

Notes on Making an Inexpensive Personal EchoLink Node (updated 28 Aug 2020)

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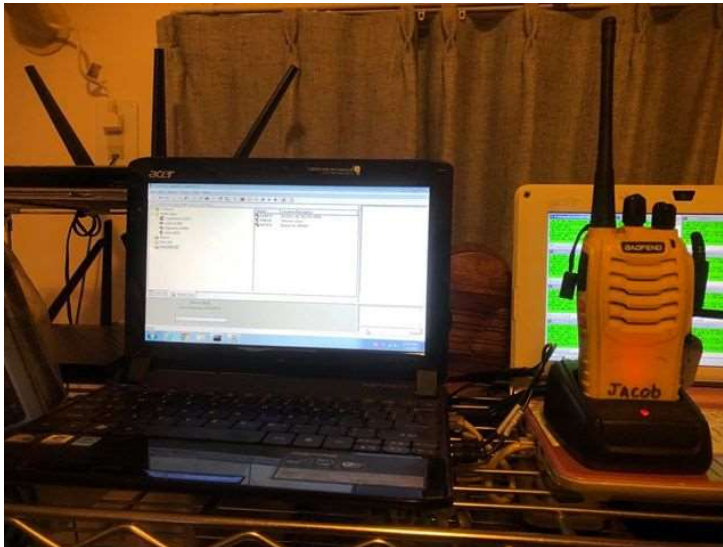
What is it? It's both an RF-to-IP and IP-to-RF interface, using a cheap HT and a PC running EchoLink software

What can you do with it?

- 1) Allow EchoLink users to connect to your node, and talk via RF to you or anyone within RF range of your node.
- 2) Allow you to use a second HT to talk to EchoLink users/conferences/repeaters when you don't have an EchoLink-connected repeater nearby, for a more natural Ham radio feel by using an HT, and so you can walk around the house

What do I need? A PC running EchoLink software in Sysop mode, a cheap HT, and an interface cable that you can build yourself

Disclaimer: There are many ways to make a personal EchoLink node, and these are just notes on how I did it. Please make appropriate adjustments and modifications for your particular situation or location, and always exercise good judgement and safety when handling electronics.



Note 1: The PC

- I use an old netbook running Windows, but you can use a laptop, a desktop, a Raspberry Pi, etc
- The PC needs to have two standard 3.5mm jacks, one for headphones and one for a microphone
 - If your PC doesn't have these, you can get a cheap USB sound card online for usually less than \$10.

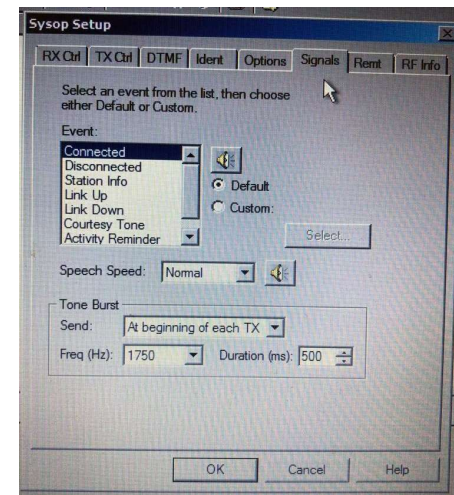
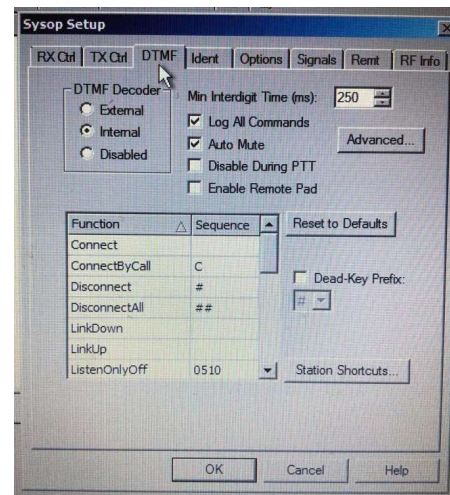
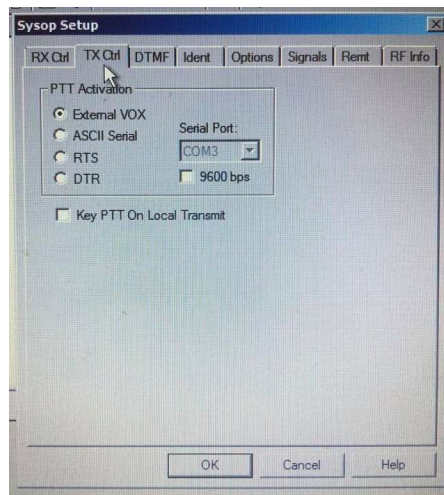
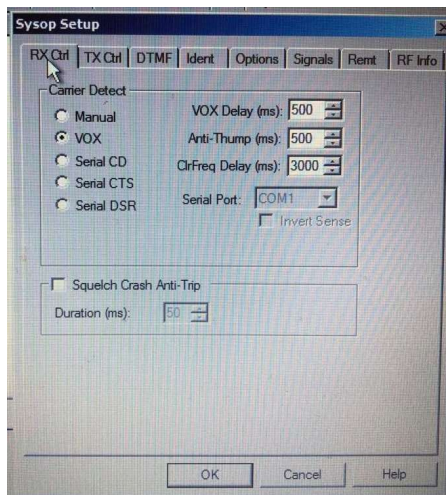


- Some modern computers only have a single 3.5mm jack for a combo headphone/mic device. In this case, you can use a USB sound card, or use a TRRS-to-TRS splitter. Make sure it is a "TRRS to TRS" splitter. The photo should show a male connector with 4 contacts.
 - The terms TRRS and TRS describe the configuration of the plug. It stands for Tip, Ring, Ring, Sleeve; and Tip, Ring, Sleeve. TRRS has two rings, as shown in the photo to the right as #2 and #3.
- Of course, your PC needs internet access. Wifi or wired connection is fine.



Note 2: The Software

- The easiest software to use is the standard EchoLink program for Windows. There are others like svxlink for Linux/Raspberry Pi that should work also, but I've never used them.
- You'll need to put EchoLink into "Sysop" mode, which will require you to register another callsign with Echolink that has a "-L" at the end of it to indicate it is a "link" node.
 - The key settings are under the Sysop Setup window are:
 - Under the RX Ctrl tab, Carrier Detect is set to VOX.
 - Under the TX Ctrl tab, PTT Activation is set to External VOX.
 - Under the DTMF tab, DTMF Decoder is set to Internal.
 - Under the Signals tab, Tone Burst is set to "At beginning...", any Freq, & "500". This helps trigger your HT's VOX.
 - All the other Sysop settings, you can play with as needed to fine-tune your setup.
- If this is a second EchoLink device on your home network, you will likely need to setup EchoLink to connect through a public proxy, under the Setup window & Proxy tab. Google "EchoLink Public Proxy" for more info if this applies to you.



Note 3: The Radio

- Use any regular Baofeng that has a standard Kenwood connector (3.5mm and 2.5mm jack), such as the UV-5R family, BF-888, UV-82 family, etc.
- The radio can permanently sit in the charging cradle while its powered on.
- Key settings for the radio are:
 - Power set to low.
 - VOX set to on.
 - VOX level set to a middle value. Adjust if needed.
 - Squelch level set to a low-to-middle value. Adjust as needed.
 - CTCSS set to a frequency of your choosing. Just like a repeater, your radio will not open its squelch unless it hears a tone, so it won't send every stray signal it hears over EchoLink.
 - Volume knob set to a middle-to-low volume.
 - TOT set to a relatively large number. Start with 180 seconds, then adjust if it seems to timeout often during long EchoLink chats. The good thing is that the radio is set to low power so it won't get very hot, and it's sitting in the cradle so it'll have ample prime power.



Note 4: The Interface Cable

- You'll need some cables to cut-up and splice.
- I used a regular 3.5mm-to-3.5mm AUX cord cut in half for the PC side, and I used the handsfree earpiece that came with my Baofeng for the radio side. You can buy an earpiece on eBay for less than \$10.
- Splice the cables using the chart below:



Kenwood/Baofeng Connector

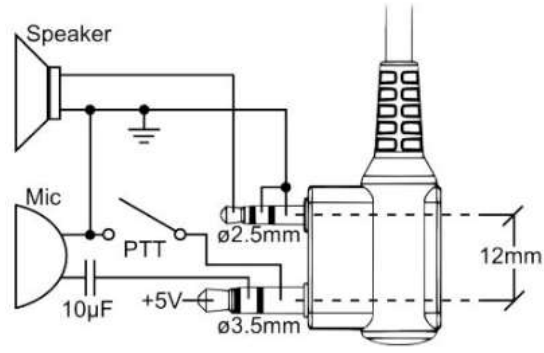
- a. 2.5mm tip = speaker connect to j
- b. 2.5mm ring = unused
- c. 2.5mm sleeve = ground connect to h, i, k, m
- d. 3.5mm tip = unused
- e. 3.5mm ring = mic connect to g
- f. 3.5mm sleeve = PTT not connected for VOX operation

PC Speaker-Out/Headphone Connector

- g. 3.5mm tip = + connect to e
- h. 3.5mm ring = tied to ground connect to c
- i. 3.5mm sleeve = - connect to c

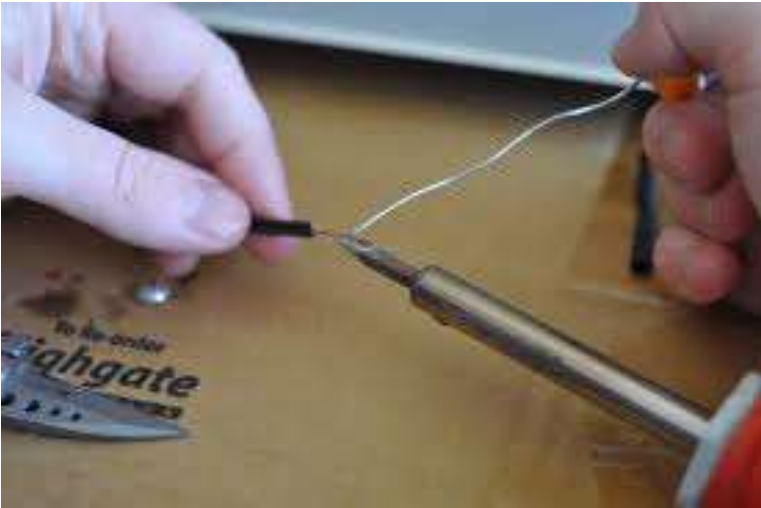
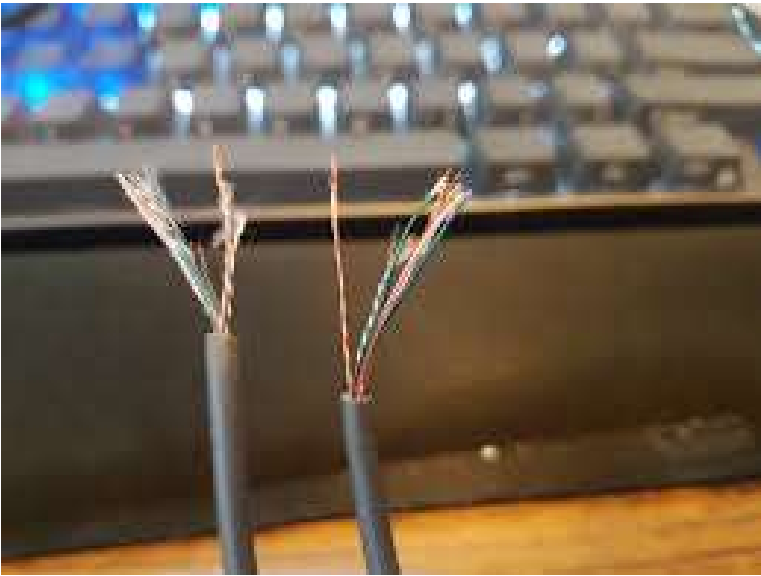
PC Line-In/Mic-In Connector

- j. 3.5mm tip = + connect to a
- k. 3.5mm ring = tied to ground connect to c
- m. 3.5mm sleeve = - connect to c



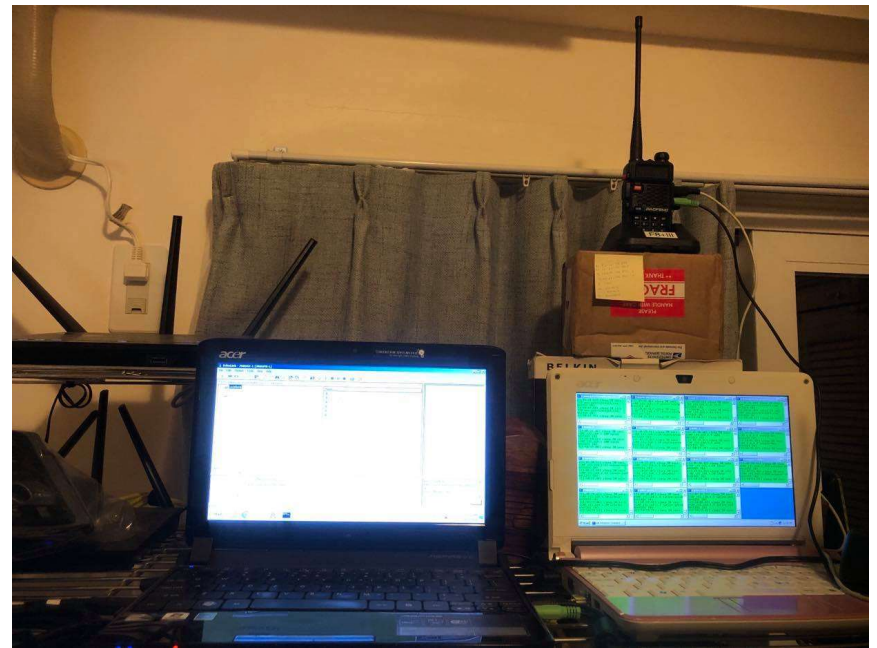
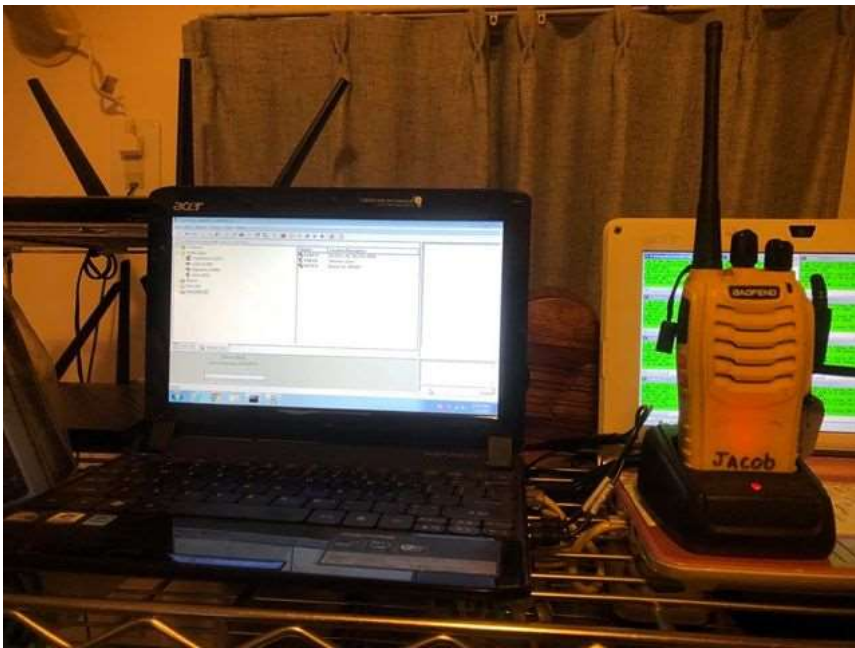
Note 4: The Interface Cable (continued...)

- Often times, the individual internal wires are very thin and have an insulation that is not easily removable. In this case, you can remove the insulation by burning it off under a cigarette lighter or match for only 1 second.
- After the burn, use a tissue or napkin to clean the soot off of the wire, then go ahead and solder.



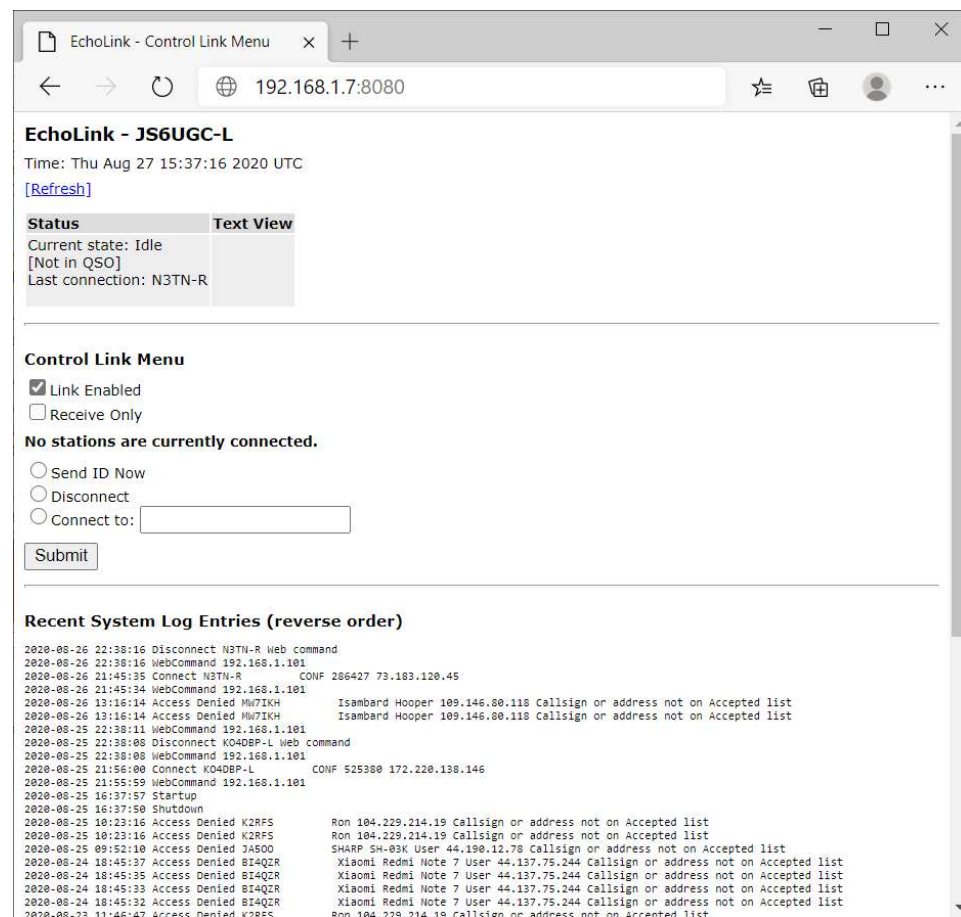
Note 5: Putting it all together

- Plug it all in and start with the radio volume set to about 25%, and the PC volume set to about 30%.
- There will be a good amount of tinkering with volume, VOX level, EchoLink settings. Get familiar with the EchoLink software and PC's volume/microphone level settings.
- Use the Ident tab under the Sysop Settings to help test, as well as the ECHOTEST server to help confirm audio settings.
- When using my BF-888 at 0.5w TX power, I could have it right next to the PC with no problem. Using my BF-F8+ at 1w which is the lowest setting, it caused problems with VOX cutting off after 2 seconds of transmit, so I moved it higher and away (on some cardboard boxes) and that solved the problem.



Note 6: Using your Node

- I like using a laptop/netbook as the EchoLink PC because I can easily see what's happening with the software, reconfigure as needed, etc.
- To tell the EchoLink PC to connect to a remote node, you can use the laptop directly, send DTMF commands through your radio, or use the Web Remote Control.
 - DTMF:
 - To connect to a remote node, send the node number (ie: 9999 to connect to test server)
 - To disconnect from a remote node, send #
 - To get status information, send *
 - Do a google search for other commands, like connect to a random node, or callsign lookup by node number.
 - Web Remote Control:
 - Configure the Web Remote Control under Sysop Settings, Remt tab
 - Access your Web Remote Control using the web browser on another PC in your house



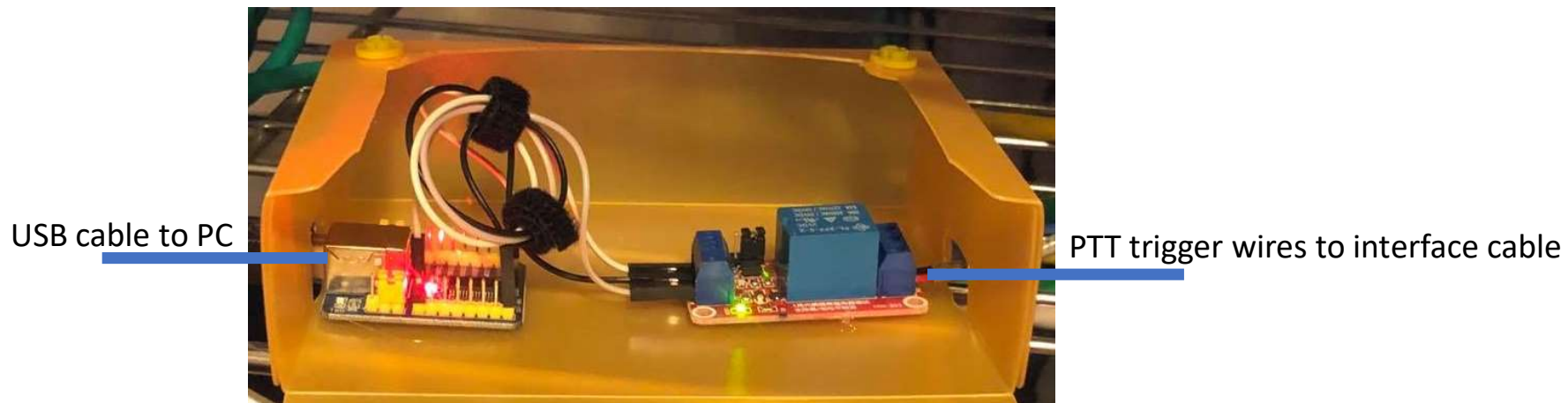
The screenshot shows a web browser window titled "EchoLink - Control Link Menu" with the address bar displaying "192.168.1.7:8080". The page content includes:

- EchoLink - JS6UGC-L**
Time: Thu Aug 27 15:37:16 2020 UTC
[\[Refresh\]](#)
- Status** | **Text View**
Current state: Idle
[Not in QSO]
Last connection: N3TN-R
- Control Link Menu**
 - Link Enabled
 - Receive Only
 - No stations are currently connected.**
 - Send ID Now
 - Disconnect
 - Connect to:
 -
- Recent System Log Entries (reverse order)**

```
2020-08-26 22:38:16 Disconnect N3TN-R Web command
2020-08-26 22:38:16 WebCommand 192.168.1.101
2020-08-26 21:45:35 Connect N3TN-R CONF 286427 73.183.120.45
2020-08-26 21:45:34 WebCommand 192.168.1.101
2020-08-26 13:16:14 Access Denied MW7IKH Isambard Hooper 109.146.80.118 Callsign or address not on Accepted list
2020-08-26 13:16:14 Access Denied MW7IKH Isambard Hooper 109.146.80.118 Callsign or address not on Accepted list
2020-08-25 22:38:11 WebCommand 192.168.1.101
2020-08-25 22:38:08 Disconnect K04DBP-L Web command
2020-08-25 22:38:08 WebCommand 192.168.1.101
2020-08-25 21:56:00 Connect K04DBP-L CONF 525380 172.220.138.146
2020-08-25 21:55:59 WebCommand 192.168.1.101
2020-08-25 16:37:57 Startup
2020-08-25 16:37:50 Shutdown
2020-08-25 10:23:16 Access Denied K2RFS Ron 104.229.214.19 Callsign or address not on Accepted list
2020-08-25 10:23:16 Access Denied K2RFS Ron 104.229.214.19 Callsign or address not on Accepted list
2020-08-25 09:52:10 Access Denied JA500 SHARP SH-03K User 44.190.12.78 Callsign or address not on Accepted list
2020-08-24 18:45:37 Access Denied B14QZR Xiaomi Redmi Note 7 User 44.137.75.244 Callsign or address not on Accepted list
2020-08-24 18:45:35 Access Denied B14QZR Xiaomi Redmi Note 7 User 44.137.75.244 Callsign or address not on Accepted list
2020-08-24 18:45:33 Access Denied B14QZR Xiaomi Redmi Note 7 User 44.137.75.244 Callsign or address not on Accepted list
2020-08-24 18:45:30 Access Denied B14QZR Xiaomi Redmi Note 7 User 44.137.75.244 Callsign or address not on Accepted list
2020-08-23 11:46:47 Access Denied K2RFS Ron 104.229.214.19 Callsign or address not on Accepted list
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Future Upgrade: Serial PTT Trigger

- VOX works pretty well, especially for a personal node, but you may feel the desire to create a serial PTT trigger. This trigger allows the EchoLink program will send a signal through a serial interface telling the radio to engage its PTT circuit.
- This trigger will reduce the amount of missed audio at the beginning of a transmission, and reduce the length of the squelch tail or dead-air time at the end of a transmission.
- For this, you need a couple components, and to modify the interface cable you built. The components are a USB-to-Serial/TTL component, and an Octocoupler/Isolator.
 - The USB-to-Serial/TTL is a serial port that uses TTL-level voltages for its signals instead of old-school serial voltages
 - Make sure to get one that allows you to set a jumper for either 3.3v or 5v operation, and either an RTS or DTR signal pin. A device based on the FT232RL is what I used. They are very common for use with Arduinos.
 - The Octocoupler/Isolator is a special relay that uses an LED to trigger the relay instead of an electromagnet
 - Like everything else, I got each component for a few dollars on Ebay or Amazon.



Baofeng EchoLink Interface with PTT

Kenwood/Baofeng Connector

- a. 2.5mm tip = speaker connect to j
- b. 2.5mm ring = unused
- c. 2.5mm sleeve = ground connect to h, i, k, m, o
- d. 3.5mm tip = unused
- e. 3.5mm ring = mic connect to g
- f. 3.5mm sleeve = PTT connect to n

PC Speaker Out Connector

- g. 3.5mm tip = + connect to e
- h. 3.5mm ring = tied to ground connect to c
- i. 3.5mm sleeve = - connect to c

PC Line-In/Mic-In Connector

- j. 3.5mm tip = + connect to a
- k. 3.5mm ring = tied to ground connect to c
- m. 3.5mm sleeve = - connect to c

Octocoupler/isolator

- n. Normally Open = PTT connect to f
- o. Common = ground connect to c
- p. DC+ = VCC / VCCIO connect to u
- q. DC- = serial ground connect to s
- r. IN = RTS connect to t

USB to Serial/TTL

- s. Ground = DC- connect to q
- t. RTS = IN connect to r
- u. VCCIO = DC+ connect to p
- v. USB = USB connect to PC's USB port

