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Signals and Communication Working Group

Approach Locking Tests

Abstract: This standard provides procedures for testing rail transit signal system approach locking.

Keywords: approach locking, locking, signal, testing

Summary: This document provides prerequisites, procedures and requirements for testing rail transit approach locking. Individual rail transit agencies may modify these requirements to accommodate their specific equipment and mode of operation.

Foreword

The American Public Transportation Association is a standards development organization in North America. The process of developing standards is managed by the APTA Standards Program's Standards Development Oversight Council (SDOC). These activities are carried out through several standards policy and planning committees that have been established to address specific transportation modes, safety and security requirements, interoperability, and other topics.

APTA used a consensus-based process to develop this document and its continued maintenance, which is detailed in the manual for the APTA Standards Program. This document was drafted in accordance with the approval criteria and editorial policy as described. Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

This document was prepared by the Signals and Communication Working Group as directed by the Rail Standards Policy and Planning Committee.

This document represents a common viewpoint of those parties concerned with its provisions, namely transit operating/planning agencies, manufacturers, consultants, engineers and general interest groups. APTA standards are mandatory to the extent incorporated by an applicable statute or regulation. In some cases, federal and/or state regulations govern portions of a transit agency's operations. In cases where there is a conflict or contradiction between an applicable law or regulation and this document, consult with a legal adviser to determine which document takes precedence.

This document supersedes APTA RT-SC-S-004-02, which has been revised. Below is a summary of changes from the previous document version:

- This document has been updated using the latest document template for the APTA Standards Program (e.g. new sections include a summary, foreword, summary of changes, etc.). This document was revised with new language describing approach locking tests.
- The acronym RTS has been replaced with rail transit system and/or rail transit agency throughout the document in addition to minor grammatical corrections.
- Section 1 Test Requirements - Section 1.1 test frequency, Entire section was updated with new language
- Section 1.2 Materials and data - Entire section was added
- Section 1. 3 Tools - Entire section was updated with new language
- Section 1. 5 Safety - Entire section was updated with new language
- Section 1.6 Test prerequisites - Entire section was added
- Section 2 Test procedure - Entire section was updated with new language
- Related APTA standards - The document APTA RT-SC-S-035-03, Vital Processors-Based Systems Inspection, Testing and Configuration Control was added
- References - Entire section was added and includes new language
- Abbreviations and acronyms - ASR approach stick relay, PPE personal protective equipment and RTS rail transit system was removed.

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Introduction

This introduction is not part of APTA RT-SC-S-004-02, "Approach Locking Tests."

APTA recommends the use of this document by:

- individuals or organizations that operate rail transit agencies;
- individuals or organizations that contract with others for the operation of rail transit agencies; and
- individuals or organizations that influence how rail transit agencies are operated (including but not limited to consultants, designers and contractors).

Scope and purpose

This document is intended to satisfy the following objectives: to ensure that special life/safety equipment is operational and reliable; to incorporate safety considerations during the inspection and maintenance process; and to identify those inspection criteria and maintenance standards that provide a high level of passenger and personnel safety. The purpose of this document is to verify that approach locking systems are operating safely and as designed through periodic testing, thereby increasing reliability and reducing risks of hazards and failures.

Note on alternate practices

Individual rail transit agencies may modify the practices in this standard to accommodate their specific equipment and mode of operation. APTA recognizes that some rail transit agencies may have unique operating environments that make strict compliance with every provision of this standard impossible. As a result, certain rail transit agencies may need to implement the standards and practices herein in ways that are more or less restrictive than this document prescribes. A rail transit agency may develop alternates to APTA standards so long as the alternates are based on a safe operating history and are described and documented in the system's safety program plan (or another document that is referenced in the system safety program plan).

Documentation of alternate practices shall:

- identify the specific APTA rail transit safety standard requirements that cannot be met;
- state why each of these requirements cannot be met;
- describe the alternate methods used; and
- describe and substantiate how the alternate methods do not compromise safety and provide a level of safety equivalent to the practices in the APTA safety standard (operating histories or hazard analysis findings may be used to substantiate this claim).

Approach Locking Tests

1. Test requirements

1.1 Test frequency

Approach locking tests shall be performed based on the following intervals:

- Relay-based systems shall be tested when placed in service; after modification, repair or disarrangement; and at a regular interval not to exceed four years.
- Microprocessor-based systems being maintained under a configuration control plan conforming to APTA RT-SC-S-035-03 shall be tested when placed in service and after modification, repair or disarrangement.
- Microprocessor-based systems being maintained without a configuration control plan conforming to APTA RT-SC-S-035-03 shall be tested when placed in service; after modification, repair or disarrangement; and at a regular interval not to exceed four years.

1.2 Materials and data

The following materials are required for approach locking tests:

- current book of plans for the location under test that includes the following details:
    - signals/routes to be tested
    - approach sections
    - time settings
    - switches and their position in each route
    - interlocking layout including track circuit limits and switch/signal locations
    - conflicting signals/routes
- test data sheets or means to record test results

1.3 Tools

Test tools and apparatus shall be as required by the OEM and/or rail transit agency. Applicable tools shall be calibrated in accordance with rail transit agency and/or OEM requirements.

1.4 Personal protective equipment

Personal protective equipment, as required by the rail transit agency, shall be worn at all times during testing.

1.5 Safety

Rail transit agency safety rules, procedures and practices shall be followed at all times during testing. No work of any type shall be performed until train movements have been protected. The normal functioning of any device shall not be interfered with, in testing or otherwise, without first taking measures to provide for the safety of train operation, which depends on the normal functioning of such device.

1.6 Test prerequisites

Prior to performing approach locking tests, the test person shall ensure the following:

- A test plan is in place to ensure that all approach locking is tested consistent with the intended train operation and in-service status of all devices, circuits and systems controlling or controlled by approach locking.
- Track circuit setup and shunting has been completed for all track circuits within the scope of this test.
- Switch lock relays or equations have been verified to lock the proper switches for each switch within the scope of this test.
- All track circuits within the approach have been verified to be properly represented in the approach relay logic or equation.

2. Test procedure

The test for approach locking shall be modified for each rail transit agency's requirements (see "Note on alternate practices") but shall contain the items listed in steps 1–11 as a minimum. Test requirements represented here may be combined with other tests for efficiency or ease of execution. When performing this test procedure, ensure that non-vital logic does not mask the proper operation of the vital logic (if the configuration of the system prevents this, then the method of testing shall be addressed through a documented alternate practice). Where actual relays are not available to verify logic states, the test person shall use the OEM-recommended microprocessor diagnostic tool to verify the internal states of vital logic equations.

1. Notify the operations control center (OCC) and/or other authorities of the test activities to be performed.
2. Establish the route to be tested.
3. Simulate track occupancy in an approach track circuit.
4. Cancel the route previously established.
5. Verify that the timing device is running time and that approach locking is in effect until the documented time interval has elapsed.
6. Use an accurate timing device to verify that the actual time interval is within 10% of the documented time requirements.
7. Verify that each switch in the route is locked during the period when approach locking is in effect by observing the status of the appropriate lock relay/equation.
8. Verify that conflicting routes cannot be established during the period when approach locking is in effect.
9. Repeat steps 2–8 for each track circuit within the approach section.
10. Restore the system to its original operating condition (close the opened gold nuts/test links, remove applied temporary jumpers, reset temporary time settings to documented times, etc.).
11. Notify the OCC and/or other authorities that testing has been completed.

3. Correction of deficiencies

Deficiencies identified during approach locking tests shall be corrected and documented in accordance with rail transit agency and/or OEM requirements.

4. Documentation

Testing activities shall be documented, reviewed and filed in accordance with rail transit agency procedures.

Related APTA standards

APTA RT-SC-S-035-03, "Vital Processor-Based System Inspection, Testing and Configuration Control"

References

In addition to the most recent edition of OEM specifications for testing approach locking, as well as route aspect charts and/or track plans with approach locking specifications for the signals under test, this document shall be used in conjunction with the following:

American Railway Engineering and Maintenance-of-Way Association (AREMA), "Communications and Signals Manual of Recommended Practices," Part 2.4.5, Section D: Approach Locking.

Federal Railroad Administration (FRA), Office of Safety, "Rules and Regulations Governing Railroad and Train Control Systems," Section 236.377: Approach Locking.

Abbreviations and acronyms

OCC operations control center
OEM original equipment manufacturer

Document history

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