



# THE BELT RAILWAY COMPANY OF CHICAGO

Signal and Communication Rules, 49 CFR Part 234

# SIG - 1

NOVEMBER 1, 2020

## FRA 49 C.F.R Part 234 RULES AND PROCEDURES

### STANDARD TEST PROCEDURES FOR THE INSPECTION AND TESTING OF SIGNAL EQUIPMENT. SIG-1

#### Foreword

The operations of the BRC depend heavily on the proper operation of our signal systems. The success of operations through highly technical systems depends on the manner in which it is installed and maintained, and the abilities and knowledge of those signalmen who maintain it.

Our objective as Signalman is to ensure the continuous, safe and reliable movement of trains over the BRC.

These rules, and the Standard Test Procedures in Appendix A, are intended to provide the technical information necessary to help you achieve these objectives, while complying with Part 234 of the Rules, Standards and Instructions for Signal Systems, as prescribed by the Federal Railroad Administration.

In inspecting, maintaining, and testing signal apparatus, the following parameters must be observed:

1. The normal functioning of any device shall not be interfered with without first taking measures for insuring the safety of train operations, which depend on the normal functioning of such device.
2. When making electrical tests, the proper test equipment and meters must be used, and no unsafe condition must be set up by the application of such testing apparatus, without first protecting the operation of trains.
3. Alterations or additions must not be made to any signal apparatus or circuit unless authorized by the Manager of Terminal Signal and Communications, a Signal Supervisor, Signal Inspector or Signal Foreman.
4. When signal apparatus is replaced, tests shall be made to determine that the apparatus is in fact functioning as intended, and the system in which it is installed in is functioning as designed.
5. Signal Maintainers are wholly responsible for the inspection, testing, adjustment and maintenance of all signals and interlocking apparatus within their assigned territory, and wholly responsible for the timely filing of required reports. They must report any defect requiring the attention of the Manager of Terminal Signal and Communications promptly.
6. Employees in doubt of the correct and safe course in the discharge of their duties must promptly seek clarification from a supervisor.

Explanations and Applications of Federal Regulations related to Signal Components.

**Where applications are shown within this document, they are not a replacement for the text of the regulation, which is authored and maintained by the Government Printing Office on the direction of US Department of Transportation.**

**The language of the regulation is available in paper form, or at [www.ecfr.gov](http://www.ecfr.gov).**

**This web resource must be utilized whenever an employee needs to obtain the most recent version of the active regulation in effect at a specific time.**

**49 C.F.R. § 234.1 Scope.**

This part imposes minimum maintenance, inspection, and testing standards for highway-rail grade crossing warning systems. This part also prescribes standards for the reporting of failures of such systems and prescribes minimum actions railroads must take when such warning systems malfunction.

This part also requires particular identified States to develop State highway-rail grade crossing action plans. This part does not restrict a railroad from adopting and enforcing additional or more stringent requirements not inconsistent with this part.

**49 C.F.R. § 234.5 Definitions.**

As used in this part:

**ACTIVATION FAILURE** means the failure of an active highway-rail grade crossing warning system to indicate the approach of a train at least 20 seconds prior to the train's arrival at the crossing, or to indicate the presence of a train occupying the crossing, unless the crossing is provided with an alternative means of active warning to highway users of approaching trains. (This failure indicates to the motorist that it is safe to proceed across the railroad tracks when, in fact, it is not safe to do so.)

A grade crossing signal system does not indicate the approach of a train within the meaning of this paragraph if more than 50 percent of the flashing lights (not gate arm lights) on any approach lane to the crossing are not functioning as intended, or in the case of an approach lane for which two or more pairs of flashing lights are provided, there is not at least one flashing light pair operating as intended.

Back lights on the far side of the crossing are not considered in making these determinations.

**APPROPRIATELY EQUIPPED FLAGGER** means a person other than a train crewmember who is equipped with a vest, shirt, or jacket of a color appropriate for daytime flagging such as orange, yellow, strong yellow green or fluorescent versions of these colors or other generally accepted high visibility colors. For nighttime flagging, similar outside garments shall be retro reflective.

Acceptable hand signal devices for daytime flagging include "STOP/SLOW" paddles or red flags.

For night time flagging, a flashlight, lantern, or other lighted signal shall be used.

**CREDIBLE REPORT OF SYSTEM MALFUNCTION** means specific information regarding a malfunction at an identified highway-rail crossing, supplied by a railroad employee, law enforcement officer, highway traffic official, or other employee of a public agency acting in an official capacity.

**FALSE ACTIVATION** means the activation of a highway-rail grade crossing warning system caused by a condition that requires correction or repair of the grade crossing warning system. (This failure indicates to the motorist that it is not safe to cross the railroad tracks when, in fact, it is safe to do so.)

For the purposes of highway crossing protection under **Rule 6.32.2 of the General Code of Operating Rules**, as amended by BRC Special Instruction, a crossing with a False Activation is considered as being **MALFUNCTIONING**.

**HIGHWAY RAIL GRADE CROSSING** means a location where a public highway, road, street, or private roadway, including associated sidewalks and pathways, crosses one or more railroad tracks at grade.

**PARTIAL ACTIVATION** means activation of a highway-rail grade crossing warning system indicating the approach of a train, however, the full intended warning is not provided due to one of the following conditions:

1. At non-gated crossings equipped with one pair of lights designed to flash alternately, one of the two lights does not operate properly (and approaching motorists cannot clearly see flashing back lights from the warning lights on the other side of the crossing)
2. At gated crossings, the gate arm is not in a horizontal position; or
3. At gated crossings, any portion of a gate arm is missing, if that portion normally has a gate arm flashing light attached.

**TRAIN** means one or more locomotives, with or without cars.

**WARNING SYSTEM MALFUNCTION:** means an activation failure, a partial activation, or a false activation of a highway-rail grade crossing warning system.

#### **49 C.F.R § 234.101 Employee Notification Rules**

##### Application:

This section requires that each railroad issue rules requiring that its employees report malfunctions of highway-rail grade crossing warning systems to a designated railroad employee or employees, and that such reports shall be made by the quickest means of communications available.

##### BRC Procedure:

Any BRC employee observing any crossing protection failure must report it to the BRC dispatcher as soon as possible by radio or phone.

#### **49 C.F.R §234.103 Timely response to report of malfunction.**

##### Application:

This section requires that once a credible report of a malfunction of a highway-rail grade crossing warning system has been received, the railroad having maintenance responsibility for the warning system shall promptly investigate the report. Further, if such malfunction is found to be caused by a faulty component, such component shall be adjusted, repaired, or replaced without undue delay, as required by 49 C.F.R. § 234.207.

##### BRC Procedure:

Upon notification of a road crossing malfunction, the BRC dispatcher will notify the appropriate Signal Road Maintainer of the location and nature of the crossing malfunction.

Signal Road Maintainer will proceed to the crossing as soon as possible.

Repairs, adjustments or replacements will be recorded in the appropriate form in RailDOCs.

The Maintainer completing repairs at the location is responsible for completing the entry in the Crossing Failure application in Belt Apps.

#### **49 C.F.R. §234.105 Activation Failure**

##### Application:

This section requires that a railroad having maintenance responsibility for a warning system take prompt action to provide alternative means of warning highway users and railroad employees at a specific crossing where a credible report of a system malfunction involving an activation failure has been received. This section further requires specific actions to be followed to provide an alternative warning.

When a railroad receives a credible report of a system malfunction involving an activation failure, it is required to take prompt action to notify train crews and other railroads operating over such crossing prior to the next train operation over the crossing. Further, the railroad is required to notify the law enforcement agency having jurisdiction over such crossing or the railroad police who are capable of responding to control vehicular traffic at the crossing. Finally, the railroad must act to ensure that its employees, or a law enforcement agency, provides the required alternative means of warning for highway users at the crossing.

For the purposes of highway crossing protection under **Rule 6.32.2 of the General Code of Operating Rules**, as amended by BRC Special Instruction, a crossing with an Activation Failure is considered as having an ACTIVATION FAILURE.

#### BRC Procedure:

1. Maintainers or any Signal employee, called or notified of a road crossing system malfunction, shall promptly investigate the report and determine the cause of the malfunction.
2. Maintainer or Signal Department employee must take steps to protect the roadway user, rail traffic and pedestrians.

Appropriate PPE and proper flagging equipment must be used.

Protection using GCOR Rule 6.32.2 will be used when protection is required for protection of roadway user, rail traffic, and pedestrians. On territory that is other than main track, and not located on the South Chicago District Industrial Lead, the Elsdon Industrial Lead, the Train Dispatcher will be unable to provide protection. On other than main track only, where the train dispatcher can provide protection under GCOR 6.32.2, this protection does not negate the requirement to utilize red flags to assure compliance with GCOR 6.28.

3. After determining the cause of the failure, make all necessary repairs, replacements or adjustments.
4. Test the crossing using a 0.06-ohm shunt to verify correct operation of the crossing. Place a shunt at 90% of crossing approach length, on both sides of the crossing approaches. Make sure crossing activates.
5. Do any other testing required by equipment manufactures requirements or the BRC Rules and Procedures.
6. After repairs and testing are completed, release the GCOR Rule 6.32.2. If possible, observe the operation of the crossing under normal train operations.
7. If repairs cannot be completed and the crossing is still malfunctioning, the Signal employee will notify the Signal Supervisor.
8. If after notifying the Signal Supervisor and the Maintainer receives permission to leave the malfunctioning crossing, but before leaving, the maintainer will notify the dispatcher that the crossing is malfunctioning and protection prescribed by GCOR Rule 6.32.2 is still in effect.
9. Record the date of test, repairs or adjustments on the appropriate RailDOC's form.
10. The Maintainer completing repairs at the location is responsible for completing the entry in the Crossing Failure application in Belt Apps.

#### **49 C.F.R. §234.106 Partial Activation**

##### Application:

This section requires that a railroad having maintenance responsibility for a warning system take prompt action to provide alternative means of warning highway users and railroad employees at a crossing where a credible report of a system malfunction involving a partial activation has been received. This section further requires that specific actions be followed to provide that alternative warning.

When a railroad receives a credible report of a system malfunction involving a partial activation, it is required to take prompt action to notify train crews and other railroads operating over such crossing prior to the next train operation over the crossing. Further, the railroad is required to

notify the law enforcement agency having jurisdiction over such crossing, or the railroad police who are capable of responding to control vehicular traffic at the crossing. Finally, the railroad must act to assure that its employees, or a law enforcement agency, provide the required alternative means of warning for highway users at the crossing.

**BRC Procedure:**

1. Maintainers or any Signal employee, called or notified of a road crossing system malfunction, shall promptly investigate the report and determine the cause of the malfunction.
2. Maintainer or Signal employee must take steps to protect the roadway user, rail traffic and pedestrians. Appropriate PPE and flagger equipment shall be used.

GCOR Rule 6.32.2 will be used when protection is required for protection of roadway user, rail traffic, and pedestrians. In the application of the rule the crossing is considered as MALFUNCTIONING.

Protection using GCOR Rule 6.32.2 will be used when protection is required for protection of roadway user, rail traffic, and pedestrians. On territory that is other than main track, and not located on the South Chicago District Industrial Lead or the Elsdon Industrial Lead, the Train Dispatcher will be unable to provide protection. On other than main track only, where the train dispatcher can provide protection under GCOR 6.32.2, this protection does not negate the requirement to utilize red flags to assure compliance with GCOR 6.28.

3. After determining the cause of the failure, make all necessary repairs, replacements or adjustments.
4. Test the crossing using a 0.06-ohm shunt to verify correct operation of the crossing. Place a shunt at 90% of the crossing approach length, on both sides of the crossing approaches. Make sure crossings activate. Do any other testing required by equipment manufactures requirements.
5. After repairs and testing are completed, release the GCOR Rule 6.32.2 protection. If possible, observe the operation of the crossing under normal train operations.
6. If repairs cannot be completed and the crossing is still malfunctioning, the Signal employee will notify the Signal Supervisor.
7. If after notifying the Signal Supervisor and Maintainer receives permission to leave the malfunctioning crossing, but before leaving, the maintainer will notify the dispatcher that the crossing is malfunctioning and GCOR Rule 6.32.2 are still in effect.
8. Record the date of test, repairs or adjustments on the appropriate RailDOC's form.
9. The Maintainer completing repairs at the location is responsible for completing the entry in the Crossing Failure application in Belt Apps.

## **49 C.F.R. § 234.107 False Activation**

### **Application:**

This section requires that a railroad having maintenance responsibility for a warning system take prompt action to provide alternative means of warning for highway users and railroad employees at a specific crossing where a credible report of a system malfunction involving a false activation has been received. This section further requires that specific actions be followed to provide that alternative warning.

When a railroad receives a credible report of a system malfunction involving a false activation, it is required to take prompt action to notify train crews and other railroads operating over such crossing prior to the next train operation over the crossing. Further, the railroad is also required to notify the law enforcement agency having jurisdiction over such crossing, or the railroad police who are capable of responding to control vehicular traffic at the crossing. Finally, the railroad must act to assure that its employees, or a law enforcement agency, provide the required alternative means of warning for highway users at the crossing.

### **BRC Procedure:**

1. Maintainers or any Signal employee, called or notified of a road crossing system malfunction, shall promptly investigate the report and determine the cause of the malfunction.
2. Maintainer or Signal employee must take steps to protect the roadway user, rail traffic and pedestrians. Appropriate PPE and proper flagger equipment shall be used.
3. Maintainer or Signal employee must take steps to protect the roadway user, rail traffic and pedestrians. Appropriate PPE and flagger equipment shall be used.

GCOR Rule 6.32.2 will be used when protection is required for protection of roadway user, rail traffic, and pedestrians. In the application of the rule the crossing is considered as MALFUNCTIONING.

Protection using GCOR Rule 6.32.2 will be used when protection is required for protection of roadway user, rail traffic, and pedestrians. On territory that is other than main track, and not located on the South Chicago District Industrial Lead or the Elsdon Industrial Lead, the Train Dispatcher will be unable to provide protection. On other than main track only, where the train dispatcher can provide protection under GCOR 6.32.2, this protection does not negate the requirement to utilize red flags to assure compliance with GCOR 6.28.

4. After determining the cause of the failure, make all necessary repairs, replacements, or adjustments.
5. Test the crossing using a 0.06-ohm shunt to verify correct operation of the crossing. Place a shunt at 90% of crossing approach length, on both sides of the crossing approaches. Make sure crossings activate. Do any other testing required by equipment manufactures requirements.
6. After repairs and testing are completed, release the GCOR Rule 6.32.2. If possible, observe the operation of the crossing under normal train operations.
7. If repairs cannot be completed and the crossing is still malfunctioning, the Signal employee will notify the Signal Supervisor.

8. If after notifying the Signal Supervisor and Maintainer receives permission to leave the malfunctioning crossing, but before leaving, the maintainer will notify the dispatcher that the crossing is malfunctioning and GCOR Rule 6.32.2 are still in effect.
9. Record the date of test, repairs or adjustments on the appropriate RailDOC's form.
10. The Maintainer completing repairs at the location is responsible for completing the entry in the Crossing Failure application in Belt Apps.

#### **49 C.F.R. § 234.201 Location of Plans**

Application:

Plans are necessary for the proper installation, inspection, maintenance, testing, and repair of highway-rail grade crossing warning systems. Such plans are required to be legible and correct.

Plans shall be kept at each highway-rail grade crossing warning system location.

#### **49 C.F.R. §234.203 Control Circuits**

Application:

This section requires that all control circuits that affect the safe operation of a highway-rail grade crossing warning system shall operate on the fail- safe principle.

#### **49 C.F.R §234.205 Operating Characteristics of Warning System Apparatus**

Application:

This section requires the operating characteristics of electromagnetic, electronic, or electrical apparatus of each highway-rail grade crossing warning system be maintained in accordance with the limits within which it is designed to operate.

#### **49 C.F.R. § 234.213 Grounds**

Application:

This section requires that circuits that affect the proper functioning of a highway-rail grade crossing warning system are to be kept free of grounds equal to or in excess of 75 percent of the release value of any relay or electromagnetic device in the circuit. Track circuits, common return wires of grounded common return single break circuits, and alternating current power distribution circuits grounded in the interest of safety, are excluded.

#### **49 C.F.R. §234.215 Standby Power System**

Application:

This section requires railroads to provide a standby power source to operate the warning system for a reasonable length of time during a period of primary power interruption. The designated capacity shall be specified on the plans, as required by 49 C.F.R. § 234.201.

## BRC Procedure for Testing Battery Banks:

Caution: Storage batteries connected in series have high current flow potentials, even when AC to their chargers is turned off. Use care with metal tools around batteries as this a potential for electrical arcing and potential electric shock. The potential for electrical flashing exists if metal objects touch or fall across the battery terminals.

### Testing Battery Cells:

1. Turn off chargers supplying battery bank. If in bungalow, let batteries operate for a minute or two. If at a road crossing bungalow or case, operate gates down and up once to remove voltage float.
2. Power Safe DDR batteries should have a voltage of 2.23 -2.27 volts per cell.
3. Cell voltages should be stated on battery labels.
4. Measure total battery bank voltage and record values.
5. Measure cell voltages and record values.
6. Check that battery connections are tight and that there is no corrosion on terminals or cable ends.
7. See the manual for the battery charger at the location to set the proper charge rate for the battery bank.
8. Make sure the correct number of cells is set on the charger as an incorrect number of cells may cause operation issues!
9. Repairs, adjustments or replacements will be recorded in the appropriate form in RailDOCS.

### **49 C.F.R. §234.217 Flashing Light Unit**

#### Application:

This regulation requires that each flashing light unit be properly positioned and aligned and visible to a highway user approaching the crossing. Each flashing light unit shall be maintained to prevent dust and moisture from entering the interior of the unit. Roundels and reflectors shall be clean and in good condition. All light units shall flash alternately and the number of flashes per minute shall not be less than 35 nor more than 65.

### **49 C.F.R. §234.219 Gate Arm lights and Light Cables**

#### Application:

This section requires that each gate arm light be maintained so that it is properly visible to approaching highway users. It also requires that lights and light wire be secured to the gate arm. This section applies to gate arm lights and light wires installed at active warning systems. Each gate arm light shall be visible to approaching highway users and pedestrians, if applicable. This section also requires that lights and light wires be securely fastened to each gate arm. The intent of this section is that lights and light wires shall be maintained in accordance with design specifications.

**BRC Requirements:**

Each gate arm shall be equipped with 3 red lights arranged to shine in both directions across the roadway.

The lights shall operate, at all times, when the gate is in the position to block the roadway traffic. Gate lights will be located and operated as follows:

- A. The light nearest the tip shall not be less than 12", nor more than 18" from the gate tip and shall be lit constantly.
- B. The other 2 lights shall be located to suit local conditions. They shall flash alternately in unison with the lights on gate pole.

**49 C.F.R. §234.221 Lamp Voltage**

**Application:**

This section requires the at the voltage at each lamp shall be maintained at not less than 85 percent of the prescribed lamp rating.

**BRC Procedure:**

- A. Standard CC-6 filament 25-watt bulbs will be set at 9 to 10 volts.
- B. All LED lighting will have voltage feeds set at 8.5 to 10 volts.

**49 C.F.R. §234.223 Gate Arm**

Each gate arm, when in the downward position, shall extend across each lane of approaching highway traffic and shall be maintained in a condition sufficient to be clearly viewed by approaching highway users. Each gate arm shall start its downward motion not less than three seconds after flashing lights begin to operate and shall assume the horizontal position at least five seconds before the arrival of any normal train movement through the crossing.

At those crossings equipped with four quadrant gates, the timing requirements of this section apply to entrance gates only.

**Application:**

This section requires that each gate arm, when in the horizontal position, extend across each lane of approaching highway traffic and be maintained in a condition sufficient to be clearly viewed by approaching highway users. Each gate arm shall start its downward motion not less than 3 seconds after flashing lights begin to operate and assume the horizontal position at least 5 seconds before the arrival of any normal train movement through the crossing.

The required length of each gate arm is determined by the design length as indicated on the circuit plans.

In the absence of a design length, the gate arm must extend across at least 90 percent of each lane of approaching highway traffic.

#### **49 C.F.R. §234.225 Activation of Warning System**

Application:

This section requires that each highway-rail grade crossing warning system be maintained to activate in accordance with the design of the warning system, but in no event shall it provide less than 20 seconds warning time for the normal operation of through train movements before the crossing is occupied by rail traffic.

#### **49 C.F.R. §234.227 Train Detection Apparatus**

Application:

This section requires that train detection apparatus be maintained to detect a train, locomotive, or car which occupies any part of a train detection circuit, in accordance with the design of the warning system. It shall not be a violation if the presence of sand, rust, dirt, grease, or other foreign matter prevents effective shunting.

When these conditions are known to exist, a railroad shall take appropriate action as required by 49 C.F.R. § 234.105.

The alternative protection provided by 49 C.F.R. § 234.105 is meant to be a temporary measure since conditions affecting effective shunting must be corrected without undue delay as required by 49 C.F.R § 234.207.

#### **49 C.F.R § 234.229 Shunting Sensitivity**

Application:

This section requires that each highway-rail grade crossing train detection circuit shall detect the application of a 0.06-ohm resistance shunt when the shunt is connected across any part of the track rails of the train detection circuit.

#### **49 C.F.R § 234.231 Fouling Wires**

Application:

This section requires that when a switch turnout located within a highway-rail grade crossing train detection circuit is equipped with fouling wires, those wires shall consist of two discrete conductors, and each conductor shall be of sufficient conductivity and maintained in such condition to ensure proper operation of the train detection circuit as required in 49 C.F.R. § 234.227.

#### **49 C.F.R. § 234.233 Rail Joints**

Application:

This section requires that each non-insulated rail joint located within the limits of a highway-rail grade crossing train detection circuit be bonded by means other than joint bars and that the bonds be maintained in such condition to ensure electrical conductivity.

Cad-Weld bonds shall be used.

#### **49 C.F.R § 234.237 Reverse Switch Cut-Out Circuit**

##### Application:

This section requires that when a switch is equipped with a switch circuit controller connected to the point and interconnected with highway-rail grade crossing warning system circuitry, such switch circuit controller shall be maintained so the warning system can be cut out only when the switch point is within one-half inch of the full reverse position.

Tests shall be made by placing an appropriate gauge between the reverse switch point and rail, 6 inches from the end of the point, and applying pressure against the gauge until it cannot be removed.

Normally open contacts shall be open at least one-sixteenth inch. The one-sixteenth inch requirement applies to reverse contacts when the switch is in the full normal position, or the normal contacts when the switch is in full reverse position.

Repairs, adjustments or replacement will be recorded in the appropriate form in RailDOC's.

#### **49 C.F.R § 234.239 Tagging of Wires and Interference of Wires or Tags with Signal Apparatus**

##### Application:

This section requires that each wire be tagged or otherwise marked that it can be identified at each terminal. Tags and other marks of identification shall be made of insulating material and so arranged that tags and wires do not interfere with moving parts of apparatus.

This section applies to each wire, at each terminal, in all housings, including switch circuit controllers and terminal or junction boxes. This requirement does not apply to flashing light units, gate arm light units, and other auxiliary light units.

Wiring shall be tagged or otherwise marked at a terminal. A terminal is any point where the wire terminates from its point of origin to and including the point of final termination.

The wire may be tagged or marked in any manner so that it can be identified.

All tag and wire identification shall correspond with the circuit plan. If it is necessary to pull the wire to identify it, the railroad is in noncompliance.

The local wiring on a solid-state crossing controller rack will not require tags, as long as the wiring is an integral part of the solid-state equipment.

Repairs, adjustments or replacement will be recorded in the appropriate form in RailDOCs.

#### **49 C.F.R. § 234.245 Signs**

Application:

This section requires that each sign mounted on a highway-rail grade crossing signal post or mast be maintained in good condition and be visible to the highway user.

This section applies to any sign that is attached to a signal pole located at a highway-rail grade crossing and is associated with warning highway motorists.

#### **49 C.F.R § 234.247 Purpose of Inspections and Tests; Removal from Service of Relay or Device Failing to Meet Test Requirements**

Application:

This section requires that the inspections and tests set forth in § 234.249 through § 234.271 are required at highway-rail grade crossings with active warning systems located on in-service railroad tracks and shall be made to determine if the warning system and its component parts are maintained in a condition to perform their intended function.

Repairs, adjustments or replacements will be recorded in the appropriate form in RailDocs.

#### **49 C.F.R. § 234.257 Warning System Operation**

Application:

This section requires that each highway-rail grade crossing warning system be tested for proper operation when the warning system is placed in service and at least once each month thereafter, and whenever modified or disarranged.

When a warning bell or other stationary audible warning device is used, it shall be tested for proper operation when placed in service.

Thereafter it must be tested at least once each month and whenever modified or disarranged.

Repairs, adjustments or replacement will be recorded in the appropriate form in RailDOC's.

#### **49 C.F.R § 234.259 Warning Time**

Application:

This section requires that each highway-rail grade crossing warning system be tested for the prescribed warning time at least once every 12 months and when the warning system is modified because of a change in train speeds.

Testing can be accomplished by observation of a train movement, if practical, by calculation and track shunt simulation of a train movement, or by use of an electronic device that accurately determines warning time.

Repairs, adjustments or replacement will be recorded in the appropriate form in RailDOCs.

#### **49 C.F.R § 234.261 Highway Traffic Signal Pre-Emption**

##### Application:

This section requires that highway traffic signal pre-emption interconnections, for which a railroad has maintenance responsibility, be tested at least once each month.

The pre-emption of a highway traffic signal requires an electrical circuit between the control device of the crossing warning system and the controller assembly of the highway traffic signal.

The railroad will only be responsible for the maintenance and testing of its interconnections.

Repairs, adjustments or replacements will be recorded in the appropriate RailDoc's form.

#### **49 C.F.R. § 234.263 Relays**

##### Application:

This section requires that each relay which affects the proper functioning of a crossing warning system shall be tested at least once every 4 years, except:

1. Alternating current vane type relays, direct current polar type relays, and relays with soft iron magnetic structure, shall be tested at least once every 2 years.
2. Alternating current centrifugal type relays shall be tested at least once every 12 months. This section applies to in-service relays used in vital circuits of highway-rail grade crossing warning systems. Such relays include power off (POR) or power transfer relays (PTR), and flasher relays (FLR). It does not apply to miniature nonvital relays or motor control and gate mechanism relays.

This section is applicable only to relays in service. A relay, after being tested or repaired, is not considered in service until it is installed in a warning system.

Use of an "in-service" relay that has broken glass, high resistance contacts, burnt contacts, burnt ribbons, broken or bent contacts, improperly installed ribbons, or evidence of moisture or other foreign matter inside its housing is not considered properly maintained and is prohibited.

Tests of operating characteristics include pickup, release, and working values. They may be recorded in either voltage or current values.

Repairs, adjustments or replacements will be recorded in the appropriate form in RailDOC's.

#### **49 C.F.R § 234.265 Timing relays and Timing Devices**

##### Application:

This section requires that each timing relay and timing device be tested at least once every 12 months. The timing shall be maintained at not less than 90 percent nor more than 110 percent of the predetermined time interval. The predetermined time interval shall be shown on the plans or marked on the timing relay or timing device.

Timing relays and timing devices are essential components of time-out circuits which are primarily used for train switching movements at active warning system installations using conventional relay type train detection circuits.

Timing devices which perform internal functions associated with motion detectors, motion sensors, and grade crossing predictors are not subject to the requirements of this part.

Repairs, adjustments or replacements will be recorded in the appropriate form in RailDOCs.

#### **49 C.F.R § 234.267 Insulation Resistance Tests**

##### **Application:**

This section requires that insulation resistance tests be made when wires or cables are installed and at least once every 10 years thereafter.

Insulation resistance tests shall be made between all conductors and the ground and between all other wires or conductors within a cable.

Track wires, line wires, and case wiring are excluded from the requirements of this rule.

Where a conductor is found with insulation resistance of less than 500,000 ohms, prompt action is required for repair or replacement of the defective wire or cable.

Until repair or replacement, insulation resistance tests must be made annually.

The reason for this provision is to allow lead time for the acquisition of cable or scheduling of workforces. However, if material and work forces are available to effect repairs or replacement, corrective action shall be taken immediately.

Where a conductor is found with insulation resistance of less than 200,000 ohms, the conductor shall be either repaired immediately or removed from service.

Repairs, adjustments or replacements will be recorded in the appropriate form in RailDOC's.

#### **49 C.F.R §234.271 Insulated Rail Joints, Bond Wires, and Track Connections**

##### **Application:**

This section requires that each insulated rail joint, bond wire, and track connection be inspected at least once every 3 months.

Each insulated rail joint shall be inspected at least once every 3 months for compliance with 49 C.F.R § 234.235.

Each bond wire shall be inspected at least once every 3 months for compliance with 49 C.F.R. § 234.233.

Each track connection shall be inspected at least once every 3 months to maintain the integrity of the warning system.

Repairs, adjustments or replacements will be recorded in the appropriate form in RailDOC's.

## **Appendix A:**

Appendix A contain procedures for specific equipment governed by SIG-1.

Procedures are ever changing based upon manufacturer requirements and will be included as they are received.

When new procedures are added, or existing procedures are modified, they will be added or modified by Engineering General Order.

In the absence of a documented procedure, refer to your previous technical training and refer any questions to your Foreman.

## Procedure S1 Testing of Battery Banks

### **CAUTION:**

Storage batteries connected in series have high current flow potentials, even when AC to their chargers is turned off.

Use care with metal tools around batteries as there are shock and arc flashing potentials if metal objects touch or fall across the battery terminals.

### Testing Battery Cells:

Turn off chargers supplying the battery bank. If in bungalow let batteries operate for a minute or two. If at a road crossing bungalow or case, operate gates down and up once to remove voltage float.

Power Safe DDR batteries should have a voltage of 2.23 -2.27 volts per cell.

Cell voltages should be stated on battery labels.

Measure total battery bank voltage and record values.

Measure cell voltages and record values.

Check that battery connections are tight and that there is no corrosion on terminals or cable ends.

See the manual for the battery charger at the location to set proper charge rate for the battery bank.

Make sure the correct number of cells is set on the charger as incorrect number of cells will cause operational issues!

Repairs, adjustments or replacements will be recorded in the appropriate form in RailDOCS.

## **Procedure S2 Use of Battery Chargers**

When installing new/replacement battery chargers follow manufacturer's instructions presented in the manual that comes with the equipment.

### EXIDE Battery Chargers:

#### Maintenance:

Minor maintenance is required once charger has been properly set up.

If charger is operating improperly check function #12 for possible error codes. If codes are displayed see the manual for description of the problem.

Determine if charger 120/240 input voltage present?

If not reset circuit breaker in circuit panel.

Check for output voltage.

Check fuses/circuit breaker in charger. If fuse is blown, replace with same size and type of fuse.

If there appears to be a problem that is not recognized by the charger:

- Begin by pressing all 4 of the buttons of the front of the charger simultaneously. This resets the charger.
- If there is no output and the above steps have been followed, then replace the charger.

### Cragg Rail Charger:

Minor maintenance is required once charger has been properly set up.

DC volt and DC Ampere gauges shown actual operating values.

If there is no output check 120/240-volt supply circuit breaker.  
Check AC fuse in charger.

Push reset button on charger.

Measure output at terminals.

If there is no output and the above steps have been followed, then replace the charger.  
Record date of test, adjustments or replacements in the appropriate form in Rail DOCs.

## **Procedure S3 DC Non-Coded Track Circuits**

Standard Test Procedure for DC Non-Coded Track Circuits

### Test Objectives:

- Ensures that track relays are not over-energized and have the proper shunting sensitivity.

### Test Procedures:

1. Obtain the working voltage and current values of the track relay from the inspection tag or nameplate on the relay.
2. Measure both voltage and current at the track relay, comparing values to the relay's specifications. In no case should the track circuit current be more than 150 milliamps above the working current of the relay.
3. Verify shunting sensitivity by placing a 0.06-ohm shunt across the rails, and observing the track relay drops away.
4. Shunt around insulated joints to ensure that failure of the joint will shunt both adjacent track circuits.

### Required Results:

Track circuits must be maintained in accordance with the relay specifications, and must drop away with a standard 0.06-ohm shunt placed anywhere in the circuit.

Failure of an insulated joint must cause both adjacent track circuits to drop away.

Record date of test, adjustments or replacements in the appropriate form in RailDOCs.

## Procedure S4 Track Circuits – Standard Maintenance

### Standard Maintenance of Track Circuits

Maintenance Frequency: Monthly, or as assigned.

Maintenance Objectives:

- Ensures proper operating characteristics of the track circuits.

Maintenance Procedures:

Walk track circuit, inspect, checking the condition of all track circuit hardware, such as:

1. Cad-weld rail bonds
2. Fouling wires
3. Track circuit bootlegs
4. Insulated joints
5. Gauge plate insulation
6. Lightning Arrestors
7. Termination Shunts and Insulated Joint Couplers

Repair or replace defective or marginal track circuit hardware as required.

**NOTE:**

When all repairs or adjustments are completed, test track circuits operating characteristics in accordance with the appropriate Standard Test Procedure for the type of track circuit.  
(Electro-Code, DC Track Circuits, Motion Sensor, etc.).

Repairs, adjustments or replacement will be recorded in the appropriate form in RailDOCs.

## **Procedure S5**

### **Harmon PMD Motion Sensors**

Test Procedures for Harmon PMDII Motion Sensors

Test Frequency: Semi-Monthly

Test Objectives:

- Ensures the proper operating characteristics of the motion sensing equipment.

Test Procedures:

#### **Island Section Adjustment**

1. Place transfer switch in the normal position.
2. Shunt 3 feet outside the Island Section receiver track lead, using a 0.06-ohm shunt.
3. Adjust receiver gain control (ISR) clockwise until meter registers in the "operate" (GREEN) area, then back off counterclockwise until meter moves into the "adjust" (YELLOW) area.
4. Remove shunt and observe that meter returns to the "operate" area.
5. Remove the Subtone Converter Board (STC Normal). Adjust receiver gain (TLB) clockwise until receiver module monitor LED is on.
6. Place a Hardwire Shunt 20 feet outside the Island Receiver. Receiver module monitor LED should be off.
7. Adjust receiver monitor gain counterclockwise until the receiver module monitor LED (TLB) just lights.
8. Remove shunt and replace Subtone Converter Board.
9. Toggle Transfer Switch to Standby and repeat steps 2 through 4 for the Standby Island Section.

## Procedure S6 Motion Sensor Adjustment

### Motion Sensor Adjustment

#### Adjustment Procedure:

1. Place top switch of the Sync Detector (SYDT) in the Phase position. Observe the Phase Angle in degrees on the Digital Display of the Transceiver (XCVR) module.
2. Place top switch of the Sync Detector (SYDT) in the RX position. Observe the RX level on the Digital meter, and adjust the Current Drive Pot on SYDT to match the RX level with the Phase Angle, according to the following chart:

PHASE	45	48	51	54	57	60	63	66	70	75	79	83	87
RX	58	65	70	75	79	82	84	85	86	85	83	80	77

3. Observe High Signal and Low Phase LED's on the Motion Detector (MD) module. If either is on, reset the module. Both LED's should go out.
4. Transfer to Standby and repeat steps 1 through 3 to adjust the standby unit.
5. After adjustments are complete, transfer to Normal and place transfer switch in the auto position.

#### Required Results:

Motion Sensors must be maintained within the parameters outlined in the test procedures.

#### Documentation of Results:

Record the tests performed, repairs or adjustments in the appropriate form in RailDOCs.

