ACOM 2020S

1.8-54 MHz
Linear Power Amplifier
with Touch-Screen Remote Control

User's Manual

Installation, Operation
and Maintenance

OUTSTANDING HF POWER PRODUCTS

June 2022

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Title of Documentation
ACOM 2020S 1.8-54 MHz Linear Power Amplifier
with Touch-Screen Remote Control
User's Manual
Installation, Operation and Maintenance

Type of Documentation
User's Manual

Purpose of Documentation
This manual explains Installation, Operation and Maintenance of the ACOM 2020S 1.8-54 MHz linear power amplifier.

Record of Revisions

Description	Release Date	Notes
ACOM 2020S User's Manual	30.06.2022	First edition, R01

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1. GENERAL INFORMATION

Congratulations on purchasing one of the finest solid-state 1.8-54 MHz linear amplifiers in the world today.

ACOM is pleased that you have chosen one of our products, and we will endeavor to provide you with the information and support you need to enjoy your purchase for many years.

We urge you to read all of the following materials before you embark on operating your new amplifier.

1.1. Introduction and Description

This manual explains:

- Installation
- Operation and
- Maintenance

of the ACOM 2020S solid-state linear power amplifier.

The ACOM 2020S is a state-of-the art 1500 W heavy-duty, solid-state linear amplifier, covering all amateur bands from 1.8 to 54 MHz.

The amplifier employs two powerful modules in power splitting/combining technique which is well time-proven in high-power commercial applications to provide sufficient output headroom. Thanks to input and output ports isolation from each other, the intermodulation is reduced, and SWR toughness, self-excitation resistance, and reliability are improved.

It features a Remote Control Unit model R05 (abbr. RCU hereinafter) with the operating information shown on a multi-functional, high resolution color touch screen. All indicators and controls (except the primary mains switch and power indicator) are accessible via the touch screen RCU, as well as, all command input to the RCU is menu-driven.

As standard, the ACOM 2020S is equipped with Ethernet interface facilitating its usage in Remotely Operated Stations.

1.2. Product History and Documentation Validity

The ACOM 2020S amplifier serial production started in April 2022.

This manual refers to the ACOM 2020S amplifiers and describes the operating possibilities of all amplifiers produced till the publishing date of this manual.

This manual is valid till a new manual is issued.

Production Version Release Date	Notes
04.2022	Basic design;

Table 1-1 | Production versions history

1.3. Owner Assistance

If assistance is needed, you should contact your local dealer first. If necessary, your dealer will contact ACOM for additional guidance.
If you still have an issue you need to discuss with one of ACOM's specialists, the contact information is as follows:

ACOM Ltd.
E-mail: support@acom-bg.com

Bulgaria | Bozhurishte 2227
Sofia-Bozhurishte Industrial Park | 6 Valeri Petrov Str.
GPS coordinates: 42.748616° | 23.209801°

1.4. Equipment Supplied

The ACOM 2020S amplifier (including Remote Control Unit model R05) is shipped in a cardboard carton.

The ACOM 2020S is shipped as package, consisting of:

Nr.	PACKAGE CONTENTS	Pcs.
1	Amplifier ACOM 2020S (unit only)	1
2	Remote Control Unit with Touch Screen (model R05)	1
3	Cable (ACOM 2020S to RCU R05 connection), 1.5 m	1
4	Power supply cable, 1.8 m (with free cable end)	1

Table 1-2 | Package contents

The User's Manual is available as PDF-file only.
The latest version of the User's Manual is available at www.acom-bg.com.

1.5. Features

- **Easy to operate**
  The overall operation of ACOM 2020S is extremely simplified: the touch screen menus are intuitive and easy to follow, and no special skill is required from the operator when changing frequency bands.
- **User-friendly automatic control**
  When connected to a transceiver with CAT capability, the amplifier will track the operating frequency and will change bands accordingly.
  Even if not CAT connected, the amplifier monitors the input signal frequency through the built-in frequency counter and automatically switches bands.
- **High resolution color display with Touch screen**
  Amplifier status indications are explained via detailed text displayed on the RCU 7" high-resolution color touch display (155x90 mm, 1024x600 pixels, and 24-bit color)
  All indicators and controls (except the primary mains switch and power indicator) are accessible via the RCU's touch screen, as well as, all command input to the RCU is menu-driven.
- **Transceiver-independent**
  Compatible with all transceiver models - does not need any special signals: "ground on transmit" and RF drive power is sufficient.
- **Two power modules**
  Employs two powerful modules in the power splitting/combining technique.
- **LDMOS transistor technology**
  The two final PA stages use a rugged LDMOS transistor - MRFX1K80HR5 or equivalent.
- **Broadband input circuit**
  Broadband input circuit, providing a perfect transceiver load with SWR below 1.2 (typically 1.1), without retuning throughout the whole frequency range from 1.8 to 54 MHz.
- **Intelligence**
  Takes care of itself during operation via continuously working protection circuits in all modes.
  The operator can monitor 11 (eleven) parameters of the amplifier in operation.
- **Easy maintenance**
  Detailed data (55 parameters) about each of the last 28 hard-fault protection trips is stored in the amplifier's memory.
- **Remote control capabilities**
  Remotely controlled via the Internet through integrated Web interface and built-in Ethernet RJ45 port and Wi-Fi adapter.
- **Compact and lightweight construction**
  Extremely compact and lightweight construction with built-in switching-mode power supply (SMPS) that operates with an extended mains voltage range of 200-240 VAC, ±10% (180-264 VAC limiting values), with no internal switch over. The consumed current is purely sinusoidal, Power Factor Corrected (PFC) and inrush current limited. This makes the operation of unstable mains and generators easy and trouble free.
- **Electromagnetic compatibility**
  Complies with the CE electromagnetic compatibility (EMC) requirements and FCC regulations. Perfect compatibility with both highly sensitive devices and the powerful devices in the radio station (receivers, computers, other amplifiers) due to the used PFC and built-in radio-frequency filters.

1.6. Safety Considerations, Explicit Definitions

The ACOM 2020S linear power amplifier is a Safety Class I unit regarding protection against electric shock. The third grounding lead of its mains cord (which is colored yellow with two green stripes) and the ground stud on the rear panel of the amplifier (marked **GND**, see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (a)) must be connected to the station's grounding system for safe operation.

The amplifier is designed to meet international safety standards and complies with CE safety and electromagnetic compatibility requirements, as well as FCC regulations.

This User's Manual contains information, warnings (signal words **Danger**, **Warning**, **Caution** and **Notice**) and instructions, related to hazards, that should be followed by the user in order to ensure safe operation and to keep the amplifier in a safe working condition at all times.

The EXPLICIT DEFINITIONS described below apply to this User's Manual:

⚠ DANGER

*These notes call attention to a procedure or instructions which, if not correctly performed, **will result in serious personal injuries and even death**.*

⚠ WARNING

*These notes call attention to a procedure or instructions which, if not correctly performed, **could result in serious personal injuries and even death**.*

⚠ CAUTION

*These notes call attention to a procedure or instructions which, if not correctly performed, **could result in minor or moderate personal injuries**.*

NOTICE

*These notes call attention to a procedure or instructions which, if not correctly performed, **could result in property damage or equipment damage not exclusively to the amplifier but also to connected equipment**.*

Information notes described below apply to this User's Manual:

These notes highlight operating procedures or practices that may improve equipment reliability and/or personnel performance, or to emphasize a concept.

ORANGE TEXT as LINKS

marks all internal links in the document between Sections, Figures, Tables, etc. for your convenience.

The safety instructions contained in this User's Manual feature specific signal words (**Danger**, **Warning**, **Caution** or **Notice**) and, where required, a safety alert symbol, in accordance with actual standards ISO 3864 or ANSI Z535.

PRECAUTIONS:

⚠ DANGER

Both the mains voltage and the high DC voltage up to 500 V inside the ACOM 2020S amplifier are LETHAL!

For your safety, pull the amplifier power plug out of the mains wall outlet and WAIT AT LEAST 3 minutes EACH TIME BEFORE you remove the cover of the amplifier.

⚠ DANGER

Never allow anyone, ESPECIALLY CHILDREN, to push or put anything into holes in the case - this will cause electric shock. NEVER TOUCH AN ANTENNA or antenna insulators during transmission or tuning - this may result in an electric shock or burn. NEVER EXPOSE the amplifier to rain, snow or any liquids. AVOID placing the amplifier in excessively dusty environments or in direct sunlight. DO NOT OBSTRUCT COOLING ducts or vents. Keep a minimum clearance distance of 10 cm (4 inches) to any other devices or objects.

⚠ WARNING

Do not undertake on your own repairs or changes in hardware or software of the amplifier in order not to endanger your or other's health and life and not to damage the amplifier and the equipment connected with it, not covered by warranty. The manufacturer is not liable for another's actions and responsibility shall be assumed by the doer.

⚠ WARNING

To avoid damage (not covered under warranty) read the Section ***2 INSTALLATION*** of this User's Manual carefully. If you have any doubts about the installation, operation or safety of the amplifier, please, consult your dealer.

⚠ WARNING

NEVER operate the equipment if you notice an abnormal odor, sound or smoke. Immediately turn off the power and contact your dealer for assistance (see Section ***1.3 Owner Assistance***).

2. INSTALLATION

2.1. Unpacking and Initial Inspection

Before you install your amplifier, thoroughly read this manual.

First, carefully inspect the cardboard carton and its contents for physical damage. ACOM ships amplifiers in highly protected containers, but it cannot assure that mistreatment by shippers will not occur. If damage is evident, notify your dealer immediately. Delay may void the carrier's warranty.

Keep all packing materials for possible future amplifier shipment (See Section ***8.4.4 Returning to the Service Provider***).

2.2. Line Voltage Selection

The ACOM 2020S amplifier is supplied with built-in switching-mode power supply (SMPS).

The amplifier operates in an extended mains voltage range of 200-240 VAC, ±10% (180-264 VAC limiting values), with no internal switch over. The consumed current is purely sinusoidal, Power Factor Corrected (PFC) and inrush limited. This makes the operation from unstable mains and generators easy and trouble free.

Thanks to the built-in SMPS, the ACOM 2020S has no mains line voltage selector to take care of!

2.3. Amplifier Location Selection

⚠ CAUTION

The weight of the unit (RCU excluded) is about 22 kg, which should preferably be handled by two persons.

Position the amplifier near the place where it will be used. You will need an easy access to the rear panel cabling.

NOTICE

The ACOM 2020S is forced air cooled. Keep a minimum clearance distance of 10 cm (4 inches) to any other devices or objects.

The exhaust air can reach 65 °C (150 °F) and if the surrounding devices are sensitive to heating from outside or use forced air cooling themselves, increase the distances accordingly.

Figure 2-1 | RCU model R05 - Front panel with Touch screen

Figure 2-2 | Amplifier - Front view

For ergonomic operation you can place the RCU on your desk, near to your transceiver. Please, have in mind that the length of a connecting cable between ACOM 2020S and RCU R05 is 1.5 m.

NOTICE

Do not leave accidental paper, cloth or other lightweight pieces around and under the amplifier. They may be drawn in by the cooling air stream and block the vents. This will lead to overheating and accelerated material aging, not covered by the warranty.

2.4. Connections

Please, see ***Figure 2-3 | Amplifier rear panel - Connections*** and ***Figure 2-6 | RCU model R05 rear panel***.
Connection to your station must be accomplished in the order described below, before you apply mains voltage to the amplifier.

Before you connect the amplifier to external grounding, you should advise with a licensed electrician and confirm such kind of connection is allowed by your national and local electrical code, safety rules, and regulations in force. Simultaneous connection to the earth grounding and protective earth may be inadmissible or may fall under special requirements in some countries!

⚠ DANGER

Never use the gas installation pipes for grounding. This can cause an EXPLOSION!

⚠ DANGER

Do not use the steam-heating or water-supply network pipes for grounding! You may expose to dangerous voltage not only yourself but also other people using the same installation.

2.4.1. Connections on Amplifier rear panel

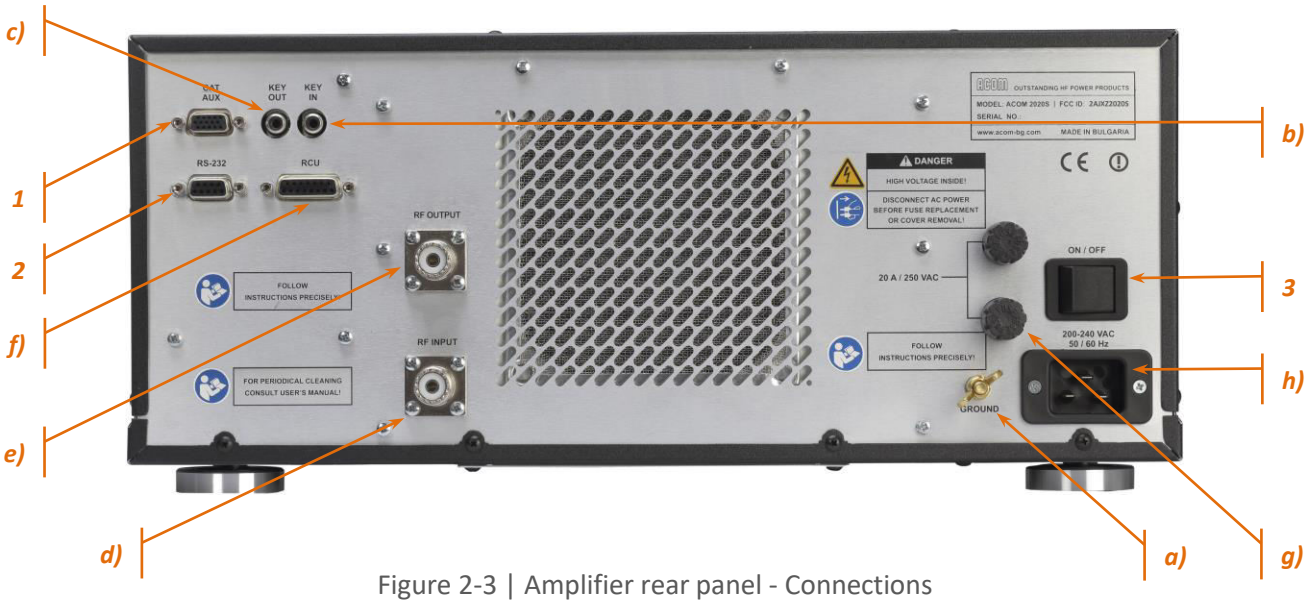


Figure 2-3 | Amplifier rear panel - Connections

a) **GROUND** stud

First, connect the wing-nut grounding stud of the amplifier (on the rear panel, marked **GROUND**) to the station's grounding system (see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (a)).

⚠ WARNING

Note that the grounding system may have to withstand currents over 20 A with insignificant voltage drop on it. Therefore, it may be necessary to improve it considerably, i.e., to become less resistive, with heavier leads and lower-resistive ground path. The grounding leads should be at least 8 mm² (AWG 8 or SWG 10).

For details and recommendations on the grounding and RF counterpoise system concerning the electromagnetic compatibility see also Section ***3.6.f) Elimination of electromagnetic compatibility (EMC) problems***.

b) **KEY-IN** connector

This is the amplifier's input for receive/transmit control from the transceiver.

The transceiver controls the amplifier from receive mode into transmit mode (RX/TX) by grounding of the **KEY-IN** input.

Run a shielded cable from the "ground on transmit" connector or terminal on your transceiver to the amplifier rear panel **KEY-IN** connector (see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (b)). The **KEY-IN** connector uses a standard RCA phono plug.

The switching voltage presented from amplifier **KEY-IN** connector to the transceiver "ground on transmit" output does not exceed 12 V (positive to the ground). The closed-circuit current is below 6 mA (see Section ***8.1.j) Receive / Transmit control***).

Your amplifier will not work if **KEY-IN** input is not connected properly.

Transceiver producers give different names to this output and they are for instance TX-GND, SEND, T/R-LINE, PTT, etc. Some transceivers require that "ground on transmit" is implemented via a software command, or by changing the setting of a switch on the rear panel, or interior of the transceiver. Check your transceiver's manual.

c) **KEY-OUT** connector

This is the amplifier's transmit-enabling control output to the transceiver.

The **KEY-OUT** connector provides an extra control signal from the amplifier to the transceiver. This can be used for improving the receive/transmit (RX/TX) switching safety.

NOTICE

KEY-OUT is a low-power open-drain output, make sure that the signal voltage coming from the respective transceiver connection does not exceed 50 VDC (open circuit) and the closed-circuit current is below 20 mA.

If your transceiver has a suitable input that disables transmission unless grounded externally, we recommend that you connect it with a shielded cable terminated in a Phono (RCA) connector to the **KEY-OUT** connector (see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (c)) of the amplifier.

ACOM 2020S will operate normally with **KEY-OUT** unconnected if your transceiver has no such input.

Transceiver producers give different names to this input and they are for instance TX-INHIBIT, MUTE, LINEAR, etc. Check your transceiver's manual.

d) **RF INPUT** connector

Connect a suitable coaxial cable from the transceiver output to the amplifier RF INPUT SO-239 connector (see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (d)), using PL-259 plug.

NOTICE

In order to avoid a damage (not covered by the warranty), turn off your transceiver's internal antenna tuner.

e) **RF OUTPUT** connector

NOTICE

If this is the first time you will use a power amplifier in your station, pay attention to the coaxial cable type from the amplifier's output to the antenna. It must handle the increased power safely, particularly on the 10- and 6 meters bands. We recommend that you use RG213 cable or better. Check the same for the antenna switch and tuner, as well as the whole antenna system (especially multi-band trap antennas).

Connect a suitable coaxial cable with a PL-259 plug from the **RF OUTPUT** (see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (e)) to the antenna switch or tuner, or to antenna for the respective frequency band.

f) **RCU** connector

Connect the ACOM 2020S - RCU R05 connection cable (part of delivery - see ***1.4 Equipment Supplied***, Pos. 3) from the connector **RCU** (see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (f)) to the connector **AMPLIFIER** located on the RCU rear panel (see ***Figure 2-6 | RCU model R05 rear panel***, Pos. (i)).

Figure 2-4 | ACOM 2020S - RCU R05 connection cable

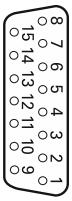
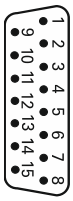
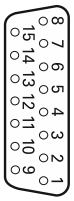
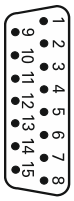
ACOM 2020S amplifier Rear panel		Connecting cable				ACOM RCU R05 Rear panel	
RCU connector						AMPLIFIER connector	
	1 | DISP_REMOTE_TX		1	———	1		1 | DISP_REMOTE_TX	
	2 | DISP_CPUREM_RX		2	———	2		2 | DISP_CPUREM_RX	
	3 | RCU_POWERON		3	———	3		3 | RCU_POWERON	
	4 | DISP_CPU_TX		4	———	4		4 | DISP_CPU_TX	
	5 | +24 V		5	———	5		5 | +24 V	
	6 | BTN1		6	———	6		6 | BTN1	
	7 | GND		7	———	7		7 | GND	
	8 | +5 V		8	———	8		8 | +5 V	
	9 | DISP_REMOTE_RX		9	———	9		9 | DISP_REMOTE_RX	
	10 | DISP_CPUREM_TX		10	———	10		10 | DISP_CPUREM_TX	
	11 | DISP_CPU_RX		11	———	11		11 | DISP_CPU_RX	
	12 | +24 V		12	———	12		12 | +24 V	
	13 | +24 V		13	———	13		13 | +24 V	
	14 | GND		14	———	14		14 | GND	
	15 | GND		15	———	15		15 | GND	
	Housing		Housing	Cable shield	Housing		Housing	
D-sub connector, 15-pin, female (Rear panel front view)		D-sub connector, 15-pin, male				D-sub connector, 15-pin, female		D-sub connector, 15-pin, male (Rear panel front view)

Table 2-1 | ACOM 2020S - RCU R05 connection cable wiring

g) Main fuses

Please, see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (g).

NOTICE

If occasion should require replacement of the mains fuses, replace them as described in Section ***7.3 Fuse Replacement***!

h) The IEC 320-C20 (IEC 60320-C20) Power inlet

Please, see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (h).
Due to the different standards in different countries, the mains plug for the amplifier power supply cable is supplied and mounted by the dealer. He connects to the mains cord end a standard mains supply plug which meets the Safety Class I unit standard in your country.
The power supply cable (a part of delivery) is in-factory assembled with power plug IEC 60320-C19 and with free cable end at other side (3x2.5 mm², length 1.80 m (suitable cables are AWG 13 or SWG 15)).

Figure 2-5 | Power supply cable

2.4.2. Connections on RCU rear panel

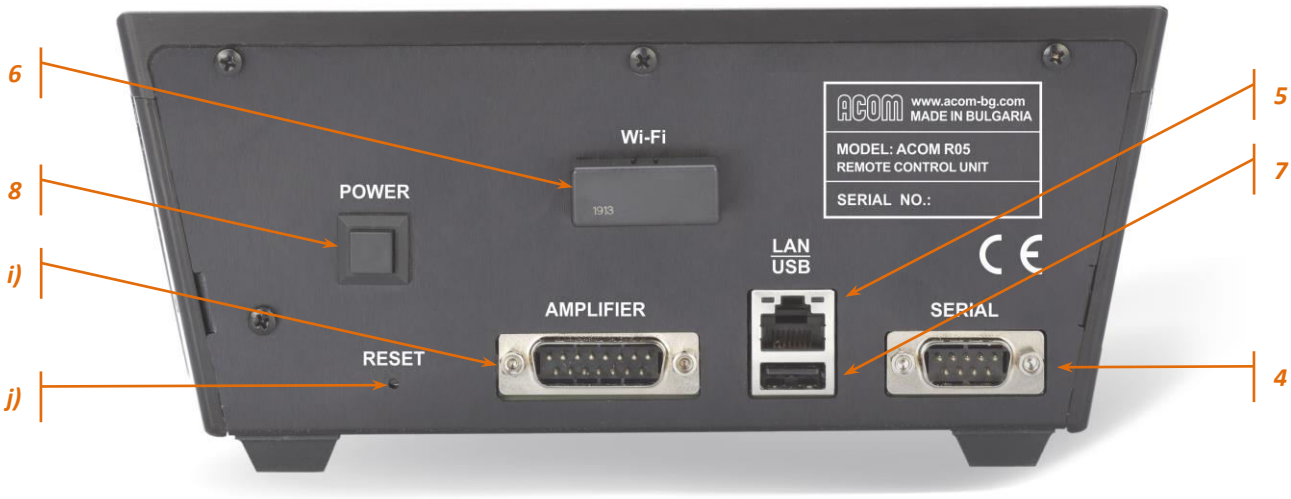


Figure 2-6 | RCU model R05 rear panel

i) **AMPLIFIER** connector

Please, see ***Figure 2-6 | RCU model R05 rear panel***, Pos. (i).
Connect the end of the ACOM 2020S to RCU connecting cable (part of delivery - see ***1.4 Equipment Supplied***) as described in Section ***2.4.1.f) RCU connector***.

j) **RESET** button

Please, see ***Figure 2-6 | RCU model R05 rear panel***, Pos. (j).
In the unlikely event of RCU malfunction/freeze you can restart it by pressing **RESET** button for at least 3 seconds.

k) Preparation of wall outlet

⚠ WARNING

Before connecting the amplifier to your mains supply using a licensed electrician, check that the supply is correctly wired, and is adequate for the current drawn by the amplifier (up to 20 A). Make certain that the grounding lead is connected properly and that it has a cross section not less than the cross section of the phase conductor in the wall outlet for the amplifier.

It is preferable that you use the wall outlet closest to the source. The installation leads should be at least 2.5 mm² (AWG 13 or SWG 15), recommended values if there are no stricter requirements by your local standard.

Check that the panel fuse has a free capacity for the additional load from the amplifier as specified in Section Specifications ***8.1.h) Mains Power Consumption at Rated Output Power***. If you connect the amplifier to a different mains outlet, be sure that you check it, too.

Make sure the main Power Switch (marked **ON**/**OFF**, see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (3), on the rear panel is in **OFF** position and insert amplifier's mains plug into the wall outlet prepared for it. The amplifier remains switched off.

2.5. Connecting to External Devices (transceiver, computer, etc.)

a) Amplifier's **CAT/AUX** interface connector

Please, see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. 1.
CAT/AUX interface is used for connecting and operating with various transceiver models (see ***Table 2-2 | Signals and pin out of the CAT/AUX connector*** below and the respective menu in Section ***5.3 Menu CAT SETTINGS***, ***Table 5-1 | Transceiver interface type and command set selection*** and ***Figure 5-7 | Menu CAT SETTINGS***).

Most of the modern transceivers can be connected by CAT to the ACOM 2020S. This will allow the amplifier to track the transceiver frequency without any transmission and change the bands automatically when in OPERATE mode.

The CAT cable can be supplied optionally, ordered separately or home brewed according to ***Table 2-2 | Signals and pin out of the CAT/AUX connector*** and also the transceiver's manual.

NOTICE

The CAT connection requires a cable made especially for the ACOM 2020S and your transceiver. Using an inappropriate cable may cause a serious damage to the amplifier and your transceiver!

If you need cable wiring diagrams, please, see our document **ACOM CAT cables Technical Information** (freely available as PDF-file at www.acom-bg.com), or contact your dealer (see Section ***1.3 Owner Assistance***).

Note that some of the connections - to the transceiver's BCD band data outputs and Band Voltage outputs do not provide an exact frequency data, but only band data.

Besides the RS-232 and TTL compatible serial interface, the CAT connector also carries the KEY-IN and KEY-OUT lines, which can be used instead of using separate cables for those functions from the transceiver to the sockets of the same names.

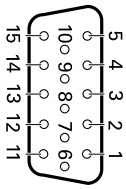
CAT/AUX interface	Pin Nr.	Pin name	Description	Specification
 D-sub connector, 15-pin, 3-row, female (Rear panel view)	1	RxD	Receive Data	TTL input
	2	RxD	Receive Data	RS-232 input
	3	TxD	Transmit Data	RS-232 output
	4	TxD	Transmit Data	TTL output
	5	GND	Ground	0 Volt
	6	BAND voltage	Analogue input	0 to +8 V
	7	Band data 0	Bit 0	TTL input
	8	Band data 1	Bit 1	TTL input
	9	Band data 2	Bit 2	TTL input
	10	Band data 3	Bit 3	TTL input
	11	ON RMT	Remote Power On	+4.5 to +15 V / 3 mA max
	12	Debug mode	CPU only Power input	+8 to +15 V / 0.4 A
	13	KEY-IN	Tx request	Less than +12 V / 6 mA
	14	KEY-OUT	Tx Ready	O.C. output, up to +50 V / 20 mA
	15	GND	Ground	0 Volt

Table 2-2 | Signals and pin out of the CAT/AUX connector

b) RCU's **SERIAL** interface connector

Please, see ***Figure 2-6 | RCU model R05 rear panel***, Pos. 4 and ***Table 2-3 | Signals and pin out of the RCU's SERIAL connector***.

RCU **SERIAL** interface will be used for connecting and operating various station components that cannot supported by amplifier's **CAT/AUX** connector - transceivers, rotators, etc.

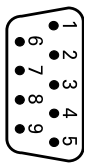
SERIAL interface	Pin Nr.	Pin name	Description	Specification
 D-sub connector, 9-pin, male (Rear panel view)	1	-	Not connected	-
	2	RxD	Receive Data	RS-232 input
	3	TxD	Transmit Data	RS-232 output
	4	-	Not connected	-
	5	GND	Ground	0 Volt
	6	-	Not connected	-
	7	RTX	Request To Send	RS-232 output
	8	CTX	Clear To Send	RS-232 input
	9	-	Not connected	-

Table 2-3 | Signals and pin out of the RCU's SERIAL connector

c) Amplifier's **RS-232** interface connector

Please, see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. 2 and ***Table 2-4 | Signals and pin out of the amplifier's RS-232 connector***.
This connector may remain unused until you decide to control the amplifier remotely (see Section ***6.2 Remote Control via RS-232 interface***).

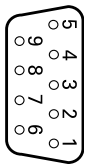
RS-232 interface	Pin Nr.	Pin name	Description	Specification
 D-sub connector, 9-pin, female (Rear panel view)	1	-	Not connected	-
	2	TxD	Transmit Data	RS-232 level output
	3	RxD	Receive Data	RS-232 level input
	4	-	Not connected	-
	5	GND	Ground	0 Volt
	6	DSR	Data Set Ready / Remote Power On	RS-232 level input
	7	-	Not connected	-
	8	CTS	Clear To Send / Remote Power On	RS-232 level input
	9	-	Not connected	-

Table 2-4 | Signals and pin out of the amplifier's RS-232 connector

d) RCU's **LAN** Ethernet interface connector

Please, see ***Figure 2-6 | RCU model R05 rear panel***, Pos. 5 and ***Table 2-5 | Signals and pin out of the RCU's LAN socket*.**
This socket (RJ45 type) may remain unused until you decide to control the amplifier remotely via your local network or via Internet.
You may select either Ethernet (cable connection) or Wi-Fi (wireless connection) interface to connect the amplifier to your local network or to Internet (see Section ***6.1 Remote Control via Ethernet Interface***). Automated software update process enables amplifier firmware download over Internet (see Section ***7.5 Firmware***).

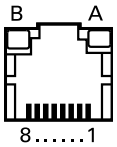
LAN interface	Pin Nr.	Pin name	Description	Colors (T568A pin assignment)
 RJ45 socket, 8-pin, female (Rear panel view)	1	Rx+	Receive Data	White - Green
	2	Rx-	Receive Data	Green
	3	Tx+	Transmit Data	White - Orange
	4	Unused	-	Blue
	5	Unused	-	White - Blue
	6	Tx-	Transmit Data	Orange
	7	Unused	-	White - Brown
	8	Unused	-	Brown

Table 2-5 | Signals and pin out of the RCU's LAN socket

e) RCU's **Wi-Fi** device interface

Please, see ***Figure 2-6 | RCU model R05 rear panel***, Pos. 6.
This interface may remain unused until you decide to control the amplifier remotely via your local Wi-Fi network or via Internet.
You may select either Ethernet (cable connection) or Wi-Fi (wireless connection) interface to connect the amplifier to your local network or to Internet (see Section ***6.1 Remote Control via Ethernet Interface***). Automated software update process enables amplifier firmware download over Internet (see Section ***7.5 Firmware***).

f) RCU's **USB** interface connector

Please, see ***Figure 2-6 | RCU model R05 rear panel***, Pos. 7 and ***Table 2-6 | Signals and pin out of the RCU's USB type A connector***.
This connector (USB type A, female) may remain unused until you decide to update firmware of your amplifier or to save Log Files to USB flash memory stick.
Please, see Sections ***7.5 Firmware*** and ***5.4 Menu FAULTS LOG***.

USB interface	Pin Nr.	Pin name	Description	Colors	
 1 2 3 4 USB A connector, 4-pin, female (Rear panel view)	1	V_{BUS}	+5 V	Red or	Orange
	2	D-	Data-	White or	Gold
	3	D+	Data+	Green	
	4	GND	Ground	Black or	Blue

Table 2-6 | Signals and pin out of the RCU's USB type A connector

3. FIRST POWER-ON, CONTROL SYSTEM, AND INITIAL CHECK

NOTICE

Do not turn the amplifier on for at least 2 hours after unpacking it in the room where it will be used. Pay particular attention when you move it from a very cold into a warm place - condensation is likely and this could result in damage to the high voltage circuits. In such a case, wait at least 4 hours. A similar effect can occur after a rapid warming of the operating room (for instance after switching on a powerful heater in a cold shack).

After following all instructions in Section ***2 INSTALLATION***, check whether the amplifier's rear panel mains rocker switch is turned OFF (see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. 3). Then insert amplifier's mains plug into the wall outlet prepared for it. The amplifier remains switched off.

Figure 3-1 | Amplifier and RCU Front panels - Controls and Readouts

3.1. Low Energy STANDBY Mode of the Power Supply

Now you can turn on the amplifier's mains rocker switch (see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. 3). This will activate only the low-energy STANDBY mode of the amplifier power supply and the red LED on amplifier's front panel will light up (see ***Figure 3-1 | Amplifier and RCU Front panels - Controls and Readouts***, Pos. (a)), as well as the red LED on RCU's front panel will light up also (see ***Figure 3-1 | Amplifier and RCU Front panels - Controls and Readouts***, Pos. (b)), while the amplifier's main power supply is still off and the RCU display is dark (see ***Figure 3-1 | Amplifier and RCU Front panels - Controls and Readouts***, Pos. (c)).

3.2. RCU Remote Control Unit

a) **POWER** button

Please, see ***Figure 2-6 | RCU model R05 rear panel***, Pos. 8.
When the amplifier's rear panel mains rocker switch is turned on, push and hold the **POWER** button located on the RCU rear panel for 1-2 seconds to start the amplifier up. In order to turn off the amplifier, push the same button to go back to low-energy STANDBY mode.

b) LED indicator

Please, see ***Figure 3-1 | Amplifier and RCU Front panels - Controls and Readouts***, Pos. (b).
When lit red and the RCU screen is dark (see ***Figure 3-1 | Amplifier and RCU Front panels - Controls and Readouts***, Pos. (c)), the amplifier is in low-energy STANDBY mode and may be turned on by pushing the **POWER** button.

When you want to fully disconnect the mains power, switch off also the amplifier's rear-panel rocker switch (see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. 3). The RCU's front-panel red LED should go off and the **POWER** button located on the RCU rear panel will become inoperative.

c) Touch screen

Please, see ***Figure 3-1 | Amplifier and RCU Front panels - Controls and Readouts***, Pos. (c).
The Remote Control Unit model R05 is equipped with 7" touch screen which features a high resolution, 24-bit color display showing the operating information.

All indicators and controls (except the primary mains switch and power indicator) are accessible via the RCU's touch screen, as well as, all command input to the RCU is menu-driven.

Touch screen precautions:

- The touch screen may not properly work when the protection film is attached;
- Touching the screen with your finger nails, sharp topped object and so on, or touching the screen hard may damage it (not covered by the warranty);
- Popular touch screen operations such as flick, zoom in (pinch in) and zoom out (pinch out) cannot be performed on this device.

Please, note that RCU R05 is delivered with protection film sticked on the display. The protection film must be carefully removed before using RCU R05 for first time.

The touch screen display may have cosmetic imperfections that appear as small dark or light spots. This is not a malfunction or defect, but a normal characteristic of the display.

3.3. Initial Turning On

In order to start up the amplifier, push and hold the RCU's rear panel **POWER** button for one or two seconds. After pressing the power button, you will hear two short beeps, indicating that power on sequence is started. About ten seconds later (boot sequence) the touch screen will flash and show the basic screen with the amplifier information (see ***Figure 3-2 | Basic screen***).

The amplifier may start in either STANDBY or OPERATE mode depending on AUTO OPERATE user settings (see Section ***4.1.c) AUTO OPERATE user settings***).

3.4. Basic Screen

The basic screen of the RCU is most suitable for monitoring the operation of the amplifier in real time. It also controls frequently used functions of the ACOM 2020S. This includes touch change of OPERATE / STANDBY mode and bands, selection of monitored parameters, as well as access to user settings and service functions.

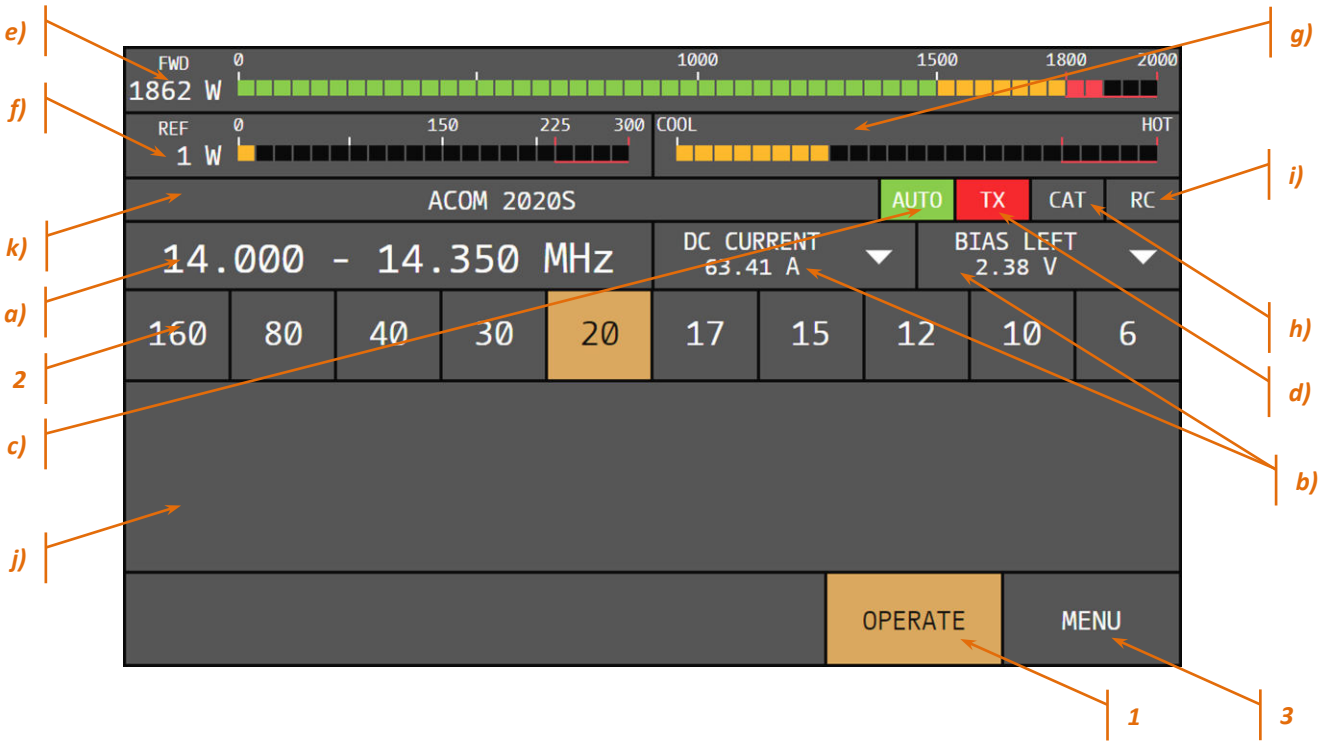


Figure 3-2 | Basic screen

The following information areas are to be distinguished on the basic screen:

a) Information area for the frequency band

Please, see ***Figure 3-2 | Basic screen***, Pos. (a).
The edges of the currently selected BAND are displayed. If the amplifier doesn't receive any operating frequency data from CAT or via RS-232, it will switch to the last used band.
It changes automatically in case the amplifier is sent a signal in a frequency range, different than the one currently selected. However, it is recommended to manually change to the intended range using the band-selection buttons (see ***Figure 3-2 | Basic screen***, Pos. 2).

b) Operating values

Please, see two parameter panels on ***Figure 3-2 | Basic screen***, Pos. (b).
Any two selected parameters will be shown here. Each of them displays the value of a selected parameter. The parameter to be displayed can be chosen by touching either panel and selecting a parameter from the drop-down list. As the list is longer than the screen space, it can be scrolled by dragging with a finger. To avoid confusion, the panel for which a parameter is being chosen is highlighted while the drop-down list is visible. The wanted parameter is chosen by a single touch.

Once a new parameter is selected, the list closes automatically. The list can also be closed without selecting a new parameter by touching the **BACK** button (see ***Figure 3-3 | Basic screen - Operating values***) or by touching the highlighted panel.

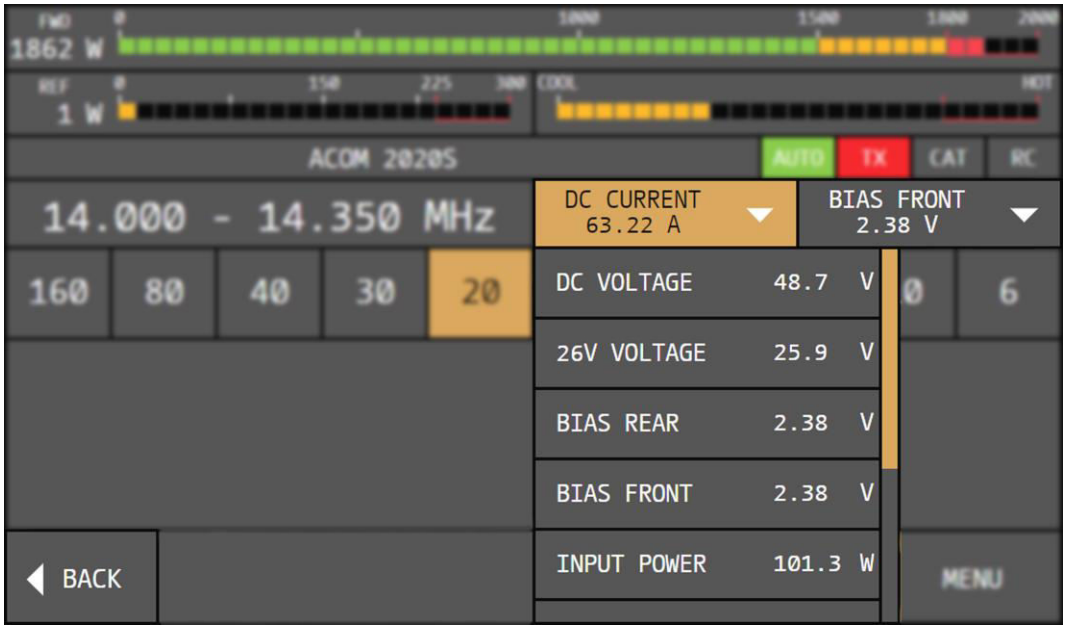


Figure 3-3 | Basic screen - Operating values

c) AUTO OPERATE indicator

Please, see ***Figure 3-2 | Basic screen***, Pos. (c).
This indicator represents the state of the AUTO OPERATE setting in the USER PREFERENCES menu (see Section ***4.1.c) AUTO OPERATE user settings***). Green color indicates that AUTO OPERATE is set to ON and dark grey color indicates that AUTO OPERATE is set to OFF.

d) RX/TX status indicator

Please, see ***Figure 3-2 | Basic screen***, Pos. (d).

RX/TX indicator displays the current operating mode of the amplifier:

- Receiving (RX) / Green light color;
- Transmitting (TX) / Red light color;
- Service (SVC) / Dark grey color.

The indicator will flash frequently if switch over request is rejected by the amplifier controller.
The service menus can be accessed either directly through the RCU touchscreen or through the web interface. If any service menu is open via the web interface, the RCU RX/TX indicator will show (SVC).

e) Forward power bar-graph and digital readout

Please, see ***Figure 3-2 | Basic screen***, Pos. (e).
Displays the forward power fed into the antenna.

f) Reflected power bar-graph and readout

Please, see ***Figure 3-2 | Basic screen***, Pos. (f).
Displays the power reflected from the antenna. Entering the red zone is not allowed.

g) PA temperature bar-graph

Please, see ***Figure 3-2 | Basic screen***, Pos. (g).
This bar-graph shows the temperature of PA module as COOL-HOT status. Entering the red zone is not allowed.

h) CAT interface information

Please, see ***Figure 3-2 | Basic screen***, Pos. (h).
CAT indicator lights green when CAT interface has been activated. When CAT is deactivated, this field is shaded.

i) REMOTE CONTROL information field

Please, see ***Figure 3-2 | Basic screen***, Pos. (i).
Flashing green the REMOTE CONTROL represents RS-232 port dataflow.

j) Alarm messages area

Please, see ***Figure 3-2 | Basic screen***, Pos. (j).

Any status or alarm messages (either WARNING or SOFT FAULT) appear on yellow background and are flashing frequently in order to attract the operator's attention (see ***Figure 4-1 | Appearance of an alarm message***). In cases where more than one messages need to be displayed at the same time, they are being automatically toggled every few seconds.

The WARNING messages appear only temporarily (for about three seconds), afterwards the indication is restored automatically (see Section ***4.3.a) First protection level - WARNING***).

The SOFT FAULT messages appear in the same field but they remain on the screen until the AUTO OPERATE time is elapsed (see Section ***4.1.c) AUTO OPERATE user settings***) or until the operator pushes any button.

k) Call sign area

Please, see ***Figure 3-2 | Basic screen***, Pos. (k).
As its name suggests this field can be used to display the User's callsign, however, any custom text can be set in the USER PREFERENCES menu.

3.5. Control System - Buttons and Menus

1) The **OPERATE/STANDBY** button is used for manual (local) control.

Please, see ***Figure 3-2 | Basic screen***, Pos. 1.
The button **OPERATE/STANDBY** switches over the amplifier between OPERATE and STANDBY modes, and serves as an indicator of the current state;

2) The ten band-selection buttons are used for direct manual (local) control.

Please, see ***Figure 3-2 | Basic screen***, Pos. 2.
These ten buttons are used to select the desired band and are labeled in meters. Currently selected band is highlighted and upon selecting one, the FREQUENCY indicator (see ***Figure 3-2 | Basic screen***, Pos. (a)) changes its value to reflect the change.

3) The **MENU** button provides access to the amplifier's settings and service functions.

Please, see ***Figure 3-2 | Basic screen***, Pos. 3.
For more details on the control system and use of the menus see Section ***5 MENUS - SETTINGS AND SERVICE*** FUNCTIONS.

3.6. Test Transmission

To make sure that you have installed the amplifier correctly, make a test transmission as described below. Repeat these tests for each band and antenna to be used, as well as after installing a new or repaired antenna, antenna switch, tuner, and / or the connecting cables.

a) Check of RF bypass path of a non-driven amplifier

For this check the amplifier must be completely installed and connected according to Section ***2 INSTALLATION***, but not powered by the mains, i.e., the main rocker switch on the rear panel (see ***Figure 2-3 | Amplifier rear panel - Connections,*** Pos. 3) must be turned off. In any case the red LED on amplifier's front panel (***Figure 3-1 | Amplifier and RCU Front panels - Controls and Readouts***, (Pos. (a)), as well as the red LAD on RCU's front panel must be dark for this test.

First, check if the transceiver's reception is normal. If you observe a significant worsening of reception, first check for a problem in the coaxial connections to the amplifier (see Sections ***2.4.1.d) RF INPUT connector*** and ***2.4.1.e) RF OUTPUT connector***, and ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (d) and (e)). Be sure to connect to the amplifier output an antenna having good SWR in the band being tested.

Provided the reception is normal, prepare the transceiver as follows:

- Select a continuous carrier mode (CW, RTTY, FM);
- Switch the microphone off (decrease the mic gain), disable FSK;
- Reduce the output power control to a minimum;
- Select a suitable indication so that you can watch the RF power and SWR at the transceiver output;
- If the transceiver has a built-in antenna tuner - switch it off.

Now in RECEIVE mode select a frequency which is not occupied at the moment and press shortly the PTT or TX key while watching the transceiver output power and the SWR readings. If either the power or SWR at the transceiver output are too high (over 5 W or SWR over 2) release the key and check for the reason as follows:

- Check again whether the power control is set at minimum;
- Check whether the frequency is within the operating range of the selected antenna;
- Check the good working order of the coaxial cables, connectors, and feed lines from the transceiver antenna jack through the amplifier bypass path (RF INPUT - RF OUTPUT), the antenna switch or external tuner (if there is one) to the BALUN transformer, and the antenna itself.

If the power and SWR are as expected, transmit again and while watching the power and the SWR readings, increase transceiver power gradually from minimum to maximum (but not more than 200 W, in order to not overload the RF by-pass circuit of the amplifier).

If SWR remains below 2 (preferably below 1.5) at the last test, decrease the power from the transceiver to minimum again and continue with the next check-up.

b) Check-up in STANDBY mode

Turn the amplifier on, as described in Sections ***3.1 Low Energy STANDBY Mode of the Power Supply*** through ***3.4 Basic Screen*** (see ***Figure 3-2 | Basic screen***).

Make sure that the amplifier is in STANDBY mode. Push the **OPR/STB** button if needed to change to STB.

Repeat receive and transmit tests the same way you just did with the amplifier turned off but in STANDBY mode now. During these tests note also whether the forward and reflected power bar graph and digital readout (see Sections ***3.4.e) Forward power bar-graph and digital readout*** and ***3.4.f) Reflected power bar-graph and readout***), show respective RF power presence. If the reflected power exceeds the forward power, verify that the input and output coaxial cables to the amplifier are not interchanged (see Sections ***2.4.1.d) RF INPUT connector*** and ***2.4.1.e) RF OUTPUT connector***, and ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (d) and (e)),

The power indication accuracy is optimized around the 1500 W level and usually it is unreliable below 50 W.

c) Entering OPERATE mode

Entering the OPERATE mode the transceiver receiving should not suffer. If it worsens and besides the indicator RX changes into TX although the transceiver is in receive mode, check the control cable connected to the **KEY-IN** input (see Section ***2.4.1.b) KEY-IN connector*** and ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (b)) for a short circuit. A wrong connection to the transceiver could cause the same problem.

d) Test transmission with the amplifier

If not readily set by CAT, switch the amplifier to the same band as the transceiver and antenna.

Set the transceiver to a continuous carrier mode and minimum power. In OPERATE mode choose a free frequency and push the PTT or CW key briefly, while watching the amplifier's behavior:

- RX mode must change to TX;
- The reflected power must read below 20 W;
- The forward power must read between 60 and 120 W with 5 W drive power from the transceiver;

If the above test goes normally, push briefly the PTT once again, this time watching the transceiver's SWR reading (i.e., the input SWR of the amplifier) - this must be below 1.2.

If the SWR to the transceiver is higher than 1.2, check the coaxial cable between transceiver's output and amplifier's input socket (see Section ***2.4.1.d) RF INPUT connector*** and ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (d)).

e) Setting of drive level and typical operation

After successfully passing of the above tests push PTT or CW key for several seconds, watching the forward and reflected power. Increase the drive power until the forward power bar graph and digital readout reach 1500 W.

Upon reaching 1500 W forward power check the following parameters (continuous carrier operation):

- The reflected power must not exceed ~166 W (for SWR 2) or better still to be below 60 W (for SWR 1.5);

f) Elimination of electromagnetic compatibility (EMC) problems

If you use powerful amplifier for the first time in your shack, you may need to make some improvements in the setup. It is possible you might experience tingling from metallic objects due to the stronger radiated RF field. It could affect the operation of your station or systems outside, if they are too sensitive - typical examples are the microphone, CW keyer, computer keyboard or mouse, as well as TV receivers, Hi-Fi, intercom or telephone setups and others.
For instance, induction of RF currents into the microphone, CW keyer or computer keyboard, may lead to distortion in the peaks or relaxation oscillation in SSB mode, "sticking" or breaking off the dots or dashes from a Morse keyer, or garbling computer screen images. For the elimination of such problems, we recommend that you take the following general measures:

- Minimize the radiation from the antenna feeders by reducing the common mode currents in them, and improving the balance of antennas;
- In case you use asymmetric antennas (GP and similar) install as many radials as practical (use a well-developed counterpoise system);
- Add current chokes on the coaxial feeders;
- Place as far away as possible (also by height) the radiating elements of antennas from the premises, where the affected devices are located. In this sense, asymmetrical antennas without a separate feeder (Long Wire, Windom, and similar) may cause more interference because their radiating element begins immediately from the shack (part of it is the feeder itself);
- If the use of asymmetrical directly fed "wire" antennas is inevitable, use mainly half wave or half wave multiple lengths - they have a high input impedance, operate respectively with a small current at the feed point, and in the grounding of the shack. Thus, you can reduce the strength of the disturbing RF fields more than 10 times (at the same radiated power) compared to the case with quarter-wave and multiple to quarter-wave antennas of this class - you should avoid them because they have a low input impedance and operate with a large RF current in the grounding system and in the power supply network respectively, i.e., they create stronger disturbances (RFI);
- Improve the RF grounding system: use the shortest and widest possible metal strips for the connections to ground and between the different gear in the shack. Connect one or more counterpoises (sized for the problematic band) to the feeder shield at the point, where it enters the building, and the same point - with the possibly shortest and widest connections - to the grounding system: this is a very efficient measure, in particular if the shack is located on a high floor above ground;

- To reduce the RF impedance of the grounding connections sheet metal stripes instead of flexible braids are preferred;
- Thread ferrite beads or snap-in ferrites with medium permeability (800-4000) over the power cord, the feeder and the signal cables leading to the affected devices (TV, etc.); besides the size, consider the frequency range in which the offered ferrites are effective - normally they are optimized for suppression of interferences on HF (with larger permeability), with medium permeability for HF-VHF or with low permeability - only the VHF range. The latter are ineffective for HF;
- Whenever possible use shielded cables and ground their shields at both ends;
- The addition of even quite simple low pass L/C or R/C filters directly to the disturbed inputs or outputs of the devices is very effective, provided it is practically applicable.

Last but not least, bear in mind that the benefit of the above measures is two-fold.

Firstly - they reduce the interferences from your transmissions to the ambient environment and secondly - they reduce the background noise floor for your reception.

Practically, with no great efforts, implementing the above measures, you can reduce the receive background noise floor with one or more S-units across the different bands. This will allow you not to miss weaker stations, which will hear you because of your increased transmission power.

And third, but very important: the EMI environment at your station will become safer for you and those close to you.

4. OPERATION

4.1. Change of Modes RX/TX and OPERATE/STANDBY; AUTO OPERATE User Settings

a) STANDBY mode

In STANDBY mode, as well as when the amplifier is not powered, receiving and transmitting (no more than 200 W) with the transceiver is done via RF bypass between **RF INPUT** and **RF OUTPUT** of the amplifier. In STANDBY, the transceiver's RF power is not amplified, the control **KEY-IN** input does not affect the operation, and the **KEY-OUT** output follows the **KEY-IN** input unconditionally (see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (b, c)).

b) OPERATE mode

In OPERATE mode the receive-transmit (RX/TX) direction is controlled by the **KEY-IN** input:

- At open **KEY-IN** (OPERATE/RX mode), the transceiver receives the signals from the antenna through the same RF by-pass path between **RF INPUT** and **RF OUTPUT** as with amplifier turned off or in STANDBY mode;
- At grounded **KEY-IN** ((OPERATE/TX mode) the RF drive is amplified and fed to the antenna through the **RF OUTPUT** connector.

In order to provide time required for the relays to switch safely from receive to transmit, the transceiver should provide a dead time, i.e., must "notify" the amplifier in due time by grounding the control **KEY-IN** input not later than 10 ms before feeding drive power toward the amplifier RF input. Otherwise, the protection system will read "HOT SWITCHING ATTEMPT" and will trip off.

In OPERATE mode the **KEY-OUT** output (see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (c)) follows the **KEY-IN** input only after all conditions for safe transmission have been found good by the amplifier control unit. When used, the **KEY-OUT** output duly disables transmission while the amplifier is not ready.

The two modes OPERATE and STANDBY may be changed in either way:

- Manually (locally) - by pressing the OPR/STB button alternatively (see ***Figure 3-2 | Basic screen***, Pos. 1);
- Automatically at a SOFT FAULT protection trip - when the AUTO OPERATE user setting is activated (see Section ***4.1.c) AUTO OPERATE user settings***).

Access to the OPERATE mode can be locked in the AMP SERVICE menu, the OPERATE ACCESS user setting (see Section ***5.1 Menu USER PREFERENCES*** and ***5.1.c) OPERATE ACCESS***).

c) AUTO OPERATE user settings

AUTO OPERATE user setting can be turned on/off by the operator in the USER PREFERENCES menu (see Section ***5.1 Menu USER PREFERENCES*** and ***Figure 5-2 | Menu USER PREFERENCES***) or by a remote control command.

When the AUTO OPERATE user setting is OFF, the two modes OPERATE and STANDBY can be changed alternatively by the **OPR/STB** button or by a remote control command. At a SOFT FAULT protection trip, the amplifier will revert to STANDBY mode and wait for the operator to return it to OPERATE mode by pressing the **OPR/STB** button.

When AUTO OPERATE is ON (see Section ***5.1 Menu USER PREFERENCES***), the amplifier will start up in OPERATE mode as soon as you turn it on. At a SOFT FAULT protection trip, the amplifier will also revert to STANDBY mode, but will return automatically to OPERATE mode in about 4 seconds.

Even at AUTO OPERATE on, the operator can revert to and remain in a STANDBY mode manually by the **OPR/STB** button or by a remote command. The next **OPR/STB** button push or remote command will switch the amplifier to the OPERATE mode and restore the normal operation of the AUTO OPERATE user setting.

4.2. Band Change, Standard and Expanded Frequency Coverage

When connected to a transceiver with CAT, the amplifier will change frequency bands automatically, following the transceiver's operating frequency changes.

Without CAT connection, the bands can be changed either manually or automatically (by the built-in frequency counter).

The bands are changed manually via the ten band-selection buttons (see ***Figure 3-2 | Basic screen***, Pos. 2 and Section ***3.5 Control System - Buttons and Menus***, Point 2).

For an automatic band change via the built-in frequency counter, make a quite short pre-transmission (100 ms is enough) and release the PTT for a moment before the main transmission.

If the new frequency is out of the amplifier's frequency range (see Section ***8.1.a) Frequency Coverage***), the transmission request will be denied and the following fault message will appear on the screen:

"FREQUENCY OUT OF RANGE"

The amplifier specifications are guaranteed within the bands listed in Section ***8.1.a) Frequency Coverage***.

4.3. Automatic Protection System

The ACOM 2020S control unit (see Section ***7.4 Using the Fault Codes (signatures) for Diagnostics***) keeps track of most amplifier analogue and logic signals in all modes.

Those are the receive/transmit control signal, the output relay contact state and switching times, the RF drive frequency and drive power (the input power), the final transistors DC current and DC voltage on the drains as well as, the gates bias voltage and the heat sink temperature, the main power-supply components temperature, the RF output forward and reflected power, and others. Some derivative parameters, as the power gain, the antenna SWR, and others, are watched too.

In the event a parameter limit is violated, the amplifier will assess the risk and will trigger one of the three levels of protection, as described in items (a) to (c) below. Every event is accompanied by a warning text on the screen (see ***Figure 4-1 | Appearance of an alarm message***). A sound alarm will be also produced, if set on in the USER PREFERENCES menu (see Section ***5.1 Menu USER PREFERENCES***).

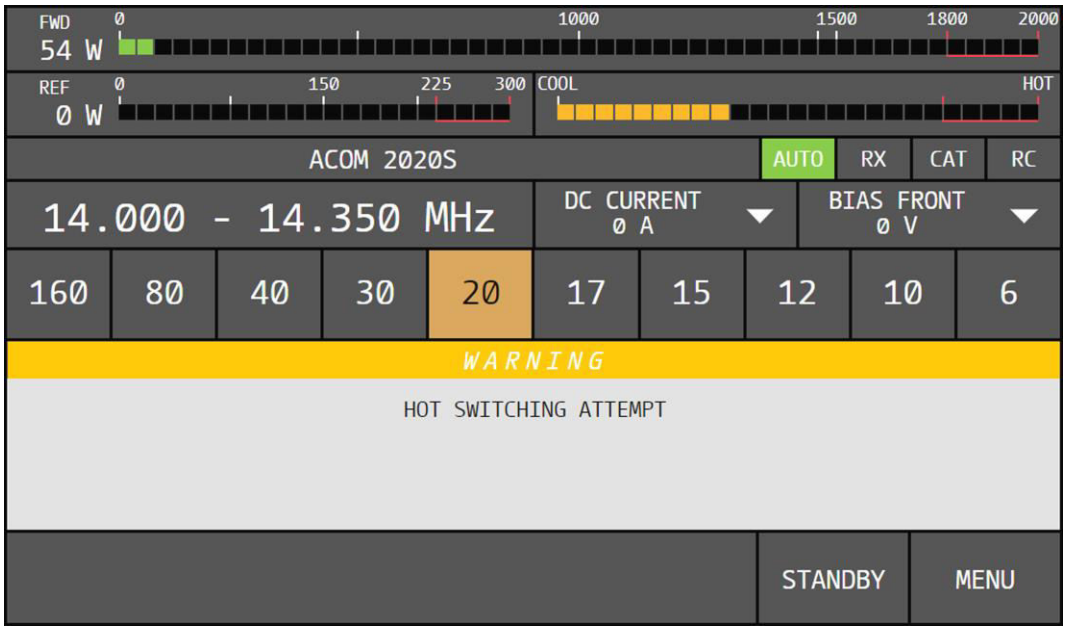


Figure 4-1 | Appearance of an alarm message

a) First protection level - **WARNING**

The first (most forgiving) protection level is a WARNING. When a value watched by the control unit approaches the protection threshold, the transmission is not interrupted, but a message appears - for example "Drive Power too High", "Drain Current too High", "Reflected Power 120 W" or another (see ***Figure 4-1 | Appearance of an alarm message***).

You can continue to transmit in these conditions, but you may take some measures, for example, to reduce a bit the drive power from the transceiver. The warnings remain on the screen for at least three seconds so that they can be read through and will disappear after the reason has dropped off.

b) Second protection level - **SOFT FAULT**

The second protection level is a SOFT FAULT - when a value exceeded the safe level, but does not put the amplifier in a danger of a failure.

At the second level (SOFT FAULT) the amplifier reverts to STANDBY mode for four seconds or permanently if the AUTO OPERATE user setting had been activated (see Section ***4.1.c) AUTO OPERATE user settings***). A respective message is shown on the screen, for example "Excessive Reflected Power", "Excessive Drain Current", and others, accompanied by a sound alarm (unless the sound had not been muted - see Section ***5.1 Menu USER PREFERENCES***).

Unlike those for a WARNING, the SOFT FAULT messages remain on the screen and persist until the operator pushes any button - in order to confirm that the message is read - or until the OPERATE mode is resumed automatically if the AUTO OPERATE user setting is active (see Section ***5.1 Menu USER PREFERENCES***).
A SOFT FAULT calls for fast and simple correcting actions by the operator, such as, for example, reducing the drive power, improving of load SWR through retuning the antenna tuner, antenna change, etc.

c) Third protection level - **HARD FAULT**

The third and most serious protection level is a HARD FAULT. The amplifier will be turned off automatically to avoid possible further damages.

When a HARD FAULT protection trips off, the data about the fault is stored in the memory and the front panel screen is blanked. There is also a sound alarm - a series of "F" sent in CW.

If the reason for tripping the protection is not obvious, you can try to turn on the amplifier. If the amplifier allows this after the fault, a fault message will appear with information about the reason for the latest automatic shutdown (for example, overheating of the power supply unit or of the PA stage).

After pushing any button, the fault message will disappear, and if there are no further problems (for example, the overheated unit has already cooled down), the amplifier operation will be restored. In the event a threshold is still violated, a new message will appear on the screen, or the protection will trip again immediately after the recovery attempt.

If the problem persists, please, contact your dealer (see Section ***1.3 Owner Assistance***).

At each HARD FAULT shutdown, the amplifier stores diagnostic data, concerning the controls and values, time stamp, and others. Your dealer or his service may ask you to copy or take a picture on the data from the amplifier screen or download it by RS-232 interface and store it in a computer file (see Section ***5.4 Menu FAULTS LOG***).

5. MENUS - SETTINGS AND SERVICE FUNCTIONS

By pushing the **MENU** button (see ***Figure 3-2 | Basic screen***, Pos. 3), the user invokes the MENU SELECTION screen (see the figure below). Each menu can be selected by a finger touch. Close the MENU SELECTION screen by touching the **BACK** button. The choices are described in the Sections below.

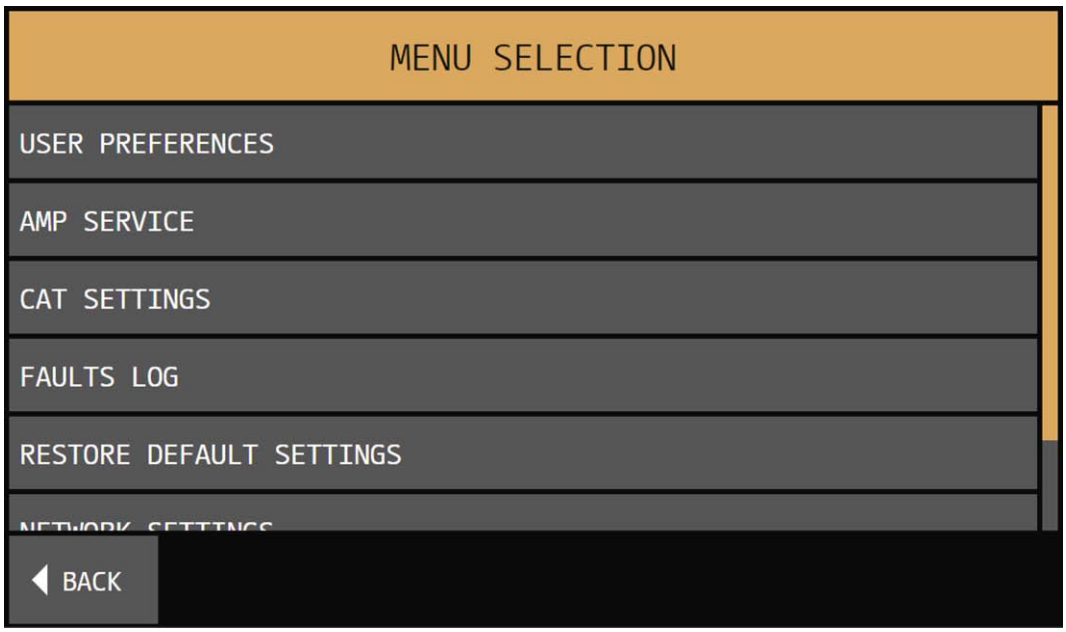


Figure 5-1 | MENU SELECTION

5.1. Menu USER PREFERENCES

The first choice from MENU SELECTION screen (see ***Figure 5-1 | MENU SELECTION***) is the menu USER PREFERENCES:

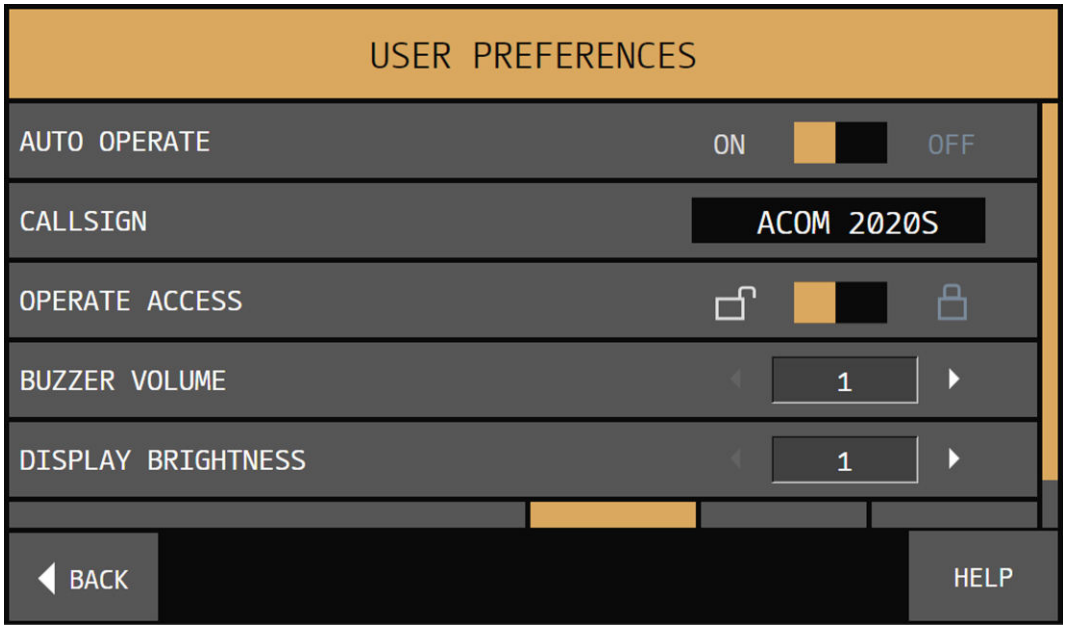


Figure 5-2 | Menu USER PREFERENCES

a) AUTO OPERATE

The AUTO OPERATE user setting is described in Section ***4.1.c) AUTO OPERATE user settings***. The amplifier may start in either STANDBY or OPERATE mode depending on this ON or OFF setting (see Section ***3.3 Initial Turning On***).

Upon triggering a WARNING during amplifier operation, a message is displayed and the amplifier is switched automatically to STANDBY mode. When AUTO OPERATE is set to ON, the amplifier will automatically be switched back to OPERATE in a few seconds.

b) CALLSIGN

If entered here, a call sign (or another text) will be displayed on the Basic screen (see ***Figure 3-2 | Basic screen***, Pos. (k)) and will be included in the FAULT LOG file generated by the amplifier (see Section ***5.4 Menu FAULTS LOG***). The call sign (or another text) will not replace ACOM 2020S logo on the startup screen.

To enter or edit the call sign text, the text area needs to be touched. This will open the virtual keyboard - see the figure below:

Figure 5-3 | Virtual keyboard

c) OPERATE ACCESS

When the OPERATE ACCESS user setting is locked, the amplifier remains in STANDBY and cannot be switched to OPERATE unless unlocked in the same menu. Passwords are not used - this is only a simple protection against possible child actions, or involuntary switching to OPERATE mode. While locked, the STANDBY/OPERATE button is disabled if not in OPERATE mode.

d) BUZZER VOLUME

BUZZER VOLUME user setting is used to set the volume of the built-in buzzer. Values from 1 to 5 can be set for volume control.

e) DISPLAY BRIGHTNESS

DISPLAY BRIGHTNESS user setting is used to set the brightness of the screen. Values from 1 to 10 can be set for brightness control.

f) INTERFACE SKIN

The interface of ACOM 2020S is skinnable - it supports various visual skins (styles). The INTERFACE SKIN control can be used to suit the interface appearance your taste. Please, note that all screenshots in this User's Manual are from the Default/Classic skin - see ***Figure 5-4 | Classic skin interface - time proven and ergonomic***, or you may prefer the dark one - ***Figure 5-5 | Dark skin interface - sleek and elegant*** below:

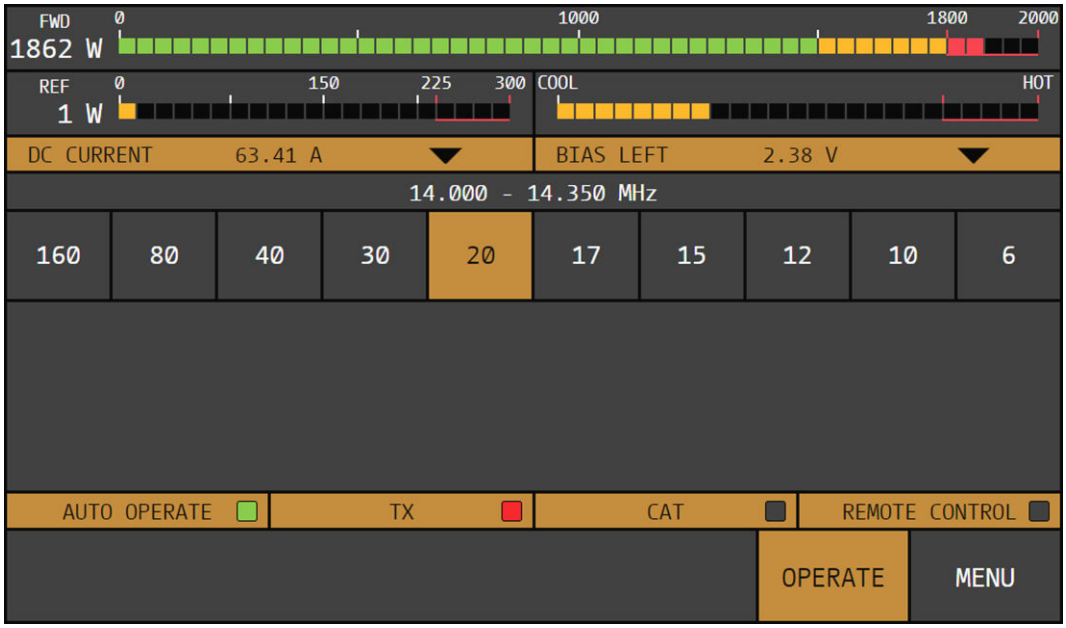


Figure 5-4 | Classic skin interface - time proven and ergonomic

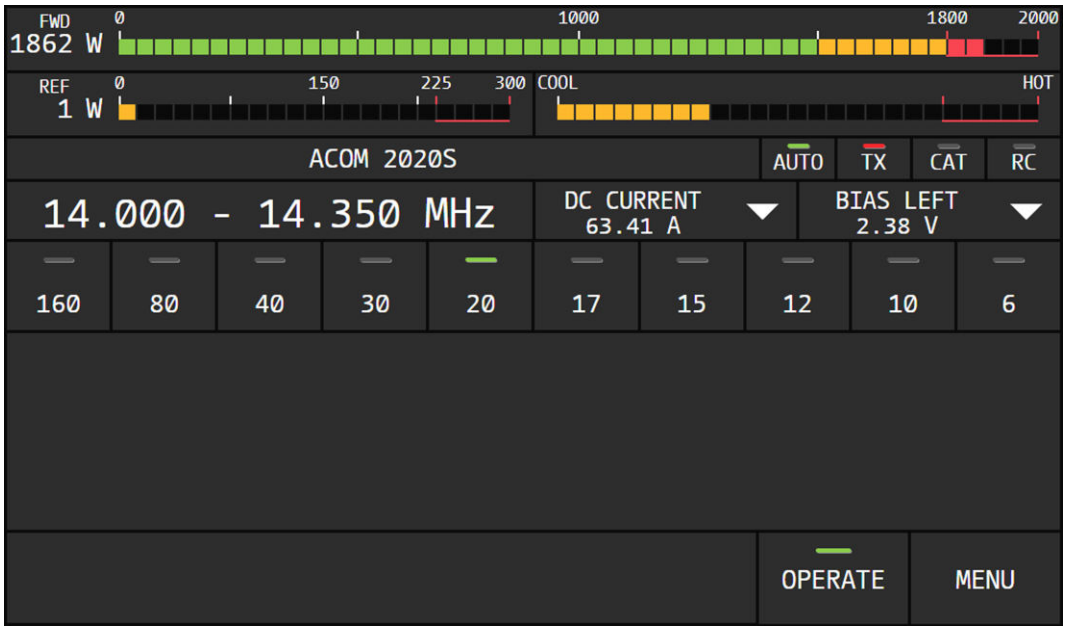


Figure 5-5 | Dark skin interface - sleek and elegant

5.2. Menu AMP SERVICE

The menu AMP SERVICE (see ***Figure 5-6 | Menu AMP SERVICE***) is accessible from the MENU SELECTION screen (see ***Figure 5-1 | MENU SELECTION***).

NOTICE

The AMP SERVICE menu is used for checking and adjustment of the zero-signal (idle) drain current of the final transistors and for testing some functions and circuits of the amplifier when serviced. We recommend these procedures are carried out only by a trained service technician!

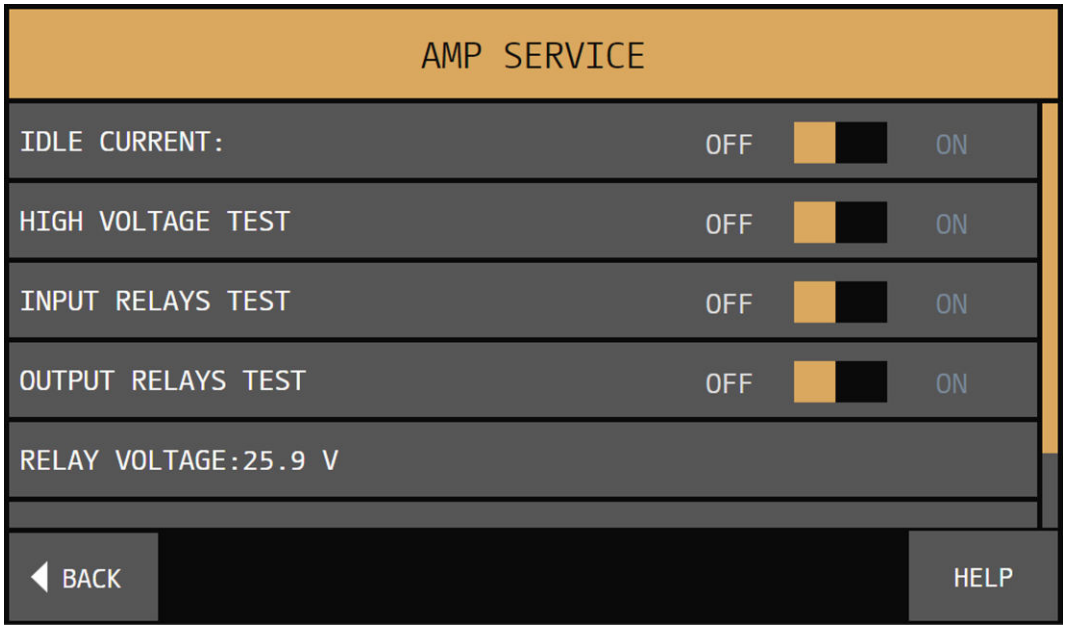


Figure 5-6 | Menu AMP SERVICE

The inactive functions are greyed out and the active are red. When leaving a function submenu, it is turned off and deactivated automatically. At pressing the **BACK** button all service functions are turned off, and the MENU SELECTION screen comes back (see ***Figure 5-1 | MENU SELECTION***). At consecutive pushing of the **BACK** button, the basic screen returns (see ***Figure 3-2 | Basic screen***).

If, the device does not operate normally and you need an amplifier servicing, we recommend repair, performed only by a trained service technician.

Contact your ACOM dealer for assistance (see Section ***1.3 Owner Assistance***).

5.3. Menu CAT SETTINGS

The menu CAT SETTINGS (see ***Figure 5-7 | Menu CAT SETTINGS***) is accessible from the MENU SELECTION screen (see ***Figure 5-1 | MENU SELECTION***).

After a CAT cable is connected between the transceiver and amplifier (see ***2.5 Connecting to External Devices (transceiver, computer, etc.)***, the correct settings for the transceiver have to be set via this menu. If there is no CAT connection, OFF has to be selected as INTERFACE type.

The CAT settings are accessible only in RX mode. The amplifier will automatically switch to SERVICE mode when entering the CAT SETTINGS menu and switch to STANDBY mode upon exiting.

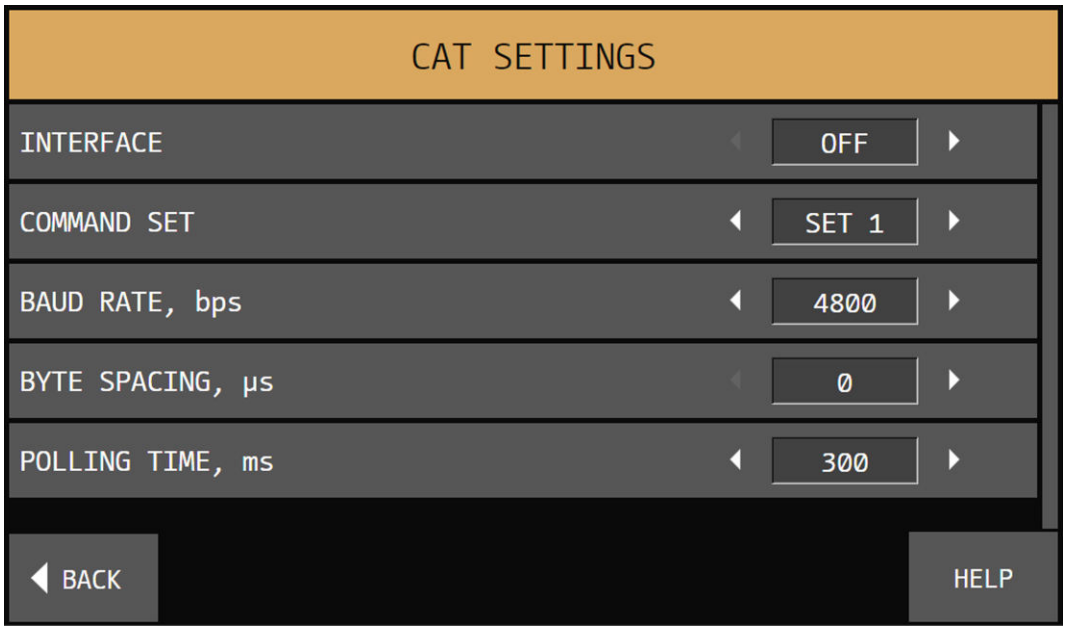


Figure 5-7 | Menu CAT SETTINGS

To setup the CAT interface, first the type of INTERFACE needs to be selected (see ***Figure 5-7 | Menu CAT SETTINGS***):

- RS-232 (serial band data, RS-232 levels);
- TTL (serial band data, TTL levels);
- BCD (parallel band data);
- VOLTAGE (analog band data).

If the amplifier **CAT** port is connected to the transceiver via either BCD or VOLTAGE output, select the respective interface type and push the **BACK** button. The other items and values will be ignored with such a selection.

If the CAT cable is plugged into the transceiver's serial port (RS-232 or TTL), select the INTERFACE and COMMAND SET according to ***Table 5-1 | Transceiver interface type and command set selection***. The baud rate has to be set to the same value as the transceiver's. The byte spacing and polling time may be left unchanged.

The different transceiver brands and models have a great variety of controls and settings of their CAT interfaces. For maximum flexibility and clarity, they are divided into several groups (SETs). In order to select the COMMAND SET and protocol parameters (BAUD RATE, BYTE SPACING, and POLLING TIME) suitable for the transceiver being used, see ***Table 5-1 | Transceiver interface type and command set selection***.

The BAUD RATE specifies the data transfer rate in number of bits per second (communication speed with the transceiver). This parameter is valid only for serial (RS-232 or TTL) CAT interface. The selection should match the baud rate selected in the respective transceiver's menu.
The BYTE SPACING introduces a pause with a specified duration (in microseconds) between the bytes within a message sent to the transceiver. This parameter is valid only for serial (RS-232 or TTL) CAT interface. The default byte spacing duration is zero (0 µs). The parameter should be increased only if communication problems appear with the transceiver.

The POLLING TIME specifies how often (in milliseconds) the amplifier checks the transceiver for a new frequency (the pause between messages sent to the transceiver). This parameter is valid only for serial (RS-232 or TTL) CAT interface. Default duration is 500 ms. Its concerns the re-tune time of the amplifier. If too short time is selected communication could suffer with some transceivers.

Transceiver	Interface	Command set
ELECRAFT K3, K3C, K4	RS-232 (8N1)	SET 5
ICOM (Connection to the CI-V REMOTE socket/jack)	TTL (8N1)	SET 1
ICOM (Connection to the RS-232 port or RS-232 port on CT-17 (CI-V level converter))	RS-232 (8N1)	SET 1
KENWOOD TS-2000, 480, 590, 890, 990 and similar	RS-232 (8N1)	SET 5
YAESU FT(FTDX)-101, 10, 450, 950, 991, 1200, 2000, 3000, 5000, 9000, and similar	RS-232 (8N2)	SET 2
YAESU FT-1000MP	RS-232 (8N2)	SET 4
YAESU FT-817, 857, 897	TTL (8N2)	SET 3

Table 5-1 | Transceiver interface type and command set selection

5.4. Menu FAULTS LOG

The menu FAULTS LOG (see ***Figure 5-8 | Menu FAULTS LOG***) is accessible from the MENU SELECTION screen (see ***Figure 5-1 | MENU SELECTION***).

This function dumps on the screen the information stored in the amplifier's memory about the last 28 HARD FAULT protection trips. The information may be also downloaded in a plain-text format file through the RS-232 port and a computer using a standard terminal emulating program (TTY).

Also, in FAULTS LOG reading mode the amplifier can save the file to USB memory stick (see Section ***2.5.f) RCU's USB interface connector***).

Saving a faults log file to USB memory is a functionality under development and will be available in a future firmware versions.

Please, see Section ***7.4 Using the Fault Codes (signatures) for Diagnostics***.

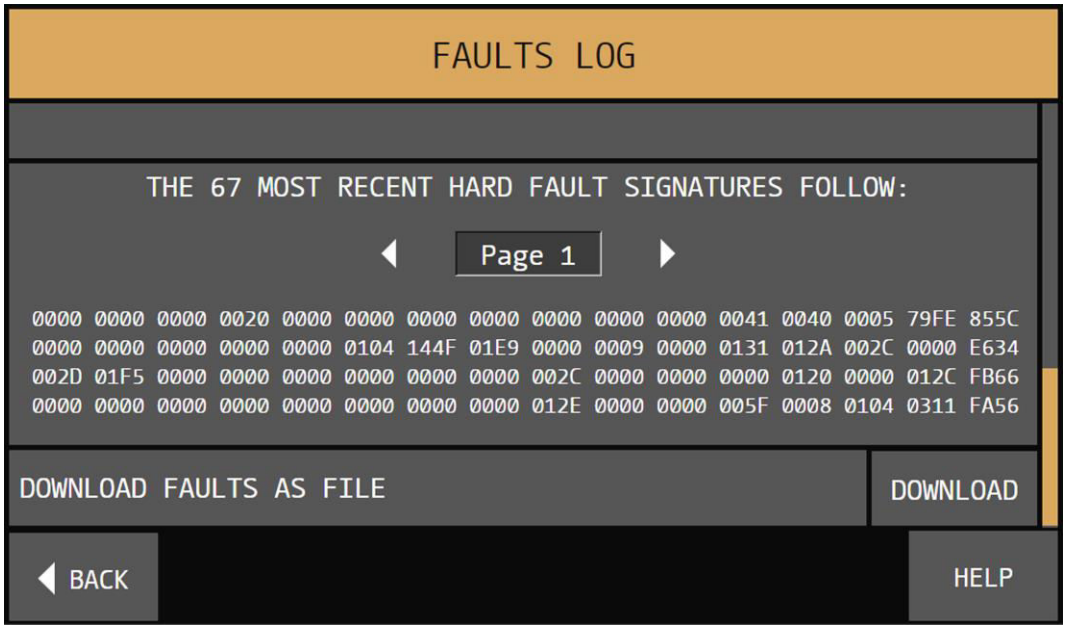


Figure 5-8 | Menu FAULTS LOG

In the Log-file title individual information about the amplifier and the options is given: model, user call sign, serial number, revisions of the hardware, firmware, bootloader, and number of worked hours.

Further on, the downloaded file contains detailed information about 55 parameters, operating frequency, and what event has tripped the protection.

5.5. Menu RESTORE DEFAULT SETTINGS

The menu RESTORE DEFAULT SETTINGS (see ***Figure 5-9 | Menu RESTORE DEFAULT SETTINGS***) is accessible from the MENU SELECTION screen (see ***Figure 5-1 | MENU SELECTION***).

Two different factory-reset options are available (see ***Figure 5-9 | Menu RESTORE DEFAULT SETTINGS***):

- RESET USER PREFERENCES TO FACTORY DEFAULTS
  Resets User Preferences (the settings from ***Menu USER PREFERENCES***) to their factory default values.

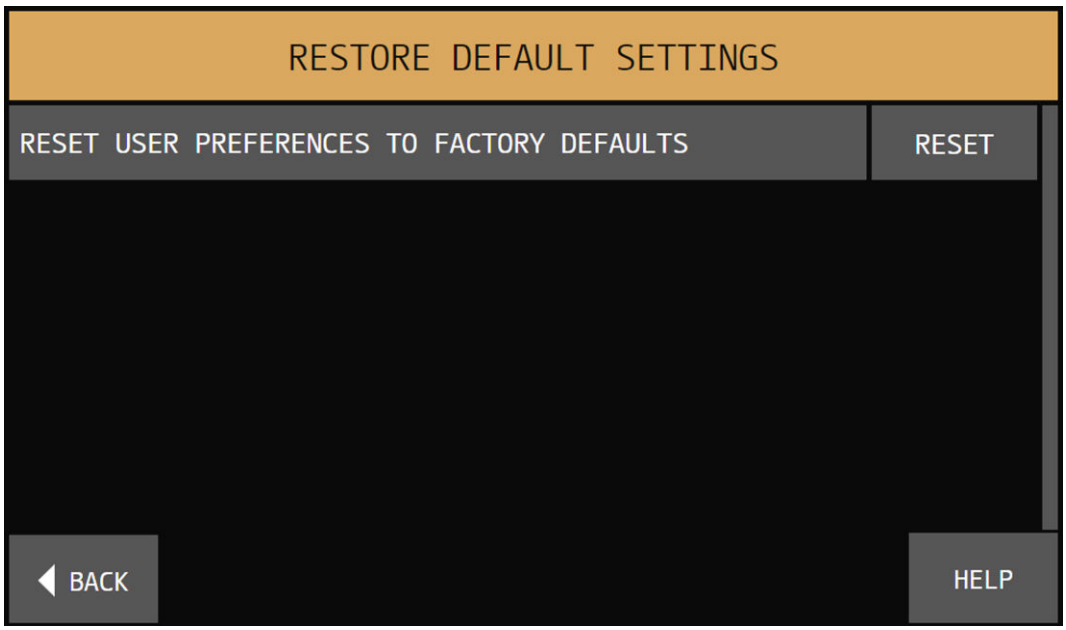


Figure 5-9 | Menu RESTORE DEFAULT SETTINGS

To reset a setting, touch the corresponding **RESET** button. This will invoke a confirmation screen with **RESET** and **CANCEL** buttons. Touch again **RESET** button to confirm resetting and return to the FACTORY RESET menu or touch **CANCEL** button to return to FACTORY RESET menu without resetting.

5.6. Menu NETWORK SETTINGS

The menu NETWORK SETTINGS (see ***Figure 5-10 | Menu NETWORK SETTINGS***) is accessible from the MENU SELECTION screen (see ***Figure 5-1 | MENU SELECTION***).
This menu is used to set the parameters for LAN (Local Area Network) network connection.

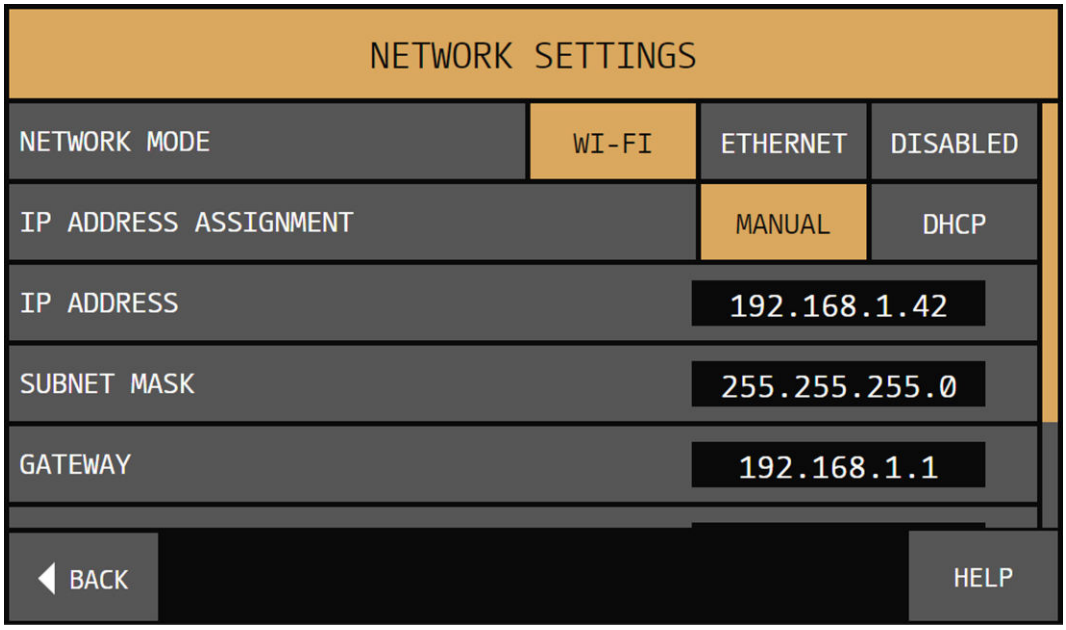


Figure 5-10 | Menu NETWORK SETTINGS

Available network parameters:

- NETWORK MODE
  This parameter is used to choose between:
  - ETHERNET wired (cable) connection (see ***2.5.d) RCU's LAN Ethernet interface*** connector);
  - Wi-Fi (wireless) connection (see ***2.5.e) RCU's Wi-Fi device*** interface);
  - DISABLED network connection (in this selection, all other fields are hidden until either ETHERNET or Wi-Fi is selected).
- IP ADDRESS ASSIGNMENT
  This parameter is used to selects the method to set the IP (Internet Protocol) address, subnet mask and gateway of the chosen network interface. There are two possibilities:
  - MANUAL
    If MANUAL is selected, the fields IP ADDRESS, SUBNET MASK, GATEWAY and DNS are enabled, and the user is able to set their values, using the on-screen virtual keypad that pops up once they are touched (see ***Figure 5-11 | Virtual keypad***);

- DHCP (Dynamic Host Configuration Protocol)
  If DHCP is selected, the fields IP ADDRESS, SUBNET MASK, GATEWAY and DNS are disabled and cannot be edited, however they remain visible so the user is able to review the settings.

- IP ADDRESS
  This parameter is used to set the IP address for ACOM 2020S in your LAN network. This parameter is disabled when DHCP is selected in parameter IP ADDRESS ASSIGNMENT.
- SUBNET MASK
  This parameter is used to set the Subnet Mask address for ACOM 2020S in your LAN network. This parameter is disabled when DHCP is selected in parameter IP ADDRESS ASSIGNMENT.
- GATEWAY
  This parameter is used to set the Gateway address for ACOM 2020S in your LAN network. This parameter is disabled when DHCP is selected in parameter IP ADDRESS ASSIGNMENT.
- DNS (Domain Names System)
  This parameter is used to set the DNS address for ACOM 2020S in your LAN network. This parameter is disabled when DHCP is selected in parameter IP ADDRESS ASSIGNMENT.

If Wi-Fi is selected in parameter NETWORK MODE, two additional fields appear:

- SSID (Service Set Identifier)
  Here you can enter the ID (name) of the wireless network you are connecting the device to;
- NETWORK KEY
  Here you can enter the required by the wireless network key/password (if any).

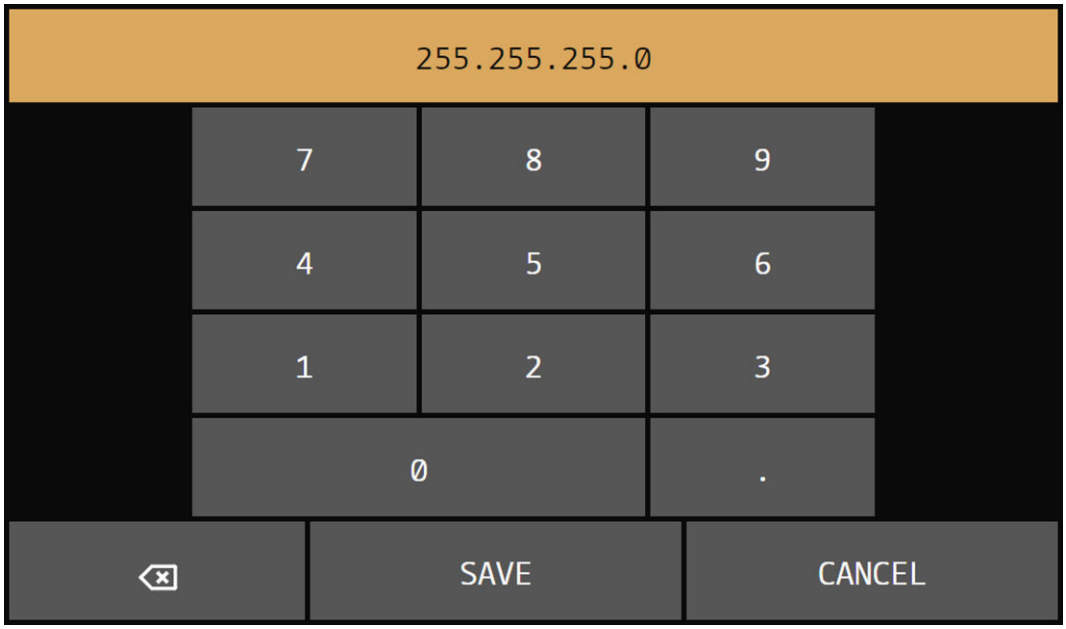


Figure 5-11 | Virtual keypad

The virtual keypad functions similarly to the virtual keyboard with the addition of real-time checking the validity of the entered IP address format. For example, it will not allow the value of an octet to be above 255 and will not allow a fifth octet.

For details on NETWORK SETTINGS and how to connect ACOM 2020S to your LAN network, please, contact a local IT professional or your Internet provider.

5.7. Menu AMP UPDATE

The menu AMP UPDATE is accessible from the MENU SELECTION screen (see ***Figure 5-1 | MENU SELECTION***).
This menu is used for updating the firmware of the amplifier.
Please, see Section ***7.5 Firmware***.

5.8. HELP information

You can find **HELP** button in many of the amplifier's menus. This is a context sensitive information and when the button is touched will display the help information for the particular menu.

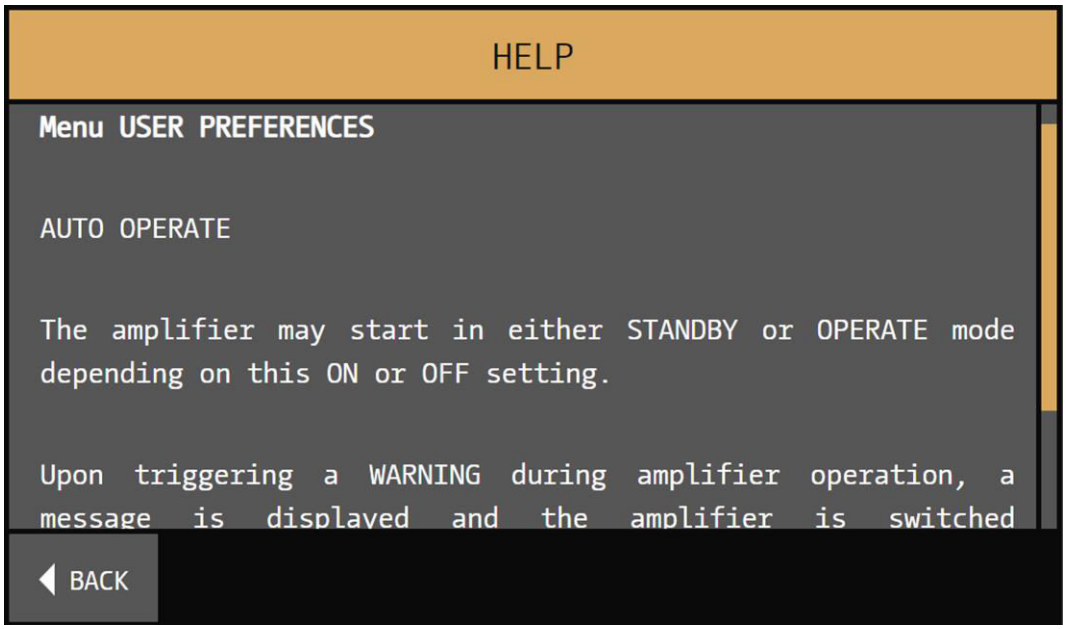


Figure 5-12 | HELP information

6. REMOTE CONTROL

Remote control of ACOM 2020S is provided by either ACOM 2020S built-in Ethernet interfaces, or RS-232 interface.

6.1. Remote Control via Ethernet Interfaces

Remote control of ACOM 2020S via Ethernet interface is provided by built-in:

- Cable Ethernet interface (see ***Figure 2-6 | RCU model R05 rear panel***, Pos. 5);
- Wireless (Wi-Fi) Ethernet interface (see ***Figure 2-6 | RCU model R05 rear panel***, Pos. 6).

When the amplifier is connected to your LAN network, its IP address (see ***Figure 6-1 | Web-interface running in web browser on a PC***, Pos. 1) can be used to access its web-interface in an any web browser, running on a device (PC, smart phone, or tablet) connected to the same LAN network. The IP address of ACOM 2020S can be seen and changed in the NETWORK SETTINGS menu (see ***5.6 Menu NETWORK SETTINGS***).

The amplifier's visualization through web-interface is identical to amplifier's "standard" user interface when operated locally.
Through amplifier's web-interface you have a full access to all menus and functionalities of ACOM 2020S.

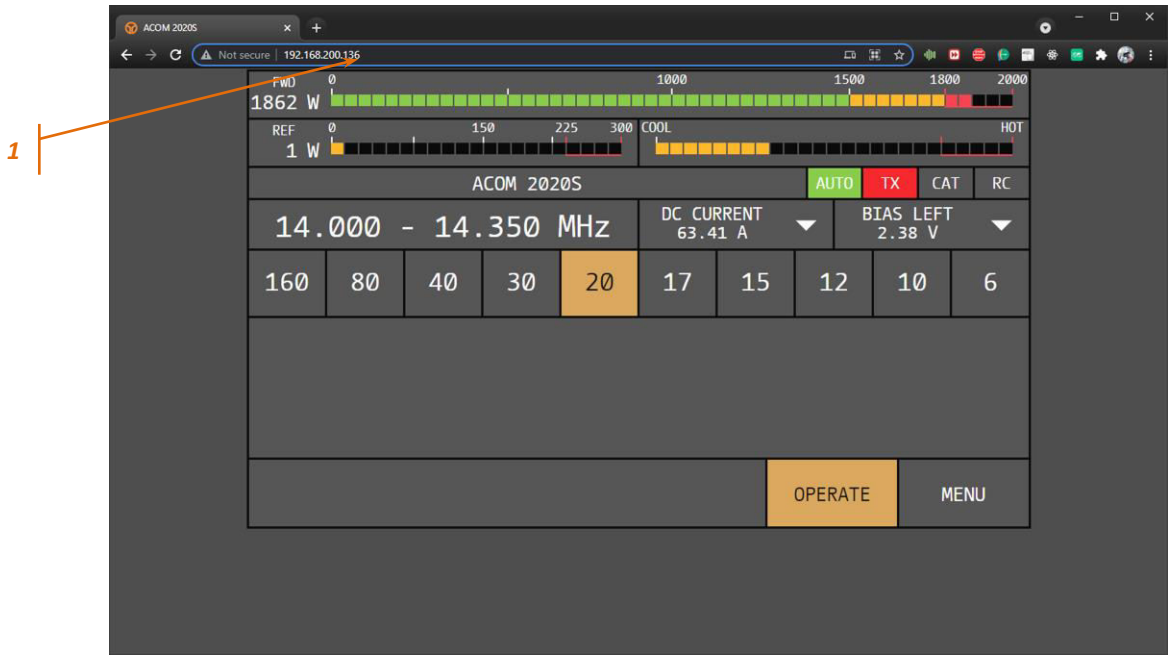


Figure 6-1 | Web-interface running in web browser on a PC

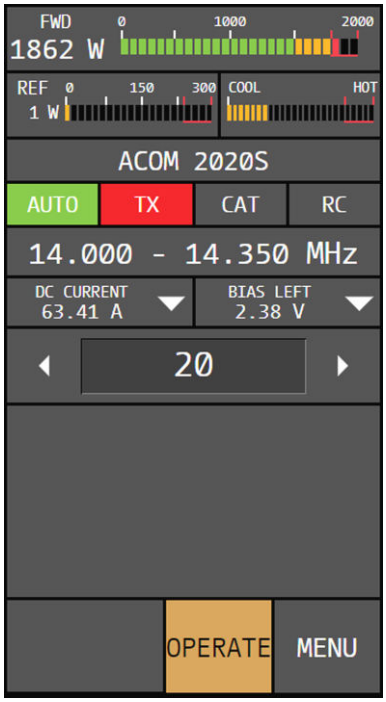


Figure 6-2 | Web-interface running in web browser on a smart phone

6.2. Remote Control via RS-232 interface

The ACOM 2020S may be controlled remotely by the RS-232 port.
For cable connection, please see Section ***2.5.c) Amplifier's RS-232 interface*** connector and ***Table 2-4 | Signals and pin out of the amplifier's RS-232 connector***.

For ACOM 2020S RS-232 interface protocol, please, contact your dealer (see Section ***1.3 Owner Assistance***).

7. MAINTENANCE

⚠ DANGER

Both the mains voltage and the high DC voltage up to 500 V inside the ACOM 2020S amplifier are LETHAL!

For your safety, pull the amplifier power plug out of the mains wall outlet and WAIT AT LEAST 3 minutes EACH TIME BEFORE you remove the cover of the amplifier.

7.1. Periodic Maintenance

Periodically (but at least once per year) check all connections, contact cleanliness and the tightening of all connectors, in particular the coaxial ones.

Check the integrity of the cables, in particular when they are laid on the floor. Check also if the cables are secured well in the area where they come out of the connector body.

Pay particular attention to the mains plug and the wall outlet (see Sections ***2.4.1.h) The IEC 320-C20 (IEC 60320-C20) Power inlet*** and ***2.4.2.k) Preparation of wall outlet***). If you have any doubts consult with a qualified electrician.

Periodically check the SWR of the antennas and if this changes over time. Problems could occur more often in poor weather conditions - rain, snow, strong wind etc.

7.2. Cleaning

⚠ CAUTION

Do not use any solvents for cleaning. They may be dangerous to you and damage amplifier surfaces, paint and plastic components.

Do not open the amplifier. Cleaning of the amplifier outer surfaces can be done with a piece of soft cotton cloth lightly moistened with clean water.
Also, clean (as much as possible from the outside, without opening the amplifier) all ventilation apertures on the front panel, rear cover and the chassis, including the ones on the top and the bottom.

⚠ DANGER

Never push or put anything into holes in the case - this will cause electric shock.

Touch screen cleaning:

- If the touch screen becomes dusty or dirty, wipe it clean with a soft, dry cloth;
- When you wipe the touch screen, be careful not to push it too hard or scratch it with your finger nails. Otherwise, you may damage the screen.

7.3. Fuse Replacement

⚠ DANGER

If replacement of fuses is necessary, first pull out the amplifier mains plug from the mains outlet and wait for at least 3 minutes!

NOTICE

For replacement, only use standard fuses from the types recommended below.

The two Primary Mains Fuses of the amplifier are located on the rear panel (see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (g)). They are fuses of the "T" type (time lag / slow blow), European size 6.3x32 mm, ceramic (or glass) body cartridge.

The fuses must be rated for 20 A / 250 V.

Suitable 20 A fuse is Schurter, PN: 8020.0605 (ceramic body cartridge).
This fuse can be ordered from:

- DigiKey (www.digikey.com), PN: 486-3829-ND;
- Farnell (www.farnell.com), PN: 1829562;
- Mouser (www.mouser.com), PN: 693-8020.0605.

If, after Primary Mains Fuses replacement, the device does not operate normally, we recommend repair, performed only by a trained service technician.

Contact your ACOM dealer for assistance (see Section ***1.3 Owner Assistance***).

Besides the primary fuses, there are internal fuses inside the amplifier.

⚠ WARNING

Do not replace internal fuses located inside the amplifier.

Blown internal fuses can be a symptom of a more serious problem, which should be resolved beforehand. A fault of this type will not occur under normal operating circumstances.

Replacing internal fuses is a complex and potentially dangerous operation.
For this reason, we recommend this work be carried out only by a trained service technician.

Contact your ACOM dealer for assistance (see Section ***1.3 Owner Assistance***).

Unauthorized replacement of inside fuses infringes the warranty conditions!

Besides several specific national standards, the principal fuses standard applied worldwide is IEC 60127.

7.4. Using the Fault Codes (signatures) for Diagnostics

The data of the last 28 HARD FAULT protection trips is stored in the amplifier memory (see Section ***5.4 Menu FAULTS LOG***).

The data can be downloaded from ACOM 2020S memory through the RS-232 port and stored in a computer file even if the amplifier cannot be turned on after a serious fault - feeding external power to the Control unit only in either of the following ways will do:

- 8 to 15 V DC voltage applied to the "DEBUG mode" input (see ***Table 2-2 | Signals and pin out of the CAT/AUX connector***) of the CAT/AUX port. The power supply has to be capable of 0.4 A current;

- If the Control board has already been taken out of the amplifier, it can be powered directly with +5 V (0.4 A) and the fault log downloaded via the RS-232 port.

In the FAULT LOG reading mode (see Section ***5.4 Menu FAULTS LOG***), the Control board automatically transmits FAULTS LOG data from the memory through the RS-232 interface (see Section ***2.5.c) Amplifier's RS-232 interface*** connector). The RS-232 protocol settings are: 9600, 8, N, 1 (9600 bit/s, 8 information bits, no parity check, 1 stop bit).

Depending on the number of fault events stored in the memory, the transmission may take between 0.5 and 12 seconds. A pause of 6 seconds follows, then transmission starts again. The data can be read in a plain-text format with a computer, using a standard terminal emulating program (TTY).

You can send the recorded file to your dealer or to ACOM accordingly. They could also provide the necessary instructions, if you choose to decode the downloaded hexadecimal data by yourself.

To decode the downloaded hexadecimal data you have to use the **ACOM Hard Faults Signatures Converter** (Excel file) for your amplifier model, distributed by ACOM free of charge. You can download **ACOM Hard Faults Signatures Converter** from ***www.acom-bg.com***.

The **ACOM Hard Faults Signatures Converter** for amplifier ACOM 2020S is a functionality under development and will be available in a future.

7.5. Firmware

7.5.1. Firmware Versions

The history of available ACOM 2020S firmware versions is shown in ***Table 7-1 | Firmware versions history***.

Version	Release Date	Amplifier CPU Module firmware / Notes
1.3	25.11.2021	Base firmware version;
Version	**Release Date**	**RCU model R05 firmware / Notes**
1.0	25.11.2021	Backend / Base firmware version;
1.0	25.11.2021	Interface / Base firmware version;

Table 7-1 | Firmware versions history

The new firmware is issued as a file, for example **ACOM_2020S_CPU_FW V1.3 - 25.11.2021.DAT**. You can download the available firmware from ***www.acom-bg.com*** free of charge.

7.5.2. Prequistments

Before you change the firmware version, check the new version compatibility with the revisions of the hardware and of the boot loader in your amplifier (see ***Figure 5-8 | Menu FAULTS LOG***). If you have any doubts about the versions, please, consult your dealer before you undertake any action.

When ACOM issues a new firmware version, the user can upload it in the amplifier after he checks the compatibility. When compatibility is confirmed a return to an earlier version is also possible.

7.5.3. Firmware update of amplifier ACOM 2020S (unit only)

For uploading a firmware to ACOM 2020S (unit only) you have three possibilities:

- Use the **ACOM Terminal S** software, distributed by ACOM free of charge. You can download **ACOM Terminal S** from ***www.acom-bg.com***;
- Use the USB memory stick connected to RCU USB port;
- Automatic firmware update through Internet.

To use the **ACOM Terminal S**, you have to install the software on a PC equipped with RS-232 port. The **ACOM Terminal S** communicates with amplifier via RS-232 interface. For cable connection, please see Section ***2.5.c) Amplifier's RS-232 interface*** connector and ***Table 2-4 | Signals and pin out of the amplifier's RS-232 connector***.

The **ACOM Terminal S** is available for MS Windows, Apple Mac, and Linux operation systems.

Firmware update from USB memory or through Internet is a functionality under development and will be available in a future firmware versions.

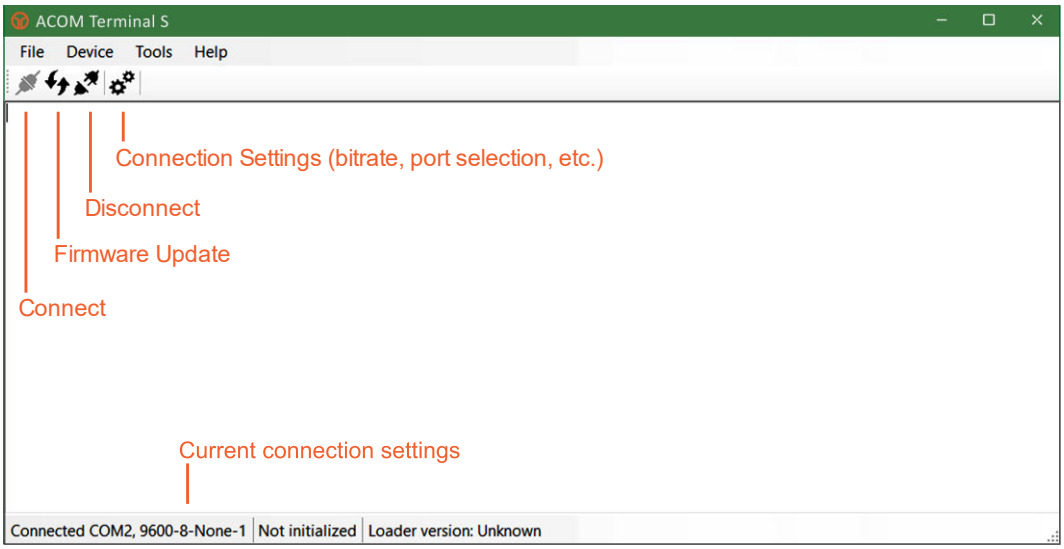


Figure 7-1 | ACOM Terminal S screenshot

For detailed instructions how to upload a firmware, please, read **Help** information in **ACOM Terminal S** software.

We strongly recommend that you backup your current amplifier firmware before performing an update procedure!

7.5.4. Firmware update of Remote Control Unit model R05

For uploading a firmware to RCU you have two possibilities:

- Use the USB memory stick connected to RCU USB port;
- Automatic firmware update through Internet;

Firmware update from USB memory or through the Internet is a functionality under development and will be available in future firmware versions.

8. SPECIFICATIONS

8.1. Parameters

a) Frequency Coverage*

1.800 - 2.000 MHz	(160 m band)
3.500 - 4.000 MHz	(80 m band)
5.020 - 5.455 MHz	(60 m band)**
7.000 - 7.300 MHz	(40 m band)
10.100 - 10.150 MHz	(30 m band)
14.000 - 14.350 MHz	(20 m band)
18.068 - 18.168 MHz	(17 m band)
21.000 - 21.450 MHz	(15 m band)
24.890 - 24.990 MHz	(12 m band)
28.000 - 29.700 MHz	(10 m band)
50.000 - 54.000 MHz	(6 m band)**

* Extensions or changes of the frequency coverage are possible on request.
** Please, refer the applicable regional band plans and laws for specific allocations and limitations.

b) Rated Output Power
- 1500 W, PEP or continuous carrier, no mode limit;

c) Intermodulation Distortions (IM3)
- Better than 30 dB below rated PEP;

d) Harmonic and Parasitic Emissions Output Suppression
- 1.8-29.7 MHz - better than 60 dB below rated output;
- 50-54 MHz - better than 70 dB below rated output;

e) Input and Output Impedances
- Nominal value: 50 Ohm unbalanced, UHF (SO-239A) type connectors;
- Input: Broadband, SWR below 1.2 (1.1 typically), 1.8-54 MHz continuous range without retuning or switching;
- RF bypass: SWR - below 1.1, 1.8-54 MHz;
- Output: Antenna SWR below 1.5 is recommended; up to SWR 3 is allowable with proportional power reduction;

f) RF power gain
- 14 dB ±1 dB (typically 60 W drive for 1500 W output);

g) Mains Power Supply Voltage
- 200-240 VAC, ±10%, 50-60 Hz, Single phase;

h) Mains Power Consumption at Rated Output Power
- Up to 3300 VA;
- Power factor of 0.95 or higher (PFC-corrected current);

i) Mains Power Consumption in Low Energy (Waiting) Mode
- Less than 1 VA;

j) Receive / Transmit control
- **KEY-IN** - Phono RCA connector
  - Voltage applied to the transceiver keying output - up to +12 V;
  - Closed-circuit current flow to the transceiver keying output - up to 6 mA;
- **KEY-OUT** - open-drain Phono RCA connector
  - Output resistance: not more than 120 Ohm;
  - The maximum allowable open-circuit voltage coming from external devices connection: +50 V;
  - Maximum allowable closed-circuit current flow by external devices: 20 mA;
- Minimum required time of sequencing between sending a request for transmitting (**KEY-IN** "ground on transmit" signal) and applying RF drive power at **RF INPUT** connector for safely switching receive to transmit: 10 ms.

k) Safety and Electromagnetic Compatibility
- Complies with CE safety and electromagnetic compatibility requirements, as well as with the US Federal Communications Commission (FCC) regulations;

l) Size & Weight (operating, excluding connected cables)
- Amplifier, WxDxH: 428x425x190 mm, 21.9 kg (16.9x16.8x7.5 inches, 48.3 lbs.);
- Remote Control Unit, WxDxH: 204x144x92 mm, 0.9 kg (8.1x5.7x3.7 inches, 2.0 lbs.);

m) Operating Environments
- Temperature range: -10 to +40 degrees Celsius (14 ^{o}F to 104 ^{o}F);
- Relative air humidity: up to 95% @ 35 degrees Celsius (95 ^{o}F);
- Height above sea level: up to 3050 m (10000 ft) without output deterioration.

8.2. Functions

a) Frequency control directly by CAT from the transceiver

b) Remotely controlled via Internet through integrated Web interface and built-in Ethernet RJ45 port and Wi-Fi adapter, or via RS-232 interface

c) Remote POWER ON by DSR/DTR and CTS/RTS lines on the RS-232 port or by built-in Ethernet port

d) Remote POWER ON / POWER OFF by DC voltage impulse or continuous DC voltage on CAT/AUX port ON_RMT input.

8.3. Regulatory Requirements

a) European conformity

European Conformity / CE mark (Conformitè Europëenne)
This symbol explains that "CE" marked ACOM product meets the essential requirements of Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

b) US Federal Communications Commission (FCC) regulations

FCC ID: **2AJXZ2020S**

FCC ID number

The FCC ID number explains that market ACOM product complies with the US Federal Communications Commission (FCC) regulations.

The FCC ID number can be checked at
www.fcc.gov/oet/ea/fccid.

FCC ID numbers consists of two elements:

- A grantee code (for example **2AJXZ**), and
- An equipment product code (for example **2020S**).

c) RF Exposure Information

This unit (ACOM 2020S amplifier) complies with the FCC RF Exposure limits for an uncontrolled environment.

To comply with FCC RF exposure limit requirements, antennas must be operated at a minimum distance of 818.24 cm or 26.85 feet between the radiator and any person's body!

The ***Table 8-1 | RF exposure distance chart*** is a calculation of distances in **meters** for several different antenna gains using the guidance in the bulletin. To calculate the distances in feet, please. multiply the distance in meters by 3.28.

CFR Title 47 Part 97.13(C) (as of Apr. 1, 2020) requires the amateur operator to be in compliance with the radio frequency exposure requirements.

The ***Table 8-2 | Different antenna gain chart*** is a representation of some commonly used antenna gains. This will give you a rough estimation of the safe distance needed from the antenna in the direction of maximum gain. The chart is worst-case conditions of a continuous carrier for the full time allowed for exposure. The charts do not take into account the antenna patterns or elevation above the ground. In practice, most antennas have the maximum gain elevated above the ground. For a better estimate, the actual antenna would need to be analyzed for direction of maximum gain and gain in the direction of interest.

Controlled environments apply where people are aware of their exposure and have the ability and knowledge to control it. Greater MPE levels are permitted in controlled areas.

A good rule of thumb is that the controlled exposure limit can be applied to those areas in which you can control access. An example of this is your fenced-in backyard. Your own household can also be a controlled environment if your family or guests have been given instruction about RF exposure and safety.

The uncontrolled environment applies to areas where people would not normally know they are being exposed. This includes "public" areas such as your property line or a neighboring apartment.
The actual exposure level is time and power averaged which will usually reduce the total exposure.

For example, the average SSB power is around 20% (if not heavily compressed) of the peak power and will be averaged for the time of the actual transmission.
For CW the power will be 100% but the transmitter will be transmitting for only about 40% of the total time. RTTY, FT-8 (also other digital modes), AM and FM, will be 100% duty cycle and last for the length of the transmission.
These calculations are for the direction of maximum gain. The FCC Office of Engineering and Technology (OET) Bulletin 65 Supplement B has more information on meeting the requirements.

For details, please, see:
https://www.fcc.gov/bureaus/oet/info/documents/bulletins/oet65/oet65.pdf
https://www.fcc.gov/bureaus/oet/info/documents/bulletins/oet65/oet65b.pdf.

Band m	Frequency MHz	Antenna gain dBi	100 W		750 W		1500 W	
			Controlled distance in meterts	Uncontrolled distance in meterts	Controlled distance in meterts	Uncontrolled distance in meterts	Controlled distance in meterts	Uncontrolled distance in meterts
160	2.000	0	0.2	0.3	0.4	0.6	0.6	0.9
		3	0.2	0.3	0.6	0.9	0.8	1.2
80/75	4.000	0	0.2	0.5	0.6	1.2	0.8	1.7
		3	0.3	0.7	0.8	1.7	1.1	2.4
60	5.450	0	0.3	0.6	0.8	1.6	1.0	2.3
		3	0.4	0.9	1.0	2.3	1.5	3.2
40	7.300	0	0.4	0.8	1.0	2.2	1.4	3.0
		3	0.5	1.1	1.4	3.0	1.9	4.3
		6	0.7	1.6	1.9	4.3	2.7	6.0
30	10.150	0	0.5	1.1	1.4	3.0	1.9	4.2
		3	0.7	1.6	1.9	4.2	2.7	6.0
		6	1.0	2.2	2.7	6.0	3.8	8.4
20	14.350	0	0.7	1.6	1.9	4.2	2.7	6.0
		3	1.0	2.2	2.7	6.0	3.8	8.4
		6	1.4	3.1	3.8	8.4	5.3	11.8
		9	2.0	4.4	5.3	11.8	7.5	16.7
17	18.168	0	0.9	2.0	2.4	5.3	3.4	7.5
		3	1.3	2.8	3.4	7.5	4.8	10.6
		6	1.8	3.9	4.8	10.6	6.7	15.0
		9	2.5	5.5	6.7	15	9.5	21.1
15	21.450	0	1.1	2.3	2.8	6.3	4.0	8.9
		3	1.5	3.3	4.0	8.9	5.6	12.5
		6	2.1	4.6	5.6	12.5	7.9	17.7
		9	2.9	6.5	7.9	17.7	11.2	20.5
12	24.990	0	1.2	2.7	3.3	7.3	4.6	10.3
		3	1.7	3.8	4.6	10.3	6.5	14.6
		6	2.4	5.3	6.5	14.6	9.2	20.6
		9	3.4	7.5	9.2	20.6	13.0	29.0
10	29.700	0	1.5	3.2	3.8	8.7	5.5	12.3
		3	2.0	4.5	5.5	12.3	7.8	17.3
		6	2.9	6.4	7.8	17.3	11.0	24.5
		9	4.0	9.0	11.0	24.4	15.5	34.5
6	54.000	0	1.5	3.2	3.9	8.5	5.6	12.4
		3	2.0	4.5	5.6	12.4	7.8	17.5
		6	2.9	6.4	7.8	17.5	11.0	24.7
		9	4.0	9.0	11.0	24.7	15.6	34.9
		12	5.7	12.8	15.6	34.8	22.0	49.3
		15	8.1	18.0	22.0	49.2	31.1	69.6

Table 8-1 | RF exposure distance chart

Antenna	Multiband vertical (R8)	Dipole 10 m high	12 m Vertical with some radials	3 el. Tribander	6 el. Yagi
Frequency, MHz	Gain, dBi	Gain, dBi	Gain, dBi	Gain, dBi	Gain, dBi
1.800	-	2.68	1.6		
3.700	-	3.37	0.7		
7.000	3.0	3.80	0.0		
14.000	3.0	6.82	1.1	9.5	11.3
21.000	3.0	7.62	4.0	10.3	11.5
28.000	3.0	7.17	4.5	10.7	11.5
50.000	3.0	8.20	6.1		12.3

Table 8-2 | Different antenna gain chart

8.4. Storage and Shipment

8.4.1. Storage Environment

The amplifier may be kept packed in a dry, ventilated and unheated location (with no chemically active substances such as acids or alkalis) within the following environment ranges:

- Temperature range: -40 to +70 degrees Celsius (-40 °F to 158 °F);
- Humidity: up to 75% @ +35 degrees Celsius (95 °F).

8.4.2. Shipping Size and Weight

- Amplifier, WxDxH: Approx. 740x600x370 mm, 29.0 kg (29.2x23.7x14.6 inches, 64.0 lbs.);

Please, contact ACOM (see ***1.3 Owner Assistance***) for shipment details.

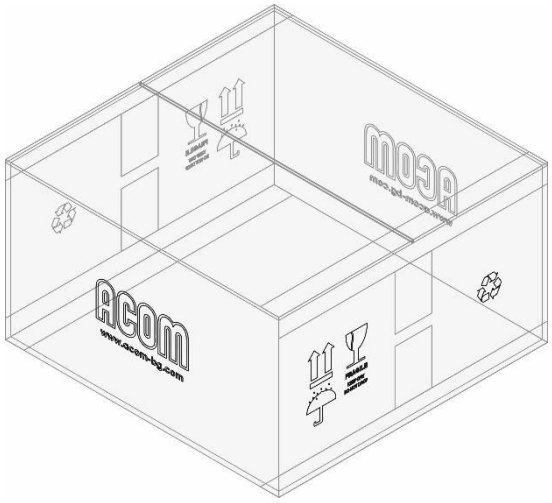


Figure 8-1 | Packaging cardboard box

8.4.3. Transportation

All types of transportation may be used, including storage in an aircraft baggage compartment at up to 12000 meters (40000 ft) above sea level.

8.4.4. Returning to the Service Provider

This document section contains the general information on packing and shipping an amplifier for diagnostics and repair.

NOTICE

Should it be necessary to ship the amplifier, use the original packing as described below.

NOTICE

Before shipping the amplifier, you should contact your local dealer first.

Your dealer can have a specific shipment requirement, e.g., a different shipping address. It is the sole customer's responsibility to ensure the commutator and all accessories are properly packaged to avoid any shipping damage.

If transporting for diagnostics and repair, you may not need to ship some cables or accessories. Please, consult with your dealer first.

Prepare the amplifier for shipping as described below:

- Switch off the amplifier via Main Power Switch (see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. 3); Make sure the Main Power Switch is in OFF position;
- Pull the amplifier's line (mains) plug out of the outlet;
- Do not disconnect **GND** connection;
- Disconnect all cables from the rear panel of the RCU;
- Disconnect all cables (except **GND** connection) from the rear panel of the amplifier;

⚠ DANGER

Remove the **GND** connection last (see ***Figure 2-3 | Amplifier rear panel - Connections***, Pos. (a)) and wait 30 minutes for safety.

- Pack the RCU in its original cardboard carton;
- Pack the amplifier in its original cardboard carton and add ACOM 2020S to RCU connection cable in a separate inner box (see ***Figure 2-4 | ACOM 2020S - RCU R05 connection cable***);
- Add the RCU carton into the amplifier carton;
- Seal the amplifier carton with heavy duty, 2-inch-wide self-adhesive tape;
- Finally, the external strapping needs to be added over the amplifier carton. Either plastic or metal bands can be used;
- Now, the amplifier is ready for shipment.

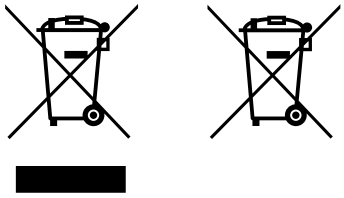
Basic shipping insurance is provided by the customer when sending in an amplifier - you can verify the amount covered by the shipping company by looking on their website. If you are shipping the amplifier, full/upgraded coverage is available as a suggested option.

For alternative shipping instructions, please, contact your local dealer.

8.5. Information on Disposing and Recycling of Old Electrical and Electronic Equipment

The information in this section is applicable for countries that have adopted separate waste collection systems.

ACOM products cannot be disposed as household waste.



Waste electricals

This symbol (crossed-out wheeled bin) explains that you should not place the electrical item in the general waste.

Waste electricals

This symbol (three green arrows going in a triangle with electrical plug in the center) means that according to local laws and regulations this product should be sent for recycling.

Old electrical and electronic equipment and batteries should be recycled at a facility capable of handling these items and their waste byproducts.

Contact your local authority for details in locating a recycle facility nearest to you.

Proper recycling and waste disposal will help conserve resources whilst preventing detrimental effects on our health and the environment.

NOTES

This manual is for electronic distribution mainly.
If you have it on paper and you no longer need it, please, recycle it!

The latest versions of our User's Manuals are available at
www.acom-bg.com

Dealer/Partner's address:

ACOM Ltd.

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Sofia-Bozhurishte Industrial Park | 6 Valeri Petrov Str.
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