EZE (UK) G3VFP

Echolink MKIIIA Handbook

EchoLink Interface

Thank you for taking the opportunity to purchase the EchoLink interface.

The Interface:

The interface is based upon a PIC microcontroller IC1 which communicates via ASCII to and from a serial port (or USB port in the MKIIIUSB) via an RS232 transceiver IC4 which accomplishes the level change between ttl, and RS232 standards. Between the two devices is a buffer for both tx and rx data consisting of two gates of IC3. The unit utilizes the Holtek DTMF receiver IC2 which decodes all dtmf tones and passes the result of each tone to the pic processor. The pic decodes and passes this information to the software as described above. PTT is derived from an ASCII command and passed to the pic which in turn drives the ptt driver transistor. There is also a provision for utilizing the low going collector of the ptt transistor to drive a fan control transistor and relay. For carrier detect or COR operation IC7 takes a high going voltage of around 4 to 5 volts from the transceiver squelch detector output (where fitted in the transceiver) and provides both an led indication of the squelch opening, and simultaneously provides for approximately +6V to be fed to the CTS line of the com port. When present the Echolink software detects that high on the CTS and flags up a "SIG" and hand icon on screen to indicate the system is receiving a signal.

The audio side for both transmitted and received audio is isolated via two 600 ohm data modem transformers which maintain ground isolation between pc and radio. The TX AF which is audio coming from the internet is fed via a level control, and dc isolating capacitor to the mic, or aux audio input on the transceiver. The RXAF coming from the radio's speaker or aux audio output is fed via the transformer directly to the DTMF receiver, and also via a tone control circuit based around IC6 which is a low noise op amp. The output from the tone control is then fed out to the line input, or mic input of the PC soundcard.

The power supply for these functions comes via a 2.1 mm jack socket at 12V via a protection diode in series, together with a semiconductor resettable fuse. The 12 volt supply is decoupled and used to feed IC6 tone control, and also both the ptt relay, and where installed the fan control relay. The 12V is fed to a 5V regulator ic, decoupled at multipoints around the circuit board, and used to feed all other ic's.

Full ground to ground isolation is maintained throughout the interface by the use of the transformers, relays, or opto coupler, and as such is also suited for use with other software for data modes, or Eqso. For Eqso use the only point to note is that carrier detect should be selected as CTS but also invert the signal. RTS from the com port is utilized as an alternative to provide ptt with other softwares like EchoStation, and can be selected in Eqso.

There are four LED indicators present for use, and left to right on the front of the interface these are, power monitor which is fitted to the +5V rail in the interface. DTMF which lights upon receipt of a dtmf tone press. PTT which monitors the collector of the ptt transistor TR1. COR which monitors the status of IC7 to indicate when the squelch is open.

CONNECTING UP:

All that is required is to connect the cables between soundcard and controller using line in (or mic in), and line out (or speaker out) of the PC soundcard. The stereo connectors fitted to one end of these cables ALWAYS goes to the PC soundcard. Only one channel of the audio is selected, but it still requires the stereo plugs. The mono plugs on these cables go to RXAF and TXAF on the controller respectively. Connect the ptt lead, Connect the com port lead, and where applicable

the COR lead. Double check that you have the correct locations for all these before finally plugging in the dc supply to the 2.1mm dc input plug. Ten minutes and you are up and running.

DC FAN CONTROL

For those using the "DC Fan Controller", There is a phono output socket located above the DC input connector which is the switched dc fan output. It is wired for a 12V dc fan at 1Amp maximum. UNDER NO CIRCUMSTANCES MUST YOU USE THIS UNIT TO SWITCH AC FANS OF 110V OR 230V IT IS ONLY RATED ISOLATION FOR LOW VOLTAGE 12V DC USE. YOU SHOULD ALSO FUSE THE FAN SUPPLY WITH A 1AMP FAST BLOW FUSE.

You may use this switched 12V dc output voltage to power an independent external 12V DC relay which could then supply your AC fan as long as sufficient isolation exists between the dc and ac circuits on your relay. Wire your fan to the phono plug with the POSTIVE to the INNER, and NEGATIVE to the Screen. The fan relay is controlled by the ptt control transistor.

SOFTWARE SETTING UP:

Once logged into the Echolink system the sysop can set various parameters in the software, and literally sit back and await a connection, or initiate one. In reality though you will have to work hard at it! Use every available opportunity to advertise your link, and the system. Use an introduction wav file so that when potential users hit the star key (Or you do in order to initiate the message as a means of educating link users) they will know what the system is, and how to use it. The file is set up using "SYSOP" settings, into "Signals", then highlight "Station Info". Set it to custom, and browse to your echolink/wav file folder to insert your intro.wav file. Remember if you record your own wav files they must be in 8000hz 8Bit Mono format. Or use Echotime text to speech software by KH2D. www.kh2d.net. A good voice for text to speech if using Echotime is the NeoSpeech Kate voice.

Received audio coming from the internet and decoded by the CODEC (software for the soundcard) is passed to the soundcard, outputting from the line output or speaker output, passed via the interconnecting cable to the interface unit where it is fed to the mic, or tx audio ACC socket on the link, or repeater transceiver, together with the ptt. Set up by using the volume, and wav controls in the "playback" section of your soundcard mixer controls.
Conversely an rf users signal being received by the link or repeater transceiver has its rx audio or ACC output coupled to the interface, through interconnecting cable to the rxaf input, and from the interface line input socket to the line input of the pc's soundcard. It is then encoded and passed as digitized information through the internet to the recipient station (s). Set up this audio level by selecting Line Input in the "recording" section of your soundcard mixer controls.

SETTING UP THE AUDIO:

A useful way to set your internet transmission level is to open the squelch on your link transceiver, and set the audio levels so that the vu bar is illuminated for approximately three quarters. Then you will only need to fine tune it so to say when a user connects through your link or repeater. (Don't forget to close the squelch again afterwards :-).

The PLAYBACK WAV and VOLUME controls set the audio output level which is fed to your link transceivers tx audio input or deviation level.

So you adjust the PLAYBACK controls to set the right deviation, or output audio level on your link transmitter. Set it so you get about three quarters of the way on the VU meter bar. It is very easy

to become confused at first as to how the system functions, (unless you are cleverer than I :-)) so do not be afraid to play with audio settings etc, and remember you can still play with those settings whilst live in a qso too.

Remember too that there are audio level pre set controls within the interface. These are usually set to optimum output. Also there are "TONE" controls on the interface. Removing the four screws from the base of the case, and removing the lid, will show the pcb of course :-). The "Tone" controls ONLY affect the incoming rf users signal before it is passed to the PC's soundcard.

If you do change their settings for either more bass lf, or treble hf then make sure you are connected to someone whose experience you trust. You could go on changing these settings forever dependent on who thinks it sounds right :-). Use your best judgment, and not someone else's :-).

The DTMF LED lighting by the way does not mean the resultant number being sent is a valid node number, as only the software can confirm that by indicating, or not as the case may be. Also as that operation is user " human " activated, the correct decode will depend on the length of time a person holds down a particular keypad number, or the amount of signal to noise from that rf user into your link. If a user holds a key press too long the dtmf receiver could easily accept it as a double number, and process it as such. So be aware of that, and play with your own handi talkie, or whatever transceiver you are accessing the link with to get both a feel of the tones, and duration, and also to check that once audio levels are correctly set, that the dtmf receiver does decode each number or key press accurately 99% of the time.
Remember that whilst these DTMF receiver chips are manufactured to close tolerances for data comms work; they will suffer from being overloaded, or under driven. You need to check (if you have a variable audio output from your link transceiver) it's output level, in tandem with the line input level on your soundcard mixer controls (Located in the "RECORDING" section or option of your soundcard mixer controls, and NOT "PLAYBACK". If you have a speaker icon on your lower right task bar you can double click it which will bring up the mixer controls, go to options, and select recording. You will then get the recording controls. Remember that the PC is if you like recording the link transceivers rx audio as it is digitized to go onto the internet.

If you are using a speaker output from your link transceiver you will have to ensure it is ALWAYS returned to the same point if that control is ganged with your radios on/off switch. The input level from the link receiver is critical for good dtmf decoding as the DTMF receiver ic has a critical input range. When you are setting up test the input level at different settings to achieve correct DTMF decoding if it is too high, or too low you will get either no DTMF decodes, or some characters and not others.

The COR or squelch activated system relies on a +5 to +12 volt dc level output from your link transceiver when the squelch is opened by a carrier. Not all transceivers have this facility built into them, and if that is the case you would have to select vox operation. If the sq output is low impedence or ground when the sq is open then you can tick inverse on CTS, but the LED will be lit when the sq is closed, and off when it is open. Inverting does not apply to FT8100 or FT1500 as both of these transceivers give a positive output voltage.

CONNECTORS FAN & PSU:

On the rear of the unit there are eight connectors. RXAF input, TX AF output, Line Input, Line Output (or LS output from the soundcard), COR, PTT, RS232 Comms, and a 12V socket. Refer to the drawing for the interconnection information. Also a 12V DC switched output for cooling fan

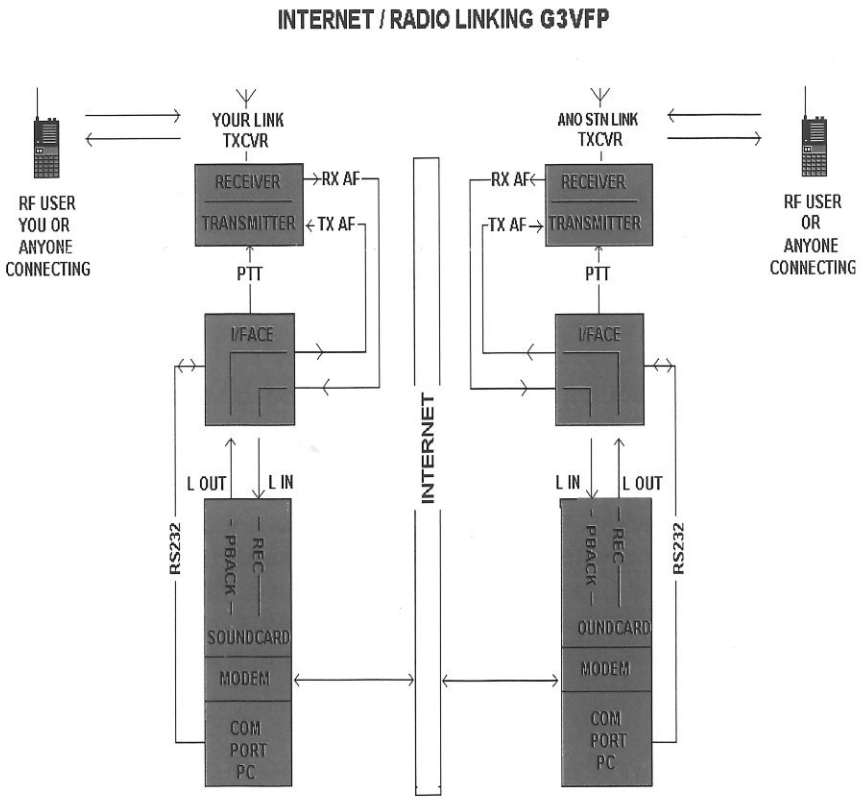
control if installed. The Red RCA Phono socket mounted above the DC input voltage socket is the DC fan output. Positive to inner.

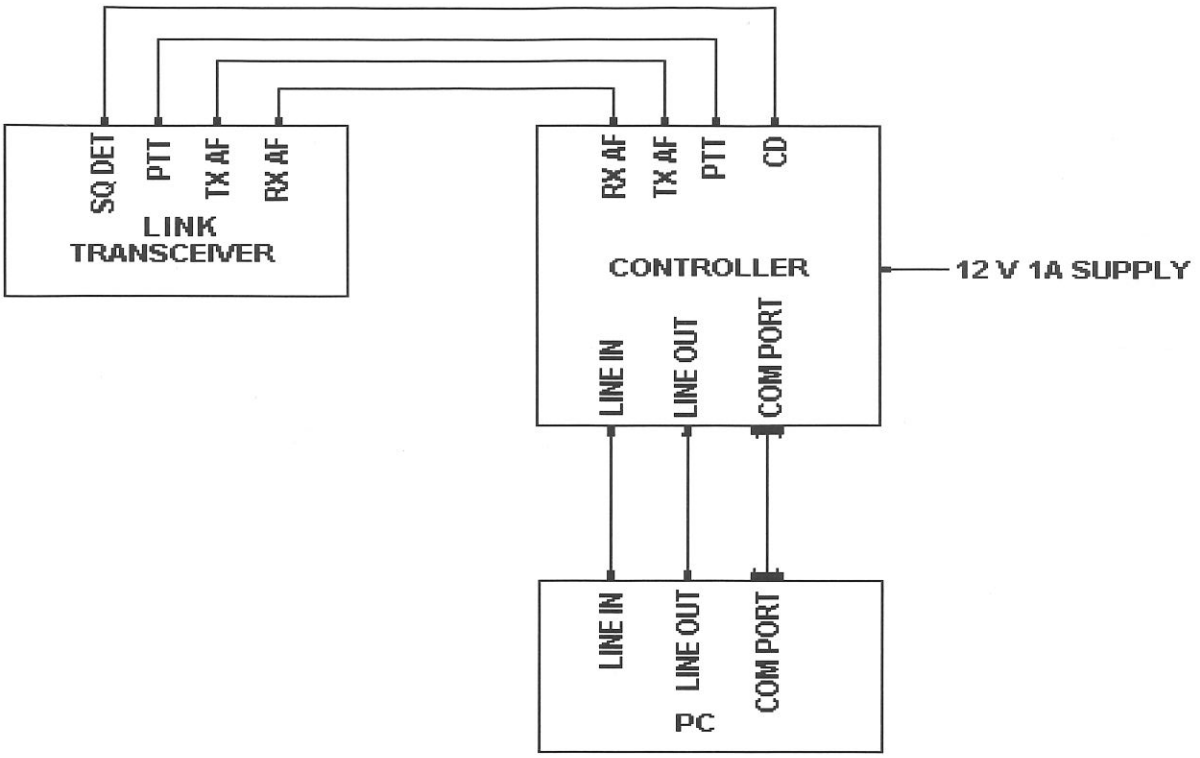
Note: that to ensure ground isolation between link radio and PC, you must run the unit from a small plug in power supply of its own. IE a 9V to 12V regulated supply of the type used for games machines, or toys. It must have a 1 Amp capability or 2A if the maximum current is used for a cooling fan. It is not imperative, but necessary if you want to maintain that isolation.

Also note that when running Eqso with this unit you need to select CTS as carrier detect, and click the invert button.

ECHOLINK LINKING:

It is far easier to understand how the internet linking system works by way of an overall diagram, than a thousand words. It matters not whether you use EchoLink, EQso, or ILRP. (Except ILRP won't allow PC user access) this is more or less how the system functions. You would talk to your link just like any other user accessing your node. Usually by a handi talkie which has DTMF capability.





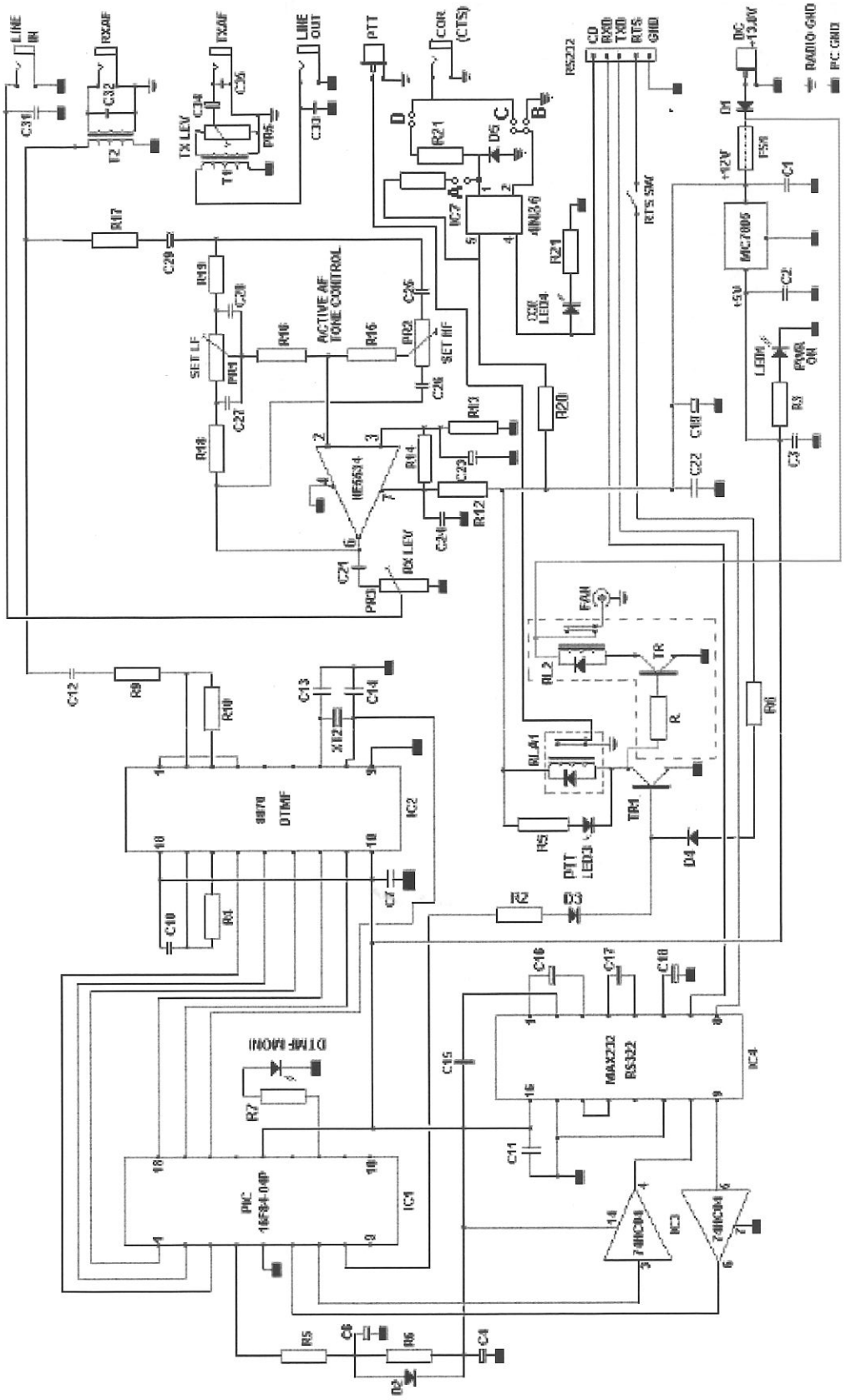
Ideally you should try to use a soundcard which has both line, and speaker outputs.

It may be that you are using a handie talkie or an FT-847 as the gateway link which may use a combined ptt and tx audio socket. In this case you would need to connect according to the instructions given for the microphone. Usually this would mean isolating the DC level between interface and transceiver with a capacitor. A 1mfd capacitor is fitted in the interface in the txaf output just in case you do need it, but you may also need a resistor from tx audio to ptt of around 2K2. Please refer to your particular radio manufacturer's handbook if that is the case.

AUDIO CABLES ARE ALWAYS STEREO TO PC, MONO TO CONTROLLER FOR LIN IN (LINE IN) AND LOUT (LINE OUT) .

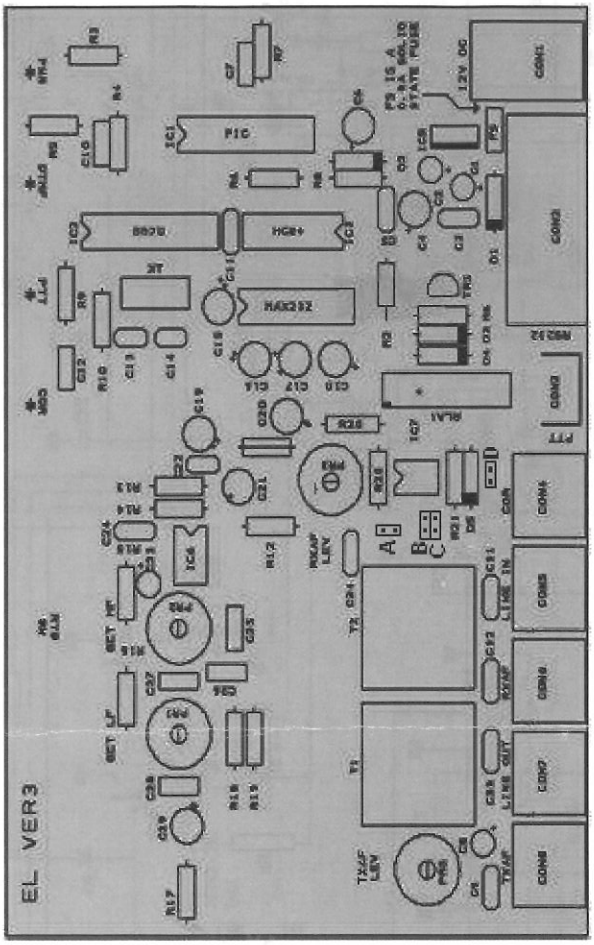
IF YOU ARE USING A FIREWALL BE SURE TO GIVE BI DIRECTIONAL ACCESS TO PORTS 5198, AND 5199 UDP, AND 5200 TCP.

Other information can be obtained from my web site www.g3vfp.org or by email of course. Or from www.echolink.org who have an excellent page concerning firewall setup.


LINE IN
RXAF
TXAF
LINE OUT
PTT
COR (CTS)
RS232
CD
RXD
TXD
RTS
GND
DC +13.8V
RADIO GND
PC GND
TX LEV
ACTIVE AF TONE CONTROL
SET LF
SET HF
RX LEV
RTS SW
+12V
+5V
MC7805
PWR ON
FAN
DTMF
MAX232
RS232
PIC 16F84-04P
74HC04
DTMF-MON
PTT LED3
COR LINKS: D & B ARE HIGH VOLTS INPUT
A & C ARE FOR LOW INPUT
ECHOLINK CONTROLLER VERSION 3A JAN 2008 G3VFP

PCB OVERLAY

BOTTOM LEFT PRE SET CONTROLS ARE RF RECEIVE TONE ADJUSTMENTS. BOTTOM RIGHT PRE SET CONTROL IS THE TXAF (LINK RADIO DEVIATION) LEVEL CONTROL. THE MIDDLE OF THE BOARD PRE SET IS RXAF LEVEL (AUDIO COMING INTO THE LINK RADIO)



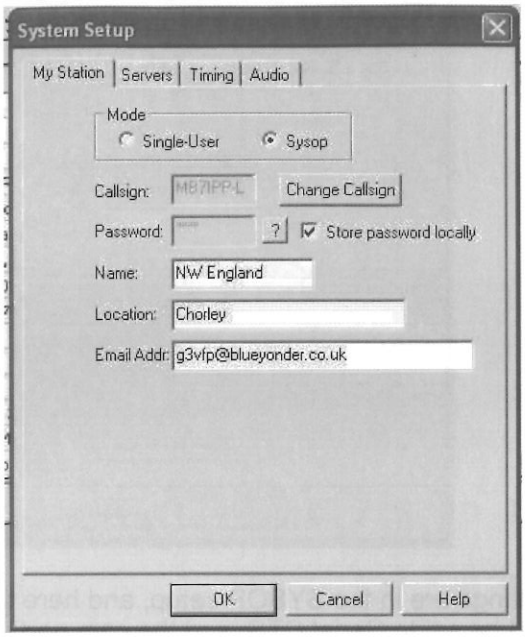
ECholink Controller Ver IIIA has selectable COR (carrier detect) options.
The default is high or +5V incoming, but can now be selected via links on the pcb to give either high or low input around IC7.

Links:
A = For Low input
B = For High input (default)
C = For Low input
D= For High input (default

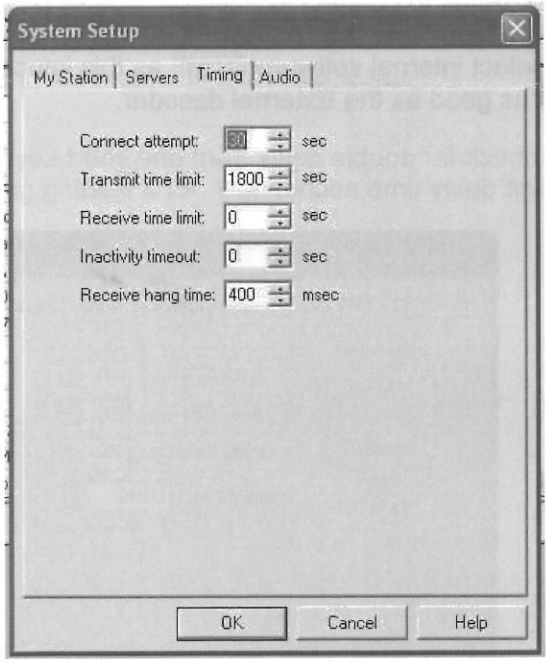
This information is also printed inside the controllers case.

Please note that when using CTS cor instead of vox for RXCtrl . There are some pc's that will pull the CTS com port signal. The effect is the "SIG" legend staying up after the rf user signal has dropped. If you experience this the solution is easy to do. Simply open up the pc com port plug and insert a silicon diode in series with the lead going to pin 8.
Place the cathode (band end)of the diode to pin 8, and solder the lead to the other end. That will resolve the issue.

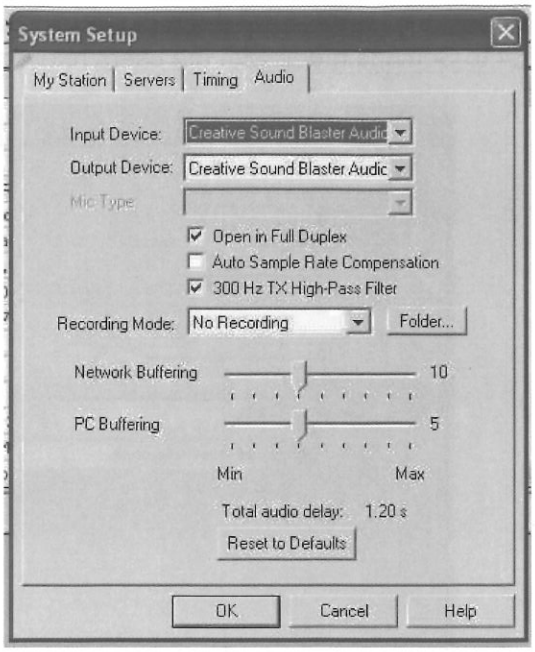
The next step is to connect the controller to the radio, and pc to be used of course. Echolink should be set to Settings mode with the users relevant call sign and password.



The next tab in settings is the servers. This is set automatically by Echolink itself. The third tab is the Timings tab.



The next setting is the audio tab. Ensure that the correct soundcard is selected, and if CTCSS tones are to be used then do select the 300Hz High Pass Filter Option. The network and pc buffering settings can remain as defaults, or increased at the expense of path delay time.



The other critical settings are in the SYSOP setup, and here there are some options. The RXCtl options should be set to Serial CTS, and the com port selected to that which you are using for Echolink. The other timing settings can be altered to suit, but the ones shown have been proved to work well. The next tab is TXCtl this MUST be set to ASCII, DO NOT tick 9600 baud box. Select the correct com port you will be using. The third tab is DTMF If you do not wish users to use tones to connect to Echolink gateways, or this could be a nuiscance in a repeater connection, you have the choice of External for the controllers DTMF decoder, or Disabled. Do NOT select internal software DTMF as this imposes demands upon the PC and software, and is not as good as the External decoder.

When using DTMF check for double digits from one short keypress, and adjust the minimum interdigit delay time accordingly. As a starting guide set it to 5mS.