

# DIY SIMPLE CIRCUITS for MODEL RAILROADS

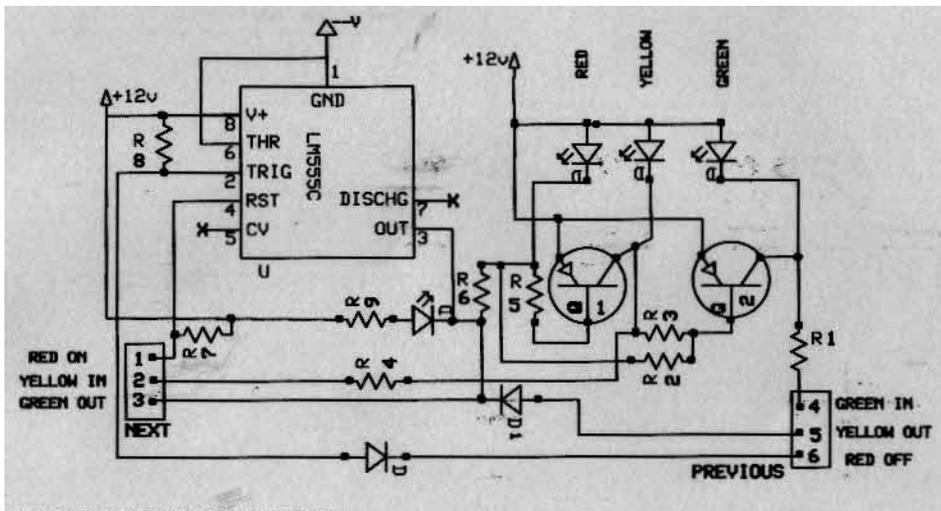
## AUTOMATIC SIGNAL CIRCUIT WITH BLOCK DETECTION

This is my favorite signal system, it is easy to build and install on an existing layout. It also adds a lot of animation to the layout.

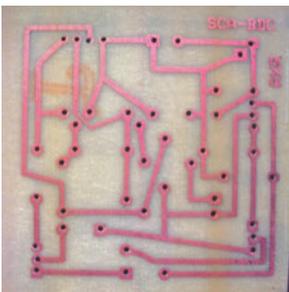
This circuit has been around for awhile in one design or another. I have redesigned it to incorporate a block detector circuit to make it easy to wire one circuit board to another. The two in one circuit also makes it more cost effective.

What it does is really very neat, as a train passes over the first detector the signal for that block turns red, the next block signal turns green provided it is not occupied. The previous block signal turns yellow to alert an oncoming train that the track ahead is occupied. An occupied block will always show a red signal because it prevails over any other condition. Each block requires a signal, a circuit board and an in-track detector. For the most impressive results a minimum of a three signal block systems is recommended. The cost of each block would compare to the cost of a freight car in the mid-price range. However the costs can be reduced by doing some things yourself.

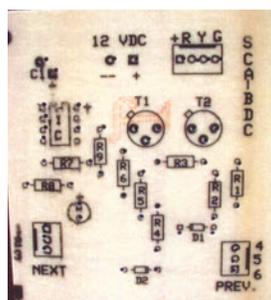
This is a schematic of the circuit which is then transformed into a circuit on a copper circuit board. This is done on a CAD program that is available free at [expresspcb.com](http://expresspcb.com). This is not a complicated process, however some special equipment is required to make the circuit board. If you already have some of this equipment on hand I suggest you give it a try. There are a couple of methods used and are detailed on the Internet Search "How To Build A Circuit Board".



This schematic is of the signal circuit and the block detector circuit.

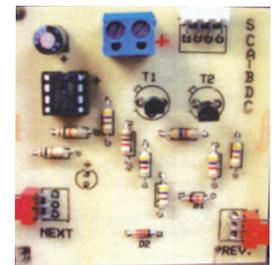


On the left is the bottom layer of the circuit board with copper traces and component mounting holes. On the right is the top layer of the



circuit board with printed locations for the components.

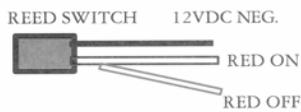
To the right is a completed circuit board.



To activate the signals each CB has "NEXT-RED ON" and "PREV-RED OFF" connections. As the train passes over the detector at the first signal it turns that signal red then when it passes over the next detector it turns that signal red and turns the previous red signal off which then automatically goes yellow. This sequence continues until there are no more detectors or signals. The in-track detector is a reed switch that is activated by a magnet attached to the underside of the engine or any car. This is not the ordinary glass tube reed switch, they break too easily. This reed switch is very small and is in a plastic holder. It will fit between HO and larger scale rails, for N scale it can be placed under the ties. Over a year ago I set up this system at a hobby shop with four signals on a small oval and it has worked flawlessly five days a week, six hours a day.

The wiring is very simple, in the pictures you can see the connection points "NEXT and :PREV." along with the 12VDC power input at the top. The "+ R Y G" is the connection for the LED signal lights.

“Yellow In” is the connection for “Yellow Out” from the previous circuit board, “Green Out” is the connection for “Green In” from the previous circuit board. The “Red On” connection goes to the reed switch affecting the signal connected to this circuit board. For this I use a white wire with a red marking. The “Red Off” connects to the reed switch from the next signal. For this I use a white wire with a green marking. Any color wire can be used, just use the same colors thru out the system. 24 or 26 AWG wire will work OK.



This is what the reed switch connection will look like. A black 12VDC Negative feed wire is connected to one of the terminals, the white/red and white/green wires are connected to the other terminal.

Regulated power supply is recommended to avoid start up spikes that will damage electronic parts. When connecting circuit boards together always use the same power supply. For a buck a 12 volt regulator can be soldered to the out put wires of an inexpensive DC wall transformer. Use one rated at one amp. (1000 MA) or more, that way you will have more than enough power.

When soldering components on the circuit board use a 30 watt pencil soldering iron with a very small tip and the smallest diameter rosin core solder you can find. A temperature controlled soldering station is the best choice. If you are uncomfortable soldering electronic parts, check out the internet for soldering technics.

For some of you parts of this DIY project may not be in your comfort zone so I have listed the items available for this project. Every thing here can be done, it just takes some practice, patience and determination.

### ITEMS AVAILABLE FOR THIS PROJECT

Signal/Block Circuit Board (etched - printed - drilled)	\$4.50
Component Package (as per material list)	\$4.30
Signal/Block Circuit Board with components soldered on & tested	\$12.80
Special Reed Switch	\$1.00
Magnet	\$0.50
12 VDC Voltage Regulator	\$1.00

Shipping is via USPS and costs will vary and will only be actual cost

### ELECTRONIC COMPONENT MATERIAL LIST

Resistors R1-R4-R9 470ohm R2-R3-R5 4.7K R6 1K R7-R8 10K

Transistors: Q1 & Q2 PN2907 or 2N2905 Diodes: D1 & D2 1N914

Capacitor: C1 100uf Semiconductor: IC NE555 & 8 pin socket LED: 3mm any color

Molex Connectors: 2-3 pin housing & header 1-4 pin housing & header 10-wire crimp terminals

One 2 pin power connector

I do not have a web site to list the many things I have for sale, however some of my items can be viewed and purchased at [www.blueridgehobbies.com](http://www.blueridgehobbies.com). Under manufacture select RXRTRONICS.

Contact me direct at “[rxrtrronics@yahoo.com](mailto:rxrtrronics@yahoo.com)”. If you want me to call you with additional information please include your phone number and the best time to call.

We may have the cart before the horse? This is what makes a signal work but we need a signal!

I also have a DIY to make your own signals, if there is some interest in it, it will be forthcoming. Let me know what think.