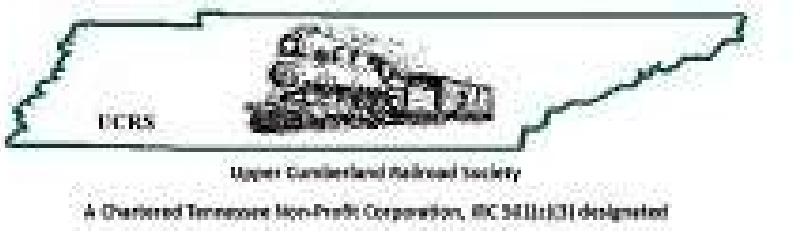


MODEL WIRING – PART I

TRACK

Paul Falk
March 15, 2025

Goals for Today

The Wiring that make trains GO!

Things that improve wiring reliability

Things that improve DCC reliability

Reversing loops demystified

Answer Your Questions

Enjoyment

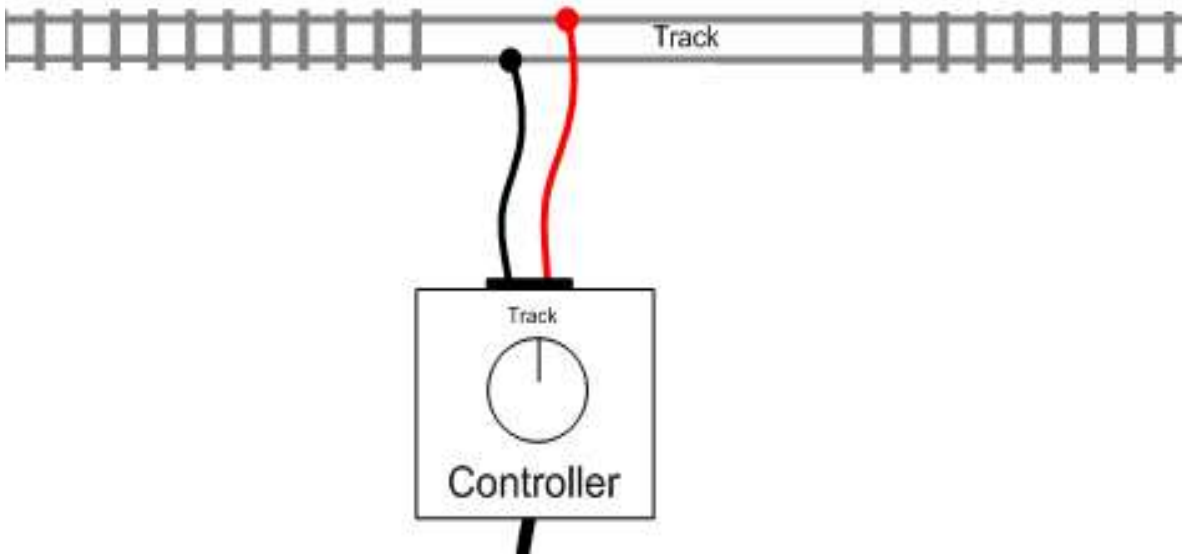
Wiring

Today's Clinic is Geared Towards Two Rail DC & DCC

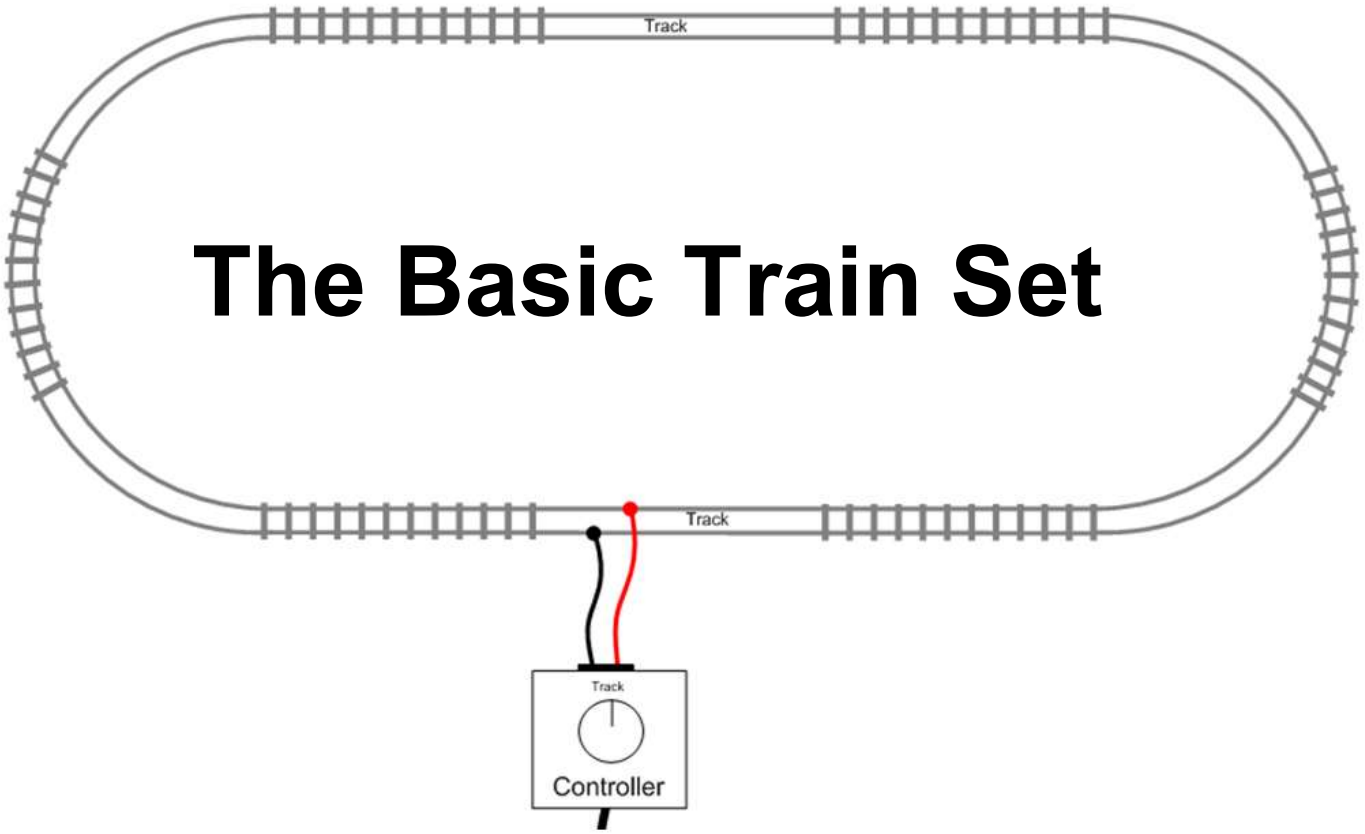
THE DECISIONS CONTINUE

- **DC or DCC or BOTH**
- **What the Purpose? Holiday vs Operating**
- **Level of Commitment for both Time & Budget**
- **Level of Skills Needed**
- **Tools Needed**
- **Personal Preferences**
- **Parts Available?**

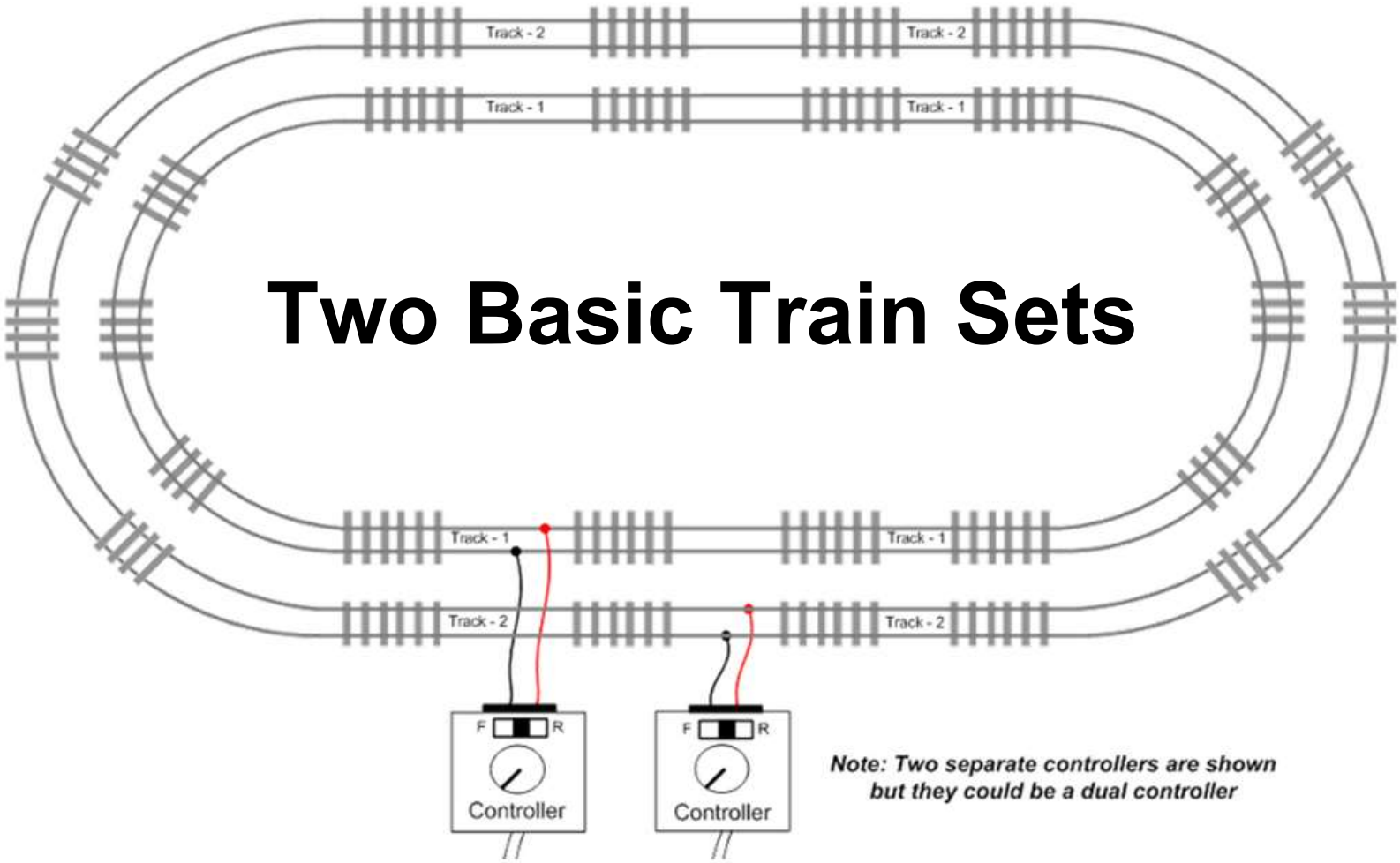
The Basic Train Set

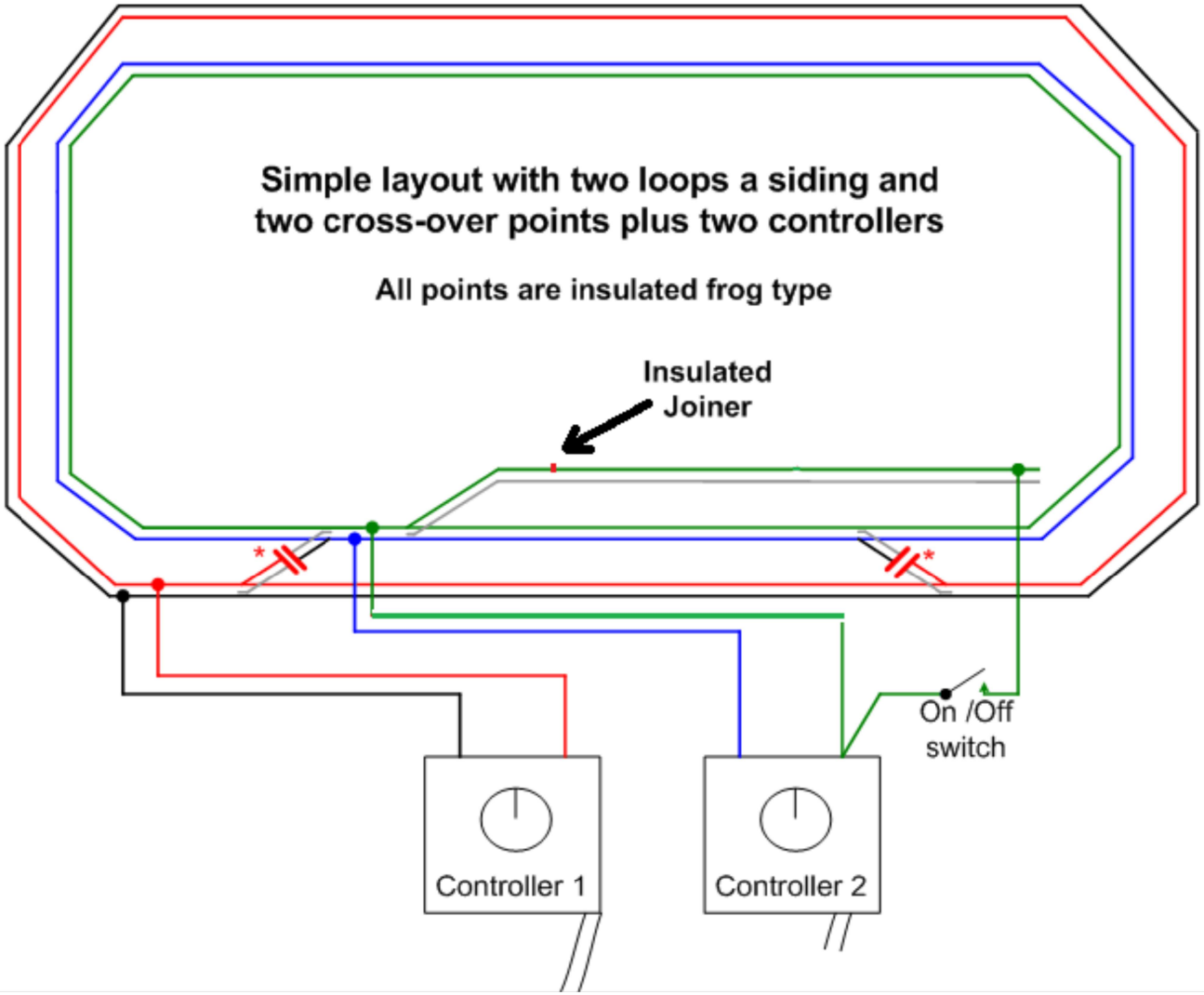


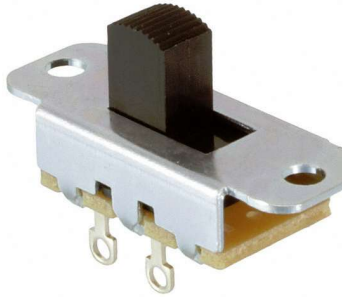
The Basic Train Set



Two Basic Train Sets




Simple layout with two loops a siding and
two cross-over points plus two controllers
All points are insulated frog type
Insulated
Joiner
*
*
On /Off
switch
Controller 1
Controller 2



Single Pole Single Throw
SPST

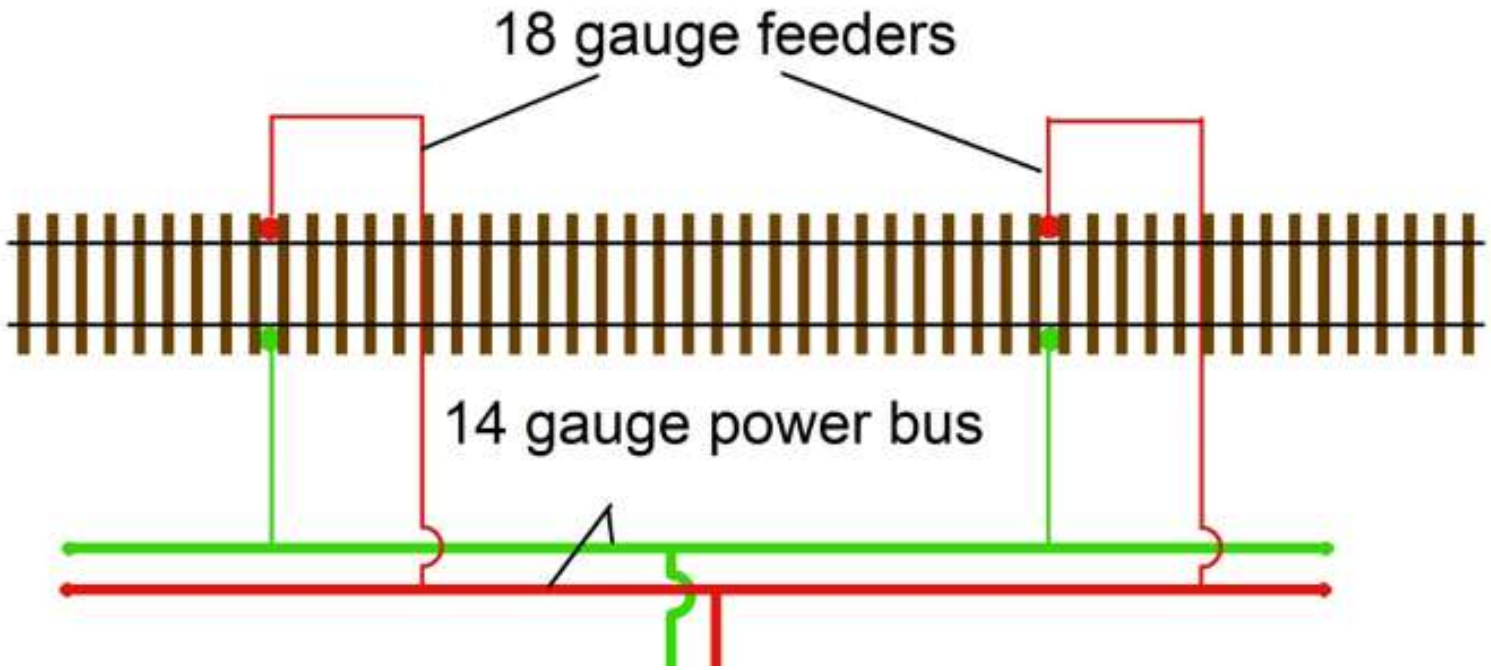
On/Off Switches

Atlas #215 4 Block Switch

Four DTSP Switches w/Center Off

Select Between 2 Power Packs

HO Scale Common Wire Sizes

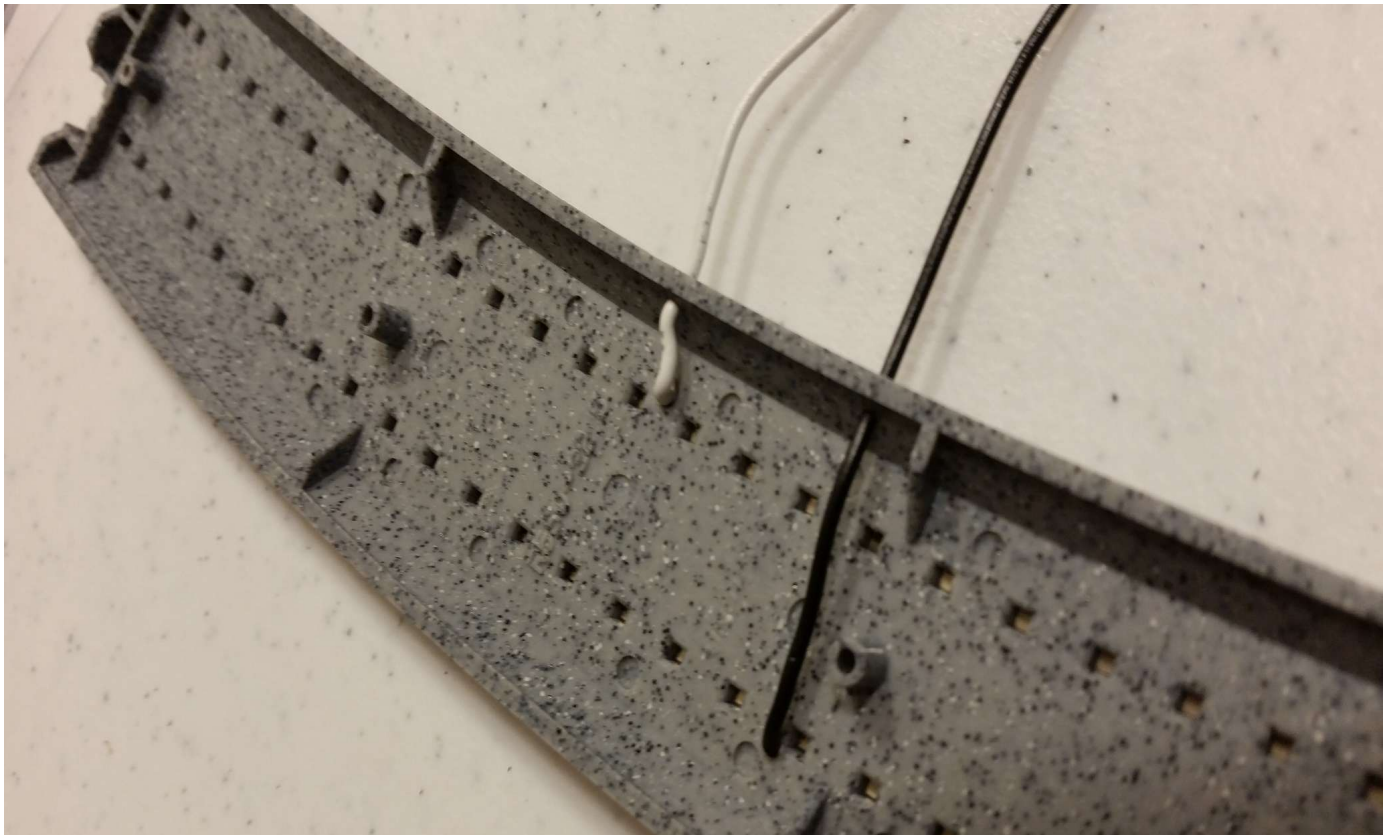


N Scale Can Use Smaller Sizes

Piko Pre-wired Joiner

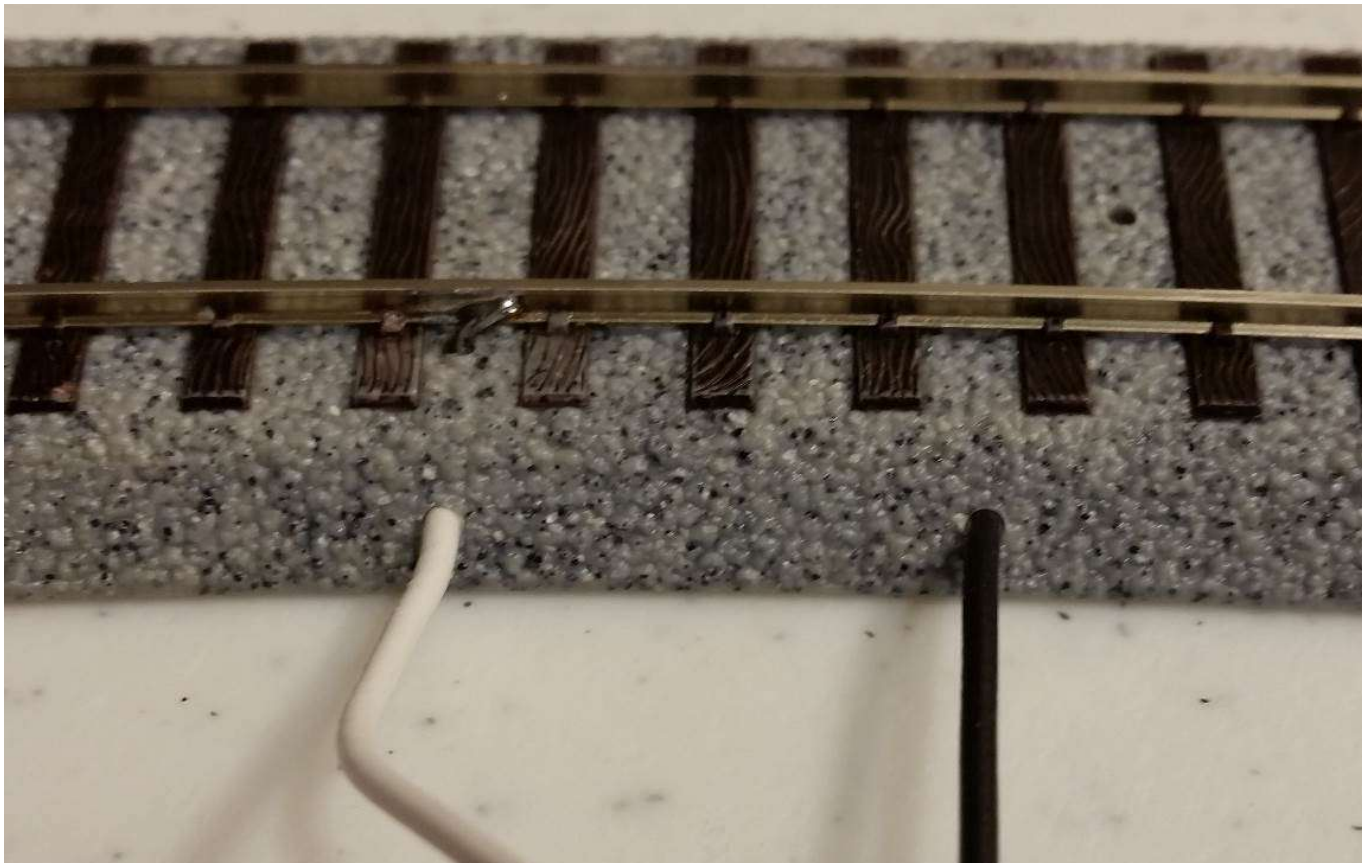
Atlas Pre-wired Joiner

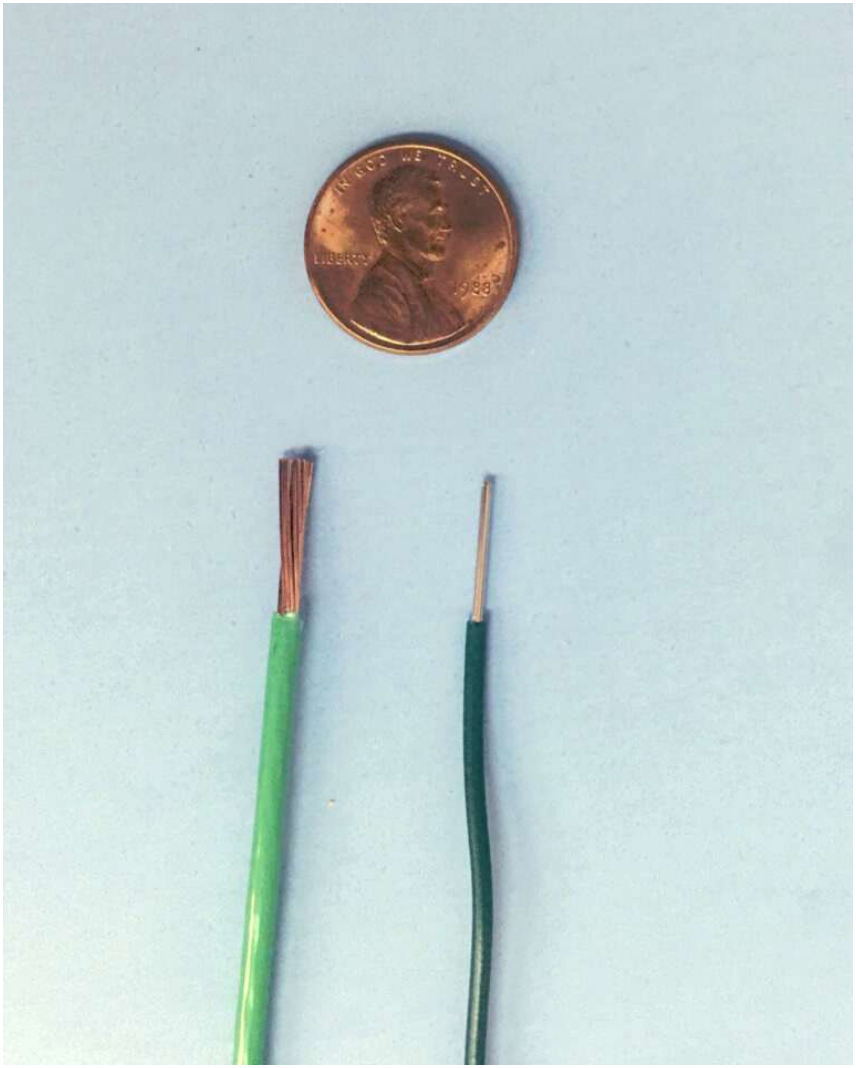
Kato Unitrack Joiner Remover Tool & Pre-wired Joiner

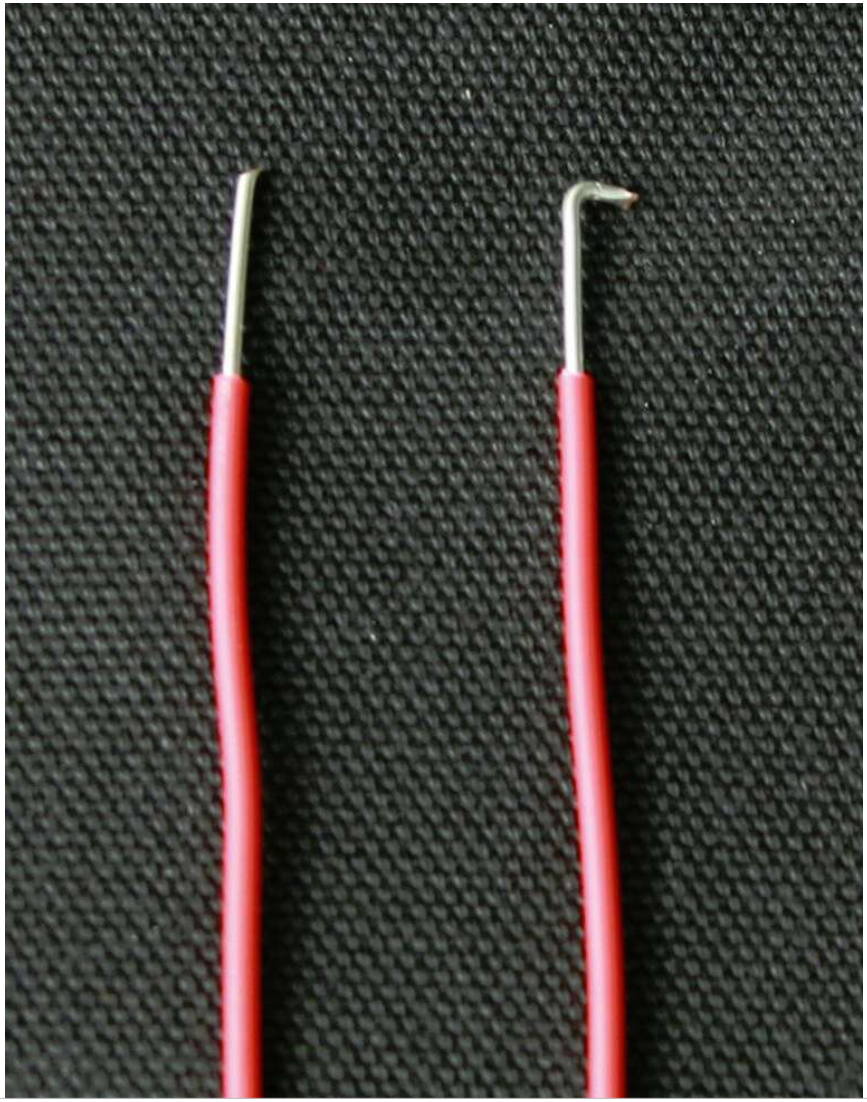


Kato Unitrack Underside
w/Solid Wire to Layout Surface

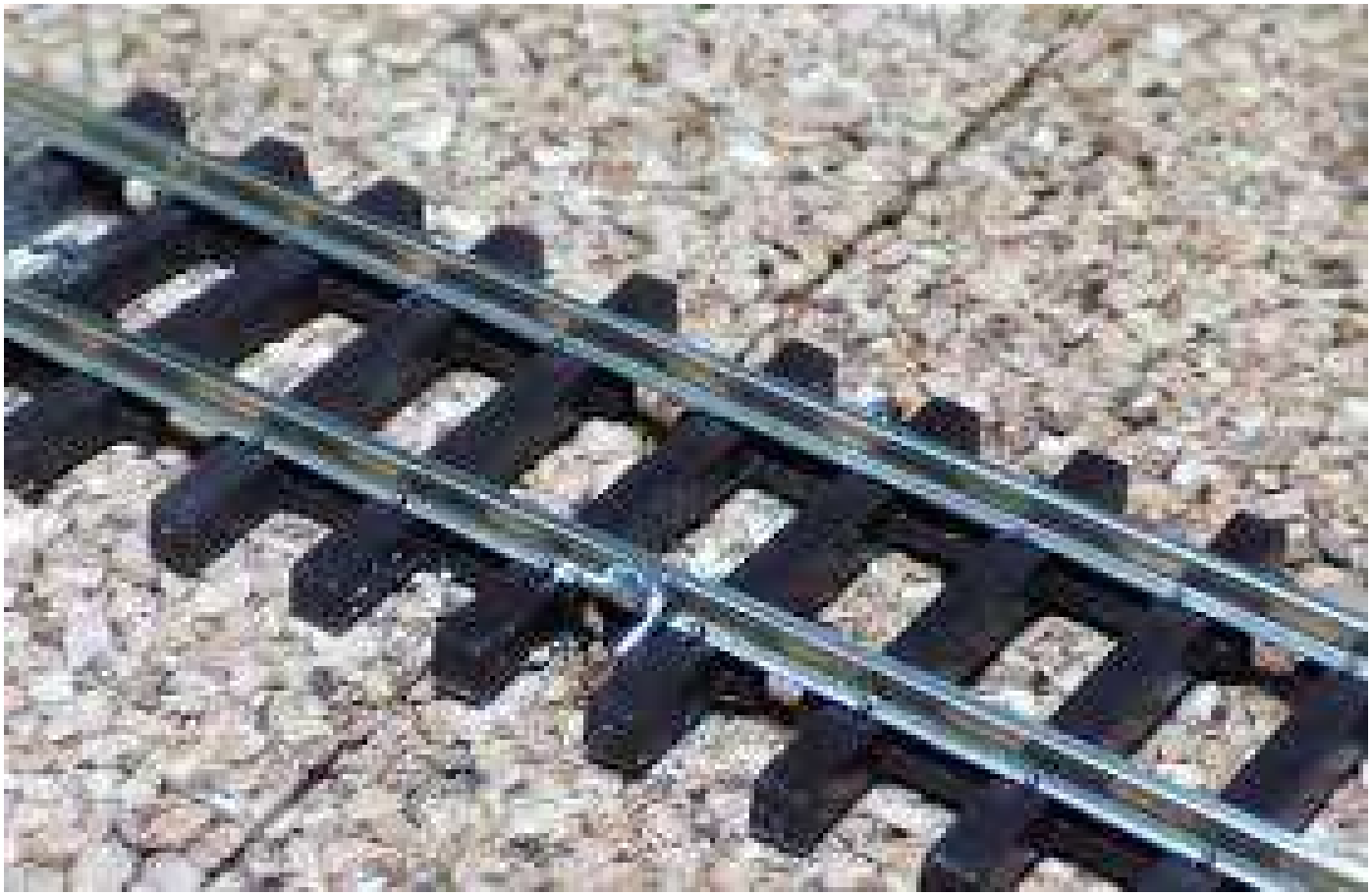
Kato Unitrack w/Soldered Solid Wire to Rail Outer Rib



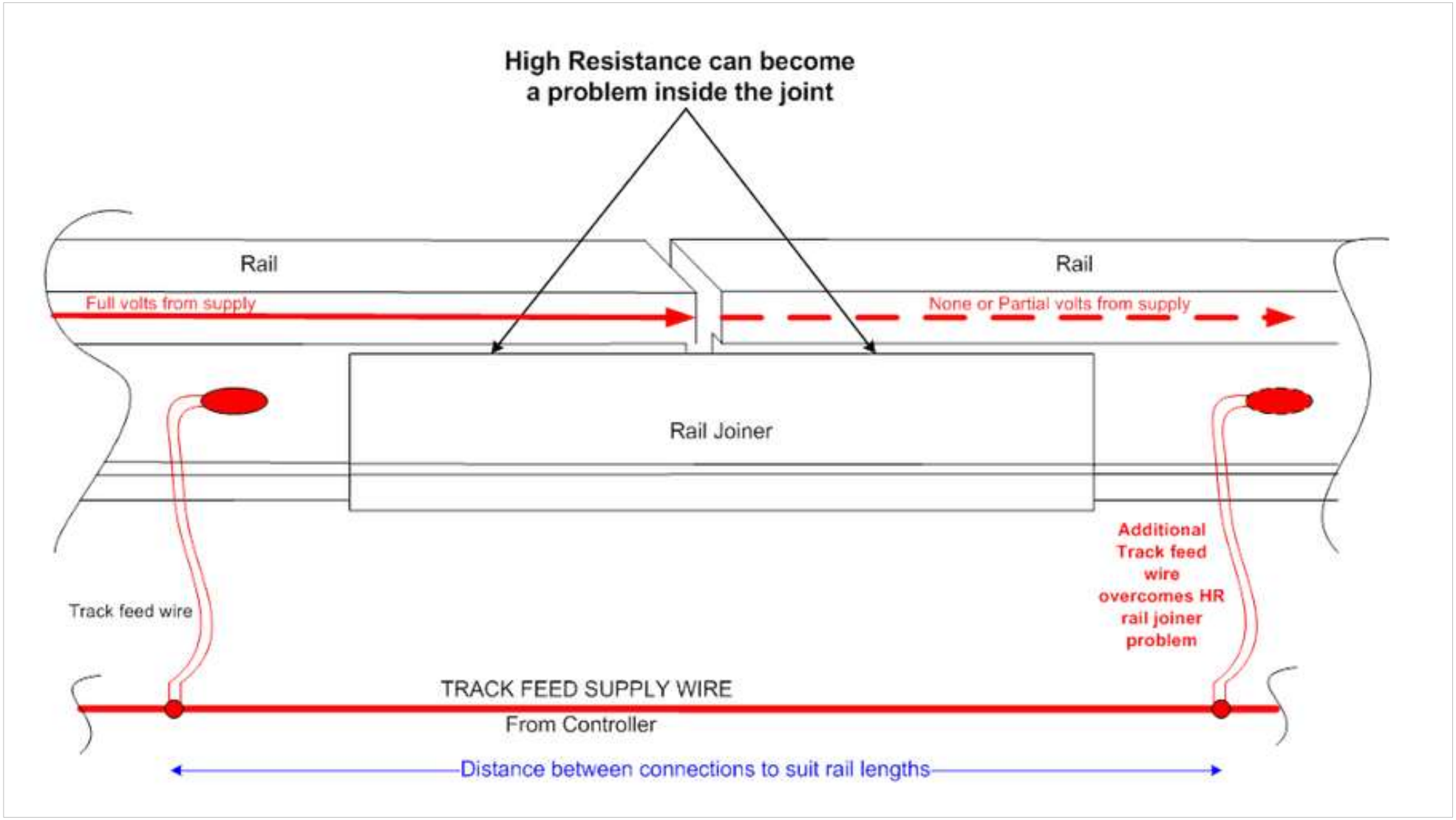

IN GOD WE TRUST
LIBERTY
1988

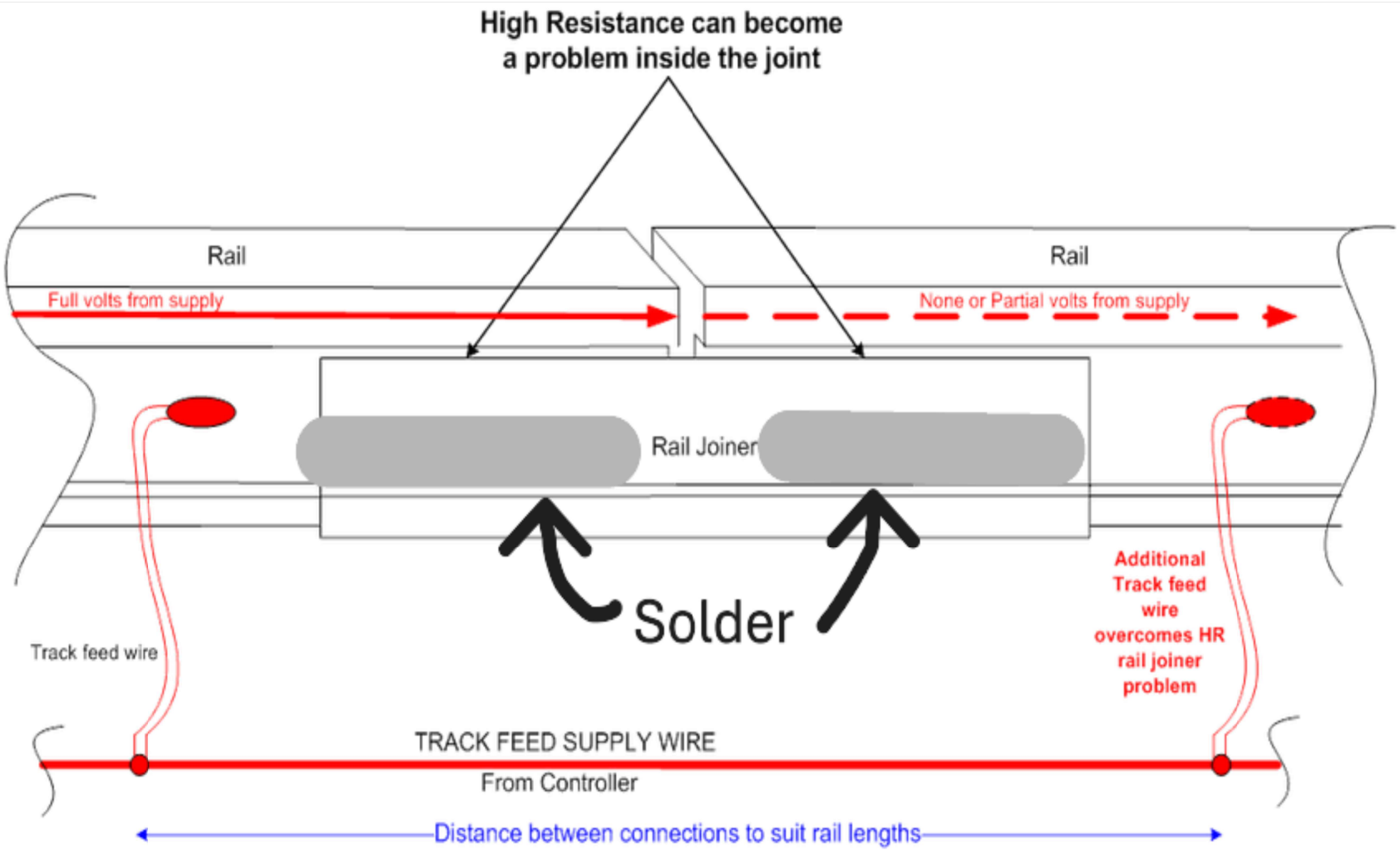


Preparing to Solder Solid Wire to Rail Outer Rib



Soldered Solid Wire to Rail Outer Rib


High Resistance can become
a problem inside the joint
Rail
Rail
Full volts from supply
None or Partial volts from supply
Rail Joiner
Track feed wire
Additional
Track feed
wire
overcomes HR
rail joiner
problem
TRACK FEED SUPPLY WIRE
From Controller
Distance between connections to suit rail lengths


High Resistance can become
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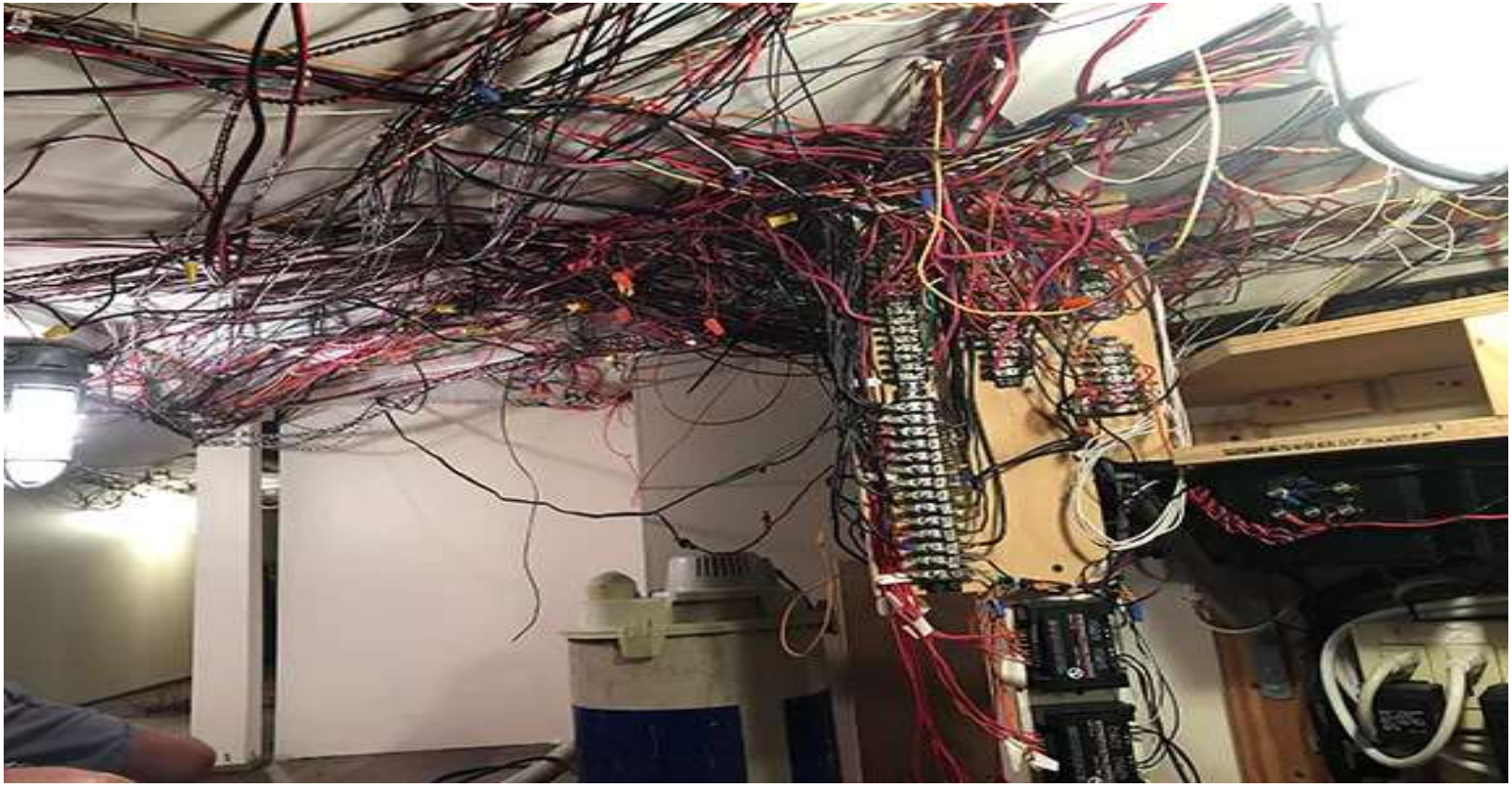
Rail
Rail
Full volts from supply
None or Partial volts from supply
Rail Joiner
Solder
Track feed wire
Additional
Track feed
wire
overcomes HR
rail joiner
problem
TRACK FEED SUPPLY WIRE
From Controller
Distance between connections to suit rail lengths

Simple wire connection methods

OFC Wire vs Copper plated Aluminum or Steel

Look at bulk spools to help control costs



Track Plans are easier than Wiring Plans. And layouts tend to evolve—expect changes as you go and document everything as you plan for the future

Surge protector recommended, stay on single outlet if possible (assures all 120 volt is the same phase)

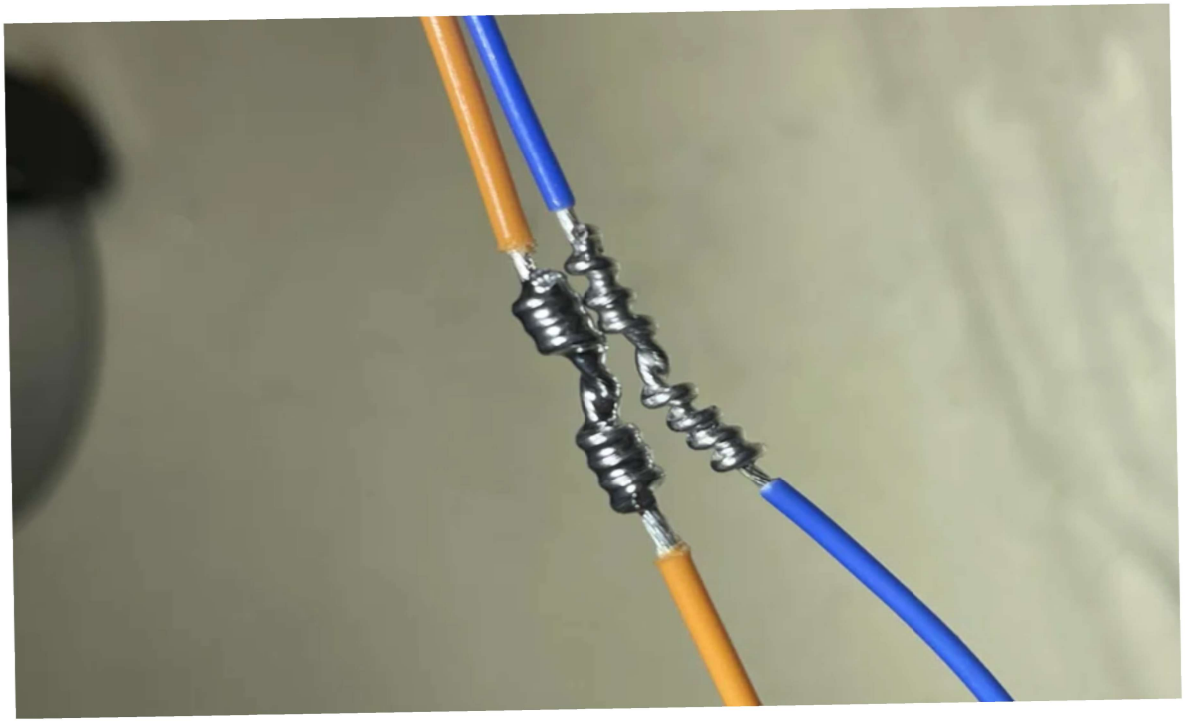
Many Circuits to Expect

Track power, full-time & switched accessory DC wiring (recommend 15 volt bus with buck converters), DCC programming provisions, switchable under table lighting, signals, crossings, telemetry wiring (example loconet, Ethernet, WiFi) 120 volt AC for wall warts power tools vacs etc. And all the switches that these will need.

DCC Floating (Reference) Ground as a separate wire. Do NOT connect to house ground.

More important as layout grows when adding devices that need that reference ground. Loconet carries two reference grounds

Keep track connections staggered to avoid have to insulate between them - See Next Slide



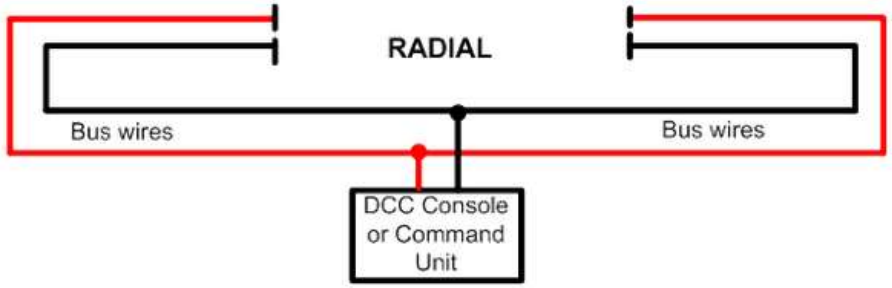
Simple soldered wire connection

If planning occupancy detectors do it as you do the wiring—it impacts the drops. Leave long service loops on drops if nothing else

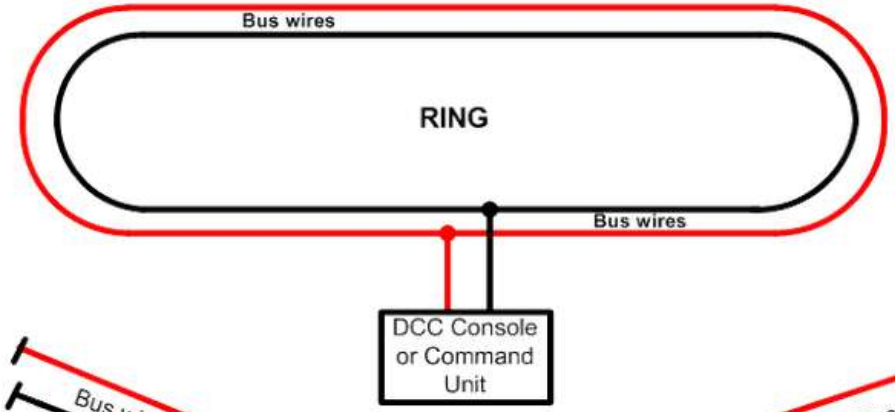
Tools/supplies: strippers, volt meters, drills, soldering equipment & supplies, needle nose pliers, notebook, markers, wire markers, wire hangers , stapler, heat shrink tubing

Power manage all frogs and/or Keep a-lives

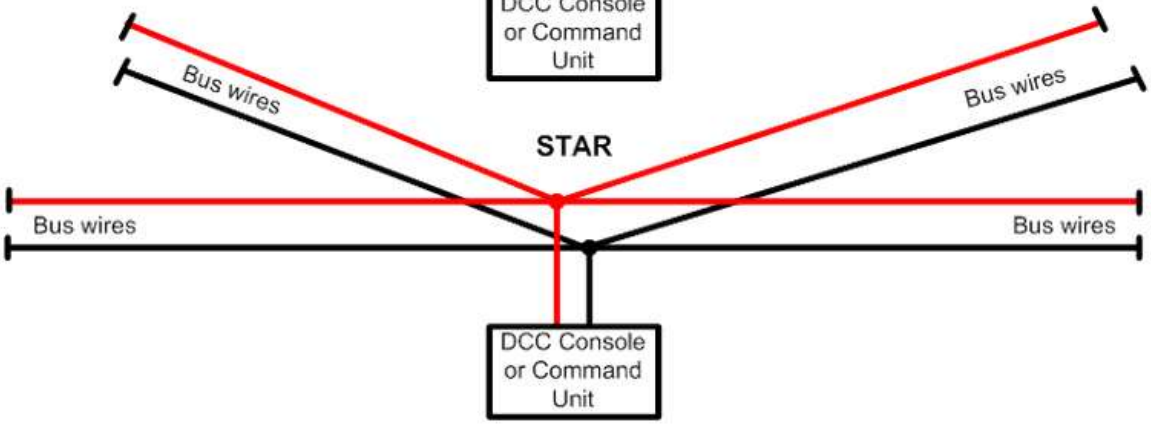
YES


RADIAL
Bus wires
Bus wires
DCC Console or Command Unit

NO

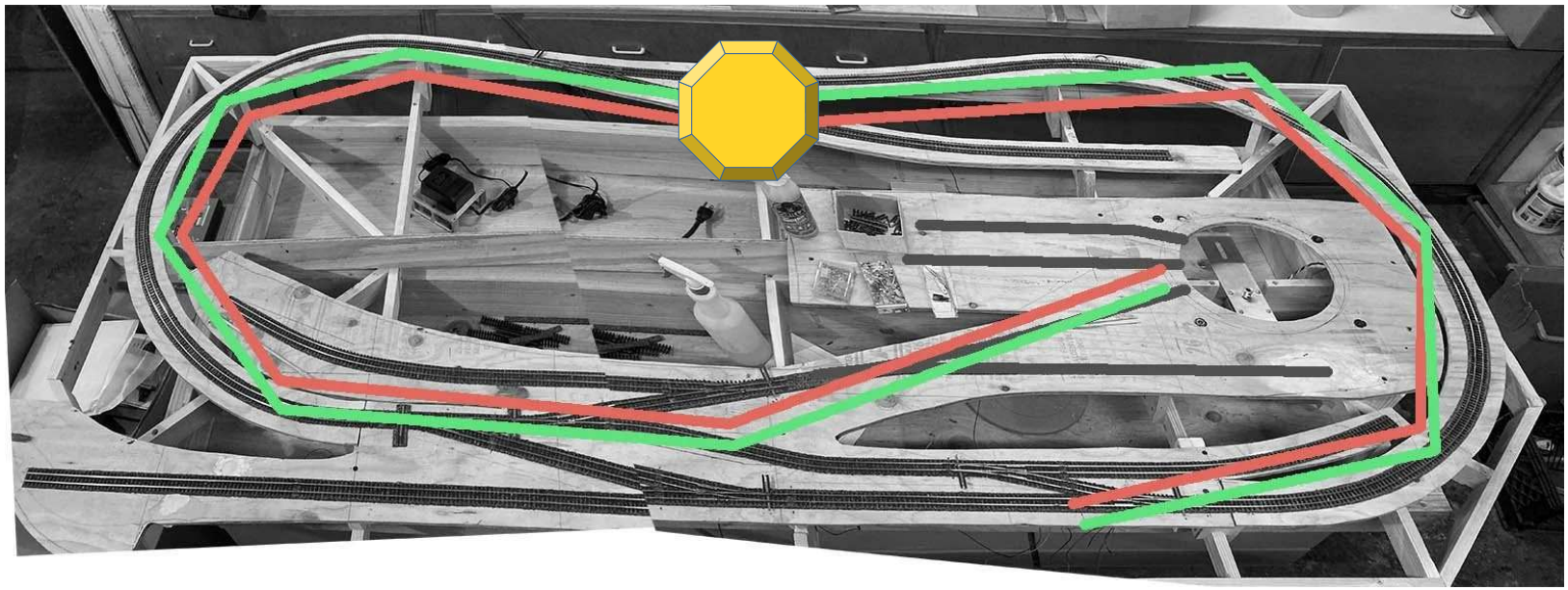

Bus wires
RING
Bus wires
DCC Console or Command Unit

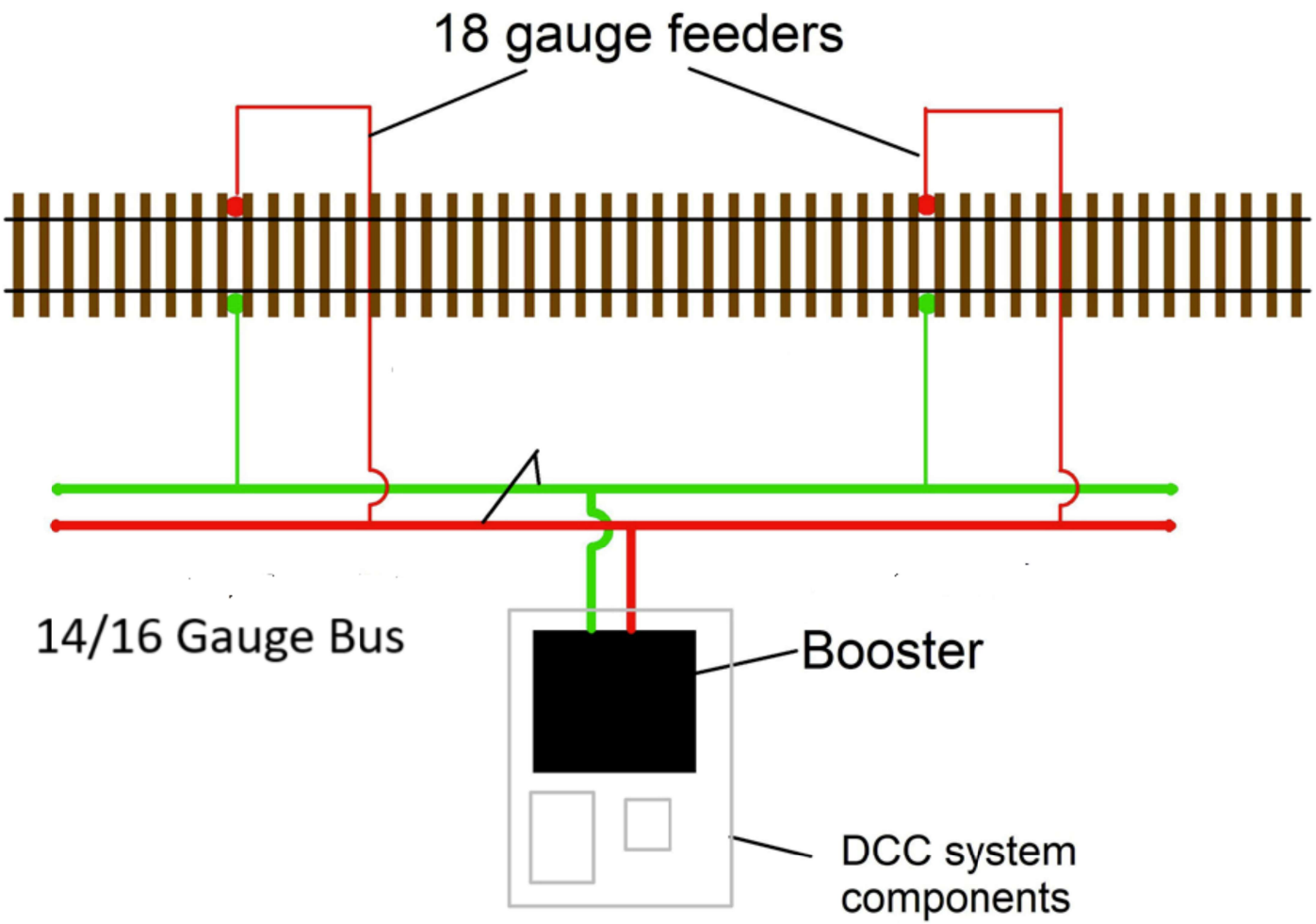
YES

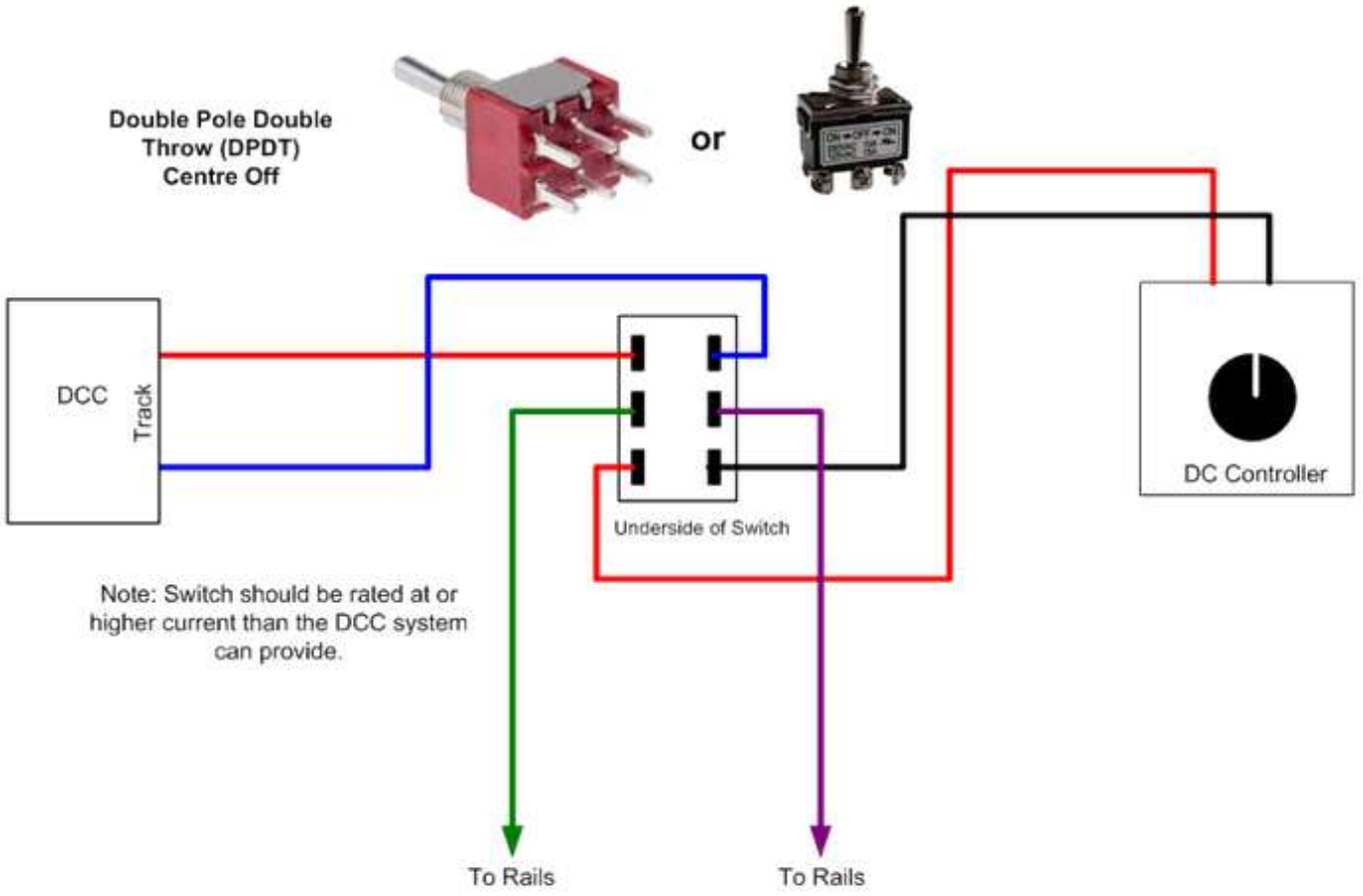

Bus wires
Bus wires
STAR
Bus wires
Bus wires
DCC Console or Command Unit

16 gauge wire is plenty big enough for a track buss on your layout, Keep in mind that track bus should not circle around and be connected to the start, they are an open ended bus. Essentially one bus from the controller goes off to the right and one goes off to the left and they do not meet and connect together!

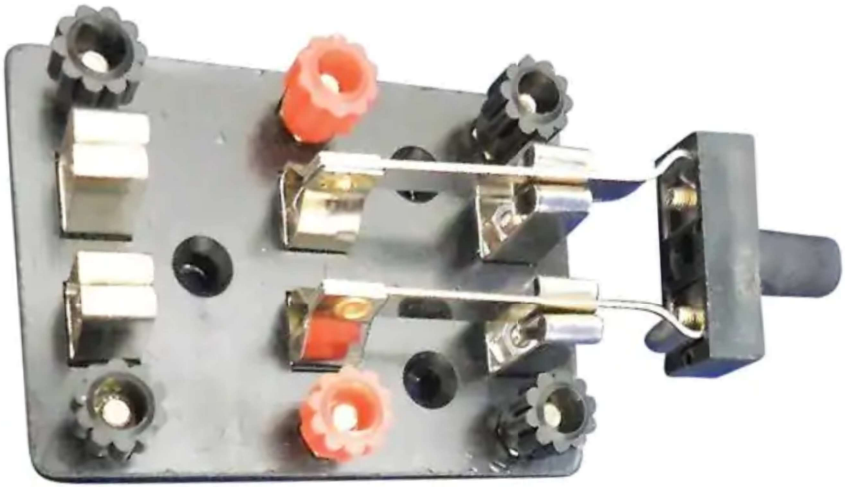
So the bus is probably half the length your thinking.




18 gauge feeders
14/16 Gauge Bus
Booster
DCC system components

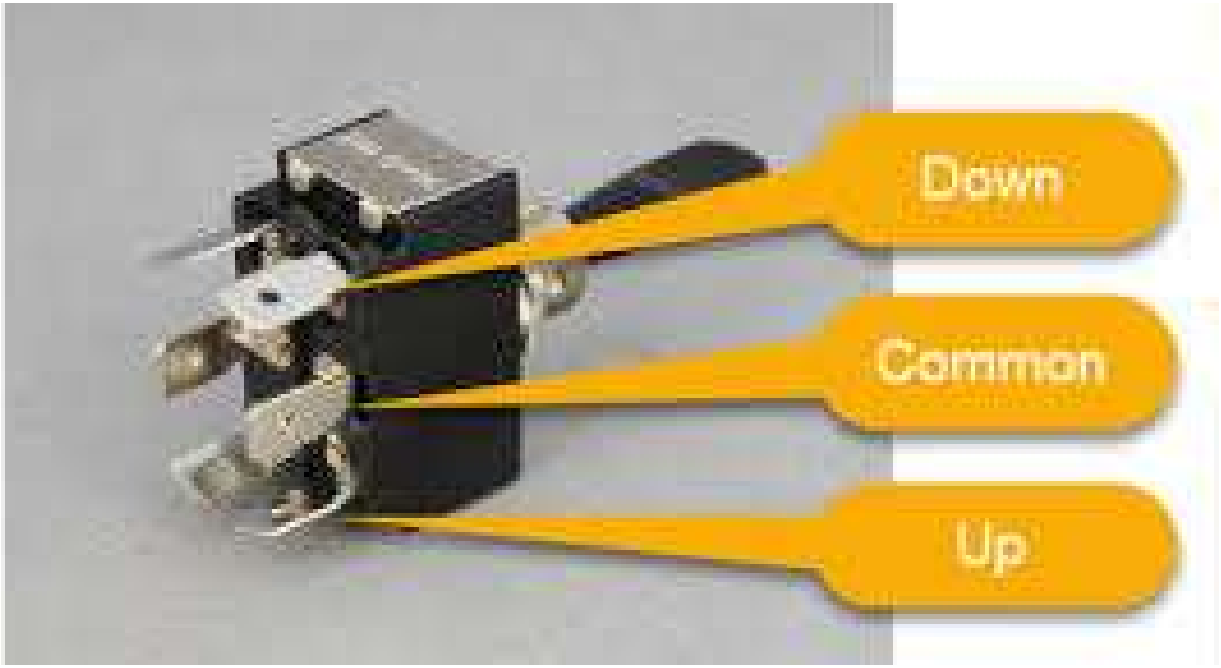

Double Pole Double
Throw (DPDT)
Centre Off
or
DCC
Track
Underside of Switch
DC Controller
Note: Switch should be rated at or
higher current than the DCC system
can provide.
To Rails
To Rails

Double Pole Double Throw DT/DT Knife Switch



Double Pole Double Throw
On/Off/On Switch

DPDT



Do you experience the following?

Loss of train control.

Runaway locomotive.

Loss of decoder programming Features/Address

Decoders “blowing up” Needing Reset

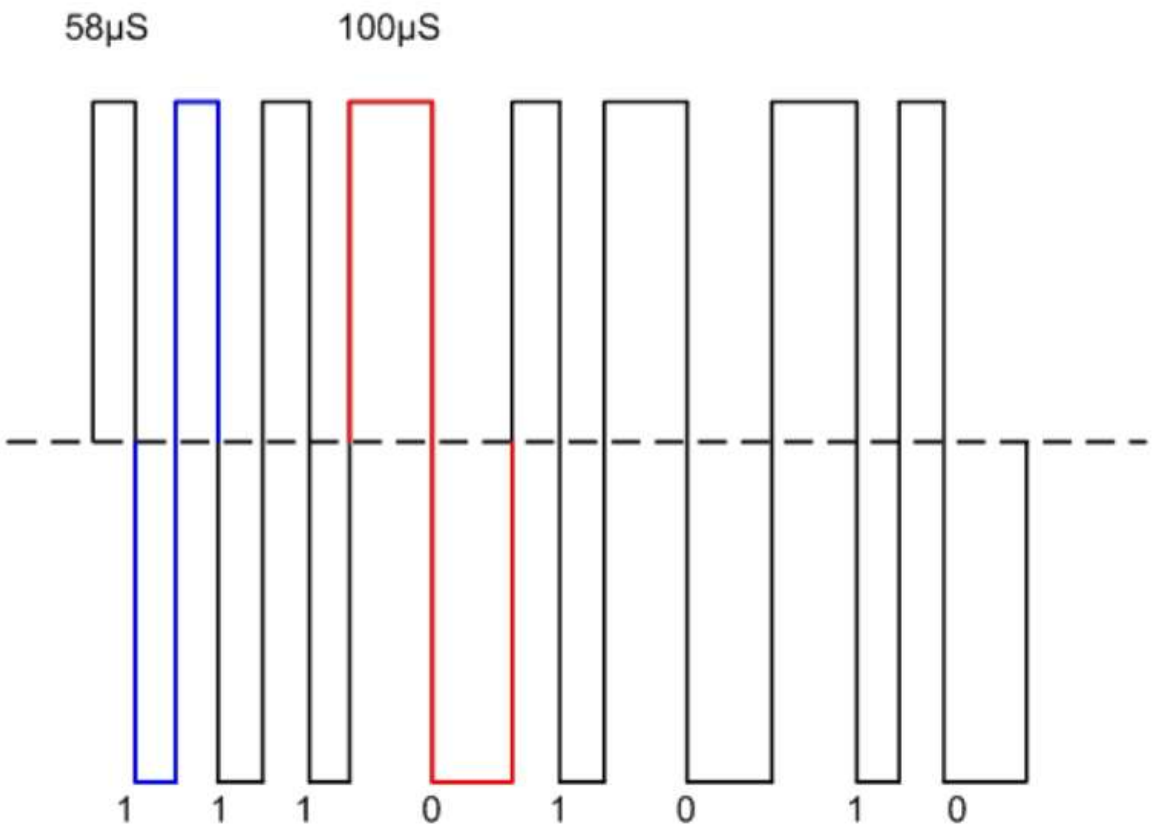
INDICATIONS YOU MAY NEED A RC FILTER

(aka SNUBBER) ON THE TRACK BUS?

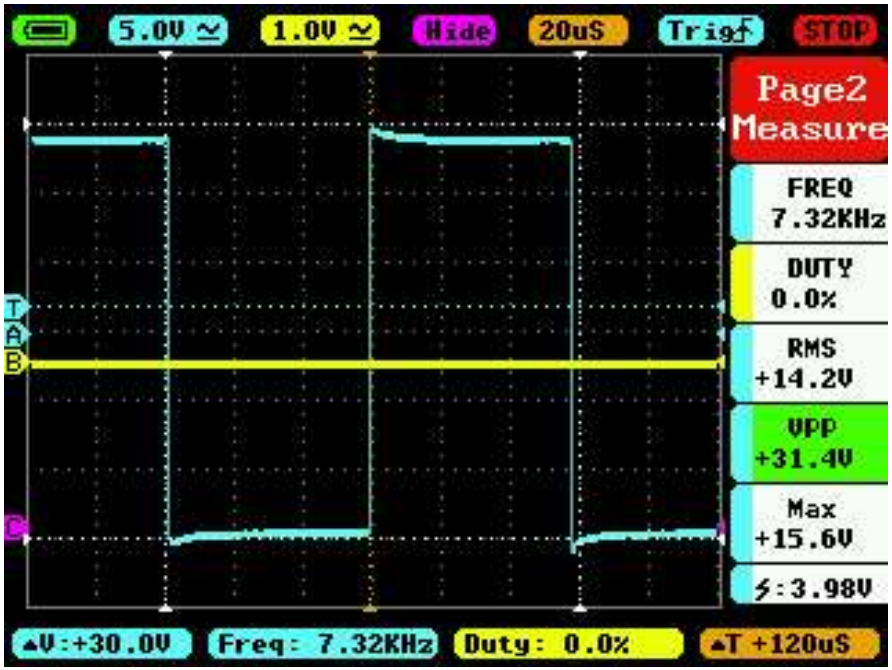
This is not a required item! You don't need them unless you have one of the problems listed.

However it is an inexpensive item to help avoid the problems listed above.

Typical example of a mid packet bit stream

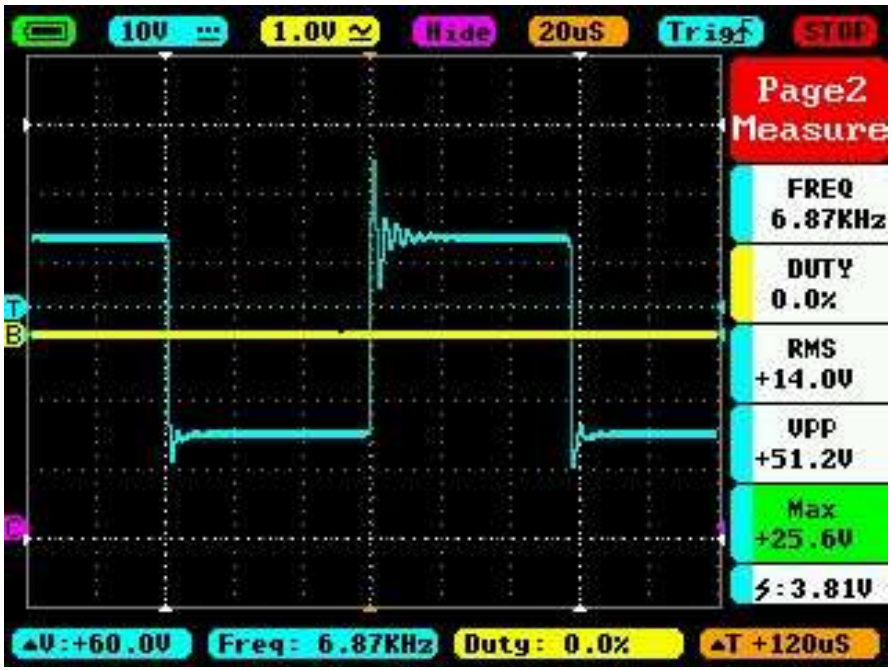


AT BOOSTER—NO TRACK CONNECTED

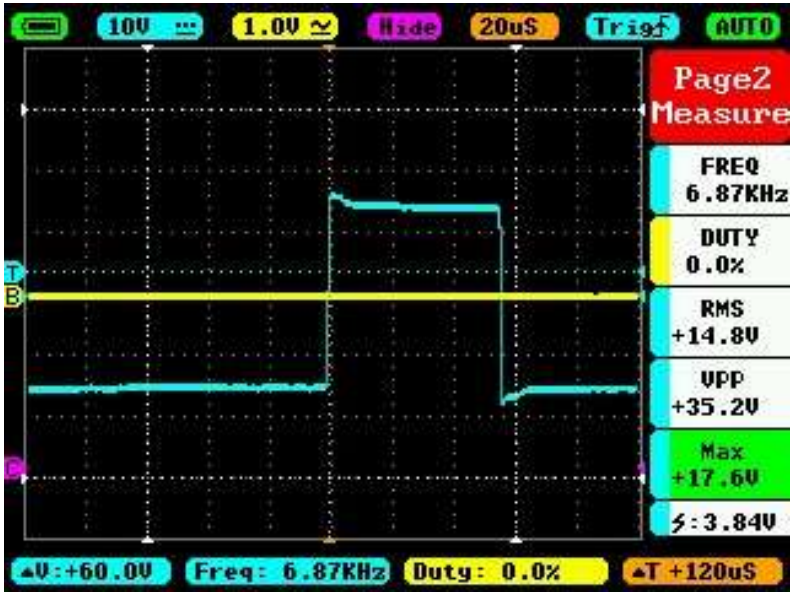


From MRH

AT BOOSTER
WITH EMPTY TRACK CONNECTED

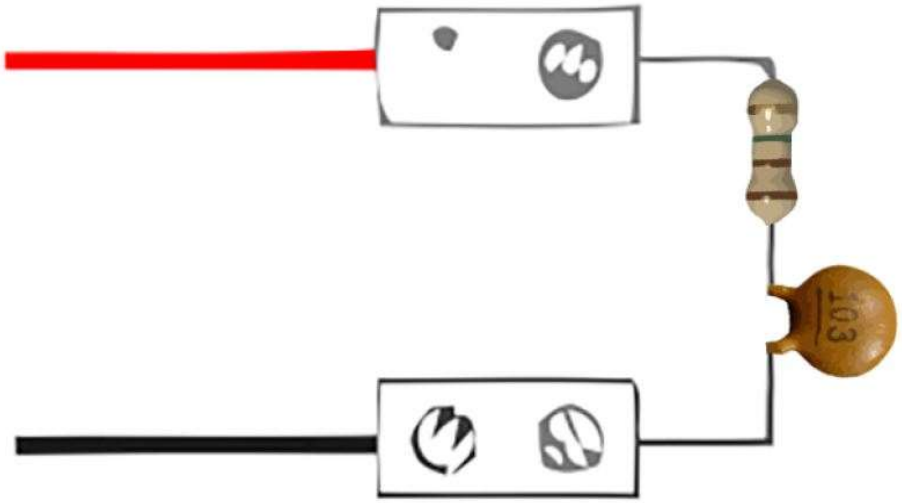


AT BOOSTER
EMPTY TRACK & SNUBBER CONNECTED



DCC Bus Terminator / Filter / Snubber Wiring

ScotRail
Strathpeffer Junction
strathpefferjunction.com



150Ω 2W Resistor

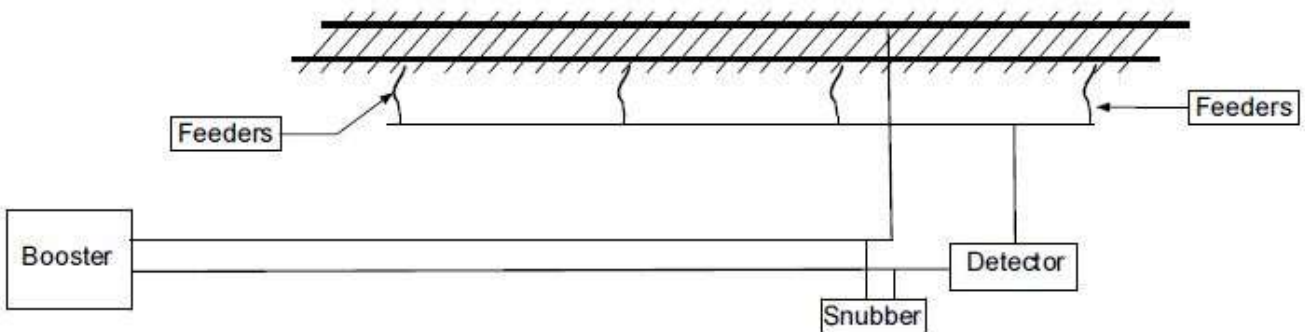
0.1µf Ceramic Capacitor

NB. The filter/snubber is not polarity-dependent.

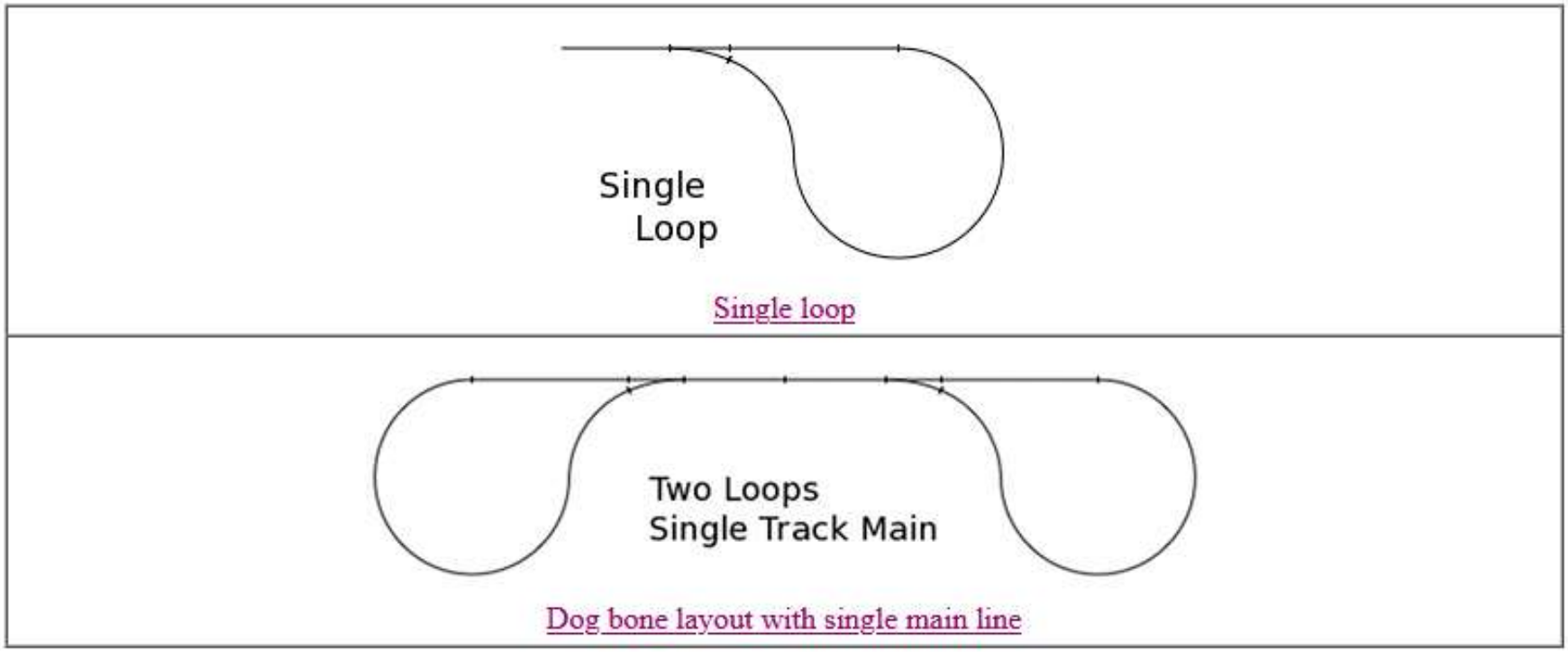
Installing snubbers:
Connect the snubber across the farthest end of the DCC bus run (from the booster) to the two screw terminals of the snubber. Do this for every booster/track bus you have. If the DCC bus has multiple branches in a "Y" configuration put a snubber at the end of each branch.

If you have high power boosters (8-10 Amps) or very long bus runs greater than 60 feet it is advisable to use two snubbers at the end of each bus.

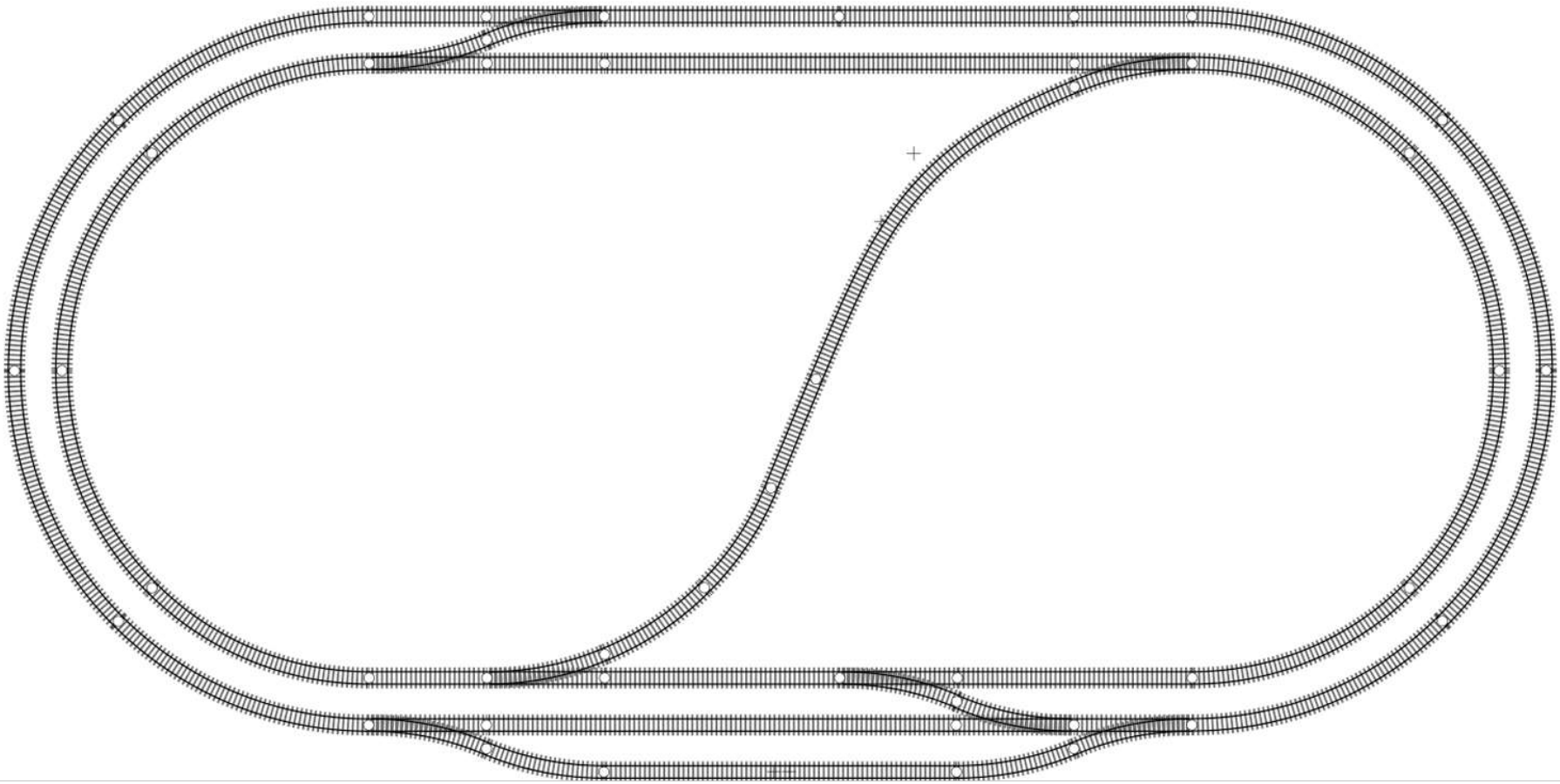
If you have current based block detectors:
Place the snubbers between the booster and the detector as close to the detector as feasible. See the diagram below:



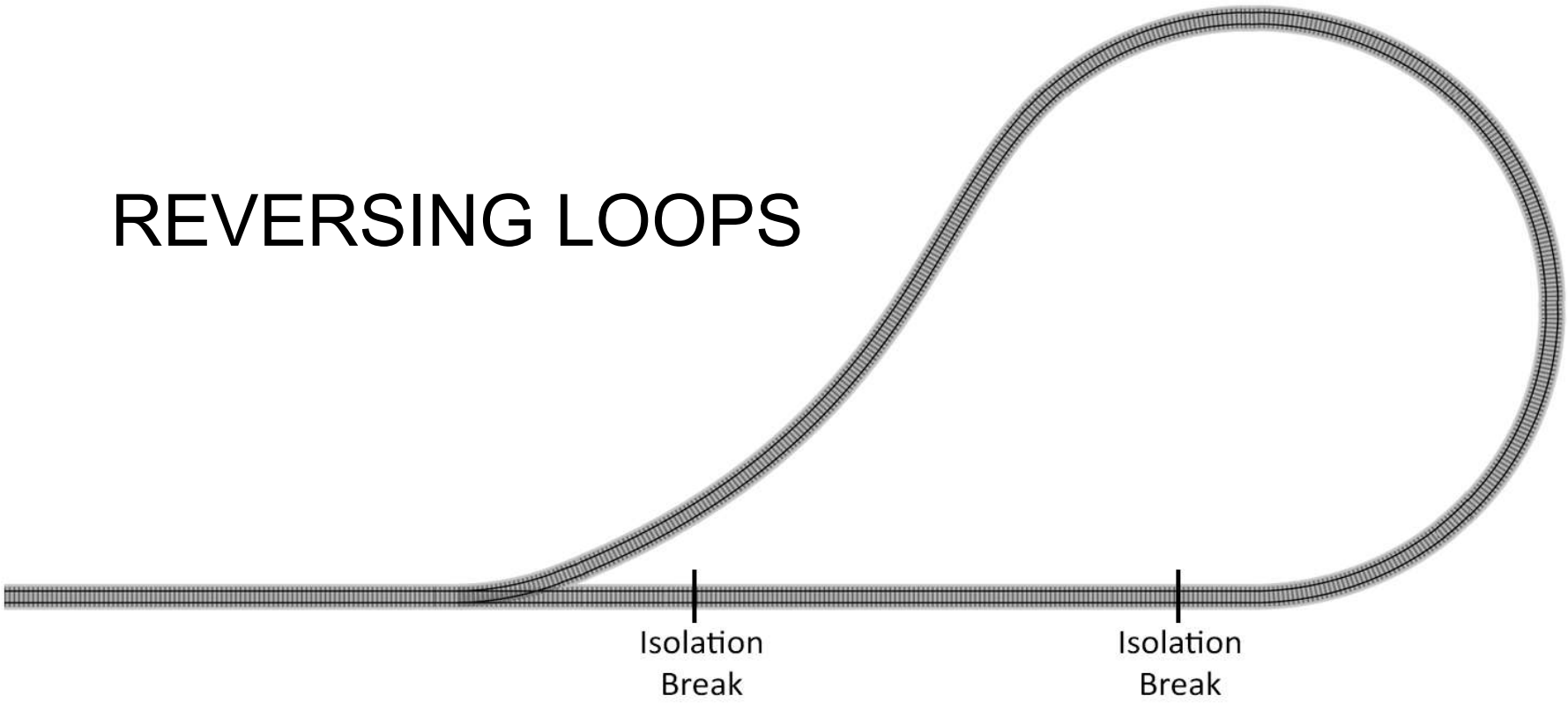
REVERSING LOOPS



REVERSING LOOPS

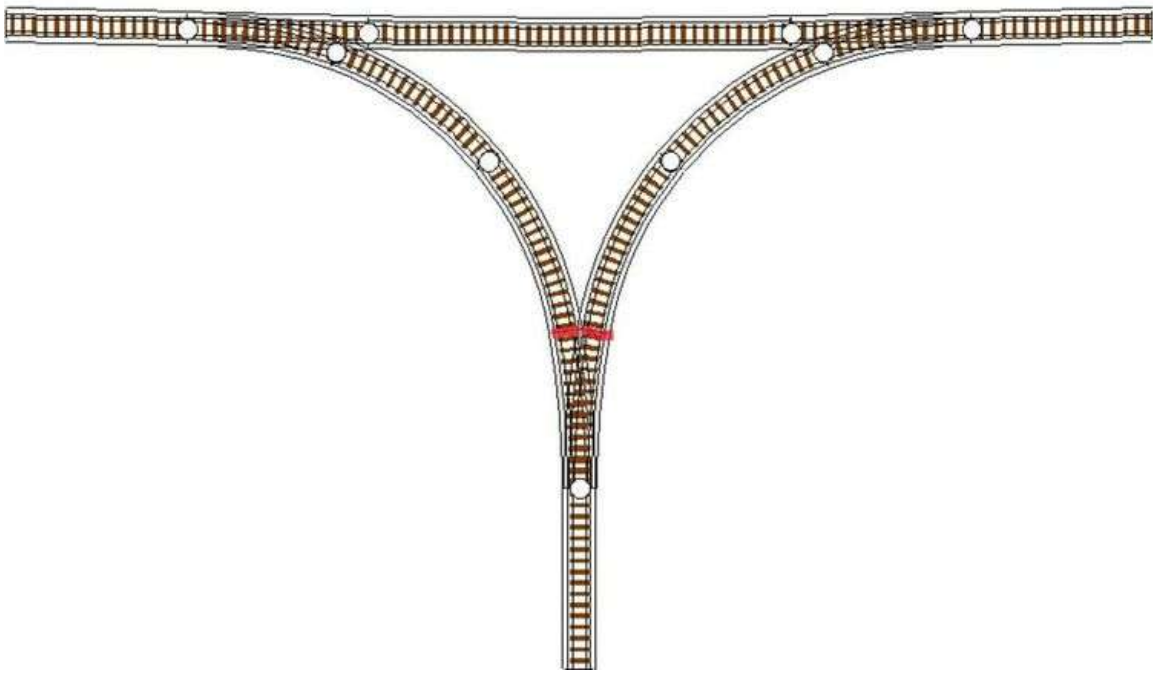


REVERSING LOOPS

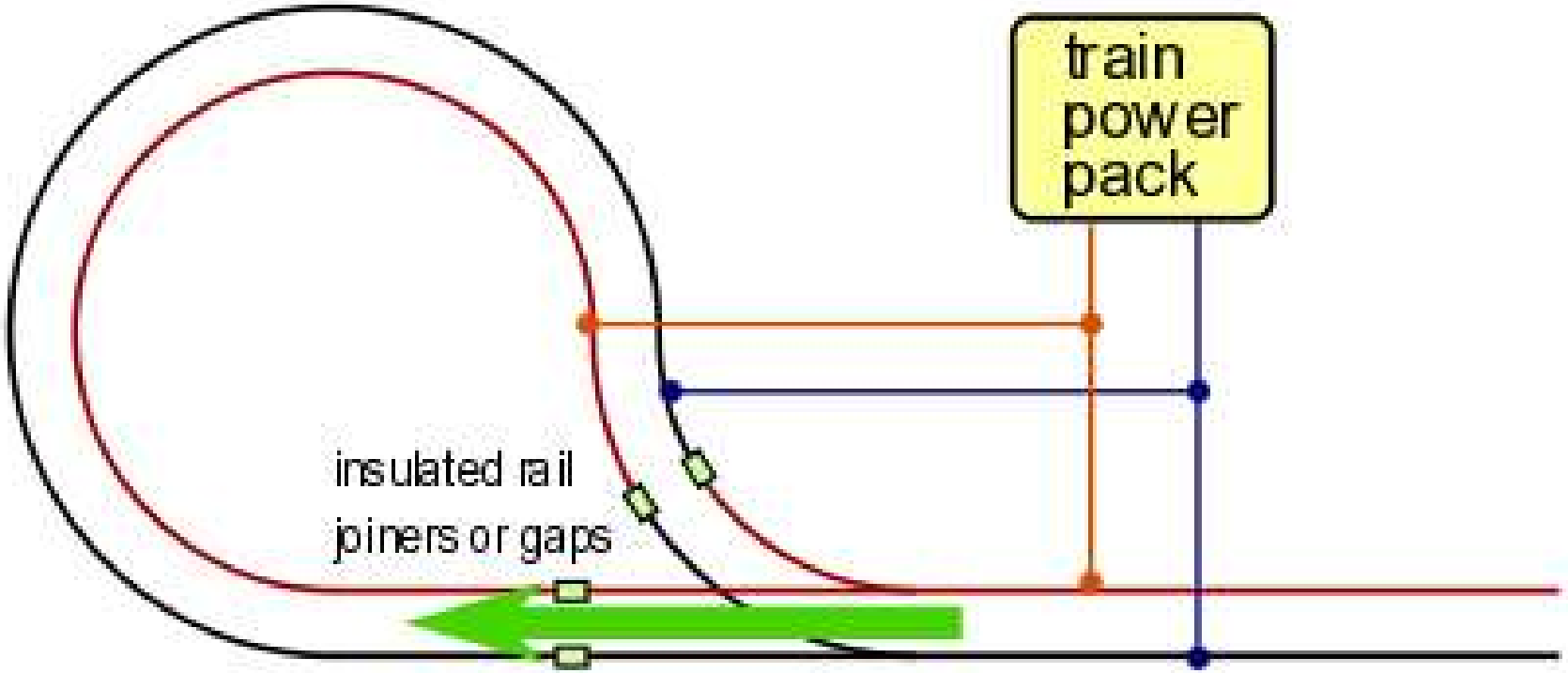


The distance between the two isolation breaks is slightly greater than the length of your longest locomotive or multiple unit.

REVERSING LOOPS

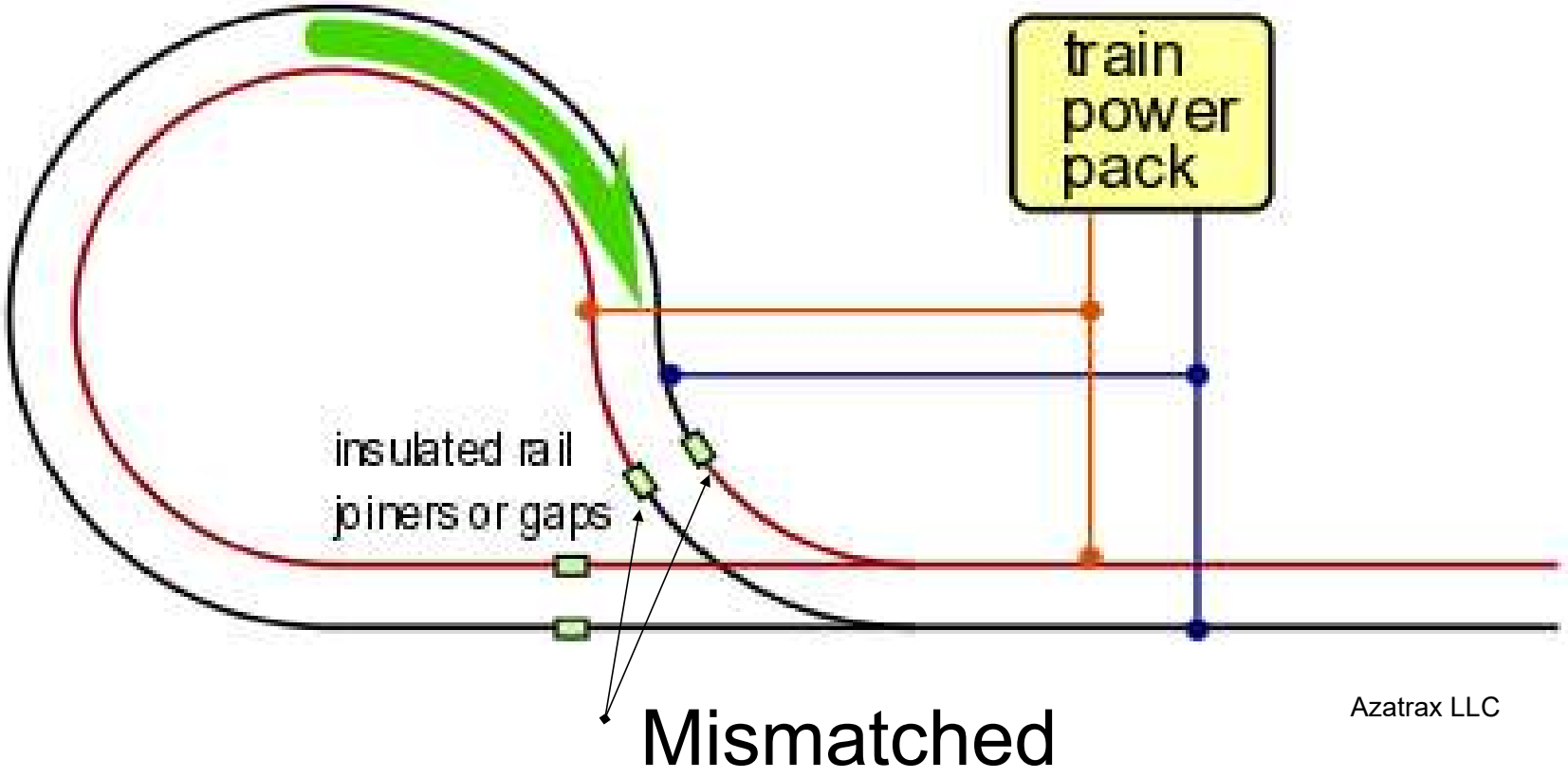


DC REVERSING LOOP



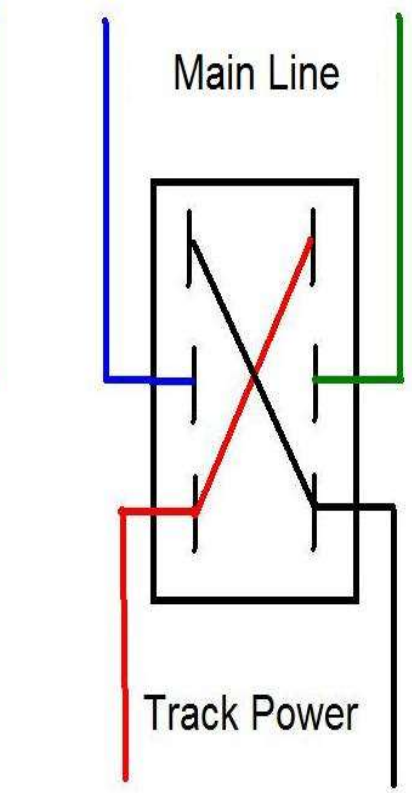
Azatrax LLC

DC REVERSING LOOP



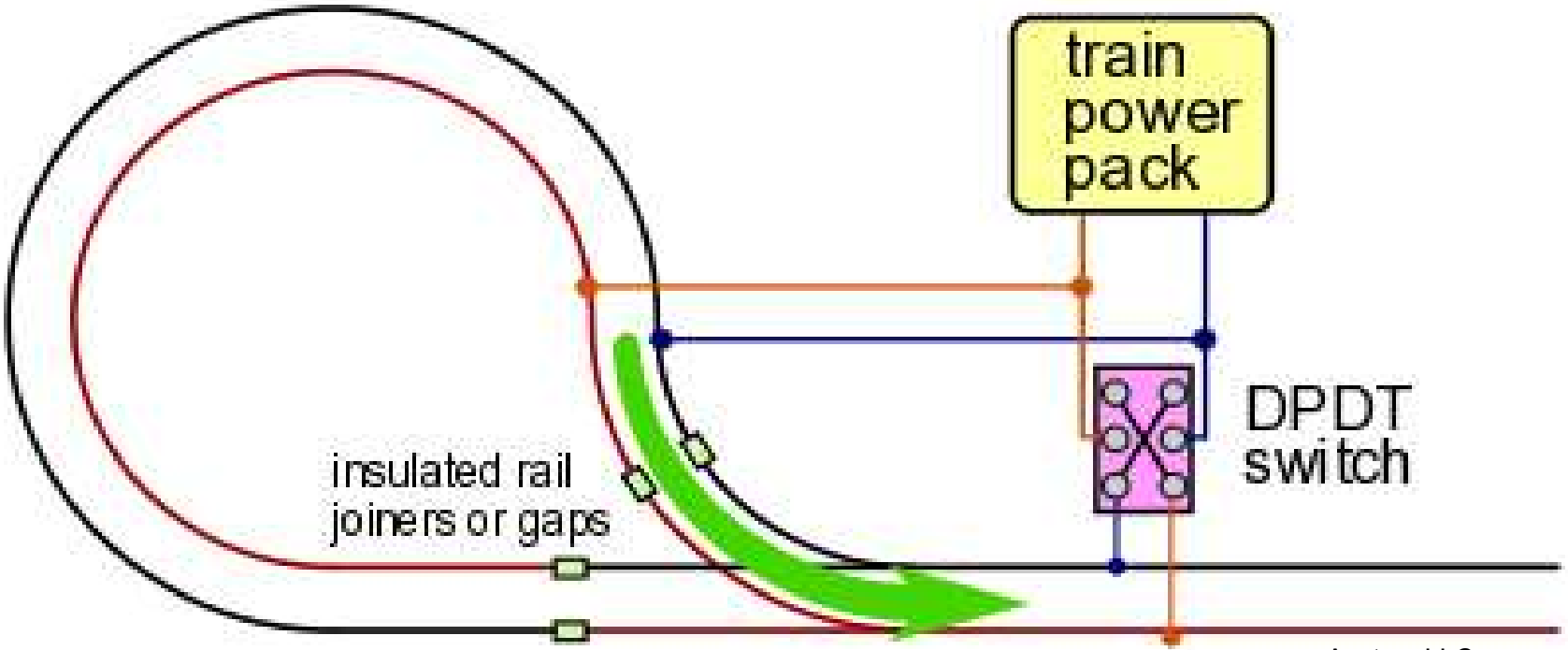
Azatrax LLC

DPDT



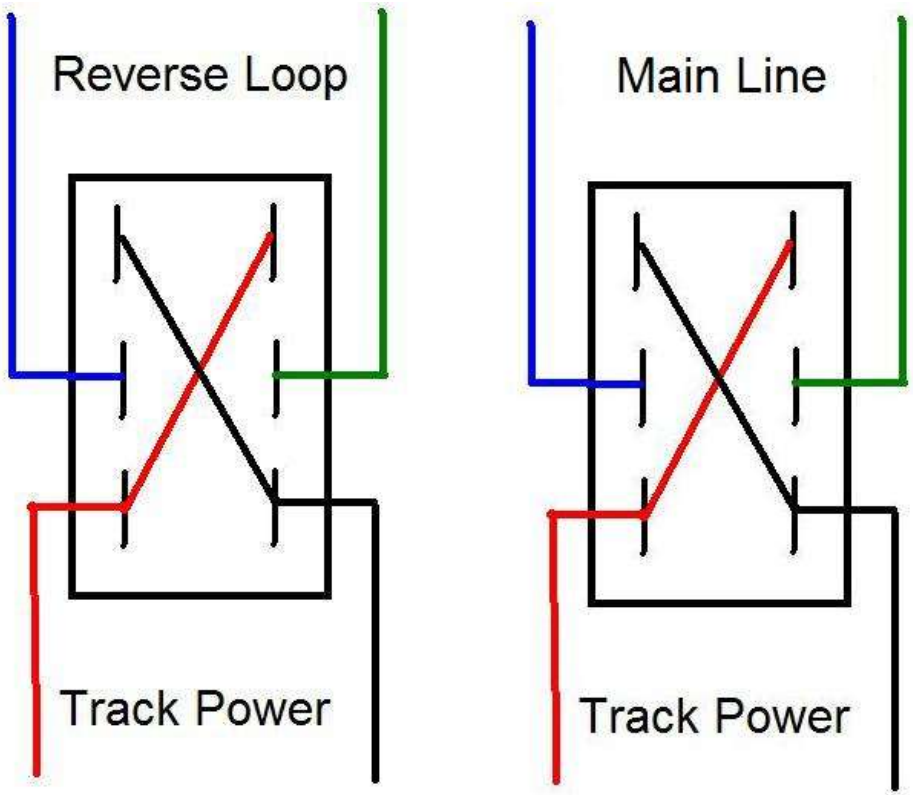
Wired to Reverse Polarity

DC REVERSING LOOP



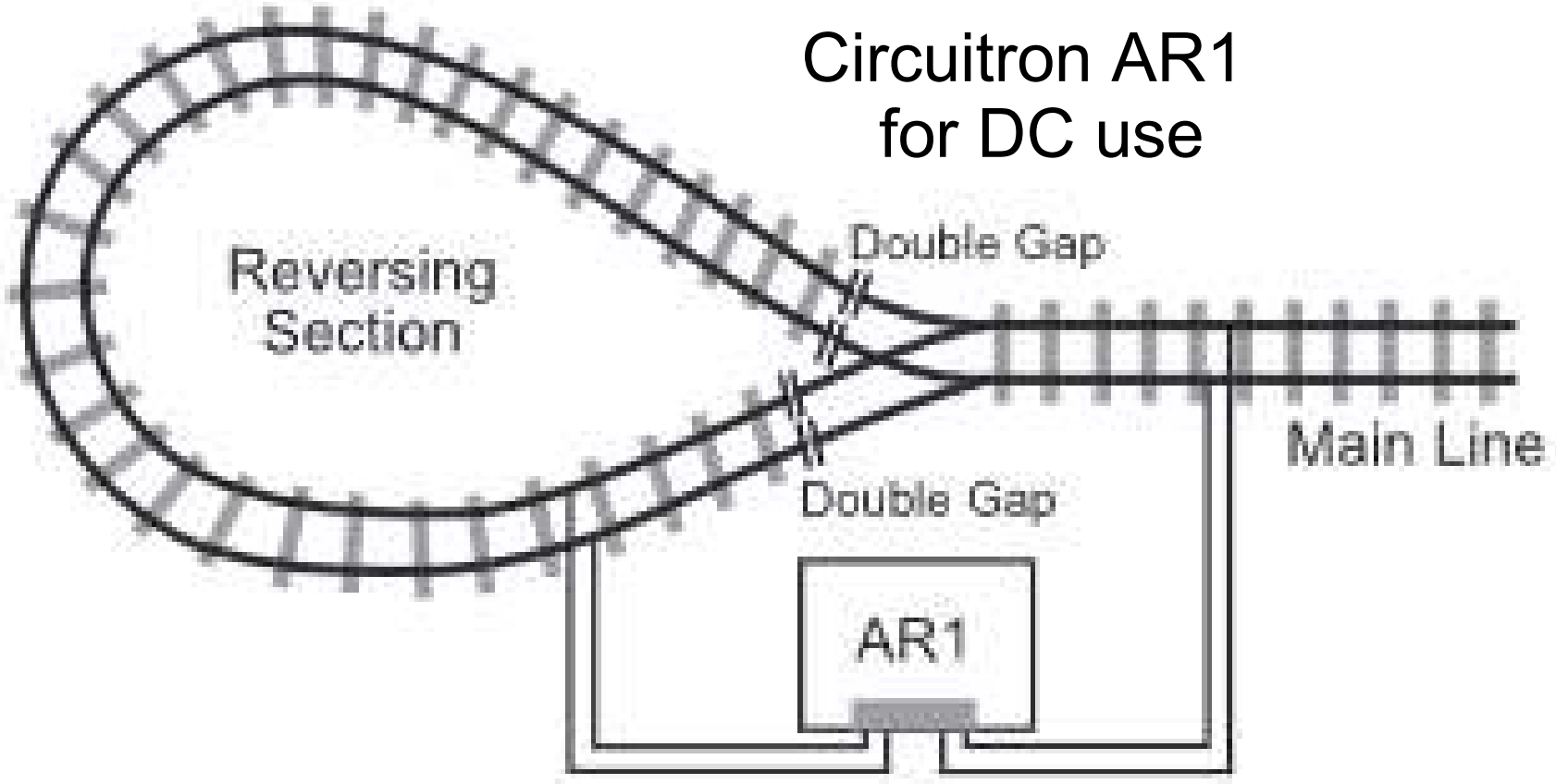
Azatrax LLC

DPDT

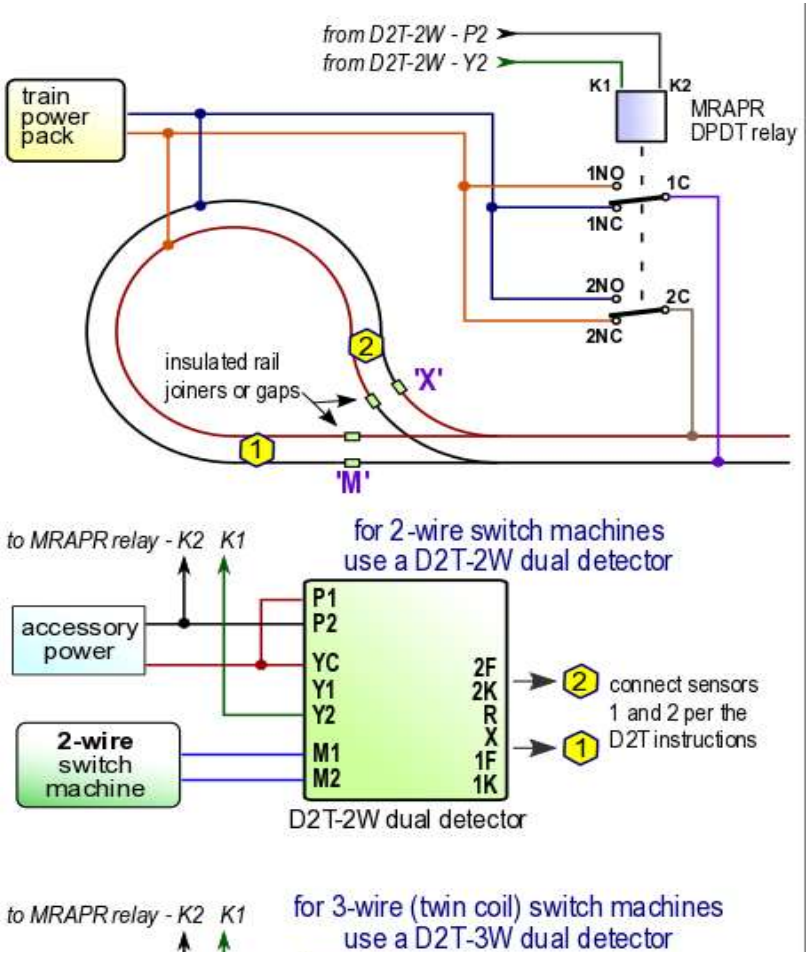


DPDT

Circuitron AR1 for DC use



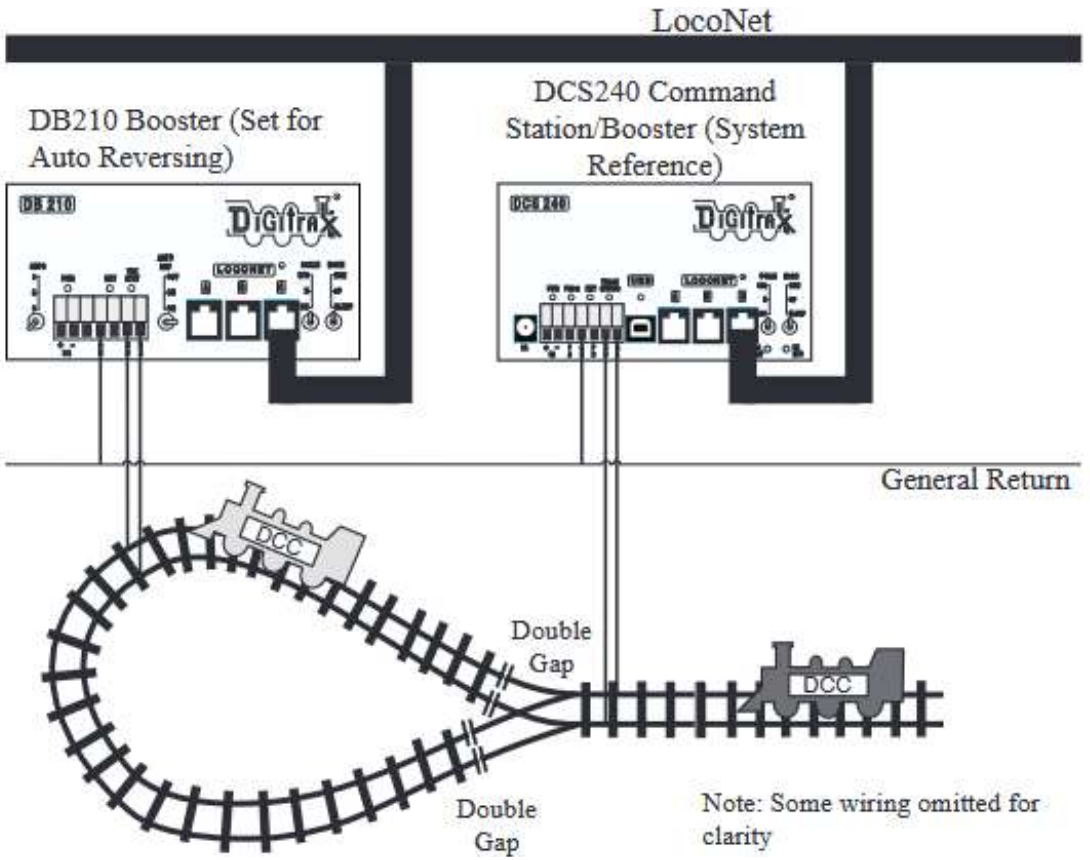
DCC REVERSING LOOPS



DCC Modules Detect the Mismatch & Flip Rail A & B

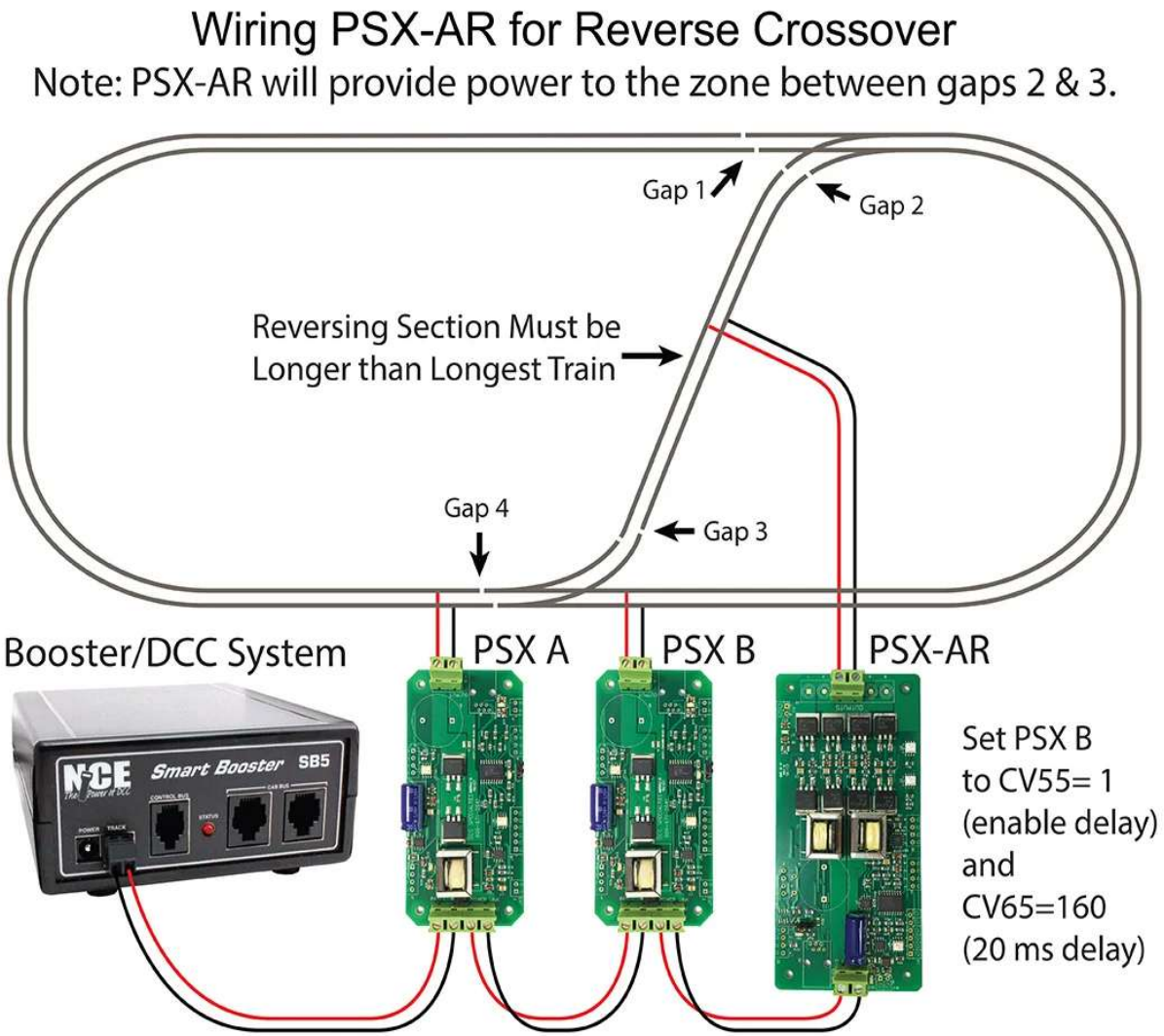
Azatrax LLC

DCC REVERSING LOOPS



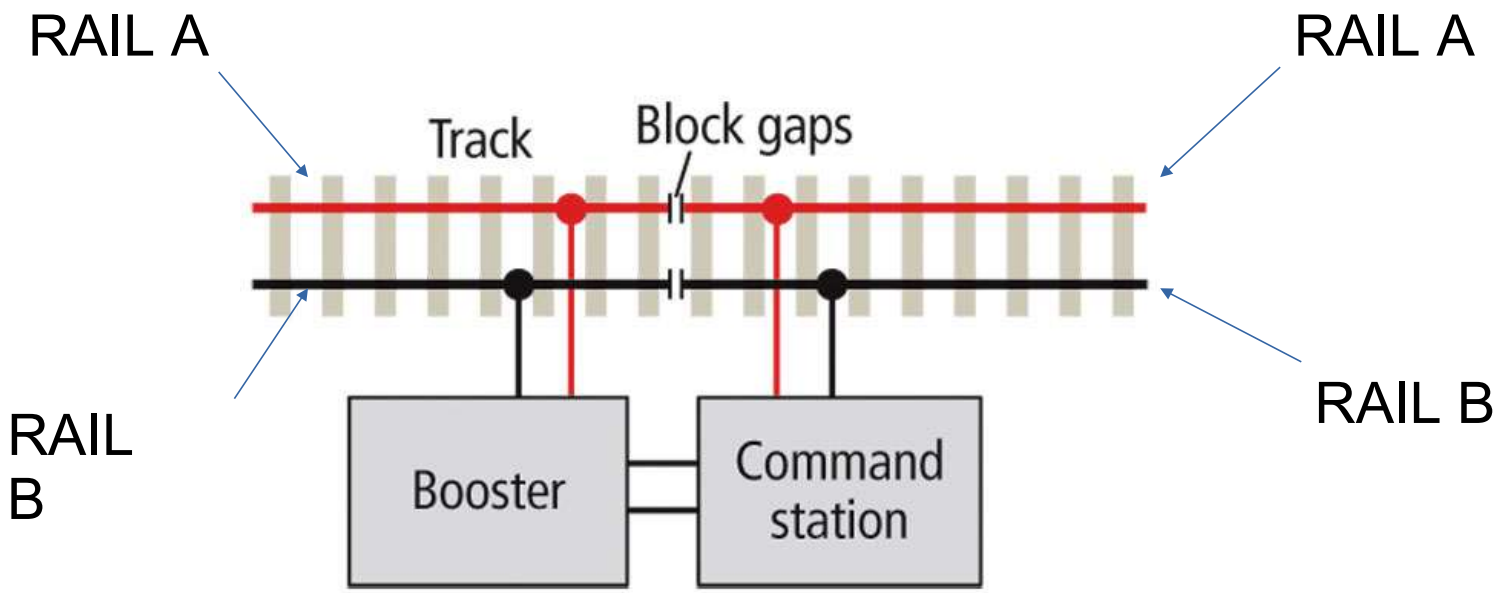
Using a Digitrax DB210 for Auto Reversing

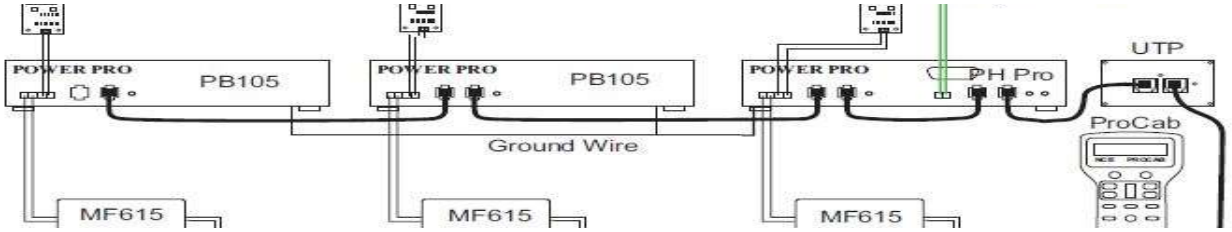
DCC REVERSING LOOPS



PROPER BOOSTER WIRING

Mismatch will Cause Shorts

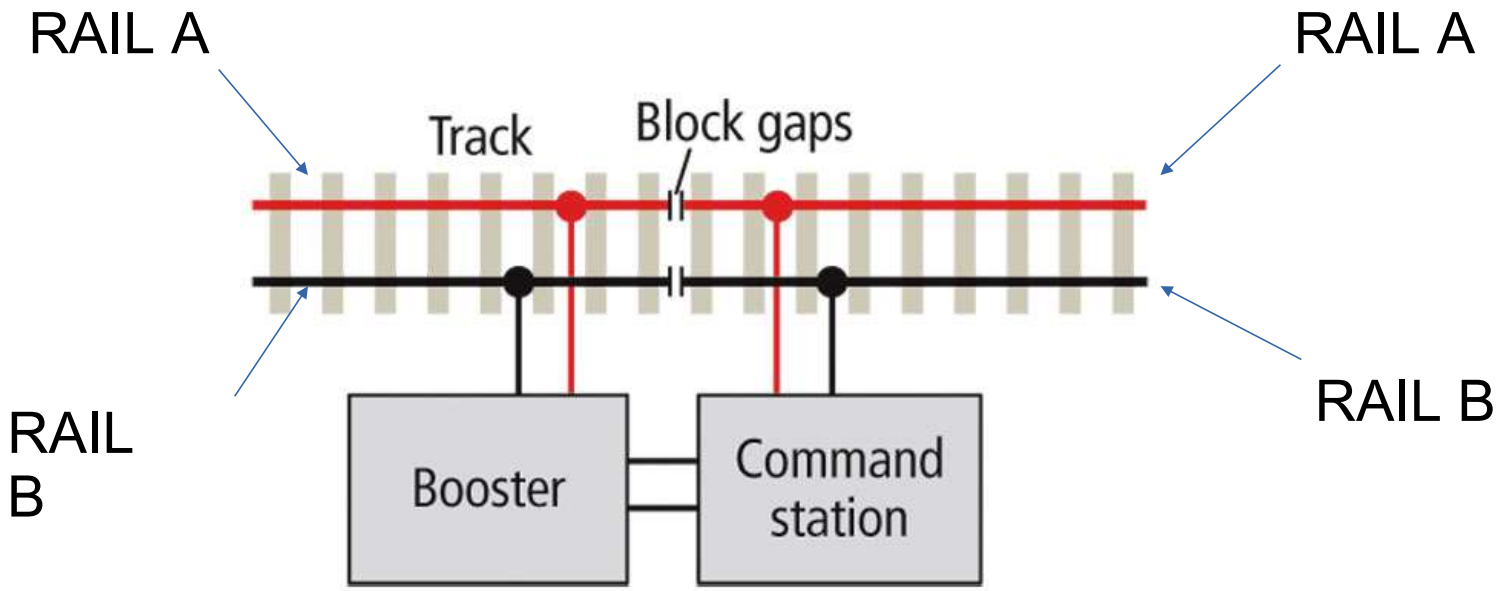




Keep it grounded. Both NCE and Digitrax recommend installing a ground connection (the green wire) between the command station and the booster(s).

The flat gray Loconet cable allows the DCC commands to be passed from the command station to the booster.

PROPER BOOSTER WIRING



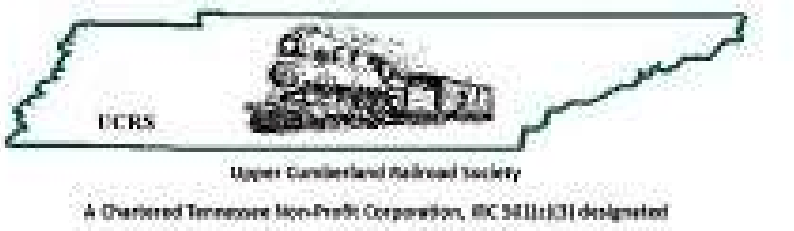
Booster Output Voltages Need To Be Matched

Patience

is Mandatory

Enjoyment

is Assured



MODEL WIRING – PART I

TRACK

QUESTIONS ????

March 15, 2025

MODEL WIRING – PART II

TURNOUTS??

AND ??? IDEAS