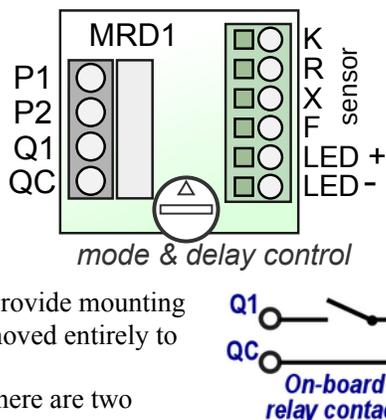


**What it is:** The MRD1 model train detector senses the presence of a train at a single place on the track. It closes a relay contact to activate a separate circuit on the layout. It also can illuminate an LED such as a signal or control panel indicator. A separate power supply is required (see pg 2).

**Kit contents:**

- ★ Circuit board
- ★ One infrared light-emitting diode (IR LED) with orange & white wire leads
- ★ One infrared receiver with green & yellow wire leads
- ★ Two 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 not to damage the leads.

**How it works:** Trains are detected by infrared (IR) light, invisible to the human eye. There are two sensing elements placed at the track location - an IR LED light source paired with an IR receiver. A yellow LED on the MRD1 lights while a train is detected. The detector relay turns on as soon as a train is detected. The **delay control setting** determines how long the detector waits to turn off the relay after the train departs.



**One-Shot mode**

Turn the delay control **anti-clockwise from center** to put the MRD1 in **one-shot mode**.

When a train arrives at the sensor, the MRD1's 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 MRD1 can be re-activated.

Use one-shot mode for accessories that should only be energized for a short time, such as coil-operated turnouts or latching relays.

Turn the delay control fully anti-clockwise for the shortest 'on' time (1/3 second). Gradually turn the control back toward center for a longer 'on' time, up to 14 seconds.



**Continuous mode**

Turn the delay control **clockwise from center** to put the MRD1 in **continuous mode**.

When a train arrives at the sensor, the MRD1's relay will turn on, and will remain on for as long as the train is on the sensor.

When the train clears the sensor, the relay stays on for a 'drop-out' delay time, then the relay turns off.

Turn the delay control to the clockwise limit for the shortest delay (1/3 second). Gradually turn the control back toward center for a longer delay. The longest available delay time is 14 seconds.



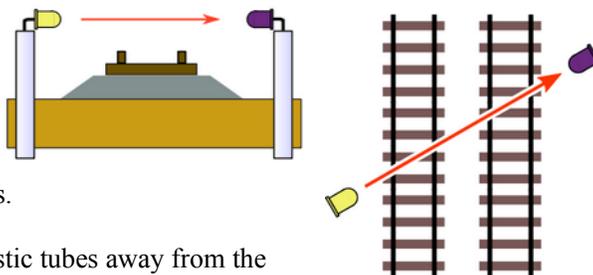
The on-board LED will flash while the delay control is being turned. It flashes faster as you get closer to center. The LED turns off when the delay control reaches the longest time or delay setting. When the delay control is not being changed, the LED will light when a train is being detected.

**Installation**

There are four installation steps: Sensor installation, Power connection, Sensor adjustment and Output connection. Start with the delay control turned fully anti-clockwise (one-shot mode) or fully clockwise (continuous mode). After sensors are adjusted correctly, turn the delay control toward center if you want a longer activation time.

**First, install the sensors:** The sensor pair may be installed in one of two different ways - 'Across the Track' or 'Reflective.'

**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 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.

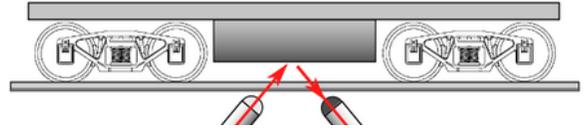


**Tip #1** - If mounting the sensors vertically as shown here, slide the plastic tubes away from the sensor then carefully bend the leads to a right angle. The leads are somewhat brittle, bending them more than two or three times may cause a break.

**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](http://www.azatrax.com) for details.

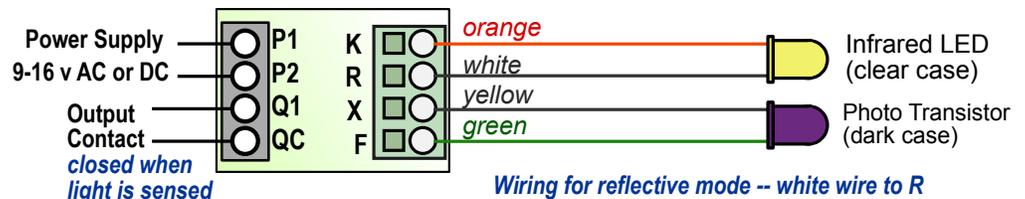
**Reflective sensing:** Trains are detected when light from the IR LED is reflected off a train and sensed by the IR receiver. Typically the sensors are mounted in two #12 (3/16 inch or 4.8mm) holes drilled in the roadbed as shown here. Vertical installation works for S, O and larger scales as long as 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 transparent tape. Apply ballast. When the glue has dried, use a small pick to remove ballast from the sensors. An opening of only 1 or 2 mm is required.

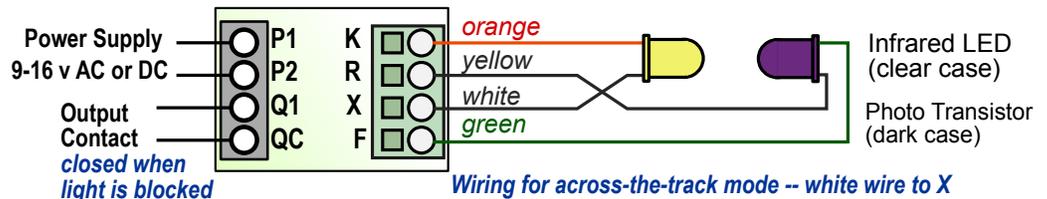
**Connect the sensor pair to the circuit board:** Connect the **orange wire** from the IrLED to the 'K' terminal.

Connect the **green wire** from the IR receiver to the 'F' terminal. **For Reflective Mode operation**, connect the **white wire** from the IR LED to the 'R' terminal, and the **yellow wire** from the IR receiver to the 'X' terminal.



To connect a wire to the sensor terminal block, push in the square button firmly, then insert the stripped wire at a 45° angle.

**For Across-the-track operation**, connect the **white wire** from the IR LED to the 'X' terminal, and the **yellow wire** from the receiver to the 'R' terminal.



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

**Connect power to the MRD1 module:** Connect a power supply of 9 to 16 volts AC or DC to terminals P1 and P2.

**Adjust the sensors:** With no trains in the detection zone, the LED on the MRD1 should be off. If the 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 receiver are pointed at each other, and nothing is between them.
3. Shade the IR receiver from bright lights, and point it away from windows or other strong 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. Pull the IR LED and receiver a bit deeper into the roadbed.
3. Infrared light may be 'leaking' through the roadbed material from the IR LED to the receiver. Push a metal shim, such as the tip of a hobby knife blade, vertically into the roadbed between the IR LED and receiver.
4. Is there an object above the sensor, such as a bridge, or an upper track level? Mount the IR LED and receiver at a shallower angle, or paint the object flat black. Or use across-the-track sensing.

**Test for train detection.** Place a locomotive or car in the detection zone. The on-board LED should light. If it does not, correct the 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 the receiver.

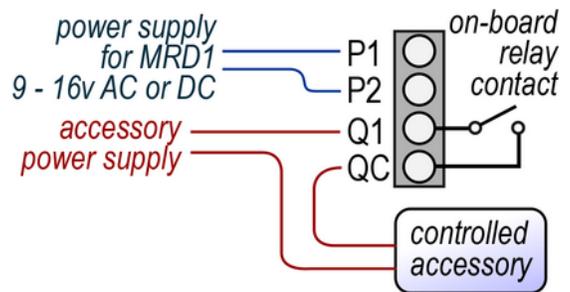
**To fix a false clear indication for Reflective mode:**

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. Try pulling it deeper into the roadbed or create shade with scenery or a structure. Or change the nearby light from an incandescent to a fluorescent or LED bulb.

Test with several types of rolling stock and adjust the sensors as needed.

**Output connection:** Connect terminals Q1 and QC to the circuit that will be controlled by the MRD1.

Q1 & QC only connect to the relay contacts on the circuit board. This acts like a simple on/off switch. It does not supply power to your accessory. Use a power supply with a voltage and current rating appropriate for the controlled accessory. This may be the same power supply that is connected to terminals P1 & P2, or it may be a separate power supply.

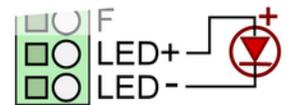


The MRD1's contact is rated for up to 3 amps and up to 28 volts. For higher power loads, use the MRD1 to control a power relay, such as the Azatrax MRAPR, then use the contacts of the power relay to switch the load.

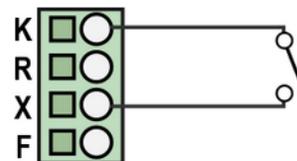
**Remote LED indicator:** A remote LED may be wired to the terminals labeled "LED -" and "+".

A current-limiting resistor is already on the MRD1, no other resistor is needed. The remote LED lights when a train is detected and turns off when the train is gone.

The remote LED will flash briefly when the power supply is first turned on. It will also flash with the on-board LED while the delay control is being changed.



**Triggering with a switch:** Instead of the IR sensors, a remote switch such as a push button can be used to trigger the MRD1-V. This will produce a delayed response to the activation of the switch. Connect a normally open switch to terminals X and K as shown here.



*Triggering with a switch.*

More information and assistance is available at the Azatrax website:  
[www.azatrax.com](http://www.azatrax.com)