EXPERT ELECTRONICS

Software Defined Radio

User Manual Addendum Version 6.13 May 2022

MB1 – SunSDR2 – Colibri – ESDR* Software

This document was devised and written by

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1 About this Manual

1.1 Purpose

This guide is intended for users of different degrees of knowledge and experience with the Expert Electronics ESDR* software system.

- The system users can learn how to extend the functionality of their EE product, especially by attaching digital mode software, contest software and other bolt-on products.

This guide assumes that you have some knowledge of the Windows operating system and the ESDR* system. For more information, see the appropriate documentation for your transceiver / receiver.

1.2 Why This Manual Was Written

I acquired my Expert Electronics MB1 in August 2016. The memory of the day I unboxed it and set it on my operating desk is firmly etched on my mind. After verifying CW and SSB transmission, I was lost. How to work digital modes? How to maximise performance? How to interface my amplifier? What to do? Little help was at hand. Fortunately for me all things technical come easily. I could work it out. But it was a long laborious task and one which, I could see, would put off a lot of people. I decided to document every step of what I did.

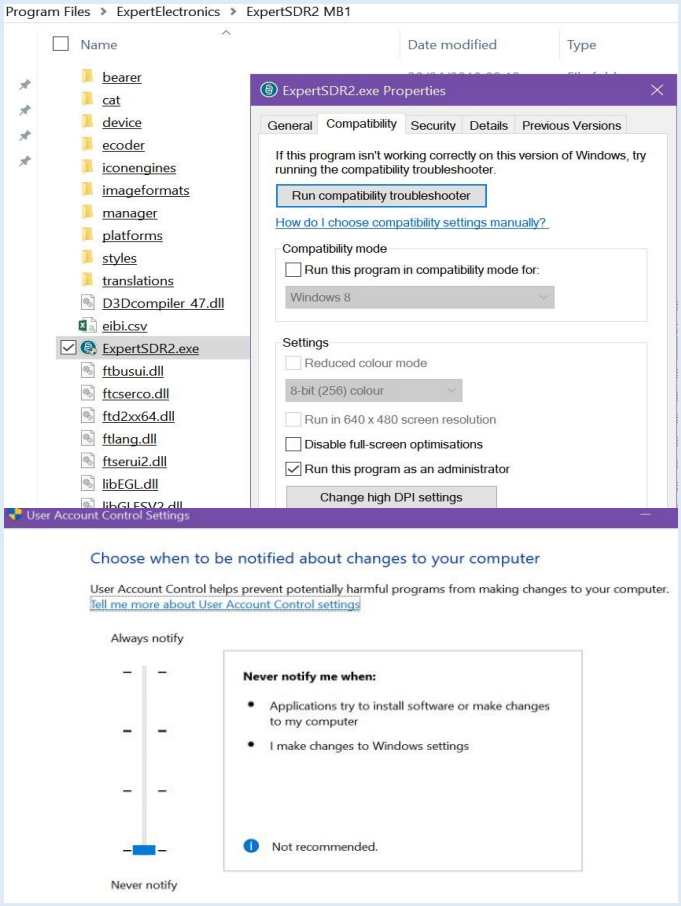
1.3 Scope

The first versions of the User Manual Addendum were written from the perspective of an MB1 owner. I publicised its existence. It became popular, even being translated and published in Japanese. However, through input from many people, I came to realise that whilst not explicitly saying so, it also covered the SunSDR2 + other EE products and the Expert SDR software generally. Because my pictures come from ESDR* interfaced with an MB1, this latest version is still MB1 biased. But everything contained herein is adaptable to your product. The only real difference between the MB1 and the SunSDR2 is that in the MB1 the computer and SDR are in the same unit.

1.4 System Organisation

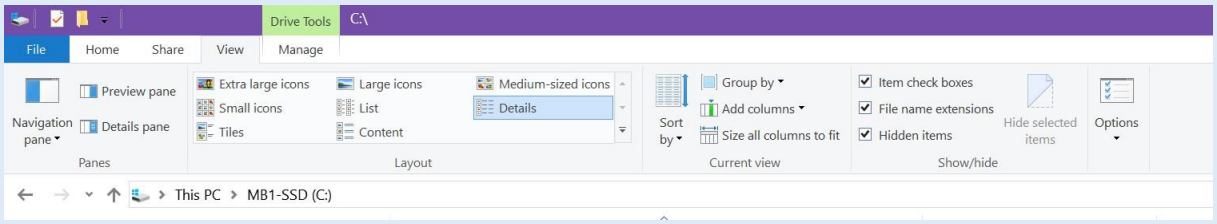
Ensure you have version 1.3.1 Update 8 or later of ESDR* software and latest firmware installed. MB1 owners and SunSDR2 owners with 64bit computers should use the 64bit version of ESDR*.

For ESDR*, and indeed every software package that you install, ensure that you set in the Properties of the exe file, ‘Run as Administrator’.



Unless you have a serious aversion to doing so, set the Windows User Account Control at its minimum settings.

Some of the following instructions require access to so-called ‘hidden files’ in the Windows file system. You will also need to see the file extensions. In any Windows File Explorer window, go to View and set to on the three attributes you see in the picture below.



1.5 ESDR* Software Versions

This edition of the UMA is illustrated by pictures from the 1.3.x version of ESDR2. There are some changes in 1.3 compared to 1.2 that are detailed below.

It is no longer possible to set a VAC Line to PC MIC as described in section 12. For a remote input to the radio, the solution is to set this VAC Line in Soundcard>Mic Input.

CPU utilisation is much higher in 1.3 such that slower computers, including the MB1 i5-6400, suffer when using other high CPU cycle software such as WSJTx/JTDX.

See section 6.12. Running multiple instances of WSJTx/JTDX with one on each of the two receivers is compromised in 1.3.x because of high CPU utilisation. If you also run other software such as a logger with DX Cluster / Band Maps, the MB1 with i5-6400 CPU can only do it, and preserve maximum WSJTx/JTDX decoding efficiency and accurate PTT switching, with ESDR2 1.2.0. Recent JTDX versions are in 64bit exe with a significant performance increase. This may mitigate the ESDR2 issue, though I would recommend MB1 basic owners upgrade the hardware.

Not all the actions in section 9.5 of the UMA, Settings for DX Working, can be applied in ESDR2 1.3, specifically the AGC Threshold parameter. It has been removed in 1.3 and hence it is not possible to ensure that very weak signals can be heard. This applies to CW mode. Some DSP enhancements incorporated from Beta 7 onwards allow for digital operation on a par with 1.2. The importance of AGC-T can be seen at https://www.youtube.com/watch?v=Hwm6rszuMis

The workaround is to turn AGC off but I cannot recommend this action due to the severe risk to the receiver, and your hearing, should a very strong signal or intense QRN appear in the passband. Other than remain with 1.2, if CW mode receiver performance is important to you, the only other mitigating action is shown in section 9.5 but this is not a real substitute.

ESDR3 was released in May 2021. CPU utilisation is much improved in this version. AGC optimisation is further reduced. General references to ESDR2 have been changed to ESDR*. I have no intention of updating this manual further but the content should be adaptable to ESDR3 if this becomes your version in use.

2 How to Set Up VAC

The minimum number of virtual audio cables (and COM ports) required to use your radio is zero. You can attach an antenna and microphone/key, switch on, run ESDR* software and be on the air. If you want to use digital modes, a logbook, contest software, a CAT controlled amplifier or another CAT device, virtual audio and virtual COM software can be installed.

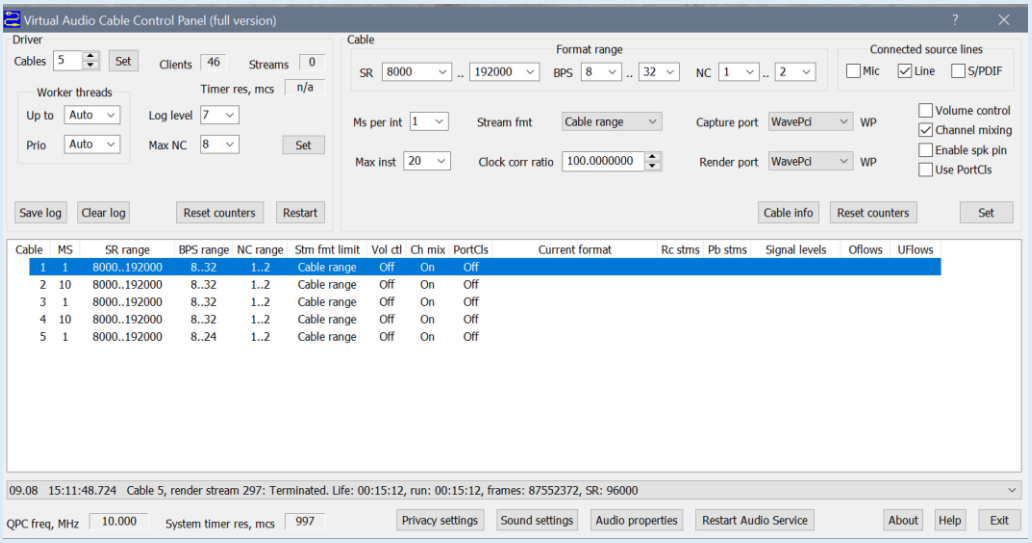
2.1 Key Features

No matter the complexity of your demands, the following procedures will cover all requirements. Merely adapt to what you need for your particular product and operating environment.

2.2 Download Link

VAC Virtual Audio Cable: http://software.muzychenko.net/eng/vac.htm

2.3 VAC Set Up



To allow the connections between ExpertSDR2 and various software, it is necessary to create up to 9 virtual audio cables (10 cables if you use remote operation via Skype). For basic digital operation, like RTTY or FT8, you need only 2 cables per receiver. *Do not create more cables than you need, you can add to them later if necessary*. Run VAC with administrator privileges. You will see the configuration screen.

Top left, Driver parameters, increase the number of cables to 9 (or whatever you require – you can add to them later if needed) and press Set.

For cables 1 to 4 inclusive, the Cable parameters are 8000…192000

For cables 5 and 6, the Cable parameters are 22050…192000

For cables 7 to 9 inclusive, the Cable parameters are 22050…96000

For cable 10 (used with Skype for remote) set the same as cable 1

The Format Range should be 8..24 for all cables unless you have the 32 bit sample size JTDX version in which case the parameter for VAC 1, 2, 3 and 4 is 8..32. VAC versions prior to 4.60 also have a Stream Buffer setting which should be put to 10ms.

NOTE: For Windows 10 version 21H1, the latest since May 2021, whatever version of VAC was being used needs to be updated to the latest 4.65 if you use GFSK modes such as FT8. In this Windows version using VAC 4.65, the MS per Int figure for the RX line VAC 1 should be set to 1. For the TX line VAC 2, the MS per Int setting should be 10. The Capture and Render ports need to be set to WavePCI. The ESDR* VAC buffer size can be set to 512 samples. Some users, not many though, successfully use 256 samples. Audio enhancements are meant not to be applied in ESDR* when using DIGu mode but complaints suggest that Limiter is still active. To be sure, turn it off for FT8 operation.

VAC 1 to 4 are used for digital communications TX and RX.

VAC 5 and 6 are used for I/Q Skimmer (Afreet CW Skimmer).

VAC 7 is used for connection audio I/O Skimmer. Mostly an obsolete requirement.

VAC 8 is used for line output ESDR* (e.g. recording audio into Audacity etc).

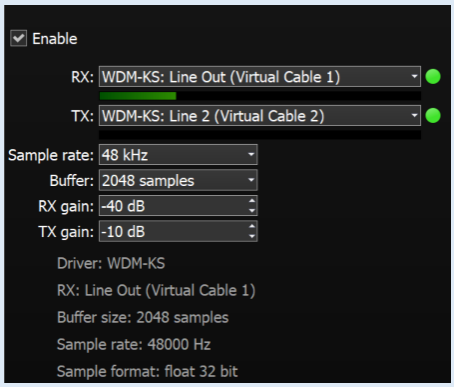
VAC 9 is used for monitoring SSB through the MB1 sound card for a Digital Voice Keyer (DVK) and recorded audio playback. With 'MON in SSB for VAC' in ESDR* enabled, VAC 9 is unnecessary. VAC 10 is used for remote working and connecting Skype to the radio.

NOTE: Should the software report an error when trying to save the configuration, stop the Windows Audio Service (go to Services). It can be restarted after VAC has been set up.

NOTE: Registered users of VAC, wanting to update to the latest full version, need only amend the original download link sent by email to them, changing the version number. For example, if 415 appears in your download link, change it to 465.

NOTE: ESDR2 1.3 has an upgraded TCI protocol which is a transport system for CAT and audio. This means that VAC can dispensed with for software that has adopted it. JTDX is a prime example where, in the latest versions, both CAT and audio can be via TCI.

2.4 Setting VAC in ESDR*



In Options>Device>VAC set the RX to VC1 and TX to VC2. The sample rate is 48000Hz. Keep the gain settings at the default 0dB for the time being. They may need to be adjusted later if JTDX or WSJTx is used. Buffer here is set at 2048 samples in VAC version 4.64 but some users successfully use 256 samples. The lower size means less latency but can give rise to audio artifacts.

3 Virtual COM Port Setup

Virtual COM ports are defined in software and, in an SDR, they replace physical ports. This is the same principle as VAC replacing wired audio connections.

3.1 Download Link

Virtual Serial Port Emulator: http://eterlogic.com/Products.VSPE.html

NOTE: For all features listed below, install version 1.0.5.443 or later.

3.2 VSPE Set Up

Install Virtual Serial Port Emulator. The 64bit version launches with a pop-up box asking for paid registration. This is at a nominal cost but the software will run perfectly well if the box is simply dismissed.

This document works on the premise that the first virtual port is COM 5. This is because in the MB1 its physical port is COM1. Some computers reserve COM 2. The use of a Winkeyer for CW and a USB connected control panel for an amplifier require COM ports 3

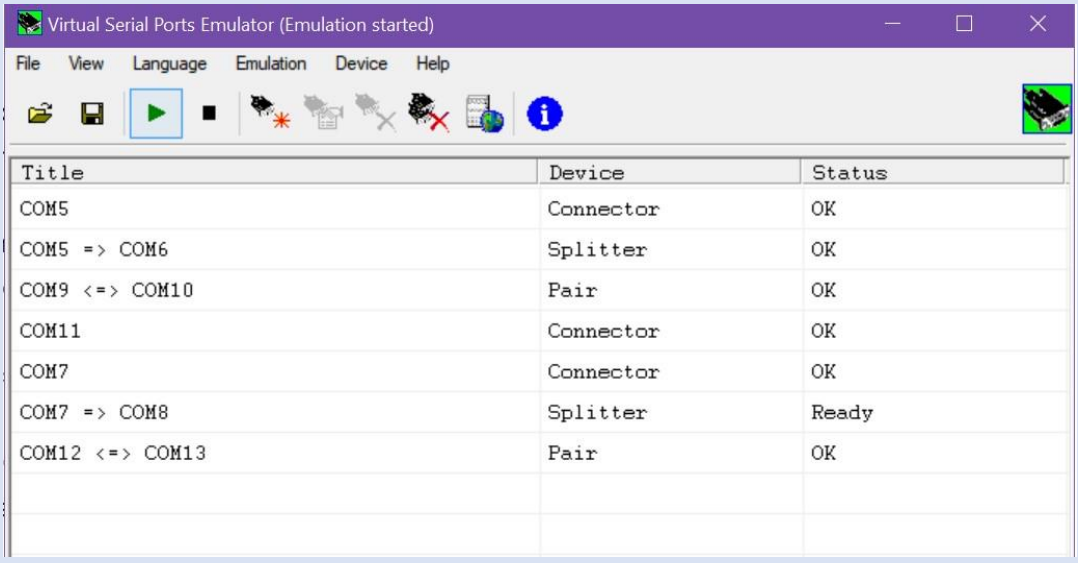
and 4. Hence COM 5 is the starting point. Of course, you are free to nominate your own numbering. Just adapt the instructions that follow accordingly.

For CAT to software such as a logbook, digital mode software etc, the COM port pairs 5>6 for CAT and 9>10 for PTT is all that are required.

From the top menu, go to Device and Create. Select Connector and set it to COM 5. Repeat Device > Create, now choose Splitter and set it to Virtual Port 6 and Data Source Serial Port 5.

Use Device > Create > Pair to make the COM 9 and COM 10 pair.

NOTE: As you go through the set up in VSPE, you will see in some cases the option 'emulate baud rate'. Always set this on. Ensure that the baud rate setting is 19200.
NOTE: RTS and DTS default to on during Splitter creation. Normally they can remain so.



Here is an example of VSPE fully set up for all the functions that will be described in the next pages.

The first 3 lines result from the instructions above. Later we will see the purpose of COM 11. The last 3 lines relate to the 2nd receiver if it is used.

When finished with the setup, go to File and Save As: save to the desktop or other suitable location. The simplest location is the root drive, example save to C:\config.vspe

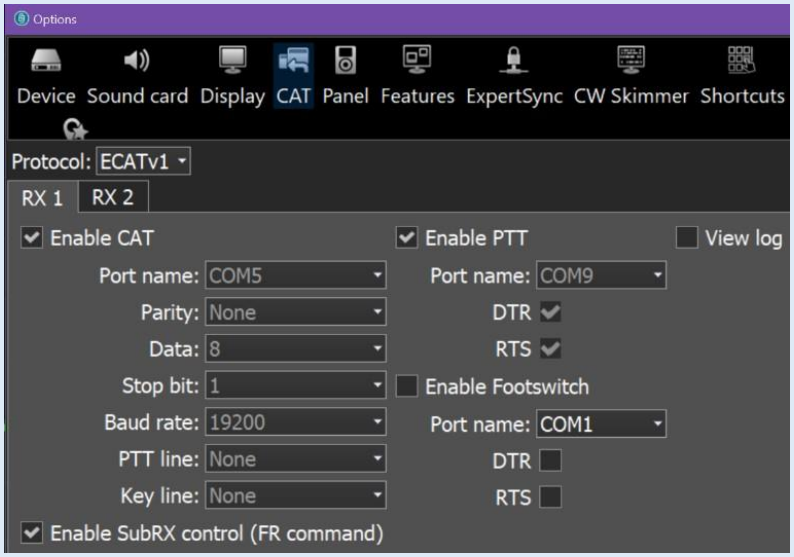
The configuration file must run before ExpertSDR2, therefore ensure ESDR* does not load at boot up.
To make VSPE run automatically at Windows boot, and to minimise CPU load, the latest versions can be run as a Windows Service. You must have an activated version.

Click ‘Helpers’ > ‘Set Up as a Windows Service. Press the ‘Open VSPE Configuration file’ button and navigate to your saved config.vspe file. Follow the instructions. When pasting the command line, do it only in a CMD command window (run as administrator) and do not try to use Powershell. The Service will be created but then go into Windows Services, locate EterlogicVspeService, and ensure its properties are set to Automatic and not Manual.

VSPE will run on Windows boot to create the ports, connectors and splitters and then close but leave them running.

3.3 Setting CAT in ESDR*

Open ESDR* Options and select the CAT tab. The settings for CAT and PTT (used by some of the software described later) are shown in the picture below. Do not set PTT line and Key line unless you find you need them otherwise some software will assert PTT when you don’t want it.



CAT protocol ECATv1 is identical to Kenwood TS-480. The ports used in ESDR* are the source side of the COM port pairs. Your 3rd party application software will be set to COM 6 for CAT and COM 10 for PTT, as we will see later.

ESDR2 versions from 1.2.0 onwards have Omnirig as an alternative CAT method. Setting up Omnirig is explained later. Not all 3rd party software can access Omnirig and so I do not recommend using it here unless you have a specific reason for doing so.

3.4 A VSPE Case Study

A common question asked of me is how to configure VSPE for port sharing between, for example, a logbook program and a digital mode program. In this example the radio owner had Logger32 and FLDigi, neither of which are compatible with Omnirig. He therefore needed an alternative way of directing CAT to both applications.

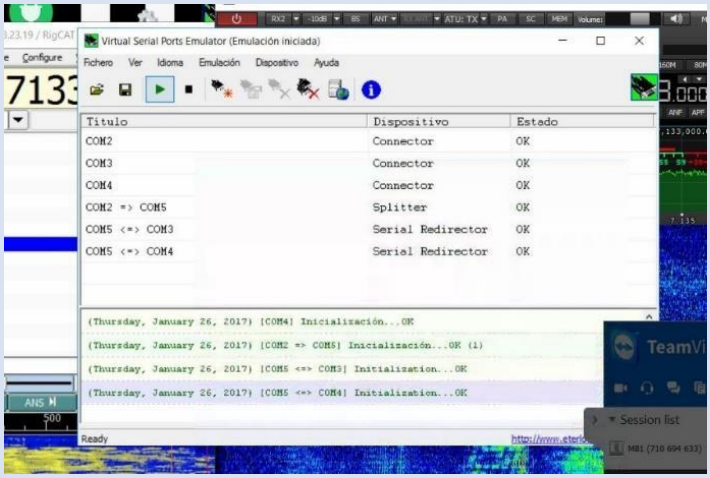
IN ESDR*, the CAT port had been defined as COM 2. In other respects, the CAT parameters are as per the above picture. To get the desired result:

Create a Connector, COM 2 – as usual, tick ‘emulate baud rate’.
Create Connectors COM 3 and COM 4

Create a Splitter COM 2=>COM 5

Create a Serial Redirector COM 5<>COM 3

Create a Serial Redirector COM 5<>COM 4
VSPE will therefore be configured thus:



Save this configuration and have it load before ESDR*.

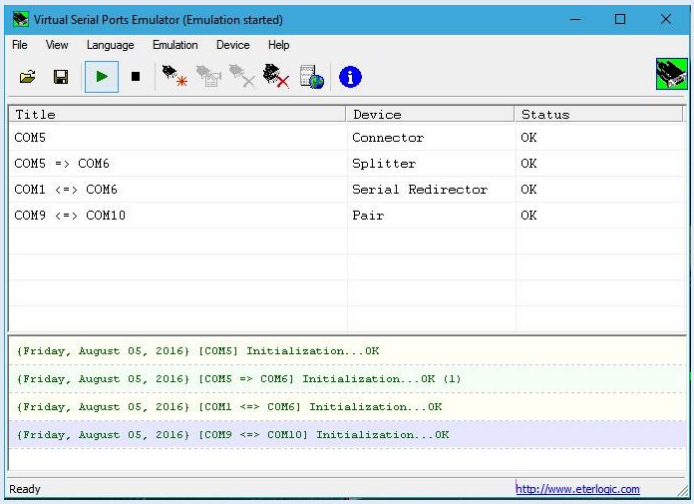
Configure Logger32 to use COM 3 and configure FLDigi to use COM 4.

3.5 VSPE for CAT Controlled Amplifier

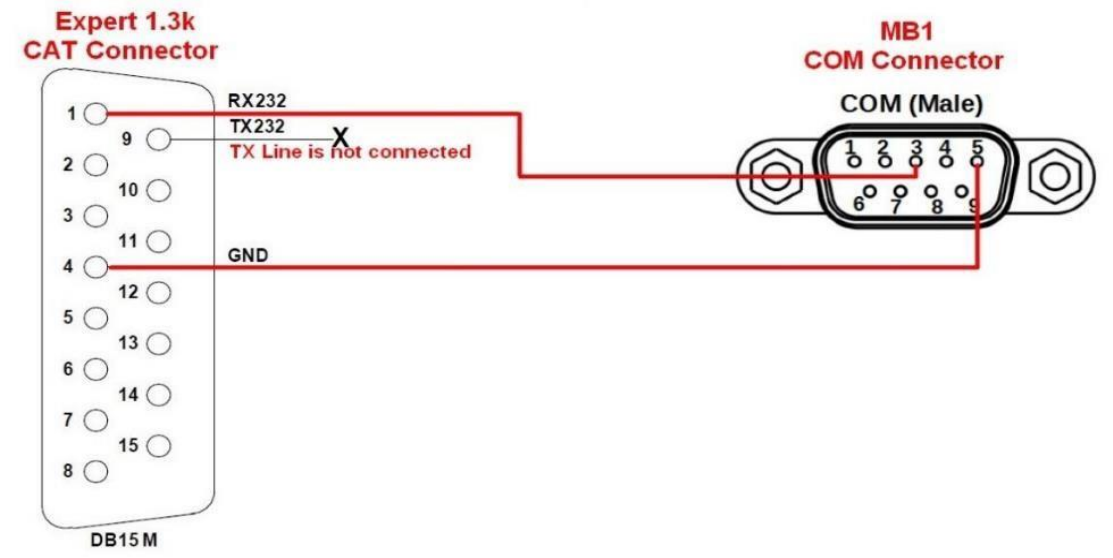
If you use SDC (see later in the Manual), use its PA interfacing via TCI facility. If you do not use SDC, set up CAT interfacing in VSPE as follows.

NOTE: this is written for the MB1 but the principle is the same for whenever you need to redirect CAT from COM 6 to another COM port.

NOTE: the example given here is for the SPE 1.3k-fa so therefore adapt to your own CAT controlled amplifier or another device.

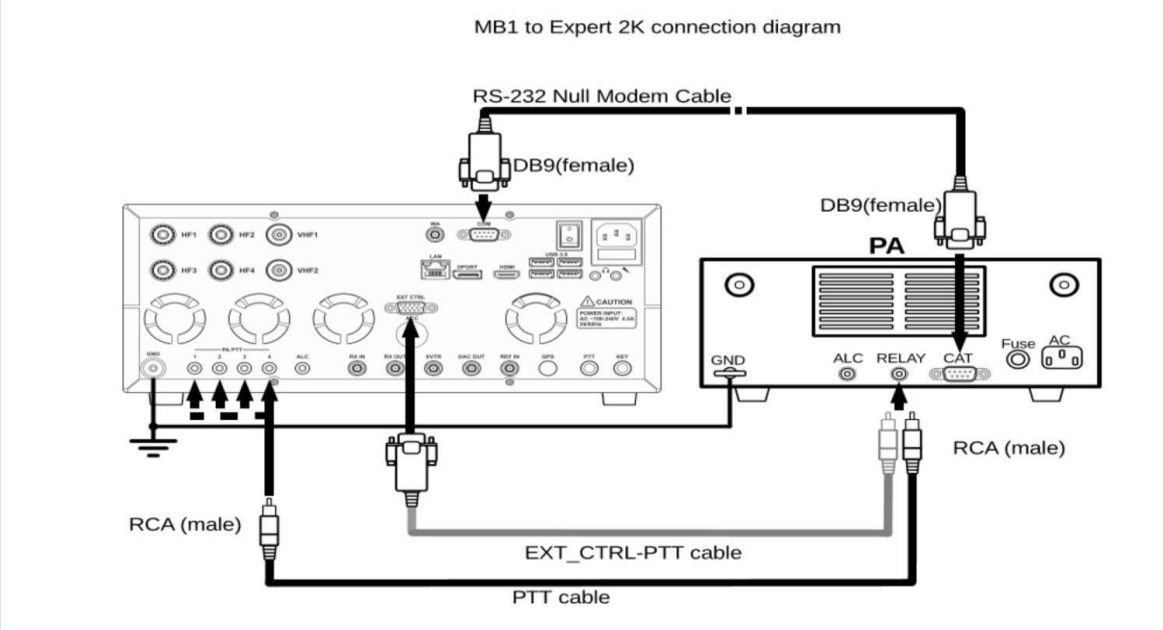


In VSPE redirect COM 6 so that it transfers data from COM 5 to COM 1 (the physical hardware port on the MB1). Go to Device > Create > Serial Redirector and select COM 1 on the left and COM 6 on the right. Remember to save the VSPE configuration. The result can be seen in VSPE – see COM1<>COM6 Serial Redirector in the picture.



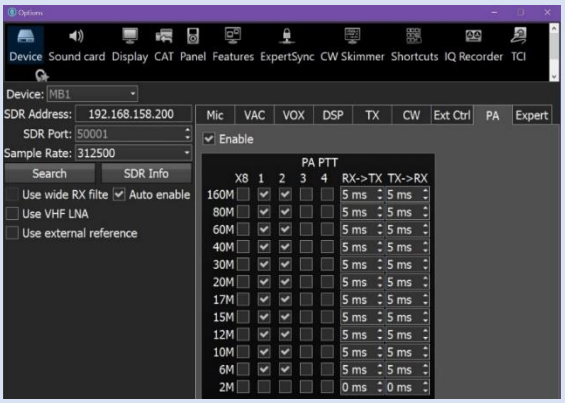
By virtue of having redirected COM 6 to COM 1, the MB1 hardware port now carries CAT data. It can be used for connecting to another computer, via a null modem cable, or to an external device CAT port. For a CAT controlled amplifier, a fully wired null modem cable is

not required, though it can be used providing the pin assignment is correct. The pin diagram for the SPE Expert 1.3k-fa is shown above.



ALC is not connected. As at ESDR2 1.3.1 Update 8, ALC has not yet been implemented.

In ESDR*, for PA control, turn on PA and set up PA PTT in Options. Avoid hot-switching by setting a delay of at least 5ms. The headings X8, 1, 2, 3, 4 refer to the PTT connectors on the MB1 rear panel.



NOTE: The PA PTT delay is active for all modes except CW. In ESDR2 there is a cryptic message: “PTT switching delay disabled” but, contrary to the implication, the PTT delay in CW cannot be enabled because it does not exist. Therefore, for a hard-wired key, achieve the required delay with the Break-In setting. For COM port keying and Winkeyer, set the required delay in the software.

NOTE: Using SDC and CAT via TCI instead of VSPE is covered in section 5.9 of the Manual. Where TCI can be used, this is by far the better method. SDC allows CAT via TCI to be transferred to any number of virtual COM ports. Therefore, TCI and SDC (Rig emulator on the TCI tab) can be used for software, amplifiers, other external devices. This renders VSPE somewhat redundant.

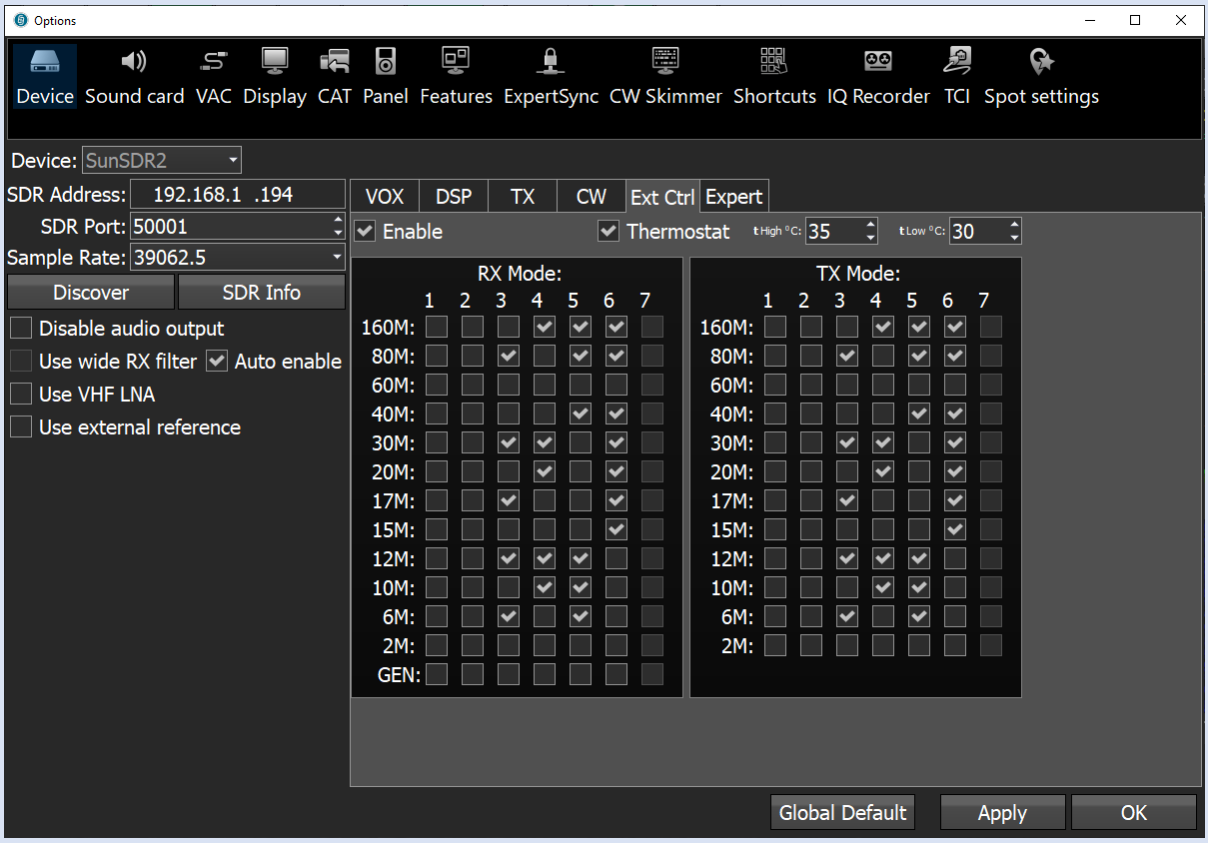
4 Binary Code Decimal (BCD) by Ray G3XLG

Some amplifiers are designed to receive Binary Code Decimal information from the radio to enable them to automatically change bands, e.g. Elecraft KPA500 and KPA1500, in preference to “sniffing” the rf from a couple of “dits” on the key.

BCD can also sometimes be used to change antennas on an antenna switch e.g. the Antenna Genius from 4O3A which, like the Elecraft amps, has a built in BCD decoder. Binary Coded Decimal is a process for converting decimal numbers into their binary equivalents and has been implemented in ESDR* for the MB1, SunSDR2Pro and derivatives.

The system in transceivers was probably pioneered by Yaesu where the different bands were coded as follows: Binary code / Band: 0001 160m, 0010 80m, 0011 40m, 0100 30m, 0101 20m, 0110 17m, 0111 15m, 1000 12m, 1001 10m, 0101 6m. The built in Band Decoder provides source driver outputs, which provide a source of 12Vdc for the “hot” side of external relays or switches in the amp or antenna switch.

To use in the EE transceivers, it is necessary to set up the codes in the External CTRL table. See Options/Device/Ext CTRL exactly as below, where we are using Key 3,4,5 & 6 in both the RX & TX mode table for Bits 0, 1, 2, 3..



A 4-wire cable must then be made up to plug into the Ext CTRL socket on the transceiver and to, for example, the AUX socket of a KPA500 amp. Use a DB15 male plug for the EE transceiver end and either a male or female plug for the amplifier end as appropriate. (Beware of buying VGA cables which are not wired pin to pin in some cases). It is convenient to at the same time add four more wires to the cable to enable the amp PTT line, 12Vdc, Ground connection and a wire for a thermostatically controlled fan for the SunSDR2Pro. (4th additional wire not needed for the MB1 which has a built-in fan.

Make-up of the cable: -

4 wires for BCD to the KPA500

Pin 2 X4 Bit 1

Pin 7 X3 Bit 0

Pin 8 X6 Bit 3

Pin 12 X5 Bit 2

Optionally three wires to include amplifier PTT control & 12V DC & ground

Pin 13 X8 PTT

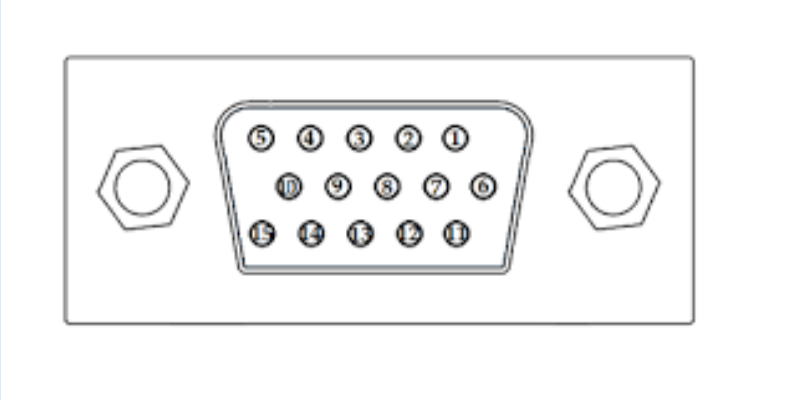
Pin 14 +12V DC

Pin 15 Ground

For the SunSDR2Pro an additional wire to thermostatically control fan ON/OFF

Pin 3 X7 for fan control

For fan control you need to enable the Thermostat in the Ext CTRL tab and tick Key 7 for both RX & TX. Add a tap on the Pin 14 wire for 12V DC and to the Pin 15 wire for ground/earth. The fan is fed with the 12V DC and the ground connection but switched by the SunSDR2Pro. You may choose to add a diode (e.g. 1N400X etc) across the fan connection for protection.



4.1 BCD Interfacing for the Elecraft KPA1500 By Terry N1KIN

(The SDR2DX is shown as an example for all of the Sun family of SDR rigs).

Using an HD15 cable, wired as shown below, PTT enable and BCD band data are automatically passed to the Elecraft KPA1500 amplifier. The Ext CTRL band setting table is also shown. Setting it up like this, the amp now automatically follows the radio's band changes and the TX enable (PTT in) for the Elecraft is also satisfied.

SunSDR2 DX				Elecraft KPA1500
Ext Ctrl	Comment	Male HD15 pin#		Female HD15 pin#
X1	BCD-3	1	→	14
X2	BCD-2	11	→	9
X3	BCD-1	7	→	3
X4	BCD-0	2	→	13
X8	PTT out to PA	13	→	10
Gnd	Gnd	15	→	5

Notes:

Set "Radio Type" in KPA1500 to "BCD"

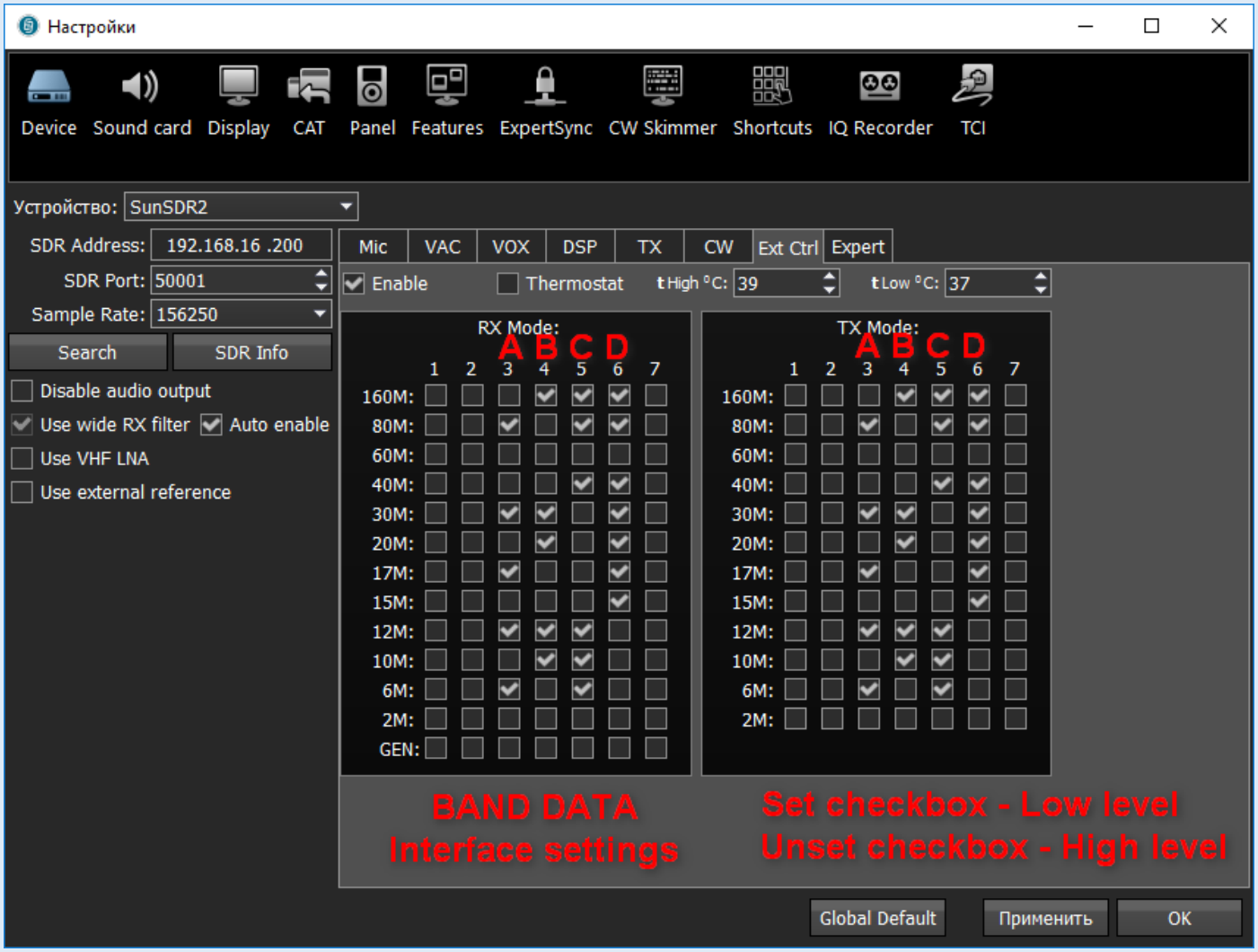
Set "Ext Ctrl" tab as shown for both RX & TX Mode

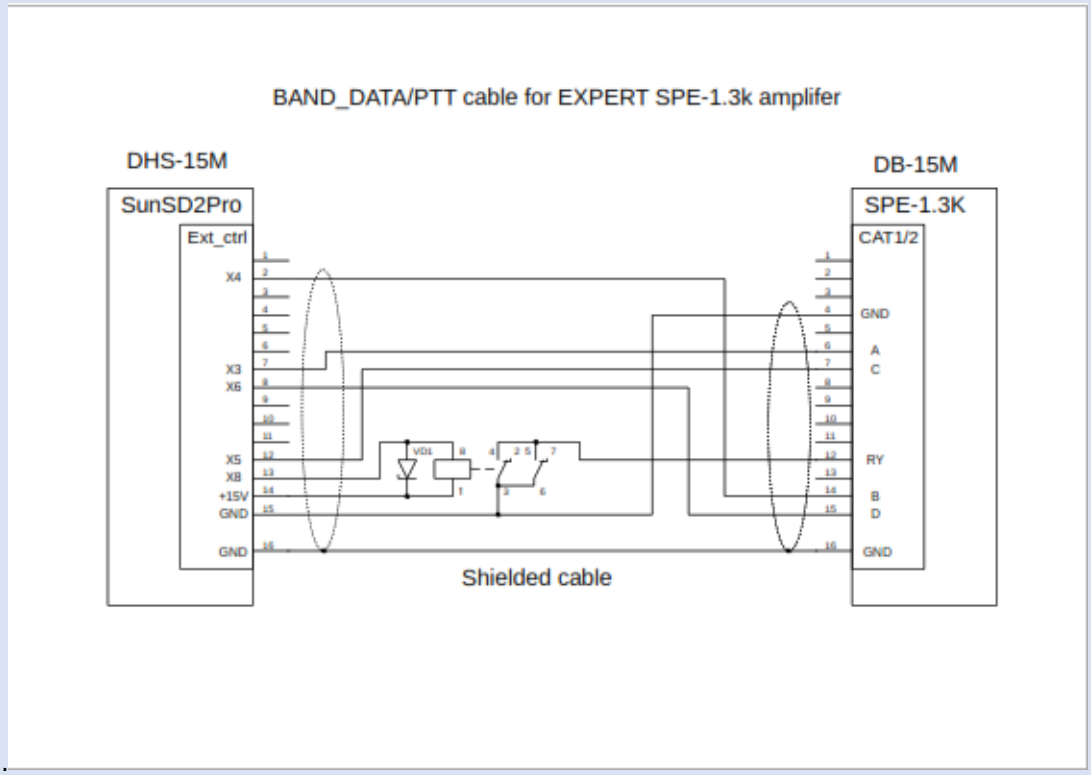
Connect shields on HD15's, and use clamp-on ferrites on both ends

4.2 BCD Interfacing for the SPE Range of Amplifiers

This table was supplied by Roman at Expert Electronics. Any questions to him.

Set the amplifier to Yaesu Band-Data. Pin layout: SUBD15 (SunSDR) DB15 (amplifier) 2 14 (Band-Data B); 7 6 (Band-Data A); 8 15 (Band-Data D); 12 7 (Band-Data C); 13 12 (PTT) 15 4 (GND); 14 to 14,6,15,7. Then you need to set the band-data in the “Ext section of ExpertSDR software to the correct values as per the table.





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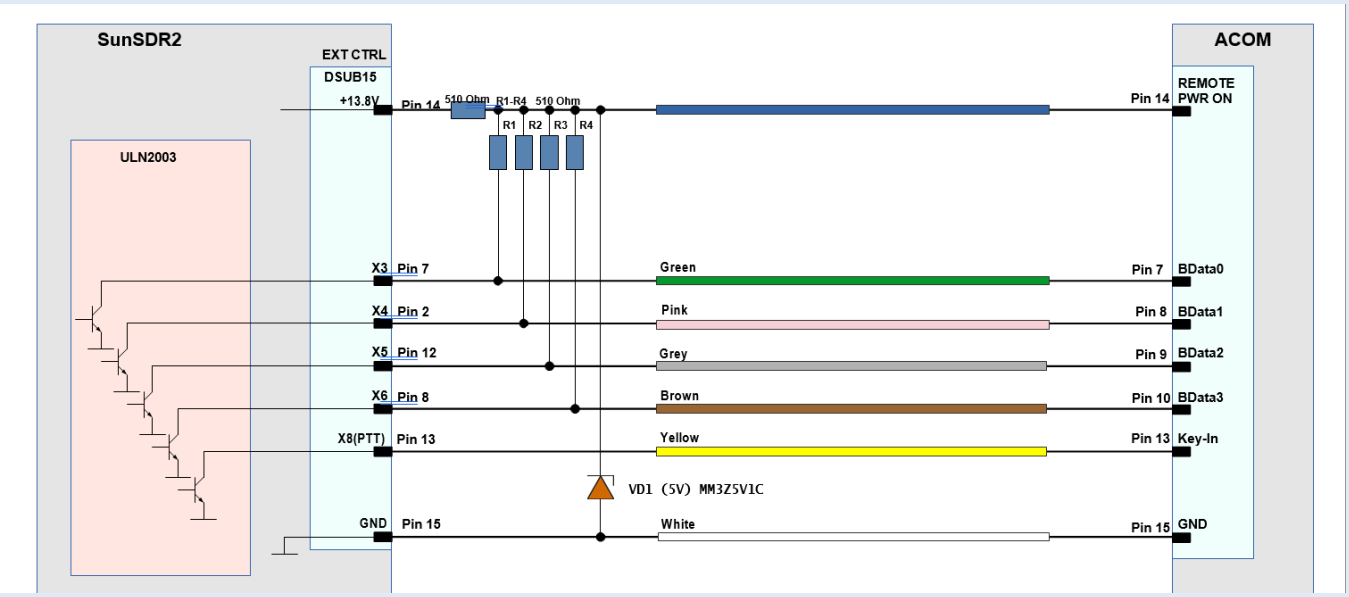
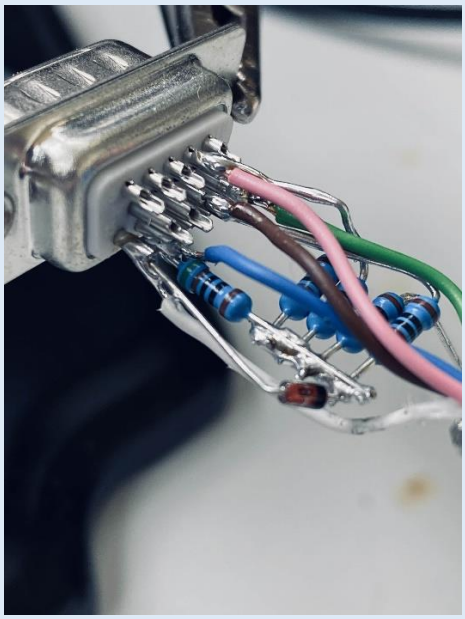
A ready-made cable is available from www.hamcables.co.uk if required.

4.3 BCD Interfacing for the Acom Range of Amplifiers

Below cable wiring for Acom. Ext Ctrl grid programming is as before. Courtesy of Mathias DD5MD.





5 Software Defined Connectors (SDC)

SDC comes with a user manual. To open it either use Windows Start > Programs > SDC and open SDCen.pdf or within the software, go to the Setup tab, select English help file and click on the book icon top right.

5.1 Introduction

Comprising of a suite of vitally important features, SDC developed by Yuri UT4LW, affords to the ESDR* user:

- Local and external DX Spots to the Panorama in all modes: CW, SSB and Digital.
- Integration with 5MContest and N1MM+.
- Integration to your logbook software via Telnet to a Cluster window.
- Own Skimmer(s) with low resource usage (unlike CW Skimmer), high decoding ability.
- “599 to Panorama” to track a DXpedition working a pile-up which makes DX working so much easier.
- CAT controlled device interfacing using TCI – amplifiers, dynamic antenna controller, Auto-ATU, etc are sent CAT data via TCI obviating the need for COM ports.
- Networking of COM ports, audio and CW key for SunSDR2 users with external computer.
- Synchronisation of transceivers and receivers.
- Audio Channel Client / Server to allow audio and COM port data to a 2nd computer via LAN.
- Remote Server.
- Profile Manager – store various configurations via profiles.

5.2 Download Links

The SDC 64bit version is at http://www.lw-sdc.com/
As from the onset of the Russian invasion of Ukraine, no further support of EDSR* will be provided by Yuri.

In the Setup tab, SDC can be configured to check for and download version updates. The website highlights most of the features and, in addition, the program has an extensive English language help file.

5MContest: http://5mcontest.qrz.ru/

5.3 Installation and Initial Setup

Install from the downloaded file. Subsequent updates will automatically uninstall the previous version before installing. Your settings will remain intact. When SDC is launched, its icon will appear in the  Taskbar.

I recommend having SDC start when the computer boots. Create a shortcut for the SDC exe which is located at C:\Program Files\LwSoft\SDCx64 and then move the shortcut to Windows 10 startup folder. This is accessed by right-clicking on Windows Start icon, select Run and enter **shell:startup** – the correct start folder will open in Windows Explorer.

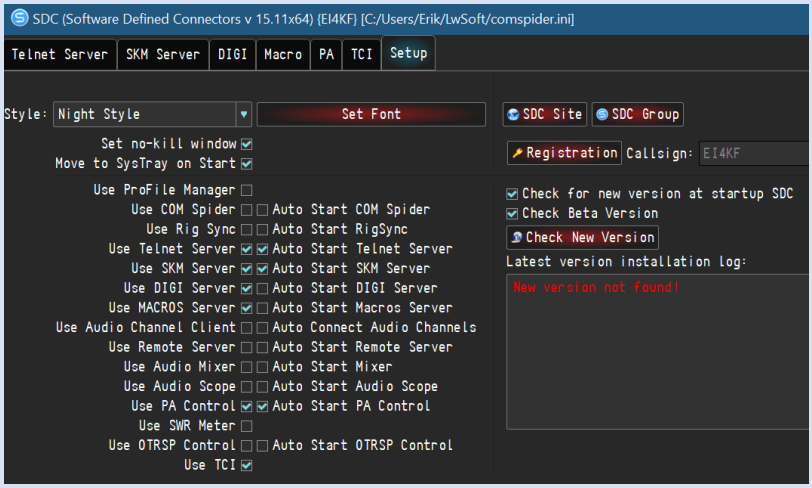
Right-click on the Taskbar icon and select Show/Hide SDC Window to toggle the GUI on / off.

SDC has a huge number of features and you surely will not use them all. All the important ones are covered below – use or adapt according to your own requirements.

The directory C:\Program Files\LwSoft\SDCx64 contains an English language PDF help file.

5.4 Setup Tab

At the minimum, you are likely to want to use the Telnet Server, Skimmer Server and TCI of course. If you have a CAT controlled amplifier or another device, you will need PA Control.



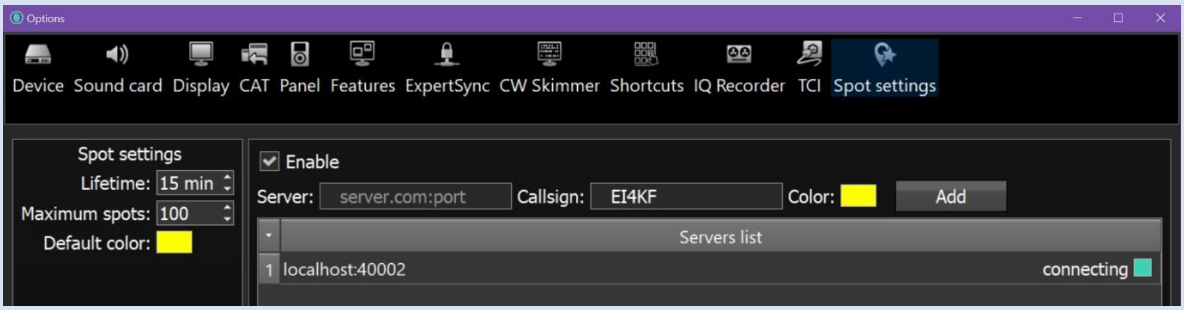
Style and font are user customisable.

Enable the functions as per the picture.

TCI must be enabled in ESDR* in two places.

The first is the obvious Options > TCI.

The other is in Options > Spot Settings tab. See below.



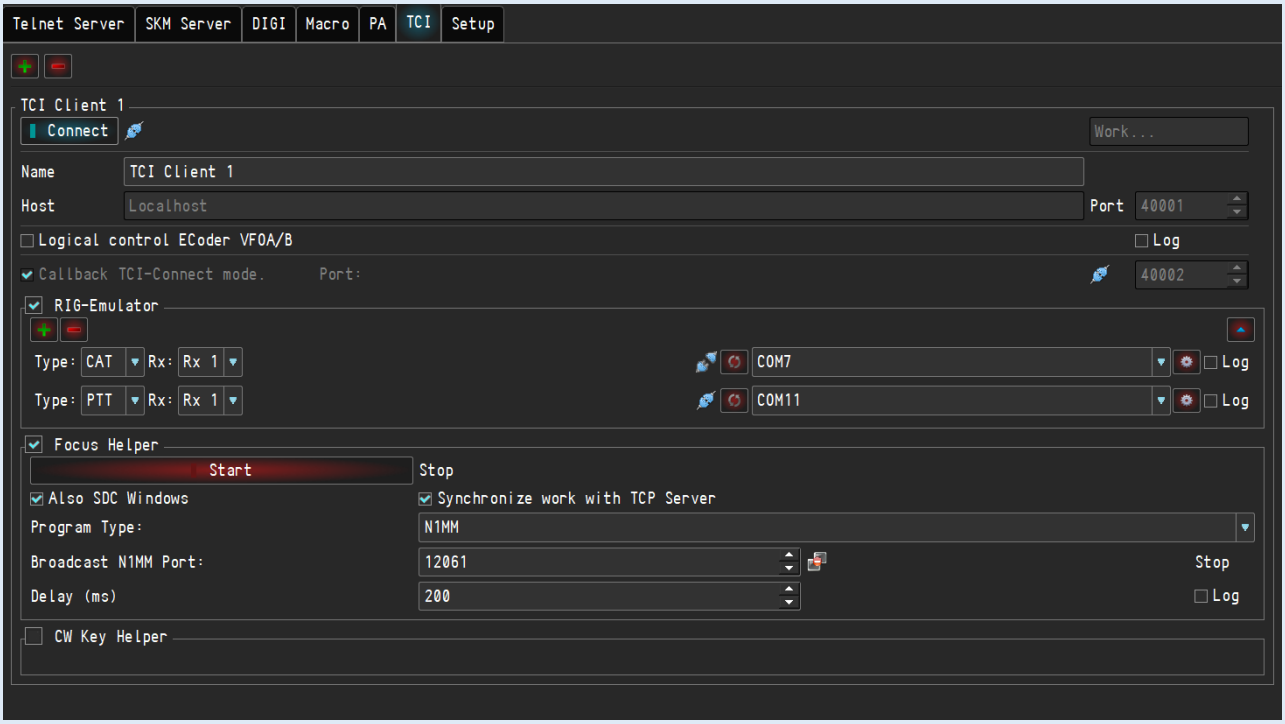
With Enable unchecked, enter into the Server box: localhost:40002 with your callsign in the Callsign box. Press Add – it will go into the Cluster server select list. Set Enable.

In this tab, also set your preferred Spot settings for maximum spots and Lifetime (time before Spots disappear from the Panorama). Cluster servers should not be connected here if SDC is used. Default colour over-rides colours selected in SDC. It does not over-ride colours determined by the Swisslog logbook so that Swisslog can accurately show worked, needed, confirmed.

5.5 TCI Tab

Section 5.4 showed how to enable TCI in ESDR*. TCI requires set up in SDC.

In the SDC TCI tab create / remove a TCI Client using the +/- buttons. If you plan to work



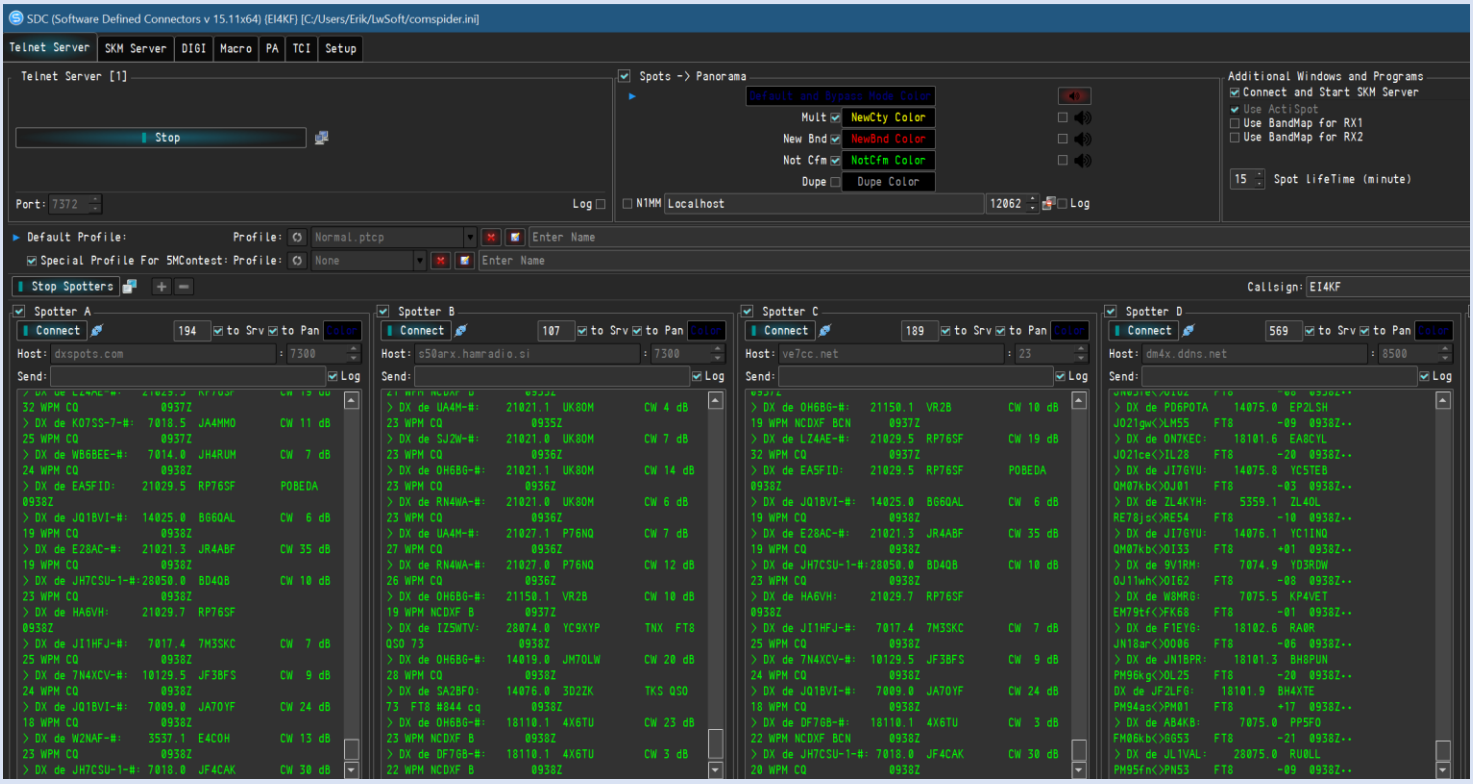
with two or more transceivers, create the appropriate number of clients. Specify the name of the connection, address and port (normally 40001). Enable the Callback TCI-Connect mode on port 40002, the same port we set up in ESDR*. Test with the connect button. Normally the TCI link will establish automatically.
Section 5.11 gives details of the purpose of 'Focus Helper', used primarily for integration with N1MM+.

Rig-Emulator takes CAT and / or PTT from TCI and transfers it to any number of virtual COM ports thus allowing the control of software, amplifiers, external devices such as an Auto-ATU and dynamic antenna controllers.

The Focus Helper can be directed to any program where it is necessary to return the focus to the QSO input window of the program.

CW Key Helper allows for PTT delay and Breakin mode on the 2nd receiver. More desirable though is to operate macro CW via CAT control, as explained in the N1MM section, so that sudden computer CPU usage does not affect the CW timing.

5.6 Telnet Server Tab



The Telnet Server, as seen above with left half at top, is used to select which local and external Cluster servers are used and how the incoming data is distributed. It also determines globally whether Spots go to the Panorama, whether the SDC Skimmer(s) are active, Spot colours, and if additional windows BandMap(s) and ActiSpot are displayed.
Enter your callsign in the Callsign box, seen in right half, lower picture.

Enable Spots > Panorama with Mult, New Bnd and Not Cfm checked. In everyday use, this ensures all Spots are sent to the Panorama. In conjunction with 5MContest and N1MM+, the Spot status as determined from the respective logs, with its associated colour, will be an aid to contest working.

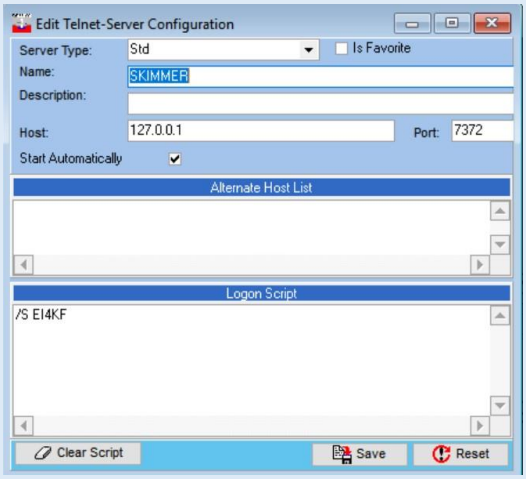
Check Connect and Start SKM Server and other additional windows as required.
ActiSpot is very useful as we shall see later. The BandMap(s) are rudimentary compared

to those in Swisslog but can be activated here to view them. The Spot Lifetime here relates to the Maps.

Sound can be activated, especially useful in contests to alert for new multiplier, etc. Activating Sound also activates a Notification (message) in the Windows System Tray.

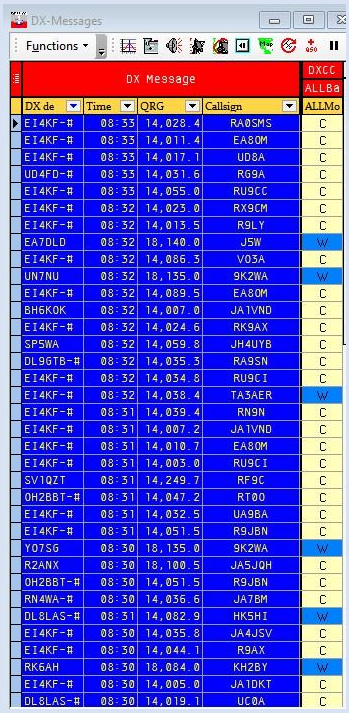
Spotters are windows used for local or external Cluster access and their number may be changed with the +/- buttons. In the above picture, Spotter B and C are normal DX Clusters. Spotter D is a special Cluster feed for FT8 Spots. Define as per your own requirements. In each case activate ‘to Srv’ and ‘to Pan’. You can over-ride the Spot colour to Panorama here as you see for Spotter D. In each case also enter check marks in Log.

My Spotter A is a special case. If you have the Afreet CW Skimmer, you can also direct its output to the Srv (Telnet Server). However, do not direct its output to the Pan because it is already doing that through ESDR*.



Srv (Telnet Server) collects all Spots and sends them to a logbook Cluster server window. Every logbook software deals with this differently but on the left is an example from Swisslog: set a Port number in SDC Telnet Server box – mine is 7372. Somewhere in your logbook application will be provision for editing / creating Cluster access.

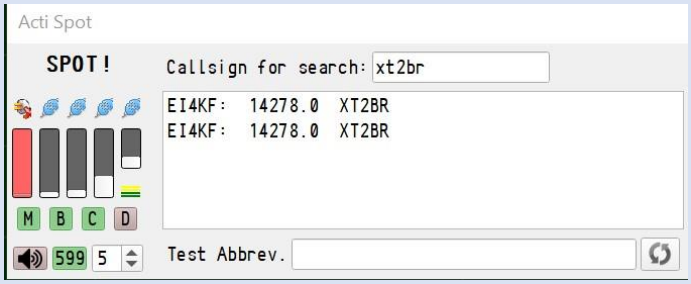
In Swisslog I have defined a new entry called SKIMMER with the local computer address and Port 7372. It is set to connect automatically. This is important because it is the connection from SDC to the logbook that auto-starts the Spotters in SDC. If there is no such link, the Spotters need to be started manually. Another example of Telnet Access to a logbook Cluster window is seen in the N1MM+ section of this Manual.



Left picture shows the end result. All the collected data from the SDC Spotters is sent through the Server to the logbook to be displayed in whatever form that logbook allows. An example, again from Swisslog is shown here.

The local Skimmer, the one monitoring the receiver, is sending its Spots to the log prefixed by EI4KF-#. This happens to be the Afreet CW Skimmer. When we set up the SDC Skimmer later, its Spots will be prefixed with skim-#. All other Spots are derived from the Clusters defined in each of the Spotter windows in SDC. Everything comes together into this one logbook window.

- ActiSpot window.

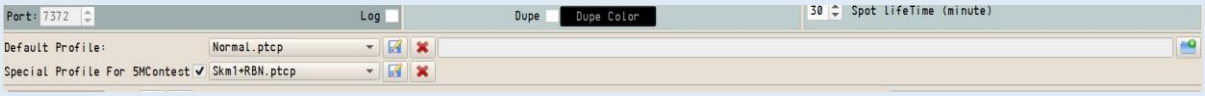


A callsign can be entered in the search box to alert you when that station is Spotted. If the search box is empty, ActiSpot monitors for your own callsign. So, if you are Spotted, you will know it from ActiSpot. Alternatively, a contest abbreviation in Spots can be searched for, an example being AA for All Asian contest. A Spot with AA in the comment field will be displayed.

The ‘thermometers’ on the left represent activity in the Spotters windows. Since the SDC GUI is normally hidden, this will show if something has disconnected – the Spotter A, local CW Skimmer, is disconnected in the above example. M B C D toggle Mult, New Bnd, Cfm, Dupe respectively. 599 toggles the ‘599 to Panorama’ pile-up tracking feature with the pile-up width defined by the number. More about this feature later.

- After setting up Telnet Server and, optionally placing the ActiSpot window where you want it, you should save the configuration (save is top right).

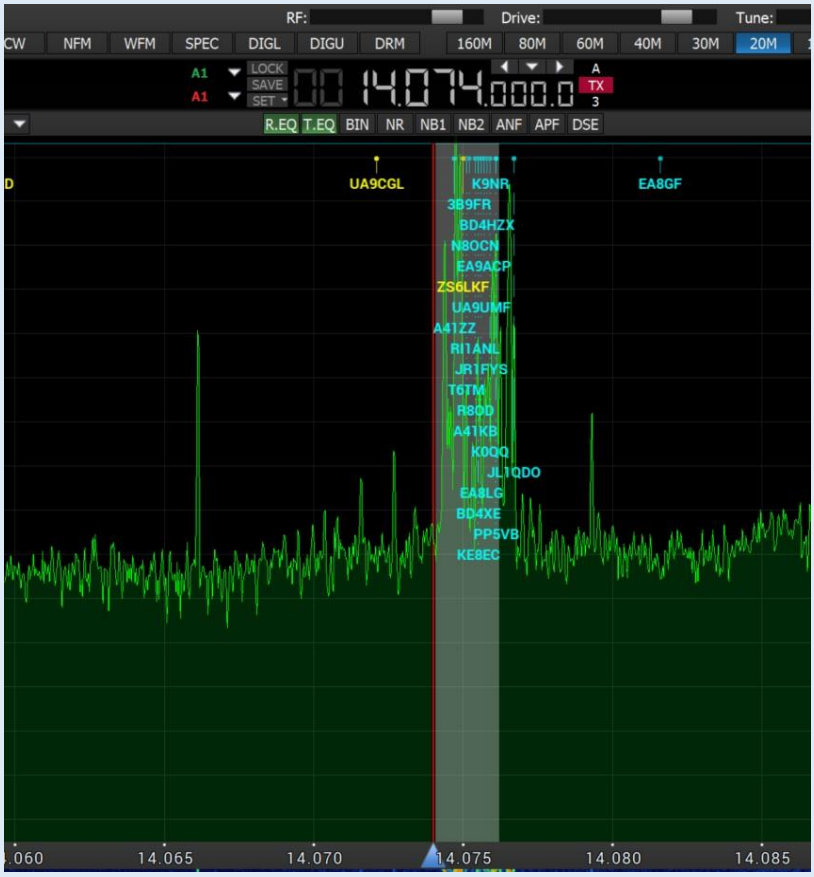
- Create profiles.



Write a profile name in the right-hand side box and click the save icon on the right to create it. Profiles can be selected so that there is one for normal use and one for 5MContest where you might have no Cluster servers but a RBN server, for example.

5.7 Filtering

Considerable filtering is now possible so that the Spots seen on the Panorama are, if from external sources, only those that you want. This is done by applying a filtering command to the external server.



Whether you use DL9GTB as one of your external servers or not, his web page has a comprehensive list of filtering commands available. An example is what I use. I do not want to see Spots of European stations and I do want to see Spots from European Spotters only. Skimmers are numerous therefore I want to stop duplicates. The filter command for this is:

Set dx filter (cont=AS or cont=OC or cont=AF or cont=NA or cont=SA) and spottercont=EU and not skimdupe

In SDC, type your filter command in the ‘send’ box and hit ‘enter’ to send it. The server will respond to confirm acceptance or else notify you of failure in the event of a syntax error or if the Server does not understand the command. AR-Cluster servers are excellent for filter commands. You may need to experiment with different Servers if you want to take advantage of filtering. As you can see in the above picture, all my Spots are DX Spots outside of EU. A snapshot of the Panorama reveals that all non-local-Skimmer Spots are all DX:

5.8 SDC Skimmer

It is no longer necessary to have the Afreet CW Skimmer because SDC has its own.

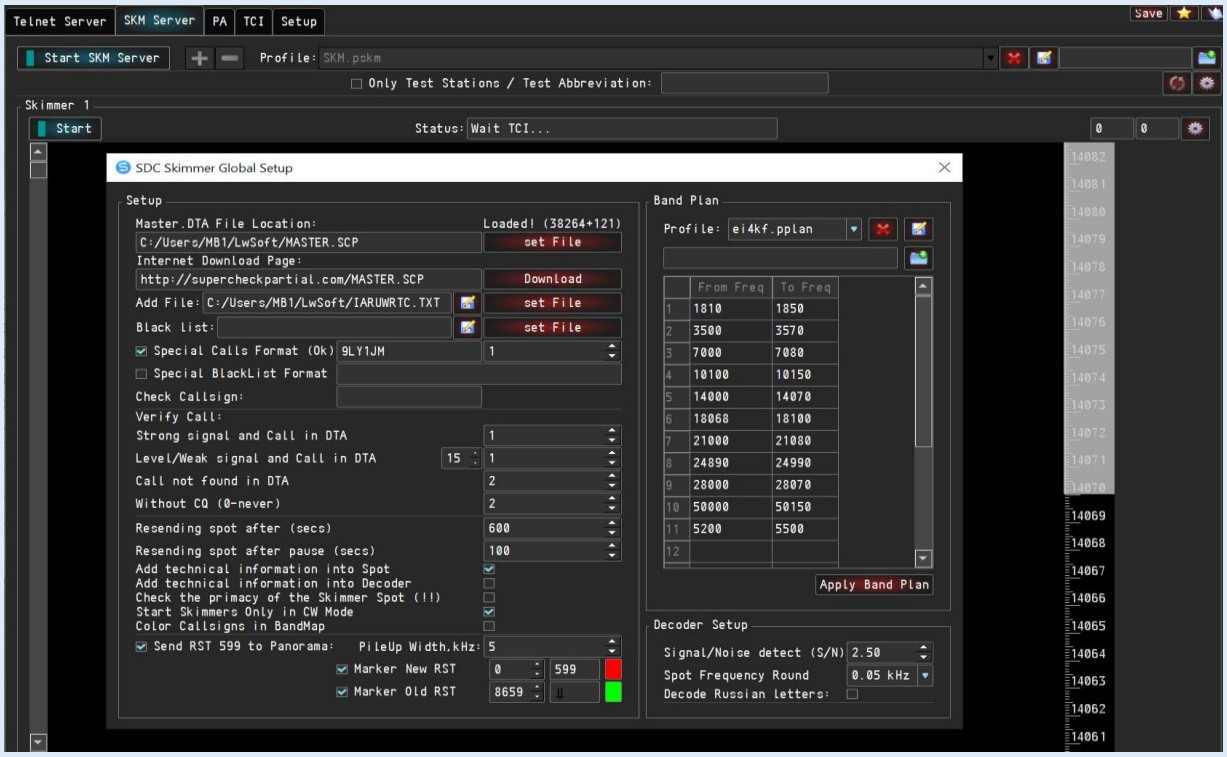
- The advantages of the SDC Skimmer are many:
  Free – not necessary to buy CW Skimmer at $75.
  SDC Skimmer uses much less computer resources, allowing Skimmers to run on both receivers simultaneously without pushing the CPU load to near maximum.
  Decoding ability on a par with CW Skimmer.
  Has add-on facilities such as ‘599 to Panorama’.
  Has a detachable decoding window for each receiver – position on screen or specific monitor can be saved.
  Many user customisable settings.

- SKM Server – Global Setup window

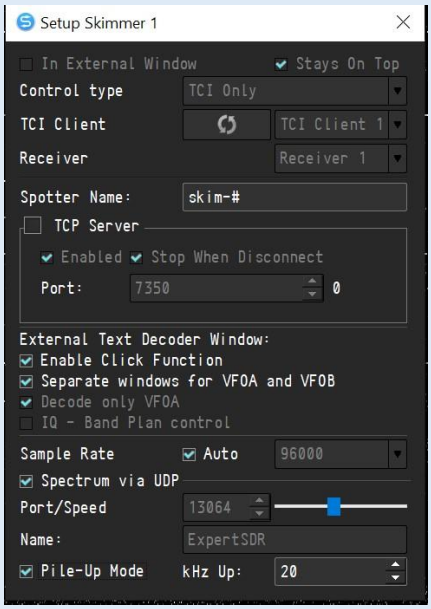
  Picture below shows optimum settings. A full explanation of all the parameters is in the SDC help file. Some extra pointers follow:

  1 Add 5200 to 5500 to the band plan for the Skimmer to work on 60 meters.

2 In Verify Call – Without CQ, a setting of 0 will prevent Spots from going to the Panorama if not accompanied by CQ. The setting of 2 means non-CQ decodes will go the Panorama providing the callsign has been decoded twice. This helps stop false decodes.



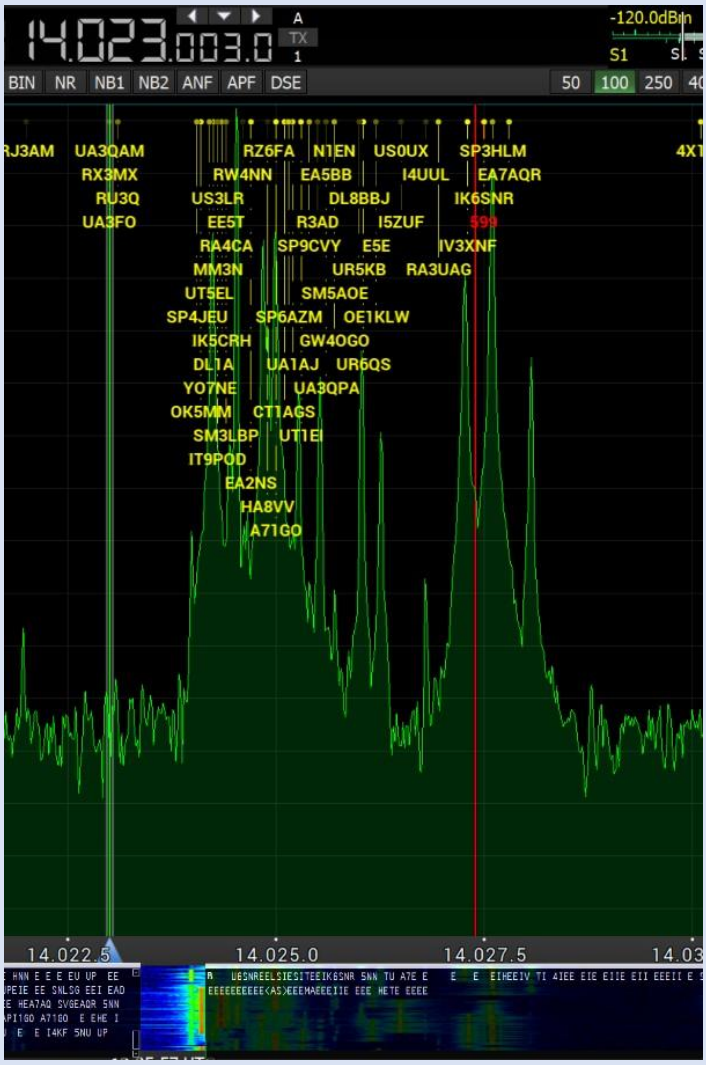
3 The lower cog-wheel settings icon opens the Skimmer set up window.



Sample Rate of the Skimmer can be set manually or set to Auto so that it always matches the sample rate of the SDR.

The Spectrum via UDP section is for integration with N1MM+ which is described below – see 5.11

4 599 to Panorama tracks stations sending 599 when they are being worked by a DX Station. This shows you where the DX Station is listening. A marker can be defined instead of 599 and enabling both new and old, with different markers, will show graphically how the DX Station is working the pile – moving up or down or random. You will easily anticipate where to call to get your QSO quickly.

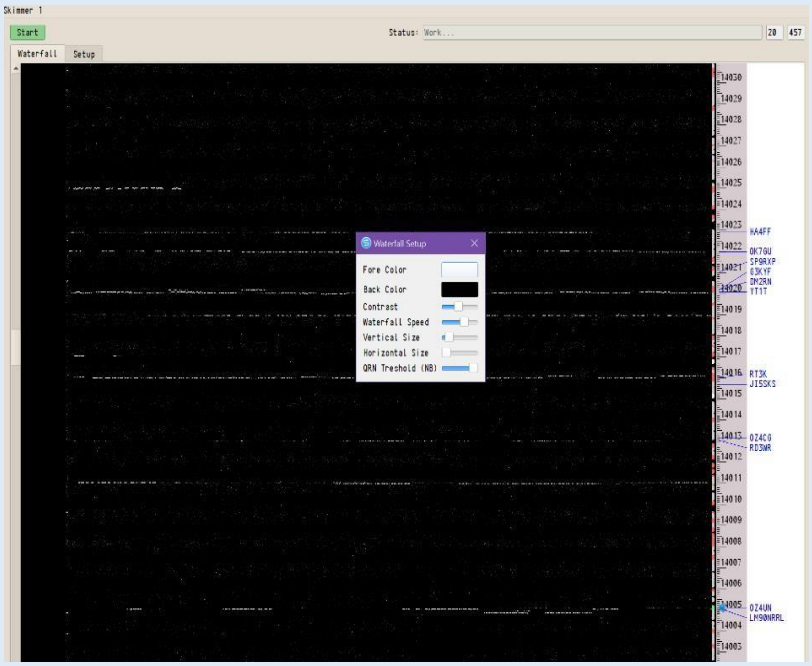


An example of usage. Left picture: I am calling, and have just worked, 6O6O and made the QSO thanks to SDC sending 599 to the Panorama when the station worked before me sent his report, thus showing me where the 6O was listening.

At the bottom of the picture can be seen part of the VFO A decoding window on the left and the VFO B decoding window on the right.

- SKM Server – Waterfall tab

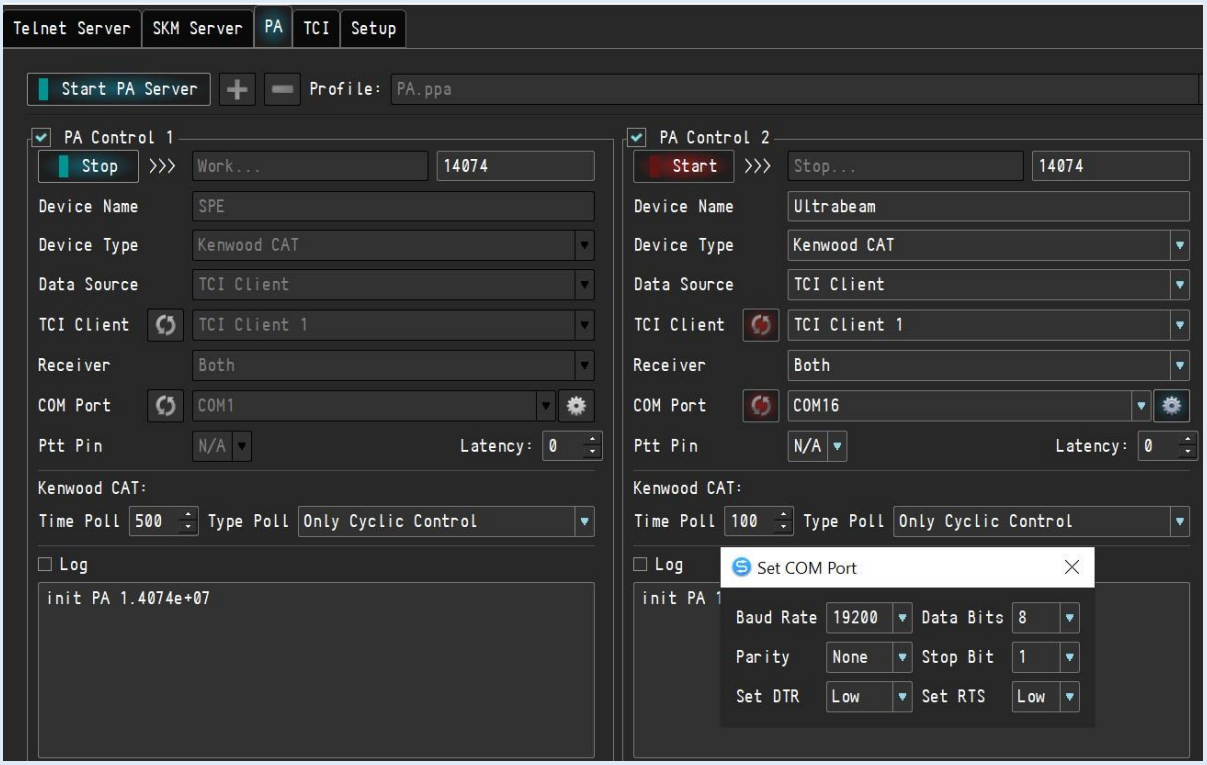
It is not necessary to see the Waterfall but, if desired, it can be detached and moved. Right-click for the menu. QRN Threshold is off when the slider is fully to the right.
When SDC is first installed, the external text decoder windows for VFO A and VFO B will be displayed here. Because SDC normally runs hidden, move them to a convenient monitor and position.



Left: Skimmer waterfall window with right-click menu. Below VFO A & B decoder windows on top of ESDR* – note their transparency to see whatever is underneath.

5.9 PA Tab

TCI in ESDR* allows interfacing the radio with a CAT controlled amplifier and / or other CAT controlled device.



The protocols of Kenwood, Icom and Elecraft are supported. The SDC help file gives an explanation of the parameters. Ensure you set the baud rate for the COM port to 19200.

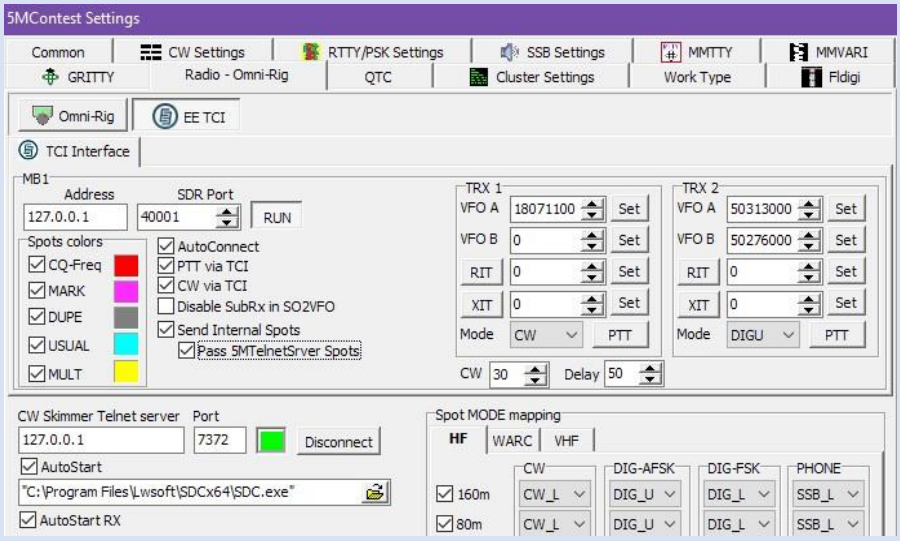
The picture above shows the settings for my SPE amplifier, connected by CAT cable from the rear COM port on the MB1, and an Ultrabeam dynamic antenna controller which is using a USB COM port adapter set for COM 16. The cog-wheel setting window is for defining the COM port parameters. For more on COM port adapters, see section 7.2.

Set up of ESDR* is shown in section 3.3 of this Manual.

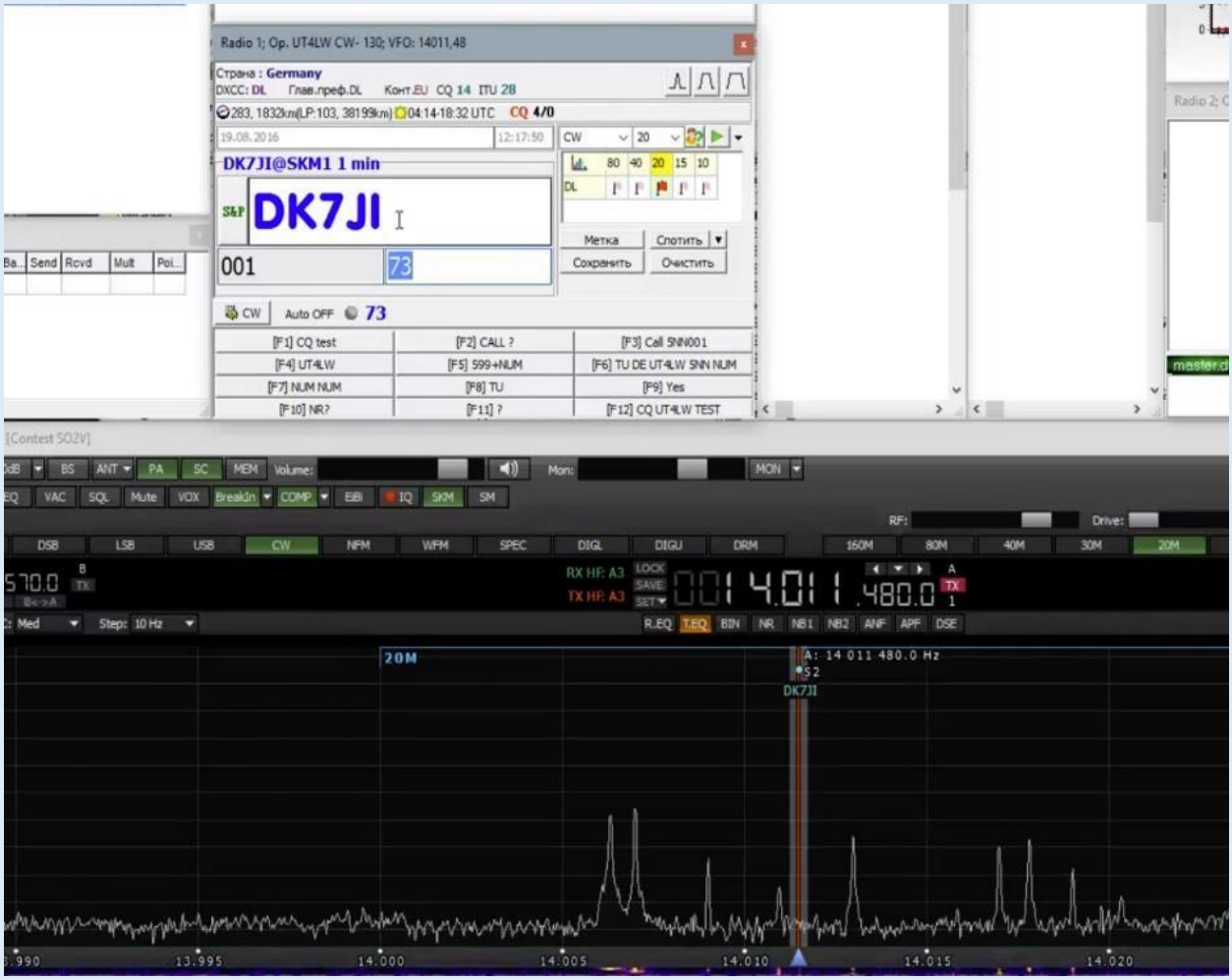
For automatic and immediate operation, have SDC start with Windows boot. As was done for VSPE, create a shortcut for SDC.exe (C:\Program Files\LwSoft\SDCx64) and move it to the Windows 10 startup folder (which is accessed by using Run and entering **shell:startup**).

5.10 SDC in Conjunction with 5MContest

5MContest has its own help file in Russian but I have made a crude translation into English. It is not perfect but can assist with setting up the program. Download it at
https://www.dropbox.com/s/6s4kgdong2e5517/5M_Help_ENG.pdf?dl=0
The SDC help file describes in detail the use of the program with 5MContest. The latest version of 5M now interfaces with ESDR* via TCI. This conveniently precludes the need for COM port CW keying because this is now done by TCI, as is PTT.



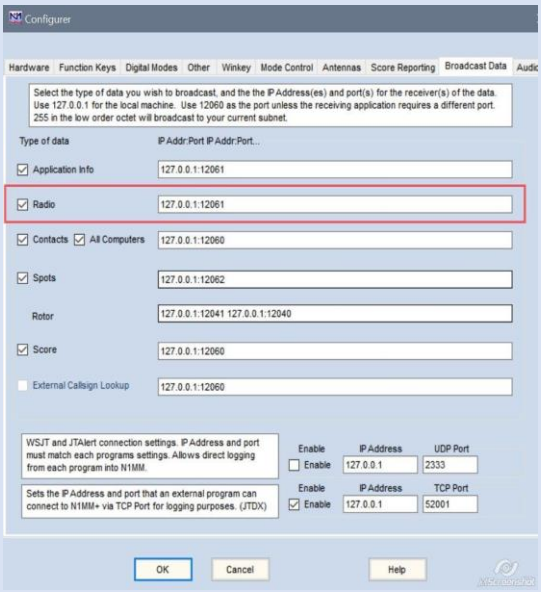
Ensure you have a separate 5M profile in SDC. With SDC closed, start 5M and it will invoke SDC with the correct profile, attach and establish full integration. As you tune the Panorama, spotted callsigns will appear in the 5M input window.



5.11 SDC in Conjunction with N1MM+

Note: This function requires SDC version 12.18b40 or later. Download link is above.

N1MM when checked in the Telnet Server Tab will do the same as 5M. Spots from N1MM+, with the Spot status and associated colour as determined by the N1MM+ log, will be sent to the Panorama. Set up N1MM as per page 59 onwards. This is the same function as



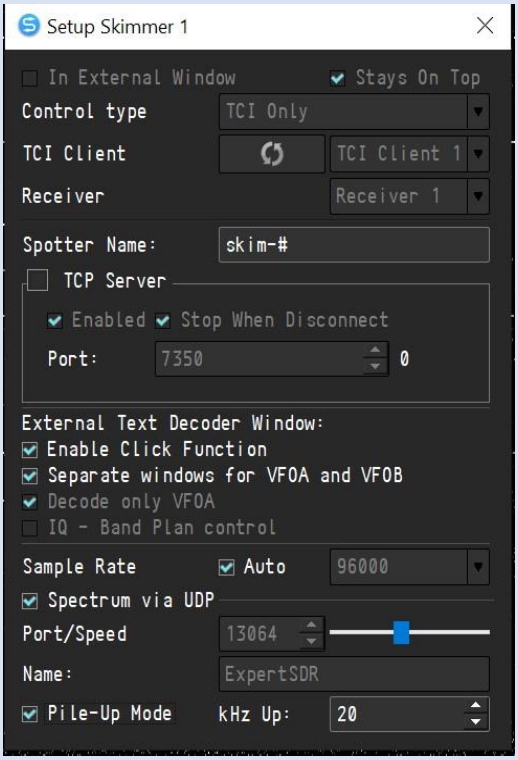
with VSElink shown in the N1MM section (6.15). A setting in the SDC TCI tab, Focus Helper, will enable window focus to be returned to N1MM+ whenever there is a click on the ESDR* panorama, split buttons, filter, etc. or the frequency is changed. The focus will automatically return to the N1MM+ window. An additional setting has to be made in N1MM+ for focus to work. See picture left.

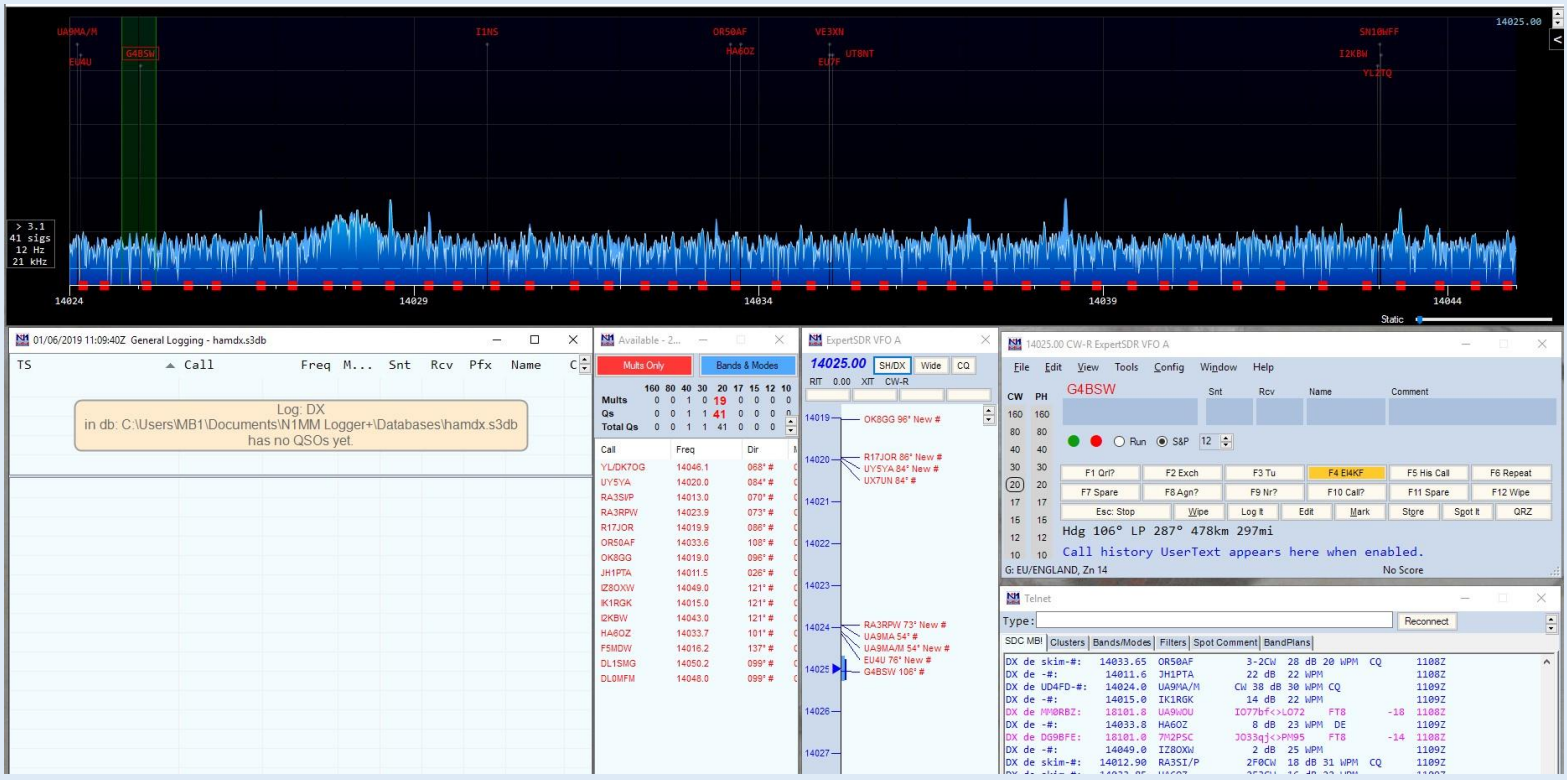
The N1MM+ Spectrum Scope can also be interfaced with ESDR*.

- In SDC SKM Server Tab, click the cogwheel icon on the right to open the settings window (see section 5.8 above). Enable Spectrum via UDP to see the N1MM+ Panorama integrated with SDC.

- The result is that DX Spots will be posted not just to the ESDR* Panorama but also to the N1MM+ Panorama (enable a DXCluster in the N1MM Telnet window), colour coded per your settings for new country, new multiplier, new band, etc.

- As you tune the VFO and reach a valid DX Spot, its callsign will be transferred to the N1MM+ QSO input panel just as it is in 5M.





- The picture above shows an example. All the Spots in my picture are red because I have not worked any stations yet so they are all new. In the ESDR* Panorama and in the N1MM+ Panorama, the VFO is over G4BSW and therefore this callsign is transferred automatically to the N1MM input window.

- Slower computers may have trouble rendering both the ESDR* Panorama and the full N1MM+ Panorama. The latter can be limited to a fixed size in kHz and is set with the Pile-Up Mode parameter in the Skimmer 1 setup.

- Note the Port/Speed parameter in the Skimmer setup window: the speed set here governs the speed of the Spectrum Scope.

- You will see in section 6.15 that VSELink will also interface the Scope to ESDR* and, in my opinion, works better. But try both for comparison.

- The resolution of the N1MM Scope is much less that the ESDR* panorama so how much use this has is debatable.

6 Software for Logging and Digital

With VAC and VSPE installed, setup details follow for a variety of 3rd party software. You should soon see a common theme for the setting of CAT and PTT and be able to apply it to any other software not listed.

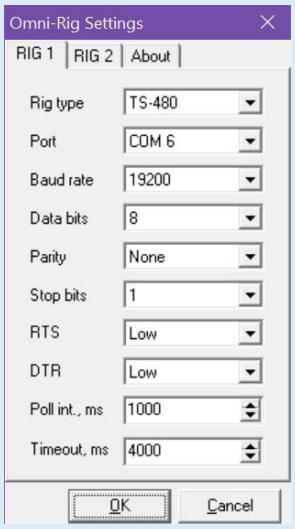
6.1 Download Links

CW Skimmer:	http://www.dxatlas.com/Download.asp
FLDigi:	https://sourceforge.net/projects/fldigi/files/
Ham Radio Deluxe V5 (free):	https://www.egr.msu.edu/msuarc/software/ham-radio-deluxe Ham Radio Deluxe V6 (paid): http://ham-radio-deluxe.com/
JTDX:	http://jtdx.tech/en/
K9DUR DVK:	http://k9dur.info/voice_keyer.html
LogHX	http://rx4hx.grz.ru/index.php?page=projects_loghx
MMTTY:	http://hamsoft.ca/pages/mmtty.php
MultiPSK:	http://f6cte.free.fr/index_anglais.htm
N1MM+:	https://n1mm.hamdocs.com/tiki-index.php
Omnirig:	http://www.hb9ryz.ch/omnirig/
Swisslog:	https://www.swisslogforwindows.com/english/Frame_EN.htm
Writelog / DigiRite	https://writelog.com/
WSJTx:	http://physics.princeton.edu/pulsar/k1jt/wsjtx.html

6.2 Omnirig v2.0

Required if using the Afreet CW Skimmer and can be utilised for MixW, DXMonitor, Win-Test, Logic 9, PZT-Log, Log4OM, Live MUF, etc. Once configured, running any of these programs will also run Omnirig but silently in the background. The old Afreet version was transferred to HB9RYZ who updated it with new features and a shorter polling time, improving its performance.

This version will also allow up to four radios instead of the previous two.

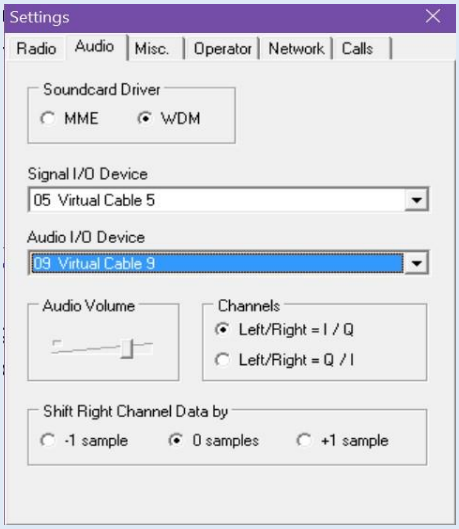


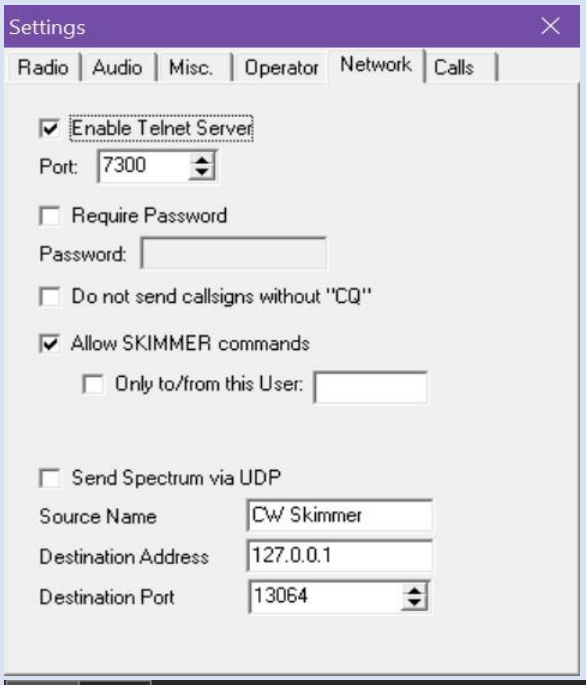
The ESDR* CAT emulates the Kenwood TS-480 protocol. The application end of our COM port pair for CAT is COM 6. We set the baud rate at 19200 in ESDR*. Initially set RTS and DTR to Low but, in the event of a connection failure, try with High. Once configured, click OK which will save the configuration.

Omnirig is a ‘multi-threading’ application and will allow more than one program to attach to it simultaneously.

6.3 CW Skimmer

In Skimmer Settings, configure per the pictures below. In Audio settings, only VC 5 in Signal I/O Device is required. Use Audio I/O Device VC 9 only if you want audio to your computer sound card.

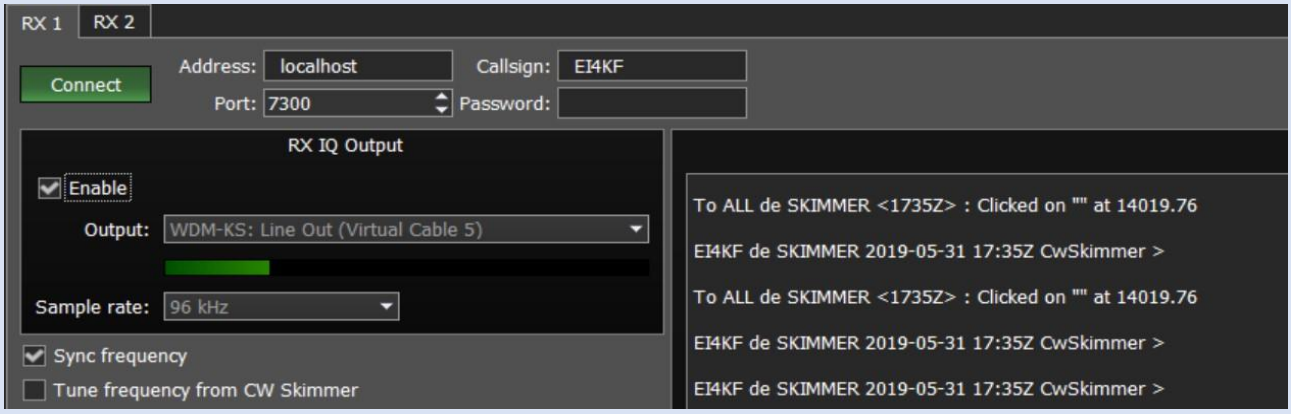




This assumes that Sample Rate in ESDR* is set to 312500 . If you are using 156250, set the Skimmer Sampling Rate to 96kHz. Skimmer will skim the chosen bandwidth with its centre on the frequency tuned.

Below, the setup of Skimm er in the CW Skimmer tab of ESDR*. Choose the same telnet port as set in the picture on the left.

Skimmer Spots to the ESDR* Panorama are enabled in Options > Display > Spectrum tab.



The Features tab in ESDR* Options can be used to launch CW Skimmer when starting ESDR*.

NOTE: In Windows 10 version 2004 because of VAC problems, for the VAC 5 line input to CW Skimmer, the MS per Int setting should be 10.

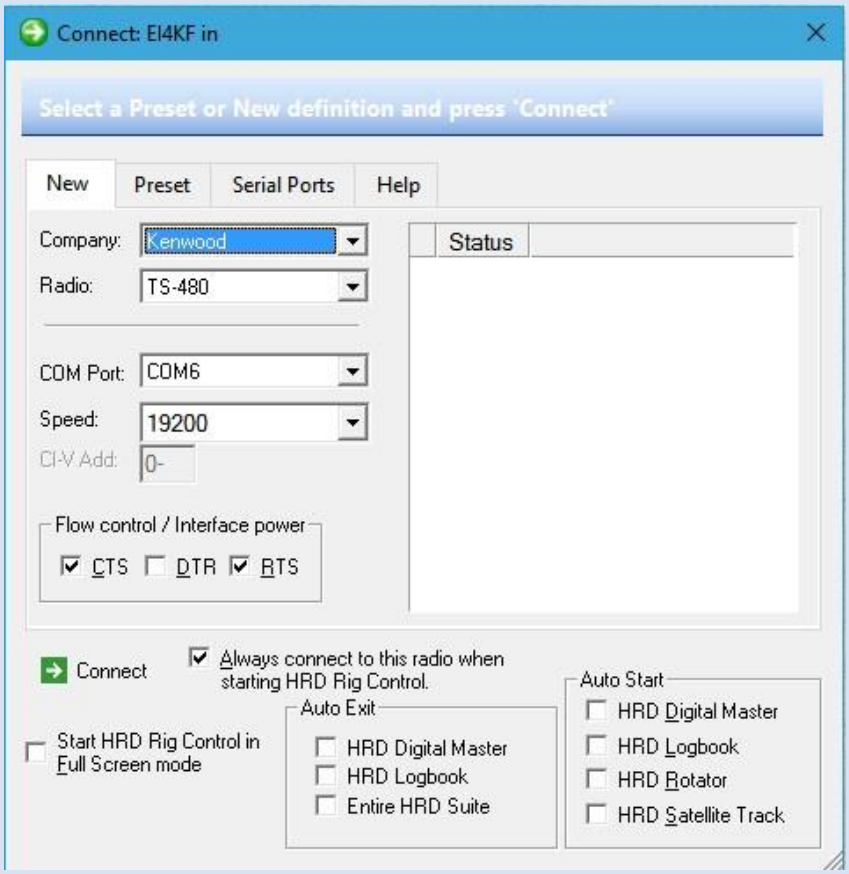
6.4 Skimmer Spots to a Logbook and Skimmer on RX2

It is possible to send CW Skimmer Spots direct to a Cluster Telnet window in a logbook. It is also possible to configure a 2nd instance of CW Skimmer for the 2nd RX. The latter is exceptionally heavy on computer resources. Both are taken care of by Software Defined Connectors (SDC) software, which has its own Skimmer(s) and telnet server(s), and which

is very light on resources. I recommend using the procedures detailed in the section 5.8, SDC Skimmer.

6.5 Ham Radio Deluxe

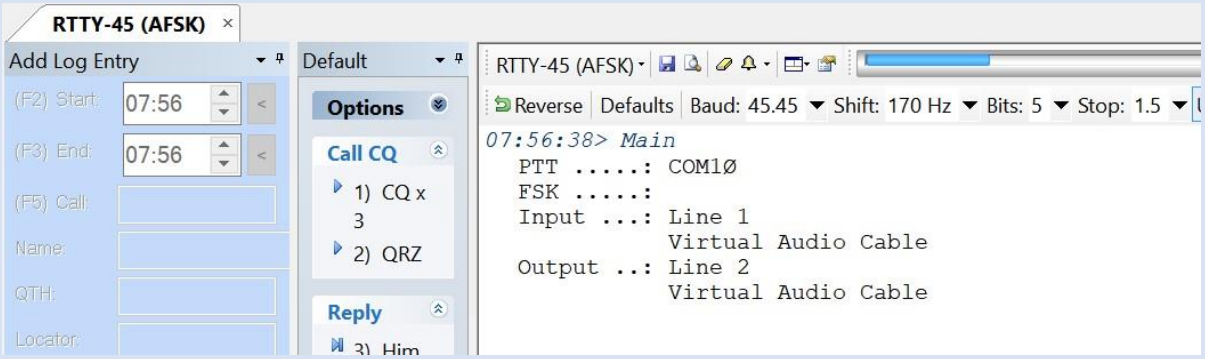
HRD, and most logging software, is very simple to configure. Remember that as with VAC, COM ports are in pairs. We set COM 5 at the ESDR* end and so we must set COM 6 at our application software.



The CAT protocol ECATv1 is equal to Kenwood TS-480. If you find that HRD has difficulty connecting, try increasing the Speed (Baud Rate) to 115200 with only RTS checked. The mismatch in Baud Rate does not matter so long as you set ‘emulate baud rate’ in VSPE. Later versions of HRD appear to have this bug fixed.

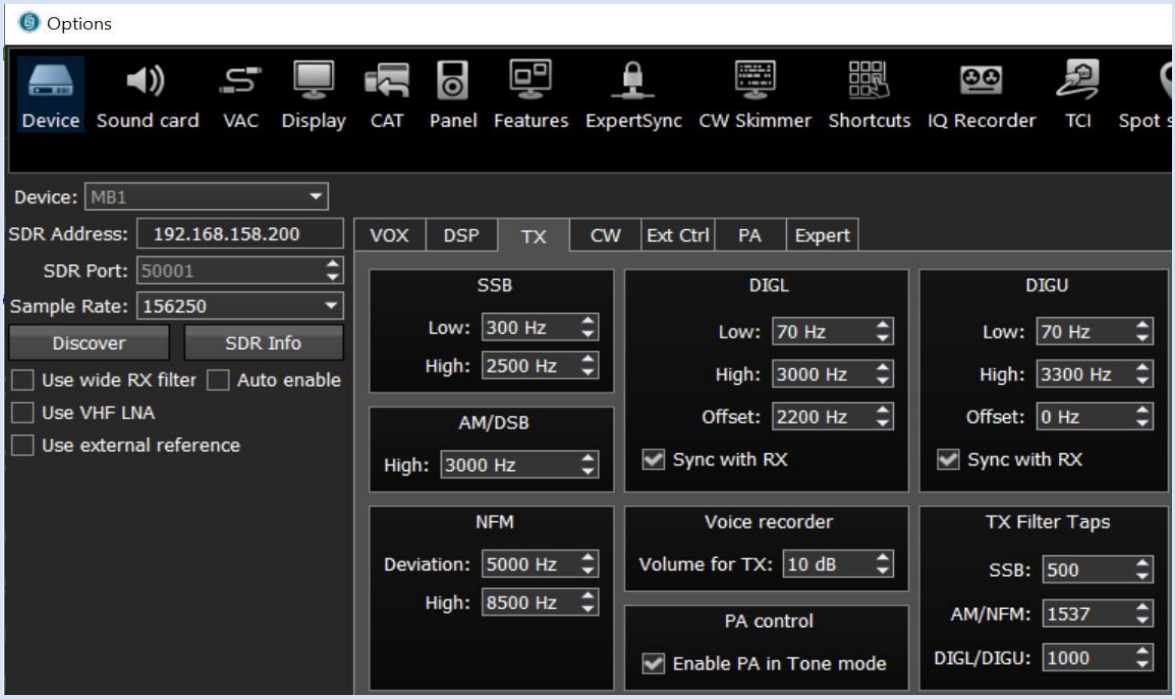
6.6 HRD DM-780 Digital

It is extremely simple to set up DM-780.



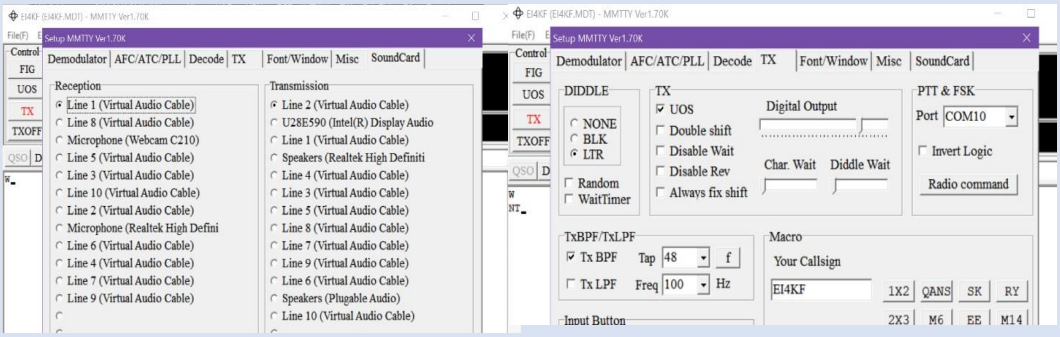
As with all digital mode software, the audio lines are Line 1 for input (receive) and Line 2 for output (transmit). PTT is on COM 10, the application side of our COM 9<>COM 10 pair we created in VAC.

The radio mode for digital is DIGL for RTTY. Use DIGU for other AFSK modes such as JT65, FT8, PSK, MSK144 etc, or you can use USB. The best mode for AFSK is DIGU because, unlike if using SSB, the MIC AGC level is locked at 0dB thus preventing over-driving. In ESDR*, set the DIGL offset to 2200Hz for RTTY and the DIGU offset at 0Hz so that you are on the exact carrier frequency when using FT8, JT65 etc, PSK, etc.



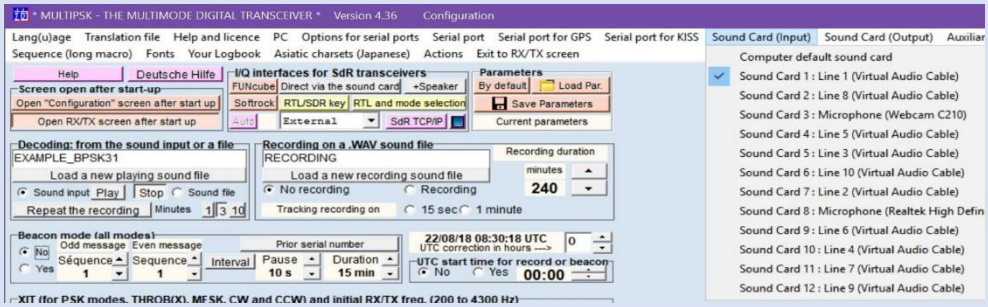
6.7 MMTTY

MMTTY is not only a standalone program but is often embedded in other applications, for example RCKRtty, 5MContest, etc. You may find that having downloaded those programs that you already have MMTTY. Setup is easy and you need only set the audio paths and PTT.



6.8 MultiPSK

The picture shows the configuration screen. PTT and sound card input / output are the usual.

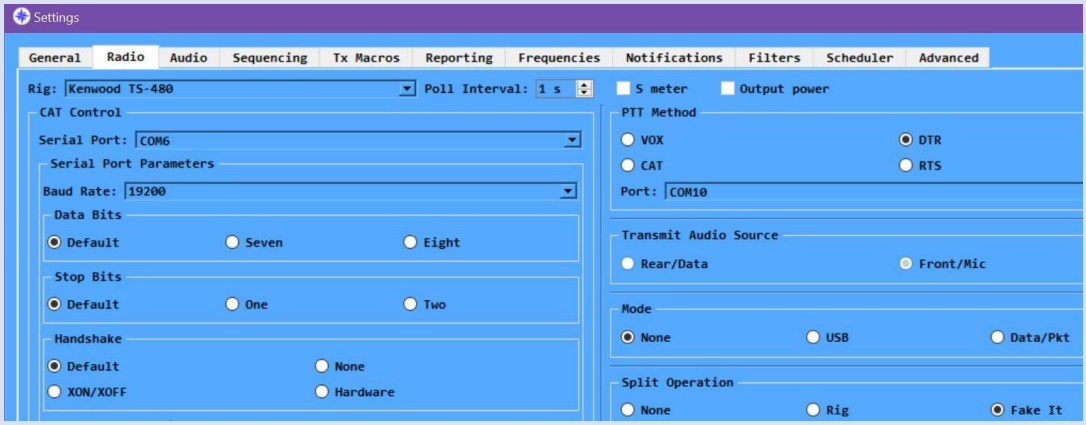


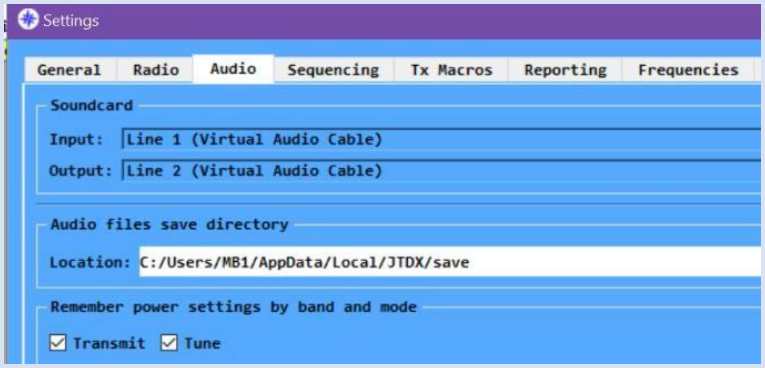
6.9 JTDX (and WSJTx)

The procedure outlined here for setup is for JTDX but WSJTx is identical and uses the same settings. I have chosen JTDX to illustrate the setup because it is my preferred choice, having superior decoding ability to over WSJTx and many more features, especially aimed at DX working.

There are many various methods for setting CAT and PTT, including via HRD, Omnirig and so on. JTDX can use TCI, see section 6.11 below. For WSJTx, the one and only reliable method is per the following picture. Do not be tempted to use CAT for PTT. This not only calls on Hamlib, which cannot process the <RX> command as it is not supported in the

Kenwood CAT protocol, but it also introduces a switching delay and that is something to be avoided in 15 second TX modes like FT8.





I hardly need to show the audio settings but, as you can see, they are always RX on VAC1 and TX on VAC2.

Mode is set to None. If you are using DIGU, as recommended for the radio mode, setting Mode to Data/Pkt can cause a 'rig control error'. If you use a very high-gain amplifier and find it very hard to control the input power, and hence output, when the MIC AGC is locked at 0dB in DIGU mode, use SSB mode and adjust the power slider in JTDX to keep MIC AGC between 0dB and +0.8dB. This gives better control of output power. In both cases the mode is determined by the radio when Mode = None and this gives trouble free operation.

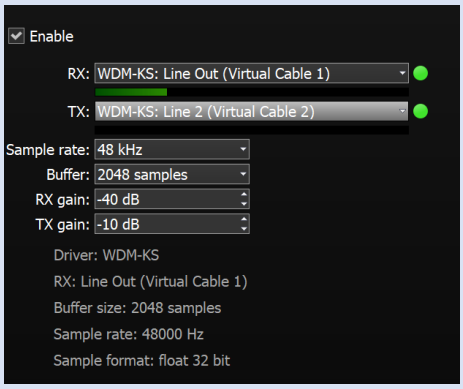
NOTE: If using USB in ESDR* instead of DIGU, it is best to turn off the Compressor during digital operations. Remember to turn it on again for SSB. Bizarrely, in ESDR* 1.3.0 computer GUI, the COMP indicator has been removed and therefore it is necessary to momentarily change to the MB1 GUI or open the PROC panel to see its status.

ESDR* responds correctly to the Split command when Split Operation is set to Fake It, as seen above. This ensures a constant audio level input regardless of the audio frequency and hence constrains any harmonics to within the FT8 bandwidth. It is also required for correct Fox/Hound operation where the TX should be sent to below 1000Hz for transmission of the R+dB report.

6.10 JTDX 32bit Sample Size

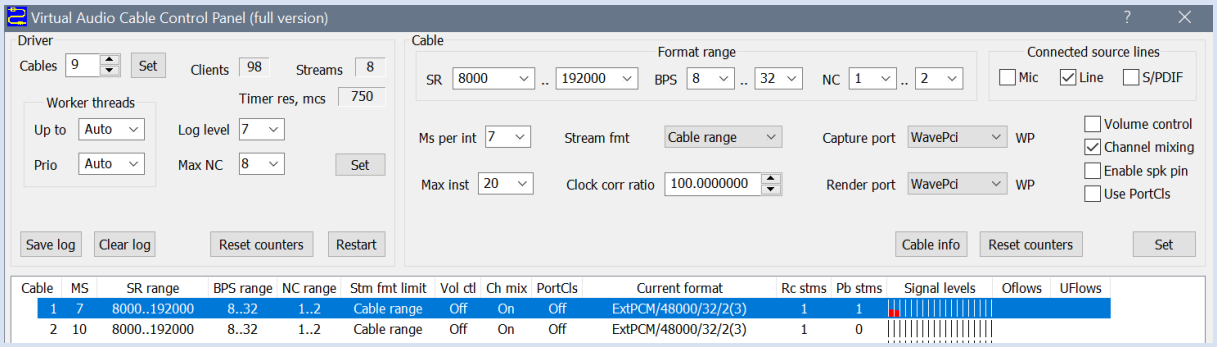
From February 2020 there is a new branch of JTDX development that takes advantage of both the high dynamic range of the Expert Electronics family of SDR transceivers and also implements 32bit sample size. This is experimental and may be discontinued.

Settings have to be correct in ESDR* and VAC to facilitate the optimised audio streams open to JTDX with their associated maximum decoding efficiency.



Firstly, ensure that in ESDR* VAC settings you have configured as seen on the left. Sample Rate is 48000Hz and Sample format is 32 bit. Buffer can be reduced to 512 samples for less latency.

Then the VAC Control Panel needs a change. Open it ‘As Administrator’. For the two cables used by JTDX, normally Cable 1 and Cable 2, change the BPS setting to 8..32 (it is probably set to 8..24 at the moment).



After changing Cable 1, press ‘Set’ (next to Reset Counters). Do the same with Cable 2. Finally, at the bottom of the VAC Panel (not shown) press Restart Audio Engine. If you get an error here it is because you did not run the Panel ‘As Administrator’.

Go to https://jtdx.tech/en/2-articles/ft8v2/53-32-bit-audio-jtdx-branch for the built Windows 64bit version of JTDX 32Bit audio.

Go to https://github.com/jtdx-project/jtdx/tree/jtdx_32a for the source code if you want to compile it for JTSDKv3. Note that JTDX 64bit cannot be compiled in JTSDKv2. To install JTDSKv3, the instructions are at https://sourceforge.net/projects/jtsdk/files/win64/3.1.0/#new-installation

6.11 JTDX CAT and Audio via TCI

From JTDX version 2.2.156, both CAT and audio can be achieved through TCI. I recommend this method over VSPE / VAC because there is less latency, better decoding and a cleaner transmit signal.
In JTDX settings, select TCI Client on the Radio tab and TCI audio on the Audio tab. Press ‘refresh’ if necessary, to enforce the new configuration.

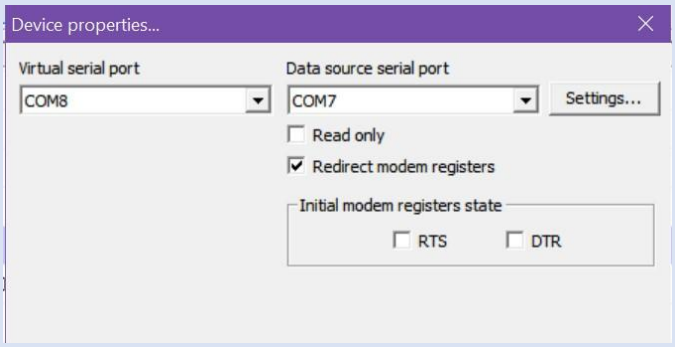
6.12 Multiple Instances of JTDX to Monitor RX1 + RX2

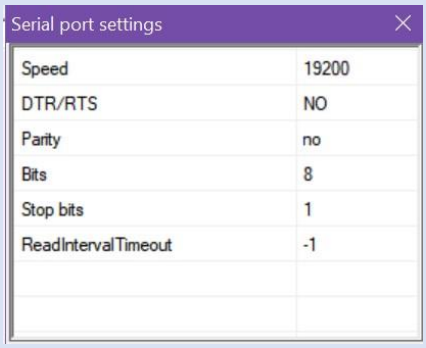
With the popularity of digital modes, especially FT8, it is useful to be able to have both RX1 and RX2 monitoring FT8 on two separate bands or the 6 mtr FT8 frequencies 50313 and 50323. These instructions show how to set it up. Whilst I have created additional instances of JTDX for RX1 and RX2, you can adapt the original JTDX instance to RX1 and create just one other instance for RX2. It is just that I have preferred to leave the original JTDX intact.

- VAC for RX2: refer to the section on VAC. If you already created the 9 VAC lines as described, then there nothing more to do. If not, create VAC lines 3 and 4 with the same parameters as Lines 1 and 2.

- **NOTE: if you are using the Muzychenko VAC version 4.51, you must set the ‘Ms per int’ figure to 3 for the TX line.**

- VSPE COM for RX2: refer to the section on VSPE. Create a Connector COM 7 with ‘emulate baud rate’ enabled. Then create a Splitter COM 7 to COM 8.

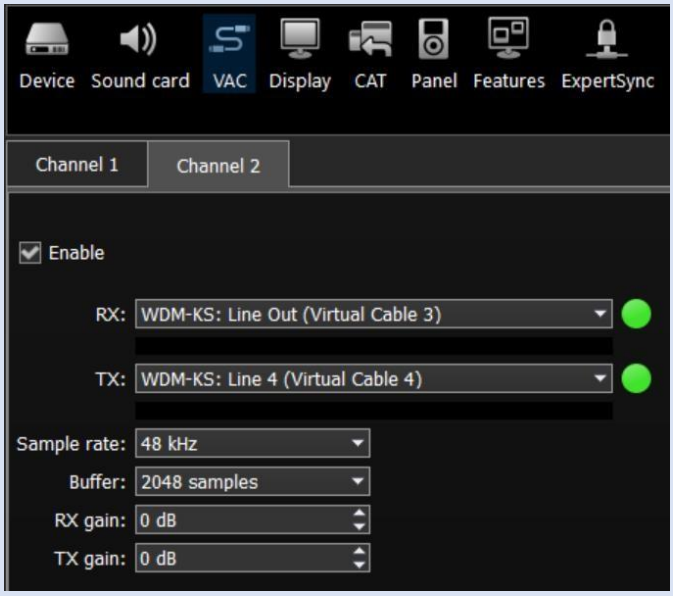




Also, for PTT, create a COM Pair COM12<>COM13 just like the COM9<>COM10 Pair. Remember to update and save your VSPE configuration.

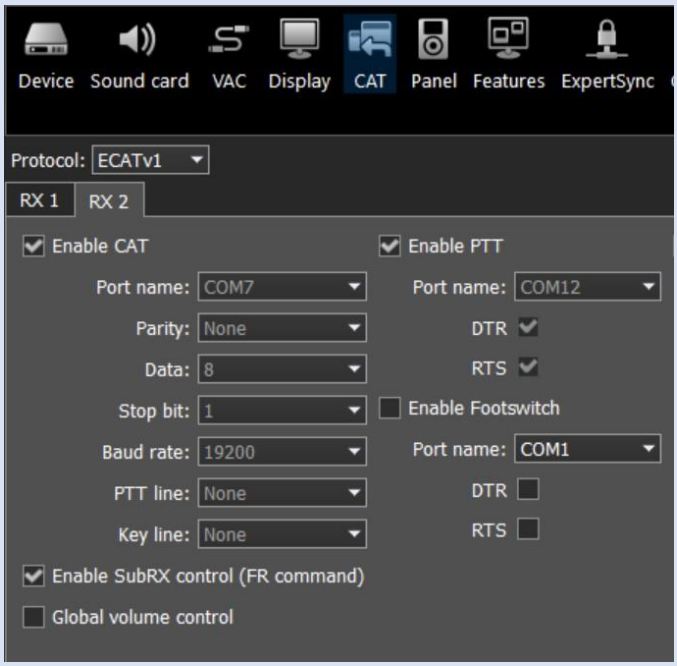
- ESDR* Options for RX2: In ESDR* Options>Device, set auto enable on for the wide receiver (which should be off normally). This will set the wide filter to on so that the two receivers can work on different bands.

- Set the VAC lines as below.



The picture is from the MB1 but the principle is the same for the SunSDR2.

Now set CAT per the picture below, noting the COM numbers and baud rate.



This concludes the setting up of VAC, VSPE and ESDR*.

- **NOTE: TCI can be employed for CAT and audio on RX1 instead of CAT and VAC. However, for RX2 it is still necessary to use the method above because ESDR* has not been furnished with a second TCI server at the time writing this document. Hopefully, this will change and TCI will be available for both receivers.**

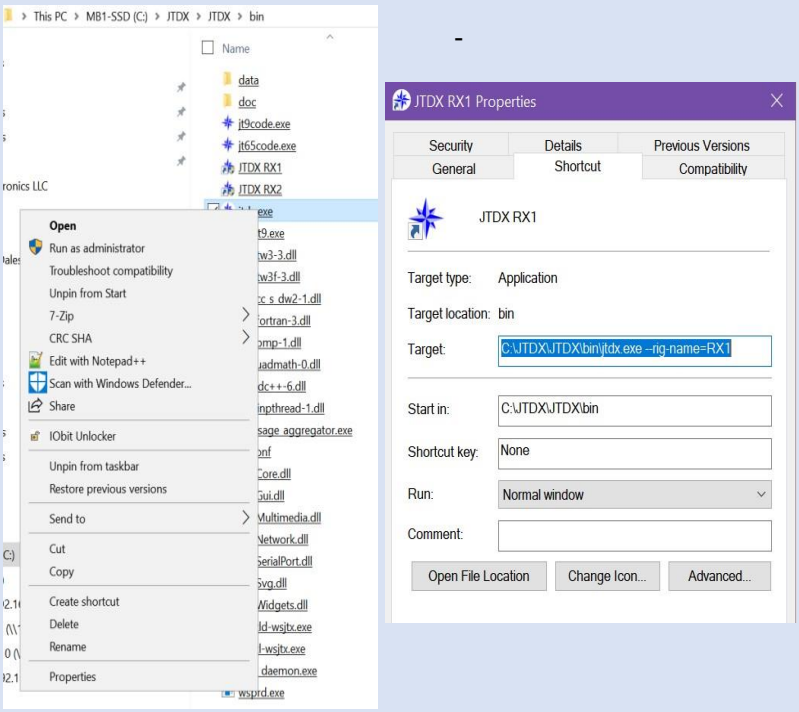
- Multiple instances of JTDX can be run if their respective shortcuts have unique rig names.

However, to proceed with JTDX it is necessary to do the following:

Using Windows Explorer, navigate to your JTDX>bin folder, as seen below:

Right click on the JTDX exe and create a shortcut. Rename it to JTDX RX1.

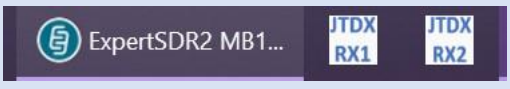
Next, right click on JTDX RX1 and select properties. In the Target box, after jtdx.exe, leave one space and append '—rigname=RX1' so that the whole line becomes C:\JTDX\JTDX\bin\jtdx.exe --rig-name=RX1



-

- Repeat the above procedure to create a separate instance for RX2. Right-click on jtdx.exe and create a shortcut, renaming it to JTDX RX2. In its Properties, the Target will be: C:\JTDX\JTDX\bin\jtdx.exe –rig-name=RX2
- The location of these shortcuts, being in Windows Explorer, is not very useful. However, by right-clicking on each of them, they can be pinned to Start and / or Taskbar. This gives easy access to both instances of JTDX. Before doing this, you might want to consider changing their displayed icon. Left alone, you will have your JTDX RX1 and JTDX RX2 with the same icon and differentiating between them is not so easy. You can find .ico icon files in an online search or design your own .png images in Paint or other image software, and convert them to .ico files.

  Having found or made icons, before pinning to Start / Taskbar, right-click each shortcut and go to Properties and Change icon. To demonstrate, I made these simple ones so I know which JTDX is for which receiver.



- We have now set up JTDX. Have ESDR* running. Open JTDX RX1 and JTDX RX2.

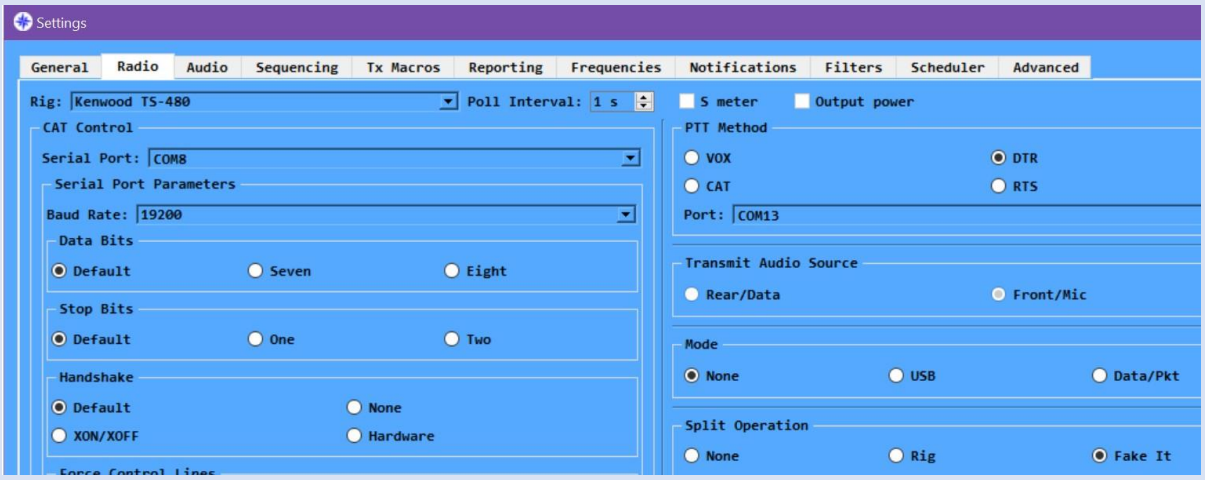
  Now close both of them. This creates their respective settings (.ini) files. Navigate to the JTDX log file and settings folder. With ‘show full path’ and ‘show hidden files’ enabled in Folder Options, the location of the settings file is at: C:\Users*user-name*\AppData\Local\JTDX where *user-name* is your computer name.

- Open the JTDX.ini file, select / copy all its contents. Close that file and go to \AppData\Local\JTDX-RX1 and then open the JTDX-RX1.ini file. Overwrite its contents by pasting with those you just copied. Save and Close. Do the same with \AppData\Local\JTDX-RX2 and the JTDX-RX2.ini file. Your JTDX settings are now the same for each instance.

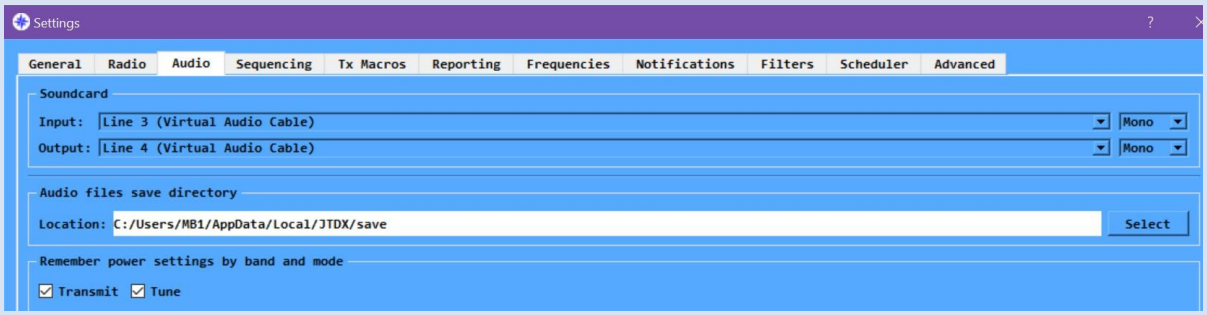
- Go back to the C:\Users*user-name*\AppData\Local\JTDX folder and copy the log file wsjtx_log.adi and paste it to the JTDX-RX1 and JTDX-RX2 folders. Later, I will show you how to synchronise those logs so that they are always the same as each other. If you do not want synchronised logs, ignore that step.

- JTDX-RX1 now has the correct settings because it is a mirror image of the original JTDX. The same applies if you simply changed the original JTDX to JTDX-RX1. JTDXRX2 has to be set up for the 2nd receiver. With ESDR* running, open JTDX RX2 and go to settings.

- The CAT and PTT settings are as below, COM 8 and COM 13 respectively.



- The VAC audio settings are these:



- Each instance of JTDX will receive and decode according to the band for RX1 and RX2. You can answer and transmit or call CQ on either receiver. So, if you have RX2 monitoring 20mtrs and you see a station you want to work, clicking on that instance of JTDX will put the transmitter on that band.

- If you have a TCI / CAT controlled amplifier it will NOT switch to whichever band is current – in other words selecting RX2 will not move the amplifier from the band in RX1. It will respond to changing bands within either RX1 and RX2. I have asked EE to implement a TCI enhancement so that “Active RX” will set the CAT frequency via TCI. This request has not yet been implemented – maybe in ESDR3? Meanwhile, if your amp is like my SPE 1.3, it will switch bands on TX due to RF sensing. So, it is not a serious issue.

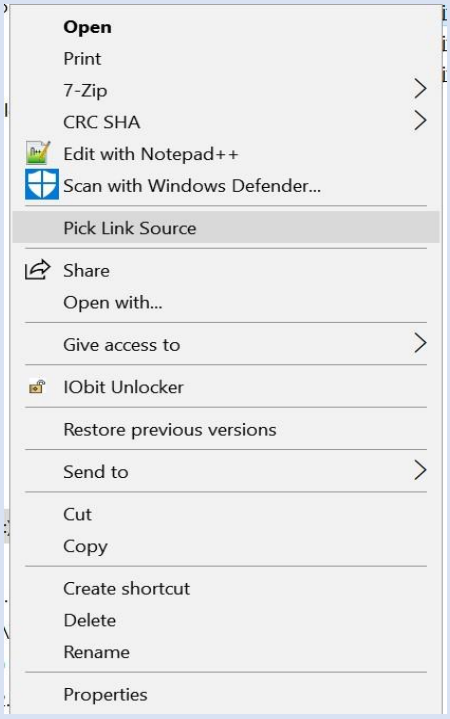
- This leaves one other consideration which is logging. As set up above, we now have 2 or 3 instances of JTDX (depending on whether you modified the

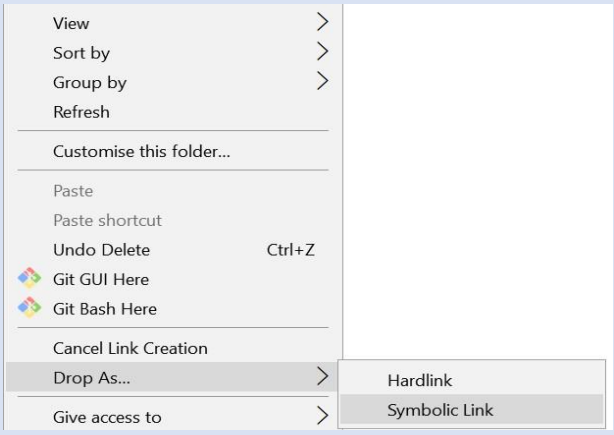
original JTDX to RX1 or created new instances for both RX1 and RX2). Each has its own log file and therefore QSOs logged to one will not be logged to the others. This may not matter; in which case you can skip this step. But if you use the QSO B4 facility or highlight stations / grids / DXCCs already worked, it is important to have all logs synchronised. Otherwise, if you use JTDX RX1 on 20mtrs to work ZS1AAA and later have JTDX RX 2 on 20mtrs, ZS1AAA will show as unworked.

- This is easily done in Windows 10, using the in-built Link Shell Extension. In order to avoid complex command line instructions, there is a little bit of software that does it for you and uses the Window 10 symbolic link feature. Download LSE from https://www.techspot.com/downloads/downloadnow/7107/?evp=55a0483f93407fe3e2cf240b45268c35&file=1

- Install the application. Navigate to C:\Users*user-name*\AppData\Local and create a new folder called JTDX Log.
- Now go to the C:\Users*user-name*\AppData\Local\JTDX folder and **Cut** wsjtx_log.adi and **Paste** it into the new JTDX Log folder. Go to the JTDX-RX1 and JTDX-RX2 folders and delete the wsjtx_log.adi file in each folder.

- Go back to the JTDX Log folder and right-click on wsjtx_log.adi and now you will see a new menu item ‘Pick Link Source’:





- Click this and then navigate back to the JTDX folder, select empty white space and right-click. Click 'Drop As > Symbolic Link'. This will create a synchronised log file (see below). Whilst the size is shown as 0KB, actually you can open it and see that it is a mirror image of the master log file in the JTDX Log folder.

- Do the same as above for JTDX-RX1 and JTDX-RX2. Right-click on the .adi file in JTDX Log, select 'Pick Link Source', go to JTDX-RX1 and right-click and 'Drop As > Symbolic Link'. Repeat for RX2.

- No matter which instance of JTDX logs a QSO, all log files will be updated. Thus, all JTDX instances will show the correct colours for worked stations, DXCCs, etc irrespective of which one is in use.
- The picture below gives an example.

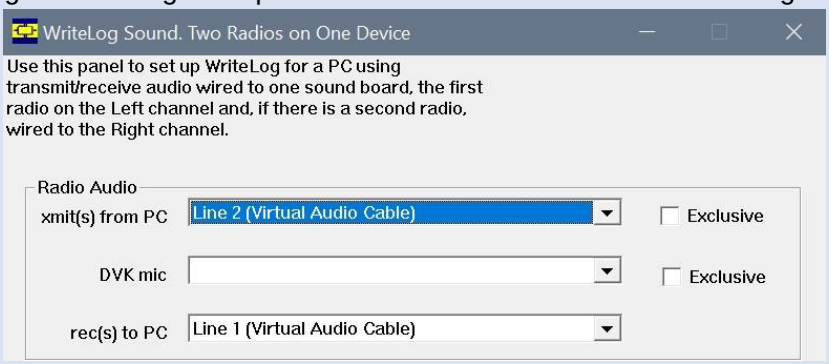
JTDX RX1 is on 17mtrs and JTDX RX2 is on 20mtrs. Stations were worked on 18.100 and then later on 14074. Normally I have the RX2 window on a separate monitor.

- Logging to external software: currently, irrespective of whether RX1 or RX2 are active, a TCI enabled logbook will show only the frequency of RX1. In this case, ensure that JTDX is linked to your TCI logbook via UDP. Swisslog supports this. For non-TCI logbooks, configure using COM ports per your logbook documentation and, again, check whether UDP linking is supported. When it is, no matter what frequency is sent via CAT to the logbook, the log will receive the correct band and frequency via the UDP link from JTDX. Logging is therefore perfect to the external logger.

6.13 Writelog and DigiRite

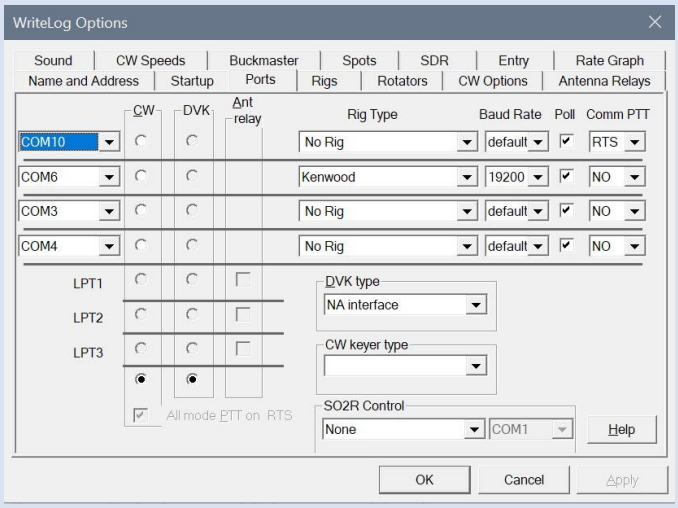
In addition to contest software such as 5M and N1MM+ (which we come to later in 5.13) and in addition to WSJTx for FT8 contesting, there is a combined suite of Writelog/DigiRite that has full contest control including scoring and FT8 (FT4 to be added soon). DigiRite is free and can be used standalone but is more effective if run from Writelog. There is a demo version of Writelog, without time limitation, so you can see its features and how it runs with DigiRite. Writelog of course can used without DigiRite as it is contest software for all modes SSB, CW and RTTY.

After downloading both installation files, install Writelog. Using the Windows start menu, go to Writelog and open the Soundboard mixer control. Writelog has an extensive help file so only the settings relevant to ESDR* are mentioned here. With VAC set up as before, nominate VAC 2 for xmit(s) from PC and VAC 1 for rec(s) to PC (receive).



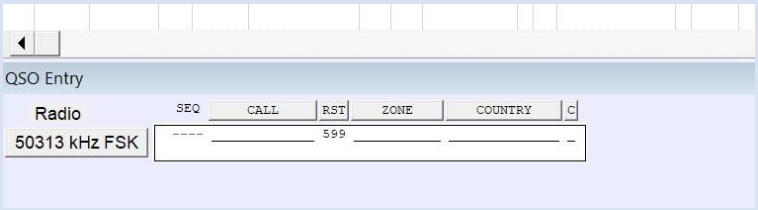
Do not check the boxes marked Exclusive.
Click OK and open Writelog.

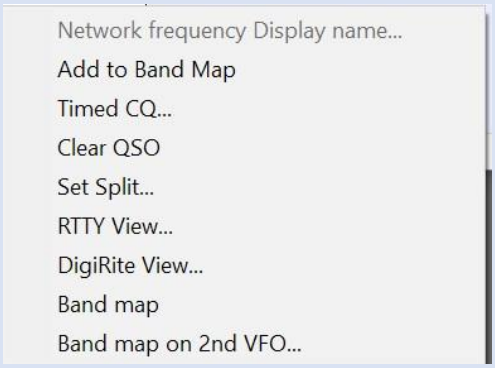
If you are intending to operate in specific contest, pick it from the list (the demo version has only 4 to choose from). For everyday use, see later on how to modify the CQ to omit ‘test’ from it. For now, pick a contest to see the Writelog GUI. We are obviously concerned with CAT and PTT functions.



Go to Setup>Writelog Options>Ports. COM 10 is our PTT port so set it per the picture. COM 6 is our CAT port, using Kenwood protocol with 19200 baud rate. Other interfaces can be added here such as COM port keying or Winkeyer for CW, DVK, etc.

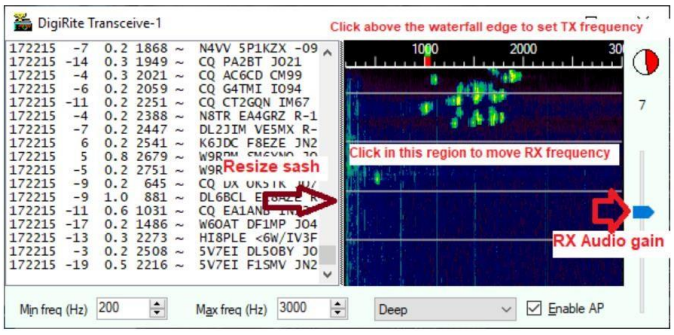
The QSO entry box at the bottom the main GUI (log window) will now show the correct frequency of your radio.



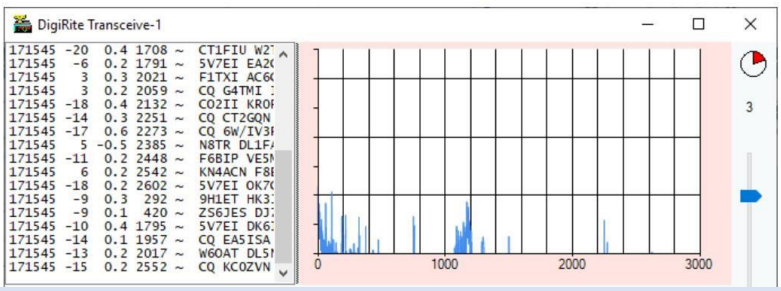


Right click in the log entry box that you see above to bring up a menu, from which select DigiRite View.

This screen snapshot is when run with WriteLog's unlimited version.

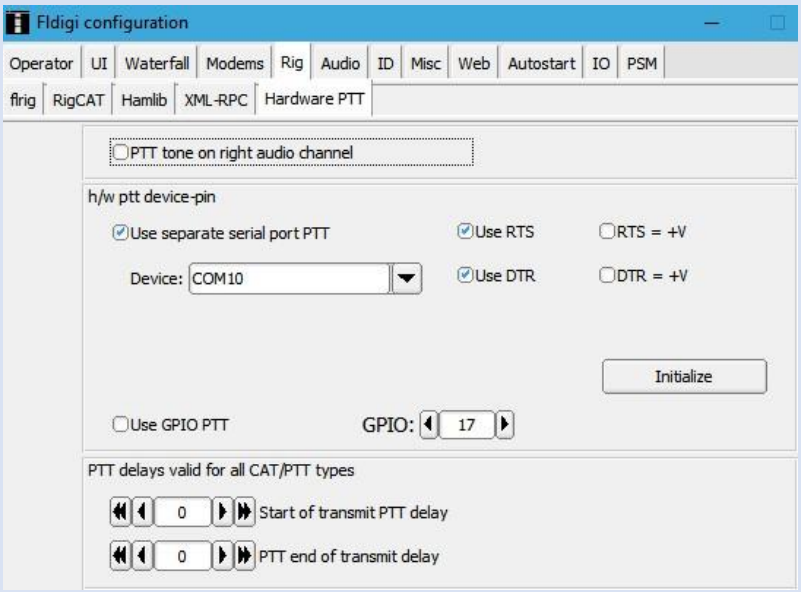


Standalone, or with the WriteLog demo version, the Transceive screen has a spectrum line instead of a waterfall:



As with JTDX/WSJTx, it is necessary to set the VAC TX and RX levels in ESDR* to the correct levels. TheDigiRite levels are different and can be saved in ESDR* with a user profile.

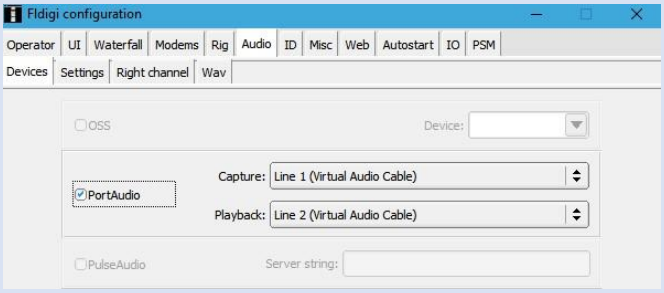
As usual, match the ESDR* DIGU filter width to the spectrum, 3kHz being normal.



Just an additional word about testing the combination in a non-contest scenario. Writelog uses some unfamiliar terms. To change the FT8 CQ message in the WL demo version from CQ TEST to a plain CQ, go to Writelog Setup>Document settings>CW RTTY CW messages and edit the last line to remove the' TEST de' from it. DigiRite will then send CQ <*callsign*> <*locator*> as normal. It supports multiple streams and will conduct several QSOs in FT8 simultaneously, logging to Writelog automatically. The resulting log can be transferred to your normal logger later.

6.14 FLDigi

I do not intend covering every digital mode program. You will surely have learnt the basics from the preceding examples. FLDigi requires special attention though. It is popular amongst users as it is, in many ways, superior to the likes of DM-780, MultiPSK, etc. It caters for many digital modes, automates QSOs and logging and it also has a basic contest set up section.

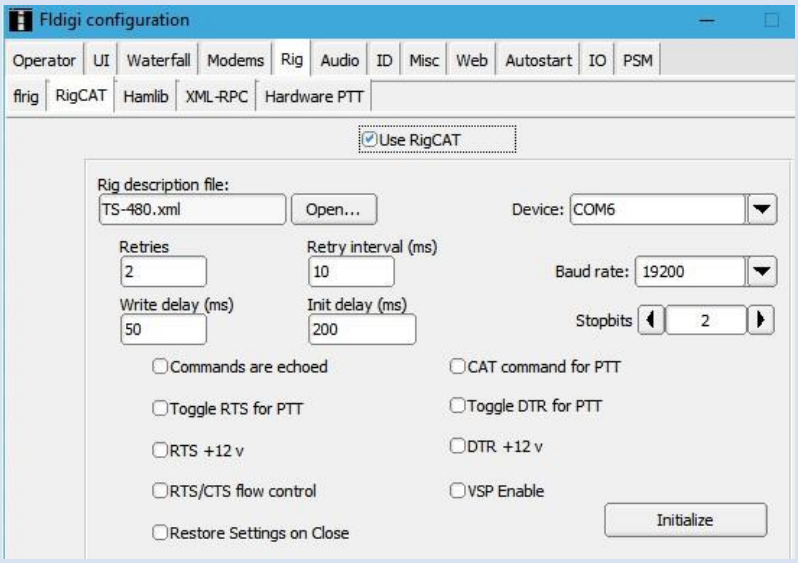


The audio set up is straightforward using the normal VAC 1 and VAC 2.

Then for PTT use the Hardware tab to set up a direct link to ESDR*.

For CAT, the RigCAT method is best but keep the ‘CAT command for PTT’ unchecked.

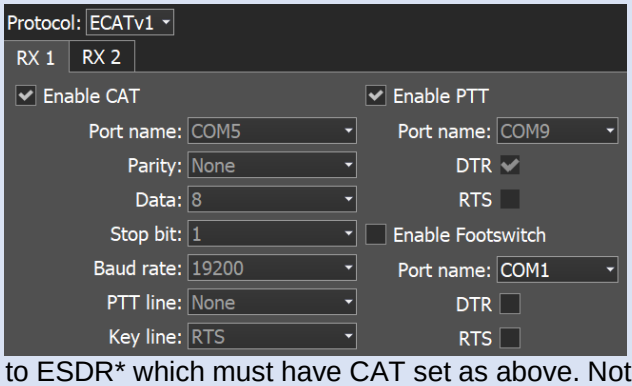
The TS-480.xml rig file is available from https://sourceforge.net/projects/fldigi/files/xmls/kenwood/TS-480.xml/download



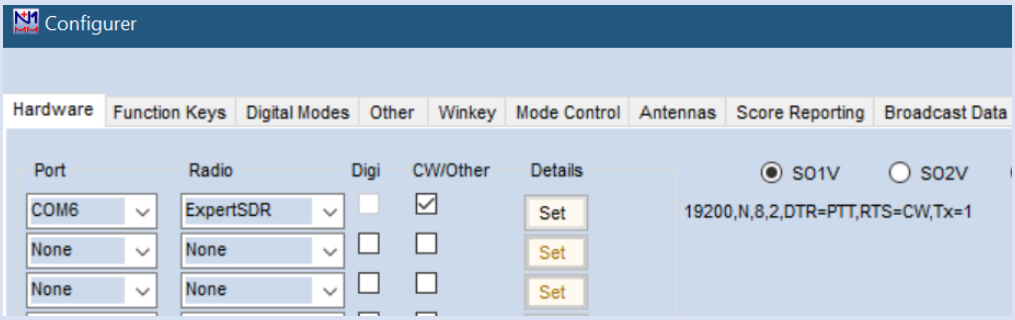
NOTE: if you get a ‘port audio not available error’ see the Troubleshooting section for the remedy.

6.15 N1MM+

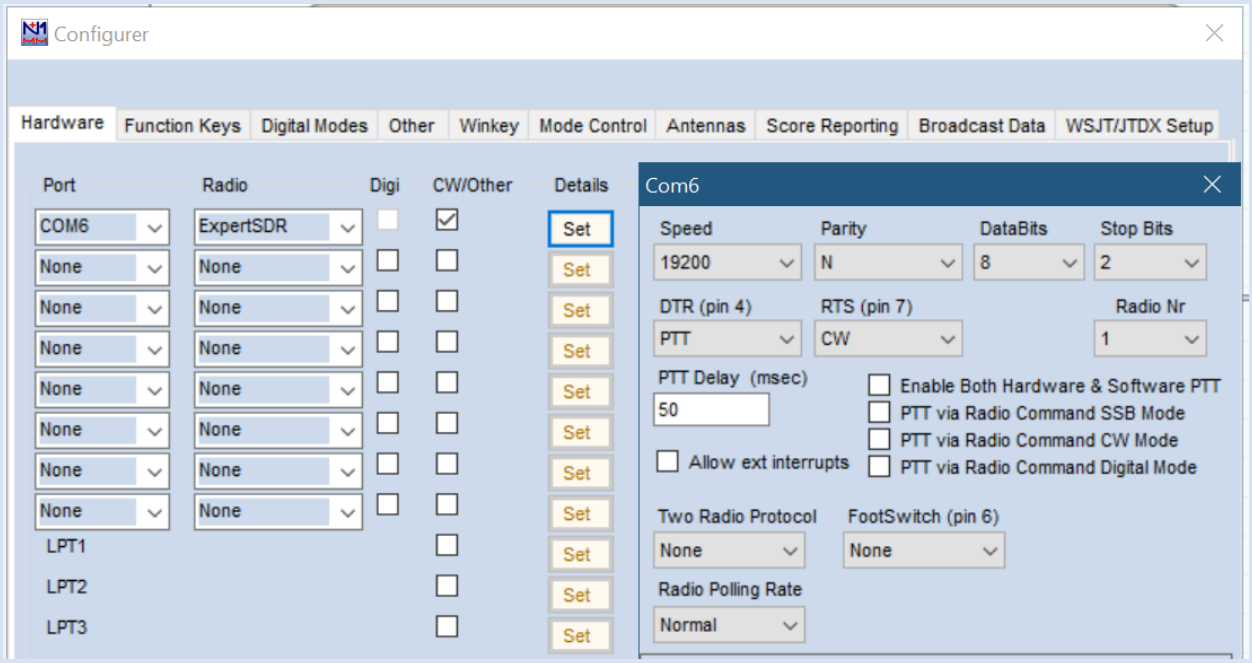
N1MM+ is a popular choice for contesting as it automates much of the QSO in SSB, CW and digital modes. It also automatically logs and scores for virtually every event in the contest calendar. It takes some practice to become totally familiar with it and its operation can feel daunting. The N1MM website has a comprehensive manual. What follows are the setup procedures as they relate to ESDR* which must have CAT set as above. Note the key line is set to RTS. N1MM uses the COM5<>COM6 pair for CAT, PTT and CW.



- CAT and PTT. When N1MM+ is started, select the Config tab and then ‘Configure Ports, Mode Control, Audio, other’.



Single operator, one radio, configuration is achieved by selecting COM 6. N1MM+ includes ExpertSDR in its Radio list. Check CW/Other and then click Set and apply the parameters below.



For the 2nd RX, define the COM port and Splitter COM7<>COM8 as was done for JTDX and set it up in N1MM+ in the next line down, under COM 6 in the above example. The port settings will be the same except that the ‘Radio Nr’ is 2. Press OK to save.

- CW. There are two ways to send CW macros and keyboard CW. If you use Winkeyer, which is the preferable method because its timing cannot be affected by computer load, define its port in the configurer and use the Winkey tab for its settings. Else use COM port CW sending. In ESDR* Options, Device > CAT, define CAT and PTT as on page 59 above.

These changes, where RTS is set in the CAT Key line is necessary only if COM port keying is to used. It does not affect operation with other software and so can be made a permanent change.

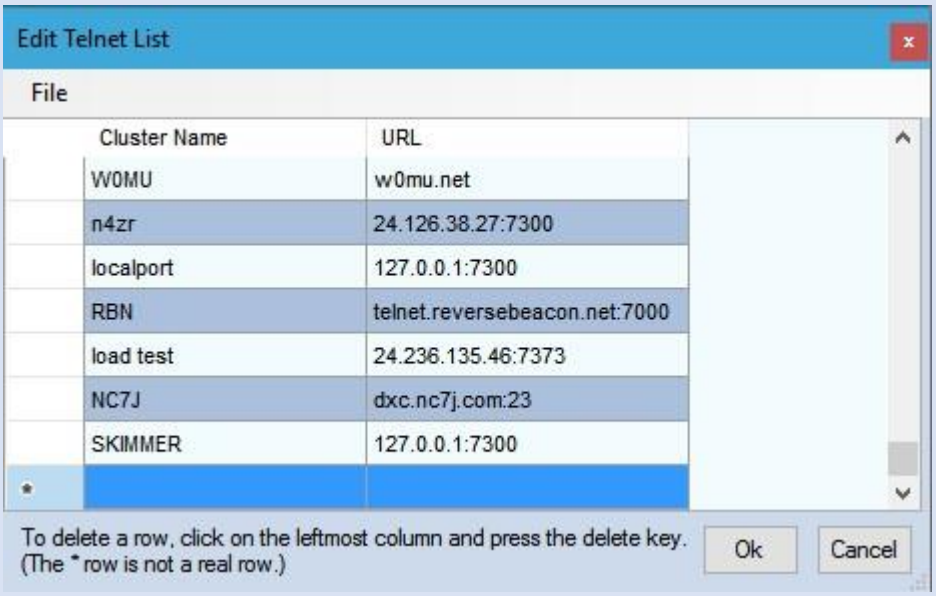
Previous versions of the UMA showed the use of the ‘Secondary Key’, found in ESDR* Options>Device>CW tab, but this can lead to stutter in sending especially at CW speeds over 20wpm. Therefore, this method here is better.

Referring to the picture above, click Set for port COM 6. In the dialogue box that opens, set the DTR and RTS parameters as you see them here. Effectively, COM 6 is being used for CAT, PTT and CW. PTT delay needs to be a short as possible before characters are truncated when sending. Experiment to find the best setting.

- Digital (RTTY). The Configuration window has a Digital Modes tab in which you set the Path to MMTTY on your computer. If you have not yet downloaded MMTTY, you will need to do so although N1MM+ does have MMVARI built-in as an alternative. Assuming MMTTY is to be used, in the N1MM+ log screen go to Window > Digital Interface. The Interface will open as will MMTTY. If not yet set up, do that now by referring to the MMTTY section in this Manual.

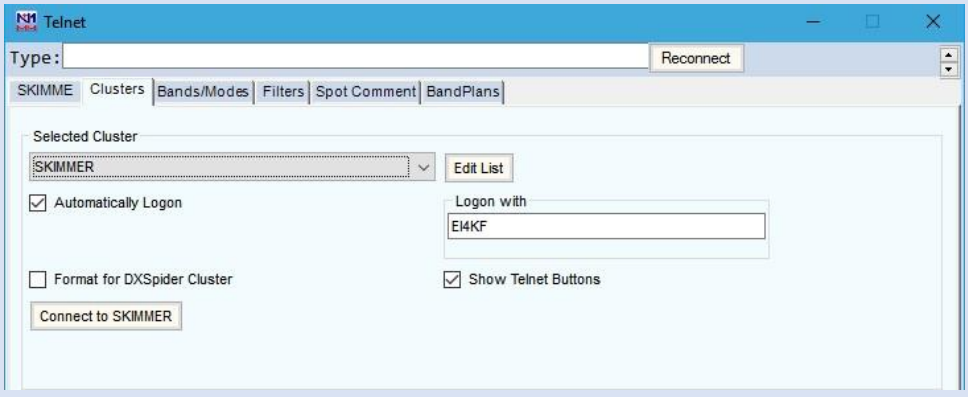
NOTE: It is not necessary when using MMTTY with N1MM to set PTT in both. If set in N1MM then do not have it set in MMTTY. N1MM will control PTT.

- CW Skimmer with N1MM+. From the main N1MM+ log window, select Tools and Telnet Window Tools. Go to the Clusters tab and Edit List. In the box that appears, scroll to the bottom and enter the details of your Skimmer(s).



The Skimmer address and port are separated by a colon (:) and if you had two Skimmers the Cluster name for the 2nd one would be SKIMMER2 and the URL 127.0.0.1:7301 (port 7301 would be defined in the 2nd Skimmer instance). Press OK and return to the main N1MM+ window. Go to the top menu and select Window and Telnet. This will open another box in which, on the Clusters tab, SKIMMER can be selected as the Cluster. See picture below. Connect to it and the telnet window will receive data.

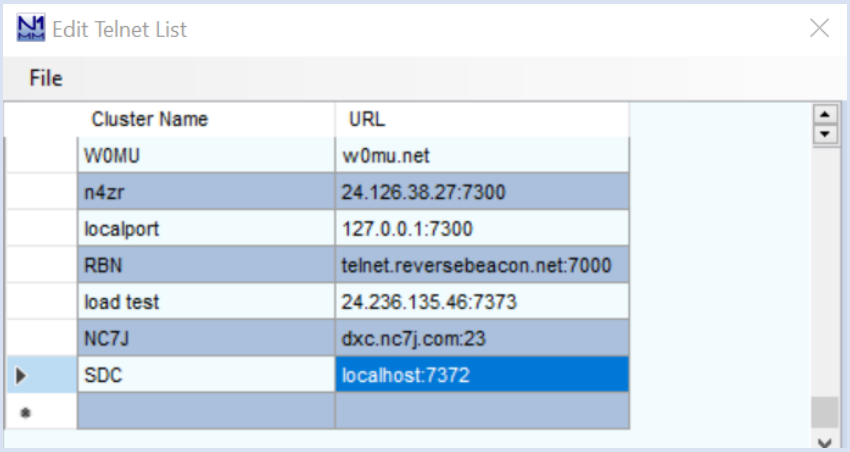
The SDC Skimmer can be connected instead of CW Skimmer. In section 5.8 see the description of the Skimmer Setup. Each SDC Skimmer can be declared a server, to which third-party programs like N1MM can connect to receive Spots. Specify the port in the Skimmer Setup.



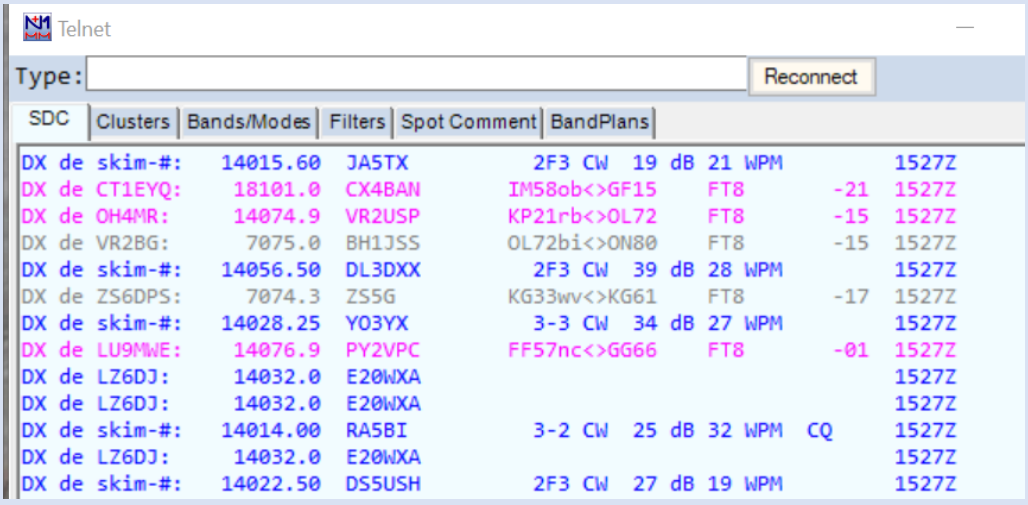
- All SDC Spot output can be sent to N1MM. This will mean that tuning in a station that has been spotted to the Panorama will automatically show

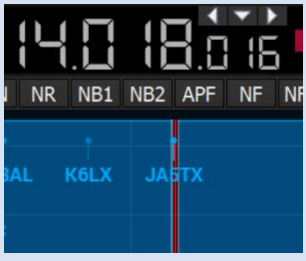
in N1MM. In this scenario, there are no external Clusters defined in N1MM which gets all its Spots from SDC instead.

Make a Telnet Cluster entry in N1MM. The port must be the same as that used in the SDC Telnet window.



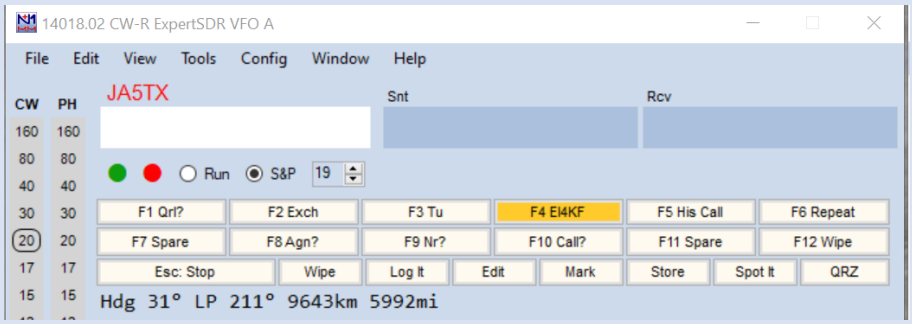
This is then selected in the N1MM Cluster List as the Cluster for N1MM to use. Set 'Automatically Logon' so that a connection is made when N1MM starts. The output from the external Clusters defined in SDC, together with the SDC Skimmer, will be sent to N1MM.



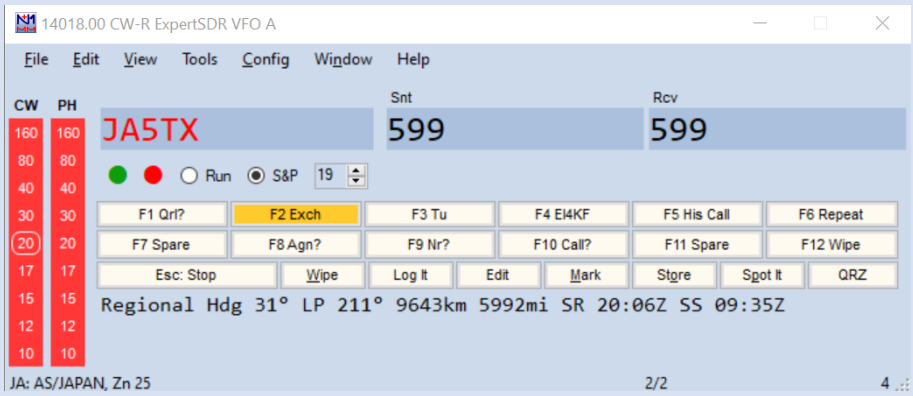


Above you can see the SDC Skimmer Spots (skim-#) with the external Cluster Spots.

When you tune to a Spot on the Panorama, example JA5TX from the list above, the callsign will appear in the N1MM logger window.



If in S&P mode, with ESM enabled, pressing ‘Enter’ will fill the log box and your callsign will be transmitted.



This is almost the same as the 5MContest<>SDC integration.

NOTE: the N1MM Configurer, Broadcast Data tab, must be set as in the picture shown in section 5.11 for Radio and Spots.

- Recording and sending SSB audio with N1MM+. For contest operations, SSB macros are used (Digital Voice Keyer). Also, QSOs can be recorded and replayed.
  Some contests require a complete recording to be made.

  Go to Config>Logger + Audio setup. Playback (TX) is VAC Line 2. To record SSB messages on-the-fly, set your preferred microphone input in the Message Recording tab.

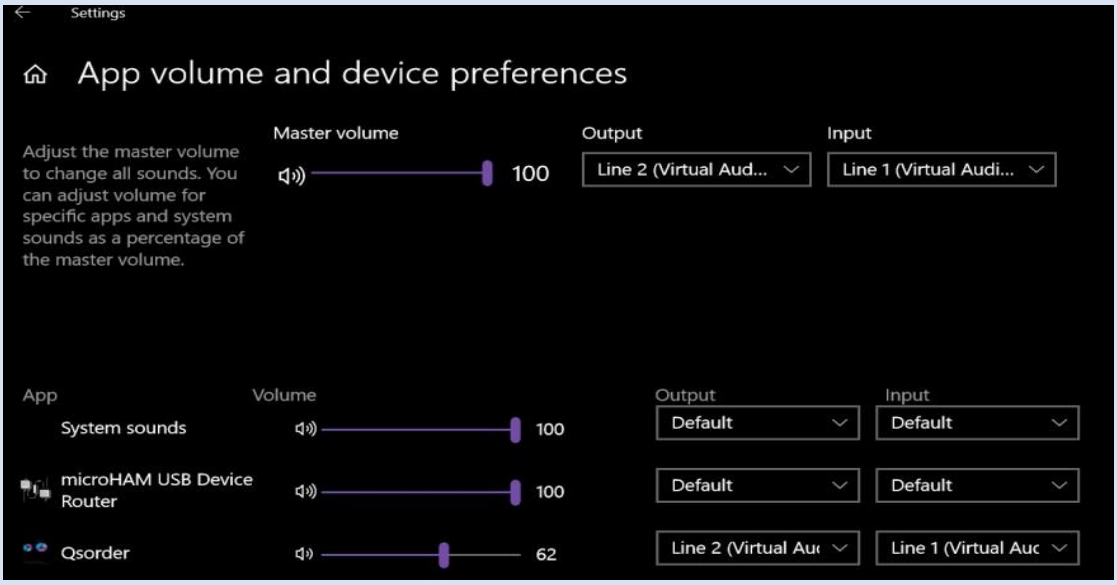
- Recording QSOs (CW/SSB) for everyday and contest. For this QSOrder is used and can be downloaded from its project area at https://github.com/k3it/qsorder/releases The files should be extracted to

\Documents\N1MM Logger+\QsoRecording If you prefer to save uncompressed WAV files instead of MP3 files, delete lame.exe (Lame is a very fast, free MP3 encoder).
Create a folder in which you will store the non-contest recording files. In the QsoRecording directory, make a folder called AUDIO_YYYY (where YYYY is the year). Example is AUDIO_2019.

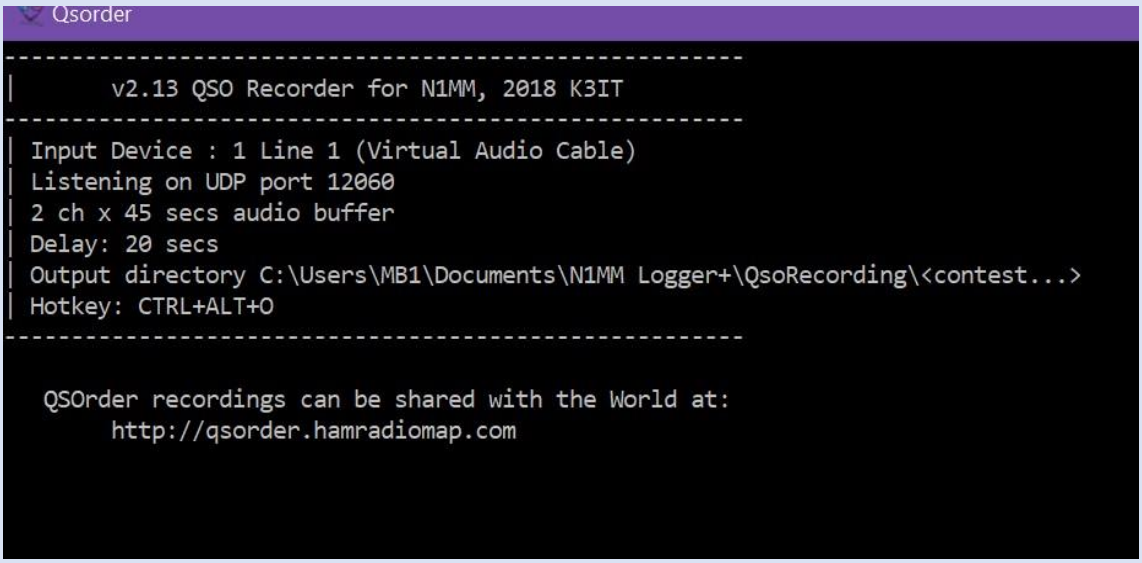
QSOrder uses N1MM+ Logger's UDP broadcasts. The broadcasts trigger a dump of the audio buffer to a file after a specified delay time (the default is 20 seconds). The delay helps with capturing a tail-end after a QSO was entered in the log.

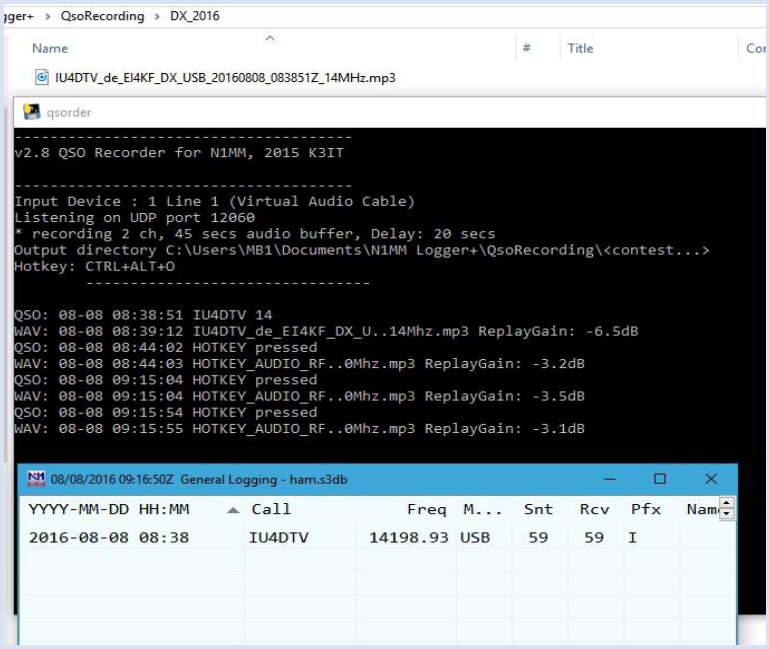
Find the [ExternalBroadcast] section in your N1MM Logger.ini file and include the lines below. This enables local QSO info UDP broadcast. Restart N1MM after making the changes.
[External Broadcast]
BroadcastContactAddr=127.0.0.1:12060
IsBroadcastContact=True

To use QSOrder for a particular contest, start the QSOrder program and run it at the same time as N1MM+. Each time a QSO is logged in the Logger, a UDP broadcast will trigger QSOrder to save a recording of that QSO. Recordings are saved in a subfolder named by contest-name and year (created automatically), and each QSO is saved in a file whose name includes the callsign of the station worked, the name of the contest, the date, time and band. When you first start QSOrder, if prompted by Windows Firewall, make sure you allow local network communication. QSOrder should tell you which audio input was selected. If it is not the correct one, in Windows versions prior to Windows 10 1803, go to Windows audio settings and change the 'Default Recording Device' to the correct one – VAC Line 1. In Windows 10 1803 onwards, go to Settings > Sound and adjust its application settings.



For non-contest recording, at times when you are not using N1MM+ for example, the Hot-Key CTRL+ALT+O will save the current audio buffer to a file in your AUDIO_YYYY directory. Whatever your radio is hearing, QSOrder will record 45 seconds of audio.





Left, an overlay of 3 windows. At the top, File Explorer showing an MP3 recording file just made of IU4DTV. Below is the QSOrder window showing the creation of the initial .wav file which started when IU4DTV was logged in N1MM+ in the bottom window.

To stop QSOrder, close the command window.

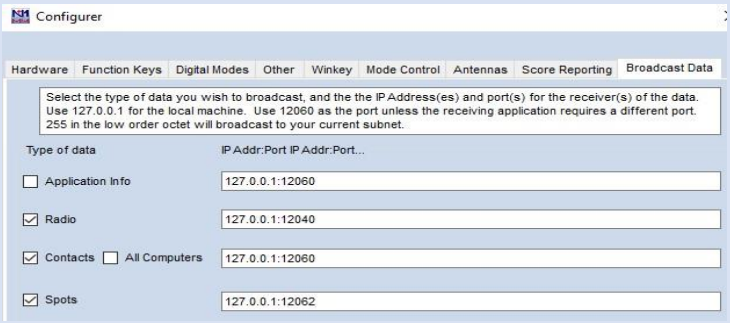
- DX Spot output from N1MM+ to the ESDR* Panorama is new option for this logger. Phil M0VSE has developed VSELink, a small application that converts the Spot broadcasts from a telnet DX Cluster, defined in N1MM, from UDP to TCI. The Spots it sends to ESDR* are colour coded depending on their status in the N1MM log. Full details and the download link are at https://www.m0vse.uk/22-release-of-vselink-forn1mm-expertsdr2.html

  Save the zip file to c:\vselink and unzip the contents. You can either choose to manually start the program when you want it or install it as a Windows Service. In this case, it will run on Windows boot. To install as a Service, go to Windows Settings>Personalisation>Taskbar and check you have PowerShell enabled. Right click the Windows Icon in the Taskbar and select Windows PowerShell (admin). In the command window enter ‘CD c:\vselink’, press enter, then enter the command ‘.\vselink –install’ (.\vselink, a space, two hyphens, install) and the Service will be created. See below.

```
PS C:\vselink> .\vselink --install
VSELink v0.2b by Phil Taylor M0VSE
Copyright (c) 2018 M0VSE

Loading config file: C:\vselink\VSELink.xml
Log file : C:\vselink\VSELink.log
Trying to install VSELink as a service.
VSELink is installed.
PS C:\vselink>
```

When run for the first time, a xml file will be created in the vselink folder. This contains important parameters such as colours, TCI port and the N1MM+ UDP broadcast port. A right-click on the xml file, followed by selecting Edit, will give you access. Changes can be made directly into the xml file.



The set up for N1MM+ is simple. Go to Config > 'Configure Ports, Mode Control, Audio, other' and open the Configurer. In the Broadcast Data tab, enable Spots with an address:port of 127.0.0.1:12062

- Additionally, VSELink can be used to interface ESDR* with the N1MM+ Spectrum Scope. To enable this function there are two settings to change in the VSELink xml file. Set enable spectrum display to 'true' and set the spectrum frequency to '10' (this controls the spectrum speed).

```
<!-- Enable/Disable N1MM+ Spectrum Display -->
<SpectrumDisplayEnabled>true</SpectrumDisplayEnabled>
 <!-- Frequency of spectrum updates (per second) N1MM+ recommend no more than 10
More frequent updates can impact system performance -->
<SpectrumFrequency>10</SpectrumFrequency>
```

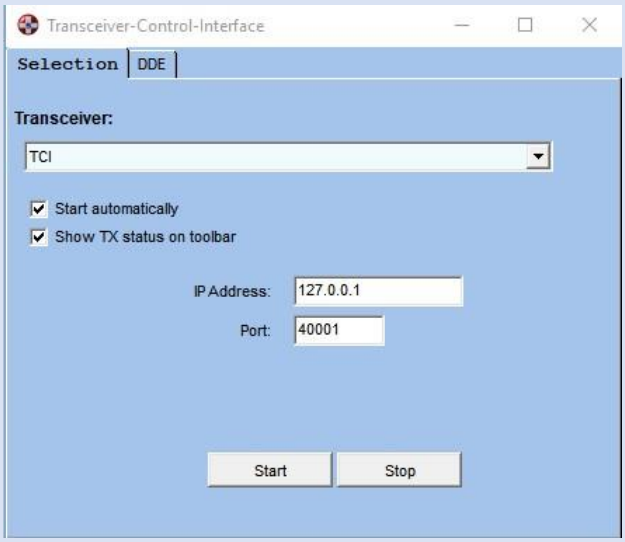
With the left mouse wheel on the Scope, adjust the noise floor so that you get only signals.

DX Spots will appear when N1MM is connected to a DXCluster in its Telnet window. Tuning the radio to a Spot on the Scope will prepare the Input window with that callsign – JN1THL in the above picture. An alternative method of interfacing ESDR* with the N1MM Spectrum Scope can be done with SDC. See section 5.11 for details. The SDC implementation is not as good, in my opinion, but try it for comparison.

The resolution of the N1MM Scope is not even close to that of ESDR* so it is questionable how much use can really be made of it.

6.16 Swisslog

Swisslog is the 3rd software application, after ‘Software Defined Connectors’ (SDC which we will come to later) and Russian logger LogHX to implement TCI interfacing to ESDR*. Moreover, Swisslog is one of the most powerful and feature packed logbooks available. With TCI, allowing DX Spots to the Panorama that can be coloured by status (needed, worked, confirmed), and CAT control without COM ports, it is the most suitable logger for ESDR* users.



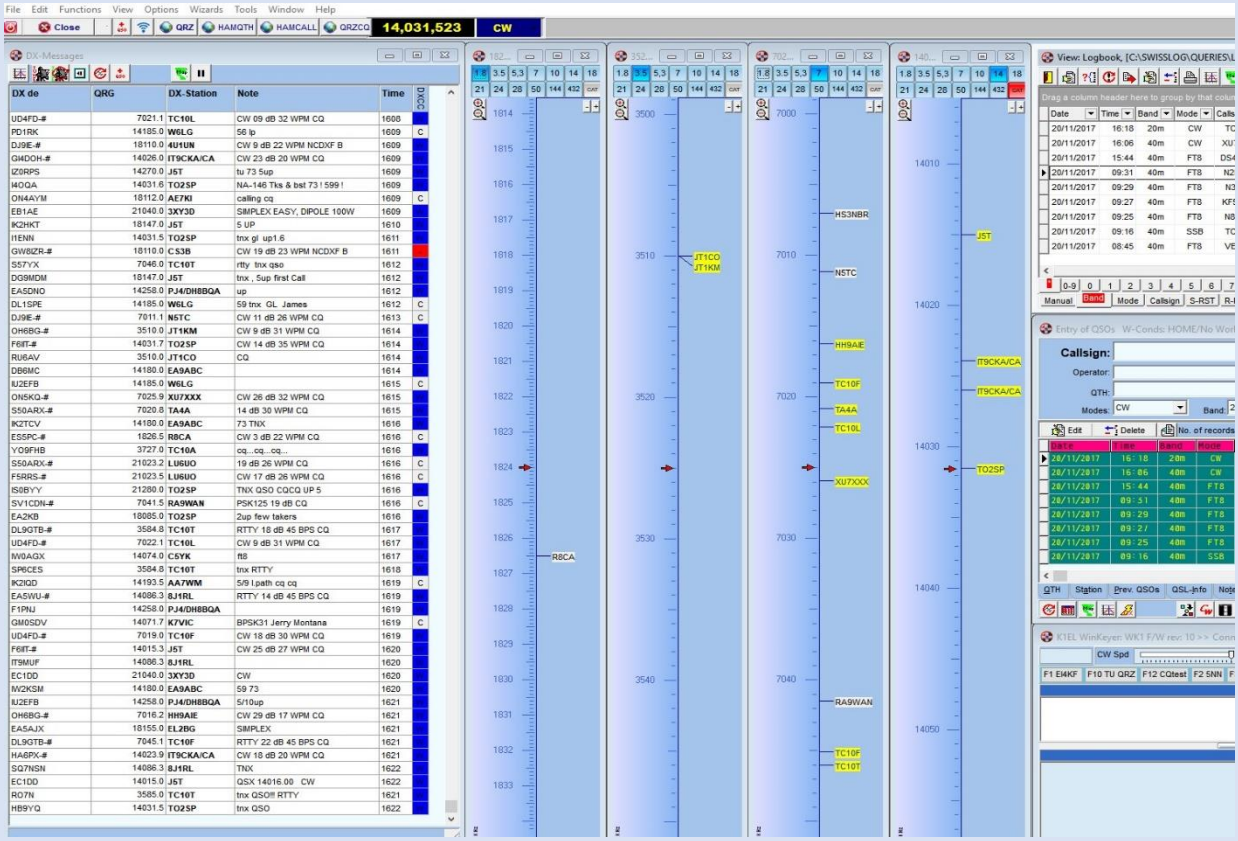
In the Swisslog Options > Transceiver Interface, select TCI from the drop-down menu. Check Start automatically and Show TX status. The port address of 40001 matches that in ESDR* Options > TCI tab where, of course, TCI must also be enabled.

Swisslog has more features than any other logbook software:

* Add, Edit and Delete QSOs.
* Display detailed information about the QSO-Partner.
* View and Print Logbook with powerful filtering functions on every field: auto-filters, customisable filters, field grouping.
* Dual monitor support: you can place the following functions in a standalone window for another monitor: add QSO, logbook views, Register QSL cards, K1EL WinKeyer, DX-message windows, band maps and world map.
* Import and Export of QSOs. Swisslog fulfils the ADIF v3.0.8 specifications. * Manage many Awards: DXCC, IOTA, WAS, WAE, WAZ, WPX, SOTA, WCA, WFF, JA Prefectures, US Counties, DOK, RDA, TEN-TEN, ARLHS and many more.
* Fully integrated LoTW automatic and manual synchronisation. Supporting configuration for multiple certificates and station locations. TQSL 2.0 or higher needed.
* Fully integrated eQSL automatic and manual synchronisation. Supporting configuration for multiple callsigns and QTHs. Fully detailed error report after synchronisation to correct logging errors or wrong QSL requests.
* Instant display of eQSL cards and QRZ/QRZCQ profile images. (Internet connection and QRZ / QRZCQ subscription required). Image viewer fully resizable with no loss of quality. Print/Save buttons available.

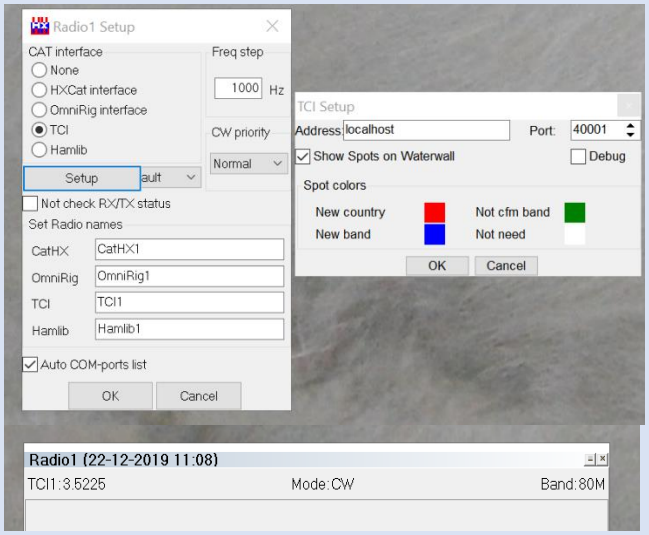
* Real-time logging to most important online logs: QRZ, Club Log, eQSL, HAMLOG, HAMQTH and HRDLOG. Multiple callsign configuration for eQSL, HAMLOG and QRZ. Add/Delete QSO in real-time and also real-time editing in HAMQTH, HRDLOG and Club Log.
* Upload your full/partial logbook to Club Log, HAMLOG, HAMQTH (only full), HRDLOG and QRZ with few clicks.
* Special logos panel indicating if the station is member of:
- LoTW, eQSL AG user (also eQSL regular member).
- the following club / association membership: 30MDG, AGCW, BCA, BDM, CWOPS, DIG, DMC, EA QRP Club, EPC, FISTS, FOC, HSC, Lynx DX Group, MF, NDG, RCA, REF, SKCC, TENTEN, URE, URA, Club Log and True Blue DX Club (TBDXC).
* You can update LoTW and eQSL AG users list and many award references through internet.
* Transceiver Control (Kenwood, Yaesu, Icom, Elecraft, TRX Manager, MixW, HRD, OmniRig, DX Lab Commander, FLRIG and TCI.)
* One click ultra-fast transceiver switching in dual transceiver configurations (using OmniRig as transceiver control).
* Rotor-Control (ARS-USB interface and ARS-VCOM software from EA4TX, Hy-Gain, Yaesu, Sartek and PstRotator).
* Azimuth indicator.
* Integrated Telnet and Internet Support.
* Callbook Support: local (RACB, BUCKMASTER) and Internet DBs (QRZ, HamCall, HAMQTH and QRZCQ).
* Support of QSL-Manager Databases: local DBs: (RACB and DF6EX) and Internet DBs: QRZ and IK3QAR.
* DX-Cluster Support - Now indicating if a DX station is LoTW and/or eQSL AG user.
* Fully featured Band map function: wide zoom in/out range, custom font size for DX-Spots, band filtering (including 60m), resizable window, full spot details (including if LoTW / eQSL user) when placing mouse cursor over a DX spot. With the following Swisslog exclusive functions:
- Customisable statistic selection. By default, this is DXCC but user can select any statistic.
- Enable/disable CAT link by means of a button.
- Colours customisation: background, ruler gradients, ruler measures, frequency and even buttons.
- You can have as many band maps as you want with different band filters, colours and statistics.
- You can place every band map as standalone window for dual monitor systems.
* DX-Telnet Support – specifically for use with Internet DX Clusters.

* SWISSLOG interfaces with the following digital modes programs: MixW, Hamscope, TrueTTY, FLDIGI, MultiPSK, WSJT-X, JTDX, JT65-HF HB9HQX Edition, SIMPSK and Digital Master 780.
* SWISSLOG links with the following CW programs/interfaces: CW-Type, CW Get, CW Skimmer and K1EL WinKeyer.
* World map.
* Uses ACCESS database to store the QSO's. * User Definable Logbook Queries like ACCESS.



6.17 LogHX

Download and install, creating the log database file when the dialogue box appears. After completing the basics in Setup>General setup, go to Setup>Radio Setup. LogHX uses TCI so ensure it is enabled in ESDR*. Select TCI in the Radio 1 Setup box and use the default settings for TCI Setup.

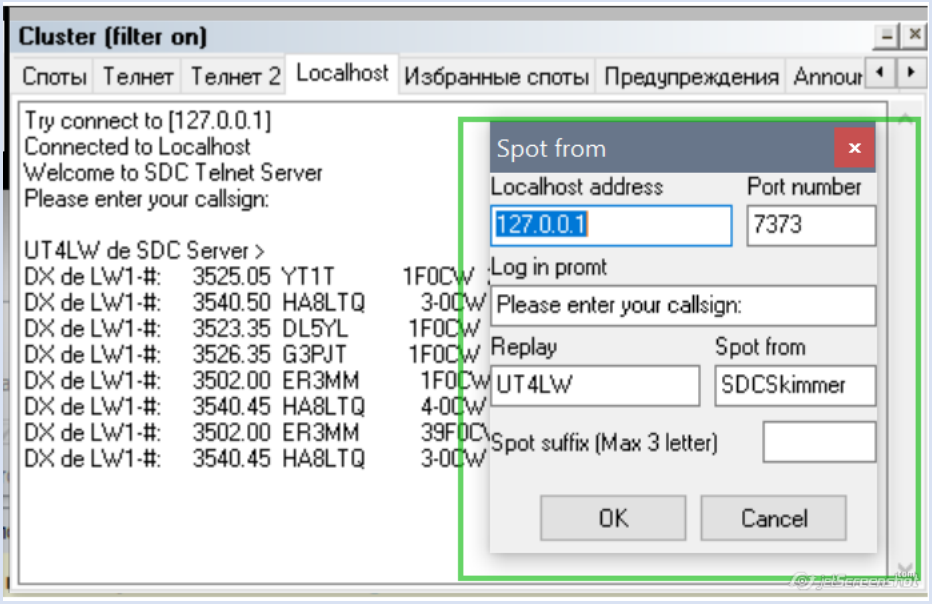


Click OK and you will see immediately that the logging box shows the frequency and mode of the radio:

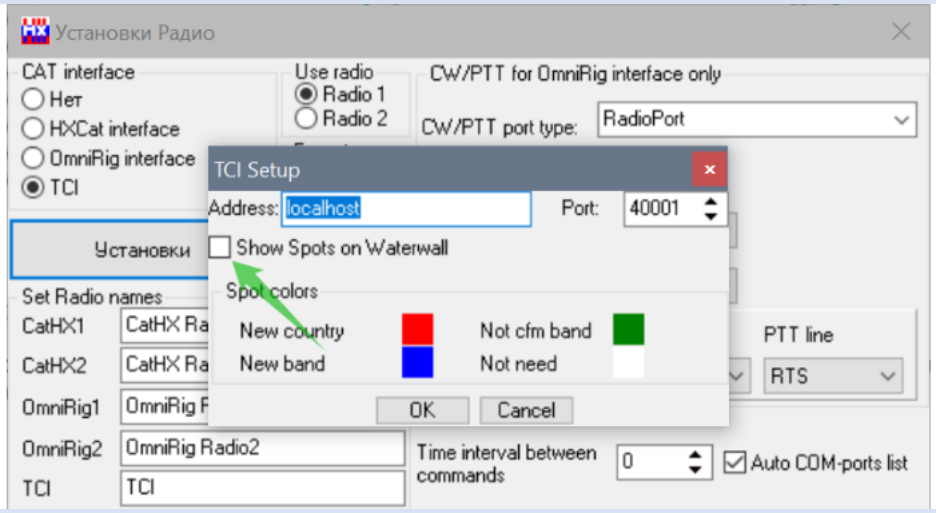
CW is controlled by TCI and it is only necessary to edit the F- keys in the CW window. Opening the digital mode window will automatically set the radio mode appropriately and closing it will revert the mode to its previous state. External programs can be integrated, like JTDX for instance, using the Programs>Setup External Programs menu.

Like Swisslog, LogHX can process received Spots and respond with lines indicating the status of callsigns. The software will fully integrate with SDC for this purpose, allowing for showing the status of callsigns received through the SDC Telnet Server and also those that are decoded by the SDC Skimmers.

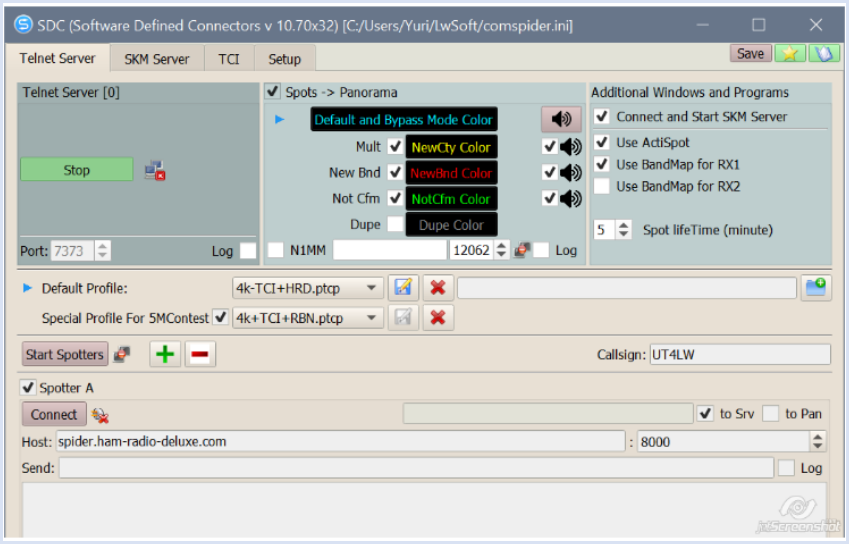
Go to the LogHX Cluster – Localhost window and specify the address of the SDC Telnet Server.



If you only want Spots from the SDC Skimmers to be displayed on the transceiver's panorama, then in LogHX-TCI setting, disconnect the callsign to the panorama directly from the log:



In the SDC Telnet Server, the types of callsigns are marked for those that you want sent to the panorama, and their colour is indicated:



Check the LogHX connection to the SDC Telnet Server. In the Telnet Server section, the logo of the LogHX program should appear. When LogHX is connected to the SDC Telnet Server, the profile specified in 'Profile' will be selected.

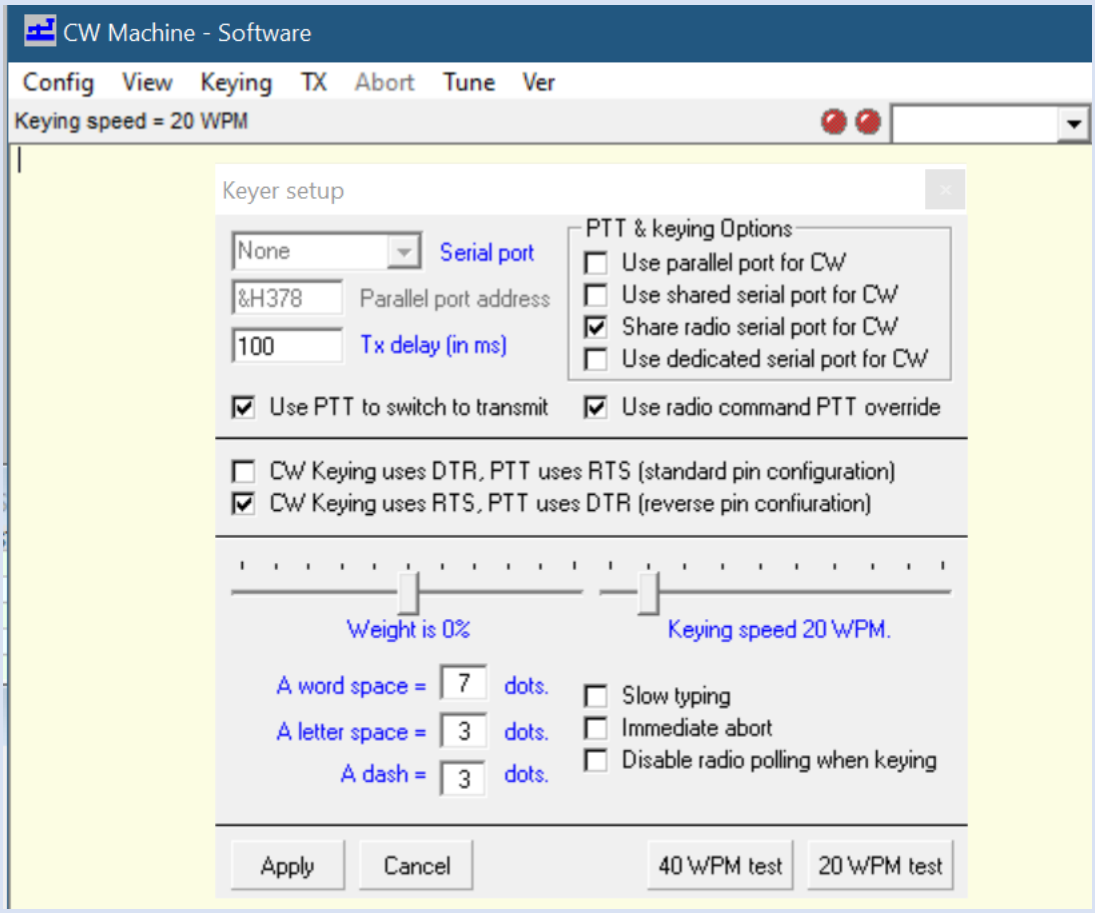
Additional information is provided by Vasily in a video that can be viewed at https://www.youtube.com/watch?time_continue=502&v=2JApW4wBj1o&feature=emb_logo

Also see https://translate.google.it/translate?sl=it&tl=en&u=https%3A%2F%2Fiw7dmh.jimdofree.com%2Fsunsdr2-pro-pages%2Floghx3-log-con-supporto-tci%2F

6.18 Logger32

The CAT side of Logger32 is quite straightforward to set up. Just use the normal COM 6 in Radio 1 configuration. More obscure is how to enable macro and keyboard CW sending.

Keeping ESDR* settings as they are for N1MM, see above, set Logger32 by going to View > CW machine. Open Config and go to Keyer setup.

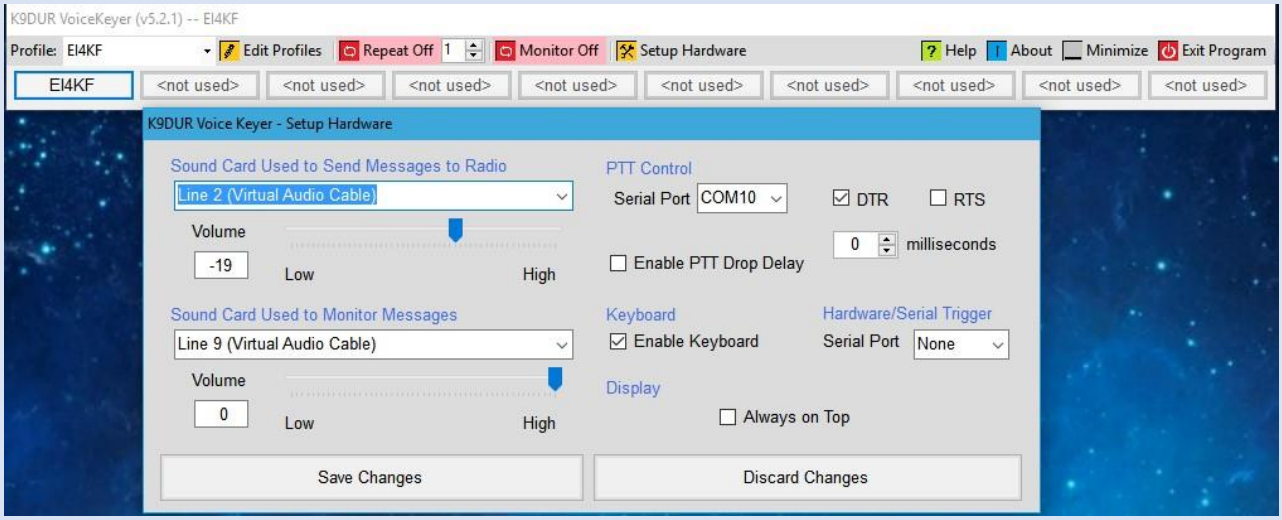


In this set up, the CW keying port is shared with CAT as with N1MM. Ensure Breakin is on in ESDR*. The delay may need to be adjusted to the shortest possible value without truncating the signal.

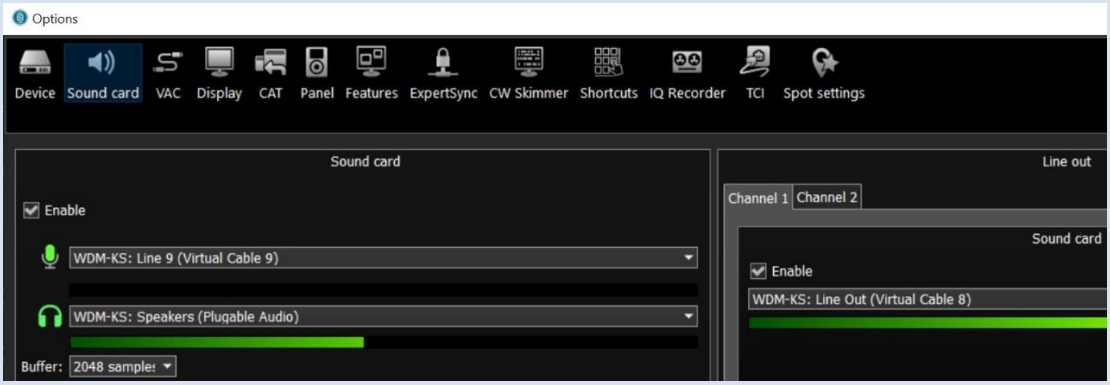
6.19 K9DUR Voice Keyer

NOTE: This software is largely redundant now because voice, as well as CW and digital mode, macros can be sent using SDC and TCI. Use the Macro tab in SDC and enable 'External Window'.

A voice-keyer is very useful for contests and for calling in pile-ups too. Not only does it save your voice when calling in a pile-up, because of its compressed digital nature it will have more 'punch' than your normal audio.

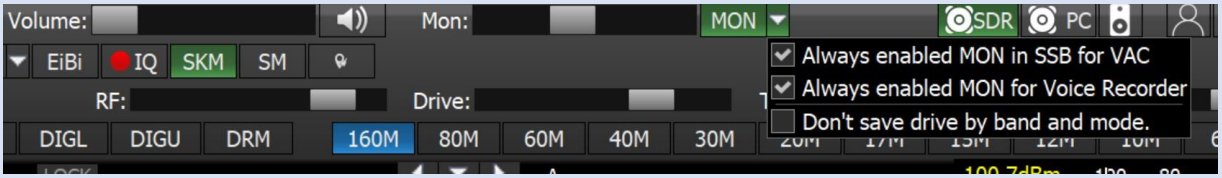


Click Setup Hardware from the main screen to open the configuration window. Set the parameters as above. The volume under Line 2 VAC controls the audio gain of the transmitted macro and should be adjusted to avoid over driving the radio. Line 9 VAC for monitoring messages and Line 8 VAC for recording messages can be set up in ESDR* Sound Card tab



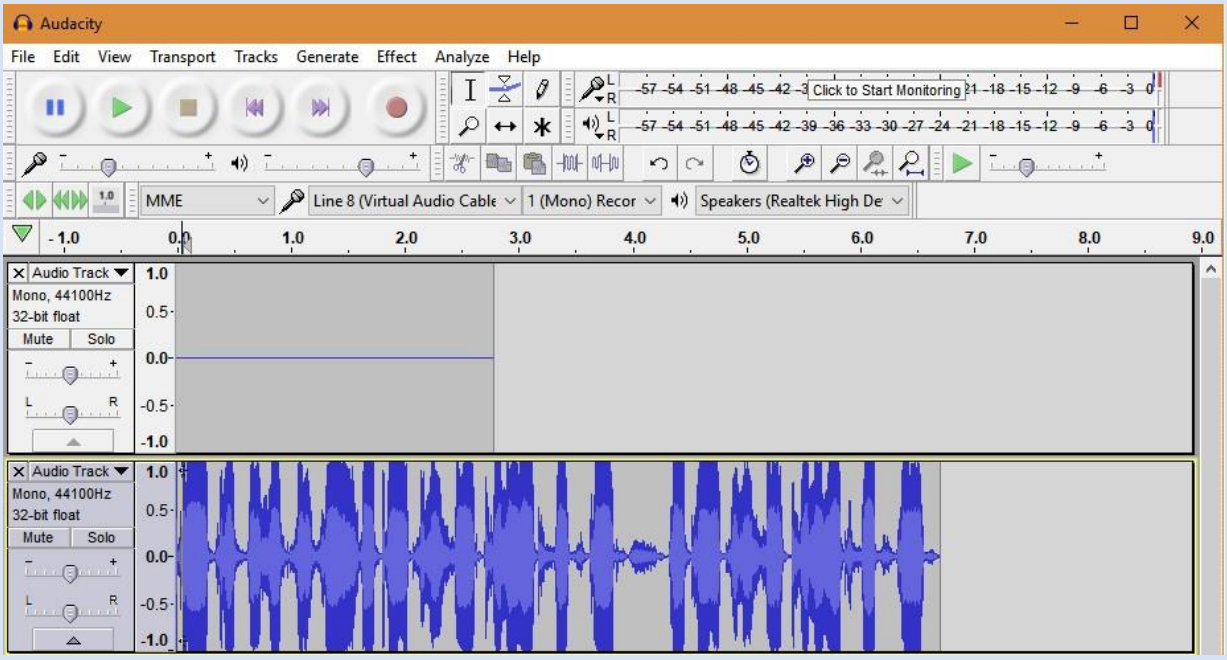
but are optional. Only Line 2 is actually required for transmitting and Line 8 for recording messages.

Regarding monitoring sound output in transmit, I recommend using the settings in ESDR*.



Set to on the ‘Always enabled MON in SSB for VAC’ (and for voice recorder).

The K9DUR help file describes how to create and store the message wav files. The easiest application for the purpose is Audacity: https://www.audacityteam.org/download/



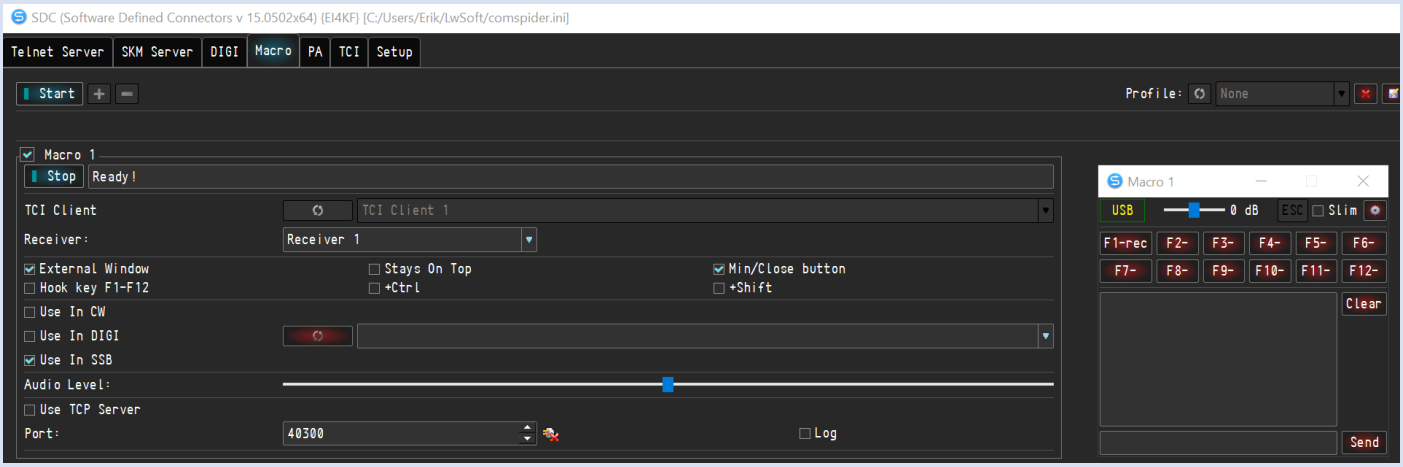
Ensure that in VAC you configured lines 8 and 9 (see the VAC section in this Manual). Configure Audacity to use Line 8 with MME as the driver. Record your mono .wav file by using your normal radio microphone with the radio in TX but power out at zero. Using Audacity, edit the file to remove non-audio time before and after the message. Save the .wav file and transfer to the K9DUR folder. Macros are set in K9DUR profiles.

6.20 ESDR* Voice Recording and Playback

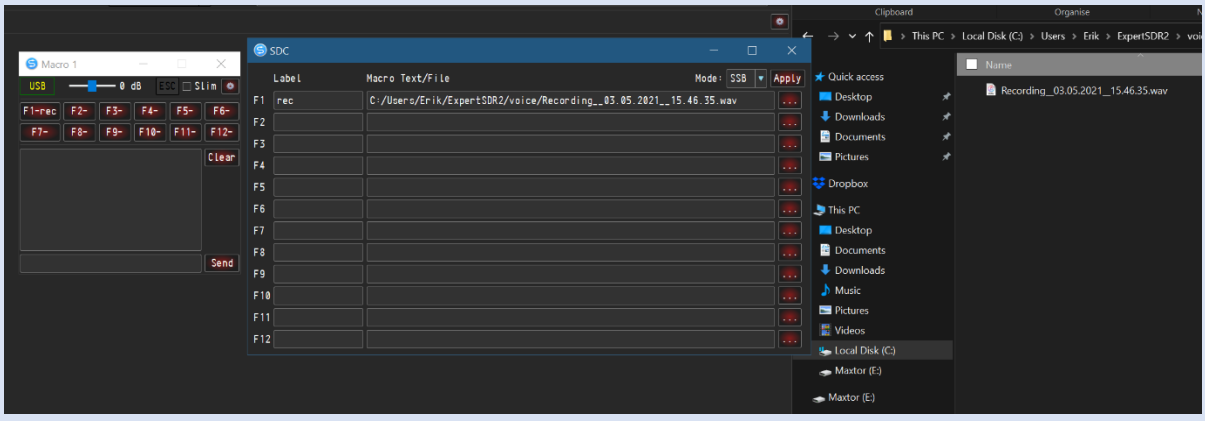
ESDR* has an off-air recording facility with playback for the last recorded file. This function can be extended through SDC to permit playback locally and over the air. This uses the SDC Macro tab. The macro server can actually serve CW and Digi as well as SSB.

To use it for voice, make your recording(s) using the on/off line recording to wave file feature in ESDR*. Do not convert to mp3.

In SDC with Macro enabled and set for Use in SSB, have External Window checked.



Use the external window, called Macro 1, to load the wav file. The cog icon top right of Macro 1 does that.



Press F1 in the Macro 1 window and your radio will transmit the file over the air.

7 CAT to Many Devices

Either with the MB1 and its single physical COM port, or also with external computers as used by SunSDR2 owners, you may need to have CAT enabled on multiple ports for serially connected devices such as SteppIR, Ultrabeam, Palstar HF-Auto ATU, amplifier, etc.

NOTE: Using a MicroHam unit is no longer necessary at all. Without any extra hardware everything can be achieved using TCI and SDC. See previous references in this document.

7.1 MicroHam

Popular rig interfaces, used originally with non-SDR transceivers, are those made by MicroHam. They make a number of different models such as the MicroKeyer II, III, and USB CW Keyer. These can be interfaced with the MB1 or SunSDR2 and afford certain advantages.

A special MicroHam cable is required. For the MB1 the part number is DB37-EE-MB1 and connects to the rear RS-232 port. The CW Keyer has its own cable CAT RS232-YX. The MicroHam website shows other available cables to suit your radio.

If you have multiple external devices that use CAT, there is the problem that only one cable, perhaps to a CAT controlled amplifier, can be connected to the MB1 rear COM port. I would not advocate buying a MKII for the purpose because a much cheaper option is to use USB-RS232 serial port adapters and direct CAT to them via SDC. But if you already have one of these units, it is simple to connect and has outputs for the amplifier, a SteppIR or Ultrabeam antenna, etc.

The cable, much like this one below, provides CAT output from the MB1 COM port.

The USB CW Keyer also has a CAT output (and the cable for it is less complex and cheaper to buy). These devices connect to a USB port, either on the MB1 or on an external computer which then gives a CAT feed to that machine. COM port configuration is done by the MicroHam Device Router software.

7.2 USB to COM Port Adapters

A cheap and easy method to get CAT to an amplifier, dynamic antenna, Auto-ATU, etc is to use either a 9-pin or 15-pin USB to COM port adapter.

When you plug them in, Windows will load drivers for them. You then assign unused COM port numbers. By using VSPE or SDC, CAT data can be sent to them. See the relevant section in this Manual on port splitting and serial redirection if using VSPE. The use of SDC simplifies things greatly.

These adapters generally have FTDI drivers which are native to Windows 10. Some adapters have Prolific drivers, of which there are a great number of varieties that are Chinese clones. The official Prolific drivers do not work with them. If you have one of these, and you will know because it is not working and is shown with a yellow exclamation point in Device Manager, the solution is to download this driver:

http://www.totalcardiagnostics.com/files/PL2303_64bit_Installer.exe

1. Unplug all USB-To-Serial adapters from your computer - and double-click on "PL2303_64bit_Installer.exe"
2. When it prompts you, plug in one (1) of your Prolific USB-To-Serial adapters and click "Continue".
3. Reboot your computer.

I recommend using FTDI adapters. Some external devices will work only with this type.

8 Housekeeping

A significant number of questions that come to me are of the type: “it was working fine but I did something and now there’s a problem and I can’t get it back”. I tell you this to illustrate that basic housekeeping functions are not being done by ExpertSDR2 users. As a consequence, self-inflicted frustration often ensues. I recommend that on installing your MB1, SunSDR2 or other EE product, that you take the following common-sense measures.

1 The MB1 User Manual devotes 19 pages to the creation of a Windows 10 Restore Point and the disabling of the Windows 10 sign-on password function. Get into the habit of creating a Restore Point at every significant event in the life of the Operating System. Out of the box, with only ESDR* installed, create a Restore Point. After each software installation (VSPE, VAC, logbook, SDC, etc), do the same. When something goes wrong, which you can bet will happen eventually, you have a working configuration to revert to.

2 The password function could be essential for some users, for example if the radio was at a Club Station or somewhere that might be open to unauthorised use. But normally, it is unnecessary and only delays the start-up time for the SDR.

3 Windows 10 Recovery Options work quite well. But what if something happens and you cannot access them? Use the Windows 10 Media Creation Tool to facilitate an in-place upgrade that will allow you to keep your files, settings, and applications while correcting any problems with your current Windows installation. Download the appropriate ISO for your Windows installation and save it to a location on your PC or even better an external drive.

Open File Explorer, navigate to the save location for the ISO, and double-click the ISO file to open it.

Windows will “mount” the image so you may access the files contained therein. Double-click the Setup.exe file to launch the install process

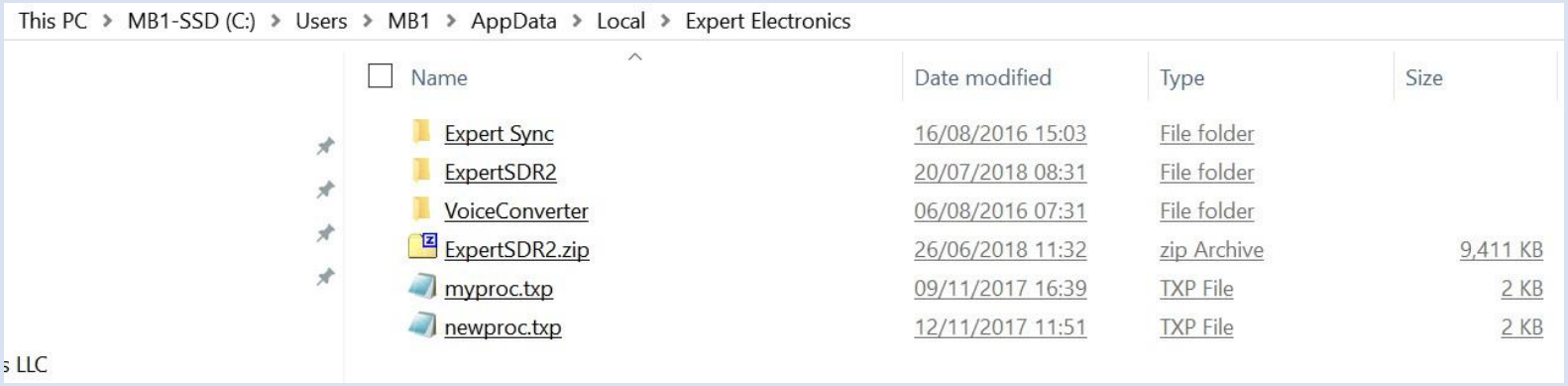
NOTE: During setup, ensure you select the option to “Keep Windows settings, personal files, and apps”.

4 Always have a back-up USB drive attached to your MB1 / computer. I have a Maxtor 1TB Drive which serves as a secondary Drive and back-up Drive. In the MB1, the solid-state Drive is of relatively low capacity.

5 Use quality back-up software that, in its operation, makes no impact on the computer. There are several choices – mine is Syncovery. It runs a back-up of all changed files on C: Drive once per day. It also runs in real-time, monitoring my Logbook, so that every time a new QSO is logged a back-up is made. It runs these tasks silently in the background.

6 When you have set up ESDR*, create and save a Profile (or more than one Profile if you have settings that vary – example VAC gain settings for JTDX, FLDigi, etc). When something unexpected happens to ESDR*, invoke the saved profile.

7 Back-up and save your entire ESDR* settings folder. Create a .zip file of it. If the ESDR* configuration gets completely messed up, you can replace all the settings from the .zip file.



9 Troubleshooting

In no particular order, what follows are common questions relating to issues that MB1 / ESDR* users experience. If you have an issue, check this list to see if it is covered. If not, help is at hand. Either post a message to the EE Forum or email Roman at EE directly

9.1 No Audio from MB1

Ensure that ‘sound out from SDR’ is set either in the MB1 Utility or from ESDR*. Also, if speaker audio is required, check that ‘Speaker’ is enabled. If PC audio is required, set ‘Sound out from PC’. The ESDR* volume must be greater than -60dB as that is the point at which audio is muted. There is also a Mute button so check that it is not activated.

NOTE: having PC audio enabled causes noise artefacts in the SDR, especially in CW mode, so keep it off until needed.

9.2 No SSB Transmit Audio

Ensure you have the correct type of microphone for the MB1 input. MIC1 is for electret microphones and so the usual Heil mic will not be compatible. MIC2 is for dynamic microphones. Select the MIC input in software to match the type being used. MIC gain is likely to vary between microphones but, for example, my Antlion Mod Mic is best at 10dB of gain with a compression setting of 4.0 and a threshold of -30dB.

9.3 Power Out is Less Than 100 watts

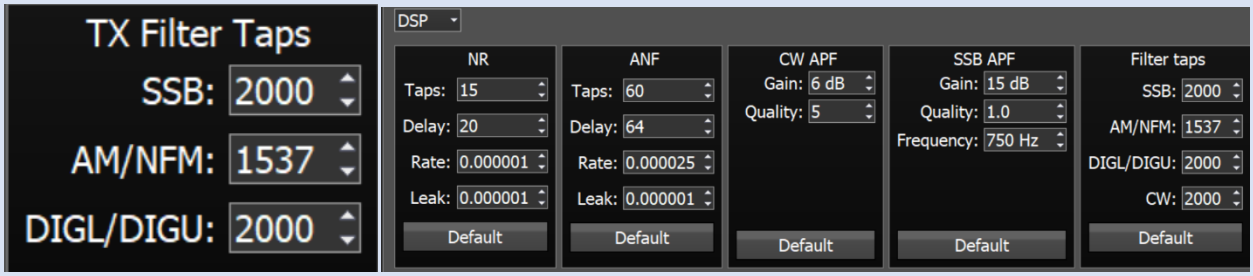
MB1 output varies per band with more than 100 watts on some bands and much less on others. 50MHz is notable for low output at around 60 watts. If output is very low, ensure you are reading Peak and not RMS. Turn off MIC AGC for full output. Check for over-driving by invoking the MIC-meter scale on TX (right-click on the meter in the computer GUI and go to TX>MIC-meter). Do not get confused between Drive and Tone. The latter is only for setting up external devices and the main power out is controlled by Drive.

9.4 Excessive Background Noise on Receive

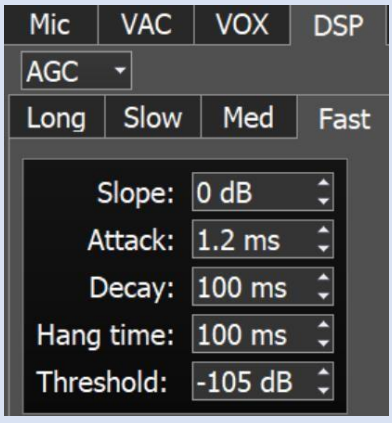
Optimum dynamic range is achieved with the Wide RX Filter is set to off. Auto-enable can be checked so that the Wide Filter is active when using both receivers. DITH should be unchecked in Options>Expert tab. Keep PC sound off.

9.5 Settings for DX Working

The common question is the meaning of, and best setting of, the Filter Taps. Experiment yourself – my settings are seen in the picture.

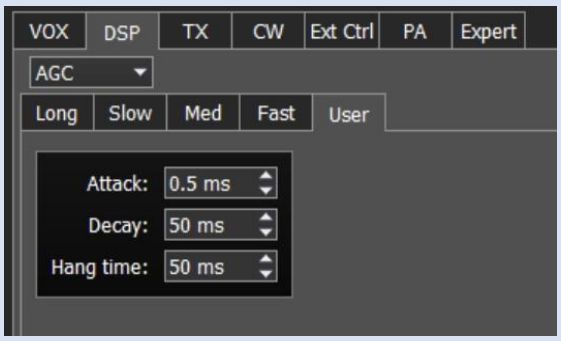


Filter Taps represent the shape of the filter. The higher number means a more rectangular shape, steeper skirts, but at the expense of delay (latency). Do not use filter tap settings above 2000 for FT8 working, especially if TCI is employed. The latency is too high for maximum decoding.Also important is the AGC Threshold figure. An explanation for the effects of this parameter can be found online (the Flex Radio site also has a useful video at https://www.youtube.com/watch?v=Hwm6rszuMis).



The setting I use is in the picture to the left. The value depends on your noise level. Set your AGC on Fast and then work up from the -120dB default setting until you hear a slight decrease in noise level. This is the threshold of gain on weak signals but which prevents AGC action on the noise level. Set correctly, marginally readable weak CW will come above the noise level.

In ESDR2 1.3 this parameter has been removed and no longer can the receiver be properly optimised. The closest workaround is shown on the left, using the User setting. However, this not the same as AGC-T.



The last I heard from EE was that this important parameter was not going to be reinstated.

9.6 Truncated CW

You are sending CW but the characters are truncated (shortened). Break-In delay needs to be extended. Click the down arrow next to Break-In in ESDR* to see the menu. Start at 500ms, which will be more than enough, and then experiment by reducing the delay until just before characters get truncated. When sending CW from a keyboard or software macro, the delay is usually controlled by the 3rd party software and may need adjustment in that software. The ESDR* Break-In menu becomes irrelevant in this case. Do not get confused by the ESDR* 'Makro' setting as this is for TCI enabled software only.

9.7 Recording SSB and CW

The ESDR* recorder is a voice recorder. It cannot record CW. Recordings can be sent over the air by a mouse left-click on the playback button. In this mode, there is no control over monitor level. Playback without TX is by right-click. Then audio volume is changed by using the AF control. To record CW QSOs, see QSO recording by QSOrder in section 6.15 N1MM+.

9.8 EDSR2 Strange Behaviour

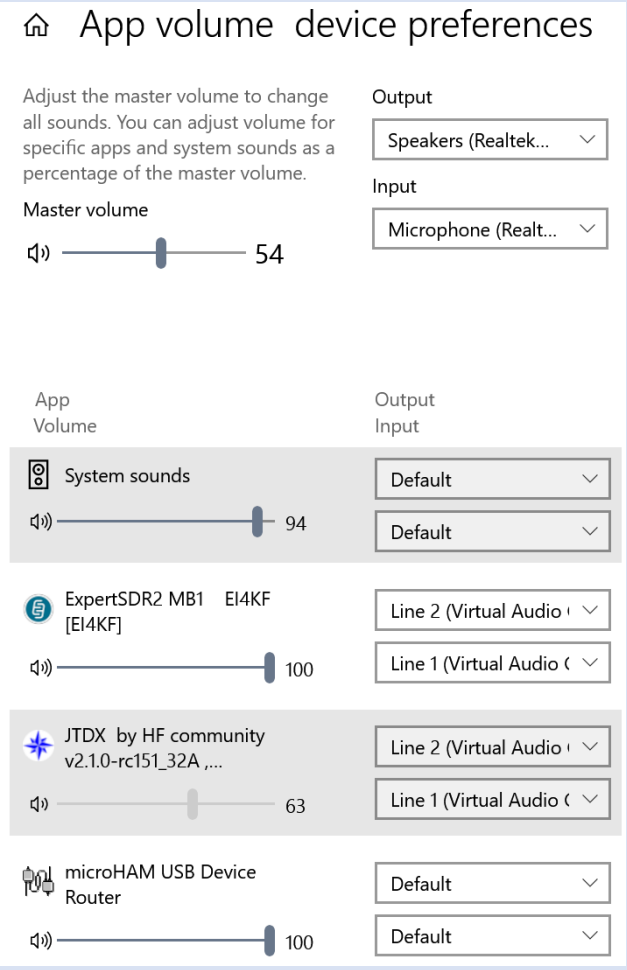
Sometimes reported are issues like the antenna switch settings are not saved per band, changing mode is problematic (example is click DIGU and the radio goes to AM), and other anomalies. These are due to option.ini file corruptions. In addition to the back-up routines described in section 8, take care when shutting down your radio and ESDR*, especially if you have the MB1, so as not to interrupt any disk-write activity that Windows might be making. Turn off the SDR with the red power

button in ESDR*, close ESDR* and any other open software, use the MB1 front panel switch to shutdown Windows.

9.9 Miscellaneous Audio Issues

These include ‘port audio not available’ in FLDigi, audio failures with various messages in WSJTx / JTDX and in other digital software.

Windows sound system has some bearing on VAC. The audio path does not use this route providing that in the VAC Control Panel you have not checked 'Volume Control' for either of the VAC lines used for RX and TX. Note that if you use VB-Cable, the audio is routed through the Windows Sound System (see the final part of this section).



The Golden Rules for Windows sound system:

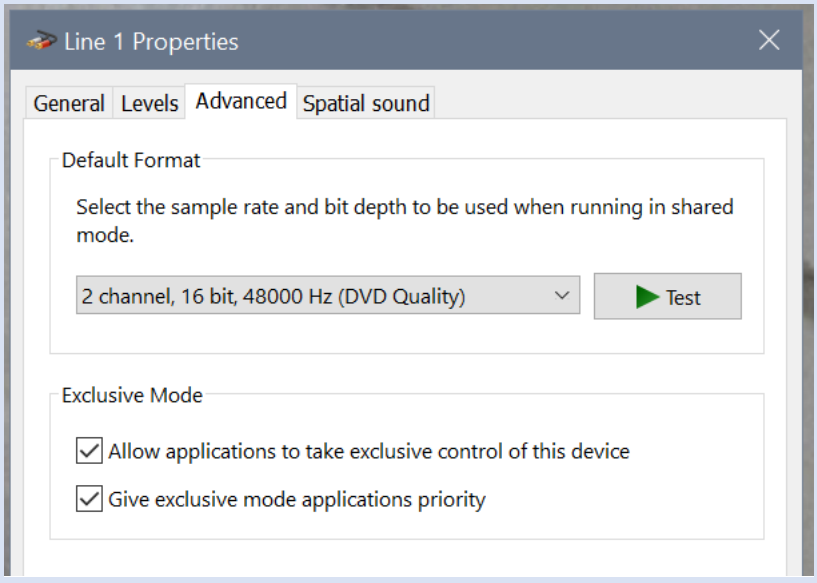
Microphone access must be on (Windows considers every digital application to be a microphone). In Windows Settings, Microphone page, ensure it is on and then scroll down to 'Allow Desktop Apps to Access Microphone' and ensure that is on.In Windows Settings, go to the Sound page. Output Device should be your Windows Speakers, whatever you listen to computer audio with. Input device should be your Windows microphone. If you do not have one, set this to a dummy entry, anything other than a used VAC Line. With your digital apps of your choice open, scroll down to App Volume Device Preferences and for each one set as JTDX and ExpertSDR2 per the picture on the left.

Applications such as web browser, Skype, Films & TV, etc must of course use your computer speakers and microphone. Set these in the application settings section. If an application that you use is not listed, close Settings and open that app, reopen the ‘App volume and device preferences’ window and you will now see it in the list so that you can modify its audio attributes.

Incidentally, this work is largely 'set and forget', no need to revisit unless you later install a new program with audio that might reset this stuff to default.

Back on the previous Sound page, on right hand side click Sound Control Panel. Now nothing here needs their properties setting but the two Windows devices we just set up, Speaker for Windows audio and Windows Microphone (or whatever was picked as a dummy) must be set to Default Device and Default Communication Device. There will be speakers on the Playback tab and microphone on the Recording tab. This is so that any computer audio, real or noise generated by computer activity, stays in the Windows audio system and is not allowed to affect digital, or worse, get broadcast.

There are the VAC Line properties. These do not matter unless you use a different virtual audio cable software, like VB Cable/Voicemeeter Banana, or you have Volume Control enabled in the VAC Control Panel (you should not do that except if there is too much audio gain for WSJTx/JTDX and you need to reduce it more than can be done in ESDR* (a very rare scenario)). Then the following settings apply:



9.10 MB1 with Multiple External Monitors

A normal DPORT cable is used in that port if you choose to connect 2 monitors to the MB1 using its native monitor ports. But in this configuration the MB1 panel display does not work. It is better to acquire a USB to HDMI adapter and use it, plus the HDMI port, for the external monitors and then the panel display will work. The 3 monitors can be configured in an extended display format. An example of the USB to HDMI adapter can be seen at: https://www.amazon.co.uk/Adapter-Monitor-Adaptor-Converter-Compatible-Grey/dp/B075K86J5R/ref=sr_1_19?s=electronics&ie=UTF8&qid=1539353931&sr=119&keywords=usb+hdmi+adapter

If the absence of the MB1 display is not an issue, by all means just use the MB1 HDMI and DPORT outputs and similarly these can be configured for extended display. The MB1 can accommodate as many monitors as USB to HDMI adapters are used, with the panel display working, limited by the available RAM.

No changes to ESDR* are required unless one or more of the external screens are 4K. In this event, there is a setting in Options > Display > Main Window to set to on.

9.11 MB1 CMOS Battery Replacement

This can be required sooner than the 5 years of theoretical life – mine showed loss of voltage after 2.5 years as indicated by an often-inaccurate computer clock and then loss of some BIOS settings, including the panel display (which causes the picture to be replaced by lines).

The battery is a CR2032W (CR2032 with wire lead). It is a simple task to replace the battery inside the MB1.

9.12 SunSDR2Pro Fails to Connect to the Computer

To access the boot-loader mode manually:

a. Switch off the transceiver with the PWR button

b. Press and hold the L/W button on the rear panel of the transceiver (you will hear a light click), switch on the transceiver with the PWR button. The LED will blink. c. Release the L/W button

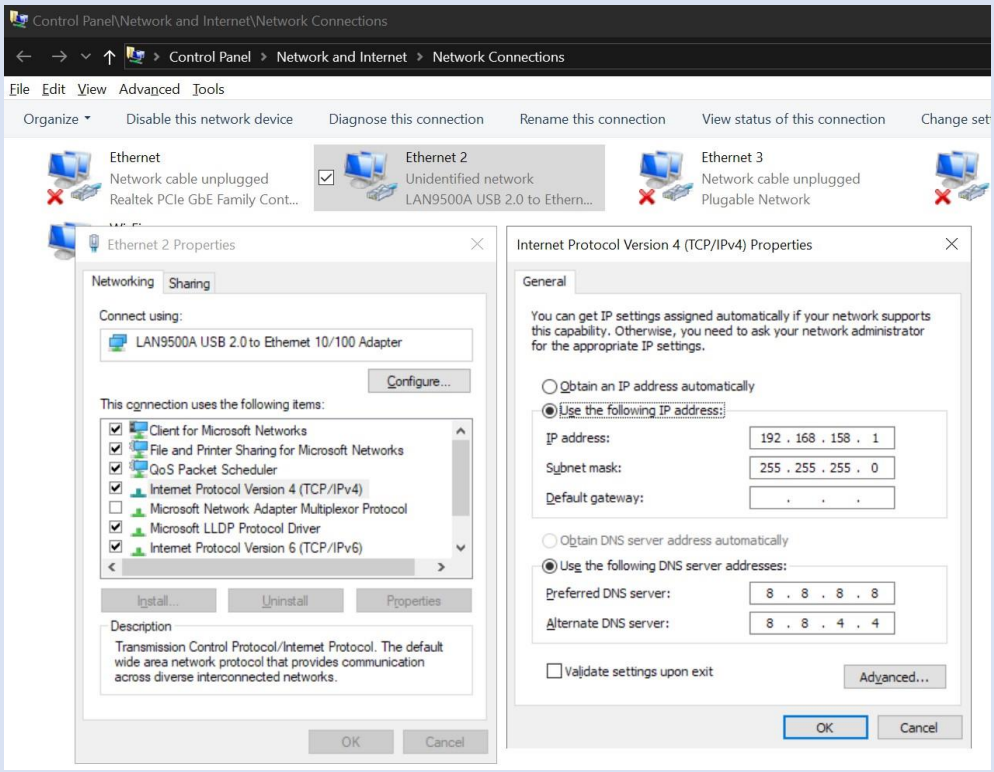
d. Open ESDR* software and open Options-> Device menu, Expert tab and press Firmware update.

e. After firmware update is finished, LED will turn to constant green light.

NOTE: see also 9.13.2 below for checking if a 3rd party application has seized the UDP port.

9.13 MB1 Fails to Connect to the Computer

1. Often overlooked, especially after reinstalling Windows, is the need to configure the ethernet connection between the OS and the SDR. Open Control Panel and navigate to Network Connections. Right-click on the Ethernet connection that is LAN9500A and open Properties. Then open Internet protocol Version 4 and set the IP address and Subnet mask to the same as the picture. The DNS servers are optional and can be left blank. Your Gateway address is not required.



2. If your SDR module stops connecting and you have checked above, most probably the issue is some application which uses the same UDP-port as SunSDR2PRO /QRP /MB1.

To determine PID of the application which uses the same UDP-port, open terminal (press Windows+R, in the window that appears write **cmd** and press enter). In the terminal window enter the following command:
netstat -aon | findstr 0.0:PORT_NUM , example: *netstat -aon* | *findstr 0.0:50001* result: *UDP 0.0.0.0:50001 *:* 2740*

If there is no application that uses this port, then terminal will not give you any result.

To determine the application name by PID write the following command in the terminal: **tasklist /svc /FI "PID eq PID_NUM"** where PID_NUM is PID of the application, which is given by the previous command. Example: *tasklist /svc /FI "PID eq 2740"*

If there is another application which uses the same UDP-port as SunSDR2 PRO/QRP/MB1 just change the port in that application to an available one. The latest update of the *AnyDesk* application uses port 50001, and is hard coded in the software. Because the UDP port in the MB1 cannot be changed, uninstall *AnyDesk.*

10 Upgrading the MB1

Unless you bought a special version of the MB1, it came supplied with 8GB RAM, an intel i5 6400T CPU and a 120GB 750MB/sec solid-state drive. Even with 64bit ESDR* software, much less resource hungry than the original 32bit, running external monitors, CW Skimmer and both receivers, can cause the CPU usage to get near to 100%. This not only degrades performance but also creates extra heat.

- RAM
  Adding an additional 8GB RAM module is cheap to do and makes a significant improvement. The correct module for the MDH11-HI motherboard is a Kingston KVR16LS11/8 DDR3 (not the 16S11 which has the incorrect voltage).

Access is by removing the case screws and lifting the MB1 top case. Remove the screen. There is a speaker attached to the underside of the screen so be sure to carefully detach the speaker leads.

NOTE: 4th generation MB1s have the MDH11-KI motherboard with DDR4 RAM so, in this case, check existing RAM for the correct module.

- CPU

High-end users may still find, even with 16GB RAM, that the i5-6400T CPU is overstretched when using multiple monitors, receivers, etc. The CPU upgrade is to the i7- 6700T. Whilst it is possible to flash the BIOS so that the MDH11-HI will accept a i77700T, the 6700T in the existing BIOS is more than adequate. The T model is a 35 watt device and is necessary because the MB1 case is not strictly a computer case and cannot exhaust the heat generated by the more normal 65 watt devices.

NOTE: 4th generation and later MB1s have BIOS version F6 (or later) in which case the CPU can be upgraded to the i7-7700T.

NOTE: The 6700T CPU is becoming harder to source. If you need to upgrade to the 7700T but have the F5 BIOS, update details are available from me by request.

1 Ensure that the MB1 is unplugged from the electricity supply and is stood on either a rubber or anti-static mat. Access is as before.

2 The CPU fan is removed by unscrewing the spring-loaded screws. Turn anticlockwise until you hear a click. Carefully pull up the fan and move it to one side.

3 Press down on the CPU lever, move it slightly right, then raise it up. The CPU can be removed. The replacement CPU can be inserted. Obviously, its orientation is the same as the old CPU but it has an arrow lower left side to match the socket. Slowly close the lever and secure it under the hook.

4 Now the important procedure: cooling is a critical issue and heat transference from the CPU, through the fan and exhausted from the MB1 case is of paramount importance. A volume cooling test was conducted on the MB1 by Gigabyte and, as a result, you should take these steps.

A The underside of the fan will be contaminated with old grease and must be cleaned thoroughly. Acquire a thermal material remover such as ‘ArctiClean 1’ to

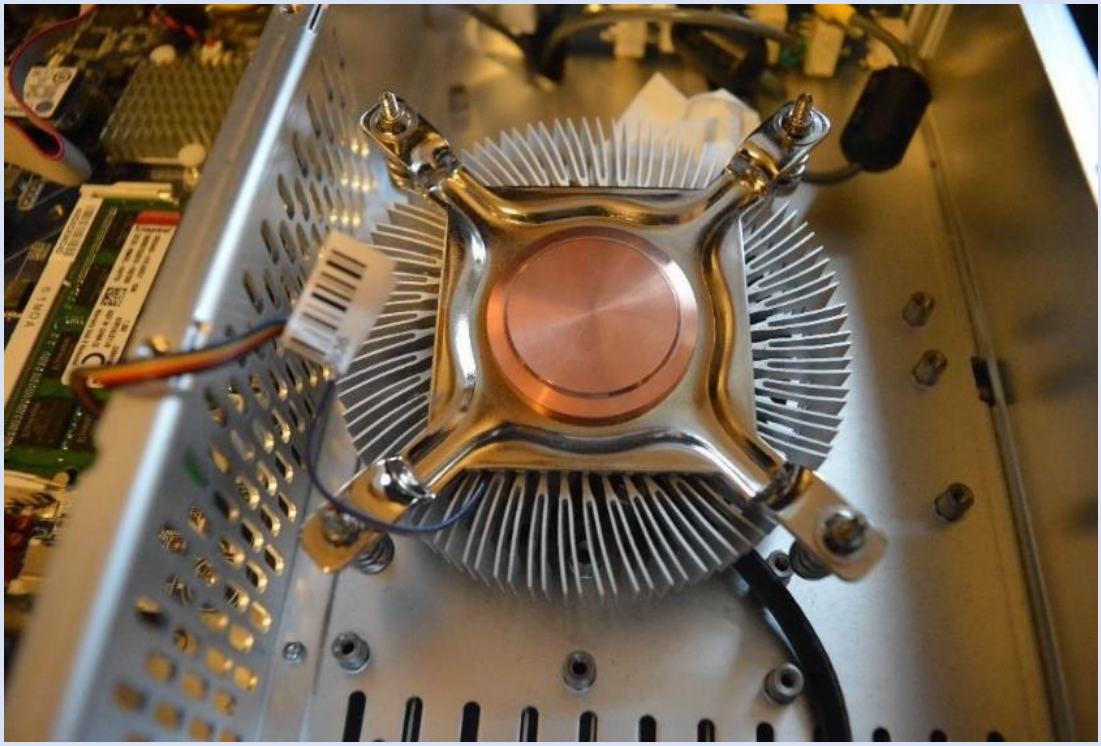
dissolve the grease. Follow this with an application of thermal surface purifier such as ‘ArctiClean 2’. Use lint free cloths for the job. You should restore the fan heatsink to pristine condition.

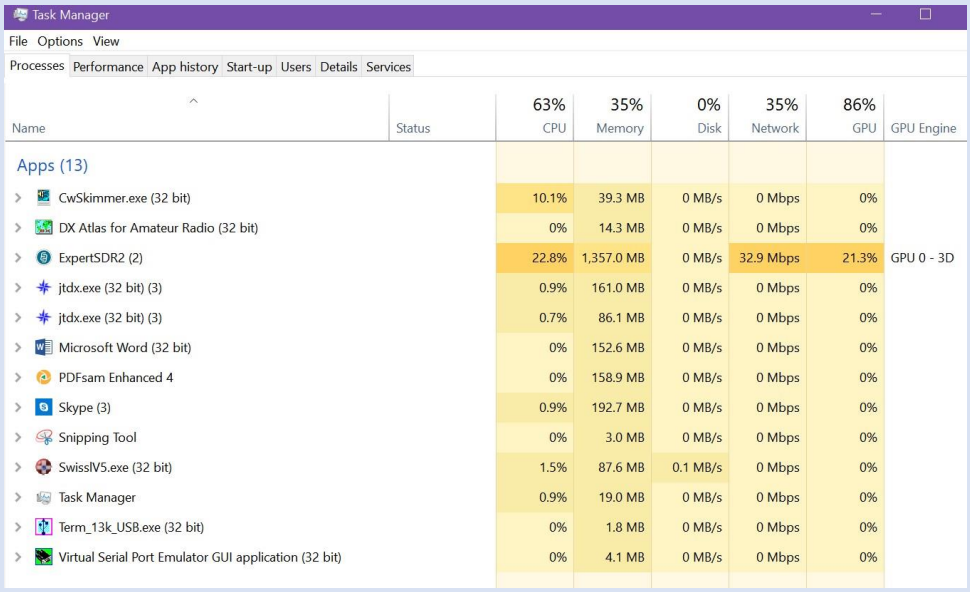
The recommended thermal paste to use is ‘Arctic Silver 5’. It is less likely to decay over time than other pastes. Do not spread it over the surface of the CPU as this creates tiny air pockets. Instead, apply a vertical line in the middle of the CPU. To see an example, go to:

https://www.techadvisor.co.uk/how-to/desktop-pc/how-to-apply-thermal-pastecpu-3636146/

Refit the fan. Tighten the screws evenly and in turn. As the fan squeezes against the CPU, the paste will evenly spread without its integrity being compromised.

5 When ESDR2 was available only in 32bit, the CPU upgrade reduced maximum CPU load from nearly 100% to 68%. This is with everything running – 3 monitors, 2 CW Skimmers and 2 receivers. Now that ESDR* is in 64bit format, CPU usage is even lower. Performance no longer suffers from scratchy artefacts in the receiver, there is no loss of smoothness in the rendering of the Panorama and delays in PTT switching are less apparent.





Above, MB1 with 3 monitors, 2 receivers, 2 instances of JTDX, CW Skimmer, SDC and Swisslog all running.

- Solid State Hard Disk

  The installed SSD is a Kingston SM2280S3G2/120G, 120GB capacity, that has a data transfer rate of 750MB/sec. Discussions with Robin VA2NRJ, to whom I am grateful for sharing his performance data with me, showed that this SSD is a severe limitation on the performance of the MB1.

  Whatever replacement SSD you choose, it must be M2 compatible. The problem is that the MDH11-HI motherboard is not in a computer case. A 2.5-inch SSD will not fit.

  There are two types of M2 SSD: M2 SATA and M2 PCIe (PCI Express). The NVMe type of SSD is the fastest and can be used in the SATA slot in place of the Kingston. Greater speed would be realised if the PCIe slot could be used. Unfortunately, there is no access to it due to the construction of the MB1.

  The Samsung 970 EVO (PLUS) M2 SSD is a direct replacement for the Kingston. It is one of the fastest M2 SSDs. The upgrade is even more worthwhile if one with a greater capacity than the original is chosen. I opted for a 250GB model.

  The challenge when replacing a SSD Drive is being able to clone the original disk to the new disk. The only proven method of cloning that I know of is to use Acronis True Image software and acquire a StarTech.com 4x M.2 SATA Mounting Adapter for 3.5in Drive

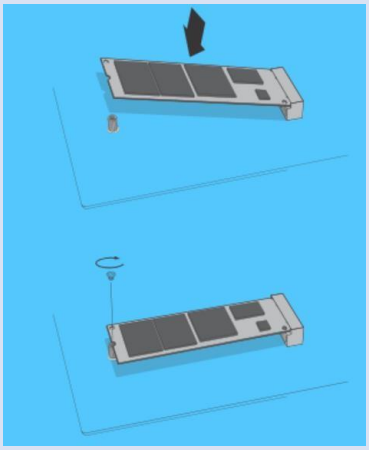
Bay and using it to house the original SSD while the new Samsung is placed in the M2 slot. Any issues in your working W10 installation will of course be transferred to the new drive. Sometimes it is better to bit the bullet and make a fresh install of the OS on the new drive.

To replace the SSD:

1 Access is as before.

2 Undo the small screw at the end of the SSD opposite the connector.

3 Lift the SSD at an angle and remove from the M2 connector.



4 Insert the replacement at an angle, push down into place and re-insert the screw.

5 Clone from the original drive or Install W10 from the download as described in section 8.3 of this Manual.

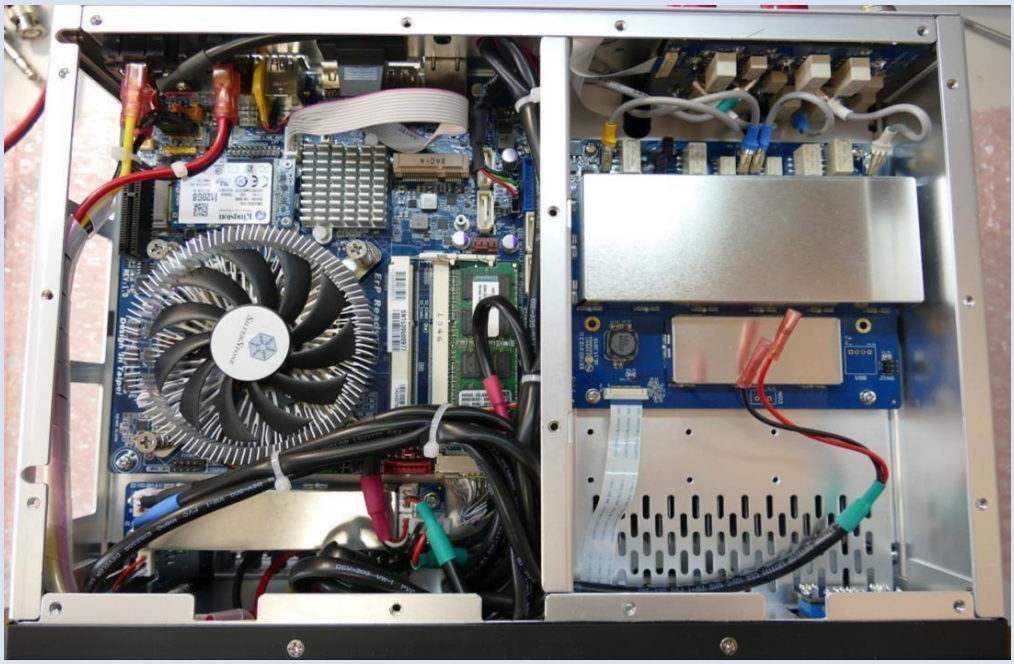
6 If you bought the Samsung, install the Samsung Magician software and follow the instructions to optimise the performance.

7 The performance comparison between the original Kingston and the new Samsung 970EVO: note the Disk Score – was 61 and now 173. Nearly 3x faster.

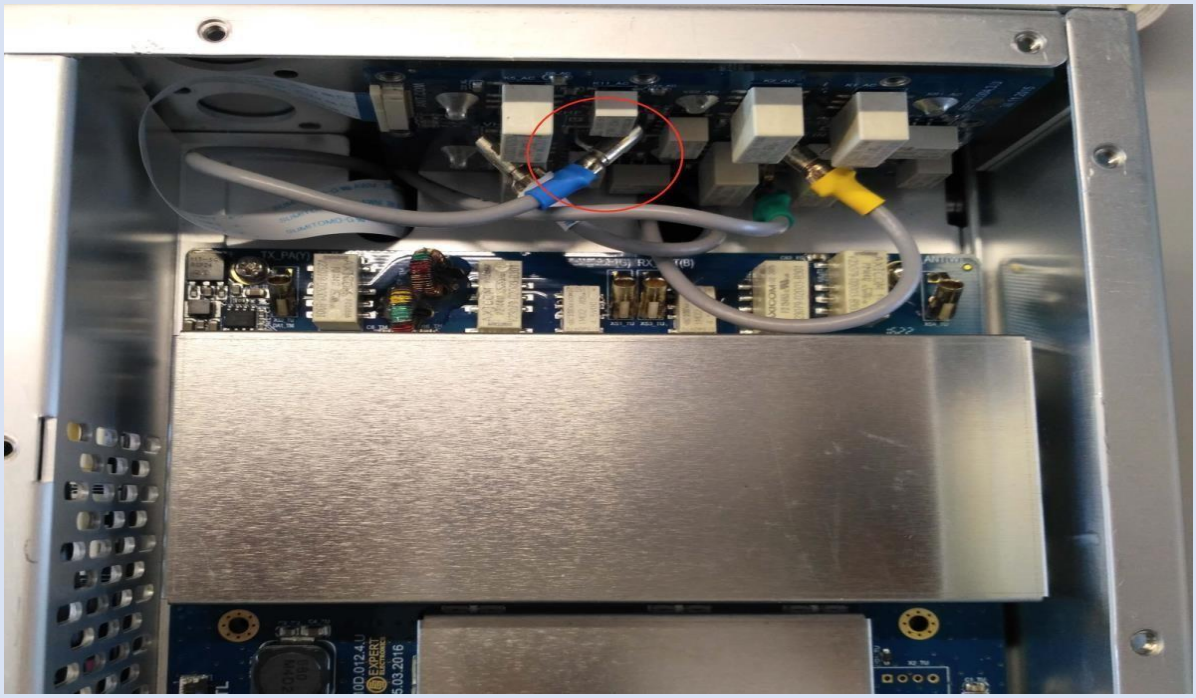
The disk speed is vastly improved with the new disk and this is very well demonstrated in the MB1 which is now very fast.

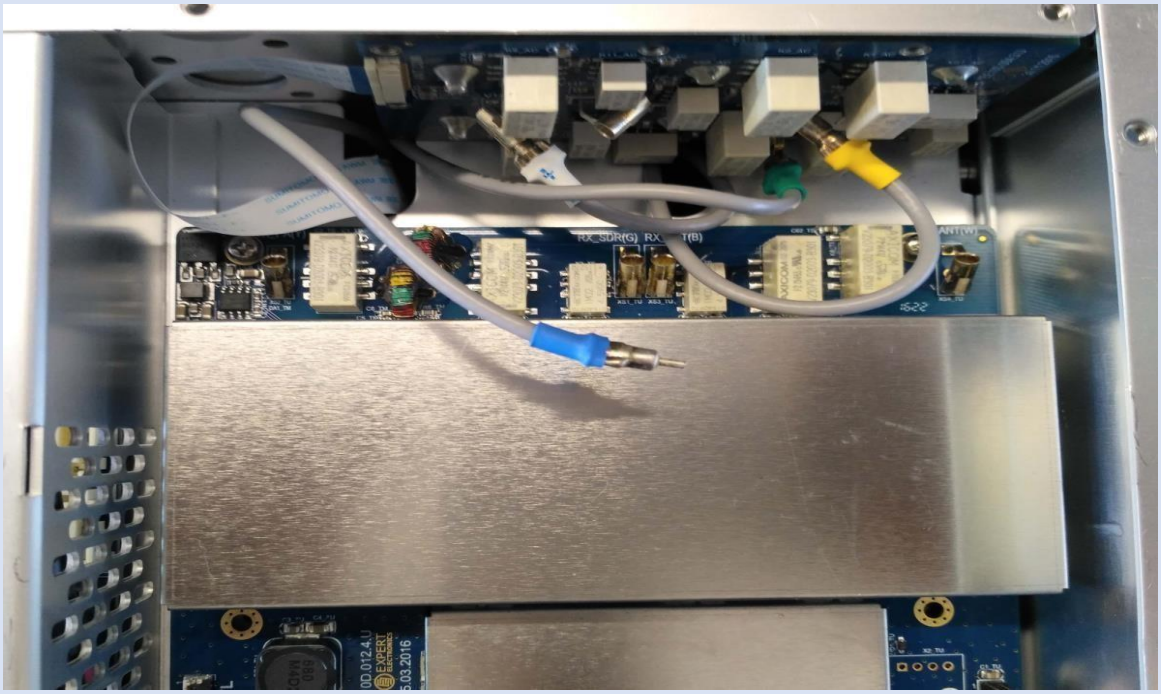
- High Pass Filter
  The HPF for improved VHF reception is available at
  https://www.hamradiosolutions.net/en/expert-electronics/202-mb1-vhf-filter.html

  It is simple to install. Remove the MB1 top case and the internal shield. Pay attention to the cables for the internal speaker. You now have access to the antenna switch.

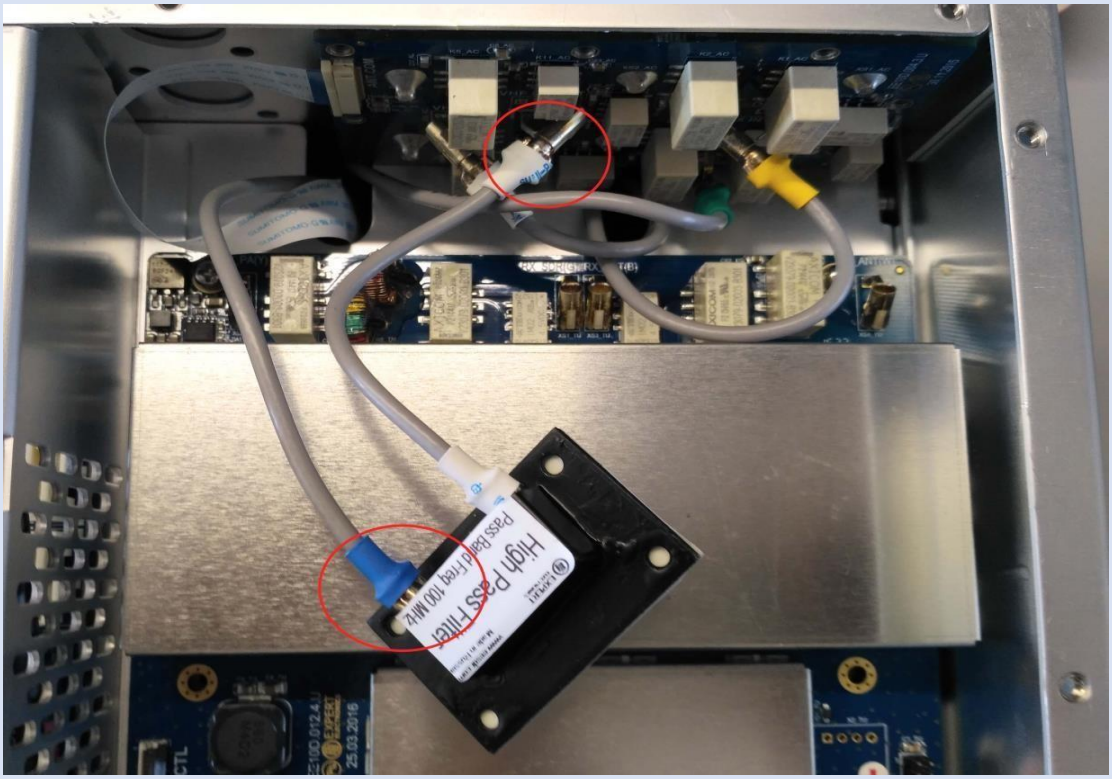


1. HPF should be installed between antenna switch and SDR board. Detach the blue cable (VHF OUT).





On the back of the HPF board you can see sticky surface, you should attach the HPF to the shield with it, as shown below.



Assemble transceiver in the reverse order. Remember to reconnect the speaker.

11 TX Processing Module (PROC)

The user manual for the TX Processing Module is now contained within the main radio user manual. Therefore, here I only give some personal findings about the various settings. Because each user will have different voice characteristics, microphone, and have a preference for type of audio (full-range, DX punch, something in-between), these findings should only be considered as a starting point. My own target preference for audio is for DX working with minimal latency. My microphone is the AntLion Mod Mic 4 electret, connected to the MIC1 input.

- DC Block – is useful as it makes a subtle difference to the amplification of low frequencies. I have it enabled with a time constant of 5ms.

- Filters – suitable for my voice and for DXing are only High Shelf. The others do not help. I have frequency 2000Hz, Quality 0.7 and Gain 6.0dB.

- Noise Gate – is off because I find it 'muddies' the signal. There may be an optimum combination for its parameters but I doubt its overall value.

- Compressor makes such an improvement that it is mandatory to have it enabled. Ratio is 4.0:1, Threshold -30dB, Attack 10ms, Release 10ms, Type = Hard. Latency in MON, the monitor, is slightly worsened if Attack and Release times are extended.

- Limiter – can be enabled with certain microphones with default values except that Input boost is set to +2dB. I have it disabled with a Mod Mic 4. In any event it must be off if using DIGu and GFSK modes such as FT8 and FT4. DIGu should disable all audio enhancements but seems it leaves Limiter on. A good case for separate audio profiles – see below.

- Equalizer is enabled – my settings are zero gain for all ranges except 4dB and 3dB for the 2.00K and 4.00K ranges respectively.

- AGC is the same as MIC AGC. It has to be disabled to achieve maximum output power in SSB.

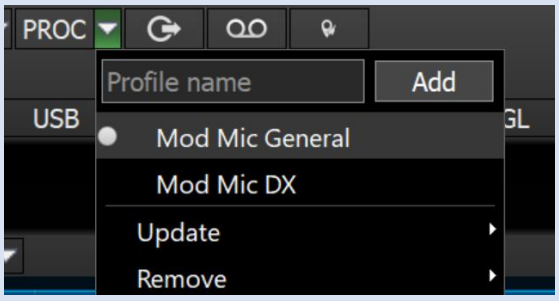
- Clipper is enabled with Type = Hard and Threshold at -8dB. This is for increased audio punch. I find the Amplitude gain of no value and have left it at 0dB.

- ‘Rotator’ is bad translation of rotation, referring to phase rotation. The theory is that its use improves operation of the clipper. It was designed to shift the phases of speech harmonics to reduce asymmetry and allow clipping to be applied without adverse side effects. A good demonstration can be seen at https://youtu.be/NM2x2tk0UbY . There is now a scope to monitor transmit waveform in ESDR*.

- Pre proc is a very useful pre-processor. Usually it is better to not overdo the boost. I have it enabled with Attack 10ms, Release 10ms, Type Mode 3 and Input boost of 1 dB.

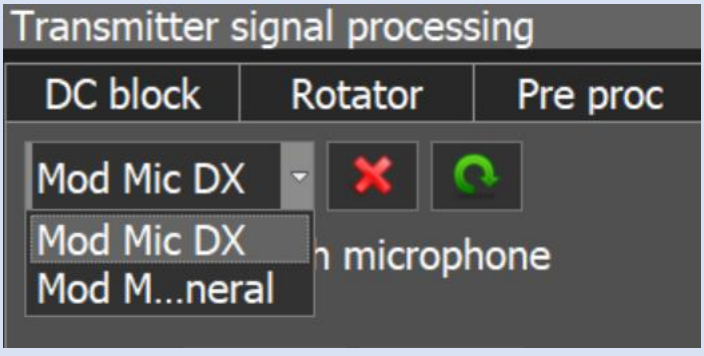
- Profile – creating, saving and selecting:

  Create TX audio profiles by arranging your settings then use the drop-down arrow next to PROC in the main GUI.



From here it is also possible to update and delete the profiles.

For the actual selection of a saved profile, this can be done here too by clicking the relevant line. A dot will appear next to the selected profile. Also, a saved profile can be selected from the PROC panel in the Profile tab. There is a drop-down box from which a profile can be selected.



12 Remote Operation

Remote operation is accomplished by one of two popular methods. These are by using Skype and Expert Electronics' Remote software. Skype is easy and reliable plus it does not need other software except TeamViewer. The EE package is dedicated to remote working and will be incorporated into ESDR3 in the future, thus making the SDR software a more complete solution.

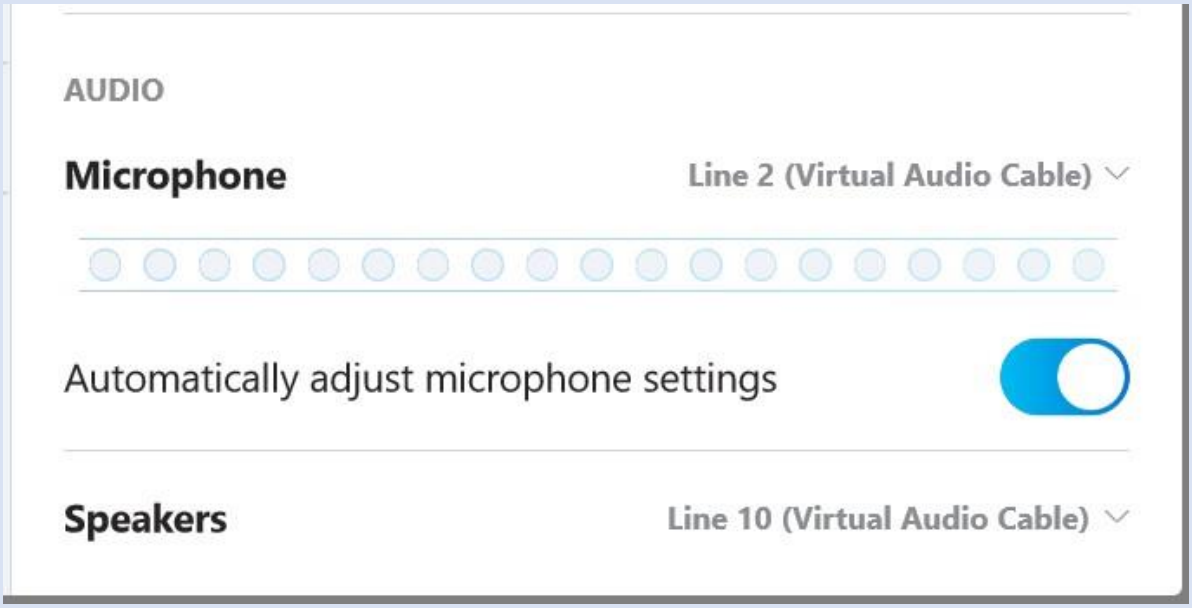
12.1 Skype and TeamViewer

It is unlikely that TeamViewer can be used alone for remote operation. It is ideal for video rendering of the computer desktop, and hence provision of visual representation of ESDR*, but the audio path is not retained intact.

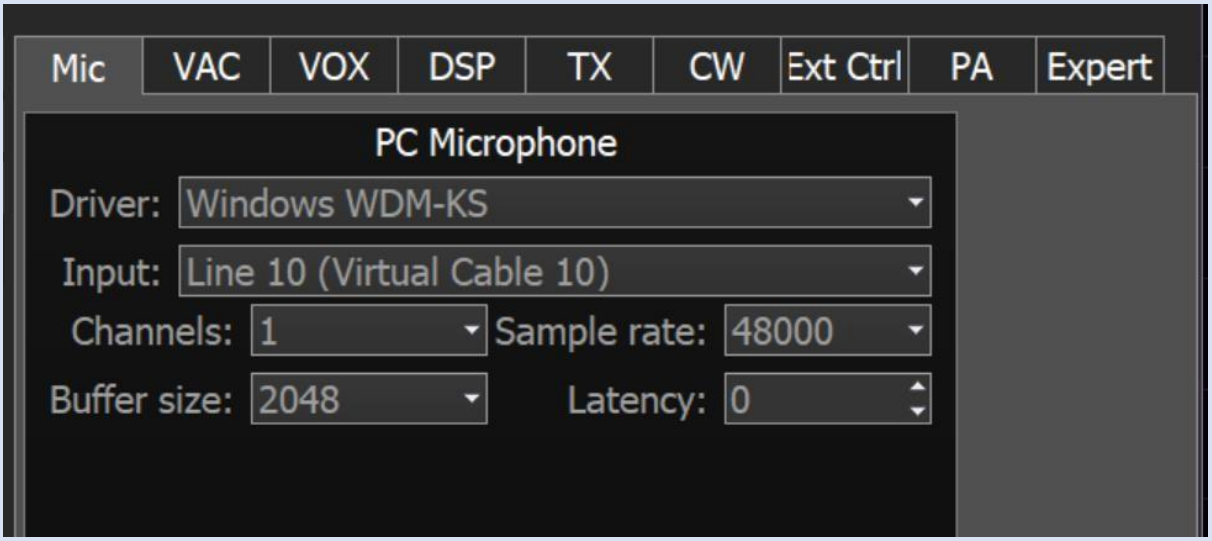
A second application needs to be run alongside TeamViewer for audio in/out. There are many possibilities but a convenient one is Skype. The procedure for setting up the remote station using Skype is detailed below. This will use the normal Skype account that either you already have or which can be created for this purpose. At the local site, you will also need Skype but on a different account.

At the remote site computer, if you use Virtual Audio Cable by Muzychenko, create an additional VAC line. If you have followed the setting up of VAC in the User Manual Addendum it will be VAC 10 – but any VAC number will do. In this example it is VAC 10. Its settings are the same for the normal TX line as detailed in the UMA. Note that if your VAC version is 4.51 you must set the 'Ms per int' setting to 3.

Set up Skype at the remote location, on the computer attached to your radio, with the following audio settings (note that the Skype Audio page may differ depending on Skype version).

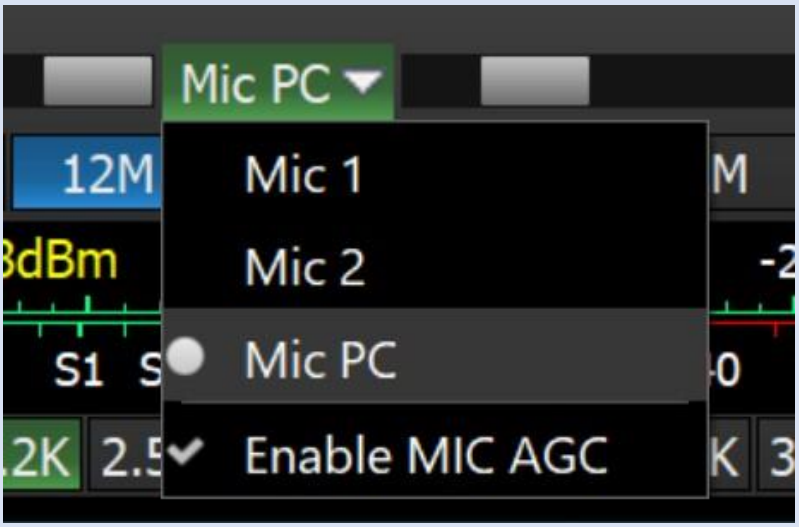


Set up ESDR* to accept audio input for TX from Skype:

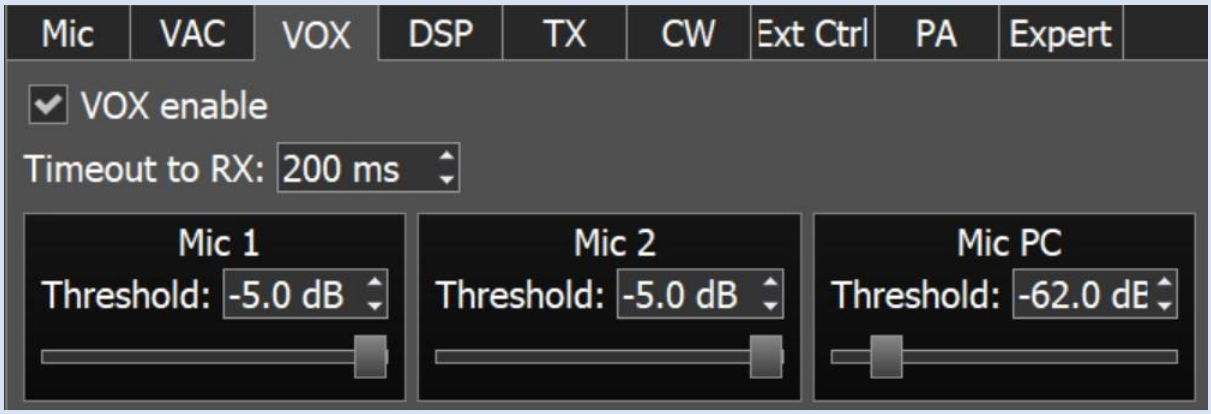


If using ESDR* version 1.3 there is now no separate PC Microphone setup. The VAC Line 10 input would need to be put in the Soundcard setting. See section 6.19 – Line 10 is set where Line 9 is shown there.

The microphone input for the Radio will be Mic PC:



You will need to set VOX on for PC Mic and adjust the Threshold to suit:



At the local site you will call TeamViewer as normal and establish a video connection.

Using the Skype account at the local site, make a call to your Skype account at the remote location. Either make Skype answer automatically or answer via manipulation through TeamViewer. You will hear the audio from your radio.

When you transmit into Skype at the local site, using whatever microphone you have (but a simple PC Mic will do), audio will go to Skype at your remote site and be transmitted by your radio. Adjust your VOX settings to ensure words are not truncated but also that there is not too long a PTT tail at the end of transmission.

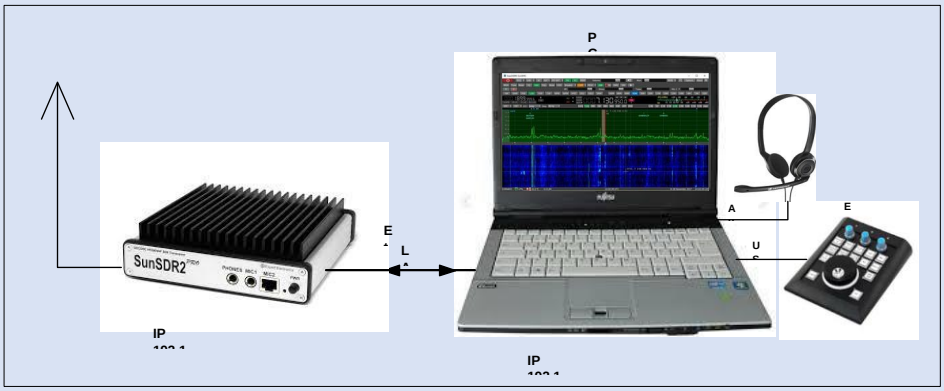
Several ESDR* users are active on remote operation via this method. A PY station is QRV SSB, CW and digital using TeamViewer and Skype for audio. 90% of his activity is via remote from his place of work. He never misses a DXpedition on any mode.

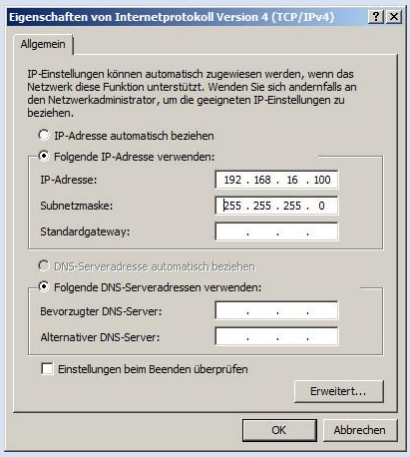
12.2 Expert Electronics Remote Control

For simplicity, what follows is a description of the setting up and remoting of a SunSDR2Pro. Except for the separate computer, the principle can be applied to the MB1. Of course, the procedures apply well to the QRP and DX models.

i. SunSDR2Pro with connection to a PC

Here the radio is connected directly to a local PC by an Ethernet Cable. When first installing ESDR* and starting the program, an error message “Can’t Connect to SunSDR2!” appears.



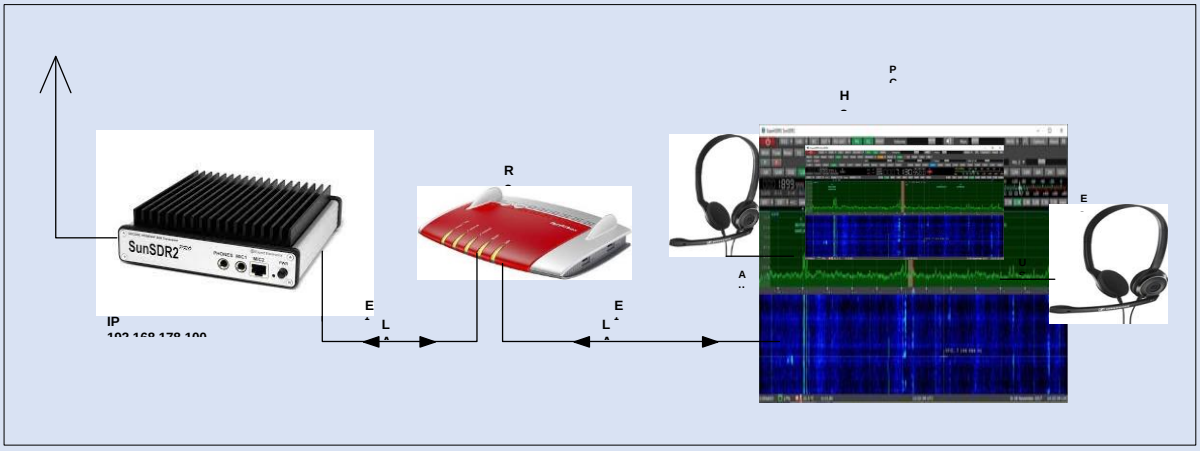


This is because the PC does not recognise the radio due to their IP addresses not matching. The radio is set to 192.168.16.200 at the factory. Therefore, open Windows Network and Sharing Centre > LAN Connection > Properties > Internet Protocol > IPv4 and set the IP address of the PC to (for example) 192.168.16.100. After restarting the software, the SunSDR2Pro is recognised by the PC and can be remotely controlled from this PC.

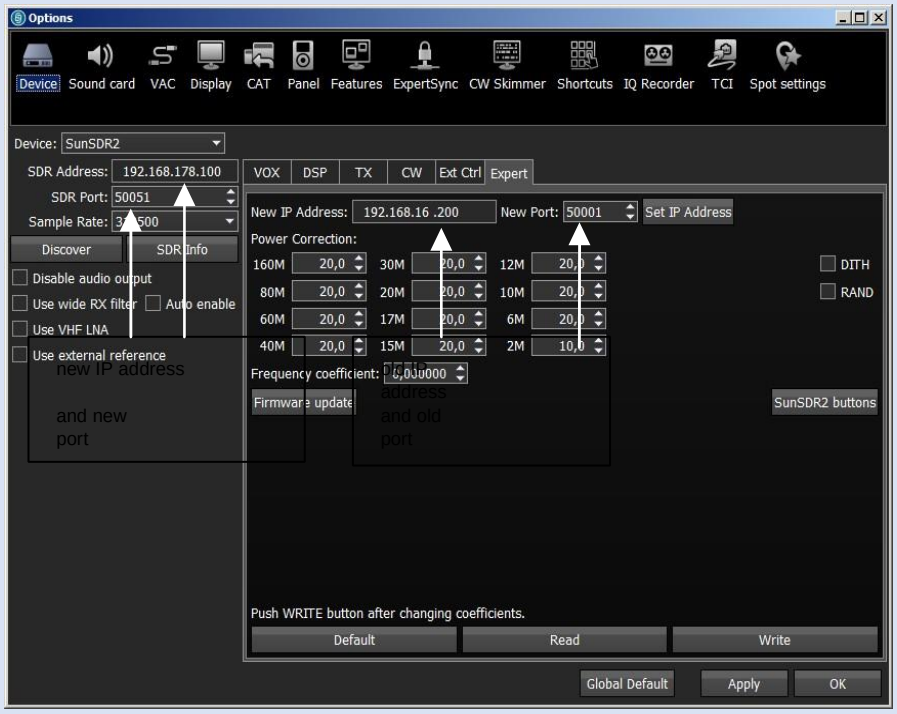
ii. SunSDR2Pro with connection to a home network

A more usual configuration is to connect the radio to a home network so that it can be controlled from all other PCs in the LAN / WLAN such as from another room or from the garden. To do this, connect the radio to the home network router, either by Ethernet or by

WIFI. Initially connect by Ethernet and note that the same error message as before will appear, this time because the router IP address does not match that of the radio. A suitable IP address for the radio must be selected.



First of all, determine a free IP address on the router. Example, if the router's own address is 192.168.0.1 and it is allocating DHCP (automatic IP assignment) in the range 192.168.100 to 192.168.0.200 then select a free address below .100 as a static address (example 192.168.0.99). Enter this into the ESDR* software. The SDR port of 50001 is set at the factory and should not be used by any other software on your network. See the Troubleshooting section if this is not the case.

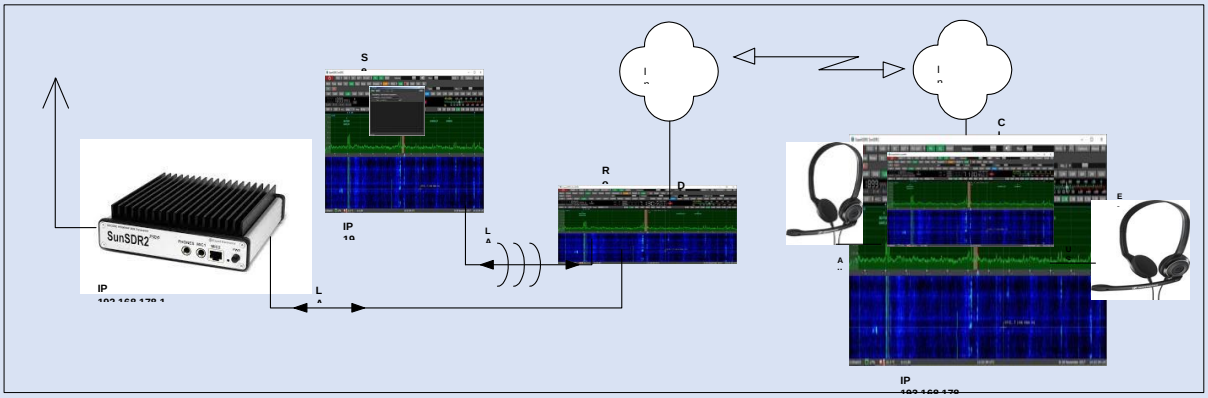


Left, where to set the radio IP address for use on a home network. See text above. Enter the new address and press OK to confirm. After saving the data, switch off the radio, disconnect the Ethernet cable from the PC and reconnect to the router. Switch the radio back on and wait until the green PWR LED lights up continuously.

Start ESDR* and go to Options > Discover. A window “Found SunSDR2 Transceivers” opens showing the selected IP address and port. Press “USE” and a connection will be established. The radio can then be controlled from all PCs on the network that have ESDR* installed.

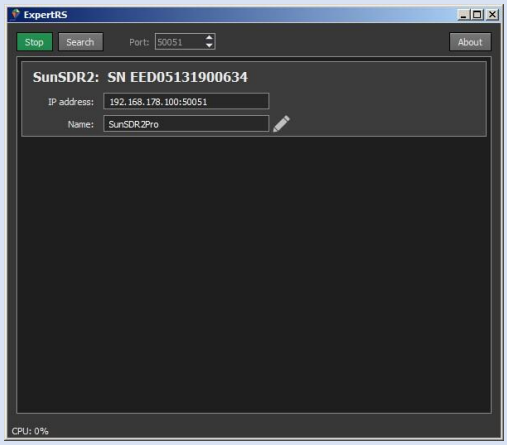
iii. SunSDR2Pro with connection to the internet

The advantage of an internet connection is that the transceiver can be reached from all PCs worldwide simply by entering its IP address. Providing the internet is reasonably fast at the remote location, the latency is low enough that it is hardly noticeable. Now we are on the way to proper remote operation.



A server / client connection is required for remote control via the internet. Any PC / laptop in the home can act as a server. From https://eesdr.com/en/software-en/expertremote-en the remote server and remote client software can be downloaded. Install on the remote and local PCs.

Setting up the server PC: Start the ExpertRS program on the server PC, Search and select the radio. The SunSDR2Pro will be found under its address in the network.



The port for forwarding is set to 5050 by default. Enter the current port, example 50051. The window can then be closed; the server remains activated and the icon of the server appears the task window.

In addition, the port forwarding must be carried out on the server PC. To do this, open the router and enable port 50051 to 50053 (data and audio) of the server PC under TCP and UDP. Every router is different so refer to its user manual. My Huawei B525, for example, can open ports under ‘Special Applications’. If you have a fixed public IP address, note it down as this will be used in the client.

Setting up the client PC: Start the RemoteClient program on the client PC and go to Options > Network. Enter the public IP address and the port of the SunSDR2Pro. Click Apply and OK.

After starting the program, the radio can be found on the internet and can then be remotely controlled as a receiver and transmitter. Access works under LAN, WLAN, LTE and 3G/4G/5G.

The sampling rate can be selected in steps from 39062Hz to 312500Hz, corresponding to a span of 40kHz to 300kHz, with an adjustable traffic rate of 70kBit/sec to 1Mbit/sec. The upstream rate of 120kBit/sec is usually

enough. Note though that via LTE / 3G, the selected size of the upstream will affect the amount of data used and hence the cost.

Should you not have a fixed IP address, or it is prone to change, you can register with a Dynamic DNS Service. Many routers have an in-built option for this. Example, mine is www.ei4kf.spdns.org:50051 and executing that connects me to the radio regardless of its public IP address at the time.

Firewall: the PC's firewall must be set accordingly so that data can be exchanged between the radio and the PC. It is also advisable, if an e-coder is used, to enable that in the firewall too in order that there is no problem in having it recognised.

Summary: Expert Electronics' remote software works reasonably well. Almost all functions are retained. The FFT display has a very fast repetition frequency. The system suffers when the internet connection is slow at one or both ends. This is where the Skype method excels because the remoting is using the very fast Microsoft servers.

At home, either the server PC must always be switched on or have some method of powering up remotely. Alternatively using a RPi3 as a server overcomes this limitation.

NOTE: The remote software will be integrated into ESDR3 and the above will no longer apply.