

## Bendix® R-12DC® Relay Valve with Biased Double-Check

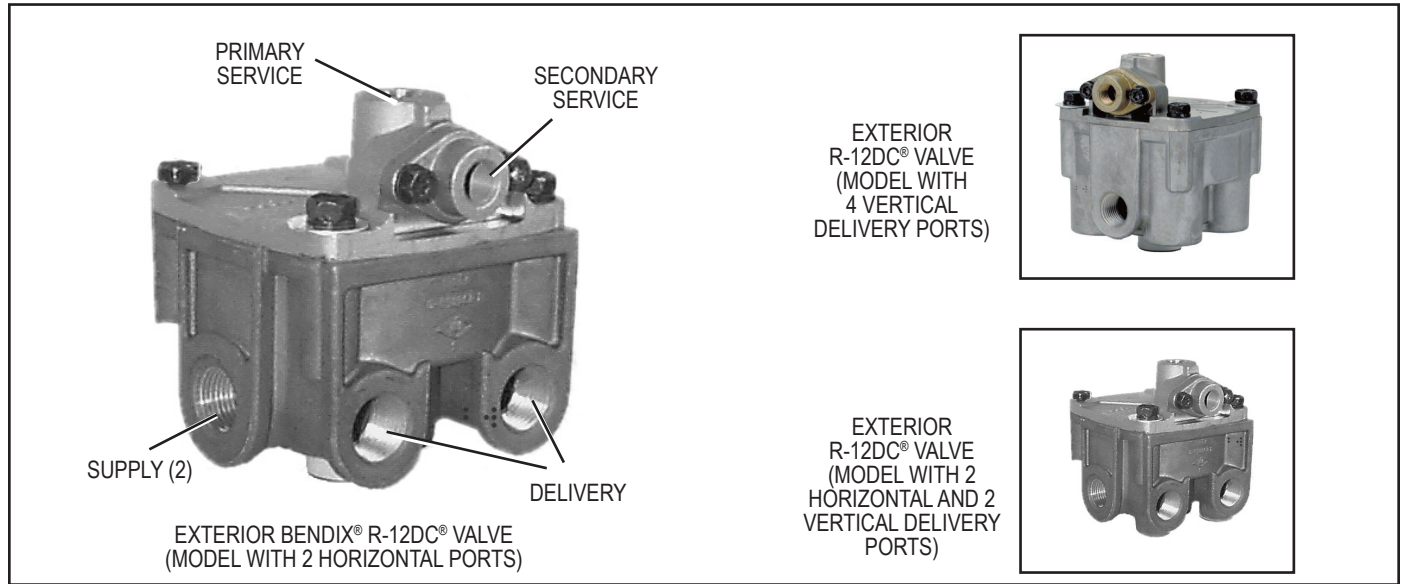


Figure 1 – Exterior Views

### 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.

Bendix® R-12DC® relay valves are designed for either reservoir or frame mounting. (See Figure 1). For ease of servicing, the inlet/exhaust valve can be replaced without the need for line removal.

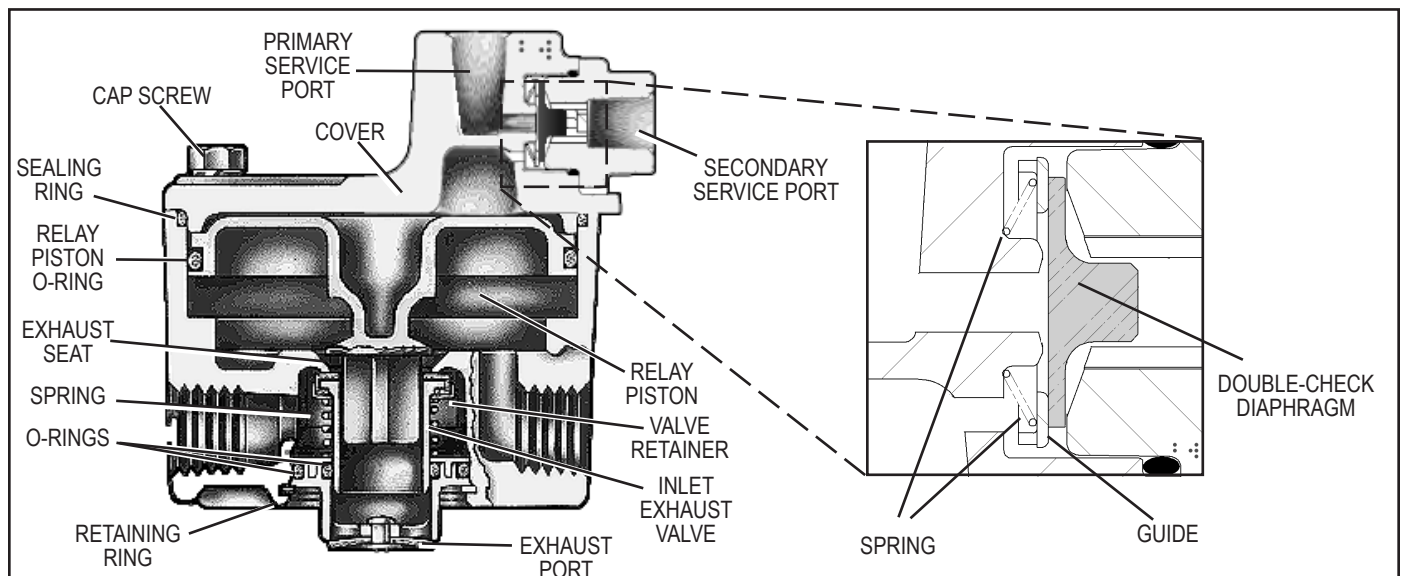


Figure 2 – Bendix® R-12DC® Relay Valve with Biased Double-Check Sectional View



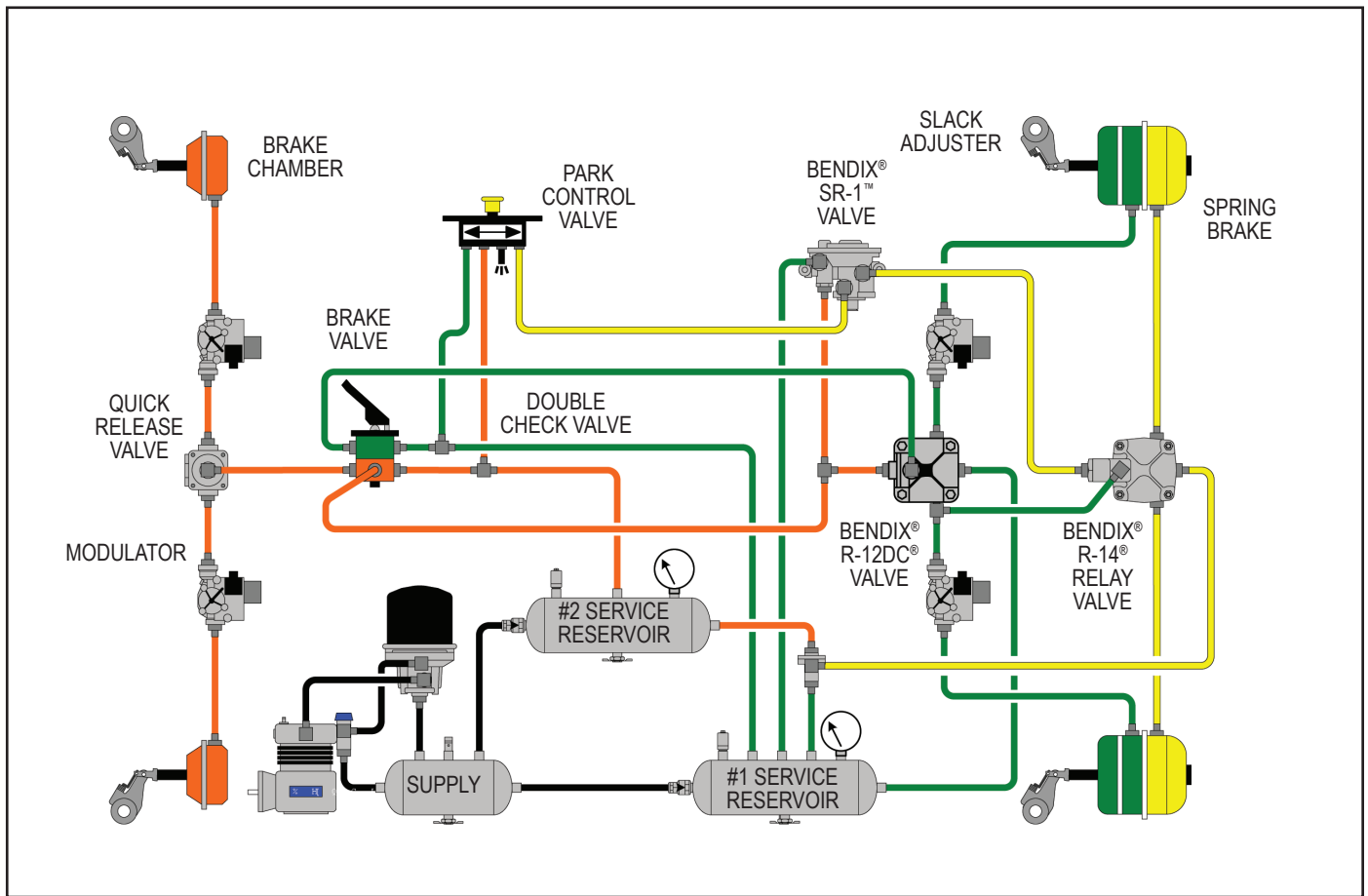
## GENERAL SAFETY GUIDELINES

**WARNING! PLEASE READ AND  
FOLLOW THESE INSTRUCTIONS**

### **TO AVOID PERSONAL INJURY OR DEATH:**

**When working on or around a vehicle, the following guidelines should be observed AT ALL TIMES:**

- ▲ **Park the vehicle on a level surface, apply the parking brakes and always block the wheels. Always wear personal protection equipment.**
- ▲ **Stop the engine and remove the 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.**
- ▲ **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.**
- ▲ **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 a Bendix® AD-IS® air dryer system, a Bendix® DRM™ dryer reservoir module, or a Bendix® AD-9si® air dryer, be sure to drain the purge reservoir.**
- ▲ **Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.**
- ▲ **Never exceed manufacturer's recommended pressures.**
- ▲ **Never connect or disconnect a hose or line containing pressure; it may whip and/or cause hazardous airborne dust and dirt particles. Wear eye protection. Slowly open connections with care, and verify that no pressure is present. Never remove a component or plug unless you are certain all system pressure has been depleted.**
- ▲ **Use only genuine Bendix® brand replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, wiring, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems.**
- ▲ **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.**
- ▲ **Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.**
- ▲ **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.**
- ▲ **The power MUST be temporarily disconnected from the radar sensor whenever any tests USING A DYNAMOMETER are conducted on a vehicle equipped with a Bendix® Wingman® system.**
- ▲ **You should consult the vehicle manufacturer's operating and service manuals, and any related literature, in conjunction with the Guidelines above.**



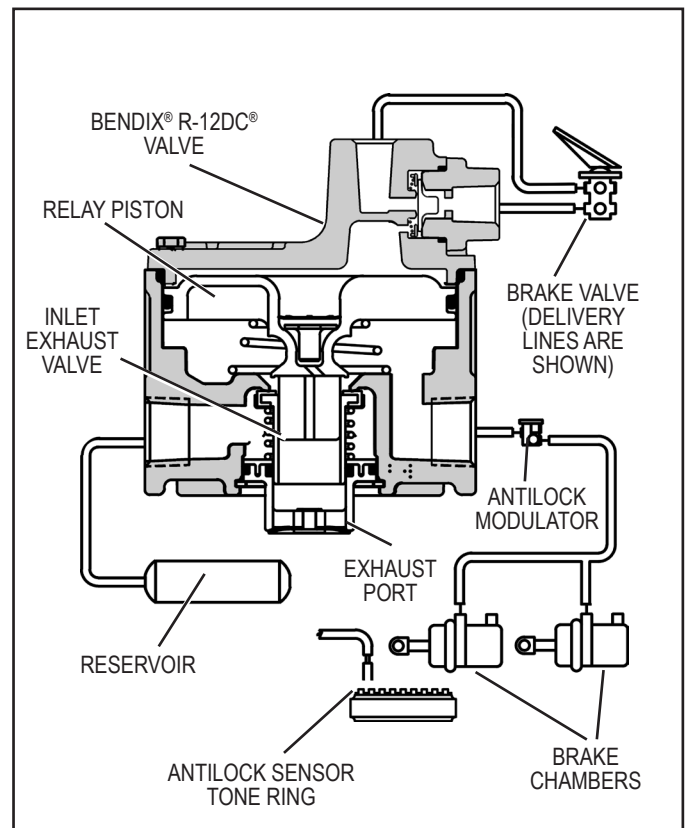
**Figure 3 – Typical System Schematic**

## OPERATION

### APPLICATION

Under normal conditions, the internal biased double-check valve ensures that the primary service signal controls the valve. Air pressure delivered to the primary 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 service brake chambers. In the event of a loss of the primary service line, (see Figure 5) the double-check valve mechanism in the cover of the Bendix® R-12DC® valve will move, shutting off the primary service line, and instead allow the secondary service line to apply the air pressure needed to operate the valve.

**Note:** Secondary service line may leak out of the primary service at control pressures up to 20 psi when the primary signal is not present.



**Figure 4 – Bendix® R-12DC® Valve Sectional View with Typical System Components**

## 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 ports, air pressure in the cavity above the relay piston is exhausted through the primary circuit of the brake valve. At the same time, 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.

## 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.

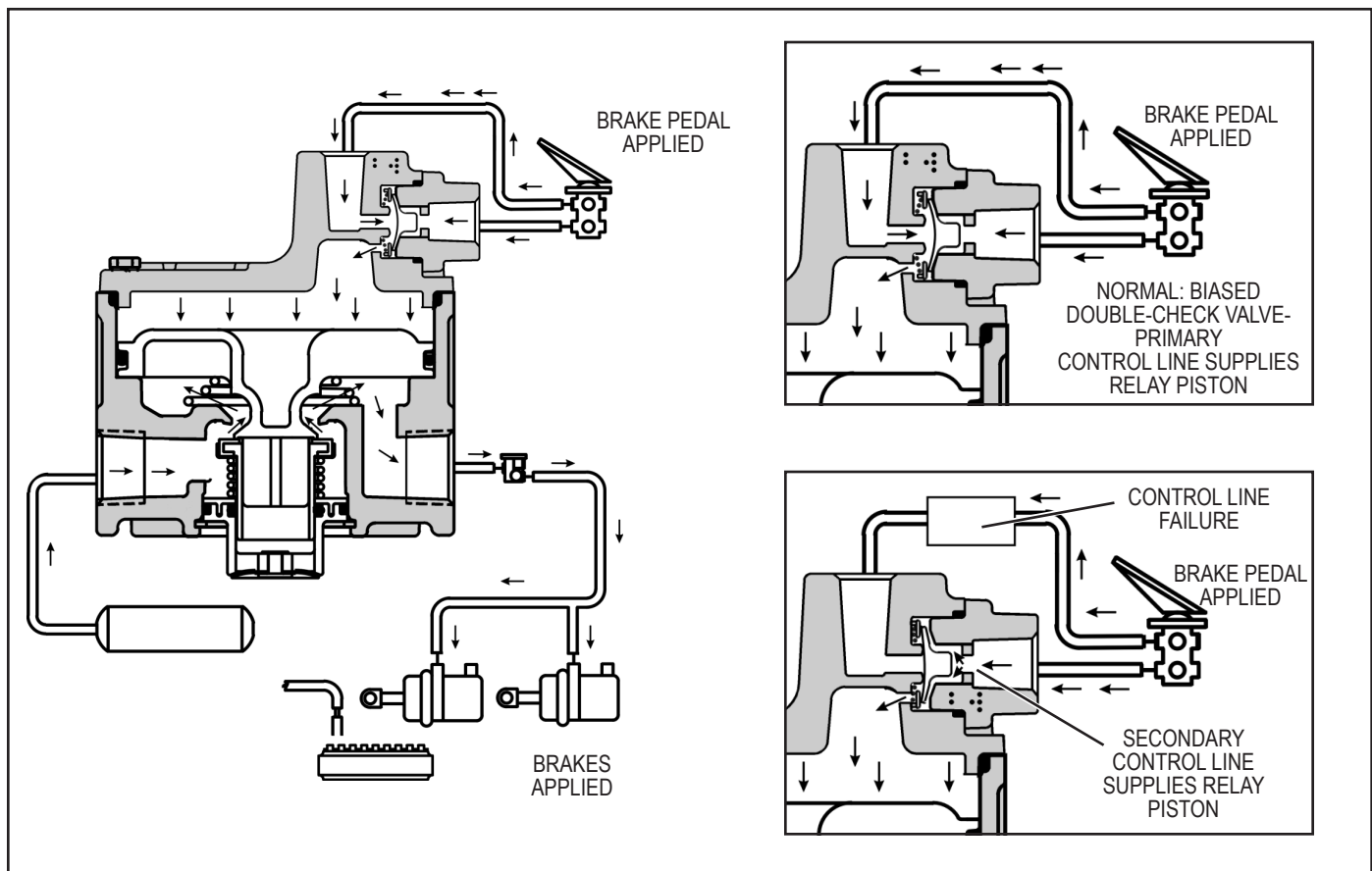


Figure 5 – Bendix® R-12DC® Valve Applied Position (Showing Biased Double-Check Operational Views)

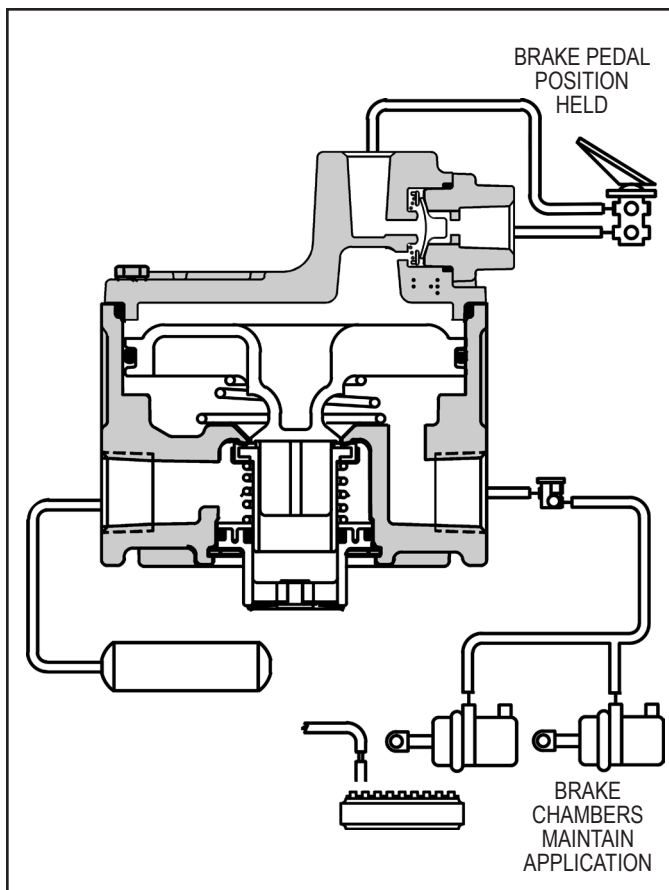


Figure 6 – Bendix® R-12DC® Valve Balance Position

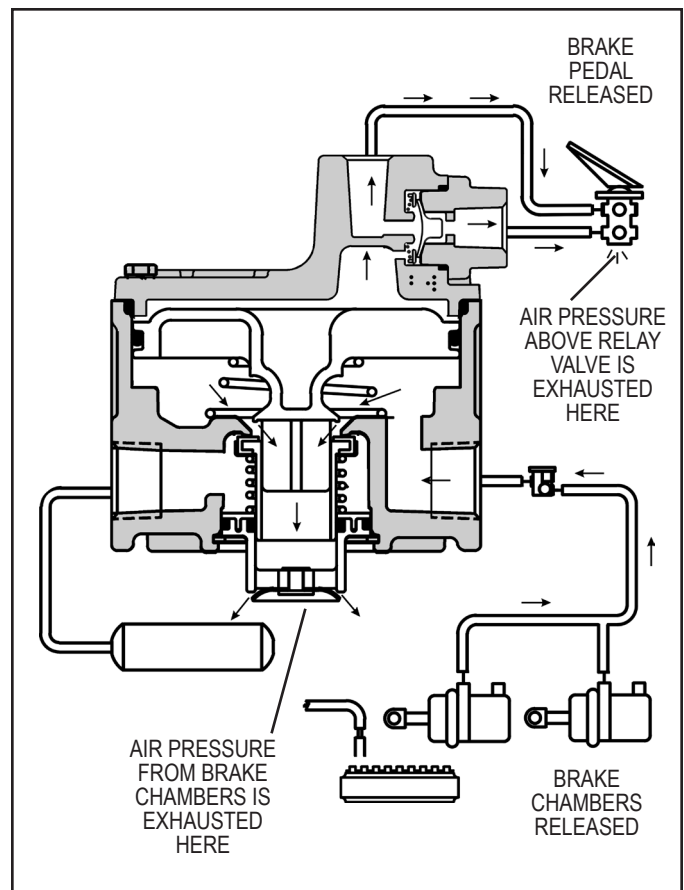


Figure 7 – Bendix® R-12DC® Valve Exhaust Position

## REMOVAL AND INSTALLATION

### REMOVAL

1. Block and hold the vehicle by means other than the air brakes.
2. Drain the air brake system reservoirs.
3. If the entire valve is to be removed, identify the air lines to facilitate reinstallation. Prior to disassembly, remove as much contamination as possible from the exterior of the device taking care to keep all contamination from entering the open ports.
4. Disconnect the air lines from the valve.\*
5. Remove the valve from the reservoir or, if remotely mounted, remove the mounting bolts and then the valve.

\*It is generally not necessary to remove the 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 the inlet/exhaust valve.

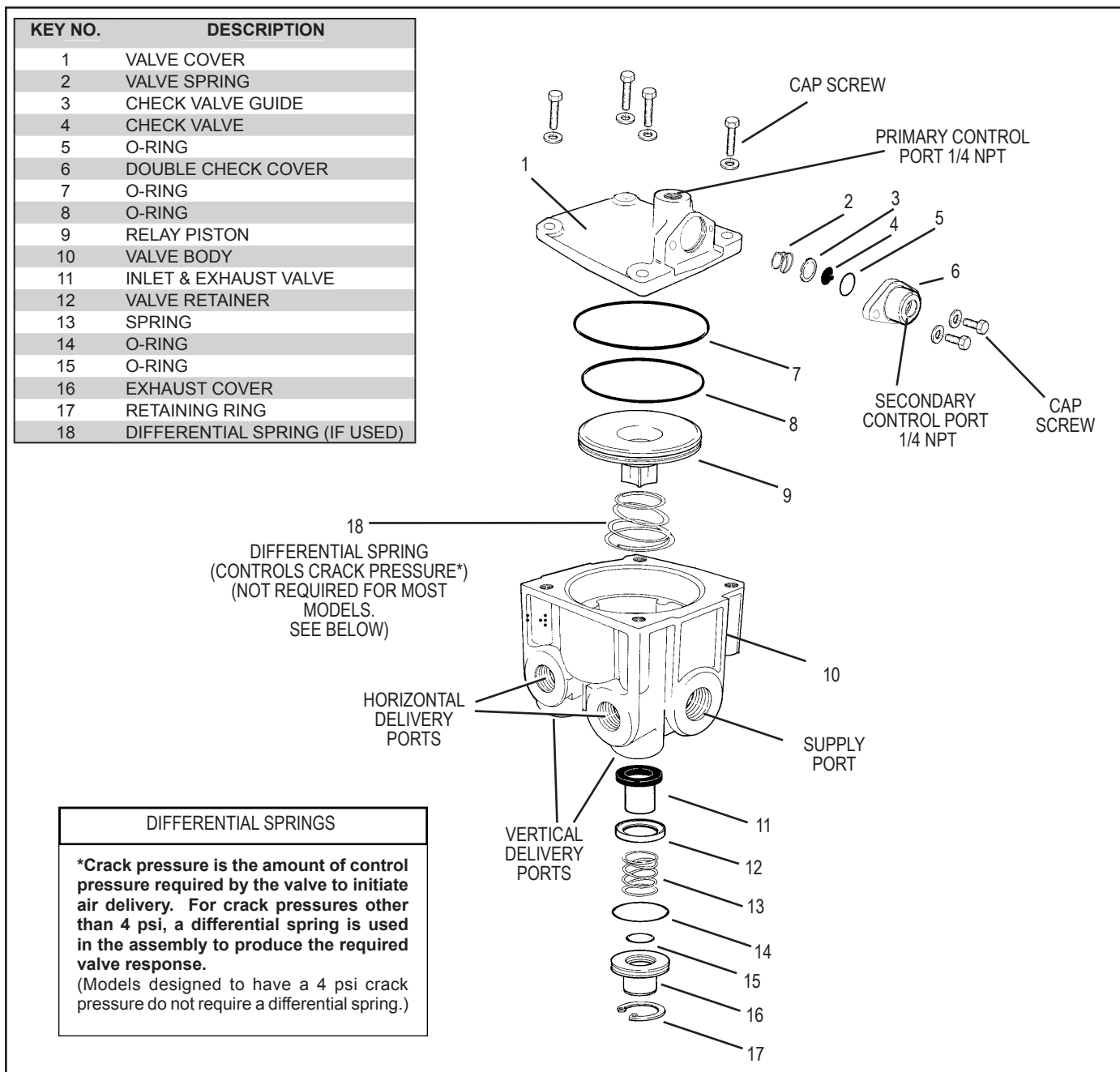
**Caution:** Drain all reservoirs before attempting to remove the inlet/exhaust valve.

### DISASSEMBLY

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

**CAUTION:** The valve body may be lightly clamped in a bench vise during disassembly, however, over-clamping will result in damage to the valve and result in leakage and/or malfunction. If a vise is to be used, position the valve so that the jaws bear on the supply ports on opposing sides of the valve's body. Refer to Figure 8.

1. Remove the four cap screws securing the mounting bracket and cover to the body. Retain the cap screws for reuse.
2. Discard the mounting bracket.
3. Remove and discard the sealing ring (7) from the cover (1).
  - a. Remove the two Torx® screws securing the double-check cover (6) to the cover (1).
  - b. Remove the double-check cover (6) from the valve cover (1) and remove and discard the spring (2), guide (3), double-check diaphragm (4), and o-ring (5).



**Figure 8 – Bendix® R-12DC® Exploded View**

4. Remove and discard the sealing ring (7) from the cover (1), and mounting bracket.
5. Remove the piston (9) from the body (10) and retain for reuse.
6. Remove and discard the o-ring (8) from the piston (9).
7. Depress and hold the exhaust cover assembly (16) and remove and discard the retaining ring (17) from the valve body (10).
8. Slowly release the holding force on the exhaust cover assembly (16) to relax the spring.
9. Remove and discard the following parts:
  - a. Exhaust cover assembly (16)
  - b. O-rings (14 & 15)
  - c. Spring (13)
  - d. Inlet/exhaust valve (11)
  - e. Retainer (12)



## CLEANING AND INSPECTION

1. Wash all metal parts in mineral spirits and dry them thoroughly.  
(**Note:** When servicing the Bendix® R-12DC® valve, 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.
5. Inspect the check valve seat in the R-12DC 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 torque specified in this manual are assembly torque and can be expected to fall off slightly after assembly. **Do not re-torque** after initial assembly torque fall. 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.

Wash all remaining parts in mineral spirits and dry thoroughly. Using the lubricant provided in this kit, lightly lubricate all o-rings, o-ring grooves, body bores and sliding surfaces.

1. Install o-rings (14 & 15) in the exhaust cover assembly (16).
2. Install o-ring (8) on piston (9).
3. Install sealing ring (7) on cover (1).
4. Install retainer (12) on the inlet/exhaust valve (11) and insert both in the body (10).
5. Install spring (13) in the body (10).
6. Install exhaust cover assembly (16) in the body (10). Depress and hold the exhaust cover assembly in the body.
7. Install retaining ring (17) in the body (10). Make certain the retaining ring is completely seated in the groove in the body.
8. Install piston (9) in the body (10).
9. Install o-ring (5) on double-check cover (6), install spring (2), guide (3) and double-check diaphragm (4) in cover (1). Install cover (1) and torque torx head screws to 80–100 in-lbs.

10. Referring to the marks made during disassembly, install cover (1).
11. Install the mounting bracket (not shown) on the cover (1).
12. Install the four cap screws in the cover (1) and torque to 80–100 in-lbs.
13. Test the valve as outlined in the *Operational and Leakage Test* section before returning the valve to service.

## INSTALLATION

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

## 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. Make this check with the service brakes released. Coat the exhaust port and the area around the retaining ring with a soap solution; leakage of a one inch bubble in three seconds is permitted.
4. Check for exhaust valve leakage. Make this check with the service brakes fully applied. Coat the outside of the valve where the cover joins the body to check for seal ring leakage; no leakage is permitted.

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 parts, available at any authorized Bendix parts outlet.



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