



EI-151 Installation Instruction Guide

AMATEUR RADIO AND VOIP BRINGING THE WORLD CLOSER

KJ6ZD – EI-151 Interface

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EI-151 Description

The EI-151 is a full featured Echo-Link® Interface that utilizes its own DTMF receiver for reliable communication and control.

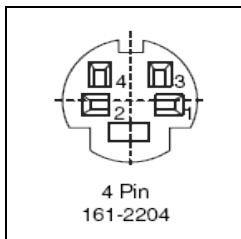
The EI-151 is a full featured Echo-Link® interface that is easy to install and to use. The built in DTMF receiver will ensure that DTMF codes are correctly decoded and sent to the running Echo-Link® Software. This allows disabling the internal software decoder. The interface will take care of all received DTMF codes as long as the received signal is within reach of your radio receiver. The EI-151 also has features that are not found in competitors units. For example: Echo-Link® will drop your connection if it runs into the preset timeout. The FCC requires in the, that a maximum continuous carrier is not to exceed 3 Minutes on automated systems. If the hardware latches up, some mechanism must be present to disable the transmission.

The EI-151 has a built in time out timer with selectable timeout periods. As mentioned above Echo-Link® will drop the connection if it ran into the timeout trap. In this case the user would have to re-connect to the node it was working through. The other party might think that the conversation has ended and goes away. With the EI-151 the Sysop can set the Echo-Link® timeout to infinite and let the EI-151 control the timing. This way the internet connect stays active and all that happens is a drop of carrier on the local side. After a short period (30 second penalty) the system is available again.

NOTE: The EI-151 can not control the distant station timeout.

In rare cases you may need to disable your EI-151 for periods while the station is unattended or other reasons. The EI-151 provides for a simple way to disable the unit and enable it again over the air using DTMF Codes.

Installation and Connection



Let's get started with the wiring to the computer. This is necessary because Echo-Link is continuously communicating with the EI-151 using the Echo-Link protocol.

The image to the left, shows the connector used with the EI-151 and reflects a view as if you would look at the interface back. This is easier to comprehend since the solder cups are in the same position. Note: Later models are equipped with a 6 PIN Mini DIN.

Due to the extreme small size of the EI-151 the use of Mini DIN connector are necessary to fit all connector into the enclosure. Unfortunately, there are no off shelf cable assemblies available. Therefore, we will have to manufacture our own with the supplied connector. Note there is only a plug supplied because of the many installation variations. You'll need at least a three conductor AWG24 shielded cable and a connector that matches your interface connector on your computer, mostly a 9 Pin SubD. There is no NULL modem adapter required, since the EI-151 does route the correct signals to the connector.

Refer to the table below for correct hookup.

Pin	Signal
1	DCD or COR
2	RXD (Computer)
3	TXD (Computer)
4	GND

Solder a wire from your AWG24 cable to each of the solder cups on the plug. Make a note of the color used for easy identification later. Also, keep in mind that in some installations the length of your assembly may be significant in terms of noise pickup. We suggest to cutting a length that is a multiple of a $\frac{3}{4}$ Wavelength of the Operating Frequency. Tie the shield and one of the wires together. If it is too difficult to solder, use just the shield as ground.

Next solder the DCD wire to pin 1 of the 9 Pin SubD connector. The RXD signal goes to Pin 2 and the TXD goes to Pin 3. Shield / Ground wire goes to pin 5. **Do not install the shells before you are sure it is working correctly.**

Checking the RS232 communication

Insert the 4 Pin Mini DIN plug into the receptacle on the EI-151 and the 9 Pin SubD into COM 1 of your computer. It maybe difficult to insert the plug with the Shell installed, since it maybe somewhat bigger in diameter as the provided space on the interface. In this case, trim the plastic shell on the 4 pin DIN back until it fits easy and makes a good connection. **DO NOT USE EXESSIVE FORCE** since this can cause permanent damage to the connector.

Once everything is connected power up the computer and the EI-151. At this point there is no need for any other connection. Your EI-151 should indicate that it is going through the start up sequence by illuminating the front panel LED's alternating. The Power On indicator should be steady ON.

On your computer start the Windows supplied hyper term application. Set it up for direct COM1 or COM2 depending on which you use, 2400 Baud, no parity, 8bit Data and 1 Stop Bit. The terminal emulation does not have a great effect on the simple test you will perform and can be the default.

All following commands must be input as upper case character or it will not work!

Press **M** and Hyper term will send the character immediately to the EI-151. The EI-151 should return its model number (Model# 2) and version number among other information. If you see this you are halfway there.

Press **1** and watch the PTT LED. It will flash once to indicate that the Timeout is set to two minutes. It also has stored this value in non volatile memory and uses this value at next power up.

Press **2** and watch the PTT LED. It will flash two times to indicate that the Timeout is set to three minutes.

Press **3** and watch the PTT LED. It will flash three times to indicate that the Timeout is set to four minutes.

Press **4** and watch the PTT LED. It will flash four times to indicate that the Timeout is set to five minutes.

Press **T** and the PTT LED will indicate that the PTT circuit is active and if a transmitter would be connected it would key same.

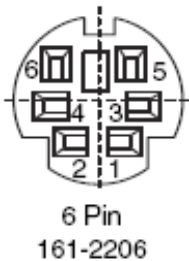
Press **R** and the PTT LED will be unlit and the PTT circuit is inactive.

- ✓ Congratulations, you have just successfully tested the RS232 communication!

Radio connection

The EI-151 uses a 6 Pin Mini DIN connector to interface with a Radio transceiver. There are cable assemblies available with a molded plug on both ends. Those assemblies are in general about 6 feet long and can be cut half way. Due to the great variety of today's radios we are unable to provide precise instructions on how to connect the EI-151 to your radio transceiver.

Amateur Radio Accessories can and will not be liable for damages occurred to your radio transceiver caused by incorrect hookup.



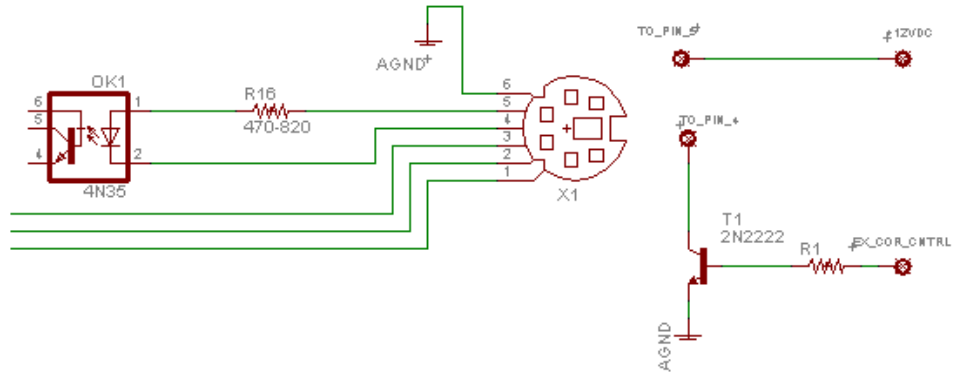
Be very careful while connecting your radio since incorrect hookup can cause permanent damage to your radio and the EI-151.

The image to the left shows the connector used on the EI-151 for the radio hookup. It reflects a view as if you would look at the back of the EI-151 and represents the same view to the solder cup of the Plug.

Refer to the table below for the appropriate signal:

Name	Pin #
Microphone	1
AF	2
PTT	3
COR (minus)	4
COR (positive)	5
Radio Ground	6

External COR signal, is a special issue. Although, Echo-Link will work fine with the software VOX, it may be useful to connect some external carrier detect signal and transmit the same to echo-link for positive signal detect. Since there are many ways to configure the CAS, we left the input of the optocoupler open. There is R16 in series to the input pin. This value may have to be changed depending on configuration. In general one can supply a 12VDC (or less to about 5VDC) to CAS+ and switch the CAS- via a transistor.



The COR could be configured as above, although there are many more ways. Whenever the External COR goes high the EI-151 COR is active and sends a signal to Echo-Link. Echo-Link has provisions to invert the polarity from either high active to low active.

The rest does not need a lot to be explained. Just make sure that there are no shorts or loose connections. The receive audio can be picked off either from the Speaker terminal or if the radio provides a packet radio audio line, it can be connected to there. If everything is connected correctly you'll be soon able to enjoy your Echo-Link node. Keep in mind that the speaker terminal can put out several watt of audio power. Keep it conservative until you know where to set the Volume control.

At this point you should be able to interconnect to Echo-Link and send an ID through the EI-151 over the Air. It may be too loud or sound too distorted. In the contrary it may be too low and very little is heard. The result greatly depends on the Microphone Input sensitivity of your Transmitter.

Setting up the Audio Levels

We believe that the best way to setup audio levels is to start with Windows Audio Control panel. If there is 20dB boost option switch it off for now. Set the Wave Audio Slider to about 50%. The EI-151 is also set to about 50% during bench testing. This refers to the Transmitted audio i.e. what goes into the transmitter's microphone. The Slider in the Audio Control panel is not the MIC slider rather it is the Speaker, line out, play back or whatever it is called to output audio.

The receive audio is primarily adjusted via the Radios Volume Control. The objective is to set the level that the DTMF decoder sees approximately 750mVpp. This level is defined by the chip manufacturer and actually is defined as 0dBm. However, a somewhat lower level will work just fine under most conditions. Without test equipment one would proceed as following.

Using a second transmitter that is known not to over deviate the audio, enter some DTMF codes on the frequency your simplex radio is listening to. If the DTMF LED on the EI-151 is illuminating every time you sent a code, no further adjustment is necessary. If the DTMF LED tends to flicker (possibly while entering 3 or 5) you may have to increase or decrease the Volume on your Radio slightly.

Too high levels will distort the received signal and causing it to be falsely or not at all decoded. The same goes for a level too low, however the noise floor may become dominant and the decoder is unable to decode properly. We have very good experiences over the air where a station just breaks the Squelch and the EI-151 still decodes the tones.

After the Echo-Link software is properly setup we suggest connecting to the Echo-Link Test Server (code 9999) and recording some audio to it. The test server will playback anything you talked into it without modifying the audio. This is a good way to verify that your audio sounds clean and its level is high enough. You can at this point try to fine tweak the transmitted audio using the Treble / Bass adjustments. This is an Error and Trial adjustment and may take several attempts until it is satisfying your hearing. This will complete the audio adjustment. The EI-151 also provides an internal level adjust for Microphone and Line audio. Make only adjustments to the internal level if you can't achieve satisfying results externally.

Programming the Time Out Timer

By default the EI-151 is set to time out after 3 Minutes of continuous key up of the local transmitter. The time out time can be changed by sending DTMF codes of the air.

A word of caution! Echo-Link lets you store shortcuts. These shortcuts contain the node number you wish to reach. By using a short DTMF code for example "1" it could instruct Echo-Link to connect to a node that is stored in a list and responds to "1".

Since the EI-151 uses the character "A" as a start flag for the command following, we suggest refraining using the "A" character in the shortcut list or use it in a combination so that the EI-151 does not respond to it. Best way is to not use the "A" character at all. Otherwise it may produce undesired results.

Sending an "A" over the air your EI-151 will be placed into Command mode. If a second valid number or character is sent within one second from the received "A" it will interpret this character as a command. If more than a second passes by the next received character will be just that. NO COMMAND WILL BE EXECUTED.

Command	Time Out
A1	2 Minutes (One Flash PTT)
A2	3 Minutes (Two Flash PTT)
A3	4 Minutes (Three Flash PTT)
A4	5 Minutes (Four Flash PTT)
AD	Disable Unit (No Transmit)
A*	Enable Unit (Normal Operation)

We hope that this Guide is useful for the setup, interconnect and use of the EI-151 Echo-Link interface. Due to the great variation of Router Hardware, Software Firewall and other internet software, we are unable to support you with the setup of the Echo-Link Software. In general your Echo-Link Software must be setup in SYS-OP mode, external DTMF, if COS is used the external COS and not VOX should be selected. The Ports 5198, 5199, 5200 in your firewall must be opened for the Echo-Link Software to properly communicate over the internet. If you can see the Echo-Link Node list but can't connect to any node, you have a Firewall issue that you need to resolve before you can use the EI-151.

For more information visit the Echo-Link Web Site
http://www.echolink.org/firewall_solutions.htm

For more information on the Echo-Link Interface series visit
<http://www.kj6zd.net>

Good Luck and enjoy!