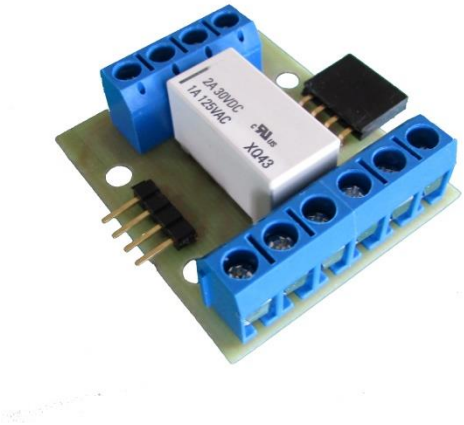
JTElectronics
Expandable Latching Relay Board
Model: JTELR1



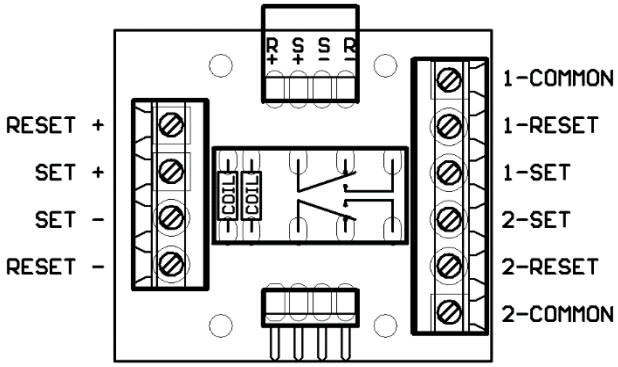
This relay board will allow switching power to tracks or points or turnouts or lights or whatever other purpose you see fit with separate control coils for “SET” and “RESET” relay states. The relay is a “latching” type meaning the output contacts will stay in either the SET or RESET position even when power is removed from the relay control coils. Its like they have a “memory”.

The relay control consists of two coils which when momentarily supplied with power will either “SET” or “RESET” the relay output contact state depending on which coil was energised. The relay control coils are rated at 12VDC (continuous) but will handle a higher voltage for a brief time eg. A pulse from your high voltage points motor Capacitor Discharge Unit. Having all four relay control coil terminals available gives great versatility to how you can connect them... If you are familiar with a 3-terminal relay coil arrangement, just connect “SET-“ and “RESET-“ terminals together and onto the common control wire (There is a set of solder pads under the relay that can also be joined by a blob of solder to achieve this) and connect your two control signals to the “SET+” and “RESET+” terminals.

The relay output contacts are “Double-Pole Double-Throw” so there is a COMMON terminal connected to either the SET or RESET terminal depending on which relay control coil was last energised – And there are two separate sets of contacts. If you need even more relay output contacts, the relay board can be expanded by plugging another relay board in series with the first one and the four control coil connections are passed onto the next relay board. The **Expanded Latching Relay Board** image below shows the system expanded to four sets of output relay contacts, and you could easily plug in more relay boards to expand the sets of output contacts to the required amount – all controlled from the same SET or RESET control signals.

The relay control coils will NOT work with AC power source, only DC power of about 12V. If you really want to control the relays from an AC power source, just put a diode in series with it to convert the AC to DC. Of course the output contacts will handle either AC or DC without a problem...

SINGLE LATCHING RELAY BOARD



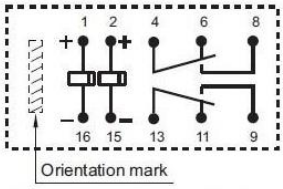
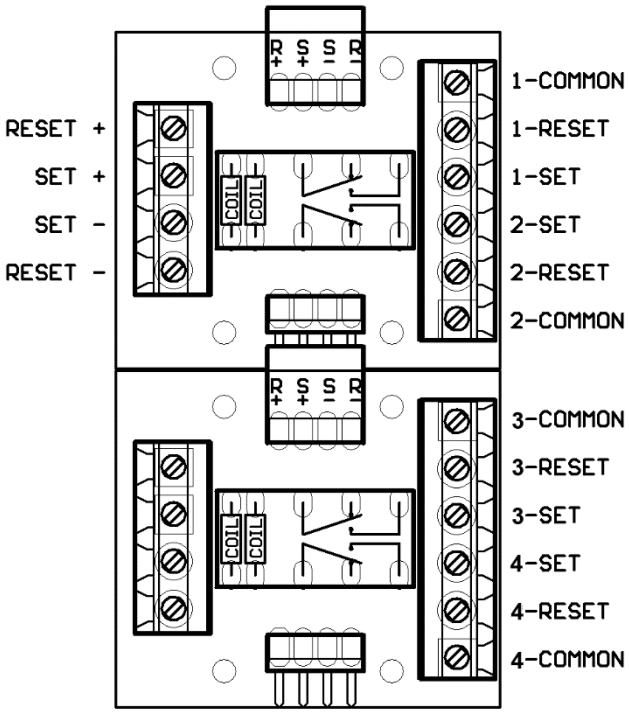


Diagram shows the "reset" position
Energize terminals 1 and 16 to "set"
Energize terminals 2 and 15 to "reset"

EXPANDED LATCHING RELAY BOARD

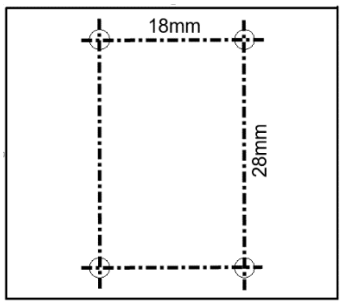


LATCHING RELAY DIAGRAM

LATCHING RELAY BOARD SPECIFICATIONS:

Coil Nominal Voltage	12VDC (use a series diode with an AC control voltage)
Coil Minimum Voltage	9.6VDC
Coil Maximum Voltage	24VDC
Coil Switching Power	150mW “sensitive coils”
Coil Resistance	960 Ohm +/- 10%
Contact Max Current	2A @ 30VDC
Contact Max Switching Power	125VA/90W
Contact Switching Time	4.5ms Max
Board Dimensions	Approx. 42mm x 36mm
Mounting Hole Grid	18 x 28mm
Mounting Hole Diameter	3.0mm

MOUNTING HOLE DRILLING TEMPLATE



USING THE LATCHING RELAY BOARD AS A FLASHER

With a few extra components you can use the latching relay board as a flasher unit for your railway crossing lights. Sure you can get some electronic flashers but using this relay board is nearly indestructible, and gives you an insight into how the latching relay works and what else you could use it for… With the components specified the relay will switch between states approximately every half-second. The switching rate also depends on your supply voltage so some experimentation with resistor values may be required to get the exact desired speed. Smaller resistors will cause a faster flash, and larger resistors will cause a slower flash.

Flasher Circuit Wiring Diagram:

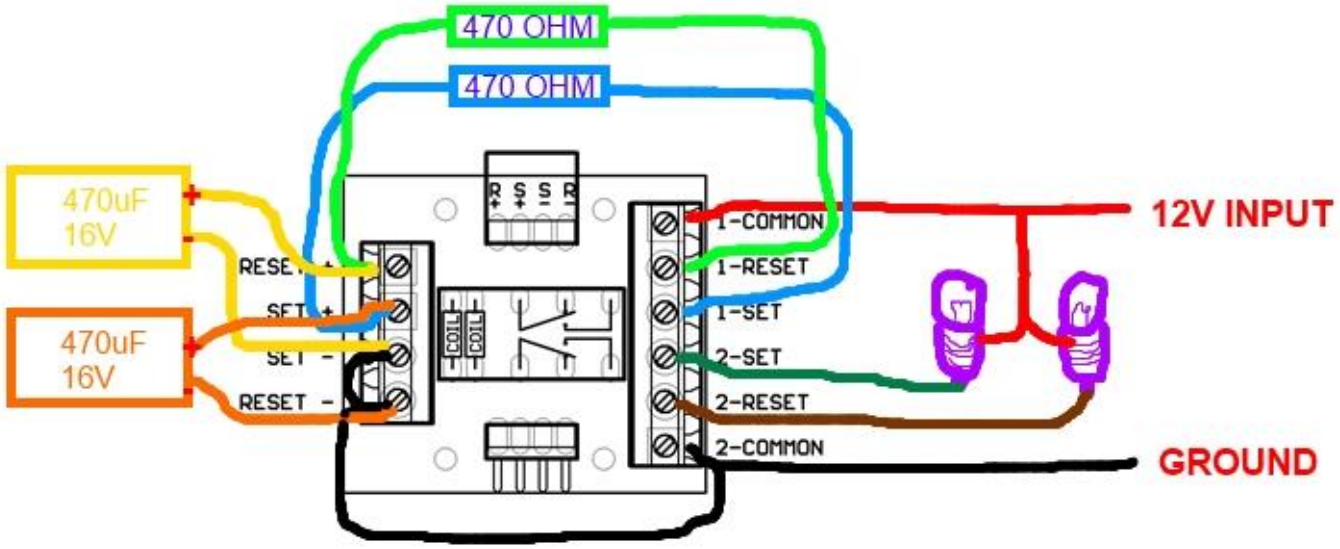
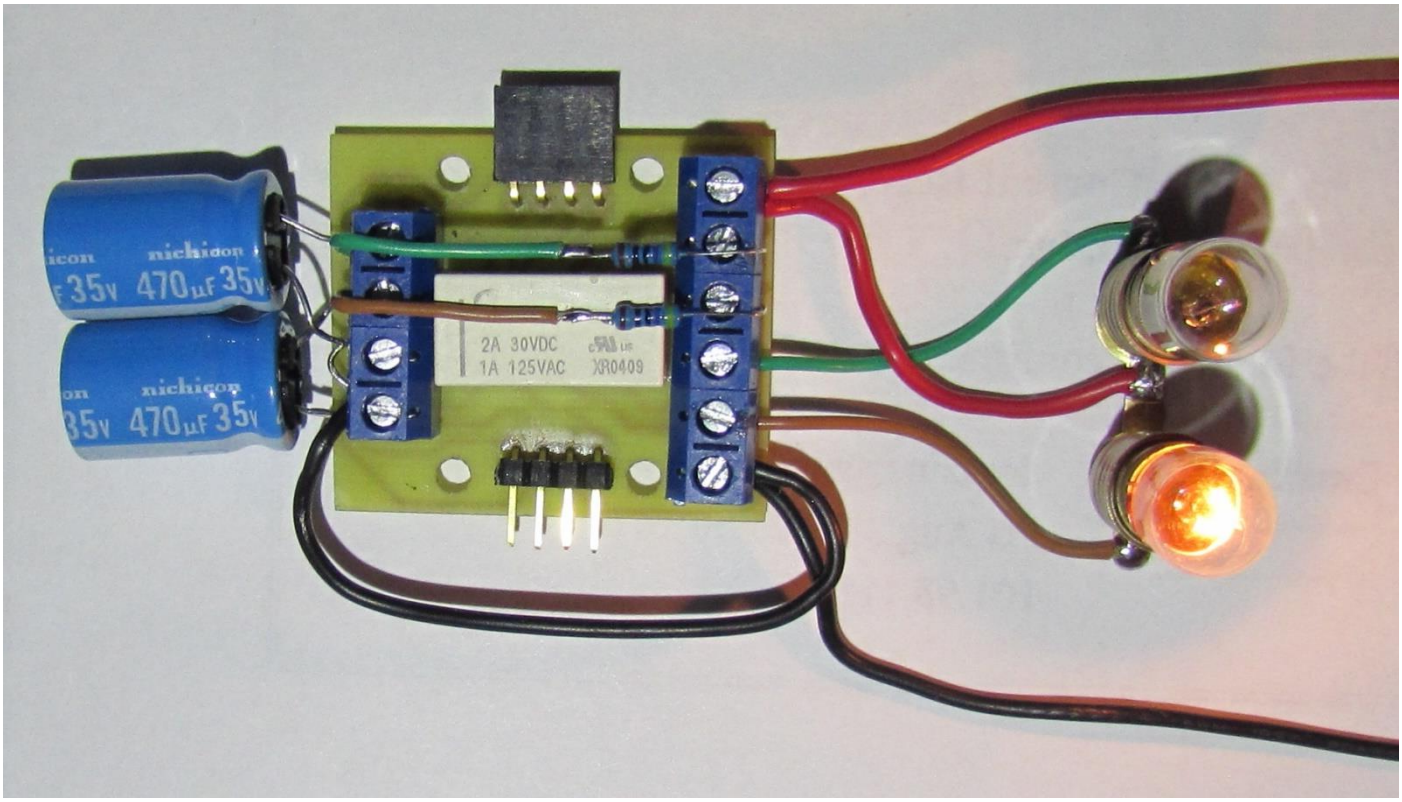


Photo Of Completed Flasher Wiring:



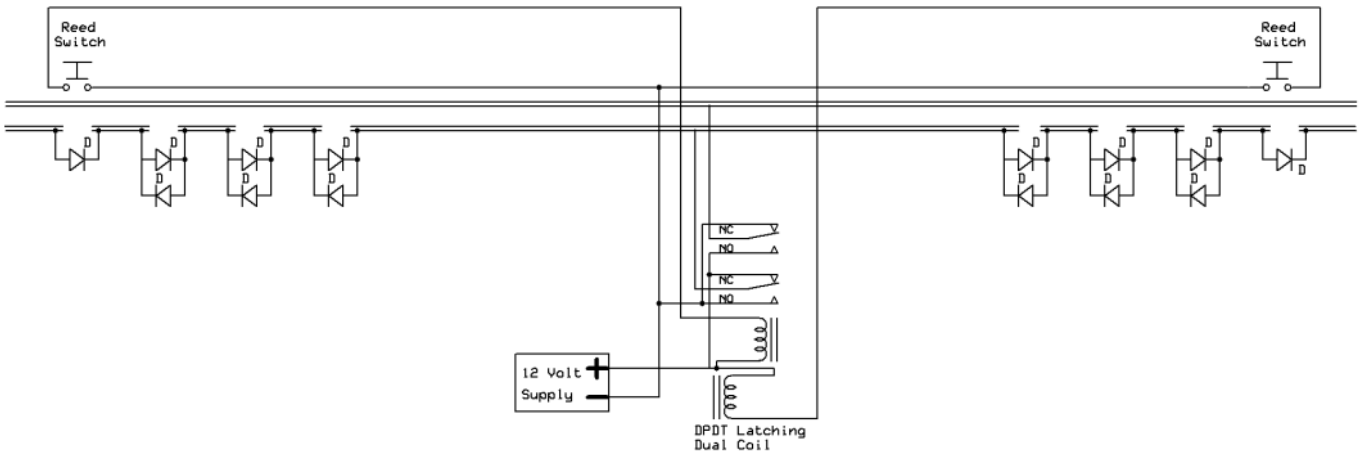
USING THE LATCHING RELAY BOARD AS
AN AUTO-REVERSE or BACK & FOURTH CONTROLLER

Information obtained from: http://www.trainelectronics.com/Reverse_loop_dual_coil_relay/

The DPDT dual-coil latching relay can be used to create what may be the simplest auto-reverse controller you can make. Auto-reverse controllers are frequently used to operate a trolley or other small engine on a single run of track. The trolley goes to one end, reverses and proceeds to the other end where the back & forth operation continues.

To wire this controller replace the two push button switches in the diagram above with magnetic reed switches. Then glue a magnet to the bottom of an engine or trolley so that it passes directly over each of the reed switches as it travels back and forth. It will trigger the appropriate coil to change the polarity as the train reaches the end of a point-to-point track. Place the reed switches between the rails a few inches before the diodes at either end of the track. The diodes are optional and are only there to stop the train should the reed switch fail to sense the magnet passing over it.
This version adds pairs of diodes to the ends of the point-to-point. These sets of diodes will gradually slow the train as it nears the end of the line. Most common diodes will drop a voltage going through them by approximately 0.7 volts. This circuit will first slow the train a bit by dropping the voltage by 0.7 volts then a bit more by another 0.7 volts and so on until the reed switch is encountered. Note that there are two diodes wired back-to-back at each block. This is so that the train can go in either direction through the blocks. Additional blocks can be added to slow the train more and more. Just be sure that there is enough power at the last block to allow the train to make it to the reed switch rather than just stopping short! Also check there is enough power available for the train to start moving in the opposite direction!

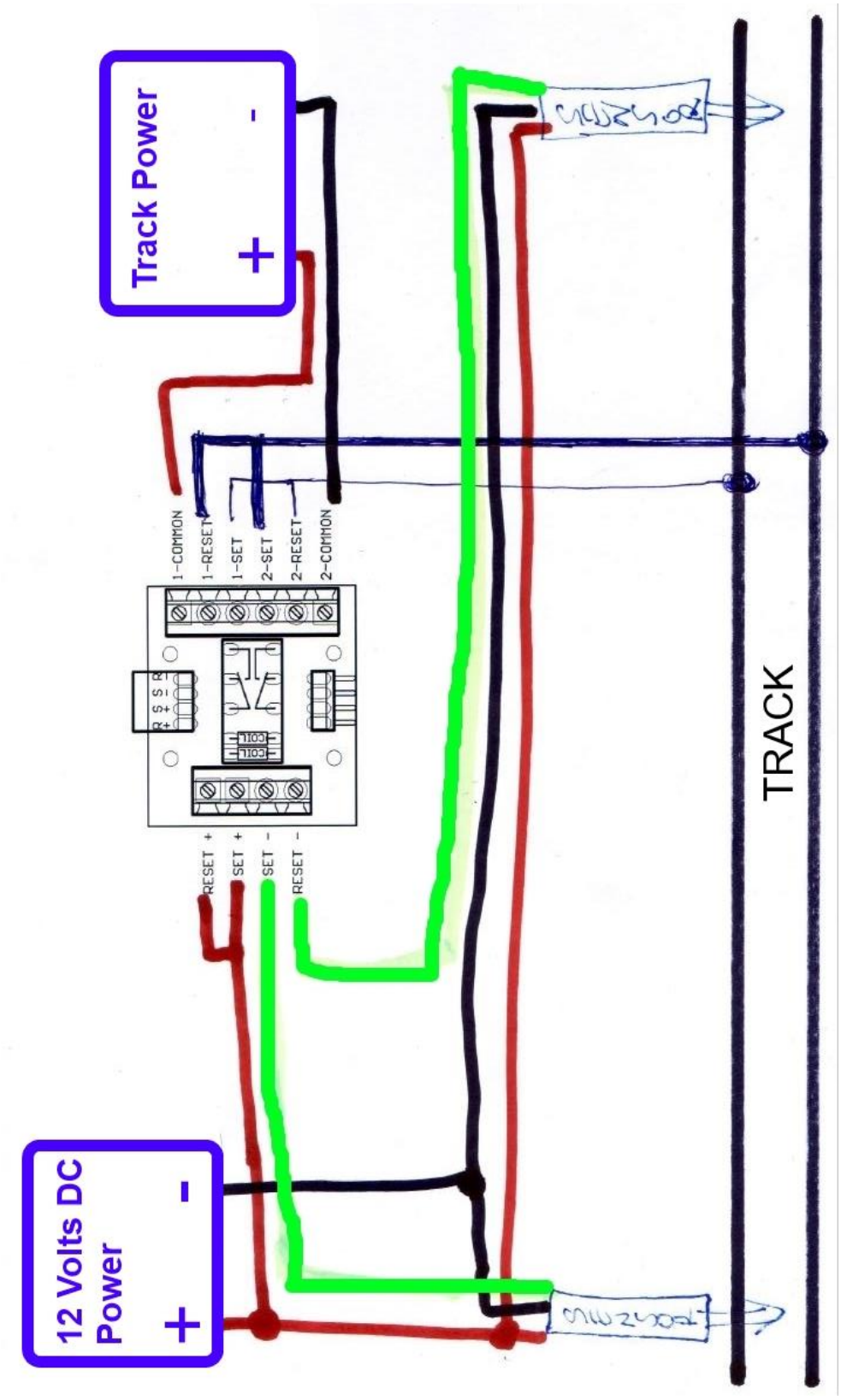
Even though the sets of diodes are shown very close together in this drawing on a layout there would be one or more feet between each set.



Better still, you could easily replace the reed switches (and magnets on all the first and last rolling stock) in these diagrams with my JTEILD infra-red locomotive detector boards at either end of the track to detect the train. The JTEILD boards are more reliable at detecting the train and <u>don't require any modification</u> to the locomotive / rolling stock / train!

AUTO-REVERSE / BACK AND FORTH CONTROLLER WIRING USING JTEILD SENSORS

Below is a diagram of how to wire the JTELR1 latching relay board as an auto-reverse back & forth controller using the JTEILD sensors at each end of the track. Once wired up you may have to swap the track power connections (at either the Track Power or Track connection points) to get the locomotive travelling in the correct direction. Although not shown on this diagram, you may want to add the diodes in series with one track to slow the locomotive before it is detected and changes direction – see the previous page which shows how and where the diodes are connected.



EXPLAINATION OF AUTO-REVERSE / BACK AND FORTH CONTROLLER AND SENSORS

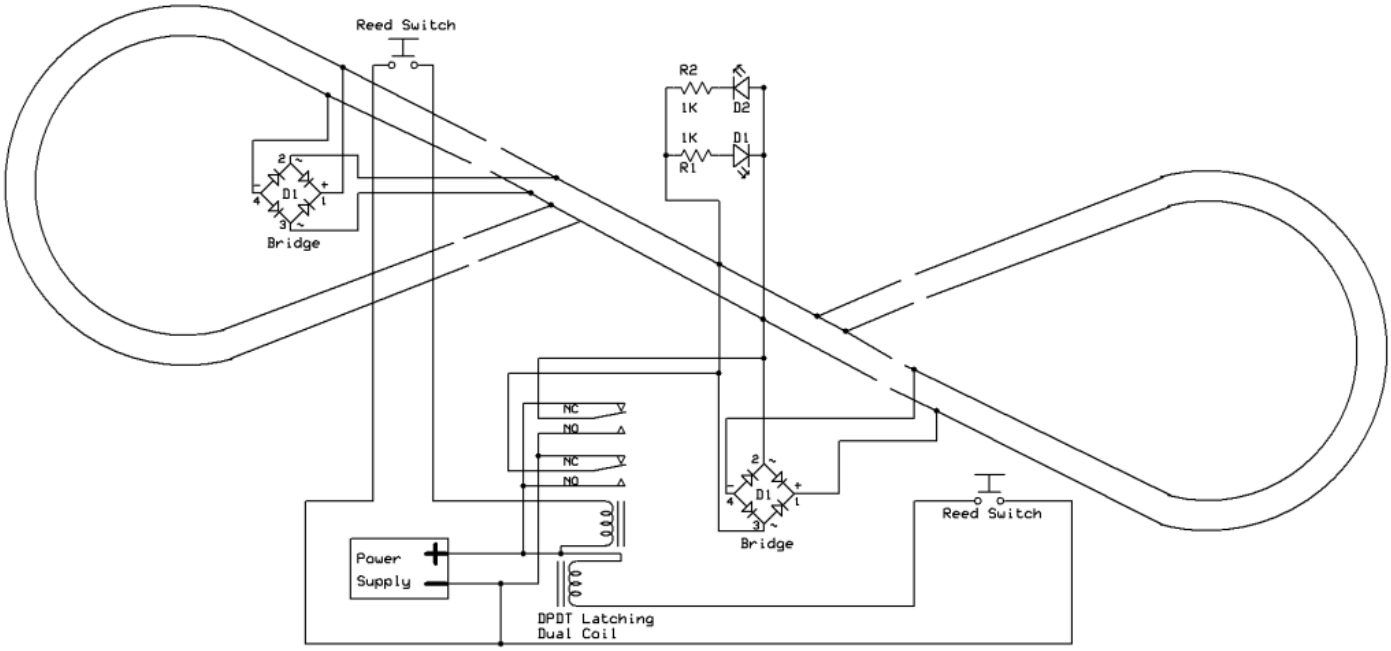
You will need to check if the sensors are wired up and working correctly. If you "activate" each sensor in turn and listen to the relay on the JTELR1 board, you should hear a small "click" as the relay switches between its SET and RESET states which will correspond to each sensor being activated (the sensor's green LED turning on).

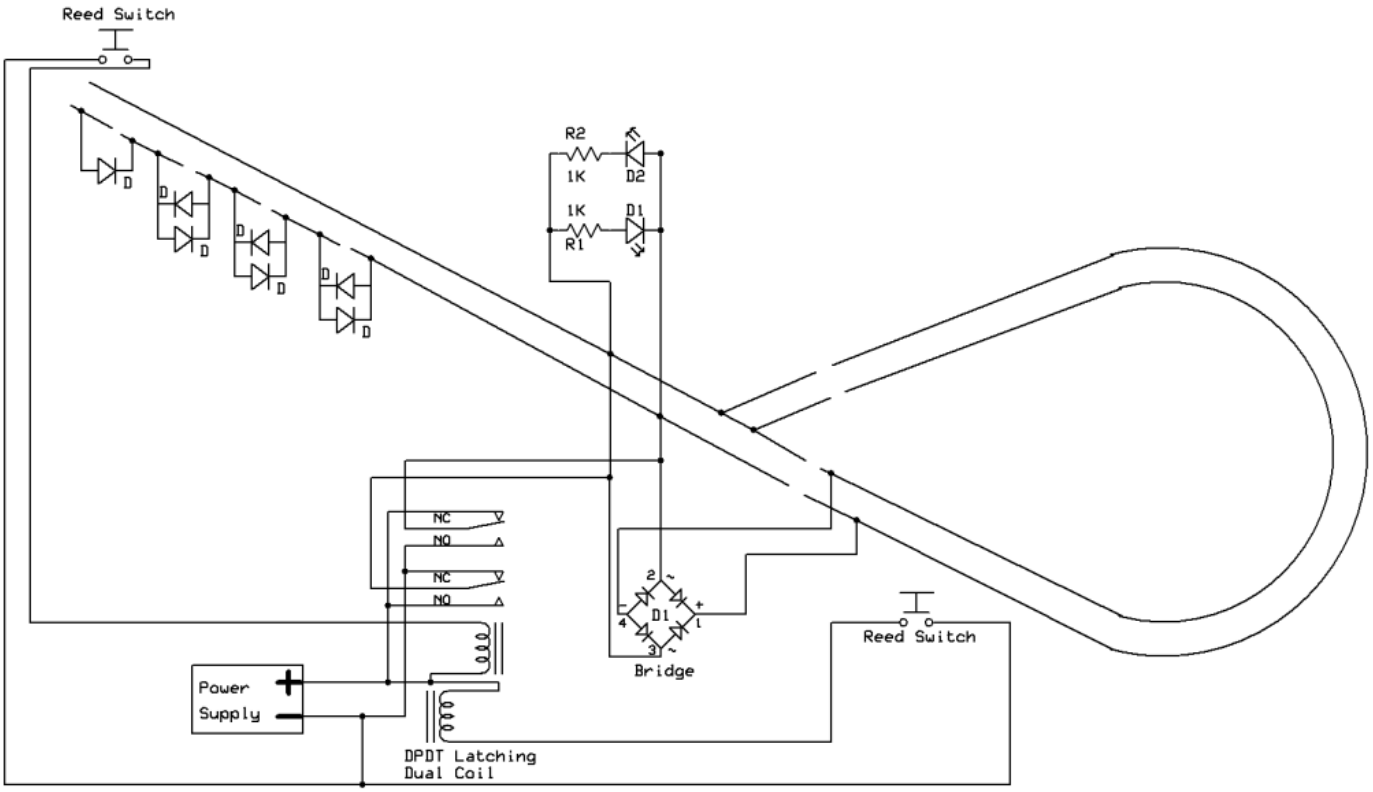
Once you've got the sensor/control side tested and sorted we can move onto what happens with the track power. It works like this:

1. The relay board could be in either state (SET or RESET) depending on where it was last left so lets just assume it's in the RESET state. This means the internal relay contacts are mechanically joined between terminals 1-COMMON + 1-RESET and separately joined between terminals 2-COMMON + 2-RESET.
2. If the right-hand sensor (with green output wire connected to RESET- terminal) is activated nothing will happen because the relay control coil will try to switch the relay to the RESET state and it's already there. You won't hear the relay click as the relay tries to mechanically switch state because there's no mechanical movement.
3. Now if the left-hand sensor (with green output wire connected to SET- terminal) is activated the relay will "click" and now switch to the SET state. The relay's internal contacts will now be mechanically joined between terminals 1-COMMON + 1-SET and separately joined between terminals 2-COMMON + 2-SET.
4. If the right-hand sensor (with green output wire connected to RESET- terminal) is now activated, the relay "click" and will now switch back to the RESET state.
5. We feed track power into the relay COMMON terminals with positive track power into the 1-COMMON relay terminal and negative track power into the 2-COMMON terminal. This allows us to change the polarity of power going to the track as the relay switches back and forth between the RESET and SET states as follows…
6. In the RESET state, the relay's 1-COMMON terminal is connected to the relays 1-RESET terminal so positive track power is applied to the bottom track rail. Also, the relay's 2-COMMON terminal is connected to the relays 2-RESET terminal so negative track power is applied to the top track rail. The locomotive moves in one direction, at a speed determined by track power voltage.
7. The locomotive will travel along the track until it activates the left-hand sensor, which causes the relay to switch to the SET state
8. In the SET state, the relay's 1-COMMON terminal is connected to the relays 1-SET terminal so positive track power is applied to the top track rail. Also, the relay's 2-COMMON terminal is connected to the relays 2-SET terminal so negative track power is applied to the bottom track rail. The locomotive moves in the opposite direction, at a speed determined by track power voltage.
9. The locomotive will travel along the track until it activates the right-hand sensor, which causes the relay to switch to the RESET state
10. The track power is reversed, and the locomotive repeats the back and forth cycle…

USING THE LATCHING RELAY BOARD AS A REVERSE LOOP CONTROLLER

Information obtained from: http://www.trainelectronics.com/Reverse_loop_dual_coil_relay/



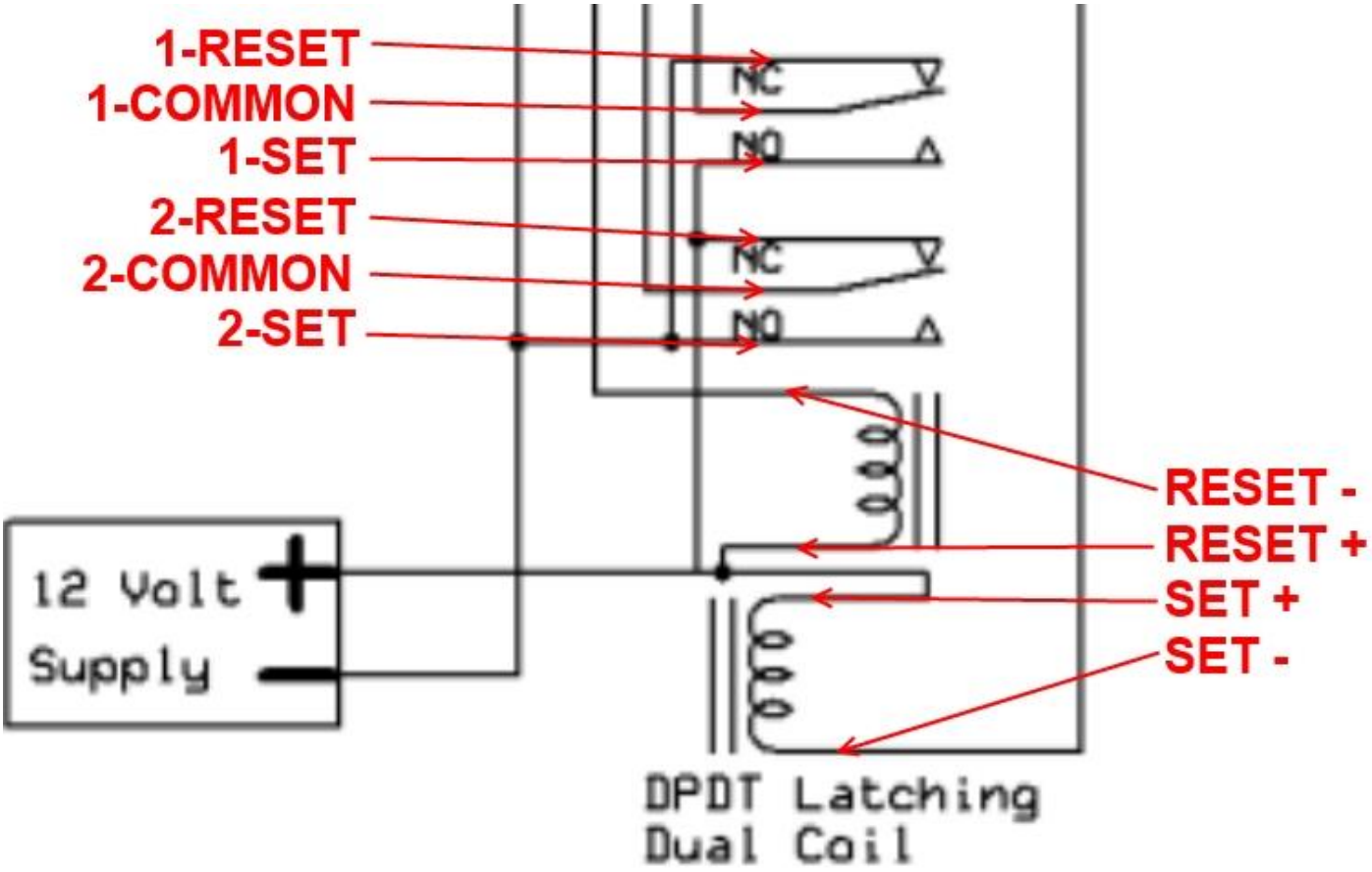


RELAY WIRING

The above diagrams are a little confusing in the labelling of the relay connections. With a latching relay the Normally Open (NO) and Normally Closed (NC) contact labels are invalid as the relay has no “Normal” state – the relay is in whatever state was last activated and therefore “latched” until the other state is activated. I have called the two relay states SET and RESET where energising the SET coil will cause the SET and COMMON relay contacts to close, and energising the RESET coil will cause the RESET and COMMON contacts to close.

The picture below shows the above wiring diagrams with connections labelled for using this JTELR1 latching relay board.

You should test your wiring by using a magnet above the reed switches and if the switching voltages or locomotive direction seem to be operating in reverse of what you would expect, try swapping the SET- and RESET- relay coil connections which will swap how power is applied to the tracks.



COMPONENTS

This diodes in the above diagrams can be type 1N5404 which is Jaycar part code ZR1014, and the reed switches can be Jaycar part code SM1002. You cold also get the magnets from Jaycar too.

POINT MOTOR LED INDICATORS

Below is a diagram of how to wire the JTELR1 latching relay board in parallel with a “Peco” 2-coil type point motor with LED indicators to show the state of the point motor.

You must use a resistor in series with a LED and the diagram below shows a single resistor in series with the power supply which will limit the current to both LED’s. The value of the resistor connected in series with the LED power supply will technically depend on the power supply voltage, LED forward voltage, and the LED current – google “led resistor calculator” for many online calculators.

A value of 470 ohms @ ¼ watt will be a sufficient starting point for most LED’s @ 20 milliamps and a 12 volt DC power supply. A larger value of resistor will reduce the LED current and therefore it’s brightness.

If you want to use 12V lamps instead of LED’s just omit the resistor…