# Automatic Uncoupling "Breaking Up Ain't Hard to Do"

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## **Topics**

- Manual uncoupling
- Automatic uncoupling
- Hands-free automatic uncoupling
- Locating and concealing uncouplers
- Materials list

Note: This presentation is oriented around Kadee products; there are other brands available, but I prefer Kadee ....



## Manual Uncoupling



## **Common Manual Uncoupling Tools**

#### Wooden Skewers

#### **Accurail Accumate Switchman**

## Kadee Dual Tool

(uncoupling and spring pick)



#### **Rix Uncoupling Tool**



### **Micro-Mark UncoupleLITE**



## Manual Uncoupling Tools (cont'd)

## Wire Hook



Used for passenger cars with diaphragms



## Manual Uncoupling Tools

### **Pros:**

- Flexible, versatile, portable "works anywhere on the layout"
- No preplanning during construction
- Inexpensive
- Fits in your pocket



## Cons:

- Must be able to reach cars and access couplers from above (or alongside if using a hook)
- Can interfere with scenery
- Sometimes takes a bit of fiddling to work



## The Ultimate Manual Uncoupling Tool



aka *"The Maidenform"* (lifts and separates)

### **Pros:**

- Costs nothing
- Totally portable
- Doesn't even require pockets

### Cons:

- Must be able to reach cars
- Exposes car to dirty fingers and broken detail parts
- Often ends up derailing the car



## **Automatic Uncoupling**



## **Automatic Uncouplers**

#### **Pros:**

- Eliminates reaching over (and breaking) scenery
- Eliminates car handling
- Most effective way to uncouple cars with diaphragms
- Adds to the play factor

#### Cons:

- Less flexibility can only uncouple at fixed locations
  - Should be installed on straight, or nearly straight track
- Not all operators know how, or care, to use them
- Under-the-track installation requires planning when laying track, or removing / re-installing track and ballast
- Steel wheels and axels can tend to drift toward magnet



## Kadee Uncouplers

Kadee makes several types of uncouplers in multiple gauges:

- Permanent Always "on"
- *ElectroMagnetic* Only "on" when energized
- **Between-the-Rails** Installed on top of ties
- Under-the-Track Installed below ties
- **Delayed and Non-delayed** (See next charts)



## **Delayed Uncouplers**

Couplers are spread far enough apart so cars can be pushed "thumb to thumb"



Stopped over a Magnetic uncoupler, allowing slack to occur between the couplers. Knuckles have opened.



Enter over uncoupler again, couplers are in delayed position allowing pushing of car(s) without causing re-coupling.



Withdraw slightly to disengage couplers. Magnetic force of the uncoupler draws couplers apart, uncoupling them.



Withdraw, leaving uncoupled car(s) on desired track. Couplers automatically return to normal coupling position.



## Delayed uncoupler in action ...



## **Non-delayed Uncouplers**

# Couplers are only spread far enough to uncouple, but not far enough for pushing

Stop couplers over magnetic uncoupler

Withdraw and disengage couplers. Magnetic force 2 draws knuckles off center

To couple, push off magnet. Knuckles return to coupled position







**Non-Delayed** 

Delayed



### Kadee Between-the-Rails Permanent Uncouplers (HO scale shown)

#### #312 Non-delayed







#### #321 for HO Code 100 track

#### #322 for HO Code 83 track (remove ties for Code 70, 55 and 40)

#811 for O scale (#809 for 3-rail)



## Kadee Between-the-Rails Permanent Uncouplers

#### Kadee uncoupler gluing jig #334 positions between-therails Delayed and Non-delayed magnets on track



### Kadee Under-the-Track Permanent Uncouplers (HO scale shown)

#### #308 Delayed



(Also works for S, O, On3 and On30)

#### #309 EletroMagnetic Delayed





## ElectroMagnetic Uncoupler





18 VOLT Min, 1.5 Amp

-0

## "Hands-free" Automatic Uncoupling



## *"Hands-free" ElectroMagnetic Uncoupler*

Design is based on a November 2015 Model Railroader article by Jean Piquette

## Improved hands-free uncoupler control

This new circuit works much quicker, and includes a light to indicate operation

By Jean C. Piquette • Photos by the author



 $\begin{array}{c} D1 \\ \hline T \\ \hline T \\ \hline \\ R3 \\ R3 \\ \hline \\ R1 \\ C1 \\ \hline \\ C1 \\ \hline \\ \hline \\ R1 \\ \hline \\ R2 \\ \hline \\ R2 \\ \hline \\ R2 \\ \hline \\ R2 \\ \hline \\ R1 \\ \hline \\ R2 \\ \hline \\ R2 \\ \hline \\ R1 \\ \hline \\ R2 \\ \hline \\ R2 \\ \hline \\ R1 \\ \hline \\ R1 \\ \hline \\ R2 \\ \hline \\ R1 \\ \hline \\ R1 \\ \hline \\ R2 \\ \hline \\ R1 \\ \hline \\ R1 \\ \hline \\ R2 \\ \hline \\ R1 \\ \hline \\ R2 \\ \hline \\ R1 \\ \hline \\ R1 \\ \hline \\ R2 \\ \hline \\ R1 \\ \hline \\ R2 \\ \hline \\ R1 \\ \hline \\ R2 \\ \hline \\ R1 \\ \hline \\ R1 \\ \hline \\ R2 \\ \hline \\ R1 \\ \hline \\ R2 \\ \hline \\ R1 \\ \\$ 

circuit was featured in the November 2011 Model Bailroader.

Fig. 2 Improved hands-free circuit. The new circuit removes resistors from the power circuit, and only draws power when energized. It's also faster, and includes an indicator light to show when it's in operation.



Emitte

t. Fig. 3 Transistor connections. The two leads on the back of the power transistor (T1) are slightly off center. In r, this orientation, the emitter (E) is at the top, the base (B) is at the bottom. The case is the collector (C). In the November 2011 Model Railroader 1 presented a circuit designed for hands-free control of a Kadee 309 electromagnetic uncoupler. The circuit provided 20 to 25 seconds of activation of the electromagnet after only a 2- to 3second press of a pushbutton.

. I now have an improved and updated version of the circuit. One advantage of the new circuit is it includes an indicator bulb that lights when the electromagnet is energized. In **fig. 1**, the circuit is in operation, with bulb aglow, using the testbed I built for development and testing.

#### New circuit

The new version of the circuit is shown in **fig. 2**. In addition to the indicator bulb, a second advantage of the new circuit is the elimination of the resistors from the original circuit that got very hot, even when the electromagnet wasn't being energized. The new circuit doesn't draw any power unless the pushbutton (S1) has been pressed.

The power transistor (T1) still gets hot when the circuit is operated, so the circuit should still be installed with good ventilation. Adding a heat sink to the transistor would also be helpful.

Another advantage to the new circuit is that it activates much quicker. The original circuit required pressing the button for 2 to 3 seconds in order to get the full 20 to 25 seconds of activation of the uncoupler.

The new circuit responds almost instantaneously (in much less than 1 second). So with this circuit there's no need to keep the button pressed down for more than an instant. As with the original circuit, uncoupling action starts once the pushbutton is released.

#### **Power source**

Since developing the original circuit, I've learned ideal sources of inexpensive power supplies for this circuit are AC adapters sold as replacement power supplies for laptop computers. I've bought new adapters from www.amazon.com for under \$6. One is shown in **fig. 1**.

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## *"Hands-free" ElectroMagnetic Uncoupler*

#### The Concept

- When the circuit is activated, a slow-discharge capacitor activates the ElectroMagnetic uncoupler and an indicator light for 20-25 seconds of "hands-free" time allowing the operator to focus solely on maneuvering cars over the delayed uncoupling magnet
- Without this, the operator would need to keep one hand continuously on the uncoupler switch while working the throttle with the other hand

## "Hands-free" ElectroMagnetic Uncoupler Master Circuit Board



#### Front

Transistor with Heat Sink Capacitor 2 Diodes 2 Resistors

**Terminal Block** 





## "Hands-free" ElectroMagnetic Uncoupler Operator Control Panel



#### Front

Rotary Switch Momentary Switch 12 VDC Bulb Resistor





## "Hands-free" ElectroMagnetic Uncoupler



## Circuit Electronics (for you techno-nerds ...)

- The circuit is powered by 16VDC from a dedicated AC/DC transformer.
- A rotary switch selects the desired Kadee uncoupler.
- A momentary switch (S1) activates the circuit by opening the path to the capacitor allowing it to charge.
- When S1 is released, the charge from the capacitor drives the base of the transistor causing current to flow to the selected Kadee coil and the indicator bulb for as long as the capacitor discharges.
- Resistor (R1) and the applied voltage determines the base current
- (R2) limits the current to the indicator light so it doesn't burn out
- (R3) controls the charge current to the capacitor
- Diodes (D1) and (D2) protect the power supply and the bulb when the coil de-energizes and dissipates energy in the opposite direction



## Locating and Concealing Uncouplers



## Where to Locating Automatic Uncouplers?

- Use <u>Permanent</u> uncouplers <u>on spurs</u>
- Use <u>Electro-Magnetic</u> uncouplers <u>on mainlines, passing</u> <u>tracks and</u> arears with <u>heavy traffic</u>



#### Tips ...

- Use non-magnetic wheels
- Install uncouplers on straight track



## **Concealing Under-track Uncouplers**

Model Railroader - How to Build Realistic Reliable Track By Andy Sperandeo 2009 (out of print)





Bury them in your track bed and cover them with ballast

By Andy Sperandeo//Photos by Bill Zuback and Jim Forbes

Magnetic uncoupling can look like magic at work on your model railroad, especially if the magnets can't be seen. Kadee and other manufacturers offer both permanent magnets and electromagnets strong enough to work from below the ties. Using them takes a little planning, but figure out where to put them and you can build

them into your roadbed. lay track right over them, and conceal them with ballast.

Electromagnets are usually activated with momentary push buttons, making them ideal for locations in main tracks and at both ends of double-ended sidings and yard tracks. Because they're only



The only clues that there's a Kadee no. 309 electromagnet buried under this track are the two gray-painted ties. Andy Sperandeo paints the ties above the ends of the magnet pole pieces to show where to uncounle cars.

magnetic when you want to use them, they're also good for locations where a train or switch cut may be working over more than one magnet at once. Reserve the permanent magnets for single-ended spurs and vard tracks.

The photos illustrate some other tips for hiding uncoupling magnets. 🍩



Andy glues a rectangle of .005" styrene over the buried Kadee no. 309 magnet so he won't have to fill the roadbed recess with ballast or have ballast fall through the opening in the plywood subgrade. Next he'll glue flextrack over the magnet with adhesive caulk.



The Kadee no. 308 permanent magnet is wider than the shoulders of some HO roadbed. Fortunately, this magnet is made from a rubber-like material that can be carved. Here Andy uses a knife to "break" the uncoupler's sharp corners so they won't show through the ballast.



## Installing Under-track Permanent Uncouplers

Follow Kadee's instructions and mount the uncoupler centered directly under the two rails and flush under the ties ....



The magnet can be trimmed so it doesn't show through the ballast edges, and can be painted and ballasted without affecting it's performance (but try to keep it thin) ....



## **Concealing ElectroMagnetic Uncouplers**

Follow Kadee's instructions to cut an opening through the deck, then a shallow trench in the roadbed for the mounting plate. Poster putty works great to hold the mounting plate in place and adjust the height so that it's flush under the ties ....



Cover with .05" styrene to hide magnet, then lay track and ballast ....





## **Concealing ElectroMagnetic Uncouplers**



Mark uncoupler location with weathered ties, paint marks on rails, track signs, posts, old ties or other scenery items

## Hands-free Uncoupler Materials List



## Hands-free Uncoupler Materials List

Component	Manufacturer	Manufacturer's Part Number	Mouser Part Number	Digi-Key Part Number
Transistor (T1 or Q1)	ON Semiconductor	2N6284G	863-2N6284G	2N6284GOS-ND
Heat Sink	Aavid Thermalloy	501603B00000G	532-501603B00	HS110-ND
Capacitor (C1)	Nichicon	UPW1E272MHD	647-UPW1E272MHD	493-1840-ND
Diodes (D1, D2)	Fairchild Semiconductor	1N5402	512-1N5402	1N5402FSCT-ND
Resistor (R1)	Vishay Dale	CMF551K7400FHEB	71-CMF551K7400FHEB	CMF1.74KHFCT-ND
Resistor (R2)	Vishay BC Components	PR01000101000JR500	594-5073NW100R0J	PPC100W-1CT-ND
Resistor (R3)	Ohmite	WNE100FET	588-WNE100FET	WNE100FETCT-ND
Terminal Blocks	TE Connectivity	282834-6 (6 position) 282834-2 (2 position)	571-282834-6 571-282834-2	A98337-ND A98333-ND
10 amp Rotary Switch (S2)	All Electronics	RSW-610	www.allelectronics.com	
"Chicken Head" Knob	Jameco	102788	www.jameco.com	
Momentary Switch (S1)	Radio Shack	275-1549		
12 VDC Bulb (B1)	Radio Shack	272-0331		
Printed Circuit Board	Radio Shack	276-0147		
Universal AC Adapter (E)	E-Top	B00LQ9D73Q (Amazon ASIN)	www.amazon.com	
ElectroMagnetic Uncoupler	Kadee	309	www.kadee.com	
20 AWG stranded wire	Various			



# **Questions?**



"On the green light you go and on the red light you stop, because no engineer would ever run a red light."

"Engineer Bill" Stulla, KHJ-TV Cartoon Express, Los Angeles, 1954

