

Installation Instructions

BP-R1/LQ-5 RETROFIT



Figure 1

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 <u>at all times</u>.

- 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.
- 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.



Figure 2 - Schematic with BP-R1

BP-R1 RETROFIT/INSTALLATION

- 1. Park vehicle on a level surface and block wheels and/or hold the vehicle by means other than the air brakes.
- 2. Drain air pressure from all vehicle reservoirs.
- 3. If the vehicle is equipped with a front axle limiting valve, such as the Bendix LQ-4, it must be removed or replaced with an LQ-5 Bobtail Ratio Valve. A quick release valve must also be used. (See LQ-5 INSTALLATION.)
- 4. Identify, mark, then disconnect all air lines to the existing rear axle BP-R1 or service relay valve, and remove the valve.
- 5. Like the rear axle service relay valve, the BP-R1 can be frame or crossmember mounted. And it uses the same air lines as the relay valve, with the exception of the BP- R1 control line. This 1/8" pipe thread marked "CON," connects to the delivery of the trailer supply valve (dash control valve with red octagonal button). If installing the BP-R1 on a vehicle not previously equipped with one, install a tee in the trailer supply valve delivery line and connect it to the BP-R1 control port.
- 6. Connect the remaining ports as follows:
 - Service port ("SER") to rear axle brake valve delivery
 - Supply port ("SUP") to rear axle service reservoir
 - Delivery ports ("DEL") to rear axle actuators

OPERATION AND LEAKAGE TESTS Operation Test

To properly test BP-R1 function, use a pair of test gauges or gauges of known accuracy.

- 1. Park the vehicle on a level surface and block the wheels and/or hold the vehicle by means other than the air brakes.
- 2. Drain air pressure from all vehicle reservoirs.
- 3. Install one air gauge at the brake valve rear axle service delivery port, and install the other at the rear axle service actuator.
- 4. Connect the tractor service and emergency "glad hands" (hose couplings) to hose couplings that have been plugged, or alternatively, to a trailer. Build tractor system

air pressure to governor cut-out and make 4 to 5 full brake applications. Check the air fittings at the BP-R1 for leakage. Tighten as necessary.

- 5. Activate the trailer supply valve (dash control with red octagonal button) and system park valve (dash control with yellow diamond button) for tractor-trailer operation.
- 6. Make and hold a full (100 psi or greater) brake application and note that full pressure is delivered to the chambers.
- 7. Activate the dash mounted trailer supply valve for bobtail tractor operation. Then make a <u>slow</u> brake application, increasing the brake valve delivery to 20 psi while observing the actuator pressure. Note that service actuator pressure rises to approximately 5-10 psi and remains constant while brake valve pressure continues to rise to 20 psi. Release the application.
- Make another brake application and slowly increase the brake valve delivery to between 60 and 70 psi while observing the actuator gauge. Note that service actuator pressure rises at a proportioned rate of <u>approximately</u> 3:1. At 70 psi service pressure, service actuator pressure should be 15 to 25 psi.
- 9. Make a full brake application and note that both test gauges register the same pressure.
- 10. If the vehicle being tested has more than one rear axle; remove the test gauge from the service actuator and reinstall it in either service actuator on the next axle and repeat test steps 4 to 9. Continue this process until one service actuator has been tested on <u>each rear axle</u>.
- 11. If the pressure readings obtained during testing do not fall within the limits specified, check all air connections for proper installation. If the air connections appear to be correct then install a test gauge at the SER (service) port of the BP-R1 and activate the trailer supply valve for BOB-TAIL operation. Make a 30 psi brake application and note that the pressure registered on the gauge at the brake valve delivery port and at the BP-R1 SER ports are equal. If the pressure readings are not equal, then a pressure modifying valve may be present in the line between the brake valve and the BP-R1. Before further modifying the vehicle, obtain approval from Bendix Engineering.

Leakage Test

- 1. Build air system pressure to governor cut-out. With the trailer supply valve activated for tractor-trailer operation, apply a soap solution to all three exhaust ports (two in cover and one in body). The leakage noted should not exceed a one inch bubble in less than three seconds at any exhaust port.
- 2. Make and hold a full brake application and apply a soap solution to all three exhaust ports and where the cover joins the body. The leakage noted should not exceed a one inch bubble in less than three seconds at any of the locations.

LQ-5 RETROFIT/INSTALLATION

- 1. Park vehicle on a level surface and block wheels and/or hold the vehicle by means other than the air brakes.
- 2. Drain air pressure from all vehicle reservoirs.
- 3. Identify, mark, then disconnect all air lines to the existing LQ-5 or front axle limiting valve. Remove the valve.



Figure 3 - Schematic with LQ-5

- 4. If installing the LQ-5 on a vehicle not previously equipped with one, install a tee in the trailer supply valve delivery line and connect it to the LQ-5 control ("con") port.
- 5. Connect the remaining ports as follows:
 - -- Supply ("SUP") to front axle service brake delivery
 - -- Delivery ("DEL") to front axle actuators

OPERATION AND LEAKAGE TESTS

Operation Test

1. Park the vehicle on a level surface and block the wheels and/or hold the vehicle by means other than the air brakes.

- 2. Drain air pressure from all vehicle reservoirs.
- 3. Install two air gauges in the front axle service system: one at the front axle service brake delivery port and one at the front axle actuator.
- 4. Build system air pressure to governor cut-out and activate the trailer supply valve for tractor-trailer operation.
- 5. Apply the service brake foot valve and have someone observe the gauges. When the gauge at the brake valve reaches 40 psi, the actuator gauge should read approximately 20 psi (+ 5 psi).
- 6. Make a full service brake application. Both gauges should read the same pressure.
- 7. With the trailer supply valve pulled out (bobtail mode), make a 30-40 psi service brake application. Both gauges should read the same pressure.
- 8. If the pressure readings obtained during testing do not fall within the specified limits, check all air connections for proper installation. If the air connections appear to be correct, and the pressure readings still do not fall within the specified limits, an inversion valve may be present in the line between the trailer supply valve and the LQ-5. Before further modifying the vehicle, obtain approval from Bendix Engineering.

Leakage Test

- 1. Build system pressure to governor cut-out. With the trailer supply valve pushed in for tractor-trailer mode, apply a soap solution to the LQ-5 exhaust port. The leakage should not exceed a one inch bubble in less than three seconds.
- 2. Make and hold a full brake application and apply a soap solution to the exhaust port and around the cover where it joins the body. The leakage should not exceed a one inch bubble in less than three seconds.

Vehicle Restrictions and Requirements

The BP-R1 Bobtail Proportioning Relay Valve and the LQ-5 Bobtail Ratio Valve are designed for tractor air brake systems only. The BP-R1 is installed in place of a standard rear axle service relay valve, and the LQ-5 is installed in the front axle service circuit in place of a front axle limiting valve, such as the Bendix LQ-4.

Please refer to the following restrictions and requirements before installing the valve.

Restrictions:

- 1. The BP-R1 should not be used on vehicles using wedge or disc brakes, unless prior approval is obtained from Bendix Engineering.
- 2. If the vehicle is equipped with a front axle limiting valve, such as the Bendix LQ-4, it <u>must</u> be removed. The LQ-5 may be used in its place (see Figure 3 and LQ-5 installation instructions).
- 3. Best bobtail performance will be obtained with the brakes properly balanced. It is recommended that a 4 psi crack pressure BP-R1 (no differential spring in the valve) be used and that a 1 psi maximum quick release valve be used on the steering axle. This will result in best brake force balance and best control at low pressure applications.

- If quick release valves are used RATHER THAN RELAY VALVE(S) to apply the tractor rear axle SERVICE BRAKES, consult Bendix Engineering for necessary vehicle brake system modifications, PRIOR to installing the BP-R1.
- 5. WARNING: USING NO FRONT AXLE BRAKES IS ILLEGAL AND NEGATES THE ADVANTAGES OF THE BP-R1 SYSTEM.
- 6. DONOT USE THIS SYSTEM ON TOWING TRUCKS OR ON TRACTORS THAT CARRY A LOAD WHEN NOT TOWING A TRAILER.

Requirements:

- 1. Maximum unloaded rear axle weight: four wheel tractor -- 6,500 pounds six wheel tractor --10,000 pounds
- 2. Minimum of 15" x 4" front axle s-cam brakes
- 16.5" x 7" rear axle s-cam brakes (For other brake sizes, contact Bendix Engineering)
- 4. "Vented" dummy hose couplings (minimum of 1/4" diameter vent hole)
- 5. Before placing vehicle into service, **IT IS ESSENTIAL** that the Operation Tests be performed.