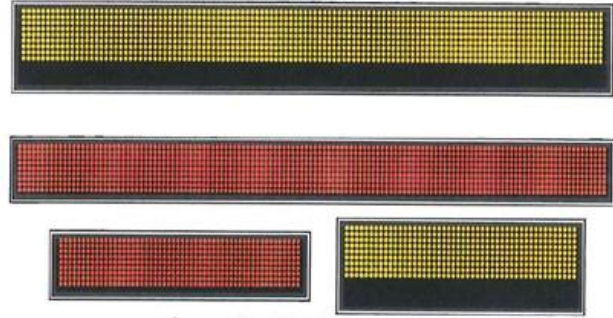


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**Inspection and  
Maintenance  
of  
Rail Vehicle  
Communication Systems**

**Course 210**



**PARTICIPANT  
GUIDE**



# Communication Systems Inspection and Maintenance Course 210

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## Participant Guide

June 2019 DRAFT

Rail Car Training Consortium

# REVISION INDEX

Any additions, deletions, or revisions are to be listed below.

Revision No.	Date	Section	Description of Change	Revision Author
1	6-29-19		Technical Edits	K.Youngbluth
2	1-1-20		Pilot Edits	K.Ribaudo

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# HOW TO USE THE PARTICIPANT GUIDE

## Purpose of the Course

*Course 210: Inspection and Maintenance of Rail Vehicle Communication Systems* provides participants with an overview to the inspection and maintenance procedures followed for the rail vehicle's communication system and its individual components.

## Approach of the Book

Each course module begins with an outline, a statement of purpose and objectives, and a list of key terms. The outline will discuss the main topics to be addressed in the Module. A list of *key terms* identifies important terminology that will be introduced in this Module. *Learning Objectives* define the basic skills, knowledge, and abilities course participants should be able to demonstrate to show that they have learned the material presented in the Module. *Exercises* are built in throughout the course materials to assist the participants in learning and reviewing key information.

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# MODULE 1

## *Inspection and Maintenance of Communication Systems*

### Outline

- 1-1 Overview
- 1-2 Working Safely
- 1-3 Inspection Schedules and Checklists
- 1-4 Summary

### Purpose and Objectives

The purpose of this Module is to provide participants with an understanding of safety requirements and inspection and maintenance schedules for rail vehicle communication systems.

Following the completion of this Module, the participant should be able to complete the objectives with an accuracy of 75% or greater:

- Explain the difference between scheduled and unscheduled maintenance.
- Identify PPE specific to inspection and maintenance of rail vehicle communication systems.
- Explain agency specific inspection schedules.

### Key Terms

- Scheduled maintenance
- Personal Protective Equipment
- Unscheduled maintenance
- Safety glasses
- Run Maintenance Test
- Preventive maintenance
- Grounding strap

## 1-1 OVERVIEW

In order to keep transportation agencies running safely and efficiently, rail vehicles need to be fully operational. Maintenance on rail vehicles is meant to keep equipment in its existing condition; preserved or protected; or kept from failure or decline. Maintenance is meant to provide reliability, meet safety standards, and provide onboard services for rail passengers and crew.

There are two types of maintenance; unscheduled and scheduled. **Unscheduled maintenance** is unavoidable. One example of unscheduled maintenance is where the Centralized Communication Control Unit is not receiving inputs. Other terms unscheduled maintenance is referred to is reactive maintenance, corrective maintenance or breakdown maintenance.

**Scheduled maintenance**, also referred to as **preventive maintenance**, is the proactive approach of scheduling maintenance in order to preserve, protect and keep rail car systems from failure or decline. Scheduled maintenance helps to keep equipment working properly and to extend the life of the equipment. Scheduled maintenance is guided by agency requirements, regulatory and code requirements, technical safety requirements, in-service inspection and testing, as well as engineering decisions and OEM recommendations.

## 1-2 WORKING SAFELY

Hazards exist in every workplace in many different forms; sharp edges, falling objects, flying sparks, chemicals, noise, and a myriad of other potentially dangerous situations. The Occupational Safety and Health Administration (OSHA) requires that employers protect their employees from workplace hazards that can cause injury.

**Personal Protective Equipment**, often referred to as PPE, is equipment provided to the worker to limit exposure to workplace hazards. Hard hats, safety glasses, ear plugs and safety boots are common pieces of PPE. According to OSHA, PPE is worn to minimize the risk the exposure to chemical, radiological, physical, electrical, mechanical or other workplace hazards.

OSHA Standard 1920.132(a) states that personal protective equipment or PPE, including protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers. PPE shall be provided, used, and maintained in a sanitary and reliable condition whenever it is necessary by reason of hazards, processes, environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

PPE should be maintained and cleaned per equipment and agency guidelines. PPE should fit comfortably. The difference between properly and ill-fitting PPE, could result in injury or death.

A full list of PPE items was provided in Course 100. When performing rail vehicle communication system maintenance or inspection checks, it is necessary to wear the appropriate PPE. PPE specific to communication systems inspection and maintenance include:



- Safety glasses; and
- Grounding strap.

**Safety glasses** are a standard PPE that rail car technicians should wear. They protect the eyes and can be constructed from metal or plastic. On some models, they may have side shields.



*Figure 1.1 Safety Glasses*

**Fall Protection**

Falls are one of the most common workplace injuries. Fall protection is designed to protect employees from falling. In the event a fall does happen, fall protection is intended to prevent serious injury. Employees are responsible for providing employees with proper fall protection training. Replacing antennas on top of a vehicle is an example of when a technician would use fall protection.



*Figure 1.2 Fall Protection*



**Learning Application 1.1 – PPE**

Together as a class, identify any additional PPE that may be used within the specific scope of inspecting and maintaining rail vehicle communication systems at your agency. Identify type of PPE and function in the chart below.

TYPE OF PPE	FUNCTION

## 1-3 INSPECTION SCHEDULES AND CHECKLISTS

There is no scheduled, or preventive maintenance, on the communication system. Maintenance is performed during a pre-trip inspection or if an operator calls in a problem with the communication system.

### Pre-Trip Inspection

Prior to the rail vehicle entering revenue service each day, the technician will perform a pre-trip inspection. The communication system and its components will be inspected during the pre-trip inspection. The pre-trip inspection includes:

- Cycle doors: ensure automatic “door opening” and “door closing” announcements come on and can be heard;
- Verify signs are working;
- Passenger Intercom Unit: All PIUs are working. communication between car and operator is audible. Verify red light on the outside of vehicle ignites to identify which car the PIU was initiated in;
- Trainline communication: verify announcements can be made and heard throughout the consist; and
- Radio check: Ensure radio communication with central control and yard control.



#### Learning Application 1.2 – Pre-Trip Inspection Procedures

Pre-Trip Inspection procedures vary by agency. With the help from your instructor, identify the steps of a *communication system* pre-trip inspection. Who performs the inspection; technician or operator?

PRE-TRIP INSPECTION	
STEP 1	
STEP 2	
STEP 3	
STEP 4	
STEP 5	

Some agencies will also have the ability perform **Run Maintenance Tests**. These types of tests are highly specific to the individual agency and depend on the type of vehicle and software being used. For example, on WMATA's new 7000 series trains, the pre-trip inspection is performed entirely from the train's control display. This touchscreen display performs a run maintenance test of every individual component of the communication system. If there are any faults, they are flagged and the technician is then able to further investigate.



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**Learning Application 1.3 – Run Maintenance Test**

**Group Discussion:** Run Maintenance Tests are specific to the individual agency. If your vehicles use a specific type of software to run maintenance tests, identify which software. Discuss how the maintenance software is used. Take notes for future reference

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Module 2 will discuss in greater depth how to inspect and maintain each individual component that comprises the communication system. If during the pre-trip inspection, a specific fault is identified with one of the communication system components, the technician will need to directly address that problem.

## 1-4 SUMMARY

This Module presented the learner with an overview to working safely and specific PPE used for inspection and maintenance of the rail vehicle's communication system. Inspection schedules and pre-trip inspection procedures were also discussed. As always, refer to your agency for specific information regarding the inspection schedules and processes of the communication system.

# MODULE 2

## *Inspection and Maintenance of Communication System Components*

### Outline

- 2-1 Overview
- 2-2 Vehicle Internal Components
- 2-3 Vehicle External Components
- 2-4 Summary

### Purpose and Objectives

The purpose of this Module is to provide participants with an overview to maintenance and inspection schedules for individual components of the communication system.

Following the completion of this Module, the participant should be able to complete the objectives with an accuracy of 75% or greater:

- Demonstrate the ability to inspect and maintain communication system components to include:
  - Amplifiers
  - Automatic Announcement Control Panel
  - Automatic Vehicle Identification
  - Automatic Passenger Counting
  - Camera and Video System
  - Centralized Communication Control Unit
  - GPS
  - Microphone and Radio
  - Passenger Intercom Unit
  - Public Address System (PA)
  - Speakers
  - Train-to-Wayside Controls (TWC)
  - WiFi

## Key Terms

- Centralized Communication Control Unit
- Microphone
- Radio
- Automatic Announcement Control Panel
- Passenger Intercom Unit
- Speakers
- Antennas
- Public Address System (PA)

## 2-1 OVERVIEW

The communication system requires less maintenance than any other railcar system, however, it is one of the most important systems to ensure efficient and safe operation of the vehicle.

Maintenance on the communication system is mostly visual to ensure parts aren't broken, wires are connected and audible sounds are coming from the speakers. However, it is still necessary for the rail car technician to know and be able to inspect and maintain each individual component associated with the communication system.

This Module helps the participant examine maintenance procedures that can be modeled in their approach to inspect and maintain the rail vehicle's internal and external communication system components. There are variations in a rail car's communication system in terms of configuration as well as OEM design. This Module uses a two-part approach in listing recommended practices for inspection and maintenance:

1. An overview of the component.
2. A guide showing general recommended inspection and maintenance steps for the component that provides room for the participant to note their agency-specific inspection and maintenance requirements for that component.

When necessary, a case study from a consortium agency will be shared to provide a useful context that the participant can take to approach the inspection and maintenance of that component and consult with their agency's documentation on the correct procedures.

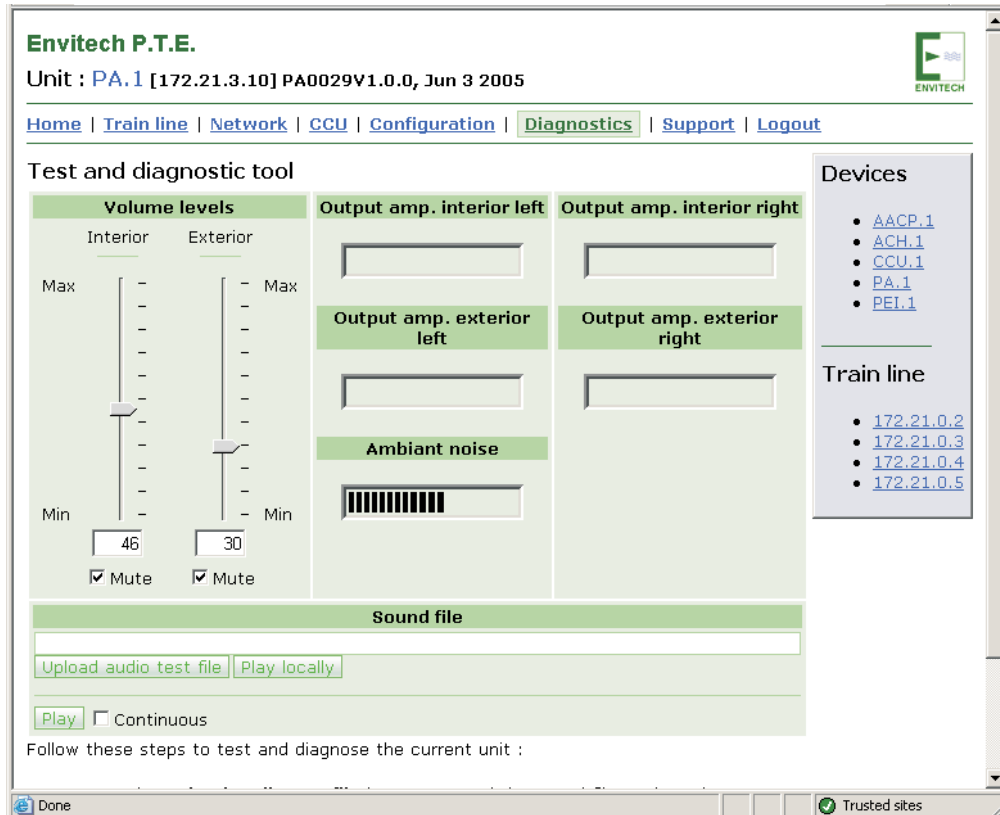
## 2-2 VEHICLE INTERNAL COMPONENTS

### AMPLIFIER

Public Address System, internal and external amplifiers help to increase and adjust the speaker volume to ambient noise on the rail vehicle. Amplifiers are vital to ensure passengers are able to hear announcements.

Amplifier Inspection and Maintenance	
General Recommendations	Your Notes on Agency Requirements
<ul style="list-style-type: none"> <li>• Visual inspection for damage to Amplifier enclosure</li> <li>• Check condition and tightness of mounting screws and connectors</li> </ul>	

**Figure 2.1** shows a screenshot from a Portable Test Unit for a diagnostic check of a PA amplifier used to test the microphone at CATS. This diagnostic test allows the technician to check volume levels, output amp, ambient noise and sound file. It is important ensure the current software version is being used when using a PTU to diagnose problems. The correct date and time stamps must also be verified.



**Figure 2.1** PA Amplifier Diagnostic. Courtesy of CATS



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**Learning Application 2.1 – Amplifier Diagnostic Test**

Using a PTU, perform a diagnostic test of the amplifier. With the help of your instructor, upload a sound file. Identify the correct volume, output amp and ambient noise levels. Adjust the volume levels and take note how it affects output level. Take notes to use for future reference.

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Notes:



## AUTOMATIC ANNOUNCEMENT CONTROL PANEL (AACP)

The AACP is used to store pre-recorded audio and display information correlated to specific routes. Prior to entering revenue service, the operator will put the AACP into test mode and run through a system test to ensure the announcements are functioning properly.

<b>Automatic Announcement Control Panel Inspection and Maintenance</b>	
General Recommendations	Your Notes on Agency Requirements
<ul style="list-style-type: none"> <li>• Visual inspection for damage to the display and membrane that contains function buttons and LEDs.</li> <li>• Check tightness of mounting screws and connectors.</li> <li>• Perform Amplifier functional test (two-technician job):                             <ul style="list-style-type: none"> <li>○ Technician 1 shall press the “PA” pushbutton in the operator’s cab to initiate a PA announcement, make an announcement and then cancel the PA function. This is repeated for every speaker network on the rail vehicle.</li> <li>○ Technician 2 shall confirm the sound can be heard on the selected speaker network</li> </ul> </li> </ul>	



**Case Study 2.1 – Automatic Announcement Test – Niagara Frontier Transportation Authority (NFTA)**

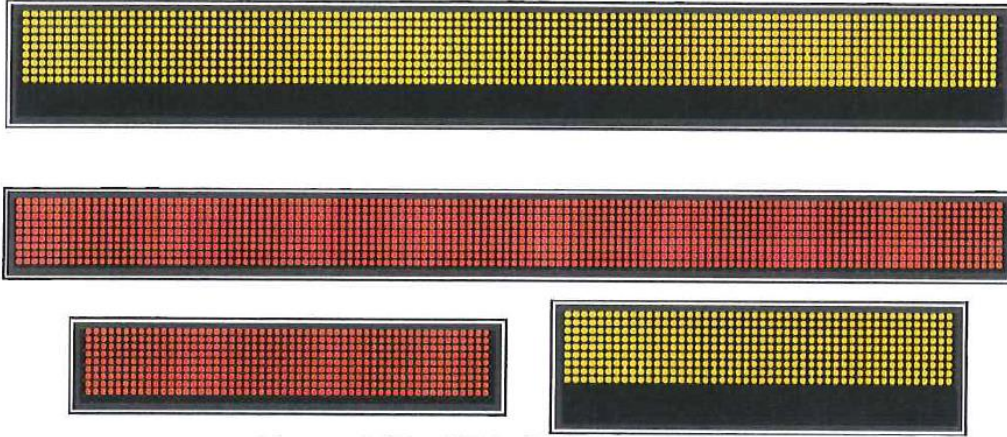
Read Case Study 2.2, which provides the steps followed for an automatic announcement test at NFTA. After, compare and contrast the process to that at your agency.

4	<p><b>Test with activity in progress =AUTOMATIC ANNOUNCEMENT</b></p> <p>From the active console, trigger any automatic announcement. If necessary, during the rest of the test, when the message ends, trigger any new one.</p> <ul style="list-style-type: none"> <li>• Establish a call from the radio: the automatic announcement is interrupted and the radio audio is routed to the PA speakers.</li> <li>• Close the communication from the radio.</li> <li>• While the automatic announcement is being played, set the CCH switch to PA and press the PTT button: the automatic announcement is interrupted and the PA audio can be heard through the coach speakers.</li> <li>• While the automatic announcement is being played, press the PIU call button: the automatic announcement will be terminated and, when the PTT button is pressed, the PIU conversation can take place.</li> <li>• With the CCH selector set to INC, press the PTT button to call the opposite cab: no cab-to-cab activity will start</li> </ul>			
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## AUTOMATIC VEHICLE IDENTIFICATION (AVI)

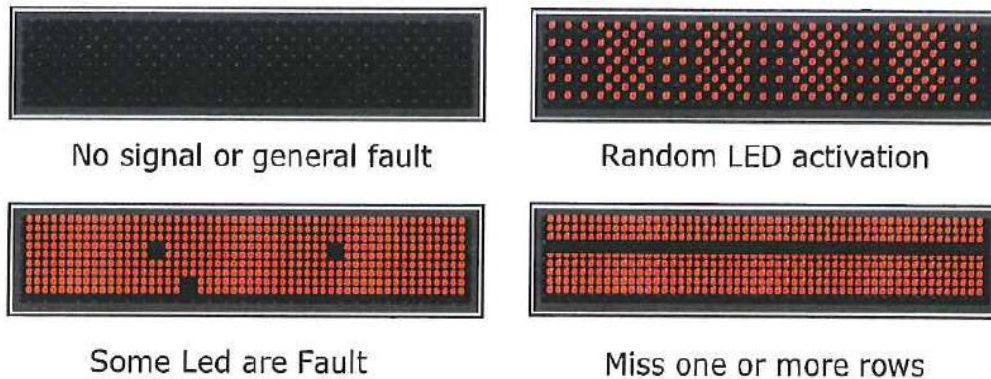
Rail vehicle signs include front destination, run number, internal and external destination. Sign inspection is purely visual. Verify for an LED that is burnt or damaged.

**Figure 2.2**, courtesy of NFTA, shows examples of all sign LEDs turned on and working.



*Figure 2.2 LEDs working. Courtesy of NFTA*

**Figure 2.3**, also courtesy of NFTA, shows examples of sign faults.



*Figure 2.3 Sign Faults. Courtesy of NFTA*

## CAMERA AND VIDEO SYSTEM

The inspection and maintenance of the video and camera system is limited and is typically performed via a self-diagnostic test. Generally, if the lights are blinking, it is assumed that the systems are working properly. Technicians will visually inspect to ensure there are no frayed or crimped wires and connections are tight. If the lights are not blinking, the vendor, or a specialized department is typically brought in to assess the situation. Rail car technicians will usually only access the video and camera system if the vehicle is involved in an accident. With the use of a PTU, the video will be downloaded and handed off to the proper authorities.

Inspection and Maintenance Procedures for Video and Camera Systems

## CENTRALIZED COMMUNICATION CONTROL UNIT (CCCU)

The CCCU is the “heart” of the communication system and monitors the functions of many components, such as the PEI and PA Amplifier, among others. The inspection and maintenance of the CCCU will vary depending on make and model.

The CCCU is typically inspected first, as part of the daily pre-trip inspection, and before the vehicle enters revenue service. Using Metro Transit vehicles as an example, the rail car technician can hook a PTU up inside the cab. By entering an IP address of the CCCU, the technician is able to view each component and determine if there are any faults. If faults are identified, the technician can then access each individual component and perform the necessary maintenance or troubleshooting procedures. Case Study 2.2 provides an example of a CCCU functional test followed at Metro Transit and CATS.

Additionally, it is important to remember that CCCU’s have internal batteries, which are used for memory. The batteries also need to be inspected. To do so, the technician will visually verify the date the battery needs to be replaced.



**Case Study 2.2 – CCCU Functional Test**

Read Case Study 2.2, which provides the steps followed for a CCCU Functional Test. Afterwards, discuss as a class the similarities and differences between the CCCU Functional Test at CATS and Metro Transit and your agency. Use the space provided to take notes for future reference.

STEP	TEST ITEM	OPERATION	EXPECTED RESULT
1	DHCP server.	Using the PTE (see paragraph 4.3.3) select the "Network" page.  Using the PTE (see paragraph 4.3.3) select the "Trainline" page.	All the DVCS units in the vehicle (1 CCU, 2 PA amp, 2 PEI, 2 ACH and 2 AACP) should be present and have an IP address assigned.  All the other vehicles of the consist with their equipment should be present.
2	Software version.	Using the PTE (paragraph 4.3.3) check for software version of every DVCS unit.	The software version should be the latest release.
3	Text and audio announcement database version.	Using the PTE (paragraph 4.3.3) check for announcement database version (vac).	The database version should be the latest release.
4	RS-485 trainline interface.	Execute a PEI call (see Table 3-2 step 2) from another vehicle.  Execute a PA announcement (see Table 3-2 step 3).	Same results as per Table 3-2 step 2.  The PA announcement should also be played in other vehicles.
5	MVB interface.	While playing an automatic audio announcement on the cab speaker, change cab speaker volume on the driver's control panel display.  Initiate a PEI call.  Check health status of DVCS component on the MVB equipment.	The cab speaker volume should change accordingly.  The location of the calling PEI should appear on the driver's control panel display.  Health status of DVCS equipment should be OK.

<b>Agency Specific: CCCU Functional Test</b>			
Step	Test Item	Operation	Expected Result
①			
②			
③			

④			
⑤			

## MICROPHONE AND RADIO

The rail vehicle operator’s cab will have a radio and microphone. The radio provides two-way communication between the operator and central control. The microphone is used to communicate via the PA system to the passengers. The microphone may be built into the dashboard or free standing. In addition to the microphone and radio, the operator will always carry a hand-held radio as back-up, and in the event of an emergency.

<b>Microphone and Radio Inspection and Maintenance</b>	
General Recommendations	Your Notes on Agency Requirements
<p><b>Microphone</b></p> <ul style="list-style-type: none"> <li>• Visual inspection for obvious damage</li> <li>• Check tightness of mounting screws</li> <li>• Using a PTU, perform a diagnostic of microphone</li> </ul> <p><b>Radio</b></p> <ul style="list-style-type: none"> <li>• Visual inspection for obvious damage</li> </ul>	

**Figure 2.4** shows a screenshot from a PTU for a diagnostic test of the gooseneck microphone test used at CATS. The handset microphone input display shows presence of signal at the gooseneck’s microphone input.

**Envitech P.T.E.**  
 Unit : ACH.1 [172.21.3.16] ACH0029V1.0.0, Jun 3 2005

Home | Train line | Network | CCU | Configuration | **Diagnostics** | Support | Logout

**Test and diagnostic tool**

**Lamps**

- PA Lamp
- PEI Lamp
- CCI Lamp

**Last key selection**

PEI Button

**Volume levels**

Cab Spkr

Max - Min

Min - Max

51

Mute

**Handset microphone input**

**Sound file**

Upload audio test file | Play locally

Play  Continuous

Follow these steps to test and diagnose the current unit :

- Press the **Upload audio test file** button to send the sound file to the unit
- When the sound file upload is completed, Press the **play** button to start the audio file playback

**Devices**

- [AAP.1](#)
- [ACH.1](#)
- [CCU.1](#)
- [PA.1](#)
- [PEI.1](#)

**Train line**

- [172.21.0.2](#)
- [172.21.0.3](#)
- [172.21.0.4](#)
- [172.21.0.5](#)

Figure 2.4 Microphone diagnostic test. Courtesy of CATS



### Learning Application 2.2 – Microphone and Radio Diagnostic

Together as a class, using a PTU, perform a diagnostic test of the radio and microphone functions. Take notes on steps and processes to use for future reference.

Notes:


## PASSENGER INTERCOM UNIT (PIU)

Passenger Intercom Units, or PIU, allow for two-way communication between passengers and the operator. PIUs are only used in the event of an emergency.

<b>PIU Inspection and Maintenance</b>	
General Recommendations	Your Notes on Agency Requirements
<ul style="list-style-type: none"> <li>• Visual inspection for damage to faceplate, LED and pushbutton</li> <li>• Check tightness of mounting screws and connectors</li> <li>• Check for any debris (gum) that may be stuck to speaker or button</li> <li>• Perform PIU functional test (<i>two-man job</i>)                             <ul style="list-style-type: none"> <li>○ Technician 1 initiates a PIU call from any PEI in the rail vehicle</li> <li>○ The pushbutton lamp on the operator's control panel and LED should flash. Technician 2 will confirm this.</li> <li>○ Technician 1 should press the pushbutton to terminate the call.</li> <li>○ Technician 2 will confirm the call is terminated and pushbutton lamp and LED extinguishes.</li> </ul> </li> </ul>	

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### Case Study 2.3 – PIU Test



Read Case Study 2.2, which provides the steps followed for a PIU Test. Afterwards, discuss as a class the similarities and differences between the PIU test at NFTA and your agency. Use the space provided to take notes for future reference.

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**COURSE 210: INSPECTION AND MAINTENANCE OF COMMUNICATION SYSTEMS**

STEP	ACTION	OK	KO	OPERATOR
1	<b>Start conditions</b> <ul style="list-style-type: none"> <li>• All PIS devices connected and switched on;</li> <li>• Desk key inserted;</li> <li>• PIS system initialized;</li> <li>• CPU and Database must be updated (see Update Manual)</li> </ul>			
2	During (first seconds) system startup check if both leds (red & green) for each PIU blink 3 times;			
3	<b>Test PIU data communication (RS485, test by console):</b> <ul style="list-style-type: none"> <li>• Press F1 to start;</li> <li>• Choose "Maintenance" menu (5);</li> <li>• Choose "System status" menu (1);</li> <li>• Check the presence of all PIUs from ID1 to ID6 and SW_Ver;</li> <li>• if SW_Ver=0 the RS485 line doesn't works correctly (check RS485 line about that PIU);</li> </ul>			
4	<b>Test PIU audio communication (test by CCH);</b> <ul style="list-style-type: none"> <li>• Press call button on PIU;</li> <li>• Check RED led switches on and bing-bong sound from cab speaker;</li> <li>• On CCH panel in Primary CAB check if RED led switches on (doesn't require a specific selector position);</li> <li>• Verify, outside the train, that the red alarm light are blinking</li> <li>• Press PTT button;</li> <li>• Talk into the microphone;</li> <li>• Check in the calling PIU's speakers the voice;</li> <li>• Release PTT button;</li> <li>• Check if the calling PIU's red led turns off and the green one turns on;</li> <li>• Talk into PIU and check the voice on CAB speaker;</li> <li>• Press INTERCOM RESET and check greed led (on PIU) and red one (on CCH panel) turns off.</li> <li>• Verify that the red alarm light outside the train switch off as well.</li> </ul>			

Notes:

## PUBLIC ADDRESS (PA) SYSTEM

The PA allows the operator to make announcements to passengers by using the active cab microphone.

<b>Public Address System Inspection and Maintenance</b>	
General Recommendations	Your Notes on Agency Requirements
<ul style="list-style-type: none"> <li>• Visual inspection for damage.</li> <li>• Switch the microphone selector in the PA position.</li> <li>• Press “push to talk” (PTT) button and speak to the CAB microphone.</li> <li>• Verify all speakers on the train work correctly.</li> </ul>	

## SPEAKERS

Speakers are strategically placed internally and externally throughout the rail vehicle and are used by the PA system and AACP. The number of speakers will vary by make and model.

<b>Speakers Inspection and Maintenance</b>	
General Recommendations	Your Notes on Agency Requirements
<ul style="list-style-type: none"> <li>• Visual inspection for damage to speakers.</li> </ul> <p><b>Cab Speakers</b></p> <ul style="list-style-type: none"> <li>○ Run a sound wave file. Ensure sound can be heard.</li> </ul> <p><b>Interior and Exterior Speakers</b></p> <ul style="list-style-type: none"> <li>○ Run a sound wave file. Ensure sound can be heard on all interior and exterior speakers.</li> </ul>	



**Learning Application 2.3 – Uploading a Sound Wave File**

Many diagnostic tests on communication system components involve uploading a sound wave file. With the help of your instructor, write the process for uploading a sound file. A hands-on application of uploading a file will happen at the end of this Module.

Step	Procedure Description
①	
②	
③	
④	
⑤	

**2-3 VEHICLE EXTERNAL COMPONENTS**

**ANTENNAS**

There is relatively low maintenance for antennas. Technicians will visually inspect for cracked or damaged antennas. For example, if someone throws a rock and breaks an antenna, a rail car technician will typically fix the antenna. For most other problems, a separate department will be called in to handle the maintenance of components that have antennas.

Agency specific requirements:


## AUTOMATIC PASSENGER COUNTER (APC)

The automatic passenger counter tracks passengers entering and exiting the rail vehicle by use of sensors located above the door. The APC is typically inspected by performing a “figure 8” pattern walking test. The rail car technician will walk in a figure 8 pattern in and out of doors/sensors throughout the entire rail vehicle to test if the counter is working properly. When this test is performed, the system is placed in test mode so data is not stored in the database. Additionally, technicians will replace or clean the APC sensors above the doors if they get vandalized or there are any broken wires. If maintenance beyond this test is needed, the work is typically outsourced to another department.

Inspection and Maintenance Procedures for Automatic Passenger Counter

## GPS AND WIFI

GPS and WiFi are inspected and maintained similarly and will be discussed together. Although procedures will vary by agency, there is relatively low maintenance for these components. Technicians will ensure GPS is transmitting a signal and input is being received by the CCCU. For most other problems, a separate department will be called in to handle the maintenance of GPS and WiFi. The following process is used at NFTA to perform a diagnostic test of the GPS.

Step	Action
1	<p><b>Start conditions:</b></p> <ul style="list-style-type: none"> <li>• All PIS devices connected and switched on</li> <li>• Desk key inserted</li> <li>• PIS system initialized</li> <li>• CPU and Database must be updated</li> </ul>

2	<p><b>Test of GPS date and time regulation</b></p> <p>The vehicle must be outside to allow proper GPS signal receiving</p> <ul style="list-style-type: none"> <li>• Temporarily remove the GPS connector from the VAC panel in order to allow manual Date and Time setting.</li> <li>• Using the active cab console, set a wrong date and time in the PIS</li> <li>• Reconnect the GPS wire to the VAC panel and make sure the PIS is receiving the correct GPS signal</li> <li>• Within one minute the PIS must set the correct date and time using GPS data (time zone and daylight-saving time will be automatically considered).</li> </ul>
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Inspection and Maintenance Procedures for GPS and WiFi

## TRAIN-TO-WAYSIDE-CONTROLS (TWC)

Inspecting Train-to-Wayside Controls or TWC can be done visually and/or with use of a PTU. The general procedure is as follows:

- Visual inspection for damage from wayside debris;
- TWC sends and receives the proper signals;
- TWC is aligned correctly.

The inspection and maintenance of the TWC antenna is fairly limited. The technician shall visually inspect for any physical damage or cracks.

## 2-4 SUMMARY

This Module identified inspection and maintenance procedures for communication system internal and external components. General procedures and case studies were shared for participants to put the information into context of their roles as a rail car technician. As make, model and OEM specific procedures will vary, it is important to always refer to your agency for specific processes related to rail vehicles at your agency.