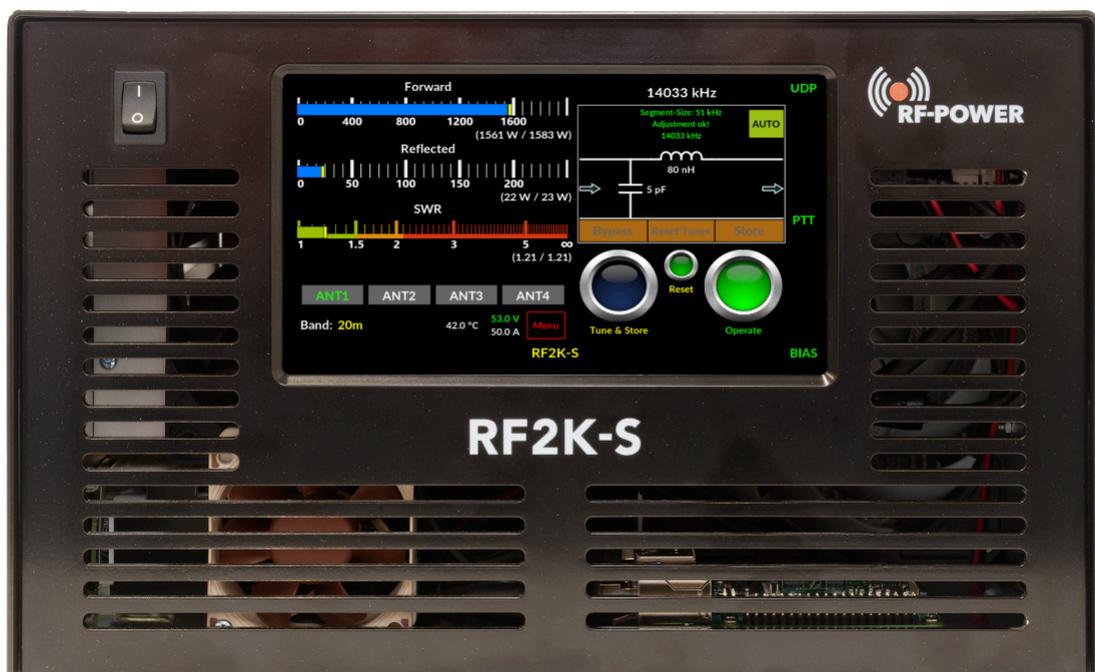




RF-POWER



RF2K-S

HF Solid State Amplifier User Manual

Dear customer,

congratulations on your purchase of an RF-POWER power amplifier! RF-POWER devices offer you innovative and reliable technology, functionality and attractive design.

If, despite our careful quality control, you should have any reason for a complaint or a question about the device, please contact your trusted dealer or RF-POWER directly.

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Austria

<https://www.rf-power.eu>
support@rf-power.eu

Note: This user manual describes the range of functions of the linear amplifier RF2K-S with software version G169C239. If the software of your device has a lower version number, you may not be able to access all the functions described here (see also Chapter **6.2.3 Update** on page **23**).

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1. Explanation of symbols

1.1 Warnings



Warnings in the text are marked with a warning triangle and are delimited by lines above and below the text. In addition, signal words indicate the type and severity of the consequences if the measures to avert the danger are not followed.

The following signal words may be used in this document in connection with a warning:

- **NOTICE** - Material damage may occur.
- **WARNING** - There is a risk of serious or life-threatening personal injury.
- **DANGER** - There is a high risk of serious or fatal personal injury.

1.2 Important information



Important information without danger to people or property is marked with the adjacent symbol. They are delimited by lines above and below the text.

Symbol	Meaning
▶	Instruction for action
»	Reference to a position in the document
•	Enumeration / list entry
–	Enumeration / list entry (2 nd level)

2. Compliance

2.1 Packaging

The packaging protects the device from damage during transportation. The packaging materials have been selected according to environmental and disposal considerations and are therefore recyclable.

Returning the remaining packaging parts, such as packaging tapes, PE bags, etc. to the material cycle saves raw materials and reduces the amount of waste. Your dealer will generally take back these packaging parts. If you dispose of the packaging parts yourself, please ask for the address of the nearest recycling center.

If you plan to transport or ship the power amplifier at a later date, we recommend storing the packaging parts in a dry place.

2.2 WEEE

Disposal of electrical and electronic equipment



The symbol of the “crossed-out dustbin” means that you are legally obliged to dispose of this device separately from unsorted municipal waste. Disposal via household waste, such as the residual waste garbage can or the yellow garbage can, is prohibited. Avoid incorrect disposal by disposing of it correctly at special collection and return points.

Removal of batteries and lamps

If the product contains batteries and accumulators or lamps that can be removed from the old device without causing damage, these must be removed before disposal and disposed of separately as batteries or lamps.

Options for returning old devices

Owners of old devices can return them free of charge within the framework of the options for the return or collection of old devices set up and available by public waste disposal authorities to ensure that the old devices are disposed of properly.

Data Protection

We would like to point out to all end users of waste electrical and electronic equipment that you are responsible for deleting personal data (e.g. callsign or WiFi access data) on the waste equipment to be disposed of.

WEEE registration number

RF-POWER GmbH is registered as a manufacturer of electrical and/or electronic equipment under license number 52510 with ERA Elektro Recycling Austria GmbH, Mariahilfer Straße 123, A-1060 Vienna and license number 26711 with Altstoff Recycling Austria AG, Mariahilfer Straße 123, A-1062 Vienna.

Collection and recycling rates

According to the WEEE Directive, EU member states are obliged to collect data on waste electrical and electronic equipment and transmit this to the European Commission. You can find more information on this on the [BMIMI website](#).

2.3 FCC

FCC-ID: 2AW84RF2K-S contains FCC ID: 2ABCB-RPI4B.

CFR47 §15.19(3) Statement

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

CFR47 §15.105(b)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ▶ Reorient or relocate the receiving antenna.
- ▶ Increase the separation between the equipment and receiver.
- ▶ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- ▶ Consult the dealer or an experienced radio/TV technician for help.

3. Safety instructions

- Read these operating instructions carefully and completely before attempting to operate the device.
- Keep these operating instructions in a safe place. These operating instructions contain important safety and operating instructions for the use of the RF2K-S power amplifier.
- Hand this document over to the buyer when selling the device.
- Dangerous voltages are present inside the device! Before opening the device:
 - Switch off the device by pressing the **On/Off switch (1)** on the front of the device and wait until all fans stop.
 - Disconnect the power supply cable from the **mains connection socket (9)** at the rear.
- Pay close attention to the notes and warnings on the following pages to avoid damage to the device and avoid the risk of serious injury.
- Please only use this power amplifier in accordance with the instructions in this operating manual.
- The device is only designed for operation on frequencies of the amateur radio service. For legal operation you need a valid amateur radio license.
- This device is NOT A TOY! It must not be handled by children or set up or even operated within the reach of children.
- The device may only be opened or serviced by a qualified technician.
- This device generates high-frequency energy. Use the device with due care regarding the system configuration.
- When connected to an antenna, this power amplifier can generate high-frequency electromagnetic fields that must be evaluated according to applicable national laws. Appropriate steps must be taken to ensure human exposure is maintained within allowed limits with minimum distances observed.
- The radio frequency energy generated by this device may interact with some electronic devices such as pacemakers or defibrillators.
- Follow the instructions of the manufacturer of the pacemaker or defibrillator regarding precautions to be taken in the vicinity of a radio frequency transmitter.
- Stop an ongoing transmission immediately if an interaction or malfunction with a pacemaker or defibrillator is suspected!



DANGER - HIGH VOLTAGE!

NEVER connect an antenna or remove a connected antenna while the device is transmitting! This can lead to electric shock or burns.



DANGER - HIGH VOLTAGE!

NEVER operate the device without the housing cover properly fitted. This can lead to electric shock or burns!



DANGER - HIGH VOLTAGE!

NEVER apply mains voltage before the power amplifier is grounded. Touching the power amplifier in this case can lead to an electric shock.



WARNING!

NEVER operate the device with a mains voltage that deviates from the recommended mains voltage of 90...290 V. This could cause a fire or destroy the device.



WARNING!

NEVER use the device with an extension cord or a multiple socket. This could lead to a fire or cause an electric shock.



WARNING!

NEVER allow metal, wires or other objects to touch the internal parts or connections on the back of the device. This can lead to electric shock or burns!



WARNING!

NEVER leave children alone with the device when it is ready for use! Risk of injury due to electric shock!



WARNING!

The device is intended for operation in closed rooms. NEVER expose the device to liquids and NEVER operate it in a damp environment! This can lead to electric shock or burns and destroy the device.



WARNING!

The device gets hot during prolonged transmission!



WARNING!

Avoid using or installing the device in environments with temperatures below $-10\text{ }^{\circ}\text{C}$ ($+14\text{ }^{\circ}\text{F}$) or above $+40\text{ }^{\circ}\text{C}$ ($+104\text{ }^{\circ}\text{F}$). Avoid direct sunlight on the device and operation in excessively dusty environments.

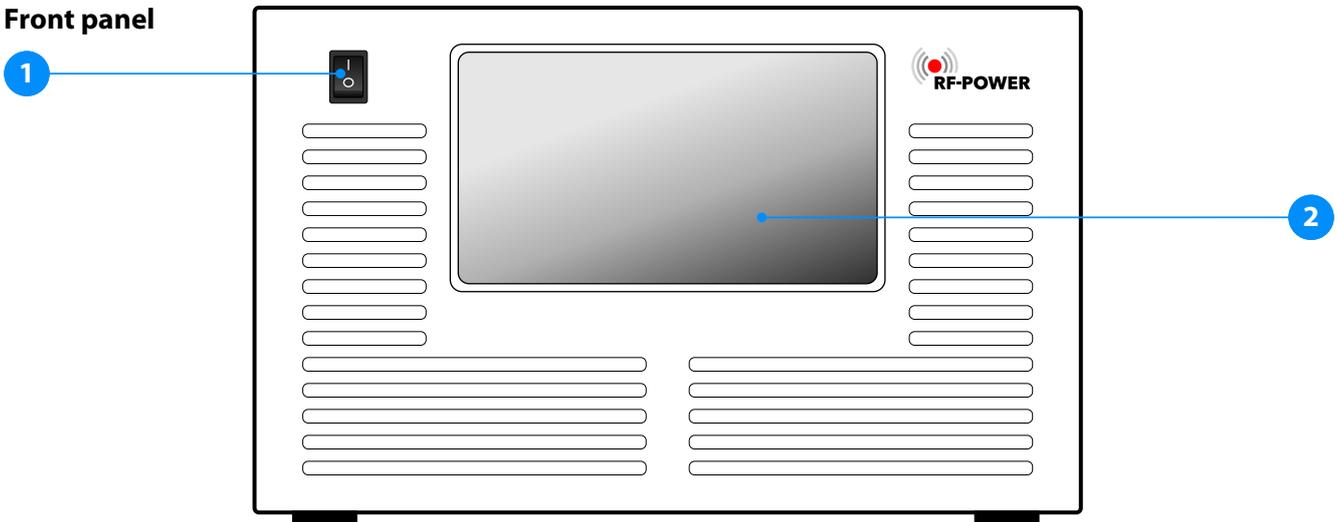


WARNING!

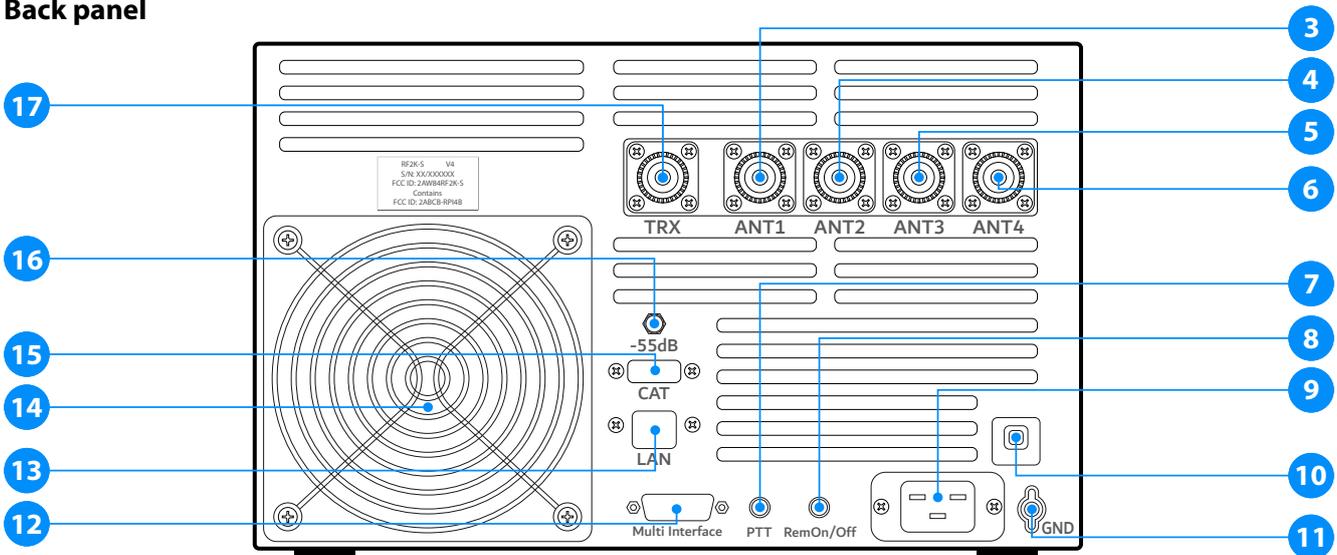
Only set up the device in a well-ventilated place! Make sure that no objects are placed on the device or near the ventilation openings that could hinder heat dissipation.

4. Control elements and connections

Front panel



Back panel



- | | | | |
|----------|-------------------------|-----------|---------------------------------|
| 1 | On/Off switch | 10 | Mains fuse |
| 2 | Touch screen | 11 | Ground terminal |
| 3 | Connection socket ANT 1 | 12 | Multi-function socket |
| 4 | Connection socket ANT 2 | 13 | LAN connection socket |
| 5 | Connection socket ANT 3 | 14 | Fan |
| 6 | Connection socket ANT 4 | 15 | CAT USB |
| 7 | PTT | 16 | Transmit signal output (-55 dB) |
| 8 | Socket Rem On/Off | 17 | Connection socket TRX |
| 9 | Mains connection socket | | |

1 On/Off switch

This rocker switch switches the device on and off.

2 Touch screen

You can control the device in all operating states using this touch-sensitive screen. At the same time, you receive context-related information on the operating status of the device.

3...6 Connection socket ANT 1...ANT 4

Up to four antennas can be connected to the SO-239 connection sockets.



When switched off, the **connection socket TRX (17)** is looped through directly to the **connection socket ANT 1 (3)** (max. power 200 watts).

7 PTT

RCA/Cinch connection socket for transmit/receive switching. The center contact of the socket is connected to +5 VDC.

8 Rem On/Off

RCA connection socket for remote control: The device can be switched on remotely by applying +12 VDC (min. 10 V, max. 15 V!) to the center contact. If this DC voltage drops below 10 V, the PA switches off. To use this feature, the **On/Off switch (1)** must be switched off ("0").

9 Mains connection socket

Connection socket for mains voltage of 90...290 VAC.

10 Mains fuse

A 16 A automatic circuit breaker trips in the event of a fault. If it does this several times in succession, there is usually a good reason!



ATTENTION!

Do not open the device yourself, but contact your RF-POWER dealer in this case!

11 Ground terminal

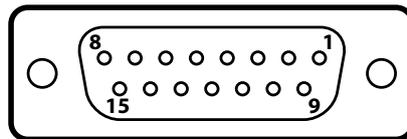
M4 threaded bolt for connecting the power amplifier to ground.

12 Multi-function socket

Pins 1...4 can be used to address up to 16 antennas connected to an external antenna switch and store the associated antenna tuner setting data. The antennas are not switched via the amplifier (this must be done via

a separate switch), but the BCD input reports to the power amplifier which antenna or antenna combination is currently active.

Each of these external antennas can also be a multi-band antenna and antenna tuner setting data can be saved for each frequency.



Top view of the power amplifier socket

Pin Assignment

- 1 In A:** External antenna switch BCD input *, see table 1
- 2 In B:** External antenna switch BCD input *, see table 1
- 3 In C:** External antenna switch BCD input *, see table 1
- 4 In D:** External antenna switch BCD input *, see table 1
- 5 Out D:** BCD band data output, see table 2
- 6 Out C:** BCD band data output, see table 2
- 7 Out B:** BCD band data output, see table 2
- 8 Out A:** BCD band data output, see table 2
- 9 TKEY:** Output and input for antenna tuner control (see “Tuner Interface” on page 20)
- 10 TSTR:** Input for antenna tuner control (see “Tuner Interface” on page 20)
- 11** For future applications
- 12** For future applications
- 13 GND**
RF2K-S V1: GND RF2K-S ≥ V2: For future applications
- 14 GND**
RF2K-S V1: GND RF2K-S ≥ V2: For future applications
- 15 OUT 15 V**
Max. 500 mA when the power amplifier is on; can be used for external controls (e.g. relay control for remote operation).

*
Min. voltage to be applied: 5 VDC.
Max. voltage to be applied: 15 VDC (RF2K-S V1) or 50 VDC (for RF2K-S ≥ V2).
For version number, see type plate on the rear of the power amplifier.

Antenna	Pin 1 (In A)	Pin 2 (In B)	Pin 3 (In C)	Pin 4 (In D)
1	0	0	0	0
2	1	0	0	0
3	0	1	0	0
4	1	1	0	0
5	0	0	1	0
6	1	0	1	0
7	0	1	1	0
8	1	1	1	0
9	0	0	0	1
10	1	0	0	1
11	0	1	0	1
12	1	1	0	1
13	0	0	1	1
14	1	0	1	1
15	0	1	1	1
16	1	1	1	1

Table 1 Addressing of the externally connected and managed antennas (0=inactive; 1=active)

Band	Pin 5 (Out D)	Pin 6 (Out C)	Pin 7 (Out B)	Pin 8 (Out A)
160 m	0	0	0	1
80 / 75 m	0	0	1	0
60 m	0	0	0	0
40 m	0	0	1	1
30 m	0	1	0	0
20 m	0	1	0	1
17 m	0	1	1	0
15 m	0	1	1	1
12 m	1	0	0	0
10 m	1	0	0	1
6 m	1	0	1	0

Table 2 Addressing according to the YAESU band data table (0=inactive; 1=active)

13 LAN connection socket (RJ45)

Connect your RF2K-S to your home network here for control via Ethernet cable.



Alternatively, you can connect the RF2K-S to your local WiFi network via the built-in WiFi.

14 Fan

The high-performance fans are temperature-controlled and ensure reliable cooling of the power electronics with minimal noise, even during maximum continuous load (e.g. contest operation).

15 CAT USB

CAT interface to the transceiver (» chapter **6.2.6 Interface** on page 31).

16 Transmit signal output (-55 dB)

SMA socket for adaptive predistortion of the transmission signal when using appropriately equipped transceivers. The connection can also be used for other measuring purposes or signal monitoring.

17 Connection socket TRX

The transceiver is connected to this SO-239 connection socket.

5. Preparation for operation

5.1 Unpacking the device

- ▶ After unpacking, inspect the device for shipping damage.
- ▶ Report any damage immediately to the delivering carrier or dealer. Keep the shipping carton.

5.2 Scope of delivery

- 1x RF2K-S power amplifier
- 1x AC power cable with country-specific plug (USA: NEMA 6-15P; other countries: CEE 7/4 "Schuko")

5.3 Selecting a suitable location

For weight reasons, the device must be placed on a stable surface.

- ▶ Select an installation location for the power amplifier where sufficient air circulation is ensured (at least 10 cm free space in front of and behind the device).
- ▶ Avoid installation locations with extreme heat or cold, high humidity and vibrations.

Do not operate the device near televisions, television aerials, radios and other electromagnetic sources.

5.4 Grounding the device

To avoid electric shocks, television interference (TVI), radio interference (BCI) and other problems:

- ▶ Ground the power amplifier via the **ground terminal (11)** on the back of the device using as short a cable as possible.



WARNING!

NEVER connect the **ground terminal (11)** to a gas or power line, as this can lead to an explosion or electric shock!

5.5 Connecting the transceiver

Connect the power amplifier to the antenna output of the transceiver using a coaxial cable via the **connection socket TRX (17)**. Make sure that any antenna tuner in the transceiver is not in operation when operating the power amplifier.

5.6 Connecting the PTT line

- ▶ Connect the power amplifier to the PTT output of the transceiver using an RCA/Cinch cable via the **PTT connection socket (7)**.

5.7 Preparing the network connection

- ▶ Connect an Ethernet cable to the **LAN connection socket (13)**.
- ▶ Connect the Ethernet cable to the router/switch of your local network.

5.8 Connecting the antennas



WARNING!

Do not transmit without a connected antenna or artificial antenna (“dummy load”)!

Select one or more 50 Ω antennas with 50 Ω feed line and up to 2 kW rated power.

- ▶ Connect one to four antenna(s) to the desired 50 Ω antenna connection sockets **ANT 1 (3)**, **ANT 2 (4)**, **ANT 3 (5)**, **ANT 4 (6)** using suitable, low-loss coaxial cable with properly attached PL-259 plugs.
-



When switched off, **TRX 1 (17)** is looped through to **ANT 1 (3)**.

5.9 Establishing the mains connection

The device works with mains voltages between 90 and 290 V AC. We recommend using 200-240 V / 50-60 Hz AC to ensure the full performance of the device.

If the device is operated with 110 V AC, for example, the maximum output power drops to approx. 900 W.

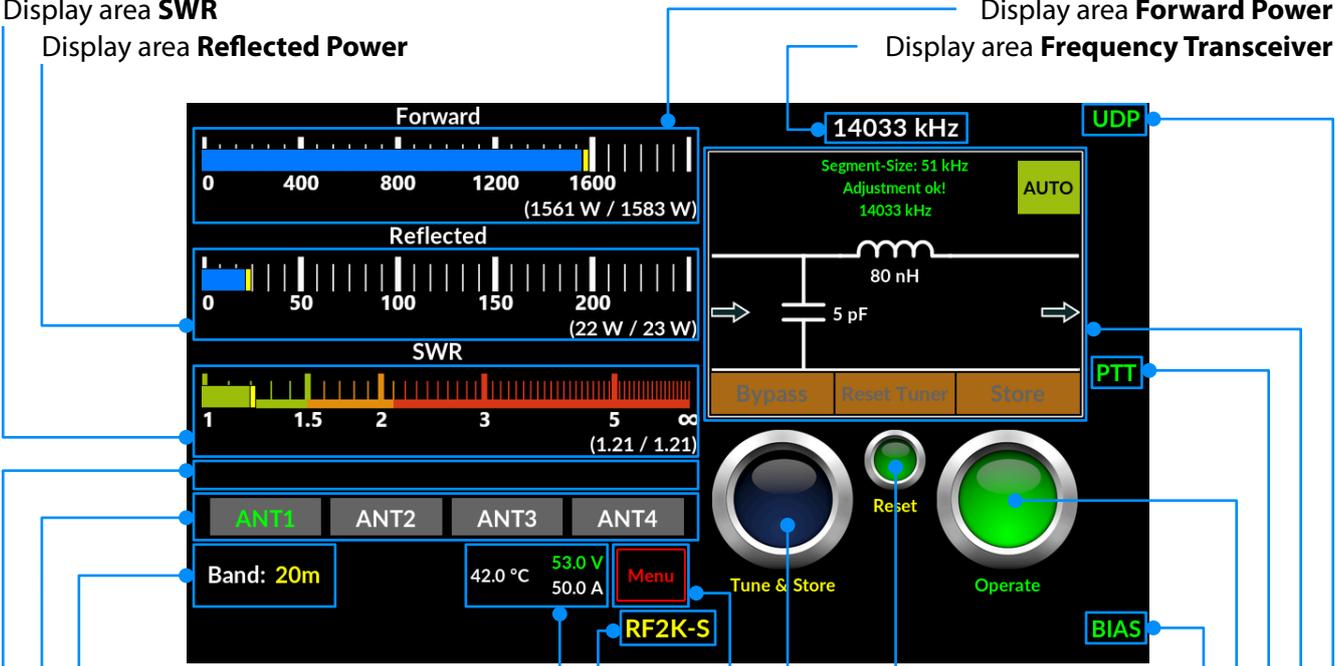
- ▶ Connect the device to a suitable AC socket via the **mains connection socket (9)** using the mains cable supplied.

6. Putting the device into operation

6.1 Switching on the device

- Switch the device on using the **On/Off switch (1)**.

The power amplifier loads the software, the **touch screen (2)** lights up and the user interface shown below is displayed within a few seconds:



The screenshot shows the following interface elements:

- Forward Power:** A bar graph showing power levels from 0 to 1600 W, with a current reading of 1561 W / 1583 W.
- Reflected Power:** A bar graph showing power levels from 0 to 200 W, with a current reading of 22 W / 23 W.
- SWR:** A bar graph showing SWR levels from 1 to infinity, with a current reading of 1.21 / 1.21.
- Frequency Transceiver:** Displays 14033 kHz, Segment-Size: 51 kHz, Adjustment ok!, and an AUTO button.
- Antenna Tuner:** Shows a circuit diagram with an 80 nH inductor and a 5 pF capacitor, and buttons for Bypass, Reset Tuner, and Store.
- Antenna Selection:** Buttons for ANT1, ANT2, ANT3, and ANT4. ANT1 is currently selected.
- Band:** Displays 20m.
- Operating Parameters:** Shows 42.0 °C, 53.0 V, and 50.0 A.
- Buttons:** Tune & Store, Reset, Operate, Menu, BIAS, PTT, and UDP.

Display area SWR

Display area Reflected Power

Display area Forward Power

Display area Frequency Transceiver

Display area Used Band

Button / Display area Currently Selected Antenna
» Chapter 6.2.2 Antennas on page 20

Display area Error Messages
» Chapter 8 Troubleshooting on page 42

Display area Operating parameters
Temperature PA, end transistor supply voltage, output stage current consumption

Display area Personalization Text
» Chapter 6.2.1 Settings on page 17

Button Reset
» Chapter 8 Troubleshooting on page 42

Display area BIAS (Bias voltage OK)

Button Standby / Operate „Standby“ (red) / „Operate“ (green)

Display area PTT (PA on transmit)

Area Antenna Tuner
» Chapter 7 Antenna Tuner on page 36

Button Interface
» Chapter 6.2.6 Interface on page 31

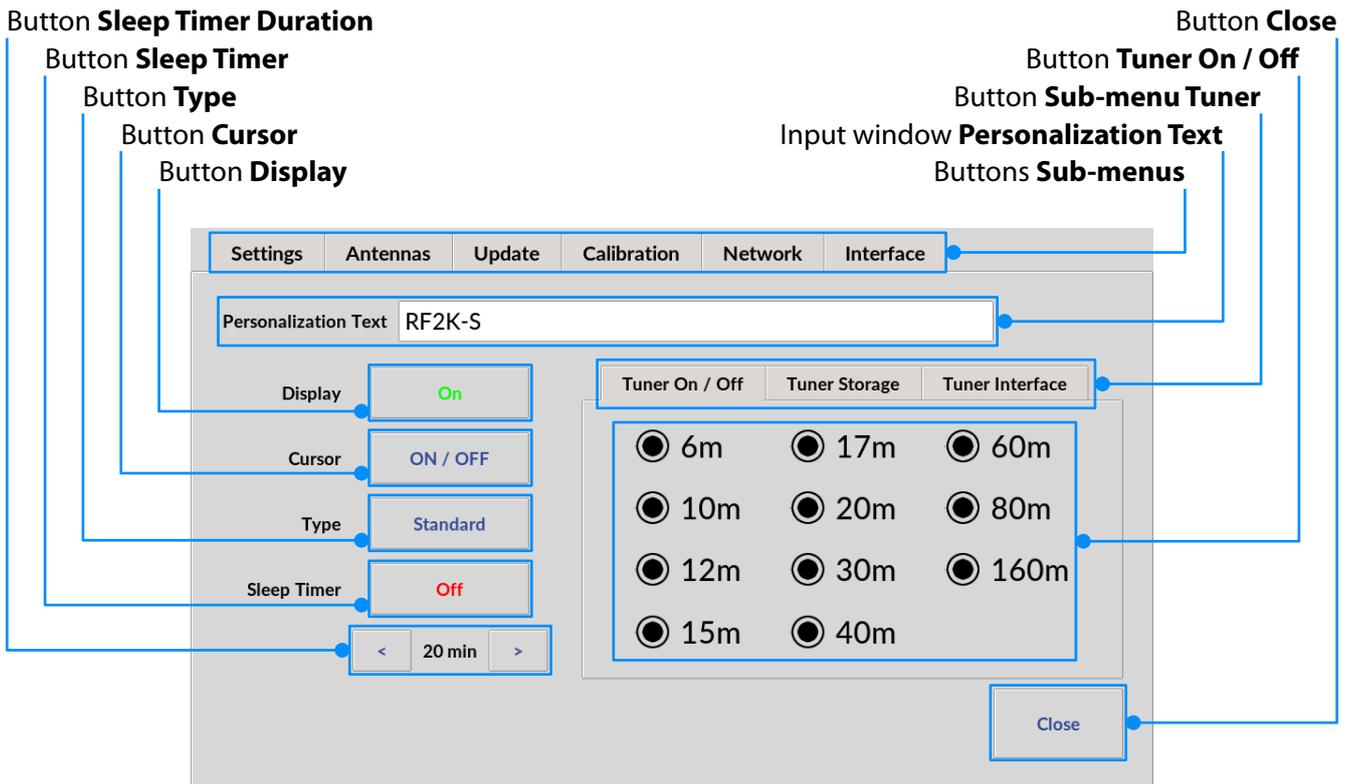
Button Tune
» Chapter 7 Antenna Tuner on page 36

Button Menu
» Chapter 6.2 User Menu on page 17

6.2 User Menu

- ▶ Press the **Menu** button on the user interface.

The **touch screen (2)** switches to the user menu and displays the user interface shown below.



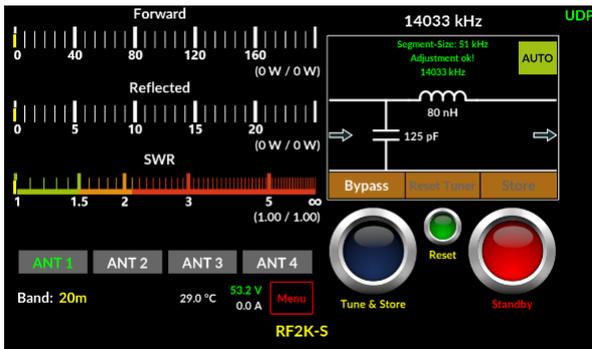
The following sub-menus can be selected:

6.2.1 Settings

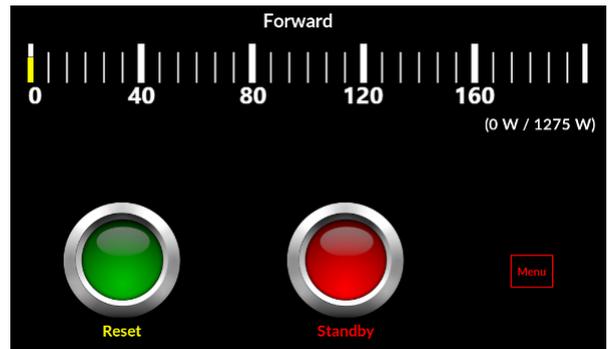
- **Personalization Text**
A text with a maximum length of 20 characters (e.g. callsign, name or some nice words) can be entered and is displayed at the bottom center of the user interface.
- **Display**
For remote operation, it is advisable to switch off the **touch screen (2)** (activated "On" / deactivated "Off"). The screen can be reactivated via VNC or by switching the device off and on again. When the device is restarted, a dialog appears at the beginning, which can be used to reactivate the display. In remote operation, the display disappears automatically after 10 seconds and the screen goes dark.



- **Cursor**
Selection cursor visible (“ON”) / invisible (“OFF”)
- **Type**
The appearance of the user interface can be selected:



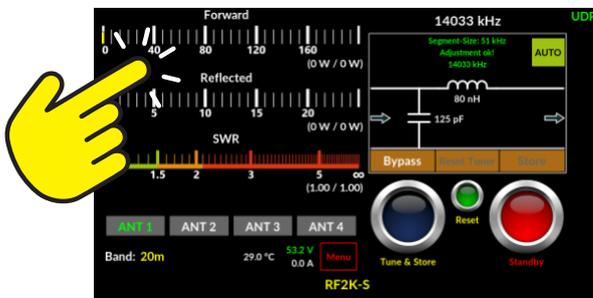
User interface **Standard**



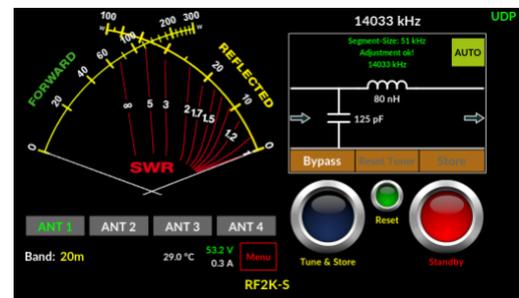
User Interface **Contest**



The power and SWR display can be switched between bar and cross needle display on the user interface by tapping in the respective area.



Bar display



Cross-needle display

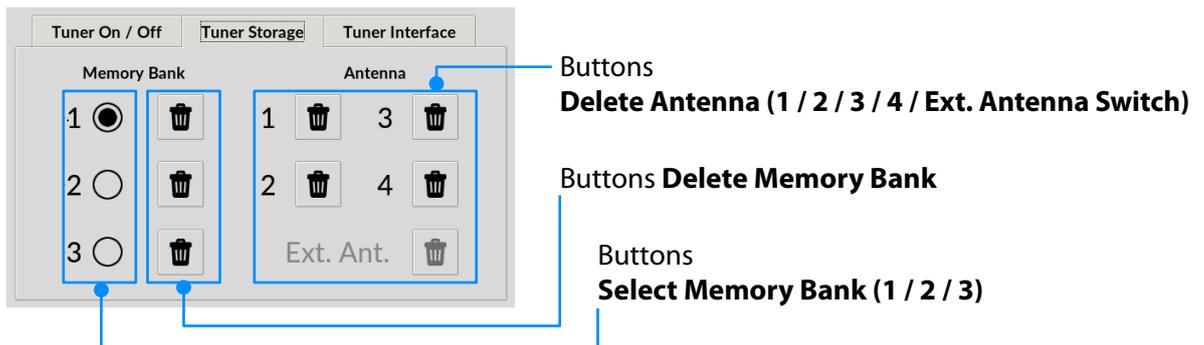
- **Sleep Timer**
Activate or deactivate the sleep timer by clicking this button (multiple times) (sleep timer is activated by “On” and deactivated by “Off”)
- **Sleep Timer Duration**
By clicking on < or >, the sleep timer can be set from 3 to 60 minutes in 1-minute increments.

If there is no operation during the set duration, the device switches to standby mode after the set duration has elapsed. Any activity on the **touch screen (2)** resets the sleep timer to the set duration and the countdown to standby starts again.

- **Sub-menu Tuner**
 - **Tuner On/Off**

These buttons can be used to switch the tuner on or off for each band individually. Activation or deactivation is done by tapping the round buttons several times.

- **Tuner Storage**



Activating a Memory Bank

A **Memory Bank** contains the number and all settings determined for the antennas assigned to it. Only one **Memory Bank** can be activated at a time.

- ▶ Select the currently active **Memory Bank** by clicking on one of the three circle fields. The currently active **Memory Bank** is indicated by a filled circle field.

The contents of the other two **Memory Banks** remain untouched.

Deleting a Memory Bank

- ▶ Clicking on the **garbage can** button next to a **Memory Bank** deletes the contents of the corresponding **Memory Bank**. Emptying a **Memory Bank** only deletes the **antenna tuner** setting data determined in connection with this specific **Memory Bank** for all **antenna connections** assigned to the memory bank.



NOTICE!

The contents are always deleted, regardless of whether the corresponding memory bank is currently activated.

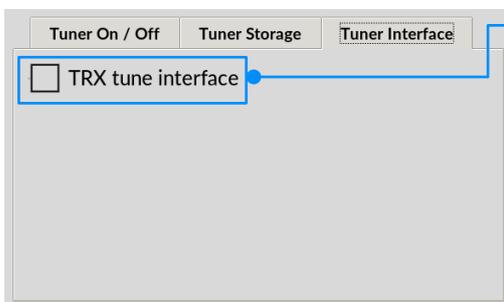
Delete Antenna

Deletes the antenna tuner setting values of an **antenna connection (1 / 2 / 3 / 4 / Ext. Antenna Switch)** within a currently active **Memory Bank**.

- ▶ Delete the antenna tuner settings of an **antenna connection** by clicking on the corresponding **trash can** button.

- Tuner Interface

By ticking the **TRX tune interface box**, the power amplifier is informed that it is connected to the transceiver through pins 9 and 10 of the 15-pin **multi-function socket**. This connection makes it possible to start the tuning process of the antenna tuner of the power amplifier using the ATU button of the connected transceiver.

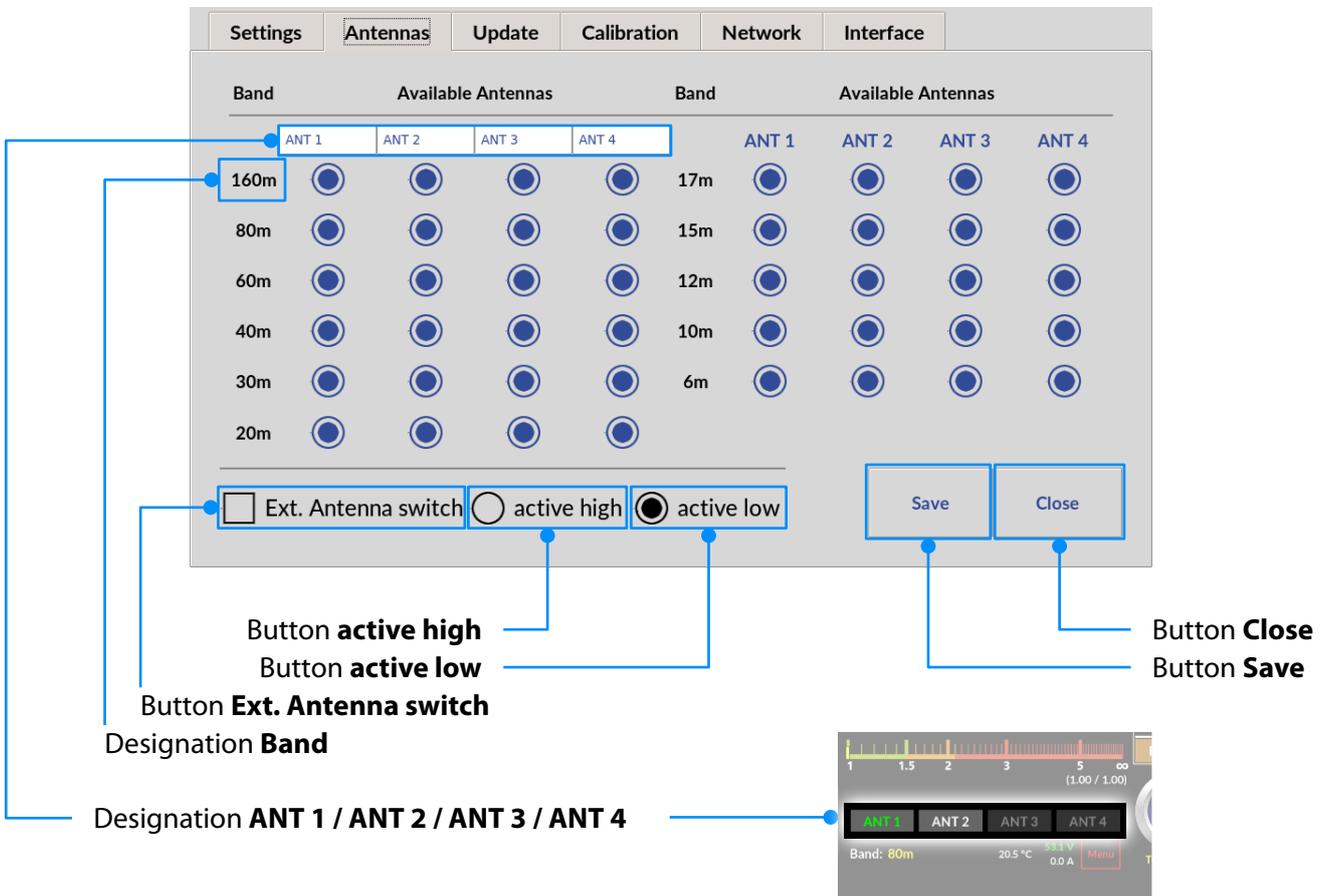


Button **TRX tune interface**



The pin assignments for various transceiver manufacturers are shown in Chapter "A **Pin assignment TRX tune interface**" on page 45.

6.2.2 Antennas



Band	Available Antennas				Band	Available Antennas			
	ANT 1	ANT 2	ANT 3	ANT 4	ANT 1	ANT 2	ANT 3	ANT 4	
160m	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	17m	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
80m	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	15m	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
60m	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	12m	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
40m	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	10m	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30m	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	6m	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20m	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					

Ext. Antenna switch
 active high
 active low

Button **active high**
 Button **active low**
 Button **Ext. Antenna switch**
 Designation **Band**
 Designation **ANT 1 / ANT 2 / ANT 3 / ANT 4**
 Button **Close**
 Button **Save**

To assign an antenna connection to a band:

- ▶ Tap in the corresponding **column/row** in the **circle field**.

The circle field is now filled in **blue** and thus indicates the current antenna assignment for the respective band.

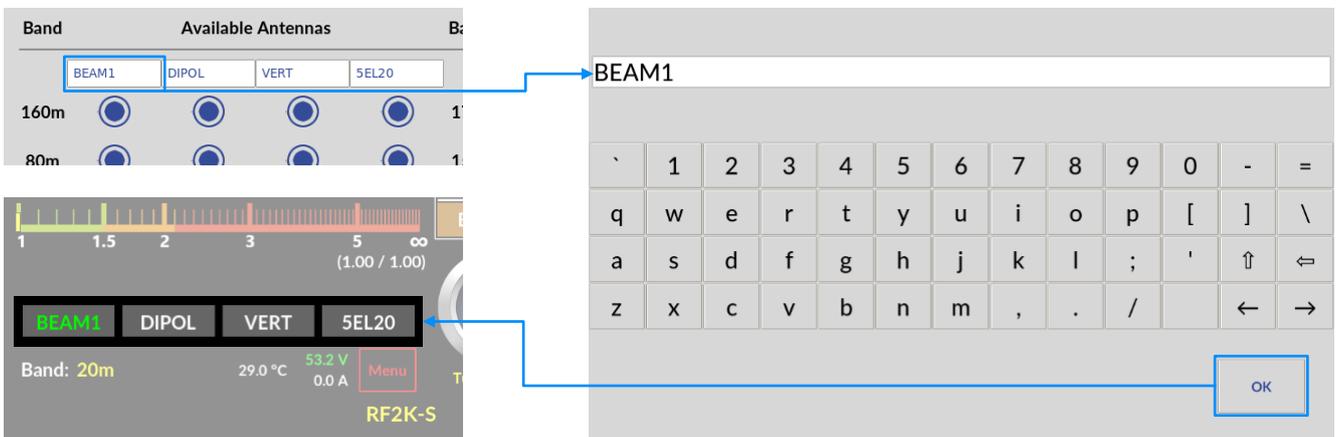
- ▶ To deselect the corresponding option, tap the circle field again.
- ▶ Tap the Save button to save the selected assignment(s).



When changing bands, the antenna connection last used for the respective band is always selected.

The name of the antennas (**ANT 1** to **ANT 4**) can be customized.

- ▶ In the sub-menu **Antennas** in the left half of the window, tap the name of the antenna you want to change. The virtual keyboard opens, which you can use to enter the name (max. 5 characters long). After entering the new name, confirm with **OK**.



Antennas (connections) available for the selected band are displayed with white lettering. The antenna currently connected to the device is displayed with a green label. Buttons that are grayed out cannot be selected.

6.2.2.1. Ext. Antenna switch

The device supports the use of an external antenna switch (through connection socket **ANT1**), with which up to 16 additional antennas (each of which can also be a multiband antenna!) can be addressed and the associated antenna tuner setting data can be saved.

Antennas connected to an external antenna switch are addressed through pins 1-4 of the **multi-function socket (12)**. Details on addressing and pin assignment can be found in Chapter **4 Control elements and connections** on page **10**.

To activate a correctly connected external antenna switch via the user menu, please proceed as follows:

- ▶ Press the **Menu** button.

The **touch screen (2)** shows the user menu.

- ▶ Press the **Antennas** button.
- ▶ Tap the **Ext. antenna switch** button.

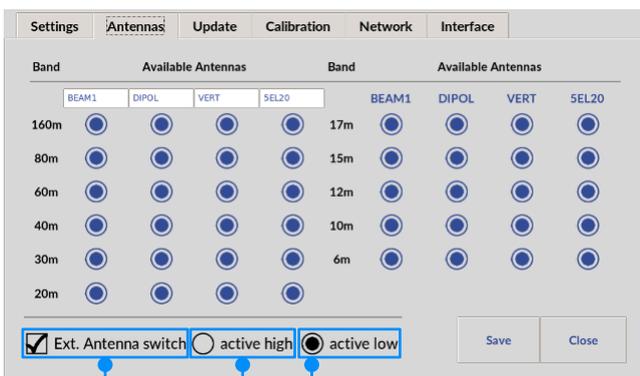
The previously empty square is now marked with a **tick**, indicating the activated use of an external antenna switch. Depending on the model, an external antenna switch expects a “low” or a “high” control signal:

- ▶ Tap the **active high** or **active low** button to select.

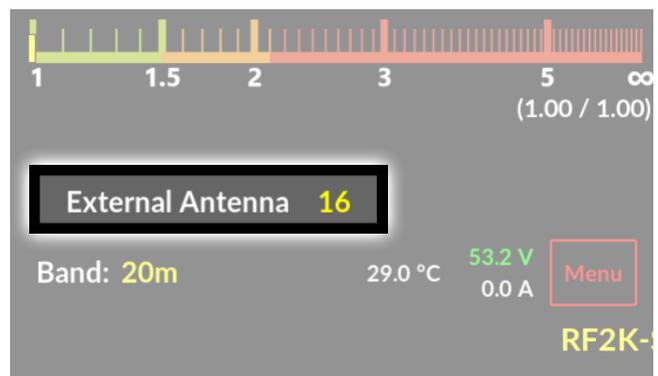
The corresponding circle field is now filled in **black** and thus indicates the selected type of activation instruction.

- ▶ Tap the **Save** button to save the selected settings.

After returning to the main screen, the corresponding external antenna is now shown in the display area of the **currently selected antenna (1-16)**.



Button **active low**
 Button **active high**
 Button **Ext. Antenna switch**



6.2.3 Update

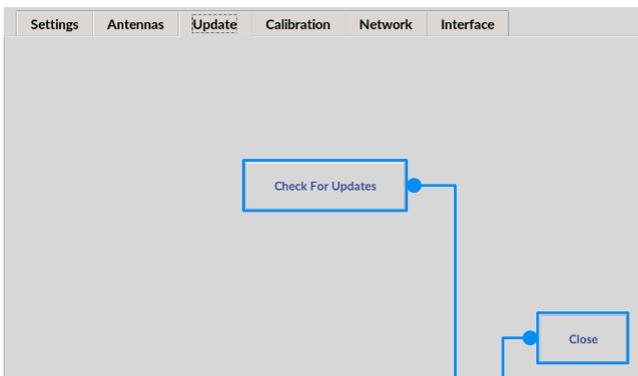
The graphical user interface (GUI) and the controller firmware are subject to continuous further development. We therefore recommend that you check for available **updates** from time to time.

If the device is connected to the Internet, you can search for **updates** for the graphical user interface (GUI) and the power amplifier controller firmware. If more recent versions are available, they can be installed quickly and easily.

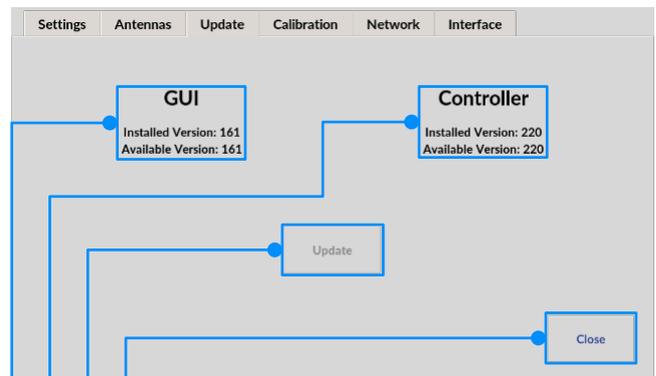


Before starting the update process, make sure that you have connected the linear amplifier to the Internet either via the LAN connection OR via WiFi. If both connections are set up, there may be complications during the update.

- ▶ Tap the **Check For Updates** button to check for available **updates**.
- ▶ Tap the **Update** button to start the update process.



Button **Check for Updates**
 Button **Close**



Button **Close**
 Button **Update**
 Software version **Controller**
 Software version **GUI** (graphical user interface)



The version numbers of the currently installed user interface and the controller firmware can also be seen at the bottom right of the user interface:



6.2.4 Calibration

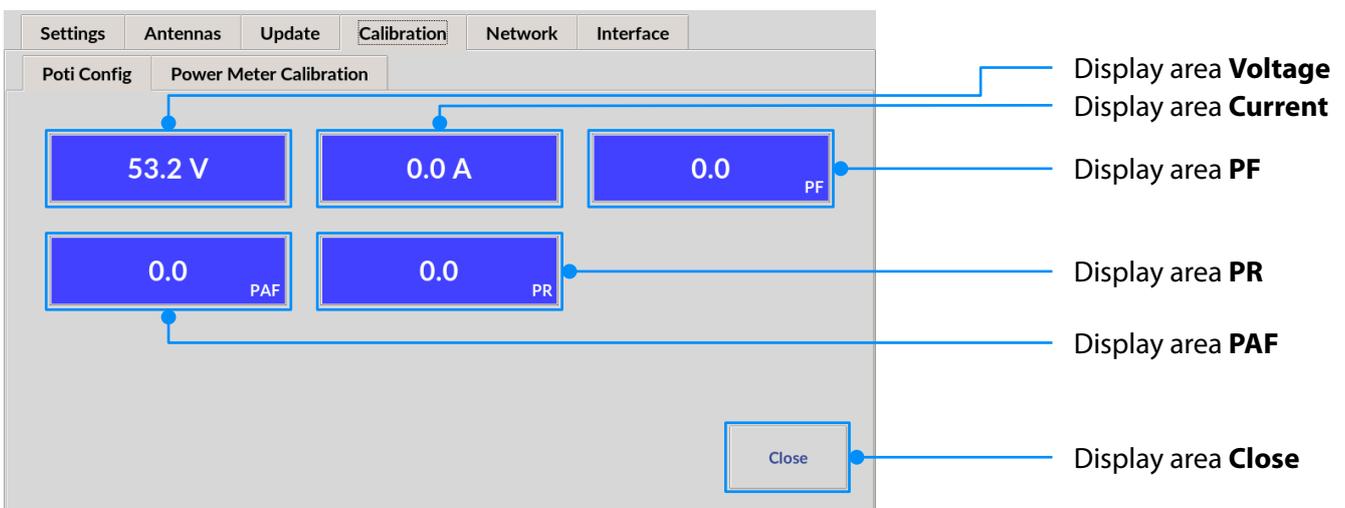
This menu item is divided into two sub-menus:

- **Poti Config:**
Operating data display area
- **Power Meter Calibration:**
Calibration of internal power measurement

6.2.4.1. Poti Config

This **display area** informs you about some electrical values of the power amplifier.

- **Voltage**
Drain voltage of the LDMOS transistors
- **Current**
Current consumption of the LDMOS transistors
- **PF**
LPF Power Output
- **PAF**
Power amplifier module Power Output
- **PR**
Reflected Power



The screenshot shows the 'Poti Config' sub-menu within the 'Calibration' section. It displays five numerical values in blue boxes: 53.2 V, 0.0 A, 0.0 PF, 0.0 PAF, and 0.0 PR. A 'Close' button is located at the bottom right. Blue lines connect callout labels to each of these elements.

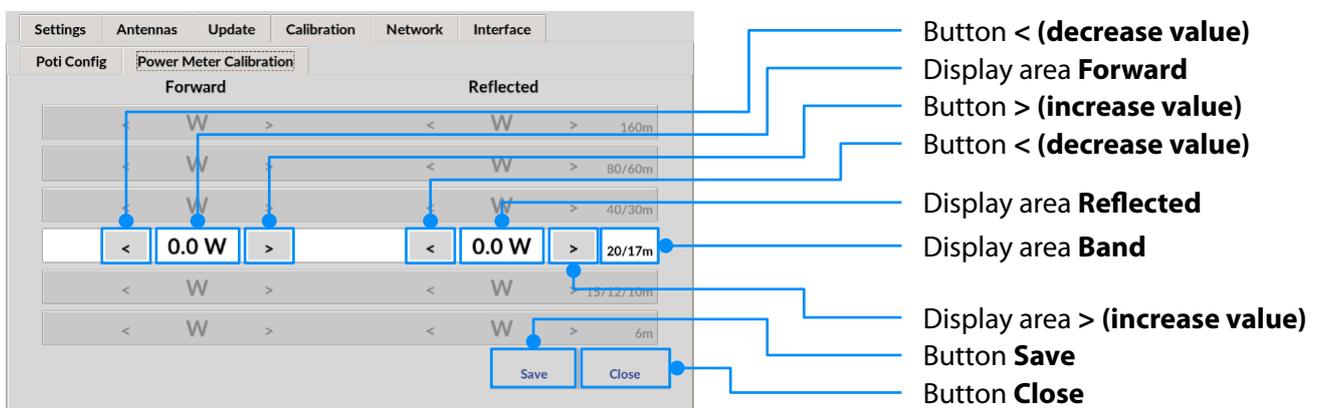
Value	Label
53.2 V	Display area Voltage
0.0 A	Display area Current
0.0 PF	Display area PF
0.0 PAF	Display area PAF
0.0 PR	Display area PR
Close	Display area Close

6.2.4.2. Power Meter Calibration

The unavoidable frequency-dependent deviations in the linearity of the directional coupler used for internal power measurement can be calibrated here for each of the six bandpass ranges.

The calibration should be carried out at an output power of 1 kW. Use your preferred reference wattmeter for the adjustment.

The bandpass range is selected automatically during transmission. The detected band is highlighted.



- ▶ Adjust the internal power display by pressing the > (**increase value**) or < (**decrease value**) buttons.

Pressing briefly changes the display only gradually. Pressing for longer changes the value continuously.

- ▶ Press the **Save** button to save the settings.
- ▶ Repeat this process for each bandpass range to be set.

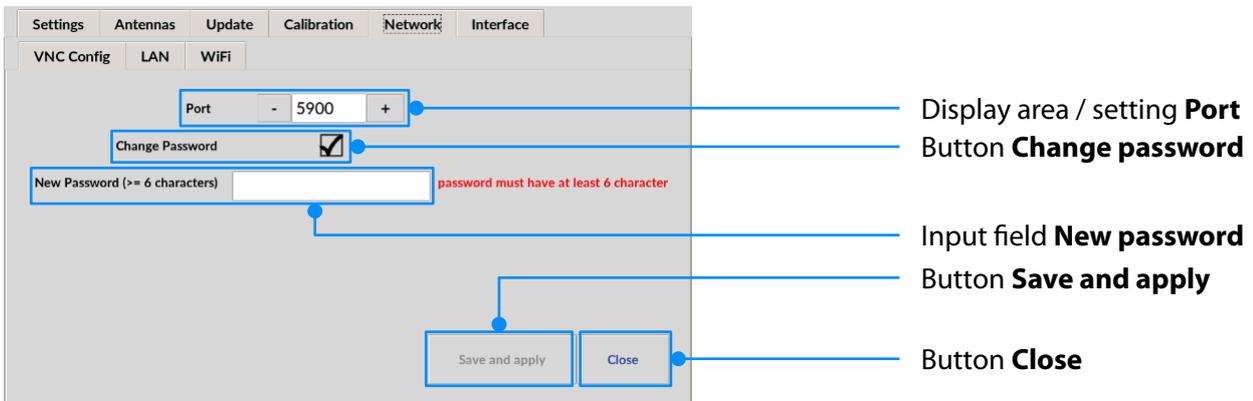
6.2.5 Network

All the necessary settings for VNC remote operation of the power amplifier are made here. The network connection is possible via LAN or WiFi.

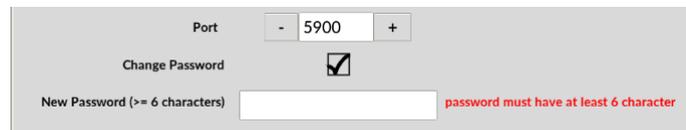
6.2.5.1. VNC Config

With a VNC connection, the device can be remotely controlled and operated from any PC, tablet PC or smartphone connected to the Internet or local network using VNC software (e.g. the free available RealVNC Viewer).

Display / setting **port** (default setting is port 5900).



- ▶ Use the “-” or “+” buttons in the **Port** display to set the desired VNC port address.



Alternatively, you can also enter the desired VNC port address directly:

- ▶ Tap in the **Port** display.

A virtual keyboard appears for entering the VNC port address.

- ▶ Finish entering the VNC port address by pressing the **OK** button.

The VNC Config screen is then displayed again.

A VNC connection is password-protected. You can change the VNC password at any time:



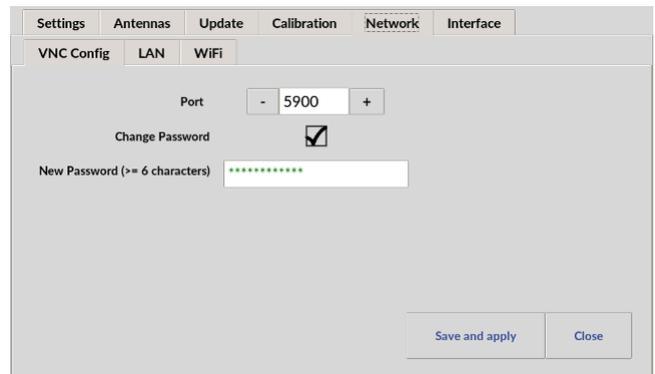
In the state of delivery, the VNC user name is **pi** and the VNC password is **rfkit**. It is highly recommended to change the password during the setup of the power amplifier.

- ▶ Tap the **Change Password** button.

The **New Password** input field appears:

- ▶ Tap in the **New Password** input field.

A virtual keyboard appears for the input:



- ▶ If required, tap the **show password** button to make the entered characters (minimum 6, maximum 63) visible.

As long as the minimum number of six characters for a valid new VNC password is not reached, the characters entered up to that point are displayed in **red**. From the 6th character onwards, the VNC password is valid and therefore displayed in **green**.

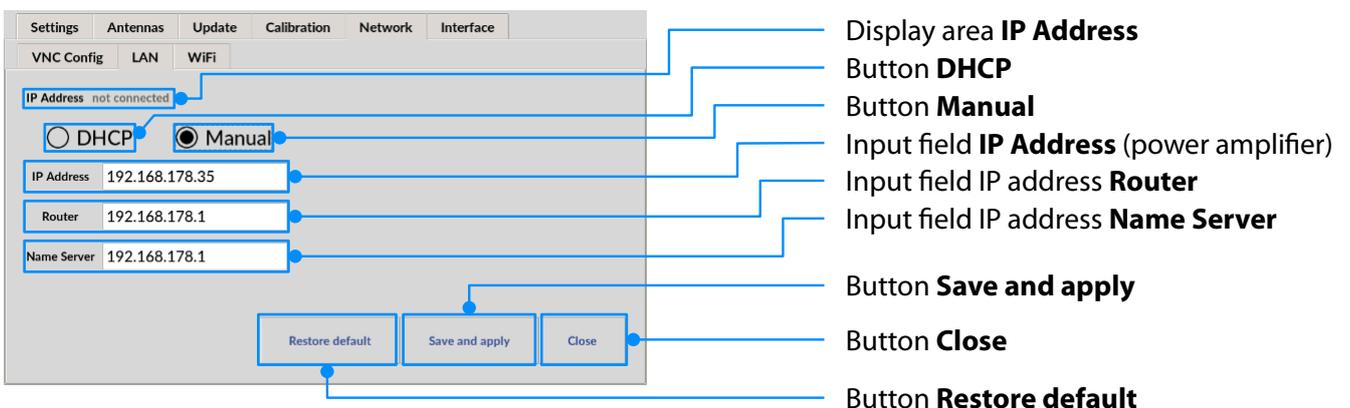
- ▶ End the VNC password entry by pressing the **OK** button.

The **VNC Config** screen is then displayed again.

- ▶ Press the Save and apply button to **Save and apply** the VNC settings.

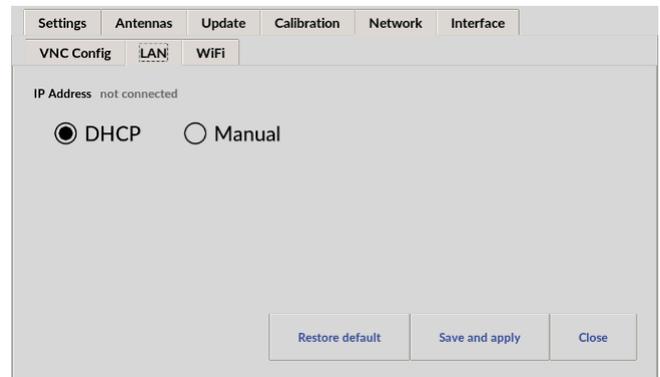
6.2.5.2. LAN

This chapter describes how to set up a network connection via cable. To do this, the power amplifier must be connected to an existing network via an Ethernet cable (see also "Preparing the network connection" on page 15).



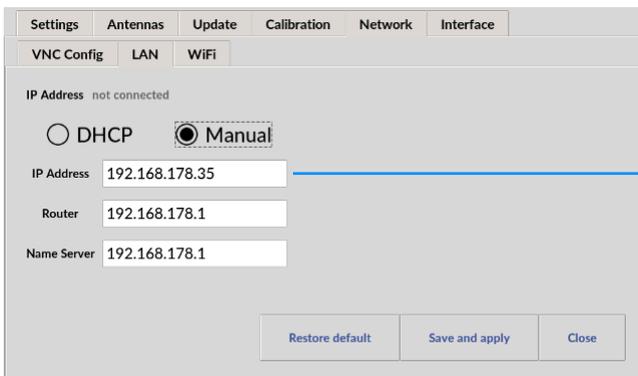
Set up LAN connection with dynamic IP address (DHCP)

- ▶ Tap the **DHCP** button.
- ▶ Press the **Save and apply** button to save and apply the LAN setting. If the connection is successful, the assigned IP address of the power amplifier is displayed instead of “not connected”.



Setting up a LAN connection with a fixed IP address

- ▶ Tap the **Manual** button.
- ▶ Tap in the **IP address (Router / Name Server)** input field.



A virtual keyboard appears for the input:

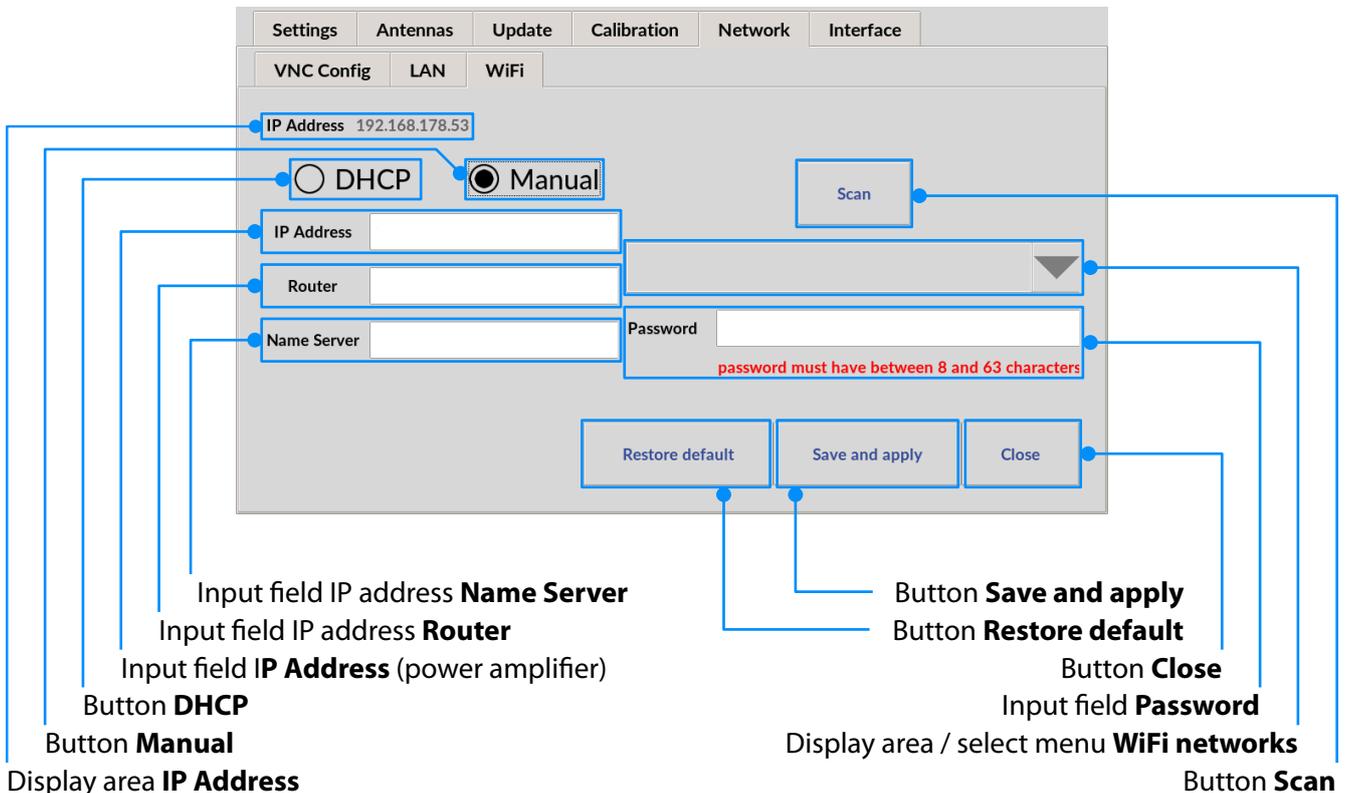
- ▶ Finish the entry by pressing the **OK** button.

The **LAN** screen is then displayed again. The IP addresses are entered in the **Router** or **Name Server** input fields in the same way.

- ▶ Press the **Save and apply** button to save and apply the LAN settings. If the connection is successful, the entered IP address of the power amplifier is displayed instead of “not connected”.

6.2.5.3. WiFi

This chapter describes how to set up a wireless network connection. To do this, you will need the access data



for the desired WiFi network.

Search and display available WiFi networks

- ▶ Tap the **Scan** button.

The device searches for available WiFi networks.

- ▶ Tap on the black triangle in the **WiFi networks** selection menu.

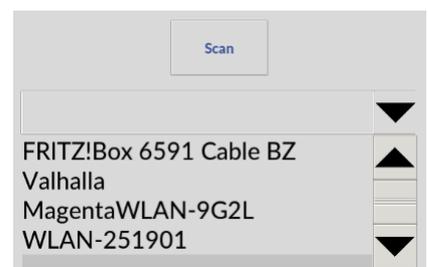
The available WiFi networks are displayed:

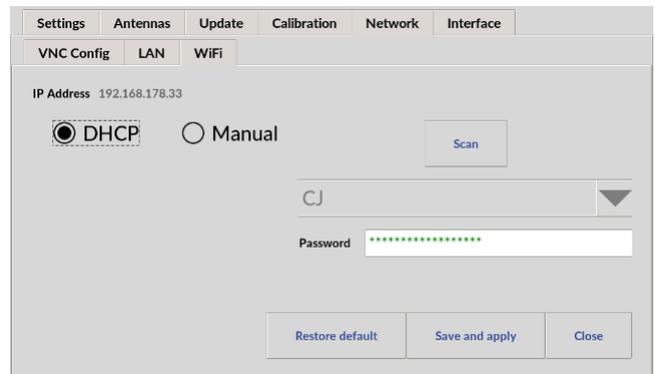
- ▶ Select the desired WiFi network.

The selection menu closes and the selected WiFi network is displayed.

- ▶ Tap in the **Password** input field.

A virtual keyboard appears for input:





- ▶ If required, tap the **show password** button to make the entered characters visible.

As long as the minimum number of characters (= 8) for a valid password is not reached, the characters entered up to that point are displayed in **red**. From the 8th character onwards, the password is valid and therefore displayed in **green**.

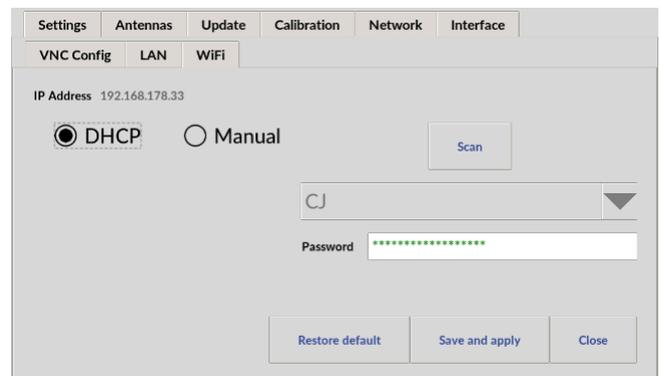
- ▶ Finish entering the password by pressing the **OK** button.

The **WiFi** screen is then displayed again.

- ▶ Press the **Save and apply** button to save and apply the WiFi network settings.

Set up WiFi connection with dynamic IP address (DHCP)

- ▶ Tap the **DHCP** button.
- ▶ Press the **Save and apply** button to save and apply the WiFi setting.



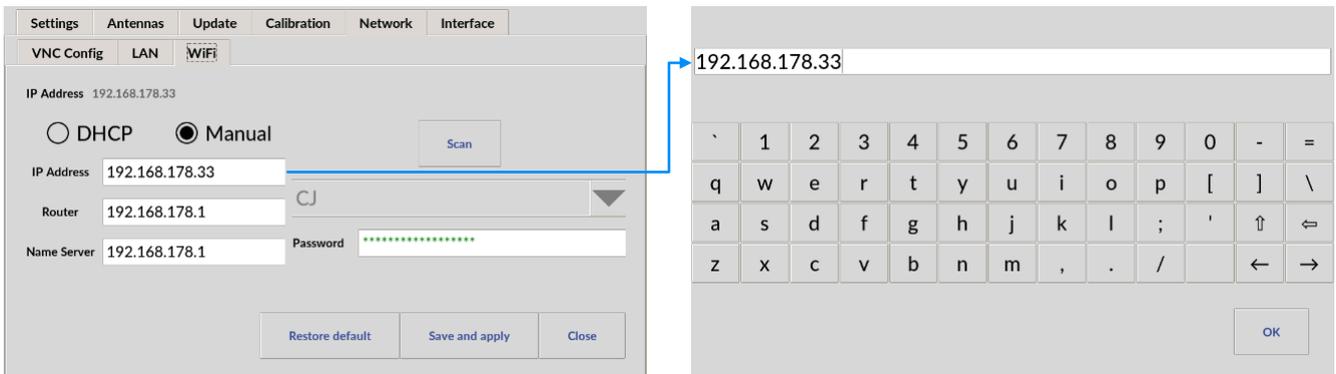
Setting up a WiFi connection with a fixed IP address

- ▶ Tap the **Manual** button.
- ▶ Tap in the **IP address** input field.

A virtual keyboard appears for input, which you can use to enter the desired IP address.

- ▶ Finish the entry by pressing the **OK** button.

The **WiFi** screen is then displayed again. The IP addresses are entered in the **Router** or **Name Server** input fields in the same way.



- ▶ Press the **Save and apply** button to save and apply the WiFi settings.

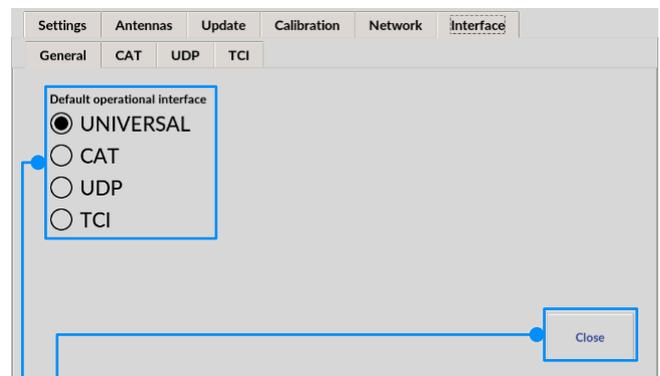
If the connection is successful, the assigned IP address of the power amplifier instead of “not connected” is displayed in the display area **IP Address**.

6.2.6 Interface

6.2.6.1. General

The selected interface is used to send the transmit frequency of the transceiver to the power amplifier. It is set as default when the power amplifier is restarted. Select the communication protocol between the power amplifier and the transceiver or the PC software by clicking on one of the buttons **UNIVERSAL**, **CAT**, **UDP** or **TCI**.

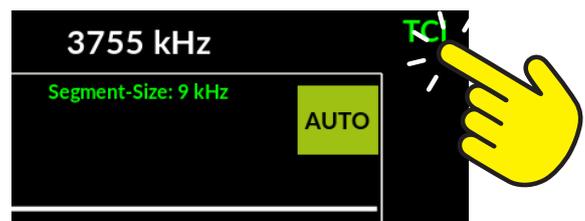
The **UNIVERSAL** protocol does not require any further settings. The **CAT**, **UDP** and **TCI** communication protocols require further settings, which must be made in the corresponding sub-menus.



Button **Close**
Buttons **Default operational interface**
(UNIVERSAL / CAT / UDP / TCI)



Pressing the display in the top right-hand corner of the user interface several times switches between the different communication protocols. This allows you to choose the desired setting.

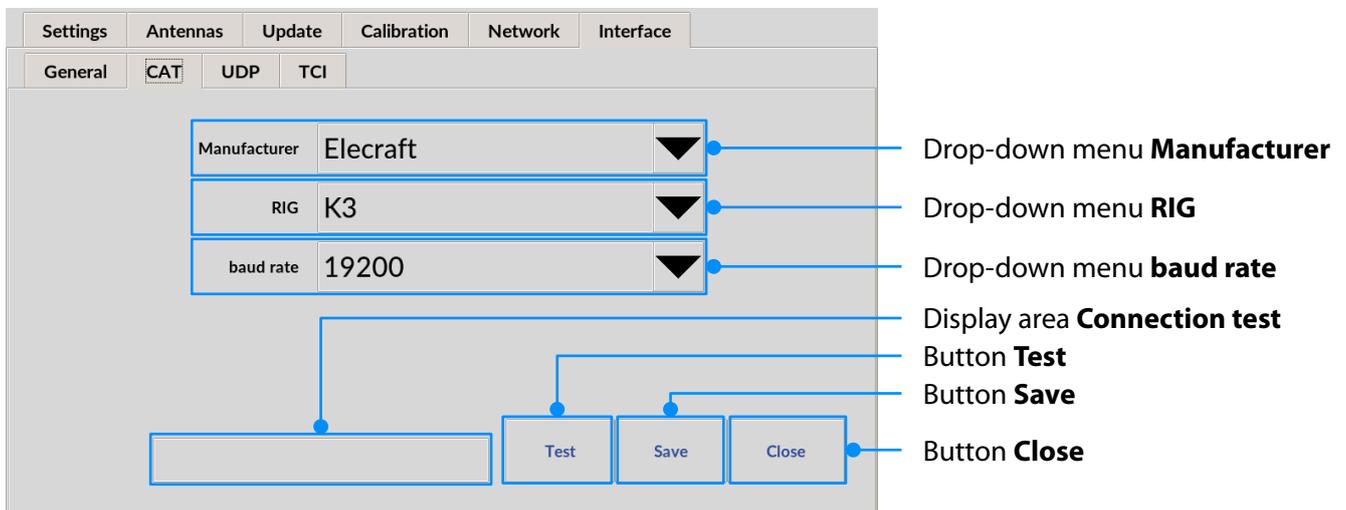


6.2.6.2. UNIVERSAL

There is no data connection to the transceiver. The frequency counter built into the power amplifier measures the transmit frequency of the transceiver when it is transmitting. The power amplifier configures itself accordingly. As there is no data exchange between the power amplifier and transceiver, no further settings are required. **Only use this type of connection if the transceiver you are using does not offer a CAT, UDP or TCI interface.**

6.2.6.3. CAT

Select this type of data connection if you are using a transceiver that offers CAT.

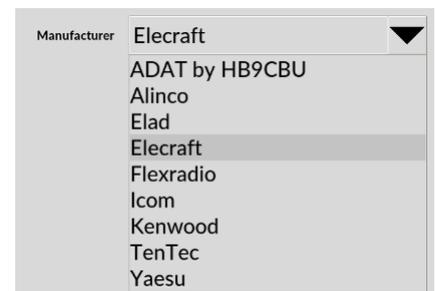


Some manufacturers and devices are already stored in the operating system of the power amplifier, along with the necessary command lists.

- Drop-down menu **Manufacturer**
 - ▶ Tap on the black triangle in the **Manufacturer** drop-down menu

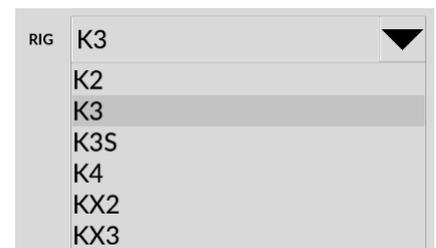
A list of device manufacturers appears.

- ▶ Tap on the corresponding manufacturer name.



The drop-down menu is closed and the selected device manufacturer is displayed.

- Drop-down menu **RIG**
 - ▶ Tap on the black triangle in the **RIG** drop-down menu.



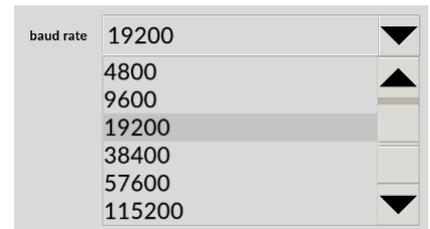
A list of device types appears.

- ▶ Tap on the relevant model.

The drop-down menu is closed and the selected device type is displayed.

- Drop-down menu **baud rate**

- ▶ Tap on the black triangle in the **baud rate** drop-down menu.



A list of connection speeds appears.

- ▶ Tap on the desired connection speed.

The drop-down menu is closed and the selected connection speed is displayed.

- Button **Test**

- ▶ Tap the **Test** button to test the configured CAT data connection.

If the connection is successful, the frequency set on the transceiver is displayed in the **Connection test** display area. If there is a connection problem, the message **“No frequency”** is displayed in the **Connection test** display area:



- Button **Save**

- ▶ Tap the **Save** button to save the configured CAT data connection.

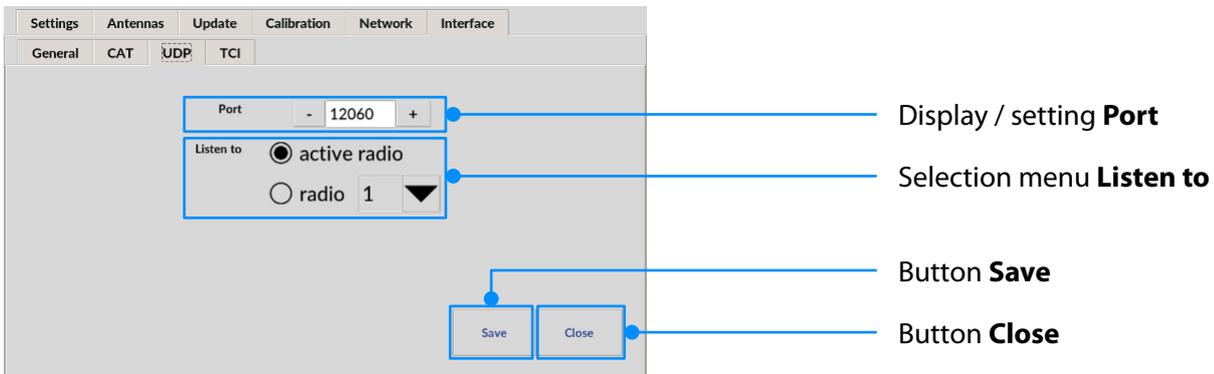
6.2.6.4. UDP

The User Datagram Protocol (UDP) is a protocol from the TCP/IP world. Various programs use UDP to send information from the transceiver to certain ports in the network (e.g. the transmit frequency).

The advantage of UDP is that no CAT interface is required. This is often already used by other programs, e.g. for controlling the transceiver or the logbook.

The RF2K-S can analyze this UDP protocol and adjust to the transmission frequency.

- If, for example, “Listen to: radio 2” is set, the RF2K-S follows the transceiver with the number 2 in the network.
- If “Listen to: active radio” is selected, the RF2K-S will follow the active transceiver in the network.



This function is required when using the RF2K-S as an SO2R power amplifier. For example, the “N1MM” logging software sends a UDP protocol from both transceivers in use in SO2R mode. The protocols indicate which transceiver is currently the active one and needs the power amplifier.

- Display or setting **Port**

- ▶ Use the “-” or “+” buttons in the **Port** display to set the desired UDP port address.

The default setting is Port 12060.

Alternatively, you can also enter a desired UDP port address directly.

- ▶ Tap in the **Port** display.

A virtual keyboard for entering the UDP port address appears:

- ▶ Complete the entry of the UDP port address by pressing the OK button.

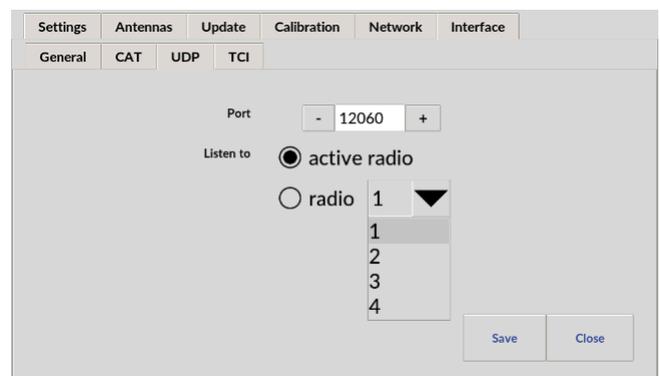
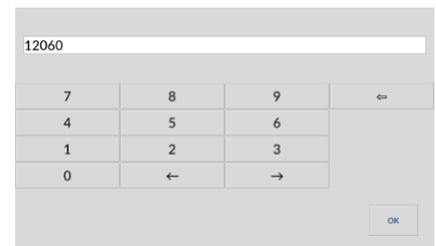
The **UDP** screen is then displayed again.

- Selection menu **Listen to**

The setting is made depending on your station configuration.

If one or more transceivers are to control the power amplifier:

- ▶ Tap the **active radio** button so that the power amplifier follows the frequency of the currently active transceiver.



If several transceivers are in use, but the power amplifier is only assigned to one:

- ▶ Tap the **radio** button to always associate the power amplifier with a specific transceiver.
- ▶ Tap the black triangle of the **radio** drop-down menu and select a specific transceiver so that the power amplifier only follows the frequency of this selected transceiver.

The power amplifier then listens to the broadcast address of the network to which it is connected.

Example: The IP address of the power amplifier is 192.168.178.33 (» Chapter **6.2.5 Network** on page **25**). This means that the software that sends the frequency information via UDP must do so on 192.168.178.255.

6.2.6.5. TCI

The open-source protocol TCI (Transceiver Control Interface) - originally developed by Expert Electronics - connects a wide range of components in an amateur radio station. The control software of the transceiver serves as a server and the other devices such as power amplifiers, antenna switches or various logging programs serve as clients. The data exchange for this is carried out via a TCP connection through the local network.

In the user menu of the RF2K-S, you can set the TCI protocol under **Interfaces - General** to supply the power amplifier with frequency information from the transceiver. The configuration is carried out in the **TCI** sub-menu.

- ▶ Tap the **Host** input field.

A virtual keyboard for the input appears to enter the desired IP address.

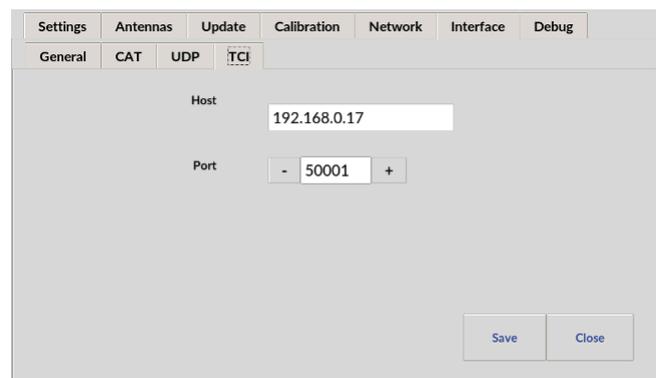
- ▶ Use the “-” or “+” buttons in the **Port** display to set the desired TCI port address.

Alternatively, you can also enter a desired TCI port address directly.

- ▶ Tap in the **Port** display.

A virtual keyboard appears for entering the TCI port address.

- ▶ Complete the entry of the TCI port address by pressing the **OK** button.



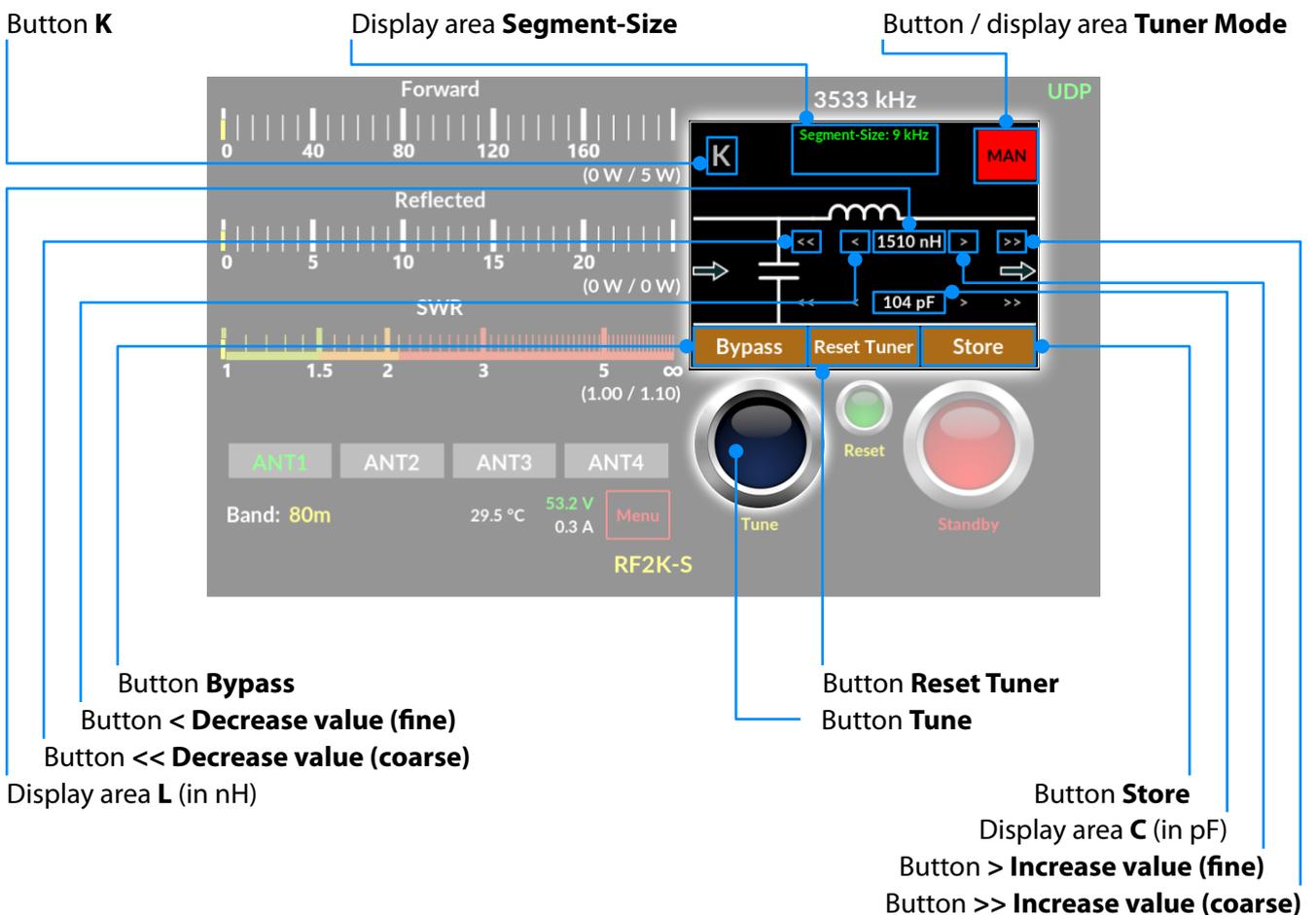
The **TCI** screen is then displayed again. Press **Save** to store the settings and **Close** to display the user interface. **TCI** appears in the top left corner.

7. Antenna Tuner

7.1 Mode of operation

The LC network in the antenna tuner is designed to compensate for reactive components and to establish power matching so that the antenna also radiates the supplied transmit power via the radiation resistance.

To do this, the reactance of the antenna system must be compensated and the resistance for power adjustment of the transmitter must be transformed to the antenna system. An antenna system is always understood to be the antenna in combination with an impedance-transforming feed line.



Available C: Minimum 0.0 pF; Maximum 1,275 pF

Available L: Minimum 0.0 nH; Maximum 10,160 nH



NOTICE!

If the antenna tuner is activated but no valid tuning is stored, transmission is not possible!



When changing bands, the last antenna connection selected for the respective band is always used.

The antenna tuner integrated in the power amplifier can do this matching for you automatically at the push of a button (tuner mode “**AUTO**”); in this case, the device determines the required configuration and all settings itself after you press the **Tune** button. You also have the option of performing this tuning completely manually (tuner mode “**MAN**”) or to fine-tune a configuration that has already been automatically determined.

Regardless of how the settings were determined, the values can be stored and quickly retrieved later after changing the tuning segment (tuner mode “**AUTO**”), making a new tuning process unnecessary.

A separate data record is created in the active **Memory Bank** (see also “Tuner Storage” on page 19) for each antenna connection or external antenna configuration, in which the settings already determined for this antenna connection are saved.

Each antenna connected to the power amplifier can also be a multi-band antenna, whereby the settings of the antenna tuner can be stored for each frequency.

Depending on the currently selected antenna connection, only the settings stored for this antenna connection are taken into account during operation. With a frequency change, the antenna tuner continuously checks for the presence of a suitable, already stored setting for the currently selected antenna. When changing frequencies, the antenna tuner always first accesses the saved settings that were last determined for this band/antenna combination.

If an alternative antenna is to be used for the tuned frequency, select an antenna using the **Currently selected antenna** (ANT1 to ANT4) button.

Antenna connections available for the selected band are shown with a white label. The antenna currently connected to the device is shown with a green label. Buttons that are grayed out cannot be selected.

This means that a large number of different setups can be stored for one and the same tuning segment, depending on the number of connected antennas, and can be called up depending on the antenna selection.



NOTICE!

If you wish to operate an external antenna tuner together with the power amplifier, please ensure that the antenna tuner built into the power amplifier is not in operation on the corresponding bands. See also “**Tuner On/Off**” on page 19.

7.2 Drive power for tuning

For a tuning process of the antenna tuner, the drive power for tuning must be between 4 and 39 W. Outside this power range, the **Tune** button is not activated and remains dark blue (= tuner inactive). Although the antenna tuner also works with QRP transceivers from as little as 4 watts, we recommend at least 10 watts of drive power for a precise tuning process.



The power amplifier is in standby mode and the tuner is inactive (the **Tune** button is dark blue).



There is a carrier signal at the input of the power amplifier. The antenna tuner is ready for tuning (the **Tune** button becomes slightly brighter).

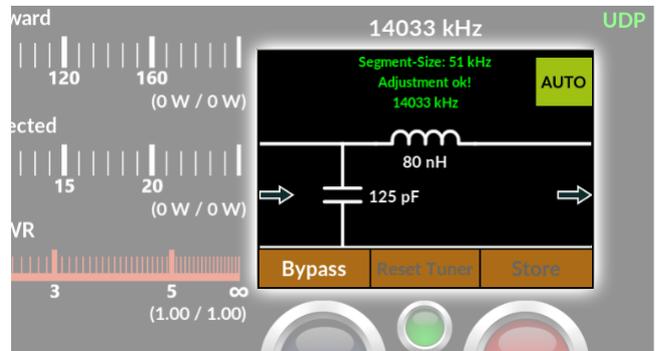


The internal antenna tuner is in the tuning process (the **Tune** button lights up light blue).

7.3 Automatic tuning process

To automatically determine and then save a tuner configuration and setting for the current antenna/frequency combination, please proceed as follows:

- ▶ Press the **Standby / Operate** button to switch the power amplifier to standby mode.
- ▶ Press the **Tuner Mode** button until the **AUTO** highlighted in **green** is displayed.
- ▶ If the antenna tuner is set to "Bypass", press the **Bypass** button until "L" and "C" are displayed.
- ▶ Set the drive power of the transceiver (» **7.2 Drive power for tuning** on page **38**).
- ▶ Start transmitting a continuous carrier (CW, FM or tune function of the transceiver). The **Tune** button lights up slightly brighter.
- ▶ Press the **Tune** button.



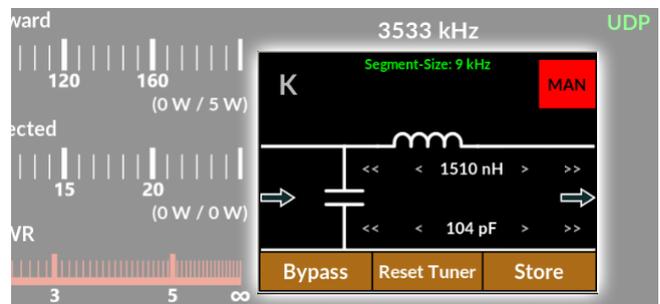
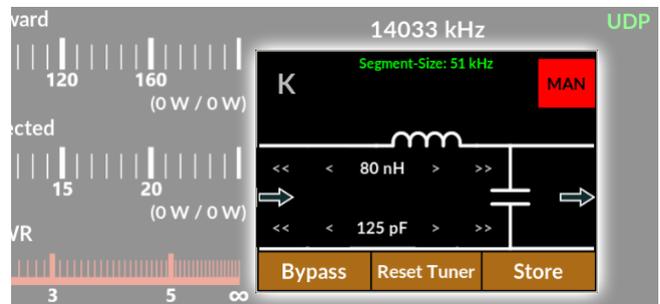
This starts the tuning process. Within a few seconds, all possible values and configurations are tried out to set the antenna tuner to the lowest SWR. The success of the tuning can be followed and checked in the **SWR** display area. A successful tuning is automatically stored in a memory bank assigned to the antenna connection.

If no suitable antenna tuner values are found during the automatic tuning process, you can try to find a suitable setting using the manual tuning process.

7.4 Manual tuning process

To **manually** determine and store a tuner configuration for the current antenna/frequency combination, proceed as follows:

- ▶ Press the **Standby / Operate** button to switch the power amplifier to standby mode.
- ▶ Press the **Tuner Mode** button until **MAN** highlighted in **red** is displayed.
- ▶ Adjust the drive power (» **7.2 Drive power for tuning** on page 38).
- ▶ Start transmitting a continuous carrier in CW or FM or by pressing the tune button on your transceiver.
- ▶ Press the **K** button to switch between the low-pass variants of the tuner.
- ▶ Press the **Reset Tuner** button to reset the values for L and C to zero if necessary.



Tuning of L with the buttons ...

- > Increase value (fine) +0.08 μ H
- >> Increase value (coarse) +0.80 μ H
- < Decrease value (fine) -0.08 μ H
- << Decrease value (coarse) -0.80 μ H

Tuning of C with the buttons ...

- > Increase value (fine) +5 pF
- >> Increase value (coarse) +50 pF
- < Decrease value (fine) -5 pF
- << Decrease value (coarse) -50 pF

The tuning to the SWR minimum can be followed and checked in the **SWR** display area.

- ▶ To end the tuning process, stop the transmission of the transceiver.
- ▶ Press the **Store** button to save the settings of the antenna tuner for the current antenna/frequency combination.

The **Store** button flashes twice briefly to indicate the storage process.

7.5 Bypass the antenna tuner (Bypass)

The antenna tuner can be removed (bypassed) from the transmission path in both automatic and manual mode for test purposes, when using resonant antennas or an external antenna tuner:

- ▶ Manual / Automatic mode: Press the Bypass button to bypass the antenna tuner.
- ▶ Pressing the Bypass button again re-inserts the antenna tuner into the transmission path.



7.6 Display area Segment Size

The display area **Segment-size** (= size of the tuning segment) indicates the usable segment width for a stored antenna tuner setting in kHz.

- The lower the transmit frequency, the narrower this range.
- The higher the transmit frequency, the wider this range.

Example:

The frequency $f = 3535 \text{ kHz}$ is tuned. In the 80 m band, the **Segment-size** is 9 kHz. The tuner setting therefore applies (rounded down) to the frequency range of

$$3535 \text{ kHz} \pm 9 \text{ kHz} / 2 = \mathbf{3531 \dots 3539 \text{ kHz}}$$

If the transmit signal is within this frequency range, no further tuning is required. The message **Adjustment ok!** indicates a valid tuning.



If the deviation from the center of the currently used tuning segment is more than half of the **Segment Size**, then the antenna tuner switches to the settings stored for the tuning segment following in the tuning direction. In the example below 3531 kHz or above 3539 kHz. If the next segment has not yet been tuned, the display in the **Segment-size** display area changes from **green** to **yellow**. Transmission is still possible, but separate tuning of the tuner in this segment is recommended.

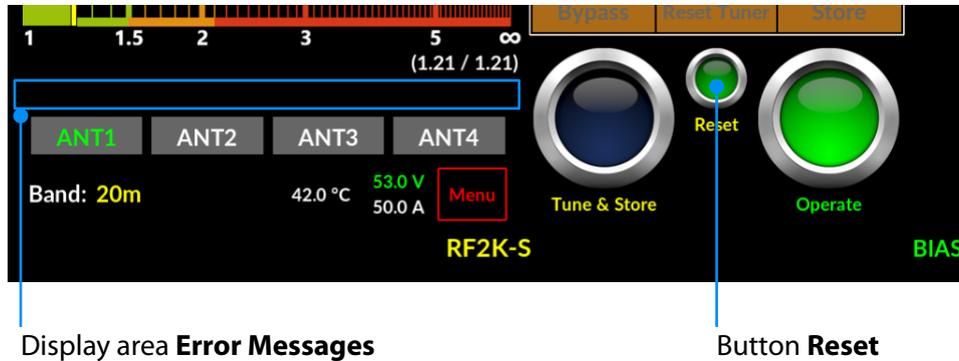
From a distance of more than twice the segment size to the next segment with a valid setting, the antenna tuner issues a warning: "**Not Tuned!**" (below 3523 kHz or above 3548 kHz).



NOTICE!

If the antenna tuner is activated but no valid tuning is stored, transmission is not possible!

8. Troubleshooting



The power amplifier issues error messages if one of the many safety circuits has been triggered. By pressing the **Reset** button, you can delete these error messages and restore the power amplifier to an operational state. Before resuming transmission operation, you should analyze the cause of the error and rectify it. The table below serves as a guideline for classifying the error messages.

Error message	Cause	Solution
High Antenna Reflection	The reflected power (> 100 watts) or the SWR (> 2) at the output of the power amplifier is too high (depending on which limit value is reached first).	<ul style="list-style-type: none"> • Check that the connections from the power amplifier to the antenna are OK and that the correct antenna is selected. • Check the SWR of the antenna with a suitable antenna analyzer. • If you cannot adjust the antenna better yourself, try to improve the SWR with the built-in tuner. » Chapter 7 Antenna Tuner on page 36
High Input Power	The drive power is too high. This is band-dependent and depends on the maximum possible output power.	Reduce the drive power of your transceiver.
Severe Error LPF	The attention of the low-pass filter is too high.	Check whether the error also occurs on other bands. If the linear amplifier behaves normally on the other bands, only the low-pass filter of the affected band is defective. Contact your RF-POWER dealer.

Error message	Cause	Solution
<i>Wrong Frequency</i>	The measured frequency at the input of the linear amplifier is too far away from the frequency that is transmitted via the CAT, UDP or TCI interfaces.	<ul style="list-style-type: none"> ● If the distance between the transmit and receive frequency is more than 30 kHz during split operation of the connected transceiver, transmit with VFO A and receive with VFO B. ● If this is not the case, switch to UNIVERSAL in the interface menu and make a short transmission with the transceiver to check whether the display of the linear amplifier shows the same frequency as on the transceiver. If the difference is more than 30 kHz, contact your RF-POWER dealer.
<i>No internal high voltage</i>	The voltage for the reverse bias of the pin diodes is missing.	Contact your RF-POWER dealer.
<i>High Current</i>	The current limit of the PA module has been exceeded.	Check with low power whether the power amplifier is behaving normally. If this is not the case, contact your RF-POWER dealer.
<i>Overheating</i>	The temperature on the PA module exceeds 72 °C.	Wait until the temperature is around 63 °C before continuing transmission.
<i>High SWR</i>	The SWR is higher than 2.	<ul style="list-style-type: none"> ● Check that the connections from the power amplifier to the antenna are OK and that the correct antenna is selected. ● Check the SWR of the antenna with a suitable antenna analyzer. ● If you cannot adjust the antenna better yourself, try to improve the SWR with the built-in tuner. <p>» Chapter 7 Antenna Tuner on page 36</p>

9. Technical Data

9.1 Technical Data

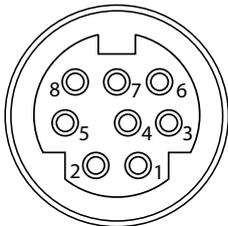
Frequency range	1.8...30 MHz and 50...54 MHz
Output power	1,500 W (at 230 VAC) 800 W (at 110 VAC)
Required drive power	≤ 55 W on all bands (US version)
Efficiency	Up to 70% (frequency-dependent)
TX/RX switching time	Fast QSK < 2 ms
Matching range of antenna tuner	SWR < 3
Connections (SO-239)	1x TRX 4x antenna 16x external antennas via external antenna switch
Dimensions (W x H x D)	31.0 x 19.0 x 42,5 cm (12.2" x 7.5" x 16.7")
Weight	16 kg / 35.2 lbs.
Supply voltage	90 - 290 VAC
Current consumption	Max. 13 A
FCC-ID	2AW84RF2K-S

9.2 Features

- **Highest spectral purity** of the transmitted signal due to **Dual LDMOS transistors**
- **Very quiet operation** due to speed-controlled, low-noise fans
- **7" color touch screen**
- **Multiple graphical user interfaces** can be selected by the user
- **-55 dB output** for predistortion
- **Automatic band switching** through frequency measurement
- **CAT connection** via USB (the USB port is provided by the Raspberry Pi) or **LAN** (UDP and TCI)
- **LAN** connection
- **WiFi** (client mode)
- **Very quiet switching power supply** 90-290 VAC
- **Precise power display** (from 1 W to 2 kW)
- **Software update** via the Internet
- **Remote operation via the Internet** with a PC, tablet or smartphone (Supported platforms: Apple iOS, Android, Linux and Windows)
- **External power/ON** by applying +12 V
- **BCD band data output** for controlling external devices (e.g. bandpass filter switching)
- **BCD data input** for external antenna switch
- **Integrated automatic antenna tuner** with an almost unlimited number of memory locations, also for the settings of up to 16 antennas provided by an external antenna switch
- **Sleep mode** for lower power consumption

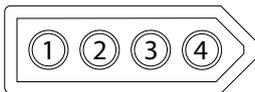
A. Pin assignment TRX tune interface

YAESU



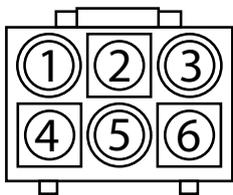
		RF2K-S (DB15)	RF2K+ (ATU/AUX)
1	TKEY	9	1
2	GND	Chassis	5
3	START	10	4

ICOM



		RF2K-S (DB15)	RF2K+ (ATU/AUX)
1	TKEY	9	1
2	START	10	4
4	GND	Chassis	5

Kenwood



		RF2K-S (DB15)	RF2K+ (ATU/AUX)
2	TKEY	9	1
5	START	10	4



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