REMOTELY CONTROLLED STAGING/INTERCHANGE

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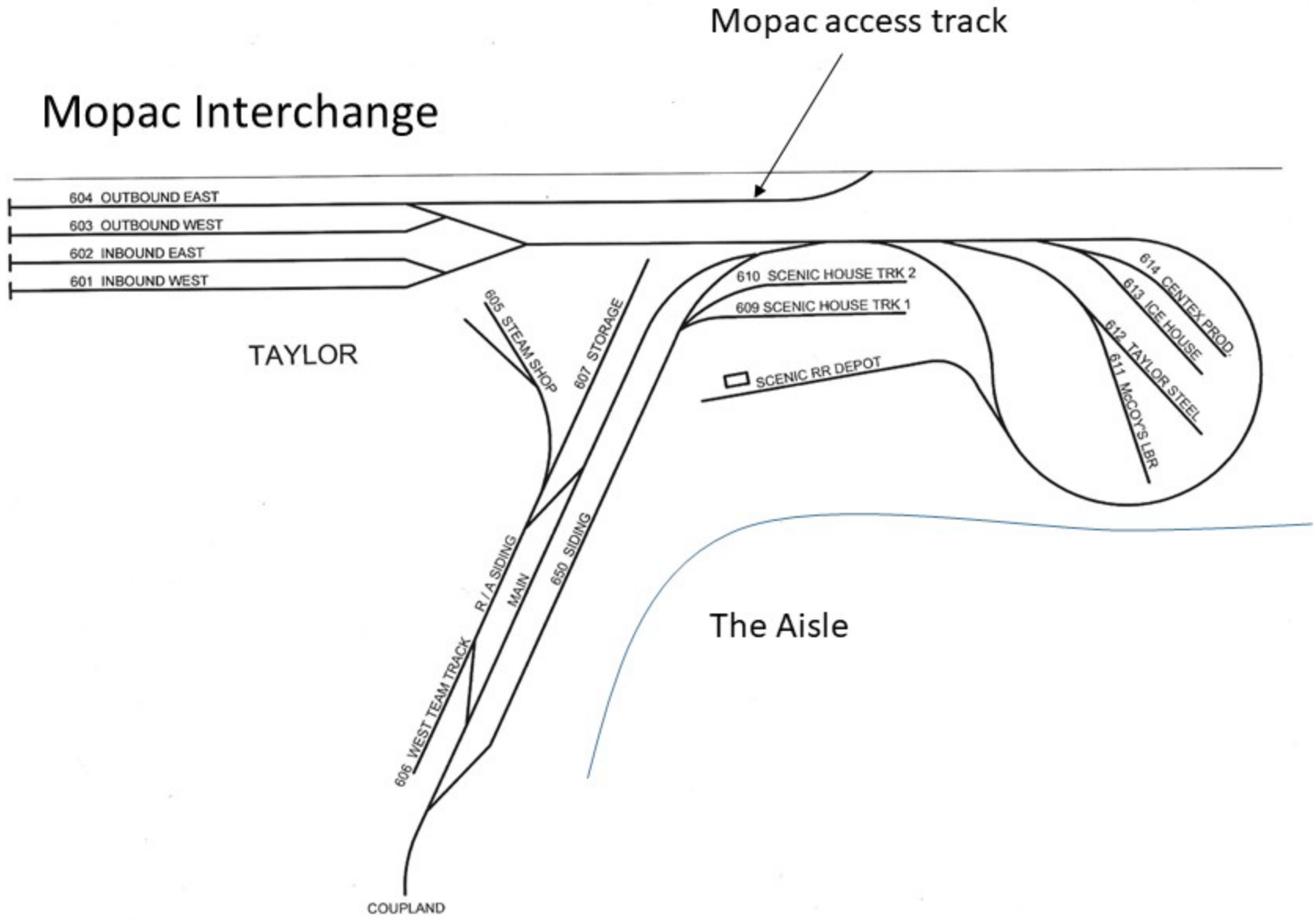
September 12, 2020

Div 4 ZOOM

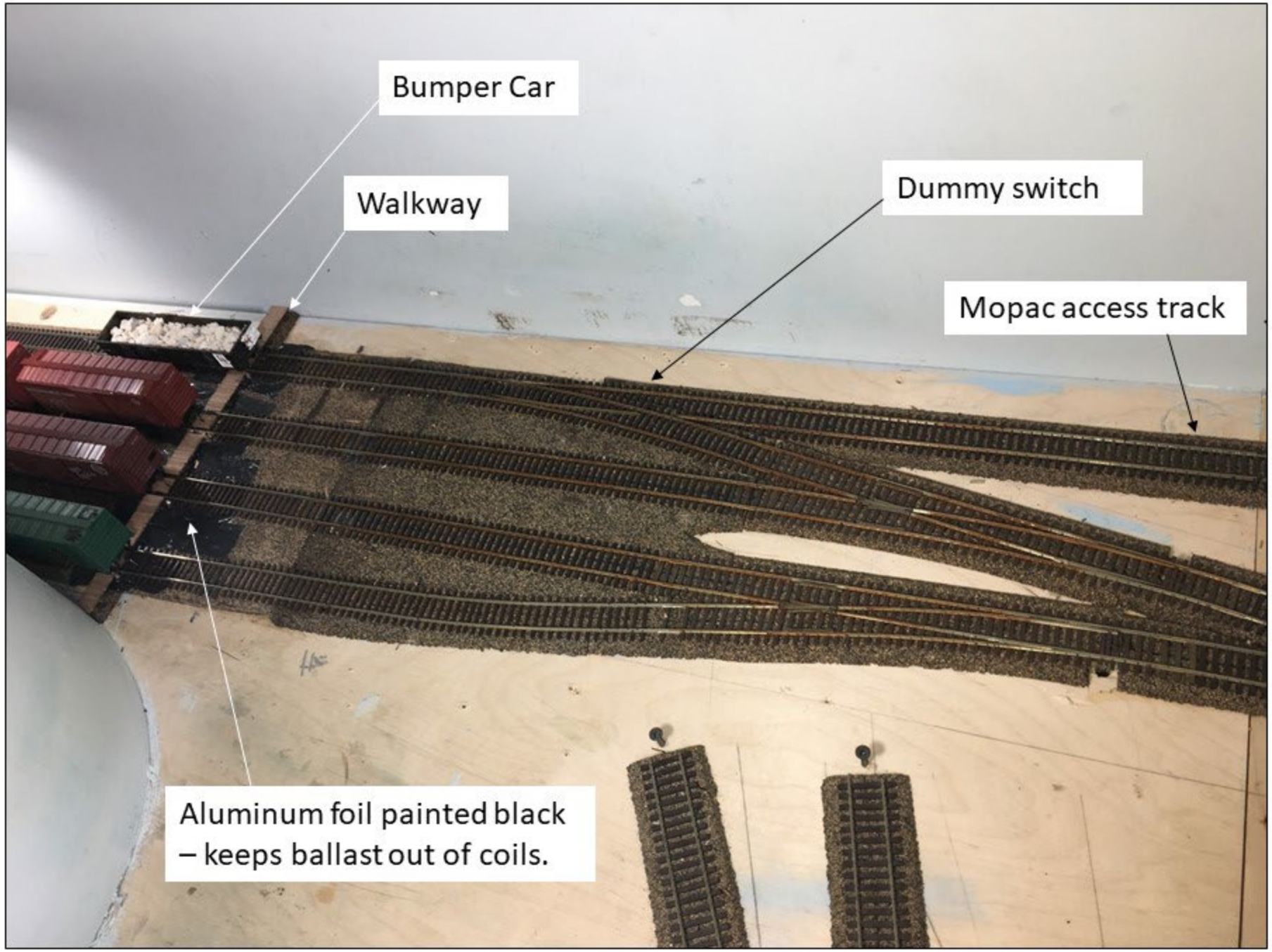
ABSTRACT - This is a description of how a remote staging, or interchange, yard can be built and operated in a hands-off fashion. Track selection is performed by pushbutton. Uncoupling is accomplished with Kadee electromagnetic coils that are controlled by an Arduino. Coupling and uncoupling are facilitated by "bumper cars" that provide resistance for coupling, and an anchor when cars are uncoupled.

Highlights:

- Pushbutton track selection
- Kadee uncoupling coil with timed activation controlled by Arduino
- Bumper cars aid coupling and uncoupling

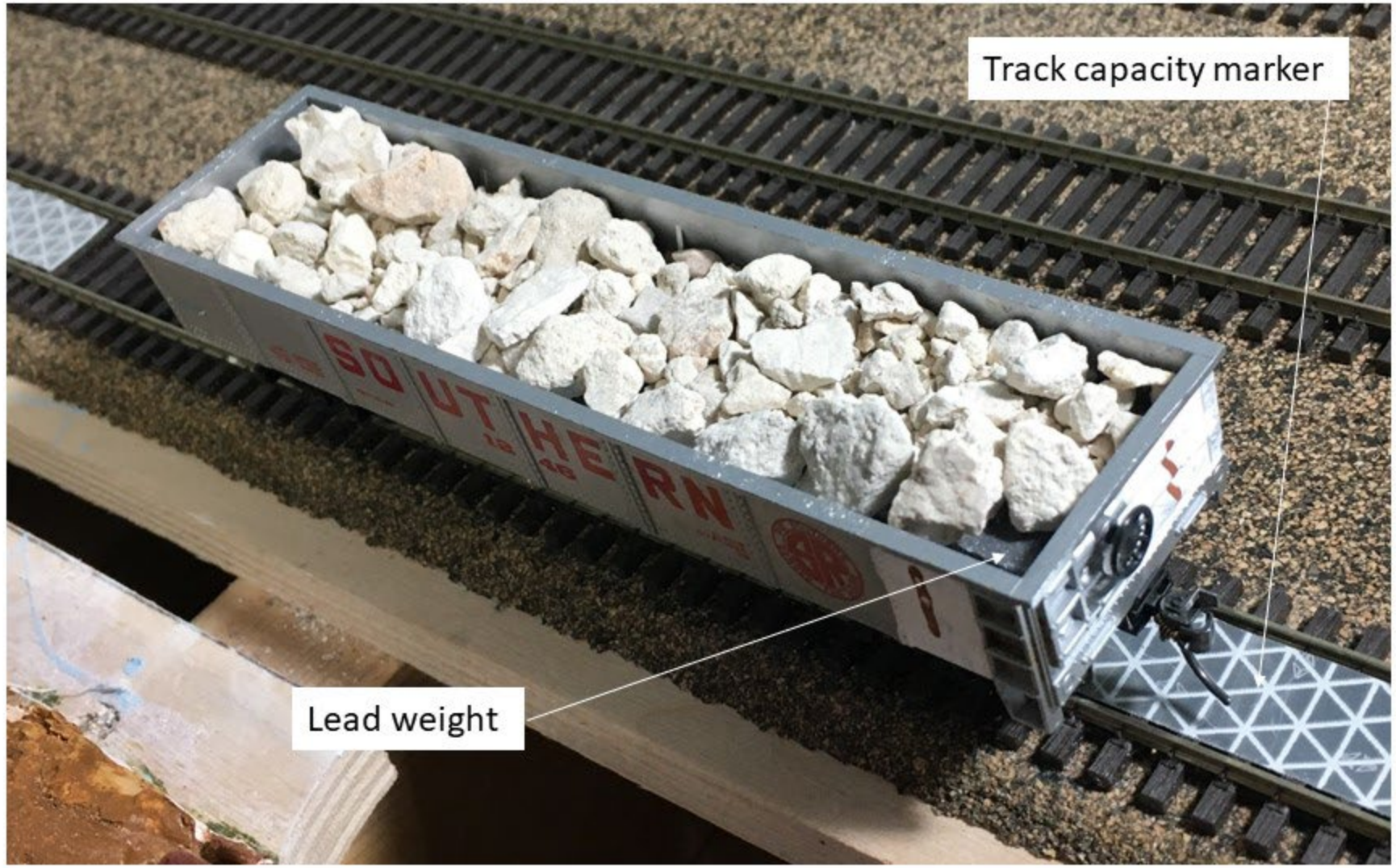

Mopac access track
Mopac Interchange
604 OUTBOUND EAST
603 OUTBOUND WEST
602 INBOUND EAST
601 INBOUND WEST
TAYLOR
605 STEAM SHOP
607 STORAGE
610 SCENIC HOUSE TRK 2
609 SCENIC HOUSE TRK 1
SCENIC RR DEPOT
614 CENTEX PROD
613 ICE HOUSE
612 TAYLOR STEEL
611 McCOY'S LBR
606 WEST TEAM TRACK
R / A SIDING
MAIN
650 SIDING
The Aisle
COUPLAND

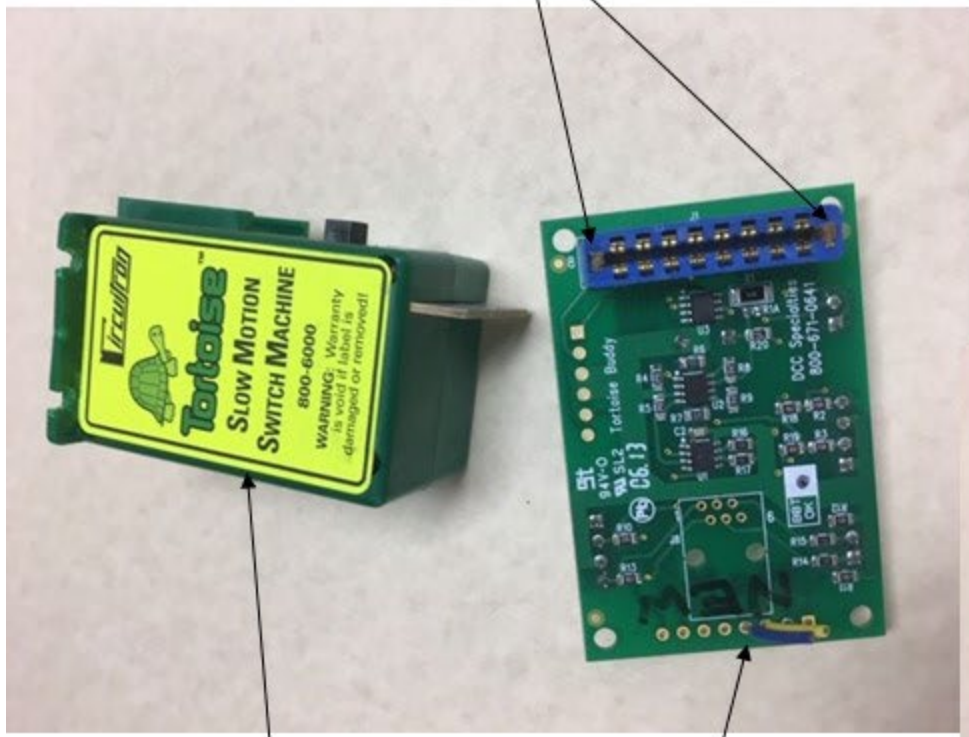
End of track access
Parabolic mirror
Track capacity markers
Bumper cars
Walkway


Bumper Car
Walkway
Dummy switch
Mopac access track
Aluminum foil painted black
– keeps ballast out of coils.


SOUTHERN PACIFIC

Bumper Cars





Wood spacers

Tortoise switch machine

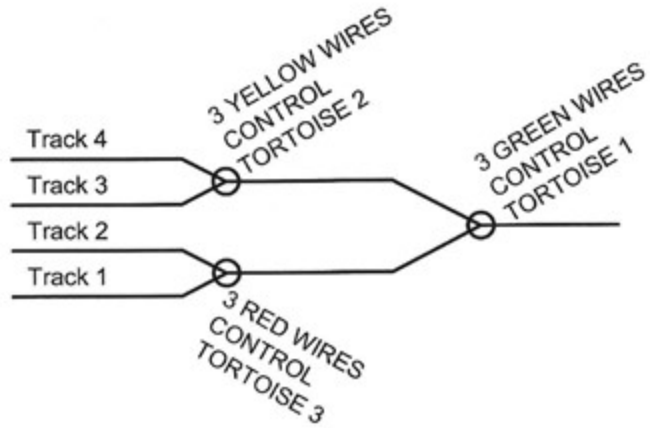
Tortoise Buddy Wiz-Kid

Switching controlled by pulse

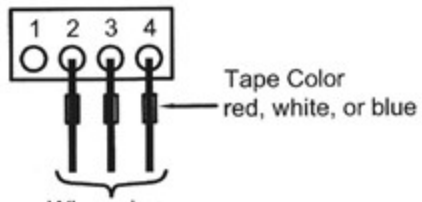
Contact closures indicate switch direction

Connector J7

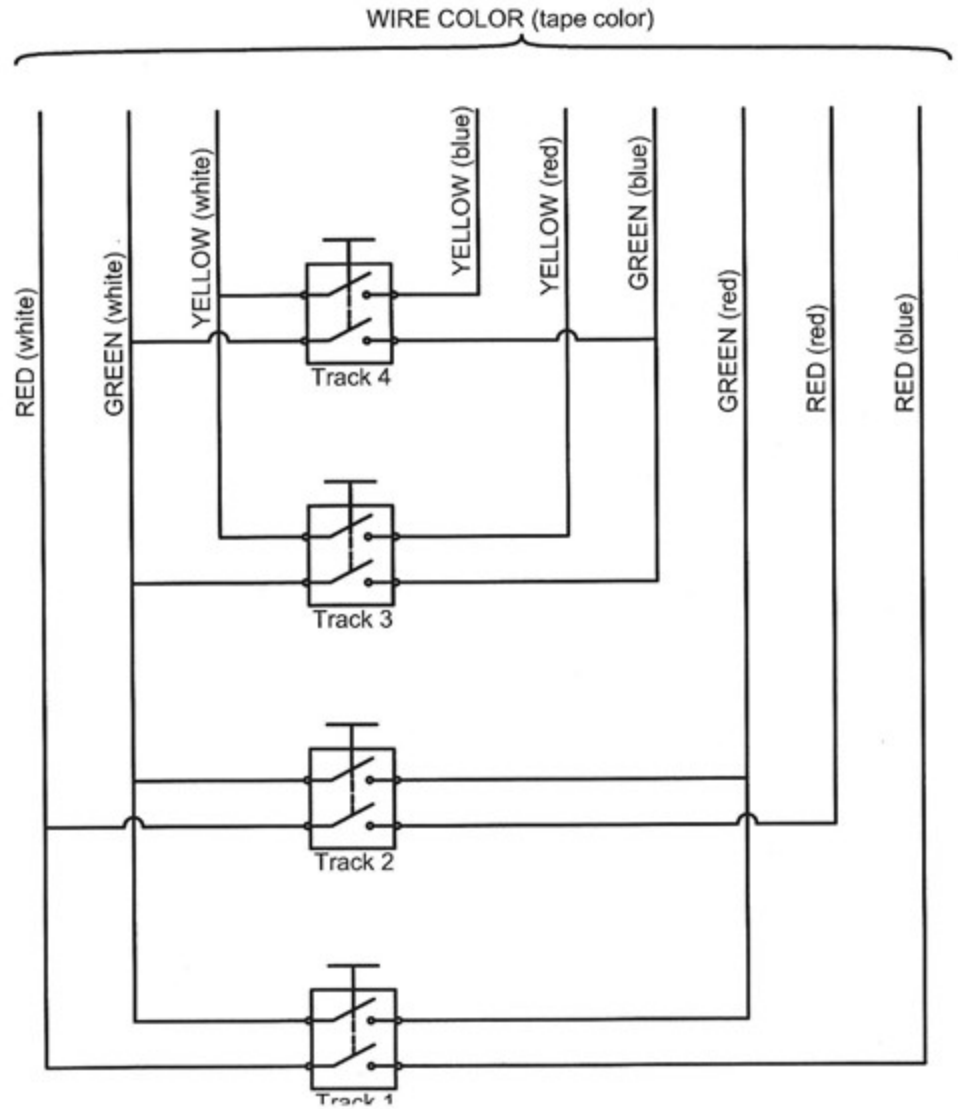
CONTROLLING TRACK SELECTION WITH **DPST** PUSHBUTTONS



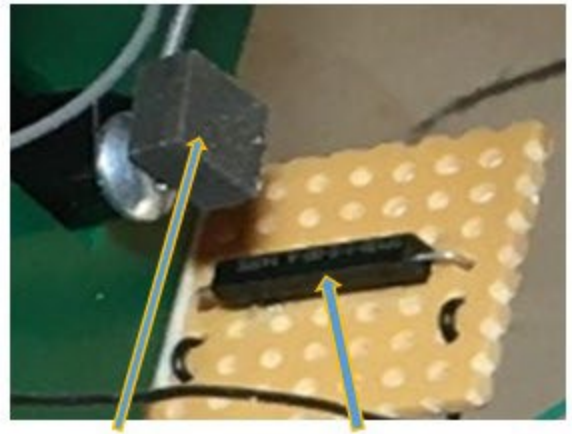
CONNECTIONS TO TORTOISE
BUDDY WIZ-KID
Connector J7
Switch Control



Short contacts 2 and 3, switch goes one way.
Short contacts 3 and 4, switch goes other way.

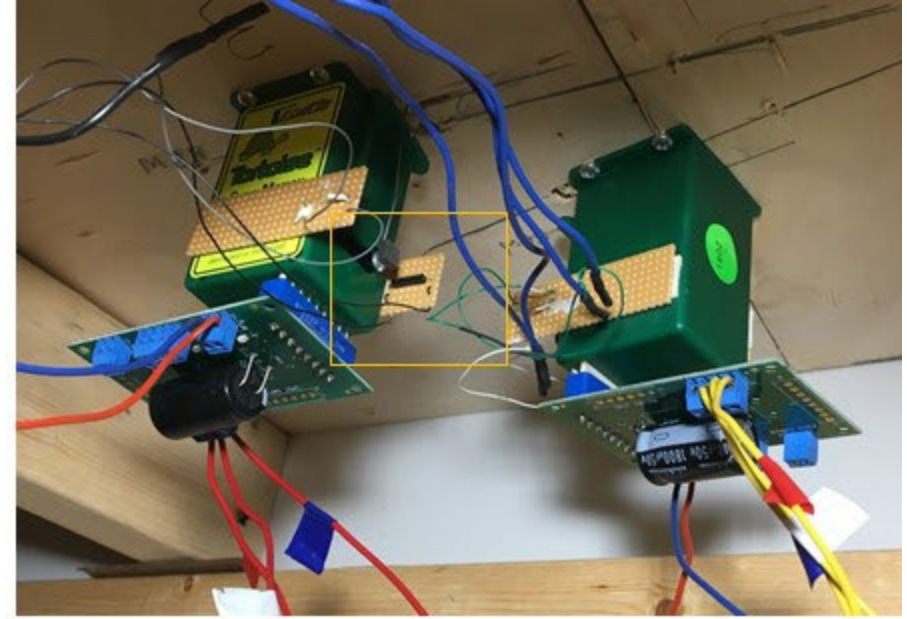


CONTROL PANEL LED's INDICATE THE TRACK

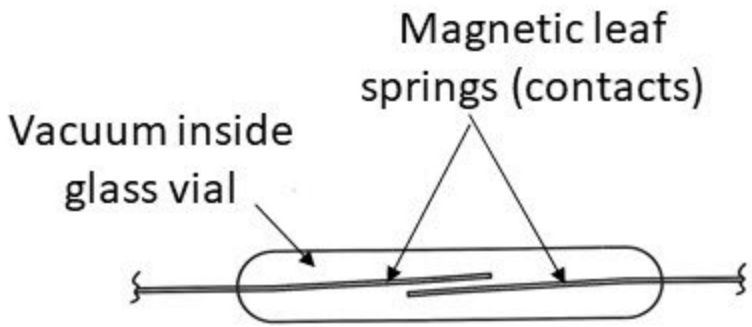


Permanent magnet

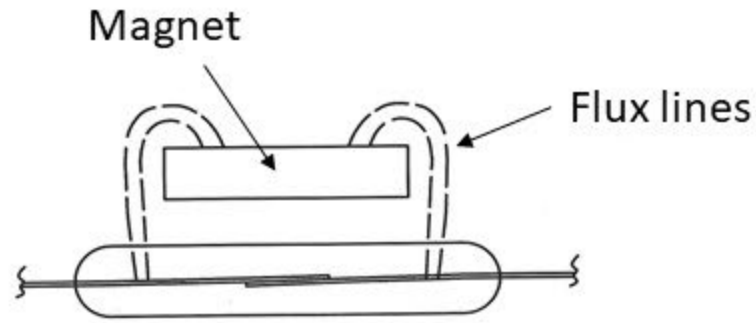
Reed switch
(200V, .5A)



HOW REED SWITCHES WORK

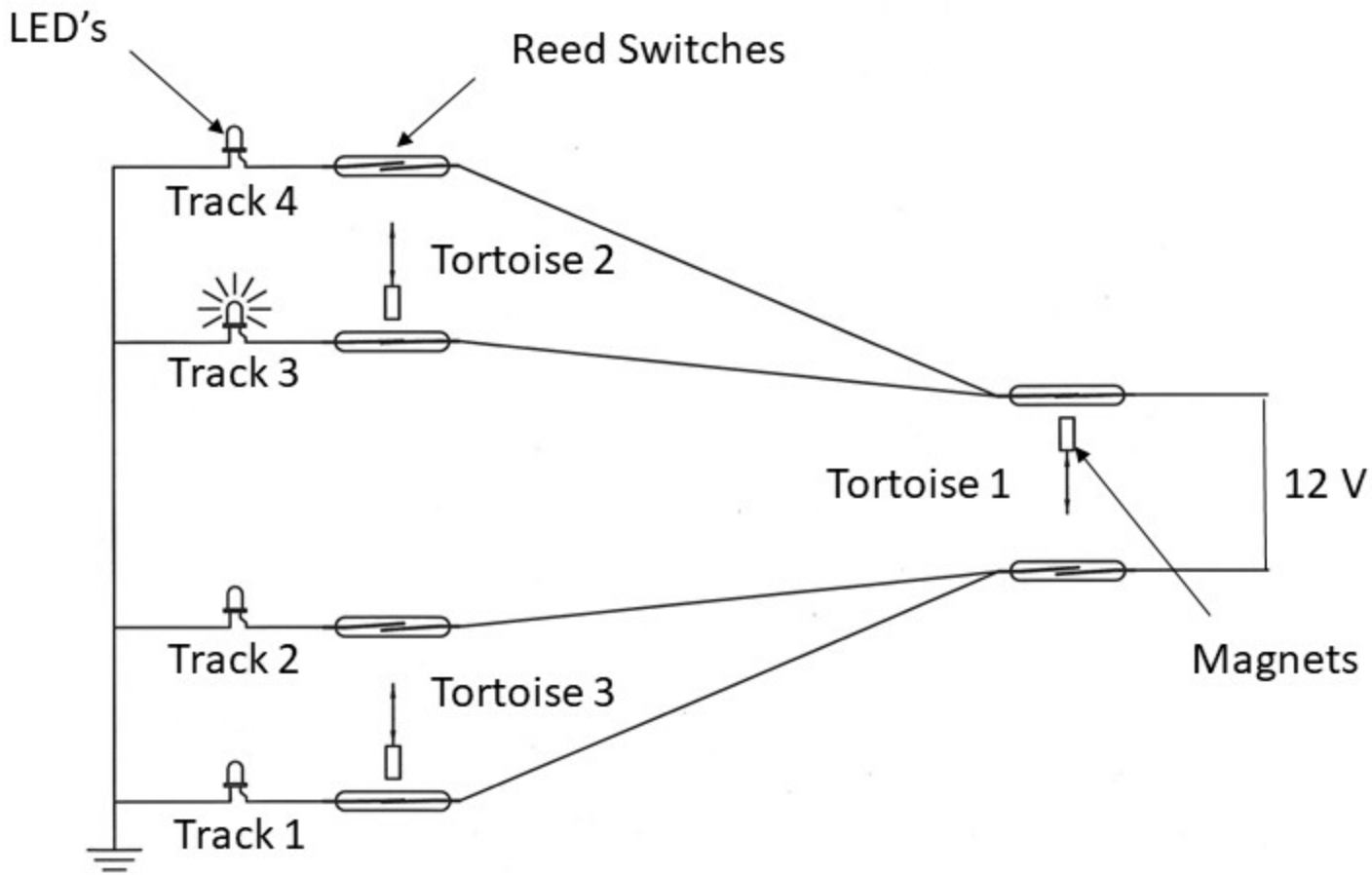


Switch Open



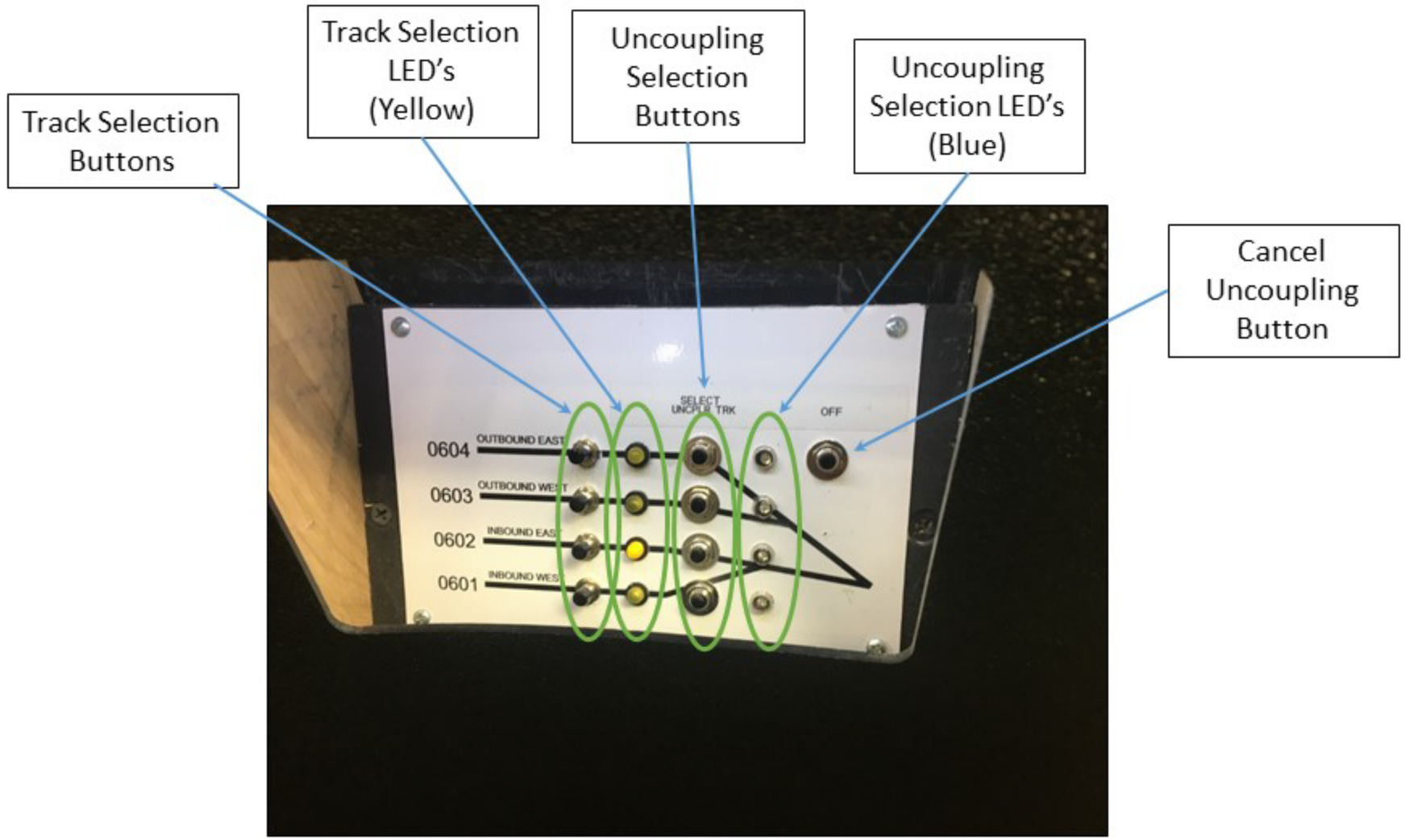
Switch Closed

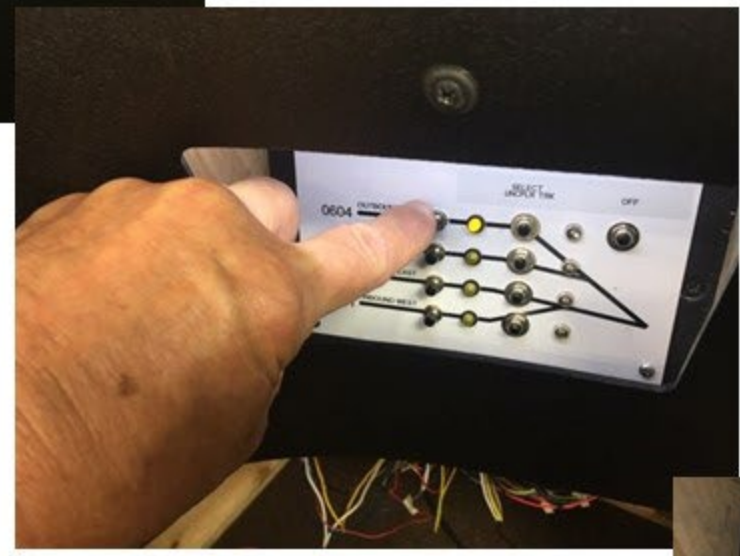
LIGHTING UP THE RIGHT LED



Tortoises are lined up on track 3, so light up track 3 LED.

Control Panel





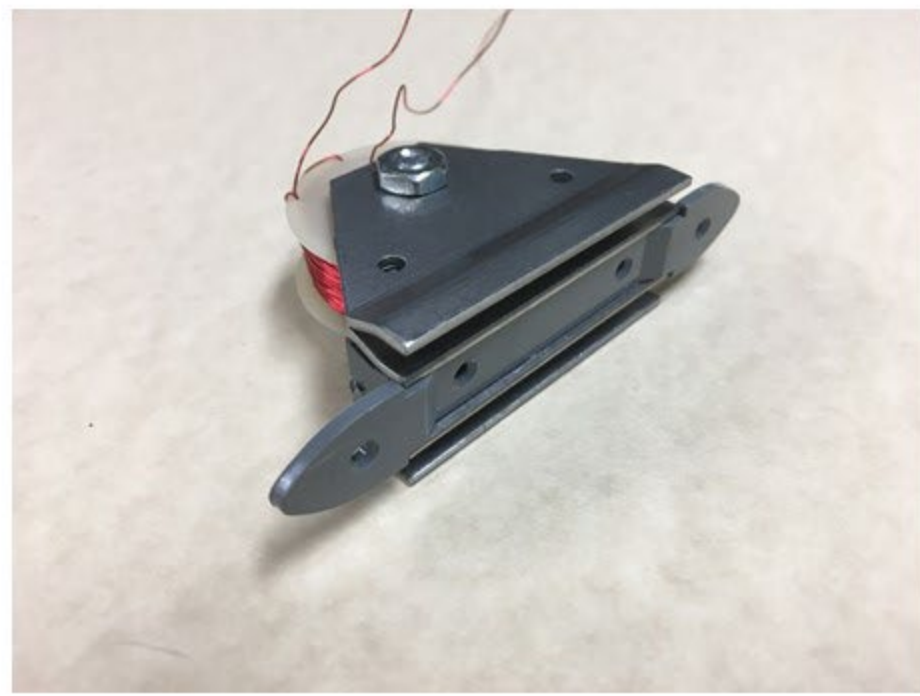
Selected track is indicated
with yellow LED

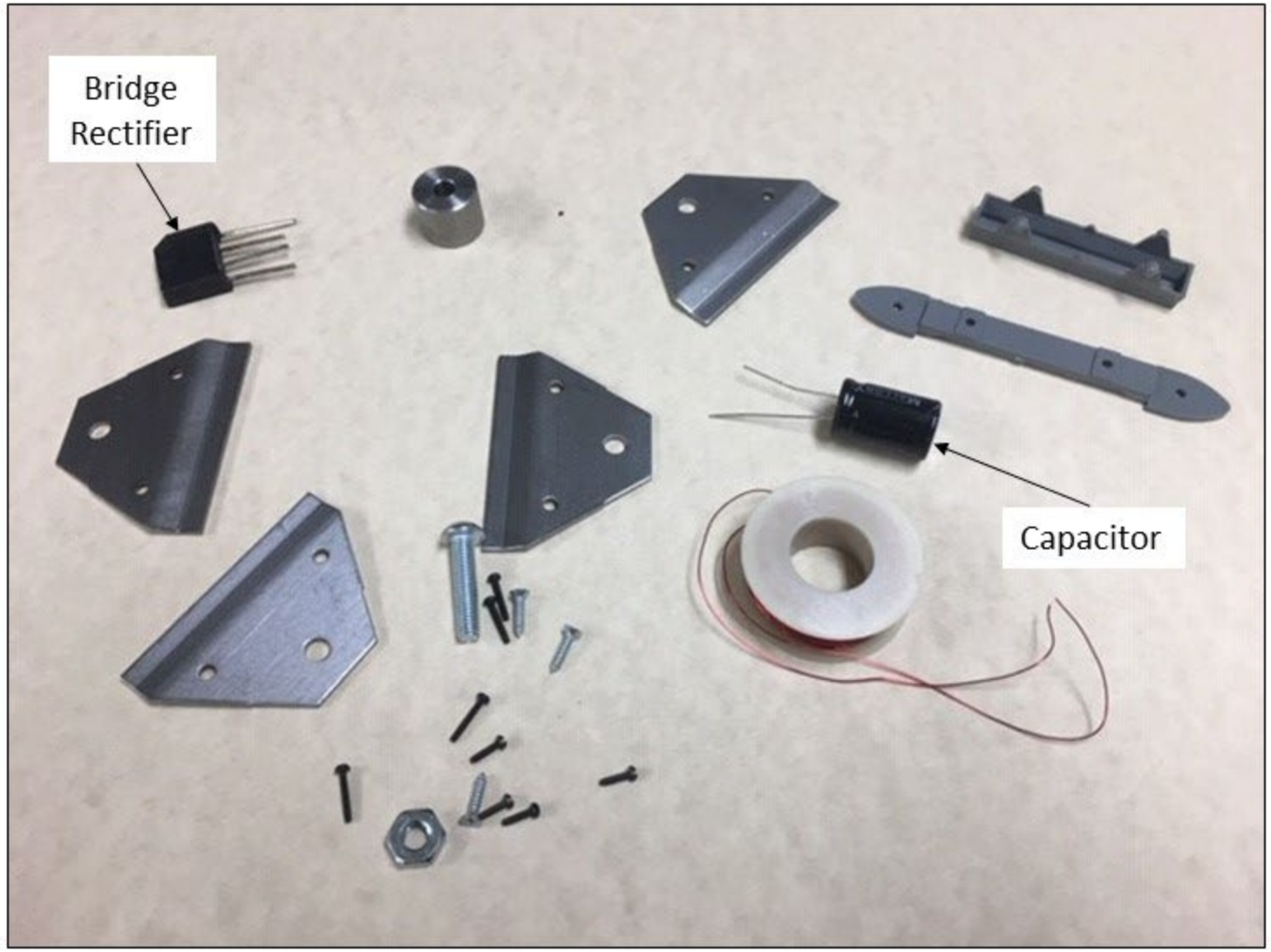
UNCOUPLING

KADEE 309 Electromagnetic Uncoupler

"Why not?" other uncouplers

- Spontaneous uncoupling
- Spotting accuracy
- Electrical noise (?)
- Delayed uncoupling can fail




Bridge
Rectifier
Capacitor

Coil assembly is attached to a piece of track.

Under The Ties 309

DELAYED-ACTION MAGNE-ELECTRIC UNCOUPLER

ASSEMBLY INSTRUCTIONS

BEFORE YOU BEGIN CAREFULLY READ THE INSTRUCTIONS AND STUDY THE ILLUSTRATIONS. Check the package contents and familiarize yourself with each part. If any parts are missing, damaged, or defective please contact Kadee® Quality Products at the address on the package.

PACKAGE CONTENTS: 1 each of the following: coil, steel core, bolt and hex nut, field plate divider, upper track mounting plate, bridge rectifier, radial capacitor, 4 each field plates, 3 each 2-56 flat head screws, 4 each 0-48 x 3/8" screws, 4 each 0-48 x 1/4" screws.

OTHER ITEMS NEEDED: These are to be provided by the modeler. 16 volt DC power source (at least 1.5 Amps) or 18 volt AC power source (at least 1.5 Amps)converted to DC with bridge rectifier. The Kadee® #166 Transformer meets power requirements, small piece of aluminum foil for ballast, #52 and #55 drill bits, (Kadee® #780 Tap & Drill set) 20 gauge wire, Kadee® #165 Normally Open momentary contact push button switch, light bulbs or LEDs of appropriate voltage, AMP/ Voltage meter, general hobby tools, wood working tools for cutting a hole into the layout base (see text) and tools to cut the

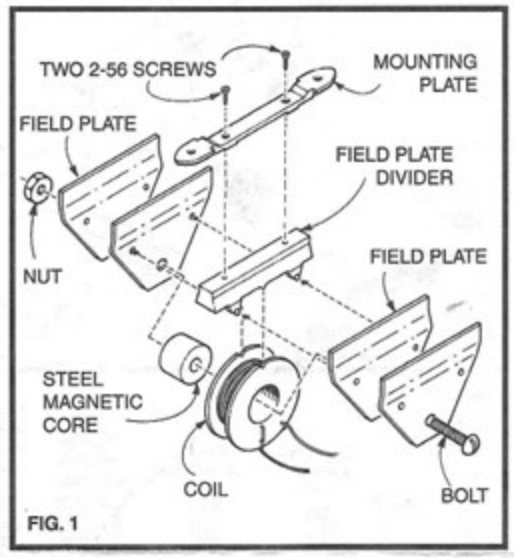


FIG. 1

16 V, 1.6 A

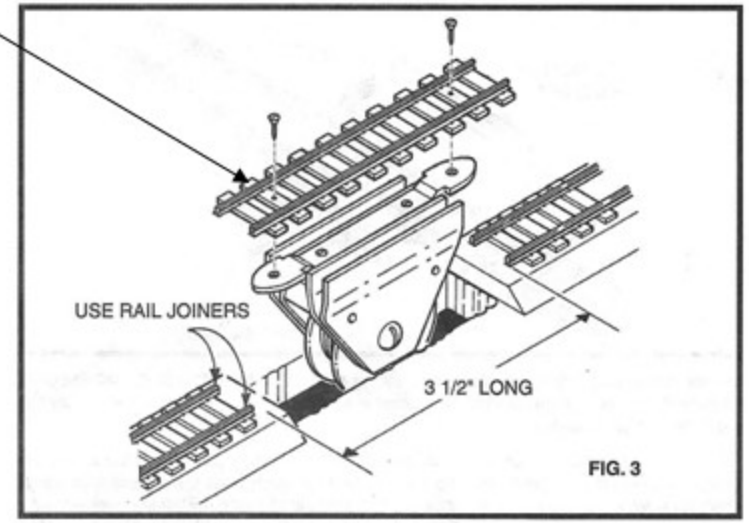


FIG. 3

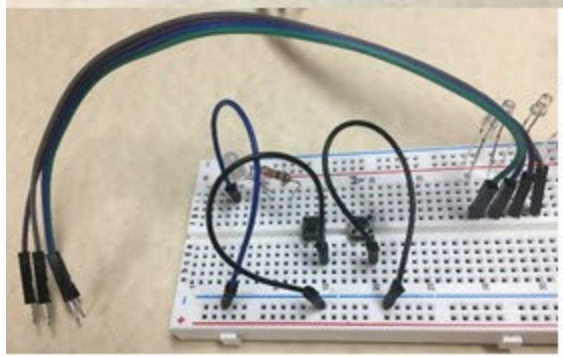
To avoid overheating and to assure reliable operation the uncoupler must have an electrical source of at least 3 Amps and no more than 16 volts DC. **Do not energize continuously for more than two minutes, or overheating will occur.**

ASSEMBLY & INSTALLATION: It would be best, where possible, to install the #309 uncoupler while you are building your layout. All uncouplers should be placed on a straight piece of track where your two longest models will fit on each side of the uncoupler. We do "not" recommend placing an uncoupler on or near a curve, switch, or turn out, both models need to be as straight as possible with each other for reliable uncoupling.

Assemble the uncoupler as the illustration shows (fig. #1). Insert the core into the coil, fit two field plates opposite to each other, one bent out one bent inward, as shown, slip the bolt through, place the field plate divider into the holes of the field plate, fit the other field plates over the bolt and against the coil. Make sure the prongs on the divider are inserted into the holes on the field plates and the tabs are fitted into notches of the coil where the lead wires are at the bottom of the coil and not under the field plates. Place the hex nut onto the bolt and tighten just snug and turn the assembly upside-down and tap it on a flat surface to get the plates aligned as even as possible, hold it on the surface and tighten the hex nut firmly. Set the top plate onto the divider (between the field plates) and secure with the 2-56 flathead screws, tighten just firm, overtightening will easily strip the plastic holes.

After you have determined the location where you wish to install the uncoupler you will have to cut a hole in the layout surface (base). The hole must be 1 1/16" wide and 2 1/8"

Arduino – Mega 2560



Combine an Arduino and a breadboard

...RRRduino...

by Speed

In the current Marker Lamp

```
#define RELAYOUT01    40
#define RELAYOUT02    42
#define RELAYOUT03    44
#define RELAYOUT04    46
#define LED01         32
#define LED02         34
#define LED03         36
#define LED04         38
#define BUTTONIN01    22
#define BUTTONIN02    24
#define BUTTONIN03    26
#define BUTTONIN04    28
#define BUTTONIN05    30
#define LEDPIN        13

// TIMEOUT is in milliseconds, so 10 seconds is 10,000 milliseconds
#define TIMEOUT     5000   // relay turns off after...5 seconds
#define LEDTOGGLE    200   // cycle period of pin 13
```

Assign variable names to pins

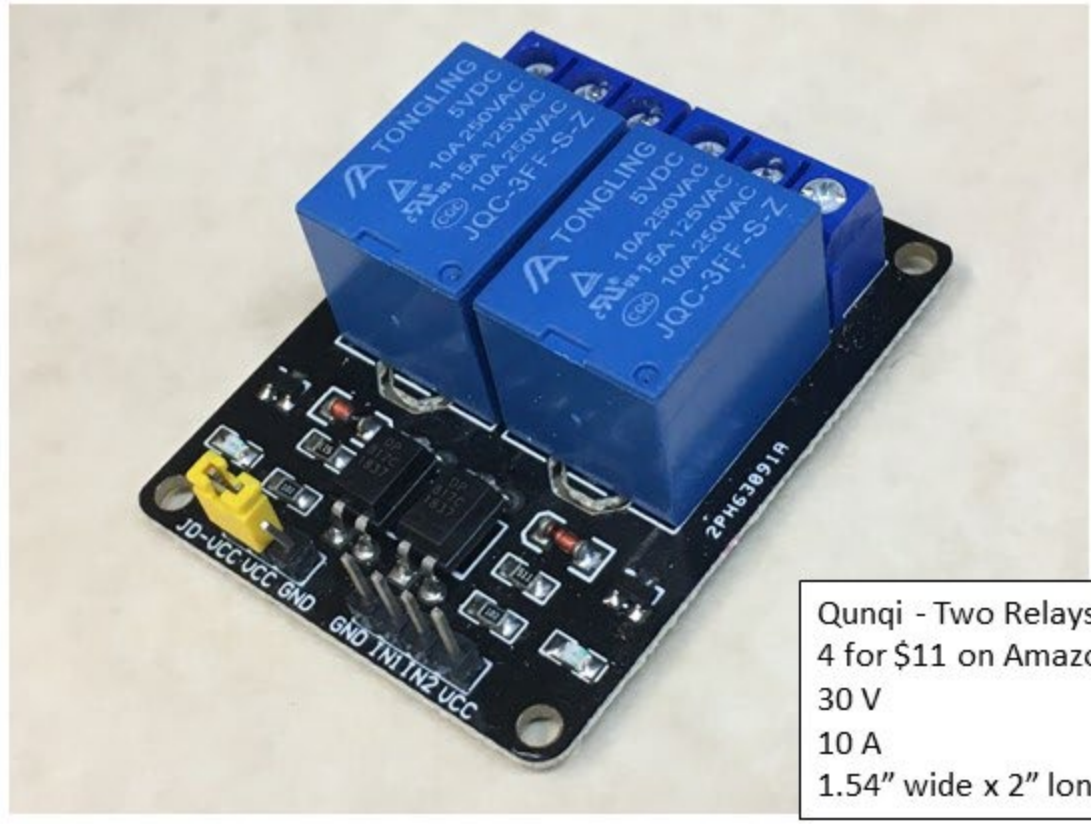
Define uncoupling duration as 5 seconds

Turn LED and Relay OFF if 5 seconds exceeded

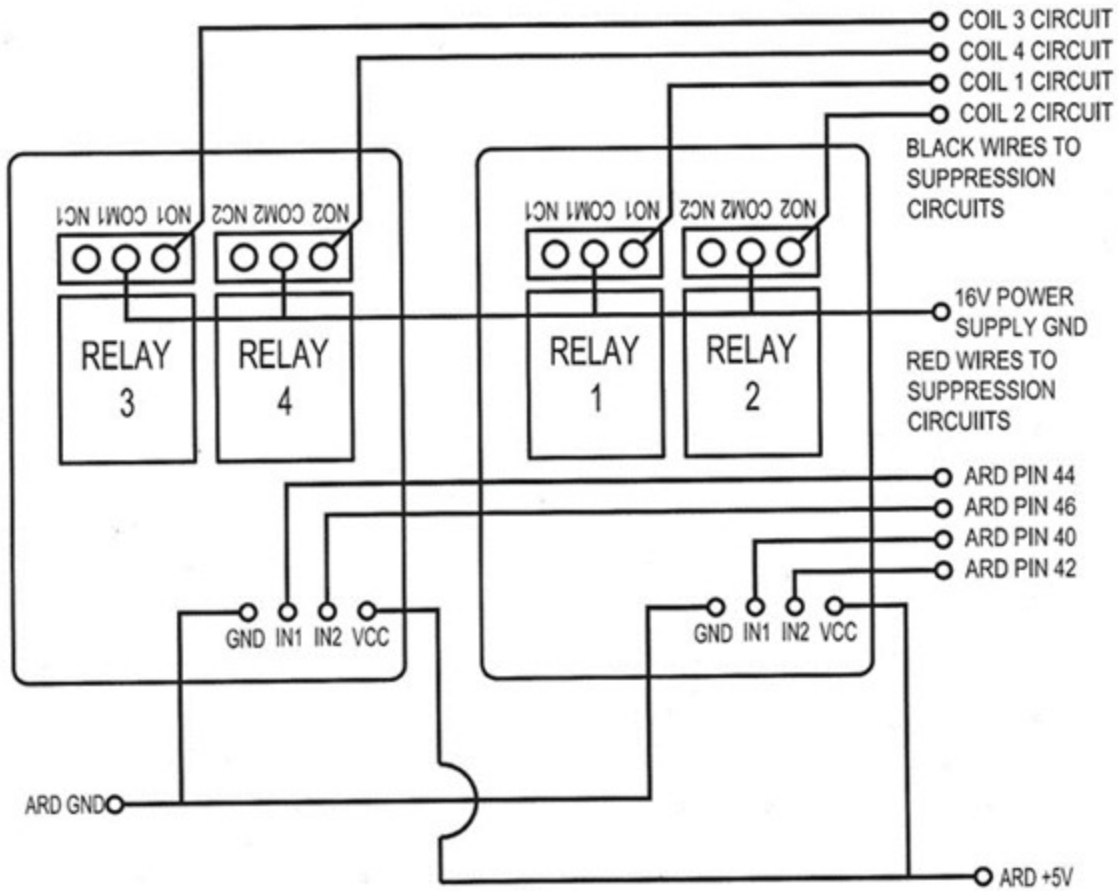
Turn LED and Relay ON if button pushed

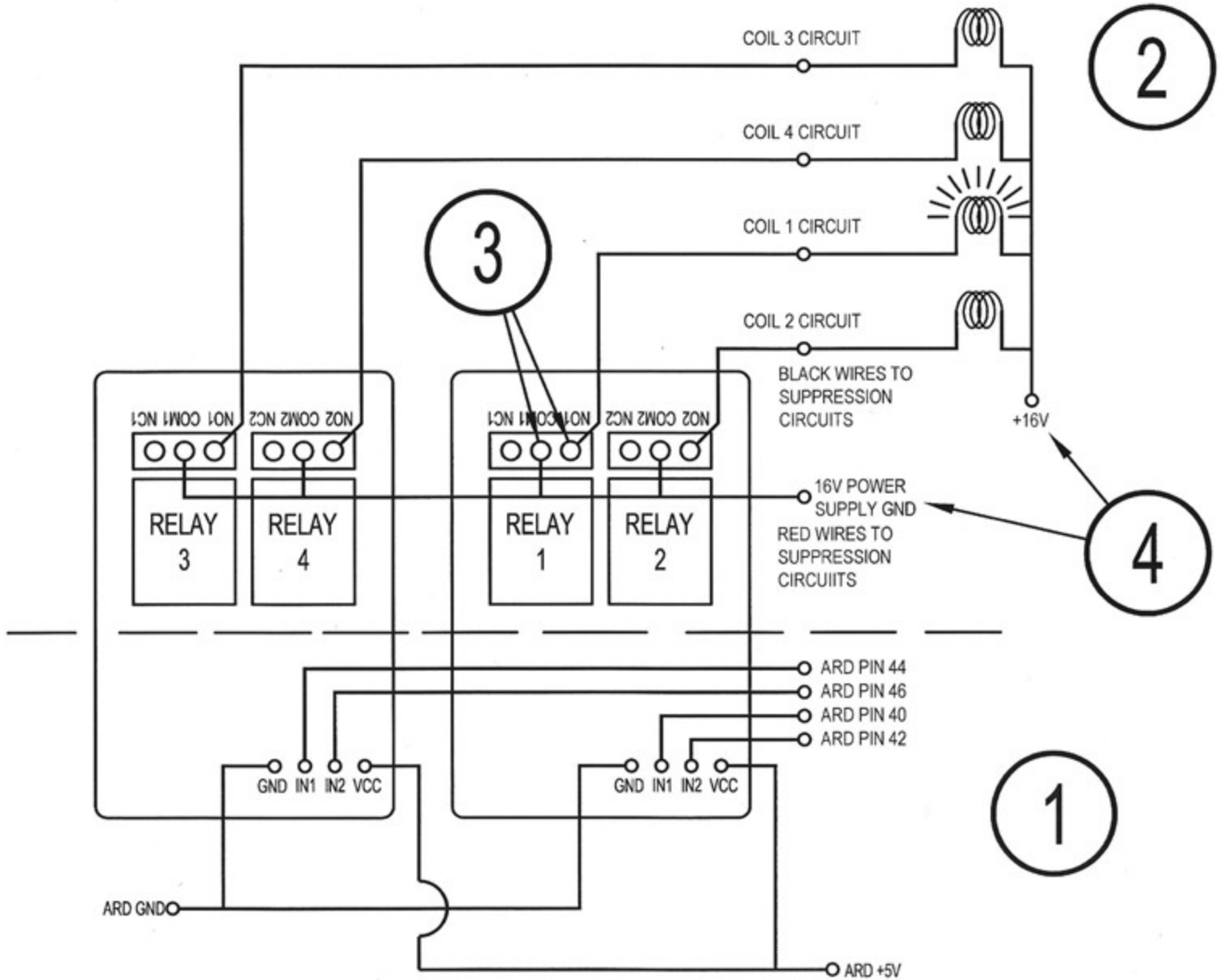
```
void loop( ) {                          // Loop starts here
  now  = millis( );                     // capture now

  // first relay
  if( relayOn01 ) { // is relay01 on? then check timeout
    if ( now - beforeRelay01 > TIMEOUT ) {  // now minus before longer than timeout?
      digitalWrite( LED01, HIGH );          // turn LED off
      digitalWrite( RELAYOUT01, HIGH );     // turn relay off
      relayOn01 = false;                    // no need to check for timeout, since it is now off
    } // if timeout
  } // if on

  if( digitalRead( BUTTONIN01 ) == LOW ) {  // the button is connected to ground when pressed, thus LOW
    allOff( );
    relayOn01 = true;                       // now we should check the timeout
    beforeRelay01 = now;                    // set the time to check against
    digitalWrite( LED01, LOW );             // turn LED on
    digitalWrite( RELAYOUT01, LOW );        // turn relay on
  } // if pressed
```

Coil is energized by an Arduino turning on a powerful relay.



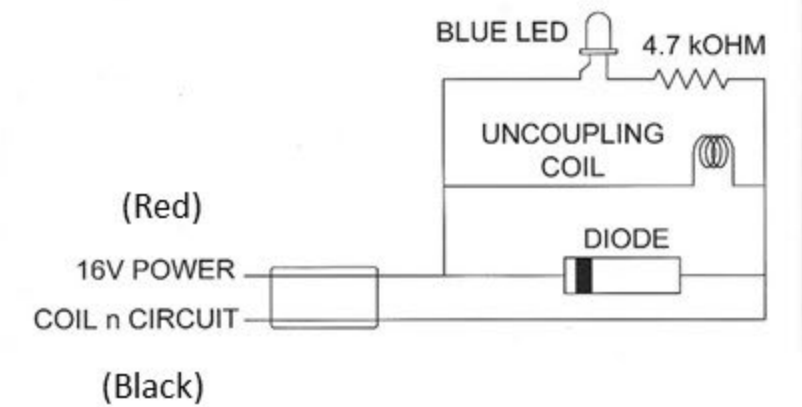
Qunqi - Two Relays
4 for $11 on Amazon
30 V
10 A
1.54” wide x 2” long x .75” tall

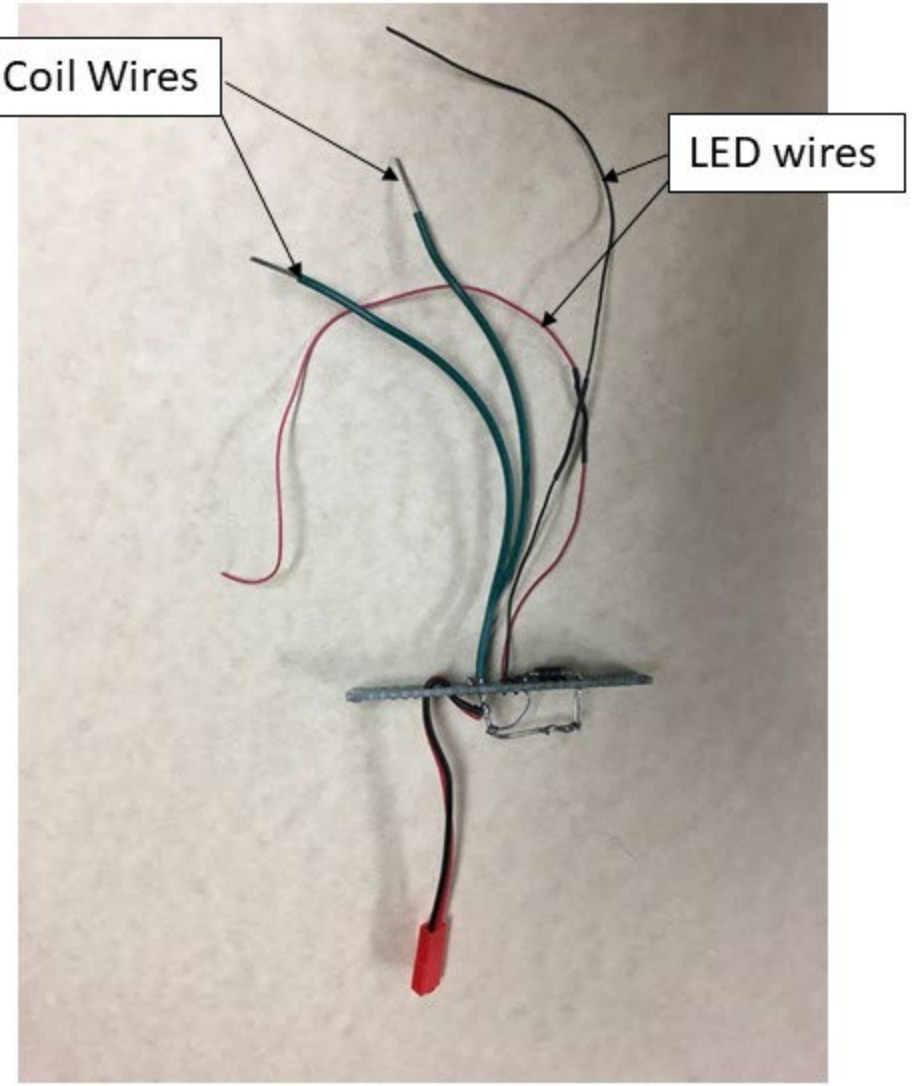

COIL 3 CIRCUIT
COIL 4 CIRCUIT
COIL 1 CIRCUIT
COIL 2 CIRCUIT
BLACK WIRES TO SUPPRESSION CIRCUITS
NC1 COM1 NO1
NC2 COM2 NO2
NC1 COM1 NO1
NC2 COM2 NO2
16V POWER SUPPLY GND
RELAY 3
RELAY 4
RELAY 1
RELAY 2
RED WIRES TO SUPPRESSION CIRCUIITS
ARD PIN 44
ARD PIN 46
ARD PIN 40
ARD PIN 42
GND IN1 IN2 VCC
GND IN1 IN2 VCC
ARD GND
ARD +5V

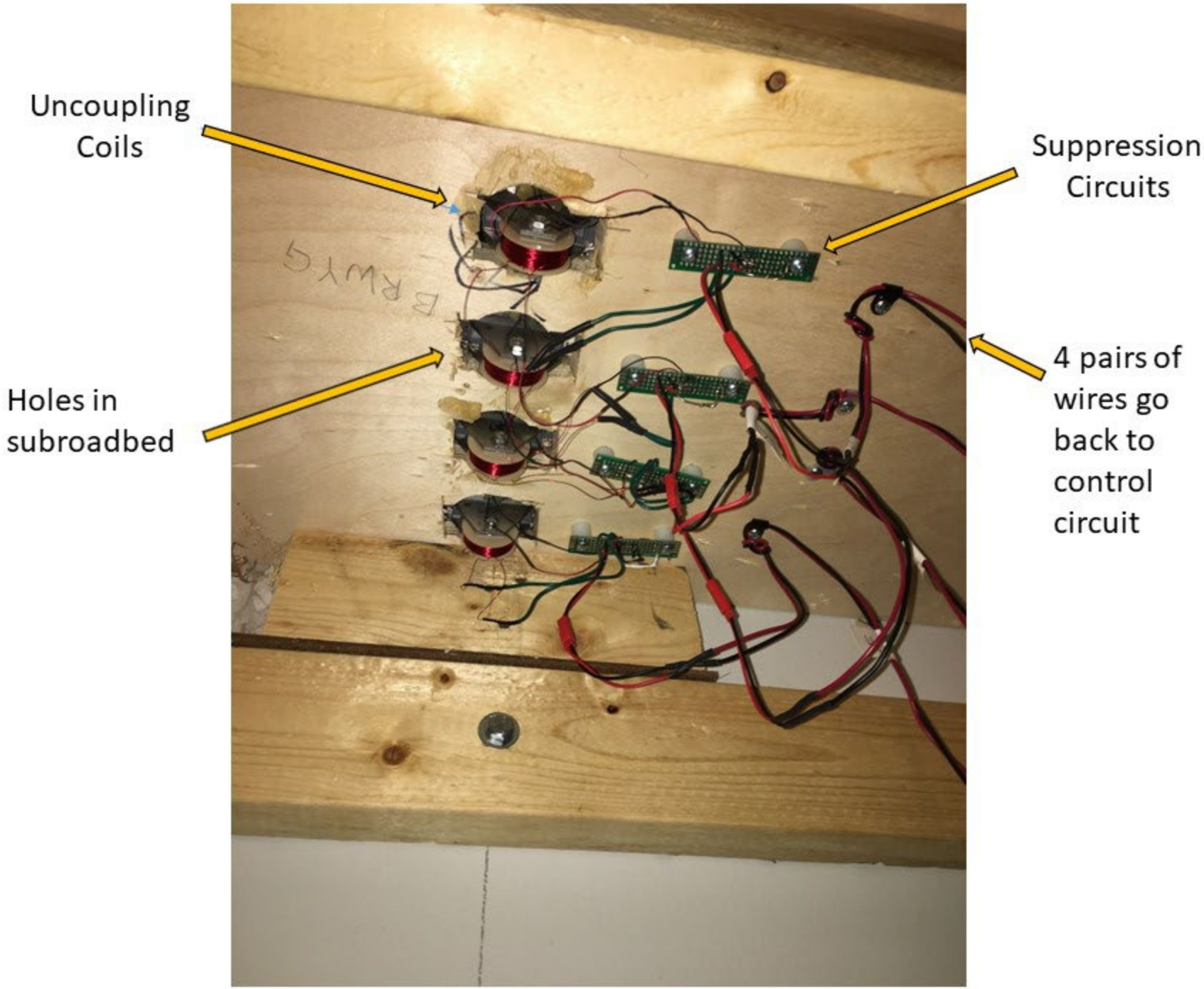

COIL 3 CIRCUIT
COIL 4 CIRCUIT
COIL 1 CIRCUIT
COIL 2 CIRCUIT
2
3
4
1
BLACK WIRES TO SUPPRESSION CIRCUITS
+16V
16V POWER SUPPLY GND
RED WIRES TO SUPPRESSION CIRCUIITS
NC1 COM1 NO1
NC2 COM2 NO2
RELAY 3
RELAY 4
RELAY 1
RELAY 2
ARD PIN 44
ARD PIN 46
ARD PIN 40
ARD PIN 42
GND IN1 IN2 VCC
GND IN1 IN2 VCC
ARD GND
ARD +5V

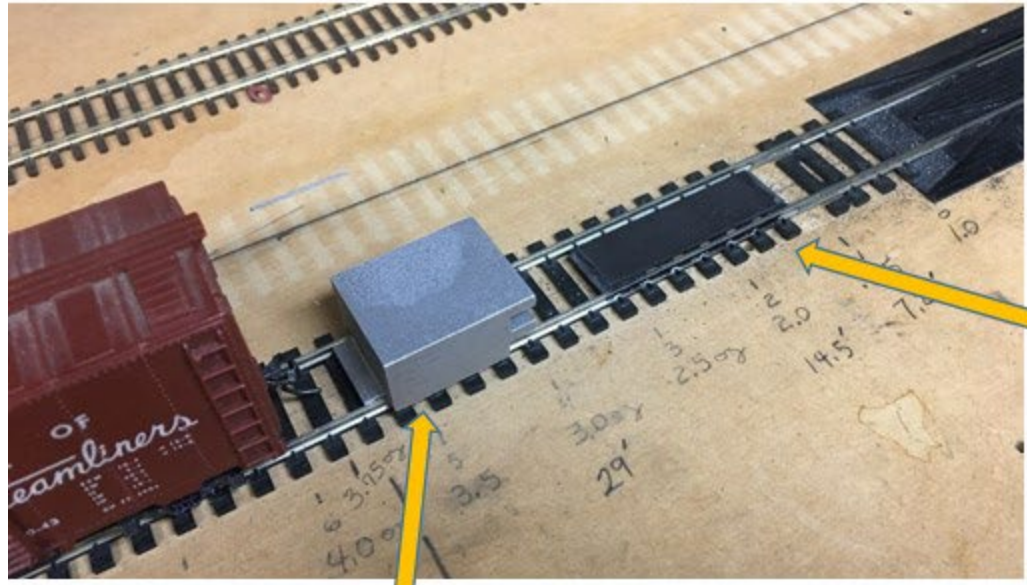
And one more thing . . .

An energy dissipation circuit





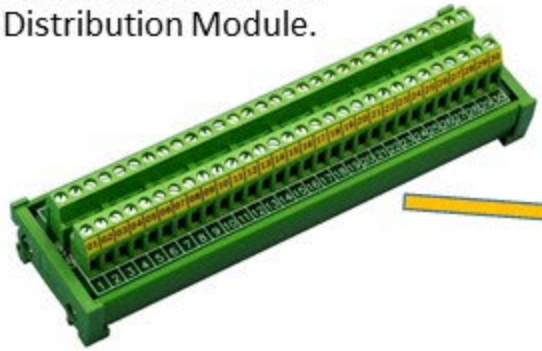

Uncoupling Coils
Suppression Circuits
Holes in subroadbed
4 pairs of wires go back to control circuit



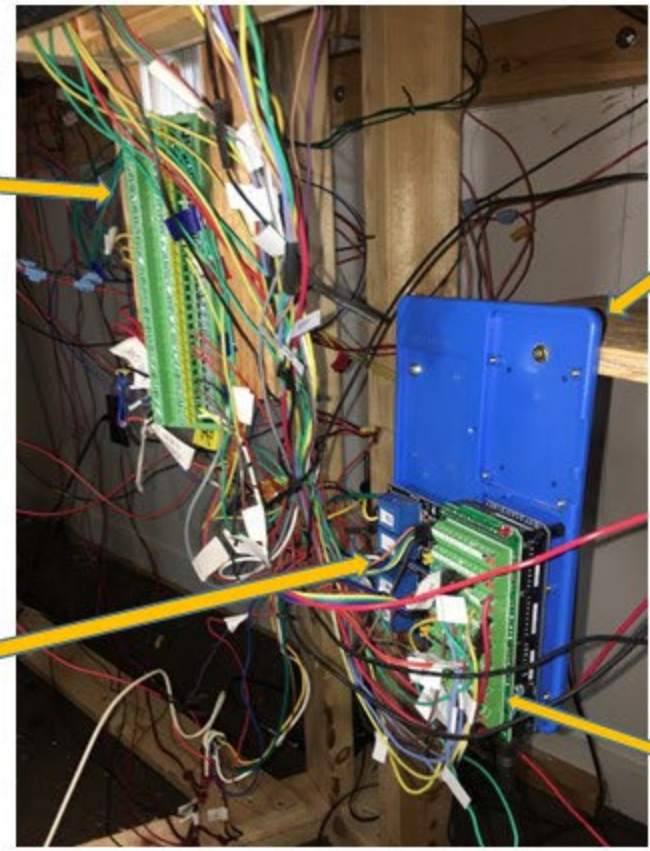
Permanent magnet uncoupler

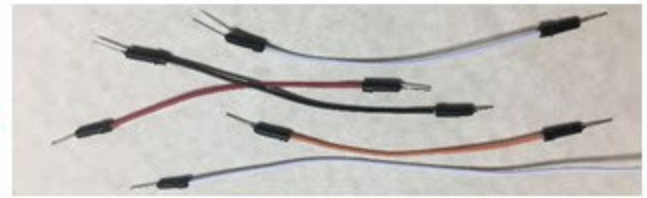
Micro-Mark adjustment tool

Electronics-Salon DIN Rail Mount 30 Position 24A / 400V Screw Terminal Block Distribution Module.



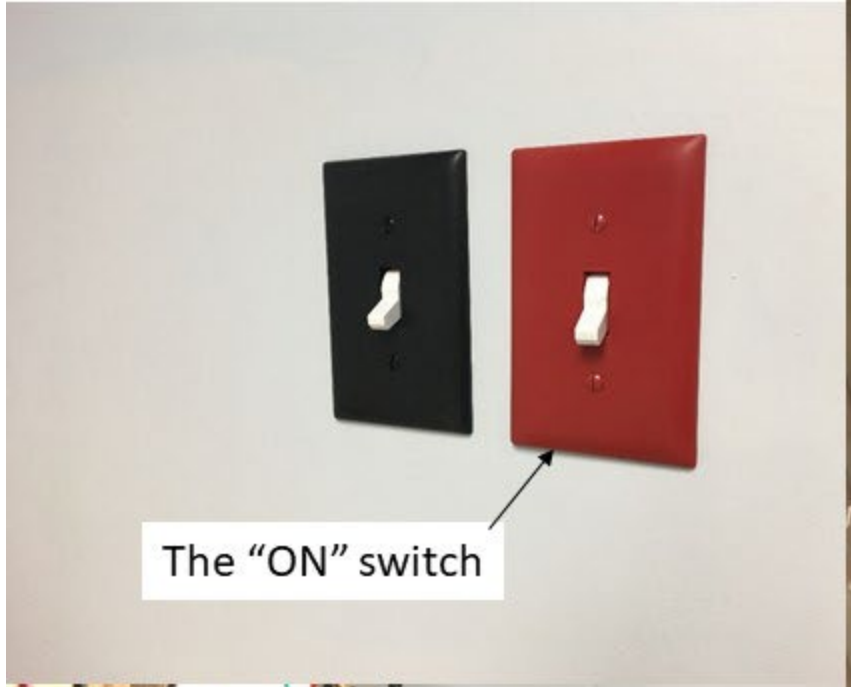
UNIROI 7 in 1 RAB Holder Raspberry Pi Breadboard

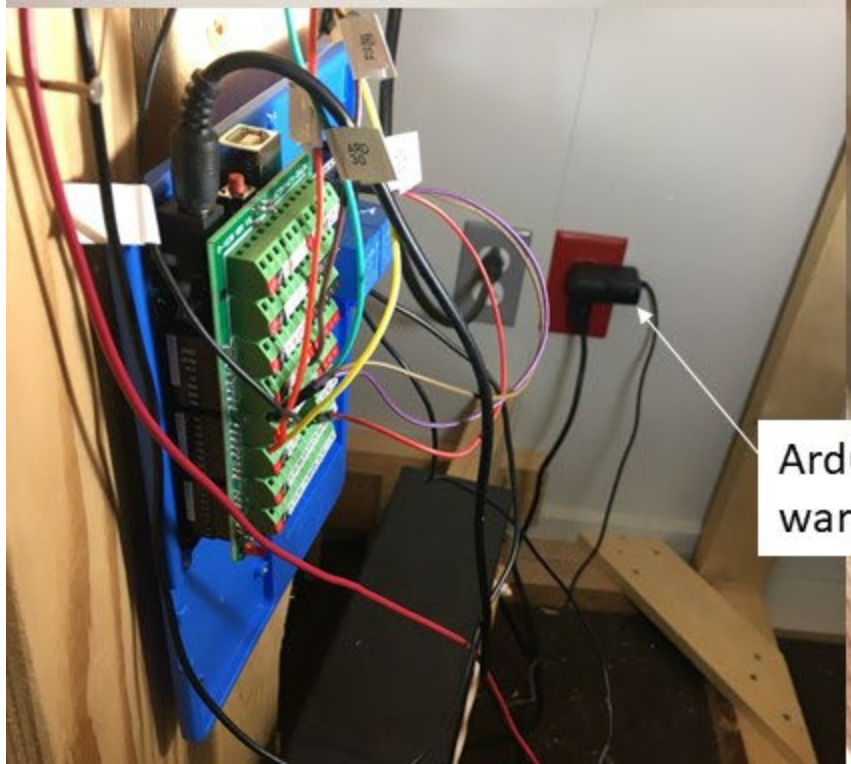




Electronics-Salon Screw Terminal Block Breakout Module, for Arduino MEGA-2560 R3 (on top)

Arduino MEGA-2560 R3 (on bottom)


The “ON” switch


Arduino wall wart


Uncoupler Power supply
TACKLIFE
MDC01
16.00 V
1.602 A
C.V.
C.C.
output
VOLTAGE
GND