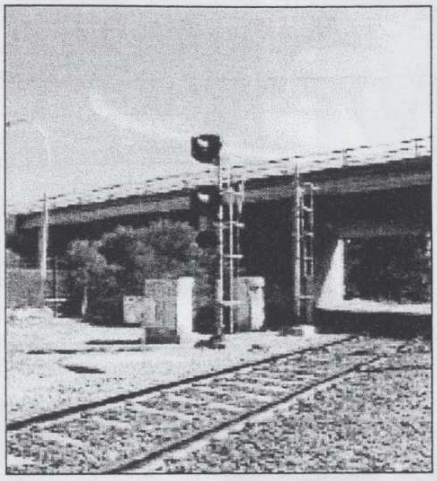
How can we control Bill Dick's signals?

Dean Schluter

Now that we have some very nice target signals being produced by Bill, you should consider adding signals to your layout to help prevent your operators crashing your pride and joy.



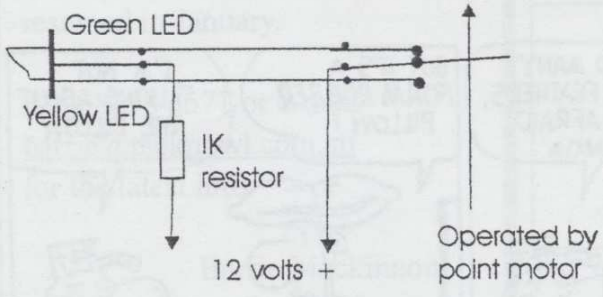
There are a few conditions that would help to prevent accidents:

1. An indication of turnout settings, such as approaching and leaving a passing loop etc.
2. Occupancy on a two way single main line.
3. Occupancy on a double main line.

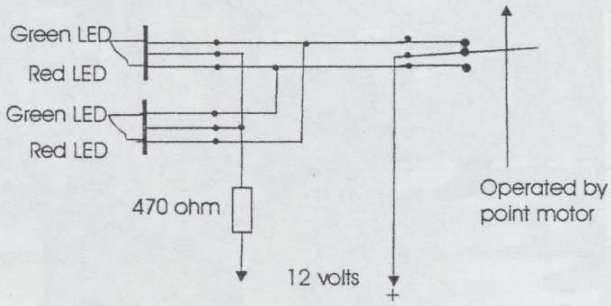
If the signal is used only to indicate a point setting we could use a single target signal that gives a green for the main changing to yellow for the loop, but a double target would be more authentic, indicating green over red for the main, red over green for the loop and red over red if both were occupied.

The first is easy to accomplish using a single pole switch (double pole if live frogs are used) mounted under the switch motor the circuit for this is below.

It requires a 3mm green and yellow LED. I have a number of these at a reasonable cost to club members only.



The second condition using a double target, using 2 x green/red LEDS, can be as simple as the above <u>but</u> if they are also to indicate occupancy the circuit becomes much more complicated. The uncomplicated circuit is below. When the switch on the point motor is set to the main it will turn the top target to green and the bottom target to red; when the loop is selected the top target is red and the bottom target is green.



Signals used to control a section of track in a single bi directional situation.

There have been several methods devised over the years for the detection of trains. One is to use a detection circuit that will detect any resistance across the track, i.e. the loco's motor, and requires the last vehicle to have a resistor across one of its axles. The problem with this for me is that you must isolate one rail of the section that is signalled and feed that rail's supply through a special circuit; this is done to all the tracks that you want to control with signals. This means you are back to the old DC block wiring method with all its duplication of wiring and defeats the advantage of less wiring with DCC. The last vehicle of course must have the resistive wheel set which in itself is no problem using a guard's van or Blinky Bill. The prototype works by detecting the resistance across the track but they have rails isolated from each other and solid wheel sets; we don't of course.

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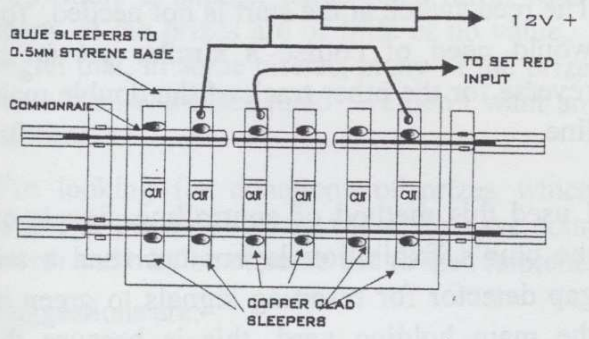
Another method is to have a timer on the signal so that after the loco has passed the trigger point (infra red detector, optical, rail gap) it sets a timer running for as theoretically long as it takes for the train to clear the block. This is fine as long as all trains travel at the same speed and are the same length, and don't come apart in a tunnel. It could get a bit hairy on a two way single line if a train stalls in a section out of view of the other operator and becomes very complicated.

The system I have devised on my layout requires two different methods of detection, one to detect the loco and a different method for detecting the brakevan/ last car. This is so the circuit used to control the signal knows the first vehicle from the last vehicle.

To detect the first vehicle (loco) any commercial detector, e.g. optical, infra red, etc., can be used. But to save expense I use a small isolated piece in one rail (see below); the rail used is the common rail that is designated so on a DC or DCC layout.



Cut a section of flexi-track containing eight sleepers plus rail extensions to fit four joiners; cut a piece of 0.5mm styrene long and wide enough to fit under the six inner sleepers.

Prepare six copper clad sleepers by cutting a gap in the centre and tinning the outer areas where the rails are to be soldered. Carefully remove the six inner plastic sleepers, and clean and tin the underside of the rails without melting the plastic sleepers. Lay out the six copper sleepers and glue them evenly to the styrene with Kwik Grip. When dry solder the rails to the copper sleepers, and with a razor saw cut a gap in the rail between the second and third copper sleeper and fourth and fifth copper sleeper. Solder a lite bridging wire between the second and fifth sleeper to electrically connect the common rail, and also solder a lite plastic covered wire to the third sleeper to go to the signal control circuit. You can discard the two plastic sleepers if you wish, as they were only there to help assembly.

We supply a positive voltage via a 4,700 ohm resistor to the common rail anywhere on the layout, from a separate 12 volt supply used for all the signals around the layout.

When the metal wheels of the loco pass over this small section of isolated rail a positive pulse is sent to the signal control circuit. This pulse changes the condition of an electronic circuit and a slave at the other end of the section so that instead of having a green light the signals now change to red and will stay that way. Each end of the section you want to protect will have a single bi-colour target signal and a rail gap detector (as I call it); the two signals work in unison: as a train triggers either end both signals turn red.

To detect the last vehicle and reset the signals to green, the only thing I could think of that could differentiate between it and any other vehicle on the train was to place a small magnet under the last vehicle. Powerful tiny magnets are available and can be attached under a brakevan (or the vehicle with a Blinky Bill). If you have visitors with their own equipment the magnets can be attached with blue tack.

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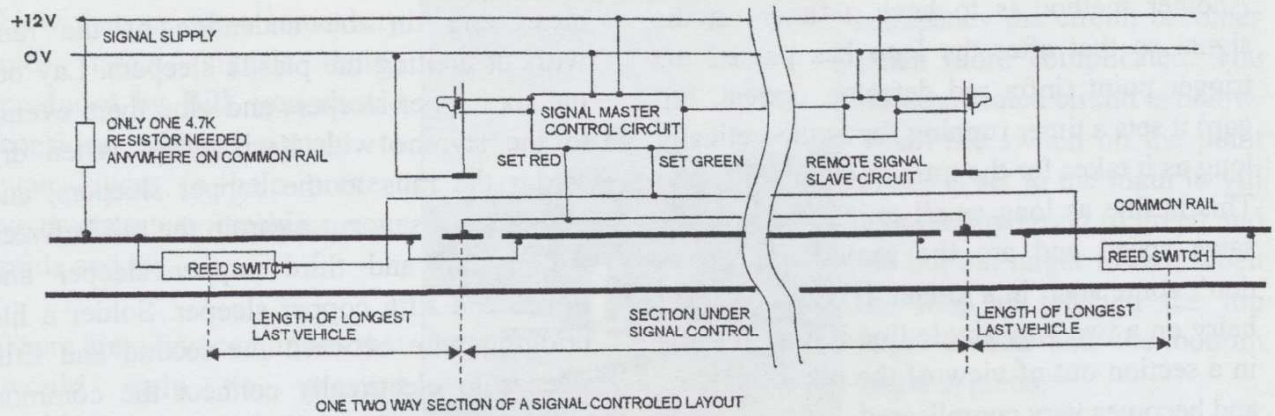

ONE TWO WAY SECTION OF A SIGNAL CONTROLED LAYOUT

To detect the magnet a small reed switch is placed between the rails. Reed switches are used mainly in the security industry for detecting open doors, etc. They are small glass tubes with a pair of leads and a pair of contacts that are changed by a magnetic field, they come in two versions: normally open which is what we want and normally closed. They are small enough to fit below the code 83 railhead. They are placed parallel to the rails, the leads are carefully bent at 90° and fed through two holes in the road bed. Don't put any pressure on the leads or the glass will fracture. One of the reed switch wires is connected to the common rail (with the +12v on it) the other is connected to the reset on the signal control circuit. One is placed at both ends of the section beyond the signals by at least the length of the last vehicle.

The operation of the system is: as the loco passes over the rail gap at one end of the section, a momentary positive pulse will trigger the signal master circuit to display a red signal and also sends a voltage to a slave circuit controlling the signal at the other end of the section changing it to red. The train proceeds to the other end, passing the signal until the last car passes over the reed switch at that end sending a reset pulse back to the master circuit changing the signals back to green. The wiring diagram needed for this is shown above.

In the diagram the two heaver lines represent the track and the two rail gap detectors are placed right on the position of the signals.

The two boxes represent the signal control circuit and the slave circuit for the remote end of the section under signal control. The circuit diagram for the master and slave circuit are available to club members only, on request.

If we apply this control method to one way running only, we require the rail gap detector by the signal at the start of the section, and a reed switch at the other end of the section. The reed switch at the start is not needed. You would need of course a similar set up in reverse for the other track of the double main line.

I used this method of controlling signals on the club's Exhibition layout but used a rail gap detector for resetting signals to green in the main holding yard, this is because the signals are mainly for show but would be needed if the layout was equipped with DCC. I also used rail gap detectors to control the automatic running of the Grain Board layout at the Show Grounds, they have worked faultlessly for 5 years.

I wrote similar article to this in the AMRM some years ago. I hope this may answer some questions on this subject for you.