

Grade Crossing Electronics For O Scale

Don Woodwell

The use of scale-sized grade crossing signals for prototypical operation of train layouts has grown over the past several years largely due to miniaturization of components and demand by O-scale modelers. In the following paragraphs, I will describe various scale grade crossing devices such as flashing lights, moving gates, and ringing bells, as well as supporting electronics. These components are train detectors, activation circuits, and gate motors. Lastly, I'll describe their installation and layout integration.

Lights.

Flashing lights on a crossbuck scaled to 1/4 inch are a realistic 9.5 feet above the highway surface. If your layout's main highway needs extra protection and warning, a cantilever signal may be seen further away by vehicle drivers since its lights flash at a 20 foot scale height. Both crossbucks and cantilever signals utilize long lasting and very bright light-emitting diodes (LED) whose alternating flash is controlled by an electronic flasher circuit.

Action.

Moving grade crossing protection devices include crossing gates or moving crossing gates with flashing lights. The activating mechanism for a scale-sized gate is located under the layout's surface. For example, you could raise and lower a crossing gate from N.J. International, Inc. and others with Circuitron Tortoise switch machine equipped with an add-on 'Remote Signal Activator' also supplied by Circuitron. Another slow motion switch machine from Lemaco and supplied by DALLEE would be mounted vertically underneath the gate to raise and lower it.

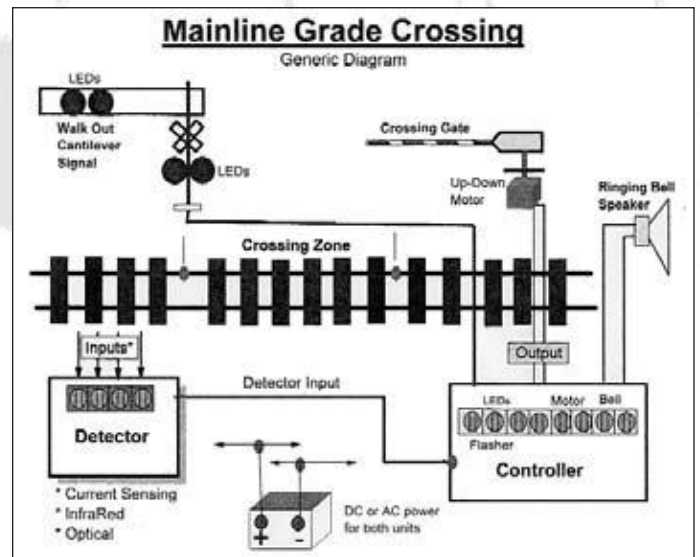
Sound.

Ringing bells add a third dimension to the well-protected grade crossing. Sound-boards are very familiar to operators today, and the crossing bell is no exception. All firms offer a digitally recorded bell while Circuitron also supplies a board to activate a real mechanical bell.

Detection.

Prototypical activation of any crossing device requires a train detection method such as current sensing, infrared, and opto-electrical. When the train is detected, an electrical circuit is completed that turns on lights, rings a bell, or lowers crossing gates.

- **Current Sensing:** (Circuitron, Custom Signals, and DALLEE) The current flowing through a locomotive or lighted car in a block is detected by a sensitive solid state circuit



that outputs an electrical signal thereby causing something to happen such as turning on crossing signals, ringing a bell, or activating a gate.

- **Infrared:** The following two types result in an activation signal: DALLEE – An emitter and detector are located in a direct line of sight on both sides of the track; Z-Stuff – The single emitter/detector is housed in a single unit dwarf block signal.

- **Opto-electrical:** (Circuitron) Light sensitive photocells mounted between the rails detect a passing train when it shades the photocell from the ambient room lighting. The associated electronic circuit outputs an activation signal.

Electronic Controller

Detectors feed a controller whose task it is to activate the crossing protection equipment. A controller output flashes the LEDs on the crossbuck or cantilever signal, rings the crossing bell, or starts the crossing gate motor. Diagram 1 illustrates the generic connections among the devices. Each detector and controller circuit supplier executes its designs differently so it's advisable to study their technical documents before buying their products to ensure that you are buying the right product for your grade crossing requirements.

The diagram shows a single mainline track, but your highways may cross a double or triple mainline or perhaps a mainline and siding or you may have a unidirectional mainline with multiple crossings. Each of these situations requires a different configuration of detectors and controllers not to mention multiple crossing protection devices. As such, pre-planning your grade crossing electronics is essential.

Grade Crossing Electronics

Installing the Components

I like to simulate a concrete base for mounting each signal by cutting a round piece of 1" diameter dowel about $\frac{1}{4}$ " to $\frac{1}{8}$ " in length, painting it with a concrete color, and glueing to the layout's surface. When this glue is dry, drill a hole in the base for the crossbuck or cantilever signals' wires and gates' activating rod. Add a spot of glue to the signal or gate base after feeding the LED wires or rod through the hole.

If you have several supplier's components like signals, gates, and electronics, you should diagram the complete installation based on the separate instruction sheets. Subsequently, fax a copy to the suppliers for their approval. It's best to get the connections right the first time rather than trying to debug errors when you find the equipment doesn't work after it's installed.

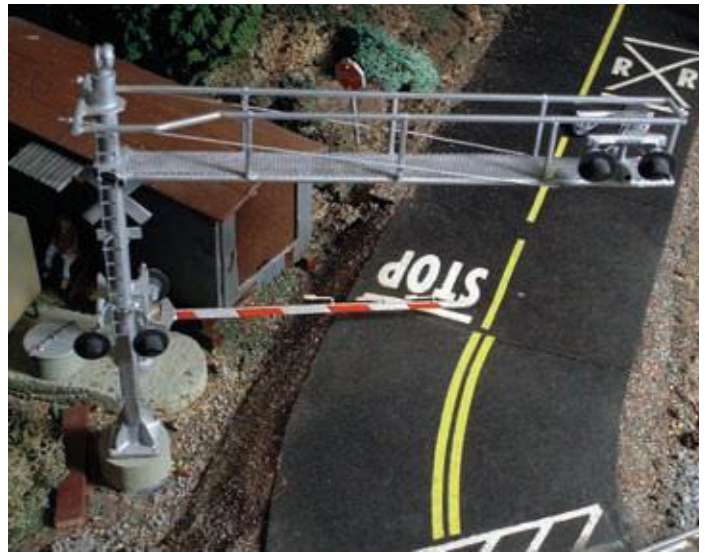
In order to protect the components from dirt, dust, and damage, I mount them in black plastic "project boxes" purchased at Radio Shack, and use color-coded wires to facilitate connections to the track, crossing devices and the other electronics. Mount the plastic boxes to the platform's underside either with screws or double-sided tape after the electrical components are mounted to the box but before wiring to the devices.

Carefully connect wires between the plastic boxes and the flashing lights, moving gates, and ringing bells to ensure that they work the first time. You should recheck the connections several times to make certain that they are attached according to your approved diagram.



The trolley grade crossing is a combination crossbuck & gate.

Electronics: The two units in the center of the photo are the detector on the left and controller on the right. They are mounted on the base of a plastic box whose top was removed to show the components. Below the electronics is the up/down motor for the gate. To the right to of the electronics is a terminal block that I used as the interface between the controller's outputs and the LED's, motor, speaker, and DC power. The electronics, cantilever signal, crossing gate, and combo unit were are purchased from Custom Signals. The up/down motor was supplied by Ross Switches.



Cantilever/gate/bunkhouse/lineside details: Cantilever signal mounted on "concrete" base. To the left are a round cable vault and electric equipment cabinet. In the background is a bunkhouse that houses the crossing bell speaker behind the brown panel in the end wall [these 3 items are mentioned in the text]

Test the completed installation by running your trains over the detection points and check the operation of each function. Assuming all wires are connected properly, all devices and functions should work. If they don't, note what is not working, recheck each wire, and test again. If you still have difficulty call the supplier for his suggestions.

Lineside Details

Integrating the grade crossing scene into your layout with added line-side details adds greatly to its realism. In addition to detailing the physical grade crossing, you may wish to add scale-size battery vaults, control panels, and sheds to house the controls.

I mounted the grade crossing ringing bell speaker in a crew bunkhouse near the crossing by glueing a two-inch speaker and sound tube to a cutout sidewall and hiding it with a cloth speaker cover in a color the same as the bunkhouse exterior wall. You have no idea that a speaker is housed in that little

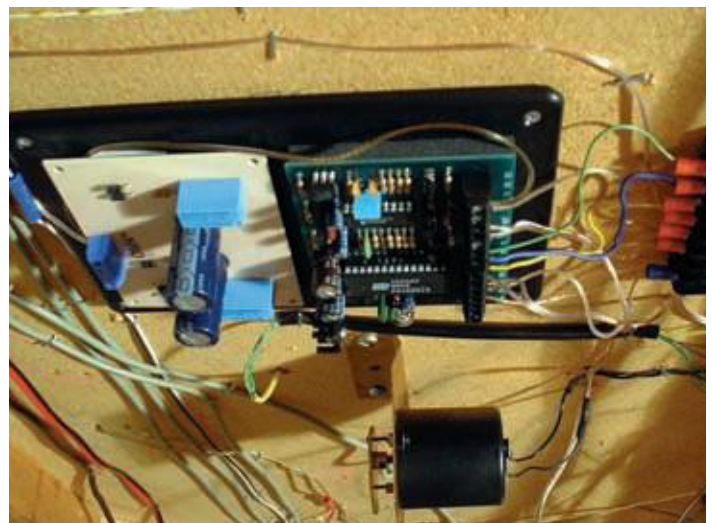


TABLE 1 Supplier Details	Detectors	Controller	Crossbuck	Cantilever	Gates	Bell	Lineside
Circuitron	X	X				X	
Custom Signals	X	X	X	X			
DALLEE	X	X				X	
Keil Line							X
NJ Intl.			X		X		
Oakridge							X
Walthers					X		X
Z-Stuff	X	X	X		X	X	

building once it is landscaped. The sound-board is mounted under the tabletop in the black plastic box described above.

Summary

Model railroaders who want a more realistic layout and high-rail operators should consider enhancing their highway grade crossings with light, action, and sound for prototypical operations. State-of-the-art electronics packages make the upgrading easy and realistic, and the results are clearly worth the effort. ♦

Grade Crossing Electronics Supplier Addresses

1. Circuitron, 211 RocBaar Drive, Romeoville, IL 60446-1163
2. Custom Signals, 32 Alexander Blvd., Poughkeepsie, NY 12603,
3. DALLEE Electronics, 246 W. Main Street, Leola, PA 17540
4. Keil Line, 6440 McCullom Lake Rd., Wonder Lake, IL 60097
5. NJ International, P.O. Box 99, East Norwich, NY 11732
6. The Oakridge Corporation, P.O. Box 247, Lemont, IL 60439,
7. Walthers, P.O. Box 3039, Milwaukee, WI 53201-3039
8. Z-Stuff, Distributed by:, GarGraves Trackage Corporation, Dept. O, 8967 Ridge Road, North Rose, NY 14516-9793



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