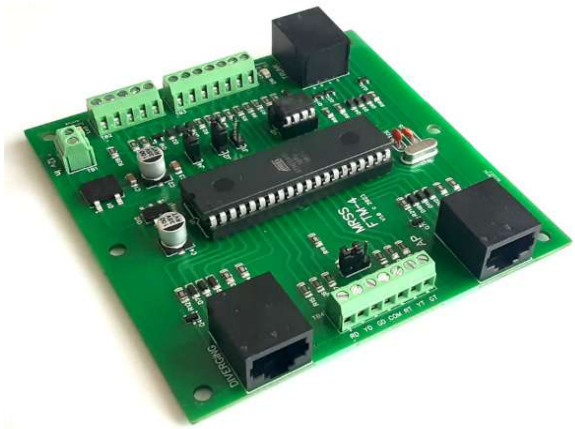
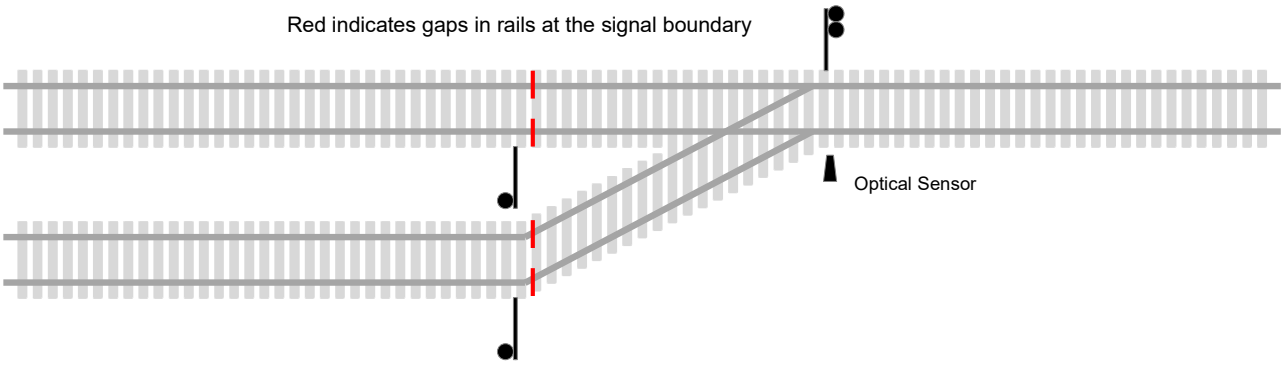
.: Model Railroad Signal Systems

FTM-4 Freemo Turnout Module

Board Version V1.0



- The **FTM-4** Module has been designed to route occupancy signal bus information through a turnout that uses a set of signals to protect the turnout.
- Designed as an MSS Cascade to be used at a 2 to 1 or WYE signal boundary with 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 damage. Be sure work in an area where static is not an issue.

STEP 1 – Jumper Settings

There are four jumpers on the FTM-4, (v1.0) Free-mo Turnout Module. The chart in Table 1 list the different signal types and the settings for the jumpers. If the jumpers are not set correctly, your signals will not operate properly. If you make changes to the jumper settings, you should reset the power to the FTM-4 board so your signals operate properly.

1	2	3	4	Jumper Number
On				- 1 LED Signal Head, 2 wire
Off				- 2 or 3 LED signal Head, 3 and 4 wire
	Off	CA		- 2 LED Signal Head, Common lead is positive (+)
	Off	CC		- 2 LED Signal Head, Common lead is negative (-)
	On	CA		- 3 LED Signal Head, Common lead is positive (+)
	On	CC		- 3 LED Signal Head, Common lead is negative (-)
			On	Approach Diverging on – MSS 2.0
			Off	Approach Diverging off – MSS 2.0

Table 1

STEP 2 – Mounting the FTM-4 board

Choose an area under your Free-mo module that is suitable for mounting the FTM-4 board. Keep in mind the length of your signal leads. Under or near the protected turnout is most likely the best place.

STEP 3– Turnout Contacts

The FTM-4 board relies on a set of contacts at the turnout. The contacts can be a part of the turnout motor, or any other circuit that provides a set of closed contacts when the turnout is in the diverted route position. This allows the FTM-4 to divert the occupancy bus information from the approach side of the turnout to the diverted route providing your signals with realistic operation. Turnout contacts will connect to the GND and TO terminals on the FTM-4 board.

STEP 4 – Signal Connections

There are several types of signals that can be connected to the Turnout Module. Refer to the information sheet that comes with your signals to determine which kind you have.

Supported types are:

- 4 Wire, 3 LED common cathode (-)
- 4 Wire, 3 LED common anode (+)
- 3 Wire, 2 LED common cathode (-)
- 3 Wire, 2 LED common anode (+)
- 2 Wire, 1 LED

Terminal connections for the signals are as follows:

RD – Red led, diverted signal.

YD – Yellow led, diverted signal.

GD – Green led, diverted signal.

RT – Red led, through signal.

YT – Yellow led, through signal.

GT – Green led, through signal.

RU – Red led, upper approach signal.

YU – Yellow led, upper approach signal.

GU – Green led, upper approach signal.

RL – Red led, lower approach signal.

YL – Yellow led, lower approach signal.

GL – Green led, lower approach signal.

COM – Common signal wire for all signals.

Note: Incandescent signal types are not to be connected to the FTM-4 board as they draw too much current and will damage the board.

STEP 5 – Power Connections

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

– A separate AC adapter that can supply between 8 and 12 volts AC or DC or a 12 volt battery.

Connect power to the terminals labeled 12v In

STEP 6 – Optical Sensor

The optical sensor is meant to be installed under the track at the approach end of the turnout just past the points. Be sure not to cover the sensor with ballast or other objects otherwise the sensor will not work.

Connecting the provided FC-51 optical sensor is simple and should be made as follows:

Sensor LED lead – Yellow.	To LED terminal.
Sensor Ground lead – Black.	To GND terminal.
Sensor Power lead - Red.	To 5v terminal.
Sensor Output lead - White.	To OS terminal.

Refer to the separate document labeled FC-51 IR sensor for more information about how to set up an calibrate the sensor.

Auto Infrared sensing

Upon power up, the board will read the optical sensor for external sources of infrared light. (Ensure there are no trains covering the sensors during power up in order for this feature to work properly). If an external source of infrared light is present, the sensor will work in beam break mode and will automatically turn off the infrared led on the sensor. If no external infrared light is present, the sensor will work in beam reflect mode.

STEP 7 – Occupancy Bus

The RJ45 jacks are used to connect your Free-mo Turnout Module to other boards such as block detectors or cascade modules. This is called the Occupancy Bus. The cable type to be used between modules must be a Cat 5 cross over Ethernet cable. The use of just a strait through cable will not allow your signals to function properly.
If the module next to yours does not have a signal bus, you can extend your cable with a strait through cable as long as there is an odd number of cross over cables between circuit modules.

STEP 8 – 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.

Notes – MSS V2.0 – Occupancy Bus Pin 8

The release of MSS v2.0 has implemented a few changes to the occupancy bus. The Approach Diverging function has been added to pin 8 where prior versions of MSS has this pin tied to ground. Please note that none of the boards created by Model Railroad Signal Systems have pin 8 tied to ground. Pin 8 simply connects from one RJ45 Jack to the next RJ45 jack.

If MSS V2.0 Approach Diverging is a desired function while using the FTM-4 board, ensure jumper J4 is installed. When the turnout is thrown to the diverging route, pin 8 on the approach RJ45 jack will go to a logic HIGH state so the previous signal board that supports approach diverging will produce a yellow signal.

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.