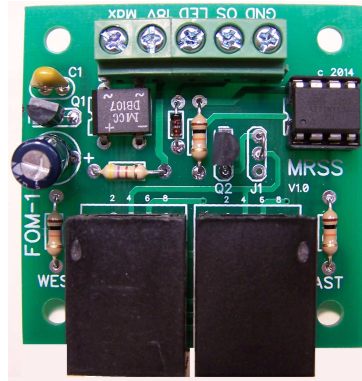


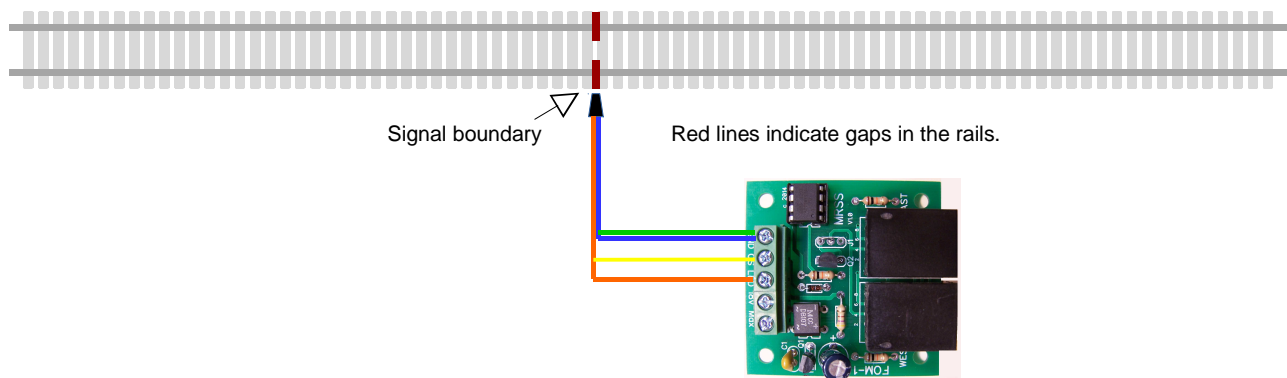
# .: Model Railroad Signal Systems

## Free-mo Optical Module - Installation Instructions

Board Version 1.2



- Provides optical detection using the OPB704W optical sensor.
- Detects rolling stock as it passes over the sensor.
- Sensor is normally installed between blocks or signal districts.
- Designed as an MSS Cascade at a signal boundary without signals.
- Designed for the Modular Signal System used on Free-mo modules.
- Can be used on any layout, not just Free-mo.



Please read these instructions before you begin to ensure the installation is done correctly. Failure to properly connect the board may result in damage to the circuitry. Ensure all power is turned off before you begin the installation.

## Handling of the circuit board

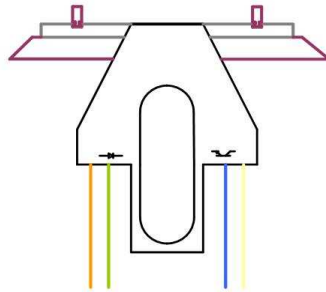
Use care when handling the circuit board. Most electronic circuits are sensitive to static electricity and can easily be damaged. Be sure to work in an area where static is not an issue.

## STEP 1 – Mounting the FOM-1 board

Choose an area under your Free-mo module that is suitable for mounting the FOM-1 board. Keep in mind the length of your sensor leads when mounting the board.

## STEP 2 – Optical Sensor

The optical sensor is meant to be installed under the track between the two isolated track sections. Be sure not to cover the sensor with ballast or other objects otherwise the sensor will not work. Figure 1 is a cut away diagram displaying how the sensor should be mounted.



**Figure 1**

Connecting the provided optical sensor is simple and should be made as follows:

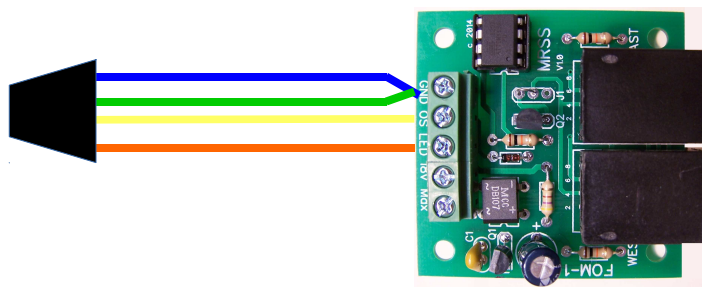
LED Anode lead – Orange. To LED terminal.

LED Cathode lead – Green. To GND terminal.

TRANSISTOR Emitter lead – Blue. To GND terminal.

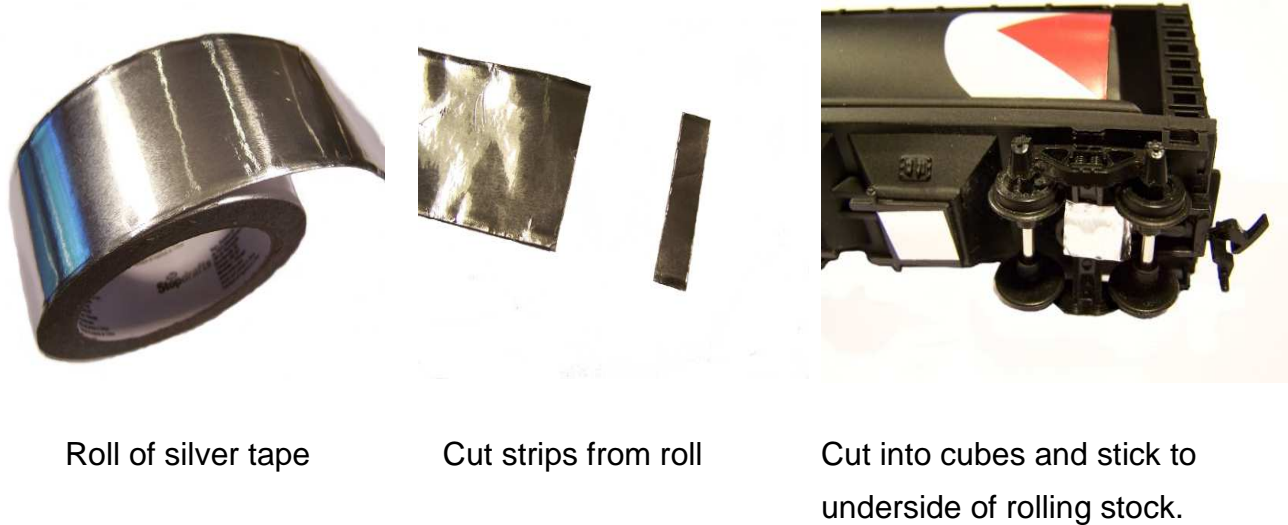
TRANSISTOR Collector lead – White. To OS terminal.

There is no need to put a current limiting resistor in line with the LED as this is already on the circuit board. Connect the sensor as shown in Figure 2.



**Figure 2**

Most rolling stock have a dark non reflective surface which greatly reduces the optical sensor's ability to reflect back the infrared light it produces. This can lead to a non detected train even though the train is sitting directly over the optical sensor. There is a simple way to correct this problem. Hardware stores sell a roll of silver tape that is normally used to seal cracks in HVAC ducts. Cutting small strips off the roll and sticking them to the under side of your rolling stock provides an excellent reflective surface for the optical sensor. This is shown in the three photos in Figure 3.



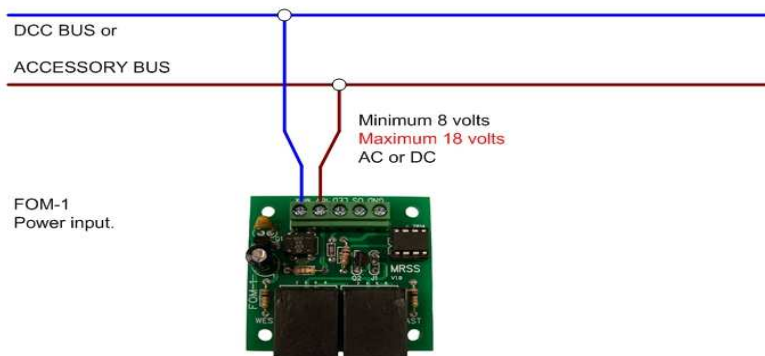
**Figure 3**

### **STEP 3 – Power Connections**

The Free-mo Optical Module has been designed to accept several different power supplies.

- A separate AC adapter that can supply between 8 and 18 volts AC or DC.
- Connecting the board to the accessory bus.
- Connecting the board to the DCC bus.
- A 12 volt battery.

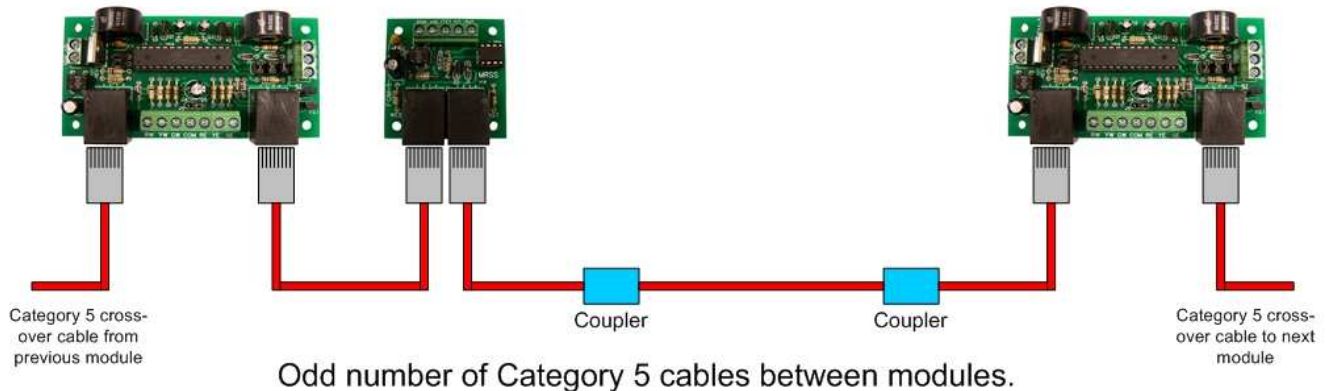
Refer to figure 4 when making power connections.



**Figure 4**

## **STEP 4 – Occupancy Bus**

The RJ45 jacks are used to connect your Free-mo Optical Module to other modules. The cable type to be used between modules must be a cross over Ethernet cable. The use of a straight through cable will not allow your signals to function properly. If the module next to yours does not have an occupancy bus, you can extend your cable with a straight through cable as long as there is an odd number of cross over cables between circuit modules. See figure 5.



**Figure 5**

## **STEP 5 – Applying power**

The last step is to turn on the power and test your module. Double check all your connections prior to applying power. A second look can save you a lot of frustration if connections are made incorrectly.

## **Disclaimer**

All the circuits designed and posted on the Model Railroad Signal Systems website have been designed and created as a hobby. Many hours of research and development have gone into the design of each circuit so that they will operate as described without any problems.

The circuits will work as designed and will not be dangerous to persons or property when used in their intended manner. However, if you choose not to follow the installation instructions as stated above and use the circuits in any other fashion, you may pose a risk to yourself and property.

I am not responsible for any injuries or damages whatsoever that may arise from the use or misuse of these circuits as I have no control over the actions of the user or installer.

### **Warranty**

All the circuits here are inspected and tested before they are shipped. If there is a defect due to manufacturing or programming, I will gladly replace your board for a new one within 90 days of purchase.

Misuse, abuse, or the use of cheap power supply to power these circuits which will cause damage to the board, is not covered by warranty. If you have any doubts about the use of any type of power supply, please contact me before applying power to your board.

### **Questions or Comments**

If you have any questions or comments please send them to me by using the email address on the Model Railroad Signal Systems Website.