

Enhancing the NCE Decoder Tester

The ability to checkout a decoder before installing it is very helpful for a number of reasons. This allows you to test the decoder before it is installed and determine that the decoder is working correctly. This is a lot less frustrating than going to the trouble of installing a decoder only to find that it is defective. You can set the address and many of the CVs. You can even check out used decoders to see if they are functional.

Decoder testers will work with *any* DCC systems because they only pass the DCC data from the rails to the decoder. The decoder tester then mimics the functions of a locomotive.

The NCE decoder tester model **DKT** is a neat low cost small decoder tester. For connections to a decoder there is an 8 pin NMRA and a 9 pin JST on the board. Red and green surface mount LEDs are used for indicators. The tester also comes with two cables for connecting decoders. One cable has 9 pin JST connectors on both ends that plugs in the board with a second connector used to plug onto a decoder for testing. The second cable is also a 9 pin JST to connect to the tester and nine colored wires that can be wired to the connectors of your choice. The tester also has connections for two wires to the track and two for an optional test motor. A small lamp on the tester is used as a load along with two LEDs for motor direction indication. A load is needed in order for the command station to be able to read back decoder CV values. Four more LEDs are used for forward, reverse lights and two other functions.

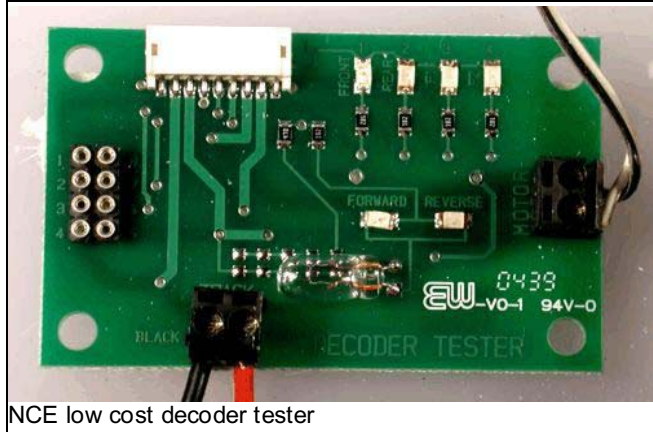
This tester can be used as is for most decoders but needs some additions for testing sound decoders. Some simple additions that made the tester more flexibility.

ENCHANTMENTS

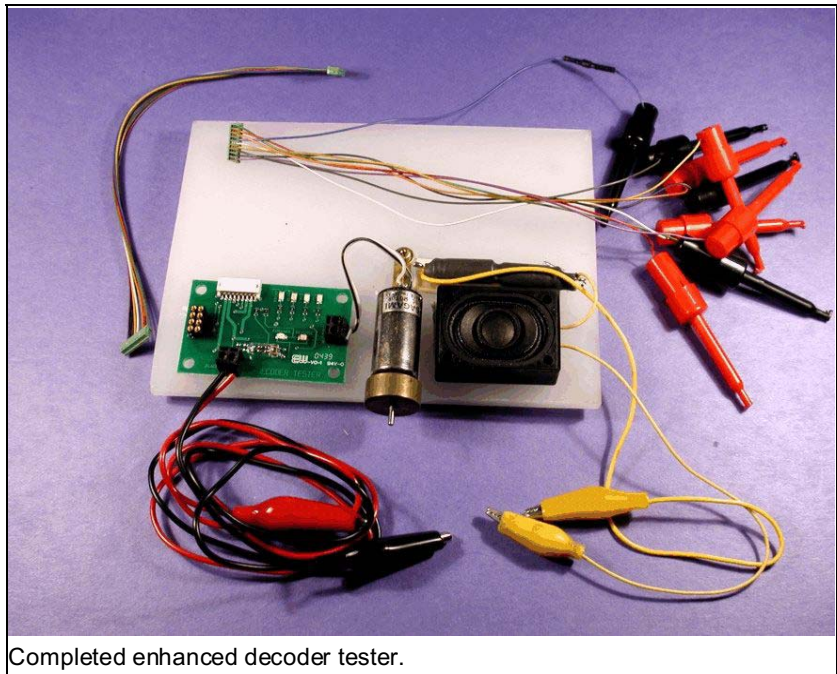
First I mounted the tester on a small scrap piece of plastic about 6 X 4.5 inches and held it in place with foam tape. Long wires with alligator clips were connected for easy connection to the track inputs of the tester.

I like to have a motor to watch the action when starting and the "kick" when doing a CV read back. I found a small motor with a flywheel in my box of old motors and attached it to the plastic board. The motor was connected to the motor terminals on the tester.

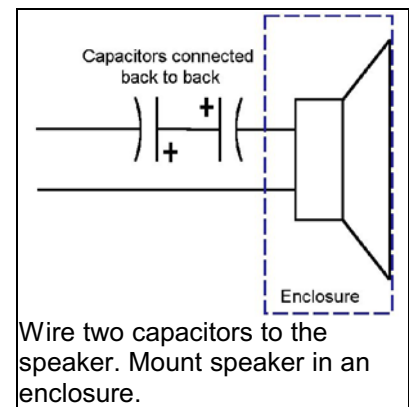
For sound decoders a speaker is needed. A speaker with a matching enclosure was attached using more foam tape. Wires with test clips were installed. I used an oval speaker with a matching enclosure. I also put two capacitors in series



NCE low cost decoder tester



Completed enhanced decoder tester.



with the speaker so if a decoder was attached a capacitor would not be needed. I used 2 electrolytic capacitor and wire them back to back. (Either the two + or the two – together.) This makes a non-polarize capacitor and prevents damage to the decoder if you happen to forget to connect the standard capacitor when testing a sound decoder. The value of the capacitors can be from 47uF to 250uF at 16 volts. The value is not critical. (Be sure to install the capacitor supplied with the decoder when you install it in the locomotive.)

Four soft plastic feet were put on the bottom of the piece of plastic so it would not slide around.

The instruction that come with the tester mention that a set of alligator clips from Radio Shack (RS 278-1175) could be used for the ends of the leads. I prefer the mini hook type test connector because they grip better and there is less chance of the “flying lead disease”. (That is when the lead slipping off and shorts out against other leads. A short circuit can mean a long trip back for repair!) The hook type clip will grip both leads and the connections like those on the AT type decoders. Radio Shack has two types of hook clips, one for solder connections and another two be used with “pin” type connectors. Be sure to get the solder type (RS 270-373C). They look the same in the package until get home and open the package! There is also a micro hook clip available from some electronic suppliers.



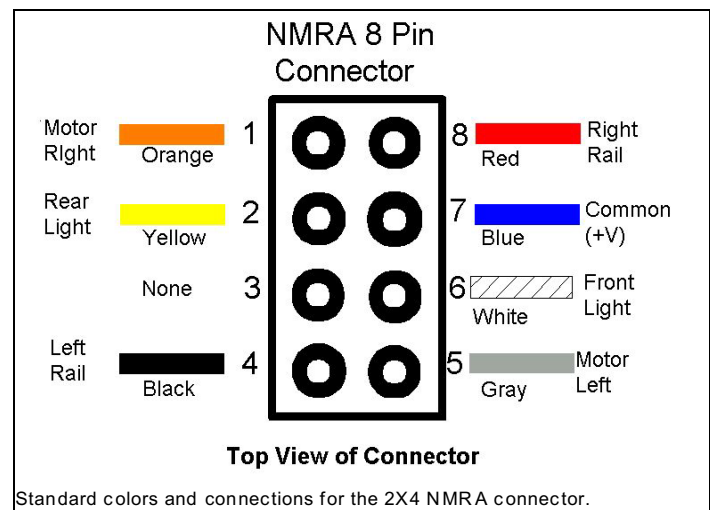
Hook Clip on AT style decoder

One other handy thing is a small plastic box to hold all the cables and any other additional stuff together.

Notes on Testing Decoders

One of the most important items needed when setting up a decoder is the manual or instruction sheet that came with the decoder. Once the decoder is working, be sure to save these documents in a safe place for reference at a later time. A three ring binder works. Some of the documents may need to have holes punched to fit into the binder. Three ring pockets are available to hold odd sized documents.

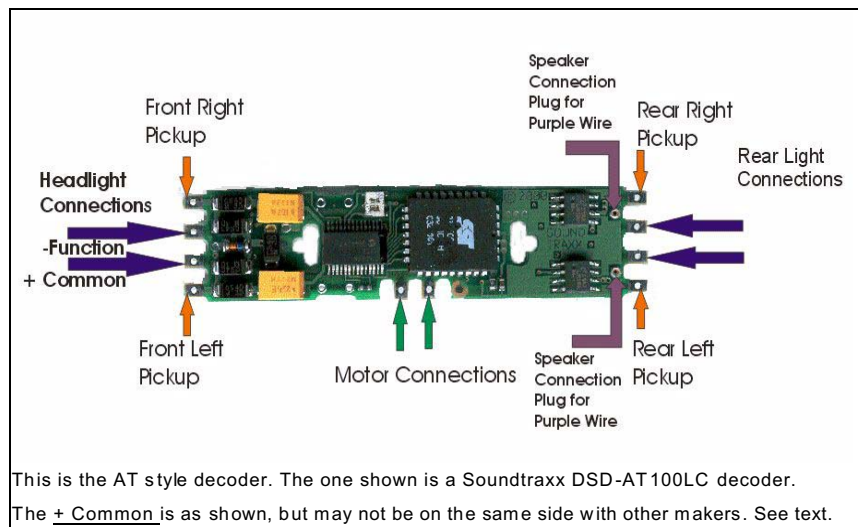
Some decoders have connectors that are hard to connect to with any type of test lead. This is the case with some of the additional functions and speaker connections on the decoder. For these type of connections connect a sort wire to the connections and then connect the tester to the added wire. You may need to temporarily solder this wire to the decoder.



Standard colors and connections for the 2X4 NMRA connector.

Decoders that use the standard 2X4 NMRA connector with a short cable just plug into the tester. Some have the connector mounted on the decoder board. Decoders with this type connector may not be plugged directly into the tester due to interference with other parts on the tester. I found that plugging in a spare NMRA 2X4 connector into the socket on the tester will raise the height and allow the decoder to be plugged into the added 2X4 connector. (Spare 2X4 connectors are available from Tony's part **NMRA M/F**.)

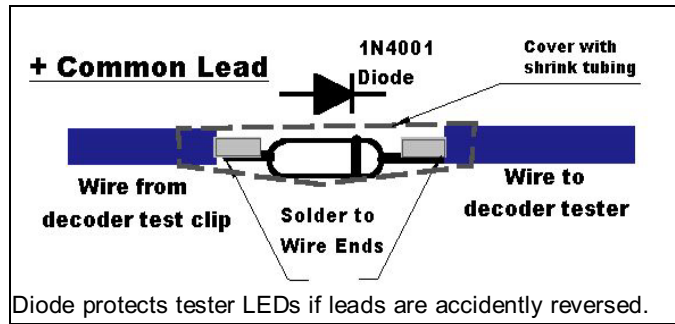
Be sure to connect the tester to program track when first testing the decoder to test for shorts. Make sure that normal track voltage is not on the rails when you first connect.



This is the AT style decoder. The one shown is a Soundtraxx DSD-AT100LC decoder. The + Common is as shown, but may not be on the same side with other makers. See text.

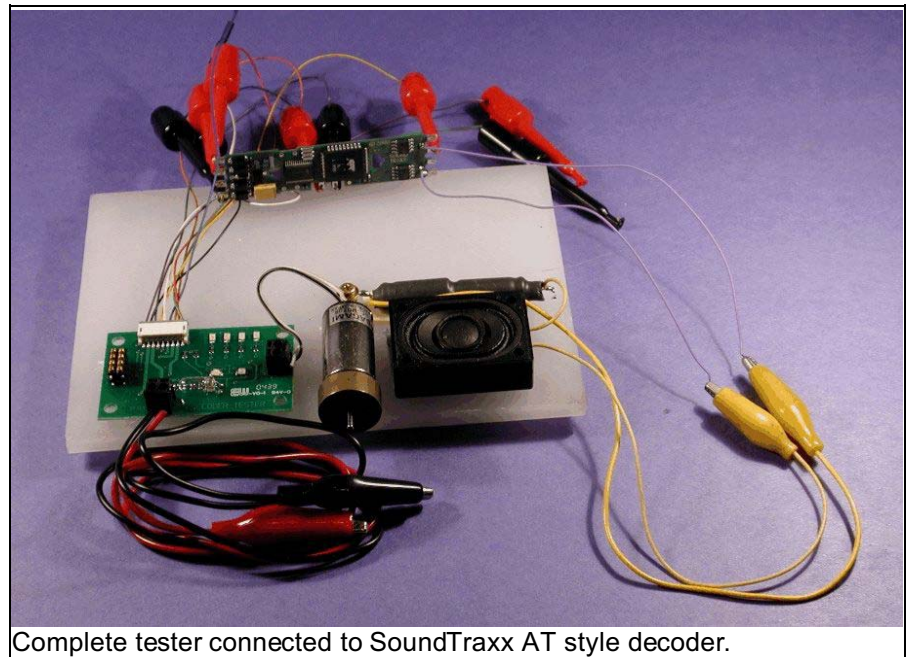
The AT style decoder has outputs on both ends for rail pickups and lights. Each end has a common output and a function output. This is OK when using lamps because they are not polarity sensitive. The problem is the tester uses LEDs that are polarity sensitive. The blue wire from the tester attaches to the + common connector. The problem is the side the +common is on maybe on either one of the two center connectors. To check which one is common you can use a meter and see which pair of connectors are connected in common.

If you would like to protect the function tester LEDs a diode (1N4001) can be added to the blue lead. Cut the lead near the clip lead, slide a piece of shrink tubing over the wire. Then solder the diode as shown in the illustration. Slide the shrink tubing over the diode and shrink with heat.



The response of LEDs differ from lamps. If the decoder you are testing will be installing and a locomotive with a lamp instead of LEDs the appearance of the tester LED may be different. This is especially true when setting up special lighting light like Mars lights. Normal lights and strobes are the same. When setting up with the NCE system (new EPROM release) there is a bit that can be set in some decoders if the light will be an LED.

If the forward and reverse motor LEDs are in reverse of the command sent to the decoder, reverse the orange and gray motor leads. This should correct the problem.



Four Digit Addressing

Most system automatically setup 4 digit (long) addresses. These systems put the correct values in CV-17 and CV-18 based on the locomotive address. CV-29 bit 5 (weight 32) also needs to be set on for 4 digit addresses. If your system does not automatically setup 4 digit addressing here is a way to do it manually. The basic idea for this came from a QSI manual.

The following method uses a calculator.

- A. Start with the locomotive address and divide it by 256. Sample $4449 \div 256 = 17.3789....$
- B. Take the whole number (17) and add it to 192. Sample $17 + 192 = 207$
- C. Program the value (207) in step B is into **CV-17**.
- D. Multiply the whole number (17) from step A by 256. Sample $17 \times 256 = 4352$
- E. Subtract the locomotive address from the computed value in step D. Sample $4449 - 4352 = 97$
- F. Program the value (97) in step E is into **CV-18**.
- G. To activate 4 digit addressing a value of 32 (bit 5) needs to be added to **CV-29**.

If your DCC system does not setup CV-29, the following list shows the bits and weights and functions. Figure out what you want and add the weight together for the value to program into CV-29.

CV-29 Settings Here is a chart showing the standard decoder functions of CV-29.

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 Addressing(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.

Decoder Program Modes

There are four different modes used to program decoders. The **Address Mode** and **Register Modes** are older and not used much anymore. The **Paged Mode** is used for most decoders today and the **Direct Mode** is the way of the future. I think the Direct Mode will become the standard way of programming decoders. If a decoder does not seem to program, you may be using the wrong mode. Some systems will test the decoder for the right mode before programming starts. You may need to check the decoder manual for the correct mode. Many decoder will accept more than one programming mode. Most decoder today will work with Register, Page and Direct modes. Not all DCC systems can program in all modes.

This tester can also be used with OPS mode (On-the-fly) programming used by most DCC systems. The Digitrax Super Empire Builder does not have an output for program track operation and can only program on the mainline.

Factory Reset

If things seem to be going strangely when setting up a decoder you may be able to reset the decoder to the original factory settings. In most cases the reset is kickoff by setting a bit. Check the documents that came with the decoder to see if the decoder has this function. It is best to refer to the decoder manual for instructions.

For Digitrax FX³ decoders program CV-8 with a value of 8 to reset the decoder. For QSI decoder the instructions have you remove a jumper on the decoder, apply power to reset, power off then replace the jumper.

The new NCE software release has a **Rescue Mode** that will reset most decoders.

Don Fiehm 19Jan05