

**Single Car Testing Device, Code of Tests
Freight Device
Pamphlet No. 5039-4 Sup. 1, January 1950
Adapted to Pipe Fitting Single Car Test Device;
Equivalent to Freight Device of 1/1950**

**Recommended Practice
RP-002-21**

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Abstract: This recommended practice provides an alternative device and code for testing air brake equipment found on freight, or formerly freight, cars operated by Tourist, Scenic, Historic and Excursion Railroad Operators.

Keywords: Air Brakes, Single Car Test, Inspection and Maintenance.

Summary: This document contains recommendations for an alternative air brake single car test device that may be constructed and used in accordance with the test code instructions provided within this document. This recommended practice is designed to complement Recommended Practice RP-001-21. The test codes provided in this document only apply to the alternative device for use in testing pre-AB, and AB air brake valves found on cars originally built for freight service.

Scope and purpose: This document provides a structured, systematic method for the testing of freight car air brake equipment, including obsolete or non-interchange cars used in Tourist, Scenic, Historic and Excursion Operations, for which railroad industry standards no longer apply, or are no longer supported. It applies to freight and passenger equipment that was constructed to applicable industry standards at the time of manufacture, which are no longer supported or maintained by the railroad industry.

This document represents a common viewpoint of those parties concerned with its provisions, namely Tourist, Scenic, Historic and Excursion Operators and their trade associations. The application of any recommended practices or guidelines contained herein is voluntary. Federal and/or state regulations may govern portions of an operation. In those cases, the government regulations take precedence over this publication. The Heritage Rail Alliance recognizes that for certain applications, the standards, or practices, as implemented by individual operators, may be more or less restrictive than those given in this document.

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Participants

The Heritage Rail Alliance (HRA) greatly appreciates the contributions of the **"Project 232"** Mechanical Group which provided the primary effort in the drafting of this document.

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Introduction

The pipe fitting single car test device to which this paper refers represents a joint effort of the HRA, Railroad Passenger Car Alliance (RPCA), and Federal Railroad Administration (FRA) to provide tourist and heritage railroads with a simple and economic alternative to a factory-made single car test device.

This effort was in response to changes made to 49 CFR Part 232 as of December 2020. Part 232 Appendix B governed air brake maintenance and inspection standards on heritage railroads. As of December 2020, Appendix B is now classified as Subpart H, and along with that formatting change comes the requirement that heritage railroads must develop a written maintenance plan for obsolete valves that are no longer covered in currently-published air brake maintenance standards (previously, Appendix B was silent on this matter, and gave no guidance). As of the writing of this paper, current Association of American Railroads (AAR) maintenance standards omit a few principal types of historic freight brake valves/systems; the AB-type, the K-type, the Quick Action (commonly H)-type, and Plain (commonly F)-type – essentially all freight valves that are older than the ABD-type.

A key component of an air brake maintenance plan for a piece of rolling equipment is providing a method by which there can be a reasonable level of insurance that the control valve and brake system will perform properly before the equipment is released for service, and will continue to perform properly during service for the foreseeable future. This insurance is provided by the single car test device. By

providing this device with proper porting and operating the device and brake system at specified air pressures, it can be determined that the necessary practical functions of the control valve and brake system are performing to manufacturer and AAR specifications.

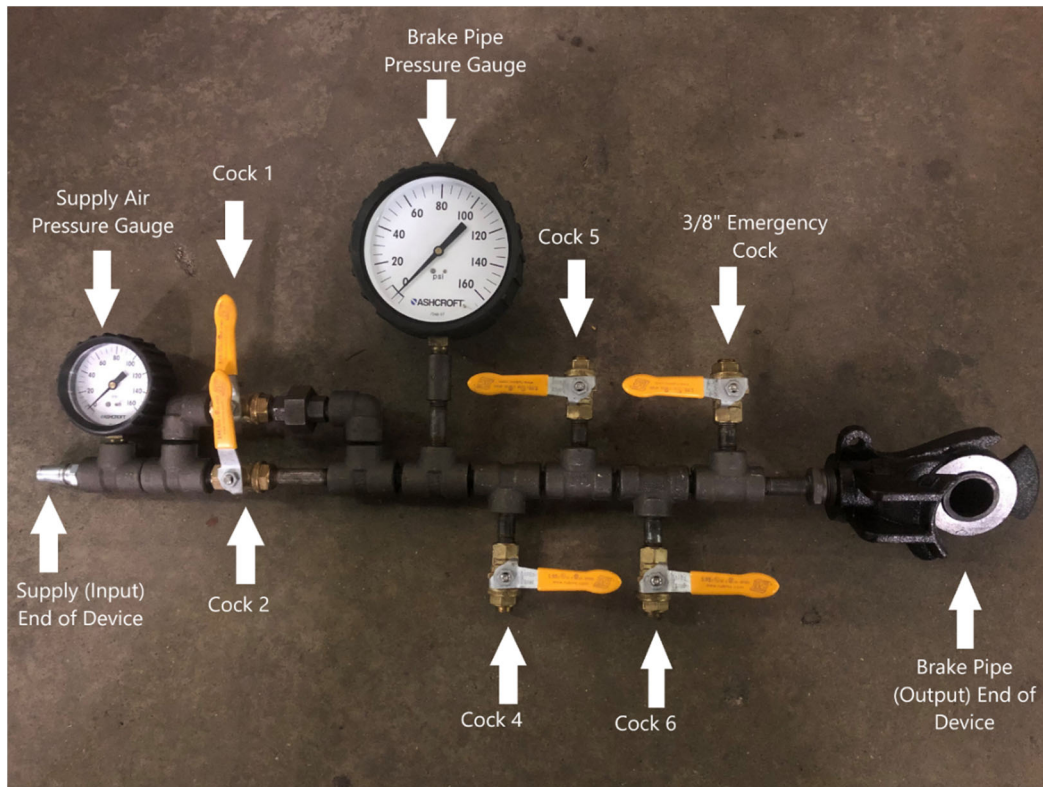
It is understood, however, that requiring a periodic single car test may place a burden upon some railroads not already equipped with an appropriate OEM device. Manual single car test devices are still available to some extent, but they are not inexpensive, nor easy to come by. It is to help alleviate this burden that the organizations named above developed a test device that can be constructed with simple, off-the-shelf pipe fittings detailed in Appendix A . It should be noted that this device was evaluated and tested against an OEM Single Car Test Device and found to function in an equivalent manner. Manufacturing a similar device with different dimensions or components may alter the performance of the resulting device and require a similar evaluation in that case. This device was constructed to meet the critical dimensions of the manual freight device in AAR's January 1950 Single Car Test Code. This device and code were chosen as they offered the latest revision of the simplest freight device possible – this was the last code in which the freight device lacked the air flow metering device known as the Flowrator, and also was the last to omit an integral supply air regulating valve. As the most modern "obsolete" freight control valve – the AB – had been in successful AAR interchange service for 17 years by 1950, it is believed that this edition of the test code and test device offers a sufficient level of safety and reliability for the level of service a control valve will need to provide on a heritage railroad.

The original January 1950 edition of the manufacturer and AAR approved freight device test code has been adapted to mate with the ball valve operation by which the pipe fitting device functions. Though the code was rewritten to accommodate the alternate construction of the pipe fitting device, the standards and end results meet the specifications of the original test code in every way.

Note that this device must be constructed with Schedule 80, minimum ½" diameter pipe fittings. Also, the device must be constructed with quarter turn ball valves, as opposed to globe-type valves or some other equivalent. This is to provide for quick and positive movement of each valve and positive port opening and closure, thereby mimicking the performance of the rotary valve of the OEM device. See Appendix A, Figure 3, for a schematic detailing the construction of this device. Air pressure gauges must meet requirements as called out in Figure 3.

When operating the pipe fitting device, care should be taken upon closing the exhaust cocks following a brake pipe reduction. If an exhaust valve is closed too quickly, this can cause a slight artificial rise in brake pipe pressure possibly falsely releasing the brakes. The caution noted here is the same that should be practiced when returning the rotary valve of an OEM device to position 3 following a brake pipe reduction.

Note also that this device is simply the direct equivalent of the OEM freight device; which is to say that the Brake Cylinder and Retaining Valve tests outlined in the referenced January 1950 test code are not affected by the use of this equivalent device, and these tests should be carried out according to the procedure contained within the original test code.



Photographic Illustration of Pipe Fitting Device*

*Note: Photo above is for illustrative purposes only. Device code text and Appendix A schematics must be used for proper construction of the device.

Critical porting of pipe fitting single car test device:

- **Cock 1** – supply line charges brake pipe through ¼" diameter orifice
- **Cock 2** – supply line charges brake pipe through .0225" (No. 74 drill) diameter orifice
- **"Position 3"** – not a physical valve or handle position; rather the equal of Position 3 on the factory device is met when all pipe fitting device cocks are closed, obtaining lap position
- **Cock 4** – brake pipe pressure reduces through .035" (No. 65 drill) diameter orifice
- **Cock 5** – brake pipe pressure reduces through .0781" (5/64" drill) diameter orifice
- **Cock 6** – brake pipe pressure reduces through .147" (No. 26 drill) diameter orifice

- **"3/8" Test Device Cock"** – brake pipe pressure reduces through .250" (1/4" drill) diameter orifice; cock termed as shown to maintain alignment with terminology on factory device

Test Code

All Freight Triple Valves Predating AB

The tests are to be made with the supply line feed valve adjusted for 70 to 90psi, depending upon nominal car length, as shown in the following table:

Feed Valve Pressure, psi	Car Length, feet
70	Under 50
80	From 50 to 70
90	From 70 to 90

Before the test apparatus is attached to the air supply line, the supply line must be blown out to clear it of any accumulated moisture or debris.

Daily Test for Testing Device

Before the device is connected to the supply line, the supply line must be blown out. Before coupling device to brake pipe, close all test device cocks and open the cock in the supply pipe for the purposes of testing device cock 1 and 2 leakage. There should be no escape of air from the brake pipe connection (output end) of the device.

After testing device cock 1 and 2 leakage, connect a dummy coupling to the output end of the device, then open cock 1, charging the device to full supply pipe pressure. Once device is fully charged, close cock 1, and check leakage of cocks 4, 5, 6, and device piping. There must no audible leakage from the cock outlets and device piping, and there must be no drop in pressure as shown by device brake pipe gauge.

Connecting Device to Car

Connect the output (brake pipe glad hand) end of the device to the brake pipe hose at one end of the car. Open cock 1. With both angle cocks open, note that a continuous blow of air from the open hose occurs at the end of the car opposite to where the device is connected. Close the angle cock at the end of the car opposite the test device, and fully charge the brake pipe and auxiliary reservoir to supply line feed valve pressure.

Between the testing device and the outlet hose coupling, which connects to the brake pipe hose on the car, the use of a hose is optional. If used, such outlet hose must be of $\frac{3}{4}$ " size with $\frac{1}{2}$ " connecting nipples and not greater than 8 feet in length.

1. Application Test

After a full brake pipe and auxiliary reservoir charge has been obtained, close cock 1, then open cock 4, reducing the brake pipe pressure 10psi, then close cock 4, thus effectively putting the device in "Position 3" (lap).

The brake must apply before the brake pipe pressure is reduced the amount specified. Failure to apply indicates the valve must be removed for further investigation. *Triple valves that fail to apply after a release with cock 1 must not be removed, unless they fail to apply after being released with cock 2.*

2. Brake Pipe Leakage Test

Open cock 5 and reduce the brake pipe pressure an additional 5psi, then carefully close cock 5.

Observe the pressure on the brake pipe gage. Leakage in the brake pipe will be indicated by a drop in pressure, which must not exceed 2psi in one minute.

3. Auxiliary Reservoir and Graduating Valve Leakage Test

During the brake pipe leakage test, if the triple valve releases the brake in less than one minute with the device in "Position 3" (lap), it indicates a leaky graduating valve, slide valve, a leak from the auxiliary reservoir volume, or a leak into the brake pipe past cocks 1 or 2 (though this last defect should be omitted by way of the device test prior to coupling the device to the car).

4. Release Test

Open cock 1 to charge the equipment to proper pressure. Close cock 1 and note that a full charge is obtained, which will be noted by a stable brake pipe at full pressure.

Open cock 4 and reduce brake pipe pressure 8psi, then close cock 4. Note that brakes apply. Allow 10 seconds for pressure to settle. Open cock 2. Brakes must release within 45 seconds. If triple valve fails to release, recheck brake pipe leakage, which must not exceed 2psi per minute. If the brake pipe leakage checks OK and the valve still fails to release, it indicates excessive piston ring leakage in the valve, and the valve must be removed for further investigation.

During the release test, the feed valve (supply line) pressure must not vary more than 2psi. When the variation is greater, means must be provided for maintaining a constant pressure and the release test repeated.

5. Emergency Test

Open cock 1 to recharge the brake pipe and auxiliary reservoir to proper pressure. Close cock 1. When testing triples on cars under 46 feet in length, open cock 6, reducing the brake pipe pressure 20psi. When testing triples on cars over 46 feet in length, open test device 3/8" cock (1/4" diameter orifice), reducing brake pipe pressure 20psi. This test must produce emergency. If emergency is not obtained prior to a 20psi brake pipe reduction, it indicates the valve must be removed for further investigation.

At the completion of the test, close previously opened exhaust cock (if still open) and open cock 1. Note that there is no prolonged blow at the triple valve exhaust, indicating that the quick action parts have assumed their normal position.

6. Service Stability Test

With cock 1 open, ensure that the brake pipe and auxiliary reservoir are recharged to proper pressure. Close cock 1, then open cock 5 and reduce brake pipe pressure 20psi. This test must not produce emergency. If an emergency application is obtained, the valve must be removed for further investigation.

At the completion of the test, open cock 6 to drain all brake pipe pressure. Once brake pipe is depleted, test device may be removed from car.

Test Code AB Valves

These tests are to be made with the supply line feed valve adjusted to 70psi. Before the test device is attached to the supply line, the line must be blown out to clear the line of any moisture or debris.

Daily Test for Testing Device

Before the device is connected to the supply line, the supply line must be blown out. Before coupling device to brake pipe, close all test device cocks and open the cock in the supply pipe for the purposes of testing device cock 1 and 2 leakage. There should be no escape of air from the brake pipe connection (output end) of the device.

After testing device cock 1 and 2 leakage, connect a dummy coupling to the output end of the device, then open cock 1, charging the device to full supply pipe pressure. Once device is fully charged, close cock 1, and check leakage of cocks 4, 5, 6, and device piping. There must no audible leakage from the cock outlets and device piping, and there must be no drop in pressure as shown by device brake pipe gauge.

Connecting Device to Car

Connect the output (brake pipe glad hand) end of the device to the brake pipe hose at one end of the car (preferably the "B" end). Open cock 1. With both angle cocks open, note that a continuous blow of air from the open hose occurs at either end of the car. Close the angle cock at the end of the car opposite the test device, and fully charge the brake pipe and auxiliary reservoir to supply line feed valve pressure.

After a minimum of 8 minutes, cock 1 may be closed at frequent intervals for five seconds at a time to determine whether the equipment is fully charged to 70psi. Insufficient charge or brake pipe leakage will be indicated by a drop in pressure as shown by the brake pipe gage. Though the AB system will, by nature, take longer to obtain an initial charge than earlier freight brake systems, the time required to obtain a full charge must not exceed 15 minutes.

Between the testing device and the outlet hose coupling, which connects to the brake pipe hose on the car, the use of a hose is optional. If used, such outlet hose

must be of $\frac{3}{4}$ " size with $\frac{1}{2}$ " connecting nipples and not greater than 8 feet in length.

1. Application Test

With the equipment fully charged to 70 psi, close cock 1 and open cock 4 until the brake starts to apply, then promptly close cock 4. The brake application must be obtained with a brake pipe reduction of not more than 3psi. The brake pipe reduction must continue to drop until the quick service limiting valve closes, so that the total brake pipe reduction is not less than 4psi or more than 10psi. A further drop in brake pipe pressure may be due to brake pipe leakage or failure of the quick service limiting valve to close.

*Note: When testing single cars equipped with "Type A" Quick Service Valve, a greater quick service activity will be indicated, and the brake pipe reduction may exceed the 10psi maximum specified above. If the total brake pipe reduction, however, exceeds 14psi, it may be due to excessive quick service limiting valve piston friction, or failure of the quick service limiting valve to close.

2. Brake Pipe Leakage Test

Make a further brake pipe reduction by opening cock 4 until a total brake pipe reduction of 15psi has been obtained, then carefully close cock 4. Observe the pressure on the brake pipe gage. Leakage in the brake pipe will be indicated by a drop on the gage which must not exceed 2psi per minute. If brake pipe leakage exceeds this limit and no brake pipe or associated piping leakage can be detected by use of soap suds, excessive leakage may be due to failure of quick service limiting valve to close. A slight pumping action of the emergency piston, indicated at quick action exhaust, will not affect the brake pipe leakage test.

3. Auxiliary Reservoir Leakage Test

During the brake pipe leakage test, if the AB valve releases the brake in less than one minute with the device in "Position 3" (lap; all cocks closed) it indicates a leaky graduating valve, slide valve, auxiliary reservoir, auxiliary reservoir pipe, or a leak into the brake pipe past test device cocks 1 or 2.

4. Release Test

Open cock 1 and charge the equipment to 70psi.

Close cock 1 and note that the equipment is fully charge which will be noted by the brake pipe gage stabilized at 70psi. Open cock 4 until brakes start to apply, then promptly close cock 4. Allow brake pipe pressure to continue to drop until the quick service limiting valve closes. Allow 10 seconds for pressure to settle. Open cock 2. Brakes must release within 45 seconds. If service portion fails to release during this test, recheck brake pipe leakage, which must not exceed 2psi per minute.

During the release test, supply line pressure must not drop below 70psi. If it does, means must be provided for supplying a constant pressure, and the release test repeated.

At the end of the test close cock 2.

5. Service Stability Test

Open cock 1 and charge the brake pipe and reservoirs to 70psi. Close cock 1, then open cock 5, reducing brake pipe pressure 20psi, then carefully close cock 5. This test must not produce an emergency application.

6. Emergency Test

Immediately following the 20psi brake pipe reduction in the previous test, open the test device 3/8" cock. This test must produce an emergency application, as indicated by the brake pipe pressure venting to zero.

*Note: In rare instances, failure to obtain an emergency application in Test No. 6 may be caused by a decrease in the quick action chamber volume in the pipe bracket due to the accumulation of excessive moisture or by a badly restricted quick action chamber charging choke.

7. Release Test after Emergency

At the completion of the emergency test, wait approximately one minute before attempting a release in order to permit the quick action chamber pressure to exhaust to atmosphere, then close the 3/8" emergency cock.

Open cock 1 and charge the brake pipe to 28psi, then immediately close cock 1, and note that the brake pipe pressure continues to rise, due to the air from the brake cylinder and auxiliary reservoir flowing into the brake pipe. This will indicate the emergency piston has moved to accelerated release position.

When the brake pipe, brake cylinder, and auxiliary reservoir pressures are nearly equalized, this additional flow of air to the brake pipe will be cut off, and the test

device cock 1 should then be opened to permit the brake pipe to be charged until the AB valve service parts to move to release position.

Once the release test has been completed, close cock 1 and make a 20psi brake pipe reduction by opening cock 5. Then open the 3/8" emergency and allow the brake pipe to vent to 0psi. Once the brake pipe is depleted of air pressure, the test device may be removed from the car.

Code for Testing Pipe Fitting Single Car Test Device ("Standard" Method – Using 800cu/in Operating (Brake Pipe Volume) Reservoir, and 1550cu/in Supply Reservoir)

Device Testing Intervals – same intervals apply regardless of test device testing method:

- To secure reliable and uniform results with the Pipe Fitting Single Car Test Device, it must be kept in good condition and free from leakage, and the device must be tested as called out herein by the "standard" method or "alternate" method not less frequently than once every 30 calendar days, or before each use of the device if the interval in which the device is used extends beyond 30 calendar days. More frequent testing may be required if found necessary due to rough handling of the device, adverse environmental conditions, ect. Any leakage that is discovered during the device test must be corrected.
- Test device air pressure gages must be tested for accuracy once every 92 calendar days, or before each use of the device if the interval in which the device is used extends beyond 92 calendar days. Supply and brake pipe pressure gages must be compared to a master gage calibrated annually according to ASME standards, or to a calibrated deadweight tester, within 1psi.
- Test rack air pressure gages must be tested for accuracy once every year, or before each use of the rack if the interval in which the rack is used extends beyond one calendar year. Supply reservoir, operating reservoir, and volume reservoir – as applicable – pressure gages must be compared to a master gage calibrated annually according to ASME standards, or to a calibrated deadweight tester, within 1psi.

Operation Test

Attach the brake pipe end of the device to the operating reservoir and attach the supply end of the device to the supply reservoir, as shown in Fig. 1. The supply reservoir must be maintained at 70psi by a suitable feed valve.

Begin with all device cocks closed (device in "Position 3", or lap). Open test rack supply cock 1, and open test device 3/8" cock. Coat the opening of the 3/8" cock with soap suds to detect any air leakage past test device cock 1 or 2. Then close the 3/8" test device cock, and open test device cock 1. Coat the air outlet of test device cocks 4, 5, 6, and 3/8" with soap suds to detect any air leakage past these

cocks. Leakage at the outlet of each cock must be no greater than a ½" bubble in less than 5 seconds.

Open test rack cock 2, and when rack operating reservoir reaches 58psi, close test device cock 1 and open test device cock 2. Note that the operating reservoir charges from 60 to 65psi in 25 to 30 seconds, to ensure proper porting in device cock 2. At the completion of this test, close test device cock 2 and open test device cock 1 and charge the operating reservoir to 70psi.

By opening the test device exhaust cocks as called out, note that the rate of discharge from the operating reservoir meets the values as specified in the following table:

OPERATING RESERVOIR – RATE OF CHANGE IN PRESSURE

Before checking the rate of exhaust of air produced by each of the exhaust cocks, note that operating reservoir has obtained a full charge of 70 psi with test device cock 1 open, and then close test device cock 1 prior to opening respective exhaust cock. Not less than 30 seconds must elapse between each test, to allow air pressure to settle and minimize temperature effect.

Open Cock	Operating Reservoir Pressure – PSI	Time
4	Decrease 70 – 60	In 10 – 12 seconds
5	Decrease 70 – 50	In 5 – 7 seconds
6	Decrease 70 – 30	In 3.5 – 5 seconds
3/8" test device cock	Decrease 70 – 10	In no more than 3.5 seconds, no less than 3 seconds

See Appendix A, Figure 1 for illustration showing method of "standard" test.

Code for Testing Pipe Fitting Single Car Test Device ("Alternate" Method – Using 800cu/in Volume (Brake Pipe Volume) Reservoir, No Supply Reservoir)

Attach the brake pipe end of the test device to the volume reservoir, then attach the air supply line to the supply end of the test device, as shown in Fig. 2. The supply line pressure must be maintained at 70psi by means of a suitable feed valve.

Ensure that the volume reservoir cutout cock is closed. With all cocks on the test device closed, open the test device 3/8" test device cock to check for test device supply cocks 1 and 2 leakage. Leakage must be no greater than a 1/2" bubble in less than 5 seconds.

Close the 3/8" test device cock, then open test device supply cock 1. Coat the exhaust orifices at cocks 4, 5, 6, and 3/8" test cock to detect any leakage. Leakage at the outlet of each cock must be no greater than a 1/2" bubble in less than 5 seconds.

Open volume reservoir cutout cock, and when the reservoir is fully charged, note that reservoir air pressure gage and test device brake pipe pressure gage register within 1/2 psi.

By opening the test device exhaust cocks as called out, note that the rate of discharge from the volume reservoir meets the values as specified in the following table:

VOLUME RESERVOIR – RATE OF CHANGE IN PRESSURE

Before checking the rate of exhaust of air produced by each of the exhaust cocks, note that volume reservoir has obtained a full charge of 70 psi with test device cock 1 open, and then close test device cock 1 prior to opening respective exhaust cock. Not less than 30 seconds must elapse between each test, to allow air pressure to settle and minimize temperature effect.

Open Cock	Volume Reservoir Pressure – PSI	Time
2*	Increase 40 – 50	In 38 – 43 seconds
4	Decrease 70 – 50	In 27 – 31 seconds
5	Decrease 70 – 50	In 5 – 7 seconds
6	Decrease 70 – 20	In 5.5 – 7 seconds

*Note – Begin test by first reducing volume reservoir pressure to 30psi.

See Appendix A, Figure 2 for illustration showing method of “alternate” test.

4. Related Standards

MAINTENANCE, INSPECTION AND TESTING OF CAR AIR BRAKE EQUIPMENT- HRA Recommended Practice RP-001-21, latest revision.

4.1 References

Legacy Test Code Pamphlets Issued by TRAIN in 2001 including:

5039-4, Sup.3 Standard S-044 April 1,1991

5039-4, Sup.1 January 1974, Revised January 1980

5039-4, Sup.1 January 1956

2377-2, July 1942-Test Code for Car Air Signal Testing Device

Pamphlet 5039-4 Sup.2 April 1, 1987 - Single Car Test Code

4.2 Definitions

- Air Date – The date when the air brake system last received cleaning, lubrication and testing of the brake valves (COT&S).
- Single Car Test – An air test done on a single car isolated from any other car, performed using a specific test device appropriate for the type of brake equipment being tested.
- Single Car Test Device – An arrangement of piping, gauges and valves combined in a portable unit to be used in performing a single car test.
- Test Code – A written instruction or procedure for the testing of brake equipment.

4.3 Abbreviations and Acronyms

AAR Association of American Railroads

APTA American Public Transportation Association

CFR Code of Federal Regulations

COT&S Clean, Oil, Test and Stencil of the brake equipment as it refers to an Air Date

FRA Federal Railroad Administration

HRA Heritage Rail Alliance

OEM Original Equipment Manufacturer

RPCA Railroad Passenger Car Alliance

4.4 Document history

Document Version	Publication Date	Summary of Changes
Initial Release	May 31, 2022	Initial Release
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Appendix A - Schematics Related to Constructing and Testing Pipe Fitting Device

