

# Installation Instructions



## BENDIX® AD-SP® SYSTEM PURGE AIR DRYER KIT

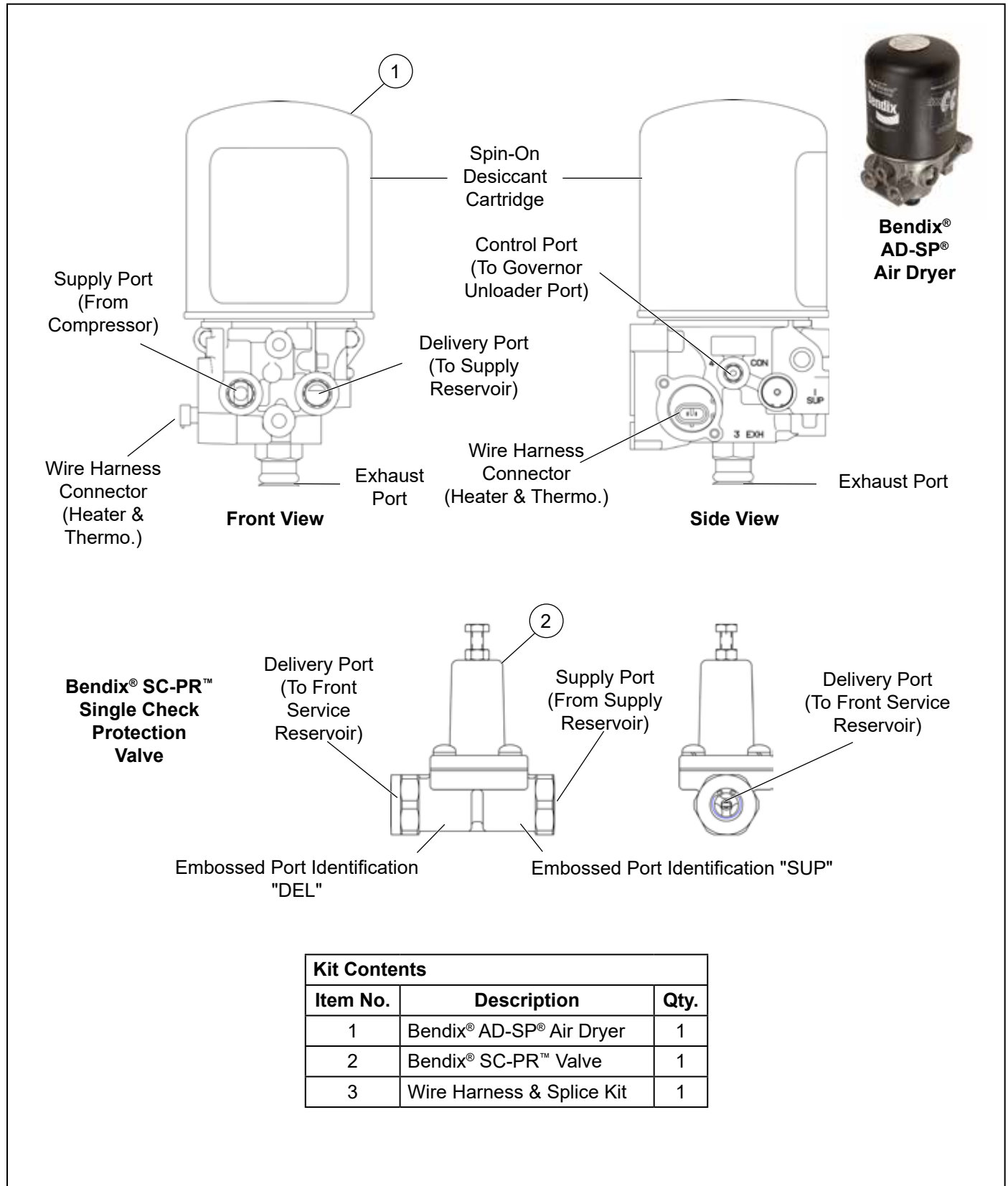


Figure 1 – Bendix® AD-SP® System Purge Air Dryer

## 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, a Bendix® AD-9si, AD-HF®, or AD-HF®i 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.
- ▲ You should consult the vehicle manufacturer's operating and service manuals, and any related literature, in conjunction with the Guidelines above.
- ▲ 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.

## KIT DESCRIPTION

This kit contains a Bendix® AD-SP® system purge air dryer (1). The system purge air dryer differs from other air dryers offered by Bendix in that it does not incorporate integral storage of dry air for the purge cycle (purge volume). The AD-SP air dryer uses a SMALL AMOUNT of air from the supply and front axle (secondary) reservoirs to perform the purge function. Because of this difference, the AD-SP air dryer is considerably smaller and lighter than integral purge air dryers such as the Bendix® AD-9® air dryer.

A service replacement AD-SP air dryer should be used, instead of this kit, when replacing an existing AD-SP or a competitive system purge air dryer.

In order for the AD-SP air dryer to function properly, a single check protection valve, such as the Bendix® SC-PR™ single check protection valve (2), must be installed in the front axle (secondary) reservoir in place of the conventional single check valve.

This kit is intended for use;

- A. When installing an air dryer on a vehicle that previously had no air dryer.
- B. When replacing an integral purge air dryer, such as the Bendix AD-9.

## VEHICLE APPLICATION REQUIREMENTS

### GENERAL

The basic application requirements presented here apply to a standard air dryer installation. The majority of vehicles in use today will meet these basic requirements however, some may not.

The following are examples of vehicles where the AD-SP air dryer should not be used: bulk trailer unloading operations, city transit coaches, trash compactors, and other high air consumption or continuous flow systems. When vehicles of this type are encountered other Bendix air dryer models must be used. Consult your local authorized Bendix parts outlet or sales representative for additional information.

1. Charge Cycle Time - The AD-SP air dryer is designed to provide clean, dry air for the brake system. When a vehicle's air system is used to operate non-brake air accessories it is necessary to determine that, during normal, daily operation the compressor should recover from governor "cut-in" to governor "cut-out" (usually 100 psi to 120 psi) in 90 seconds or less at engine RPMs commensurate with the vehicle vocation.



**NOTE:** The AD-SP air dryer must be used in conjunction with governors which have a 120 to 130 psi nominal cut-out pressure. If a governor is used that is not within this limitation, contact your Bendix parts outlet or sales representative for additional information. If the recovery time consistently exceeds this limit, it may be necessary to "by-pass" the air accessory responsible for the high

air usage. Consult your local authorized Bendix parts outlet or sales representative for additional information.

2. Purge Cycle Time - During normal vehicle operation, the air compressor must remain unloaded for a MINIMUM OF 15 SECONDS. This minimum purge time is required to ensure complete regeneration of the desiccant material. If the purge time is occasionally shorter than the times specified, no permanent ill effect should be expected, however, if the purge time is consistently less than the minimum, an accessory by-pass system must be installed.
3. European Air Brake Systems - The AD-SP air dryer MUST NOT BE INSTALLED in brake systems that incorporate compressors without integral unloading mechanisms and/or utilize a compressor discharge line unloader valve. When vehicles of this type are encountered, other Bendix air dryer models must be used. Consult your local authorized Bendix parts outlet or sales representative for additional information.
4. Air Compressor Size - The AD-SP air dryer was designed primarily for use with compressors rated up to 30 CFM. It is recommended that when using the AD-SP air dryer with a compressor which has a rated displacement exceeding 30 CFM that an authorized Bendix parts outlet or Bendix Tech Team be contacted for assistance. The Tech Team can be reached by calling 1-800-AIR-BRAKE (1-800-247-2725).
5. Holset® "E or QE" Type Air Compressors - The AD-SP air dryer can be installed with the Holset Type "E or QE" compressor. When the AD-SP air dryer is used in this installation, the Holset ECON valve should be removed and the special orifice check valve in the "make-up" line should be removed and replaced with a conventional single check valve. This is most easily done using a special 45° supply port fitting, 112864, and single check valve 109710.
6. Use the following guidelines to determine the vehicle application suitable for the AD-SP air dryer;

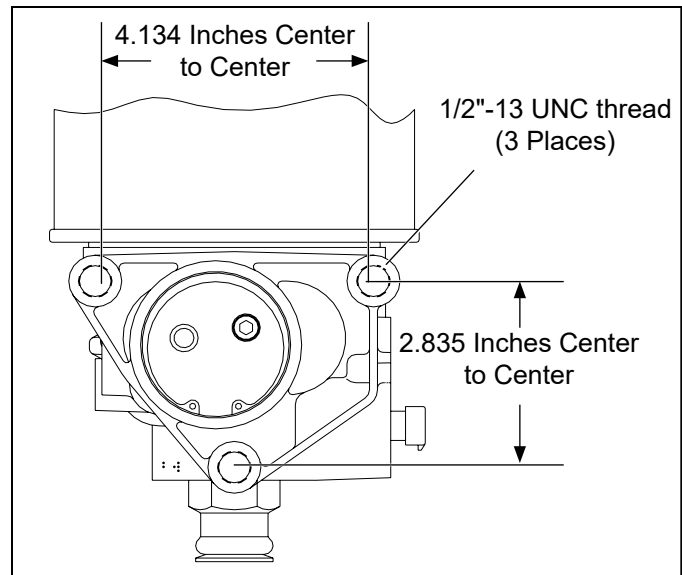
Total Vehicle Res. Volume (Cu. In.)	Air Dryer Model
Less than 9,000	AD-SP
Less than 9,000 w/several air accessories or high air usage (i.e. AD-9EP Extended Purge for transit coaches & refuse haulers)	AD-9 Extended Purge Volume Air Dryer
Greater than 9,000	AD-9 Extended Purge Volume Air Dryer or Contact the Bendix Tech Team

## VEHICLE PREPARATION

1. Park the vehicle on a level surface and prevent movement by means other than the brakes.
2. Locate the front axle service (secondary) reservoir in preparation for installing the Bendix® SC-PR™ single check protection valve included with this kit.
  - A. With full system pressure in all reservoirs, drain any single reservoir and observe the reaction of the dash gauges. If the supply reservoir was drained, no reaction will be noted on the dash gauges. Drain air from another reservoir. When the front axle service reservoir gauge displays a pressure loss, mark the reservoir that was drained. Confirm that the front axle service (secondary) reservoir has been found by building system pressure to governor cut-out and draining the marked reservoir. After the reservoir is completely drained, make a service brake application and have an assistant observe the front axle service brakes. The front axle brakes should be inoperative.
  - B. Some vehicles may be equipped with multi-compartment reservoirs. This type of reservoir is easily identified by the presence of more than one drain cock in the reservoir shell. The most common is a two compartment reservoir with a "built in" single check valve between the two compartments. In most instances when this type of reservoir is in use, one of the two compartments (usually the smallest) will be the supply reservoir and the second compartment will be either the front or rear service reservoir. Drain air from either of the two compartments and observe the dash gauges. If the supply reservoir compartment was drained, no reaction will be noted on the dash gauges. If one dash gauge displays pressure loss note whether it is the front axle (secondary) or rear axle (primary) reservoir. Mark the front axle service (secondary) reservoir or compartment. Confirm that the correct reservoir has been found in the same manner described in 2A.
3. Locate and mark the single check valve that is used to protect and isolate the front axle service reservoir.
4. Drain all reservoirs to 0 psi (0 kPa).

## LOCATING THE BENDIX® AD-SP® AIR DRYER ON THE VEHICLE

1. The Bendix® AD-SP® must be mounted vertically (purge exhaust port toward road surface) outside the engine compartment in an area of air flow while the vehicle is in motion. The AD-SP must not be exposed to direct wheel splash (located behind the axle mud flap is acceptable).
2. Locate the AD-SP air dryer as close to the first (supply) reservoir as possible.
3. Do not locate the AD-SP air dryer near heat producing components—such as the vehicle exhaust—and make certain adequate clearance from moving components (i.e.; drive shaft, suspension, pitman arm, etc.) is provided.



**Figure 2 – Bendix® AD-SP® Valve Body Mounting Bracket Dimensions**

4. Locate the air dryer on the vehicle so that a minimum of one inch clearance above the cartridge is available to allow cartridge servicing. Additionally, provide access to the bracket bolts so the unit may be removed for servicing.
5. When choosing the mounting location for the AD-SP air dryer, note the discharge line length requirements stated under the heading "CONNECTING THE AIR LINES", elsewhere in this instruction sheet.



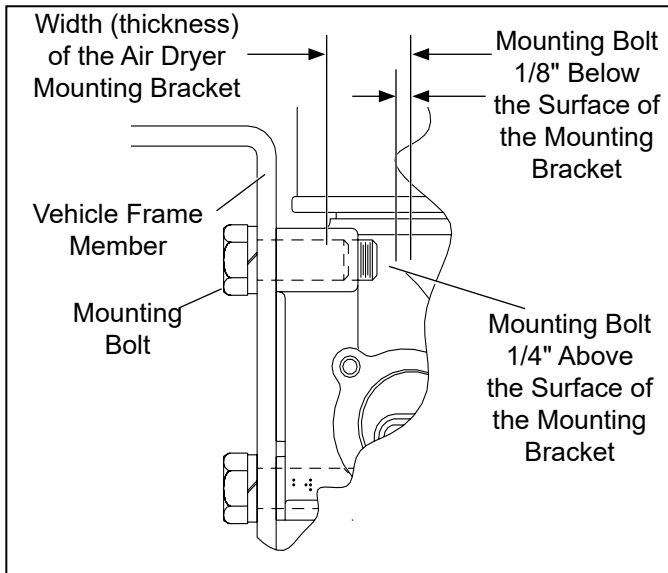
*NOTE: Under normal operating conditions, the maximum inlet air temperature for the AD-SP air dryer is 150°F.*

## MOUNTING THE AD-SP AIR DRYER

1. Install the AD-SP air dryer by seeing *Figure 2* and drilling the triangular mounting hole pattern in a mounting plate and then mounting the plate on the vehicle or by drilling the mounting hole pattern in the area of the vehicle chosen for mounting. *NOTE: Check the vehicle manual before drilling a frame member.*



2. The length of the three mounting bolts used to attach the AD-SP air dryer to the mounting plate is very important. (*See Figure 3.*) The threaded end of the 1/2"-13 UNC bolt must be between 1/8" below to 1/4" above the surface of the AD-SP air dryer mounting bracket surface when FULLY INSTALLED and TIGHTENED TO 50 FT-LBS. Damage to the AD-SP air dryer body will result if the bolt warning is ignored. Measure the thicknesses of all materials that the three mounting bolts must pass through. Small adjustments can be made using flat washers under the bolt heads. Do not use more than three flat washers.

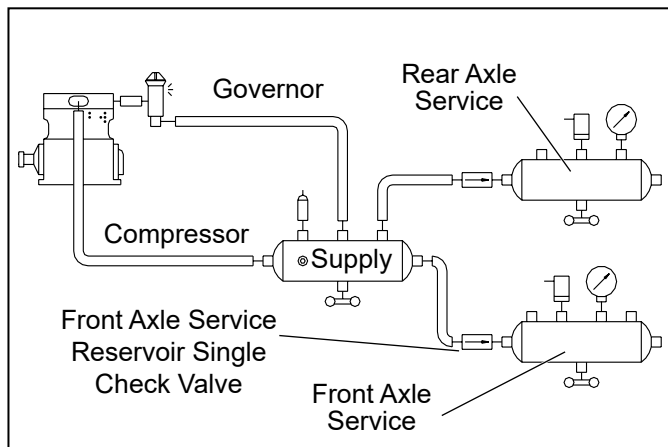


**Figure 3 – Bendix® AD-SP® Mounting Bracket Bolt Length Limits**

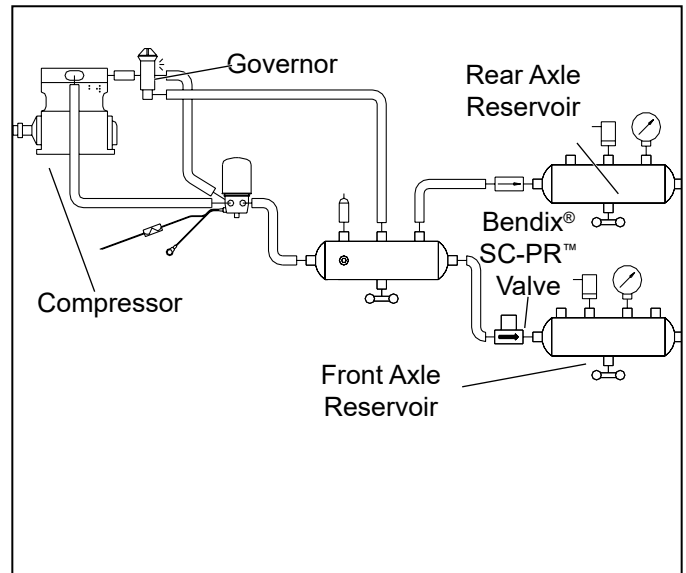
3. Mount the Bendix® AD-SP® air dryer® on the vehicle using three 1/2" bolts (grade 5 min.) of the proper length and washers. Torque to 50 ft-lbs.

### INSTALLING THE BENDIX® SC-PR™ VALVE

1. Refer to steps 2A and 2B under Vehicle Preparation. If the front axle (secondary) reservoir is:
  - A. A single reservoir and not part of a multiple compartment, proceed to step 2.
  - B. One compartment in a multiple compartment, proceed to step 3.
2. Locate the single check valve that protects and isolates the front axle reservoir and remove it. Install a 1/2" heavy wall pipe nipple in the delivery port of the Bendix® SC-PR™ check valve (See Figure 1.) Remove the air line



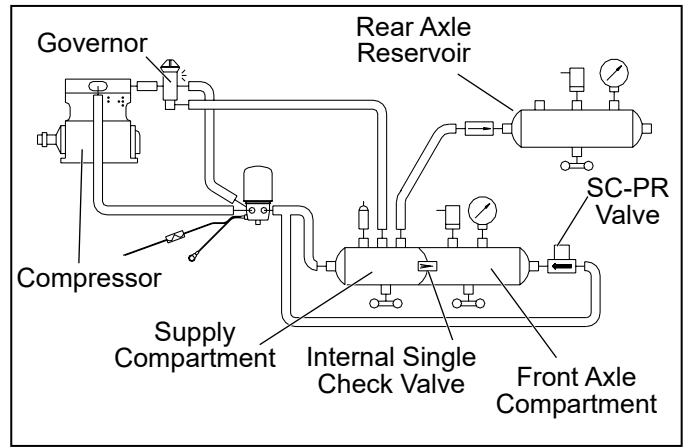
**Figure 4 – Air Brake System w/o AD-SP Air Dryer**



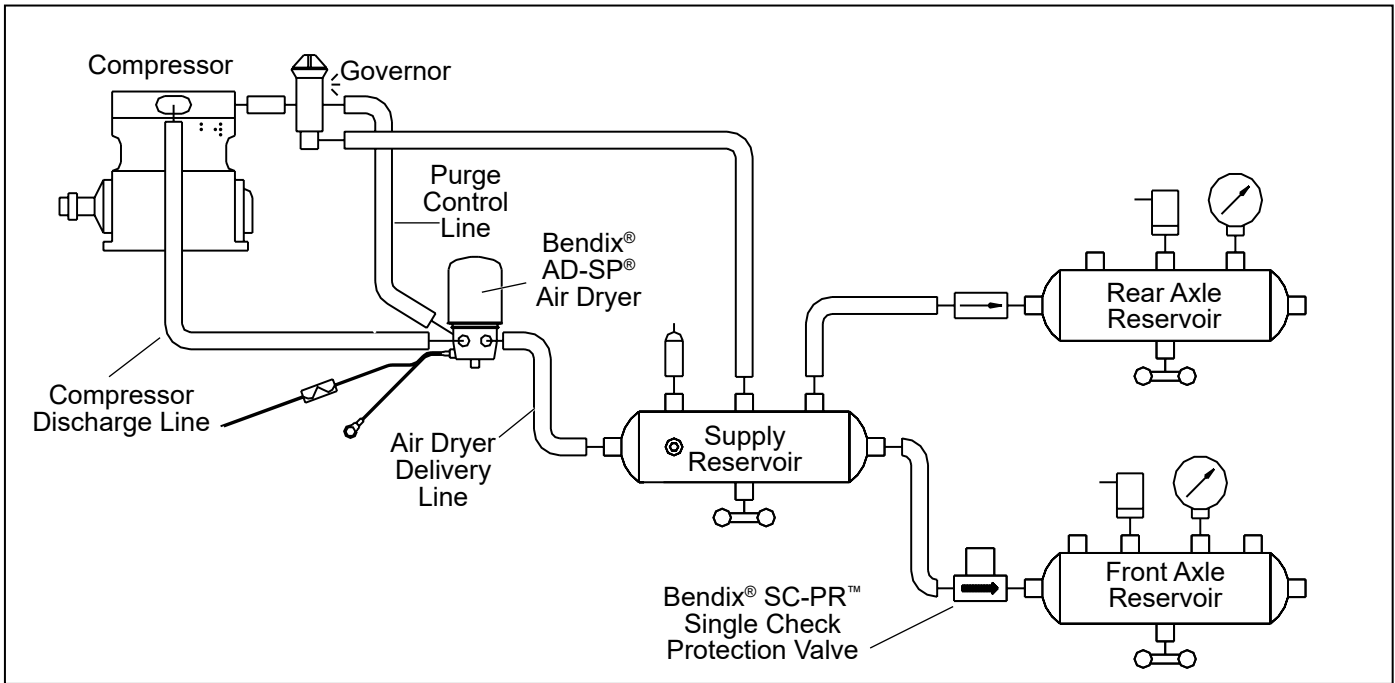
**Figure 5 – System SC-PR Valve Installed in Front Axle Service**

fitting from the single check valve and install the same fitting in the SC-PR valve. Install the heavy wall pipe nipple with the SC-PR valve and fitting in the reservoir port that was formerly occupied by the single check valve. Reconnect the air line to the SC-PR valve. (See Figure 5.)

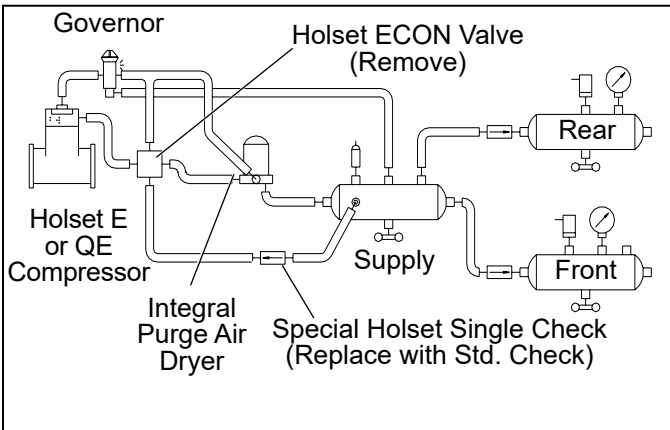
3. Locate an unused port in both the supply compartment and front axle compartment of the multiple compartment reservoir. Install the 1/2" pipe nipple in the delivery port of the SC-PR valve (See Figure 1.) Install the SC-PR valve in the front axle reservoir (or compartment) and tee the supply port of the SC-PR valve into the delivery of the AD-SP air dryer. (See Figure 6.)



**Figure 6 – SC-PR Valve Installed in Front Axle Service Compartment**



**Figure 7 – Bendix® AD-SP® Air Dryer and SC-PR™ Valve Installation**



**Figure 8 – Holset® E or QE System with Integral Purge Air Dryer**

Typical P&D, School Bus, and Line Haul		
The minimum discharge line length is 6 feet and the maximum is 16 feet.		
Discharge Line Length	Minimum Line I.D.	Other Requirements
6.0 - 9.5 ft.	1/2 in.	None
9.5 - 12.0 ft.	1/2 in.	Last 2-3 feet, including the supply port fitting must be insulated with 1/2 inch thick closed cell polyethylene pipe insulation
12.0 - 16.0 ft.	5/8 in.	
If the discharge line length must be less than 6 feet or greater than 16 feet, contact your local Bendix Brakes representative or authorized parts outlet for further information.		

## CONNECTING THE AIR LINES

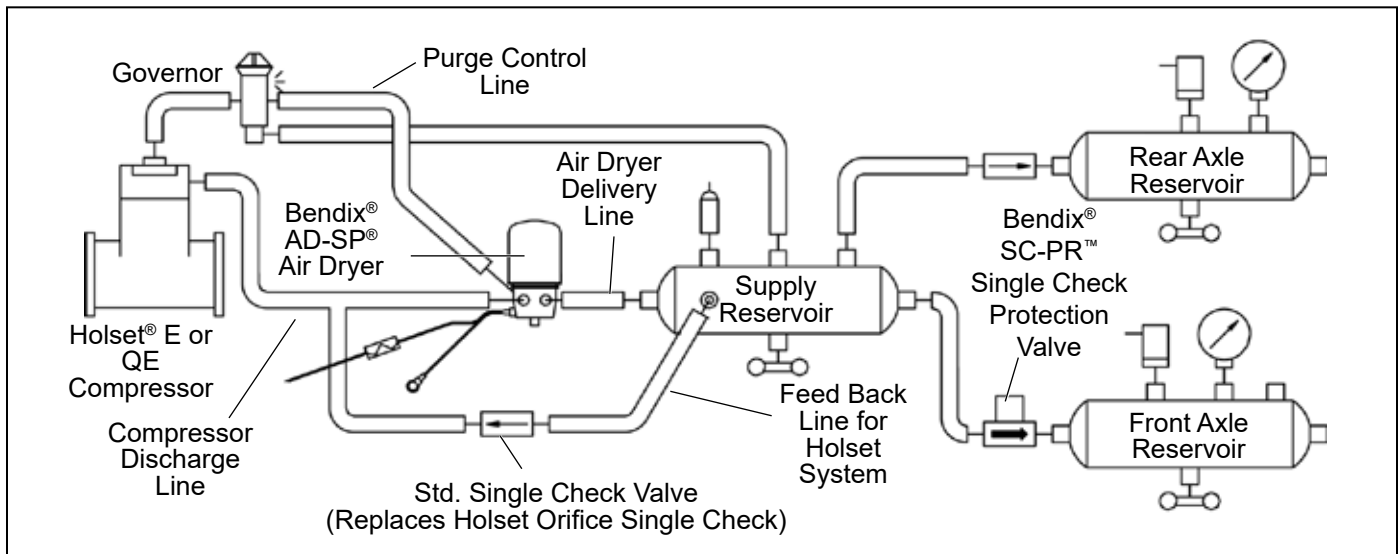
### IMPORTANT GENERAL INSTRUCTIONS

The instructions that follow apply to all installations of the Bendix® AD-SP® air dryer regardless of whether the AD-SP air dryer is replacing an existing air dryer or is being installed on a vehicle that never had one installed.

If the vehicle is currently equipped with an air dryer some additional considerations apply.

- A. If the AD-SP air dryer is replacing an integral purge air dryer, such as the Bendix® AD-9® air dryer, on a vehicle equipped with any compressor EXCEPT the HOLSET® TYPE E & QE, all that is necessary is that the air dryer be removed and the existing air lines be correctly connected to the AD-SP air dryer.

- B. If the AD-SP air dryer is replacing an integral purge air dryer such as the Bendix® AD-4™ or AD-9 air dryer, on a vehicle EQUIPPED with a HOLSET TYPE E or QE compressor, in addition to removing the existing air dryer and correctly connecting the existing air lines to the AD-SP air dryer, it will be necessary to remove and discard the Holset ECON and special orifice check valve. (See Figure 8.)



**Figure 9 – Bendix® AD-SP® Air Dryer and SC-PR™ Valve Installation (Holset System)**

### PURGE CONTROL LINE

1. Install a purge control air line having a minimum inside diameter of 3/16 inches between the Bendix® AD-SP® air dryer control port and an unused unloader port on the governor. The control line must be plumbed direct to the governor and not in series with automatic drain valves, lubrication systems, etc.
2. The control line should slope downward to the AD-SP air dryer without forming potential water traps.

### DISCHARGE LINE

#### GENERAL:

Where minimum diameters are specified, larger line diameters generally improve performance and life and reduce inlet temperatures, particularly in severe applications.

1. The discharge line material should be wire braided Teflon® hose, copper tubing, or a combination of both.
2. The discharge line should slope downward from the compressor discharge port to the AD-SP air dryer supply port without forming water traps, kinks or restrictions. Crossovers from one side of the frame rail to the other, if required, should occur as close as possible to the compressor.
3. Fitting extensions must not be installed at the AD-SP air dryer supply port.
4. Discharge line lengths and inside diameter requirements are dependent on the vehicle application and are as follows;

### DELIVERY LINE

1. Install an air line of the same approximate I.D. as the discharge line between the AD-SP air dryer delivery port and the first (supply) reservoir. This line should also slope downward to the reservoir, if possible.

### EXHAUST LINE

1. If it is necessary to direct the AD-SP air dryer discharge contaminates away from vehicle components, a 1 inch (25.4 mm) I.D. hose can be clamped on the air dryer exhaust.

### WIRING THE HEATER/THERMOSTAT

1. Determine the vehicle's electrical system voltage and make certain that the AD-SP air dryer that is to be installed contains the same voltage heater. Use the AD-SP air dryer part number to confirm the proper voltage. The AD-SP air dryer is available with either a 12 or 24 volt heater and each uses 90 watts of power.
2. A separate wire harness and splice kit (3) is included in this kit. Refer to the instructions contained in that kit for the proper wiring procedure.

### TESTING THE BENDIX® AD-SP® AIR DRYER

#### GENERAL OPERATIONAL STATEMENT

The AD-SP system purge air dryer (1), operates differently than integral purge air dryers such as the Bendix® AD-9®. The system purge designation is used because this air dryer uses a small portion of the supply and front axle (secondary) reservoir air pressure to purge or dry the desiccant material. During the purge cycle, an approximately 10 psi drop in air pressure will be noted on the front axle (secondary) service reservoir dash gauge. The drop in pressure is the result of using a small amount of air from the reservoir to purge the AD-SP desiccant.

The Bendix® SC-PR™ valve (2) protects the air pressure in the front axle (secondary) service reservoir, in the event of a compressor, supply or rear axle reservoir failure, or malfunction of the AD-SP purge control valving.

## TESTING

Before placing the vehicle in service, perform the following tests.

1. Close all reservoir drain cocks.
2. Build up system pressure to governor cut-out while observing that both the front axle (secondary) and rear axle service reservoir dash gauges rise equally in pressure from 0 psi to governor cut-out. If either gauge fails to display this condition, stop testing and check the installation of the Bendix® SC-PR™ valve. Note that the Bendix® AD-SP® air dryer purges with an audible escape of air when governor cut-out pressure is reached.
3. Note that the front axle (secondary) service reservoir pressure drops approximately 10 psi and that the rear axle service reservoir loses no air pressure.
4. "Fan" the service brakes to reduce system air pressure to governor cut-in. Note that the system once again builds to full pressure and is followed by a purge at the AD-SP exhaust.
5. Test the operation of the SC-PR valve. Build system air pressure to governor cut-out and turn the ignition off. Drain the supply reservoir and note that pressure in the front axle (secondary) service reservoir does not drop below 90 psi.
6. It is recommended that the following items be tested for leakage to ensure that the AD-SP air dryer will not cycle excessively.
  - (A) Total air system leakage (See Bendix publication BW5057 "Air Brake Handbook")
  - (B) Compressor unloader mechanism
  - (C) Governor
  - (D) Drain cock and safety valve in first (supply) reservoir
  - (E) All air connections leading to and from the first (supply) reservoir



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