JL OJLITER

OL-SD20A

SDR Transceiver

User Manual

Contents of this manual

1. Disclaimer for Proper Use of Amateur SDR Transceiver

⚠️ Please read the following disclaimer and both the Software and Hardware licenses carefully before using the SDR transceiver

- Proper Connection and Installation

The connection and installation of the SDR transceiver are the sole responsibility of the user. It is crucial that all connections are made by the user in accordance with industry standards and best practices to ensure the safety and proper functionality of the equipment.

- Liability

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- Warranty and Damage

In the event of equipment damage, if it is determined that the cause of damage was improper use or incorrect connection by the user, Olliter SAgl will not honor any warranty claims. Users are strongly encouraged to follow all usage instructions and safety guidelines to prevent voiding the warranty.

- Electrostatic Discharge (ESD) Precautions

Users must take appropriate precautions to protect the SDR transceiver from electrostatic discharge (ESD). Failure to implement ESD protection measures can result in permanent damage to the device. ESD precautions include, but are not limited to, using an ESD wrist strap when handling connectors or any interface of the device, properly grounding all equipment, and working on an ESD-safe surface.

- Safety and Compliance

Users must ensure that their use of the SDR transceiver complies with all local laws and regulations. This includes adhering to frequency allocation rules, power output restrictions, and any other regulatory requirements pertaining to the operation of amateur radio equipment.

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The hypothetical commands `show w' and `show c' should show the appropriate parts of the General Public License. Of course, your program's commands might be different; for a GUI interface, you would use an "about box".

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The GNU General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Lesser General Public License instead of this License. But first, please read <https://www.gnu.org/licenses/why-not-lgpl.html>.

- Contact information

For any questions regarding the Software license terms, please contact us at:

Olliter Laboratory SAgl

Amsler 1,

CH-7304 Maienfeld

Or, via email at the following address:

legal@olliter.com

3. Hardware license

The hardware component, comprising the SDR device and associated accessories, is manufactured by Olliter SAgl. Our engineers have meticulously designed, developed, and tested this product to optimize performance as an amateur radio communication device.

- Intellectual property rights

Olliter SAgl retains exclusive ownership of all intellectual property rights pertaining to the hardware's design and implementation. This agreement grants you a limited license to use the hardware, but ownership remains with Olliter SAgl.

- Warranty disclaimer

Olliter SAgl offers a limited warranty covering manufacturing defects. The warranty period aligns with applicable consumer protection laws in your jurisdiction. For precise warranty details, please consult the consumer protection regulations in your country of residence.

This warranty does not encompass damages resulting from misuse, accidents, unauthorized modifications, or ordinary wear and tear (including but not limited to knobs, switches, and fuses).

- Right to repair

In compliance with EU regulations, Olliter SAgl will provide spare parts and repair manuals for a minimum of two years post-product discontinuation or until component availability from our supplier's ceases. We are committed to exploring alternative repair solutions during this period.

While federal Right to Repair legislation may not exist in all non-EU countries, certain states have enacted their own laws. Olliter SAgl will adhere to applicable Right to Repair regulations in our markets. Our aim is to empower users with the necessary information and resources to maintain device functionality for an extended period.

- Requesting hardware assistance

To report a defect, please contact hello@olliter.com for technical support or authorized repair center information.

- License grant

Olliter SAgl grants you a non-exclusive, non-transferable, limited license to use the hardware solely for its intended purpose as outlined in the accompanying documentation. This license includes the right to:

— Access and repair the hardware using readily available tools and parts.
— Seek repair services from independent repair shops in addition to Olliter SAgl's authorized service providers.

- Restrictions

By utilizing the Olliter SDR transceiver, you agree to:

— Refrain from reverse engineering the hardware for purposes other than repair or security research (unless authorized in writing by Olliter SAgl).
— Avoid modifying, adapting, or creating derivative works based on the hardware that infringe upon Olliter SAgl's intellectual property rights.
— Preserve all proprietary notices and labels on the hardware.

- Limitation of Liability

To the fullest extent permitted by law, Olliter SAgl shall not be held liable for any indirect, incidental, special, consequential, or punitive damages, including but not limited to loss of profits, revenues, data, use, goodwill, or other intangible assets, arising from:

— Our use or inability to use the hardware.

— Unauthorized use or alteration of the hardware.

— Other hardware-related issues (including but not limited to static discharge, improper external device connections, fire, or weather-related incidents).

- Indemnification

You agree to indemnify and hold harmless Olliter SAgl from any claims, liabilities, damages, losses, expenses, including reasonable attorney fees, arising from your hardware use or agreement violations.

- Termination

This agreement remains in effect until terminated by either party. Your failure to comply with agreement terms automatically terminates your rights without notice. Upon termination, you must cease all hardware use and destroy accompanying documentation.

- Governing law

Swiss law governs this agreement, excluding conflict of law principles. Any legal disputes arise exclusively in Swiss courts.

- Entire Agreement

This agreement constitutes the entire understanding between you and Olliter SAgl regarding hardware use, superseding all prior or contemporaneous agreements (written or oral).

- Amendments

Olliter SAgl reserves the right to modify this agreement with prior notice. Continued hardware use post-amendment implies acceptance of the revised terms.

- Contact information

If you have any questions about this hardware agreement, please contact:

Olliter Laboratory SAgl

Amsler 1,

CH-7304 Maienfeld

Or, via email at the following address:

legal@olliter.com

4. Important user notice

This radio is designed to comply with your country's radio regulations. It operates on frequencies allocated exclusively for amateur radio use. To legally operate this radio, you must possess a valid amateur radio license of the appropriate class issued by your government.

Radio frequency (RF) emissions from transmitters can potentially interfere with electronic devices, including pacemakers and defibrillators. If you suspect any interference with your medical device while operating this radio, immediately cease transmission and seek medical attention if necessary.

5. Introduction

The main purpose of this guide is to help you configuring for the first time your Olliter SDR Transceiver.

This guide may not fully cover the hardware configuration of the device or every feature available on the software, it will cover the first steps to connect the SDR transceiver, receive and transmit.

6. Device overview

This chapter covers the input and output of the Olliter SDR transceiver to guide the user when interfacing with external devices.

- Front panel
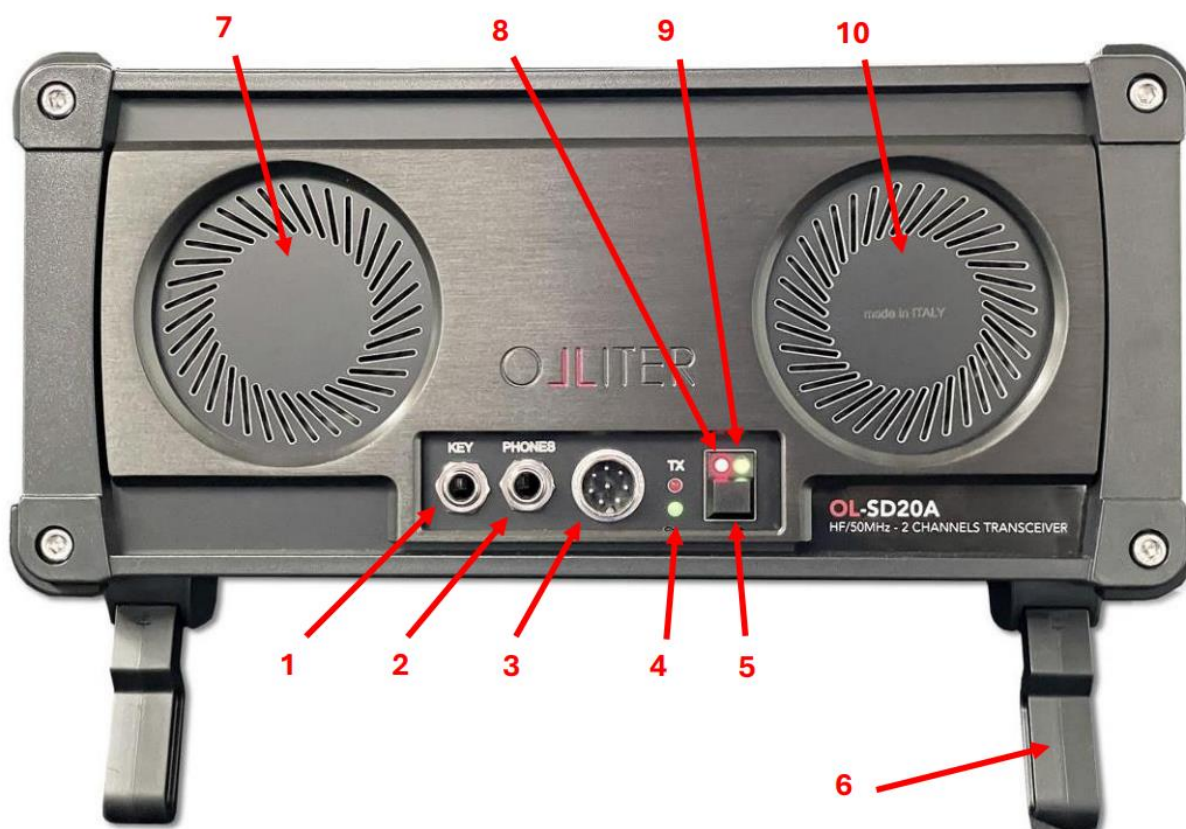
1. Morse key input
2. Headphones output
3. Microphone input
4. Connection LED
5. Power button
6. Adjustable legs
7. Left speaker
8. Standby LED
9. Power-on LED
10. Right speaker

o   Front panel LEDs

The front panel offers four different LEDs, each LED have a different meaning
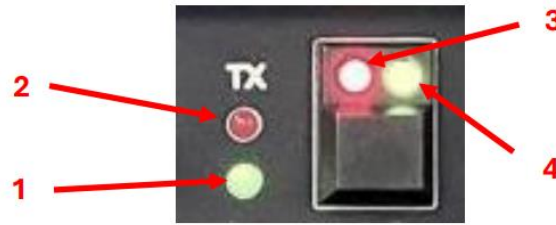
1. Connection status: this LED is ON when OL-Master is communicating with the transceiver
2. Transmission: this LED is ON when the device is transmitting
3. Stand-by: this LED is ON when voltage is applied to the device
4. Power-on: this LED is ON when the power button is pressed and stays on when the device is operating (even if not communicating with OL-Master)

If the Power-on LED is not turning on when pressing the power button, please refer to the Troubleshooting chapter of this manual

o   Front speakers

These speakers are controlled by OL-Master and can be used to play the demodulated signal that is tuned. The onboard speakers can be enabled or disabled from OL-Master, volume control is also provided by the software

- Back panel
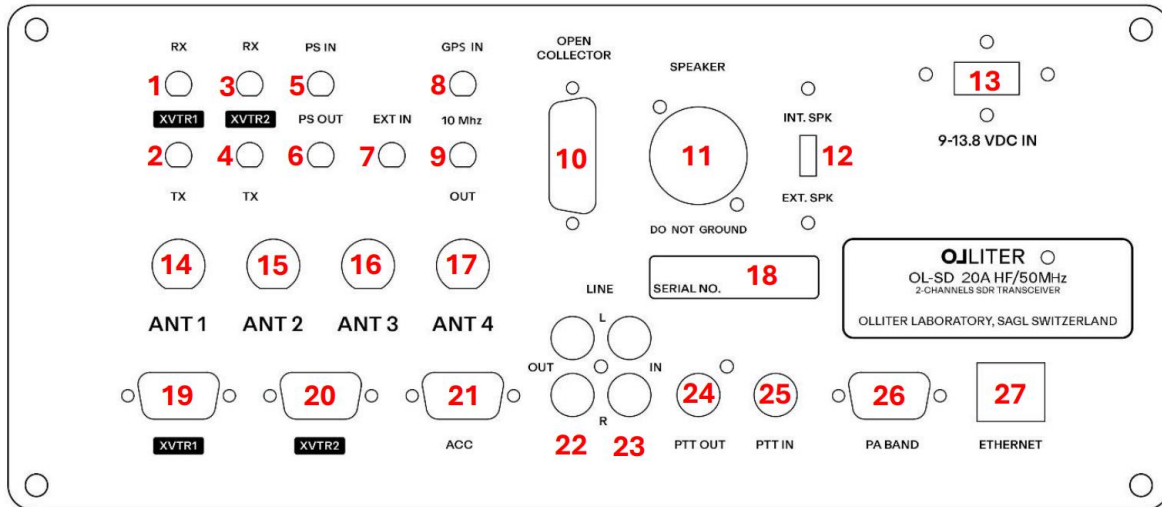
1. Receiving line for the transverter interface 1
2. Transmitting line for the transverter interface 1
3. Receiving line for the transverter interface 2
4. Transmitting line for the transverter interface 2
5. Pure signal input
6. Pure signal output
7. EXT IN (unfiltered RF input)
8. 10MHz input from an external oscillator (GPSDO or rubidium reference)
9. 10MHz output for external devices (such as transverters)
10. Open collector I/O (can be configured from OL-Master)
11. Speaker connection (high power output, designed for external 8-ohm speakers)
12. Internal or external speaker selector
13. Power supply input (13.8V DC)
14. Antenna 1 receiving and transmitting connector
15. Antenna 2 receiving and transmitting connector
16. Antenna 3 receiving and transmitting connector
17. Antenna 4 receiving and transmitting connector
18. Serial number location
19. Transverter 1 interface (digital inputs and outputs to control external transverters)
20. Transverter 2 interface (digital inputs and outputs to control external transverters)
21. External accessories interface (digital inputs and outputs)
22. RCA audio output (low power output, to be sent to the line-in of external audio devices)
23. RCA audio input (low power input, to be used as transmitting audio line)
24. Open collector PTT output
25. External PTT input (active low)
26. Band output (digital output)

27. Ethernet interface (1Gbps only)

- Connectors description

Here is a description of the inputs and outputs of the Olliter SDR transceiver. Some of these connections are highly sensitive to ESD, overvoltage, short-circuit, overcurrent and more, please take all the recommended measures when connecting external devices.

⚠️ The warranty for your Olliter SDR device will be voided if our customer assistance department determines that the device has been damaged or rendered inoperative due to improper connection of external devices.

⚠️ The warranty for your Olliter SDR will be voided if our customer assistance department determines that the device has been damaged or rendered inoperative due to connection of external devices that generate or absorb excessive current or voltage

o Morse key jack

This ¼ inch (6.35mm) jack is used to connect either a paddle or a straight key. When using a paddle, the DOT and DASHES can be swapped from the CW menu of OL-Master settings.

This connector uses either 5V or 3V3 pull-up resistors. Voltage can be selected by moving the internal "3.3 – 5V I/O" jumper.
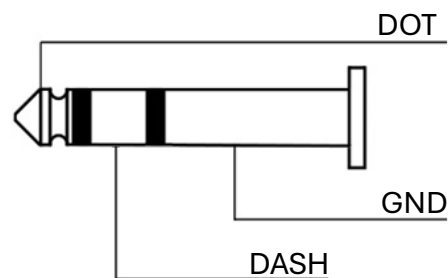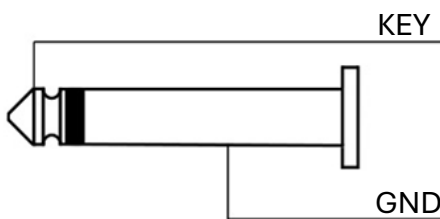
o   Headphones output

This output is designed to drive standard headphones with a nominal impedance of 16Ω impedance, output level is 50mW for a -75dB THD.

⚠️ Prolonged use of headphones at high volume can cause permanent hearing dagame. Adjust the volume to a safe level to protect your ears.

LEFT

GND

RIGHT
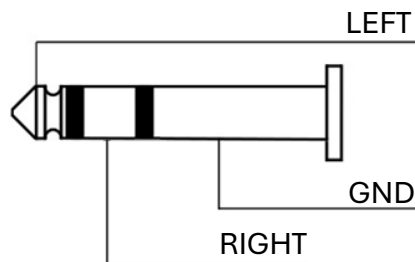
o   Microphone input

⚠️ If the transceiver was ordered with a Icom wiring, a Yaesu microphone cannot be used and vice-versa. Using a different microphone style can damage the transceiver and/or the microphone.

This input should be chosen when placing the order for the Olliter SDR transceiver. This input is designed to work with either Icom (such as the SM-30) or Yaesu (such as M-70) microphones.

In addition to the microphone wiring that was requested, and independently from the user choice, a balanced input for a dynamic capsule is also available on the same connector.

> ⚠️ Before connecting any kind of microphone to the transceiver, please adjust the voltage settings in the Setup menu of OL-Master software. Incorrect voltage settings may damage the transceiver and/or the microphone.

Selection between 5V, 8V or none can be toggled in the Setup menu of OL-Master.

Advanced features (like up/down, scan, etc.) are not available.

Transceiver that was ordered with Icom wiring		
Pin	Icom SM-30	Dynamic microphone
1	Microphone signal	Balanced input +
2	+8V microphone power	N.C.
3	N.C.	N.C.
4	N.C.	Balanced input -
5	PTT signal	PTT signal
6	PTT GND	PTT GND
7	Microphone GND	GND
8	N.C.	N.C.

Transceiver that was ordered with Yaesu wiring		
Pin	Yaesu M-70	Dynamic microphone
1	N.C.	N.C.
2	+5V microphone power	N.C.
3	N.C.	N.C.
4	N.C.	Balanced input -
5	PTT GND	PTT GND
6	PTT Signal	PTT Signal
7	Microphone GND	GND
8	Microphone signal	Balanced input +

Icom and the Icom logo are registered trademarks of Icom Incorporated (Japan)

Yaesu and the Yaesu logo are registered trademarks of Yaesu Musen Co., Ltd.

o   Transverter interfaces

The transverter input and outputs are designed to drive external devices to provide additional bands to the transceiver.

The transverter input 1 is connected to the CH1 line of the SDR, while the transverter input 2 is connected to the CH2 line of the SDR. Both inputs are passed through a dedicated 50MHz low-pass filter, a 32dB software-controlled attenuator and a 20dB amplifier. The suggested maximum input should be -2dBm (assuming no attenuator is used).

The nominal output for the transverter transmission line is 10dBm, this value may vary a little depending on the IF frequency that is configured. The transmission signal is passed through a 50MHz low-pass filter, and a programmable attenuator (which is controlled by the TX Power slider in OL-Master).

Transverters can be configured using the dedicated section of the OL-Master software.

o   EXT IN

⚠ The EXT IN connector provide direct access to the ADC2 device inside the transceiver, excessive power input can permanently damage the internal circuits

This input provides an unfiltered path to the CH2 line of the transceiver, it is typically used to interface with external devices where filters are already installed (such as panadapter interfaces).

To enable this feature please select RX2 as receiver channel for the receiver that is going to be used.
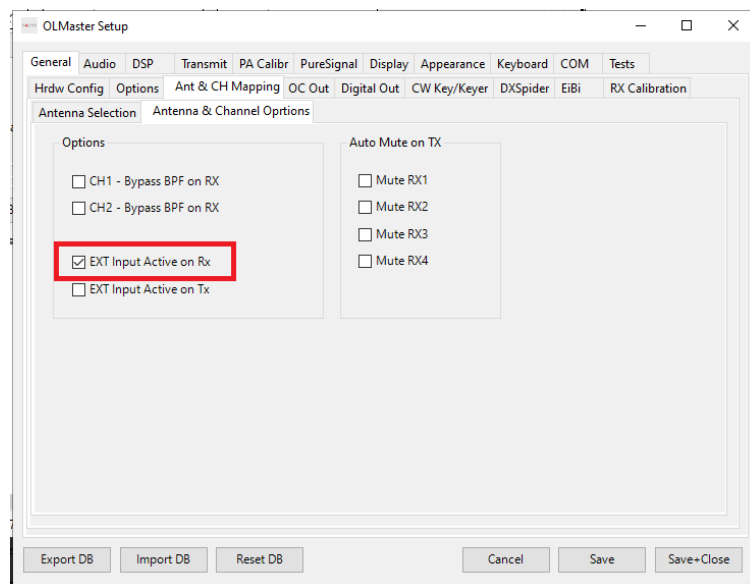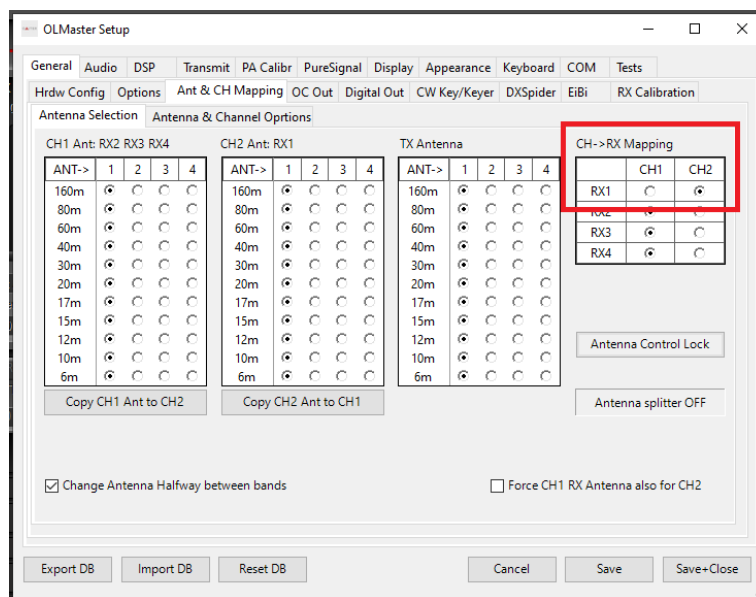
- o 10MHz references

The Olliter SDR transceiver can be connected to an external 10MHz reference to provide better frequency stability, this is very convenient when working with high-frequency devices like microwave transverters.

The 10MHz input (labelled as GPS IN) is a 50Ω input between -15dBm and +5dBm. This input is protected against overvoltage but using an attenuator (if needed) is recommended.

The 10MHz output (labelled as OUT) provides a 3.3V CMOS output with a series resistance (used as short-circuit protection). This output can only be used as a frequency reference, and it was not designed to provide more than 20mA. This output comes from the internal TCXO when no external reference is applied.

○   PA Band connector

This connector offers some digital outputs that can be used to drive external antenna switches or amplifiers.

These outputs can be programmed by the user using the Setup menu of OL-Master.

These outputs are normally in a LOW state using a pull-down resistor.

The voltage that is provided by this port depends on the internal "3.3 – 5V I/O" jumper. Maximum available current is limited with a 220Ω series resistor.
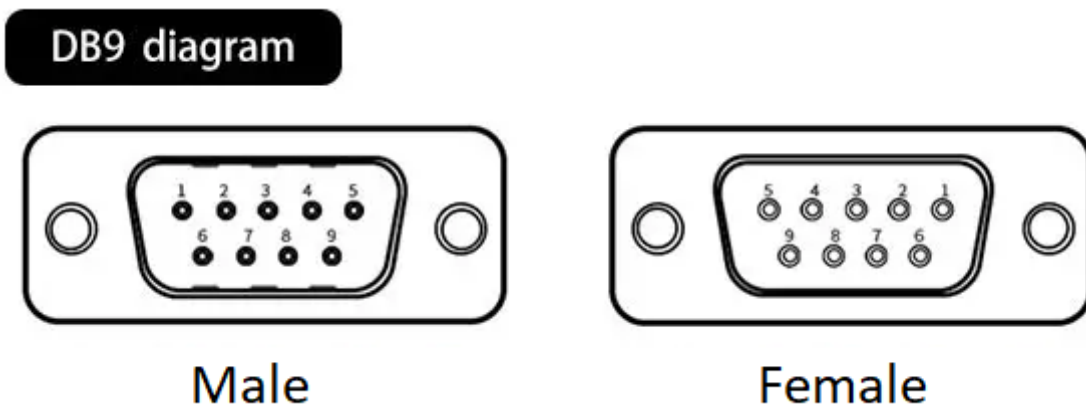
DB9 Pin	Software output
1	Digital out 1
2	Digital out 2
3	Digital out 3
4	Digital out 4
5	GND
6	Digital out 5
7	Digital out 6
8	Digital out 7
9	Digital out 8

○   ACC Connector

This connector offers some inputs to control several features of the SDR, such as PTT controls for RX2, RX3 and RX4, an external inhibit line, and two additional analog inputs that can be used to get information from external devices (like temperature probes or flow meters).

The voltage that can be applied to the digital input port depends on the internal "3.3 – 5V I/O" jumper. In any case, it should never exceed the configured voltage.

	3.3V I/O	5V I/O
Low state	0V to 0.8V	0V to 1.5V
High state	2V to 3.3V	3.5V to 5V

The voltage range for both ADC0 and ADC1 is 0V to 3.3V. Excessive voltage can cause severe damage to the ADC circuitry.

Pins 6 and 8 have an internal 4.7KΩ pull-up resistor, while pins 7 and 9 have an internal 4.7KΩ pull-down resistor.

DB9 diagram
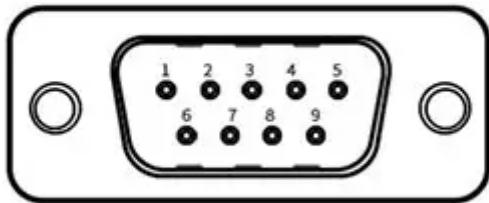
Male
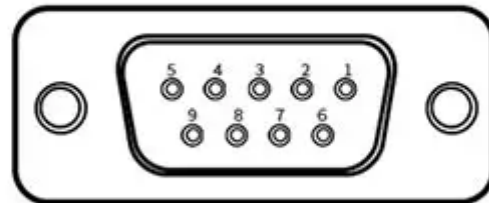
Female

DB9 Pin	Software output
1	GND
2	N.C.
3	ADC in 1
4	ADC in 0
5	GND
6	PTT RX2 (active LOW)
7	PTT RX4 (active HIGH)
8	PTT RX3 (active LOW)
9	Ext Inhibit (active HIGH)

     ○   OC connector

This connector offers 8 open-collector outputs that can be used to drive external accessories like power amplifiers or antenna relays.

The maximum V_{CE} that can be used at the open-collector outputs is 48V DC.

The 13.8V DC lines are derived from the main power supply and are protected by a 250mA resettable fuse.
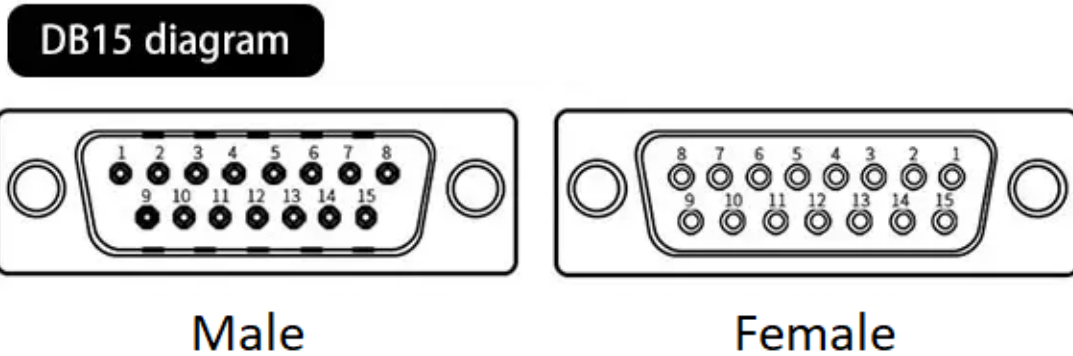
DB15 Pin	Software output
1	GND
2	OUT 2
3	OUT 4
4	OUT 6
5	OUT 8
6	GND
7	GND
8	13.8V
9	OUT 1
10	OUT 3
11	OUT 5
12	OUT 7
13	Open-collector common
14	GND
15	13.8V

External relay connection example:
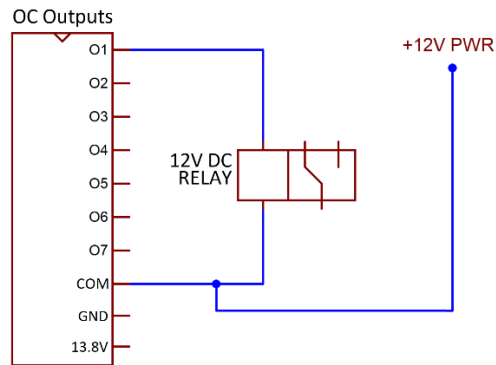
 o Power connector

Please refer to the Connecting the power supply chapter for further information

 o Antenna connectors

These four BNC connectors are used by the transceiver to receive and transmit. Different bands can receive or transmit on different antennas, mapping between bands, mode and antenna can be done in the Setup menu of OL-Master.

Please refer to the Connecting the antenna for further information

7. System requirements

An SDR transceiver requires a control device to work, the hardware of the transceiver is used to convert analog RF signals to an IQ stream that is sent to a software installed on the control device, where it is processed to extract an audio signal. When transmitting, the process is reversed. The hardware and software need to work together to receive and transmit signals using the SDR transceiver.

Some I/O are available on-board to interface with external accessories like microphones, headphones and Morse key or paddle.

A simplified schematic representation of the SDR device is shown below.
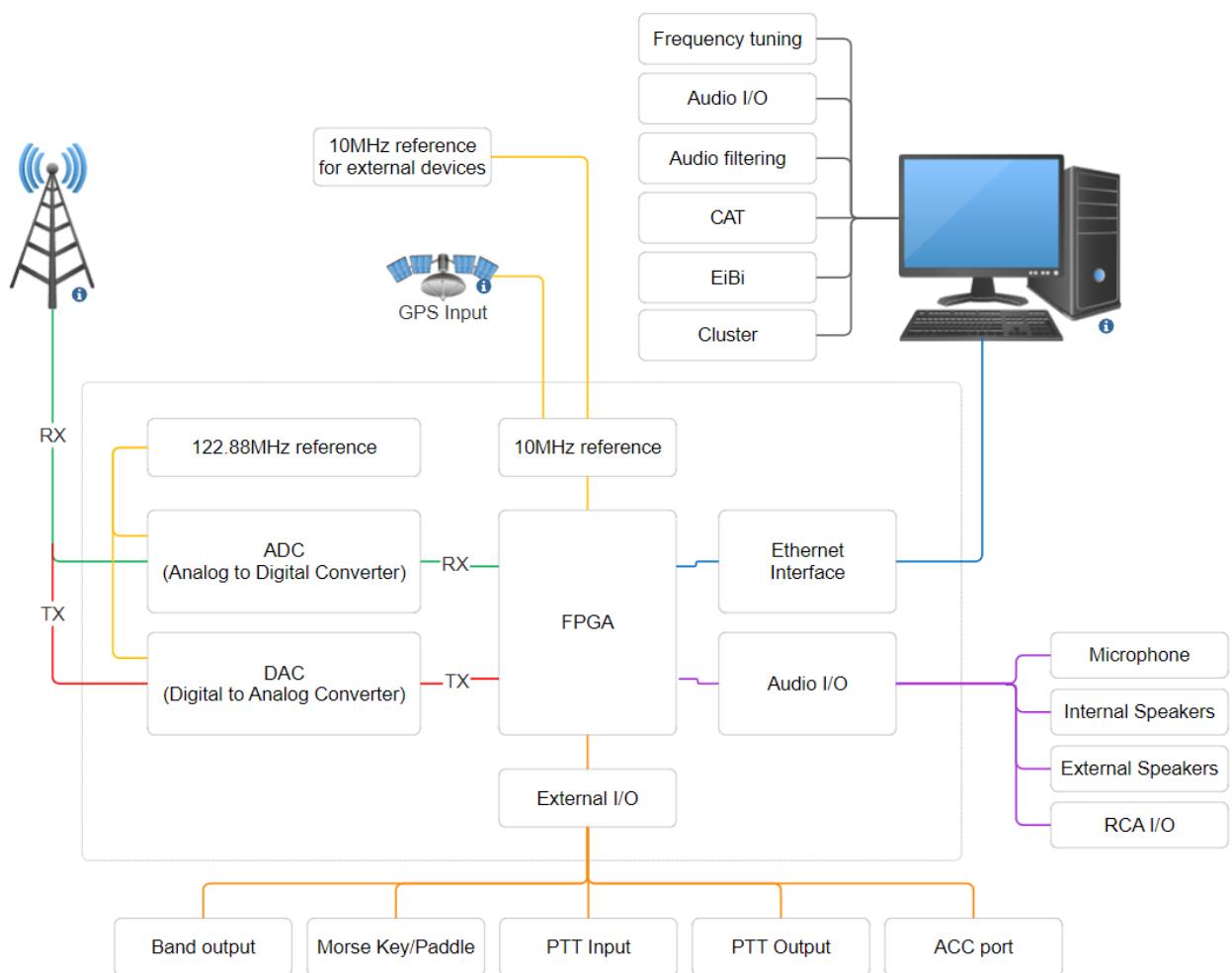
- Software requirements

As any SDR device, one of the main components is the PC that is used to control the device, the same PC is also used to decode and process the raw digital stream of data to usable audio stream. This decode process requires some minimum software and hardware requirements that should be met.

    o Operating system requirements

The OL-Master application was developed for Microsoft Windows 10 or later. Virtualization of such operating systems is also supported, if the host machine is capable enough.

Compatibility with Microsoft Windows 8.1 or previous versions of Microsoft Windows cannot be ensured due to lack of support for .NET Framework 4.8.1 which was used to develop the application.

    o .NET 8

The operating system should be updated to the latest version and the .NET8 must be installed on the machine (latest update of the .NET8 can be downloaded from the following URL https://dotnet.microsoft.com/en-us/download/visual-studio-sdks). Depending on the system configuration, both the .NET8 SDK and .NET8 Runtime might be needed.

    o Microsoft Visual C++ Redistributable

Some components of the software were written using highly optimized C++ code, this requires the latest version of the Microsoft Visual C++ Redistributable package to be installed and updated. The latest version of this package can be downloaded from the following URL: https://learn.microsoft.com/it-it/cpp/windows/latest-supported-vc-redist?view=msvc-170 .

As per the moment this manual was written, the latest available version is 14.40.33810.0.

- Hardware requirements

Recommended hardware setup is an 7th generation Intel Core i5 or later, with at least 16GB of RAM and 1GB of available storage space (disk usage may vary depending on additional features like recordings, cluster, EIBI and more).

Ethernet interface at 1Gbps on the control PC is mandatory if using more than one receiver window. Ethernet interface at 1Gbps is mandatory to configure the IP address of the device if connected directly to the control PC.

- Network requirements

An ethernet interface capable of 1Gbps <u>is mandatory</u> for the transceiver to communicate with the control device (PC), a properly configured ethernet switch with interfaces at 1Gbps is suggested to be used in between the SDR and the PC.

Please note, the transceiver <u>does not support negotiating any speed lower than 1Gbps</u> with the control device or the switch/router that is plugged into.

An ethernet cable CAT5 or superior is highly recommended to interface the SDR to the switch/router and the PC.

To ensure best performances, use high quality switch or router and cables, make sure the whole network from the SDR to the master PC is capable of continuously communicate at 1Gbps.

An internet connection is not required if not using external services (like clusters or EIBI).

A network connection diagram is available at the Sample Ethernet connection chapter.

8. Installing OL-Master

After buying an Olliter SDR, you should receive the setup file for OL-Master, this is the main application that controls the SDR and must be installed on the PC.
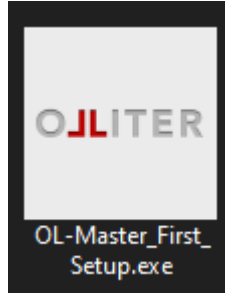
Double click the executable to start the installer, administrative privileges are mandatory to install the software. Follow the on-screen instructions to proceed with the installation.
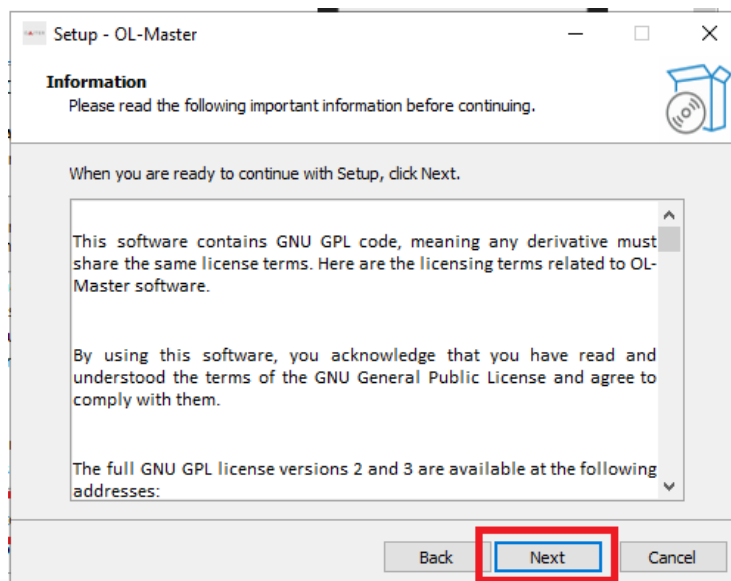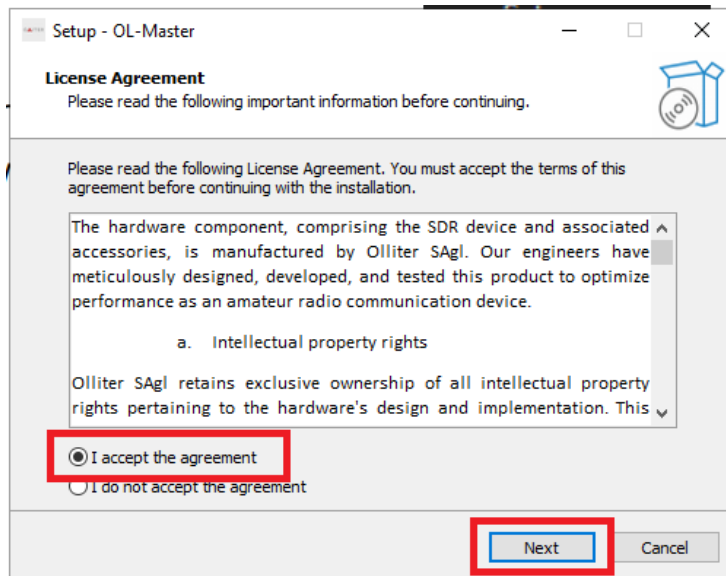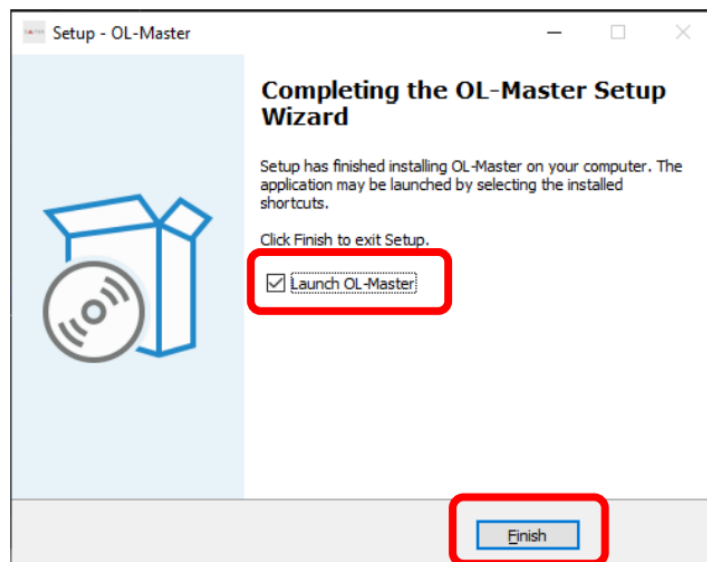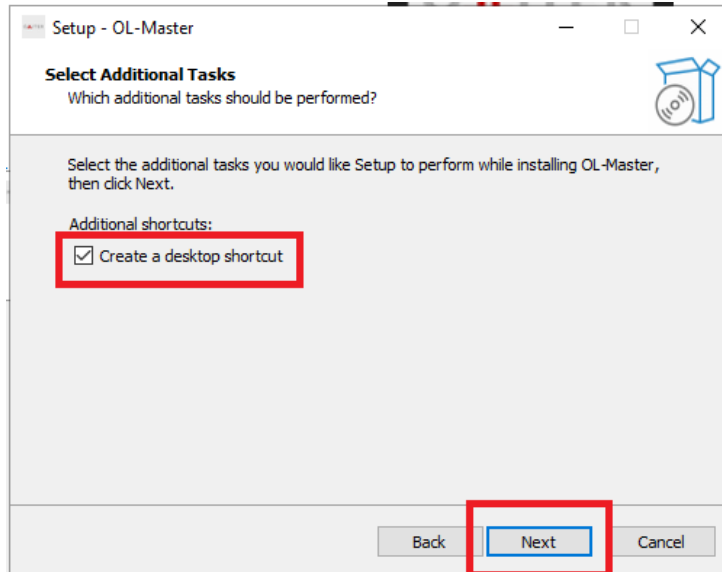
Setup is now completed, before starting the software, please read carefully the next chapter.

9. Wiring the transceiver

> Electrostatic Discharge (ESD) can cause severe damage to electrical circuits, potentially leading to costly repairs or replacements. Always take measures to protect your equipment. These safety measures include but are not limited to:
> - Proper grounding: make sure all equipment and workstations are properly grounded
> - Avoid static-inducing clothing: avoid wearing synthetic materials that generate static electricity
> - Handle components with care: touch components only by their edges or the grounding case avoiding touching pins and circuitry

Connecting the transceiver is simple but a couple of considerations and safety measures are needed, please read carefully the wiring instructions to prevent damages to the Olliter SDR.

- Connecting of the PureSignal cable

To achieve optimal transmission quality and reduce the spurious emissions, the Pure Signal technology is supported by the Olliter SDR transceiver.
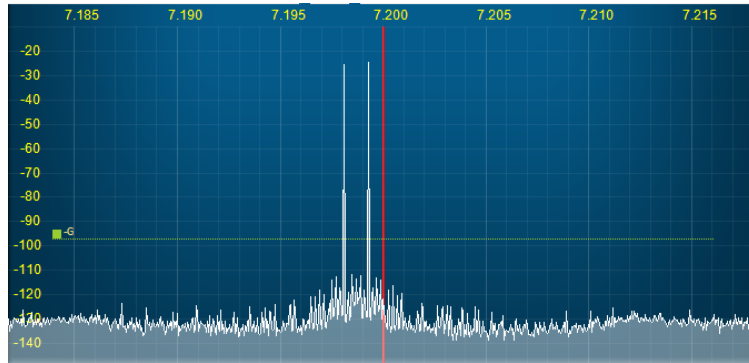
Pure Signal is the name given to the theory and implementation of the clean transmission logic developed by the OpenHPSDR team and implemented in both the Olliter SDR software and transceiver. The algorithm behind the Pure Signal technology is quite simple, when both the drive applied to the Digital-to-analogue converter (DAC) and the output as measured at the antenna are known it is possible to modify the drive so that the output is as clean as possible.

The Pure Signal technology is enabled by connecting the PS IN with the PS OUT using the provided SMA to SMA coaxial cable.

- Connecting the power supply

The Olliter SDR was designed to operate from a stable and constant power supply which is capable of continuously delivering 13.8V at 5A for the 20W model.

An integrated protection circuit is added to the transceiver which can help in protecting the radio from excessive voltage fluctuations by cutting the power line and turning off the device.

⚠️ The integrated protection circuit should not be considered a surge, lightning or electrostatic protection, it was designed to protect the circuitry from excessive or low voltages which may negatively impact the transceiver performances.

Connect the power supply to the Olliter SDR by using high-quality Anderson PowerPole® connectors. Wire size should be chosen according to the length of the connection, here are our suggestions:

- Wires shorter than 2 meters (6.5ft) long will require 2mm^2 (AWG14) wires
- Wires between 2 and 4 meters (6.5ft to 13ft) will require 4mm^2 wires
- Wires longer than 4 meters (13ft) are not recommended as they may pick up excessive noise from the surrounding environment or cause excessive voltage fluctuations

Make sure to connect all the needed wires before turning on the power supply.

If the transceiver does not show the red (standby) light after applying power, please refer to the Troubleshooting chapter.

- Connecting the antenna

Up to 4 antennas can be connected to the Olliter SDR, these can be configured in software to allow receiving and transmitting on different bands with different antennas.

To begin, connect an antenna using a male BNC connector to the ANT1 socket.

- Ethernet connection

To interface the transceiver with the local network, please refer to the Connection of the SDR to the PC chapter of this manual.

- Connecting the microphone

Each device comes with a dedicated microphone wiring which should be selected when ordering the transceiver, use the front 8-pin socket to connect the microphone.

JL OLLITER

10. Configuring the firewall

Network communication to the device is performed using UDP protocol, a security system exception must be created for the software to work reliably.

Open the Windows firewall settings.
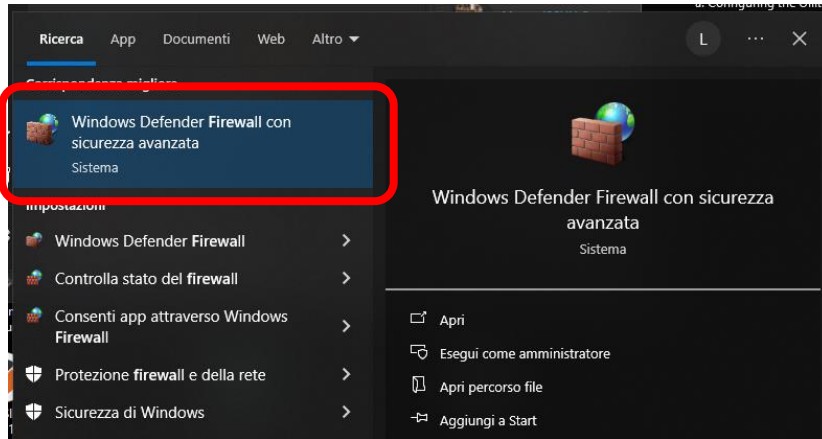
Select "Inbound connection rules" on the left menu.
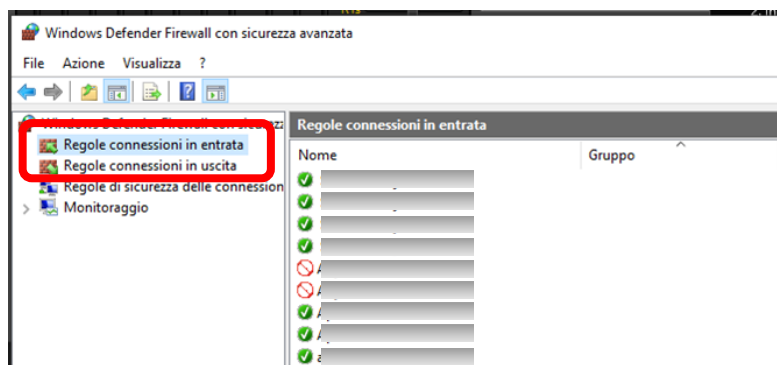
Click on "New rule" on the right menu.
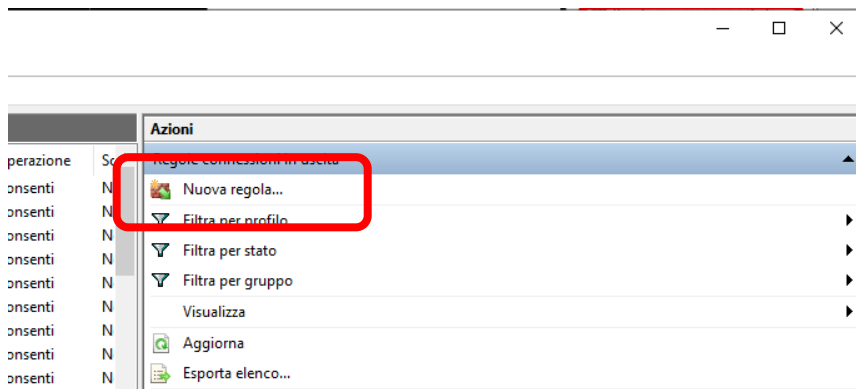
Select "Program" and click "next".
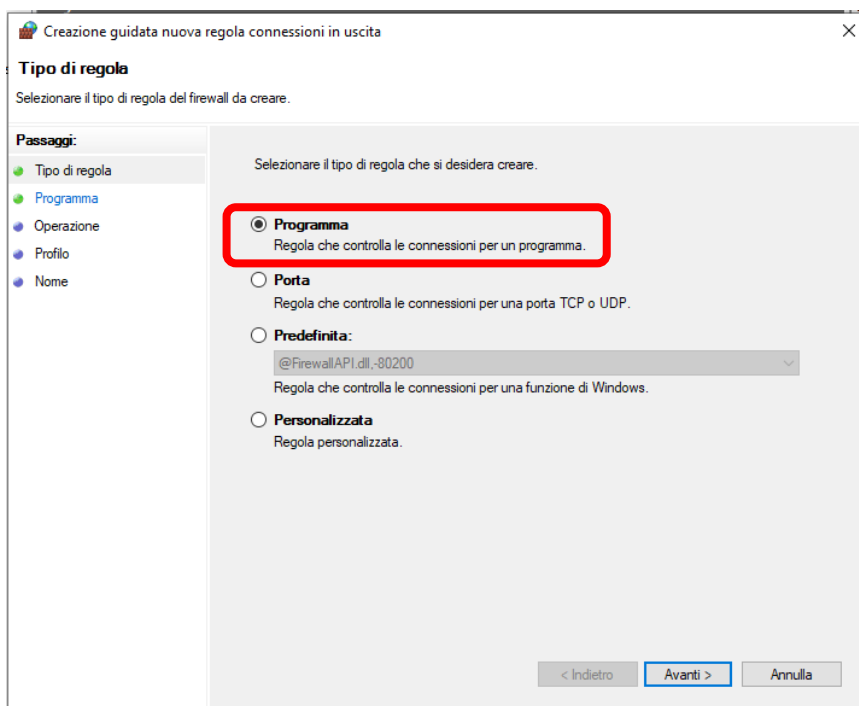
Click on "Browse" and navigate to "C:\Program Files\Olliter\Ol-master.exe"
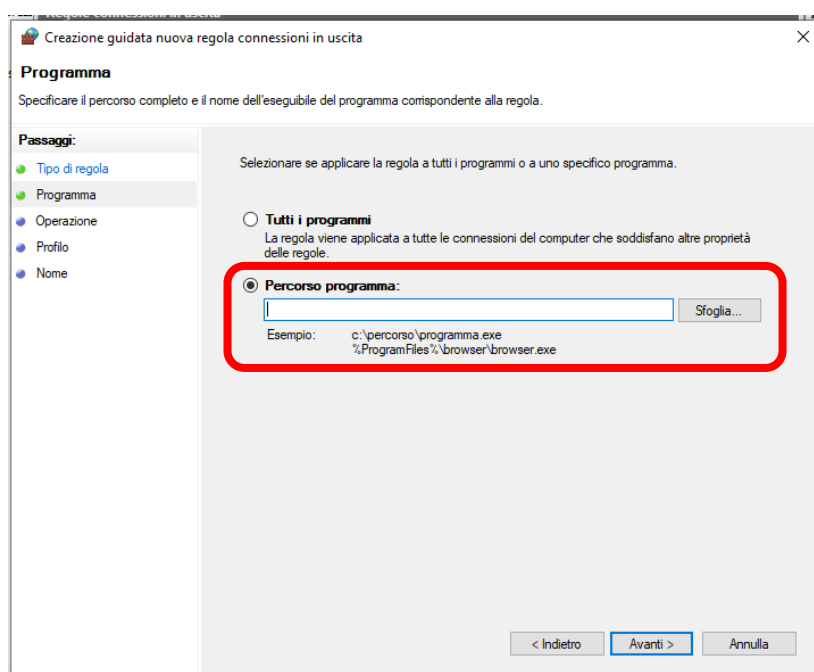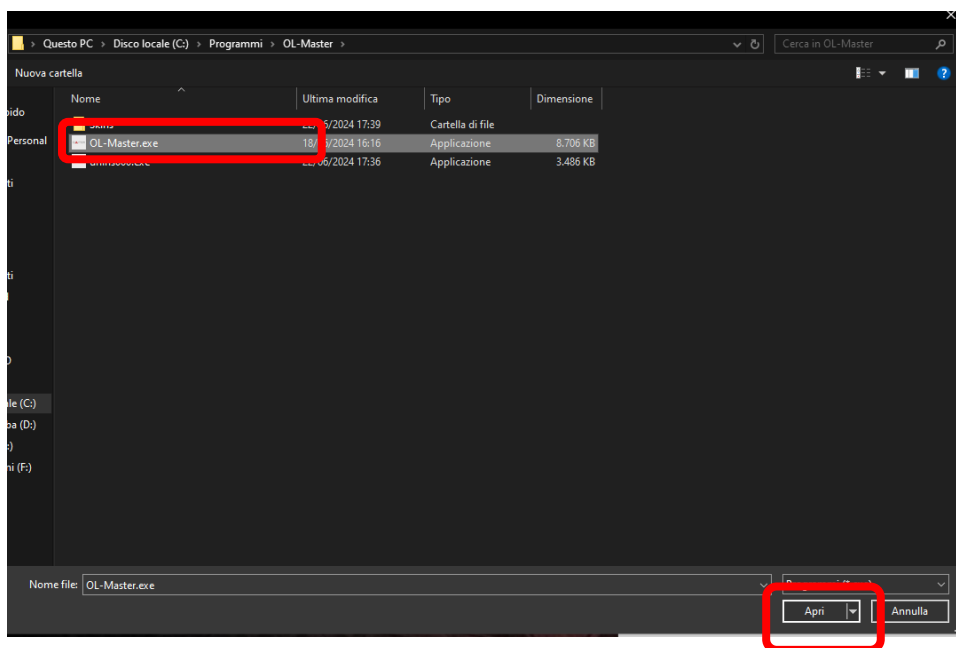
Click on "Next"
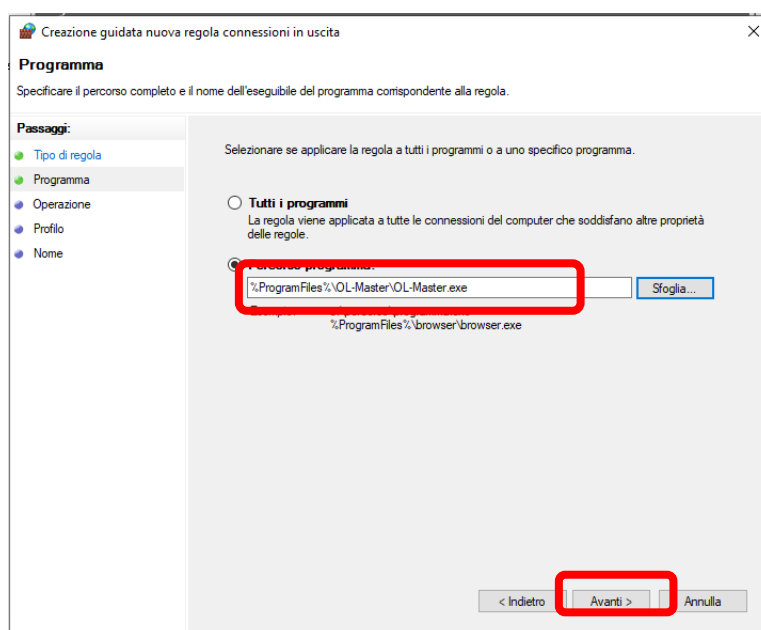
Select "Allow connections" and click "Next".
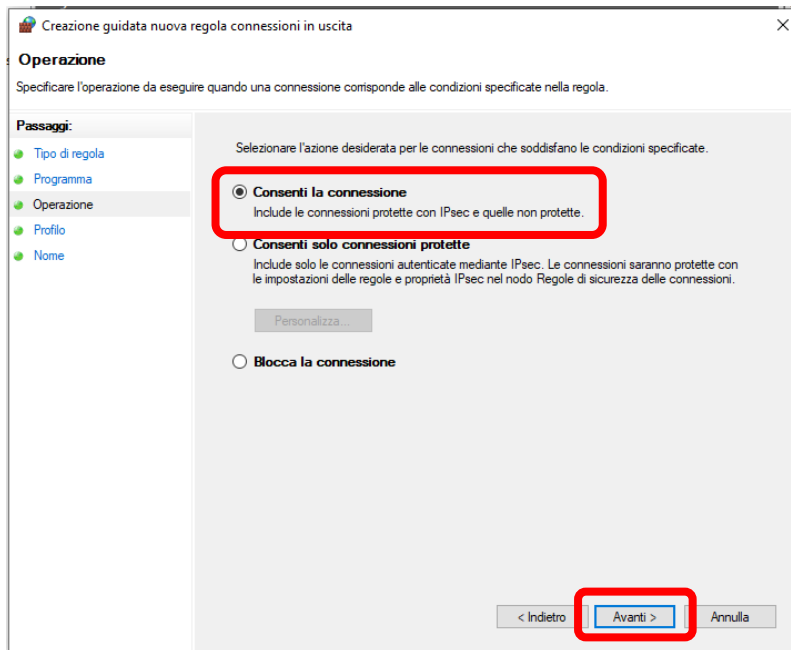
Now select the kind of network that you are using, by default it should be "Private", if you are using a different kind of network, please select the option that best fits your configuration.
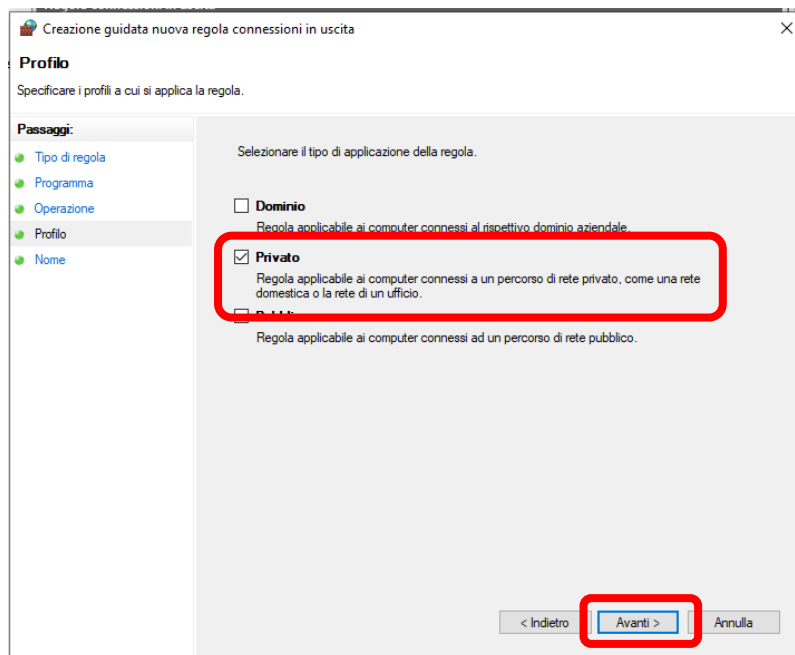
Insert any name you like and then click on "Complete".
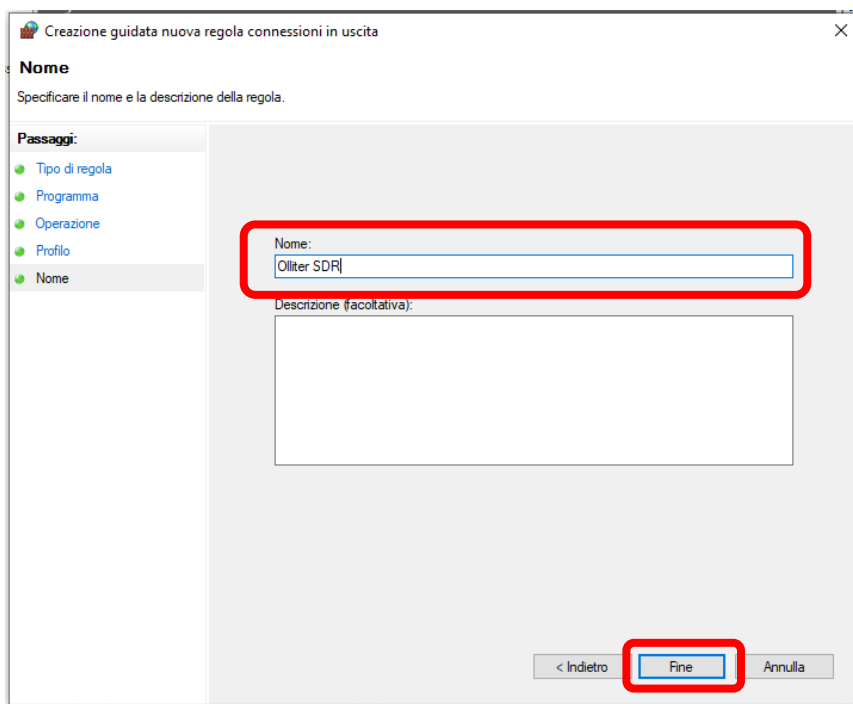
11. Connection of the SDR to the PC

Connection of the transceiver to the PC is performed using an Ethernet/IP protocol, make sure to use high quality network equipment and cables to achieve best results.

- Default Olliter SDR IP address

The transceiver comes with a preconfigured IP address set to 192.168.1.111, if this address is valid on your local network (meaning your local network has an address family like 192.168.1.X and the subnet mask is 255.255.255.0), you can just plug the device to the local network and skip the IP address setup guide.

> ⚠️ Before applying any voltage to the SDR, connect the device to your home switch/router using a high-quality CAT5 (or superior) ethernet cable

> ⚠️ The transceiver can only communicate at 1Gbps, if the switch/router or the master PC does not support such speed, the connection may be unavailable or unstable

- Sample Ethernet connection

The following schematic illustrates the recommended connection of the SDR device to the PC.
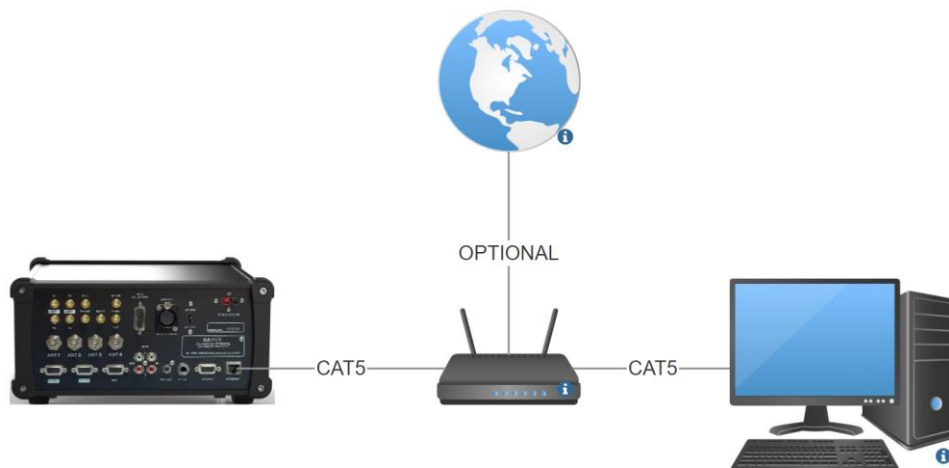
- Changing the Olliter SDR IP address

Management of the IP address is performed using OL-Master, if the default IP address (192.168.1.111) is not valid or available on your local network, follow this procedure to change it to a valid one.

- o Connect the device to the PC

Using a straight CAT5 Ethernet cable, connect the Olliter SDR to the PC (make sure the PC has an Ethernet interface that supports 1Gbps communication)
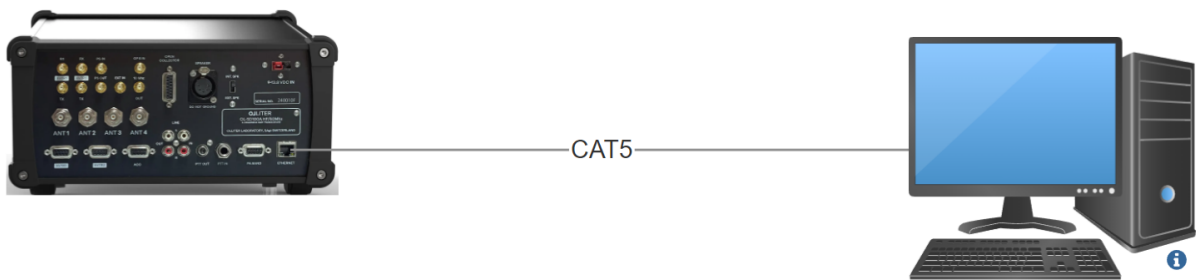
- o Manually set the IP address of the PC

On the Windows PC, open Control Panel and select "Network and internet".
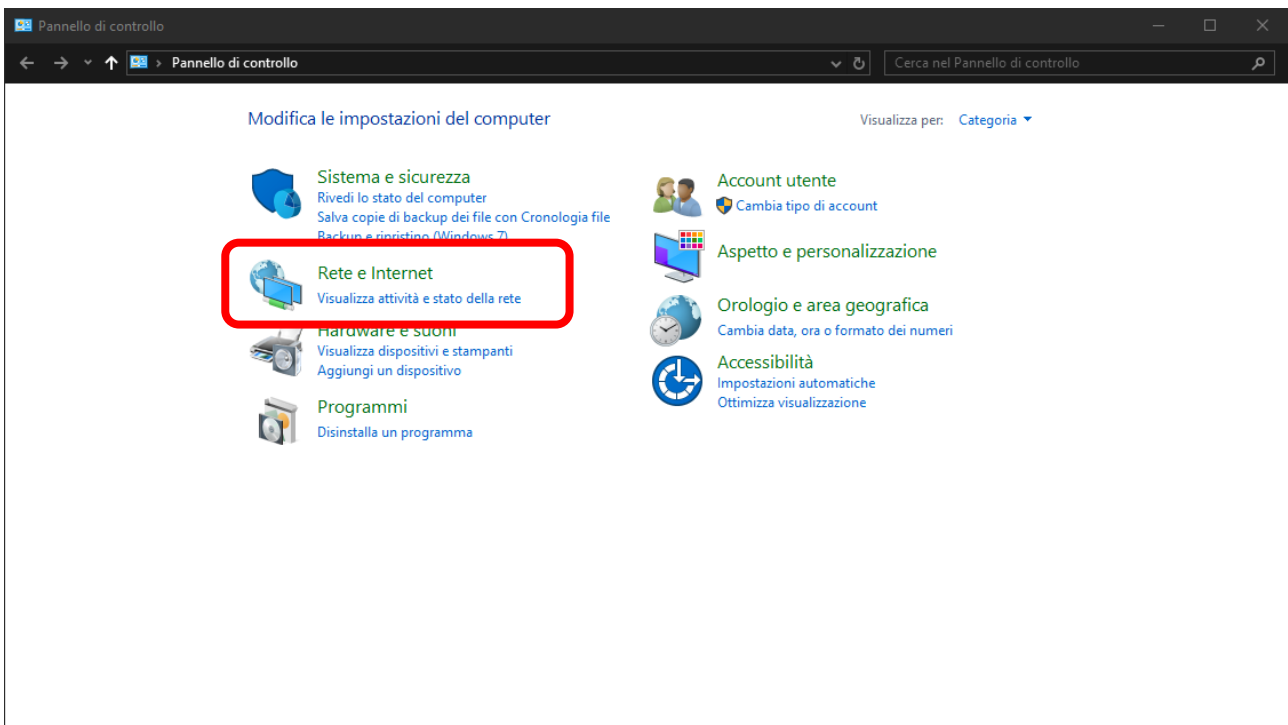
Select "Network and sharing"
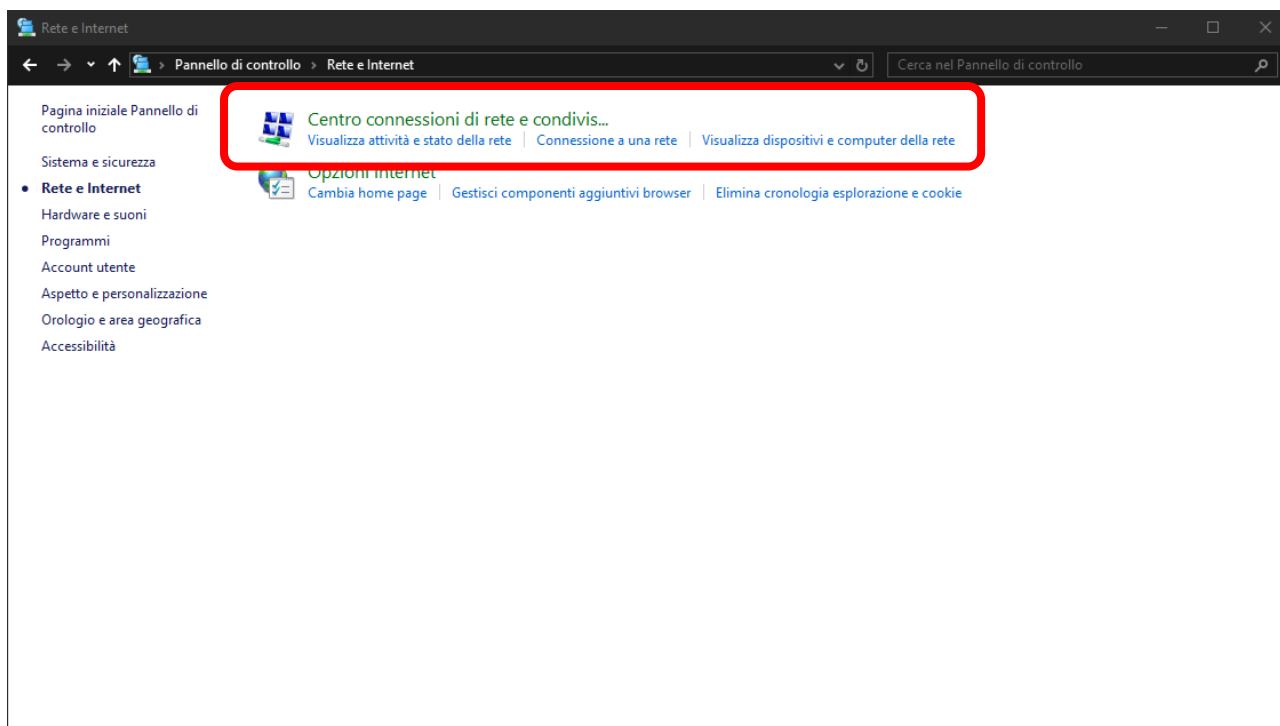
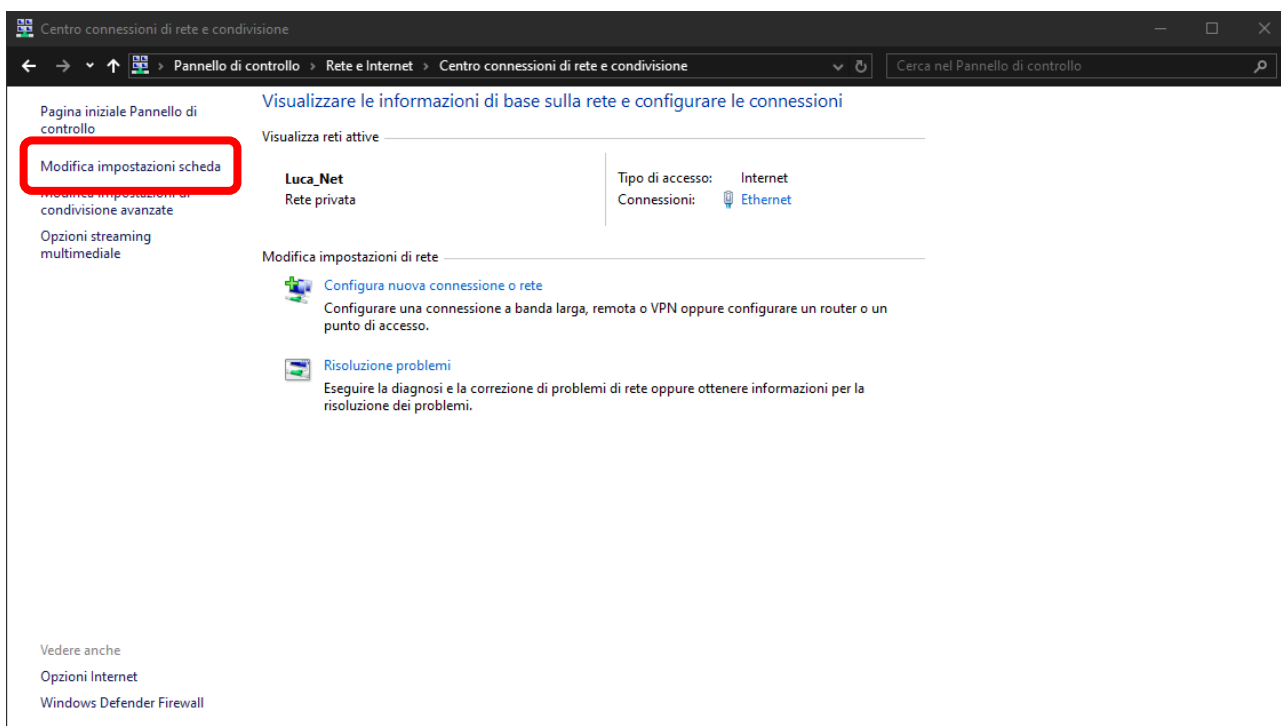Click on "Change adapter settings" on the left side.
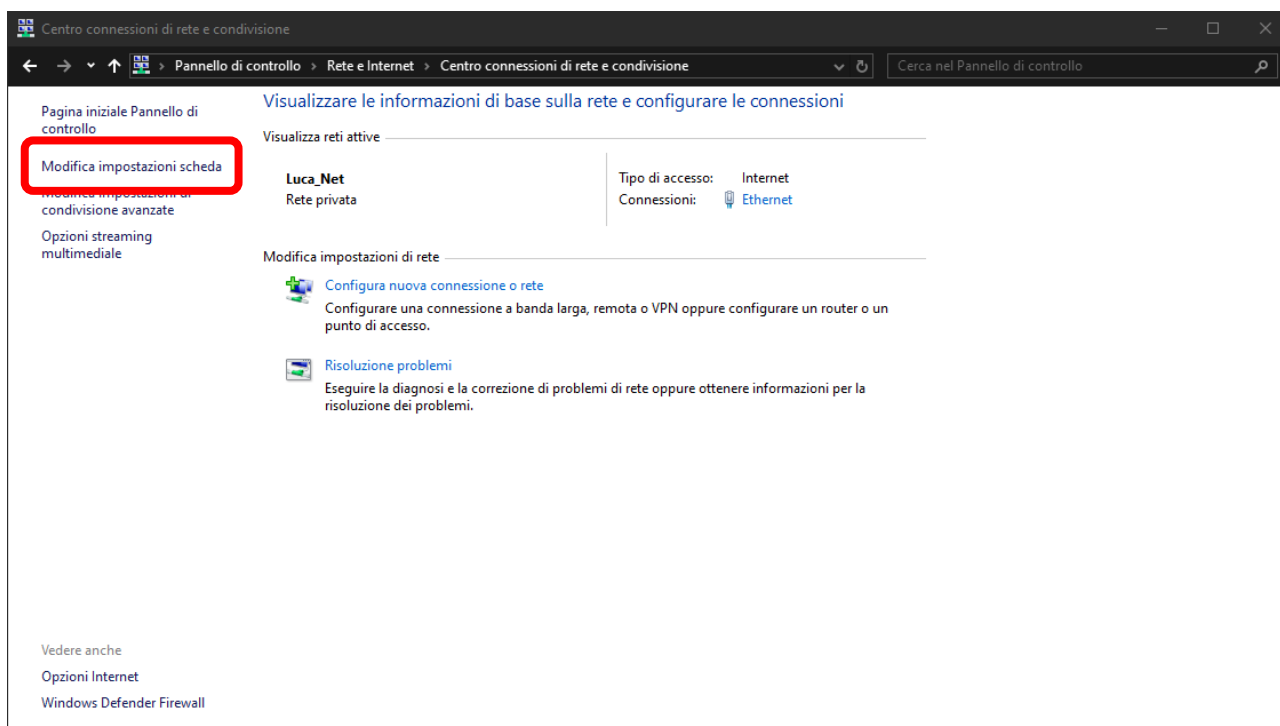
Right click the Ethernet interface that was used to connect the SDR device and open the Properties menu.
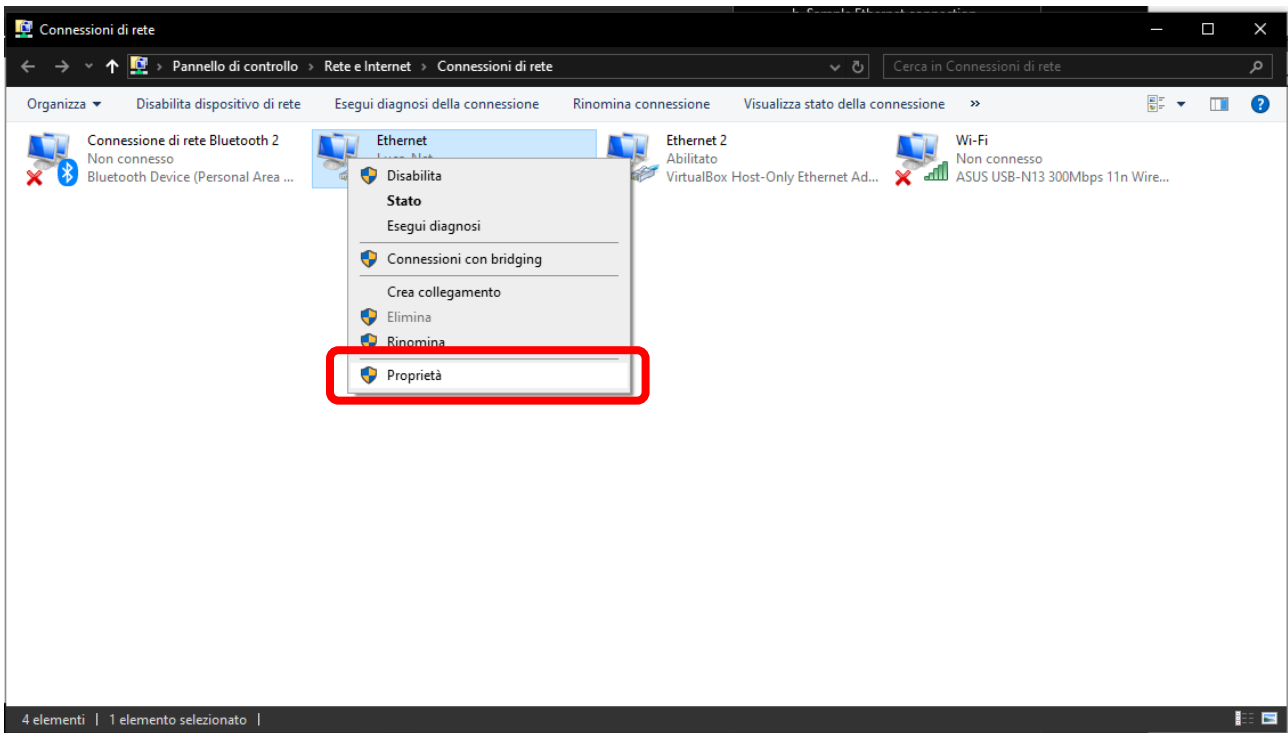
Scroll down to select "Internet protocol version 4 (TCP/IPv4)" and then click on "Properties".
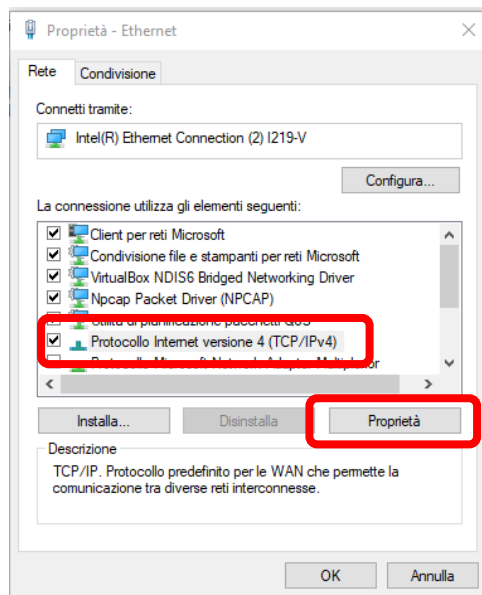
Click on the radio button to enable "Use the following IP address" and then input 192.168.1.10 as IP address and 255.255.255.0 as subnet mask. Leave default gateway and the DNS empty.
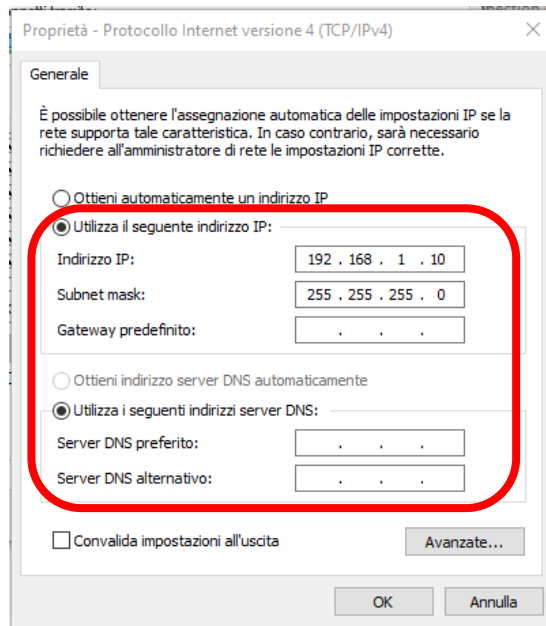
Click "Ok" on all dialogs to save the settings and execute OL-Master

- o   Setting the device address using OL-Master

Once the device is plugged, and the Ethernet interface is configured, turn on the transceiver and wait a couple of seconds for the device to initialize.

After executing the software, an error message will appear, informing the user that the connection to the device is not available, click OK to proceed.

If the dialog does not appear, it means that OL-Master was able to discover the device on the local network using UDP broadcast, this does not impact the procedure.
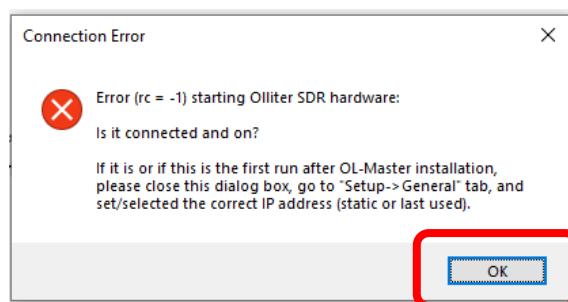
Once the software has started, click on the "FW Maintenance" menu on the top bar.

A dialog will appear listing the devices that were discovered on the local network, the Olliter SDR should show up, select it from the list.
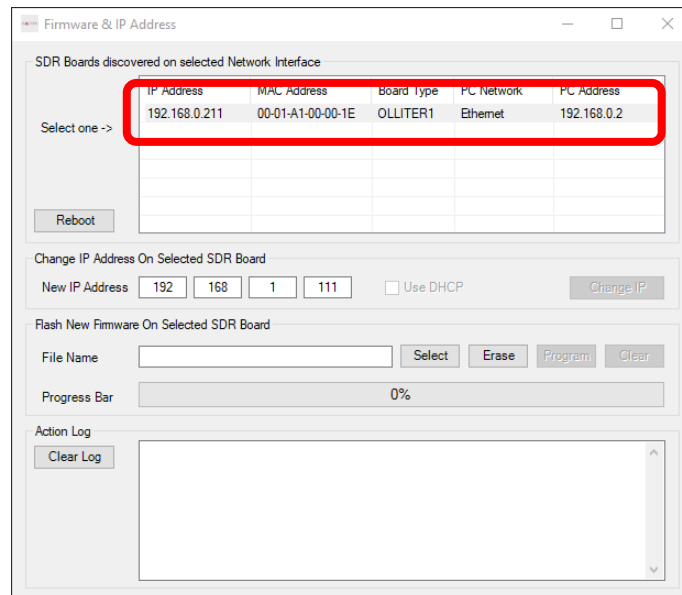
In the central part of the dialog, type in the new IP address to be used by the device, the IP address must be valid on your local network and must not be used by any other device.

After inserting the IP address, click on Change IP to persist the settings to the device, the SDR should now reboot.
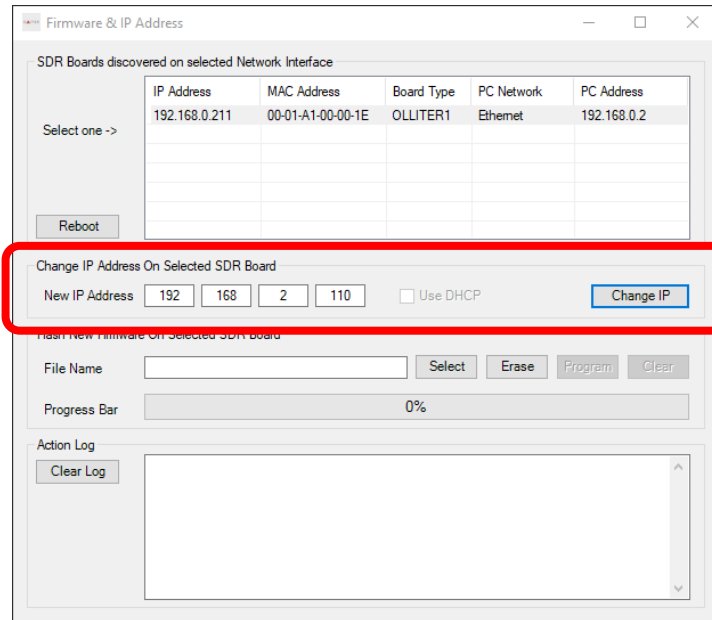
o   Restore the default IP settings of the PC

Once the IP address of the transceiver is properly configured to a valid address, the master PC can be reconfigured to DHCP mode or the original IP address that was previously configured.

On the Windows PC, open Control Panel and select "Network and internet".
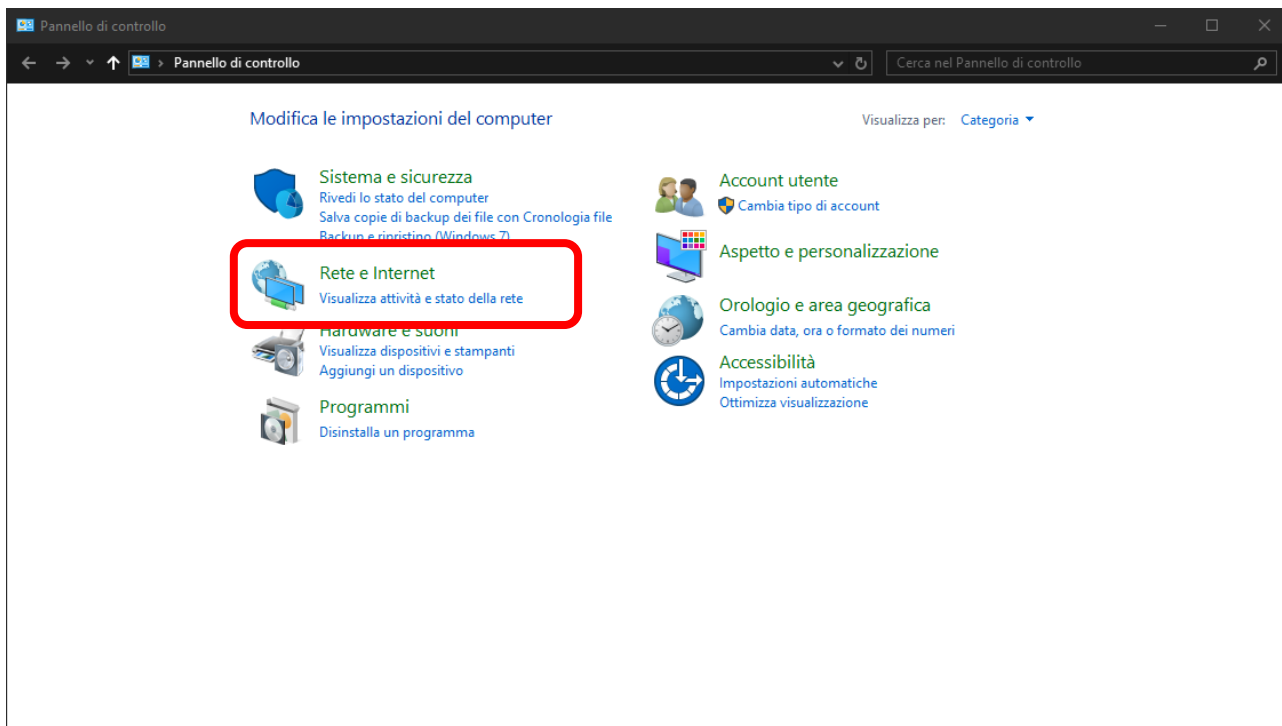
Select "Network and sharing"
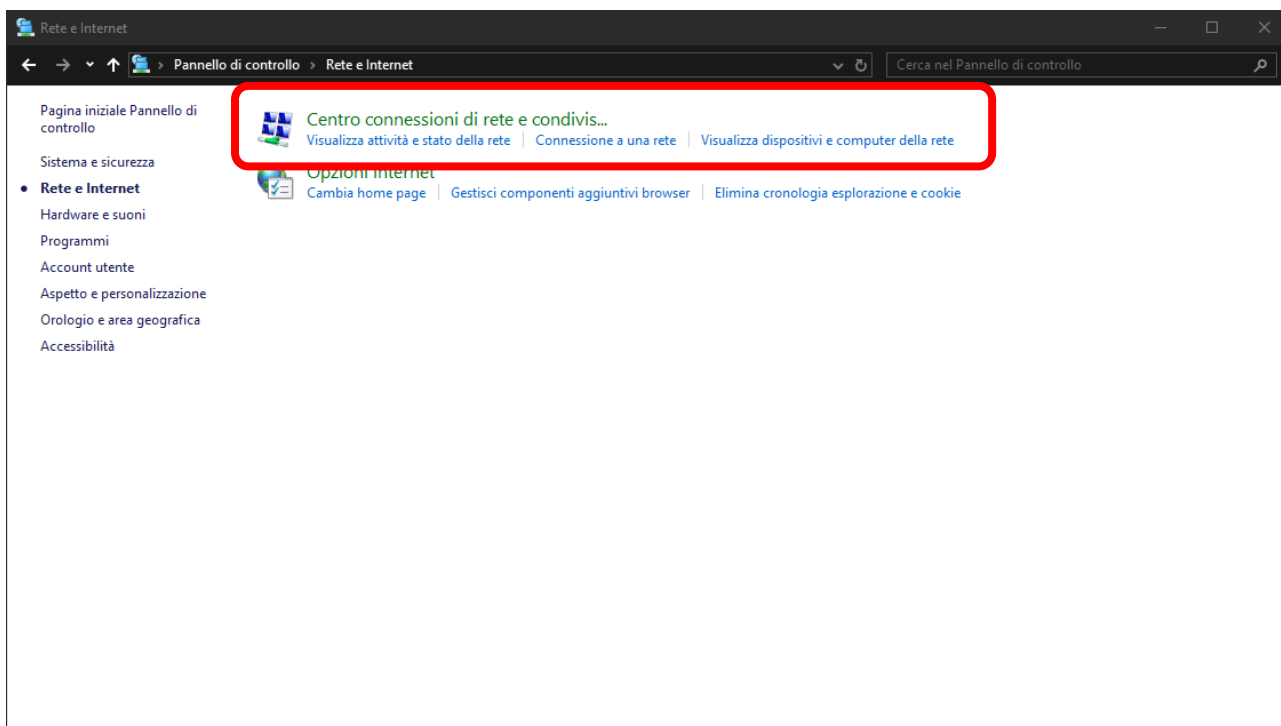
Click on "Change adapter settings" on the left side.

Right click the Ethernet interface that was used to connect the SDR device and open the Properties menu.
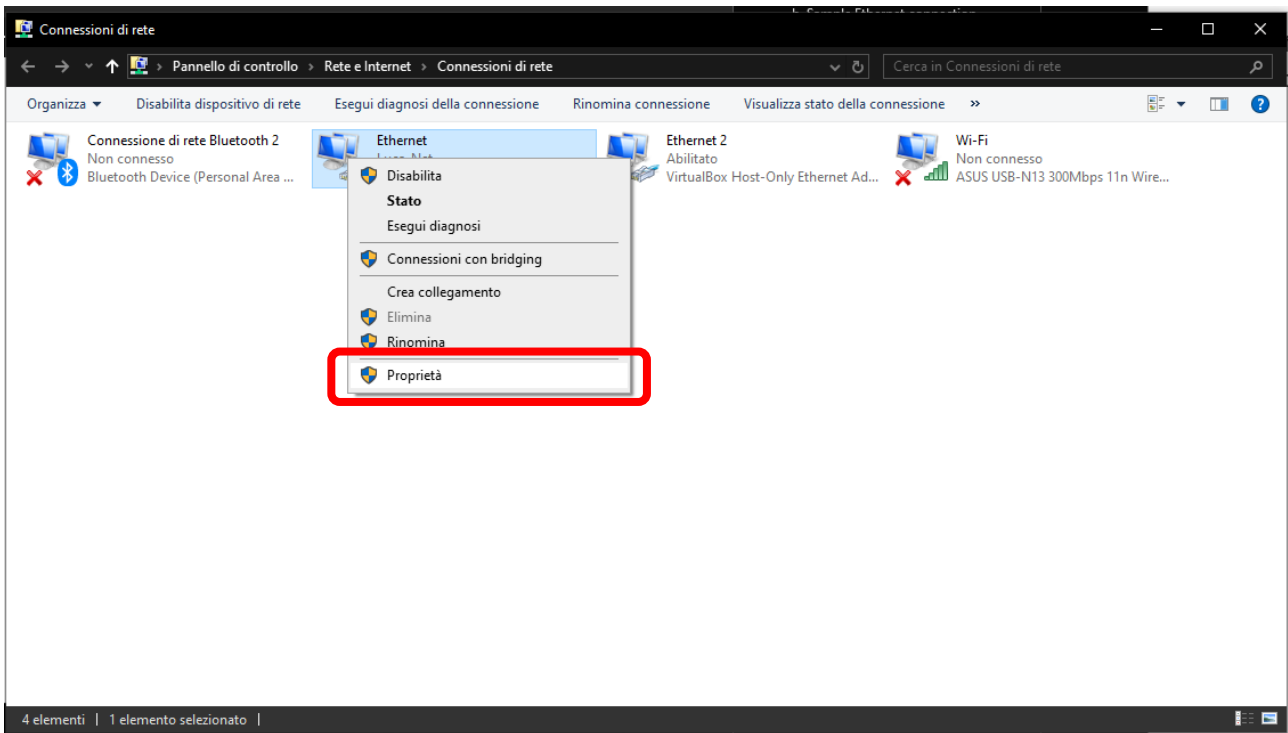
Scroll down to select "Internet protocol version 4 (TCP/IPv4)" and then click on "Properties".
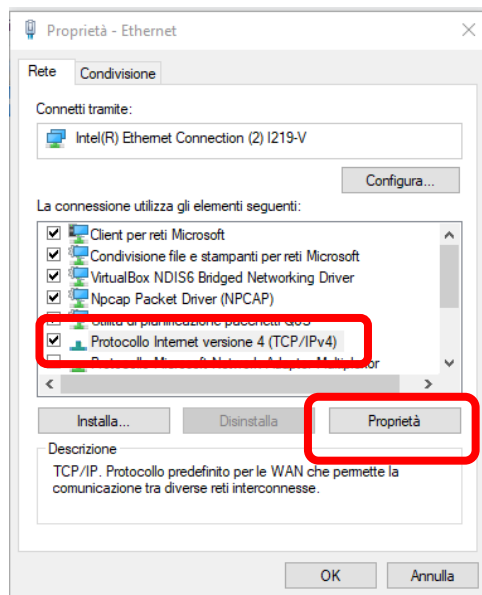
Restore the previous IP address settings as needed.
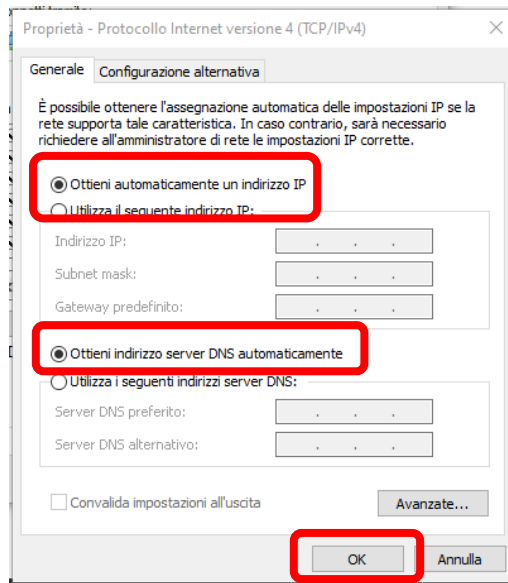
Now, please connect the Olliter SDR as shown in the Sample Ethernet connection chapter.
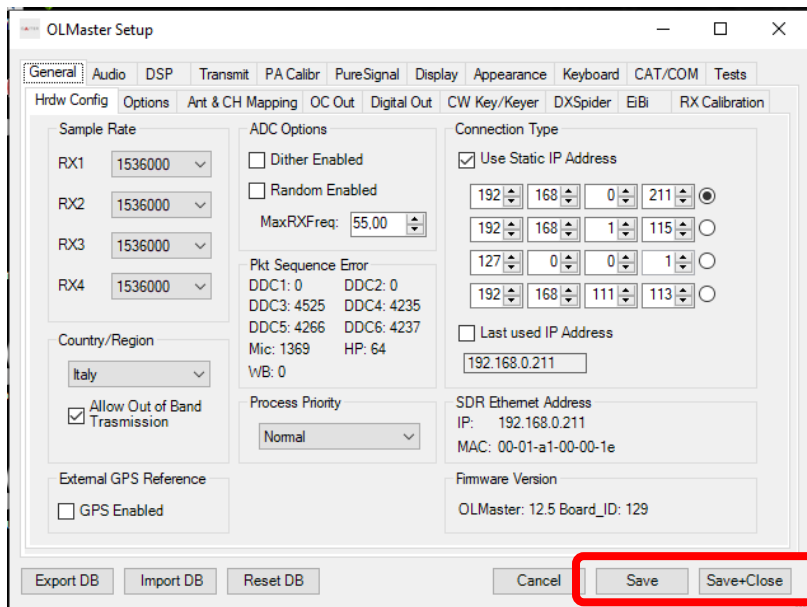
12. Usage of OL-Master

- Configuring OL-Master

All the following settings are accessed using the Setup menu of the OL-Master application, in OL-Master, click the Setup menu, then follow the subsequent instructions.

Settings are persisted using the *Save* or the *Save and Close* buttons.

o   Configuring the Olliter SDR address

In *General > HW Config* make sure the "*Use static IP Address*" option is enabled, then insert the IP address of the Olliter SDR that was configured.

This address is 192.168.1.111 by default, if it was manually changed following the above procedure, please input the new IP address that was configured.

Once the IP address has been configured and selected (using the radio button on the right), click Save and close the dialog box.
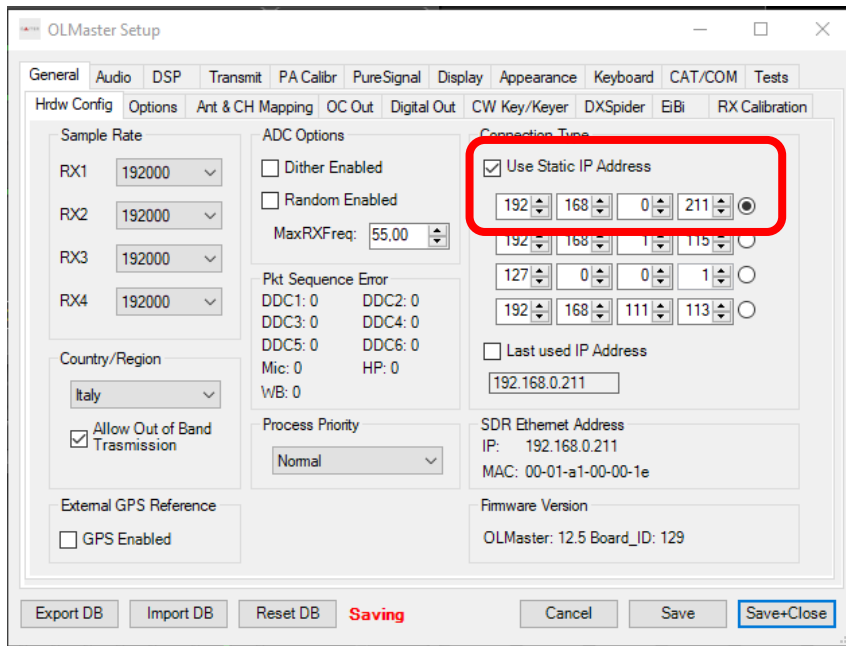
o   Configuring the operator settings

In *General > Options*, set the callsign and grid locator of the station.
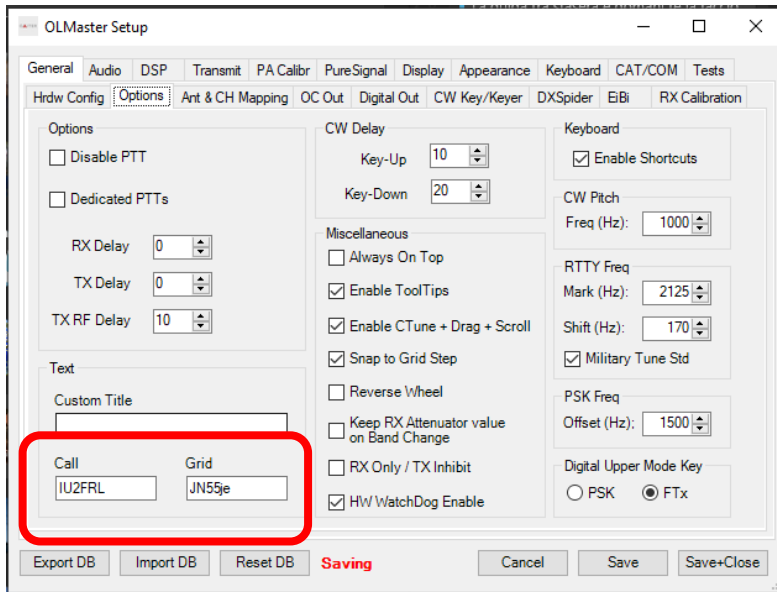
   o   Configuring the audio interface

If the user wants to enable the audio to be routed to the master PC, the following procedure is needed.

In *Audio > Audio & Common VAC* configure the *Driver* to MME, select the desired *Input* and *Output* devices, then select "*Enable PC Speaker via common VAC*".

The onboard speakers can be deactivated using the "*Local speaker disable*" option.
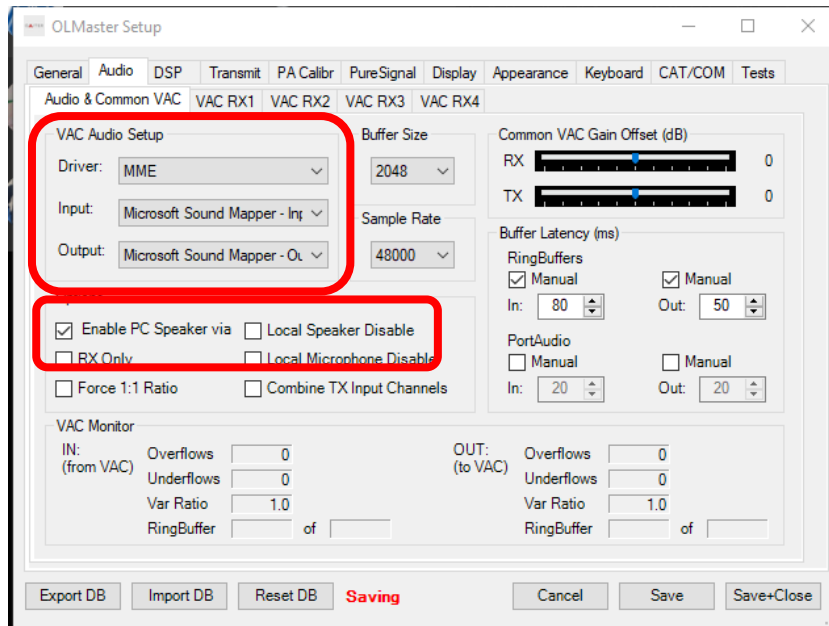
If a microphone is connected to the radio, the RX Only option can be checked to exclude audio transmission from the PC
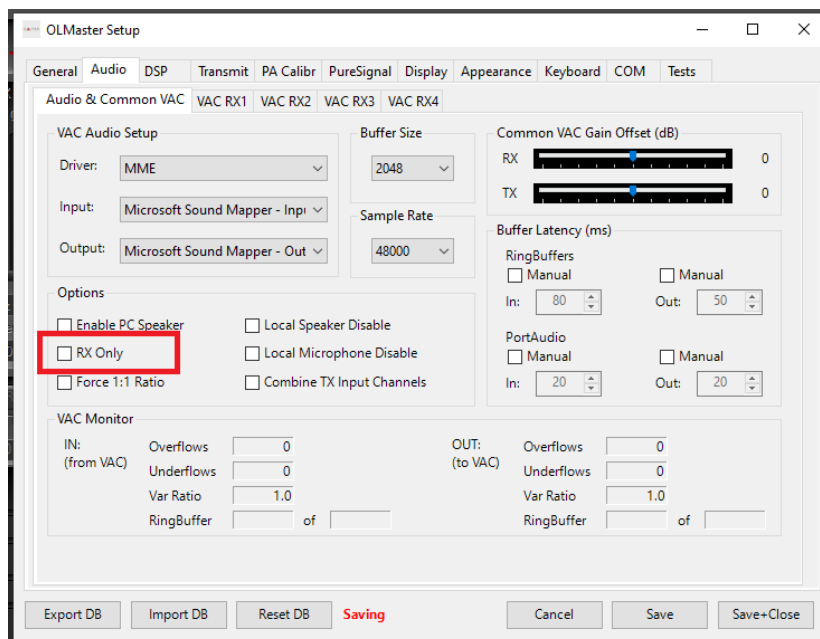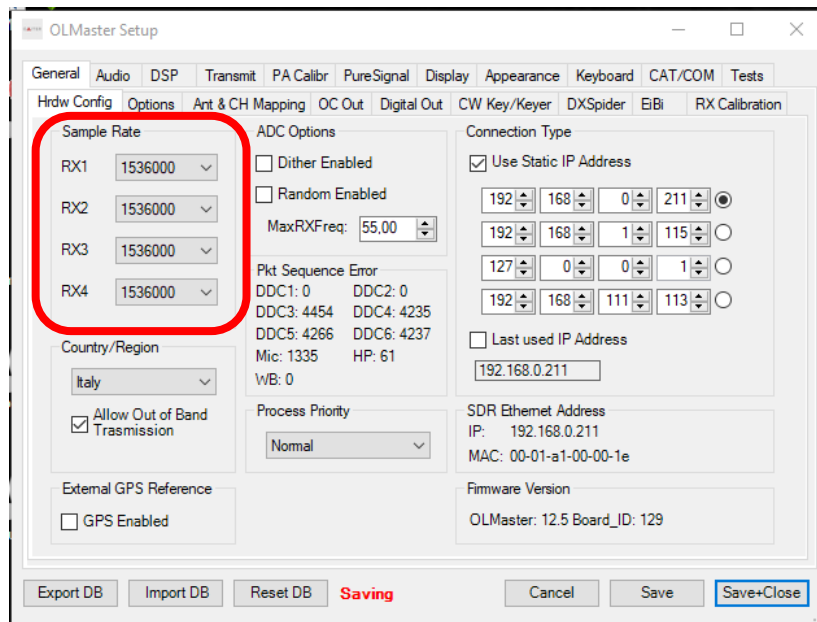
o   Configuring the receiver bandwidth

The SDR is capable of receiving and displaying a wide area of the RF spectrum, the receiver span can be configured in *General > HW Config > Sample Rate*.

The spectrum span that is rendered is roughly the 80% of the sample rate set in the settings menu, for example if 192000 samples per second are selected, the displayed spectrum will be roughly 180KHz.

The recommended sample rate is 192000 samples per second.

⚠️ As the sample rate is increased, more system and network resources will be required by the software, please adjust the settings accordingly

o   Configuring the refresh rate

The refresh rate of the receivers windows can be adjusted in *Display > General*. The suggested value is between 10 and 20 frames per second.

⚠️ Increasing the refresh rate can significantly impact the system load, if the system starts lagging or the UI starts behaving, reduce the "Main Display FPS" value
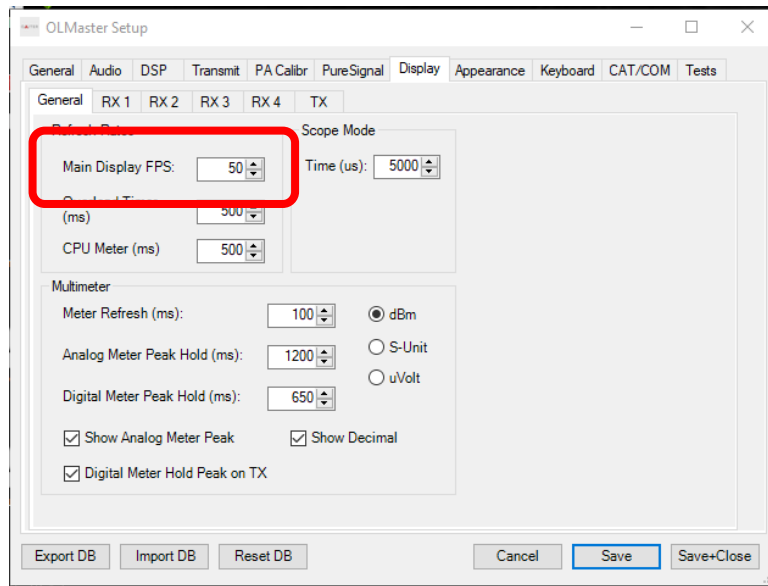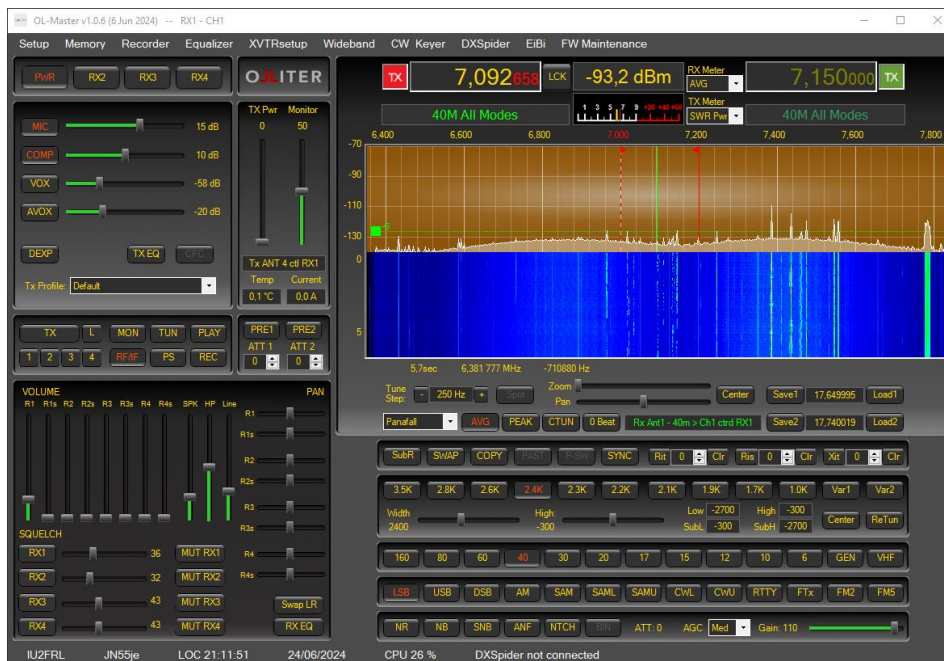
- Starting the device

Once the device settings were configured by the user, the device can now be started using the PWR button, the spectrum should animate, and audio will start.

- Controlling the transceiver

This chapter will cover the main settings of the OL-Master software, such as changing band, changing mode or interacting with the spectrum.
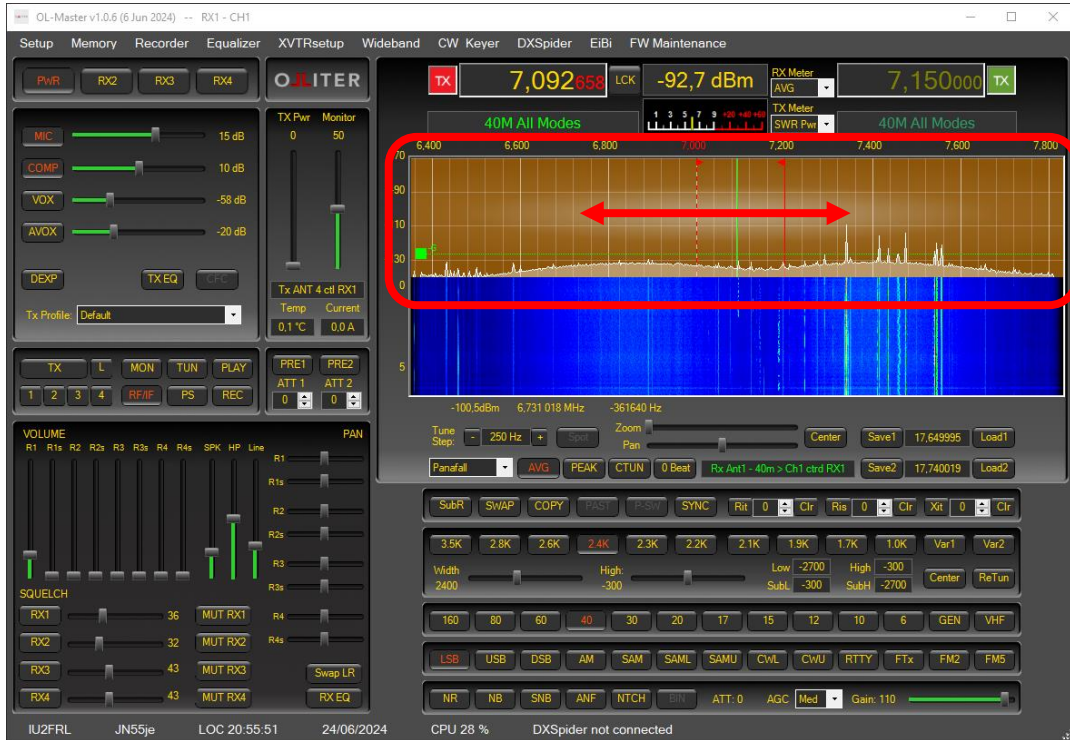
o   Selecting a different band

The transceiver can operate on all amateur bands of HF plus the 50MHz (6mt) band. The received band can be selected using the dedicated buttons.

○ Tuning a frequency

There are multiple ways to tune the received frequency, the main ones are by panning the receiver spectrum or by selecting the frequency using the dedicated numeric input.
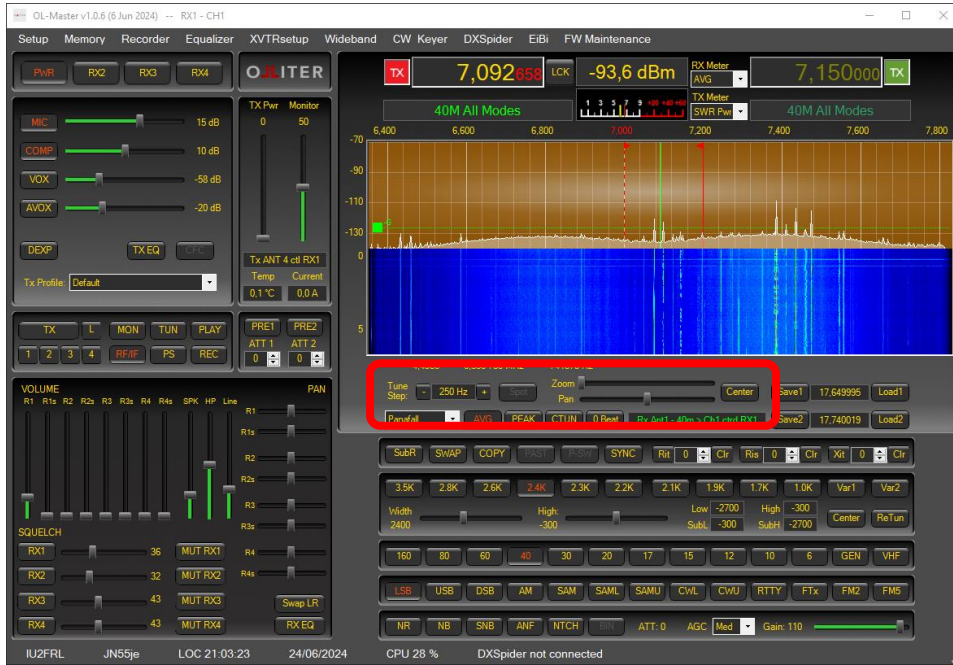
○   Setting the visualization mode

Different viewing modes can be selected for the receivers, each band will save the view setting that is restored every time the band is recalled.
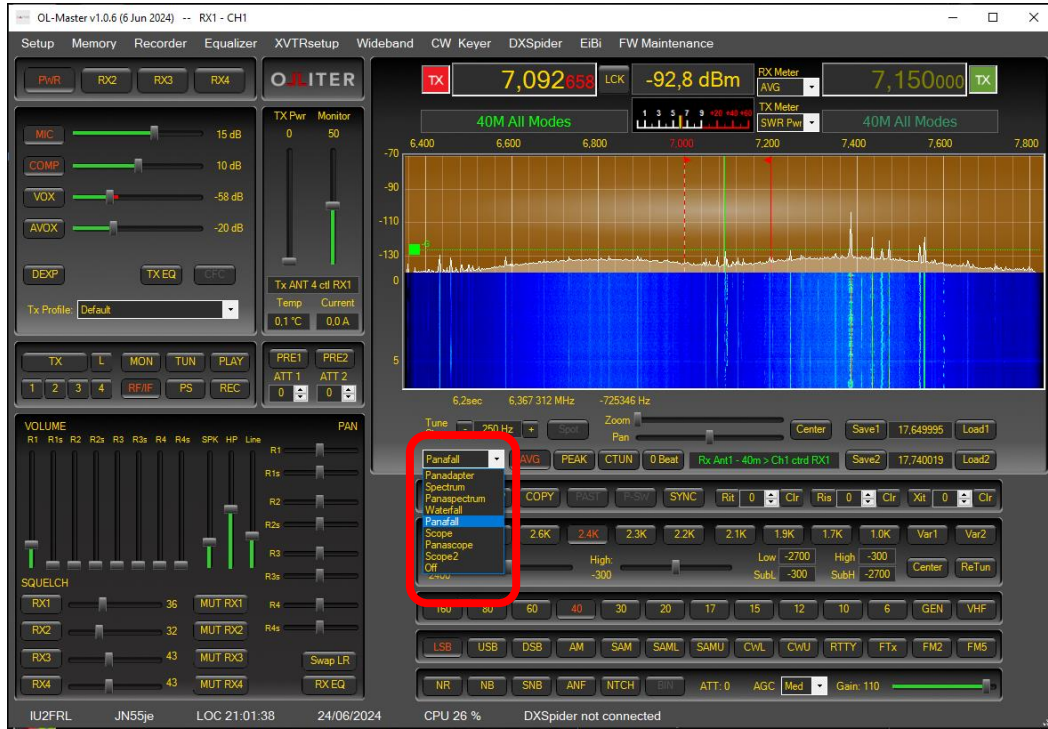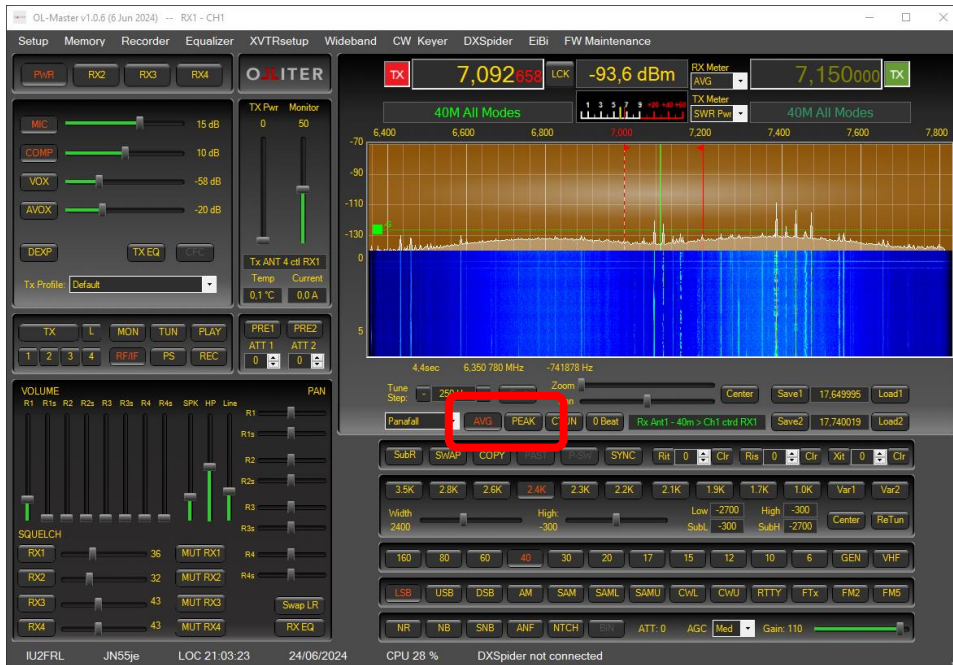
o Interacting with the spectrum

The receiver spectrum can be interacted using the spectrum controls, these allows zooming, panning and setting the tune step.

The spectrum can be rendered to display the average or the peak mode.
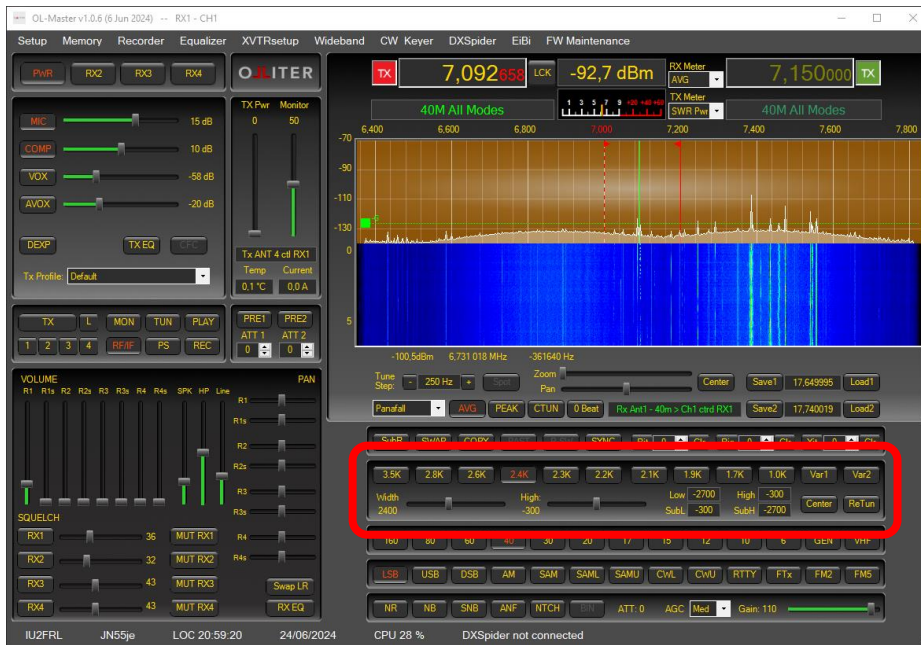
JL OLLITER

○ Setting the receiver mode

All main operative modes are supported by the transceiver, this can be selected using the dedicated buttons.

Then, for each operating mode, the bandwidth can be adjusted as needed.

o   Adding additional receivers

RX1 is located in the main window of the software, additional receivers can be enabled using the RX2, RX3 and RX4 buttons in the main window.

> ⚠️ Using additional receivers may significantly impact the system load, if the system starts to lag, reduce the number of receivers, or reduce the sample rate.
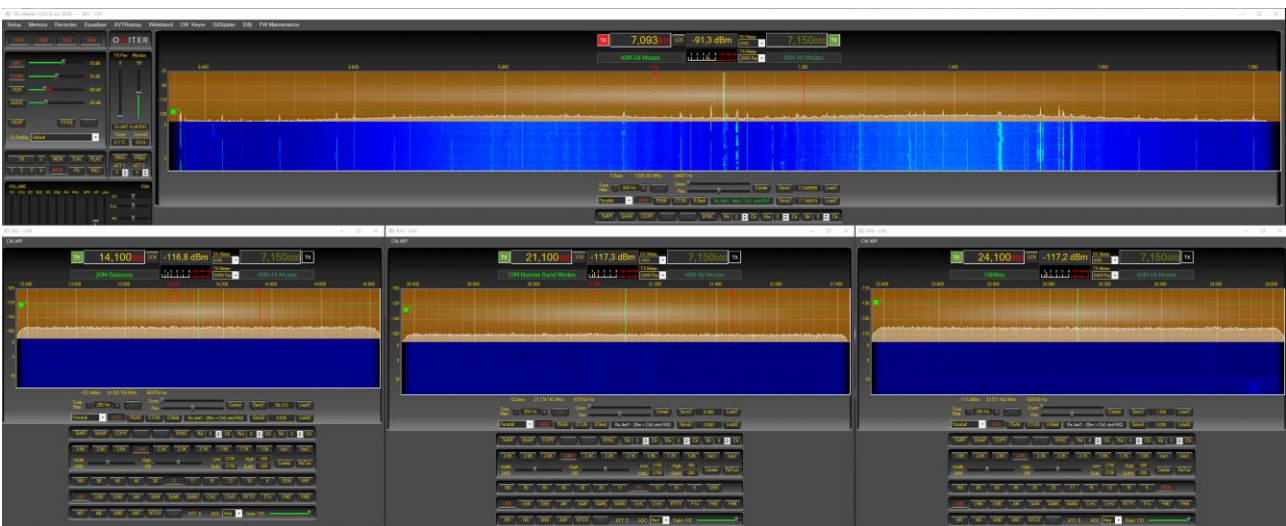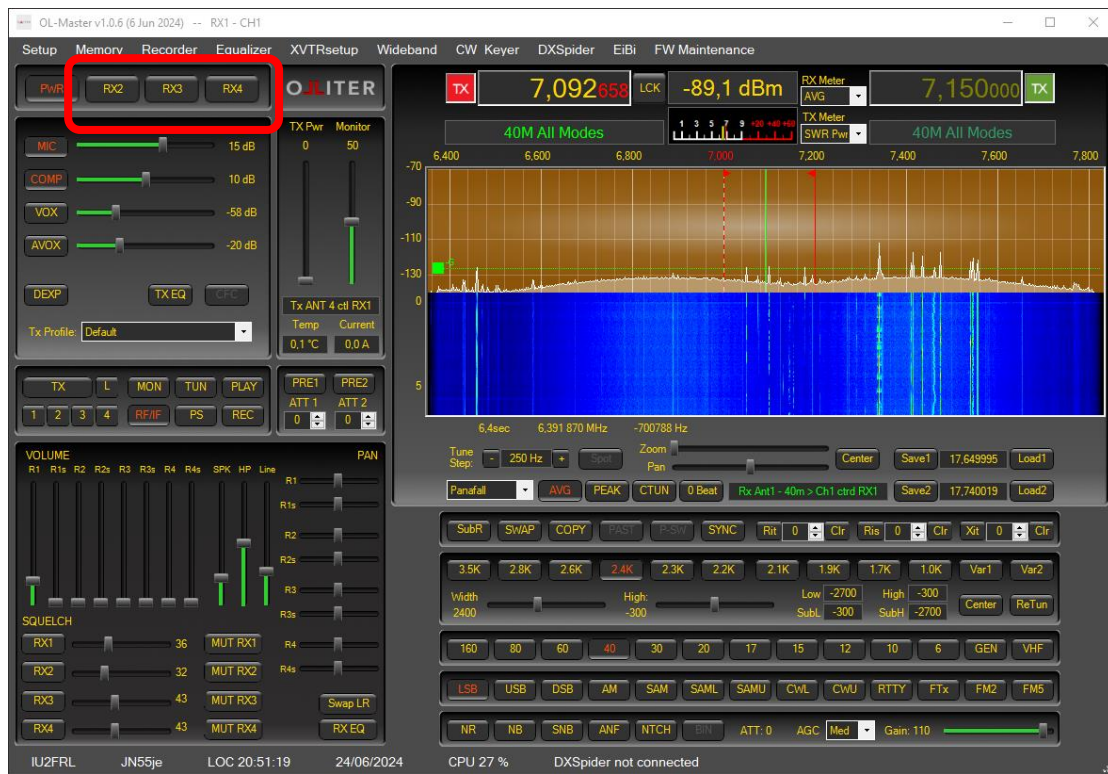
o   Adjusting the receivers volume

The main and sub volumes, per each receiver can be configured using the *Volume* controls group.
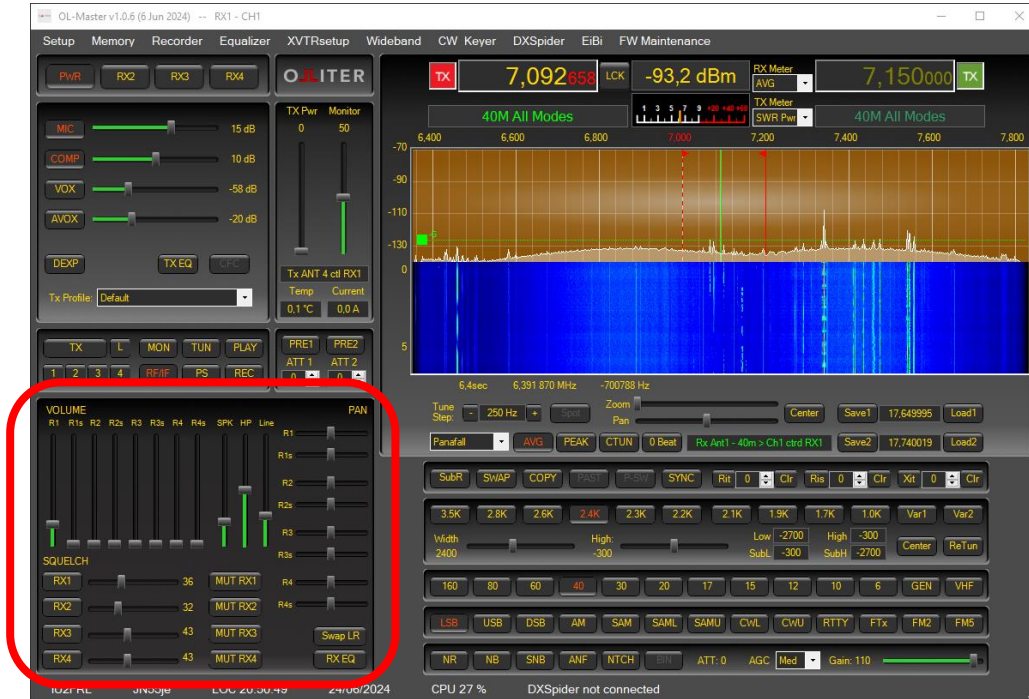
○   DSP options

Multiple software-based filters can be added to any receiver mode, these can significantly improve the reception of a given signal. Some filters are tuned to improve the voice quality, others to remove clicking, background noise or unwanted whistles. Filters can be enabled using the dedicated buttons.
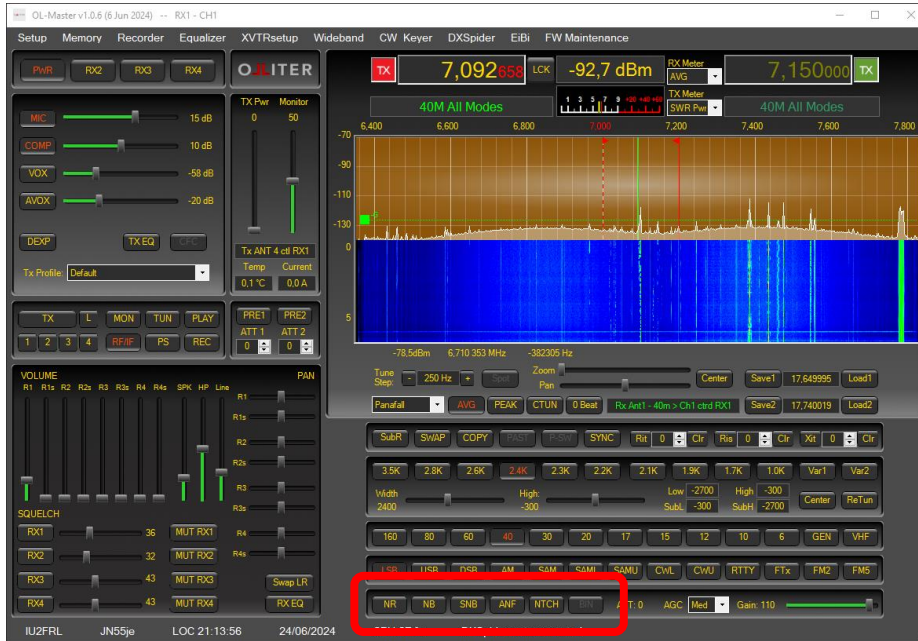
- Firmware upgrade

Upgrade of the firmware is performed using the OL-Master application with a dedicated menu.

> ⚠️ Although the Olliter SDR has a recovery mode that can be enabled in case of major firmware failures, the firmware upgrade is a delicate process that requires some attention. Please read this chapter carefully before starting the procedure.

> ⚠️ Make sure to close all background apps and to have a reliable power source for both the PC and the transceiver before attempting a firmware upgrade.

Extract the ZIP file containing the firmware anywhere on the local PC to get the *.hex* file which contains the new firmware.

> ⚠️ Extract the file on the local hard drive, do not use USB sticks, network drive or other unreliable locations that may create latency or issues.

Once the file is extracted you should see something like this:
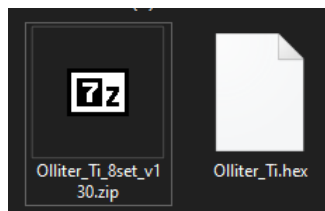
Make sure the transceiver is ON and reachable on the local network, then open OL-Master and select the *FW Maintenance* menu. The SDR should be detected automatically by the software.
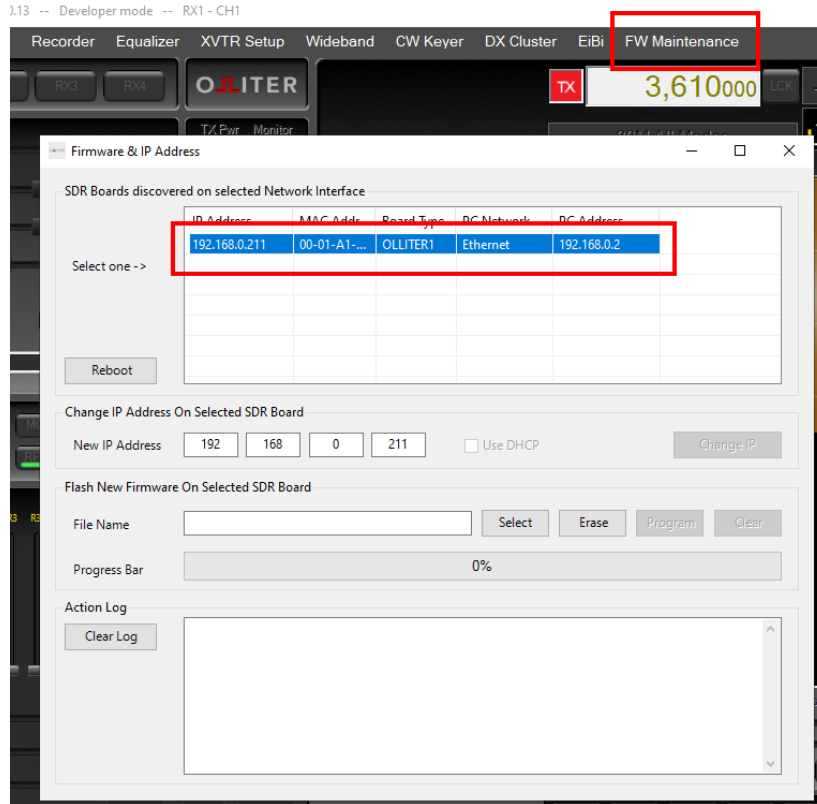
Using the Select button, navigate to the .hex file that was just extracted and select it.
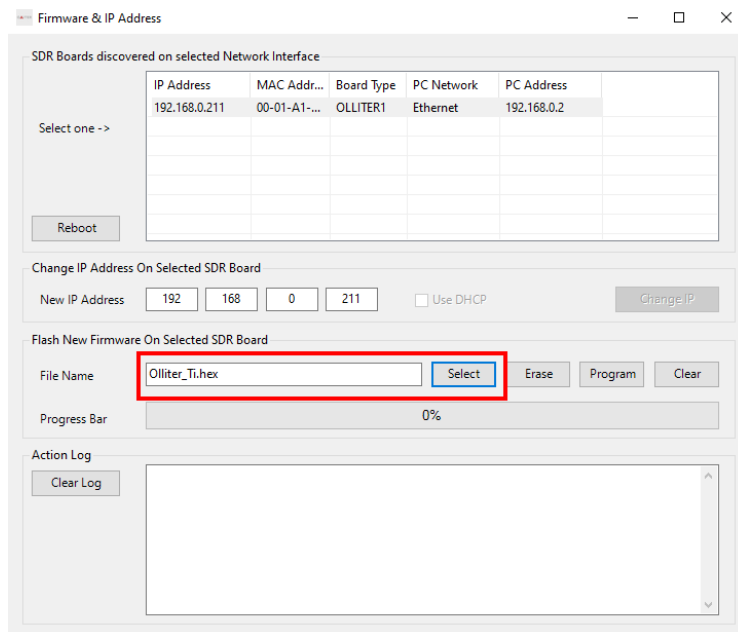
Once the file is selected, click the Program button to start the upgrade procedure.

⚠️ The upgrade procedure will take about a minute, please be patient.
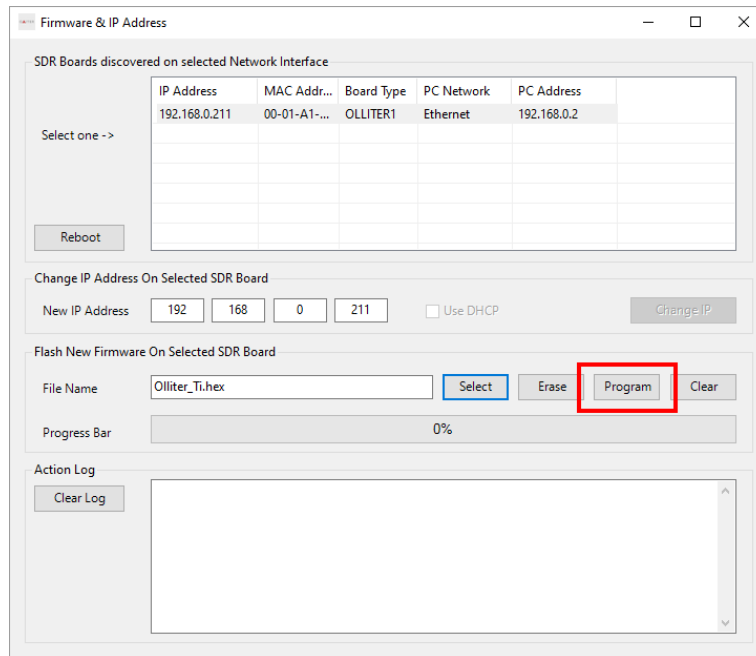
At first, the software will erase the content of the FPGA, this is a monolithic task, so the software may look like it's frozen, please be patient and just wait for the process to complete. Once the erase task is completed, you should see the progress bar moving, and when it reaches 100%, the transceiver should be restarted automatically.

⚠️ If the process hangs after some minutes, or if any error occurs, please contact our customer assistance to get further assistance.

Wait for the upgrade window to close automatically after a couple of seconds, then the process is complete, and the transceiver can be used as normal.

13. General recommendations

- Digital modes (FT8)

The following steps outline the proper configuration of the Olliter SDR for operating in FT8 mode. Ensure that the settings are applied carefully to avoid issues with audio processing and transmission.

o Using Virtual Audio Cable (VAC)

- VAC RX1: Set the software to use VAC RX1 (or RX2, RX3, or RX4) for audio input, but do not use the "Common VAC" setting. This configuration ensures that the audio is correctly routed through the system without interference from other processes.
- VAC Type: Use monodirectional VAC for both input and output. You may need to configure separate VACs for input and output if your version supports bidirectional audio (such as Muzychenko's VAC). If your system uses bidirectional VAC, it is possible to use a single VAC for both input and output.

o Audio Levels and Filters

- Compressor and Leveler: In FT8 mode, disable both the Compressor and Leveler. These audio processors are not required in FT8 and may cause distortion or improper modulation of the digital signal.
- VAC RX Level: Set the VAC RX level to approximately -27 dB. This ensures that the audio level is appropriate for digital signal processing, avoiding overload.
- VAC TX Level: Set the VAC TX level to 0 dB. This level ensures that the transmitted signal is clear and within the normal operational range for FT8 transmissions.

o Transmit and Receive Filters

- TX Audio Filter: When WSJT-X is set to Radio -> Split: NONE, the TX audio filter of the Olliter SDR must be adjusted to match the RX filter and the bandwidth used by FT8. For example, if you are using FT8 between 200 Hz and 3500 Hz, the TX audio filter should also be set between 200 Hz and 3500 Hz. Additionally, the RF filter should be aligned to this range.
- Split Mode (RIG or FAKE): If using WSJT-X with the "Split" mode set to either RIG or FAKE, there is no need to modify the TX audio filter beyond its normal range. In this case, set the TX filter to 300 Hz to 2700 Hz, and FT8 will adjust the RF frequency to keep the audio signal centered within the bandwidth. The RF filter can be set freely, but note that it will limit the FT8   band   visible   on   WSJT-X   or   similar   software.

- SSB mode

When switching from FT8 or other digital modes to SSB, several adjustments need to be made to ensure optimal audio performance. Follow these instructions for setting up the Olliter SDR for SSB operations.

  o   Microphone Voltage Considerations

- Yaesu Microphones: Typically require 5V for proper operation.
- ICOM Microphones: Typically require 8V. Verify the correct voltage before connecting the microphone to prevent damage or malfunction.

Please refer to the Microphone input chapter to see how to change the microphone voltage.

  o   Switching from FT8 to SSB

- Deactivate VAC: After using FT8 or other digital modes, ensure that VAC RX1 (or RX2, RX3, RX4) is deactivated before switching to SSB. Failure to do so may prevent audio from being transmitted properly.

  o   Audio Processing Settings for SSB

- Leveler: Reactivate the Leveler when operating in SSB mode. The recommended setting is 7 dB, which helps maintain consistent output levels. After adjusting, verify that the Automatic Level Control (ALC) is set to approximately 3 dB.
- Compressor: For SSB, it is recommended to enable the Compressor at 8 dB, or even 10 dB, especially when using the PureSignal feature. This improves the overall signal clarity and transmission quality.

  o   Transmitting Filter Settings

- TX Audio Filter: In the Setup -> Transmitting menu, adjust the TX audio filter according to your preferences. The default range for voice transmission is 300 Hz to 2700 Hz; this range provides a balance between intelligibility and bandwidth usage.

14. Troubleshooting

This chapter contains some issues that may occur while operating the transceiver, if the proposed solution does not work for you, please get in touch with the customer care department.

- Olliter SDR Not Powering Up

Some linear power supplies with large filtering capacitors can cause the Olliter SDR to power up improperly if it is connected before the power supply is turned on. This occurs because the slow charging process of the power supply's output filters triggers a low voltage alert in the transceiver, activating the protection circuit and cutting off the power.

Solution: Resetting the Protection Circuit

If the Olliter SDR does not show the green light when pressing the power button after turning on the power supply, follow these steps:

- Disconnect the Input Voltage
    - o Ensure the power supply remains on.
    - o Disconnect the input voltage from the Olliter SDR.
- Wait for a Few Seconds:
    - o Allow a couple of seconds for the protection circuit to reset.
- Reconnect the Power:
    - o Reconnect the input voltage to the Olliter SDR.

By following these steps, the protection circuit should reset, and the Olliter SDR should power up correctly. If the issue persists, ensure all connections are secure and the power supply is functioning correctly.

- OL-Master reporting an error at startup

If the OL-Master software throws an error at startup stating "Cannot load DLL 'ChannelMaster', cannot find the specified module" means that some dependencies are not satisfied.

Solution: Refer to the System requirements chapter and make sure all software and hardware requirements are met.

- No voice from the front-panel microphone when transmitting

This issue can relate to multiple reasons, both software and hardware.

- VAC is enabled on the receiver

VAC will have priority over the microphone audio when transmitting, make sure the VAC is disabled on the current receiver from the Setup menu to enable the audio stream from the microphone.

Solution: disable VAC for the receiver that is being used

- Wrong microphone style

Each transceiver is shipped with a dedicated microphone wiring, a different brand of microphone cannot be used without switching to a new wiring kit. Contact the customer assistance service to receive information on the wiring that was shipped with your transceiver or to request a new microphone wiring kit.

Solution: verify the microphone wiring that was installed

- Wrong microphone voltage

Different microphone brands have different settings, make sure the right microphone supply voltage was selected in the Setup menu.

Solution: verify the microphone supply voltage

- Improper microphone gain setting

Microphone gain is set from the upper-left panel of the OL-Master software when in SSB mode, adjust the slider to get a good quality of the transmitted audio.

Additional settings can be found in the Setup menu, like preamplifier or the adjustment range of the main slider.

Solution: verify the microphone gain.

- Additional windows (like EiBi or Cluster) are not showing up

Windows sometimes "hides" some UI elements outside the screen boundaries, just restore the window position to show it up.

Solution: Restoring the new window position

Hover the mouse to the OL-Master icon in the Windows bar (usually the bottom part of your screen), you should see two or more windows as in the picture
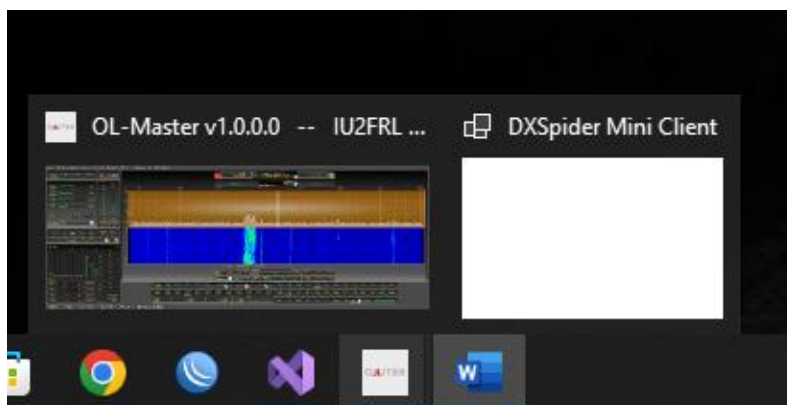
Right click on the window that has disappeared (the DX Spider Client in this example) and select "Maximize". The window should now appear on your main screen fully maximized, click on the title bar and drag it anywhere to return to its normal size. The new location should be stored in the database and recovered at the next reopening.

- User interface is not updating or feels slow

If the UI is laggy or unresponsive, it may be caused by a CPU overload, the bottom bar of OL-Master shows the CPU utilization, if this is too high, or even if the number is low but the interface feels "slow", please consider closing other software running in background or use a more powerful computer.

Another way to reduce the computing load of the software is to reduce the sample rate from the OL-Master "Setup" menu, closing additional receivers, turn off some advanced filtering (like NB2 or NR2) or disabling external services like cluster or EiBi.

Please remember that on SDR devices, the biggest part of the job is performed by the computer, so a powerful transceiver, requires an adequately powerful PC.

Solution: Reduce the sample rate, close all background applications or consider a PC hardware upgrade

- Audio from the speakers feels clicky or saturated

Audio levels is monitored by the AGC algorithm, if the AGC is set to any manual setting and the volume is too high, the audio will be saturated and sound bad.

Solution: lower the audio volume or enable AGC

- I connected the transceiver to a different PC and all settings were reset

Settings of the transceiver are not stored in the transceiver itself, they are stored in an xml file which lives in the *%appdata%/OL-Master* folder of the control PC. This file should be copied across the different devices where OL-Master is installed

Solution: copy the database file to the new PC

- I get a weird error at startup telling my database cannot be loaded for some reason

The database probably got corrupted due to some hardware or software issues, automatic backups are created by the software in the %appdata%/OL-Master/Backups/Automatic folder, these files can be copied back to *%appdata%/OL-Master* and renamed to *database.xml* to restore a previous configuration

Solution: restore one of the automatic backups of the database

- You can't stop using the Olliter SDR transceiver

We're glad that you got to this point, if you can't stop using the Olliter SDR, it means that our engineers have worked really hard to get the most out of the best hardware which is currently available on the market and you're enjoying the result. Please let's keep in touch with our team using the Olliter website www.olliter.com or our social media so you will be notified at every new software release or be the first one to test our new hardware.

15. Additional resources

Some additional material was developed by our engineers to help you troubleshoot or configure some sections of the software, here are some links that every user should check out:

- Olliter website

This is the official website where all news are published, here you can find manuals, software and all the information that are created for our customers.

Olliter website: https://www.olliter.com/

Downloads section: https://www.olliter.com/download.html

OL-SDR page: https://www.olliter.com/sdr.html

- Olliter YouTube channel

This is the main source of information on how to configure third-party software (like WSJT-X, CW-Skimmer or DX-Lab).

Link to the Olliter YouTube channel: https://www.youtube.com/@OLLITER-EU

Link to the OL-Master Playlists: https://www.youtube.com/@OLLITER-EU/playlists

- Olliter on Facebook

Here you can find some news about our devices, plus some previews of the devices that are being developed or tested.

Link to the Olliter Facebook page: https://www.facebook.com/Olliter/

- Olliter on Instagram

Wanna see some cool stuff? Some pictures from events, presentations or our laboratories? Instagram is the place for you.

Link to the Olliter Instagram page: https://www.instagram.com/_olliter_/