SunSDR2 *PRO*

DUC/DDC HF/6M/VHF SDR Transceiver
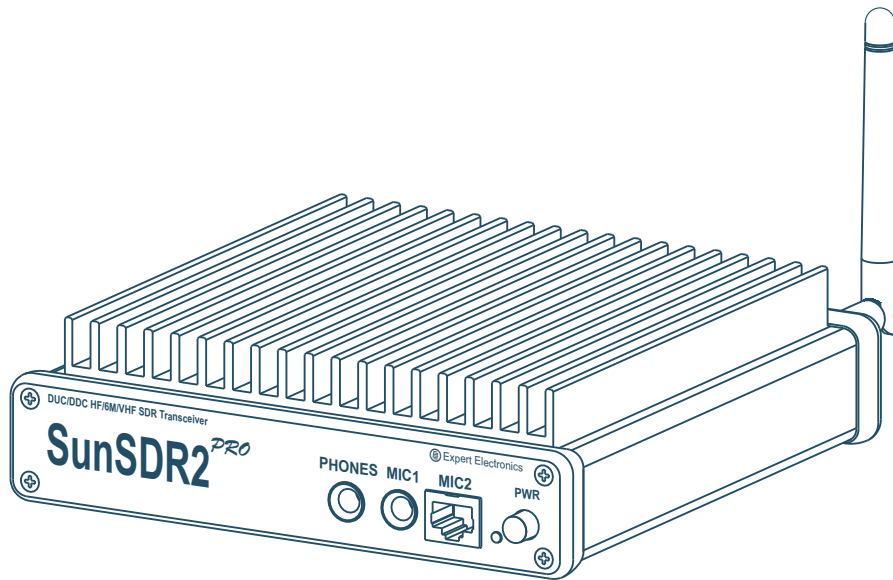
Hardware manual

V1.0

Contents

1. Operating rules

- Visually inspect the SunSDR2 PRO transceiver for the absence of mechanic damages before connecting it to PC;

- Learn attentively the manual, before using the Transceiver. Connecting and operation of the Transceiver without the instructions can bring to the fatal errors;

- If Transceiver was held in the climatic conditions, different from the operational, it is recommended not to switch it on within 2 hours holding it in operational conditions;

- Connecting the Transceiver to a PC should be done in accordance with the connection diagram, given in the Manual;

- Check the presence of the ground connection of the PC and the ground wire of the antenna connector (SMA) of the Transceiver before switching;

- It is forbidden to connect the Transceiver to PC with the voltage presence on it or in the switched condition;

- It is forbidden to use the power supply with the voltage more that +16 V. *Remember! The transceiver's power is the voltage direct current!*

- Before connecting the external devices to connector EXT CTRL read the Manual, learn the tables and the diagrams of connecting the external devices;

- Remember! The transistor switches have the limitations over supply voltage and current, going through them. The power swap is forbidden*;*

- It is forbidden to use the Transceiver in the temperatures lower than 0ºC and higher than +75ºC;

- It is forbidden to use and store the Transceiver in the dusted rooms and on exposure to direct sunlight;

- Avoid exposure of the atmospheric precipitations on the Transceiver. Never spill any liquids (especially aggressive) on the Transceiver;

- It if forbidden to use the Transceiver during storms;

- Don't open the Transceiver. It contains the radio elements, which have the high-sensitivity to the static electricity. This document contains all the necessary information about the internal design to satisfy the curiosity of Users. To repair the Transceiver ask the manufacturer;

- Always unplug the Transceiver's antenna, if you don't control it or if there appear a danger of atmospheric electricity damage;

- Save the Transceiver, cables and wires from the influence of the magnetic pickups (emergency states), out controlled currents and voltages and the domestic animals;

- To exclude the damage of the devices and not to produce the harmful interference on air don't allow to control the Transceiver people with the doubtful reputation;

- Keep out of the reach of children.

2. Technical characteristics

General coverage receiver in HF, MHz	0.09...65
General coverage receiver in VHF, MHz	95...148
Frequency coverage in HF in TX mode, MHz	All amateur frequencies
Frequency coverage in VHF in TX mode, MHz	144...148
Sensitivity, uV	0,07
Maximum transmitter's output power in HF, W	15
Maximum transmitter's output power in VHF, W	7
Blocking dynamic range in HF mode (BDR), dB	129
Blocking dynamic range in VHF mode (BDR), dB	>114
RF ADC clock frequency, MHz	160
RF ADC resolution, bit	16
RF DAC clock frequency, MHz	640
RF DAC resolution, bit	14
Recommended power supply, V	15
Supply voltage range, V	12...16
Local oscillator's stability, ppm	+/- 0.5
Maximum consumption current, A	5
Built-in audio codec resolution, bit	24
ALC input voltage range, V	0..4
Dimensions, mm	165x165x35
Operating temperature, °C	0 to +75
Weight, kg	1,5

3. Work in standard conditions

Standard are considered the conditions, when the transceiver is on the table next to PC. Make the connection of the transceiver over the following steps:

1. Connect headphones and microphone to the transceiver. If you have an electret microphone or PC headset, connect the microphone to jack MIC1. If you have a dynamic microphone, plug it into the jack MIC2. Headphones are plugged into the **PHONES** connector;
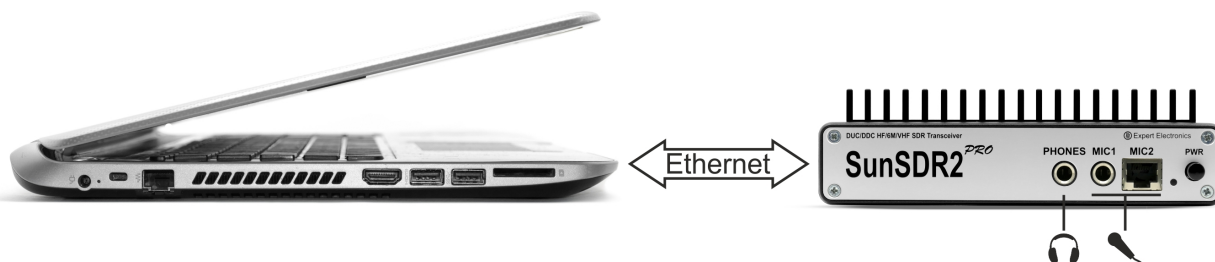

Figure 3.1 – In the standard conditions the headphones and the microphone are connected to SunSDR2 PRO transceiver

2. Connect HF-antenna to connector A3;
3. Set up a LAN connection to a PC;
4. Turn on the transceiver;
5. Open menu **Options**→ **Device** and set the check boxes in accordance with the figure 3.2:
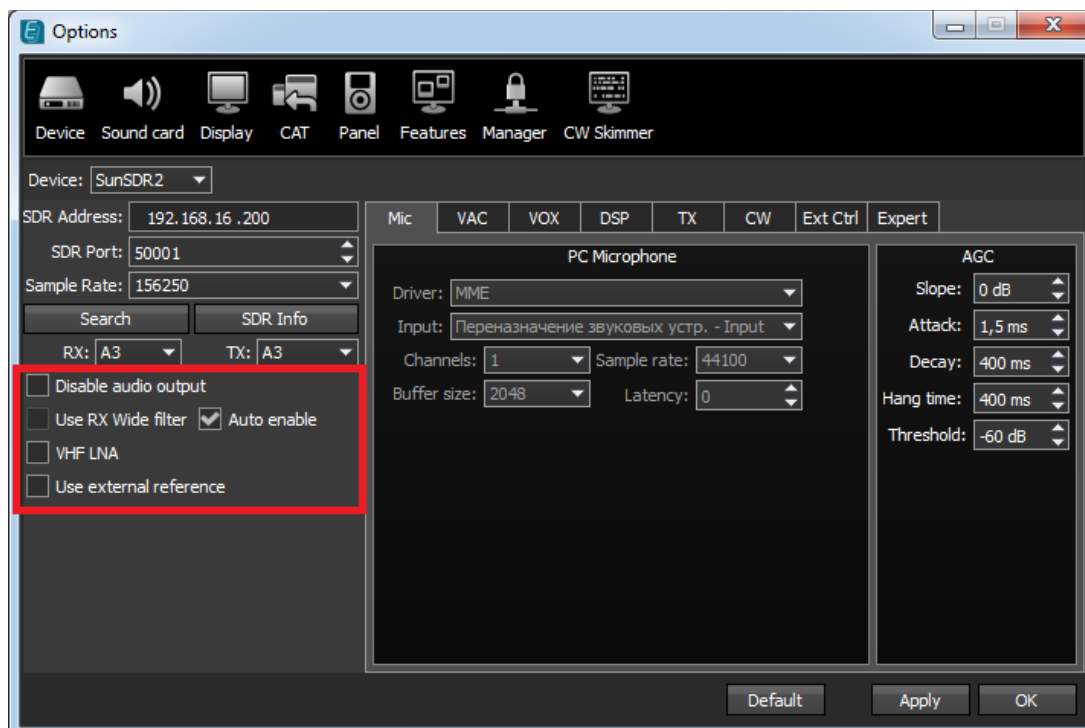

Figure 3.2 – Transceiver's settings

6. In the main ExpertSDR2 software dialogue window specify the connector to which is connected the microphone (see figure 3.3);
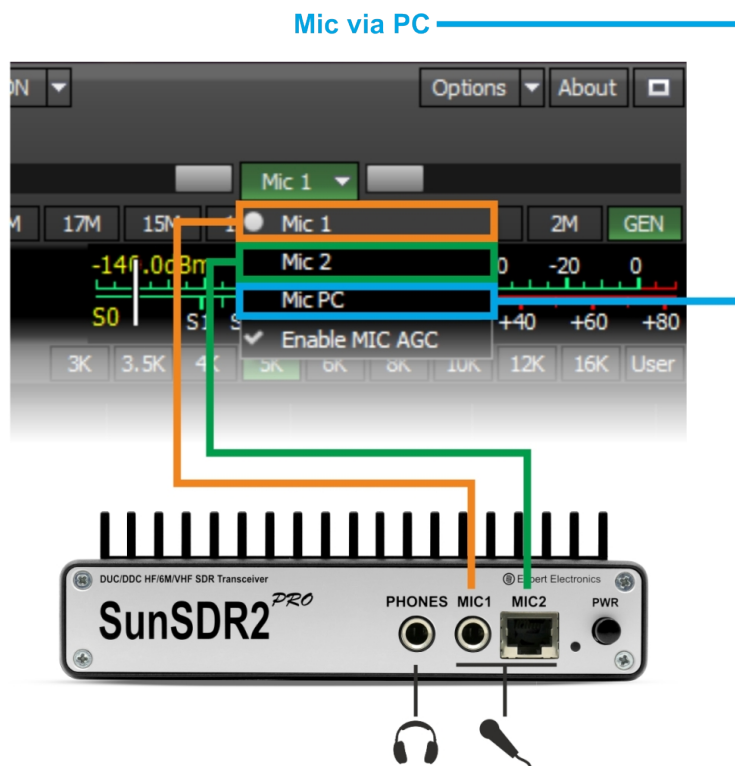

Figure 3.3 –Controlling the microphone inputs of the transceiver

7. Go to **Sound Card** menu and check that the check box enable is removed. See figure 3.4;
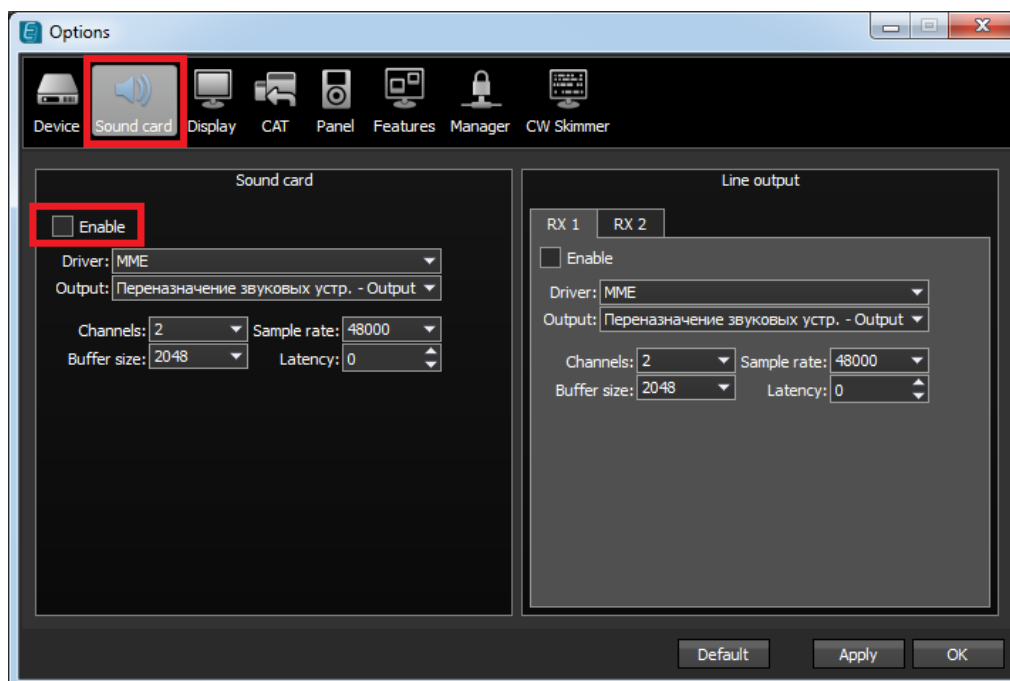

Figure 3.4 – Controlling the microphone inputs of the transceiver

8. Press the button **Start** in the program. If everything is done correct you will see the air noise track.

4. Remote work

Transceiver SunSDR2 PRO has the ability to work remotely.

1. Connect the headphones and microphone or the PC headset to the sound card of the PC (see figure 4.1);
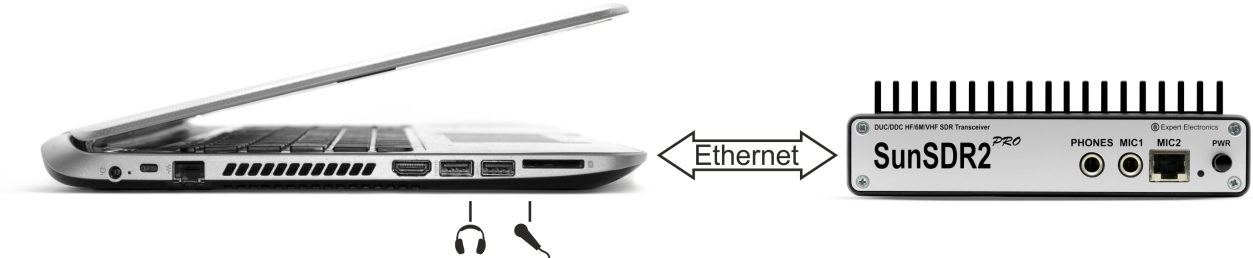

Figure 4.1 – Connecting headphones and microphone when work remotely

2. Connect HF-antenna to connector A3;
3. Set up a wired LAN connection to a PC. For that read the [Getting Started Manual](#) at the manufacturers web-site;
4. Turn on the transceiver;
5. Open menu **Options→ Device** and set the check box in accordance with the figure 4.2:
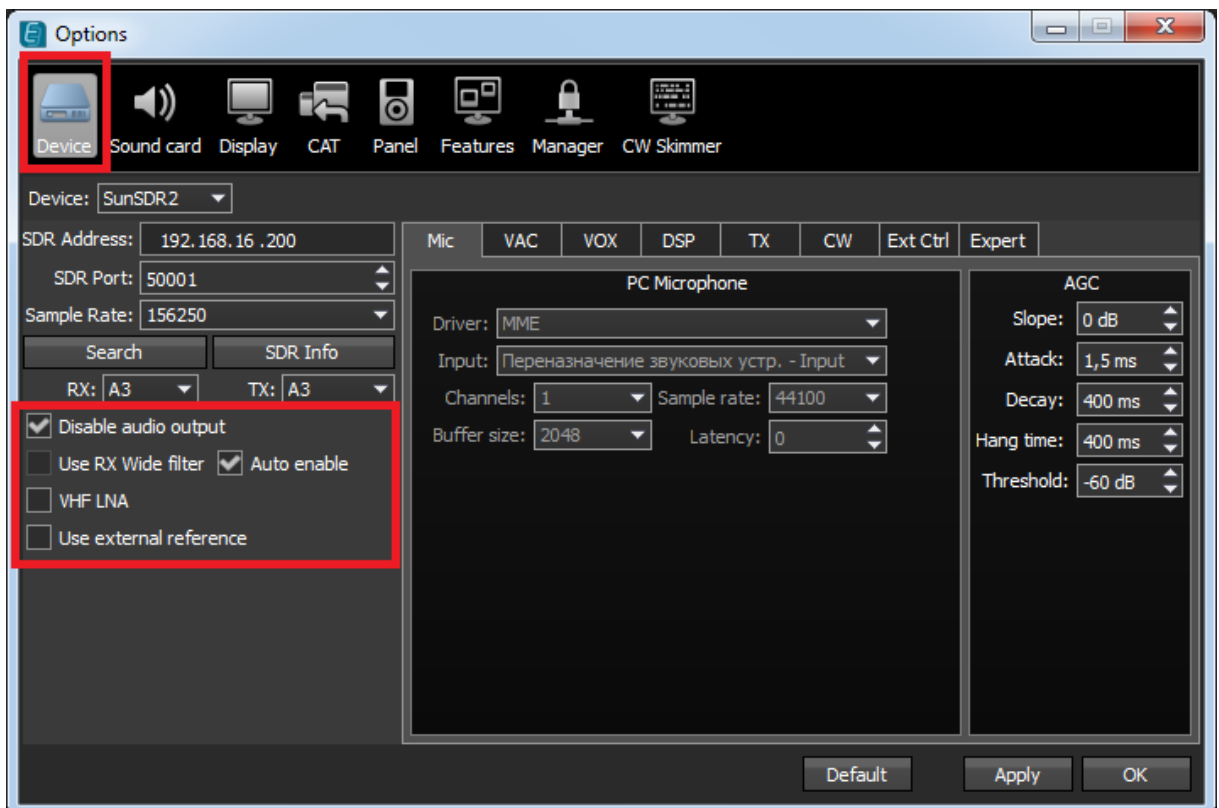

Figure 4.2 – Transceiver's settings

6. In the Sound Card menu choose Driver and select input and output devices and click the check box Enable (see figure 4.3);
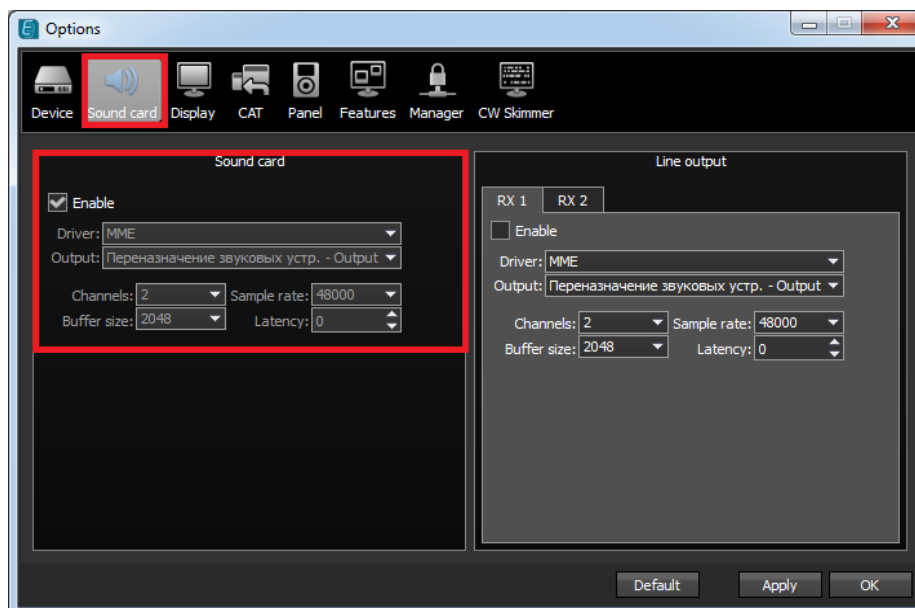
Figure 4.3 – Transceiver's settings

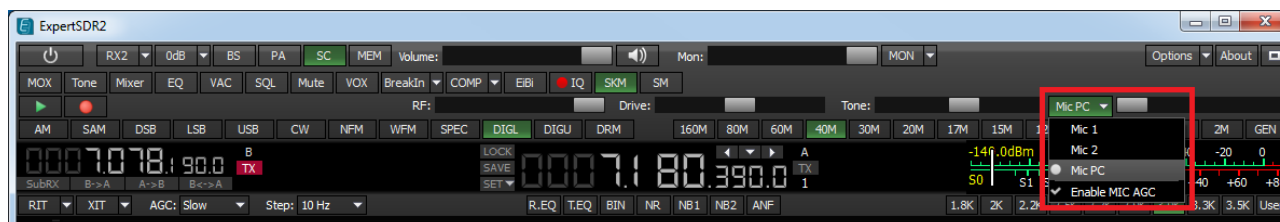7.   Choose MicPC in the drop down menu of the main program window (see figure 4.4);

Figure 4.4 – Choose the microphone connected to PC

Press the **Start** button in the software. If everything is done correctly, you will see the air noise track on the panorama and hear the sound in the headphones. After that transceiver is ready for work.

5. Operation

5.1 Operating controls

Transceiver SunSDR2 PRO has several external operating controls. On the transceiver's front panel (figure 5.1) are placed the connectors for headphones and two types of microphones, dynamic and electret, LED to indicate the work modes and power switch. All the rest operating controls are placed on the rear panel (figure 5.2).
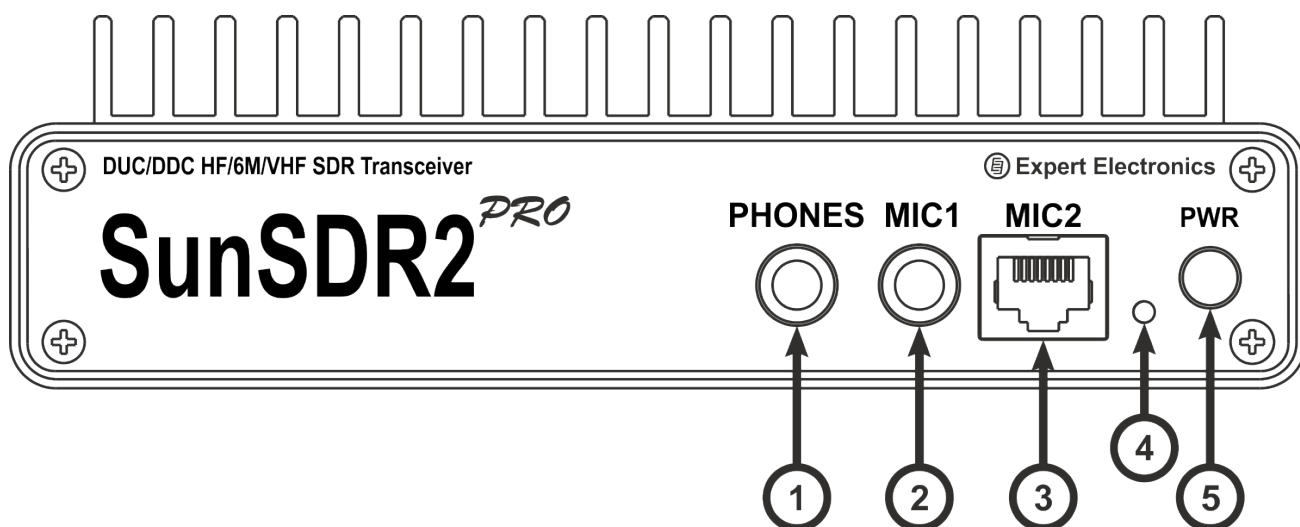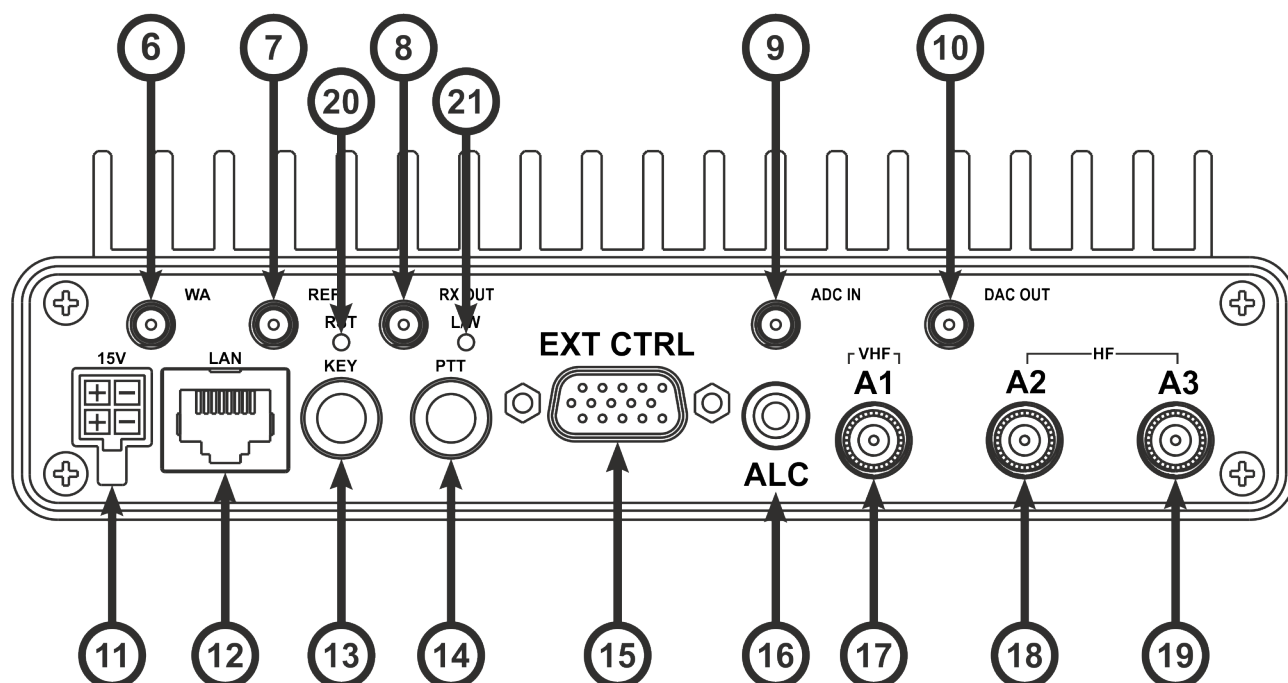

Figure 5.1 – Front panel of the transceiver

Figure 5.2 – Rear panel of the transceiver
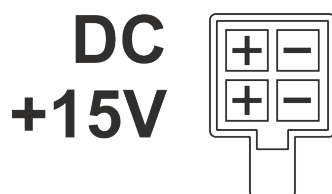
Pin out of the power connector (figure 5.3).

Figure 5.3 – The power connector pinout

Table 1 – Description of the operating controls

№	Operating controls description	Comments
1.	Jack for connecting the headphones	Headphones with the resistance 16-32 Ohm or active dynamics can be connected to this jack
2.	Jack for connecting the electret microphone	Electret microphone of the PC's headset or similar can be connected to this jack
3.	Jack for connecting the dynamic microphone	This jack is intended to connect the dynamic microphone MH-31 or any other dynamic microphone with the connector RJ-45 and corresponding pinout
4	Power indication LED	This indicator shows the working modes of the transceiver: - green color: work via LAN cable; - orange color: work via WiFi (when the transceiver has a WiFi option); - red color: transmit mode is switched on; - blinking green or orange color: the network search.
5.	Power button	This button switches on and off the transceiver's power
6.	Connector for connecting compact WiFi antenna	This connector is installed when the transceiver has a WiFi option
7.	Input of the external reference oscillator 10MHz 10 MHZ CMOS level input	Voltage with the amplitude 10..13 dB/mW and frequency 10MHz can be energized to this input. **Warning!** Improper use or high voltage supply on it can put the transceiver out of operation!
8.	RX OUT	Output of the internal receiver's front-end **Warning!** Improper use or high voltage supply on it can put the transceiver out of operation!
9.	Connector of the ADC uncomplemented input	This connector is intended for connection the external signal sources to the input of high-speed ADC directly, bypass all the filters. **Warning!** Improper use or high voltage supply on it can put the transceiver out of operation!
10.	Connector of the direct output of high-speed DAC	Connector is intended for direct connection of the external devices to the output of the high-speed

		DAC, bypass all the filters, amplifiers, etc. **Warning!** Improper use or high voltage supply on it can put the transceiver out of operation!
11.	Power connector	Connector is intended for connection of unipolar power source with voltage +15V and maximum load current 5A. Transceiver has the embedded shutdown from the power polarity reversal.
12.	LAN connector	Connector is intended for connecting the transceiver to the local network via LAN cable
13.	Telegraph key connector (CW)	Connector is intended for connecting the telegraph key
14.	PTT footswitch connector	Connector is intended for connecting the PTT footswitch
15.	External control connector (EXT CTRL)	Connector is intended for controlling the external devices, pinout is shown at the figure 6.3 **Warning!** Improper use of this connector can put out the keys with open collector and the transceiver in whole!
16.	ALC input	ALC input for external power amplifier
17.	Connector A1 for connecting VHF antenna	Connector is intended for connection the VHF antenna. Antenna should be connected to this connector when receipt and transmit of signals with the frequencies from 80 MHz. **Note!** All the antennas from connectors A2 and A3 should be disabled during the VHF receipt!
18, 19.	Connectors for connecting HF antenna	HF antennas should be connected to this connector when receipt below the frequencies 80 MHz. Controlling the antenna switch is done from ExpertSDR2 software.
20.	Button to reset IP-address settings	This button is intended to reset the IP-address and UDP-ports of the transceiver on the ip default values: 192.168.16.200, ports: 50001, 50002. Instruction how to reset is given in Clause 5.2.
21.	Button to switch the operating modes "local network/ WiFi"	This button is intended to switch the transceiver into LAN or WLAN working mode. If WLAN option is not set, transceiver won't work when the WLAN mode is switched on. Single pressing the button changes the working mode.

5.2 Default Settings

Sometimes it is necessary to reset the transceiver's settings on default, that is IP-address and the UDP-port numbers, on the values set by default. This procedure is done in several steps. To reset the settings do the following actions, given below:

1. Switch off the transceiver's power supply;
2. Press **RST** button on the rear panel of the transceiver and hold it. You will hear a light click;
3. Switch on the transceiver's power supply. The LED will blink different colors (green and red);
4. Release **RST** button;
5. Wait till the LED start burning green color. This means that the process of reset the transceiver's settings on default is done;
6. Reset is successfully done.

In rare cases it is necessary to make the "deep" reset. For that do the following steps:

1. Switch off the transceiver's power supply;
2. Press simultaneously the buttons **L/W** and **RST** on the rear panel of the transceiver and hold them;
3. Switch on the transceiver's power supply. The LED will blink different colors (green and red);
4. Release **RST** and **L/W** buttons;
5. Wait till the LED start burning green color;
6. This means that the process of "deep" reset of the transceiver is successfully done.

After the reset procedure transceiver will have the IP-address by default 192.168.16.200 and the used ports 50001 and 50002.

Note! It is forbidden to switch off the transceiver's power supply while the LED won't stop blinking.
After switching on the RST button won't be active. Pressing it doesn't have any effect.

6. Terminal descriptions

6.1 EXT CTRL pinout

Connector EXT CTRL is intended for controlling the external devices, such as power amplifiers, antenna switching units and tuners, block of narrow band pass filters. Control is done directly from SDR-software. At figure 6.1 is given the layout of the connector at the transceiver's rear panel and its pinout.
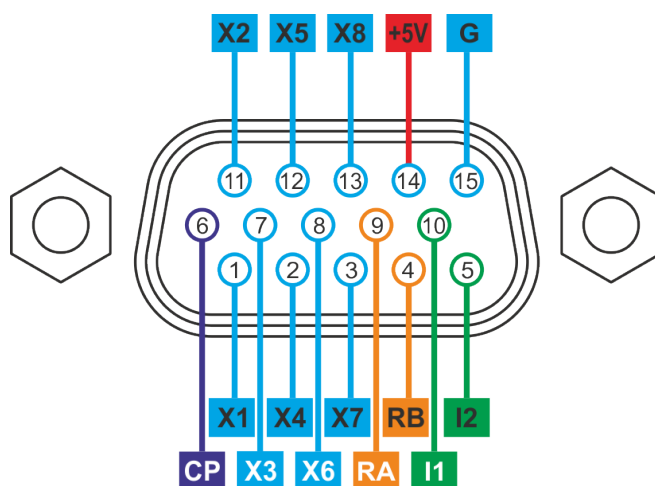

Figure 6.1 – Layout and pinout of the EXT CTRL connector

Table 2 – Pin description of the controlling connector EXT CTRL

No.	Pin Name	Description
1.	X1 – X7	Pins of the programmable keys with open collector
2.	X8	A pin of the key with open collector for controlling PTT power amplifier
3.	CP	Protective diode pin
4.	+12V	Pin for power supply +12V, current up to 0.5 A **Attention!** It is forbidden to connect the loads with the current more than 0.5 A, it can bring to the transceiver's breakdown
5.	G	Transceiver's ground terminal
6.	I1, I2	Pins for connecting the button sensors, works on the input
7.	RA, RB	Interface pins RS485

6.2 MIC1 pinout

Connector MIC1 is intended for connection the electret microphone, PC headset or any other electret microphone, which is intended to work with PC. Connector JACK6.3 to JACK 3.5 is used for connection (included into the set). Circuit diagram for the electret microphone is shown at the figure 6.2.
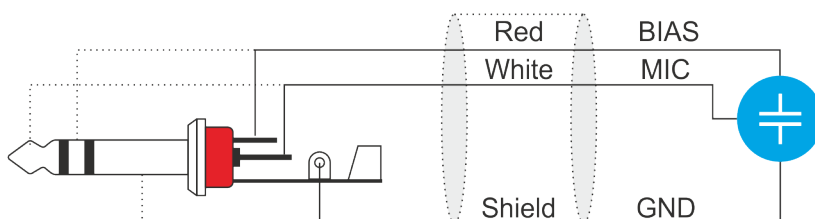
Figure 6.2 – JACK 6.3 мм connector pinout for connection to MIC1

6.3 MIC2 pinout

It is known that dynamic microphones are less sensitive to the extraneous noises due to greater focus. Those microphones as a rule have a higher speech quality and signal/noise rate on transmission.

MIC2 connector is intended to connect the dynamic microphones. This connector has a pinout which corresponds to the dynamic microphone Yaesy MH-31a8J. At the figures below you can find the appearance of Yaesy MH-31a8J (figure 6.3), PTT diagram (figure 6.5) and the direction of numbering (figure 6.6).

Figure 6.3 – The appearance of the PTT Yaesu MH-31a8J.

The PTT diagram consists of the dynamic microphone and the minimum amount of details. It includes

the UP, DWN and FST buttons for which can be specified the software functions and the button PTT which moves the transceiver in transmit mode. The slider tone at the rear side of the PTT Yaesu MH-31a8J in SunSDR2 PRO transceiver is not supported and should always be in position 2 (figure 6.4).

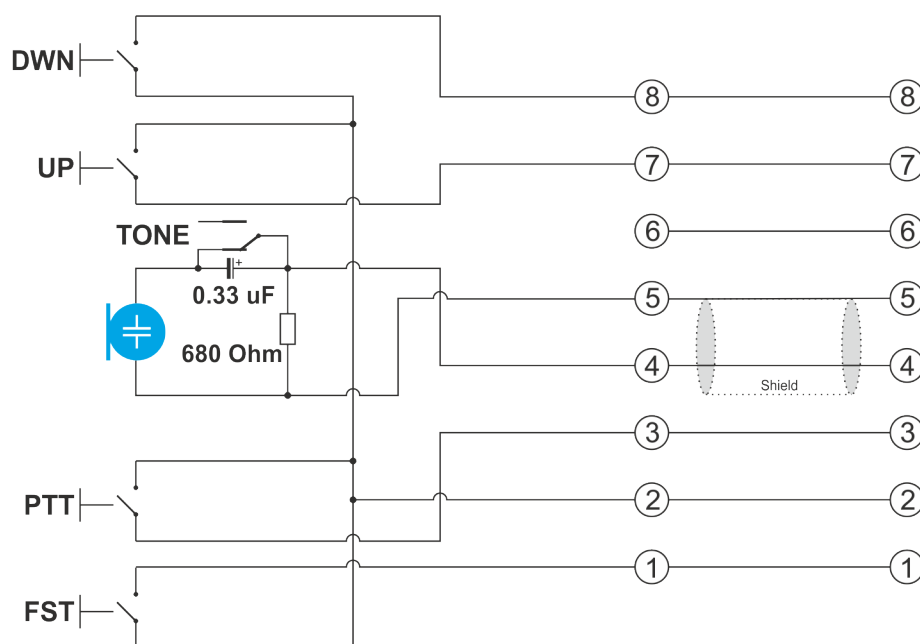Figure 6.4 – Rear panel of the PTT Yaesu MH-31a8J

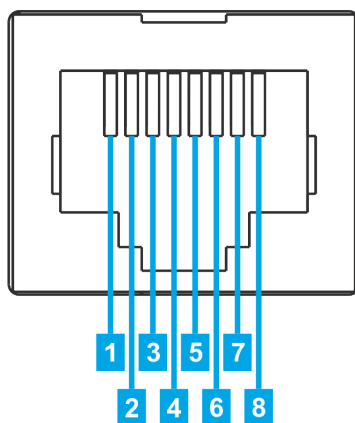Figure 6.5 – Pin description of the dynamic microphone connector

Figure 6.6 – Pin description of MIC2 connector and the direction of numbering

6.4 PTT footswitch cable pinout

The PTT footswitch is intended for switching the SunSDR2 PRO transceiver into transmit mode. Cable pinout is given at figure 6.7, appearance – figure 6.8.
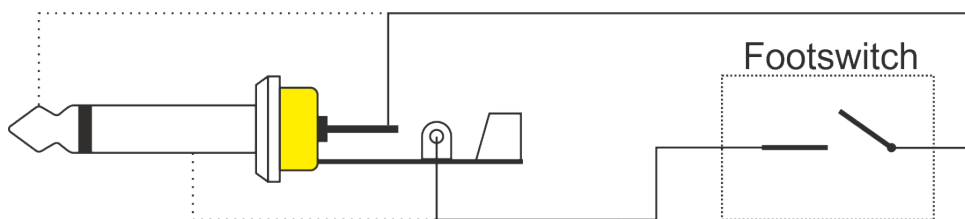

Figure 6.7 – Cable pinout for connecting the PTT footswitch

Figure 6.8 – PTT footswitch appearance

6.5 CW-keyer connector pinout

As different CW-keyers have different connectors, the cable for it should be produced individually. For connection to PC the JACKs 6,5 mm are also used. The jack pinout is given at the figure 6.9.
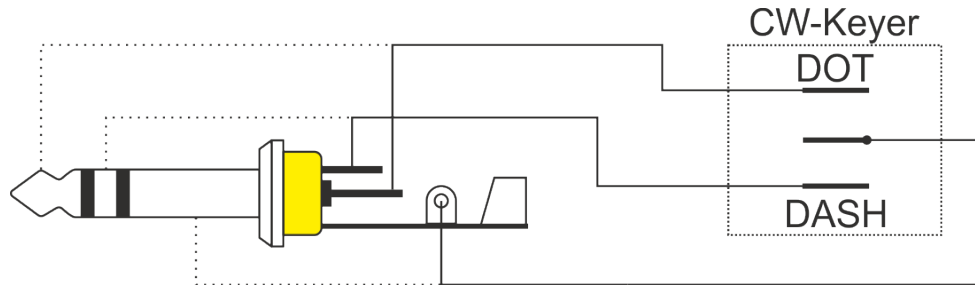

Figure 6.9 – CW-keyer connector pinout