and depressurize as described in (1) (a) and (b) above.

2. Remove attaching tube assembly (figs. 159, 194, and 195).

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly (fig. 159) for damage or deformation.

(c) Replace all defective parts and install tube assembly (figs. 159, 194, and 195) as described in (4) (b) through (d) above.

(d) Install panel cover (fig. 154).

g. Cylinder Manifold Group.

(1) Removal.

(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(c) Remove the panel cover (fig. 154).

(d) Disconnect three tube assemblies (fig. 160) attached to cylinder manifold group.

(e) Remove manifold group and cap all open lines.

(2) Disassembly. Disassemble the manifold group.

(3) Assembly. Assemble cylinder manifold group.

Note. Install priority valve assembly with RELIEF FLOW (larger) arrow pointing away from the hydraulic cylinder manifold. Install speed control valve with REGULATED FLOW arrow pointing away from manifold. Install check valve with arrow pointed away from manifold.

(4) Installation.

(a) Position and install manifold group.

(b) Connect three tube assemblies and torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167899</td>
<td>1000</td>
</tr>
<tr>
<td>8525037</td>
<td>1000</td>
</tr>
<tr>
<td>9031015</td>
<td>500</td>
</tr>
</tbody>
</table>

(c) Close the EQUILIBRATOR SYSTEM BY-PASS valve and the SYSTEM BY-PASS valve (fig. 60).

(d) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) Inspection and test.

(a) Check all hydraulic connections for fluid leakage; if there are any leaks, perform 1 and 2 below.

1. Open valves and depressurize as described in (1) (a) and (b) above.

2. Remove attaching tube assembly (figs. 160 and 189).

(b) Check the tube end and coupling nut and the mating part which attaches to tube assembly (fig. 160) for damage or deformation.
Figure 160. Cylinder manifold group — removal and installation.
1—Hydraulic oil reservoir assembly
2—Cap—AN929-6C
3—%18 hexagon nut—AN924-6
4—Nipple—AN832-6
5—Drain tube assembly—9152182
6—Elbow—AN833-6
7—%18 locknut—AN6289-6
8—0.468 id x 0.072 od nonmetallic washer—MS28777-6
9—Preformed packing—8034446
10—No. 10-32 hexagon nut—AN315-3R (2)
11—No. 10 lockwasher—MS35338-43 (2)
12—No. 10-32 x 2% hexagon-head bolt—AN3-5A (2)
13—No. 10 flat washer—MS15795-208 (2)
14—Bracket—9152183

Figure 161. Drain tube assembly—removal and installation.

(c) Replace all defective parts and install tube assembly (figs. 160 and 189) as described in (4) (b) through (d) above.

(d) Install panel cover (fig. 154).

82. Hydraulic Oil Reservoir Assembly

The hydraulic oil reservoir (fig. 3) is located on the left side of the launcher base.

Note. The key numbers in parentheses in a.1 and a.2 below refer to figure 161 unless otherwise indicated.
Figure 162. Hydraulic oil reservoir assembly – removal and installation.
a. Drain Procedure.
(1) Raise the erecting beam to the up-and-locked position as described in paragraph 44.
(2) Depressurize the hydraulic oil reservoir (fig. 60) by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

Note. The hydraulic fluid capacity of the hydraulic oil reservoir is approximately 20 gallons. Provide a container to hold this fluid before removing cap (2).

(3) Remove cap (2).
(4) Drain the hydraulic fluid into container and discard fluid.
(5) Replace cap (2) and torque to 270 ±25 pound-inches.

a.1. Drain Tube Assembly.
(1) Removal.
(a) Drain hydraulic oil reservoir assembly (1) as described in a above.
(b) Remove drain tube assembly (5).
(2) Installation. Install drain tube assembly (5) and torque all connections to 270 ±25 pound-inches.

a.2. Refill Procedures.
(1) Fill the hydraulic oil reservoir assembly (1) to the full mark with hydraulic fluid as specified in paragraph 37a.
(2) Pressurize the hydraulic oil reservoir (fig. 60) to 20 psi by turning the handle of the plug cock to the AIR position.

b. Hydraulic Oil Reservoir Assembly.
(1) Removal.

Note. The extent of maintenance required on the hydraulic oil reservoir assembly (fig. 162) determines whether its removal is necessary.

Caution: Be careful not to damage the attached pipe or tube assemblies when removing or installing the reservoir assembly.

(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
(b) Drain the hydraulic oil reservoir assembly (fig. 162) as described in a above.
(b.1) Remove drain tube assembly (5, fig. 161) as described in a.1(1) above.
(c) Remove tube assemblies—8167875, 8167877, and 9031118 (fig. 162), disconnect tube assemblies—8167919 and 8167889. Cap all open lines.
(d) Remove reservoir tee group (fig. 167).
(e) Remove the reservoir assembly (fig. 162).

(2) Installation.
(a) Position and install the hydraulic oil reservoir assembly (fig. 162).
(b) Install drain tube assembly (5, fig. 161) and torque all connections to 270 ±25 pound-inches.
(c) Install reservoir tee group (fig. 167).
(d) Install and connect tube assemblies (fig. 162) and torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167875</td>
<td>300</td>
</tr>
<tr>
<td>8167877</td>
<td>1450</td>
</tr>
<tr>
<td>8167889</td>
<td>500</td>
</tr>
<tr>
<td>8167919</td>
<td>1450</td>
</tr>
<tr>
<td>9031118</td>
<td>300</td>
</tr>
</tbody>
</table>

(e) Fill the reservoir assembly to the FULL mark with hydraulic fluid as specified in paragraph 37a.
(f) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
(g) Pressurize the reservoir assembly to 20 psi by turning the handle of the plug cock to the AIR position.

c. Reservoir Cap Assembly. The reservoir cap assembly (fig. 163) screws on to the top of the hydraulic oil reservoir assembly.
(1) Removal.

(a) Depressurize the hydraulic oil reservoir (fig. 60) by turning the handle of the plug cock to the
VENT position and holding until all pressure is discharged.

(b) Remove cap assembly (fig. 163) and preformed packing.

(2) Installation.

(a) Install preformed packing and reservoir cap assembly.

(b) Pressurize the hydraulic oil reservoir (fig. 60) to 20 psi by turning the handle of the plug cock to the AIR position.

d. Reservoir Cover Group.

(1) Removal.

(a) Depressurize the hydraulic oil reservoir (fig. 60) by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(b) Remove cover group (fig. 164).

(c) Remove knurled nut and fluid filter.

(2) Installation.

(a) Install reservoir cover group.

Torque eight $\frac{1}{4}$-28 x 2% hexagon-head cap screws to 35 pound-inches.

(b) Pressurize the hydraulic oil reservoir (fig. 60) to 20 psi by turning the handle of the plug cock to the AIR position.

e. Internal Pipe Assemblies.

(1) Removal.

(a) Drain hydraulic oil reservoir assembly as described in a above.

(b) Remove the reservoir cover group (fig. 164).

(c) Disconnect and remove pipe assembly (fig. 165) and nipple from reservoir assembly as required. Cap open lines and outlet port.

(2) Installation.

(a) Connect nipple to outlet port.

(b) Install pipe assemblies and torque coupling nuts to 400 pound-inches.

(c) Install reservoir cover group (fig. 164) and torque the eight $\frac{1}{4}$-28 x 2% hexagon-head cap screws to 35 pound-inches.
(d) Install cap (2, fig. 161) and torque to 270 ±25 pound-inches.

(e) Fill the reservoir assembly to the FULL mark with hydraulic fluid as specified in paragraph 37a.

(f) Pressurize the hydraulic oil reservoir (fig. 60) to 20 psi by turning the handle of the plug cock to the AIR position.
Figure 165. Internal pipe assemblies – removal and installation.
f. Safety Relief Valve.

(1) Removal.
   (a) 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.
   (b) Remove the drain pipe assembly (fig. 166).
   (c) Remove elbow, pipe assembly, and safety relief valve assembly. Cap open lines and inlet port.

(2) Installation.
   (a) Install elbow, preformed packing, and locknut.
   (b) Install pipe assembly, drain pipe assembly, and safety relief valve assembly. Torque the coupling nut on pipe assembly—8167952 to 300 pound-inches and the coupling nut of the drain pipe assembly to 112 pound-inches.
   (c) Install the clamps.
   (d) Pressurize the hydraulic oil reservoir (fig. 60) to 20 psi by turning the handle of the plug cock to the AIR position.

g. Reservoir Tee Group.

(1) Removal.
   (a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
   (b) Drain the hydraulic oil reservoir assembly as described in a above.
   (c) Disconnect tube assembly—8167889 (fig. 167) and remove tube assembly—8167877.
   (d) Remove tee group; cap all open lines and return port.

(2) Disassembly (fig. 168). Disassemble tee group.

(3) Assembly. Assemble reservoir tee group.
Figure 167. Reservoir tee group — removal and installation.

(4) Installation.

(a) Install tee group (fig. 167) on hydraulic oil reservoir assembly and connect and install two pipe assemblies. Torque coupling nut on pipe assembly — 8167889 to 500 pound-inches and 8167877 to 1450 pound-inches.

(b) Install cap (2, fig. 161) and torque to 270 ±25 pound-inches.

(c) Fill the reservoir assembly to the FULL mark with hydraulic fluid as specified in paragraph 37a.

(d) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(e) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) Liquid Sight Indicator Group.

(1) Removal.

(a) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(b) Drain the hydraulic oil reservoir assembly as described in a above.

(c) Remove the reservoir cover group (fig. 164).

(d) Remove liquid sight indicator group (fig. 169).

(2) Disassembly. Remove nipples and preformed packings from indicator group.

(3) Assembly. Attach nipples and preformed packings to liquid sight indicator group.

Note. Each nipple has two threaded shanks. One shank is long and the other is short. The short shank fits into the liquid sight indicator assembly.

(4) Installation.

(a) Install indicator group.

(b) Install cap (2, fig. 161) and torque to 270 ±25 pound-inches.
50 pound-inches and safety with 0.051-inch lockwire.

(c) Fill the hydraulic oil reservoir assembly to the FULL mark with hydraulic fluid as specified in paragraph 37a.

(d) Install reservoir cover group (fig. 164) and torque the eight ½-28 x 2% hexagon-head cap screws to 50 pound-inches.

(e) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(f) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

83. Equilibrator Accumulator Group

The equilibrator accumulator group (fig. 170) is located on the launcher base assembly, to the left of the hydraulic pumping unit assembly.

a. Removal.

(1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(3) Depressurize the equilibrator accumulator as described in paragraph 41d.

(4) Disconnect the tube assembly and
pipe assembly from the accumulator group.

(5) Remove the accumulator group; cap both open hydraulic lines.

b. Disassembly.

(1) Disassemble accumulator group (fig. 171).

(2) Disassemble accumulator assembly (fig. 171 or 172).

c. Assembly of Equilibrator Accumulator Assembly—8528083.

(1) Install a preformed packing (fig. 171) in the center recess of the piston and two retaining packing back-up rings in each outside recess.

(2) Install nipple, elbow, locknut, all preformed packings, and non-metallic washers on the end caps.

(3) Position air end cap on shell so that pin in cap fits in slot of shell.

(4) Install and tighten nut and safety with 0.032-inch steel lockwire.

Note. There are two sides to the piston: one is flat and the other is curved. The curved side must face the air end cap.

(5) Insert piston in shell.

(6) Position hydraulic end cap on shell so that pin in cap fits in slot of shell.

(7) Install and tighten nut and safety with 0.032-inch steel lockwire.

(8) Assemble equilibrator accumulator group (fig. 171).

(9) Pour at least one gallon of hydraulic fluid as specified in paragraph 37a into the hydraulic port of the accumulator group and plug port. This prevents fluid spillage during handling of accumulator group.

d. Assembly of Equilibrator Accumulator Assembly—9022271.

(1) Assemble fittings (fig. 172) on both end caps.

(2) Install two T-rings on piston and one on each end cap.
(3) Install air end cap and nut. Tighten nut until it bottoms against end cap.

Note. There are two sides to the piston: one is flat and the other is curved. The curved side must face the air end cap.

(4) Insert piston in cylinder.

(5) Install hydraulic end cap and nut. Tighten nut until it bottoms against end cap.

(6) Assemble equilibrator accumulator group (fig. 171).

(7) Pour at least one gallon of hydraulic fluid as specified in paragraph 37a into the hydraulic port of the accumulator group and plug port. This prevents fluid spillage during handling of accumulator group.

e. Installation.

(1) Install the accumulator group (fig. 170).

(2) Connect tube assembly to the front end of the accumulator group and torque coupling nut to 150 pound-inches.

(3) Remove plug from hydraulic port of accumulator group.

(4) Connect pipe assembly to rear end of accumulator group and torque coupling nut to 1000 pound-inches.
Figure 171. Equilibrator accumulator group — disassembly and assembly.
Figure 172. Equilibrator accumulator assembly – 9022271 – disassembly and assembly.
84. Cam-Operated Valve Group

Note. The key numbers shown in parentheses in a through d below refer to figure 173.

a. Removal

(1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(3) Disconnect two tube assemblies (1 and 2).

(4) Remove cam-operated valve group (6) and cap tube assemblies (1 and 2).

b. Disassembly

(1) Disassemble valve group (6).

(2) Disassemble cam-operated valve assembly (fig. 174).

c. Assembly

(1) Assemble cam-operated valve assembly.

(2) Assemble valve group (6).

d. Installation

(1) Install valve group (6).

(2) Connect the two tube assemblies (1 and 2) and torque coupling nuts to 500 pound-inches.

(3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

85. Plug Cock Group

a. Removal

(1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(3) Depressurize the compressed gas cylinder as described in paragraph 41d.

(4) Disconnect the three tube assemblies (fig. 175).

(5) Remove plug cock group and cap tube assemblies.
Figure 173. Cam-operated valve group – removal and installation.
Figure 174. Cam-operated valve assembly – disassembly and assembly.
b. Disassembly.
   (1) Disassemble plug cock group.
   (2) Disassemble plug cock assembly (fig. 176).

c. Assembly.
   (1) Assemble plug cock assembly.

(2) Assemble plug cock group (fig. 175).

d. Installation.
   (1) Install the plug cock group.
   (2) Connect the three tube assemblies to plug cock group. Torque coupling nut
Figure 175. Plug cock group – removal and installation.
Figure 176. Plug cock assembly – disassembly and assembly.
of tube assembly—8167875 to 300 pound-inches and the other two coupling nuts to 150 pound-inches.

(3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(4) Precharge the compressed gas cylinder as described in paragraph 40.

(5) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

86. EQUILIBRATOR SYSTEM BY-PASS Valve Group

a. Removal.

(1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(3) Disconnect the two tube assemblies (fig. 177).

(4) Remove EQUILIBRATOR SYSTEM BY-PASS valve group from mounting bracket; cap two tube assemblies.

b. Disassembly.

(1) Disassemble valve group.

(2) Disassemble globe valve assembly (fig. 147).

c. Assembly.

(1) Assemble globe valve assembly.

(2) Assemble valve group (fig. 177).

d. Installation.

(1) Position valve group on mounting bracket and install with mounting nut.

(2) Connect the two tube assemblies to the valve group and torque coupling nuts to 150 pound-inches.

(3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
(4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

87. Precharge System Hydraulic Network

The precharge system hydraulic network consists of three tube assemblies (fig. 178) and clamps. Tube assembly—8167879 connects the hydraulic pumping unit assembly to the equilibrator accumulator. Tube assembly—8167878 connects the hydraulic pumping unit assembly to the plug cock. Tube assembly—8167875 connects the plug cock to the hydraulic oil reservoir assembly.

a. Tube Assembly—8167875.

(1) Removal.

(a) Open the EQUILIBRATOR SYS-
TEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(b) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

c. Remove tube assembly (fig. 178) and cap open lines.

(2) Installation.

(a) Install tube assembly and torque coupling nuts to 300 pound-inches.

(b) Pressurize the hydraulic oil reservoir (fig. 60) to 20 psi by turning the handle of the plug cock to the AIR position.

c. Close the EQUILIBRATOR SYSTEM BY-PASS valve and the SYSTEM BY-PASS valve.

b. Tube Assembly — 8167878.

(1) Removal.

(a) Raise the erecting beam to the up-and-locked position as described in paragraph 44.

(b) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(c) Depressurize the compressed gas cylinder as described in paragraph 41.

(d) Remove clamps (fig. 178) and tube assembly, and cap open lines.

(2) Installation.

(a) Install tube assembly and torque coupling nuts to 150 pound-inches.

(b) Pressurize the compressed gas cylinder as described in paragraph 40.

c. Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(d) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

88. Axial Pistons Pump System

Hydraulic Network

The axial pistons pump system hydraulic network consists of four tube assemblies (fig. 179), hydraulic fittings, and clamps. Tube assembly — 8167919 supplies hydraulic fluid to the hydraulic pumping unit assembly from the hydraulic oil reservoir assembly. Tube assemblies — 8167881 and 8167877 carry return fluid from the pumping unit assembly to the reservoir assembly. Tube assembly — 9031118 is the case drain return line (fig. 8) connecting the pumping unit assembly to the axial pistons pump.

a. Removal.

(1) Raise the erecting beam to the up-and-locked position as described in paragraph 44.

(2) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
(3) Drain the hydraulic oil reservoir assembly by removing the drain plug as described in paragraph 82a(1).

(4) Remove tube assemblies (fig. 179), tube elbows, tube tee, and clamps; cap all open lines.

b. Installation.

(1) Install tube assemblies, tube tee, tube elbows, and clamps. Torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167919</td>
<td>1450</td>
</tr>
<tr>
<td>8167881</td>
<td>1000</td>
</tr>
<tr>
<td>8167877</td>
<td>1450</td>
</tr>
<tr>
<td>9031118</td>
<td>1450</td>
</tr>
</tbody>
</table>

Figure 179. Axial pistons pump system hydraulic network — removal and installation.
(2) Install drain plug (fig. 161) and pre-formed packing. Torque plug to 50 pound-inches.

(3) Fill the hydraulic oil reservoir assembly with hydraulic fluid to the FULL mark as prescribed in paragraph 37a.

(4) Pressurize the hydraulic oil reservoir (fig. 60) to 20 psi by turning the handle of the plug cock to the AIR position.

(5) Close the EQUILIBRATOR SYSTEM BY-PASS valve and the SYSTEM BY-PASS valve.

(6) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

89. Locking Wedge System

Hydraulic Network

The locking wedge system hydraulic network consists of the tube assemblies, clamps, and fittings necessary to provide hydraulic pressure and return lines for the operation of the locking wedges (fig. 41) at the front and rear inside the launcher erecting beam.

a. Removal of Tube Assemblies, Fittings, and Clamps between Two Locking Wedges.

(1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(3) Remove three plates (view A, fig. 180) and the front end cover.

(4) Remove beam center cover (fig. 82).

(5) Remove clamps (fig. 181) from tube assemblies to be replaced.

(6) Remove tube nipples, tube tees, tube elbows, and tube assemblies to be replaced; cap all open lines.

b. Installation of Tube Assemblies, Fittings, and Clamps between Two Locking Wedges.

(1) Install tube assemblies, tube nipples, tube tees, tube elbow and clamps, torque coupling nuts to 300 pound-inches.

(2) Pressurize the hydraulic oil reservoir (fig. 60) to 20 psi by turning the handle of the plug cock to the AIR position.

Note. The locking wedge hydraulic cylinders (fig. 181) have no bleed plugs. There are two tube assemblies attached to each hydraulic cylinder. Bleed each of these four tube assemblies separately as prescribed in (3) below:

(3) Loosen the tube assembly from the tube elbow on right side and the tube nipple at bottom of hydraulic cylinder. Permit fluid, which is at hydraulic oil reservoir pressure, to flow. When fluid flows free of air, tighten and torque coupling nut to 300 pound-inches.

(4) Install three access cover plates (view A, fig. 180), front end cover, and the beam center cover (fig. 82).

(5) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

c. Removal of Tube Assemblies, Fittings, and Clamps between the Rear Locking Wedge and the Swivel Joints.

(1) Remove beam center cover (fig. 82), erecting beam trunnion dust cover, and three access cover plates (fig. 180).

(2) Raise the erecting beam to the up-and-locked position as described in paragraph 44.

(3) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(4) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
Figure 180. Hydraulic network access covers - removal and installation.
Figure 181. Removal and installation of the locking wedge system hydraulic network.
NOTE: LAUNCHER REMOVED FOR CLARITY

1 - Hose assembly 8020842
2 - Container
3 - Bleeder valve

Figure 181.1. Air bleed procedure for lines to forward ends of wedge groups.

(3.8) Remove hose assembly (1, fig. 181.2) and install cap (fig. 181) on valve.

(3.9) Remove erecting beam support (fig. 57) as prescribed in paragraphs 36d(2) and 44.

(4) Install the three access cover plates (view A, fig. 180), front end cover, and beam center cover (fig. 82).

(5) Install three gasket cover assemblies (fig. 83).

c. Removal of Tube Assemblies, Fittings, and Clamps between the Rear Locking Wedge and the Swivel Joints.

(1) Remove beam center cover (fig. 82), erecting beam trunnion dust cover, and 3 access cover plates (fig. 180).

(2) Raise erecting beam to up-and-locked position as described in paragraph 44.

(3) Open EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.

(4) Depressurize hydraulic oil reservoir by turning handle of plug cock to VENT position and holding until all pressure is discharged.

(5) Remove clamps (fig. 182) from tube assemblies to be replaced.

(6) Remove tube elbows (figs. 181 and 182) and tube assemblies to be replaced; cap all open lines.

d. Installation of Tube Assemblies, Fittings, and Clamps between Rear Locking Wedge and Swivel Joints.

(1) Install tube assemblies (figs. 181 and 182) and clamps; torque coupling nuts to 300 pound-inches.

(2) Close EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.

(3) Pressurize hydraulic oil reservoir to 18 to 22 psi by turning handle of plug cock to AIR position.

(4) Lower launcher erecting beam to down-and-locked position as described in paragraph 44.

(5) Bleed air from lines as prescribed in paragraph 89b (2) through (3.9).

(6) Install beam center cover (fig. 82), erecting beam trunnion dust cover, and three access cover plates (fig. 180).

e. Removal of Support Trunnion, Tube Assemblies, Fittings, and Clamps Located in Main Trunnion.

(1) Open EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.

(2) Depressurize hydraulic oil reservoir by turning handle of plug cock to VENT position and holding until all pressure is discharged.

(3) Remove erecting beam trunnion dust cover (fig. 82) and shield, launcher base shield assembly (fig. 183), and hydraulic tubing rear cover.

(4) Remove the three plates (view A, fig. 180) and beam center cover (fig. 82).
(5) Disconnect the four tube assemblies (fig. 184) inside erecting beam from the four tube swivel joints. Cap all open lines.

(6) Disconnect the four tube assemblies (fig. 186) on right side of launcher base assembly. Cap all open lines.

(7) Disconnect support trunnion group (fig. 184) from hydraulic trunnion bracket.

(8) Disconnect trunnion group (fig. 185) at right side.

(9) Remove those loop clamps (fig. 184) which are accessible and which attach electrical power cable assembly to trunnion group.

(10) Loop clamps on cable assembly that are not accessible must be removed as follows:

(a) Move trunnion group (fig. 185) out right end of main trunnion. The cable assembly (fig. 184) will not move, but the oversized loop clamps will slide over the cable assembly.

(b) Remove these loop clamps as they appear in opening at center of main trunnion.

(c) Repeat steps (a) and (b) above until all loop clamps have been removed.

(11) Remove trunnion group (fig. 185).

(12) Remove support to be replaced.
Figure 182. Locking wedge system hydraulic network – removal and installation — Continued.
Figure 183. Launcher base hydraulic network access covers – removal and installation.
Figure 184. Locking wedge system hydraulic network — removal and installation.
Figure 185. Locking wedge system hydraulic network — removal and installation — Continued.
(13) Remove tube assemblies to be replaced on support trunnion by disconnecting from swivel joint and removing two supports.

(14) Remove tube nipple or tube elbow to be replaced.

(15) Remove tube swivel joint assembly.

(16) Remove hydraulic inboard swivel joint assembly.

f. Installation of Support Trunnion, Tube Assemblies, Fittings, and Clamps Located in Main Trunnion.

(1) Install tube swivel joint assembly and hydraulic inboard swivel joint assembly.

(2) Connect tube assemblies to swivel joint assemblies and torque coupling nuts to 300 pound-inches.

(3) Install two supports.

(4) Install loop clamps (fig. 184) as described in (a) through (c) below.
   (a) Slide support trunnion group (fig. 185) in main trunnion until first loop clamp (fig. 184) can be installed.
   (b) Install loop clamp.
   (c) Repeat (a) and (b) above until all loop clamps are installed.

(5) Position and install trunnion group (figs. 184 and 185) at each end of trunnion.

(6) Connect four tube assemblies (figs. 186 and 204) on launcher base assembly and torque coupling nuts to 300 pound-inches.

(7) Connect tube assemblies (fig. 184) to their respective swivel joints. Torque coupling nuts to 300 pound-inches.

(8) Close EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.

(9) Bleed air from lines as prescribed in paragraph 89b (2) through (3.9).

(10) Install trunnion dust cover (fig. 82), shield, launcher base shield assembly (fig. 183), and tubing rear cover.

(11) Install the three access cover plates (view A, fig. 180) and beam center cover (fig. 82).

g. Removal of Tube Assemblies, Fittings, and Clamps Located on Right Side of Launcher Base Assembly.

(1) Open EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.

(2) Depressurize hydraulic oil reservoir by turning handle of plug cock to VENT position and holding until all pressure is discharged.

(3) Remove hydraulic tubing front cover (fig. 183), center cover, and rear cover.

(4) Remove the three access cover plates (view A, fig. 180) and beam center cover (fig. 82).

(5) Remove hydraulic tubing brackets (fig. 186) and loop clamps.

(6) Remove tube assemblies and tube nipples. Cap all open lines.

h. Installation of Tube Assemblies, Fittings, and Clamps Located on Right Side of Launcher Base Assembly.
Figure 186. Locking wedge system hydraulic network – removal and installation – Continued.
(1) Install tube nipples and tube assemblies. Torque coupling nuts to 300 pound-inches.

(2) Close EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.

(3) Bleed air from lines as prescribed in paragraph 89b (2) through (3.9).

(4) Install hydraulic tubing front cover (fig. 183), center cover, and rear cover.

(5) Install the three access cover plates (view A, fig. 180) and beam center cover (fig. 82).

90. Hydraulic Down-Lock System

Hydraulic Network

The hydraulic down-lock system hydraulic network consists of tube assemblies, a rubber hose assembly, fittings, and a clamp necessary to provide a hydraulic pressure line to the hydraulic down-lock assembly.

a. Removal.

(1) Raise erecting beam to up-and-locked position as described in paragraph 44.

(2) Open EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.

(3) Depressurize hydraulic oil reservoir by turning handle of plug cock to VENT position and holding until all pressure is discharged.

(4) Remove panel cover (fig. 154).

(5) Remove clamps (fig. 187), tube assemblies, elbow, restrictor check valve, and rubber hose assembly. Cap all open lines.

b. Installation.

(1) Install tube assemblies and torque coupling units to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167880</td>
<td>500</td>
</tr>
<tr>
<td>8167884</td>
<td>1000</td>
</tr>
<tr>
<td>8522062</td>
<td>500</td>
</tr>
</tbody>
</table>

(2) Install elbow, rubber hose assembly, restrictor check valve, and clamps. Torque coupling nuts of tube assemblies to check valve to 500 pound-inches.

(3) Close EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and SYSTEM BY-PASS valve.

(4) Pressurize hydraulic oil reservoir by turning handle of plug cock to AIR position.

(5) Bleed hydraulic down-lock (fig. 64) as prescribed in (a) and (b) below.

Warning: To prevent bodily injury from the descending launcher erecting beam (fig. 2), personnel should stand outside the launcher base while performing step (a) below:

(a) Lower launcher erecting beam to approximately 70 degrees as described in paragraph 44.

(b) Loosen bleeder valve (fig. 64) on down-lock and permit fluid to flow. When fluid flows free of air, tighten plug until leakage stops.

Caution: Do not overtighten bleeder valve. Overtightening the valve will damage seating surface of valve and permit fluid leakage.

(6) Install panel cover (fig. 154).

91. Erecting System Hydraulic Network

The erecting system hydraulic network consists of tube assemblies, hose assemblies, and clamps necessary to provide hydraulic pressure and return lines to the power cylinders (fig. 8).

Figure 187. Hydraulic down-lock system hydraulic network - removal and installation.
(1) Open EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(3) Remove the panel cover (fig. 154).

(4) Remove tube assemblies (fig. 188) and tube tee to be replaced; cap all open lines.


(1) Install tube assemblies. Torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>816788</td>
<td>1000</td>
</tr>
<tr>
<td>8167885</td>
<td>1000</td>
</tr>
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<td>8167895</td>
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<tr>
<td>8167897</td>
<td>1000</td>
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<td>8167899</td>
<td>1000</td>
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<tr>
<td>8167907</td>
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<tr>
<td>8167908</td>
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</tr>
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<td>8167909</td>
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<td>8167910</td>
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<td>8167920</td>
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<tr>
<td>8167923</td>
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<td>8525034</td>
<td>1000</td>
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<tr>
<td>8525035</td>
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<tr>
<td>8525037</td>
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<tr>
<td>9030292</td>
<td>1000</td>
</tr>
<tr>
<td>9030293</td>
<td>1000</td>
</tr>
</tbody>
</table>

(2) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(3) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(4) Perform the launcher hydraulic system air bleed procedure as described in paragraph 43.

(5) Install panel cover (fig. 154).

c. Removal of Erecting System Hydraulic Network in Center Section of Launcher Base Assembly.

(1) Raise the erecting beam to the up-and-locked position as described in paragraph 44.

(2) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(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) Remove clamps and supports securing tube assemblies (fig. 189) to launcher base.

(5) Remove tube assemblies, tube nipple, tube tees, and tube reducers to be replaced; cap all open lines.

d. Installation of Erecting System Hydraulic Network in Center Section of Launcher Base Assembly.

(1) Install tube assemblies, tube nipple, tube tees, and tube reducers. Torque coupling nuts to values specified in b(1) above.

(2) Install clamps and supports to secure network.

(3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

(6) Perform the launcher hydraulic system air bleed procedure as described in paragraph 43.


(1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
Figure 188. Erecting system hydraulic network – removal and installation.
Figure 189. Erecting system hydraulic network—removal and installation—Continued.
(3) Remove hydraulic tubing covers (fig. 180 and 190).

(4) Remove launcher rack assembly as described in paragraph 61a (1) and (2).

(5) Remove clamps (figs. 191 and 192) and supports securing tube assemblies to be replaced.

(6) Remove tube assemblies (figs. 191, 192, and 193) to be replaced; cap all open lines.


(1) Install tube assemblies and torque coupling nuts to values specified in b(1) above.

(2) Install clamps and supports.

(3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) Perform the hydraulic system air bleed procedure as described in paragraph 43.

(6) Install hydraulic tubing cover (figs. 180 and 190).

(7) Install launcher rack assembly as described in paragraph 61b (5) and (6).
92. **Equilibrator System Hydraulic Network**

The equilibrator system hydraulic network consists of tube assemblies, hose assemblies, valves, fittings, and clamps necessary to provide hydraulic pressure and return lines for the operation of the equilibrator cylinders (fig. 8).

**a. Removal of Equilibrator System Hydraulic Network in Hydraulic Panel.**

1. Raise the erecting beam to the up-and-locked position as described in paragraph 44.

2. Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

*Figure 191. Erecting system hydraulic network – removal and installation.*
(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) Remove the panel cover (fig. 154).

(5) Remove clamps (fig. 194).

(6) Remove pipe or tube assemblies and tube tee; cap all open lines.

b. Installation of Equilibrator System Hydraulic Network in Hydraulic Panel.

(1) Install pipe or tube assemblies and tube tee. Torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube or pipe assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167871</td>
<td>150</td>
</tr>
<tr>
<td>8167880</td>
<td>500</td>
</tr>
<tr>
<td>8167882</td>
<td>1000</td>
</tr>
<tr>
<td>8167885</td>
<td>1000</td>
</tr>
<tr>
<td>8167893</td>
<td>1000</td>
</tr>
<tr>
<td>8167894</td>
<td>500</td>
</tr>
<tr>
<td>8167896</td>
<td>1000</td>
</tr>
</tbody>
</table>

(2) Install clamps and secure network to launcher base assembly.

(3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
(4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

(6) Perform launcher hydraulic system air bleed procedure as described in paragraph 43.

(7) Install the panel cover (fig. 154).

d. Removal of Equilibrator System Hydraulic Network in Center Section of Launcher Base.

(1) Raise the erecting beam to the up-and-locked position as described in paragraph 44.

(2) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(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) Remove clamps (fig. 195), pipe clamp, and tube saddle support.

(5) Remove tube assemblies, tube nipples, reducers, and tube tees to be replaced; cap all open lines.

(6) Close the EQUILIBRATOR SYSTEM BY-PASS valve.

(1) Install tube assemblies, tube nipples, reducers, and tube tees. Torque coupling nuts to values specified in b(1) above.

(2) Install clamps and secure network to launcher base assembly.

(3) Close the EQUILIBRATOR SYS-
TEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

(5) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

(6) Perform the launcher hydraulic system air bleed procedure as described in paragraph 43.


(1) Remove launcher rack assemblies as described in paragraph 61a (1) and (2).
Figure 195. Equilibrator system hydraulic network – removal and installation – Continued.
(2) Open EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(3) Remove hydraulic tubing covers (figs. 180 and 190).

(4) Remove supports (fig. 196), support clamps (fig. 197), and hydraulic tubing supports securing tube assemblies to be replaced.

(5) Remove tube assemblies (figs. 196, 197 and 198), tube nipples, reducers and tube tees to be replaced; cap all open lines.

(6) Remove EQUILIBRATOR SYSTEM BY-PASS valve group (fig. 177) and cap both open lines.

(7) Remove cam-operated valve group (fig. 173) and cap both open lines.
Figure 197. Equilibrator system hydraulic network – removal and installation – Continued.

1. Install cam-operated valve group.

2. Install EQUILIBRATOR SYSTEM BY-PASS valve group (fig. 177).

3. Install tube assemblies (figs. 196, 197, and 198) tube nipples, reducers, and tube tees. Torque coupling nuts to values specified in b(1) above.

4. Install support clamps (fig. 197), supports (fig. 196) and secure network to launcher base assembly.

5. Close EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

6. Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

7. Perform the launcher hydraulic system air bleed procedure as described in paragraph 43.

8. Install hydraulic tubing covers (figs. 180 and 190).

9. Install launcher rack assemblies as described in paragraph 61b (5) and (6).

93. Hydraulic Up-Lock System Hydraulic Network

The hydraulic up-lock system hydraulic network consists of tube assemblies, a hose assembly, fittings, and clamps to provide a hydraulic pressure line to the hydraulic up-lock assembly.


1. Install the erecting beam support —
9029892 as described in paragraph 36d.

(2) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(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) Remove panel cover (fig. 154).

(5) Remove loop clamps (figs. 199 and 200), rubber hose assembly (fig. 200), tube nipples (figs. 199 and 200), tube reducers (fig. 199), and tube tee.

(6) Remove tube assemblies (figs. 199 and 200); cap all open lines.

b. Installation of Hydraulic Up-Lock System

Hydraulic Network:

(1) Install rubber hose assembly (fig. 200), tube assemblies (figs. 199 and 200) tube nipples, tube reducers (fig. 199), and tube tee. Torque coupling nuts to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167885</td>
<td>1000</td>
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<tr>
<td>8167898</td>
<td>500</td>
</tr>
<tr>
<td>8167906</td>
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</tr>
<tr>
<td>8167915</td>
<td>500</td>
</tr>
<tr>
<td>8167917</td>
<td>200</td>
</tr>
<tr>
<td>8167918</td>
<td>200</td>
</tr>
</tbody>
</table>

(2) Install loop clamps (figs. 199 and 200) and secure network.

(3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(4) Pressurize the hydraulic oil reservoir by turning the handle of the plug cock to the AIR position.

(5) Install the panel cover (fig. 154).

(6) Remove the erecting beam support—9029892 as described in paragraph 36d.

(7) Perform the launcher hydraulic system air bleed procedure as described in paragraph 43.
94. **Missile Hydraulic System Network**

The missile hydraulic system network consists of the tube assemblies, fittings, and clamps that connect the hydraulic pumping unit (fig. 8) to the Nike-Ajax launching and handling rail M1A1 or M1A2 and to the loading rack test stations.

a. **Removal of Missile Hydraulic System Network between Front End Cover and Beam Center Cover.**

1. Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig 60) and the SYSTEM BY-PASS valve.

2. Depressurize the hydraulic oil reser-
voir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

3. Remove the three plates (view A, fig. 180) and front end cover.

4. Remove beam center cover (fig. 82).

5. Remove clamps (figs. 201 and 202), and tubing supports (fig. 202).

6. Remove tube assemblies (figs. 201 and 202), tube nipples, tube elbows, and resistor assembly (fig. 202).

7. Remove coupling assembly and quick-disconnect coupling half assembly (fig. 201). Cap all open lines.

b. Installation of Missile Hydraulic System Network between Front End Cover and Beam Center Cover.

1. Install tubing supports (fig. 202), restrictor check valve, tube nipples (fig. 201 and 202), tube elbows, tube assemblies and loop clamps.

2. Install pipe-to-tube elbows (fig. 201), coupling assembly, and quick-disconnect coupling half assembly.

3. Torque coupling nuts of all tube assemblies (figs. 201 and 202) to values specified below:

<table>
<thead>
<tr>
<th>Tube assembly</th>
<th>Torque value (pound-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8167789</td>
<td>500</td>
</tr>
<tr>
<td>8167790</td>
<td>500</td>
</tr>
<tr>
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<tr>
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</tr>
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<td>8525231</td>
<td>500</td>
</tr>
<tr>
<td>9032848</td>
<td>500</td>
</tr>
</tbody>
</table>

4. Install beam center cover (fig. 82).

5. Install the three access cover plates (view A, fig. 180) and the front end cover.

6. Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

7. Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

c. Removal of Missile Hydraulic System Network between Rear Locking Wedge and Main Trunnion.

1. Remove beam center cover and erecting beam trunnion dust cover (fig. 82).

2. Raise the erecting beam to the up-and-locked position as described in paragraph 44.

3. Open EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

4. Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

5. Remove clamps (fig. 203), tubing supports, and hydraulic erecting beam spacer.

6. Remove tube assemblies, tube elbows, and tube reducers; cap all open lines.

d. Installation of Missile Hydraulic System Network between Rear Locking Wedge and Main Trunnion.

1. Install tube elbows, tube reducers, and tube assemblies; torque coupling nuts to values specified in b (1) above.

2. Install clamps, tubing supports, and hydraulic erecting beam spacer.

3. Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

4. Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
Figure 201. Missile hydraulic system network – removal and installation.
Figure 202. Missile hydraulic system network - removal and installation - Continued.
Figure 203. Missile hydraulic system network — removal and installation — Continued.
(5) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

(6) Install beam center cover erecting beam trunnion dust cover (fig. 82).

e. Removal of Missile Hydraulic System Network on Right Side of Launcher Base Assembly.

(1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS VALVE.

(2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.

(3) Remove trunnion dust cover (fig. 82) and shield.

(4) Remove launcher base shield assembly (fig. 183).

(5) Remove hydraulic tubing rear cover, center cover, and front cover.

(6) Disconnect the four tube assemblies (figs. 186 and 204) near main trunnion. Cap all open lines.

(7) Disconnect the four tube assemblies (figs. 182 and 203) from the swivel joints. Cap all open lines.

(8) Remove the support trunnion group as described in paragraph 89e (7) through (11).

(9) Remove supports (fig. 205), tube nipple, tube elbow, tube assemblies, hydraulic inboard swivel joint assembly and tube swivel joint assembly. Cap all open lines.

(10) Remove six hydraulic tubing brackets (fig. 204) and three hydraulic tube clamps.

(11) Remove tube assemblies, MISSILE HYDRAULIC SHUT-OFF valve assembly, and two tube adapters.

(12) Remove tube tee.

(13) Remove check valve and tube nipple.

(14) Disassemble valve assembly (fig. 147).

f. Installation of Missile Hydraulic System Network on Right Side of Launcher Base Assembly.

(1) Assemble globe valve assembly.

(2) Install hydraulic inboard swivel joint assembly (fig. 205) and tube swivel joint assembly on support trunnion.

(3) Install tube elbow and tube nipple.

(4) Install tube assemblies and supports.

(5) Install support trunnion group as described in paragraph 89f (2) through (6).

(6) Connect swivel joint assemblies (figs. 182 and 203) to tube assemblies. Torque coupling nuts to values specified in b(1) above.

(7) Install tube assemblies (fig. 204), three hydraulic tubing clamps, six hydraulic tubing brackets, tube nipples, and check valve.

(8) Install MISSILE HYDRAULIC SHUT-OFF valve assembly, two tube adapters, and tube tee.

(9) Torque coupling nuts of tube assemblies to values specified in b(1) above.

(10) Install shield (fig. 82) and erecting beam trunnion dust cover.

(11) Install launcher base shield assembly (fig. 183) and the hydraulic tubing front, center, and rear covers.

(12) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(13) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.

g. Removal of Missile Hydraulic System Network between Hydraulic Panel and Hydraulic Oil Reservoir Assembly.

(1) Raise the erecting beam to the up-and-locked position as described in paragraph 44.
Figure 204. Missile hydraulic system network — removal and installation — Continued.
Figure 205. Missile hydraulic system network — removal and installation — Continued.
(2) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(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) Remove loop clamps (fig. 206) and sleeve spacers.
(5) Remove the tube assemblies to be replaced and cap all open lines.

h. Installation of Missile Hydraulic System Network between Hydraulic Panel and Hydraulic Oil Reservoir Assembly.

(1) Install tube assemblies and torque coupling nuts to values specified in b(1) above.
(2) Install loop clamps and sleeve spacers.
(3) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
(4) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
(5) Lower the launcher erecting beam to the down-and-locked position as described in paragraph 44.

i. Removal of Missile Hydraulic System Network between Hydraulic Oil Reservoir Assembly and Power Distribution Box Assembly.

(1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
(2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
(3) Remove the by-pass valve tube assembly (fig. 208) and MISSILE HYDRAULIC SHUT-OFF valve assembly and two adapters. Cap all open lines.
(4) Remove the quick-disconnect coupling half assemblies and unions. Cap all open lines.
(5) Disassemble valve assembly (fig. 147).

j. Installation of Missile Hydraulic System Network at Quick-Disconnect Coupling Half Assemblies.

(1) Assemble valve assembly.
(2) Install the MISSILE HYDRAULIC SHUT-OFF valve assembly (fig. 208) and by-pass valve tube assembly. Torque coupling nuts to values specified in b(1) above.
(3) Install two unions and two quick-disconnect coupling half assemblies.
(4) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
(5) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
(6) Perform the launcher hydraulic system air bleed procedure as described in paragraph 43.
Figure 207. Missile hydraulic system network – removal and installation – Continued.
LAUNCHER BASE ASSY
QUICK-DISCONNECT COUPLING HALF ASSY — 8526593
DUST CAP/PLUG AND COUPLING ASSY — 8166998
UNION — 8530662
QUICK-DISCONNECT COUPLING ASSY — 8713983
QUICK-DISCONNECT COUPLING HALF ASSY — 8526593
QUICK-DISCONNECT COUPLING ASSY — 8713983,
UNION — 8530662,
9/16-18 HEX NUT — AN924-6
9/16-18 HEX NUT — AN924-6

BY-PASS VALVE ASSY — 8167873
TUBE ASSY — 8167874
TUBE ASSY — 8167928
MISSILE HYDRAULIC SHUT-OFF VALVE ASSY — 8528923
ADAPTER — AN8116-6-6 (2)

Figure 208. Missile hydraulic system network — removal and installation — Continued.
SECTION VII. MAINTENANCE OF RUBBER HOSE ASSEMBLY BRACKET GROUP AND POWER AND EQUILIBRATOR CYLINDER ASSEMBLIES

95. General
This section covers the maintenance of a typical power or equilibrator cylinder assembly and a rubber hose assembly bracket group. The general precautions in paragraph 58 must be observed when any hydraulic system maintenance is performed.

96. Hose Assembly Bracket Group

a. Removal.
   (1) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
   (2) Depressurize the hydraulic oil reservoir by turning the handle of the plug cock to the VENT position and holding until all pressure is discharged.
   (3) Remove the launcher rack assembly as described in paragraph 61a (1) and (2).
   
   Note. The key numbers shown in parentheses in (4) through (8) below refer to figure 209.
   (4) Remove U-bolts (3).
   (5) Disconnect tube assemblies (4, 5, 6, and 7).
   (6) Disconnect hose assemblies (8).
   (7) Remove bracket group (9).
   (8) Cap all open tube assemblies and hose assemblies to prevent entry of foreign material.

b. Disassembly. Disassemble bracket group (fig. 210) as required.

c. (Deleted)

d. Installation. At least two men are required to accomplish this procedure. An additional rubber hose assembly (1 of step A, fig. 210.1) and a union (2 of step A, fig. 210.1) are used to assemble and install the hose assembly bracket group (fig. 210). Obtain these two parts before proceeding with (1) below.

   Note. The key numbers shown in parentheses in (1) through (1.2) below refer to figure 210.1.

   (1) Join two rubber hose assemblies (1 and 3 of step A) together using a union (2 of step A).
   (1.1) Slide the hose assemblies (1 and 3 of step B) through a metal hose (4 of step B).
   (1.2) Connect rubber hose assembly (3 of step B) on nipple (step B) of launcher and torque to 500 pound-inches.

   Note. The key numbers in parentheses in Note and (1.3) through (1.6) below refer to figure 210.2.

   Note. The metal hose (1 of step A) is designed to be installed in the compressed condition. For ease of maintenance, an adjustable wrench (step A) should be used to assist installation.

   (1.3) Compress metal hose (1 of step A) far enough to expose rubber hose assembly (2 of step A).
   (1.4) Adjust wrench (step A) to outside diameter of rubber hose assembly (2 of step A).
   (1.5) Insert wrench over rubber hose assembly (2 of step A) and release compression of metal hose (1 of step A).
   (1.6) Disconnect hose assembly (3 of step B) and remove nipple (4 of step B).
   (1.7) Install tube elbow (1, fig. 210.3) on bracket (2, fig. 210.3) and connect rubber hose assembly (5, fig. 210.3).
   (1.8) Torque connection to 500 pound-inches and remove adjustable wrench (fig. 210.3).
   (1.9) Install each of the three remaining hose assemblies (3 of step A, fig. 210.1) as described in (1) through (1.8) above.
   (1.10) Install hose assembly bracket group (9, fig. 209) and secure with U-bolts (3, fig. 209), lockwashers (2, fig. 209), and hexagon nuts (1, fig. 209).

(2) (Deleted)
Figure 209. Typical removal and installation of the hose assembly bracket group and power or equilibrator cylinder assembly.
(3) Install launcher rack assembly as described in paragraph 61b (5) and (6).

(4) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(5) Pressurize the hydraulic oil reservoir by turning the handle of the plug cock to the AIR position.

(6) Perform the launcher hydraulic system air bleed procedure as described in paragraph 43.

97. Power or Equilibrator Cylinder Assembly

Note. The key numbers shown in parentheses in a below refer to figure 209.

a. Removal.

(1) Remove bracket group (9) as described in paragraph 96a.

(2) Remove cover (10).

(3) Provide a suitable container under rear of cylinder assembly (25) being removed to catch hydraulic fluid.
1 - Rubber hose assembly — 8526305 (used only during installation procedure)
2 - Union — AN832-8 (used only during installation procedure)
3 - Rubber hose assembly — 8526305 (4)
4 - Metal hose — 8525195 (4)

Figure 210.1. Hose assembly bracket group — assembly and partial installation — typical.
1 — Metal hose — 8525195 (4)
2 — Rubber hose assembly — 8526305 (4)
3 — Rubber hose assembly — 8526305 (used only during installation procedure)
4 — Union — AN832-8 (used only during installation procedure)

Figure 210.2. Hose assembly bracket group — assembly and partial installation — typical — Continued.
(4) Remove tube assemblies (4 and 5) or (6 and 7) and allow fluid to drain.

Note. On HERCULES monorail launcher assemblies (1 through 3684), perform steps (5), (6) through (8), and (9) below. On launcher assemblies (3685 and subsequent), perform steps (5.1) through (7), (8.1), and (9) below.

(5) Remove nut (11), lockwasher (12), spacer assembly (14), and washer (15).

(5.1) Remove nut (11), lockwasher (12), retainer (13), bearing spacer (14), and washer (15).

(6) Loosen setscrew (16) and move pin (17) with a 2 x 4 x 24 piece of wood until end of pin is flush with eyebolt (27).

(7) Disconnect cylinder assembly (25) from trunnion support arm (26), lift cylinder assembly at rear, and remove eyebolt (27) from pin (17).

(8) Remove spacer assembly (28) and washer (29).

(8.1) Remove bearing spacer (28) and washer (29).

(9) Cap all open tube assemblies to prevent entry of foreign material.

Note. After removal of the lockwasher and flat washer, the bearing inside the eyebolt is capable of swiveling seven degrees from center. This will permit easier movement of eyebolt for removal from pin in the following step.
Note. The key numbers shown in parentheses in b through d below refer to figure 211 unless otherwise indicated.

b. Disassembly.

(1) Remove two retaining rings (1), needle roller bearing (2), and lubrication fitting (3) from eyebolt (4).

(2) Loosen two stop nuts (5), and remove the rod end cap (6) and the launcher erecting cylinder clevis (9) from the erecting beam sleeve cylinder (10).

(3) Remove bolt (11) from end cap (6).

(4) Remove cylinder retainer (19) and remove and disassemble packing retainer (12).

(5) Disassemble end cap (6) and the clevis (9).

(6) Remove two locknuts (34) and disassemble the hydraulic cylinder piston (36) and bolt (11) as required.

Note. When removing check valve assembly (29) place hand under valve assembly to prevent losing any of its spring-loaded components.

(7) Disassemble check valve assembly (fig. 212).

c. Assembly.

(1) Install preformed packing (7) and packing retainer (8) in launcher erecting cylinder clevis (9).

(2) Screw stop nut (5) onto erecting beam sleeve cylinder (10) as far as possible and screw clevis (9) onto sleeve cylinder (10) until clevis (9) bottoms.

(3) Install preformed packing (25), valve seat (24), bleeder valve (23), tube cap (22), preformed packing (31), plug (33), preformed packing (31), hexagon nut (32), and elbow (30) on clevis (9).

Note. Location of elbow (30) is interchangeable with plug (33) depending upon whether tube assembly—8167920 or—8167921 is connected to clevis (9).

(4) Place nonmetallic washer (52) in bolt (11) and secure both in position with retaining ring (51).

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Note. The location of this part must correspond with location of elbow (30) on clevis (9). **The location of this part is interchangeable with plug (33) depending on whether tube assembly—8167920 or 8167921 is connected to cylinder clevis (9).**

Figure 211. Power or equilibrator cylinder assembly—disassembly and assembly—typical—legend.
Figure 211. Power or equilibrator cylinder assembly—disassembly and assembly—typical.
(5) Place helical compression spring (50) in bolt (11).

(6) Place retaining ring (49), erecting beam cylinder bushing (48), and retaining ring (47) on erecting beam cylinder orifice (46).

(7) Place erecting beam cylinder orifice (46) in bolt (11) and secure with retaining ring (49).

(8) Install beam cylinder orifice sleeve (45), packing retainer (44), two piston rings (43), sleeve spacer (42), and helical compression spring (41) on end of bolt (11).

(9) Assemble two packing retainers (39), preformed packing (40), two packing retainers (37), and one O-ring (38) on hydraulic cylinder piston (36) and install piston on bolt (11).

Note. Locknuts (34) must be installed so that their chamfered sides face each other.

(10) Install one locknut (34) and torque to 30 ±10 pound-feet.

(11) Install one lockwasher (35) and locknut (34). Torque outside locknut to 10 pound-feet and safety with tab of lockwasher (35).

(12) Install bolt (11 and its assembled parts) with piston (36) into sleeve cylinder (10).

(13) Install preformed packing (7) and packing retainer (8) in rod end cap (6).

(14) Install stop nut (5) on sleeve cylinder (10).

(15) Install preformed packing (25), valve seat (24), bleeder valve (23), tube cap (22), nonmetallic washer (27), machine thread plug (26), and pipe plug (28) on rod end cap (6).

(16) Assemble check valve assembly (fig. 212) and install check valve assembly (29) on rod end cap (6).

Note. The location of check valve assembly (29) on rod end cap (6) must correspond with location of elbow (30) on clevis (9).

(17) Install packing retainer (18) and new O-ring (17) in outside recess of packing retainer (12).

(18) Assemble preformed packing (16) between two packing retainers (15) and install in recess of packing retainer (12).

(19) Install felt strip (14) in front recess of packing retainer (12).

(20) Install packing retainer (12) and hydraulic piston rod wiper ring (13) over bolt (11) and in rod-end cap (6), and install cylinder retainer (19).

(21) Install lubrication fitting (3), needle roller bearing (2), and two retaining rings (1) in eyebolt (4).

d. Inspection, Test, and Adjustment.

(1) Back off rod-end cap (6) and cylinder clevis (9) until the two bleeder valves (23) are aligned.

(2) Perform inspection and acceptance test of power and equilibrator cylinders using hydraulic test stand—8523711 (fig. 49), in conjunction with Instruction Card 2011, steps A through C-3.f.

(3) Slowly adjust RELIEF VALVE on hydraulic test stand to read 3000 ±25 psi.

(4) Torque stop nut (5) against rod-end cap (6) to 50 ±10 pound-feet.
With eyebolt (4) retracted, make adjustment, if necessary, by loosening hexagon nut (21) and adjusting eyebolt (4) to obtain length of 59 inches between the center of eyebolt and center of mounting holes of clevis (9).

Continue inspection and acceptance test of the cylinder as described in TB 9-1440-252-34/16.

Torque stop nut (5) against cylinder clevis (9) to 50 ±10 pound-feet.

With eyebolt (4) extended, the stroke length must be $27\frac{1}{8} \pm \frac{1}{16}$ inches.

Note. The key numbers shown in parentheses in e below refer to figure 209.

e. Installation.

Note. On HERCULES monorail launcher assemblies (1 through 3684), perform steps (1), (2) through (4), and (5) through (8) below. On launcher assemblies (3685 and subsequent), perform steps (1.1) through (3), and (4.1) through (8).

1) Install spacer assembly (28) and flat washer (29) on pin (17).

1.1) Install bearing spacer (28) and flat washer (29) on pin (17).

Section VIII. MAINTENANCE OF HYDRAULIC DOWN-LOCK ASSEMBLY AND LATCH CLEVIS GROUP

98. General

This section covers maintenance of the hydraulic down-lock assembly and the latch clevis group. The general precautions in paragraph 58 must be observed whenever any maintenance is performed.

99. Hydraulic Down-Lock Assembly

a. Removal.

1) Raise the erecting beam to the up-and-locked position as described in paragraph 44.

2) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

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.

b. Disassembly (fig. 214).
Figure 213. Hydraulic down-lock assembly and latch clevis group - removal and installation.
Figure 214. Hydraulic down-lock assembly—disassembly and assembly.
Warning: The piston in the hydraulic sleeve cylinder is spring-loaded. To avoid injury, use caution when performing step (1) below:

(1) Remove eight castellated hexagon nuts from four studs.

(2) Disassemble remaining parts of down-lock assembly, as required.

c. Assembly.

(1) Assemble the hydraulic down-lock assembly.

(2) Safety the eight ½-20 castellated hexagon nuts with 0.051-inch steel lockwire.

d. Inspection and Test. Perform a functional test of down-lock assembly using hydraulic test stand—8523711 (fig. 49) in conjunction with Instruction Card 2012.

e. Installation.

Note. The key letters shown in parentheses in (1) through (10) below refer to figure 213.

(1) Install pin trunnions (N) with retaining rings (P).

(2) Install latch clevis group (K).

(3) Position hydraulic down-lock assembly (E) and install two pillow block caps (C) and lubrication fitting (D).

(4) Install cylinder latch pin (S) and 0.250 x 1% spring pin (T) in latch clevis group (K) and down-lock assembly.

(5) Install down-lock assembly with headless grooved pin (M) and two retaining rings (L).

(6) Install preformed packing (F), ring (G), ¾-16 locknut (H), and elbow (J).

(7) Connect rubber hose assembly (R) and torque coupling nut to 500 pound-inches.

(8) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(9) Pressurize the hydraulic oil reservoir by turning the handle of the plug cock to the AIR position.

(10) Perform launcher hydraulic system air bleed procedures as described in paragraph 43.

100. Latch Clevis Group

Note. The key letters shown in parentheses in a and d below refer to figure 213.

a. Removal.
(1) Raise the erecting beam to the up-and-locked position as described in paragraph 44.

(2) Remove spring pin (T).

(3) Remove retaining ring (L) and headless grooved pin (M).

(4) Remove cylinder latch pin (S).

(5) Remove latch clevis group (K).

**b. Disassembly** (fig. 215). Disassemble clevis group.

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**Section IX. MAINTENANCE OF HYDRAULIC UP-LOCK ASSEMBLY**

**101. General**

This section covers maintenance of the hydraulic up-lock assembly. The general precautions in paragraph 58 must be observed whenever any maintenance is performed.

**102. Hydraulic Up-Lock Assembly**

Procedures for pressurizing the hydraulic uplock assembly (12, fig. 215.1) require using an external supply of dry air or nitrogen, together with certain other parts necessary for a proper hookup. Refer to table XII.1 for a list of these parts.

| Table XII.1. Parts Required for Pressurization of Hydraulic Up-Lock Assembly |
|------------------------------------------|-----------------------------|
| Nomenclature                            | Part No.   | Quantity |
| Inlet hose                               | MS28759-8-1000 | 1         |
| Inlet valve                              | 8166713    | 1         |
| Inlet valve nipple                       | AN816-7    | 1         |
| Tube nipple                              | AN815-8    | 1         |

**a. Removal.**

(1) Install the erecting beam support – 9029892 as described in paragraph 36d.

(2) Open the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.

(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.

*Note.* The key numbers shown in parentheses in (4) through (9) below refer to figure 215.1.

(4) Place two automatic jacks (1) capable of lifting a minimum of three tons, under the launcher strut (2), using hardwood blocks (3) as required; raise packs until they are equally snug under struts.

(5) Remove tube assembly — 8167906 (fig. 199) and cap tube ends.

(6) Remove clamp — AN742D5.

(7) Connect inlet valve (4) to supply hose (5). Torque coupling nut to 500 pound-inches.

(8) Connect inlet valve nipple (6) to inlet valve (4). Torque coupling nut to 500 pound-inches.

(9) Connect inlet hose (7) to tube nipple (8) and to inlet valve nipple (6). Torque coupling nut to 500 pound-inches.

*Note.* The key numbers shown in parentheses in (10) through (15) below refer to figure 216.

(10) Remove four hexagon-head cap screws and lockwashers (1 and 2).

(11) Remove hexagon nut (3) and hexagon-head cap screws (4).

(12) Remove four launcher strut up-lock covers (7) and (10).

(13) Remove four sealing rings (11) and four split ring seals (12).

(14) Remove four machine keys (13).
1 - Automobile jack (2)  
2 - Launcher strut  
3 - Hardwood blocks (as required)  
4 - Inlet valve - 8166713  
5 - Supply hose  
6 - Inlet valve nipple - AN816-7  
7 - Inlet hose - MS28759-8-1000  
8 - Tube nipple - AN815-8  
9 - Pressure regulator valve  
10 - Supply shut-off valve  
11 - Bleed plug - AN814-4 (2)  
12 - Hydraulic up-lock assembly  
13 - Dry air or nitrogen supply

Figure 215.1. Hydraulic up-lock assembly – pressurization hookup.

1 - 1/4-20 x 3/4 hexagon-head cap screw – MS35291-6 (4)  
2 - 1/4-inch lockwasher – MS35338-25 (4)  
3 - 5/8-11 hexagon nut – 503289  
4 - 5/8-11 x 2 hexagon-head cap screw – 428697  
5 - No. 10-32 x 5/16 round-head screw AN520C10R5 (28)  
6 - No. 10 lockwasher – MS35338-24 (28)  
7 - Launcher strut up-lock cover – 8167107 (2)  
8 - No. 10-32 x 5/8 flat-head screw – MS35201-52 (2)  
9 - No. 10 external-teeth lockwasher – 138597 (2)  
10 - Launcher strut up-lock cover – 8167106 (2)  
11 - Sealing ring – 8167225 (4)  
12 - Split ring seal – 9032350 (4)  
13 - Machine key – 8528788 (4)  
14 - 3/8-16 x 1/2 hexagon-socket setscrew – 142744  
15 - Tube assembly – 8167918  
16 - Tube assembly – 8167917  
17 - Erecting beam grooved shaft – 8167817  
18 - Hydraulic up-lock assembly – 8167856  
19 - Launcher strut lock key – 8167846 (4) (Part of hydraulic up-lock assembly – 8167856)  
20 - Preformed packing – AN6227-47 (2)  
21 - Upper strut arm (2)

Figure 216. Hydraulic up-lock assembly – removal and installation – legend.
Figure 216. Hydraulic up-lock assembly – removal and installation.
**Caution:** Some launchers may have two setscrews installed, one locking the other in place. In those instances, both setscrews must be removed.

(15) Remove hexagon-socket setscrew (14).

*Note.* The key numbers shown in parentheses in (16) through (18) below refer to figure 215.1.

(16) Close inlet valve (4).

(17) Open supply shut-off valve (10).

(18) Adjust pressure regulator valve (9) to 170 ± 20 psi.

**Warning:** Use only dry air or nitrogen supply for pressurization of up-lock assembly (12, fig. 215.1). Any other external supply may result in an explosion.

**Warning:** The up-lock assembly (weight 73 pounds) must be adequately supported during the procedures described in steps (19) through (24) below to prevent injury to personnel or damage to equipment.

(19) Remove erecting beam grooved shaft (17, fig. 216).

(20) Pressurize up-lock assembly (18, fig. 216) by opening inlet valve (4, fig. 215.1).

(21) Lift up-lock assembly free of upper strut arms (21, fig. 216).

**Warning:** Keep hands away from ends of up-lock assembly when performing steps (22) and (23) below to prevent injury to personnel.

(22) Close supply shut-off and inlet valves (10 and 4, fig. 215.1).

(23) Depressurize up-lock assembly by slowly loosening either bleeder valve (11, fig. 215.1).

(24) Disconnect tube assemblies (15 and 16, fig. 216) from up-lock assembly (18, fig. 216).

(25) Depressurize supply hose (5, fig. 215.1) by slowly opening inlet valve (4, fig. 215.1); cap all hydraulic connections.

(26) Remove four lock keys (19, fig. 216) and two preformed packings (20, fig. 216).

*Note.* Typical disassembly and assembly procedures for only one side of the up-lock assembly are described in b and c below.

**b. Disassembly.** The up-lock assembly is symmetrical, that is, all parts in the left half are identical and common to all parts in the right half.

(1) Remove retaining strap (fig. 217).

(2) Remove two hexagon-socket set-screws and cylinder locking nut.

(3) Remove cap bleeder valve, preformed packings, machine thread bushings, gaskets, and reducer.
Figure 216. Hydraulic up-lock assembly - removal and installation.
(15) Remove hexagon-socket setscrew (14).

*Note.* The key numbers shown in parentheses in (16) through (18) below refer to figure 215.1.

(16) Close inlet valve (4).

(17) Open supply shut-off valve (10).

(18) Adjust pressure regulator valve (9) to 170 ±20 psi.

**Warning:** Use only dry air or nitrogen supply for pressurization of up-lock assembly (12, fig. 215.1). Any other external supply may result in an explosion.

**Warning:** The up-lock assembly (weight 73 pounds) must be adequately supported during the procedures described in steps (19) through (24) below to prevent injury to personnel or damage to equipment.

(19) Remove erecting beam grooved shaft (17, fig. 216).

(20) Pressurize up-lock assembly (18, fig. 216) by opening inlet valve (4, fig. 215.1).

(21) Lift up-lock assembly free of upper strut arms (21, fig. 216).

**Warning:** Keep hands away from ends of up-lock assembly when performing steps (22) and (23) below to prevent injury to personnel.

(22) Close supply shut-off and inlet valves (10 and 4, fig. 215.1).

(23) Depressurize up-lock assembly by slowly loosening either bleed plug (11, fig. 215.1).

(24) Disconnect tube assemblies (15 and 16, fig. 216) from up-lock assembly (18, fig. 216).

(25) Depressurize supply hose (5, fig. 215.1) by slowly opening inlet valve (4, fig. 215.1); cap all hydraulic connections.

(26) Remove four lock keys (19, fig. 216) and two preformed packings (20, fig. 216).

*Note.* Typical disassembly and assembly procedures for only one side of the up-lock assembly are described in *b* and *c* below.

**b.** Disassembly. The up-lock assembly is symmetrical, that is, all parts in the left half are identical and common to all parts in the right half.

(1) Remove retaining strap (fig. 217).

(2) Remove two hexagon-socket set-screws and cylinder locking nut.

(3) Remove plug, preformed packings, machine thread bushings, gaskets, and reducer.

(298.2)
Figure 217. Hydraulic up-lock assembly—partial disassembly and assembly.
(4) Remove launcher beam plug.
(5) Disassemble remaining parts of assembly as required for maintenance.

c. Assembly.
(1) Position helical compression spring inside piston.
(2) Assemble retaining ring, wiper ring, felt strip, and packing retainer inside cylinder locking nut.
(3) Assemble two packing retainers and preformed packings on outside of piston.
(4) Assemble packing retainer and preformed packing inside launcher beam plug.
(5) Assemble packing retainer and preformed packing on outside of beam plug.
(6) Assemble cylinder locking nut on piston.
(7) Position beam plug inside hydraulic strut box cylinder so that holes in beam plug align with holes in cylinder.
(8) Install reducer, gaskets, machine thread bushings, new preformed packings, bleeder valve, and cap.
(9) Install four \( \frac{1}{4}-20 \times \frac{3}{4} \) hexagon-head setscrews.
(10) Install retaining strap and clamp.

d. Inspection and Test. Perform a functional test of the up-lock assembly using hydraulic test stand—8523711 (fig. 49) in conjunction with Instruction Card 2013.

e. Installation.

Note. The key numbers shown in parentheses in (1) through (9) below refer to figure 215.1 unless otherwise specified.

(1) Install four launcher strut lock keys (19) and two preformed packings (20).
(2) Connect tube assemblies (15 and 16), and torque coupling nuts to 200 pound-inches.
(3) Close inlet valve (4, fig. 215.1).
(4) Adjust pressure regulator valve (9, fig. 215.1) to 170 ±20 psi.
(5) Open supply shut-off valve (10, fig. 215.1).

Warning: Keep hands away from ends of up-lock assembly (18) when performing step (6) below to prevent injury to personnel.

(6) Pressurize up-lock assembly (18) by opening inlet valve (4, fig. 215.1).
(7) Position up-lock assembly between upper strut arms (21).
(8) Install erecting beam grooved shaft (17).
(9) Install four \( \frac{1}{4}-20 \times \frac{3}{4} \) hexagon-head cap screws (1) and \( \frac{1}{4} \)-inch lockwashers (2).

Note. The key numbers shown in parentheses in (10) through (17) below refer to figure 215.1 unless otherwise specified.

(10) Close inlet valve (4).
(11) Depressurize up-lock assembly (12) by slowly loosening either bleeder valve (11).
(12) Disconnect inlet hose (7) from tube nipple (8).
(13) Close supply shut-off valve (10).
(14) Depressurize supply hose (5) by slowly opening inlet valve (4).
(15) Connect tube assembly—8167906 (fig. 199), and torque coupling nuts to 500 pound-inches.
(16) Install clamp—AN742D5 (fig. 199).
(17) Tighten valves (11).

Note. The key numbers shown in parentheses in (18) through (22) below refer to figure 216 unless otherwise specified.

(18) Install four machine keys (13).
(19) Install \( \frac{5}{8}-11 \times 2 \) hexagon-head cap screw (4) and \( \frac{5}{8}-11 \) hexagon nut (3).
(20) Position four split ring seals (12) and four sealing rings (11) on up-lock assembly.
(21) Install four launcher strut up-lock covers (7) and (10).
(22) Install \( \frac{5}{8}-16 \times \frac{1}{2} \) hexagon-socket setscrew (14).
(23) Close the EQUILIBRATOR SYSTEM BY-PASS valve (fig. 60) and the SYSTEM BY-PASS valve.
(24) Pressurize the hydraulic oil reservoir to 20 psi by turning the handle of the plug cock to the AIR position.
(25) Remove the erecting beam support—9029892 as described in paragraph 36d (2).
(26) Perform the launcher hydraulic system air bleed procedures as described in paragraph 43.