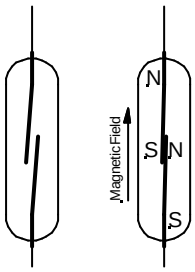
Using Magnet Operated Reed Switches



Introduction

A reed switch comprises two soft iron overlapping switch leaves, separated by a small gap, mounted within an evacuated or inert gas filled tubular glass envelope.

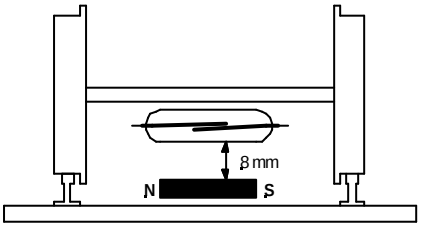
When subjected to a suitable magnetic field, the two switch leaves become magnetised with opposite magnetic polarity, and are attracted to each other, thus closing the switch. When the magnetic field is removed, the attracting force is removed and the switch opens.

The operating magnetic field may be generated either electrically, using a solenoid coil wrapped around the reed switch envelope, or by a suitably positioned permanent magnet.

For model railway operation, the reed switch will normally be mounted on the vehicle, operated by a track mounted permanent magnet. This ***Technical Note*** gives guidance on how to mount and wire reed switches and magnets to give reliable operation.

Magnet Positioning

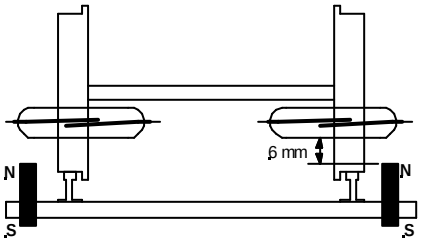
You can position reed switches and magnets in one of three ways to ensure that the switch operates reliably and without multiple switch closures as the switch passes over the magnet.



Method 1

Position the reed switch **across** the track, and mount the track magnet in line with the switch, immediately below it. For reed switches and magnets supplied by ***Timpdon Electronics***, reliable operation can be ensured at a spacing of 8 mm.

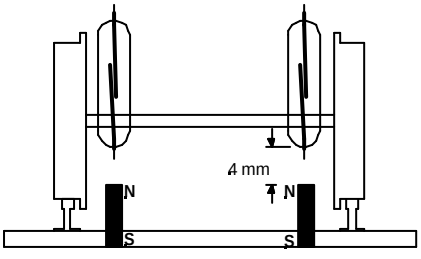
This mounting method will normally only be practicable only if you are using a single vehicle mounted reed switch, but is the preferred method in this case.



Method 2

Position the reed switch **across** the track, and mount the magnet vertically, positioned beneath the **outer end** of the switch. For reed switches and magnets supplied by ***Timpdon Electronics***, reliable operation can be ensured at a spacing of 6 mm.

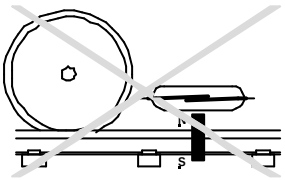
This mounting method will allow two separate reed switches to be used on a single vehicle, each operated independently by its own track magnet, but will normally require the magnets to be positioned outside the track gauge to ensure that only one switch is operated by each magnet.



Method 3

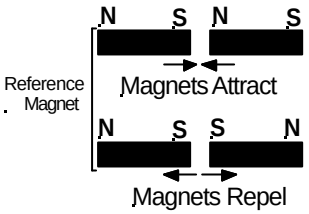
Position the reed switch **vertically**, and mount the magnet so that the upper end is adjacent to the lower end of the reed switch it. For reed switches and magnets supplied by ***Timpdon Electronics***, reliable operation can be ensured at a spacing of 4 mm.

This mounting method also permits two separate reed switches on a single vehicle and has the advantage that both the switches and magnets can usually be positioned within the track gauge. The disadvantage is that the reliable operating distance may be less than for **Method 2**.



Caution

Do not mount a reed switch in line with the direction of travel. In this orientation, as the switch passes a magnet, the switch may close and open **twice**.



Magnet Polarity

Ideally, all track magnets should be mounted with the same magnetic polarity. The actual polarity, **north** or **south**, does not matter, as long as it is the same. You can easily determine magnet polarity by using a reference magnet.

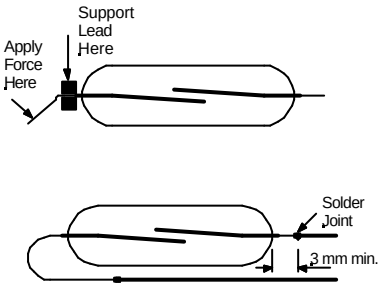
Forming Reed Switch Leads

For vehicle mounting, you may need to form the leads of a reed switch so that the connecting wires both exit on the same side.

When bending leads, take extreme care not to impose any stress on the seal where the lead enters the glass envelope. This is very fragile and the glass will almost certainly break if you stress it, completely wrecking the reed switch.

When bending switch leads, always support the lead with a pair of fine pliers at its exit from the glass envelope, and apply bending force only to the free end of the lead.

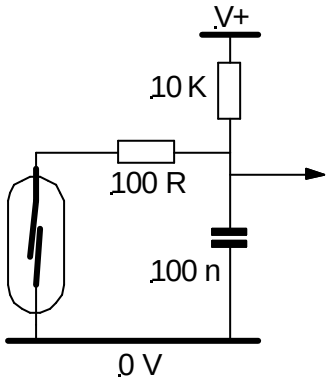
Do not solder connecting wires to switch leads closer than 3 mm to the glass envelope to avoid applying thermal stress which might fracture the glass seal.



Contact Welding

Because of the structure of a reed switch, its contacts are especially prone to contact welding on high inrush currents when the contact closes, even if these currents only last for a few milliseconds. This can cause significant problems, particularly if a contact bounce suppression capacitor is fitted directly across the switch contacts. You are recommended always to fit a small series resistor directly in series with the switch contact to limit the inrush current on closure. A minimum value of 100 ohms is recommended.

All ***Timpdon Electronics*** products which are designed for reed switch operation already have this protection built in.



Geoff Garside, B.Sc., C.Eng., MIET
Chief Engineer – ***Timpdon Electronics***