

37. Recommended Practice for Signal and Communication System Configuration Control

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Abstract: This recommended practice provides guidelines for rail transit signal and communication system configuration control.

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Introduction

(This introduction is not a part of APTA RT-SC-RP-037-03, *Recommended Practice for Signal and Communication System Configuration Control*.)

APTA rail transit safety standards and recommended practices represent an industry consensus on 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 recommended practice provides guidelines for inspecting and testing rail transit signal and communication system configuration control.

APTA recommends this practice 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)

The application of any 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 recommends.

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Recommended Practice for Signal and Communication System Configuration Control

1. Overview

1.1 Scope

This recommended practice provides guidelines for the configuration control of rail transit signal and communication systems including documentation that describes the current versions of hardware, firmware, and software.

1.2 Purpose

The purpose of this recommended practice is to provide guidelines for accurately documenting signal and communication system configurations, thereby increasing reliability and reducing risks of hazards and failures. This recommended practice covers key elements of software development configuration control but will not attempt to cover all aspects of this complex subject.

2. References

This recommended practice should be used in conjunction with the most recent versions of the following publications.

APTA RT-SC-RP-030-03, Recommended Practice for Non-Vital Processor Based Systems Inspection, Testing and Configuration Control.

APTA RT-SC-S-035-03, Standard for Vital Processor Based Systems Inspection, Testing and Configuration Control.

3. Definitions and acronyms

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

3.1 Definitions

3.1.1 configuration control: A process to assure that all documentation that describes a system and its various components is current and reflects the actual functional and physical characteristics of the system throughout its life cycle.

3.1.2 firmware: A device that is programmed with instruction set software and installed in a processor based system, e.g., EPROM.

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

3.1.4 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.

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

3.1.6 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.

3.1.7 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.

3.2 Acronyms

CAD	computer aided design
OCC	operations control center
OEM	original equipment manufacturer
PPE	personal protective equipment
RTS	rail transit system

4. Configuration control provisions

4.1 Configuration control frequency

The configuration control procedures in this recommended practice should be performed when signal and communication systems are placed in service, when they are modified, repaired, or disarranged, or as otherwise deemed necessary by the RTS.

The RTS should determine the need for additional inspection and testing frequencies for signal and communication systems. 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 should comply with applicable federal, state, and local regulations.

4.2 Training

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

4.3 Materials

No consumable materials are recommended for signal and communication systems configuration control unless otherwise specified by the OEM and/or RTS.

4.4 Tools

The following tools are recommended for signal and communication systems configuration control:

- Software configuration control tool
- Computer
- RTS-approved portable radio
- Standard tools carried by maintenance personnel
- Additional tools as recommended by the OEM and/or RTS

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

4.5 Personal protective equipment

Personal protective equipment, as required by the RTS, should be worn at all times during configuration control.

4.6 Safety

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

4.7 Configuration control procedures

The configuration control procedures in this recommended practice may be modified for each rail transit system's requirements but should contain the steps listed in Sections 4.7.1-4.7.3 as a minimum.

4.7.1 Document configuration control

- 4.7.1.1 Develop a formal document change management process that includes a configuration control board and clearly defines roles and responsibilities.
- 4.7.1.2 Develop a procedure to ensure configuration control is secure and prevents unauthorized access to documents under configuration control.
- 4.7.1.3 Establish a process for uniquely identifying each document.
- 4.7.1.4 Develop a standard format for document types including CAD software, text and graphics format, locations for identification and standard data, revision identification, and symbol conventions. Suppliers should be required to furnish documents in RTS formats.
- 4.7.1.5 Develop change control processes to ensure that:
 - a) all changes to documents are identified
 - b) the change has been approved by the proper authority
 - c) the accuracy of the changes are verified
 - d) dates of changes and implementation are identified
 - e) the reason for the changes are recorded
- 4.7.1.6 Establish a document retention schedule to define a document's useful life. The retention schedule should consider legal as well as technical issues.
- 4.7.1.7 Establish a distribution process to ensure:
 - a) documents are available to the users
 - b) users are notified of revisions;
 - c) users can determine the applicable documents
 - d) obsolete documents are removed from service or field locations
- 4.7.1.8 Develop a standard storage and retrieval process, especially for electronic media.

4.7.1.9 Create and store duplicate copies of documentation in a location separate from the main document repository.

4.7.2 Software development configuration control

The software configuration control procedures listed below apply when rail transit systems develop software in house as opposed to purchasing it commercially.

4.7.2.1 Develop a procedure to ensure configuration control is secure and prevents unauthorized access to software being developed.

4.7.2.2 Develop a formal software change management process that includes a configuration control board that clearly defines roles and responsibilities.

4.7.2.3 Develop change control processes to ensure that:

- a) the change has been approved by the proper authority
- b) the accuracy of the changes are verified
- c) dates of changes and implementation are identified
- d) changes within software code are clearly identified and documented
- e) the reason for the changes are recorded

4.7.2.4 Establish a reliable naming and numbering process for identifying software, directory structure, and version. The process should identify all source codes for each version and the compiling tools used.

4.7.2.5 Utilize a software configuration control tool.

4.7.2.6 Develop a process to track problems and their resolutions.

4.7.2.7 Document test results.

4.7.2.8 Establish a version compatibility matrix to identify which hardware configurations the software version is compatible with.

4.7.2.9 Place fully developed software under configuration control as described in Section 4.7.3.

4.7.3 Fully developed software configuration control

The software configuration control procedures listed below apply when the software is fully developed and relatively static. See Section 4.7.2 for configuration control of software under development.

- 4.7.3.1 Develop a procedure to ensure configuration control is secure and prevents unauthorized access to software under configuration control.
- 4.7.3.2 Establish a master record of all in-service software.
- 4.7.3.3 Software identification should include the system(s) it is used in, version, version date, and in-service date.
- 4.7.3.4 Develop standard archiving storage and retrieval processes.
- 4.7.3.5 Create and store duplicate copies of software in a location separate from the main software repository.
- 4.7.3.6 The RTS should obtain all source code and compiling tools. In the event a vendor can no longer support a product or the RTS intends to modify the software, these materials should be escrowed to ensure availability under pre-established conditions.
- 4.7.3.7 Establish an audit process to ensure proper baseline software is delivered by vendors, and in-service software is under configuration control.
- 4.7.3.8 Develop formal firmware programming procedures to produce copies from archive files or master copies of firmware.
- 4.7.3.9 Label firmware with name, revision level, revision date, check sum value, and socket location on printed circuit card, e.g. U32.
- 4.7.3.10 Establish a distribution process to ensure:
 - a) software is available to the users
 - b) users are notified of software revisions
 - c) users can determine the applicable software
 - d) obsolete software/firmware is removed from service or field locations

Refer to the *Standard for Vital Processor Based Systems Inspection, Testing and Configuration Control* and *Recommended Practice for Non-vital Processor Based Systems Inspection, Testing and Configuration Control*¹ for software configuration control requirements for those systems.

4.8 Correction of deficiencies

Deficiencies identified during signal and communication system configuration control should be corrected and documented in accordance with OEM and/or RTS requirements.

¹ For references in Italics, see Section 2.

4.9 Documentation

Configuration control activities should be documented, reviewed, and filed in accordance with RTS procedures.

Annex A

(informative)

Bibliography

- [B1] AREMA communication and signals signal manual. Volume 4: Section 17, Quality Principles, Processor Based Equipment, 1999 (includes 1998-1999 revisions).
- [B2] Original equipment manufacturer (OEM) specifications for signal and communication system configuration control.
- [B3] RTS procedures for signal and communication system configuration control.