MAINTENANCE, INSPECTION AND TESTING OF CAR AIR BRAKE EQUIPMENT

Recommended Practice
RP-001-21

Adopted: October 6, 2021 Revised: June 10, 2022

Abstract: This recommended practice provides a methodology and a standardized form for maintaining car equipment operated by Tourist, Scenic, Historic and Excursion Railroad Operators.

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

Summary: This document contains recommendations for periodic and reliability-centered maintenance based on historical precedent, as well as technology improvements that may be applied to the referenced equipment. It outlines practices that may be modified to reflect local conditions and circumstances of operation by the tourist and historic railroads, with guidelines and processes to document the reasoning behind those modifications.

Scope and purpose: This document provides a structured, systematic method for the uniform maintenance of car 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 outlines practices that may be modified to reflect local conditions and circumstances of operation by the equipment operators, with guidelines and processes to document the reasoning behind those modifications.

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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Introduction
On December 11, 2020, the Federal Railroad Administration (FRA) published Miscellaneous Amendments to Brake System Safety Standards and Codification of Waivers. With this publication, the FRA implemented Subpart H-Tourist, Scenic, Historic and Excursion Operations Braking Systems Regulations in the Code of Federal Regulations (CFR), 49 CFR Parts 232.700 through 232.719. This rulemaking was carried out to rationalize the overlapping regulations and, sometimes, conflicting operation and maintenance practices that have evolved between the railroad industry and tourist and historic operations that typically use equipment which is no longer in interchange or general railroad system use.

The FRA regulation now cites industry standards issued by the Association of American Railroads (AAR) and the American Public Transit Association (APTA), some of which are incorporated in the regulation by reference. The referenced AAR and APTA documents contain references to historic maintenance and test practices that were the most recent issues governing the systems addressed in this recommend practice.

Brake System Inspection, Test and Maintenance

1. Periodic Attention

Cleaning, Oiling, Testing and Stenciling (COT&S) of brake systems must be carried out in compliance with the specifications and test codes contained in the following industry standards:
CODE OF AIR BRAKE SYSTEM TESTS FOR FREIGHT EQUIPMENT—SINGLE CAR TEST - AAR Standard S-486, latest revision

CODE OF TESTS FOR PASSENGER CAR EQUIPMENT USING SINGLE CAR TESTING - APTA PR-M-S-005-98, Rev 4, or latest revision

PASSENGER EQUIPMENT CAR MAINTENANCE REQUIREMENTS - AAR Standard S-4045, latest revision

1.1 Obsolete Freight Brake Equipment

Freight brake equipment that is no longer listed in the AAR Field Manual of Interchange Rules is to be maintained and tested to the last documentation which was available at the time the system was eliminated from interchange service.

1.2 Obsolete Passenger Brake Equipment

Passenger brake equipment that is listed APTA PR-M-S-005-98, Table 4 Equipment-Dependent Instructions, is to be maintained and tested to the last issued document for those systems, as listed in the standard. The requirements for periodic attention for obsolete passenger brake valves are specified in AAR Standard S-4045, Table 2.1 - COT&S performance on air brakes.

1.3 Current Passenger and Freight Brake Equipment

Freight Brake Equipment newer than AB and Passenger Brake Equipment newer than UC, are to be maintained and tested to the current AAR and APTA standards. That attention is to be carried out as prescribed by 49CFR Part 238 for passenger, AAR Standard S-4045, and the AAR Interchange Rules 3 and 4 for freight.

2. Modification of Periodic Attention Schedules

The periodic attention schedule of obsolete braking systems may be modified or extended based on the circumstances and conditions of their use by tourist and historic railroads. The railroad industry has had a long history of brake development wherein new brake valve, maintenance, and testing technologies have allowed the periodic attention of some brake equipment to be extended. Once the improvement has been identified, testing was typically carried out to demonstrate the ability of the brake valve to reliably function for a longer period without attention, supported by more frequent testing and examination of equipment after removal from the test.

Primarily for economic reasons, the brake suppliers and the railroads have not carried out any life-extension tests for brake valves that have been superseded by newer designs. As a result, attention extensions based on operating environment, improved component materials, and lubricants have not been realized. This document provides a process or “road map” to document and justify extended periods for COT&S of valves commonly found in tourist and historic railroads.

It should be noted that any equipment being moved by a common carrier railroad for the purpose of transporting it must meet the more stringent requirements of the
current standards identified in Section 1 and may not move on an extended COT&S date.

2.1 Applicability

Modification of the COT&S Period may only be considered for obsolete brake valvular equipment that is not currently in interchange or Amtrak/commuter rail service, defined as Pre-ABD for freight and Pre-D22 for passenger valves.

2.2 Supporting Information

With the advent of modern materials that may be used in valve construction and repair, as well as lubricants and filtering devices, extended COT&S intervals may be extended with no deterioration in valve performance. Most obsolete air valves see greatly diminished service with consequently less wear on valve parts, thereby making longer cleaning and lubrication intervals possible.

When considering an extension of periodic attention, the operator should consider a number of factors including those outlined in this section. Historically, extensions of time are considered after careful analysis of possible failure modes, data collected through examination of valves after extended demonstration periods, and additional periodic testing and record keeping during the demonstration period. Once all of this information has been collected, a determination of the acceptable extension of time, balanced by whatever failures may have been observed, can be made.

Factors for such extensions include:

2.2.1 Technology Improvements

2.2.1.1 Materials
2.2.1.2 Lubricants
2.2.1.3 Filters

2.2.2 Environmental and Operational Factors

2.2.2.1 Consistent Operating Environment
2.2.2.2 Consistent Storage Environment
2.2.2.3 Air Quality
2.2.2.4 Reduced Operating Cycles

2.2.3 Decision Tree

Extending the COT&S interval may be considered if any or all of the following can be shown to provide more consistent operation of the valve over longer periods of time.
2.2.3.1 Substitution of materials in the valve

2.2.3.2 Use of lubricants whose properties remain consistent for longer periods

2.2.3.3 Filters that effectively prevent foreign matter from entering the valve

2.2.3.4 Operating environment with more consistent and/or favorable climatic conditions (e.g., Captive service where the car is not going from the Pacific northwest to Florida)

2.2.3.5 Consistent and/or favorable environment for out-of-service storage (e.g., In a climate-controlled building versus outdoors)

2.2.3.6 Clean air from the supply source

2.2.3.7 Reduced operating cycles that reduce wear and degradation of parts and lubricants

2.3 Extension of Periodic Testing Intervals and Credit for Out of Service Time

In addition to the conditions cited in 2.2.1, 2.2.2, and 2.2.3, a single car test shall be used as often as needed to ensure proper operation of the valve, but not less than the most recent revision of the COT&S schedule for that valve.

If a COT&S extension is desired for U-type or older equipment, the justification must be stated as shown in Appendix B. To support the periodic attention for U-type or older equipment, the owner/operator of a piece of rolling equipment must keep a written record of out of service months, and this record must be available for inspection by FRA inspectors. If no record is kept for a given piece of rolling equipment, then that piece of equipment will be considered to be in service every calendar month, and the COT&S interval for that piece of equipment will be held to 24 calendar months instead of service months, as shown as the baseline interval in Appendix A. Additionally, if the FRA determines that operational, environmental or other conditions are such as to prohibit a COT&S extension, then a piece of equipment may be held to a 24 calendar month COT&S interval instead of service months as shown as the baseline interval in Appendix A.

Credit for out of service months (i.e., any calendar month in which a piece of rolling equipment performs no revenue service) for U-type and all older equipment may be accumulated and justified by the methodology outlined in Appendix B. COT&S interval may be extended past the calendar month equivalent as shown in Appendix A by the number of out of service months justified as outlined in Appendix B.
In no case may a COT&S for U-type and all older equipment be extended beyond a term of 60 calendar months. In any case, ultimate acceptance of a desired COT&S extension period will be determined by local FRA jurisdiction, as there are many different factors that weigh on air brake performance that may vary from one operation to another, as outlined in section 2.2.

In no case may the COT&S for AB type equipment be extended beyond the calendar month requirements as shown in Appendix A. For all types of brake equipment, in no case may a Brake Cylinder and Packing Cup inspection be extended beyond the calendar month requirements as shown in Appendix A.

In summary:

Note that per the current scope of this RP, the availability for out of service extension only applies only to the valvular components of U-type or older equipment. The potential for out of service extension for this equipment exists regardless of the type of rolling stock on which this equipment is in use.

AB-type equipment will be held to the calendar month requirements as shown in Appendix A.

All passenger and freight equipment newer than the equipment called out in this RP is subject to the requirements of currently published standards.

2.4 Test Codes and Records

In general, the most recent test code that applies to a specific valve family, must be used for all tests. A record sheet should be developed that documents each step that was taken in the test process, and where applicable, the result or pressure value observed may be entered. Examples of test forms are shown in Appendix C.

In cases where a car is equipped with a Hybrid Brake System, i.e. one fitted with some, but not all of the same generation or type of valves, a plan should be developed to document what test codes apply to the individual valves.

An example of a system update may be to apply a ABDX control valve to a passenger car that was originally equipped with a UC valve. In this case, the original conductor’s valves, brake cylinder and slack adjuster, as well as other equipment such as the water raising system, would be continued in service; but now at the periodic attention schedule for the new control valve. The Test Code for the new valve does not contain any test instructions for those other components, so a table must be constructed to include all of the other components and direct the tester to the correct test instruction for those components. Additionally, a review of the older components must be carried out to justify that they can provide satisfactory service over the longer term, which may necessitate increased periodic testing.
An example of a plan that reflects the elements of 26-C passenger system tests in comparison to ABDX freight tests is shown in Appendix D.

2.5 Test Plan Acceptance

In accordance with 49 CFR Part 232.717(c) all operators of discontinued (obsolete) brake systems to which 49 CFR Part 232 applies must adopt a written maintenance plan. The testing procedures and intervals contained within this document have been accepted by the FRA and should form the basis of a written maintenance plan (Note: acceptance is pending under 49CFR232.717(d)).

Although the standards contained within this document have been proven to be safe and suitable for most operators of discontinued brake systems, some operators may find it desirable to deviate from these standards.

Any requests for deviation from the standards in this document should take into consideration the information and process described in 49 CFR Part 232.307.

3. Single Car Test Devices

3.1 Device Development and Modifications

The single car test device was developed in the early 1900’s as a method by which to test the air brake system of a single freight or passenger car. The device is essentially a modified and somewhat simplified version of the automatic or independent rotary brake valves used by the engineer in the cab of a locomotive. Standards were established by the air brake companies, and approved by the Association of American Railroads, to set limits for the crucial performance aspects of the brake system on a car when being tested by the device – including brake application, brake set, brake release, and system leakage, among other features that were added with more modern braking systems. The single car test device is equipped with precise porting to affect the test procedures and ensure the control valve and system adhere to the test standards put forth. This method of testing a single car brake system thereby provided insurance that the car’s system would perform its due part when included in a lengthy consist of an over the road train.

Two devices were developed that are similar in appearance but had distinctly different porting; one device is to be used for freight equipment, and the other device for passenger equipment. The freight device is generally equipped with smaller release and application porting than the passenger device, to reflect the slower brake pipe pressure increase and decrease brought about by the larger brake pipe volume on long freight trains.

Concurrent with the publication of the January 1956 single car test code, the freight device was equipped with a brake pipe air flow measuring device termed a Flowrator. The Flowrator consisted of a plastic ball inside a clear tube with graduations, the graduations representing various levels of air flow in cubic inches.
per minute. The Flowrator could be cut into the brake pipe to show precisely the amount of air that was flowing into the brake pipe, even at low rates that may not readily be detected by a rise or drop in pressure gage readings. This allowed leakage to be detected that was not likely, or possible, to be detected with a device that was not so equipped, and therefore allowed/forced mechanics to find brake system leaks that – though minor on a single car – had a significant effect on long trains, especially in cold weather.

The Flowrator immediately became standard equipment on the freight device when introduced. It was subsequently introduced on the passenger device, as well, with the Flowrator-equipped and non-Flowrator-equipped passenger devices both allowed by the single car test code and termed the “Standard” device and “Alternate Standard” device. This allowance existed for many years, until finally the Flowrator became required equipment on the passenger device, as well.

Over the years, a brake pipe strainer and double pressure regulating valve was added to the device, to improve reliability, to make the device more self-contained, and to provide for a method by which to supply a higher or lower brake pipe pressure as the newer single car test codes require.

As of present day, computer controlled single car test devices are used to test many modern freight and passenger cars. Programmable and automated, they are capable of recording test results while in operation. The older, rotary valve operated devices are still approved by the AAR, however, and certainly have their place when testing older brake equipment. The computer-controlled devices are now known as the “Automated Single Car Test Device”, and the rotary valve operated devices are known as the “Manual Single Car Test Device”.

3.2 Correct Test Device/Brake Valve Application

When considering performing a single car test on a given piece of equipment, the question naturally arises as to what the proper device is for a particular valve/system. The overarching category of the freight versus passenger device as described above is the first choice to be made and is generally straightforward as determined by the type of rolling stock and/or valve being tested. However, there were some minor changes made to the porting in the rotary valves of both devices over the years, as standards tightened and greater insurance of reliability of safety was demanded as time went on. As a general rule, AAR, manufacturer, and government air brake standards demand that the most recent revision of a respective device for a given brake valve/system is the proper one to be used for the single car test. Overall, this is what is reflected in the description below, though there are exceptions to every rule, and these exceptions will be called out as applicable. This information is summarized in Table No. 1 for Freight Equipment and Table 2 for Passenger Equipment.
### Table 1 Freight Equipment

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Test Code</th>
<th>Test Device</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>K, H, and all earlier types</strong></td>
<td>Pamphlet 5039-4 Sup. 1, January 1956</td>
<td>Pamphlet 5039-4 Sup. 1, January 1950 OR Test Device per RP-002-21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OEM Freight Device, January 1956 revision (Flowrator equipped) OR Test Device per RP-002-21</td>
</tr>
<tr>
<td>AB</td>
<td>Pamphlet 5039-4 Sup. 1, April 1987</td>
<td>Pamphlet 5039-4 Sup. 1, January 1950 OR Test Device per RP-002-21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OEM Freight Device, April 1987 revision</td>
</tr>
<tr>
<td>ABD, and all newer types</td>
<td>AAR S-486, most recent revision</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OEM Freight Device Compliant with AAR S-486, most recent revision</td>
</tr>
</tbody>
</table>

**Freight Equipment**

**K, H, and all earlier types of freight triple valves**

Pamphlet 5039-4 Sup. 1, January 1956 –

The freight device and test code in this pamphlet is the most recent revision for the brake valves called out in the heading above. Further revisions of the freight single car test code omitted all reference to K and older triple valves, as these valves were last approved by the AAR for routine interchange service in 1948.

**AB control valves**

Pamphlet 5039-4 Sup. 1, April 1987 –

This is the latest revision of the test code and test device that are directly suited to test the AB control valve. The last year the AB control valve was approved by the AAR for routine interchange service was 1994.

*Note: For an alternate code and device for testing the triple/control valves noted above, see Section 3.3, below.*

**ABD and newer control valves**

AAR S-486, most up to date edition –
ABD and all newer freight control valves are currently approved for AAR interchange service. The latest revision of AAR standard S-486 should be used to test these valves.

Table 2 Passenger Equipment

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Test Code</th>
<th>Test Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-12, 3-E, L, P, and all older valve types</td>
<td>Pamphlet 5039-4 Sup. 1, November 1980</td>
<td>OEM Standard Device</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OEM Alternate Device, as compliant with Pamphlet 5039-4 Sup. 1, November 1980</td>
</tr>
<tr>
<td>U-12 B/C/D, D-22</td>
<td>Pamphlet 5039-4 Sup. 1, April 1991</td>
<td>OEM Standard Device</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OEM Alternate Device, as compliant with Pamphlet 5039-4 Sup. 1, April 1991</td>
</tr>
<tr>
<td>26-C, or equivalent variation</td>
<td>APTA-PR-M-S-005-98, Revision 4</td>
<td>OEM Device, as compliant with APTA-PR-M-S-005-98, Revision 4</td>
</tr>
</tbody>
</table>

Passenger Equipment

**U-12, 3-E, L, P, and all older valve types**

Pamphlet 5039-4, Sup. 1, November 1980 –

This is the most recent revision of the single car test code and device suited to testing all passenger valves U-12 and older. Both “Standard” (non-Flowrator equipped) and “Alternate Standard” (Flowrator equipped) passenger devices are called out and approved for use in this code.

**U-12-B/C/D, D-22**

Pamphlet 5039-4, Sup. 1, April 1991 –

This is the most recent revision of the single car test code and device suited to testing U-12-B, U-12-BC, U-12-BD, and D-22 type passenger control valves. Note that by the time of the publication of this code the “Standard” and “Alternate Standard” devices were still approved for use, however the terminology applied to each device had reversed – the “Standard” device was now that which was Flowrator equipped, and the “Alternate Standard” device was now non-Flowrator equipped.

**26-C, or equivalent variation**

APTA-PR-M-S-005-98, Revision 4

This code is the most recent revision for modern passenger control valves – 26-C or equivalent diaphragm operated valves. Note that as of the
publication of this code only one passenger device was approved – that which is integral strainer, regulating valve, and Flowrator equipped.

3.2.1 Test Device Porting

The porting of the single car test device, particularly the rotary valve which comprises the main portion of the device, has undergone changes over the years that reflects more sensitive and flexible valve performance, increased valve and system features, increased train lengths and speeds, and a greater demand for safety and reliability brought about by modern transportation requirements.

Freight Device Porting

The porting as called out in the freight brake equipment test codes referenced in this standard is as shown Table 3.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1950</td>
<td>No</td>
<td>.250”</td>
<td>.0225”</td>
<td>Lap</td>
<td>.035”</td>
<td>.078”</td>
<td>.147”</td>
<td>.250”</td>
</tr>
<tr>
<td>January 1956</td>
<td>Yes</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>April 1987</td>
<td>Yes</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>.266”</td>
</tr>
<tr>
<td>AAR S-486, Current Edition (*Note: Most recent revisions to device made circa 2013)</td>
<td>Yes</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>.136”</td>
<td>.1875”</td>
<td>.3125”</td>
</tr>
</tbody>
</table>

Notes: 1. Symbol --- indicates porting remained unchanged from the previous version of the device.
2. Not all changes to porting are shown; only those that are applicable to the codes called out in this standard and as listed in Table 1.

Passenger Device Porting

The porting as called out in the passenger brake equipment test codes referenced in this standard is as shown in Table 4 (see page 12).

3.3 Alternative Device

This maintenance standard was written in response to changes made to 49 CFR Part 232 as of December 2020. A significant change made to this regulation at this time is the requirement for heritage railroads to develop a written maintenance program for all their operable “obsolete” valves – those valves whose maintenance schedules are no longer covered by currently published AAR standards.
### Table 4 Passenger Device Porting

<table>
<thead>
<tr>
<th>Single Car Test Code Date</th>
<th>Flowrator Equipped (Std./Alt. Std.)</th>
<th>Position 1</th>
<th>Position 2</th>
<th>Position 3</th>
<th>Position 4</th>
<th>Position 5</th>
<th>Position 6</th>
<th>3/8” Emergency Cock</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 1980</td>
<td>Standard Device (non-Flowrator equipped)</td>
<td>.250”</td>
<td>.038”</td>
<td>Lap</td>
<td>.0465”</td>
<td>.093”</td>
<td>.1875”</td>
<td>.375”</td>
</tr>
<tr>
<td></td>
<td>Alternate Standard Device (Flowrator equipped)</td>
<td>---</td>
<td>.0225”</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>April 1991</td>
<td>Standard Device (Flowrator equipped)</td>
<td>---</td>
<td>.0225”</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Alternate Standard Device (non-Flowrator equipped)</td>
<td>---</td>
<td>.038”</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>APTA 1998, Revision 4</td>
<td>Standard Device (Flowrator equipped)</td>
<td>---</td>
<td>.0225”</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

Notes:  
1. Symbol --- indicates porting remained unchanged from the previous version of the device.  
2. Not all changes to porting are shown; only those that are applicable to the codes called out in this standard and as listed in Table 2.

A key component for any modern air brake maintenance standard is the requirement for a periodic single car test. Manual, OEM single car test devices manufactured by an air brake company are still available to some extent, but they are not inexpensive nor easy to come by. It is to help alleviate this burden that this standard incorporates and allows the use of a test device that can be constructed with simple, off-the-shelf pipe fittings. This device was constructed to meet the critical dimensions of the manual freight device as called out in the 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 a Flowrator, and integral supply air regulating valve and inlet strainer. As the most modern “obsolete” freight control valve – the AB – had proven reliable in 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 construction 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. See
the Recommended Practice RP-002-21 for more information and for proper test
device procedure.

Additionally, as the January 1950 code is deemed acceptable as it applies to the
Alternate Device for all freight control valves AB or older, the 1950 code and
Factory Device is also considered acceptable to test AB or older control valves –
though the January 1956 code and Flowrator-equipped device is preferable if
available.

3.4 Test Device Maintenance and Certification

As the single car test device is relied upon to ensure control valve and brake
system performance and reliability, it stands to reason that the test device must be
checked occasionally to insure that it is maintained properly, performing reliably,
and that the porting continues to meet the specifications set forth for increasing
and exhausting brake pipe pressure.

Older single car test standards required that the device be tested once every 30
days. Current AAR S-486 standard requires the device be tested once every 92
days. This extension in test device testing frequency was likely made as air
compressing and filtering equipment improved, and brake systems and test devices
were exposed to less dirt and grime. Additionally, it is understood that heritage
railroads will not be using their device(s) to test near as many cars, and therefore
not using their devices near as frequently as Class 1 railroads. As a result, the 92
day service and testing interval is sufficient for all devices, regardless of age and
type.

Air gauges must be calibrated with the same frequency as the test device is
serviced and tested. Gauges must be checked against a master gauge, or a
calibrated deadweight tester.

See the applicable single car test code for more detail on test device testing
procedures and test requirements.

4. Related Standards

CODE OF AIR BRAKE SYSTEM TESTS FOR FREIGHT EQUIPMENT—SINGLE CAR TEST
- AAR Standard S-486, latest revision.

CODE OF TESTS FOR PASSENGER CAR EQUIPMENT USING SINGLE CAR TESTING -
APTA PR-M-S-005-98, Rev 4, or 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

HeritageRail Alliance Recommended Practice RP-002-21, 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

4.2 Definitions

- **Air Date** – The date when the air brake system last received cleaning, lubrication and testing of the brake valves COT&S.
- **Revenue service** – Any use of a piece of rolling equipment other than positioning for storage, repair, or disposition.
- **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 (SCT)** – An arrangement of piping, gauges and valves combined in a portable unit to be used in performing a single car test.
- **Service Month** – Any calendar month in which a piece of rolling equipment is operated in any revenue service.
- **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
- **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
### 4.4 Document history

<table>
<thead>
<tr>
<th>Document Version</th>
<th>Publication Date</th>
<th>Summary of Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>December 31, 2021</td>
<td>Initial Release</td>
</tr>
<tr>
<td>1</td>
<td>June 10, 2022</td>
<td>Corrected typographical error in Section 1.3: D-22 to UC</td>
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</table>
APPENDIX A        Extended Attention Periods and Requirements

The HRA Mechanical Committee has developed the following extension times for obsolete brake valves based on the conditions of extension noted:

<table>
<thead>
<tr>
<th>Valve Family</th>
<th>COT&amp;S Period*</th>
<th>Packing Cup &amp; Cylinder Period**</th>
<th>Conditions of Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>K, L, P, PS and all older types of Triple Valves</td>
<td>24 Service Months</td>
<td>60 Calendar Months</td>
<td>Single Car Test is required prior to the first revenue service the piece of rolling equipment sees following 12 calendar months after most recent previous Single Car Test.</td>
</tr>
<tr>
<td>U-Type</td>
<td>24 Service Months</td>
<td>60 Calendar Months</td>
<td>Single Car Test is required prior to the first revenue service the piece of rolling equipment sees following 12 calendar months after most recent previous Single Car Test.</td>
</tr>
<tr>
<td>AB</td>
<td>120 Calendar Months</td>
<td>120 Calendar Months</td>
<td>Single Car Test is required 24 calendar months after the last Periodic Single Car Test or prior to being placed in service. Note: 49CFR232.717 (a)(2)(i) applies to all freight equipment.</td>
</tr>
<tr>
<td>AB In Passenger Service</td>
<td>72 Calendar Month</td>
<td>72 Calendar Month</td>
<td>Single Car Test is required 12 calendar months after the last Periodic Single Car Test or prior to the next season of operation.</td>
</tr>
</tbody>
</table>

* For COT&S Period given in Service Months with the potential of extension of COT&S period up to 60 calendar months based on type of service and out of service credits (e.g., 24 service months with a 60 calendar month period).

**Cylinder arrangements utilizing modern rubber packing cups and lubricants may be continued in service for a period of not more that the number of months shown.
### APPENDIX B  Sample Forms for Extended COT&S Qualification

Document to list the vehicles to which it applies along with the extended time and justification for applying it to those vehicles.

**EXAMPLES**

| XYZ Railroad, Rolling Equipment Air Brake Inspection Record |
|---|---|---|---|---|---|---|---|---|
| **Car Initials and Number** | **Car Type** | **Control Valve Type** | **Safety Valve Type (If Applicable)** | **Cylinder Size (Diameter X Stroke)** | **Type of Brake Cylinder Packing Cup** | **COT&S and Single Car Test Done** | **Single Car Test Due (See Note)** | **COT&S Due (See Note)** | **Packing Cup and Cylinder Inspection Done** | **Packing Cup and Cylinder Inspection Due** |
| XYZ 5678 | Gondola | AB | N/A | 10” X 12” | Rubber | 4/10/21 | 4/10/23 | 4/10/31 | 4/10/21 | 4/10/31 |
| DEF 9012 | Passenger Coach | AB | Type A | 12” X 12”, truck mounted (qty. 4) | Rubber | 4/15/21 | 4/15/22 | 4/15/27 | 4/15/21 | 4/15/27 |

**Note** | **Application** | **Justification for Extended Period**
---|---|---
1 | ABC 1234 | Car is stored and on display in a temperature controlled roundhouse structure unless removed for specific operation of no more than 0 days per year.
2 | XYZ 5678 DEF 9102 | Cars with this brake schedule were subjected to a long-term test in the XYZ Railroad’s service, with periodic tests and teardowns to demonstrate stability of operation. The test results were documented in Report # 0000 furnished to FRA on 00/00/0000.
### XYZ Railroad Rolling Stock Service Month Record

<table>
<thead>
<tr>
<th>Year: <strong>2021</strong></th>
<th>Car Initials and Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number</strong> = cumulative month in service since most recent COT&amp;S</td>
<td>ABC 1234</td>
</tr>
<tr>
<td><strong>OOS</strong> = Out of Service</td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>5</td>
</tr>
<tr>
<td>February</td>
<td>OOS</td>
</tr>
<tr>
<td>March</td>
<td>OOS</td>
</tr>
<tr>
<td>April</td>
<td>OOS</td>
</tr>
<tr>
<td>May</td>
<td>6</td>
</tr>
<tr>
<td>June</td>
<td>OOS</td>
</tr>
<tr>
<td>July</td>
<td>OOS</td>
</tr>
<tr>
<td>August</td>
<td>OOS</td>
</tr>
<tr>
<td>September</td>
<td>7</td>
</tr>
<tr>
<td>October</td>
<td>8</td>
</tr>
<tr>
<td>November</td>
<td>OOS</td>
</tr>
<tr>
<td>December</td>
<td>OOS</td>
</tr>
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</table>
### APPENDIX C  Sample Forms for Air Brake Test Recording

Examples of forms to record test results.

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
<th>Actual</th>
<th>Pass/Fail</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.0</td>
<td>Leakage tests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.1</td>
<td>System Leakage Test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td>Main Reservoir Leakage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.0</td>
<td>Functionality Testing</td>
<td></td>
<td></td>
<td></td>
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<td>8.2</td>
<td>Service Stability Test</td>
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<tr>
<td>8.3</td>
<td>Release Testing</td>
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<td></td>
<td></td>
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<tr>
<td>8.3.1</td>
<td>Release test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.4</td>
<td>Application Test</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>8.5</td>
<td>Release Sensitivity Test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.0</td>
<td>Emergency Brake Application Tests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.1</td>
<td>Emergency Test (aux. venting Portions)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.2</td>
<td>Emergency Test (Control Valve/Op. Unit)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9.3</td>
<td>Brake Cylinder Cut-out cocks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.4</td>
<td>Release Test after Emergency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td>Leakage Tests-control and brake oil</td>
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<td></td>
<td></td>
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<tr>
<td>10.1</td>
<td>Control Valve</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>10.2</td>
<td>Brake Cylinder Leakage</td>
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<td></td>
<td></td>
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<td>11.0</td>
<td>Emerg. Brake-Conductors Valve Test</td>
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<td>12.0</td>
<td>Variable Load Control</td>
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<tr>
<td>12.1</td>
<td>Empty (light) Car</td>
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<td></td>
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<tr>
<td>12.2</td>
<td>Loaded (heavy) Car</td>
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<td>13.0</td>
<td>Graduated Release Test</td>
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<td>14.0</td>
<td>Miscellaneous Devices</td>
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<td>14.1</td>
<td>Hand Brake</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>14.2</td>
<td>Wheel Slide Protection Equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.3</td>
<td>Main Reservoir Pipe Pass-through</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.4</td>
<td>Conductor’s Signal System</td>
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<tr>
<td>14.5</td>
<td>Electropneumatic Operation</td>
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<td>14.6</td>
<td>Auxiliaries Pneumatic Equipment</td>
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<td></td>
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<td>15.0</td>
<td>Completion of Testing</td>
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<td></td>
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<tr>
<td>15.2</td>
<td>Final Car Preparation</td>
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<td></td>
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</tr>
</tbody>
</table>

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APPENDIX C Sample Forms for Air Brake Test Recording

FREIGHT CAR SINGLE CAR TEST  
K, H, and all earlier types of freight triple valves  
Per Instruction Pamphlet 5039, January 1950

Date ______________

Car No. and Mark ______________

Name of Inspector ______________

Shop or Road ______________

Location of Test ______________

Type of Valve, and Identifying Number ______________

1. Check in-date certification of device, and perform Daily Test  
   PASS  FAIL

2. Test Device Leakage, prior to connection to car  
   PASS  FAIL

4. Application Test  
   PASS  FAIL

5. Brake Pipe Leakage Test  
   PASS  FAIL

6. Auxiliary Reservoir and Graduating Valve Leakage –  
   (brakes must remain applied a minimum of (1) minute)  
   PASS  FAIL

7. Release Test – Brakes release in _________ seconds  
   PASS  FAIL

6. Emergency Test  
   PASS  FAIL

7. Service Stability – (Emergency application is a failure)  
   PASS  FAIL

8. Brake Cylinder and Retaining Valve Test  
   - Test No. 1, Leakage _________psi/min.  
     PASS  FAIL
   - Test No. 2, Retaining Valve Test  
     PASS  FAIL

9. Check the car’s handbrake(s)  
   PASS  FAIL

10. Stencil Car
APPENDIX C  Sample Forms for Air Brake Test Recording

FREIGHT CAR SINGLE CAR TEST
AB type freight control valves
Per Instruction Pamphlet 5039, January 1950

Date ______________
Car No. and Mark ______________
Name of Inspector ______________
Shop or Road ______________
Location of Test ______________
Type of Valve, and Identifying Number ______________

1. Check in-date certification of device, and perform Daily Test  PASS  FAIL
2. Test Device Leakage, prior to connection to car  PASS  FAIL
3. System Charging/Leakage Test, upon connecting device to car
   - Time to fully charge equipment ________ min.  PASS  FAIL
4. Application Test – Amount of brake pipe reduction upon control valve assumption of
   lap position ________ psi  PASS  FAIL
5. Brake Pipe Leakage Test  PASS  FAIL
6. Auxiliary Reservoir Leakage Test – (brakes must remain applied a minimum of (1)
   minute)  PASS  FAIL
7. Release Test – Brakes release in ________ seconds  PASS  FAIL
8. Service Stability Test  PASS  FAIL
9. Emergency Test  PASS  FAIL
10. Release Test After Emergency  PASS  FAIL
11. Brake Cylinder and Retaining Valve Test
    - Test No. 1, Leakage ________ psi/min.  PASS  FAIL
    - Test No. 2, Retaining Valve Test  PASS  FAIL
12. Check the car’s handbrake(s)  PASS  FAIL
13. Stencil Car
APPENDIX C Sample Forms for Air Brake Test Recording

FREIGHT CAR SINGLE CAR TEST
K, H, and all earlier types of freight triple valves
Per Instruction Pamphlet 5039, January 1956

Date ______________

Car No. and Mark ______________

Name of Inspector ______________

Shop or Road ______________

Location of Test ______________

Type of Valve, and Identifying Number ______________

1. Check in-date certification of device, and perform Daily Test
   PASS FAIL

2. Test Device Leakage, prior to connection to car
   PASS FAIL

3. System Leakage Test, upon connecting device to car
   - Leakage _________ cu.in./min.
   PASS FAIL

4. Application Test
   PASS FAIL

5. Release Test – Brakes release in _________ seconds
   PASS FAIL

6. Emergency Test
   PASS FAIL

7. Service Stability – (Emergency application is a failure)
   PASS FAIL

8. Brake Cylinder and Retaining Valve Test
   - Test No. 1, Leakage _________psi/min.
   PASS FAIL
   - Test No. 2, Retaining Valve Test
   PASS FAIL

9. Check the car’s handbrake(s)
   PASS FAIL

10. Stencil Car
APPENDIX C

Sample Forms for Air Brake Test Recording

FREIGHT CAR SINGLE CAR TEST
AB type freight control valves
Per Instruction Pamphlet 5039, April 1987

Date __________________
Car No. and Mark __________________
Name of Inspector ________________
Shop or Road ________________
Location of Test ________________
Type of Valve, and Identifying Number ________________

1. Check in-date certification of device, and perform Daily Test
   PASS  FAIL
2. Test Device Leakage, prior to connection to car
   PASS  FAIL
3. Brake Pipe Leakage Test, upon connecting device to car
   - Leakage ________ cu.in./min.
   PASS  FAIL
4. Continuous Quick Service Valve Test (if equipped)
   PASS  FAIL
5. Vent Valve Test (if equipped)
   a. Part of reduction relay valve (if equipped)  N/A  PASS  FAIL
   b. Vent valve equipped ONLY  N/A  PASS  FAIL
6. Handbrake Inspection
   PASS  FAIL
7. System Leakage Test – Leakage ________ cu.in./min.
   PASS  FAIL
8. Piston Travel and Mechanical Slack Adjuster
   - Piston travel ________ in.
   PASS  FAIL
9. Minimum Application and Brake Cylinder Leakage Test
   - Amount of brake pipe reduction upon control valve assumption
     of lap position ________ psi
     PASS  FAIL
10. Slow Release Test – Brakes release in ________ seconds
    PASS  FAIL
11. Service Stability – (Emergency application is a failure)
    PASS  FAIL
12. Emergency Test
    PASS  FAIL
13. Release After Emergency and Retaining Valve Test
    PASS  FAIL
14. Stencil Car
As noted in Section 2.4, a test plan similar to this example should be developed to assure that all rolling equipment with hybrid braking systems (i.e., those systems that combine different types of braking equipment into a singular system) are tested by the proper method, and at proper intervals.

<table>
<thead>
<tr>
<th>TEST ELEMENT</th>
<th>APTA SS-M-005-98 Rev. 4</th>
<th>AAR S-486-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Leakage Test</td>
<td>7.1</td>
<td>3.5</td>
</tr>
<tr>
<td>Brake Pipe Leakage Test</td>
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<td>3.3</td>
</tr>
<tr>
<td>Main Reservoir Leakage Test</td>
<td>7.2</td>
<td>N/A</td>
</tr>
<tr>
<td>Main Reservoir Pass-Through Test</td>
<td>7.2.7</td>
<td>Use APTA 7.2.7</td>
</tr>
<tr>
<td>Service Stability Test</td>
<td>8.2</td>
<td>3.8</td>
</tr>
<tr>
<td>Graduated Release Test</td>
<td>8.3.2</td>
<td>N/A</td>
</tr>
<tr>
<td>Direct Release Test</td>
<td>8.3.1</td>
<td>N/A</td>
</tr>
<tr>
<td>Application Test</td>
<td>8.4.1</td>
<td>3.13</td>
</tr>
<tr>
<td>Release Sensitivity Test</td>
<td>8.4.2</td>
<td>3.15</td>
</tr>
<tr>
<td>Emergency Test – Venting Devices</td>
<td>9.1</td>
<td>3.4</td>
</tr>
<tr>
<td>Emergency Test (Cont. Valve.)</td>
<td>9.2</td>
<td>3.10</td>
</tr>
<tr>
<td>Brake Cylinder Cutout Cocks (Test Each)</td>
<td>9.3</td>
<td>Use APTA 9.3</td>
</tr>
<tr>
<td>Release Test After Emergency</td>
<td>9.4</td>
<td>3.11</td>
</tr>
<tr>
<td>Control Valve Leakage Test W/ Relay</td>
<td>10.1</td>
<td>3.12.3.1</td>
</tr>
<tr>
<td>Brake Cylinder Leakage Test-W/ Relay</td>
<td>10.2</td>
<td>Use APTA 10.2</td>
</tr>
<tr>
<td>Emergency Brake/Conductor Valve Test</td>
<td>11.1</td>
<td>Use APTA 11.1</td>
</tr>
<tr>
<td>Manual Release Valve Test</td>
<td>N/A</td>
<td>3.19</td>
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<tr>
<td>Variable Load-Light Car (Use test for specific system)</td>
<td>12.1</td>
<td>3.20</td>
</tr>
<tr>
<td>Variable Load-Heavy Car</td>
<td>12.2</td>
<td>3.20</td>
</tr>
<tr>
<td>Hand Brake/Parking Brake Test</td>
<td>13.1</td>
<td>3.6</td>
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<tr>
<td>Wheel Slide Protection Equipment</td>
<td>13.2</td>
<td>Use APTA 13.2</td>
</tr>
<tr>
<td>Retaining Valve Test</td>
<td>Use AAR 3.11</td>
<td>3.12</td>
</tr>
</tbody>
</table>