# 16. Recommended Practice for Private Branch Exchange (PBX) System Inspection, Testing and Maintenance

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**Abstract:** This recommended practice provides guidelines for inspecting, testing, and maintaining rail transit communication system private branch exchange (PBX) systems and equipment.

**Keywords:** communication, communication system, inspection, PBX, private branch exchange, tape head cleaning, tape head testing, test, testing, trunk group UPS

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# Introduction

(This introduction is not a part of APTA RT-SC-RP-016-03, *Recommended Practice for Private Branch Exchange [PBX] System Inspection, Testing and Maintenance*.)

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, testing, and maintaining rail transit private branch exchange systems.

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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# Contents

# Recommended Practice for Private Branch Exchange (PBX) System Inspection, Testing Maintenance

## 1. Overview

### 1.1 Scope

This document establishes recommended guidelines for inspecting, testing, and maintaining rail transit private branch exchange (PBX) systems.

### 1.2 Purpose

The purpose of this recommended practice is to verify that PBX systems and equipment are operating safely and as designed through periodic inspection, testing, and maintenance, thereby increasing reliability and reducing the risk of hazards and failures.

## 2. Definitions and acronyms

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

### 2.1 Definitions

**2.1.1 battery:** A device that converts chemical energy to electrical energy.

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

**2.1.3 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.**

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

**2.1.5 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.

**2.1.6 private branch exchange (PBX):** A telephone system that implements four- or five- digit dialing between users.

**2.1.7 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**.

**2.1.8 trunk line:** A system that connects the private branch exchange (PBX) to the local carrier switch or public switch telephone network (PSTN).

**2.1.9 un-interruptible power supply (UPS):** A system that provides continuous electrical power and acts as a backup power supply in the event of utility power loss.

## 2.2 Acronyms

| | |
|---|---|
| **OCC** | operations control center |
| **OEM** | original equipment manufacturer |
| **PBX** | private branch exchange |
| **PPE** | personal protective equipment |
| **PSTN** | public switched telephone network |
| **RTS** | rail transit system |
| **UPS** | un-interruptible power supply |

# 3. Inspection, testing, and maintenance provisions

## 3.1 Inspection, testing, and maintenance frequency

The inspection, testing, and maintenance procedures in this recommended practice should be performed

a) when PBX systems are placed in service

b) when they are modified, repaired, or disarranged

c) at the frequencies in Table 1 below

d) as otherwise deemed necessary by the RTS

**Table 1 – Inspection, testing, and maintenance frequency**

| Action | Recommended frequency (minimum) |
|---|---|
| Trunk line diagnostic test | Upon receiving an alarm indication or weekly if not performed automatically via maintenance diagnostic cards. |
| Air flow test | Upon receiving an alarm indication or bi-annually (every 6 months) |
| UPS test | Bi-annually (every 6 months) |
| Tape head cleaning (where applicable) | Quarterly (every 3 months) |

The RTS should determine the need for additional inspection, testing, and maintenance frequencies for PBX 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.

## 3.2 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.

## 3.3 Materials

No consumable materials are recommended for inspecting, testing, and maintaining PBX systems unless otherwise specified by the OEM and/or RTS.

## 3.4 Tools

The following tools are recommended for inspecting, testing, and maintaining PBX systems:

- Data communication diagnostic test set*
- Tape head cleaner
- Digital multi-meter*
- Battery tester*
- RTS-approved portable radio
- Standard tools carried by maintenance personnel

– Additional tools as recommend 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, should be worn at all times during inspection, testing, and maintenance.

## 3.6 Safety

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

## 3.7 Inspection, testing, and maintenance procedures

PBX system inspection, testing, and maintenance may be modified for each rail transit system's requirements but should contain the steps listed in Sections 3.7.1-3.7.10 as a minimum.

**3.7.1** Notify the operations control center (OCC) and/or other authorities of the inspection, testing, and maintenance activities to be performed.

**3.7.2** Visually inspect equipment, components, and wiring.

**3.7.3** Check that trunk lines are within specified limits

**3.7.4** Check diagnostic cards for alarms caused by improper airflow

**3.7.5** Check PBX equipment filters to ensure that:

– Air flow is adequate

– Air flows in proper direction

**3.7.6** Replace air filters as required.

**3.7.7** Check un-interruptible power supply (UPS) battery voltage using the following steps:

a) Transfer power of the PBX system to the UPS

b) Check voltage levels of the UPS batteries to ensure the knee of voltage curve is not approached

c) Upon completion of test restore PBX system to the normal power source

**3.7.8** Thoroughly clean the tape head using RTS/OEM approved materials.

**3.7.9** Cycle card redundancy. Move power supply and other redundant cards from primary to backup in order verify that it is operational.

**3.7.10** Notify the OCC and/or other authorities that inspection, testing, and maintenance activities are complete.

## 3.8 Correction of deficiencies

Deficiencies identified during PBX system inspection, testing, and maintenance should be corrected and documented in accordance with OEM and/or RTS requirements.

## 3.9 Documentation

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

# Annex A

(informative)

## Bibliography

[B1] Original equipment manufacturer (OEM) specifications for PBX inspection, testing, and maintenance.

[B2] Rail transit system (RTS) procedures for PBX inspection, testing, and maintenance.