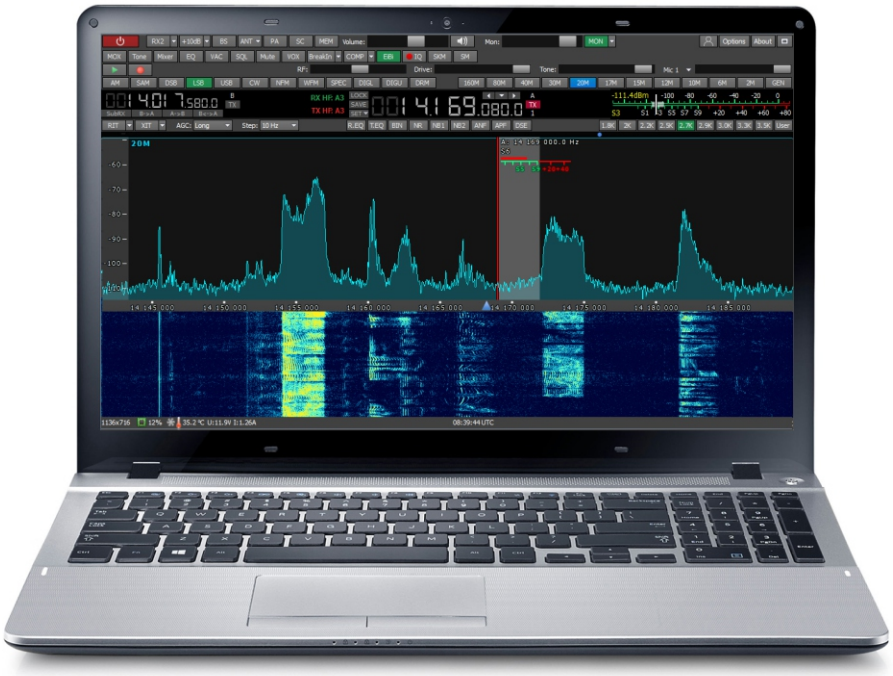
ExpertSDR2

software



for SunSDR2, SunSDR2 PRO transceivers.

User Manual

V1.0

Introduction

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

At this moment ExpertSDR2 software supports:

- ColibriDDC receiver in the RX mode;
- SunSDR1, SunSDR2, SunSDR2 PRO, MB1 transceivers in the RX and TX modes;

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

ExpertSDR2 Software License Agreement

ExpertSDR2 software is the proprietary 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 manufacturers website in section "SunSDR2 PRO Transceiver/Downloads".

New versions of the SunSDR2 PRO 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 PRO 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 PRO Transceiver / Documentation".

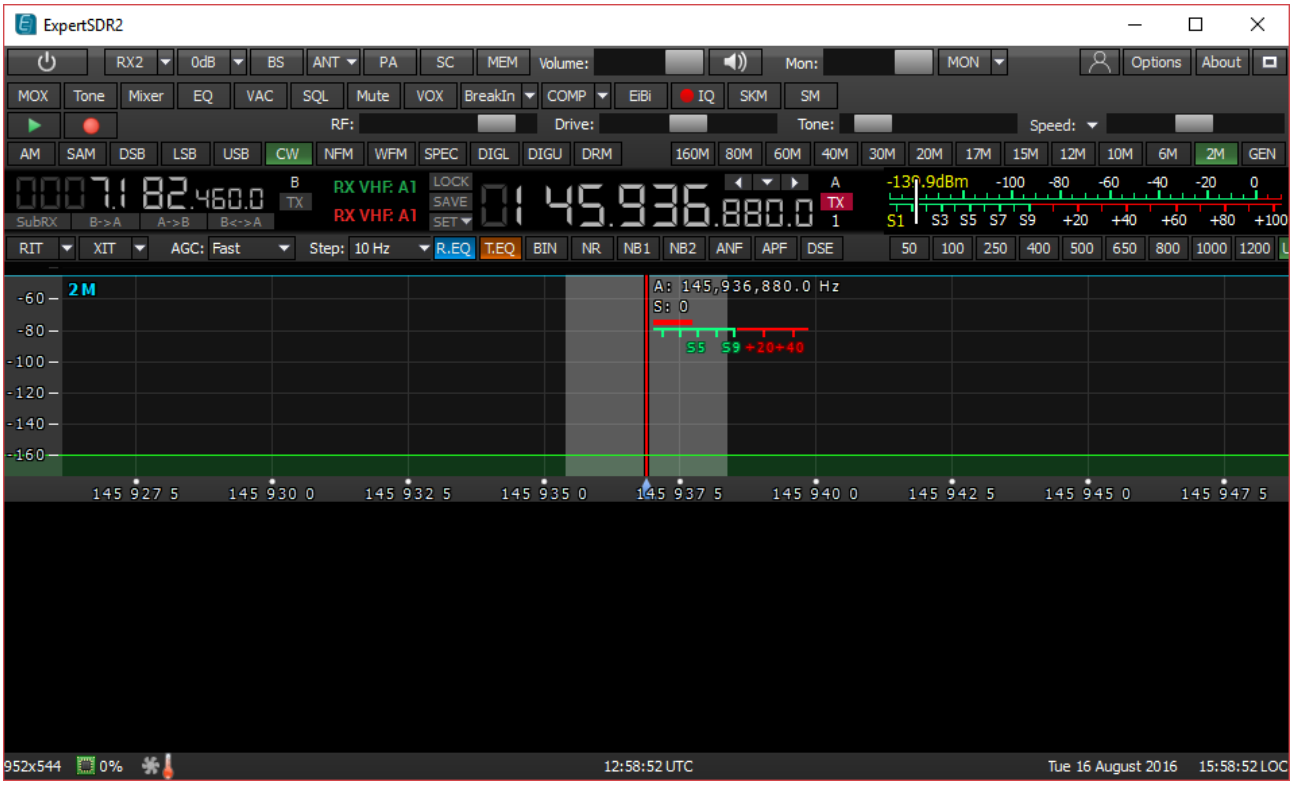
Users of the SunSDR2 PRO transceiver can update the SunSDR2 PRO software themselves by downloading from the official website of the Expert Electronics company.

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

1. ExpertSDR2 Software Description

The basic description of the software interface is presented in the Getting Started guide on our web-site: eesdr.com

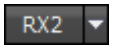
Software settings which won't be mentioned or addressed in this manual, are set by default or provided to the user's self-study and experiments. All the unmentioned settings cannot cause the fatal damage of the SunSDR2 PRO transceiver's hardware, so you can safely experiment with them. You're dealing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



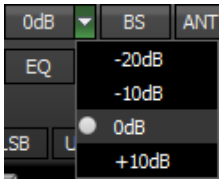
1.1. Global controls panel

This panel consists of the following buttons:

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

 - enable/disable button of the second software receiver.

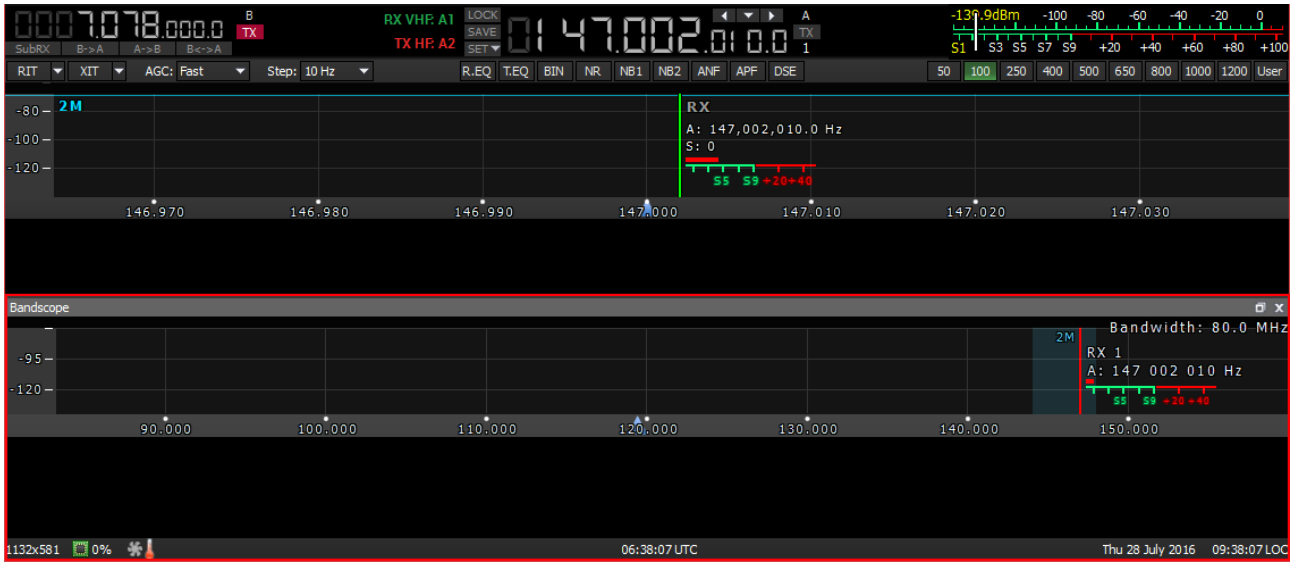
In the **RX2** drop-down menu you can select receiver's window configuration. **RX2** window has the same interface as the **RX1**.

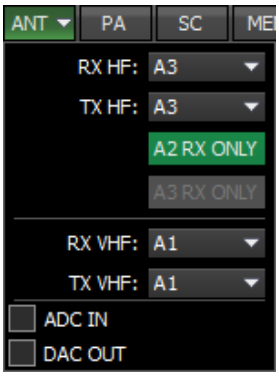


Attenuator level can be set via the drop down menu or by successive presses of the indicator button, which cycles upwards the attenuation coefficient in the following order: -20dB, -10dB, 0dB, +10dB

BS - enable/disable button of the wide **bandscope** from 0 to 80 MHz or from 80 to 160 MHz, it's the same as the **RX1** frequency. When you use **bandscope**, set the **Use wide RX filter** checkbox or **Auto enable** checkbox (it will turn the Wide RX filter automatically) in the Options > Device menu.

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 similar to the panorama settings of the main receiver and will be described on pages 23-25.





RX antenna menu. This menu allows you to lock the required HF antenna input **only for RX**. When the certain HF antenna input is locked for RX you **cannot** select it for TX.

ADC IN - connector is the direct input, bypassing Band Pass Filters (BPFs). ADC IN connector may be used for connection of the receiving antennas, transverters, additional BPFs, preamplifiers, attenuators etc.

Note! The signal from ADC IN connector goes to the ADC input and may be amplified by the preamplifier +10dB, if it will be chosen in the software.

Warning! Maximum allowed signal level on the ADC IN connector is 0.3V of the active voltage (RMS). Do not exceed it, it may result in the transceivers overload and ADC fatal damage.

DAC OUT – is the transceiver's low-power output, works in the wide frequency band.

Note! The output can be used for connection of the external power amplifiers, transverters and as a generator of the measuring signal.
Transmission is possible only on the amateur bands.

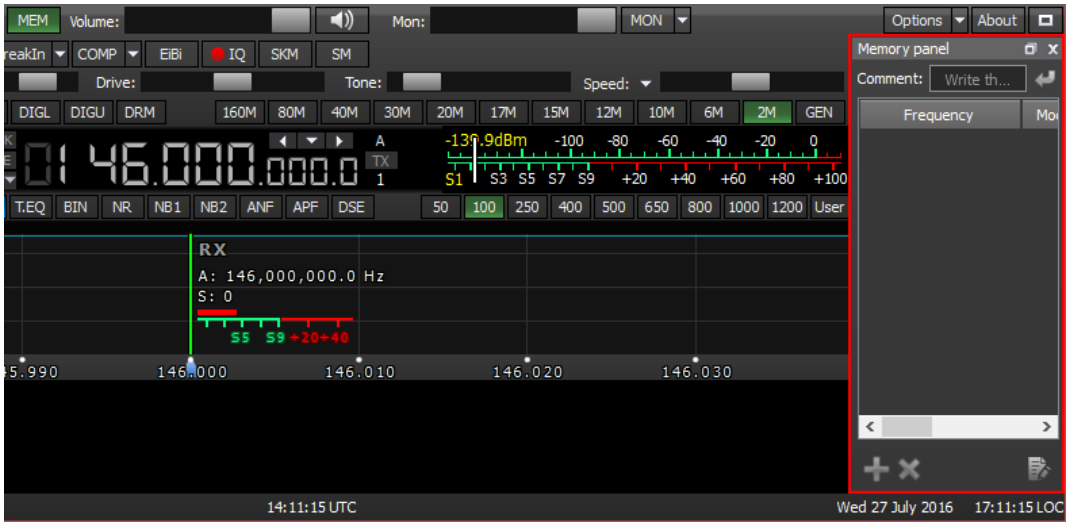
DAC OUT output parameters:

- Frequency band: 0.1...150 MHz
- Transmitted signal band: 20 kHz
- Impedance: 50 Ohm
- Signal level: +10 dBm (max)

- enable/disable button of the external power amplifier.

- enable/disable button of the sound output from the PC's sound card.

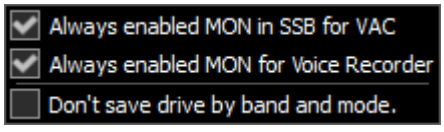
- enable/disable button of the frequency memory panel.



- **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 (internal dynamic) and as a result to the self-triggering of the audio path.



Even if the **MON** button is switched off, it is possible to choose 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 check box is not set, **Drive** level is memorized for the frequency bands and mode types. **Tone** level is memorized only for the frequency bands.*

Options - **Options** menu will be fully described later in the **Paragraph#3** 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.

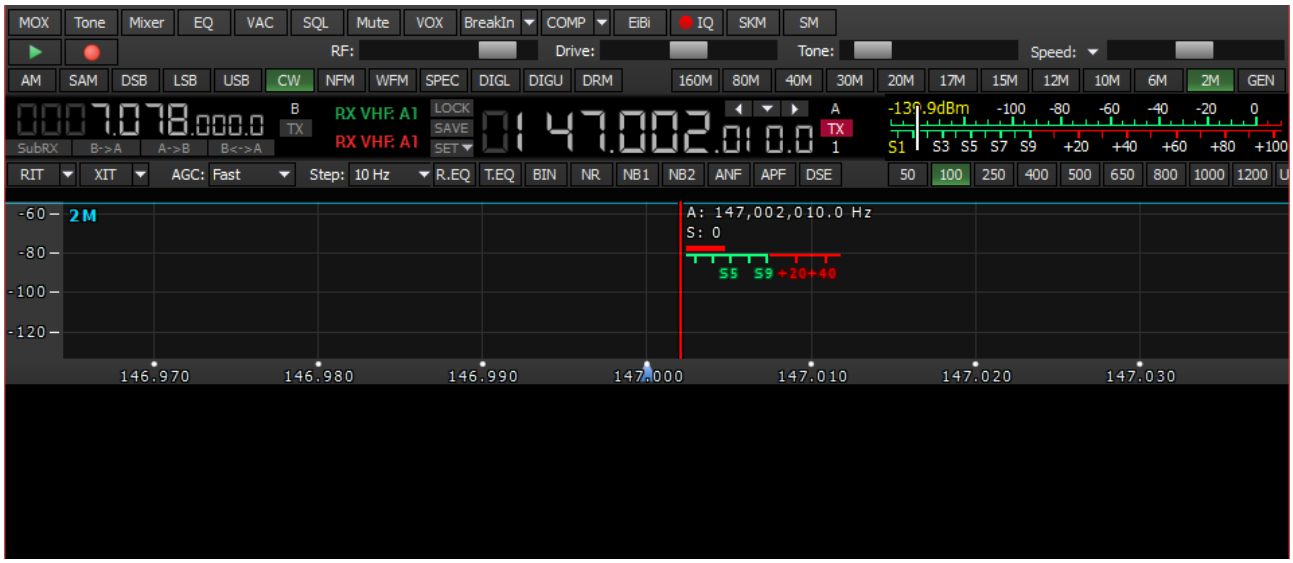
About - **About** button opens the new window with the info about current version of the ExpertSDR2 software:

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

Notes! While using Band Pass Filters (BPFs), the attenuator and the 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**.*

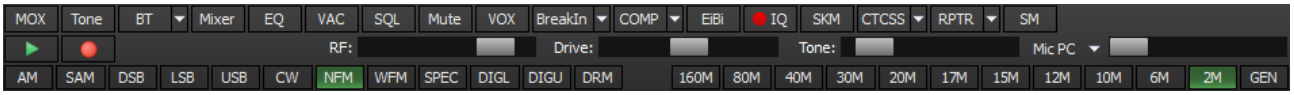
Two independent software receivers can operate simultaneously only on one Nyquist zone 0-80 MHz or 80-160 MHz.

1.2. Software transceiver settings



These settings are divided in four logical parts:

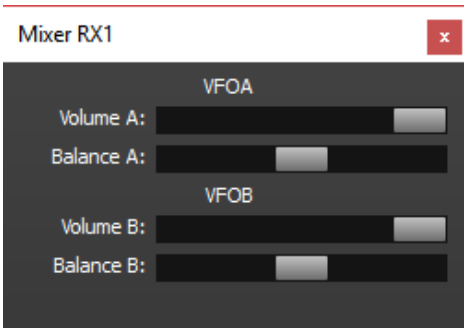
1.2.1. Transceiver control panel



MOX - enable/disable manually operated transmit mode.

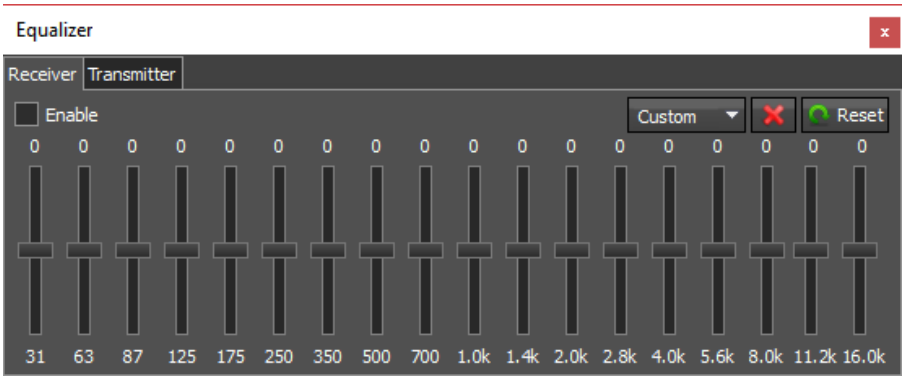
Tone - enable/disable tone (carrier) signal in TX mode, the output power can be adjusted by the **Tone** slider.

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



EQ - button opens 18-band equalizer menu. You can set different settings for Receiver

and Transmitter.



Each has its own indicator below the VFO A frequency tab (both are enabled on the picture below).

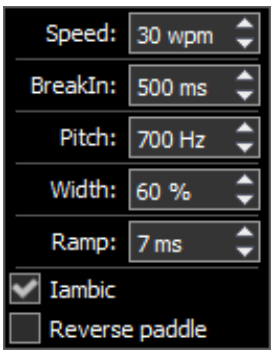
VAC - button enables the VAC (data exchange via virtual audio cables).

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

Mute - button mutes LF signal.

VOX - (Voice Activated Transmit) button switches the transceiver in TX mode when you speak in the microphone (more details on page 31).

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



Speed - 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 Dash ratio control. Set the required Dot to Dash ratio.

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

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 checkbox to generate dots and dashes in reverse order.

COMP - turns on the compression of the transmitted signal.

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

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

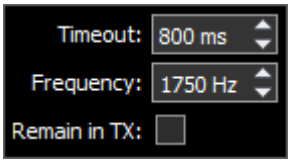
IQ - IQ-files recording is required for storing the RX bandwidth panorama. The file is saved to the "C\Users\User\ExpertSDR2\wave".

SKM - turns on the CW Skimmer (more details on page 57).

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

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

BT - **Burst Tone** button. 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 (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.

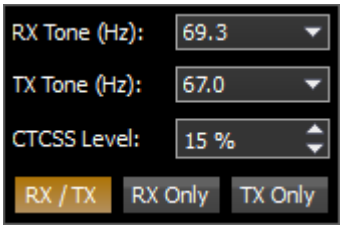
4. Press the BURST TONE button.

The transceiver will send the FM tone signal with your pre-sets.

CTCSS - **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:



1. Set the NFM mode.

2. Set the receiver's tone frequency with the RX TONE menu.

2.a. Set the transceiver's tone frequency with the TX TONE menu.

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.

RPTR - button switches the shift of the transmission frequency, to operate through a repeater. This function is usually used on the 10m, 6m, 2m and 70cm bands.

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

Enable the shift of the TX frequency to work through a repeater. 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 automatically detects whether the station is strong or not and allows you to listen to it in **stereo** mode.

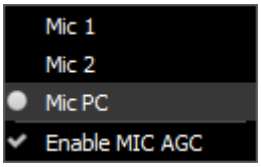

- **Play/Record** buttons. This function allows you to record the RX audio signal and play it instantly via the IQ player. Also you can transmit the recorded audio to the air.

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

- slider for the transceiver's output power adjustment.

- slider for the transceiver's output power when TX tone (carrier) signal.

- slider for the microphone gain level. In CW mode it switches to the **Speed** button and duplicate 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 on page 29).

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.

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 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 external decoder of the DRM signals. Connect third-party software (is not supplied) to the transceiver software for decoding of the DRM signals.

160M – 2M – amateur bands.

GEN – if out of the amateur bands.

1.2.2. Frequency and S-meter indicators

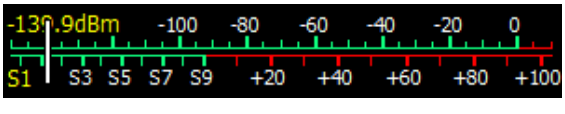
Mainly, this panel consists of the visual indicators, like the VFO A/B frequencies, signal level on the antenna's input (S-meter) and several control buttons.

Displaying elements:

Frequency indicator of the **VFO B** (sub-receiver).

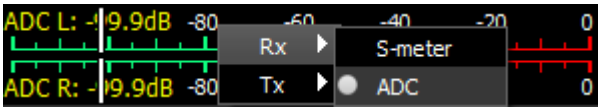
*Note! You won't hear the audio from the **VFO B** if it is out of the panorama bandwidth.*

Frequency indicator of the **VFO A** (main receiver).

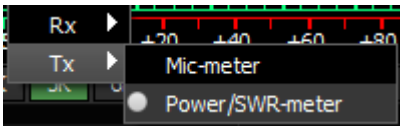


S-meter - by default this scale displays the power level of the signals in the RX filter bandwidth. The scale has two grade types: in S-units and in dBm. To the left of the S-meter grade figures, displayed the signal strength in dB mW (yellow figure). In the TX mode the output power is indicated in W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

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.

Sub-receiver control unit:

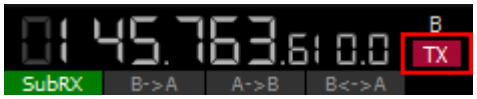
SubRX – enable sub-receiver. If you want to listen to the VFO A and VFO B frequencies simultaneously, use the Sub-receiver.

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.*

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

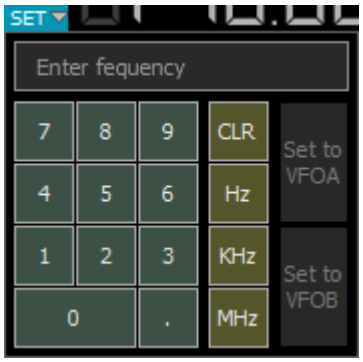
A>B – assign the VFO A frequency to VFO B

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

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

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.

To use the **SPLIT** operation:

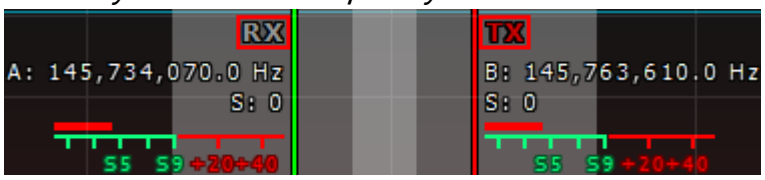
1. Activate the **SPLIT** mode by pressing the TX button near the VFO B frequency indicator to turn to TX on this frequency. Flashing red indicator in the software window means the **SPLIT** mode is enabled.
2. Set the required transmit frequency (VFO B) in the **SPLIT** mode. **Disable the SPLIT** mode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

*Note! While in 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 a **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, on the front panel of the transceiver. 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.

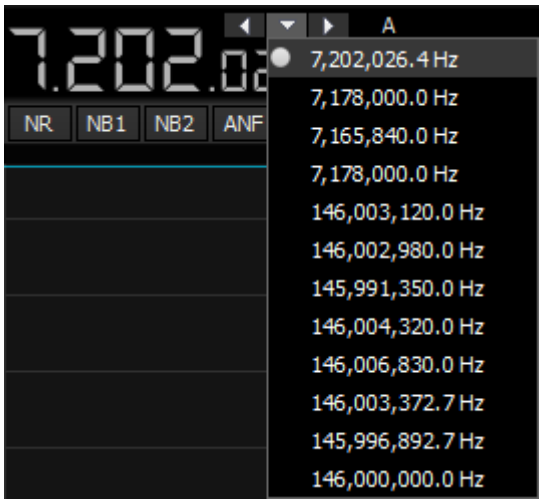
Note! Sub-receiver's red tuning line means that you'll transmit on the VFO B frequency. You can switch the TX status between VFO A and VFO B by pressing the RX indicator near any VFO tuned frequency.



*While in 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.*

Band Stacking Memories indicator (VFO A only). One 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 available memory slots. It might be useful for quick frequency changes within a band. To replace one memory slot:

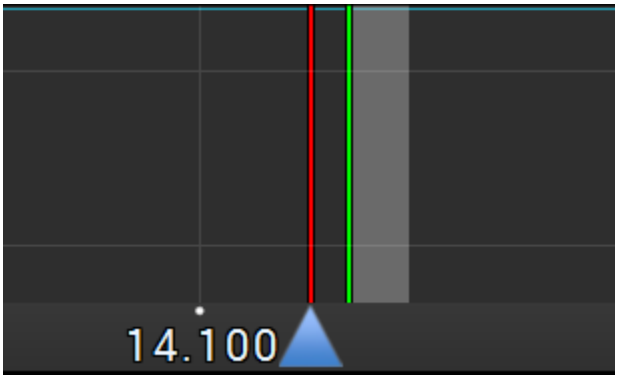
1. click the required band button you would like to modify.
2. change the frequency (within a selected band), mode, and filter to the required settings.
3. click the band button again to save the values.



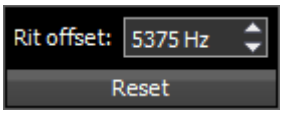
Navigation buttons. The quick memory cells are automatically stored with the frequencies if the receiver stands still over a second. Then those frequencies can be selected in order back and forth, as in an internet browser. Total stack contains 16 cells.

1.2.3. DSP control panel

- 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. Offset is displayed as a translucent band on the spectrum scope. RX frequency displayed as the tuned receiver's frequency - 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 filter 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.

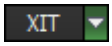
When the **RIT** is enabled, frequency tuning changes a bit:

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

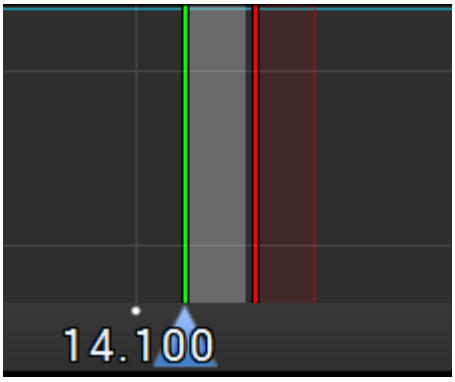
Press and hold the left right button inside the RX filer to move the whole panorama with the filter.

Press and hold the middle mouse button inside the RX filer then move it 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, then if you disable the **RIT** it's state will be saved. When you activate the **RIT** next time, the offset will equal the previous value.*

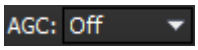


- Transmit Incremental Tuning.



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. Offset is displayed as a translucent band on the spectrum scope. RX frequency displayed as the tuned receiver's frequency - green line. TX frequency displayed as the tuned transceiver's frequency - red line with the filter band (on the picture you can see the USB mode).

XIT functionality is similar to **RIT** functionality.



- 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.

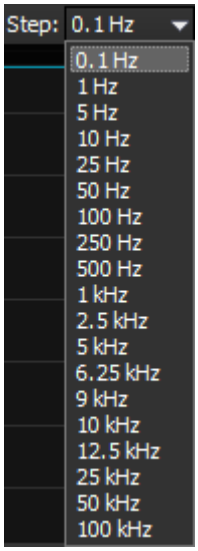
SLOW - preset with slow AGC reaction (approximately 500 ms). Recommended for phone, digital modes.

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.

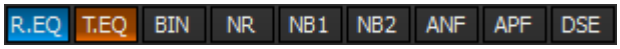
USER - preset with custom AGC reaction (by default the slowest 1000 ms).

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



Step list allows to change the step in range from 0.1Hz to 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 (in one of the headphone channels, the signal will be shifted in phase).

NR - enable the receiver's Noise Reduction.

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 - Automatic Notch Filter for automatic reduction 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 - Analog Pick Filter, it creates the triangle filter's AFC (amplitude-frequency characteristic) in the filter bandpass.

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. Signal in the filter's center is equally heard in both channels of 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 load in both ears.

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

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

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

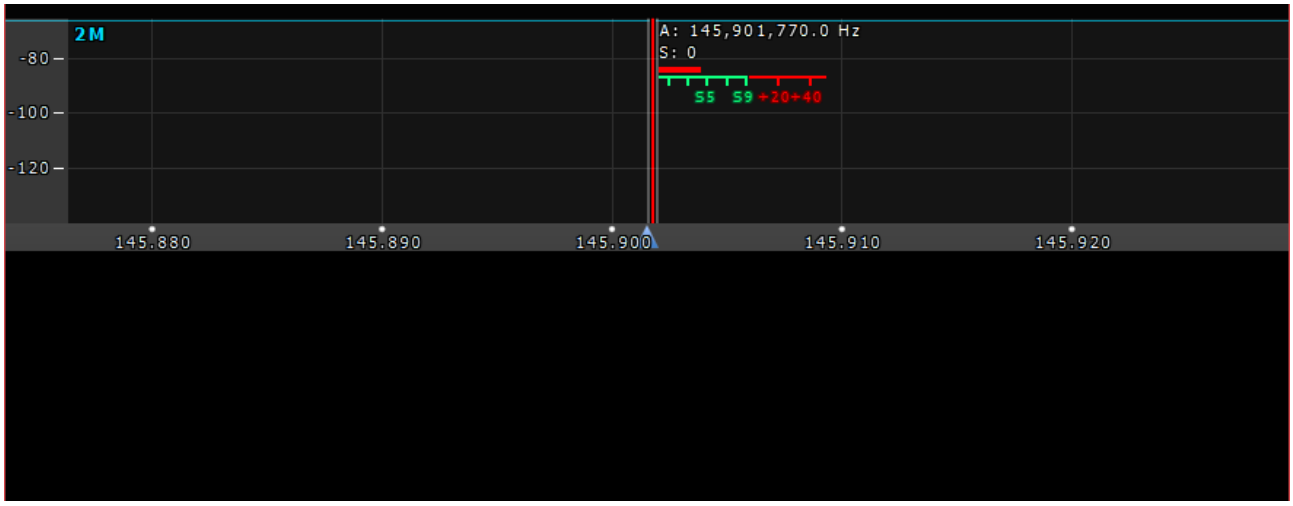
- CW mode (**50 – 1200 Hz**);

- WFM mode (**150 – 310 kHz**);

- DRM mode (has one fixed band **10 kHz**);

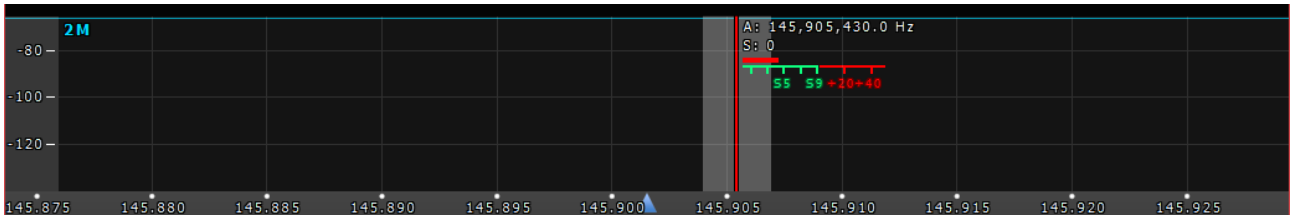
- user can adjust the RX filter bandwidth by himself (possible at any modulation type except DRM).

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 frequency band with the sample rate from 39 up to 312 kHz (adjustable by User). Also there is the RX filter.

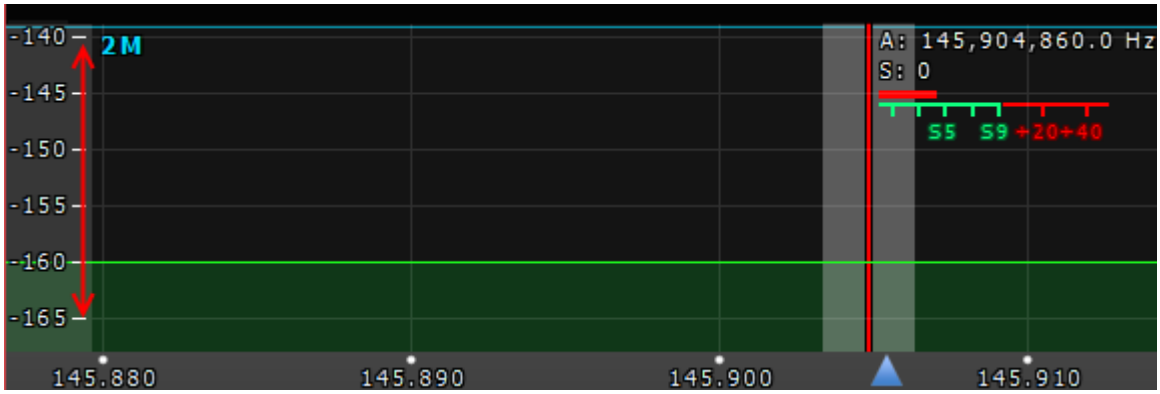
There is a vertical scale to the left of the spectrum scope, it indicates the power level of signals in dBm. Amateur band indicator displayed as the blue line on top of the graph with the name of the band, it shows the limits of the amateur band.

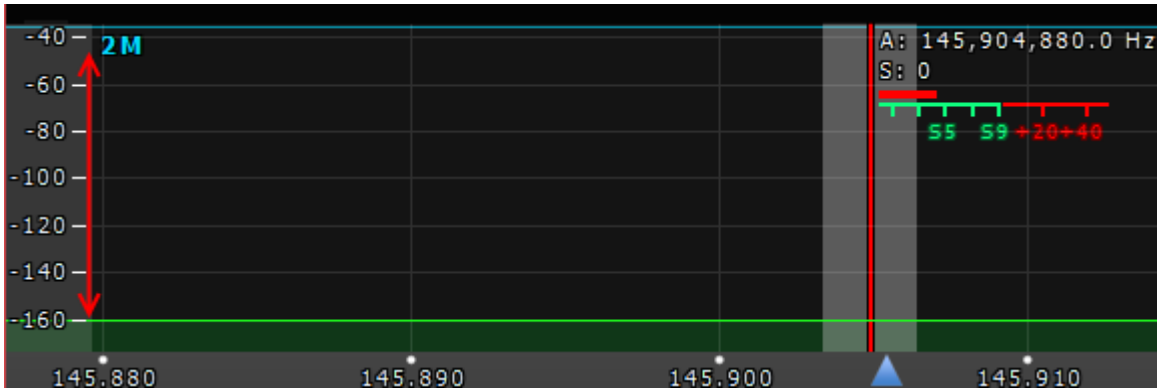
RX/TX filter position is indicated by the vertical red line. To the right of the filter indicated it's precise tuning frequency (can be switched off in Options). Below the frequency you can see the S-Meter (can be switched off in Options). RX filter bandwidth displayed as the translucent gray area around 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 on page 44).

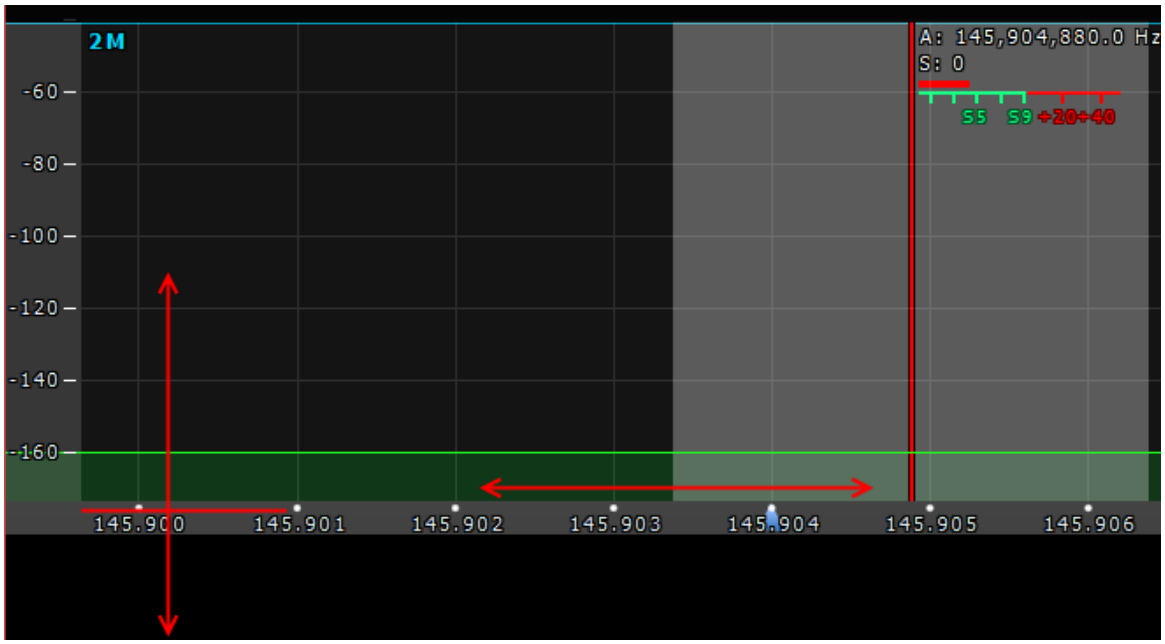
1.2.4.1.1. Spectrum Scope scaling

When you move the mouse cursor on 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.

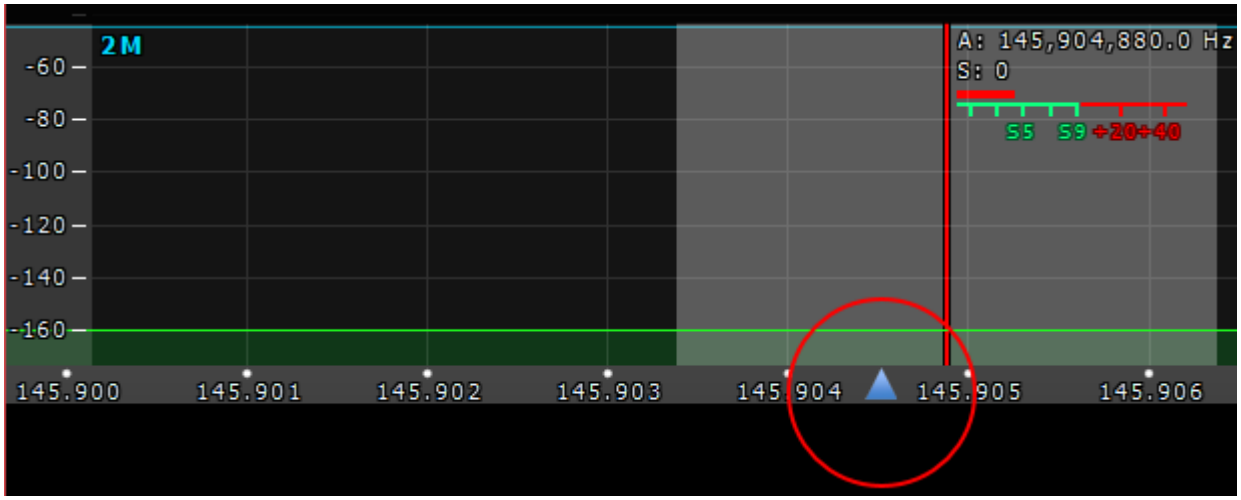




Horizontal scale between the spectrum scope and waterfall shows the frequency of the certain point on the spectrum. When you move the mouse cursor on the horizontal scale a hand will appear. Press and hold the right mouse button, then move it left/right to zoom in/out the panorama or press and hold the 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 position** and drag it left/right,
2. Click the mouse wheel on frequency scale.

1.2.4.1.2. Frequency tuning on the spectrum scope

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 is standstill.

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.

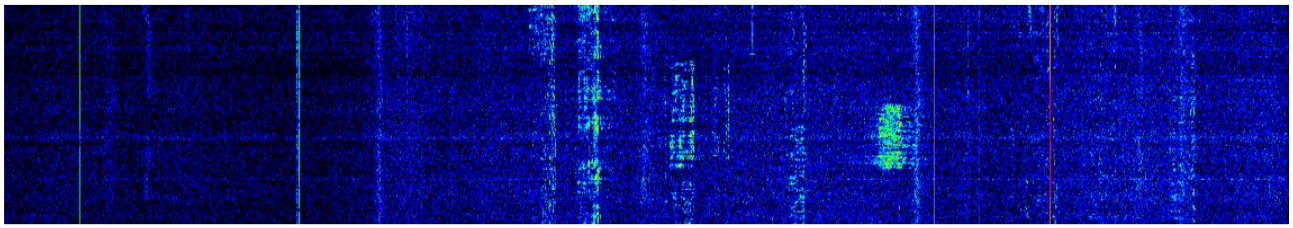
Press and hold the right mouse button anywhere on the filter and move it left/right. Basically, this is not a way of tuning. It allows to observe the air outside the panorama window, not changing the tuning frequency.

Fine tuning.

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

Aside from the listed above ways of tuning, implemented the synchronous tuning between the bandscope and the main receivers. Press the right mouse button on the required frequency on the bandscope, the main receiver simultaneously tunes to this frequency.

1.2.4.2. Waterfall



Waterfall graphic - timed spectrum scope in format: amplitude - brightness, frequency - horizontal, time - vertical. The comfortable settings are set by default, but you can change them if necessary (more details on page 46).

There are three ways of the waterfall rendering: rainbow, monochrome and custom, you can adjust them in the software Options (more details on page 46).

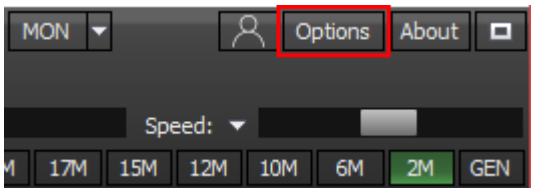
1.3. Status bar

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

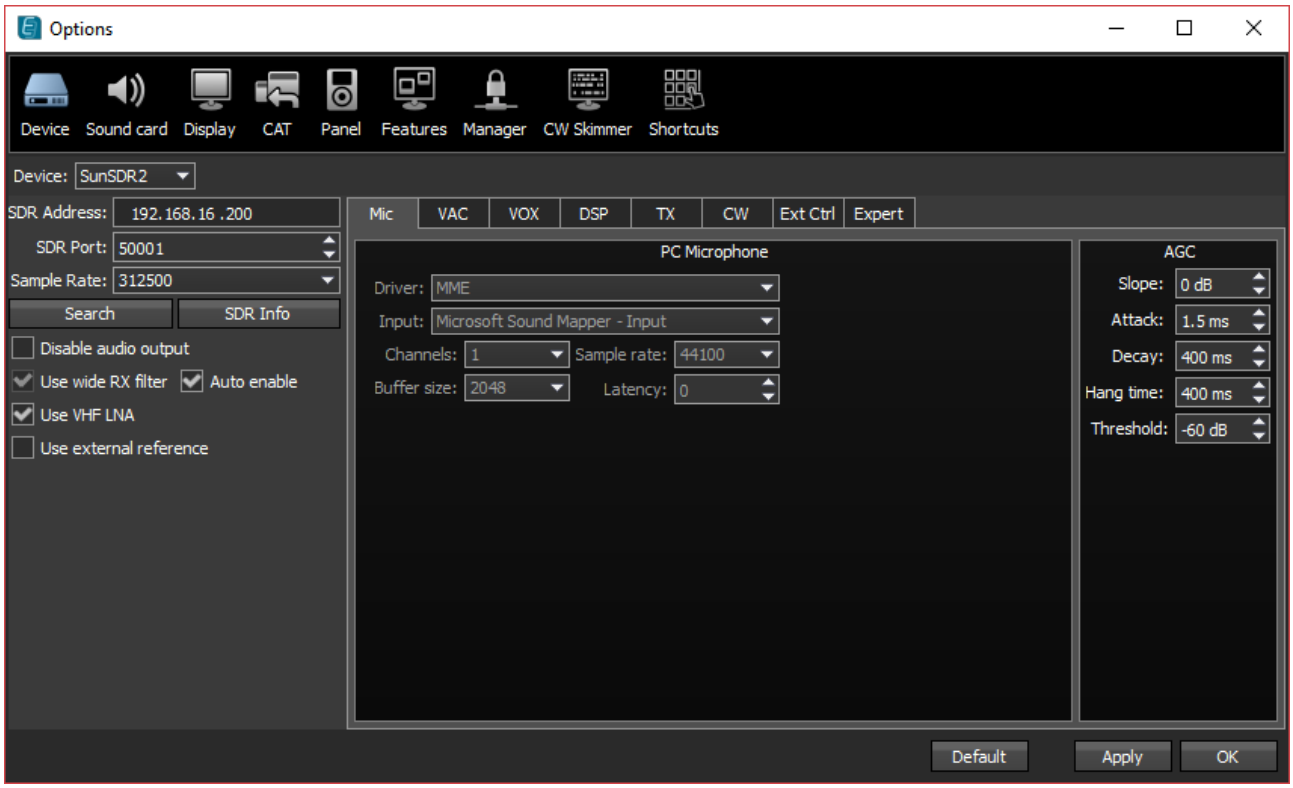
- ExpertSDR2 window size in pixels.
- CPU load in percent.
- Temperature inside the transceiver.
- Coordinated Universal Time (UTC).
- Current date.
- Local Time.

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 setting to the default level by simply clicking the **Default** button. The same goes to some enclosed menus, where the **Default** button is present.*
*- 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 **Options** window.*



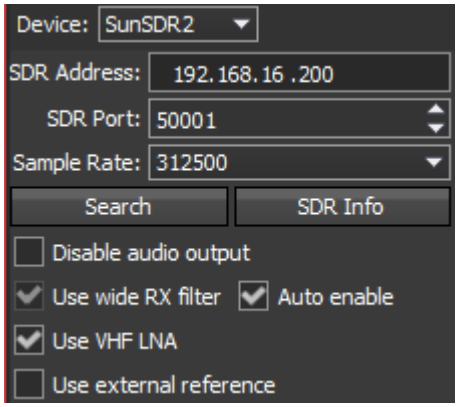
WARNING! We recommend you to study this section of the manual very carefully, because many settings are hidden in the sub-menus.

2.1. Device menu

There are software functions of the signal processing and hardware settings in the **Device** menu.

2.1.1. Device Settings

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

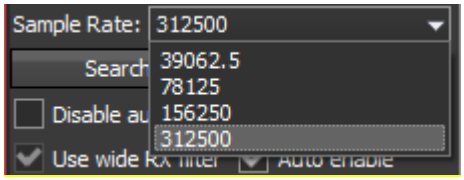


Device – Transceiver type menu. Shows that the ExpertSDR2 software works in the SunSDR2 mode.

SDR Address – Physical IP-address of the MB1 transceiver, 192.168.16.200 by default. This setting cannot be changed.

SDR Port – Port number, which used for the date exchange, 50001 by default. This setting cannot be changed.

Sample Rate – IF sample rate, equals the panorama bandwidth. You can choose one of four panorama bandwidth values.



Search – Search the device in the local network. When you press the **Search** button, software searches for the SDR-transceivers 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 setup - you'll see the transceiver's info, if not - nothing will show up.

Disable audio output – turns off the transceiver audio output from the "HP" connector.

Use RX Wide filter – Set the **Use RX Wide filter** checkbox to enable the wide filter for the whole HF (0...65 MHz) or VHF (95...155 MHz) band.

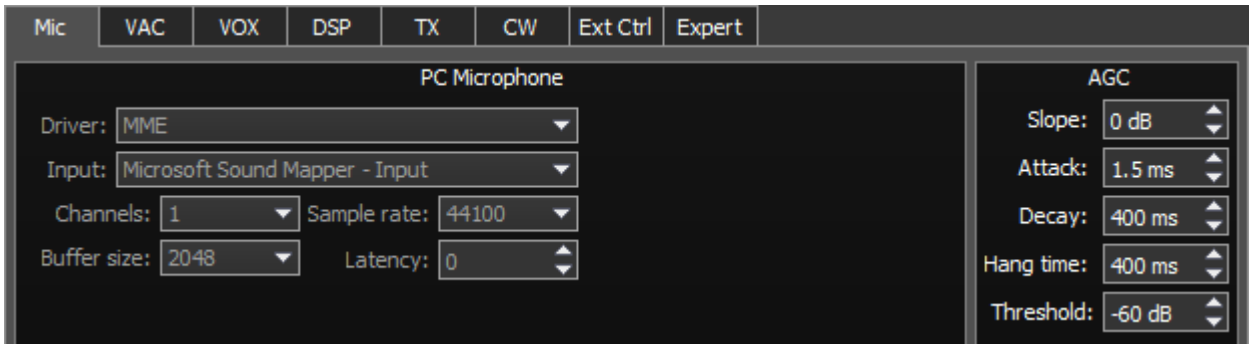
Auto enable – Set the **Auto enable** checkbox to auto enable RX WF when the band-scope and/or the second receiver on the other band are switched on.

VHF LNA – Set the **VHF LNA** checkbox to auto enable Low Noise Amplifier for the VHF band.

Use external reference – Set the **Use external reference** checkbox to enable REF input on the rear panel of the transceiver and use it as reference input.

2.1.2. Mic Tab

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



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.

In the **AGC** category you can adjust the microphone's AGC. This settings influences both types of microphones. **AGC** category consists of the following items:

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.

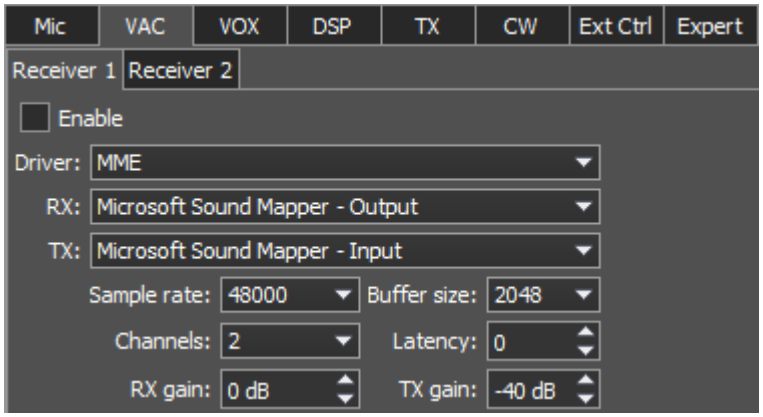
Hang time – signal recovery time.

Threshold – AGC trigger threshold.

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

VAC category consists of the following items:

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

Input – select the sound card's physical input or the virtual audio cable's number.

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

Sample rate – sampling frequency.

Buffer size – size of the buffer.

Latency – signal delay time.

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

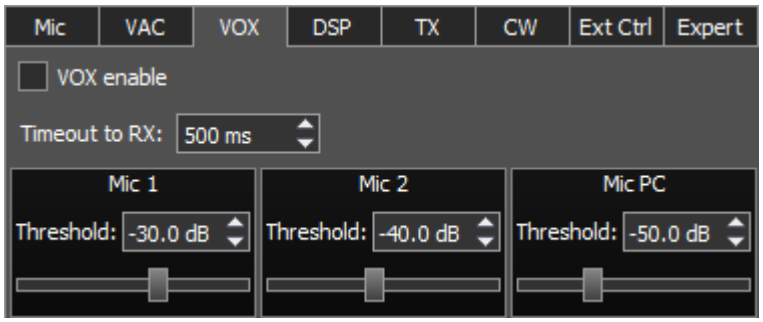
TX gain – additional signal amplifying in the virtual audio cable's TX path in dB.

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. 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:

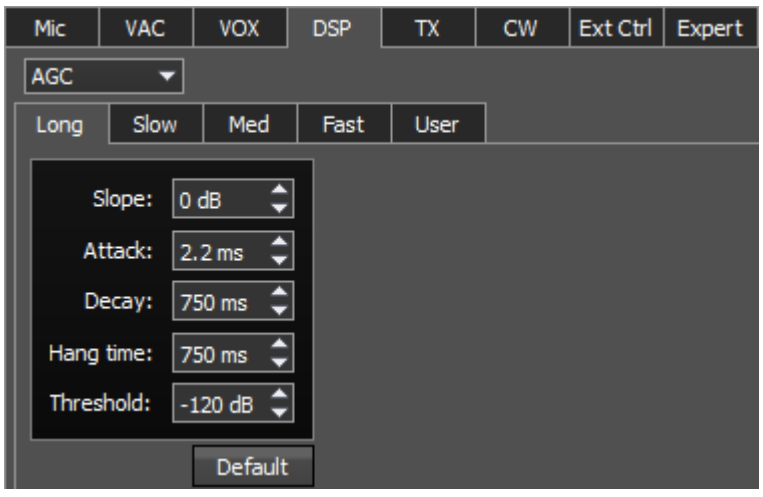
AGC – receiver's AGC settings.

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.

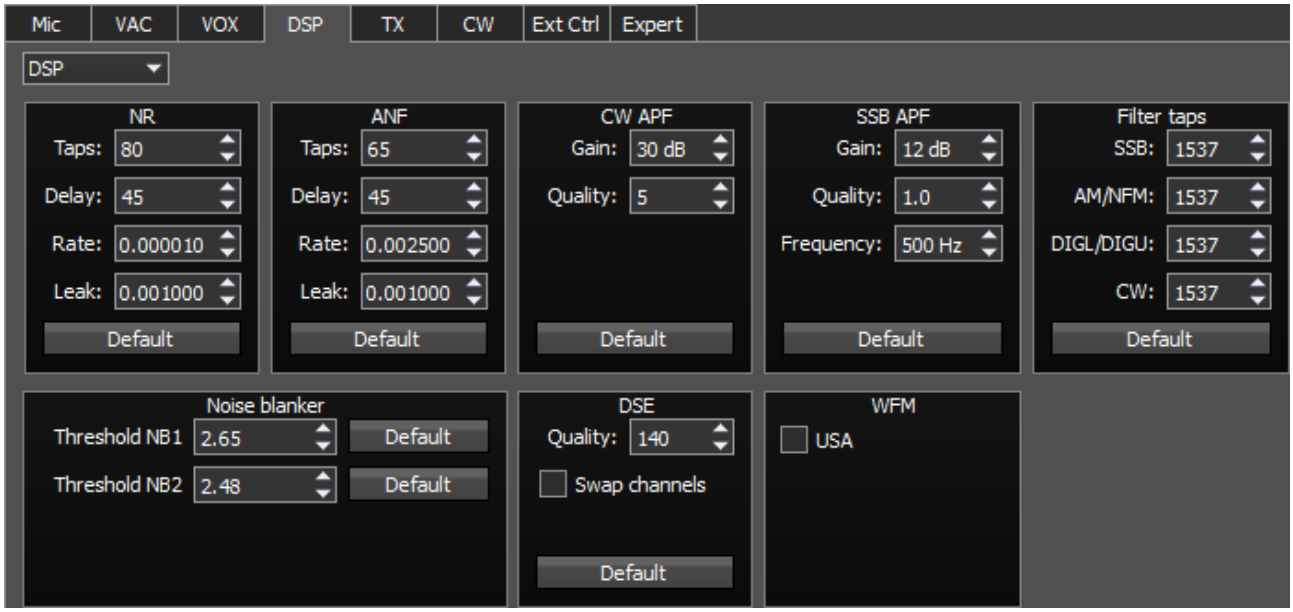
Hang time – signal recovery time.

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 clears the signal from abnormal noises and crosstalk. These are the standard functions:



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 – 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.

NB – Noise Blanker, removes impulse interference.

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).

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. Signal in the filter's center is equally heard in both channels of stereo phones.

Note! DSE effect cannot be heard in mono phones and internal MB1 dynamic.

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.

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.

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.

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.

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

WFM – Wide FM standard:

USA – set this checkbox to listen to WFM stations in 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.

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 synchronize RX filter bandwidth with TX filter bandwidth.

NFM - Narrow band receiver FM settings.

Deviation – FM deviation. Width of the FM signal in air will be two times more than deviation.

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.

Voice Recorder - Settings of the internal dynamic's playback level.

Volume for TX – Internal dynamic's volume. Set this parameter so that the signal on MIC-meter would reach -10...-5 dBW values.

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.

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 network of the external PA.

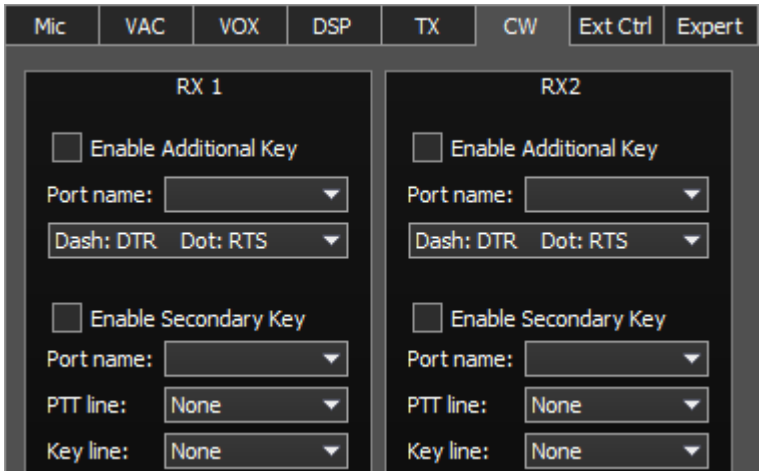
PTT switching delay – set the delay time between switching the transceiver to RX/TX and the first relay closure.

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 RX1 and RX2 receivers.

Enable Additional Key - Checkbox to enable additional CW keys. 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 - Lines menu, used for Dot and Dash signals. In the **Lines** 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.

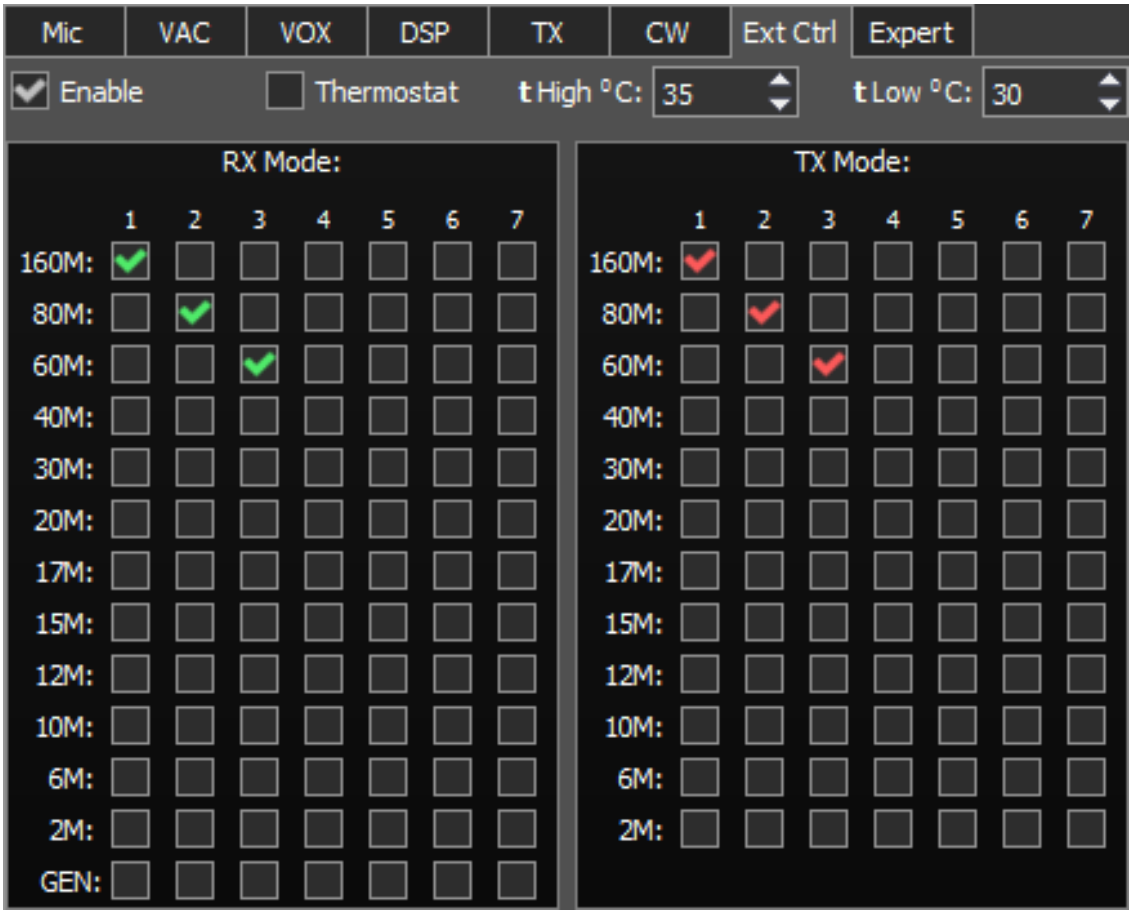
Key line - Line menu, is being used to generate CW signal.

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. For more details on how to use the **Ext Ctrl** connector, look in the " *Connecting an external PA, fan, relay etc. to the SunSD2 PRO* » document.

The best way to use this feature is the switching of the narrow-band filters in the RX mode and switching of the LPF in the TX mode preamplifier. Also you may arrange your own antenna switch, having only the relay.



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

Enable – checkbox to enable control of the electronic keys.

Thermostat – activate the Thermostat mode and the seventh key.

t High C – high temperature limit to turn on the fan.

t Low C – low temperature limit to turn off the fan.

Rx Mode - electronic keys settings in the RX mode.

1...7 - electronic keys numbers.

160...2, GEN - electronic key enable checkbox on the corresponding band.

TX Mode - electronic keys settings in the TX mode.

1...7 - electronic keys numbers.

160...2 - electronic key enable checkbox on the corresponding band.

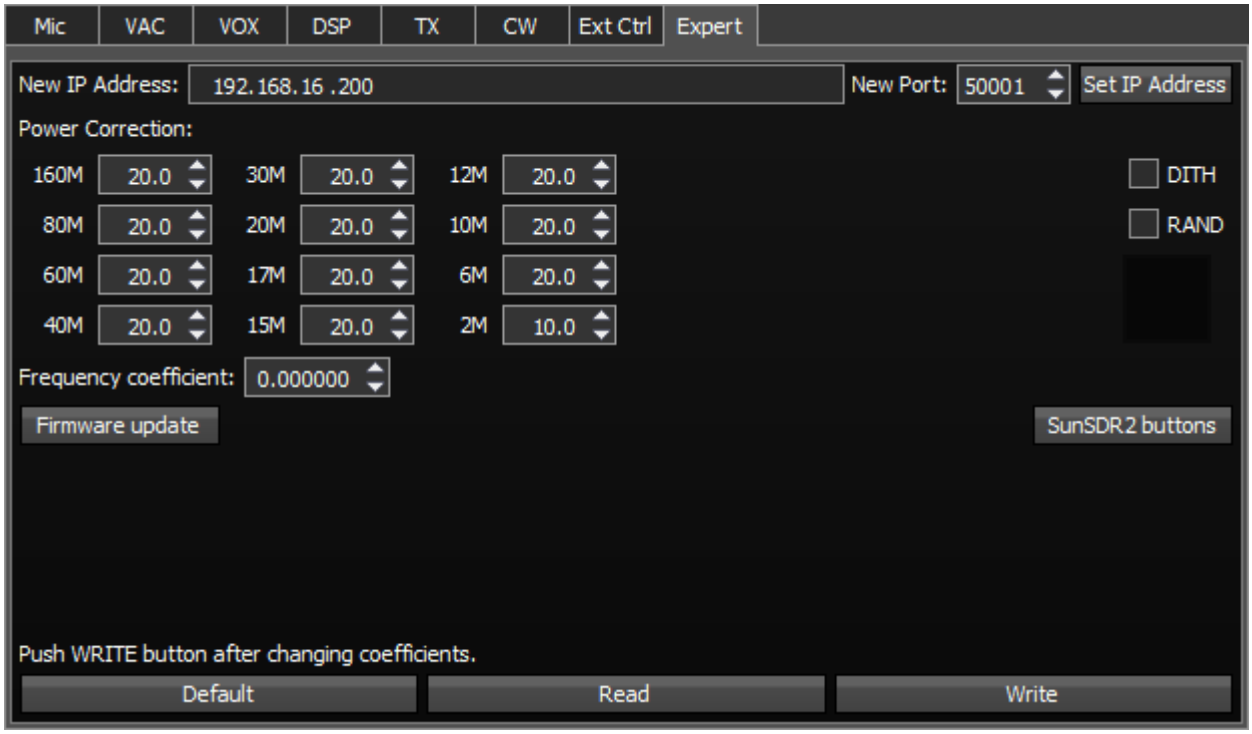
Note! On the picture you can see an example of using the keys in the 160M, 80M and 40M bands for both RX and TX modes.
While working on the 160M band in the RX mode, #1 key is enabled, if turn to TX mode, #1 key is still active.

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 40M 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. 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.

Power Correction - Output power correction menu of the transceiver by bands. Set the

output power value for each band. Value = 20 means maximum output power of the transceiver.

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 in the transceiver's SDR module. Press the **Firmware update** button to initialize firmware update process.

SunSDR2 buttons - Input lines control button. Press the **SunSDR2 buttons** button to open the text window for lines control of CW key, PTT footswitch and PTT microphone button.

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, 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.

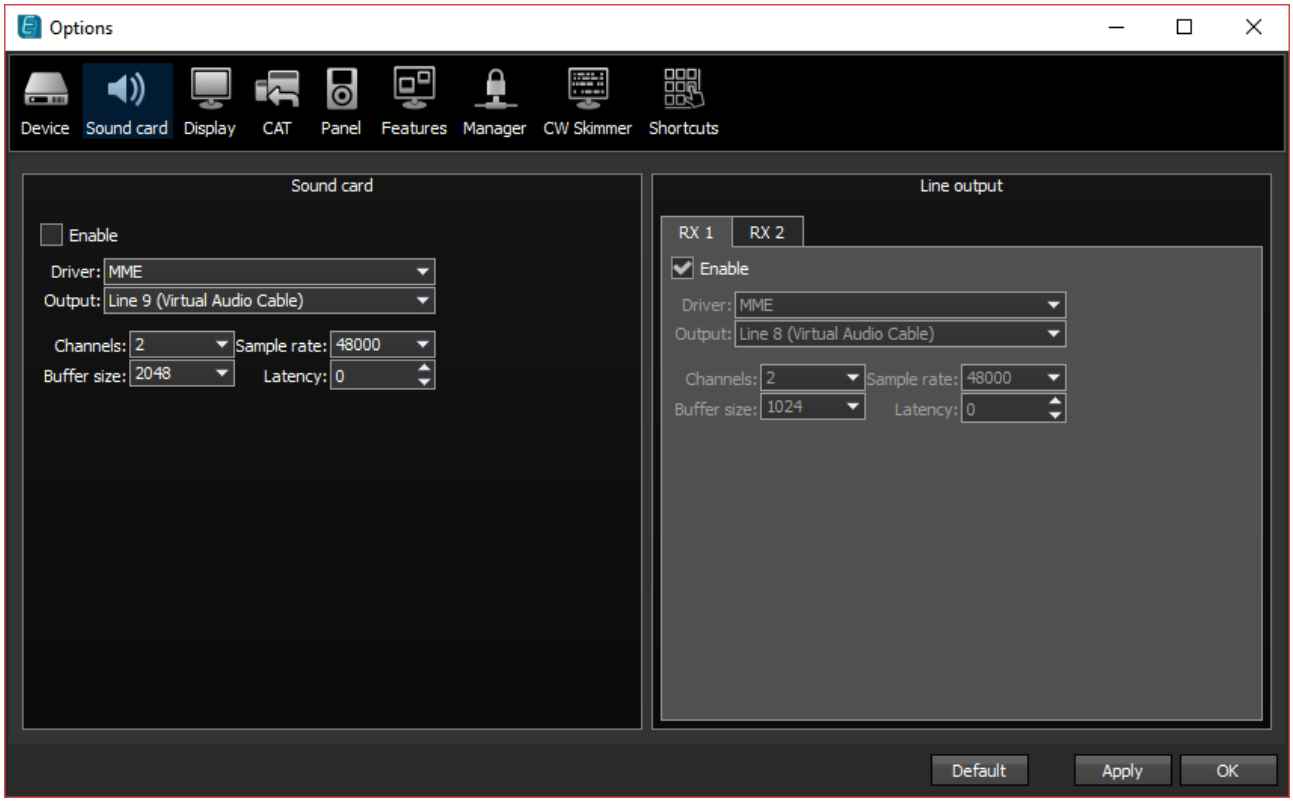
Default - Default hardware settings button. Press the **Default** button to return to the default settings.

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.

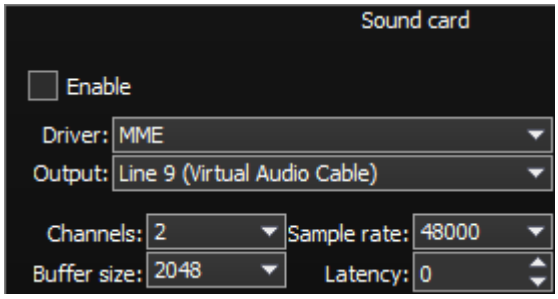


Audio signal output is carried out via the **PHONES** connector on the front panel of the transceiver. If you connect to the transceiver from the remote PC, you may use PC's sound card for the audio signal output.

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! You may have an additional sound output via the PC's sound card, which will be simultaneous with audio output (from **PHONES** output) from the transceiver.*
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 – Choose the sound card's driver type.

Output – Choose the sound card's physical output.

Channels – Choose the amount of active sound card's channels.

Sample rate – Sampling frequency.

Buffer size – Buffer size.

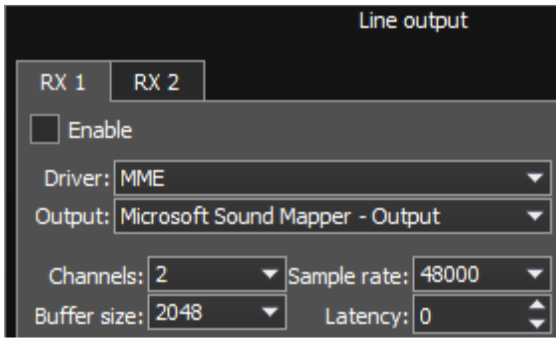
Latency – signal delay time.

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 the amount of active sound device' channels.

Sample rate – Sampling frequency.

Buffer size – Buffer size.

Latency – signal delay time.

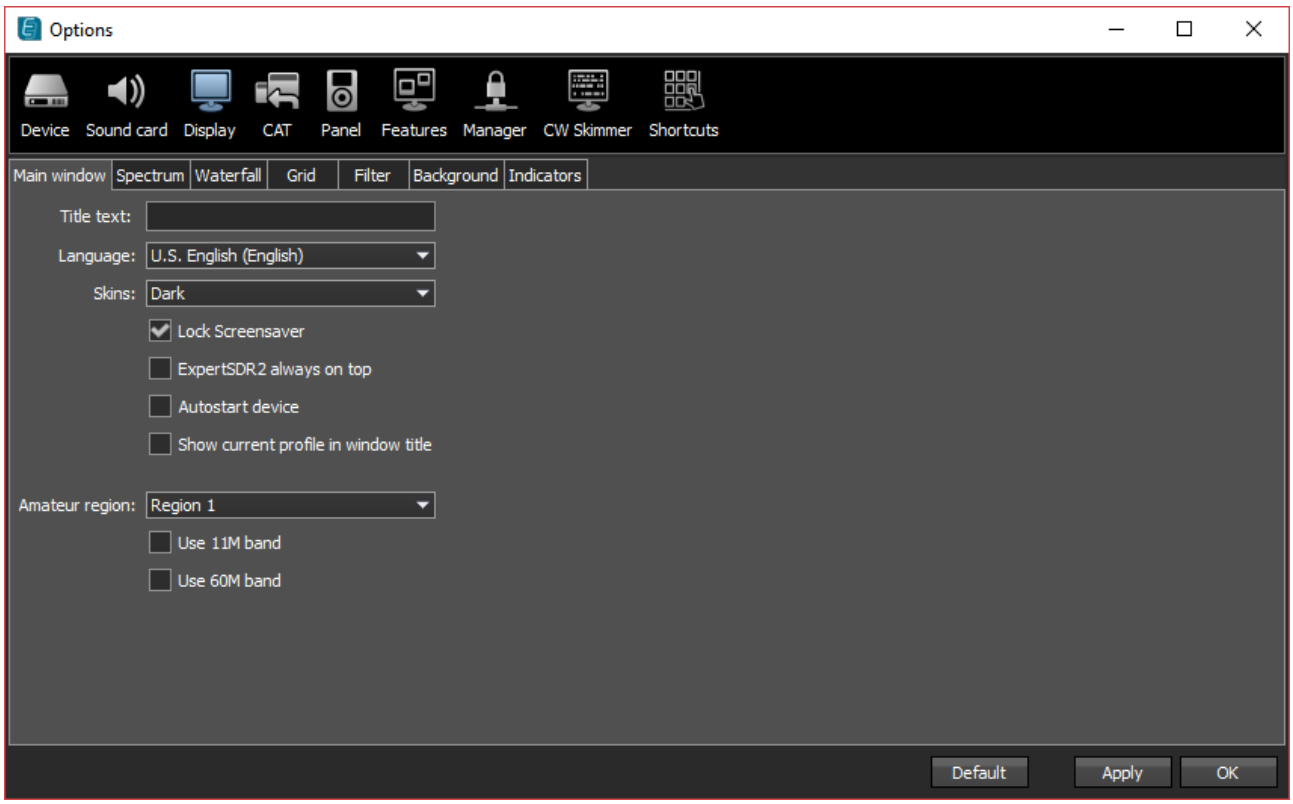
Note! Before you'll enable the Line output by the Enable checkbox, make sure that all sound devices settings are set correctly
You can use the sound card as a sound device - the signal goes out of the transceiver, you can use the virtual audio cable as a sound device - the signal goes in the transceiver in the software, which functions on the internal PC, e.g. in contest log.

2.3. Display menu

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

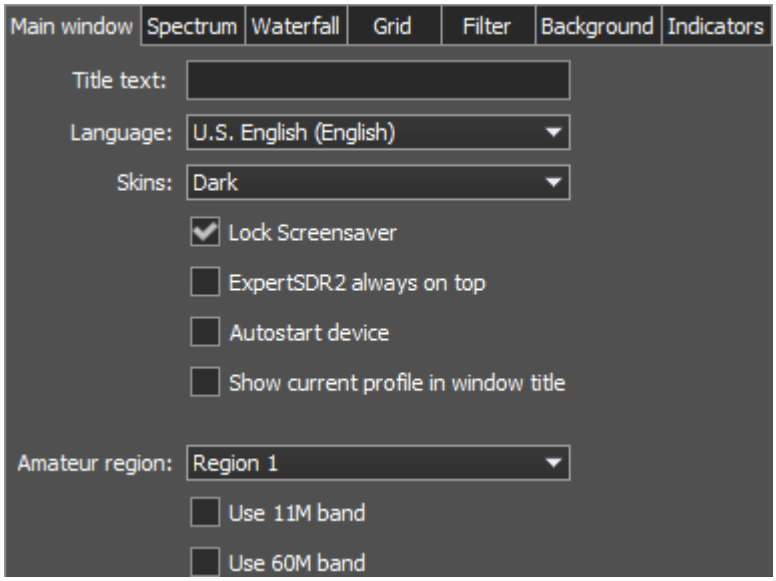
Display settings in the Device menu are placed according to their purposes:

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.

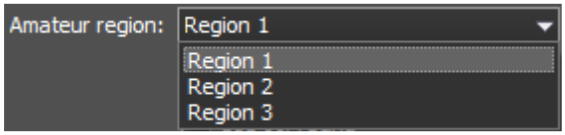
Lock Screensaver - Lock screensaver checkbox. Set the **Lock Screensaver** checkbox to block the display turn off by the Windows OS. **Recommended checkbox setting - on**.

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.

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.

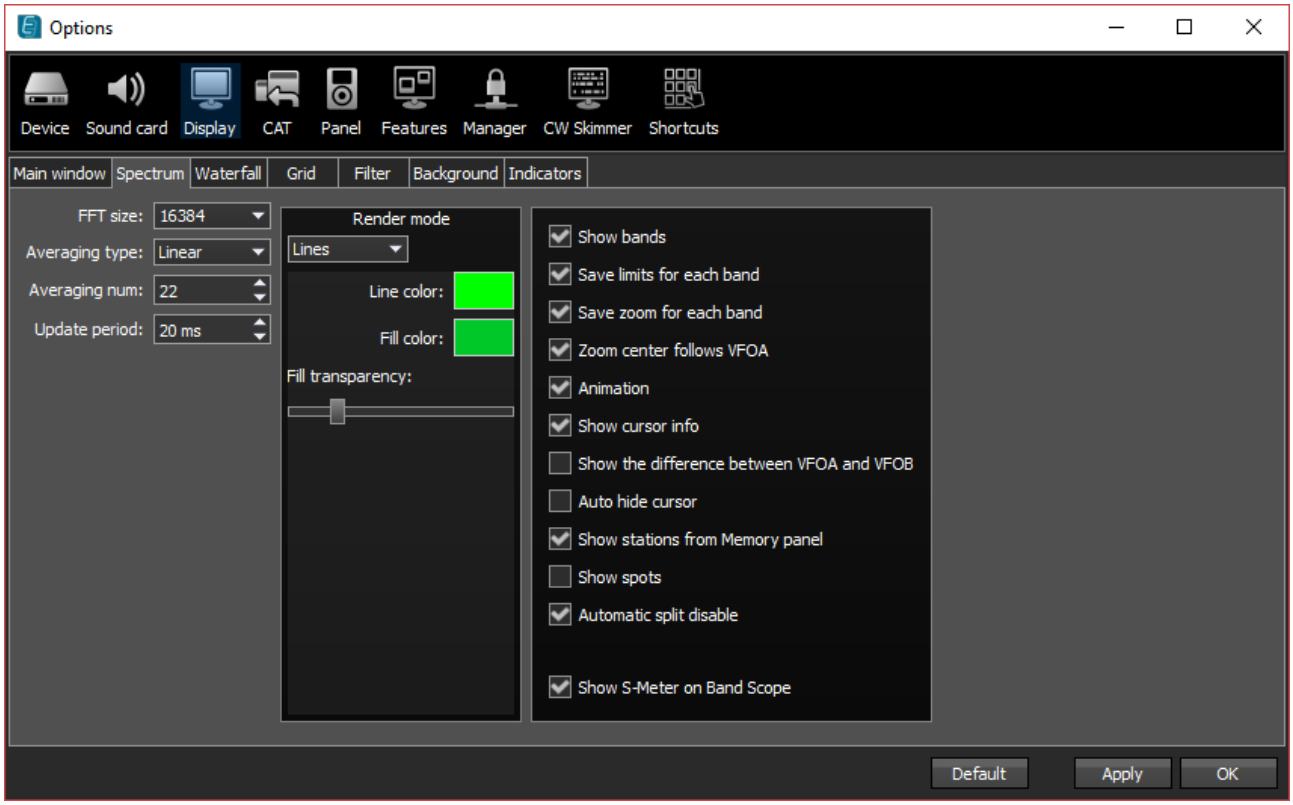
Use 11M band - 11M band enable checkbox. Set the **Use 11M band** checkbox to enable 11Ì band.

Use 60M band - 60M band enable checkbox. Set the **Use 60M band** checkbox to enable 60Ì band.

Note! After you choose the amateur region and/or set the checkbox Use 11M/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. Choose 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 - Amount of samples for averaging. Set the required amount of samples for averaging. The bigger the amount of samples, the slower the specter 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 - Specter render mode: lines, gradient. Set the required specter render mode.

Line color - Spectrum scope line color. Choose the required line color from the palette.

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

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

Show bands - Show amateur bands borders. 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. Set the **Zoom center follows VFOA** checkbox to enable zoom center marker lock on the VFOA position.

Animation - Spectrum scope animation while transition 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.

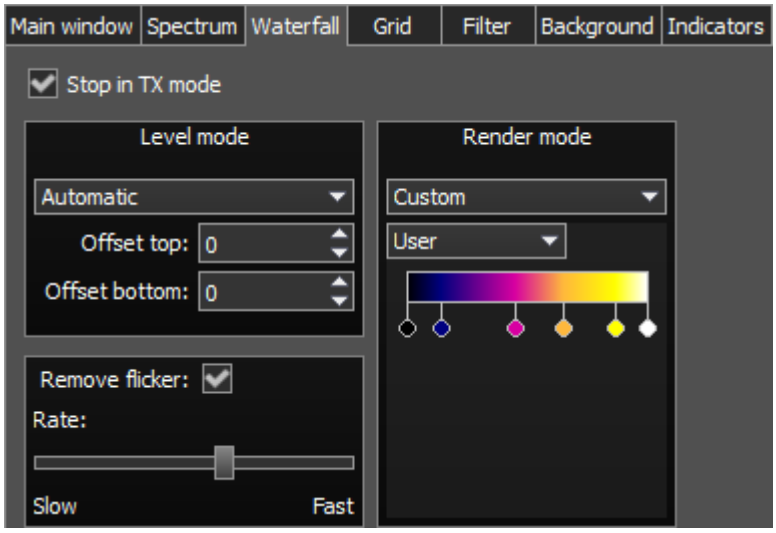
Show spots - Show spots from the CW Skimmer on the spectrum scope. Set the **Show spots** checkbox to show spots from the CW Skimmer on the spectrum scope as markers with call-signs.

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 S-Meter on Band Scope - Show the S-Meter on the 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 color presets: 1,2,3 and User adjustable mode.

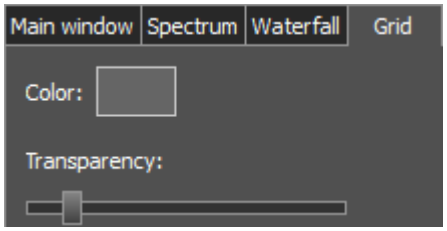
In the User preset there are 6 color markers at maximum. Double click of the left mouse button on the color marker opens the color menu, double click of the right mouse button on the color marker delete it. Double click of the left mouse button on the empty space adds the color marker.

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.

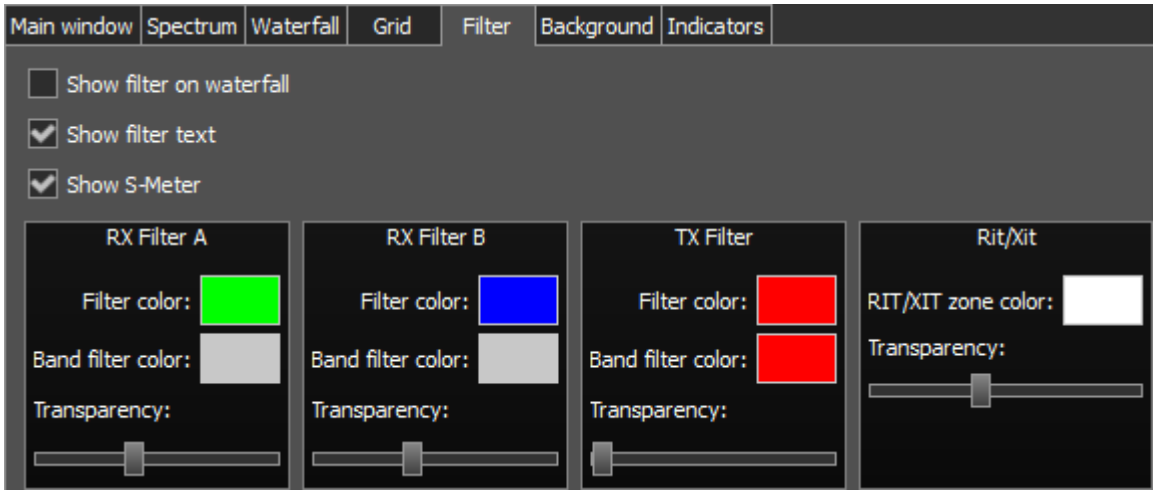


Color - Color of the spectrum scope grid. Choose the required grid color from the palette.

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

2.3.5. Filter tab

In this tab, the color of filters and the necessity to display the additional text information are selected.



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, 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.

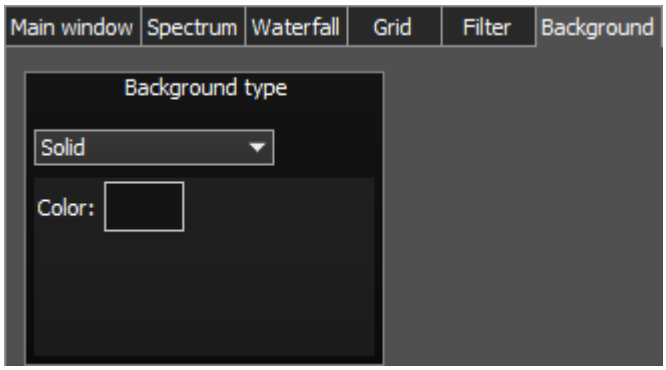
Rit/Xit zone color - RIX/XIT active zone color menu. Choose the required RIX/XIT active zone color from the palette.

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

2.3.6. Background tab

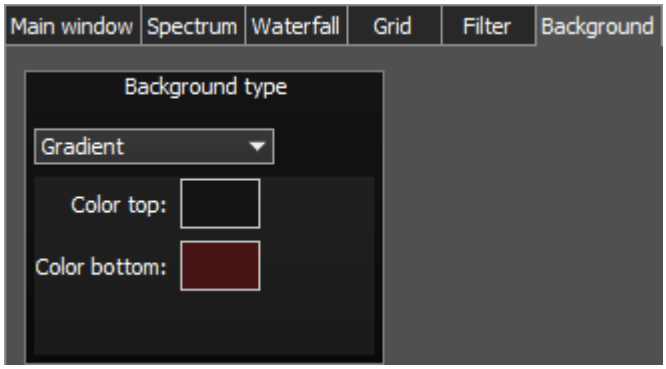
On the **Background** tab you can see the spectrum scope background settings.

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



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

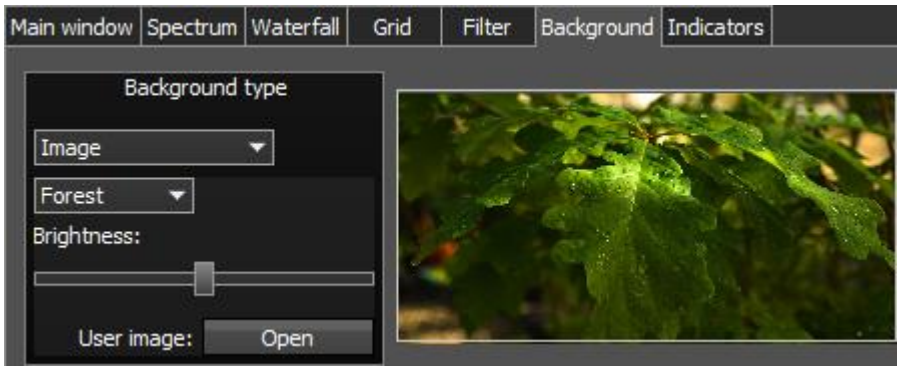
Color – Background color menu. Choose the required background color from the palette.



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 Indicators tab you can change the indication mode of the TX signal power:

Peak – in this mode the power meter shows peak power values.

RMS – in this mode the power meter shows the true RMS power values.

2.4. CAT menu

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

CAT-interface is used to control the transceiver from a third-party software. This could be contest logs, digital modes decoder-software, SAT-tracker etc.

Software receivers 1 and 2 could be controlled separately via the CAT-protocol.

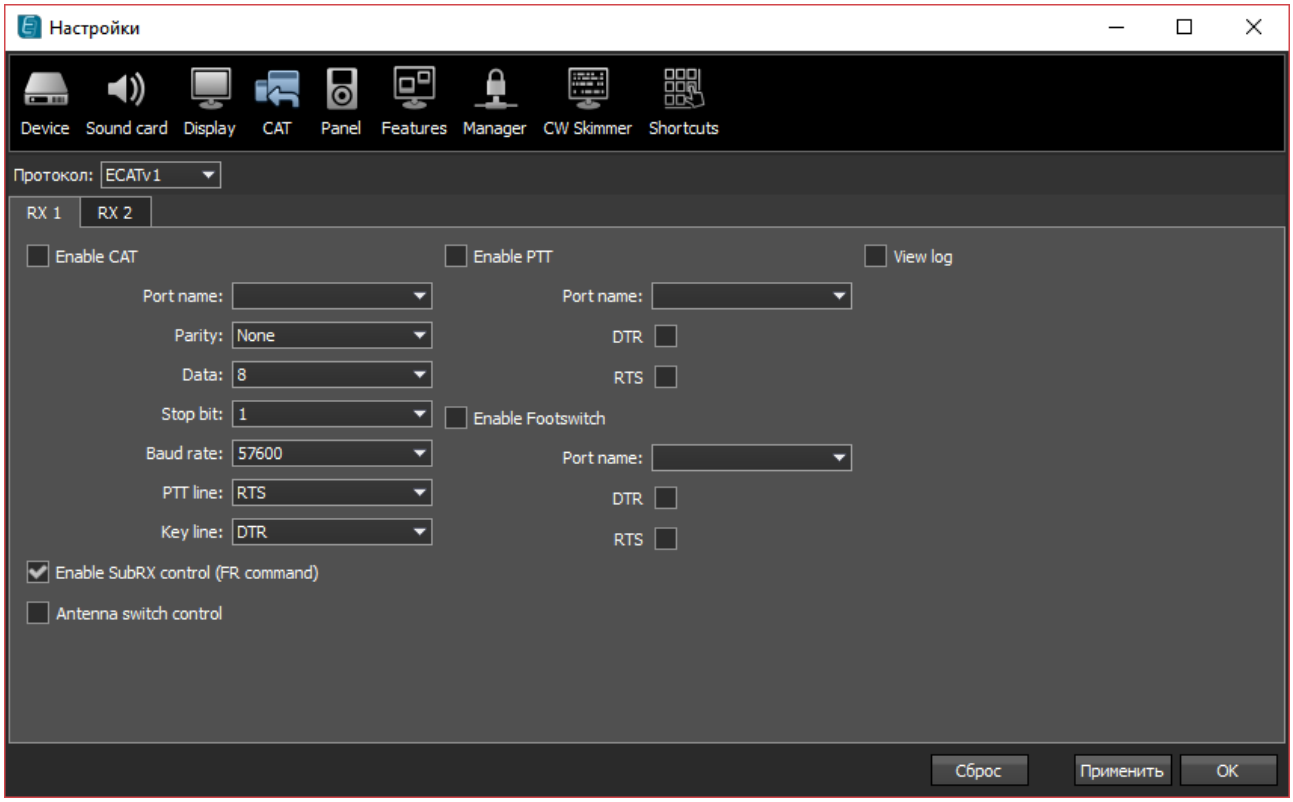
Protocol - Exchange protocol with an external devices or software.

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

Separate settings for RX1 and RX2 available on the corresponding tabs.

2.4.1. RX1 receiver

RX1 tab contains a 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.

DTR/RTS – COM-port line for the PTT 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 subreceiver 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.

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.

Port name – COM-port number.

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

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 checkbox to select them as control.

View log – Display CAT command log

2.4.2. RX2 receiver

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

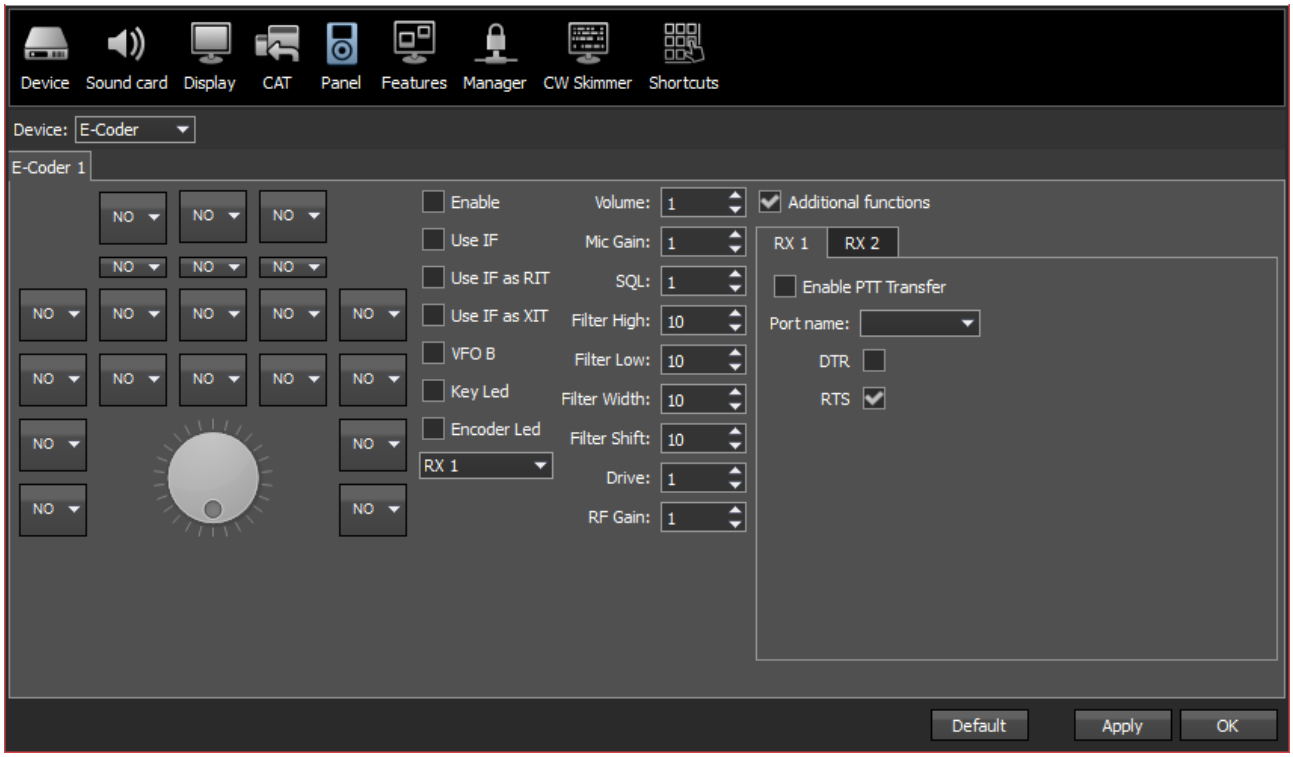
The settings are similar to the RX1 receiver.

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 a 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 on the E-Coder panel buttons:

Unused – button is unused.

Band Up/Down – band switching.

Mode Up/Down – mode switching.

Volume Up/Down – volume adjustment.

Mute – switch off sound.

BIN – enable/disable binaural mode.

NR – enable/disable noise reduction.

ANF – enable/disable analog pick filter.

NB1 – enable/disable noise blanker 1.

NB2 – enable/disable noise blanker 2.

Filter Up/Down – receiver's filter switching.

SQL – enable/disable squelch.

PA – enable/disable power amplifier.

AGC Up/Down – AGC type switching.

Preamp Up/Down – preamp or attenuator level switching.

Step Up/Down – tuning step adjustment.

Zoom In/Out – spectrum zoom modes switching.

MOX – enable/disable manually operated transmit mode.

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.

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

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. Main knob will tune the frequency of one of the receivers.

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

On/Off Sub RX – enable/disable SubRX.

RIT On/Off – enable/disable RIT offset.

RIT Reset – reset RIT offset to 0.

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

XIT On/Off – enable/disable XIT offset.

XIT Reset – reset XIT offset to 0.

Split – enable/disable Split mode.

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

Voice recording – enable/disable voice recording.

RX ANT - enable/disable receive antenna.

LOCK - lock the frequency tuning.

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.

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.

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

Volume - set the volume change step for one knob's clack.

Mic Gain - set the Mic gain change step for one knob's clack.

SQL - set the squelch threshold change step for one knob's clack.

Filter High - set the filter's high limit change step for one knob's clack.

Filter Low - set the filter's low limit change step for one knob's clack.

Filter Width - set the filter's width change step for one knob's clack.

Filter Shift - set the filter's shift change step for one knob's clack.

Drive - set the output level power change step for one knob's clack.

RF Gain - set the RF gain change step for one 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.

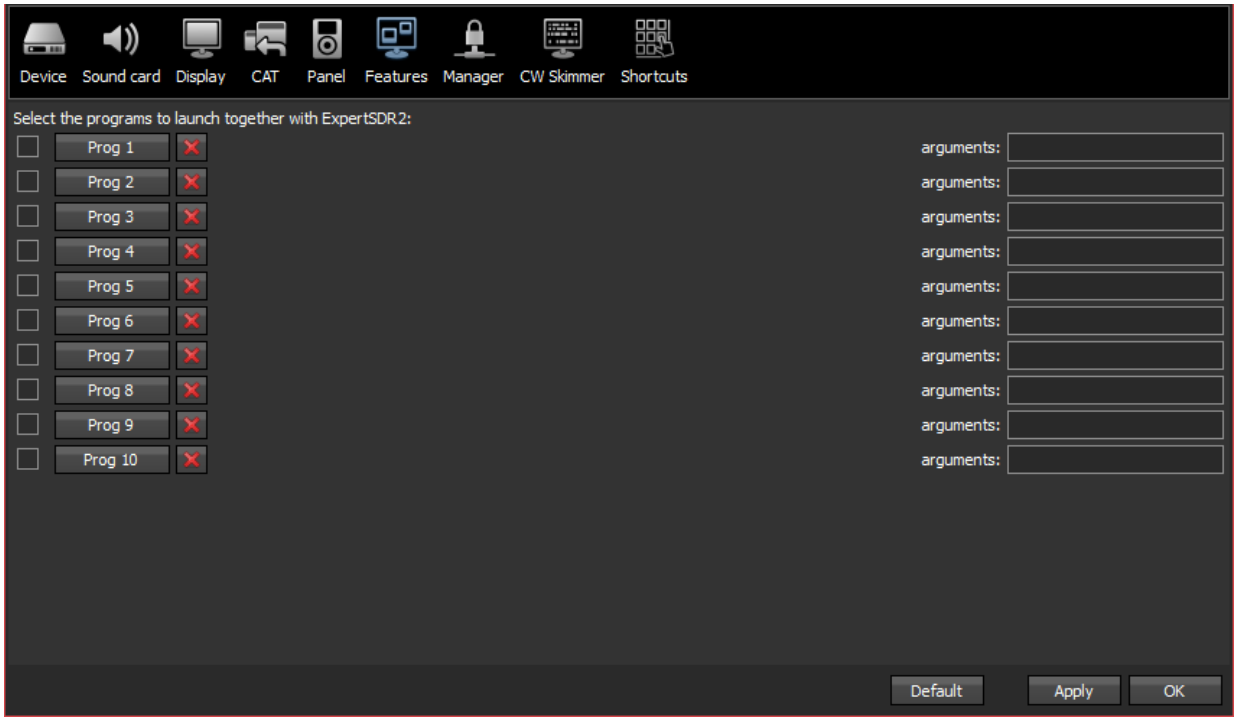
Port name - COM-port number.

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

2.6. Features menu

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

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



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 .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.

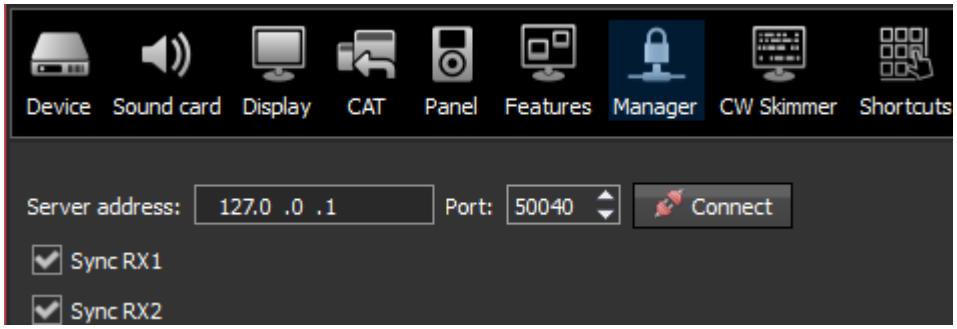
Arguments - Input box to enter the argument after program's launch. Enter some text message in the **arguments** input box for the corresponding program.

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. Manager 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 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. Blue indicator means there is a connection.

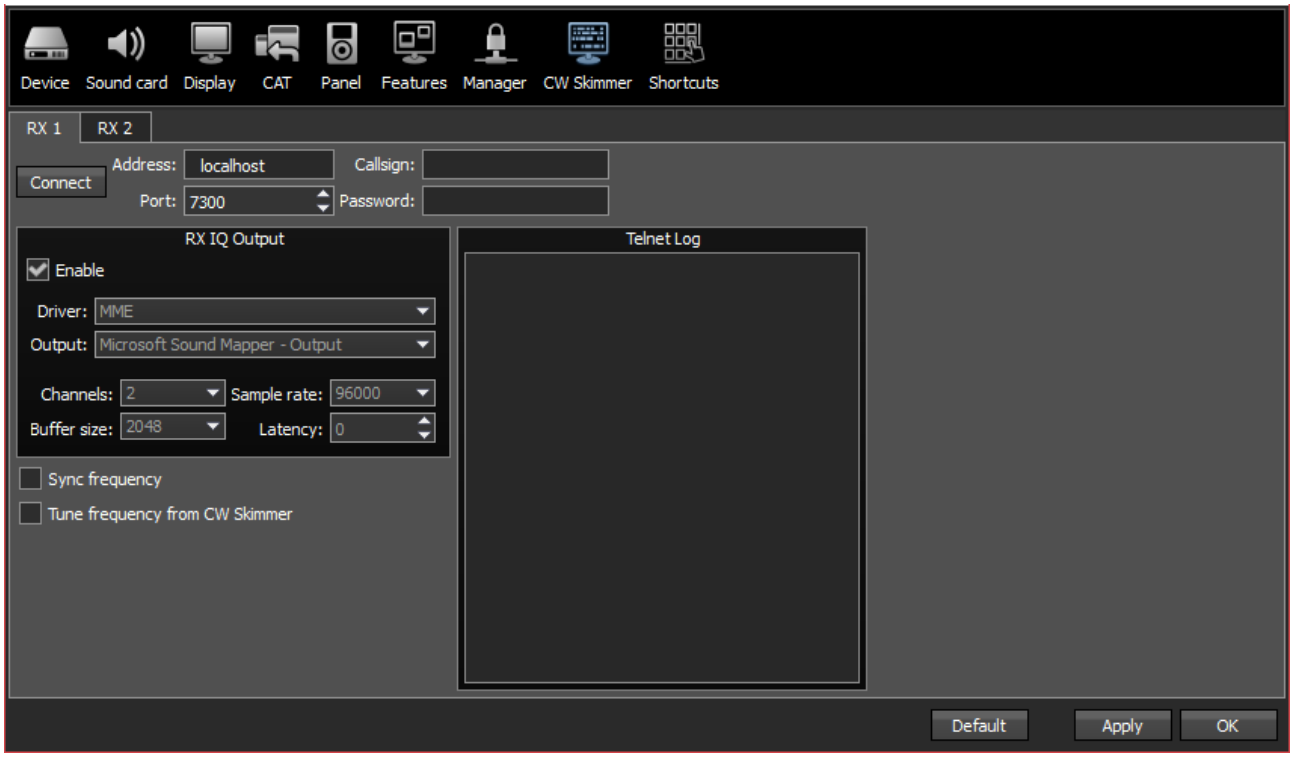
Sync RX1 - RX1 receiver sync button. Set the **Sync RX1** checkbox to synchronize RX1 receiver with remote RX1 receiver.

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

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 server-spotter.

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



Connect - Button to launch the connection with the CW Skimmer software or Internet server-spotter. 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 - Input box of the data exchange port. Enter the exchange port number in the **Port** input box.

Callsign - Callsign input box. 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 EpertSDR2 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 - ExpertSDR2 set the CW Skimmer frequency.

Tune frequency from CW Skimmer - CW Skimmer set the ExpertSDR2 frequency.

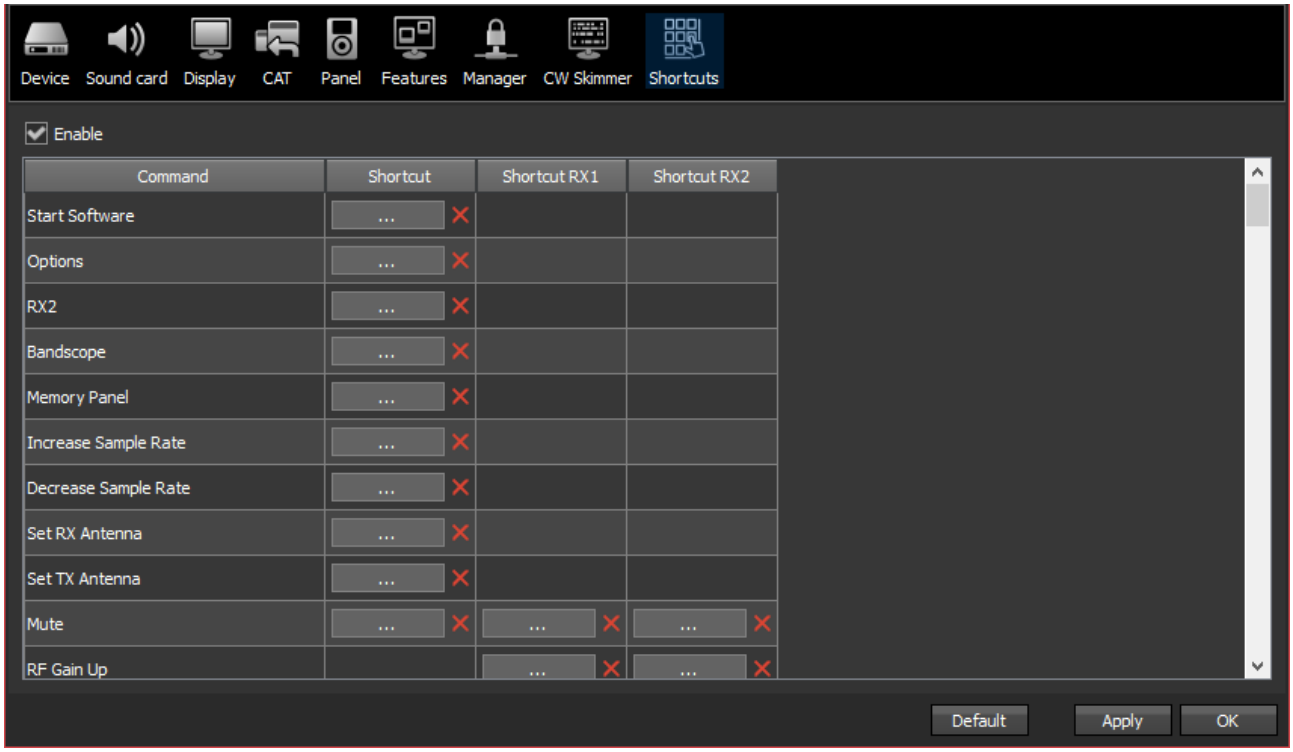
More information of the ExpertSDR2 and CW Skimmer connection described in the guide over the following link: ExpertSDR2_CW_Skimmer.pdf.

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.



Enable - Shortcuts enable button. Set the **Enable** checkbox to activate assigned shortcuts.

Function - Transceiver's functions column. In the **Function** column displayed all transceiver's functions available for shortcuts.

Common Shortcut - Column with the main shortcuts. In the **Common Shortcut** column you can set the main transceiver's functions.

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

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

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

 - Delete shortcut button. Press the Delete shortcut button near the shortcut you want to delete.

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 use our technology, good luck and 73!

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

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