Model Railroad Hobbyist magazine™

HAVING FUN WITH TRAINS

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eReader Edition

August 2012

Animating an Athearn crane

EXCLUSIVE! Grand Rails National Convention Report

- Modeling CP's Sudbury Division
- Steam loco scratchbuilding, part 3
- Build a CTC-style control panel
- EMD GP38-3 kitbash

... and lots *more, inside*!

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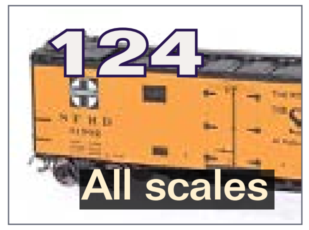

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Bring a Wrecking Crane to Life

With Micro Motors and Sound Decoders

by Dr. Geoff Bunza

Photos by the author except where noted otherwise

Reader Feedback (click here)

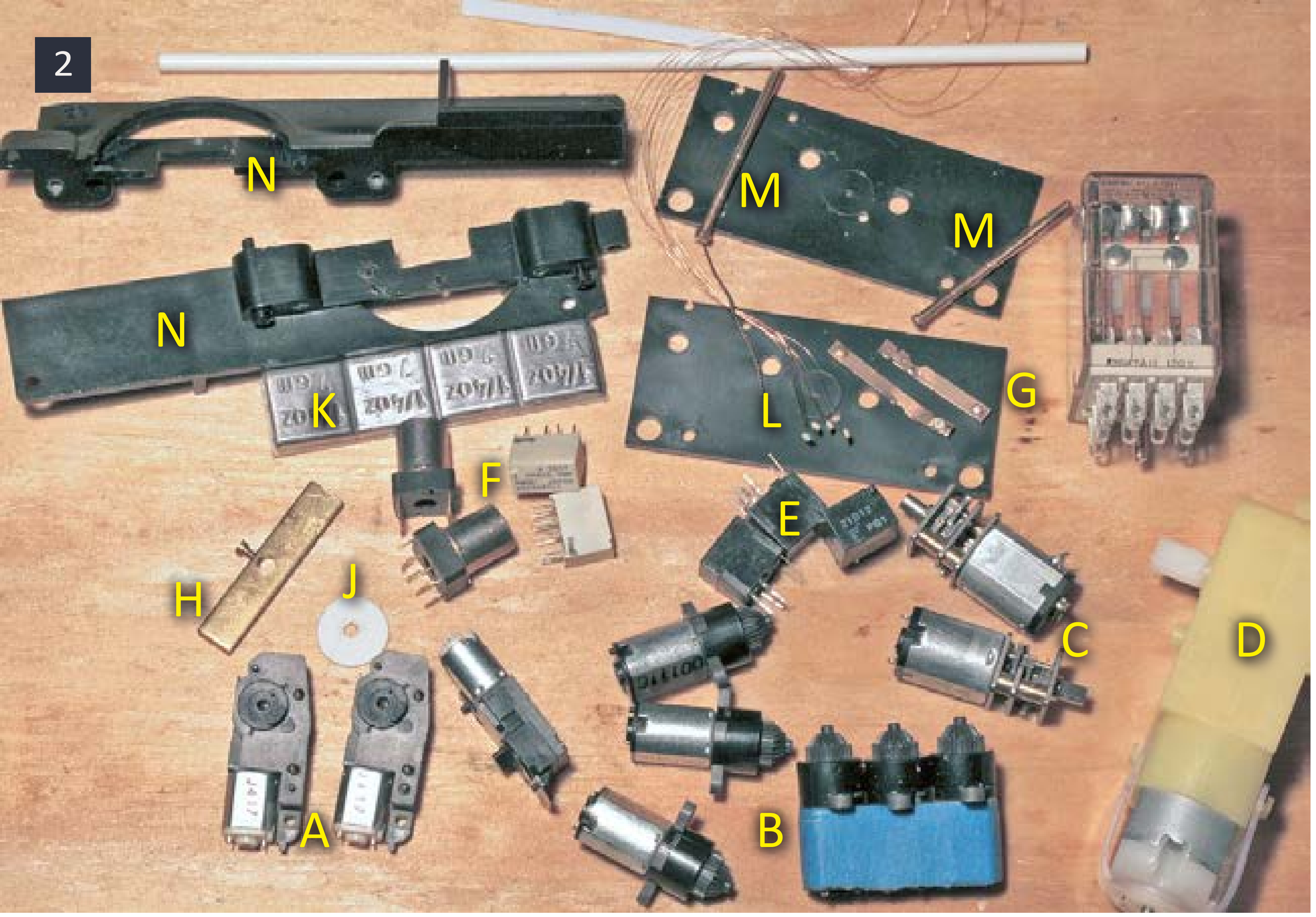
Figure 1: A NYC crane, prepares to lift an errant box car back onto the track. Geoff fully animated this HO scale Athearn crane with sound and working lights – Charlie Comstock photo

Like the prototype, model railroads often have a wrecking crane standing by, waiting for action. Some of the larger cranes were quite powerful and looked as impressive as the locomotives or cars they were called upon to lift.

Older steam cranes, such as the Athearn 250-ton crane model, had a boiler, pistons, gears, and accompanying machinery which included front and rear lights, work lights, a whistle, and sometimes (though rarely) a bell. One 120-ton Southern Pacific crane which I inspected had no fewer than nine external lights! The whistles were usually a smaller, single chime, used to warn of impending crane movement.

One to three hooks were used for lifting, each rated for the maximum weight that it could lift.

Outriggers were deployed on both sides at the front and rear to stabilize the crane when lifting heavy loads. These "I" beams were pulled out and placed upon wooden blocks or cribbing (manually, by the way) to steady



2: The bits and pieces used in my crane modification.

- A – Boom and hook gear motors
- B – I considered, but didn't use these gear motors
- C – Cab rotation drive motors
- D – This drive was rejected because of its size
- E – These 12V SPDT relays control power to the drive motors
- F – Other relay possibilities
- G – Big relay and disassembled contacts used for well wiper
- H – Holding bar for bracing the cab rotation drive axle
- J – A side of the boom and hook cable spindles
- K – Lead weights
- L – Micro LED's (0603) with attached wire leads
- M – Sprung pogo contact pins
- N – Cab base halves

the crane. When the crane boom was deployed to the side, this allowed lifting heavier loads without tipping the crane or torquing the frame. Many railroads distinguished between derricks and cranes. Derricks were most often used for clearing wrecks and were heavy lifters (>100 tons). Cranes usually had longer, lighter booms, and could be equipped with clamshells, draglines, or electromagnets for maintenance jobs.

Some cranes were self-propelled but a top speed of a few miles per hour limited them to repositioning themselves at a wreck site. Sometimes these were called locomotive cranes. Most steam cranes were not self-propelled. Once in place, a steam crane created quite a show – lights, sound, and action.

I love animating things and I couldn't resist bringing life to the motionless and silent crane in my yard.

Getting Started

The Athearn steam crane (more correctly labeled steam derrick) model has been available to HO modelers for over 50 years. It represents one of the larger (but not largest) railroad steam wrecking cranes ever made.

The Louisville and Nashville (railroad.net/articles/railfanning/worktrains2/media/LWF0027.jpg) and Southern Pacific railroads (railpictures.net/viewphoto.php?id=127831) had cranes very close to the Athearn model. I wanted to capture its look, sound and feel, but I didn't feel compelled to recreate a specific prototype.

Low cost miniature gear motors, micro LED's, and Digitrax fully programmable DCC sound decoders (SDN144PS) allowed me to bring my venerable Athearn model crane to life.

Finding the right components took a while – I've collected small motors and gears for many years. You can see many of the parts I used (and some others I collected) in figure 2. I purchased my gear motors off eBay. Together with bits of styrene, brass, and some wire, I launched into the project. This is how I went about it.

Electrical Contacts and Cab Drive

I am going to assume you already know how to assemble and disassemble the Athearn kit. I obtained a couple of assembled cranes at a local swap meet for experimentation.

Good power pickup from the rails is a necessity. The later version of the Athearn crane has six-wheel buckeye trucks with plastic frames. Intermountain metal wheel sets can be inserted in the truck by spreading the frame slightly (3). To insure good conductivity from the rails, I chose to use a combination of flat shim stock and wire contacts.

You'll notice that the wire contacts use multiple thin wires, helping insure electrical contact while traversing irregular

3: Spread the truck frame sides to insert Intermountain metal wheel sets.

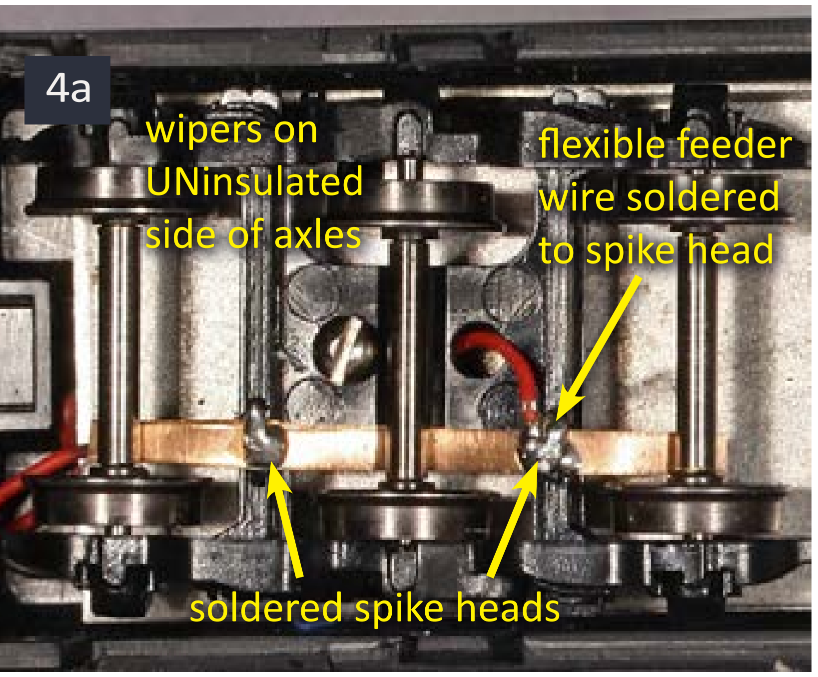
track. Cut a 1/8” wide strip from a sheet of 0.003” phosphor bronze shim stock (Tomar wiper kit H-825), and slip it under the axles on the uninsulated side of the axle. Drill a small hole on each truck frame rib. File or sand the heads of small or medium rail spikes to expose bare metal and insert them into the holes with the spike heads overlaying the contact strip.

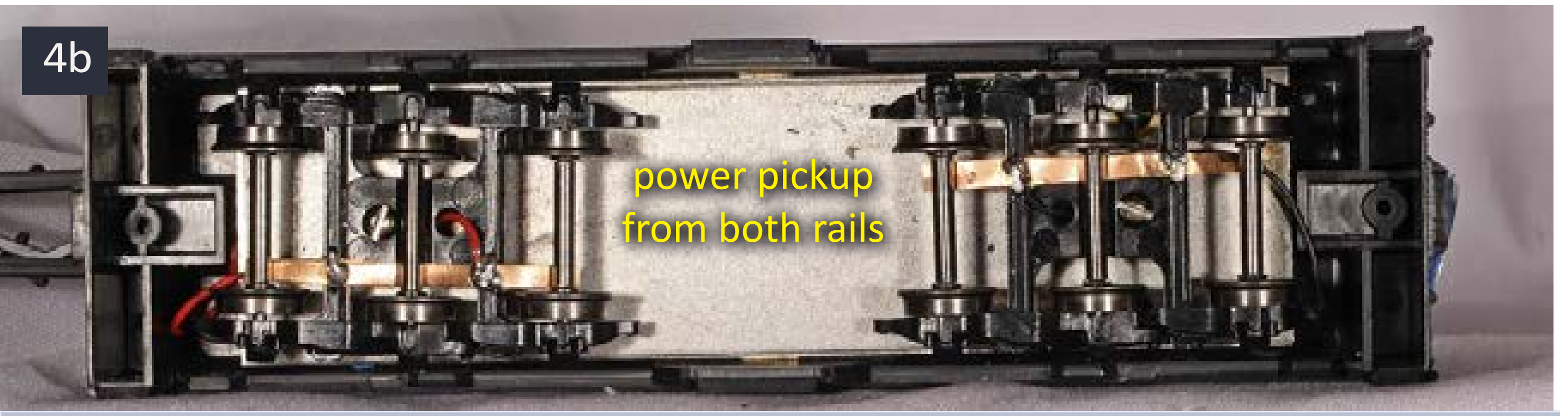
Carefully solder the spike head to the contact strip. Then solder a four to six inch piece of thin, very flexible wire to one of the spike heads. Feed the wire through the second mounting hole on the truck.

The trucks are mounted facing opposite directions so one feeder draws power from the right rail and the other truck will pick up power from the left rail.

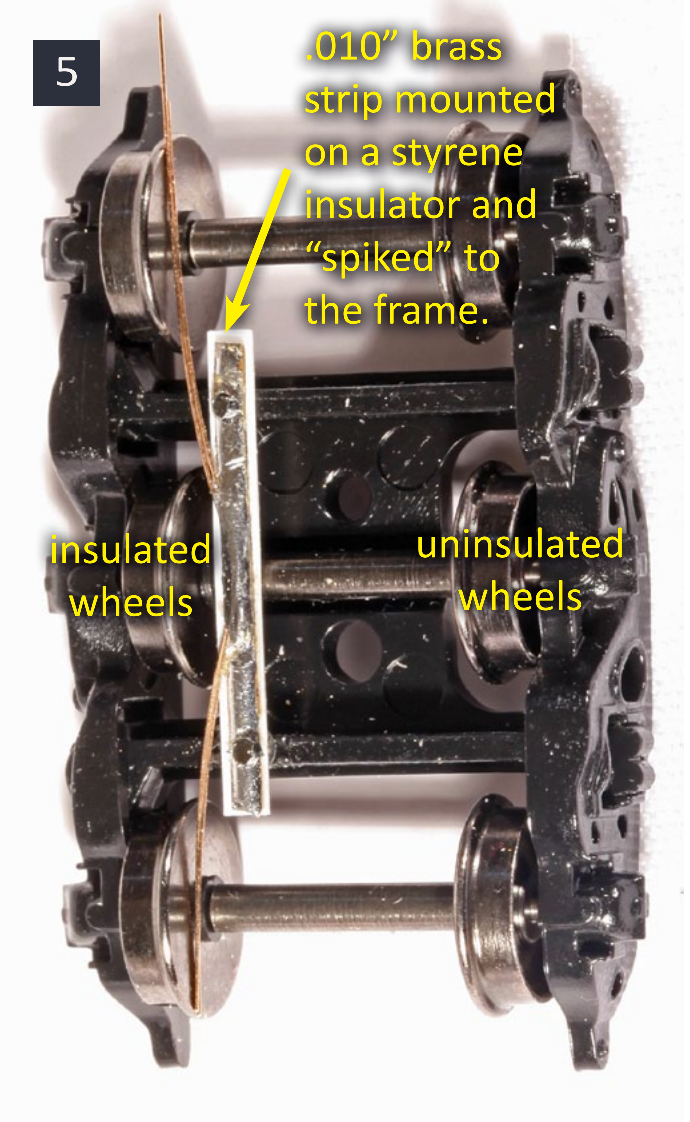
Optionally, wire contact wipers can be added to the insulated wheels for improved electrical pickup. This will give your crane 10- or 12-wheel electrical pick up. Cut a piece of 1/16” x 0.010” brass strip, then then solder a pair of 0.008” phosphor bronze wires, bent into a shallow “V” shape. Use a pair of wires to create a “bifurcated” contact for each wheel to improve electrical conductivity (5).

Glue the brass strip to a piece of .020” styrene slightly wider than the brass to prevent shorts with the middle axle. Drill holes and mount the wiper assembly using rail spikes as with the previously described pickup wipers in figures 4a and 4b. Take care not to deform the contact wires. Make sure the wires touch the back face of the wheels but are well above the axle. Trim the excess wire, and solder 4” to 6” of flexible wire to the brass strip and feed it through the second open frame hole. Be sure to color code each track’s wiper wires.





4a and 4b: Phosphor bronze contact wipers must be added to the crane’s trucks for primary power pickup.



5: Add phosphor bronze wires to wipe the backs of the insulated wheels. When these wipers are added to the axle wipers (in figure 4), track power is picked up by 10 wheels, eliminating sound decoder dropouts due to poor electrical connection.

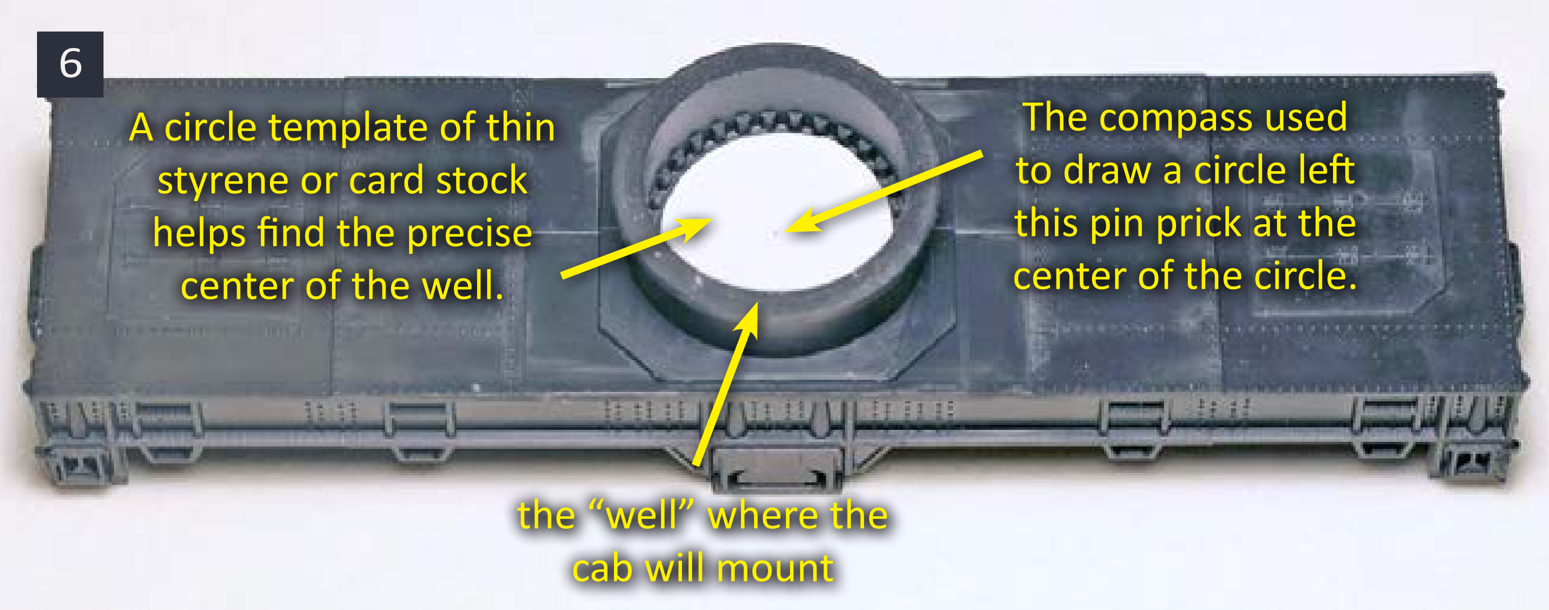
Preparing the Well

Set the trucks aside. Now we’ll prepare the “well” where the crane connects with the chassis.

A gear motor, with its shaft fixed to the chassis and the crane cab attached to its body, will rotate the crane. Besides securing the drive motor shaft, we’re also faced with getting the two electrical connections (from the rails) into the cab. The cab can turn 360 degrees—so wire connections are not practical. They could become severely twisted and break.

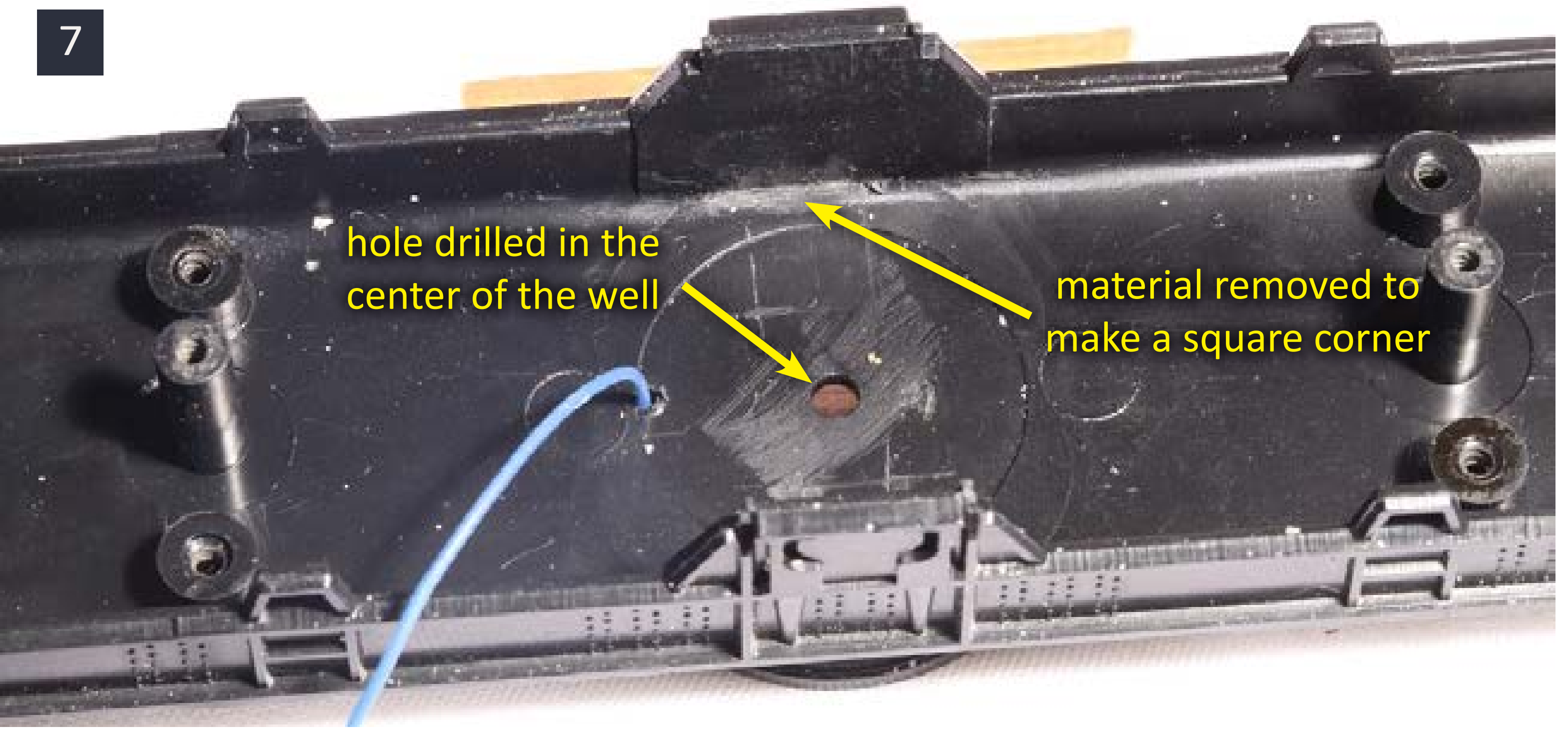
We need to drill a vertical hole for the motor shaft in the exact center of the crane well’s bottom. Measure the inside of the well, divide by two, and using a compass, draw a circle with this radius on a thin piece of sheet plastic or card stock. Make sure you can see the center point of the circle clearly.

Carefully cut out the disk with a pair of scissors – it should be a perfect fit in the bottom of the well. If not, re-do the process until it does—I needed three attempts before I got it right (6). Mark the center of the bottom of the well



6: Cut a circle of material that will fit exactly in the well as a way to locate the precise center of the well.

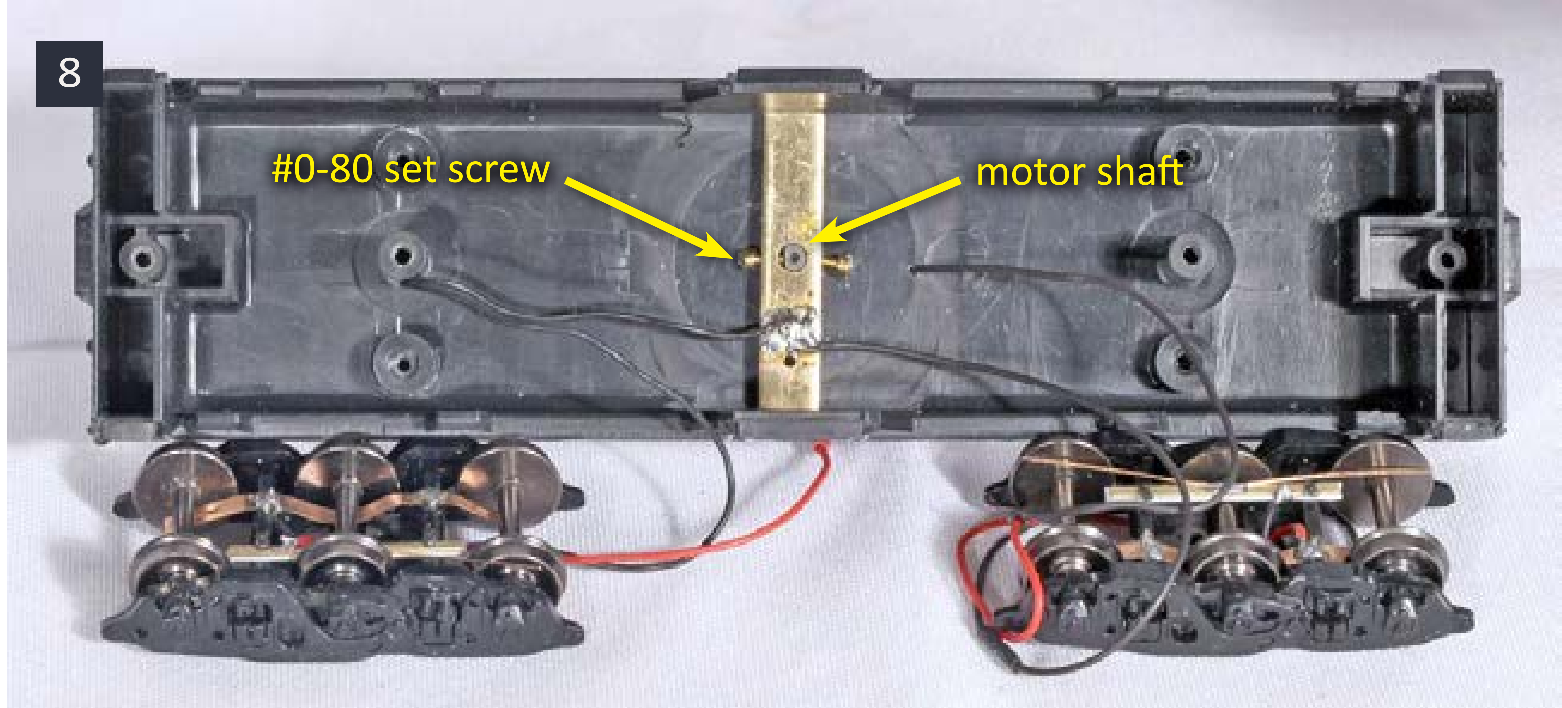
7: The bottom of the frame, must be ground away to make the bottom corners square.



with a scriber or pin. Remove the disk and drill a hole for the gear motor axle used to turn the cab – 3 millimeters in my case. Take care that the hole is drilled vertically. If you have a small drill press, use it.

Turn the chassis over and note the corners along the side opposite the well-bottom-hole are not square. Square them off for about 3/8" with a mototool using a router or grinding bit on either side of the hole.

Now cut a length of brass 1/4" by 3/32" bar stock to just barely fit across the bottom of the chassis. It should be an easy but snug fit. Now center it over the



8: The brass mounting bar with the shaft of the cab-rotation motor installed. The 0-80 screws prevent the shaft from rotating.

hole you drilled before, then mark and drill a vertical hole of the same diameter through the brass. My motor's shaft already had a flat on the end of the axle. If yours does not, make one.

Drill and tap holes for #0-80 screws which will hold the axle in place. This way the motor and gearbox will turn with the crane cab as a unit when mounted (8). Check that you can insert the motor axle and tighten the holding screws with ease.

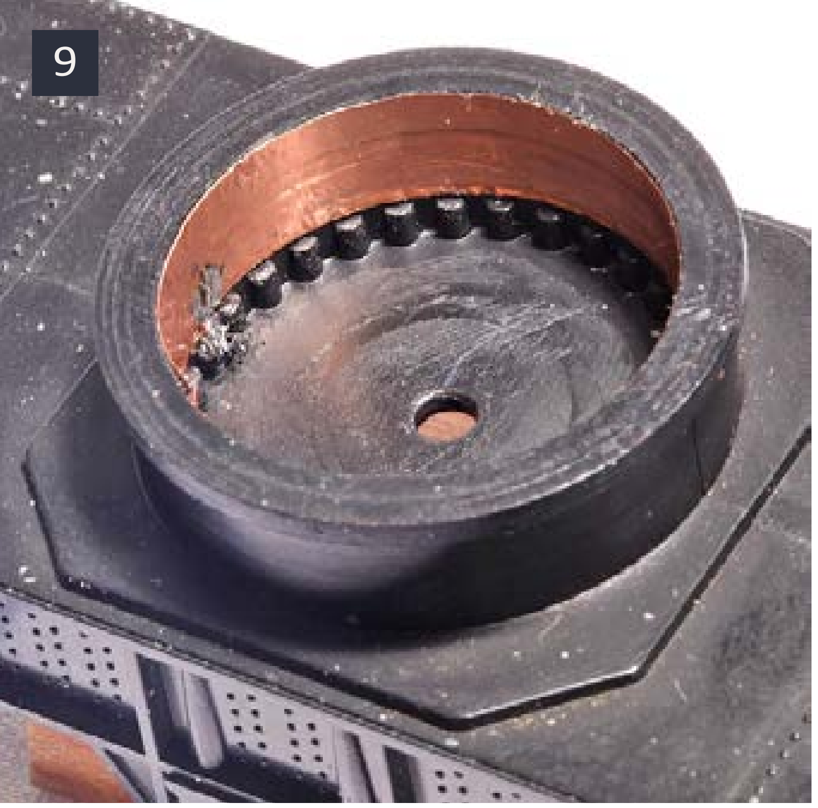
Getting Power into the Cab

I chose to pass one rail's power through the gearbox and shaft. The other polarity would require wipers on a contact surface. I came up with two ways to make wipers and contacts: a washer in the bottom of the cab well and a strip around the wall of the cab well. You can use either (or both) of these methods.

I started by drilling two #60 holes in the bottom of the well near the longitudinal center line of the chassis. Make them as close to the walls of the well as possible. Track power wires will pass through these holes.

I chose to use copper tape to make a contact surface around the inside of the well (9). The tape must lie perfectly flat against the well with a carefully fitted butt joint. As the contact slider moves across the joint, it can hang up on bumps or imperfections and rip the tape apart. Thread a small wire through one of the #60 holes in the bottom of the well and solder it to the bottom edge of the foil.

For the floor contact method prepare a "washer" of .005" to .008" thick phosphor bronze shim stock. Draw two circles on the stock; one the same radius as the crane well, the other with a radius about 1/4" smaller. Cut out the washer (outer circle) – scissors work well for this. Removing the inner part is trickier. I drilled lots of holes around



9: Copper foil around the side of the well provides a contact surface for track power.

10: A phosphor bronze "washer" on the bottom of the well provides an alternate source for track power. Both contact surfaces are for one rail. The other rail's power will be fed through the metal gear box.

the inner line, then cut through them with a sharp hobby knife. The edge was pretty rough so I filed it smooth. Make sure the washer's hole is large enough to clear the motor's gear box. If the washer and gearbox touch you'll have a short circuit.

Solder a small wire to the top edge of the phosphor bronze washer making sure the washer lays flat after the wire is connected.

Insert the wire through one of the holes you drilled and test fit the washer in the bottom of the well. If it fits and lays flat, glue the washer in place with ACC making sure it's centered in the well.

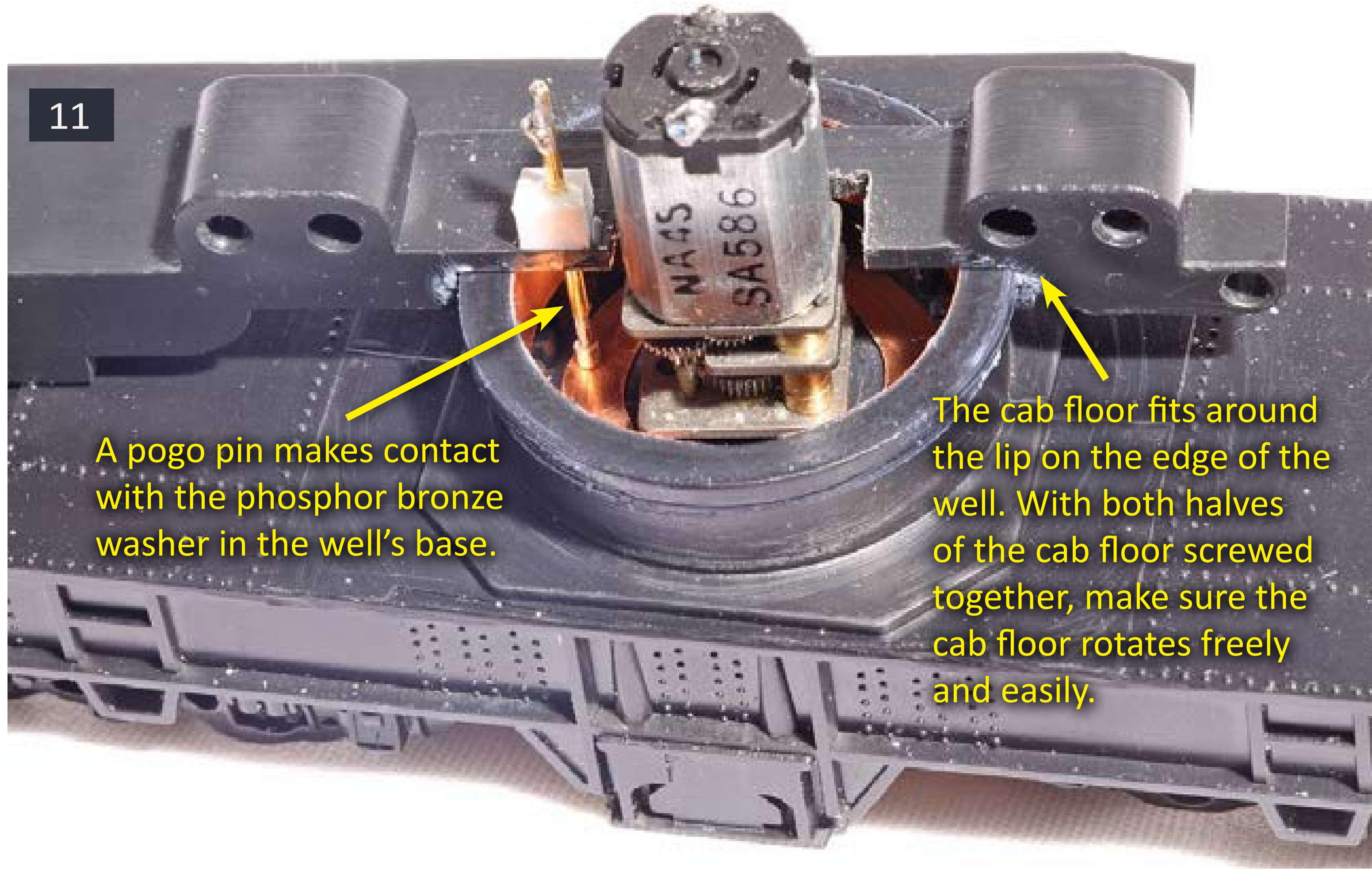
Figure 10 shows both the well floor contact and wall contact strips with the motor and gear box in place.

Mounting the Cab

Screw the two pieces of the cab floor together. Center them above the well and scribe the dimensions of the gearbox on the cab floor. Remember we are mounting the gearbox shaft-down in hole in the bottom of the well.

Disassemble the floor halves and cut out the opening for the motor. This should be a loose fit over the motor, but the flat sides of the motor will press against the sides of the rectangular cutout to move the cab.

It is very important that the cab floor rotates easily around the well. Take time to smooth the floor and well mount until you can rotate the assembled halves easily.



11: One half of the cab's base with cut-out for the motor and with a pogo pin power pickup installed.

Remove the floor and insert the gearmotor attaching its shaft to the brass mounting bar under the frame, using the set screws to hold it in place.

Hook up some temporary power connections and test run the motor to ensure it is vertical and rotates freely under its own power. Assemble the floor around the motor and gearbox and test run it again.

It took me over an hour to get the motor to smoothly rotate the cab. I've done this for several models and found the adjustment process was slightly different for each. A touch of plastic compatible Teflon grease may help.

Widening the opening in the floor may be intuitive, but can increase the play in the mechanism. If you cut too wide an opening, cement plastic strips to the floor, to narrow the gap.

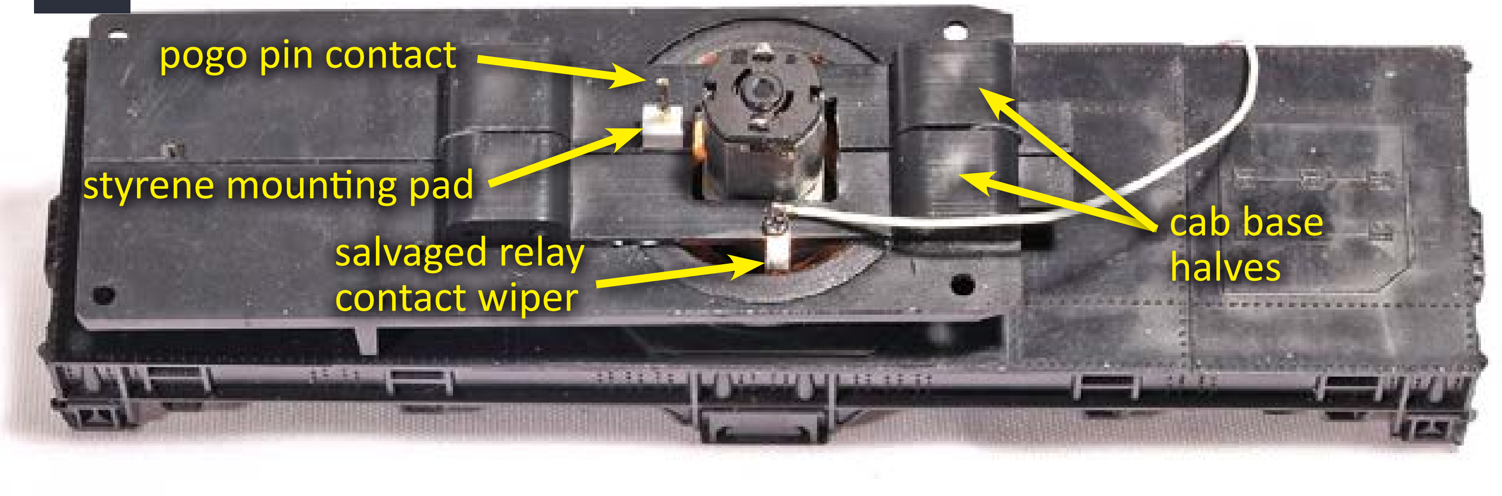
Adding Power Contacts

Now we need a way to get power from the contact strips in the well floor and/or walls, to the electronics in the cab (12).

For the bottom washer contact, I found what are sometimes called pogo pins (available from www.adafruit.com and www.goldmine-elec.com). They are straight, spring loaded pins (11).

If you use these, drill a mounting hole though the cab floor and in a 1/8" by 1/8" styrene mounting pad allowing

12



12: The cab base, installed over the cab rotation drive motor with both pogo-pin and contact wiper electrical pickups.

the spring contact to gently hit the center of the well's phosphor bronze contact washer with a slight compression of the pin. If the contact end of your pin is serrated or very sharp, file and sand it smooth to minimize friction and wear. If you experience continuity problems, use two pogo pins, wired in parallel, on opposite sides of the motor.

For side wall contacts you can use wipers made of phosphor bronze, either wire, or strips. Alternatively, a salvaged contact from an old relay works well. I used the latter – they have polished contact nubs which make good contact with the copper tape. Bend the contacts so they gently touch the inner wall. I screwed them onto the cab's floor (12).

NOTE: If you use both types of contacts (floor and wall), make sure the friction isn't excessive which makes the motor work too hard.

Now install the motor and cab floor assembly. Temporarily attach one motor electrical contact to either (or both) sliding contact(s) and the other motor electrical terminal to the metal gearbox or motor housing. Test the assembly by connecting power to the brass motor mounting bar and the feeder wire(s) to the phosphor bronze washer or wall contact foil from below the chassis. If you did everything right, the cab floor should rotate freely, moving indefinitely in each direction without problem.

Boom and Hook Drive

Trim back the small gear motors (13) as much as possible (cutting and filing) so two of them can be stacked and screwed with 0-80 screws after holes are drilled and tapped.

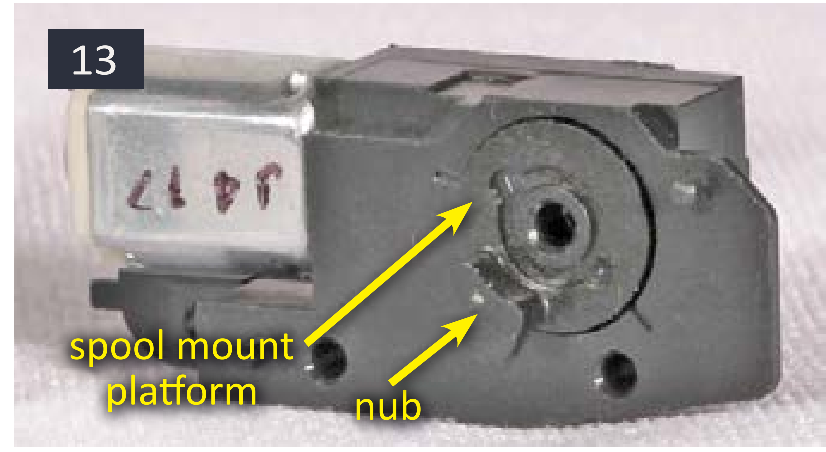
Then glue the stack to a .040" styrene base plate which sits on top of a spool mounting plate cut to fit the inside width of the back of the crane's cab (14). Three miniature relays will be glued, side-by-side to the bottom plate.

I made the drive spools for the boom and hook cables from .010" styrene sheet and a styrene tube (15). I cut two disks and drilled them to clear a 2-56 screw, then cut a length of 3/16" tube and drilled it to also clear a 2-56 screw.

The 2-56 screw needs to be cut to length and goes into a tapped hole in the gear drive. I had to use a bottoming tap – one the cuts threads all the way to the bottom of a hole – as the hole is very shallow. Assembly is easy – one styrene disk goes on the screw, then the tubing, then the other disk.

The gear drive has a plastic nub protruding from the spool mounting plate (13). I filed it down to a pin and made a corresponding hole in the inner spool disk. This locks the spool

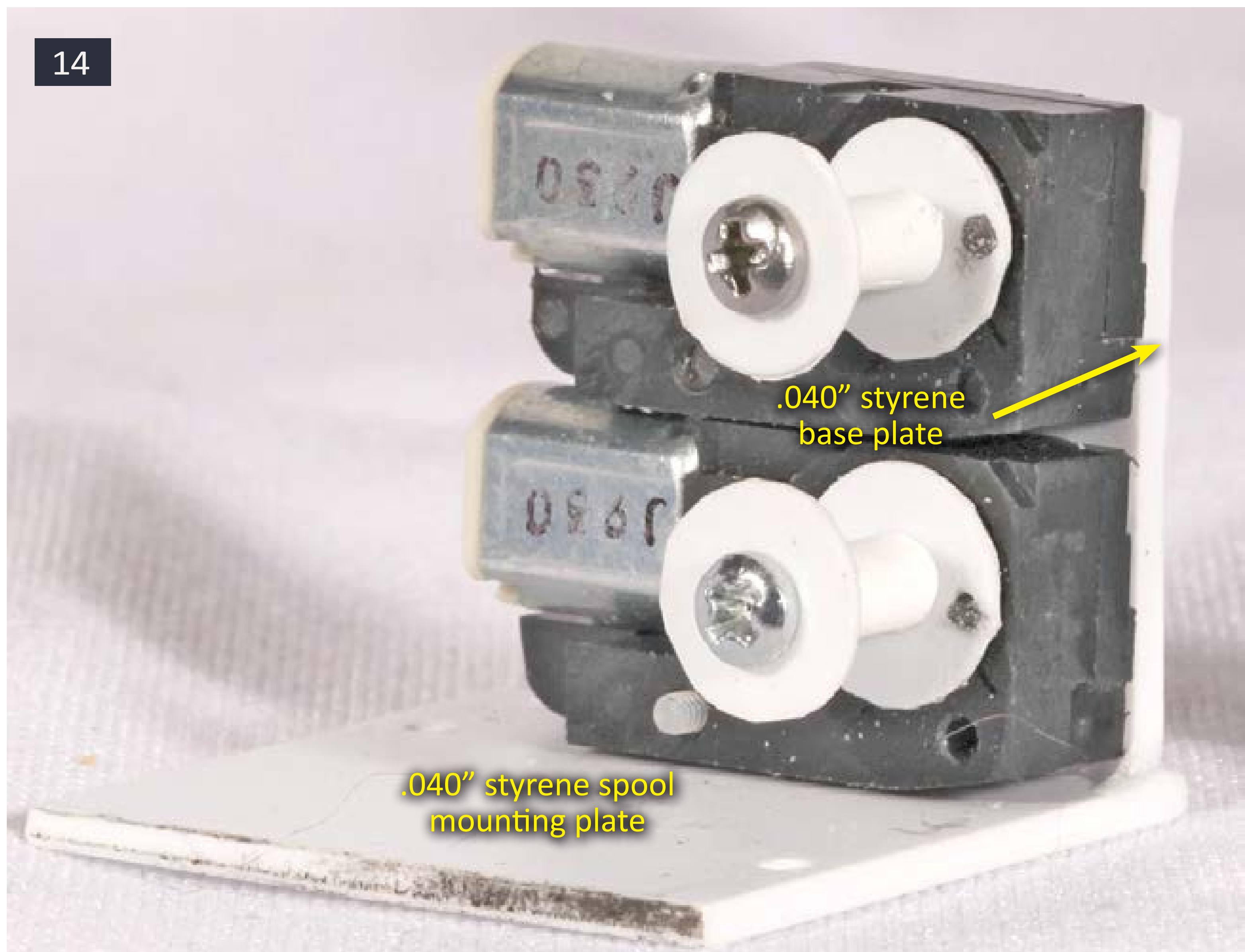
13

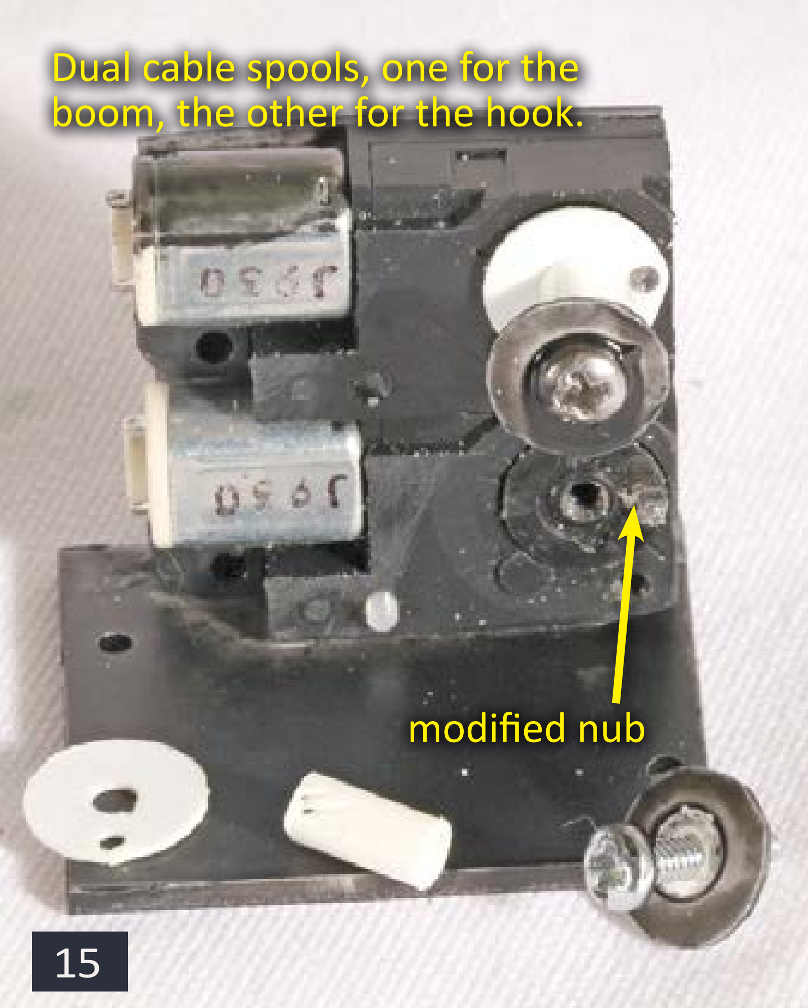


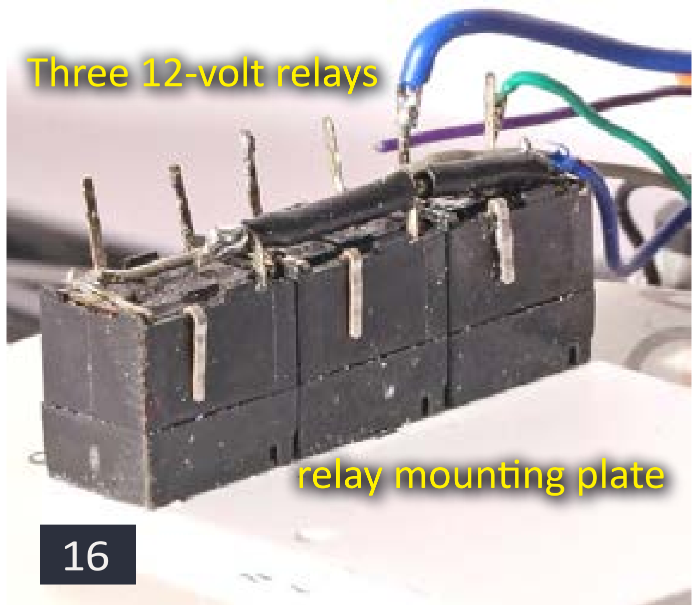
13: Boom/hook drive gear motor before trimming.

14: Drive motors (with spools) after trimming and mounting.

14







15: Drive spool parts.

16: Motor control relays mounted on bottom plate.

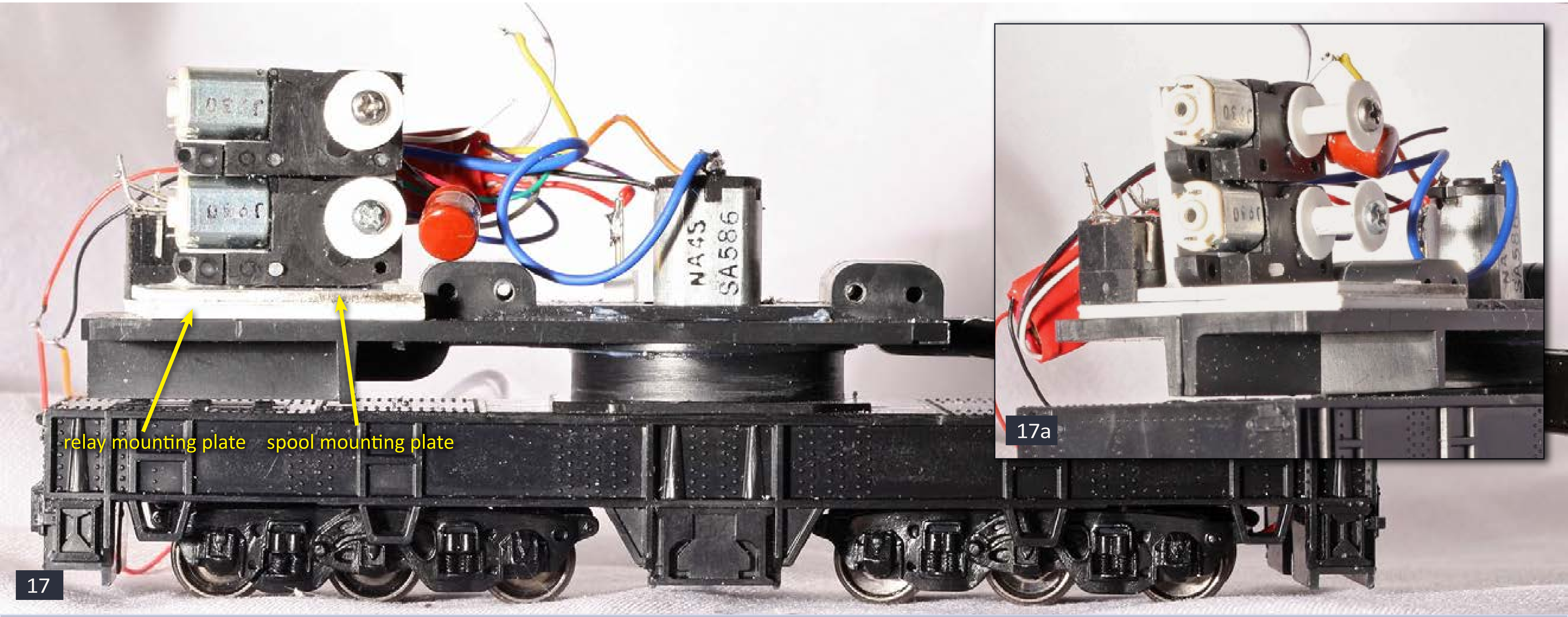
17: Mechanical assembly with cab floor, motors, relays, boom, and sound decoder.

and mounting plate together so I don't have to overtighten the 2-56 mounting screw (likely stripping the threads in the shallow hole).

The relay assembly and the motor assembly are screwed to the floor assembly of the cab to facilitate dis-assembly if needed. If you glue the plates to the cab floor, only glue them to one half of the floor so you can still separate the floor halves if needed.

I found that nylon thread was best (strong and flexible) for the boom and hook cables. I used lighter thread for the hook than for the boom – this was important since the metal hooks are not very heavy and they need to put tension on the "cables" to keep them taut. The hooks were attached normally (via Athearn instructions), but I made sure the routing back to the take-up spools was smooth and unobstructed. I added a small piece of tubing between the boom beams to widen the take-up path for the main hook. This prevented the main hook cables from twisting together when the hook was raised or lowered.

I attached the cables to the spools by loosening the spool assemblies, wind-ing the thread around the screw once between the sleeve and the end disk, then retightening the screw to hold it



in place. I applied power to the spool motor while applying a little tension to the thread to wind it onto the spool.

Wiring

The wiring is straightforward, even though figure 18 makes it look complicated. A Digitrax SDN144PS sound decoder is the heart of the crane.

The "throttle" controls the speed of rotation, boom, or hook movement after connecting that motor to the decoder using F1, F3, or F4.

Note: I remapped the function output wires of the SDN144PS using configuration variables.

I custom programmed the decoder with prototype crane recordings (mostly taken from a Southern Pacific 120-ton crane at [Antique Powerland in Brooks, Oregon](#)) for all decoder sounds.

Because space in the crane's cab is at a premium, I removed the eight-pin plug from the decoder and soldered wires directly to it to save precious space.

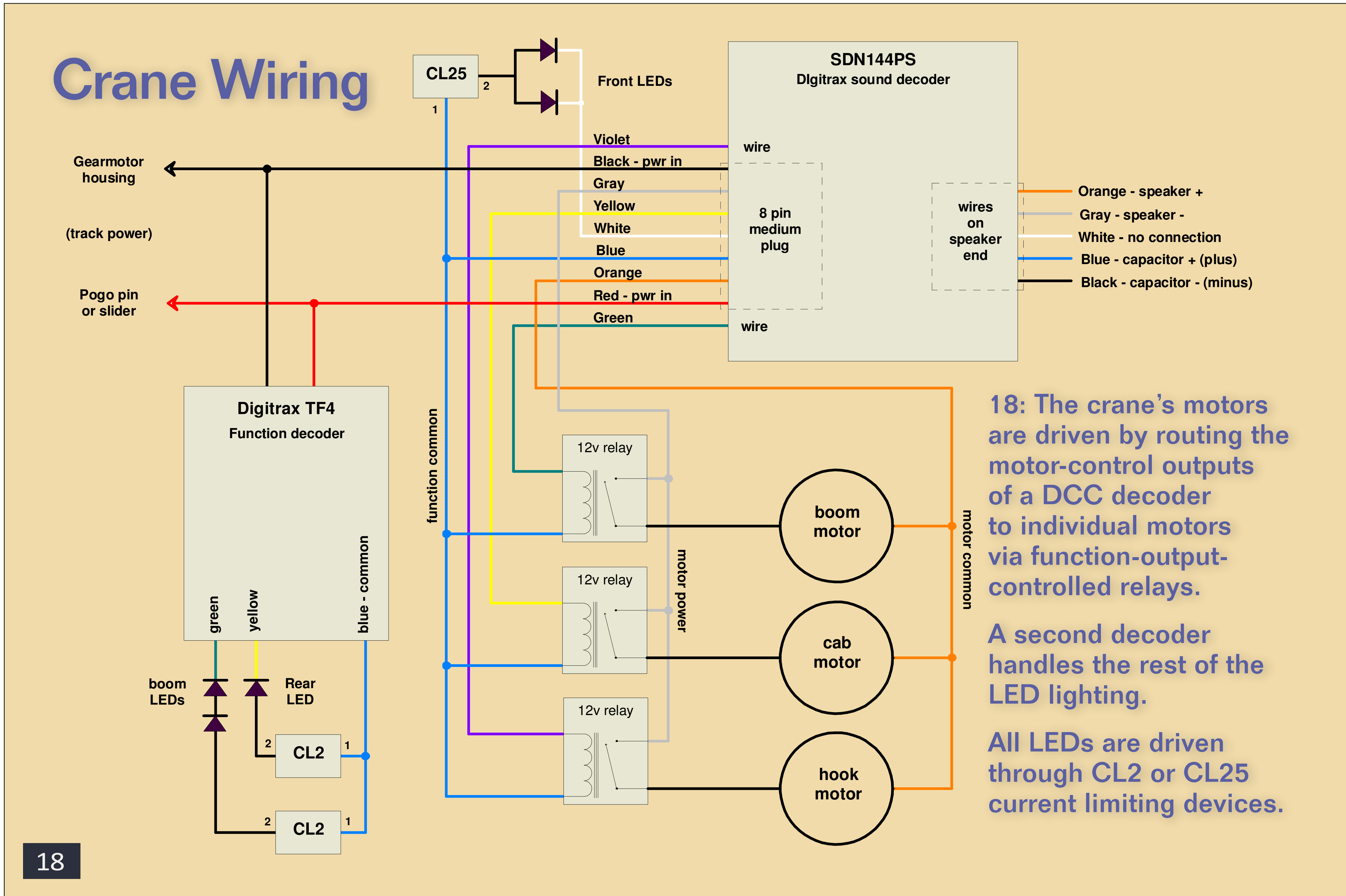
The F0 output (white wire) drives the two front spotlights wired in parallel and fed through a CL25 current regulator. The two LEDs are wired in parallel and share the 25ma equally. Operating them at 12.5ma reduces the brightness, but these are still very bright 0603 sunny white LED's.

The other three decoder functions (Yellow, Green and Violet) power very small, single pole double throw (SPDT) 12-Volt relays (from All Electronics [www.allelectronics.com/make-a-store/item/RLY-616/MICROMINIATURE-12-VDC-SPDT-RELAY/1.html](#)). When a function is activated (F1,F3,F4), the corresponding relay connects the decoder's motor control output (gray wire) to the appropriate motor.

The maximum motor speed (output power) should be limited to avoid burning out the tiny 5-volt motors. I did this using decoder CVs but putting a current limiting resistor in series with the motors would also work. Yes, I learned to limit the motor power the hard way – after I burned out one of the larger cab rotation motors!

To make the sound audible, I mounted a 0.75" 8-ohm speaker in the bottom of a cut off pill bottle, sealing it with glue. This enclosure, albeit crude, vastly improves the sound quality. I finished it by painting it black.

I needed two more functions to activate the rear light and the under-boom utility lights. A Digitrax TF4 function-only decoder programmed for the same DCC address filled the bill. I was using F5 for my bell so the TF4 was programmed to respond to F6 and F7. I used the Yellow (F6) and



18: The crane's motors are driven by routing the motor-control outputs of a DCC decoder to individual motors via function-output-controlled relays.

A second decoder handles the rest of the LED lighting.

All LEDs are driven through CL2 or CL25 current limiting devices.

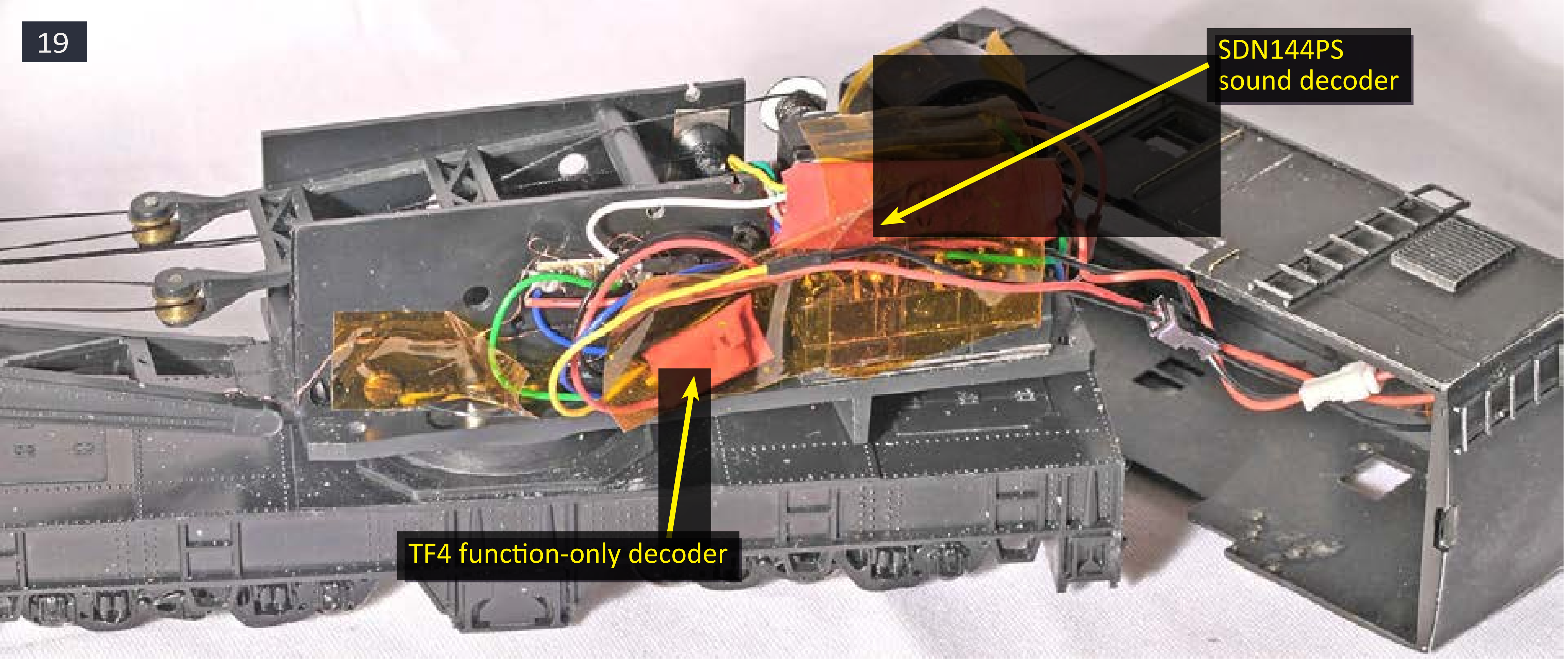


Figure 19: Decoders and other wiring shoe-horned into the crane's cab. Geoff was very careful to keep the wiring from fouling the cables that raise and lower the boom and hook.

Green (F7) wires for the rear and boom lighting (19).

Program the two decoders separately, then double check them BEFORE soldering them in place. Because their addresses are set the same, once connected to the same track power wires they can't be individually programmed.

The orange and gray motor-power decoder wires are connected to the cab rotation, boom, and hook motors though the relay contacts.

Depending on how you program your decoders, this may preclude your ability to read the value of a CV. Set it up correctly before assembly and test them out first. Note also that the two boom lights are 0603 LED's wired in series, this time, driven by a 20ma CL2 current regulator. (See my article in the [February 2012 Model Railroad Hobbyist](model-railroad-hobbyist.com/magazine/mrh-2012-02-feb/points_of_light) (model-railroad-hobbyist.com/magazine/mrh-2012-02-feb/points_of_light). This lights each LED at its maximum operating 20ma current, regardless of voltage, yielding bright lighting – just the way I like them (20).

The wire feeds to the forward and rear lights on the cab shell are run through two 2-pin 2mm tiny male/female connector pairs, to make disassembly and maintenance easier. The fine magnet wires require gentle handling. Once in place, I secured the wires and decoders with pieces of Kapton tape (21).

Throughout the project I thought that I would simply glue the secondary hook (the small front hook) in place since I didn't intend to power it. As it turned out, all animation assemblies fit outside of the original Athearn mechanisms for the boom and hook spools. So I reassembled the original sides and added one of the original Athearn spools for the front hook, which I could manually adjust for desired hook placement.

Other Cab and Boom Mods

Cranes were non-revenue equipment and were usually assigned to railroad division maintenance sections. They sometimes received some very rough treatment, and often were repaired locally. Patches, window and door replacements, and other

Geoff Bunza started as a model railroader when he received a Mantua train set for Christmas, at age 6. He fed his interests through college becoming a member of the Tech Model Railroad Club (TMRC) at MIT and getting four degrees in Electrical Engineering. He has collected Lionel HO trains for many years, which spawned his interest in realistic animation and lighting.

He models the New York Central (he's a member of the NYC Historical Society) and sometimes the Great Northern, paying little heed to timeframe. On occasion, Geoff reverts to HOn30 modeling of strange, narrow critters from the woods of Maine.

Geoff has been diverted from model railroading over the years by engineering and management challenges in computer design, automatic test systems, electronic design automation, and starting five companies. He is blessed with his wife, Lin, in marriage for 33 years and their two terrific sons. He is a life member of the NMRA.

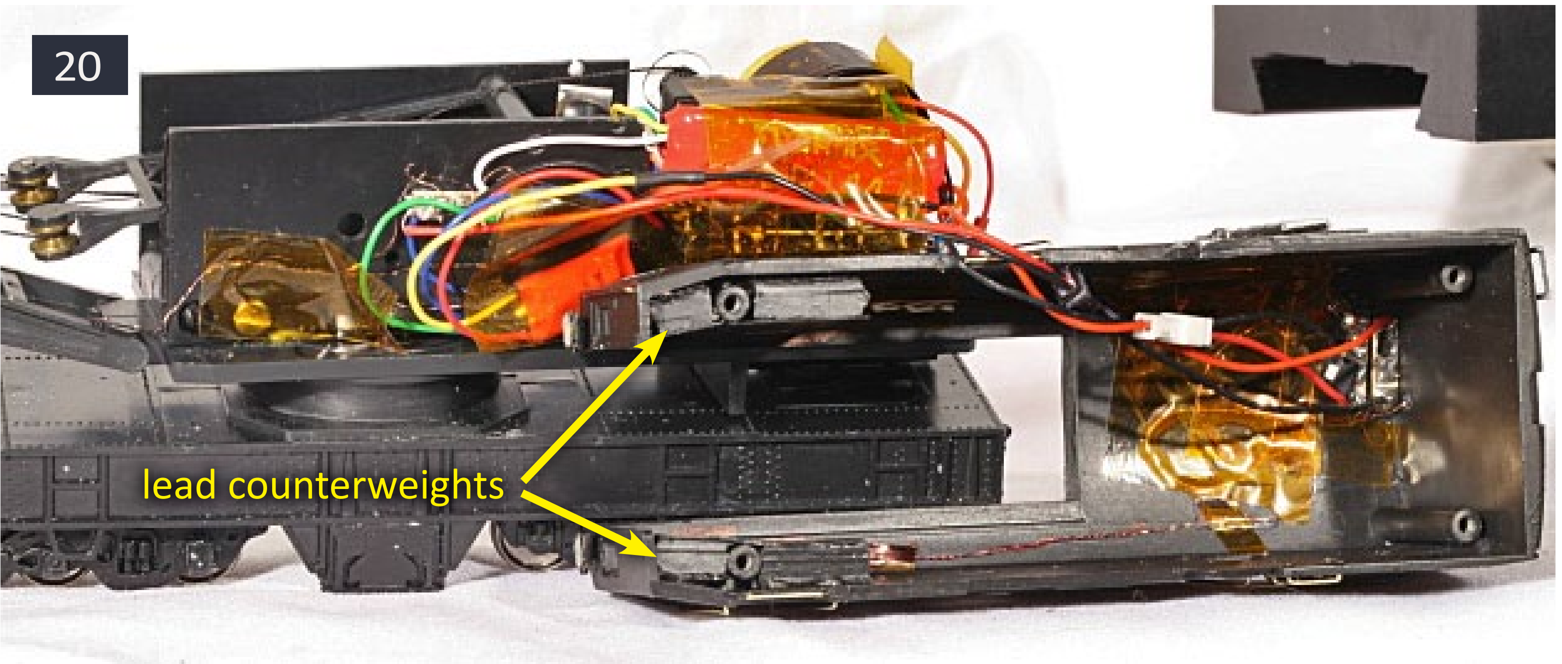
customizations were common. I have yet to find pictures of two similar cranes exactly alike owned by the same railroad. So there is plenty of leeway for detailing.

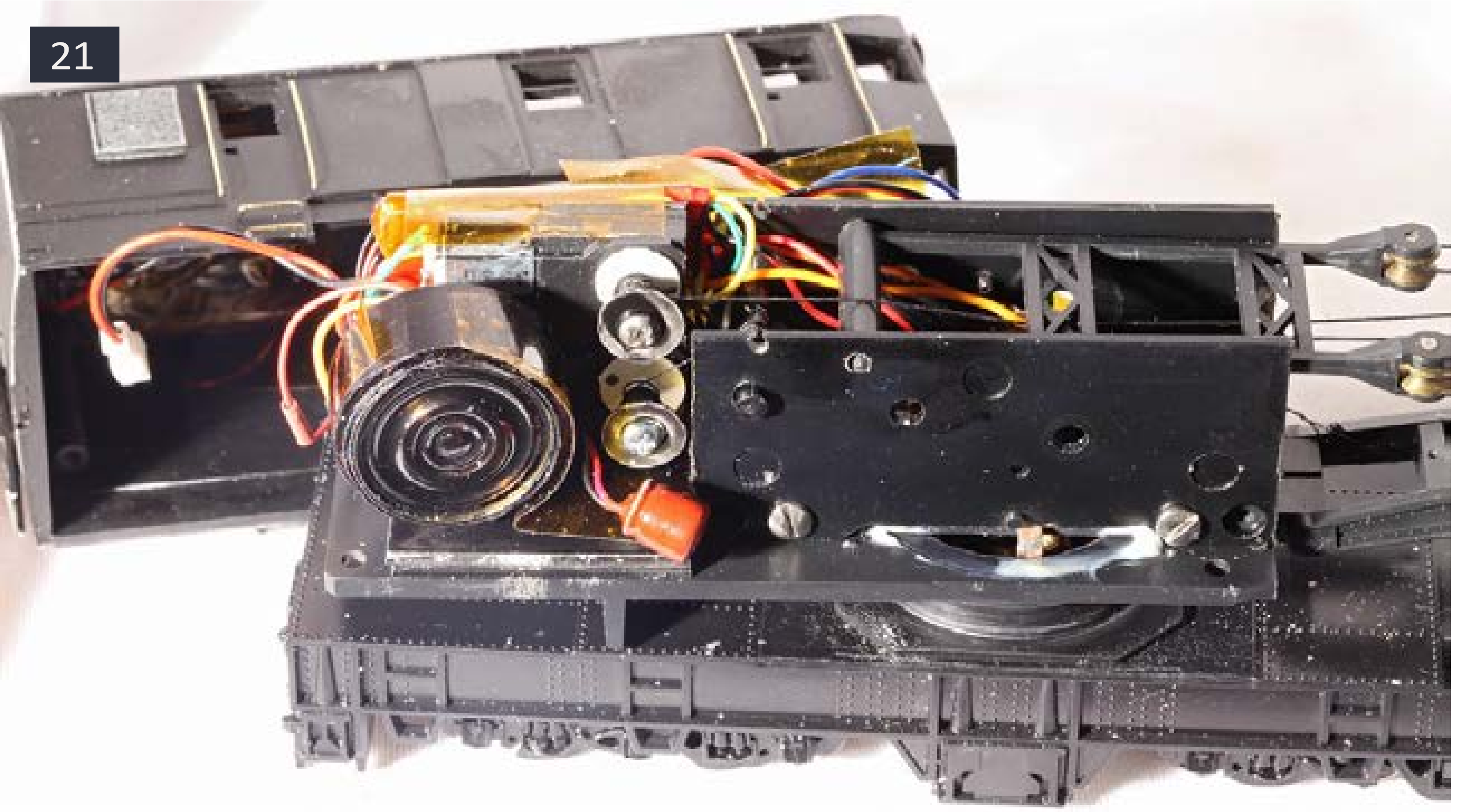
My first attempt to test the mechanism caused the crane tip over backwards from the added weight of the electronics in the rear! So I added lead counterweights with double-sided tape and ACC glue to the front inside cab walls, being careful not to block the windows (20).

The very front top window was filled in on the right (typically engineer's) side. Vertical window mullions were cut out as well as some horizontal ones (see photos).

Louvers were added to both sides towards the rear, as well as a small hatch and whistle on the roof. Handrails and grab irons were fashioned from .015" brass wire. The entire rear wall was sanded smooth and covered with a sheet of .005" styrene (23).

The left rear side was sanded smooth and likewise covered, reshaping the lower outline to one which appeared to be more commonplace to me. Ladders were also added to the left and rear sides (24).





20: The in-cab wiring. Note the generous amounts of Kapton tape holding things in place.

21: Other side view of the cab wiring showing the 3/4" speaker's home.

22: Counterweights added to the front of the cab balance the weight of the electronics.

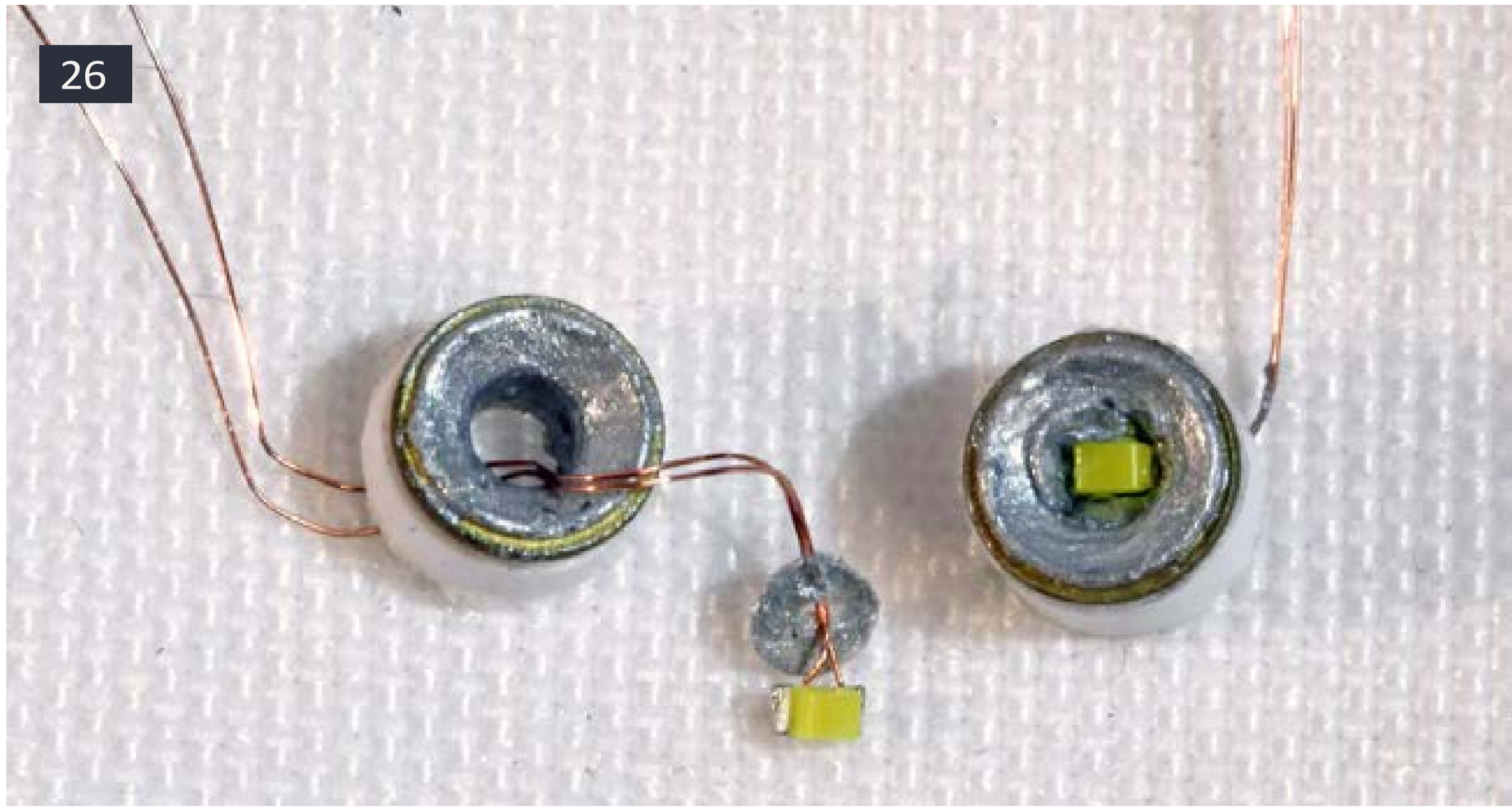
23: Modifications to the right side of the cab.

24: Modifications to the left side of the cab.

25: A front light mounted on the cab.

26: Rear lighting – a 0603 sunny white LED in a housing.

27: Head lights in their housings.



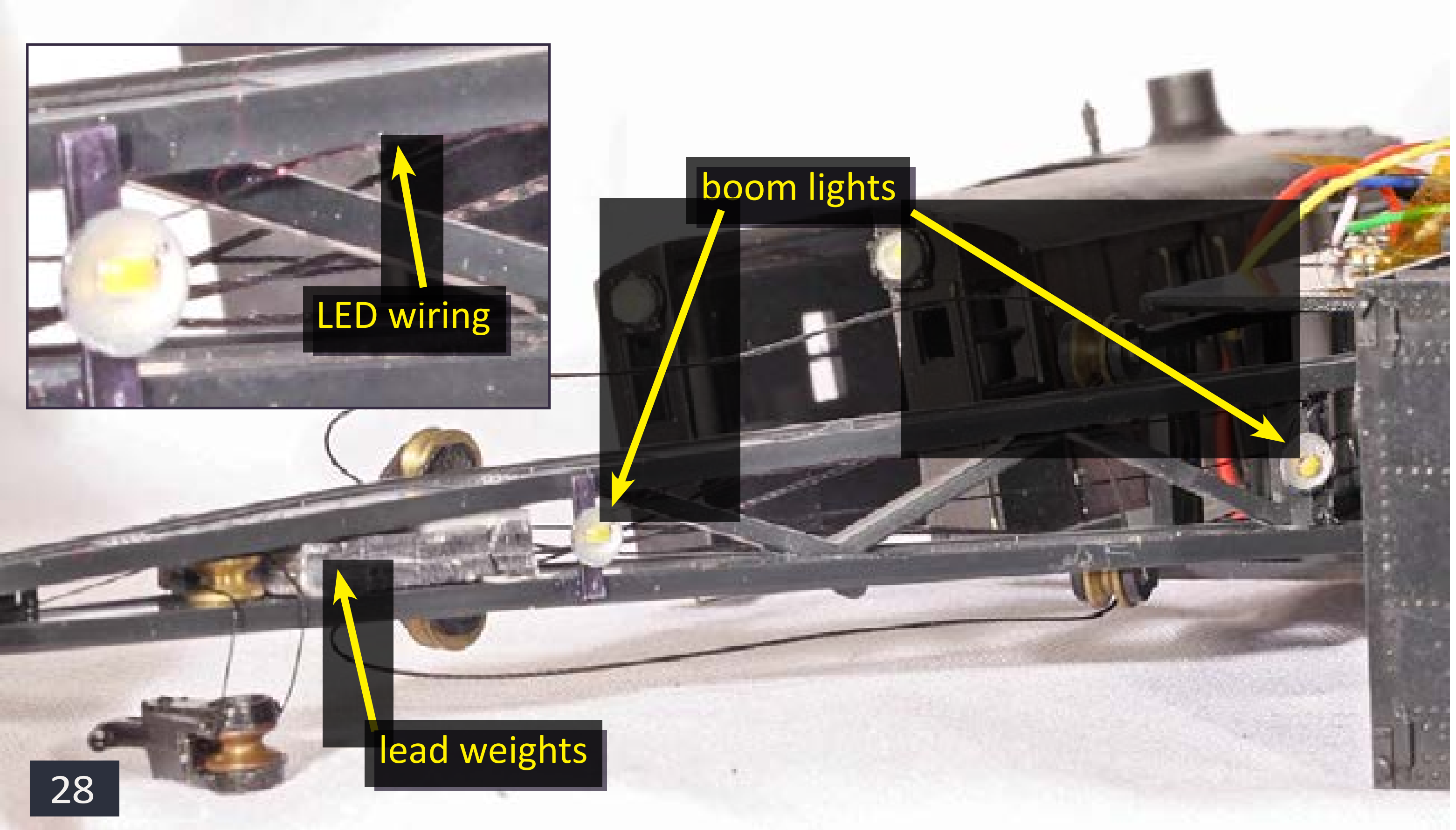
Holes were drilled to mount the front spotlights and handrails. The Cal-Scale #190-304 Light-Switcher casting is a very close representation to several that I have seen mounted on cranes (25).

The rear light is a Cal-Scale 190-413 Modern GE 44 tonner light mounted in a short section of plastic tubing. Each casting is drilled for the 38-gauge wires of the pre-wired 0603 sunny white LEDs (available from Ledbaron (stores.ebay.com/ledbaron).

I painted the reflectors bright silver and glued the LED in place on an insulator of painted paper with canopy glue. White glue, Krystal Kleer, or watch crystal cement would also work as they all dry clear. Each light then was covered with a punched out cover of untreated .005" clear styrene. I also used the clear styrene to glaze the windows. They received a spray of Dullcote before installation to give them a uniform "dirty" look (27).

The crane boom received lead weights. They were cut to fit just behind the main hook pulley (28) and glued in place with ACC and painted. This provided additional counterweighting of the cab, but more importantly put tension on the boom-lifting cables.

I added two boom work lights using Tichy lamp shades and 0603 golden white LEDs (29). I selected LEDs with a warmer yellowish tint to match the prototype's incandescent bulbs in a reflector.



28: The weighted boom with lights.

29: Boom lights.

30: The assembled crane with its tender – Charlie Comstock photo

The forward boom light was mounted on a painted plastic strip and glued to the bottom of the boom. The other light was directly glued to the boom. I twisted the tiny LED lead wires together and ran them along the bottom of the boom to the cab, spot gluing them in three places. A coat of paint further disguised the wiring.

Once assembled and painted the crane was starting to look good (30).

Giving the Crane a Voice

Sound decoders are produced by several manufacturers. I settled on the [Digitrax SDN144PS](#) as sound decoder for this project. It fit in the limited cab space and is completely programmable when it comes to sounds – both the sounds themselves and their sequencing. It would have been perfect if it had two more functions. Oh well, I used a [Digitrax TF4](#) decoder to solve that issue.

My attempt at sound decoder programming was greatly simplified by the use of a freely available program named SPJHELPER developed by Fred Miller ([fnbcreations.net/spjhelper/index.html](#)). I highly recommend it as Fred has done a remarkable job. You will need a Digitrax PR2 or PR3 to load the sound program and sound recordings with the Digitrax Soundloader that SPJHELPER creates. The details of sound sequencing and programming are beyond the scope of this article but some basic information is present in the sidebar Programming the Digitrax sound decoder.

The SPJ program sequencing is shown in the Sound Sequencing sidebar and my complete sound project (including SPJ file) may be [downloaded here](#).

I edited recordings of several 120-ton steam cranes for use in my sound project (see the Sound Sequencing sidebar). Sounds include background steam hiss, mechanical linkages, gear

rattles, pumps, and a single-chime, triple-toot whistle.

The sounds are coordinated with function key presses for cab, boom, and hook movements. The throttle controls the speeds. If a function key is pressed and the throttle is set to zero, no additional engine sounds are generated.

Functions are assigned as follows:

- F0 – Front spot lights
- F1 – Select cab rotation*
- F2 – Whistle (Always a triple toot)
- F3 – Select boom motion*
- F4 – Select hook motion*
- F5 – Bell
- Boom lights
- Reverse light
- F8 – Mute

* F1, F3, and F4 select which feature of the crane will move. Actual movement is controlled using the throttle.

The large number of CVs involved suggests using software such as Decoder Pro to set their values (31).

The sound files were custom made for this project using Fred Miller's Sound Project software.

Project Cost

The major costs for this project were:

- DCC decoders – about $61
- Gear motors – less than $20
- Other parts – less than $20

If you don't have the ability to program the decoders yourself, paying someone else will increase costs.

You could simplify this project (and save a few $$) if you use one function key to turn on all the lights and omit the TF4 decoder. You could also eliminate the boom lights, or the main hook motion control to simplify the project.

Crane Technique

I love to watch the crane in action. I run it around my layout coupled to its boom tender car (33 and 34). Once at the "wreck site", I raise the boom and turn the cab 180° so the boom extends

Decoder Configuration

I set up the crane's decoders with the configuration values (CVs) shown in the two tables to the right.

Due to the large number of CVs using computer software (such as DecoderPro from the JMRI – Java Model Railroad Interface – group – jmri.org) is a good idea. This software will remember the CV settings making it easy to reprogram a decoder should it lose its memory or if you decide to build a second crane.

Decoder Pro is free but you'll need an interface for your computer to talk to your DCC system. Unfortunately, not all DCC systems support such an interface. Digitrax and NCE do.

Digitrax SDN144PS (sound decoder):
ID: **NYC_X-24** DCC Address: **24**

CV	Value		CV	Value		CV	Value		CV	Value	
	Dec	Hex		Dec	Hex		Dec	Hex		Dec	Hex
1	24	18	39	0	00	71	44	2C	94	251	FB
2	3	03	40	0	00	72	53	35	95	128	80
3	0	00	41	0	00	73	62	3E	105	0	00
4	4	04	42	0	00	74	71	47	106	0	00
5	92	5C	49	0	00	75	80	50	132	64	40
6	47	2F	50	0	00	76	89	59	133	63	3F
7	16	10	51	0	00	77	98	62	134	32	20
8	129	81	52	0	00	78	107	6B	135	0	00
9	0	00	54	80	50	79	116	74	140	50	32
11	6	06	55	128	80	80	125	7D	141	28	1C
16	0	00	56	80	50	81	134	86	142	5	05
17	0	00	57	6	06	82	143	8F	143	35	23
18	0	00	58	15	0F	83	152	98	145	48	30
19	0	00	60	0	00	84	161	A1	146	36	24
21	0	00	61	0	00	85	170	AA	147	64	40
22	0	00	62	0	00	86	179	B3	148	64	40
29	3	03	63	0	00	87	188	BC	149	30	1E
33	1	01	65	2	02	88	197	C5	150	9	09
34	1	01	66	128	80	89	206	CE	151	12	0C
35	2	02	67	8	08	90	215	D7	152	38	26
36	0	00	68	17	11	91	224	E0	153	5	05
37	4	04	69	26	1A	92	233	E9	154	60	3C
38	1	01	70	35	23	93	242	F2	155	0	00

Digitrax TF4 (function only decoder):
ID: **YC_X-24_TF4** DCC Address: **24**

CV	Value	
	Dec	Hex
1	24	18
7	254	FE
8	129	81
17	0	00
17	0	00
18	0	00
29	6	06
49	0	00
50	0	00
54	64	40
61	0	00
62	0	00
63	0	00
64	2	2

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Reader Feedback (click here)

beyond the end of the train and is ready for work.

Don't forget to blow the whistle before any major movements to warn the crew for safety's sake!

Enhancements

A crane could be placed at a wreck site, and computer control could wake it up from time to time, swinging the boom around. Couple it to a loco and have it move the crane around, working to "clear" the wreck.

If you can find out how to add another motor and relay the secondary hook could also be raised and lowered.

I'm considering adding someone shouting "Take it easy!" or "That'll do!" – perhaps after a long motion. Coordinated movement at the door of the boom tender facing the crane is also possible. A figure could open the door and shout "Watch out!" to the crane operator. Or a man on the ground could have his arms move to guide the crane operator.

Reader Feedback (click here)

Come up with some other additions to bring your own wrecking crane to life and keep your right-of-way clear! ☑

"I love animating things and couldn't resist bringing the motionless and silent crane in my rail yard to life."

Sound Sequencing

Sound sequence summary. Click here to download the complete set of sound sequencing files.

Events in Voice 1

```
E:0 Trigger when FKey 8 Turn On
Set Mute ON
================================
E:1 Trigger when FKey 8 Turn OFF
Set Mute OFF
================================
E:15 Trigger when FKey 1 Turns ON
Test Memory Slot 0 for 1
Branch to Tag No. 1
Set Volume by value in CV 140
Play Sound Clip 4 Looping
Play CraneBoomEnd.wav Once
Set a Tag No. 1
================================
E:8 Trigger when FKey 3 Turns ON
Test Memory Slot 0 for 1
Branch to Tag No. 0
Set Volume by value in CV 140
Play Sound Clip 4 Looping
Play Sound Clip 1 Once
Set a Tag No. 0
================================
E:11 Trigger when FKey 4 Turns ON
Test Memory Slot 0 for 1
Branch to Tag 2
Set Volume by value in CV 140
Play Sound Clip 4 Looping
Play Sound Clip 1 Once
Set Tag 2
```

Events in Voice 2

```
E:3 On Power Up
Enable Motor
Set Timer 1 by CV144
Set Memory Slot 0 to 0
Set Timer 2 by CV151
================================
E:2 Trigger when Moving Turns ON
Set Memory Slot 0 to 1
================================
E:7 Trigger when FKey 2 Turns ON
Set Volume by value in CV 147
Play Sound Clip 10
Play Sound Clip 11 Once
Play Sound Clip 12
================================
E:10 Trigger when Moving Turns OFF
Set Memory Slot 0 to 0
================================
E:9 Trigger when Power While ON
Set Volume by value in CV 149
Play Sound Clip 16 Once
```

Events in Voice 3

```
E:6 Trigger when FKey 5 While ON
Set Volume by value in CV 146
Play Sound Clip 9
Delay per value in CV 150
================================
E:4 While Timer0 is On
Set Timer 0 by CV142
Set Volume by value in CV 143
Play Sound Clip 5 Looping
Set Timer 0 by CV141
================================
E:5 While Timer1 is On
Set Volume by value in CV 145
Play Sound Clip 13 Once
Play Sound Clip 14 Once
Play Sound Clip 14 Once
Play Sound Clip 14 Once
Play Sound Clip 14 Once
Play Sound Clip 15 Once
Set Timer 1 by CV144
================================
E:12 While Timer2 is On
Set Volume by value in CV 153
Play Steam_blow_run.wav
Play Sound Clip 0 Once
Play Steam_blow_run.wav
Set Timer 2 by CV151
================================
E:13 Reset CVs when Decoder Reset
Set CV 132 to 64
Set CV 135 to 0
Set CV 139 to 31
Set CV 140 to value 50
Set CV 141 to value 28
Set CV 142 to 5
Set CV 143 to 64
Set CV 144 to value 37
Set CV 145 to 64
Set CV 146 to value 50
Set CV 147 to value 55
Set CV 148 to 64
Set CV 149 to value 30
Set CV 150 to value 9
Set CV 151 to value 12
Set CV 153 to value 64
```

CVs Used

```
CV8 - Default Reset [9]
CV58 - Master Vol 0-15 [15]
CV60 - Sound Scheme [0]
CV132 - Notch Rate [64]
CV135 - Mute Volume [0]
CV139 - Distance Gauge [31]
CV140 - Chuff Volume [50]
CV141 - Compressor Cycle Time [28]
CV142 - Compressor Run Time [5]
CV143 - Compressor Volume [64]
CV144 - Water Pump Cycle Time [37]
CV145 - Water Pump Volume [64]
CV146 - Bell Volume [50]
CV147 - Whistle Volume [55]
CV148 - Blow Down Volume [64]
CV149 - Boiler Volume [30]
CV150 - Bell Rate Delay [9]
CV151 - Hiss Cycle Time [12]
CV153 - Compressor Volume [64]
```

Function Keys Used

```
F1 - Cab
F2 - Whistle
F3 - Boom
F4 - Hook
F5 - Bell
F8 - Mute ON/OFF
```

Sound Files Used

```
Clip#0 – Silence
Clip#1 - CraneBoomEnd.wav
Clip#2 - Steam_blow_run.wav
Clip#4 - CraneBoom.wav
Clip#5 - Steam_airpump.wav
Clip#9 - CraneBell.wav
Clip#10 - CraneWhistleStart.wav
Clip#11 - CraneWhistleRun.wav
Clip#12 - CraneWhistleEnd.wav
Clip#13 - Steam_water_start.wav
Clip#14 - Steam_water_run.wav
Clip#15 - Steam_water_end.wav
Clip#16 - CraneIdle.wav
```

Programming the Digitrax Sound Decoder

Reprogramming a Digitrax SDN1144PS sound decoder is possibly a little beyond the comfort zone of many model railroaders.

- The “normal” set of control variables (CV’s) must be set. Remember, there are two decoders with the same decoder address in the crane. Most functions are re-mapped. For example, the yellow wire of the SDN1144PS is normally connected to a backup light – because I use this wire to select cab rotation I reprogrammed it to respond to F1 – much more convenient.
- New, crane appropriate sounds, must be created for the decoder. This requires a source of sounds (I used my own and Youtube video/audio snippets) and sound editing software to trim the samples and apply noise reduction, emphasis, and volume adjustment. The files are saved in 11.0 kHz, 8 bit, mono .WAV format.
- Sounds must be provided for all functions (boiler background, mechanical/gear sounds, steam hiss, single chime whistle, and bell. Many sound decoders don’t allow reprogramming all of these.
- Sounds and actions must be sequenced – this works with the remapped functions and multiple sound files. In some cases, such as mechanical movement, sound generation depends on motor speed.

The Digitrax SDN144PS decoder makes all of this is possible (many other sound decoders don’t allow this level of reprogramming). It has three voices, each of which can independently play a sound in a prioritized sequence!

I have not mastered sound sequencing, but Fred Miller’s SPJHelper tool (**fnbcreations.net/spjhelper/index.html**) made it a lot easier – if not possible. SPJHelper takes the sound files and an orderly, prioritized representation of the sound and function sequencing, reformats it all, and generates code for the microcontroller in the decoder. It outputs a Digitrax compatible sound project file (an .spj file) to the Digitrax Soundloader programmer for decoder programming via a PR3 interface.

This is a bit larger project than setting momentum CV’s and changing a decoder address. All my working files are available for **download** to give you a head start on your project.

Don’t let the challenge scare you off. This is a tremendous starting point for a myriad of fantastic scale model animation projects to come! ☑

Check out the crane in action in this video!

33: Geoff detailed the crane’s tender with spare truck and miscellaneous stuff appropriate salvaging wayward freight cars – Charlie Comstock photo.

34 (next page): The wrecking train, loco, tender, and crane make an interesting addition to a layout – Charlie Comstock photo.

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Bring a wrecking crane to life, page 16