



# Block Occupancy Signals on the ARE

Abrams Railroad Empire

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Visit the Abrams Railroad Empire at  
[http://home.comcast.net/~abrams\\_railroad/](http://home.comcast.net/~abrams_railroad/)

# Overview

- ◆ Previously installed dwarf signals to indicate how turnout is thrown

- Clinic on web

- [http://home.comcast.net/~potomac\\_nmra2/Clinics/MakingDwarfSignals.pdf](http://home.comcast.net/~potomac_nmra2/Clinics/MakingDwarfSignals.pdf)



- ◆ This clinic discusses block occupancy signals and detection

- ARE operating mode

- Occupancy detection

- Signal construction

- Advanced modes



as used on ARE



# Operations on the ARE

## ◆ The ARE operates using

### □ Switch lists generated by RailOP

PickUp	Truck Terminal	ADVX	548	Box	Blue	Advance	Balistics
	Roy's Place	ATSF	3124	Box	White		
SetOuts	Truck Terminal	ARE	57431	Box	Tuscan		
	Roy's Place	HJH	484	Reefer	Yellow	Heinz	

### □ “Employee instructions” detailing the route a train is to follow

- The ARE has a single track main line with alternative branches and reversing loops
- Trains run complex routes to give extra running time

## ◆ Time Table and Train Order (TT&TO) operation didn't work for us

## ◆ Too much variability due to switching and operator skills

### □ Added too much tension

### □ Want enjoyable operating experience



# Single Track Control

- ◆ Single track section must be controlled
  - Occupied by only one train
  - Some hidden track



## Track Warrant

Silver Spring District

Extending from Carnegie  
to Schenley and Squirrel  
Hill

Possession of this Track  
Warrant is required before  
a train may enter the stated  
district. Return Warrant  
when exiting district.

- ◆ Previously used physical track warrants
  - Must hold warrant to enter track block
  - People forgot to pick up or return warrant
- ◆ Automatic signals
  - More prototypical
  - Passively visible to everybody
  - Red means occupied – don't enter
  - Put signal at each end of block



# Introduction to Block Occupancy Detection

- ◆ Block occupancy current detectors measure the flow of current into block caused when a powered engine, lighted car or a car equipped with a current path (resistor) in the block.
  - Need insulating gaps for signal blocks
- ◆ There's a great article *Easy Block Detection and 2-Color Signals* at <http://www.gatewaymra.org/detection1.htm>
- ◆ Older twin "T" and diode detection circuits can be used for DC & DCC
  - Detection fails when DC voltage reduced to zero
- ◆ DCC has power on the rails at all times, enabling additional detector designs.
  - I decided to use a DCC detector
  - Computer interface possible, but I don't use it



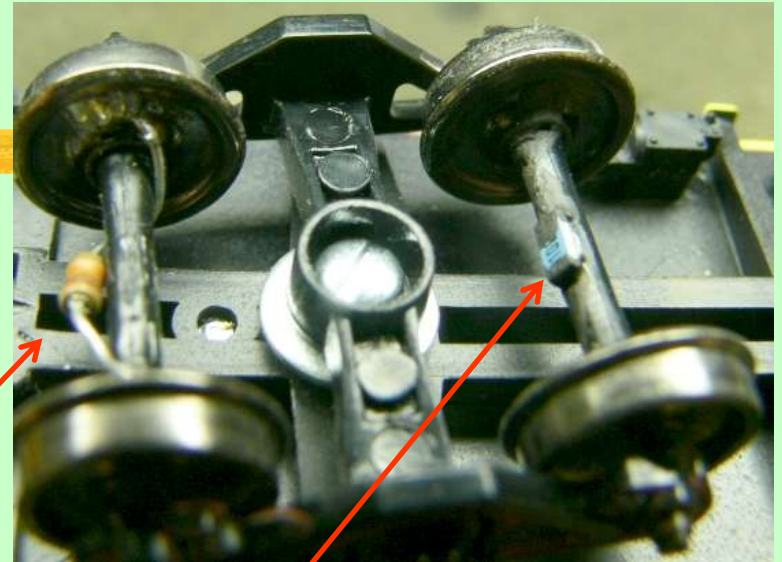
# DCC Block Occupancy Detection

- ◆ DCC supports current sensing occupancy detection
  - Detect current through DCC decoder, even when engine stopped
  - Need resistance wheel set, or a lighted caboose or passenger car (see next slide)
- ◆ I considered the following products
  - BlockWatcher™ by DCC Specialties
  - TRAK-DT by Dallee Electronics
  - SIG-12 by North Coast Engineering (NCE)
  - RR-CirKits by Dick Bronson
  - VT-5 Block Occupancy Detector For DCC by Rob Paisley
- ◆ I decided to use DCC Current Sensor by Richard Napper, MMR
  - Published in *Caboose Kibitzer* , Spring 2006
  - Available from him, built or as kit

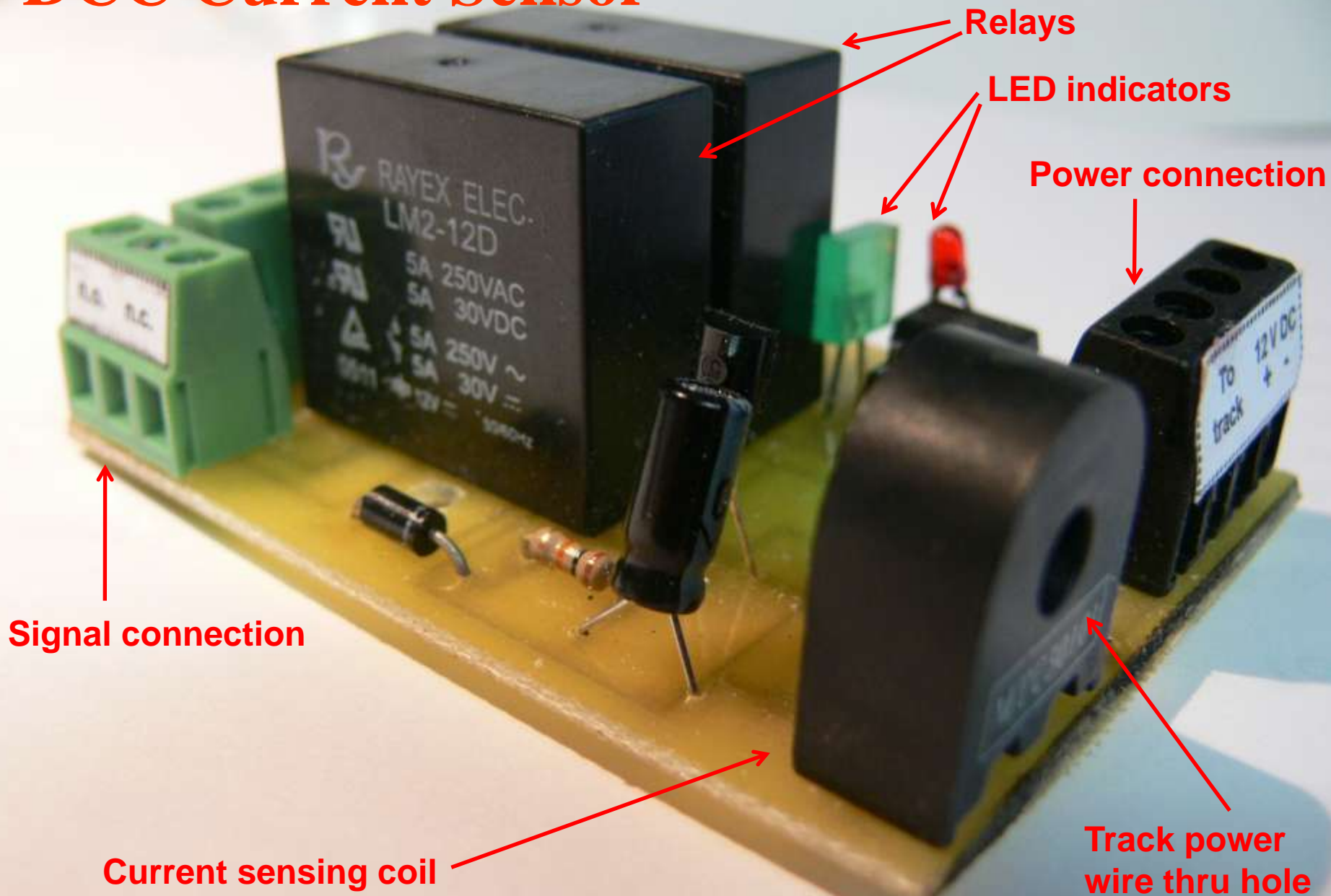


# Resistance Wheel Sets

- ◆ Add resistor between wheels to allow enough current to flow to be detected
  - I used 10K ohm per axle
- ◆ Picture shows two types of resistors
  - Discrete component soldered to wheels, harder and more expensive
  - Film PC-board resistor super-glued to axle and connected to wheels with wire glue
    - Inexpensive, carbon-bearing, conductive liquid
- Buy resistors from most electronic suppliers such as Digi-Key
  - <http://www.wireglue.us/>
  - <http://www.digikey.com/>
- ◆ More info at [http://www.afticarr.com/How\\_To\\_Resistive\\_Wheels.html](http://www.afticarr.com/How_To_Resistive_Wheels.html)
- ◆ Jaybee wheelsets available with resistors built in: Walthers #369-10620

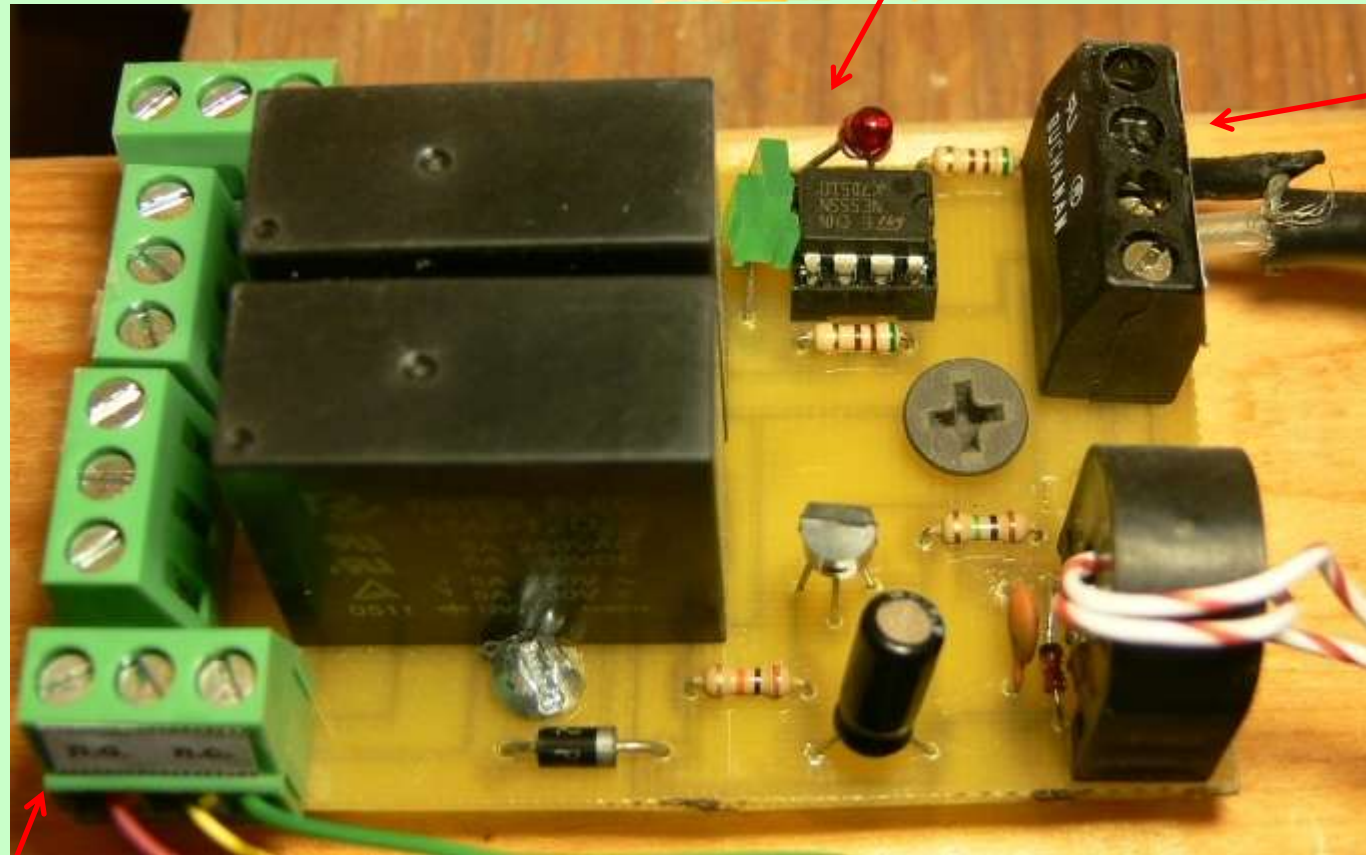


# DCC Current Sensor





# Sensor on Layout



LED indicators

Power connection

Track power wire thru hole

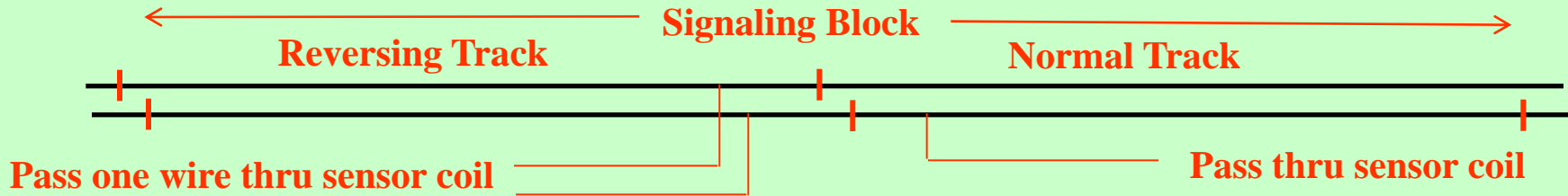
Note: more turns increases sensitivity

Signal connections

- ◆ Current flowing to track block is sensed
- ◆ Relay changes state
  - Signal lights change



# Special Case: Using Sensor for Two Blocks



- ◆ DCC reversing track and normal track are part of signal detection block.
- ◆ Use sensor to detect current in either (or both) normal and reversing track sections
- ◆ Thread the feeder wire for the normal DCC track section & the DCC reversing track section thru the current sensing coil
- ◆ One end of the train can be in the DCC reversing track section and the other end in the normal DCC track section
- ◆ Detector picture on next slide

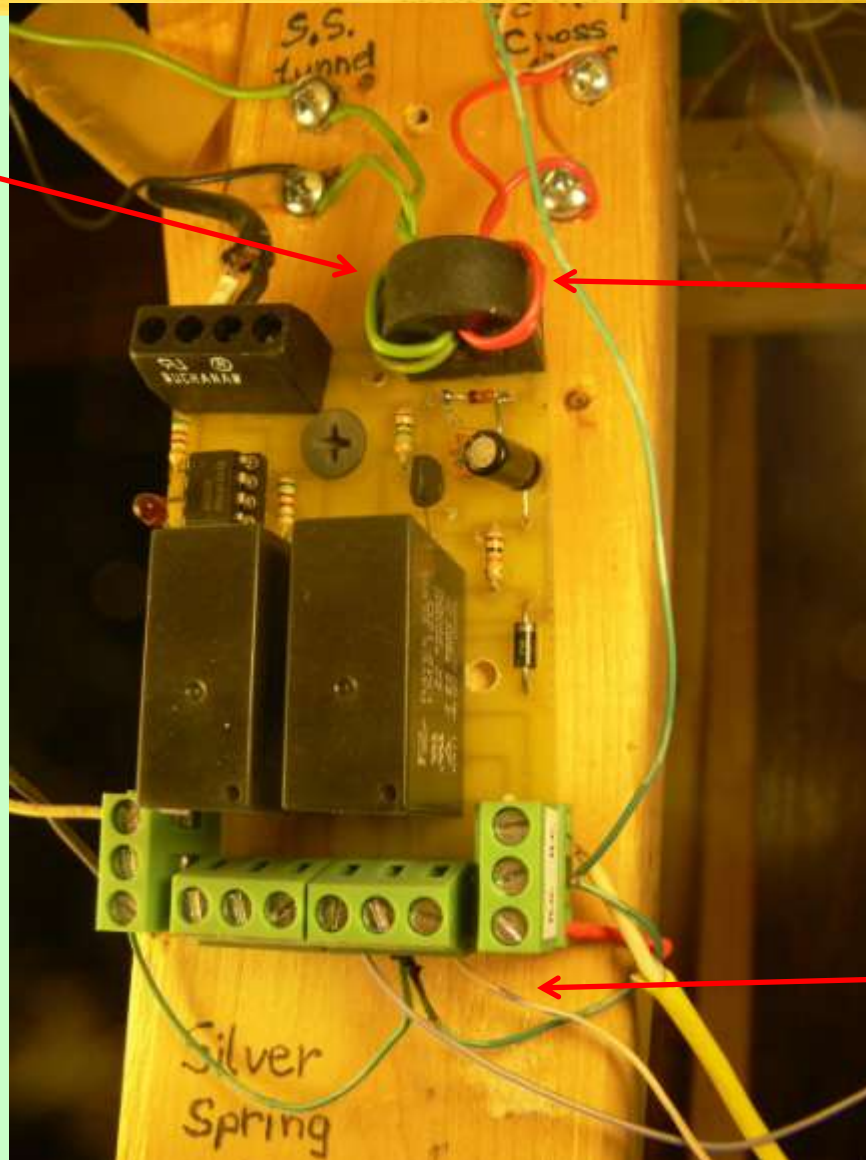


# 2-Block Sensor on Layout

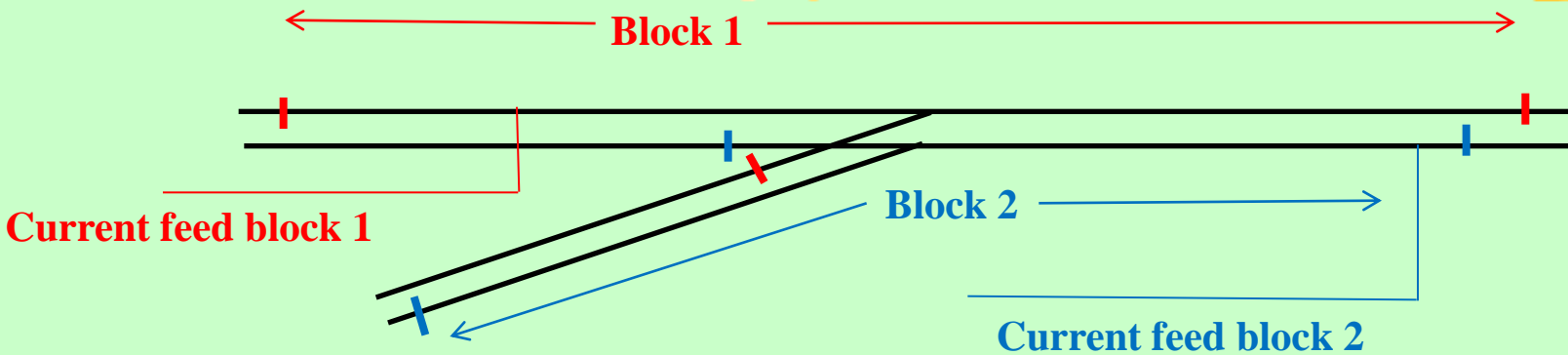
Green wire = power to normal track section

Red wire = power to reversing track section

Signal connections



# Another Special Case: Track in Two Blocks



- ◆ A different case. Blocks 1 & 2 are independent but share a common segment of track.
  - Block 1 dead ends in a town with a small yard
  - Block 2 is part of the main line
- ◆ Use each rail to define block
- ◆ Track to right of turnout is in both blocks
- ◆ Track to left of turnout is in only one block

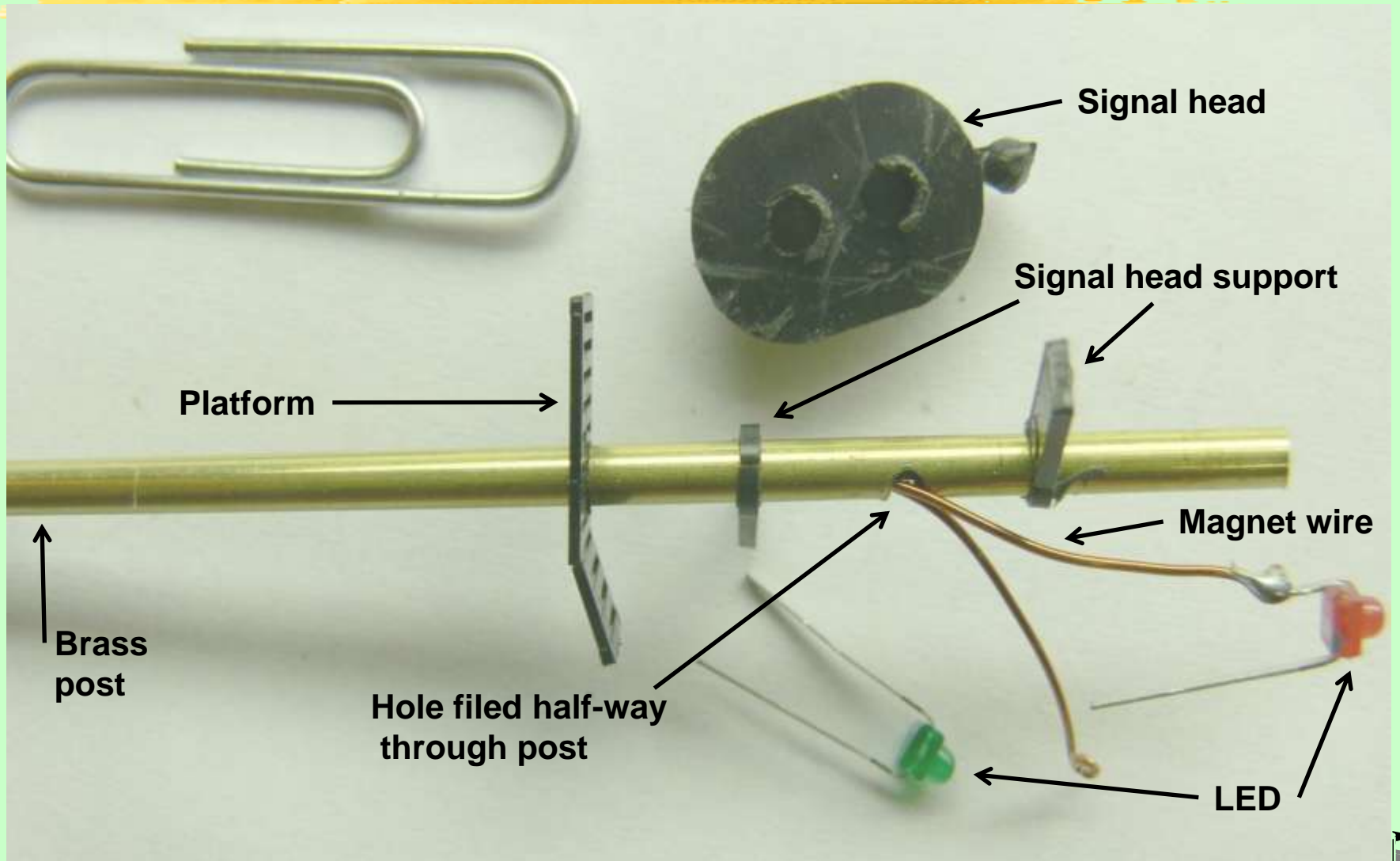


# Signals

- ◆ There are many ready-built and kit signals available
- ◆ I decided to build kits from Oregon Signals
  - Less expensive
  - I like building kits

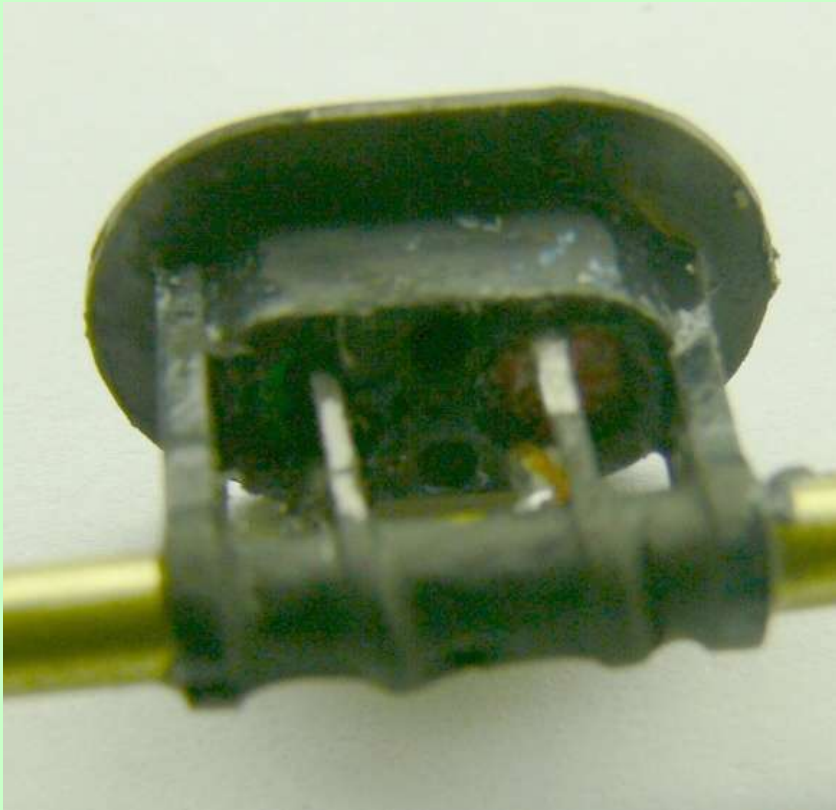


# Signal Partially Assembled



# Signal Head Attachment

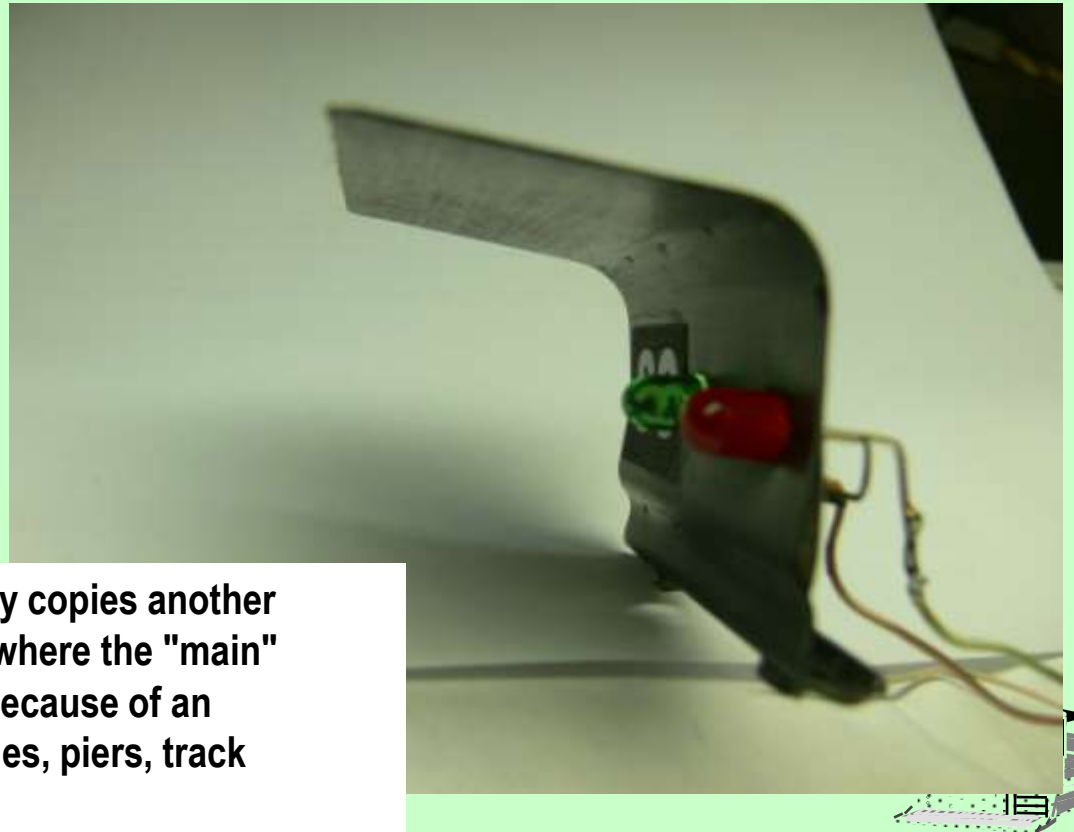
- ◆ Used Wire Glue to connect LED to brass post
- ◆ Strengthen with super glue



# Repeater Signal ‡

- ◆ What if you're not in position to see the track-side signal?
  - Too far away
  - Too high above the track
- ◆ Repeater signals are the answer

- ◆ Made out of Z-shaped piece of black plastic from microwave container
- ◆ Red and green LEDs inserted from rear



‡ A Repeater Signal aspect exactly copies another signal's aspect. Repeaters are used where the "main" signal cannot be seen early enough because of an obstruction of the line of sight: bridges, piers, track curvature, etc.

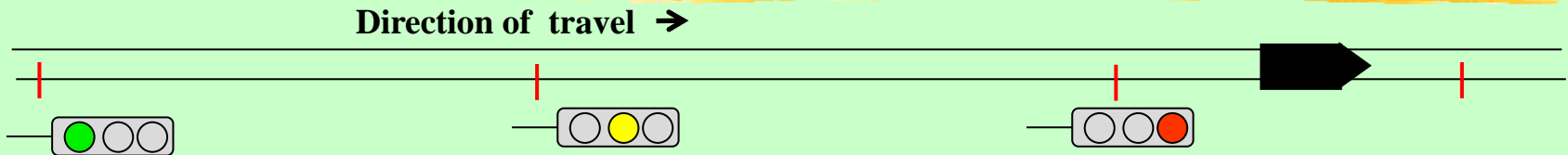


# Repeater Installed Above Backdrop

Repeater



# Advanced Mode — Approach Signal



- ◆ Three aspect signals: red–stop, amber–slow, green–proceed
- ◆ Possible to implement using all 4 sets of relay contacts
  - Too complex to describe here
- ◆ Atlas signal system
  - Reviewed in *Scale Rails*, October 2009
  - Signal circuit board required in addition to detector
  - More complex capabilities from Custom Signals
    - O, HO and N Scale Model Railroad Signals and Signal System
    - ABS and APB Signaling possible
    - Fully compatible with the Atlas 21st Century Signal System™
- ◆ Not clear how reverse direction is signaled



# Signals on the Layout (1/2)



# Signals on the Layout (2/2)



# Links and References — Articles

- ◆ Easy Block Detection and 2-Color Signals  
<http://www.gatewaynmra.org/detection1.htm>
- ◆ DCC Current Sensor by Richard Napper, MMR  
*Caboose Kibitzer*, V.56 #2, Spring 2006:  
[www.mcor-nmra.org/Publications/Kibitzer/Volume56-2.pdf](http://www.mcor-nmra.org/Publications/Kibitzer/Volume56-2.pdf)  
email: [renapper@wildblue.net](mailto:renapper@wildblue.net)
- ◆ Block Occupancy Detector For DCC by Rob Paisley  
<http://home.cogeco.ca/~rpaisley4/DccBODvt5.html>  
email: [rpaisley4@cogeco.ca](mailto:rpaisley4@cogeco.ca)
- ◆ Resistive wheel sets  
[http://www.afticarr.com/How\\_To\\_Resistive\\_Wheels.html](http://www.afticarr.com/How_To_Resistive_Wheels.html)



# Links and References — Products

- ◆ BlockWatcher™ by DCC Specialties  
<http://www.dccspecialties.com/>
- ◆ TRAK-DT by Dallee Electronics  
<http://www.dallee.com/>
- ◆ SIG-12 by North Coast Engineering (NCE)  
[www.ncedcc.com/pdf/10\\_min\\_signal\\_system.pdf](http://www.ncedcc.com/pdf/10_min_signal_system.pdf)
- ◆ RR-CirKits by Dick Bronson  
<http://rr-cirkits.com>
- ◆ Wire glue  
<http://www.wireglue.us/>
- ◆ Custom Signals  
<http://www.customsignals.com>
- ◆ Atlas All Scales Signal System  
<http://download.atlasrr.com/09TrackCat/Signals119-126.pdf>
- ◆ Digi-Key <http://www.digikey.com/>

