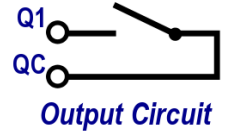
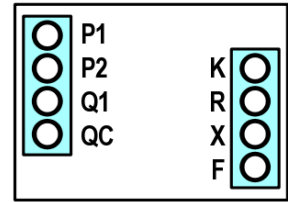


**What it is:** The MRD1 model train detector senses the presence of a train at a single place on the track. It closes a relay contact to activate a separate circuit on the layout. A separate power supply is required (see below).

**Kit contents:**

- ★ Circuit board
- ★ One infrared light-emitting diode (IR LED) with orange & white (2 ft length) wire leads
- ★ One infrared phototransistor (light receiver) with green & white (2 ft length) 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 phototransistor (the receiver). The output relay contacts are electrically isolated from the detector electronics. A yellow LED on the MRD1 lights when the contacts are closed.

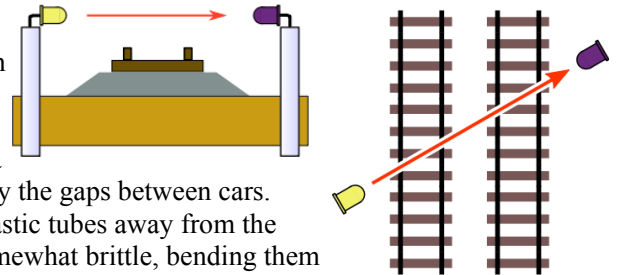


**Installation**

There are four installation steps: Sensor installation, Power connection, Sensor adjustment and Output connection.

**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 phototransistor is placed on the opposite side. A train is detected when it blocks the light path between the LED and phototransistor. The distance between the LED and phototransistor 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.

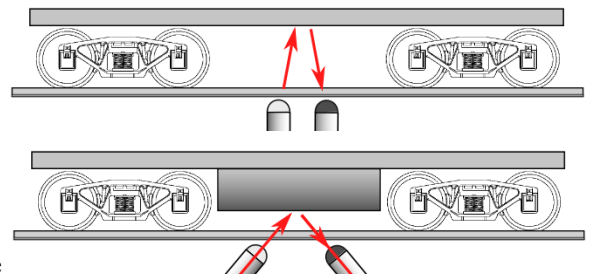


**Tip #1** - If mounting the sensors vertically as shown here, slide the plastic tubes away from the sensor then carefully bend the leads to a right angle. The leads are somewhat brittle, bending them more than two or three times may cause a break.

**Tip #2** - Locate the phototransistor (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.

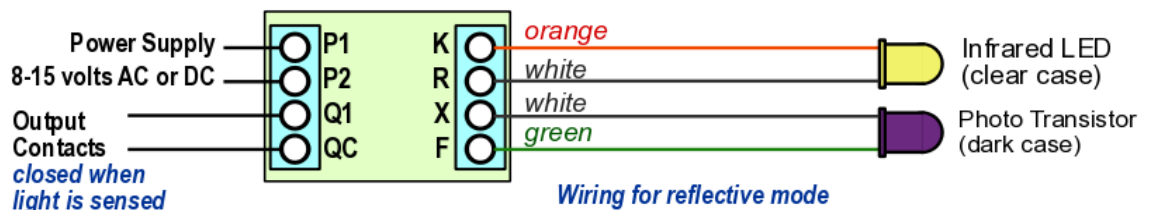
**Tip #3** - The detection zone of each detector can be expanded by adding a second IR LED/phototransistor pair. Additional sensor pairs may be purchased from Azatrax, see the website [www.azatrax.com](http://www.azatrax.com) for details.

**Reflective sensing:** Trains are detected when light from the IR LED is reflected off a train and sensed by the IR phototransistor. Typically the sensors are mounted in two 3/16-inch (4.8mm) holes drilled in the roadbed as shown here. Vertical installation works for HO and larger scales as long as there is no structure above the track such as a bridge. Angling the IR LED and phototransistor toward each other is best for N 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 phototransistor so their centerlines intersect at the height of the bottom of your rolling stock.

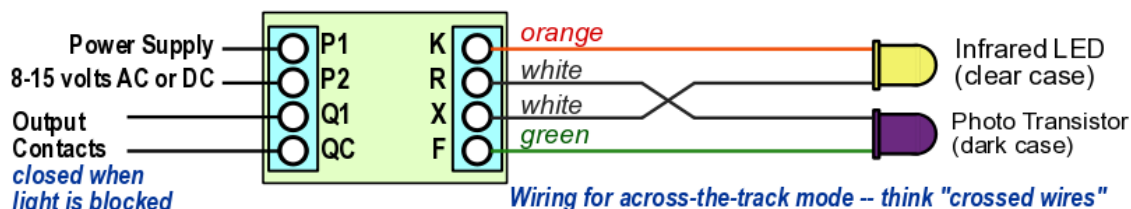


**Tip #4** - You can ballast your track after sensors are installed. Cover each sensor with a bit of transparent tape. Apply ballast. When the glue has dried, use a dental pick or similar tool to remove ballast from the sensors. An opening of only 1 or 2 mm is required.

**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 phototransistor to the 'F' terminal. **For Reflective Mode operation**, connect the **white wire** from the IrLED to the 'R' terminal, and the **white wire** from the photo-transistor to the 'X' terminal.



For **Across-the-track** operation, connect the **white wire** from the IrLED to the 'X' terminal, and the **white wire** from the photo-transistor to the 'R' terminal.



**Tip #5** - For "normally closed" operation (relay contact closed when no train is present, and open when a train is present), swap the two white wires at 'R' and 'X'. Use this when using the MRD1 to replace a CdS photo cell in an existing system.

Additional wire may be spliced to the sensor leads if needed. Use similar twisted pair wire for total length up to 25 ft (6m).

Connect power to the MRD1 module: Connect a power supply of 8 to 15 volts AC or DC to terminals P1 and P2.

Adjust the sensors: With no trains in the detection zone, the yellow LED on the MRD1 module 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 phototransistor are pointed at each other, and nothing is between them.
3. Shade the phototransistor 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 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 phototransistor a bit deeper into the roadbed.
3. Infrared light may be 'leaking' through the roadbed material from the IR LED to the phototransistor. Push a metal shim, such as the tip of a hobby knife blade, vertically into the roadbed between the IR LED and phototransistor.
4. Is there an object above the sensor, such as a bridge, or an upper layout level? Mount the IR LED and phototransistor 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 yellow 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 phototransistor.

**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 phototransistor. Try pulling it deeper into the roadbed or create shade with scenery or a structure. Change the nearby light from incandescent to a fluorescent 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. The MRD1's contact is rated for up to 0.5 amps. Controlling an incandescent lamp? **Note that incandescent lamps have an inrush current about 8 times their normal current. So limit incandescent lamps to 62 ma (0.062 amp) or less.** LED lamps do not have this high inrush current, the MRD1 may switch LEDs totaling up to 500 ma (0.5 amp).

Connecting to MRX1 or MRXP crossing controller: Connect **QC** on the detector to any **C** terminal on the controller. Connect **Q1** on the detector to one of the sensor inputs on the controller (**FE, ME, NE, NW, MW** or **FW**).

Remote LED indicator: A remote LED indicator may be wired to the two solder terminals labeled "LED". Connect the LED anode (usually the long lead) to the '+' terminal, and the LED cathode (short lead, or the flat side of the flange) to the '-' terminal. A current-limiting resistor is already on the board, no other resistor is needed.

The remote LED will flash briefly when the power supply is first turned on.

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