The Air Brake Handbook

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.	☐	☐
2.	Observe the dash gauge pressures for 2 minutes and note any pressure drop. A. Pressure Drop: Single Vehicle (A 4 psi drop within 2 minutes is allowable for either service reservoir) B. Pressure Drop: Tractor/Trailer (A 6 psi drop within 2 minutes is allowable for either service reservoir) C. Pressure Drop: Tractor/2 Trailers (An 8 psi drop within 2 minutes is allowable for either service reservoir)	☐ ☐ ☐	☐ ☐ ☐

Make all the 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.

1. Supply lines and fittings
2. Low pressure indicator(s)
3. Service brake relay valve(s)
4. Spring brake relay valve (where applicable)
5. Dual brake valve
6. Trailer hand control valve
7. Parking control valve
8. System safety valve(s) in the supply reservoir and/or air dryer
9. Governor (may be mounted on the air dryer as illustrated, on the compressor, or remotely).
10. 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

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 not be performed).

NOTE: The 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.

TEST 4

Leakage service air delivery

Full pressure, engine stopped, parking brakes released

1. Make and hold brake application. This can be accomplished by using the BVA-85™ brake valve actuator. If the vehicle is not equipped with a BVA-85™ brake valve actuator, a block of wood can be used to hold the foot valve down during these tests.
2. Allow pressure to stabilize for 1 minute; then begin timing for 2 minutes while watching the dash gauges for a pressure drop.
   A. Pressure Drop: Single Vehicle (A 4 psi drop within 2 minutes is allowable for either service reservoir)
   B. Pressure Drop: Tractor/Trailer (A 6 psi drop within 2 minutes is allowable for either service reservoir)
   C. Pressure Drop: Tractor/2 Trailers (An 8 psi drop within 2 minutes is allowable for either service reservoir)
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 in the service chambers.

Brake Chamber Size	Maximum Allowable Stroke	Maximum 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)	-	2½"
30	2"	2½"

4. Check the angle formed between the brake chamber push rod and slack adjuster arm. It should be approximately 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.

1. Loose service lines and fittings
2. Trailer control valve
3. Stoplight switch
4. Brake chamber diaphragms
5. Tractor protection valve
6. Service brake relay valves
7. Dual brake valve
8. Inverting relay spring brake control valve (where applicable – usually found on spring brake relay valve) straight trucks and buses
9. 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, then identify and fix the problem. DO NOT adjust and return to service!

Retest to verify proper operation of all items repaired or replaced.

TEST 5

Manual Parking Brake Operation

Full pressure, engine idling 600-900 rpm

FOR STRAIGHT TRUCKS, BUSES AND BOBTAIL TRACTOR:

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.

FOR TRACTOR/TRAILER COMBINATIONS:

1. Manually operate the tractor protection control valve (trailer supply valve usually red octagonal button). Note that trailer brakes apply and release promptly as the control button is pulled out and pushed in.
2. Manually operate system park control (usually yellow diamond button) and note all parking brakes (tractor and trailer) apply promptly.

Make all necessary repairs before proceeding to test 6; see Checklist 5 for common corrections.

CHECKLIST 5

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

1. Dented or kinked lines
2. Improperly installed hose fitting
3. A faulty quick release valve or spring brake control valve
4. Binding cam shafts or ungreased cam shaft bushings

If the trailer brakes do not actuate and the trailer supply line remains charged, check the:

1. Tractor protection control
2. Trailer spring brake valve
3. Binding cam shafts or ungreased cam shaft bushings

Retest to verify proper operation of all items repaired or replaced.

TEST 6

Dual circuit system integrity check (emergency braking) and/or Automatic application of the parking brake and /or Tractor protection valve operation

Full pressure, engine stopped, parking brakes released

1. Drain the front axle or secondary reservoir to 0 psi.
   A. The rear axle or primary reservoir should retain most of its pressure.
   B. On combination vehicles, the trailer air system should remain charged.
   C. Tractor and trailer brakes should not apply automatically.
2. With no air pressure in the front axle reservoir make a brake application.
   A. Rear axle brakes should apply and release when application is released.
   B. On combination vehicles the trailer brakes should also apply and release when application is released.
   C. The stop lamps should light and go off when the application is released.
3. Optional "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 Bulletin TCH-03-051.]

   A. Install an accurate "shop standard" pressure gauge in the secondary service reservoir.
   B. Build pressure in the service reservoirs until the compressor cut-out is reached, shut the engine off.
   C. Open the manual drain valve on the primary service reservoir allowing the reservoir to drain completely.
   D. Open the secondary reservoir's manual drain valve creating a bleed rate of approximately 20-50 psi/min.
   E. Verify that the parking control automatically "pops".
4. For Towing Vehicles Only - Test the tractor protection valve feature
   A. Charge the air system to governor cut-out.
   B. Disconnect the service or control (blue) line to the trailer.
   C. Take care to restrain the service coupling and direct flow safely away while making and holding a full service brake application via the foot valve.
   D. As the service application is vented through the open gladhand the service system pressure drops until the tractor protection control (red) valve trips shutting off the leak through the open coupling.
   E. Record the pressure in the service reservoirs. Disconnect the trailer supply coupling to verify that the supply or emergency (red) coupling has been vented to atmosphere, thereby activating the trailer emergency feature.
5. Close the drain cocks, recharge system and drain rear axle, primary reservoir to 0 psi.
   A. The front axle reservoir should retain most of its pressure.
   B. On combination vehicles the trailer air system should remain charged.
6. With no air pressure in the rear axle reservoir, make and release a brake application.
   A. Front axle brakes should apply and release.
   B. On combination vehicles the trailer brakes should also apply and release.
   C. If the vehicle is equipped with a spring brake modulating valve, typically found on trucks, towing trucks and buses, the rear axle brakes should also apply and release by exhausting spring brake air.

Make all necessary repairs before proceeding; See checklist 6 for common corrections.

CHECKLIST 6

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

1. Fittings
2. Kinked hose or tubing
3. Pressure protection valves
4. Double check valves
5. Tractor protection valve
6. Tractor protection control valve
7. Parking control valve
8. Relay valves (antilock modulators)
9. Trailer spring brake control valve
10. Inverting relay spring brake control valve (optional) straight trucks and buses

Retest to verify proper operation of all items repaired or replaced.

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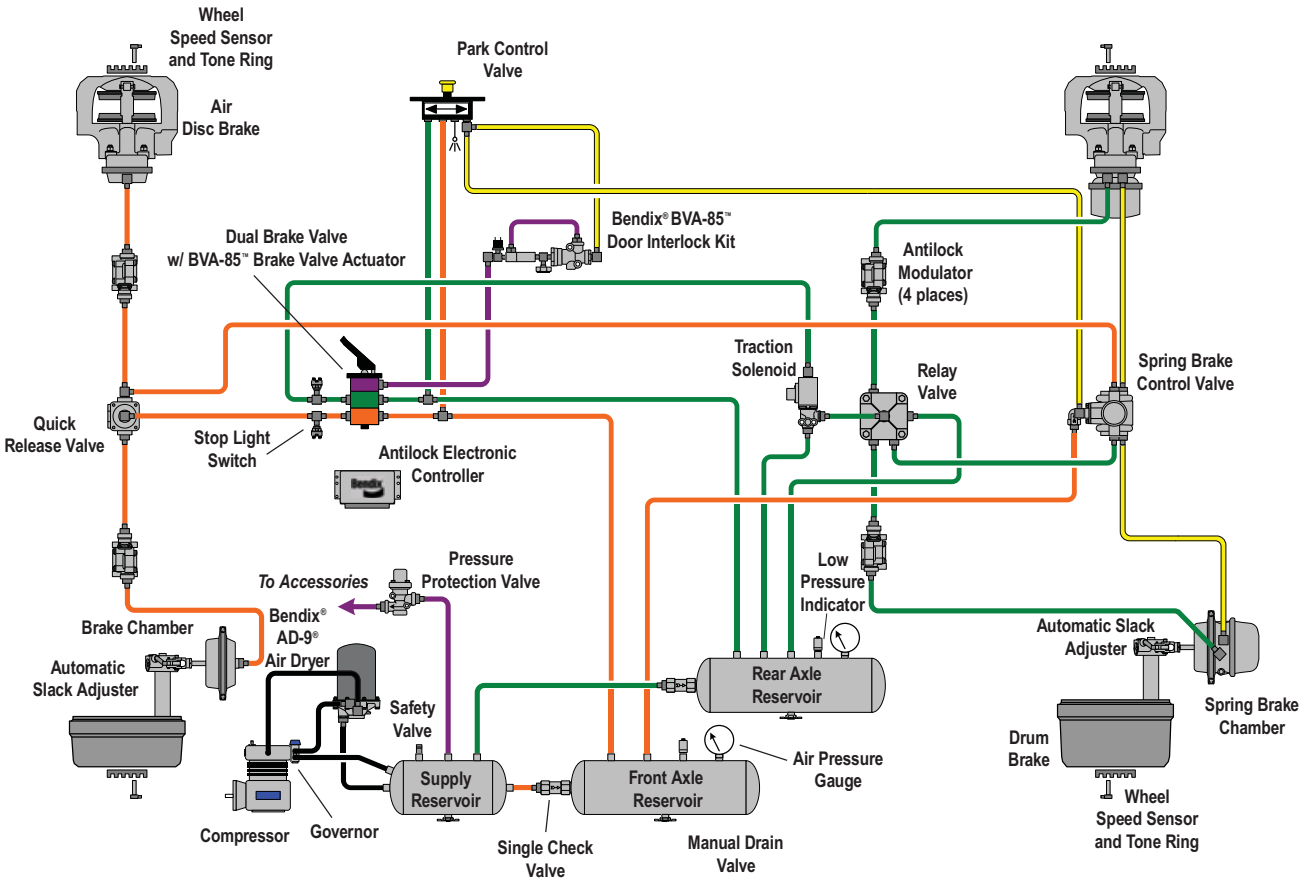
Typical School Bus Air System Schematic with a Bendix® AD-9® Air Dryer

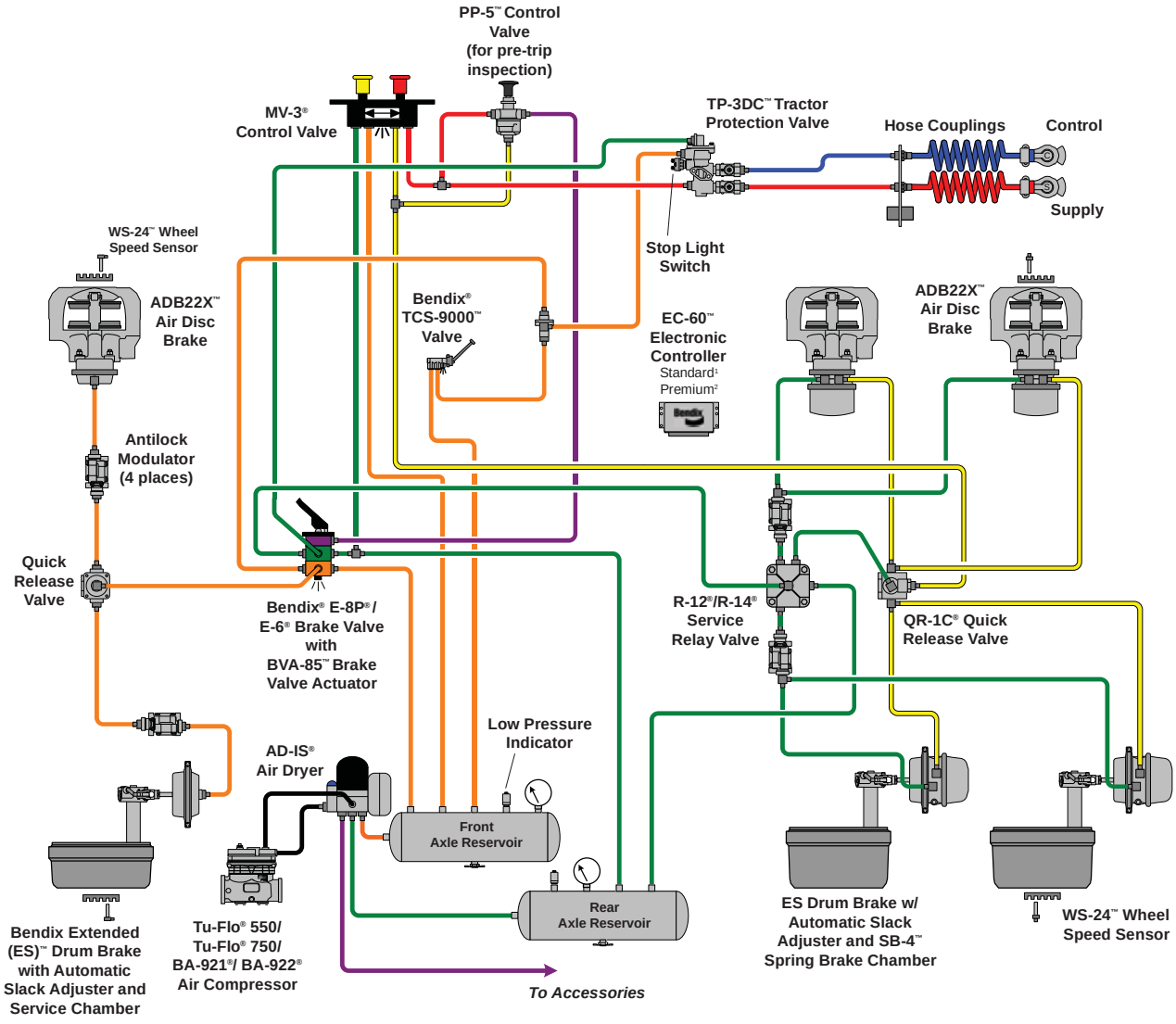


Notes:

The color coding of the brake system schematic follows TMC Recommended Practice #423. Air disc & drum brake actuation combined on a single axle are shown for pictorial purposes only.

SCHOOL BUS:				
Charging	Primary	Secondary	Parking (Control)	Accessories

Typical Tractor System Schematic



Notes:

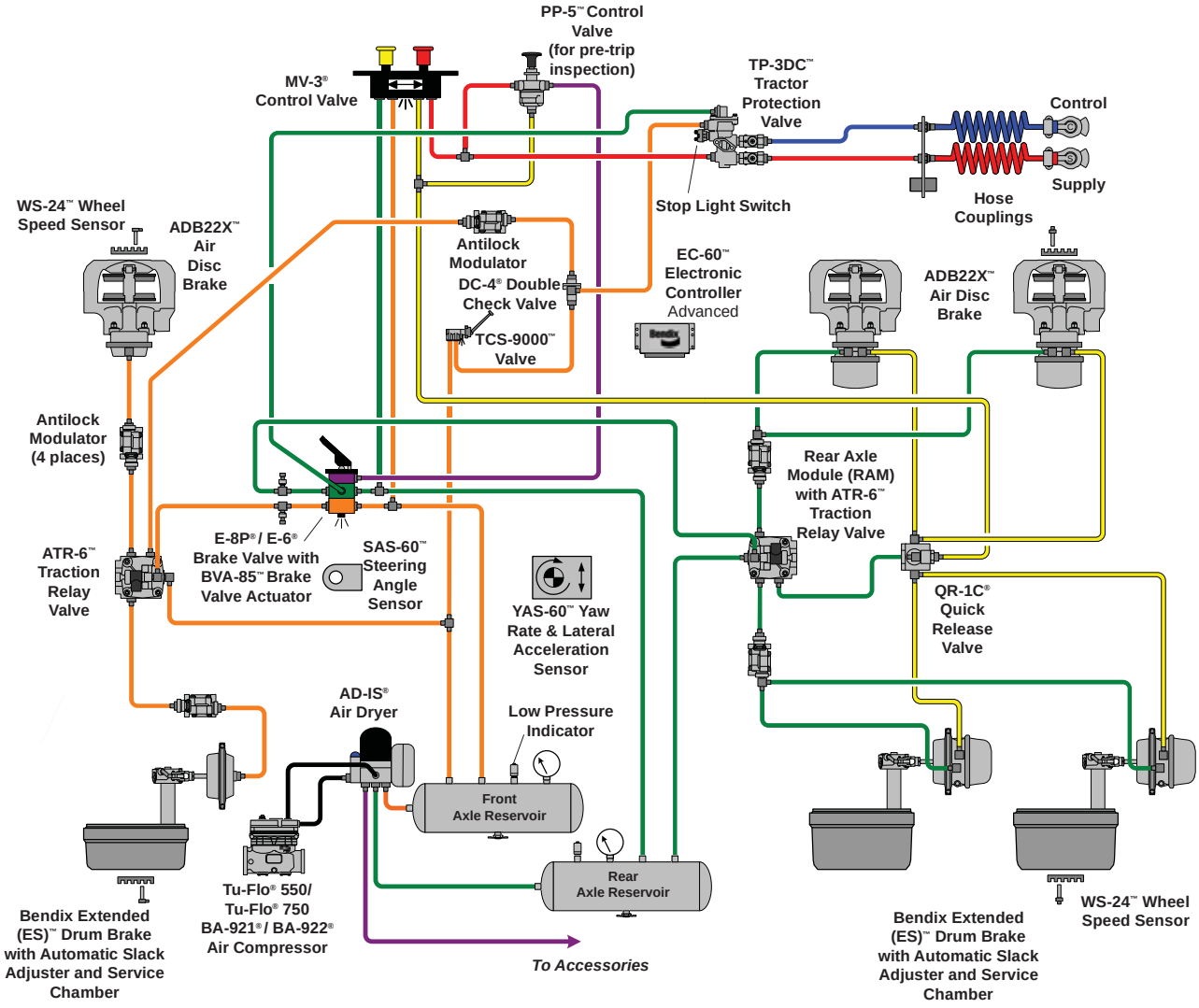
The color coding of the brake system schematic follows TMC Recommended Practice #423.
Air disc & drum brake actuation combined on a single axle are shown for pictorial purposes only.

¹ Equipped with standard Bendix® ABS Antilock Brake System

² Equipped with Bendix® ABS and Smart ATC™ Traction Control

TRUCKS AND TRUCK TRACTORS:					
Charging	Primary	Secondary	Park (Supply)	Parking (Control)	Accessories

Typical Tractor System Schematic with Bendix® ESP® Full Stability

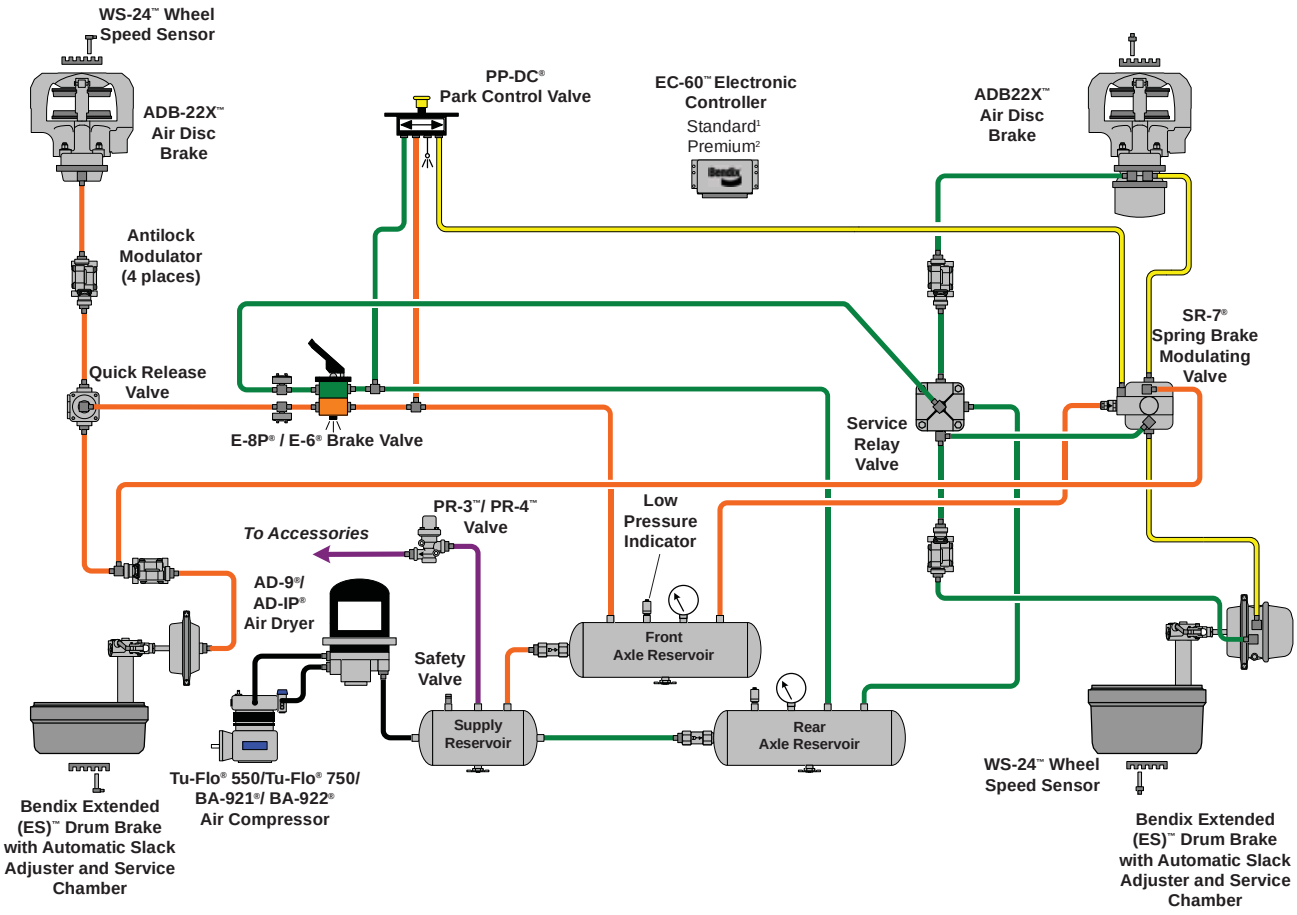


Notes:

The color coding of the brake system schematic follows TMC Recommended Practice #423.
Air disc & drum brake actuation combined on a single axle are shown for pictorial purposes only.

TRUCKS AND TRUCK TRACTORS:					
Charging	Primary	Secondary	Park (Supply)	Parking (Control)	Accessories

Typical Truck System Schematic



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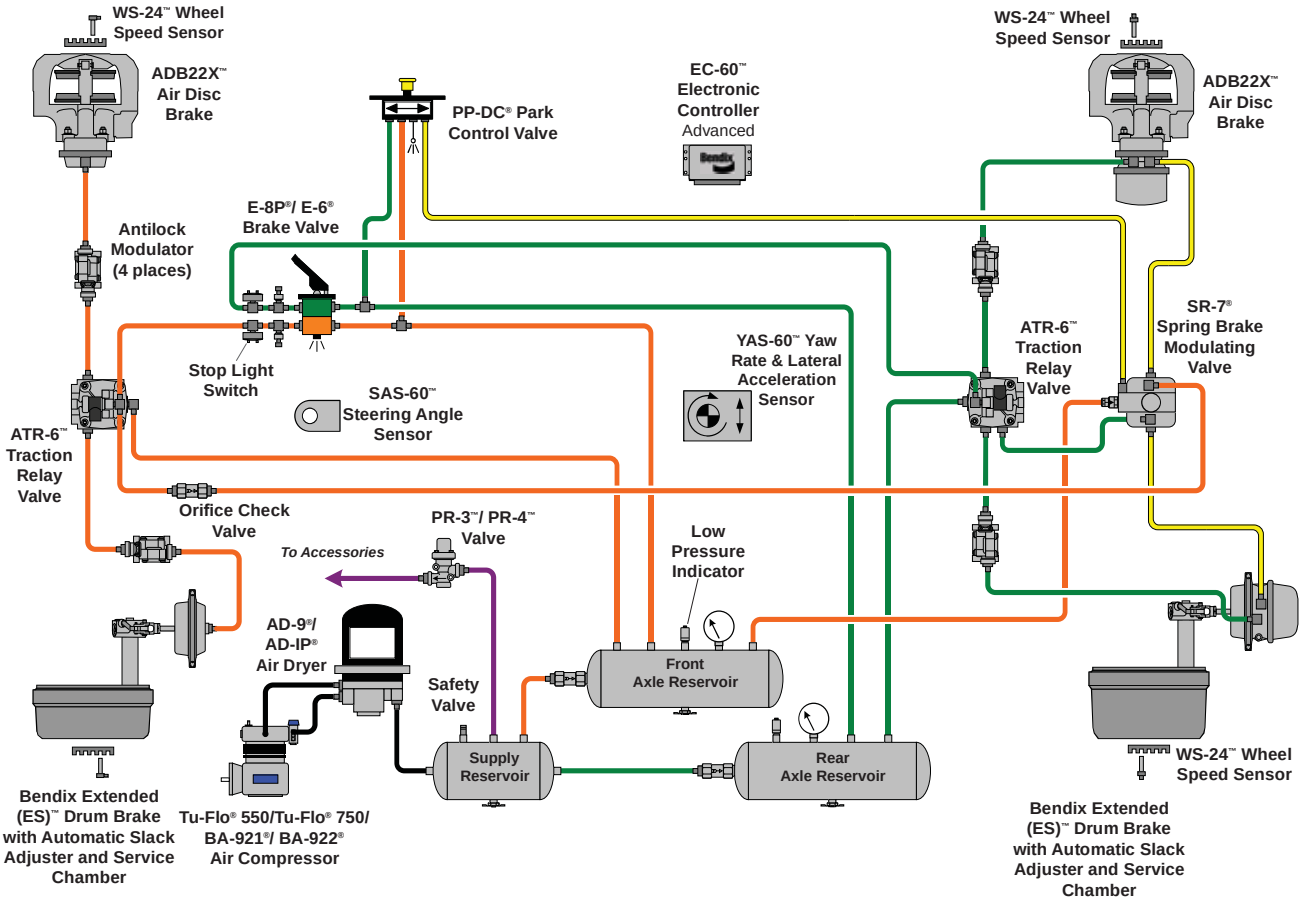
The color coding of the brake system schematic follows TMC Recommended Practice #423.
Air disc & drum brake actuation combined on a single axle are shown for pictorial purposes only.

[1] Equipped with standard Bendix® ABS Antilock Brake System

[2] Equipped with Bendix® ABS and Smart ATC™ Traction Control

TRUCKS AND TRUCK TRACTORS:					
Charging	Primary	Secondary	Park (Supply)	Parking (Control)	Accessories

Typical Truck System Schematic with Bendix® ESP® Full Stability

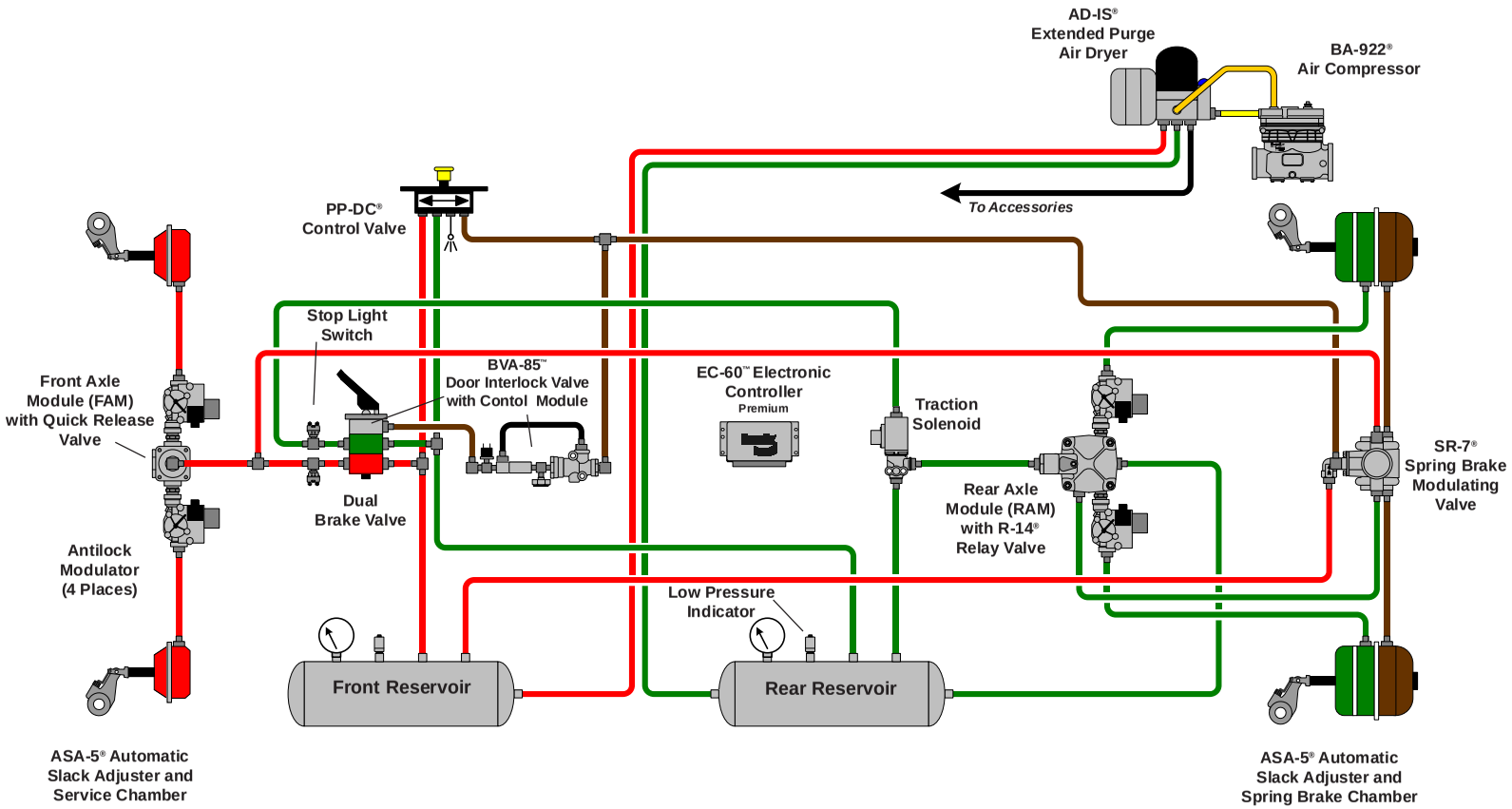


Notes:

The color coding of the brake system schematic follows TMC Recommended Practice #423.
Air disc & drum brake actuation combined on a single axle are shown for pictorial purposes only.

TRUCKS AND TRUCK TRACTORS:					
Charging	Primary	Secondary	Park (Supply)	Parking (Control)	Accessories

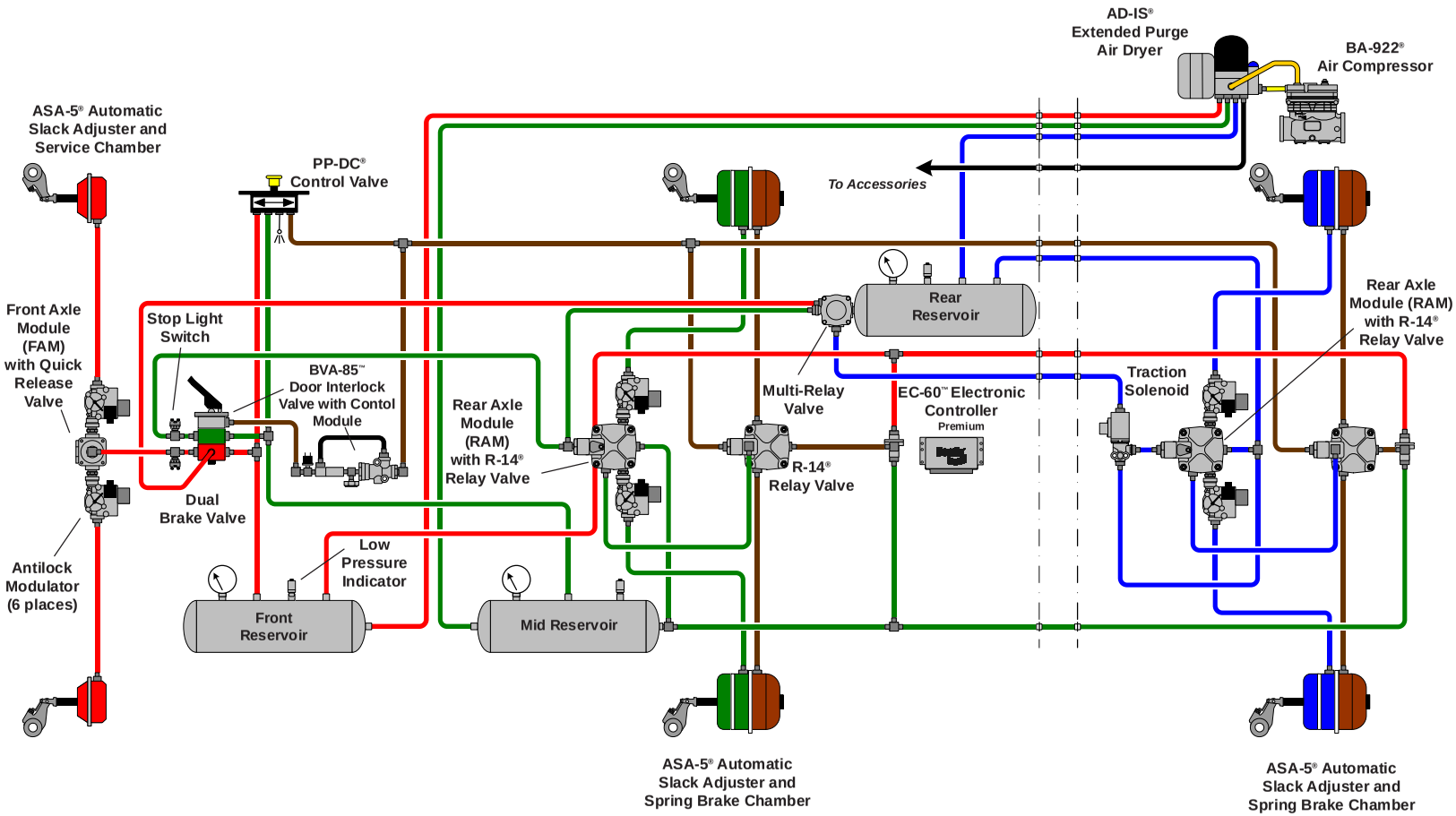
Typical Coach Bus Air System Schematic



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.

COACH:				
Primary & Supply	Secondary	Parking	Compressor Governor	Accessories

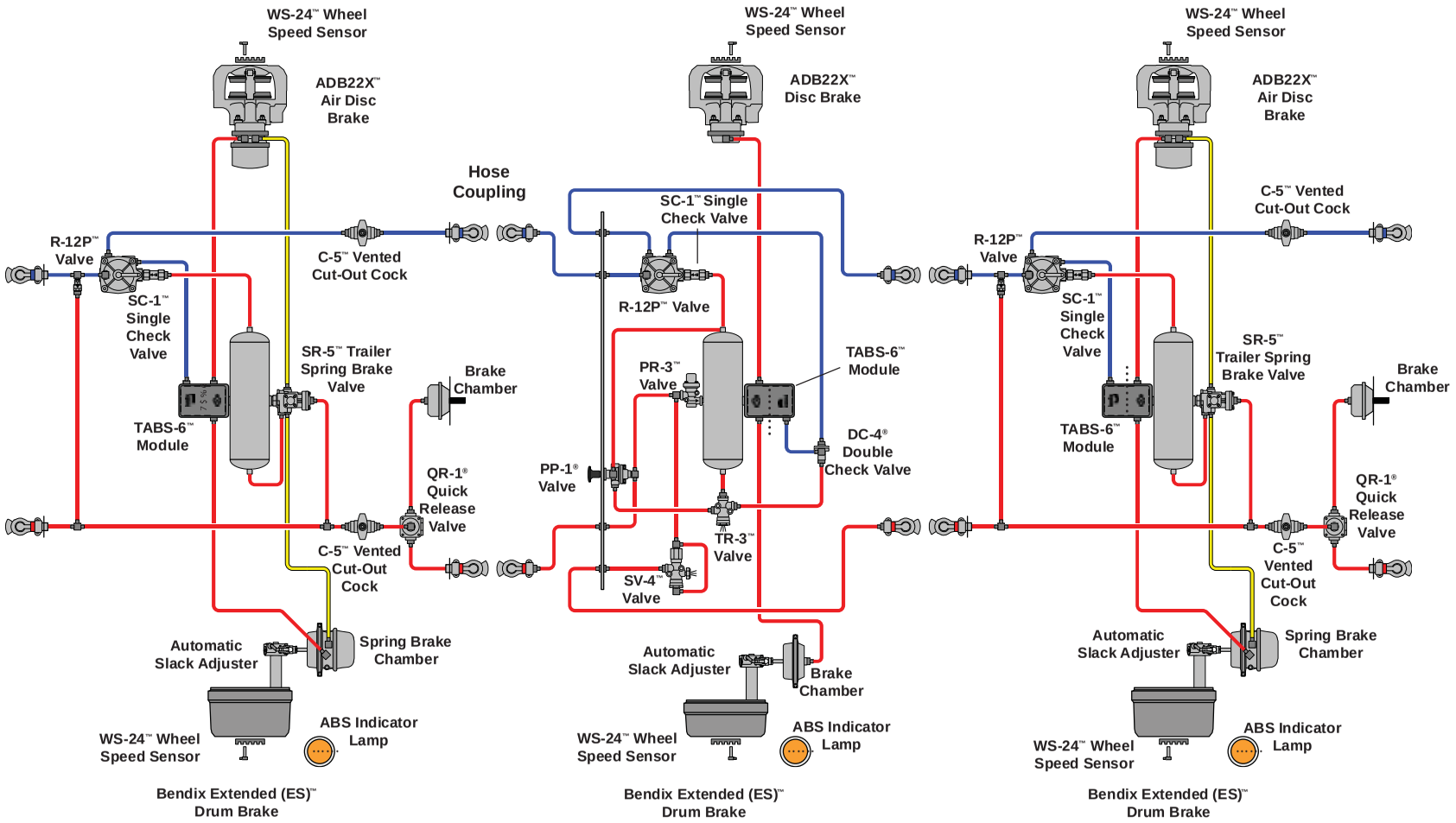
Typical Articulated Coach Bus Air System Schematic



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.

COACH:					
Primary & Supply	Articulated Circuit	Secondary	Parking	Compressor Governor	Accessories

Typical Double Train

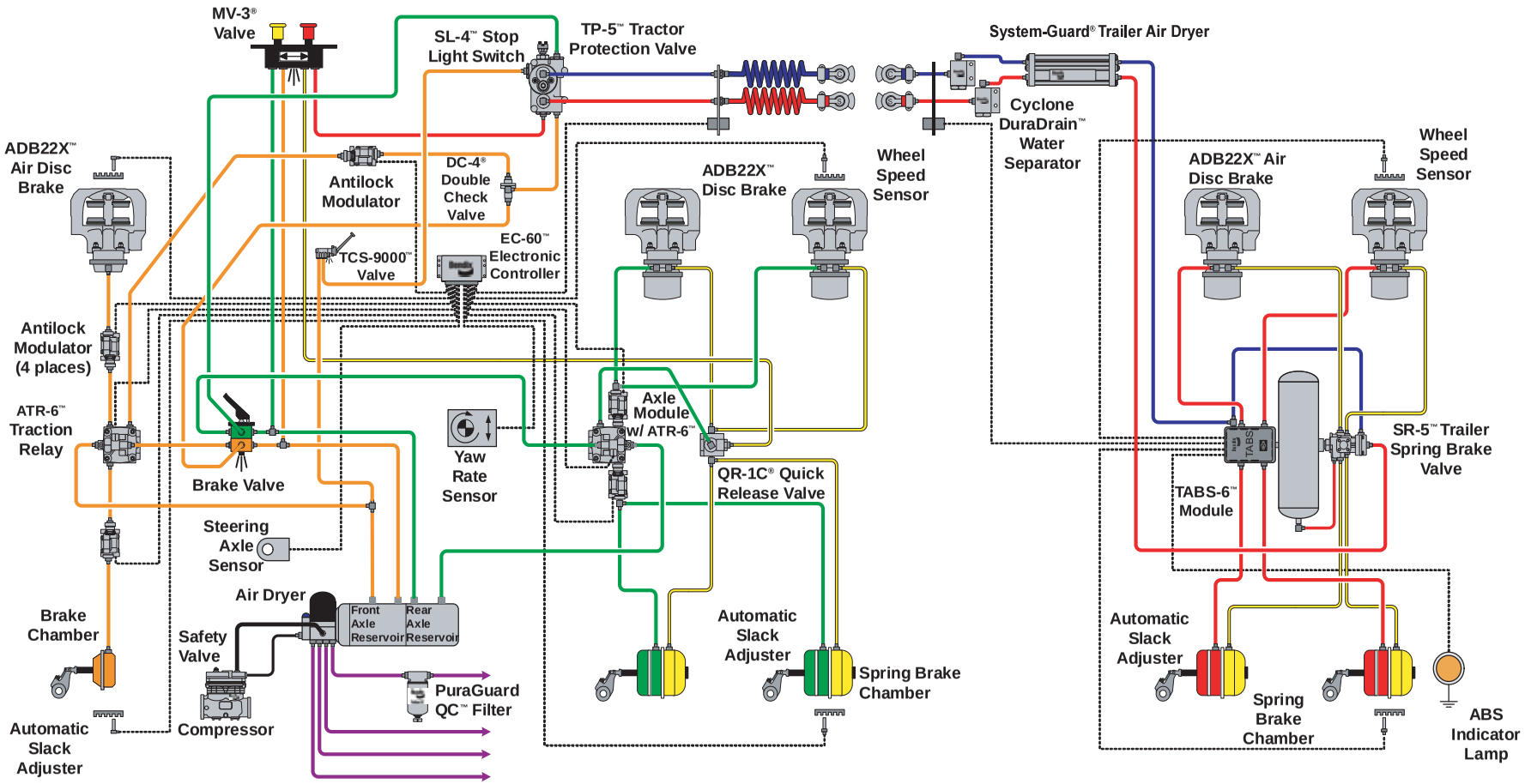


Air disc & drum brakes combined on a single axle are shown for pictoral purposes only.

TRAILERS:		
Trailer (Supply)	Trailer (Control)	Trailer (Park)

Typical Tractor System

Typical Trailer System



_ _ _ _ Indicates electrical connection

Air disc & drum brakes combined on a single axle are shown for pictoral purposes only.

TRUCKS AND TRUCK TRACTORS:					
Charging	Primary	Secondary	Park (Supply)	Parking (Control)	Accessories

TRAILERS:		
Trailer (Supply)	Trailer (Control)	Trailer (Park)

Typical Tractor System Schematic