Model Train™ TECHNOLOGY

MTT PRECISION DETECTOR™

Trackside Box & Mile Marker

1mm precision up to 150mm

OPERATIONS MANUAL

Version 4.3c

Works with Z, N, HO and O Scale

The Model Train Technology™ ***PRECISION DETECTOR™ – Trackside*** and ***Mile Marker*** are designed to provide an adjustable, multifaceted, and ***precise*** way to detect trains on one or more parallel tracks with the least amount of work to install and operate. At last, there is no need to adjust or calibrate for changing or difficult light conditions. The detector is housed inside an 3D printed electrical box that is mounted from the top of the layout. We think this is easier than banging around under the layout to install brackets and drill holes in the track. It's also more prototypical because the real track detection of modern railroad ***IS*** housed inside electrical boxes along the trackside. We provide two types of base mounts, one with holes for screws or glue, or a minimally sized base that matches the footprint of the electrical box cover. The ***PRECISION DETECTOR™*** sensor board slides into the base bracket and then the box top slides over that.

After we had our share of frustration with IR (infrared) detectors that are susceptible to ambient light, particularly florescent, some LEDs and mercury bulbs found at large train shows, we searched for a smaller, faster, more precise technology that would also be impervious to poor light conditions. The sensor we chose, along with our software, will detect the location of a train car anywhere within a 150mm

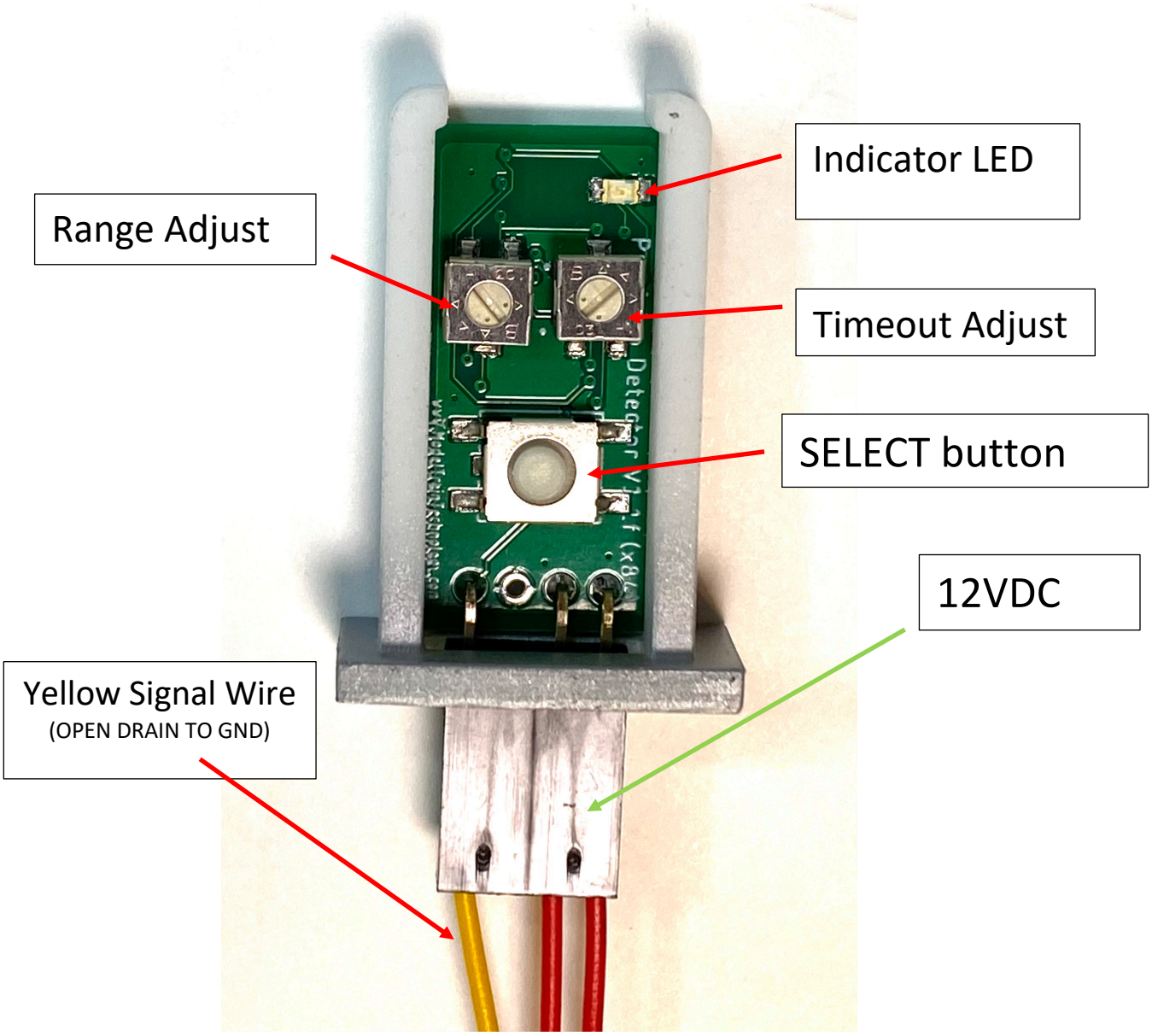
(5.5”) range with 1mm precision without regard to lighting conditions.

This means you can put the sensor near the track, or you can hide it away in a nearby building or in the side of a hill. You can also use the ***PRECISION DETECTOR™*** to alert when a train has reached the endpoint of track inside a hidden yard. In other words, aimed down the track from the endpoint, not across it. In this example the detector will only “see” the train on the track its’ aim down – and not the adjacent track.

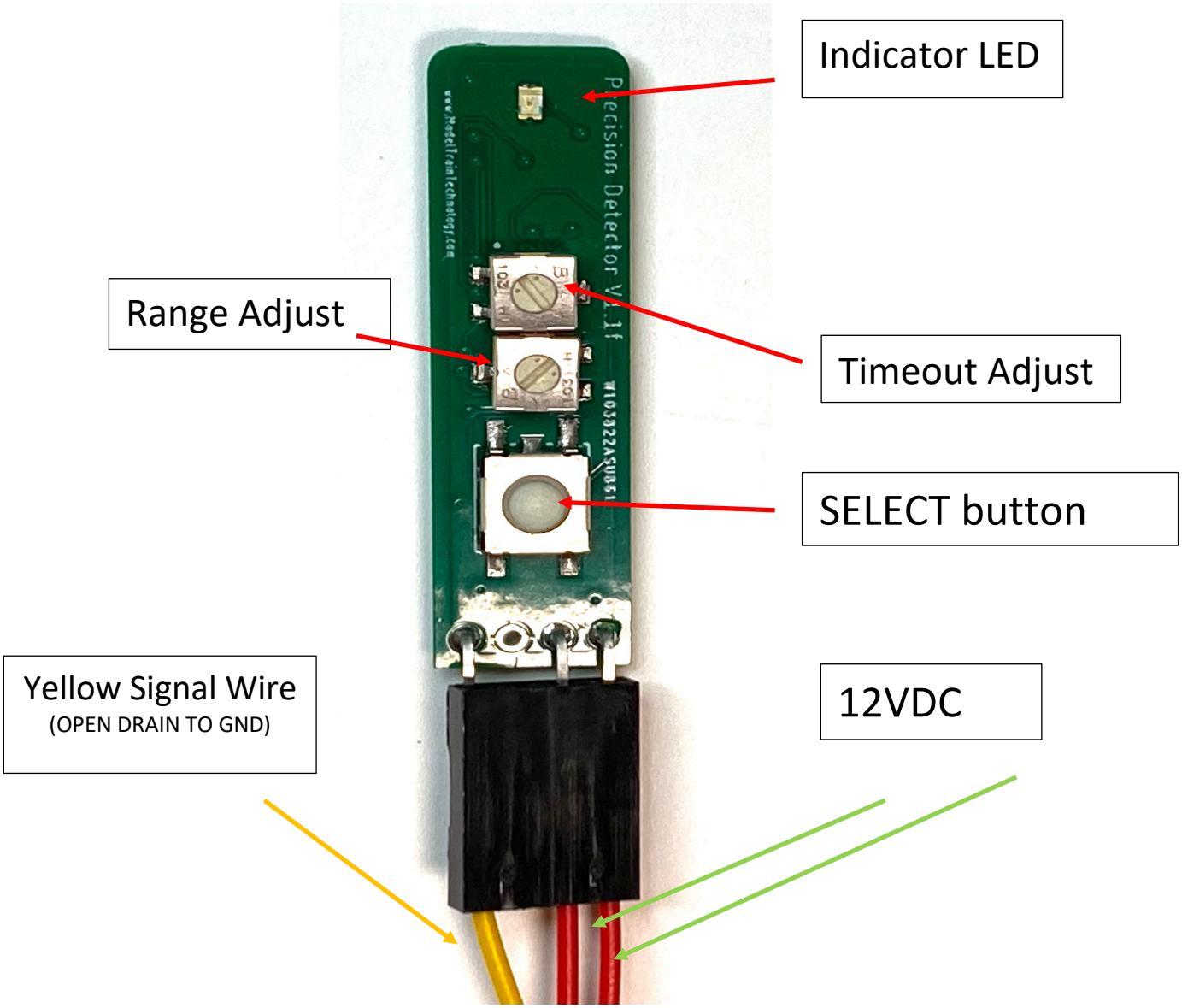
Summary of Features:

- Long, precise sensor range (1mm up to 150mm)
- No more adjusting for varying light conditions.
- Adjustable detect ranges (N & HO and O gauge)
- Auto-calibration mode for precise range setting
- Detect one parallel track and ignore the others
- Adjustable time-out (0-60 seconds)
- Reversable Signal output (INVERT)
- Electrical box integrated design
- Mile Marker style – for variety of layout design
- Includes a 2mm screwdriver.

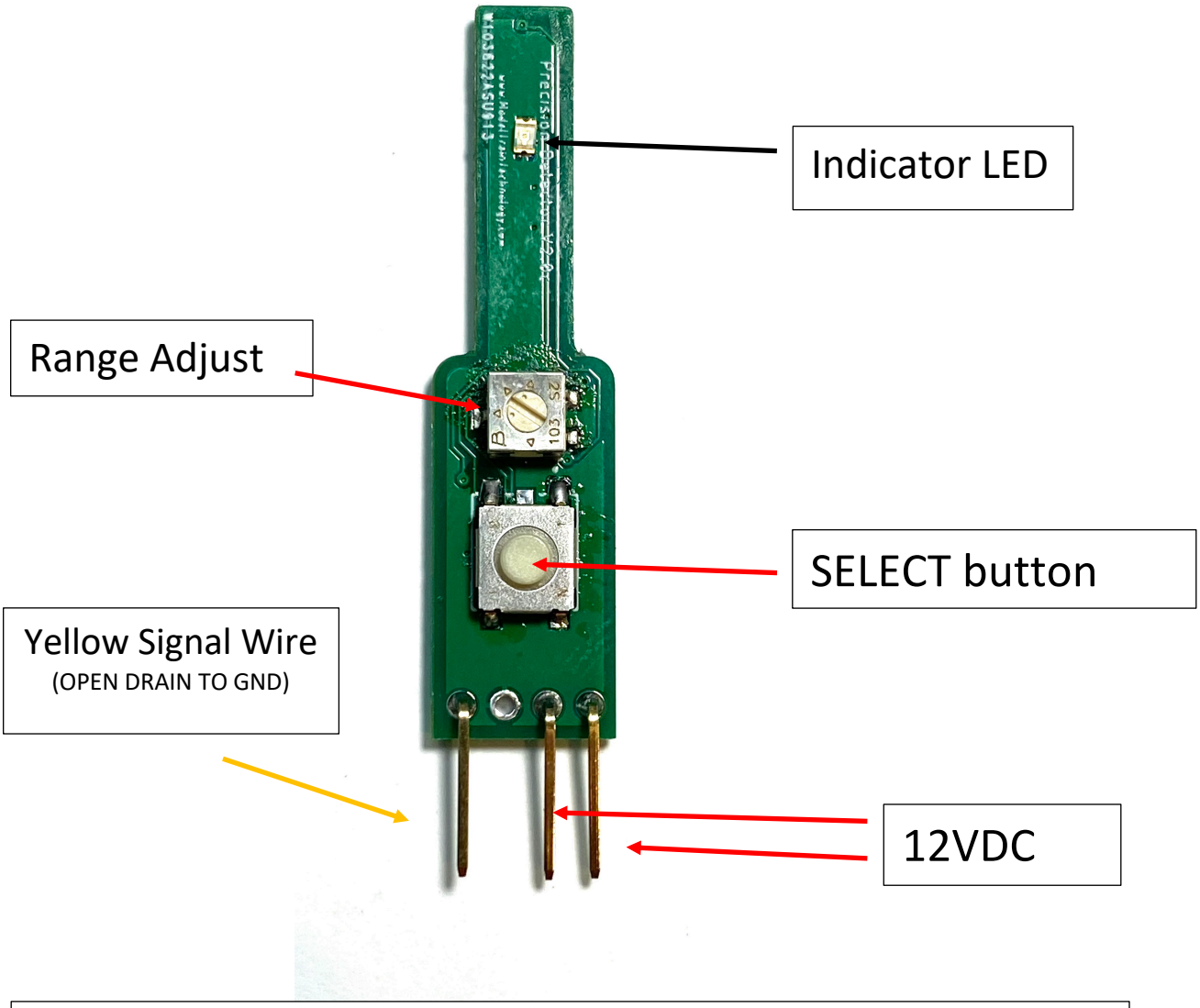
HO *PRECISION DETECTOR™ sensor board*



N Scale *PRECISION DETECTOR™ sensor board*



Mile Marker *PRECISION DETECTOR™ sensor board*



The Mile Marker version of the Precision Detector does not have an adjustable trim to set the Detect timeout. Instead, you use the Select button to choose between Immediate (no timeout) and 15, 30, 45 and 60 Seconds)

The Mile Marker version shown above uses the N Scale Plug for mounting. This requires a 5/8” hole be drilled into to the layout.

The board can be powered with a 12VDC supply which is what the MTT Power Module outputs. To make sure all the detection works properly we designed a low-cost Power Center Module that comes with a power supply.

To operate properly the Signal Controller and the Precision Detector must be connected to the same power source.

Simply press the SELECT button according to this chart:

1	Default Wide Range (5-150mm)
2	N Scale Narrow range (10mm)
3	HO Scale Narrow range (15mm)
4	Toggle: Timeout range + 30 seconds
5	Toggle: INVERT mode

The detector can be set to detect an adjustable **Wide Range** from 5mm up to 150mm. Anything within the range you set beginning at 5mm - will trigger the detector.

The second mode allows you to select a narrow sub-range anywhere within the 5-150mm range. If you select N Scale the detection range will be 10m WIDE and that 10mm range can be

“placed” anywhere inside the 5 to 150mm range. Anything closer or further will not be detected.

Detection Range Width:

N Scale	10mm
HO/O/S scale	15mm

All you do is push the SELECT button to fit your scale and adjust the location of the sensor to meet your specific needs.

In addition, there is a second trim potentiometer (trim pot) that allows you adjust how long the trigger stays “tripped” after the detector is clear. We provide a 2mm screwdriver for adjusting this. (I can’t tell you how many times I needed a small screwdriver for this kind of thing and could not find it and didn’t want to buy another jeweler’s kit.) If you buy a lot of detectors, you can return the extra screwdrivers. We will reuse them.

The default setting with the trim pot adjusted all the way to the left (counterclockwise) is under 1 second. With the dial adjusted all the way to the right (clockwise) the timeout period is either 30 seconds or 60 seconds depending on the timeout option selected via the pushbutton.

If you are using the ***PRECISION DETECTOR™*** with our MTT Signal Controller you will most likely want to leave the setting to 1 second and let the Signal Controller manage the timing. If you are using our Sound Module, then use the ***PRECISION DETECTOR™*** timing to adjust when to stop a sound after the train has passed. An example would be a crossing bell sound. With our Fiber Lighting Controller and a gate crossing use the ***PRECISION DETECTOR™*** to set the timeout so the lights and sound stop at the same time.

The ***PRECISION DETECTOR™*** provides a DIGITAL signal output (LOW) which is the kind used by many model railroad electronic controls that you would normally hook up such as sound modules, Light Controllers (like our Fiber and LED Controllers) and Block Signal Controllers. This detector can be configured to switch a relay that has a digital input option, but it cannot power or switch the relay itself. (see the example at the end on how to connect a relay)

Once installed on the layout, the supplied electrical box cover is designed to protect and hide the electronics. We recommend using Gem-Tack® glue to fasten the mounting plate to the layout surface. The advantage of using this particular white glue

is that you can remove it if you need to. Don't use "super glue".

On the board is a blue indicator LED. This will flash four times when power is first turned on and thereafter will light when the detector is triggered. (INVERT mode will have the light ON when not triggered and OFF when triggered)

The Precision Detector software has been updated to include a new feature called Auto Calibrate. (NOT AVAIABLE ON THE MILEMARKER VERSION). 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). The trim pot for the HO sensor is on the left and for N scale it is the lower of the two.

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 LED will blink 10 times, once per second, to allow you time to slide the sensor back into its bracket (NO COVER YET) and place a train car on the track in front of the sensor you wish to calibrate.

5. 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.

6. 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 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.

7. 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.

NOTE: Auto Calibrate works in either wide zone or narrow zone modes. In wide zone mode the software adds 1mm to the detected zone. In narrow zone mode, it subtracts 1mm. In both cases this happens to assure that the detector sees the rail car using the Auto Calibrated settings.

INSTALLATION and TESTING

The default setting is to detect the **Wide Range** from 5mm to 150mm. Anything in this range will trip the detector. We recommend you start with this for testing purposes.

Connect the RED power wires to your 12VDC power source. There is no polarity required. With power ON you can place your hand in front of the sensor and the blue LED should light and go off when you move away.

To shorten the detect range, turn the left-hand trim pot to the left (counterclockwise). With the slot of the trip pot showing vertical the detect distance is about 65mm. Test this by moving your hand, or some object, from outside the 150mm range to closer until the blue light goes on. In this mode, anything from 5mm away from the sensor to 65mm will trip the detector.

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 about 7-10 seconds. This demonstrates the delayed timeout aspect of the detector.

Turn the timeout back all the way to the left (1 second) during the following testing and experimentation. It is easier to change the detector settings when the timeout setting is zero. It just helps speed things up to follow what's going on instead of waiting for the time out.

The ***MTT PRECISION DETECTOR™*** has an accuracy to 1mm. That allows it to detect the exact rail space of N, HO or O Scale track. In the example below we used the DIP switches to set the scale to N Scale which gives us a 10mm "zone". Then we place the detector within 150mm of the furthest rail of the track we want to detect. Then you adjust the range so that the blue indicator light goes on at the closest edge of the zone. (indicated by the red line). The procedure to do this is:

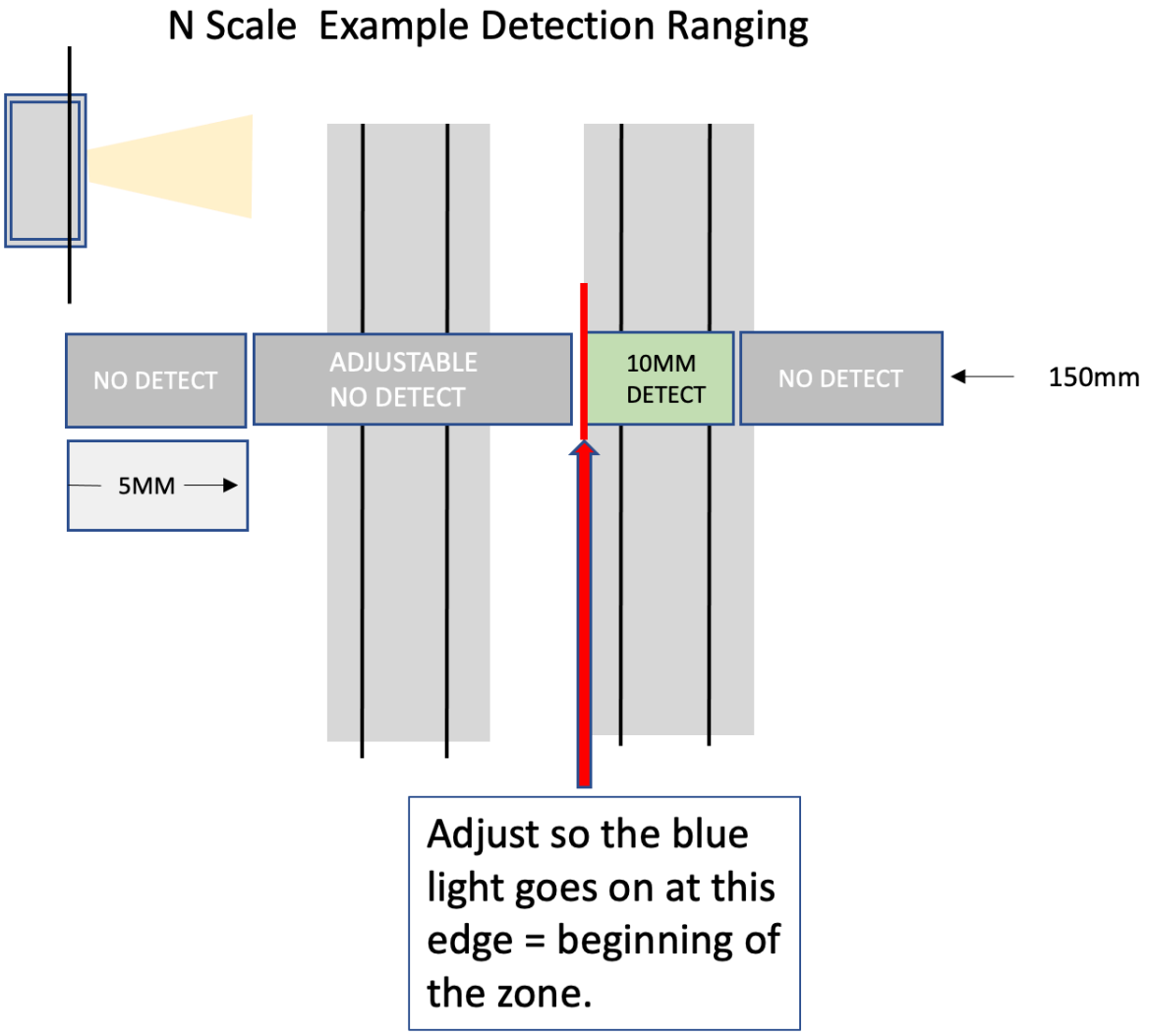
1. For N Scale, press the SELECT button twice.

2. Place any car on the track you want to detect at the detection location you want. (we'll assume you have placed the ***PRECISION DETECTOR™*** where you want it. You can tape it down to the layout temporarily to test things out.

3. Turn the Range trip pot all the way to the right.

4. Turn the Range trim pot slowly to the left (counterclockwise) until the blue light goes on. You might have to very finely tune the trim pot to get the range where you want it. Once set you will not have to adjust it again. Ever.

5. Test by moving the car in and out of the sight of the detector. The Blue indicator should go on and off. Move the car out of sight. Place you hand or an object between the detector and the track. Nothing should happen since it is not within the 10mm range that you set – which should be directly over the rails of the track.



Keep in mind that the trim pot rotation is 300 degrees which allows adjustment over 145mm. When you are adjusting the range in N Scale it only takes a small amount of rotation to move 10mm.

The Yellow Signal wire can now be connected to the controller device of your choice. The signal protocol is called OPEN DRAIN

(LOW). This simply means that the device will work with control units that are looking for a connection to GROUND through the signal wire.

HOWEVER, the detector must have a way to connect back to a source of ground. The most bullet proof way to do that is to have the controlling device and the detector powered by the same power supply. Then naturally they will share a common ground through the power supply, and everything will work fine.

INVERTED SIGNAL

An INVERTED SIGNAL simply means that the ***PRECISION DETECTOR™*** will send an ON signal when the sensor is OFF, and visa versa. You can tell this is the case if the blue LED is always on but turns OFF when you place your hand in front of the sensor. Why would you use this? You can use this when you are connection to a block signal system or more likely if you are using our MTT Sound Module. You can have ambient background noises going while the train is away and then have them turn off as the train (with sound) passes or pulls into the

station. To change the Signal out to INVERT, change the right most DIP switch to ON (up position).

NOTE: Whenever you change any of the DIP switches the ***PRECISION DETECTOR™*** detects that change and updates its operation automatically. It takes two seconds to update on a DIP switch change.

TRIGGER TIMEOUT SETTINGS
(See table below for Mile Marker settings)

Rotate the trim pot clockwise to increase the length of the detector timeout. There are two ranges: 0-30 and 31-60 seconds. You change to the 31-60 second range by pressing the SELECT button 4 times. This is a toggle type switch. To turn OFF the extra time, press the SELECT button 4 times again.

MILE MARKER DETECTOR FUNCTIONS

1	Standard Range Mode
2	N Scale (10mm) Range
3	HO Scale (15mm) Range
4	No Timeout
5	INVERT mode
6	5 Second Timeout
7	10 Second Timeout
8	15 Second Timeout
9	30 Second Timeout
10	45 Second Timeout
11	60 Second Timeout

Press the SELECT button the number of times indicated on the left to activate the various options.

The ***PRECISION DETECTOR™ – Trackside*** is very fast and very precise to the point that it can detect the space between cars when a train is moving slowly. To avoid the sensor going off in this situation, adjust the timeout just a little above the time that it takes a car with the biggest gap to cover the detection area. Usually, 1-2 seconds is all that's needed.

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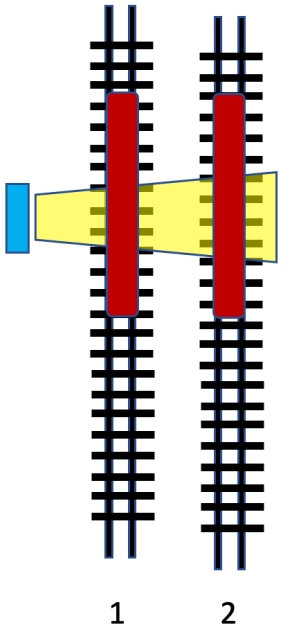
PRECISION DETECTOR ™ APPLICATION NOTE

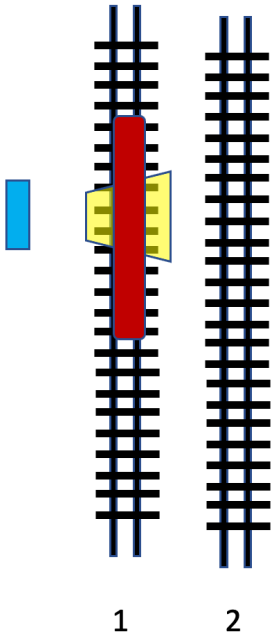
SCENARIO A

Detects any train on Tracks 1 or 2



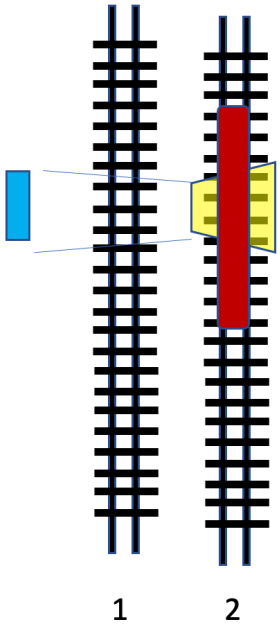
SCENARIO B

Detects any train on Track 1

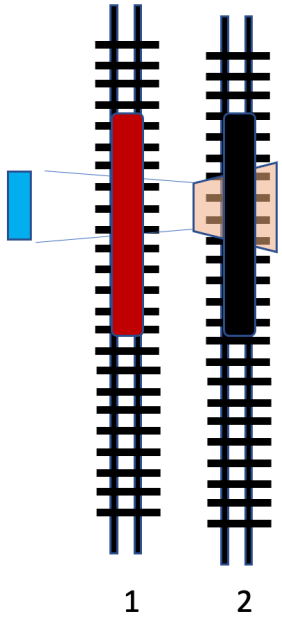


SCENARIO C

Detects any train on Track 2



*Note: There is no train detect if a train on Track 1 is blocking the view of Track 2



Model Train TECHNOLOGY

MTT Precision Detector™

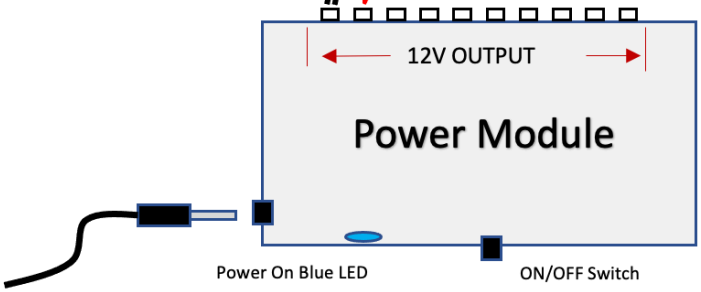
FIBER SIGNAL CONTROLLER HOOKUP

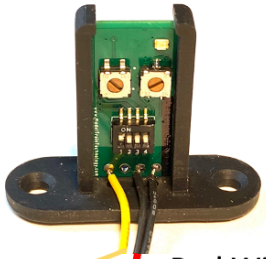
Fiber Output Light is WHITE
Block Signal Lens are colored

Black Wires to Power.
Polarity doesn't matter.

Select Fiber Pin Size
(.50,.75,1.00,1.50mm)

Yellow Signal Wire





Red Wires to Power.
Polarity doesn't matter.

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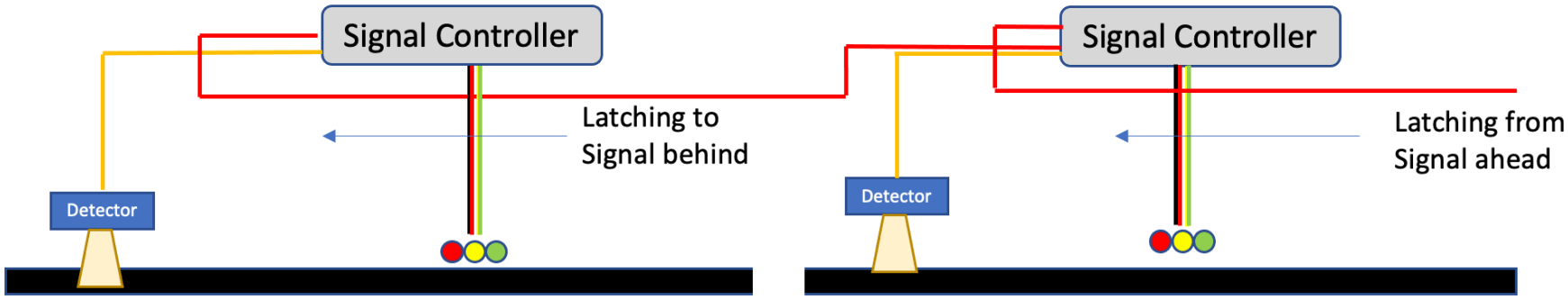
Signal Latching Example



ELECTRONICS AND STATIC ELECTRICITY

The ***MTT PRECISION DETECTOR™ - Trackside*** circuit board and components are exposed when the cover is off. 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 as per the instructions.

ONE YEAR MANUFACTURER WARRANTY: We warrants 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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