



VARA

A High Speed Data Mode

Presented by
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ARES/RACES

With credit and thanks to Oliver, K6OLI and Scott, NS7C

Amateur Radio is the Hobby;
Emergency Communications is the *Commitment*

ARRRRGH! Why do I need to learn another complicated mode?

- ▶ ARES/RACES goal is fast, accurate information transfer
 - We started with voice
 - Inaccurate and very slow
 - We moved to packet on VHF and Pactor on HF
 - Accurate and slow
 - Both required complicated hardware between the computer and the radio
 - As computers got faster and software got better, we were able to simplify the interface and move the work to the computer



Some BRIEF History

- ▶ Packet was developed for computer networks (early 1960's)
 - Accurate information transfer was critical
 - Used for VHF communications by hams (late 1970's)
- ▶ AMTOR was developed by hams to improve HF radioteletype (RTTY) communications (1970's)
- ▶ Pactor incorporates some of the best features of both (1990's)
 - Requires a modem between the radio and the computer



Last of the BRIEF History

- ▶ Sound card modes started with PSK-31 (late 1990's)
 - Dozens of modes now - FT8 is the current big one
- ▶ “Perfect” copy requires exchanging information about what was sent and received - called Automatic Repeat Request or ARQ
- ▶ Development of sound card modes with ARQ and advanced Digital Signal Processing (DSP) continues today
- ▶ Winmor developed by the Winlink Development Team (WDT) (beta testing in 2009)
 - Obsolete now
- ▶ VARA is the latest very fast, relatively inexpensive mode



Some Details about VARA

- ▶ VARA comes in 2 separate programs: VARA FM and VARA HF
 - VARA FM specifically designed for use with an FM Radio on VHF/UHF
 - VARA HF to be used with (surprise!) your HF radio
- ▶ Due to radio limitations at VHF/UHF and for propagation/interference reasons at HF, each program has 2 modes
 - VARA FM 9600 and VARA FM 1200
 - VARA HF 2300 and VARA HF 500



A Few More Details about VARA

- ▶ VARA FM 9600 is also called VARA FM Wide
 - 9600 is not the speed, but it must be connected to the 9600 baud port on your radio
 - It is REALLY fast!
- ▶ VARA FM 1200 is also called VARA FM Narrow
 - 1200 is not the speed, but it can be connected to either the 1200 baud or 9600 baud port of your radio
 - Licensed versions of VARA FM 1200 are roughly $\frac{1}{2}$ the speed of VARA FM 9600



Some More Details about VARA

- ▶ Use both programs for free, but their incredible speed is deliberately slowed. Buy a full speed license for a 1 time fee of \$69 (single license) or \$55 (>10 group purchase)
 - The slow speed is about 10% of maximum speed
- ▶ VARA installations on gateways will run at full speed without a license fee
- ▶ Audio level set up procedures for both programs are very similar

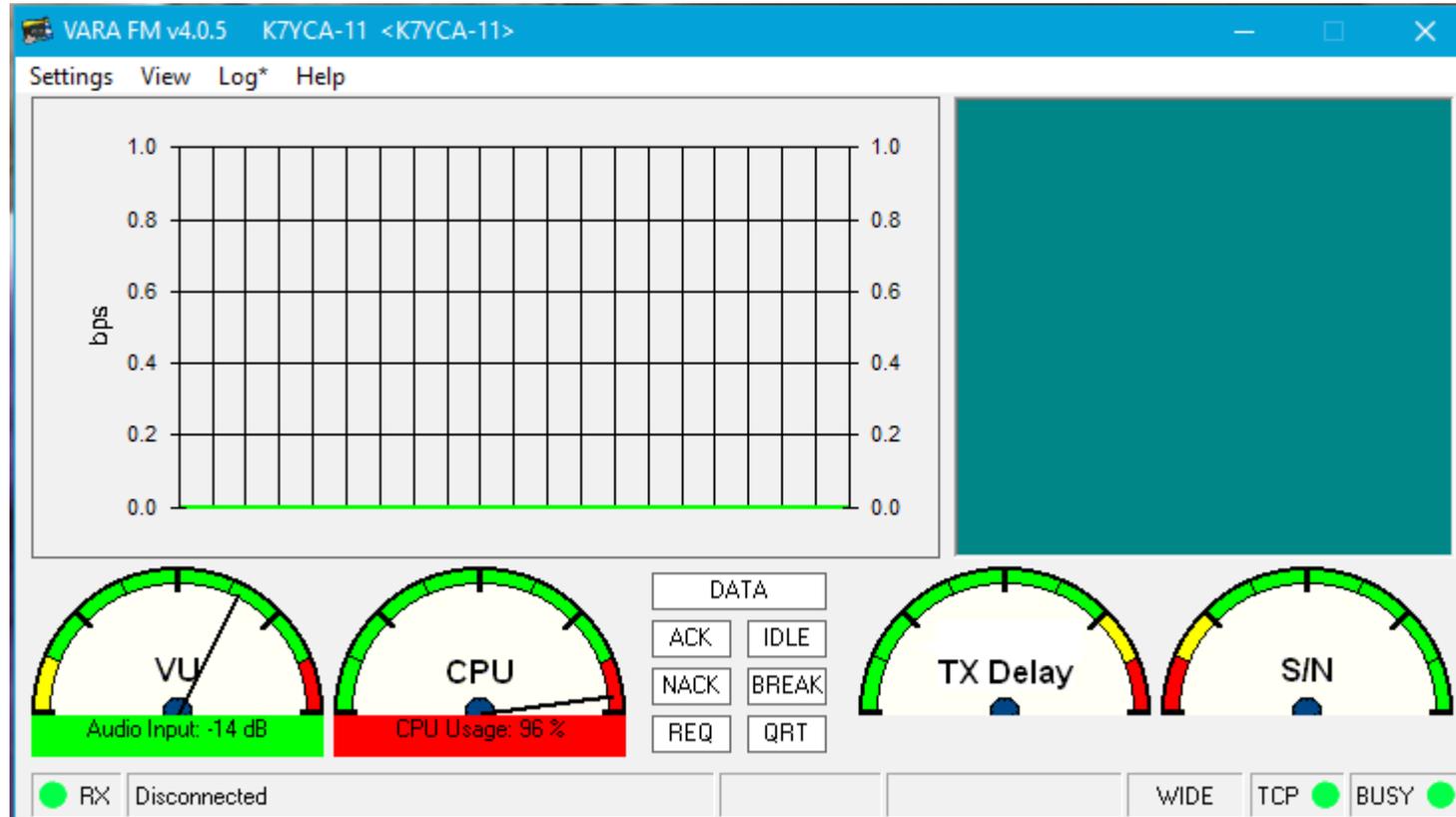


Even More Details about VARA

- ▶ Support for VARA is built into Winlink Express
- ▶ Published documentation of the VARA specifications does not keep up with the software releases
 - It's difficult to compare performance
- ▶ Very roughly, for very strong signals, VARA FM Narrow is 18 times faster than packet.
- ▶ Very roughly, for very strong signals, VARA HF 2300 is 5 times faster than ARDOP/Winmor



Done with Details about VARA



Your Packet/VARA Station

Computer

Soundcard

Radio

Antenna



Windows 10
Winlink Express
UZ7HO Sound
Modem
VARA HF and/or
VARA FM

Signalink or
Digital Radio
Adapter - XX

Your Choice
(modern)

Your Choice
(big)



Your Packet/VARA Station



- ▶ Only Signalinks manufactured since June 2018 will allow you to use VARA FM 9600 (compare your Signalink PC board here: <https://www.tigertronics.com/slusbbrd.htm>)
- ▶ The connection labeled 1 is a USB A to USB B cable and is supplied with both the Signalink and the DRA-XX.
- ▶ The connection labeled 2 may be unique to your radio



Your Packet/VARA Station

- ▶ Purchase the cable for your radio from Tigertronics (Signalink)

OR

- ▶ Determine the data connector type on your radio and decide which cable to use between the radio and DRA-XX. The XX in the model number determines the output connector type and audio level.
- ▶ Most recent radios have standardized on the 6 pin Mini DIN and they all use the same pin connections internally to the radio. A 3' male to male 6 pin Mini DIN cable is available on Amazon for \$5. Search for Kentek 3 Feet FT Mini DIN6 MDIN6 PS/2. The matching sound card is the DRA-36 or DRA-50 (has higher audio output).

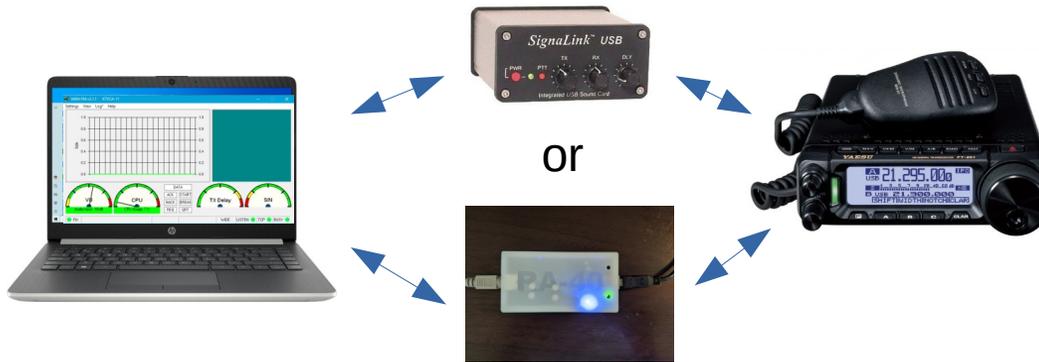


Your Packet/VARA Station

Computer

Soundcard

Radio



Adjust Sound Levels through Control Panel, Sound

Adjust Sound Levels through Front Panel (Signalink) or internal resistors (DRA-XX)

If available, Adjust Sound Levels through Radio Menu



Equipment Set Up for Packet



Equipment Set Up for Packet

- ▶ Sound Card (DRA-XX)
 - For the computer set up procedure on slide 16
 - If you are using a DRA-36 or equivalent, all 3 screw-driver-adjust potentiometers (pots) on the PCB should be set fully or almost fully clockwise
 - If you are using a DRA-50 or equivalent, all 3 screw-driver-adjust potentiometers (pots) on the PCB should be set approximately at mid-range



Equipment Set Up for Packet

- ▶ Sound Card (DRA-36)
 - For the computer set up procedure on slide 16
 - To set the RX signal level to an optimum level, you may have to make adjustments back and forth between the large pot R12, the Windows Sound sliders and the radio menu
 - To set the TX signal level to an optimum level, you may have to make adjustments back and forth between small pot R14, Windows Sound sliders and the radio menu



Equipment Set Up for Packet

▶ Computer

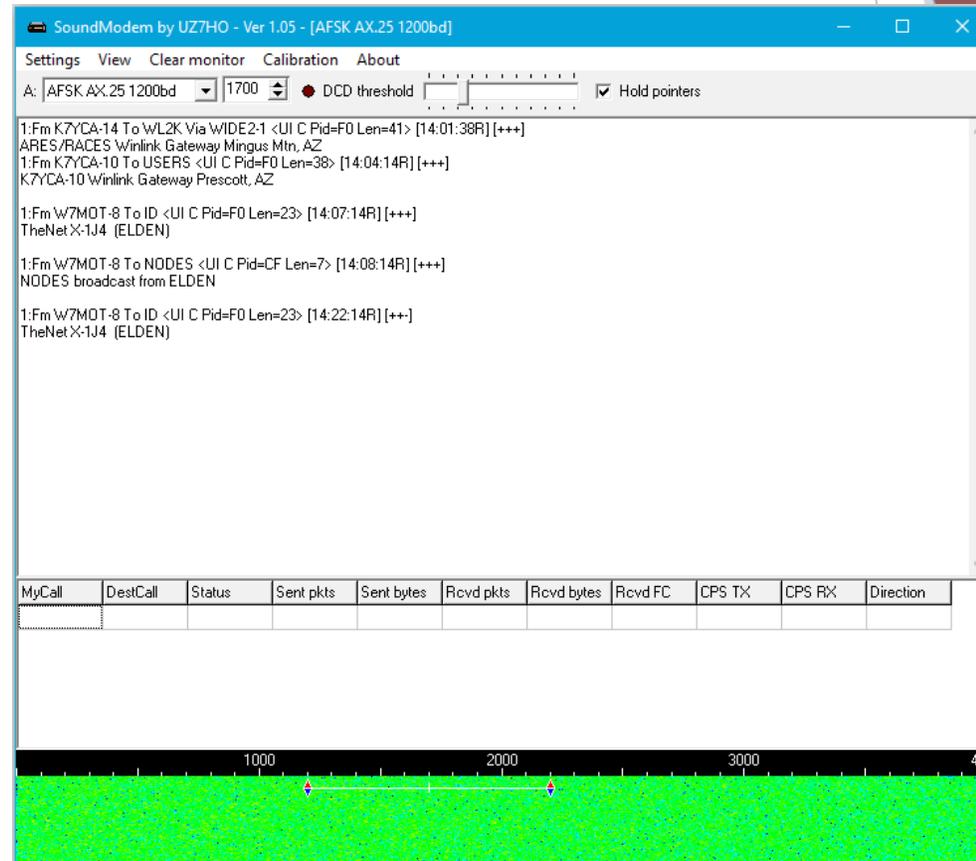
- From winlink.org, down load and follow this document
- https://winlink.org/sites/default/files/RMSE_FORMS/quick_setup_guide_for_winlink_sound_card_packet_for_vhf-uhf_on_windows_v1.2.pdf
- Except for the changes on the following page, follow these instructions precisely!!!
- This procedure will allow you to use your sound card with packet



Equipment Set Up for Packet

▶ Computer

- Soundmodem main panel, Settings, Devices - also check TX Rotation and Color Waterfall
- Soundmodem main panel, Settings, Modems - set or leave the TXDelay at 250 msec
- Adjust the receive level so that the waterfall looks like this



Equipment Set Up for VARA FM



Equipment Set Up for VARA FM

► Computer

- From <https://rosmodem.wordpress.com/> download
 - VARA FM v.4.0.5 (or latest version number)
 - Install this program (carefully follow the instructions - right click on the unzipped VARA FM setup.exe file and select Run as administrator)
- If you are interested in VARA HF, download and install that program also.
- Download the Quick Setup Guide for VARA FM 3.0.5 and Higher.....
- This program and setup will allow you to use VARA FM through a Signalink



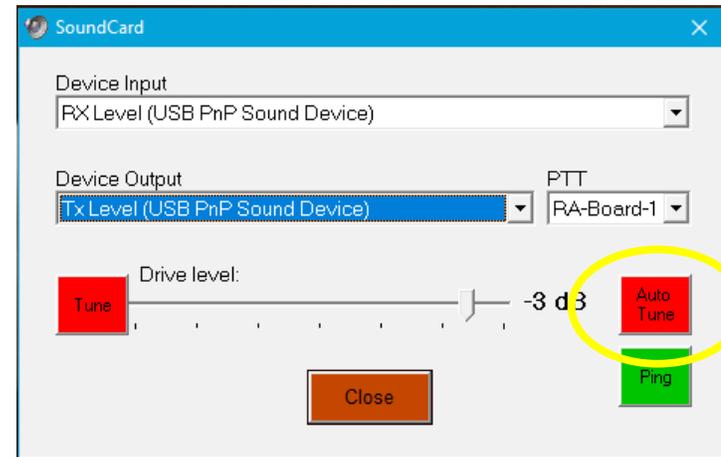
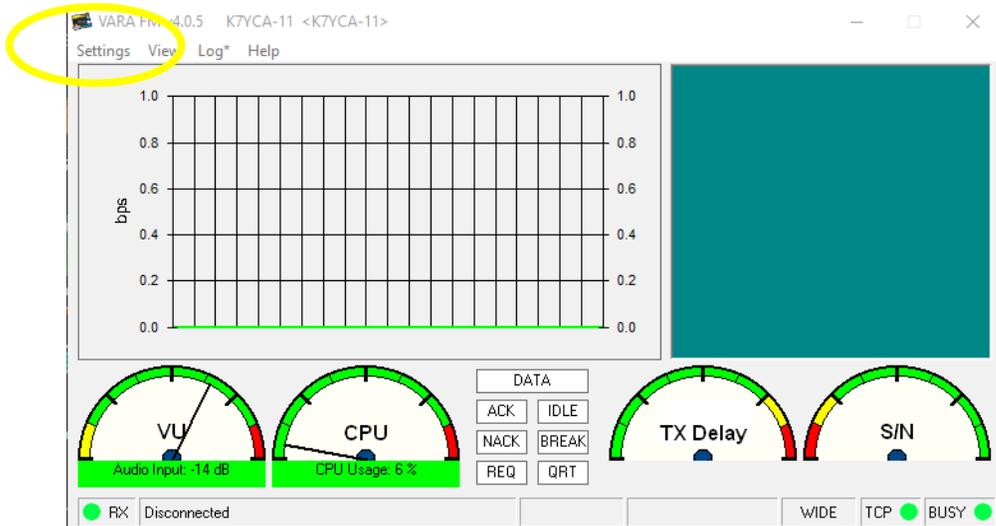
Equipment Set Up for VARA FM

► Final Set Up

- The packet settings should get you very close to the best settings for VARA FM
- For a different perspective on the set up procedure, see
- <http://www.masterscommunications.com/products/radio-adapter/dra/vara-primer.html>
- If you have a VARA license, enter your callsign and license code in VARA, Settings, VARA Set Up.
- If you have a VARA FM station near you, set your radio to the correct frequency and go to VARA, Settings, Soundcard and select Auto Tune



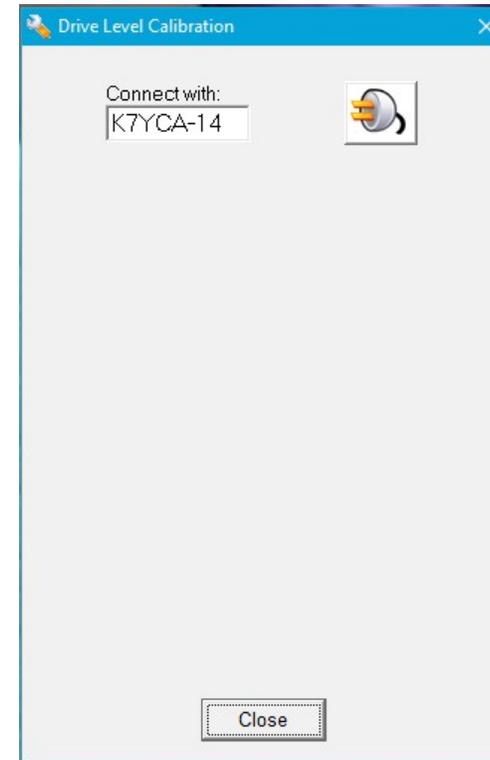
Equipment Set Up for VARA FM



Equipment Set Up for VARA FM

► Final Set Up

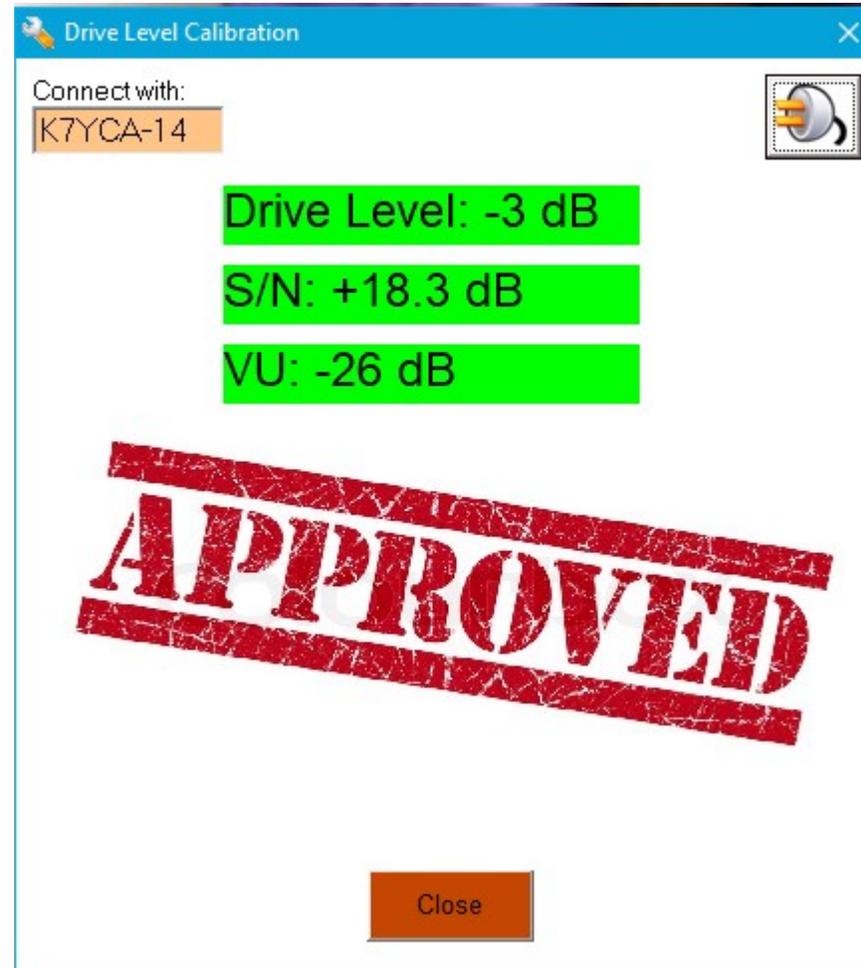
- Enter the callsign of the station near you
- Select the “Plug”
- Your station will send signals at different levels and if the other station is close enough, it will return calibration information to your station which will automatically set your output level.
- This setting is optimum only for this station but is usually accurate



Equipment Set Up for VARA FM

► Final Set Up

- You should see this: →
- If not, follow the instructions that appear in this window and re-test until you see this →



Equipment Set Up Signalink and VARA HF



Equipment Set Up Signalink and VARA HF

► READ THIS FIRST!

- Your computer, Signalink, VARA HF and your radio may have 4 adjustments for setting the transmit and receive levels.
 - The sound outputs from the computer
 - The RX and TX potentiometers (pots) on the front of the Signalink
 - VARA HF has a transmit level slider built in to it
 - Your radio may have menu settings to set the levels
- You may have to adjust all 4 in order to get the levels set properly



Equipment Set Up Signalink and VARA HF

▶ READ THIS FIRST! (cont'd)

- If your radio covers both HF and 2 Meters and you have set your Signalink for VARA FM, do not adjust the Signalink or computer sound levels except as a last resort
- If you must adjust the Signalink or computer sound levels, try setting the VARA HF drive level or the radio menu settings to the maximum or minimum level (depending on which way you need to go) and making very small adjustments to the Signalink or the computer sound levels



Equipment Set Up Signalink and VARA HF

▶ Start VARA HF

- Select Settings, VARA Setup
 - If you have a license code, enter your callsign and the code
 - Select Allow VARA check for Updates via Internet
 - Leave all the default settings and select Close
- Select Settings, SoundCard
 - Using the drop down menu, choose USB Audio Codec for both the Device Input and Output
 - Select Close
- Ensure your radio and Signalink are connected and the radio is on



Equipment Set Up Signalink and VARA HF

▶ RX Sound Level Setting

- Ensure your radio is set up in Data mode and the filters are set Wide. Read the Manual!
- If there are radio menu settings to adjust the sound levels (they are probably called something other than sound levels), leave them at the default level or set them for mid-range



Equipment Set Up Signalink and VARA HF

▶ RX Sound Level Setting

- If you have set the sound levels for VARA FM in this radio, skip ahead to slide 35
- Click on the Windows Icon 
- When the Start window opens, type Control Panel and select Control Panel, Sound (see slides 32 - 34)



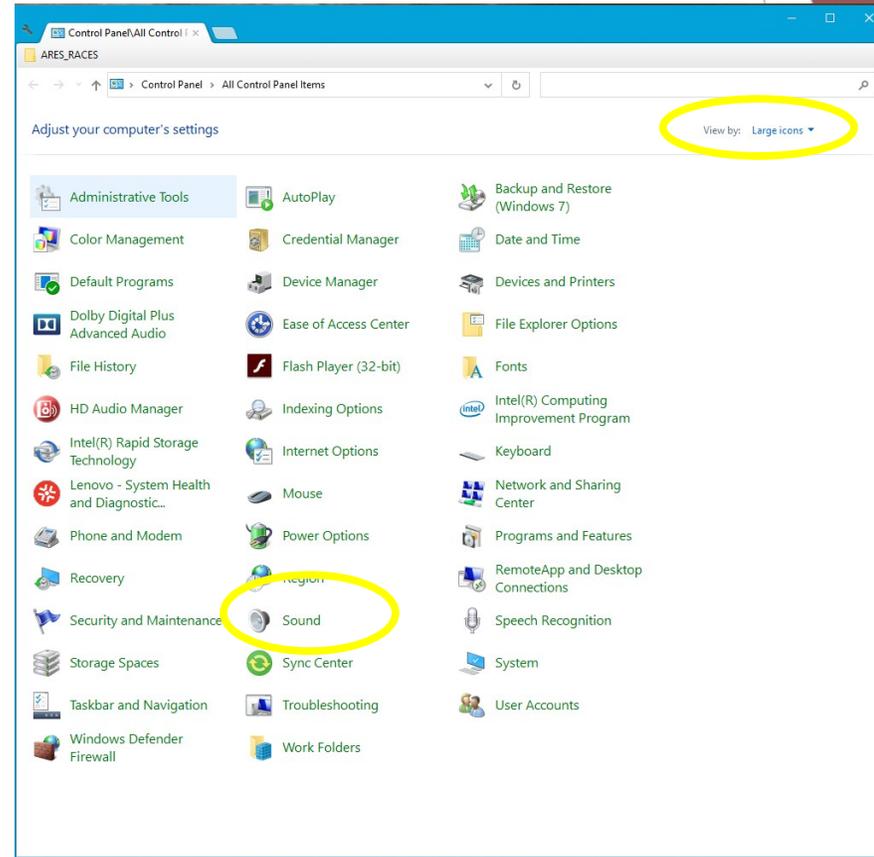
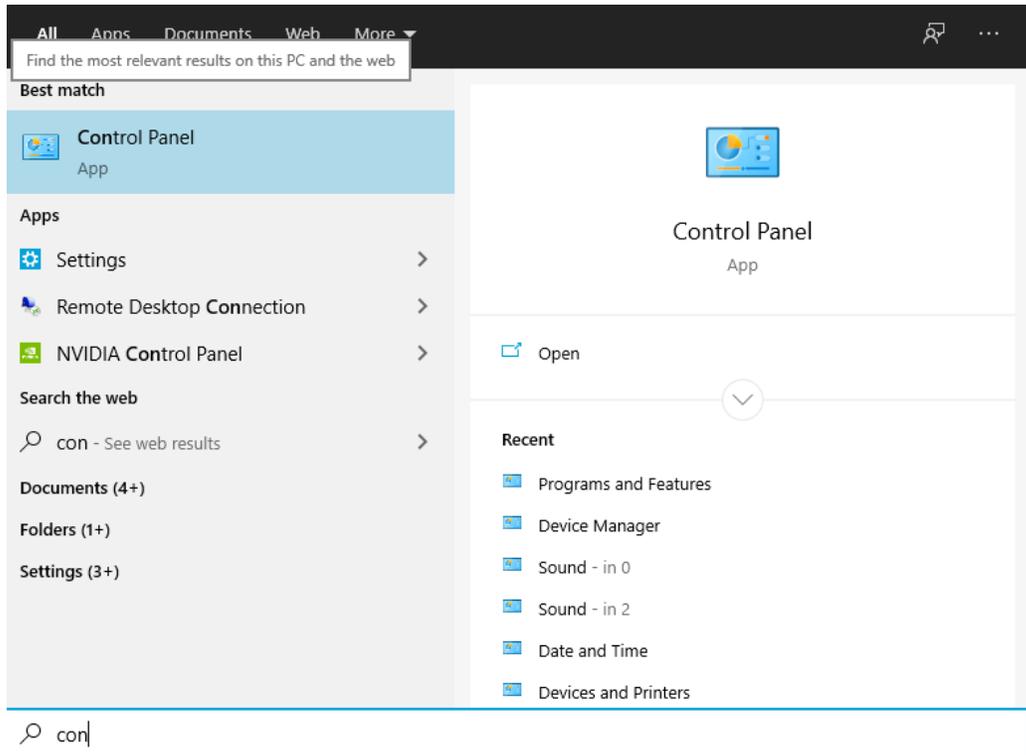
Equipment Set Up Signalink and VARA HF

▶ RX Sound Level Setting

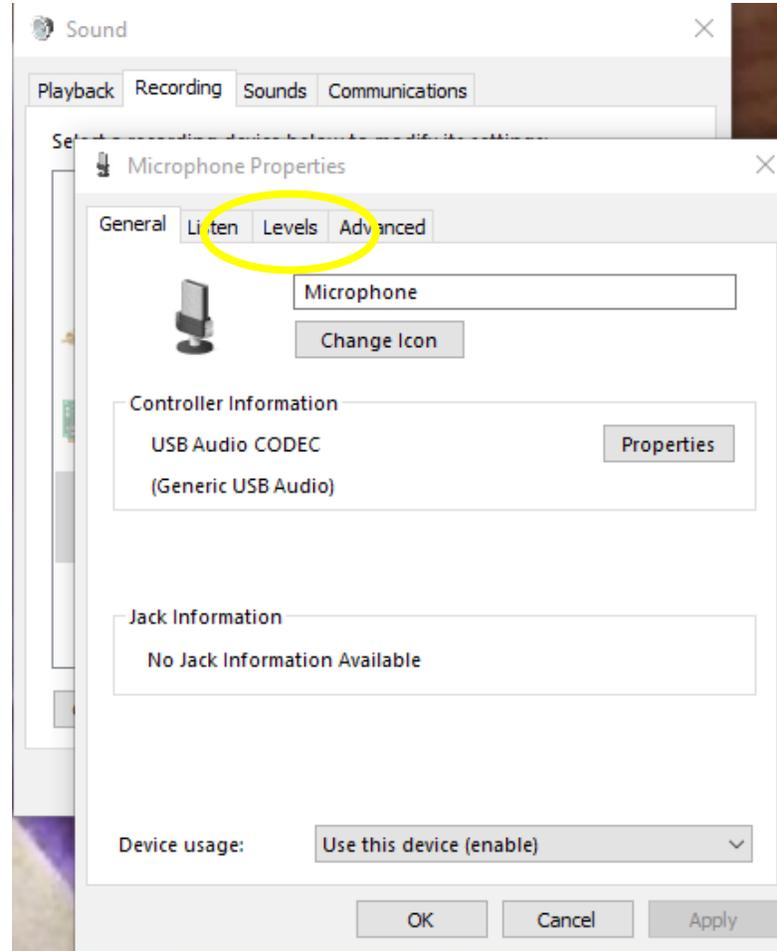
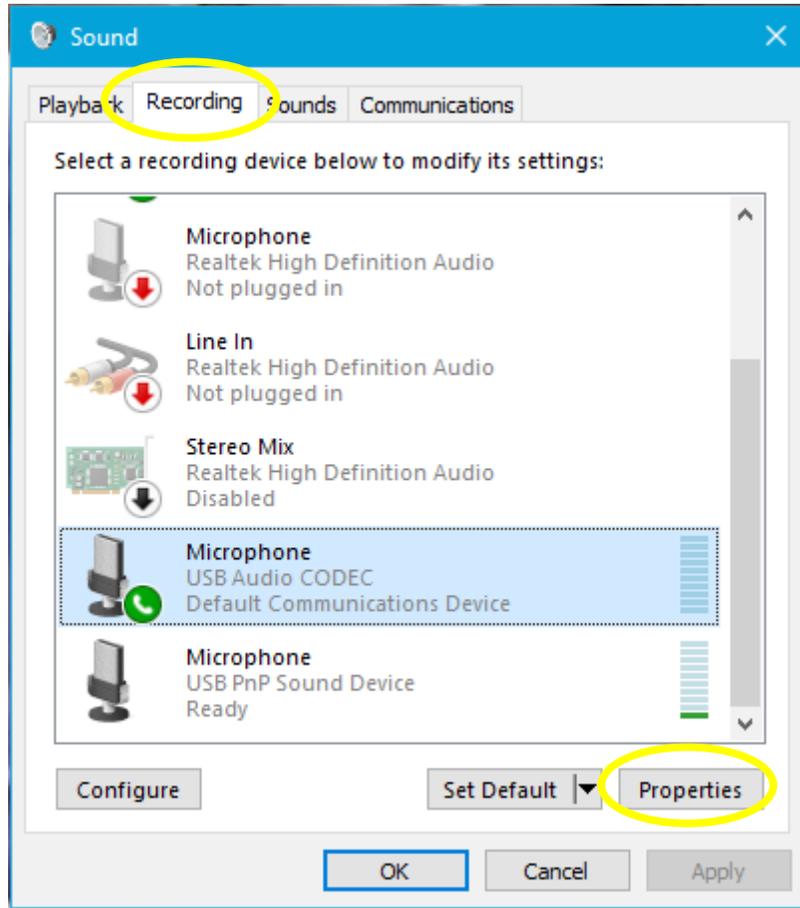
- In the Sound window, select the Recording tab and highlight the USB Audio Codec. Select Properties
- In the Properties window, select the Levels tab. Adjust the slider so the VARA VU meter is approximately at the 2:30 o'clock position or not quite to the red area



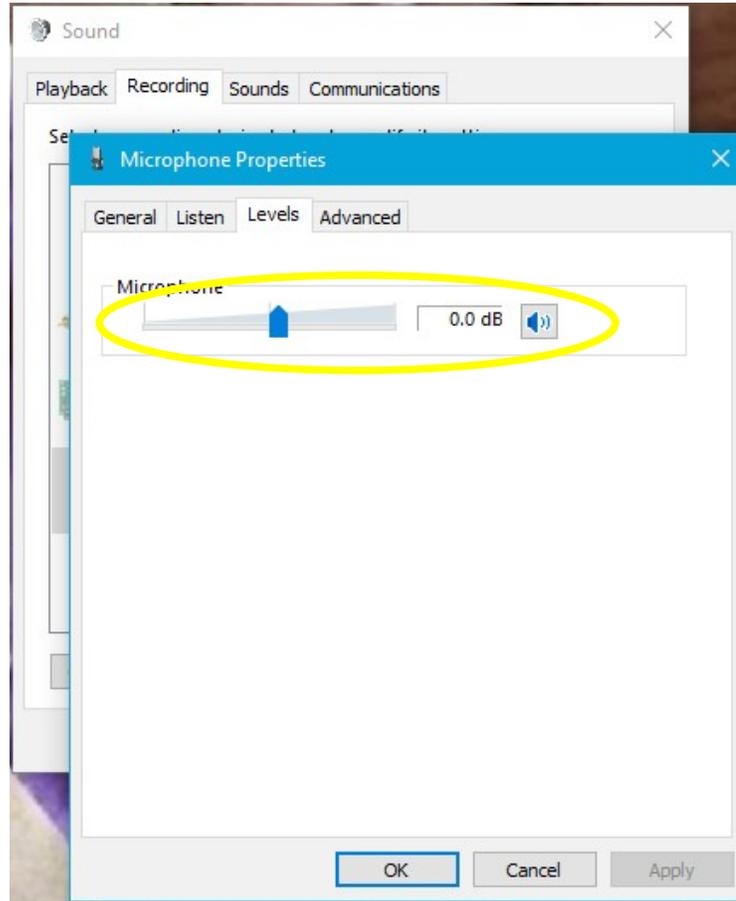
Equipment Set Up Signalink and VARA HF



Equipment Set Up Signalink and VARA HF



Equipment Set Up Signalink and VARA HF



Equipment Set Up Signalink and VARA HF

▶ RX Sound Level Setting

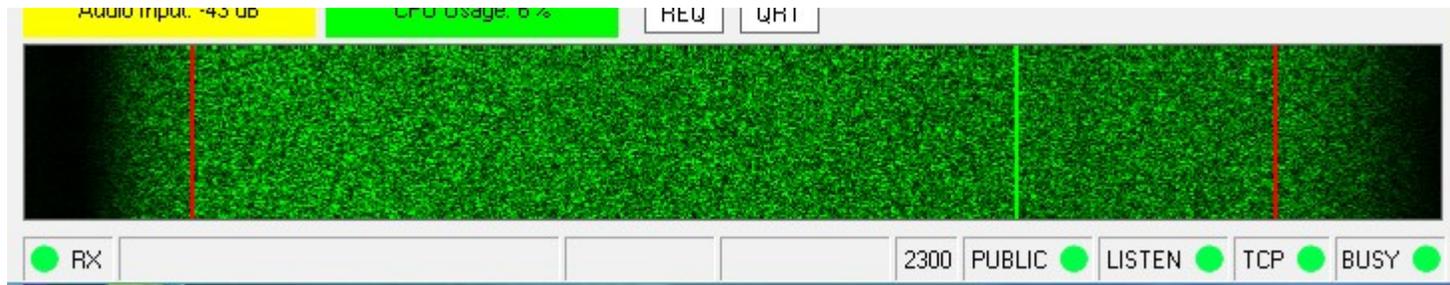
- If your VU meter is not between 12 and 3 o'clock, adjust the sound level settings in your radio menu to set the VU meter between 12 and 3 o'clock
- If you cannot set the VU meter to the correct range, you must re-adjust either the computer sound levels or the Signalink levels, plus the radio menu settings
- Continue to the next slide when you get the levels set properly



Equipment Set Up Signalink and VARA HF

► RX Sound Level Setting

- Select OK in the Properties window and the Sound window
- Your waterfall should look approximately like this
- If there is more dark area on the left, ignore it for now



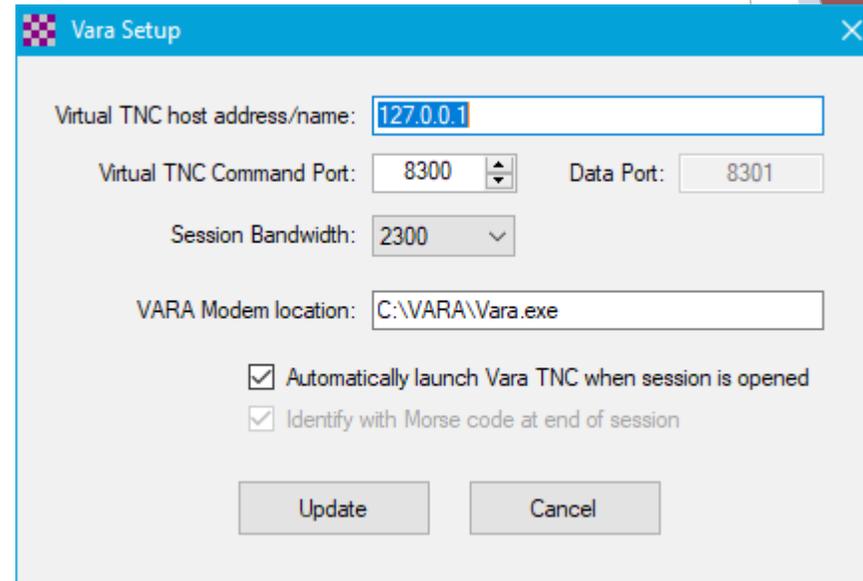
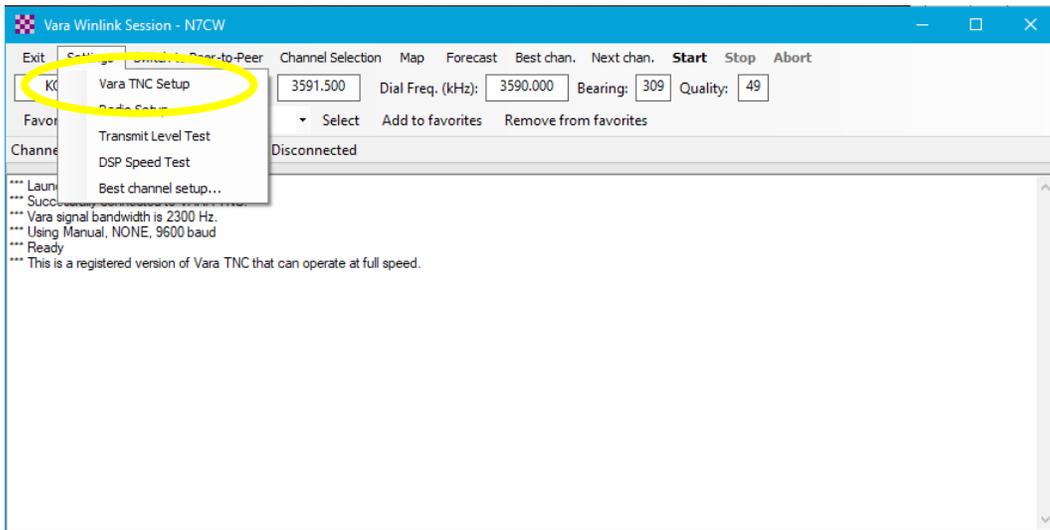
Equipment Set Up Signalink and VARA HF

▶ TX Sound Level Settings

- Open Winlink Express, choose a VARA HF Session
- Select Settings, VARA TNC Setup (see next slide)
- Make sure the TNC host address/name is 127.0.0.1, the TNC Command Port is 8300 and the Session Bandwidth is 2300. Do not select Enable 2750 Hz channels
- Enter the VARA Modem Location. If you put it in the default folder it is C:\VARA\Vara.exe
- Select Automatically Launch Vara TNC.... And Update
- The session will re-start



Equipment Set Up Signalink and VARA HF



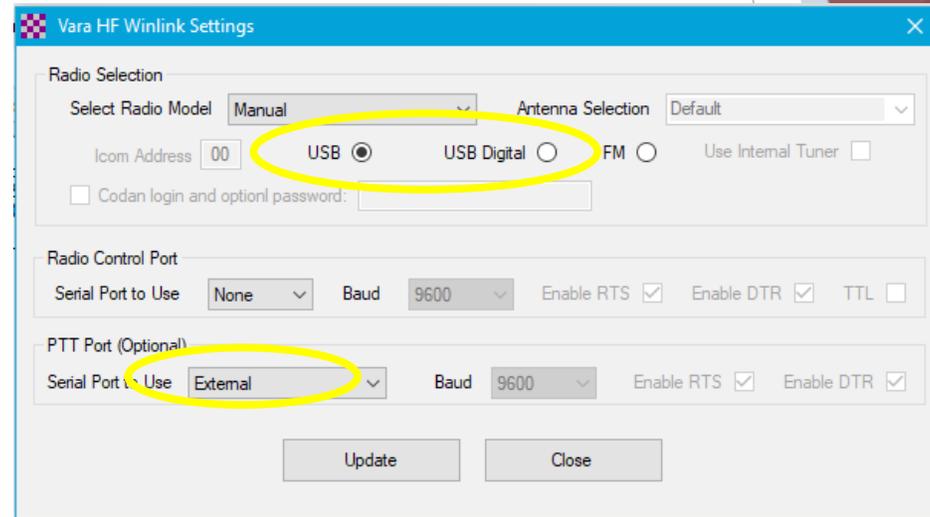
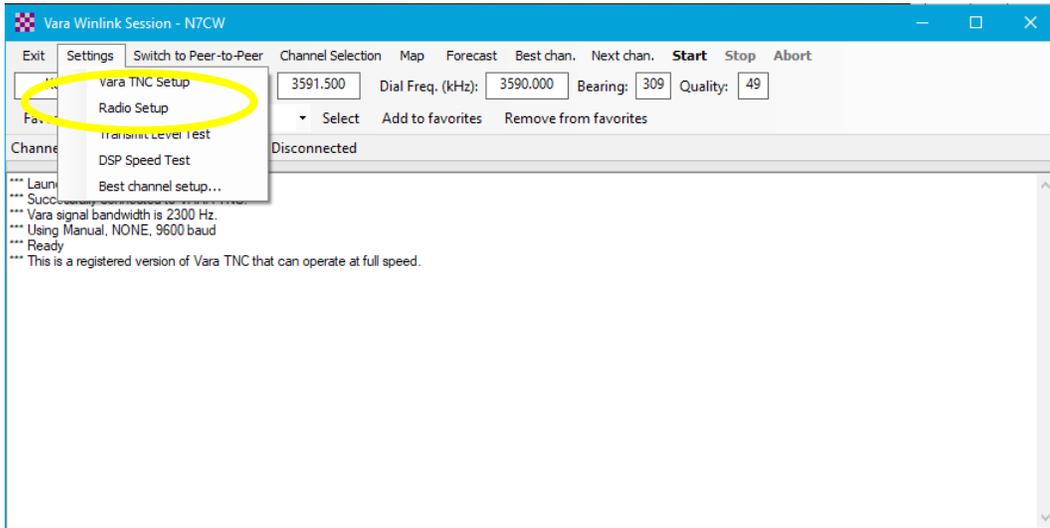
Equipment Set Up Signalink and VARA HF

▶ TX Sound Level Settings

- Select Settings, Radio Setup (see next slide)
- Leave the Radio Model at Manual, but select whether your radio is using USB or USB Data (read the manual!)
- Ensure the PTT Port is set to External, select Update and Close
- Set your radio to monitor the ALC level (read the manual!)
- Open VARA HF, select Settings, Sound Card
- Verify the frequency you have chosen is clear
- Set the Drive Level slider at -15 dB and select Tune



Equipment Set Up Signalink and VARA HF



Equipment Set Up Signalink and VARA HF

▶ TX Sound Level Settings

- The Signalink PTT LED should light
- The radio should go into transmit. Adjust the Drive Level slider for Zero or the smallest indication on the ALC meter on Yaesu and Kenwood radios and 1/3 ALC on Icom radios
- If you can see the power output of the radio, ensure it remains at 100 watts as you adjust the TX level
- You may have to use the Signalink TX Level pot, but try not to since it is set up for VARA FM!
- Select Stop when the levels are set properly



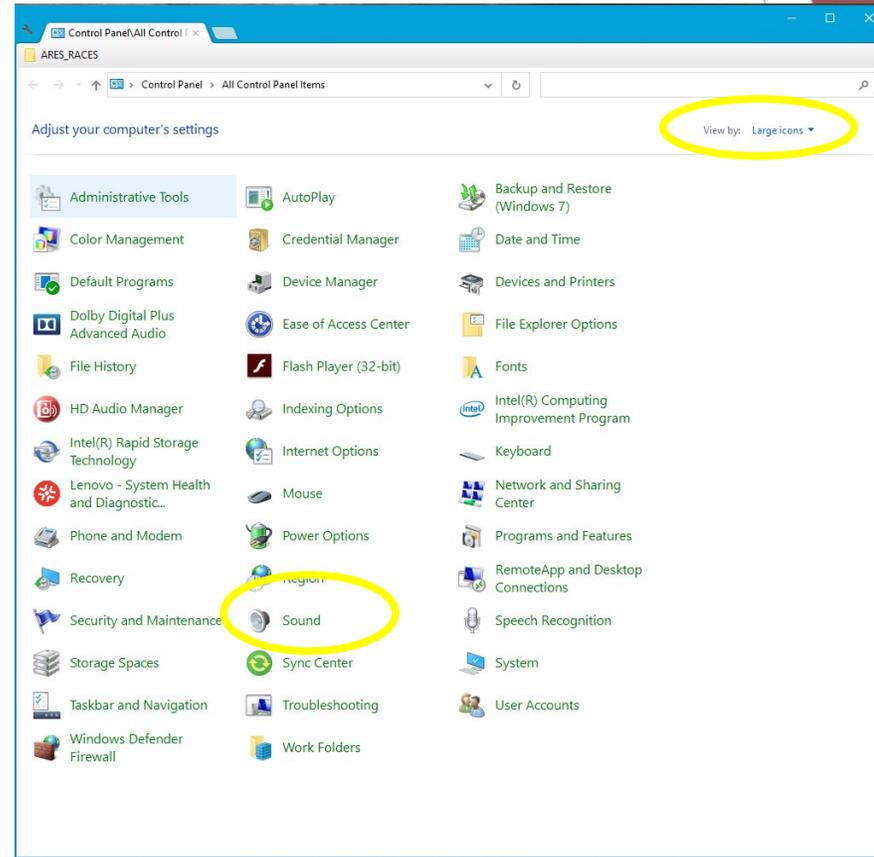
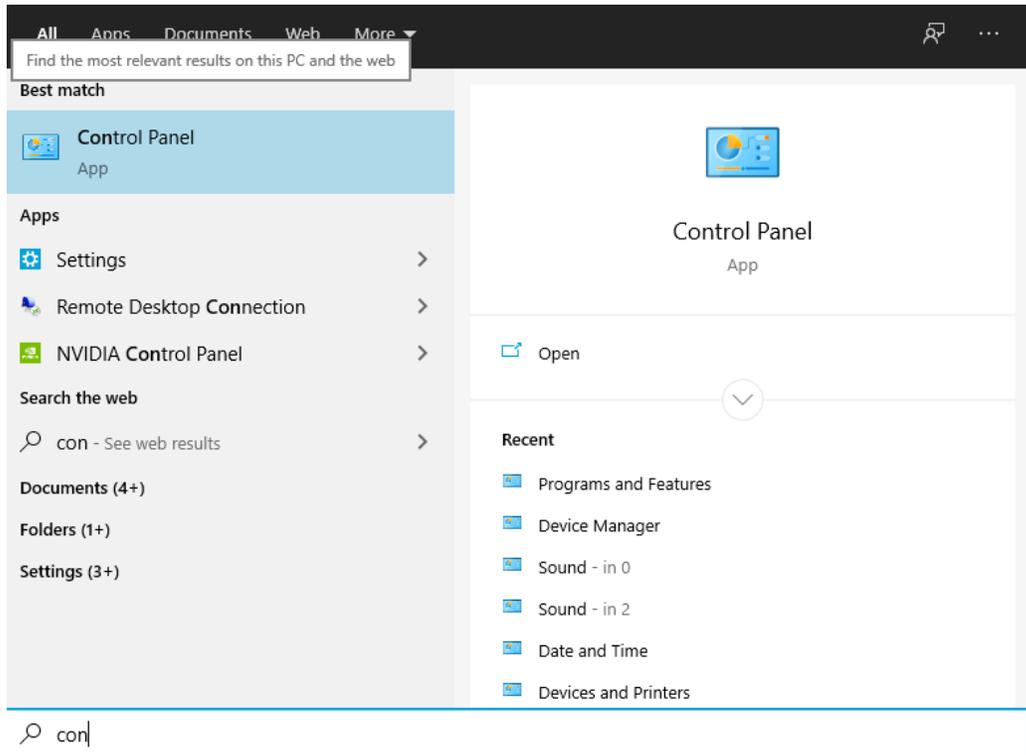
Equipment Set Up Signalink and VARA HF

▶ TX Sound Level Settings

- If you can see the power output of the radio, ensure it remains at 100 watts as you adjust the TX level
- If you still cannot set the ALC properly, select Stop in the VARA HF window
- Click on the Windows Icon 
- When the Start window opens, type Control Panel and select Control Panel
 - If necessary, change the Control Panel View to Large Icons
 - Select Sound



Equipment Set Up Signalink and VARA HF



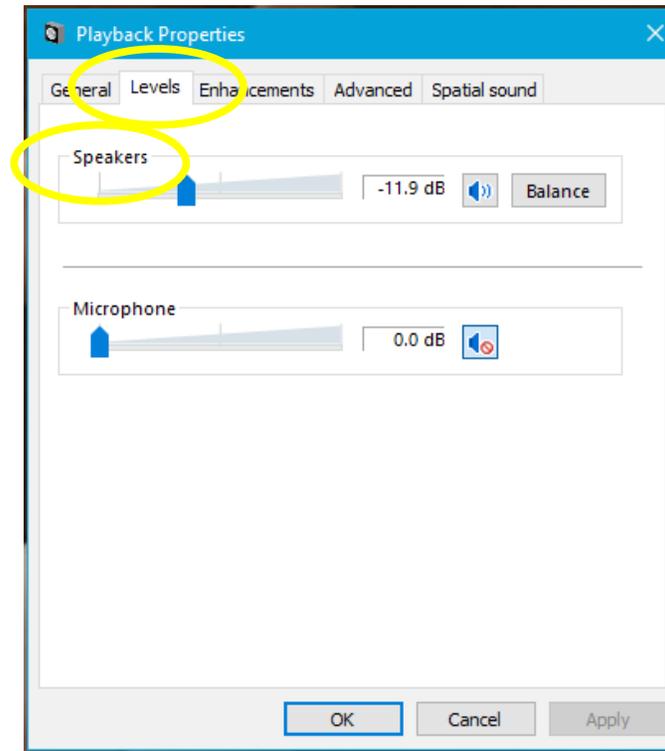
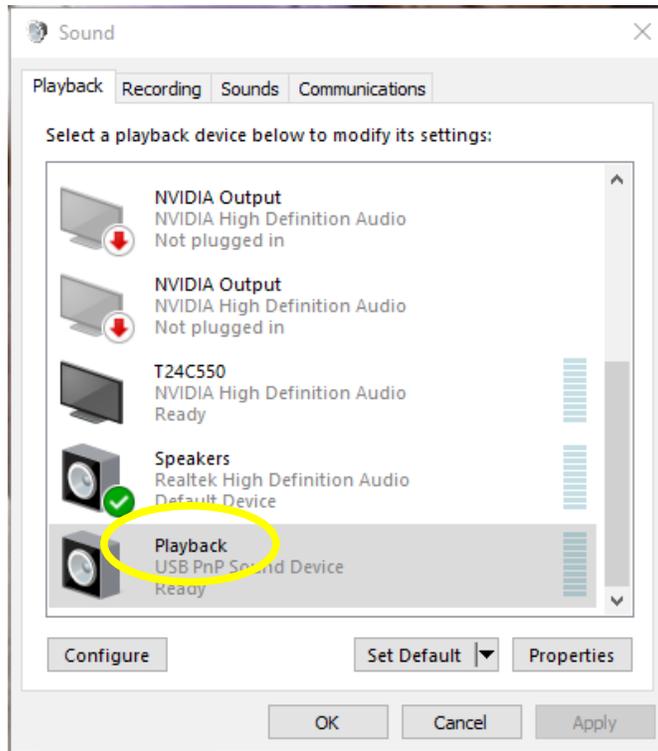
Equipment Set Up Signalink and VARA HF

▶ TX Sound Level Settings

- In the Sound window, select the Playback tab and highlight the Speakers USB PnP Sound Device. Select Properties
- Select the Levels tab
- Set the Drive Level slider at -15 dB



Equipment Set Up Signalink and VARA HF



Equipment Set Up Signalink and VARA HF

- ▶ TX Sound Level Settings
 - Select Tune
 - The radio should go into transmit. Adjust the Speakers Drive Level slider for Zero ALC on Yaesu and Kenwood radios and 1/3 ALC on Icom radios
 - If you can see the power output of the radio, ensure it remains at 100 watts as you adjust the TX level
 - You may have to modify all 4 adjustments to get the ALC set properly
 - Select Stop when the levels are set properly



Equipment Set Up Signalink and VARA HF

▶ Radio Control Setup

- If you wish to control your radio frequency with Winlink Express, start Winlink Express and open a VARA HF Winlink session
- Select Settings, Radio Setup. Next to Select Radio Model, use the drop down menu to select your radio model.
- If you have an Icom radio, enter the Icom address.
- Select the Serial Port where your radio is connected and the baud rate. Select the proper levels for RTS and DTR
- Select Update.



Equipment Set Up DRA-XX and VARA HF



Equipment Set Up DRA-XX and VARA HF

▶ READ THIS FIRST!

- Your computer, DRA-XX, VARA HF and your radio may have 4 adjustments for setting the transmit and receive levels.
 - The sound outputs from the computer
 - The RX and TX potentiometers (pots) in the DRA-XX
 - VARA HF has a transmit level slider built in to it
 - Your radio may have menu settings to set the levels
- You may have to adjust all 4 in order to get the levels set properly



Equipment Set Up DRA-XX and VARA HF

- ▶ READ THIS FIRST! (cont'd)
 - If your radio covers both HF and 2 Meters and you have set your DRA-XX for VARA FM, do not adjust the DRA-XX or computer sound levels except as a last resort



Equipment Set Up DRA-XX and VARA HF

- ▶ Start VARA HF (not Winlink Express!)
 - Select Settings, VARA Setup
 - If you have a license code, enter your callsign and the code
 - Select Allow VARA check for Updates via Internet
 - Select RA-Board PTT
 - Leave all the other default settings and select Close
 - Select Settings, SoundCard
 - Using the drop down menu, choose USB PnP Sound Device for both the Device Input and Output
 - Select Close



Equipment Set Up DRA-XX and VARA HF

▶ RX Sound Level Setting

- Ensure your radio and DRA-XX are connected and the radio is on
- Ensure your radio is set up in Data mode and the filters are set Wide. Read the Manual!
- If there are radio menu settings to adjust the sound levels (they are probably called something other than sound levels), leave them at the default level or set them for mid-range



Equipment Set Up DRA-XX and VARA HF

▶ RX Sound Level Setting

- If you have set the sound levels for VARA FM in this radio, skip ahead to slide 53
- Click on the Windows Icon 
- When the Start window opens, type Control Panel and select Control Panel, Sound (see slides 50 - 52)



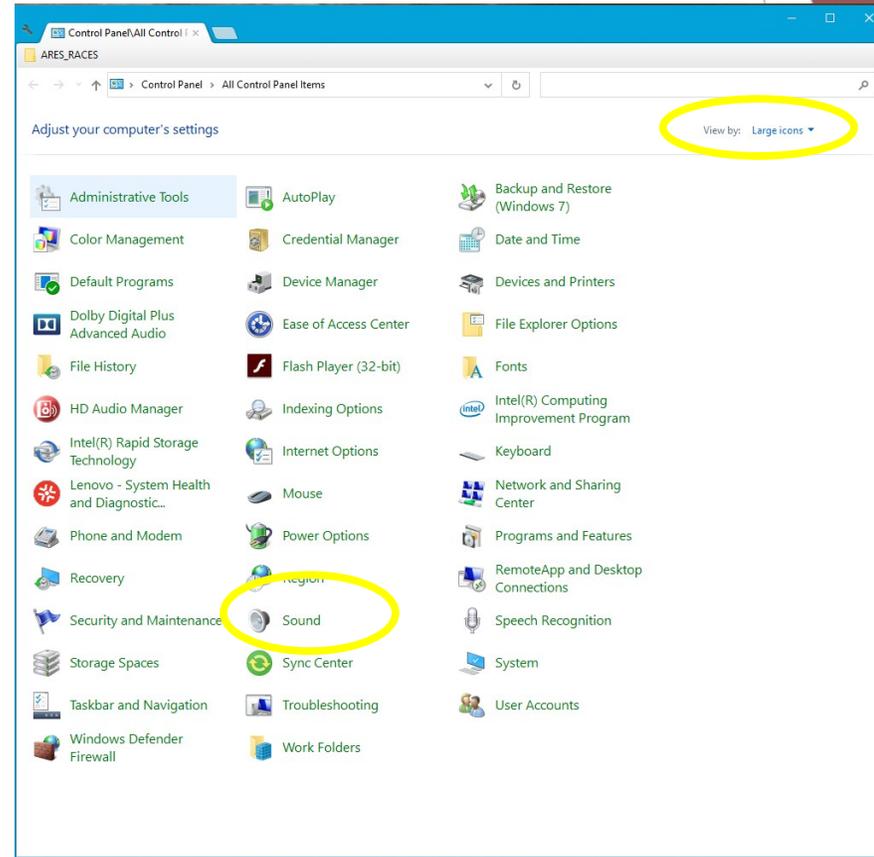
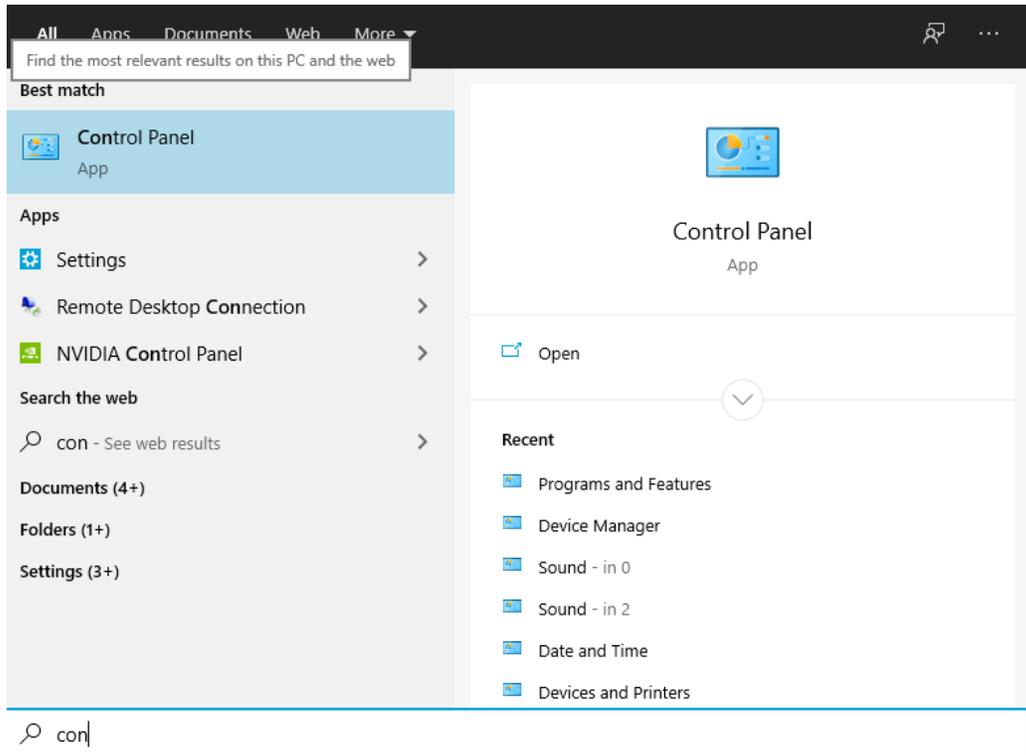
Equipment Set Up DRA-XX and VARA HF

▶ RX Sound Level Setting

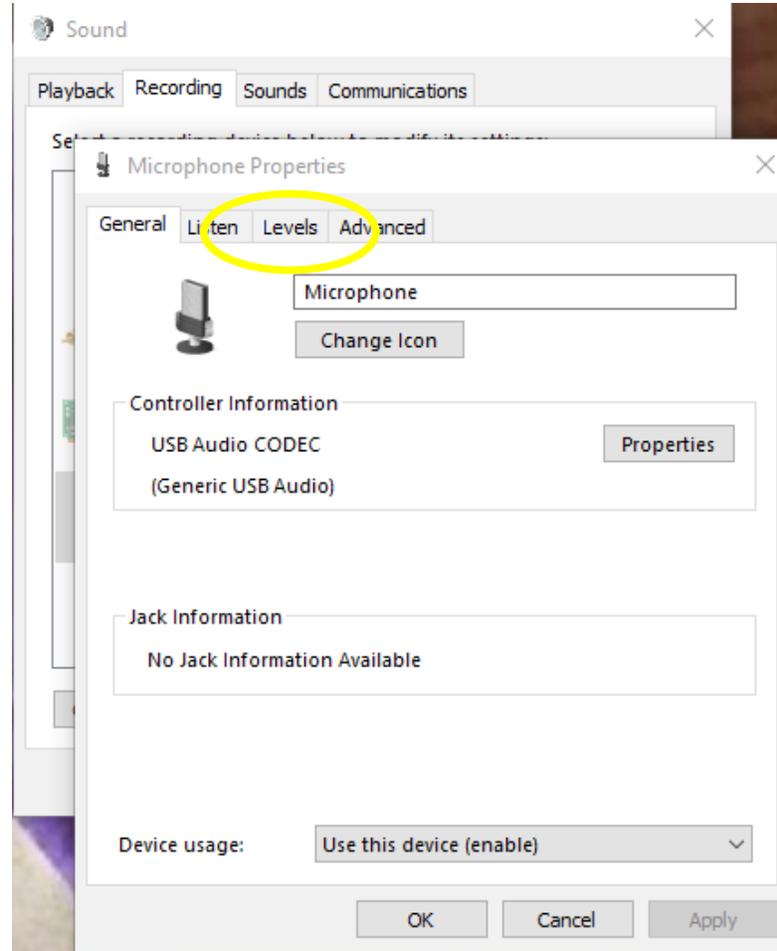
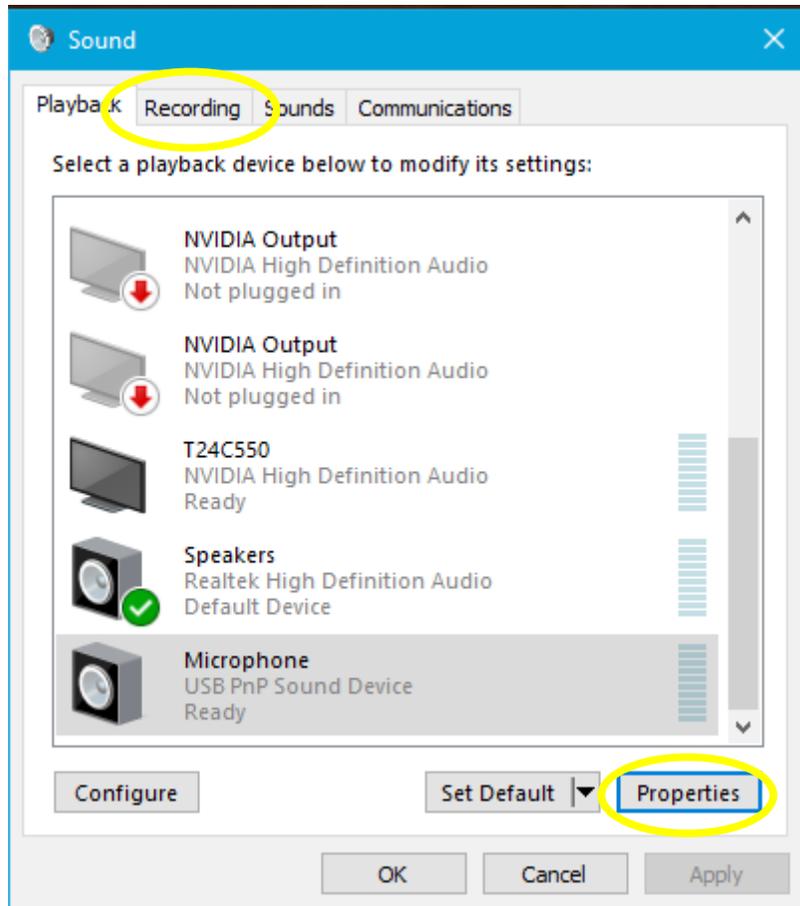
- In the Sound window, select the Recording tab and highlight the USB Audio Codec. Select Properties
- In the Properties window, select the Levels tab. Adjust the slider so the VARA VU meter is approximately at the 2:30 o'clock position or not quite to the red area



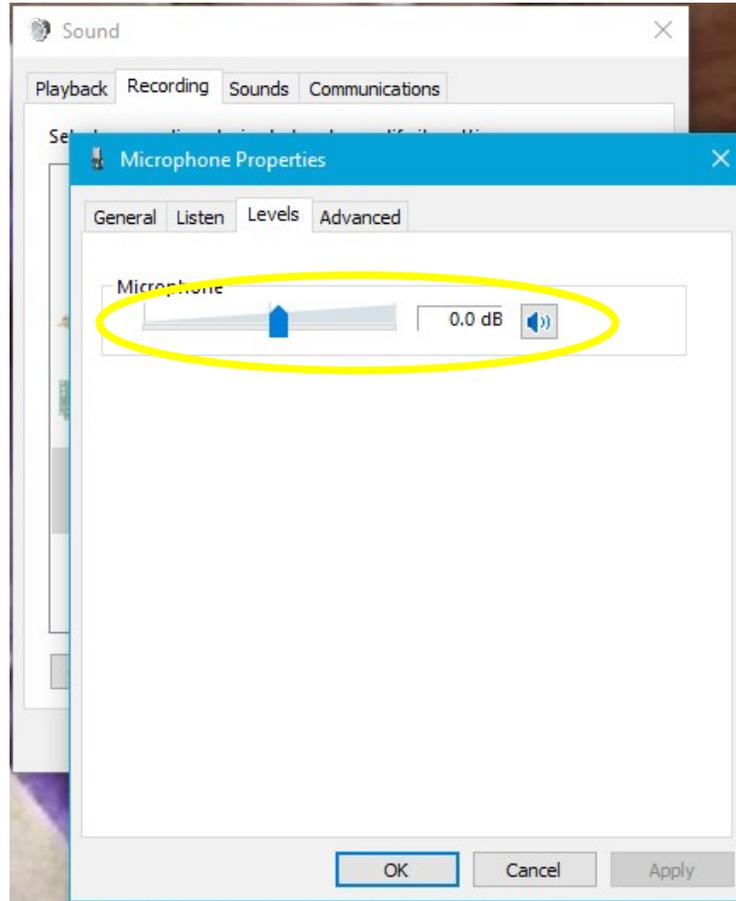
Equipment Set Up DRA-XX and VARA HF



Equipment Set Up DRA-XX and VARA HF



Equipment Set Up DRA-XX and VARA HF



Equipment Set Up DRA-XX and VARA HF

▶ RX Sound Level Setting

- If your VU meter is not between 12 and 3 o'clock, adjust the sound level settings in your radio menu
- If you cannot set the VU meter to the correct range, you must re-adjust either the computer sound levels or the DRA-XX levels, plus the radio menu settings



Equipment Set Up DRA-XX and VARA HF

▶ RX Sound Level Setting

- Your waterfall should look approximately like this
- Close VARA



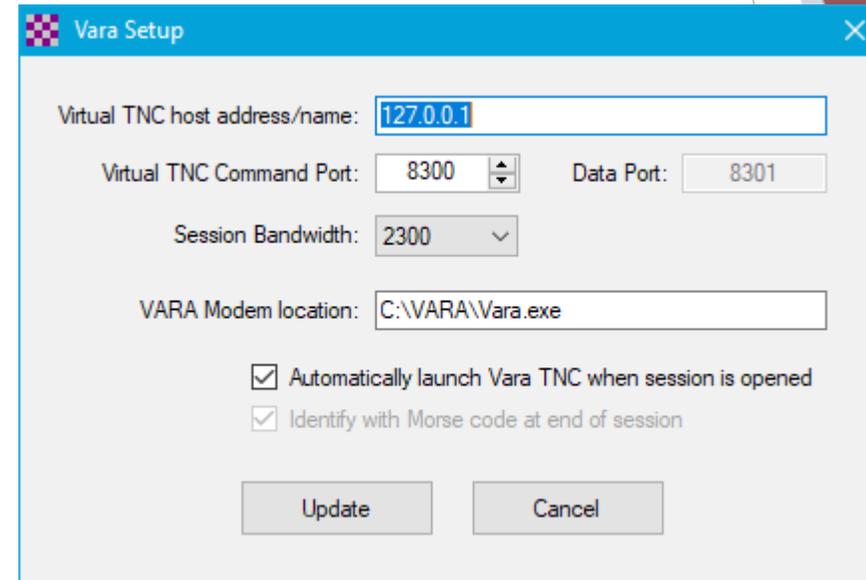
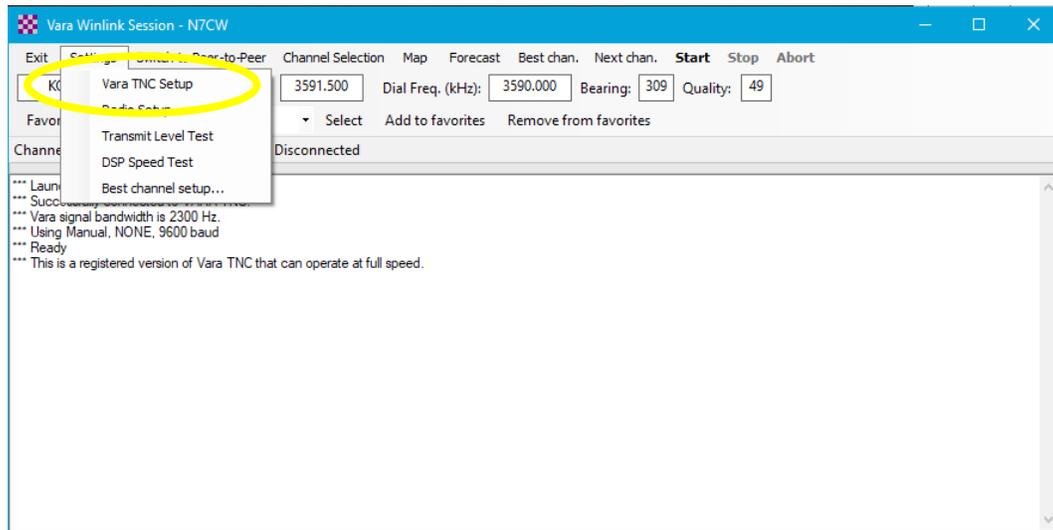
Equipment Set Up DRA-XX and VARA HF

▶ TX Sound Level Settings

- Open Winlink Express, open a VARA HF Session
- Select Settings, VARA TNC Setup (see next slide)
- Make sure the TNC host address/name is 127.0.0.1, the TNC Command Port is 8300 and the Session Bandwidth is 2300. Do not select Enable 2750 Hz channels
- Enter the VARA Modem Location. If you put it in the default folder it is C:\VARA\Vara.exe
- Select Automatically Launch Vara TNC.... And Update
- The session will re-start



Equipment Set Up DRA-XX and VARA HF



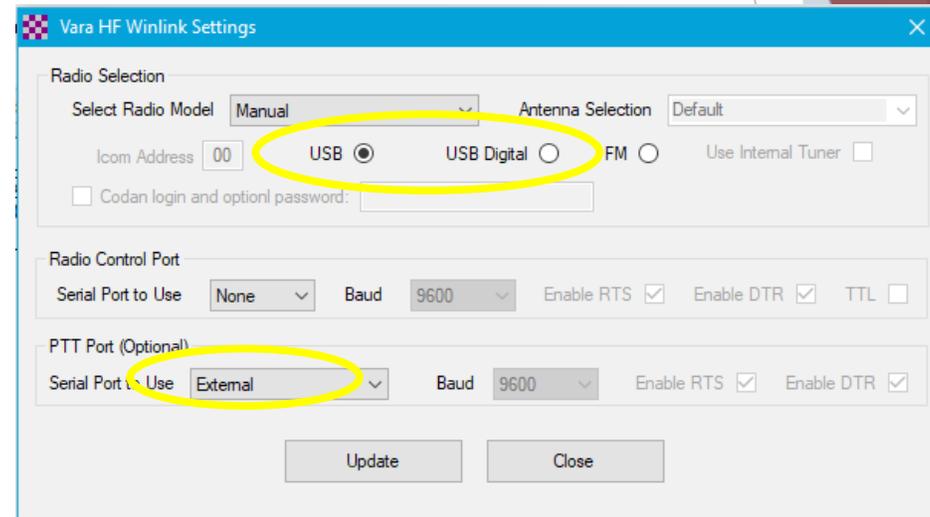
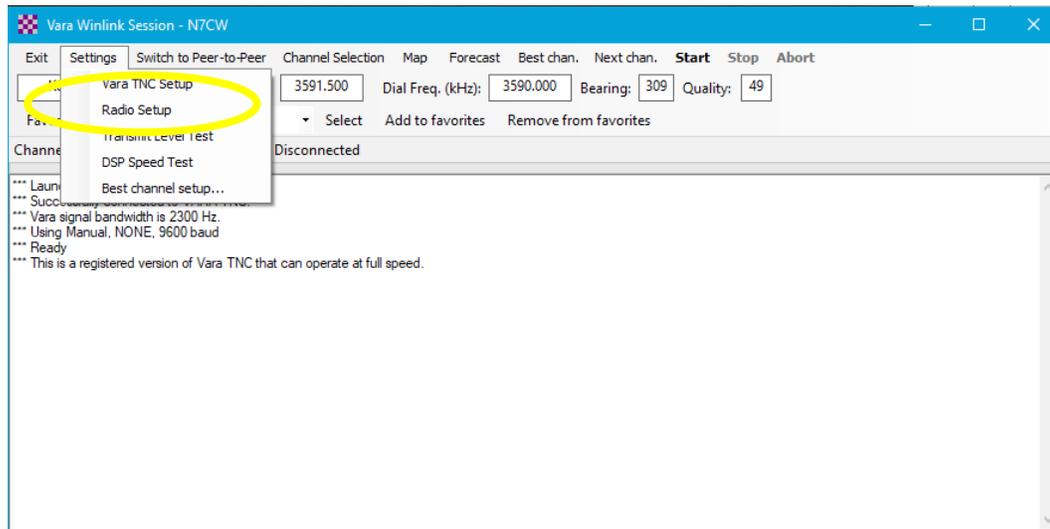
Equipment Set Up DRA-XX and VARA HF

▶ TX PTT Set Up

- Start Winlink Express and open a VARA HF Winlink session
- Select Settings, Radio Setup. Leave the Radio Model as Manual. Select whether your radio is using USB or USB Data (read the manual!)
- Under PTT Port, use the drop down menu to select External
- Select Update. The VARA HF session will re-start



Equipment Set Up DRA-xx and VARA HF



Equipment Set Up DRA-XX and VARA HF

▶ TX Sound Level Settings

- Select Settings, Radio Setup
- Set your radio to monitor the ALC level
- Open the VARA HF window (it starts minimized)
- Select Settings, Sound Card
- Check that the frequency you have chosen is clear
- Set the Drive Level slider at -15 dB and select Tune
- The radio should go into transmit. Adjust the Drive Level slider for Zero ALC on Yaesu and Kenwood radios and 1/3 ALC on Icom radios



Equipment Set Up DRA-XX and VARA HF

▶ TX Sound Level Settings

- If you can see the power output of the radio, ensure it remains at 100 watts as you adjust the TX level
- If you cannot set the ALC properly, select Stop in the VARA HF window
- Click on the Windows Icon 
- When the Start window opens, type Control Panel and select Control Panel
 - If necessary, change the Control Panel View to Large Icons
 - Select Sound



Equipment Set Up DRA-XX and VARA HF

▶ TX Sound Level Settings

- In the Sound window, select the Playback tab and highlight the Speakers USB PnP Sound Device. Select Properties
- Select the Levels tab
- Set the Drive Level slider at -15 dB and select Tune
- The radio should go into transmit. Adjust the Speakers Drive Level slider for Zero ALC on Yaesu and Kenwood radios and 1/3 ALC on Icom radios
- If you can see the power output of the radio, ensure it remains at 100 watts as you adjust the TX level



Equipment Set Up DRA-XX and VARA HF

▶ TX Sound Level Settings

- If you cannot set the ALC properly, you may have to use the small pot inside the DRA-XX, but try not to if you it set up for VARA FM!
- If you must use the small pot in the DRA-XX, set the VARA HF slider and the Speakers, Levels tab to midway in their range
- You may have to modify all 4 adjustments to get the ALC set properly
- Select Stop when the levels are set properly



Equipment Set Up DRA-XX and VARA HF

▶ Radio Control Setup

- If you wish to control your radio frequency with Winlink Express, start Winlink Express and open a VARA HF Winlink session
- Select Settings, Radio Setup. Next to Select Radio Model, use the drop down menu to select your radio model.
- After reading the manual! Select whether your radio should be in USB or USB Data. If you have an Icom radio, enter the Icom address.
- Select the Serial Port where your radio is connected and the baud rate. Select the proper levels for RTS and DTR
- Select Update.

