

5. Standard for Route Locking Testing

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Abstract: This standard provides procedures for testing rail transit route locking.

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Introduction

(This introduction is not a part of APTA RT-SC-S-005-02, *Standard for Route Locking Testing*.)

APTA rail transit safety standards represent an industry consensus on safety practices for rail transit systems to help achieve a high level of safety for passengers, employees, and the general public. This document was created by and for those parties concerned with its provisions; namely, rail transit systems (operating agencies), manufacturers, consultants, engineers, and general interest groups. This standard provides procedures for testing rail transit route locking

APTA recommends this standard for:

- Individuals or organizations that inspect, maintain, and/or operate rail transit systems
- Individuals or organizations that contract with others for the inspection, maintenance, and/or operation of rail transit systems
- Individuals or organizations that influence how rail transit systems are inspected, maintained, and/or operated (including but not limited to consultants, designers, and contractors)

This standard intends to meet the following objectives:

- To ensure special life/safety equipment is operational and reliable
- To help rail transit systems incorporate safety considerations during the inspection and maintenance process
- To identify inspection criteria and maintenance standards that provide a high level of passenger and personnel safety

The application of any standards, practices, or guidelines contained herein is voluntary. In some cases, federal and/or state regulations govern portions of how a rail transit system operates. In such cases, the government regulations override any conflicting practices this document requires or recommends.

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Standard for Testing Route Locking

1. Overview

1.1 Scope

This document establishes standard requirements for testing rail transit route locking at an interlocking.

1.2 Purpose

The purpose of this standard is to verify that route locking systems are operating safely and as designed through periodic testing, thereby increasing reliability and reducing the risk of hazards and failures.

1.3 Alternate practices

Individual rail transit systems may modify the practices in this standard to accommodate their specific equipment and mode of operation. APTA recognizes that some rail transit systems may have unique operating environments that make strict compliance with every provision of this standard impossible. As a result, certain rail transit systems may need to implement the standards and practices herein in ways that are more or less restrictive than this document prescribes. A rail transit system (RTS) may develop alternates to the 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:

- a) Identify the specific APTA rail transit safety standard requirements that cannot be met
- b) State why each of these requirements cannot be met
- c) Describe the alternate methods used
- d) 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).

2. Definitions, abbreviations, and acronyms

For the purposes of this standard, the following definitions, abbreviations, and acronyms apply:

2.1 Definitions

2.1.1 approach stick relay (ASR): A vital interlocking relay used in an approach locking circuit.

2.1.2 aspect: (A) The appearance of a fixed signal conveying an indication as viewed from the direction of an approaching train. **(B)** The appearance of a cab signal conveying an indication as viewed by an observer in the cab.

2.1.3 hazard: Any real or potential condition that can cause injury, death, or damage or loss of equipment or property.

2.1.4 locking: The electrical or mechanical establishment of a condition for a switch, interlocked route, speed limit, or automatic function that cannot be altered except by a prescribed and inviolate sequence of unlocking actions.

2.1.5 non-vital logic: The software that is used in interlocking microprocessors that replaces the entrance/exit (NX) relay logic and performs non-vital functions.

2.1.6 operations control center (OCC): A location or locations designed, equipped, and staffed for the purposes of monitoring and controlling RTS activities from a central location or locations. *Syn:* **rail control center, rail operations center, rail service control center.**

2.1.7 original equipment manufacturer (OEM): The enterprise that initially designs and builds a piece of equipment.

2.1.8 personal protective equipment (PPE): All clothing and other work accessories designed to create a barrier against workplace hazards. Examples include safety goggles, blast shields, hard hats, hearing protectors, gloves, respirators, aprons, and work boots.

2.1.9 rail transit system (RTS): The organization or portion of an organization that operates rail transit service and related activities. *Syn:* **operating agency, operating authority, transit agency, transit authority, transit system.**

2.1.10 route: The course or way traveled. *See also:* **conflicting routes.**

2.1.11 route locking: Electric locking, effective when a train passes a signal displaying a permissive aspect, that prevents the movement of any switch, movable point frog, or derail in advance of the train within the route entered.

2.1.12 sectional release: A route locking design that allows segments of route and switch locking to be released as the appropriate track circuits become unoccupied as a train advances through a route.

2.1.13 shunt: A by-path in an electrical circuit.

2.1.14 signal: An appliance that conveys information governing train movement.

2.2 Abbreviations and acronyms

ASR	approach stick relay
NX	entrance/exit
OCC	operations control center
OEM	original equipment manufacturer
PPE	personal protective equipment
RTS	rail transit system

3. Test requirements

3.1 Test frequency

The testing procedures in this standard shall be performed when route locking is placed in service, when it is modified, repaired, or disarranged, or as otherwise deemed necessary by the RTS.

The RTS shall determine the need for additional test frequencies for route locking. A review of the following factors may be useful in making this assessment:

- OEM-recommended intervals
- Industry experience
- Operating environment/conditions
- Historical data
- Reliability-centered maintenance program development
- Failure analysis
- RTS testing and experience
- Regulatory requirements

The frequency of tasks shall comply with applicable federal, state, and local regulations.

3.2 Training

The RTS and/or their maintenance contractors shall develop and execute training programs that provide employees with the knowledge and skills necessary to safely and effectively perform the tasks outlined in this standard.

3.3 Materials

No consumable materials are required for testing route locking unless otherwise specified by the OEM and/or RTS.

3.4 Tools

The following tools are required for testing route locking:

- Multi-meter*
- Test shunt
- Stop watch
- RTS-approved portable radio
- Standard tools carried by signals personnel
- Additional tools as required by the OEM and/or RTS

* Calibrate in accordance with OEM and/or RTS requirements.

3.5 Personal protective equipment

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

3.6 Safety

RTS safety rules, procedures, and practices shall be followed at all times during testing.

3.7 Test procedure

Route locking testing procedures may be modified for each rail transit system's requirements (see Section 1.3) but shall contain the steps listed in 3.7.1-3.7.8 as a minimum. When performing this test procedure, ensure that non-vital logic does not mask the proper operation of the vital logic.

- 3.7.1** Notify the operations control center (OCC) and/or other authorities of the test activities to be performed.
- 3.7.2** Establish the route to be tested and ensure the controlling signal displays a permissive aspect and the approach section is unoccupied.
- 3.7.3** Shunt the first track circuit beyond the signal under test.
- 3.7.4** Verify that the signal displays a red aspect, the route is canceled, the approach stick relay (ASR) is energized, and the appropriate route stick relay is de-energized. Where a two-track pickup of an approach stick is provided, it will be necessary to momentarily shunt the second track circuit in the route to energize the ASR.

- 3.7.5 Attempt to operate the switches and derailleurs located in the route. Switches and derailleurs should not operate.
- 3.7.6 Simulate the movement of a train through the route by sequentially shunting each track circuit within the route.
- 3.7.7 Shunt the next track circuit in the route before removing the shunt from the previous track circuit.
- 3.7.8 Attempt to operate all switches and derailleurs located in the route. Switches and derailleurs should not operate. If sectional release locking is provided, switches in track circuits in the route that are not shunted may be free to operate.
- 3.7.9 During the test, verify that the locking relay is de-energized for each switch and derail in the route.
- 3.7.10 Verify the route stick relays energize when the track circuit shunt is removed.
- 3.7.11 Notify the OCC and/or other authorities when testing is complete.

3.8 Correction of deficiencies

Deficiencies identified during route locking testing shall be corrected and documented in accordance with OEM and/or RTS requirements.

3.9 Documentation

Testing activities shall be documented, reviewed, and filed in accordance with RTS procedures.

Annex A

(Informative)

Bibliography

- [B1] AREMA-Communications and Signals Manual of Recommended Practices— Part 2.4.5, Section G: Route Locking, 1996.
- [B2] DOT FRA Section 236.379: Route Locking, Rules and Regulations Governing Railroad and Train Control Systems, Office of Safety February 14, 2000.
- [B3] NYCT Division of Signal Policy Instruction Std 11.006.2-1987, Standard Test Instruction, Section 3.15: Route Locking.
- [B4] Original equipment manufacturer (OEM) specifications for testing route locking.
- [B5] Rail transit system (RTS) procedures for testing route locking.
- [B6] Route aspect charts or track plans with route locking specifications for the signals under test.