

SunSDR2

Review



by Graziano Roccon **IW2NOY**

March 2020

Review of the SunSDR2 Pro and SunSDR2 DX – Graziano Roccon IW2NOY – March 2020

Prologue

Last year (2019) in Friedrichshafen, I had the honor and pleasure to meet the guys of Expert Electronics, the perfect opportunity to pick-up my new SunSDR2 Pro. The team of Expert Electronics is fantastic, they are very kind and really competent.

Many other reviews have been written on the SunSDR2, describing esthetic and features of the product, but I want to concentrate my review on what has not been said and that make the SunSDR2 a different SDR products from the others and Expert Electronics a different manufacturer.

I will review not only the SunSDR2 Pro but also her big sister, the “full power” model SunSDR2 DX. During this month Mr. Dino Tersigni of “[Ham Radio Shop](#)”, the Italian reseller of Expert Electronics products, was so kind to send me a brand new SunSDR2 DX for my shack. Therefore, in the final part I will also add some words also on the new SunSDR2 DX and the differences between the two models.

Some considerations

I think that Expert Electronics with the SunSDR2 line of products is driving a revolution in the SDR transceiver sector, because they are not only proposing an RTX SDR but they are building around their product a great software and they are also creating new standard of communications and technologies that were not yet available. They are really driving the revolution, with competitive well-built SDR transceiver, with a great software companion that work with all their products (ExpertSDR2) and especially with the new TCI protocol and they (and us) hope will be used also by other SDR market players.

To allow the use of the TCI protocol to different SDR products (who said Elecraft?), they are releasing the protocol as open source, and this is another sign of their open minds.

Finally, the SunSDR2 PRO is the ONLY SDR RTX that you can manage with only ONE cable and nothing more.

I cannot understand why no one said this!

I think is an important distinctive point!

With only one cable, you can manage the SunSDR2 PRO for:

- CAT control
- Audio transfer
- RTX control (Virtual Audio Cable), you can do all the digital modes (on the same cable)
- With TCI configured you can have cw skimmer and dx cluster information in real time on the bandscope, send cw and ssb macro to the RTX, transfer cat or audio data remotely to other software or devices (like a linear amplifier for example)

All this with same Ethernet cable that connect the SunSDR2 to the computer.

This is cool, in my opinion!

Expert Electronics offer also a complete solution for remote control of the SunSDR2, with server and client software, giving also a pre-configured Raspberry PI solution as server. The client to control the SunSDR2 remotely could be the software Eesdr2 Remote Client (a special lite version of ExpertSDR software) or a new complete web interface built with HTML5 that can be used with any PC browser or mobile devices.

This is a unique offer on the market.

Those guys at Expert Electronics are driving the SDR Revolution!

The radio...



What can I say about the radio?

The SunSDR2 PRO, in a very small and well-built package, can cover all HF amateur bands plus VHF coverage of the 50MHz and 145MHz bands. Power output is 20 watts in HF and about 7/8 watts on the VHF bands. The receiver architecture is direct sampling with 16-bit digital down conversion (DDC), and a 14-bit Digital Up Conversion (DUC) for the transmitter. The ADC is a LTC2209 at 16 bit and 160 Mhz, the possible sample rates are 39 khz, 78 khz, 156 khz and 312 khz at 24 bit. The frequency range is from 0.1 to 65 Mhz and from 95 to 155 Mhz

From the connections point of view, on the front panel we can find two jacks (1/4" size) for the phones and microphone, plus a RJ-45 plug for a microphone with Yaesu standard pins.

On the rear panel:

- the Ethernet RJ-45 connection (100 Mb/s)
- three mini-uhf for antenna connections, one for VHF and two for HF
- morse key input jack
- external PTT input jack
- ADC in and out socket
- ALC phono RCA (to drive optional linear amplifier)
- 4 pin molex power connector
- a 15 pin "D" type connector called EXT-CTRL
- an input for an external reference at 10 Mhz

The choice to use the mini-uhf for antenna connections is a bit strange and cable adapters is not easy to find, but luckily, Expert Electronics include one cable adapter in the box. The sunSDR2 Pro can be powered up to 16v, more than a conventional radio. The EXT-CRTL port can be used to connect and control many kind of different devices, the behavior of the 15 pins can be configured in the software for example to control band switching.

Everything in the SunSDR2 Pro give the idea of quality and solidity, the radio is built very well and is well engineered, I like it.

Using the RJ-45 Ethernet jack and the network cable found in the box, the radio can be connected directly to the PC or to an internet modem, in the second case you can reach the radio from any point of the home network. The radio come with the default ip address 192.168.16.200 but can be changed from the software ExpertSDR2 to suite any network class of your choice. The software ExpertSDR2 can discover the radio connected to the network or the PC and instantly can be managed for any operation.

The software...

ExpertSDR2

What can I say about the software that in this kind of application is the heart of the solution?

Normally other SDR makers do not give a clear roadmap of their development plans for the software, instead ExpertSDR2 have a detailed plan published and updated on the Expert Electronics website. In this way, anyone can see what is being worked now and what is coming and when.

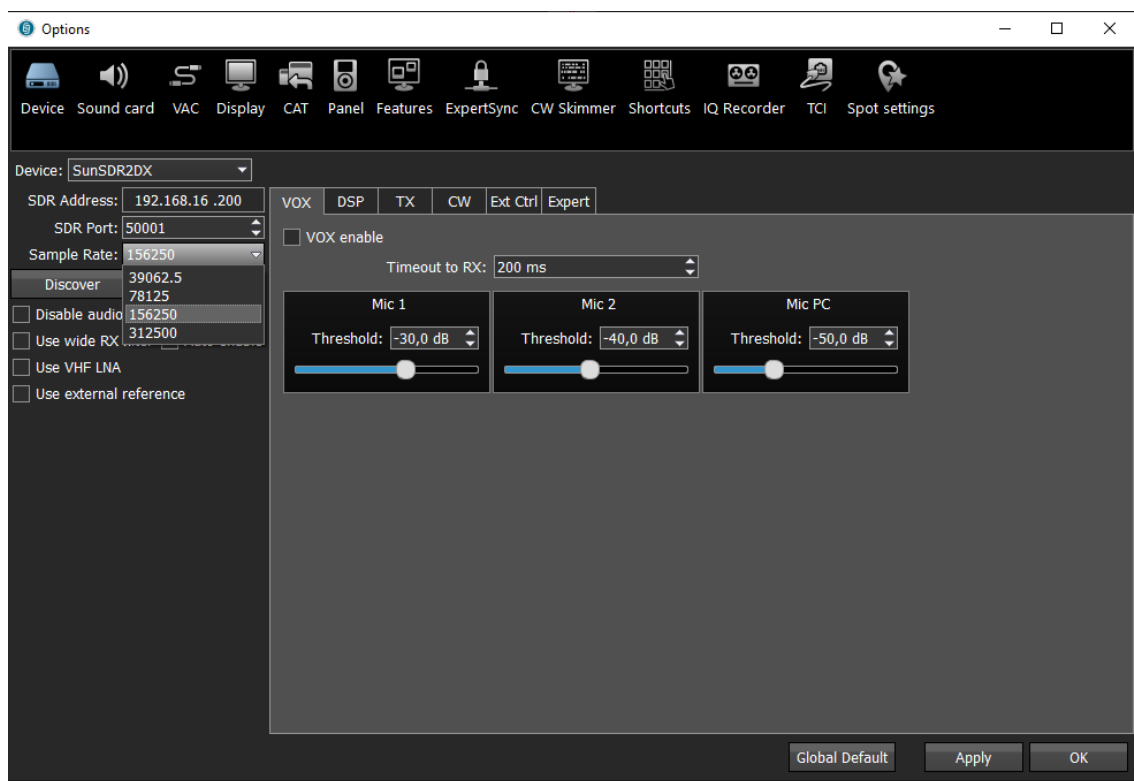
Here you can find information on the software map and features implementations:
<https://eesdr.com/en/software-en/expertsdr2-en>

Moreover, the core business of Expert Electronics is the ham radio market and not military or commercial applications, so they are focus on us.

They listen their customer and often they release the functionality asked by the base users or change their development plans if a feature have more request than another one.

Finally yet importantly, the ExpertSDR2 software is available for any platform (MS Windows, Apple Mac and Linux) and not only MS Windows as usual. Therefore, you are free to use you SunSDR2 with your favorite operating system. Another point for Expert Electronics!

Coming back to the software ExpertSDR2, I think is a good piece of software, well done, well organized and fast. There are tons of options to configure the radio based on your way to operate, together with many functionalities to tailor every aspect to your taste.



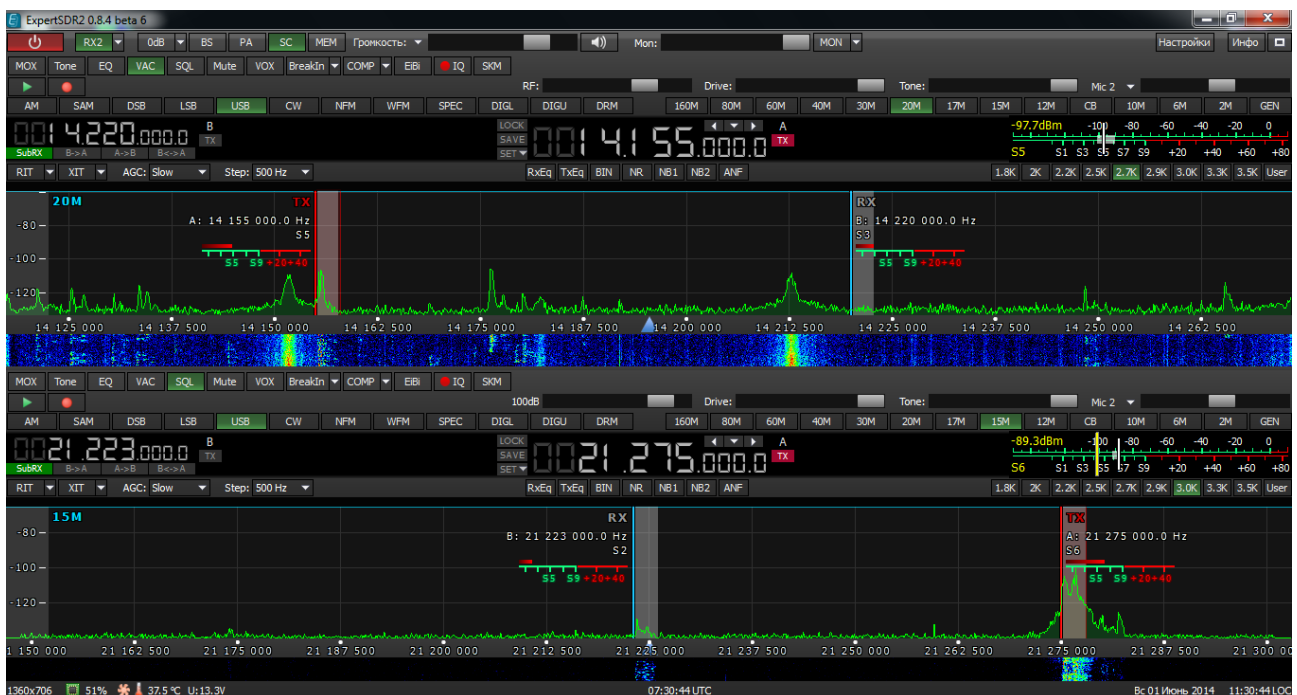
We can set a very large number of parameters, starting from sample rate (how wide will be our bandscope), to a very complex and fine tuning of DSP capabilities and ending with all kind of communications and integrations we can have with other software or devices.

An example of the DSP and TX settings



I could write a lot about how much things can be configured in the software, the main aspect is that everything is considered important, not only the technical settings but also the visual aspect. In effect also the bandscope and waterfall colors or background image can be chosen by the user, or an analog s-meter can be shown for nostalgic operator, both ears and eyes can be satisfied.

The bandscope is clear and fast, on the bandscope we can see the two VFO for both receiver, dx-spots, notch filters, filter width and many other informations. The software (and radio) permit to have two independent receivers (organized in vertical, horizontal or with dedicated windows) with two slices each, for VFO-A and VFO-B. All the controls to fly from band to band and change modes are in the same place, very useful the preset filter for any mode, frequency can be changed with the mouse wheel on the numbers for fast QSY. There are slide controls (faster to move) for power, RF Gain, general volume and monitor volume.



Moreover, at the bottom of the screen, it is possible to have always displayed a very large bandscope of about 80 Mhz covering from 160 meters to 2 meters and have a visual idea of the traffic on all bands.

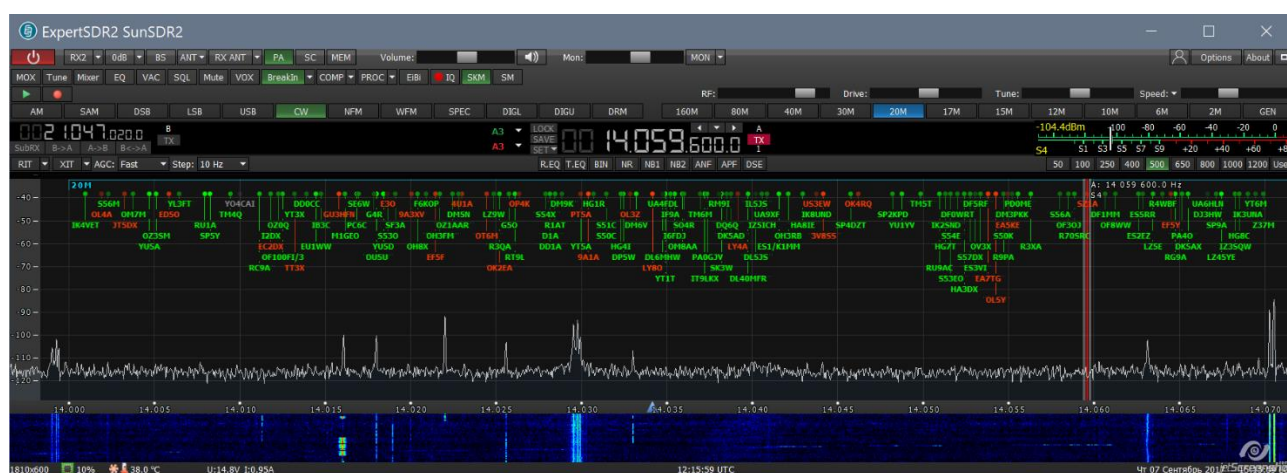


Useful software to use in bundle with ExpertSDR2: unleash the power!

The ExpertSDR2 software can be used in bundle with SDC (Software Defined Connectors) by Yuri Pavlov (UR4IX) to have a personal CW Skimmer and a cluster connection of our choice, giving the benefit of having all the spots directly on the bandscope, without the need to look at the cluster. Obviously, simply clicking on the spot will take the radio on the frequency, ready for transmit and make the QSO. Again, we can choose the colors of the different informations coming on the bandscope, so we know which is the source of the informations. All these connections and informations are managed by the new TCI protocol I mentioned on the beginning of the review. Everything is working flawlessly and the configurations is a matter of a couple of minutes. Those are just two interesting but basic functions, SDC can also be configured to connect and drive linear amplifier switching band to follow the radio, audio server, audio mixer, keep in sync different radios and an incredible and useful feature that allows to route informations between all the COM port used on the PC.

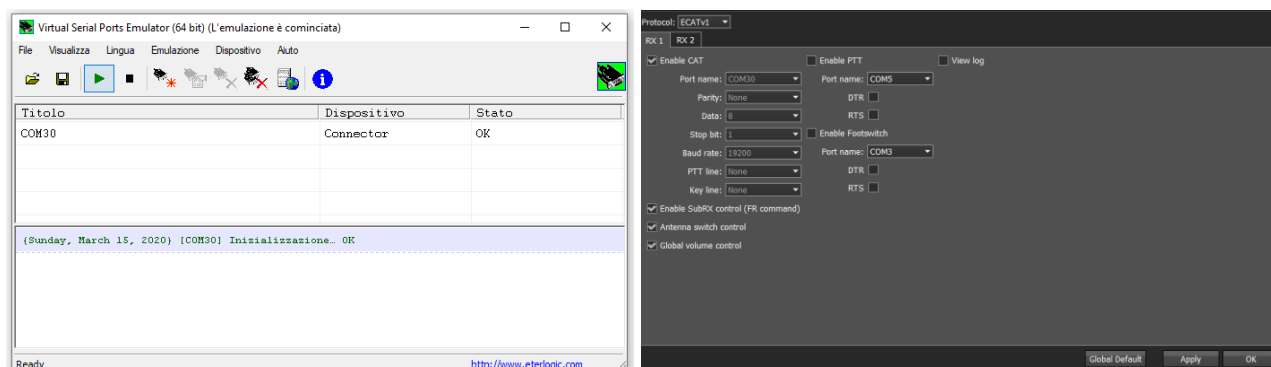
Can you imagine how big help could be during a contest ? ;-)

SDC could be found on the software page on Expert electronics Website: <https://eesdr.com/en/software-en/software-en>



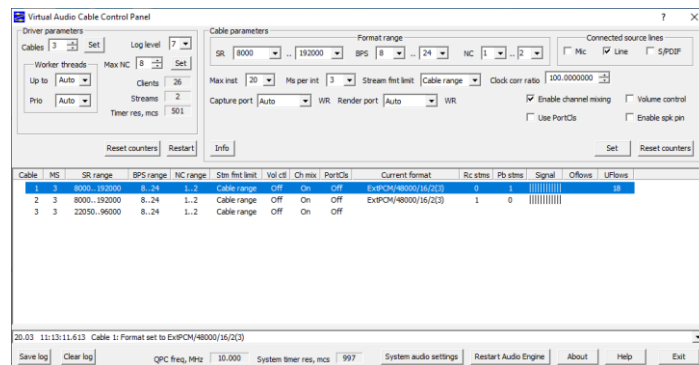
Two very useful software combined with ExpertSDR2 are VSPE (Virtual Serial Port Emulator – <http://www.eterlogic.com>) and VAC (Virtual Audio Cable - <https://software.muzychenko.net/eng/vac.htm>).

The first one, VSPE, is used to create virtual serial ports that can be used by more than one software at the same time or for some more complex configurations like data redirection, ports multiplier and so on. One basic application is to create a virtual serial port to be used for CAT control of the SunSDR2 Pro, the new serial port will be used by ExpertSDR2 and the station log software. For example:

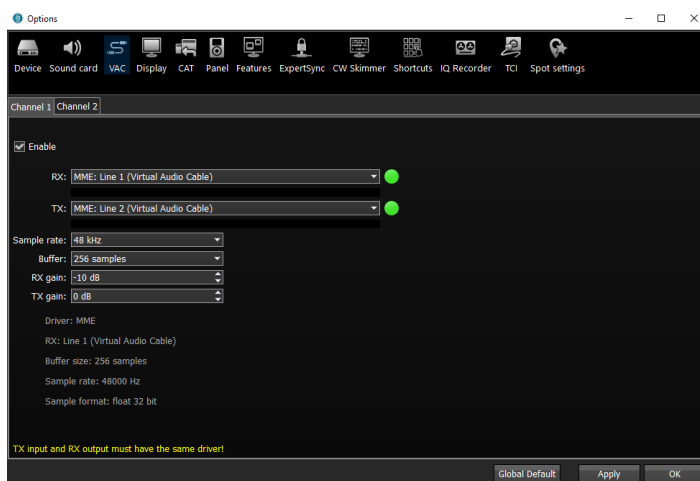


Instead, VAC, has a more important function, it could be used to carry audio from SunSDR2 Pro to Virtual Audio Cable created ad-hoc that subsequently will be use by software like WSJT-X or MMTTY for digital mode. It is enough to create two virtual cables, one for RX and one for TX, these two cables will be seen by the operating system of the PC like two soundcards and can be configured in the digital mode software as devices to be used for sound treatment. For example, my configuration for FT8:

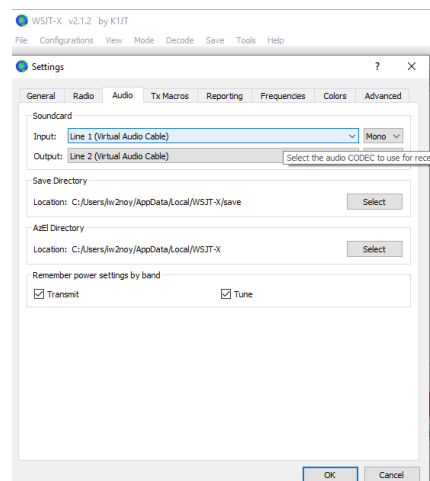
VAC Control Panel



ExpertSDR2 Configuration Panel

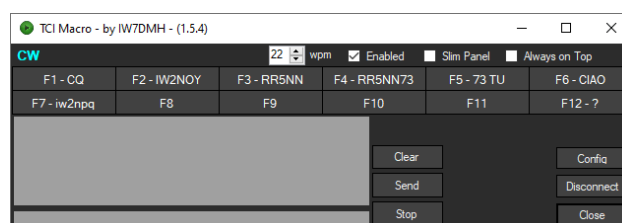


WSJT-X Configuration Panel



Another interesting software to be used with ExpertSDR2 and the SunSDR2 radios is “Macro TCI” of my friend Vincenzo IW7DMH, you can find the software on his site at: <https://iw7dmh.jimdofree.com/sunsdr2-pro-pages/tci-macro/>. I suggest to visit it, with plenty of useful informations devoted to the SunSDR2.

This little piece of software is very useful to send CW and voice macro to the SunSDR2 radios via TCI, this software is lite, clean and fast. The configuration requires just a few minutes and after that you can go on air with automatic call and answer in CW and SSB. Here is a screenshot of my configuration.



Ok, I ended my overview on the useful software for ExpertSDR2 and the SunSDR2 radios to complete our experiences during our shack time and I want ask you a question:
Did I mention CABLES to connect or INTERFACES to use ?

You are right, the answer is NO !

Now, we have:

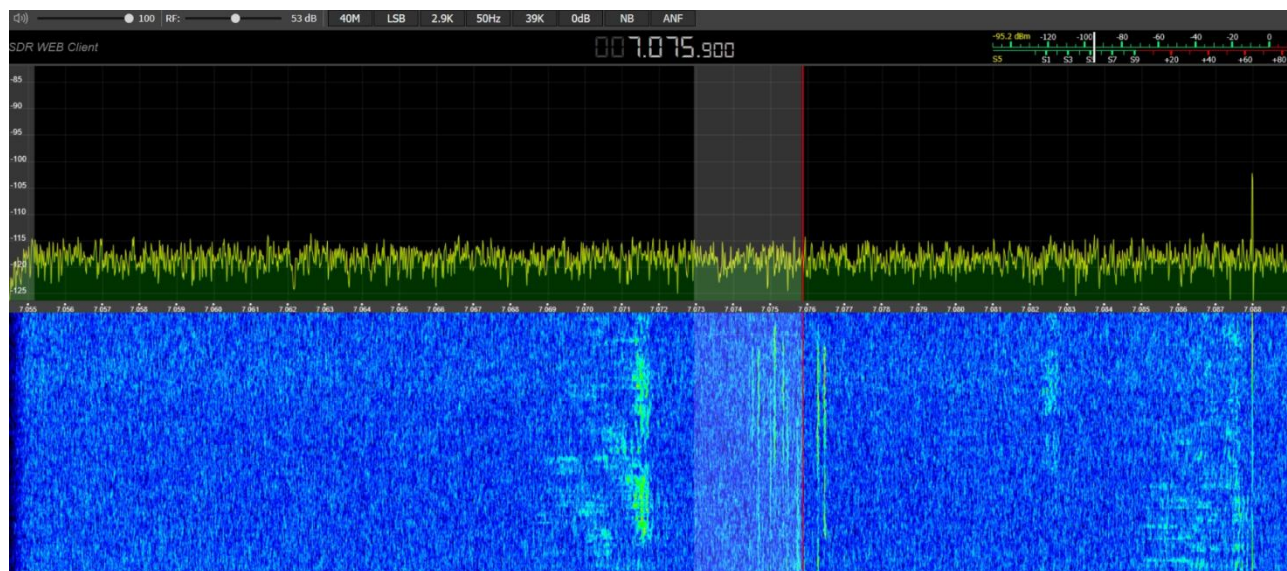
- CAT control for our station logging software
- Audio for Digital Modes
- Macro for CW and SSB
- DX spot from DX-Cluster and CW-Skimmer
- Linear Amplifier Control

All this without any additional cable or connection between the radio and anything else. The SunSDR2 Pro is still connect with only ONE cable, the Ethernet cable to the PC or to the network modem. All the informations flows via TCI protocol or internally to the PC thanks to virtual devices created by software ad-hoc.

Expert Electronics remote system solutions

Expert Electronics releases also two dedicated software for remote control: ExpertRS (Server) and a special lite version of ExpertSDR2 software called "ExpertSDR2 Remote Client" (client). The ExpertRS software act as server and make the SunSDR2 device available for a TCP connection on port 5050. The ExpertRS capability can be combined with a custom embedded Apache Web Server installation containing a complete Web interface in HTML5 standard to use the radio from an internet browser, in this way it is possible to use the radio with any PC or mobile devices with an HTML5 capable browser (like a smartphone or a tablet running Android or Iphone). Remember to plug the antenna to the connector number 3 (A3), only this antenna is usable during this use mode.

This a screenshot from the web interface, got it from the webserver running on my PC.



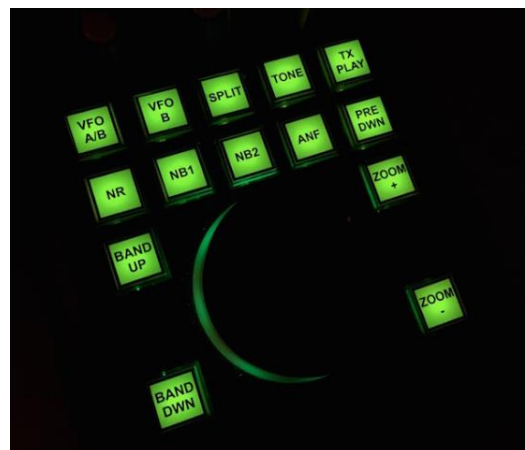
And what about useful hardware ?

Expert Electronics has an external VFO dedicated to the SunSDR2 line, called E-coder. Basically is a panel with an optical encoder, three knobs and many buttons that can be connected to the PC via USB. The E-coder is automatically detected by ExpertSDR2 and all the knobs and buttons can be customized with any functions of the ExpertSDR2 software, giving a complete personalization of the tool to suite all behaviors.

The most interesting thing is the possibility to connect a paddle or a straight key to the E-coder, giving the ability to use a “real” paddle in remote. I think this is very nice, especially for people like me that love to use their hands and brain instead of computer or macro to do CW. Using this combination, I was able to make several QSO in CW just using my PC with the E-Coder plus and my Begali paddle connected to the E-coder, far from the radio and the shack.

The E-coder is lighted with a soft green light, ideal for night use. In the product box you will also find included a sheet with all the labels (of all functions that can be assigned to the buttons) ready to be stuck on the chosen buttons. A nice idea and gift from Expert Electronics that can save time and headaches.

I like the E-coder plus, it's perfect for OM that absolutely want a VFO knob to turn when doing radio, is good to have the most used functions on your fingertips but above all the most important function is the opportunity to remote the paddle for CW (at least for me).



How the SunSDR2 Pro and SunSDR2 DX perform?

The SunSDR2 like other SDR is not a conventional radio, so it should be understood a bit and you must learn how to use it, to avoid surprises or have bad impressions and unpleasant experiences during the use. Therefore, let me give some first suggestions and explore others hidden features in the review. These notes are also mentioned in the ARRL review, also their lab fallen in some tricks.

Turning off “Wide RX Filter” and “Auto Enable” (default is ON) can improve the second-order IMD dynamic range considerably, avoiding for example, signals from strong broadcast stations may mix in the receiver and cause false received signals.

Another thing to keep in mind to listen broadcast FM band is to set the sample rate to 312 kHz and adjusting the filter bandwidth to match the bandwidth of the FM signal in WFM (wide FM) mode.

Again, the 2 meter sensitivity is low if the LNA (preamp) is turned off, to have good sensitivity the LNA must be enabled.

Don't be shy and ask to friends or in the eesdr forum at <https://eesdr.com/en/forum-en>, or simply write to Expert Electronics, they are always available to answer to their customers.

Anyway, experiment with the radio, don't stop trying all the possible settings.

But, now... how the SunSDR2 goes ? Let me say that is a little jewel, I love it!

The audio is superb and smooth, there are a lot of possibilities to tailor the SSB or CW audio to your taste. For voice operation the quality can be like Hi-Fi, it is possible to obtain a very high audio quality, having all the tones or emphasize the pitch we prefer. Obviously, this can be done for RX but also for TX audio, so you can go out on the air with the modulation you like. On CW, the audio can be tailored around our favorite tone pitch or managed to get out the very weak signal. I enjoyed using the SunSDR2 also to listen to AM and FM broadcast stations ranging from some kHz to 88-108 Mhz pleased by incredible sound in my headphones and I don't regret not having used a traditional device. In this case the "Mixer" window is magical. The "Memory Panel" can come in handy to store the stations we like. The "Wide-RX" and "auto BPF/LPF" options in the device setup can improve the reception when we are out of ham bands. There are also sound effects like "BIN" (The BIN aural effect) or the "DSE" for CW (Digital Sound Effect for CW).

Unfortunately, playing on FM broadcast band, all this makes me miss Dolores O'Riordan even more (if possible), she was an Angel.

Coming Back to ham radio...

For SSB transmission I used an Heil Sound Proset with HC4 element as microphone but any PC headset with a stereo jack for the microphone connection can be used. For CW I used my Begali paddle but I gave a chance also to my other bugs, a Hi-Mound BK-100 and Vibroplex J-36, the last two work correctly just removing "iambic" from the "break-in" menu in ExpertSDR2. From the same menu it is possible to set speed, break-in delay, pitch and so on, giving complete controls on CW TX parameters. The SunSDR2 doesn't suffer any kind of lag while operating CW. **One important thing to remember** is to connect always paddle and headset (or speaker) in the same way, both to the radio or both to the PC, mixing the connections can cause difficulty to the software to keep transmission and RX audio in sync.

RF Power comes out from the radio without problem in any condition, reaching the maximum power easily. In CW is never a problem, in SSB all the numerous settings in the "Proc" menu can be used to boost the modulation and get the preferred audio. In this case, 20 watt from the SunSDR2 Pro for HF/6M and around 7-8 watt for VHF. This is ideal for QRP lover but is also enough to drive many linear amplifier to full power. With the SunSDR2 DX I got more than 100 watt in HF, sometimes I have seen peak to 130 watt, the regular 50 watt in 6 meters and 7-8 watt in VHF.

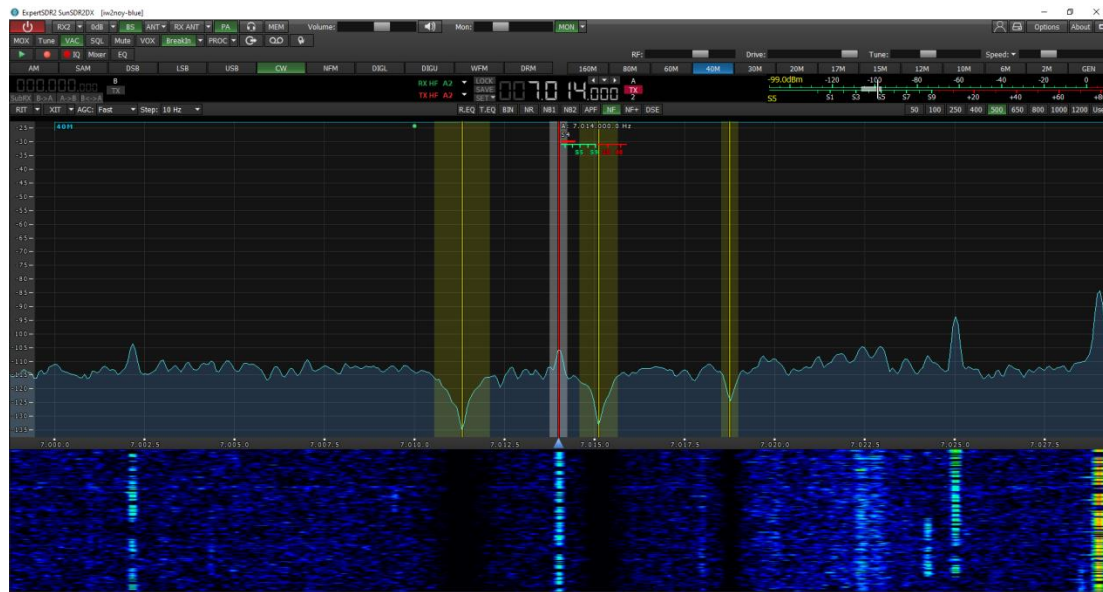
The SunSDR2 is very selective, giving the possibility to listen to the intended signal also with another strong one very close if not attached. The preset (bandwidth) filters are very comfortable and well chosen, these vary in relationship to the mode in use (ssb, cw, am, and so on), in any case it's always possible to change the filter width to your needs.

In the software are implemented all the old and modern helps for a good reception and to fight noise, interference or very weak signals. Those includes:

- Noise blankers (NB1 and NB2)
- NR (Noise Reduction)
- Auto Notch (ANF)
- Manual Notch (NF+)
- APF (Audio Peak Filter)

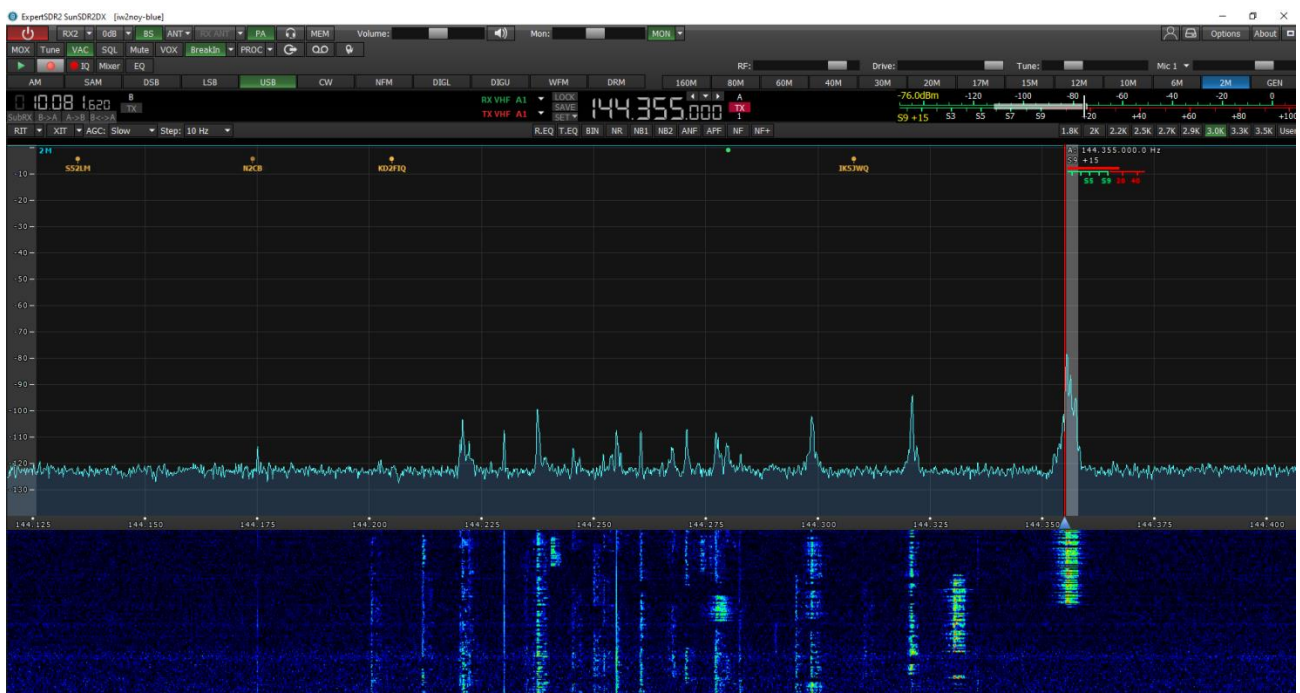
All these filters, today, are well known and work as expected. All the filters can be set in any functional parameters from the "DSP Settings" panel we have seen in the previous pages.

What intrigued me most is the new NF+, a manual notch filter that permit to create multiple instances of the filter to be placed wherever is need. This is a particular application of the notch filter never seen before, to my memory. See an example below.



I tried the radio also in VHF during an italian contest, where normally, all the SDR suffers in presence of a lot of strong signals through the band. I can say that I was able to listen (and make a qso) with any station in the panadpter, I could see difference between strong and weak signals but the strong ones didn't cause any kind of problems. The antennas used were a vertical Diamond X-510 and a beam Tonna 11 elements for VHF. I got also good audio reports from the corresponding stations. I am not an expert on high bands and microwaves, but I think that the SunSDR2 is widely usable on these bands, also during contest. Remember to activate the “Use VHF LNA” in the settings.

Nothing is missing, including repeaters offsets and Tone Squelch/CTCSS codes, to access repeaters and doing some local “rag chewing”.



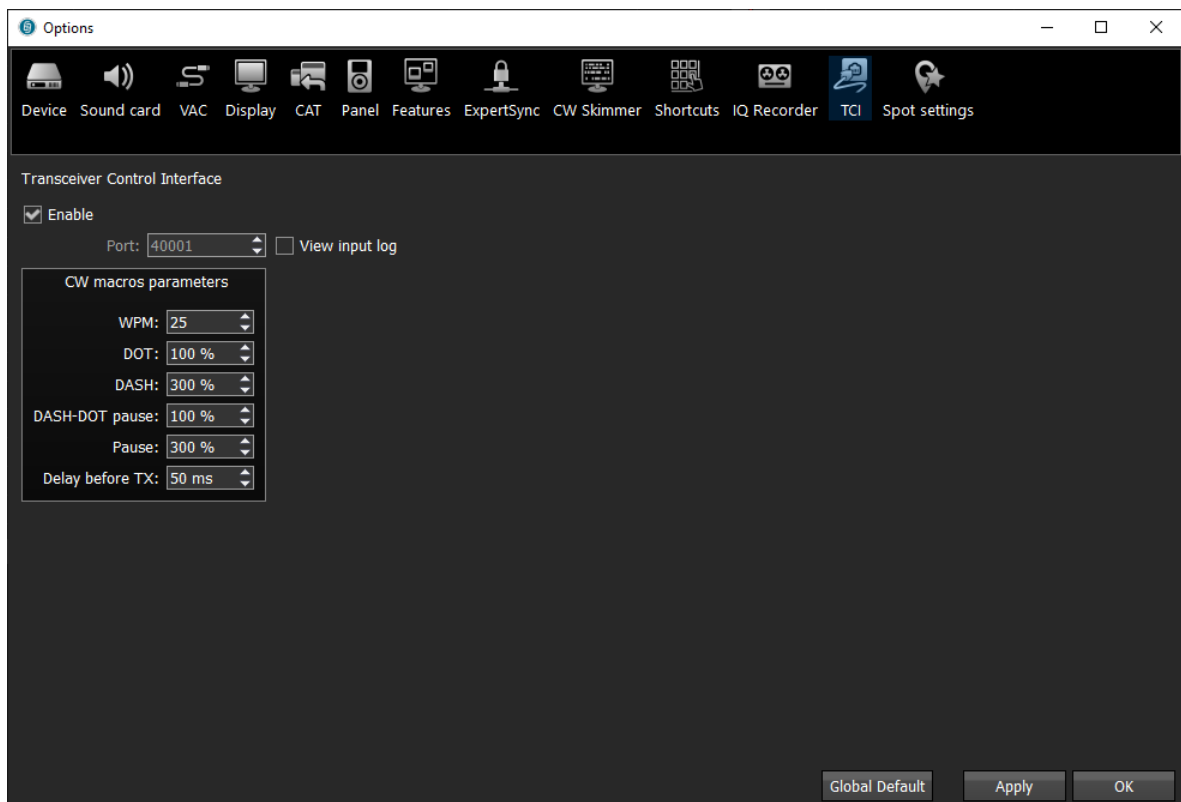
A note about software log supporting TCI protocol

For all uses, it's very comfortable to jump from a signal to another simply clicking on the panadapter and have a great view of what is happening on the band, a big plus compared to traditional radio. Especially with SDC sending DX cluster and CW Skimmer spots on the panadapter, there is no need to watch elsewhere but on the ExpertSDR2. To complete the “one cable SunSDR2 experience” you only need a software log that supports TCI protocol and therefore integrates the log. In this way, to save the QSO data is just a matter of one click: to spot on the panadppter, to set the spot frequency, to have the callsign lookup in the log and finally to save the QSO.

Software log that support TCI protocol, for the moment are:

- LogHX by Alexei V. Chernobai (RX4HX) for Windows
- SWISSLOG by Walter Baur (HB9BJS) for Window
- 5MContest by Vitaly Filonenko (RM5F) for Windows
- RUMlog by Thomas Lindner (DL2RUM) for macOS
- MacLoggerDX by Don Agro (VE3VRW), since release v6.23b47 for macOS
- LinLog by Sergey Baston (UR4LGA) for Linux

Again, Expert Electronics site is always up to date also for software log supporting their TCI protocol.



Difference between the SunSDR2 Pro and the SunSDR2 DX.



The first thing easy to notice is that the DX model is bigger than his little sister. The DX is about three centimeters taller than the Pro (without the fan), the box containing the electronics is about the same, the rest is used by the big heat-sink and the fan supplied with the unit. Obviously, also the weight is different with the DX around 1,8 Kg and the Pro around 1,5 Kg.

The big differences are on the back panel, where you will find an Anderson power pole connector instead of the 4 pins molex of the Pro, the 8 pins round connector for a future external tuner and a GPS port.

All the hardware differences, as documented on the producer website, are:

- Improved supply system, which leads to less heating and less power consumption
- HPF for VHF (100 MHz) to eliminate strong out-of-band stations coming from HF
- LPF for HF (70 MHz) to eliminate strong out-of-band stations coming from VHF
- New VHF LNA chip - PGA103+
- New high-performance built-in stereo audio codec 24 bit with 114 dB dynamic range
- Sturdy DIP-type ExtCtrl connector
- New connectors: external tuner control, external fan control, GND
- Improved PCB topology

Basically, using DX instead of Pro, I appreciated the greater output power of 100 watt in HF and 50 watt in 6 meters, the new VHF LNA in 2 meters, for the rest performance and yield are the same. I noticed that the DX can managed the temperature in a better way, the Pro soon reach temperature between the 40° and the 50° making risky to touch the heatsink, while the DX is supplied with a big fan to install on the heatsink and is directly managed by the radio so the tempeature is always under control and never goes to risky limit. In case, the Pro model goes in “protection mode” if the temprature become too high, I think that with the DX cannot happen, thanks to the new improvement to supply system and the generous fan supplied with the radio. I suggest to put a small computer fan on the heatsink of the Pro, to be more secure.

The software ExpertSDR2 is available in two version, for the SunSDR2 (Pro) and the SunSDR2 DX, it must be used the correct version with the respective model.

Now, make your choice !

Conclusion

I found very funny and productive to use the SunSDR2, because it's easy, comfortable and give a me a lot of options and solutions. From CW to SSB to FT8, everything works smooth. I liked to use the radio in many different modes without using many cables or interfaces. Jump from a mode to another is just a click with the mouse, there aren't menu to re-configure or settings to change back and forth.

Despite to the small size, don't be tricked by that, the SunSDR2 is powerful SDR with 16 bit direct sampling and is an incredible RTX rich of traditional and modern features.

I can suggest to everyone to seriously consider the SunSDR2 Pro or DX as RTX for his own shack, not only to try the SDR experience if not already done, but also to have a good all-purpose RTX easy to connect and use for all needs. Just putting the SunSDR2 behind a good linear amplifier (hey guys, remember the legal limit, eh ?), power on the computer and the shack is done, in a half square meter, but ranging from 0 to 155 Mhz really in ALL modes. There is a hole, for the 70 Mhz not yet covered, but maybe in a future software release... who knows 😊. The 80 Mhz wide bandscope is not to forget, I think is a unique feature of the SunSDR2 and ExpertSDR2. The opportunity to use some external add-ons to extend the SunSDR2 capabilities between the 0 and 700 Mhz bandwidth covered by the ADC, is not to underestimate.

Expert Electronics is always improving the dedicated software ExpertSDR2, adding new features and refining the interface and controls. The version used during this test is 1.3.1 Update 5.

If you want to taste the SDR experience or you are already interested to an SDR radio, give a try to the SunSDR2 Pro, or DX, and "Expert Electronics" team, I guess you will not regret for the experience.

And last... pages, let me thanks some peoples.

(Many) Thanks to...

Expert Electronics

I wish to thanks “**Expert Electronics**” team, at Fredrichshafen they have been fantastic and very friendly. The three guys remember me the famous western film “The good, the bad and the ugly”, but in their case in a new version that could be “The serious, the giant and the gentleman”, where:

Vasily is the serious and shady man with cold eyes, always dedicated to his marvellous toy and always ready to tell you what the magic-box can do, to bring you in Wonderland and let you feel like the little Alice.

Vitaly is the silent giant, always watching you from his high peak, he careful listen any word you say and seems trying to understand who are you..... exactly!

Roman is the gentleman, with his trained and muscular body, always smiling to everyone no matter who you are or which is the arguments, always hearty in any situation.

However, all they has been incredibly kind and really accomodating for all the time we passed togheter, I don't know enough good words to thanks they, so just “Thanks a lot, thanks for all”... my friends. Thanks Vasily, thanks Vitaly and thanks Roman.

I had fun finding these analogies with the famous western film and the guys from Expert Electronics, I hope they find them funny too and laugh on it.

Site: <https://eesdr.com/en/>

Dino Tersigni – Ham Radio Shop (Italy)

I wish to thanks Dino Tersigni of Ham Radio Shop, the italian reseller of Expert Electronics, for the loan of HIS brand new SunSDR2 DX to test in my shack. I have to thank Dino also for all the other situations where he has been always kind and ready to help me in true real-time for all my needs in Ham Radio equipments and accessories. Dino have all the SunSDR2 models ready to ship.

Site: <https://www.hamradioshop.it/>

Paolo Reda – AntennaHub (Italy)

I wish to thank Paolo and AntennaHub team, the italian reseller of Ultrabeam Dynamic Antenna, for the effort given to me this summer, when an hurricane destroyed my antenna system and for the 2 elements Ultrabeam UB6-40 that now has replaced my previous Yagi. The UB6-40 2 elements give me the opportunity to do from 40 meters to 6 meters, in just 16 kg and a boom of 1,60 meters , without sacrifying the performances.

Site: <http://antennahub.it/>

Vincenzo Stefanazzi – IW7DMH

I wish to thank Vincenzo for his incredibly help and his fantastic personal site full of informations about the SunSDR2 and his use. Vincenzo has been always available to help me in any kind of situation and find togheter new ways to go.

Site: <https://iw7dmh.iimdofree.com/>

Alberto Zagni – I2KBD

I wish to thank Alberto to share with me the fun of the "Sun experiences" and to have continuously stimulated me to look for new solutions and reach new goals. Last but not least, for reading and correcting this review instead of sleeping. Thanks Alberto

Mauro Granata – IW2JWD

I will never stop thanking Mauro for all the things he has done for me and that he does whenever I am in trouble and I need his help. Without him, my antenna system would never have existed. Without him, all my radio amateur experiences would not be the same. And last, but most important, to be my best friend. Thanks for everything, Mauro.