Understanding Soundcard-Based Digital Ham Radio issues with WINDOWS Stereo Audio Outputs

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OVERVIEW of this whitepaper:
#1 Setting up audio soundcard (e.g. $10TNC or Signalink) for VHF Packet
#2 Setting up audio soundcard for HF FLIDGI
#3 Setting up classlesss soundcard for VHF Packet with Raspberry Pi linbpq

HINT: The first thing to check with most WINDOWS computers is that the audio output for the soundcard is selected and that the output volume is toward the higher side.

#1 VHF PACKET OPERATION with audio soundcard --- TWO PIECES OF SOFTWARE

1. The higher-level send/receive (or keyboard/monitor) is typically done by one application (e.g. **WINLINK** or **EASYTERM**)

   WINLINK <-----characters sent/received ---------> soundmodem.......
             (WINLINK uses the KISS tcp/ip interface)
   EASYTERM<----characters sent/received---------> soundmodem.......
             (EASYTERM uses the older AGWPE tcp/ip interface)

   Set up WINLINK to use port 8100.
   Set up EASYTERM to use port 8000.

2. With most Alachua County (soundcard-based) packet stations, soundmodem.exe is the software used to convert characters into tones for the radio and back again.

   …...modem program <----tones sent/received----> interface <--->radio

SOUNDMODEM SETUP | DEVICES
SOUNDMODEM happily includes a SETUP|DEVICES option that does exactly what we want: "SINGLE CHANNEL OUTPUT".   This "single channel" refers not to stereo L/R channels ---

what it means is that only <u>Modem A</u> will be running, and it will send tones to BOTH Left and Right Headphone channels, which means it will activate the interface PTT feature with R channel, and send signals through the interface to the radio with the L channel. [1]
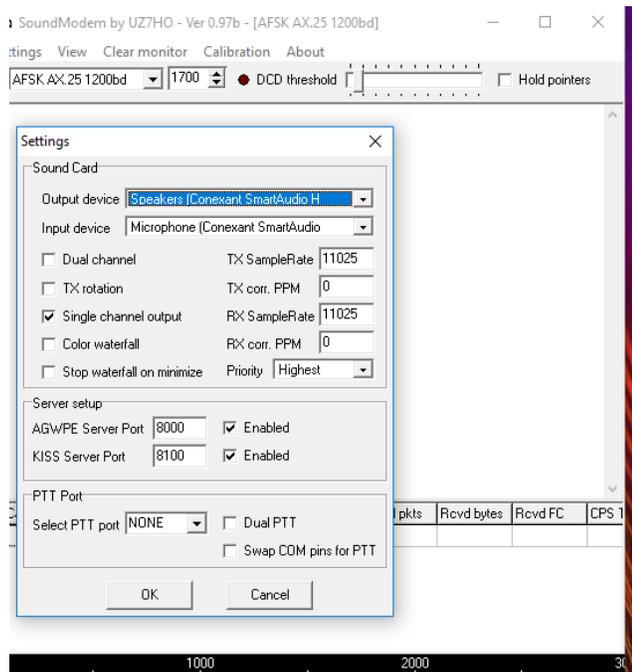
SOUNDMODEM Settings | Devices –
a) Output Device & Input Device should be your soundcard (usually something with "USB" in it, not the onboard soundcards as this one is set up for
b) SINGLE CHANNEL OUTPUT – forces system to use MODEM A and to send the audio to both L and R audio channels
c) AGWPE port 8000, and checked – used by EASYTERM
d) KISS server Port 8100, and checked – used by WINLINK

WARNING
You can get into significant confusion if you select anything other than solely SINGLE CHANNEL OUPUT. Selecting Dual Channel means both Modem A and Modem B will operate independently, and since you can't drive both of them simultaneously from WINLINK you may have audio but not PTT, or PTT and no audio. Selecting "TX ROTATION" makes it even more confusing, as this option, combined with Single Channel Output can cause first one headphone channel and then the other to transsmit, and if the two Modems are set to different speeds.....the result may be bedlam.

SOUNDMODEM SETUP|MODEMS

Now that you have your soundcard "connected" properly, you need to set it for the right protocol (type of "tones") , speeds, audio frquencies, etc. SETUP|MODEMS should look like this:
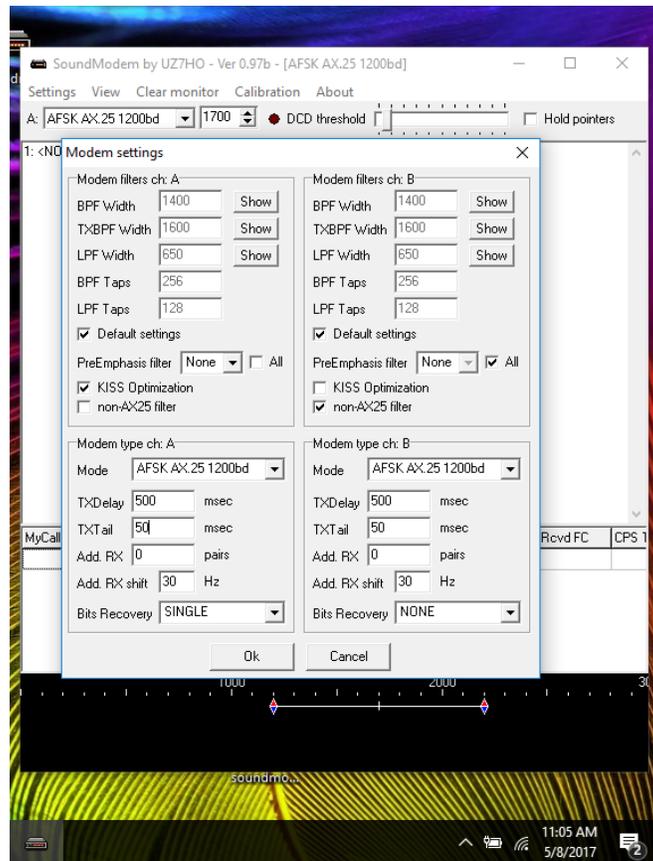
SETTINGS | MODEMS

The "top half" just leave alone for now. *We don't yet know the optimum pre-emphasis, filters, etc.,* and many of our nodes auto-correct for issues there anyway. The BOTTOM HALF is more important, especially the "A" Modem

- Mode: AFSK AX.25 1200 baud --- very important. Also, center frequency on the main screen must be 1700 Hz.
- TX DELAY: depends on your radio. Baofengs need 500 milliseocnds. Some mobile rigs may do with much less, but 500 is conservative.
- TX TAIL: Start with 50 and if all goes well, decrease to 20
- Add Rx: Set to 0.   You don't need these on FM transceivers and they take up processor cycles
- BIT RECOVERY: Try "SINGLE"

To be on the safe side, set the "B" Modem to same settings.

Then select OK and go back to the main screen and be sure that you have yourself centered on 1700 Hz:
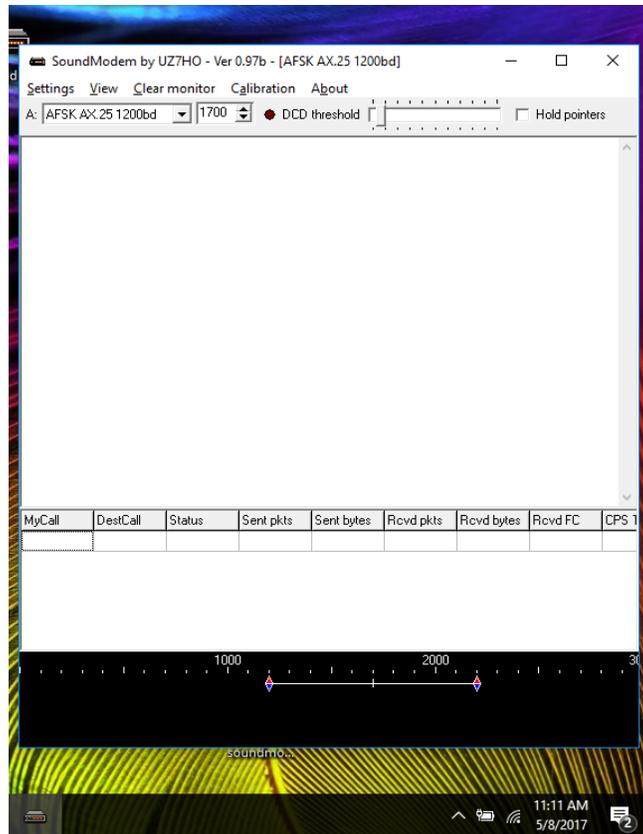
Make sure that your center frequency is 1700 Hz, the MODE is AFSK 1200 Baud AX.25, and the DCD setting is set rather low, to be more sensitive.

- You can test your receiver by pressing the "MONITOR" button if your receiver had that, and seeing that white hiss shows up on your FFT window.   If you're in an area of high packet usage, verbiage will begin to show up on your soundmodem monitor pane.
- You can test your transmitter by clicking CALIBRATE on Soundmodem and selecting high, low or both tones and watching that your transceiver transmits.   Be sure to turn off the transmission.

> With a Signalink – be certain the DELAY is turned fully CCW to MINIMUM delay.

#2   HF BAND SOUNCARD OPERATION WITH FLDIGI

Standard FLDIGI operation is to use Headphone Right to send a solid audio tone for the purpose of operating the PTT (push to talk).   The $10TNC right audio input goes to a sound-operated ("VOX") push -to-talk system. FLIDGI is "single modem" software --- there is only 1 data stream, usually sent to the L headphone channel, so the R is free to be used for the PTT function. Note that FLDIGI

includes both the keyboard/monitor   as well as the MODEM within one program.

#3 RASPBERRY PI LINBPQ / DIREWOLF SETTINGS

It turns out that I quite happily and luckily avoided all of these issues when configuring Raspberry Pi-based digital node systems, because from the beginning I simply chose "single channel" operation inside DIREWOLF modem configuration file. (direwolf.conf)   Linbpq uses tcp/ip KISS interface, and the port used is often not the same as the one we selected for windows-based computers, but as long as DIREWOLF and LINBPQ expect the same port, it works fine.

---------------------------------   REVIEW --

The following Table attempts to portray the best choices in a tabular format

WINDOWS SOFTWARE	BEST CONFIGURATION	RESULT WITH NORMALLY WIRED TWO CHAN INTERFACE BOARD (Normally interface wired as follows: L headphone → transceiver mic R headphone → VOX PTT)
FLDIGI	Check "PTT on R Chan"	Correct operation. Digital gets transmitted, and PTT works properly
Soundmodem	Settings|Devices Checked and unchecked options as follows: ☐ Dual channel (unchecked) ☐ TX rotation (unchecked) ■ Single Channel output (checked)	Correct operation. In "single channel" mode soundmodem happens to send Modem A to both L and R headphone outputs simultaneously. Thus digital packet gets transmitted, and PTT is driven by same tones sent to R headphone output.
Soundmodem	Single Chan Output selected	To Soundmodem, "chan" refers to a modem, not a headphone channel. Modem Type "Chan A" is utilized and works properly. (soundmodem

		happens to send Chan A packet to both L & R headphone output.

The following "sticker" may be helpful to affix to your sound card interface device if used with Windows-based software:

SOFTWARE	BEST CONFIGURATION
FLDIGI	Configure | Sound Card | Audio | Right Channel: Check ONLY this box: ■PTT tone on right audio channel
WINLINK SOUNDMODEM:	Select KISS modem interface and set port to match choice in soundmodem. Settings | Devices , select as follows: ☐ Dual channel (unchecked) ☐ TX rotation (unchecked) ■ Single Channel output (checked) BE CERTAIN AFSK 1200 BAUD AX.25 and CENTER FREQ 1700

APPENDIX

Some higher level applications may be able to address two different modems (e.g., KISS, as well as KISS PORT TWO.   We did not build the Alachua County $10TNCs to accommodate anything more than ONE port, because we built them to also be compatible with FLDIGI, which uses both left and right stero channels.   So our VHF goal is usually us to use only KISS (not KISS PORT TWO) in Packet Winlink, and with EASYTTERM, to use "Port 1 with Soundcard Chan A" rather than Port 2 With Soundcard Chan B".

> Note: If you can only get things to work with KISS PORT 2, it suggests that you don't have the LEFT headphone audio channel going properly toward the transceiver mic input.   Check your soundcard wiring.

1 The Adafruit USB sound adapter only has mono (1-channel) microphone so there is less confusion on the RX side of things.