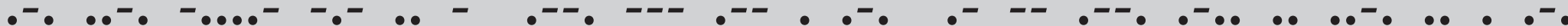




RF-KIT POWER AMPLIFIER

User manual



Dear customer,

Congratulations on the purchase of your RF-KIT linear amplifier!

RF-KIT devices incorporate innovative and reliable technology, comprehensive functionality and appealing design.

If, despite our best efforts problems are encountered or you have a question about the device, please contact your dealer or RF-KIT directly.

vy 73 es gd dx de

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1. Introduction

1.1 Explanation of symbols

Warnings

	<p>Warnings are marked by a warning triangle. In addition, qualifiers indicate the nature and severity of the consequences if the measures to avert the hazard are not followed.</p>
---	--

The following qualifiers are used in this document:

- **NOTE** - Risk of damage to equipment and property.
- **WARNING** - Risk of serious or even life-threatening personal injury.
- **DANGER** - High risk of serious or life-threatening personal injury.



Important information without danger to people or property is marked by the adjacent symbol. These informations are bounded by lines above and below the text.

1.2 Important informations

Symbol	Meaning
▶	Instruction
→	Reference to a position in the document
●	Enumeration/List entry
-	Enumeration/List entry (2 nd level)

1.3 Environment protection

Disposal of packaging

The packaging protects the device against damage during transport. The packaging materials are selected according to environmentally friendly and disposal-related criteria and thus recyclable.

Return of the remaining packaging parts, such as packaging straps, PE bags etc., into the material cycle saves raw materials and reduces waste.

If you plan to dispose of packaging yourself, please do so at your nearest recycling centre.

2. Safety informations

Read these operating and installation instructions carefully and completely before attempting to install and operate the device!

Carefully retain these operating and installation instructions. Important safety and operating instructions are contained herein.

When selling the device hand this document to the new owner.

There are dangerous voltages inside the device! Before opening the device:

- ▶ Switch off the device by pressing the power switch **On/Off (1)** at the front of the device and wait until all cooling fans stop.
- ▶ Disconnect the power cable from the **Power jack (9)**.

Pay close attention to the notes and warnings on the following page to avoid damage to the device and avoid the risk of serious injury.

Please use this linear amplifier only according to the instructions provided in this manual.

The device is designed only 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 placed within their reach.

The unit should 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 linear amplifier can generate high-frequency electromagnetic fields, which 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 and defibrillators.

Refer to the manufacturer instructions of a pacemaker or defibrillator for precautions in the vicinity of a radio frequency transmitter.

Immediately stop an ongoing transmission if malfunction or interference with a pacemaker or defibrillator is suspected!



DANGER - HIGH TENSION!

NEVER connect an antenna or remove an antenna socket while the unit is transmitting!
This can cause electric shock or burns!



DANGER - HIGH TENSION!

NEVER operate the device without its cover securely in place.
This can cause electric shock or burns!



DANGER - HIGH TENSION!

NEVER apply mains voltage before the linear amplifier is Grounded.
Touching the linear amplifier in this case can cause an electric shock!



WARNING!

NEVER operate the device with a mains voltage other than the recommended 90-240 V mains voltage.
This could cause a fire or destroy the device!



WARNING!

NEVER operate the device together with an extension cord or multiple socket.
This could cause a fire or electric shock!



WARNING!

NEVER allow pieces of metal, wires or other objects to touch the internal parts or connectors on the back of the device!
This can cause electric shock or burns!



WARNING!

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



WARNING!

The device is intended only for indoor use. NEVER expose the device to liquids and NEVER operate it in a humid environment!
This can cause electric shock, burns and destroy the device!



WARNING!

The device gets hot during prolonged transmission operation!



NOTE:

Avoid using or installing the device in environments with temperatures below -10 °C (+ 14 ° F) or above + 40 °C (+ 104 ° F).
Avoid locating the device where it will be exposed to direct sunlight or high levels of dust.



NOTE:

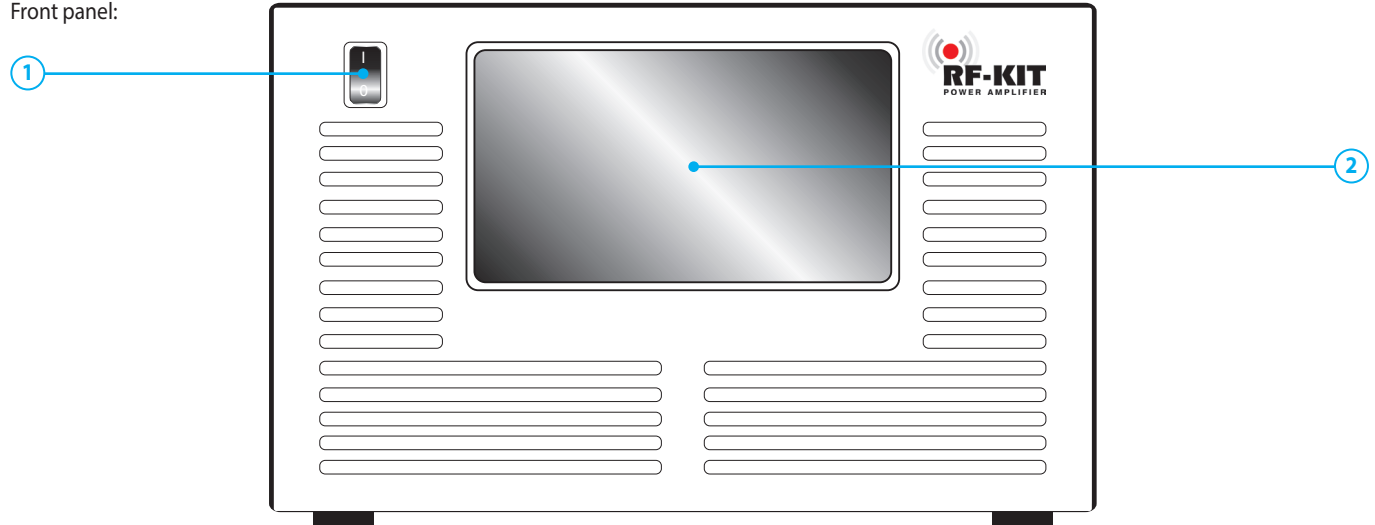
Locate the device in a well-ventilated area. Make sure that no objects are placed on the device or near the ventilation openings, which will hinder heat disposal.

3. Control elements and connections

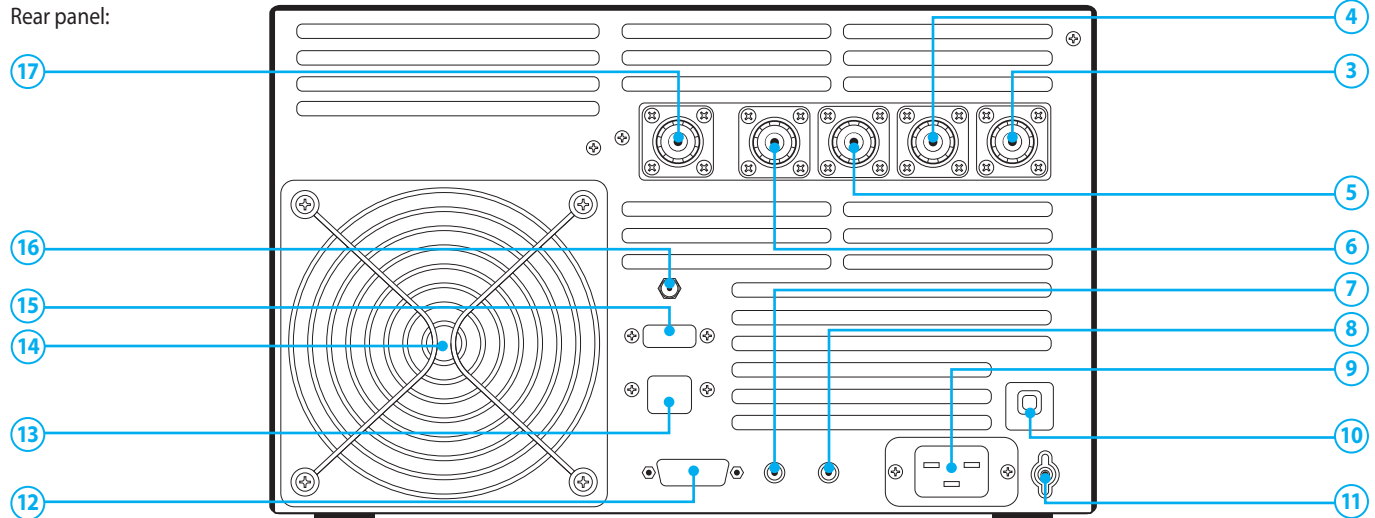
3.1 Panel description

- 1 **On/Off**
- 2 **Touch screen**
- 3 **ANT 4**
- 4 **ANT 3**
- 5 **ANT 2**
- 6 **ANT 1**
- 7 **PTT**
- 8 **Power On External**
- 9 **Power jack**
- 10 **Fuse**
- 11 **Ground connector**
- 12 **Multifunction connector**
- 13 **LAN**
- 14 **Cooling fan**
- 15 **CAT USB**
(USB-port is provided by the **Raspberry Pi®**)
- 16 **-55 dB output**
- 17 **Exciter input**

Front panel:



Rear panel:



3.2 Control elements and connections

- 1 Power switch **On/Off (1)** (main switch)
This rocker switch switches the device on / off.
- 2 **Touch screen** - GUI
This Touch screen controls the device in all operating states.
Also you receive context-related information about the operating status of the device.
- 3 **ANT 4**
50 Ω antenna socket SO-239 (PL-259)
- 4 **ANT 3**
50 Ω antenna socket SO-239 (PL-259)
- 5 **ANT 2**
50 Ω antenna socket SO-239 (PL-259)
- 6 **ANT 1**
50 Ω antenna socket SO-239 (PL-259)



When device is switched off, **TRX (17)** is looped through to **ANT 1 (6)**.

- 7 **PTT**
RCA connector for transmit/receive switching

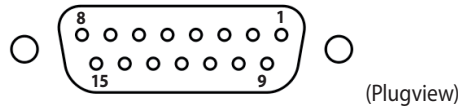


At the center contact (+) of the connector **PTT (7)** +5 V is present.

- 8 **Power On External**
RCA connector for remote control: The device can be switched on remotely by applying + 12V DC (at least 10 V, max 15 V!) to the center contact. The power switch **On/Off (1)** must be switched off ("0"). When DC voltage drops, the PA switches off.
- 9 **Power jack**
A plug for this power socket is included and can be wired to the user supplied power cord capable of 16 Amps, that meets their countries power plug requirement.
- 10 **Fuse** - automatic circuit breaker 16 A
If this automatic circuit breaker trips several times in succession a serious fault condition may exist!

WARNING!
Do not open the device by yourself, contact the manufacturer!

- 11 **Ground connector**
- 12 **Multifunction connector** DB-15



DB-15 External Antenna Select Input (Pin 1-4):
The RF2K-S internal controller can store tuner settings for up to 16 antennas per band. Your external antenna selectors connect via the Ant 1 connector. With this arrangement the amplifier must be made aware which of the up to 16 antennas is in use. This is done by providing BCD data to Pins 1-4 as detailed in the table. Antennas may be mono or multi-band.

- 1 - **In A** BCD input from ext antenna selector system.*
- 2 - **In B** BCD input from ext antenna selector system.*
- 3 - **In C** BCD input from ext antenna selector system.*
- 4 - **In D** BCD input from ext antenna selector system.*

* Max. voltage: 15 V for RF2K-S **V1** / 50 V for RF2K-S **V2**.
For the version number, see the nameplate at the back of the PA.

Addressing externally connected and managed antennas
(1 = active; 0 = inactive):

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

DB-15 BCD Band Data Output (Pin 5 - 15):

- 5 - Out D** BCD band data output
(Outputs are Open Collector 50mA to GND)
- 6 - Out C** BCD band data output
(Outputs are Open Collector 50mA to GND)
- 7 - Out B** BCD band data output
(Outputs are Open Collector 50mA to GND)
- 8 - Out A** BCD band data output
(Outputs are Open Collector 50mA to GND)

Addressing according to the YAESU® band data table:

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

- 9 - TKEY** Output/input for future tuner control
- 10 - TSTR** Input for future tuner control
- 11 - RS232 TX** For future applications
- 12 - RS232 RX** For future applications

- 13 - GND** RF2K-S **V1:** GND
RF2K-S **V2:** Ext. input 5-15 V
(for future functions)
- 14 - GND** RF2K-S **V1:** GND
RF2K-S **V2:** Ext. input 5-15 V
(for future functions)

15 - OUT 15 V Max. 500 mA if device is switched on; can be used for external controls (e.g., remote control relay control).

13 RJ45 LAN Connector

Here you can connect your RF2K-S to your home network for remote control by LAN-cable.

Note: Alternatively you can use the build-in Wi-Fi to connect the RF2K-S to your local Wi-Fi network.

14 Cooling fan

The high-performance fan is temperature-controlled and ensures reliable cooling of the power electronics with minimal noise, even during maximum continuous load (contest operation!).

15 CAT USB - USB 2.0 connector "CAT"
Band data import / export between exciter and PA.

16 -55 dB output
SMA connector for adaptive pre-distortion of the exciter signal in appropriately equipped SDR transceivers..

17 TRX - 50 Ω SO 239 connector
Input exciter (transceiver) signal.

4. Preparing for operation

4.1 Unpacking

- ▶ After unpacking, inspect the device for shipping damages.
- ▶ Report any damage immediately to the delivery company and your supplier. Keep the shipping box.

4.2 Scope of delivery

- 1x RF2K-S Power Amplifier
- 1x 120 V AC line cord
- 1x 240 V AC line cord
- 1x Short coaxial cable with 1x SMA connector ("Pigtail")
- 1x Micro SD-Card for operating system

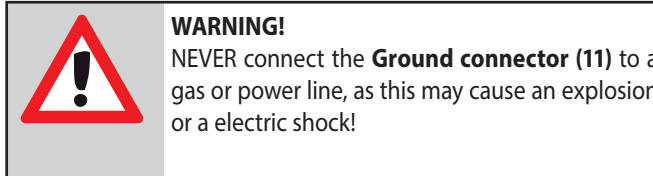
4.3 Selecting a location

Because of its weight the device must be situated on a stable surface.

- ▶ Select a location for the device that ensures adequate air circulation (at least 10 cm of free space in front of and behind the PA are necessary).
- ▶ Avoid locations with extreme heat or cold, high humidity and vibrations.

Avoid operation near TV sets, television antennas, radios and other electromagnetic sources.

4.4 Grounding



To prevent electric shock, television interference (TVI), radio interference (BCI) and similar problems:

- ▶ Ground the device via the **Ground connector (11)** at its back. For best results, use a copper wire with large cross-section to connect to a copper rod, as long as possible, buried in conductive soil.
- ▶ Keep the length of this copper wire as short as possible!

4.5 Connecting exciter

- ▶ Connect the antenna socket of the exciter (a transceiver in general) to the connector **TRX (17)** of the PA via a coaxial cable.

4.6 Connecting PTT-cable

- ▶ Connect the PTT connector of the exciter (a transceiver in general) to the connector **PTT (7)** of the PA via a RCA cable.



At the center contact (+) of the connector **PTT (7)** +5 V is present.

4.7 Preparing LAN connection

- ▶ Connect a ethernet cable to the **LAN (13)** socket.
- ▶ Connect the ethernet cable to the router / switch of your local area network.

4.8 Connecting antenna(s)

Do NOT transmit without an antenna or dummy load connected! Select one or more 50 Ω antennas or dummy load with 50 Ω lead and more than 2 kW rated power.

- ▶ Connect 1-4 antenna(s) to the desired 50 Ω antenna socket using suitable coaxial cable with as little loss of power as possible, and professionally mounted PL-259 plugs to connector **ANT 1 (6)**, **ANT 2 (5)**, **ANT 3 (4)**, **ANT 4 (3)**.



When device is switched off, **TRX (17)** is looped through to **ANT 1 (6)**.

4.9 AC Line cord connection

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

If the device is operated at 110 V, the maximum output power drops to approximately 900 W.

- ▶ Connect the device with the included line cord via **Power jack (9)** to a properly installed power outlet.

5. Using the device locally

5.1 Turning device on

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

The **Touch screen (2)** lights up and shows the user interface:

The screenshot shows the user interface of the RF-KIT RF2K-S power amplifier. The interface is divided into several sections:

- Forward Power:** A bar graph showing power levels from 0 to 160 W, with a digital readout of 0 W / 3 W.
- Reflected Power:** A bar graph showing power levels from 0 to 20 W, with a digital readout of 0 W / 0 W.
- SWR:** A bar graph showing SWR levels from 1 to 5, with a digital readout of 1.00 / 1.25.
- Antenna Selection:** A row of buttons labeled ANT 1, ANT 2, ANT 3, and ANT 4. ANT 1 is currently selected and highlighted in green.
- Band:** A display showing the current band as 80m.
- Operating Parameters:** A display showing 27.0 °C, 53.5 V, and 0.0 A.
- Frequency TRX:** A display showing 3691 kHz.
- Segment-Size:** A display showing 9 kHz, with a note "Adjustment ok!" and a digital readout of 0 kHz.
- ATU (Antenna Tuner):** A display showing "ATU bypassed" with "Bypass", "Reset Tuner", and "Store" buttons below it.
- Reset PA:** A green button labeled "Reset".
- Standby:** A red button labeled "Standby".
- Tune:** A blue button labeled "Tune".
- Menu:** A red button labeled "Menu".
- Personalization Text:** A display showing "B26 RF2K-S" and "RF-KIT RF2K-S".
- Version:** A small text at the bottom right: "(RF-KIT PA Version: G70C92 © 2019-2021 by RF-KIT)".

Labels on the right side of the image point to specific UI elements:

- Indication area **Frequency TRX**
- Switching area **Interface**
- Switching area/ Indication area **Antenna Tuner**
- Switching area **Standby**
- Switching between "Standby" (red) "Operate" (green)
- Switching area **Reset PA**
- If the PA switches off due to an error, it is reactivated after actuating this switching area; the error message (e.g. "zu hohes SWR" vanishes)
- Switching area **Tune**
- Touching this switching area triggers a tuning process
- Switching area **Menu**
- Touching this switching area activates the user menu

Labels on the left side of the image point to specific UI elements:

- Indication area **Forward Power** (analog PEP and digital / maximal)
- Indication area **Reflected Power** (analog PEP and digital / maximal)
- Indication area **SWR** (analog PEP and digital / maximal)
- Indication area **Error Messages**
- Switching area/Indication area **Currently Selected Antenna**
- Individual connections for a band are assigned in the „Antennas“ user menu. Antenna(connections) available for the selected band are displayed with white labeling. The antenna currently connected to the device is displayed with green label. Dark grayed out buttons cannot be selected.
- Indication area **Used Band**
- Indication area **Operating Parameters** (Temperature output stage, end transistor supply voltage, output stage current consumption)
- Indication area **Personalization Text** (An individualization text to be edited in the user menu (e.g. call sign) is displayed here)

5.2 User menu

- ▶ Touch the switching area **Menu**.

The **Touch screen (2)** changes to the user menu and displays the screen shown to the right. The following submenus can be selected:

5.2.1 Settings

- **Personalization Text**

- ▶ Click the text box and a touch screen keyboard will appear to allow editing the personalisation text.

- **Display**

- ▶ During remote operation, it makes sense to turn off the **Touch screen (2)** (activated "On" / deactivated "Off")

- **Cursor**

- ▶ Selection cursor visible („ON“) / invisible („OFF“)

- **Type**

- ▶ Choose your preferred Power display (Standard / Cross Pointer):



Standard



Cross Pointer

Switching areas **Submenus**
(Settings / Antennas / Update / Calibration / Network / Interface)

Input field
Personalization Text
Editing via a PC connected to the PA

Switching area
Display
(activated („On“) / deactivated („Off“))

Switching area
Cursor
(cursor visible („ON“) / invisible („OFF“))

Switching area
Type
(Standard / Kreuzzeiger)

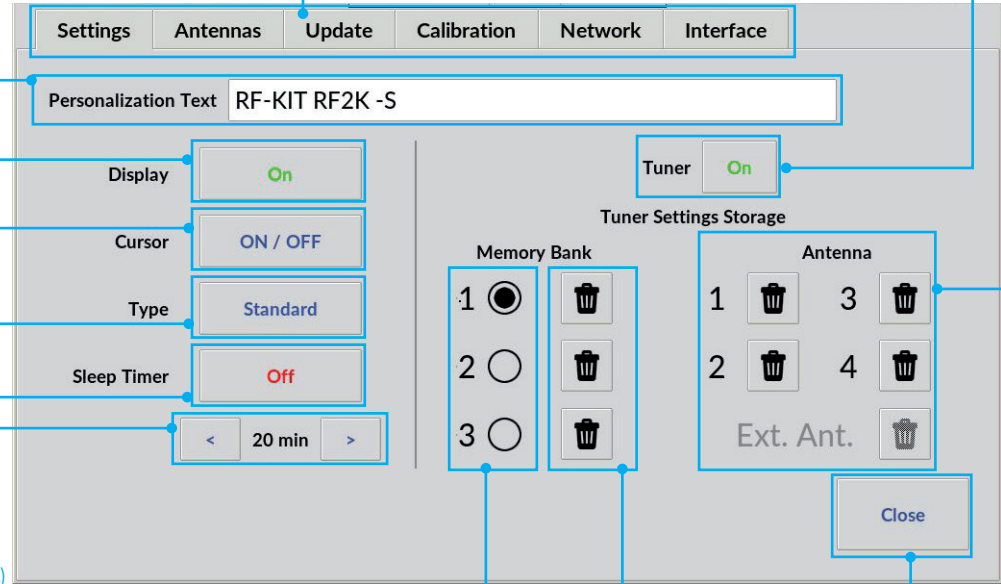
Switching area
Sleep Timer
(activated („On“) / deactivated („Off“))

Switching areas
Sleep Timer Duration
(Time until Standby in minutes)

Switching areas
Memory Bank (1 / 2 / 3)
Touching one of these switching areas selects one of three memory banks together with the antenna sockets assigned to them (max. 4)

Switching areas
Erase Memory Bank
Touching one of these switching areas deletes the contents of only the selected memory bank

Switching area
Close
Touching this switching area closes the user menu; subsequently the main screen will be displayed



Switching area
Tuner
Activates („On“) / deactivates („Off“) the antenna tuner

Switching areas
Delete Antenna (1 / 2 / 3 / 4 / Ext. Ant)
Delete antenna for selected memory bank

- **Sleep Timer**

- ▶ The **Sleep Timer** is activated/deactivated by (multiple) touching this switching area (**Sleep Timer** activated "On" / deactivated "Off")

- **Sleep Timer Duration**

- ▶ By touching the switching areas "<" or ">" the **Sleep Timer** can be adjusted.

If there is no operation during the set duration, the unit switches to stand-by mode (**Stand By**) after the set duration has expired. Each activity via the **Touch screen (2)** resets the **Sleep Timer** to the set duration and the countdown to **Stand By** starts again.

- **Memory Bank**


Only one **Memory Bank** can be activated at a time.

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

A **Memory Bank** contains the number and all determined setting data of the **Antennas** assigned to it. Clearing a **Memory Bank** only clears the antenna tuner setting data determined in connection with this specific **Memory Bank** for all **Antenna Sockets** assigned to the **Memory Bank**. The contents of the other two **Memory Banks** remain untouched.

- **Erase Memory Bank**

- ▶ By clicking on one of the three circular fields, the contents of the corresponding **Memory Bank** are deleted.

	<p>NOTE! Contents are deleted in any case and regardless of whether the corresponding memory bank is currently activated.</p>
---	--

- **Tuner**

- ▶ The **Antenna Tuner** is activated/deactivated by (multiple) touching this switching area (**Antenna Tuner** activated "On" / deactivated "Off")

- **Delete Antenna**

Deletes the **Antenna Tuner Setting Values** of an **Antenna Socket** within a currently active **Memory Bank**.

- ▶ Deleting the **Antenna Tuner Setting Values** of an **Antenna Connector** (1 / 2 / 3 / 4 / Ext. Ant.) by touching the switching area **Garbage Can**.

Further submenus are:

- **Antennas**
- **Update**
- **Calibration**
- **Network**
- **Interface**

5.2.2 Antennas



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

To assign an **Antenna Socket** to a band:

► Tap the **circle field** in the corresponding **column/row**.

The **circle field** is now displayed **in blue** confirming the antenna connector/band assignment.

► Tap the switching area **Save** to store the selected assignment(s).

Settings					Antennas					Update					Calibration					Network					Interface				
Band					Available Antennas				Band					Available Antennas															
					ANT 1	ANT 2	ANT 3	ANT 4						ANT 1	ANT 2	ANT 3	ANT 4												
160m					<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	17m					<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>												
80m					<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	15m					<input checked="" type="radio"/>	<input checked="" 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 checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	10m					<input checked="" type="radio"/>	<input checked="" 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 checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>																					

Ext. Antenna switch
 active high
 active low

Save Close

Name ANT 1
Name ANT 2
Name ANT 3
Name ANT 4

Name Band
Switching area Ext. Antenna switch
Switching area active high
Switching area active low
Switching area Save
Switching area Close

5.2.2.1 Ext. Antenna switch

This device supports the use of an **external antenna switch**, which can be used to select up to 16 antennas (each of them can be a mono or multiband antenna). The associated antenna tuner settings data can be stored.

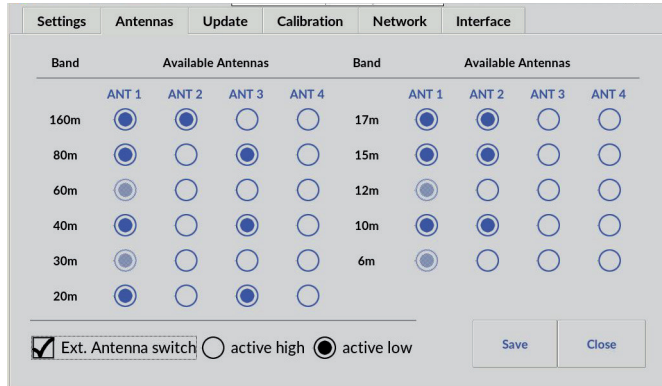
When an external antenna selector is in use, selected antenna data should be supplied to the amplifier via the **multi-function socket (12)** Pins 1-4. For details on addressing and pin assignment, refer to chapter „**3.2 Operating elements and connections**“ on page 6.

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

- ▶ Tap the switching area **Menu**.

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

- ▶ Tap the switching area **Antennas**.
- ▶ Tap the switching area **Ext. Antenna switch**.



The previously empty square is now displayed **checked**, indicating the activated use of an external antenna switch.

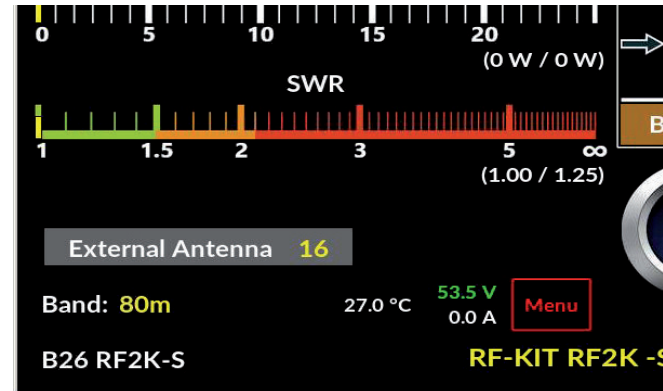
Depending on the model, an external antenna selector switch provides a „low“ or a „high“ signal as activation instruction:

- ▶ Tap the switching area **active high** resp. **active low** for selection.

The **circle field** is now **black** confirming your selection.

- ▶ Tap the switching area **Save** to store the settings.

After returning to the main screen, the display area of **currently selected antenna** is now shown as follows:



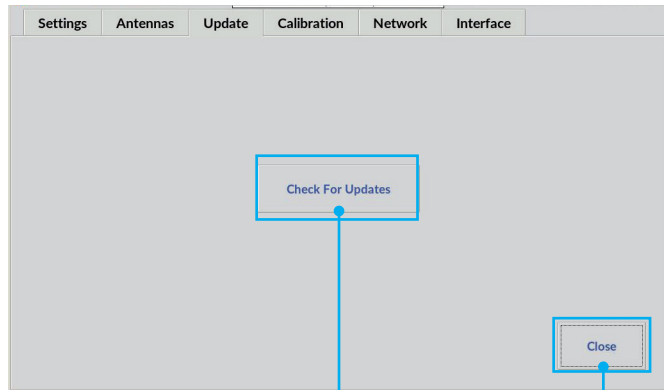
In the example shown above, the selection of antenna 16 is displayed for the external antenna switch („External Antenna 16“).

5.2.3 Updates

The graphical user interface (GUI) and the controller firmware are under continuing 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 here for updates for the graphical user interface (GUI) and the controller firmware of the PA. If newer versions are available, they can be installed quickly and easily.

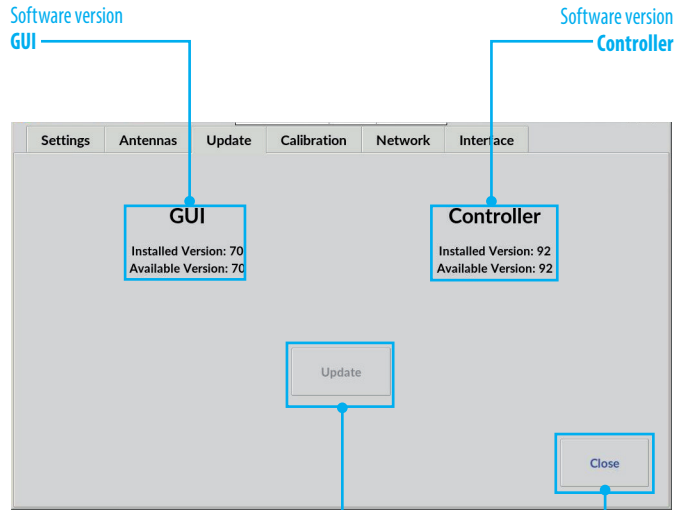
- ▶ Tap the switching area **Check for Updates** to check for available updates.



Switching area **Check for Updates**
Touching this switching area checks whether updates are available

Switching area **Close**
Touching this switching area closes the user menu; subsequently the main screen will be displayed

- ▶ Tap the switching area **Update**, to start the update process.



Switching area **Update**
Touching this switching area starts the update process

Switching area **Close**
Touching this switching area closes the user menu without performing an update; subsequently the main screen will be displayed

5.2.4 Calibration

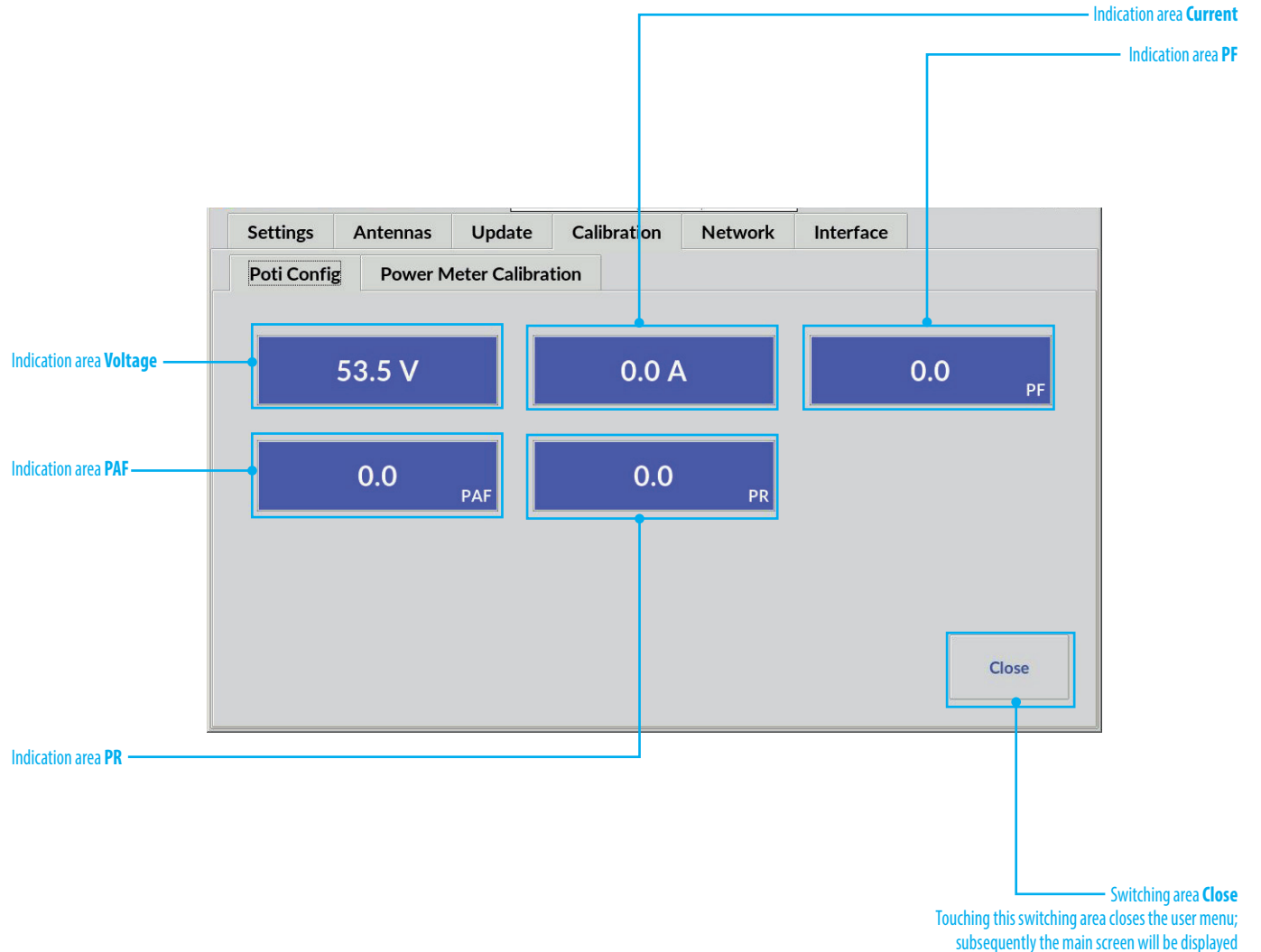
This menu item is divided into two submenus:

- **Poti Config:**
Indication area operating data
- **Power Meter Calibration:**
Calibration of the internal power measurement

5.2.4.1 Poti Config

The indication areas on this screen are used during amplifier alignment.

- **Voltage**
Power MOS-FETs Drain voltage
- **Current**
Power MOS-FETs Current consumption
- **PF**
LPF Power Output
- **PAF**
PA module Power Output
- **PR**
Reflected Power



5.2.4.2 Power Meter Calibration

Inherent frequency-dependent deviations in linearity of the directional coupler used for internal power measurement can be minimized for each band-pass range.

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

Selection of the bandpass range is done automatically during transmission. The detected band is highlighted.

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

Brief actuation changes the value in the indication area **Forward** only slightly.

Longer actuation changes the value continuously.

- ▶ Tap the switching area **Save** to store the settings.
- ▶ Repeat this procedure for each bandpass range to be adjusted.

Switching area >
(increase value)

Switching area <
(decrease value)

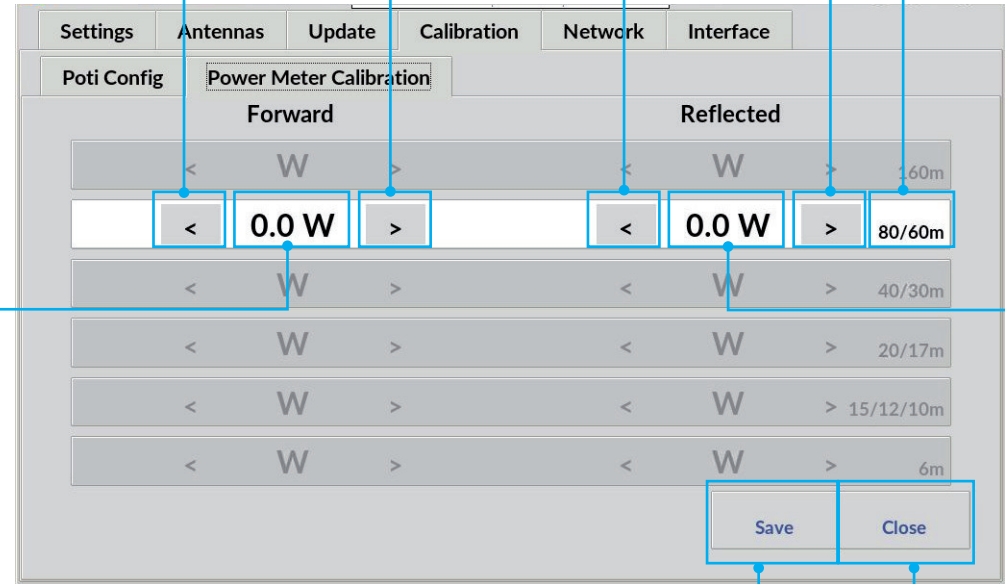
Switching area <
(decrease value)

Switching area >
(increase value)

Indication area
Band

Indication area **Forward**

Indication area
Reflected



Switching area **Save**
Touching this switching area stores the settings

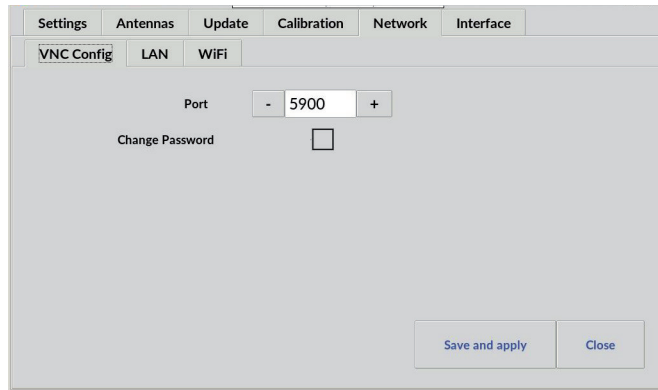
Switching area **Close**
Touching this switching area closes the user menu; subsequently the main screen will be displayed

5.2.5 Network

All necessary settings for a VNC remote operation of the PA are made here. The network connection is possible via LAN or Wi-Fi.

5.2.5.1 VNC Config

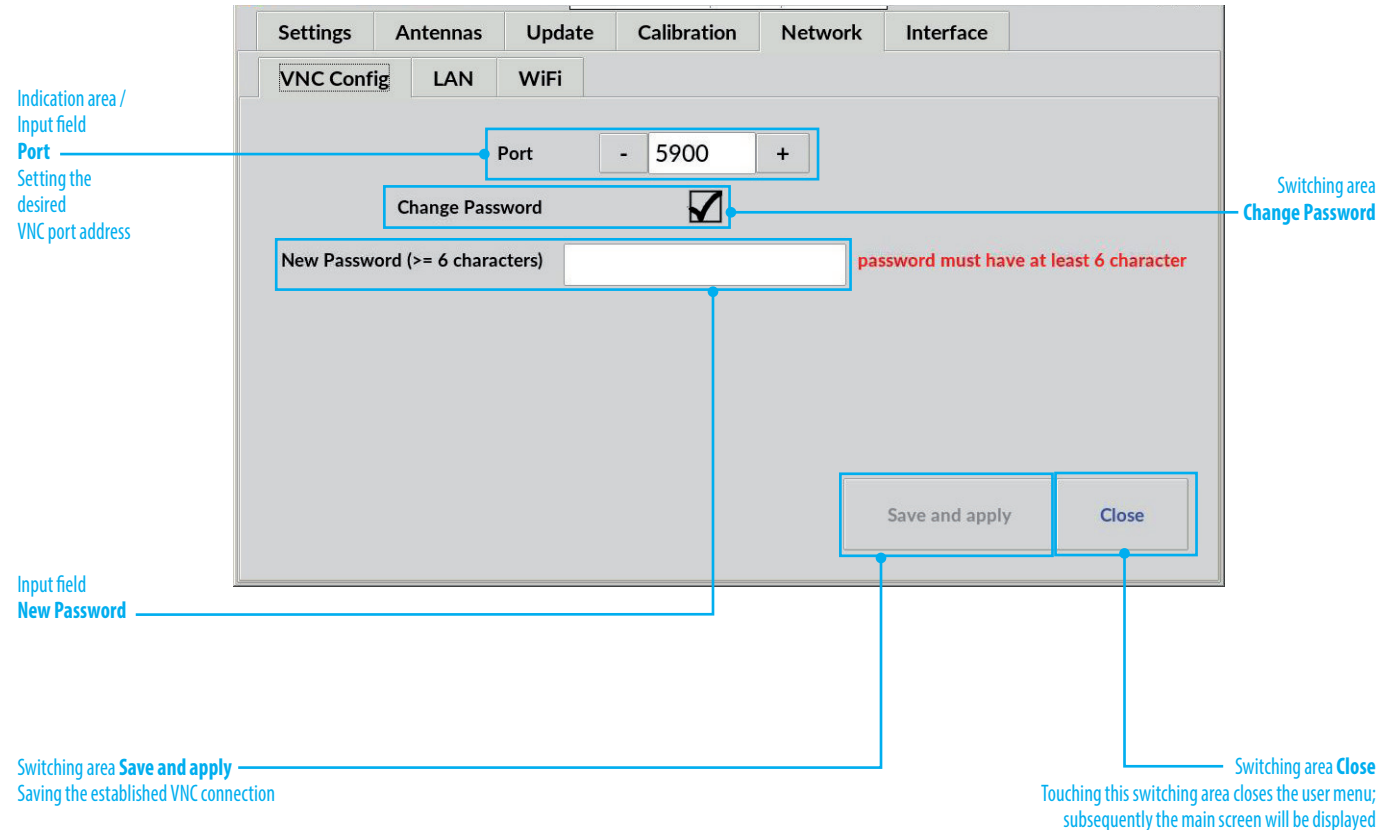
With a VNC connection, the device can be remotely controlled and operated from any PC, tablet PC or smartphone connected to the Internet or local network using VNC software (remote operation).



- Indication area resp. setting of **Port** (default setting is port 5900.)

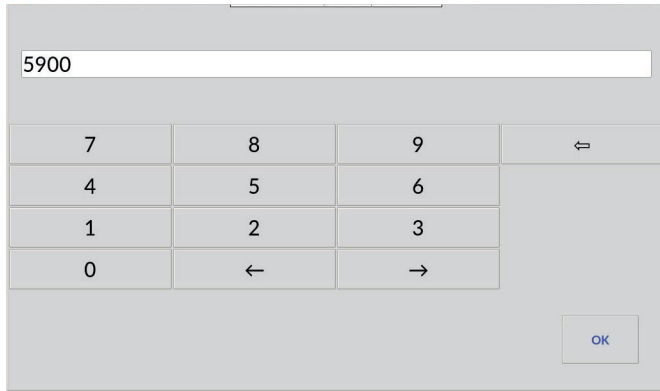
- Use the „-“ or „+“ buttons in indication area **Port** display to set a desired VNC port address.

Alternatively, you can enter a desired VNC port address directly:



- ▶ Tap into the input field/indication area **Port**.

A virtual keyboard appears for entering the VNC port address:



- ▶ Finish entering the VNC port address by tapping the **OK** switching area.

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

A VNC connection is password protected.

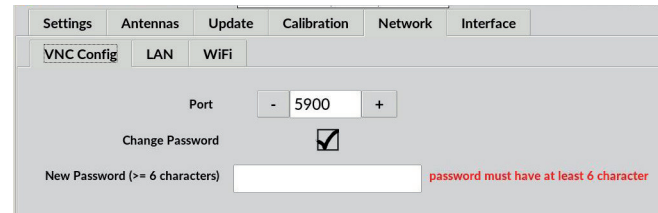


In the delivery state the VNC password is: „rfkit“

You can change the VNC password at any time:

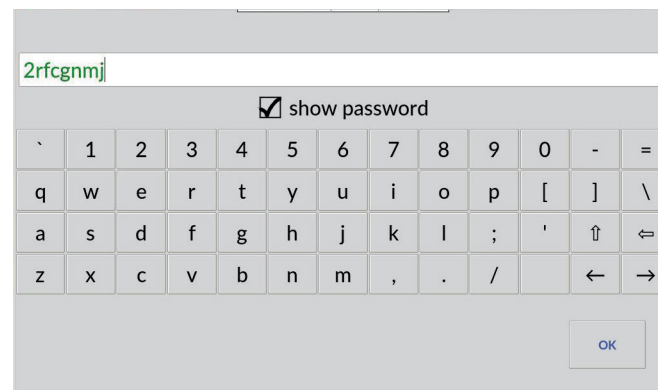
- ▶ Tap the switching area **Change Password**.

The input field **New Password** appears:



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

A virtual keyboard appears for entering the new password:



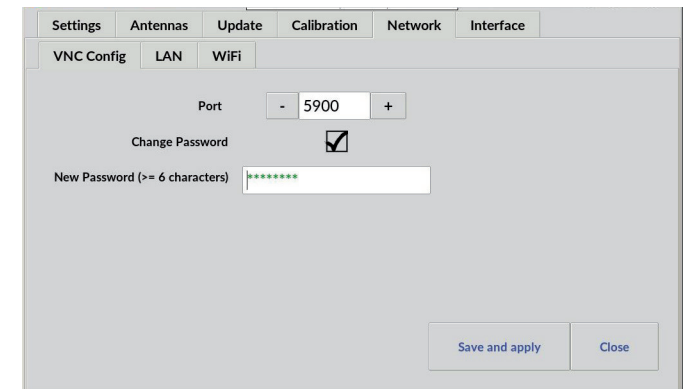
- ▶ If necessary, tap the switching area **show password** to make the entered characters (min. 6 / max. 63 characters) visible.

As long as the minimum number of characters (= 6) for a valid new VNC password is not reached, the characters entered up to that point are displayed in **red**.

From the 6th character on, the VNC password is valid and therefore displayed in **green**.

- ▶ Finish the VNC password entry by tapping switching area **OK**.

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



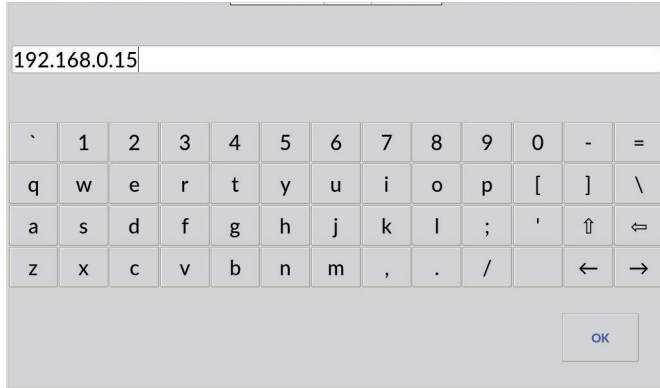
- ▶ Tap the switching area **Save and apply** to save and apply the VNC settings.

5.2.5.2 LAN

Set up LAN connection with fixed IP address:

- ▶ Tap the switching area **Manual**.
- ▶ Tap the input field **IP-Address (Router / Name Server)**.

A virtual keyboard appears:

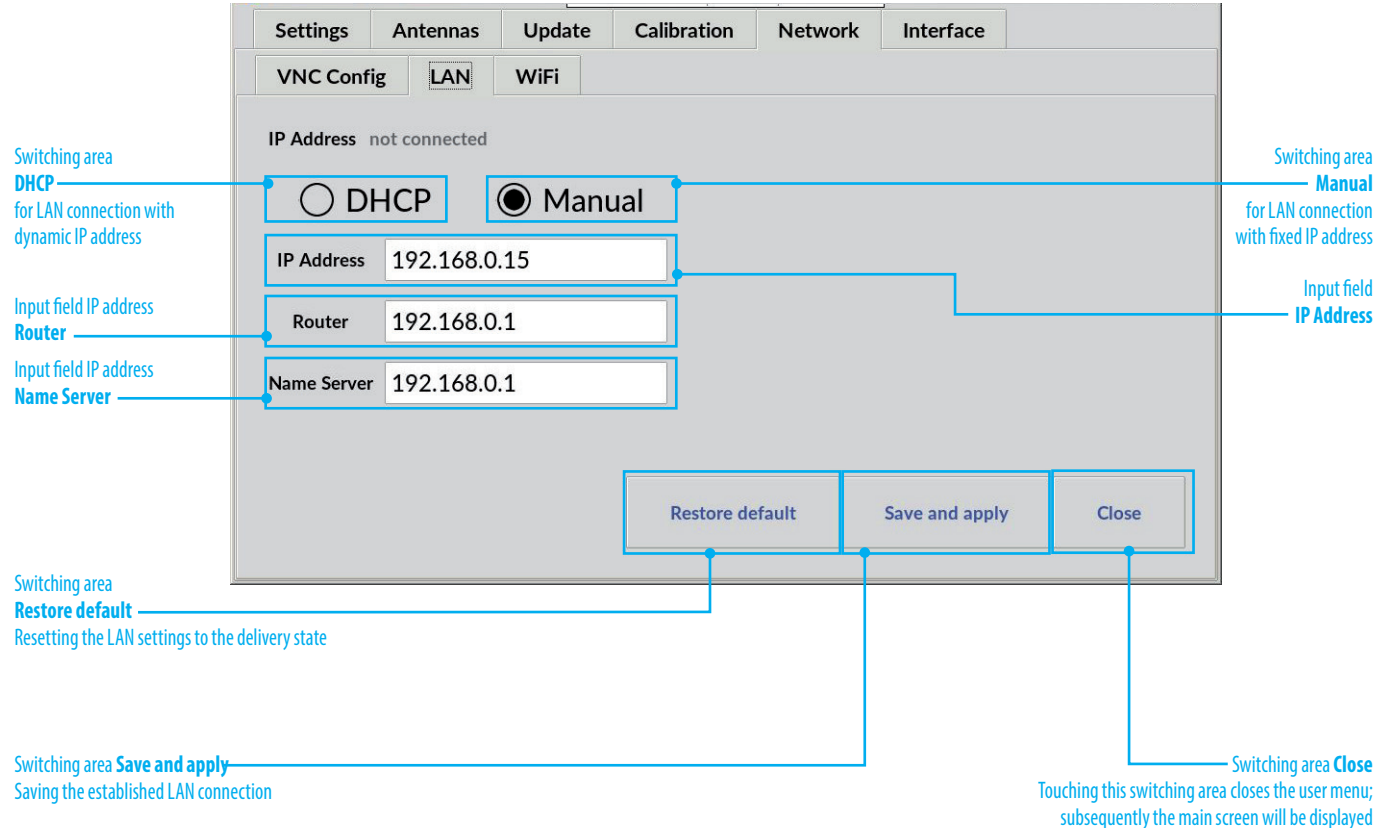


The IP addresses are entered in the **Router** or **Name Server** input fields in the same way.

- ▶ Finish the entry by tapping switching area **OK**.

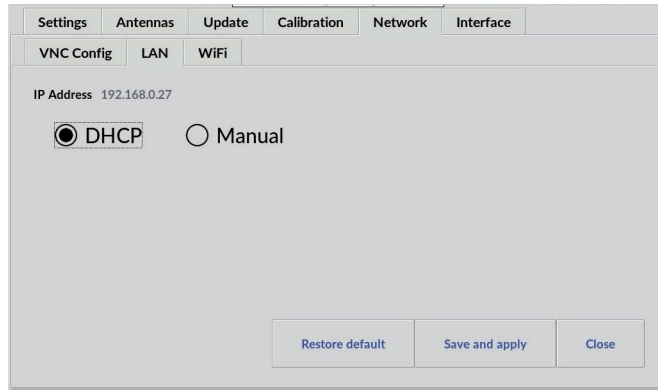
The **LAN** screen is then displayed again.

- ▶ Tap the switching area **Save and apply** to save and apply the LAN settings.



Set up LAN connection with dynamic IP address (DHCP):

- ▶ Tap the switching area **DHCP**.



- ▶ Tap the switching area **Save and apply** to save and apply the LAN settings.

5.2.5.3 Wi-Fi

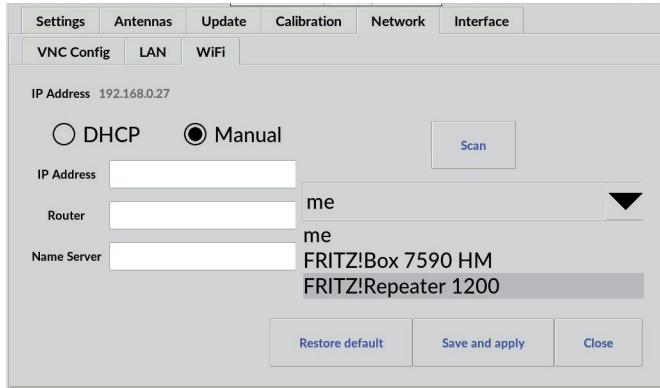
Search and view available Wi-Fi networks

► Tap the switching area **Scan**.

The device searches for available Wi-Fi networks.

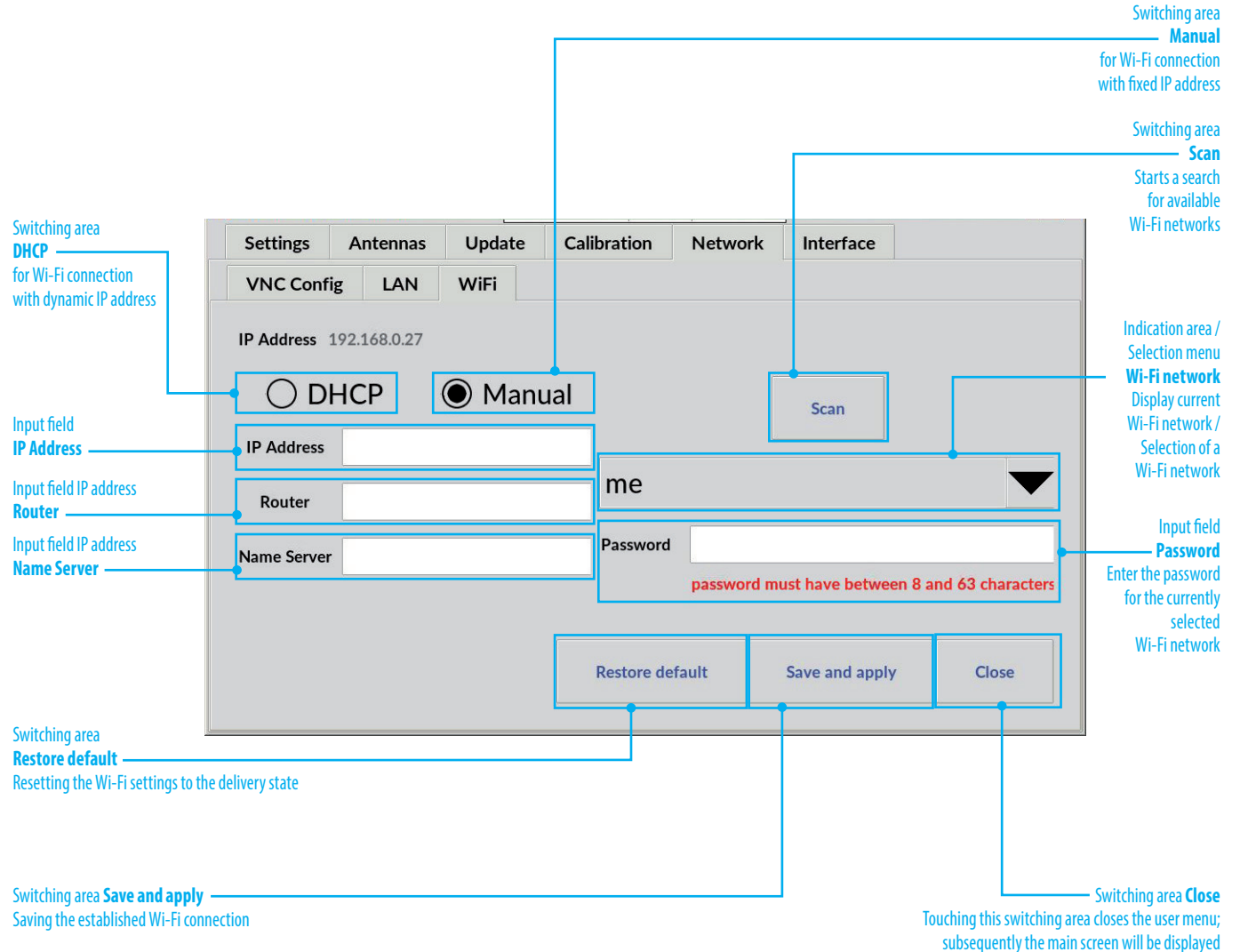
► Tap on the black triangle of the **Wi-Fi networks** selection menu.

Available Wi-Fi networks are displayed:



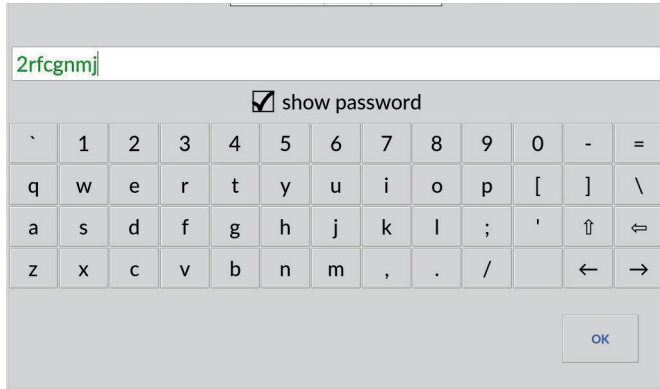
► Select the desired Wi-Fi network and tap the black triangle of the selection menu again.

The selection menu closes and the selected Wi-Fi network is displayed.



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

A virtual keyboard appears for entering the password:



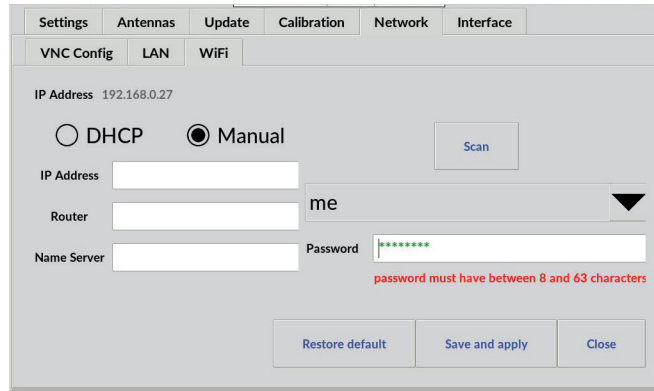
- ▶ If necessary, tap the switching area **show password** to make the entered characters visible.

As long as the minimum number of characters (= 6) for a valid new VNC password is not reached, the characters entered up to that point are displayed in **red**.

From the 8th character on, the Wi-Fi password is valid and therefore displayed in **green**.

- ▶ Finish the Wi-Fi password entry by tapping switching area **OK**.

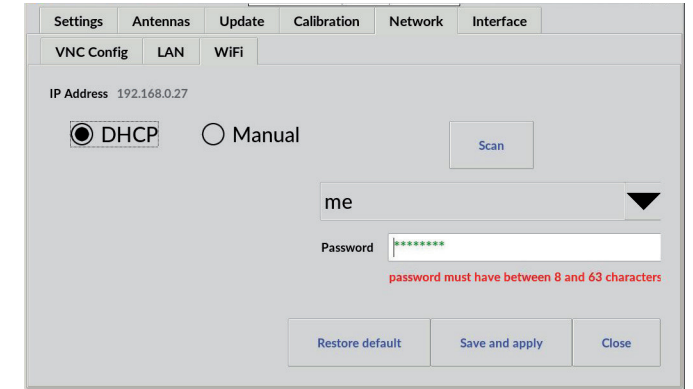
The **Wi-Fi Config** screen is then displayed again.



- ▶ Tap the switching area **Save and apply** to save and apply the Wi-Fi settings.

Set up Wi-Fi connection with dynamic IP address (DHCP)

- ▶ Tap the switching area **DHCP**.

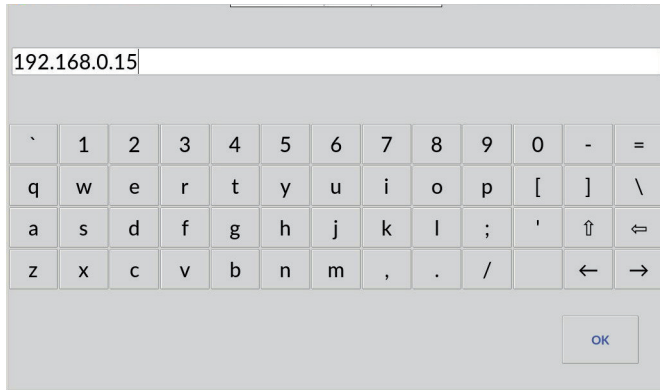


- ▶ Tap the switching area **Save and apply** to save and apply the Wi-Fi settings.

Set up Wi-Fi connection with fixed IP address:

- ▶ Tap the switching area **Manual**.
- ▶ Tap the input field **IP-Address (Router / Name Server)**.

A virtual keyboard appears:

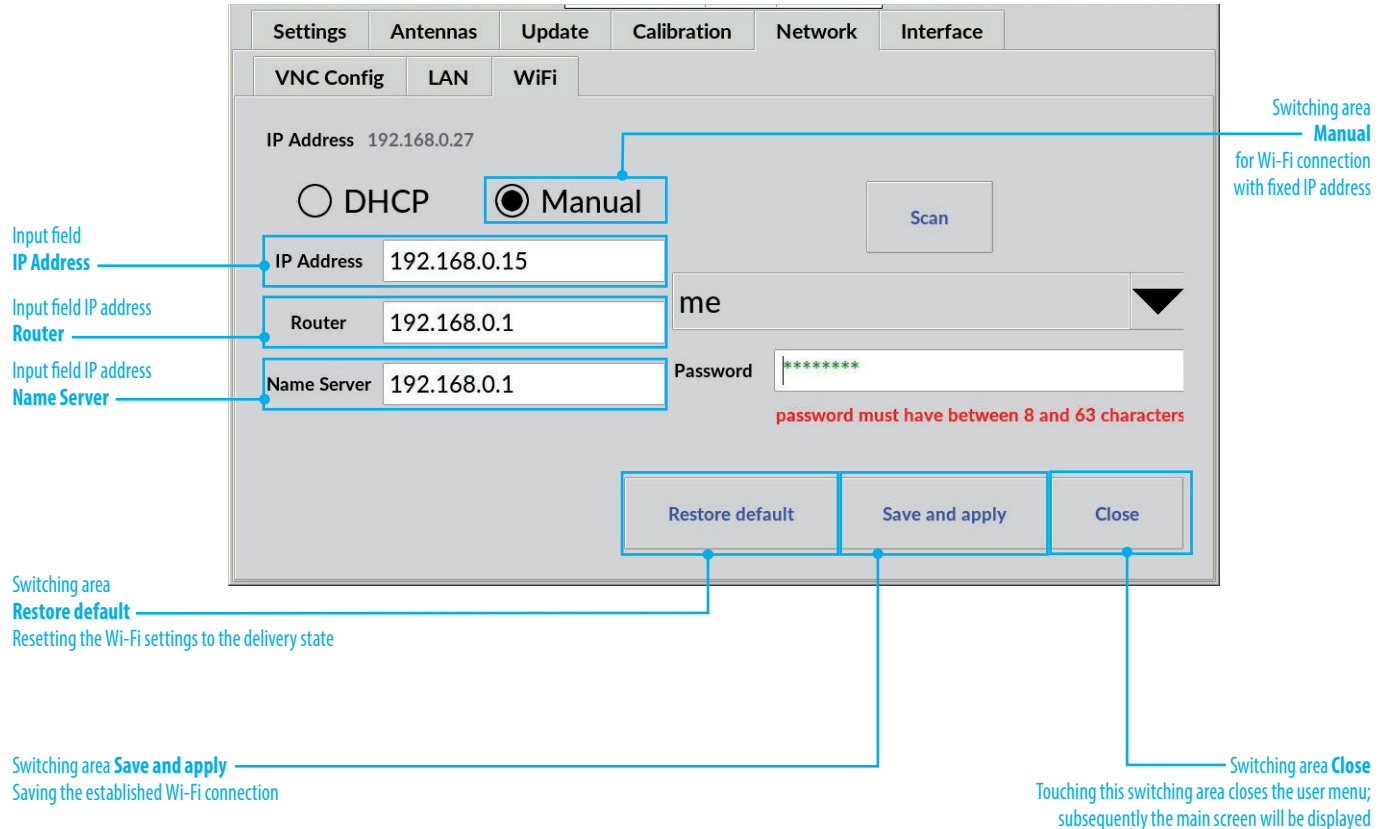


The IP addresses are entered in the **Router** or **Name Server** input fields in the same way.

- ▶ Finish the entry by tapping switching area **OK**.

The **Wi-Fi** screen is then displayed again.

- ▶ Tap the switching area **Save and apply** to save and apply the Wi-Fi settings.

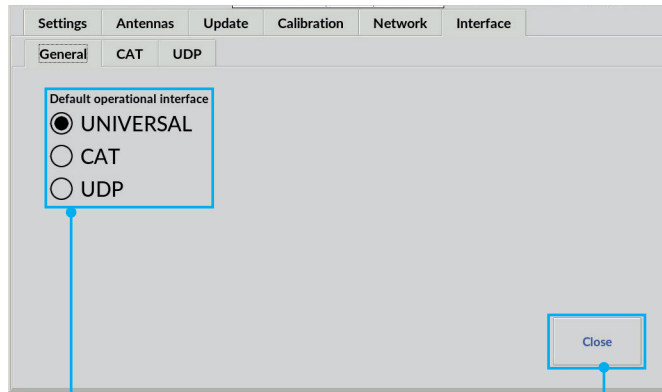


5.2.6 Interface

5.2.6.1 General

Select here the communication protocol between the PA and the exciter/transceiver by clicking one of the buttons **UNIVERSAL**, **CAT** or **UDP**. The selected interface will be used as default when the PA is restarted.

The communication protocols **CAT** and **UDP** require further settings to be made in the corresponding submenus.



Switching areas
Default operational interface
 („UNIVERSAL“ / „CAT“ / „UDP“)

Switching area **Close**
 Touching this switching area closes the user menu; subsequently the main screen will be displayed

UNIVERSAL

No data connection of the PA with the exciter/transceiver: The PA measures the transmission frequency and configures itself accordingly.

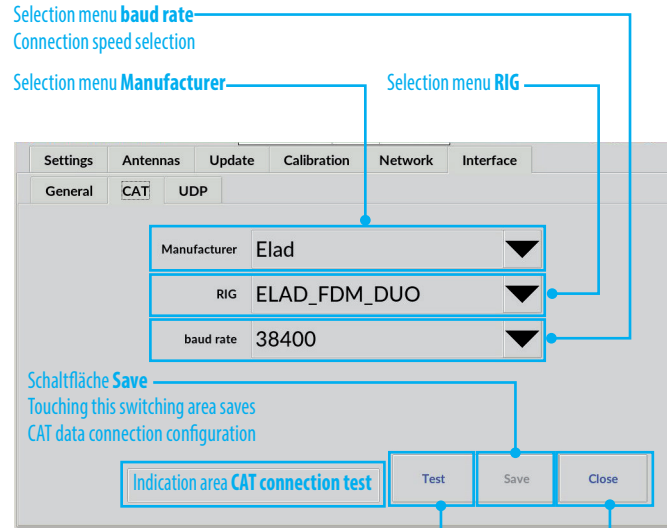
Because there is no data exchange between PA and exciter/transceiver in this configuration, no further settings are required.

Use this type of connection when the exciter/transceiver you are using does not offer a CAT or UDP interface.

5.2.6.2 CAT

Select this type of data connection if you are using an exciter/transceiver that offers this type of connection.

In the operating system of the PA, some manufacturers and devices are already stored together with the necessary command lists.



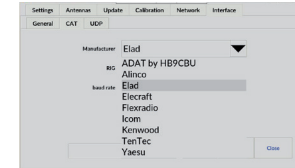
Switching area **Test**
 Touching this switching area starts a test of the CAT data connection

Switching area **Close**
 Touching this switching area closes the user menu; subsequently the main screen will be displayed

- Selection menu **Manufacturer**

▶ Tap on the black triangle of the selection menu **Manufacturer**.

A list of radio manufacturers appears:



▶ Tap on the corresponding manufacturer name.

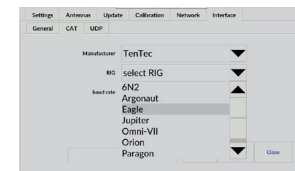
▶ Tap the black triangle of the selection menu **Manufacturer** again.

The selection menu closes, the selected radio manufacturer is displayed.

- Selection menu **RIG**

▶ Tap on the black triangle of the selection menu **RIG**.

A list of radios appears:



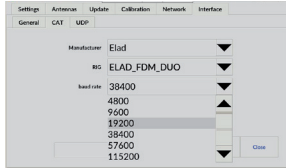
▶ Tap on the corresponding radio name.

The selection menu closes, the selected radio is displayed.

- Selection menu **baud rate** (connection speed)

- ▶ Tap on the black triangle of the selection menu **baud rate**.

A list of connection speeds appears:



- ▶ Tap on the desired connection speed.

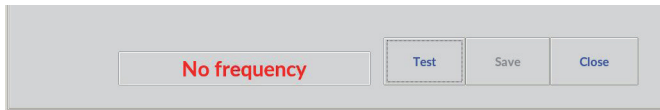
The selection menu closes, the selected connection speed is displayed.

- Switching area **Test**

- ▶ Tap on the switching area **Test** to test the configured CAT data connection.

If the connection is successful, the frequency set on the exciter/transceiver is displayed in the **CAT connection test** indication area.

In the case of a connection problem, in the **CAT connection test** indication area the warning „No frequency“ is displayed:



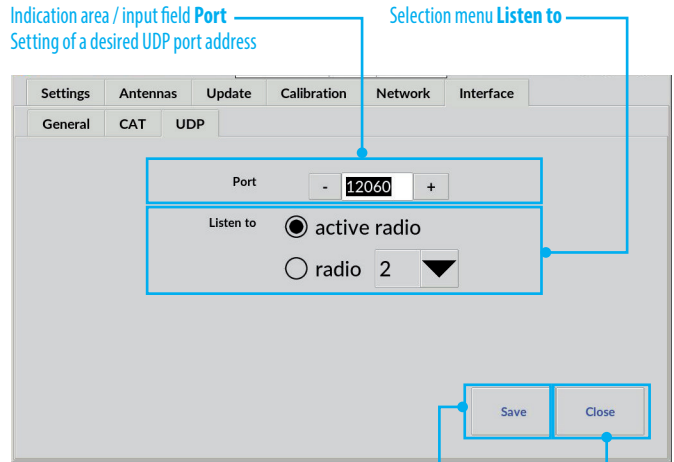
- Switching area **Save**

- ▶ Tap on the switching area **Save** to save the configured CAT data connection.

5.2.6.3 UDP

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

The advantage of UDP is that no CAT interface is needed. This is often already occupied by other programs e.g. for the „DX-Cluster“ or by TRX control software.



Indication area / input field Port
Setting of a desired UDP port address

Selection menu Listen to

Switching area Save
Touching this switching area saves the UDP connection configuration

Switching area Close
Touching this switching area closes the user menu; subsequently the main screen will be displayed

The RF2K-S can read this UDP protocol and adjust to the transmit frequency.

- For example, if „Listen to: radio 2“ is set, the RF2K-S will follow the radio with the number 2 in the network.
- If „Listen to: active“ is selected, the RF2K+ follows the currently active radio in the network.

This function is needed when using the RF2K-S as a SO2R PA.

For example:

The N1MM software sends in SO2R mode from both used TRX a UDP protocol. From the protocols the RF2K-S can see which radio is currently the active one and therefore needs the PA at the moment.

UDP was tested with „N1MM“ and „DX-Commander“.

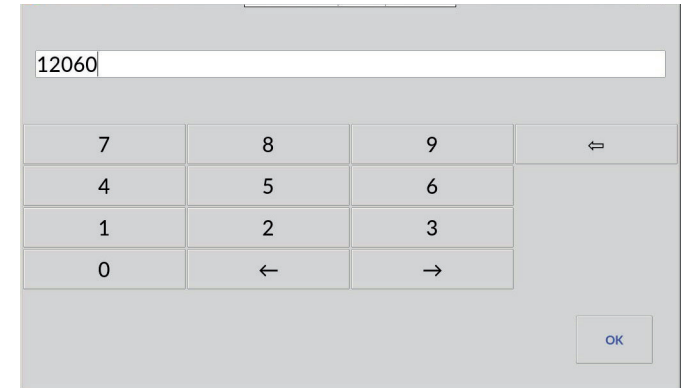
- Indication area / Input field **Port** (default setting is port 12060.)

- ▶ Use the „-“ or „+“ buttons in indication area **Port** display to set a desired UDP port address.

Alternatively, you can enter a desired UDP port address directly:

- ▶ Tap into the input field/indication area **Port**.

A virtual keyboard appears for entering the UDP port address:



- ▶ Finish entering the UDP port address by tapping the **OK** switching area.

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

- Selection menu **Listen to**

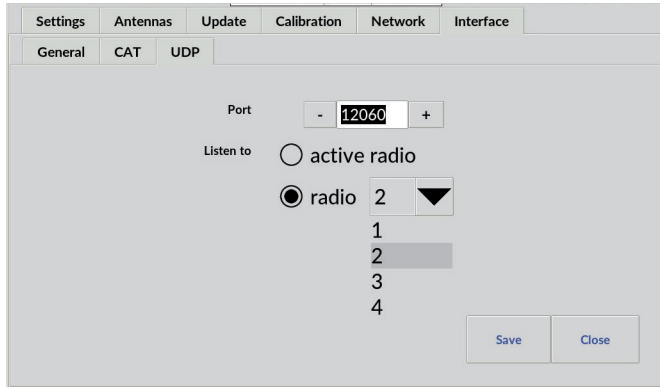
The setting is made depending upon your station configuration.

Where one or more exciter(s)/transceiver(s) will drive the PA:

- ▶ Tap on the switching area **active radio** to track the frequency of the active exciter/transceiver.

Where multiple exciters/transceivers are in use but the PA is dedicated to just one:

- ▶ Tap the switching area **radio** then.
- ▶ Tap the black triangle of the selection menu **radio** to track the frequency of the attached exciter/transceiver.



The selection menu closes, the selected exciter/transceiver is displayed.

6. Antenna tuner

6.1. Description

The internal antenna tuner comprises an LC circuit configured as an L Match. This matches the impedance of the amplifier's RF pallet output to the selected antenna connector.

The circuit may be configured with leading L or leading C as required, by touching switching area K.

Available values of C: Minimal 0.0 pF; Max. 1275 pF

Available values of L: Minimal 0.0 μ H; Max. 10,16 μ H

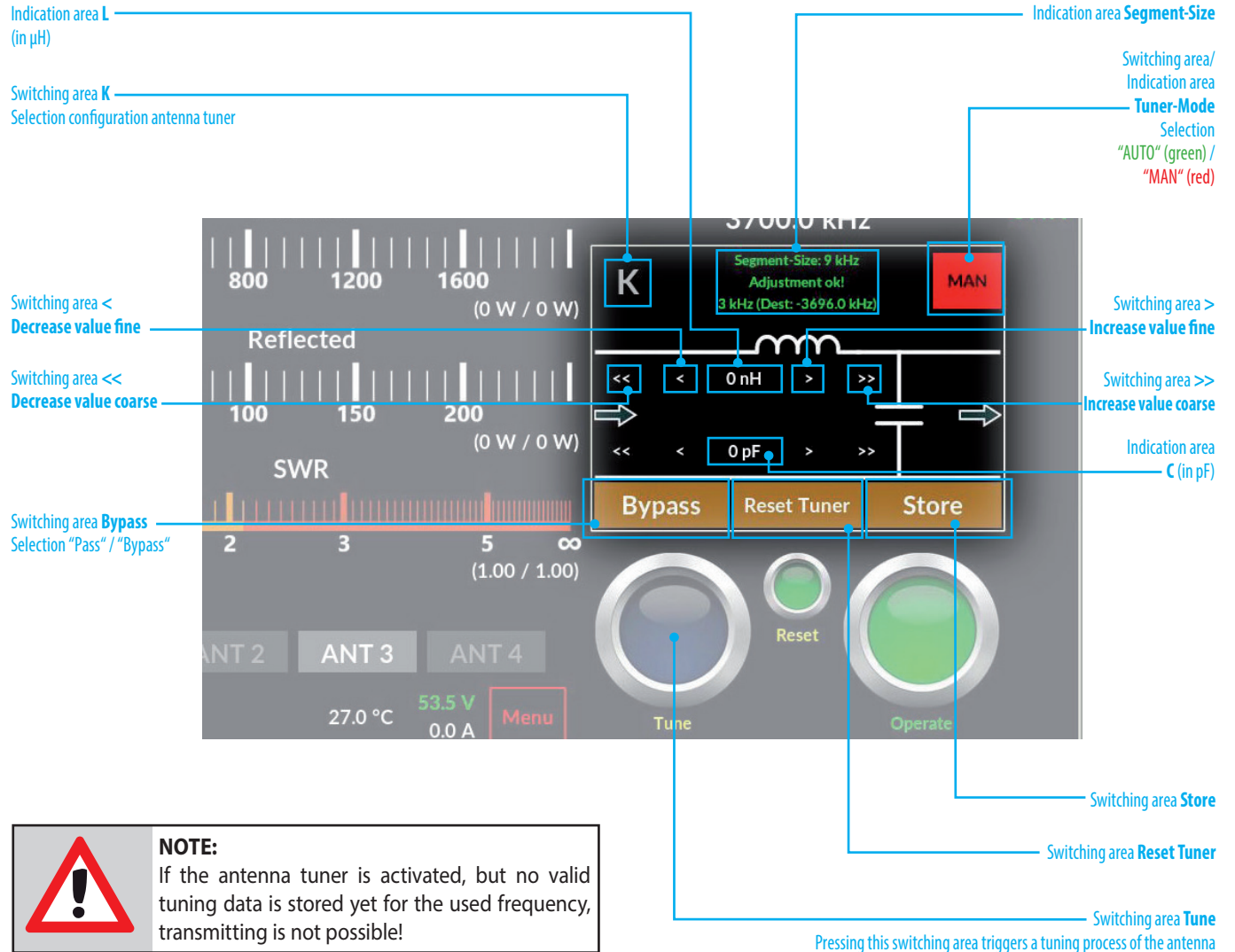
A match may be found "at the push of a button" (tuner mode "MAN"). In this case, after touching the switching area Tune, the Tuner will automatically determine the required configuration and settings.

You may alternatively perform the tuning process manually by touching switching area <</< or >/>> (tuner mode "MAN") or refine a configuration that has already been determined.

Regardless how a setting has been determined, by touching switching area Store the associated values by antenna and band frequency segment can be stored for later retrieval (tuner mode "AUTO"). Further tuning will not be required unless the connected antenna/feeder characteristics have changed since a tune operation was last performed.

A database is created for each antenna connection, in which settings already determined for this antenna are stored.

Connected antennas may be mono-band or multi-band. In the latter case settings data may be stored for each band and frequency segment on which the antenna will be used.





When changing bands the last antenna connector used on that band will be selected by default.

Depending on the currently selected antenna connector, only settings stored for this connector are then taken into account during operation. During 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 selects the settings applicable to the last antenna used on that band.

If an alternative antenna is to be used for the tuned frequency, a corresponding antenna must be selected with the switching area **Currently Selected Antenna**.

Antenna(connections) available for the selected band are displayed with white labeling.

The antenna currently connected to the PA is displayed with **green** label. Dark grayed out buttons cannot be selected.

Hence for each tuning segment a large number of different settings may be stored dependent upon the number of different antennas available for use in that segment.

6.2 Input Power for tuning

For an automatic tuning to take place the RF power level must be in the range 4 W to 39 W.

Outside this power range, the switching area **Tune** button is not activated and remains **dark blue** (= tuner inactive).

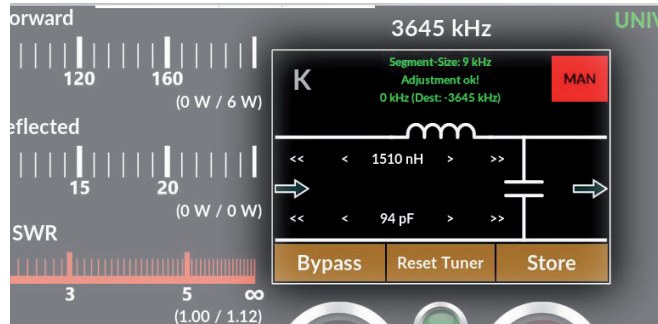
6.3 Manual tuning

To manually detect and save a tuner configuration and settings for a given antenna / frequency combination, proceed as follows:

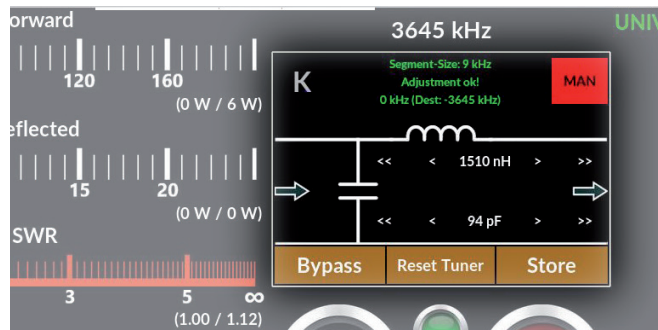
- ▶ Tap at switching area **Tuner Mode**, until "MAN" is displayed in **red**.

At the start of manual tuning the antenna tuner can be configured with leading C or leading L.

- ▶ Tap (repeated) switching area **K** to configure with leading L:



- ▶ Tap (repeated) switching area **K** to configure with leading C:



- ▶ Adjust exciter power between 4 W and 39 W.
- ▶ Select exciter mode to CW or FM mode.
- ▶ Commence transmission.
- ▶ Tap at switching area **Tuner Reset**, to reset values for L and C to "zero".
- ▶ Tuning of **L** by tapping at switching areas
 - > **Increase value fine (+0,08 uH)**
 - >> **Increase value coarse (+0,80 uH)**
 - < **Decrease value fine (-0,08 uH)**
 - << **Decrease value coarse (-0,80 uH)**
- ▶ Tuning of **C** by tapping at switching areas
 - > **Increase value fine (+5 pF)**
 - >> **Increase value coarse (+50 pF)**
 - < **Decrease value fine (-5 pF)**
 - << **Decrease value coarse (-50 pF)**

The results of the tuning can be seen by the value for SWR displayed in indication area **SWR**.

Finish manual tuning process:

- ▶ Terminate transmission.
- ▶ Tap at switching area **Store** to save the settings for the current antenna / frequency combination.

Switching area **Store** flashes 2x to confirm the settings have been stored.

6.4 Automatic tuning

For **automatic** detection and to save a tuner configuration and settings for a given antenna / frequency combination, proceed as follows:

- ▶ Tap at switching area **Tuner Mode** until the the switching area appears **red** and “MAN” will be displayed.
- ▶ If the antenna tuner is bypassed, tap at switching area **Bypass** until “L” and “C” are displayed.
- ▶ Adjust exciter power between 4 W and 39 W.
- ▶ Tap at switching area **Tune**. The color of the switching area changes from **dark blue** to **light blue**, indicating that the antenna tuner is now active.

A **full tuning process** is triggered by a **longer touch (about 1 s)** of switching area **Tune**:

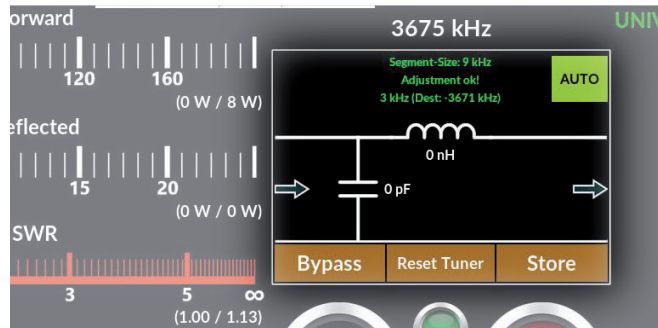
A completely empty database requires a **full tuning process** that includes all possible values and configurations; this tuning process takes about 28 s.

A **normal tuning process** is triggered by a quick **tap** at switching area **Tune**:

With already determined settings for frequencies that do not deviate from the current working frequency by more than twice a **segment size**, approx. 8 s are sufficient for a normal tuning process.

On successful completion of an automatic tuning process the settings may be stored in a database assigned to the antenna connector in use.

The results of the tuning can be seen by the value for SWR displayed in indication area **SWR**.



- ▶ Tap at switching area **Store** to save the settings for the current antenna / frequency combination.

Switching area **Store** flashes 2x to confirm the settings have been stored.

6.5 Indication area Segment-Size

Indication area **Segment-Size** displays the usable segment width for a stored setting in kHz. The term **Segment-Size** describes the frequency range for which a stored setting can be used.

- The lower the transmit frequency, the narrower this frequency range becomes.

- The higher the transmit frequency, the wider this frequency range becomes.

Example:

The tuned frequency is $f_0 = 3.675$ MHz. For the 80 m band the **Segment-Size** is 9 kHz. A tuner setting already determined for 3.678 MHz therefore applies (rounded) for the frequency range

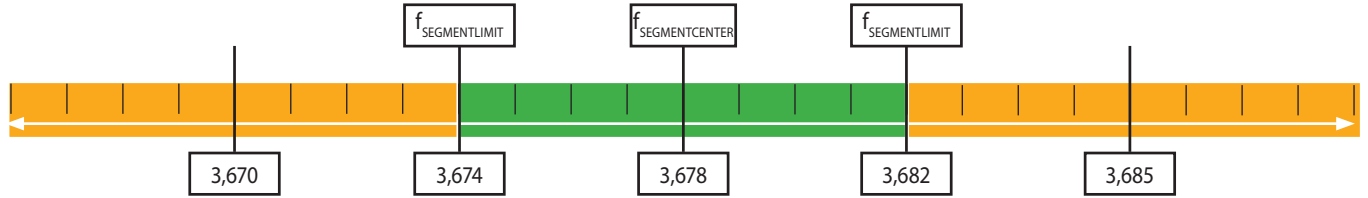
$$f_{\text{SEGMENTCENTER}} = 3.678 \text{ MHz} \pm f_{\text{SEGMENTSIZE}} / 2 = 3.674 - 3.682 \text{ MHz.}$$



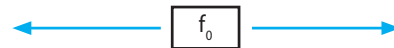
If you leave $f_{\text{SEGMENTCENTER}} = 3.678$ MHz and tune your exciter to $f_0 = 3.675$ MHz, the deviation to $f_{\text{SEGMENTCENTER}}$ will be displayed.

The deviation to $f_{\text{SEGMENTCENTER}}$ is **-3 kHz**, as displayed in **(Dist:)** in the screenshot above.

(At present, memory segmentation and querying the neighboring segments is not yet possible. The function will be activated in one of the next versions as part of an update).



Tuning direction



- **Segment C and D** refer to the stored setting values of **Segment B**.
- **Segment F and E** refer to the stored setting values of **Segment H**.
- To transmit at a frequency in **Segment E** a tuning process is necessary.



A valid tuning process will be confirmed by display of **“Match!”**

If the deviation from the center of the currently used tuning segment is more than $f_{\text{SEGMENTSIZE}} / 2$, then the antenna tuner changes to the settings stored for the next available tuning segment in tuning direction.

If the following segment has not yet been assigned to a setting, the color of indication area **Segment-Size** changes from **green to yellow**.

From a difference of more than twice the segment size to the next segment with valid settings stored, the antenna tuner warns with the note: **“Not tuned”**.

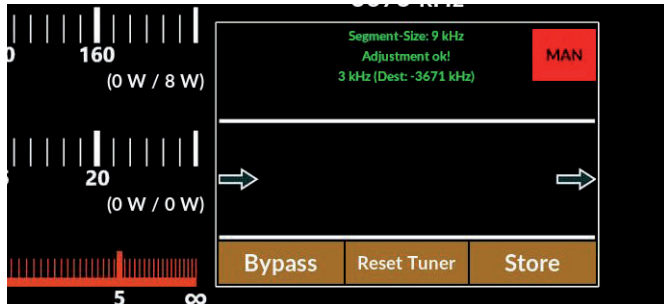
NOTE:
If the antenna tuner is activated, but no valid tuning data is stored yet for the used frequency, transmitting is not possible!

Therefore no transmission is possible without successful antenna tuning process.

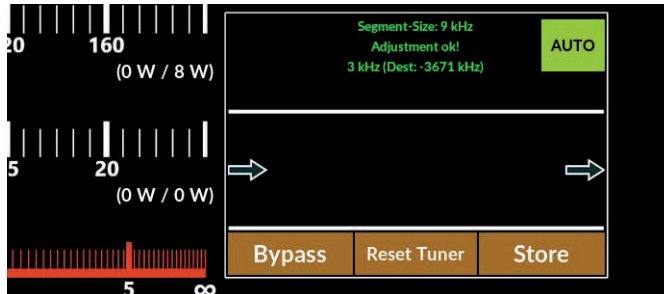
6.6 Bypass the antenna tuner

For testing purposes, or when using resonant antennas or an external antenna tuner, the internal antenna tuner may be taken out of the transmit path.:

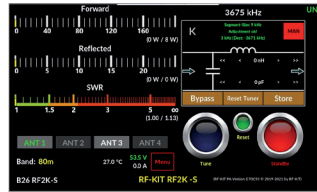
- ▶ **Mode "MAN":** Tap at switching area **Bypass** to bypass the antenna tuner.



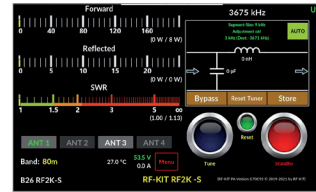
- ▶ **Mode "AUTO":** Tap at switching area **Bypass** to bypass the antenna tuner.



- ▶ Tapping again the switching area **Bypass** reinserts the antenna tuner again into the transmit path.



Mode „MAN“



Mode „AUTO“

7. Technical data, characteristics and certifications

7.1 Technical data

- **Frequency range:** 1.8 - 30 MHz and 50 - 54 MHz
- **HF-Out:** 1500 W (an 230 V/AC)
800 W (an 110 V/AC)
- **Exciter Drive Level:** 55 W all bands
- **Efficiency:** up to 70% (varies by band)
- **TX/RX switching:** Fast QSK
- **Connectors (UHF/PL259):** 1x Exciter
4x Antennas
16x external antennas via external antenna selector switch
- **Dimensions (W x H x D):** 19.0 x 31.0 x 42.5 cm
(7.4 x 12.2 x 16.7 inch)
- **Supply voltage:** 90-290 V AC
- **Current consumption:** max. 13 A
- **FCC-ID:** 2AW84RF2K-S

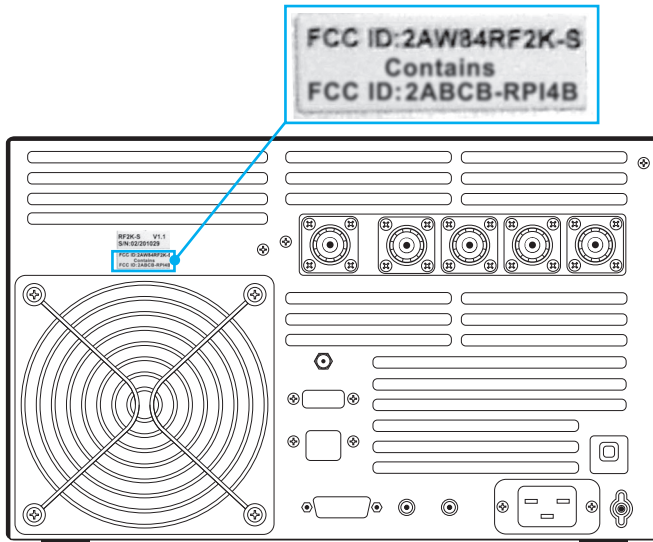
7.2 Characteristics

- **Highest spectral purity** because of **Dual LDMOS transistors**, rated at 3400 W
- **Very silent operation** due to speed controlled low noise fans
- **7"-Color Touch screen**
- **Multiple user selectable displays**
- **-55 dB output** for use with pre-distortion systems
- **Automatic band switch** by frequency measurement
- **CAT connectivity** via USB
(USB-port is provided by the **Raspberry Pi®**)
- **CAT data** via IP (UDP)
- **LAN** connectivity
- **Wi-Fi** (client mode)
- **Quiet Internal PSU** 90-290 V AC
- **Power meter** (from 1 W up to 2 kW)
- **Software update** via internet
- **Remote Internet operation** via PC, tablet or cell phone.
Supports platforms such as Apple IOS, Android, Linux and Windows
- **External power/ON** by applying +12 V
- **BCD Band Data Output** for external antenna selector switch
- **Integrated automatic antenna tuner**
with almost unlimited number of memories, also for the setting values of up to 16 antennas provided via an external antenna selector switch

7.3 Certifications

- **FCC-ID:** 2AW84RF2K-S

Below you'll see the position of the FCC ID: 2AW84RF2K-S which is a permanent label:



1. Contains FCC ID: 2ABCB-RP14B.

2. 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."

3. 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.



RF-KIT

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