Quick Setup Guide for VARA FM 4.x.x

By Oliver K6OLI
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Special thanks go to **Scott KI6SC, Martin HB9AUR, Keith KD6PYD**, **Brian KM6IGY, Jeff W2JCL, Tom KN6BKT, Mike KM6KAQ, Jim KM6TGJ (SK), Ken KI7EIH and Scott NS7C** for your testing, for your suggestions, insights and encouragement.

Table of Contents

Get the Software

Download

- VARA FM: download VARA FM directly from here https://rosmodem.wordpress.com/, or follow the link for VARA FM in Winlink Express, then extract the install files in a location you can find easily (e.g. Desktop). Now right-click on the install file, select **Run as administrator** and install it in C:\VARA FM\
- VARA FM is a separate program from VARA Modem. If you want to only use VARA FM, only download VARA FM. If you want to use VARA on HF you should also download and install VARA Modem.
- NOTE: Some antivirus programs may identify VARAFM.exe as a Trojan or virus. It is a false positive. Create an exception in your antivirus program for the folder VARAFM.exe is located in.
- NOTE: VARA FM can cause Signalink sputtering when third-party antivirus programs are present. Removing the third party antivirus and using Windows Defender is one solution.
- NOTE: VARA FM works perfectly fine without a license key. The key only unlocks the higher speeds and digipeating. Basic VARA FM will be more than twice as fast as Packet.
- NOTE: VARA FM 4.x.x and higher are <u>not</u> compatible with VARA FM 3.x.x or lower.

Soundcard Considerations

After you have hooked up your Signalink please make sure it is not selected as the default audio device.

Right Click on the Windows Icon ![Windows Icon] [1]
Select **Run**
Type or copy and paste **mmsys.cpl**
Press **Enter**
Select **Playback**
Right click on your computer soundcard
Select **Set Default Device**
Right click on your computer soundcard
Select **Set As Default Communication Device**

Then select **Recording**. Right-click your computer's internal soundcard and **Set as Default Device** and then right-click again and **Set as Default Communication Device**. There should be a green check mark on the internal soundcard device now.

Then click **OK.**
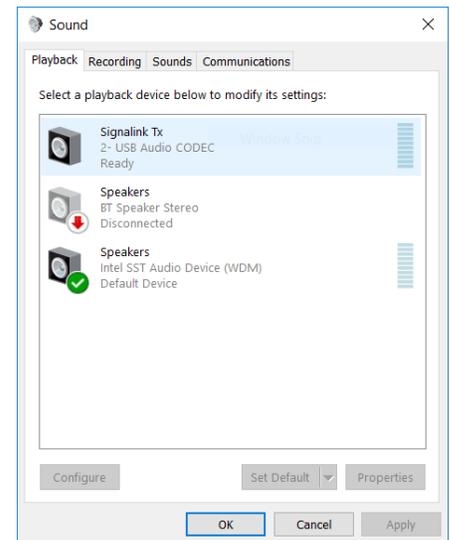
Quick Tip: Soundcard Shortcut

- Right-click on **Desktop**
- Select **Create Shortcut**
- In "Type the location of the item" copy and paste **control mmsys.cpl**
- Click **Next**
- Type **Soundcards**
- Click **Finish**

Customize your Soundcards Shortcut icon:
Properties -> Shortcut -> Change Icon -> paste **C:\Windows\system32\SHELL32.dll**

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[1] In some Windows 10 installations you can right-click on the speaker icon in the Windows task bar and then select Sounds.

Also make sure that Signalink is not your active Playback Device. You can select your active playback device by left clicking on the speaker icon and selecting any playback device other than USB Audio CODEC. Selecting Speakers/Headphones in the example here is a good idea.

Select playback device

Speakers / Headphones (Realtek High De...

Acer T232HL (Intel(R) Display Audio)
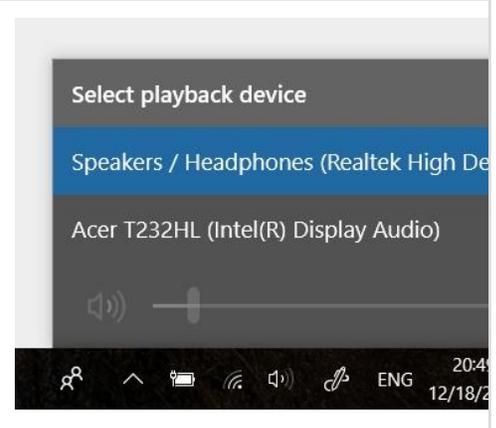
Signalink & DRA/RIM9600 Settings

Set the TX and RX dials on your Signalink to the 9 o'clock position. You can adjust that later if needed. Set DLY(delay) to the 7:00 setting, i.e. off.

VU Meter:

Open the squelch on your transceiver or press the monitor button. Adjust the Signalink RX dial on your Signalink so that the VU meter needle shows between -15dB and -10dB.
You want to avoid the red zone.

Signalink Audio Settings in Windows[2]:
With Signalinks your Windows settings for USB Audio CODEC audio levels should be

… 100% for Speakers and ...

Signalink TX Properties

General Levels Enhancements Advanced Spatial sound

Speakers

100 Balance

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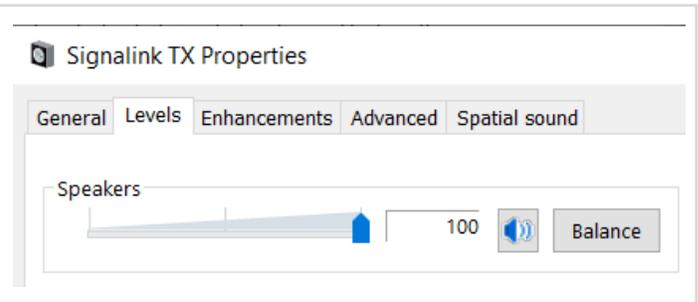
[2] Access the settings: **Right Click on the Windows Icon ;** Select **Run ;** Type or copy and paste **mmsys.cpl ;** Press **Enter**

… as near to 0dB for Microphone as possible.	**Signalink RX Properties** General Listen Levels Advanced Microphone 0.0 dB
DRA/Rim9600 Start with a reasonable number like shown below and then adjust the pot on the DRA device. You can then fine tune in Windows if needed. With the RIM1200/9600 all the audio settings are adjusted in Windows. … 80% for Speakers and ...	
… as near to 50%for Microphone. Your mileage may vary. Use a well configured remote station to ping and check and adjust your audio levels.	
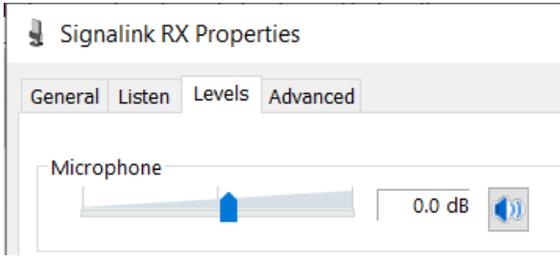
Setting up Winlink for VARA FM

Open Winlink Express
In the Open Session window select **VARA FM P2P**[3] or **VARA FM WInlink**
Click on **Open Session**
You will see this screen:
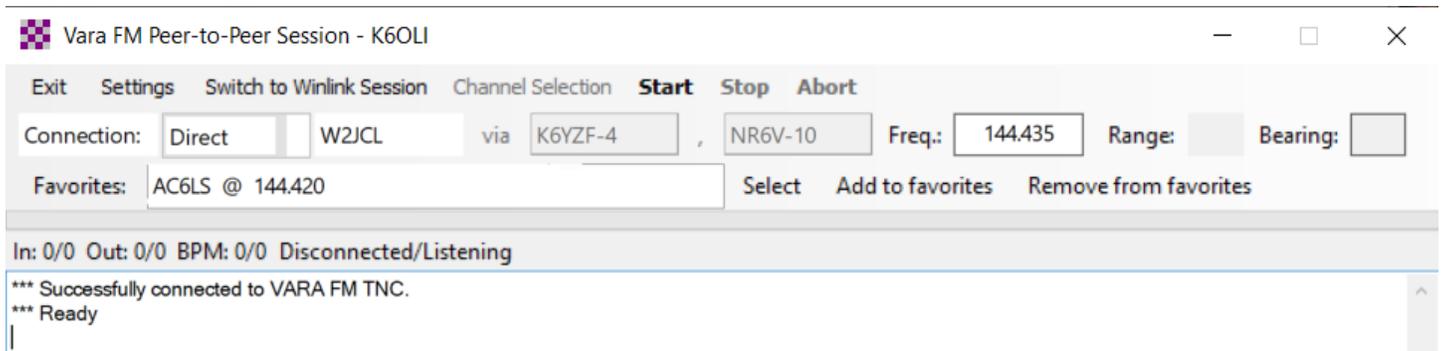
VARA FM Winlink TNC Setup

Click on **Settings**
Select **VARA TNC Setup**
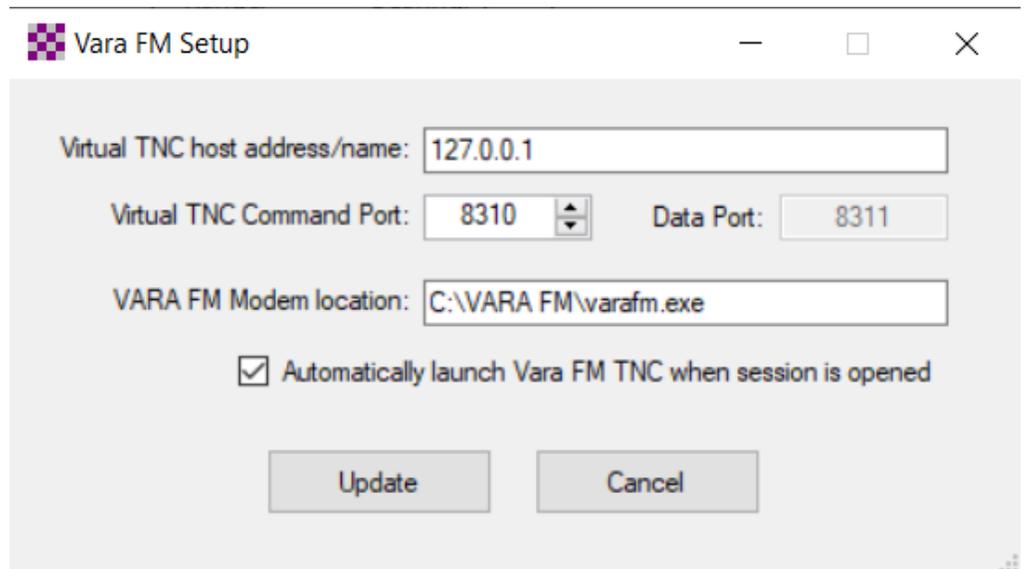
Virtual TNC host address/name: **127.0.0.1**
Virtual TNC Command Port: **8300**[4]

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[3] VARA FM settings carry over from the VARA P2P to the Winlink VARA Session and vice versa
[4] In the screenshot above it is set to 8310 due to personal preference.

VARA Modem location **C:\VARA FM\VaraFM.exe** (or the path you chose during VARA FM install, if different from default).

Check "Automatically Launch VARA FM TNC when the session is opened", if you want to launch VARA FM automatically.

Click **Update**.

Quick Tip: NARROW vs WIDE

Pin 1200 is limited to 3kHz audio bandwidth. **VARA FM NARROW** is used with pin 1200.

Pin 9600 is limited to 6kHz audio bandwidth. So either **VARA FM NARROW or WIDE** can be used.

You need a 9600 capable transceiver in order to use VARA FM WIDE.
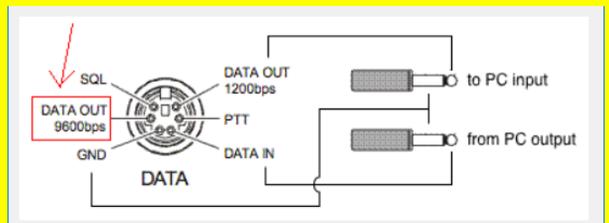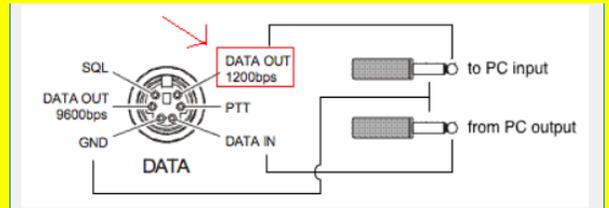
VARA FM Modem Setup

Click on the VARA FM Modem icon next to the Winlink Express icon at the bottom of your screen.
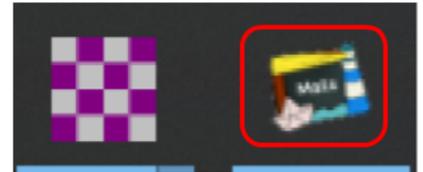
You will see this screen:
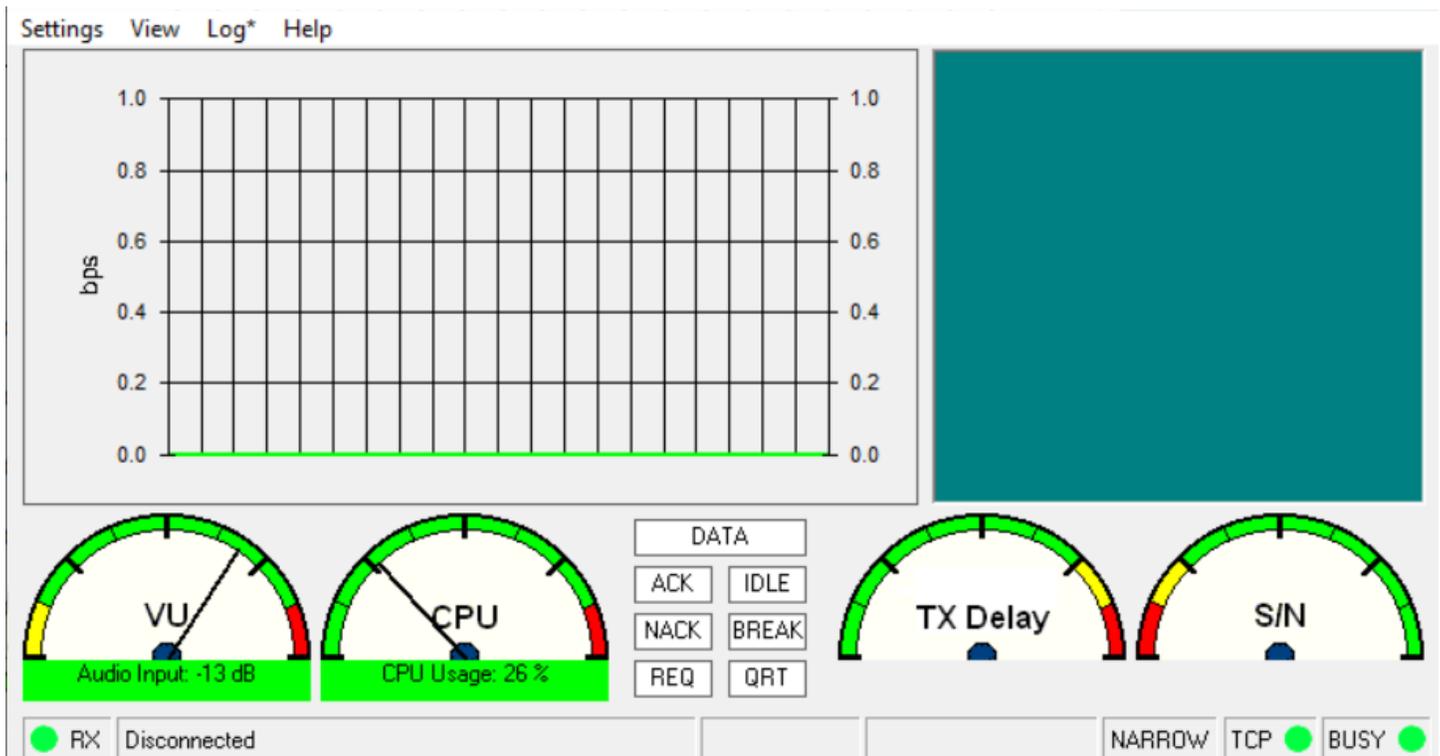
VARA FM Setup

Click on **Settings**
Select **VARA Setup**

Make sure the following is set

TCP Ports: Command **8300**[5]
FM System: **NARROW** (or **WIDE** if you are set for 9600)
[6]Registration Key: (here is where you enter your registration key if you have one)
Retries: **2**
Click **Close**

VARA FM Digipeater Setup

Enter your call sign and an SSID of your choice in the Digipeater field.

Digipeaters in VARA FM are standalone, that is only VARA FM, your soundcard device and your radio need to be running with the Digipeater filled in for your station to work as digipeater.

By convention in SoCal operator stations use SSID -4 and gateways use their gateway call

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[5] I use port 8310. This must match the port you selected in the Winlink VARA FM Session above.
[6] Use NARROW for devices using a microphone or 1200 pin configuration. Use WIDE for devices using the 9600 pin configuration. NARROW and WIDE are cross compatible.

signs. For example, my laptop VARA FM would use Digipeater call K6OLI-4, my gateway would use Digipeater call K6OLI-12.	

Special note: VARA FM 4.x.x and higher set the software TX Delay automatically.
We recommend setting the Signalink Delay (DLY) to the lowest setting.

VARA FM SoundCard Setup Click on **Settings** Select **SoundCard** Set the following Device Input: **USB Audio CODEC** Device Output: **USB Audio CODEC** Drive Level: -**5dB** Click **Close**	
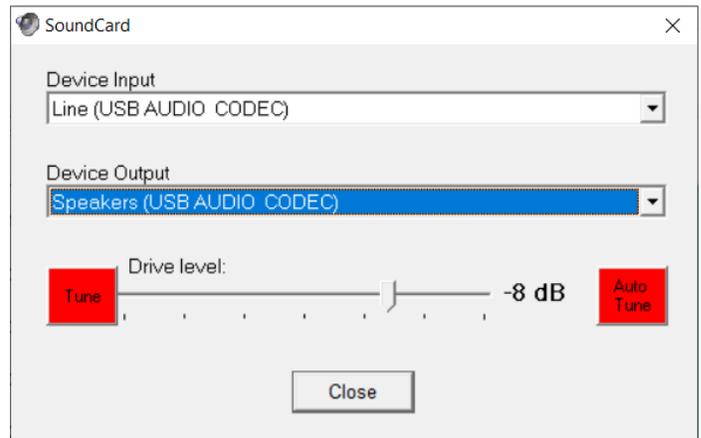
Note: This selects your Signalink as the Output and Input device for VARA FM and Winlink Express.
Note: The Signalink may sometimes show up as 2-USB Audio CODEC or similar.

PTT Choose **Settings** Select **PTT**	
Signalink (or similar) Set radio button to **VOX**	

DRA Boards, RIM9600 (or similar) Set radio button to **RA-Board** Note: for RIM9600 make sure the **AGC** is turned off on the Windows Sound Settings.	
ICOM IC-7100 (or similar) Select **CAT** Brand: **Icom** Port: **COM**7 (this port will likely be different on your rig, it will be the one labeled _A in your "Device Instance Path")[7] Model: **IC-7100** Bauds: **19200** CI-V: **88**	
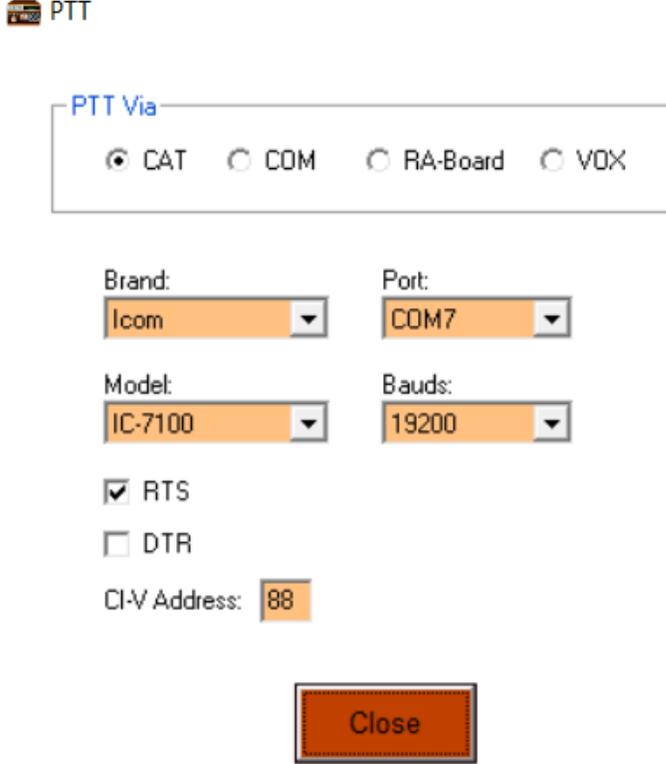
Done! You are now set up to use VARA FM. It is a good idea to exit your VARA FM P2P session at this point and re-initialize it to ensure the changes are saved.

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[7] For details see Icom's "Tips for USB Port Settings": https://www.icomjapan.com/support/manual/2574/

Ping

Ping is a new feature that helps you set audio levels in VARA FM 4.x.x, specifically your TX audio. You can ping a gateway or a P2P station. The pinged station will respond with an audio level reading.

You can ping a station directly or via one or two digipeaters.

A Ping reveals how you can hear the other station and how it can hear you.

K6OLI-4	K6YZF-11
S/N: +25.5dB This is how your station "hears" the remote station's signal. In other words, you are looking at the S/N and VU meters on your station. A S/N greater than +10dB is considered good for connections. **VU: -22 dB** Represents the signal level of K6YZF-11.	**S/N: +14.9dB** This is how the remote station station "hears" your signal. In other words, you are looking at the S/N and VU meters on the remote station. An S/N greater than +10dB is considered good for connections. **VU: -22 dB** Represents the signal level of K6OLI-4.

Notes:
You can adjust how the remote station hears you by

- Decreasing or increasing your TX volume through
  - Your audio device pot, e.g. Signalink or DRA Board
  - Your Windows speaker levels
  - The VARA FM Drive Level
  - Your radio volume settings, on radios that support that
- Decreasing or increasing power
  - Increasing power should only be a matter of last resort. VARA FM works well on low or medium power. Always try adjusting volume first.

Conversely, the other station can improve its signal to you through the same TX focused mechanisms.

If your RX level is set to -13dB (+/- 2dB) on the VU meter then there is little you can do to improve a bad signal from the other side. In rare cases you can pick the signal out by adjusting your RX levels, but the problem is more likely on their TX or on their or your antenna.
There is also a penalty: adjusting your RX to a station with bad TX will result in you having a worse time receiving other stations.

VARA FM is a low signal modem. In most cases users overdrive their signals resulting in poor S/N. Reducing your TX volume will often increase throughput and S/N ratio.

Best practices:
- Ping the remote station before starting a Winlink session to check whether a viable path exists.
- Ping the individual hops in a digipeat connection. For example, if K6OLI wanted to connect to W6RH-10 via K6YZF-11 and NR6V-10 then he would first ping to the first hop, K6YZF-11. Then do another ping to NR6V-10 via K6YZF-11. And then ping W6RH-10 via K6YZF-11 and NR6V-10. If there is a problem along the path the ping will reveal that quickly. Conversely, if the path has good S/N the ping will show that also.
- Avoid sending traffic on any connection with a S/N less than 10dB. It ties up the frequency unnecessarily.

Auto Tune

Auto tune is a practical feature to optimize your transmit (TX) signal.

You can autotune with a gateway or with a peer. When tuning with a peer make sure he/she is running VARA FM 4.x.x or higher and in a Winlink P2P session.

Ideally you tune with a station that has a good signal to you.

You only need to tune once for a specific radio, antenna, location, combination.

Click on **Auto Tune**

Enter the call sign of the station you want to tune with, in this example, K6YZF-11, a gateway.

Click on the power plug icon

VARA FM will key the radio and go through a number of levels. The other station will transmit results. VARA FM uses these results to either
   a) Set the drive level automatically
   b) Recommend setting changes on the Signalink

Click **Close**
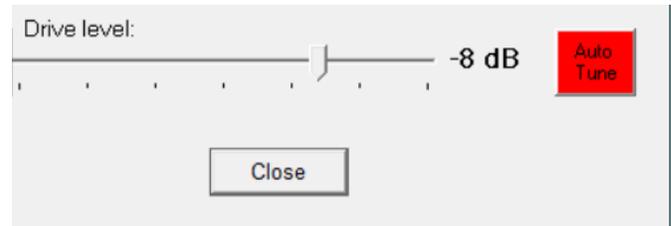
Winlink Operation

Winlink VARA FM P2P Connection

Make sure both stations are in a VARA FM P2P session

Enter the call sign of the station you are trying to connect with.
Enter a frequency in the **Freq.:** field.
Note: For Signalinks the frequency itself is of no consequence, but it is best operating practice to enter the frequency you are working. It will matter once you use a rig with CAT.
Ensure that your transceiver is set to the correct frequency.
Click **Start**
VARA FM will connect and any Peer-to-peer traffic in your outbox addressed to the receiving station will be passed.

Appendix I

Signalinks can support the full speed of VARA FM WIDE, if wired for 9600. VARA FM WIDE works with radios that allow access to the discriminator and an RA-board, rig built-in soundcard or homebrew USB soundcard interface.

VARA FM NARROW uses the microphone path and is compatible with the greatest number of radios.
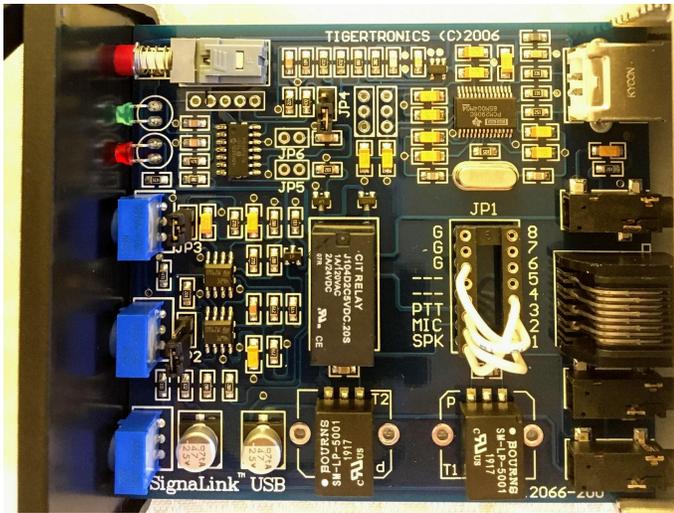
Signalink WIDE Connection at Level 13[8]
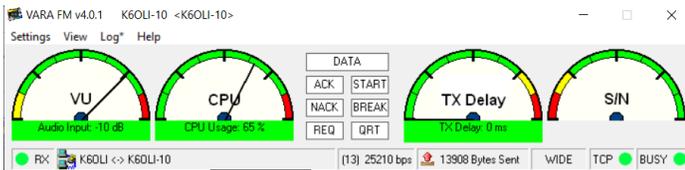
Signalink Wiring for 6 Pin Mini DIN

(before proceeding check out the Tigertronics wiring diagrams here: https://www.tigertronics.com/sl_wire.htm)

VARA FM Narrow (1200)

1 ⇔ MIC
2 ⇔ GND
3 ⇔ PTT
5 ⇔ SPKR

VARA FM Wide (9600)

1 ⇔ MIC
2 ⇔ GND
3 ⇔ PTT
4 ⇔ SPKR

If your rig has low output volume on the 9600 setting then connect jumper JP3.

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[8] Signalinks work perfectly fine with VARA FM WIDE.

DRA-50 Board for 6 PIN Mini DIN

Check this out before proceeding:
http://www.masterscommunications.com/products/radio-adapter/dra/txt/dra50-DIN-pinout.txt

JU3 ⇔ Open
JU4 ⇔ Open
JU5 ⇔ A for left audio
JU6 ⇔ Open
JU7 ⇔ A for (1200), B for WIDE (9600)

RX:
- Set Windows Microphone Level to 0.0dB (or as close as possible).
- Start VARA FM and select PTT and Soundcard
- With the squelch open and no carrier present adjust R12 until VU shows -13dB (+/- 2dB)

TX
- Set Windows Speaker Level to 90%
- Turn R14 completely counterclockwise
- Ping a local gateway or a friend
- Increase R14 until the pings show diminishing returns. Then back off a little.
- Fine tune in the future using the Windows Speaker Level

Check the Google Groups for suggestions on building a USB soundcard interface:
https://groups.google.com/forum/#!forum/winlink-programs-group
https://groups.google.com/forum/#!forum/varahfmodem

Appendix II

Winlink Express

VARA FM Winlink Session (i.e. Gateways)

Enter the call sign of the Gateway you are trying to connect with.
Enter a frequency in the **Freq.:** field.
Note: For Signalinks the frequency itself is of no consequence, but it is best operating practice to enter the frequency you are working. It will matter once you use a transceiver with CAT.
Ensure that your transceiver is set to the correct frequency.
Click **Start**
VARA FM will connect and any traffic in your outbox addressed to the receiving station will be passed.

Using the VARA FM Channel Selector

In the session Window
Click on **Channel Selection**
Highlight a channel
Click **Select Channel** or **Double-click** the
channel

Winlink will populate the channel information in
the Winlink Session window for you.

Remember to set your transceiver to the
frequency shown in the **Freq.:** field!

Note: Update your channel table regularly, at
least once a month. If you have access to the
internet
Click **Update Table Via Internet**

Digipeating[9]

VARA FM has digipeating capabilities. You may
digipeat to and from a gateway or to and from a
peer. The process is the same in the respective
session.
You can digipeat via gateways and via peers.
Please ping the path and check whether it is
even viable before trying to connect.

In VARA FM Winlink Session

Connection: **Digipeater**
In the first box enter the target station (K6OLI-12
in this example)
In the **via** box enter a digipeater.
Enter another digipeater in the second via box, if
required.
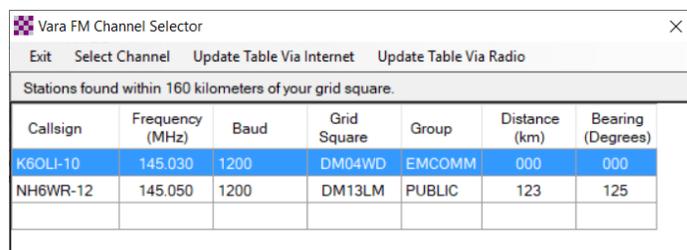
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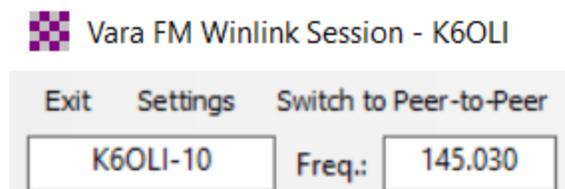
[9] Digipeating is only available to stations with a paid VARA license. For details contact the VARA author Jose EA5HVK at
https://rosmodem.wordpress.com

Peer-to-peer message

If you want to send a message as a Peer-to-Peer Message (P2P) you need to ensure that you select Peer-to-Peer Message in the Send as drop-down menu. Then click Post to Outbox.
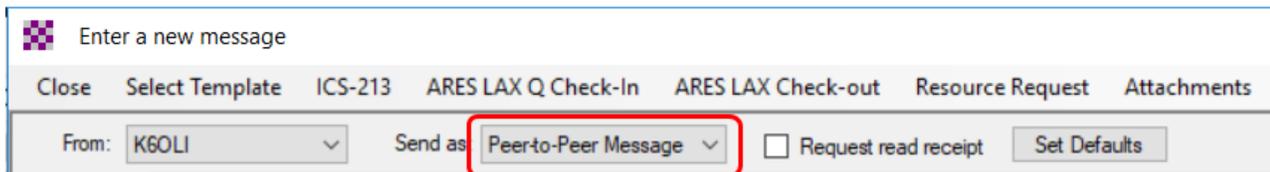
Double-check that the message is P2P by clicking on the **Outbox** and verifying under **Recipient** recipient's call sign is followed by **(P2P)**. In this example **KI6SC (P2P)** indicates the message is P2P.
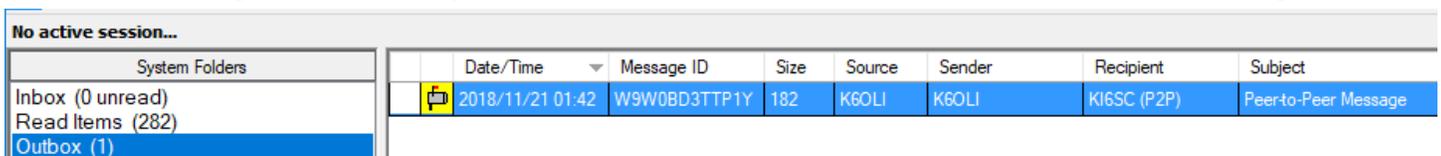
- P2P Messages can only be sent to the call sign in the **To:** field and only when in a P2P session with that station.
- Both stations need to be in the same type of session at the same time for P2P traffic to be exchanged.
- You can push a message to the other station or they can pull the message from your Winlink by initiating the session on their end. Only the initiating station needs to enter the target station's call sign and then press start in a P2P session.
- You can enter multiple addresses in the To: field and Winlink will create separate, but identical messages for each recipient. Each recipient has to either pull the message from your system or you have to push each message to each respective recipient in separate sessions, i.e. enter each recipient's call sign in the Session window and press Start. Having stations pull messages is more efficient for a central station.

Winlink Message (via Gateway, Telnet CMS, etc.)

If you want to send a message as a Winlink Message via a gateway or the internet you need to ensure that you select **Winlink Message** in the Send as drop-down menu. Then click **Post to Outbox**.

Double-check that the message is a Winlink Message by clicking on the Outbox. Winlink Messages are preceded by **//WL2K** in the **Subject** have no (P2P) after the call sign under Recipient.

- In the example above, we could first initiate a regular Winlink Session with a Gateway (or through the Internet via Telnet) and the message to HB9AUR would be sent. The message to KI6SC (P2P) would stay in the Outbox.
- We could also first initiate P2P Session with KI6SC and the message to KI6SC (P2P) would be sent. The message to HB9AUR would stay in the Outbox in this example.
- You can change whether a message is sent via Winlink Gateway or P2P after the fact by double-clicking on the message in the **Outbox**, changing the mode (**Winlink Message, Radio Only, Peer-to-Peer**) in the **Send as** dropdown menu and then clicking **Post to Outbox**.

Appendix III

VARA FM KISS Interface

The KISS Interface provides a connection for DATA Packet applications with Network KISS capabilities, such as PinpointAPRS and similar. VARA FM, HF and SAT KISS signals are incompatible with AX.25 and will only work with other VARA Stations.
Under no circumstances should the VARA KISS interface be used on established Packet and APRS frequencies, to avoid interference.

The KISS Interface was designed to work on tactical or dedicated VARA frequencies and for manual, operator controlled beaconing.

For an basic instructions on how to set up PinpointAPRS see the ARES LAX Guide to PoinPointAPRS: https://bit.ly/QG-PinpointAPRS-Web

VARA FM from Version 4.1.7 onwards provides a KISS interface which can be used to send and receive DATA Packets.

Please remember that VARA FM and AX.25 protocols are INCOMPATIBLE. So your net must decide at the beginning which mode to use. Never transmit VARA FM data packets on designated Packet frequencies, such as the national APRS frequency.

VARA FM KISS Setup	
Open VARA FM Enter your Digipeater address, if you have not already done so. In this example it is K6OLI-4*. **Check** KISS Interface KISS Port: **8100**** * By convention in SoCal client stations use SSID -4, gateways use their gateway SSID. For example, gateway K6OLI-12 would also use K6OLI-12 as digipeater SSID. ** 8100 is the default. This port needs to match the network KISS port in PinpointAPRS. 8100 is a popular port, consider using 8150 to deconflict.	
Pinpoint APRS Setup for VARA FM KISS	
In PinpointAPRS go to **Tools > Options** Click on **TNC** TNC Type: **Network KISS mode** **Ignore** the Serial TNC Settings	
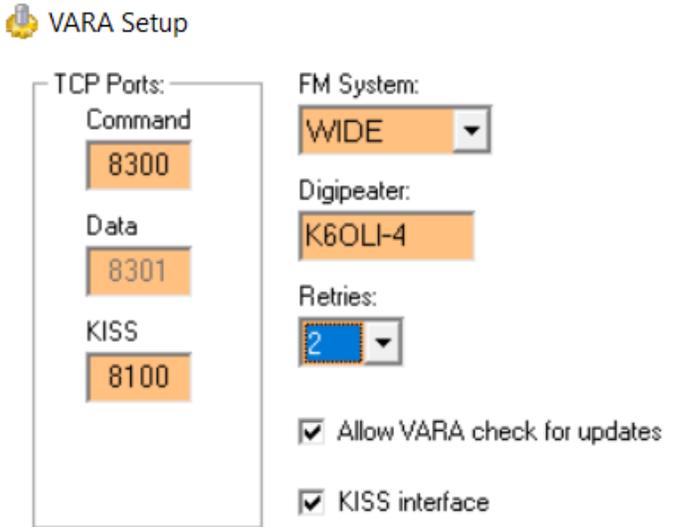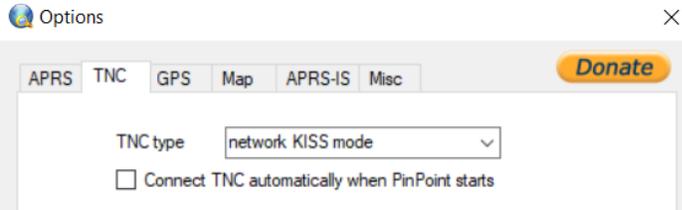
Network KISS TNC Settings

TCP/IP address or URL: **127.0.0.1**
Port: **8100****

** 8100 is the default. This port needs to match the network KISS port in VARA FM.
8100 is a popular port, consider using 8150 to deconflict.

Verify APRS Settings

Click on **APRS**
My APRS Call sign + SSID: Enter your preferred callsign and SSID, in this example it is K6OLI-1
APRS Path: Enter your digipeater preferred digipeater. In this case it is the remote gateway K6OLI-12, which has VARA FM KISS enabled.
Check: Enable APRS beaconing
Beacon at least every **600*** minutes
Click **OK**

* 600 is the minimum - essentially that is manual beaconing. You do not want to beacon automatically with VARA FM. Automatic beaconing is likely to cause interference. Always listen for a clear frequency before beaconing.

Beacon

In PinpointAPRS click on Tools
Click **Send Position Beacon**
Alternatively press the F1 key