Train Detection

And

Simple Signaling

By Scott Russell 01/11/14

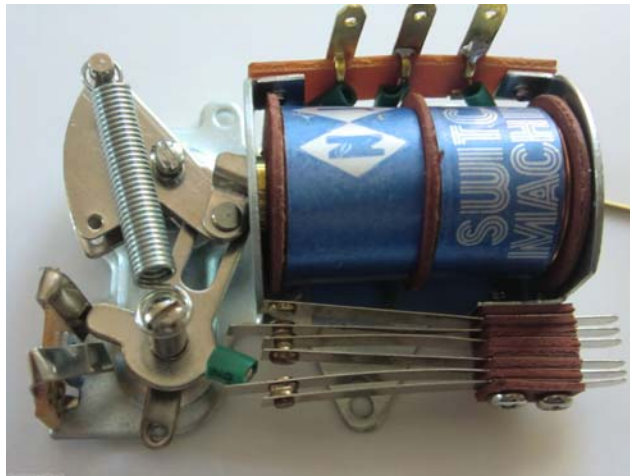# Simplest Train Detection

Train

John

"I see there is a train in that block"

Turnout Position Indication

- Detection: Need to know which way the turnout is thrown
  - Auxiliary Contacts – What is needed depends on the signal circuit
    - Solenoid switch machine contacts (relay style)

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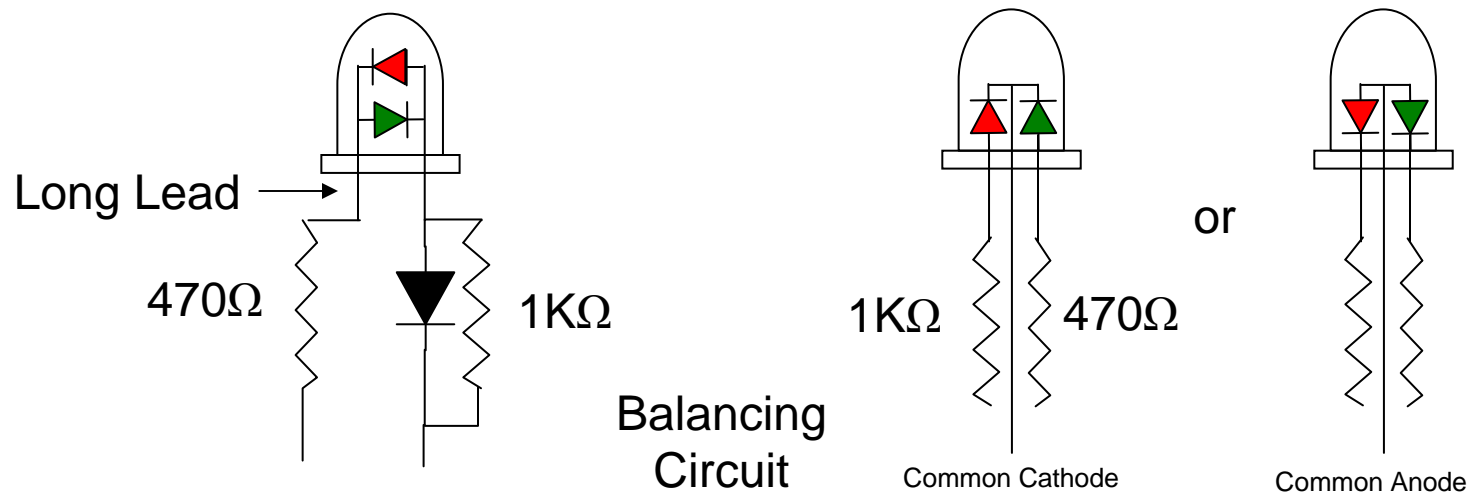   - Hand throws with contacts

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    - Electrical or mechanical switches/relays separately actuated
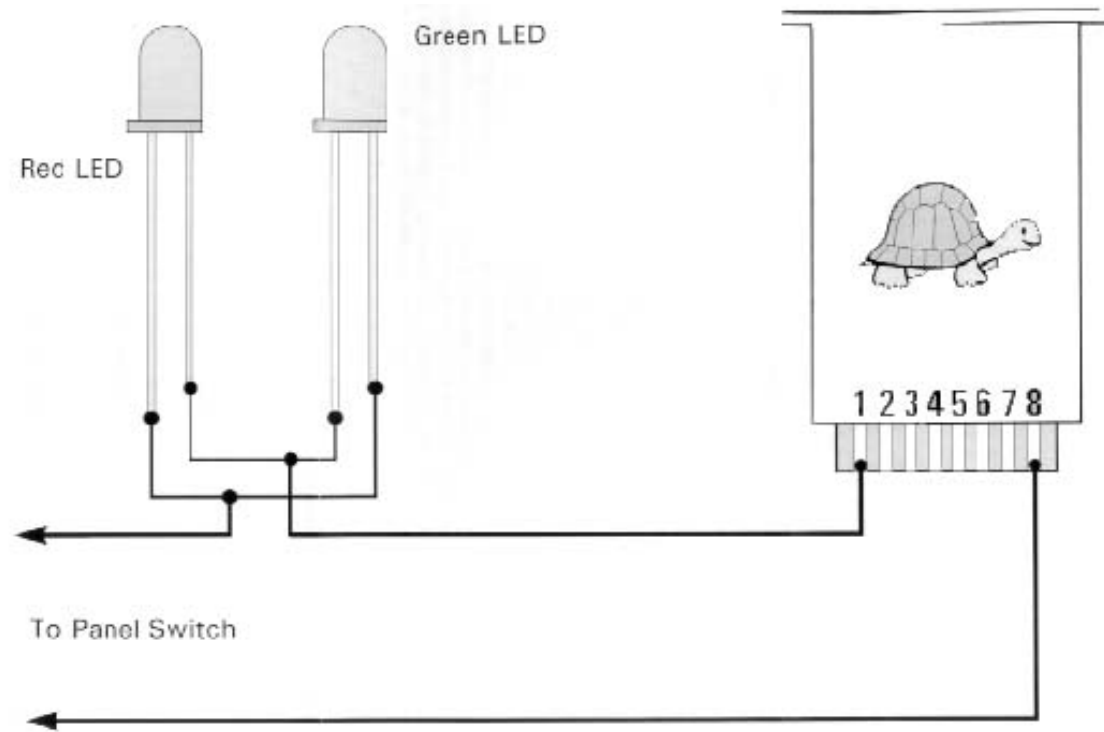
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    - Electrical or mechanical switches/relays separately actuated
- Indication: What to do now that you know the turnout position
  - Single Color LED's or bulbs
  - Bi-color (Bi-polar) LED's
    - 2 lead
    - 3 lead

Signal or Panel Indication

- Doesn't matter where you put the signal (panel or layout, or both)
- A bulb is a voltage device – rated voltage or slightly lower
- An LED is a current device – voltage only has to be high enough to turn it on, but can be much higher. Resistor controls the current.
- A Bi-color LED can indicate yellow if both red and green are on at the same time (requires AC on 2-lead device)
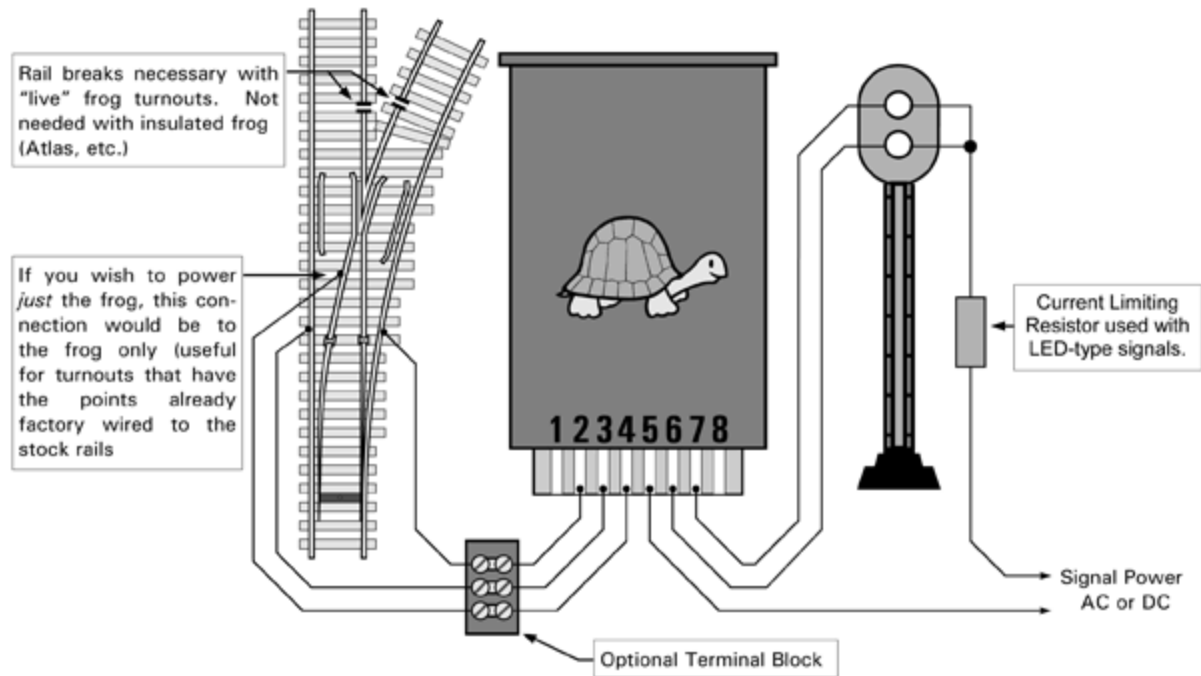
Long Lead

470Ω   1KΩ

Balancing
Circuit

or

1KΩ   470Ω

Common Cathode   Common Anode

Tortoise Panel Indicator Circuit

Rec LED

Green LED

1 2 3 4 5 6 7 8

To Panel Switch

http://www.tonystrains.com/technews/archive/circuitron.htm

Tortoise Signal/Turnout Circuit

Rail breaks necessary with "live" frog turnouts. Not needed with insulated frog (Atlas, etc.)

If you wish to power *just* the frog, this connection would be to the frog only (useful for turnouts that have the points already factory wired to the stock rails

1 2 3 4 5 6 7 8

Current Limiting Resistor used with LED-type signals.

Optional Terminal Block

Signal Power AC or DC

http://www.tonystrains.com/technews/tortoise/signal-wiring.htm

Typical Signal Indication

Depends on your prototype, or preference

Straight   **D4** ⊢ 🔴   🟢🔴⊢ **D6**

D2 ⊢ 🟢

Diverging   **D4** ⊢ 🟢   🔴🟢⊢ **D6**

D2 ⊢ 🔴
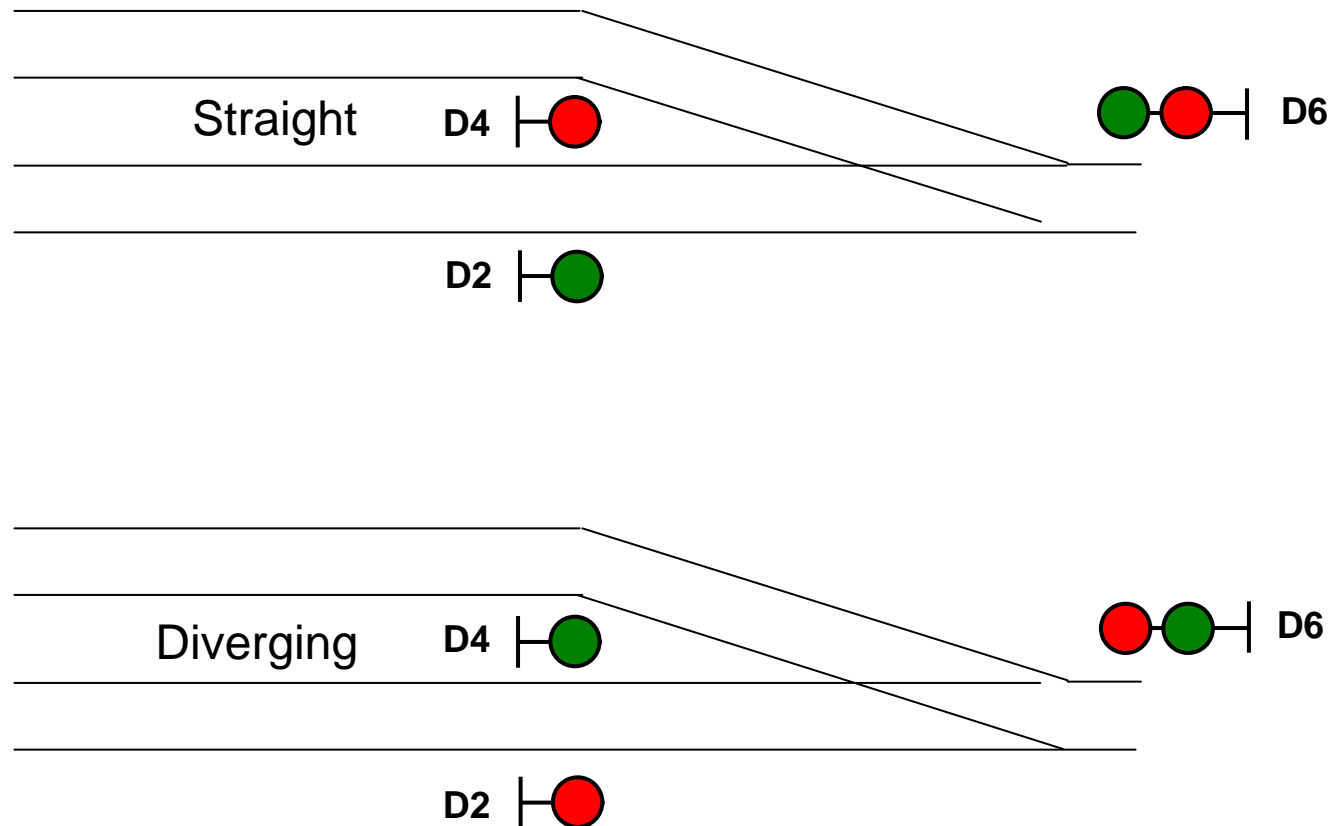
Dwarf Signal Circuit for Turnout
3 Lead LED's

Top

D6

Bottom
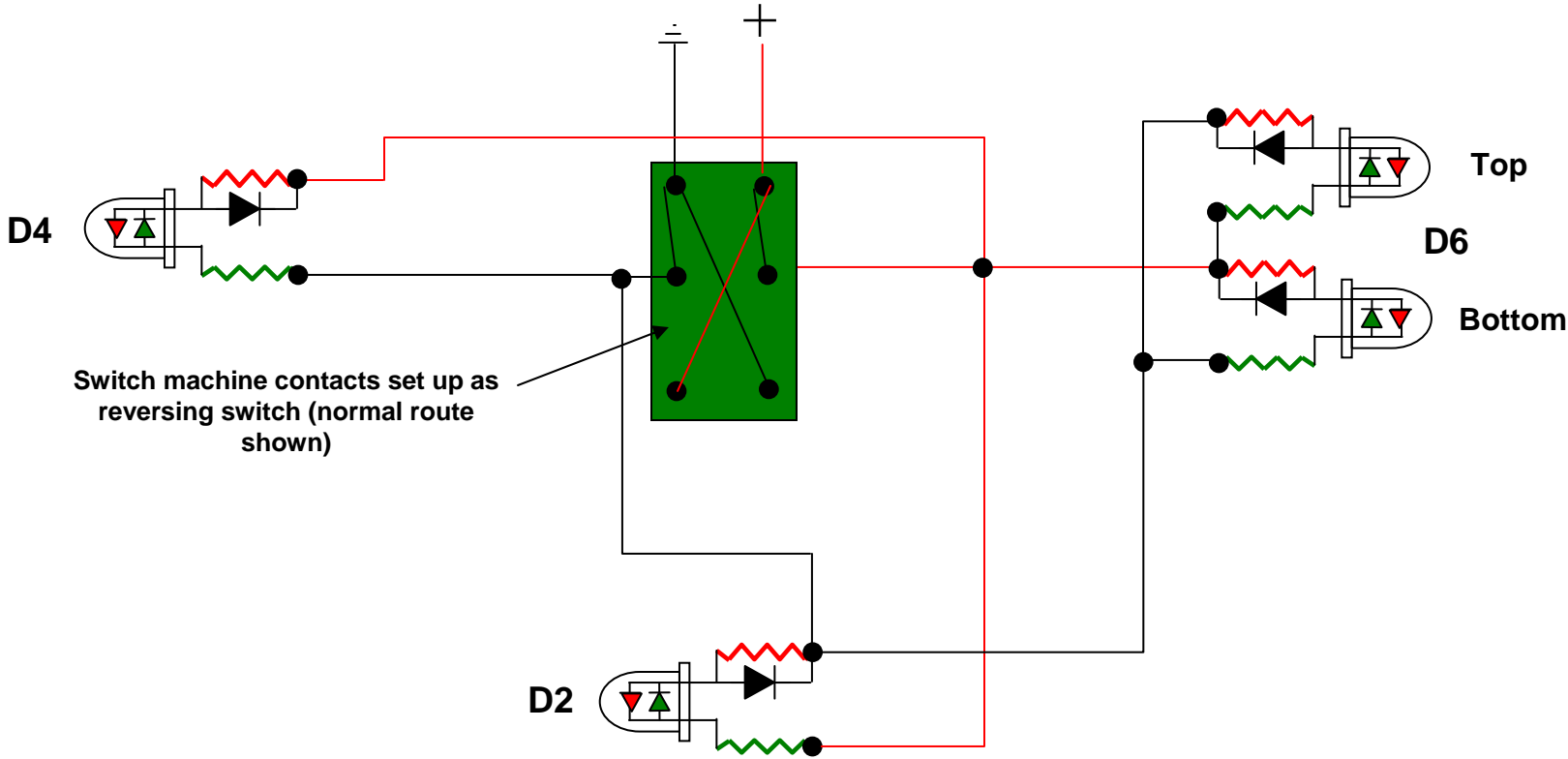
D4

D2

Switch Contacts

(shown normal)
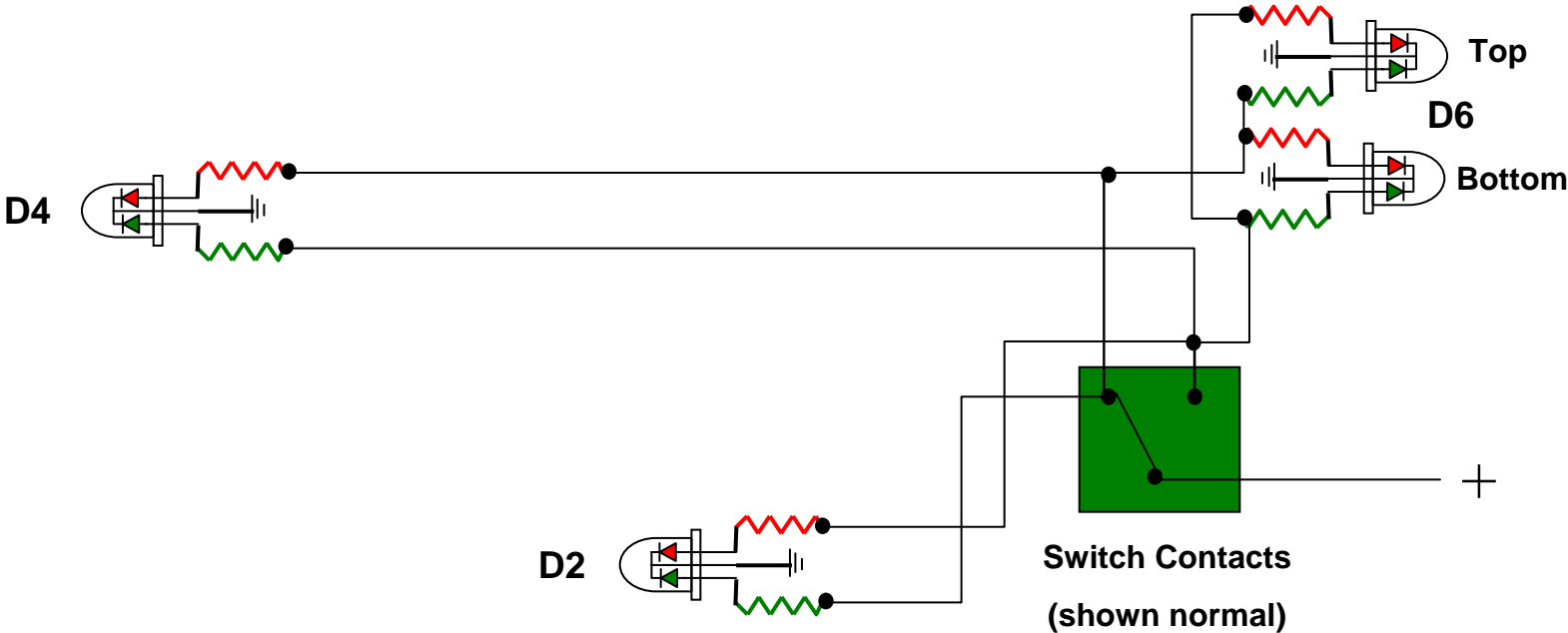
Normal = D2 Green; D6 = Top Green, Bottom Red; D4 = Red

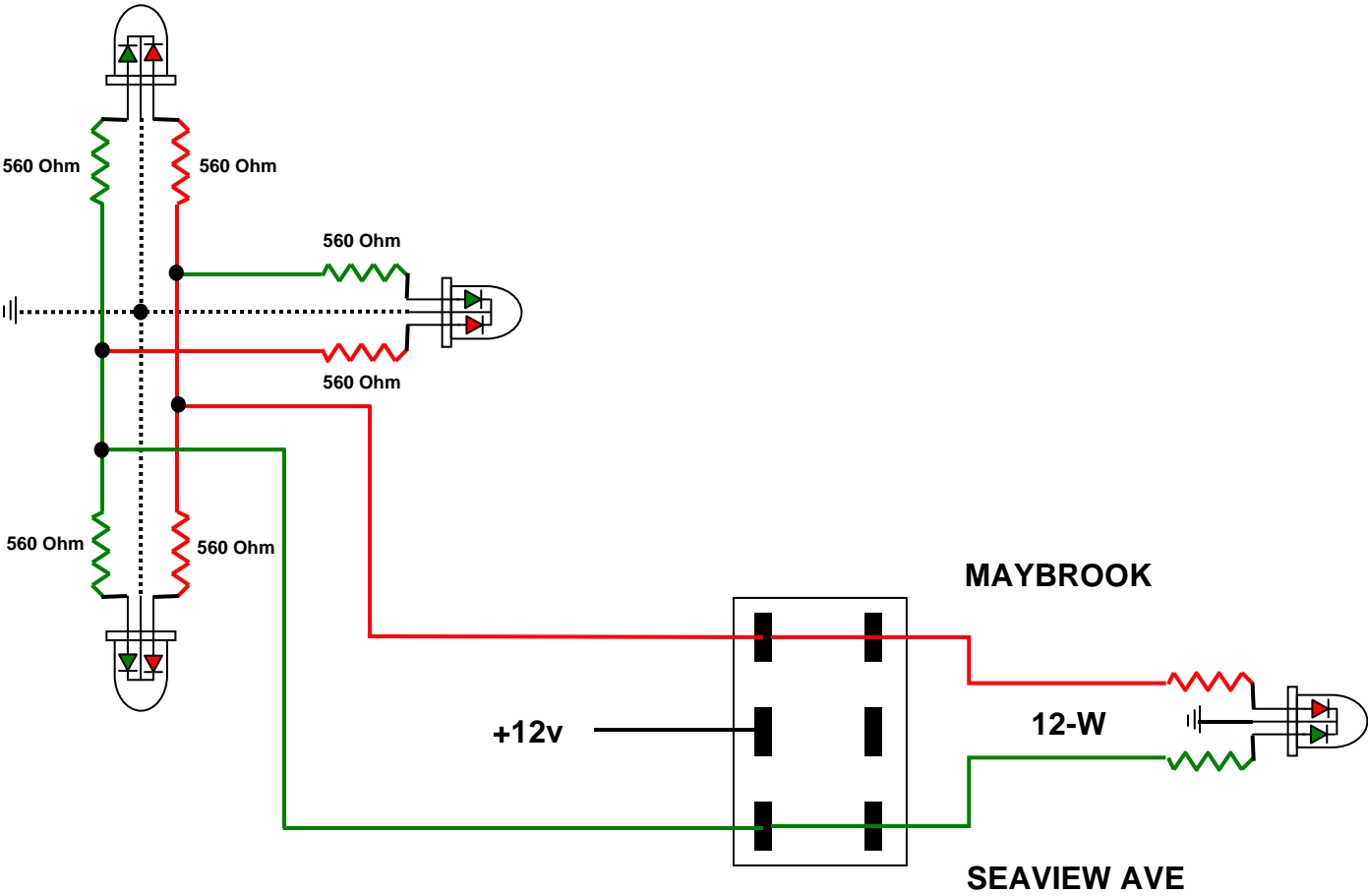**Reversed = D2 Red; D6 = Top Red, Bottom Green; D4 = Green**

Dwarf Signal Circuit for Turnout
2 Lead LED's

D4

Switch machine contacts set up as reversing switch (normal route shown)

D2

Top

D6

Bottom

Straight: D2 = Green; D6 = Top Green, Bottom Red; D4 = Red

Diverging: D2 = Red; D6 = Top Red, Bottom Green; D4 = Green

Maybrook / Seaview Ave Signals

Turnout Indication with Separate Relay

Switch Panel w/Bi-Color LED Indicators
(1 turnout shown)

+12v

Atlas Relay

**Switch
Machine**

Toggle Switch

**Momentary
Center Off**
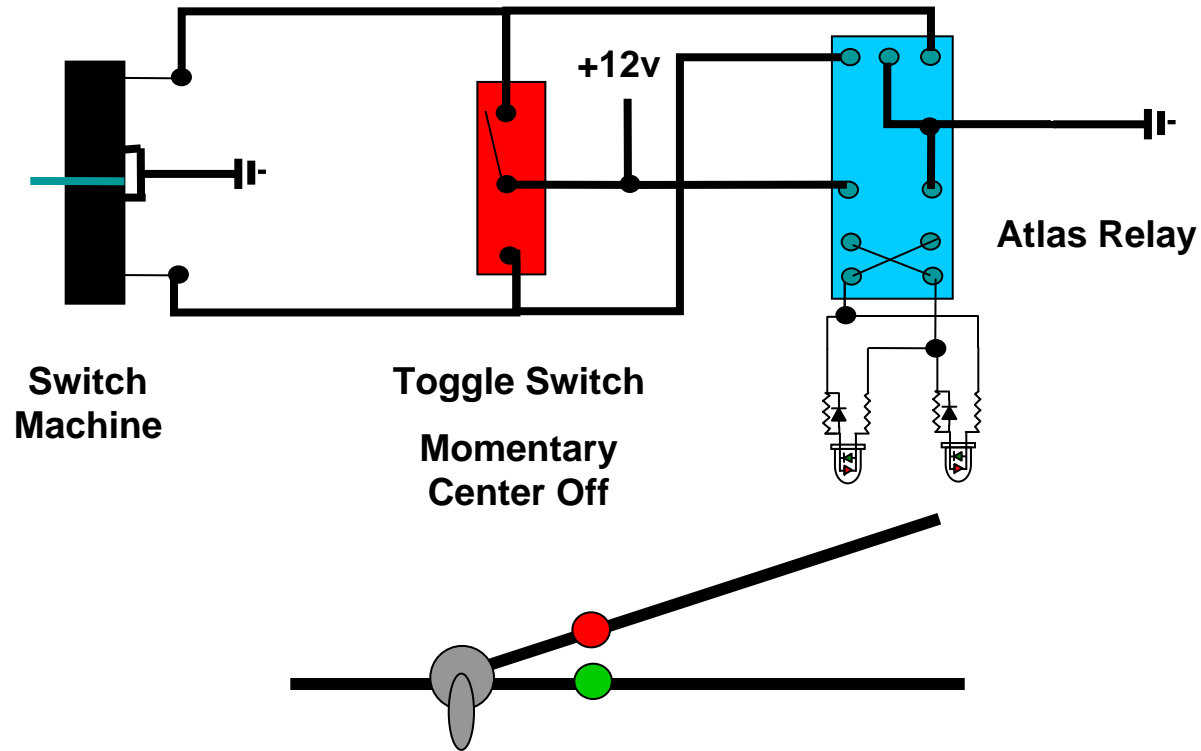
Block/Train Detection

- Basic detectors: Non-contact, not part of track circuit
  - Components
    - Photocells (CdS, CdSe)
    - Phototransistors / Photodarlingtons (Silicon)
    - Photo Schmitt Detectors (Silicon)
    - Reflective
    - Magnetic (reed switch, Hall Effect)
  - "Store Bought"
    - Dallee Trak-DT (current sensing), Opto-DT (IR)
    - Circuitron DT-1,2,3,4 (uses Photocells)

Basic Detectors
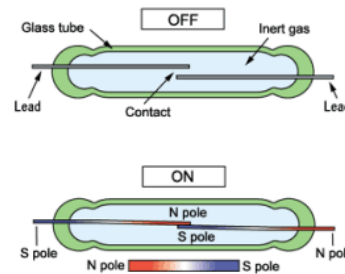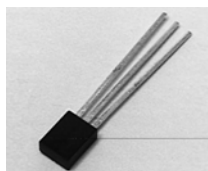## Components

CdS / CdSe

TO-46c

T1 (3mm)

Phototransistors / Photodarlingtons

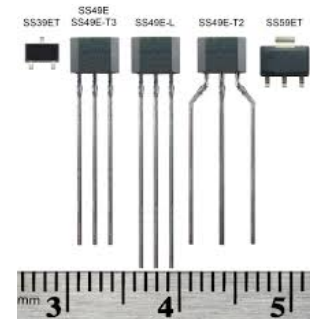Sidelooker

Sidelooker
PhotoSchmitt
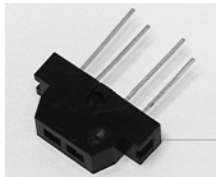
Reflective

Reed Switch

Hall Effect Sensor
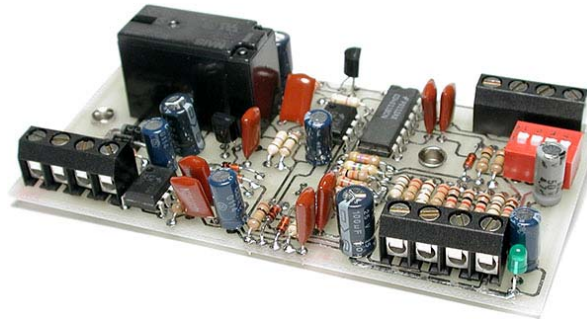
http://home.cogeco.ca/~rpaisley4/CircuitIndex.html#REVISION

Basic Detectors
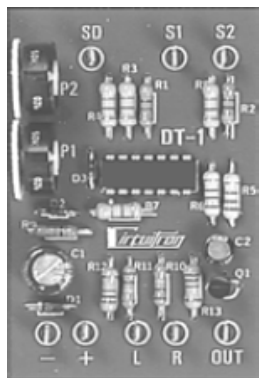
"Store Bought"

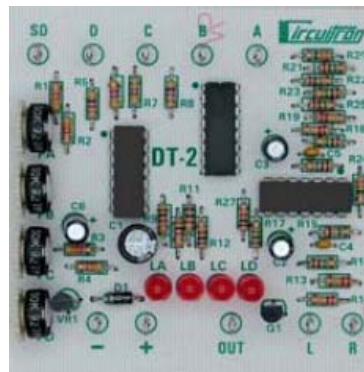Shameless Plug for John Grosner's Photocell Circuit
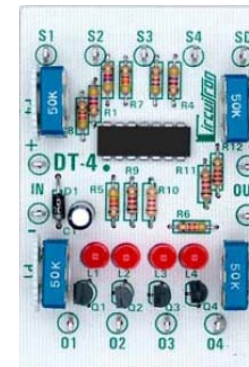

Dallee Opto-DT

Dallee Trak-DT

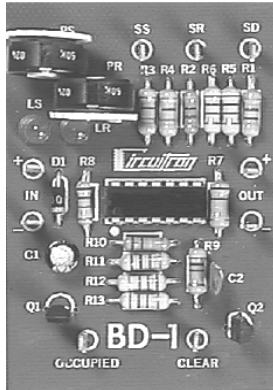DT-1 Grade Crossing Detector

DT-2 Grade Crossing Detector w/Logic
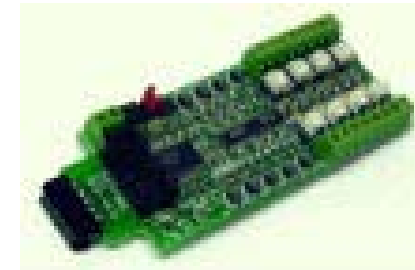

DT-4 Rolling Stock Detector

More Sophisticated Detectors and Signaling
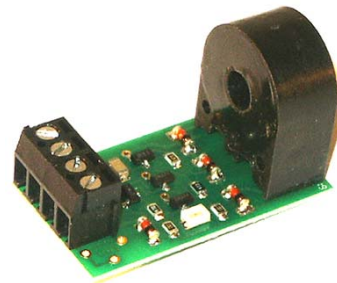## Topics for next Clinic

Circuitron BD-1

Digitrax BD-4

RR-CirKits BOD-8

Integrated Signal
Systems
Block Occupancy
Detector

NCE BD-20

DCC Specialties
Block Watcher

Block 4 & 12 Detection for Diamond Interlocking and Semaphore Signal

Common Rail

BW1 — Track 12 Approach Blocks — DCC Specialties Blockwatcher — J1 J2 J6 J4

BW2 — Track 12 Center Block — DCC Specialties Blockwatcher — J1 J2 J6 J4

BW3 — Track 4 Center Block — DCC Specialties Blockwatcher — J1 J2 J6 J4

BW4 — Track 4 Approach Blocks — DCC Specialties Blockwatcher — J1 J2 J6 J4

DCC Input (12)

DCC Input (4)

F8A F8B

F3 F4 F7

+12 v

Relay 1

F1

Relay 2

F2A F2B

Red Input

Semaphore Control Board

(Outputs to Semaphore motor not shown)

Yellow Input

Rev 04/18/09