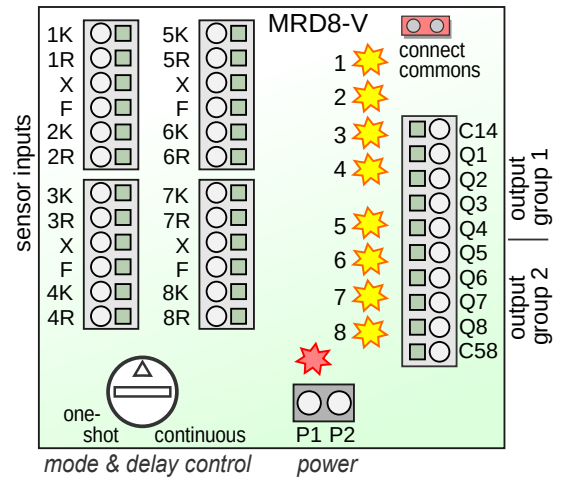


What it is: The MRD8 is an eight-channel model train detector. It can detect model trains at eight different locations on the layout and activate eight different electrical circuits.

Kit contents:


- ★ Circuit board
- ★ Eight infrared light-emitting diodes (IR LEDs) with red & white wire leads
- ★ Eight infrared receivers with blue & yellow wire leads
- ★ Plastic mounting tubes. The tubes are for protection of the sensor leads and to provide mounting support. They are not essential for detector operation and may be shortened or removed entirely to best fit your situation. Just use caution to avoid damaging the leads.
- ★ Mounting screws



How it works: Trains are detected by infrared (IR) light, invisible to our human eyes. There are two sensing elements at each detection location - an IR LED light source paired with an IR receiver. Yellow LEDs on the MRD8 show the status of the detectors -- lit if the circuit is detecting an object, off if no object is being detected. The output relay contacts are electrically isolated from the detector electronics and can switch AC or DC loads up to 0.35 amp each. The output relay contacts are normally open ('N.O.'), they close when the corresponding detector is sensing an object.

The **delay control setting** determines how long the detectors wait to turn off their relay after the train departs.

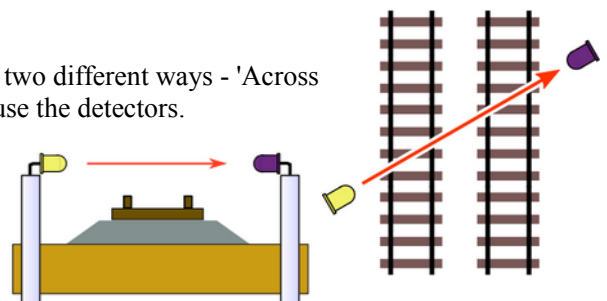
The delay control setting applies equally to all detectors. Detector timing cannot be adjusted individually.

<u>One-Shot mode</u>	<u>Continuous mode</u>
<p>Turn the delay control anti-clockwise from center to put the MRD8 in one-shot mode.</p> <p>When a train arrives at the sensor, an MRD8 output relay will turn on for a certain amount of time, then will turn off whether the train is still on the sensor or not. The sensor must be clear for at least 2 seconds before the MRD8 can be re-activated.</p> <p>Use one-shot mode for accessories that should only be energized for a short time, such as latching relays.</p> <p>Turn the delay control fully anti-clockwise for the shortest 'on' time (½ second). Gradually turn the control back toward center for a longer 'on' time, up to 20 seconds.</p>	<p>Turn the delay control clockwise from center to put the MRD8 in continuous mode.</p> <p>When a train arrives at the sensor, an MRD8 output relay will turn on, and will remain on for as long as the train is on the sensor.</p> <p>When the train clears the sensor, the relay stays on for a 'drop-out' delay time, then the relay turns off.</p> <p>Turn the delay control to the clockwise limit for the shortest delay (0.1 second). Gradually turn the control back toward center for a longer delay. The longest available delay time is 20 seconds.</p>
<p> The red on-board LED will flash while the delay control is being turned. It flashes faster as you get closer to center. The LED turns off when the delay control reaches the longest time or delay setting.</p>	

Installation

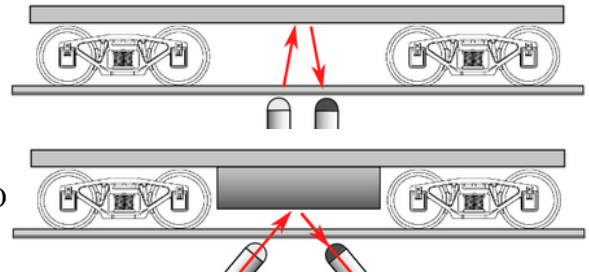
First, install the sensors: Each sensor pair may be installed in one of two different ways - 'Across the Track' or 'Reflective.' Choose locations according to how you will use the detectors.

Across the Track sensing: The IR LED is positioned horizontally on one side of the track(s), and the IR receiver is placed on the opposite side. A train is detected when it blocks the light path between the IR LED and its receiver. The distance between the LED and receiver can be up to 18 in. (46cm), or more with careful alignment. Placing the sensors at an angle across the track(s) creates a longer detection zone and avoids possible detector flickering caused by the gaps between cars.

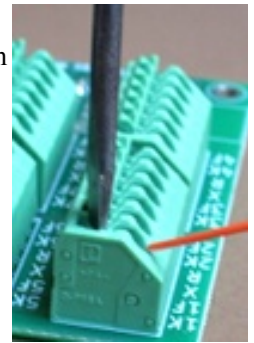


- Tip #1** - If mounting the sensors vertically as shown here, slide the plastic tubes away from the sensor then carefully bend the leads to a right angle. The leads are somewhat brittle, bending them more than two or three times may cause a break.
- Tip #2** - Locate the IR receiver so it faces away from bright lights or sunny windows. Use scenery or structures to conceal the sensors and shade them from room lighting.
- Tip #3** - The detection zone of each detector can be expanded by adding a second IR LED/ receiver pair. Additional sensor pairs may be purchased from Azatrax, see the website www.azatrax.com for details.

Reflective sensing: Trains are detected when light from the IR LED is reflected off a train and sensed by the IR receiver. Typically the sensors are mounted in two #12 (3/16 inch or 4.8mm) holes drilled in the roadbed as shown here. Vertical installation works for S and larger scales as long as there is no structure above the track such as a bridge. Angling the IR LED and receiver toward each other is best for N and HO scale where the trains are close to the rail head, and in places where an object above the track might otherwise cause false detections. Angle the IR LED and receiver so their centerlines intersect at the height of the bottom of your rolling stock.



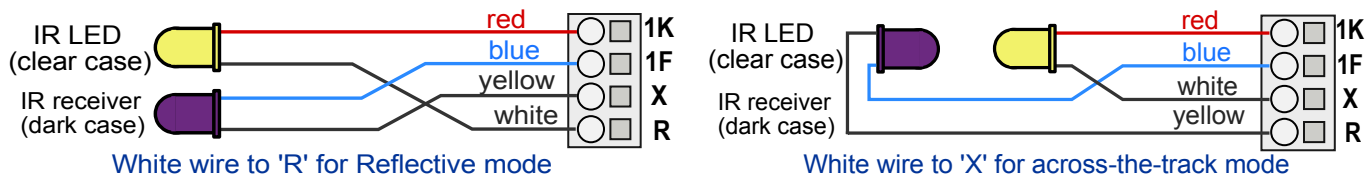
Tip #4 - You can ballast your track after sensors are installed. Cover each sensor with a bit of tape. Apply ballast. When the glue has dried use a dental pick or similar tool to remove ballast and tape from the sensors. An opening of just 1 or 2 mm is required.



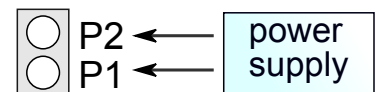
Connecting wires to the terminal blocks: The MRD8 has 'spring cage' terminal blocks. Connections are made as follows:

- ♣ Strip 3/8 inch (1 cm) of insulation off the end of the wire. You can measure with the strip gauge printed on the edge of the circuit board.
- ♣ Use a small screwdriver to push down (push, do not turn) the terminal's button. Push firmly.
- ♣ Hold the wire at a 45 degree angle to the terminal block, and push it in. About 3/8 inch of wire should go into the terminal block.
- ♣ Release the button. Tug on the wire to make sure it is secure.

Connect sensor pair 1: Connect the red wire from the IR LED to terminal 1K. Connect the blue wire from the IR receiver to terminal 1F. Now, how you connect the two white and yellow wires to the MRD8 will determine whether Detector 1 will operate in 'Across the Track' or 'Reflective' mode. See the diagrams below.



Connect a power supply to P1 & P2: Power should be 9 to 16 volts, AC or DC. Polarity +/- does not matter. The yellow LEDs will flash briefly to show that the circuit is working. Connecting to track power is not recommended.



Test and adjust sensor pair 1 as follows before connecting the rest of the sensors:

Adjust the sensors:

With no trains in any of the eight detection zones, all of the yellow LEDs on the MRD8 module should be off. If any LED is on, correct the false sensing condition.

To fix false sensing for Across-the-Track mode:

1. Verify that the sensor pair is wired correctly.
2. Make sure the IR LED and IR receiver are pointed at each other, and nothing is between them.
3. Shade the IR receiver from sunlight, point it away from windows or other bright light sources.
4. Change the nearby room light from incandescent to a fluorescent or LED bulb if possible.

To fix false sensing for Reflective mode:

1. Verify that the sensor pair is wired correctly.

2. Push the IR LED and receiver a bit deeper into the roadbed. They should be below the tops of the ties.
3. Infrared light may be 'leaking' through the roadbed material from the IR LED to the receiver. Paint the sides of the IR LED with thick black or brown paint. Fill any gap between the tie and roadbed with the same paint.
4. Is there an object above the sensor, such as a bridge, or an upper layout level? Mount the IR LED and its receiver at a shallower angle, or paint the object flat black. Or use across-the-track sensing.

Are all detectors now off? Now **test for train detection**. Place a locomotive or car in the detection zone of Detector 1. Yellow LED#1 should light. If it does not light, correct sensor pair 1 for a false clear condition.

To fix a false clear indication for Across-the-track mode:

1. Verify that the sensor pair is wired correctly.
2. Adjust the sensor height so the train is fully blocking the light path from the IR LED to its receiver.

To fix a false clear indication for Reflective mode:

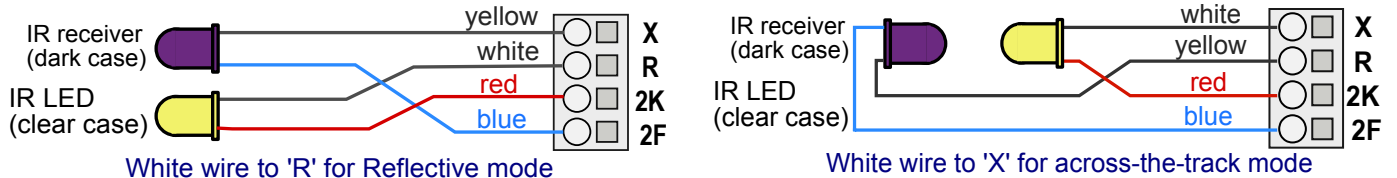
1. Verify that the sensor pair is wired correctly.
2. Adjust the sensors higher or lower in the roadbed.
3. A bright light source above and to the side of the track may be saturating the IR receiver. Pull it deeper into the roadbed or create shade with scenery or a structure. Change the nearby light from incandescent to a fluorescent or LED bulb.

Test with several types of rolling stock and adjust the sensors as needed.
Remove the train from Detector 1's detection zone, make sure LED#1 goes out.

Add connections for sensor pair 2: Turn off power before making any connections to the circuit.

Connect the red wire from the IR LED to terminal 2K. Connect the blue wire from the IR receiver to terminal 2F. As with sensor pair 1, how you connect the two white and yellow wires will determine whether Detector 2 will operate in 'Across the Track' or 'Reflective' mode. Detector 2 can operate in the same mode as Detector 1, or in a different mode. Note that when both sensor pairs are wired to the MRD8, there will be two white or yellow wires in 'X' and two white or yellow wires in 'R.' Twist the bare ends of the wires together for a more reliable connection.

Additional wire may be spliced to the sensor leads if needed. Use similar twisted pair wire for total length up to 26 ft (8m).



►► Pairing is important! The IR LED that is connected to 1K must be paired on the layout with the IR receiver that is connected to 1F. The IR LED that is connected to 2K must be paired on the layout with the IR receiver connected to 2F.

Turn on power and test sensor pair 2, as was done with sensor pair 1.

Connect sensor pair 3: Turn off the power. Move on to the next input terminal block. Connect the red wire from the IR LED to terminal 3K. Connect the blue wire from the IR receiver to terminal 3F. Again, how you connect the white and yellow wires to the MRD8 will determine whether Detector 3 will operate in 'Across the Track' or 'Reflective' mode.

Test as above, then repeat for the remaining sensors.

Output connection

There are eight output relays, one for each detector. Each relay is an electrical switch that connects one of the "Q" output terminals to a "common" connection. The outputs are electrically isolated from other circuits on the MRD8 and from the power connected at P1 & P2. Outputs do not provide power, they are only "on/off" switches. **Therefore the device being activated by the detectors must have its own power source.**

The outputs are arranged in two groups. Outputs Q1-Q4 are group 1. When an output relay in group 1 is active, it connects its Q output terminal to common terminal C14.

Outputs Q5-Q8 are group 2. When an output relay in this group is active, it connects its Q output terminal to common terminal C58.

Two pins on the MRD8 circuit are labeled "connect commons." When a jumper (connecting block, or shunt) is placed on both pins, C14 is connected to C58, and all eight outputs can be used as a single group. The MRD8 is shipped with this jumper in place on both pins.

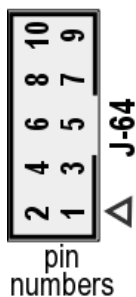
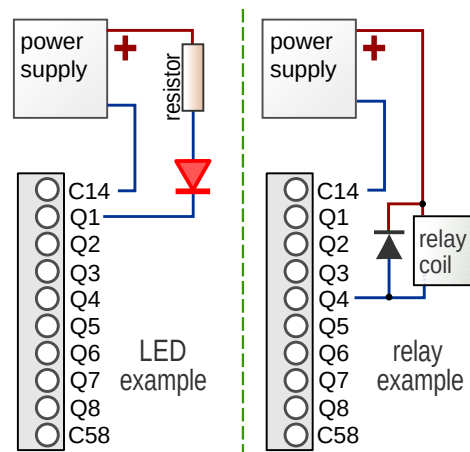
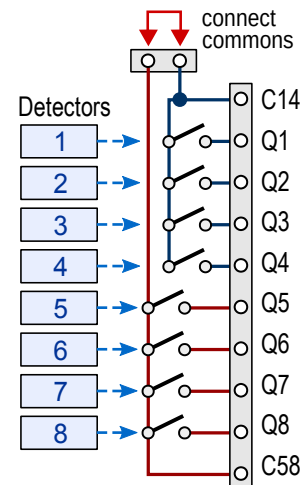
When detector circuit #1 senses an object, it turns on LED #1 and closes the Q1 relay contact. When detector #1 is not sensing an object, it turns off LED #1 and opens the Q1 relay contact. When detector circuit #2 senses an object, it turns on LED #2 and closes the Q2 relay contact. When detector #2 is not sensing an object, it turns off LED #2 and opens the Q2 relay contact.

The other detector circuits operate in a similar manner.

The relays are solid state, not mechanical. When a relay contact is closed there is 1-2 ohms of resistance from the Qx terminal to either C14 or C58. Each relay can handle a maximum current of 350 mA (0.35 amp) and up to 24 volts, AC or DC.

The example on the left shows detector 1 controlling an LED signal. LEDs require a series resistor to limit current, otherwise the LED burns out quickly.

The second example shows detector 4 controlling a relay. An external relay will allow the MRD8 to control higher current accessories. An inductive load like a relay or solenoid requires a diode to be connected across the coil. The diode will suppress the high reverse voltage that is generated when the coil current is switched off. Azatrax relays have this diode built in, so an external diode is not needed with Azatrax relays.



pin#	10 = Q1	9 = Q2
	8 = Q3	7 = Q4
	6 = none	5 = C58
	4 = Q5	3 = Q6
	2 = Q7	1 = Q8

Output connections are also available on connector J-64, which is compatible with RR-CirKits Tower 64™. When using the J-64 connector, make sure the connect-commons jumper is in place so that all relay 'commons' will be connected to pin 5 (C58).

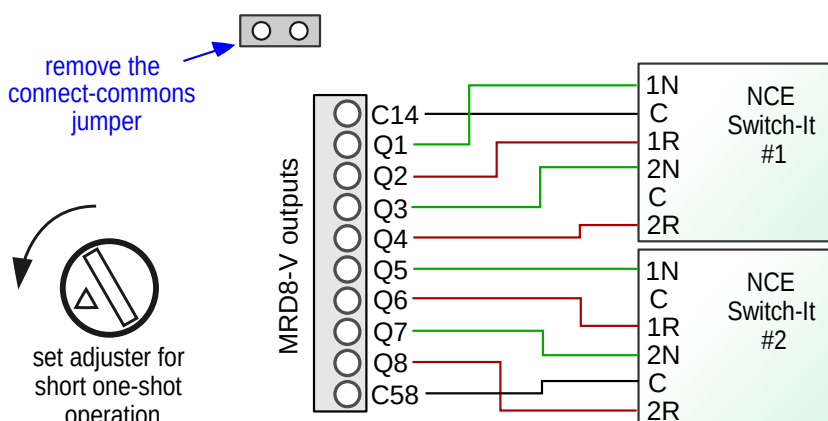
For more information see the Azatrax website, www.azatrax.com
Tower 64 is a trademark of RR-CirKits, Waxhaw, NC.

In this example an MRD8-V is used to add automatic activation to four DCC-controlled turnouts.

The NCE Switch-Its are DCC stationary decoders, each controls two Tortoise switch machines.

The MRD8-V outputs connect to the push button inputs on the Switch-It. Only one C connection is needed on each Switch-It.

Remove the connect-commons jumper on the MRD8-V to keep the C connections separate between the two Switch-Its, as recommended by NCE.



Switch-It is a trademark of NCE Corp, Webster, NY
Tortoise is a trademark of Circuitron Inc, Romeoville, IL