



NCE DCC System Hints & Tips

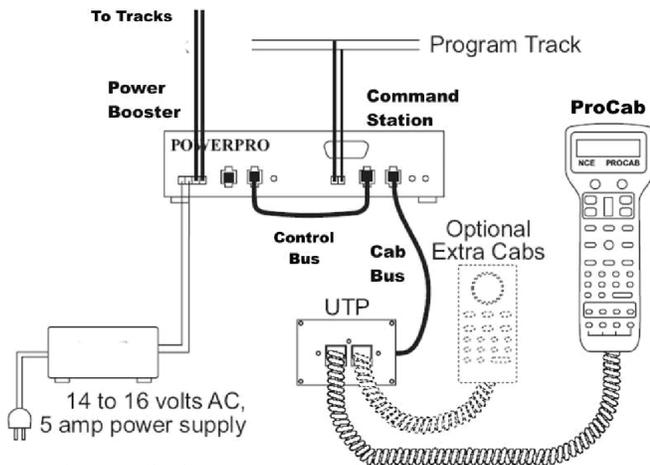


These notes are an evolving tip sheet on operation of the Power Pro DCC System from NCE. The source of these tips comes from customer questions, personal experience and NCE manuals. Some graphics from the Power Pro System Manual.

NCE Corporation

Jim Scorse of NCE Corp has been designing DCC systems since 1993. NCE started by offering chipsets to other DCC system makers. This led to NCE building their own systems. NCE now has the capacity to not only build their own products, but also make products for other DCC companies. NCE has a full line of DCC systems and DCC decoders.

Jim is an active model railroader and models the Erie Railroad in O



Basic 5 amp NCE System

scale. The NCE system is known by the hammerhead shaped cab that is part of the company logo. The company takes pride in the system's ease of setup and operation. NCE says it is the user friendly system. The company has a full line of cabs, power booster and decoders plus the command station. Along with this is a number of DCC accessory products.

The command station has upgradeable software.

In Jan 05 a new release of the software was available that included many fixes and improvements. One of the changes is the use of more function keys. The new release expands the system from F0 -F8 to allow use of F0 to F12.

The new software release guides you thru many setups by using English instead of asking which CV to change. Complex setups like the new NCE, SoundTraxx Tsunami and QSI decoders have their own separate routines to simplify decoder programming.



The NCE system

NCE gives you a number of system choices. You can go wired or wireless. Different handheld cabs available. There is the full featured "hammerhead" style with all the bells and whistles plus an LCD readout. This cab comes with the starter system. The cab is needed for programming decoders and setting up the system. Smaller cabs without the LCD readout are also available. These smaller cabs work well for operators.

The command station is available combined with a 5 amp booster or as a separate unit. The separate command station is used with a separate 10 amp booster.

NCE System Basic Specification

The NCE system can support up to 63 cabs or operators. Max number of 250 trains can be operated at one time. Has full range of addressing (2 digit addressing and consists 1-127, 4 digit addresses 0000 to 9999). Signal and accessory addressing range 1-2044.

The command station has an RS-232 serial interface that allows you to communicate with the system using a PC or Mac. Most model railroad programs support the NCE system. One popular program is Decoder Pro, available free over the internet.

Selecting a System

First select a starter system. The basic system (Power Pro) comes with a command station, 5 amp Booster, ProCab, 2 decoders and system manual. The wireless version (Power ProR) comes with all of the basic items plus a wireless base station and substitutes a wireless ProCab for the standard ProCab. There are two systems with 10 amp boosters available. The basic 10 amp system (Power Pro10) comes with all the basic items. The combination command station/booster is replaced with a separate command station and a 10 amp booster. The 10 amp wireless system (Power Pro10R) includes the wireless base station and substitutes the wireless ProCab in place of the standard cab.

The 5 amp system will supply sufficient power for N to On3 layouts. The 10 amp boosters work well with O and G scales. Even newer O scale engines require less power than the engines with the older motors. I've run two newer O scale locomotives with 2.5 amps DCC system. The rail in smaller gauges may have enough resistance that a 10 amp booster's circuit breaker may not trip when a short circuit occurs.

Transformer Requirements

The command station and power boosters need to be powered by a transformer. If a transformer is used with a rating less than the output of the Power Booster there may not be enough power to trip the over-current protection. The transformer should also

have a voltage rating that is slightly higher than the output voltage you have selected for your scale. The Power Boosters put out a regulated voltage and must dissipate any excess voltage in the form of heat. An input voltage that is too high can damage the Power Booster or the Command Station.

POWER BOOSTER / SUGGESTED TRANSFORMER

- Power Pro** - Command Station, 5 amp Power Booster / **MF615** 16VAC 6 Amp
- PB105** - 5 Amp Power Booster / **MF615** 16VAC 6 Amp
- PB110** -10 Amp Power Booster / **XFR12** 18VAC 12 Amp
- CS02** - Comm and Station / Takes power from booster transformer

Command Station Battery

When you customize the Command Station the information is stored in a memory that is powered by a battery when the power is off. Information like the macros and other changes that you have made are lost if the battery dies. The expected life of the battery is about 5 to 7 years. The NCE manual says to replace the battery with the power **on** to prevent a loss of the data. If a battery is dropped on the circuit board when power is *on* it could cause a short that might result in permanent damage! A note from Mark Gurries on the internet suggests that it is safer to replace the battery with power **OFF!** This is one suggestion that I agree with. The inconvenience of reprogramming the command station is faster than the trouble and time to replace the command station circuit board should an accident occur. If you do replace the battery with power **on** the system manual does suggest putting a piece of paper over the lower board in case the battery is dropped. The battery is a standard **CR-2032** 3 volt lithium.

Layout Wiring and System Setup

Layout Wire

Wire has resistance and the longer the wire the higher the resistance. Smaller wire has more resistance per foot. Resistance can cause a loss of voltage. More current equals higher voltage loss resulting in a loss in train speed and dimming lights. It is best to keep the voltage loss to under one volt. To add to the loss in wiring, nickel-silver rail is not a good electrical conductor. Feed wires should be installed in parallel to the rails and a drop from the rails to the wiring at least every 6 to 10 feet. The wire from the rails to the feed wires can be a short sm all gage wire like 20 to 24 gage. Some modelers use a drop wire on every section of rail. The wires should be soldered for best reliability. This minimizes the problem with poor connections due to rail joiners. Here is a chart listing wire size, currents and lengths. A good source of wire is speaker wire from Radio Shack. Stranded wire works best for

block feed lines and solid for the drop down wires. The block feed wires should be twisted with about 3 twists per foot.

Booster Wiring and Voltage

If you are installing more than one booster check the system manual. There is a difference for common rail and double gap rail layouts. The boosters should be "in phase". You can check this by measuring the voltage at a gap between the rails supplying power from the different boosters. When in phase there should be little to no voltage on the same side of the rail. If you measure a high voltage try reversing the connections from one of the power boosters. (Reverse loops will normally have one gap with high voltage, this is OK.)

The output voltage from the NCE boosters is adjustable 9.5 to 18 volts. Factory setting (14.25 volts) is normally satisfactory. If you do wish to adjust the voltage be sure to use a meter that can accurately measure the voltage. You need a meter like the RRampMeter designed to read the DCC voltage wave form.

Blocking the Layout

With only two wires connected to layout a single short will shut it down. To prevent a single shorts from shutting down the entire system the layout should be divided into blocks. With DCC these blocks are called power districts and power subdistricts. A district is a section of the layout that is powered by a single Power Booster. A subdistrict is a section of track or block that has a separate circuit breaker. Another type of block or subdistrict is a reversing loop or reversing section like a turning wye. Circuit breakers provide the benefits of short circuit protection without the cost of adding additional Power Boosters. The OnGuard!, circuit breaker (OG-CB) is rated at 4 amps and will trip before the booster. This circuit breaker will work with either common rail (ground) or home (double gapped) wiring.

Length Feet for 1/2 volt Drop

Wire Size	1 Amp	4 Amps	5 Amps	10 Amps
8	796	199	159	80
10	501	125	100	50
12	314	79	63	31
14	198	50	40	20
16	124	31	25	12
18	78	20	16	8
20	50	12	10	5

This chart shows voltage drop for 1/2 volt. The figures would equal 1 volt for a two way path.

Circuit Breakers and Accessory Decoder Wiring

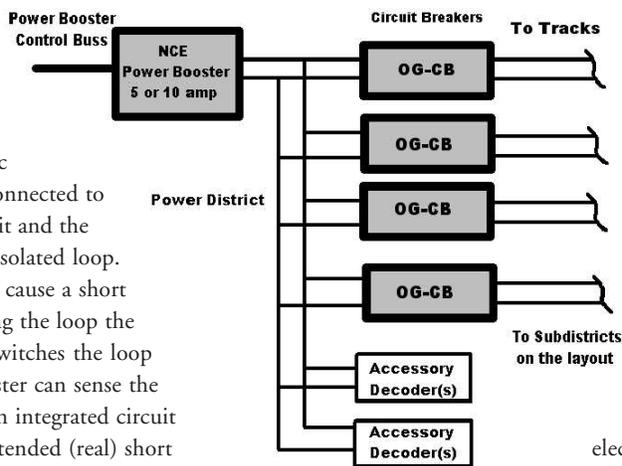
One of the most common causes of short circuits is running into a turnout that is set the wrong way. If you power an accessory decoder from the rails for turnouts the short will cut the power to the decoder and you can not throw the switch the clear the short. This situation can be avoided by wiring the power directly from the power booster to the accessory decoder. A short circuit will trip the circuit breaker while the accessory decoder continues to receive power via the power booster and allows you to throw the switch and clear the short.

Reversing Loops

A reversing loop is a section of track that allows the train to turn around and reverse directions. Reverse loop wiring and operation

is much simpler with DCC than dc. On dc the reverse loop was wired so you could flip the polarity of the mainline while the train was in the loop. On DCC it is done in the opposite way. With DCC the polarity of the train can be reversed under the train while it is in the loop. Polarity can be automated with a reverse loop adapter.

An OnGuard! OG-AR is a solid state electronic device. Two wires are connected to the mainline or base unit and the other two wires to the isolated loop. When the metal wheels cause a short either entering or leaving the loop the adapter automatically switches the loop polarity before the booster can sense the short. The PSRev has an integrated circuit breaker if there is an extended (real) short circuit.



only occurs when current is flowing! You can make a simple load from an automotive lamp. Measure the voltage with the load and then without the load to determine the amount of loss. The 1156 lamp will give little over a 2 amp load, a 1141 is about 1.5 amps, and the 912 lamp near 1 amp. The RRampMeter is a handy tool to have for testing and monitoring the electrical system of a layout.

Program Track Isolation

Some DCC systems recommend that a dead section of track be placed between mainline power and program track to protect the Command Station from damage due to another loco accidentally placed over the gap. This is not necessary because the NCE system turns the mainline power off when you go to the program track mode and the program track input to the Command Station is electronically protected.

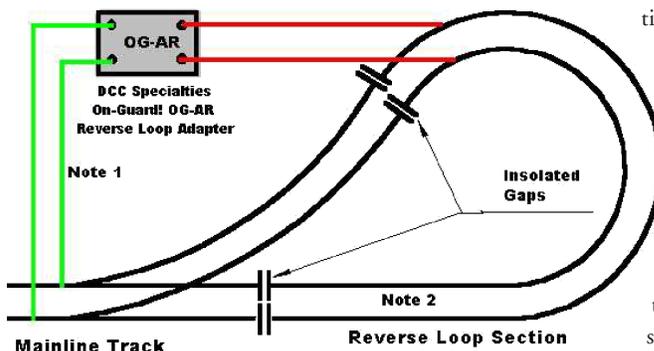
Only one loco can be programmed at a time and all lights on the loco should be turned off. Higher current from two locos or lights can cause problems when reading the CVs. The program track cannot be used to operate a loco while in programming track mode. All connections to the program track should be soldered with minimum of 22 ga wire.

Track and loco wheels must be clean or you will get a CAN'T READ CV message. Another can't read problem is caused by a decoder that draws more current like sound decoders and some of the locomotives with QSI decoders. There is nothing wrong with the decoders, they just overload the startup current of the program track to charge capacitors. If you have this problem the PowerPax program track adapter can be used to fix the problem.

A temporary way to wire the program track is to use a piece of track that is not connected to the layout. Simply run two wires from the track to the Program Track output of the Command Station.

Powerhouse Pro Booster mode switch LOOP/NORMAL

This switch has been eliminated on the newer models. In the LOOP mode the power polarity is reversed when a short is sensed. This requires another booster in order to implement this feature. It is much cheaper to use an OGAR Auto Reverser adapter than adding another booster.



Note 1 Wires can be feed directly from the base unit.
Note 2 The reverse loop track must be longer than the longest train.

Testing Existing Layout

Once you have the power boosters and/or circuit breakers installed you should do the "Quarter Test". (For O Scale this is the silver dollar test!) This test checks out the total resistance of the layout. Put the coin across the rails and check to be sure the circuit breaker trips. This test should be done on all parts of the layout. If the circuit breaker does not trip, you should investigate the reason and correct the problem. It may mean adding larger wire or more rail feeds between sections of rail.

To determine the voltage drop of an existing layout wiring you can use an RRampMeter. Voltage drop

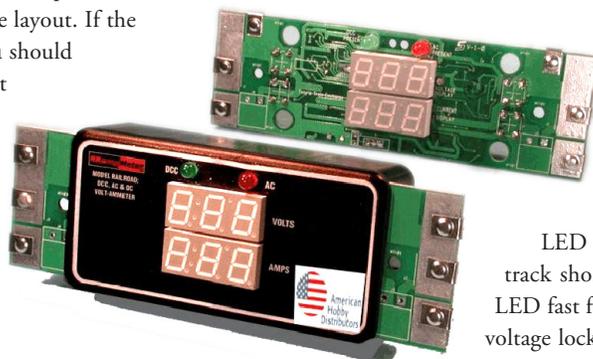
Status Lights on the Booster

The status light (red LED) on the left face of the Powerhouse or booster relates to the DCC booster output as follows:

LED on steady = DCC output nominal

LED slow flash rate = DCC output shorted or track shorted

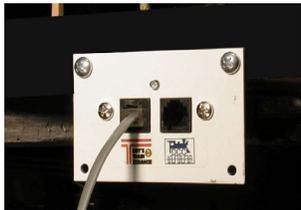
LED fast flash rate = no DCC output or low input voltage lock out



LED strobe flash, on 1/10 sec off 2 sec= over temp shutdown
 The status light LED on the right front panel of the Powerhouse unit indicates the characteristic of the DCC signal output. Normally it is a yellow/amber, a distinct red or green indicates a DC output bias and may be indication of a booster malfunction.

Cab Bus Extension Panels

To allow you to walk with your train places are needed around the layout to plug in cabs. The inexpensive UTP or Universal Throttle Panel can provide a convenient method of extending the cab bus with sockets for cabs. UTPs should be placed near yards, industrial areas and any other active location on the layout. Wireless cabs give you freedom from “plugging-in” as you follow your train around the layout. The layout should have cab connectors sprinkled around so you can still plug in the cab if batteries run low or you have a spot with reception problems. Consistent and using the program



UTPs should be mounted in convenient locations.

can be used to help locate the panel in a dark room.

Cab Bus Cables

If you need to make or buy cab cables to run from the booster to UTP locations on the layout they

should correctly wired. Correct wiring has the same wire connected to the same pin on both ends of the cable. Be sure to use a good quality crimper if you make your own cables. Some of the cheap crimpers don't apply enough pressure to adequately connect the wires to the pins.

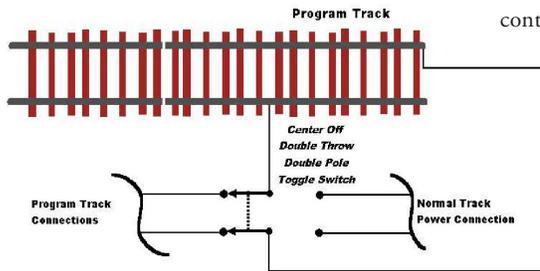
Here are some general hints

CV-29

This is an important CVs and one that is not always well understood. The NCE system does set this CV up for you in most cases. Sometimes you need to make a change. There is a chart below with the various functions that CV-29 controls. Basically you need to know which

functions you are using or wish to use. Add up the “weights” of the bits and this is the value needed. Here is a sample; 28 speed steps and 4 digit addressing would be bits 1 and 5 on. Bit 1=2 and bit 5=32 for a total of 34. Bit 0 (Value 1) is used when the locomotive direction is reversed from cab. The new level of software can setup CV-29 by asking a series of questions. (Program loco selection #3.)

Program Track Wiring

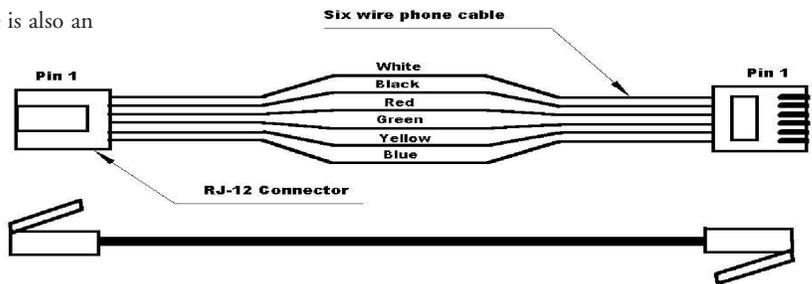


A center off toggle switch allows to have a section of dead track to put equipment on the tracks w/o shorting out the system.

track still work best if plugged in due to the slower reaction time with the radio link. Programming should always be done with a wired cab for reliable results. The UTP has two RJ-12 4/6 wire connections on the front for cabs and two in the back so the cab bus can be “Daisy Chained” to the next UTP. There is also an optional LED that

DCC or dc Settings

CV-29 Bit 2 (Weight 4) permits some decoders to operate when dc is on the rails. This bit should be left off unless you have a real need to switch between DCC and dc operation. Leaving this bit off can reduce the possibility of runaways. Some decoders do not support dc operation. NCE no longer supports the “stretched zero” function that allows one dc, none decoder equipped locomotive to operate on DCC.



CV-29 Settings			
Bit	Weight	Function (When on)	Purpose
0	1	Normal Direction of Travel (NDOT)	To correct direction problems so forward is forward. Reverses the normal direction of travel.
1	2	14 or 28/128 speed steps	Sets use of 14 or 28/128 Speed Steps. Should be on unless you have an old decoder (14 speed step is obsolete and rarely used)
2	4	Power Source Conversion	Allows the decoder to operate on dc or DCC. Not supported by all decoders. Best left off.
3	8	Advance Decoder Acknowledgment	This is a feature in some newer decoders. Leave this bit off unless you have the function.
4	16	Use Speed Alternate Table	Used for speed matching. Leave off unless you set up the speed table at CV67 to CV94.
5	32	4 Digit Address (Off for 2 digit)	Sets 4 digit addressing. (2 Digit in CV-3 and 4 digit in CV-17 & 18.)
6	64	Reserved for Future use	Not used at the present time.
7	128	Defines Accessory Decoders	On if an accessory decoder/Off for mobile decoder.

NCE Addressing VS. Other systems.

Short (2 digit) addressing or long (4 digit addressing) is available on most systems. The NCE system can setup short addresses from 1 to 127 and long addressing from 0001 to 9999. Not all systems have this full of range of addressing. Some systems limit the short addressing to 1 to 99. Some DCC systems limit long addressing to 0128 to 9983. The problem is you can program a decoder with the NCE system for an address that is outside the limit of some other systems. OK when used with NCE, but can be a problem if you move to a system with limited addressing. The NCE extended addressing can also be an advantage. You can setup one locomotive with a short address of "8" and another with a long address of "0008". Both engines can be addressed separately with the NCE system. Keep in mind that consist addresses also use the short 2 digit address range.

You may wonder why addresses 100 to 127 are called 2 digit addresses when they are actually 3 digits. The decimal range of 2 digit address is 1 to 127 the same range in hex (hexadecimal) is 00 to FF. This is 2 digits in hex. NCE works in decimal, but some decoder manuals are in hex. Be aware that you may need to convert in some cases.

Some System Functions

Program Changes for the Pro Cab

Note the following information comes from the latest system manual. This information may vary with other model cabs. *Refer to the instructions that came with the cab.* . This document can not begin to show all the features available with this system. No manual? Manuals can be downloaded from the NCE website.

Selecting a Locomotive

When selecting a loco and entering an address, only enter the actual digits. Example for address 3 you push:

1. SELECT LOCO
2. #3
3. ENTER

If you enter "0" and "3" (03) the system sees this as a long four digit address. The only time you enter a "0" before the numeral is when programming cab address or long address. Cab addresses are always two digits, like 03, 09 and so on.

Recall Feature

The number of recalls can be set from 2 to 6. When operating trains I find that 2 or 3 locomotives is about all I can handle at one time. Each press of the recall key brings up the next locomotive number in a round robin fashion.

OPS Mode Programming

The OPS mode is also called on-the-fly programming. Once the address is set and your decoder is operational most of the programming can be done in this mode. You might try setting the speed step at 1 and then change the value in CV-2 until the locomotive just starts to move. Another handy ability is to set sounds levels with OPS mode. This allows you to hear the difference instantly.

Consisting

A powerful feature is the simplified setting up of consists. They can be setup in any of three ways, basic, universal or advance. The ProCab will setup a consist and allow locomotive(s) to be dropped, added or the whole consist cancelled.

Ballistic Tracking : Encoder

When you use the thumbwheel (encoder) for speed control the faster you advance/turn the thumbwheel the faster the rate of increase/decrease of speed. You can program the rate from 0-7. The default setting is 3.

Yard Mode

The yard mode allows you to use the thumbwheel for both speed & direction. The speed control buttons cannot be used when in yard mode set ballistic tracking, 7 highest ballistic rate, 7 is best for yard mode. Thumb wheel will control speed & direction. A speed step setting of 14 or 28 gives the fastest response in yard mode.

In the yard mode the speed keys are disabled. Use of the recall feature in yard mode is not recommended because there will be a speed offset from the previous loco when the next loco recalled.

Whistle and Bell key

If you have a sound decoder and the whistle or bell key does not work, you may need to change the default function used by the whistle or bell keys. You can test which key works by using the 0-9 function keys. To change the default press the PROG key 6 times to step thru the choices to SET CAB PARAMS then press ENTER. Then step thru the choices to HORN TO FUNC:x. Press your function key selection. Then press ENTER for the Bell function selection.

Tips on Wireless Cab operation

Wireless operation adds a lot to the flexibility of walkaround control. NCE has an excellent document on using the wireless cabs. This document is called Pro Cab Wireless Supplement and is available on the NCE web site (www.ncedcc.com).

The good place to locate the base station for the wireless cabs is near the center of the layout. This make the shortest distance between the base and the handheld cabs. To camouflage the base station it can be put into a mountain or even a building. Transmission between the base and cab can fail if you are too close. Too close is just a couple of feet to around 5 feet.

Photo on the right shows a base station with an HO building and a tall stack for the antenna superimposed over the base station. This is a power plant and the door slightly open to show the flickering red LEDs of the base station. The tall stack is Walthers 933-3509 and the building is parts from Design Preservation Models including their learning kit.

Installing Decoders

The first thing to do with a new decoder is to check it out before installing it just in case there is a problem. The address can be setup and functions checked with a decoder tester. NCE has an

inexpensive decoder tester with a number of connectors to fit standard "DCC Ready" connectors. The tester includes test wiring harnesses to connect to the 9 pin JST connector and the NMRA 8 pin connector. Six LEDs on the board show the forward, reverse lights allow with F1 and F2 plus two for motor direction. I found mounting the tester on a piece of plastic helped to hold it in place when working with a decoder. I added a motor and speaker plus putting hook type connector in the ends of the wires. Test connections were also put on the speaker and track connections.

LED or Lamp?

Should you use a lamp or an LED on the locomotive? Look at the facts. LEDs have life measured in years, lamps in hours. LED produce light and little heat, lamps produce heat and some light. LEDs only require a 1K (1000) ohm resistor, lamps require a variety of resistors depending on current and voltage. Newer Yeloglo LEDs have a color output that looks like a lamp instead of a blueish cast. The only problem is LEDs do not respond like lamps when used with special lighting like Mars lights. NCE decoders fix this problem with a bit in the CV controlling the function output.

Miniatronics has both lamps and Yeloglo LEDs in stock. The LEDs come in 3mm and 5 mm sizes. The 3mm works best for HO headlights.

DCC Documents

When you buy a system, cab, decoder or any other device they normally come with some type of manual or information sheet.

Once you have the device working, SAVE THE DOCUMENTS. Most manufacturers have these documentations available online. In a few years the documents might be taken off or the company goes out of business.

Getting Help

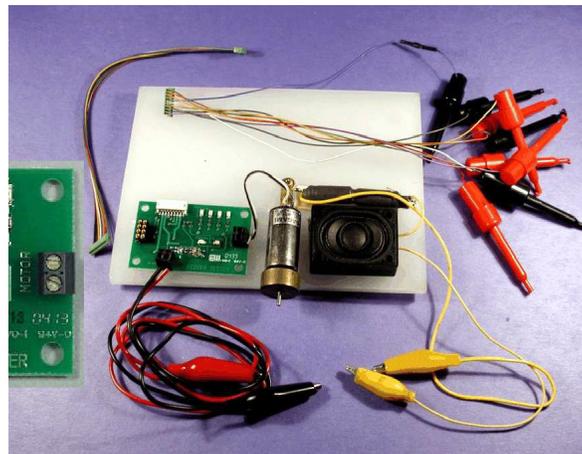
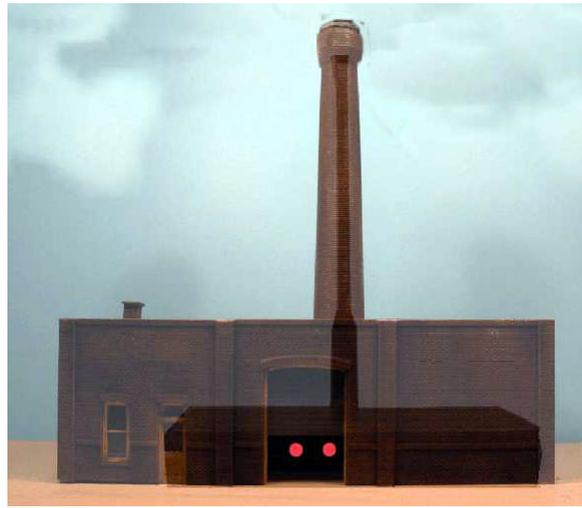
One of the fastest ways to get an answer is to ask the question on the NCE internet group.

Yahoo! Groups Links

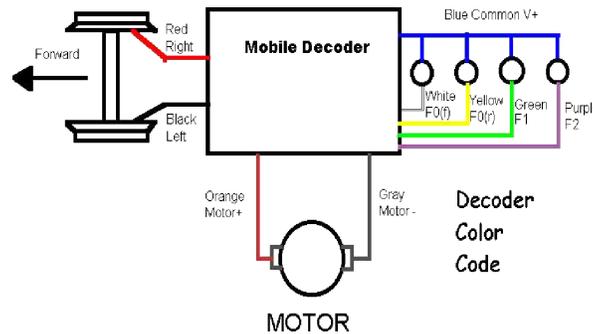
Post message: NCE-DCC@yahoogroups.com
Subscribe: NCE-DCC-subscribe@yahoogroups.com
Unsubscribe: NCE-DCC-unsubscribe@yahoogroups.com

To contact NCE
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(FAX) 1-585-671-9337

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NCE Corporation, 899 Ridge Road
Webster, New York 14580



The NCE Decoder Tester mounted on a piece of plastic with motor and speaker added. See "Enhancing the NCE Decoder Tester" available on the TTE website (tonystrains.com).



Standard color code for decoders.