

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	Module Title	
	<i>Responsibilities / Course Content</i>	
	Learning Objectives	
Signals Overview (2 modules -- level 100 and 200)		
100 Overview		
100-1	<i>History and Purpose of signal systems</i>	
100-1-1	Describe how signals are used to maximize capacity of limited track safely	
100-1-2	Describe different failures that caused something to be done to improve the system	
100-1-3	Describe different systems that have been used throughout history	
100-2	<i>Fail safe principles of signals</i>	
100-2-1	Describe the importance of train order/time tables	
100-2-2	Describe how continuous refinements make the system more fail safe	
100-2-3	Explain why system has to fail in a safe manner	
100-3	<i>Introduction to Track Circuits</i>	
100-3-1	Describe normally energized relays on track circuits	
100-3-2	Describe normally de-energized relays on track circuits	
100-3-3	Explain how most restrictive aspects/a signal set at "danger"	
100-3-4	Define and describe the uses of vital relays	
	Explain reasons for regular inspection and testing of vital relays	
	Inspect/Test vital relays	

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	Module Title	
	<i>Responsibilities / Course Content</i>	
	Learning Objectives	
		Perform vital relay testing
100-4		<i>Safety Principles</i>
100-4-1		Describe process of moving people safely
100-4-2		Explain the how the purpose of system is to keep trains from colliding
100-5		<i>Rail roadway worker protection</i>
100-6		<i>Safe train operation/expedited train movement</i>
100-6-1		Demonstrate ability to coordinate track related activities with central dispatch
100-6-2		Describe how individuals responsible for own safety
100-6-3		Describe importance of maintaining awareness of your environment
100-6-4		Describe that human communication is a VITAL part of the process -- cannot lose site of those working on the tracks
100-6-5		Describe the importance of human communications to central control to train mechanics to operators and all staff
100-6-6		Describe the overall layout of your system to reduce your personal risk/injury
100-6-7		Describe why there is a need for more reliable system to track whereabouts of those working on the tracks - for safety reasons
100-6-8		Explain function of permissive proceed signal and how it is unique to each system
100-6-9		Explain purpose of slow zone/work zone
100-6-10		Explain results of failure to comply - high risks and dangers
100-6-11		Explain rules, policy, procedures at your organization
100-6-12		Explain why there is no room for human error
100-7		<i>Regulatory/regulations (importance of testing)</i>
100-7-1		Demonstrate awareness and comply with rules and regulations
100-7-2		Describe different levels of rules and regulations (Company, FRA, FTA, levels of government) and the jurisdiction of each
100-8		<i>Signal System Operation</i>
100-8-1		Demonstrate ability to refer to glossary of terms/nomenclature)
100-9		<i>Special tools</i>
100-9-1		Explain the use and purpose of preventive maintenance and standard operating procedures at your agency
100-9-2		Explain the use of an access vehicle
100-10		<i>Test Equipment (generally these will be specific to individual agencies)</i>
100-10-1		Demonstrate ability to use switch obstruction gauge
100-10-2		Demonstrate ability to use oscilloscope/spectrum analyzer
100-10-3		Demonstrate ability to use shunt strap/shunt cord
100-10-4		Demonstrate ability to use RR volt/ohm meters

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	Module Title	
	<i>Responsibilities / Course Content</i>	
	Learning Objectives	
100-10-5		Demonstrate ability to use automatic train stop test equipment
100-10-6		Demonstrate ability to use frequency specific volt meters
100-10-7		Demonstrate ability to use IJ checker
100-10-8		Demonstrate ability to use Megger
100-10-9		Demonstrate ability to use relay testers
100-10-10		Demonstrate ability to clamp on amp meter (both AC and DC)
100-10-11		Demonstrate use of surge coils
100-10-12		Demonstrate ability to use stop watches
100-11	<i>Function and purpose of signal equipment and defining nomenclature</i>	
100-11-1		Explain FRA nomenclature
100-11-2		Explain AREMA nomenclature
100-11-3		Explain IEEE nomenclature (developing CBTC)
100-11-4		Explaining the use of barcodes
100-11-5		Explain Signal nomenclature
100-11-6		Explain use and how to access APTA Standards and recommended best practices
100-12	<i>Advanced test equipment</i>	
100-12-1		Demonstrate ability to maintain, calibrate and care for test equipment
100-12-2		Maintain Laptops, software and PTE (Portable Test Equipment)
100-12-3		Maintain packet checker
100-12-4		Demonstrate ability to use clamp on amp meter (both AC and DC)
100-12-5		Demonstrate ability to use surge coils
	200 Overview	
200-1	<i>Test Equipment (specialized testing equipment)</i>	
200-1-1		Demonstrate ability to maintain, calibrate and care for test equipment
200-1-2		Perform maintenance on test equipment
200-1-3		Demonstrate ability to use and maintain laptops, software and PTE (Portable Test Equipment)
200-1-4		Perform maintenance on laptops, software and PTE (portable test equipment)
200-1-5		Perform maintenance on packet checker
200-2	<i>Power</i>	
200-2-1		Verifying operation of power supply
200-2-2		Check and verify power supply
200-2-3		Check input/output using prints

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	<i>Module Title</i>	
		<i>Responsibilities / Course Content</i>
		<i>Learning Objectives</i>
<i>Train Control (4 modules -- levels 100 through 400)</i>		
<i>101 Train Control (Intro and Overview)</i>		
101-1		<i>The fundamentals of DC track circuits</i>
101-1-1		Understand circuit principles and operations of a DC Track Circuit
101-1-2		Identify track components
101-1-3		Inspect and perform preventive maintenance on a DC Track Circuit
101-2		<i>Reading track circuit prints and documentation</i>
101-2-1		Demonstrate ability to use aspect charts
101-2-2		Demonstrate ability to use track plans
101-2-3		Demonstrate ability to use train markers
101-2-4		Demonstrate ability to use electrical prints
101-2-5		Identify equipment location (rack)
101-2-6		Identify control lines
101-3		<i>DC track circuits and related components</i>
101-3-1		Describe signals and aspects
101-3-2		Demonstrate ability to read schematics
101-3-3		Describe traffic direction
101-3-4		Identify and understand function of Rectifier/battery
101-3-5		Identify and understand function of the resistor
101-3-6		Identify and understand function of track fuse
101-3-7		Identify and understand function of Down the rail
101-3-8		Identify and understand function of fuse on the relay end
101-3-9		Identify and understand function of 1 to 1 transformer
101-3-10		Identify and understand function of relay
101-4		<i>Coded track circuits</i>
101-4-1		Describe how code is transmitted to the rail
101-4-2		Identify components of a coded AC track circuit
101-4-3		Describe difference between train detection and cab signals
<i>201 Train Control (Inspection and Maintenance)</i>		
201-1		<i>DC Track Circuits Inspection and Maintenance</i>
201-1-1		Understand function of all DC Track circuit components
201-1-2		Perform an inspection and basic maintenance of full circuit, including:
201-1-3		Demonstrate ability to do track profiles for AC and DC (performance profiles)
201-1-4		Perform shunt test
201-1-5		Demonstrate ability to do polarity check (that polarity is different from one track to the next)
201-1-6		Setup base reference
201-1-7		Inspect and maintain Rectifier/battery
201-1-8		Inspect and maintain the resistor
201-1-9		Inspect and maintain track fuse
201-1-10		Inspect and maintain Down the rail
201-1-11		Inspect and maintain fuse on the relay end
201-1-12		Inspect and maintain 1 to 1 transformer
201-1-13		Inspect and maintain relay

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	Module Title	
		<i>Responsibilities / Course Content</i>
		Learning Objectives
201-1-14		Inspect and maintain Automatic Block System
201-1-15		Inspect and maintain switch circuit controllers
201-1-16		Inspect and maintain repair relay and relay logic circuits
201-2		<i>DC track Circuits Basic Troubleshooting</i>
201-2-1		Identify and correct basic common faults in DC track circuits
201-2-2		Check track voltage at the receive end in the house
201-2-3		Check track voltage at feed end - same as in the house
201-2-4		Inspect for broken rail and wires
201-2-5		Check integrity of insulated joints
201-3		<i>AC track circuits Inspection and Maintenance</i>
201-3-1		Understand function of all AC Track circuit components
201-3-2		Perform an inspection and basic maintenance of full circuit
201-3-3		Inspect and maintain Fuse
201-3-4		Inspect and maintain Transformer
201-3-5		Inspect and maintain Primary fuse
201-3-6		Inspect and maintain Secondary
201-3-7		Inspect and maintain variable resistor
201-3-8		Inspect and maintain track fuse
201-3-9		Inspect and maintain rail
201-3-10		Inspect and maintain bond wires
201-3-11		Inspect and maintain track leads
201-3-12		Inspect and maintain insulated joints
201-3-13		Inspect and maintain fuse on the relay end
201-3-14		Inspect and maintain adjustable resistor
201-3-15		Inspect and maintain isolation transformer (on single rail track circuits)
201-3-16		Inspect and maintain frequency (60 Hz/100 Hz)
201-3-17		Inspect and maintain Impedance bonds
201-3-18		Inspect and maintain narrow and broad band shunts
201-3-19		Inspect and maintain single rail/double rail
201-3-20		Inspect and maintain AC vane relays
201-3-21		Inspect and maintain DC to AC code converters
201-3-22		Inspect negative return bonds

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	<i>Module Title</i>	
	<i>Responsibilities / Course Content</i>	
	<i>Learning Objectives</i>	
201-4	<i>AC track circuits Basic Troubleshooting</i>	
201-4-1		Identify and correct basic common faults in AC track circuits
201-4-2		Check track voltage at the receive end in the house
201-4-3		Check track voltage at feed end - same as in the house
201-4-4		Inspect rail bonds and for broken rail and wires
201-4-5		Check integrity of insulated joints
201-4-6		Determine whether phase angles are correct
201-4-7		Determine whether a problem is due to a ground or DC propulsion current
201-5	<i>Track circuit protective devices Inspection and Maintenance</i>	
201-5-1		Inspect and maintain surge suppressors
201-5-2		Inspect and maintain ground fault detectors
201-5-3		Inspect and maintain lightning arrestors
201-5-4		Inspect and maintain equalizers
201-5-5		Inspect and maintain fuses
201-6	<i>Audio frequency overlay (AFO) train detection systems Inspection and Maintenance</i>	
201-6-1		Inspect and maintain carrier frequency
201-6-2		Inspect and maintain track frequency
201-6-3		Inspect and maintain power levels
201-6-4		Inspect and maintain transmitters, receivers, transceivers
201-6-5		Inspect and maintain frequency compatibility "for harmonics"
201-6-6		Inspect and maintain common usage areas - for overrun circuits
201-6-7		Inspect and maintain transmitter
201-6-8		Inspect and maintain audio frequency overlay
201-6-9		Inspect and maintain phase shift overlay
201-6-10		Inspect and maintain modulated track frequency
201-6-11		Inspect and maintain indicating track occupancy (no train means that the relay is up)
201-6-12		Inspect and maintain modulated train/cab frequency (only transmitted when train is present)
201-6-13		Demonstrate ability to transmit speed information
201-6-14		Inspect and maintain twisted pair

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	<i>Module Title</i>	
	<i>Responsibilities / Course Content</i>	
	Learning Objectives	
201-6-15		Inspect and maintain transmitting mini bond
201-6-16		Inspect and maintain running rail
201-6-17		Inspect and maintain receiving mini bond (Tuned to receive signal from the transmitter (frequency selective))
201-6-18		Inspect and maintain receiver
201-6-19		Put out DC voltage to energize the relay
201-6-20		Inspect and maintain track relay (vital relay)
201-7	<i>Audio frequency overlay (AFO) train detection systems Basic Troubleshooting</i>	
201-7-1		Check transmit voltage at test points
201-7-2		Check train transmit voltage and frequency
201-7-3		Check receive voltage at test points
201-7-4		Check track receive voltage
201-7-5		Check voltage input to receive board
201-7-6		Check receive level
201-7-7		Check rail and components
201-7-8		Check track frequency
201-8	<i>Coded track circuits inspection and maintenance</i>	
201-8-1		Inspect and maintain coded track circuit
201-8-2		Inspect and maintain Code transmitting and following relays
201-8-3		Inspect and maintain AC Coded Track
<i>301 Train Control (Troubleshooting and Repair)</i>		
301-1	<i>DC track Circuits Troubleshooting</i>	
301-1-1		Follow general troubleshooting process including:
		Check status - is it working or not
		Check for presence of a grounded circuit
		Check voltage in/out
		Check relays
		Check insulated joints
		Check bonds
		Understand and check track schematics
		Verify rail integrity
		Check feed and relay resistors
		Check feed and relay fuse
		Check track connections and terminations
		Check fouling wires
		Check train transmit voltage and frequency
301-1-2		Troubleshoot, adjust or repair 1 to 1 transformer
301-1-3		Troubleshoot, adjust or repair Fuse on the relay end
301-1-4		Troubleshoot, adjust or repair Relay
301-1-5		Troubleshoot, adjust or repair the Rectifier/battery
301-1-6		Troubleshoot, adjust or repair the resistor

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	<i>Module Title</i>	
	<i>Responsibilities / Course Content</i>	
	Learning Objectives	
301-1-7		Troubleshoot and repair Interlocking (verify request / response)
301-1-8		Troubleshoot and repair Automatic Block System
301-1-9		Troubleshoot and repair switch circuit controllers
301-1-10		Troubleshoot and repair relay and relay logic circuits
301-1-11		Troubleshoot and repair track circuit
301-1-12		Troubleshoot and repair a circuit ground
301-2	<i>AC Track Circuits Troubleshooting</i>	
301-2-1		Troubleshoot, adjust or repair adjustable resistor
301-2-2		Troubleshoot, adjust or repair frequency (60 Hz/100 Hz)
301-2-3		Troubleshoot, adjust or repair fuse on the relay end
301-2-4		Troubleshoot, adjust or repair insulated joints
301-2-5		Troubleshoot, adjust or repair isolation transformer (on single rail track circuits)
301-2-6		Troubleshoot, adjust or repair track leads
301-2-7		Troubleshoot, adjust or repair bond wires
301-2-8		Troubleshoot, adjust or repair Fuse
301-2-9		Troubleshoot, adjust or repair Primary fuse
301-2-10		Troubleshoot, adjust or repair Secondary
301-2-11		Troubleshoot, adjust or repair track fuse
301-2-12		Troubleshoot, adjust or repair Transformer
301-2-13		Troubleshoot, adjust or repair variable resistor
301-2-14		Troubleshoot, adjust or repair AC vane relays
301-2-15		Troubleshoot, adjust or repair DC to AC code converters
301-2-16		Troubleshoot, adjust or repair Impedance bonds
301-2-17		Troubleshoot, adjust or repair narrow and broad band shunts
301-2-18		Troubleshoot, adjust or repair single rail/double rail
301-2-19		Test voltage on secondary transformer
301-2-20		Troubleshoot and repair a circuit ground
301-3	<i>Track circuit protective devices Troubleshooting</i>	
301-3-1		Troubleshoot, adjust or repair equalizers
301-3-2		Troubleshoot, adjust or repair fuses
301-3-3		Troubleshoot, adjust or repair ground fault detectors
301-3-4		Troubleshoot, adjust or repair lightning arrestors
301-3-5		Troubleshoot, adjust or repair surge suppressors
301-4	<i>Audio frequency overlay (AFO) train detection systems Troubleshooting</i>	
301-4-1		Follow general troubleshooting process including:
		Adjust transmit voltage and receive voltage
		Use of frequency selective (or specific) voltmeter
301-4-2		Troubleshoot, adjust or repair carrier frequency
301-4-3		Troubleshoot, adjust or repair common usage areas - for overrun circuits

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	<i>Module Title</i>	
	<i>Responsibilities / Course Content</i>	
	Learning Objectives	
301-4-4		Troubleshoot, adjust or repair frequency compatibility "for harmonics"
301-4-5		Troubleshoot, adjust or repair power levels
301-4-6		Troubleshoot, adjust or repair track frequency
301-4-7		Troubleshoot, adjust or repair transmitter
301-4-8		Troubleshoot, adjust or repair transmitters, receivers, transceivers
301-4-9		Troubleshoot, adjust or repair modulated train/cab frequency
301-4-10		Troubleshoot, adjust or repair audio frequency overlay
301-4-11		Troubleshoot, adjust or repair indicating track occupancy
301-4-12		Troubleshoot, adjust or repair modulated track frequency
301-4-13		Troubleshoot, adjust or repair phase shift overlay
301-4-14		Troubleshoot, adjust or repair receiver
301-4-15		Troubleshoot, adjust or repair receiving mini bond
301-4-16		Troubleshoot, adjust or repair track relay (vital relay)
301-4-17		Troubleshoot, adjust or repair transmitting mini bond
301-4-18		Troubleshoot, adjust or repair twisted pair
301-4-19		Put out DC voltage to energize the relay
301-4-20		Replace circuit board with proper frequency
301-5	<i>Interlocking Troubleshooting</i>	
301-5-1		Describe how interlocking may be controlled by automatic, remote or local control
301-5-2		Describe how interlocking may be controlled by all three, one at a time
301-5-3		Troubleshoot and repair event recorders
301-6	<i>Using frequency shift key (FSK)</i>	
301-7	<i>Coded track circuit troubleshooting</i>	
301-7-1		Troubleshoot, adjust or repair AC Coded Track
301-7-2		Troubleshoot, adjust or repair Code transmitting and following relays
301-7-3		Troubleshoot, adjust or repair coded track circuit
301-8	<i>Advanced track circuit and transmission/receiving Troubleshooting</i>	
301-8-1		Check train transmit voltage and frequency
<i>401 Train Control (Installation, Rebuild, Set up and Testing)</i>		
401-1	<i>DC track circuits Installation, Rebuild and Testing</i>	
401-1-1		Install, replace, rebuild, set-up or test 1 to 1 transformer
401-1-2		Install, replace, rebuild, set-up or test fuse on the relay end
401-1-3		Install, replace, rebuild, set-up or test Relay
401-1-4		Install, replace, rebuild, set-up or test the Rectifier/battery
401-1-5		Install, replace, rebuild, set-up or test the resistor
401-2	<i>AC track circuits Installation, Rebuild and Testing</i>	
401-2-1		Install, Replace, Rebuild, set up or test AC vane relays
401-2-2		Install, Replace, Rebuild, set up or test DC to AC code converters
401-2-3		Install, Replace, Rebuild, set up or test Impedance bonds
401-2-4		Install, Replace, Rebuild, set up or test narrow and broad band shunts
401-2-5		Install, Replace, Rebuild, set up or test single rail/double rail
401-2-6		Install, replace, rebuild, set-up or test adjustable resistor
401-2-7		Install, replace, rebuild, set-up or test frequency (60 Hz/100 Hz)

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	<i>Module Title</i>	
	<i>Responsibilities / Course Content</i>	
	Learning Objectives	
401-2-8		Install, replace, rebuild, set-up or test fuse on the relay end
401-2-9		Install, replace, rebuild, set-up or test insulated joints
401-2-10		Install, replace, rebuild, set-up or test isolation transformer (on single rail track circuits)
401-2-11		Install, replace, rebuild, set-up or test track leads
401-2-12		Install, replace, rebuild, set-up or test bond wires
401-2-13		Install, replace, rebuild, set-up or test Fuse
401-2-14		Install, replace, rebuild, set-up or test Primary fuse
401-2-15		Install, replace, rebuild, set-up or test Secondary
401-2-16		Install, replace, rebuild, set-up or test track fuse
401-2-17		Install, replace, rebuild, set-up or test Transformer
401-2-18		Install, replace, rebuild, set-up or test variable resistor
401-3	<i>Audio frequency overlay Installation, Rebuild and Testing</i>	
401-3-1		Install, Replace, Rebuild, set up or test modulated train/cab frequency
401-3-2		Install, Replace, Rebuild, set up or test audio frequency overlay
401-3-3		Install, Replace, Rebuild, set up or test indicating track occupancy
401-3-4		Install, Replace, Rebuild, set up or test modulated track frequency
401-3-5		Install, Replace, Rebuild, set up or test phase shift overlay
401-3-6		Install, Replace, Rebuild, set up or test receiver
401-3-7		Install, Replace, Rebuild, set up or test receiving mini bond
401-3-8		Install, Replace, Rebuild, set up or test track relay (vital relay)
401-3-9		Install, Replace, Rebuild, set up or test transmitting mini bond
401-3-10		Install, Replace, Rebuild, set up or test twisted pair
401-3-11		Put out DC voltage to energize the relay
		Install DC voltage to energize the relay
401-3-12		Install, Replace, Rebuild, set up or test carrier frequency
401-3-13		Install, Replace, Rebuild, set up or test common usage areas - for overrun circuits
401-3-14		Install, Replace, Rebuild, set up or test frequency compatibility "for harmonics"
401-3-15		Install, Replace, Rebuild, set up or test power levels
401-3-16		Install, Replace, Rebuild, set up or test track frequency
401-3-17		Install, Replace, Rebuild, set up or test transmitter
401-3-18		Install, Replace, Rebuild, set up or test transmitters, receivers, transceivers
401-4	<i>Coded track circuits installation, rebuild and testing</i>	
401-4-1		Install, replace, rebuild, set-up or test AC Coded Track
401-4-2		Install, replace, rebuild, set-up or test Code transmitting and following relays
401-4-3		Install, replace, rebuild, set-up or test coded track circuit
401-5	<i>Track circuit protective devices installation, rebuild and testing</i>	
401-5-1		Install, replace, rebuild, set-up or test equalizers
401-5-2		Install, replace, rebuild, set-up or test fuses
401-5-3		Install, replace, rebuild, set-up or test ground fault detectors
401-5-4		Install, replace, rebuild, set-up or test lightning arrestors
401-5-5		Install, replace, rebuild, set-up or test surge suppressors

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	<u>Module Title</u>	
	<i>Responsibilities / Course Content</i>	
	<i>Learning Objectives</i>	
<i>Turnouts (Switches) (4 modules -- levels 100 through 400)</i>		
<i>102 Turnouts (Intro and Overview)</i>		
102-1	<i>Turnout layout and components</i>	
102-1-1	Describe theory of operation and purpose of Turnouts	
102-1-2	Overview of turnout prints	
102-1-3	Describe turnout components: rail, frogs, points, etc.	
102-1-4	Describe purpose and components of point detection	
102-1-5	Describe purpose and components of electric/mechanical locks	
102-2	<i>Types of switches</i>	
102-2-1	Describe theory of operation - how do switches work	
102-2-2	Describe main features of various types of switches	
<i>202 Turnouts (Inspection and Maintenance)</i>		
202-1	<i>Understanding Layout prints</i>	
202-1-1	Demonstrate ability to read switch layout prints (specs, dimensions and tolerances)	
202-1-2	Demonstrate ability to read and understand diagrams, prints and schematics	
202-2	<i>Switch Layout and components, Inspection and Maintenance</i>	
202-2-1	Perform inspection (Maintenance and adjustment)	
202-2-2	Perform obstruction tests	
202-2-3	Inspect / Test and maintain detector rods (indication rod)	
202-2-4	Inspect / Test and maintain electric Switch Lock	
202-2-5	Inspect / Test and maintain lock rod	
202-2-6	Inspect / Test and maintain switch circuit controller	
202-2-7	Inspect / Test and maintain switch layout	
202-2-8	Inspect / Test and maintain throw rod	
202-2-9	Inspect / Test and maintain track components (rail, frogs, points)	
202-2-10	Reference fouling wires and circuits (from other modules)	
202-2-11	Explain relationship between various turnout components	
202-2-12	Inspect / Test and maintain bonds	
202-2-13	Inspect / Test and maintain fouling wires and circuits	
202-2-14	Perform Preventive maintenance tasks according to regulations or manufacturer's specifications	
202-3	<i>Power switch inspection and maintenance</i>	
202-3-1	Perform Inspection (Maintenance and adjustment)	

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	<i>Module Title</i>	
	<i>Responsibilities / Course Content</i>	
	<i>Learning Objectives</i>	
202-3-2		Inspect / Test and maintain air source
202-3-3		Inspect / Test and maintain hydraulic switch
202-3-4		Inspect / Test and maintain electric (AC/DC) switch machines
202-3-5		Inspect / Test and maintain pneumatic switch
202-3-6		Inspect / Test and maintain solenoid switch
202-3-7		Inspect / Test and maintain switch heaters/snow melters
202-4	<i>Hand throw switches inspection and maintenance</i>	
202-4-1		Inspect / Test and maintain electric/mechanical locks
202-4-2		Inspect / Test and maintain spring switch
202-4-3		Inspect / Test and maintain slap switch or variable point switch
<i>302 Turnouts (Troubleshooting and Repair)</i>		
302-1	<i>Switch layout and components Troubleshooting</i>	
302-1-1		Troubleshoot, adjust or repair connecting rods
302-1-2		Troubleshoot, adjust or repair detector rods (indication rod)
302-1-3		Troubleshoot, adjust or repair electric Switch Lock
302-1-4		Troubleshoot, adjust or repair lock rod
302-1-5		Troubleshoot, adjust or repair switch circuit controller
302-1-6		Troubleshoot, adjust or repair switch layout
302-1-7		Troubleshoot, adjust or repair throw rod
302-1-8		Troubleshoot, adjust or repair track components (rail, frogs, points)
302-2	<i>Power Switch Troubleshooting</i>	
302-2-1		Troubleshoot, adjust or repair electric/mechanical locks
302-2-2		Troubleshoot, adjust or repair hydraulic switch
302-2-3		Troubleshoot, adjust or repair motor AC/DC
302-2-4		Troubleshoot, adjust or repair pneumatic switch
302-2-5		Troubleshoot, adjust or repair power (electric) switch
302-2-6		Troubleshoot, adjust or repair solenoid switch
302-2-7		Troubleshoot, adjust or repair spring switch
302-2-8		Troubleshoot, adjust or repair switch circuit controller
302-2-9		Troubleshoot, adjust or repair switch heaters/snow melters
<i>402 Turnouts (Installation, Rebuild, Set up and advanced testing)</i>		
402-1	<i>Switch Layout and Components Installation, Rebuild and Testing</i>	
402-1-1		Install, replace, rebuild, set-up and/or test connecting rods
402-1-2		Install, replace, rebuild, set-up and/or test detector rods (indication rod)
402-1-3		Install, replace, rebuild, set-up and/or test electric Switch Lock
402-1-4		Install, replace, rebuild, set-up and/or test hydraulic switch
402-1-5		Install, replace, rebuild, set-up and/or test lock rod
402-1-6		Install, replace, rebuild, set-up and/or test switch circuit controller
402-1-7		Install, replace, rebuild, set-up and/or test switch layout
402-1-8		Install, replace, rebuild, set-up and/or test throw rod
402-1-9		Install, replace, rebuild, set-up and/or test track components (rail, frogs, points)
402-2	<i>Power Switch Installation, Rebuild and Testing</i>	
402-2-1		Install, replace, rebuild, set-up and/or test electric/mechanical locks

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	<i>Module Title</i>	
		<i>Responsibilities / Course Content</i>
		Learning Objectives
402-2-2		Install, replace, rebuild, set-up and/or test hydraulic switch
402-2-3		Install, replace, rebuild, set-up and/or test motor AC/DC
402-2-4		Install, replace, rebuild, set-up and/or test pneumatic switch
402-2-5		Install, replace, rebuild, set-up and/or test power (electric) switch
402-2-6		Install, replace, rebuild, set-up and/or test solenoid switch
402-2-7		Install, replace, rebuild, set-up and/or test spring switch
402-2-8		Install, replace, rebuild, set-up and/or test switch heaters/snow melters

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	<u>Module Title</u>	
	<i>Responsibilities / Course Content</i>	
	<i>Learning Objectives</i>	
<i>Grade Crossing (4 modules -- levels 100 through 400)</i>		
<i>103 Grade Crossing (Intro and Overview)</i>		
103-1	<i>Grade crossing warning system theory and operation</i>	
103-1-1	Describe grade crossing warning systems history	
103-1-2	Describe equipment, circuits and warning devices	
103-1-3	Describe grade crossing types, (gated and non-gated) and levels of protection	
103-1-4	Describe types of warning systems, constant warning time vs. fixed distance warning	
103-1-5	Describe regulations pertaining to grade crossings	
103-1-6	Describe types and operation of gate mechanisms	
<i>203 Grade Crossing (Inspection and Maintenance)</i>		
203-1	<i>Grade Crossing Inspection and Maintenance</i>	
203-1-1	Perform Preventive maintenance tasks according to regulations or manufacturer's specs, including items below:	
203-1-2	Inspect and Maintain warning devices (gates, warning lights, signage, bells and grade)	
203-1-3	Inspect and Maintain grade crossing controls (prediction/protection)	
203-1-4	Inspect and Maintain crossing structures	
203-1-5	Inspect and Maintain crossing signage	
203-1-6	Inspect and Maintain barriers/gate arm	
203-1-7	Inspect and Maintain gate mechanisms	
203-1-8	Inspect and Maintain approach and island circuits	
203-1-9	Inspect and Maintain non gated grade crossing	
203-1-10	Inspect and Maintain event recorders/monitoring equipment	
203-1-11	Inspect and Maintain quad gates	
203-1-12	Inspect and Maintain traffic signal interface (preemption)	
203-1-13	Perform a post accident inspection	
<i>303 Grade Crossing (Troubleshooting and Repair)</i>		
303-1	<i>Grade crossing warning system Troubleshooting and Repair</i>	
303-1-1	Troubleshoot causes of false activations and activation failures	
303-1-2	Explain processes for if a warning system cannot be repaired promptly	
303-1-3	Troubleshoot, adjust or repair warning devices (gates, warning lights, signage, bells and grade)	
303-1-4	Troubleshoot, adjust or repair grade crossing controls (prediction/protection)	
303-1-5	Troubleshoot, adjust or repair crossing structures	
303-1-6	Troubleshoot, adjust or repair crossing signage	
303-1-7	Troubleshoot, adjust or repair barriers/gate arm	
303-1-8	Troubleshoot, adjust or repair gate mechanisms	
303-1-9	Troubleshoot, adjust or repair approach and island circuits	
303-1-10	Troubleshoot, adjust or repair non gated grade crossing	
303-1-11	Troubleshoot, adjust or repair event recorders/monitoring equipment	
303-1-12	Troubleshoot, adjust or repair quad gates	
303-1-13	Troubleshoot, adjust or repair traffic signal interface (preemption)	
<i>403 Grade Crossing (Installation, Rebuild, Set up and Testing)</i>		
403-1	<i>Grade crossing warning system installation, rebuild, setup and testing</i>	
403-1-1	Explain how to safely disable a crossing to facilitate emergency repairs	

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	Module Title	
	<i>Responsibilities / Course Content</i>	
	Learning Objectives	
403-1-2		Demonstrate track circuit frequency selection for grade crossing repairs
403-1-3		Install, replace, set-up or test warning devices (gates, warning lights, signage, bells and grade)
403-1-4		Install, replace, set-up or test grade crossing controls (prediction/protection)
403-1-5		Install, replace, set-up or test crossing structures
403-1-6		Install, replace, set-up or test crossing signage
403-1-7		Install, replace, set-up or test barriers/gate arm
403-1-8		Install, replace, set-up or test gate mechanisms
403-1-9		Install, replace, set-up or test approach and island circuits
403-1-10		Install, replace, set-up or test non gated grade crossing
403-1-11		Install, replace, set-up or test event recorders/monitoring equipment
403-1-12		Install, replace, set-up or test quad gates

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	Module Title	
	<i>Responsibilities / Course Content</i>	
	Learning Objectives	
Power Distribution (4 modules -- levels 100 through 400)		
104 Power Distribution (Intro and Overview)		
104-1	<i>Power distribution theory and operation</i>	
104-1-1	Describe theory of operation of local power distribution system	
104-2	<i>Primary power sources and system and components</i>	
104-2-1	Demonstrate ability to read schematics	
104-2-2	Describe how incoming power comes from utilities, the types of power and its uses for signaling systems	
104-2-3	Describe operation of breakers	
104-2-4	Describe power source	
104-2-5	Explain how to sectionalize power sources for testing and troubleshooting and repair on low and high tension	
104-2-6	Explain how to properly phase different power sources	
104-2-7	Explain how to use voltage tester and phasing tester	
104-2-8	Explain how to perform insulation testing and cable fault testing on low and high tension sources	
104-2-9	Describe theory of operation of pneumatic power distribution system	
104-2-10	Explain how to sectionalize power sources for testing and troubleshooting and repair on pneumatic systems	
204 Power Distribution (Inspection and Maintenance)		
204-1	<i>Primary power sources, Inspection and Maintenance</i>	
204-1-1	Demonstrate ability to troubleshoot using a meter	
204-1-2	Inspect and Maintain DC power rectified	
204-1-3	Inspect and Maintain frequency converters	
204-1-4	Inspect and Maintain rectifiers	
204-1-5	Inspect and Maintain solar panels	
204-1-6	Inspect and Maintain Transfer switches	
204-1-7	Inspect and Maintain transformer, circuit breakers, cables	
204-1-8	Inspect and maintain pneumatic supplies and allied equipment	
204-2	<i>Secondary power sources inspection and maintenance</i>	
204-2-1	Demonstrate ability to troubleshoot using a meter	
204-2-2	Inspect and Maintain batteries	
204-2-3	Inspect and Maintain chargers	
204-2-4	Inspect and Maintain inverters	
204-2-5	Inspect and Maintain rectifiers	
204-2-6	Inspect and Maintain secondary power	
204-2-7	Inspect and Maintain solar panels	
204-2-8	Inspect and Maintain UPS (emergency or standby power)	
204-3	<i>Power distribution system Inspection and Maintenance</i>	

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	<i>Module Title</i>	
		<i>Responsibilities / Course Content</i>
		<i>Learning Objectives</i>
204-3-1		Demonstrate ability to troubleshoot using a meter
204-3-2		Inspect and Maintain AC power
204-3-3		Inspect and Maintain batteries
204-3-4		Inspect and Maintain Chargers
204-3-5		Inspect and Maintain DC power rectified
204-3-6		Inspect and Maintain primary power
204-3-7		Inspect and Maintain rectifiers
204-3-8		Inspect and Maintain solar panels
204-3-9		Inspect and Maintain transfer switches
204-3-10		Inspect and Maintain transformer, circuit breakers, cables
204-3-11		Inspect and Maintain UPS (emergency or standby power)
		<i>304 Power Distribution (Troubleshooting and Repair)</i>
304-1		<i>Primary power sources, Troubleshooting</i>
304-1-1		Troubleshoot, adjust or repair AC power
304-1-2		Troubleshoot, adjust or repair DC power rectified
304-1-3		Troubleshoot, adjust or repair rectifiers
304-1-4		Troubleshoot, adjust or repair transformer, circuit breakers, cables
304-1-5		Troubleshoot, adjust or repair grounds; determine what type of ground is present
304-1-6		Replace a rectifier
304-2		<i>Secondary power sources Troubleshooting</i>
304-2-1		Troubleshoot and replace batteries
304-2-2		Troubleshoot and replace chargers
304-2-3		Troubleshoot and replace inverters
304-2-4		Troubleshoot, adjust or repair secondary power
304-2-5		Troubleshoot, adjust or repair UPS (emergency or standby power)
304-3		<i>Power distribution system Troubleshooting</i>
304-3-1		Troubleshoot, adjust or repair AC power
304-3-2		Troubleshoot and replace batteries
304-3-3		Troubleshoot and replace chargers
304-3-4		Troubleshoot and replace frequency converters
304-3-5		Troubleshoot and replace inverters
304-3-6		Troubleshoot, adjust or repair primary power

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	<i>Module Title</i>	
	<i>Responsibilities / Course Content</i>	
	Learning Objectives	
304-3-7		Troubleshoot, adjust or repair rectifiers
304-3-8		Troubleshoot, adjust or repair transfer switches
304-3-9		Troubleshoot, adjust or repair transformer, circuit breakers, cables
304-3-10		Troubleshoot, adjust or repair UPS (emergency or standby power)
304-3-11		Troubleshoot, adjust or repair air equipment, such as pneumatic train stops and switches. Sectionalize air mains
304-3-12		Perform ground detection testing
<i>404 Power Distribution (Installation, Rebuild, Setup and Testing)</i>		
404-1		<i>Primary power sources Installation</i>
404-1-1		Install, replace, rebuild, set-up or test AC power
404-1-2		Install, replace, rebuild, set-up or test Batteries
404-1-3		Install, replace, rebuild, set-up or test Chargers
404-1-4		Install, replace, rebuild, set-up or test DC power rectified
404-1-5		Install, replace, rebuild, set-up or test frequency converters
404-1-6		Install, replace, rebuild, or set-up Inverters
404-1-7		Install, replace, rebuild, set-up or test primary power
404-1-8		Install, replace, rebuild, set-up or test rectifiers
404-1-9		Install, replace, rebuild, set-up or test transfer switches
404-1-10		Install, replace, rebuild, set-up or test transformer, circuit breakers, cables

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	Module Title	
	<i>Responsibilities / Course Content</i>	
	<i>Learning Objectives</i>	
404-1-11		Install, replace, rebuild, set-up or test UPS (emergency or standby power)
404-2	<i>Secondary power source Installation</i>	
404-2-1		Install, replace, rebuild, set-up or test AC power
404-2-2		Install, replace, rebuild, set-up or test frequency converters
404-2-3		Install, replace, rebuild, set-up or test meter
404-2-4		Install, replace, rebuild, set-up or test Transfer switches
404-2-5		Install, replace, rebuild, set-up or test transformer, circuit breakers, cables
404-3	<i>Power distribution system Installation</i>	
404-3-1		Install, replace, rebuild, set-up or test batteries
404-3-2		Install, replace, rebuild, set-up or test chargers
404-3-3		Install, replace, rebuild, set-up or test inverters
404-3-4		Install, replace, rebuild, set-up or test secondary power
404-3-5		Install, replace, rebuild, set-up or test UPS (emergency or standby power)

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	Module Title	
	<i>Responsibilities / Course Content</i>	
	<i>Learning Objectives</i>	
Signals (3 modules -- levels 200 through 400)		
205 Signals (Inspection and Maintenance)		
205-1	<i>Signaling Systems Inspection and Maintenance</i>	
205-1-1	Inspect / Test and maintain automatic train protection (ATP)	
205-1-2	Inspect / Test and maintain automatic train operation (ATO)	
205-1-3	Inspect / Test and maintain automatic train supervision (ATS)	
205-1-4	Inspect / Test and maintain automatic train supervision (ATS)	
205-1-5	Inspect / Test and maintain automatic train supervision (ATS)	
205-1-6	Inspect / Test and maintain automatic train supervision (ATS)	
205-2	<i>Wayside signaling inspection and maintenance</i>	
205-2-1	Inspect / Test and maintain automatic block system (ABS)	
205-2-2	Inspect / Test and maintain wayside signaling	
205-2-3	Inspect / Test and maintain interlocking signal system	
205-3	<i>Train wayside communication (TWC) inspection and maintenance</i>	
205-3-1	Inspect / Test and maintain movable Block	
205-3-2	Inspect / Test and maintain communication based train control (CBTC)	
205-3-3	Inspect / Test and maintain Positive Train Separation (PTS)	
205-3-4	Inspect / Test and maintain automatic train control (ATC)	
305 Signals (Troubleshooting and Repair)		
305-1	<i>Signaling Systems Troubleshooting</i>	
305-1-1	Troubleshoot, adjust and/or repair automatic train protection (ATP)	
305-1-2	Troubleshoot, adjust and/or repair automatic train operation (ATO)	
305-1-3	Troubleshoot, adjust and/or repair automatic train supervision (ATS)	
305-1-4	Troubleshoot, adjust and/or repair centralized traffic control	
305-1-5	Troubleshoot, adjust and/or repair advanced train control system (ATCS)	
305-1-6	Troubleshoot, adjust and/or repair advanced automatic train control (AATC)	
305-2	<i>Wayside signaling Troubleshooting</i>	
305-2-1	Troubleshoot, adjust and/or repair automatic block system (ABS)	
305-2-2	Troubleshoot, adjust and/or repair wayside signaling	
305-2-3	Troubleshoot, adjust and/or repair interlocking signal system	
305-3	<i>Train wayside communication (TWC) Troubleshooting</i>	
305-3-1	Troubleshoot, adjust and/or repair movable Block	
305-3-2	Troubleshoot, adjust and/or repair communication based train control (CBTC)	
305-3-3	Troubleshoot, adjust and/or repair Positive Train Separation (PTS)	
305-3-4	Troubleshoot, adjust and/or repair automatic train control (ATC)	
405 Signals (Installation, Rebuild, Setup and Advanced Testing)		

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	Module Title	
	<i>Responsibilities / Course Content</i>	
	<i>Learning Objectives</i>	
405-1	<i>Signaling Systems Installation, rebuild and set up</i>	
405-1-1	Install, rebuild, set-up and/or test automatic train protection (ATP)	
405-1-2	Install, rebuild, set-up and/or test automatic train operation (ATO)	
405-1-3	Install, rebuild, set-up and/or test automatic train supervision (ATS)	
405-1-4	Install, rebuild, set-up and/or test centralized traffic control	
405-1-5	Install, rebuild, set-up and/or test advanced train control system (ATCS)	
405-1-6	Install, rebuild, set-up and/or test advanced automatic train control (AATC)	
405-2	<i>Wayside signaling installation, rebuild and set up</i>	
405-2-1	Install, rebuild, set-up and/or test automatic block system (ABS)	
405-2-2	Install, rebuild, set-up and/or test interlocking signal system	
405-3	<i>Train wayside communication (TWC) installation, rebuild and set up</i>	
405-3-1	Install, rebuild, set-up and/or test movable Block	
405-3-2	Install, rebuild, set-up and/or test communication based train control (CBTC)	
405-3-3	Install, rebuild, set-up and/or test Positive Train Separation (PTS)	
405-3-4	Install, rebuild, set-up and/or test automatic train control (ATC)	

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	<i>Module Title</i>	
	<i>Responsibilities / Course Content</i>	
	<i>Learning Objectives</i>	
<i>Train Stops (3 modules -- levels 200 through 400)</i>		
<i>206 Train Stops (Inspection and maintenance)</i>		
206-1	<i>Mechanical</i>	
206-1-1		Demonstrate ability to understand electrical prints and ground equipment diagrams
206-1-2		Explain operation of train stops
206-1-3		Inspect / test and Maintain mechanical parts
206-1-4		Inspect / Test / Maintain speed enforcement system (wheel detector)
206-2	<i>Magnetics</i>	
206-2-1		Inspect / test and Maintain magnetic stops
206-2-2		Inspect / Test / Maintain speed enforcement system (wheel detector)
206-3	<i>Wheel pickups</i>	
206-3-1		Inspect / test and Maintain wheel pickups
206-3-2		Inspect / Test / Maintain speed enforcement system (wheel detector)
206-4	<i>De-rail</i>	
206-4-1		Inspect / test and Maintain de-rail
206-4-2		Inspect / Test / Maintain speed enforcement system (wheel detector)
<i>306 Train Stops (Troubleshooting and Repair)</i>		
306-1	<i>Mechanical</i>	
306-1-1		Troubleshoot, adjust or repair mechanical parts
306-1-2		Identify which modules interface with the trip stop
306-2	<i>Magnetics</i>	
306-2-1		Troubleshoot, adjust or repair magnetic stops
306-3	<i>Wheel pickups</i>	
306-3-1		Troubleshoot, adjust or repair wheel pickups
306-4	<i>De-rail</i>	
306-4-1		Troubleshoot, adjust or repair de-rail
<i>406 Train Stops (Installation, Rebuild, Setup and Advanced Testing)</i>		

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	Module Title	
		<i>Responsibilities / Course Content</i>
		Learning Objectives
406-3		<i>Mechanical</i>
		Use track install diagram
406-3-1		Install, replace, rebuild, or set-up mechanical parts
406-2		<i>Magnetics</i>
406-2-1		Install, rebuild, or set-up magnetic stops
406-4		<i>Wheel pickups</i>
406-4-1		Install, rebuild or set-up wheel pickups
406-1		<i>De-rail</i>
406-1-1		Install, rebuild, or set-up de-rail

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	Module Title	
	<i>Responsibilities / Course Content</i>	
	<i>Learning Objectives</i>	
Interlocking (2 modules -- levels 100 and 200)		
107 Interlocking (Intro and Overview)		
107-1	<i>Explain concepts of interlocking operation</i>	
207 Interlocking (Inspection and Maintenance)		
207-1	<i>Interlocking</i>	
207-1-1	Inspect and maintain manual interlocking	
207-1-2	Inspect and maintain automatic interlocking	
307 Interlocking (Troubleshooting and Repair)		
307-1	<i>Troubleshooting Interlocks</i>	
307-1-1	Perform route locking test	
307-1-2	Perform approach locking test	
307-1-3	Perform time locking test	
307-1-4	Perform traffic locking test	
307-1-5	Perform indication locking test	
307-1-6	Download and read event reports	

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	Module Title	
	<i>Responsibilities / Course Content</i>	
	Learning Objectives	
Control Panels (3 modules -- levels 200 through 400)		
208 Control Panels (Inspection and Maintenance)		
208-1	<i>Local control panels/human machine interfaces (HMI)</i>	
208-1-1	Inspect and Maintain components	
208-1-2	Inspect and Maintain safety tool	
208-1-3	Inspect and Maintain Communication Based Train Control (GPS)	
208-1-4	Demonstrate ability to read control panel schematics	
208-1-5	Identify functions of each light, button or key.	
208-1-6	Explain each panels function as it relates to interlocking	
208-1-7	Replace light indicators and switches	
208-2	<i>New Technology</i>	
208-2-1	Inspect and Maintain Electronic Track Circuit	
208-2-2	Inspect and maintain programmable logic controllers	
308-2-3	Inspect and maintain solid state interlocking	
308-2-4	Inspect and maintain computer based interlocking	
308 Control Panels (Troubleshooting and Repair)		
308-1	<i>Local control panels/human machine interfaces (HMI)</i>	
308-1-1	Troubleshoot, adjust or repair control panel componentes	
308-1-2	Use control panel to troubleshoot the interlocking	
308-1-3	Troubleshoot, adjust or repair Communication Based Train Control (GPS)	
308-2	<i>New Technology</i>	
308-2-1	Troubleshoot, adjust or repair Electronic Track Circuit	
308-2-2	Troubleshoot and repair PLCs (Programmable Logic Controllers)	
308-2-3	Troubleshoot and repair solid state interlocking	

**Rail Signals Training Content and Standards,
Revised in response to APTA comments**

ID	Module Title	
		<i>Responsibilities / Course Content</i>
		Learning Objectives
308-2-4		Troubleshoot and repair computer based interlocking
408 Control Panels (Installation, Rebuild, Setup and Testing)		
408-1		<i>Local control panels/human machine interfaces (HMI)</i>
408-1-1		Fulfilling testing requirements
408-1-2		Install or replace control panels
408-1-3		Perform simulations to test interlocking
408-2		<i>New Technology</i>
408-2-1		Install, replace, rebuild, set-up or test Electronic Track Circuit