

# Sound Card Digital on Winlink Express



# WHAT WINLINK OFFERS FOR EMCOMM

## Flexibility:

- Internet-only (Telnet) direct connections to Winlink.
- Radio link bridge to Internet e-mail.
- Radio-only store and forward messaging.
- Peer-to-peer connections between radio end-users.
- Familiar and simple e-mail client interface.

## Interoperability: Connect different types of systems

- Bridge different radio capabilities (VHF/UHF/HF).
- Seamless integration with Internet e-mail.

Geographical dispersion and redundancy for reliability

# WHAT WINLINK OFFERS FOR EMCOMM (MORE)

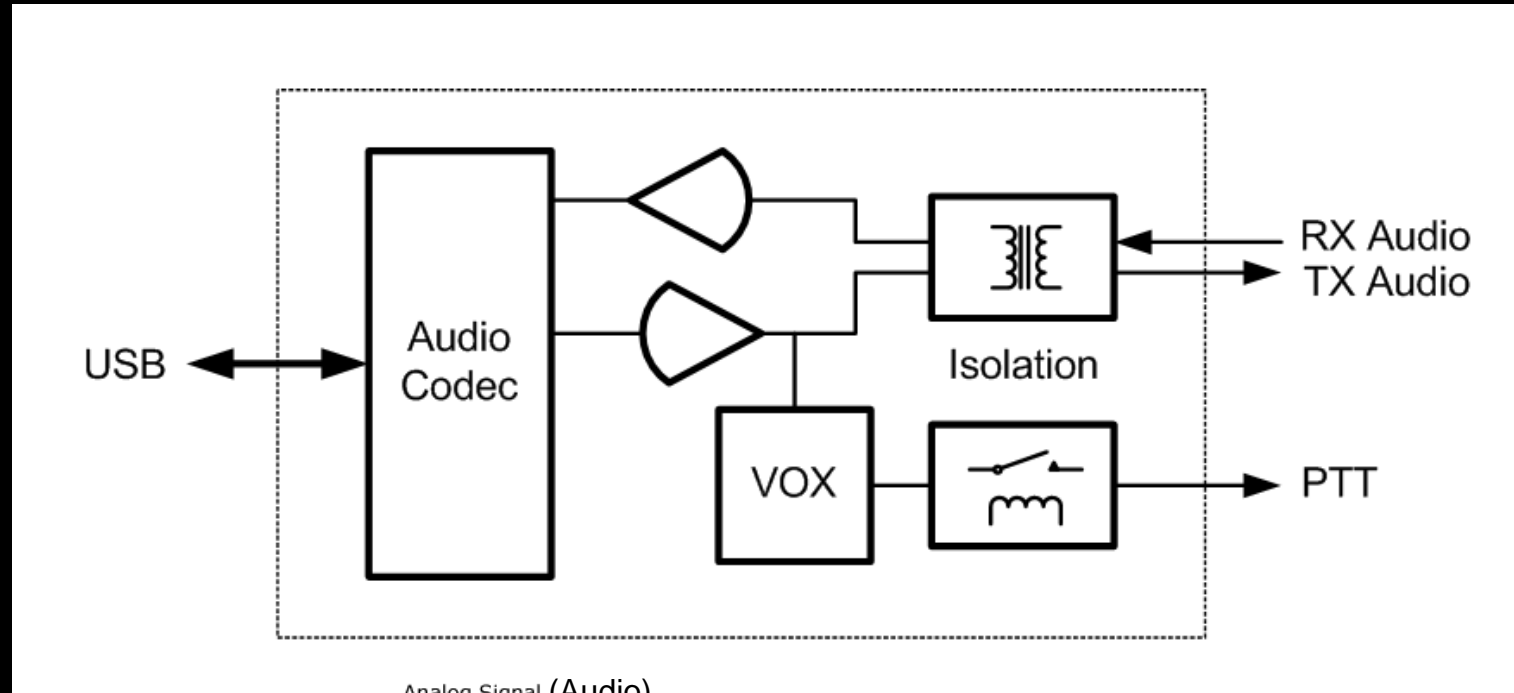
- Standard e-mail format with many features.
  - Binary file attachments (pictures, pdf, spreadsheets).
  - Automatic message compression/decompression.
  - White listing used to prevent spam.
- Time independence.
- Ability to collect messages while unattended.
- Good operation at most power levels.
- Not limited by station-to-station propagation.
- Message logging, and ICS report generation.
- Forms and template support.
- GPS location information and mapping.
- Wide adoption by EmComm related agencies.

# WHY SOUND CARD DIGITAL?

## Flexibility and Performance:

- Most Winlink modes are available using only a sound card interface (Packet, ARDOP, Vara HF, Vara FM)
- Less expensive hardware options, may be built-in to radio
- Superior decode performance over hardware devices
- Not limited to just Winlink, other weak signal and experimental modes require a sound card interface (WSJT, WSPR, FT8, etc.)

# SOUND CARD INTERFACE BLOCK DIAGRAM



Analog Signal (Audio)



Digital Signal (USB)



# SOUND CARD OPERATION

## Interface:

- Basically a simple signal interface, it is not a TNC
- May provide ground isolation between radio and computer
- Provides Push To Talk (PTT) signal
- Does not process the modem signals
- Signal processing is done by software running on the host computer
- May include additional ports for rig control

## Host Software:

- Does signal processing (modulation/demodulation)
- Provides timing of data and control signals
- Implements the data protocol

# SOUND CARD OPERATION

## WINLINK EXPRESS SOUND CARD MODES

Mode	Speed	Application
ARDOP (HF)	Up to 4000bps	Included
Vara (HF)	Up to 7,000bps	External
Packet (V/UHF)	1200/9600bps <sup>1</sup>	External
Vara FM (V/UHF)	Up to 25,210bps	External

- The ARDOP modem was developed by the WDT and is included with Winlink Express
- Vara and Packet modes are provided by external modem applications:
  - Vara (HF) and Vara FM (V/UHF)
  - UZ7HO Soundmodem (V/UHF Packet)
  - Direwolf (V/UHF Packet)

1. Both Soundmodem and Direwolf provide additional PSK modes between 1200 and 9600

# SOUND CARD INTERFACE

- Simple device powered by USB connection.
- Cost is between \$50-\$100 depending on features.
- Radio needs to have a "data" (analog) port or use the microphone and speaker connections for lower speed.
- Some modes need to run an external modem application like Direwolf or UZ7HO soundmodem (for packet) or Vara FM.





# SOUND CARD INTERFACE OPTIONS



RIM Lite

Various interfaces designed around USB codec chips (C-Media or others). May be kits, pre-built, or DIY. Many “AllStar Link” interfaces are available and will likely work fine for digital modes.



Masters Communications DRA-50



IC-7100 with built-in sound card

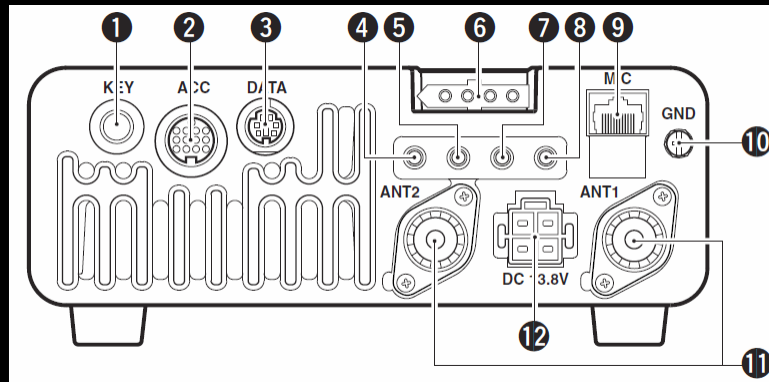
# RESOURCES NEEDED FOR WINLINK EXPRESS

V/UHF Packet/Vara FM

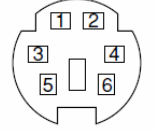
- Windows computer, Windows 10+
- Winlink Express
- V/UHF radio with "data" (analog) port or speaker and mic jack
- USB soundcard interface or radio with built-in sound card
- Appropriate cables to connect interface to radio
- External application, Soundmodem, Direwolf, Vara FM
- All software is free (except Vara), but donation is suggested

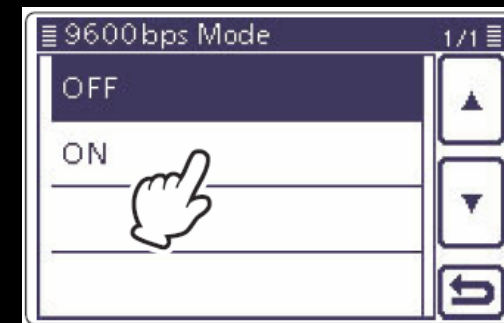
Vara registration is \$69/call sign or \$50/call sign for groups of 10 or more

# HARDWARE CONNECTIONS



- Data Jack, poor name, but standard
- ACC jack varies by manufacturer
- 1200/9600bps doesn't really mean that
- CI-V, Cat varies by manufacturer
- Switching between 1200 and 9600 operation also requires menu changes

DATA	PIN No.	NAME	DESCRIPTION
 <p>Rear panel view</p>	1	DATA IN	Input terminal for data transmit. (1200 bps: AFSK/9600 bps: G3RUH, GMSK)
	2	GND	Common ground for DATA IN, DATA OUT and AF OUT.
	3	PTT P	PTT terminal for packet operation. Connect to ground to activate the transmitter. When grounded, microphone input (pin 6) of [MIC] connector will be disconnected.
	4	DATA OUT	Data out terminal for 9600 bps operation only.
	5	AF OUT	Data out terminal for 1200 bps operation only.
	6	SQL	Squelch out terminal. This pin is grounded when the transceiver receives a signal which opens the squelch. <ul style="list-style-type: none"> <li>•To avoid interfering transmissions, connect squelch to the TNC to inhibit transmission when squelch is open.</li> <li>•Keep RF gain at a normal level, otherwise a "SQL" signal will not be output.</li> </ul>

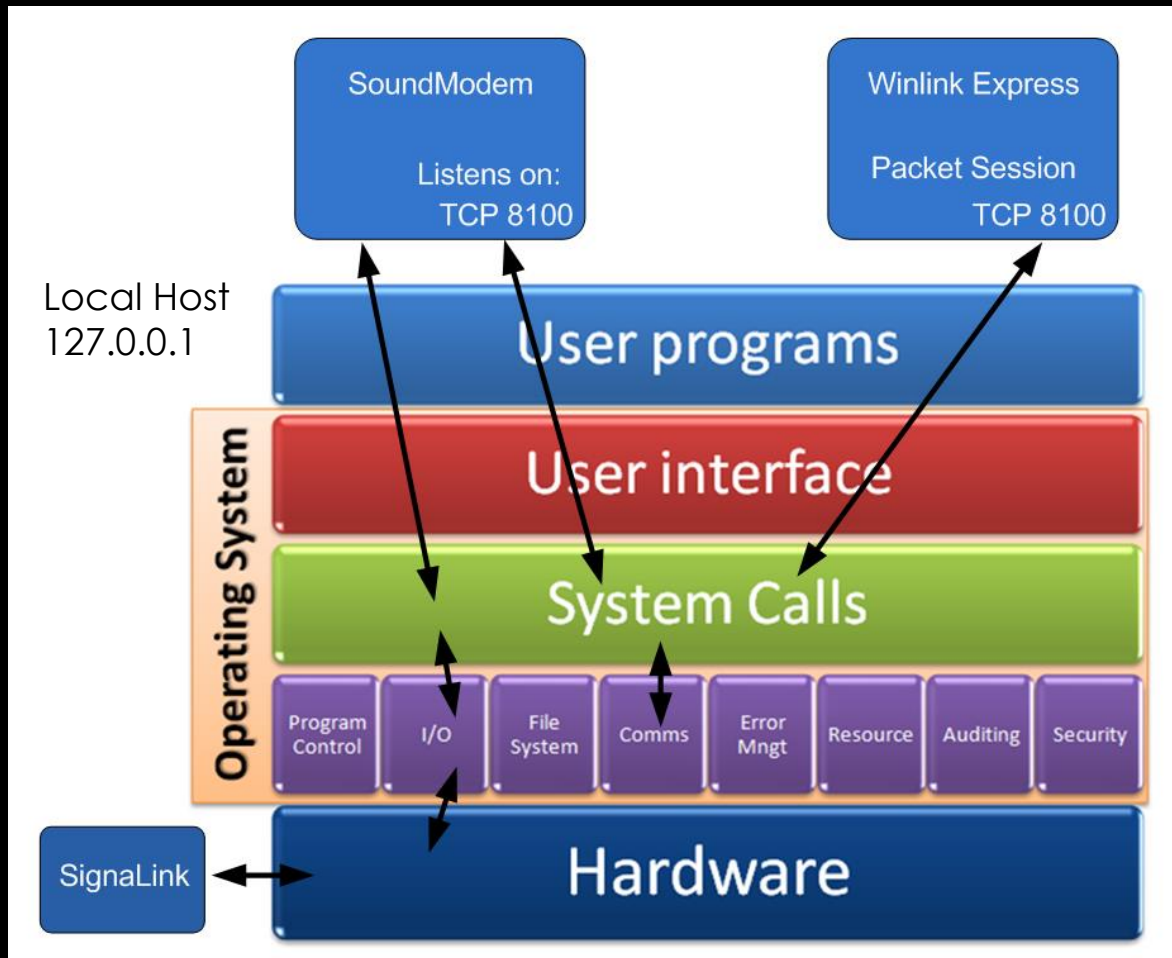


# HARDWARE CONNECTIONS

Data Jack (6-Pin DIN connector) explained:

- Used for analog signals, not really digital signals
- Not really related to 1200 or 9600 bps data rate
- “1200” connections go through the regular “voice” path in the radio, including pre/de-emphasis. Audio frequency bandwidth is typically filtered to about 3kHz (voice frequencies).
- “9600” connections go direct to the modulator and discriminator. Greater audio bandwidth is possible, maybe up to 6kHz.
- Pin assignments are standardized; however, impedance and voltage levels are not! Some manufacturers do not even document what is expected at this jack.

# SOFTWARE CONNECTIONS



Modem programs communicate using the OS network stack via TCP ports.

Communication stays within the system and does not go out on the LAN or the Internet.

Port numbers must match and must not conflict with other programs.

# INITIAL PACKET SETUP

## SOUND CARD INTERFACE

### Using UZ7HO Soundmodem

- Download zip file (UZ7HO):
  - <http://uz7.ho.ua/packetradio.htm>
  - Look for “Soundmodem” or “hs\_soundmodem” (for 9600)
  - Also download the ptt-dll.zip file
  - Unzip to the folder of your choice
  - Run Soundmodem
  - Allow the firewall exception
  - Configuration settings from the drop-down menus

# INITIAL PACKET SETUP

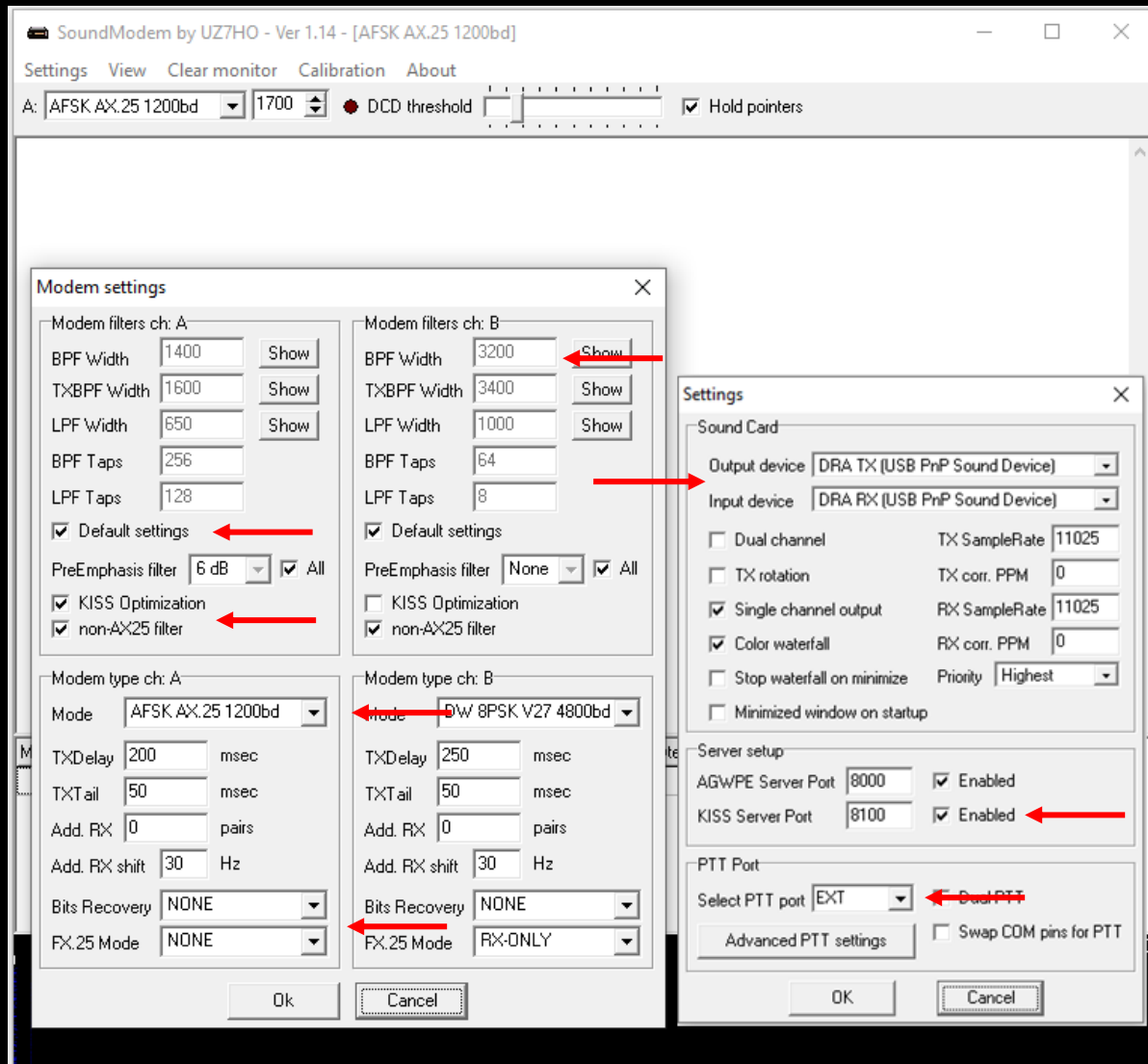
## SOUND CARD INTERFACE

### Using Direwolf

- Download zip file (Direwolf):
  - <https://github.com/wb2osz/direwolf/releases>
  - Extract the program files from the zip file and run the app
  - Edit the CONF file to configure
  - Multi-platform capable, for Linux/OS-X, download the source and compile (git clone, etc.)
  - Perhaps build your own RasPi based soundcard hardware device

# INITIAL PACKET SETUP

## SOUND CARD INTERFACE (UZ7HO AND DRA)

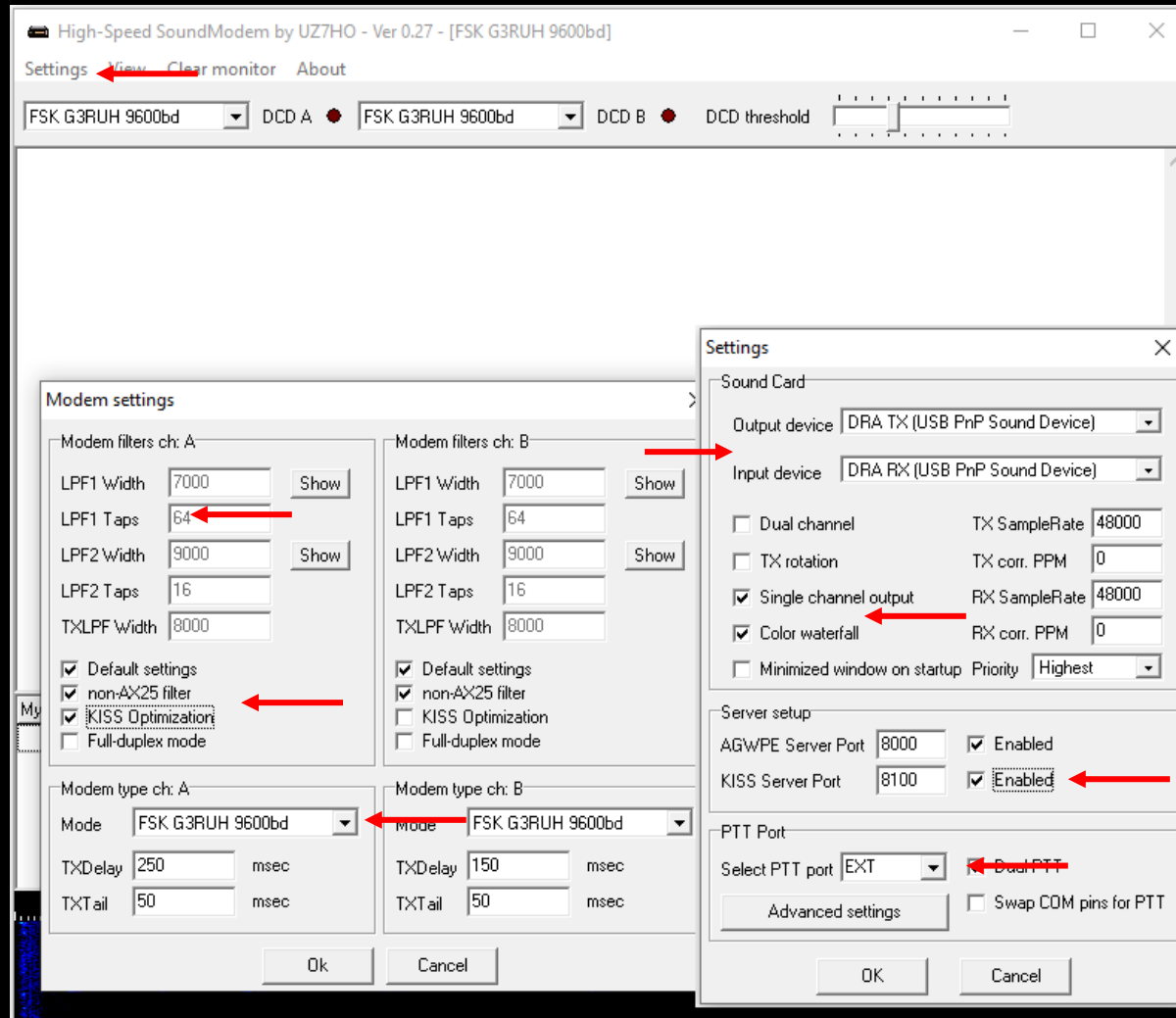


Run Soundmodem, then use the "Settings" drop down menus to configure devices and modem settings. Default settings will work in most cases.



# INITIAL PACKET SETUP

## SOUND CARD INTERFACE (UZ7HO HIGH SPEED)



HS\_Soundmodem is used for 9600 packet operations

# INITIAL PACKET SETUP

## SOUND CARD INTERFACE (UZ7HO OR DIREWOLF)

Winlink Express packet settings for TCP ports must match UZ7HO or Direwolf settings.

Winlink Express can start and close the TNC application when a packet session starts.

UZ7HO KISS supports ACKMODE, Direwolf does not.

The on-air parameters can be adjusted to improve performance, but defaults should work OK.

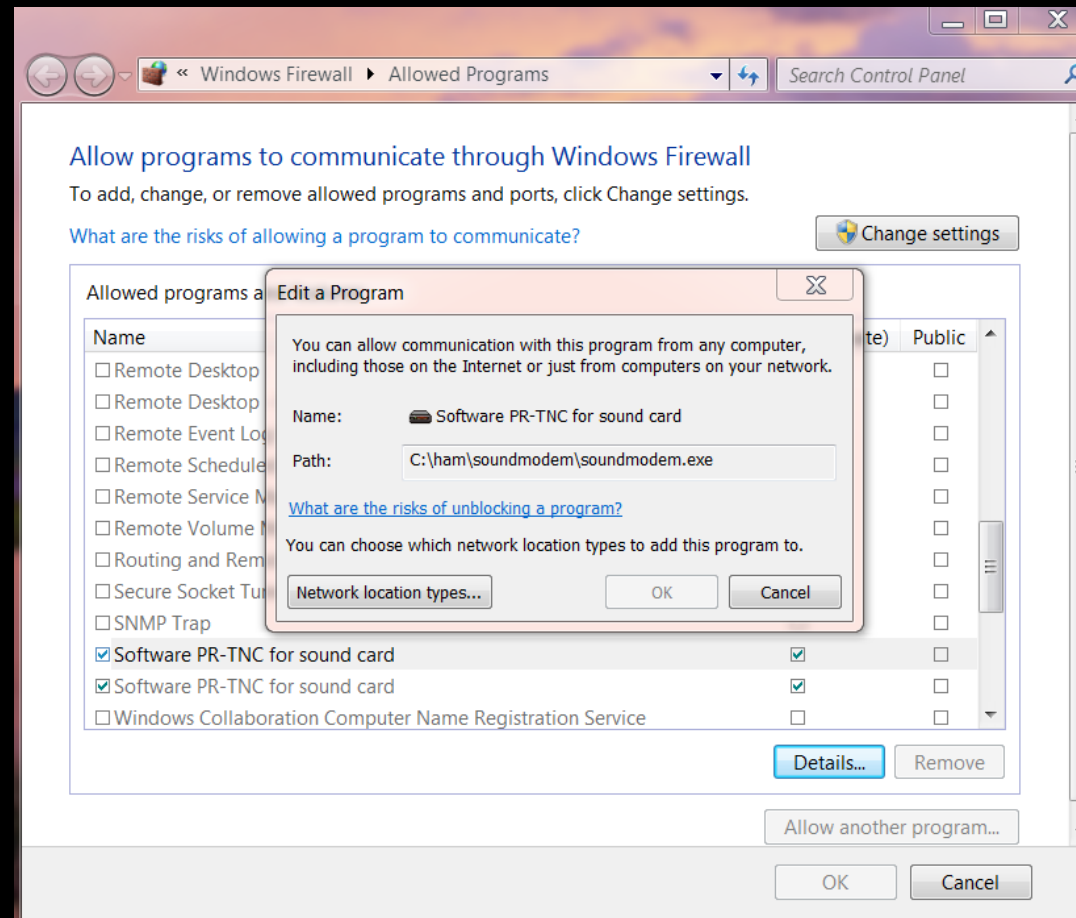
The screenshot shows the 'Packet Winlink/P2P Setup' dialog box. Red arrows point to the following settings:

- Packet TNC Type: KISS
- Packet TNC Model: ACKMODE
- Serial Port: TCP
- TCP Host/Port: 127.0.0.1 8100
- Packet sound modem: C:\Ham\Soundmodem\soundmodem114\soundmodem.exe
- Automatically launch packet sound modem:
- TNC Parameters: 1200 Baud (selected)
- TX Delay (Milliseconds): 300
- Maximum Packet Length: 128
- Maximum Frames: 3
- Frack: 2
- Persistence: 160
- Slot time: 10
- Maximum Retries: 10
- Transmit Level: 300
- Enable IPoll:
- Automatic Calling: Autoconnect time: Disabled

Buttons at the bottom: Update, Cancel

# INITIAL PACKET SETUP SOUND CARD INTERFACE (UZ7HO)

UZ7HO and Direwolf both create “KISS TNC” servers within the network stack, ports on the firewall must be opened to allow Winlink Express (and other applications) to use the software TNC. You will be prompted to allow this when the application is first run, or edit the firewall settings to allow the software TNC application.



# INITIAL PACKET SETUP

## SOUND CARD INTERFACE (UZ7HO AND SIGNALINK)

UZ7HO and Direwolf both allow for multiple modems using a “stereo” sound card, usually only modem “A” is used. Set to AFSK AX.25 1200bd modem.

Both programs can try to correct single bit errors. This is NOT advised for EMCOMM.

Both programs also now support FX.25 which adds FEC to the standard AX.25 packet frame. This is not compatible with any hardware TNC (though it is transparent) and will add overhead.

The screenshot shows the 'Modem settings' dialog box with the following configurations:

Channel	Modem filters	Modem type
ch: A	BPF Width: 1400 TXBPF Width: 1600 LPF Width: 650 BPF Taps: 256 LPF Taps: 128 Default settings: <input checked="" type="checkbox"/> PreEmphasis filter: 6 dB KISS Optimization: <input checked="" type="checkbox"/> non-AX25 filter: <input checked="" type="checkbox"/>	Mode: AFSK AX.25 1200bd TXDelay: 200 msec TXTail: 50 msec Add. RX: 0 pairs Add. RX shift: 30 Hz Bits Recovery: NONE FX.25 Mode: NONE
ch: B	BPF Width: 3200 TXBPF Width: 3400 LPF Width: 1000 BPF Taps: 64 LPF Taps: 8 Default settings: <input checked="" type="checkbox"/> PreEmphasis filter: None KISS Optimization: <input type="checkbox"/> non-AX25 filter: <input checked="" type="checkbox"/>	Mode: DW 8PSK V27 4800bd TXDelay: 250 msec TXTail: 50 msec Add. RX: 0 pairs Add. RX shift: 30 Hz Bits Recovery: NONE FX.25 Mode: RX-ONLY

The 'FX.25 Mode' dropdown for channel A is highlighted with a red circle, showing options: NONE, RX-ONLY, and RX+TX.

# INITIAL PACKET SETUP

## SOUND CARD INTERFACE (DIREWOLF)

```
direwolf - Notepad
File Edit Format View Help

#####
#
#          TEXT TO SPEECH COMMAND FILE
#
#####

#SPEECH dwespeak.bat

#####
#
#          VIRTUAL TNC SERVER PROPERTIES
#
#####

#
# Dire Wolf acts as a virtual TNC and can communicate with
# client applications by different protocols:
#
#   - the "AGW TCP/IP Socket Interface" - default port 8000
#   - KISS protocol over TCP socket - default port 8001
#   - KISS TNC via serial port
#
AGWPORT 8000
KISSPORT 8100

#
# Some applications are designed to operate with only a physical
# TNC attached to a serial port. For these, we provide a virtual
# port that appears to be connected to a TNC.
#
# Take a look at the User Guide for instructions to set up
# two virtual serial ports named COM3 and COM4 connected by
# a null modem.
```

Packet Winlink/P2P Setup

TNC Connection

Packet TNC Type: KISS

Packet TNC Model: NORMAL Serial Port: TCP

TCP Host/Port: 127.0.0.1 8100

Packet sound modem: C:\Ham\Direwolf\direwolf.exe Browse

(For KISS mode)  Automatically launch packet sound modem

TNC Parameters

1200 Baud  9600 Baud

TX Delay (Milliseconds): 300 300

Maximum Packet Length: 128 128

Maximum Frames: 3 4

Frack: 2 2

Persistence: 160 224

Slot time: 10 20

Maximum Retries: 10 10

Disable Xmt Level Adjust  Transmit Level: 300 300

Enable IPoll:

Automatic Calling

Autoconnect time: Disabled

Automatically call when there are pending outgoing messages

Update Cancel

# INITIAL PACKET SETUP

## SOUND CARD INTERFACE (DIREWOLF HIGH SPEED)

The image shows two windows side-by-side. On the left is a Notepad window titled 'direwolf.conf - Notepad' containing configuration text. On the right is a 'Packet Winlink/P2P Setup' dialog box with various settings.

**direwolf.conf - Notepad:**

```
File Edit Format View Help
# 9600 High speed - can't use Microphone and Speaker connections.
#
# In the simplest form, just specify the speed.
#
#MODEM 1200
#MODEM 300
MODEM 9600 ← Uncomment desired
#
# These are the defaults should be fine for most cases. In special situations
# you might want to specify different AFSK tones or the baseband mode which do
# not use AFSK.
#
#MODEM 1200 1200:2200
#MODEM 300 1600:1800
#MODEM 9600 0:0
#
# On HF SSB, you might want to use multiple demodulators on slightly different
# frequencies to compensate for stations off frequency. Here we have 7 differ
# demodulators at 30 Hz intervals. This takes a lot of CPU power so you will
# probably need to reduce the audio sampling rate with the /n option.
#MODEM 300 1600:1800 7@30 /4
#
# Uncomment line below to enable the DTMF decoder for this channel.
#
#DTMF
#
# If not using a VOX circuit, the transmitter push to Talk (PTT)
# control is usually wired to a serial port with a suitable interface circuit.
# DON'T connect it directly!
#
# For the PTT command, specify the device and either RTS or DTR.
# RTS or DTR may be preceded by "-" to invert the signal.
# Both can be used for interfaces that want them driven with opposite polarity
#
PTT COM4 RTS ← Specify PTT port used
#PTT COM1 RTS -DTR
#
# The Data Carrier Detect (DCD) signal can be sent to the same places
# as the PTT signal. This could be used to light up an LED like a normal TNC.
```

**Packet Winlink/P2P Setup:**

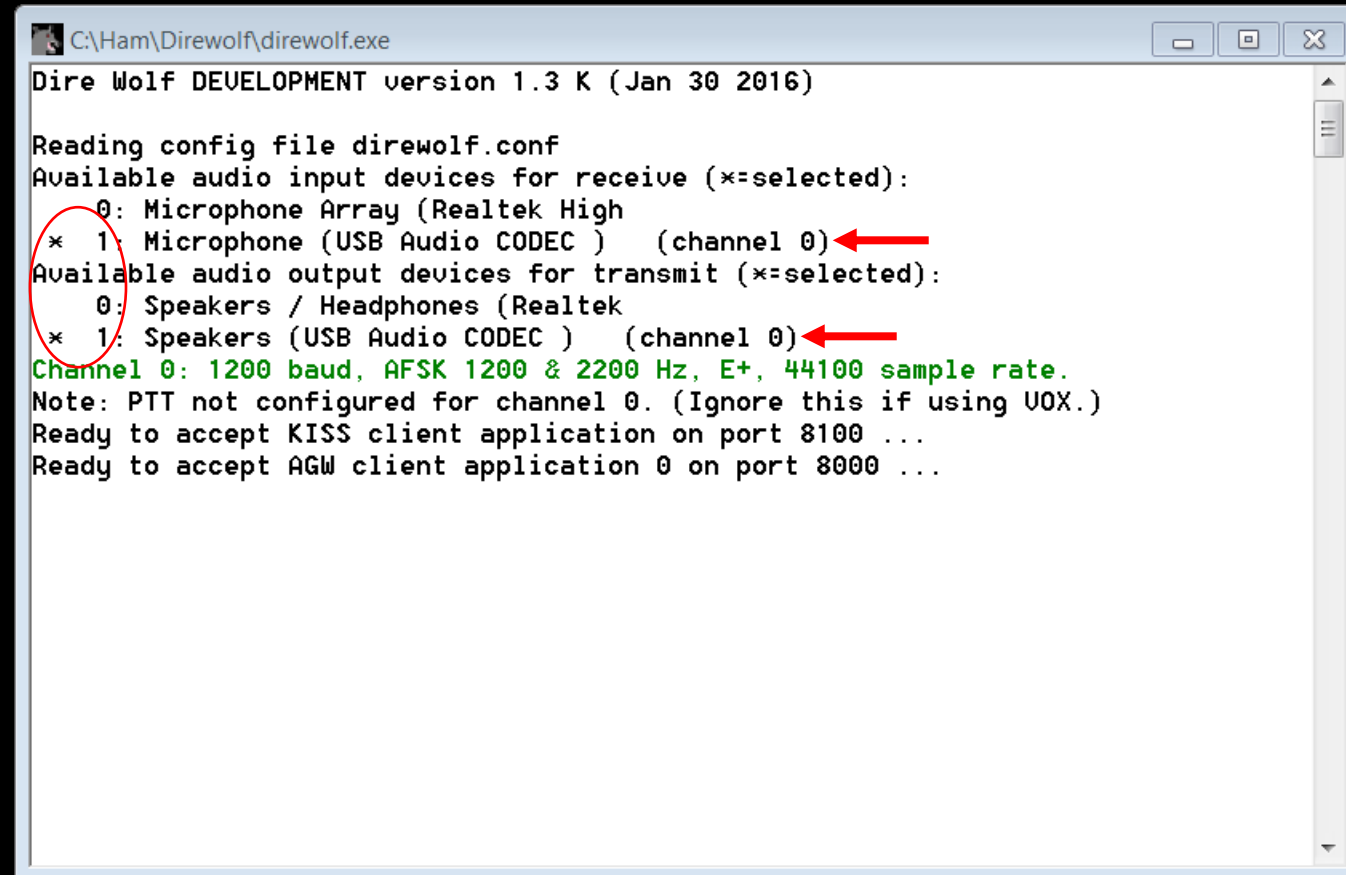
- TNC Connection: Packet TNC Type: KISS, Packet TNC Model: NORMAL, Serial Port: TCP
- TCP Host/Port: 127.0.0.1, 8100
- Packet sound modem: C:\Ham\Direwolf\direwolf.exe (For KISS mode)
- Automatically launch packet sound modem
- TNC Parameters:  1200 Baud,  9600 Baud
- TX Delay (Milliseconds): 300, 200
- Maximum Packet Length: 128, 128
- Maximum Frames: 3, 4
- Frack: 2, 2
- Persistence: 160, 224
- Slot time: 10, 20
- Maximum Retries: 10, 10
- Disable Xmt Level Adjust:  Transmit Level: 300, 300
- Enable IPoll:
- Automatic Calling: Autoconnect time: Disabled
- Automatically call when there are pending outgoing messages

# INITIAL PACKET SETUP

## SOUND CARD INTERFACE (DIREWOLF)

Direwolf startup shows available audio devices. Sound cards show as USB Audio Codec.

Sound card to use needs to be set in the configuration file (there are multiple ways to do this).



```
C:\Ham\Direwolf\direwolf.exe
Dire Wolf DEVELOPMENT version 1.3 K (Jan 30 2016)

Reading config file direwolf.conf
Available audio input devices for receive (*=selected):
  0: Microphone Array (Realtek High
* 1: Microphone (USB Audio CODEC ) (channel 0) ←
Available audio output devices for transmit (*=selected):
  0: Speakers / Headphones (Realtek
* 1: Speakers (USB Audio CODEC ) (channel 0) ←
Channel 0: 1200 baud, AFSK 1200 & 2200 Hz, E+, 44100 sample rate.
Note: PTT not configured for channel 0. (Ignore this if using UOX.)
Ready to accept KISS client application on port 8100 ...
Ready to accept AGW client application 0 on port 8000 ...
```

# INITIAL PACKET SETUP

## SOUND CARD VIRTUAL TNC

Direwolf and Soundmodem  
have different user interfaces

```
C:\Ham\Direwolf\direwolf-1.7.0-dev-A_x86_64\direwolf-1.7.0-7fa91dd_j686\...
Ready to accept AGW client application 0 on port 8000 ...

NS7C audio level = 21(3/3) [NONE] |||||__
[0.3] NS7C>TASS:(SABM cmd, p=1)

TASS audio level = 24(4/4) [NONE] _||||__
[0.2] TASS>NS7C:(UA res, f=1)

NS7C audio level = 19(3/3) [NONE] |||||__
[0.3] NS7C>TASS:(I cmd, n(s)=0, n(r)=0, p=0, pid=0xf0)C 2 AE6EQ-7<0x0d
>

TASS audio level = 18(4/4) [NONE] |||||__
[0.2] TASS>NS7C:(I cmd, n(s)=0, n(r)=1, p=0, pid=0xf0)TASS:W6SLO-1} At
tempting downlink to AE6EQ-7 on port 2<0x0d>

NS7C audio level = 21(3/3) [NONE] _|||||__
[0.3] NS7C>TASS:(RR res, n(r)=1, f=0)

TASS audio level = 20(4/4) [NONE] |||||__
[0.2] TASS>NS7C:(I cmd, n(s)=1, n(r)=1, p=0, pid=0xf0)TASS:W6SLO-1} Co
nected to AE6EQ-7<0x0d>

TASS audio level = 17(4/4) [NONE] |||||__
[0.2] TASS>NS7C:(I cmd, n(s)=2, n(r)=1, p=0, pid=0xf0)SLO County EOC<0
x0d>

NS7C audio level = 20(3/3) [NONE] |||||__
[0.3] NS7C>TASS:(RR res, n(r)=3, f=0)
```

SoundModem by UZ7HO - Ver 1.14 - [AFSK AX.25 1200bd]

Settings View Clear monitor Calibration About

A: [AFSK AX.25 1200bd] 1700 DCD threshold  Hold pointers

SLO County EOC

1:Fm NS7C To TASS <RR R R3> [17:49:09R] [+++]  
1:Fm TASS To NS7C <I C R1 S3 Pid=F0 Len=21> [17:49:10R] [+++]  
[WLZK-5.0-B2FWIHJM\$]

1:Fm NS7C To TASS <RR R R4> [17:49:12R] [+++]  
1:Fm TASS To NS7C <I C R1 S4 Pid=F0 Len=14> [17:49:13R] [+++]  
;PQ: 52659522

1:Fm TASS To NS7C <I C R1 S5 Pid=F0 Len=16> [17:49:14R] [+++]  
CMS via AE6EQ >

1:Fm NS7C To TASS <I C R6 S1 Pid=F0 Len=46> [17:49:15R] [+++]  
;Fw: NS7C SLOECC-3I43663978 SLOECC-6I43663978

1:Fm NS7C To TASS <I C R6 S2 Pid=F0 Len=30> [17:49:15R] [+++]  
[RMS Express-1.7.2.2-B2FHM\$]

1:Fm NS7C To TASS <I C R6 S3 Pid=F0 Len=14> [17:49:15R] [+++]  
;PR: 76339303

1:Fm NS7C To TASS <I C R6 S4 Pid=F0 Len=21> [17:49:16R] [+++]  
; 2 DE NS7C [CM95PP]

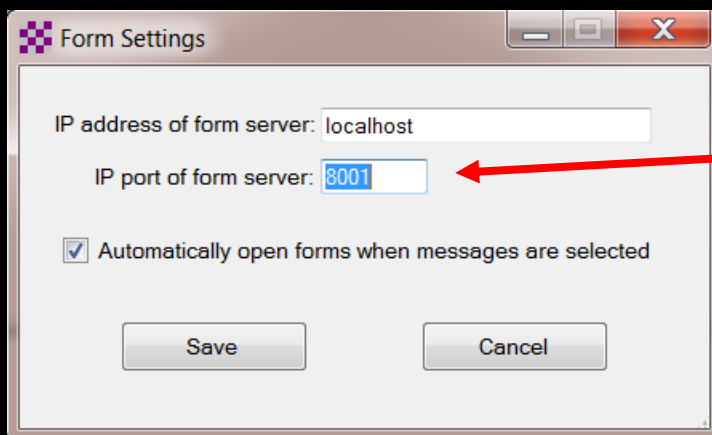
MyCall	DestCall	Status	Sent pkts	Sent bytes	Rcvd pkts	Rcvd bytes	Rcvd FC	CPS TX	CPS RX	Direction



# INITIAL PACKET SETUP

## SOUND CARD VIRTUAL TNC

Make sure your Virtual TNC server TCP ports do not conflict with the Winlink Express forms server (Direwolf default KISS port settings will).



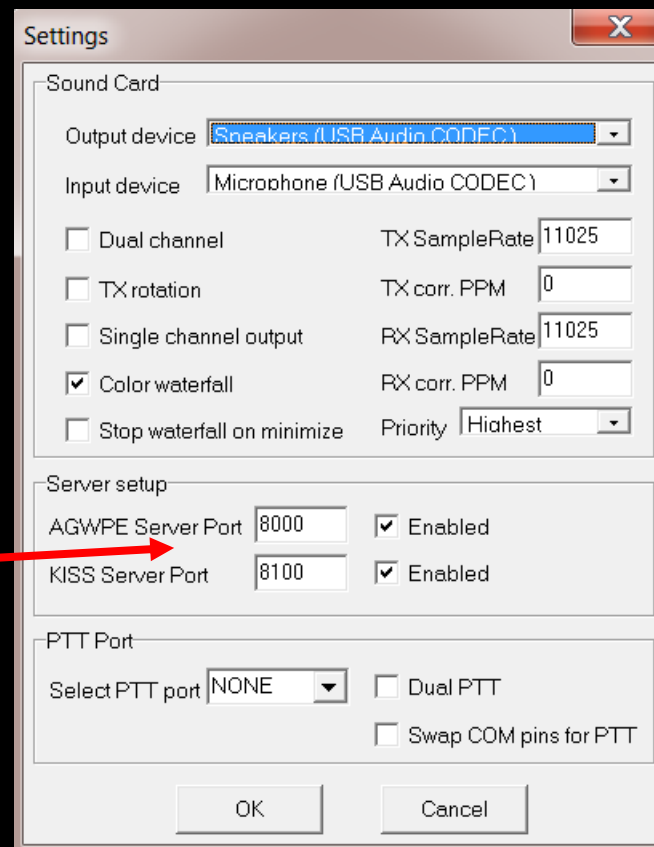
Form Settings

IP address of form server: localhost

IP port of form server: 8001

Automatically open forms when messages are selected

Save Cancel



Settings

Sound Card

Output device: Sneakers (USB Audio CODEC)

Input device: Microphone (USB Audio CODEC)

Dual channel TX SampleRate: 11025

TX rotation TX corr. PPM: 0

Single channel output RX SampleRate: 11025

Color waterfall RX corr. PPM: 0

Stop waterfall on minimize Priority: Highest

Server setup

AGWPE Server Port: 8000  Enabled

KISS Server Port: 8100  Enabled

PTT Port

Select PTT port: NONE  Dual PTT

Swap COM pins for PTT

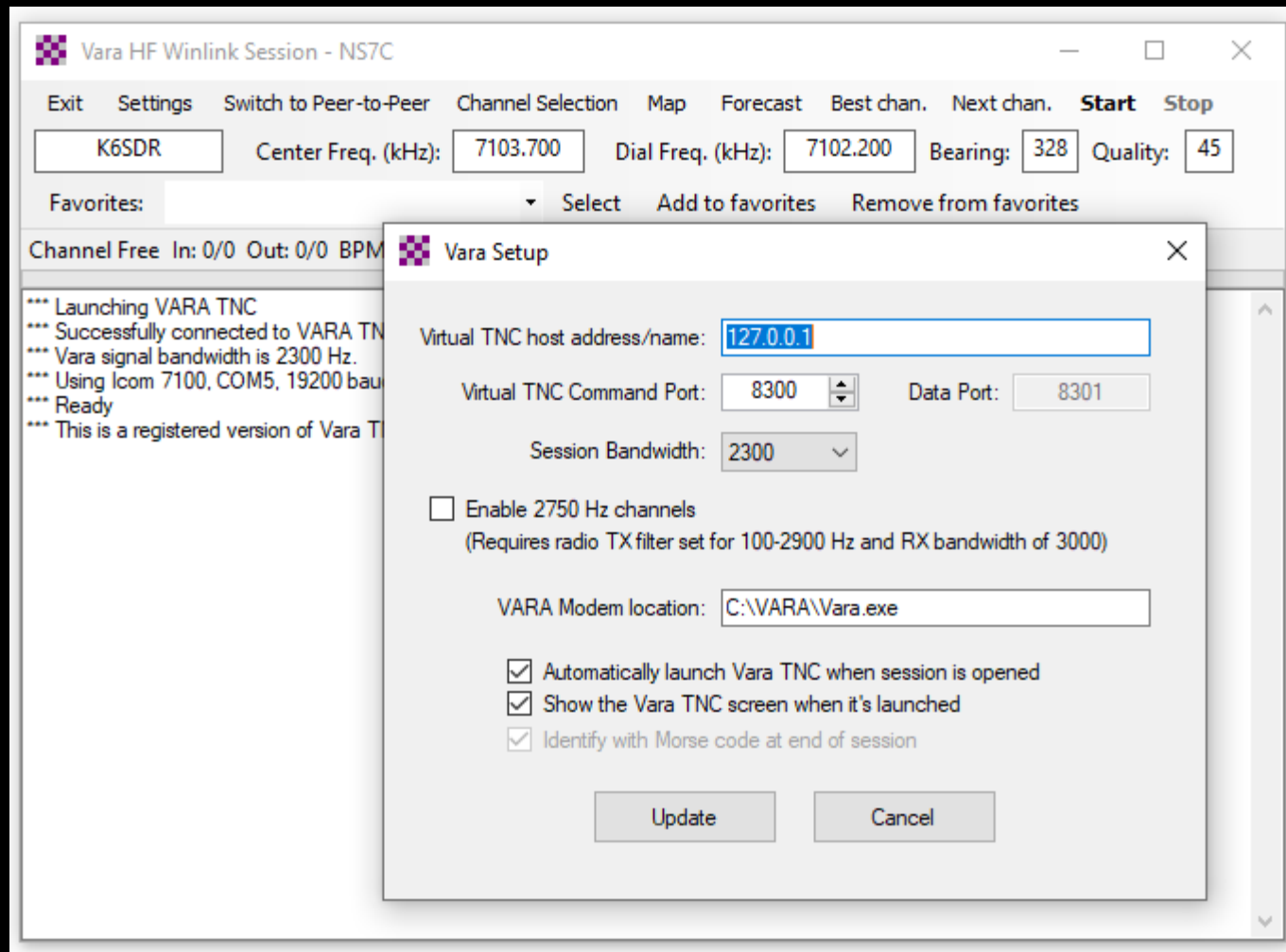
OK Cancel





# SOFTWARE SETUP

## VARA HF



Again, accept the defaults of local host and port 8300/8301 unless you need to make a change. Select the default session bandwidth (usually 2300) and check the boxes to launch the modem automatically and start it non-minimized.

# SOFTWARE SETUP

## VARA HF

The image shows the VARA HF v4.6.1 software interface and its setup dialog box. The main window displays a graph of bps (bits per second) over time, with a scale from 0.0 to 1.0. Below the graph are two gauges: VU (Audio Input: -12 dBFS) and CPU (CPU Usage: 19%). A control panel includes buttons for DATA, ACK, IDLE, NACK, BREAK, REQ, and QRT. The status bar shows a green RX indicator and 'Disconnected'.

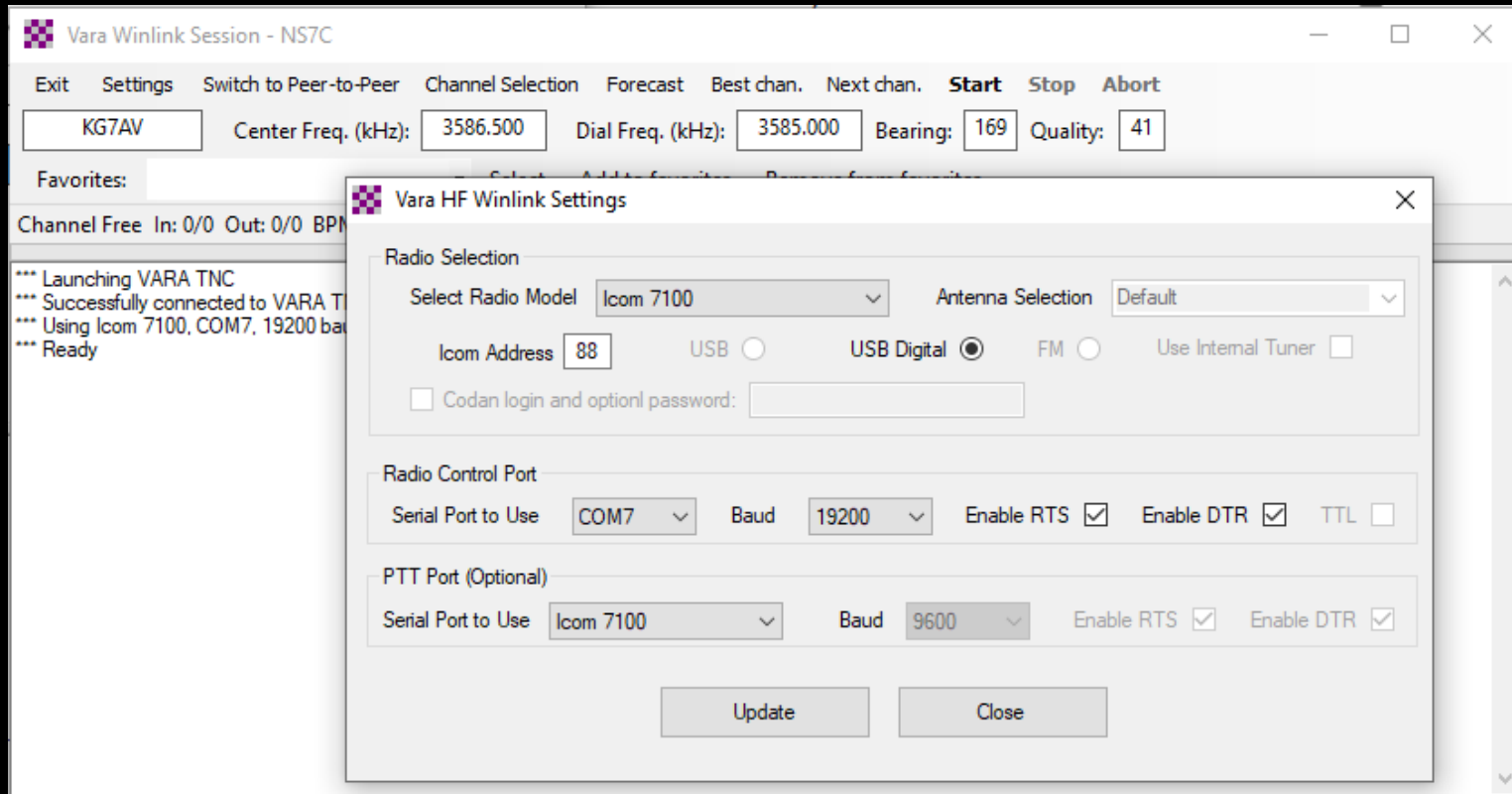
The VARA Setup dialog box is open, showing the following configuration options:

- TCP Ports: Command (8300), Data (8301)
- VARA Licenses: Callsign (NS7C), Registration Key (XXXXXXXXXXXXXXXXXXXX)
- Checkboxes:  Allow VARA check for updates via internet,  Accept 500 Hz connections,  Tuner enhancement,  CW ID,  KISS Interface,  RA-Board PTT,  SysLog
- Retries: 15 (dropdown menu)
- Close button

Bring up the Vara TNC, select settings and Vara Setup. Make sure the ports match the Winlink Session. Add your registration key and set retries to at least 5. If you are using a C-Media based sound card interface, select the RA-Board PTT option.

# SOFTWARE SETUP

## VARA HF



Adjust your radio selections to match your HF Rig Settings (CAT/CI-V). There are different options for PTT depending on what your rig supports.

# SOFTWARE SETUP

## VARA HF

The screenshot displays the VARA HF v4.6.1 software interface. The top window shows the 'Settings' menu with options for 'View', 'Log\*', 'Monitor', and 'Help'. Below this is a grid for signal strength in bps, ranging from 0.0 to 1.0. The bottom section features two analog meters: a VU meter for 'Audio Input: -7 dBFS' and a CPU meter for 'CPU Usage: 22%'. A green bar at the bottom indicates 'RX Disconnected'.

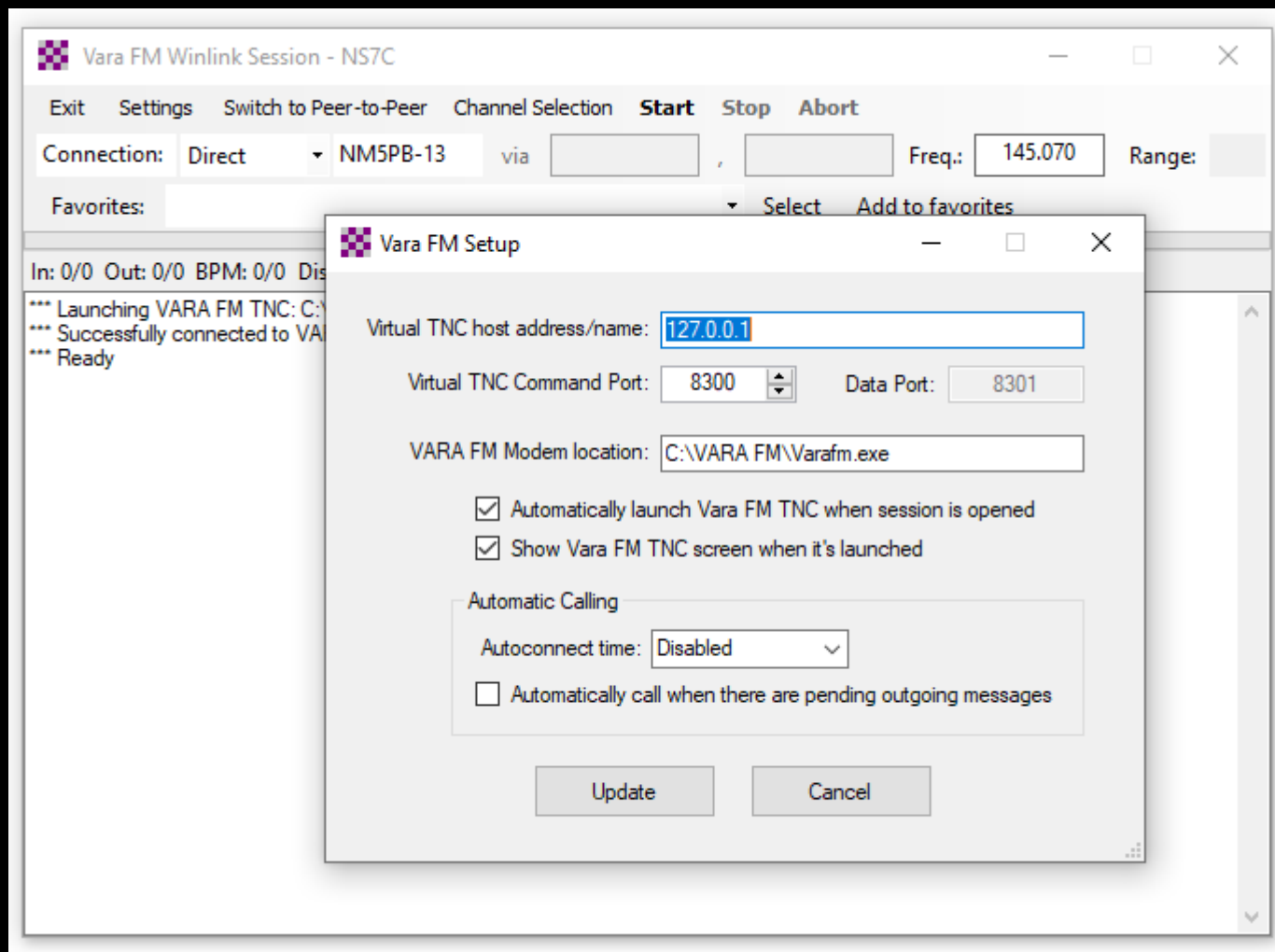
The 'SoundCard' window is open, showing 'Device Input' set to '7100RX (USB Audio CODEC)' and 'Device Output' set to '7100TX (USB Audio CODEC)'. A 'Drive level' slider is positioned at -4 dB. A red 'Tune' button is visible, with a note: 'Press Tune and set the Drive Level for ALC=1/3'.

The main interface shows a frequency display of 14.067.00 MHz. The ALC meter is highlighted with a red box and an arrow pointing to the '1/3 ALC' mark. Other meters include P.AMP1, AGC-F, AN, NB, COMP, SWR, Id, Vp, and TEMP.

Select settings again, then Sound Card. Here you will select the sound card interface, and check/adjust the drive level. Note the tip on adjusting drive for about 1/3 scale on the ALC meter.

# SOFTWARE SETUP

## VARA FM V/UHF



Open a Vara FM session and select Settings. If Vara FM is not found on the computer in the default location, you will be given a link to the download page for Vara FM. Check the host and port settings. Select the ports and start options similar to Vara HF.

# SOFTWARE SETUP

## VARA FM V/UHF

The screenshot displays the VARA FM v4.2.3 software interface. The main window shows a menu bar with 'Settings' circled in red. Below the menu is a graph showing signal strength in bps, and two VU meters for 'Audio Input: -14 dBFS' and 'CPU'. The 'VARA Setup' window is open, showing 'TCP Ports' (Command: 8300, Data: 8301), 'FM System' (NARROW), 'Digipeater' (NS7C-1), and 'Retries' (3). The 'VARA Licenses' window shows 'Callsign: NS7C' and a registration key. The 'SoundCard' window shows 'Device Input: DRA RX (USB PnP Sound Device)' and 'Device Output: DRA TX (USB PnP Sound Device)'. The 'PTT' window shows 'PTT Via' set to 'RA-Board'. The 'Speakers Properties' window shows 'Speakers' set to 100. The 'DRA-30 Properties' window shows 'AGC' set to 'Must not be checked'. A hardware connection diagram shows a radio connected to a PC via a 'Signalink USB' interface, with labels for 'DATA OUT 1200bps', 'DATA OUT 9600bps', 'PTT', 'DATA IN', and 'GND'. A note indicates that VARA FM WIDE needs a special soundcard interface (RA-Board, Signalink 'Black' transformer, home direct cable).

Settings View Ping Log\* Help

VARA Setup

TCP Ports: Command 8300 Data 8301

FM System: NARROW

Digipeater: NS7C-1

Retries: 3

Allow VARA check for updates

KISS interface  SysLog

VARA Licenses

Callsign: NS7C Registration Key: [REDACTED]

SoundCard

Device Input: DRA RX (USB PnP Sound Device)

Device Output: DRA TX (USB PnP Sound Device) PTT: RA-Board-1

Drive level: -21 dB

PTT

PTT Via:  CAT  CDM  RA-Board  VDX

Speakers Properties

Speakers: 100

DRA-30 Properties

AGC: Must not be checked

Compatible with Signalink USB

DATA OUT 1200bps

DATA OUT 9600bps

PTT

DATA IN

GND

DATA

\* VARA FM WIDE needs a FM rig set for use with a special soundcard interface (6 kbps panel: RA-Board, Signalink "Black" transformer (red audio transformers removed), home direct cable)...

\* In other case, you must select VARA FM

On the Vara FM modem, select Settings and Vara setup. Like Vara HF, check the TCP ports, and enter the call sign and registration key. Select settings then Sound Card and select the sound card interface input and output, click on Tune and adjust the drive as needed. Select settings then PTT and select the PTT option based on your radio and sound card interface. Also note the information about AGC and levels.



# SOFTWARE SETUP

## VARA FM V/UHF

VARA Setup

TCP Ports:  
Command: 8300  
Data: 8301

FM System: **NARROW**  
Digipeater: NS7C-1  
Retries: 3  
 Allow VARA check for updates  
 KISS interface  SysLog

VARA Licenses:  
Callsign: Registration Key:  
NS7C  
Callsign: Registration Key:  
N6APR  
Callsign: Registration Key:  
Callsign: Registration Key:

Compatible with Signalink USB

SQL  
DATA OUT 9600bps  
GND  
DATA  
DATA IN  
PTT  
DATA OUT 1200bps  
to PC input  
from PC output

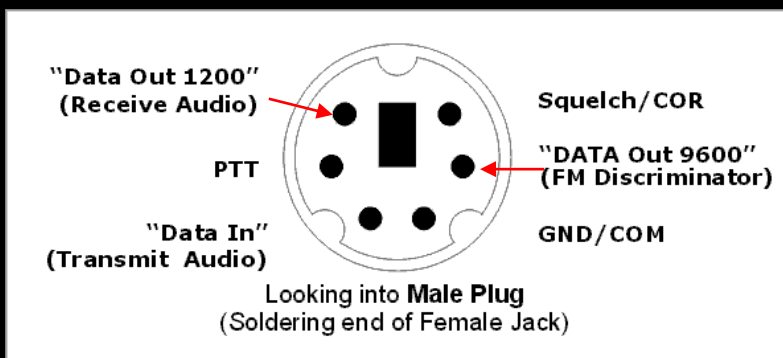
\* VARA FM WIDE needs a FM rig set for 9600 Packet operation, with a special soundcard interface (6 kHz BW) connected to rear panel: RA-Board, Signalink "Black" transforms, Modified Signalink (red audio transforms removed), homebrew interface (a simple direct cable)...

\* In other case, you must select VARA FM NARROW

Close

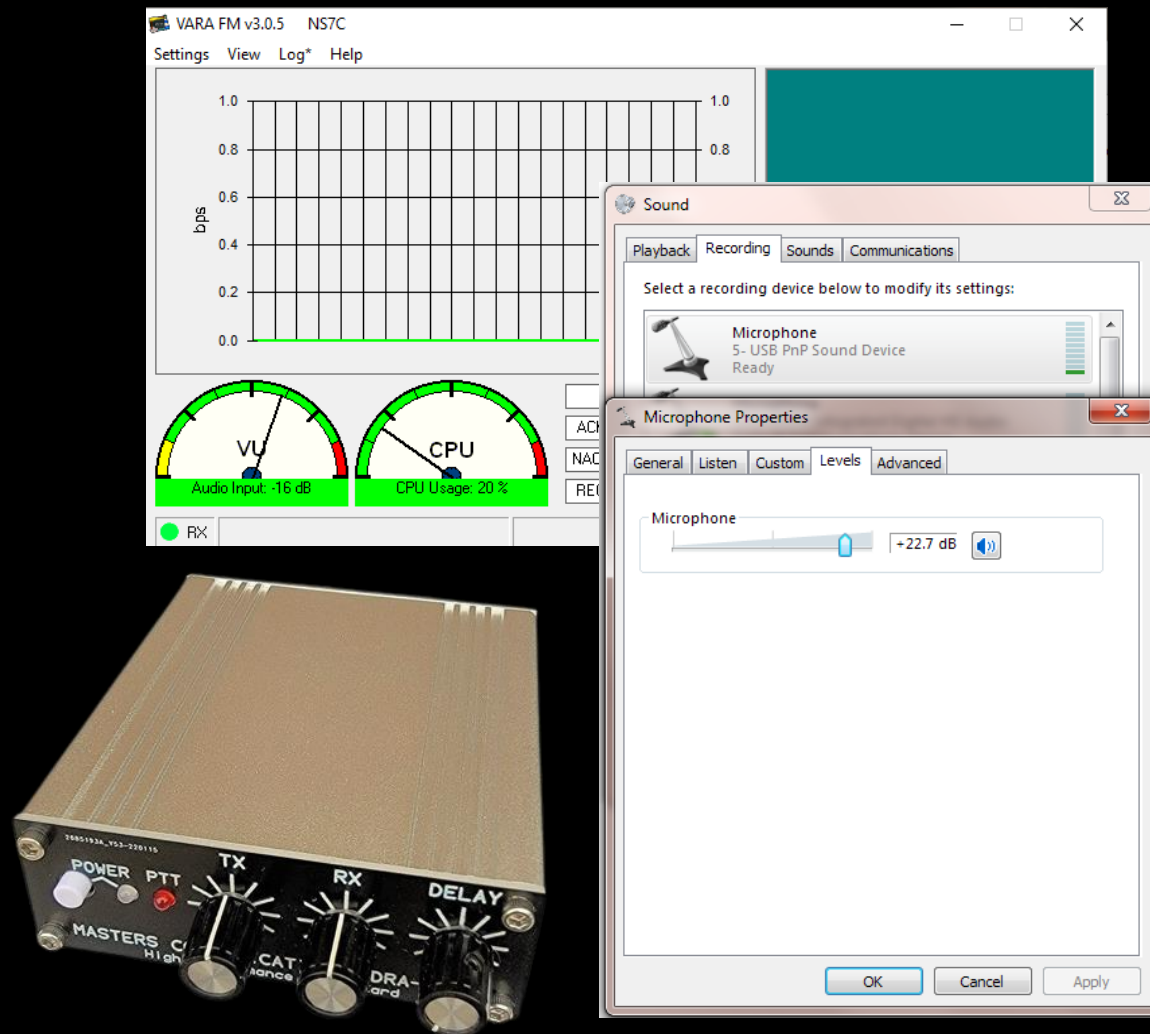
Vara FM has two speed modes that are selectable within Winlink Express. Narrow mode can be used with limited bandwidth radio connections like speaker and microphone, or the "1200" pins on the data connector. Wide mode requires more audio bandwidth and must use the "9600" connection on the data connector. 9600 mode will also need to be set in the radio menus. The speed mode can be set in the setup menu, on the session screen, and also in the channel selector. Stations that are set for Wide mode can connect to Narrow stations. The mode is adjusted automatically.

Top speed on Narrow is 12,098bps  
Top speed on Wide is 25,210bps



# SOFTWARE SETUP

## VARA FM V/UHF



The Vara FM input level should be in the 50-75% range on the VU meter. Transmit audio should be 2.5kHz (much more drive is needed for Wide connections). Adjust the TX and RX levels on the sound card interface controls, and/or the Windows mixer to achieve these levels. Some experimenting will be needed to achieve top performance. The built-in "Autotune" function will adjust the TX level automatically against a destination station. Document these settings for future reference or for resetting them after changing modes.

# SOFTWARE SETUP

## VARA FM V/UHF

The screenshot displays the VARA FM v4.2.3 software interface. A 'Drive Level Calibration' dialog box is open, showing the following results:

- Drive Level: +0 dB
- S/N: +13.9 dB
- VU: -25 dB

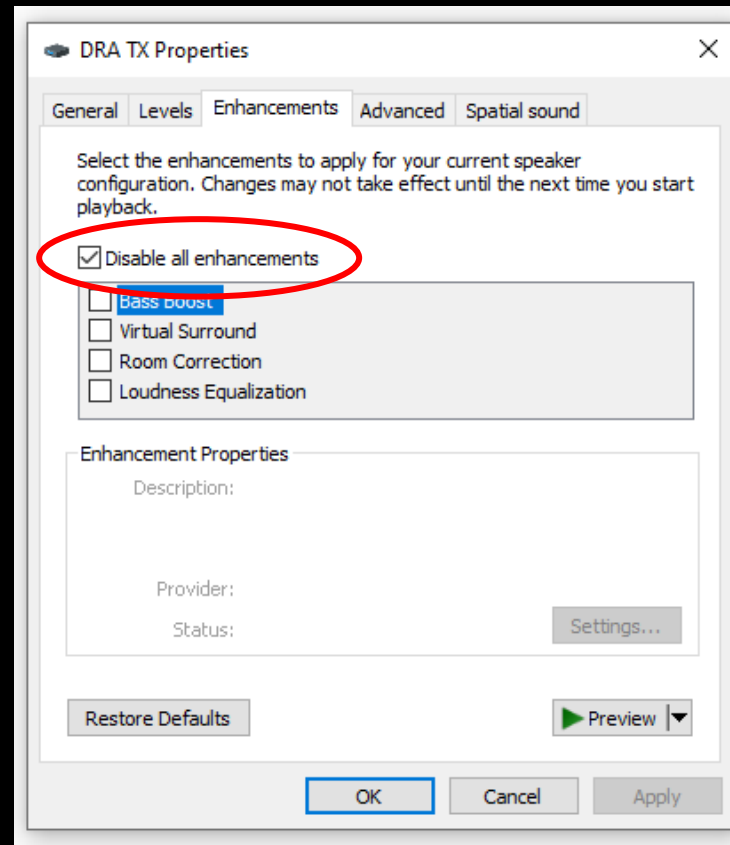
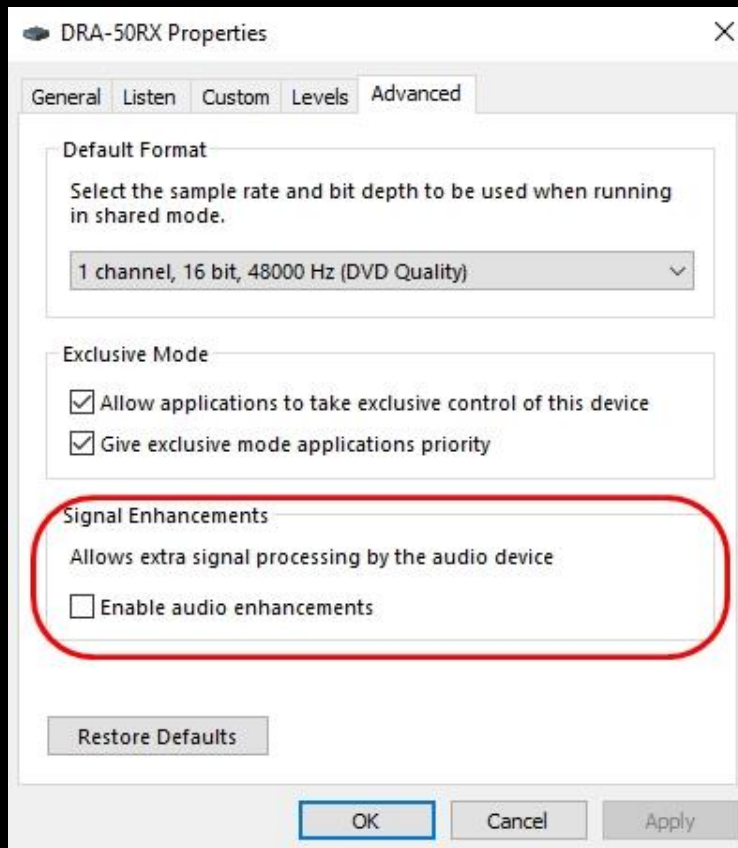
Below the results is an image of a green PCB with a red arrow pointing to a blue trimpot labeled R14. The instruction reads: "Turn the R14 trimpot to the right". A 'Close' button is at the bottom of the dialog.

The background software interface includes a 'SoundCard' window with 'Device Input' set to 'RA-Board-1', a 'PTT' dropdown menu, and an 'Auto Tune' button. A VU meter shows 'Audio Input: -15 dB'.

The Vara FM AutoTune function assists in setting up the transmit drive level. Select AutoTune, enter the call sign of an available station to test with, and press the “plug” button. Vara FM will send a series of test transmissions, adjusting the level with each transmission. The remote station will then respond with the setting that had the best S/N ratio. Vara will adjust the drive slider to that level. If the level is too high, or too low, Vara will instruct you to adjust the level on the Windows mixer or the sound card TX controls. Green “Approved” results are good!

# SOFTWARE SETUP

## VARA HF/FM



Windows Sound Settings include options to Enhance the recording and playback experience (bass boost, dynamic range, noise reduction, etc.). While these enhancements may be good for music and gaming, they are terrible for data transmission. Be sure to disable all enhancements.

Note: Create a shortcut on your desktop that calls `mmsys.cpl` to get directly to the sound settings.

# SOFTWARE SETUP

## VARA FM V/UHF

VARA FM v3.0.5

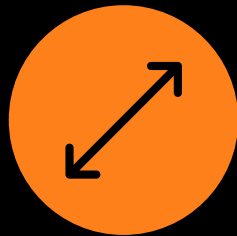
Level	VARA FM WIDE				VARA FM NARROW			
	Symbol Rate	Carriers	Mod.	Net Rate (bps)	Symbol Rate	Carriers	Mod.	Net Rate (bps)
1	42	55	4PSK	1098	42	55	4PSK	1098
2	42	55	4PSK	2253	42	55	4PSK	2253
3	42	98	4PSK	4040	42	55	4PSK	3022
4	42	98	4PSK	5387	42	55	16QAM	4032
5	42	98	16QAM	7185	42	55	16QAM	5375
6	42	98	16QAM	9580	42	55	32QAM	6720
7	42	116	16QAM	11340	42	55	64QAM	8065
8	42	116	32QAM	14144	42	55	64QAM	9072
9	42	116	64QAM	16932	42	55	128QAM	10585
10	42	116	64QAM	19003	42	55	256QAM	12091
11	42	116	128QAM	22102				
12	42	116	256QAM	25210				

Vara FM uses a very efficient FEC protocol, resulting in a significant speed improvement over traditional Packet Radio (over 2X 9600 packet). It will shift to the different speed levels automatically based on the receive signal quality.

Vara FM Narrow can also be used over regular voice repeaters or cross-band repeaters (at somewhat slower rates).

Unlike Packet, Vara FM does not support link-level network systems like network nodes, but it does have support for digipeating.

# CONCLUSION



WINLINK USE CONTINUES  
TO GROW, ESPECIALLY  
FOR EMCOMM USE



THE WINLINK  
DEVELOPMENT TEAM  
CONTINUES TO ENHANCE  
CAPABILITIES TO ADAPT TO  
CHANGING NEEDS



STEADY IMPROVEMENTS  
ARE BEING IMPLEMENTED



SOUND CARD INTERFACES  
AND MODES PROVIDE  
LOW COST AND HIGH  
PERFORMANCE  
SOLUTIONS TO DATA  
TRANSFER OVER RF

# CONTACT



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