

40. Standard for Ac Track Circuit Inspection and Maintenance

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Abstract: This standard provides procedures for inspecting and maintaining rail transit ac track circuits.

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Introduction

(This introduction is not a part of APTA RT-SC-S-040-03, *Standard for Ac Track Circuit Inspection and Maintenance*.)

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 inspecting and maintaining rail transit ac track circuits.

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 Ac Track Circuit Inspection and Maintenance

1. Overview

1.1 Scope

This document establishes standard requirements for inspecting and maintaining rail transit ac track circuits. Ac track circuits are known as “power frequency track circuits” at some rail transit systems.

1.2 Purpose

The purpose of this standard is to verify that ac track circuits and equipment are operating safely and as designed through periodic inspection and maintenance, 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 and acronyms

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

2.1 Definitions

2.1.1 ac track circuit: An ac electrical circuit that makes use of both rails to detect train occupancy of the track and, in response, to actuate signals, train control devices and grade crossing protective equipment. *Syn:* **power frequency track circuit.**

2.1.2 feed end: The point in an ac track circuit at which the alternating current originates and is applied to the rails.

2.1.3 fouling point: The location on a turnout, beyond the frog, at which insulated joints or derails are placed at or beyond the clearance point.

2.1.4 gauge plate: A metal plate, extending from rail to rail, used to maintain gauge of track.

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

2.1.6 insulated joint: A joint in which electrical insulation is provided between adjoining rails.

2.1.7 operations control center (OCC): That facility from which train control, train dispatching, and/or train supervision takes place for the entire RTS or for specific segments of a system if there is more than one control center. *Syn:* **rail control center, rail operations center, rail service control center, train command center.**

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

2.1.9 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.

2.1.10 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.**

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

2.1.12 staggered polarity: The method of alternating negative and positive ac polarities at insulated joints for the purpose of detecting defective insulated rail joints to prevent feed through of a voltage into an adjacent track circuit that could create an unsafe condition.

2.1.13 switch rod: A rod connecting the two points of a switch or moveable point frog, by means of which the relative distance between the points is maintained.

2.1.14 track transformer: An electrical device used to supply ac voltage for a track circuit and/or secondary signal circuits.

2.2 Acronyms

OCC	operations control center
OEM	original equipment manufacturer
PPE	personal protective equipment
RTS	rail transit system

3. Inspection and maintenance requirements

3.1 Inspection and maintenance frequency

The inspection and maintenance procedures in this standard shall be performed when ac track circuits are placed in service, when they are modified, repaired, or disarranged, or as otherwise deemed necessary by the RTS.

The RTS shall determine the need for additional inspection and maintenance frequencies for ac track circuits. 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

The following materials are required for inspecting and maintaining ac track circuits:

- RTS-approved lubricants
- RTS-approved cleaning solutions
- Additional materials as required by the OEM and/or RTS

3.4 Tools

The following tools are required for inspecting and maintaining ac track circuits:

- Multi-meter*
- RTS-approved shunting device
- RTS-approved portable radio
- Standard tools carried by maintenance 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 inspection and maintenance.

3.6 Safety

RTS established safety rules, procedures, and practices shall be followed at all times during inspection and maintenance.

3.7 Inspection and maintenance procedures

Ac track circuit inspection and maintenance procedures may be modified for each rail transit system's requirements (see Section 1.3) but shall contain the steps listed in Sections 3.7.1-3.7.2 as a minimum.

3.7.1 Inspection

3.7.1.1 Notify the operations control center (OCC) and/or other authorities of the inspection activities to be performed.

3.7.1.2 Inspect the track circuit for an accumulation of debris. Remove and bag debris.

- 3.7.1.3 Inspect wayside drains for blockage or ineffective drainage.
- 3.7.1.4 Inspect the track circuit for damage caused by standing water, water leaks, or retention.
- 3.7.1.5 Inspect the track circuit for any condition that may interfere with the operation of the equipment.
- 3.7.1.6 Inspect the track circuit wayside cables/wiring, bonding, and hardware for defective insulation, rust, corrosion, missing components, damage and loose or broken connections. Holes and unused entrances not used for ventilation shall be sealed.
- 3.7.1.7 Inspect track circuit insulated joints, gauge plates and switch rods for bridging, broken or deteriorated insulation, metal shavings, loose or missing hardware.
- 3.7.1.8 Inspect the ac track circuit room and/or enclosure equipment, for damage, cracks, breaks, defective latches, locks, hinges, covers, and loose, deteriorated, or damaged conduit connections, and hardware.
- 3.7.1.9 Inspect polyvinyl chloride (PVC), fiberglass, rubber and other cable conduit material for damage, cracks, breaks, loose conduit connections, missing or loose components, and hardware.
- 3.7.1.10 Ensure covers, doors, and locks are in place and secured.
- 3.7.1.11 Notify the OCC and/or other authorities when inspection is complete.

3.7.2 Maintenance

- 3.7.2.1 Notify the OCC and/or other authorities of the maintenance activities to be performed.
- 3.7.2.2 Using RTS procedures, check and compare ac track circuit parameters.
- 3.7.2.3 Verify the proper operation of the track relay. Visually observe the armature and other movements and verify there are no defects or binding.
- 3.7.2.4 Apply the RTS-approved shunt across the rails at the feed end, relay end and if applicable any fouling points. The track relay must assume the full de-energized position with the shunt applied at any location in the track circuit. When the RTS-approved shunt is removed the track relay must assume the fully energized position.
- 3.7.2.5 Verify staggered polarities are present in adjacent track circuits by prescribed RTS procedure. If staggered polarity is not present between the two adjacent track circuits, take corrective actions using RTS procedures.
- 3.7.2.6 Notify the OCC and/or other authorities when maintenance activities are complete.

3.8 Correction of deficiencies

Deficiencies identified during ac track circuit inspection and maintenance shall be corrected and documented in accordance with OEM and/or RTS requirements.

3.9 Documentation

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

Annex A

(informative)

Bibliography

- [B1] Original equipment manufacturer (OEM) specifications for ac track circuit inspection and maintenance.
- [B2] Rail transit system (RTS) procedures for ac track circuit inspection and maintenance.