HO POWERED UNCOUPLING RAMP

By Fred Miller, MMR

Many modelers seem to be using little sticks or screwdrivers to perform the uncoupling action while switching their model rolling stock equipped with couplers manufactured by Kadee® and others. However, there are times when the reach to slip that little stick between the cars becomes difficult. In my traction modeling case, my overhead wire is another challenge to reaching between cars. Of course an old tried and true solution to this difficult location problem is the under-track uncoupling magnet. Kadee® and other manufacturers offer these magnets for use in several modeling scales. These might work well in areas where there will be little train movement over the magnets to cause inadvertent uncoupling.

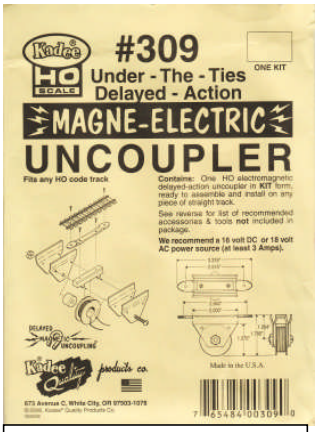


Fig 1 – Kadee Uncoupler

A solution to inadvertent magnetic uncoupling is to use an electrically powered magnetic uncoupling device, which can be activated only when needed. Kadee® has recently upgraded it's product and offers the new #309 Magne-Electric Uncoupler. This new offering seems to work well in a completely under the ties mounting. See figure 2. The uncoupler can be completely hidden under the ballast.

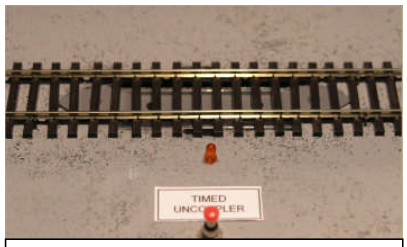


Figure 2 – Under ties mounting

This new powered uncoupler requires 3-4 amps of DC current at 16 to 18 volts. If that amount of power is left on for more than a minute or two at a time, the device may overheat and be damaged. This operating characteristic encouraged me to develop a power source that:

- Did not use an on-off toggle that could be inadvertently left on. A push button switch was the better alternative.
- Did not require the full 3-4 amps to flow through the controlling switch, which would exceed the rating of many smaller push buttons. I like the Kadee® #160 "Quickie Switch" panel button for panel mounting but they have a suggested maximum current rating of 1 amp.
- Did not require holding the push button while performing a switching move. One hand on a controlling push button would leave only one other hand to manipulate the controls on the locomotive throttle.

I designed my powered magnetic uncoupling control circuit to meet those requirements. The circuit will activate the uncoupler for a 5-6 second period after a brief tap on a small panel mounted push button. The activation time is easily

adjusted to accommodate requirements. A LED lamp is also activated near the uncoupler to indicate the power is on.

Uncoupler Construction

The Kadee® #309 Magne-Electric Uncoupler kit comes with instructions to build and mount the device. My installations include the Bridge Rectifier and capacitor as referenced in those instruction. I used an LED with resistor instead of the lamp suggested in the Kadee® instructions. I use a 16VAC, 4A power transformer available from Jameco® to power all my ramps.

Circuit Design

My circuit design makes use of a handful of electronic components and resistors and capacitors. The operation includes a 555 IC device, which provides the 5-6 second time pulse when activated by the pushbutton. A Triac device is used for

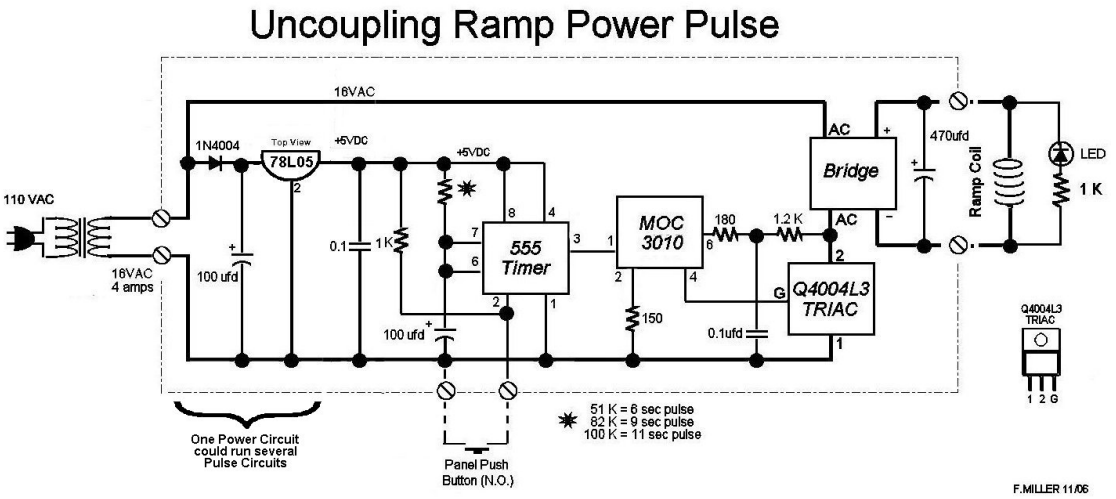


Figure 3 – Complete Electronic Control Circuit for Powered Uncoupler

the solid-state on-off control of the 16VAC. The timer and Triac are isolated from each other with an opto-issolator IC. The AC is then converted to DC with a Full Wave Bridge. The circuit in Figure 3 shows a self contained power supply for the 555 Timer. This power supply could be separated from the pulse circuit and used to provide the 5VDC power for several pulse circuits.

Control Circuit Construction

Most of my electronic circuits are constructed on perf-board available from Radio Shack® as shown in the photos. I always start construction using a drawing program on my PC. Paint Shop Pro™ from Jasc® Software is my favorite. I lay out the components on a graphical grid, representing the perf- board, with the parts arranged similar to the actual circuit design. I then draw lines representing the wiring connections. I do this on a *top view* as shown in Figure 4a. I then use

the drawing program's ability to flip the drawing. This then gives me the *bottom view* as shown in Figure 4b. This represents the actual wiring side and is used as a guide for the physical wiring.

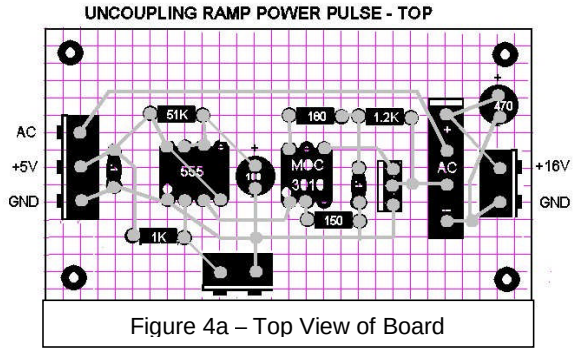


Figure 4a – Top View of Board

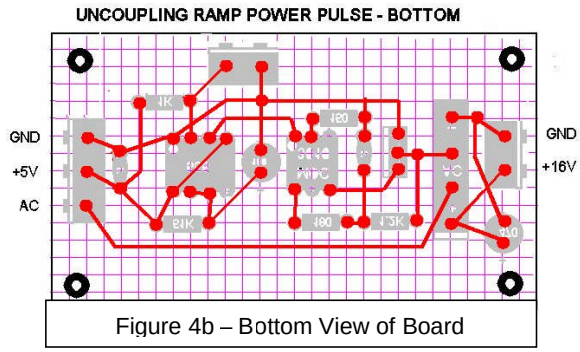


Figure 4b – Bottom View of Board

Care should be taken to draw (and later solder) the components that have a polarity marking. This includes the capacitors, diode, ICs and voltage regulator. Drawing the components in the top view and marking the leads helps in the later construction.

I always use sockets for IC devices which in this case would be the 555 timer and the 3010 opto-issolator. My construction sequence generally follows this approach:

- Cut the perf-board to size and epoxy the screw-terminal blocks.
- Mount the other devices in an approximate location.
- Start establishing the wiring connections using the leads from the resistors and capacitors as most of the connections. Small (#22 gauge) solid wire is used as necessary. The insulation from the wire is used only when wires cross over each other.
- After all connections are soldered I clean the board of any remaining rosin using alcohol or lacquer thinner.
- I then test all connections from the top with a continuity tester. I made a simple battery powered one many years ago which sounds a tone when a tested connection is complete. Many inexpensive meters also have continuity testing capability.
- After the wiring is confirmed as above, I apply power to the circuit to test that the voltages are appropriate for the locations. Note that I have NOT yet inserted the ICs into the sockets. I only do that after the voltages appear correct.
- If all of the above looks good (and sometimes I have to correct a mistake in wiring) I then test that the circuit is behaving as it should, looking at the voltages at various points. In this case I tested that the 16VDC develops on the coil for the 5-6 seconds after pressing the push button. Of course, a good "smoke test" is appropriate at this time.

I have found the Uncoupling Ramp Power Pulse circuit to be a reliable piece of electronics. Since there are no mechanical contacts used in the power circuit, it

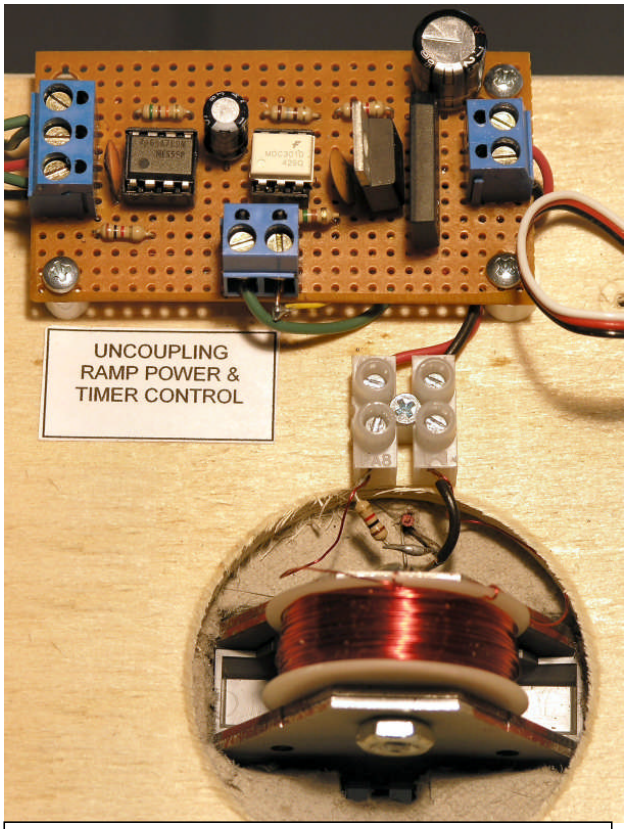


Figure 5 – Mounted Circuit Board and Uncoupler

should last for a long time. I mount the circuit boards close to the ramp coil to prevent power loss in long wiring runs. The control circuit (push button on panel or layout fascia) can be long and need not have heavy wiring since minimal voltage and current flows in the momentary contact.

Parts List

Many of the parts can be purchased from Radio Shack®. However the availability is sometimes limited and the prices are substantially higher than a mail-order electronics supplier. I like Jameco® (www.jameco.com) for good prices, wide availability and good service. Those items which can be purchased from Radio Shack®, albeit higher prices, are marked below with (RS)

Kadee® #309 Magne-Electric Uncoupler kit
Jameco® 16AC, 4A Power Supply (Jameco #176604)
7805 5-Volt Regulator (RS)
1N4004 Diode (RS)
555 Timer IC (RS)
MOC 3010 Opto-Issolator
Q4004L3 Triac
Full Wave 4 Amp AC bridge (RS)
0.1ufd disk capacitors (x2) (RS)
100uf capacitor (RS)
470uf capacitor (RS)
1K(x2), 82K, 150, 180, 1.2K resistors (RS)
Screw terminal blocks
8 pin IC sockets (x2)
Perf-Board (Radio Shack® sells this in multiple sizes) (RS)
Push Button (RS)
LED (RS)

Anyone interested in further information, please contact me at tractionfan@aol.com. If there is enough interest, I would be glad to develop and make available, on a cost basis, a printed circuit board along with a complete Jameco order sheet. See next page for parts list and photos of completed board.

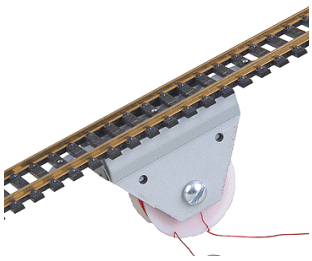
PART REQUIREMENTS FOR UNCOUPLING RAMP POWER PULSE BOARD									
PART ID	PART DESCRIPTION	JAMECO PART NO.	JAMECO PRICE	MIN QTY	REQ'D PER BOARD	QTY ORDER (1ST BOARD)	COST (1ST BOARD)	QTY ORDER (NEXT BOARD)	COST (NEXT BOARD)
KADEE MAGNE-ELECTRIC UNCOUPLER KIT #309							14.95		14.95
X1	TRANSFORMER, 16VAC, 4 AMPS	176604	$17.10	-	1	1	$17.10	0	-
D1	1N4004 DIODE	35991	$0.04	10	1	10	$0.40	0	-
D2	4 AMP FULL WAVE BRIDGE RECTIFIER	PROVIDED WITH THE KADEE KIT							
IC1	78L05 5V RECTIFIER	51182	$0.29	-	1	1	$0.29	1	$0.29
IC2	555 TIMER	27422	$0.29	-	1	1	$0.29	1	$0.29
IC3	MOC3010 OPTICAL TRIAC TRIGGER	26278	$0.49	-	1	1	$0.49	1	$0.49
IC4	Q4008L3 TRIAC 8 AMP	160207PS	$1.28	-	1	1	$1.28	1	$1.28
C1, C3	100 ufd, 50V ELECTROLYTIC CAPACITOR	606774	$0.26	-	2	2	$0.52	2	$0.52
C2, C4	0.1 UFD, 50V DISK CAPACITOR	15270	$0.15	10	2	10	$1.53	0	-
C5	470 UFD, 35V ELECTROLYTIC CAPACITOR	PROVIDED WITH THE KADEE KIT							
R1, R6	1 K OHMS 1/4 WATT RESISTOR	690865	$0.01	100	2	100	$1.00	0	-
R2	100K OHMS TRIMMER	770427	$0.78	-	1	1	$0.78	1	$0.78
R3	150 OHMS 1/4 WATT RESISTOR	690662	$0.01	100	1	100	$1.00	0	-
R4	180 OHMS 1/4 WATT RESISTOR	690689	$0.01	100	1	100	$1.00	0	-
R5	1.2 K OHMS 1/4 WATT RESISTOR	690881	$0.01	100	1	100	$1.00	0	-
LED	RED LED	333851	$0.12	10	1	10	$1.18	0	-
T1	3-TERMINAL SCREW BLOCK CONNECTOR	152355	$0.47	-	1	1	$0.47	1	$0.47
T2	2-TERMINAL SCREW BLOCK CONNECTOR	152347	$0.65	-	1	1	$0.65	1	$0.65
TOTALS W/O POWER SUPPLY & KADEE UNCOUPLER KIT							**$11.88**		**$4.77**
TOTALS INCLUDING ALL COMPONENTS							**$45.93**		**$21.72**

Notes

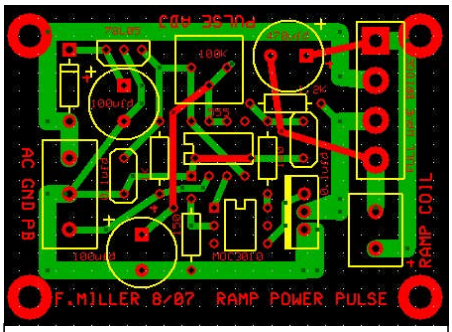
(1) As noted above in the Parts Table, D2 – the Bridge Rectifier, and C5 – the 470 ufd capacitor are supplied in the Kadee kit.

(2) The cost of parts for subsequent boards would be ($4.77 without the Kadee Kit) because of minimum qty ordering on the first.

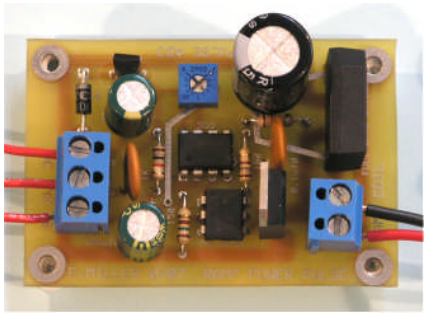
(3) The LED and R6 resistor are optional but suggested. Any LED could be used.



Assembled Kadee Ramp



PC Board Art Work – approx actual size



Completed Board