

**AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment**

S-486

**CODE OF AIR BRAKE SYSTEM TESTS FOR FREIGHT
EQUIPMENT—SINGLE CAR TEST**

**Standard
S-486**

Adopted: 1991; Last Revised: 2018

TABLE OF CONTENTS

Paragraph or Appendix	Topic	Page
1.0	Scope	E[S-486]2
2.0	Single Car Testing Device	E[S-486]2
2.1	Description	E[S-486]2
2.1.1	General	E[S-486]2
2.1.2	Capacity of the By-Pass Reducing Valve	E[S-486]3
2.1.3	Positions and Chokes of Freight Test Device	E[S-486]3
2.2	Pretest Instructions	E[S-486]4
2.3	Daily Test for Testing the Single Car Testing Device	E[S-486]5
3.0	Tests—Standard Freight Brake Equipment	E[S-486]6
3.1	Preliminary Procedures, Inspections, and Car Set-Up	E[S-486]6
3.2	Connecting the Device to the Car	E[S-486]7
3.3	Brake Pipe Leakage Test	E[S-486]8
3.4	Separate Brake Pipe Venting Devices	E[S-486]8
3.4.1	Continuous Quick Service Valve (if Equipped)	E[S-486]8
3.4.2	A-1 Reduction Relay Valve (if Equipped)	E[S-486]8
3.4.3	Separate Vent Valve Test (if Equipped)	E[S-486]8
3.5	System Leakage Test	E[S-486]9
3.5.1	Cylinder Maintaining Leakage Test (for Cars Equipped with CM)	E[S-486]9
3.6	Hand Brake Inspection	E[S-486]10
3.7	Slack Adjuster Conditioning (with Blocks)	E[S-486]11
3.8	Service Stability Test	E[S-486]11
3.9	Piston Travel [with Block(s)] and Rigging and Brake Cylinder Pressure	E[S-486]12
3.10	Emergency Test	E[S-486]13
3.11	Release Test after Emergency	E[S-486]13
3.12	Retaining Valve Test	E[S-486]13
3.13	Minimum Application and Quick-Service Limiting Valve Test	E[S-486]14
3.14	Brake Cylinder Leakage Test	E[S-486]14
3.15	Slow-Release Test (with Variations for Car Length)	E[S-486]14
3.16	Slack Adjuster Conditioning (without Blocks)	E[S-486]15
3.17	Accelerated Application Valve (AAV) Test	E[S-486]15
3.18	Recheck of Piston Travel [without Block(s), if Car Is Equipped with Automatic Slack Adjuster]	E[S-486]15
3.19	Manual Release Valve Test	E[S-486]16
3.20	Empty/Load Test	E[S-486]16
3.21	Disconnecting the Single-Car Test Device	E[S-486]17
4.0	Special Tests	E[S-486]18
4.1	Slack Adjuster Test and Piston Travel Adjustment	E[S-486]18
4.2	Retaining Valve Test	E[S-486]19

IMPLEMENTED 08/2018

4.3	Auxiliary Devices	E[S-486]20
4.4	Brake Cylinder Pressure Tap Leakage Test	E[S-486]20
4.5	Brake Cylinder Leakage Test	E[S-486]21
4.6	Empty/Load Test	E[S-486]22
5.0	Quarterly Test for Testing the Device (Using the Test Apparatus in Fig. 5.2)	E[S-486]23
6.0	Quarterly Test For Testing the Device (Using the Test Apparatus in Fig. 6.1)	E[S-486]27
7.0	Brake Cylinder Pressure Gauge	E[S-486]29
Appendix A Troubleshooting Procedures		E[S-486]30

1.0 SCOPE

The purpose of the single car testing device is to provide a means of making a general check on the condition of the brake equipment on cars as called for in the *Field Manual of the AAR Interchange Rules*.

Note: Main air supply pressure must not fall below 90 psi other than at time of recharge. A minimum of 100 psi supply pressure is recommended.

2.0 SINGLE CAR TESTING DEVICE

2.1 Description

2.1.1 General

There are two types of single car testing devices that are similar in appearance. One is for passenger cars and the other is for freight cars. The device identified by nameplate "FRT" is used for testing freight brake equipment referred to in these instructions. See approved versions in Fig. 2.1.

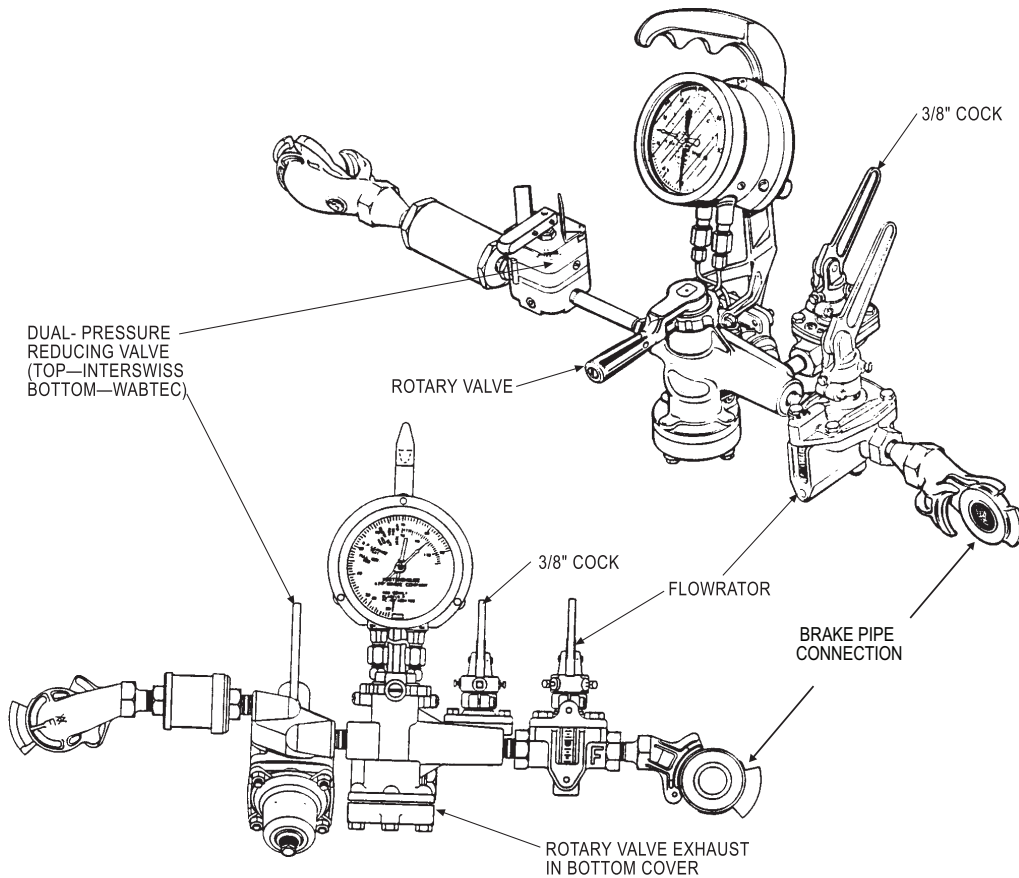


Fig. 2.1 Freight single car testing device with flowrator

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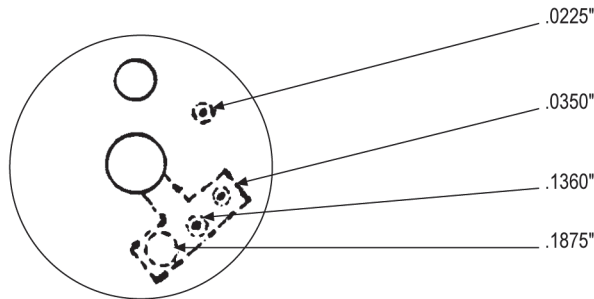
2.1.2 Capacity of the By-Pass Reducing Valve

The dual-pressure reducing valve must be capable of supplying sufficient airflow at 80 psi to detect a leakage rate of 80 in.³/min within 1 minute after placing the reducing valve in the low-pressure position. The test device must be coupled to a 1700-in.³ test volume (equivalent to 110 ft of brake pipe) charged to 80 psi. The test volume will have a choke or needle valve adjusted to give a leakage rate of 75 to 80 in.³/min. The following valves have been demonstrated to meet the requirements of paragraph 2.1.2:

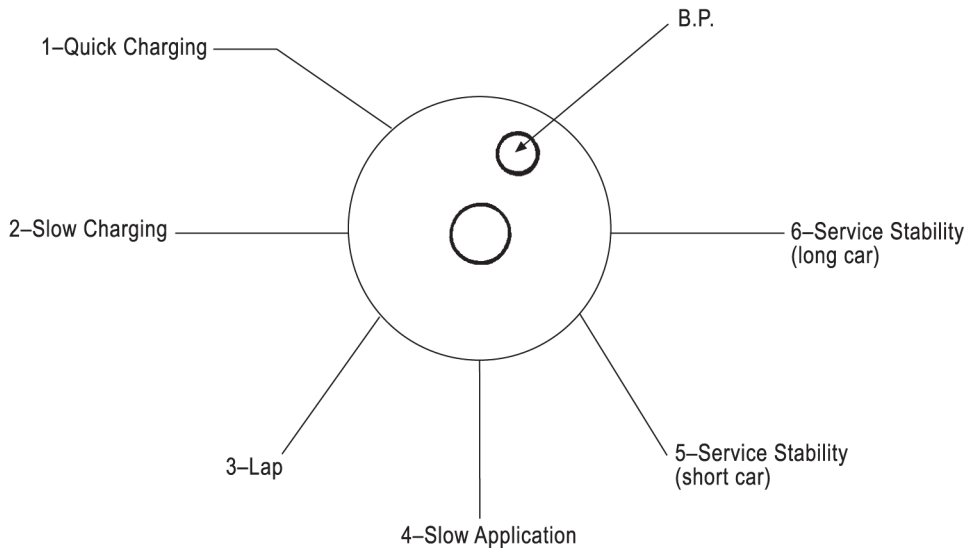
Westinghouse Air Brake Company N-1-B, Two-Stage Reducing Valve
Inter Swiss, Ltd., Dual-Pressure Regulating Valve

2.1.3 Positions and Chokes of Freight Test Device

ORIFICE SIZES



HANDLE POSITIONS



- Position No. 1 Main reservoir charges brake pipe through .2500 in. (1/4-in. drill) opening
- Position No. 2 Main reservoir charges brake pipe through .0225 in. (#74 drill) opening
- Position No. 3 Lap
- Position No. 4 Brake pipe pressure reduces through .0350 in. (#65 drill) opening
- Position No. 5 Brake pipe pressure reduces through .1360 in. (#29 drill) opening
- Position No. 6 Brake pipe pressure reduces through .1875 in. (3/16-in. drill) opening
- Test device 3/8-in. cock—5/16-in.-diameter choke

Fig. 2.2 Rotary valve and rotary valve seat of single car test device

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2.2 Pretest Instructions

Note: To secure reliable and uniform results with the single car testing device, it must be kept free from leakage and must be completely disassembled, cleaned, and tested not less frequently than every 92 days after being placed in service, or more often if necessary (see paragraph 5.0 or paragraph 6.0). No mechanical device may remain in service past one year from the last quarterly test date. Any leakage other than leakage from the reducing valve must be corrected. Leakage from the bleed vent of the reducing valve is normal. The test device must be dated when given a quarterly test. Automatic (electronic) single car test devices and electronic pressure gauges shall be calibrated at least once every 365 days. Test devices, brake cylinder gauges, and test couplings must be dated with the next test due date when they are placed in service.

2.2.1 The single car testing device arrangement must include suitable reducing valve(s) in the supply line for the purpose of providing constant pressure sources of 90 psi and 80 psi, as defined in the test codes, and an efficient air filter in the supply line ahead of the reducing valves. Blow out the supply line before attaching the test device to the test rack or repair track air supply.

2.2.2 The use of a hose or a combination of hose and pipe between the test device and the outlet hose coupling is optional. If used, such an outlet hose or hose/pipe combination must be 3/4-in. ID with 1/2-in. connection nipples and must be no greater than 8 ft in total length.

2.2.3 It is important that the flowrator be within 15° of vertical when readings are being made. Each marking on the flowrator tube denotes 25 in.³/min of airflow. The bottom mark is 50 in.³/min, and the red condemning line is 225 in.³/min.

2.2.4 Care must be exercised in moving the test rotary valve handle back to Position 3 (lap) after making brake pipe reductions of 15 psi or more in Position 5 or 6. When snapped back to Position 3, the temperature effect will cause the brake pipe pressure to rise 1 to 2 psi and may cause an undesired release of the brakes. The rotary valve handle must be moved slowly toward Position 3 (lap).

2.2.5 In this document, the term “car” will refer to one complete set of air brake equipment consisting of one control valve and all associated auxiliary valves, reservoirs, brake cylinder(s), and brake pipe.

2.2.5.1 When making tests of cars having two or more sets of brake equipment, each set, with the section of brake pipe it controls, must be tested separately. Refer to car maintenance instructions or car stenciling to determine where brake pipe should be separated for testing.

2.2.5.2 On cars having two sets of brake equipment sharing a common length of brake pipe, each set of equipment must be tested separately, with the branch pipe cut-out cock closed to one set while the other set is being tested. If both sets are connected to use one common brake cylinder release valve, it will be necessary to blank off the 3/4-in. brake cylinder pipes at both the control valve and the brake cylinder(s) on the set not being tested. This may be done by temporarily inserting blanking plates between the flange fittings and the bolting faces.

2.2.6 Pressure-maintained high-pressure and low-pressure positions are used in qualifying single car test devices. With the rotary valve handle in Position 1, move the lever to either the high-pressure or low-pressure position, as required.

2.2.7 For hook-and-eye rigging arrangements, refer to Recommended Practice RP-5599 to correct lever angularity, binding, or fouling defects.

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AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment

S-486

2.3 Daily Test for Testing the Single Car Testing Device

<p>1. This test is to be performed at least once each day of use. The tests are to be made with the device high-pressure Position adjusted for 90 psi and the low-pressure Position set to 80 psi.</p> <p>2. Blow out the supply line and attach it to the device.</p> <p>Note: Leakage from the bleed vent of the reducing valve is normal.</p> <p>3. Set the device to the high-pressure position.</p> <p>4. Close the 3/8-in. cock.</p> <p>5. Move the rotary valve handle to Position 2.</p> <p>6. Close and open the flowrator cock. Observe that the ball rises and falls and does not stay at the top of the tube.</p> <p>7. Move the device handle to Position 3.</p> <p>8. Couple a dummy coupling (do not use the test coupling for this test) to the brake pipe or coupling end of the test device.</p> <p>9. Plug a quick-disconnect coupling with a brake cylinder gauge into a test male pressure tap.</p> <p>Note: The test male pressure tap can be mounted on the dummy coupling or to the brake pipe or coupling end of the test device.</p>
<p>TEST 2.3.1—With the rotary valve handle in Position 1, the brake pipe pressure (black needle) must read 90 psi.</p>
<p>10. Set the test device to the low-pressure position. The brake pipe must reduce to and stabilize at 80 psi.</p>
<p>TEST 2.3.2—The brake cylinder pressure gauge must read between 77 and 83 psi. The brake cylinder test gauge shall be calibrated every 92 days (see paragraph 7.0).</p>
<p>11. Reset the test device to the high-pressure position.</p> <p>12. When the brake pipe is charged to 90 psi, move the rotary valve handle to Position 3.</p>
<p>TEST 2.3.3—Observe the device gauge for leakage for a period of 1 minute. A drop of not more than 1 psi is permitted.</p> <ul style="list-style-type: none">• This test will detect leakage from the rotary valve seat to a leaking gauge or gauge pipe.
<p>13. If necessary, soap the test device, fittings, couplings, and brake cylinder gauge assembly.</p>
<p>TEST 2.3.4—A 1-in. bubble in not less than 5 seconds is permitted.</p>
<p>14. Open the test device 3/8-in. cock to exhaust air from the brake pipe and remove the dummy coupling.</p> <p>15. Couple a test coupling equipped with a .28-mm. (.011-in.) choke to the brake pipe or coupling end of the device.</p> <p>16. Close the test device 3/8-in. cock.</p> <p>17. Move the rotary valve handle to Position 1.</p> <p>18. Close the flowrator by-pass cock.</p>
<p>TEST 2.3.5—The flowrator ball must rise and float in the tube in the zone between the condemning line and the top of the tube.</p>
<p>19. Move the device handle to Position 3 (lap).</p> <p>20. Open the flowrator by-pass cock and the 3/8-in. cock.</p> <p>21. Remove the test coupling.</p> <p>22. Close the 3/8-in. cock.</p>
<p>TEST 2.3.6—Check for leakage from the brake pipe connection and the exhaust port of the rotary valve located in the bottom cover of the device. If leakage is detected with soap suds, the leakage must not exceed a 1-in. bubble in 5 seconds.</p>

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3.0 TESTS—STANDARD FREIGHT BRAKE EQUIPMENT

3.1 Preliminary Procedures, Inspections, and Car Set-Up

Note: If any test fails, refer to the test's troubleshooting and restart requirements located in Appendix A. The content of Appendix A is not considered code as referenced in the *Code of Federal Regulations*.

The following inspections and services shall be performed in accordance with applicable *Field Manual of the AAR Interchange Rules*. The preliminary procedures, inspections, and car set-up can be performed in any order.

Caution: During inspections, if the brake system is charged, the possibility exists that the brakes will apply, particularly if the supply pressure is lost.

Caution: Do not remove the brake cylinder pressure tap, or any other component in the brake cylinder line, with brakes applied.

- Protect car from any movement.
- Drain the reservoirs completely.
- With the hand brake in the released position, note that the brake cylinder piston push rod(s) has returned into the brake cylinder(s).
- Check for worn, missing, or incorrect brake shoes and replace with the correct shoe, as required.
- Check for worn brake levers and pins and replace as required.
- Check to ensure brake rigging, levers, and rods do not bind or foul.
- Check all air brake hoses for cuts, breaks, or over-age. Replace as required per the *Field Manual of the AAR Interchange Rules*, Rule 5.
- Ensure both angle cocks are in the open position.
- Apply new air hose coupling gaskets per the *Field Manual of the AAR Interchange Rules*, Rule 3.
- Apply a brake cylinder pressure test gauge to the downstream brake cylinder pressure tap. Brake cylinder pressure tap must be applied per the *Field Manual of the AAR Interchange Rules*, Rule 3.
- Make certain that the retaining valve is in the Direct Exhaust (EX) position.
- Loosen the vent protector and street ell if the car has a vent valve.
- Close the branch pipe cut-out cock.
- Determine if the car has an open EHMS LORF-NCF alert.
- Determine if the car is equipped with special valves having Brake Cylinder Maintaining or Hot Wheel Protection features.

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AAR Manual of Standards and Recommended Practices

Brakes and Brake Equipment

S-486

3.1.1 Empty/Load Devices

For cars equipped with empty/load devices, all test procedures must be performed in the loaded position. Ensure that all empty load valves remain in the loaded position until the empty load test is performed.

- For side frame sensing devices, place a block (2-in. minimum thickness) under the sensing arm.
- For slope sheet sensing devices, do one of the following:
 - Insert a pin (supplied by Ellcon-National).
 - Push in the lockout button (WABTEC—see note below).
 - Pull out the round flat knob (NYAB).

For all other slope sheet empty load devices, refer to the original equipment manufacturer's instructions.

Note: Cars with empty/load devices that automatically reset to the empty position must be manually reset to the loaded position prior to each test.

3.2 Connecting the Device to the Car

3.2.1 Connect to Air Source

1. Confirm that the daily test for the device has been performed.
2. Confirm that the supply line has been blown out before attaching the device.
3. Ensure that the single-car test device gauge reads 90 psi in the high-pressure position.
4. Ensure that the 3/8-in. cock is closed.
5. Ensure that the flowrator bypass cock is open.

3.2.2 Connect to Car

1. Close the branch pipe cut-out cock.
2. Ensure that the reservoirs are completely drained.
3. Connect the device to the car using the end marked "BP" and the trainline gladhand. Testing from the B end of the car is preferred. Connect the supply line to the end near the two-stage reducing valve.
4. Starting with both angle cocks open, move the rotary valve to Position 1.

TEST 3.2.2.1—A continuous blow of air must occur from the open hose at the opposite end of the car.

5. Close the angle cock and attach a dummy coupling to the air hose coupling at the opposite end of the car. Reopen the angle cock slowly while holding the end hose to control movement.

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3.3 Brake Pipe Leakage Test

If performing only the brake pipe leakage test per the *Field Manual of AAR Interchange Rules*, Rule 3, Chart A, complete paragraph 3.1, “Preliminary Procedures, Inspections, and Car Set-Up,” and paragraph 3.2, “Connecting the Device to the Car,” prior to conducting the test.

1. With the rotary valve in Position 1, charge the brake pipe to 90 psi.
TEST 3.3.1 —Close the flowrator by-pass cock. The top of the ball must stabilize below the condemning line.
2. Open the flowrator by-pass cock.

3.4 Separate Brake Pipe Venting Devices

If the car is equipped with separate brake pipe reduction devices such as a continuous quick-service valve and/or a vent valve, the following tests must be performed prior to proceeding with paragraph 3.5, “System Leakage Test.”

3.4.1 Continuous Quick Service Valve (if Equipped)

1. With the control valve cut out and the brake pipe charged to 90 psi, move the rotary valve handle to Position 4.
2. Observe that brake pipe pressure is being reduced as indicated by the brake pipe needle on the single-car test device gauge.
TEST 3.4.1.1 —The vent valve must not function, and brake pipe pressure must not be reduced to 0 psi.
TEST 3.4.1.2 —An intermittent exhaust at the quick-service valve must be observed during this reduction.
3. When an exhaust has been noted, place the rotary valve handle in Position 1 and charge the brake pipe to 90 psi.

3.4.2 A-1 Reduction Relay Valve (if Equipped)

1. On cars equipped with an A-1 reduction relay valve and less than 85 ft of brake pipe, the B-1 quick-service function must be nullified by replacing the vent protector on the bottom of the pipe bracket with a 3/8-in. pipe plug prior to proceeding.

3.4.3 Separate Vent Valve Test (if Equipped)

1. Reduce brake pipe pressure to 50 psi with the rotary valve handle in Position 5.
2. Place the rotary valve handle in Position 3. Note: If the car is equipped with a separate control valve emergency portion in place of a vent valve, make the reduction to 50 psi in Position 5 if the BP length is less than 75 ft or in Position 6 if it is greater than 75 ft.
TEST 3.4.3.1 —The vent valve must not function, and brake pipe pressure must not be reduced to 0 psi.
3. With the brake pipe pressure no lower than 40 psi, quickly open the test device 3/8-in. cock.
TEST 3.4.3.2 —The vent valve must function and immediately vent brake pipe pressure to 0 psi.
4. Close the test device 3/8-in. cock.

Note: For cars with an open EHMS LORF-NCF alert, do the following:

1. Return the handle to Position 1 and wait for the car to release.
2. Close the flowrator by-pass cock and verify that the flowrator ball is below the top of the tube.
3. Open the flowrator by-pass cock.
4. Repeat the steps for paragraph 3.4.3 per the <i>Field Manual of AAR Interchange Rules</i> , Rule 3.

IMPLEMENTED 08/2018

AAR Manual of Standards and Recommended Practices Brakes and Brake Equipment

S-486

3.5 System Leakage Test

If performing only the system leakage test per the *Field Manual of AAR Interchange Rules*, Rule 3, Chart A, complete paragraph 3.1, “Preliminary Procedures, Inspections, and Car Set-Up,” and paragraph 3.2, “Connecting the Device to the Car,” prior to conducting test 3.5.2 and test 3.5.3.

The hand brake inspection (paragraph 3.6) can be made while the car brake system is being charged.

Refer to the *Field Manual of the AAR Interchange Rules*, Rule 4, for valve identification information.

1. Move the rotary valve handle to Position 1.
2. Cut in the control valve by slowly opening the branch pipe cut-out cock.
TEST 3.5.1 —During charge, there must be no venting of air from the retaining valve, and the brake cylinder piston(s) must remain in the release position.
3. If the markings on the service valve under test identify it as having the Brake Cylinder Maintaining feature, then confirm that the brake cylinder pressure is 0 psi and the brake cylinder piston is retracted. Remove the retaining valve and replace it with a CM retaining valve test fixture while the system is charging.
4. After the car has had sufficient time to charge (approximately 8 minutes), close the flowrator by-pass cock.
TEST 3.5.2 —Soap both reservoir pipes, fittings, and gaskets. No leakage is allowed.
TEST 3.5.3 —The top of the ball must stabilize below the condemning line.
5. Open the flowrator by-pass cock. Note: If the markings on the service valve under test identify it as having the Brake Cylinder Maintaining feature, then perform the Cylinder Maintaining Leakage Test after this step 5.

3.5.1 Cylinder Maintaining Leakage Test (for Cars Equipped with CM)

1. Charge to 90 psi so that the flowrator ball floats below the top of the tube. Ensure that the piston is fully released.
2. Move the rotary valve handle to Position 4 and reduce brake pipe pressure to 87 psi.
3. Promptly return the rotary valve handle to Position 3.
TEST 3.5.1.1 —Brakes must apply.
4. Move the reducing valve handle to the low-pressure position.
5. Move the rotary valve handle to Position 1. Brake pipe pressure must be at or above 80 psi.
TEST 3.5.1.2 —Brake cylinder pressure must be above 17 psi.
6. Ensure that the CM retainer test fixture ball valve is closed.
7. Move the reducing valve handle to the high-pressure position.
TEST 3.5.1.3 —Soap the retainer test fixture and associated retainer piping. No leakage is allowed.
8. Wait 1 minute.
9. Note the brake cylinder pressure.
10. Wait 1 minute.
11. Note the brake cylinder pressure.
TEST 3.5.1.4 —No more than a 1 psi increase or decrease in brake cylinder pressure is allowed.
12. Open the test fixture ball valve and vent the brake cylinder to 0 psi.
13. Confirm that the brake cylinder pressure is 0 psi and the brake cylinder piston is retracted. Remove the test fixture and reapply the retaining valve.

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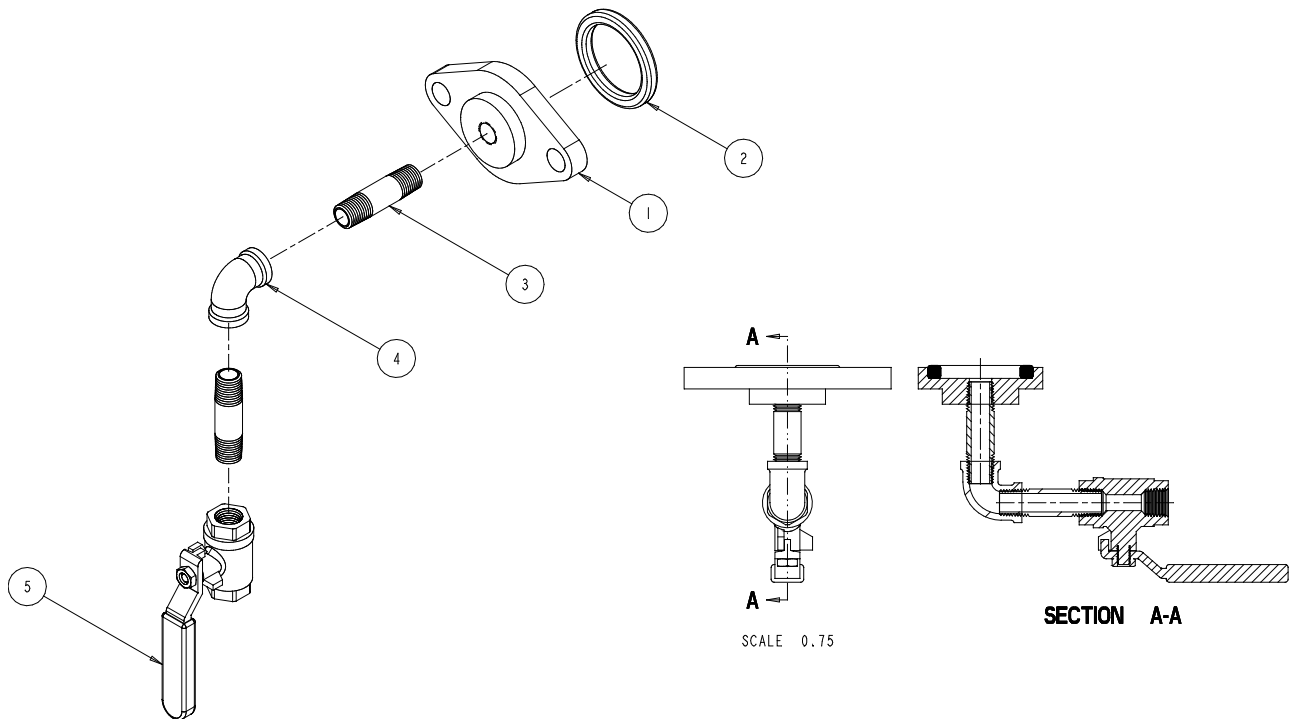


Fig. 3.1 Cylinder maintaining retainer test fixture

3.6 Hand Brake Inspection

1. Lubricate the hand brake per <i>Field Manual of the AAR Interchange Rules</i> , Rule 13.
TEST 3.6.1 —With the hand brake in the released position, note that the brake cylinder piston push rod(s) has returned into the brake cylinder(s).
2. Apply the hand brake.
TEST 3.6.2 —Observe that the bell crank, if equipped, is in a normal working range.
TEST 3.6.3 —Using a bar, determine that all brake shoes applied by the hand brake are firmly set against the wheels and verify that associated linkage does not bind or foul.
3. On cars with WABCOPAC/NYCOPAC-type truck-mounted brakes and a hand brake that operates the brake beams on one or both trucks, a minimum of one shoe on each beam must be firmly set against the wheel to verify that associated linkage does not bind or foul.
4. Release the hand brake.
TEST 3.6.4 —Verify that the drum chain is fully unwound and that the bell crank, if so equipped, drops to a lower limit and that there is minimal slack in the horizontal chain. To ensure minimal chain slack on body-mounted brake cylinders, the push-rod may need to be manually pushed into the full-release position.
Note: Once the hand brake has passed the requirements of paragraph 3.6, there is no need to repeat the hand brake inspection unless otherwise specified.

IMPLEMENTED 08/2018

AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment

S-486

3.7 Slack Adjuster Conditioning (with Blocks)

Note: The brake applications made to condition the slack adjuster must not generate an emergency vent of brake pipe pressure.

1. If the car is equipped with an automatic slack adjuster, install block(s) between the brake shoe and the wheel at one end of the car. Cars with truck-mounted brakes must have blocks installed at each slack adjuster location. CAUTION: Do not put your hand between the brake head and the wheel because a loss of supply air pressure will cause the brakes to apply.
2. Charge to 90 psi. Make a 15 psi reduction in Position 4.
3. Immediately return to Position 1.
4. Wait for the cylinder to release.
5. Make a 30 psi reduction in Position 4.
6. Immediately return to Position 1.
7. Wait for the cylinder to release.
8. Charge to 90 psi.
9. Close the flowrator by-pass cock and verify that the flowrator ball is below the top of the tube. Open the flowrator by-pass cock.

3.8 Service Stability Test

Note: On cars equipped with a separate emergency vent valve, this valve must be plugged or cut out before proceeding with the test.

1. Install a plug in the body of the vent valve and not in the street ell if so equipped.
2. On cars equipped with a bleed/stabilizing-type vent valve, plug the valve and pull out the bleed stem, noting a continuous blow of air.

Note: If the brake pipe length is unknown, add 8 ft to the actual car length for cars having conventional end hose arrangements. Add 20 ft to the actual car length for cars having end hose arrangements similar to that depicted in *MSRP* Standard S-4003.

3.8.1 Cars with Up to 75 ft of Brake Pipe

1. Move the rotary valve handle to Position 5.
2. Make a 40 psi reduction.
3. When the brake pipe reaches 55 psi, slowly return the rotary valve handle through Position 4 to Position 3 until the brake pipe reads 50 psi.

IMPLEMENTED 08/2018

3.8.2 Cars with Over 75 ft of Brake Pipe

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|--|
| <ol style="list-style-type: none">1. Move the rotary valve handle to Position 6.2. Make a 40 psi reduction.3. When the brake pipe reaches 55 psi, slowly return the rotary valve handle through Position 5 and Position 4 to Position 3 until the brake pipe reads 50 psi. |
|--|

TEST 3.8.2.1 —This test must not produce an emergency application.

Note: If the brake pipe reduction continues after the rotary valve handle is placed in Position 3, do the following:

- | |
|--|
| <ol style="list-style-type: none">1. Move the handle to Position 2 until the brake pipe stops reducing.2. Then move it back to Position 3.3. On cars equipped with a bleed/stabilizing type vent valve, ensure that the bleed valve is reset (stem in, no air exhausting). |
|--|

TEST 3.8.2.2 —The brake pipe reduction must stop. The continuous exhaust at the emergency portion must not continue after the brake pipe reduction is stopped or after using Position 2 to stop the decrease of pressure.
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Note: For cars with an open EHMS LORF-NCF alert, do the following:

- | |
|--|
| <ol style="list-style-type: none">1. Return the handle to Position 1 and wait for the car to release.2. Close the flowrator by-pass cock and verify that the flowrator ball is below the top of the tube.3. Open the flowrator by-pass cock.4. Repeat the steps for paragraph 3.8 per the <i>Field Manual of AAR Interchange Rules</i>, Rule 3. |
|--|

3.9 Piston Travel [with Block(s)] and Rigging and Brake Cylinder Pressure

TEST 3.9.1 —Measure and note brake cylinder piston travel. Piston travel must be within the nominal range shown in the <i>Field Manual of the AAR Interchange Rules</i> , Rule 3.
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TEST 3.9.2 —Check all brake levers for angularity.

TEST 3.9.3 —Determine that all shoes are applied and are firmly set against the wheels to verify that associated linkage does not bind or foul.
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Note: Any repair or replacement of brake rigging components, levers, or brake beams requires a restart at paragraph 3.5, "System Leakage Test," and the performance of paragraph 3.6, "Hand Brake Inspection."

TEST 3.9.4 —Brake cylinder pressure must be greater than 50 psi.

Note: Cars that have been modified for application of high-friction brake shoes and are equipped with a modulating valve or cars equipped with an empty/load valve that cannot be set in the loaded condition are not required to meet the 50 psi minimum pressure. Modulating valves and empty/load valves that cannot be set to the loaded condition must develop a minimum of 25 psi.

TEST 3.9.5 —Take note of the brake cylinder pressure after the brake pipe pressure has stabilized for later comparison with paragraph 3.10, "Emergency Test," and paragraph 3.20, "Empty/Load Test."

Note: For new and Rule 88 cars requiring a brake cylinder leakage test, as outlined in Standard S-401 (current revision), timing and measurement of brake cylinder leakage can be performed at this time.

IMPLEMENTED 08/2018

AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment

S-486

3.10 Emergency Test

If the brake pipe length is unknown, add 8 ft to the actual car length for cars having conventional end hose arrangements. Add 20 ft to the actual car length for cars having end hose arrangements similar to that depicted in *MSRP* Standard S-4003.

3.10.1 Cars with Less than 100 ft of Brake Pipe

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| 1. With the brake pipe pressure no lower than 40 psi, quickly open the test device 3/8-in. cock. |
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3.10.2 Cars with Brake Pipe Length over 100 ft

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| 1. Move the rotary valve handle to Position 4. |
| 2. With the brake pipe pressure no lower than 40 psi, quickly open the test device 3/8-in. cock. |

TEST 3.10.2.1 —This test must produce a control valve emergency application as indicated by the rapid venting of brake pipe pressure to 0 psi.

TEST 3.10.2.2 —The brake cylinder pressure must be at least 5 psi higher than the final full-service pressure noted in test 3.9.5.

3.11 Release Test after Emergency

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| 1. After the emergency test, turn the handle of the retaining valve to the High Pressure Retain (HP) position. |
| 2. Close the test device 3/8-in. cock. |
| 3. Place the device handle in Position 3. |
| 4. Wait for 2 minutes. |

TEST 3.11.1 —Open the 3/8-in. cock and verify no presence of air exhausting.

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| 5. Close the 3/8-in. cock. |
| 6. Move the device handle to Position 1. |
| 7. Charge the brake pipe to 28 psi. |
| 8. Immediately return the device handle to Position 3. |

TEST 3.11.2 —The brake pipe pressure must continue to rise, indicating that the emergency accelerated release feature is operating correctly.
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3.12 Retaining Valve Test

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| 1. Move the rotary valve handle to Position 1. |
| 2. Wait for 4 minutes. |

TEST 3.12.1 —The brakes must remain applied, and brake cylinder pressure must be equal to or greater than 12 psi.
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| 3. Turn the retaining valve handle to the Direct Exhaust (EX) position. |
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TEST 3.12.2 —A blow of air must be noted at the retaining valve exhaust.

IMPLEMENTED 08/2018

3.13 Minimum Application and Quick-Service Limiting Valve Test

<ol style="list-style-type: none"> 1. Charge to 90 psi so that the flowrator ball floats below the top of the tube. Ensure that the piston is fully released. 2. Move the rotary valve handle to Position 4 and reduce brake pipe pressure to 87 psi. 3. Promptly return the rotary valve handle to Position 3.
TEST 3.13.1 —Brakes must apply.
<ol style="list-style-type: none"> 4. If the brake pipe reduction continues below 86 psi after the rotary valve handle is placed in Position 3, do the following: <ul style="list-style-type: none"> • Move the rotary valve handle to Position 2 until the brake pipe stops reducing. • Then move it back to Position 3.
TEST 3.13.2 —The brake pipe reduction must stop and the continuous exhaust at the emergency portion must not continue after the brake pipe reduction is stopped or after using Position 2 to stop the decrease of pressure.
TEST 3.13.3 —Brake pipe pressure must be at or above 80 psi.
<ol style="list-style-type: none"> 5. Move the reducing valve handle to the low-pressure position. 6. Move the rotary valve handle to Position 1.

3.14 Brake Cylinder Leakage Test

<ol style="list-style-type: none"> 1. After the brake pipe pressure has stabilized at 80 psi, wait 3 minutes.
TEST 3.14.1 —Note the pressure on the brake cylinder gauge. Brake cylinder pressure must be between 12 and 30 psi.
<ol style="list-style-type: none"> 2. Wait an additional 1 minute, then recheck the brake cylinder gauge.
TEST 3.14.2 —No more than a 1 psi increase or decrease in brake cylinder pressure is allowed.
<ol style="list-style-type: none"> 3. Close the flowrator by-pass cock and observe the flowrator until the ball stabilizes.
TEST 3.14.3 —The top of the flowrator ball must stay below the condemning line.
<ol style="list-style-type: none"> 4. Open the flowrator by-pass cock.

3.15 Slow-Release Test (with Variations for Car Length)

Verify that brake pipe pressure at the start of this test is 80 psi and that the brakes are applied.

<ol style="list-style-type: none"> 1. Move the rotary valve handle to Position 3. 2. Move the reducing valve handle to the high-pressure position. 3. Determine the release time test limit according to brake pipe length. 								
<p>Table 3.1 Brake pipe length maximum release time</p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="padding: 5px;">Less than 75 ft</td> <td style="padding: 5px;">45 seconds</td> </tr> <tr> <td style="padding: 5px;">75 ft up to 100 ft</td> <td style="padding: 5px;">55 seconds</td> </tr> <tr> <td style="padding: 5px;">100 ft up to 125 ft</td> <td style="padding: 5px;">75 seconds</td> </tr> <tr> <td style="padding: 5px;">Over 125 ft</td> <td style="padding: 5px;">100 seconds</td> </tr> </table>	Less than 75 ft	45 seconds	75 ft up to 100 ft	55 seconds	100 ft up to 125 ft	75 seconds	Over 125 ft	100 seconds
Less than 75 ft	45 seconds							
75 ft up to 100 ft	55 seconds							
100 ft up to 125 ft	75 seconds							
Over 125 ft	100 seconds							
<p>Note: If the brake pipe length is unknown, add 8 ft to the actual car length for cars having conventional end hose arrangements. Add 20 ft to the actual car length for cars having end hose arrangements similar to that depicted in MSRP Standard S-4003.</p>								
<ol style="list-style-type: none"> 4. Move the rotary valve handle to Position 2 and start timing. 								
TEST 3.15.1 —Brake must release within the time specified in Table 3.1 as noted by exhaust of air at the retaining valve.								
<ol style="list-style-type: none"> 5. Place the rotary valve handle in Position 1 and charge the car to 90 psi on the single-car test device gauge. 6. Remove block(s) between the brake shoe(s) and the wheel(s). <p>CAUTION: Do not put your hand between the brake head and the wheel because a loss of supply air pressure will cause the brakes to apply.</p>								

IMPLEMENTED 08/2018

**AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment**

S-486

3.16 Slack Adjuster Conditioning (without Blocks)

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| <ol style="list-style-type: none">1. Make a 15 psi reduction in Position 4.2. Immediately return to Position 1.3. Wait for the cylinder to release.4. Make a 30 psi reduction in Position 4.5. Immediately return to Position 1.6. Wait for the cylinder to release.7. Charge to 90 psi.8. Close the flowrator by-pass cock and verify that the flowrator ball is below the top of the tube. Open the flowrator by-pass cock. |
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3.17 Accelerated Application Valve (AAV) Test

This test checks the accelerated application feature of AAV-equipped emergency portions. All emergency portions other than AB, ABD, and ABDS have an AAV feature.

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| <ol style="list-style-type: none">1. Move the rotary valve handle to Position 4. |
| TEST 3.17.1 —While the brake pipe is reducing, there must be an exhaust at the emergency portion. |
| TEST 3.17.2 —This test must not produce an emergency application. |
| <ol style="list-style-type: none">2. Continue the reduction to a pressure of 60 psi on the brake pipe gauge.3. Place the rotary valve handle in Position 3.4. If the brake pipe reduction continues to drop below 60 psi after the rotary valve handle is placed in Position 3, do the following:<ul style="list-style-type: none">• Move the handle to Position 2 until the brake pipe stops reducing.• Then move it back to Position 3. |
| TEST 3.17.3 —The brake pipe reduction must stop. |
| <ol style="list-style-type: none">5. The continuous exhaust at the emergency portion must not continue after the brake pipe reduction is stopped or after using Position 2 to stop the decrease of pressure. |

3.18 Recheck of Piston Travel [without Block(s), if Car Is Equipped with Automatic Slack Adjuster]

Unless the brake pipe pressure has already been reduced to 60 psi in the accelerated application valve test, do the following:

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| <ol style="list-style-type: none">1. Make a 30 psi reduction with the rotary valve handle beginning in Position 5.2. When pressure reaches 65 psi, slowly return the rotary valve handle through Position 4 to Position 3 until the brake pipe pressure is 60 psi.3. Recheck piston travel to determine if the slack adjuster is working properly. |
| TEST 3.18.1 —Piston travel must be within $\pm 1/2$ in., measured and noted previously in test 3.9.1, and piston travel must be within the nominal range shown in the <i>Field Manual of the AAR Interchange Rules</i> , Rule 3. |
| <ol style="list-style-type: none">4. The slack adjuster may need to be cycled with two or more air brake applications. The final application must be a full-service application made with the equipment charged to 90 psi so that the flowrator ball floats below the top of the tube.5. If the slack adjuster is found to be defective, continue with the single-car test. After the single-car test is completed, make necessary repairs and/or replace the slack adjuster; and test the slack adjuster according to paragraph 4.1. |

IMPLEMENTED 08/2018

3.19 Manual Release Valve Test

<ol style="list-style-type: none"> 1. Move the rotary valve handle to Position 5. 2. Allow brake pipe pressure to decrease to 0 psi. 3. Pull the handle of the brake cylinder release rod or common release rod through its full travel, hold it for 3 seconds, and then release it. 4. Verify that the release rod does not bind or foul through the range of travel.
TEST 3.19.1 —The brake cylinder piston must return to the release position and remain there.
<ol style="list-style-type: none"> 5. Place the rotary valve handle in Position 1 and verify that the regulator valve is in the high-pressure position.
TEST 3.19.2 —The brake cylinder piston must remain in the release position during charging.
<ol style="list-style-type: none"> 6. If the car is empty and equipped with an empty/ load device, go to paragraph 3.20. 7. If the car is loaded or not equipped with an empty/load; 8. Move the rotary handle to Position 1 until the pressure is 80 psi. 9. Place the rotary valve handle in Position 5 and allow the brake pipe pressure to decrease to 0 psi.
TEST 3.19.3 —Brakes must apply.
<ol style="list-style-type: none"> 10. Go to paragraph 3.21, step 1.

3.20 Empty/Load Test

Follow these steps if the car is equipped with an empty/load device and the car is empty.

<ol style="list-style-type: none"> 1. Move the rotary valve handle to Position 1. 2. Verify that the regulator valve is in the high-pressure position. 3. Set the empty/load valve to the empty position. 4. For side frame sensing devices, remove the block that was previously placed under the sensing arm. 5. For slope sheet sensing devices, do one of the following: <ul style="list-style-type: none"> • Remove the pin (Ellicon-National). • Device may reset automatically. Ensure that the lockout button is extended (WABTEC). • Pull out the key chain ring (NYAB). 6. Wait until the flowrator ball floats below the top of the tube. 7. Place the rotary valve handle in Position 5. 8. Allow the brake pipe pressure to decrease to 0 psi.
TEST 3.20.1 —The brakes must apply.
TEST 3.20.2 —The brake cylinder pressure must be at least 17 psi lower than the final full service pressure noted in test 3.9.5.
<ol style="list-style-type: none"> 9. Soap the empty/load device, the equalizing reservoir, and associated piping.
TEST 3.20.3 —No leakage is allowed.

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**AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment**

S-486

3.21 Disconnecting the Single-Car Test Device

1. Remove the brake cylinder gauge.
2. Soap the male brake cylinder pressure tap.

TEST 3.21.1—No leakage is allowed.

3. If a separate emergency vent valve was previously plugged, remove the plug and replace the vent protector.
4. If the B-1 quick-service valve was previously plugged, remove the plug and replace the (wasp excluder) vent protector.
5. If a separate emergency portion was cut out, open the cut-out cock.
6. Secure the car to prevent movement.
7. Shut off the air supply to the test device or place the rotary valve handle in Position 3.
8. Open the 3/8-in. cock and disconnect the test device.
9. Drain car reservoirs.
10. If a car is empty and equipped with an empty/load device, return the empty/load valve to the empty position.
 - For side frame sensing devices, remove the block that was previously placed under the sensing arm.
 - For slope-sheet sensing devices, do one of the following:
 - ~ Remove the pin (Elcon-National).
 - ~ Device may reset automatically; ensure lockout button is extended (WABTEC).
 - ~ Pull out the Key Chain Ring (NYAB).
11. Remove the dummy coupling.

IMPLEMENTED 08/2018

4.0 SPECIAL TESTS

Perform the following inspections and services in accordance with applicable *Field Manual of the AAR Interchange Rules*.

Note: If any test fails, refer to the test’s troubleshooting and restart requirements.

Caution: During inspections, if the brake system is charged, the possibility exists that the brakes will apply, particularly if the supply pressure is lost. Do not remove the brake cylinder pressure tap, or any other component in the brake cylinder line, with brakes applied.

For any repair, replacement, or readjustment required, refer to the original equipment manufacturer’s instructions.

4.1 Slack Adjuster Test and Piston Travel Adjustment

This test is intended to check the performance of a slack adjuster. If the car has a separate emergency vent valve, it does not need to be plugged.

Complete paragraph 3.1, “Preliminary Procedures, Inspections, and Car Set-Up,” and paragraph 3.2, “Connecting the Device to the Car,” prior to conducting the test.

Note: For cars equipped with empty/load devices, all test procedures must be performed in the loaded condition as indicated in test 4.1.3. Cars with empty/load devices that automatically reset to the empty position must be manually reset to the loaded condition for each of the tests defined herein. For troubleshooting procedures, reference Appendix A, test 3.9.1.

<ol style="list-style-type: none"> 1. With the branch pipe cut-out cock open and the rotary valve in Position 1, charge the brake pipe to 90 psi so that the flowrator ball floats below the top of the tube. 2. Move the rotary valve to Position 4, reduce brake pipe pressure to 60 psi, and move the rotary valve to Position 3.
<p>TEST 4.1.1—Measure and note brake cylinder piston travel. Piston travel must be within the nominal range shown in the <i>Field Manual of the AAR Interchange Rules</i>.</p>
<ol style="list-style-type: none"> 3. Place the rotary valve handle in Position 1 and completely recharge the car to 90 psi so that the flowrator ball floats below the top of the tube. 4. Install block(s) between the brake shoe and the wheel at one end of the car. Cars with multiple slack adjusters must have blocks installed at each slack adjuster location. CAUTION: Do not put your hand between the brake head and the wheel because a loss of supply air pressure will cause the brakes to apply. 5. Make a 30 psi reduction in Position 4. Move the rotary valve handle to Position 1 to release. Repeat this process two additional times, waiting until the piston fully retracts between cycles. Note: If the car is equipped with an empty/load that has an automatic reset feature, the car must be reset to the loaded setting for each application. 6. Place the rotary valve handle in Position 1 and completely charge the car to 90 psi so that the flowrator ball floats below the top of the tube. 7. Move the rotary valve to Position 4, reduce brake pipe pressure to 60 psi, and move the rotary valve to Position 3.
<p>TEST 4.1.2—Measure and note brake cylinder piston travel. Piston travel must be within $\pm 1/2$ in. of that measured in test 4.1.1.</p>
<ol style="list-style-type: none"> 8. Place the rotary valve handle in Position 1 and charge the car to 90 psi so that the flowrator ball floats below the top of the tube. Remove block(s) between the shoe(s) and wheel(s). 9. Make a 30 psi reduction in Position 4. Move the rotary valve handle to Position 1 to release. Repeat this process two additional times, waiting until the piston fully retracts between cycles. Note: If the car is equipped with an empty/load that has an automatic reset feature, the car must be reset to the loaded setting for each application. 10. Place the rotary valve handle in Position 1 and completely charge the car to 90 psi so that the flowrator ball floats below the top of the tube.

IMPLEMENTED 08/2018

AAR Manual of Standards and Recommended Practices Brakes and Brake Equipment

S-486

IMPLEMENTED 08/2018

11. Move the rotary valve to Position 4, reduce brake pipe pressure to 60 psi, and move the rotary valve to Position 3.
TEST 4.1.3 —Measure and note brake cylinder piston travel. Piston travel must be within $\pm 1/2$ in. of that measured in test 4.1.2.
12. Move the rotary valve handle to Position 3 and open the test device 3/8-in. cock. This test may or may not produce an emergency application. Note: If a car is empty and equipped with an empty/load device, return the empty/load valve to the empty position. <ul style="list-style-type: none"> • For side frame sensing devices, remove the block that was previously placed under the sensing arm. • For slope-sheet sensing devices, do one of the following: <ul style="list-style-type: none"> ~ Remove the pin (Ellcon-National). ~ Device may reset automatically; ensure lockout button is extended (WABTEC). ~ Pull out the Key Chain Ring (NYAB).
13. Complete the test starting from paragraph 3.21, “Disconnecting the Single-Car Test Device.”

4.2 Retaining Valve Test

Complete paragraph 3.1, “Preliminary Procedures, Inspections, and Car Set-Up,” and paragraph 3.2, “Connecting the Device to the Car,” prior to conducting the test.

Note: For cars equipped with empty/load devices, all test procedures must be performed in the loaded position as indicated in paragraph 3.1.1. Cars with empty/load devices that automatically reset to the empty position must be manually reset to the loaded condition for each of the tests defined herein. For troubleshooting procedures, reference Appendix A, test 3.12.1 and test 3.12.2.

1. With the branch pipe cut-out cock open and the rotary valve in Position 1, charge the brake pipe to 90 psi so that the flowrator ball floats below the top of the tube.
2. Place the rotary valve handle in Position 6 and quickly open the test device 3/8-in. cock to make an emergency application.
3. Turn the handle of the retaining valve to the high-pressure (HP) position.
4. Wait 1 minute.
5. Close the test device 3/8-in. cock.
6. Move the rotary valve handle to Position 1 to move the control valve to the release position.
7. Wait for 4 minutes.
TEST 4.2.1 —The brakes must remain applied and brake cylinder pressure must be equal to or greater than 12 psi.
8. Remove the brake cylinder gauge and soap the male pressure tap. No leakage is allowed.
TEST 4.2.2 —Turn the retaining valve handle to the Direct Exhaust (EX) position. A blow of air must be noted at the retaining valve exhaust.
Note: If a car is empty and equipped with an empty/load device, return the empty /load valve to the empty position. <ul style="list-style-type: none"> • For side frame sensing devices, remove the block that was previously placed under the sensing arm. • For slope-sheet sensing devices, do one of the following: <ul style="list-style-type: none"> ~ Remove the pin (Ellcon-National). ~ Device may reset automatically; ensure lockout button is extended (WABTEC). ~ Pull out the Key Chain Ring (NYAB).
9. Complete the test starting from paragraph 3.21, “Disconnecting the Single-Car Test Device.”

4.3 Auxiliary Devices

Other auxiliary devices (such as relay valves and modulating valves) are to be tested in accordance with the original equipment manufacturer's specifications.

4.4 Brake Cylinder Pressure Tap Leakage Test

This test checks for leakage of a newly applied male brake cylinder pressure tap.

Complete paragraph 3.1, "Preliminary Procedures, Inspections, and Car Set-Up," and paragraph 3.2, "Connecting the Device to the Car," prior to conducting the test.

A brake cylinder gauge is not required for this test.

Note: For cars equipped with empty/load devices, all test procedures must be performed in the loaded position as indicated in paragraph 3.1.1. Cars with empty/load devices that automatically reset to the empty position must be manually reset to the loaded condition for each of the tests defined herein. For troubleshooting procedures, reference Appendix A, test 3.21.1.

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| <ol style="list-style-type: none">1. With the branch pipe cut-out cock open and the rotary valve in Position 1, charge the brake pipe to 90 psi until the ball floats below the top of the tube.2. Move the rotary valve handle to Position 3 and open the test device 3/8-in. cock. This test may or may not produce an emergency application. |
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TEST 4.4.1 —Soap the brake cylinder pressure tap and threads for leakage. No leakage is allowed.

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| <ol style="list-style-type: none">3. If the empty/load device on an empty car was set to the loaded position, return the setting to the empty position.4. Complete the test as described in paragraph 3.21, "Disconnecting the Single-Car Test Device." |
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IMPLEMENTED 08/2018

AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment

S-486

4.5 Brake Cylinder Leakage Test

Complete paragraph 3.1, “Preliminary Procedures, Inspections, and Car Set-Up” and paragraph 3.2, “Connecting the Device to the Car,” prior to conducting the test.

Note: For cars equipped with empty/load devices, all test procedures must be performed in the loaded position as indicated in paragraph 3.1.1. For troubleshooting procedures, reference Appendix A, test 3.14.1 and test 3.14.2.

If the markings on the service valve under test identify it as having the Brake Cylinder Maintaining feature, conduct test 4.5B, otherwise conduct test 4.5A.

Refer to the *Field Manual of the AAR Interchange Rules*, Rule 4, for valve identification information.

A.

1. With the branch pipe cut-out cock open and the rotary valve in Position 1, charge the brake pipe to 90 psi until the ball floats below the top of the tube.
2. Move the reducing valve handle to the low-pressure position while leaving the device handle in Position 1.
3. Brake pipe pressure will reduce to 80 psi.
TEST 4.5.1 —After the brake pipe pressure has stabilized at 80 psi, wait 3 minutes. Brake cylinder pressure must be between 12 and 30 psi.
TEST 4.5.2 —Note the pressure on the brake cylinder gauge.
TEST 4.5.3 —Wait an additional 1 minute and then recheck the brake cylinder gauge. No more than a 1 psi increase or decrease in brake cylinder pressure is allowed.
4. Complete the test starting from paragraph 3.21, “Disconnecting the Single-Car Test Device.”

B.

1. Remove the retaining valve and replace it with a CM retaining valve test fixture while the system is charging.
2. After the car has had sufficient time to charge (approximately 8 minutes), close the flowrator by-pass cock.
TEST 4.5.4 —Soap both reservoir pipes, fittings, and gaskets. No leakage is allowed.
3. Charge to 90 psi so that the flowrator ball floats below the top of the tube. Ensure that the piston is fully released.
4. Move the rotary valve handle to Position 4 and reduce brake pipe pressure to 87 psi.
5. Promptly return the rotary valve handle to Position 3.
TEST 4.5.5 —Brakes must apply.
6. Move the reducing valve handle to the low-pressure position.
7. Move the rotary valve handle to Position 1. Brake pipe pressure must be at or above 80 psi.
TEST 4.5.6 —Brake cylinder pressure must be above 17 psi.
8. Ensure that the CM retainer test fixture ball valve is closed.
9. Move the reducing valve handle to the high-pressure position.
TEST 4.5.7 —Soap the retainer test fixture and associated retainer piping. No leakage is allowed.
10. Wait 1 minute.
11. Note the brake cylinder pressure.
12. Wait 1 minute.
13. Note the brake cylinder pressure.
TEST 4.5.8 —No more than a 1 psi increase or decrease in brake cylinder pressure is allowed.
14. Open the test fixture ball valve and vent the brake cylinder to 0 psi.
15. Confirm that the brake cylinder pressure is 0 psi and the brake cylinder piston is retracted. Remove the test fixture and reapply the retaining valve.

IMPLEMENTED 08/2018

4.6 Empty/Load Test

Perform the following test after empty/load equipment has been replaced and properly adjusted. When empty/load equipment is installed on a car, the equipment must be installed and adjusted according to the original equipment manufacturer’s instructions.

Complete paragraph 3.1, “Preliminary Procedures, Inspections, and Car Set-Up” and paragraph 3.2, “Connecting the Device to the Car,” prior to conducting the test.

Note: For cars equipped with empty/load devices, all test procedures must be performed in the loaded condition with the control valve cut in as indicated in paragraph 3.1.1. For troubleshooting procedures, reference Appendix A, test 3.20.2 and test 3.20.3.

<ol style="list-style-type: none"> 1. With the branch pipe cut-out cock open and the rotary valve in Position 1, charge the brake pipe to 90 psi until the ball floats below the top of the tube. 2. Move the reducing valve handle to the low-pressure position while leaving the device handle in Position 1. 3. Brake pipe pressure will continue to drop to 80 psi.
<p>TEST 4.6.1—After the brake pipe pressure has stabilized at 80 psi, wait 3 minutes. Brake cylinder pressure must be greater than 12 psi.</p>
<p>TEST 4.6.2—Note the pressure on the brake cylinder gauge.</p>
<p>TEST 4.6.3—Wait 1 minute and then recheck the brake cylinder gauge. No more than a 1 psi increase or decrease in brake cylinder pressure is allowed.</p>
<ol style="list-style-type: none"> 4. Move the reducing valve handle to the high-pressure position. 5. Place the rotary valve handle in Position 1 and charge the equipment to 90 psi until the ball floats below the top of the tube. 6. Move the rotary valve handle to Position 4 and reduce the brake pipe pressure to 60 psi as indicated on the single-car test device gauge.
<p>TEST 4.6.4—Note the brake cylinder pressure and compare it to that taken in test 4.6.5.</p>
<ol style="list-style-type: none"> 7. Place the rotary valve handle in Position 1 and charge the equipment to 90 psi until the ball floats below the top of the tube. 8. Set the empty/load equipment to the empty position. Note: If a car is empty and equipped with an empty/load device, return the empty /load valve to the empty position. <ul style="list-style-type: none"> • For side frame sensing devices, remove the block that was previously placed under the sensing arm. • For slope-sheet sensing devices, do one of the following: <ul style="list-style-type: none"> ~ Remove the pin (Ellicon-National). ~ Device may reset automatically; ensure lockout button is extended (WABTEC). ~ Pull out the Key Chain Ring (NYAB). 9. Place the rotary valve handle in Position 4 and allow the brake pipe pressure to decrease to 0 psi as indicated on the single-car test device gauge.
<p>TEST 4.6.5—The brake cylinder pressure must be at least 17 psi lower than the final full service pressure noted in test 4.6.4.</p>
<p>TEST 4.6.6—Soap the empty/load device, the equalizing reservoir, and associated piping. No leakage is allowed.</p>
<ol style="list-style-type: none"> 10. Complete the test starting from paragraph 3.21, “Disconnecting the Single-Car Test Device.”

IMPLEMENTED 08/2018

**AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment**

S-486

5.0 QUARTERLY TEST FOR TESTING THE DEVICE (USING THE TEST APPARATUS IN FIG. 5.2)

1. To secure reliable and uniform results with the single car testing device, it must be kept free from leakage and must be completely disassembled, cleaned, and tested not less frequently than every 92 days after being placed in service, or more often if necessary. Any leakage other than leakage from the reducing valve must be corrected. Leakage from the bleed vent of the reducing valve is normal. Rubber parts need to be replaced only as necessary. No device may remain in service past 1 year from the last quarterly test date. The test device, brake cylinder pressure gauge, and test coupling must be dated when given a quarterly test. The test device, brake cylinder pressure gauge, and test coupling must be dated or tagged with the next calibration due date when placed in service, and can remain in service for a maximum of 92 days. No device may remain in service past 1 year from the last quarterly test date.
2. The rotary valve must be lubricated with oil (*MSRP* Specification M-912). Lubricate the standard quick-opening diaphragm cock with a small amount of grease.
3. Confirm that the rotary has been modified with the diameters detailed in paragraph 2.0 and that the rotary is stamped with the number "13" per Fig. 5.1.

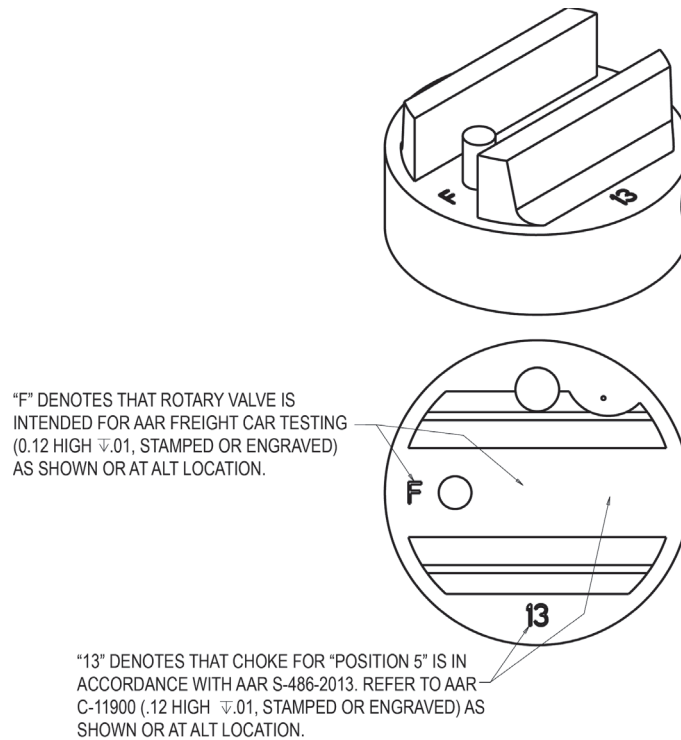


Fig. 5.1 Rotary valve date stamp details

IMPLEMENTED 08/2018

4. The single car test gauge must be compared with a master gauge for accuracy as often as the test device itself is being tested. The master gauge must be checked for accuracy annually or as required. See *MSRP Standard S-465*, for complete test apparatus test requirements.
5. Attach the end of the test device marked "BP" to the volume reservoir coupling of the test rack (Fig. 5.2) and then couple the supply line to the test device end marked "MR."

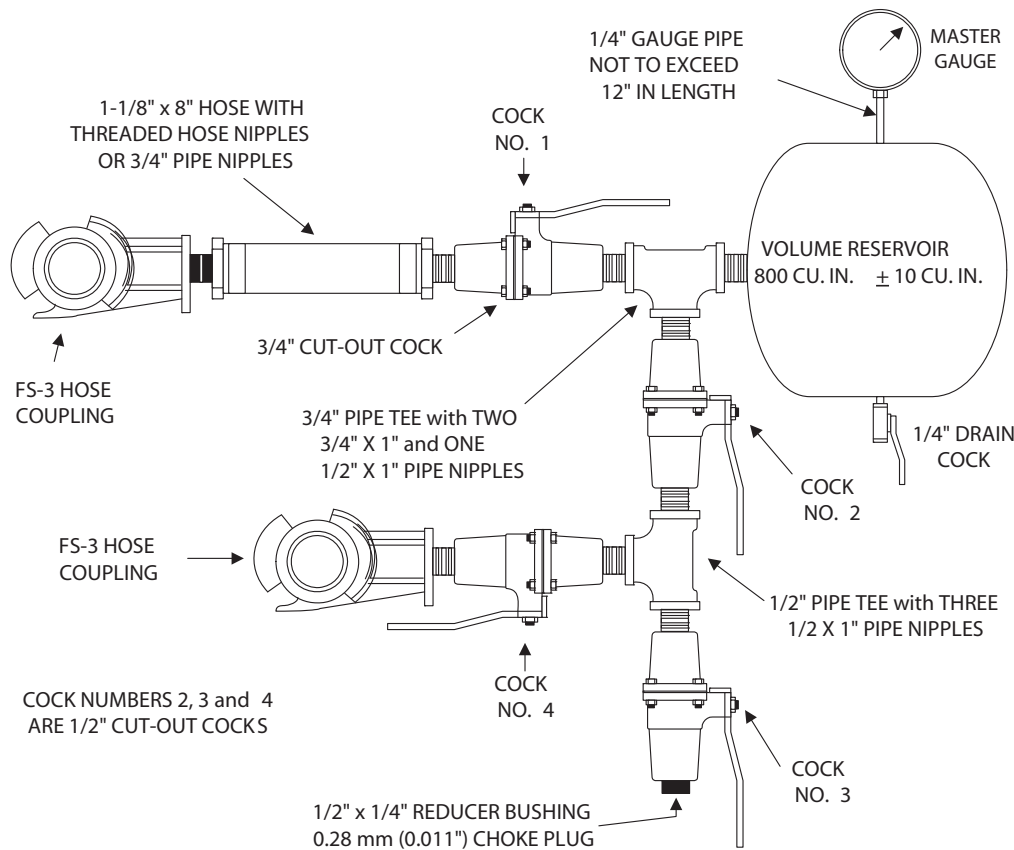


Fig. 5.2 Device for quarterly test of the single car testing device—alternate 1

6. The supply line pressure must be maintained above 90 psi by means of a suitable regulating valve. (It is recommended that this regulating valve setting be at least 10 psi greater than the test pressure.)
7. Operate the valve several times by moving the device handle from Position 1 to Position 6, finally leaving the handle in Position 3 (lap). Open the flowrator by-pass cock.
8. With the device handle in Position 3 (lap) and cocks 1, 2, 3, and 4 closed, open the supply cock and test device 3/8-in. cock. Coat the opening of the 3/8-in. cock with soap suds to detect rotary valve leakage to the brake pipe. Leakage must not exceed a 1-in. bubble in 5 seconds.
9. Close the 3/8-in. cock, move the test device handle to Position 6, and coat the device exhaust port with soap suds. Leakage must not exceed a 1-in. bubble in 5 seconds. Repeat the test in Positions 5, 4, 3, 2, and 1 consecutively. With the test device handle in Position 1, soap the glad hand connection between the test device and the test rack. No leakage is permitted.
10. Set the test device in the low-pressure position, open cock 2, and then open cock 1. After the reservoir is charged to 80 psi, compare the reservoir test gauge and the test device black hand and note that the gauge hands register within 1/2 psi. Reset the test device to the high-pressure position. After the reservoir is charged to 90 psi, compare the reservoir test gauge and the test device red and black hands and note that the gauge hands register within 1/2 psi.

IMPLEMENTED 08/2018

AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment

S-486

11. Move the rotary valve handle to Position 3. Observe the device gauge for a period of 1 minute. No leakage is permitted. Move the device handle to Position 1.

TEST 5.1—Close the flowrator by-pass cock. There must be no indication of air flow. Open the flowrator by-pass cock and open cock 3, allowing air to vent through the .28-mm (.011-in.) choke fitting on the test rack. Then close the flowrator by-pass cock. The ball must rise and float in the tube in the zone between the condemning line and the top of the tube.

12. If the flowrator fails to pass this test, check the calibrating choke according to step 14 and repeat test 5.1. If the calibrating choke has been checked, the ball and the glass tube of the flowrator must be cleaned to remove all oil or foreign matter that may have been carried into the device. When the tube is properly installed, the dot on the tube must be below the condemning line.

13. If the flowrator passes this test, close cock 2 and wait until flow of air from the .28-mm choke fitting stops. Close cock 3. Open the flowrator by-pass cock. Proceed to paragraph 5.2 and complete the test device test. If testing the test coupling, proceed to paragraph 5.1

14. Open cock 2 and the flowrator bypass cock. Charge the volume reservoir to 90 psi and wait 1 minute. Move the rotary valve handle to Position 3, open cock 3, and observe that the volume reservoir gauge reduces from 86 to 81 psi in 57 to 69 seconds. Close cock 2 and wait until flow of air from the .28-mm choke fitting stops. Close cock 3. If the choke fitting fails this test, carefully replace the filter and blow the choke clean. Do not use metal tools to clean the choke. An appropriate cleaning solution may be used as needed. Once the choke is cleaned or replaced, repeat test 5.1.

IMPLEMENTED 08/2018

5.1 Test Coupling Capacity Test

<ol style="list-style-type: none"> 1. Move the rotary valve handle to Position 1, open cock 1, and open the flowrator by-pass cock. Close cocks 3 and 4. Open cock 2. 2. Attach the test coupling to the FS-3 hose coupling. Charge the volume reservoir to 90 psi and wait 1 minute. Move the rotary valve handle to Position 3 and with the flowrator by-pass open, open cock 4.
TEST 5.1.1 —Observe that the volume reservoir gauge reduces from 86 to 81 psi within 58 to 70 seconds.
<ol style="list-style-type: none"> 3. Close cock 2 and wait until flow of air from the .28-mm choke fitting stops. Close cock 4. Remove the test coupling. If the choke fitting fails this test, carefully replace the filter and blow the choke clean. Do not use metal tools to clean the choke. An appropriate cleaning solution may be used as needed. Once the choke is cleaned or replaced, repeat paragraph 5.1.

5.2 Rotary Valve Calibration

<ol style="list-style-type: none"> 1. Close cocks 2, 3, and 4 and open the flowrator by-pass cock. Move the rotary valve handle to Position 1. Allow 1 minute for system charging. 2. Move the rotary valve handle to Position 3. Open the test device 3/8-in. cock.
TEST 5.2.1 —Volume reservoir must decrease from 90 to 30 psi in 1.0 to 1.5 seconds.
<ol style="list-style-type: none"> 3. Close the 3/8-in. cock. Move the rotary valve handle to Position 2 and charge the volume reservoir to 30 psi. Move the rotary valve handle to Position 3. Wait 1 minute. 4. Move the rotary valve handle to Position 2.
TEST 5.2.2 —Volume reservoir pressure must increase from 40 to 50 psi in 24 to 29 seconds.
<ol style="list-style-type: none"> 5. Move the rotary valve handle to Position 1. Wait 1 minute. 6. Move the rotary valve handle to Position 4.
TEST 5.2.3 — Volume reservoir pressure must decrease from 90 to 60 psi in 32 to 40 seconds.
<ol style="list-style-type: none"> 7. Move the rotary valve handle to Position 1. Wait 1 minute. 8. Move the rotary valve handle to Position 5.
TEST 5.2.4 —Volume reservoir must decrease from 90 to 40 psi in 4.5 to 5.5 seconds.
<ol style="list-style-type: none"> 9. Move the rotary valve handle to Position 1. Wait 1 minute. 10. Move the rotary valve handle to Position 6.
TEST 5.2.5 —Volume reservoir must decrease from 90 to 30 psi in 3 to 5 seconds.

IMPLEMENTED 08/2018

AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment

S-486

6.0 QUARTERLY TEST FOR TESTING THE DEVICE (USING THE TEST APPARATUS IN FIG. 6.1)

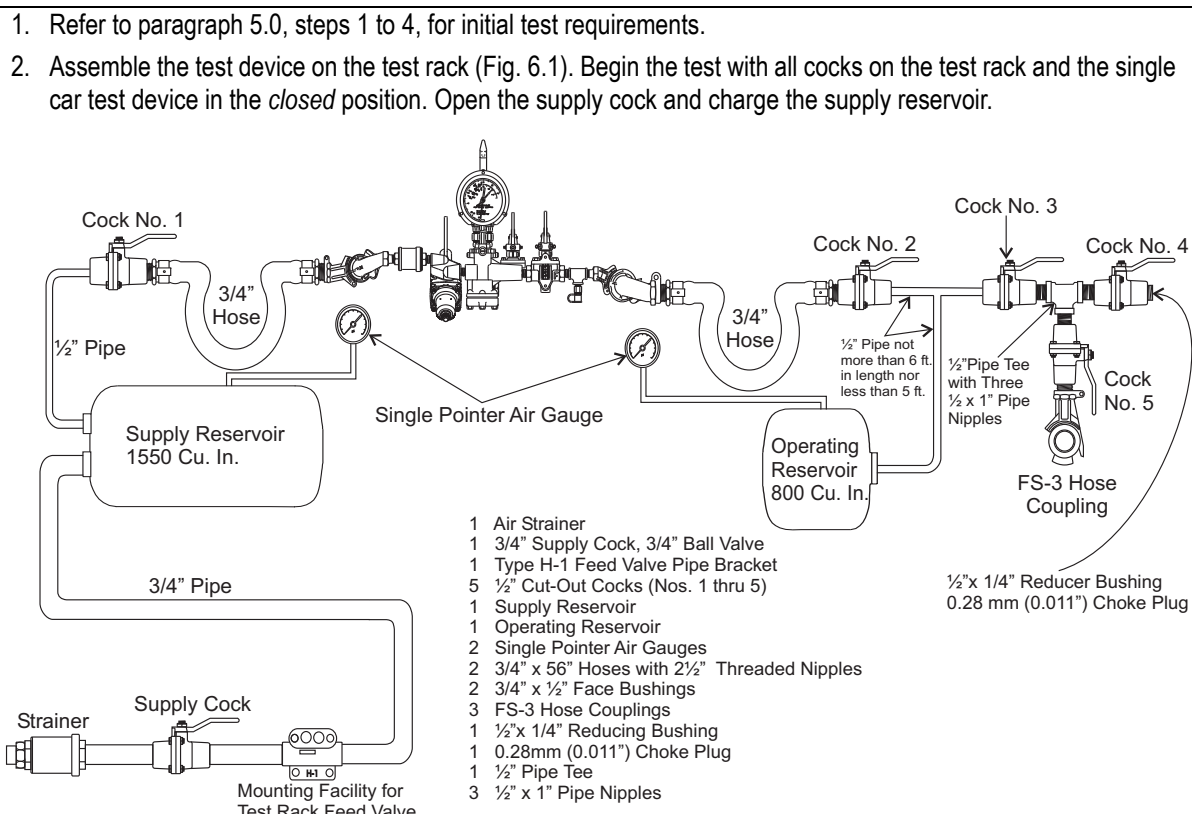


Fig. 6.1 Device for quarterly test of the single car testing device—alternate 2

1. Refer to paragraph 5.0, steps 1 to 4, for initial test requirements.
2. Assemble the test device on the test rack (Fig. 6.1). Begin the test with all cocks on the test rack and the single car test device in the *closed* position. Open the supply cock and charge the supply reservoir.
3. The supply line pressure must be maintained above 90 psi by means of a suitable regulating valve. (It is recommended that this regulating valve setting be at least 10 psi greater than the test pressure.)
4. Operate the valve several times by moving the rotary valve handle from Position 1 to Position 6, finally leaving the handle in Position 3 (lap). Open the flowrator by-pass cock.
5. Commence the test with all numbered cocks closed and the test rotary valve handle in Position 3 (lap). Open cock 1 and the test device 3/8-in. cock. Coat the opening of the 3/8-in. cock with soap suds to detect rotary valve leakage to the brake pipe. Leakage must not exceed a 1-in. bubble in 5 seconds.
6. Close the 3/8-in. cock, move the test rotary valve handle to Position 6, and coat the device exhaust port with soap suds in Positions 6, 5, 4, 3, 2, and 1 consecutively. Leakage must not exceed a 1-in. bubble in 5 seconds. With the test rotary valve handle in Position 1, soap the glad hand connection between the test device and the test rack. No leakage is permitted.
7. Set the test device in the low-pressure position, open cock 3, and then open cock 2. After the reservoir is charged to 80 psi, compare the reservoir test gauge and the test device black hand and note that the gauge hands register within 1/2 psi. Then reset the test device to the high-pressure position. After the reservoir is charged to 90 psi, compare the reservoir test gauge and the test device red and black hands and note that the gauge hands register within 1/2 psi.
8. Move the rotary valve handle to Position 3. Observe the device gauge for a period of 1 minute. No leakage is permitted. Move the rotary valve handle to Position 1.

TEST 6.1—Close the flowrator by-pass cock. There must be no indication of air flow. Open the flowrator by-pass cock and open cock 4, allowing air to vent through the .28-mm (.011-in.) choke fitting on the test rack. Then close the flowrator by-pass cock. The ball must rise and float in the tube in the zone between the condemning line and the top of the tube.

IMPLEMENTED 08/2018

9. If the flowrator fails to pass this test, check the calibrating choke according to step 11 and repeat test 6.1. If the calibrating choke has been checked, the ball and the glass tube of the flowrator must be cleaned to remove all oil or foreign matter that may have been carried into the device. When the tube is properly installed, the dot on the tube must be below the condemning line.
10. If the flowrator passes this test, close cock 2 and wait until flow of air from the .28-mm choke fitting stops. Close cock 3. Open the flowrator by-pass cock. Proceed to paragraph 6.2 and complete the test device test. If testing the test coupling, proceed to paragraph 6.1.
11. Open the flowrator bypass cock, move the rotary valve handle to Position 1, and charge the volume reservoir to 90 psi. Wait 1 minute. Move the rotary valve handle to Position 3 and with the flowrator by-pass open, open cock 4 and observe that the volume reservoir gauge reduces from 86 to 81 psi in 62 to 75 seconds. Close cock 3 and wait until flow of air from the .28-mm choke fitting stops. Close cock 4. If the choke fitting fails this test, carefully replace the filter and blow the choke clean. Do not use metal tools to clean the choke. An appropriate cleaning solution may be used as needed. Once the choke is cleaned or replaced, repeat test 6.1.

6.1 Test Coupling Capacity Test

1. Move the rotary valve handle to Position 1, open cocks 1 and 2, and open the flowrator by-pass cock. Close cocks 4 and 5. Open cock 3.
 2. Attach the test coupling to the FS-3 hose coupling. Charge the volume reservoir to 90 psi and wait 1 minute. Move the rotary valve handle to Position 3 and with the flowrator by-pass open, open cock 5.
- TEST 6.1.1**—Observe that the volume reservoir gauge reduces from 86 to 81 psi within 63 to 76 seconds.
3. Close cock 3 and wait until flow of air from the .28-mm choke fitting stops. Close cock 5. Remove the test coupling. If the choke fitting fails this test, carefully replace the filter and blow the choke clean. Do not use metal tools to clean the choke. An appropriate cleaning solution may be used as needed. Once the choke is cleaned or replaced, repeat paragraph 6.1.

6.2 Rotary Valve Calibration

1. Close cocks 3, 4, and 5 and open the flowrator by-pass cock. Move the rotary valve handle to Position 1. Allow 1 minute for system charging.
 2. Move the rotary valve handle to Position 3. Open the test device 3/8-in. cock.
- TEST 6.2.1**—Volume reservoir must decrease from 90 to 30 psi in 1.0 to 1.5 seconds.
3. Close the 3/8-in. cock. Move the rotary valve handle to Position 2 and charge the volume reservoir to 30 psi. Move the rotary valve handle to Position 3. Wait 1 minute.
 4. Move the rotary valve handle to Position 2.
- TEST 6.2.2**—Volume reservoir must increase from 40 to 50 psi in 24 to 29 seconds.
5. Move the rotary valve handle to Position 1. Wait 1 minute.
 6. Move the rotary valve handle to Position 4.
- TEST 6.2.3**—Volume reservoir must decrease from 90 to 60 psi in 32 to 40 seconds.
7. Move the rotary valve handle to Position 1. Wait 1 minute.
 8. Move the rotary valve handle to Position 5.
- TEST 6.2.4**—Volume reservoir must decrease from 90 to 40 psi in 4.5 to 5.5 seconds.
9. Move the rotary valve handle to Position 1. Wait 1 minute.
 10. Move the rotary valve handle to Position 6.
- TEST 6.2.5**—Volume reservoir must decrease from 90 to 30 psi in 3 to 5 seconds.

IMPLEMENTED 08/2018

AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment

S-486

7.0 BRAKE CYLINDER PRESSURE GAUGE

7.1 The brake cylinder pressure gauge shall be calibrated not less frequently than every 92 days. Electronic brake cylinder pressure gauges shall be calibrated once every 365 days or less.

7.2 The gauge shall be calibrated by using a calibrated single car test device or master gauge set at 28, 40, 60, and 80 psi (± 3 psi). The brake cylinder pressure gauge must read within ± 3 psi of the master gauge.

7.3 Apply a brake cylinder test gauge tag or sticker indicating the calibration date, initials of the person performing the test, and the date that the gauge or test coupling is due for the next calibration.

IMPLEMENTED 08/2018

**APPENDIX A
TROUBLESHOOTING PROCEDURES**

<p>Test 2.3.5—The flowrator ball must rise and float in the tube in the zone between the condemning line and the top of the tube.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • If the device fails, soap the test coupling glad hand to check for leakage and then inspect the .28-mm (.011-in.) choke to ensure that it is free of obstructions and that the filter is clean. • If necessary, replace the choke and the filter and repeat step 16. • Do not use metal tools to clean the choke because damage to the choke can result. If the flowrator fails the repeat test requirements, refer to the cleaning procedure for the flowrator tube outlined in the quarterly test (test 5.1 or test 6.1).
<p>Test 3.2.2.1—A continuous blow of air must occur from the open hose at the opposite end of the car.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate an obstruction in the train line. • Take corrective action; restart at step 2, repeat the test.
<p>Test 3.3.1—Close the flowrator by-pass cock. The top of the ball must stabilize below the condemning line.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate leakage in the brake pipe, branch-pipe, branch pipe cut-out cock, glad hands, hoses, or auxiliary venting valves and gaskets. • Leakage through the closed branch pipe cut-out cock can also cause a failure. Air exhausting from the release valve after pulling the release valve handle may indicate a defective branch pipe cut-out cock. • Take corrective action; restart at paragraph 3.2.2, step 2; repeat test.
<p>Test 3.4.1.1—The vent valve must not function, and brake pipe pressure must not be reduced to 0 psi.</p> <p>Troubleshooting: A failure of this test may indicate a defective vent valve.</p>
<p>Test 3.4.1.2—An intermittent exhaust at the quick-service valve must be observed during this reduction.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate a defective quick-service or vent valve. • Take corrective action; restart the test at paragraph 3.3, “Brake Pipe Leakage Test.”
<p>Test 3.4.3.1—The vent valve must not function, and brake pipe pressure must not be reduced to 0 psi.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate a defective vent valve. • Take corrective action; restart the test at paragraph 3.3, “Brake Pipe Leakage Test.”
<p>Test 3.4.3.2—The vent valve must function and immediately vent brake pipe pressure to 0 psi.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate a defective vent valve. • Take corrective action; restart the test at paragraph 3.3, “Brake Pipe Leakage Test.”
<p>Test 3.5.1—During charge, there must be no venting of air from the retaining valve, and the brake cylinder piston(s) must remain in the release position.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • If the piston remains extended or the exhaust at the retaining valve continues after the system is charged to 90 psi, this indicates a defective service portion. • If the piston retracts and the exhaust at the retaining valve stops when the system is charged to 90 psi, this indicates a defective emergency portion. • Take corrective action.

IMPLEMENTED 08/2018

**AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment**

IMPLEMENTED 08/2018

<p>Test 3.5.2—Soap both reservoir pipes, fittings, and gaskets. No leakage is allowed.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • No leakage is allowed. Completely drain system and repair as required.
<p>Test 3.5.3—The top of the ball must stabilize below the condemning line.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate the following: <ul style="list-style-type: none"> ~ Leakage at the combined reservoir, associated piping, and gaskets ~ Leakage at the control valve portions and associated gaskets • Take corrective action. <p>If repair is made to reservoir, reservoir pipe, gaskets, or control valves, restart the test at paragraph 3.5, “System Leakage Test.”</p> <ul style="list-style-type: none"> • A failure of this test may indicate the following: <ul style="list-style-type: none"> ~ Leakage in the brake pipe, branch-pipe, branch pipe cut-out cock, glad hands, hoses, or auxiliary venting valves and gaskets or at the open branch pipe cut-out cock • Take corrective action. <p>If repair is made to brake pipe, branch pipe cut-out cock, piping, hoses, gaskets, or auxiliary venting devices, restart the test at paragraph 3.2.2, step 2.</p>
<p>Test 3.5.1.4—No more than a 1 psi increase or decrease in brake cylinder pressure is allowed.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test for greater than a 1 psi increase may indicate the following: <ul style="list-style-type: none"> ~ Internal valve leakage resulting in a brake cylinder pressure increase ~ Defective service valve portion ~ Defective emergency valve portion • A failure of this test for greater than a 1 psi decrease may indicate the following: <ul style="list-style-type: none"> ~ Leakage at the emergency valve portion and associated gaskets ~ Leakage at the service valve portion and associated gaskets ~ Leakage at the brake cylinder, associated piping, pressure taps, and gaskets ~ Leakage at the empty/load pipes and associated gaskets • Soap all associated piping connections and hardware and hardware vent ports. • Take corrective action. <p>If any repair is made, restart the test at paragraph 3.5, “System Leakage Test.”</p>
<p>Test 3.6.1—With the hand brake in the released position, note that the brake cylinder piston push rod(s) has returned into the brake cylinder(s).</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate the following: <ul style="list-style-type: none"> ~ Defective hand brake ~ Broken brake cylinder return spring ~ Defective brake rigging
<p>Test 3.6.4—Verify that the drum chain is fully unwound and that the bell crank, if so equipped, drops to a lower limit and that there is minimal slack in the horizontal chain. To ensure minimal chain slack on body-mounted brake cylinders, the push-rod may need to be manually pushed into the full-release position.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • Failure of these tests may indicate a defective hand brake or associated components. • Take corrective action per original equipment manufacturer’s instructions and repeat paragraph 3.6, “Hand Brake Inspection.”

AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment

Test 3.8.2.1—This test must not produce an emergency application.

Troubleshooting:

Note: Ensure that pre-test instructions were followed:

- Vent valve plugged (if so equipped)
 - ~ Bleed/stabilizing ring pulled out (continuous blow of air)
- restart the test at paragraph 3.5, "System Leakage Test," as necessary.
- A failure of this test may indicate a defective emergency portion.
- Take corrective action and restart the test at paragraph 3.5, "System Leakage Test."

Test 3.8.2.2—The brake pipe reduction must stop. The continuous exhaust at the emergency portion must not continue after the brake pipe reduction is stopped or after using Position 2 to stop the decrease of pressure.

Troubleshooting:

- If the reduction does not stop or resumes when the handle is returned to Position 3, ensure that the bleed stem is in (no blow of air) and carefully check the separate venting device plug for leakage. If this plug leaks, repair and repeat restart the test at paragraph 3.5, "System Leakage Test." A failure of this test may indicate the following:
 - ~ A defective service portion
 - ~ A defective emergency portion
- A defective service portion can cause the brake pipe to continue reducing as indicated by a continuous vent at the bottom cover.
- A defective accelerated application valve (AAV) feature also can cause the brake pipe to continue reducing as indicated by a continuous vent at the emergency valve portion exhaust. A failure of this test may indicate excessive brake cylinder leakage or a defective emergency portion.
- Confirm that brake cylinder pressure has stabilized above 12 psi. Excessive brake cylinder leakage at the brake cylinder, cylinder pipe, gaskets, or control valves can result in a continuous decrease in brake pipe pressure.
- Take corrective action; restart the test at paragraph 3.5, "System Leakage Test."

Test 3.9.1—Measure and note brake cylinder piston travel. Piston travel must be within the nominal range shown in the Field Manual of the AAR Interchange Rules, Rule 3.

Troubleshooting:

- For Piston Travel adjustment refer to the *Field Manual of the AAR Interchange Rules*, Rule 3, "Correct Repairs."
- Ensure that the slack adjuster has stabilized. To ensure correct piston travel, the slack adjuster may need to be cycled with two or more air brake applications. The final application must be a full-service application made with the equipment charged to 90 psi so that the flowrator ball floats below the top of the tube.
- Confirm that the empty/load valve is in the loaded condition and that brake cylinder pressure has stabilized. Low brake cylinder pressure or excessive leakage at the brake cylinder, cylinder pipe, gaskets, or control valves can result in incorrect piston travel.
- Take corrective action and restart the test at paragraph 3.5, "System Leakage Test."
- A failure of this test may indicate incorrect piston travel adjustment.
- Piston travel must be adjusted according to original equipment manufacturer's instructions.
- A failure of this test may indicate a defective slack adjuster.
- Replace or repair the slack adjuster according to original equipment manufacturer's instructions.
- Take corrective action; restart the test at paragraph 3.5, "System Leakage Test."

IMPLEMENTED 08/2018

AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment

IMPLEMENTED 08/2018

<p>Test 3.9.3—Determine that all shoes are applied and are firmly set against the wheels to verify that associated linkage does not bind or foul.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none">• A failure of these tests may indicate bent, broken, excessively worn, or deformed components.
<p>Test 3.9.4—Brake cylinder pressure must be greater than 50 psi.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none">• A failure of this test may indicate that the car is equipped with a modulating valve or an empty/load valve that cannot be set in the loaded condition.• Cars that have been modified for application of high friction brake shoes and are equipped with a modulating valve or cars equipped with an empty/load valve that cannot be set in the loaded condition are not required to meet the 50 psi minimum pressure but must meet the 25-psi minimum cylinder pressure.• If equipped with a modulating valve or with an empty/load valve that cannot be set in the loaded condition and the cylinder is less than 25 psi, take corrective action as required.• Confirm that the car is not equipped with a modulating valve.• A failure of this test may indicate the following:<ul style="list-style-type: none">~ The empty/load valve is set in the empty condition~ Long piston travel• Confirm that the empty/ load valve is in the loaded condition and that the piston travel is within acceptable limits.• Ensure that the slack adjuster has stabilized. To ensure correct piston travel, the slack adjuster may need to be cycled with two or more air brake applications. The final application must be a full-service application made with the equipment charged to 90 psi so that the flowrator ball floats below the top of the tube.• If the empty/ load valve is found to be defective or in need of adjustment, take corrective action per original equipment manufacturer’s instructions; restart the test at paragraph 3.5, “System Leakage Test.”• If piston travel requires adjustment, restart the test at paragraph 3.5, “System Leakage Test.”• A failure of this test may indicate the brake system was not fully charged.• Confirm that the system was fully charged.• If system was not fully charged, the top of the ball must stabilize between the condemning line and the bottom of the tube. Ensure system is fully charged; restart the test at paragraph 3.5, “System Leakage Test.”• A failure of this test may indicate excessive brake cylinder or reservoir leakage.• Confirm that brake cylinder pressure has stabilized. Excessive brake cylinder leakage and/or reservoir leakage can result in test failure.• If repair is made to the brake cylinder, cylinder pipe, gaskets, modulating valve, empty/load valve, or control valve, restart the test at paragraph 3.5, “System Leakage Test.”
<p>Test 3.9.5—Take note of the brake cylinder pressure after the brake pipe pressure has stabilized for later comparison with paragraph 3.10, “Emergency Test,” and paragraph 3.20, “Empty/Load Test.”</p> <p>Troubleshooting:</p> <ul style="list-style-type: none">• Soap the male pressure tap and coupling. No leakage is allowed.• A failure of this test may indicate leakage at the brake cylinder pressure tap and or gauge.• Take corrective action; restart the test at paragraph 3.5, “System Leakage Test.”
<p>Test 3.10.2.1—This test must produce a control valve emergency application as indicated by the rapid venting of brake pipe pressure to 0 psi.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none">• A failure of this test may indicate defective emergency portion.• Take corrective action; restart the test at paragraph 3.5, “System Leakage Test.”

**AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment**

IMPLEMENTED 08/2018

<p>Test 3.10.2.2—The brake cylinder pressure must be at least 5 psi higher than the final full-service pressure noted in test 3.9.5.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate excessive brake cylinder or reservoir leakage. • Confirm that brake cylinder pressure has stabilized. Excessive brake cylinder leakage and/or reservoir leakage can result in test failure. • If repair is made to the brake cylinder, cylinder or reservoir pipe, gaskets, or control valve; restart the test at paragraph 3.5, “System Leakage Test.” • A failure of this test may indicate the following: <ul style="list-style-type: none"> ~ The empty/load valve is set in the empty condition ~ Long piston travel • Confirm that the empty/ load valve is in the loaded condition and that the piston travel is within acceptable limits. • Ensure that the slack adjuster has stabilized. To ensure correct piston travel, the slack adjuster may need to be cycled with two or more air brake applications. The final application must be a full-service application made with the equipment charged to 90 psi so that the flowrator ball floats below the top of the tube. • If the empty/ load valve is found to be defective or in need of adjustment, take corrective action per original equipment manufacturer’s instructions; restart the test at paragraph 3.5, “System Leakage Test.” • If piston travel requires adjustment, restart the test at paragraph 3.5, “System Leakage Test.” • A failure of this test may indicate a defective emergency portion. • Take corrective action; restart the test at paragraph 3.5, “System Leakage Test.”
<p>Test 3.11.1—Open the 3/8-in. cock and verify no presence of air exhausting.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate the following: <ul style="list-style-type: none"> ~ Defective emergency portion ~ Defective service portion • Take corrective action; restart the test at paragraph 3.5, “System Leakage Test.”
<p>Test 3.11.2—The brake pipe pressure must continue to rise, indicating that the emergency accelerated release feature is operating correctly.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate a defective emergency portion. • Take corrective action; restart the test at paragraph 3.5, “System Leakage Test.”
<p>Test 3.12.1—The brakes must remain applied, and brake cylinder pressure must be equal to or greater than 12 psi.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • Pressure below 12 psi may indicate the following: <ul style="list-style-type: none"> ~ Leakage at the retaining valve pipe and associated gaskets ~ Defective retaining valve ~ Leakage in brake cylinder or associated piping • Take corrective action; restart the test at paragraph 3.5, “System Leakage Test.”
<p>Test 3.12.2—A blow of air must be noted at the retaining valve exhaust.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate the following: <ul style="list-style-type: none"> ~ A defective retaining valve ~ An obstruction in the retaining valve piping • Take corrective action; restart the test at paragraph 3.5, “System Leakage Test.”

AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment

S-486

APPENDIX A

IMPLEMENTED 08/2018

Test 3.13.1—Brakes must apply.

Troubleshooting:

- A failure of this test may indicate that the system was not fully charged.
- A failure of this test may indicate a defective service valve portion.
- Take corrective action; restart the test at paragraph 3.5, "System Leakage Test."

Test 3.13.3—Brake pipe pressure must be at or above 80 psi.

Troubleshooting:

- The continuous exhaust at the emergency portion must not continue after the brake pipe reduction is stopped or after using Position 2 to stop the decrease of pressure.
- If the reduction does not stop or resumes when the handle is returned to Position 3, ensure that the bleed stem is in (no blow of air) and carefully check the separate venting device plug for leakage. If this plug leaks, repair and restart the test at paragraph 3.5, "System Leakage Test."
- A failure of this test may indicate a continuous vent of brake pipe pressure:
 - ~ A defective service portion
 - ~ A defective emergency portion
 - ~ A defective continuous quick service valve
- A defective service portion can cause the brake pipe to continue reducing as indicated by a continuous vent at the bottom cover.
- A defective accelerated application valve (AAV) feature also can cause the brake pipe to continue reducing as indicated by a continuous vent at the emergency valve portion exhaust or continuous quick service valve exhaust.
- Take corrective action; restart the test at paragraph 3.5, "System Leakage Test."
- A failure of this test may indicate excessive brake cylinder leakage.
- Confirm that brake cylinder pressure has stabilized at or above 12 psi. Excessive brake cylinder leakage at the brake cylinder, cylinder pipe, gaskets, or control valves can result in a continuous decrease in brake pipe pressure.
- If repair is made to the brake cylinder, cylinder pipe, or gaskets, restart at paragraph 3.13, "Minimum Application and Quick-Service Limiting Valve Test."

Test 3.14.1—Note the pressure on the brake cylinder gauge. Brake cylinder pressure must be between 12 and 30 psi.

Troubleshooting:

- Brake cylinder pressure not greater than 12 psi may indicate excessive brake cylinder leakage:
 - ~ Leakage at emergency valve portion and associated gaskets
 - ~ Leakage at service valve portion and associated gaskets
 - ~ Leakage at the brake cylinder, associated piping and gaskets
 - ~ Leakage at the Empty/Load pipes and associated gaskets
- Soap all brake cylinder fittings, correct the leakage, and repeat the test.
- If no leakage is found, the probable cause is a defective service portion.
- Take corrective action:
 - ~ If repair is made to reservoir, reservoir pipe, gaskets, or control valve portions, restart the test at paragraph 3.5, "System Leakage Test."
 - ~ If repair is made to brake cylinder, cylinder pipe, or gaskets, restart at paragraph 3.13, "Minimum Application and Quick-Service Limiting Valve Test."

AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment

IMPLEMENTED 08/2018

<p>Test 3.14.2—No more than a 1 psi increase or decrease in brake cylinder pressure is allowed.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test for greater than a 1 psi increase may indicate the following: <ul style="list-style-type: none"> ~ Internal valve leakage resulting in a brake cylinder pressure increase ~ Defective service valve portion ~ Defective emergency valve portion <p>To determine which portion may be defective, move the rotary valve handle to Position 5, increase the brake application to a 30 psi reduction; and then return the rotary valve handle to Position 3.</p> <ul style="list-style-type: none"> • After the brake pipe pressure has stabilized, wait 2 minutes and then note the brake cylinder pressure. • Wait another minute and then recheck the brake cylinder pressure. • If the brake cylinder pressure has increased, the emergency portion is defective or an internal leak exists in the reservoir separation plate between the auxiliary and emergency reservoirs. • If the brake cylinder pressure did not increase, then the service portion is defective. <p>A failure of this test for greater than a 1 psi decrease may indicate the following:</p> <ul style="list-style-type: none"> ~ Leakage at emergency valve portion and associated gaskets ~ Leakage at service valve portion and associated gaskets ~ Leakage at the brake cylinder, associated piping, pressure taps, and gaskets ~ Leakage at the empty/load pipes and associated gaskets <ul style="list-style-type: none"> • Take corrective action: <ul style="list-style-type: none"> ~ If repair is made to reservoir, reservoir pipe, gaskets, or control valve portions, restart the test at paragraph 3.5, “System Leakage Test.” ~ If repair is made to brake cylinder, cylinder pipe, or gaskets, restart at 3.12 Minimum Application and Quick Service Limiting Valve Test
<p>Test 3.14.3—The top of the flowrator ball must stay below the condemning line.</p> <p>Troubleshooting:</p> <p>A failure of this test for greater than a 1 psi decrease may indicate the following:</p> <ul style="list-style-type: none"> ~ Leakage at emergency valve portion and associated gaskets ~ Leakage at service valve portion and associated gaskets ~ Leakage at the brake cylinder, associated piping, and gaskets ~ Leakage at the empty/load pipes and associated gaskets <ul style="list-style-type: none"> • Take corrective action: <ul style="list-style-type: none"> ~ If repair is made to reservoir, reservoir pipe, gaskets, or control valve portions, restart the test at paragraph 3.5, “System Leakage Test.” ~ If repair is made to brake cylinder, cylinder pipe, or gaskets, restart at 3.12 Minimum Application and Quick Service Limiting Valve Test
<p>Test 3.15.1—Brake must release within the time specified in Table 3.1 as noted by exhaust of air at the retaining valve.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate a defective service valve portion. • Take corrective action; restart the test at paragraph 3.5, “System Leakage Test.”
<p>Test 3.17.1—While the brake pipe is reducing, there must be an exhaust at the emergency portion.</p> <ul style="list-style-type: none"> • A failure of this test may indicate a defective emergency valve portion.
<p>Test 3.17.2—This test must not produce an emergency application.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate a defective emergency valve portion.

AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment

IMPLEMENTED 08/2018

<p>Test 3.17.3—The brake pipe reduction must stop.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • The continuous exhaust at the emergency portion must not continue after the brake pipe reduction is stopped or after using Position 2 to stop the decrease of pressure. • If the reduction does not stop or resumes when the handle is returned to Position 3, ensure that the bleed stem is in (no blow of air) and carefully check the separate venting device plug for leakage. If this plug leaks, repair and restart the test at paragraph 3.17, “Accelerated Application Valve (AAV) Test.” • A failure of this test may indicate a defective emergency valve portion. • Take corrective action; restart the test at paragraph 3.5, “System Leakage Test.”
<p>Test 3.18.1—Piston travel must be within $\pm 1/2$ in., measured and noted previously in test 3.9.1, and piston travel must be within the nominal range shown in the Field Manual of the AAR Interchange Rules, Rule 3.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • For piston travel adjustment refer to the <i>Field Manual of the AAR Interchange Rules</i>, Rule 3, “Correct Repairs.” • Ensure that the slack adjuster has stabilized. To ensure correct piston travel, the slack adjuster may need to be cycled with two or more air brake applications. The final application must be a full-service application made with the equipment charged to 90 psi so that the flowrator ball floats below the top of the tube. • Confirm that the empty/ load valve is in the loaded condition and that brake cylinder pressure has stabilized. Low brake cylinder pressure or excessive leakage at the brake cylinder, cylinder pipe, gaskets, or control valves can result in incorrect piston travel. • Take corrective action and restart the test at paragraph 3.17, “Accelerated Application Valve (AAV) Test.” • A failure of this test may indicate a defective slack adjuster. • Piston travel must be adjusted and slack adjuster repaired or replaced according to original equipment manufacturer’s instructions. • Complete single car test; make necessary repairs and/or replace the slack adjuster; and test the slack adjuster according to paragraph 4.1.
<p>Test 3.19.3—Brakes must apply.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate a defective service valve portion. • Take corrective action; restart the test at paragraph 3.5, “System Leakage Test.”
<p>Test 3.20.1—The brakes must apply.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate a defective service valve portion. • Take corrective action; restart the test at paragraph 3.5, “System Leakage Test.”
<p>Test 3.20.2—The brake cylinder pressure must be at least 17 psi lower than the final full service pressure noted in test 3.9.5.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • A failure of this test may indicate the following: <ul style="list-style-type: none"> ~ Defective empty/load valve portion ~ Empty/load valve not in empty position or not adjusted correctly • Complete single car test; make necessary readjustment, repairs, and/or replacement to empty/ load equipment; and test according to paragraph 4.6.
<p>Test 3.20.3—No leakage is allowed.</p> <p>Troubleshooting:</p> <ul style="list-style-type: none"> • Complete single car test; make necessary readjustment, repairs, and/or replacement to empty/ load equipment; and test according to paragraph 4.6.

AAR Manual of Standards and Recommended Practices
Brakes and Brake Equipment

Test 3.21.1—No leakage is allowed.

Troubleshooting:

- A failure of this test requires replacement of the brake cylinder pressure tap. Test according to paragraph 4.4.

Test 5.1—Close the flowrator by-pass cock. There must be no indication of air flow. Open the flowrator by-pass cock and open cock 3, allowing air to vent through the .28-mm (.011-in.) choke fitting on the test rack. Then close the flowrator by-pass cock. The ball must rise and float in the tube in the zone between the condemning line and the top of the tube.

Troubleshooting:

- If the flowrator fails to pass this test, check the calibrating choke according to step 14 and repeat test 5.1. If the calibrating choke has been checked, the ball and the glass tube of the flowrator must be cleaned to remove all oil or foreign matter that may have been carried into the device. When the tube is properly installed, the dot on the tube must be below the condemning line.
- If the flowrator passes this test, close cock 2 and wait until flow of air from the .28-mm choke fitting stops. Close cock 3. Open the flowrator by-pass cock. Proceed to paragraph 5.2 and complete the test device test. If testing the test coupling, proceed to paragraph 5.1

Test 6.1—Close the flowrator by-pass cock. There must be no indication of air flow. Open the flowrator by-pass cock and open cock 4, allowing air to vent through the .28-mm (.011-in.) choke fitting on the test rack. Then close the flowrator by-pass cock. The ball must rise and float in the tube in the zone between the condemning line and the top of the tube.

Troubleshooting:

- If the flowrator fails to pass this test, check the calibrating choke according to step 11 and repeat test 6.1. If the calibrating choke has been checked, the ball and the glass tube of the flowrator must be cleaned to remove all oil or foreign matter that may have been carried into the device. When the tube is properly installed, the dot on the tube must be below the condemning line.
- If the flowrator passes this test, close cock 2 and wait until flow of air from the .28-mm choke fitting stops. Close cock 3. Open the flowrator by-pass cock. Proceed to paragraph 6.2 and complete the test device test. If testing the test coupling, proceed to paragraph 6.1.

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