Model Train™ TECHNOLOGY

G-Controller™

OPERATIONS MANUAL

Version 1.1d

INTRODUCTION

Video Instructions: https://youtu.be/FRAdZwGpwZQ

The Model Train Technology™ ***G-Controller™*** provides an extremely simple plug-and-play system for lighting and animating G Scale block signals and RR Crossing Flashers.

- No Soldering
- No Computer
- No Programming

Our simplified system will provide great animation in just a few minutes of installation time, not days or years and at a fraction of the cost of elaborate CTC systems and no programming is involved.

Summary of Precision Detector MAX Features:

- Long, precise sensor range (10 to 600 mm)
- No more adjusting for varying light conditions.
- Auto-calibration mode for precise range setting
- Detect one parallel track and ignore the others
- Adjustable time-out (0-30 seconds)
- Electrical box integrated design
- Includes a 2mm screwdriver.

OVERVIEW

Each ***MTT G-Controller*** (“***Controller”***) stands on its own and is triggered by a ***Precision Detector MAX™*** sensor, mounted either on the front or back of the main circuit board depending on whether you have the battery or wired 12VDC version. Our ***Precision Detector™*** technology was incorporated in the ***Controller*** design using a cousin of the earlier chip for range detection. The chip for the G-Controller has a longer range but otherwise has the same characteristics as our standard detector. This is not an IR sensor, so it is not affected by the typical and difficult lighting conditions of indoor or outdoor layouts, including when facing into the sun. You can connect additional ***Precision Detectors*** to the ***Controller*** to extend detection areas or catch East/West traffic for crossing signals.

When the ***Controller*** is tripped by the sensor, it starts a display (aspect) cycle that begins with red. While the sensor shows occupied, the ***Controller*** will stay red. Once the block (detector) is cleared, the ***Controller*** will start a change of light sequence based on one of the options shown below. The time between stages can be adjusted on the ***Controller.***

The ***Controller*** has four outputs that are synchronized to the selected aspect behavior. You can adjust the brightness of each of the outputs individually. This lets you set the brightness appropriate to your layout. You can also individually adjust each of the different colored LEDS. The typical colors of the LEDS (Red, Yellow and Green) do not glow at the same brightness with the same voltage. The ***Controller*** allows you to adjust them to your liking. No resistors are needed! The ***Controller*** supports both common anode and cathode (UNIVERSAL version only).

The ***Controller*** allows you to set the speed by which the Aspect (colors) shifts from Red to Yellow to Green after the train has passed and the block is unoccupied. You can make it occur almost immediately, or you can set it up to 30 seconds. Each ***Controller*** has its own speed adjustment

The ***Controller*** has eight distinct behaviors that are set with the single push button. The time between stages is set with the screwdriver(provided) and trim screw. They are:

- Red, Green
- Red, Yellow, Green
- Red, Yellow, Yellow flash, Green

- R, R&Y, G&Y, Green
- R, R&Y, R&Y-Flash, G&Y-flash, Green
- Red, fade to Yellow, fade to Green
- Alternate flash (speed adjustable) *
- Alternate flash with fade (speed adjustable) *

**For use with gate crossings*.

There are two types of controllers:

1. Battery Powered
2. 12VDC Powered

Functionally, they are identical.

The ***Controller*** for LEDs operates at 7.4v (Battery) or 12VDC. The LEDs are powered up to 5VDC but there are built in resistors to limit the current to "safe" levels for the LEDs we use in our signals. The ***Controller*** can light two LED block signals each with three 2-5v LEDS or up to four Crossing Flashers.

The circuit board has been coated with a Conformance coating to reduce oxidation on electrical components.

LATCHING (Clear-to-Proceed)

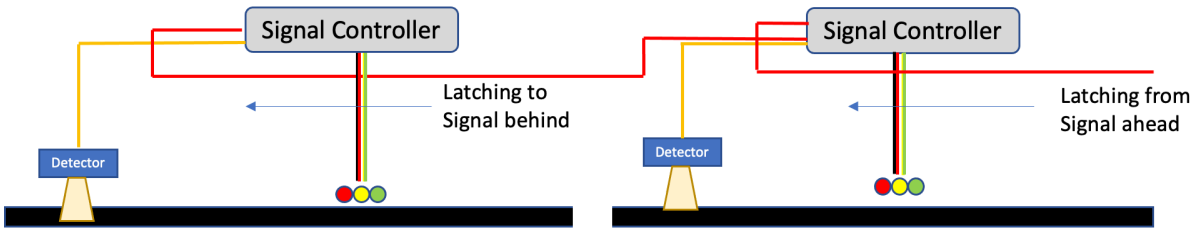
While not a true CTC signaling system, there is one feature that will give the appearance of one – without the complexity.

In short, if you connect the Signal wire of the G-Controller from the block ahead to the LATCH terminal of the G-Controller of the block behind, while the block ahead is occupied the block behind will wait at the last aspect before green. Once the block ahead is clear, the G-Controller of the block behind is “released” and will turn green. You can daisy-chain as many latching connections as you like.

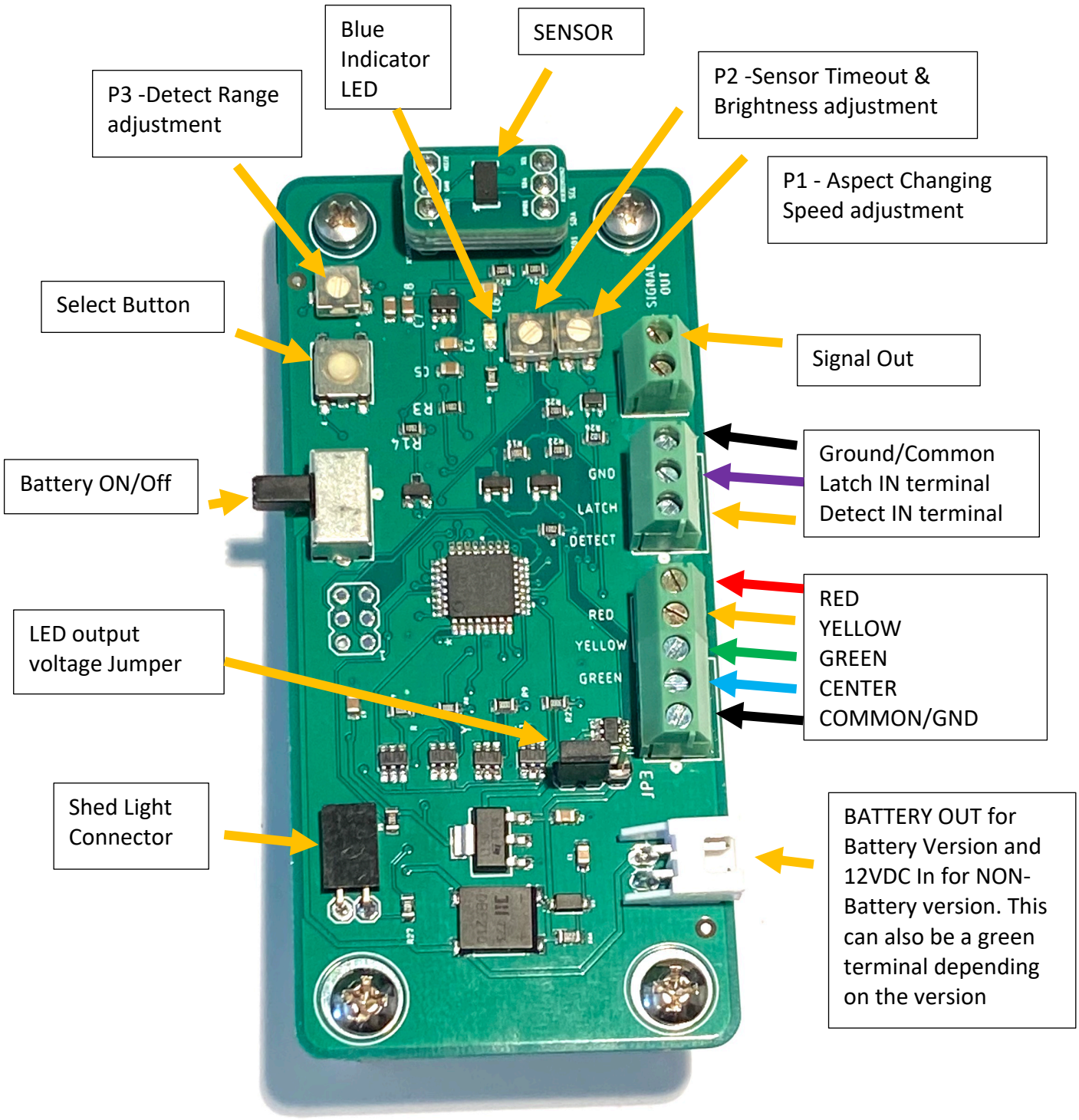
Here Is the wiring for Latching:

Model Train TECHNOLOGY

Signal Latching Example



G-Controller Circuit Board



The circuit board components are exposed when you handle the board outside of the case.
Be as careful as you can not to touch the components themselves and avoid static electricity.

DO NOT CONNECT 12VDC to the BATTERY VERSION of the G Controller. IT WILL FRY THE BOARD

SETUP AND OPERATION

If battery powered, slide the battery power switch into the UP/ON position. Otherwise, activate your 12VDC supply.

After 1 second the blue indicator LED will flash four times rapidly and the green LED will light.

If you put your hand or an object in front of the sensor, the blue LED will light, and the Controller will change the aspect to RED (Occupied).

The default range on the sensor is set to a max range of 600 mm or about 20 inches. The Zone mode is STANDARD, which means anything in the range of the sensor will be detected.

The Aspect SPEED is set low (fast speed) so that you can quickly see the aspect change when you move away from the detection zone of the sensor.

To slow down the rate of aspect change, turn the P1 trim potentiometer (trimPot) to the right (increasing time) using the small screwdriver provided.

The sensor timeout is also set to low (immediate) so that when you move away from the sensor it times out immediately. That is shown by the blue LED turning off. Adjusting the P2 Sensor Time Out allows you to delay when

the Controller is released after the train passes. For example, the train could pass, and the controller might wait 20 seconds (stay RED) until it starts the aspect timer. This helps to increase realism of the signal changes.

Another reason to use the time out adjustment is to AVOID the sensor going off when it sees a gap between train cars. The sensor is very precise and fast. This effect is less pronounced if the sensor is near its max range from the track but may occur if the sensor is close to the track. Increasing the timeout to 1-2 seconds helps to avoid this situation.

SELECTING A SIGNAL BEHAVIOR (ASPECTS)

You push the Select Pushbutton the number times needed to select an option according to the table below. Once you stop pushing the button the Controller will wait 2 seconds and then all the LEDs will turn off. One second later the green signal LED will blink the number count matching the button pushes.

PUSHES	SIGNAL BEHAVIOR
2	Red, Green
3	Red, Yellow, Green
4	Red, Yellow, Yellow flash, Green
5	R, R&Y, G&Y, Green
6	R, R&Y, R&Y-Flash, G&Y-flash, Green
7	Red, fade to Yellow, fade to Green

8 Alternate flash no fade (speed adjustable)*
9 Alternate flash with fade (speed adjustable) *

** For use with Gate Crossing Flasher*

The default setting is 3.

SELECTING THE ASPECT SPEED – P1

The behavior speed adjustment screw is inside the Controller. You access it with the provided 2mm screwdriver. Gently turn the screw inside from zero to about 300 degrees. It does not turn 360 degrees. Left or counterclockwise is faster (less time between stages), right or clockwise increases the time between stages. You can make the adjustment at any time since the Controller reads the setting at the beginning of each detector trip event.

FORWARD LATCHING

The way standard latching works is the G-Controller in the forward block “holds” the G-Controller behind it at the YELLOW stage until the train is clear of the forward block. Once clear the train is clear of the forward block, it releases the latch and the block behind it is cleared to Green.

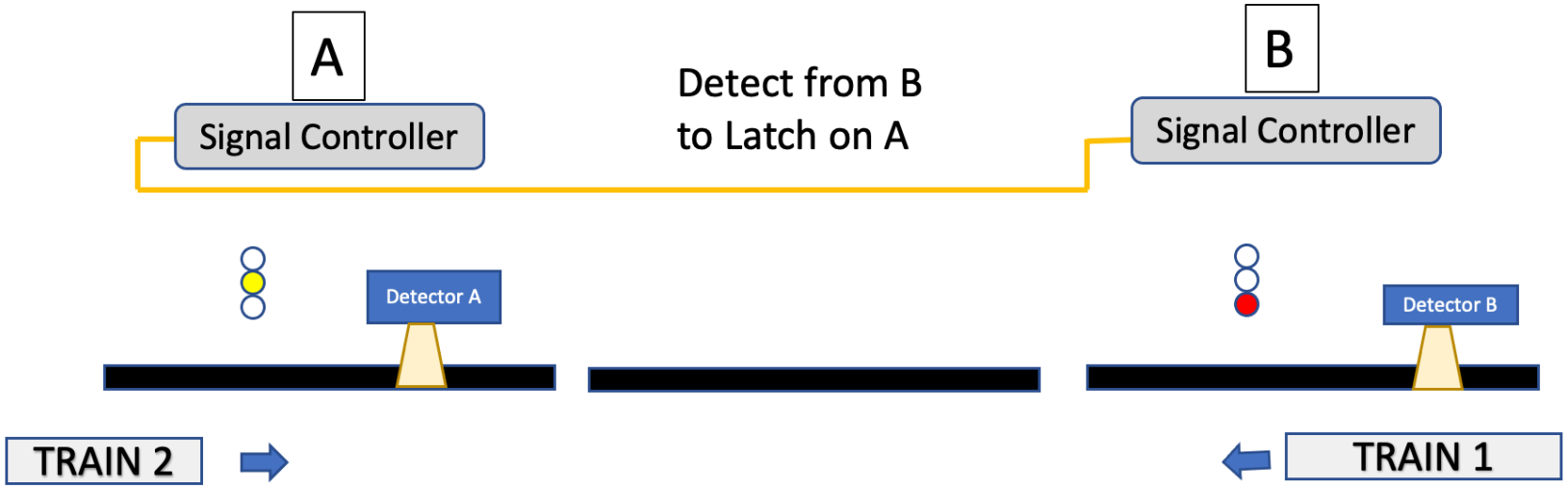
This all assumes that the trains are on the same track heading in the same direction. This also means that the blocks have been tripped by detection.

<u>Forward Latching allows a G-Controller (via Detection) to cause a “Non-tripped” G-Controller to instantly show Yellow.</u>

This would normally be caused by two trains approaching each other with a passing siding nearby. Forward latching tells the “second” train to slow down (via the yellow indication). It could also be set to red by connecting another detector that is in the closer block.

You DO NOT have to configure Reverse Latching. It happens automatically if the latching wire is connected, and the conditions explained happen.

Here is an example:



Train #1 traveling West trips detector B for Signal Controller B. As normal, the block signal changes to RED as shown. Train#2 is approaching Block A but has not tripped its detector. HOWEVER, Signal Control B, via reverse latching, causes Signal Controller A to show a yellow condition. It will stay yellow while Detector B is active OR Train 2 trips Detector A – at which point it will cause Signal A to change to red.

RESET

To reset the Controller to factory defaults, press the SELECT button 13 times.

SETTING THE RANGE TO STANDARD MODE

By default, the sensor is set to detect the range from 10mm to 600mm. If you happen to have set the range to ZONE mode, press the SELECT button 11 times to return to STANDARD MODE. We recommend you start with the STANDARD mode for testing purposes.

To shorten the detect range, turn the P3 trim pot to the left (counterclockwise). Test this by moving your hand, or some object, from outside the range to closer until the blue light goes on. In this mode, anything from 10mm away from the sensor

Next, using the provided screwdriver, turn the right-hand trim pot to the right about ¼ turn (or 15 minutes' worth if you want to use a clock metaphor). Then wave your hand in front of the sensor and then away. The LED should stay lit for a second and then go out.

SETTING THE RANGE TO ZONE MODE

To avoid objects, people, cats, lizards (?) from accidentally tripping the sensor there is ZONE mode. ZONE mode is a 70mm wide detection zone that can be positioned anywhere within the max range of 600mm. To set the detector into ZONE mode press the SELECT button 12 times.

Now, adjust the LOCATION of the START of the ZONE by adjusting the P3 detector range trim pot.

Start with the trim pot turned all the way counterclockwise. Then put a car on the track where you want the zone. Turn the trim pot back to the right (clockwise) until the blue light goes on. That's it. The zone is now set to minimize any object outside the width of the track.

To test this, start outside the max range and move your hand inward until the blue light comes on indicating the outside of the zone. Keep moving your hand inward. After about 70mm of movement inward the blue light will go out – and stay out all the way to the start of the sensor range of 10mm. You will want to locate this zone so that a railcar on the tracks trips the sensor but anything reasonably outside the zone does not.

AUTOMATIC RANGE CALIBRATION

The Precision Detector includes a feature called Auto Calibrate. This make setting the exact distance for detection to a rail car extremely simple.

STEPS:

1. To activate the saved calibration, the trim pot for ranging must be set to zero. Turn the trim pot with the screwdriver all the way to the left (counterclockwise).

2. If this is the first time to use calibration, the saved setting may also be zero.

3. Press and hold the select button on the sensor. If your finger sets off the sensor (blue light), don't worry. While you continue to hold the select button the blue light will go off. Hold the button for about 8 seconds and then the blue light will come back on. When the light comes back on, release the button.

4. The blue LED will blink at 1 per second. The Controller is now in CONFIGURATION MODE. To start the Auto Ranging cycle, press the select button again twice (after to you see it blinking)

5. The LED will THEN blink 10 more times, once per second, to allow you time to place a train car on the track in front of the sensor you wish to calibrate.

6. After 10 seconds (10 blinks) there will be a 1 second pause and then the LED will blink very rapidly for about 1 second. This rapid blinking is when the sensor Auto Calibrates (measures) the detected train car distance. That distance is saved in the memory of the sensor.

7. After the rapid flashing the sensor LED will go out for 2 seconds and then return to normal operating mode. The LED should go back on since it now detects the rail car on the track in front of it. Move the rail car and the LED should go out.

   NOTE: It is BEST to set the P2 timeout adjustment to zero so that the LED will go out immediately after you move the rail car. This makes confirming the correct operations much easier.

8. Anytime that you want to use your own setting, simply adjust the trim pot accordingly using the provided screwdriver. When the trim pot is zero, the Auto

Calibrate value is used and the trim pot is ignored. When the trim pot is non-zero, the setting of the trim pot is used.

TRIGGER TIMEOUT SETTINGS

Rotate the P1 trim pot clockwise to increase the length of the detector timeout up to 30 seconds.

CONFIGURATION MODE OPTIONS

For the following setting you will need to enter the Controller's configuration mode.

1. Press and hold the select button on the sensor. If your finger sets off the sensor (blue light), don't worry. While you continue to hold the select button the blue light will go off. Hold the button for about 8 seconds and then the blue light will come back on.

2. When the light comes back on, release the button. The blue LED will blink at 1 per second.

3. The Controller is now in CONFIGURATION MODE.

SETTING THE LED BIGHTNESS

Setting the brightness for each output is accomplished through a series of pushes to the select button.

In CONFIGURATION MODE, press the select button the number of times according to this chart for the LED you wish to adjust:

RED	3	
YELLOW	4	
GREEN	5	
CENTER	6	(for 7 light signals)

The LED that you selected will light and the BLUE LED may flicker.

Gently Insert the screwdriver into the P2 adjustment screw hole and turn the insider screw clockwise and counter clockwise to reach the desired brightness for the red LED.

When you turn the P2 Trim Pot, the blue LED will flicker. This lets you know that something is happening.

When you are happy with the setting, press the select button once. This will save the Red LED setting; the Red LED will blink and go out. The Controller will exit CONFIGURATION mode any time you press the SELECT button once.

To avoid having re-enter CONFIGURATION MODE, such as when you want to adjust all the LED brightness in sequence, instead of pressing SELECT once to save and exit, simply press the number of times for the next color to adjust. So, for yellow, pressing 4 times will SAVE the Red setting and then light the Yellow light ready for adjustment. Likewise, if you were then to press the button 5 times. Press once to save and exit after the last adjustment.

After you have exited CONFIGURATION MODE the Controller will go back to normal operations – which will be a Green signal unless the sensor was tripped.

If you have selected either behavior 8 or 9, which are the crossing gate alternate flash modes, all the LEDs will remain off until a block occupied trip signal is received.

NOTE: after you have adjusted the brightness, remember to RE-SET the adjustment screw to the timeout setting you want. Most of the time when you set the brightness of the LEDs the adjustment screw will be toward the "high" side, meaning all the way clockwise. This is also the LONGER time setting for the aspect changes.

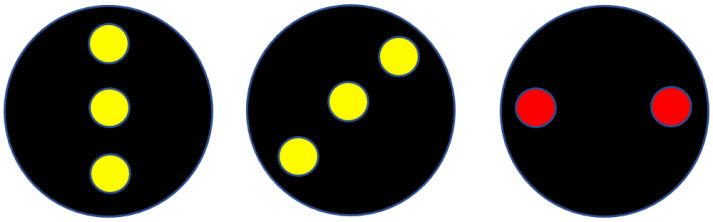
CROSSING GATE LIGHT SETTINGS (Aspects 8 & 9)

The speed of the alternate flashing can be adjusted by turning the P1 aspect speed adjustment screw. It adjusts the time between stages just as before but in this case, it is the speed of the back and forth of the two output ports (red and green).

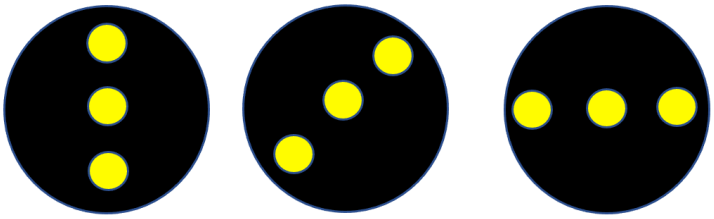
SEVEN LIGHT SIGNALS

The G-Controller has four outputs, the fourth output is used to light the center light on a round 7 light signal. We currently support two behaviors: Pennsylvania Railroad (PRR) and Long Island Railroad (LIRR).

For the PRR the signals will look like this:



For the LIRR the signals will look like this:



NOTE: typically, the PRR STOP is two Reds horizontal with the middle light off. There are some variations, but this is what this controller will show. If you want green and yellow signals, we can do that.

The LIRR signals are typically all white with the center light on all the time. We kept to this except when the lights are flashing and then the center light flashes with the other lights. That is NOT a prototypical behavior but we kept that mode in the controller so you could implement it if you like.

SETTING THE STEP MODE & PRR & LIRR SETTINGS

With the Controller in Configuration Mode, press the SELECT button as follows:

7 - PRR, no center light with RED.

8 - LIRR, center light on all the time

If you have a three light signal this will have no effect on operations.

SLEEP MODE

To extend battery life, you can set the Controller into SLEEP mode. In SLEEP mode, after 1 hour of no detection, the LEDs will go off. When the detector activates again, with a train passing the LED's will come back on instantly and restart the 1-hour SLEEP clock

While in SLEEP mode, the outside shed light will blink every 4 seconds. This lets you know the Controller is alive but sleeping.

With the Controller in Configuration Mode, press the SELECT button as follows:

9 - SLEEP mode ON/Active

10 - SLEEP mode OFF.

SIGNAL OUT /DETECT TERMINAL

The Controller has a SIGNAL OUT terminal that can be used to trigger a variety of actions:

1. Act as a trip signal for Latching

2. Trip the Sound Module for Crossing Bell

3. Trip our Relay Adapter/Relay for other Animations

This is the same as if a separate Precision Detector was placed on the layout – and can be used in conjunction with other sensors to create longer block detection zones.

This is a LOW signal to GROUND (in case you were wondering).

Contact us if you have specific application questions.

G CONTROLLER SETUP & CONFIGURATION

2 ~ 7	3 Light Signal Aspect Behavior
8 ~ 9	Crossing Flasher Modes
11	Standard Range Mode
12	ZONE Range Mode
13	Reset to factory defaults

IN CONFIGURATION MODE

1	Save & Exit Configuration Mode
2	AUTO RANGING MODE
3 ~ 6	Adjust Brightness (R,Y,G,C)
7	PRR Mode, no center light
8	LIRR Mode, center always on
9	Activate Sleep Mode
10	Deactivate Sleep Mode
12	Reverse Polarity (toggle)
14	Set center light to not blink

ELECTRONICS AND STATIC ELECTRICITY

The ***MTT PRECISION DETECTOR™ - Trackside*** circuit board and components are exposed when the cover is off. Electricity can be dangerous. Static electricity can cause component failure. Scuffing along a carpet and then touching one of the component connectors can cause a static spark. These components are fairly rugged – some designed for the automotive industry. Just be mindful of the risk. The current on the board will not harm you if the board is powered and operated as per the instructions.

ONE YEAR MANUFACTURER WARRANTY:
We warrant this product to be free from defects in workmanship and materials, under normal residential use and conditions, for a period of one (1) year for the original invoice date. Shipping and handling fees are to be paid for by the customer.

LIMITATION OF LIABILITY

UNDER NO CIRCUMSTANCE SHALL COMPANY OR ITS AFFILIATES, PARTNERS, SUPPLIERS OR LICENSORS BE LIABLE FOR ANY INDIRECT, INCIDENTAL, CONSEQUENCIAL, SPECIAL OR EXEMPLARY DAMAGES ARRISING OUT OF OR IN CONNECTION WITH YOUR USE, OR INABILITY TO USE THE PRODUCT, WHETHER OR NOT THE DAMAGES WERE FORESEEABLE AND WHETHER OR NOT COMPANY WAS ADVISED OF THE POSSIBLITY OF SUCH DAMAGES. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, COMPANY'S AGGREGATE LIABILITY TO YOU SHALL NOT EXCEED THE AMOUNT OF THE PRODUCT. THE FOREGOING LIMITATION WILL APPLY EVEN IF THE ABOVE STATED REMEDY FAILS OF ITS ESSENTIAL PURPOSE.

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