

# HotShot™ Speedometer

For Model Railroads

Model No. HS-31

## Speed Trap for model railroad engineers

- Displays scale speed for passing trains – up to 400 MPH – for all scales
- Perfect for speed matching locomotives
- Realistic display action mimics a highway speed trap as trains pass
- Flashes the Display and triggers Alarm when train is over speed limit
- Push button reports last train speed, train count for session, high and average speed for session, and all time high speed record
- Includes Photo Sensors to detect trains in **typical room lighting**
- Requires **NightScope™ Infrared Detectors** (sold separately) for **dim light**
- 200 mA output drives LEDs, motors, relays when over the speed limit

## Simple Installation

- Faceplate/Circuit Assembly with a template for clean Fascia installation
- Screw terminals for all circuit board connections
- Adjustable Speed Limit and Photo Sensor separation (20 – 255 scale ft)
- Easy set up for metric distance and kilometers per hour (KPH)
- Auto-Adjustment ensures the best Photo Sensor performance
- Power Supply: DC (9-12 V) or AC (7-9 V), 100 mA capacity **required**

## Parts List

- **HotShot™ Speedometer** Faceplate/Circuit Assembly
- Photo Sensors (2)
- Fascia Template

## Before You Install

- Your **HotShot™ Speedometer** can be damaged by static electricity. Before removing the circuit board from its packaging, discharge static electricity by touching a bare metal surface.
- Do not install or make connections when circuits or track are powered.
- Insulate all exposed connections, preferably with heat shrink tubing.
- Prevent contact between your Speedometer and other wiring.
- Read through the rest of these instructions before beginning.
- Visit [www.bouldercreekengineering.com](http://www.bouldercreekengineering.com) for additional information.

## 1. Installation Instructions

Figure 1 shows the **HotShot™ Speedometer** faceplate.

1. Select the location for your Speedometer. If you are using the included Photo Sensors, well-lit locations are best. Sensors can be up to 50 feet away from the Faceplate/Circuit Assembly.

You will need a 3" by 3" space on your fascia for the Faceplate/Circuit Assembly, with at least 2" clearance behind it to access Speedometer control switches.

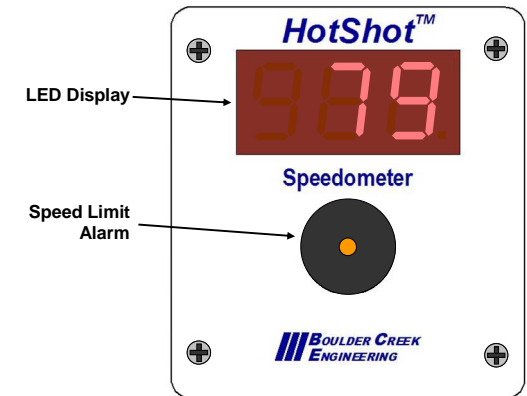


Figure 1: Speedometer Faceplate

2. Use the included Fascia Template to mark the screw and display holes on your fascia. The template shows clearance holes for No. 4 machine screws – smaller holes (or none at all) are needed for wood screws.
3. Cut out the display hole; drill the screw holes if needed.
4. Remove protective plastic wrap from Faceplate.
5. Mount the Speedometer Faceplate/Circuit Assembly to your fascia with No. 4 pan-head screws (not included).
6. You can install the Sensors from 20 to 255 scale feet apart. (Longer distances are more accurate, but give engineers a chance to “throttle back” to avoid a speed violation.)

If you do not have a scale ruler, you can measure actual distance and multiply by the ratio for your model railroad scale shown in Table 1. For example, 12 inches between sensors is 87 feet in HO scale.

1. SCALE RATIOS	
Scale	Ratio
O	48
S	64
HO	87
N	160

**If you are using meters & KPH:** Install your Sensors from 4 to 48 scale meters apart. Measure the scale distance between Sensors and multiply by 5.28. This is the number you will enter as the distance between Sensors in **Section 5: Setting Sensor Separation Distance**.

If you will use your **HotShot™ Speedometer** with normal room lighting, install the two included Photo Sensors between the rails of your track as described in this section. Skip to **Step 6** below.

If you will use your **HotShot™ Speedometer** in dim lighting or complete darkness, you will need to install two **NightScope™ Infrared Detectors** (sold separately) instead of Photo Sensors between the rails of your track.

Visit [www.bouldercreekengineering.com](http://www.bouldercreekengineering.com) to purchase two “Instant Response” Infrared Detectors and follow the installation instructions. After installing the Detectors, skip to **Section 2: Wiring Instructions**.

7. Continue with Photo Sensor Installation: Power down your track.

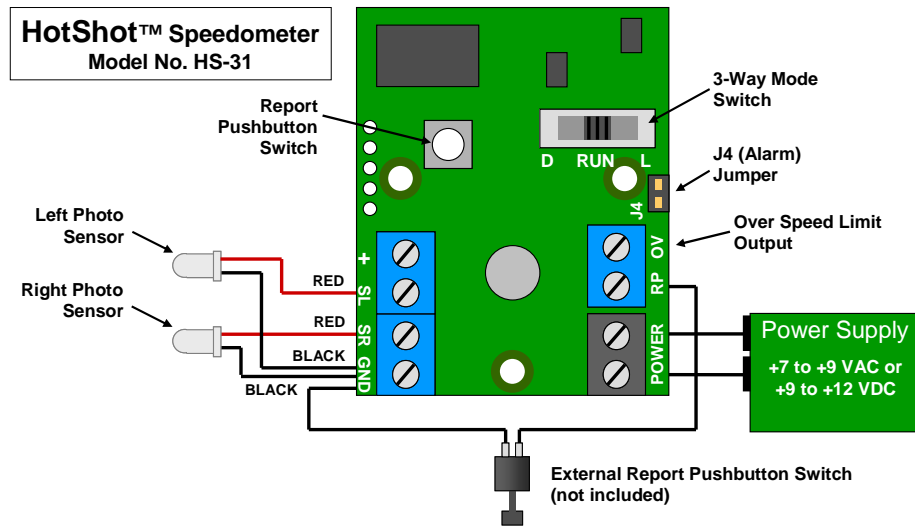
**Warning: Installing while track is powered will damage the Sensors.**

- 8. Drill a 5/32” hole in the middle of the roadbed between the rails for each Photo Sensor. Remove ties from the track if necessary to clear the hole.
- 9. Insert each Photo Sensor into its hole from above, beginning by passing its wires through the hole. Gently squeeze the insulated Photo Sensor leads together to fit the hole. Enlarge the hole slightly if the fit is too tight for the Photo Sensor body.
- 10. Align the top of the Photo Sensor with the top of the hole in the roadbed.
- 11. If lighting is too bright, pull the Photo Sensor deeper into the roadbed. (Solves Error E1 as described in **Section 4**.)

**Important: Do not glue Sensors in place until you complete Section 4.**

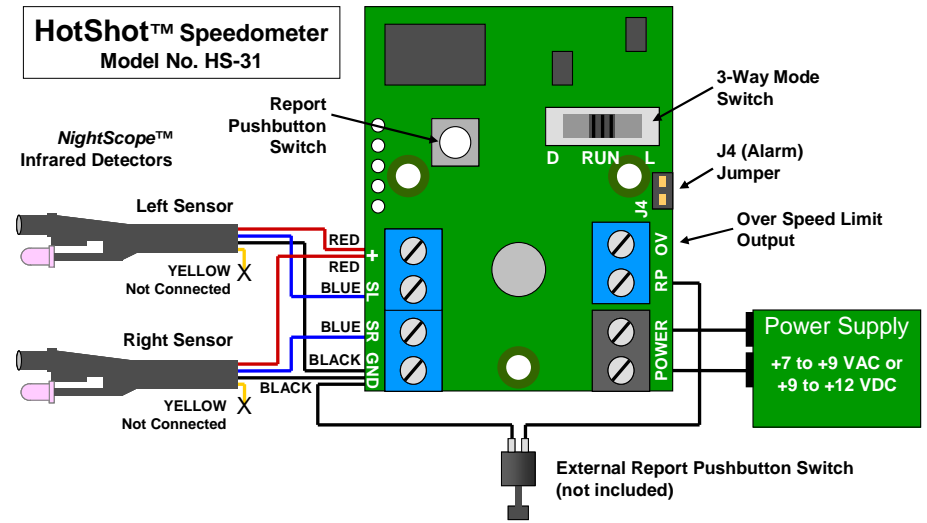
## 2. Wiring Instructions

**Figure 2** shows how to wire your **HotShot™ Speedometer** with the included Photo Sensors, along with key features on the circuit board.



**Figure 2: Circuit Board & Photo Sensor Wiring Diagram**

**Figure 3** shows how to wire your **HotShot™ Speedometer** with optional **NightScope™ Infrared Detectors** (sold separately – see Step 5 in **Section 1: Installation Instructions**).



**Figure 3: Circuit Board & Infrared Detector Wiring Diagram**

1. Connect two wires from your power supply to the Speedometer power terminals as shown in **Figure 2**. Polarity does not matter. The power supply must be 7 to 9 Volts AC or 9 to 12 Volts DC, with **100 mA** (or greater) capacity (**150 mA if you are using Infrared Detectors**). Radio Shack sells an AC adapter (#273-314) that works well.

**Warning: Do not exceed 9 Volts AC or 12 Volts DC as this will damage the circuit board.**

2. Connect the RED and BLACK wires from the Photo Sensors as shown in **Figure 2**. If you are using Infrared Detectors instead of Photo Sensors, connect their RED, BLUE, and BLACK wires as shown in **Figure 3**.
3. To disconnect the speed limit Alarm, **remove Jumper J4**. Slip the jumper over just one of the gold pins for safe keeping.
4. When pressed, the onboard **Report** Switch triggers display of the last train’s speed, train count for the session (since power up), high and average speed for the session, and the all time high speed record. If you plan to view reports often, we recommend an external Report Pushbutton Switch (n. o. type – not included) for convenience. Connect it as shown in **Figures 2** and **3** and mount it for easy access.

5. The Speedometer connects the **Over Speed Limit** output to Ground (GND) when a speeding train is detected. You can connect other electronics to this output. For more information, please visit [www.bouldercreekengineering.com/manuals.php](http://www.bouldercreekengineering.com/manuals.php).

**Warning: Output loads over 200 mA will damage the circuit board.**

### 3. Testing Your Installation

1. Check that both Sensors are uncovered.
2. Set the 3-Way Mode Switch to **RUN** (middle position). See **Figure 2**.
3. Apply power to your **HotShot™ Speedometer**.

If the middle decimal point on the LED Display flashes once every four seconds, your power and sensor wiring is correct. If you are using Photo Sensors, they are properly lit. **Congratulations**, your Speedometer is now operational! (Please go to **Section 4**.)

If the left digit on the LED Display shows an “o” bouncing up and down, the Left Sensor is not receiving enough light or is improperly connected.

If the right digit on the LED Display shows an “o” bouncing up and down, the Right Sensor is dimly lit or improperly connected. Check its wiring.

Photo Sensors need enough light to work properly – the Speedometer adjusts for some lighting problems – follow the procedure in **Section 4**.

If the Display is blank and the middle decimal point does not flash, check your power wiring.

### 4. Auto-Adjustment for Best Sensor Performance

**Important: Adjust your Speedometer for your lighting with these steps.**

1. Check that both Sensors are uncovered.
2. Set the 3-Way Mode Switch to **RUN** (middle position). See **Figure 2**.
3. Press and release the Report Pushbutton **4 times**. All three decimal points will light when the Report Pushbutton is pressed.
4. The Alarm will sound (if connected) and the Display will show “**Adj**”.
5. Press and release the Report Pushbutton; “**oPn**” (Open) will display.
6. Set the lighting on the Sensors to its normal operating level, including shadows typically cast by nearby operators.
7. Press and release the Report Pushbutton; “**cAr**” (Car) will display.
8. Place a rail car over both Sensors.
9. Press and release the Report Pushbutton.
10. If successful, “**LEv**” (the “v” will look like a “u”) will display briefly, followed by the Light Level number.
11. If adjustment fails, an Error Code as shown in Table 2 will be displayed. Adjust the lighting level and repeat starting with **Step 1**.

2. ADJUSTMENT ERRORS	
Display	Meaning
<b>E 0</b>	Light is too dim.
<b>E 1</b>	Light is too bright.
<b>E 2</b>	Contrast (light levels between Open and Car) is too small.

### 5. Setting Sensor Separation Distance

For accuracy, you must set the distance in scale feet between the Sensors using the 3-Way Mode Switch (see **Figure 2**) as follows:

1. The Mode Switch is normally kept in the **RUN** position.
2. Slide the Mode Switch to the **D** position:  
The Display counts up from 20 until the Mode Switch is set to **RUN**.
3. When the desired distance is reached, slide the Mode Switch to **RUN**:  
The last displayed distance will be the new Sensor Separation Distance.
4. The Speedometer displays its settings to confirm the selection: Speed Limit (labeled “**Lin**”), Distance (**diS**), and Light Level (**LEv**).

### 6. Setting the Speed Limit

1. The Mode Switch is normally kept in the **RUN** position.
2. Slide the Mode Switch to the **L** position:  
The Display counts up from 0 until the Mode Switch is set to **RUN**.
3. When the desired speed limit is reached, slide the Mode Switch to **RUN**:  
The last displayed limit will be the new Speed Limit.
4. The Speedometer displays its settings to confirm the selection: Speed Limit (labeled “**Lin**”), Distance (**diS**), and Light Level (**LEv**).

### 7. Operation

With the 3-Way Mode Switch set to **RUN** (see **Figure 2**), your **HotShot™ Speedometer** is ready for a train. The middle decimal point on the LED Display flashes once every four seconds while it waits.

(If the left or right digit displays a bouncing “o”, see **Section 3, Step 3**.)

The Speedometer performs as follows:

1. A passing train triggers a Sensor. The middle decimal point turns off and stays off. The left decimal point turns on if the Left Sensor triggered. The right decimal point turns on if the Right Sensor triggered.
2. When the passing train triggers the second Sensor, decimal points turn off and the LED Display shows the scale speed of the train.
3. The Display occasionally shows slight instability when displaying train speed. The final displayed speed is the true scale speed of the train.
4. If the passing train is slower than 3 MPH, the Display will show “**SLo**”.
5. If train speed is over the speed limit, the LED Display flashes the speed. The Alarm sounds if it is connected. The **Over Speed Limit** output is connected to Ground (**GND**). See **Section 2, Steps 3 and 5**.

- Four seconds after the train passes, the LED Display blanks, Alarm stops, the **Over Speed Limit** output is disconnected from Ground (**GND**) and the middle decimal point begins flashing every four seconds.
- Cycle 1 – 6 repeats with the next passing train.

**Note: Speeds faster than 400 MPH are assumed to be due to room lights turning off and are ignored.**

## 8. Reports

With the Mode Switch set to **RUN**, press and release the Report Pushbutton to start reports on the LED Display. All three decimal points will light when the Report Pushbutton is pressed.

Press and release one time and after a pause, the LED Display will show Speed Reports in the sequence and with Labels as shown in Table 3. (A Session begins at power up.)

3. SPEED REPORTS (Press Once)	
Label	Following Information
<b>LAS</b>	Speed of Last Train
<b>STn</b>	Session Train Count
<b>SHi</b>	Session High Speed Record
<b>SAv</b>	Session Average Speed
<b>LHi</b>	Lifetime High Speed Record

Press and release two times and after a pause, the Display will show Settings as in Table 4.

4. SETTINGS (Press Twice)	
Label	Following Information
<b>Lin</b>	Speed Limit
<b>diS</b>	Sensor Separation Distance
<b>LEv</b>	Light Level

Note the rough Label letters with the LED Display: “n” is used for “m”, “u” for “v”, and part of “T” is missing.

**Warning: Pressing four times begins Sensor Adjustment (Section 4).**

## 9. Resetting Lifetime & Session Speed Records

- With the Mode Switch set to **RUN**, press and hold the Report Pushbutton to reset the Lifetime and Session High Speed Records back to zero.
- After two seconds, the LED Display will show “rST”. The Alarm will sound if it is connected. See **Section 2, Step 3**.
- Continue to hold, and after four more seconds, the records will reset. Releasing early leaves the records unchanged.
- The Alarm will stop if it is on. The Lifetime High Speed Record (“LHi”) will display as zero.
- The LED Display will blank.
- Release the Report Pushbutton.

## Support & Service

If you have problems with your **HotShot™ Speedometer**, please consult our website [www.bouldercreekengineering.com](http://www.bouldercreekengineering.com). If you need additional help, please contact us at [support@bouldercreekengineering.com](mailto:support@bouldercreekengineering.com).

Your Speedometer can be repaired with a charge for parts and labor. Please contact [support@bouldercreekengineering.com](mailto:support@bouldercreekengineering.com) for a cost estimate on non-warranty repairs before sending product to us.

## Limited Warranty

Boulder Creek Engineering, LLC warrants its products to be free of defects in materials and workmanship for a period of **one (1) year** from the purchase date. Defective product received by Boulder Creek Engineering during the warranty period will be repaired or replaced at our option. You must pay shipping to and from Boulder Creek Engineering.

This warranty does not cover damage resulting from negligent installation, improper operation, or unauthorized repair or modification. Removal of the heat shrink voids this warranty. Boulder Creek Engineering makes no other warranty of any kind, expressed or implied. In no event shall Boulder Creek Engineering be liable for incidental or consequential damages.

For warranty service, please contact Boulder Creek Engineering for a Return Merchandise Authorization (RMA) number. Product must be shipped to Boulder Creek Engineering with dated proof of purchase (your receipt).



2525 Arapahoe Ave.  
Suite E4-605  
Boulder, CO 80302

(303) 443-5784  
[support@bouldercreekengineering.com](mailto:support@bouldercreekengineering.com)

Please visit [www.bouldercreekengineering.com](http://www.bouldercreekengineering.com) to see all of our Model Railroad products:

- **TrainBoss™** Talking Defect Detectors
- **WeighStation™** Track Scales
- **BrassHat™** Recordable Sound Modules
- **BrassHat™** Announcers
- **HotShot™** Speedometers
- **NightScope™** Infrared Detectors



(Photo courtesy of John Parker)