Hilberling

1 kW Power Amplifier

HPA-8000B-54

Operating Manual

Version 1.04.01

1 kW Power Amplifier

Hilberling HPA-8000B-54

Operating Manual

HPA-8000B-54
developed and manufactured in the EU

by

Hilberling GmbH

Heinrich-Hertz-Strasse 2
24790 Schacht-Audorf
Germany

Hilberling
ENTWICKLUNGSLABOR · HOCHFREQUENZTECHNIK

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

FEDERAL COMMUNICATIONS COMMISSION (FCC) STATEMENT

Note: 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.

FCC ID: V84HPA8000B-54

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.

1 ABOUT THIS MANUAL

In this manual the following signs and symbols are used:

The STOP sign indicates a warning that must be obeyed for safety reasons.

This sign indicates an important explanation or a specific advice which should be obeyed.

An additional information or explanation is indicated this way.

2 IMPORTANT NOTES

Read and save this Operating Manual carefully before attempting to operate the device. This manual contains important safety and operating instructions to prevent damages caused by faulty operation.

2.1 General Precautions

WARNING HIGH VOLTAGE !
Do not touch antenna, antenna cable or antenna plugs and sockets during transmission. This may result in an electrical shock or burn of your skin by high-frequency.

WARNING !
The plug of the 230V power cord represents the designated separation device of the amplifier from the mains according to standard. The socket must be placed near the amplifier and easily accessible. The power cord must be able easily disconnected from mains.

CAUTION !
Make sure that no objects may penetrate into device or will touch connectors on rear panel of the power amplifier. This could cause electrical shock and severe injury.

PROTECT the amplifier from precipitation like rain or any liquid. Do not operate the power amplifier in excessively dusty or very humid environment.

PROTECT the amplifier from operation by any unauthorized person notably children.

AVOID placing and using the power amplifier in areas with temperatures below -15°C or above +50°C. If the environment temperature drops so low that the dew point is undercut, avoid operating before the devices are dried completely.

AVOID placing the power amplifier against a wall. This may inhibit proper air circulation and could cause overheat. Do not cover any air inlets and outlets at front, bottom and rear panel of the device.

2.2 Notes on Placing

When selecting the place for operating the HPA-8000B-54 bear in mind the general limitation concerning environmental conditions as outlined in the specifications and the cautions at the very beginning of this manual (see section 2.1).

Always handle the HPA-8000B-54 with care – consider the weight of ca. 20 kg (ca. 50 lbs).

Please make sure proper air circulation. Do not cover any air inlets and outlets at front, bottom and rear panel of the device.

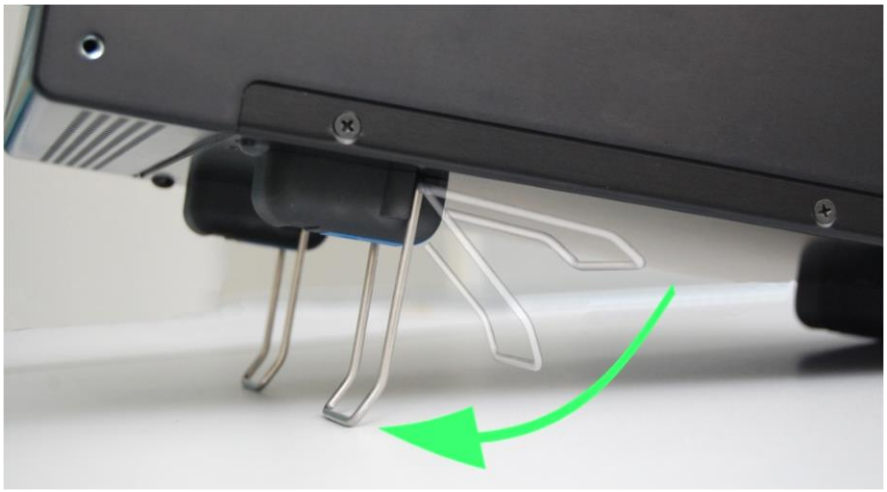
Choose the place of installation so that all connectors of the HPA-8000B-54 are reachable at any time, this is especially true for the supply cable connector.

Select a power outlet that is capable to handle the power requirements. Connect your HPA-8000B-54 to a proper ground system. In addition, observe the relevant technical electrical regulations and the local regulations of the power supplier. A good grounding system not only prevents electrical shock but also helps to ensure trouble free operation and will diminish television and broadcast interference (TVI/BCI).

For your convenience you might raise the front of HPA-8000B-54 by unfolding and locking tilt bails mounted at the front equipment feet into front position as shown on Fig. 2–1.

If a large resistance will complicate the unfolding, please easily spread the bail for hurdle the locking nib to avoid damage of the equipment foot.

Fig. 2–1: Unfolding bails (front equipment feet)



3 SCOPE OF DELIVERY

Examine your HPA-8000B-54 for signs of damage during shipping. Should any damage be apparent please take appropriate measures (contacting your carrier). We recommend to retain all packing material – it might be used for shipment of the power amplifier in the future. It is specially made for the HPA-8000B-54.

Listed below the hardware and all accessories delivered with your HPA-8000B-54. Make sure you have received and unpacked everything:

Tab. 3–1: Scope of Delivery

Quantity	Description	Fig.
1	D-Sub 9-pin (HPA-8000B-54 ⇔ PT-8000A)	3–1
1	D-Sub 25-pin (HPA-8000B-54 ⇔ PT-8000A)	3–2
1	Operating Manual	3–3
1	Software CD-ROM • HPA-8000B-54 Update Software (Windows®) • Operating Manual (PDF)	3–4

3.1 Data Cables

Fig. 3–1: Cable D-Sub 9-pin

Data Cable (HPA-8000B-54 ⇔ PT-8000A)
Length approx. 2.0 m

Fig. 3–2: Cable D-Sub 25-pin

Data Cable (HPA-8000B-54 ⇔ PT-8000A)
Length approx. 1.8 m

3.2 Operating Manual and Software/Documentation CD-ROM

Fig. 3–3: Manual HPA-8000B-54

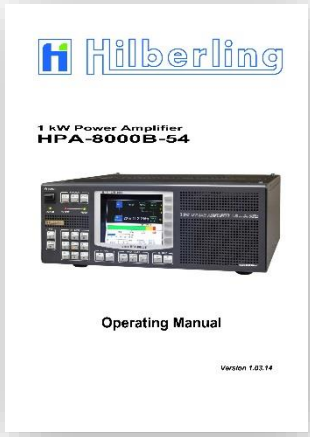


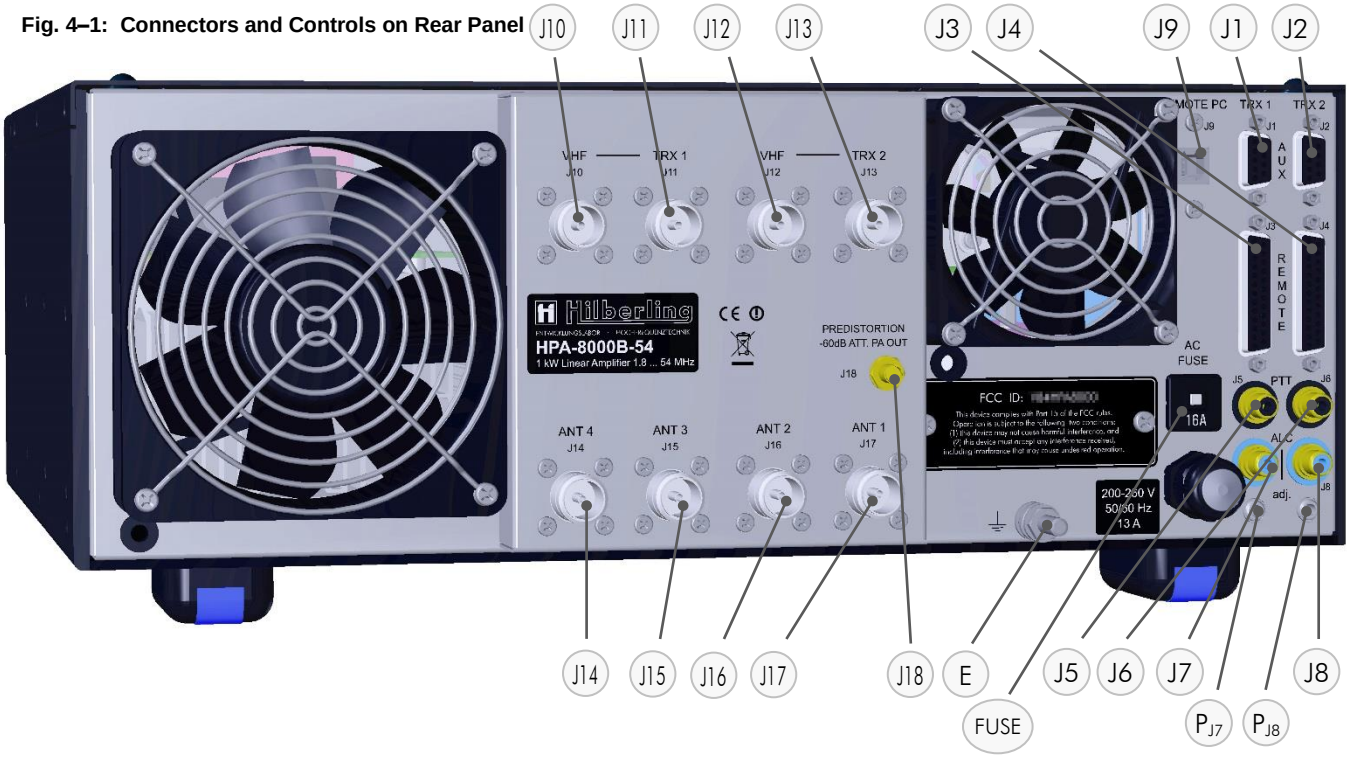
Fig. 3–4: CD-ROM

4 CONNECTORS ON REAR PANEL

This section introduces the connectors on the rear panel of the HPA-8000B-54.

4.1 Connectors and Controls

Fig. 4–1: Connectors and Controls on Rear Panel



Tab. 4–1: Connectors on Rear Panel

No	Label	Type	Description		
E	⏚	Threaded Bolt M6	Grounding connector for station ground		
FUSE	AC FUSE	Thermal Fuse 16 A time-lag	Thermal circuit breaker, 230 V AC, resettable		
J1	AUX TRX 1	DE-9 (D-Sub 9-pin)	Output / input signals for transceiver 1 (Wiring Tab. 4–2)		
J2	AUX TRX 2	DE-9 (D-Sub 9-pin)	Output / input signals for transceiver 2 (Wiring Tab. 4–2)		
J3	REMOTE TRX 1	DB-25 (D-Sub 25-pin)	Output / input signals for transceiver 1 (Wiring Tab. 4–2)		
J4	REMOTE TRX 2	DB-25 (D-Sub 25-pin)	Output / input signals for transceiver 2 (Wiring Tab. 4–2)		
J5	PTT TRX 1	RCA	HF PTT transceiver 1 +5 V / GND (GND = TX)		
J6	PTT TRX 2	RCA	HF PTT transceiver 2 +5 V / GND (GND = TX)		
J7	ALC TRX 1	RCA	ALC output transceiver 1; adjustable by P_{J7}		
J8	ALC TRX 2	RCA	ALC output transceiver 2 ; adjustable by P_{J8}		
J9	REMOTE PC	USB-B	Input / output data (USB Cable) 1. Interface to PC for HPA-8000B-54 remote operation (CAT) 2. Interface to PC for update the software on HPA-8000B-54		
J10	VHF TRX 1	N	VHF input transceiver 1 **only for TRX PT-8000A**	50 MHz TRX PT-8000A only 'CAT Type' selection: 'Hilberling' (Sec. 5.4.2 and 7.2) *	
J11	TRX 1	N	Input transceiver 1	1.8 … 29.7 MHz TRX PT-8000A	1.8 … 29.7 / 50 MHz TRX by other manufacturer

Tab. 4–1: Connectors on Rear Panel (continued)

No.	Label	Type	Description		
J12	VHF TRX 2	N	VHF input transceiver 2 **only for TRX PT-8000A**	50 MHz TRX PT-8000A only 'CAT Type' selection: 'Hilberling' (Sec. 5.4.2 and 7.2). *	
J13	TRX 2	N	Input transceiver 2	1.8 … 29.7 MHz TRX PT-8000A	1.8 … 29.7 / 50 MHz TRX by other manufacturer
J14	ANT. 4	N	HF output antenna 4		
J15	ANT. 3	N	HF output antenna 3		
J16	ANT. 2	N	HF output antenna 2		
J17	ANT. 1	N	HF output antenna 1		
J18	PREDISTORSION -60dBc ATT. PA OUT	SMA	HF Output, attenuated by 60 dB , e.g. for predistorsion on TRX		
P_{J7}	ALC adj. TRX 1	Trim Pot	Adjustment of ALC output on transceiver 1 within range 0 … −10 V at RCA J7 and D-Sub J1 Pin 6		
P_{J8}	ALC adj. TRX 2	Trim Pot	Adjustment of ALC output on transceiver 2 within range 0 … −10 V at RCA J8 and D-Sub J2 Pin 6		

* Inputs J10 and J12 are only usable for a connection to the Hilberling PT-8000A Transceiver. If so select option 'Hilberling' as a 'CAT Type' at the TRX Setup (see Section 5.4.2 and 7.2).

4.2 Pin Assignment J1 to J4 (D-Sub)

Tab. 4–2: Pin Assignment D-Sub

No.	Label	Figure	Pin Assignment
J1	AUX TRX 1		**1** HF-PTT TRX 1 +5V (GND=TX) **6** ALC OUT (0 … −10 V)* **2** <not connected> **7** GND **3** < not connected > **8** < not connected > **4** VHF-PTT TRX 1 +5V (GND=TX) **9** TX INHIBIT (GND=TX) **5** GND * adjustable by P_{J7}
J2	AUX TRX 2	as J1	Assignment analogous to J1 Pin **6** ALC OUT adjustable by P_{J8}
J3	REMOTE TRX 1		**1** GND **14** < not connected > **2** < not connected > **15** Bit A of Band Data **3** Bit B of Band Data **16** Bit C of Band Data **4** Bit D of Band Data **17** GND **5** < not connected > **18** < not connected > **6** < not connected > **19** GND **7** < not connected > **20** < not connected > **8** < not connected > **21** < not connected > **9** RX TTL for CAT 5V TTL or CI-V **22** TX TTL for CAT 5V TTL **10** Band Data Voltage Input **23** GND **11** GND **24** RS232 RX (CAT) **12** RS232 TX (CAT) **25** GND **13** GND
J4	REMOTE TRX 2	as J3	Assignment analogous to J3

5 Operating and Display Elements

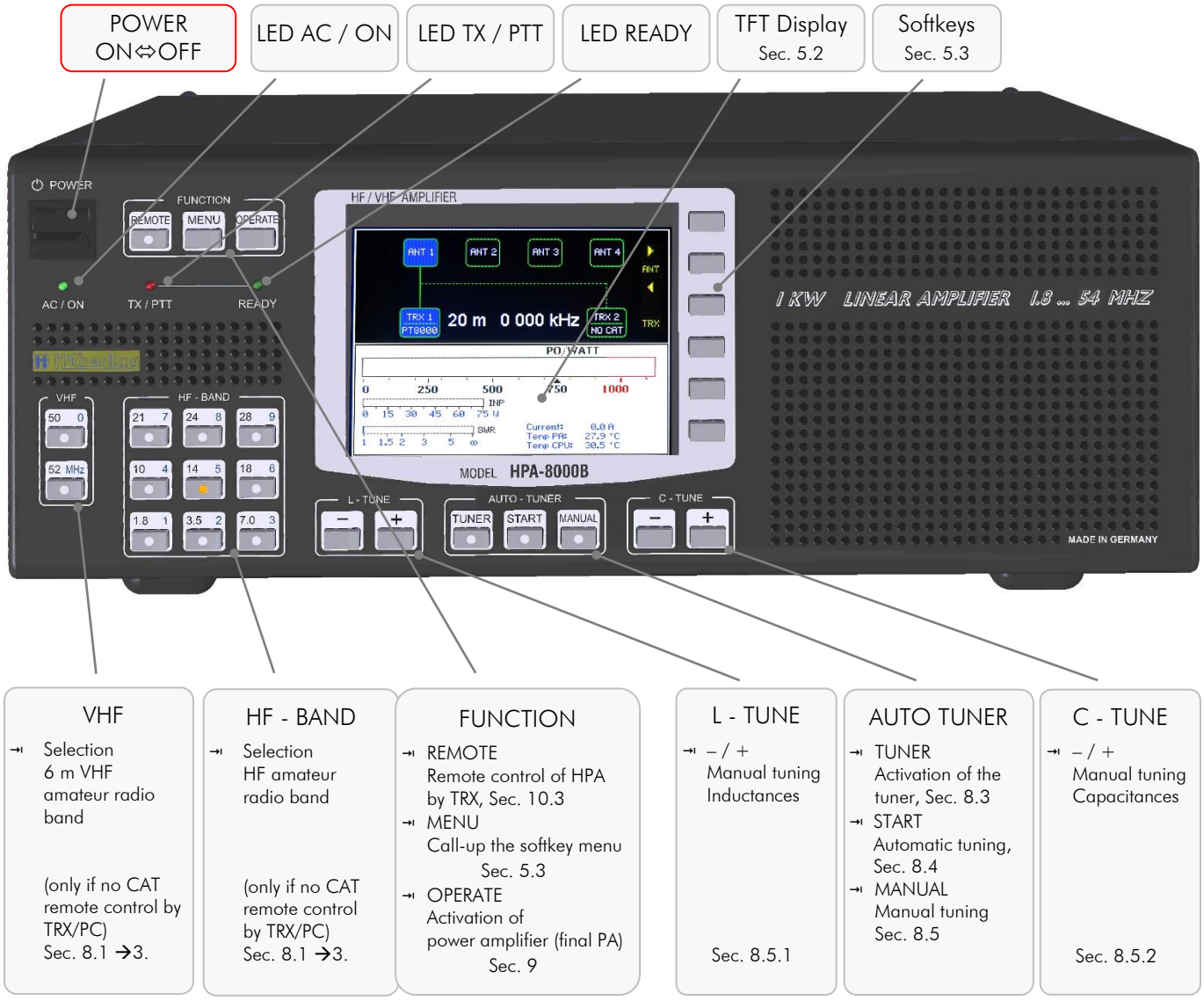
Section 5.1 and 5.2 introduce operating and display elements at the front panel. Furthermore section 5.3 describes the softkey menus and screens for configuration, system information and software update.

5.1 Overview

Tab. 5–1: Operating and Display Elements

Element	Label	Description
ON⇔OFF Main Switch	POWER	When power on: • All LEDs – including LEDs assembled to buttons – will light up for approx. 1 second (function test), • LED AC / ON will light up permanently.
LED AC / ON	AC / ON	Lights up when device is powered on and supply voltage of 230 V AC is applied.
LED TX / PTT	TX / PTT	Lights up when the PA is activated (LED READY shine) and the HPA-8000B-54 receives a PTT signal.
LED READY	READY	Lights up when the PA of HPA-8000B-54 was activated by pushing button OPERATE. When the PA is not activated, transceiver HF signals will be sent without amplification to the currently switched antenna output connector.
TFT Display	÷	The TFT display shows the relevant operating parameters and at a time the current functions of the so-called 'softkeys' placed right hand side of the display as well.

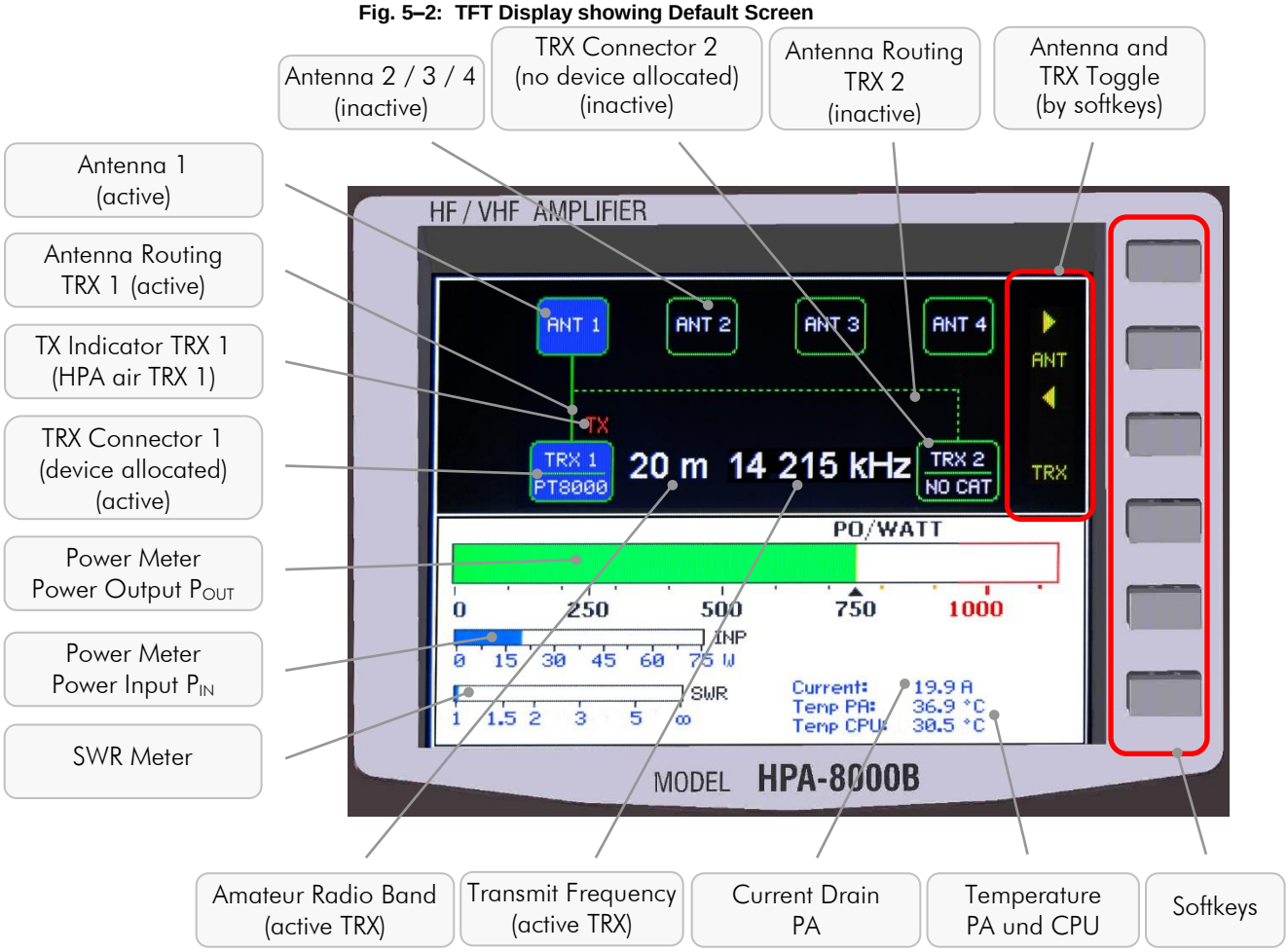
Fig. 5–1: Operating and Display Elements



5.2 TFT Display

In default view („default screen“) the TFT display gives a status overview about relevant operating parameters of the HPA-8000B-54. These include displaying the active transceiver with current band and transmission frequency, as well as the antenna which is allocated to the band, furthermore indication of power, SWR and temperature, as well as the antenna transceiver configuration of the inactive transceiver.

Fig. 5–2: TFT Display showing Default Screen



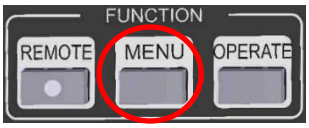
5.3 Softkeys on Default Screen

Right next to the display there are six buttons placed in vertical line as ‘Softkeys’ (buttons with changeable function) to operate the HPA-8000B-54. They allow to activate or select functions shown on display as a so-called ‘Softkey Menu’ at right border (see Sec. 5.4).
Exceptions to this rule – so softkeys without a menu – the following functions are existing:

- Toggle the antenna connector and the active transceiver is directly possible by using the upper three softkeys on default screen (Sec. 8.1).
- Manual tuning the center capacitances of the harmonic filter (CC-Tune) will be done directly by using the two lower softkeys on default screen (Sec. 8.5.3).

5.4 Softkey Menu

The six keys (so-called 'softkeys') right next to the display give access to the functions shown on the display as a so-called 'Softkey Menu' at right border (exceptions see Sec. 8.1 and 8.5.3).



When power on the HPA-8000B-54 the softkey menu is removed.
Pushing the button MENU in the cluster FUNCTION will show the softkey menu MENU (pushing again will remove the menu):

Fig. 5–3: Softkey Menu

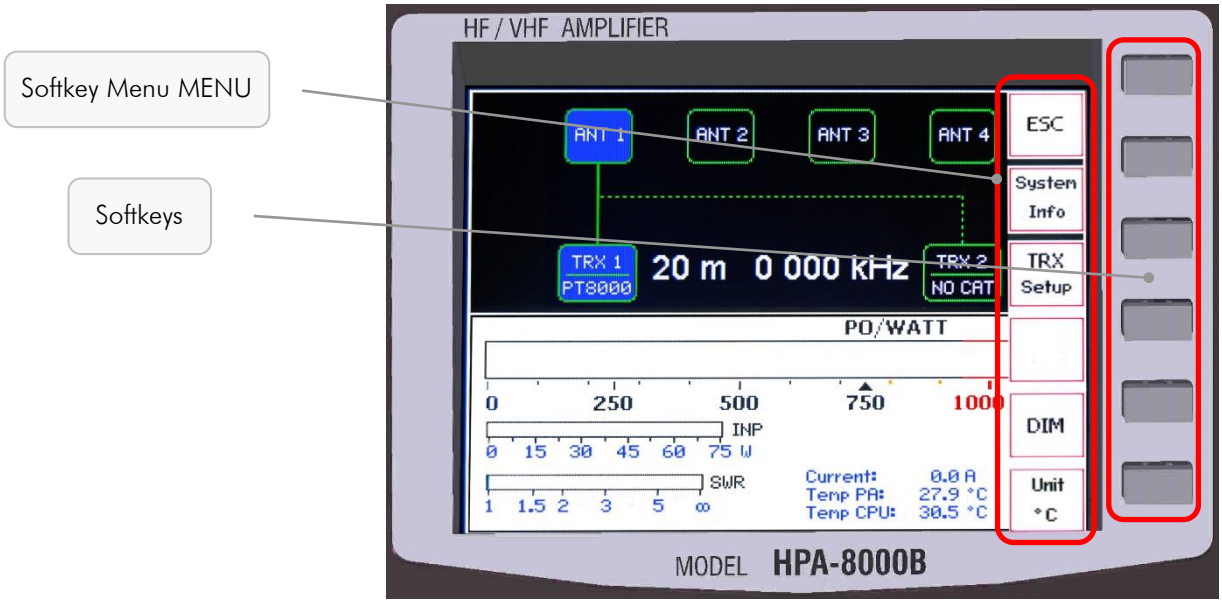
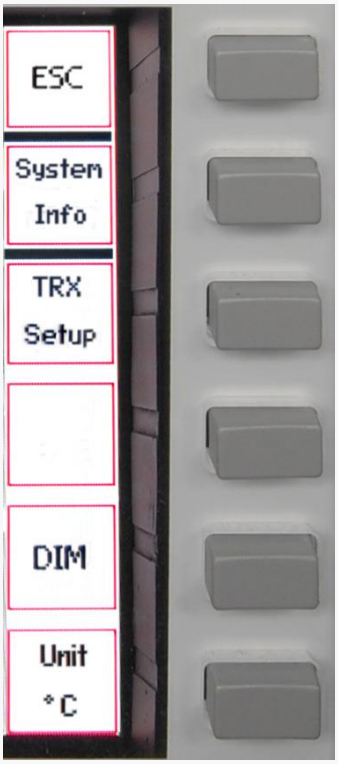


Fig. 5–4: Softkey Menu MENU



Remove the softkey menu.

Softkey menu and screen SYSTEM INFORMATION will be called up to show system information and operating parameters (Sec. 5.4.1).

Softkey menu and screen TRX SETUP will be called up to show and edit device configuration (Sec. 5.4.2).

Softkey menu DIM will be called up to adjust brightness of display (Sec. 5.4.3).

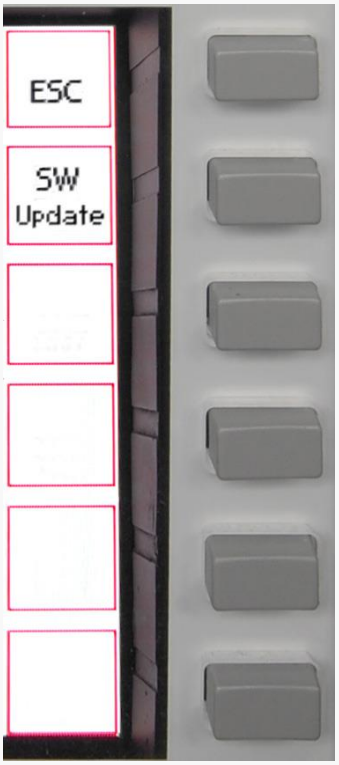
Toggles the unit of the temperature indicators for PA and CPU between degree Celsius (°C) and degree Fahrenheit (°F).

If automatic or manual antenna tuning is activated (Sec. 8.4 u. 8.5) the softkey menu (MENU) cannot be called up.

5.4.1 Display of Device Status SYSTEM INFORMATION

Pushing softkey SYSTEM Info from softkey menu MENU (Fig. 5–4) will call up softkey menu and screen SYSTEM INFORMATION:

Fig. 5–5: Softkey Menu SYSTEM INFORMATION

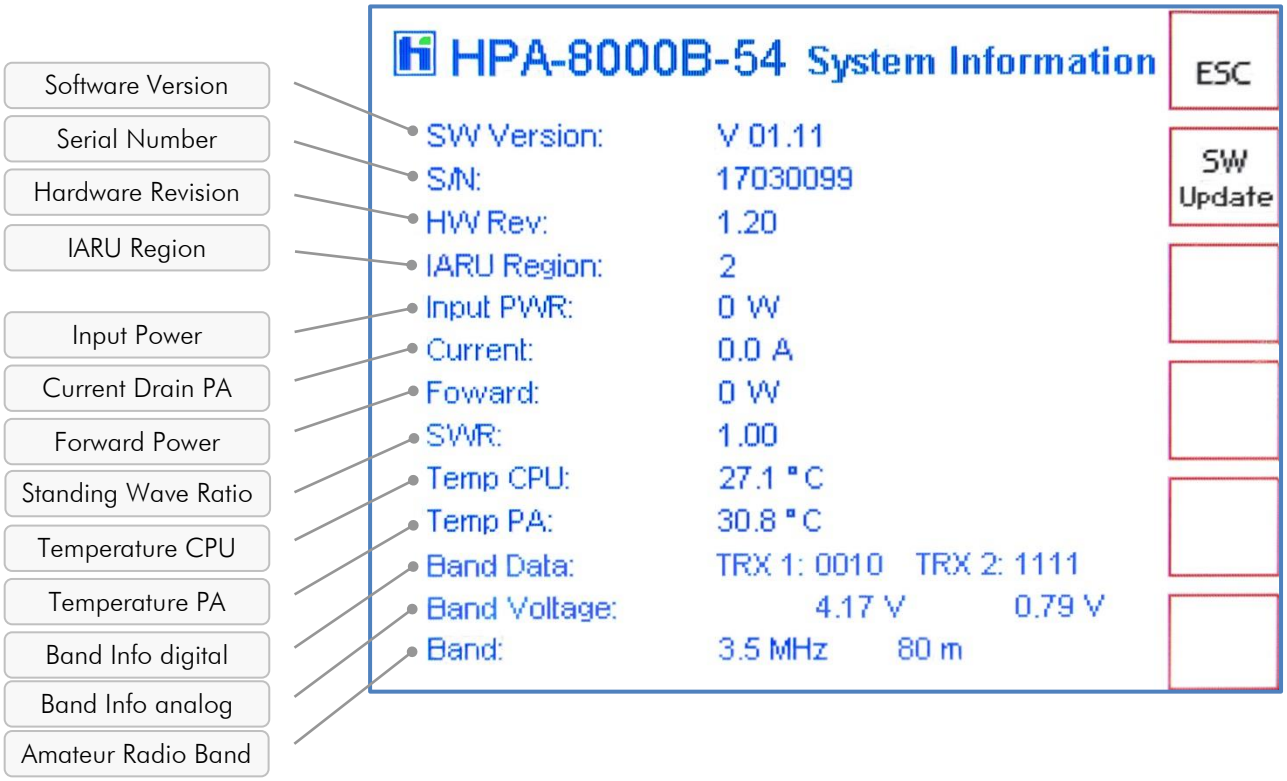


Return to softkey menu MENU (Sec. 5.4) and default screen.

Softkey menu and screen SOFTWARE UPDATE will be called up to update the operation software (Sec. 5.4.1.1).

System information will be shown on display:

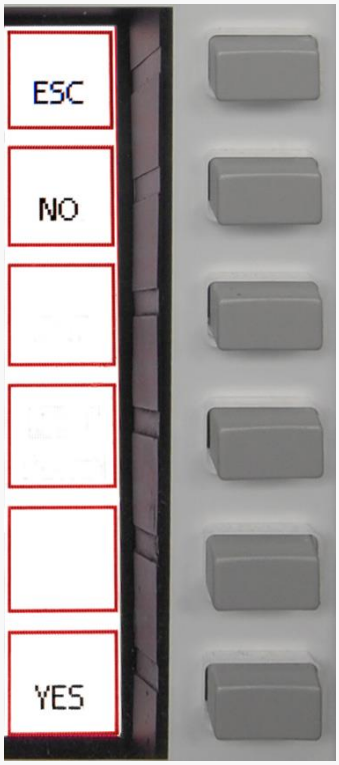
Fig. 5–6: Screen SYSTEM INFORMATION



5.4.1.1 Update Operating Software

Pushing softkey SW Update from softkey menu SYSTEM (Fig. 5–5) will call up softkey menu and screen SOFTWARE UPDATE:

Fig. 5–7: Softkey Menu SOFTWARE UPDATE



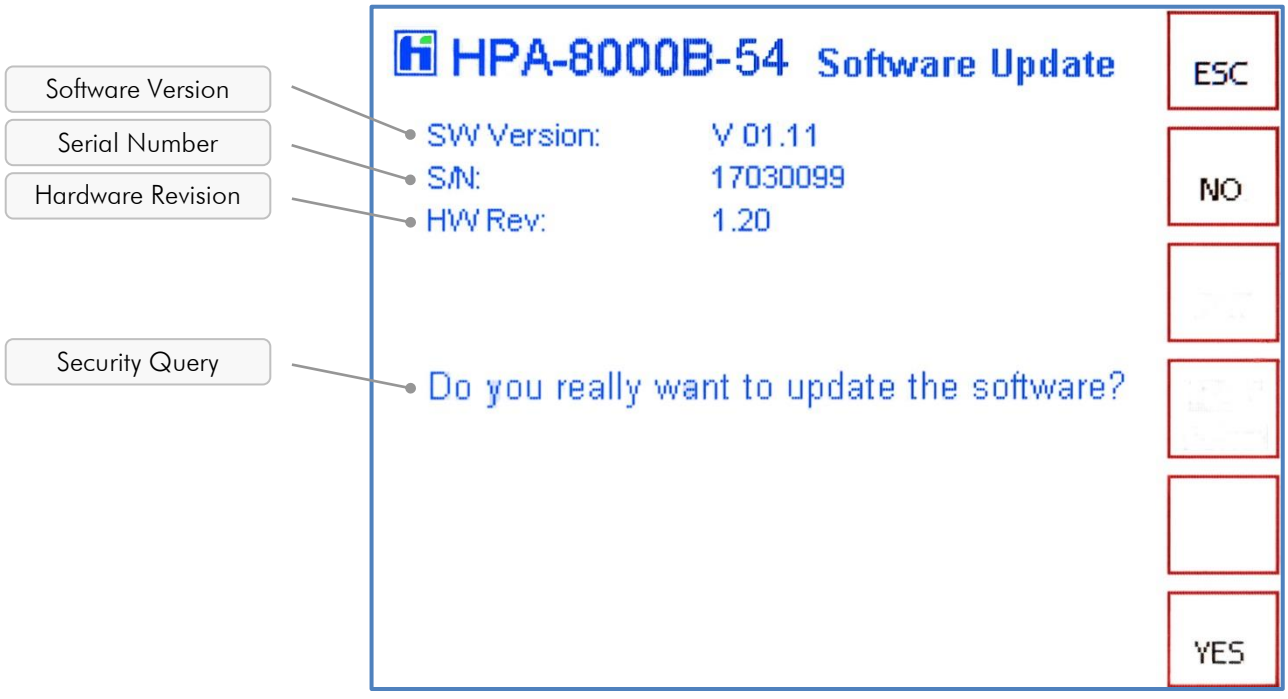
Return to softkey menu SYSTEM und screen SYSTEM INFORMATION (Sec. 5.4.1).

Software update will not be executed.
Return to softkey menu SYSTEM und screen SYSTEM INFORMATION (Sec. 5.4.1).

Software update will be continued.
A new screen will be shown on display (for details, see appendix <TBD>).

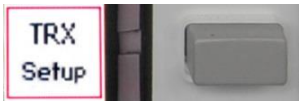
All entries starting from row 4 will be removed and a security query will be shown instead:

Fig. 5–8: Screen SOFTWARE UPDATE



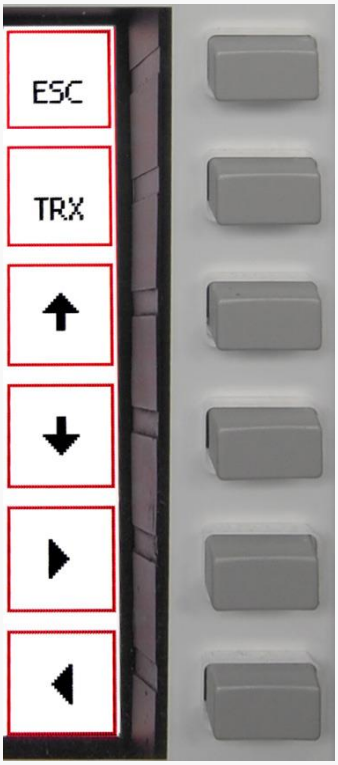
Select ESC or NO to end the update procedure.
Select YES to continue the update procedure, see appendix Sec. <TBD>.

5.4.2 Device Configuration TRX SETUP



Pushing Softkey TRX Setup from softkey menu MENU (Fig. 5.4) will call up softkey menu and screen TRX SETUP:

Fig. 5–9: Softkey Menu TRX SETUP



Return to softkey menu MENU (Sec. 5.4) and default screen.

Toggles transceiver connector (TRX1 ⇔ TRX2) whose settings shall be edited.
When the menu will be called up the currently active TRX connector is the selected one (in row CAT Type the field of selected TRX will be shown inverse).

Cyclic change of editable fields bottom-up.
Non-editable fields (= no option available) will be skipped.

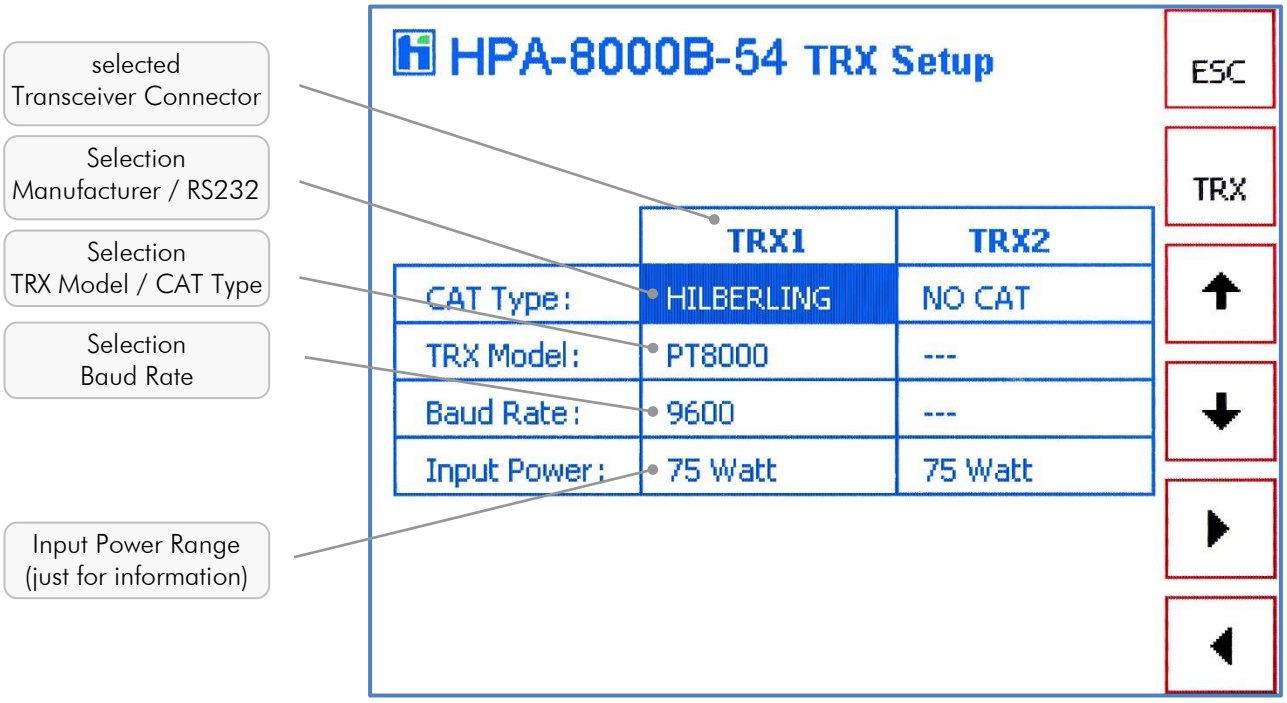
Cyclic change of editable fields top down.
Non-editable fields (= no option available) will be skipped.

Cyclic change of manufacturer ('CAT Type'), TRX Model and Baud Rate – depending on selected field and its available options – in listed order (see Table A1–15 Appendix Section A1.6).

Cyclic change of 'CAT Type', TRX Model and Baud Rate– depending on selected field and its available options – in reverse listed order (see Table A1–15 Appendix Section A1.6).

On screen a table will be shown to adjust interface parameters for each of both transceiver connectors.
The last line shows the input power range (just for information).

Fig. 5–10: Screen TRX SETUP

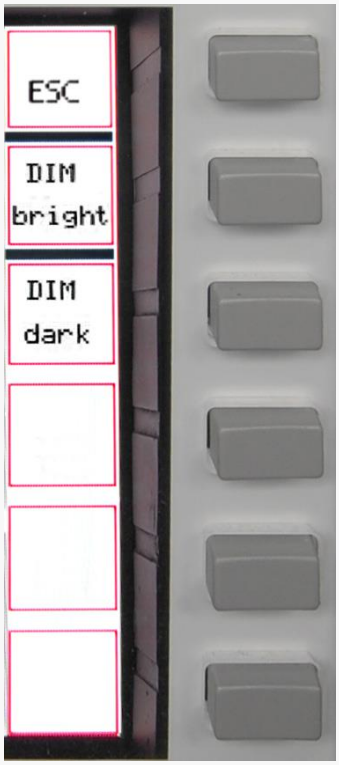


Push softkeys ↑ and ↓ for line break, push softkeys ▶ and ◀ to select respective parameters (see Tab. A1–15 Appendix Sec. A1.6).
See also section 7.2.

5.4.3 Brightness of Display DIM

Pushing softkey DIM from softkey menu MENU (Fig. 5.4) will call up the menu DIM to vary the brightness of the display:

Fig. 5–11: Softkey Menu DIM



Return to softkey menu MENU (Sec. 5.4).

Lightens up the display stepwise.

Darkens the display stepwise.

Display brightness is adjustable in ten steps.

6 INSTALLATION / INITIAL OPERATION

Prior to any operation please read this manual carefully.

The HPA-8000B-54 is unlocked by software according to the band plans of that IARU region the device is delivered (Tab A1–2 and A1–3).
The IARU region can be changed by software update.

Prior applying main power to the HPA-8000B-54 and power-on please verify the remarks in the following section 6.1.

6.1 Cable Connections

Please check at rear panel of HPA-8000B-54 (Fig. 4–1):

- Grounding stud (E) is connected to station ground,
- HF cables from HPA-8000B-54 (J11 TRX1 / J13 TRX 2) to transceiver(s) (PT-8000A: J2 HF-ANT1 / J3 HF-ANT 2) are installed properly,
- Only in case a PT-8000A is being connected:
  VHF cable from HPA-8000B-54 (J10 VHF TRX 1 / J12 VHF TRX 2) to PT-8000A (J1 VHF-ANT) is installed properly,
- Antenna(s) (J14 ANT 4 … J17 ANT 1) is/are connected properly,
- Data cable from HPA-8000B-54 (J1 AUX TRX 1 / J2 AUX TRX 2; alternatively: J5 PTT TRX 1 / J6 PTT TRX 2 und J7 ALC TRX 1 /J8 ALC TRX 2) to transceiver/s (PT-8000A: J17 AUX-TX) is/are installed,
- Data cable from HPA-8000B-54 (J3 REMOTE TRX 1 / J4 REMOTE TRX 2) to transceiver/s (PT-8000A: J21 TRANSVERTER) is/are installed.

6.2 Power-on

When all of the connections have been made and checked (6.1) put the HPA-8000B-54 into operation as follows:

- Ensure that the main switch (POWER) of the HPA-8000B-54 is switched off (pushed down),
- Connect the supply cable to main power socket,
  (200 … 260 V AC / 50 … 60 Hz);
- Switch on POWER at HPA-8000B-54 main switch.

All LEDs will light up for approximately one second (function test).
LED AC/ON will light up permanently.

On the display the default screen will be shown (Fig. 5–2).

7 TRANSCEIVER SET UP

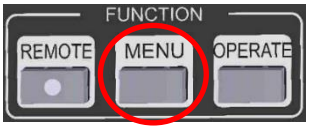
As described in section 7 and 8, prior first operation of the HPA-8000B-54 basic settings are needed to undertake.

7.1 Select Transceiver Connector

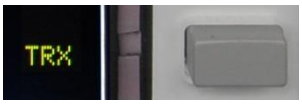
When powered-on the first time, connector TRX 1 (J11/J10) is selected by default (= "active") and therefore shown with a blue background.

Fig. 7–1: Transceiver Connector TRX 1 active / inactive

If necessary the transceiver connector will be switched as follows:



1. If a softkey menu is shown on display:
   Pushing button MENU in the cluster FUNCTION will remove the current softkey menu.

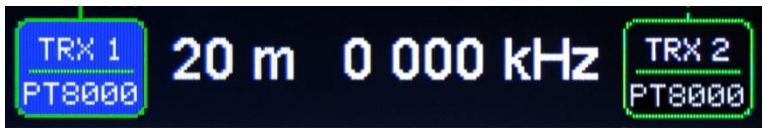


2. Pushing softkey TRX (default screen) toggles connectors TRX 1 and TRX 2. When active, the TRX indicator will be shown with a blue background (Fig. 7–1).

7.2 Allocate Transceiver Model

As a factory setting TRX model PT-8000A is allocated to both TRX connectors TRX 1 and TRX 2 (the display will show 'PT8000').

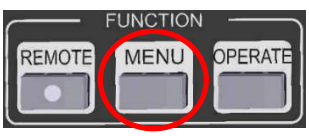
Fig. 7–2: Transceiver Connector TRX 1 active / inactive, PT-8000A allocated



Due to the allocation the default parameters of CAT mode (Band Data, Band Voltage, RS232) of the selected transceiver will be switched at HPA-8000B-54s D-Sub connectors REMOTE J3 / J4.

The allocation is made by browsing manufacturer and model list provided by operation software (see Tab. A1–15 Appendix).

A transceiver model will be allocated as follows:



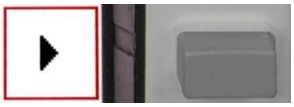
1. If no softkey menu is shown on display:
   Pushing button MENU in the cluster FUNCTION will show softkey menu MENU (Fig. 5–4).

2. Pushing softkey TRX Setup will call up softkey menu and screen TRX Setup (Fig. 5–9 and 5–10).
   In case TRX 1 is currently the active TRX connector, the first field in column TRX1 of the table (row CAT Type, see Fig. 7–3) is shown with a blue background. Subsequent adjustments by arrow softkeys (4. … 6.) will have an effect to this connector.

Fig. 7–3: Setup Transceiver Connector TRX1

3. IF adjustments are to do for the other connector, pushing softkey TRX will toggle the connectors.
   Therefore the first field in the other column will be shown with a blue background:

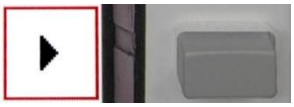
Fig. 7–4: Setup Transceiver Connector TRX2



4. Push softkey ▶ (possibly ◀) to select a manufacturer from CAT Type list.
   In case the desired manufacturer is not listed examine the possibility of an RS232 linkage to the connected transceiver (choose option RS232). If linkage is not possible (REMOTE LED does not light up), choose option NO CAT. Exit screen and softkey menu by pushing softkey ESC.

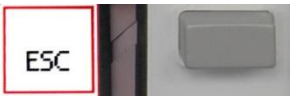
5. Push softkey 🡻 to select the next row which provides choice.
   If more than one option is selectable in row TRX Model it is the field in this row (the field is shown with a blue background).

   Push softkey ▶ (possibly ◀) to select an option from list (TRX Model or transmission mode CI-V / Band Voltage / CAT 1-2 / Band Data).



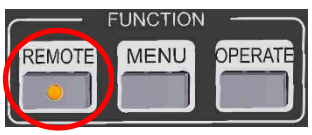
6. Push softkey 🡻 to select the next row which provides choice.
   If there is more than one baud rate selectable it is the field in this row (the field is shown with a blue background).

   Push softkey ▶ (possibly ◀) to select a baud rate supported by the shown TRX Model.



7. When all settings has been carried out exit screen and softkey menu by pushing softkey ESC.

In case a manufacturer (or option NO CAT , see row CAT Type, Point 4.) is selected and whether in row TRX Model nor in row Baud Rate an option is selectable, no more selection is possible. The last row shows only as an information the input power range (75 W), see Fig. 5-10.



When the selected and connected transceiver is powered-on, both devices will set up a communication link.
If the connection is completed successfully, the LED in button REMOTE will light up.
The HPA-8000B-54 will now take over the data for band selection and current frequency through CAT remote control from the connected transceiver.

If HPA-8000B-54 is set to REMOTE operation the band selection buttons are locked.

7.3 Input Power

The range of input power of the HPA-8000B-54 is 0 … 75 Watt for both transceiver connectors TRX 1 and TRX 2.

On default screen the power meter is showing the current input power P_{IN}:

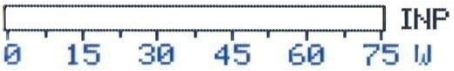


Fig. 7–5: Input Power Meter

8 ANTENNA SETUP

Prior first operation it is also necessary to verify or change the allocation of amateur radio bands to the used antenna connectors (see Sec. 8.1).

Before transmit operation starts with high power it is expedient to carry out tuning the HPA-8000B-54 to the connected and allocated antennas in that frequency ranges the radio operation is scheduled (see Sec. 8.4 and 8.5).

8.1 Antenna Allocation to Bands

One of the four antenna connectors can be allocated to each amateur radio band supported by HPA-8000B-54 (s. Appendix A1.2). There is a particular allocation for each transceiver connector TRX 1and TRX 2.

After initial power on antenna connector ANT 1 is allocated to all bands for both transceiver connectors.

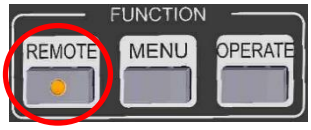
Allocation takes place for the current active transceiver connector at a time:

1. Pushing softkey TRX (on default screen – without menu) to select that transceiver connector (= switching active, TRX 1 / TRX 2), for which the allocation of a band to a antenna connector is to be carried out.
   When active, the indication is shown by a blue background.

Fig. 8–1: Antenna Allocation – Toggle the active Transceiver

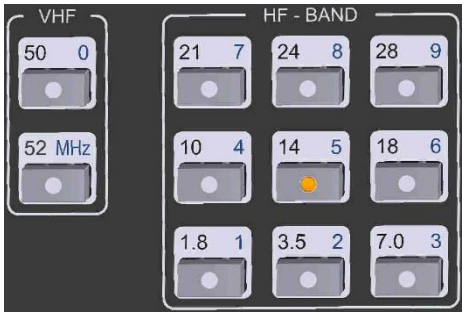
Toggle active transceiver (or TRX connector):
TRX 1: → inactive / TRX 2: → active (and vice versa, see Sec. 7.1).

When automatic or manual antenna tuning is activated (Sec. 8.4 u. 8.5), changing of the transceiver connector is not possible (active/inactive).



2. When the allocated transceiver (Sec.7.2) is connected to the HPA-8000B-54 and powered on, and the communication link is set up properly so that LED REMOTE lights up at HPA-8000B-54, the band will be selected at the allocated transceiver.
   The LED of the appropriate band button of the HPA-8000B-54 lights up.
   → Continue with point 4.

3. If a communication link to the allocated transceiver could not be setup (LED REMOTE is off), the option NO CAT must to be selected as a CAT Type. Only with this configuration the band selection can be done locally on HPA-8000B-54 (clusters HF-Band and VHF; the LED on selected band button lights up) and the amplifier can be operated. Otherwise it will remain in bypass mode.



When triggering PTT on the transceiver the current frequency will be detected by an internal frequency counter and will be shown on display. If this frequency does not match to the manually selected band this will be switched over to the corresponding band.

Band selection directly on HPA-8000B-54 is only possible if CAT type NO CAT is selected (see Sec. 7.2 →4.).

4. Select antenna connector by using softkeys ANT ▶ and ANT ◀.

Fig. 8–2: Antenna Allocation – Change of Antenna Connector

Cyclic change of antenna connector of the active transceiver in ascending order, starting at current Position.

→ ANT 1 → ANT 2 → ANT 3 → ANT 4 →

Cyclic change of antenna connector of the active transceiver in descending order, starting at current Position.

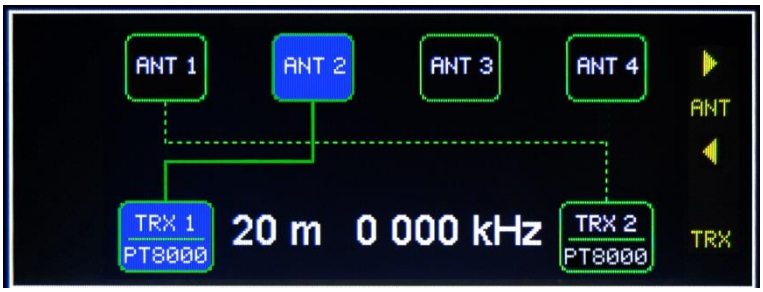
← ANT 1 ← ANT 2 ← ANT 3 ← ANT 4 ←

.

The graphical depiction of the antenna allocation varies accordingly:

Fig. 8–3: Antenna Allocation – Factory Setting

Fig. 8–4: Antenna Allocation – Variation Example



The antenna allocation will be stored permanently and without confirmation.

For the non-active (as well as for the active) transceiver is true:
Assumed the communication link to the HPA-8000B-54 is set properly the change of the used antenna connector caused by a band switch will be depicted on the display (non-active TRX = dotted line).

When automatic or manual antenna tuning is activated (Sec. 8.4 u. 8.5), changing of the antenna connector is not possible.

8.2 Antenna and Antenna Tuner – basic Considerations

Standing wave ratio (SWR) may increase significantly when using an antenna outside of the specific frequency range for which it is tuned. The power amplifier will operate at peak performance only when its load is resistive – i.e. the SWR is close to 1.0.

The HPA-8000B-54 is equipped with an automatic antenna tuner (ATU) which does not actually tune the antenna. The ATU instead matches the feed line to the final amplifiers so they always "see" a SWR close to 1.0.

The ATU has its limits – tuning mismatches with SWR greater than 3.0 become difficult and will exceed the capabilities of the ATU. Using a tuned or resonant antenna with 50 Ohm impedance at the feed point for the specific frequencies is highly recommended. The purpose of the ATU is to ensure that a resonant antenna can be used at the limits of the band selected with optimum performance of both HPA-8000B-54 and antenna system.

Never try to hook up a symmetrical open feeder line (balanced, twin-lead, ladder line etc.) directly to the HPA-8000B-54. Instead use 50 Ohm coaxial feeders only. The connectors supplied on the HPA-8000B-54 are all Type N.

With the ATU it is acceptable to use a broadband antenna system like a log periodic or T2FD system which trade wide bandwidth for an SWR ranging as high as 3.0.

8.3 Antenna Tuner

The HPA-8000B-54 is equipped with an antenna tuner, which allows automatic tuning (button START) as well as manual tuning (button MANUAL) on the HF amateur radio bands within range 1.8 to 29.7 MHz.

Each band is divided into subbands. For each of these subbands and for each of the four antenna connectors a separate filter setting. The number of subbands varies from Band to Band (s. Sec. A1.3 Appendix).

It is recommended to tune first automatically (see Sec. 8.4) and possibly cary out subsequently a manual „fine tuning" (Sec. 8.5).

Both for tuning as well as for using the tuner settings when transmitting the band and frequency data of the connected transceiver will be needed.

When the allocated Transceiver (Sec.7.2) is connected to the HPA-8000B-54 and powered on, and the communication link is set up properly so that LED REMOTE lights up at HPA-8000B-54, the band and frequency data sent by the transceiver will be shown on the display and the LED of the appropriate band button will light up.

In case a transceiver is connected without data communication link (NO CAT must be selected as a CAT Type), the current frequency will be detected by an internal frequency counter when triggering PTT on the transceiver.
In this configuration LED REMOTE will remain off. Frequency and respected band data will be shown on display and the LED on the corresponding band button will light up.

Pushing button TUNER in the cluster AUTO – TUNER will switch on the antenna tuner (pushing again will switch off), the following will be shown:

- The subband memory position corresponding to the current transceiver frequency will be shown on display („TUNE MEM XY"; Tables of subbands see Section A1.3 Appendix).
  The color of the displayed subband varies:
  Yellow Letters: This subband was not tuned yet
  (= non-tuned harmonic filter is active).
  Green Letters: This subband has been tuned
  (= settings of an earlier tuning are active).

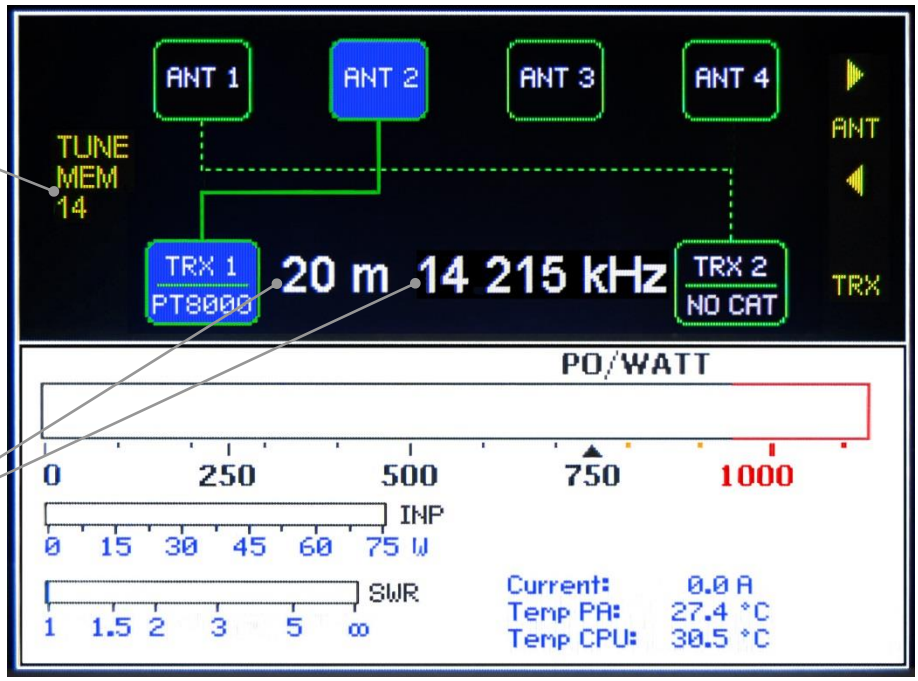
- The LED of button TUNER will light up.

Fig. 8–5: Antenna Tuner activated – Showing Frequency Information

Subband Memory Position

yellow (not tuned) or green (tuned)

Band and Frequency Information by Transceiver



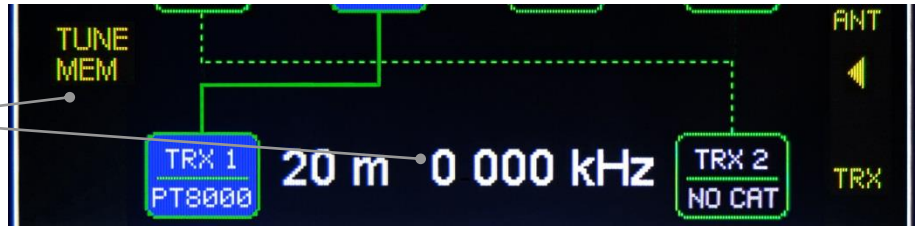
As mentioned at the beginning of this section, a frequency information is always needed for tuning. This information can be communicated by:

- Data connection from/to transceiver
  (CAT link via D-Sub connection at J3 / J4);
- CW signal from Transceiver
  (Evaluation of the HF signals at J10 … J13 by internal frequency counter);
- Data connection from/to PC (CAT remote control via USB connection J9).

In case no frequency information is available at HPA-8000B-54 (no data communication link to the transceiver; an evaluable HF signal has not received yet), the display of „TUNE MEM" will take place without designation of subband memory position. In this case the standard values of the harmonic filter for this band defined by hardware will be preselected (when OPERATE off) or switched (when OPERATE on).

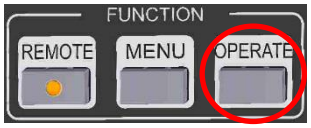
Fig. 8–6: Antenna Tuner activated – no Frequency Information

Subband Memory Position and TRX Frequency not displayed (Band Selection at HPA-8000B)



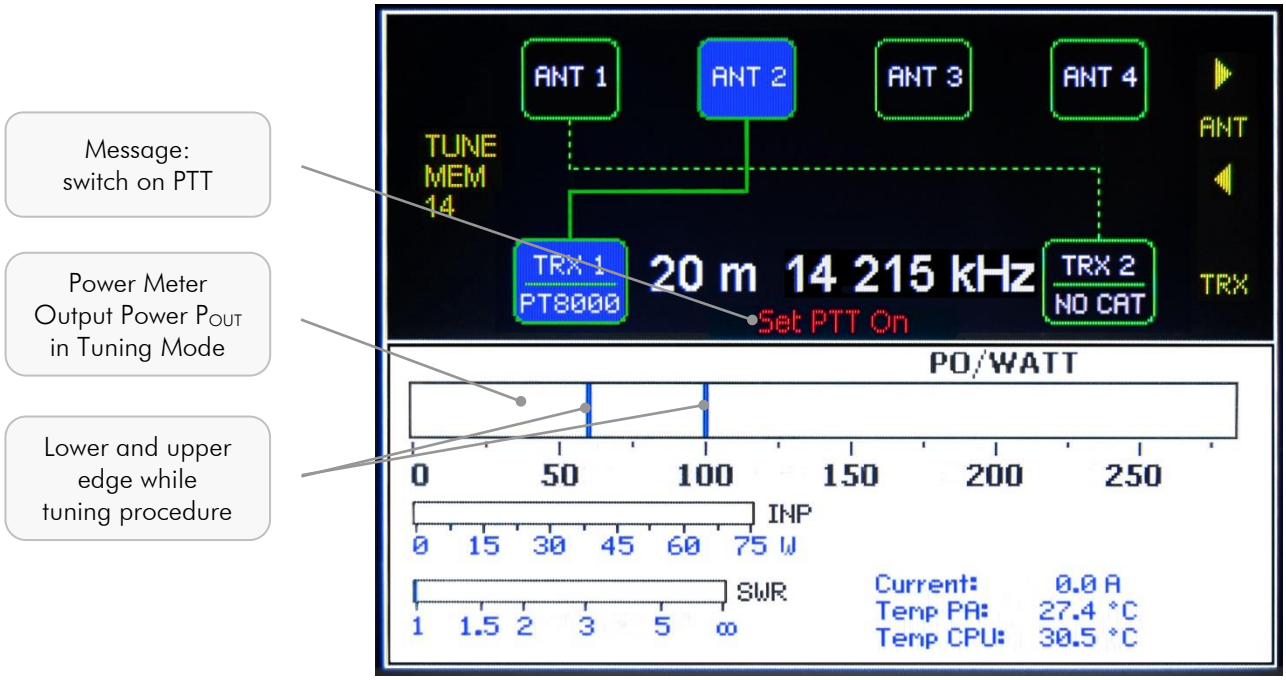
8.4 Automatic Antenna Tuning

The automatic tuning proceeds as follows:



1. As described in section 7.2 the transceiver is powered on (receive mode), band and frequency are selected at the transceiver and are recognized and displayed by the HPA-8000B-54 (remote mode; LED REMOTE shines); the tuner of the HPA-8000B-54 is activated (Sec. 8.3).
2. Preselect output power of the transceiver to a minimum (do not transmit yet = PTT off).
3. Switch final PA of the HPA-8000B-54 active (button OPERATE in the cluster FUNCTION, see Sec. 9).
4. Pushing button START in the cluster AUTO – TUNER will select the automatic tuning mode (pushing again will deselected the tuning mode):
   - The power meter for output power P_{OUT} changes to tuning mode (250 Watt scale). Two lines (lower edge at 60 watt out and upper edge at 100 watt out) mark the range of power within which it is possible to tune the filters.
   - A message will be shown to set the transceiver to transmit mode („Set PTT On“).
   - The LED of button START will light up.

Fig. 8–7: Auto-Tuning activated „Set PTT On“



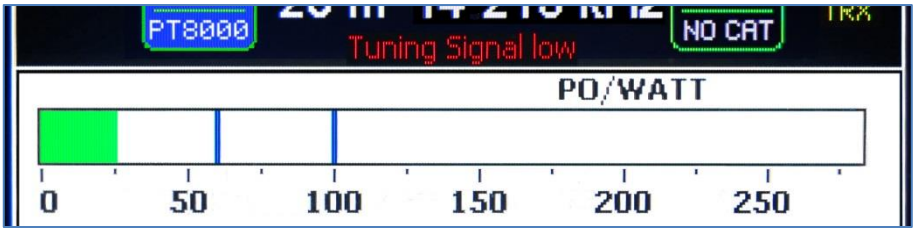
5. Select CW mode at the transceiver and activate PTT by minimum of power permanently (e.g. Hilberling PT-8000A: button TX/ON).

- It is recommended to start with a minimum of transceiver output power. When output power of the HPA-8000B-54 exceeds 250 watt the tuning process will abort and the automatic tuning mode will be deselected (button LED off).
- Automatic tuning cannot be selected as long as the final PA is not activated (OPERATE on).

In case there is shown a softkey menu or another screen than default screen they will be hidden.

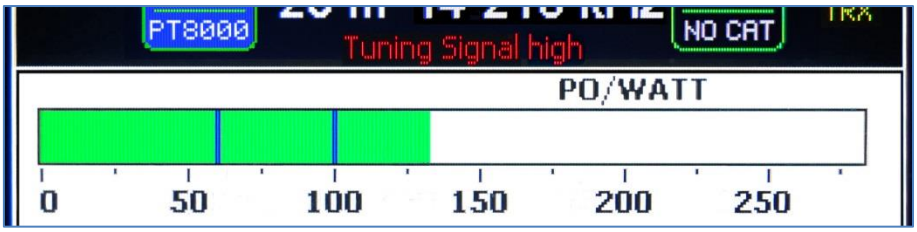
6. Increase transceiver output power slowly.
   As long as the output power of the HPA-8000B-54 stays below the lower tuning edge, the message „Tuning Signal low“ will be shown.
   If so further increase transceiver power.

Fig. 8–8: Auto Tuning – Input Power too low „Tuning Signal low“



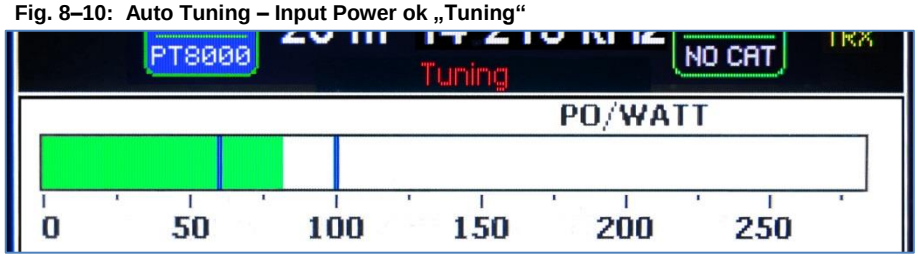
7. In case transceiver power it too high, and therefore the output power of the HPA-8000B-54 is higher than upper tuning edge still before the tuning procedure has been started, the message „Tuning Signal high“ will be shown.
   If so decrease transceiver power.

Fig. 8–9: Auto Tuning – Input Power too high „Tuning Signal high“



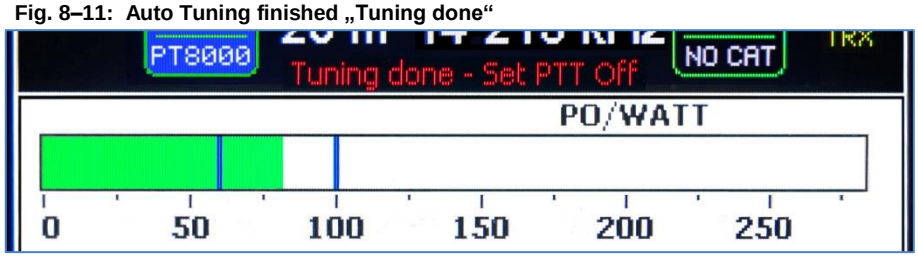
8. In case the output power of the HPA-8000B-54 is within tuning range, the tuning process will start automatically and the message „Tuning“ will be shown. On the filter board the relays will be switched audible.

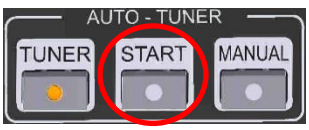
Fig. 8–10: Auto Tuning – Input Power ok „Tuning“



9. When the tuning process will be completed after a few seconds, the message „Tuning done – set PTT off“ will be shown.
   Now deactivate PTT at the transceiver.

Fig. 8–11: Auto Tuning finished „Tuning done“





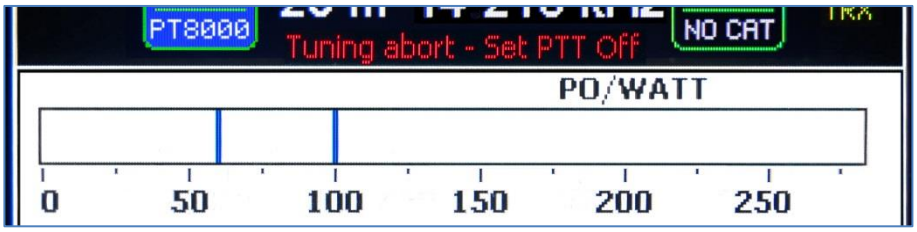
10. The LED on button START goes off and – if this subband was tuned the first time – the indicator TUNE MEM will change its color from yellow to green.

The new filter settings will be stored permanently and without confirmation.

8.4.1 Error Messages when Tuning Process was aborted

In case transceiver power it too high, and therefore the output power of the HPA-8000B-54 is higher than upper tuning edge after the tuning procedure has been started, or a failure occurs in this phase, the tuning procedure will abort with the message „Tuning Abort – Set PTT off“.
If so deactivate PTT and start the automatic tuning again.

Fig. 8–12: Auto-Tuning aborted „Tuning abort“



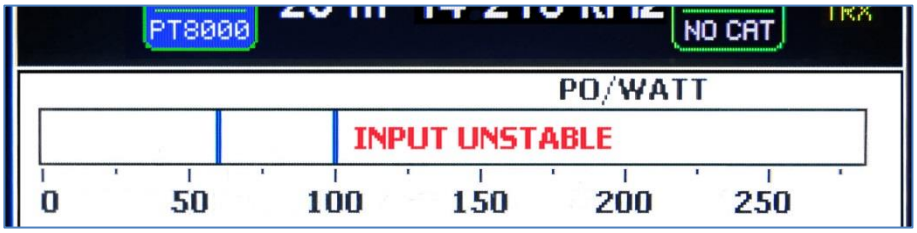
This message will also be shown when the automatic tuning procedure was aborted by operator when pushing button START.

In this case the last memorized values are valid or (if no tuning was done before) the values of the un-tuned harmonic filter.

Once the automatic tuning process has been started, a few more events can cause an abort with one of the following error messages:

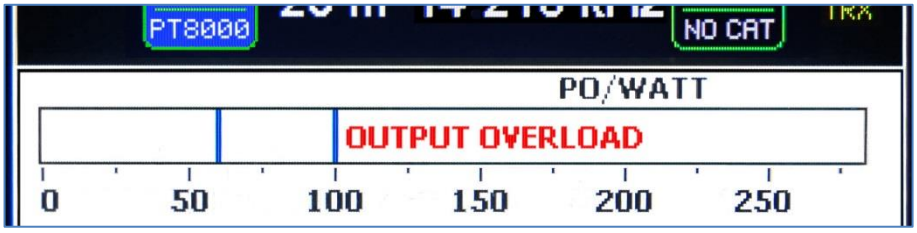
When the input power of the HPA-8000B-54 fluctuate too strongly while tuning, so that tuning of the harmonic filter is no more possible, the procedure will abort with message „INPUT UNSTABLE“:

Fig. 8–13: Auto Tuning – Input Power unstable „Input unstable“



In case the output power of the HPA-8000B-54 exceeds 250 watt while tuning, the procedure will abort with message „OUTPUT OVERLOAD“:

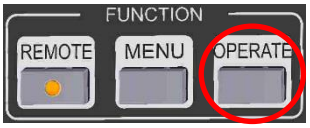
Fig. 8–14: Auto Tuning – Output Power too high „Output Overload“



- During the tuning process the TRX PTT signal must be activated permanently and the output power of the HPA-8000B-54 must be between 60 und 100 watt.
- As long as the LED in the button START shines (automatic tuning is activated), softkey menu (MENU) cannot be called up.

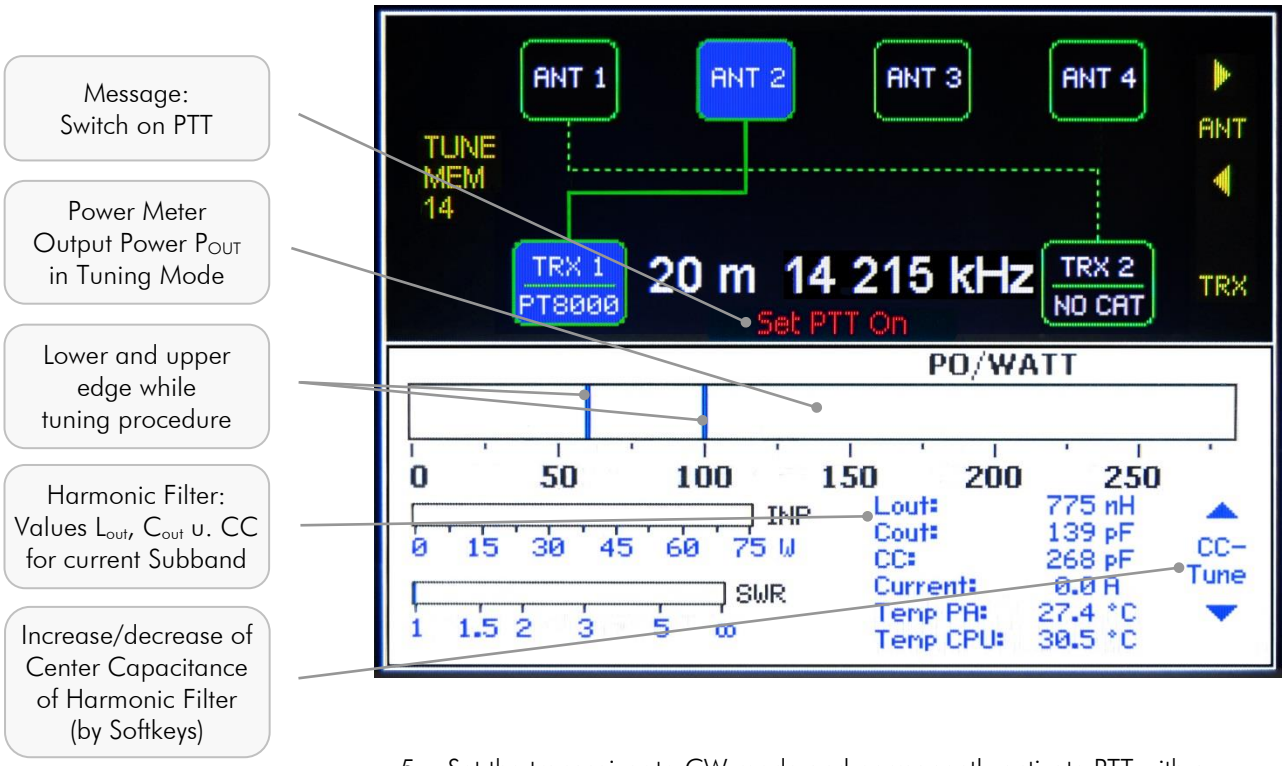
8.5 Manual Antenna Tuning

The manual antenna tuning is done in the following steps:



1. As described in section 7.2 the transceiver is powered on (receive mode), band and frequency are selected at the transceiver and are recognized and displayed by the HPA-8000B-54 (remote mode; LED REMOTE shines); the tuner of the HPA-8000B-54 is activated (Sec. 8.3).
2. Preselect output power of the transceiver to a minimum (do not transmit yet = PTT off).
3. Switch final PA of the HPA-8000B-54 active (button OPERATE in the cluster FUNCTION, see Sec. 9).
4. Pushing button MANUAL in the cluster AUTO – TUNER will select the manual tuning mode (pushing again will deselected the tuning mode):
   - The power meter for output power P_{OUT} changes to tuning mode (250 Watt scale). Two lines (lower edge at 60 watt out and upper edge at 100 watt out) mark the range of power within which it is possible to tune the filters.
   - Right below to output power meter – above displayed current and temperature values – currently switched values of the harmonic filter (L_{out}, C_{out} and CC) will be shown for the present subband.
   - Below, near right edge of the display, the softkey functions for setting the center capacitance (= CC) of the harmonic filter will be shown.
   - A message will be shown to set the transceiver to TRX mode („Set PTT On“).
   - The LED of button MANUAL will light up.

Fig. 8–15: Manual Tuning activated „Set PTT On“



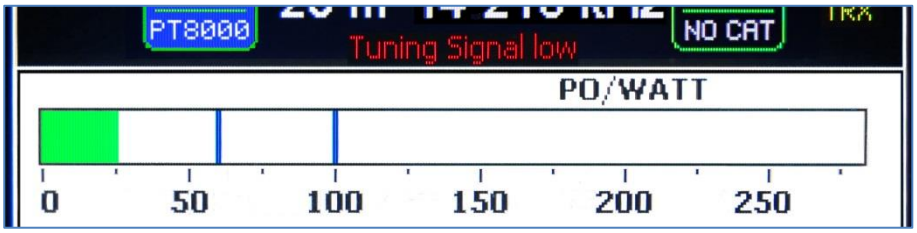
5. Set the transceiver to CW mode and permanently activate PTT with a minimum of power (e.g. Hilberling PT-8000A: button TX/ON).

- It is recommended to start with a minimum of transceiver output power.
  If HPA-8000B-54s output power will exceed 250 watt the tuning procedure will be aborted and the tuning mode will be deselected (button LED off).
- Manual tuning cannot be selected as long as the final PA is not activated (OPERATE on).

In case there is shown a softkey menu or another screen than default screen they will be hidden.

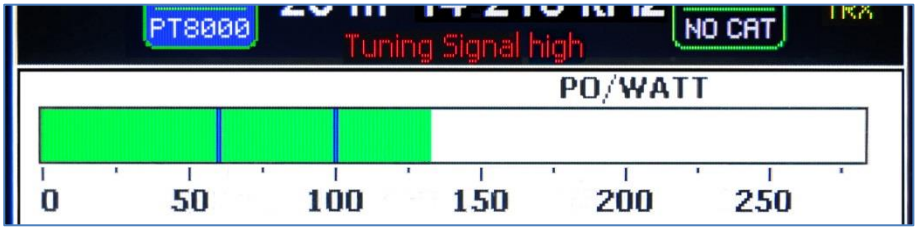
6. Increase transceiver output power slowly.
   As long as the output power of HPA-8000B-54 stays below the lower tuning edge, the message „Tuning Signal low“ will be shown.
   If so further increase transceiver power.

Fig. 8–16: Manual Tuning – Input Power too low „Tuning Signal low“



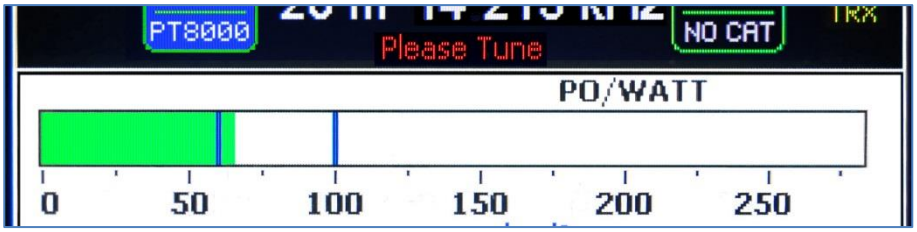
7. In case transceiver power it too high, and therefore the output power of HPA-8000B-54 is higher than upper tuning edge, the message „Tuning Signal high“ will be shown.
   If so decrease transceiver power.

Fig. 8–17: Manual Tuning – Input Power too high „Tuning Signal high“



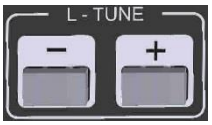
8. When output power of HPA-8000B-54 is within tuning range, the message „Please Tune“ will be shown.

Fig. 8–18: Manual Tuning – Input Power ok „Please Tune“



Using buttons [–] and [+] located in the clusters „L – TUNE“ und „C – TUNE“ and using softkeys [CC-Tune ▲] and [CC-Tune ▼] the filter values of current subband now can be adjusted (see next page).

8.5.1 Manual L Tuning

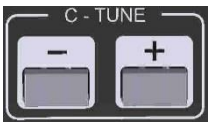


Using buttons [–] und [+] in the cluster „L – TUNE“ the inductance on output side of harmonic filter will be adjusted (labeled on display as L_{OUT}).

- [–] Decreases output inductance of harmonic filter.
- [+] Increases output inductance of harmonic filter.

Increment 25 nH / 255 steps (values see Tab. A1-13 Appendix).

8.5.2 Manual C Tuning



Using buttons [–] and [+] in the cluster „C – TUNE“ the capacitance on output side of harmonic filter will be adjusted (labeled on display as C_{OUT}).

- [–] Decreases output capacitance of harmonic filter.
- [+] Increases output capacitance of harmonic filter.

Increment 5 pF (approximated) / 255 steps (values see Tab. A1–13 Appendix)

8.5.3 Manual CC Tuning

Using softkeys [CC–Tune ▲] and [CC–Tune ▼] the center capacitance of harmonic filter will be adjusted (labeled on display as CC).

Fig. 8–19: Manual Tuning – Center Capacitance CC

Increase center capacitance of harmonic filter.

Decrease center capacitance of harmonic filter.

Increment 10 pF (approximated) / 255 steps (Values see Tab. A1–13 Appendix)

9. Manual tuning will be finished by deactivating the PTT on connected transceiver or by pushing button [MANUAL]. In the latter case the message „Tuning done – Set PTT off“ (Fig. 8–11) will be shown on display to remind the deactivation of PTT on transceiver.

10. The LED on button [MANUAL] goes off and – if this subband was tuned the first time – the indicator TUNE MEM will change its color from yellow to green.

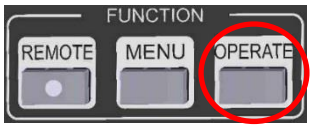
The new filter settings will be stored permanently and without any confirmation.

- During the tuning process the TRX PTT signal must be activated permanently and the output power of the HPA-8000B-54 must be between 60 und 100 watt.
- As long as the LED on button [MANUAL] shines (manual tuning is activated), softkey menu (MENU) cannot be called up.

9 INTERNAL FINAL PA OPERATE

When power on the HPA-8000B-54 the final power amplifier is set to bypass mode, i.e. it is switched inactive, correspondingly LED READY does not shine.

The complete control of the filter board is deactivated as well. When band change occurs – whether local controlled or remote controlled by connected transceiver via communication link – the filters will not switched.



Pushing button OPERATE in the cluster FUNCTION will activate the final power amplifier (pushing again will put it back into the bypass mode):

- Filter board control will be activated.
- When the PA receives a PTT signal from connected and activated transceiver, incoming HF signals will be amplified and sent according to current antenna routing to the active antenna connector.
- LED READY will light up.

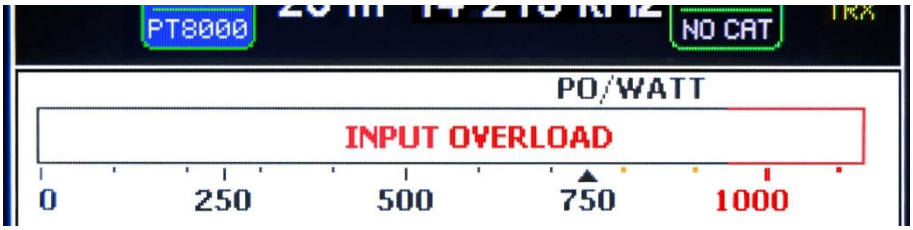
- The PA only can be activated when the PTT signal of the connected transceiver is switched off.
- The PA must be activated hence the automatic or manual tuning mode can be selected.
- The PA cannot be deactivated as long as automatic or manual tuning mode is selected.

9.1 Error Messages when Final PA was deactivated.

Once an overload inside final amplifier occurs while operating HPA-8000B-54, the internal PTT will be switched off and an appropriated error message will be shown on display for 1 to 2 seconds. To reset the HPA-8000B-54 deactivate PTT signal on transceiver.

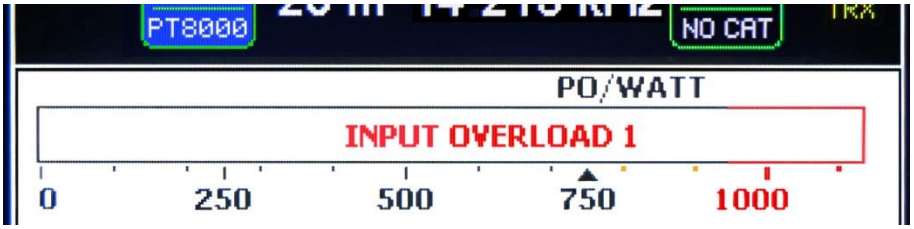
In case input power is too high and the final amplifier is switched off by software (details Tab. A1–14 Appendix), message „INPUT OVERLOAD“ will be shown on display.

Fig. 9–2: Input Overload



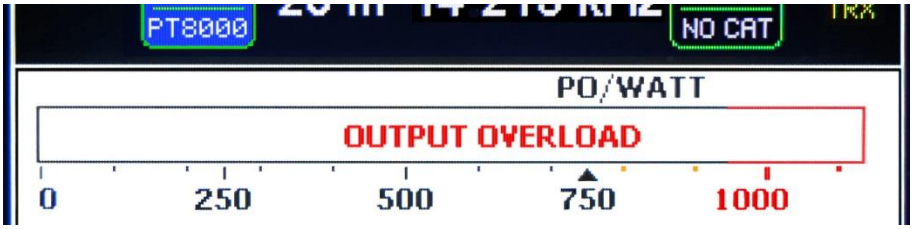
In case input power is too high and the final amplifier is switched off by hardware, message „INPUT OVERLOAD 1“ will be shown on display.

Fig. 9–1: Input Overload 1



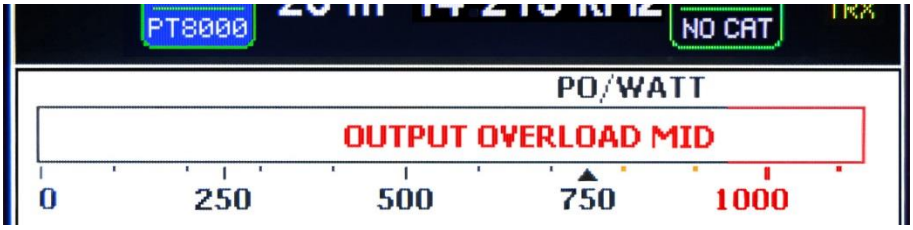
In case output power is higher than 1050 Watt for more than 500 ms, message „OUTPUT OVERLOAD“ will be shown.

Fig. 9–3: Output Overload



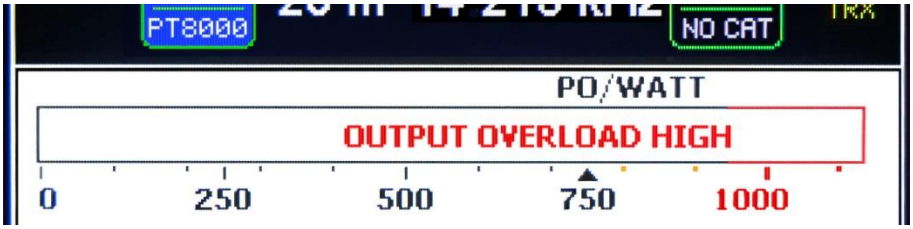
In case output power is higher than 1300 Watt for more than 100 ms, message „OUTPUT OVERLOAD MID“ will be shown.

Fig. 9–4: Ouput Overload Mid



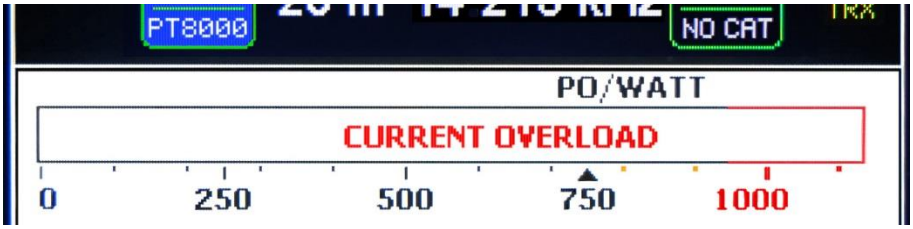
In case output power is higher than 1500 Watt, the final amplifier will be switched off immediately and message „OUTPUT OVERLOAD HIGH“ will be shown.

Fig. 9–5: Ouput Overload High



In case output current is higher than 42 Ampere for more than 1000 ms, message „CURRENT OVERLOAD“ will be shown.

Fig. 9–6: Current Overload



9.2 ALC Connection

It is recommended to prepare an ALC connection between connected transceiver/s and HPA-8000B-54 (9-pin D-Sub J1/J2 Pin 6 or RCA J7/J8) to prevent the power amplifier from overload.

For adjustment of ALC threshold trim pots P_{J7} / P_{J8} are intended. When adjustment is done the ALC meter on the transceiver can be used for optical control.

APPENDIX

A1 Technical Documents

A2 Customer Information

A1 TECHNICAL DOCUMENTS

A1.1 Technical Data

Tab. A1-1: Technical Data

Output Power (FM / AM / SSB / CW)	1 kW
Add. PA Output (Predistortion Feedback Channel)	–60 dBc ATT.
Amateur Radio Bands	160 m – 6 m (1.8 – 54 MHz) s. Tab A1–2 (not 60 m / 5.3 MHz)
Input Power	typ. 50 W / 1 kW RF Out
Transceiver Connectors	2
Antenna Connectors	4
Antenna Tuner fully automatic	1.8 – 29.7 MHz (max. SWR 3:1)
Remote Control by Transceiver (CAT)	♦ Band Switch ♦ Frequency Display
CAT Interfaces	♦ RS232 ♦ Band Data 4bit ♦ CI-V ♦ Band Voltage
Manual Control	♦ Band Buttons ♦ PTT Input (RCA) ♦ ALC Input (RCA)
PC Interface (Programming / Update)	USB / RS232
Protective circuits	♦ Overcurrent ♦ SWR ♦ Temperature ♦ Input Power ♦ Output Power
Power Supply	Internal Power Supply Unit 200 – 260 V / 50 – 60 Hz / 13 A
Dimensions	approx. 425 x 459 x 173 mm (W x D x H) (approx. 16.75 x 18.1 x 6.8'')
Weight	19.8 kg (43.7 lbs)

Technical specs subject to change without notice

A1.2 Amateur Radio Bands

Tab. A1–2: Frequency Bands HF

Button	Band	Sign	Frequency Range
1.8 1	160 m	MF	1.810[1] /1.800[2,3] ... 2.000 MHz
3.5 2	80 m	HF	3.500 ... 3.800[1] / 4.000[2] / 3.900[3] MHz
7.0 3	40 m		7.000 ... 7.200[1] / 7.300[2,3]MHz
10 4	30 m		10.100 ... 10.150 MHz
14 5	20 m		14.000 ... 14.350 MHz
18 6	17 m		18.068 ... 18.168 MHz
21 7	15 m		21.000 ... 21.450 MHz
24 8	12 m		24.890 ... 24.990 MHz
28 9	10 m		28.000 ... 29.700 MHz

[1] = IARU Region 1 [2] = IARU Region 2 [3] = IARU Region 3

Tab. A1–3: Frequency Band VHF

Button	Band	Sign	Frequency Range
50 0 52 MHz	6 m	VHF	50.000 ... 52.000[1] / 54.000[2,3] MHz

[1] = IARU Region 1 [2] = IARU Region 2 [3] = IARU Region 3

A1.3 Subbands Antenna Tuning

Tab. A1–4: Subbands 160m

	Frequency [kHz]									
TUNE MEM		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Lower		1780	1784	1788	1792	1796	1800	1804	1808	1812
Middle		**1782**	**1786**	**1790**	**1794**	**1798**	**1802**	**1806**	**1810**	**1814**
Upper		1784	1788	1792	1796	1800	1804	1808	1812	1816
TUNE MEM	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]
Lower	1816	1820	1824	1828	1832	1836	1840	1844	1848	1852
Middle	**1818**	**1822**	**1826**	**1830**	**1834**	**1838**	**1842**	**1846**	**1850**	**1854**
Upper	1820	1824	1828	1832	1836	1840	1844	1848	1852	1856
TUNE MEM	[20]	[21]	[22]	[23]	[24]	[25]	[26]	[27]	[28]	[29]
Lower	1856	1860	1864	1868	1872	1876	1880	1884	1888	1892
Middle	**1858**	**1862**	**1866**	**1870**	**1874**	**1878**	**1882**	**1886**	**1890**	**1894**
Upper	1860	1864	1868	1872	1876	1880	1884	1888	1892	1896
TUNE MEM	[30]	[31]	[32]	[33]	[34]	[35]	[36]	[37]	[38]	[39]
Lower	1896	1900	1904	1908	1912	1916	1920	1924	1928	1932
Middle	**1898**	**1902**	**1906**	**1910**	**1914**	**1918**	**1922**	**1926**	**1930**	**1934**
Upper	1900	1904	1908	1912	1916	1920	1924	1928	1932	1936
TUNE MEM	[40]	[41]	[42]	[43]	[44]	[45]	[46]	[47]	[48]	[49]
Lower	1936	1940	1944	1948	1952	1956	1960	1964	1968	1972
Middle	**1938**	**1942**	**1946**	**1950**	**1954**	**1958**	**1962**	**1966**	**1970**	**1974**
Upper	1940	1944	1948	1952	1956	1960	1964	1968	1972	1976
TUNE MEM	[50]	[51]	[52]	[53]	[54]	[55]	[56]	[57]	[58]	[59]
Lower	1976	1980	1984	1988	1992	1996	2000	2004	2008	2012
Middle	**1978**	**1982**	**1986**	**1990**	**1994**	**1998**	**2002**	**2006**	**2010**	**2014**
Upper	1980	1984	1988	1992	1996	2000	2004	2008	2012	2016
TUNE MEM	[60]									
Lower	2016									
Middle	**2018**									
Upper	2020									

Number of Subbands: 60

Increment: 4 kHz

Tab. A1–5: Subbands 80m

	Frequency [kHz]									
TUNE MEM		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Lower		3460	3470	3480	3490	3500	3510	3520	3530	3540
Middle		**3465**	**3475**	**3485**	**3495**	**3505**	**3515**	**3525**	**3535**	**3545**
Upper		3470	3480	3490	3500	3510	3520	3530	3540	3550
TUNE MEM	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]
Lower	3550	3560	3570	3580	3590	3600	3610	3620	3630	3640
Middle	**3555**	**3565**	**3575**	**3585**	**3595**	**3605**	**3615**	**3625**	**3635**	**3645**
Upper	3560	3570	3580	3590	3600	3610	3620	3630	3640	3650
TUNE MEM	[20]	[21]	[22]	[23]	[24]	[25]	[26]	[27]	[28]	[29]
Lower	3650	3660	3670	3680	3690	3700	3710	3720	3730	3740
Middle	**3655**	**3665**	**3675**	**3685**	**3695**	**3705**	**3715**	**3725**	**3735**	**3745**
Upper	3660	3670	3680	3690	3700	3710	3720	3730	3740	3750
TUNE MEM	[30]	[31]	[32]	[33]	[34]	[35]	[36]	[37]	[38]	[39]
Lower	3750	3760	3770	3780	3790	3800	3810	3820	3830	3840
Middle	**3755**	**3765**	**3775**	**3785**	**3795**	**3805**	**3815**	**3825**	**3835**	**3845**
Upper	3760	3770	3780	3790	3800	3810	3820	3830	3840	3850
TUNE MEM	[40]	[41]	[42]	[43]	[44]	[45]	[46]	[47]	[48]	[49]
Lower	3850	3860	3870	3880	3890	3900	3910	3920	3930	3940
Middle	**3855**	**3865**	**3875**	**3885**	**3895**	**3905**	**3915**	**3925**	**3935**	**3945**
Upper	3860	3870	3880	3890	3900	3910	3920	3930	3940	3950
TUNE MEM	[50]	[51]	[52]	[53]	[54]	[55]	[56]	[57]	[58]	
Lower	3950	3960	3970	3980	3990	4000	4010	4020	4030	
Middle	**3955**	**3965**	**3975**	**3985**	**3995**	**4005**	**4015**	**4025**	**4035**	
Upper	3960	3970	3980	3990	4000	4010	4020	4030	4040	

Number of Subbands:58

Increment: 10 kHz

Tab. A1–6: Subbands 40m

	Frequency [kHz]									
TUNE MEM		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Lower		6950	6960	6970	6980	6990	7000	7010	7020	7030
Middle		**6955**	**6965**	**6975**	**6985**	**6995**	**7005**	**7015**	**7025**	**7035**
Upper		6960	6970	6980	6990	7000	7010	7020	7030	7040
TUNE MEM	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]
Lower	7040	7050	7060	7070	7080	7090	7100	7110	7120	7130
Middle	**7045**	**7055**	**7065**	**7075**	**7085**	**7095**	**7105**	**7115**	**7125**	**7135**
Upper	7050	7060	7070	7080	7090	7100	7110	7120	7130	7140
TUNE MEM	[20]	[21]	[22]	[23]	[24]	[25]	[26]	[27]	[28]	[29]
Lower	7140	7150	7160	7170	7180	7190	7200	7210	7220	7230
Middle	**7145**	**7155**	**7165**	**7175**	**7185**	**7195**	**7205**	**7215**	**7225**	**7235**
Upper	7150	7160	7170	7180	7190	7200	7210	7220	7230	7240
TUNE MEM	[30]	[31]	[32]	[33]	[34]	[35]	[36]	[37]	[38]	[39]
Lower	7240	7250	7260	7270	7280	7290	7300	7310	7320	7330
Middle	**7245**	**7255**	**7265**	**7275**	**7285**	**7295**	**7305**	**7315**	**7325**	**7335**
Upper	7250	7260	7270	7280	7290	7300	7310	7320	7330	7340
TUNE MEM	[40]									
Lower	7340									
Middle	**7345**									
Upper	7350									

Number of Subbands: 40
Increment: 10 kHz

Tab. A1–7: Subbands 30m

	Frequency [kHz]									
TUNE MEM		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Lower		10050	10070	10090	10110	10130	10150	10170	10190	10210
Middle		**10060**	**10080**	**10100**	**10120**	**10140**	**10160**	**10180**	**10200**	**10220**
Upper		10070	10090	10110	10130	10150	10170	10190	10210	10230
TUNE MEM	[10]									
Lower	10230									
Middle	**10240**									
Upper	10250									

Number of Subbands: 10
Increment: 20 kHz

Tab. A1–8: Subbands 20m

	Frequency [kHz]									
TUNE MEM		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Lower		13950	13970	13990	14010	14030	14050	14070	14090	14110
Middle		13960	13980	14000	14020	14040	14060	14080	14100	14120
Upper		13970	13990	14010	14030	14050	14070	14090	14110	14130
TUNE MEM	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]
Lower	14130	14150	14170	14190	14210	14230	14250	14270	14290	14310
Middle	14140	14160	14180	14200	14220	14240	14260	14280	14300	14320
Upper	14150	14170	14190	14210	14230	14250	14270	14290	14310	14330
TUNE MEM	[20]	[21]	[22]	[23]	[24]	[25]				
Lower	14330	14350	14370	14390	14410	14430				
Middle	14340	14360	14380	14400	14420	14440				
Upper	14350	14370	14390	14410	14430	14450				

Number of Subbands: 25
Increment: 20 kHz

Tab. A1–9: Subbands 17m

	Frequency [kHz]									
TUNE MEM		[1]	[2]	[3]	[4]	[5]	[6]	[7]		
Lower		18050	18070	18090	18110	18130	18150	18170		
Middle		**18060**	**18080**	**18100**	**18120**	**18140**	**18160**	**18180**		
Upper		18070	18090	18110	18130	18150	18170	18190		

Number of Subbands: 7
Increment: 20 kHz

Tab. A1–10: Subbands 15m

	Frequency [kHz]									
TUNE MEM		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Lower		20950	20970	20990	21010	21030	21050	21070	21090	21110
Middle		**20960**	**20980**	**21000**	**21020**	**21040**	**21060**	**21080**	**21100**	**21120**
Upper		20970	20990	21010	21030	21050	21070	21090	21110	21130
TUNE MEM	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]
Lower	21130	21150	21170	21190	21210	21230	21250	21270	21290	21310
Middle	**21140**	**21160**	**21180**	**21200**	**21220**	**21240**	**21260**	**21280**	**21300**	**21320**
Upper	21150	21170	21190	21210	21230	21250	21270	21290	21310	21330
TUNE MEM	[20]	[21]	[22]	[23]	[24]	[25]	[26]	[27]	[28]	[29]
Lower	21330	21350	21370	21390	21410	21430	21450	21470	21490	21510
Middle	**21340**	**21360**	**21380**	**21400**	**21420**	**21440**	**21460**	**21480**	**21500**	**21520**
Upper	21350	21370	21390	21410	21430	21450	21470	21490	21510	21530
TUNE MEM	[30]									
Lower	21530									
Middle	**21540**									
Upper	21550									

Number of Subbands: 30

Increment: 20 kHz

Tab. A1–11: Subbands 12m

	Frequency [kHz]									
TUNE MEM		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Lower		24855	24875	24895	24915	24935	24955	24975	24995	25015
Middle		**24865**	**24885**	**24905**	**24925**	**24945**	**24965**	**24985**	**25005**	**25025**
Upper		24875	24895	24915	24935	24955	24975	24995	25015	25035
TUNE MEM	[10]	[11]								
Lower	25035	25055								
Middle	**25045**	**25065**								
Upper	25055	25075								

Number of Subbands: 11

Increment: 20 kHz

Tab. A1–12: Subbands 10m

	Frequency [kHz]									
TUNE MEM		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Lower		28000	28040	28080	28120	28160	28200	28240	28280	28320
Middle		**28020**	**28060**	**28100**	**28140**	**28180**	**28220**	**28260**	**28300**	**28340**
Upper		28040	28080	28120	28160	28200	28240	28280	28320	28360
TUNE MEM	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]
Lower	28360	28400	28440	28480	28520	28560	28600	28640	28680	28720
Middle	**28380**	**28420**	**28460**	**28500**	**28540**	**28580**	**28620**	**28660**	**28700**	**28740**
Upper	28400	28440	28480	28520	28560	28600	28640	28680	28720	28760
TUNE MEM	[20]	[21]	[22]	[23]	[24]	[25]	[26]	[27]	[28]	[29]
Lower	28760	28800	28840	28880	28920	28960	29000	29040	29080	29120
Middle	**28780**	**28820**	**28860**	**28900**	**28940**	**28980**	**29020**	**29060**	**29100**	**29140**
Upper	28800	28840	28880	28920	28960	29000	29040	29080	29120	29160
TUNE MEM	[30]	[31]	[32]	[33]	[34]	[35]	[36]	[37]	[38]	[39]
Lower	29160	29200	29240	29280	29320	29360	29400	29440	29480	29520
Middle	**29180**	**29220**	**29260**	**29300**	**29340**	**29380**	**29420**	**29460**	**29500**	**29540**
Upper	29200	29240	29280	29320	29360	29400	29440	29480	29520	29560
TUNE MEM	[40]	[41]	[42]	[43]	[44]	[45]				
Lower	29560	29600	29640	29680	29720	29760				
Middle	**29580**	**29620**	**29660**	**29700**	**29740**	**29780**				
Upper	29600	29640	29680	29720	29760	29800				

Number of Subbands: 45
Increment: 40 kHz

A1.4 Switchable L and C Elements Antenna Tuning

Tab. A1–13: Switchable Inductances und Capacitances Harmonic Filter

ID		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
L_{OUT}	[nH]	25	50	100	200	400	800	1600	3200
C_{OUT}	[pF]	5	10	22	47	82	180	560	1200
CC	[pF]	10	20	40	94	164	300	940	2000

A1.5 Switch-off Criteria for INPUT OVERLOAD

Tab. A1–14: Switch-off Criteria for Input Overload

Error Message	Input Power Range	Band	$P_{IN,max}$
Input Overload	75 W	50 MHz all other	80 W 70 W

A1.6 Interface Parameters

Tab. A1–15: Interface Parameters

CAT Type	TRX Model	Baud Rate	Displayed TRX Connector
HILBERLING	PT8000	9600, 19200, 38400, 57600, 4800	PT8000
KENWOOD	All	9600, 19200, 38400, 57600, 4800	Kenwood
ICOM	CI-V	9600, 19200, 38400, 57600, 4800	ICOM
	Band Voltage	---	
YAESU	CAT 1	--- --- --- --- 4800	YAESU
	CAT 2	9600, 19200, 38400, 57600, 4800	
	Band Data	---	
FlexRadio	FLEX-6000	9600, 19200, 38400, 57600, 4800	FLEX-6k
ELECRAFT	K3	9600, 19200, 38400, 57600, 4800	K3
TENTEC	ORION II	--- --- --- 57600 ---	ORION II
REUTER	Band Data	---	REUTER
RS232	All	9600, 19200, 38400, 57600, 4800	RS232
NO CAT	---	---	NO CAT

A2 CUSTOMER INFORMATION

A2.1 User Information

A2.1.1 Declaration of Conformity (shortened version)

Hilberling GmbH hereby declares that the HPA-8000B-54 power amplifier complies with Directive 2014/53/EU.
The complete declaration of conformity can be found on the website www.hilberling.de.

A2.1.2 Note Amateur Radio Operation

The Hilberling GmbH is obliged as a manufacturer of transmitter devices to draw attention to the following legal provisions:

The following restrictive conditions apply:

This device is intended for use by radio amateurs within the meaning of the law on amateur radio in the valid amended. During operation of the device, the amateur radio law and supplementary laws and regulations must be observed.

In Germany, as in other EU countries, special provisions for the acquisition, ownership and operation of amateur radio apply. Acquisition and ownership of this device by unauthorized persons can already be punishable!

Even if the devices HPA-8000B-54 should have extended frequency ranges, radio amateurs are generally allowed to use only the assigned ham radio frequencies depending on their country.

A2.2 Warranty Terms

Guarantee

For amateur radio power amplifier HPA-8000B-54 legal guarantee determinations apply only if the device is operated in a manner corresponding to its intended use. This includes in particular the compliance with the operating limits mentioned in this manual.

A2.3 Disposal Rules

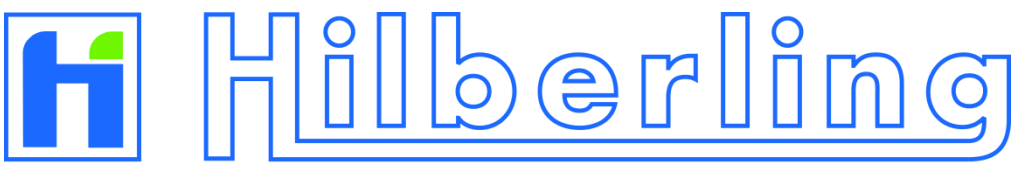
Used electrical and electronic equipment must not longer be placed in unsorted municipal waste in accordance with European standards. They must be collected separately and have to be disposed of by a public-service-disposer or equivalent private companies.

The symbol of the crossed out wheeled bin on rear panel indicates the need for separate collection.

According to the German "*Gesetz über das Inverkehrbringen, die Rücknahme und die umweltverträgliche Entsorgung von Elektro- und Elektronikgeräten*", short ElektroG, the Hilberling GmbH is registered by the *Stiftung Elektro-Altgeräte Register* as a distributor of electrical and electronic equipment under WEEE registry number DE 19129052 and thus participate in the common disposal of electrical and electronic waste.

If there are any questions, please contact Hilberling GmbH as follows:

E-Mail	info@hilberling.de
Phone	+49 (0) 4331-20171-0
Fax	+49 (0) 4331-20171-10
Mail	Hilberling GmbH Heinrich-Hertz-Strasse 2 24790 Schacht-Audorf



ENTWICKLUNGSLABOR · HOCHFREQUENZTECHNIK