The Low Relay Trigger with Delay; How It Works

Apr 2022

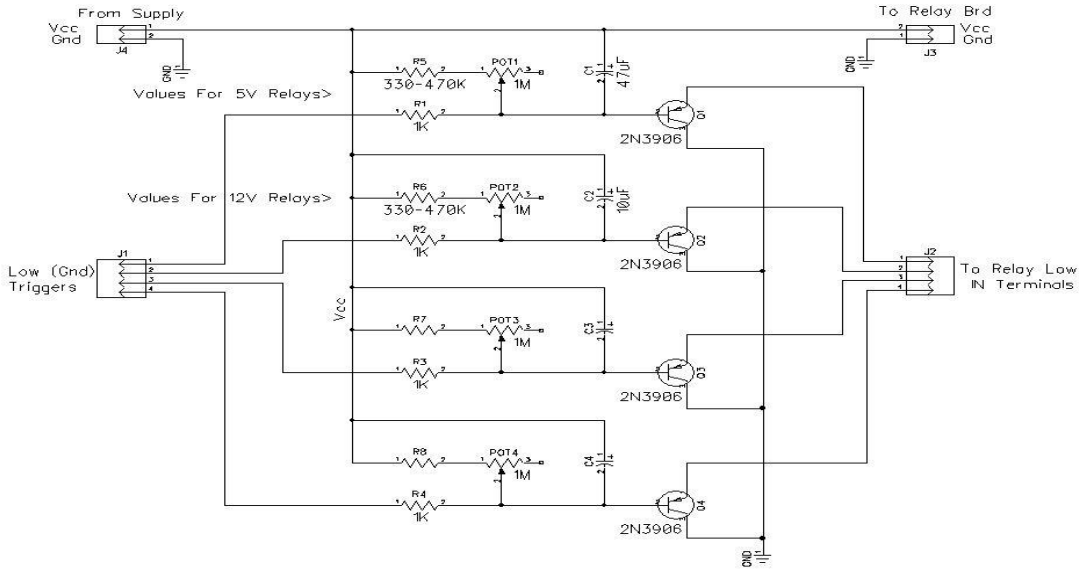
The problem: One downside when using the insulated outer rail technique to trigger signals etc through a relay, is that often the connection between the outer rails is a bit sporadic. So as the train moves through the trigger block the relay can make and break contact continuously. The result is annoying relay “chatter’ and “dropout.”

The Solution: To combat this issue we can introduce a simple buffer circuit (R1-C1) into the trigger signal, as shown below. Vcc+ is supplied as shown, but no current flows as long as the trigger remains open, ie the trigger rail is not grounded. When the rail is grounded current flows through R1; and C1 becomes charged. The values selected cause C1 to fully charge in a small fraction of a second.

Once C1 is charged, the base of PNP transistor Q1 is also at ground potential, which allows +ve level current to flow from the emitter to the collector, which is grounded. Thus the relay input is grounded and the current flow activates the opto isolator on the relay board. It is designed to switch “ON” anytime the input is grounded. The opto circuitry energizes the relay coil, and the device connected to the relay outputs is activated. The buffer action of the C1 capacitor keeps Q1 conducting during brief outages of the rail grounding, thus the relay stays solidly triggered. No more chatter!

Once the train has left the block the trigger rail is ungrounded and the charge on C1 capacitor slowly drains back through the R5-POT1 path until it is neutralized. Once the charge neutralizes the base of Q1 rises above ground potential and it stops conducting. The relay coil de-energizes and the operating device returns to normal.

The R5-POT1 path is adjustable from a low to high resistance with the values selected and the setting of POT1. More resistance equals longer delay time before Q1 stops conducting, because C1 takes longer to discharge. This effectively produces an adjustable delay in returning to normal after the train leaves the trigger block. The selected values typically produce a delay in the range of 5 to 15 seconds.

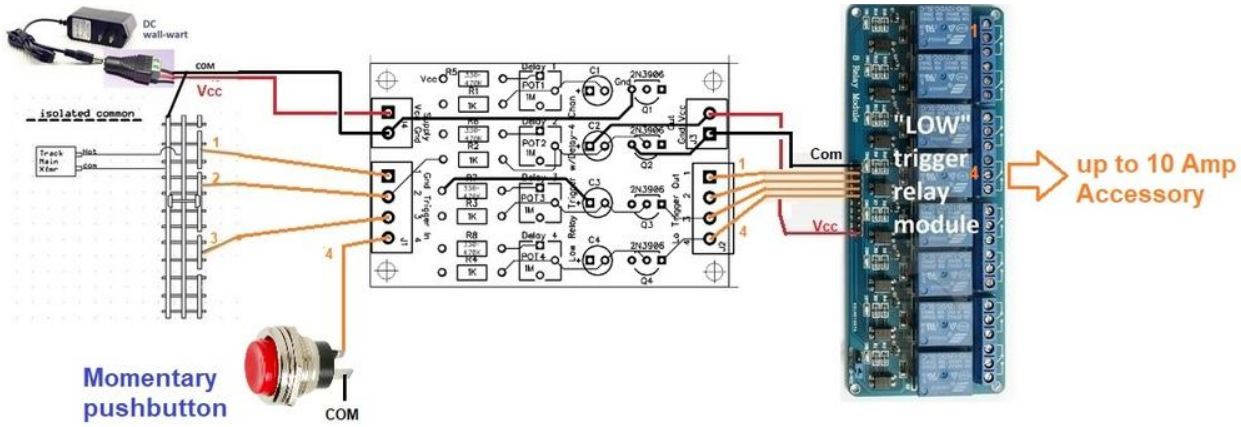


The board is equipped with screw terminals to make layout hookup easy. The Vcc level should be selected to match the operating voltage of the relays on the relay board, and the values for R5 and C1 selected accordingly. Vcc and Gnd in and out connections are provided to simplify wiring. The Gnd side of the supply must be connected to the non-isolated rail of the trigger track in order for the circuit to work. See below.

One optional simplification is to omit the pot (and jumper pads 1 to 2) and use say a 1M resistor for R5. This will result in a fixed delay of perhaps 6-10 seconds.

Offshore relay boards are typically available in 1, 2, 4, 6 and 8 relay configurations. One of these delay boards will operate from 1 to 4 separate trigger circuits. You need only populate the number of channels you will be using of course. Others can be added later as needed. Use two boards to operate a 6 or 8 relay board.

This sketch (kindly provided by Stan2004) perfectly illustrates the simple hookup:

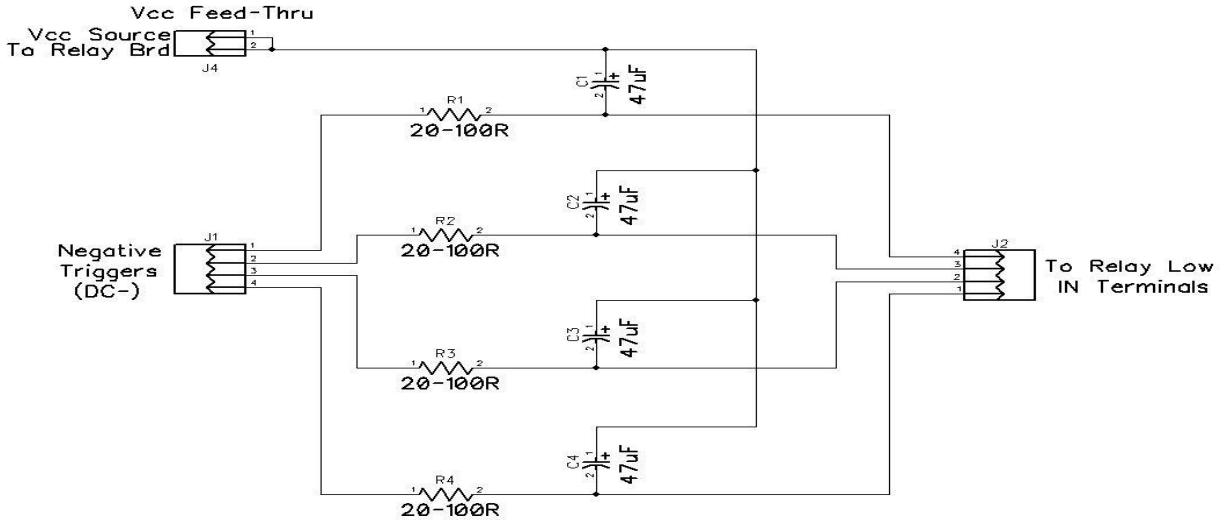


Note the option of a simple pushbutton switch to manually activate an accessory!

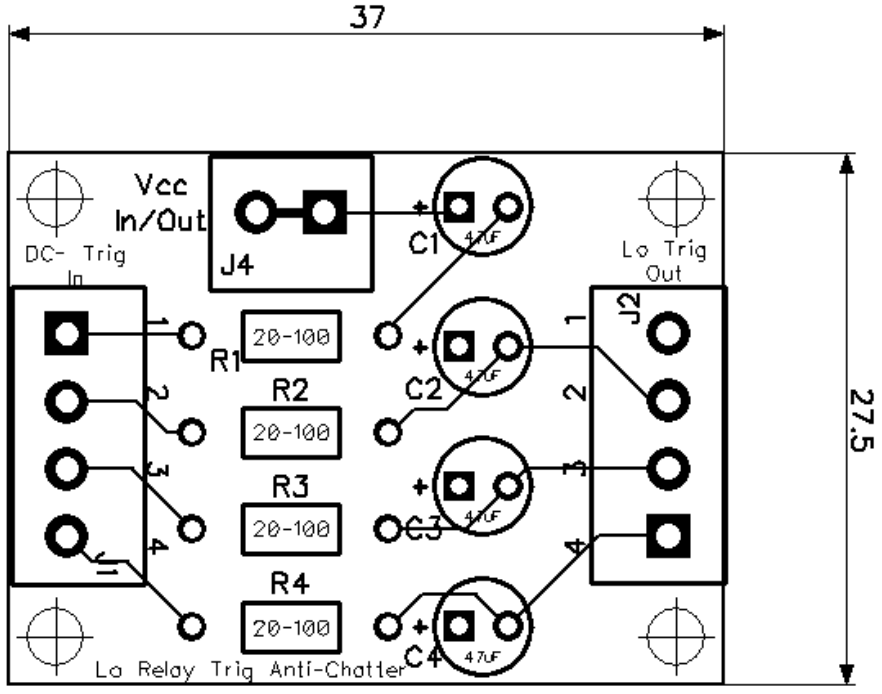
A Simple Anti-Chatter Board

A simpler alternative to the above circuit is shown below. This circuit provides basic relay anti-chatter capability through a 2 component R-C filter, but no trigger delay once the block is cleared. It has the advantage of being smaller and less expensive to build though.

When triggered cap C1 is charged through R1 in a small fraction of a second, and the respective relay is energized as described above. During short trigger dropouts the cap discharges to maintain the ground level signal input to the relay board circuit. The values shown allow C1 to charge in a few milliseconds, and the relay will stay triggered for perhaps half a second after final trigger dropout.



Again this board will accommodate up to 4 separate trigger circuits. Vcc must be supplied to the board, and there is a convenient feed thru connection for wiring to the relay board. Board hookup is identical to that shown above for the delay board, except no supply ground connection is needed for this board. But the Gnd side of the supply must be connected to the non-isolated rail of the trigger track as shown, in order for the circuit to work, exactly like the delay board hookup.



Acknowledgements: Original circuit design and other ideas supplied by Stan2004 on the OGR forum.