

# Orange Empire Railway Museum

## Crossing Inspection Instructions

January 18, 2004

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### Introduction

Mandatory Maintenance Inspections are performed monthly at all OERM grade crossings located on both OERM property and at public crossings. The inspections consist of a standard list of FRA (Federal Railroad Administration) and CPUC (California Public Utilities Commission) required checks.

The crossings are:

1. Mapes Road—flashers and gates for the public crossing where the main line crosses Mapes Road south of the museum.
2. 11<sup>th</sup> Street—flashers and gates for the public crossing where the main line crosses 11<sup>th</sup> St north of the museum.
3. Alpine—two wig-wags for the main line at the main entrance.
4. Central Avenue—one wig-wag for the trolley loop line where it crosses Central Ave near the wood shop.
5. Members' Crossing—flashers and one wig-wag where the members' entrance road crosses the Car Barn 4 Lead.

Most of the procedures are the same for all crossings, but there are some variations at each location:

1. Some switches and circuit breakers are installed in different physical locations.
2. Mapes Road and 11<sup>th</sup> Street have gates and two sets of batteries—10 volts for track circuits and 16 volts for the gate mechanisms (Note: the actual voltage of batteries labeled as B16 is closer to 14 or 15 volts). Other crossings have only 10 volt batteries for all circuits.
3. Mapes Road has four separate cases:
  - a. Main Case (located near the north side of the crossing; contains the south track audio receiver and all control logic, receives battery power from the “B” case). This case should be visited last, after the battery inspections have been done at the other cases.
  - b. North track transmitter (located at the fifth pole north of the crossing, inside the museum fence; contains the audio transmitter and battery charger; the battery box is next to the case).
  - c. South track transmitter (located at the third pole south of the crossing; contains the audio transmitter and battery charger; the battery box is next to the case).
  - d. “B” case (located near the south side of the crossing; contains the north track audio receiver, battery charger, and south side flasher circuit; the battery box is next to the case)
4. 11<sup>th</sup> Street has three cases, each with batteries located in an adjacent battery box:
  - a. Main case, just south of the crossing.
  - b. South transmitter, at the fifth pole south of the crossing. To reach this case, go east one block to Short St. and turn right. Go two blocks to the end of Short and turn right onto the dirt road. When you reach the track, the case will be right in front of you.

- c. North receiver, at the fourth pole north of the crossing.
5. Members' Crossing has two special cutout circuits; other crossings have only one simple switch.

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## General Instructions

### Safety

If any test will compromise the safety of the crossing or interfere with operations by shunting the track or track transceiver terminals, get track and time from the dispatcher. If there is no dispatcher or operations person on duty, contact the Signals Superintendent.

Don't shunt the track if a train or automobile is approaching, to avoid confusion.

### Voltage Readings

The ground test's voltage readings assume that measurements are made with a 1000 ohms per volt Volt Ohm Meter (VOM). When a digital multimeter with high input impedance is used, two 22k 1/2 watt resistors in parallel across the meter input produce equivalent readings. This resistance isn't required for any other tests, but it doesn't affect the readings and can be left in place for all tests.

### Locks and Latches

Signal cases located outside the museum fences are locked with "C" locks. Some of these locks capture the key when unlocked (the key can't be removed unless the lock is closed). Battery boxes are locked with "GP" locks. Cases inside the fences are locked with RACO locks, except that the Alpine case's right-hand door has a "C" lock so that operations personnel can shut off the wig-wags in an emergency.

When you lock a case, be sure the latches have engaged at the top and bottom of the door, by pulling firmly on the door handle.

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## Battery Inspection

Signal batteries (10 volt) must be inspected and tested monthly, with the results recorded on the Battery Inspection Record form. At crossings with gates, the second set of batteries (16 volt) must also be inspected and tested monthly. Use a separate line of the inspection record, and substitute B16 and N16 for B10 and N10.

1. Date and Identification. On a new line of the inspection record, record the date and your initials in the *Date* and *By* columns.
2. Battery Tag. Enter "B10" in the *Tag* column (and B16 in the *Tag* column of a second line, if applicable).
3. Ground Test.
  - a. Measure the DC voltage between B10 and signal case ground, making sure that the meter is shunted with the 11K resistor pair. Any reading less than 1 VDC is acceptable. If applicable, repeat for B16.
  - b. Enter "OK" or the unacceptable reading in the *Ground Test* column of the inspection record. If any reading is unacceptable, notify the Signals Superintendent.
4. Battery Voltage, Charger On.

- a. With the battery charger turned on, measure the DC voltage between any B10 and N10 terminals. If applicable, repeat for B16 and N16.
  - b. Enter the reading(s) in the *Charger On VDC* column of the inspection record..
  - c. The variation from the previous month's readings should be small, 0.1–0.2 volts. If the variation is greater, notify the Signals Superintendent.
5. Battery Current, Charger On (Quarterly)
- a. With the clamp-on DC ammeter, measure the current through the positive (B10) battery lead. If applicable, repeat for B16.
  - b. Enter the reading(s) in the *Charger On ADC* column of the inspection record..
  - c. The variation from the previous quarter's readings should be small, 0.1–0.2 amperes. If the variation is greater, notify the Signals Superintendent.
6. Battery Voltage, Charger Off.
- a. Turn the battery charger's AC supply off, using the switches or circuit breakers located as follows:
    - Mapes Road, "B" case: AC knife switch, at upper left corner of case (be careful about exposed 110 VAC contacts).
    - Mapes Road, south transmitter: AC switch, below shelf at upper right corner of case.
    - Mapes Road, north transmitter case: snap switch, at upper right corner of case.
    - 11<sup>th</sup> Street main case: circuit breaker at lower right of case, colored red and labeled "11<sup>th</sup> St. CASE"
    - 11<sup>th</sup> Street south transmitter: pull-out fuse holder at top of case (be careful about exposed 110 VAC contacts).
    - 11<sup>th</sup> Street north receiver: knife switch on left under shelf
    - Alpine Crossing: AC circuit breaker marked "Crossing" at lower center of case.
    - Central Avenue: AC knife switch, near battery charger.
    - Member's Crossing: AC circuit breaker, at lower left of case.
  - b. Wait 2 minutes.
  - c. Measure the DC voltage between the same B10 and N10 terminals used for the first (charger on) reading. If applicable, repeat for B16 and N16.
  - d. Enter the reading(s) in the *Charger Off VDC* column of the inspection record.
  - e. The variation from the previous month's readings should be small, 0.1–0.2 volts. The drop from the "Charger On" reading should be 1.0 volts or less. If any variation is greater, notify the Signals Superintendent.
7. Battery Current, Charger Off (Quarterly)
- a. With the clamp-on DC ammeter, measure the current through the positive (B10) battery lead. If applicable, repeat for B16.
  - b. Enter the reading(s) in the *Charger Off ADC* column of the inspection record..

- c. The variation from the previous quarter's readings should be small, 0.1–0.2 amperes. If the variation is greater, notify the Signals Superintendent.

**Important Note:**

Be sure to turn the charger back on. Observe the charger's meter or listen for a low hum.

8. **Line Voltage.** Be sure to do this test after the Battery Voltage (Charger Off) test as an extra check to ensure that the charger has been turned back on. Measure the AC line supply within the signal case, typically at the battery charger input terminals. Enter the reading in the *Line VAC* column of the inspection record. The voltage should be between 100 VAC and 120 VAC. If it is not, notify the Signals Superintendent.
9. **Water Level.** Check each battery cell's water level, which should be within the red marks on the side of the battery. If the transparent side of the battery is obscured or dirty, it may be necessary to remove the caps from the top of the cells and look down into the battery to judge the water level.
- If water needs to be added, record the amount in the *Water added* column of the inspection record. If no water is needed, record "OK" on the inspection record.
10. **Lead Condition.** Examine the leads and battery connections for corrosion or damage. Enter "OK" or the unacceptable condition in the *Leads Condition* column of the inspection record. Notify the Signals Superintendent about unacceptable conditions.

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## Crossing Inspection

Crossings must be inspected and tested monthly, with the results recorded on the Crossing Inspection Record form.

1. **Visual Inspection and Operational Test (Monthly)**
- a. Shunt the track circuit by placing a test jumper across the Track Receive inputs of the audio track transceiver (at Alpine Crossing, place the jumper across the Track Receive of the motion detector).

Note: If trains are operating, this won't be necessary; you can simply observe the signal operation as the train passes.

  - b. Examine the lights, gates and wig-wags to verify that the lenses are clean, undamaged and aimed correctly.
  - c. Observe each light to verify that it is flashing, except for the tip light, which should be on steady.
  - d. Enter "OK" or indicate the unacceptable condition in the *253 Lights visible, dirt, damage* column of the Crossing Inspection Record. Notify the Signals Superintendent about unacceptable conditions.
  - e. Verify that all bells are working.
  - f. Observe each wig-wag to verify that it is lit and swinging, and verify the correct operation of all warning devices.
  - g. If the crossing has gates, observe the motion of each gate to verify that it moves smoothly and completely down, and that the arm lights are lit and flashing.

- h. Remove the shunt.
- i. If the crossing has gates, observe the motion of the arm to verify that it moves smoothly and completely up, without the counterweight oscillating or the motor restarting at the top of the arm's motion
- j. Enter "OK" or indicate the unacceptable condition in the *257 Observe Operation & Bell* column of the Crossing Inspection Record. Notify the Signals Superintendent about unacceptable conditions.
- k. If the crossing has gates, enter "OK" or indicate the unacceptable condition in the *255 Gate & Mech.* columns of the Crossing Inspection Record. Notify the Signals Superintendent about unacceptable conditions.

2. Cutout Switch Test (Quarterly).

These switches are used to disable operation of the warning equipment in situations such as the failure of a track circuit (When such failures occur, the crossing must be placed out of service by contacting the dispatcher, as required by the General Code of Operating Rules). Cutout switches are located at various places in the signal cases:

- Mapes Road: pull switch, under the shelf in center of the case. This switch applies B10 to the XR relay so that the logic doesn't operate the flashers or gates.
- 11<sup>th</sup> Street: pull switch, under the shelf at the right side of the case, just to left of circuit breakers. This switch applies B10 to the XR relay so that the logic doesn't operate the flashers or gates.
- Alpine Crossing: knife switch, behind the Motion Detector. This switch breaks the connection to the wig-wags so that they don't operate.
- Central Avenue: knife switch, at the top center of the case. This switch breaks the connection to the wig-wag so that it doesn't operate.
- Members' Crossing: two toggle switches on the left outside of the case. Their operation is explained below.

**Crossings other than Members':**

- a. Shunt the track circuit in the same manner used in the Operational Test above.
- b. Operate the cutout switch and verify that the crossing bells, lights, and gates stop operating.
- c. Return the switch to normal and verify that the crossing bells, lights, and gates begin operating again.
- d. Remove the shunt and verify that the signals stop operating.
- e. Momentarily shunt the track circuit again to verify that the bells now operate.

- f. Enter “OK” or indicate the unacceptable condition in the *269 Crossing Cutout* column of the Crossing Inspection Record. Notify the Signals Superintendent about unacceptable conditions.

**Important Note:**

After the test is complete, be sure that the Cutout Switch is in its original position.

**Members’ Crossing:**

- a. Shunt the Track Receive terminals of the island audio track transceiver.
- b. Move the Barn 4 Lead Cutout Switch (the upper switch) to the down position for 2–3 seconds until the LED lights.
- c. Verify that the lights, bells, and wig-wag operate for one and a half minutes and then stop operating.
- d. Remove the shunt and wait ten seconds for relays to settle.
- e. Apply shunt again and verify that lights, bells, and wig-wag operate.
- f. Move the Bell Cutout switch (the lower switch) to the down position and hold for 2–3 seconds.
- g. Verify that the bell stops, the lights and wig-wag continue to operate.
- h. Move the Bell Cutout switch to the up position for 2–3 seconds and verify that the bell starts to operate.
- i. Move the Bell Cutout switch to the down position and verify that the bell stops operating.
- j. Remove the shunt so that the signal stops operating during the remainder of this test and doesn’t interfere with passing automobile traffic.
- k. Cover the photocell light sensor (located near the switches) for 3 minutes.
- l. Uncover the photocell and wait 2 minutes to verify that the BCOR relay has dropped.
- m. Momentarily shunt the track circuit as above to verify that the bells now operate.
- n. Enter “OK” or indicate the unacceptable condition in the *269 Crossing Cutout* column of the Crossing Inspection Record. Notify the Signals Superintendent about unacceptable conditions.

**Important Note:**

After the test is complete, verify that both spring-loaded cutout switches have returned to their center position.

3. Track Inspection (Quarterly)

- a. Walk the track and inspect all bond wires and track wire connections looking for any that have fallen off or are damaged. Verify that the insulated joints are not damaged.
- b. Enter “OK” or indicate the unacceptable condition in the *271 Ins Jts Bonds Tk Con* column of the Crossing Inspection Record. Notify the Signals Superintendent about unacceptable conditions.

4. Light Test (Annually)

- a. Measure the voltage at the terminals at the LXE-LNE and RXE-RNE terminals at the base of the flasher pole. The reading must be at least 8.5 VDC.
- b. Verify the correct alignment of the lights by walking away from the signal at least one-half block and looking to see if all lights are bright and have the same intensity when viewed from the center of the driving lanes. This requires two people with radios unless it can be done while a train is passing.

<p><b>Warning:</b> Be careful of approaching highway traffic.</p>
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- c. Verify the correct frequency of flashes (55 – 65 flashes per minute).
- d. Enter “OK” or indicate the unacceptable condition in the *253 Lights voltage align, flash* column of the Crossing Inspection Record. Notify the Signals Superintendent about unacceptable conditions.

5. Holdclear Test (Annually)

- a. Open the gate mechanism door and observe the holdclear (slot) mechanism to see that it operates smoothly with a full stroke.
- b. Enter “OK” or indicate the unacceptable condition in the *255 Holdclear* column of the Crossing Inspection Record. Notify the Signals Superintendent about unacceptable conditions.

6. Timer Test (Annually)

The timer stops the signals from operating when a train has stopped in the approach. The Central Avenue Crossing has no timer because the motion detector handles the “stopped train” situation. The Members’ Crossing timer also prevents the crossing from being turned off with a train approaching.

- a. Operate the cutout switch to disable crossing protection (see 3. Cutout Switch Test (Quarterly) above for locations of switches)
- b. Shunt the approach circuit by shunting the island audio track transceiver or motion detector Track Receive terminals.
- c. Verify that the timer (xxTU) operates for 90–110% of the time marked on the schematic or on the tag attached to the timer.
- b. Enter “OK” or indicate the unacceptable condition in the *265 Timers* column of the Crossing Inspection Record. Notify the Signals Superintendent about unacceptable conditions.