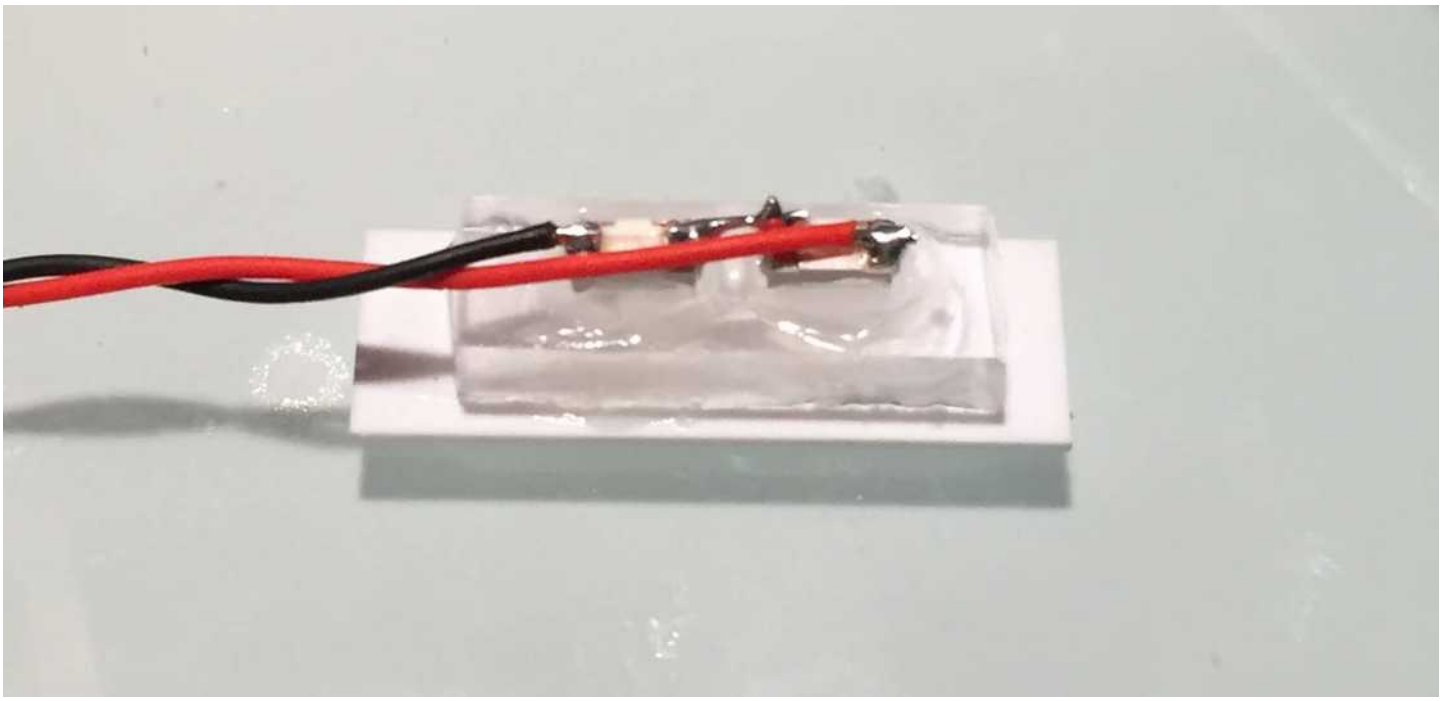
Lighting Overland Alco Century-series Number Boards

Bob #1 January 20, 2018, 9:50pm

We need more heavy motive power for preliminary op sessions, so I'm back to finishing the Century 425. There is little space in the long hood because Overland soldered a cross support member that blocks much of the access. In the cab there seems nothing to offer support.

I've been experimenting with several solutions, none of which looked good. Most involved mounting 1206 surface-mount LEDs to the back of various stacks of white styrene. All produced horrible bright spots. Some previous locomotives received elaborate light boxes that spaced the LEDs away from the diffuser, but particularly in the rear of this locomotive I couldn't fit anything comparable.

A few weeks ago it finally came to me to use a light pipe. A strip of 1/16" polycarbonate, ripped from an 8x10 sheet procured at a home store, was ACC'd to the back of a 0.015" thick white styrene diffuser, sized to fit the inside of the shell, and with enough overlap on the inside for glue.



Onto the light pipe two 1206 2700K warm white LEDs from Mouser were glued. The assembly, held down to the work table with tape, offered a perfect platform for attaching wires. These two LEDs, each of which drops about 3 Volts, are hooked in series. Then each end's LEDs get wired in parallel, and fed through a single 1K Ohm resistor. There will be plenty of light, and because these LEDs came from the same reel (batch), and were made by Cree instead of a random Chinese vendor, they

are *very* well matched to each other. Unlike siblings at the dinner table, they share current equally.

Once each was assembled and tested, I packed gray never-hardening modeling clay around the back to serve as a stray light dam. The clay also helped hold each fixture in place prior to adding a drop of ACC in each outside corner to permanently hold it in place.

Here's an inside view of the rear light package. Each number board has 2 LEDs, one each for the two rear headlights, white and red 0402 class light LEDs on each side (white and black wires, respectively. Finally there is a single walkway light not visible near the bottom-center threaded mounting hole.

In the last photo we see the number boards from the outside. Prior to adding black background decals, the perimeter of the white area will receive black gloss paint to hide any gaps around the decals.

Yes, the upper headlight is loose and has slid outside of its brass investment casting. It will receive additional glue before the rear headlights are also packed in gray clay.

A Tang-Band 1925 speaker module will attach with double-sided tape, firing down, to the crossbar in the second photo, and another that is just the right distance inside the shell. Sound primarily exits open radiator intake air louvers on either side.

FYI the tiny 0402 LEDs were procured from German eBay seller LEDBaron. Each received a small blob of ACC to insulate the solder joints so that they would not short to the brass shell and cause a regrettable problem.

Bob #2 January 24, 2018, 4:15am

On the other hand, I have a couple C424s that will require considerable brass rework to install lights

in the long hood. But for starters, I shot the cab so that one can appreciate the easy access to light the number boards, headlights, and class lights in the cab.

Inside the cab, the only difficulty is that there is are undersize holes on the inside for the headlights. That can be fixed using dental burrs and a die grinder, a/k/a “screaming banshee handmill”, a/k/a Dremel or Foredom shaft. I don’t advise attempting to drill them out. Don’t ask how I know, but something bad can happen.

When I first saw the inside of the long hood I had to say to myself “What was Overland thinking?” There’s a reason this auction site purchase came with MV lenses instead of lights!

Realistically, every O-scale locomotive I have encountered turned out to be a “Project” in some form or other. This one will be a doozy!

The first steps will be stripping a Reading paint job and popping out the MV lenses.

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jaybarnaby #3 January 25, 2018, 11:16pm

Sometimes I begin to wonder if I am smart enough for modern model railroading…

Jay

Frolin #4 January 26, 2018, 12:28am

Jay, clearly you are smart enough for modern model railroading, you posted in an online forum didn't you ?

Now… did you access the web via a "steam" powered DSL modem, or a "diesel" driven cable modem?
hum… he he he

…(yea I know what you mean these days though with DCC stuff)

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jaybarnaby #5 January 26, 2018, 2:58pm

I had the kids help with that. Hmm, maybe they could help with the DCC…

From things I read here and on he diesel list I really wonder sometimes.

Jay

1 Like

Bob #6 January 26, 2018, 6:36pm

Jay -

Don't put yourself down, my friend! The number boards are just a result of failing dozens of times before arriving at something adequate.

You ran coal trains through Glenwood Canyon and are now a yardmaster. That says volumes. You know train handling, I know a little bit of geek. That's all.

I remember the fabulous D&RGW diesels you rebuilt and detailed, brought to club meetings, and ran on the DG&T. That was precision work I could never replicate, even in O-scale. The larger scale just makes it easier to see my mistakes, such as two gaps I forgot to putty on the ends of the radiator bump-outs!

ErikLindgren #7 February 25, 2018, 4:45am

It's stunning Bob, the parabolic reflectors are out of this world. Are you going to weather it pretty

heavy or light? What a beauty.

Bob #8 February 25, 2018, 8:25pm

The A&O is set in 1968. C425s were built from 1964-1966, so this unit is just a few years old. It is dirty but not derelict.

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jaybarnaby #9 February 25, 2018, 10:54pm

What is your latest choice for the grey and red?

Bob #10 February 26, 2018, 6:38am

Jay -

I wish I had a good answer for you. This one was airbrushed with “unobtanium” paint, a/k/a PollyScale. The red is straight Pacemaker red, but oil paint weathering washes made it look a *lot* darker. The gray should be warm. I used a mix of Milwaukee Road gray and concrete. David’s reference color is Floquil concrete. Frankly I’ve never mixed a gray that brown. Maybe I’m a rebel (that’s what my uncle Ben called me.)

I ordered some bottles of TrueColor paints but haven’t yet shot color chips. I wonder if their D&H gray would be warm enough, or perhaps a mix with TC concrete.

I used a new gray primer, Badger’s unpronounceable polyurethane Stynylrez after watching glowing

testimonies from aircraft modelers on Youtube. I'm sold, but must confess I bought a Paache single-action airbrush with a big diameter needle just for the primer. Badger says don't thin it, and it worked just fine straight from the bottle even though it was thick. Next time I'll try their black primer on locomotive truck side frames.

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jaybarnaby #11 February 28, 2018, 8:10pm

Just discovered that TruColor has Pacemaker Red…

Bob #12 February 28, 2018, 9:39pm

Yes they do! I have a bottle of their PM Red and hope to make a paint swatch pretty soon. The new Caboose in Denver appears to carry the entire line. I may need to make a trip in the near future to pick up all the warm grays I can find, including concrete.

For me a downside of TruColor is that it has a highly-volatile solvent base, even though it is an acrylic. Acetone can be used to cut it, though the TC thinner has other stuff in it and I can't find an MSDS for it. I care because, although I have a two-fan spray booth with outside exhaust, it fits in a basement window. Across the basement I have gas pilot lights in a furnace and hot water heater. And I *like* having a house above my basement!

If I recall David used Floquil PM red on his C430 but it was a somewhat different shade than the PollyScale. Anyway after weathering there are no two locomotives that look exactly color matched. And I can't seem to find the color mixture I used for the gray on my C425. I have found that Golden high-flow acrylics for airbrush do mix nicely with the old PollyScale. But those are water-based not solvent-based.

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jaybarnaby #13 March 1, 2018, 1:09am

Yeah, that's why I haven't tried TC yet. Not water **based.My** spray booth is a "box" made out of furnace filters taped into a box with a box fan on one end. Really can't use volitile paint with that setup. My basement doesn't even have a window to vent out of…

Bob #14 March 1, 2018, 1:51am

I hear you, Jay.

My spray booth is made from foamcore board, a furnace filter, and couple of 110V computer box fans to pull air through the filter and into an external plenum. The width matches my basement window well. Another sheet of foamcore blocks the rest of the window opening. If the wind isn't blowing in, it works pretty well. And as long as a bird hasn't dropped dead in the window well and stinks to… ahem. Been there.

Have you considered trying your booth outside on a warm but bug-free day? Or maybe in the garage with the cars parked outside and the door wide open?

If I recall I heard second-hand of an RPM modeler who airbrushed his diesel with TC on the deck of a hotel room the day before and managed to get all the decals finished just in time. TC is reported to dry very quickly. Did I hear that one from you or Rick?

wmry1401 #15 April 6, 2018, 1:27pm

I use the TC for some projects, hit it with a hair dryer and it's like Badgers Modelflex, it's ready for decals or tape off another color right away.

Bob #16 April 6, 2018, 3:35pm

Nice to hear that they dry quickly with a hair dryer.

A few days ago I shot a bunch of TC paint chips. Some I've had on the shelf for about 6 months, others were newly-purchased from Caboose in Denver. When I approached the rack of TC paints, I detected a strong aroma of volatile organic compounds. The bottles were outgassing.

Opening my collection of samples here, some were already noticeably low, about 1/3" down. Prior to opening any there was a faint aroma of the solvents. I went through a full bottle of their thinner just refilling the low ones.

One color, D&H gray, was a warm value 5 (about 18% reflectance.) That's ***way*** too dark! It was just as dark as the gray Stynylrez primer I shot as a base coat, but it was a bit warmer. Concrete and aged concrete look identical, at least from the two bottles I sampled. ***Not good…*** Out of curiosity I

may measure these three, and the primer, with a spectrophotometer I bought years ago for digital camera and scanner color science work.

I do wish TC provided dealers with *actual* paint color samples for customers to examine. Golden high-flow artist's acrylic paint bottles each have a swatch of real paint brushed over a white/black zebra stripe on the label. The TC digital online samples are useless.

I solved the problem of spraying acetone for clean-up with an Iwata spray-out pot. It worked wonderfully when placed in the spray booth and up against the filter.

Has anyone found an MSDS for TC paints? There must be one somewhere!

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wmry1401 #17 April 6, 2018, 7:17pm

I understand the off gas is a byproduct of the plastic bottles. Acetone will replenish the loss of solvent. Besides the obvious health issues of spraying acetone I found out the hard way to make sure you spray the correct series for an airbrush and not the flat brushable series. I have sprayed TC with success but concerned about the acetone. I made a spray booth out of an old rear projection TV that I vent to a window in the basement and spray with an organic cartridge mask. Maybe it's no worse than Scalecoat which is my go to paint. Speaking of which, through email I have spoken to the owner and if provided a paint sample he's willing to look at colors not currently in the line.

Craig #18 April 28, 2018, 2:16pm

Hmmmm. Guess it's time for me to get a paint booth setup. I like all of the ideas on construction.

Bob - can you help me with a few questions.
1). You mentioned some LEDs from CREE as your number boards. Do you have a PN for those by chance? At Mouser?
2). In your number board shots you have the styrene backer going on the inside of the shell. What are you doing for the "glass" in front of the styrene? Or did engines not typically have a glass front or cover on the number boards?

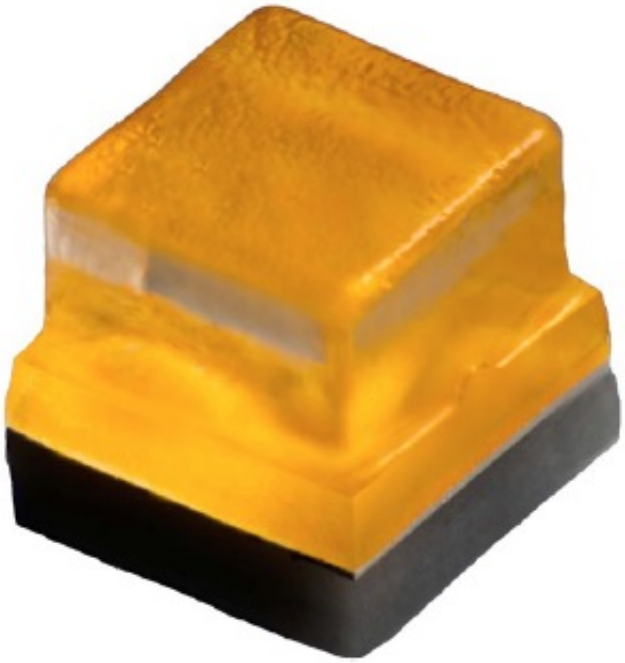
Bob knows this, but I've bought another O scale engine to help out the A&O fleet. It is an Overland RDG GP35. It needs a little work but all in all it's not bad. I have the trucks repaired and the pickups rebuilt and the pickup board created (with TVS I might add -thanks Bob). I'm envisioning this being a patch job for the A&O, covering any Reading markings and being replaced with A&O ones.

So far it's been a fun project.

Bob #19 April 28, 2018, 3:27pm

Craig -

I'm using Cree 1.6mm LEDs for *headlights*, mounted in lathe-turned reflectors. The Mouser part number is:
941-XQBAWT020000HXE7, 3000K.



It is about to be obsoleted so I'd better order a bunch more! These parts are *insanely* bright at 10 mA but mechanically they are very delicate. The tinted lens loves to separate from the silicon carbide base.

Each headlight pair is wired in series and uses a single 680 ohm dropping resistor. The Loksound decoder has a light dimmer for each function output so they can be dimmed if too bright. Here's a link to the headlight design:

> **PAR 56 Headlights - Robert**
>
> Machining O-scale locomotive headlight inserts to simulate a typical 200 watt PAR 56 lamp.

Alternatively NCE's warm white 3mm LEDs work well. These are available from a number of vendors and come in inexpensive 10-packs. These can be inserted directly into the headlight castings with the LED lens just proud of the outside mounting ring.

As for the number boards, I use my standard "go to" 2700K surface mount LED. The Mouser part number is:
720-LCWJNSHETCP5U8X

These too are scheduled to be discontinued! Some time ago I bought a reel so I'm well stocked.

Prototype number boards were generally translucent white plastic with black paint on the outer surface. For the C425 I will print ALPS decals, clear numbers with a black background. Once I establish where light needs to shine through, I will paint the perimeter of the white styrene gloss black. That way the decal will not need to precisely fill the opening. If the gloss seems non-uniform then a quick bit of brushed-on Future will make things right.

Craig #20 May 12, 2018, 4:12pm

Just got my LEDs ordered a few days ago. Ordered up 500 so that should put my stock at around 750-800.

I'm going to start working on the number boards today with it being so wet outside. No work in the garden today.

Bob #21 January 2, 2019, 12:00am

The C425 ran on the A&O for the first time on New Years Eve 2018. I need to shoot some photos of her in her new home. She still needs number board decals, and two micro LED ground lights that fit in brass castings below the cab after I gave them O-scale "root canals." The other 22 LEDs worked great (kinda went overboard there…) The machined aluminum headlights were well received and easier to install than I had expected.

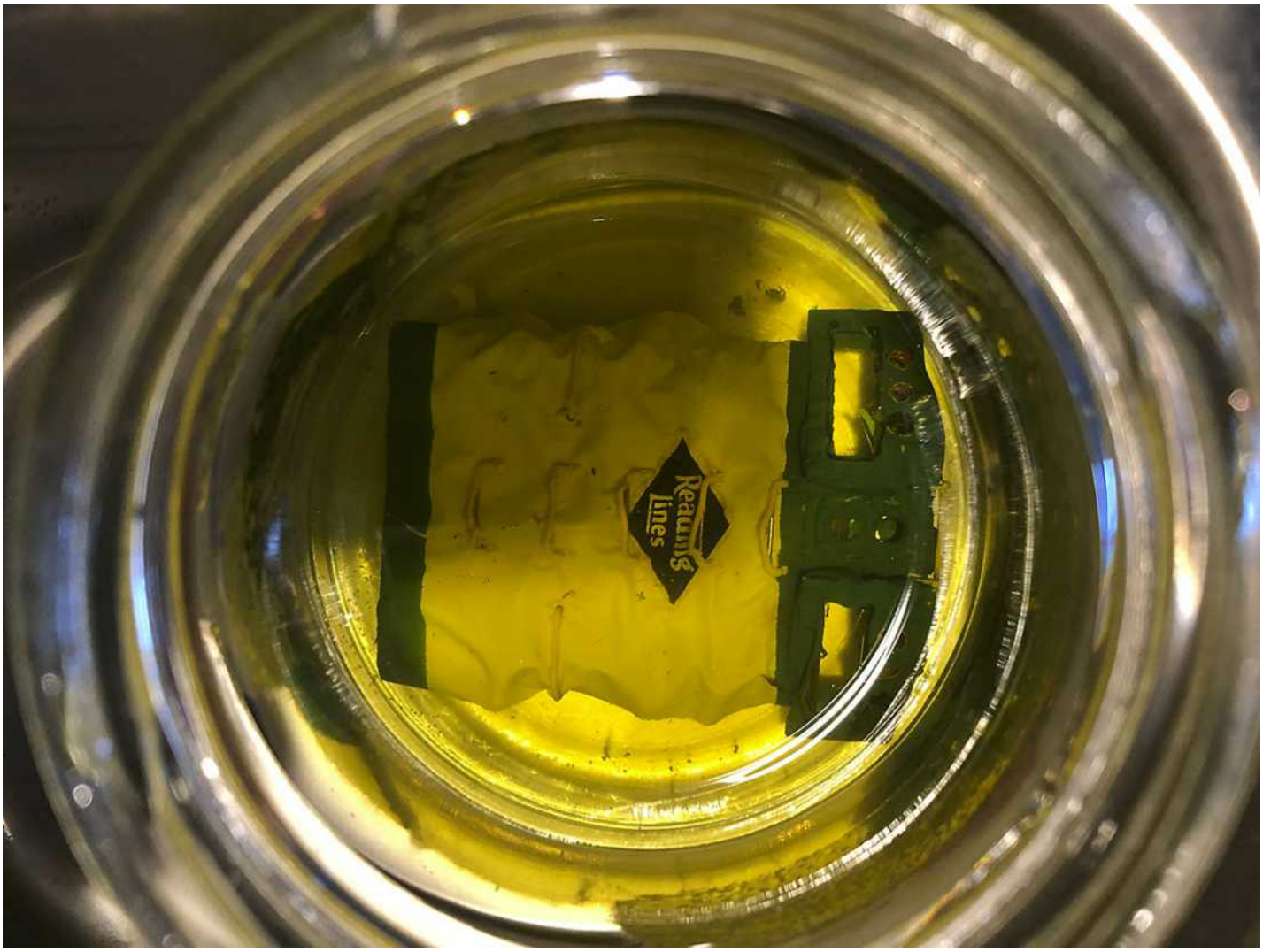
Today on a frigid New Year's Day I decided to once again tackle the first of four Overland C424s. Along with the C425 they should be primary coal train haulers. Three of them have the "what was Overland thinking?" inaccessible rear headlight, class and number boards as shown earlier in this thread. I learned that grinding away, or even trying to unsolder a thick piece of brass was impractical. So what to do? Drastic times call for drastic measures!

After a little resistance iron work to thin out weak 1980's era Overland solder joints I was able to tap lightly on a small screw driver to *pop off the entire rear of the long hood*. While I was at it the roof walk over the radiator shutters popped off along with the bottom stretcher with the screw mounting holes. No surprises there, I've re-soldered several of them. Note that I already popped out the rear headlight MV lenses.

The next photo shows the end of the long hood. I used a “Screaming Banshee Hand Mill” (term learned from Jay Barnaby) with an inverted conical dental burr to grind out a first part of the engineer’s side number board and clear out access to the rear headlights.

Since the assembly was now liberated, it was time to drop it in the ultrasonic cleaner in a jar of lacquer thinner. I didn't know what type of paint was used, but first guessed acrylics. Here we see the cleaner bowl filled with water and a glass jar with the part and thinner inside. *This is why one **NEVER** uses lacquer thinner to clean locomotive wheels*

It worked! The paint blistered and required very little work with an old toothbrush.

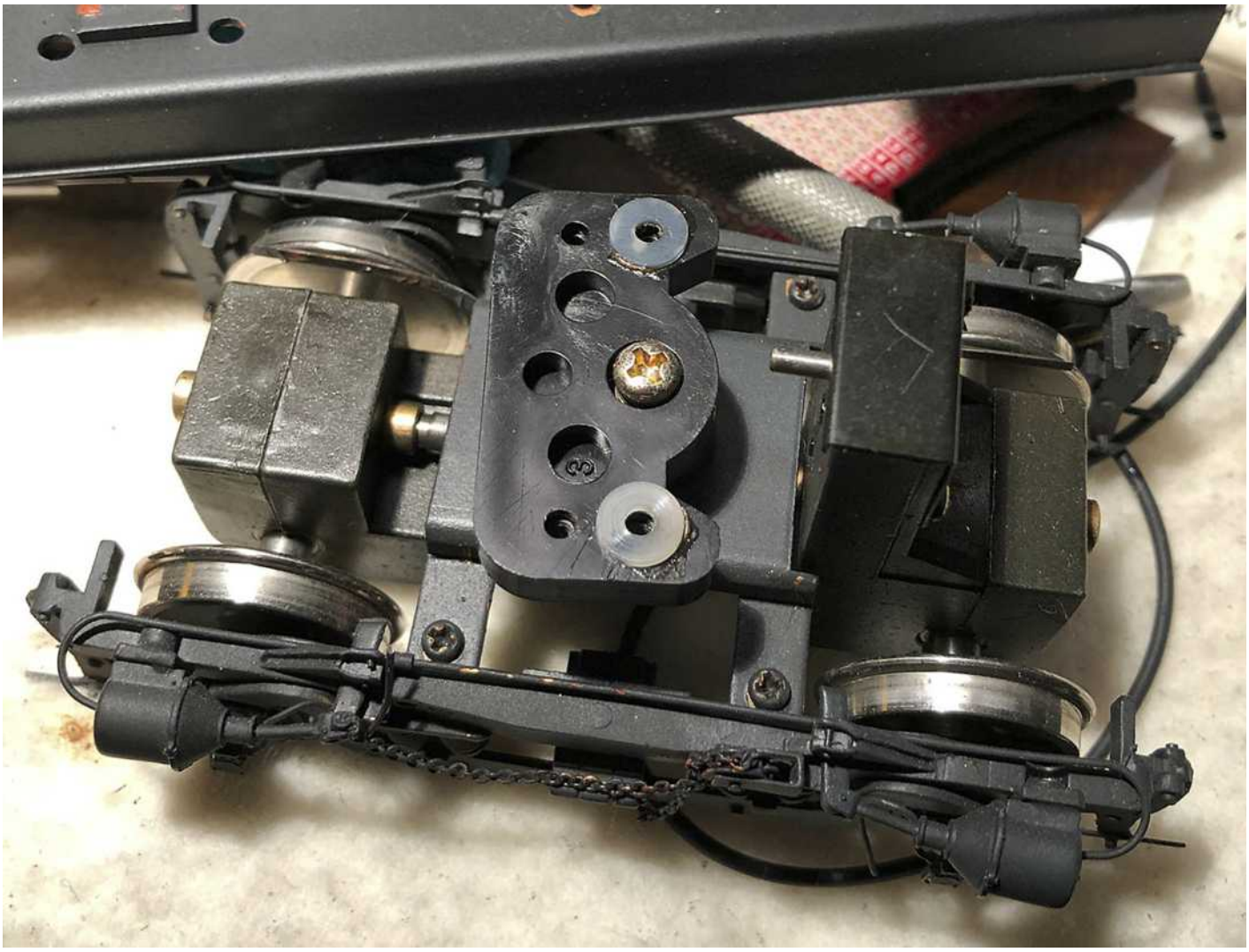


A bit more cleaning with lacquer thinner and a cotton bud (Q-tip) should make everything uniformly shiny.

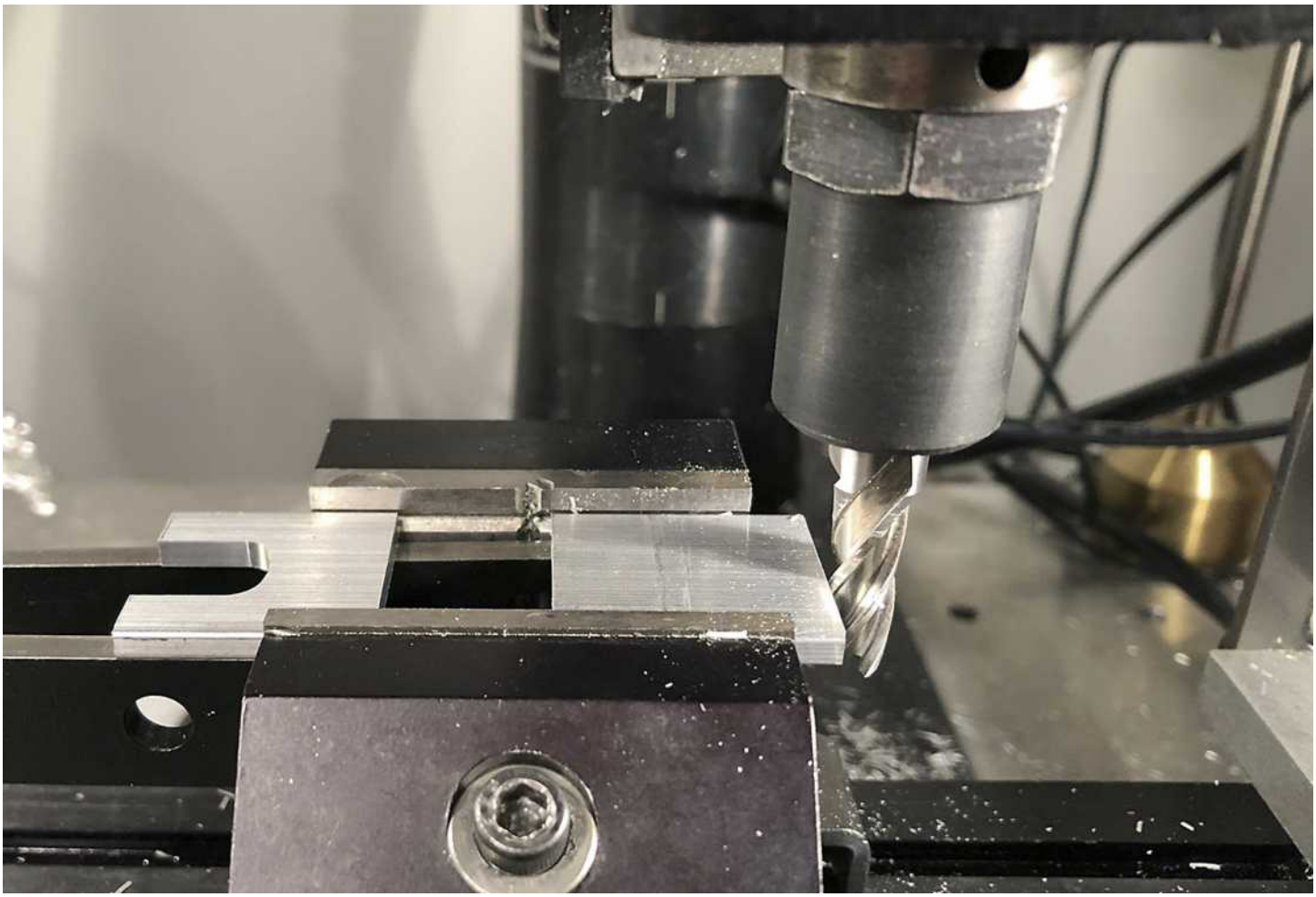
Bob #22 January 4, 2019, 11:18pm

Later this week we should have a day in the 60's instead of sub-zero at night, so then I can work outside and strip paint off of everything else.

This evening I felt like "making chips" so I tore down the chassis and started a platform for mounting the decoder and a small interconnect board. Sometimes a pre-owned locomotive can be surprising inside. I wonder why a previous owner added unsanctioned shim washers to the front truck bolster but not the rear?



Down at the Sherline mill, this is before notching an end piece for the drive shaft. The material is 1" x 0.125 aluminum.



After the cut. Time to invite Mr. Shop Vac over for a visit.

All finished.

Craig #23 January 6, 2019, 12:30am

Looking good Bob.

That's weird on the washer only being in one truck. Is the frame out of square? That's got me baffled.

PeteM #24 January 6, 2019, 5:52pm

Quality work as always! Look forward to the video of this one in action. 😀 Those washers look like plastic - could they have been an (misguided) attempt to stop a short circuit?

Pete

Craig #25 January 6, 2019, 6:45pm

That's a good thought Pete. I had some similar problems with the pick ups in that area. Had to end up

rebuilding the pickup holders because the screws for the trucks attached in that area too.

Bob #26 January 6, 2019, 11:11pm

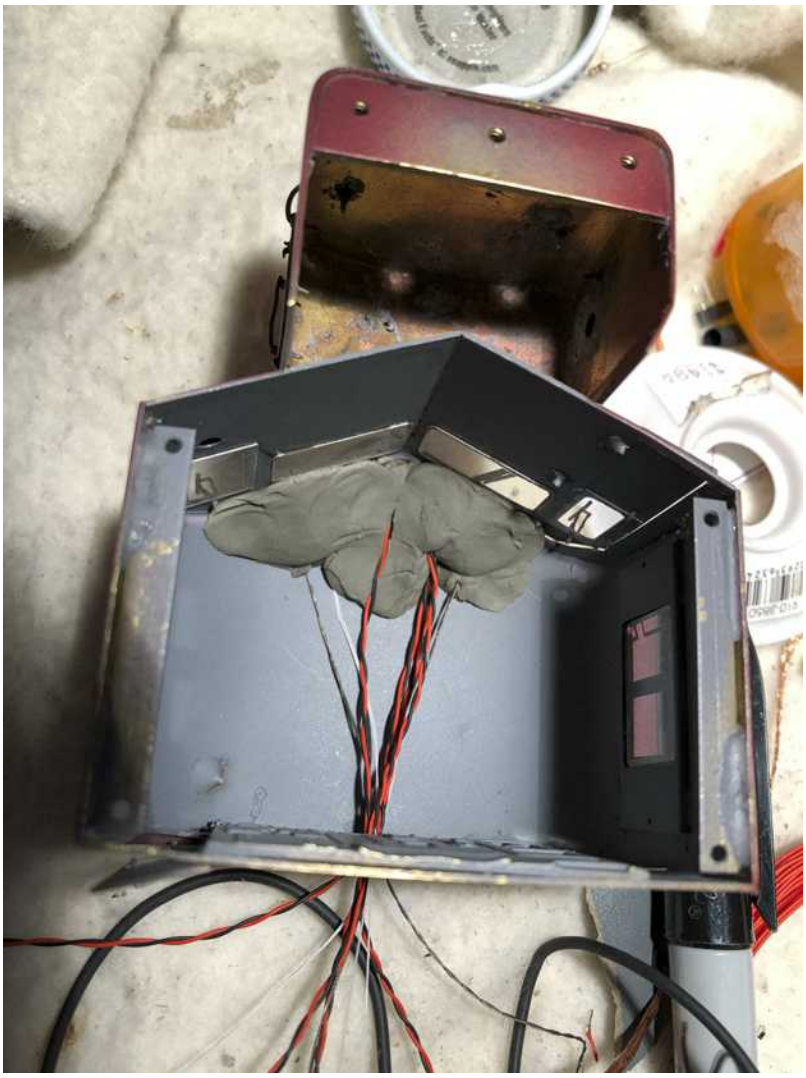
Kinda wondered that myself. Or perhaps part of the truck was scraping on something under the frame. Those shim washers should have messed up the coupler height. Before I disassemble the trucks to strip the old paint, I'll put them on my poor version of a surface plate and see if they are the same height.

I'm still pondering the assembly sequence for rear lighting. It is likely that more brass will need to be removed to allow installation of number board lighting from the inside, and packing the interior volume with black modeling clay to stop light leaks. If at all possible I want to also light the outside white and inside red class lights. So this model would sport 24 LEDs as does the C425.

Bob #27 January 6, 2019, 11:26pm

Gray and black never-hardening modeling clay is a fabulous tool for lighting installs. It is opaque and great for both holding things in place and blocking stray light. When packed behind the number boards, it doesn't have to be pretty since it can't be seen from the outside.

Here's the C425 cab before button-up. There is still one more LED to install in the front walkway light that will run along the center "V".



A new hole in the back of the cab, above the simulated control panels, carries 20 wires into the long hood just below the roof. The red and black wires are very flexible ESU 36 AWG wire. The ultra-fine white and gray wires go to pre-wired 0402 red and white LEDs from LEDBaron, a German eBay seller. Each of those LEDs was dipped in ACC then in setting solution for electrical insulation.

PeteM #28 January 7, 2019, 3:44am

That's so cool Bob! With those class lights maybe you could use Loksound's CV settings to make them cycle through off > white > red > off using only one function button. They've done this for Bowser and Scale Trains but you can download the files. Hopefully they'll work in an "L" decoder. Or I've seen the sound file schematic for this implemented in a V4 on the Loksound Yahoo list so you could copy it.

http://projects.esu.eu/projectoverviews/search?q=97436

http://projects.esu.eu/projectoverviews/search?q=95422

Also just in case, I saw your comment about using ACC with the very fine wires. I just did that with 4 SMD LEDs that had magnet wire pre-soldered. I'd mounted them on the back of a number board (stealing yet another of your great ideas!) but the ACC ate the lacquer and all 4 LEDs blew when I switched them on. Luckily the decoder survived!

Pete

Bob #29 January 7, 2019, 5:49am

Pete -

Great idea. Been there, did that, got the T-shirt.

F5 first turns on the number boards, then also turns on white class lights, then switches to red, then all off. It is simple programming but requires a V4 decoder so that it can be added to the sound schedule.

Unfortunately when power is lost (because Darwin causes a short circuit) the decoder doesn't properly remember which function outputs were on or off. Maybe the V5 decoders will remember.

Sorry to hear about ACC eating insulation on the wires. I've never experienced that.

PeteM #30 January 7, 2019, 3:21pm

LOL that's a clever setup - I figured you'd be way ahead of me… 😀

I'm hoping the V5 will have better starting and slow revs motor control for coreless motors, as well as the extra functions and improved sound quality. The timing sucks though, right after I finally get my whole roster onto Loksound. I swear I'm so unlucky, if reincarnation turns out to be true, I'll end up coming back as me! 😉

Pete

Bob #31 January 11, 2019, 12:21am

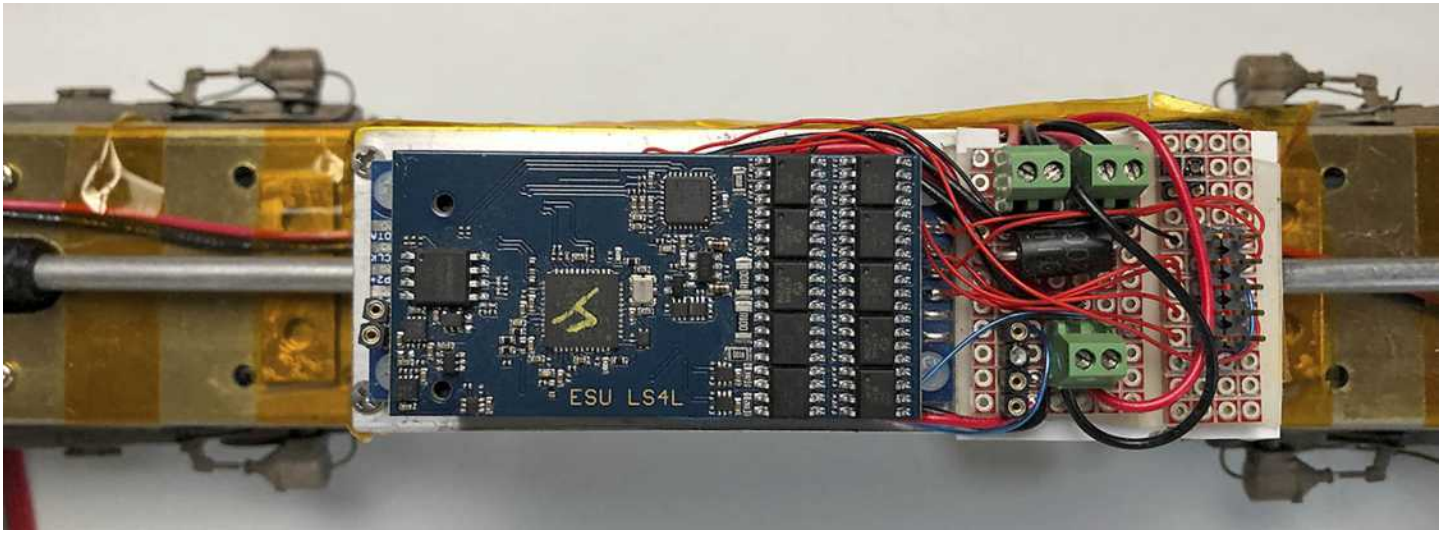
Thanks, Pete.😃

Back to decoder installs, I redesigned the C425 connections between what is on the motor/frame and what connects inside the shell. A bunch of 2-pin plugs wasn't going to cut it for 24 LEDs; connections would be too brittle.

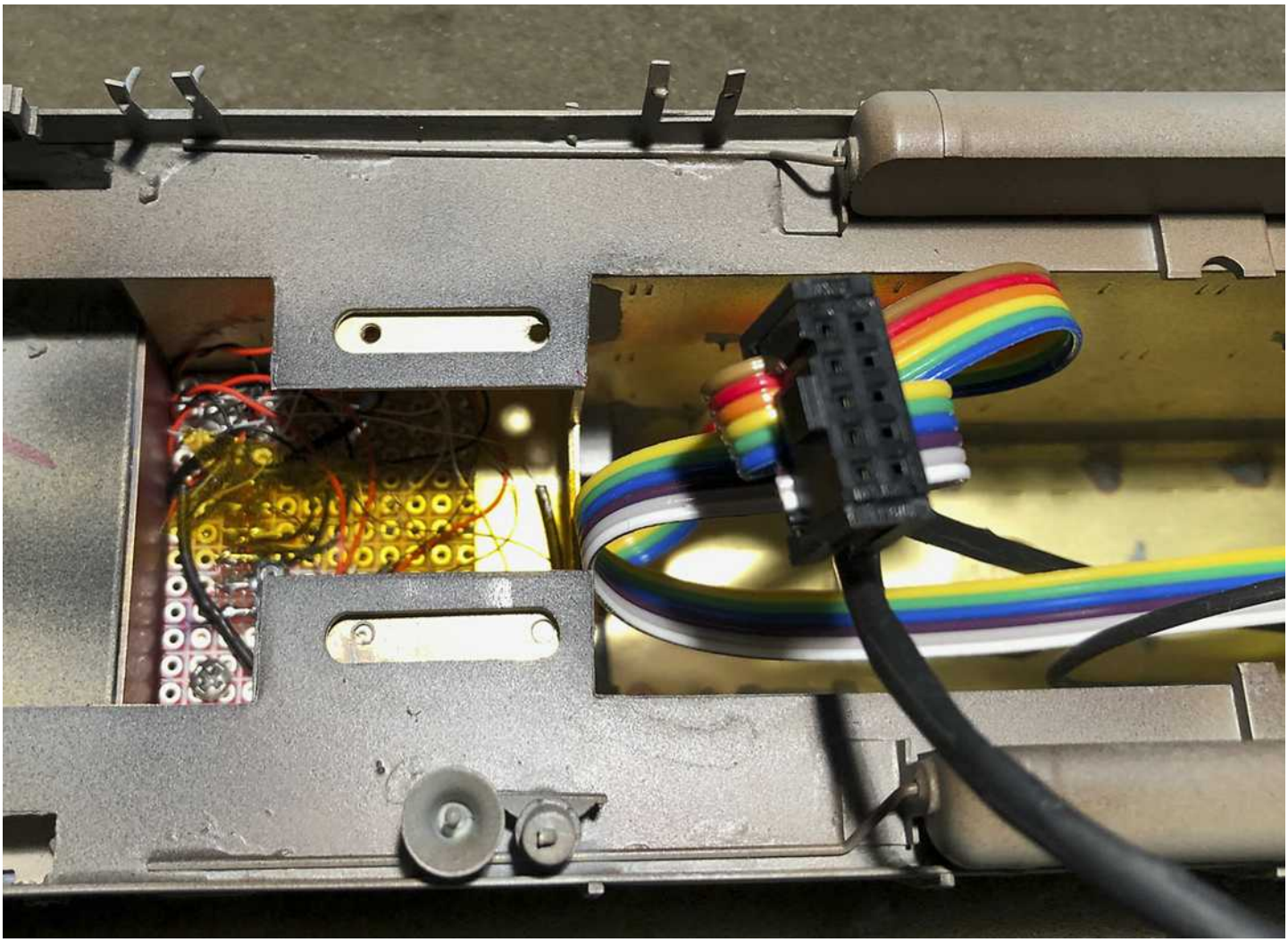
Pondering… what could I do with some 10-pin ribbon cable connectors and some surplus Sparkfun 10-wire ribbon cable? The main plug would be in the middle, with part of the cable heading to the nose and part to the tail. Several wires (including the function common) would need to run both ways.

It worked better than I expected. Here we see a top view of the new decoder wiring connections. Immediately to the right of the decoder is a hand-wired board with 3 green screw terminal connectors. Those connect to the trucks and to the motor. The black blob in the middle is a 1.5KE20CA transient voltage suppression diode wired across the trucks. We can't put "snubbers" across the rail drops because the A&O is fully-signaled. Anyway, a snubber does almost *nothing* when tested on the A&O.

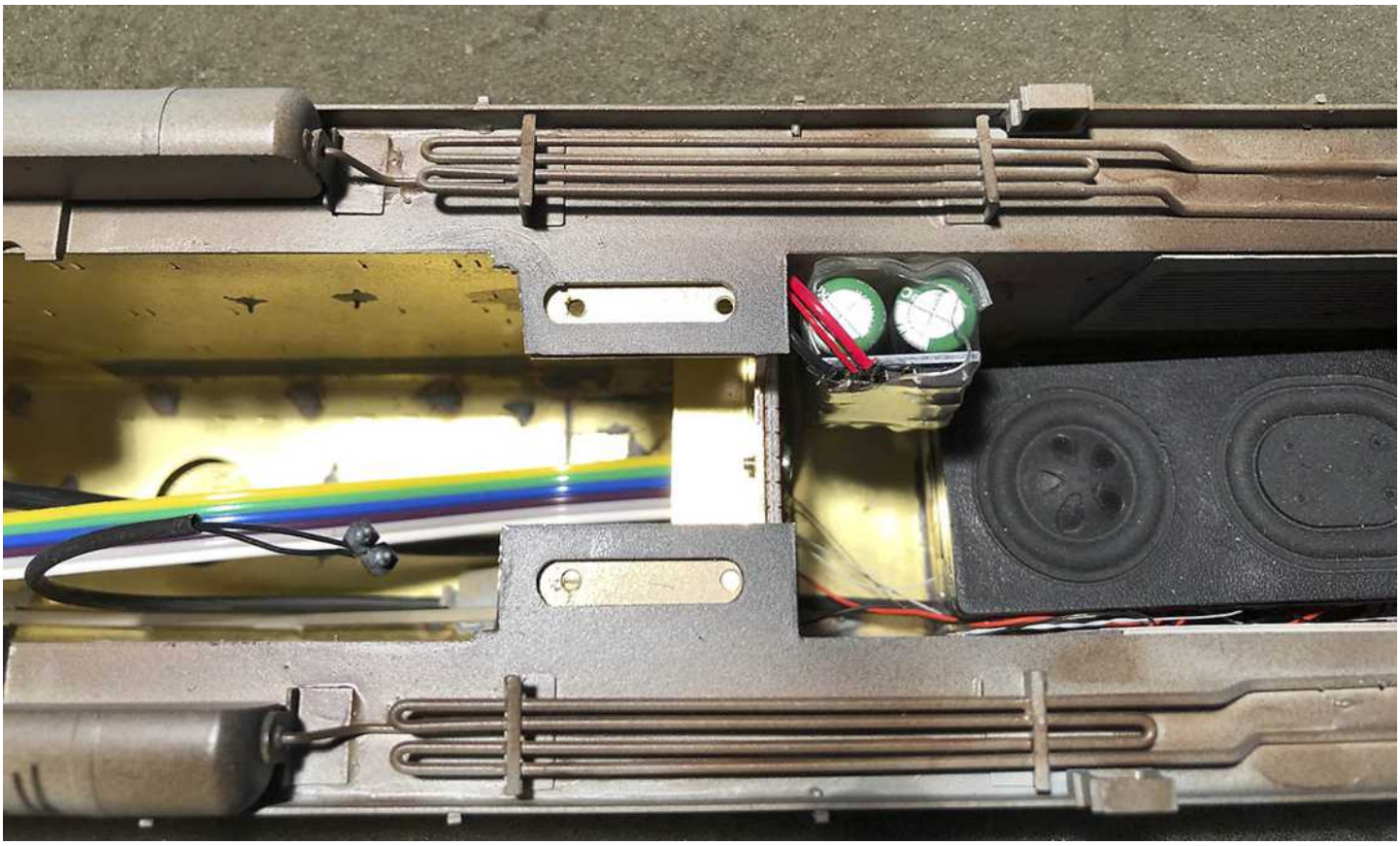
To the far right is another board with a 2x5 pin connector. That carries the lighting functions to the ribbon cable.



Here's the mating connector and the ribbon cable. One of two hand-wired circuit boards can be seen. This one has the resistors needed to drive the LEDs in the nose of the locomotive. The black thing which seems to come out of the bottom of the 10-pin plug is just a cable for the ESU Maxi keep-alive (Power Pack.)



At the rear of the install we see the Tang Band 1925S speaker module and the Power Pack. I need to make the speaker mount more robust; a couple thin strips of double-stick tape are not adequate to hold it in place. A rear PC board that holds the LED resistors is mounted vertically, just to the left of the Power Pack. Both PCBs are mounted with M2 screws into structural supports inside the locomotive. They are not going anywhere.



Note that long ago (early 2000s) we had to hand-tint white LEDs to kill the “blue meanies” and ask Scotty to give them all the power he had. Resistors were sometimes 680 Ohms. With today’s LEDs, the standard 1K is too bright. Fortunately the ESU decoder has dimmer CVs on all outputs, and I’ve dimmed them way down, from 31 (max) to at times 8 or even 4.

PeteM #32 January 11, 2019, 7:32pm

Very well executed as always Bob! I really liked your use of ribbon cable. Reminds me I have some Digitrax SE8c ribbon cable and connectors somewhere… Yet another idea I can steal, thank you! 😀

Regarding headlight LEDs, I found some so called “12V” 3mm water-clear warm-white which have become my standard as they are a nice colour for modern era, and don’t need resistors which is good news for inherently lazy, ham-fisted types such as I.

http://www.led-switch.com/12%20volt%20LED.htm#3mm%2012%20volt%20Water%20Clear%20tag

But as you say, seriously bright! I’ve got them set to about 10 on the Loksound slider, and I use H/L 2 and R/L 2 mapped to separate functions for dim, set to zero on the Loksound slider. That works well

for the ProtoThrottle H/L and R/L switch knobs which go off > dim > bright > ditch light.

That's interesting about the snubbers. I can't actually tell what they do for me (I don't even understand how they work 😟) So I'm going to read your earlier piece about the transient voltage suppression diode again!

Pete

Bob #33 January 12, 2019, 12:40am

Pete -

Thanks for the kind words. I was worried that there wouldn't be enough vertical clearance for the ribbon connector and cable, but it slid in place like butter. Perhaps that was because Overland mounted some of the motor below deck, leaving more room above.

I'll order a few of the LEDs you like. Good clear dome 3mm warm-white LEDs are getting pretty scarce. A few months ago I sampled ones from "the usual suspects." The NCE LEDs had the best color and beam pattern, with only a minor greenish ring or tint in the peripheral beam. So I recently ordered more, and wouldn't you know, they are now useless "flat top" LEDs. No beam, just flood lights. Ugh!

As for snubbers, the party-line is a 0.1 uF 50 volt ceramic capacitor in series with a 100 ohm 1 watt resistor. When I tried that on the A&O, the resistor got quite warm, but my oscilloscope didn't show much if any of an improvement in ringing voltage overshoot at about 40' from a NCE 10A booster, filtered through one of Tony's DCC circuit breakers jumpered to trip at 8A. Only the TVS (Transient Voltage Suppressor) diodes had any meaningful effect.

YMMV. 😬

Craig #34 January 13, 2019, 3:48pm

Bob. I do have to say that your idea of the TVS was a great one. Cap the voltage, regardless of which phase it is in…great idea! And it doesn't take a lot of space (well…for o scale. Hehehehe).

I've started to use some new connectors that we use at work for "space constrained" connections. Vertical height is low, just need some horizontal space (less than your decoder width).

Part is from Phoenix connectors (PN 1770885). Nice thing about these you just need a PCB to mount or you can flip over and glue to a surface. Wire connection slides inside and can be removed when needed.

I do like your ribbon cable. Makes it so easy to reconnect after done.

CentralFan1976 #35 January 29, 2019, 2:04pm

Care to share how to tint down the blue meanies?

Please, sir!
Thanks,

- Mario

Bob #36 January 29, 2019, 10:03pm

Mario -
I haven't tinted LEDs in years. Today I just buy ones that have the right color temperature to start with. I was a fan of NCE warm white LEDs but the latest pack I ordered came with flat-top LEDs instead of round domes. That makes them useless to me because they are now flood lights.

Some folks have had luck with orange Sharpie pens. Years ago I bought transparent paints at art supply stores, paints intended to simulate stained glass.

PeteM #37 January 30, 2019, 10:43pm

Mario,
I had a good result using Pebeo Vitrail yellow stained glass paint.
https://www.currys.com/catalogpc.htm?CATEGORY=PEBEO_VITRAIL_GLASS_PAINT

I found the yellow too intense out of the bottle so I reduced it with their lightening medium
https://www.currys.com/product.htm?Product=VIT051000&Source=Category&Category=PEBEO_VITRAIL_GLASS_PAINT

I found individual jars at Curry's, didn't have to buy a whole set.

Pete

Bob #38 January 31, 2019, 12:15am

Pete and Mario-

I couldn't remember the brand of paint I used for tinting LEDs, but Pete jogged my memory with **Pebeo**!

For the ca. 2000 blue meanie LEDs I originally tinted (still running in my ABA F3s), using just yellow made them turn green, since yellow is minus blue and those LEDs were greenish-blue. So I added a little bit of magenta, which is minus green. It took some trial and error, but eventually I arrived at an orange paint that worked for that package of LEDs.

When tinting them I made a small LED tester out of a 9V battery, switch, connector, 1K LED resistor, and a 1.5V incandescent lamp inside a white styrene tube (with appropriate lamp resistor in series.) The lamp+tube served as the color appearance reference, allowing me to tweak (not twerk) tints until each LED reasonably matched the bulb.

Over almost 20 years those paints solidified in the bottles.

For the C425 front class lights I lathe turned some small clear polycarbonate lenses, then tinted the outside domes with Marabu Glas procured at a local Jerry's Artarama. It came in 1/2 ounce bottles. Although it is no longer locally stocked, the sales rep said they can still order it or I could buy it online. I can't tell from the info on Jerry's web site, but the "Orange" might be about the right color for bluish LEDs. For the class lights, I used "Dark Green", "Cherry" and "Sunshine Yellow." The yellow was too strong and I should have diluted it before painting.

I only illuminated the white and red class lights, using pre-wired 0402 LEDs from German eBay seller LEDBaron. Their red LED is a very pure red color, too pure compared to the prototype. I wonder if a white LED behind the red lens would look more accurate. But the back of the 425 only has only one class light lens on each side, for all colors. A little lever was used to spin a filter wheel between a clear hole, red filter, and green filter. So I needed to put colored LEDs behind each of them. Perhaps tinting the LEDs *after* insulating them would be sufficient, but I went with red and their warmest-white LEDs.

One can obsess over the color of each LED, or quickly proclaim each LED as "good enough." That's an individual call.

All the best.

Bob #39 February 27, 2019, 12:27am

It is a slowly advancing project but I finally was satisfied with the C424 long hood end modifications, so it was time to solder it back up. I used a PBL resistance iron with a fresh carbon tip, and PBL 50-50 solder paste in a syringe (sadly, no longer available.) The acid flux in the paste worked *great*, and washed off easily with a toothbrush and warm tap water. The result was a lot more solid end solder joint compared to when it first arrived.

I also went around the cab and long hood re-soldering all of the structural brass members. In my personal experience, many of my O-scale 1980s Overland brass diesels had many brittle, cold solder joints that failed during handling.

The class lights will have to go in first, LEDs then lenses. That will be followed by black modeling clay to block stray light.

Next will be the rear headlights, inserted from the outside, in lathe-turned aluminum reflectors like the C425, the backs of both packed with black clay inserted through the number boards.

Finally the number boards need to go in, again from the outside. The white styrene diffusers need to be smaller in size and the whole assembly held into place by a thin clear number board unit, printed by the Alps in reverse.