



ADDING DCC AND SOUND TO ATHEARN LOCOMOTIVES

CARL MARCHAND

ACKNOWLEDGEMENTS

- Matt Herman - ESU
- JD Forsythe – Train Control Systems
- Nick Santo – NixTrainz
- Mark Juett – NMRA DCC Working Group
- Jeff Aley – NMRA Prototype Rails 2022

Adding Sound and DCC to Athearn Locomotives



Article and photographs by Carl Marchand

Above: It's mid-afternoon, and SCL GP35 1415 heads back to the yard with several cars in tow. This Athearn locomotive is running on the Suncoast Model Railroad Club in Largo, Florida.

Athearn locomotives have been a mainstay of HO-scale modelers for many years. While the latest RTR (Ready To Roll) and Genesis locomotives are available with sound and DCC, thousands of earlier Athearn locomotives are configured for DC only. All the company's locomotive offerings prior to 2002 were not DCC compatible without some modification. After 2002, Athearn locomotive chassis began to change. Athearn transitioned from the legacy design (affectionately known as "blue box" design) to the RTR line of locomotives and (along with the Genesis models) began factory installing circuit boards designed to accept DCC decoders. These models, labeled as "DCC Ready," had mainboards, if you will, that would accept a

8-pin NMRA or 9-pin JST plug. However, these boards were provisioned for 1.5 volt light bulbs and will not provide proper current to drive LEDs.

How to modify an Athearn unit for DCC continues to be a popular topic among model railroaders. For my friends at the Suncoast Model Railroad Club in Largo, Florida, converting Athearn locomotives to DCC is discussed at length at least once a month. The good news is that converting these locomotives to DCC is easier than ever with the current selection of decoders on the market. Adding sound/DCC is also easier today with the introduction of sugar cube (micro) speakers and smaller footprint sound decoders.

Recently, the NMRA upgraded the list of DCC standards to include the Next18 and Next18S connectors for DCC decoders (S-9.1.1.5 and TN-9.1.1.5).

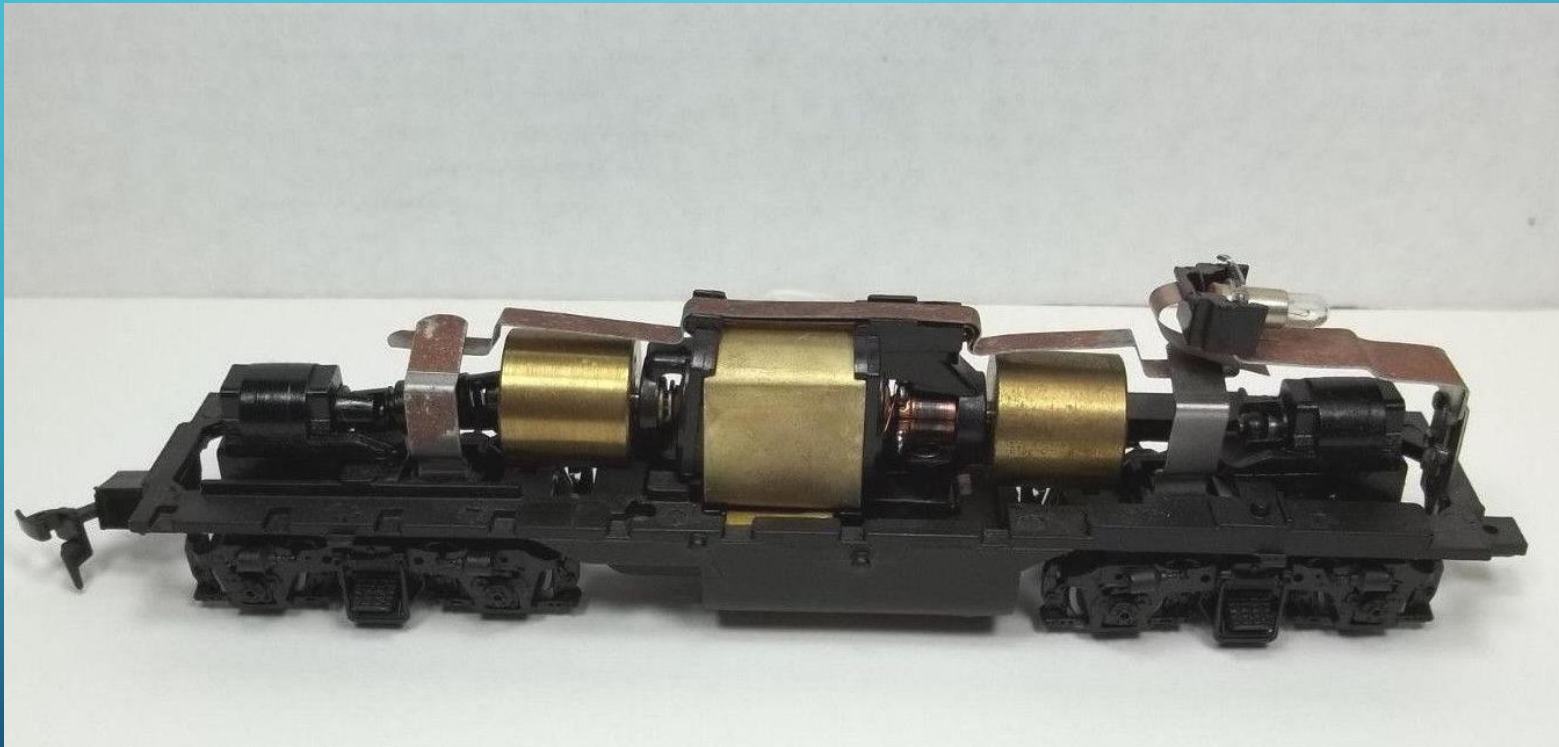
ATHEARN LOCOMOTIVES

Why they are a good fit for DCC/Sound:

- They are easy to disassemble
- They have reasonable amount of space to install decoders and speakers
- Since the 1990s Athearn's R-T-R motors are very DCC friendly
- There is lot's of support and information on Athearn loco DCC conversion

ATHEARN BLUE BOX CHASSIS

The classic Athearn chassis design used for over 30 years



ATHEARN READY TO ROLL CHASSIS

The Ready To Roll design was an improvement of the Classic Blue Box chassis

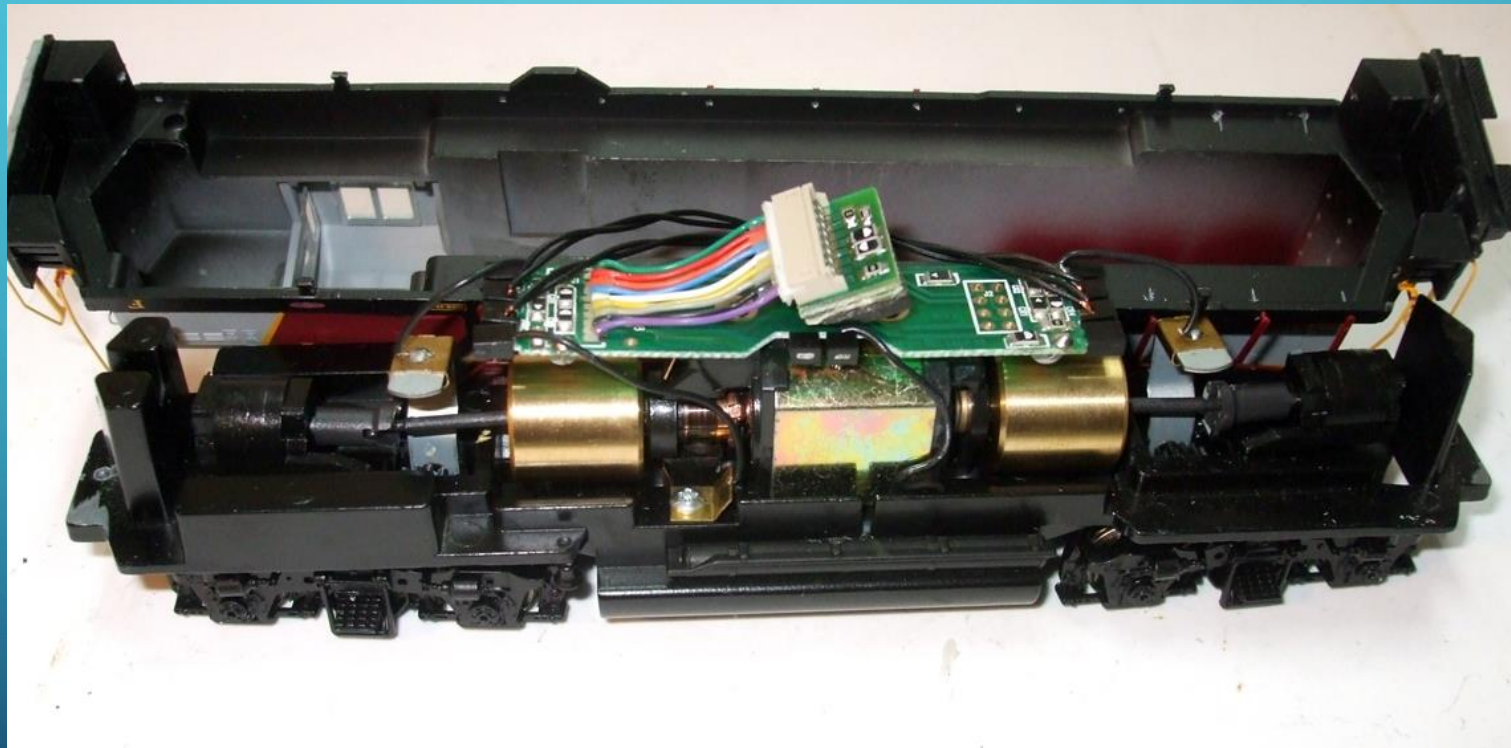
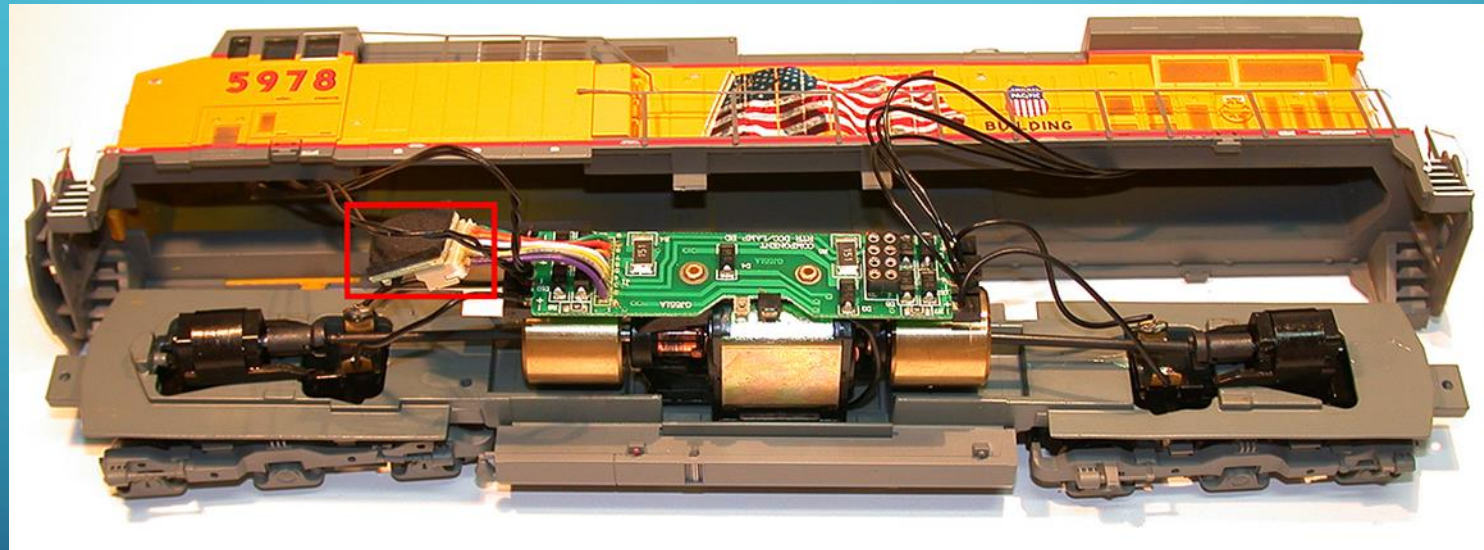


Photo Courtesy of Train Control Systems

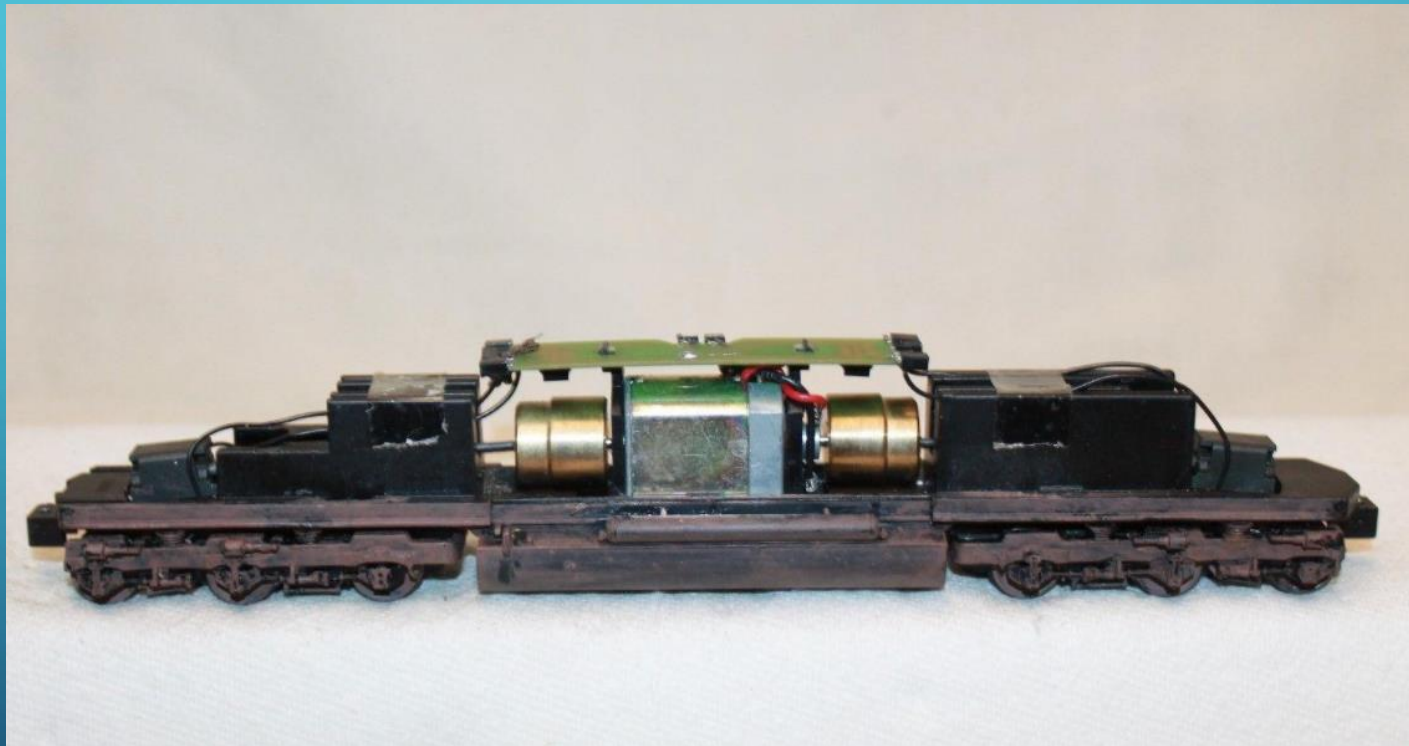
ATHEARN READY TO ROLL CHASSIS

The Ready To Roll design was an improvement of the Classic Blue Box chassis



ATHEARN GENESIS CHASSIS

Similar to the Ready To Roll Chassis, but with Buehler or Roco motor installed and upgraded drive train



Buehler motor version

ATHEARN GENESIS CHASSIS

Similar to the Ready To Roll Chassis, but with Buehler or Roco motor installed and upgraded drive train



Photo Courtesy of Train Control Systems

Early Roco motor version

ATHEARN GENESIS CHASSIS

Similar to the Ready To Roll Chassis, but with Buehler or Roco motor installed and upgraded drive train

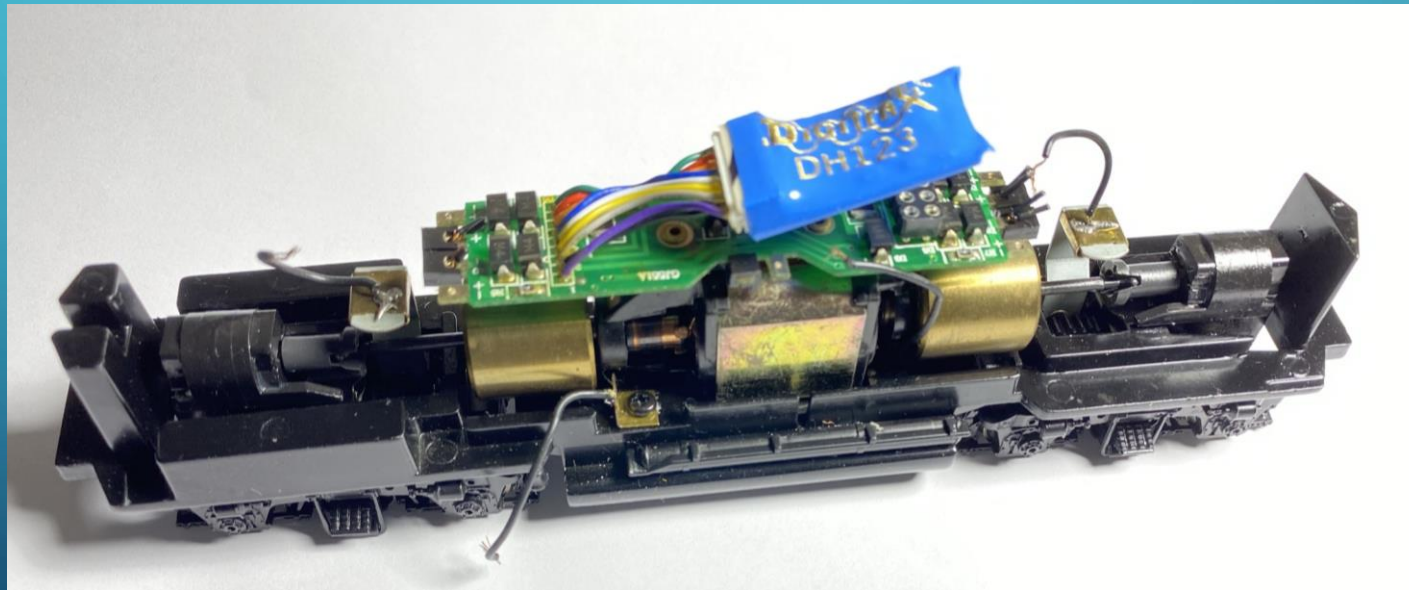


Photo Courtesy of Train Control Systems

DCC Friendly Roco motor version

IN THIS CLINIC WE WILL:

Demonstrate how to convert a RTR DCC ready locomotive to DCC and Sound



KEY STEPS

- Replace 1.5v lamps with LEDs and lenses
- Improve the power pickup
- Replace stock motherboard with DCC circuit board
- Tweak the stock motor
- Add speakers and improve the acoustics

TOOLS AND SUPPLIES

Parts List – Athearn GP35 DCC with Sound Conversion

- 10 Pack Speaker Box Closed - 15mm x 11mm x 9mm Made by Custom Model Creations LLC
- Plastruct 90291 - 1/16" (1.6 mm) Clear Acrylic Rod
- CUI CMS-15113-078SP 15mm x 11mm micro speaker, 8 Ohms
- Train Control Systems 1320 - Heat Shrink 3/64ths OD 5 feet
- Athearn ATH90037 HO Motor Brushes
- Athearn 84014 Motor Brush Springs
- Excel 30605 Burnishing Tool Set
- ESU 73700 Loksound Select Direct Sound Decoder (replacement unit ESU 58821 Loksound 5 DCC Direct Decoder)
- 0402 Warm White LEDs with leads – various eBay Vendors
- Gorilla Glue Double-sided tape
- ¼ inch Kapton Tape
- Zap PT-56 Canopy Glue
- Walthers Goo adhesive

TOOLS AND SUPPLIES



TOOLS AND SUPPLIES



1/4 inch Kapton Tape



Weller WE1010NA Digital Soldering Station



3/64 inch heat-shrink tubing

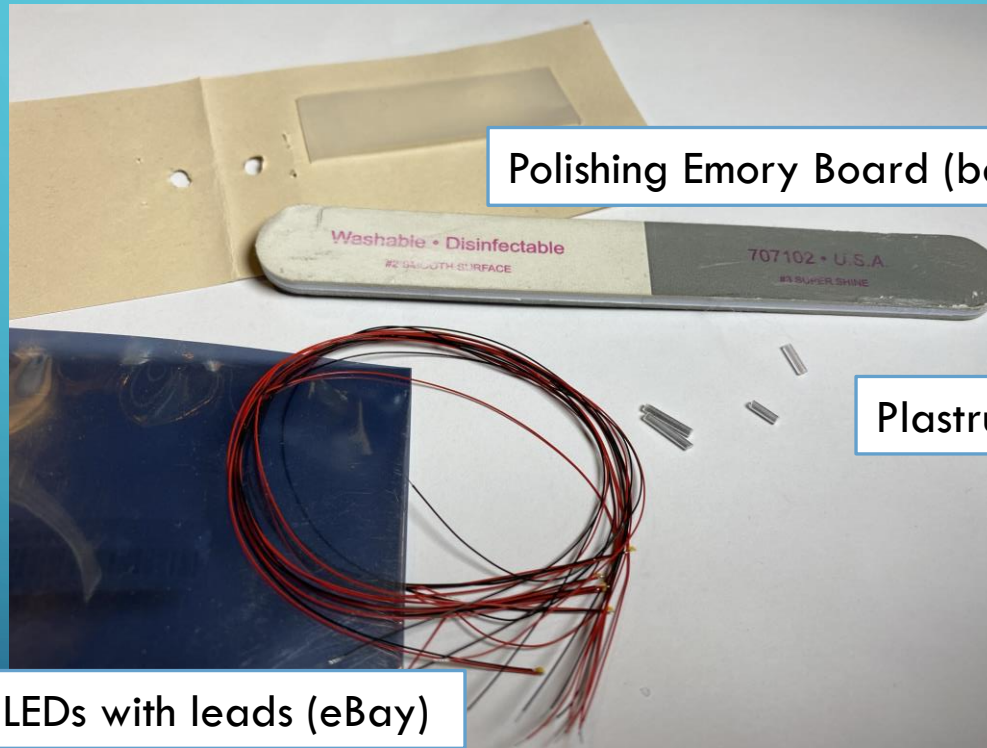


Kester Part Number 24-6337-0007

TOOLS AND SUPPLIES



LED UPGRADE

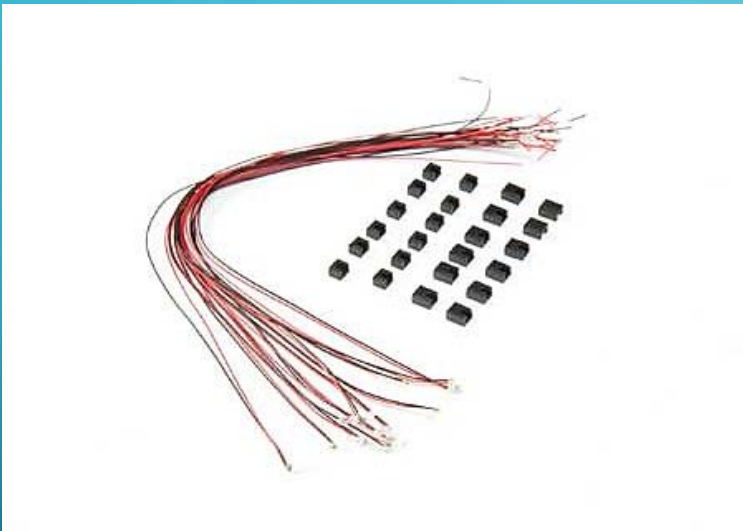


Polishing Emory Board (beauty supply store)

Plastruct 1/16 inch Clear Rod

0402 inch LEDs with leads (eBay)

ALTERNATIVES



LED Bulb-Med Length/beacon and
strobe 4.75mm (12)
[ATHG67144]

\$27.98

Cost per unit = \$2.33

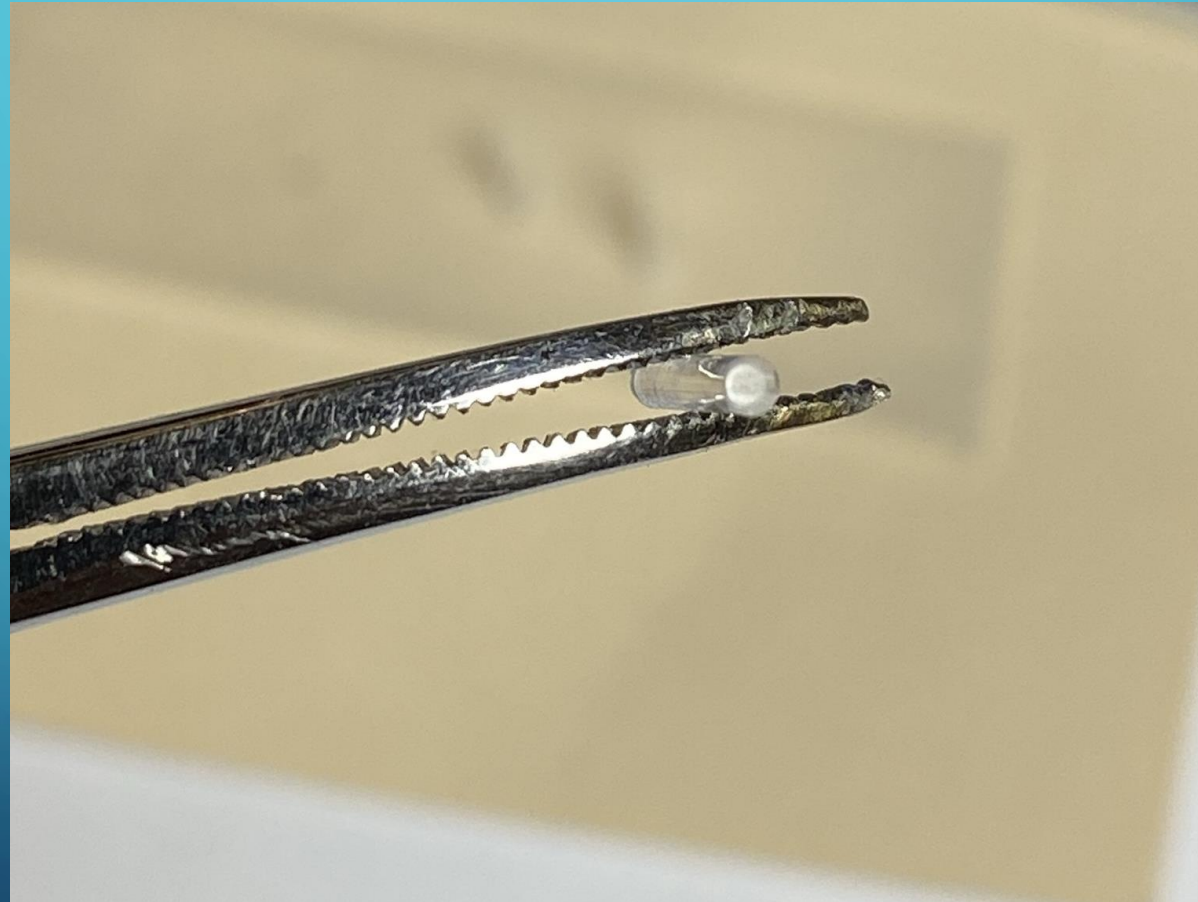
Plastruct 90291 (AR-2H / pack of 40) 1/16 acrylic rod
\$11.40 can make 944 lenses (\$0.012 each)

20 pack 0402 SMD LEDs with leads - \$16.00 avg
(eBay)

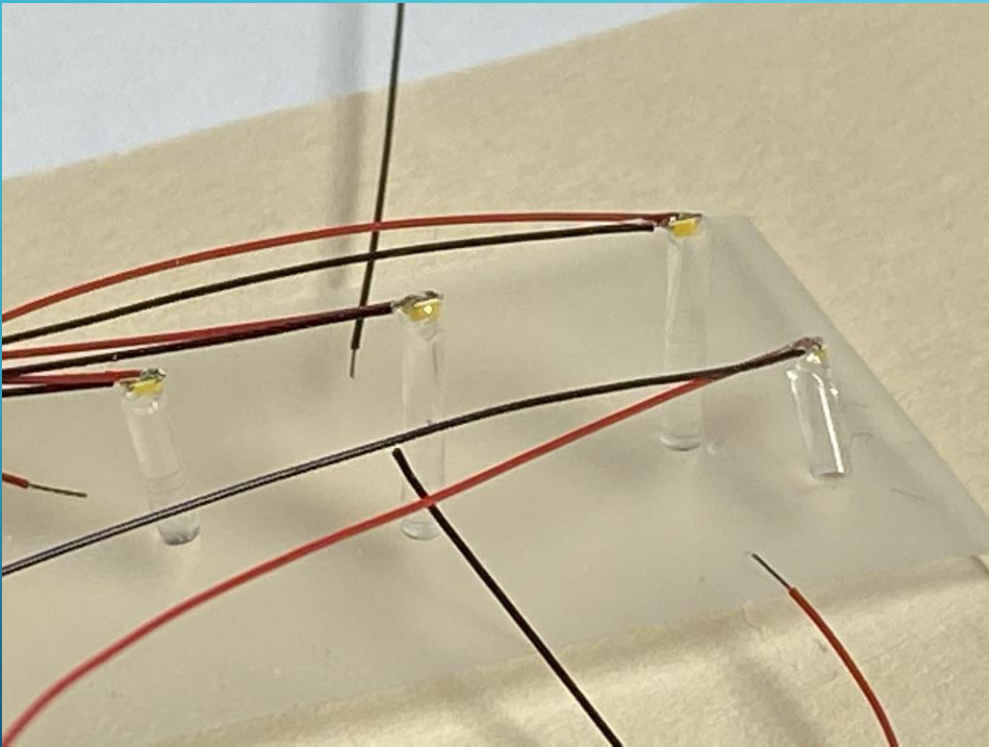
If you bought enough LEDs to match the number of
lenses made from 90291, the total cost per LED/Lens
is \$0.82

Plastruct rod + 20 LEDs Cost per unit = \$1.37

POLISHING THE LENSES

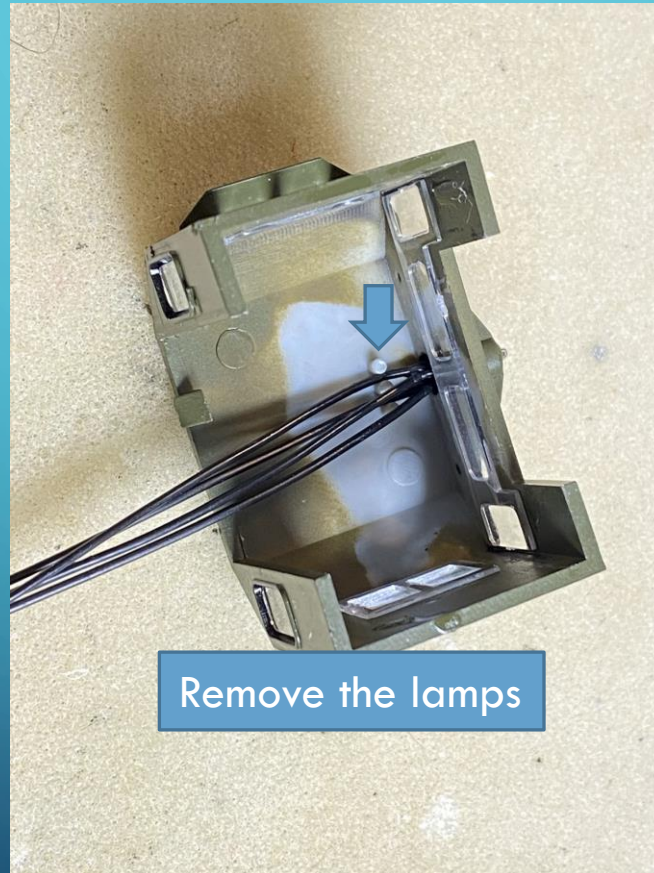


LED UPGRADE



1. Spray small amount of ZAP Kicker into a plastic cup
2. Place a drop of CA on unpolished end of the lens
3. Dip the LED into the ZAP Kicker
4. Touch the LED to the lens (end with CA)
5. Dries in SECONDS!

CAB MODIFICATIONS



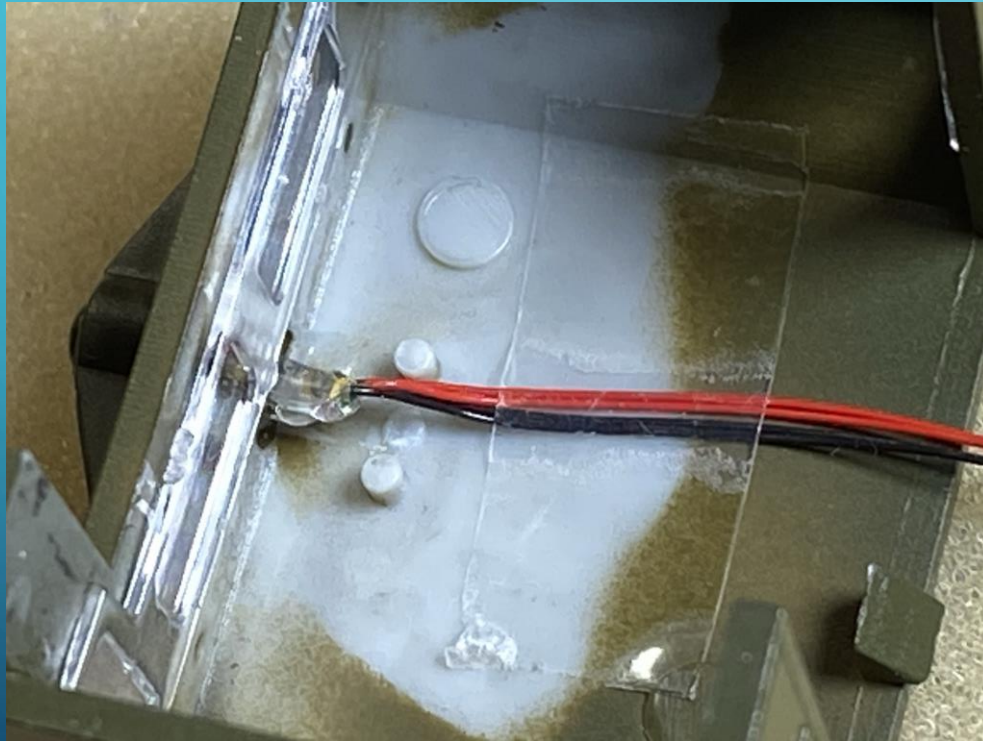
CAB MODIFICATIONS



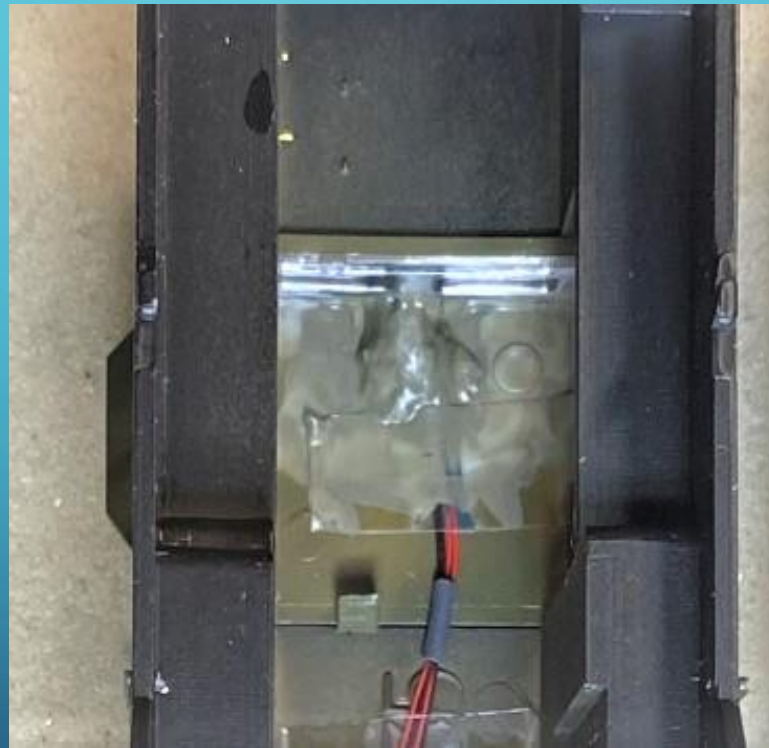
CAB MODIFICATIONS



CAB MODIFICATIONS



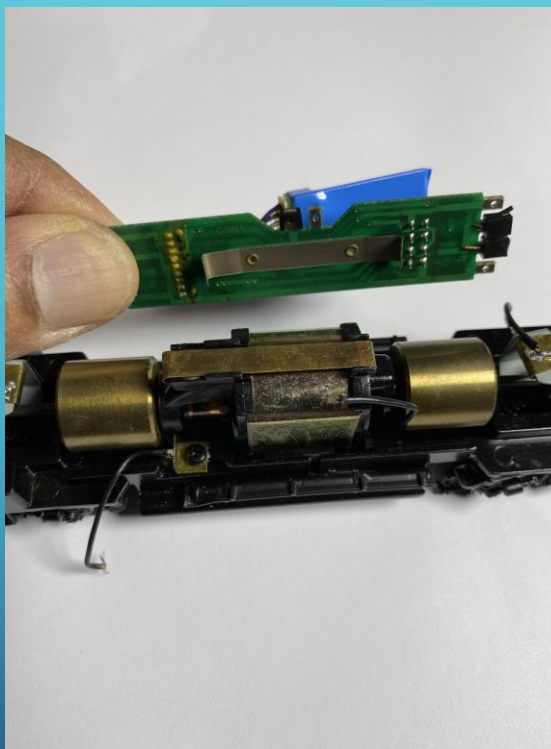
CAB MODIFICATIONS



REAR LIGHTS



REMOVE OLD DCC/LIGHTING BOARD

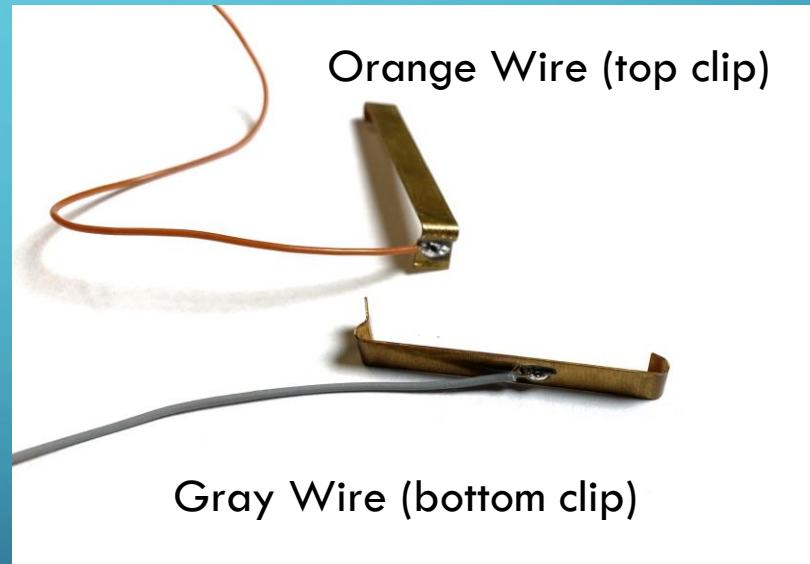
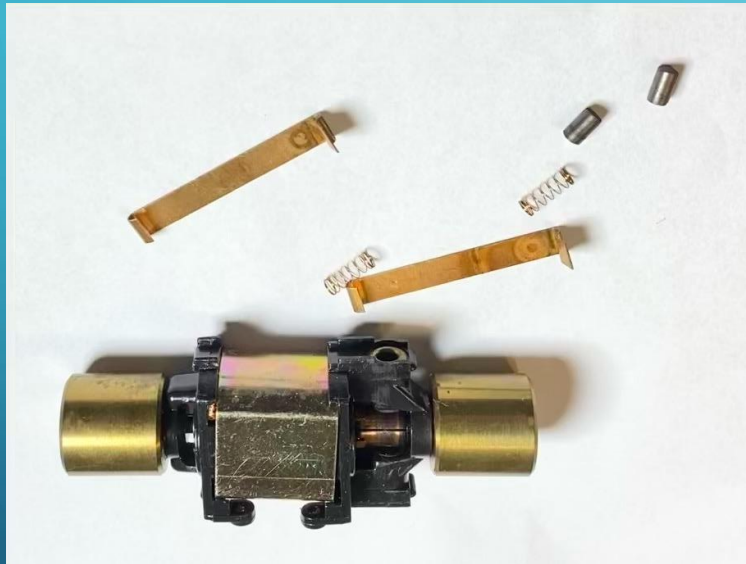


MOTOR ISOLATION

IMPORTANT!!! – for DCC the motor must be electrically isolated from the frame

- Genesis and DCC Ready unit motors are isolated from the factory.
- Classic Blue Box units are not isolated.
- Classic BB and RTR motors should be hard wired. Discard the wired clip that is featured on some RTR models.

ADDING WIRES TO MOTOR

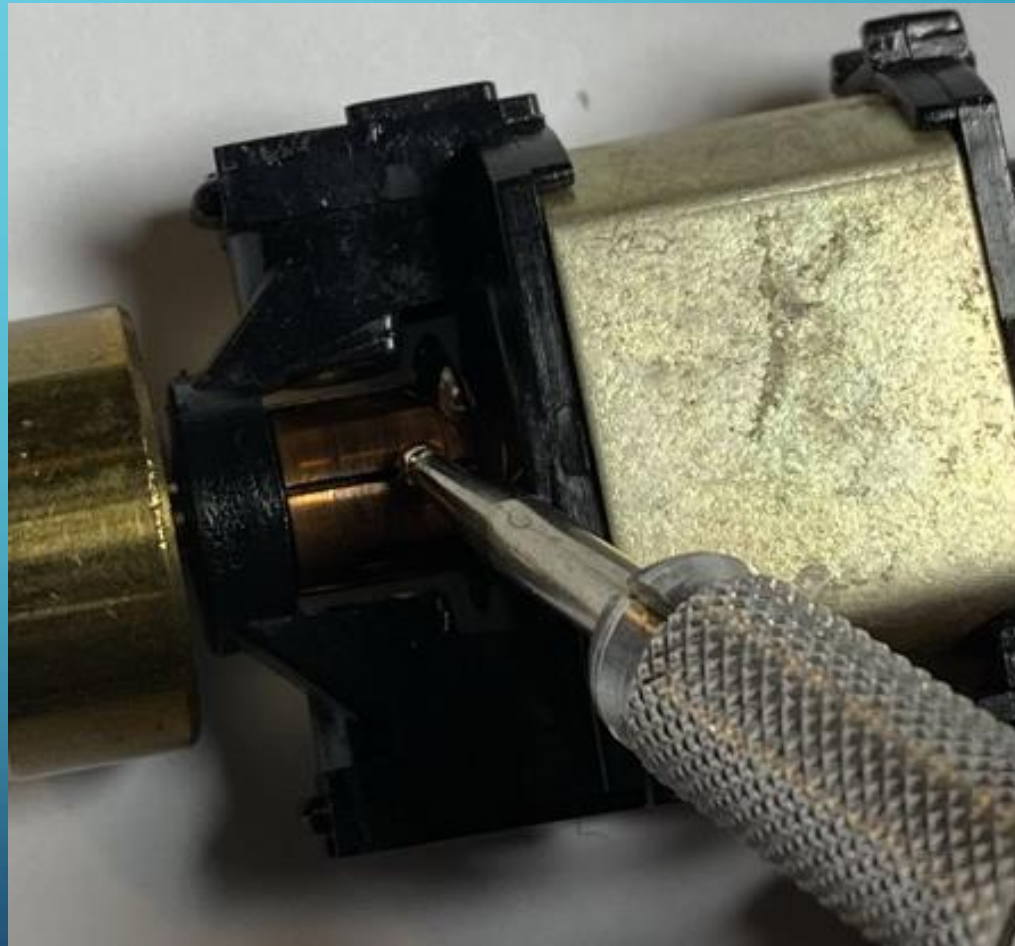


NOTE: for improved performance on older motors with steel springs upgrade with Athearn ATH90037 HO Motor Brushes and Athearn 84014 Motor Brush Springs.

REDUCE MOTOR NOISE

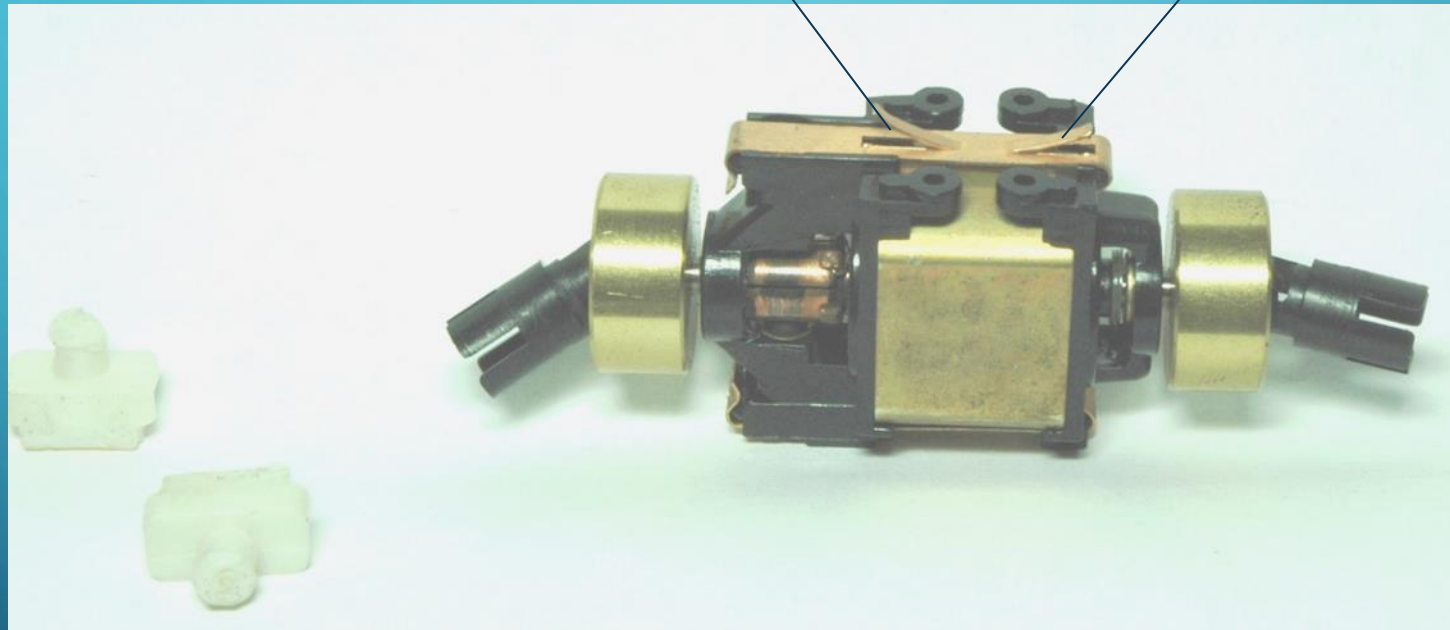


Excel 30605 burnishing tool



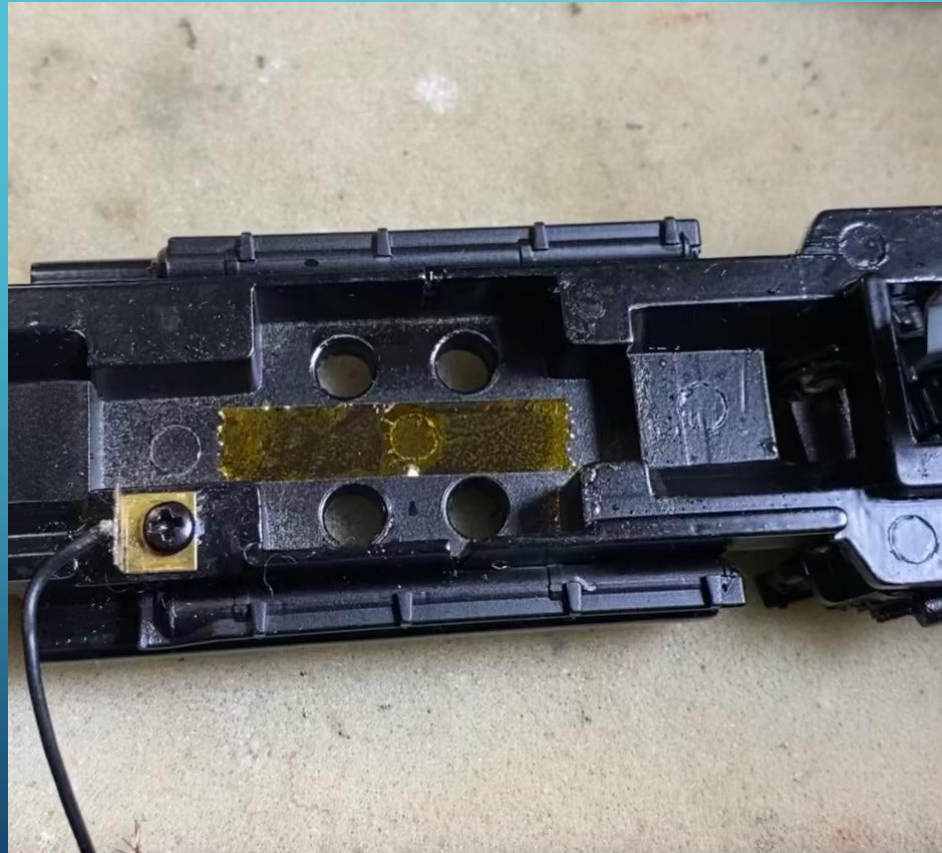
BLUE BOX FRAME MODS

Remove metal tabs from motor's bottom clip.



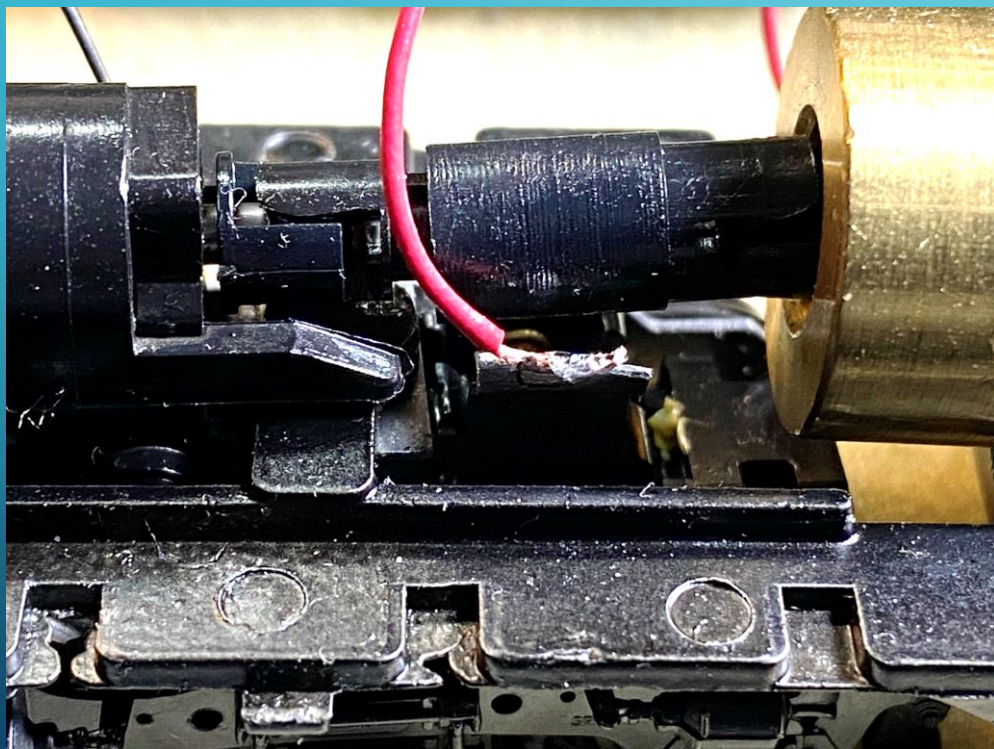
BLUE BOX FRAME MODS

Add Kapton tape to frame for isolation insurance



ADDITIONAL FRAME MODS

Hard wire trucks to improve power pickup



- Use flexible wire
- Use only solder made for electrical connections
- Remove drive couplings and worm gear covers prior to soldering to prevent damage



NEW SPECIALITY HEAVY GAUGE WIRE

20 Gauge



Pre-Packaged in
100' lengths

Ultra-Flexible

Quality PVC
Insulation

Custom Made
for TCS

Multi-Stranded

24 Gauge



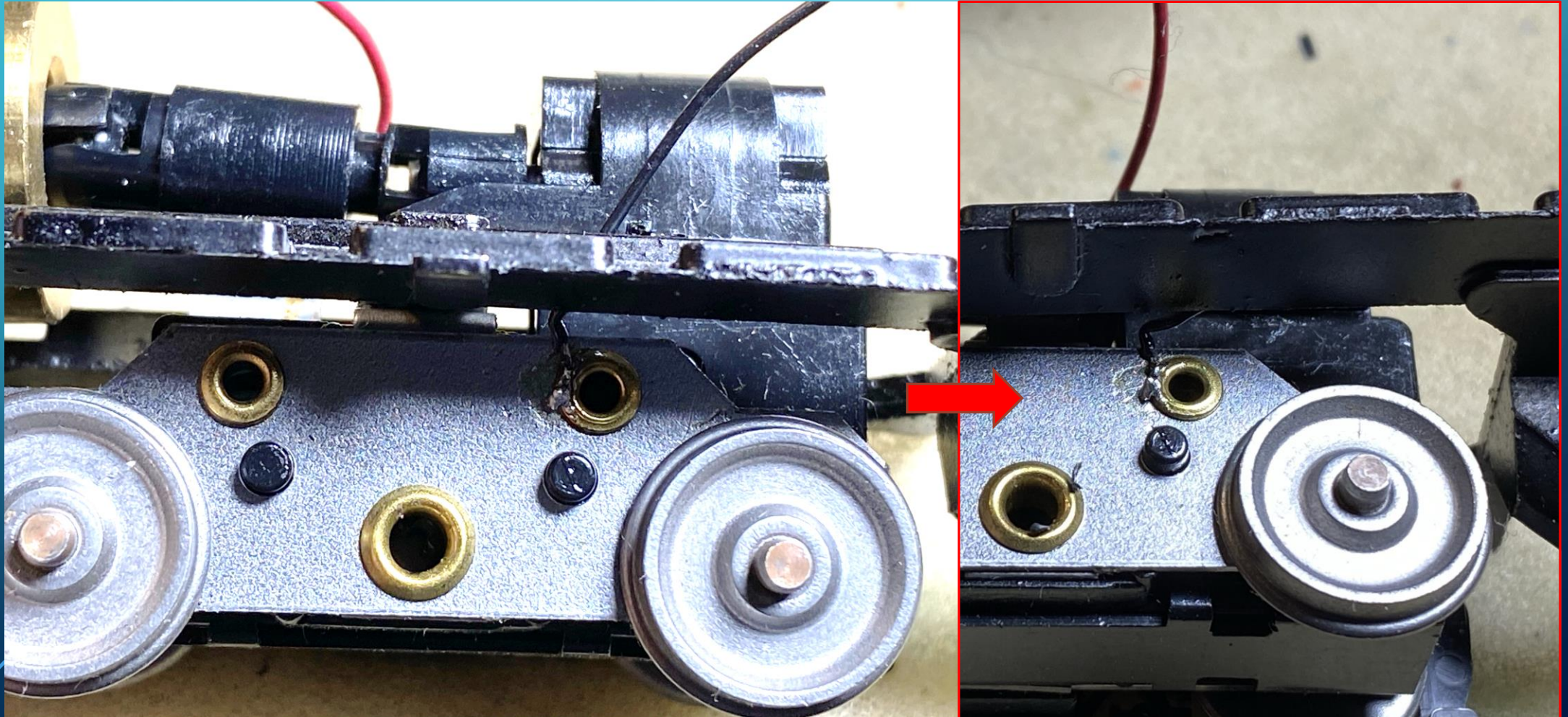
Pre-Packaged in
20' and 100' lengths

Custom lengths available upon request.



ADDITIONAL FRAME MODS

Hard wire trucks to improve power pickup

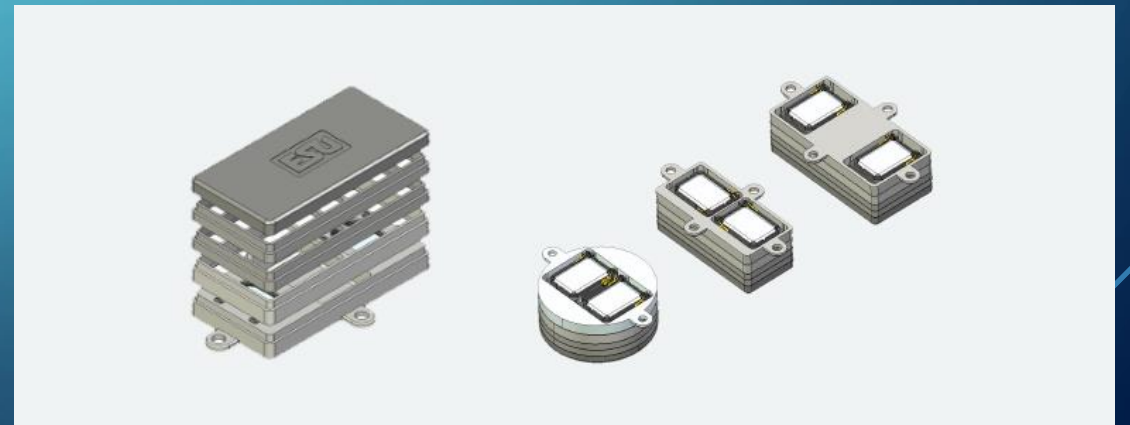
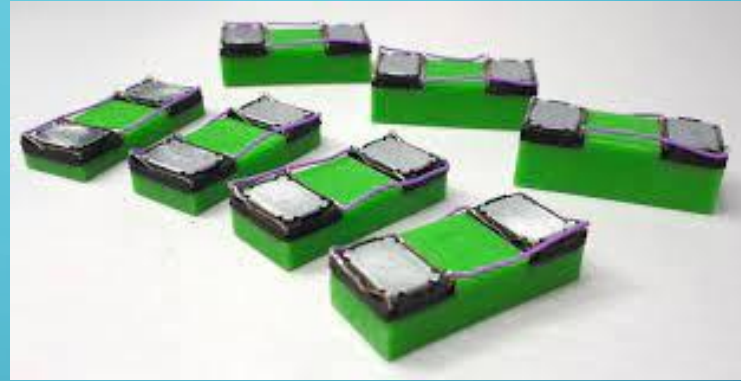


SPEAKER ASSEMBLY – SUGAR CUBE SPEAKERS

Why sugar cube (micro speakers)?

- Each speaker assembly is $\frac{1}{2}$ size of the standard 16mm x 35 mm speaker
- They provide more output (90 – 94 decibels vs 75 – 88 decibels)
- Frequency response is wider; several in the HiFi range (100Hz – 20KHz)
- Easier to add sound to locomotives where weight removal is required
- They sound sweet!

SUGAR CUBE SPEAKERS

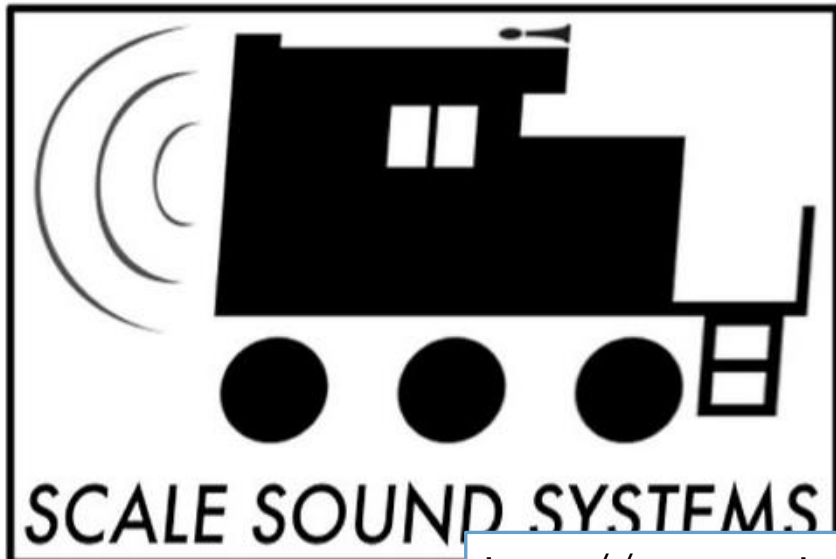




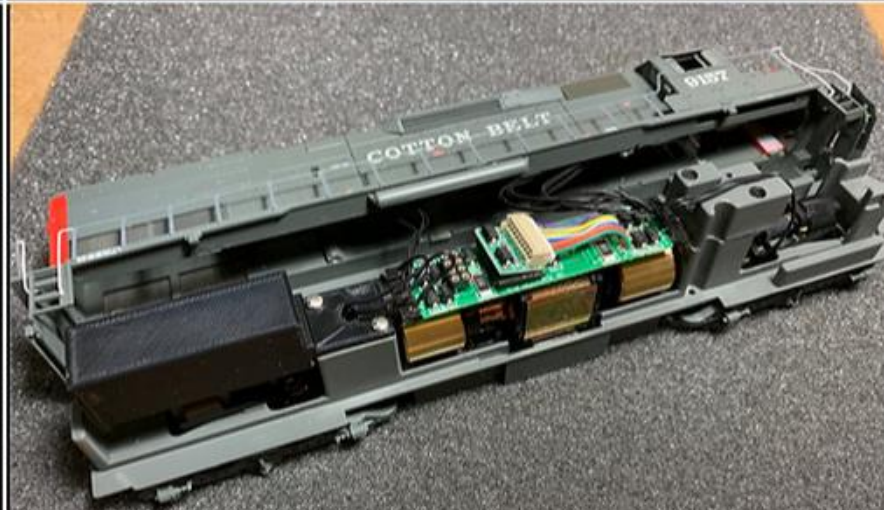
AHRR-TM01-RC1
Drop-in Speaker System for
early-run Athearn Tunnel Motors



Stock configuration

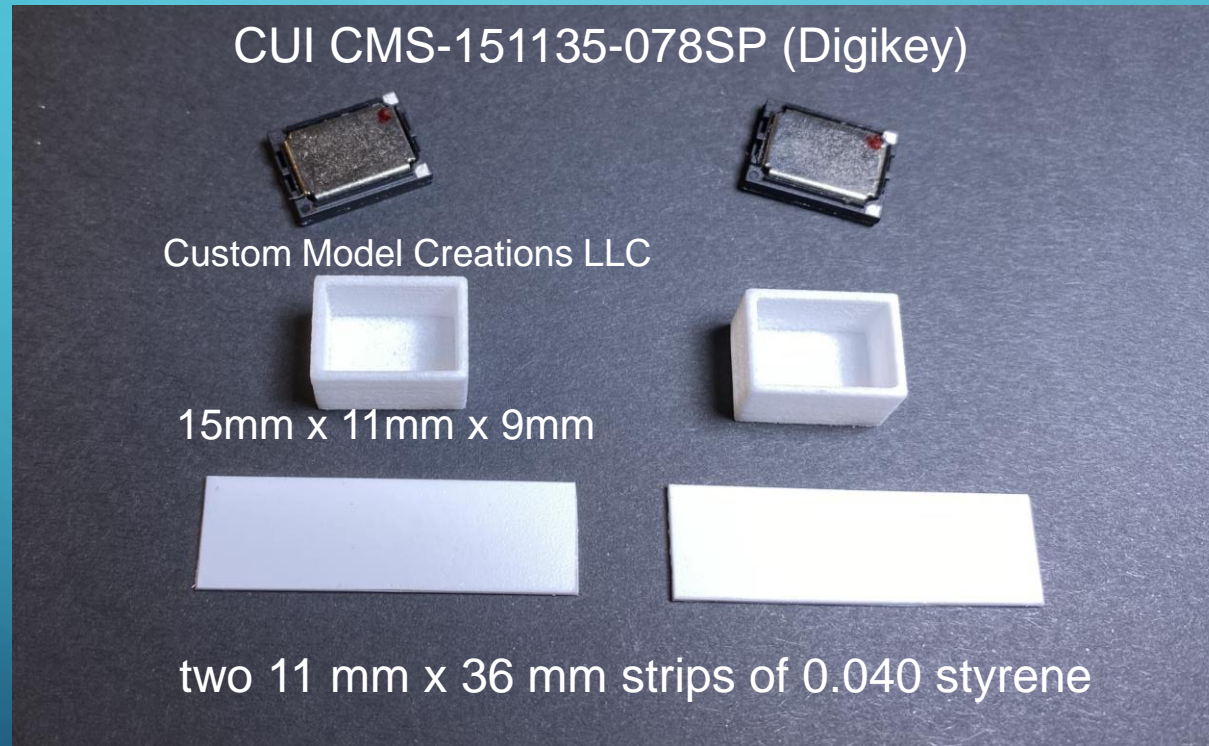


<https://www.scalesoundsystems.com>

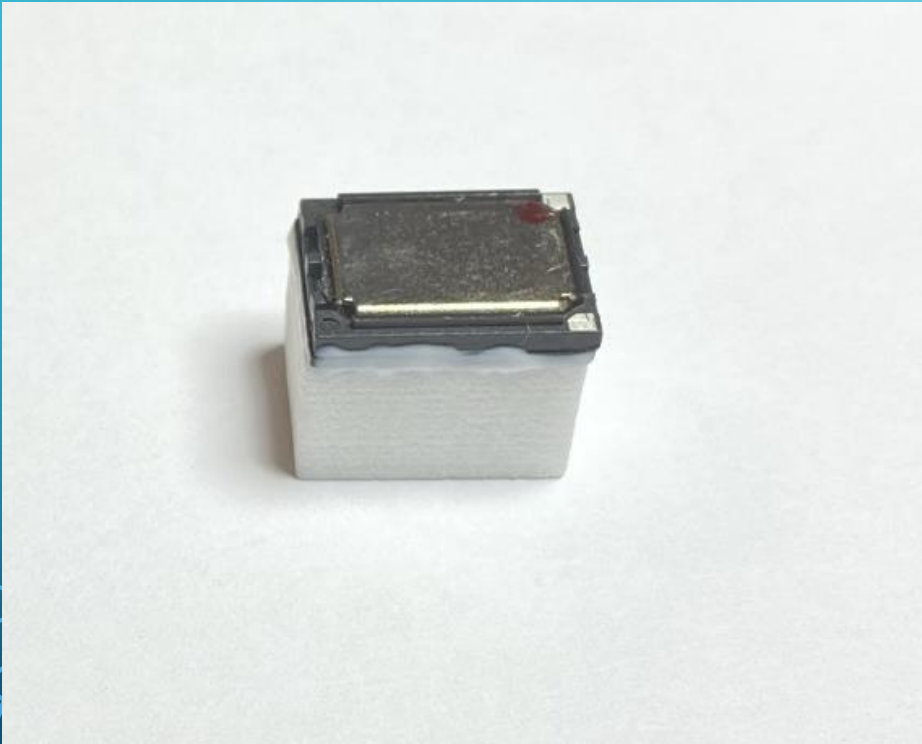


Installed with
forthcoming sound install

SUGAR CUBE SPEAKERS

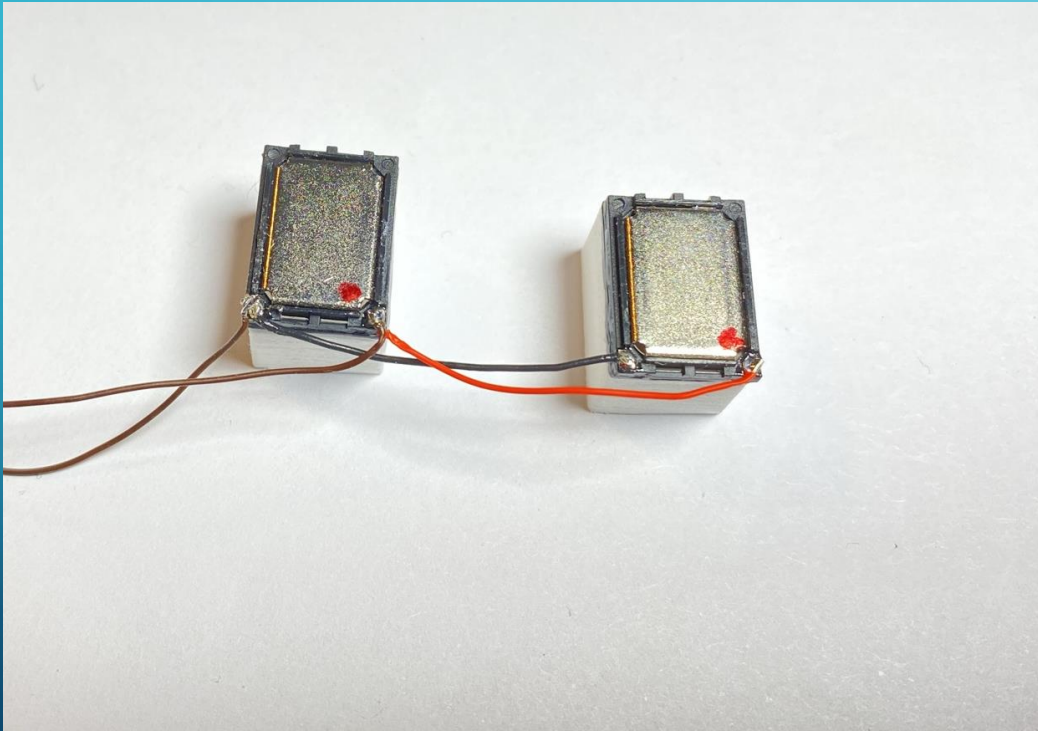


SUGAR CUBE SPEAKERS

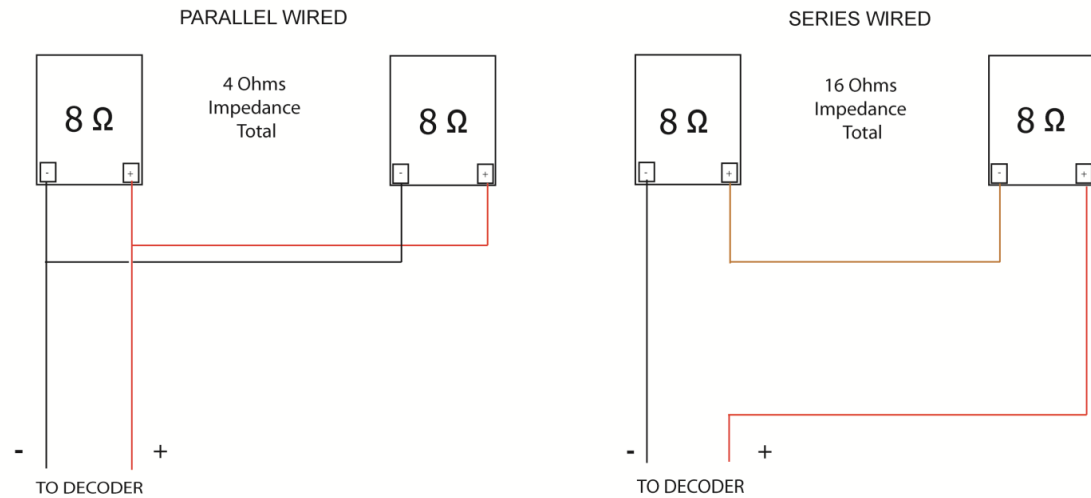


To attach the speaker to the enclosure, place a thin bead of glue around the open edge of the enclosure. Wait 60 seconds, then carefully place the speaker on the enclosure opening with the metal plate facing up (away from the enclosure). Repeat the process for the second speaker. For extra insurance you can run a thin layer of glue around the perimeter of the joint between the speaker and the enclosure.

SUGAR CUBE SPEAKERS

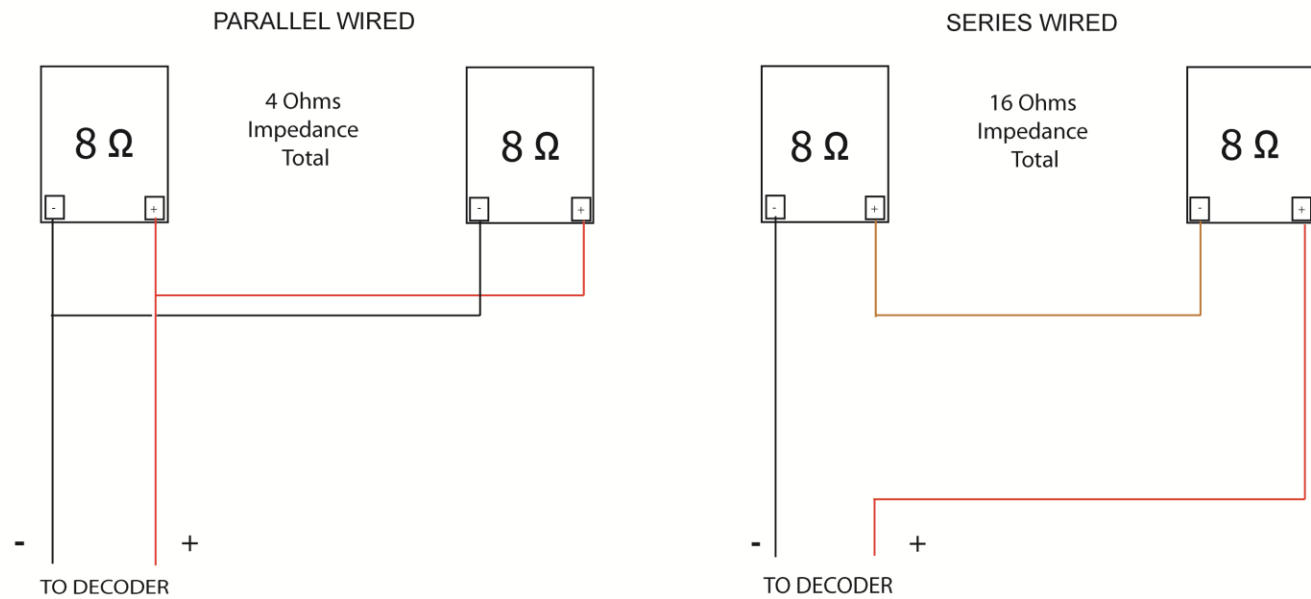


Parallel vs. Serial Speaker Wiring

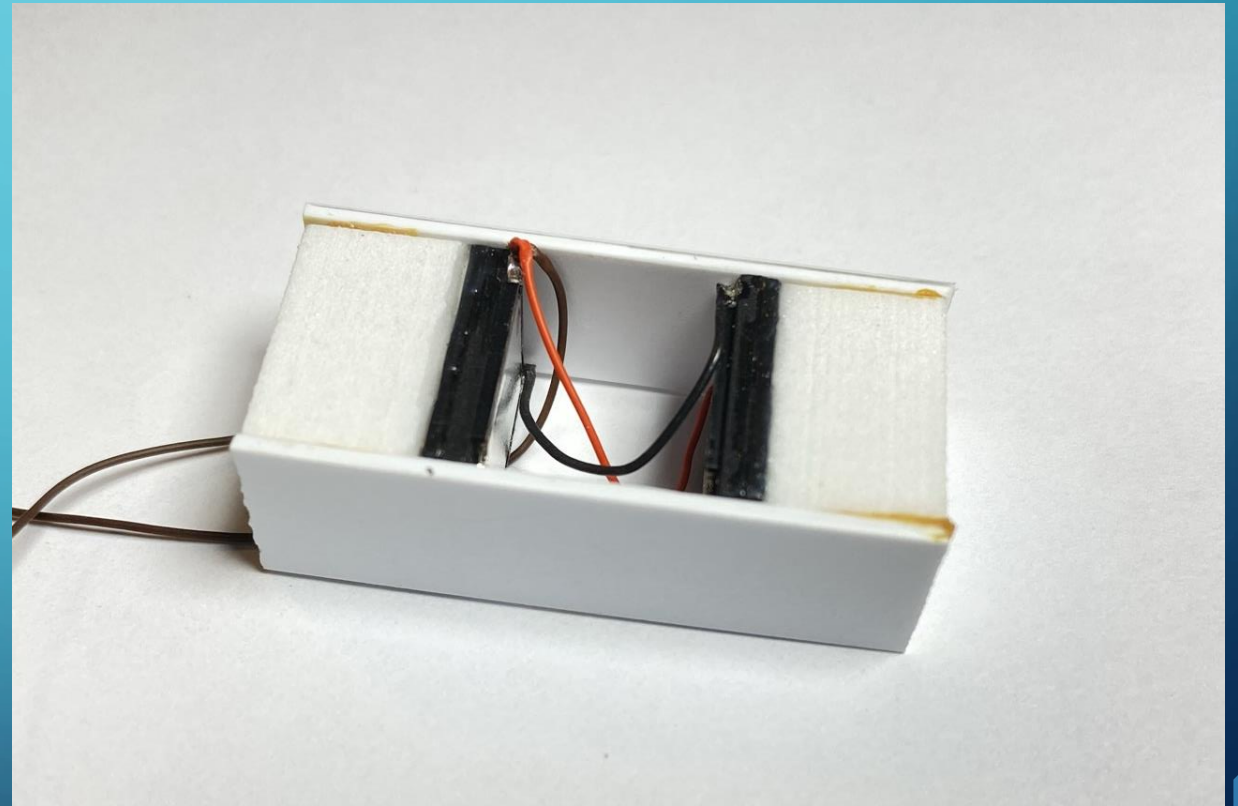
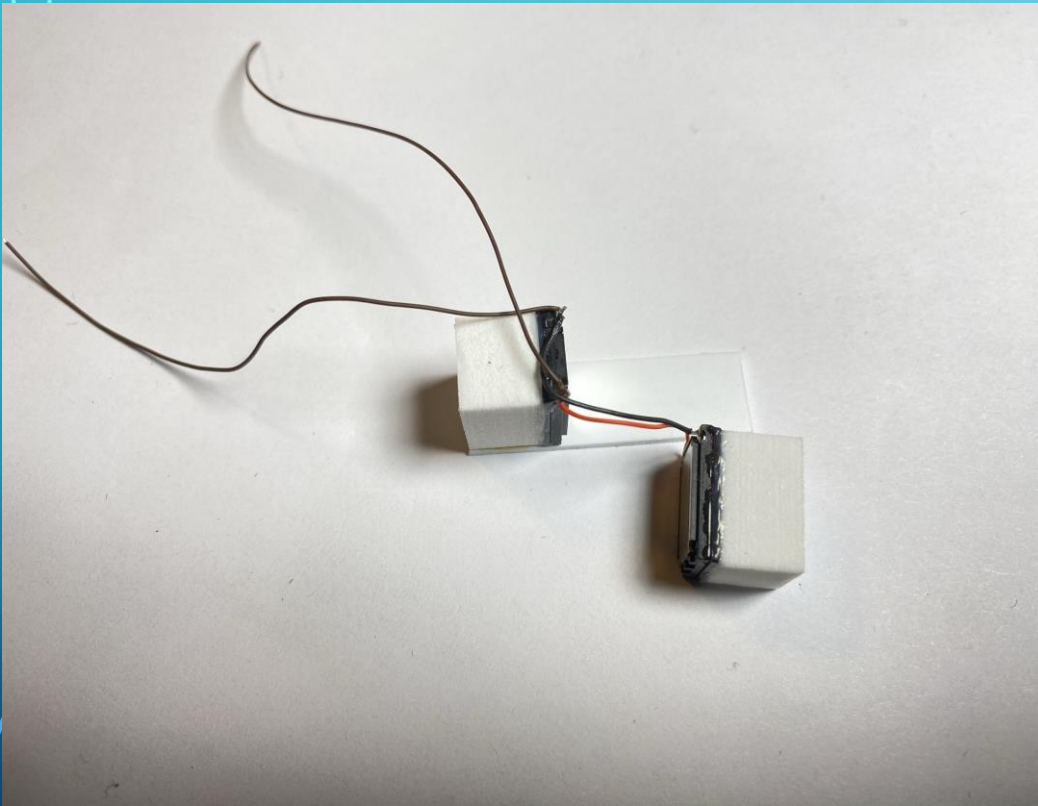


SPEAKER WIRING

Parallel vs. Serial Speaker Wiring



ISOBARIC SPEAKER DESIGN



This configuration improves low frequency response and sound volume

ESU DIRECT SERIES DECODERS

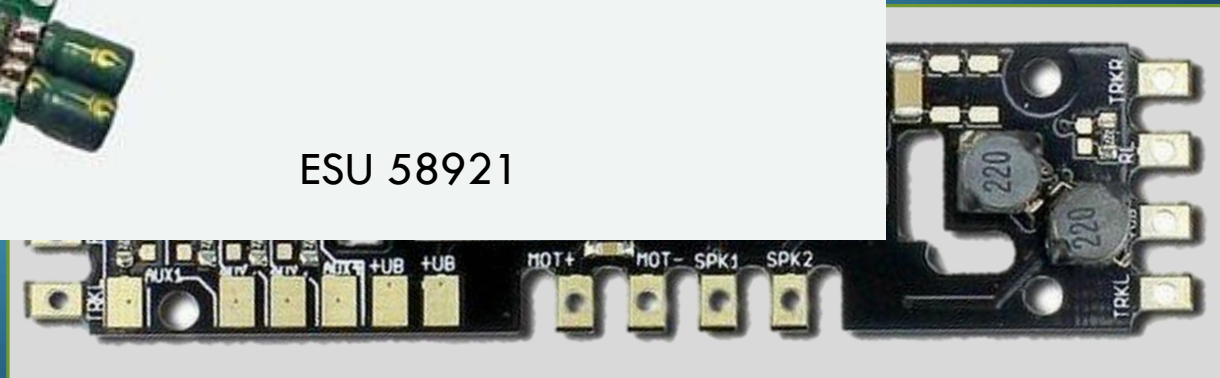


LOK SOUND
EST. 1999

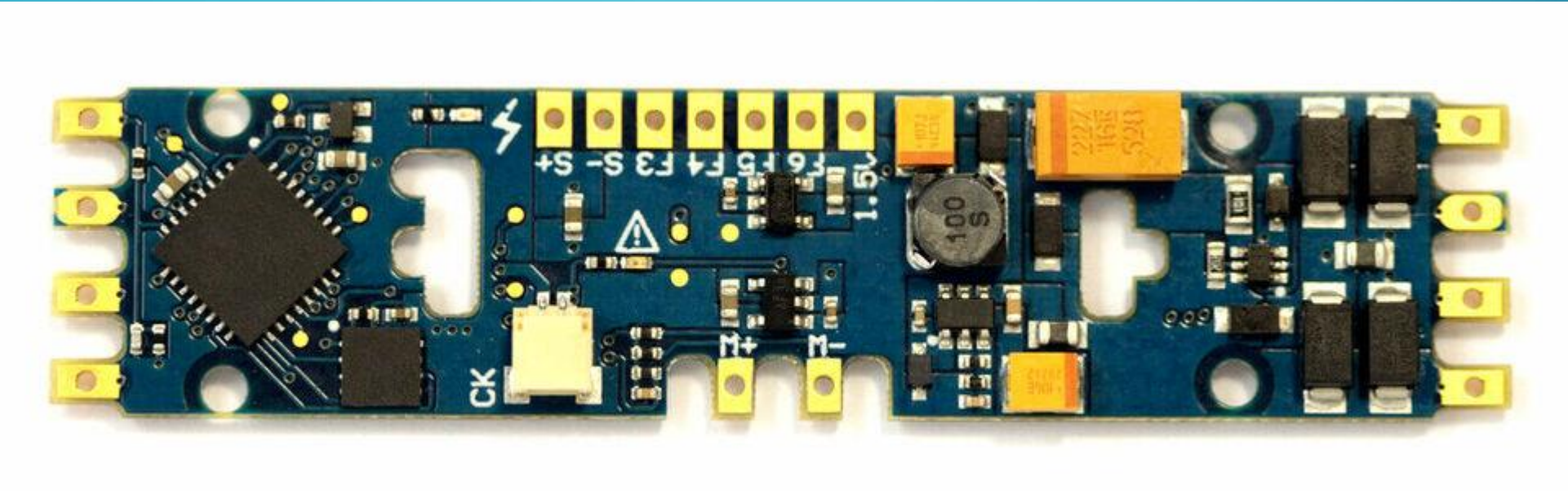
.0 family)

ESU 58921

ESU LOKSOUN

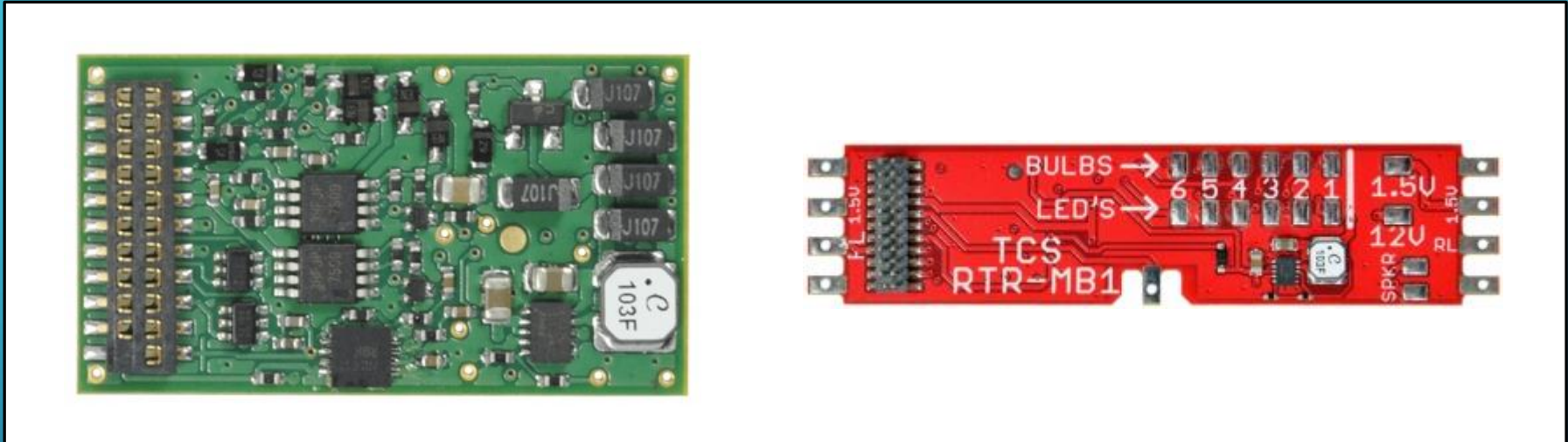


ADDITIONAL DECODER OPTIONS



Soundtraxx 885824 (TSU8F-PNP) decoder

ADDITIONAL DECODER/MOTHERBOARD OPTIONS

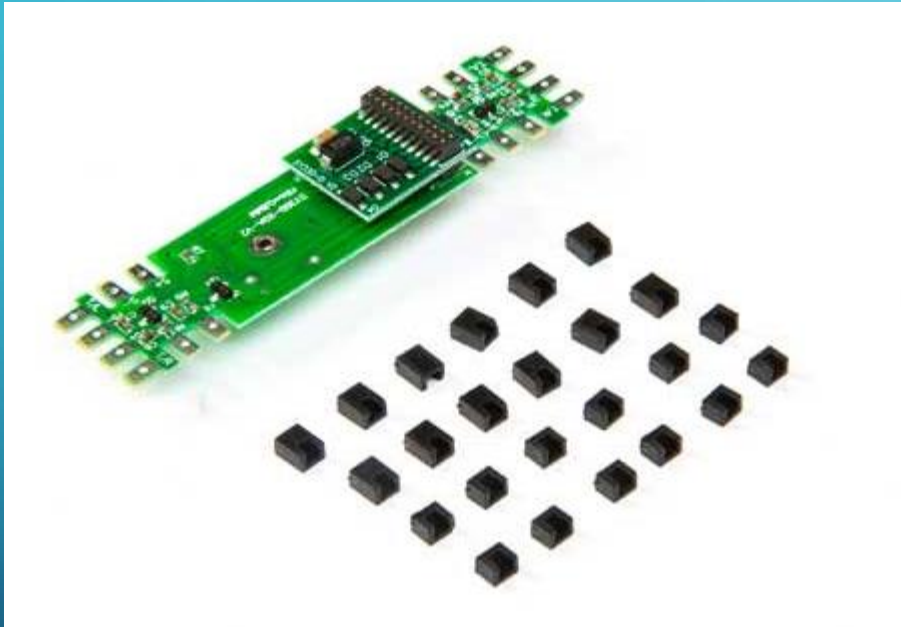


WOW121-Diesel

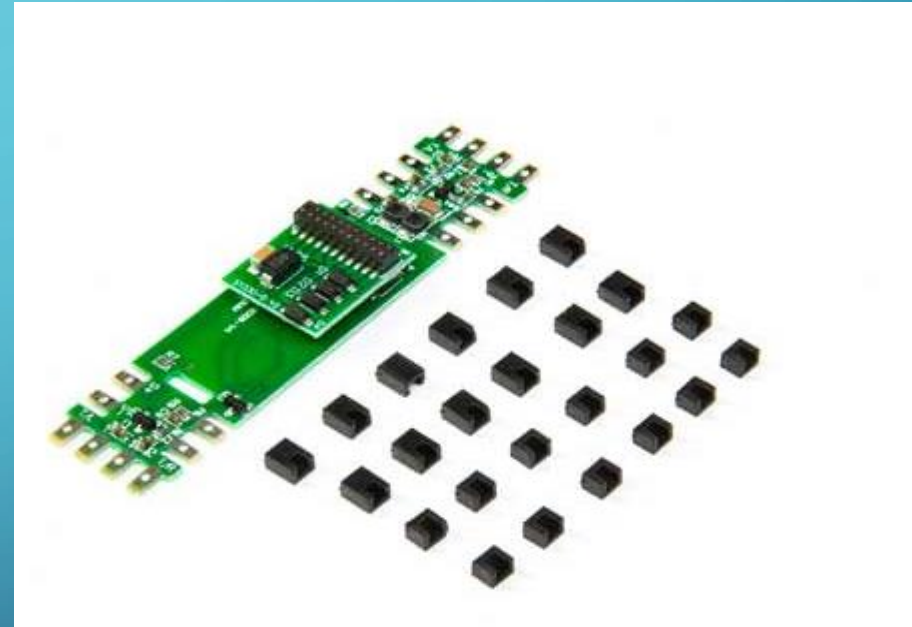
RTR-MB1 Motherboard
with Keep Alive™

Train Control Systems (TCS) MTC-21 pin
solution

ADDITIONAL DECODER/MOTHERBOARD OPTIONS



HO RTR DC-21 Pin Motherboard for LEDs
[ATH67240]



HO Genesis DC-21 Pin Motherboard for LEDs
[ATHG67140]

NIXTRAINZ DECODER BUDDY



ESU



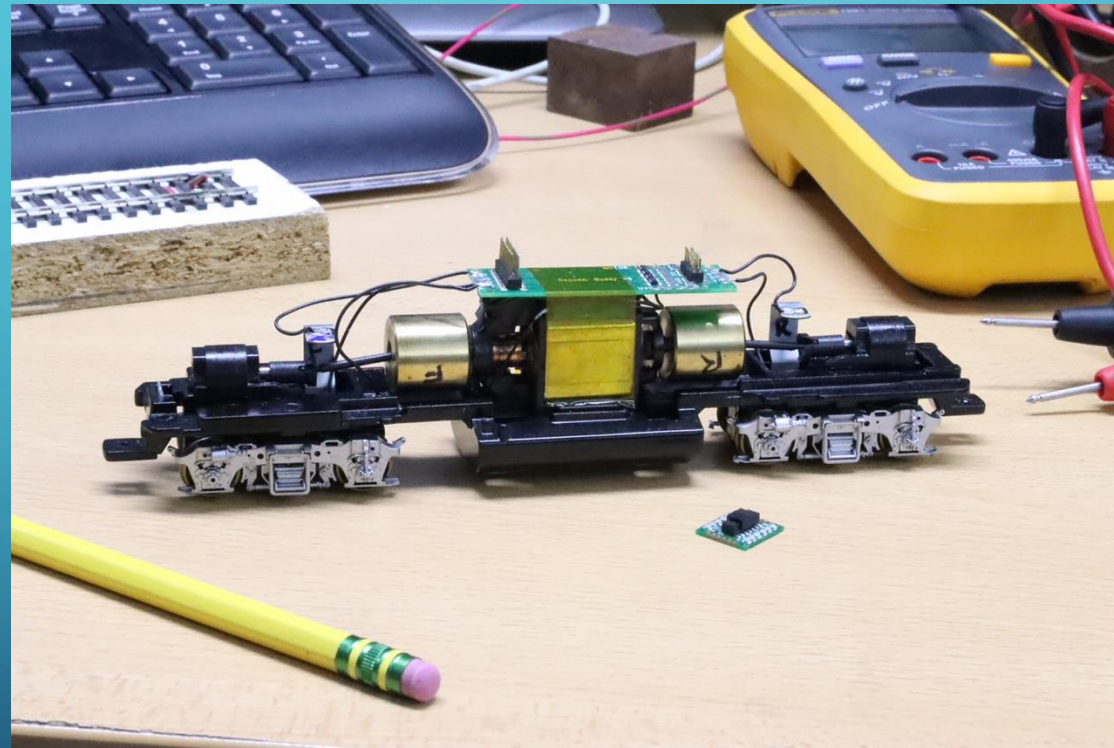
Soundtraxx



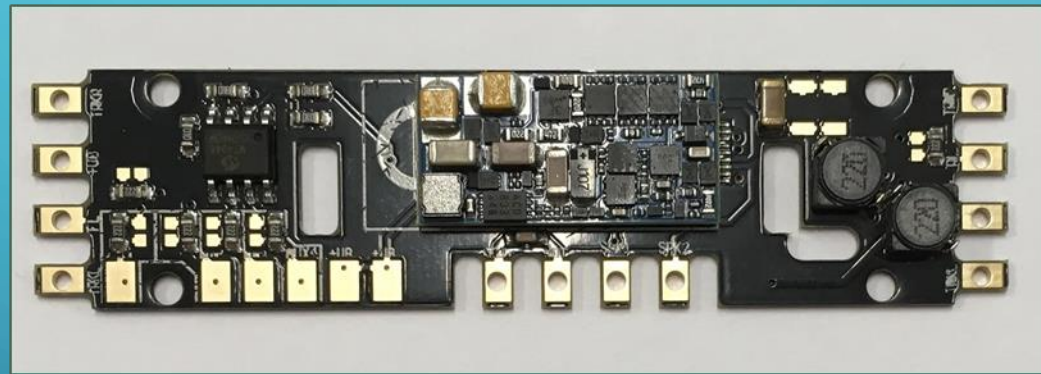
TCS

NOTE: These are intended for DCC systems only. Not recommended for DC

NIXTRAINZ DECODER BUDDY

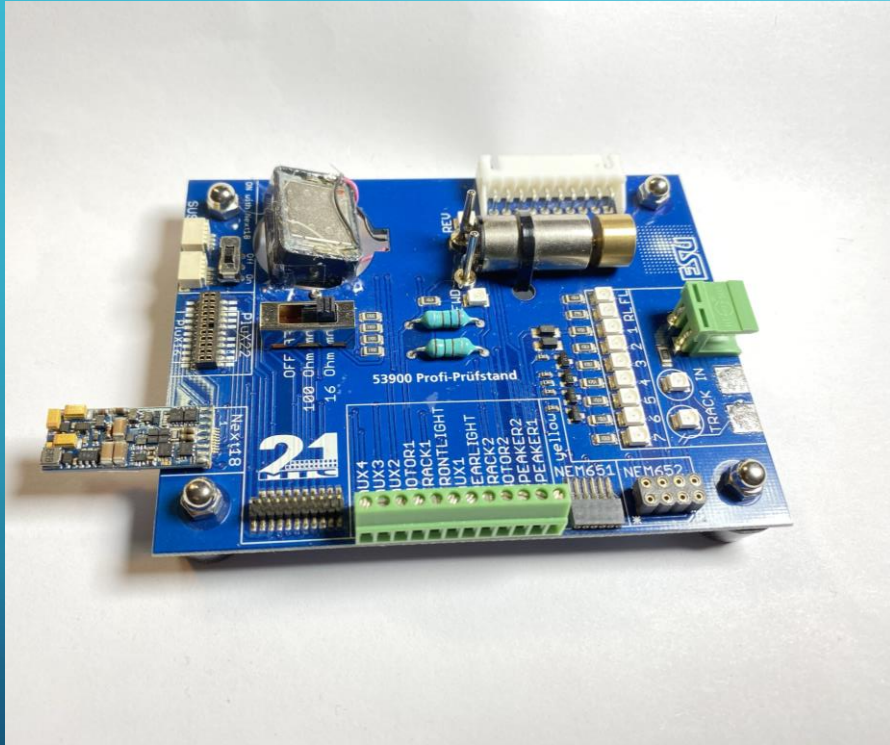


PROGRAMMING THE DECODER



ESU Loksound 5 DCC Direct = ESU Next18 decoder + ESU 51955 motherboard

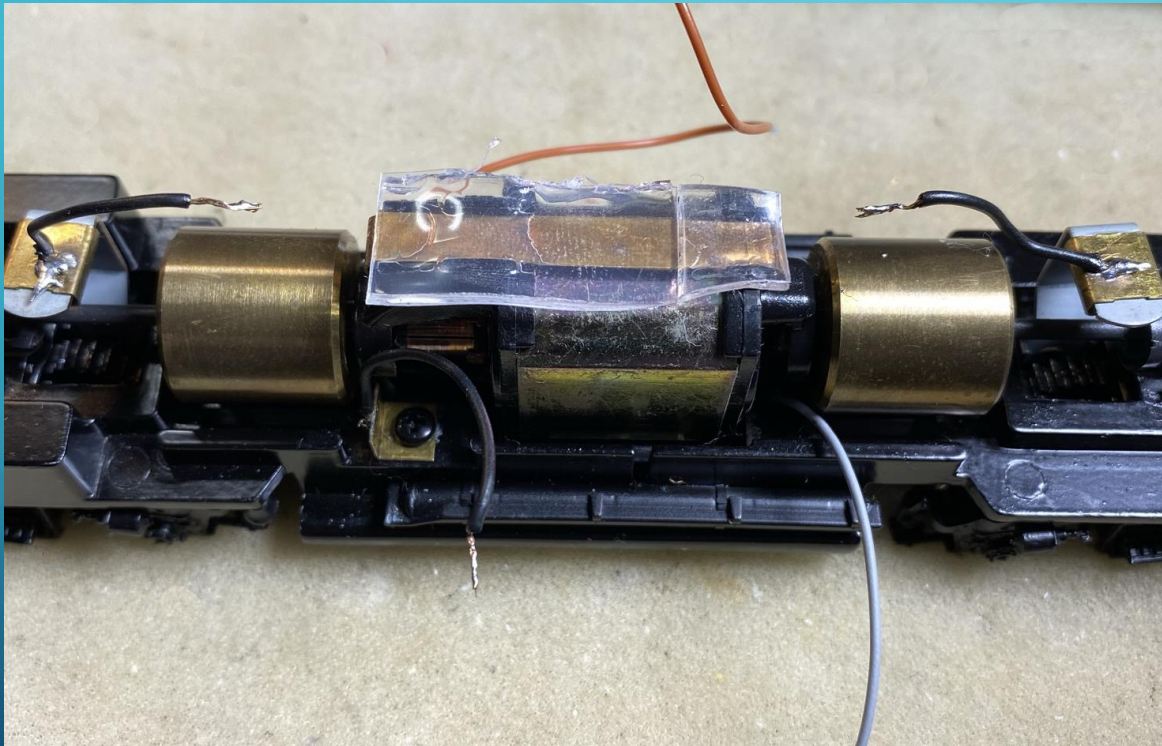
PROGRAMMING THE DECODER



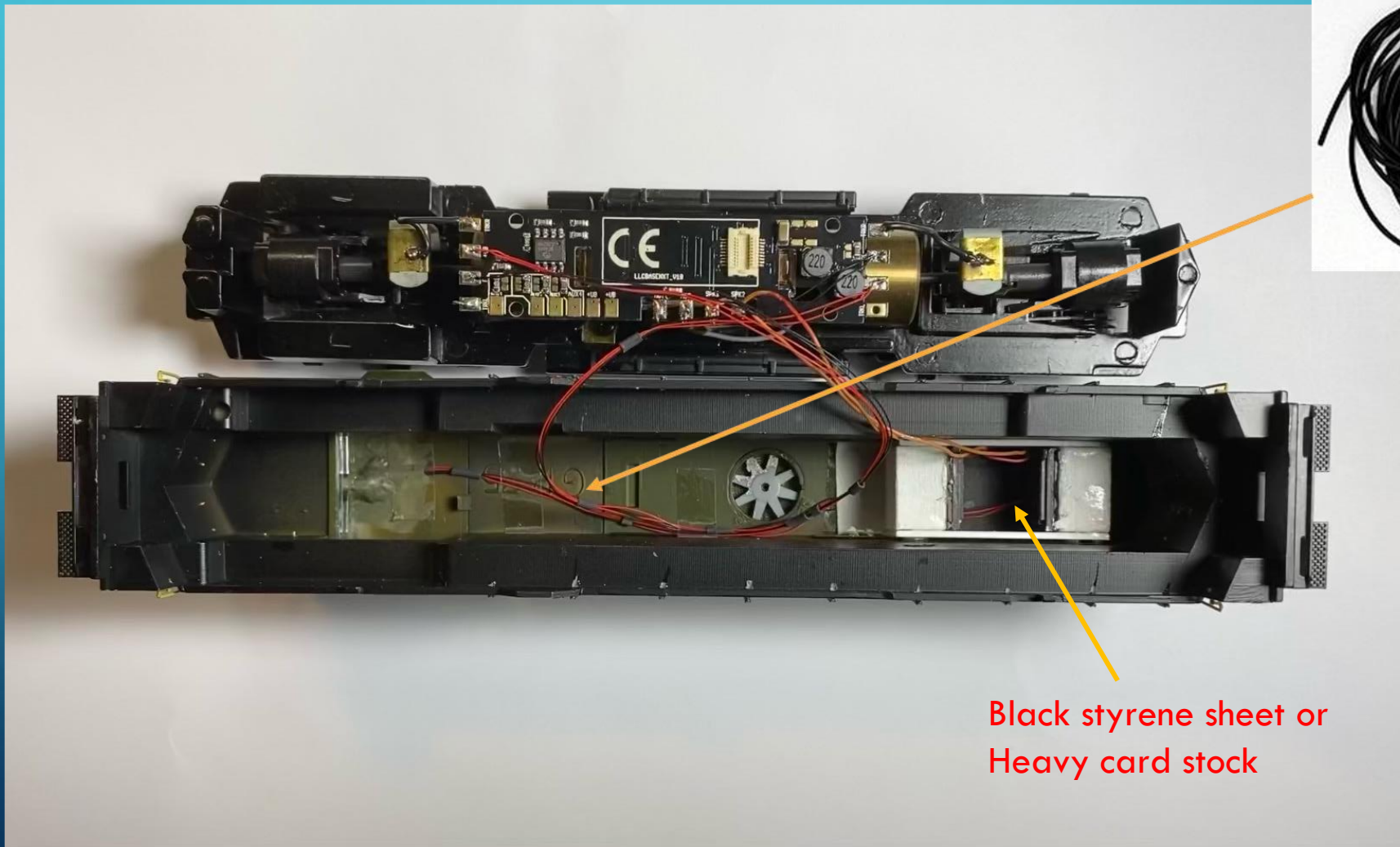
WHY OWN A LOKPROGRAMMER?

- Change the sound(s) saved on the decoder.
- Ease the programming process. Setting of all digital parameters of the Loksound decoder such as address of the loco, operation speed, maximum speed, braking deceleration, brightness of bulbs etc; are set with your computer very easily - no cumbersome entering of CVs (configuration variables) with your command station.
- Rearrange / reconfigure your sounds and transfer them to the LokSound decoder.
- You can use all sounds that can be downloaded to your computer hard disk.
- Sound can be allocated to different events.
- Additional sounds can be activated via function buttons.

PUTTING IT ALL TOGETHER

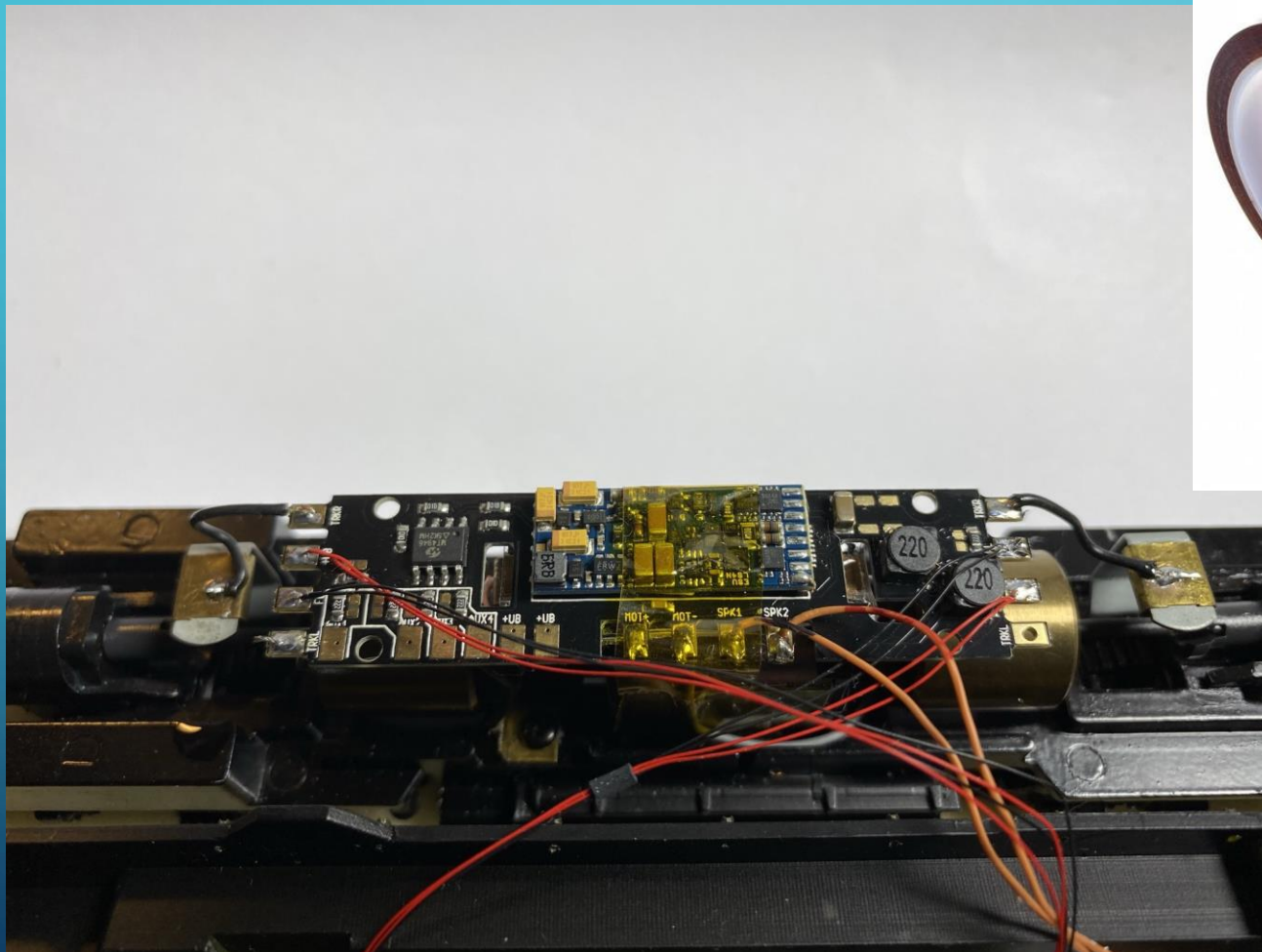


PUTTING IT ALL TOGETHER



Black styrene sheet or
Heavy card stock

PUTTING IT ALL TOGETHER



The background is a blue gradient with decorative white circuit-like lines in the corners. The lines consist of straight segments and small circles, resembling a network or data flow diagram.

QUESTIONS?

Thank You!