North Raleigh Model Railroad Club

Installing Decoders in N Scale Locomotives
Detailed Instructions

Walthers/Life-Like USRA 2-8-8-2 Steam Locomotive

by
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Introduction

LifeLike's USRA 2-8-8-2 Heritage Steam Locomotive is a good looking locomotive, runs well on DC, and is not too difficult to convert to DCC. The recent release of Digitrax's DZ123 and a good buy on a new 2-8-8-2 made the perfect opportunity to detail this conversion.

Instructions for converting this locomotive can be found elsewhere on the Internet, but hopefully the following illustrations will help clarify the installation. Note that these instructions are a compilation of two (2) other works: Bob Russell and Michael Dunn. Mr. Russell provided the instructions on the wiring and Mr. Dunn provided the instructions on how to modify the front circuit board to retain the front light function. Mr. Russell has also converted his 2-8-8-2 to include sound. The author has added notes and illustrations where helpful, as well as how to retain the rear light function. This description does not include the sound conversion.

Note: A newer version of this locomotive, including versions fully equipped with decoder and sound, has been made available by Walthers.

Tools Required

To install the decoder you will need the following tools:

Installing the Decoder

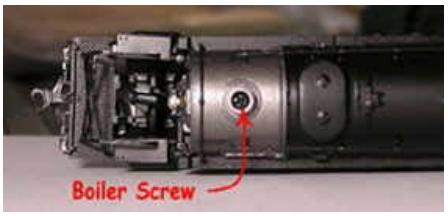
- Small Phillips-head and flat-head screwdrivers
- Wire cutter and stripper
- Soldering iron with fine tipped point, 20 watts maximum
- Fine resin core solder
- Tweezers (hook tipped work best)
- Long-nosed pliers, small
- X-Acto knife with #11 blade
- Pinvise with 0.040” diameter drill bit

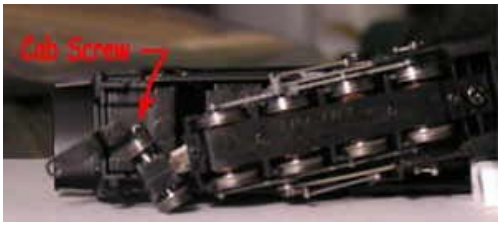
Detailed Installation Instruction
Life-Like USRA 2-8-8-2 Steam Locomotive

Print out this document. As each step in the installation is completed place a "X" or a check-mark through the box. All references to the frame are based on the front being at the top or away from you.

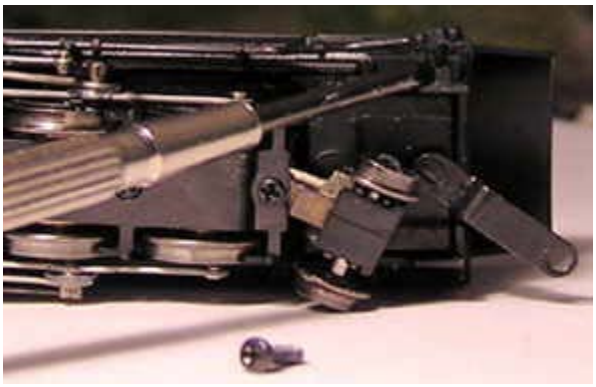
Before starting, test the decoder to insure that it is functioning correctly. Once this is determined, the covering must be trimmed on the end in order for it to fit as needed. Trim the cover opposite the wire side with a sharp Xacto knife back to the edge of the decoder circuit board.

❑ Remove the screw from the boiler smokestack on top and the screw underneath the cab.



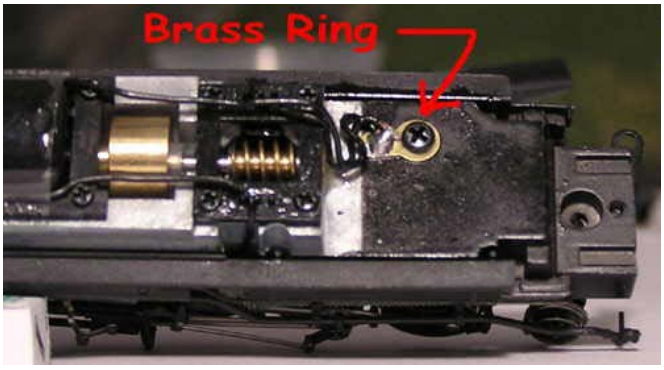


- Remove piping from boss below side of cab.

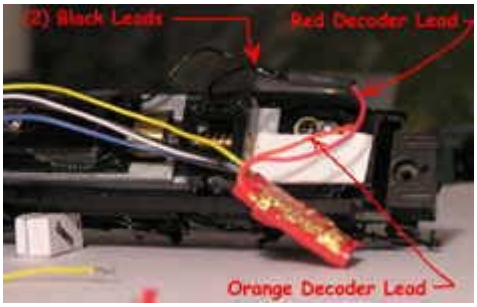


- Lift boiler and cab straight up from frame and drive train. Note location of loose weight in boiler shell.

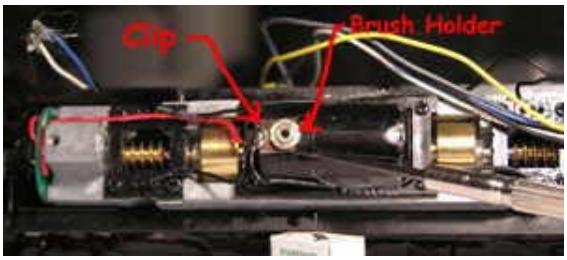
- Remove brass ring with wires soldered to it by removing attachment screw.

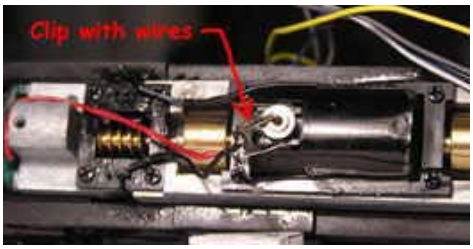


- Unsolder (2) black wires to brass ring.
- Cut orange decoder lead to 1-1/8".
- Cut red decoder lead to 1-3/8".
- Remove 3/32" insulation from orange and red decoder leads and tin them.
- Solder orange decoder lead to brass ring.
- Solder red decoder lead to (2) black wires that were removed from the brass ring.
- Insulate solder joints with liquid electrical tape or use appropriate size heat shrink tubing.
- Cut a small piece of double-sided foam tape for mounting decoder as shown.

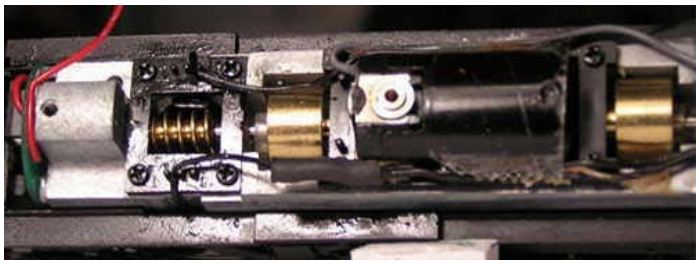


- Using a small screwdriver, carefully and gently pry up the top brush holder just enough to free the clip underneath it. Exercise caution so the brush holder is not completely removed (freeing the motor brush and spring assembly). This clip has two (2) black and one (1) red wires soldered to it and also wraps around the front of the motor with a small tab that fits into the end of the motor.

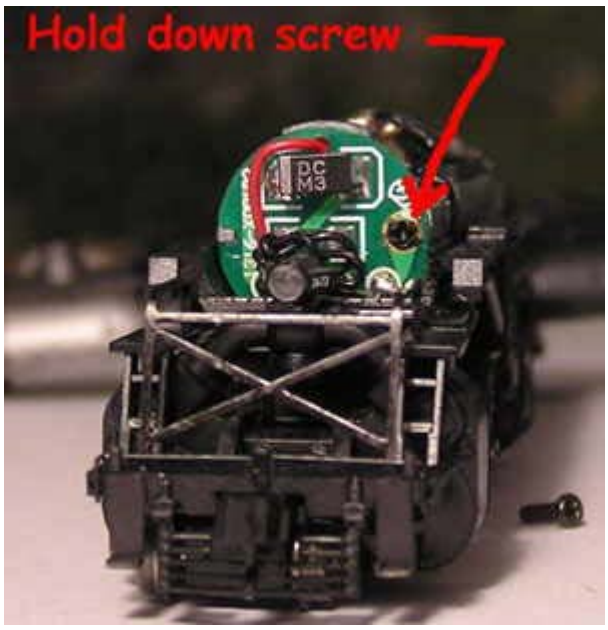


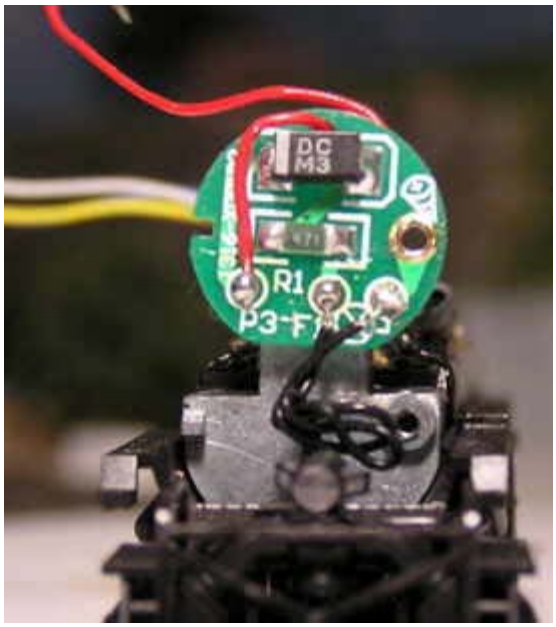


- Unsolder the (2) black wires and (1) red wire from the clip.
- Cut black decoder lead to 2".
- Cut gray decoder lead to 2-1/8".
- Remove 3/32" insulation from the black and gray decoder wire ends and tin them.
- The black wire from the front of the engine was trimmed 1/8" in length for better fit and solder joint.
- Solder black decoder lead to the two (2) black wires that were removed from the motor brush clip.
- Insulate solder joint with liquid electrical tape or thin walled heat shrink tubing.
- Solder gray decoder lead to motor brush clip.
- Replace clip under motor brush holder and press brush holder into its original position.
- Route decoder leads beside motor and hold in place with a small dab of Goo. Note protrusions on worm gear hold down plates helping to route wires. Photo shows heat shrink tubing, but this had to be replaced with liquid electrical tape due to interference with the plastic boiler shell.

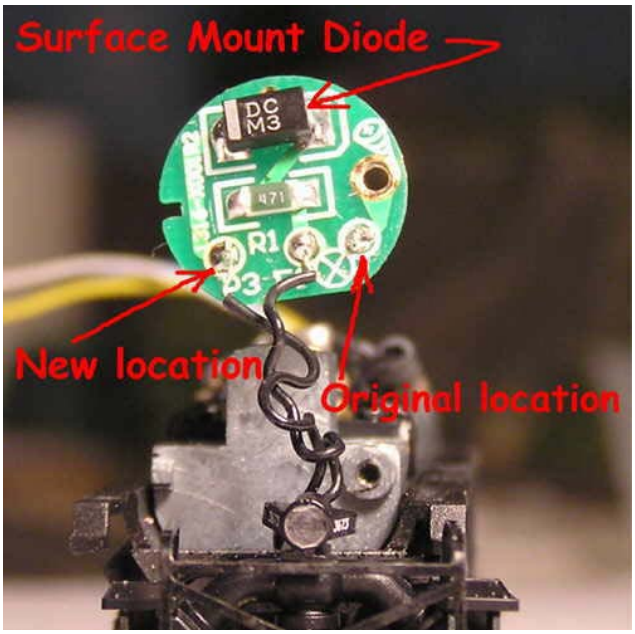


- Remove the screw holding the printed circuit board in place.



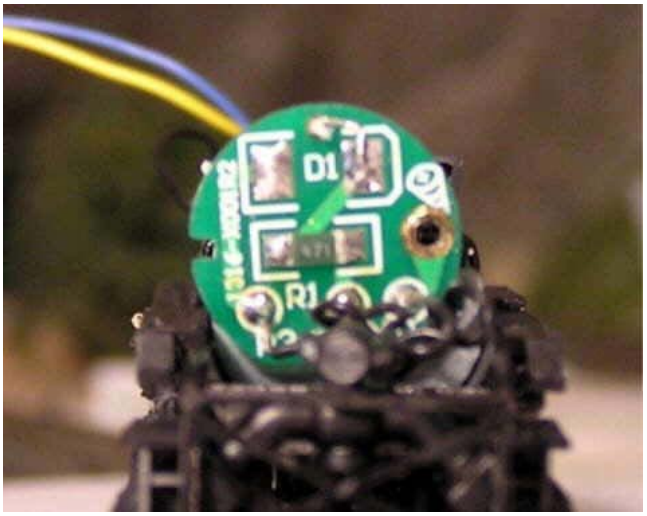


- Carefully lift the circuit board paying attention to the wire leads that are twisted and tucked down in front of the circuit board. Carefully untwist the wires and lift the board to gain additional working room.
- Facing the engine, unsolder the rightmost light lead from the circuit board (the one closest to the edge).
- Solder the right light lead just removed to the P3 pad where the red wire was previously.

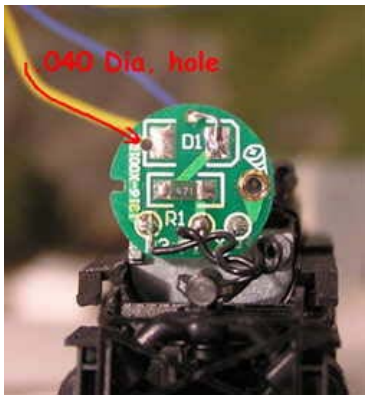


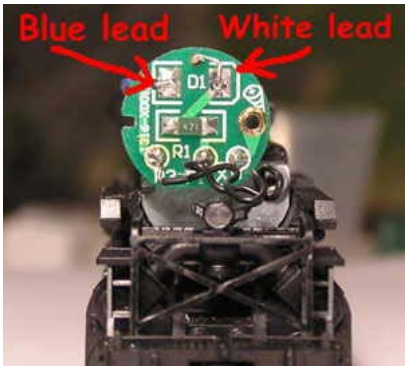
- Unsolder the surface-mount diode and remove. Note D1 pad designation under diode.
- Cut white decoder lead to 3-1/8".

- Remove 1/8" insulation from end of white decoder lead and tin. Make a pair of 90 degree bends in the tinned end so the tinned end will lie on the pad after completion of next step.
- Insert bent end of white decoder lead into hole in top of circuit board and solder to right hand D1 pad.



- Drill .040 Diameter hole in left D1 pad.
- Cut blue decoder lead to 3".
- Remove 3/32" insulation from end of blue decoder lead and tin. Bend end 90 degrees.
- Insert bent end of blue decoder lead into new hole beside left D1 pad and solder to pad.





- Carefully retwist the wires and place the circuit board closer to its installed position.
- At this time, the engine can be placed on a programming track and the unit tested to make sure the decoder is properly recognized and is programmable. If it comes back as no decoder present, or gives an indication that there is a short in the wiring, find and fix the problem before continuing. If the decoder is programmable, place it on a running track and test the operation of the running gear and light function. I noted on my unit that the throttle had to be at almost 50% before it started moving. However, from this point on it ran very smoothly and quietly.
- When satisfied with the operation, use screw to hold circuit board back into place. Check front driver set for ease of side-to-side rotation. If not properly replaced, the twisted wires can interfere with this motion. Adjust the wires as needed.
- Place the loose boiler weight at its original location and mark it for clearing the new wires and solder joints in the gray and black wires. Cut and file weight as needed for a good fit.
- Replace boiler shell. Boiler shell must slide on without resistance. If resistance is felt from interference with new wiring or solder joints, find the interference and fix it. Reinsert side piping into lower piping boss.
- Replace bottom cab screw and top smokestack screw.

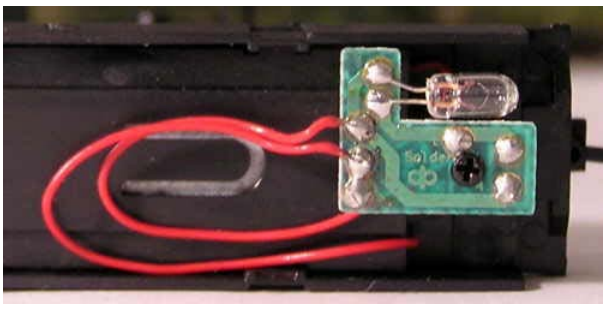
At this point, the engine conversion is complete. For the tender, I wanted to retain the reverse light function. There are several alternatives to provide this feature.

One is to run two wires from the engine to the bulb in the tender. This would require splicing into the blue decoder lead and running it to the light in the tender. The yellow decoder lead would also be run from the engine to the tender. The two red leads going to the circuit board would have to be removed from the circuit board (or cut).

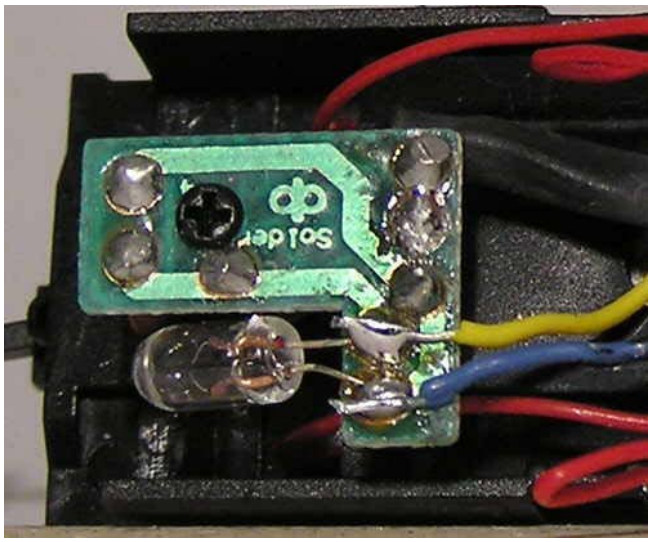
The author chose to install a separate decoder in the tender to keep from having wires running between the engine and tender. If choosing this method, it is best to use an old decoder that has blown the motor and/or head light circuits and still retains the rear light function. I originally purchased a Digitrax TF2 function only decoder (a TF1 would work as well), but could not determine how to make it only work in reverse. Wiring it the

regular way did not work. I ended up using an old DN142 that I had on hand. Due to the many variations of decoders that may be used, wire lengths will not be noted. There is plenty of room in the tender for wiring.

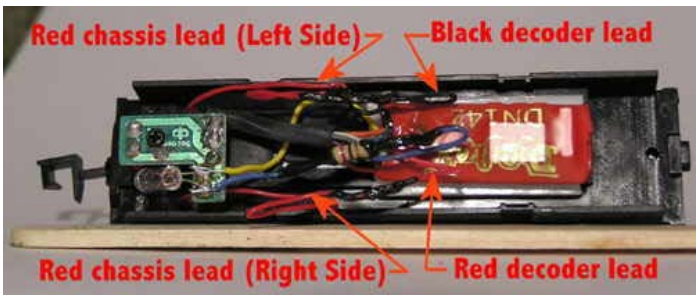
- The tender body lifts off the tender chassis by simply pulling straight up. You may need to hold the chassis in one hand while gently pulling up on the ends of the body. If particularly stubborn, a small flat blade screwdriver may be used to alternately pry each end a little upwards until the body is freed from the chassis. A sticky adhesive was evident on the sides of the chassis to help hold the body on.



- Note the two (2) red wires going to the circuit board. Unsolder both wires.
- Cut all decoder leads short EXCEPT the red, black, blue and yellow leads.
- Cut a small piece of double sided foam and mount the decoder to the chassis.
- Stretch the blue decoder lead to one of the solder pads that the light is soldered to and cut the lead to this length minus Â½".
- Solder one end of a 47 ohm resistor to the blue wire and the other to one of the solder pads the light bulb is attached to. Note I spliced the resistor in the blue wire instead to make a quick solder connection at the bulb.
- Stretch the yellow decoder lead to the other solder pad that the light is soldered to and cut the lead to this length plus Â½".
- Remove 3/32" insulation from yellow decoder lead and tin the bare wires.
- Solder yellow decoder lead to the other light bulb solder pad not occupied by the blue decoder lead.



- Cut red and black decoder leads to desired lengths.
- Trim insulation and tin ends as done for yellow and blue decoder leads.
- Looking at the top of the chassis with the Rapido coupler to the left side, the red wire on the bottom is the right rail pickup. Solder the red decoder lead to this red wire.
- Looking at the top of the chassis with the Rapido coupler to the left side, the red wire on the top is the left rail pickup. Solder the black decoder lead to this red wire.
- Insulate both solder joints with liquid electrical tape or heat shrink tubing.



- The wiring of the tender is complete. Place unit on programming track and check for decoder presence and

programmability. If it comes back as no decoder present, or gives an indication that there is a short in the wiring, find and fix the problem before continuing. If the decoder is programmable, place it on a running track and test the operation of the light function.

Although this process seems lengthy, it actually goes very quickly and makes for a great running locomotive.