



Inspection and Maintenance of Interlockings

Course 206

PARTICIPANT GUIDE

 SIGNALS TRAINING CONSORTIUM



Inspection and Maintenance of Interlockings

Participant Guide

Signals Maintenance Training Consortium

COURSE 206

September 2019 Version

PREVIEW ONLY

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How to Use the Participant Guide

Purpose of the Course

The purpose of the *Introduction and Overview of Interlockings* is to assist the participant in demonstrating proper safety procedures and gaining an overview of the functions of interlockings and their associated apparatus.

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. *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. A list of *key terms* identifies important terminology that will be introduced in each course module. *Review exercises* conclude each module to assist the participants in reviewing key information.

PREVIEW ONLY

Module 1

OVERVIEW AND SAFETY

Outline

- 1-1 Overview
- 1-2 Safety
- 1-3 Tools
- 1-4 Testing
- 1-5 Documentation
- 1-6 Summary

Purpose and Objectives

The purpose of this module is to provide a review of the safety procedures to be performed during the inspection, testing and maintenance of interlockings.

Following the completion of this module, the participant should be able to complete the exercises with an accuracy of 70% or greater:

- Describe safety procedures and requirements as per location and regulating authority
- List tools and testing equipment used in the inspection, testing and maintenance of interlockings
- Identify agency specific schedules for interlockings inspection and maintenance
- List tests, frequency and purpose of each test per your authority
- Describe inspection, maintenance and testing documentation for reporting as per agency regulations

Key Terms

- Clearing Area
- Designated Flagger Device (Dfd)
- Flagman
- Foul Time
- Interlocking Signal
- Occupied Track
- On-Track Safety
- Personal Alert Devices (Pads)
- Roadway Worker
- Roadway Worker Protection
- Watchman/Lookout

1-1 OVERVIEW

In the previous course, *Course 106: Overview and Introduction to Interlockings*, the participant was introduced to interlockings and their basic operation. The approach to this next level of training, Course 206, is to help the participant hone necessary skills for inspecting and maintaining interlockings. This module supplements and enhances agency-specific on-the-job, classroom and other training.

Note interlockings are made up of components which are covered in depth in other courses:

- 201: Inspection and Maintenance of Track Circuits
- 202: Inspection and Maintenance of Switches and Derails

Please refer to those courses for more detail. This course will cover interlocking specific tests that should be performed during regular preventive maintenance.

This course was developed by a consortium of signal maintenance and training specialists from twenty rail agencies and their unions from across the country. On the federal level, all of these rail agencies are governed by the Federal Railroad Administration (FRA) or the Federal Transit Administration (FTA). Each signal maintainer should refer to the rail transit authority's standard operating procedures (SOP) for applicable testing and maintenance. The FRA guidelines further prescribe standards to ensure that personnel working with, and affected by, safety-critical train control system related products receive appropriate training and testing.

One focus of this module is on the practice of safety for signal maintainers working around interlockings. As such, this module supplements standard safety policies of the participant's rail transit system as well as the principles of safety covered in your orientation and in Course 100 of this series of courses, particularly the module on *Signal Maintainer Worker Safety*.

Safety extends to the proper use of tools when inspecting and maintaining interlockings. This module discusses the safe use of standard tools the signal maintainer can expect to use when working on interlockings.

Every transportation authority adheres to mandatory record-keeping and timetables for inspection and maintenance in order to ensure the safety of passengers and personnel. This module gives an overview of maintenance record keeping.

This module provides the foundation for the inspection, testing and maintenance specifically of interlockings.



Warning: Safety Precautions!

As with all work on train tracks, the signal maintainer must strictly adhere to the authority-specific worker safety policies.

1-2 SAFETY

During the maintenance, inspection and testing within interlockings there are always potentially dangerous situations for signal maintainers. To avoid accidents and fatalities, employees must strictly adhere to sound safety practices.

The signal maintainer must have complete knowledge of all safety rules, policies, and guidelines of each rail transit authority when inspecting and maintaining interlockings. Roadway Worker Safety training along with any previous course work should be followed. Compliance with applicable federal, state and local requirements including Code of Federal Regulations ([CFR](#)), Part 49 Sections 214, 218, 236, [OSHA](#), the Manual on Uniform Traffic Control Devices ([MUTCD](#)) is mandatory.

To prevent injuries, the signal maintainer must complete training and testing, follow supervisor and mentor lead, follow agency rules and procedures, maintain careful and accurate records, and use reference material when required.

Working at interlockings is very dangerous because there are many distractions, including various pieces of equipment, moving trains as well as traffic in some locations. Signal maintainers are responsible for protecting themselves, co-workers (Figure 1.1) and the public by following safe work practices.



Figure 1.1 Signal Maintainers working at an interlocking

Common safe work practices such as wearing a high visibility reflective safety vest is mandatory. Since night work at interlockings is common, utilizing the hazard lights on your truck will make you more visible. The FRA and most transit agencies require signal maintainers to wear personal protective equipment (PPE) working at interlockings. Be sure to always inspect PPE prior to each use. Also, hard hats and safety goggles or glasses as mentioned in previous safety modules are almost always recommended during inspection, maintenance and testing of interlockings. As always, follow your agencies specific procedures.

Safety Definitions

The following are some common safety terminology covered in previous modules but warrant a brief recap here, given the importance of safety with regards to working around and testing interlockings. These definitions are specific to one rail agency so be sure to refer to your authority's specific terminology.

- **Clearing Area** - Moving to a location at least 4 feet outside the field side of the rail, or between sets of tracks where track centers are greater than 25 feet apart, or between the gauge of a track that is out of service.
- **Flagman** - When used in relation with roadway worker safety is an employee assigned to direct or restrict the movement of trains past a point on track to provide on-track safety for roadway workers, while engaged solely in performing that function.
- **Foul Time** - A method of establishing working limits on a main track, secondary track or siding in which a roadway worker is notified by the Train Dispatcher through the Block Operator that no trains will operate within the working limits established on that track until the roadway worker reports clear of that track.
- **Occupied Track** - Means a track on which on-track, self-propelled equipment or coupled equipment is authorized or permitted to be located while engaged in a common task with a roadway work group with at least one of the roadway workers on the ground.
- **On-track Safety** - A state of freedom from the danger of being struck by a moving railroad train or other railroad equipment provided by operating and safety rules that govern track occupancy by personnel, trains and on-track equipment.
- **Roadway Worker** - Any employee of a railroad, or a contractor to a railroad, whose duties include inspection, construction, maintenance or repair of railroad track, bridges, roadway, signal and communication systems, electric traction systems, roadway facilities or roadway maintenance machinery on or near track or with the potential of fouling a track, and Flagman and Watchman/Lookout, responsible for their protection.
- **Roadway Worker Protection** - A state of freedom from the danger of being struck by a moving train or other railroad equipment. RWP is provided by Code of Federal Regulations, Rail Transit Agency's Operations Manual, and Safety Rules for Employees that govern track occupancy by employees, trains, and on-track equipment.
- **Watchman/Lookout** - A properly equipped employee that has been annually trained on roadway worker protection whose sole duty is provide at least 15 seconds advanced visual and auditory warning of approaching trains or on-track equipment to roadway workers.

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Module 2

TESTING & MAINTENANCE OF INTERLOCKINGS

Outline

- 2-1 Overview**
- 2-2 General Inspection Procedures**
- 2-3 Steps for Performing Various Locking Tests**
- 2-4 Inspection and Tests for Interlockings**
- 2-5 Maintenance**
- 2-6 Summary**

Purpose and Objectives

The purpose of this module is to provide a general description of locking and interlocking tests to be performed during the inspection and maintenance of interlockings.

Following the completion of this module, the participant should be able to complete the exercises with an accuracy of 70% or greater:

- Perform route locking test
- Perform approach locking test
- Perform time locking test
- Perform indication locking test
- Identify FRA standards for locking tests
- Identify all interlocking apparatus
- Identify general maintenance procedures

Key Terms

- Automatic Interlocking
- Interlocking Control Panel
- Relay Interlocking
- Timing Relay

2-1 OVERVIEW

This module provides participants with an opportunity to practice performing different locking tests as well as testing, inspecting and maintaining interlockings. It is important to note that rail transportation systems may have unique operating environments where the locking tests outlined in this course may not apply. Further, individual rail transportation systems may modify the tests and maintenance procedures in this course to accommodate their specific equipment and mode of operation. The course participant should also be aware that terminology and procedures for locking tests differ among rail transit authorities. The participant should always refer to their transit authority for specific guidelines and regulations.

Before signal maintainers perform tests on interlockings and associated devices, they must take measures to provide for safe train operations. Temporary work, repairs or adjustments, when required, shall be made in such a manner that safety of train operation is not impaired. When a repair, adjustment, change or replacement is made, tests shall be made immediately to determine that the apparatuses function as intended. When making tests of apparatuses, proper instruments shall be used and it shall be known that no unsafe conditions are created by the application of testing equipment. In addition, ensure that non-vital field application logic does not interfere with or obscure the electric locking tests of the vital circuits.

The following abbreviations are used throughout this course:

APTA	American Public Transportation Association
AREMA	American Railway Engineering and Maintenance-of-Way Association
CFR	Code of Federal Regulations. In particular, 49 CFR Part 236 which govern the installation, inspection, maintenance, and repair of signal and train control systems, devices, and appliances.
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
OEM	Original Equipment Manufacturer
RS&I	Rules, Standards, and Instructions from CFR Part 236

Documentation of results of required interlocking inspections and tests is a must and should be done in accordance with your transit authority's guidelines. Most authorities mandate that all required test results are recorded in appropriate agency databases or on pertinent forms. An example of a completed form is shown in Figure 2.1.

NIRC SIGNAL DEPARTMENT RS&I FORM Test Form 11 Locking Tests FRA Rules 236.381, 236.376, 236.377, 236.378, 236.379, 236.380, and 236.384							Remarks <input type="checkbox"/> Attached <input checked="" type="checkbox"/>						
Test Results: C - Test/Inspection completed. Equipment left in satisfactory Condition *A - Adjustment made & Test Complete. Equipment left in satisfactory condition. *S - Repairs or replacement made. Equipment left in satisfactory condition. * - Explain in "Remarks"							Print Name: <u>Bill Metra</u> ID: <u>0001</u> Signature: <u>Bill Metra</u> Initials: <u>BM</u> District: <u>Rock Island</u> Subdistrict: <u>Southwest Service</u> Location Name: <u>CP Palos</u> MP: <u>19.3</u> DOT ID: _____ Page: <u>1</u> of <u>1</u>						
Line	Date of Test	Mech. Machine	Switch or Lever	Signal or Route	Circuit Nomenclature, Direction, or Timer	6 Month Cross Protection 236.384	2 Years					Initials	
							Traffic Locking 236.381	Mechanical Locking 236.376	Approach Locking 236.377	Time Locking 236.378	Route Locking 236.379		Indication Locking 236.380
1	12/1/05			2R to 2L	2TE					C	C	C	BM
2	12/1/05			2L to 2R	2TE					C	C	C	BM
3	12/1/05			4R to 4L	4TE					C	C	C	BM
4	12/1/05		3									C	BM
5	12/1/05		1									C	BM
6	12/1/05		5									C	BM
7	12/1/05		3Rev	4L to 2R	4TE					C	C	C	BM
8	12/1/05		5Rev	4L to 2R	4TE					C	C	C	BM
9													
10													
11													
12													
13													
14													
15													

Figure 2.1 Form Used for Locking Tests –courtesy METRA