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**Signals and Communication Working  
Group**

# Vital Relay Testing

**Abstract:** This standard provides procedures for testing rail transit vital relays.

**Keywords:** relay, relay test, signal, test, testing, vital relay test

**Summary:** This standard intends to ensure that special life/safety equipment is operational and reliable; to help rail transit agencies incorporate safety considerations during the inspection and maintenance process; and to identify inspection criteria and maintenance standards that provide a high level of passenger and personnel safety.



## 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-028-03, which has been revised. Below is a summary of changes from the previous document version:

- Migration to the new 2025 APTA document template which standardizes and reorganizes the document's content; a document summary and foreword were added; the scope and purpose have been combined and updated to be more specific.
- Updated list of participants.
- Updated definitions, abbreviations and acronyms to be consistent with standard definitions; specifically, RTS has been replaced with rail transit system throughout the document.
- Document sections renumbered to simplify the referencing of content
- Reference to the use of the AREMA C & S manual was updated.



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## Participants

The American Public Transportation Association greatly appreciates the contributions of the **Signals and Communication Working Group**, which provided the primary effort in the drafting of this document.

At the time this standard was completed, the working group included the following members:

**Aderemi Omotayo**, *LA Metro*, Chair

**Joel McCormack**, *AECOM*, Vice Chair

**Kurt Slesinger**, *Greater Cleveland Regional Transit Authority*, Secretary

Salvatore Ambrosino, *MTA New York City Transit*

Jose Arriojas, *New Jersey Transit Corporation*

Charles Barlow, *EverGlow NA*

Ryan Becraft, *Denver Transit Operators*

Frank Beeck, *Rail-IT*

Peter Bertozzi, *Patrick Engineering*

Stephane Bois, *AECOM*

Mark Bressi, *Hitachi Rail Systems USA*

Randy Brundridge, *KB Signaling*

Michael Bunnell, *MTA Metro-North Railroad*

Anthony Candarini, *AECOM*

Andrew Clapham, *Network Rail Consulting*

Benjamin Claus, *Port Authority of Allegheny County*

Nicholas Columbare, *KB Signaling*

David Coury, *Transit Systems Engineering*

Michael Crispo, *Hatch LTK*

Ismail Dahel, *Icomera US*

Philip Dang, *LA Metro*

Nolan Dick, *MBTA*

Martin Dyess, *Dallas Area Rapid Transit*

Stephen Farrell, *Transit Systems Engineering*

Bruce Fenlason, *Metro Transit-Hiawatha Light Rail*

John Frisoli, *SEPTA*

Johann Glansdorp, *WMATA*

Alex Goff, *AECOM*

Howard Goldberg, *Mott MacDonald*

Howard Gregson, *AECOM*

Pat Guest, *NICTD*

Daniel Hernandez, *Chicago Transit Authority*

Tru Hong, *Gannett Fleming*

Rameez Iftikhar, *TransLink*

Peter Koonce, *City of Portland*

Philip Lee, *WMATA*

Michael Lowder, *Vanasse Hangen Brustlin*

Scott Matonak, *Hitachi Rail STS*

William McClellan, *ACI*

Jerry McCormack, *Vomar Products*

Eric McGraw, *Chicago Transit Authority*

Douglas McLeod, *Network Rail Consulting*

Douglas Minto, *Siemens Mobility*

Jeannette Mitchell, *Chicago Transit Authority*

Javier Molina, *Dallas Area Rapid Transit*

Thomas Newey

Ojo Nwabara, *Hitachi Rail STS*

William Palko, *Mott MacDonald*

Stephen Ranck, *KB Signaling*

Daniel Reitz, *Port Authority Trans-Hudson*

Louis Sanders, *Ayers Electronic Systems*

Tim Shoppa, *WMATA*

Phil Wellman, *Metro Transit*

James Winter, *Siemens Mobility*

## Project team

Eugene Reed, *American Public Transportation Association*

## Introduction

*This introduction is not part of APTA RT-SC-S-028-03, "Vital Relay Testing."*

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).

## **Scope and purpose**

This document establishes standard requirements for testing rail transit vital relays. The purpose of this standard is to verify that vital relays are operating safely and as designed through periodic inspection and testing, thereby reducing the risk of hazards and failures.

## **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).

# Vital Relay Testing

## 1. Testing requirements

### 1.1 Testing frequency

The testing procedures in this standard shall be performed:

- annually;
- when vital relays are placed in service;
- when vital relays are modified, repaired or disarranged;
- at the frequencies recommended in **Table 1**; or
- as otherwise deemed necessary by the rail transit agency.

**TABLE 1**  
Testing Frequencies

Relay types	Recommended test frequency (minimum)
Vane, dc polar, electromechanical timers, electromechanical code rate transmitters/receivers	Every two years
Electronic/solid state timers, code rate transmitters/receivers	Every four years
Car-carried vital relays	Every six years
All other vital wayside relays	Every four years

The rail transit agency shall determine the need for additional testing frequencies for vital relays. 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
- rail transit agency testing and experience
- regulatory requirements

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

### 1.2 Training

The rail transit agency and/or its 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.

### **1.3 Materials**

No consumable materials are required for testing vital relays unless deemed necessary by the OEM and/or rail transit agency.

### **1.4 Tools**

The following tools are required for testing vital relays:

- stopwatch
- multimeter\*
- power source\*
- relay test unit\*
- agency-approved portable radio
- standard tools carried by maintenance personnel

**NOTE:** Tools marked with an asterisk (\*) should be calibrated in accordance with OEM and/or rail transit agency requirements.

### **1.5 Personal protective equipment**

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

### **1.6 Safety**

Rail transit agency safety rules and procedures shall be followed at all times during inspection and maintenance.

### **1.7 Test procedure**

Vital relay testing procedures may be modified for each rail transit agency's requirements (see "Note on alternate practices") but shall contain the steps listed in this section as a minimum, using the approved procedures for the specific relay under test:

1. Notify the operations control center (OCC) and/or other authorities of the test activities to be performed.
2. Check the relay pickup for proper operation in accordance with rail transit agency procedures. Visually observe the armature and other movements and verify that there are no defects and that there is no binding.
3. Check the relay drop-away for proper operation in accordance with rail transit agency procedures. Visually observe the armature and other movements and verify that there are no defects and that there is no binding.
4. Visually inspect the relay for burned, damaged, misaligned, corroded or otherwise contaminated contacts.
5. Visually inspect the relay for loose, heavily discolored or broken covers; broken seals; loose or broken gaskets; foreign material; and evidence of wear and deterioration.
6. Notify the OCC and/or other authorities when inspection is complete.

## **1.8 Correction of deficiencies**

Deficiencies identified during vital relay testing shall be corrected and documented in accordance with OEM and/or rail transit agency requirements.

## **1.9 Documentation**

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



## References

In addition to OEM specifications and rail transit agency procedures for vital relay testing, the following documents should be used in conjunction with this standard:

Alstom Engineering Data Sheets.

The most recent edition of the AREMA communication and signals manual

Union Switch & Signal Engineering Data Sheets.

## Definitions

**car-carried relay:** A relay installed on transit cars.

**contact:** A conducting part that co-acts with another conducting part to open or close an electric circuit.

**direct current (dc) polar relay:** A relay that operates in response to a change in the direction of direct current in its controlling circuit and the armature of which may or may not remain at full stroke when its control circuit is interrupted.

**electromechanical code rate transmitter relay:** A device that uses electrical energy to produce an oscillating action to periodically vary an electrical circuit at a definite predetermined code frequency.

**electromechanical timer relay:** A motor-driven relay with or without an electrically operated clutch, which will not close its front contacts or open its back contacts until the expiration of a definite time interval after the relay has been energized.

**gasket:** A sealing device used to protect equipment and to prevent gases or liquids from passing through.

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

**operations control center (OCC):** That facility from which train control, train dispatching and/or train supervision takes place for the entire rail transit agency or for specific segments of an agency if there is more than one control center. Also called *rail control center*, *rail operations center*, *rail service control center*, *train command center*.

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

**personal protective equipment:** 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.

**rail transit agency:** The organization or portion of an organization that operates rail transit service and related activities. Also called *operating agency*, *operating authority*, *transit agency*, *transit authority*, *transit system*.

**relay drop-away:** The level of current at which a relay armature drops to the normally de-energized state. Also called *release value*.

**relay pickup:** The minimum current required to move a relay armature from one state to another when its coil is energized.

**seal (tamper evident):** A device used to identify tampering and/or unauthorized access to a relay's internal components.

**seal:** A device used to prevent gases or liquids from passing through.

**sealed battery system:** A network of batteries sealed to prevent the leakage of its gas or liquid contents.

**vane relay:** A type of alternating current relay in which a metal disc (vane) moves in response to current in the controlling circuit.

**vital relay:** A relay meeting certain stringent specifications, so designed that the probability of its failing to return to the prescribed state upon de-energization is so low as to be considered practically nonexistent.

## Abbreviations and acronyms

<b>dc</b>	direct current
<b>OCC</b>	operations control center
<b>OEM</b>	original equipment manufacturer

## Document history

Document Version	Working Group Vote	Public Comment/ Technical Oversight	Rail CEO Approval	Policy & Planning Approval	Publish Date
First published	—	—	—	—	Jan. 28, 2004
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