Installation Instructions

UNIVERSAL MAJOR & MINOR MAINTENANCE KIT FOR E-12, E-14, E-15 BRAKE VALVES

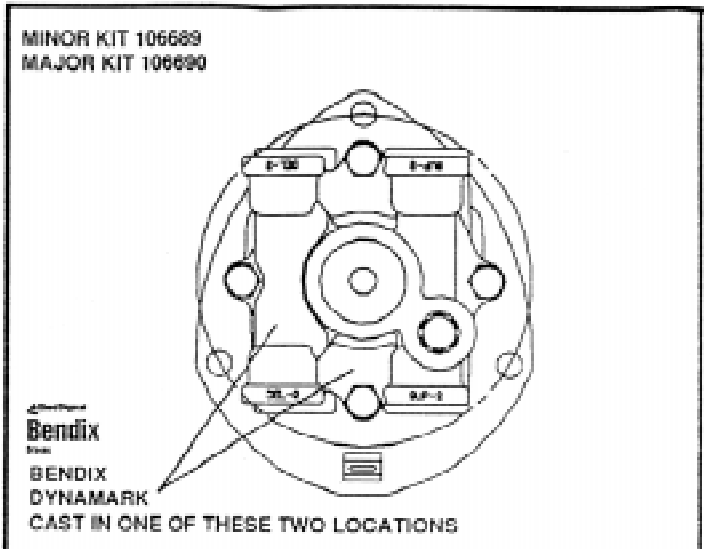


Figure 1 -- Old Version E-12/E-15

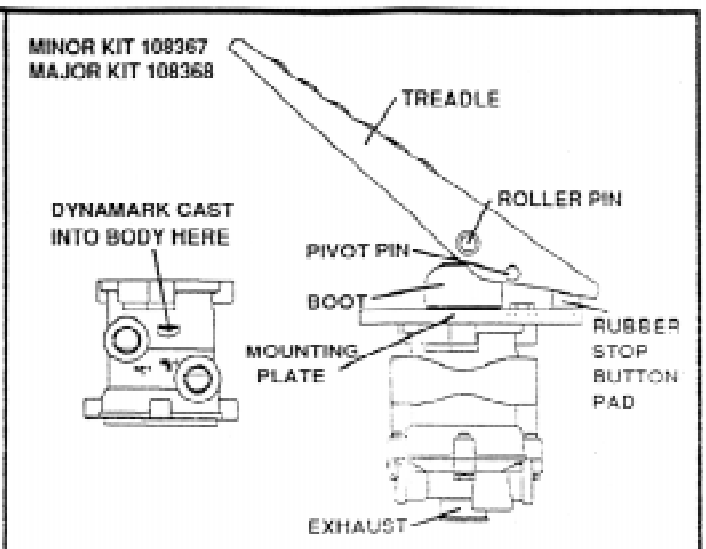


Figure 2 -- New Version E-12/E-15

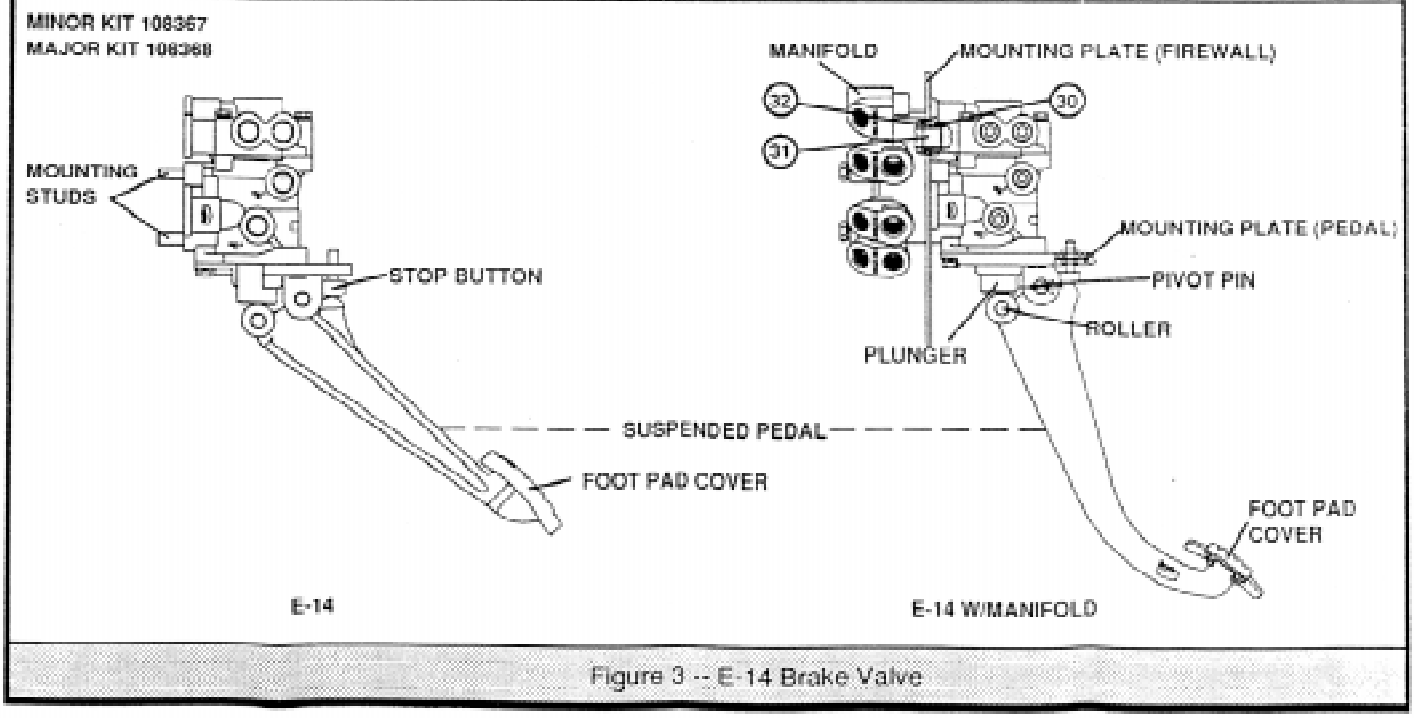


Figure 3 -- E-14 Brake Valve

IMPORTANT:

There are two versions of the E-12/E-15 brake valve. The old version uses kits 106689 + 106690. The new version uses kits 108367 + 108368. Check the location of the Bendix logo to determine the correct version and the appropriate kits.

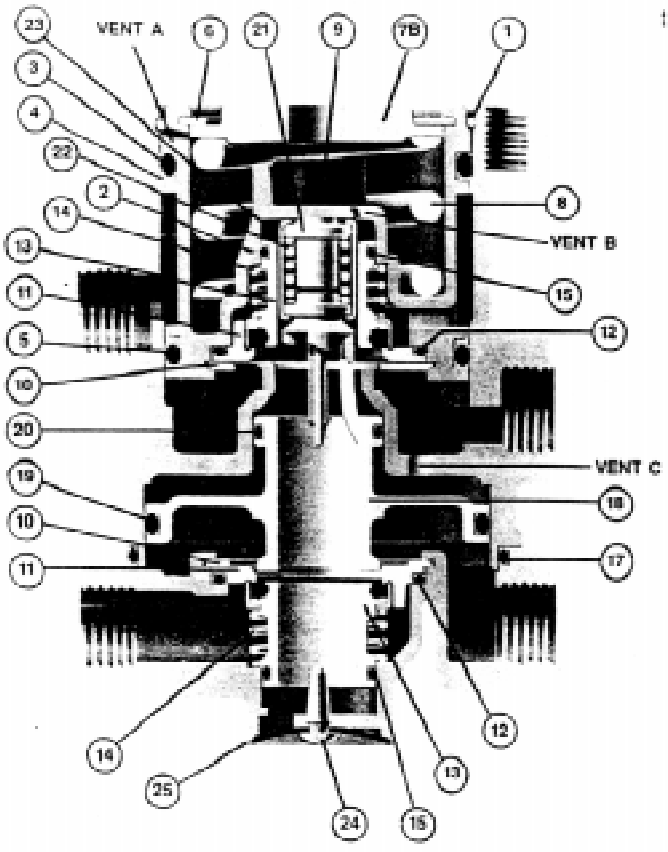
IMPORTANT! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:

When working on or around a vehicle, the following general precautions should be observed at all times.

1. **Park the vehicle on a level surface, apply the parking brakes, and always block the wheels.**
2. **Stop the engine when working around the vehicle.**
3. **If the vehicle is equipped with air brakes, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle.**
4. **Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in manner that removes all electrical power from the vehicle.**
5. **When working in the engine compartment the engine should be shut off. Where circumstances require that the engine be in operation, EXTREME CAUTION should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated, or electrically charged components.**
6. **Never connect or disconnect a hose or line containing pressure; it may whip. Never remove a component or plug unless you are certain all system pressure has been depleted.**
7. **Never exceed recommended pressures and always wear safety glasses.**
8. **Do not attempt to install, remove, disassemble or assemble a component until you have read and thoroughly understand the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.**
9. **Use only genuine Bendix replacement parts, components, and kits. Replacement hardware, tubing, hose, fittings, etc. should be of equivalent size, type, and strength as original equipment and be designed specifically for such applications and systems.**
10. **Components with stripped threads or damaged parts should be replaced rather than repaired. Repairs requiring machining or welding should not be attempted unless specifically approved and stated by the vehicle or component manufacturer.**
11. **Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.**

IMPORTANT

Because these universal kits are intended to service the E-12, E-14, and E-15 brake valves, each kit contains some components that will not be used and must be discarded. The following NOTES are keyed to the valve illustrations and describe those parts which are duplicated or unique to a particular model valve.



The parts contained in the major and minor maintenance kits are listed below for reference and are keyed to the illustrations.

MAJOR MAINTENANCE KIT

KEY	DESCRIPTION	QTY.
—	Minor Maintenance Kit (see below)	1
1	Piston Retainer Ring	1
2	Primary Piston	1
7A	Graduating Spring Retainer (E-15)	1
7B	Graduating Spring Retainer (E-12 & E-14)	1
8	Graduating Spring	1
11	Valve Seat	2
14	Valve Spring	2
18	Secondary Piston*	1
21	Differential Plunger	1
22	Differential Spring	1
23	Differential Spring Retainer	1

MINOR MAINTENANCE KIT

KEY	DESCRIPTION	QTY.
3	O-Ring	1
4	Wear Ring	2
5	O-Ring	1
6	Retaining Ring	1
9	Rubber Spring (E-12 & E-14 only)	1
10	Retaining Ring	2
12	O-Ring	2
13	Valve Assembly	2
15	O-Ring	2
17	O-Ring	1
19	O-Ring	1
20	O-Ring	1
24	Exhaust Diaphragm Retainer (E-12 & E-15)	1
25	Exhaust Diaphragm (E-12 & E-15)	1
26	Exhaust Diaphragm Retainer (E-14)	1
27	Exhaust Diaphragm (E-14)	1
28	Exhaust Diaphragm Washer (E-14)	1
29	Exhaust Diaphragm Screw (E-14)	1
30	O-Ring (E-14 Manifold)	4
31	Adapter Sleeve (E-14 Manifold)	4
32	Sealing Ring (E-14 Manifold)	4

Figure 4

NOTE 1: Two graduating spring retainers(7) are contained in the major maintenance kit, one will be discarded. It is extremely important that the correct retainer be installed, since valve performance is affected by this component. During disassembly, note the configuration of the retainer being removed, then choose the corresponding new part from the kit. Discard the other new retainer.

NOTE 2: The minor maintenance kit contains a rubber spring(9) which is used in the E-12 and E-14 brake valves only. The rubber spring is used with graduating spring retainer(7B), illustrated in the full cutaway view. Rubber spring(9) must not be installed with retainer(7A) illustrated in the inset illustration of the E-15 brake valve. Brake valve performance is changed when this component is used.

NOTE 3: The exhaust port detail components for the E-12, E-15 (floorboard mounted type) valve and the E-14 (firewall-mounted type) valve are contained in the minor maintenance kit. Referring to the illustrations, use the appropriate details and discard the unused parts. Certain versions of all three brake valve models incorporate a threaded exhaust port and therefore, do not require any of these parts. If true, then the exhaust port parts should be discarded.

NOTE 4: Items 30, 31, and 32 are used with E-14 brake valves that include a manifold on the engine compartment side. Items 30 and 32 are seal rings, and item 31 is an adapter sleeve that connects the E-14 valve through the mounting plate, to the manifold. (See Figure 3)

VALVE REMOVAL

1. Identify, mark or label all brake valve air lines and connections to ease installation. Disconnect all air lines.
2. If the brake valve is a floor board mounted type (E-12 or E-15), first mark the relationship of the valve body to the mounting plate, then remove the valve from its mounting on the vehicle.
3. If the brake valve is a firewall mounted type (E-14), remove the valve with the pedal assembly attached.

DISASSEMBLY

CAUTION: The brake valve may be lightly clamped in a bench vise during disassembly; however, over clamping will damage the valve and result in leakage and/or malfunction. Position the valve so that the vise jaws bear on the delivery and supply port bosses on opposite sides of the valve body.

1. Remove all air line fittings and plugs.
2. If the brake valve was removed with the treadle or pedal assembly attached, first mark the relationship of the mounting plate to the valve body, then remove the cap screws from the treadle or pedal assembly.
3. Mark the relationship of the upper and lower body and remove the four 1/4" cap screws(16) that secure the lower body to the upper body. Separate the two body halves and remove and discard o-ring(17).
4. Pull secondary piston(18) out of the upper body and remove and discard o-rings(19 and 20).

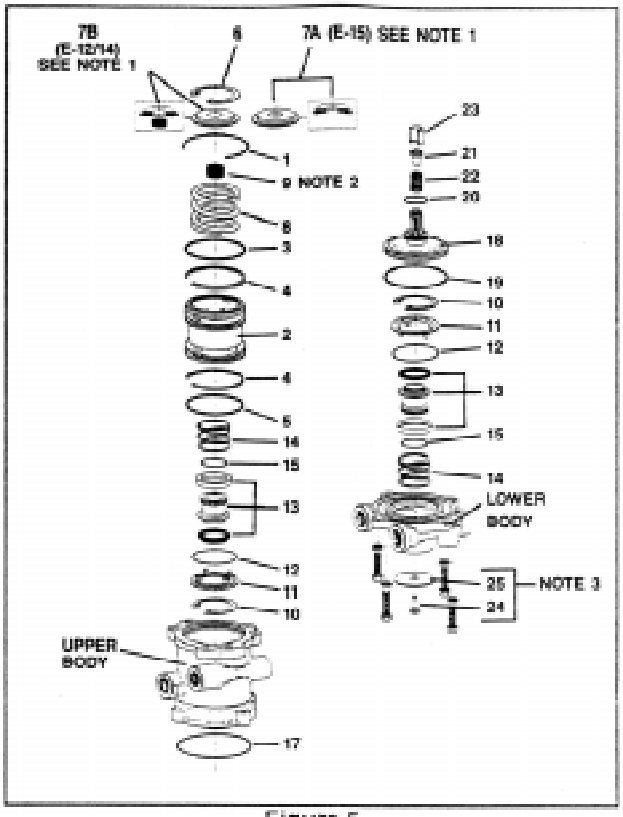


Figure 5

5. Remove and discard retaining ring(10) from the lower body while manually holding and compressing valve seat(11) in place.
6. Slowly release valve seat(11), allowing it to rise out of the body. Remove valve seat(11). Remove and discard o-ring(12).
7. Remove and discard valve assembly(13) along with o-ring(15) from the lower body. Remove valve assembly return spring(14). Go to Step 9 if servicing an E-14 brake valve.
8. Carefully remove and discard exhaust diaphragm retainer(24) and exhaust diaphragm(25) from the lowerbody. **NOTE:** Some E-12 & E-15 brake valves have threaded exhaust ports instead of items 24 & 25. Go to Step 10.
9. This step refers to the E-14 brake valve and should be disregarded when servicing either the E-12 or E-15. Using a Phillips screw driver, remove and discard exhaust diaphragm screw(29), washer(28) and diaphragm(27) from the body. Pull diaphragm retainer(26) out of the body and discard.
10. Using light force, push piston(2) into the body until piston retaining ring(1) is fully visible. Remove piston retaining ring(1), taking care not to damage the piston bore in the body.
11. Gently tap the body on a soft surface to remove piston(2). Remove and discard o-rings(3 and 5) and both wear rings(4) from piston(2).
12. Place the piston on a flat surface and using light force, depress and hold spring retainer(7), then remove and discard retaining ring(6) from piston(2).
13. Gently release spring retainer(7), allowing it to rise out of the piston. Remove spring retainer(7) and graduating spring(8) from piston(2).

14. Remove and discard rubber spring(9) from the interior of the piston(2). **NOTE:** Rubber spring(9) is used in the E-12 and E-14 brake valves only.
15. Remove and discard retaining ring(10) from piston(2) while manually holding and compressing valve seat(11).
16. Slowly release valve seat(11), allowing it to rise out of piston(2). Remove valve seat(11), then remove and discard o-ring(12).
17. Remove and discard valve assembly(13) along with o-ring(15) from piston(2). Remove valve assembly return spring(14).
18. This concludes the required disassembly. If the MINOR MAINTENANCE KIT is used, proceed to the CLEANING AND INSPECTION section. If the MAJOR MAINTENANCE KIT is used, discard the following parts (removed during disassembly steps 1 to 17) then proceed.

ITEM	DESCRIPTION	QTY.
7*	Graduating spring retainer	1
1	Piston retainer ring	1
2	Primary piston	1
8	Graduating spring	1
14	Valve return spring	2
11	Valve seat	2
18	Secondary piston w/items 21,22 &23 attached	1

***NOTE:** Before discarding, note the shape of this item and select the appropriate replacement retainer from kit. Discard both the retainer removed during disassembly and the unused retainer contained in the kit.

CLEANING & INSPECTION

1. Using mineral spirits or an equivalent solvent, clean and thoroughly dry all metal parts.
2. Inspect the interior and exterior of all salvaged metal parts for severe corrosion, pitting and cracks. Superficial corrosion and or pitting on the exterior portion of the upper and lower body halves is acceptable.
3. Inspect the bores of both body halves for deep scuffing or gouges.
4. If primary piston(2) is to be reused make certain that vents "A & B" are open and free of obstructions. (See Fig. 4)
5. Make certain vent "C" is open in the upper body of the valve. (See Fig. 4)
6. Inspect the pipe threads in both body halves. Make certain they are clean and free of thread sealant.
7. Inspect the treadle or pedal assembly and mounting plate which attaches to the basic valve. Make certain that the treadle or pedal roller turns freely and is lightly lubricated. **Note:** Some treadle/pedal assemblies, not furnished by Bendix, do not use a roller. In this case, make certain the mechanism in use moves across the plunger smoothly without binding or sticking. Inspect the plunger for excessive scuffing and wear. Check the plunger bore in the mounting plate for wear. Inspect the mounting plate for severe corrosion paying particular attention to the area around the pedal or treadle pin bores.

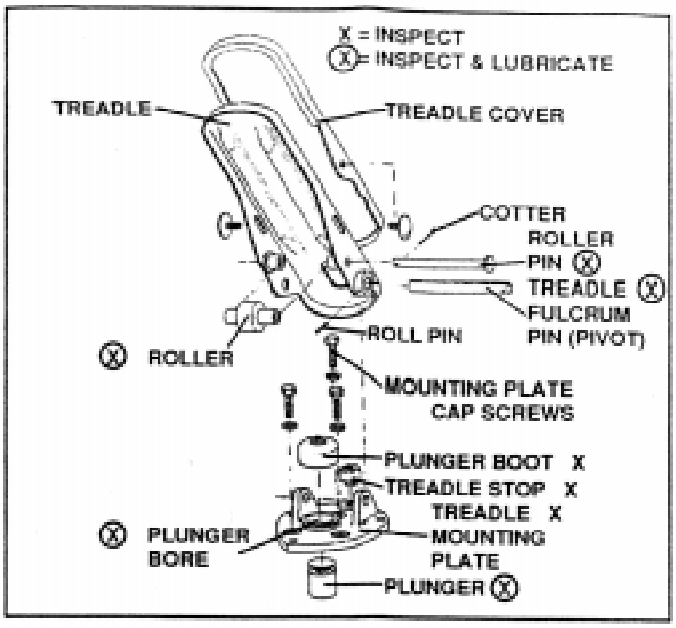


Figure 6 — Treadle Assy.

8. When applicable, check the rubber boot installed between the plunger and mounting plate for deterioration or cracking.
9. Inspect all air line fittings and plugs for corrosion. Clean all old thread sealant from the pipe threads.

Any valve or treadle assembly component exhibiting a condition described in inspection steps 1 to 9 should be discarded and replaced before proceeding.

ASSEMBLY

1. EXCEPT FOR THE SECONDARY PISTON(18) O-RINGS use the silicone lubricant provided in this kit (650-M) and lightly coat all o-rings, o-ring bores and grooves. Lightly lubricate primary piston(2) bore into which graduating spring(8) is installed. With the 328-M lubricant, lightly coat o-rings(19 and 20) and o-ring grooves of the secondary piston(18).
2. Place primary piston(2) on a flat surface and install rubber spring(9) and metal graduating spring(8). **NOTE:** The rubber spring(9) is used in the E-12 and E-14 brake valves only. If a rubber spring was not removed in disassembly step 13, discard this component. **DO NOT INSTALL RUBBER SPRING(9) IF THE VALVE IS AN E-15 BRAKE VALVE. CAUTION: Two spring retainers are provided in the major kit. Refer to the illustrations to determine the proper spring retainer to use. Installation of the incorrect spring retainer will alter the application characteristics of the brake valve.**
3. Install the proper graduating spring retainer(7) on top of graduating spring(8), making certain that the side with the high, circular protrusion is away from the spring.
4. Manually depress and hold spring retainer(7) in piston(2), then install retaining ring(6), making certain it is completely seated in its groove in the piston(2).
5. Install o-rings(15) on both valve assemblies(13).
6. Install valve spring(14) in piston(2), then install valve assembly(13) in spring(14).

7. Install o-ring(12) on valve seat(11), then install valve seat(11) on valve assembly(13). Gently depress and hold valve seat in piston(2) while installing retaining ring(10). **IMPORTANT:** Inspect retaining ring(10) to ensure that it is completely seated in its groove in piston(2).
8. Install o-rings(3 and 5) on primary piston(2). Install wear rings(4) in the o-ring grooves next to the o-rings. Make certain that one flange of wear ring(4) is in the o-ring groove, while the opposite flange extends away from the end of the piston(2) and toward the center. The wear ring flange **MUST NOT COVER OR OVERLAP EITHER O-RING.** Refer to Fig. 4 and note positions of items 3, 4, and 5.
9. Carefully insert assembled primary piston(2), valve end first, into the upper valve body until the piston retaining ring groove in the body is visible. Make certain o-rings (3 and 5) and wear rings(4) are not damaged in the process. Do not force the piston. If substantial resistance is encountered, re-check wear ring installation.
10. Install piston retaining ring(1) in its groove in the upper body, making certain it is fully seated in the groove.
11. If minor kit is being installed, proceed to step 12. Install plunger(21) in its spring(22). While manually depressing and holding the plunger and spring on piston(18) slide retainer(23) into place so that it secures both the plunger and spring to piston (18). Make certain both retainer flanges are securely installed around the piston lip and plunger groove.
12. Install o-rings(19 and 20) on secondary piston(18).
13. This step refers to the E-12 and E-15 brake valves. Proceed to step 14 if the E-14 brake valve is being serviced. Install exhaust diaphragm(25) on the lower body and secure it using diaphragm retainer(24.) **NOTE:** Some E-12 and E-15 brake valves have threaded exhaust ports instead of items 24 and 25.
14. This step refers to the E-14 brake valve and should be disregarded when servicing either the E-12 or E-15. Press diaphragm retainer(26) into the lower body. Install exhaust diaphragm(27) and diaphragm washer(28) and secure them on retainer(26) with screw(29). **NOTE:** If the threaded exhaust port is used discard items 26, 27, 28 and 29.
15. Install valve spring(14) in the lower body, then install valve assembly(13) in the spring.
16. Install o-ring(12) on valve seat(11), then install the valve seat on valve assembly(13). Gently depress and hold the valve seat in the lower body while installing retaining ring(10).
    IMPORTANT: Make certain retaining ring(10) is completely seated in its groove in the lower body.
17. Install assembled secondary piston(18) in the upper body making certain that o-rings 19 and 20 are not damaged in the process.
18. Install o-ring(17) on the upper body. Join the assembled upper and lower body halves noting the relationship marked in DISASSEMBLY, Step 2. Secure using four, 1/4" cap screws(16). Torque to 30 to 60 pound inches.
19. If the brake valve mounting plate was removed, reinstall the pedal mounting plate assembly on the basic brake valve noting the relationship marked during DISASSEMBLY, Step 2. Secure the mounting plate to the valve using the three, 5/16" cap screws and torque to 80 to 120 pound inches.
20. Install all air line fittings and plugs making certain thread sealant material does not enter the valve.

VALVE INSTALLATION

1. Install the assembled brake valve on the vehicle.
2. Reconnect all air lines to the valve using the identification made during VALVE REMOVAL, step 1.
3. After installing the brake valve assembly, perform the following "OPERATION AND LEAKAGE TESTS" before placing the vehicle in service.

OPERATION & LEAKAGE TESTS

General

A change in vehicle braking characteristics or a low pressure warning may indicate a malfunction in one or the other brake circuit. Although the vehicle air brake system may continue to function, the vehicle should not be operated until the necessary repairs have been made and both braking circuits, including the pneumatic and mechanical devices, are operating normally. Always check the vehicle brake system for proper operation after performing brake work and before returning the vehicle to service.

Operating Check

Check the delivery pressure of both No. 1 and No. 2 circuits using accurate test gauges. **Note:** The treadle or pedal will not be in a "normal" released position until the air brake system is pressurized. The pedal or treadle will rise to its normal release position as the brake system is pressurized. Depress the treadle to several positions between the fully released and fully applied positions and check the delivered pressure on the test gauges to see that it varies equally and proportionately with the movement of the brake pedal.

After a full application is released, the reading on the test gauges should quickly return to zero. **NOTE:** The No. 1 circuit delivery pressure will be about 2 to 4 psi greater than the No. 2 circuit delivery pressure with both supply reservoirs at the same pressure. This is normal for this valve.

Leakage Check

Coat the exhaust port and body of the brake valve with a soap solution.

Make and hold an 80 psi application.

Leakage permitted is a one inch bubble in 3 seconds in both the applied and released positions. No leakage permitted anywhere else.

If the brake valve does not function as described above or leakage is excessive, it is recommended that it be replaced with a new or remanufactured unit available at Bendix outlets.