

Control Panels

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Why Control Panels?

- Panels work well where you have a group of related indicators and controls close together
- Panels may not be the right answer for all fascia controls: for example turnout controls may better be placed opposite the turnout being controlled to facilitate walk around operation.



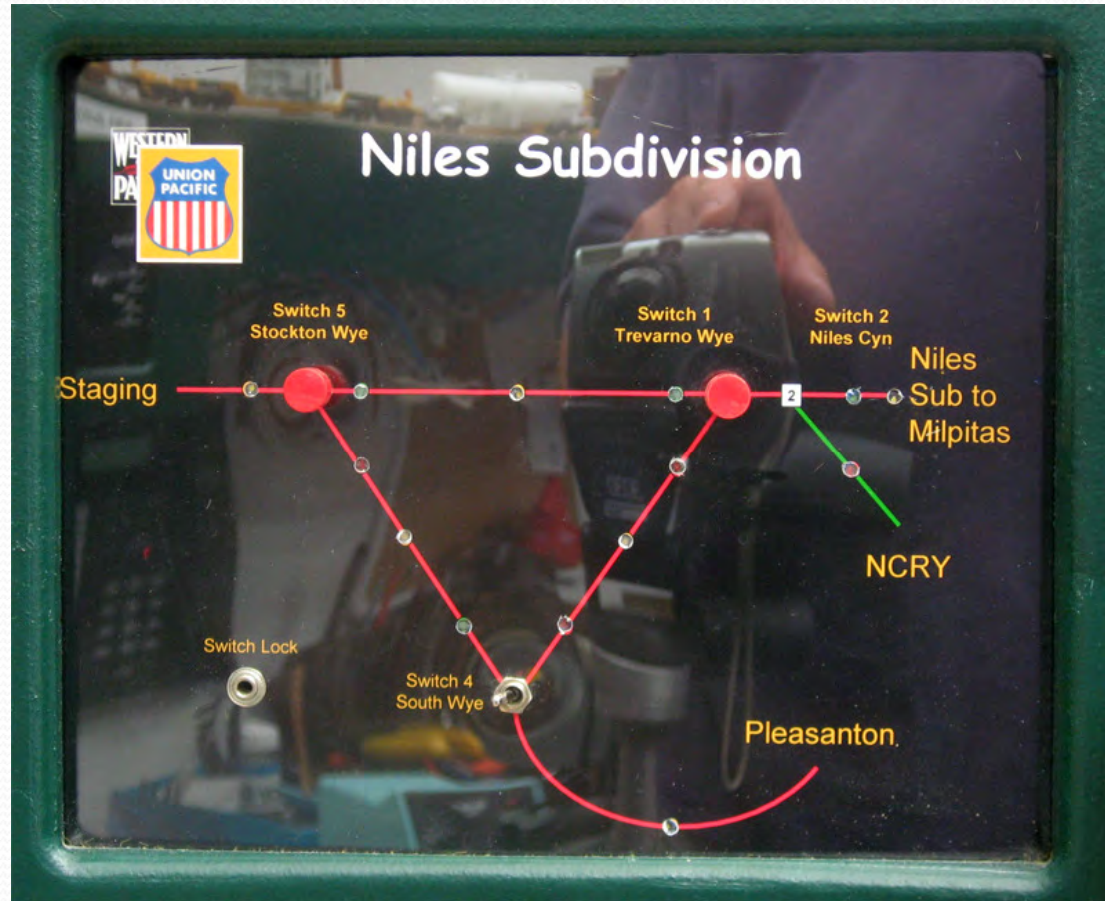
Why this clinic?

- Dave Connery (IHX Clinic Chairman) requested a clinic on the panels on my Union Pacific in Niles Canyon after a visit on a recent PCR tour
- These techniques were developed by Rick Fortin and Kermit Paul but I have expanded and adapted them for my layout: they are reasonably easy to build and inexpensive to make so they may find a place on your layout, too!

Examples



Radium Panel

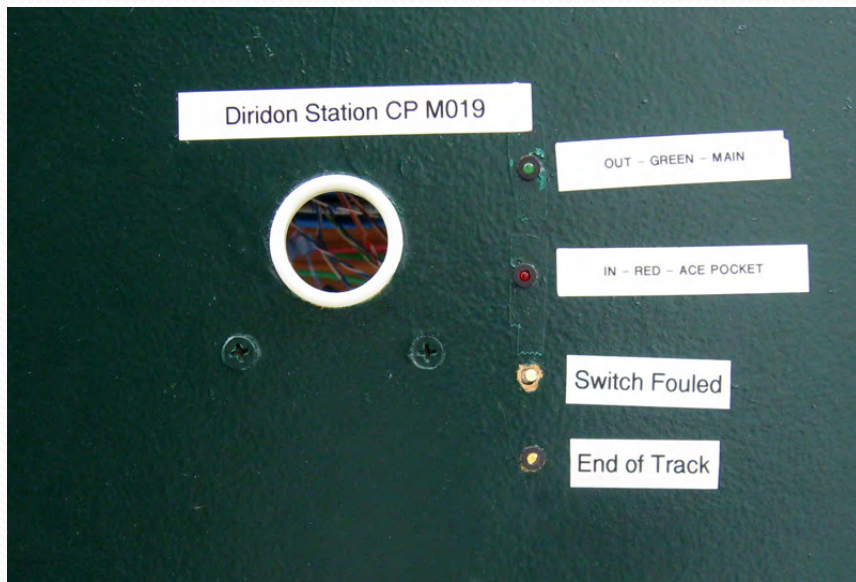


Pleasanton Panel



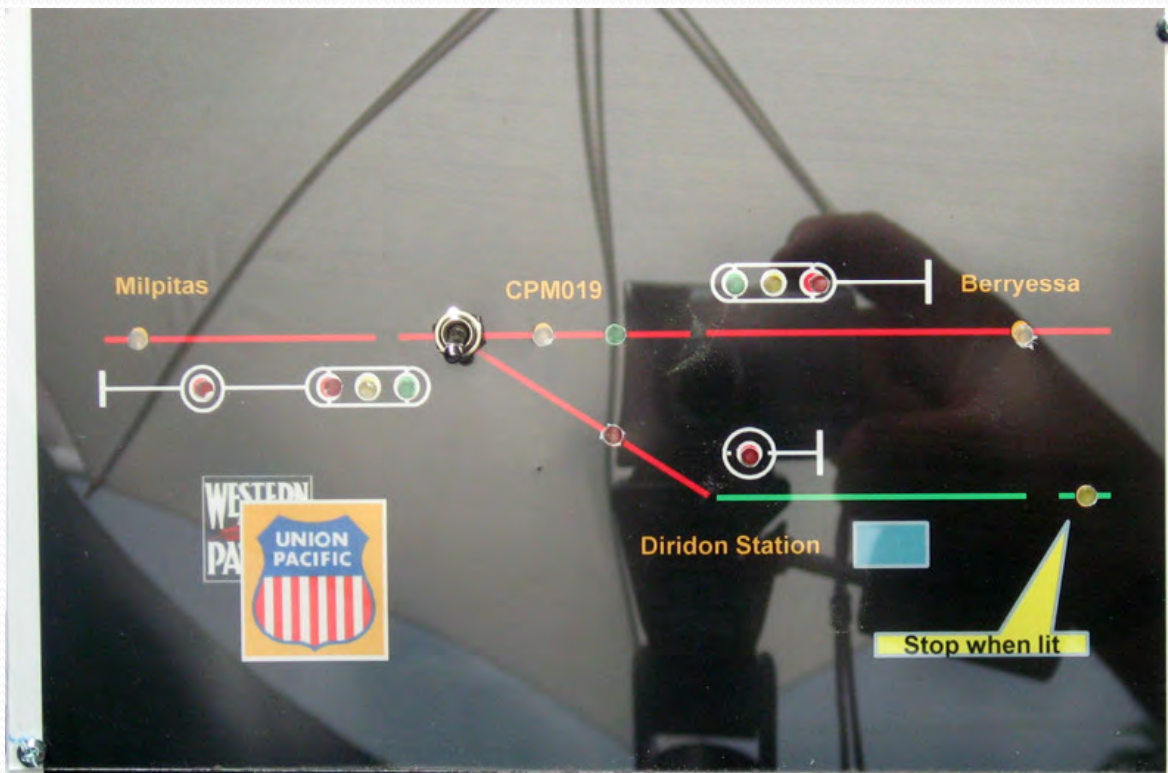
Staging Panel

Problem: Messy set of controls for Diridon Station



The labels on the fascia don't look so great and the Signal Repeater is in another location so the operator has to look around to get his train in or out of staging

Solution: A Unified Panel

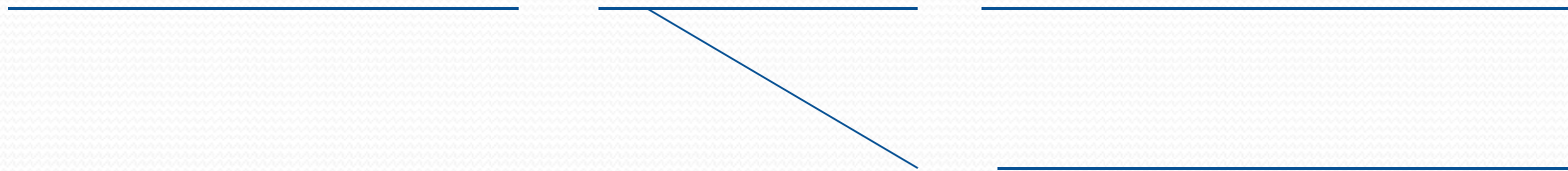




How to Make the Artwork?

- Any graphics program will do, so you use this technique with your favorite drawing, painting or CAD program
- I used PowerPoint because I used it a lot in my career as a Product Manager and it is very fast for this sort of work:
 - Draws lines and basic shapes
 - Has libraries of useful shapes and graphics
 - Import pictures in many formats
 - Is included in most versions of Microsoft Office
 - Most presentation programs have similar capabilities

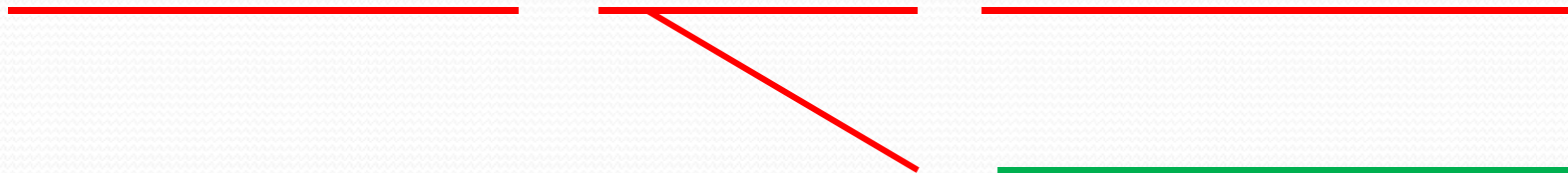
Start with lines to represent Track



Hints:

- you can lock lines to horizontal & vertical by holding the shift key as you draw them
- You can copy lines (Ctrl C) and paste them (Ctrl V)
- Use the align tool to keep things lined up

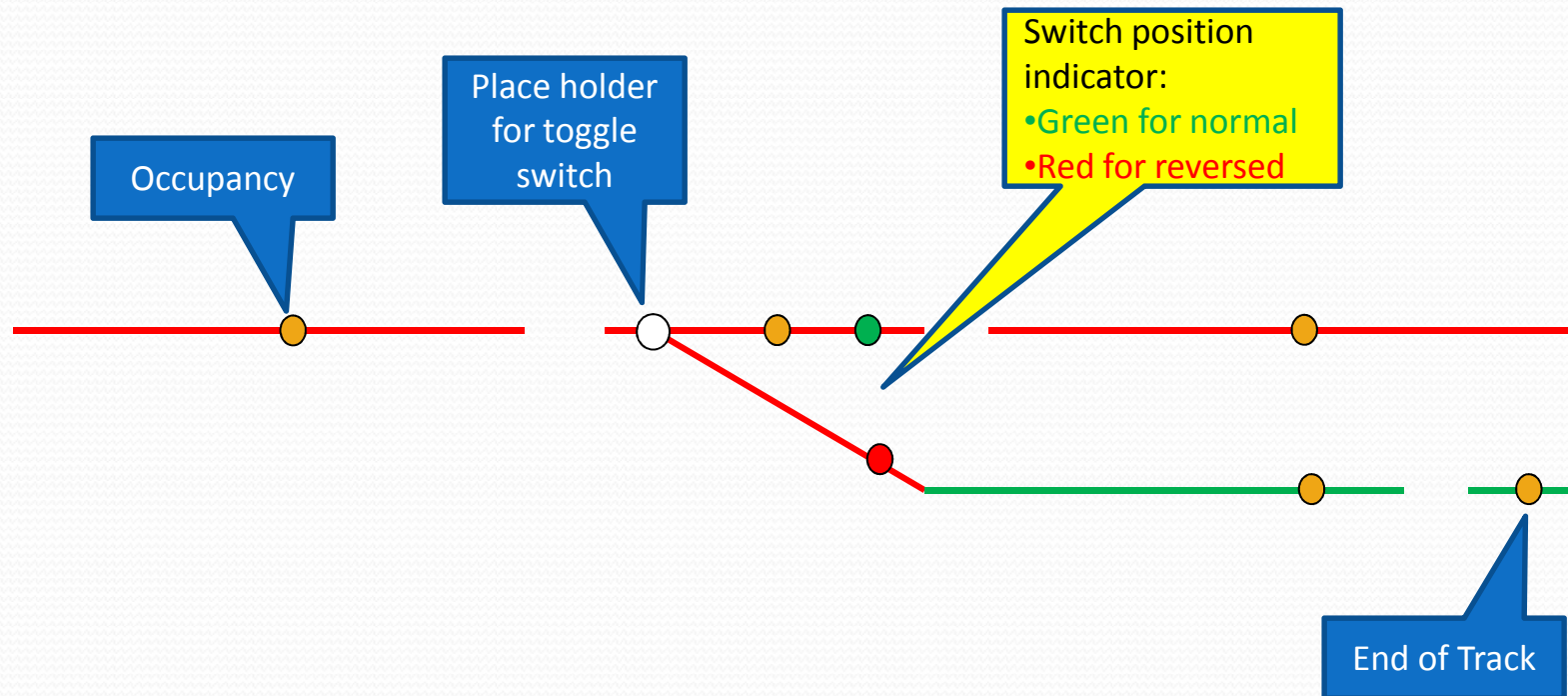
Change Line Colors and Widths



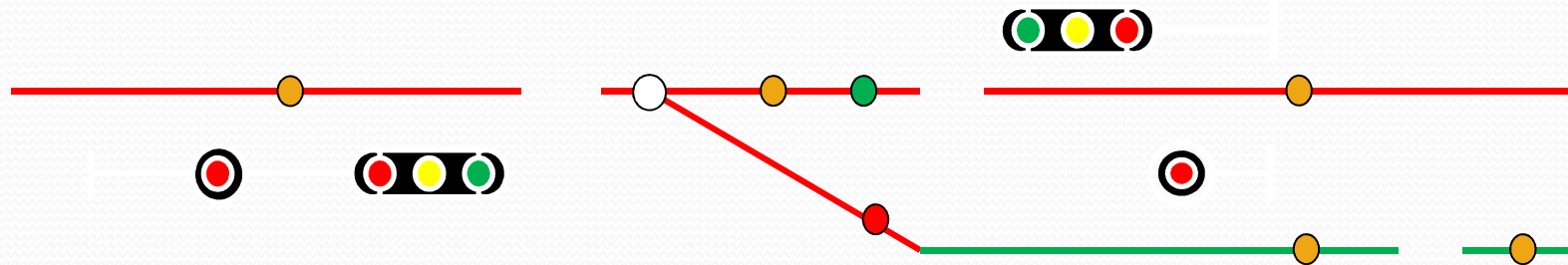
Hints:

- I use 2 ¼ for main tracks
- I use Red for main track and green for other tracks
- These tools are in the Shape Outline submenu in the drawing menu

Add the Dots for Indicators



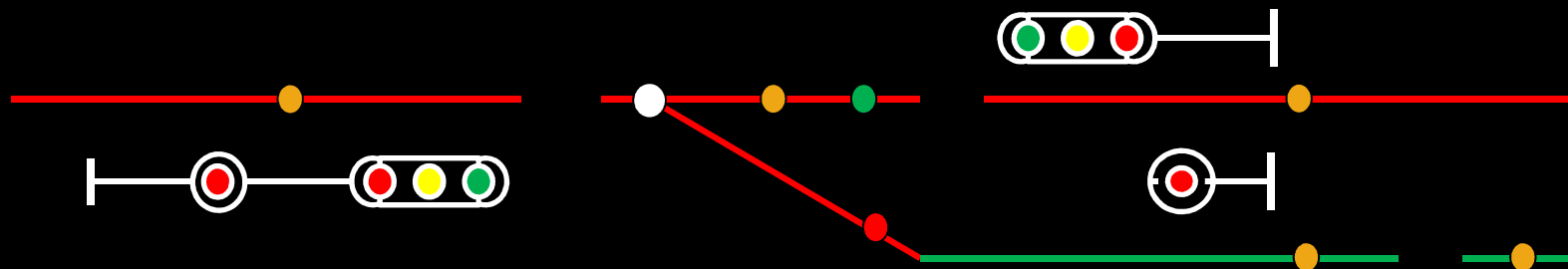
Add the Signals



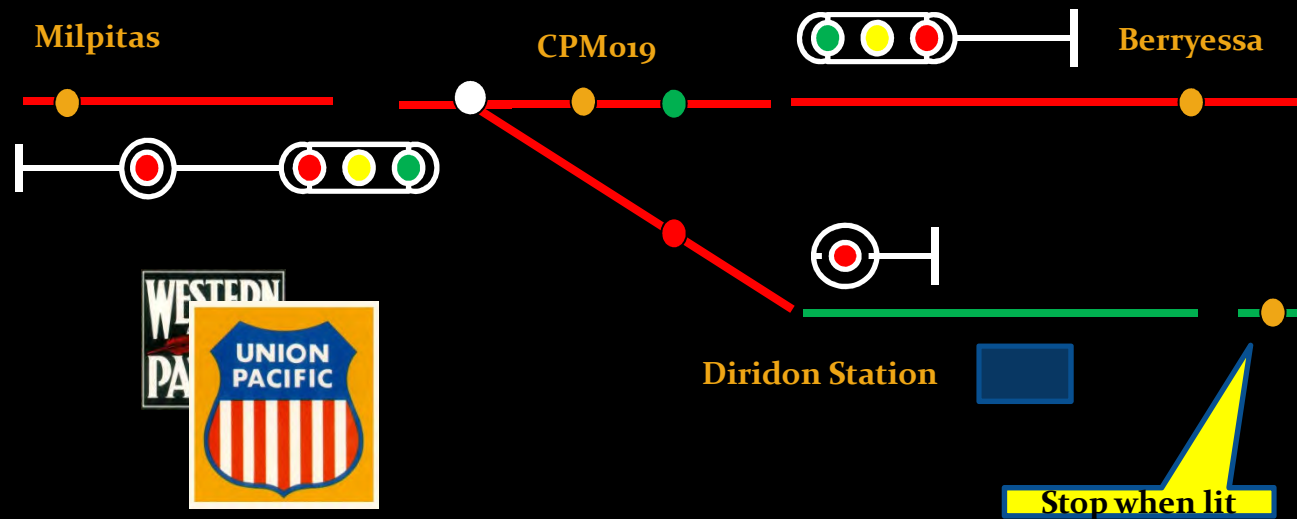
Hints:

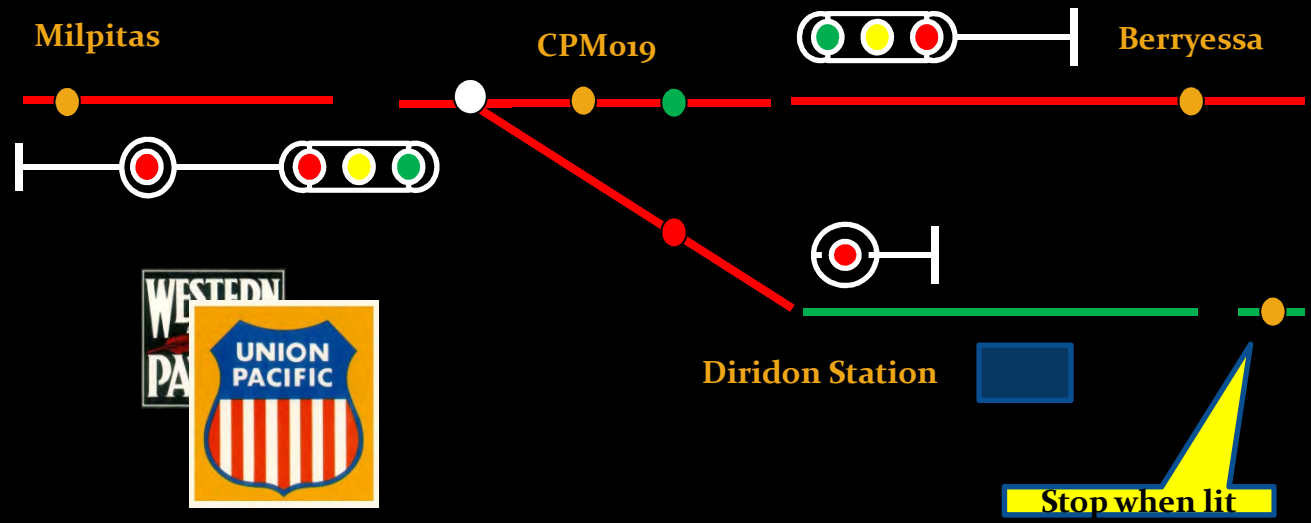
- Signals made from circles and rectangles

Set The Background And Remove Any Distracting Graphics

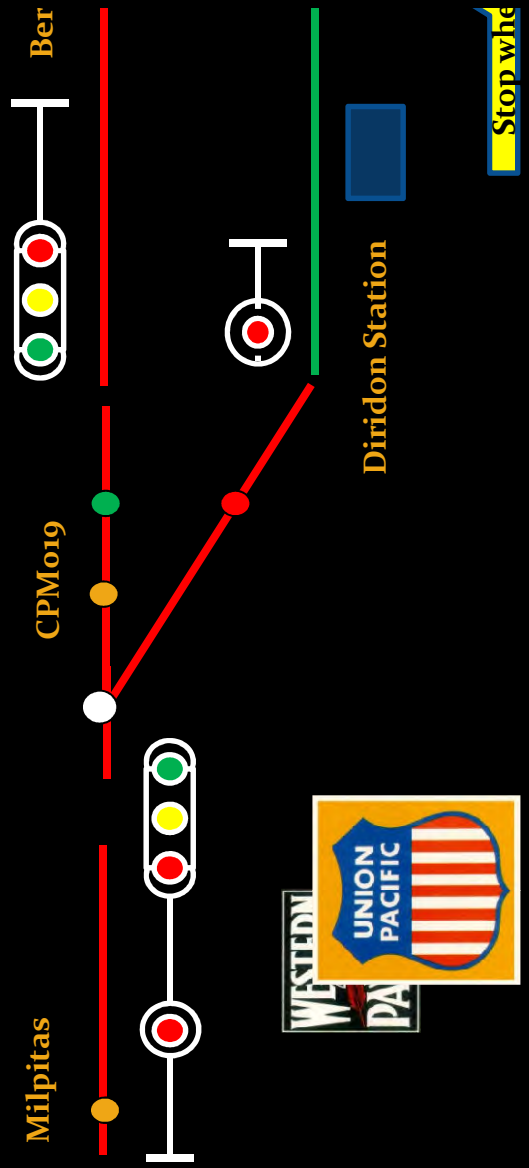
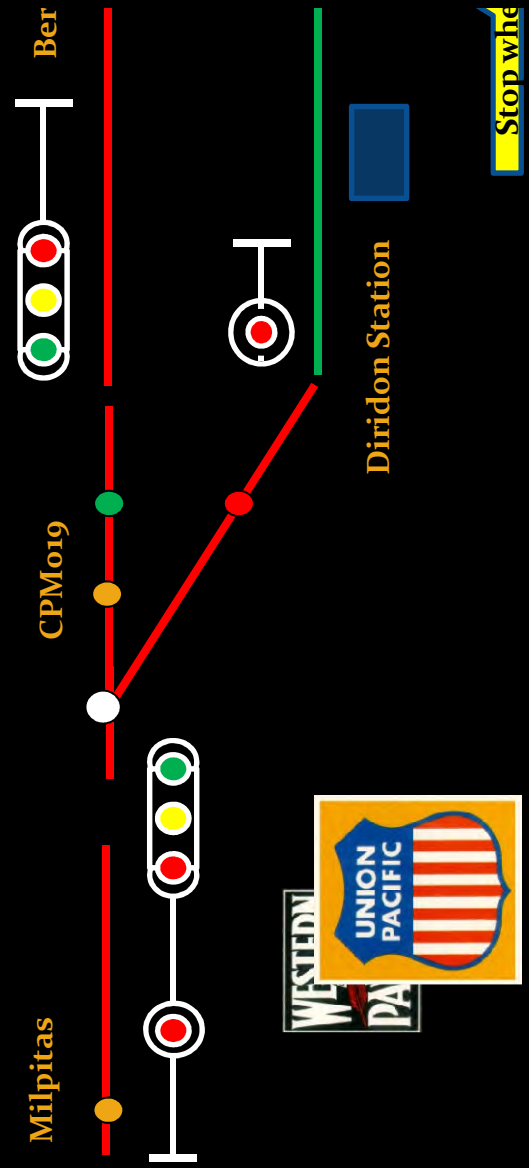


Add Text and Other items





Rotate 90 Degrees to get two copies



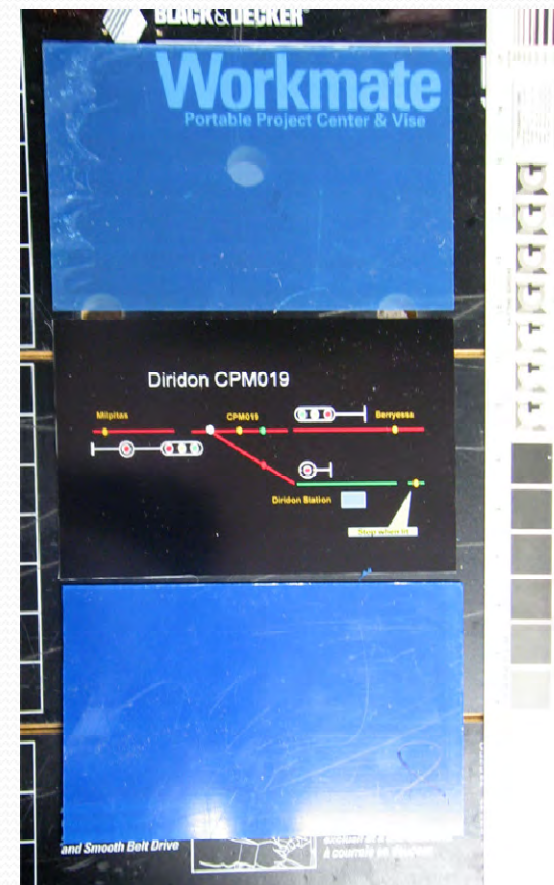
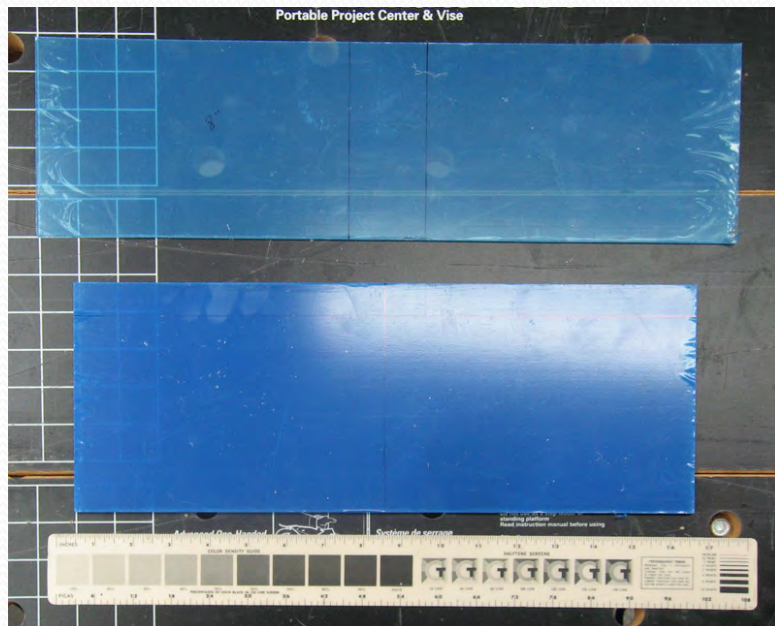


Print a test copy for sizing

- I use a basic black and white print for this phase
- Check size against the place where the panel is to go
- Check that your panel material fits
- I use two pieces of Plexiglas: 1/8 for the back and 1/16 for the cover
- You can add registration marks to your graphic for fitting

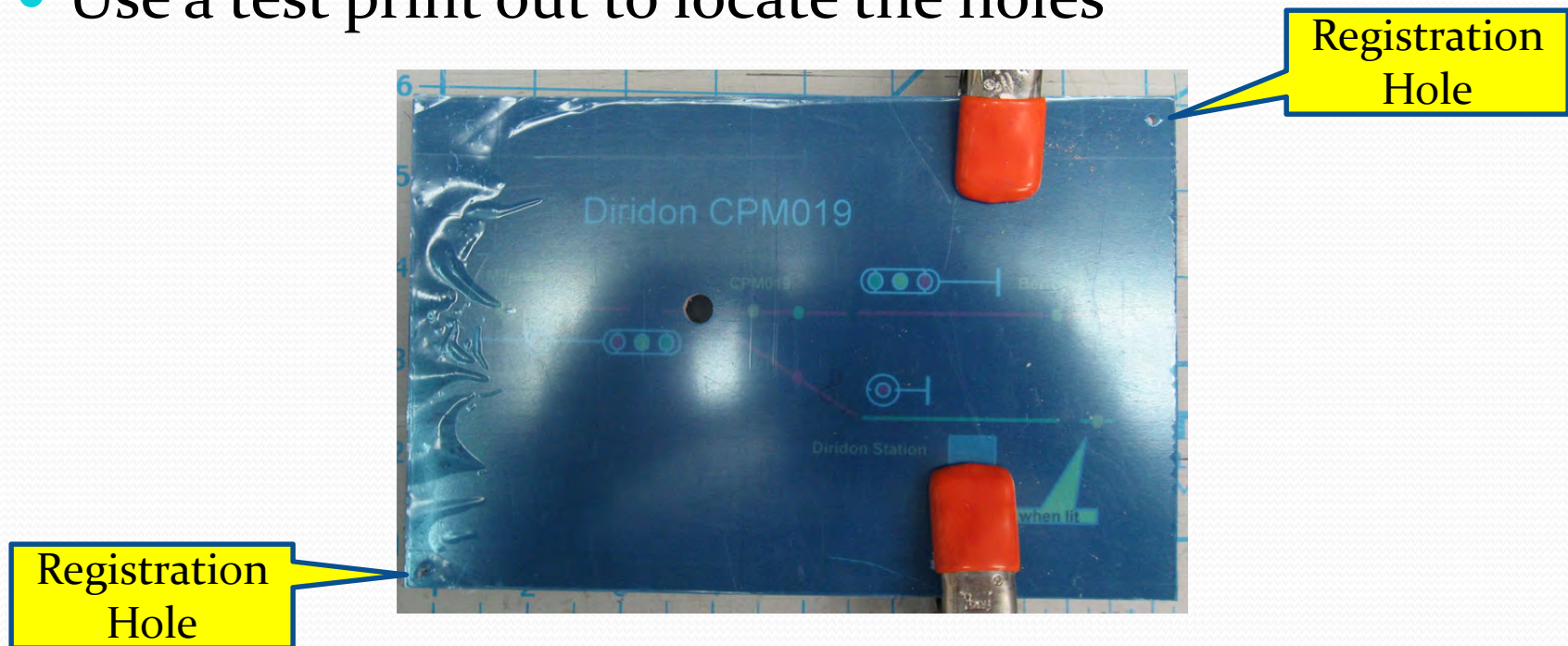
Cut your Material to Fit

- Leave a little extra if you're inserting from behind the fascia as I did



Drill Registration And Switch Holes

- I use sub-miniature toggle switches which are 5/16 diameter and have a barrel about .200" deep
- Use a test print out to locate the holes



Drill LED Holes in the Back Sheet Only

- A 3 mm LED takes a #35 bit but I use the high speed bits from TAP plastics: 1/8 is pretty close
- Use a test print out as a drilling guide
- Use a drill press or, better yet, a drill press with an XY table or a mill if you have access to one



Print Out the Final Panel Graphic

- Use Plastic Photo Paper – this is like photo paper but it's on 7 mil plastic. It won't rip under the drill like paper and it's dimensionally stable and won't suck in moisture and pucker over time
- I used “Inkpress White Gloss Film” from InkJetArt.com, last I checked, 20 sheets go for \$30 or \$1.50 a sheet



Use The Back Panel As A Drill Template For The Graphic

- No photo

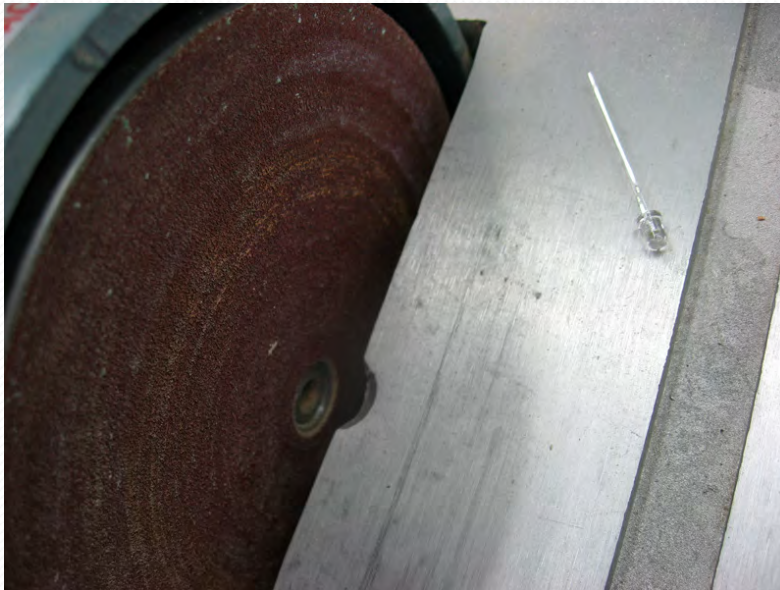


Assemble the Sandwich

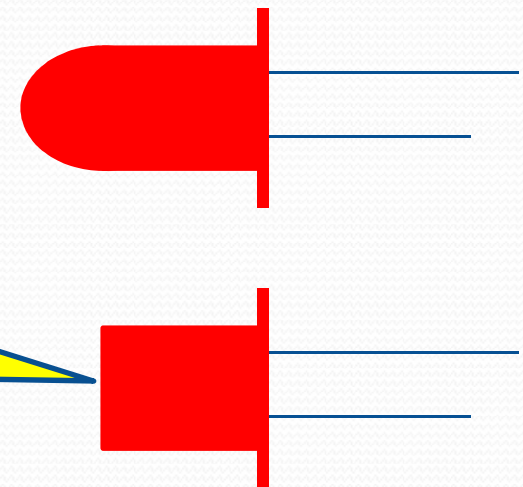
- Remove the blue protective film from all surfaces except the front of the front panel
- Front Panel
- Completed Graphic with holes for LEDs and Switches
- Back panel
- Use machine screws through the registration holes to keep everything aligned
- Mark the holes on the back for the color LED needed, it's OK to mark with Sharpies as this won't be seen. Check that the holes are correctly labeled. Ask me why <g>.

Prepare the LEDs

- This is Rick Fortin's Trick: the LEDs have a ring at the base that holds them against the 1/8" back panel but the LED are too long to seat, however you can file or sand them flat and shorter for a better fit.

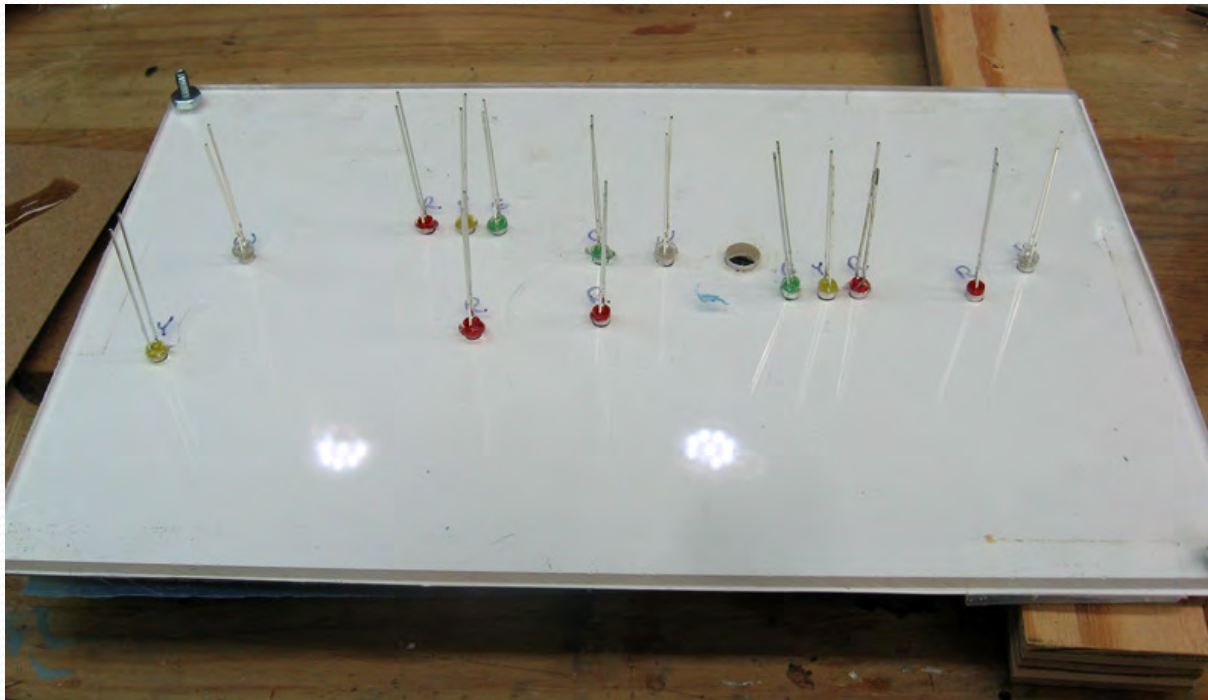


File
down to
here



Glue the LEDs in

- I use E6000 from TAP Plastics
- Keep the LEDs aligned with all long leads (anode) up or down for easier wiring
- Leave it alone to set up for a few hours

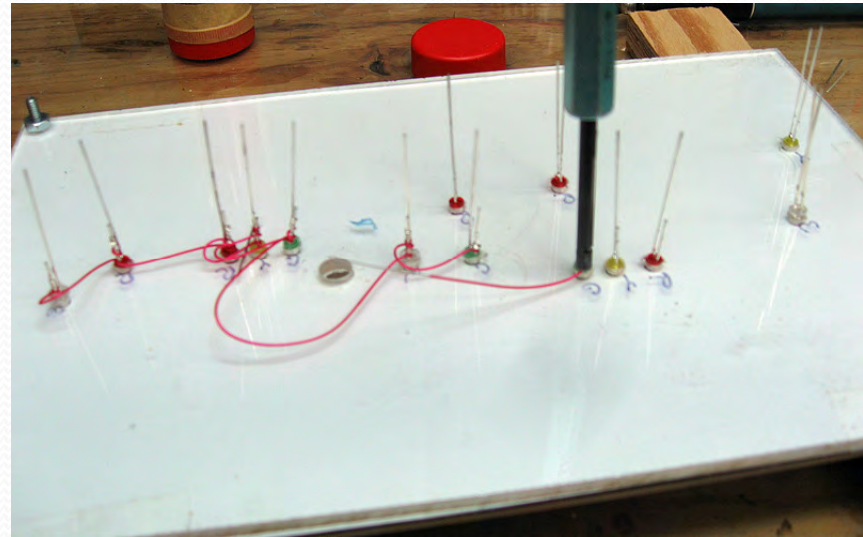


Wire the LEDs

- I like to wire my LEDs with all of the Anodes together and bussed to +5. You may have a different standard.
- This allows the LEDs to be driven by open collector or open drain drivers (like CMRI)
- Be sure to add an appropriate limiting or “ballast” resistor
- The example panel will be driven by an Arduino but I haven’t settled on the exact circuit yet. In this case it may not need limiting resistors so I didn’t install them.

LEDs with Power Bussed Together

- I use a wire wrap tool to wrap the wire to the leads and then solder over.
- I cut the leads off the anodes at about $\frac{1}{2}$ "
- You may need a different arrangement depending on your wiring requirements



LED Terminology And Wiring

- Modern LEDs will light brightly with as little as 2 or 3 mA so very little current is involved
- Forward voltage (on package) is typically 1.5 V (Red) – 3.1 V (White)

Anode, + end, long lead

+ 5 VDC



Cathode, - end, short lead

R

To Determine R:

- Subtract Forward voltage of Diode from Supply: $5 - 3.1$ (white LED) = 1.9
- Desired current = 5mA, so given Ohm's law $R = \text{Volts}/\text{Current}$ or $1.9/.005 = 380$. The nearest standard value is 390, so we use a 390 ohm Resistor
- To get a wattage rating , Watts = Volts X Current so we have $1.9V \times .005A = \sim .001 W$, so an 1/8th Watt (or larger) resistor will more than do

LED Package Info

INSTRUCTIONS

3900,4300,4400
CMD2040WC

5100 SERIES
CMD333UWC

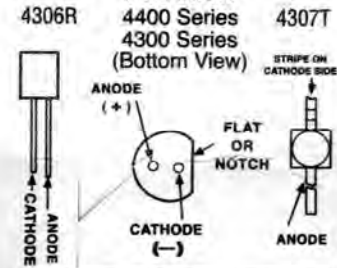
WARNING:*

Rectifier Diode must be used for AC applications

Voltage	*AC	DC
6 V.	100 ohms	220 ohms
12 V.	330 ohms	680 ohms
28 V.	750 ohms	1500 ohms

RESISTOR: 1/2 WATT

IDENTIFICATION OF POLARITY:



Model: 3990, 5100, 5110, 5210
Redlead: Anode (+)
Mtg. hole: 3990-7/32", 5100-1/4"
5210-3/16"

To mount Panel Clip
for 4304 series use 17/64 drill
or punch .265 hole in panel.
For 4305 CH series,
drill 1/4" hole.

MODELS	VOLTS	2 MA	2.5 MA
4300 LC SERIES	1.5 VDC	100 ohms	100 ohms
	3 VDC	620 ohms	470 ohms
	6 VDC	2.2K ohms	1.8K ohms
RESISTOR: 1/4 WATT	12 VDC	5.1K ohms	3.9K ohms
	24 VDC	10K ohms	9.1K ohms

B4303F5-10PK-LED



6 76137 00270 7

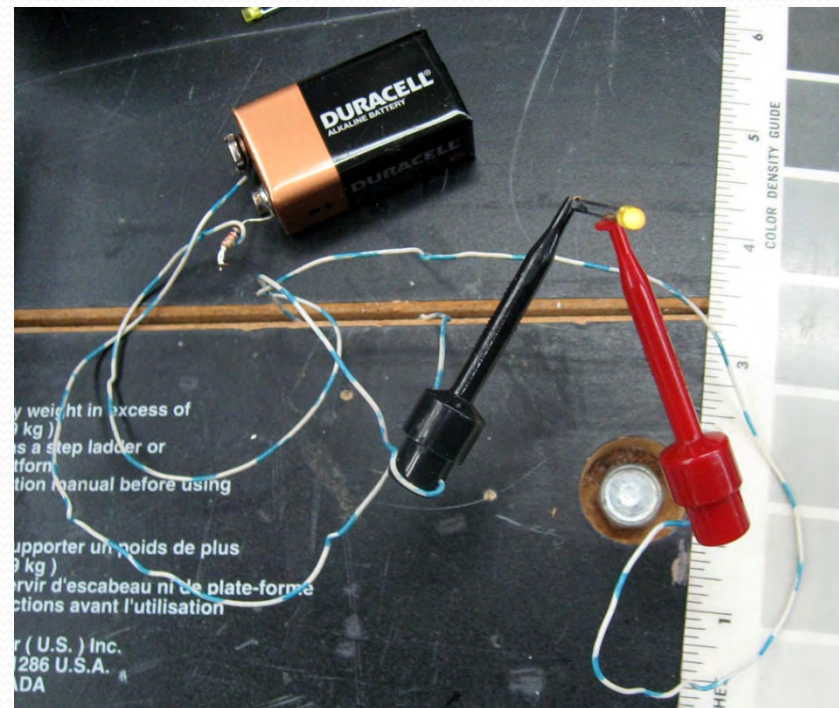
Diodes and Resistors

- I got these at the components aisle at Fry's
- Light Emitting Diodes were 10 for \$3
- $\frac{1}{4}$ W Resistors were 10 for \$1
- Also try Halted, Anchor or any of Mouser, Jameco, Digikey etc



Cheap and Dirty LED Tester

- A 9V battery with a 1K ohm resistor on the + terminal wired in series with a test lead and another test lead to ground.
- Limits current to about 9 mA
- Actual current to diode under test is from 6 – 8 mA which is safe for anything you need
- If the LED under test doesn't light, try flipping polarity. If it still doesn't light it's probably blown.

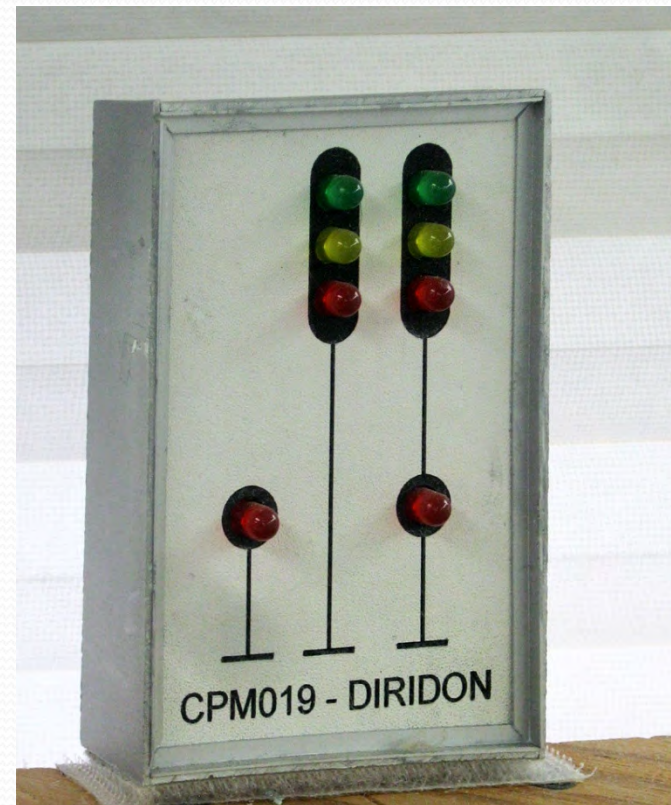


Now For Something Completely Different

- Signal Repeaters
- This appeared in the Branch Line a few years ago and in LDJ in the “Planning for Signaling” series
- I had set up my signal system but the correct signals were not yet available (long, sad story – I hope to have them on the layout by next year)
- Repeaters allowed me to start CTC operations right away and would help color-blind operators even after the correct US&S type H2 search light signals were installed on the layout.

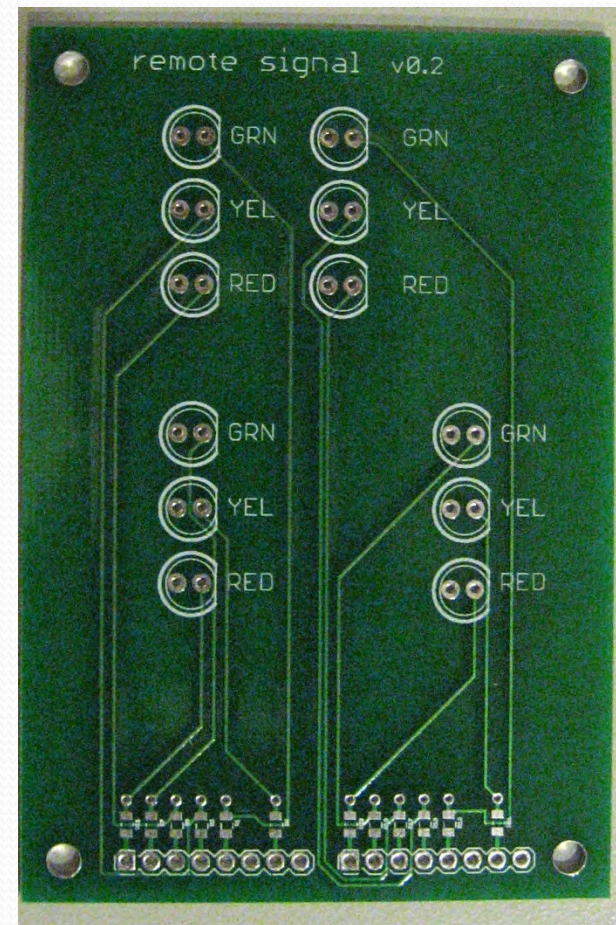
Remember those signals at Diridon Station?

- You can't actually see them because Diridon is hidden staging for the ACE train
- So I put the repeater up on top of the View Divider
- Note the signal is a "Type D" color light, red is on the bottom per railroad practice. This means color-weak guys can read them
- The low signals have only a RED LED because the most favorable aspect this signal can display is RESTRICTING (flashing Red), because Diridon is not signaled



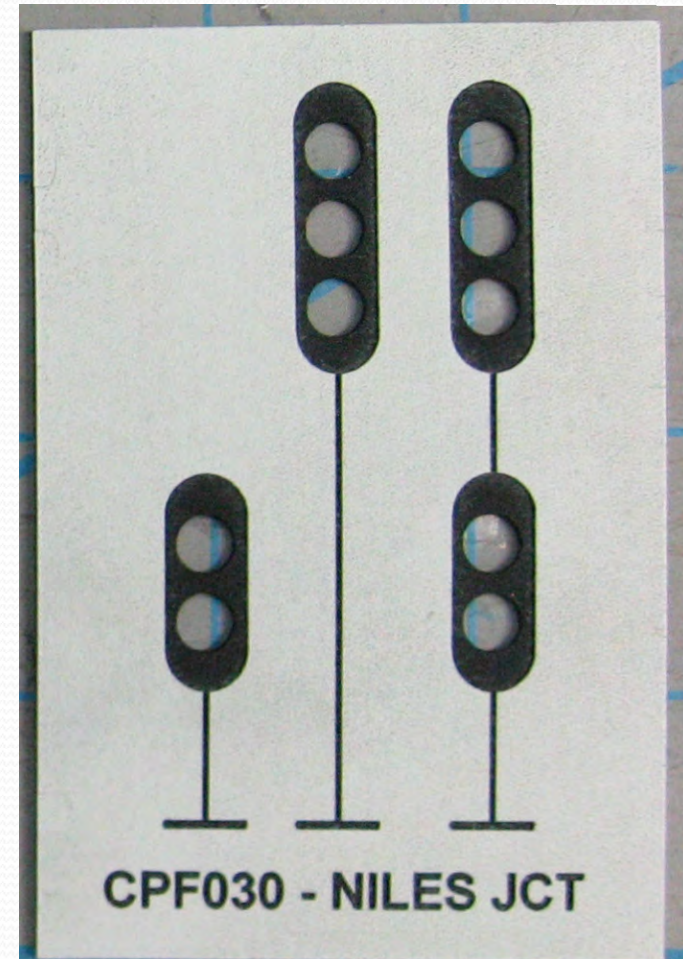
PC Board For The Repeater

- Dave Falkenburg laid this out for me. There are several services that print short run circuit boards and they are relatively inexpensive. These boards cost \$15 each a few years ago. It's less now.
- Note the board can support up to 4 heads in a CTC "triad"
- The signal can be assembled right or left handed by flipping it over and stuffing from the side you need
- Not all LEDs need to be populated – on my layout we never use "Low Green" because the turnouts are assumed to be medium speed and the most favorable aspect they can display is "APPROACH"



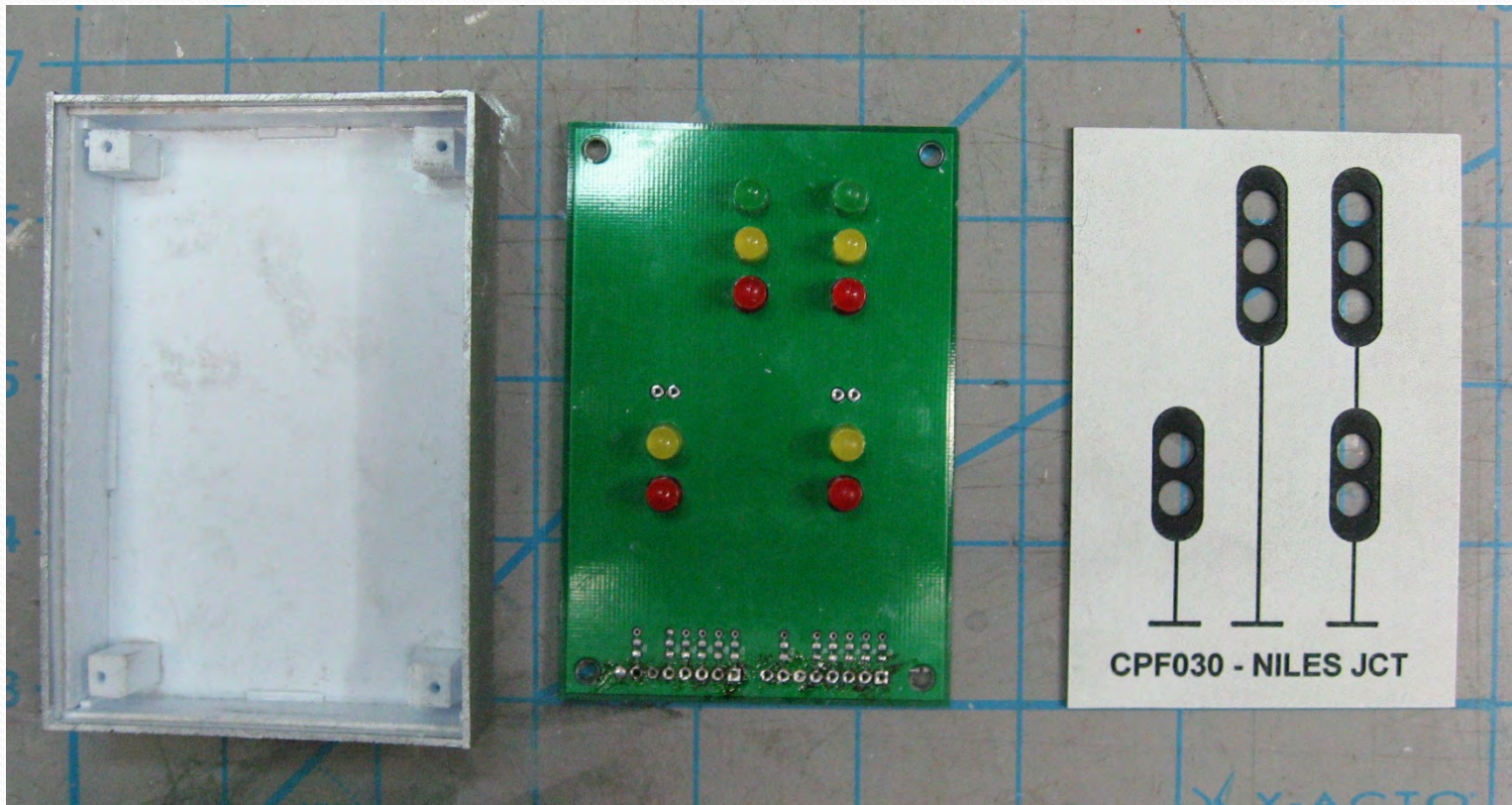
Now I needed a Cover

- The Plexiglas technique didn't work for because I couldn't control the drill well enough without an XY table – and I didn't want to buy a new drill press and table or a mill
- Kermit Paul offered the use of his Laser Cutter which is very precise

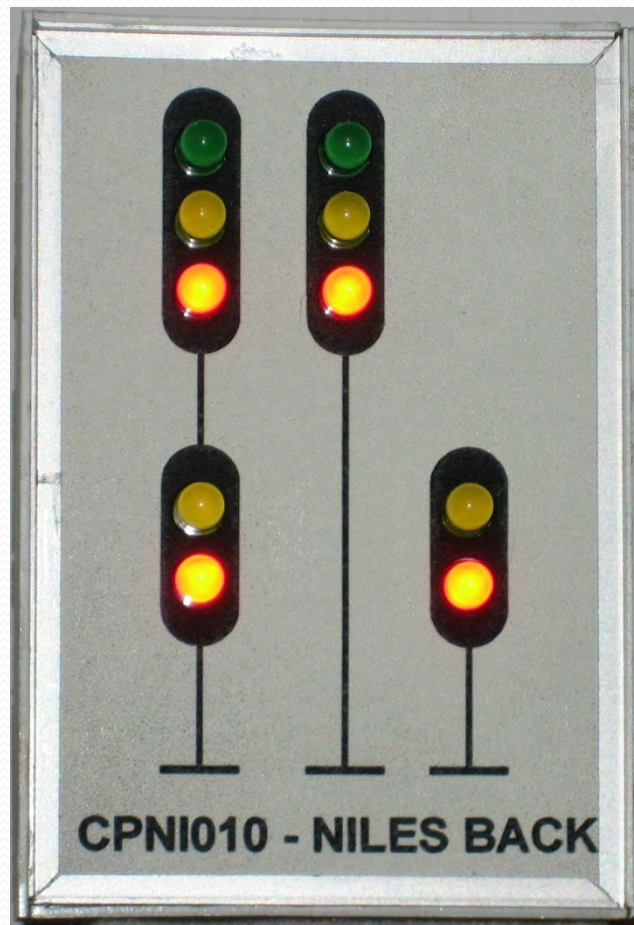


And a Box

- I built boxes out of .040 Styrene and painted them aluminum



Signal Repeater





Notes on Laser Cutting

- The laser engraves on a two level material like we use for Coast Division badges: low power burns away the surface color, high power cuts all the way through
- The laser cutter wants vector artwork. Kermit uses an older version of CorelDraw, but a quick Google search shows many freeware vector graphics tools.
- For panels that get handled, Kermit recommends a pebbled material (available at Johnson Plastics in Concord) to avoid finger prints
 - I found that the smoke from the cutting process settled into the texture on my white panels and was very difficult to clean out so I'd recommend going with a darker color
 - Since my repeaters are on top of the scenic divider, and won't be handled, I'd use the smooth material if I did it again



Questions?