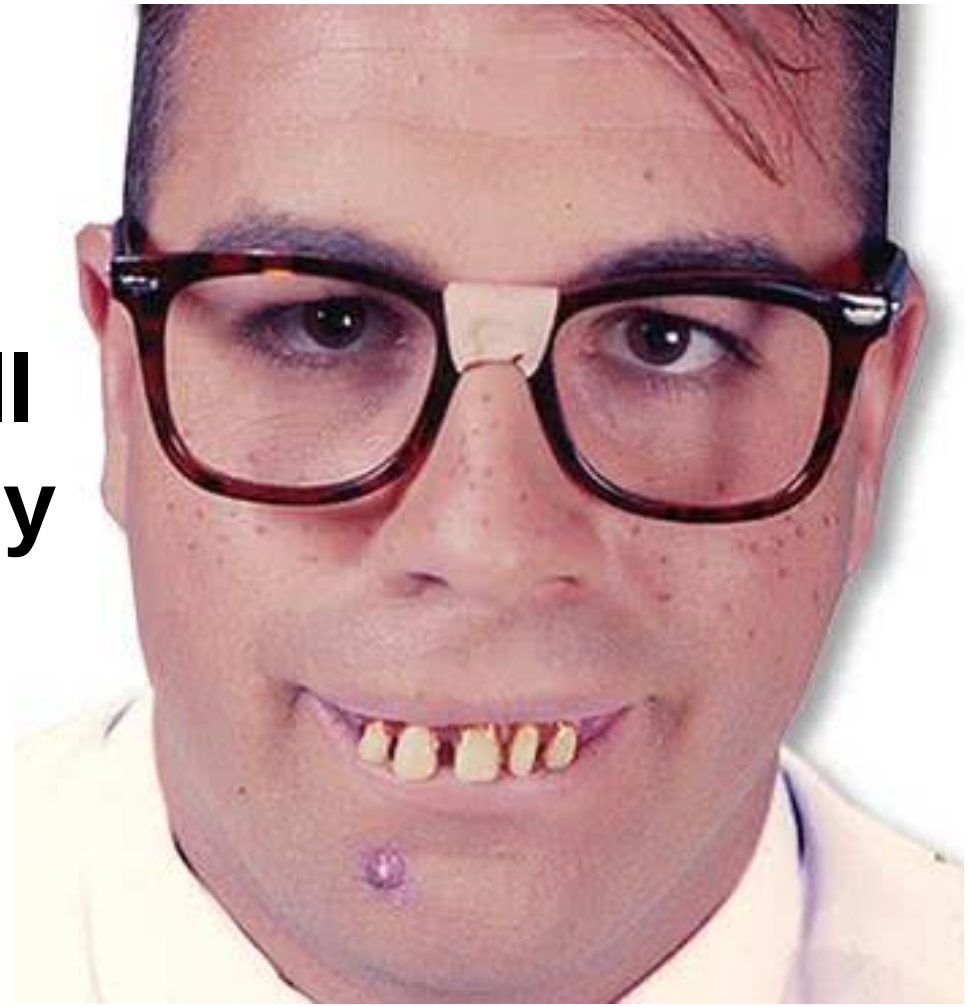
Simple Route Switching for Yards



This presentation will be just a little bit nerdy

- but fear not, no supercalafragalisticexpialadocious big words

Simple Route Switching for Yards

Jim Ironside

Mini-Meet Clinic

Calgary Model Railway Society

14 Oct 2018

Why Bother?????

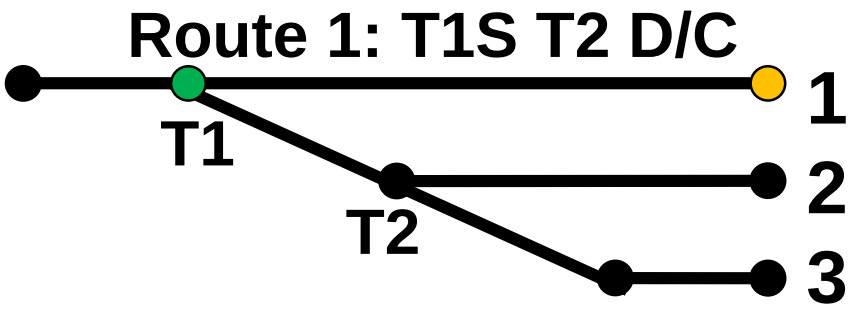
Aim

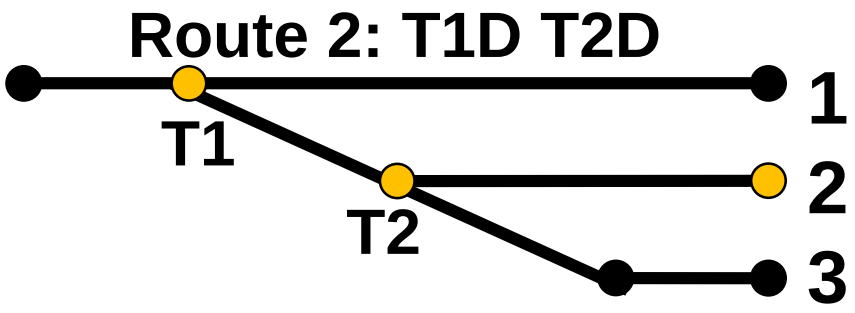
To present a (relatively) simple and inexpensive way to operate track routes, rather than setting turnouts one at a time

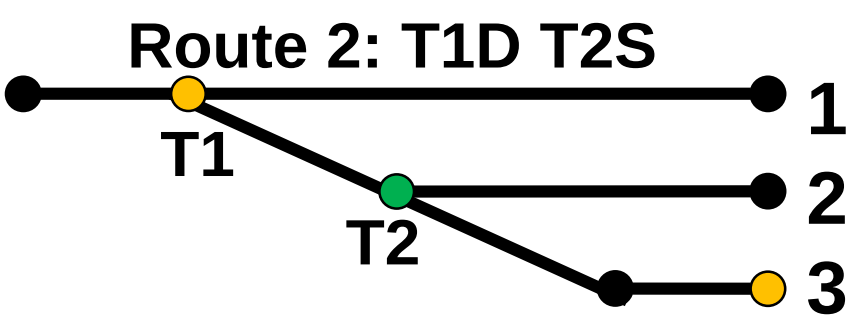
What is the problem?

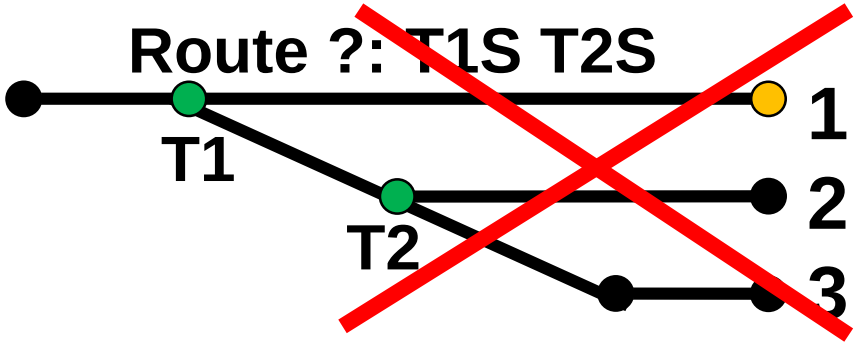
- **Yard throats/ ladders contain many turnouts**
- **Usually requires setting more than one turnout to get to destination track**

Routes in a Three Track Yard





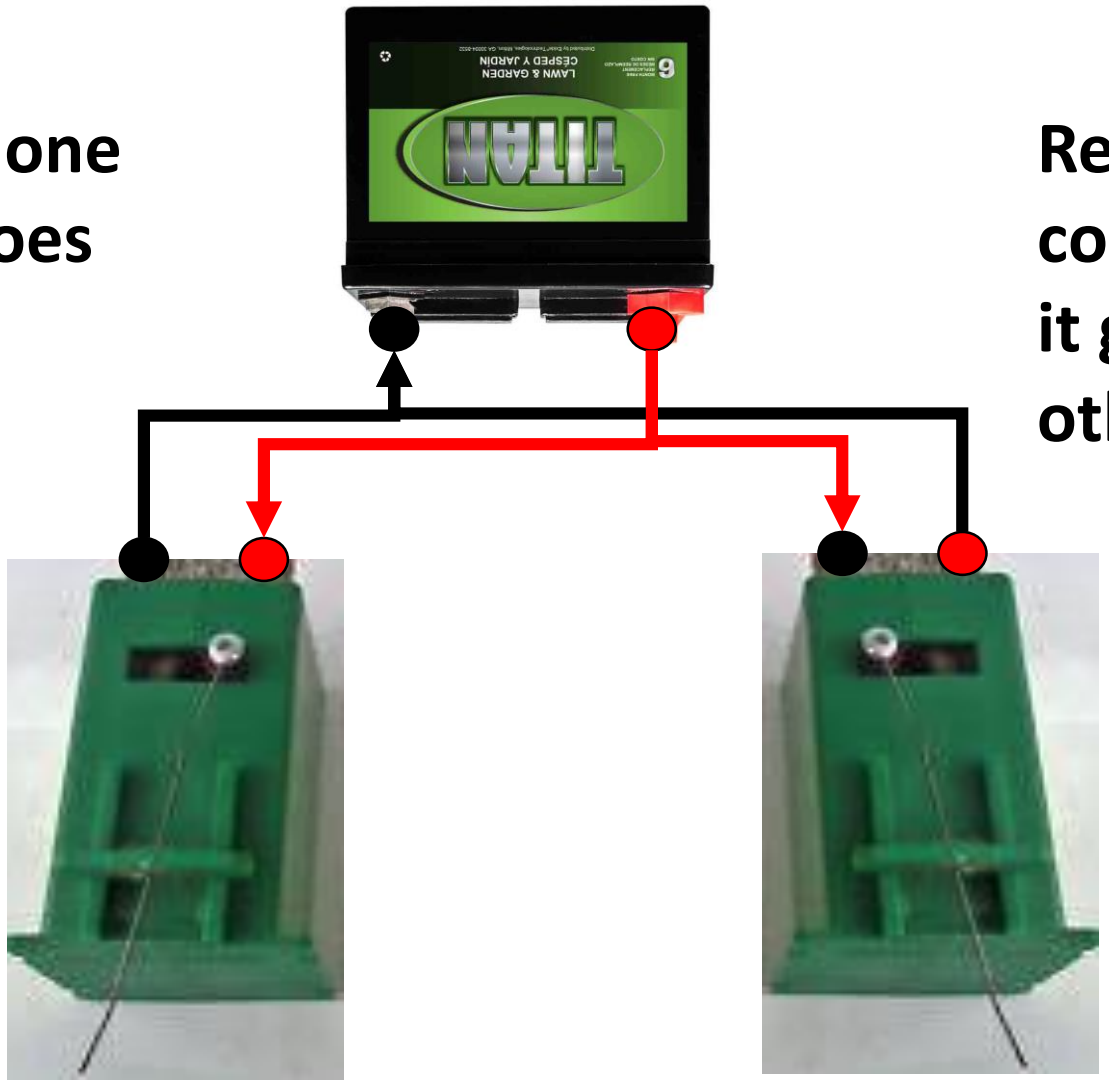




This one is not an actual different route

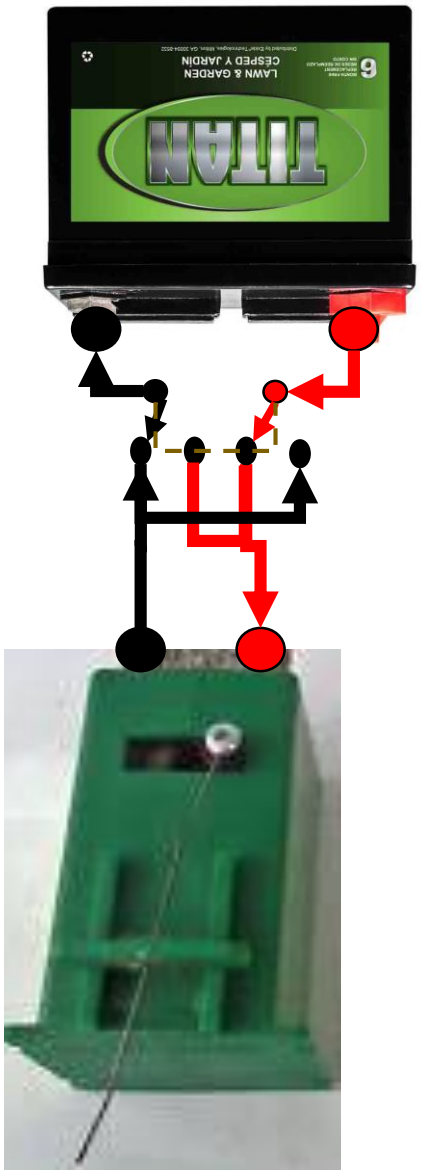
How does a Tortoise work . . . .

Connect one way, it goes one way



Reverse connections, it goes the other way

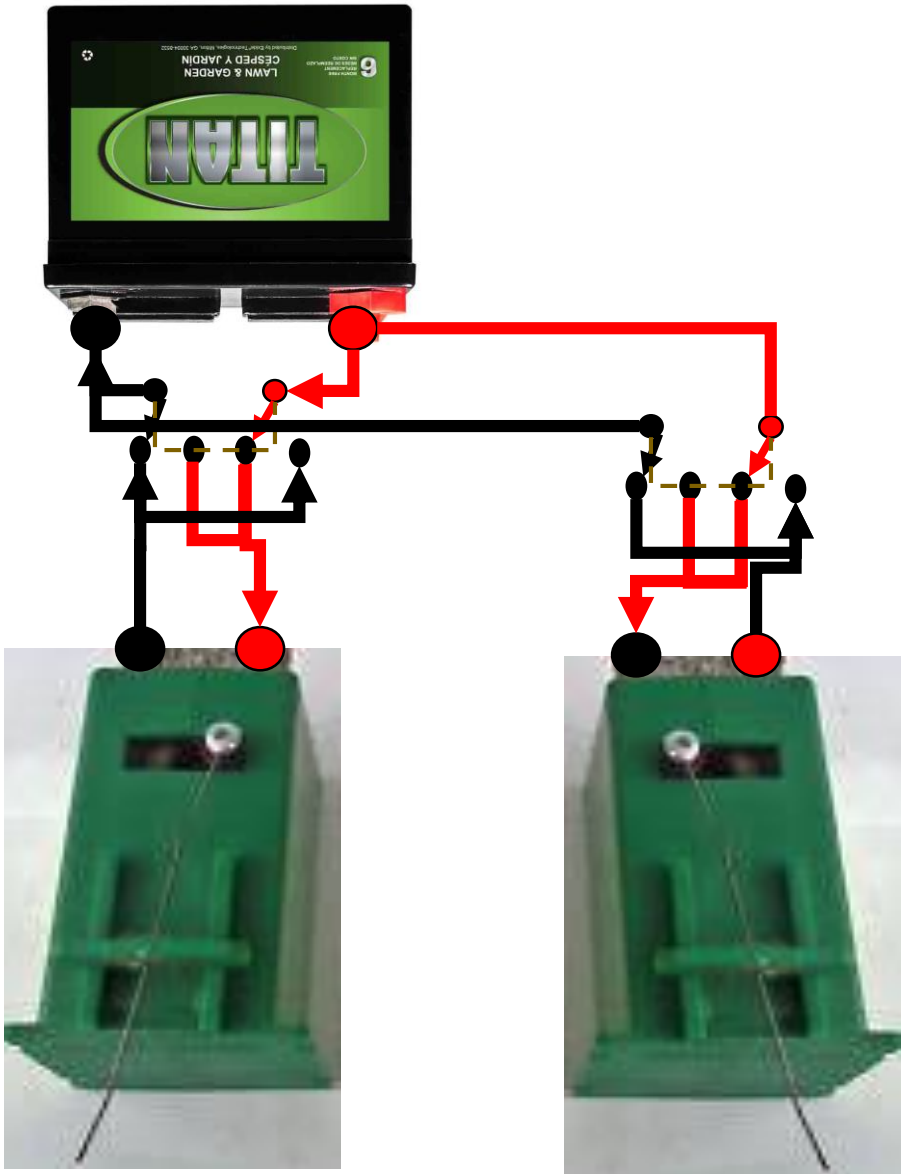
Put a switch in between . . .



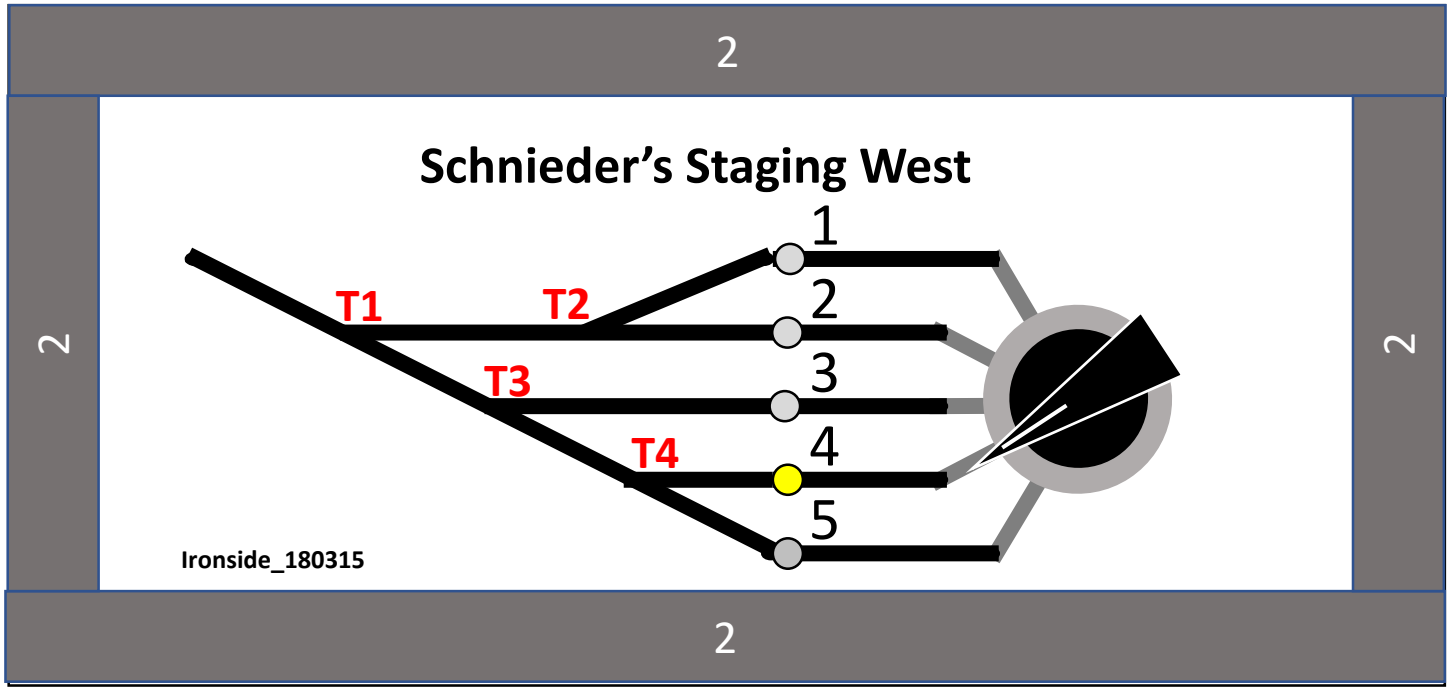
Put a DPDT toggle in, we can throw it both ways

Put two switches to two Tortoises. . .

Both must be set to set a route

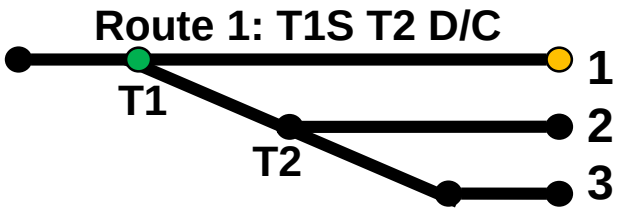


We would like something easier . . .

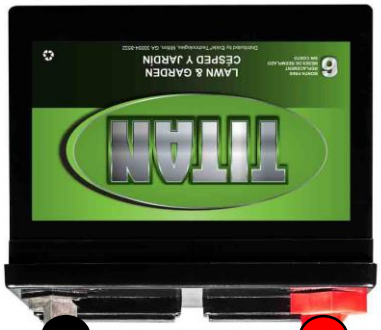


- Dial desired track
- Turnouts automatically align

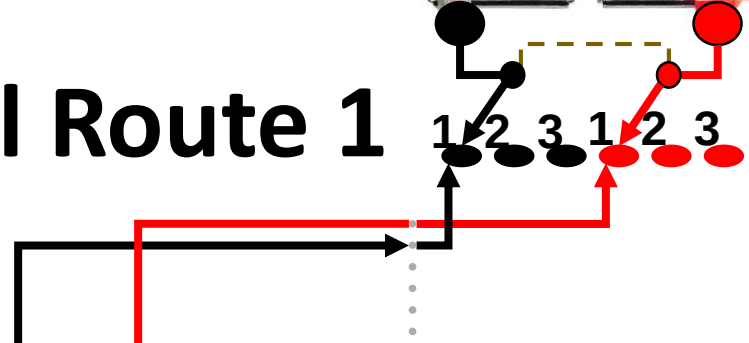
Usually requires expensive, complex controller and programming



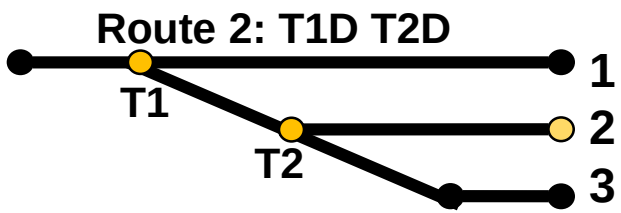
Looking at our three track yard . . .

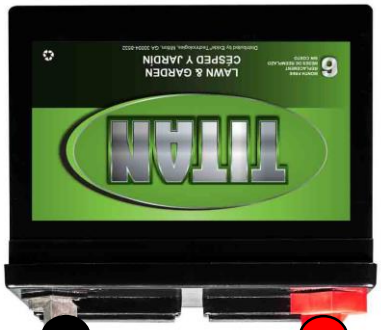


Dial Route 1



Route 1:
T1 Straight
T2 Don't Care

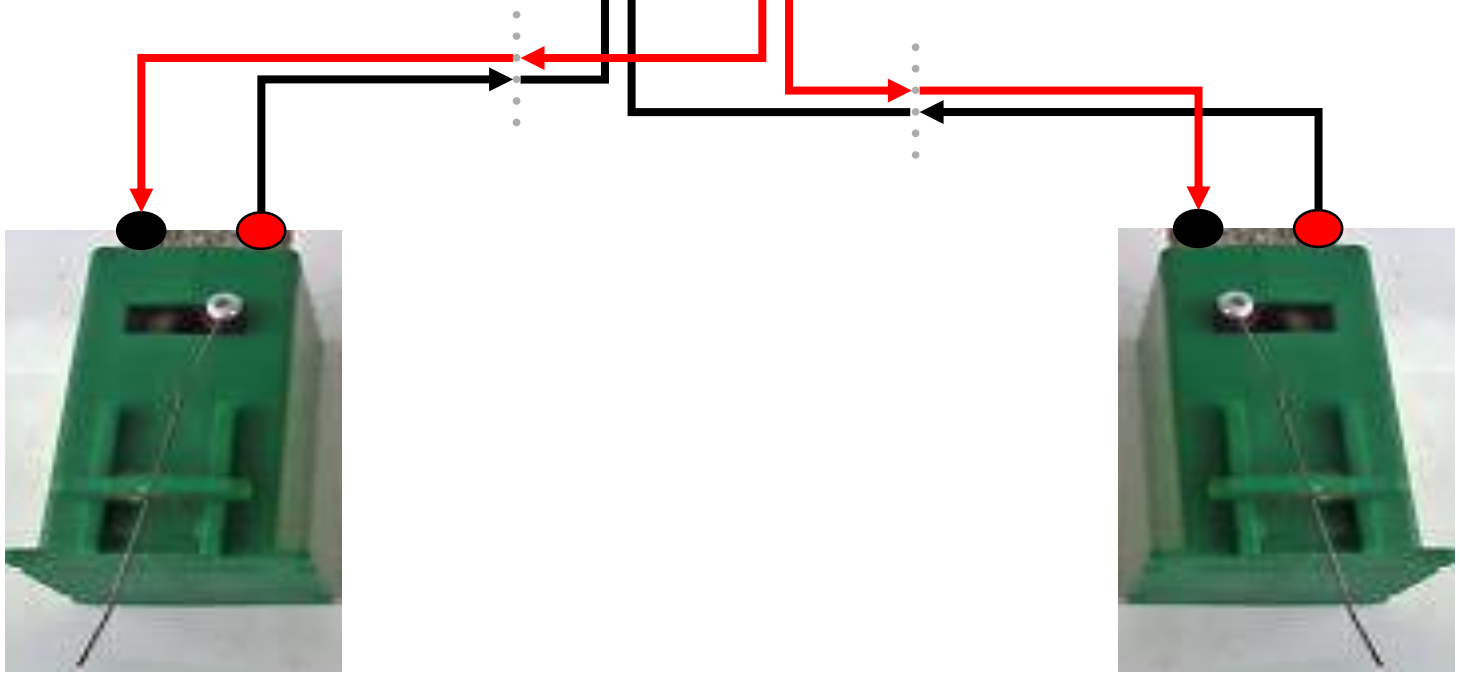


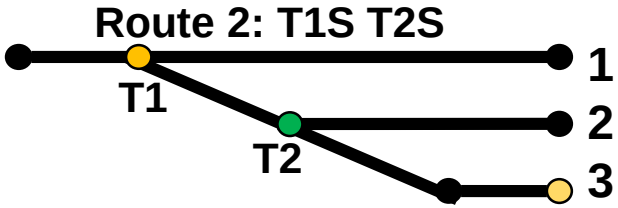


Dial Route 2

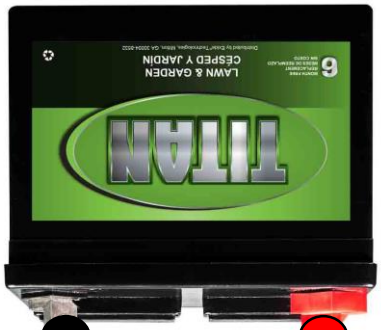
1 2 3 1 2 3

Route 2:
T1 Diverging
T2 Diverging



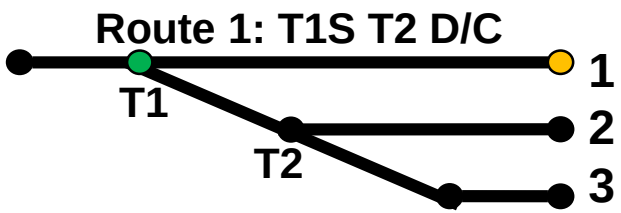


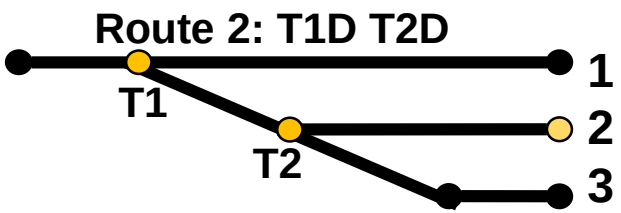
Dial Route 3

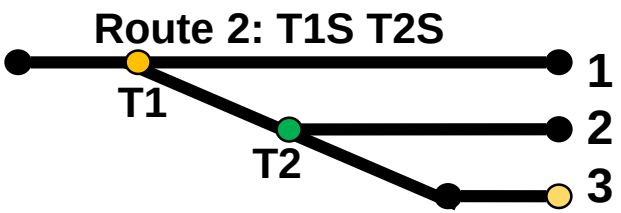


1 2 3 1 2 3

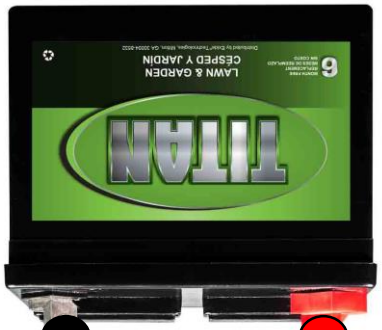
Route 3:
T1 Diverging
T2 Straight

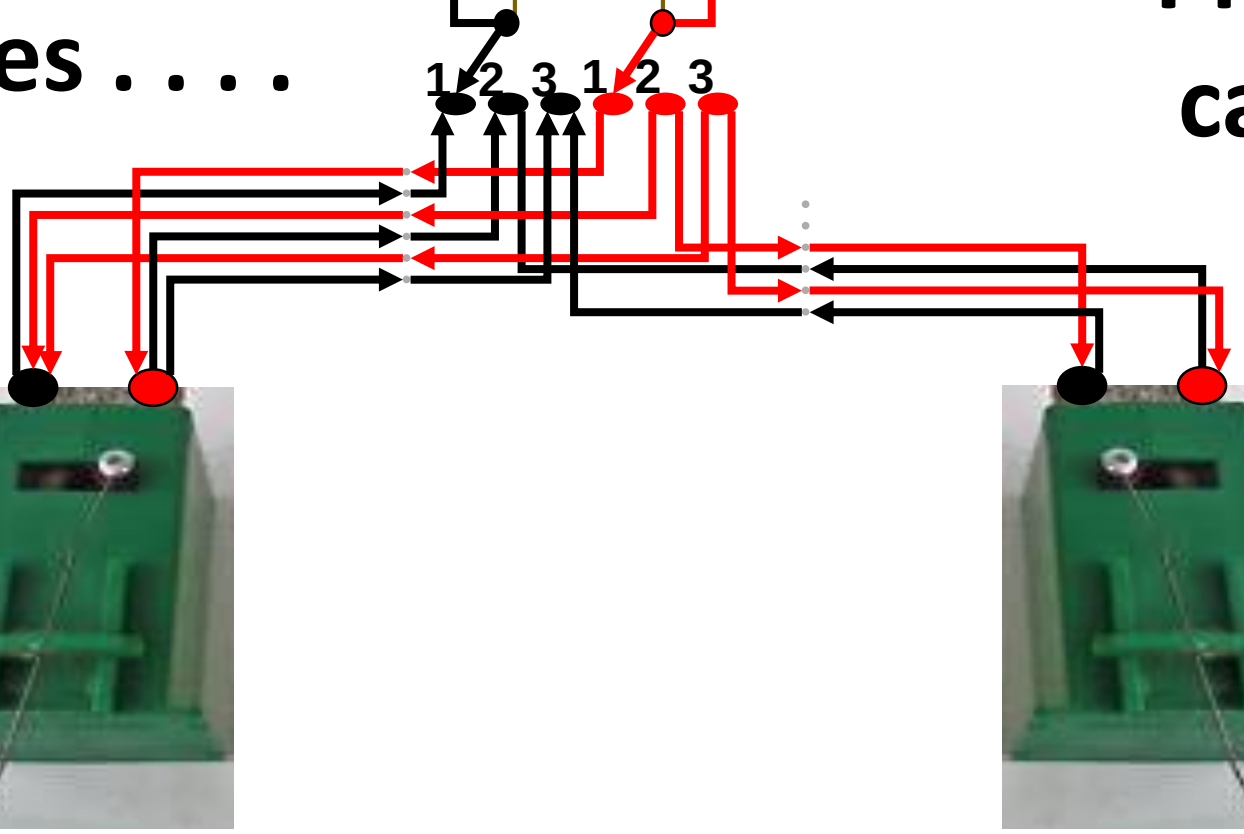




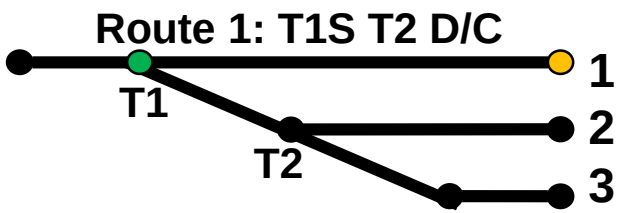


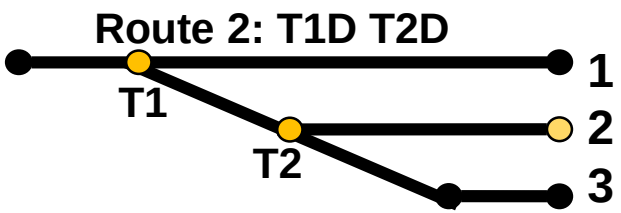
Adding up all those wires . . . .

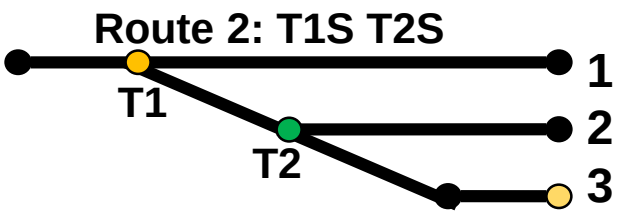




Piece of cake !!!







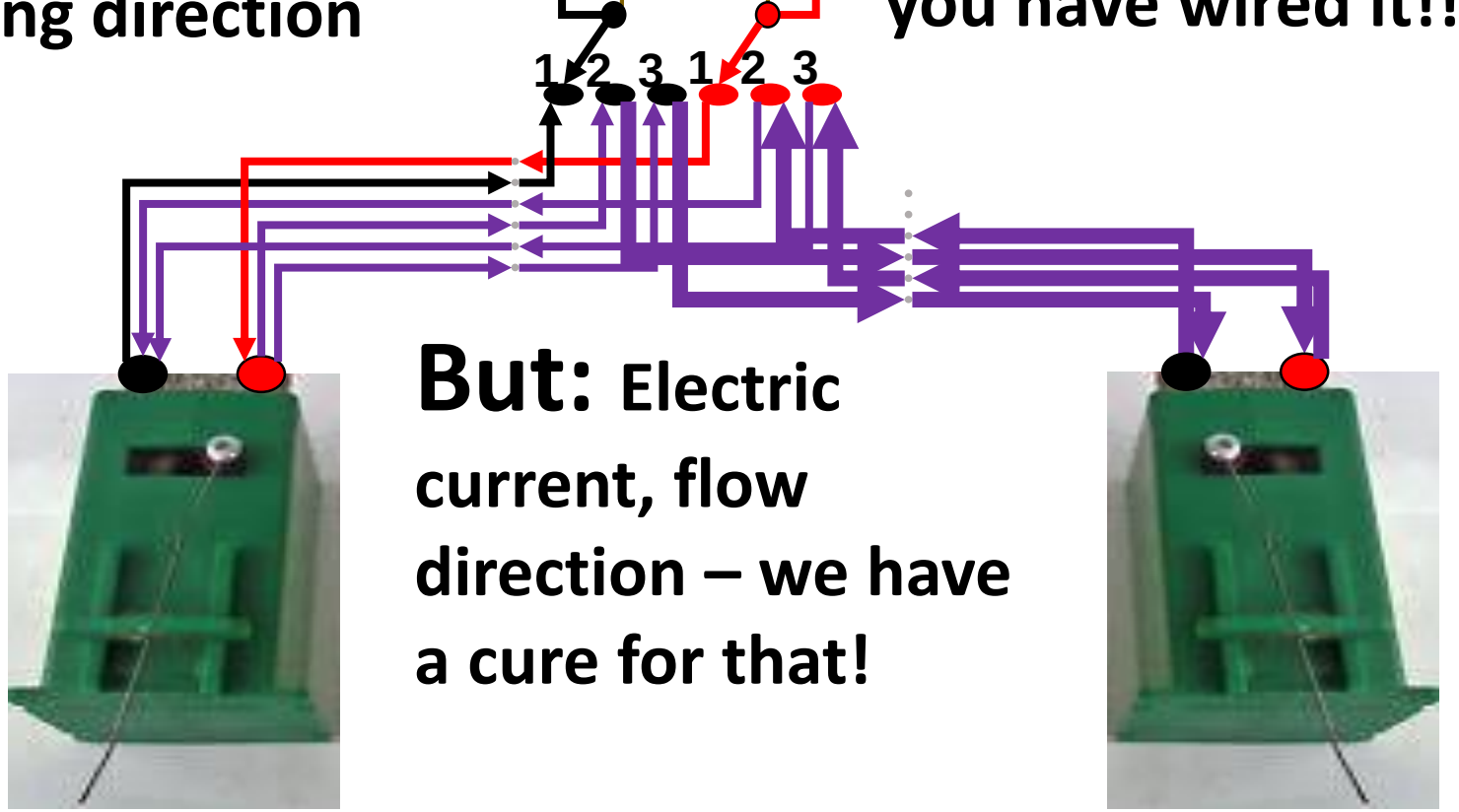
Oh Oh!!!!!

Heavy purple lines allow current flow in wrong direction

Sneak Paths

create short circuits

Try diagnosing that after you have wired it!!!



But: Electric current, flow direction – we have a cure for that!

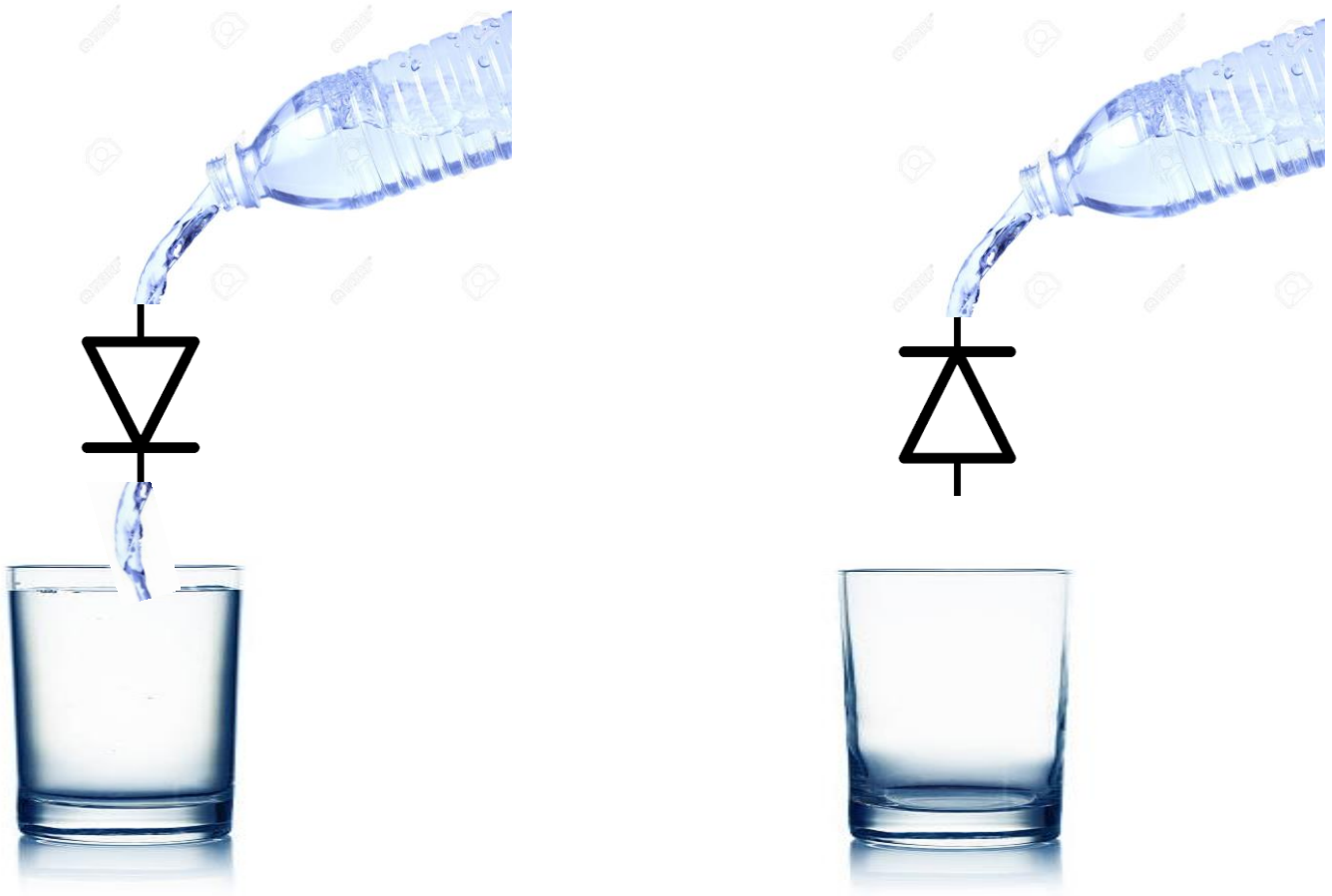
Simple Route Approach

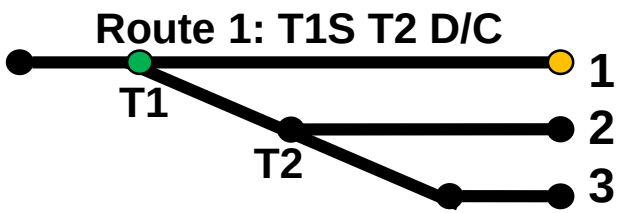
- **Complex controller – NOT SO**
- **Turnouts powered by machines go one direction or other depending on polarity of voltage applied, eg direction of electrical current**
- **Simple diodes control the direction of an electrical current**

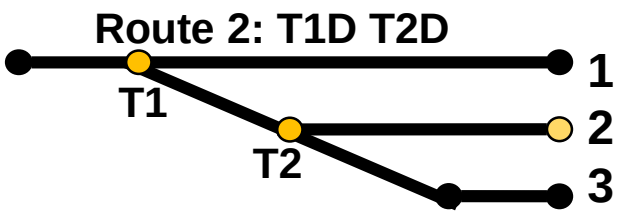
Direction - Direction - there is a solution here!!!

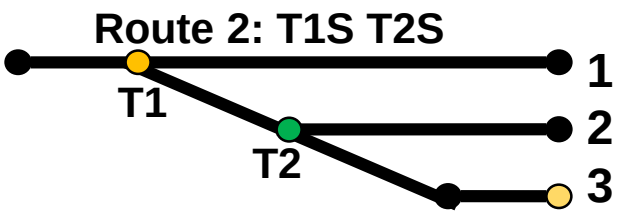
How does a diode work?

Diodes pass electric current in one direction, block it in the other



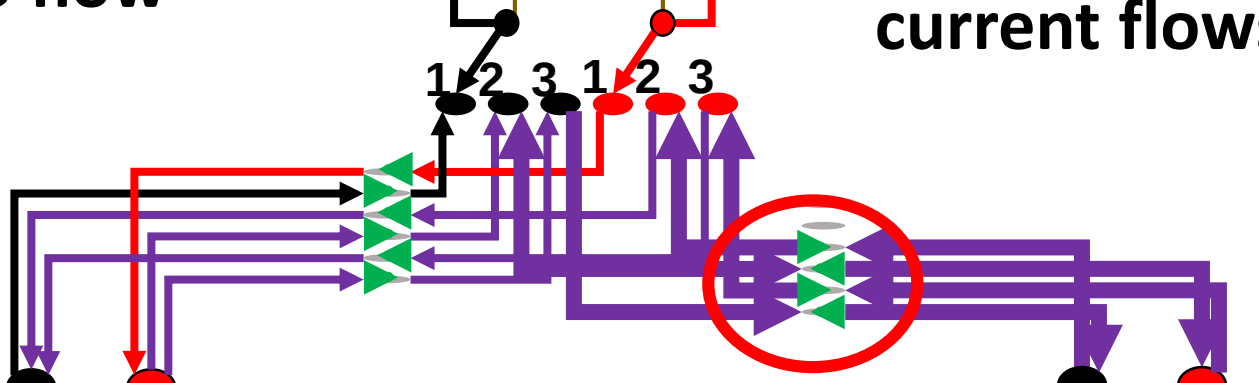


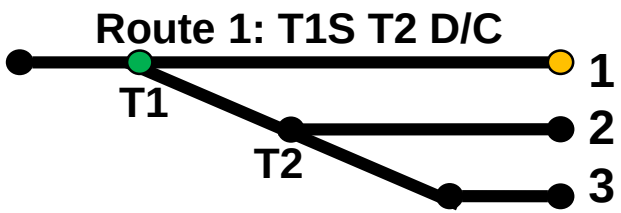


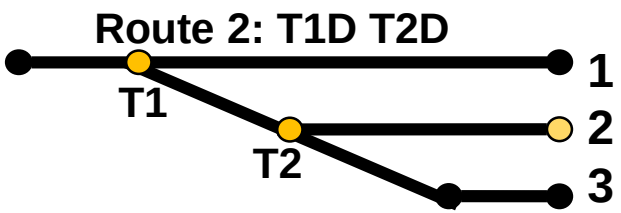


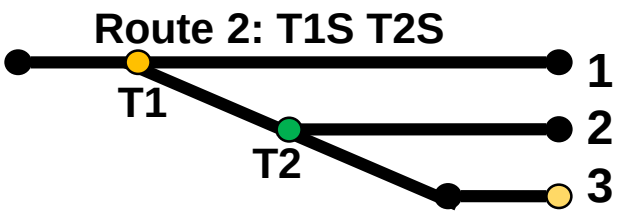
Diodes ensure current flows only in direction we want it to flow

When arrowheads point in opposite directions, no current flows

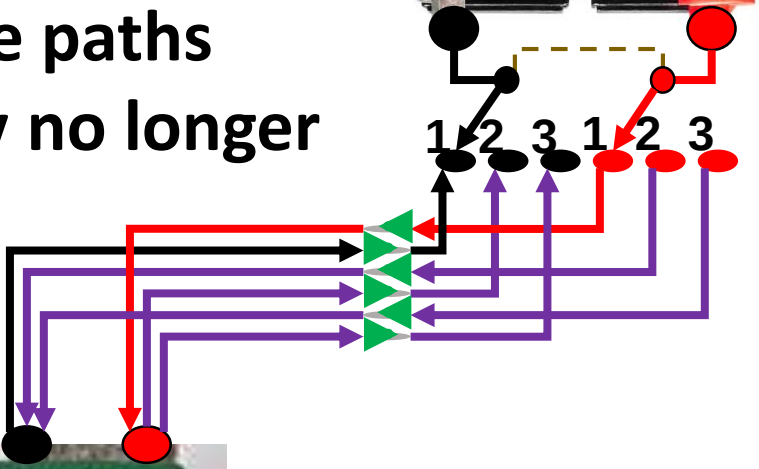








Diodes prevent backwards flowing current
Thus those paths effectively no longer exist



Wires to selector route 2 and 3 do not go anywhere so they do not cause problems

I won’t bore you . . . .

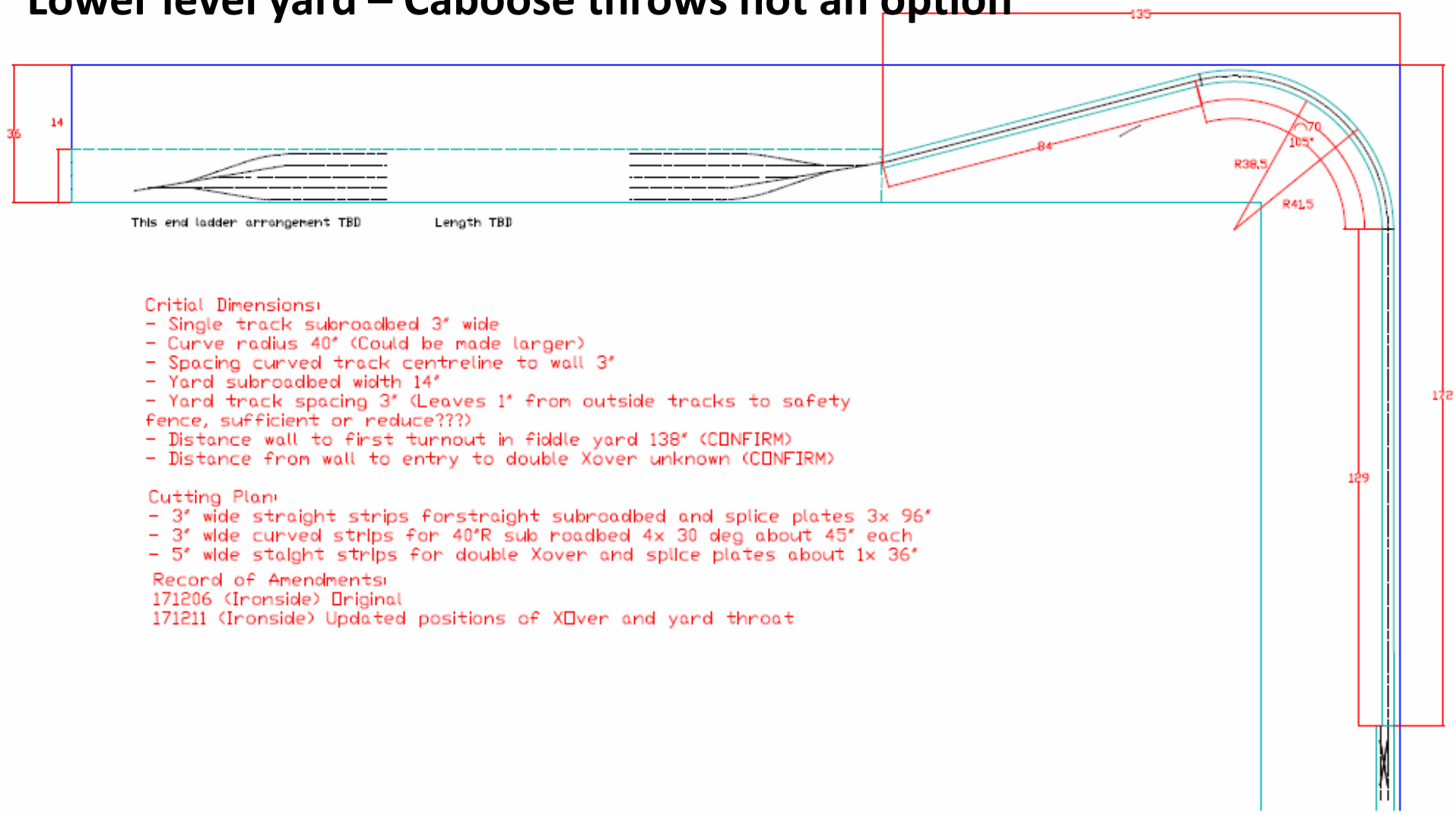
---- with the equivalent for the other switch positions – take my word for it, they also work

(Thanks accepted)

Other positions left as an exercise for the student

Practical Example: Schnieder 5-track Yard Throat

Lower level yard – Caboose throws not an option



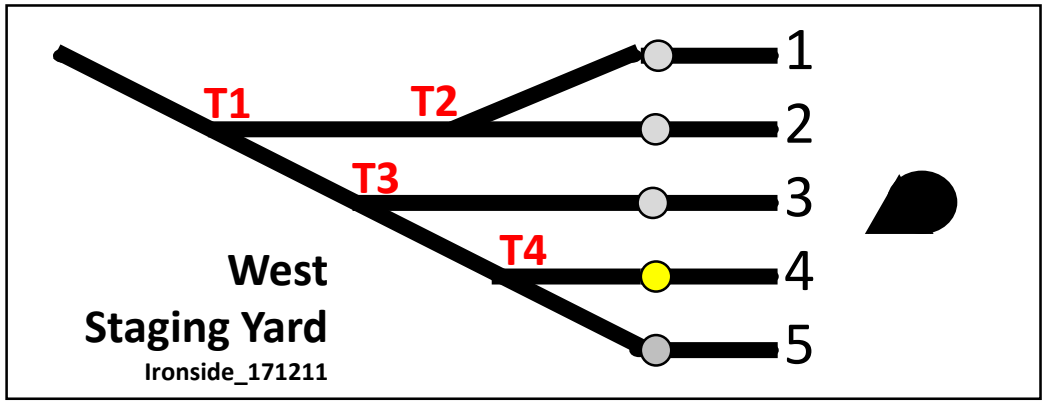
Critial Dimensions:
- Single track subroadbed 3" wide
- Curve radius 40" (Could be made larger)
- Spacing curved track centreline to wall 3"
- Yard subroadbed width 14"
- Yard track spacing 3" (Leaves 1" from outside tracks to safety fence, sufficient or reduce???)
- Distance wall to first turnout in fiddle yard 138" (CONFIRM)
- Distance from wall to entry to double Xover unknown (CONFIRM)

Cutting Plan:
- 3" wide straight strips forstraight subroadbed and splice plates 3x 96"
- 3" wide curved strips for 40"R sub roadbed 4x 30 deg about 45" each
- 5" wide staight strips for double Xover and splice plates about 1x 36"

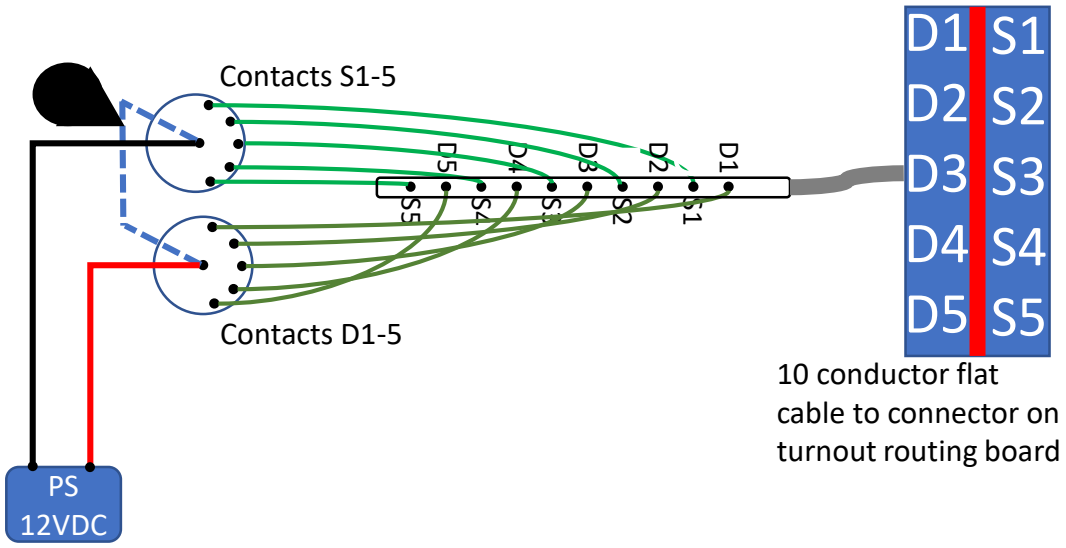
Record of Amendments:
171206 (Ironside) Original
171211 (Ironside) Updated positions of XOver and yard throat

Yard Throat

Turnout setting to track relationship



Rotary Selector set for Track 4



10 conductor flat cable to connector on turnout routing board

Route Selection

	Turnout/ Tortoise			
Track	**T1**	**T2**	**T3**	**T4**
1	D	D		
2	D	S		
3	S		D	
4	S		S	D
5	S		S	S

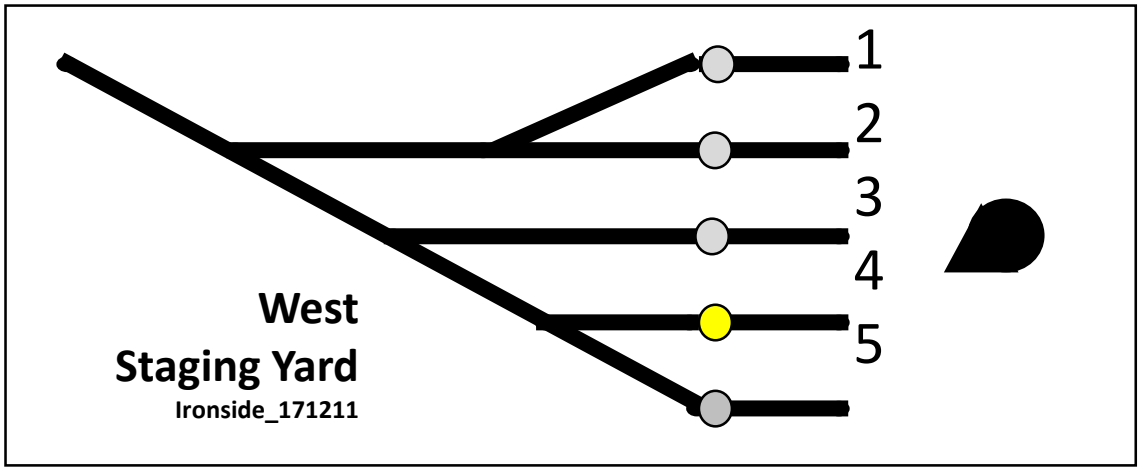
S = Straight

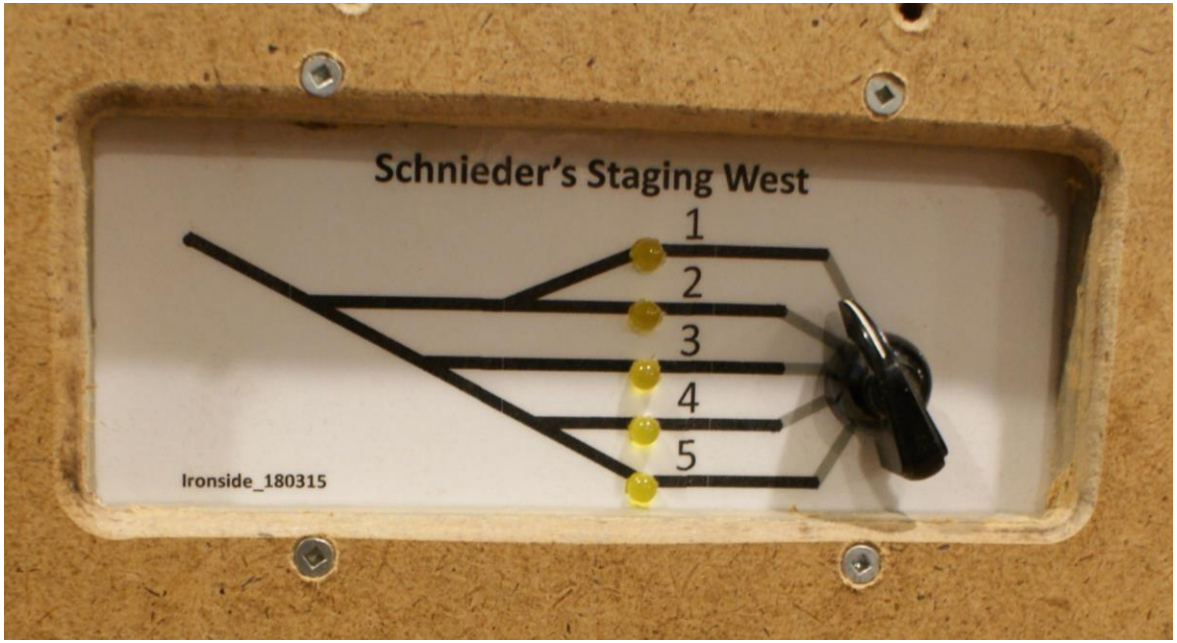
D = Diverging

Blanks are “Don’t Care”

Operator Interface

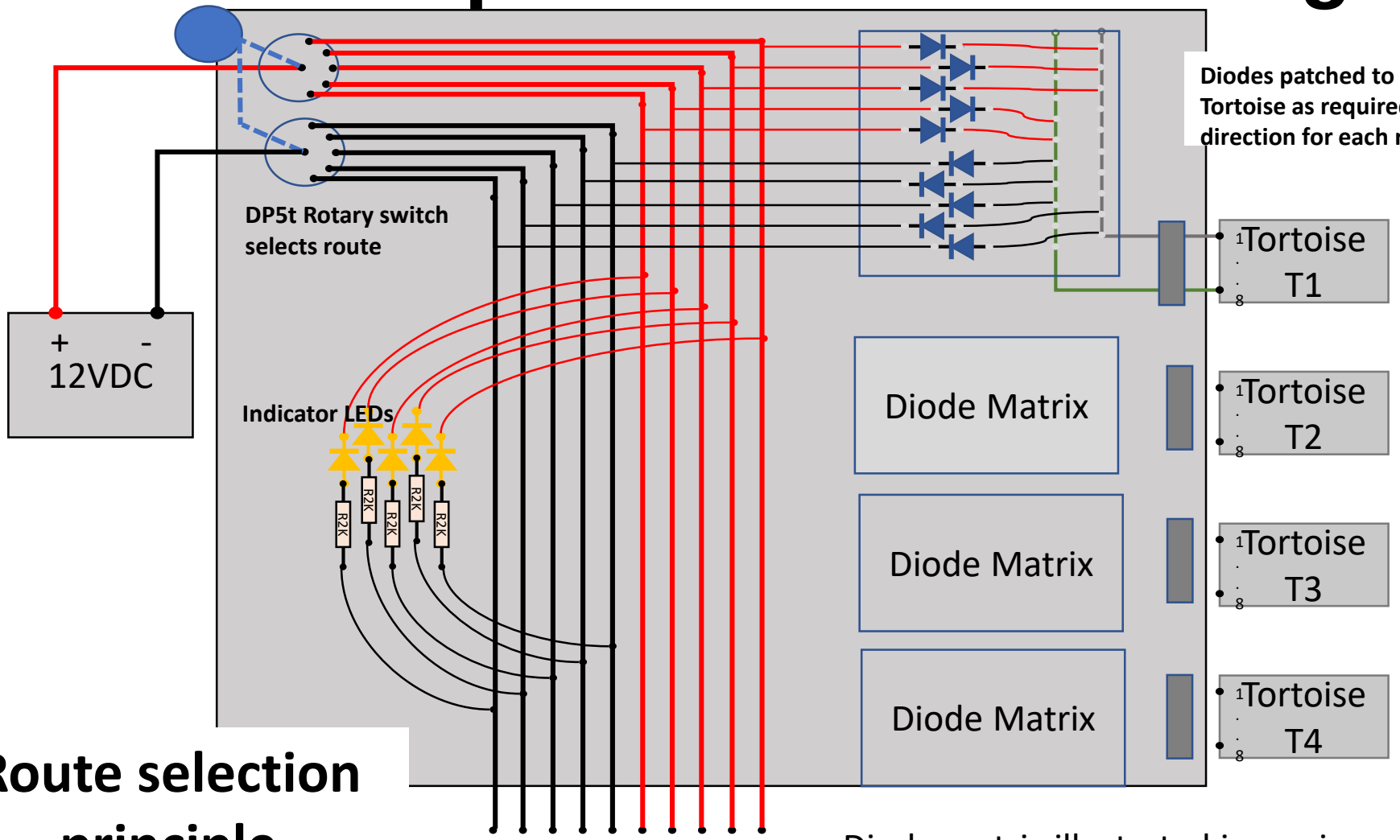
Initial Design





Actual

Interconnect panel – Generic design



Route selection principle

Selected rotary switch wafer output contacts are connected to the power leads and others are open. Diode matrices prevent sneak paths to Tortoises

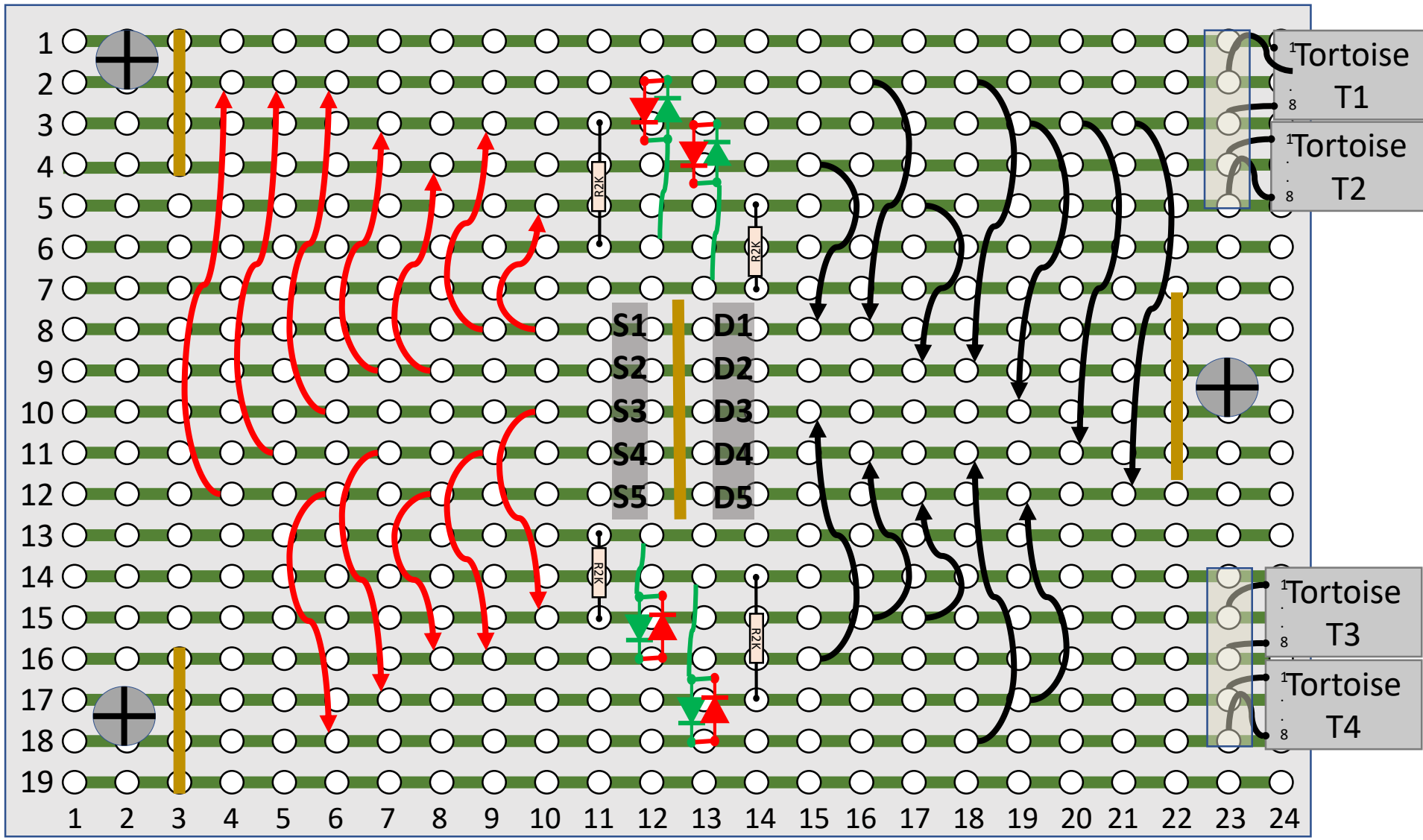
Only one +/- pair is active at a time

Diode matrix illustrated is maximum; optimization in detail design will reduce number of diodes

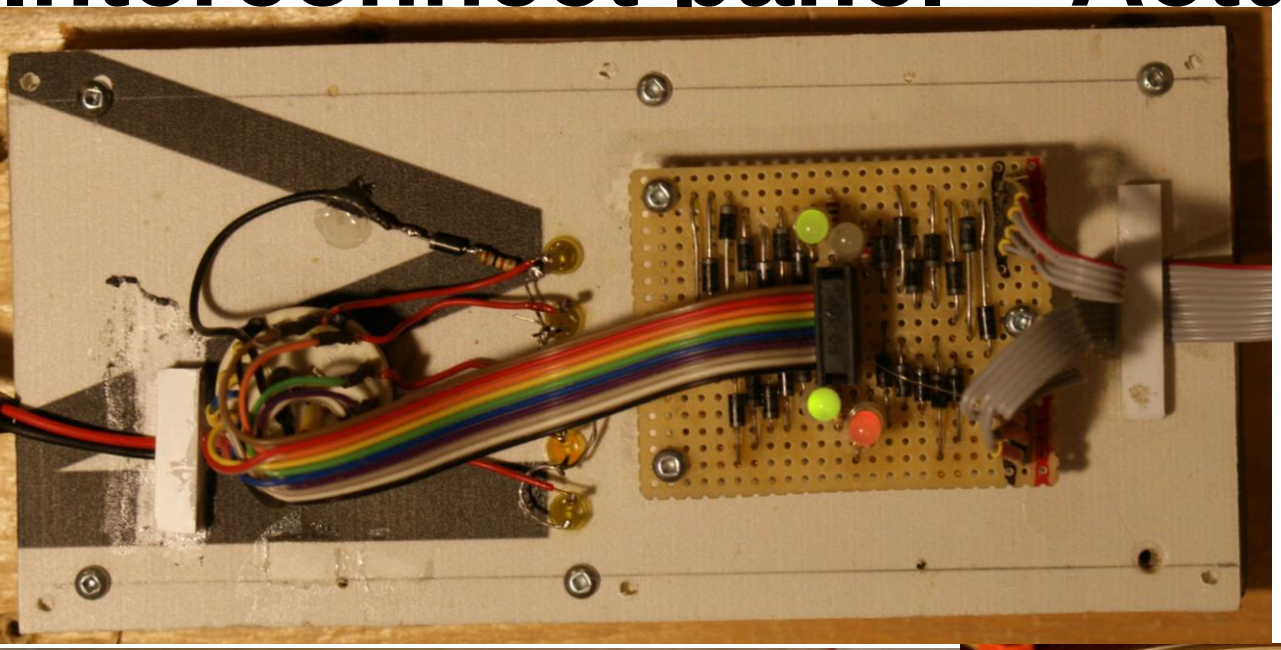
Interconnect - Specific design

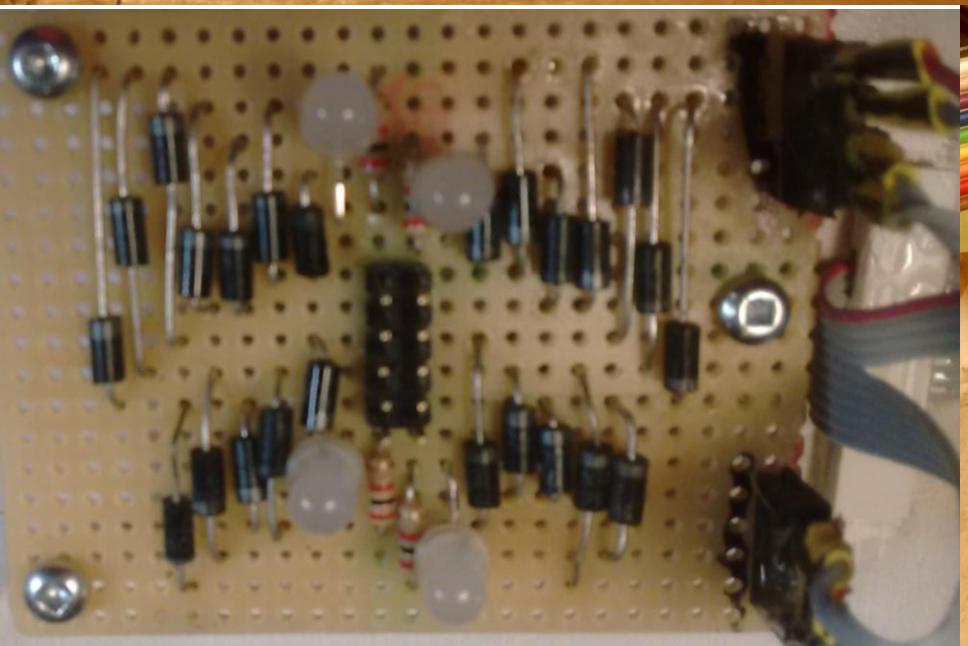
Arrow heads indicate the banded diode lead.

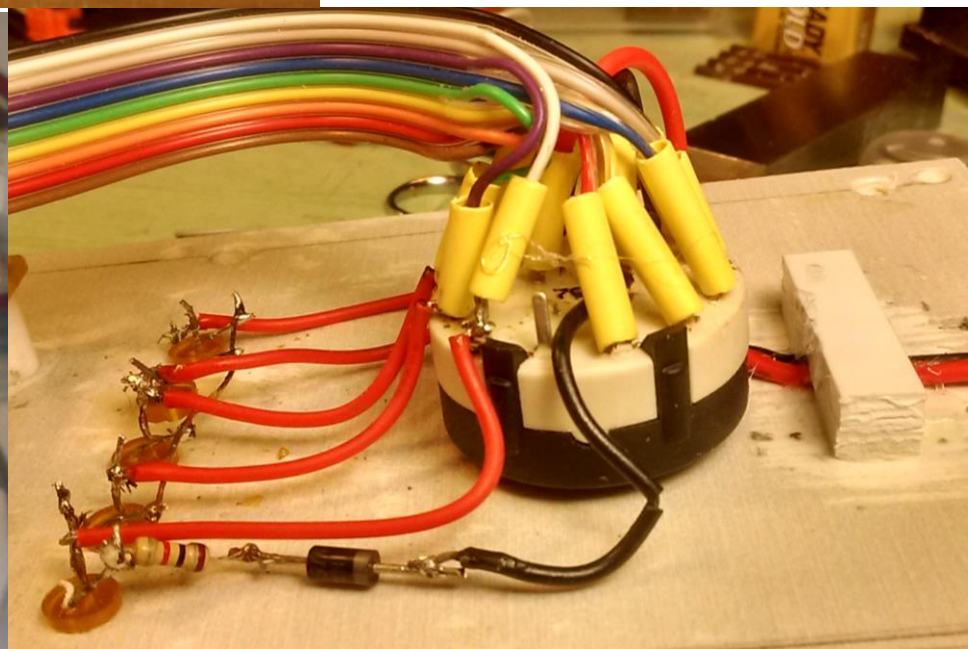
Bi-colour diodes oriented so that Red=Diverging



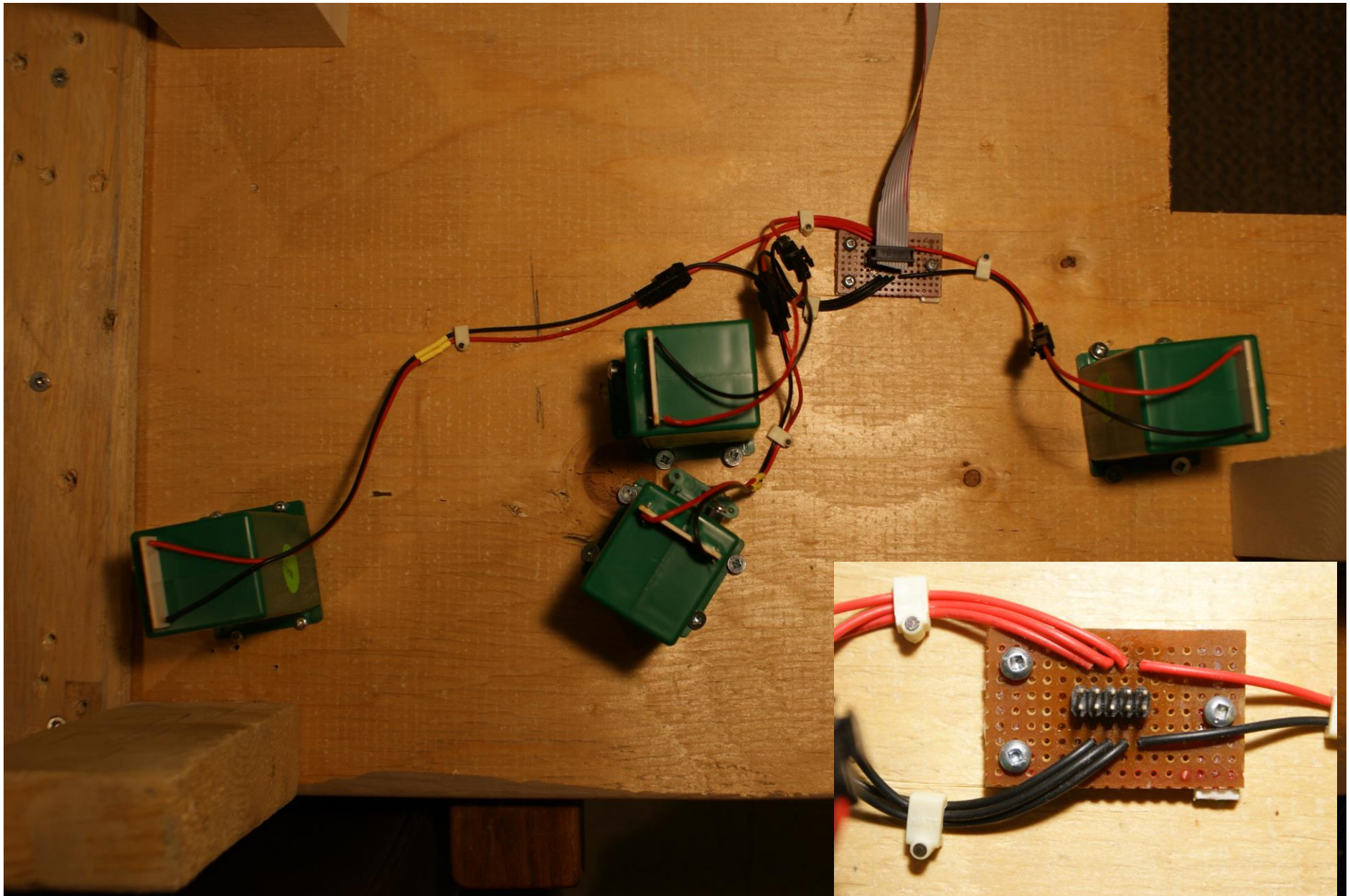
Interconnect panel - Actual build







Tortoise Connection – Actual Build



Notes on the Implementation

- **PC tracked board – ensures regular, understandable component layout**
- **Design for Maintenance – headers, flat cable, Tortoise connectors provide connections from panel to switch motors**
- **Power supply – standard wall wart or power block**
- **Bi-colour LEDs – not necessary, but useful test/ diagnostic assist**
- **Tortoise wiring – done with confirmation testing that turnouts switch correct direction**

Staging Yard Throat Panel Materials

- 1/8” Plastic substrate
- Printed panel (bond to substrate)
- 1x rotary switch
- 5x LED Ye Staging
- 4x LED Bicolour Rd/Gr
- 5x Resistors
- 25x Diodes
- 1x PC Strip board Matrix
- 1x PC Strip board Tortoise connect
- 1x Header 10-way
- 1x Plug flat cable 10 way
- 5x connector pairs 2-way
- 3ft 10-way flat cable
- 6x Screw pan Robertson #4x1/2
- 4x Screw flat Robertson #6x1/2
- Wood frame

Total cost (electronic parts from China) about $6

Summary

- **Operations made simpler by making design just a bit more complicated**

- **Particularly suited for simple yard throats/ ladders**

- **Multi-turnout routing does not require complex, expensive, programmable electronics**

Contact: Jim Ironside at IronsideJim@gmail.com