

## Train Tech overview - ask for free catalogue

**Signal kits** - OO/HO low cost easy to make signals for DC

**Sensor Signals** - easy automatic block signalling - DCC or DC

**Smart Lights** - small effects built in - DC/DCC - just 2 wires:  
Arc welding • Emergency vehicle • TV • Fire effect • Party disco

**Automatic Coach Lights** - motion - no pickups or wiring:  
Older Warm White • Modern Cool White • Tail Light • Spark Arc

**Automatic Tail Lights** - motion - easy, no wires - lantern LED:  
Flickering flame oil lamp • Modern Flashing • Constant light

**Track Tester** - quickly tests DC polarity or DCC - N-TT-HO-OO

**SFX+ Sound capsules** - no wires! - real trains - DC or DCC  
Steam • Diesel • DMU • Passenger coach • Shunted stock

**Buffer Light** - clip in lights for buffer stops - N or OO - DC/DCC

**LFX Lighting effects** - DC/DCC - screw terminals - with LEDs:  
Home & Shop lighting • Welding • Flashing Effects • Fire

**Traffic Lights** - fully assembled - just connect to DC or DCC

**Level Crossings** - assembled - N & OO versions - DC / DCC

**DCC fitted signals** - slide in the track - easy one touch setup:  
2 aspect • 3 aspect • 4 aspect • Dual head • Feathers • Theatre

**Smart Screen animated sign** - for Trains, Stations etc

**DCC Signal & Point Controllers**

**LEDs**

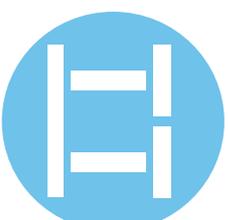
**Tools etc**



**COMPREHENSIVE CATALOGUE FREE ON REQUEST**

**[www.train-tech.com](http://www.train-tech.com)**

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# Train-Tech

Model Technology Made Easy

## ST10 Track Sensor Plus

- Sensor detects trains on OO/HO, TT and N track
- Automatic control of Crossings, Signals, Sounds
- Train detect & occupancy lights for Mimic panel
- Four control outputs for LEDs or relay control
- Built in LED to show power and Train Detection
- Compatible with analogue 12-16V DC and DCC
- Enhanced Track Sensor - directly replaces ST1
- Includes Sensor, white LED, instruction booklet

**[www.Train-Tech.com](http://www.Train-Tech.com)**

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**Please read carefully and always connect up with the power switched OFF!**

## Introduction

The ST10 Track Sensor *Plus* has a built-in infrared sensor to detect trains passing over it. It works with other Train-Tech Layout Link compatible products to control Level Crossings, Sensor Signals, Smart Screens, etc. This *Plus* version also has 4 control outputs to directly connect to and control non Layout Link products such as LEDs, solid state relays, computers etc. It can be powered by DCC or smooth DC and although chiefly designed for OO gauge track, the ST10 can also be used next to N, TT & HO gauge track.

**Layout Link Functions** - all of these items connect via a single wire to the Track Sensor Layout Link socket:

- Trigger LC10 Level Crossing lights and sounds when a train approaches
- Link to a Smart Screen to change the Arrival or Destination information as a train approaches the station
- Change a GS ground position shunt signal as a train approaches
- Trigger your own sounds at various parts of your layout using the Sound Track Sound recorder / player
- Link to a Sensor Signal to act as an unseen dummy signal or mark the end of a sensor signal block section
- Control a Dapol Semaphore signal automatically (via an SC300)

**Control outputs Functions** - The four low power LED control outputs offer the following functions:

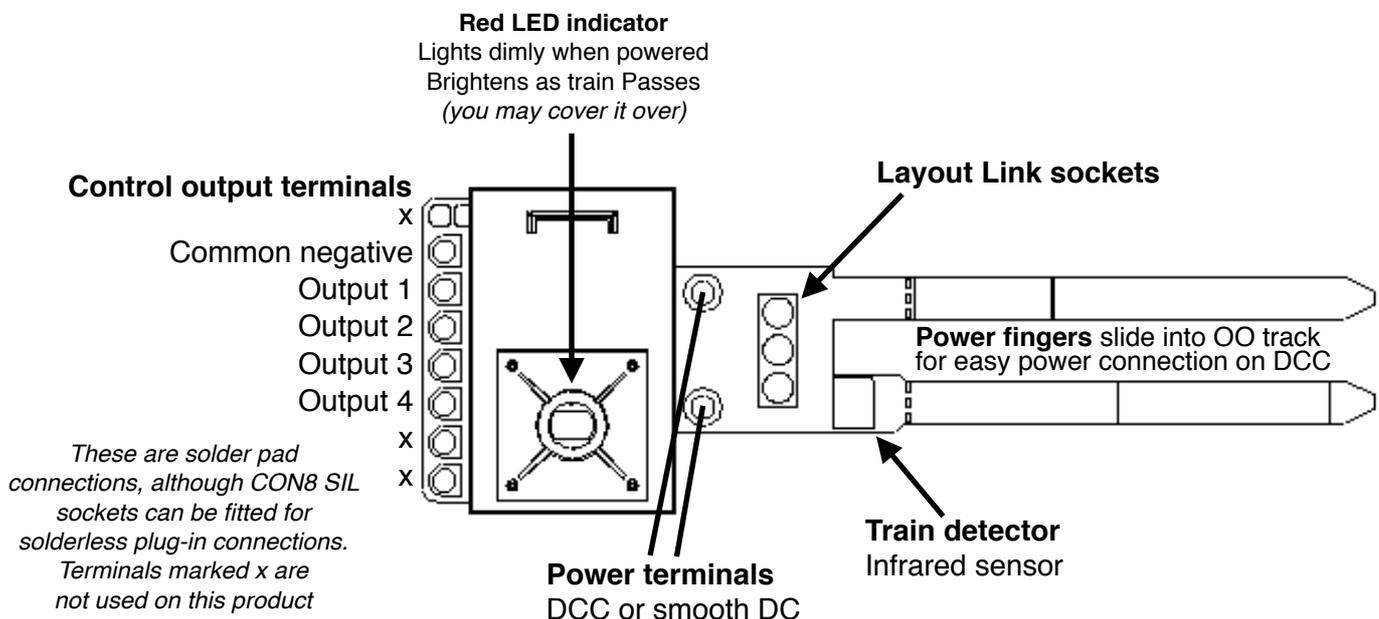
- **Output 1:** Comes on as Train passes over the sensor, stays on for a short time then switches off, unless linked to other Track Sensors or Sensor Signals in which case it stays on until train leaves the block section.
- **Output 2:** Flashes as the trains passes over the sensor then goes off unless connected to other Track Sensors or Sensor Signals in which case it stays on until train leaves the block section.
- **Output 3:** Quick random flashes as train passes to simulate electric sparks or photographer taking pictures
- **Output 4:** Comes on when one train passes over and then goes off when the next train passes

*All four outputs operate simultaneously and may all be used at the same time*

## ST10 Track Sensor *Plus* connections

The illustration below show the connections and functions of the ST10:

- It can be powered either from DCC or 12 to 16 volts *smooth* DC
- The 3 Layout Link SIL sockets fit single solid wire to link to other Layout Link products.
- The 4 control outputs are designed to be connected directly to LEDs (built in resistors for LEDs) and other low voltage low power devices including solid state relays (see page 6 and 7)



## • Powering the Track Sensor

**Switch off the power first!**

Choose an appropriate location for your Track Sensor, ideally not on a sharp bend because the optical sensor needs to 'see' the train above it. Then you are ready to connect power to the ST10.

## • Sliding the Track Sensor into OO track *suitable for DCC only*

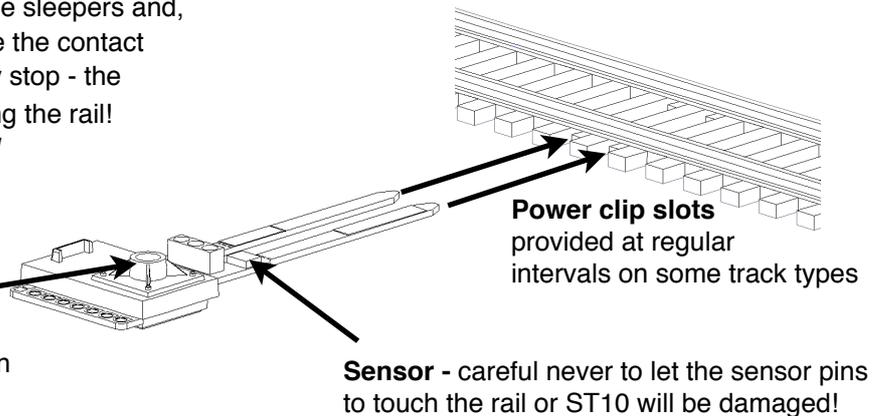
DCC layouts have power on the tracks all of the time and so the Track Sensor can take its power straight from the track by sliding contact fingers into the slots which some track has for power clips. **Note** this is only suitable for some OO track such as Hornby and Bachmann fixed track and a *very good connection* must be made at all times for reliable operation. Some Peco track also has slots but they are wider and will need a little packing to make a solid reliable connection. If in any doubt we recommend wiring power directly to the Track Sensor - see below.

To fit a Track Sensor into the track, find the power clip slots in the track between the rails and the sleepers and, holding the base, carefully align and slide the contact fingers into the slots all the way until they stop - the sensor should be close to but not touching the rail!

*This may be a tight fit so take great care!*

### Power indicator LED

Lights red to indicate the ST10 is powered and brightens when a train passes. The light may be covered with tape or blue tack etc if desired.



## • Wiring to the Track Sensor

*suitable for both DC and DCC*

If your layout is conventional DC or you have DCC but do not like the slide in fingers or do not have suitable OO gauge track with power clip slots as above, you can wire your Track Sensor to the layout power by cutting off the track fingers and soldering two wires - see below.

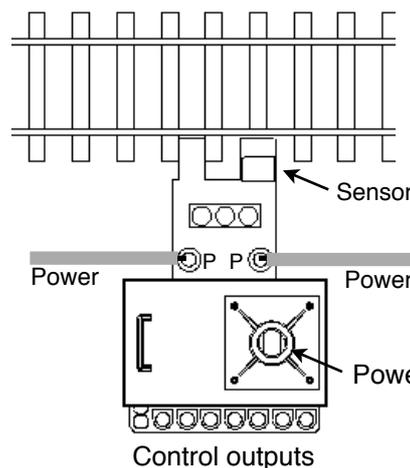
Track Sensors can be powered by DCC or smooth DC. They require a voltage of 12-16 Volts max & current of approx 0.05A each (*it should **not** be powered by an AC or unsmoothed DC supply*). Recommended supply for DC use is Gaugemaster Model GMC-WM4 12V dc 1.25A Power Supply

To cut off the contact fingers use a sharp pair of wire side cutters or modelling cutters and carefully trim off the fingers *exactly* along the dotted lines marked - - - - - on the signal circuit base, taking great care not to touch or damage the small black sensor or any of its wires as this will cause permanent damage!

Carefully solder 2 thin pretinned power wires into the holes marked P P on the drawing, **making sure that any loose strands or whiskers of wire do not touch any other contacts or components!**

On DC layouts connect these wires to a 12-16V smooth DC supply, on DCC layouts connect them to the nearest rails, DCC Bus bar or direct to the DCC controller output.

### Locating ST10 with N, TT or OO/HO track



Locate SC100 with the sensor **close to but not actually touching** the rail. If using with N or TT gauge track you may need to cut away some of the sleeper. (This picture shows it with N gauge track)

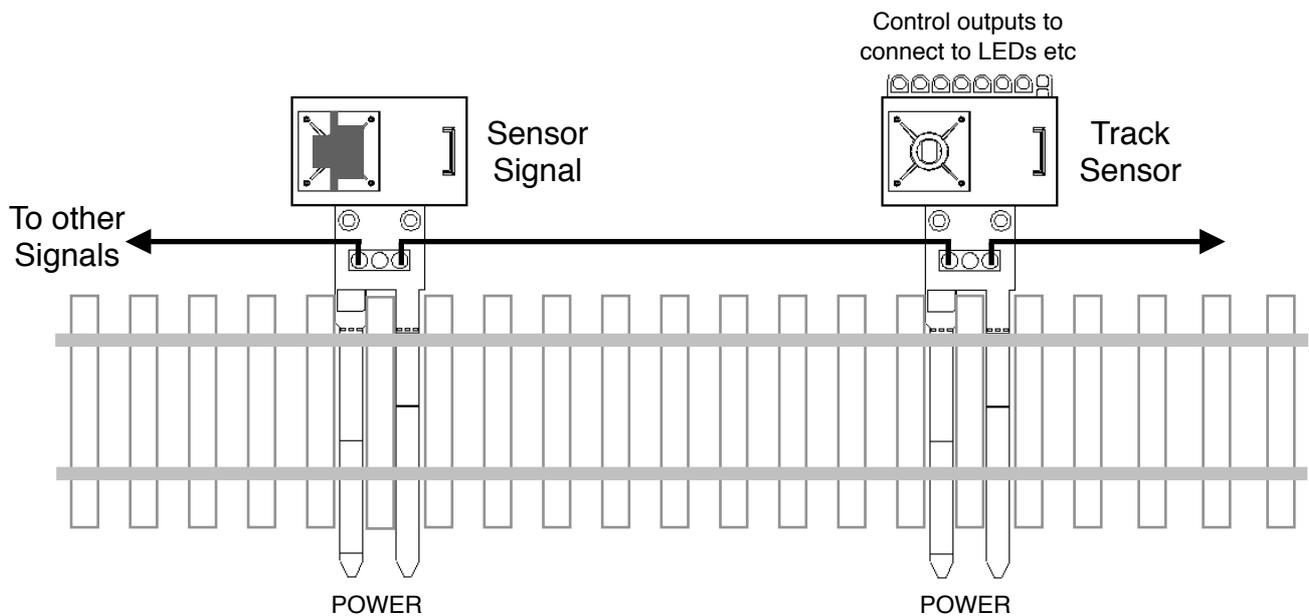
## • Using Track Sensors with Sensor Signals

The Track Sensor works in the same way as a Sensor Signal and so can be used alongside them as a lower cost alternative to Signals for extra Block section detection etc, especially useful in hidden areas like tunnels or to end a block section at the end of a Sensor Signal run.

The 3 way socket can be connected in exactly the same way as a Sensor Signal, including connecting a Mimic Light or Mimic Switch to indicate train detection.

Additionally you can also use any of the 4 control outputs to control LED indicators to indication Train position and block occupancy - see page 6.

In the example below a Track Sensor is linked to the last signal in a run to finish the final block section which will clear the signals when the train has passed the Track Sensor.



### POWER

Power both Track sensors and Sensor Signals from the *same* supply; either DCC from the track or wire to 12-16V smooth DC

# Using a Track Sensor to control a Level Crossing

You can use a Track Sensor to control a Train-Tech LC10 OO/HO gauge or LCN10 N gauge Level Crossing Light and Sound barrier set so that when a Train approaches the crossing automatically comes on and stays on until the train has passed!

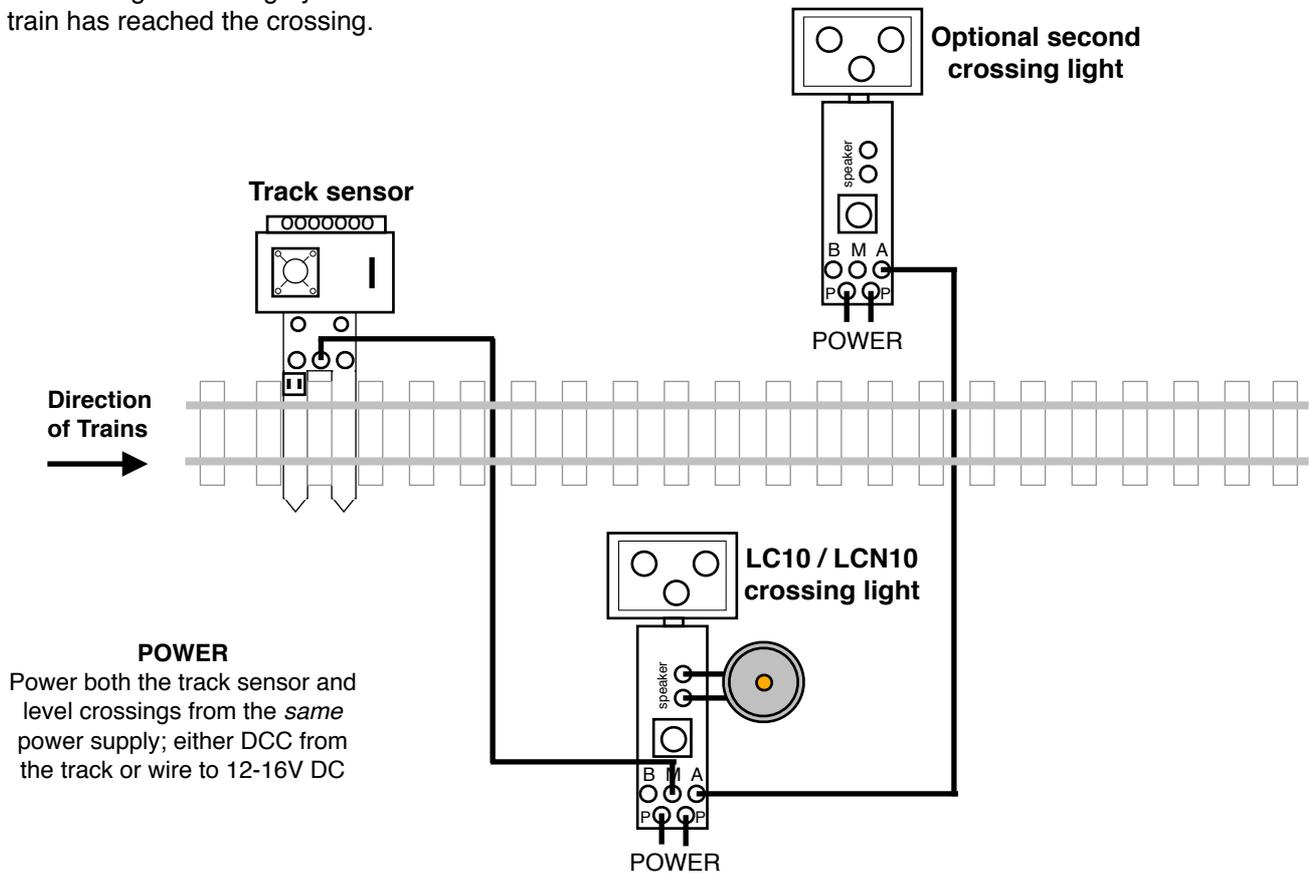
The Track sensor should be powered by the same power as the Level Crossing which can either be Digital DCC or Analogue 12-16 Volts smooth DC and one wire links from the middle socket of the Sensor to the middle socket of the Level Crossing as below.

If used on DCC a Track Sensor or Sensor Signal can either be clipped straight into some types track in the power clip slots (eg Hornby or Bachmann) but if not the slide-in fingers can be cut off and the two connections shown wired to either DCC or 12-16 Volts smooth DC - see below. You can also use the Track Sensor with N gauge track as shown on page 2.

More details are included in the LC10/LCN10 Level Crossing barrier sets, including how to use a second Track Sensor to enable 2 way single track working or control for double track crossings.

**Tip**  
You could mount an LED light on your control panel (eg a mimic panel) which is wired to Control output 2 to show when the train is passing the Track Sensor and approaching the level crossing.

*Tip* Locate the Track sensor a suitable distance from crossings so that double red flashing is showing by the time the train has reached the crossing.

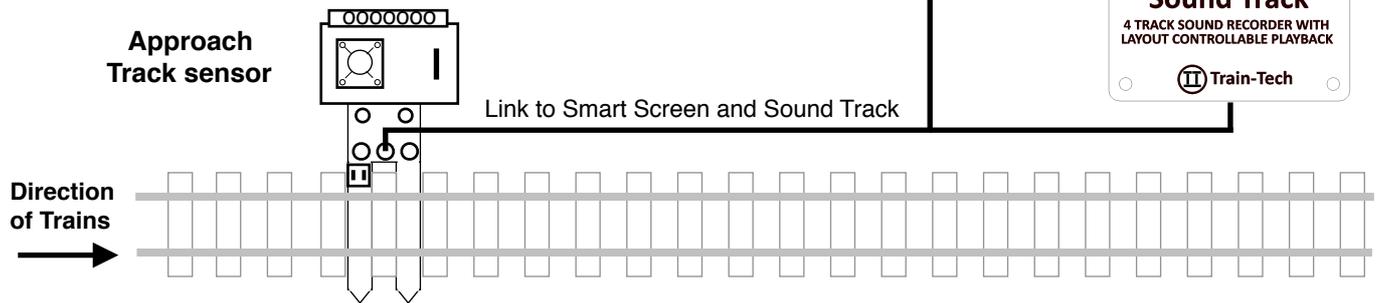


# • Using Track Sensors to control other Layout Link items

This is a selection of some of the other Train Tech products which are Layout Link compatible and so can be easily controlled using a single wire.

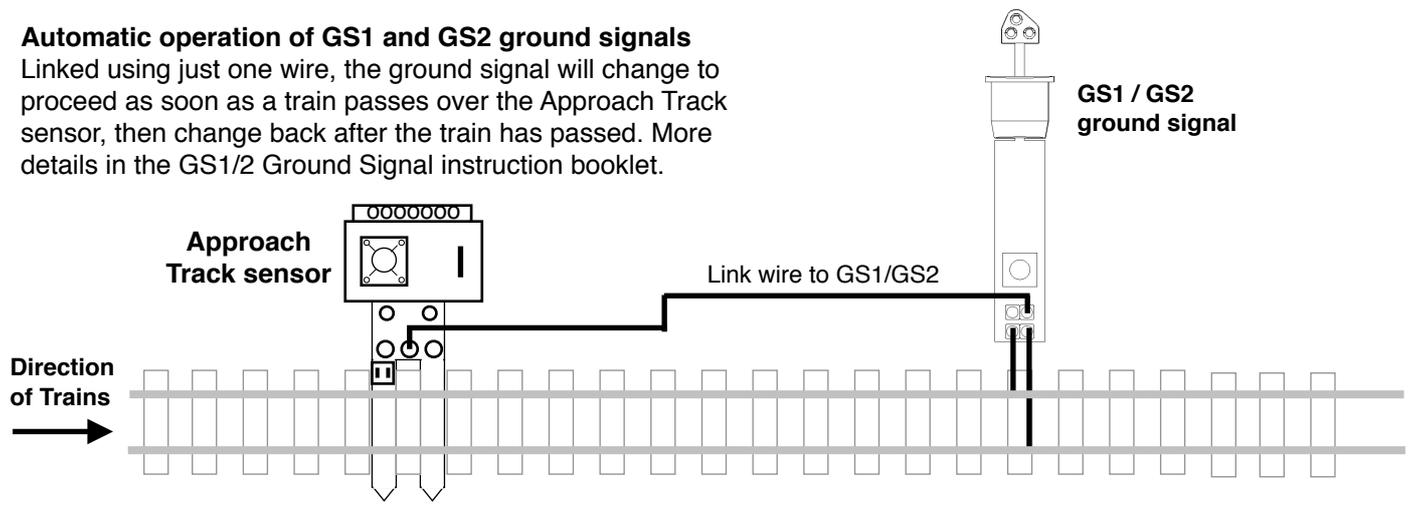
## Automatic Station arrival screens & announcements

You can use a Track Sensor to trigger Train arrivals and departures on the Train-Tech Smart Screen animated station platform display as well as announcements on the Sound Track recorder and player. And if you have two tracks running into a double platform you can connect a second track sensor to make automatic screen and voice announcements for both platforms! More information can be found on Train-Tech.com and in the Smart Screen and Sound Track instructions.



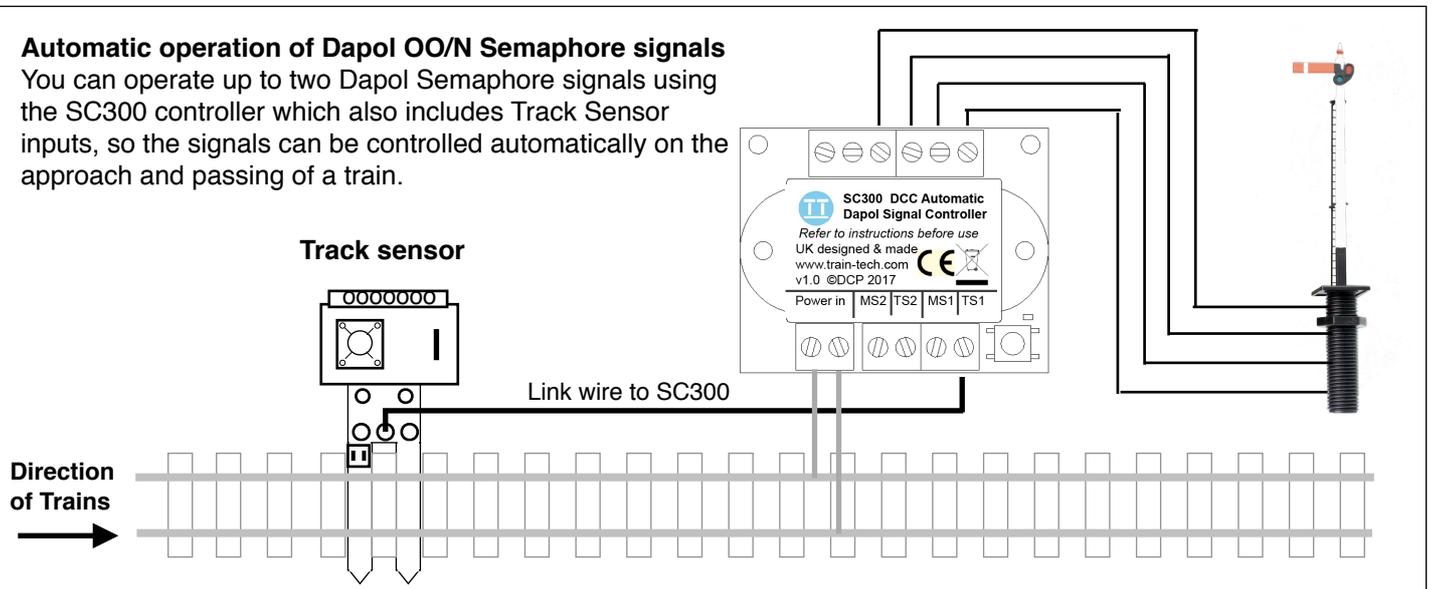
## Automatic operation of GS1 and GS2 ground signals

Linked using just one wire, the ground signal will change to proceed as soon as a train passes over the Approach Track sensor, then change back after the train has passed. More details in the GS1/2 Ground Signal instruction booklet.



## Automatic operation of Dapol OO/N Semaphore signals

You can operate up to two Dapol Semaphore signals using the SC300 controller which also includes Track Sensor inputs, so the signals can be controlled automatically on the approach and passing of a train.



## • Using the Control outputs

The Track Sensor *Plus* has 4 additional outputs which can be directly connected to LEDs to provide various different indications and effects.

**Control outputs Functions** - The control outputs offer the following functions:

**Output 1:** Comes on as a Train passes over the sensor, stays on a short time then switches off - unless it is linked to other Track Sensors or Sensor Signals where it stays on until the train leaves the block section.  
*Application:* Light on control panel or 'mimic' diagram of the layout to show exactly where train is, or a yard light in a siding, maintenance depot, or any light which comes on when a train is near. If used with a relay (opposite) it could also be used to operate motors or solenoids in special effects which need to be triggered by a train, such as a coal conveyer, level crossing barriers or gates, etc.

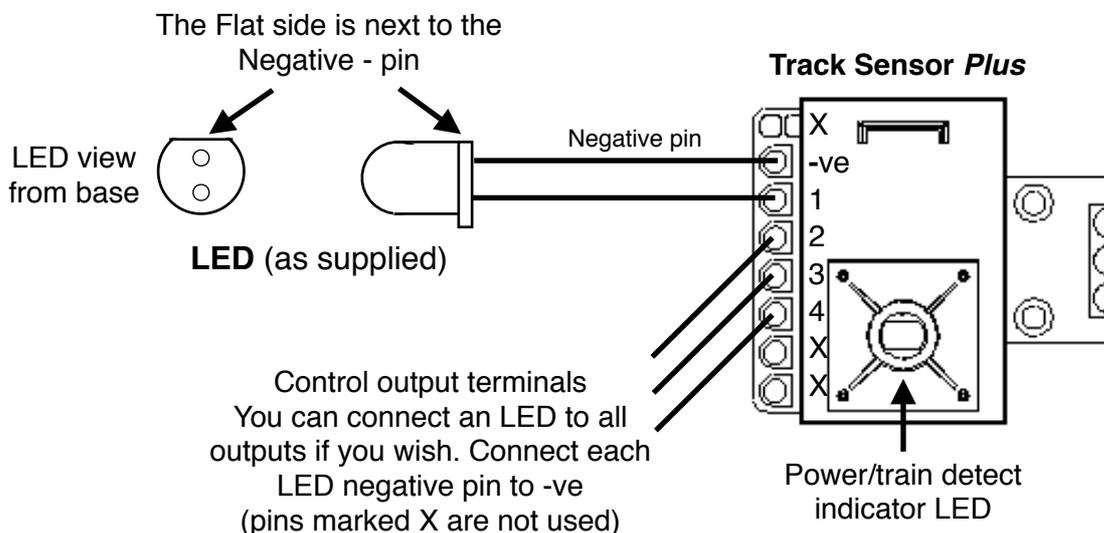
**Output 2:** Flashes as the trains passes over the sensor then goes off unless connected to other Track Sensors or Sensor Signals in which case it stays on until train leaves the block section showing occupancy.  
*Application:* Perfect for occupancy lights on a mimic diagram of your layout, showing where trains are as they move along the sections.

**Output 3:** Quick random flashes as the train first passes it to show arcing/sparking effect or a flash gun.  
*Application:* Simulates the arc flashes from many electric trains, so set an LED to light up some point work or catenary as the train goes past it (ideal use for the bright white LED supplied). Or you could conceal a tiny white LED in a figure holding a camera looking out for his favourite locomotive to go past....

**Output 4:** Comes on when one train passes over and then goes off when the next train passes  
*Application:* This output alternates each time a train goes past (minimum 10 seconds between trains), so it could be used (via a relay) to change points so that trains go into alternate sidings on a passing loop..

*All four outputs operate simultaneously and so more than one may be used at the same time*

### Connecting LEDs to the control outputs



### About LED's

LED's, or Light Emitting Diodes, are small low voltage lights which are very efficient and ideal for modellers as they only need small amounts of power, they do not get hot and are inexpensive. A diode is an electronic component which only allows current to pass in one direction, so LED's are for DC only and will only usually light up when connected to power a particular way round. An LED only needs between 2 to 4 volts, so to use them safely on any voltage higher than this they **must** have a resistor fitted in between (in series) with the LED and power supply.

To make wiring easier most Train-Tech products, including control outputs of this Track Sensor, have resistors built in so that you can safely connect LEDs directly to the output connections. There are thousands of different shapes, sizes, colours and makes of LED, but the most common style is like the one supplied with this Track Sensor and illustrated above to show polarity.

## • Using the outputs to control other things.... *Advanced users*

Whilst the outputs of the Track Sensor Plus are designed to directly run LED's, with some additional electronics they can also be used to control other things. Here we offer some ideas on how you can do this, but this is quite technical and unfortunately we cannot support these suggestions other than what we show here as teaching electronics is beyond the scope of this instruction booklet, however you may find local railway modellers or electronics enthusiasts who can assist.

The internal circuitry of Track Sensors is mainly based on a 5 volt internal supply and each of the output pins is limited to a few mA using internal resistors. This not only safely limits the current to enable direct connection of LEDs, but also helps protect the internal circuitry as there are many stray wires, voltages, back emfs etc around layouts which can damage sensitive electronics.

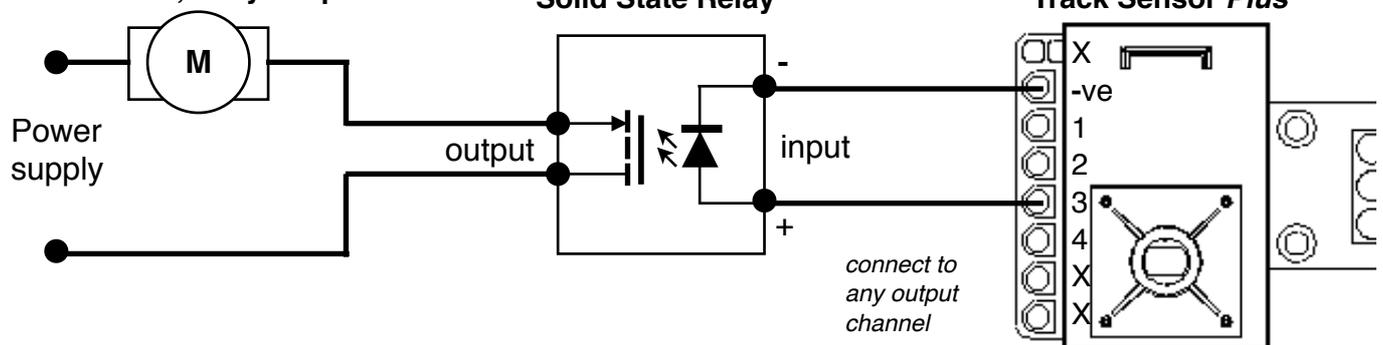
*Do not power any external electronics from the Track Sensor supply other than low power LEDs.*

### Controlling heavy loads

A relay is a device usually used to enable a relatively large amount of power to be controlled by low power, but because of the limited amount of power available in the track sensor the output is not sufficient to energise a regular solenoid coil type relay. However there are many so called 'Solid State Relays' (SSR) on the market now which have no moving parts and which need only very low currents to actuate. Internally most SSR's have an LED at the input which optically links to a high power semiconductor switch, so this is ideal for this application as you can usually connect the LED input direct to the output of this Track Sensor (but check the SSR manufacturers datasheet first).

There are literally hundreds of SSR's on the market, many of which are intended to switch mains ac voltages, so you need to look for types designed for controlling low voltage DC and run the 12-16 volt dc motors etc that you typically find on model railways. One such product is the VO14642AT made by Vishay, which can control up to 60 volts ac / dc at 2 amps. It has an LED input and a dual MOSFET output and is readily available from component distributors such as Farnell.com for around £2 where you can also download a full datasheet, but choose one to best suit your needs.

#### Load: Motor, relay lamp etc



### Connecting to other systems

As well as controlling LEDs and heavier duty items via a solid state relay, you can also interface a Track Sensor output to a system like Arduino or Raspberry Pi, or a train control system.

Most other computer based systems have a 5 volt interface like the one used in Track Sensors, however we would strongly recommend that they are linked via an Opto-isolator so that the rather 'noisy' power lines and stray earths etc from the model railway are electrically isolated from sensitive electronics. An Opto-isolator is similar to a solid state relay and a typical configuration is shown below, however check the system you are connecting for optimum compatibility.

