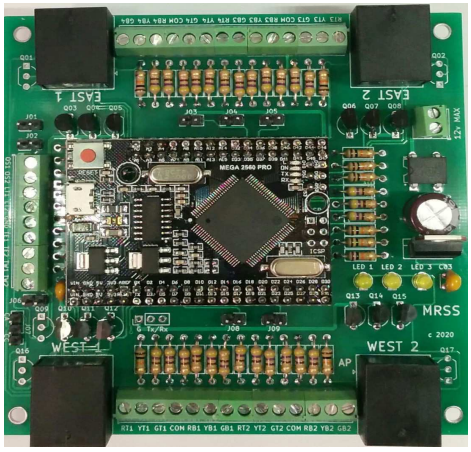
Board Version V1.0

.: Model Railroad Signal Systems

CSM-2 Crossover Signal Modual



CSM-2 Crossover Signal Module

(Signal Cascade)

- The **CSM-2** Module has been designed to route occupancy signal bus information through a crossover protected by signals.
- Designed as a Modular Signal System Cascade to be used at a crossover 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.

Crossover Configurations

The 2 types of crossover configurations supported are shown in Figure 1 & 2

The recommended placement of the signals are shown on each configuration. The turnouts are numbered so that connections to the CSM-2 Module are made correctly. The suggested infrared occupancy sensor locations are at either WEST 1 and WEST 2 or EAST 1 and EAST 2. This way a train will be detected by the infrared sensors no matter which route is selected.

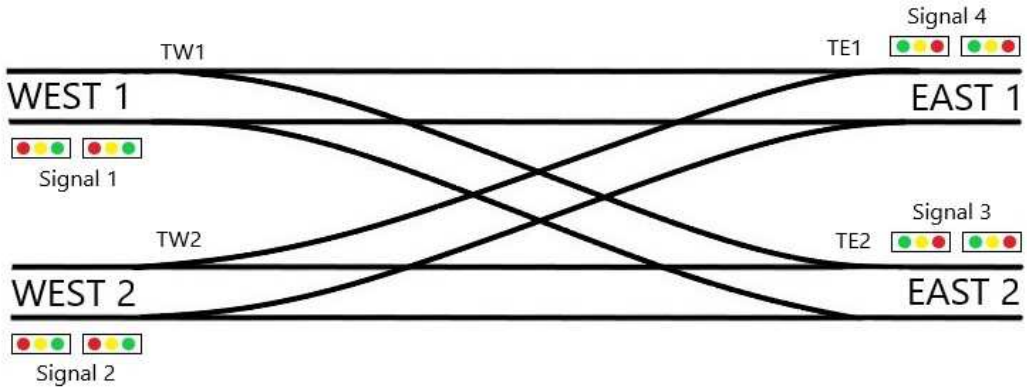


Figure 1

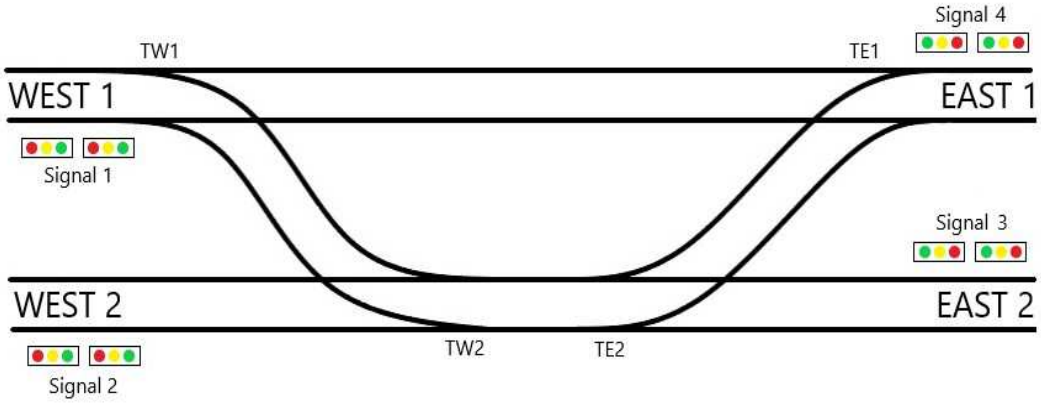


Figure 2

STEP 1 – Jumper Settings

There are nine jumpers on the CSM-2, Crossover Signal Module. The chart in Table 1 list the different signal types and the settings for each jumper. 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 CSM-2 board so your signals operate properly.

1	2	3	4	5	6	7	8	9	Jumper Number
On									Full 5 volts to IR sensor 2 when Jumper is on. *
	On								Full 5 volts to IR sensor 2 when Jumper is on. *
		On							2 Wire LED Signal Head (NJ International Signals)
			On						3 LED Signal Heads
			Off						2 LED Signal Heads
				On					Approach Diverging Enabled.
				Off					Approach Diverging Disabled.
					On				Approach Diverging MSS V2.0 Enabled. (Future)
					Off				Approach Diverging MSS V2.0 Disabled. (Future)
						On			Signal Heads are common lead is negative (-)
						Off			Signal Heads are common lead is positive +)
									Jumper 8 and 9 are for future options

Table 1

Note:

Do not place a jumper on J01 or J02 when using the stock sensors supplied with the CSM-2 board. Doing so will burnout the IR LED within the sensor. This option is for a different style of IR sensor.

STEP 2 – Mounting the CSM-2 board

Choose an area under your Free-mo module or layout that is suitable for mounting the CSM-2 board. Keep in mind the length of your signal leads. Under or near the crossover is most likely the best place.

STEP 3– Turnout Contacts

The CSM-2 board has 4 inputs to monitor turnout positions by using the contacts on the turnouts. TE1, TE2, TW1 & TW2. 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 CSM-2 to divert the occupancy bus information from the approach side of each turnout to the diverted route providing your signals with realistic operation. Figure 3 shows how the board should be connected to the turnout contacts. Figures 1 & 2 show where the position of the turnouts for each crossover are located. Be sure to wire the terminals to the correct turnout or your signals will not display the correct aspect.

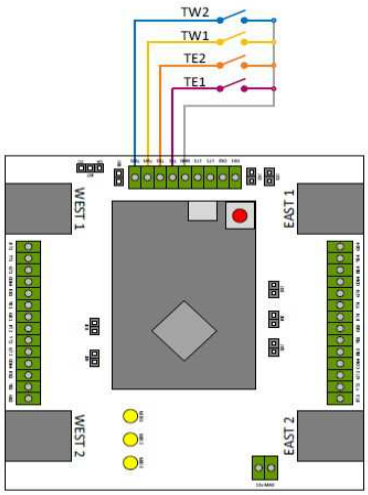


Figure 3

STEP 4 – Signal Connections

There are several types of signals that can be connected to the CSM-2 Module. Refer to the information sheet that comes with your signals to determine which kind you have. Figure 4 below shows several different types that are compatible with the CSM-2 Module. If yours in not shown, please send me an email with your details.

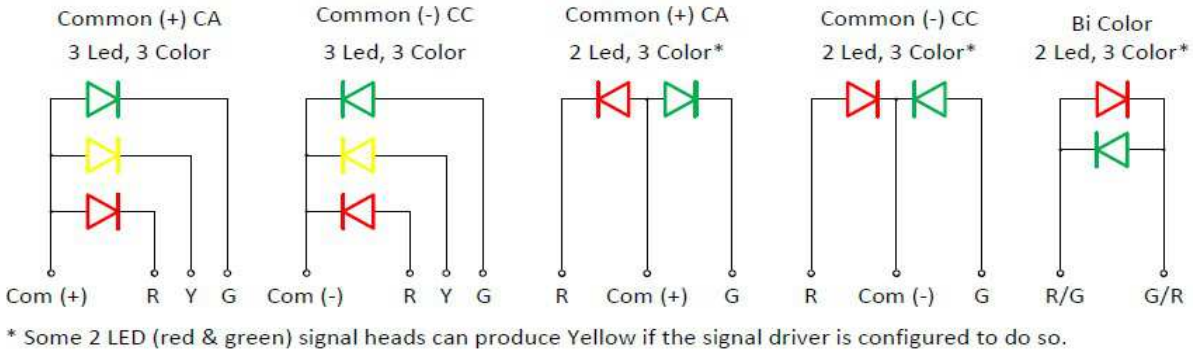


Figure 4

Terminal connections for the signals are as follows:

WEST 1 TRACK (Signal 1)

RT1 – Red led, through signal.

YT1 – Yellow led, through signal.

GT1 – Green led, through signal.

COM – Common signal wire for all 3 wire signals.

RB1 – Red led, diverging signal.

YB1 – Yellow led, diverging signal.

GB1 – Green led, diverging signal.

WEST 2 TRACK (Signal 2)

RT2 – Red led, through signal.

YT2 – Yellow led, through signal.

GT2 – Green led, through signal.

COM – Common signal wire for all 3 wire signals.

RB2 – Red led, diverging signal.

YB2 – Yellow led, diverging signal.

GB2 – Green led, diverging signal.

EAST 2 TRACK (Signal 3)

RT3 – Red led, through signal.

YT3 – Yellow led, through signal.

GT3 – Green led, through signal.

COM – Common signal wire for all 3 wire signals.

RB3 – Red led, diverging signal.

YB3 – Yellow led, diverging signal.

GB3 – Green led, diverging signal.

EAST 1 TRACK (Signal 4)

RT4 – Red led, through signal.

YT4 – Yellow led, through signal.

GT4 – Green led, through signal.

COM – Common signal wire for all 3 wire signals.

RB4 – Red led, diverging signal.

YB4 – Yellow led, diverging signal.

GB4 – Green led, diverging signal.

STEP 5 – Power Connections

The Crossover Signal Module has been designed to be powered from an AC adapter that can supply 12 volts AC or DC or a 12 volt battery. Connecting to the DCC bus for power is not recommended as this may caused false signal aspects to displayed.

Refer to figure 5 when making power connections.

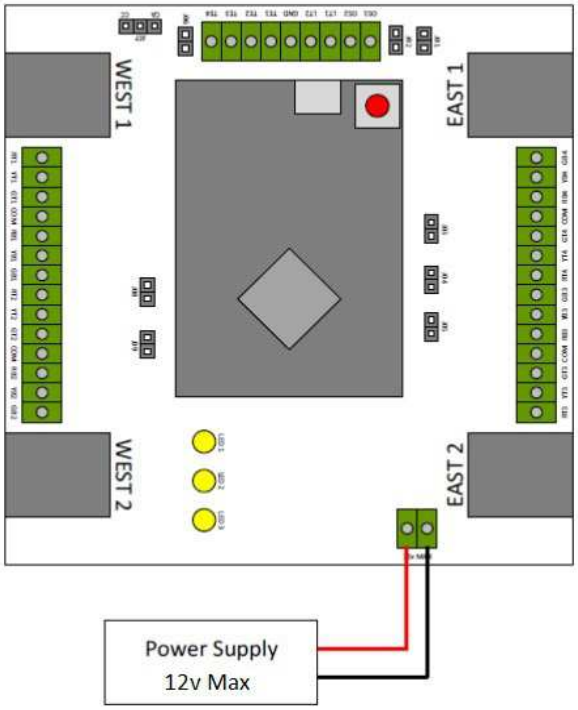


Figure 5

STEP 6 – Optical Sensor

The optical sensors are meant to be installed under the track at the approach end of each turnout just past the points. Be sure not to cover the sensor with ballast or other objects otherwise the sensor will not work. Figure 6 is a cut away diagram displaying how the sensor should be mounted. Figures 1 & 2 show the recommended location for each of the optical sensors.

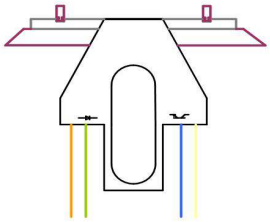


Figure 6

A total of 2 optical sensors are provided, one sensor for each track.

Connecting the provided optical sensors is simple and should be done as follows:

Track 1 sensor output lead – White	To OS1 terminal.
Track 1 sensor output lead – Blue	To GND terminal.
Track 1 sensors power lead – Orange	To LT1 terminal.
Track 1 sensors ground lead – Green	To GND terminal.
Track 2 sensor output lead – White	To OS2 terminal.
Track 2 sensor output lead – Blue	To GND terminal.
Track 2 sensors power lead – Orange	To LT2 terminal.
Track 2 sensors ground lead – Green	To GND terminal.

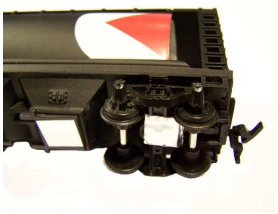
Auto Infrared sensing

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. The infrared led on the sensor will need to be disabled by turning it off by an external switch. If no external infrared light is present, the sensor will work in beam reflect mode.

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 8.

Roll of silver tape

Cut strips from roll



Cut into cubes and stick to underside of rolling stock.

Figure 8

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 on v1.0 boards.

CAUTION: Enabling the approach diverging feature for pin 8 will cause a short if using on other MSS products that connect pin 8 to ground. This will cause damage to some of the components on the CSM board.

Notes – Approach Diverging

The CSM-2, v1.0, board can be used to display an Approach Diverging aspect on an approach signal cascade that support MSS v2. This feature is still being fine tuned and will be available at a later date through a software upgrade.

The CSM-2 board also supports approach diverging with hardware designed for previous MSS versions. This feature can be activated by adding the on board jumper J5. When the diverging route is selected, the signal for that route will display an approach aspect (not clear) as long as the block in front of the signal is not occupied. Otherwise if the block is occupied, a stop aspect will be displayed. When an approach aspect is displayed for the diverging route, an advance approach aspect will be displayed at the previous 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.