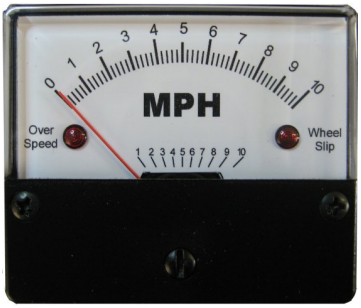
Magpie
Computer Developments
Ltd

www.magpiecd.com

Speedometer

for Model Locomotives and other vehicles



Standard Features:

- Indicates Actual Speed up to 10 MPH
- Quality Moving-Coil Meter – 70 mm x 60 mm
- Works from magnetic Wheel Sensor (supplied)
- Multi-function configuration button
- Easy entry / display of Wheel diameter
- Adjustable Over-Speed Indicator – illuminates when pre-set speed is exceeded
- Odometer Function (up to 99.99 miles recorded)
- Accommodates Wheel diameters from 1 to 9.999”
- Can be run from a 9V PP3 / MN1604 / 6LR61 battery – run it from your Driving Truck wheels – useful for Steam Locos

Alternative Options

- Odometer recording up to 999.9 miles
- Wheel diameters from 10 to 99.99”

Extra Cost Options

- Wheel-slip Indication Function (requires additional Sensor)
- Relay that closes when speed is above Over-Speed Setting, or
- Relay that closes when vehicle is moving
- Other calibrations or Metric Scales – ask for details

Description

(Standard features, with scale as shown on front page)

The speedometer needle indicates the actual speed of the vehicle in Miles per Hour. There are two indicators mounted in the meter fascia, labelled OverSpeed and WheelSlip. The OverSpeed Indicator will light when the vehicle exceeds a pre-set speed. The default setting is 6 MPH. See page 6 for information on how to change this setting.

If **WheelSlip indication** is required, then two sensors will be necessary. The Speed sensor should be mounted by a non-powered wheel (the Speed Wheel), and the Slip sensor by a powered wheel. (the Slip Wheel). The WheelSlip Indicator will light when the speed of the Slip Wheel exceeds that of the Speed Wheel by 10% or more. By default, the slip-wheel diameter is the same as the Speed wheel diameter, but this can be changed using Menu Option 6. If you don't want Wheel Slip indication, simply omit the Slip sensor.

The two indicators are also used to assist in configuring the various settings required by the speedometer. These settings are made by using the Set-up push-button. The settings that can be made are:

Set the Speed Wheel diameter.
Display the Speed Wheel diameter
Change the OverSpeed limit.
Display the Odometer Reading
Reset the Odometer
Set the Slip Wheel diameter
Display the Slip Wheel diameter

The Set-up push-button should be mounted in a convenient location. However, the only setting that MUST be made is the wheel diameter. The speedometer is supplied without a diameter setting, and will not operate until this has been set. If you don't wish to use / change any of the other settings, then you don't need to mount the button, as the wheel diameter can be set before the speedometer is fixed in place.

The Odometer is an internal meter that records the total distance travelled, up to 99.99 Miles, after which it rolls over to 0. It can be displayed and / or reset from the set-up menu whenever the loco is stationary.

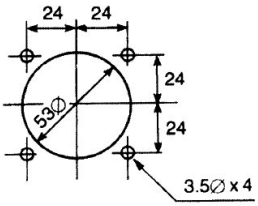
Installation

What's in the Box?

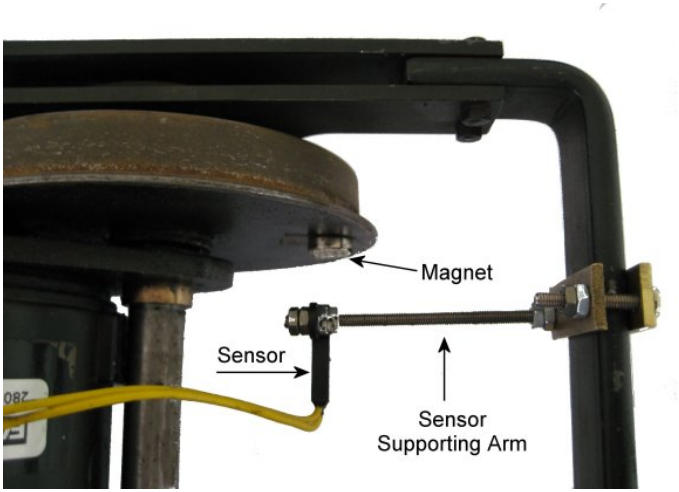
1. Speedometer
2. Speedometer fixing nuts & washers
3. Wiring Connectors
4. Sensor
5. Magnet (on double-sided sticky tape)
6. Set-up Push Button

Speedometer mounting

Cut holes to mount the speedometer as shown below.



Mounting the Sensor(s) and Magnet(s)



Mounting the Sensor(s) and Magnet(s) (cont)

The sensor needs to be mounted such that it is somewhere between 0.25 and 0.5 inches (6-12 mm) away from the magnet.
The mounting system needs to incorporate a way of adjusting the sensor relative to the magnet.
Be wary of placing the sensor too close to motors or other sources of magnetic fields.

The picture on page 3 shows a typical arrangement. The Supporting Arm is a length of M3 studding, secured to the Bogie Frame by a clamp. The sensor is locked to the Supporting Arm using a pair of M3 nuts on either side of the sensor mounting hole. In this example, the sensor is mounted end-on to the magnet; however it can be mounted side-on if this is more convenient for your situation.
The clamp can be used to move the sensor closer to, or further away from, the magnet.
The locknuts that locate the sensor on the Supporting Arm are used to position the sensor on the same circumference as the centre of the magnet. Neither of these positions are critical, as long as the speedometer shows a stable display when running, that's all that matters.
If the sensor / magnet position needs to be adjusted, the speedometer needle will have tendency to occasionally 'flick' one way or the other when running at a constant speed. This might be caused by any of the following:

1. Suspension movement changing the relative positions of magnet and sensor.
2. Influence of other magnetic fields, e.g. motor.
3. Influence of motor current caused by motor wiring and sensor leads being too close.

If any instability symptoms are evident, then adjust the sensor in one axis. If the symptom gets worse, re-adjust in the other direction. If it doesn't change, then put it back to where it was, and try another axis adjustment.

Mounting the magnets on the Wheels

The operating magnet is placed at the desired position on the wheel as follows:

A) Clean the wheel face, removing all traces of oil, etc.

B) Place a piece of double-sided sticky tape on the wheel.

C) Stick the magnet on the tape. The magnet will grip the wheel through the tape, sticking itself firmly in place.

Wiring Connections

The following connections need to be made to the Speedo.

POWER

Terminal 1. Positive (7-30V DC)

Terminal 2. Negative (0V DC)

The unit is protected against damage from accidental reverse-connection – it simply won't operate.

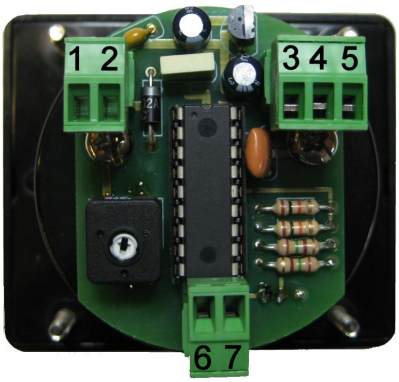
SENSOR(S)

Terminals 3 & 4. Speed Sensor (polarity is unimportant)

Terminals 4 & 5. Optional Slip Sensor (polarity is unimportant)

Set-up push-button

Terminals 6 & 7. Set-up push-button (polarity is unimportant)



Whenever power is applied to the unit, the meter needle will swing to 10 with the WheelSlip Indicator on, and back to zero with the OverSpeed Indicator on. This is so you can observe that everything's working.

Whenever the vehicle has been stationary for about 45-50 seconds, the unit will enter a low-power 'sleep' mode. This is indicated by both Indicators coming 'ON' simultaneously, then fading to OFF. It will automatically resume working when the vehicle again moves, or the set-up push-button is pressed.

Initial Power Up

The first time that power is applied, after the above indications, the OverSpeed and WheelSlip Indicators will flash alternately, as an indication that there is not a valid wheel diameter set in the unit. Push and release the set-up push-button, then proceed as for

'Setting the Wheel Diameter'.

Using the set-up push-button

The set-up push-button behaves differently depending upon whether the vehicle is moving or stationary. Press and release the button when *moving* to **set a new OverSpeed Limit.** The current speed will become the new OverSpeed Limit. It will remain at this value until it's changed again

When the vehicle is *stationary,* push and release the button to enter the **Set-up Main Menu**. When in Set-up, some options require you to enter one or more digits, each having a value of 0 to 9. To ***enter*** a digit, push and release the button the number of times corresponding to its value as follows:
Value = 0 – push TEN times.
Value = 1 – push ONCE.
Value = 2 – push TWICE
and so on.
The meter needle will display your progress (on the lower Horizontal scale) as you push the button as follows:
ONE push (value 1) – meter needle points to 1
TWO pushes (value 2) – meter needle points to 2
and so on.
There must not be a pause of more than 1 second between successive pushes. When you have finished entering a digit, release the button for a couple of seconds.

Some options ***display*** a digit's value. The meter needle will point to a number on the lower Horizontal Scale as follows:
Meter needle points to 10 – value is 0.
Meter needle points to 1 – value is 1.
Meter needle points to 2 – value is 2.
And so on.

Set-up Main Menu.

Push and release the button when *stationary.* The WheelSlip indicator will come ON, and the OverSpeed Indicator will flash continually. This means that the speedometer is asking which Menu Option you want.
Enter a digit whose value corresponds to the required Menu Option as listed below.
When an Option has completed successfully, the meter needle will return to zero, and both indicators will flash together ONCE to show that the speedometer is now back in normal operation

Setting the Speed Wheel Diameter – Option 1.

(Note – you will automatically come here on first Power-up, after pushing and releasing the button as described in **Initial Power Up**)

Measure the diameter of the wheel in INCHES to three decimal places (thou). Write this 4-digit number down without the decimal point. You are now going to enter the 4 digits one-at-a-time, from left-to-right.
On entry, the OverSpeed Indicator will flash ONCE continually – it is asking for the FIRST digit. Enter its value. When you've finished this digit, wait for about two seconds. The meter needle will return to zero, and the OverSpeed Indicator will flash TWICE repeatedly – it is asking for the SECOND digit. Enter the second digit's value and wait - the OverSpeed Indicate will flash THREE times. Enter the third digit and wait - the OverSpeed Indicator will flash continually. Enter the fourth digit and wait. That's it – done.
If you inadvertently enter a diameter of less than 1.000" the OverSpeed and WheelSlip Indicators will flash alternately, to indicate the error. Press and release the button – this returns you to the beginning of Option 1, when you can try again.

Displaying the Speed Wheel Diameter – Option 2

The OverSpeed Indicator will Flash ONCE continually, and the needle will display the value of the FIRST digit for a couple of seconds. The indicator will then flash TWICE continually, whilst the needle displays the second digit, and so on for the third and fourth digits.

Displaying the Odometer reading – Option 3

The 4 digits of the Odometer are displayed in the same manner as described for 'Displaying the Speed Wheel Diameter'. The 4-digits represent distance travelled in 1/100ths of miles.

Resetting the odometer – Option 4

The OverSpeed Indicator will flash ONCE continually – it is asking for confirmation. Enter a single digit of value 1 to Cancel, or 2 to Confirm reset.

Displaying the Over-Speed setting – Option 5

This function will move the needle to show the actual speed at which the OverSpeed indicator will come on.

Setting the Slip Wheel Diameter – Option 6

The procedure is identical to Option 1.

Displaying the Slip Wheel Diameter – Option 7

The procedure is identical to Option 2. If this diameter has not been explicitly set, then it will be the same as the Speed Wheel diameter.

NOTES

Document Revision	
10th Dec 2010	Rev D. Add sleep mode + Relay option (Serial number 227 & on)
2nd Jan 2009	Rev C. Add Horizontal Data Scale
5th Aug 2008	Rev B. Added menu options 5, 6 and 7
23rd Jul 2008	Rev A. Clarifications & corrections
14th Jul 2008	Initial Release