Signals over the Week-End

Quick start directions

In these directions, I cover the installation of a basic "2 Aspect" signaling system. The signal will display *GREEN* until a train is in the block, at which point it will display *RED*. This can be expanded into a **three aspect** system with a few connections detailed on the last page. The project can usually be accomplished in an afternoon, a weekend at most, by using assembled boards and the optional edge connectors.

This installation will assume a small layout, perhaps a couple of "train sets" combined on a plywood platform on a frame. Track from the set boxes, a few switches and the ability to run two trains independently.

Scale is unimportant; it may be G, O, H-O, or N. The circuits given here will work with any scale, provided the trains run on D-C power. Other power sources are more complex and are covered elsewhere. A web link for the complete manual is on the last page.

Requirements

{ } A starter package of **three SLC boards**

{ } **Electrical tools** suitable for making up soldered connections. Needle-nose pliers, cutters, soldering iron, solder, screwdriver(possibly)

{ } **Small wire**. Telephone or Networking(CAT3 or 4) is a suitable wire, AWG-24 in multiple colours. Length depends on the size of the layout.

{ } **Power supply**. A 9 volt *battery eliminator* is the **ideal** supply; anything from 8-12 volts will work. The load is negligible, less than 1 watt per board. The only stipulation is that it be separate from the train packs.

{ } **Signal models** with either "Grain of Wheat" lamps or Common Anode LEDs. Two for each board will permit signaling both directions.

Any other *known* signal models can be accommodated but you get out of the "Quick Start" region and into more complex wiring. The matter is covered in depth in the complete manual.

Highly **recommended** extras

{ } Pre-assembled circuit boards

{ } Circuit board "Edge Connectors", one for each card

{ } Insulated Rail Joiners for the "Set" track if you aren't comfortable cutting the rails. Rail joiners with wiring pre-attached, or extra terminal track sections if you aren't comfortable with soldering wires to the rail.

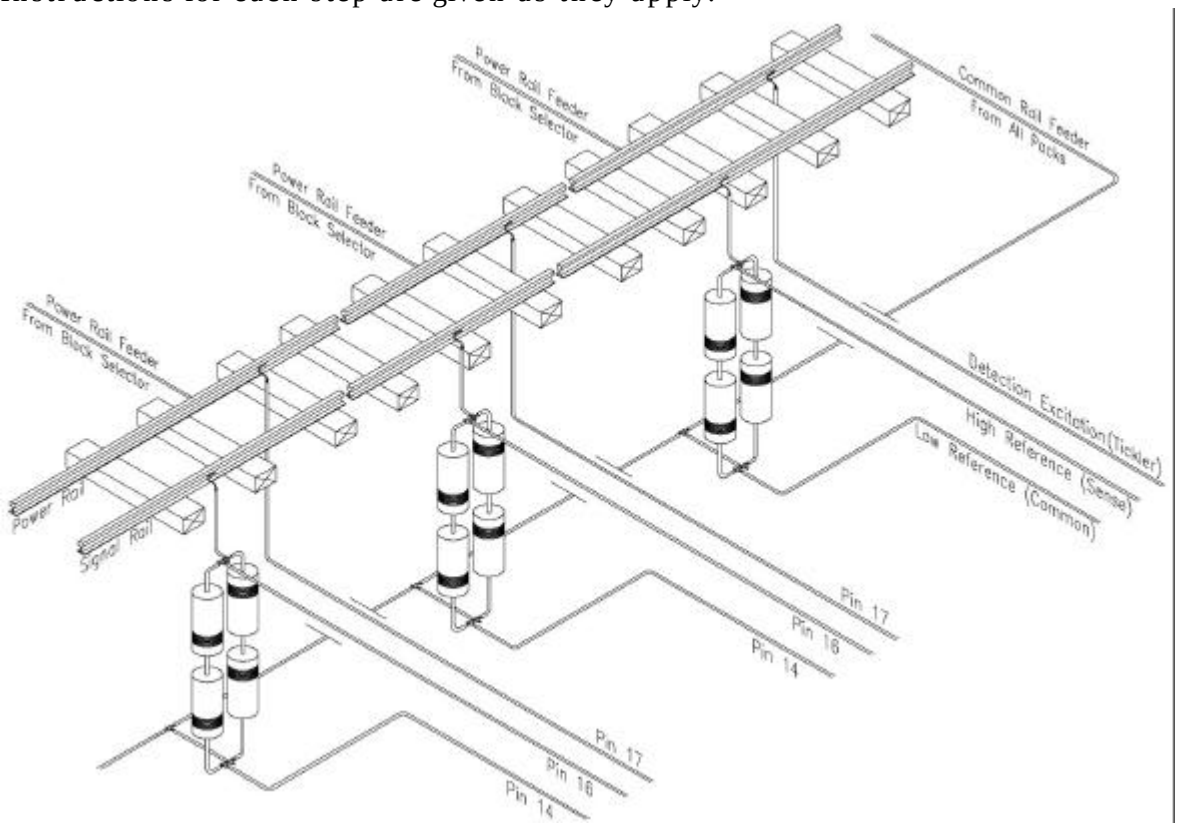
Getting Started
Detection

The first order of business is to determine if there is a train in the block. Assuming there are two power packs, normally one track lead from each is connected together and then wired to one rail of the track. Often called "Common", it is the rail we will use as a "Signal Rail".

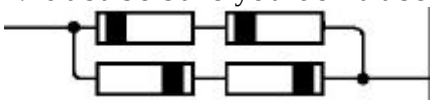
Isolate a section of that rail with insulated rail joints that is a suitable length for the signal block. If the track is already gapped in both rails with no common, so much the better. Just pick a rail to call the "Signal Rail" and follow it around the layout marking it occasionally. Should you end up where you started, but on the opposite rail, you have a "reverse loop". Reverse loops require a special technique and are not covered here.

A very good book for the novice on the subject of wiring a layout is provided by Atlas, the track folks. Atlas also has electrical controls for running two trains together, the "Controller" and the "Selector". These are proven products that have stood the test of time. They should be stock items at your local Hobby Shop.

The illustration below is what you are going to build at the track. All wiring is done below the layout, with wires coming up through the roadbed to the rails. The blocks are shown short. Make them as long as **you** want. Instructions for each step are given as they apply.



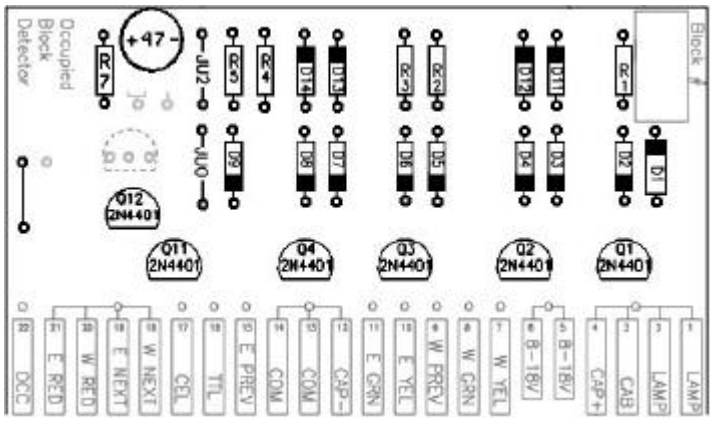
The SLC package contains a number of loose electronic components. The part you need first will be the power diodes. The part number may vary; usually 1N4006 or JE125, similar in appearance to D-1 on the circuit board. They are black with a silver band on one end. Make up four of them, as shown here, for each signal block. Just be sure you don't use the small glass diodes.



From the rail you just isolated, run a wire to the diodes. From the other side of the diodes, run a wire back to the "common" point of the power packs. There will be other wires attached here shortly. If you want to see the detector in action right away, connect a 2-3 volt GoW lamp across the diodes and run a train. When the locomotive is in the isolated block, the lamp will light. Should you have a volt-meter, it will read on the order of 1.5 to 2.0 volts. This is the phenomenon we will use to operate the detection circuit.

If the lamp doesn't light or you don't see the voltage, the "signal rail" isn't **fully isolated** and the detector won't detect.

The Circuit Board



This is the appearance of the SLC from the **component side**. The "edge connector" fingers are on the foil side and show here as a shadow. Pin (1) is to the Right and Pin (22) is to the left. The two short pins, 5-6, are the positive power input. They are the last connections to make contact should the card be inserted in a connector with power already on.

The preferred power supply is a "9 Volt *Battery Eliminator*". Other supplies may be used as well, but a 9-12 volt supply is preferred. Connect the **(-)**Negative lead to Pin 12 of the SLC. Connect the **(+)**Positive lead to Pin 5 or 6 of the SLC cards. The *board* is protected, if you hook it up backward, the board won't be damaged but nothing will function.

The average "Wall Wart" battery eliminator has sufficient power to operate up to eight(8) of the SLC boards when you are using LED signals. Power connections may be "daisy chained" between boards.

The Signal Models

The signal models are installed at each end of every block, facing along the track, visible from the right side(usually) of the locomotive cab. It is suggested the signals be temporarily connected near the controllers, so you can see them while you work. They may be moved to their final location later when the wiring is completed and tested.

Take one lead from each lamp and connect them together for the common lead. For LEDs, use the long leads.(common anode) Connect these common wires to the SLC at Pins 1 and 2. For Common Cathode models, see the complete manual. The word "common" is used to indicate that several wires are connected together. It does **not** refer to a track or power supply common.

Connect the other wire from the top lamp of each signal head to pins 8 or 11 (Green). Connect the bottom lamps to pins 20 and 21(Red). If you have three lamp signals, connect the middle lamps to pins 7 and 10(Yellow). In the case of LEDs, a series resistor is required for each LED. They should be included with the LEDs. The resistor keeps the magic smoke inside the LEDs.

For single LED "Search Light" signals, connect the red leads to pins 20 and 21. Connect the green leads to pins 8 and 11. Again, remember the resistors. To use the "approach aspect"(yellow) with these models, special wiring is required. Refer to the complete manual.

Power up the signal system to test your work. The Green lamps should light, the others stay dark. Temporarily connect a wire from pin 13 to pin 19. It needn't be soldered, just touch the two pins. The Green lamps should go dark and the Red lamps light.

If these two tests don't work properly, check your wiring or soldering work. There may be a loose strand across two pins of the connector. If nothing lights, check the power supply and wiring to the signal models.

Wiring for Detection

With the signal models operating correctly, you are ready to connect to the detection circuits. There are three wires for each block. It is suggested the connections be kept within a few inches of each other.

Connect a wire from Pin 14 to the "Low Reference" side of the detection diodes. Connect a wire from Pin 16 to the "High Reference" side of the detection diodes. Connect the excitation wire from Pin 17 to the "Control" rail, across the track from the detection diode connection.

The signal system is ready for use. Run a train and as it enters an isolated block, that block will display a Red Aspect at each end of the block. Install the signal models at their final location and you have

Signals!

Beyond "STOP & GO"

"Approach Aspect" is an integral part of the SLC. If you have used three colour position signal models connected as described above, the function may be used by connecting in the following manner:

Start with the middle block SLC board. Connect two wires at Pins 9 and 15. Make them long enough to reach the other boards. It is suggested different colour wires be used, for your convenience. Route one of these wires to each SLC board on either side. Connect to Pin 18 or 19. Doesn't matter, they are connected internally.

When a train enters the first block, the middle will shift from Green to Yellow. Should the wrong end of the block go Yellow, reverse the connections at Pins 9 and 15 of the middle SLC connector.

This is a crude but effective method for determining direction. By using this method, several pages of detailed instructions are avoided on the subject of traffic direction and feed forward signal levels.

Connect two wires to Pins 18 and 19 of the middle SLC. Connect one of these wires to the SLC in either direction. Start with Pin 9 at each board.

Run a train. In one block, "Approach" won't work correctly. On that SLC move the wire from Pin 9 to Pin 15. As before, this is a crude method but it's simple and works every time.

As you expand the system beyond the original three blocks, continue this method block by block. The last block in each direction will be unable to display outbound "Approach" because it has no input indicating the next block.

For technical details of this system, advanced techniques and aspects, and using other signal models, look into the complete Signal Logic Controller (SLC) Manual. Available online at:

http://www.hudsontelcom.com/uploads/SLCManual.pdf

Technical Note

The wire at Pin 17 of the SLC is used to detect a standing train when power is not applied to the track. A lighted passenger car(or lighted caboose) or a freight car with a resistor across the wheels is all that is required. 1000 ohms is sufficient. Wheel sets are available with 5100 ohms between the rails specifically for this method of detection. If idle detection is not needed or desired, the wire may be left out at installation or eliminated after the fact.