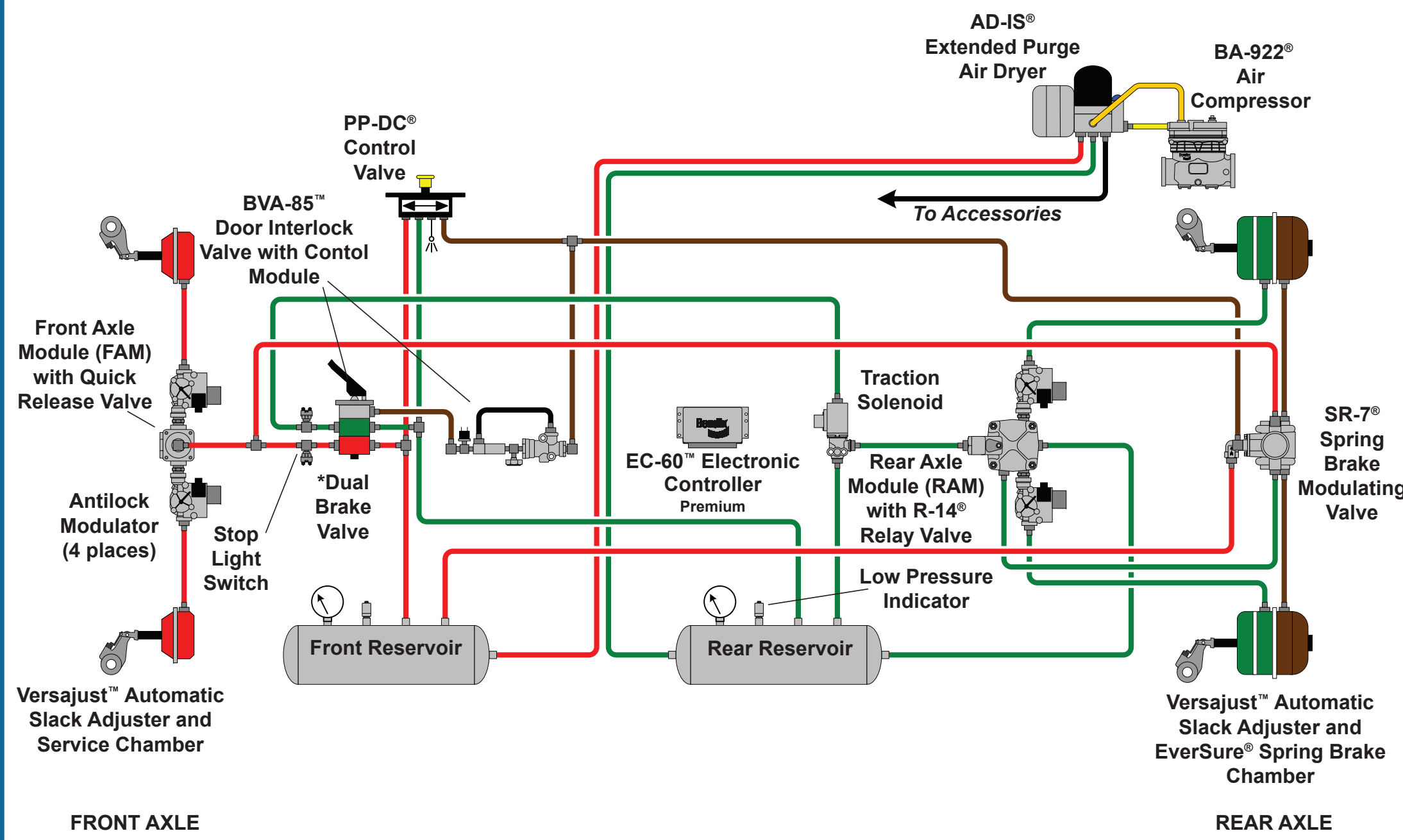
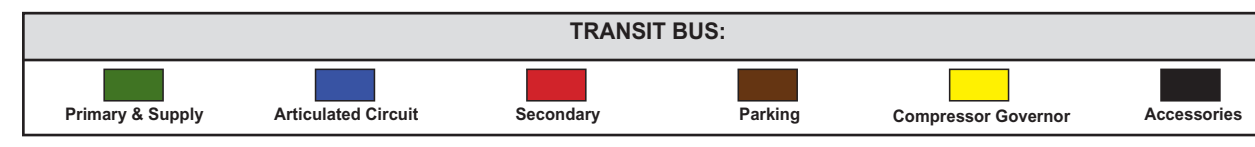


Transit Bus Air System Schematic



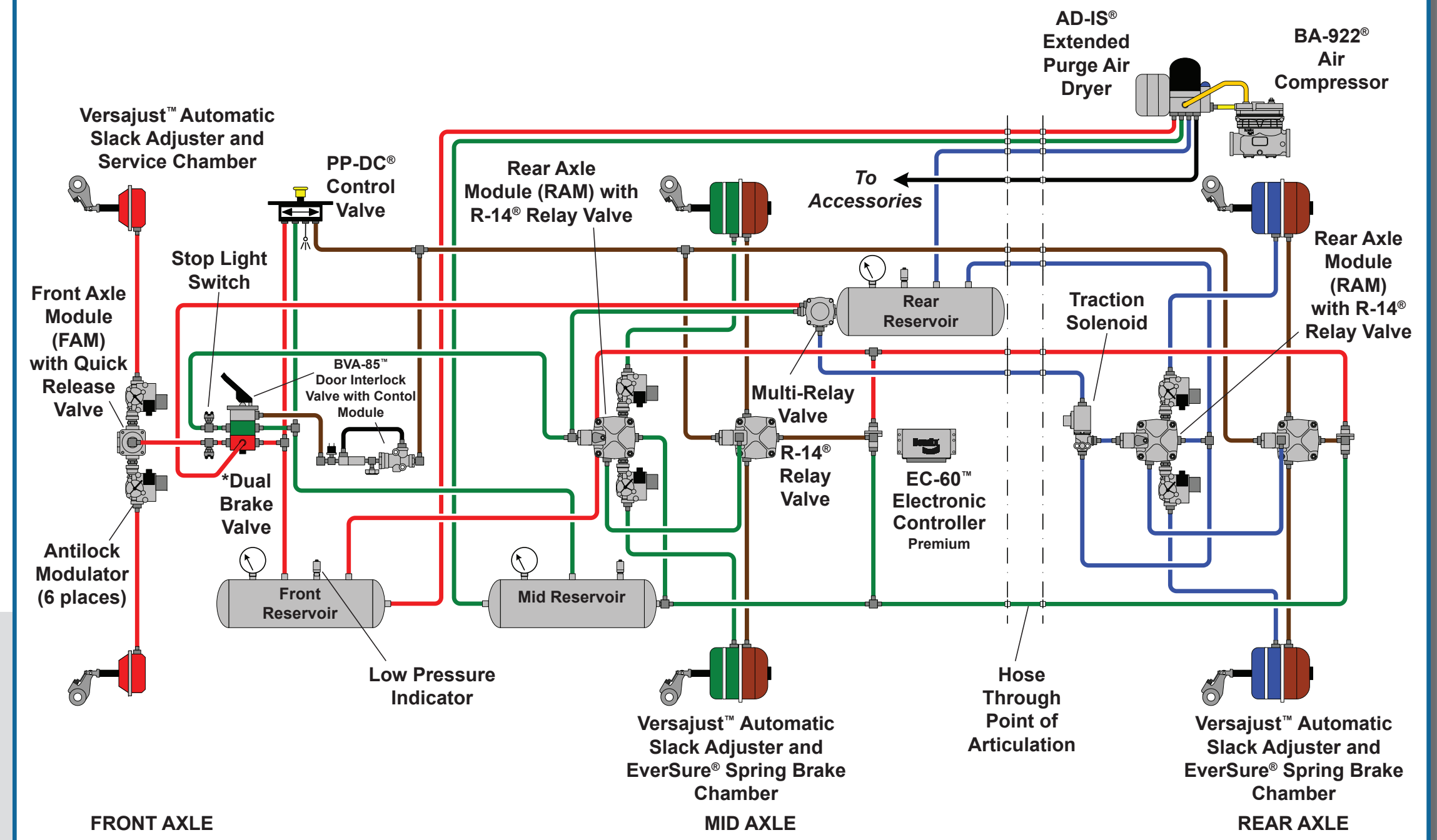
Transit Bus Air Brake System Troubleshooting



Notes:
The color coding of the brake system schematic follows APTA Recommended Practice.
Air disc & drum brake actuation combined on a single axle are shown for pictorial purposes only.

Equipped with Bendix® ABS and Smart ATC™ Traction Control.

Articulated Transit Bus Air System Schematic



TEST 1
Governor cut-out / Low pressure warning / Pressure build-up
VEHICLE PARKED, WHEELS CHOCKED

	OK	Not OK
1. Drain all the reservoirs to 0 psi.	<input type="checkbox"/>	<input type="checkbox"/>
2. Start the engine and run at fast idle. The low pressure warning should be on. Note: on vehicles equipped with ABS, the warning lamp will also come on momentarily when the ignition is turned on. On some systems, such as the Bendix® AD-IS® dryer system (illustrated), reservoirs may not fill simultaneously and one reservoir may fill to 110 psi before the other starts to fill.	<input type="checkbox"/>	<input type="checkbox"/>
3. Low pressure warning; dash warning lamp should go off above 60 psi.	<input type="checkbox"/>	<input type="checkbox"/>
4. Build-up time; pressure should build from 85-100 psi within 40 seconds at maximum recorded governor RPM.	<input type="checkbox"/>	<input type="checkbox"/>
5. Governor cut-out; cuts-out at the correct pressure, usually 125-135 psi.	<input type="checkbox"/>	<input type="checkbox"/>
6. Governor cut-in; reduce the service air pressure to governor cut-in. The difference between cut-in and cut-out pressure must not exceed 30 psi.	<input type="checkbox"/>	<input type="checkbox"/>

MAKE ALL THE NECESSARY REPAIRS BEFORE PROCEEDING TO TEST 2; SEE CHECKLIST 1 FOR COMMON CORRECTIONS.

CHECKLIST 1
If the low pressure warning lamp or buzzer doesn't come on:

- Check the warning lamp wiring.
- Check the warning lamp bulb.
- Repair or replace the buzzer, bulb or low pressure warning switch(es).

If the governor cut-out is higher or lower than specified by the vehicle manual:

- Repair, replace or adjust the governor as necessary after ensuring the compressor unloader mechanism is operating correctly.

If the low pressure warning occurs below 60 psi:

- Check the dash gauge with test gauge known to be accurate.
- Repair or replace the faulty low pressure indicator switch.

If the compressor build up time exceeds 40 seconds or is considerably greater than the permanent record figure:

- Examine the compressor air inlet filter and inlet line checking for restrictions, damage or wear. Clean or replace the filter or inlet line as necessary.
- Check the compressor discharge port and line for excessive carbon. Clean or replace the discharge line as necessary. If there is carbon, find the cause of the excessive heat.
- With the system fully charged and governor in the unloaded mode, listen at the compressor inlet for leakage. If leakage can be heard, remove the unloaders and repair or replace as necessary.

RETEST TO VERIFY PROPER OPERATION OF ALL ITEMS REPAIRED OR REPLACED.

TEST 2
Leakage (reservoir air supply)
For additional information refer to video Assessing Air Brake System Air Leakage (BW2327 - CD)
FULL PRESSURE, ENGINE STOPPED, PARKING BRAKES APPLIED

	OK	Not OK
1. Allow the air pressure to stabilize for at least 1 minute.	<input type="checkbox"/>	<input type="checkbox"/>
2. Observe the dash gauge pressures for 2 minutes and note any pressure drop. Pressure Drop: Single Vehicle (A 4 psi drop within 2 minutes is allowable for either service reservoir)	<input type="checkbox"/>	<input type="checkbox"/>

MAKE ALL NECESSARY REPAIRS BEFORE PROCEEDING TO TEST 3; SEE CHECKLIST 2 FOR COMMON CORRECTIONS.

CHECKLIST 2
If there is excessive leakage in the supply side of the pneumatic system, one or more of the following devices could be causing the problem:
NOTE: A leak detector or soap solution will aid in locating the faulty component.

- Supply lines and fittings
- Low pressure indicator(s)
- Service brake relay valve(s)
- Spring brake relay valve (where applicable)
- Dual brake valve
- Parking control valve
- System safety valve(s) in the supply reservoir and/or air dryer
- Governor (may be mounted on the air dryer as illustrated, on the compressor, or remotely)
- Compressor discharge line

RETEST TO VERIFY PROPER OPERATION OF ALL ITEMS REPAIRED OR REPLACED.

TEST 3
Pressure Modulator Valve and Traction Control Valve Chuff Test
FULL PRESSURE, ENGINE STOPPED, PARKING BRAKES RELEASED

	OK	Not OK
1. Make and hold brake application. When ignition power is applied, each modulator solenoid is briefly energized. If the air system is fully charged and the service brake pedal is depressed during ignition, the modulator creates a single, sharp audible "chuff" of air pressure. The modulators are energized in a certain pattern, as follows: right front, left front, right rear, left rear. This test is performed only when the vehicle is stationary (if the vehicle moves the chuff test will be aborted).	<input type="checkbox"/>	<input type="checkbox"/>

NOTE: The Bendix® EC-60™ controller will perform a PMV chuff test on all installed modulators in the following order:
1. Steer Axle Right PMV
2. Steer Axle Left PMV
3. Drive Axle Right PMV
4. Drive Axle Left PMV
5. Additional Axle Right PMV
6. Additional Axle Left PMV
7. Drive Axle TCV
The pattern will then repeat itself.
See appropriate Service Data Sheet for repairs.

MAKE ALL NECESSARY REPAIRS BEFORE PROCEEDING TO TEST 4.

CHECKLIST 4
If there is excessive leakage in the service side of the pneumatic system, one or more of the following devices could be causing the problem:
NOTE: A leak detector or soap solution will aid in locating the faulty component.

- Loose service lines and fittings
- Stoplight switch
- Spring brake chamber, service chamber and/or brake chamber diaphragms
- Service brake relay valves
- Dual brake valve
- Double check valve

If the automatic slack adjuster is not adjusting, repair or replace to obtain desired setting.
CAUTION: If the brake chamber push rod travel exceeds the allowable stroke, identify and correct the root cause of the excess stroke. Do not make manual adjustments of an automatic slack adjuster once it can no longer automatically adjust the brakes. Manual adjustment DOES NOT fix the underlying wheel end adjustment. As soon as possible, have the vehicle inspected by a qualified technician or consult the manufacturer's troubleshooting guidelines to find and fix the problem.

RETEST TO VERIFY PROPER OPERATION OF ALL ITEMS REPAIRED OR REPLACED.

TEST 4
Leakage service air delivery
FULL PRESSURE, ENGINE STOPPED, PARKING BRAKES RELEASED

	OK	Not OK
1. Make and hold an 80-90 psi brake application. This can be accomplished by using the Bendix® BVA-85™ brake valve actuator. If the vehicle is not equipped with a BVA-85 brake valve actuator, an assistant should be used to maintain a constant application during these tests.	<input type="checkbox"/>	<input type="checkbox"/>
2. Allow pressure to stabilize for 1 minute; then begin timing for 2 minutes while watching the dash gauges for a pressure drop. Pressure Drop: Single Vehicle (A 4 psi drop within 2 minutes is allowable for either service reservoir)	<input type="checkbox"/>	<input type="checkbox"/>
3. Check brake chamber push rod travel (refer to chart for allowable tolerances). With the parking brakes released and service brakes applied with 80 to 90 psi of air pressure to the service chambers.	<input type="checkbox"/>	<input type="checkbox"/>

Brake Chamber Size	Maximum Allowable Stroke	Max Allowable Stroke - Long Stroke
12	1-3/8"	1-3/4"
16	1-3/4"	2"
20	1-3/4"	2"
24	1-3/4"	2"
24 (Max Stroke)	-	2-1/2"
30	2"	2-1/2"

4. Check the angle formed between the brake chamber push rod and slack adjuster arm. It should be equal to or slightly less than 90° in the applied position (80-90 psi) and the same across the axle.

MAKE ALL NECESSARY REPAIRS BEFORE PROCEEDING TO TEST 5; SEE CHECKLIST 4 FOR COMMON CORRECTIONS.

CHECKLIST 4
If there is excessive leakage in the service side of the pneumatic system, one or more of the following devices could be causing the problem:
NOTE: A leak detector or soap solution will aid in locating the faulty component.

- Loose service lines and fittings
- Stoplight switch
- Spring brake chamber, service chamber and/or brake chamber diaphragms
- Service brake relay valves
- Dual brake valve
- Double check valve

If the automatic slack adjuster is not adjusting, repair or replace to obtain desired setting.
CAUTION: If the brake chamber push rod travel exceeds the allowable stroke, identify and correct the root cause of the excess stroke. Do not make manual adjustments of an automatic slack adjuster once it can no longer automatically adjust the brakes. Manual adjustment DOES NOT fix the underlying wheel end adjustment. As soon as possible, have the vehicle inspected by a qualified technician or consult the manufacturer's troubleshooting guidelines to find and fix the problem.

RETEST TO VERIFY PROPER OPERATION OF ALL ITEMS REPAIRED OR REPLACED.

RETEST TO VERIFY PROPER OPERATION OF ALL ITEMS REPAIRED OR REPLACED.

TEST 5
Door interlock
ENGINE STOPPED, IGNITION ON, PARKING BRAKES RELEASED

	OK	Not OK
1. Open the door and verify that approximately equal pressure is applied to all axles (typically 20 to 45 psi). Check with vehicle manufacturer for settings.	<input type="checkbox"/>	<input type="checkbox"/>
2. Close the door and verify the service brakes release.	<input type="checkbox"/>	<input type="checkbox"/>

MAKE ALL NECESSARY REPAIRS BEFORE PROCEEDING TO TEST 6; SEE CHECKLIST 5 FOR COMMON CORRECTIONS.

CHECKLIST 5
If the vehicle fails to pass the tests outlined, then check the pressure reducing valves and solenoid(s) for proper operation.

RETEST TO VERIFY PROPER OPERATION OF ALL ITEMS REPAIRED OR REPLACED.

TEST 6
Manual parking brake operation
FULL PRESSURE, ENGINE IDLING 600-900 RPM

	OK	Not OK
FOR BUSES: 1. Manually operate the park control, yellow button valve, and note that parking brakes apply and release promptly as the control valve button is pulled out and pushed in.	<input type="checkbox"/>	<input type="checkbox"/>

MAKE ALL NECESSARY REPAIRS BEFORE PROCEEDING TO TEST 7; SEE CHECKLIST 6 FOR COMMON CORRECTIONS.

CHECKLIST 6
If sluggish performance is noted in either test, check for:

- Dented or kinked lines
- Improperly installed hose fitting
- A faulty quick release valve or spring brake control valve
- Damaged or improperly installed Spring Brake Chamber and/or Service Chambers
- Foundation Brake component binding, improper installation and/or lack of lubrication.

RETEST TO VERIFY PROPER OPERATION OF ALL ITEMS REPAIRED OR REPLACED.

TEST 7
Dual circuit system integrity check (emergency braking) and/or automatic application of the parking brake
FULL PRESSURE, ENGINE STOPPED, PARKING BRAKES RELEASED

	OK	Not OK
1. Drain the front axle or secondary reservoir to 0 psi.	<input type="checkbox"/>	<input type="checkbox"/>
A. The rear axle or primary reservoir should retain most of its pressure.	<input type="checkbox"/>	<input type="checkbox"/>
2. With no air pressure in the front axle reservoir, make a brake application.	<input type="checkbox"/>	<input type="checkbox"/>
A. Rear axle brakes should apply and release when brake is applied and released.	<input type="checkbox"/>	<input type="checkbox"/>
B. As illustrated on the articulated transit bus, the mid and rear axles should apply and release when the brake is applied and released.	<input type="checkbox"/>	<input type="checkbox"/>
C. The stop lamps should light upon application and go off when the application is released.	<input type="checkbox"/>	<input type="checkbox"/>

TEST 7, Continued

	OK	Not OK
3. "Pop" Pressure Vehicle Test Procedure Note: Bendix is not aware of any federal legislation that specifies the pressure at which the YELLOW parking brake control valve must automatically "trip" to apply the vehicle parking brakes. This includes the Federal Motor Carrier Safety Regulations (FMCSR) for in-use vehicles, the CVSA out-of-service criteria, and the Federal Motor Vehicle Safety Standards (FMVSS) for newly manufactured vehicles. Although the "trip" pressure for the parking brake control valve is not stipulated for in-use or newly manufactured vehicles, a parking brake control valve "trip" pressure of 20-40 psi is currently (02/2009) specified as part of the Commercial Driver License in the CDL Manual. The CDL Manual is not consistent with the regulations cited above. See Bendix® Bulletin TCH-003-051.	<input type="checkbox"/>	<input type="checkbox"/>
A. Install an accurate "shop standard" pressure gauge in the secondary service reservoir.	<input type="checkbox"/>	<input type="checkbox"/>
B. Build pressure in the service reservoirs until the compressor cut-out is reached, shut the engine off.	<input type="checkbox"/>	<input type="checkbox"/>
C. Fully open the manual drain valve on the primary service reservoir allowing the reservoir to drain completely.	<input type="checkbox"/>	<input type="checkbox"/>
D. Open the secondary reservoir's manual drain valve creating a bleed rate of approximately 20-50 psi/min.	<input type="checkbox"/>	<input type="checkbox"/>
E. Monitor the pressure gauge noting the pressure at which the parking control automatically "pops". This is not a Federal requirement - See Note above.	<input type="checkbox"/>	<input type="checkbox"/>
4. Close the drain cocks, recharge the system, and drain the rear axle (mid axle on an articulated transit bus) or primary reservoir to 0 psi.	<input type="checkbox"/>	<input type="checkbox"/>
A. The front axle reservoir (plus the rear axle reservoir on the articulated transit bus, as illustrated) should retain most of its pressure.	<input type="checkbox"/>	<input type="checkbox"/>
B. With no air pressure in the primary circuit reservoir, make and release a brake application. The front and rear axle brakes should apply and release. (As illustrated on the articulated transit bus, the mid-axle does not apply.) Note: As illustrated on the standard transit bus, the rear axle application occurs via the spring brake modulation.	<input type="checkbox"/>	<input type="checkbox"/>
C. The stop lamps should light and go off when the brake is applied and released.	<input type="checkbox"/>	<input type="checkbox"/>
5. On the articulated transit bus drain the rear axle reservoir. With no air pressure in the rear axle reservoir, make and release a brake application. The front and mid axle must apply and release.	<input type="checkbox"/>	<input type="checkbox"/>

MAKE ALL NECESSARY REPAIRS BEFORE PROCEEDING; SEE CHECKLIST 7 FOR COMMON CORRECTIONS.

CHECKLIST 7
If the vehicle fails to pass the tests outlined, then check the following components for leakage and proper operation:

- Fittings
- Kinked hose or tubing
- Pressure protection valves
- Double check valves
- Tractor protection valve
- Tractor protection control valve
- Parking control valve
- Relay valves (antilock modulators)

RETEST TO VERIFY PROPER OPERATION OF ALL ITEMS REPAIRED OR REPLACED.

Visit the Bendix document library online at www.bendix.com or www.foundationbrakes.com for a complete listing of Service Data Sheets and other literature including:

- BW1114 Quick Reference Catalog
- BW1396 Tractor Air Brake System Troubleshooting Wallchart
- BW1397 Transit Bus Air Brake System Troubleshooting (small version of this document)
- BW1555 Brake Balance Procedure
- BW1640 School Bus Air Brake System
- BW2780 Troubleshooting Bendix® ESP® Stability System Wallchart
- BW5057 Bendix Air Brake Handbook
- SD-13-4863 Service Data Sheet for Bendix® EC-60™ ABS/ATC Standard & Premium Controllers

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GENERAL SAFETY GUIDELINES
WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:
When working on or around a vehicle, the following general precautions should be observed at all times:
1. Park the vehicle on a level surface, apply the parking brakes, and always block the wheels. Always wear safety glasses.
2. Stop the engine and remove ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. When circumstances require that the engine be in operation, EXTREME CAUTION should be used to prevent personal injury resulting from contact with moving, rotating, heating, heated or electrically charged components.
3. Do not attempt to install, remove, disassemble or assemble a component until you have read and thoroughly understood 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 and 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, hoses, fittings, etc. must be of equivalent size, type and strength as the original equipment and be designed specifically for such applications and systems.
9. Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.
10. Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.
11. For vehicles with Automatic Traction Control (ATC), the ATC function must be disabled (ATC indicator lamp should be ON) prior to performing any vehicle maintenance where one or more wheels on a drive shaft are lifted off the ground and moving.

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