

## Bendix® R-12® & R-14® Relay Valves

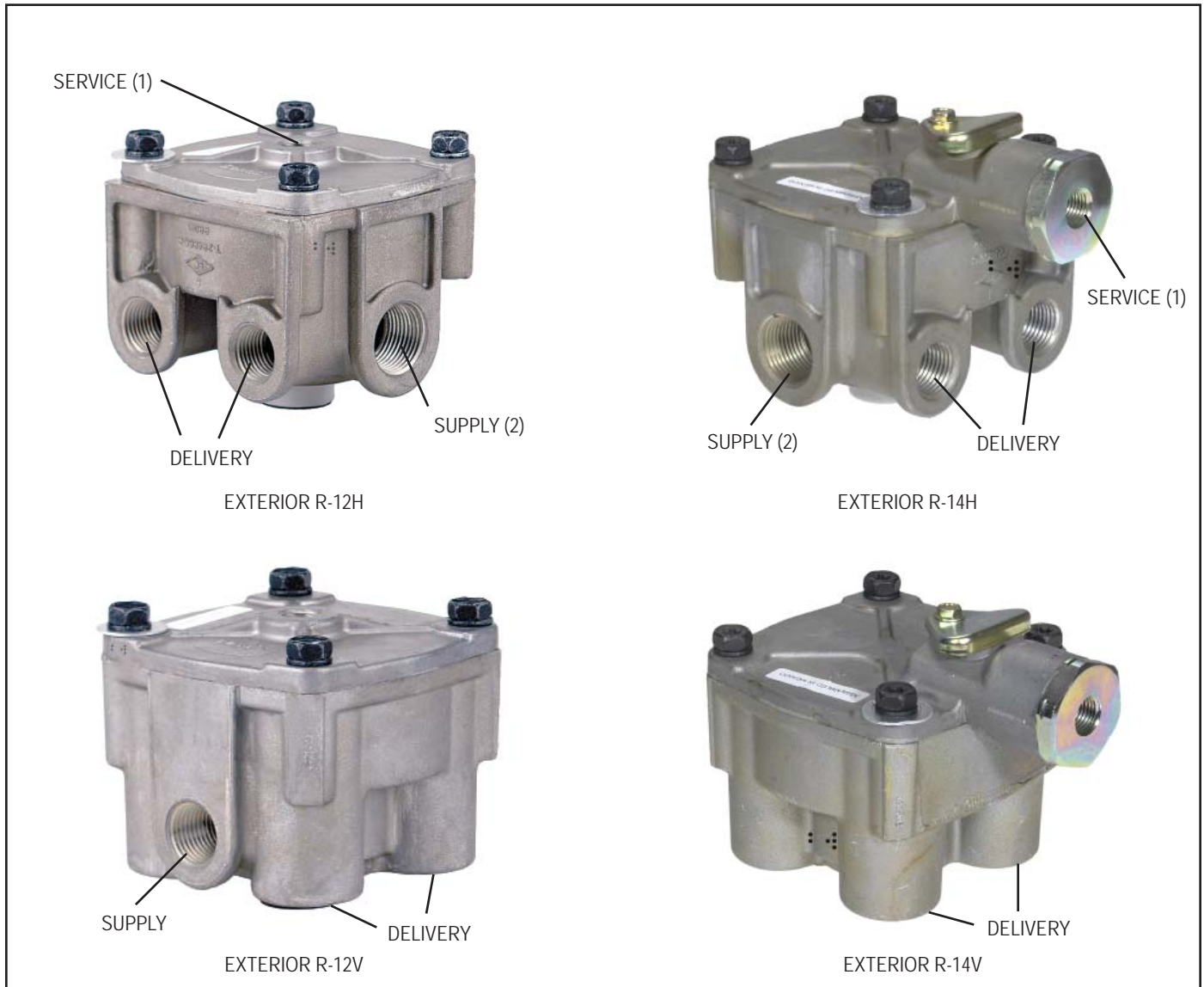


FIGURE 1 - EXTERIOR VIEWS

### DESCRIPTION

The relay valve in an air brake system functions as a relay station to speed up the application and release of the brakes. The valve is normally mounted at the rear of the vehicle in proximity to the chambers it serves. The valve operates as a remote controlled brake valve that delivers or releases air to the chambers in response to the control air delivered to it from the foot brake valve or other source.

The R-12® and R-14® relay valves are designed for either reservoir or frame mounting. A universal mounting bracket is furnished that permits easy interchange with other Bendix® relay valves. Both valves are available in the two body styles illustrated in Figure 1. The R-14® valve differs from the R-12® valve in that it incorporates a quick release and anti-compounding feature located above its horizontal service port. The R-14® valve's anti-compound feature allows it to

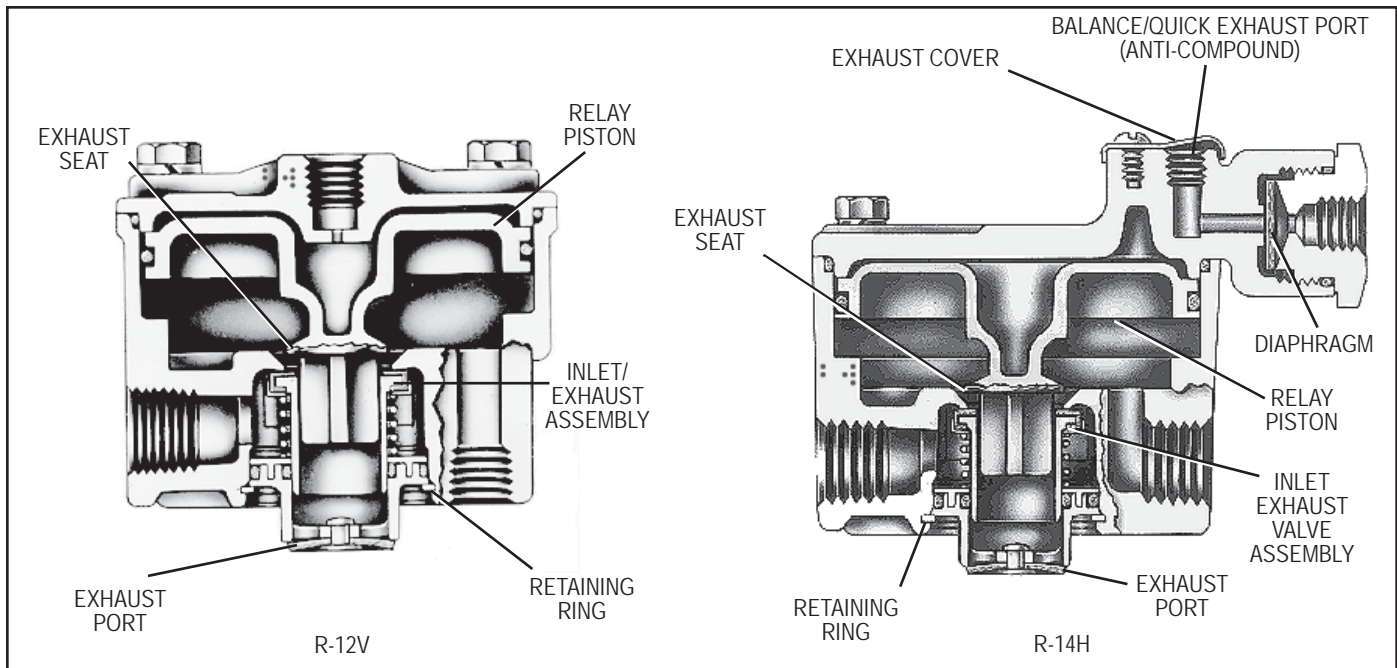


FIGURE 2 - SECTIONAL VIEWS

be conveniently used as either a service or spring brake relay valve. An exhaust cover is installed that protects the 1/8" balance port when the R-14® valve anti-compound feature is not in use.

All parts are interchangeable between the R-12® and R-14® valves with the exception of the detail components of the R-14® valve cover. Both valves make extensive use of non-metallic internal components. For ease of servicing, the inlet/exhaust valve can be replaced without the need for line removal.

## OPERATION

### APPLICATION

Air pressure delivered to the service port enters the small cavity above the piston and moves the piston down. The exhaust seat moves down with the piston and seats on the inner or exhaust portion of the inlet/exhaust valve, sealing off the exhaust passage. At the same time, the outer or inlet portion of the inlet/exhaust valve moves off its seat, permitting supply air to flow from the reservoir, past the open inlet valve and into the brake chambers.

### BALANCE

The air pressure being delivered by the open inlet valve also is effective on the bottom area of the relay piston. When air pressure beneath the piston equals the service air pressure above, the piston lifts slightly and the inlet spring returns the inlet valve to its seat. The exhaust remains closed as the service line pressure balances the delivery pressure. As delivered air pressure is changed, the valve reacts instantly to the change, holding the brake application at that level.

## EXHAUST OR RELEASE

When air pressure is released from the service port and air pressure in the cavity above the relay piston is exhausted, air pressure beneath the piston lifts the relay piston and the exhaust seat moves away from the exhaust valve, opening the exhaust passage. With the exhaust passage open, the air pressure in the brake chambers is then permitted to exhaust through the exhaust port, releasing the brakes.

## ANTI-COMPOUNDING (SIMULTANEOUS SERVICE AND PARK APPLICATION)

In those applications where the R-14® relay valve is used to control spring brake chambers, the anti-compound feature may be utilized. With the anti-compound feature of the R-14® valve connected, a service application made while the vehicle is parked is countered by a release of the parking brakes. To utilize this feature, the exhaust cover of the quick release portion of the R-14® valve is removed and a line is installed which is connected to the delivery of the service brake valve or relay valve. With no air pressure at the service port of the R-14® valve, the parking brakes are applied. If a service brake application is made, air from the service brake valve enters the exhaust port of the quick release of the R-14® valve and moves the diaphragm, blocking the service port. Air then proceeds into the cavity above the relay piston, forces the piston down, closing the exhaust and opening the inlet to deliver air to the spring brake cavity as described under the section of this manual entitled *Application*.

## PREVENTIVE MAINTENANCE

**Important:** Review the Bendix Warranty Policy before performing any intrusive maintenance procedures. A warranty may be voided if intrusive maintenance is performed during the warranty period.

No two vehicles operate under identical conditions, as a result, maintenance intervals may vary. Experience is a valuable guide in determining the best maintenance interval for air brake system components. At a minimum, the valve should be inspected every 6 months or 1500 operating hours, whichever comes first, for proper operation. Should the valve not meet the elements of the operational tests noted in this document, further investigation and service of the valve may be required.

## OPERATIONAL AND LEAKAGE TEST

1. Chock the wheels, fully charge the air brake system and adjust the brakes.
2. Make several brake applications and check for prompt application and release at each wheel.
3. Check for inlet valve and o-ring leakage.
  - A. Make this check with the service brakes released when the R-12<sup>®</sup> or R-14<sup>®</sup> valve is used to control the service brakes.
  - B. Make the check with the spring brakes applied (PARK) when the R-14<sup>®</sup> valve is used to control the spring brakes. Coat the exhaust port and the area around the retaining ring with a soap solution; a 1" bubble in 3 seconds leakage is permitted.
4. Check for exhaust valve leakage.
  - A. Make this check with the service brakes fully applied if the R-12<sup>®</sup> or R-14<sup>®</sup> valve control the service brakes.
  - B. Make this check with the spring brakes fully released if the R-14<sup>®</sup> valve is used to control the spring brakes. Coat the exhaust port with a soap solution; a 1" bubble in 3 seconds leakage is permitted. Coat the outside of the valve where the cover joins the body to check for seal ring leakage; no leakage is permitted.
5. If the R-14<sup>®</sup> valve is used to control the spring brakes, place the park control in the released position and coat the balance port with a soap solution to check the diaphragm and its seat. Leakage equivalent to a 1" bubble in 3 seconds is permitted.

**Note:** If the anti-compound feature is in use, the line attached to the balance port must be disconnected to perform this test.

If the valves do not function as described above, or if leakage is excessive, it is recommended that the valves be replaced with new or remanufactured units or repaired with genuine Bendix<sup>®</sup> parts, available at any authorized Bendix<sup>®</sup> parts outlet.

## REMOVAL AND INSTALLATION

### REMOVAL

1. Block and hold vehicle by means other than air brakes.
2. Drain air brake system reservoirs.
3. If entire valve is to be removed, identify air lines to facilitate installation.
4. Disconnect air lines from valve\*.
5. Remove valve from reservoir or if remotely mounted, remove mounting bolts and then valve.

\*It is generally not necessary to remove entire valve to service the inlet/exhaust valve. The inlet/exhaust valve insert can be removed by removing the snap ring, exhaust cover assembly and then inlet/exhaust valve.

**Caution:** Drain all reservoirs before attempting to remove the inlet exhaust valve.

### DISASSEMBLY

**Note:** Prior to disassembly, mark the location of the mounting bracket to the cover and the cover to the body.

1. Remove the four (4) cap screws and lockwashers securing the cover to the body.
2. Remove the cover, sealing ring, and mounting bracket.
3. Remove the piston and o-ring from the body.
4. While depressing the exhaust cover, remove the retaining ring and slowly relax the spring beneath the exhaust cover.
5. Remove the exhaust cover assembly and o-rings.
6. Remove the inlet/exhaust valve return spring from the body.
7. Remove the inlet/exhaust valve from the body.
8. Remove the valve retainer from the inlet/exhaust valve.
9. Remove the Phillips head screw and exhaust cover from the R-14<sup>®</sup> valve cover.
10. Remove the service port cap nut and o-ring from the R-14<sup>®</sup> valve.
11. Remove the diaphragm from the R-14<sup>®</sup> valve cover.

### CLEANING AND INSPECTION

1. Wash all metal parts in mineral spirits and dry them thoroughly.  
(**Note:** When rebuilding, all springs and all rubber parts should be replaced.)
2. Inspect all metal parts for deterioration and wear, as evidenced by scratches, scoring and corrosion.
3. Inspect the exhaust valve seat on the relay piston for nicks and scratches which could cause excessive leakage.
4. Inspect the inlet valve seat in the body for scratches and nicks, which could cause excessive leakage.

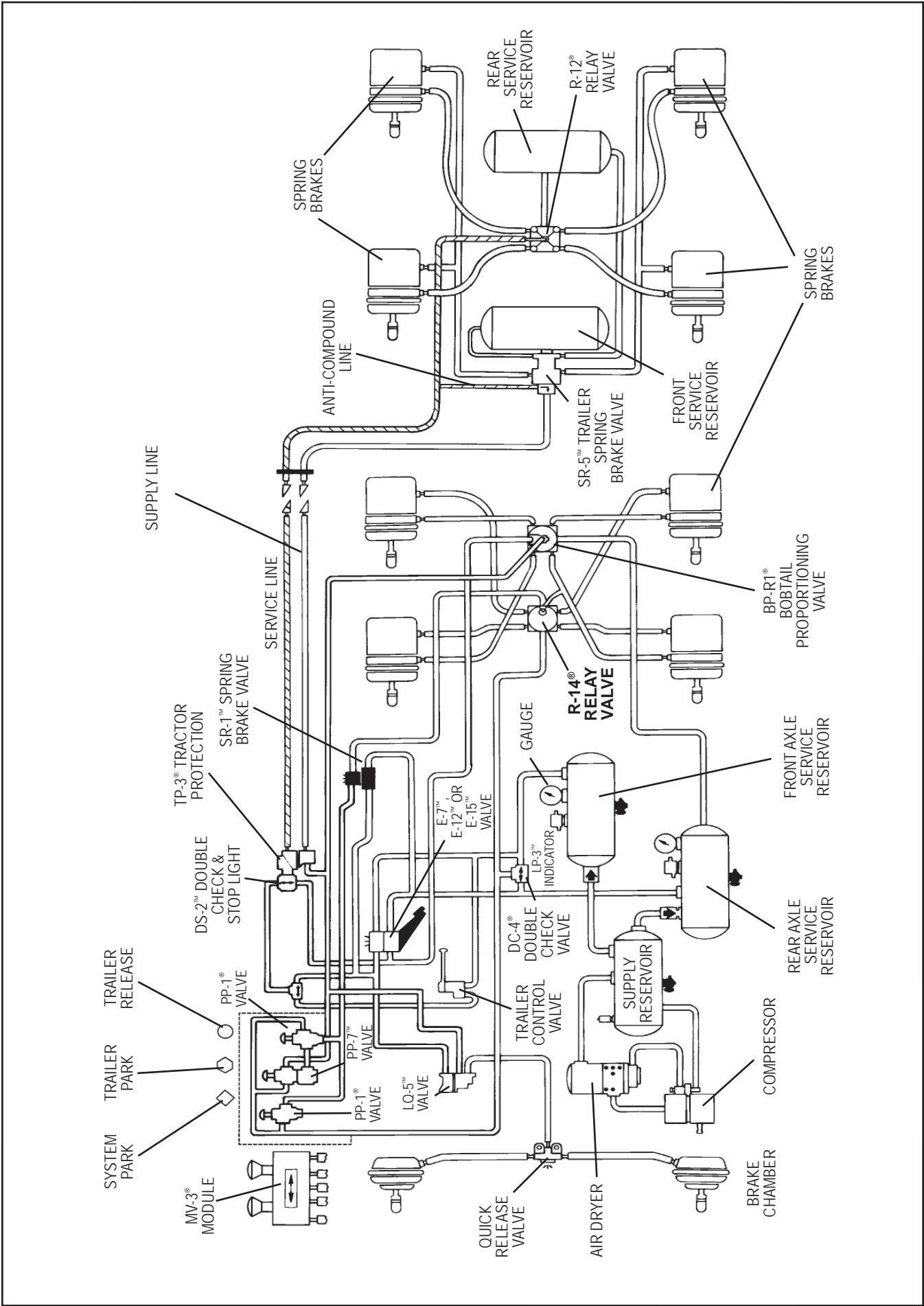


FIGURE 3 - TYPICAL PIPING SCHEMATIC



5. Inspect the exhaust seat of the quick release diaphragm in the R-14® valve cover and make sure all internal air passages in this area are open and clean and free of nicks and scratches.
6. Replace all parts not considered serviceable during these inspections and all springs and rubber parts. Use only genuine Bendix replacement parts, available from any authorized Bendix parts outlet.

## ASSEMBLY

**Note:** All torques specified in this manual are assembly torques and can be expected to fall off slightly after assembly. **Do not re-torque** after initial assembly torque falls. For assembly, hand wrenches are recommended.

Prior to assembly, lubricate all o-rings, o-ring bores and any sliding surface with a silicone lubricant equivalent to Dow Corning #10.

1. Install large piston o-ring on piston.
2. Install inner and outer o-rings in the exhaust cover assembly.
3. Install the sealing ring on the cover.
4. Install piston in body, taking care not to damage the piston o-ring.
5. Noting the reference marks made during disassembly, install the cover on the valve body and the mounting bracket on the cover.
6. Secure the mounting bracket and cover to the body using the four (4) cap screws and lock washers. Torque to 80-120 inch pounds.
7. Install the valve retainer on the inlet/exhaust valve and install in the body.
8. Install the inlet/exhaust valve return spring in the body.
9. Install the exhaust cover assembly in the body, taking care not to damage the o-ring.
10. While depressing the exhaust cover, install the retaining ring. Make certain the retainer is completely seated in its groove in the body.
11. Install the R-14® valve service port cap nut o-ring on the cap nut.
12. Install the diaphragm in the R-14® valve cover making certain it is positioned between the guide ribs in the cover.
13. Install the service port cap nut and torque to 150 inch pounds.
14. If the quick release exhaust port was protected with an exhaust cover, install the cover using the #10-24 Phillips head screw. Torque to approx. 15-25 inch pounds.
15. Test the valves as outlined in the *Operational and Leakage Test* section before returning the valve to service.

## INSTALLATION

1. Clean air lines.
2. Inspect all lines and/or hoses for damage and replace as necessary.
3. Install valve and tighten mounting bolts.
4. Connect air lines to valve (plug any unused ports).
5. Test valve as outlined in *Operational and Leakage Tests*.

## GENERAL SAFETY GUIDELINES

### **WARNING! 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. Always wear safety glasses.**
2. **Stop the engine and remove ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. 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.**
3. **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.**
4. **If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle. If the vehicle is equipped with an AD-IS® air dryer system or a dryer reservoir module, be sure to drain the purge reservoir.**
5. **Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.**
6. **Never exceed manufacturer's recommended pressures.**
7. **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.**

8. Use only genuine Bendix® replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems.
9. Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.
10. Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.
11. For vehicles with Automatic Traction Control (ATC), the ATC function must be disabled (ATC indicator lamp should be ON) prior to performing any vehicle maintenance where one or more wheels on a drive axle are lifted off the ground and moving.

