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STANDARD

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Rail Transit Standards Vehicle
Inspection and Maintenance Working
Group

Car-Borne Cab Signal Control Systems Periodic Inspection and Maintenance

Abstract: This standard covers basic procedures for periodic inspection and maintenance of cab signal control systems on rail transit vehicles.

Keywords: automatic train control, automatic train operation, automatic train protection, cab signal control systems, periodic inspection and maintenance, cab signal equipment, cab signal

Summary: This document establishes a standard for cab signal control equipment inspections and maintenance. Individual rail transit systems may tailor these standards to accommodate their specific equipment and mode of operation.

Scope and purpose: This standard includes all essential periodic inspection and maintenance requirements for cab signal control systems used on rail transit vehicles. This standard is intended for use by rail equipment maintenance organizations. It establishes procedures for periodic inspection and maintenance of cab signal control equipment used on rail transit vehicles.

This document represents a common viewpoint of those parties concerned with its provisions, namely operating/planning agencies, manufacturers, consultants, engineers and general interest groups. The application of any standards, recommended practices or guidelines contained herein is voluntary. In some cases, federal and/or state regulations govern portions of a transit system's operations. In those cases, the government regulations take precedence over this standard. The North American Transit Service Association (NATSA) and its parent organization APTA recognize that for certain applications, the standards or practices, as implemented by individual agencies, may be either more or less restrictive than those given in this document.

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Introduction

This introduction is not part of APTA RT-VIM-S-014-02, Rev. 2, “*Car-Borne Cab Signal Control Systems Periodic Inspection and Maintenance.*”

This standard represents a common viewpoint of those parties concerned with its provisions, namely transit operating/planning agencies, rail transit systems, manufacturers, consultants, engineers and general interest groups. The application of any standards or recommended practices contained herein is voluntary. In some cases, federal and/or state regulations govern portions of a rail transit system’s operations. In those cases, the government regulations take precedence over this standard. APTA recognizes that for certain applications, the standards or recommended practices, as implemented by individual rail transit systems, may be either more or less restrictive than those given in this document.

This standard describes the basic inspection and maintenance requirements for cab signal control equipment on rail transit vehicles. APTA recommends the use of this document by:

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

Note on 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 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).

Car-Borne Cab Signal Control Systems Periodic Inspection and Maintenance

1. Frequency of conduct

Periodic inspection and maintenance tasks on the car-borne cab signal control equipment shall be performed on a regular schedule as determined by the rail transit system. The frequency of any task contained within periodic inspection and maintenance should comply with all applicable federal, state and local regulations. Further, in the conduct of a RTS's periodic inspection and maintenance programs, frequencies for individual tasks shall be established based on a number of additional factors, including but not limited to the following:

- original equipment manufacturer (OEM) recommended intervals
- industry experience
- operating environment/conditions
- historical data
- performance requirements
- failure analysis
- RTS's testing and experience
- reliability-centered maintenance programs

2. Requirements and specific tasks

The inspection and maintenance procedures in this section shall be carried out when working in, under or around a vehicle that is under inspection.



WARNING: Follow proper lock-out/tag-out procedures as required by the RTS.



WARNING: Ensure that the vehicle is properly secured against uncontrolled movement in accordance with the RTS rules before commencing inspection and maintenance procedures.



WARNING: Remove power from vehicle car-borne control equipment before attempting any repairs or replacements. Follow OEM, RTS and standard electrical safety precautions when conducting preventative maintenance to reduce the possibility of electrical shock and arc flash.



WARNING: Semiconductor components may be susceptible to electrostatic discharge (ESD) damage. Follow OEM recommendations when handling printed circuit boards (PCBs) and components.



WARNING: Use only those cleaning products and lubricants proven safe and authorized for use by the RTS. Consult OEM and MSDS references for suitability for each application to prevent personal injury and damage to the equipment.

2.1 Materials

The following materials are normally required for cab signal system inspection and maintenance:

- OEM and RTS recommended lubricants
- OEM and RTS recommended cleaning supplies

Reference OEM maintenance manuals for additional materials.

2.2 Devices and tools

The following devices and tools are normally required for cab signal system inspection and maintenance:

- standard tools carried by the maintenance personnel
- special tools as recommended by the OEM and/or RTS
- test fixtures (specific to OEM equipment), which may include receiving and transmission loop antennas
- function generator*
- oscilloscope*
- frequency counter*
- digital voltmeter*
- fixed test fixtures for PCB calibrations.

NOTE: Devices and tools marked with an asterisk (*) require periodic calibration as specified by the RTS's practices.

2.3 Safety/personal protective equipment

Appropriate personal protective equipment, meeting minimum American National Standards Institute (ANSI) standards and as required by the RTS, shall be worn at all times in the performance of these inspection and maintenance tasks.

The RTS established safety practices, rules and procedures must be followed at all times in the performance of these inspections and maintenance.

2.4 Training requirements

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

2.5 Inspection and maintenance

In all the following procedures, the OEM's maintenance manuals shall be referred to for such items as torque values, voltage settings, pass/fail criteria condemning limits, clearance measurements and specific procedure methodology. Devices must be cleaned for proper inspection. These procedures cover only the visible inspection, adjustments and functional testing of the car-borne train control equipment. Methodologies for the resolution of deficiencies noted while performing these procedures must be tailored by the individual property in conjunction with the OEM's recommendations. Documentation of the inspection and maintenance process as to interval, deficiencies and resolution of those deficiencies found, shall be done in a comprehensive manner so as to create a useful database, which will enhance the reliability and accountability of the process.

2.5.1 Inspections performed during periodic maintenance

- a) Visually inspect (if equipped) antennas, receiver coils, laminated bars, inductive loops and pickup coils for damage, erosion, corrosion and dirt buildup. Clean repair, calibrate, adjust and/or replace as required.
- b) Check operation of all switches and pushbuttons. Clean, repair and/or replace as required.
- c) Check tachometers/speed sensors for wear, loose mounting, dirt buildup and frayed wiring. Clean, repair and/or replace as required.
- d) Visually inspect components for loose or missing hardware and connections. Clean, repair and/or replace as required.
- e) Visually inspect wiring and cables for broken, brittle or cracked insulation. Repair and/or replace as required.
- f) Visually inspect relay contacts for burns, pitting or any other deformities. Clean, repair and/or replace as required.

NOTE: Vital relays require periodic test and calibration based on RTS procedures and/or OEM recommendations. Technicians who perform calibration and repairs to vital relays require specialized training.

- g) Check power supply voltage(s), test coil voltage(s), wheel size setting, door no motion, door power/brake and door/step by-pass interlock(s). Make adjustments/repairs per OEM recommendations.
- h) Review on-board recording equipment for recorded faults.
- i) Check pickup current and frequency for each code rate.
- j) Check printed circuit boards for calibration per rail system procedures and OEM recommendations.

NOTE: Refer to rail transit system procedures and OEM recommendations for printed circuit board storage life and exchange criteria. OEM recommendations may require rail transit systems to develop a system for tracking the accumulated storage time for each tested and functional printed circuit board.

- k) Perform a functional (safety) check of the cab signal system before releasing vehicles from any maintenance activity that could affect operation of the cab signal system.
- l) With new rolling stock, self-tests may supersede some of the above items.

2.5.2 Functional safety test

A cab signal functional safety test shall be performed before releasing vehicles from any maintenance activity that could affect operation.

2.6 Correction of deficiencies

Any deficiencies uncovered during the inspections required in Section 2.5 shall be corrected and documented in accordance with RTS procedures and OEM recommendations.

3. Documentation/maintenance log reports

All maintenance performed on rail transit vehicle car-borne cab signal systems shall be documented and retained in accordance with RTS procedures. This documentation shall be noted on a unified type of form developed by the RTS or maintenance management information system that provides the following information and maintains complete accountability. It shall include the following:

- car number
- date maintenance performed/completed
- description of problem

- corrective action taken
- operational test and inspection
- mileage/hours/date since last maintenance activity
- serial number of part installed and removed if applicable
- signature, identification number of technician performing the maintenance activity, and date work completed

NOTE: Computerized maintenance management information systems may not accommodate technician signatures. In the absence of a signature line, it is the responsibility of the RTS to ensure that inspection reports can be traced back to the individual performing the inspection for accountability.

References

This document should be used in conjunction with the following publications:

- OEM’s specifications for cab signal control equipment inspection and maintenance
- RTS procedures for cab signal control equipment inspection and maintenance

Definitions

automatic train control: A system for automatically controlling train movement, enforcing train safety and directing train operations.

automatic train operation: A system that handles start-up and acceleration to running speed, maintains route speed, stops the train smoothly at proper platform position, and may automatically open the doors.

automatic train protection: A system for enforcing safe train operation, speed control, over-speed protection, train separation and train routing.

original equipment manufacturer (OEM): The enterprise that designs and builds equipment, initially.

Abbreviations and acronyms

ANSI	American National Standards Institute
ESD	electrostatic discharge
MSDS	material safety data sheet
NATSA	North American Transit Standards Association
OEM	original equipment manufacturer
PCB	printed circuit board
RTS	rail transit system

Summary of document changes

- Document formatted to the new APTA standard format.
- Sections have been moved and renumbered.
- Scope and summary moved to the front page
- Definitions, abbreviations and acronyms have been moved to the back of the document.
- Two new sections added: “Summary of document changes” and “Document history.”

- Some global changes to section headings and numberings resulted when sections dealing with references and acronyms were moved to the end of the document and other cosmetic changes, such as capitalization, punctuation, spelling, grammar and general flow of text.

Document history

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