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

| ID | *Module Title* / *Responsibilities / Course Content* / Learning Objectives |
|---|---|
| | ***Signals Overview (2 modules -- level 100 and 200)*** |
| | ***100 Overview*** |
| 100-1 | *History and Purpose of signal systems* |
| 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 | *Fail safe principles of signals* |
| 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 | *Introduction to Track Circuits* |
| 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 |

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| | Perform vital relay testing |
| 100-4 | *Safety Principles* |
| 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 | *Rail roadway worker protection* |
| 100-6 | *Safe train operation/expedited train movement* |
| 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 | *Regulatory/regulations (importance of testing)* |
| 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 | *Signal System Operation* |
| 100-8-1 | Demonstrate ability to refer to glossary of terms/nomenclature) |
| 100-9 | *Special tools* |
| 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 | *Test Equipment (generally these will be specific to individual agencies)* |
| 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 |

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| 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 | | *Function and purpose of signal equipment and defining nomenclature* | | |
| 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 | | *Advanced test equipment* | | |
| 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 | | *Test Equipment (specialized testing equipment)* | | |
| 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 | | *Power* | | |
| 200-2-1 | | | | Verifying operation of power supply |
| 200-2-2 | | | | Check and verify power supply |
| 200-2-3 | | | | Check input/output using prints |

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|---|---|
| | ***Train Control (4 modules -- levels 100 through 400)*** |
| | ***101 Train Control (Intro and Overview)*** |
| 101-1 | *The fundamentals of DC track circuits* |
| 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 | *Reading track circuit prints and documentation* |
| 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 | *DC track circuits and related components* |
| 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 | *Coded track circuits* |
| 101-4-1 | Describe how code is transmitted to the rail |
| 101-4-2 | Identify componends of a coded AC track circuit |
| 101-4-3 | Describe difference between train detection and cab signals |
| | ***201 Train Control (Inspection and Maintenance)*** |
| 201-1 | *DC Track Circuits Inspection and Maintenance* |
| 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 |

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|---|---|
| | *Responsibilities / Course Content* |
| | 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 | *DC track Circuits Basic Troubleshooting* |
| 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 | *AC track circuits Inspection and Maintenance* |
| 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 |
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