

ExpertSDR2

software



for SunSDR2 QRP transceiver

User Manual

V1.1

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Introduction

The ExpertSDR2 software was designed to support SDR devices of Expert Electronics Company.

At this moment ExpertSDR2 software supports:

- ColibriDDC and ColibriNANO receivers in RX mode
- SunSDR1, SunSDR2, SunSDR2 QRP, SunSDR2 PRO, MB1 transceivers in RX and TX modes

ExpertSDR2 works with Windows 7/8/10 and Linux Ubuntu/Kubuntu.

ExpertSDR2 Software License Agreement

The ExpertSDR2 software is the product and intellectual property of Expert Electronics. It is forbidden to modify, copy or disclose to third parties ExpertSDR2 software distribution.

Official versions of the software are published on the manufacturer's website in the section "SunSDR2 QRP Transceiver/Downloads".

New versions of the SunSDR2 QRP transceiver software may have different titles from time to time. This license agreement applies to all new versions of the software and may be supplemented and/or amended unilaterally by Expert Electronics.

The manufacturer reserves the right to alter and/or improve the SunSDR2 QRP transceiver software, adding new features and bug fixes. In this regard, the software may be different from the description herein. Ask your closest dealer on the availability of new, more complete version of the User Manual, or look for them on the official website of the manufacturer in the section " SunSDR2 QRP Transceiver / Documentation".

Users of the SunSDR2 QRP transceiver can update the software by themselves, by downloading from the official website of the Expert Electronics company.

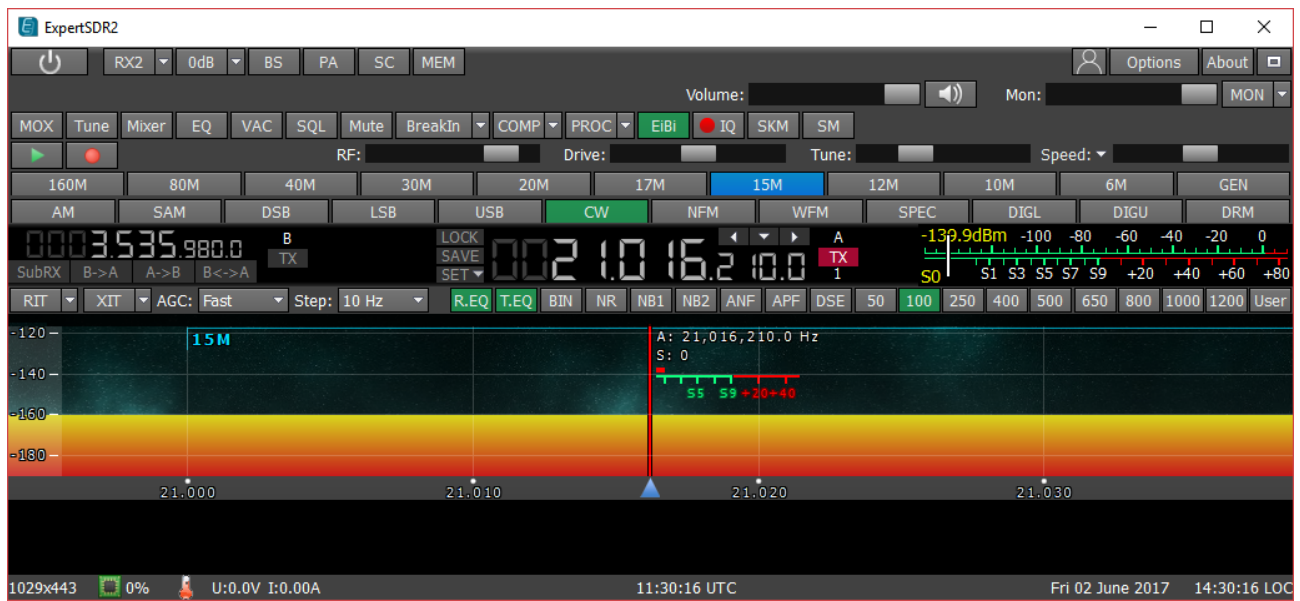
The manufacturer is not responsible for the consequences of the user utilizing an unofficial or modified version of the ExpertSDR2 software and/or changes the settings or other files which are related to the ExpertSDR2 functionality.

The manufacturer assumes no responsibility for the material, moral or any other kind of damage, whether expressed or implied, caused by using of a third-party software.

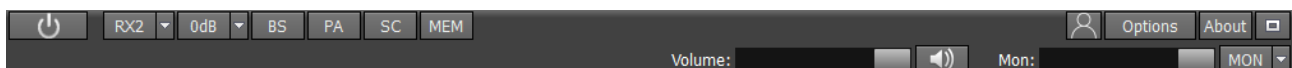
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1. ExpertSDR2 Software Description

Software settings which won't be mentioned or addressed in this manual, are set by default or provided to the user's self-study and experiments. All the unmentioned settings cannot cause fatal damage to the SunSDR2 QRP transceiver's hardware, so you can safely experiment with them. You're dealing with the software-defined radio - SDR, the main settings, and signal processing are held in the software.




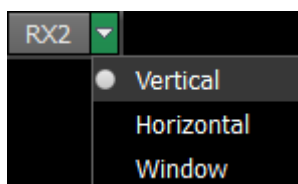
1.1. Global controls panel



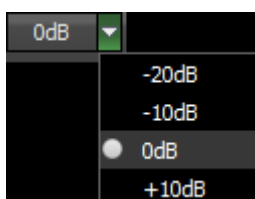
This panel consists of the following buttons:

 - the **Start** button switches on/off the ExpertSDR2 software.

 - enable/disable button of the second software receiver (**RX2**).



In the **RX2** drop-down menu, you can select receiver's window configuration. **RX2** window has the same interface as the **RX1**.



Attenuator level can be set via the drop-down menu or by successive presses of the indicator button, which cycles upwards the attenuation coefficient in the following order: -20dB, -10dB, 0dB, +10dB.

Notes! - While using Band Pass Filters (BPFs), attenuator and preamplifier values are stored for each filter and each band accordingly. When the Low Pass Filter (LPF) is enabled for the whole HF band, its attenuator/preamplifier level is already stored.

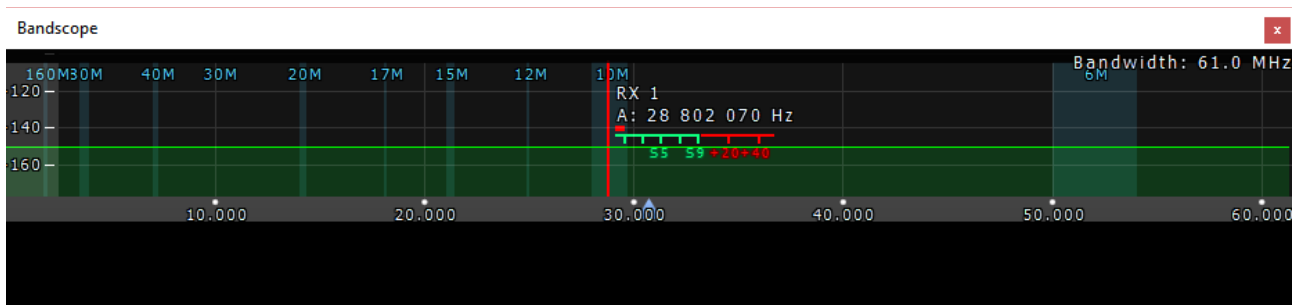
- When you use BPFs along with the **RX2**, the filters are controlled by the **RX1**.
- Two independent software receivers can operate simultaneously only in one Nyquist zone.
- **Attenuator specifics:** S-meter values and audio level have program compensation when you use the attenuator because signal level on the antenna input is always the same and doesn't depend on the attenuator level. With this solution, a user doesn't need to calculate real values on his own, every time when the -20-dB attenuator is used. Also, he doesn't need to adjust AF or RF level every time when the -20-dB attenuator is used, like in most classic transceivers.

Attenuator influences only receiving dynamic range, S-meter and audio level stay the same. If you disconnect antenna you can see how receiver's noises are changing when you switch the ATT. Receiver's noise level is lower when you select ATT 0 dB, it means that RX sensitivity is higher, but RX noise level is higher when you use ATT -20 dB, it means that RX sensitivity is worse. It is done in a hardware.

BS

- enable/disable button of the wide **bandscope** from 0 to 61 MHz. When you use the **bandscope**, set the **Use wide RX filter** checkbox or **Auto enable** checkbox (it will automatically enable the Wide RX filter) in the Options > Device menu (**BS**).

The **bandscope** window can be either adjusted inside the ExpertSDR2 window or can be displayed as the separate window on the second monitor. Navigation and settings of the **bandscope** are like the panorama settings of the main receiver.

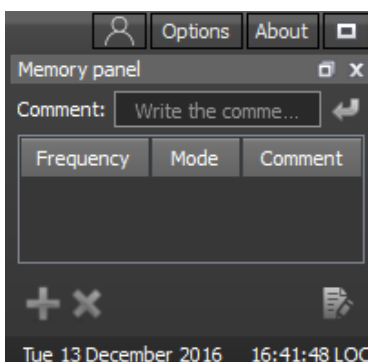


PA

- enable/disable button of the external power amplifier (**PA**).

SC

- enable/disable button of the sound output from the PC's sound card (**SC**).



MEM

- enable/disable button of the frequency memory panel (**MEM**).



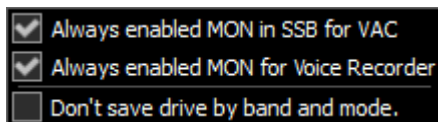
- **Volume** slider. This setting affects the LF output on the transceiver's front panel and PC's sound card output. Speaker icon has the mute function.



- **Mon** volume slider. Press the **MON** button to enable the monitoring. This function allows you to listen to the generated signal and control its quality.

Note! An excessive monitoring volume may lead to the positive acoustic connection between the microphone and headphones and as a result to the self-triggering of the audio path.

*In CW mode, transceiver always generates monitoring signal, even if the **MON** button is not pressed, you use it while working on the air. BUT, if the **MON** button is not pressed, TX signal won't be displayed on the panorama. To display your TX CW signal press the **MON** button.*



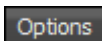
Even if the **MON** button is switched off, it is possible to enable the following functions from the drop-down menu:

Always enabled MON in SSB for VAC: if the audio record is transmitted in SSB via VAC, the self-control will be enabled.

Always enabled MON for Voice Recorder: if the voice recorder is transmitting the audio record, the self-control will be enabled.

Don't save drive by band and mode: disables saving of the **Drive** level per band and mode.

*Note! If the checkbox is not set, **Drive** level is memorized for the frequency bands and mode types. **Tone** level is memorized only for the frequency bands.*



- **Options** menu will be fully described later in the [Paragraph#2](#) of the manual.




- in the **Profile manager** menu, you can:

- add a new profile, by entering the name of the profile in the "Profile name" field and pressing **Add** button.
- set the settings of the whole program to the default state, by the **Default** button.
- **Update** the settings of the certain profile from the list to the current settings.
- **Remove** the certain profile from the list.

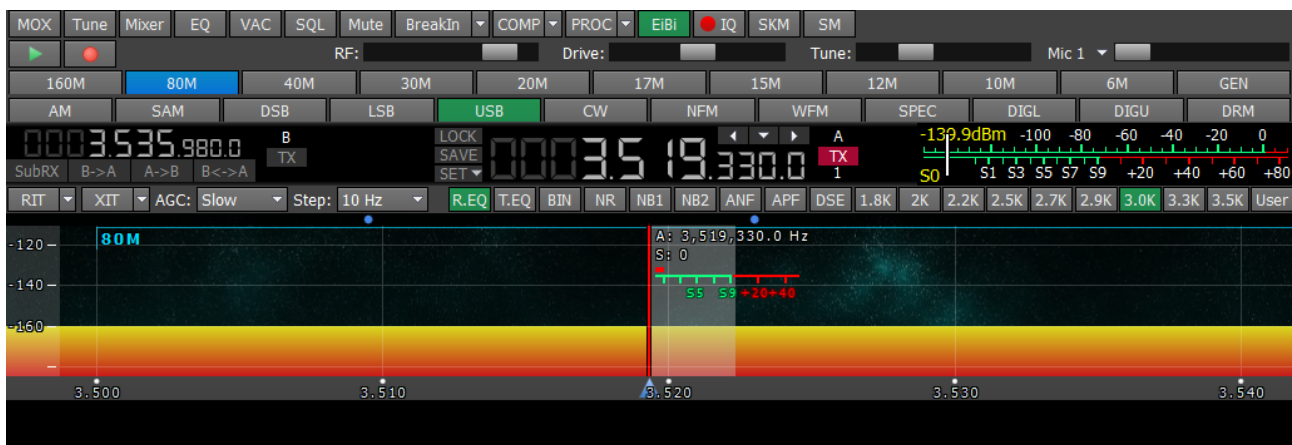
Note! All new profiles will be stacked up to the drop-down menu as a new line.

About - **About** button opens the new window with the info about current version of the ExpertSDR2 software:



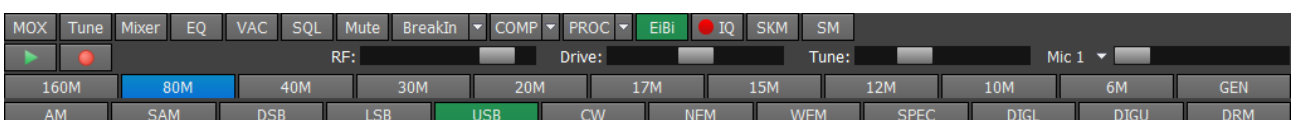
 - pressing the **Fullscreen mode** button will unfold the software window on the whole screen.

1.2. Software transceiver settings



These settings are divided into four logical parts:

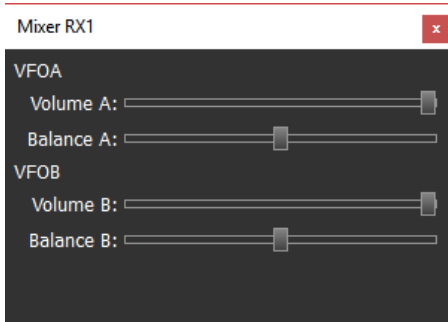
1.2.1. Transceiver control panel



MOX - enable/disable manually operated transmit mode (**MOX**).

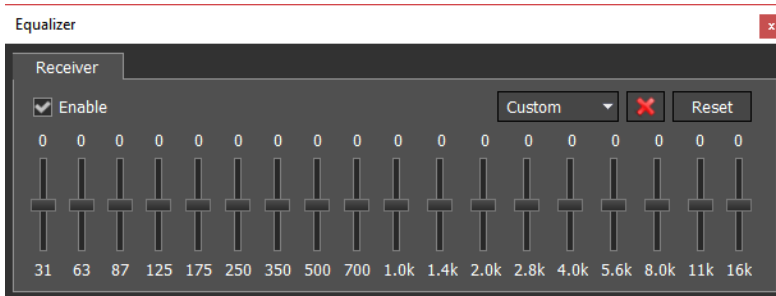
Tune - enable/disable tone (carrier) signal in TX mode, the output power can be adjusted by the **Tune** slider (**Tune**).

Mixer - volume and balance control menu for the first and second receivers separately (**Mixer**).



When you use only the RX1, Mixer settings are off, but when you enable the RX2, it activates Mixers for both RXs.

EQ - button opens 18-band RX equalizer menu (**EQ**).



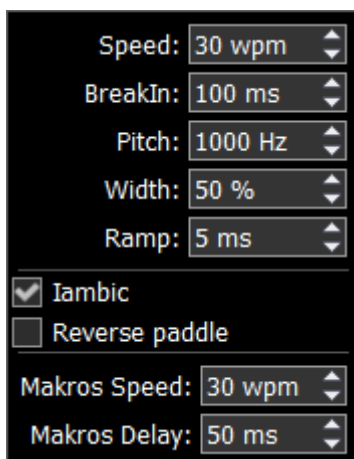
VAC - button enables the VAC (data exchange via virtual audio cable - **VAC**).

SQL - button enables squelch. Displayed as the vertical yellow needle on the S-meter. If air signal - green needle, surpasses the SQL trigger threshold - yellow needle, then you'll hear the receiving station on the receiver's LF output. If the signal level is lower than the trigger threshold, you'll hear nothing (**SQL**).

Mute - button mutes LF signal (**Mute**).

VOX - (Voice Activated Transmit) button switches the transceiver in TX mode when you speak in the microphone (**VOX**).

BreakIn - transceiver will automatically turn to TX mode on the press of the CW keyer (**BreakIn**). Dropdown menu with CW settings:



Speed - the speed of the CW signal being sent.

BreakIn delay (ms) - timing control, to keep the transceiver in the TX mode. Set the required time for the transceiver to hold in the TX mode after you let go of the CW keyer.

Pitch (Hz) - CW signal's frequency tone control. Set the required CW signal's frequency tone (also used for the RX mode).

Width (%) - Dot-to-pause ratio. Width value 50, means that Dot equals pause in length. Dash always equals 3 Dots.

Ramp (ms) - CW signals' slope length control. Set the required CW signals' slope length. The higher manipulation speed, the shorter slopes will be.

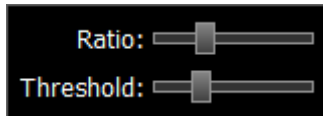
Iambic - enable/disable automatic dots and dashes generation. If the **IAMBIC** mode is off, while you press the CW keyer it will generate tone signal with **PITCH** frequency.

Reverse paddle - enable the checkbox to generate dots and dashes in reverse order.

Macros Speed - speed of CW macroses generation via TCI interface.

Macros Delay - CW macroses generation delay after switch from RX to TX, via TCI interface.

COMP - turns on the compression of the transmitted signal.


 Via the drop-down menu, you can adjust the compression and threshold level.

Mic Gain and Compression settings:

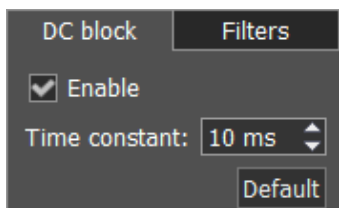
1. Set the Meter to the Mic-meter mode (right click on the S-Meter->TX-> Mic-meter).
2. Set the Drive level to 0.
3. Enable the TX mode and speak into the microphone.
4. Increase the Mic gain from 0 dB till the Mic meter readings will reach -10...-5 dB in peaks.
5. If required enable the compressor.
6. Set Compression to 2-5; set COMP threshold to ~ -30 dB. This level should be more than room noises for about 10-15 dB.

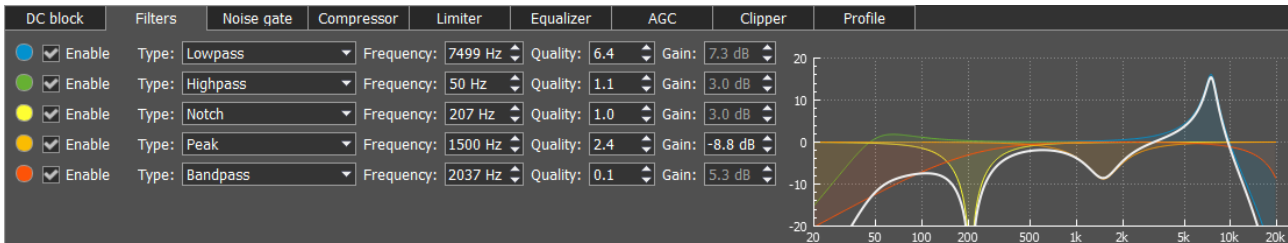
PROC - enable the microphone signal processing menu. Profile adjustment in this menu is similar to the global profile menu:

- add a new profile, by entering the name of the profile in the "Profile name" field and pressing **Add** button.
- **Update** the settings of the certain profile from the list to the current settings.
- **Remove** the certain profile from the list.

Note! All new profiles will be stacked up to the drop-down menu as a new line.

It consists of the following functions:


 DC block's purpose is to effectively remove **Time constant** in the microphone signal. Changing of **Time constant** influence quality of the applied filter. You can test it by increasing or decreasing **Time constant** value in 1-10 ms range, you'll notice low frequencies reduction with 1 ms value and amplifying with 10 ms value.



Parametric filter module with graphic display of the summed AFC (amplitude-frequency characteristic - white line) and AFC of each filter. Simultaneously you can use up to 5 filters. Available filter types:

Lowpass - Low Pass Filter (LPF). This filter passes signals with a frequency lower than a certain cutoff frequency. Cutoff frequency is determined by **Frequency**. **Quality** determines steepness of the filter slope.

Highpass - High Pass Filter (HPF). This filter passes signals with a frequency higher than a certain cutoff frequency. Cutoff frequency is determined by **Frequency**. **Quality** determines steepness of the filter slope.

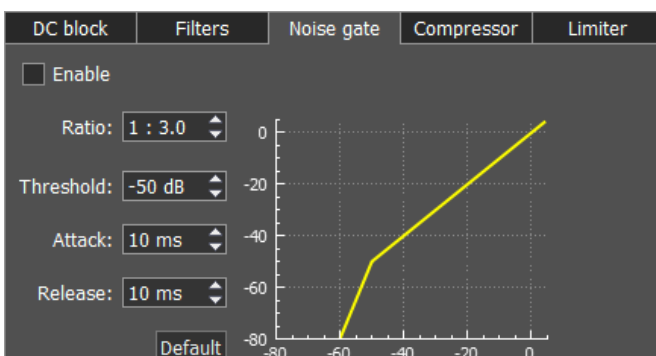
Bandpass - this filter passes frequencies within a certain range (band) and rejects frequencies outside that range. Cutoff frequency is determined by **Frequency**. **Quality** determines bandwidth of the passband.

Notch - it is a band-stop filter with a narrow stopband. It rejects a specific range of frequencies and passes all the other frequencies unaltered. Tuning frequency is determined by **Frequency**. **Quality** determines the stopband bandwidth.

Peak - also known as bell filter. This filter has similar functionality with the Notch filter, but has more flexible settings. It boosts or cuts the chosen frequency by **Gain** value, affecting the surrounding frequencies in a bell-shaped curve. Tuning frequency is determined by **Frequency**. **Quality** determines the cutoff bandwidth.

Low Shelf - this filter cuts or boosts signals of frequencies below the cutoff frequency, determined by **Frequency**. **Gain** value determines attenuation or boost level of frequencies below the cutoff frequency. Frequencies above filter's AFC will not be altered.

High Shelf - this filter cuts or boosts signals of frequencies above the cutoff frequency, determined by **Frequency**. **Gain** value determines attenuation or boost level of frequencies above the cutoff frequency. Frequencies below filter's AFC will not be altered.



Noise gate or **gate**, removes signals below **Threshold** level. Usually it is used to reduce the noise in pauses.

Gate passes signal only when it's level is higher than set **Threshold**: gate is open. If the signal is lower than set **Threshold**, gate will not pass it (or significantly attenuate): gate is closed. **Gate** should be used when

the level of the desired signal is higher than the noise level. **Gate's** level is set higher than the noise, so when there is no desired signal (higher than **Threshold**) gate is closed. **Gate** does not cleanse the signal from noises. When the gate is open, both signals get through, useful signal and noise.

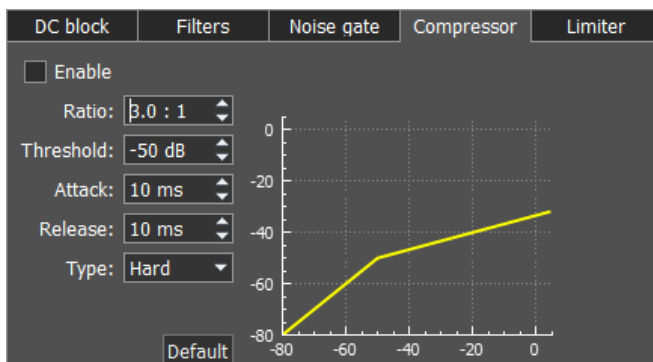
Parameters:

Ratio - attenuation value, when **Gate** is closed. Usually this parameter is set for full rejection, i.e. signal does not pass through **Gate**, when it's closed. But sometimes you might require a mild rejection in this case adjust **Ratio**.

Threshold - it sets the level for **Gate** to open - pass the useful signal. It supposed to be set above the noise level, but below the useful signal level.

Attack - it sets time (ms), required for **Gate** to change state from closed to fully opened. If **Attack** time is short, as soon as the signal level goes higher than **Threshold**, it creates a sharp noise, longer **Attack** time creates a smooth transition from closed to opened state, but because of it, you may miss first sharp characters, like T, K.

Release - it sets time (ms), required for **Gate** to change state from opened to fully closed. If **Release** time is short, as soon as the signal level goes lower than **Threshold**, it creates a sharp noise, longer **Release** time creates a smooth transition from opened to closed state, it may sound like fading.



Compressor - is used to reduce dynamic range of the audio signal, in other words, compressor reduces the difference between the quietest and the loudest sounds.

Compressor automatically controls the volume. Downward compression reduces loud sounds over a certain **Threshold** while quiet sounds remain unaffected.

Compression may improve sound audibility in loud places, where background noises may suppress quiet sounds. While loud sounds will be easily audible, quiet sounds won't be audible, and if you'll increase overall volume, it will improve the situation for quiet sounds, but loud sounds will become unbearable. If you'll apply the downward compression to this audio, the overall volume may be increased to the level when both quiet and loud sounds will be comfortable to listen.

Parameters:

Ratio - determines the ratio of input/output signals which exceed **Threshold**. For example, ratio of 3:1 means that if input level is 3 dB over the threshold, the output signal level is 1 dB over the threshold.

Threshold - a compressor reduces the level of an audio signal if its amplitude exceeds a

certain threshold. It is set in decibels dB.

Compressor may be adjusted in a way how fast it reacts:

Attack - this is the period, when the compressor is decreasing volume to reach the level that is determined by **Ratio**. It is activated when the signal exceeds **Threshold** and, if each consecutive signal has higher volume than the signal before it.

Release - this is the period, when the compressor stops compression, increasing signal volume to the default level. It is activated right after **Attack** period is finished. Each time, when after the compressed signal goes the next one, which is lower than **Threshold** or higher, but lower than the compressed one before it, then instead of **Attack**, **Release** is applied for each consecutive signal like this one and compressor stops compression according to **Release** settings. Whether there will be a compression or not while **Release period**, depends on the set time. If in **Release period** signal is compressed, it is compressed with the same **Ratio** (dB) as the signal before it. Only in that case sounds lower than **Threshold** may be compressed.

Attack and Release parameters should be adjusted depending on how frequently signal volume is changing.

Type Soft/Hard knee - controls whether the bend in the response curve between below **Threshold** and above **Threshold** is abrupt (hard) or gradual (soft). A soft knee slowly increases the compression as the level increases and eventually reaches the compression **Ratio** set by the user. A soft knee reduces the audible change from uncompressed to compressed, especially for higher **Ratios** where a hard knee changeover would be more noticeable.

Knee - available only for soft knee, determines the knee smoothness.

DC block	Filters	Noise gate	Compressor	Limiter
<input type="checkbox"/> Enable				
Attack: 1.0 ms				
Release: 50 ms				
Hang time: 100 ms				
Input boost: 0 dB				
Max amplitude: 0 dB				
Default				

Limiter - is used to limit dynamic range, when signal exceeds **Maximum Amplitude** value. In most cases used to avoid overload (clipping) and suppression of short-term level peaks, while signal dynamic range is being leveled. As a rule, limiter is used along with increasing the input level on the **Input**

Boost value, this technique increases overall signal level, while preventing distortion.

Parameters:

Attack - this is the period, when the limiter is decreasing volume to reach the level that is determined by **Max Amplitude**.

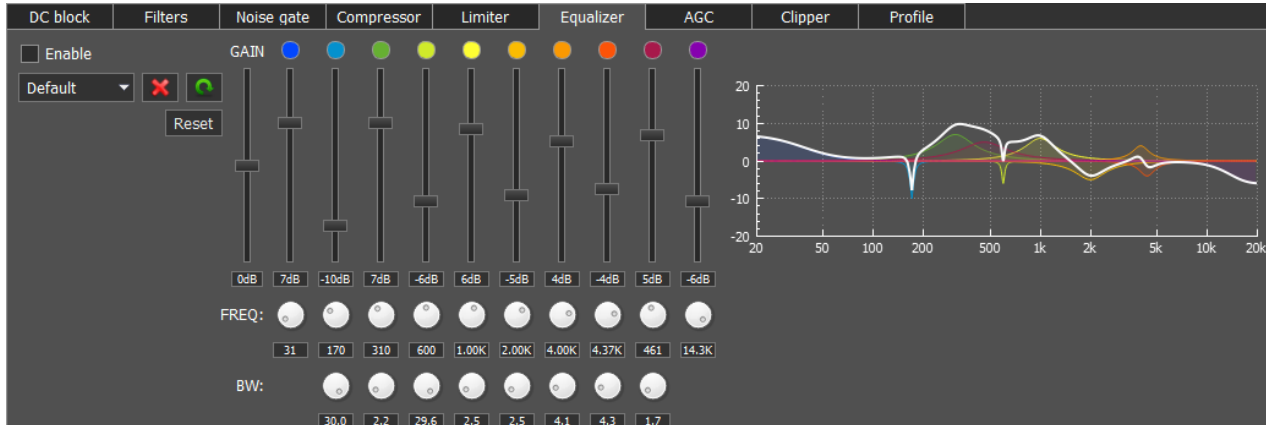
Release - this is the period, required for the signal level to be restored to the default value.

Hang time - sets time (in ms) to keep the signal level the same, after **Attack** period is over,

before beginning **Release** period.

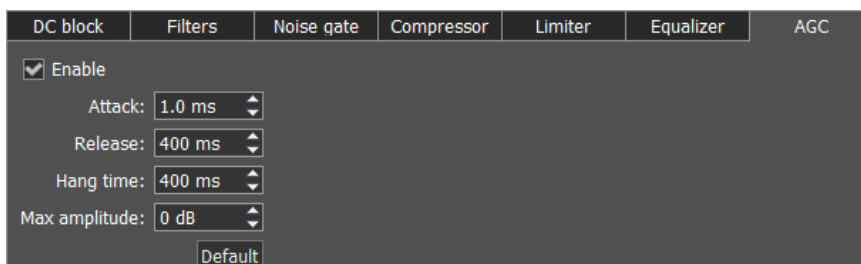
Input Boost - preamplifying of the input signal before limiter processing.

Maximum Amplitude - sets the signals maximum amplitude on the limiter output.

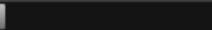


Parametric equalizer module with graphic display of the summed AFC (white line) and AFC of each equalizer. Each equalizer has independent set of controls: the center or primary frequency (**FREQ**), bandwidth (**BW**) and AFC level (boost or cut) - vertical slider. Press right mouse button on any control element to set it to the default value. Thus, using the parametric equalizer you can perform the finest tuning on any required frequency.

In this module, you can find 3 types of filters: **Low Shelf** (on the left), **High Shelf** (on the right), **Peaking or Bell** (8 units in between). Their operation is similar to the filters described in the **Filters** module.



AGC module is responsible for keeping the constant volume level of the Mic signal. Max AGC value might be adjusted by the Mic gain on the software front panel -

Mic 1 . If the Mic signal on the AGC input is too weak, then you might need to increase the Mic gain. AGC has a delay period which is adjusted by the **Attack**, increasing the Attack value will increase delay period.

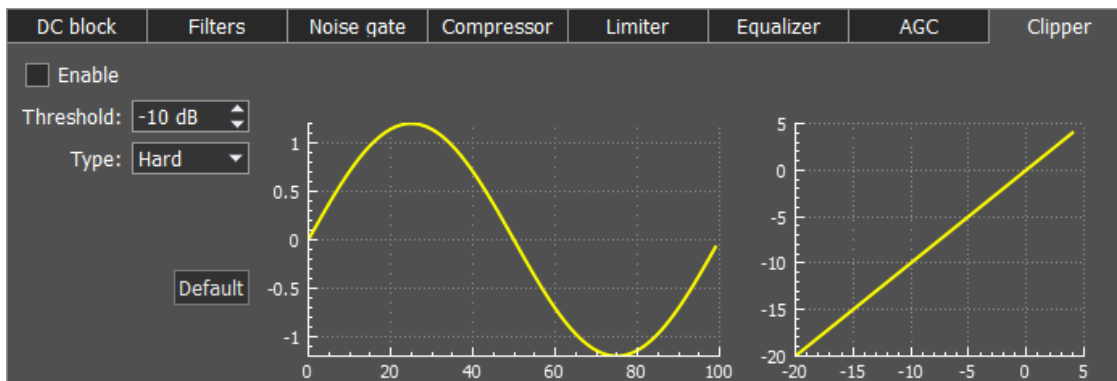
Parameters:

Attack - signal attenuation period, this value determines how fast AGC will decrease the amplitude of the loud signal to the **Maximum Amplitude** value.

Release - signal recovery period, this value determines how fast AGC will increase the amplitude of the loud signal to the value which does not exceeds **Maximum Amplitude**.

Hang time - sets time (in ms) to keep the signal level the same, after **Attack** period is over, before beginning **Release** period.

Maximum Amplitude - sets the signals maximum amplitude on the AGC output.



Clipping is a form of waveform distortion that occurs when the output Voltage exceeds **Threshold**. Visually (on oscilloscope) it looks like altered signal peaks, you can hear it as splutters and cracks. Clipper reduces signals peak-factor and increases overall power, but distorts the signal.

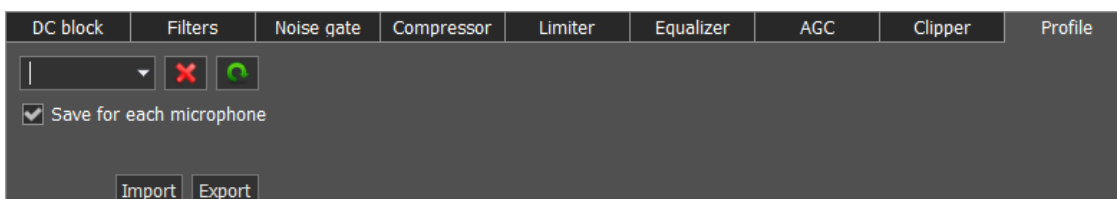
Parameters:


Threshold - if the signal exceeds this level, Clipper alters it, sets in dB.

Type Soft/Hard knee - controls whether the bend in the response curve below **Threshold** is abrupt (hard) or gradual (soft). A soft knee slowly changes the curve towards the clipped signal. A hard knee would be more noticeable.

Knee - available only for soft knee, determines the knee smoothness.

Output gain - you can adjust TX audio signal amplitude after processing, but before modulator.



In the **Profile** tab, you can save settings of the whole TX processing module in a separate module, independent from the main software profile. Load PROC settings from a file by pressing the **Import** button and save a profile in a file by pressing the **Export** button. To add a new profile, enter unique name in the input box and press the Enter button on your keyboard. You may also delete selected profile, by pressing the - .

Save for each microphone - enable this checkbox to save all **PROC** settings separately for each microphone. E.g. you set your Mic1 settings, then switched to Mic2, changed some settings then switched back to Mic1, as a result both Mic1 and Mic2 have their own different settings. If this checkbox is unchecked, all **PROC** settings apply for all microphones.

EiBi - show the HF stations markers on the panorama from the EiBi database. Hover with the mouse pointer on the station frequency and you'll see its name (**EiBi**).



IQ - IQ-files recording is required for storing the RX bandwidth panorama. The file is saved to the "C:\Users\User\ExpertSDR2\wave" (**IQ**).

SKM - turn on the CW Skimmer, described in the [Paragraph# 2.8](#) (**SKM**).

SM - bigger S-meter button. The S-meter window can be separated from the software window and moved to any place on the screen.



- press this button to clear the panorama of all displayed spots.

When you enable the **NFM** mode, three additional buttons appear:

BT - **Burst Tone** button (**BT**). In some cases, repeater stops working after some time - goes to "sleep" mode. To wake it from the "sleep" mode you need to send the **Burst Tone** of the exact frequency for some time (a common value for tone frequency is **1750 Hz**, but can vary in some repeaters). You may adjust signal **Timeout** and **Frequency** in the drop-down menu.

Remain in TX checkbox - set to stay in the TX mode after the timeout.


To form a Burst tone:

1. Set the **NFM** mode.
2. Set the tone frequency.

3. Set the required tone TX time, enough for the used repeater.

4. Press the **BURST TONE** button.

The transceiver will send the FM tone signal with your settings.

 - **Continuous Tone-Coded Squelch System** button. In some cases, it's required to activate the squelch with the help of the **CTCSS** tones.

You set the **CTCSS** level relatively to your voice signal.

To operate in the **CTCSS** mode:

RX Tone (Hz):

TX Tone (Hz):

CTCSS Level:

1. Set the NFM mode.

2. Set the receiver's tone frequency in the **RX TONE** input-box.

2.a. Set the transceiver's tone frequency in the **TX TONE** input-box.

3. Press one of the buttons **RX/TX**, **RX ONLY**, **TX ONLY**:

RX/TX - CTCSS mode is active in RX and TX modes.

RX ONLY - CTCSS mode is active in RX mode.

TX ONLY - CTCSS mode is active in TX mode.

4. Set (if required) required tone level.

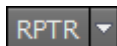
By default, 15% - common value for this mode.

5. Press the CTCSS button to activate CTCSS mode.

6. Receive signals with the CTCSS tone.

6.a. Press the PTT button on the Mic to transmit the signals with the CTCSS tone.


7. Release the PTT button on the Mic to turn to RX mode.

 - repeater button, enable to operate through a repeater. This function is usually used on 10M, 6M, 2M and 70cm bands.

 - in the drop-down window, you can adjust the **Shift** frequency.

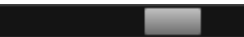
The sub-receiver displays the TX frequency and the main receiver displays the RX frequency.


When you enable the **WFM** mode, one additional button appears:


 - when enabled, this function allows the software to automatically detect whether the station is strong or not and lets you listen to it in **stereo** mode.


 - **Play/Record** buttons. Press the **Record** button to record the RX audio signal.

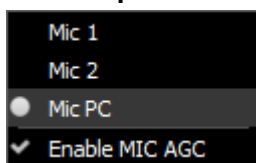
Press the **Play** button with the right mouse button to play the record instantly via the IQ player. Press the **Play** button with the left mouse button to transmit the recorded audio on the air.

RF:  - AGC sensitivity control slider (Automatic Gain Control on classic transceiver).

Drive:  - slider for the transceiver's output power adjustment.

Tune:  - slider for the transceiver's output power adjustment while transmitting the tone (carrier) signal.

Mic 1  - slider for the microphone gain level. In CW mode, it switches to the **Speed** button and duplicates the **BreakIn** functionality.



In the drop-down menu, you can select **Mic1**, **Mic2** - transceiver's microphones, **Mic PC** - PC's microphone. For fine tuning of the PC microphone open: **Options > Mic** tab (more details in Paragraph [2.1.2](#)).

Also in this menu, you can **Enable Mic AGC**. For fine tuning of the PC microphone's AGC open **Options > Mic** tab > **AGC**.

Note! Remember, if you disable the MIC AGC, it may distort your signal and cause interference to neighboring stations.

A panel of mode buttons:



AM - Amplitude Modulation.

SAM - Synchronous Amplitude Modulation.

DSB - Double Side Band.

LSB - Lower Side Band.

USB - Upper Side Band.

CW - CW mode.

NFM - Narrow FM.

WFM - Wide FM, supports receiving of the stereo signals.

SPEC - Spectrum mode. Receive the pure signal without any demodulation (panadapter bandwidth). The idea is to receive pure signal then pass it to some special device, via a cable connected to the PHONES audio output of the transceiver or PC audio output, with

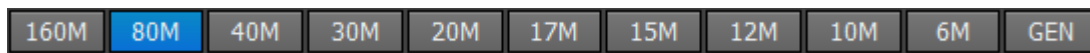
certain demodulation capabilities.

DIGL - Digital Lower Side Band. Connect a third-party software (is not supplied) to the transceiver software for operating in digital modes.

DIGU - Digital Upper Side Band. Connect a third-party software (is not supplied) to the transceiver software for operating in digital modes.

DRM - Digital Radio Mondiale, 10 kHz filter with 5 kHz IF to work with the external decoder of the DRM signals. Connect third-party software (is not supplied) to the transceiver software for decoding of the DRM signals.

Note! To work in digital modes, use DIGL and DIGU. Mic AGC gain, COMP, and EQ can distort the TX digital signal, that's why they are automatically disabled in these modes. Also in DIGL and DIGU modes, you can save your TX and RX filter width.



160M - 6M - amateur bands.

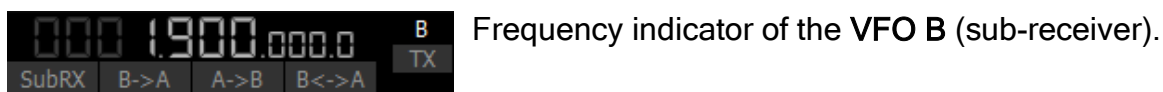
GEN - if out of the amateur bands.

1.2.2. Frequency and S-meter indicators



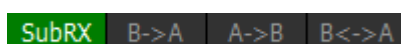
Mainly, this panel consists of the visual indicators, like the VFO A/B frequencies, the signal level on the antenna input (S-meter) and several control buttons.

Displaying elements (from left to right):



Note! You won't hear the audio from the VFO B if it is out of the panorama bandwidth.

Sub-receiver control unit:

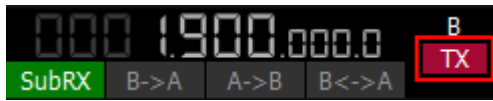


SubRX - enable sub-receiver. If you want to listen to the VFO A and VFO B frequencies simultaneously, use the Sub-receiver.

1. Activate the Sub-receiver by pressing the **SubRX** button.
2. Set the required VFO B frequency.
3. Listen to the VFO A and VFO B frequencies simultaneously.

Note! VFO A receiver's red tuning line means that in Sub-RX mode you'll transmit on the VFO A frequency.

To turn the Sub-receiver to transmit, press the TX button/indicator.



*You can switch the **point and click** control on the panorama between VFO A and VFO B receivers, by pressing the middle mouse button. You'll control the RX with the same color to the mouse cursor.*

When you change the band the SubRX is disabled.

B>A - assign the VFO B frequency to VFO A

A>B - assign the VFO A frequency to VFO B

B<>A - swap frequencies between the VFO A and VFO B



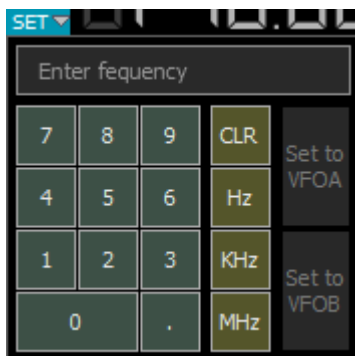
Frequency indicator of the VFO A (main receiver).

Main receiver control unit:

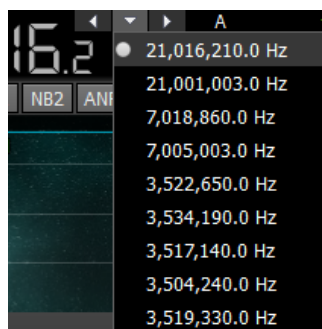


LOCK - lock the VFO A frequency tuning.

SAVE - save the current VFO A frequency and mode type in the memory panel.



SET - manual input of the frequency to VFO A or VFO B.



Navigation buttons. The quick memory cells are automatically stored with the frequencies if the receiver stands still over a second. Then those frequencies can be selected in order back and forth, as in an internet browser. The total stack contains 16 cells.

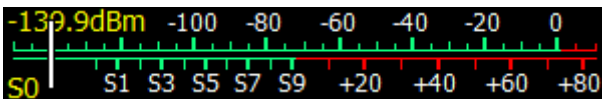


Band Stacking Memories indicator (VFO A only). Each memory slot has a frequency, mode, and filter settings. Each

band has three memory slots associated with it. Successive presses of a band button will

cycle through the stored memory slots. It might be useful for quick frequency and mode changes within a band. To replace one memory slot:

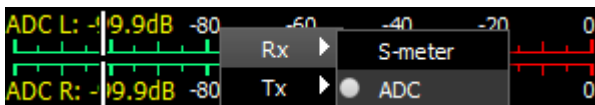
1. click the required band button you would like to modify.
2. change the frequency (within a selected band), mode, and filter to the required settings.
3. click the band button again to save the values.



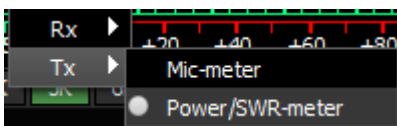
S-meter - by default this scale displays the power level of the signals in the RX filter bandwidth. The scale has two grade types: in S-units and in dBm. The signal strength displayed in dBm to mW (yellow figure) in the top left corner of the S-Meter. In the TX mode, the output power is indicated in W and antenna's SWR.

Note! S-Meter in the ExpertSDR2 has two different calibrations for HF (0-30 MHz) and VHF (30-300 MHz). HF and VHF signals with the same dBm level have different S-scale values. For example: HF S9 = -73 dBm = 50 uV (50 Ohm), VHF S9 = -93 dBm = 5 uV (50 Ohm). S-Meter in the ExpertSDR2 corresponds to the IARU recommendations, each device is calibrated at the manufacturing.

Click the right mouse button on the S-meter and select the display type for RX or TX:

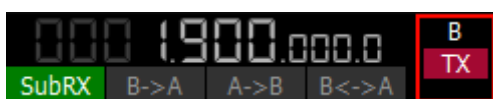


ADC type displays the power in each quadrature channel (double scale) in RX mode.



In the TX mode, the MIC-meter type shows the microphone's signal level. In the Power/SWR-meter type, the power indicator and SWR will be displayed.

SPLIT operation:



VFO A/TX, VFO B/TX - SPLIT operation allows you to receive on the VFO A frequency and transmit on the VFO B frequency. You cannot receive on the VFO B

frequency in the **SPLIT** mode.

1. Activate the **SPLIT** mode by pressing the TX button near the VFO B frequency indicator to turn to TX on this frequency. Flashing red indicator in the software window means the **SPLIT** mode is enabled.
2. Set the required transmit frequency (VFO B) in the **SPLIT** mode. **Disable the SPLIT** mode by pressing the TX button the second time.

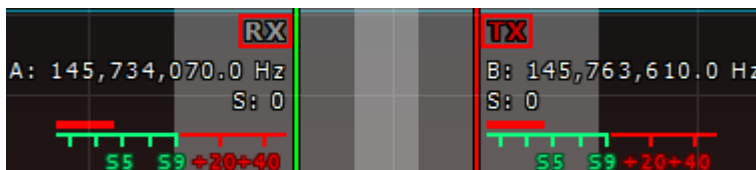
*Note! While you are in CW mode with **BREAK IN** function enabled, the transceiver will turn to TX on VFO B frequency automatically when pressing the CW key. While in **digital modes** the transceiver will turn to TX on VFO B frequency automatically if received the PTT signal via the CAT-system or a certain COM-port.*

SPLIT + Sub RX operation:

In some cases, you need to transmit in **SPLIT** mode and simultaneously listen to the TX frequency (VFO B), in other words, use Sub-receiver.

To enable this mode:

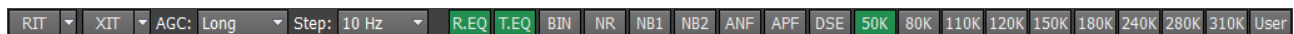
1. Activate the **SPLIT** mode by pressing the TX button near the VFO B frequency indicator. Flashing red indicator in the software window means the **SPLIT** mode is enabled.
2. Activate the Sub-receiver by pressing the **SubRX** button in the software window. Flashing green indicator in the software window means the Sub-receiver is enabled.
3. Set the required TX frequency (VFO B).
4. Listen to the VFO A and VFO B frequencies simultaneously.



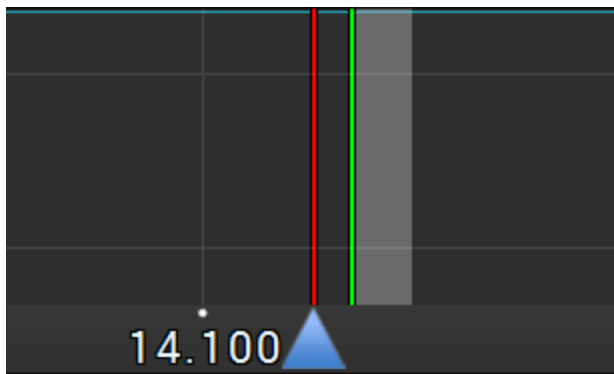
Note! Sub-receiver's red tuning line means that you'll transmit on the VFO B frequency.

You can switch the TX status between VFO A and VFO B by pressing the RX indicator near any VFO tuned frequency.

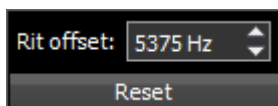
1.2.3. DSP control panel



RIT - Receive Incremental Tuning.



RIT offset in the RX mode means that transmission will be held on the tuned frequency and receiving frequency will differ by the offset value. The offset is displayed as a translucent band on the spectrum scope. Tuned TX frequency displayed as the red line. RX frequency displayed as the green line with the filter band (on the picture you can see USB mode).



In the drop-down menu, you can set the frequency offset in Hz. **Reset** - resets the offset value to zero.

You may enter the frequency offset value in the input box via keypad, or by clicking on the required frequency on the spectrum scope. At the same time the following values will be displayed below the main receiver's frequency indicator:



RIT: - the frequency offset.

L: and **H:** - low and high filter's edges frequencies.

O: - mouse cursor frequency inside the filter.

To change the filter bandwidth: move the mouse cursor over the filter edge, it will be highlighted, then drag the edge with the left mouse button.

When the **RIT** is enabled, frequency tuning changes a bit:

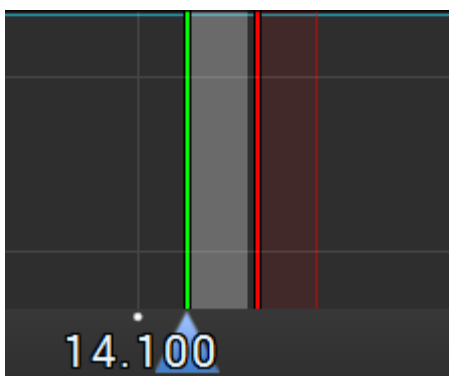
Press and hold the left mouse button inside the RX filter to move it over the panorama.

Press and hold the left right button inside the RX filter to move the whole panorama with the filter.

Press and hold the middle mouse button inside the RX filter then move the mouse cursor out of the filter bandwidth, the **O:** indicator will show the frequency difference between the mouse cursor and the RX filter.

*Note! If the **RIT** offset wasn't reset, when you disable the **RIT** its state will be saved. When you activate the **RIT** next time, the offset will equal the previous value.*

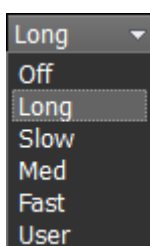
XIT - Transmit Incremental Tuning.



XIT offset in the TX mode means that receiving will be held on the tuned frequency and transmission frequency will differ by the offset value. The offset is displayed as a translucent band on the spectrum scope. Tuned RX frequency displayed as the green line. TX frequency displayed as the red line with the filter band (on the picture you can see the USB mode).

XIT functionality is like **RIT** functionality.

AGC: Long - AGC presets menu.



In the drop-down menu, you can select the receiver's AGC preset:

OFF - AGC is off.

LONG - preset with long AGC reaction (approximately 750 ms). Recommended for phone modes.

SLOW - preset with slow AGC reaction (approximately 500 ms). Recommended for phone, digital modes.

MED - preset with medium AGC reaction (approximately 250 ms). Recommended for CW, digital modes.

FAST - preset with fast AGC reaction (approximately 100 ms). Recommended for CW, digital modes.

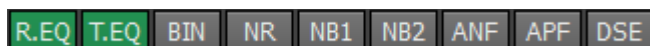
USER - preset with custom AGC reaction (by default the slowest 1000 ms).

Note! AGC settings influence the quality of the received signal. Be careful selecting the AGC preset or tuning your own preset.

Step: 0.1 Hz ▼ **Step** list allows changing the step in the range from 0.1 Hz to 100 kHz.

- 0.1 Hz
- 1 Hz
- 5 Hz
- 10 Hz
- 25 Hz
- 50 Hz
- 100 Hz
- 250 Hz
- 500 Hz
- 1 kHz
- 2.5 kHz
- 5 kHz
- 6.25 kHz
- 9 kHz
- 10 kHz
- 12.5 kHz
- 25 kHz
- 50 kHz
- 100 kHz

DSP functions:



R.EQ - enable the RX equalizer (enabled on the picture).

T.EQ - enable the TX equalizer (enabled on the picture).

BIN - binaural audio mode (the phasing of the audio signal within the RX filter gives a stereo-like effect).

NR - enable the adaptive Noise Reduction to clean the signal from noise interferences.

NB1 - enable the First Noise Blanker for impulse interference.

NB2 - enable the Second Noise Blanker for impulse interference.

Note! The NB1 and NB2 algorithms are different. Try each of them to reach the best impulse interference reduction. NB1 and NB2 Noise Blankers can be used simultaneously.

ANF - enable Automatic Notch Filter for adaptive rejection of the narrowband interference in the receiving band (interference, carrier signals, CW signals, etc.).

Note! If there are no interference, ANF could slightly affect the reception quality of the desired signal. Disable ANF, if you don't need it.

APF - enable Analog Pick Filter, it creates the triangle filter's AFC (amplitude-frequency characteristic) in the filter bandpass.

DSE - enable Digital Surround Effect for CW signals, it provides a space orientation in stereo phones.

Note! This algorithm provides panorama acoustic of the CW signals in the filter bandwidth, depending on their position in the filter:

- if the received CW signal is in the receive filter bandwidth and lower the tuned frequency, it will be louder in the left phone;
- if the received CW signal is in the receive filter bandwidth and higher the tuned frequency, it will be louder in the right phone;
- if the received CW signal is in the receive filter bandwidth and in the middle of the tuned frequency, it will be equally loud in both ears.

RX filter bandwidth presets. Presets list depends on the mode type:

- AM, SAM, DSB, NFM modes (3 - 16 kHz);

3K	3.5K	4K	5K	6K	8K	10K	12K	16K	User
----	------	----	----	----	----	-----	-----	-----	------

- LSB, USB, DIGL, DIGU modes (1.8 - 3.5 kHz);

1.8K	2K	2.2K	2.5K	2.7K	2.9K	3.0K	3.3K	3.5K	User
------	----	------	------	------	------	------	------	------	------

- CW mode (50 - 1200 Hz);

50	100	250	400	500	650	800	1000	1200	User
----	-----	-----	-----	-----	-----	-----	------	------	------

- WFM mode (50 - 310 kHz);

50K	80K	110K	120K	150K	180K	240K	280K	310K	User
-----	-----	------	------	------	------	------	------	------	------

10K - DRM mode (has one fixed bandwidth 10 kHz);

User - user can adjust the RX filter bandwidth by himself (possible at any modulation type except DRM).

1.2.4. Panorama description



The panorama consists of two parts: 1) Spectrum Scope and 2) Waterfall.

1.2.4.1. Spectrum Scope



In this window, you can see the spectrum, with the sample rate from 48 up to 960 kHz (adjustable by User) and the RX filter to tune and listen to the stations.

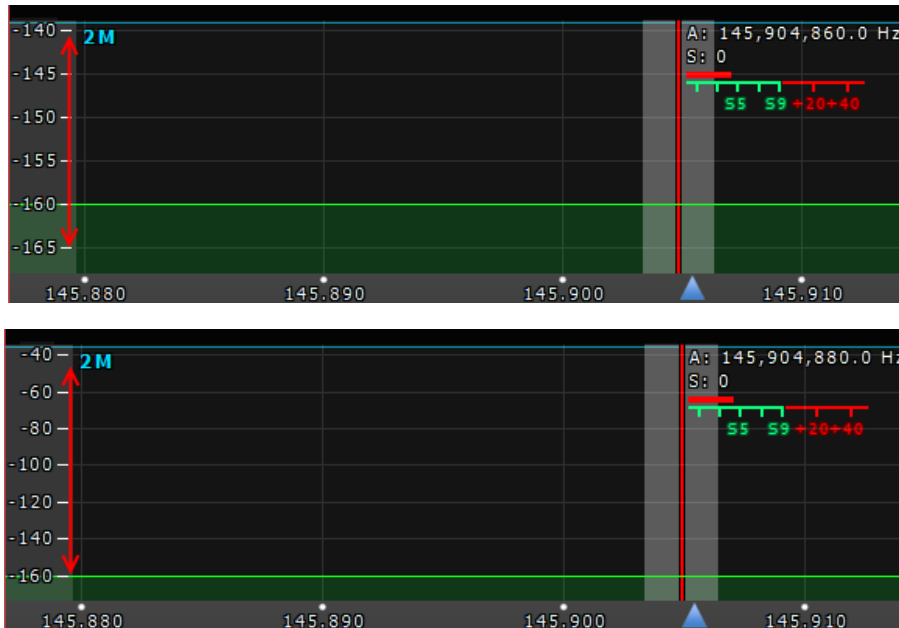
There is a vertical scale to the left of the spectrum scope, it indicates the power level of signals in dBm. Amateur band indicator displayed as the blue line on top of the graph with the name of the band, it shows the limits of the amateur band.

RX/TX filter position is indicated by the vertical red line. To the right of the line indicated its precise tuning frequency (can be switched off in Options). Below the frequency, you can see the signal level on the S-Meter scale (can be switched off in Options). RX filter bandwidth displayed as the translucent gray area around the tuning frequency. You can listen to everything within this band.

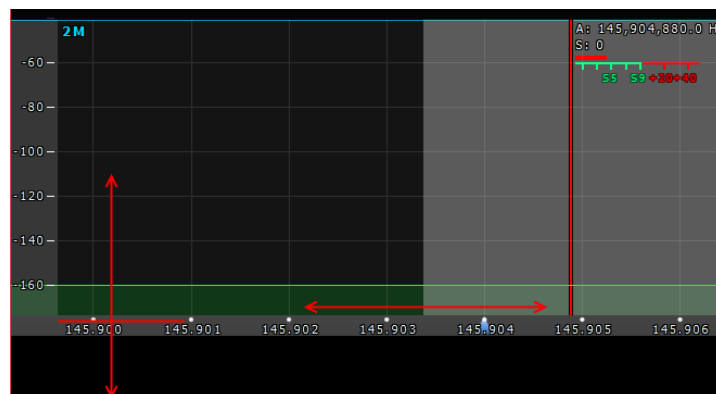
Spectrum is displayed as a line on the spectrum scope, but it also may have a filling color. You can change spectrum rendering mode, line color, filling color, transparency, etc. in the software Options (more details in paragraph [2.3.2](#)).

1.2.4.1.1. Spectrum Scope scaling

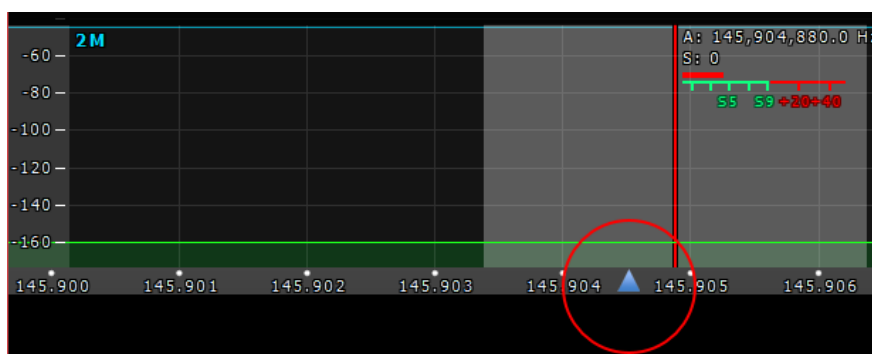
If you move the mouse cursor over the vertical scale a hand will appear. Press and hold the right mouse button, then move it up/down to change the dBm scaling or press and hold the left mouse button, then move it up/down to change the spectrum level.



The horizontal scale between the spectrum scope and waterfall shows the frequency of the certain point on the spectrum. If you move the mouse cursor over the horizontal scale a hand will appear. Press and hold the right mouse button, then move it left/right to zoom in/out the panorama or press and hold the left mouse button, then move it up/down to change the ratio of the spectrum to waterfall.



Zoom in/out of the panorama is carried out relative to the **Zoom position** marker.



You can change the **Zoom position** in two ways:

1. Press and hold the left mouse button on the **Zoom marker** and drag it left/right,
2. Click the mouse wheel on the frequency scale.

1.2.4.1.2. Frequency tuning

There are several ways of tuning on the spectrum scope:

Quick tuning by the mouse click.

On the spectrum, scope mouse cursor looks like the crosshair. Alongside this cursor displayed the exact frequency and dBm level in the certain point. The RX filter moves to this position by the click of the left mouse button.

Dragging the RX filter over the spectrum scope.

Press and hold the left mouse button on the filter, then drag it left/right to the required position.

Moving the spectrum, the RX filter stands still.

Press and hold the right mouse button anywhere on the spectrum, then move the spectrum, the filter will not change its position relatively to the spectrum.

Moving the spectrum, the RX filter moves along.

Press and hold the right mouse button anywhere on the filter and move it left/right. Basically, this is not a way of tuning. It allows observing the air outside the panorama window, not changing the tuning frequency.

Fine tuning.

More accurate tuning can be performed by rotating the mouse wheel with the accuracy specified in the "**Step**" menu.

Click on the digit of the frequency indicator.

Left button - increase value; right button - decrease value; wheel - all digits on the right become zero.

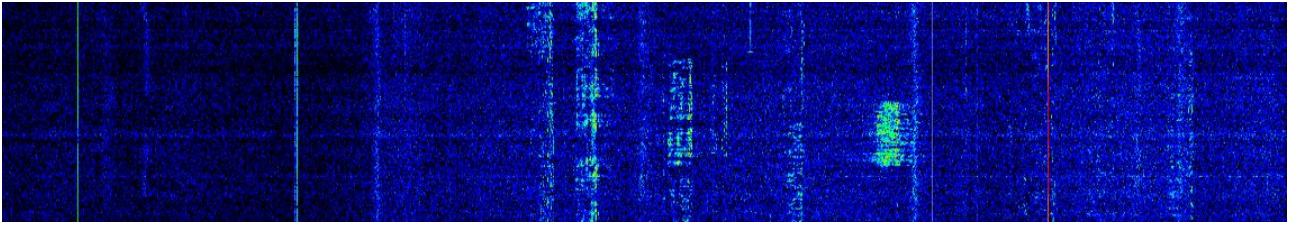
Rotate mouse wheel on the digit of the frequency indicator.

Rotate forward - increase value; rotate backward - decrease the value.

Synchronous tuning by the click on the bandscope.

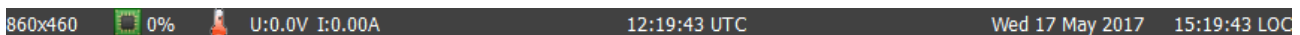
Hover the mouse cursor on the required place on the bandscope and click left mouse button
- RX filter will move to the required location on both bandscope and panorama.

1.2.4.2. Waterfall



Waterfall graphic - timed spectrum scope in the format: amplitude - brightness, frequency - horizontal, time - vertical. The comfortable settings are set by default, but you can change them if necessary (more details in paragraph [2.3.3](#)).

1.3. Status bar

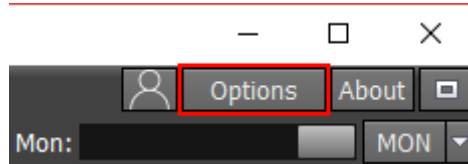


The status bar displays the following information (from left to right):

- ExpertSDR2 window size in pixels.
- CPU load in percent.
- The temperature inside the transceiver.
- Voltage and Current indicators on the power supply input.
- Coordinated Universal Time (UTC).
- Current date and Local Time.

2. ExpertSDR2 software fine tuning

For fine tuning of the ExpertSDR2 software open the **Options** menu by pressing the **Options** button in the top right corner of the software window.



Note!

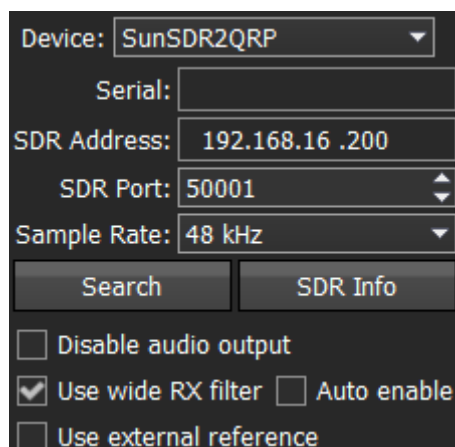
- If you changed anything in the menu and you don't like it, but you forgot the default value, you can reset **ALL** settings to default values by clicking the **Global Default** button.
- You can check the changes without leaving the **Options** window, just click the **Apply** button.
- If you are satisfied with the changes and don't want to change anything else, click the **OK** button to close the **Options** window.

WARNING! We recommend you study this section of the manual very carefully because many settings are hidden in the sub-menus.

2.1. Device menu

In the **Device** menu, you can find software functions of the signal processing and hardware settings.

2.1.1. Device Settings



Device: SunSDR2QRP

Serial:

SDR Address: 192.168.16.200

SDR Port: 50001

Sample Rate: 48 kHz

Search SDR Info

☐ Disable audio output

☒ Use wide RX filter ☐ Auto enable

☐ Use external reference

The left part of the **Device** menu is for the main system functions of communications between the transceiver's software and hardware.

Device - device type menu. Shows that the ExpertSDR2 software works in the SunSDR2QRP mode.

Serial - shows the serial number of the connected device.

SDR Address - physical static IP-address of the transceiver, 192.168.16.200 by default.

SDR Port - port number, which used for the data exchange, 50001 by default.

Sample Rate:	48 kHz
Search	48 kHz
<input type="checkbox"/> Disable au	96 kHz
<input checked="" type="checkbox"/> Use wide F	192 kHz
<input type="checkbox"/> Use extern	384 kHz
	768 kHz
	960 kHz

Sample Rate - select IF sample rate, equals the panorama bandwidth.

Search - search the device on the local network. When you press the **Search** button, software searches for the SDR-device in the network.

SDR Info - button to show you the transceiver serial number, firmware revision, PCB revision and set options.

Note! You can use this button to test the connection between the software and transceiver. If the connection is successfully set up - you'll see the transceiver's info, if not - nothing will show up.

Disable audio output - turns off transceiver's audio output from the headphones connector.

Use wide RX filter - set this checkbox to disable BPFs and use only 55 MHz LPF (Low Pass Filter) for HF band and 70 MHz HPF (High Pass Filter) for higher frequencies.

Auto enable - set the **Auto enable** checkbox to auto enable the 55 MHz LPF while using band-scope and/or the second receiver on the other band or 70 MHz HPF (High Pass Filter) for higher frequencies.

Use external reference - set this checkbox to enable REF input on the rear panel of the transceiver and synchronize it with the 10 MHz reference oscillator.

2.1.2. Mic tab

There are two microphone settings categories in the **Mic** tab: **PC Microphone**, **AGC**.

Mic	VAC	VOX	DSP	TX	CW	Ext Ctrl
PC Microphone						
Driver: MME						
Input: Microsoft Sound Mapper - Input						
Channels: 1		Sample rate: 44100				
Buffer size: 2048		Latency: 0				

In the **PC Microphone** category, you can adjust the internal PC's sound card, which is connected to the microphone.

PC Microphone category consists of the following items:

Driver - select the sound card's driver type.

Input - select the sound card's physical input.

Channels - select the amount of the sound card's used channels.

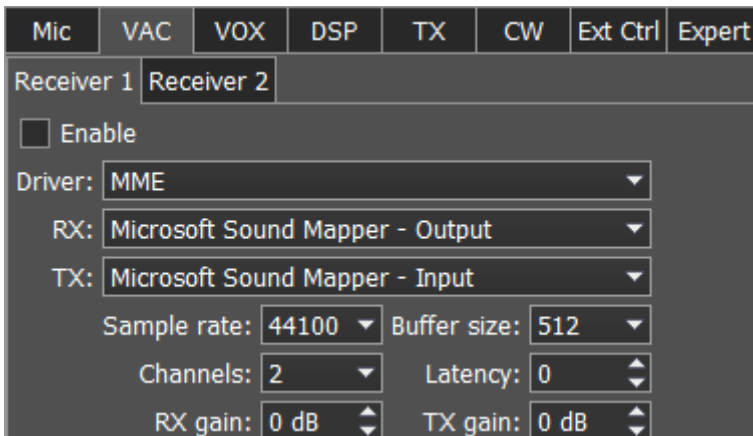
Sample rate - sampling frequency.

Buffer size - size of the buffer.

Latency - signal delay time.

2.1.3. VAC tab

If the ExpertSDR2 and digital modes software run on the same computer, they can be connected via a virtual audio cable without wires and sound cards.



For each program receiver (RX1, RX2) you can set the virtual audio cable on the corresponding tab **Receiver 1** and **Receiver 2**.

Enable - set the Enable checkbox to enable virtual audio cable.

Driver - select the audio cable's or sound card driver type.

RX - select a sound card or virtual

audio cable for audio output.

TX - select a sound card or virtual audio cable for audio input.

Sample rate - sampling frequency.

Buffer size - size of the buffer.

Channels - select the amount of the sound card's or virtual audio cable used channels.

Latency - signal delay time.

RX gain - additional signal amplifying in the virtual audio cable's RX path in dB.

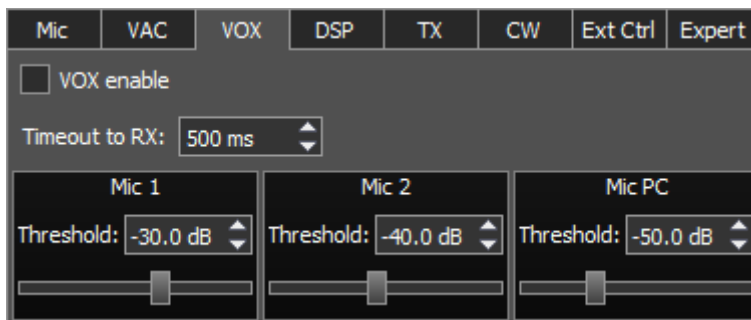
TX gain - additional signal amplifying in the virtual audio cable's TX path in dB.

Note! Before enabling the VAC, make sure all settings for audio devices are correct.

2.1.4. VOX tab

On the **VOX** tab, you can see the settings of the Voice-Operated Transmit system.

VOX system triggers when the microphones voice signal exceeds the Threshold. The threshold could be set for each microphone individually.



Set the **VOX enable** checkbox to enable VOX system.

Timeout to RX - VOX release time.

Threshold - VOX engagement threshold.

2.1.5. DSP tab

On the **DSP** tab, you can see the AGC's and Digital Signals Processing settings. There are two types of settings in the drop-down menu:

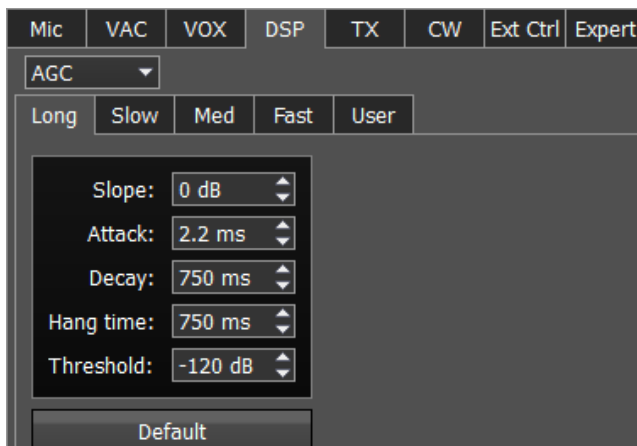
AGC - receiver's AGC settings.

DSP - digital processing filter's settings.

Receiver's AGC settings

There you can find fine AGC settings. AGC settings are divided by the processing speed on **Long, Slow, Med, Fast** and **User**.

Each settings type has its own tab and differs from others in terms of Attack, Decay and Hang time.



AGC parameters:

Slope - set the slope of the transfer characteristic.

Attack - when a signal gets stronger, this value determines how quickly the AGC will decrease gain.

Decay - when a signal gets weaker, this value determines how quickly the AGC will increase gain.

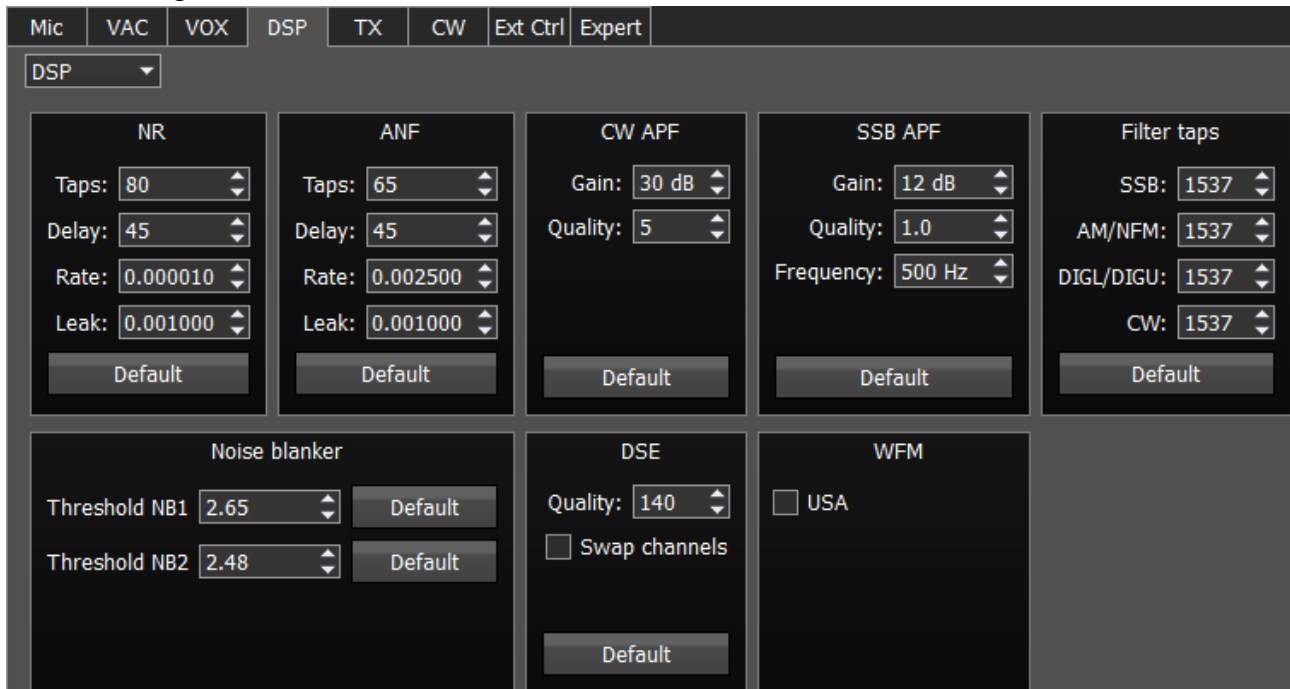
Hang time - signal recovery time.

Threshold - AGC trigger threshold.

Default - reset AGC setting to the default level. Press the **Default** button if you set wrong AGC values and don't like the result. Each AGC tab has a **Default** button.

Digital processing filter's settings.

There you can find fine the settings of the receiver's digital processing filters. DSP functions clear the signal from abnormal noises and crosstalk. These are the standard functions:



NR - Noise Reduction, removes the white noise. This is a special adaptive filter, which removes any abnormal noises from the air in the RX filter band.

ANF - Auto Notch filter, removes the carrier signals. This is a special adaptive filter, which removes any periodical signals from the air in the RX filter band.

NR and ANF parameters:

Taps - filter taps, determines the quality of the filter functionality.

Delay - trigger delay time.

Rate - set the adaptation rate of the filter.

Leak - set the signal's level.

APF - Analog peak filter for CW and SSB mode. Provides a more comfortable listening of the CW signals by amplifying the CW signal in the center of the receive filter (triangle filter's AFC (amplitude-frequency characteristic) in the filter bandpass).

CW APF - Analog Peak-Filter for CW mode:

Gain - Analog peak-filter amplifying factor.

Quality - Analog peak-filter quality (slope sharpness).

SSB APF - Analog Peak-Filter for SSB mode:

Gain - Analog peak-filter amplifying factor.

Quality - Analog peak-filter quality (slope sharpness).

Frequency - central frequency of the voice signal.

Filter taps - receiver's filter taps.

Set the required receiver's filter taps for each mode separately, by default it's 1537.

The higher the receiver's filter taps value, the more rectangular the filter's shape, but it also increases the signal pass delay. That is why the user should find the best settings for himself, between acceptable filter slopes steepness and signal delay. Optimal filter taps are set by default.

Noise blanker - Noise Blanker, removes impulse interference.

Noise blanker parameters:

Threshold NB 1 - filter 1 trigger threshold. Set the required filter 1 trigger threshold, depends on the interference level.

Threshold NB 2 - filter 2 trigger threshold. Set the required filter 2 trigger threshold, depends on the interference level.

DSE - Digital Surround Effect for CW signals. Provides a space orientation in stereo phones, stations from lower frequencies are louder in the left channel, stations from higher frequencies are louder in the right channel. The signal in the filter's center is equally heard in both channels of stereo phones.

Note! DSE effect cannot be heard in mono phones.

DSE - Digital Surround Effect for CW signals:

Quality - DSE filter quality. The higher the quality value the stronger the function's effect.

Swap channels - swap right and left receiver's channels. Set the Swap channels checkbox for correct DSE functionality, if required. Correct functionality - slowly increasing the receiver tuning frequency, while receiving the CW signal, sounds as if CW signal moves from the right to the left channel.

WFM - Wide FM standard:

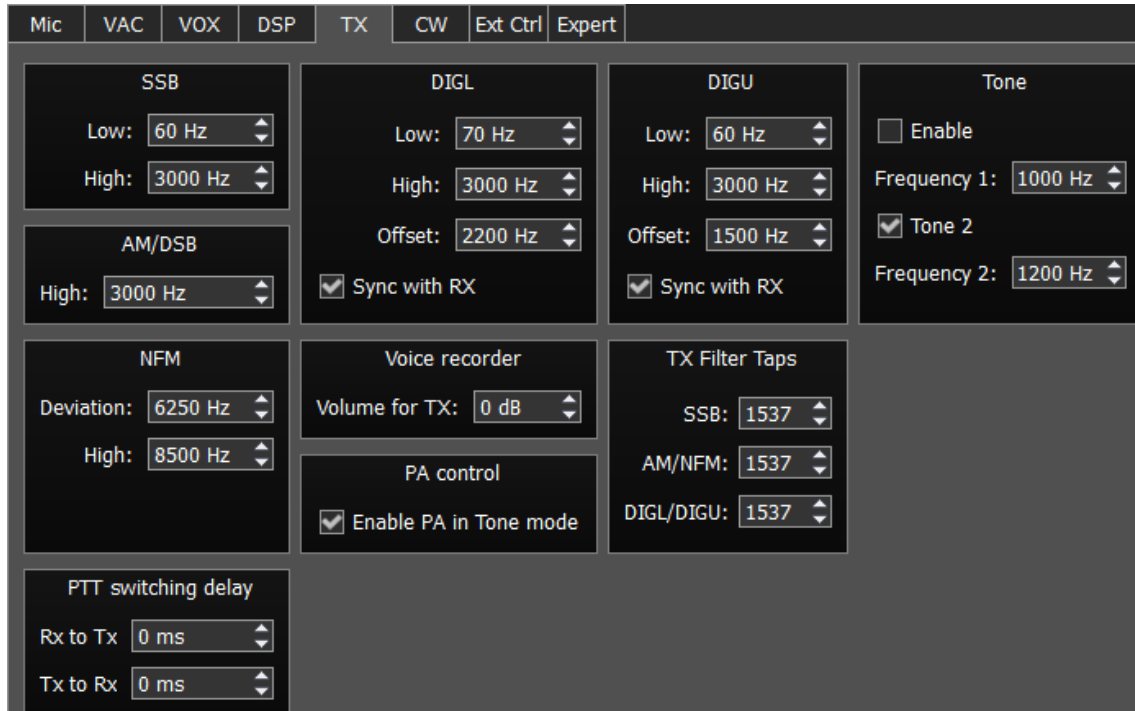
USA - set this checkbox to listen to WFM stations in the USA or South Korea.

Default - press to return settings to the default state. Each settings category has the **Default**

button. Press the **Default** button if you set wrong values and don't like the result.

2.1.6. TX tab

In this tab, you can adjust the TX filter separately for different modes.



The screenshot shows the 'TX' tab in a software interface. The tab is selected, and the settings are organized into several sections:

- SSB**: Low: 60 Hz, High: 3000 Hz
- DIGL**: Low: 70 Hz, High: 3000 Hz, Offset: 2200 Hz, ☒ Sync with RX
- DIGU**: Low: 60 Hz, High: 3000 Hz, Offset: 1500 Hz, ☒ Sync with RX
- Tone**: ☐ Enable, Frequency 1: 1000 Hz, ☒ Tone 2, Frequency 2: 1200 Hz
- AM/DSB**: High: 3000 Hz
- NFM**: Deviation: 6250 Hz, High: 8500 Hz
- Voice recorder**: Volume for TX: 0 dB
- PA control**: ☒ Enable PA in Tone mode
- TX Filter Taps**: SSB: 1537, AM/NFM: 1537, DIGL/DIGU: 1537
- PTT switching delay**: Rx to Tx: 0 ms, Tx to Rx: 0 ms

SSB/DIGL/DIGU/AM/DSB - settings for the low or/and high TX filter fronts.

Low - low front filter's frequency.

High - high front filter's frequency.

Offset - frequency offset. Used for work in digital modes. Frequency offset requirement depends on the used digital mode program. Look at the instruction of your digital mode program.

Sync with RX - set this checkbox to make TX filter bandwidth equal to RX filter bandwidth.

Tone - settings for the dual-tone signal.

Enable - enable the dual-tone transmission mode.

Frequency 1/2 - set the independent frequency for the Tone 1 and Tone 2 signals respectively.

Tone 2 - enable the Tone 2 signal.

NFM - Narrow band receiver FM settings.

Deviation - FM deviation. The width of the FM signal on air will be twice the deviation width.

High - frequency of the high filter slope of the LF signal before FM demodulator. Set the required LF signal width from zero up to high filter edge.

*Note! If a recorded signal, which was received from the air, wasn't compressed by the transmitter, it has low RMS power - lower, than compressed signal. Voice recorder has its own AGC, it doesn't allow TX signal level to surpass the maximum threshold, to avoid clipping. This AGC has maximum amplitude threshold for audio signal output: +3 dB, it allows an operator to hear slight clipping with a high gain level of voice recorder signal and adjust correct **Volume for TX** coefficient, keeping a good quality of TX signal. The Peak level set in ExpertSDR2 is 0 dB. The RMS signal level is 3 times weaker by amplitude than peak level. TX signal, recorded by the Voice Recorder, is transmitted on the air without processing e.g. TX processing module does not influence signal transmitted via the Voice Recorder.*

Voice Recorder - settings of the playback level.

Volume for TX - additional gain volume in TX for the voice record. Set this parameter so that the signal on MIC-meter would reach -10...-5 dBW values.

PA control - external PA control settings.

Enable PA in Tone mode - checkbox to enable the TX mode of the external PA in the Tone mode (transmission of the carrier frequency). Set the **Enable PA in Tone mode** checkbox to enable the TX mode for the external PA while transmitting the carrier frequency. This mode might be useful to tune the building out a network of the external PA.

TX Filter Taps - transmit Filter Taps settings.

SSB - Filter Taps in SSB mode.

AM/NFM - Filter Taps in AM mode and narrowband FM.

DIGL/DIGU - Filter Taps in DIGL and DIGU modes.

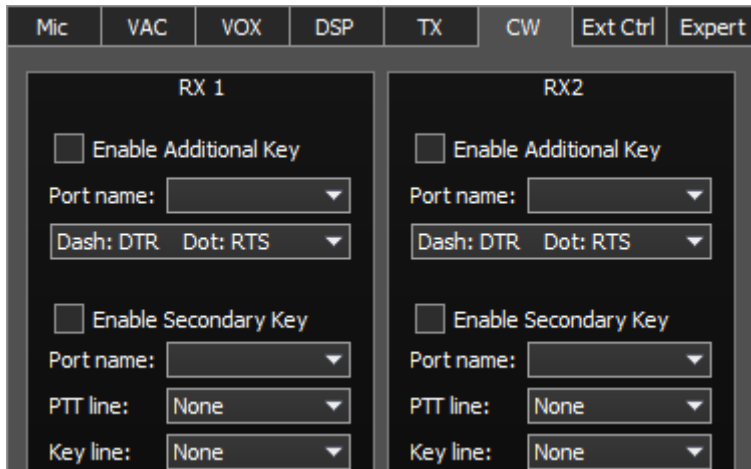
PTT switching delay - set the delay time between switching the transceiver to RX/TX and the first relay closure.

Rx to Tx - delay time to generate HF signal after turning from RX to TX.

Tx to Rx - when you stop transmitting, the transceiver waits for the certain "delay time" then switches from TX to RX.

2.1.7. CW tab

On the **CW** tab, you can see the settings of the additional CW keys.



RX1, RX2 - these categories have similar settings for the RX1 and RX2 receivers.

Enable Additional Key - checkbox to enable additional CW key. Set the **Enable Additional Key** checkbox to enable additional iambic CW key, which is connected to the COM-port.

Port name - COM-port number, which is connected to the key.

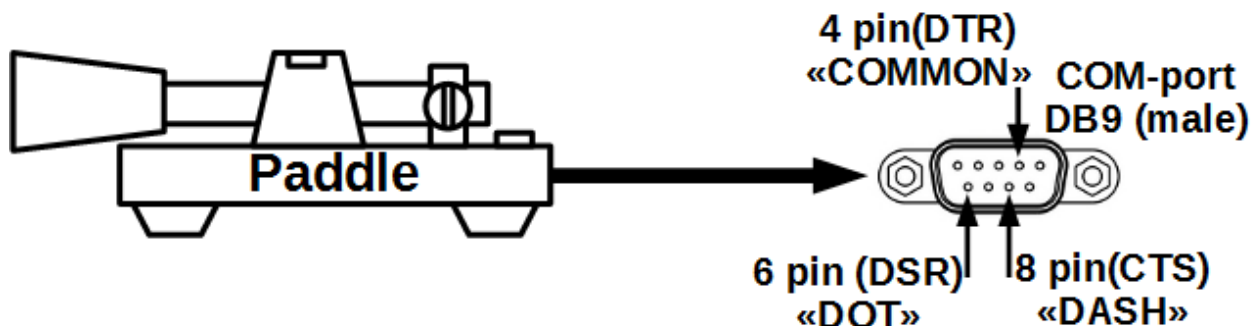
Lines - in the **Lines** drop-down menu you may swap Dot and Dash signals with COM-port bits RTS and DTR.

Enable Secondary Key - checkbox to enable secondary additional CW key. Set the **Enable Secondary Key** checkbox to enable secondary additional CW key, which is connected to the COM-port. As a rule, this port is being used for CW signal generated by the additional software (message logs, contest logs and others).

Port name - COM-port number, which is connected to the key.

PTT line - line menu, is being used to turn the transceiver to the TX mode.

Key line - line menu, is being used to generate CW signal.



CW paddle can be connected to the COM-port according to the picture above.

In the ExpertSDR2 DOT/RTS = DOT/CTS and DASH/DTR = DASH/DSR.

In the ExpertSDR2 you set COM-port pins of an external PC, which uses DTR and RTS for keying. DTR and RTS from an external PC should be connected to local DCR and CTS pins, which are showed on the picture with the paddle. DCR and CTS are RX lines (inputs) that is why they used like this.

2.1.8. Ext Ctrl tab

To control external devices, the transceiver has a special connector **Ext Ctrl**. Settings could be adjusted separately for the RX mode and TX mode.

The **Ext Ctrl** connector output consists of the keys with open collector. The best way to use this feature is to switch the narrow-band filters in the RX mode and switch the LPF in the TX mode. Also, you may arrange your own antenna switch, having only the relay.

Mic	VAC	VOX	DSP	TX	CW	Ext Ctrl	Expert
<input checked="" type="checkbox"/> Enable							
RX Mode:				TX Mode:			
160M:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
80M:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60M:	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40M:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30M:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20M:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17M:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15M:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12M:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10M:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6M:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GEN:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

You may use the 7th key to control a cooling fan for the transceiver heatsink. There is a **Thermostat** feature implemented in the software, via this feature you may control the fan and set operational temperature thresholds.

Enable - checkbox to enable control of the electronic keys.

Rx Mode - electronic keys settings in the RX mode.

1...7 - electronic keys numbers.

160...6, GEN - electronic key enable checkbox on the corresponding band.

TX Mode - electronic keys settings in the TX mode.

1...7 - electronic keys numbers.

160...6 - electronic keys enable checkbox on the corresponding band.

Note! On the picture above, you can see the example of using the keys in the 160M, 80M and 60M bands for both RX and TX modes. While working on the 160M band in the RX mode, #1 key is enabled, if turn to TX mode, #1

key is still active.

While turning on 80M band, #2 key will be enabled (#1 key will be disabled), it is active in both RX and TX modes.


While turning on 60M band, #3 key will be enabled (#2 key will be disabled), it is active in both RX and TX modes.

Connect the relays to these keys, you may create an additional antenna switch, band filters switch, PA band switch etc.

2.1.9. Expert tab

On the **Expert** tab, you can see the fine hardware settings of the transceiver.

Here you may set the new IP address and access port of the transceiver. The user can change these settings according to His LAN settings, but make sure that the required IP address is available.



Note! All settings in this tab are stored in the transceiver's energy independent memory. After setting the required values, set/unset checkboxes, press the Write button to store the info in the memory.

To read the current settings state from the memory, press the Read button.

Auto-read happens with every software launch.

New IP Address - an input box to enter new IP Address.

New Port - an input box to enter the New Port.

Set IP Address - a button to activate the new values of the IP address and Port.



Network mode - network mode of the transceiver:

DHCP Auto - at the beginning transceiver works in the **DHCP client** mode, if it doesn't receive an IP address for a minute, transceiver switches into the **DHCP server** mode, with a static IP address, by default the transceiver has an IP address 192.168.16.200. This mode is set by default.

DHCP server - transceiver works in the **DHCP server** mode and can assign two IP addresses at max.

DHCP client - transceiver works in the **DHCP client** mode, i.e. its IP address depends on the network where the transceiver is connected.

Static IP - you set a **Static IP** address for the transceiver, it always be available via this address.

Power Correction - output power correction menu, set the output power value for each band. Value = 1.00 means maximum output power of the transceiver - 5W.

Note! Adjustments may be required when connecting an external power amplifier to the transceiver.

After tuning the power values, press the Write button.

Frequency coefficient - correction menu of the transceiver's frequency tuning. Set the coefficient that the transceiver's tuning frequency would be equal to the real frequency of the received signal.

*Note! Correction of the displayed frequency could be made according to the time signals on the 4.996MHz, 9.996MHz or 14.996MHz (preferably) frequencies, where you can find easily tracked pulse signals. If they do not match with the tuned frequency, adjust the **Frequency coefficient** till the frequency match.*

The higher the frequency of the used time signal, the higher calibration accuracy.

Calibration should be performed with the maximum panorama zoom and maximum FFT size of the panorama.

*After you set the frequency correction coefficient, press the **Write** button.*

The devices are calibrated at the manufacturing by default, additional calibration is not required.

Firmware update - button for manual firmware update of the transceiver. Press the **Firmware update** button to initialize firmware update process.

DITH - checkbox to enable the internal noise source in the ADC. Set the **DITH** checkbox to enable internal noise source of the receiver's high-speed ADC.

*Note! After set/unset of the **DITH** checkbox, press the **Write** button.*

Internal noise source in the ADC gives an additional linearity to the receiver's ADC functionality. As a rule, used for lab measurements for receiver's linearity with other devices.

While operating in real air, the noise source is an actual noise of the air, that's why there is

*no need to enable **DITH** function.*

*If **DITH** is enabled, receiver's own noise is increased.*

RAND - checkbox to enable bits randomizing on the ADC's data bus. Set the **RAND** checkbox to enable bits randomizing on the receiver's ADC data bus.

*Note! After set/unset of the **RAND** checkbox, press the **Write** button.*

Bits randomizing on the ADC's data bus leads to lessening the noise from this bus to the receiver.

It is recommended to keep this checkbox on all the time.

SunSDR2QRP buttons - press this button to open the window with inputs state indicators (for developers), checkboxes are set when the certain input is activated:

SunSDR2 PTT - PTT footswitch indicator;

MH31 PTT - PTT microphone indicator;

SunSDR2 DASH/DOT - CW key indicators;

Input 1/2 - ExtCTRL indicators.

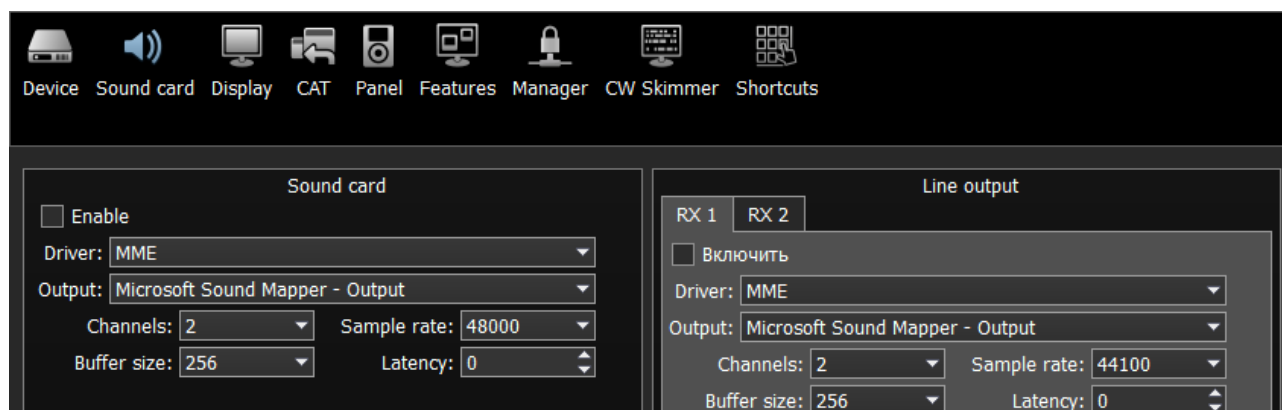
Default - default hardware settings button. Press the **Default** button to return to the default settings.

Read - read the hardware settings from the transceiver's memory. Press the **Read** button to read the hardware settings from the transceiver's memory.

Write - store the hardware settings. Press the **Write** button to store the hardware settings in the transceiver's memory.

2.2. Sound card menu

In the **Sound card** menu, you can see the settings of the audio devices, which can be used with the transceiver.



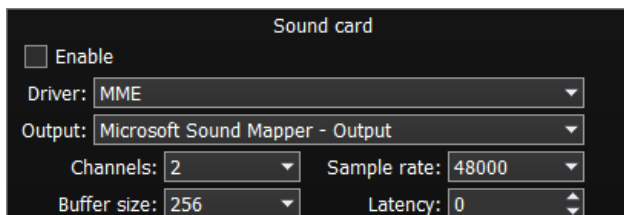
The audio signal output is carried out via the connector with headphones sign, on the front panel of the transceiver. If you connect to the transceiver from the remote PC, you may use

PC's sound card for the audio signal output, which will be simultaneous with audio output from the transceiver.

2.2.1. Sound card

In the **Sound card** category, you can see the settings of the sound card, which can be used for sound output in the RX mode.

Note! Delay for the signal output via the sound card could reach 30-500 ms.



Enable - checkbox to enable PC's sound card. Set the **Enable** checkbox to enable sound output via the sound card.

Driver - select the sound card's driver type.

Output - select the sound card's physical output.

Channels - select a number of active sound card's channels.

Sample rate - sampling frequency.

Buffer size - buffer size.

Latency - signal delay time.

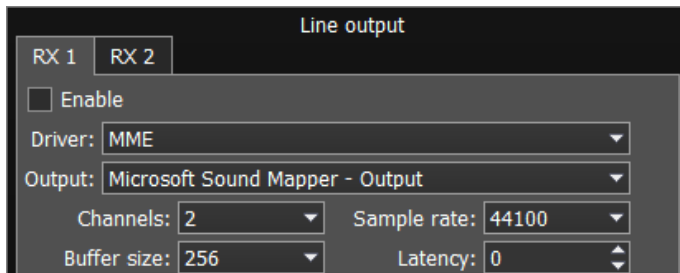
*Note! Before you'll enable the **Sound card** by the **Enable** checkbox, make sure that all sound devices settings are set correctly.*

2.2.2. Line output

In the **Line output** category, you can see the settings of the sound card or virtual audio cables, which could be used for linear sound output in the RX and TX modes, separately for RX1 and RX2 receivers.

*Note! Sound output via the **Line output** will be simultaneous with the sound output from the transceiver.*

***Line output** volume has a constant max value and cannot be changed by the operator. As a rule, sound output via the **Line output** is used for recording communications on contests and other purposes.*



There are two tabs with identical settings for RX1 and RX2 receivers, in the **Line output** category, let's look at one of them. **Enable** - checkbox to enable Line output. Set the **Enable** checkbox to enable Line output.

Driver - choose the sound device' driver type.

Output - choose the sound device' physical output.

Channels - choose a number of active sound device' channels.

Sample rate - sampling frequency.

Buffer size - buffer size.

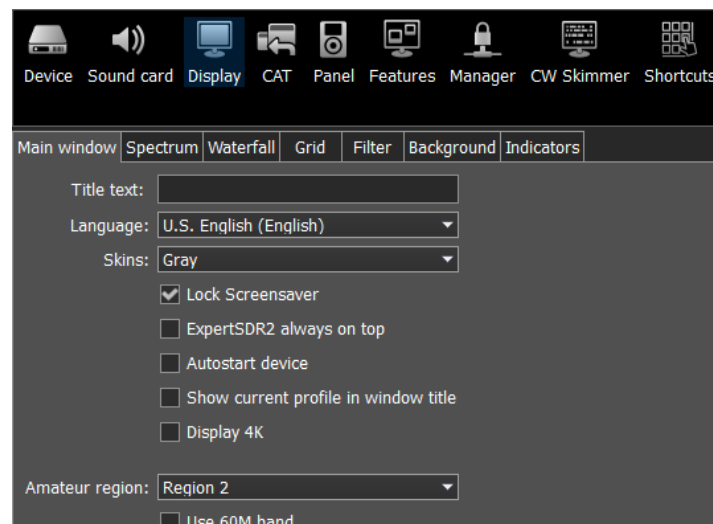
Latency - signal delay time.

*Note! Before you'll enable the **Line output** by the **Enable** checkbox, make sure that all sound devices settings are set correctly.*

2.3. Display menu

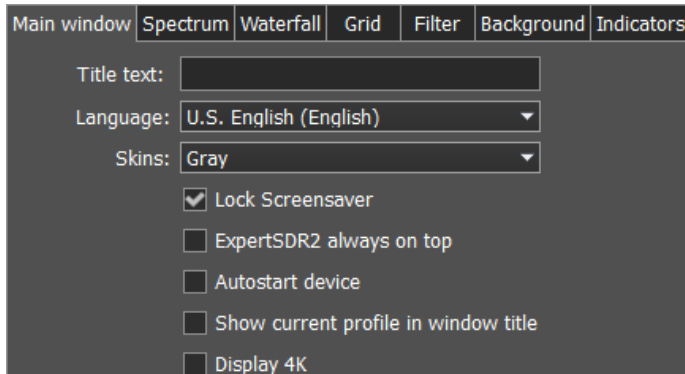
In the **Display** menu, you can see the settings of the transceiver's software display.

Display settings are placed according to their functionality:
Main window | Spectrum | Waterfall | Grid | Filter | Background | Indicators



2.3.1. Main window tab

On the **Main window** tab, you can see the settings of the transceiver's software main window display.



Title text - input box to enter the title. Enter in the **Title text** box - your call-sign or other information, it will always be displayed in the software title.

Language - interface language menu. Choose the required language from the list.

Skins - software color theme menu.

Choose the required software color theme from the list.

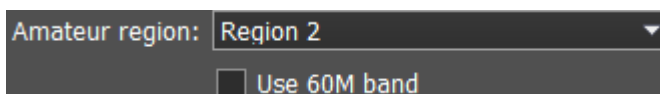
Lock Screensaver - lock screensaver checkbox. Set the **Lock Screensaver** checkbox to block the display turn off by the Windows OS. **Recommended checkbox setting - on.**

ExpertSDR2 stays on top - on top checkbox. Set the **ExpertSDR2 stays on top** checkbox to see ExpertSDR2 window constantly on top of other windows. **Recommended checkbox setting - off.**

Autostart device - receiver's autostart checkbox. Set the **Autostart device** checkbox to automatically start the receiver after the launch of the software. **Recommended checkbox setting - on.**

Show current profile in window title - display the current profile in the software window title. Set the **Show current profile in window title** checkbox to display the current profile (if the profile is on) in the software window title.

Display 4K - display mode for 4K monitors.



Amateur region - amateur region menu. Choose the region you are currently in, in the Amateur region menu.

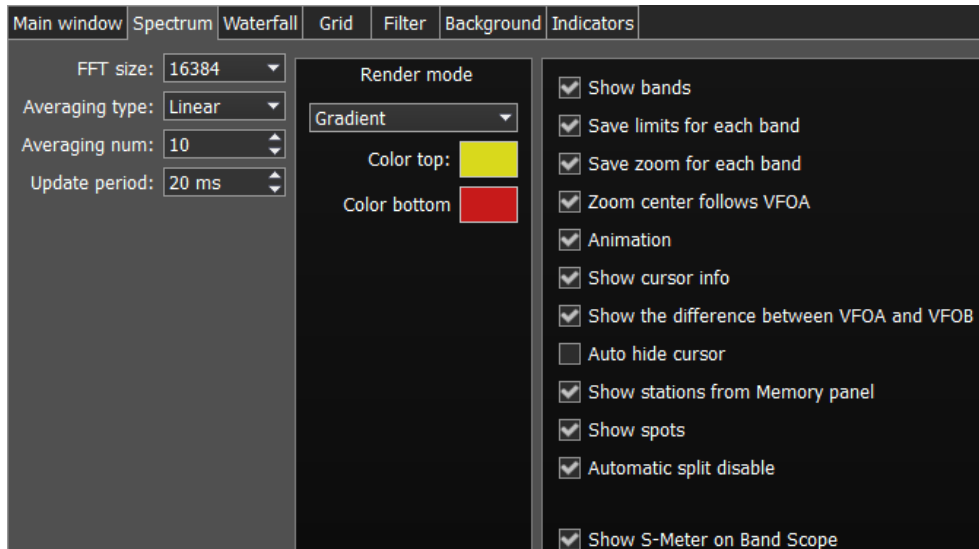
It affects the position of the amateur bands in the software.

Use 60M band - set the **Use 60M band** checkbox to enable 60M band.

*Note! After you selected the amateur region and/or set/unset the checkbox **Use 60M band** you'll see the notification window, that the settings will be applied after the restart of the software. Restart the software.*

2.3.2. Spectrum tab

On the **Spectrum** tab, you can see the transceiver's spectrum settings.



FFT size - Fast Fourier Transform (FFT) size of the spectrum scope. Select the required FFT size. The higher FFT size, the higher spectrum scope resolution by frequency, along with the higher processor load.

Averaging type - spectrum scope averaging type menu. Choose the averaging type from the list: Linear, root-mean-square (RMS), Exponential, which suits you best.

Averaging num - a number of samples for averaging. Set the required amount of samples for averaging. The bigger a number of samples, the slower the spectrum will change on the graph.

Update period - spectrum scope update period. Set the required specter's graph update period. The bigger the number, the more FPS on the spectrum scope, along with the higher processor load.

Render mode - spectrum render mode: lines, gradient. Set the required spectrum render mode. **Lines**:

Line color - spectrum scope line color. Select the required line color from the palette.

Fill color - fill color of the spectrum scope lower area. Select the required fill color from the palette.

Fill transparency - transparency slider for the spectrum scope lower area filling. Set the required filling transparency level.

Gradient:

Color top - top color of the spectrum.

Color bottom - bottom color of the spectrum.

Show bands - set the **Show bands** checkbox to show amateur bands borders at the top of the spectrum scope (blue line).

Save limits for each band - save spectrum scope amplitude limits for each band. Set the **Save limits for each band** checkbox to enable the software to save set spectrum scope limits for each band.

Save zoom for each band - save spectrum scope zoom settings for each band. Set the **Save zoom for each band** checkbox to enable the software to save spectrum scope zoom settings for each band.

Zoom center follows VFOA - zoom center marker locked on the VFOA position on the spectrum scope. This function was added for the E-Coder control panel and Main Knob of the MB1 transceiver i.e. while you tune frequency with valcoder, zoom marker follows VFOA.

Animation - spectrum scope animation while transitioning between bands. Set the **Animation** checkbox to enable animation.

Show cursor info - show frequency and dB level of the cursor position. Set the **Show cursor info** checkbox to enable info display near the cursor on the spectrum scope.

Show the difference between VFOA and VFOB - show the difference between VFOA and VFOB. Set the **Show the difference between VFOA and VFOB** checkbox to display the difference between VFOA and VFOB near the cursor.

Auto hide cursor - automatically hide the cursor from the spectrum scope. Set the **Auto hide cursor** checkbox to let the cursor disappear after idle 2 seconds.

Show stations from Memory panel - show the stations previously stored in the frequency memory. Set the **Show stations from Memory panel** checkbox to show on the spectrum scope previously stored stations as markers (blue dots in the top area of the spectrum scope). When rollover the station's marker you'll see the commentary.

Show spots - show spots from the CW Skimmer on the spectrum scope. Set the **Show spots** checkbox to show spots from the CW Skimmer on the spectrum scope as markers with call-signs.

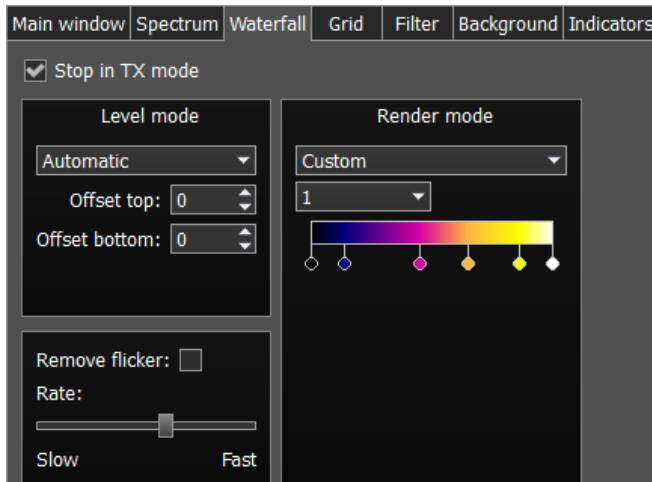
Automatic SPLIT disable - SPLIT function is automatically disabled when you change the mode type or frequency band, VFO B frequency becomes equal to VFO A frequency.

Show broadcast HF bands - enable for display of broadcast HF bands on panorama and Band Scope.

Show S-Meter on Band Scope - set the **Show S-Meter on Band Scope** checkbox to show the S-Meter on the Band Scope for each VFO.

2.3.3. Waterfall tab

On the **Waterfall** tab, you can see the transceiver's waterfall settings.



Stop in TX mode - stop the waterfall in TX mode. Set the **Stop in TX mode** checkbox to disable the waterfall while transmitting.

Level mode - waterfall bright menu. Choose the bright mode from the list: Automatic, Synchronous:

- Automatic mode depends on air signals and set offset in the settings below.
- Synchronous mode depends on the set limits of the spectrum amplitude.

Offset top - offset input box by the top dB level relatively to signals level. Set the offset in the **Offset top** box to determine the maximum brightness relatively to the max signals' levels.

Offset bottom - offset input box by the bottom dB level relatively to signals level. Set the offset in the **Offset bottom** box to determine the minimum brightness relatively to the min signals' levels.

Render mode - waterfall render mode menu: Rainbow, Monochrome, Custom. Choose the required color render of the waterfall, depending on your choice or tasks. In the Custom mode, you have three colors presets: 1,2,3 and User adjustable mode.

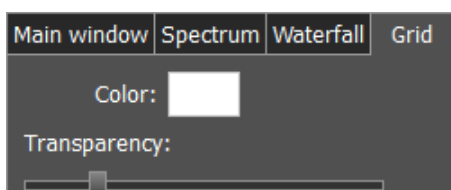
In the User preset there are 6 color markers at maximum. Double click of the left mouse button on the color marker opens the color menu, double click of the right mouse button on the color marker delete it. Double click of the left mouse button on the empty space adds the color marker.

Remove flicker - checkbox to remove the waterfall flickers. Set the **Remove flicker** checkbox to get rid of the texture flickers in the waterfall. Also, it slightly clears the waterfall from air noises.

Rate - waterfall movement speed slider. Set the **Rate** slider according to the required waterfall movement speed.

2.3.4. Grid tab

On the **Grid** tab, you can see the spectrum scope grid display settings.

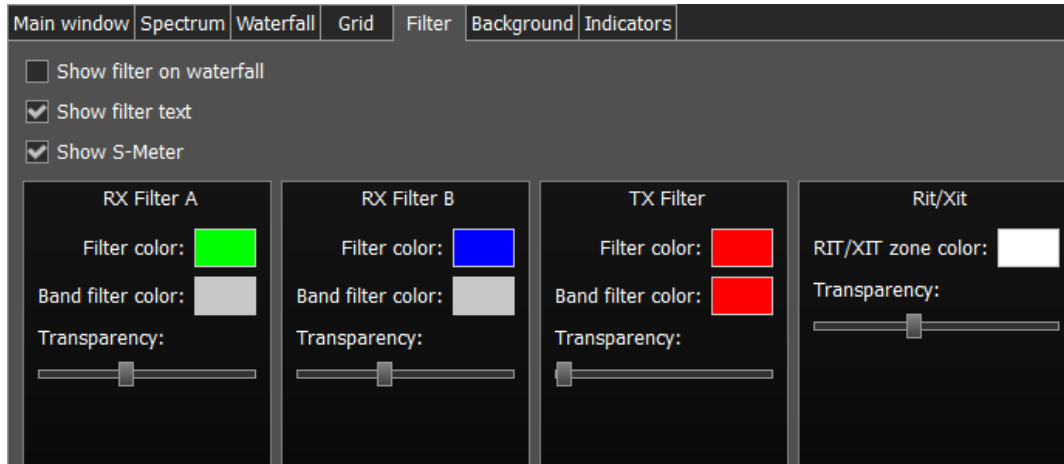


Color - the color of the spectrum scope grid. Choose the required grid color from the palette.

Transparency - grid transparency slider. Set the required grid transparency by moving the slider.

2.3.5. Filter tab

In this tab, you can set the required color of filters and the necessity to display the additional text information.



Show filter on waterfall - show receiver(s) filter on the waterfall. Set the **Show filter on waterfall** checkbox to show receiver(s) filter on the waterfall.

Show filter text - show text info near the receiver's filter on the spectrum. Set the **Show filter text** checkbox to display filter's tuned frequency, the signal level in S-units etc. in the used filter bandwidth.

Show S-Meter - enable animated S-Meter near the receivers' filter on the spectrum. Set the **Show S-Meter** checkbox to display S-Meter near the receiver's filter.

In the **RX Filter A**, **RX Filter B**, **TX Filter** categories displayed filters' color and transparency settings.

Filter color - filter's frequency color menu. Choose the required filter's tuned frequency color from the palette.

Band filter color - filter's bandwidth color menu. Choose the required filter's bandwidth color from the palette.

Transparency - filter's transparency slider. Set the required filter's transparency.

In the **Rit/Xit** category displayed RIX/XIT active zone settings.

Rit/Xit zone color - RIX/XIT active zone color menu. Choose the required RIX/XIT active zone color from the palette.

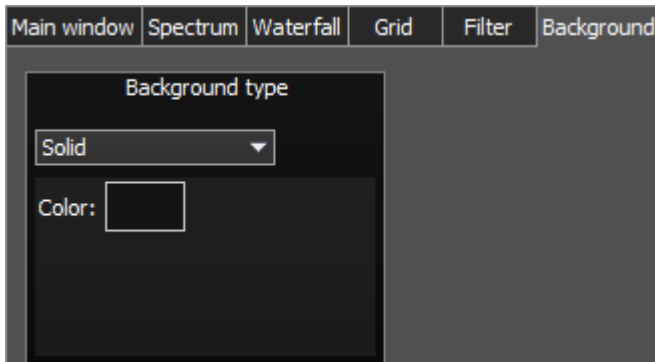
Transparency - RIX/XIT zone transparency slider. Set the required RIX/XIT zone transparency.

2.3.6. Background tab

On the **Background** tab, you can see the spectrum scope background settings.

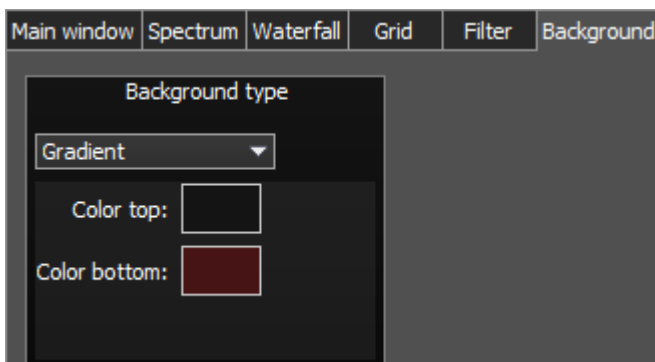
Background type - spectrum scope background type menu: **Solid**, **Gradient**, **Image**. Select in the **Background type** menu spectrum scope background render type.

In the **Solid** mode, available settings are:



Color - background color menu. Choose the required background color from the palette.

In the **Gradient** menu, available settings are:



Color top - top gradient color of the background. Choose the required top gradient color from the palette.

Color bottom - bottom gradient color of the background. Choose the required bottom gradient color from the palette.

In the **Image** menu, available settings are:

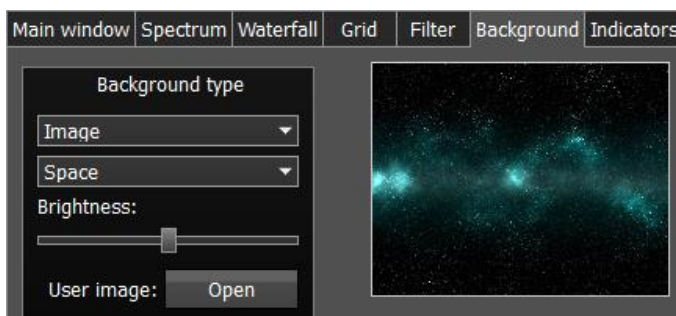


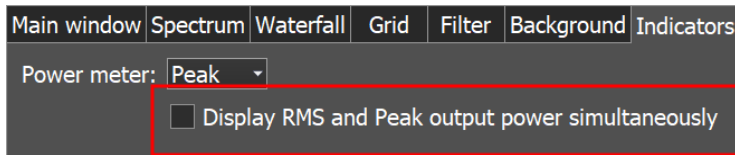
Image menu - image presets menu (Forrest, Bubbles, Space, Water, User). Pick the required image from the menu or lock one of your own images.

Brightness - background image brightness slider. Set the required background image brightness.

User image - choose the required image to be displayed on the background. Press the **Open** button, in the opened window choose the image file to set as the background.

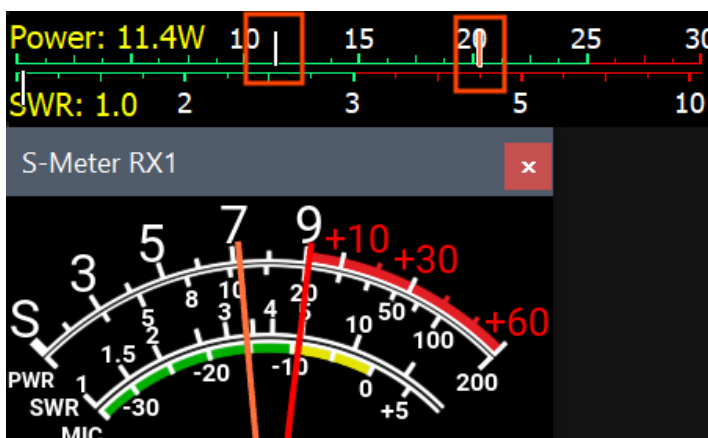
*Note! If the image file wasn't chosen previously via the **Open** button, then if you choose the User image in the presets list it'll open the window to choose the image file.*
Supported files types: png, jpg, jpeg, bmp.

2.3.7. Indicators tab



In the Peak/RMS drop-down menu you set the type of output power which is displayed on the Power and S-meters. What you check there always displayed as text on the Power meter.

Display RMS and Peak output power simultaneously - check to see both **Peak** and **RMS** indicators on Power meter and S-meter. If checked, the **Peak** power displayed as **orange** indicator on the Power meter and **red** needle on the S-meter.



2.4. CAT menu

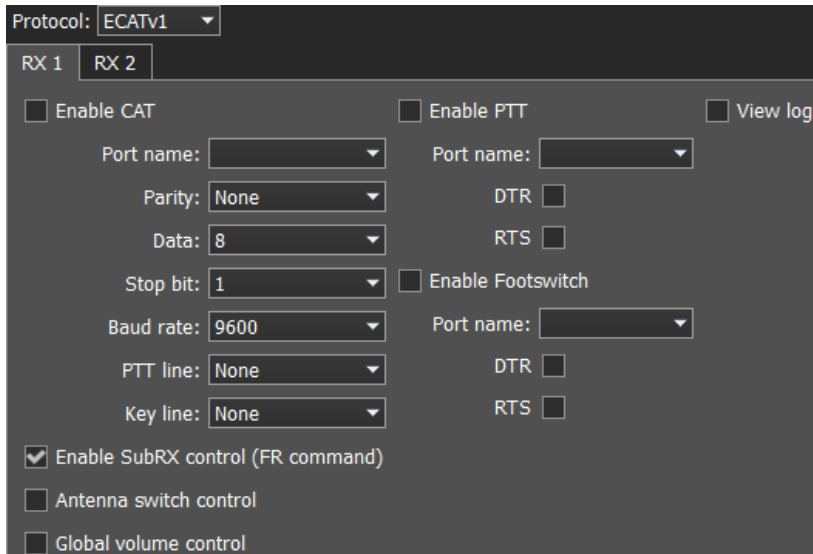
In the **CAT** menu, you can see the CAT-system settings. CAT-system is the transceiver's exchange interface with external devices and software.

CAT-interface is used for control of the transceiver from a third-party software. This could be contest logs, digital modes decoder-software, SAT-tracker etc. RX1 and RX2 have independent settings and could be controlled separately via the CAT-protocol.

ECATv1 - exchange protocol compatible with TS-480 transceiver. This protocol allows exchanging data with external devices and software via COM-port.

2.4.1. RX1 receiver

The **RX1** tab contains CAT-system settings and control of the transceiver's PTT command via COM-ports for the RX1 receiver.



Enable CAT - checkbox to enable control of the transceiver via the CAT-system.

Port name - COM-port number.

Parity - parity.

Data - amount of data in bits.

Stop bit - amount of stop bits.

Baud rate - port speed.

PTT line - COM-port line to activate the TX mode.

Key line - COM-port line for the CW mode.

Enable SubRX control (FR command) - checkbox to enable control of the sub-receiver via the CAT-system. Set the **Enable SubRX control (FR command)** checkbox to enable the control of the SubRX via the CAT-system.

Antenna switch control - checkbox to enable control of the antenna switch via the CAT-system. Set the **Antenna switch control** checkbox to enable the control of the antenna switch via the CAT-system. Useful for the Ham Radio Deluxe software.

Global volume control - when this checkbox is enabled, you control the global volume with the Volume slider, on the top of the software window, from the CAT-system. Recommended when you use one RX or VFO A only, SubRX is disabled.

Enable PTT - checkbox to enable control of the TX mode via the COM-port. Set the **Enable PTT** checkbox to enable the control of the TX mode via the COM-port.

Enable Footswitch - checkbox to enable control of rerouting the PTT signal from footswitch to additional COM-port. Set the **Enable Footswitch** checkbox to enable rerouting of the PTT signal from footswitch to additional COM-port.

Port name - COM-port number.

DTR/RTS - COM-port line for receiving the PTT commands. Set one of the **DTR/RTS** line checkboxes to select them as a control.

View log - display CAT command log.

2.4.2. RX2 receiver

The **RX2** tab contains CAT-system settings and control of the transceiver's PTT command via COM-ports for the RX2 receiver.

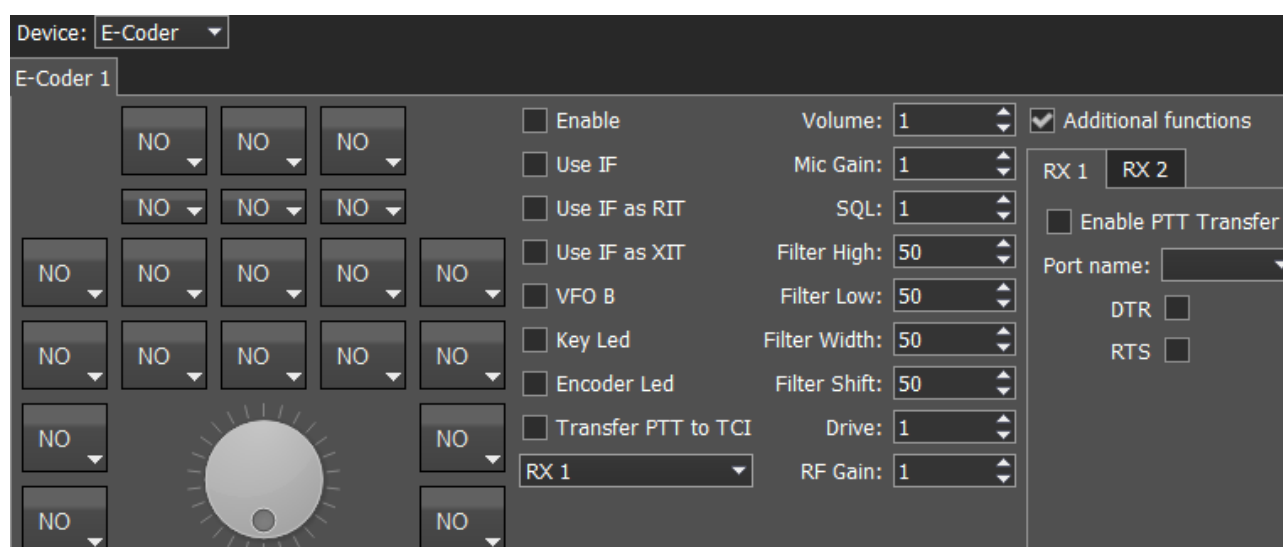
The settings are the same to the RX1 receiver.

2.5. Panel menu

In the **Panel** menu, you can see the settings of the E-Coder control panel.

In the drop-down Device menu, you can select the type of the connected control panel. In the meantime, only one type is available - E-Coder.

*Note! If one E-Coder panel is connected to the transceiver, in the **Panel** menu displayed one **E-Coder 1** tab, if several E-Coder panels are connected to the transceiver, in the **Panel** menu displayed a several tabs **E-Coder 1**, **E-Coder 2** etc. with identical settings for each panel.*



In the left part of the menu, you can see the schematic picture of the E-Coder panel with buttons and knobs. Press any button, you'll see the list of the available functions.

Note! The list of the available functions is constantly growing. Keep track of the software updates.

You can make a request to add a new function on the control button.

The following functions may be assigned to the E-Coder panel buttons:

Unused - button is unused.

Main:

AGC Up/Down - AGC type switching.

Band Up/Down - band switching.

Filter Up/Down - receiver's filter switching.

Mode Up/Down - mode switching.

MOX - enable/disable manually operated transmit mode.

PA - enable/disable power amplifier.

Preamp Up/Down - preamp or attenuator level switching.

Power ON/OFF - transceiver's power on/off.

RX ANT - enable/disable receive antenna.

Step Up/Down - change the tuning step.

Tone - enable/disable tone signal in TX mode.

WF - enable/disable Wide Filter. Filter for all Nyquist zone. If in the **Device** menu settings, you set **Auto enable** checkbox, then you don't need this function on the panel.

Zoom In/Out - spectrum zoom modes switching.

VFO/RX2:

A>B - assign the frequency from heterodyne VFO A to heterodyne VFO B.

B>A - assign the frequency from heterodyne VFO B to heterodyne VFO A.

B<>A - frequency exchange between VFO A and VFO B.

Change VFO A/VFO B - switching between VFO A and VFO B.

IF as RIT - tune the RIT offset by moving the filter over the panorama.

LOCK - lock the frequency tuning.

RX2 On/Off - enable/disable RX2.

RIT On/Off - enable/disable RIT offset.

RIT Reset - reset RIT offset to 0.

Sub RX On/Off - enable/disable SubRX.

Split - enable/disable Split mode.

Switch DDS/IF - tuning the frequency by moving the filter over the panorama, in other words changing the digital IF, or when filter stands still and spectrum moves, this is the central frequency tuning.

Switch Receiver - switching between software RX1 and RX2. The main knob will tune the frequency of one of the receivers.

XIT On/Off - enable/disable XIT offset.

XIT Reset - reset XIT offset to 0.

While you operate both RX1 and RX2, usually you need to listen to either only one of them or both of them, but in different channels (left / right). To do that we added special functions to the E-Coder panel, which set the mixer for both RXs.

Audio:

Listen both RX1, RX2 - default settings, both RXs have equal volume in both channels.

Listen RX1 only - listen to the RX1 in both channels.

Listen RX2 only - listen to the RX2 in both channels.

Listen RX1 in left channel, RX2 in right - listen to the RX1 in the left channel and RX2 in the right channel.

Listen RX1 in right channel, RX2 in left - listen to the RX1 in the right channel and RX2 in the left channel.

Similar settings were added for VFOs:

Listen both VFO A/B - default settings, both VFOs have equal volume in both channels.

Listen VFO A only - listen to the VFO A in both channels.

Listen VFO B only - listen to the VFO B in both channels.

Listen VFO A in left channel, VFO B in right - listen to the VFO A in the left channel and VFO B in the right channel.

Listen VFO A in right channel, VFO B in left - listen to the VFO A in the right channel and VFO B in the left channel.

Mute - switch off the sound.

Switch RX and mute former - change the software receiver and mute former one.

TX/Play - turn to TX and play the signal record in air.

Voice recording - enable/disable voice recording.

Volume Up/Down - volume adjustment.

DSP:

ANF - enable/disable auto notch filter.

APF - enable/disable analog pick filter.

BIN - enable/disable binaural mode.

NR - enable/disable noise reduction.

NB1 - enable/disable noise blanker 1.

NB2 - enable/disable noise blanker 2.

SQL - enable/disable squelch.

The following functions may be assigned on the E-Coder panel knobs:

Unused - encoder is unused.

Volume - volume adjustment.

Mic Gain - Mic gain adjustment.

SQL - squelch threshold adjustment.

Filter Low/High - tuning the frequency of the low/high filter's front.

Filter Width - adjusting the filter width.

Filter Shift - shifting the filter's central frequency.

Drive - adjusting the output power.

IF - tuning the frequency by moving the filter over the panorama.

RF Gain - RF Gain control.

CW Speed - CW Speed control.

RIT Offset - adjusting the RIT Offset.

XIT Offset - adjusting the XIT Offset.

In the right part of the menu you can see the main panel settings:

Enable - enable E-Coder panel control.

Use IF - frequency tuning by moving the filter over the panorama.

Use IF as RIT - tuning by IF when the RIT offset is on.

Use IF as XIT - tuning by IF when the XIT offset is on.

VFO B - enable sub-receiver.

Key Led - enable backlit keypad.

Encoder Led - enable backlit encoder.

Transfer PTT to TCI - enable reroute of the PTT signal from the panel to TCI, has higher priority than **COM-port PTT transfer** (described below).

RX1/RX2 menu - switching between RX1 and RX2 receivers, or assign an exact E-Coder panel to your receiver.

Volume - set the volume change step, per knob's clack.

Mic Gain - set the Mic gain change step, per knob's clack.

SQL - set the squelch threshold change step, per knob's clack.

Filter High - set the filter's high limit change step, per knob's clack.

Filter Low - set the filter's low limit change step, per knob's clack.

Filter Width - set the filter's width change step, per knob's clack.

Filter Shift - set the filter's shift change step, per knob's clack.

Drive - set the output level power change step, per knob's clack.

RF Gain - set the RF gain step, per knob's clack.

Additional functions:

RX1/RX2 tab - COM-port settings tab for rerouting the PTT signal from the panel to the COM-port.

Enable PTT Transfer - rerouting of the PTT signal from the panel to the COM-port. Set the **Enable PTT Transfer** checkbox to enable rerouting the PTT signal.

Port name - COM-port number.

DTR/RTS - select the COM-port line, which is used for transferring the PTT commands. Set one of the DTR/RTS line checkboxes to set it as the control line.

There are three LEDs on the E-Coder panel, from left to right:

- 1) Lights **green** when the VFO B is active
- 2) Lights **red** when on TX
- 3) Lights **orange** when the RX2 is active

2.6. Features menu

In the **Features** menu, you can see the settings to launch other programs along with the ExpertSDR2 software.

This feature allows you to automatically launch required programs by launching the ExpertSDR2 software.

Select the programs to launch together with ExpertSDR2:

<input type="checkbox"/>	Prog 1	✗	arguments:	<input type="text"/>
<input type="checkbox"/>	Prog 2	✗	arguments:	<input type="text"/>
<input type="checkbox"/>	Prog 3	✗	arguments:	<input type="text"/>
<input type="checkbox"/>	Prog 4	✗	arguments:	<input type="text"/>
<input type="checkbox"/>	Prog 5	✗	arguments:	<input type="text"/>
<input type="checkbox"/>	Prog 6	✗	arguments:	<input type="text"/>
<input type="checkbox"/>	Prog 7	✗	arguments:	<input type="text"/>
<input type="checkbox"/>	Prog 8	✗	arguments:	<input type="text"/>
<input type="checkbox"/>	Prog 9	✗	arguments:	<input type="text"/>
<input type="checkbox"/>	Prog 10	✗	arguments:	<input type="text"/>

Enable checkbox - enable program autorun in the list. Set the **Enable** checkbox in front of

the corresponding program in the list.

Program 1-10 - program's button. Press the **Prog X** button to open the window and select a .exe file of the required program.

Delete button - program delete button. Press the **Delete** button if you need to delete a program from the autorun list.

Arguments - input box to enter the argument after program's launch. Enter some text message in the **arguments** input box for the corresponding program.

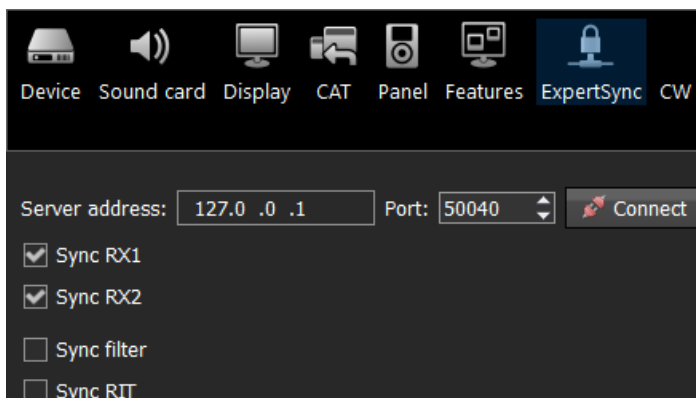
Note! Arguments allow to the same program to be launched with the different settings files etc.

Read the instruction for the certain software you are going to use, in terms of which arguments are supported.

2.7. ExpertSync Menu

In the **Manager** menu, you can see the settings of the network synchronization between the transceiver and other Expert Electronics devices.

This interface allows you to synchronize the tuning frequency and mode type between several Expert Electronics devices via the ExpertSync software ([you may download it from here](#)).



Server address - input box for the ExpertSync server IP address. Enter the ExpertSync server IP address. If the ExpertSync server is launched on the transceiver's PC, then the address will be 127.0.0.1.

Port - input box of the data exchange port. Enter the exchange port number in the Port input box.

Connect - button to launch the connection between the transceiver's software and ExpertSync. Press the **Connect** button to launch the connection between the transceiver's software and ExpertSync. The blue indicator means there is a connection.

Sync RX1 - RX1 receiver sync button. Set the **Sync RX1** checkbox to synchronize RX1 receiver with the remote RX1 receiver.

Sync RX2 - RX2 receiver sync button. Set the **Sync RX2** checkbox to synchronize RX2 receiver with the remote RX2 receiver.

Sync filter - set the **Sync filter** checkbox to synchronize the filter bandwidth with the other device connected via the ExpertSync software.

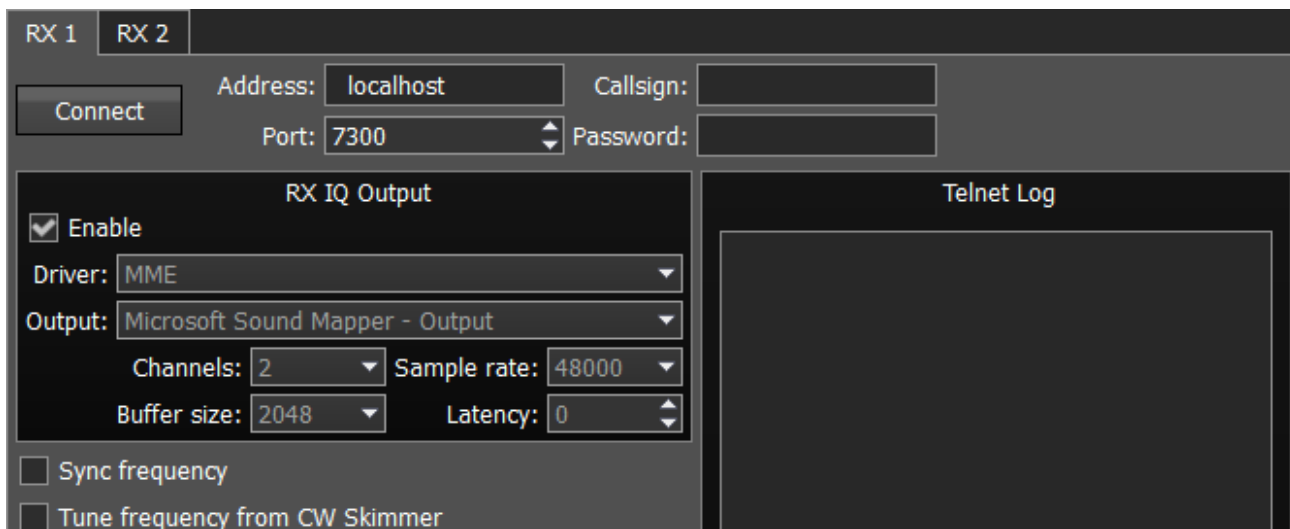
Sync RIT - set the **Sync RIT** checkbox to synchronize the receive frequency offset (RIT) with

the other device connected via the ExpertSync software.

2.8. CW Skimmer Menu

In the **CW Skimmer** menu, you can see the connection settings between the transceiver software and CW Skimmer software or Internet spotter-server.

Settings in the **CW Skimmer** menu has two identical tabs RX1 and RX2 with connection settings for each software receiver, let's look at one of them.



Connect - button to launch the connection with the CW Skimmer software or Internet spotter-server. Press the **Connect** button, after adjusting all settings, to make a connection with the CW Skimmer software or Internet server-spotter.

Address - IP address or DNS name of the CW Skimmer/server. Enter this 127.0.0.1 address or localhost, if you want to connect to the CW Skimmer, which is installed on the transceiver's PC.

Port - data exchange port. Enter the exchange port number in the **Port** input box.

Callsign - callsign. Enter your callsign if the server requires it.

Password - password input box. Enter the password if the server requires it.

To transfer the IQ signal in the CW Skimmer you need to adjust the settings of the audio device in the **RX IQ output** category, it consists of:

Enable checkbox - enable the IQ signal transfer from the EperSDR2 to the CW Skimmer.

Driver - audio device driver type.

Output - audio device physical output.

Channels - amount of the used channels of the audio device.

Sample rate - sampling frequency.

Buffer size - buffer size.

Latency - signal delay time.

Note! If CW Skimmer is installed on the transceiver's PC, then for the signal output you need to use Virtual Audio Cable.

Sync frequency - set the **Sync frequency** to synchronize the CW Skimmer frequency with ExpertSDR2 frequency.

Tune frequency from CW Skimmer - CW Skimmer set the ExpertSDR2 frequency. Set the **Tune frequency from CW Skimmer** to tune the ExpertSDR2 frequency by the mouse click on the station in the CW Skimmer.

More information of the ExpertSDR2 and CW Skimmer connection described in the guide over the following link: [ExpertSDR2 CW Skimmer.pdf](#).

2.9. Shortcuts menu

In the **Shortcuts** menu, you can see the shortcut key combinations settings.

With the help of the key combinations, you can control the transceiver from your keyboard.

Note! Shortcuts will be active only if the transceiver's software window is in focus.

<input checked="" type="checkbox"/> Enable			
Command	Shortcut	Shortcut RX1	Shortcut RX2
Start Software	Press shortcut		
Options	Press shortcut		
RX2	Press shortcut		
Bandscope	Press shortcut		
Memory Panel	Press shortcut		
Increase Sample Rate	Press shortcut		
Decrease Sample Rate	Press shortcut		
Set RX Antenna	Press shortcut		
Set TX Antenna	Press shortcut		
Mute	Press shortcut	Press shortcut	Press shortcut
RF Gain Up		Press shortcut	Press shortcut
RF Gain Down		Press shortcut	Press shortcut

Enable - set the **Enable** checkbox to activate assigned shortcuts.

Command - in the **Command** column displayed all transceiver's functions available for shortcuts.

Shortcut - in the **Shortcut** column, you can set the main transceiver's functions.

Shortcut RX1 - in the **Shortcut RX1** column you can set RX1 receiver functions.

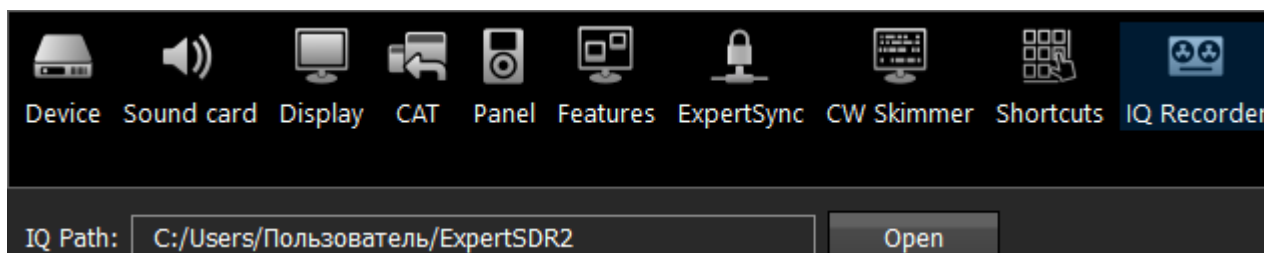
Shortcut RX2 - in the **Shortcut RX2** column you can set RX2 receiver functions.

Press shortcut - shortcut button. Press the Shortcut button, then press the key combination on the keyboard.

To delete a shortcut, press the Del button on the keyboard.

2.10. IQ Recorder menu

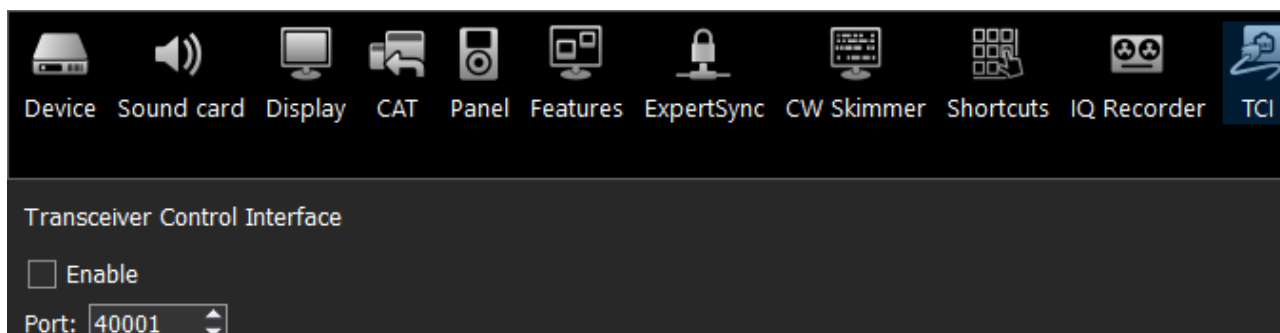
In the **IQ Recorder** menu, you can select a folder where you will store IQ recordings.



This is the first step on a way to a complete IQ Player.

2.11. TCI menu

In the **TCI** menu, you can select a port for TCI connection of ExpertSDR2 with a third-party software, with TCI support, and set the **Enable** checkbox.

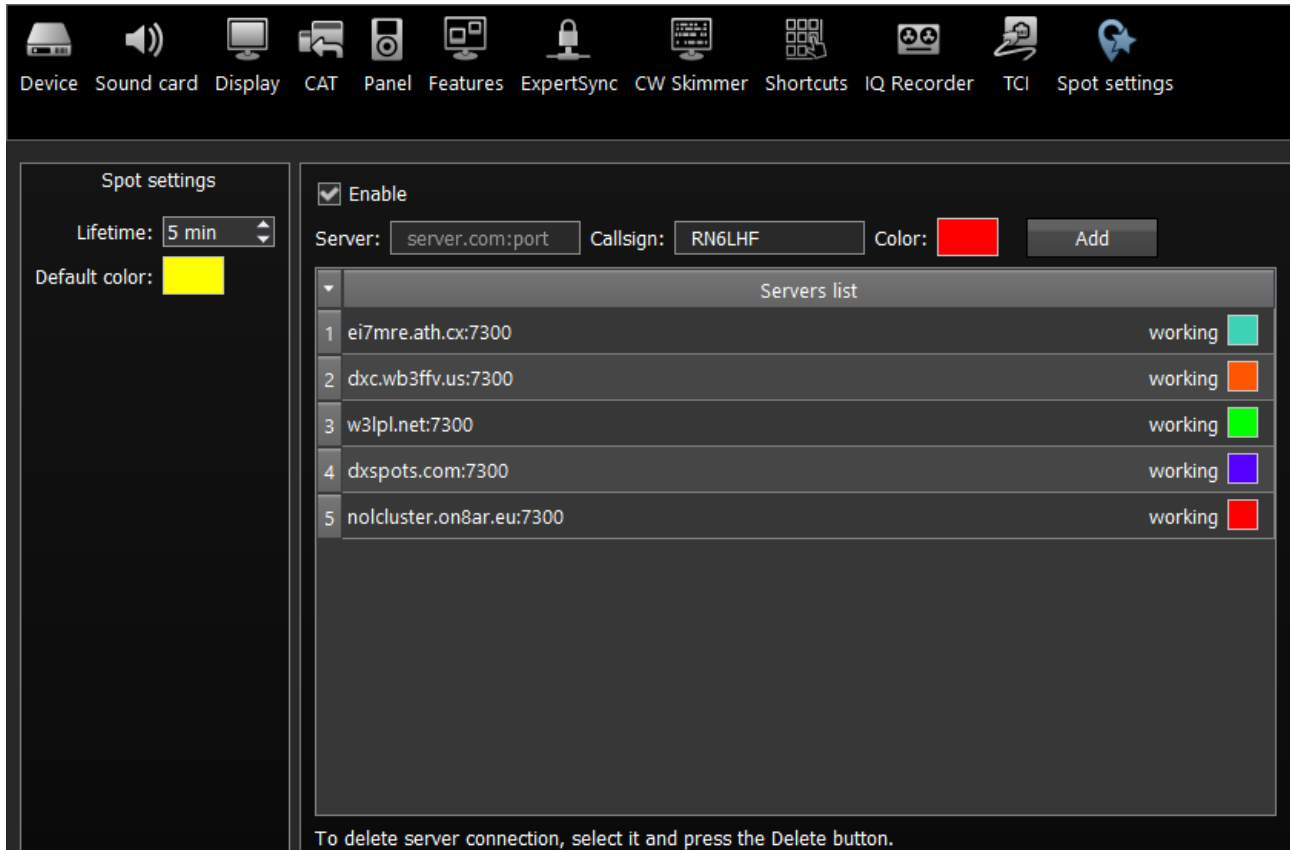


TCI - Transceiver Control Interface was developed by Expert Electronics company, for simple and still advanced connection between the ExpertSDR2 and third-party software. TCI has all required control commands similar to CAT system, but even more, it can transfer IQ-streams from the ExpertSDR2 to clients (third-party software such as signal Skimmers, etc) via local network and the Internet, CW macroses and Audio In/Out streams for digital modes (will be added soon). TCI is the universal multi-client interface (you can connect it to Loggers, Skimmers, PAs, Antenna switches etc. at the same time).

<https://github.com/maksim1210/TCI> - link to the list of files with the description of the interface in English and Russian and source code of the demo-client software with TCI support.

2.12. Spot settings menu

In the **Spot settings** menu, you can adjust spot settings you receive from CW Skimmer and telnet clusters.



In the **Spot settings** section (left part of the menu) you can set up **Lifetime** and **Default color** for spots received from CW Skimmer.

In the right half of the menu you can add connections to telnet clusters to receive spots. To add a cluster, enter a server address (you may find examples on this website <http://www.dxcluster.info/telnet/index.php>), enter your callsign and select a certain color, press the **Add** button, it's done.

To delete a server connection, select it and press the Delete button on your keyboard.

List of additions and corrections

1. PROC button description - 30.05.2017
2. Text corrections - 20.11.2017
3. Added description of IQ Recorder, TCI, Spot settings menus - 04.10.2017
4. New checkbox - Transfer PT to TCI, in Panel menu - 04.10.2017
5. Width (%) - description update - 09.10.2017
6. More details about connection of CW paddle via COM-port - 31.10.2017
7. Changes with Indicators tab - 03.11.2017
8. Additions in Compressor and Clipper - 03.11.2017
9. Added "**Show broadcast HF bands**" - 08.11.2017
10. Added important Note for Voice Recorder - 22.11.2017
11. Indicators tab changes - 23.11.2017
12. Important note for the MON button in CW - 23.11.2017

Afterword

This manual describes all operating controls of the transceiver software. You can print this document and keep a copy close to you.

The concept of the software structure won't change from one version to another, that's why the description will remain relevant for the future versions of the ExpertSDR2.

The ExpertSDR2 software is in a constant development, every day we try to make it even better.

We thank everyone who uses our technology, good luck and 73!

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DUC DDC SDR Series, SunSDR2 QRP transceiver. Specifications are subject to change without notice or obligation and specifications are only guaranteed within the amateur radio bands.

V1.1 - 23.11.2017