

How to Setup a SoftRock RXTXv6.1 with PowerSDR-sr40

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Abstract

This document describes how to setup the Softrock40 transceiver RXTXv6.1 [1] in combination with modified PowerSDR software.

Introduction

PowerSDR is a Software Defined Radio application that is originally developed to work with FlexRadio System's SDR-1000 Transceiver [2]. However, the Open Source nature of this software has led to the support of other radios such as the SoftRock40 receiver. The support for this radio as of today is limited to a receiver use only.

With the birth of the SoftRock RXTXv6.1, extensions are required to enable the transmitter path. This has led to the development of various SDR software such as KGKSDR [5], DG8SAQ [6] and extensions to PowerSDR by KD5TFD [4], and the PowerSDR-sr40 extension by me, PE1NNZ [3].

PowerSDR-sr40 is based on a (beta) version of FlexRadio's PowerSDR SVN baseline. Extensions are especially added to let PowerSDR work with cheap soundcards, such as your integrated soundcard and other 2 channel soundcards.

Features include:

- **IQ Sample Correction;**
This is required to correct the left-right sample in the event when an Audio Device introduces a delay in one of the left or right channel. This applies for sound chips like PCM290x, WM8775ED5 (as used in Creative SoundBlaster Live! 24 bit internal sound card).
- **IQ Output when transmitting;**
The SoftRock40 model can only Receive Only. However, to enable experimentation with a SoftRock40-alike transmitter, now it is possible to generate IQ signals when a PTT/MOX button is pressed. Like in RX, the IQ signals uses a variable IF frequency which is the VFO frequency relative to the "Center Freq".
- **Dual soundcard support;**
One soundcard is dedicated for the I/Q processing only, while the other soundcard is dedicated for Audio processing (Microphone input and Speaker output to the human).

- Hardware controls;
To control the transceiver in their operation, such as TX/RX support, PTT switch input to the application. Both COM Port and Parallel Port interfaces are supported.

Setup

Download the latest PowerSDR-sr40 Setup from [3]:

<http://prdownloads.sourceforge.net/powersdr-sr40>

Run the Setup and after installation, startup PowerSDR by clicking PowerSDR sr40 Shortcut. You may choose to cancel the fftw_wisdom optimization by closing the window, since the FFT optimization might not be noticeable.

Go through but reject the steps in the PowerSDR Setup Wizard by pressing next. The wizard will not help us setting up Soft Rock hardware in detail.

To use SoftRock hardware, choose Setup and select as Radio Model the Soft Rock 40. Set the Center Freq; this is the frequency selected crystal in your RXTXv6.1 divided by 4 (or 8 depending on the jumper setting). Ensure that Receive Only is disabled. Set LPT Address to 0, if you are not intended to connected your SoftRock to the Parallel Port (this will disable the sense logic via the Parallel port).

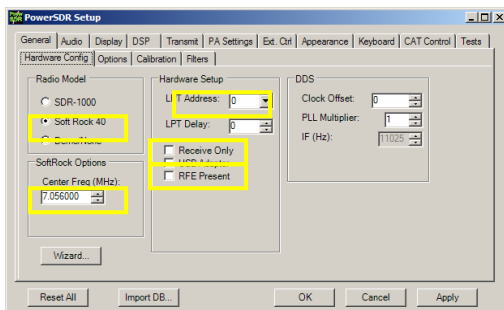


Figure 1 Hardware Config Settings that require attention

Ensure that Update Notifications is disabled, since new releases issued by FlexRadio Systems overwrite these PowerSDR sr40 extensions. Ensure that Spur Reduction is disabled, since no DDS (Direct Digital Synthesis) is used by the SoftRock, but a fixed crystal oscillator. The increment of Process Priority to Above Normal, will make the software less suspicious to interrupts in the signal processing in case other applications are busy. Ensure that Disable PTT is disabled, since we would like to use a VOX or external PTT input to enable the transmitter.

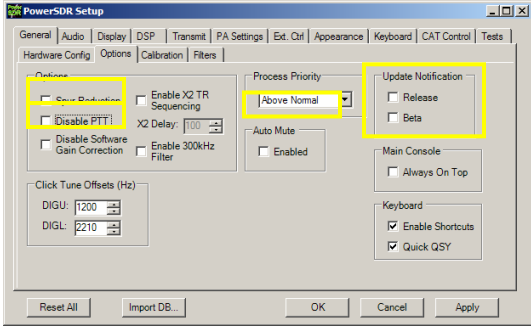


Figure 2 Options Settings that require attention

Single Soundcard Audio Setup

The SoftRock RXTX may use a single soundcard. In this configuration, it is required to connect your phones to the Phones output of the SoftRock RXTX, a microphone may be connected directly to the soundcard. Please see Dual soundcard setup section if you do not like this setup.

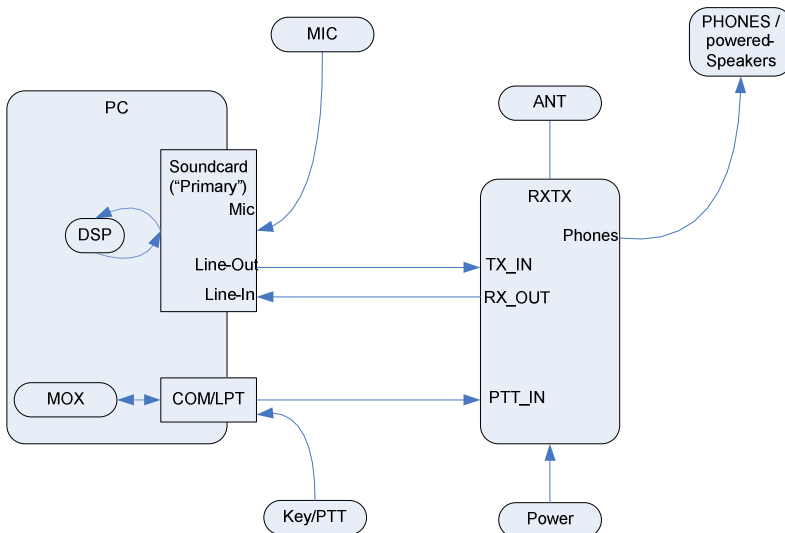


Figure 3 Interconnections for Single Soundcard Setup

The tab Sound Card, configures the Audio Device that is connected to the SoftRock RXTX and to the Phones and Microphone.

Select in the Sound Card Selection your device. If you an Unsupported Card, continue, else your Soundcard setup is finished.

Ensure Unsupported Card is selected. Set Channels to 2, to indicate that there is input and output channel.

Select MME Driver, or experiment with Windows WDM-KS Driver if you like to reduce latency by directly interface with the Audio driver.

Select the Soundcard for both input and output that is connected to the SoftRock.
Select the highest supported Sample Rate.

Set a Buffer Size (such as 1024), try what works well.

Set Latency to an acceptable value (80 might be a good value for MME Driver; 1 for Windows WDM-KS Driver, try a value that works well)

Some Soundcards delays the left or right channel stream. To correct this, apply an IQ correction. The correction is the number of samples shifted in time applied on the left channel. This Soundcards base on a chipset PCM290x, WM8775ED5 (such as Creative SoundBlaster Live! 24 bit Internal) should apply an IQ Correction of 1.

Select the Mixer of the selected Soundcard. The mixer will switch microphone and receiver input. Select in Receive, the Line-In input that will be used for I/Q Processing during RX. Select in Transmit the Microphone that will be used for Audio Processing during TX.

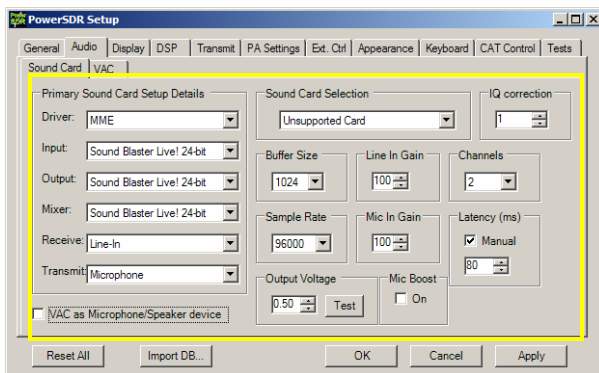


Figure 4 Sound Card Settings that require attention

Set Output Voltage to the value that appears on the line, when you press Test. For most soundcard this will be in the around 0.4 - 0.9V. Adjust it near the maximum output (not more than that since this would results in distortion).

Dual Soundcard Audio Setup

This section describes how to setup audio in case you choose to use two soundcards; one dedicated for I/Q processing, the other dedicated for Audio processing.

In this case, you may connect the microphone and speaker directly to the soundcard that is dedicated for Audio processing.

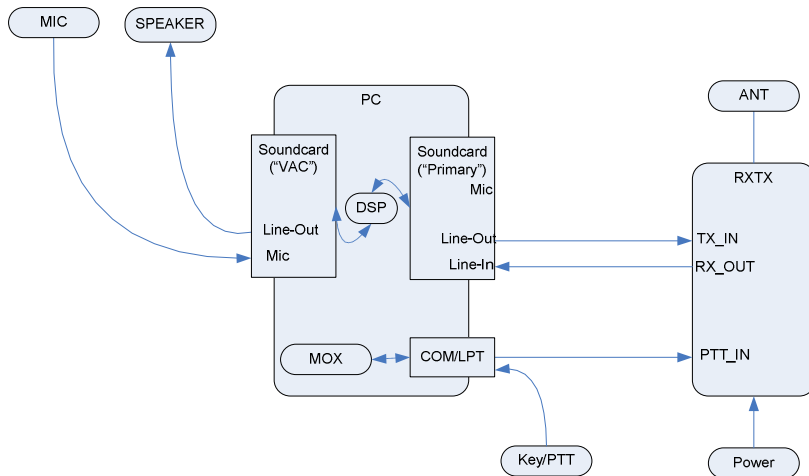


Figure 5 Interconnections for Dual Soundcard Setup

To achieve Dual Soundcard support, the VAC functionality within PowerSDR will be re-used as a secondary Audio Device. This might be misleading, but you do not require installing the VAC driver.

The tab `Sound Card`, configures the Audio Device that is connected to the SoftRock RXTX.

Ensure `Unsupported Card` is selected. Set `Channels` to 2, to indicate that there is input and output channel.

Select `MME Driver`, or experiment with `Windows WDM-KS Driver` if you like to reduce latency by directly interface with the Audio driver.

Select the Soundcard for both input and output that is connected to the SoftRock. Select the highest supported `Sample Rate` to see the largest portion of the band.

Set a `Buffer Size` (such as 1024), try what works well.

Set `Latency` to an acceptable value (80 might be a good value for `MME Driver`; 1 for `Windows WDM-KS Driver`, try a value that works well)

Some Soundcards delays the left or right channel stream. To correct this, apply an `IQ correction`. The correction is the number of samples shifted in time applied on the left channel. This Soundcards base on a chipset `PCM290x`, `WM8775ED5` (such as `Creative SoundBlaster Live! 24 bit Internal`) should apply an `IQ Correction` of 1.

Optionally, do not select a `Mixer`, but ensure that the `Input` and `Output` signals are selected in the `Windows Audio Mixer`.

Set `Output Voltage` to the value that appears on the line, when you press `Test`. For most soundcard this will be in the around 0.4 - 0.9V. Adjust it near the maximum output (not more than that since this would results in distortion).

Enable VAC as Mic/Speaker device, this will mute VAC output when transmitting, and will mute Sound Card output when receiving (use this in combination with VAC Enabled).

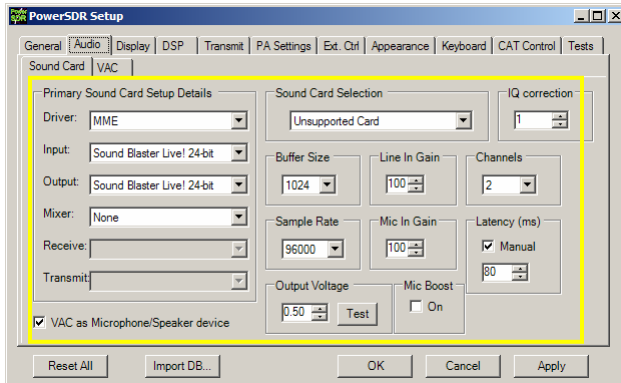


Figure 6 Sound Card Setting dedicated to I/Q Processing

The tab VAC, configures the Audio Device that is connected to the Microphone and Speaker.

Ensure VAC enabled, this will redirect audio to/from the selected device.

Select MME Driver, or experiment with Windows WDM-KS Driver if you like to reduce latency by directly interface with the Audio driver.

Select the Soundcard for both input and output that is connected to a speaker and microphone. This will normally be your default device Microsoft Sound Mapper. Select the lowest acceptable Sample Rate for audio processing, such as 11025 Samples/s; using the same Sample Rate as for the Primary Sound Card may reduce latency.

Disable, Enable Stereo, Stereo might consume more performance.

Set a Buffer Size (such as 1024), try what works well.

Set Latency to an acceptable value (80 might be a good value for MME Driver; 1 for Windows WDM-KS Driver, try a value that works well)

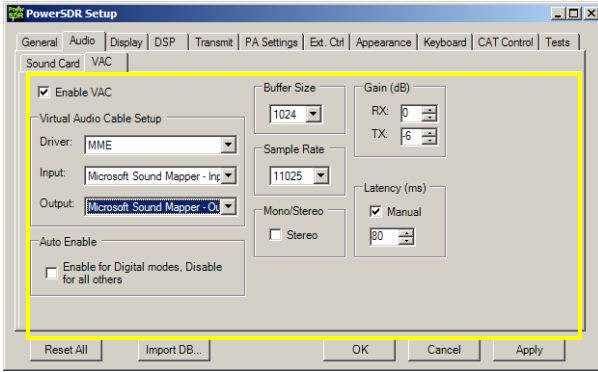


Figure 7 Sound Card (VAC) Settings dedicated to Audio Processing

Hardware Setup

Serial Interface

PowerSDR can be used with SoftRock RXTX, via the serial port. It is important to connect your SoftRock as in the table below or see schematic [10]. PowerSDR should be Setup as:

You must open a COM port as the Primary port using Setup > DSP > Keyer. If you have trouble opening the COM port, go to Setup > CAT control and disable CAT Control, which could be contending for the COM port.

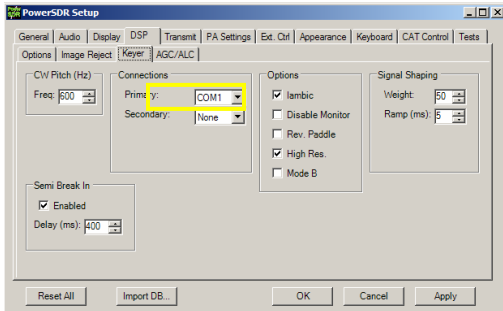


Figure 8 Hardware Config Settings that require attention

After doing this you should be able to get PowerSDR to switch the RXTX from RX to TX mode when you press the MOX button.

Attach SoftRock RXTX as:

SR T/R Line	RTS (pin 7)	This will go HIGH when in XMIT, LOW for receive
GND to SR	GND (pin 5)	

There is also support for attaching a keyer and the Soft Rock T/R line to the same serial port. To do this:

Attach Key as:

Common Output to key paddles	DTR (pin 4 on a 9 pin D shell serial port)	This is NOT ground, it will be sitting at +9-12V or so when PowerSDR is running
Dot	DSR (pin 6)	
Dash	CTS (pin 8)	

Note:

Dot and Dash also function as PTT when the mode is not CW

The common output, dot and dash work very nicely this way with just a couple resistors and capacitors at the serial connector.

Parallel Interface

If you do not have a serial port, you may alternatively use the Parallel Port for interfacing with your SoftRock RXTX. The original SDR-1000 hardware is using to PC Parallel Port to interface the radio. Although it is believed that the commonly accepted way to interconnect your SoftRock RXTX is via a serial interface, you still may choose to interface SoftRock via the Parallel Port. To do so;

Set the LPT Address to the Parallel port that interconnects the radio. Generally 378 or 3BC is used for LPT1. Ensure that RFE Present is enabled, in this way you do not need a clocked T/R signal.

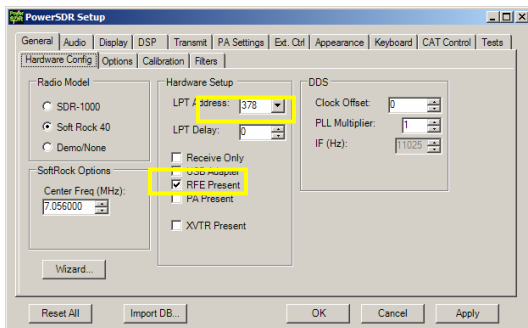


Figure 9 Hardware Config Settings that require attention

The following signals on the Parallel Port are used:

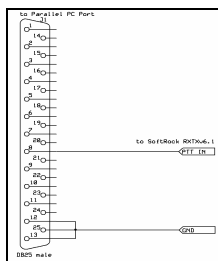


Figure 10 Schematic for interconnecting RXTXv6.1 to LPT

Attach SoftRock RXTX as:

D6 (pin 8)	SR T/R Line	In XMIT this is HIGH
GND (pin 18-25)		

Note: Connect pin 12, 13 (dot, dash) to pin 25 (GND), otherwise PowerSDR will keyed

Note2: C1- (pin 14) may optionally used as clock for T/R data (pull up)

Optionally, attach Key as:

S5+ (pin 12)	keyer (dot) or PTT switch	Inverted, pull down to GND
S4+ (pin 13)	keyer (dash)	Inverted, pull down to GND

Using VAC with third party applications

You may also use VAC to interface with an external third party application such as MixW. Install the Virtual Audio Cable loopback driver [8], and N8VB vCOM Virtual Serial Ports Driver [9].

Setup the N8VB vCOM Virtual Serial Ports Driver. Connect COM6 to COM16, COM7 to COM17.

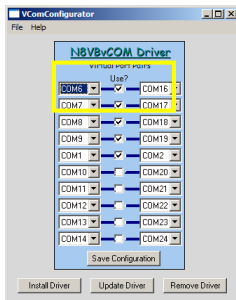


Figure 11 N8VB vCOM Virtual Serial Ports Driver Settings

Setup the N8VB vCOM Virtual Serial Ports Driver. Add two cables.

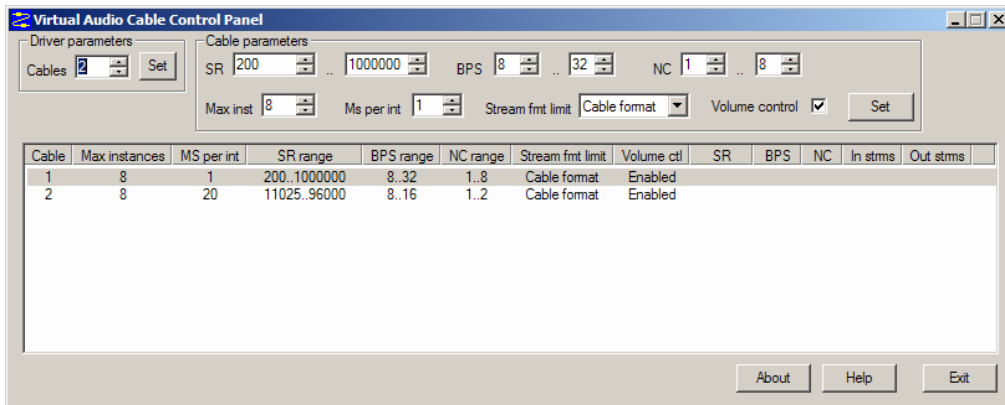


Figure 12 Virtual Audio Cable Settings

Set CAT Control Setting to COM16. Enable CAT. Set ID to TS-2000.
Set PTT Control Setting to COM17. Enable RTS. Enable DTR. Enable PTT.

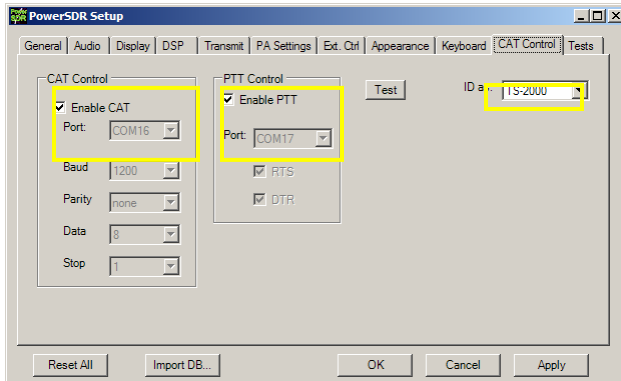


Figure 13 CAT Control Settings that require attention

Set Secondary connection to CAT.
Set PTT line to DTR. Set Key line to RTS.
Disable Semi-Break-In, since MOX switching is slow and may break the first signs.
Disable Monitor (and also when MOX is pressed disable MON), since the monitor function is broken since it does output I/Q signal.

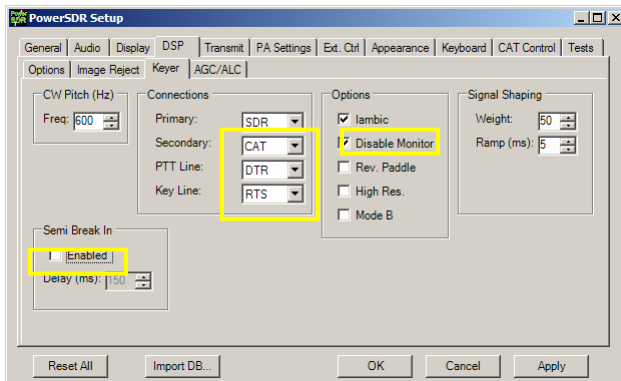


Figure 14 DSP Keyer Settings that require attention

In the Audio VAC Setup, choose the Virtual Cable 2 as Input, Virtual Cable 1 as Output.
Ensure that the lowest acceptable Sample Rate for audio processing is select, such as 11025 Samples/s; it is important not to overload the third party application.

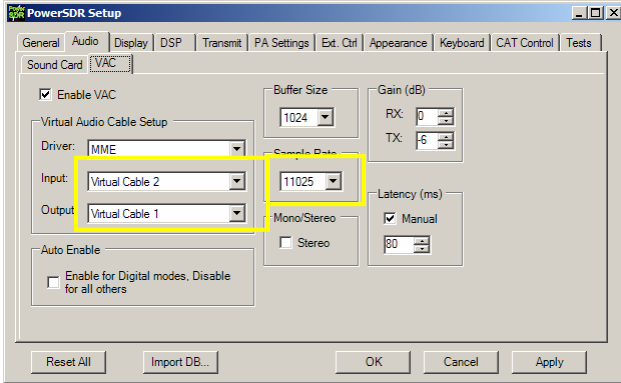


Figure 15 VAC Audio Settings that require attention

In the third party application (such as MixW, DigiPan) the following devices are available:

CAT Control	COM6	use RTS as CW, DTR as PTT.
PTT Control	COM7	use RTS or DTR as PTT.
Sound Input	Virtual Cable 1	
Sound Output	Virtual Cable 2	

Note: Use a sample rate that is same as defined in VAC Audio Settings in PowerSDR.

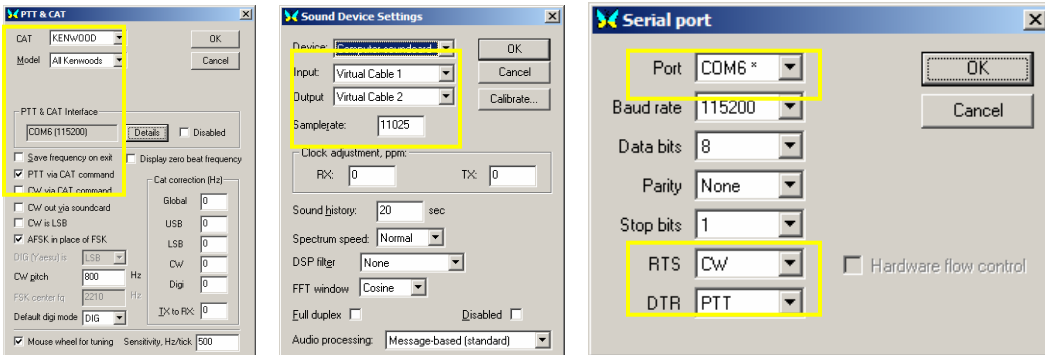


Figure 16 Example of MixW Settings: CAT Control interface is used

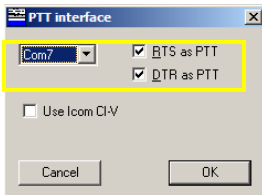


Figure 17 Example of DigiPan Settings: PTT Control interface is used

With the usage of a Third Party application, you may monitor the Audio by using the Audio Repeater simultaneously. Select as Wave in: Virtual Cable 1 , Wave out: Microsoft Sound Mapper and select a Sample Rate of 11025 (same as in PowerSDR VAC Setting).

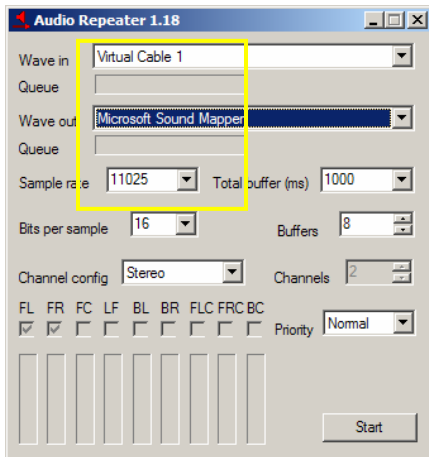


Figure 18 Audio Repeater as used for monitoring

Digital modes

It is important to set appropriate TX and RX filters; use a filter bandwidth that is equal or less than half the Sample Rate as is set in Audio VAC Settings tab. Thus use a bandwidth of 150-5150 Hz ($\sim 11025/2$ Hz).

In the Transmit tab, set the bandwidth in the Transmit Filter, and store the settings in a new profile named DIG.

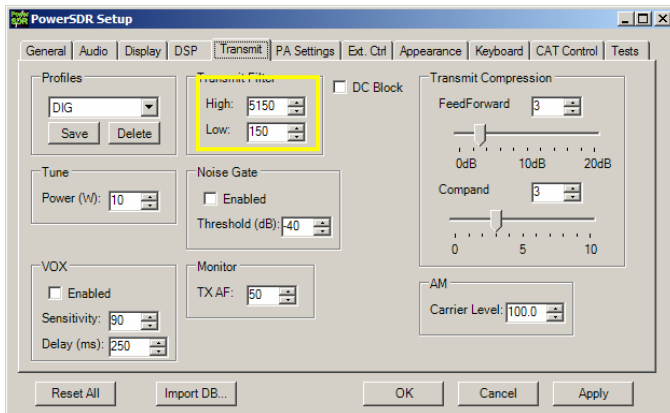


Figure 19 Transmit Settings that require attention

In the Console, choose Mode DIGL or DIGH and set the receive Filter bandwidth of 5.0k. Select the TX Profile DIG.

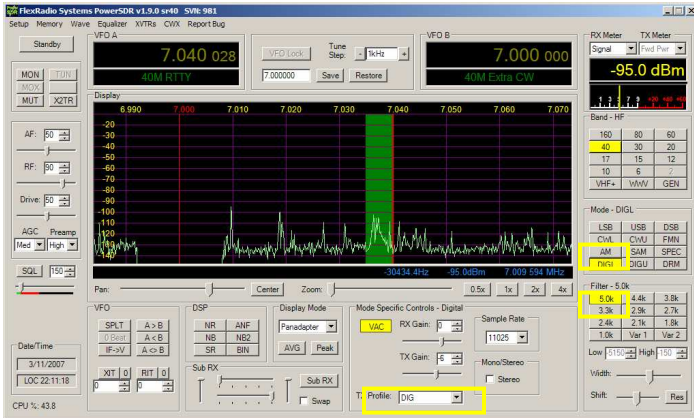


Figure 20 Console Settings that require attention

CW

Ensure that PTT is ON in advance of keying, and ensure that PTT goes OFF after at least a space duration in CW, this to deal with and prevent slow MOX switching.

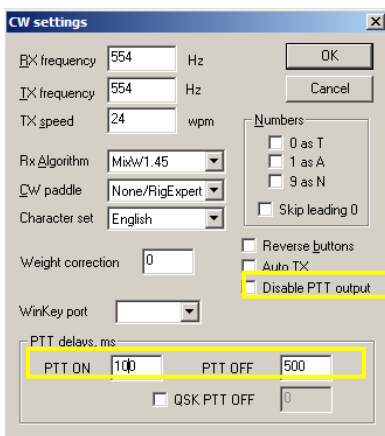


Figure 21 Example of MixW Settings: Setting up CW

Final words

Please consult PowerSDR Operation Manual [7] regarding the use of the software.

Good DX,
73, Guido PE1NNZ

References

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