



Installation Instructions

Bendix® TABS-6™
Module Kit Complete
Installation for
Trailers and Dollies

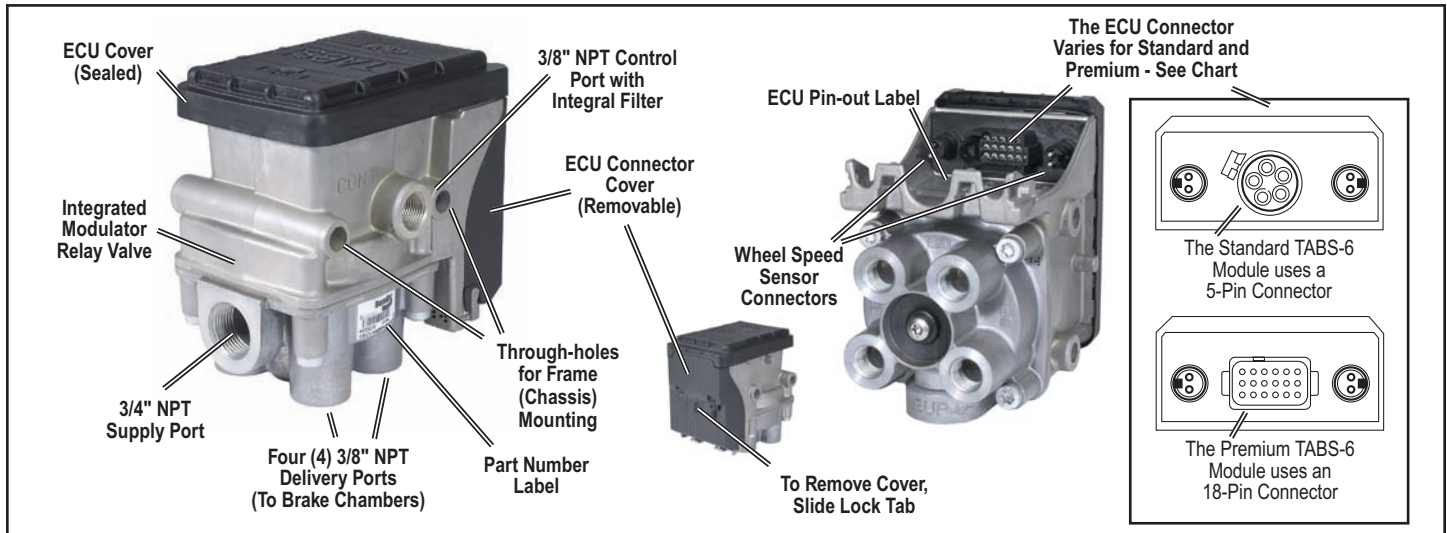


FIGURE 1 - BENDIX® TABS-6™ MODULE TRAILER ABS MODULE STANDARD AND PREMIUM MODULES

TABLE OF CONTENTS	PAGE
Bendix® TABS-6™ Module Introduction	1
General Kit Information	1
Bendix TABS-6 Module System(s) Kit Selection	2
Tone Ring and Sensor Block Selection	2
Wheel Speed Sensors	2
Bendix® BR9235™ ABS Modulator Relay Valves	2
Choosing The Axle to Place Sensors	4
Spring Brake Valve (Bendix® SR-5™) Selection	8
Safe Maintenance Practices	9
Tone Ring Installation	10
Sensor Block Installation	11
Wheel Speed Sensor Installation	12
Installation of the Bendix TABS-6 Module or Bendix BR9235 Modulator	13
Bendix SR-5 Spring Brake Valve Installation	14
Non-spring Brake Emer. Valve Installation	14
Air Hose Connections	14
Indicator Lamp Installation	14
Basic Wiring Installation Guidelines	15
Pigtail Wiring Harnesses	15
Wiring Multiple Kits	15
Leakage and Operational Tests	16
Bendix TABS-6 Module Power-Up Sequence	16
ABS Operation	17
DTCs or Incorrect Configuration	18
Contacting Bendix	18
Pre-installation Questions	18
Available Bendix TABS-6 Module ABS Kits	19

BENDIX® TABS-6™ MODULE INTRODUCTION

The Bendix® TABS-6™ module is an integrated trailer ABS controller and modulator for air-braked heavy-duty trailers, semi-trailers and dollies. The module acts as a relay valve during normal braking, but during ABS events, it will intervene to help improve stability. All modules include an Electronic Control Unit (ECU) and Modulator Relay Valve (MRV) which are integrated into a single self-contained 2S/1M (two-sensor, one modulator) trailer ABS unit. The **Premium Bendix TABS-6 module** is auto-configurable to control more sensors and modulators (up to 4S/3M) from its default 2S/1M.

GENERAL KIT INFORMATION

These instructions are intended for the installation of Bendix ABS systems on trailers or dollies that have been pre-approved for this purpose and presumes that the appropriate number and types of kits required to complete the installation are on hand when the installation begins.

Bendix trailer ABS kits are only to be applied and installed according to the recommended practices found in this document and the Bendix TABS-6 module product specification, BW-283-PR.

The complete installation of this kit may require electric welding and machining of trailer axles and hubs. Only personnel experienced and trained in these processes should proceed.

If modifications to the axle or wheel hubs are necessary, the manufacturer's warranty may be affected.

The installation should be made in the order presented to avoid unnecessary steps and possible rework.

The following additional product literature may be required to provide further details of the installation:

BW-283-PR	Bendix® TABS-6™ Module - Specifications, Application, Installation and Diagnostics
BW2469	Service Data Sheet SD-13-4767
BW2364	Bendix TABS-6 Module Trailer ABS Module Service Data Sheet SD-13-4860
BW1680	Bendix® WS-24™ Speed Sensor Service Data Sheet SD-03-4516 Bendix® SR-5™ Trailer Valve

For more information on this or other Bendix product support literature, contact Bendix or refer to your local authorized Bendix dealer.

BENDIX® TABS-6™ MODULE SYSTEM(S) KIT SELECTION

Using the trailer configuration diagrams in chart 1 and Figure 6, determine the following:

1. Which Bendix TABS-6 module ABS configuration is required for the installation?
2. Will more than one ABS kit be required for the installation?
3. Where is the approximate mounting location of the TABS-6 module (and Bendix® BR9235™ modulator)?
4. How many axle(s) require the installation of wheel speed sensors, blocks and tone rings?

Once the ABS configuration has been determined, refer to chart 6 for the Bendix TABS-6 module kit availability.

For information on other vehicle configurations or the availability of additional ABS kits, contact Bendix or refer to your local authorized Bendix dealer.

TONE RING AND SENSOR BLOCK SELECTION

One tone ring and sensor block is required for each wheel speed sensor that is to be installed. ABS ready hubs (equipped with tone rings) may be available for purchase from the hub manufacturer.

Due to ongoing manufacturing changes to axle and hub designs, refer to your axle manufacturer for the correct part numbers.

If the axles and hubs are ABS ready, tone rings and sensor blocks are not needed.

BENDIX® WS-24™ WHEEL SPEED SENSORS

Wheel speed data is provided to the Bendix TABS-6 module from the Bendix WS-24 wheel speed sensors (see Figure 4). Vehicles have an exciter ring (or “tone ring”) as part of the wheel assembly, and as the wheel turns, the teeth of the exciter ring pass the wheel speed sensor, generating an AC signal. The Bendix TABS-6 module receives the AC signal, which varies in voltage and frequency as the wheel speed changes. (The default setting expects a 100-tooth tone ring to be used.) Vehicle axle and ABS control configurations

determine if two or four wheel speed sensors are required. See Figures 4 and 5 for electrical system schematics showing wheel speed sensor connector pin locations.

A proper sensor installation is critical to correct ABS operation.

Typically, the Bendix WS-24 sensor is installed in mounting blocks that are welded to the axle housing. WS-24 wheel speed sensors are protected by a stainless steel sheath. They are designed to be used with beryllium copper clamping sleeves (sometimes referred to as a “retainer bushing”, “friction sleeve” or “clip”) (See Figure 2). The clamping sleeve provides a friction fit between the mounting block bore and the Bendix WS-24 wheel speed sensor.

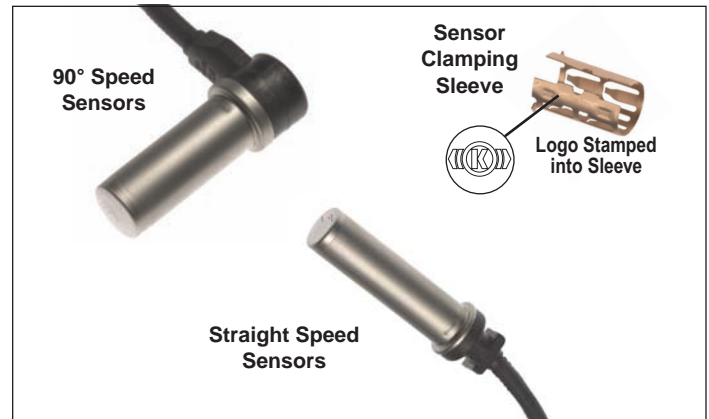


FIGURE 2 - BENDIX® WS-24™ WHEEL SPEED SENSORS

BENDIX® BR9235™ ABS MODULATOR RELAY VALVES

Bendix BR9235 modulator relay valves (MRV) are required when additional modulator relay valves are needed for multichannel brake systems (e.g. 2S/2M, 4S/2M, and 4S/3M ABS configurations).

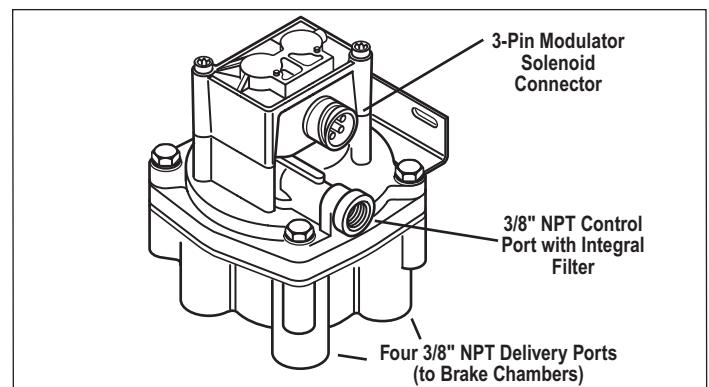


FIGURE 3 - BENDIX® BR9235™ MODULATOR RELAY VALVE

The MRV is an electro-pneumatic control valve and is the last valve that air passes through on the way to the brake chambers. The normally-open hold solenoid and normally-closed exhaust solenoid are activated to precisely modify the brake pressure on command. During normal braking, the Bendix BR9235 MRV functions as a standard relay valve. As brakes are applied or released by the driver, the control signal from the tractor foot valve causes the Bendix BR9235 MRV to apply proportional pressure to the trailer brake chambers.

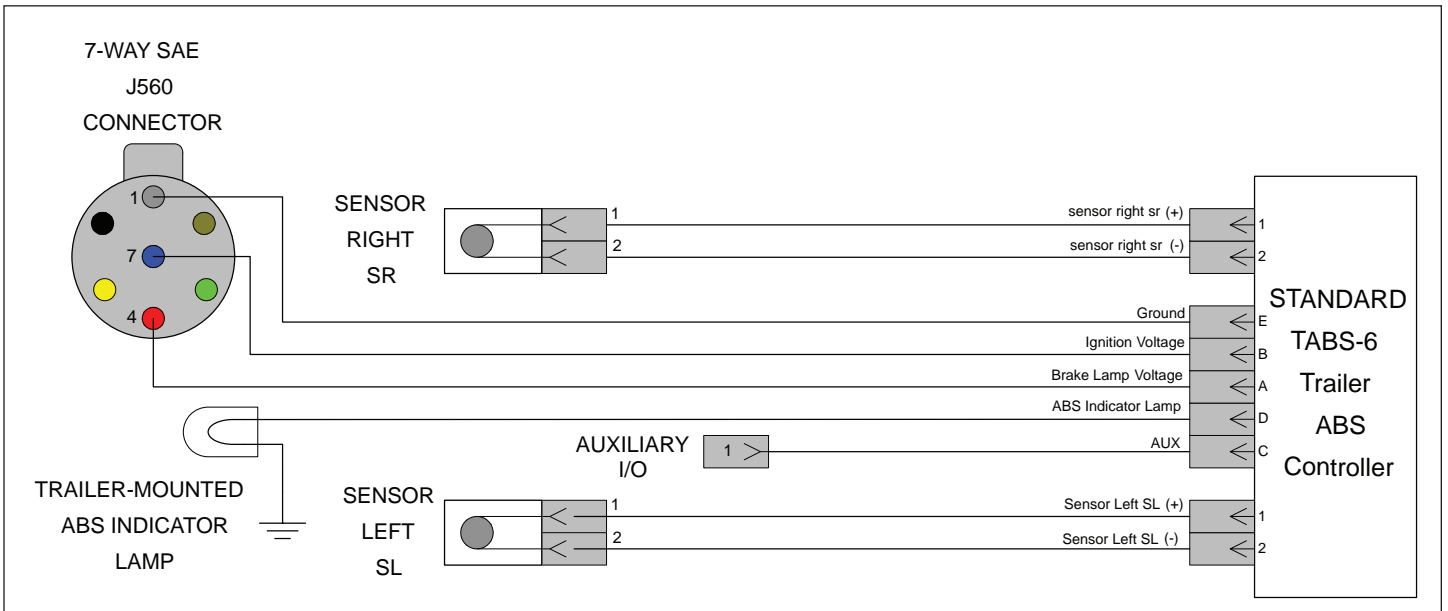


FIGURE 4 - STANDARD BENDIX® TABS-6™ MODULE TYPICAL ELECTRICAL SCHEMATIC

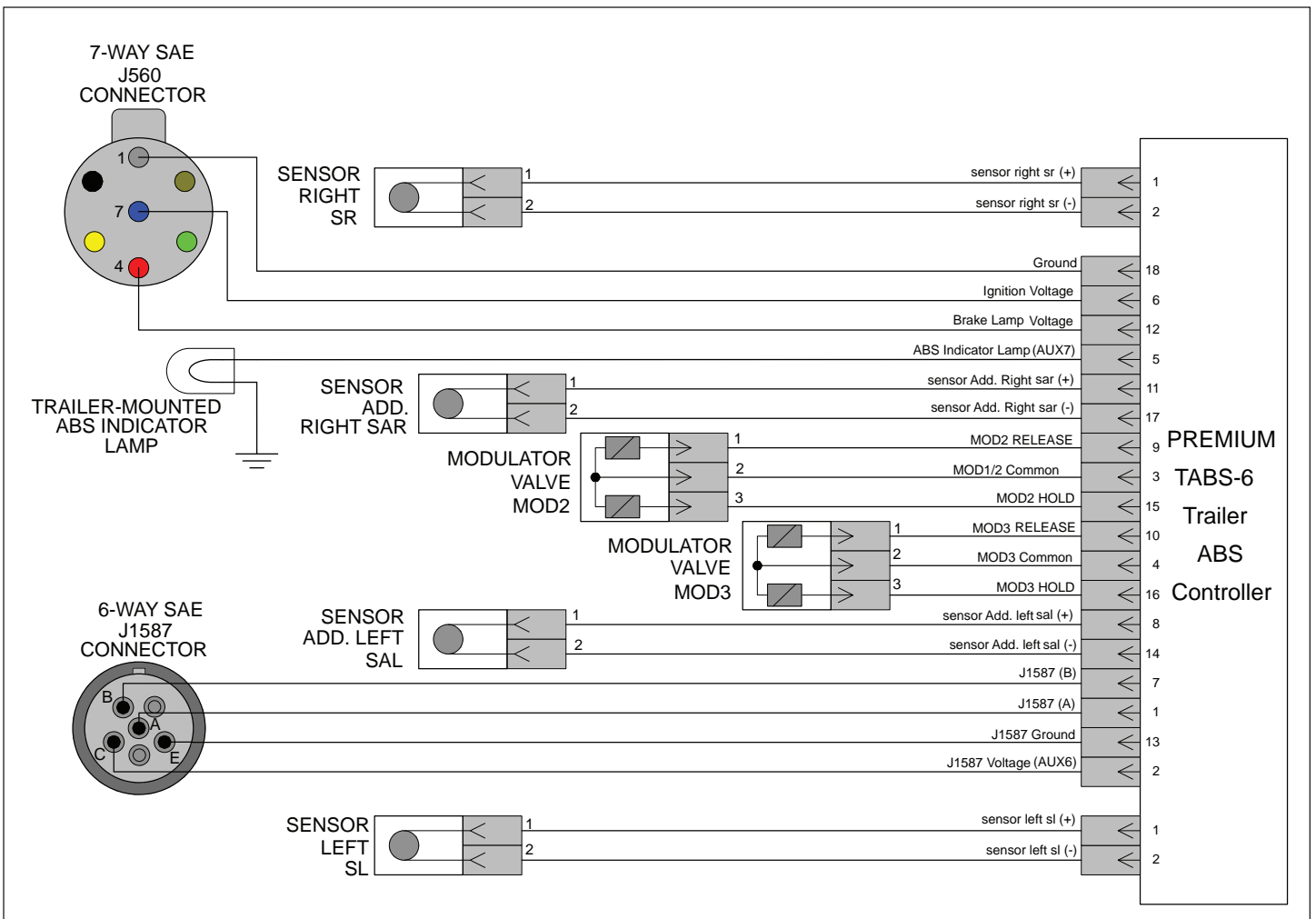


FIGURE 5 - PREMIUM BENDIX® TABS-6™ MODULE TYPICAL ELECTRICAL SCHEMATIC

The Bendix BR9235 MRV is available in both tank and bracket mounting styles.

Trailer Suspension	Wheel Speed Sensor Placement
2 Axle Spring	Forward Axle
2 Axle Air	Rear Axle
3 Axle Spring	Forward and Rear Axle
3 Axle Air	Center and Rear Axle

CHART 2 - WHEEL SPEED SENSOR PLACEMENT

CHOOSING THE AXLE TO PLACE WHEEL SPEED SENSORS

If any axle is to be controlled by the Bendix® TABS-6™ module but not sensed, the wheel speed sensors are typically located on the axle that tends to unload or lighten during braking. The standard convention for sensor placement in this case is shown in chart 2. However, due to variations in trailer suspension designs, this convention is not correct for all applications.

For more information on wheel speed sensor location, contact Bendix or refer to the vehicle or suspension manufacturer.

Use this chart to identify the vehicle and Bendix TABS-6 module configurations available for installation. The chart shows one or more system solutions for each vehicle type. (Other options may be available) For additional system options, or if the correct vehicle type is not identified in the chart, contact Bendix or refer to your local authorized Bendix dealer.

Trailer Application	2S/1M		2S/2M		4S/2M		4S/3M
	Dolly	Axle	Side	Axle	Side	Axle	Side/Axle
		✓-OR-✓					
		✓	✓-OR-✓		✓		
						✓-OR-✓	
					✓	OR	✓
					✓	OR	✓
			✓		AND		✓
						✓-AND-✓	
					✓	AND	✓
						✓-OR-✓	
	✓						

CHART 1 - BENDIX® TABS-6™ MODULE SYSTEM APPLICATIONS

2S/1M - AXLE CONTROL

Right - "Curb-Side"

Bendix® WS-24™ Wheel Speed Sensor "SR"

- A Brake Light Power
- B Ignition Power
- C NC
- D Warning Lamp
- E Ground

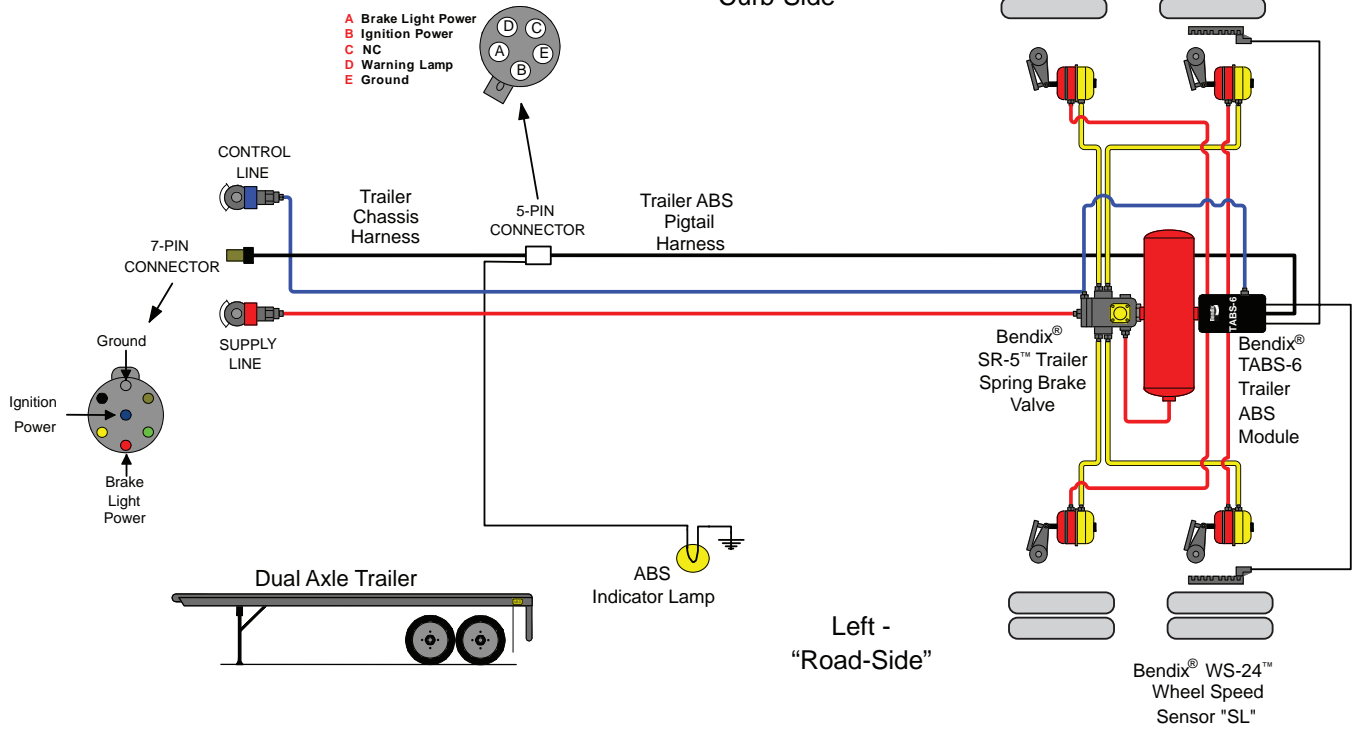


FIGURE 6 - PART ONE OF SIX: BENDIX® TABS-6™ MODULE SYSTEM APPLICATIONS

DOLLY/TOWING TRAILER WITH EMERGENCY FUNCTION

2S/1M - DOLLY AXLE CONTROL

Right - "Curb-Side"

WS-24™ Wheel Speed Sensor "SR"

- A Brake Light Power
- B Ignition Power
- C NC
- D Warning Lamp
- E Ground

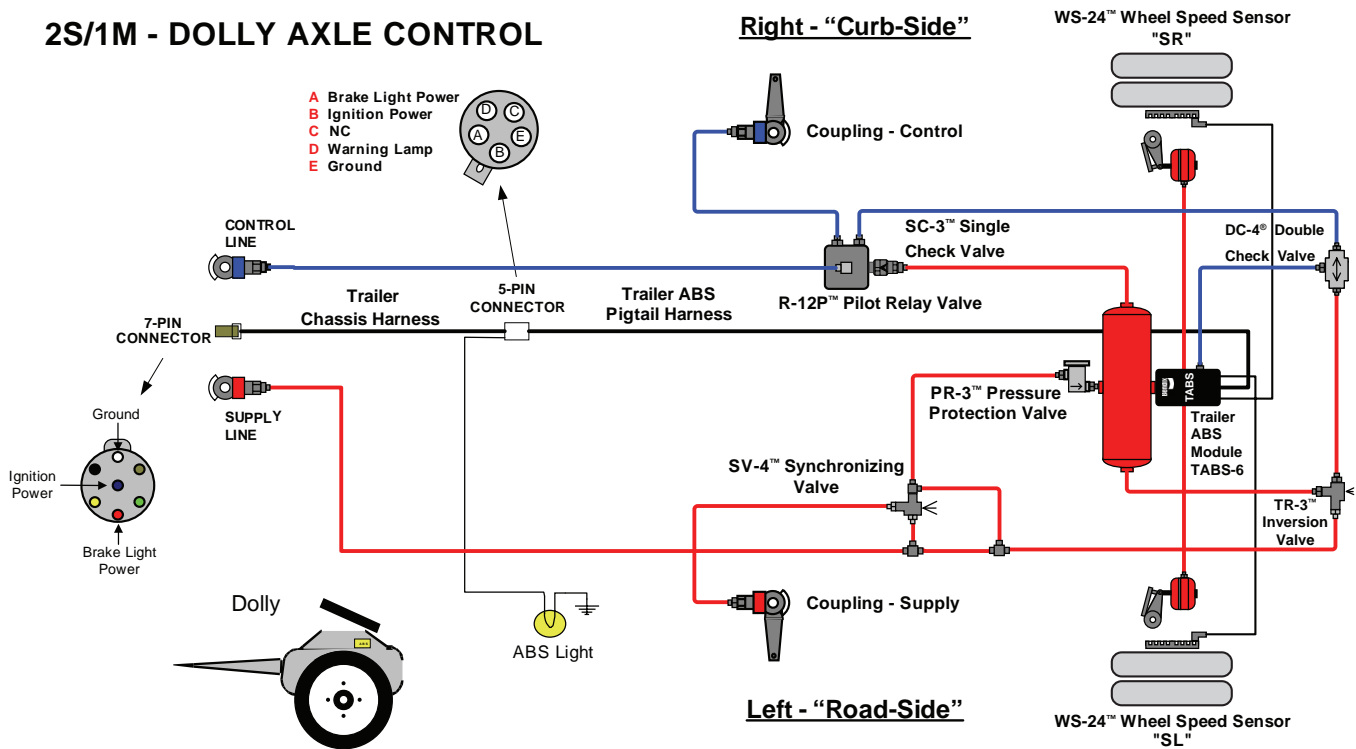


FIGURE 6 - PART TWO OF SIX: DOLLY/TOWING TRAILER WITH EMERGENCY FUNCTION VALVE SCHEMATIC

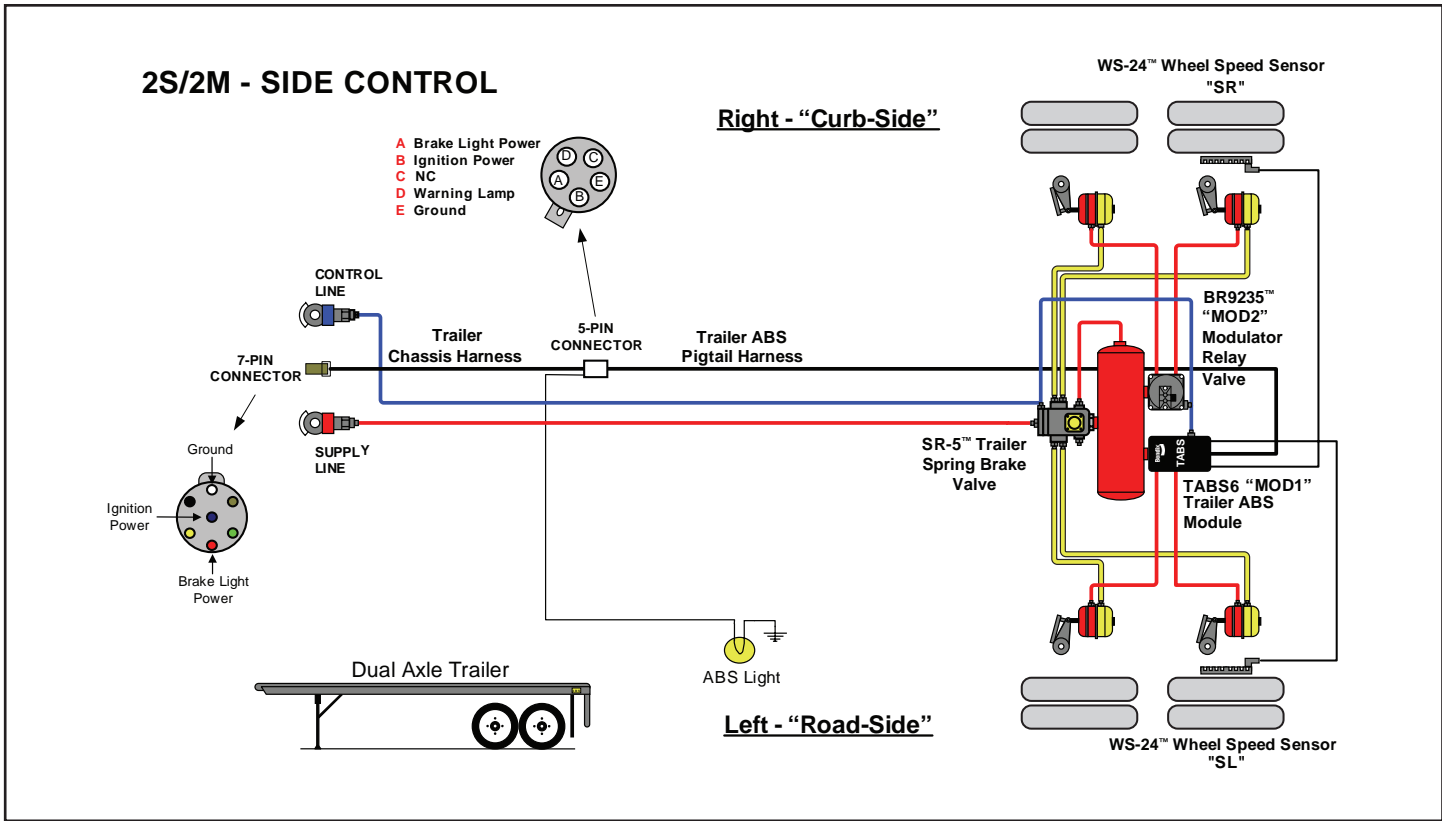


FIGURE 6 - PART THREE OF SIX: BENDIX® TABS-6™ MODULE SYSTEM APPLICATIONS

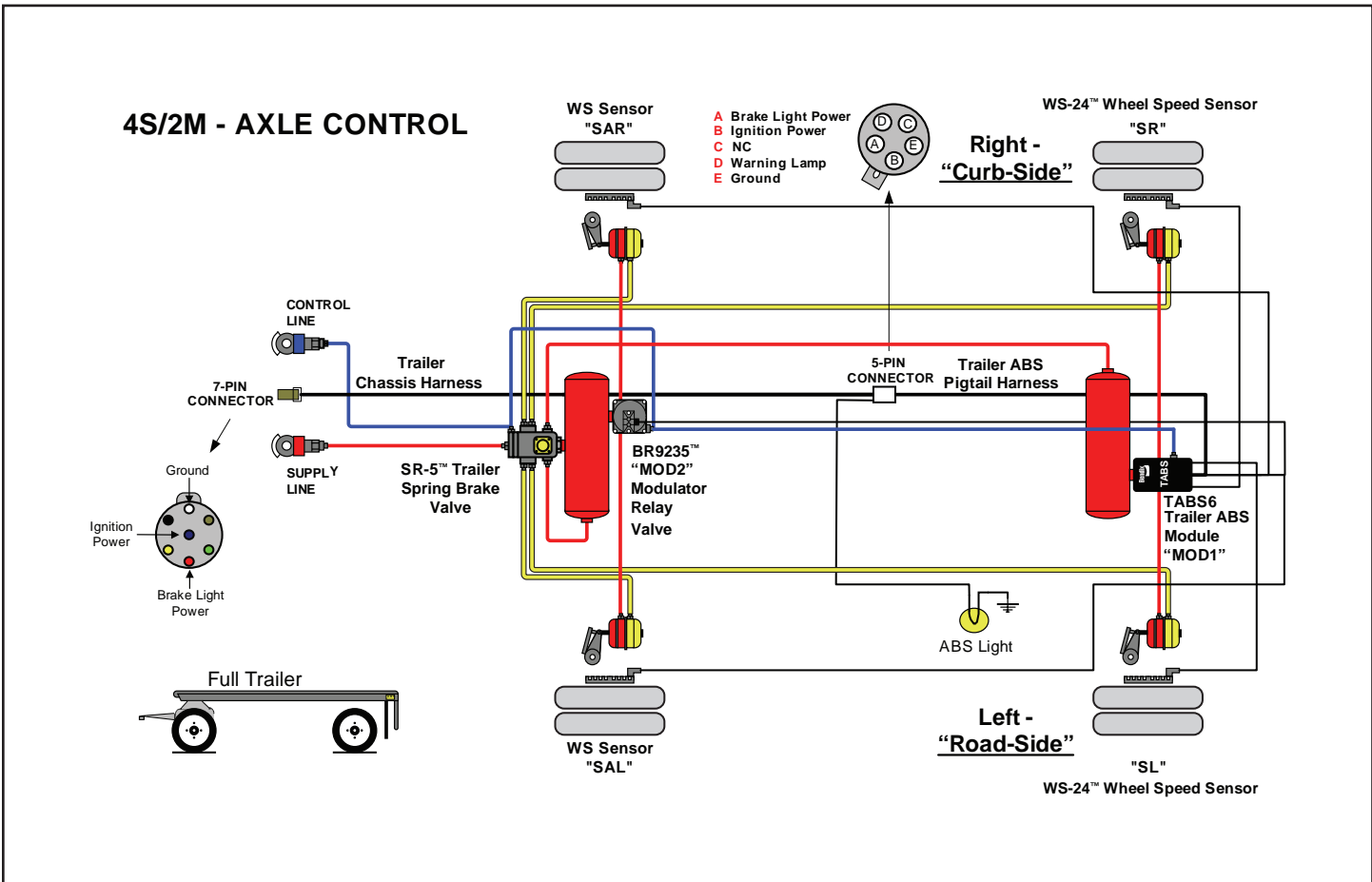


FIGURE 6 - PART FOUR OF SIX: BENDIX® TABS-6™ MODULE SYSTEM APPLICATIONS

4S/2M - SIDE CONTROL

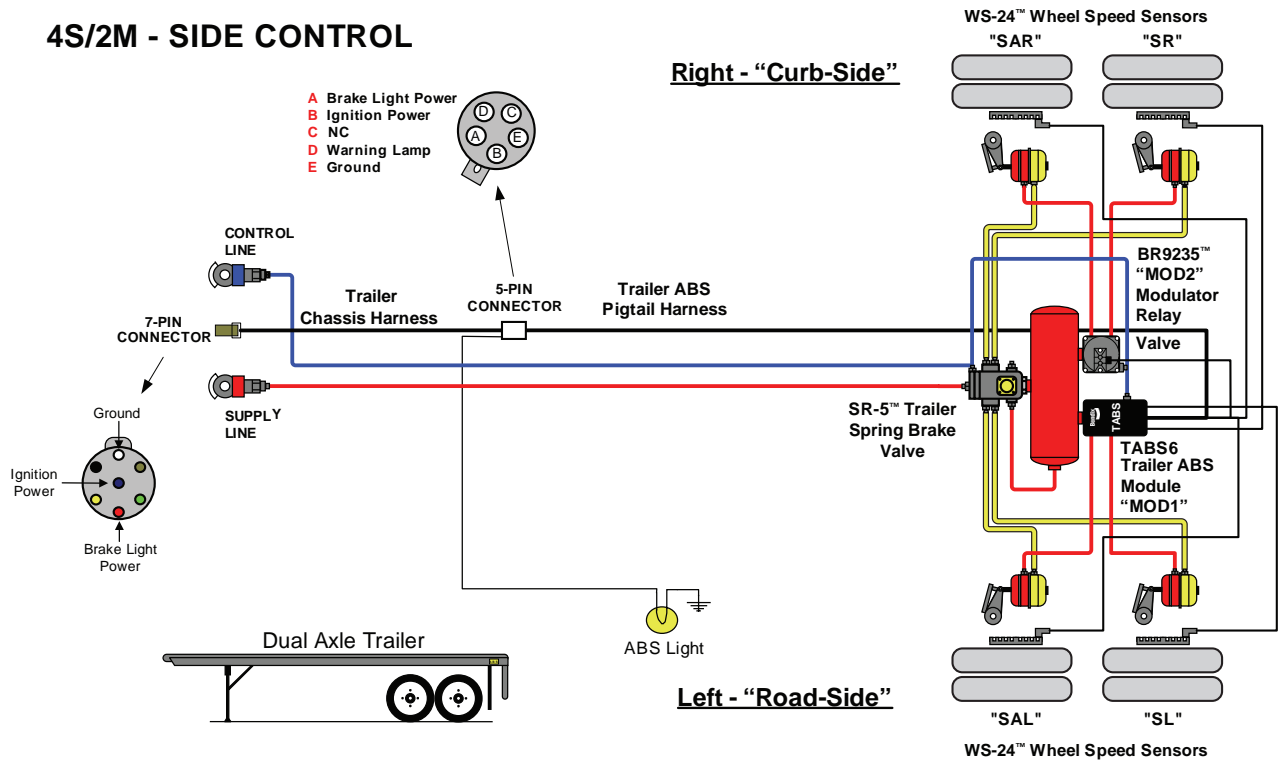


FIGURE 6 - PART FOUR OF SIX: BENDIX® TABS-6™ MODULE SYSTEM APPLICATIONS

4S/3M - SIDE/AXLE CONTROL

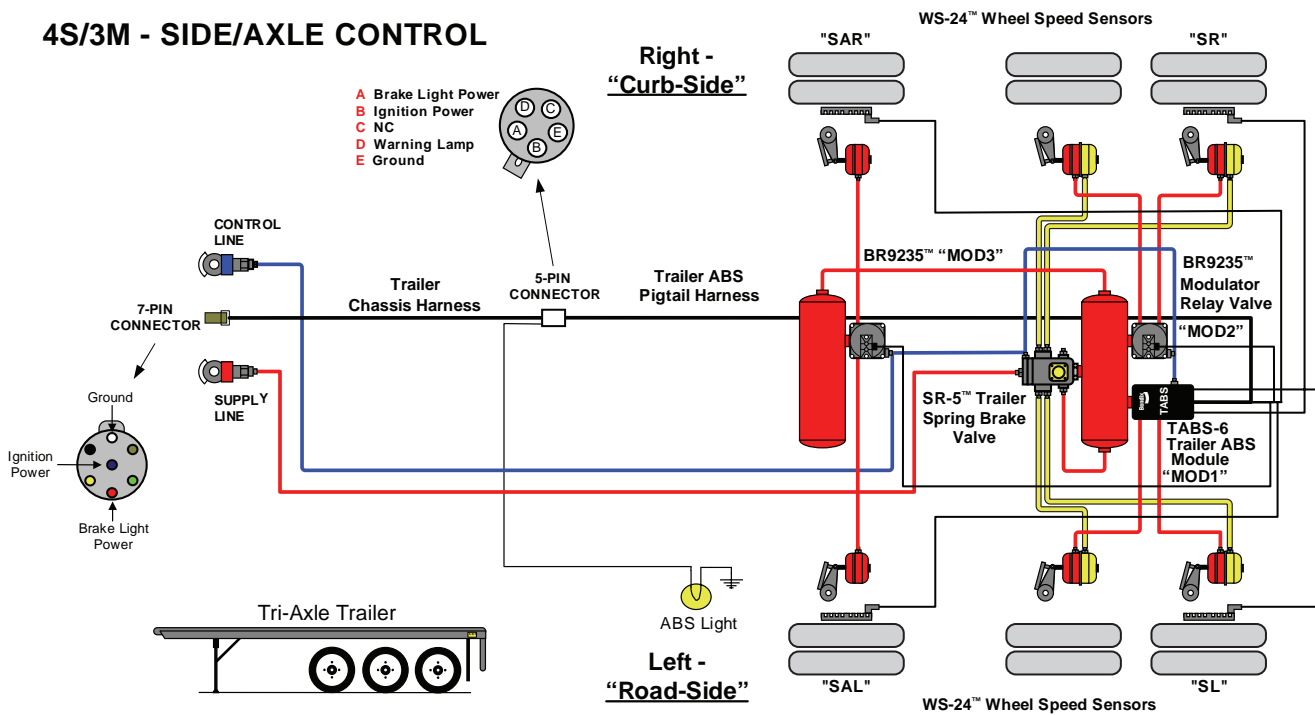


FIGURE 6 - PART FIVE OF SIX: BENDIX® TABS-6™ MODULE SYSTEM APPLICATIONS

SPRING BRAKE VALVE (BENDIX® SR-5™) SELECTION

For trailers or dollies using spring brakes for the emergency brake function, a spring brake control valve is required. The Bendix® TABS-6™ module will generally function with spring brake valves from other manufacturers, however if the vehicle is equipped with one of the valves pictured in Figure 8, a change over to the Bendix® SR-5™ trailer spring brake control valve is recommended. Refer to chart 3 for the correct Bendix SR-5 part number according to the port size on the supply reservoir.

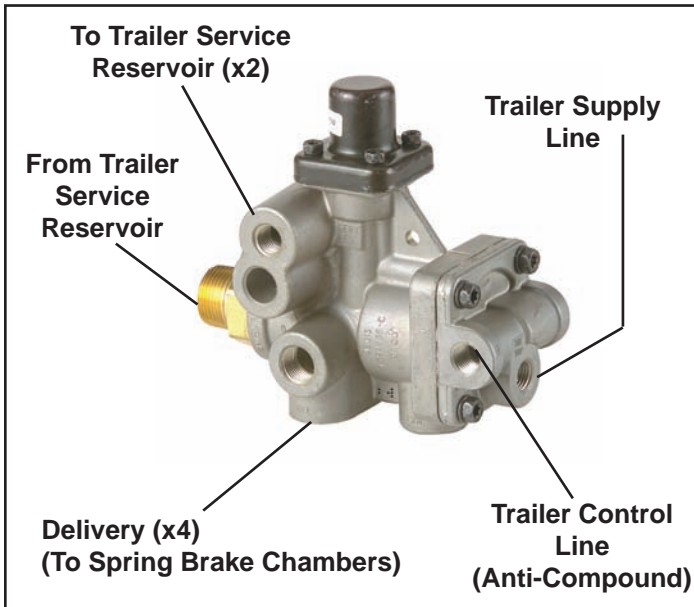


FIGURE 7 - BENDIX® SR-5™ TRAILER SPRING BRAKE VALVE

Midland/Wagner RT Series & Sealco Ratio Relay Spring Brake Control Valves



Midland/Wagner RT
A88802, A88812



Midland/Wagner RT-2
A98730, A99370



Midland/Wagner RT-4
KN26000, KN26010



Sealco Ratio Relay Valve
110170, 110171, 110191,
110310, 110315

Berg SERV & Midland FFV (Full Function Valve) Service Relay and Spring Brake Control Valve



Midland/Berg
12350



Midland
FFV or FF2 Full
Function Valve 28600

FIGURE 8 - NON-COMPATIBLE SPRING BRAKE VALVES

Bendix® SR-5™ Trailer Spring Brake Valve Part Number		Reservoir Port Size
OEM	Service	
108945	65439	1/2" Supply Port
102831	65437	3/4" Supply Port

CHART 3 - BENDIX SR-5 PART NUMBERS

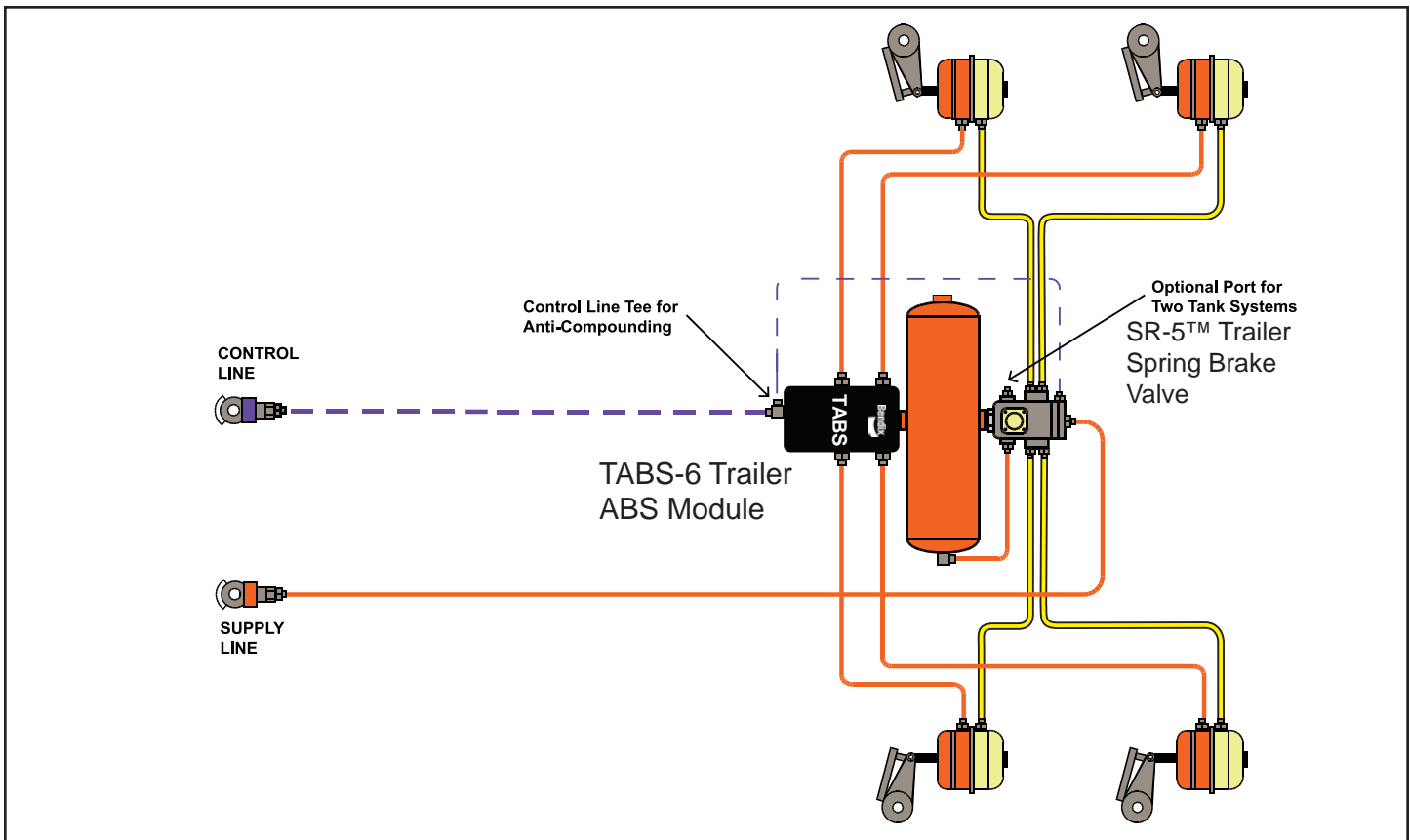


FIGURE 9 - BENDIX® SR-5™ TRAILER SPRING BRAKE VALVE SCHEMATIC

SAFE MAINTENANCE PRACTICES

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 a Bendix® 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® brand 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 Antilock 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.

tone ring installation

The actions in this section are not required if ABS ready hubs are already in use on the trailer or if new ABS ready hubs have been purchased for the ABS installation.

NOTE: When altering the hubs in any way, the owner assumes all warranty responsibility for the hub. All manufacturer warranties may be void. Check with the hub supplier.

1. Remove the wheels and hub intended for installation of tone rings.
2. Non-ABS hubs can be retrofitted with tones rings by machining the hubs to the dimensions shown in Figure 10. The tone ring is selected according to the hub manufacturer and part number. The hub is then machined to mate with the inside mounting surface of the tone ring. A minimum interference fit of 0.004 inches must be achieved for the tone ring to stay securely mounted over the life of the vehicle.

If a tone ring is undercut during machining, it must be discarded and replaced.

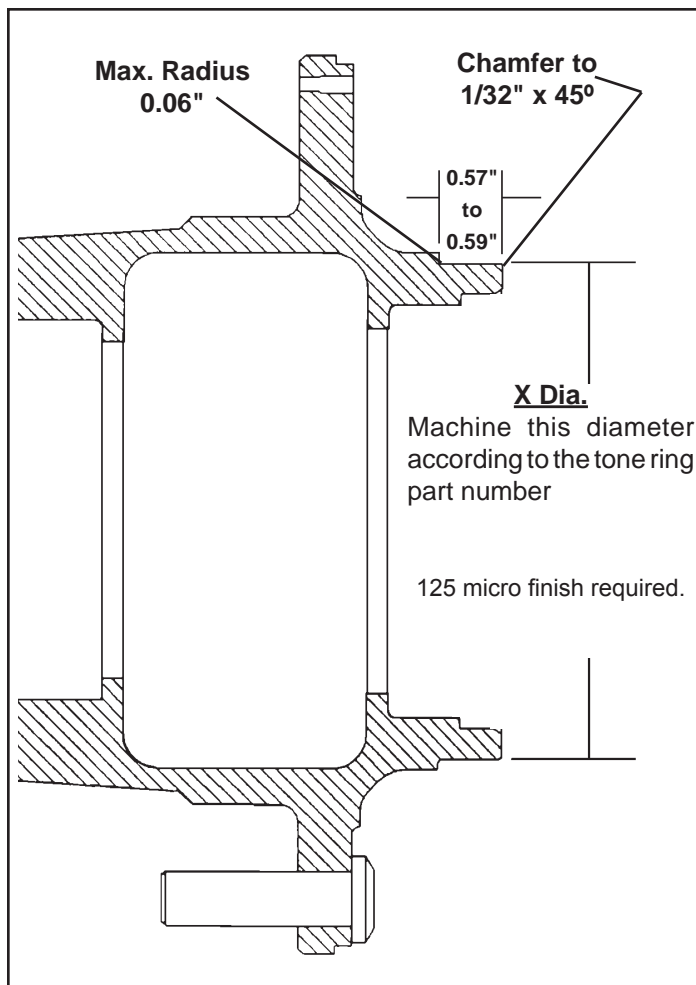


FIGURE 10 - MACHINING HUB FOR TONE RING INSTALLATION

3. Uniformly heat the tone ring to approximately 350° F. Install the ring on the machined diameter of hub making certain it fits squarely on the machined hub diameter and that the backside of the ring (side opposite the teeth) is flush with the machined shoulder. See Figure 12. **Cold pressing of the tone ring onto the hub is not recommended.**
4. After the ring and hub have cooled, verify that the ring is tight on the hub and does not slip. As a final check, install the hub/ring on the axle and properly adjust the wheel bearings. Check the axial run out while turning the hub, note that the **axial run out does not exceed +0.008 to -0.008 inches.**

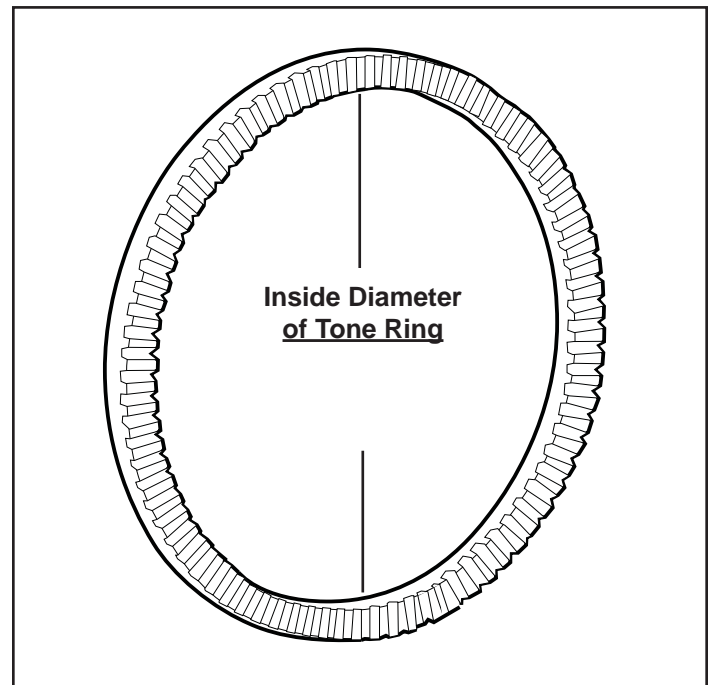


FIGURE 11 - TONE RING INSIDE DIAMETER

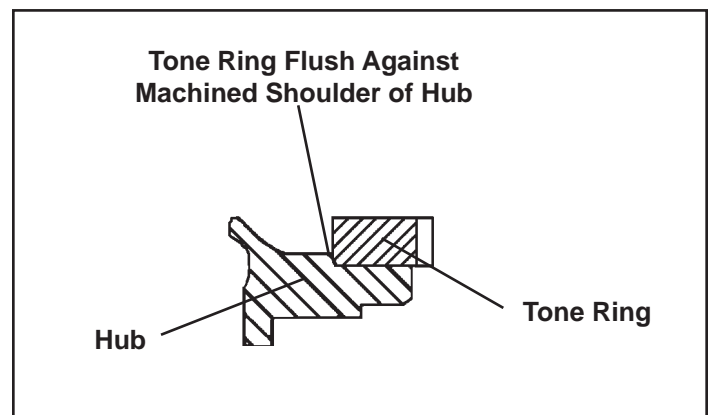


FIGURE 12 - TONE RING HEATED PRESS FIT TO HUB

SENSOR BLOCK INSTALLATION

Correct installation of the speed sensor blocks is extremely important for proper operation of the ABS system. Only use electric welding equipment to install the sensor blocks.

NOTE: The spring clip and sensor must not be inserted in the sensor mounting block during the welding operation. When welding to the axle, the owner assumes all warranty responsibility for the axle assembly. All manufacturer warranties may be void. Check with the axle supplier.

1. Properly support the trailer axle using jack stands. Allow proper clearance for the sensor block and welding equipment.
2. Clean all oil or grease from the axle spindle.
3. For best results, the sensor mounting blocks need to be positioned at approximately the 9 or 3 o'clock position on the axle spindle. These positions will see the least effect from axle flexing during loading. See Figure 15.
4. Install hub with tone ring and properly adjust the wheel bearings.
5. Position and mark the sensor block on the axle. Before welding, verify a gap of 0.125" to 0.187" between the sensor mounting block face and the tone ring teeth. See Figure 14.
6. Weld the sensor block to the spindle axle along both sides of the block.
7. Allow the sensor block to cool before installing the clip and sensor. It is recommended to apply a moderate amount of anti-seize compound to the sensor clip to ensure proper sensor adjustment during vehicle operation.

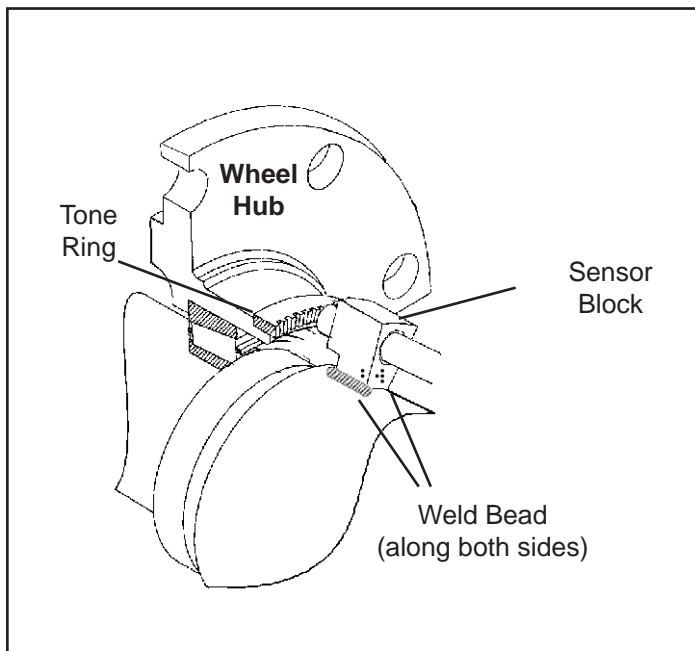


FIGURE 13 - SENSOR BLOCK ALIGNMENT ON AXLE

If provided, use the Bendix sensor block placement tool while performing welding operation.

1. Insert a spare sensor clip into the sensor block.
2. Insert the sensor block placement tool into the block/clip assembly. See Figure 13. Adjust the amount that the placement tool protrudes past the sensor block face so that a gap of 0.125" to 0.187" will be achieved between the sensor mounting block face and the tone ring teeth.
3. Secure sensor mounting block to the desired position on the axle by applying the magnetic tip of the sensor block mounting tool directly to the tone ring teeth. See Figure 13. Verify that the mounting block is squarely positioned relative to the tone ring face and the axle.
4. Tack weld a small area of each side of the block to the axle.
5. Remove the sensor block mounting tool and spare sensor clip.
6. Weld the sensor block to the spindle axle along both sides of the block.
7. Allow the sensor block to cool before installing the clip and sensor. It is recommended to apply a moderate amount of anti-seize compound to the sensor clip to ensure proper sensor adjustment during vehicle operation.

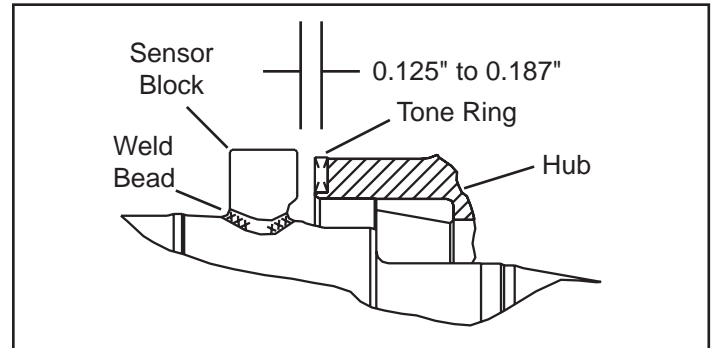


FIGURE 14 - SENSOR BLOCK GAP TO TONE RING FACE

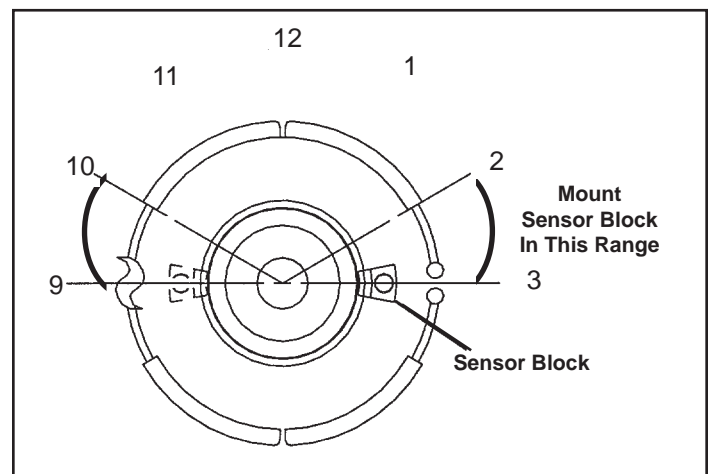


FIGURE 15 - RECOMMENDED SENSOR BLOCK MOUNTING POSITION ON AXLE

WHEEL SPEED SENSOR INSTALLATION

Wheel Speed Sensor Clips

Proper sensor installation begins by fully inserting the spring clip into the block, with the retaining tabs toward the inside of the vehicle. See Figure 16. The sensor spring clip is designed to firmly hold the wheel speed sensor in place while also allowing the sensor to adjust in position as the wheel and hub rotate. Wheel bearing play and heavily loaded axles will cause sensors to self-adjust as the wheels rotate.

Wheel Speed Sensor Adjustment

Speed sensors are properly adjusted by gently pushing (not striking) the sensor into the clip until it makes contact with the face of the tone ring. See Figure 13. The wheel speed sensor will automatically adjust as the wheel rotates. If rotating the wheel causes a gap of 0.020 in. or greater, check for excessive wheel bearing play or tone ring run-out. Proper wheel speed sensor installation is critical to proper ABS operation.

Verifying Proper Sensor Output

Once the hub is reinstalled, rotate the wheel and verify a minimum of 0.25 VAC sensor output @ 0.5 RPS across the wheel speed sensor pins. A properly positioned sensor can output more than 2.0 VAC @ 1 RPS. If the sensor output is not acceptable, recheck sensor installation.

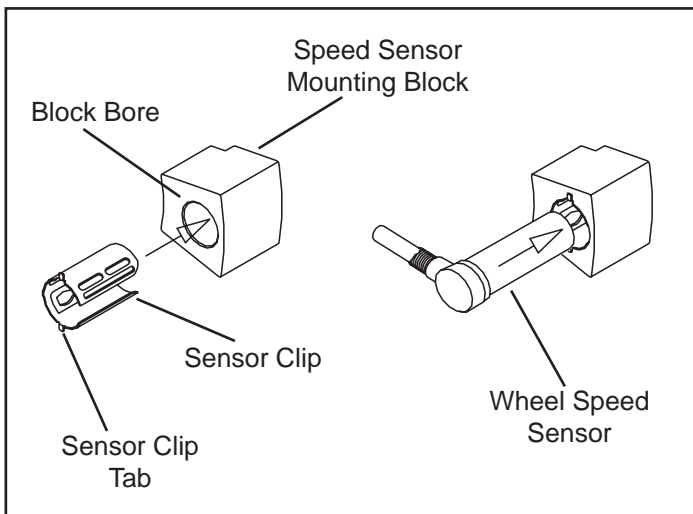


FIGURE 16 - SENSOR CLIP AND SENSOR INSTALLATION

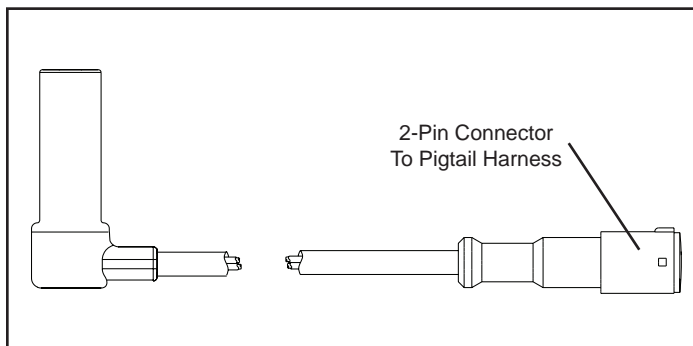


FIGURE 17 - SENSOR LEAD AND CONNECTOR

Sensor Wire Securing

Wheel speed sensor wiring coming out of the wheel ends must be routed away from moving brake components and secured to the axle to prevent wiring damage.

Figure 18 shows the proper routing of the sensor wires. The stress loop allows the sensor to properly adjust but not to be pulled out of adjustment. Use 25" tie wraps (extra wide) to secure the sensor leads along the axle as shown.

Use 12" long bow-tie tie wraps or plastic hose clips to secure the speed sensor leads to the rubber brake hoses. The sensor wires should be secured along the service brake hoses leading to the Bendix® TABS-6™ module every 12 inches. This step may have to be done after the brake hoses are secured to the Bendix TABS-6 module.

Bendix does not recommend using standard tie-wraps to secure sensor wiring directly to rubber air lines. This can cause premature wiring failure from excessive expansion when air pressure is applied.

It is recommended to tag the wheel position on each sensor connector to ensure proper connection to the Bendix TABS-6 module pigtail harness. See the Leakage and Operational Tests section.

All wiring used in the wheel speed sensor circuits must be twisted pair. At least one twist per inch is required.

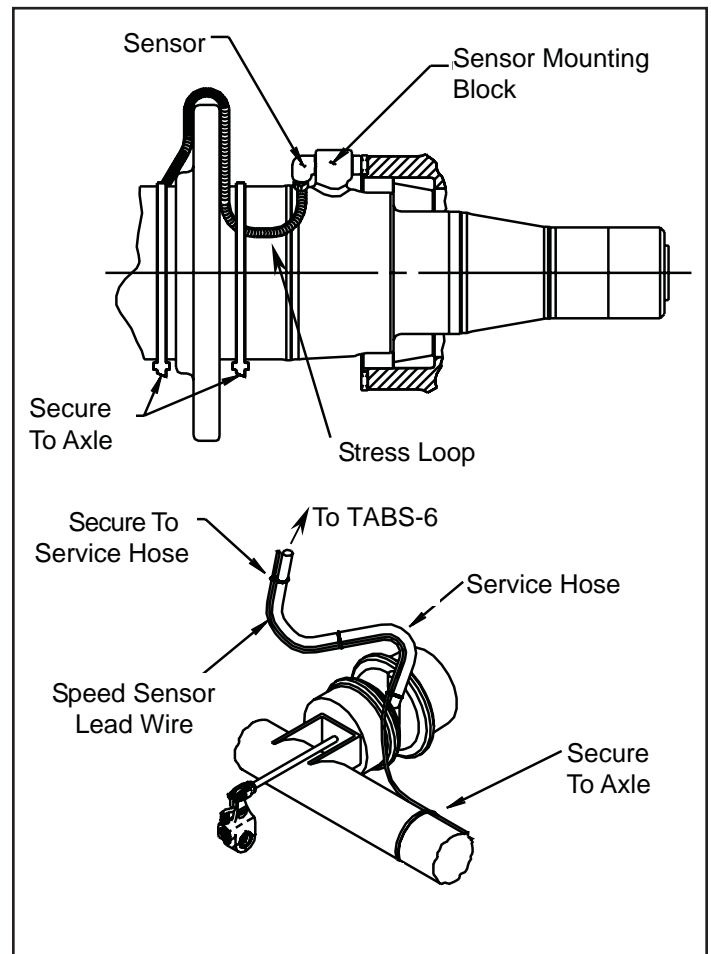


FIGURE 18 - SENSOR LEAD ROUTING AND SECURING

INSTALLATION OF THE BENDIX® TABS-6™ MODULE OR BENDIX® BR9235™ MODULATOR

The Bendix® TABS-6™ module or Bendix® BR9235™ modulator will replace the standard service relay valve on the trailer. The unit can be vertically mounted on a frame rail, cross-member or tank.

When a single Bendix TABS-6 module or Bendix BR9235 modulator will be used to control the brake pressure of more than one axle, it is very important to position the unit at an even distance from each axle to achieve balanced brake timing and ABS performance.

Determine the desired mounting location of the Bendix TABS-6 module or Bendix BR9235 modulator. The exhaust port must be pointing straight down. Wait until all valves are installed before connecting any air lines.

Tank (Nipple) Mount Unit

The Bendix TABS-6 module or Bendix BR9235 modulator may be service tank mounted as long as the tank has a reinforced port and a schedule 80 or equivalent strength 3/4" nipple is used. For more information on reinforced tanks contact Bendix or refer to your local authorized Bendix dealer.

Install the nipple fitting into the valve body supply port. Then rotate the entire assembly into the tank port until secure and upright. A wrench may be used on the nipple fitting to drive it into the tank and prevent over torquing into the aluminum valve body. Over-torquing of the nipple fitting could cause damage to the valve body. Verify proper swing clearance for the unit before attempting to install the unit on the tank. See chart 4 and Figure 19.

Tank-Mount Unit	Minimum Swing Clearance
Bendix TABS-6	4¾"
Bendix BR9235 modulator	4⅛"

CHART 4 - TANK MOUNT CLEARANCE REQUIREMENTS

COMPONENTS

Installation of the Bendix TABS-6 module typically utilizes the following components:

- Bendix® WS-24™ wheel speed sensors (2 or 4, depending

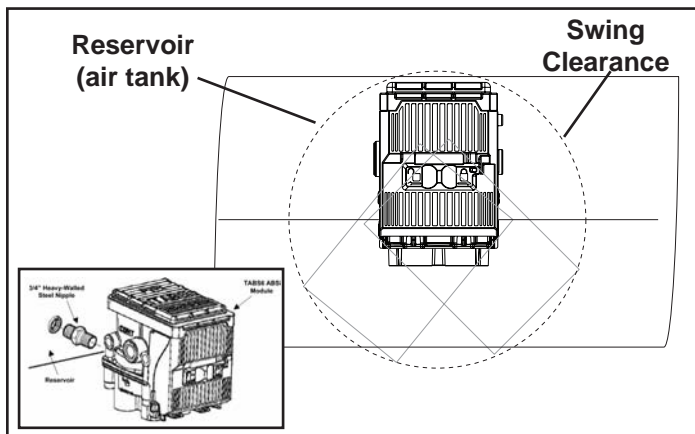


FIGURE 19 - SWING CLEARANCE RADIUS - TANK MOUNT

on configuration). Each sensor is installed with a Bendix Sensor Clamping Sleeve. See page 2.

- Bendix® BR9235™ Pressure Modulator Valves (0, 1, or 2 depending on configuration). See page 4.
- Trailer-mounted ABS indicator lamp. See page 13.
- Pigtail wiring harness(es) as needed. See Figure 23.

MOUNTING CONFIGURATIONS

Tank (Nipple) Mount

The Bendix TABS-6 module can be tank-mounted using a schedule 80 (heavy gauge steel) 3/4" NPT nipple directly between the trailer supply tank and the module's supply port. A tank with a reinforced port must be used.

Frame (Chassis) Mount

The Bendix TABS-6 module provides through-holes for frame mounting directly to the trailer frame rail or cross-member. It is recommended to use two Grade 5 3/8-16 bolts, typical length 5", torqued to 180-220 in-lbs.

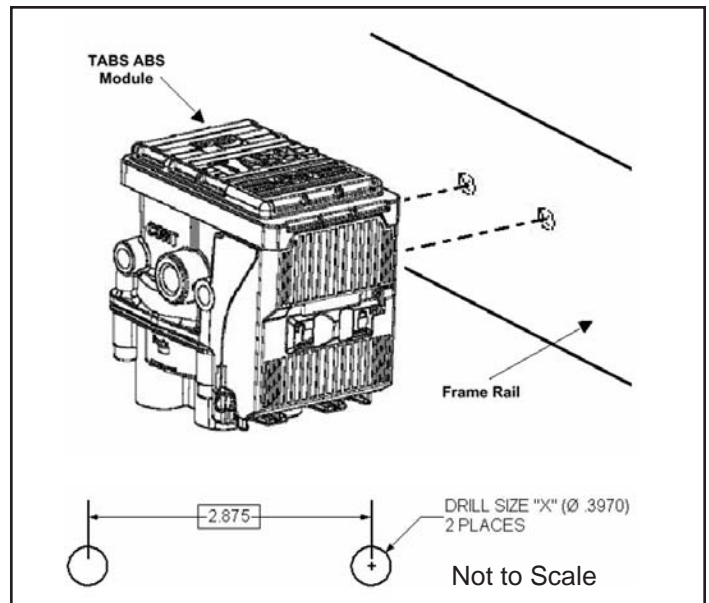


FIGURE 20 - FRAME (BRACKET) MOUNT

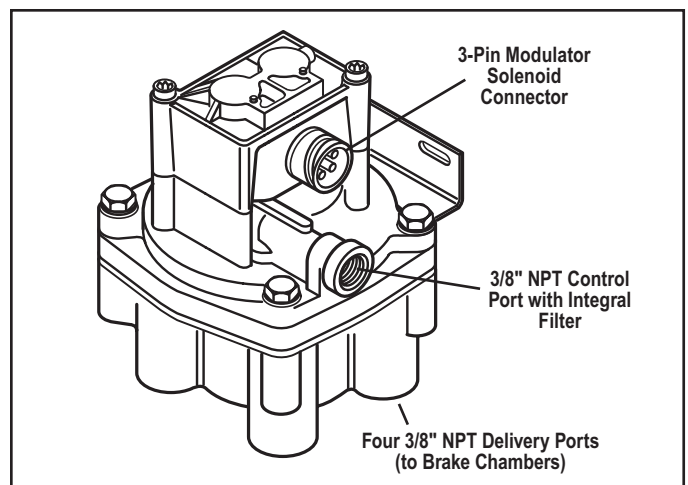


FIGURE 21 - BENDIX® BR9235™ MODULATOR RELAY VALVE

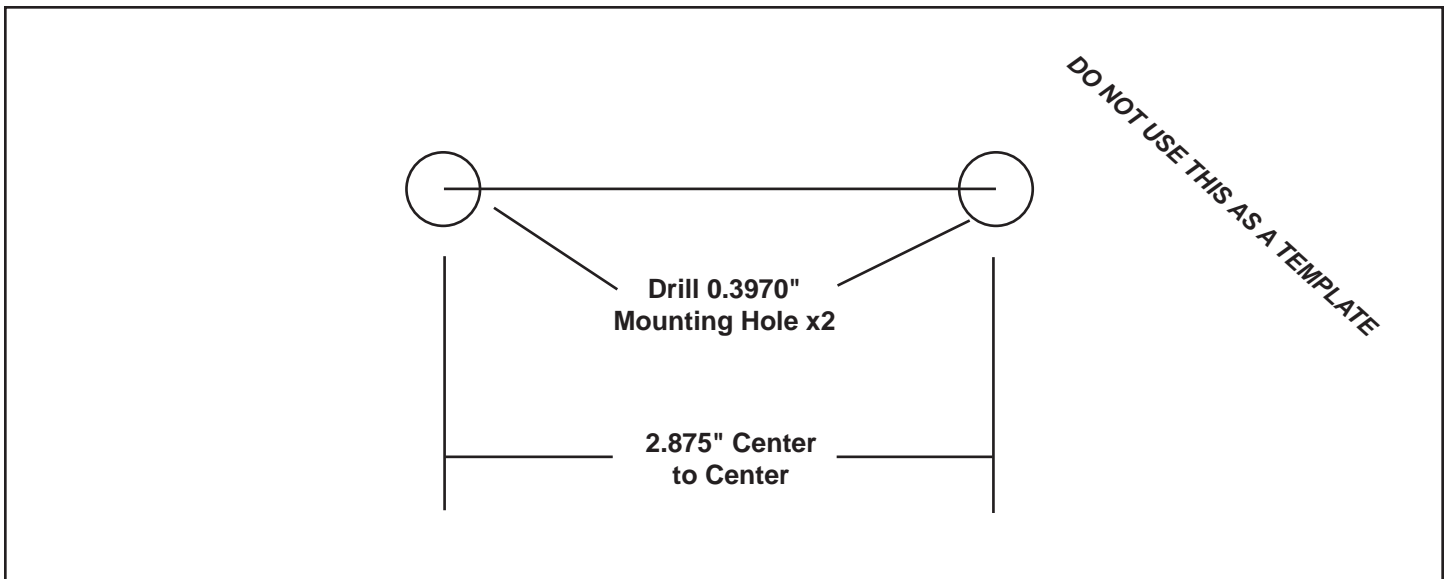


FIGURE 22 - BENDIX® TABS-6™ MODULE FRAME (BRACKET) MOUNTING HOLE PATTERN - DIMENSIONS ARE FOR REFERENCE ONLY. DO NOT USE THIS AS A TEMPLATE.

Bendix® SR-5™ SPRING BRAKE VALVE INSTALLATION

The actions in this section are not required if the vehicle is already equipped with an approved spring brake control valve.

The Bendix SR-5 valve is designed to be tank mounted. Rotate the entire assembly into the service tank port until secure and upright. A wrench may be used on the nipple fitting to drive it into the tank port. Over-torquing of the nipple fitting could cause damage to the valve body. Plumb the Bendix SR-5 valve according to Figure 7 and Figure 9. Wait until all valves are installed before connecting any air lines.

NON-SPRING BRAKE EMERGENCY VALVE INSTALLATION

The actions in this section are not required if the vehicle is already equipped with approved emergency brake control valving.

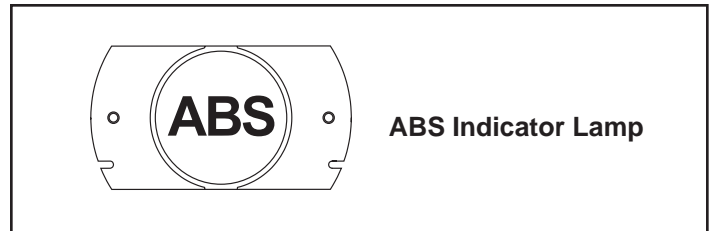
The Bendix® DC-4® valve and Bendix® TR-3™ valve combination can be used to provide emergency brake function when installed according to Figure 9. Mount these valves directly to the trailer frame rail or cross-member using the appropriate hardware. Mounting holes may need to be drilled at the mounting location.

Wait until all valves are installed before connecting any air lines.

AIR HOSE CONNECTIONS

Connect all air hoses and fittings to the Bendix® TABS-6™, Bendix® BR9235™ modulator and / or other valving. **Do not use Teflon tape!** Make certain that no excess thread sealing material enters any valve opening.

Leakage and Operational Tests must be performed before returning the vehicle to service.



INDICATOR LAMP INSTALLATION

Install the ABS indicator lamp on the vehicle, making sure a good ground is provided. The letters "ABS" must be embossed on the lamp lens or on a label next to the lamp.

Trailer (Post March 1, 1998)

Per FMVSS 121, the ABS indicator lamp must be mounted on the left side of the trailer as viewed from the rear, no closer than 150 mm (5.9 inches), and no further than 600 mm (23.6 inches) from the red rear side marker lamp.

Dolly (Post March 1, 1998)

Per FMVSS 121 each trailer converter dolly should be equipped with a lamp mounted on the permanent structure of the dolly so that the lamp is not less than 375 mm (14.8 inches) above the road surface when measured from the center of the lamp with the dolly at curb weight. When a person standing 3 meters (9.8 feet) from the lamp, views the lamp from a perspective perpendicular to the vehicle's centerline, no portion of the lamp should be obscured by any structure on the dolly.

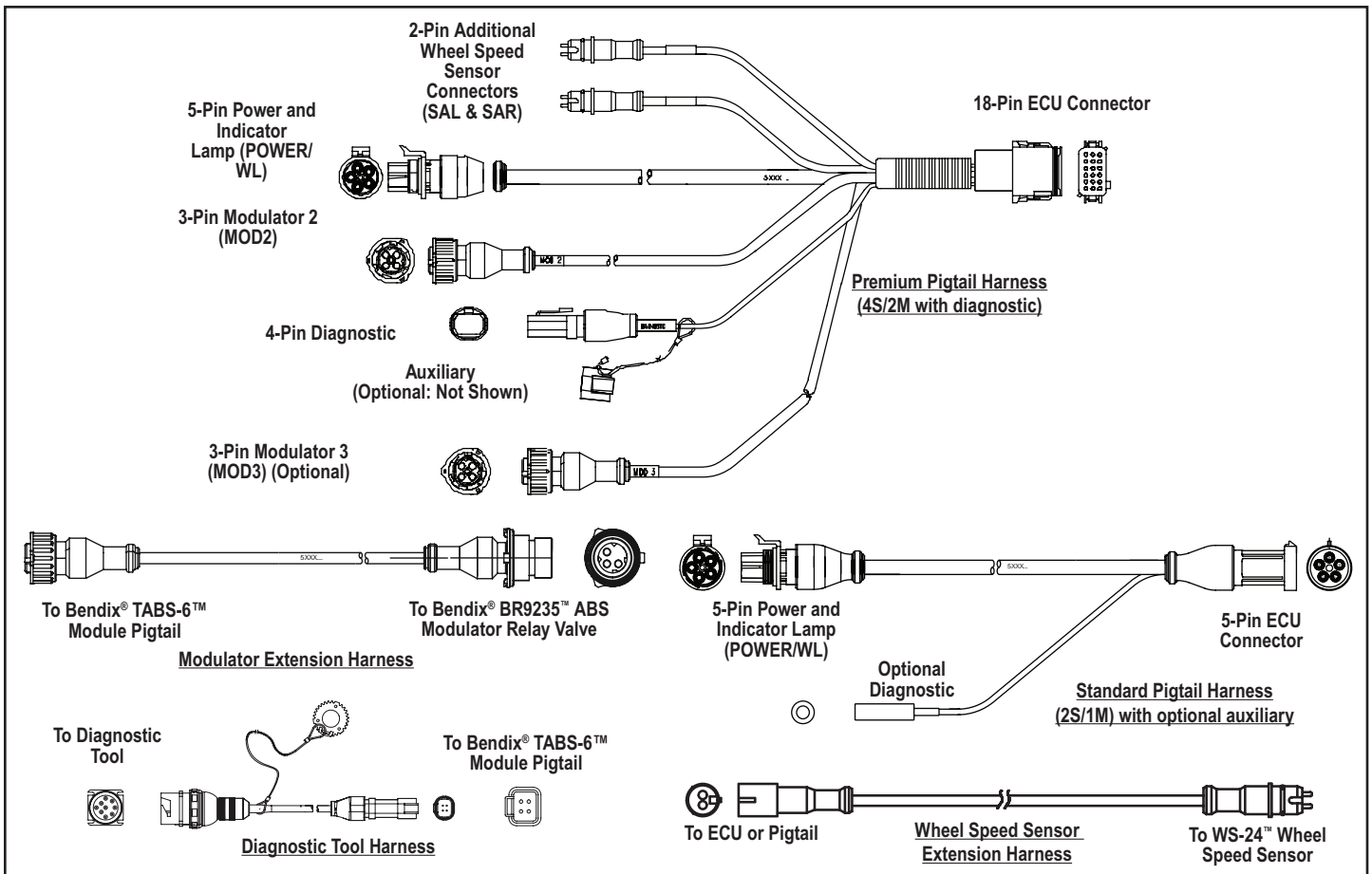


FIGURE 23 - EXAMPLES OF PIGTAIL WIRE HARNESSES AVAILABLE

BASIC WIRING INSTALLATION GUIDELINES

PIGTAIL WIRING HARNESSES

Several pigtail wire harnesses are available to connect the Bendix® TABS-6™ module with ABS and other trailer system components. Pigtail harnesses are weather sealed at the connector interface and are clearly labeled for proper installation. Because of the over-molded design of the Bendix TABS-6 module wiring harnesses, Bendix recommends that the complete harness be replaced if damage or corrosion occurs.

The following connector options may be present:

Modulator 2 (MOD2), Modulator 3 (MOD3), auxiliary, diagnostic, and additional axle wheel speed sensors.

Function Mode	Value
Operating Range	8.0 to 16.0 VDC
ECU Active	135 mA @ 12 VDC
ABS Active (1 Modulator)	3.7 A @ 12 VDC
ABS Active (2 Modulators)	5.2 A @ 12 VDC

CHART 5A – VALUES FOR OUTPUTS

Note: All Bendix TABS-6 modules include the two primary wheel speed sensor connections and therefore these are separate from the pigtail harness.

WIRING MULTIPLE KITS

If the vehicle requires more than one Bendix TABS-6 module unit, wire each kit as an individual installation with no wire splicing. Route each power harness to the power junction at the nose of the trailer. The indicator lamp wires can be connected to a single ABS indicator lamp or separate lamps can be used.

Circuit	7-Pin Trailer Conn.	5-Pin ABS Conn.	5-Pin ECU Conn.	18-Pin ECU Conn.
Ignition Power PLC (Blue Wire)	7	B	B	6
Brake Light Power (Red Wire)	4	A	A	12
Ground (White Wire)	1	E	E	18
Indicator Lamp (White/green Wire)	N/A	D	D	5

CHART 5B – POWER AND GROUND

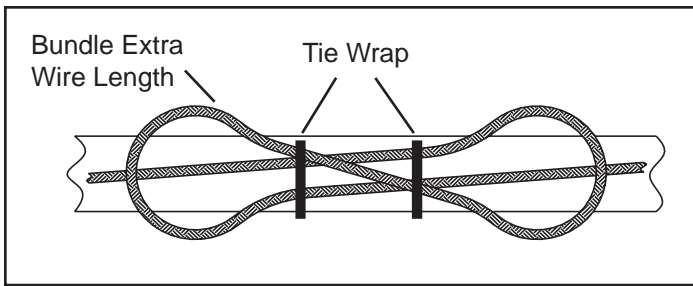


FIGURE 24 - BUNDLING EXTRA WIRE LENGTH

LEAKAGE AND OPERATIONAL TESTS

1. Before performing leak tests, block the wheels.
2. Fully charge the air brake system and verify proper brake adjustment.
3. Make several trailer brake applications and check for prompt application and release at each wheel.
4. Check the modulator valve body and all air line fittings for leakage by spraying each area with a soap solution:
 - Check the ABS solenoid body with the trailer service brakes fully applied. If leakage is excessive, replace the entire Bendix® TABS-6™ module or Bendix® BR9235™ modulator valve.

- Check the relay exhaust port and the area around the retaining ring with the trailer service brakes released. A single 1 in. bubble within 3 seconds is permitted.

- Check the relay exhaust port and the area around the retaining ring with the trailer service brakes fully applied. A single 1 in. bubble within 3 seconds is permitted.

If excessive leakage is detected at the relay exhaust port, perform the following test before replacing the Bendix TABS-6 module or Bendix BR9235 modulator valve:

Apply the trailer spring brakes. Recheck for leakage around the relay exhaust port. If the exhaust port stops leaking, this indicates a leak between the emergency and service sides of the spring brake chamber. However, if the relay exhaust port continues to leak, replace the entire Bendix TABS-6 module or Bendix BR9235 modulator valve.

5. Apply power and monitor the Bendix TABS-6 module power-up sequence to verify proper system operation. Refer to the Bendix TABS-6 module Power-Up Sequence section.
6. Determine the current ABS configuration by using hand-held or PC-based diagnostic tools at power-up or by activating blink code diagnostics. If necessary, reconfigure the Bendix TABS-6 module using a diagnostic tool.

Refer to SD-13-4767 for more information.

7. The correct wheel speed sensor position and connection can be verified by disconnecting each sensor and monitoring with a diagnostic tool. After a single sensor

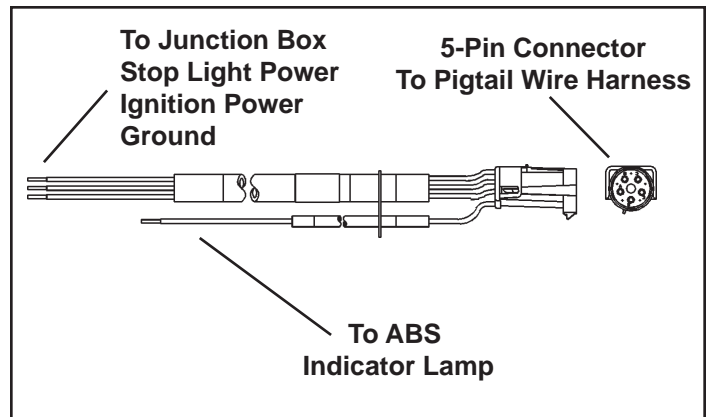


FIGURE 25 - BENDIX® TABS-6™ MODULE POWER HARNESS

position is confirmed, reconnect the sensor connector and the DTC indicator will automatically clear. Repeat with each sensor connector. If the DTC does not automatically clear, use a diagnostic tool to clear the DTC.

8. Set tire size/tone ring and odometer parameters if necessary using a diagnostic tool. Refer to SD-13-4767 for more information.
9. When necessary, it is possible to road test the ABS function by making an abrupt stop from a vehicle speed of about 20 MPH to check for proper function. The wheels should not enter a prolonged lock condition and ABS function should be audible. It is the responsibility of the technician to perform this test in a safe location.

BENDIX® TABS-6™ MODULE POWER-UP SEQUENCE

At power-up, the Bendix TABS-6 module performs a series of self-checks that can assist a technician in determining the status and configuration of the system.

Trailer ABS Indicator Lamp

At power-up without detected DTCs, the trailer ABS indicator lamp will turn on for 2.5 seconds as a bulb check and then turn off.

If a PLC-ready towing vehicle and trailer are powered at the same time, the Bendix TABS-6 module will also trigger a bulb check on the dash-mounted trailer ABS indicator lamp.

Modulator Chuff Test at Power-Up

At power-up, the Bendix TABS-6 module activates a modulator chuff test. This electrical and pneumatic ABS modulator test can help the technician identify problems with modulator installations and/or wiring.

With brake pressure applied, a properly installed modulator will cause five rapid audible chuffs of air pressure. If additional modulators are installed, the Bendix TABS-6 module activates 5 chuffs at the internal modulator (MOD1) then for each additional modulator in sequence (e.g. MOD1, then MOD2, and then MOD3). The chuff sequence is then repeated.

If the modulator is wired incorrectly, the modulator will only produce one chuff, or no chuff at all. If an issue is detected during the modulator chuff test, compare the modulator wiring and plumbing to the Bendix® TABS-6™ module's electrical system schematic and make repairs.

ABS OPERATION

The Bendix TABS-6 module uses wheel speed sensors, modulator relay valves and an ECU to control trailer wheels by axle or by side. By monitoring individual wheel turning motion during braking, and adjusting or pulsing the brake pressure at each wheel, the Bendix TABS-6 module is able to optimize slip between the tires and the road surface. When excessive wheel slip, or wheel lock-up, is detected, the ECU will activate the Pressure Modulator Valves to modulate braking pressure at the wheel ends. The ECU is able to pump the brakes on individual wheels (or pairs of wheels), independently, and with greater speed and accuracy than a driver.

Axle Control

Bendix TABS-6 module axle control uses a single modulator relay valve to control wheels on both sides of a given axle or axles. In the case of an ABS event on road surfaces with poor traction (worn, slippery, or loose gravel roads) or areas of poor traction, (e.g. asphalt road surfaces with patches of ice), axle control will maintain the wheel that is not slipping at just under the speed that will lock the wheel. Temporary periods of wheel lock are permitted on the other wheel that is experiencing slippage.

Axle control should not be used on 5th wheel dollies or steerable axles. When braking on even surfaces, an axle-control system will perform similar to a side control, two-modulator system. Axle control is available in 2S/1M, 2S/2M and 4S/2M installations, and for Modulator 3 (MOD3) in a 4S/3M installation.

Dolly-Axle Control (Select Low)

Bendix TABS-6 module dolly-axle control uses a single ABS modulator valve to control wheels from both sides of a given axle or axles. In the case of an unbalanced braking surface, (e.g. asphalt road surfaces with patches of ice), dolly axle control will control the low coefficient (slipping) wheel just under the lock limit. Vehicle stability is assisted by not allowing the high coefficient wheel (where traction is still being maintained) to sustain wheel lock.

When braking on even surfaces, a dolly axle control system will perform similar to side control or axle control systems. Dolly axle control is only available in 2S/1M installations.

Side Control

The Bendix TABS-6 module uses a single modulator relay valve to control one or more wheels on a given vehicle side. In the case of an unbalanced braking surface, the side control will individually control wheels on each side just under the point where they would lock up.

Default	Additional Components		Auto-Configuration
	Sensors	Modulators	
2S/1M Dolly Axle	-	-	2S/1M (Dolly-Axle)
	-	1	to 2S/2M (Side)
	2	1	to 4S/2M (Side)
2S/1M Axle	2	2	to 4S/3M (Side/Axle)
	-	-	2S/1M (Axle)
	-	1	to 2S/2M (Axle)
	2	1	to 4S/2M (Axle)

**CHART 6 – PREMIUM BENDIX® TABS-6™
MODULE AUTO-CONFIGURATION MATRIX**

Side control is available in 2S/2M and 4S/2M installations, and for the internal modulator (MOD1) and Modulator 2 (MOD2) in the 4S/3M installation.

Normal Braking

During normal braking, the Bendix TABS-6 module functions as a standard relay valve. If the ECU does not detect excessive wheel slip, it will not activate ABS control, and the vehicle stops with normal braking.

AUTO-CONFIGURATION

The Standard Bendix TABS-6 module is available only in the 2S/1M ABS configuration and does not use auto-configuration.

For the Premium Bendix TABS-6 module, the default ABS configuration is 2S/1M. At power-up, if a Premium ECU detects additional sensors and modulators it will perform an auto-configuration. Auto-configuration only adjusts upward (e.g. 2S/2M Side to a 4S/2M Side configuration).

Additional detected components that do not conform to a legitimate configuration will generate the appropriate DTCs. If the vehicle begins moving before the new configuration has been accepted, the reconfiguration will not take place at this time.

NON-STANDARD TIRE SIZE

The module allows for tire rolling radius and tone ring tooth count parameters to be set for each axle using a diagnostic tool. These adjustments may be necessary for the module to accurately calculate the vehicle's velocity and odometer mileage. Wheels of the same axle must be set to the same rolling radius and tone ring tooth count. In most cases, these parameters are set by the trailer OEM and do not need to be adjusted. In the case of a service replacement unit, always check that these parameters are set to match the vehicle.

The tire-rolling radius is defaulted to 512 revs/mile and can be adjusted from 342 to 692 revolutions per mile. Refer to the manufacturer's tire specification for correct values.

Tone ring tooth count is defaulted to 100 teeth and can be set from 60 to 140 teeth.

DTCs OR INCORRECT CONFIGURATION

If system Diagnostic Trouble Codes (DTCs) or the wrong ABS configuration are indicated during the power-up sequence, refer to the Bendix® TABS-6™ module Service Data sheet SD-13-4767 for diagnostic and configuration information.

CONTACTING BENDIX

Bendix.com

The Bendix on line troubleshooting guide for the Bendix TABS-6 module will help you determine the cause of any conditions that may be preventing 100% performance of your braking system. For additional troubleshooting information on the Bendix TABS-6, please refer to the bendix.com Document Library or order copies from our on line Literature Center.

The Bendix on line contacts guide will make it easy for you to find the Bendix contacts you need. From this page, you can navigate to technical support contacts, service engineers, Bendix account managers, international contacts and more. Bendix.com is your complete Bendix resource.

Bendix Technical Assistance Team

For direct personal technical support, call the Bendix technical assistance team at **1-800-AIR-BRAKE** (1-800-247-2725), Monday through Friday, 8:00 A.M. to 6:00 P.M. EST, and follow the prompts in the recorded message.

To better serve you, please record the following information before calling the Bendix Tech Team:

Bendix product model number, part number and configuration.

Vehicle make and model.

Vehicle configuration. (Number of axles, tire size, etc.)

System performance symptoms. When do they occur?

What DTCs have been identified using blink codes or diagnostic tools?

What troubleshooting / measurements have been performed?

What Bendix service data literature do you have or need?

Do you have access to the internet or email?

PRE-INSTALLATION QUESTIONS

Wheel Ends

- Are the hubs ABS-ready?
- Are ABS replacement hubs available?
- Is machining of the hubs needed?
- Do the axles have sensor blocks installed?
- Note the condition of the wheel bearings.
- Note the condition of brakes and drums.

Air System (Valves, Lines, Plumbing)

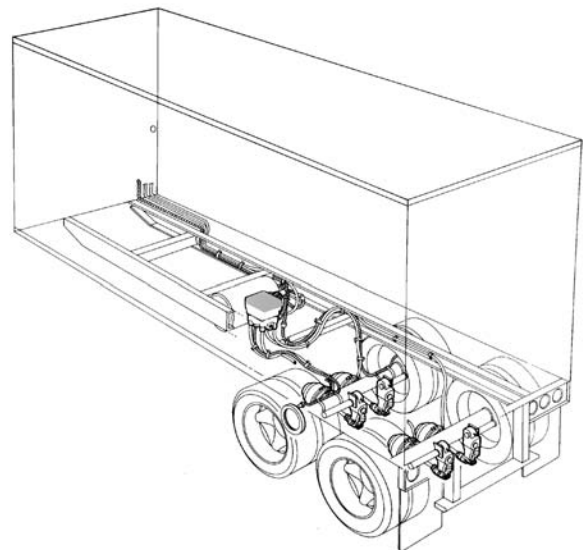
- Identify the Bendix TABS-6 module location.
- Is an Bendix® SR-5™ valve required?
- Are other emergency valves needed?
- Are new air lines or hoses required?
- Is any leakage present in the air system?
- Is the tank supply port reinforced for valve installation?
- Will the Bendix TABS-6 module / Bendix® BR9235™ modulator be tank or frame mounted?

Electrical System

- Note the condition of the 7-pin trailer electrical connector.
- Is the trailer equipped with constant power wire? (Blue wire / 7th pin)
- Note the gauge of the ground, stop light and ignition wires.
- Is extensive labor or drilling needed for power harness installation?
- Is the wiring nose box accessible?
- Can the indicator lamp be located easily?

ABS Kit

- How many axles are present?
- Note the type of suspension.
- How many axles will be sensed? (# of sensor blocks)
- Note the make and model of the axles and hubs.
- How many Bendix TABS-6 modules are to be installed?



AVAILABLE BENDIX® TABS-6™ MODULE KITS

Contact Bendix for additional kits or individual part number availability.

Kit # Description

5020216	Trailer - ABS Kit Complete (2S/1M Axle) w/Bendix® SR-5™ Trailer Spring Brake Valve
5020217	Dolly - ABS Kit Complete (2S/1M Dolly-Axle) w/Bendix® DC-4® Double Check Valve and TR-3™ Inversion Valve
K070223	Trailer - ABS Kit Complete (2S/2M Side) w/Bendix Bendix SR-5 Trailer Spring Brake Valve
5020218	Trailer - ABS Kit Complete (4S/2M Side) w/Bendix Bendix SR-5 Trailer Spring Brake Valve
K070214	Trailer - ABS Kit Complete (4S/2M Axle) w/Bendix Bendix SR-5 Trailer Spring Brake Valve
K070278	Trailer - ABS Kit Complete (4S/3M Side/Axle) w/Bendix Bendix SR-5 Trailer Spring Brake Valve

Bendix® TABS-6™ Module Kits - Contents List		Numbers					
		5020216	5020217	5020218	K070223	K070214	K070278
Part Description	Part Number	Quantities					
Bendix® TABS-6™ Module Standard, 4 Port, 2S/1M Axle Only	5014015	1					
Bendix TABS-6 Module Standard, 4 Port, 2S/1M Dolly-Axle Only	5014112		1				
Bendix TABS-6 Module Premium, 4 Port, (2S/1M Dolly-Axle (default), autoconfigures to 2S/2M Side, 4S/2M side, 4S/3M side/axle)	5014016			1	1		1
Bendix TABS-6 Module Premium, 4 Port, (2S/1M Axle (default), autoconfigures to 4S/2M axle)	5014113					1	
Bendix TABS-6 Module Premium Pigtail, 4S/2M - Pwr (9in), MOD2 (36in), Sns C-D (60in), Diag (9in)	5015026			1		1	
Bendix TABS-6 Module Premium Pigtail, 2S/2M - Pwr (9in), MOD2 (36in), Diag (9in)	5015022				1		
Bendix TABS-6 Module Premium Pigtail, 4S/3M - Pwr (9in), MOD2 (36in), MOD3 (9in), Sns C-D (60in), Diag (9in)	5015369						1
Power Harness, 5-Pin Packard (120in.), Warning Lamp (10in) Non-Terminated	5013352		1				
Power Harness, 5-pin Packard (780in.), Warning Lamp (10in) Non-Terminated	5013353	1		1	1	1	1
Bendix® Bendix® BR9235™ Modulator Relay Valve, Bracket Mount, 4 Port, 3 PSI, 3/4 in Supply	5012024			1	1	1	2
Modulator Extension Cable, 180 in.	5013345					1	
Modulator Extension Cable, 280 in.	5019463						1
Bendix® WS-24™ Wheel Speed Sensor Extension Cable, DIN, 60 in.	5015531	2	2	4	2	2	2
Bendix WS-24 Wheel Speed Sensor Extension Cable, DIN, 160 in.	300260					2	
Bendix WS-24 Wheel Speed Sensor Extension Cable, DIN, 260 in.	5019464						2
Bendix WS-24 Wheel Speed Wheel Speed Sensor, DIN, 90°, 16 in.	300083	2	2	4	2	4	4
Bendix WS-24 Wheel Speed Speed Sensor Bushing	5012878	2	2	4	2	4	4
ABS Indicator Light	112202	1	1	1	1	1	1
Decal - ABS Lamp	560560	1	1	1	1	1	1
Decal - ABS Diagnostics	5015457	1	1	1	1	1	1
Cable Tie 8" (Cable Routing)	560594	25	25	30	25	30	30
Cable Tie 24" (Sensor Lead Axle Routing)	112116	6	6	12	6	12	12
ABS Sensor Wire Clip (Sensor Delivery Hose Routing)	5020254	10	10	20	10	20	20
Bendix SR-5 Trailer Spring Brake Valve 1/2"	K033088	1		1	1	1	1
Bendix SR-5 Trailer Spring Brake Valve 3/4" (For Reference Only)	K033086						
Bendix® TR-3™ Inversion Valve	101450		1				
Bendix® DC-4® Double Check Valve	278615		1				

CHART 7 - BENDIX® TABS-6™ MODULE KITS - COMPLETE

