



Model TrainTM TECHNOLOGY

Speed StickTM

OPERATIONS MANUAL

Version 4.1



Blue display



White display



Yellow display

INTRODUCTION

The Model Train Technology™ **Speed Stick**™ is a portable and highly accurate speed measuring device for model trains from Z to G gauge plus five common European scales. It is small enough to sit on the side of the track and comes with a built-in 500mAh rechargeable lithium battery. The **Speed Stick** can be run on the battery or can be plugged into a USB-C cable to run on any 5V phone charger. There are no batteries to replace.

The Speed Stick uses our **Precision Detector** technology which is extremely fast and is precise to 1mm. The default maximum range is 150mm (5.9"), and you can set the active detection range anywhere from 10mm to 150mm using the built-in SET RANGE function.

We do not use reflective IR sensing. As a result, the Speed Stick is immune to changes in ambient light conditions. It will work outdoors and in a completely darkened room. Our SET RANGE function (see Auto-Ranging section below) lets you shorten the detection distance so the unit ignores objects on the far side of the track.

The primary use is to measure the speed of a passing train. The **Speed Stick** automatically detects the train direction. At the push of a button the readout can display MPH (Miles Per Hour) or KPH (Kilometers Per Hour).

The display can also be switched to show “raw” milliseconds.

A secondary mode is called “LOOP”. In LOOP mode you can precisely measure the time it takes for the train to complete a loop around your layout and back to the Speed Stick. The display will show Minutes, Seconds and 100ths/second in the format (59:59:99). The maximum time is 59 minutes — you would need a very large layout with a very slow train to reach that limit, unless the train stopped somewhere. By using our online widget you can calculate the scale DISTANCE of your layout track.

There are three color options for the display: Yellow, Blue and White. The display is a 128×32 OLED display. There isn't a backlight, but the display is very easy to read even though it is relatively small.

The ***SPEED STICK*** is our easiest to use product. While there may be an adequate charge on the lithium battery when you receive the unit, you will want to charge it before use. Use the included USB-C to USB cable and plug it into the supplied USB charger. The plug of the Speed Stick can go in either side up.

CHARGING THE SPEED STICK

The power switch should be to the OFF (Left) position. When you plug in the USB cable with power OFF, the green light will light. This indicates that the SPEED STICK is charging. The

green light will go out automatically when the battery is fully charged. Fresh from the charger, the **SPEED STICK** will last about 12 hours of continuous active use, 2–3 days in typical intermittent use, and about 5 days if left powered on and untouched (IDLE mode does most of the work).

Expected battery life from a full charge:

Usage Pattern	Approx. Battery Life
Continuous active measurement	~12 hours
Intermittent use (a few reads / hour)	~2–3 days
Left powered ON, idle and untouched	~5 days
Power switch OFF (on the shelf)	Many months*

** Limited primarily by the lithium cell's natural self-discharge (~1–2% per month). For storage longer than 6 months, charge to about half-full before switching off.*

Place the two “feet” into the bottom of the **SPEED STICK**. They are held pushing in and twisting. A set of spacers is included if you need to raise the **SPEED STICK** further. You can remove the feet altogether if you want.

The USB socket is strategically placed at the bottom of the **SPEED STICK**. This allows you to feed the USB cord up through a small hole in your layout to provide constant power.

SETUP & OPERATION

The **SPEED STICK** comes preconfigured to measure HO speed in MPH. Simply place the SPEED STICK parallel to the track you want to use, with the display facing you. Turn the power on (switch it to the right), and the unit will go through its startup steps:

- Blue LED lights.
- Display shows our logo.
- Blue LED flashes 4 times (sensors started and operational).
- Version number displayed.
- Battery level displayed.
- Range displayed (e.g. "RANGE:150mm"). Default = 150mm.
- Scale to be used: "HO: 87".
- Mode: (SPEED, TIME, LOOP).
- Ready...

To test the unit, place your hand in front of one of the sensors and then move it away. Immediately, the blue LED will light, and an arrow will show the direction of travel. Place your hand in front of the sensor at the other end of the stick (where the arrow is pointing) and the display will show you what the speed would be if the train had tripped the sensors. The blue LED will go off indicating it is ready for the next speed reading.

You can start at either end of the **SPEED STICK**, and it will figure out which way the train is going.

If you want to change the scale, use the chart on the SPEED STICK OPTIONS page and press the SELECT button the number of times indicated. The blue LED will flash with each successful press. You should see the updated scale displayed. If it's not right, just try again.

To change between MPH and KPH, push the SELECT button once. The word "SELECT" displays. Then press the button once. The new measurement scale will be displayed. This is a toggle — selecting this option again will change the scale back to MPH.

OBSERVATIONS

The internal precision of the SPEED STICK is milliseconds — that is, 1/1000th of a second. As a result of this level of precision, you will notice that even in the short distance of 180mm (the distance between sensors) the time, and thus the speed of the train, will vary even if you don't change the throttle. This is a result of (at least) variation in the quality of the engine, motor temperature, friction, humidity and how clean the gears of the train are. Your results may vary.

From a practical point of view, measuring MPH/KPH to one decimal is usually enough accuracy. An alternative is to set the display to show you the actual time in milliseconds. You may not care what the scale MPH is, but if you are speed-matching two engines the millisecond approach will give you more

precision. That said, it may be too much precision for the variation of the motor speeds. Experiment to find what works best for you.

Lastly, the sensors and our technology are so fast that they can see the gap between cars. Therefore, we added a system that makes sure that all cars of the train have passed before a new reading can take place. You will see the LED dim when the speed is captured and then go off when it's ready for another speed measurement.

RUNNING IN MILLISECOND MODE

To measure the speed of the train in millisecond display mode, enter SELECT mode by pressing the button once. The word "SELECT" will appear. Then press the SELECT button 2 times. This is a toggle — pressing the button again 2 times will change the unit back to MPH or KPH, depending on your previous setting.

LOOP MODE

Loop Mode records the time that the train takes to make one loop of your layout, whatever route that might take. In this mode the **SPEED STICK** uses only one of the sensors at a time.

Loop mode can get a little confusing at first because we can track and display repeated loops starting at the same spot. That means that after the first loop, when the train is detected by the sensor, that time is both the Finish time for the first loop and simultaneously the start time for the next loop. We also must keep track of when the train — its entire length — has exited the **SPEED STICK** sensor. We use that to set the trigger for when the train comes back around to the same start/finish point. And finally, we must be able to do this in EITHER direction. However, once a train is making a loop, the **SPEED STICK** assumes that the train will come back in the same direction. It WILL work if you reverse loop, but the directional arrow will be backward. Further, the design goal was to compare repeat travel time on a fixed route. While it will be fun to watch reverse-loop timings, it probably won't provide much useful information for speed calibration.

Before we describe the entire sequence, you should note that the LOOP mode and associated timers can be RESET by selecting LOOP mode again.

While in LOOP mode, press the SELECT button once. The word “SELECT” will appear in the display. Then press the button three times. This will reset the **SPEED STICK** LOOP mode and get it ready to start another looping sequence. This works best if a train (or your finger) is not in front of the sensors. An alternate approach is to simply turn the power off with the train away from the **SPEED STICK**. The unit will start up normally and will have remembered that it is in LOOP mode. Then, the loop sequence can start from either direction.

Selecting either Speed mode (1) or Time mode (2) will cause the **SPEED STICK** to exit LOOP mode.

LOOP SEQUENCE

With the SPEED STICK ready, a train may enter the detection zone from either direction. When the first sensor is tripped, the active sensor and direction of travel are set, the lap timer starts, and the blue LED lights solid. The directional arrow is shown for 3 seconds, after which a running MM:SS:hs timer takes over the display and updates twice per second.

When the train returns and trips the sensor again, the timer freezes on the display showing the completed lap time. The next lap timer starts in the background at that same moment. The frozen lap time stays on the screen for 10 seconds before the running timer for the next lap appears.

The cycle repeats for each lap until you stop the train, reset LOOP mode, or change to a different mode. If no lap completes

within 60 minutes, the display shows “Too slow!” and LOOP returns to ready for a fresh start.

IDLE mode does NOT engage while a lap is actively being timed (LOOP mode past the first sensor trip). It will only engage while LOOP mode is waiting for the first trip.

AUTO-RANGING

By default, the SPEED STICK is set to its maximum range of 150mm (5.9"). This may cause it to “see” objects on the other side of the track instead of just the train. The SET RANGE function lets you dial in a shorter, more selective detection distance anywhere from 10mm to 150mm, based on the exact geometry of your layout. The setting is stored in memory and survives a power cycle. An internal 6mm compensation for the recessed sensor window is applied automatically, so the range you set is the actual distance from the case face of the SPEED STICK to your target.

TO USE SET RANGE

- Place the SPEED STICK approximately where you want it on the layout.
- Place a train car (or any target object) on the track in front of the RIGHT-HAND sensor, at the distance you want to set as the new range.

- Press the SELECT button once. The word “SELECT” appears on the display.
- Continue holding the button. Nothing visibly changes for the first 2 seconds — this is intentional, so a normal short press still advances the menu.
- After 2 seconds a countdown appears: 5 Sec... → 4 Sec... → 3 Sec... → 2 Sec... → 1 Sec... → RELEASE.
- Release the button when RELEASE appears. The SETTINGS menu opens on “SET RANGE”. Hold the button again through the short 3-second countdown to start — three quick blue blinks confirm and the display shows “Ranging..”.
- The blue LED blinks slowly 12 times — this is your positioning window (about 10 seconds). Keep the target steady in front of the right-hand sensor.
- When the slow blinks finish, the SPEED STICK captures the measurement automatically.
- The blue LED flashes rapidly 10 times — the new range has been captured and saved to memory.
- The new range is shown on the display for 2 seconds, for example “RANGE:85mm”.
- The SPEED STICK waits until both sensors report clear, then returns to “Ready...”. No power cycle is needed — the new range takes effect immediately.

To back out without changing anything, release before RELEASE appears in the countdown, or just leave the SETTINGS menu untouched — it returns to “Ready...” after 10 seconds. Note: if you run SET RANGE with no target in front of the sensor, the range resets to the 150mm default.

SLEEP MODE

To extend battery life, the SPEED STICK will enter SLEEP mode after 60 minutes of inactivity (no sensor detections, no button presses). In IDLE mode:

- The display turns off completely.
- The sensors power down.
- The blue LED gently pulses — slowly brightening and dimming on a 2-second cycle — to let you know the unit is still on and in IDLE mode.
- Battery draw drops from about 45 mA to roughly 4 mA — that's the difference between about 12 hours of runtime and over 5 days on a single charge.

SLEEP MODE WAKE UP

To WAKE UP the unit, Press the SELECT button once. The MTT logo appears on the display for 3 seconds — this gives you time to place the SPEED STICK back on the track and let it settle without the sensors catching any motion from your hands. After the 3 seconds the unit returns to “Ready...” and is ready to measure.

The first button press after IDLE mode is consumed by the wake sequence — it will NOT open the SELECT menu. To enter the menu after waking, press the button a second time once “Ready...” appears.

IDLE mode will resume automatically after another 60 minutes of inactivity. You can also just turn the power switch OFF if the unit will sit unused for an extended time.

SETTING SLEEP MODE

IDLE mode is controlled by the SLEEP setting, which is ON by default. To turn it off — so the unit stays fully powered until the battery runs down — open the SETTINGS menu: press SELECT once so “SELECT” shows, hold through the countdown and release. Tap SELECT to step to “Sleep”, then hold to toggle it (three blue blinks and “OK” confirm). The setting is remembered across power cycles.

If you do leave the unit powered on for longer than the battery lasts, the built-in charger circuit will automatically shut the unit off when the battery gets low, protecting the cell from damage. Plug in the USB cable to recharge and it will boot normally.

RESET

To reset the Speed Stick back to factory defaults:

- Turn power OFF.
- Hold the SELECT button WHILE turning power on.
- Continue to hold the button until the word RESET appears.
- Release the button.

To enter SELECT mode, press the button ONCE. The word SELECT will appear. Then press the button the number of times indicated in the left-hand column of the SPEED STICK OPTIONS chart. The display will indicate your selection.

SPEED STICK OPTIONS

#	Option	Setting
1	MPH or Km/h	Toggle
2	Millisecond Mode	Toggle
3	LOOP mode	Toggle
4	Z Scale	1:220
5	N Scale	1:160
6	HO Scale	1:87
7	S Scale	1:64
8	O Scale	1:48
9	G Scale	1:22.5
10	N Scale (UK)	148
11	TT Scale (Europe)	120
12	OO Scale (UK)	76
13	OK O Scale (UK)	45
14	OE O Scale (Europe)	43.5

This chart is also used with the SELECT button to switch modes and scales during normal operation.

ELECTRONICS & 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.

WARRANTY

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 from 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, CONSEQUENTIAL, SPECIAL OR EXEMPLARY DAMAGES ARISING 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 POSSIBILITY 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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Version 4.1

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