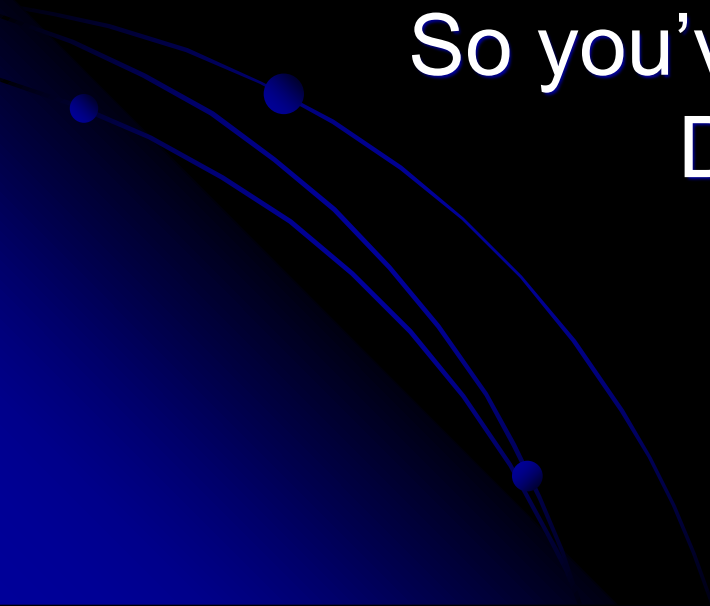


Decoder Installation

So you've decided to install a
DCC decoder!!



Before starting

- Is the loco worth the DCC decoder?
- Questions:
 - Is the loco special?
 - Can you get the model with factory-installed DCC?
 - Is the loco too beat up to justify the expense?
 - Is the loco so cheap that it just makes more sense buying a newer/better model?
 - Was your loco a special edition/limited release?
- Next, will there be issues with reworking the drive? Is it still worth it?
- For example:
 - An older Athearn Blue Box loco might be questionable for installation due to the work.
 - Some locos require milling to accommodate the decoder/speaker

What do you want to do?

- The more functions, the more options
- Basic Decoders – standard 2 functions (forward light/reverse) –you can get one for less than \$30 (including tax)
- High End Decoders – as many as 8 functions (selling for around \$200 if you want sound)
- What is a function?
 - Additional lighting or accessory options
 - Ditch lights, strobe light, Mars light, number boards, fire box, etc.



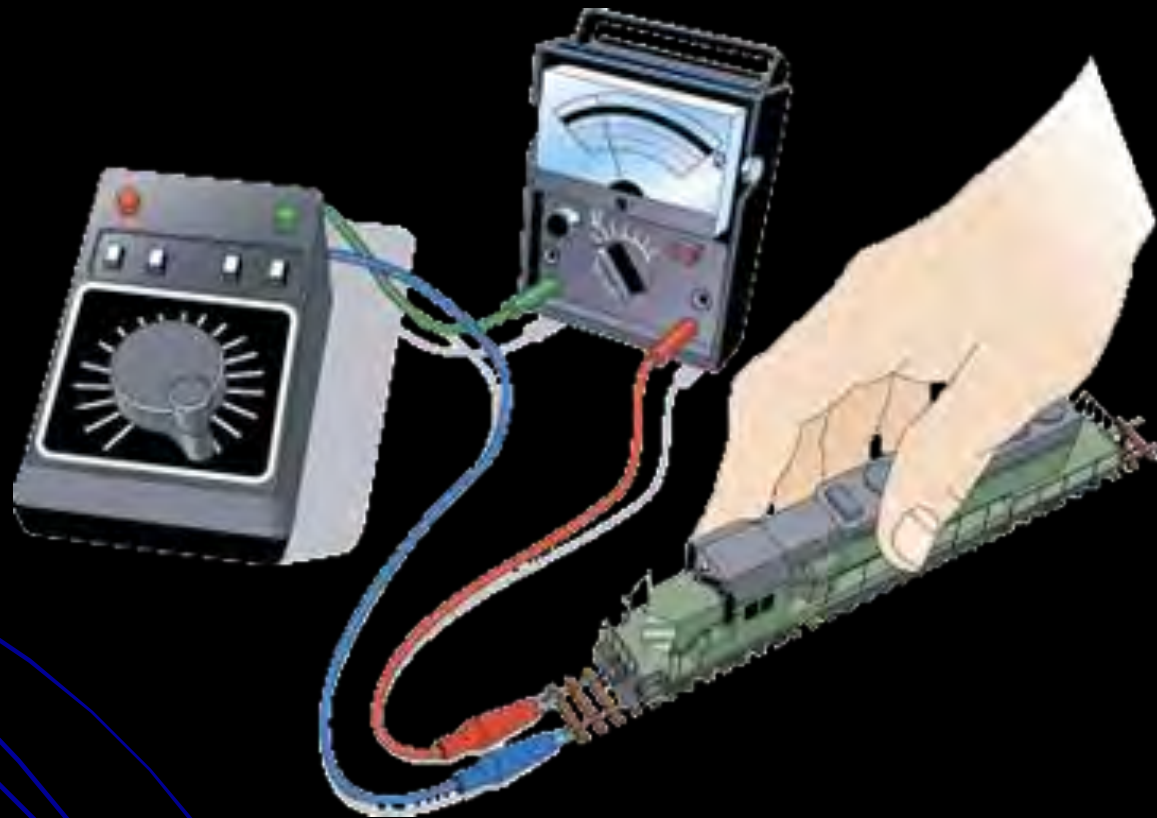
Decoder Selection

- The decoder requirements are that it must have an adequate current rating (i.e. can supply the stall current continuously) and that it will be small enough to fit in the shell. There are however other considerations to take into account:
 - Are any "accessory" outputs required? Most decoders can control one or more accessories - e.g. lights, uncouplers, sounds.

How to measure stall current?

- You will need a meter (a multimeter or an ammeter) that can measure DC amps.
- Grasp the locomotive so it doesn't take off and turn the power pack to full.
- Push down until the motor stalls (stops) and note the current. This is the stall current. Do not allow the motor to stall for more than 5 to 10 seconds. Doing so can cause damage to the motor, or other electrical components of your locomotive.

How to measure stall current?



Decoder Selection

- It is possible (and in fact many model railroaders follow this practice) to use an N scale or even a Z scale decoder in an HO gauge locomotive. As long as the current rating of the decoder meets the minimum requirements of the locomotive (most newer HO locomotives have a rating of 1 amp, as do most decoders currently in production) then there shouldn't be any difficulties using a smaller scale decoder.

Pre-Test your DC Engine

- Does the engine move?
- Check lights –Why?
 - It helps during installation
- Test on a DC track.



Pre Wiring Research

- Review the installation guide for the decoder, i.e. NCE N13sr
- Manufacturer's website for additional reference material (TCS has an excellent website for installations)
- Youtube videos
- Local modeling group
- There is no stupid question!!

Removing the Shell

- Sometimes the hardest part
- Refer to the loco's instruction manual
- General tips
 - Proto's have 8 screws to remove
 - Kato's - couplers to remove
 - Atlas - couplers and occasional frame screw
 - Athearn – couplers and body screws

DC to DCC

- Remove the manufacturer light board (in some instances you can keep the light board and integrate with a DCC chip, example TCS DP2X chip fits with Atlas light board)
- Remove incandescent bulbs (if you prefer LED's)
- Remove motor and isolate electrical pickups

Isolating the Motor

- An older model or one without a NMRA socket requires that you find and eliminate all connections between the motor brushes and track pickups. Typically, this is the biggest problem people have when they first get into DCC.

DC to DCC

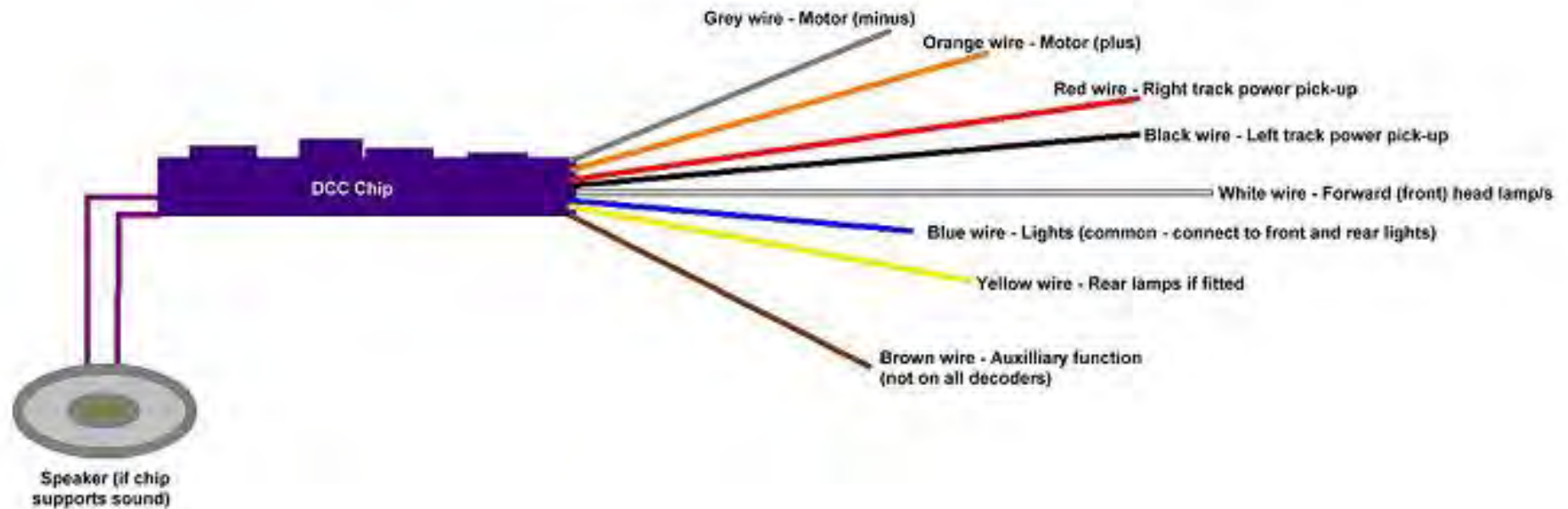
- Once you've isolated the motor from the chassis (I typically use electrical tape in the motor compartment) install the motor back in the locomotive
- Begin soldering by making all wires an appropriate length, stripping the ends, tinning all leads
- I like to start wiring the motor first (grey and orange) followed by the track pickups (red and black). I can then test the locomotive after these four wires are soldered.
- I then begin soldering remaining wires for lights (white – forward headlight, yellow – rear light, blue is common to both) Use resistors in line with yellow and white wires before wiring bulbs or LED's. Check DCC decoder rating to determine output rating

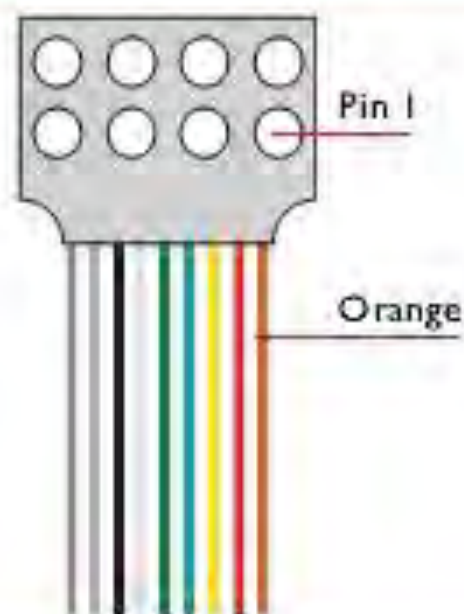
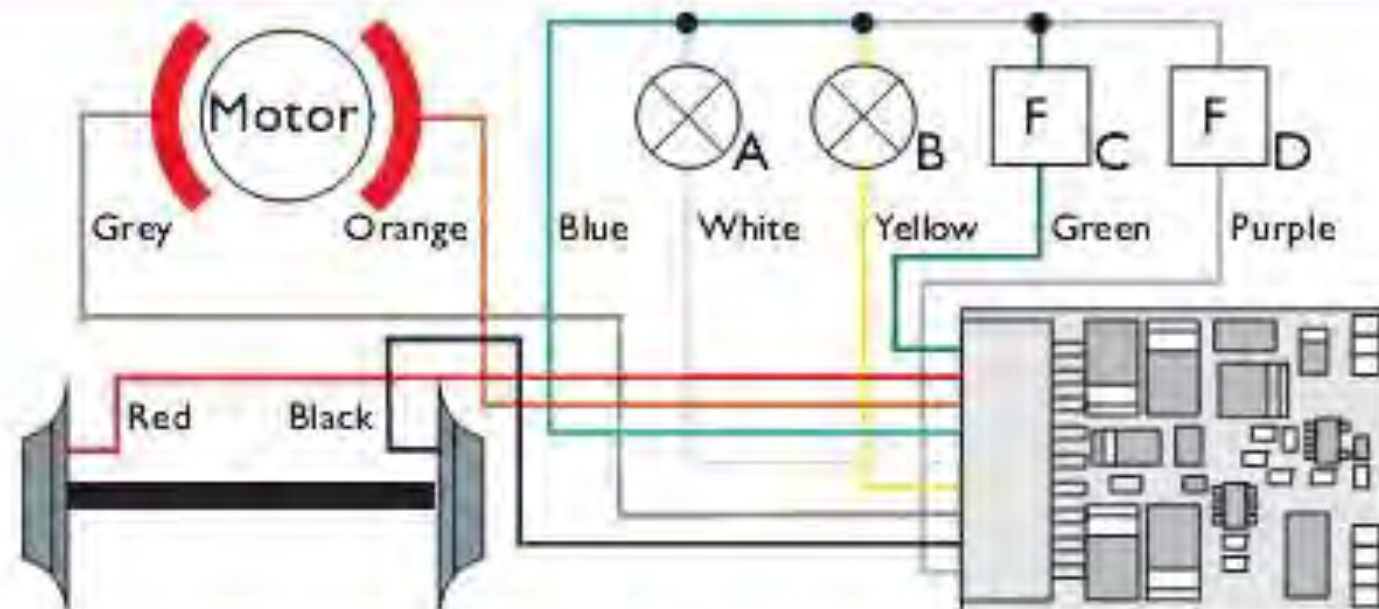
Hard Wire Decoders

- Solder the colour coded wires
 - Follow the instructions
- At the bare wire joints, cover with heat shrink tubing



Standard Wiring layout for installing DCC chips





Pin Allocations

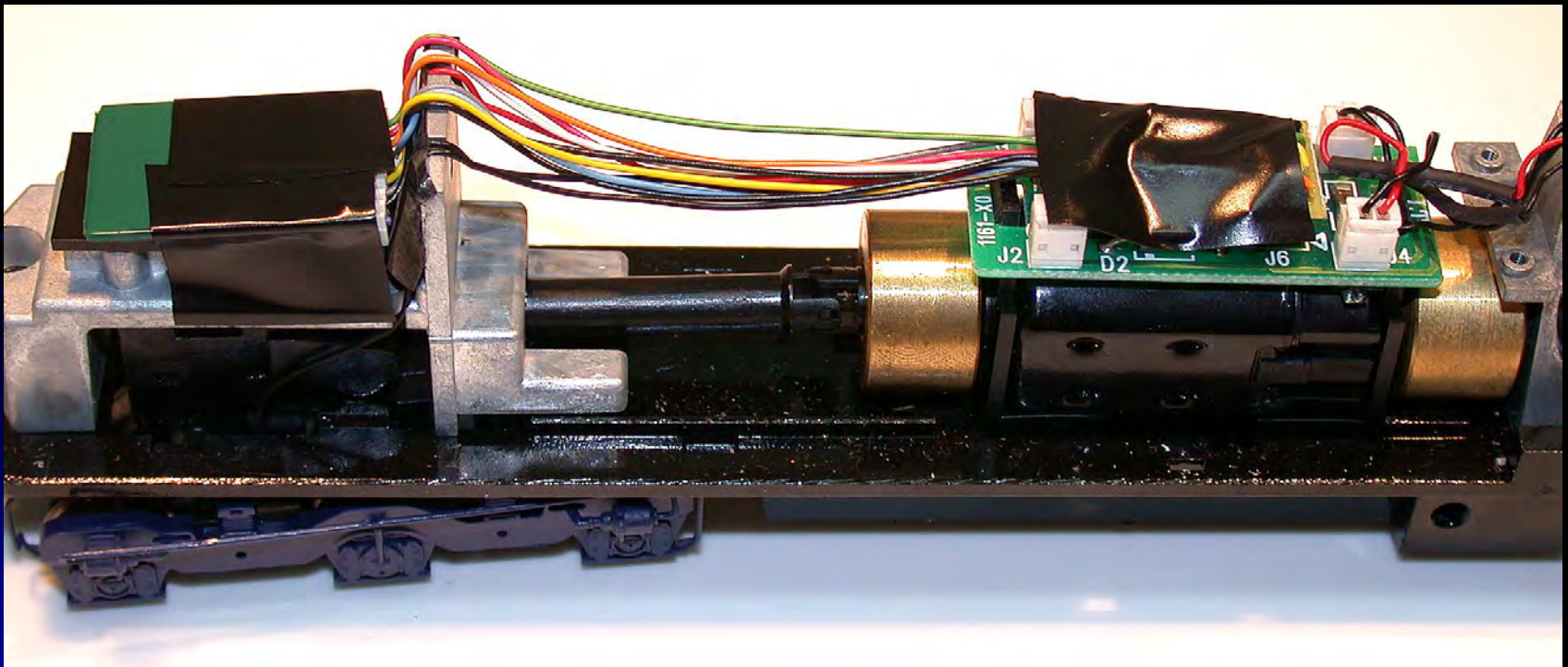
Pin	Meaning
1	Motor Connection 1
2	Function Output B (rear headlight)
3	Function Output C
4	Left Rail Pickup
5	Motor Connection 2
6	Function Output A
7	Function Positive Common
8	Right Rail Pickup

Installation Tips

- Keep the wire away from moving parts
- Use electrical tape to keep the wires in place, use Kapton tape for electrical connections
- Leave yourself enough wire in case a wire breaks or needs to be re-soldered.
- Place your shrink tubing in place before you solder the open joints.

Additional Functions Installation

- Set all additional function wiring in place.
- Most loco's will need housing made for ditch lights or modifications to light panels

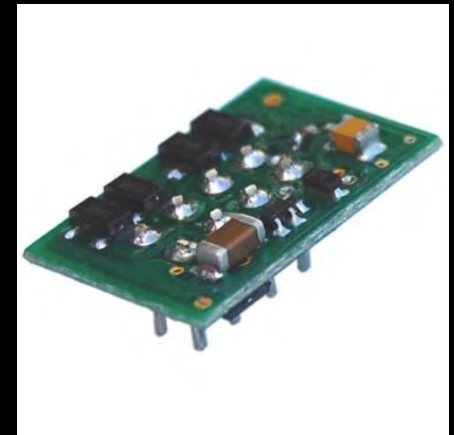


The Difficult Part

- Finding room in the shell for the decoder and the wires.
- Wiring lights – blue wire is common and must be connected to all lights. Soldering everything to this wire on the decoder can be tricky.
- Getting the shell back on snugly

Plug in Play for DCC Ready Locos

- Remove the dummy plug
- Plug in 8 pin or 9 pin decoder
- Snap shell back on and program

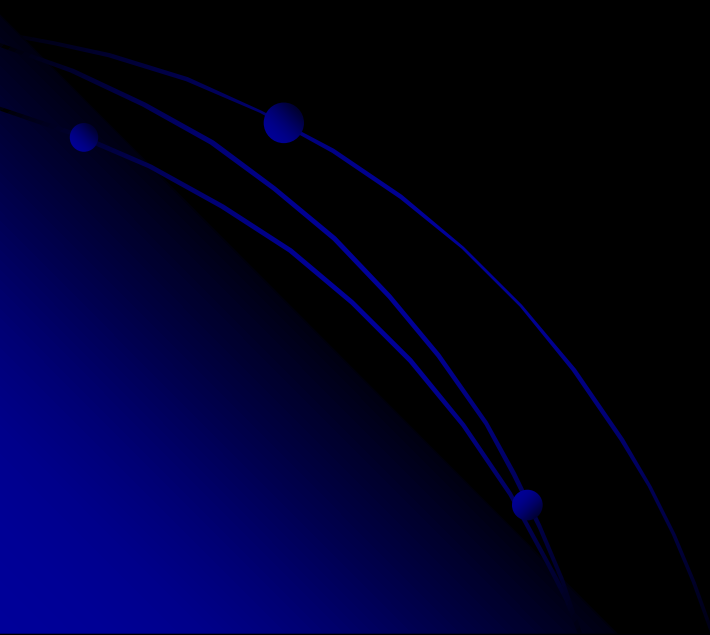


Put the Shell Back On!!



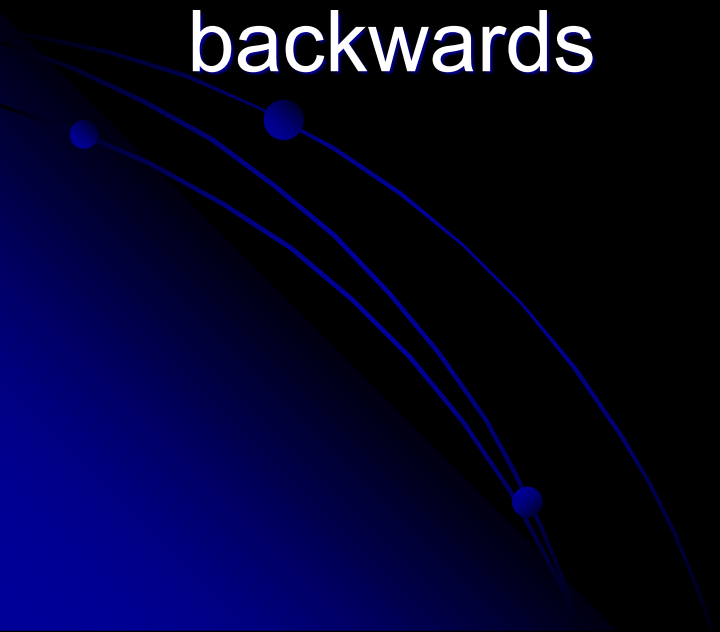
Programming the Decoder

- MAKE YOURSELF A GOOD PROGRAMMING TRACK!!
- Place on programming track
 - Set system to programming

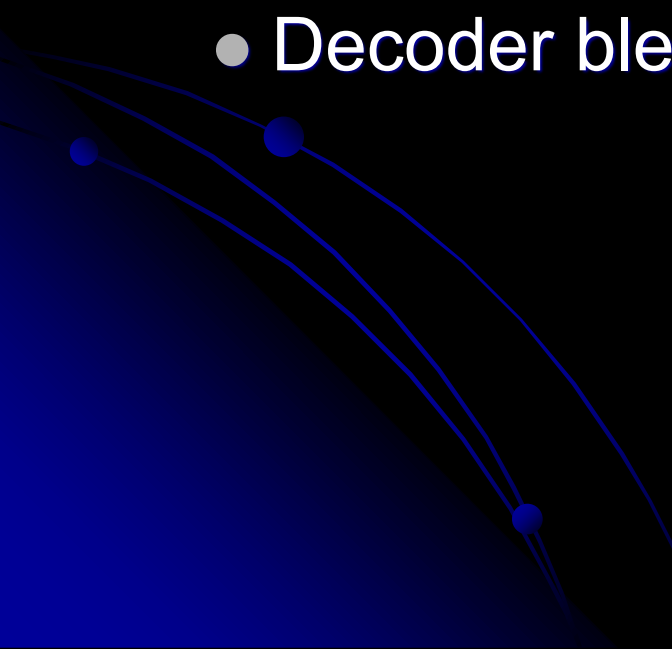


Testing the Loco

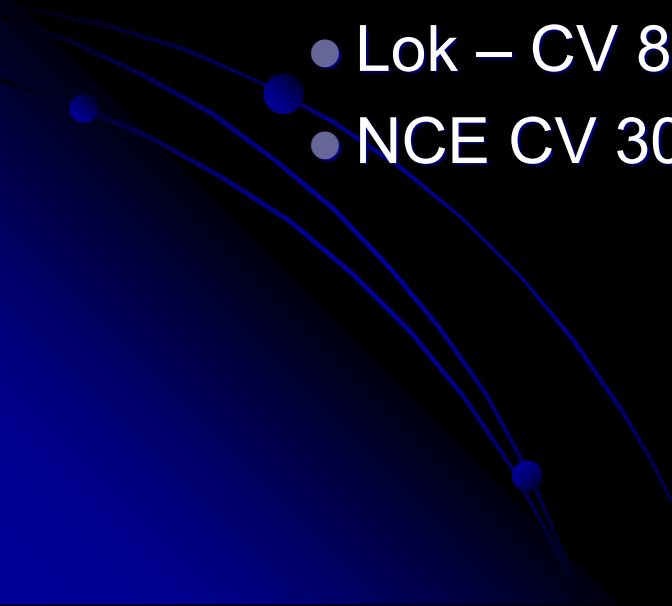
- Place on the test track
- Check lights and movement
- If forward is reverse, reverse is forward then grey and orange wires are wired backwards



Decoder Fails

- What's wrong?
 - Either the decoder is defective
 - Wired wrong and can not be read
 - A wire is loose
 - Decoder blew up
- 

Programming Issues

- My loco is not responding?
 - First thing is find the manual and refer to the last page of the decoder installation and look for the reset Configuration Variable
 - Digitrax – CV 8 value 8
 - Lok – CV 8 value 8
 - NCE CV 30 value 2
- 

Everything Works

- The loco should respond to Address 03, the standard NMRA default address
- Modifying CV's can be tricky
 - Use either the programmer track or on the main
 - Other options are Decoder Pro, or Lok Programmer if it's a Lok Pilot decoder

Questions???

