54^ PESCARA AMATEUR RADIO FAIR

3^ MEETING HAM RADIO & SPACE

WINLINK EMAIL SERVER & WEBSDR SAT QO-100

BY ROBERTO ABIS IS0GRB

01/12/2019

www.hamradiospace.it

Presentation summary

ISoGRB Winlink Email Server

- What is the Winlink Email Server

- Possible speeds currently and in the future

- Tests performed with DJoMY and PR8KW

- How Winlink Server works

- Usable modems, VARA SAT Modem

- Special features for QO-100 (Frequency Calibration)

- Connection with the Winlink network, mailbox @ winlink.org and possibility of sending and receiving to other mail accounts.
- Configuration of Winlink Express client, VARA SAT modem and Virtual CAB driver

WebSDR ISoGRB

- Listen to Qo-100 via the Internet (WebSDR)

- Hardware used, Linux software and WebSDR software

- Implementations carried out, tool for searching the QRZ database and KG-STV digital image decoder

-ISoGRB WebSDR Project Diagram

- The modification of the LNB in detail:
(LNB Twin Fracarro mod.UX-TW LTE)

What is ISoGRB Winlink Email Server
The Winlink network

ISoGRB Winlink Server is a radio e-mail service connected to the Winlink amateur network.

The Winlink server was designed for use in HF and uses only radio links; it interfaces on the Internet with the centralized servers of the Winlink network but is also able to function as an independent mail server, configurable if necessary, for example in the event of natural disasters, where the Internet is not available.

If it is interfaced via the Internet, users can send and receive e-mails with their own **callsign@winlink.org** account to other global e-mail accounts, not belonging to the winlink.org network.

The Winlink system allows users to send e-mails with attachments, location reports, general weather reports or a specific area, very useful in navigation, and informational, such as newsletters containing daily news around the world.

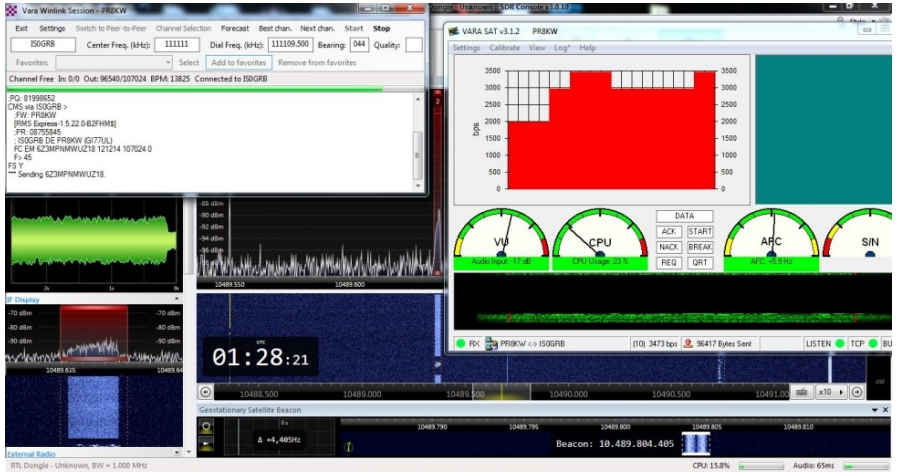
The Winlink network is known for its role in emergency and disaster relief communications. Users who use the Winlink network on amateur radio frequencies are radio amateurs with regular license.

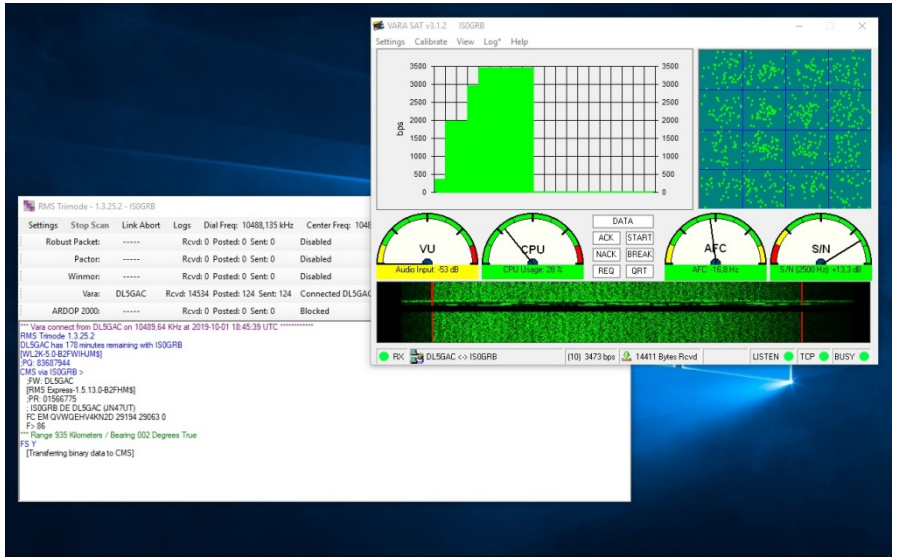
The system is built, managed and administered entirely by radio amateurs.

ISoGRB Winlink Email Server Transfer speed

The digital systems, those in connected mode, different from those in broadcast mode, to work on QO-100 must be able to manage delays of at least 1,2 seconds, due to the distance of the geostationary satellite, otherwise the system that is not receiving obtaining an answer from the correspondent in the time frame predefined by the protocol, attempts to retransmit, generating many collisions and the connection with the server is not successful.

For this reason i have personally requested support from the author of the modem VARA EA5HK and the American colleagues of the Winlink system, specifically to the authors of the modems Winmor and Ardop, asking for a modification to the modem reception / transmission software; the only modem that at the moment has been adapted and works correctly is the **VARA SAT MODEM**, SAT version of the famous VARA modem; in this way i was able to provide users with the service of sending and receiving e-mails via the QO-100 satellite with my ISoGRB server, which relies on the worldwide Winlink network through the Internet.



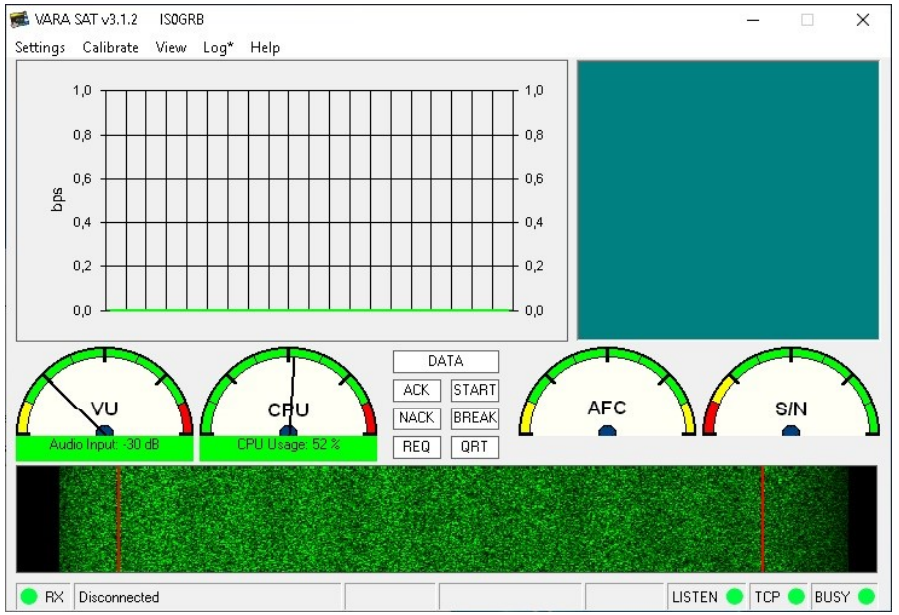


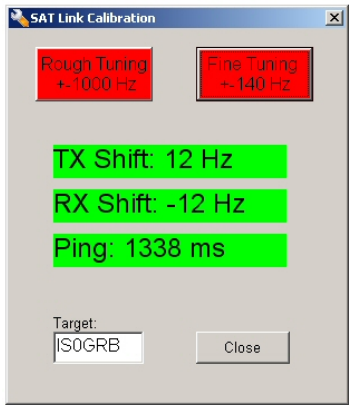
ISoGRB Winlink Email Server

Many tests have been carried out with the excellent stations of **Oscar DJoMY** and **Gustavo PR8KW** and thanks to their tests new interesting features have also been implemented on VARA SAT MODEM, aimed at managing some QO-100 problems, such as the calibration of the frequency required by the server Winlink ISoGRB (GPS-controlled) which in response communicates to the client the frequency slip detected and the duration of the ping, sent by the client to the server through the satellite, during the calibration phase on the client's optional request, before starting the connection with the client. server; this guarantees an error-free data transfer, due to slipping of the frequency of the client station.

With the Winlink server ISoGRB and the VARA SAT modem with license key, tests were performed in USB with a speed of 4.5 / 5 Kbps, allowing the transfer of a 100Kbyte file in about 7 minutes; soon, thanks to the granting of AMSAT-DL of a small slice of frequency on the WB transponder, tests will be carried out in DVB-S2 with the use of specially developed software with data rates of 66Kbps.

On the transponder NB FM transmission is absolutely forbidden and compliance with the Band Plan is strongly recommended.





Listen to Qo-100 via the Internet (WebSDR)

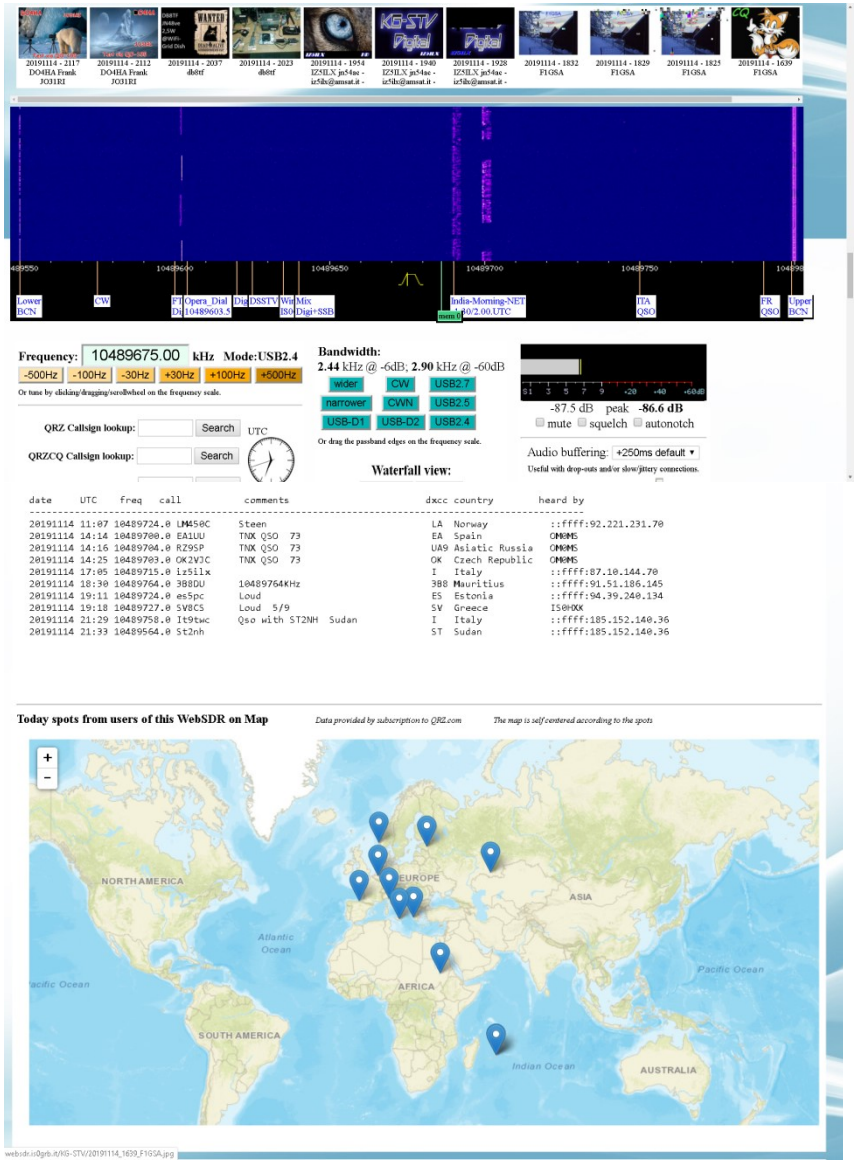
Immediately after launching the ISoGRB satellite it was activated to install and make available a ground listening station with WebSDR on the Internet, allowing the listening to the satellite, and in particular the NB transponder, to all fans of this project.

With this initiative, many amateur radio operators tuned in even before the satellite became operational, to intercept the very first tests of transmitters by Mitsubishi.

Since then many recordings have been made and immediately after the inauguration it has allowed, to many amateur radio amateurs and not, to listen to the traffic of QO-100.

With the passing of the months and with the experience matured the WebSDR ISoGRB has become a point of reference for many OMs in the world; in the meantime, other WebSDRs have also been turned on including that of BATC in England and others scattered around the world.

A point in favor of the ISoGRB WebSDR is the audio quality of the reception, with audio bandwidth starting from 100Hz in SSB, guaranteeing an excellent transmission reception.



Listen to Qo-100 via the Internet (WebSDR)

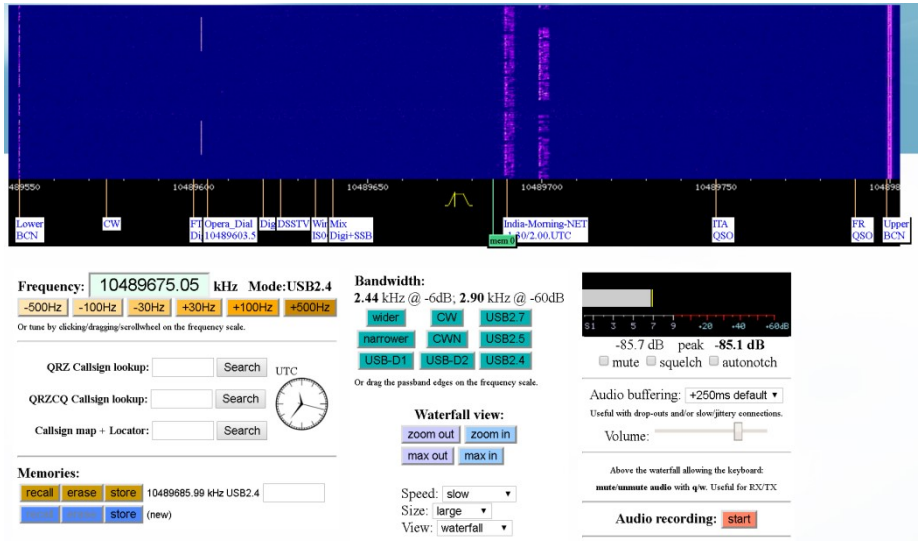
After a few months since the launch of the service, the ISoGRB WebDR is equipped with a GPS-DO, in order to provide a very precise reference even on the reception frequency indicated.

Today it also integrates an automatic software demodulator for Digital SSTV images, transmitted with the KG-STV software by various enthusiasts on the frequency of 10489625.

Users connected to the WebSDR also have the possibility of inserting DX spots of received stations, which are then displayed, through scripts in JavaScript and Perl language specially developed and thanks to the authorized query of the QRZ database, on a world map with zoom adjustable, so as to immediately identify the position of the amateur radio in transmission.

http://websdr.isogrb.it:8901
(Versione desktop – Pagina ufficiale)

http://websdr.isogrb.it:8901/m.html
(Versione Mobile per Android /IOS)



ISoGRB WebSDR. The LNB modification

In order to take advantage of a GPS-DO on the WebSDR it was necessary to use a modified Twin LNB and insert an external and precise frequency reference through one of the signal output connectors, which then became an input for the reference signal.

For this purpose a LNB Fracarro with 2 outputs was chosen, easily available on the market.

The modification of an LNB for this purpose consists in removing the internal xtal, of type HC49 / U of 25MHz, non thermostated, which allows to generate the first local oscillator of 9750 MHz (**25 MHz x 390**), which can be activated by powering the LNB with 13.8V (vertical polarization without 22kHz subtone for listening to the NB transponder).

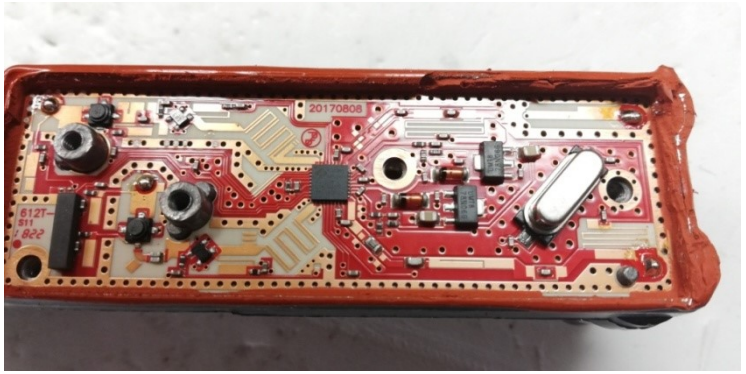
Without using a GPS-DO it is possible to use a TCXO smd inside the LNB instead of the original xtal, but with a lower precision.

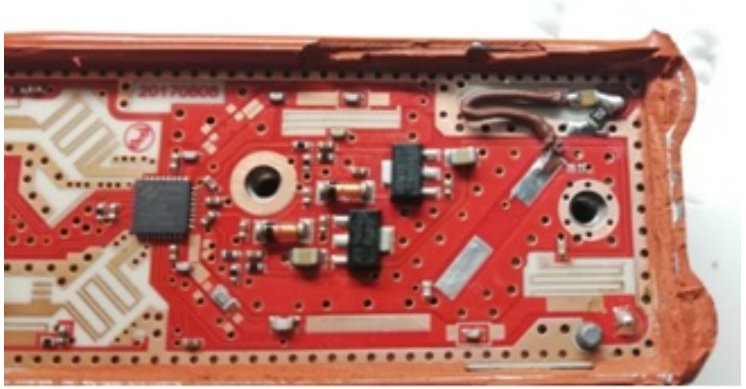
The modification of the LNB is also useful to be able to receive the QO-100 signal on a 434 MHz UHF SSB radio; refer to the modification of the LNB in detail, at the bottom of this document.

ISoGRB WebSDR. The LNB modification

As we have said, to insert this more precise signal from the outside it is necessary to modify the LNB, disabling the second output and using it as an input for the external reference signal, which will connect, with appropriate resistors and SMD capacitors, to the pad of the original quartz, previously removed.

With this ploy we will have a perfectly stable LNB, together with the possibility of converting it into any frequency up to 430MHz.



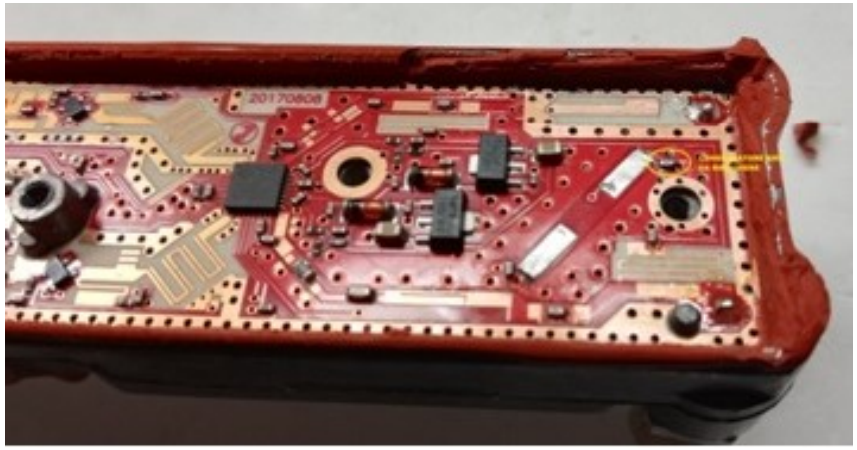


ISoGRB WebSDR. The LNB modification

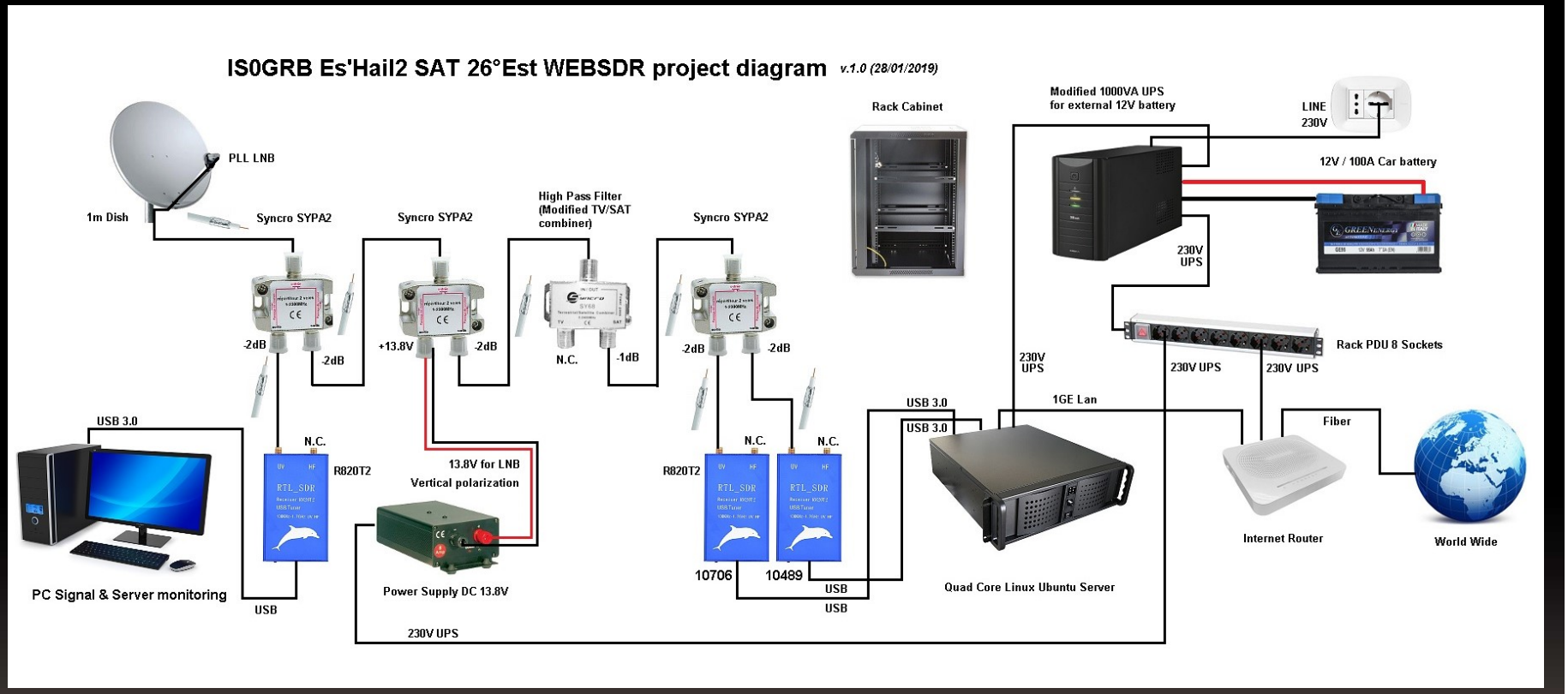
The perfect change

To obtain the maximum performance from the modification of the LNB it is possible to convert the LNB signal, instead of 739MHz or 434 MHz, above 950 MHz, for example to **1129 MHz,** using an xtal or external 24 MHz reference signal.

This choice provides the advantage of not having attenuation on the signal, since the high pass filter present inside the LNB does not act because it is designed to work under 950 MHz, and being converted in the frequency range from 950-2150MHz is easily usable also for the DATV with appositive SAT receivers; the Digital ATV is practicable on the WB transponder of QO-100.



ISoGRB WebSDR Project Diagram



The LNB modification in detail
LNB Twin Fracarro mod.UX-TW LTE

I illustrate the modification of the LNB Twin Fracarro for the insertion of an external reference.

The goal is to improve the stability of the local oscillator for use in the amateur radio field and therefore also for listening in SSB / CW mode of the QO-100 satellite.

The LNB in question was purchased at a local Bricoman store at a cost of 11,5 euros.

If you buy the 4-way model instead, you can use the output for listening to the NB and WB transponders at the same time, together with the one for entering the external reference, but the necessary change may be different from the one documented in this article.

To open the LNB you need to have a very sharp cutter and a Torx screwdriver.

Be careful not to break the plastic shell anchors, you may then have problems closing it.

The LNB modification in detail
LNB Twin Fracarro mod.UX-TW LTE

After opening the LNB and removing the 5 screws inserted in the red silicone visible in the figure (do not remove the red silicone around the screws) it is necessary to cut the red silicone around the closing cup with a cutter (cut it without removing it; seal when it is closed again) and with a thin-edged screwdriver pry on one side to open it, making sure that the screwdriver used does not go inside the circuit damaging the components.

The LNB modification in detail
Fracarro LNB Twin mod.UX-TW LTE

As you can see inside is identical to an Octagon LNB.

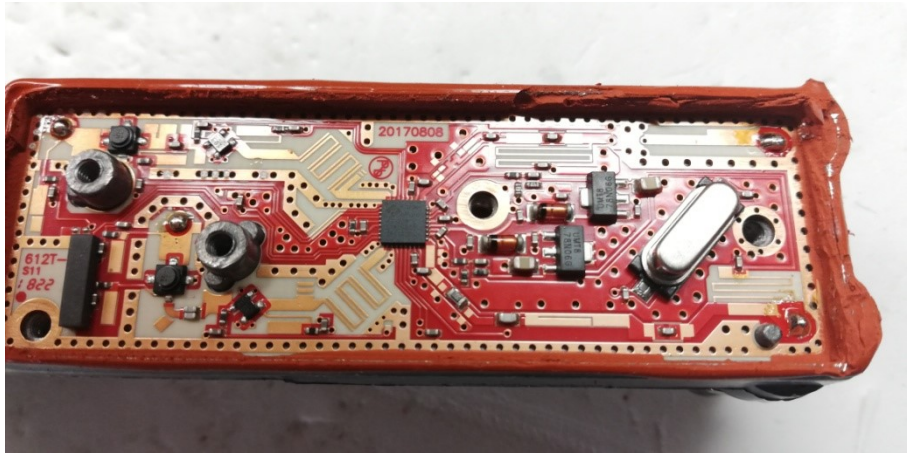
The Fracarro LNB Twin has the Octagon PCB v.2017

You will notice on the right side the welds of the central pins of the 2 output F connectors.

The xtal has the format HC49 / U with a frequency of 25,000 MHz.

In the upper part of the image it is easy to see the long track that connects that connector F; will be what we will use to insert an external 25,000 MHz signal, while the other connector will be used to pick up the signal, inserting the appropriate 13V or 18V power supply.

We begin by unsoldering the xtal, an operation that is only possible with a hot-air station, because the quartz is glued, and with the aid of the flux, which we will put all around the quartz but above all in correspondence of the soldering pads.



Heat the xtal with warm air, directing the warm air above all under the quartz and contextually in the soldering pads.

Heat it a lot so that it cannot be touched and with a thin tweezer try to lift it gently, first on one side then on the other, being careful not to pull too hard not to detach the soldering pads (the rheofors connecting the xtal are very long and folded inwards); if you notice that the xtal does not rise, continue to heat it all around.

The LNB modification in detail
Fracarro LNB Twin mod.UX-TW LTE

The operation is not simple and requires a lot of attention and delicacy so as not to ruin the circuit.

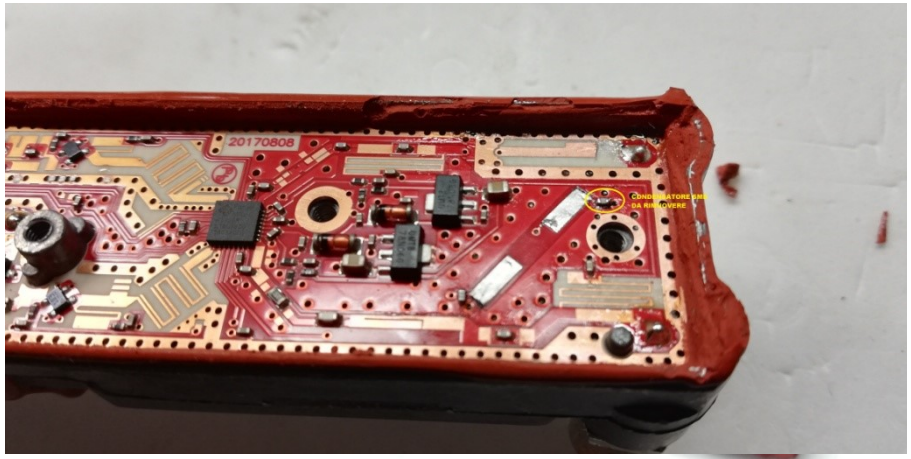
During these operations it is extremely important not to touch the RF components to the left of the central square chip with your fingers, which are part of the 10-12 GHz section, to avoid damaging or desensitizing them.

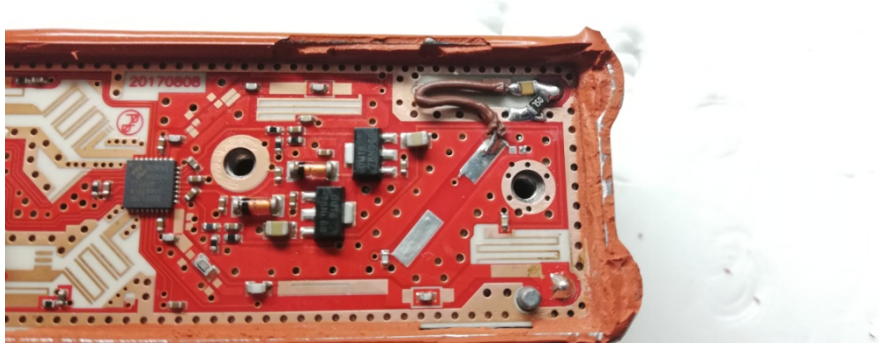
After removing the xtal and the small SMD capacitor that from the xtal pad near the track goes to ground (note the yellow indication in the photo), clean the welding pads well, inserting the flux again, with the use of a vacuum cleaner or better of a copper sock heated with the 380 degree soldering iron prepared with flux.

Now cut with the 1 cm cutter of the long track that leads to the F connector that we talked about earlier, as in the figure on the side.

Now connect a 100nF SMD capacitor to the soldering pad of connector F and a 75 ohm SMD resistor in parallel to ground.

The capacitor must then be connected to the xtal pad with a very thin wire modeled as in the figure, so that with the lid closed it is not too tight and does not break the SMD capacitor.

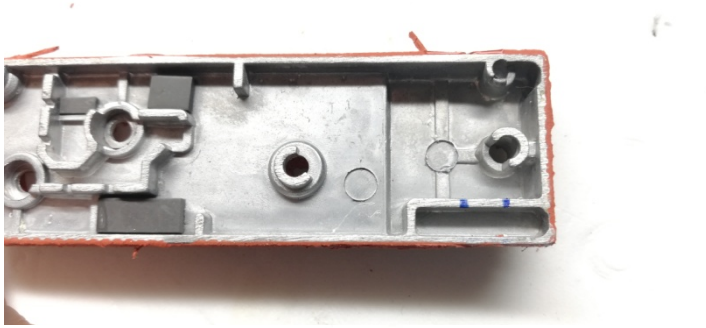


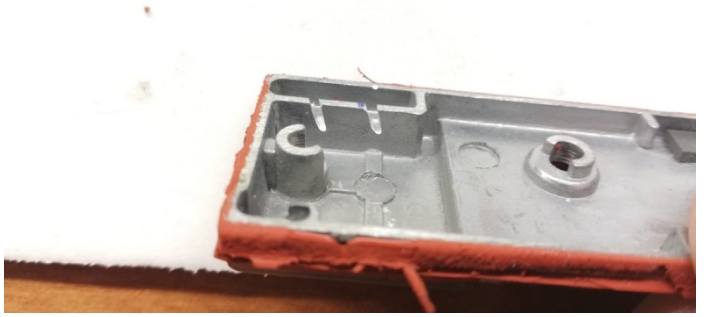


The thread will fit perfectly into the aluminum groove of the lid.

The LNB modification in detail
Fracarro LNB Twin mod.UX-TW LTE

With the help of a small hobby emery we will now cut one side of the inner aluminum separator of the lid.





The LNB modification in detail. Conclusions

Carry out the closing test of the cover now, checking that no component touches the internal aluminum separators and that the thin wire is not crushed.

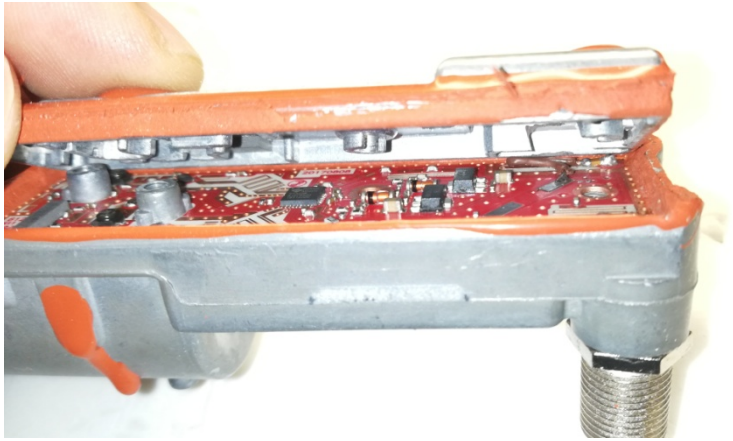
Close the cover by reinserting the 5 Torx screws and reassembling the plastic closure shell; with a DDS generator or better with a GPS-DO it will now be possible to provide a precise frequency of 25,000MHz with high stability, if necessary also through a 30-35m satellite cable.

If a DDS generator is used, it is equipped with a TCXO or OCXO, appropriately programming the desired frequency; the LNB will multiply this entered frequency **X 390**.

From tests carried out the LNB is able to work by injecting signals from 23.700 to about 25.500 MHz.

1. Using the **25,000 MHz frequency the LNB will supply 9,750,000 MHz** as the first local oscillator, supplying it with 13V or 18V without the 22kHz

2. Using instead **24.46153846153846 MHz will provide 9.540.000 MHz**, which will be useful to see the DATV transponder of the Es'Hail-2 (QO-100) satellite on a normal SAT receiver. 10.492 - 9.540 = **952** MHz



3. Instead, using the **25.78205128205128 MHz frequency will provide the frequency of 10.055.000 MHz** and we could thus listen to the NB transponder of the QO-100 satellite on 434,550 MHz (10.489550 - 10.055000) with a normal all-mode UHF radio.

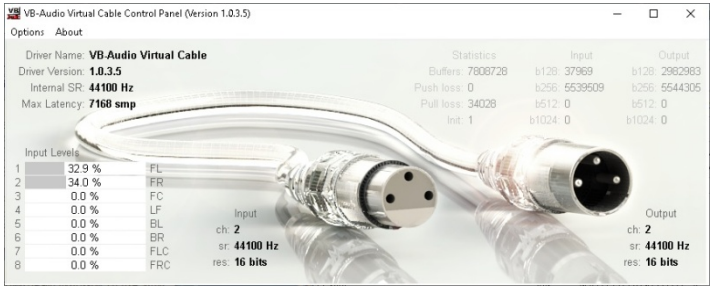
Winlink Express Client. Installation

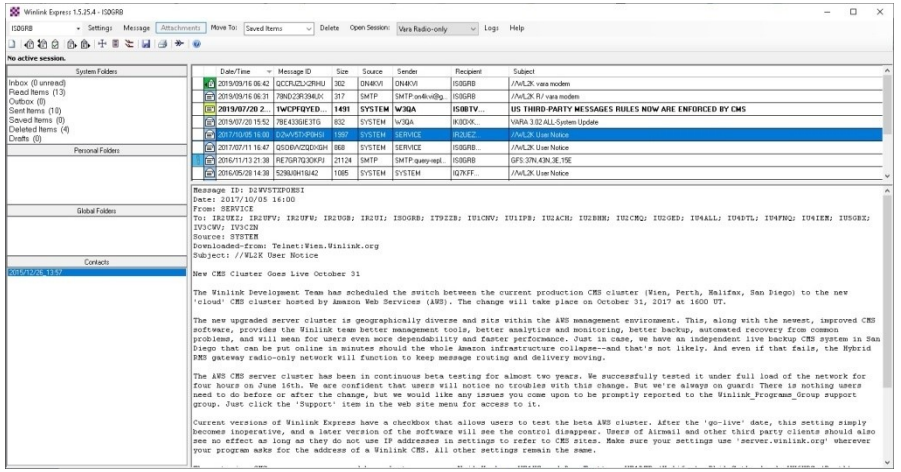
To use the Winlink ISoGRB server via Qo-100 it is necessary to install the **Winlink Express Client** program, which can be downloaded from the Winlink site at the following address: https://downloads.winlink.org/User%20Programs/

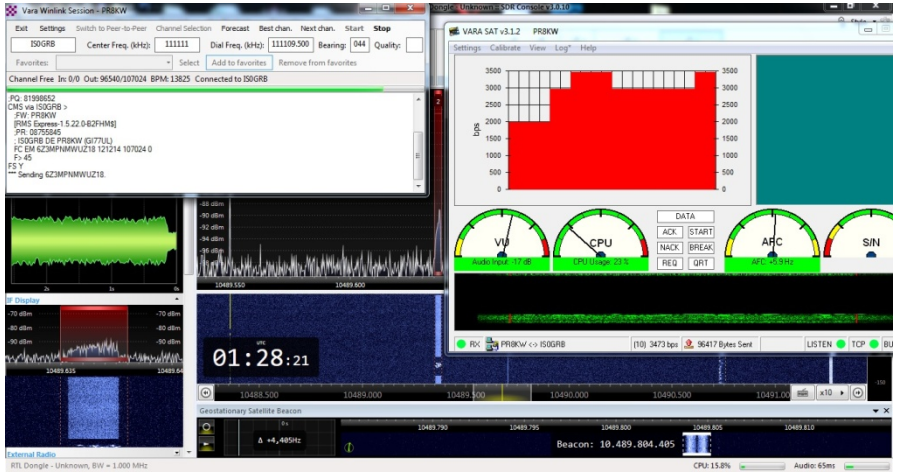
Then install the **VARA SAT modem** from EA5HVK, a single version for use via the QO-100 satellite, which can be downloaded from the following address: https://rosmodem.wordpress.com/

Now install the **SDR-Console** program from the following address: https://www.sdr-radio.com/Software/%F0%9F%92%BEDownloads
Reference to the various documents present on the Internet for the configuration of this program, to be used with SDR interface for receiving QO-100.

Also install the **Audio Virtual CAB driver** from the following address: https://www.vb-audio.com/Cable/







Winlink Express Client. Configuration

After installing the Winlink Express program it is necessary to configure some parts:

In the SETTINGS menu select the Winlink Express Setup item:

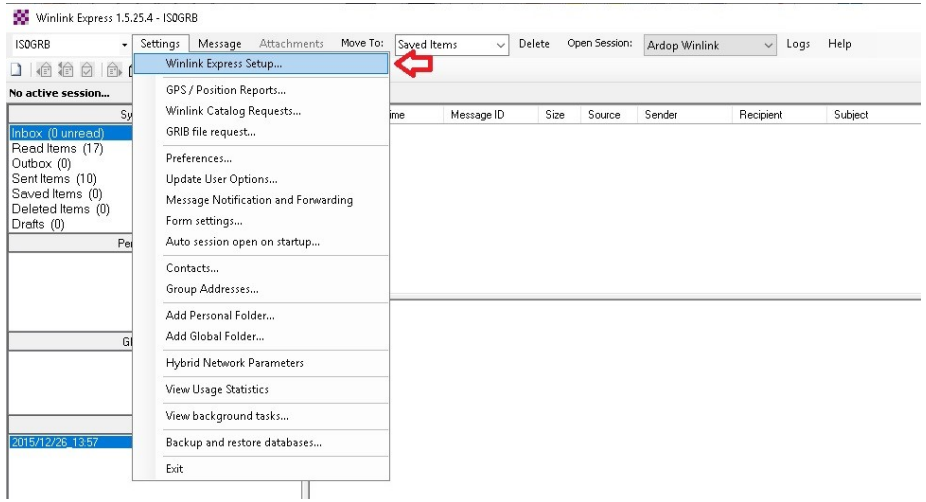
In this section it is necessary to enter all personal data, as indicated in the figure. Also indicate a preferred password, which will be used by the program for automatic access to the Winlink email server.

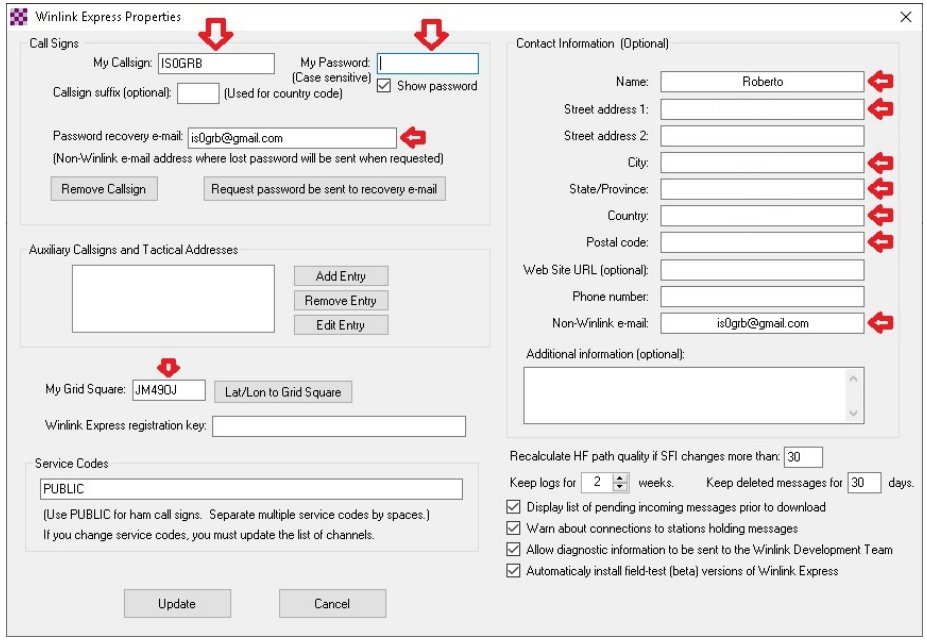
Also indicate the Grid Square Locator and the data relating to your home and email.

In the **password recovery e-mail section** enter an e-mail address where you can retrieve the password in case of loss; may be the same e-mail address shown in the right-hand box.

IMPORTANT: After entering your personal data and configuring the program, you will have to wait for Winlink to enable your account; Your mailbox **callsign@winlink.org** will be created after verifying your data and verifying that you are an authorized amateur radio operator.

Until you are enabled the server will deny you the connection.

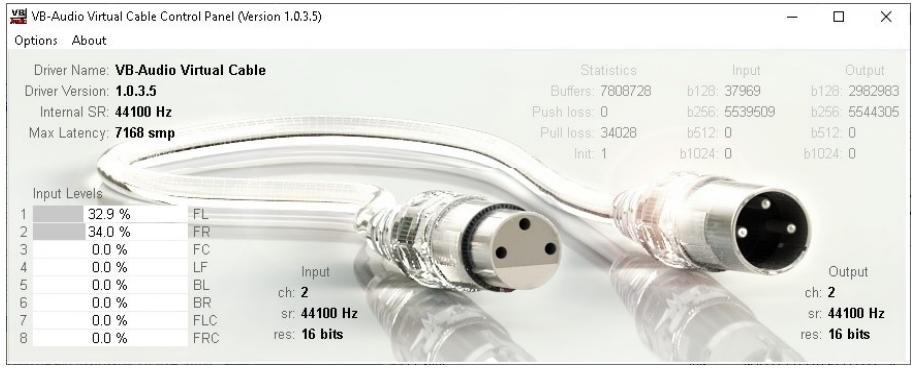




Winlink Express Client
Configuring Virtual CAB Audio Driver

After installing the Virtual CAB driver it is necessary to make some configurations.

The Virtual CAB driver allows software redirection of the audio received from the SDR-Console program to a virtual recording device, so that it can be selected as the input source for the various programs that need this audio signal to be able to function.



Winlink Express Client
Configuring Virtual CAB Audio Driver

Go to the **Windows Audio panel** and the **Playback** menu.

Set **Virtual Cable Input** as the **Default Device**.

Instead, set the **Speaker device** as the **Default communication device**.

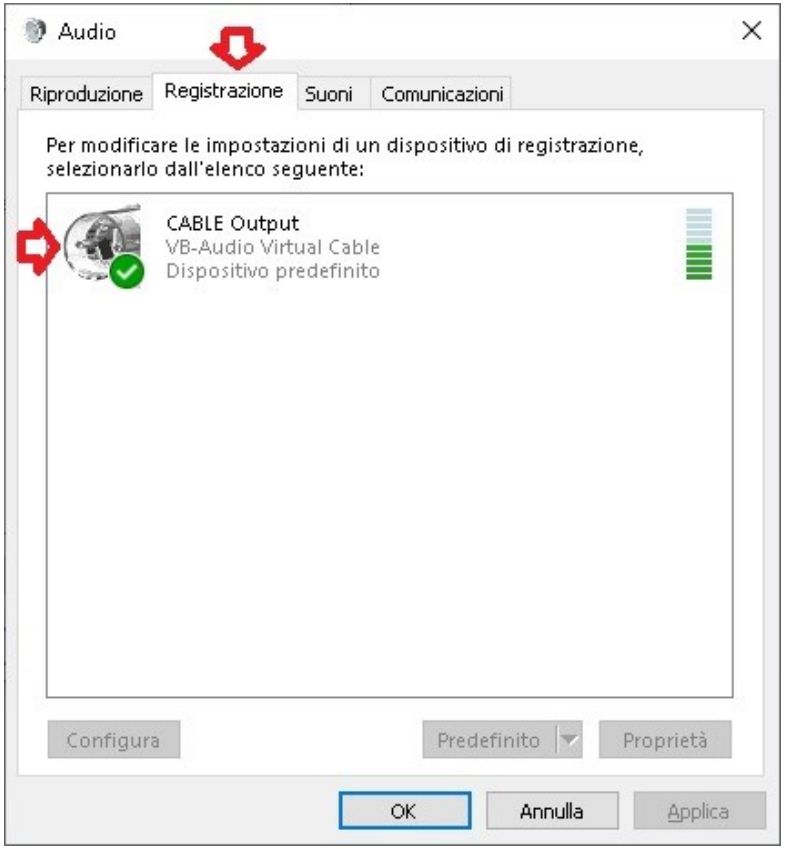
Winlink Express Client
Configuring Virtual CAB Audio Driver

Go to the **Windows Audio panel** and the **Recording** menu:

Set the **Virtual Cable Output** as the **Default device**

If you have an HDMI video connection, in the properties of this device, by right-clicking the mouse, in the **Listen menu**, check the **Listen to device** and playback device box where you prefer the audio you are receiving to be redirected with the Virtual CAB coming, in our case, from SDR-Console, for example to the HDMI device, otherwise you will not hear any audio on the PC speakers or on the HDMI monitor.

IMPORTANT: Do not select the Loudspeaker device because you will create an audio loop, by re-transmitting the audio received from the SDR-Console receiver via the Speaker device.

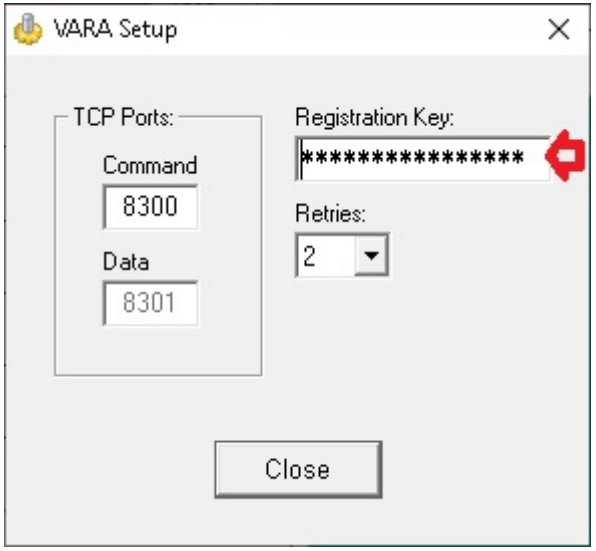


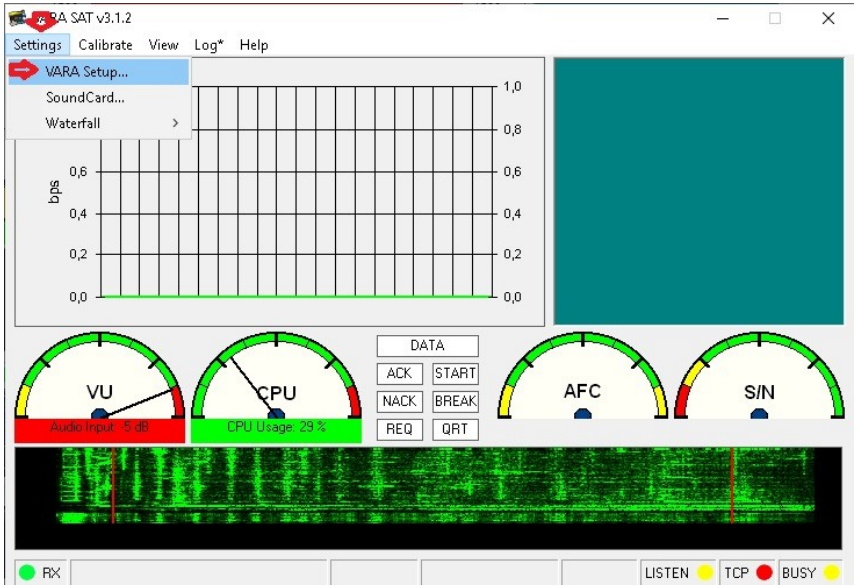
Winlink Express Client Configuration VARA SAT Modem

After installing the VARA SAT Modem it is necessary to configure it. **Important**: Perform the installation in the **C: VARA** folder

From the **SETTINGS menu select** the **VARA Setup** item

In this section, enter only and possibly the registration key purchased by the VARA software author, which will allow you to enable high speed and reach speeds of around 3500-4000bps, otherwise the maximum reachable speed will be blocked at 175 bps .





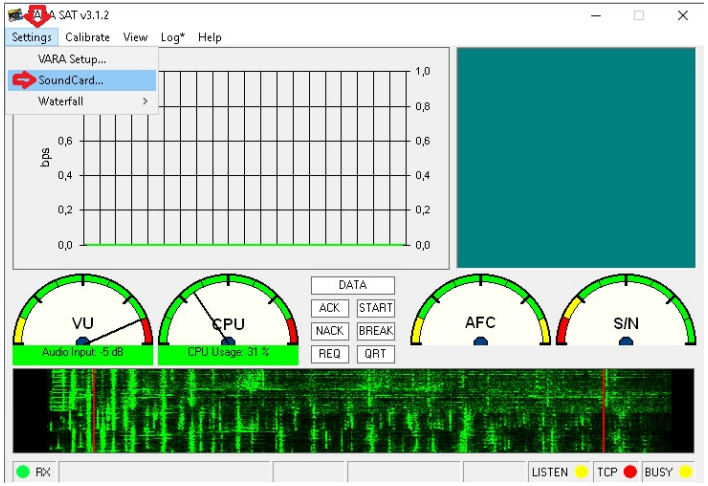
Winlink Express Client Configuration VARA SAT Modem

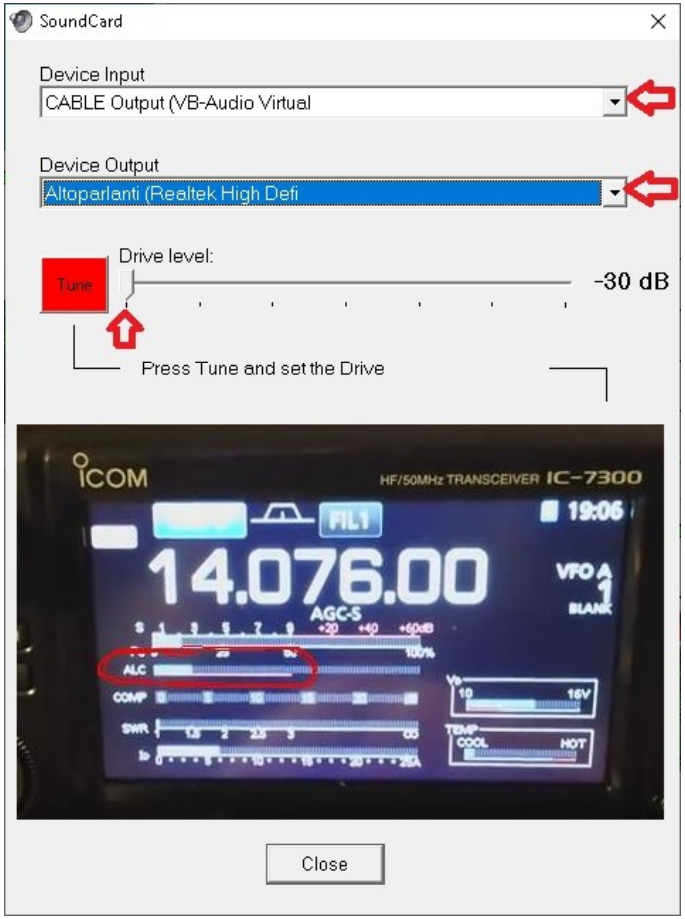
From the **SETTINGS** menu, select the **Sound Card** item

In this section it is necessary to configure the audio input and output devices; as **Device Input** select the **Cable Input** device and as **Device Output** the **Speaker device** (connect the PC speaker output with an audio cable to the transceiver audio input)

Set the audio level to -30dB, if necessary increase it if the signal on QO-100 is low, checking that the audio is not distorted.

To perform a test press the **TUNE button**, which will transmit a 1500Hz audio tone.



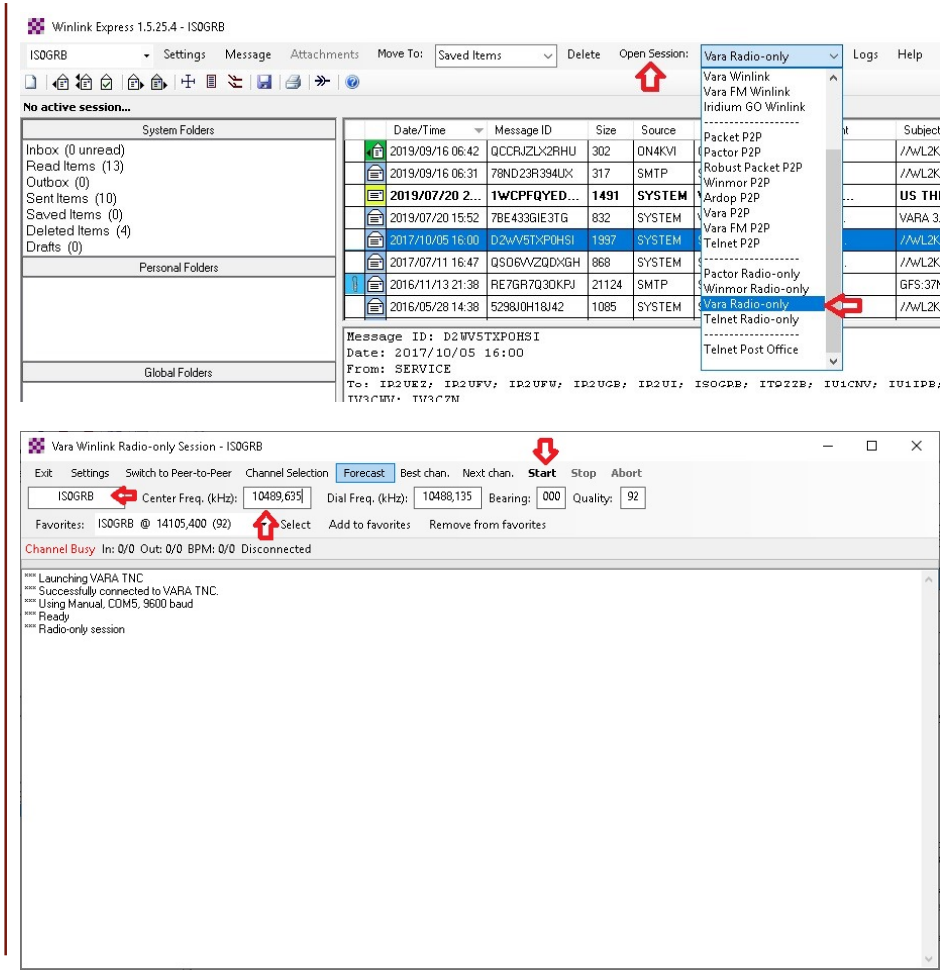


Winlink Express Client. Configuration

In the Winlink Express **Open Session** menu select the item **VARA Radio Only** and click again on **Open Session**.

The Winlink Espress connection window will be presented for use with the VARA SAT modem.

In this section enter the name of the **ISoGRB** server, the frequency 10489.635, even if not strictly necessary, and press **START** to start the connection.

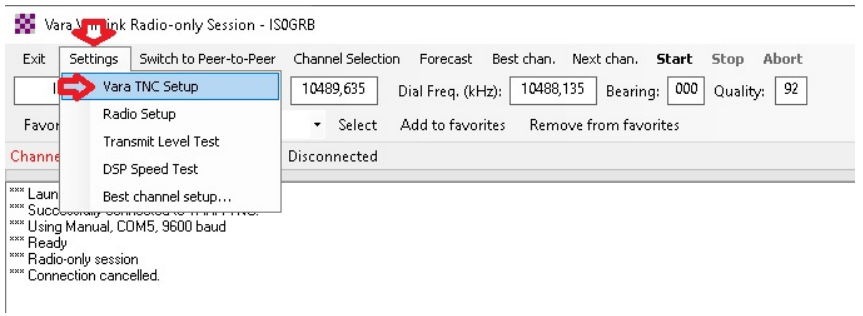


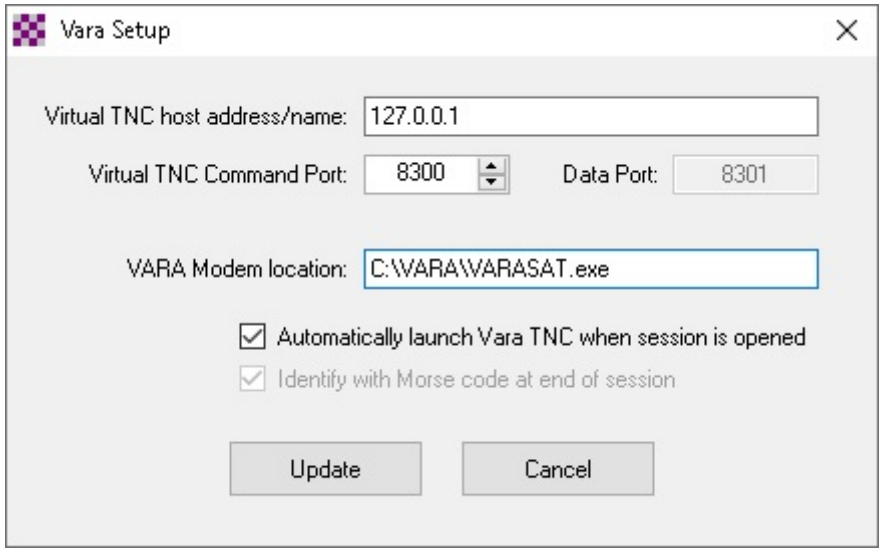
Winlink Express Client. Configuration

In the **SETTINGS** menu, in the **Open Session** section of Winlink Express, select **Vara TNC Setup** now.

In this section, verify that the folder where the VARA SAT modem was installed is correct: **C:\VARA**

Leave the other settings unchanged.





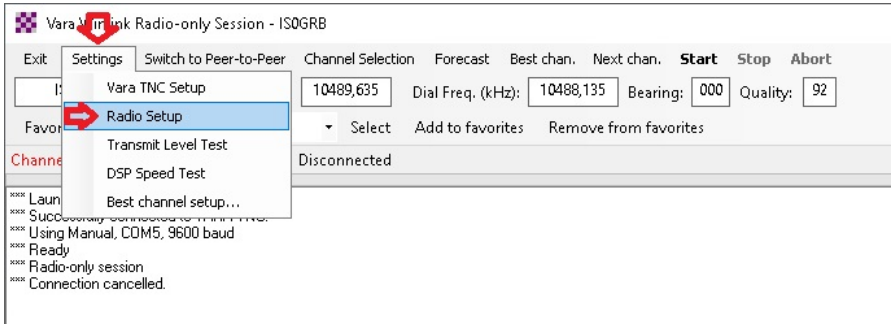
Winlink Express Client. Configuration

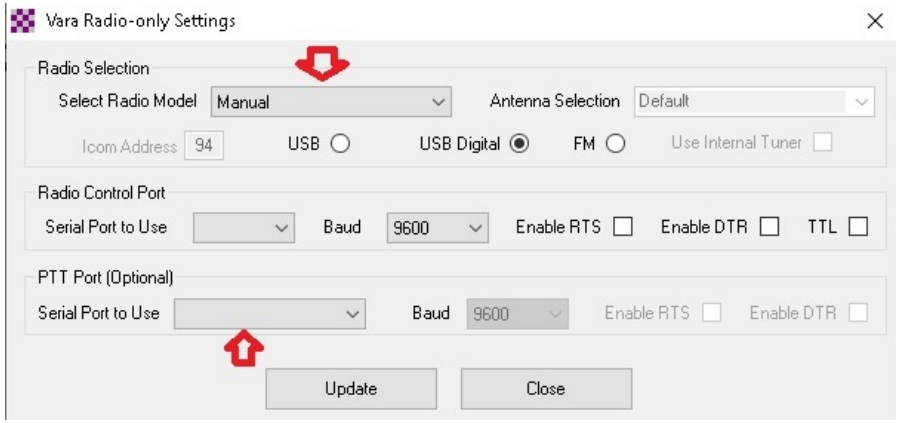
In the **SETTINGS** menu, of the previous window that is opened by clicking Winlink Express on Open Session earlier, select **Radio Setup** now.

In this section you can leave out the type of radio, probably it is not connected to a CAT interface, but it is important to select a Serial COM port that will be used for the automatic PTT of the radio.

If you do not have a serial port on your PC you will need to have a USB <-> serial adapter and after having installed the relevant drivers, select in this section the COM port detected by Windows, also setting **RTS or DTR** as pin of the serial port used for connecting the PTT with the radio.

Leave the other settings unchanged.





Winlink Express Client. Conclusion

Now press START to start the connection with the Winlink ISoGRB server via Qo-100 SAT.