

Discontinued Product Manual

ACOM 600S

1.8-54 MHz
Linear Amplifier

Operating Manual

OUTSTANDING HF POWER PRODUCTS

October 2016

ACOM600S

HF + 6 m LINEAR AMPLIFIER



OPERATING MANUAL

ACOM
Outstanding HF Power Products

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1. GENERAL INFORMATION

1-1. Inroduction and description

This manual describes the installation, operation, and maintenance of the HF+6m solid-state linear power amplifier ACOM 600S.

ACOM 600S is a state-of-the art linear amplifier which covers all amateur bands from 1.8 through 54MHz and provides more than 600 W output power (PEP or continuous carrier) with less than 30W of drive. The working parameters of the amplifier are indicated on a multi-functional, high resolution color display. The amplifier control is performed with only six buttons from the front panel, directly by CAT interface from the transceiver or remotely – by RS232 interface.

1-2. Owner assistance

If technical or operating assistance is needed, please contact your local dealer first. In the unlikely event you need further information, you may get in touch with ACOM as follows: fax: + 359 2 920 96 56, telephone +359 2 920 97 80, e-mail: acom@acom-bg.com, acom@mail.orbitel.bg or by mail to: blvd. Nikola Mushanov 151, 1330 Sofia, Bulgaria. The ACOM Internet page is: www.acom-bg.com.

1-3. Equipment supplied and options

The amplifier is supplied in single box, which includes:

- the amplifier ACOM 600S;
- this manual with a CE declaration of compliance;
- four pieces of spare fuses;

Directly from ACOM or from your dealer you can also buy some of the following options:

- CAT interface cables for connecting the supported transceiver models (please specify the wanted one);

1-4. Features

- 5“ (108x65mm) high resolution color display, 800x480 pixels, and 24-bits colors.
- The final stage uses field effect (MOSFET) transistors type MRFE6VP6300H, which, according to their manufacturer - Freescale Semiconductor - are designed to withstand high mismatch (SWR) at the output and are intended for operation in aerospace, industrial, mobile, and radio broadcast applications.
- Compatible with all transceiver models available on the market - does not need any special signals: „ground on transmit“ (PTT) and 30W of RF drive power is sufficient.

- Broadband input circuit providing a perfect transceiver load with SWR below 1.2:1 (typically 1.1:1), without retuning throughout the whole frequency range from 1.8 to 54MHz.

- The overall operation of ACOM 600S is extremely simplified: the screen menus are intuitive and easy to follow and no special skill is required from the operator when changing frequency bands.

- Possibility of automatic control – when connected to a transceiver with a CAT interface, the amplifier monitors constantly, duly follows the operating frequency, and changes the bands accordingly.

- Even if not connected with CAT interface, the amplifier monitors the frequency of the input signal through the built-in frequency counter and automatically switches over the bands.

- Remotely controlled by RS232 interface.

- Takes care of itself during operation due to the continuously working protection circuits in all modes.

- The operator can monitor digitally more than 10 parameters concerning the working regime of the amplifier.

- Easy maintenance – detailed data (55 parameters) about each of the last 28 hard-fault protection trips is stored in the amplifier's nonvolatile memory.

- Convenient for expeditions and field operation: extremely compact and light construction, extended mains voltage range 93-265VAC and 170-265VAC through changing only the main fuses - no internal switching), limited inrush current and purely sinusoidal consumed mains current, automatic Power Factor Correction (PFC) – all significant parameters in operation from unstable mains, generators etc. features achieved thanks to the built-in switching-mode power supply (SMPS).

- Perfect electromagnetic compatibility (EMC) both with the highly sensitive as well as with the powerful appliances in the radio station (receivers, computers, more amplifiers) exceeding the standard EMC requirements due to the use of PFC and the built-in additional radio-frequency filters.

1-5. Safety considerations, explicit definitions

The linear amplifier ACOM 600S is a device. Class I of protection against electric shock, i.e. the third grounding lead of its mains cord (colored yellow with two green stripes) and the grounding stud on the rear panel, marked GND (Fig. 2-1), must be connected to the grounding system of the shack for safe operation.

The ACOM 600S amplifier is designed to meet international safety standards and complies with CE safety and electromagnetic compatibility requirements, as well as FCC regulations.

This operating manual contains an assortment of precautions, indications for cautions, and warnings that MUST BE FOLLOWED by the user to ensure safe operation and always maintain the ACOM 600S amplifier in a safe working condition.

PRECAUTIONS:

The EXPLICIT DEFINITIONS described below apply to this operating manual:

WARNING **notes call attention to a procedure which, if not correctly performed, could result in personal injury, fire hazard or electric shock or lightning.**

C A U T I O N notes call attention to a procedure which, if not correctly performed, could result in equipment damage, not only in the ACOM 600S amplifier.

N O T E notes call attention to a procedure which, if not correctly performed, could result in inconvenience.

WARNING **HIGH VOLTAGE!**

The mains power voltage plus a high DC voltage up to 500V inside the ACOM 600S amplifier are LETHAL! For your safety, pull the amplifier power plug out of the mains wall outlet and WAIT AT LEAST three minutes EACH TIME BEFORE you remove the cover of the amplifier.

WARNING **HIGH VOLTAGE!**

NEVER ALLOW, ESPECIALLY CHILDREN, to push anything into holes in the case - this will cause ELECTRIC SHOCK! Never touch an antenna or antenna isolators 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 AIR movement areas.

WARNING

Do not undertake your own repairs or changes in hardware or firmware of your ACOM 600S amplifier. Doing so will endanger your or others' health or life or damage the amplifier and the equipment connected to it. Such repairs or changes are not covered by warranty and may void the warranty. The manufacturer is not liable for any such repairs or changes. Any such repairs or changes are strictly the responsibility of the person or persons engaging therein.

C A U T I O N

To avoid damage (not covered by the warranty) please read the INSTALLATION - Section 2 of this operating manual carefully. If you have any doubts or questions regarding the installation, operation or safety of the ACOM 600S amplifier, please consult your dealer immediately.

2. INSTALLATION

2-1. Unpacking and Initial Inspection

C A U T I O N

Before you start any work on installing the ACOM 600S amplifier, please thoroughly read through this manual. First carefully inspect the shipped carton and Its contents as described below for anything missing from the set (S. 1-3) or mechanical damages. If anything is missing or is obviously damaged (scratched, bent, smashed or something is rattling inside or moving freely when turning over, **notify immediately your dealer!** The delay may Infringe the warranty conditions of the carrier.

N O T E

Keep the original packing for possible future transportation.

Take out and inspect carefully the contents of the cardboard carton for possible transportation damages. On the amplifier check the chassis, the front panel, the display and the buttons below it and on the rear panel – all connectors, the main power switch, the fuses, and the integrity of the power cable - especially at the area where it comes out from the panel.

Check in the same way the options if such have been ordered.

2-2. Amplifier location selection; cooling.

Locate the amplifier close to the place where it will be used. You will need an easy access to the rear panel for connecting cables, and of course, to the buttons and the screen on the front panel of the amplifier.

The ACOM 600S operates with forced air cooling. Locate the amplifier so that there are no objects or devices closer than 10cm (4”). At an ambient temperature of 40ºC (104ºF) the exhaust air can reach 65ºC (150ºF), this is why if nearby items are sensitive to heating from outside or use forced air cooling, increase the distances accordingly.

C A U T I O N

Do not leave free papers, cloth or other light materials around and under the amplifier. They may be drawn in by the cooling air stream and block some ventilation apertures. Thus the amplifier will get easily and frequently overheated which may age prematurely the materials in its construction and lead to damages, not covered by the warranty.

2-3. Connecting the amplifier within the shack

W A R N I N G

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

W A R N I N G

Never use the gas installation tubing as grounding. This can cause an EXPLOSION!

W A R N I N G

Do not use the steam-heating or water-supply network tubing as grounding! Thus, you may involuntarily expose to dangerous voltage not only yourself but also other people using the same installation.

C A U T I O N

Have in mind that the grounding installation will have to withstand emergency currents above 15A with minimal voltage drop on it thus it may be necessary to improve its conductivity using heavier leads and lower-resistive grounding path. The grounding lead should be at least 4mm^2 (AWG 11 or SWG 13).

For details and recommendation on the grounding and RF counterpoise system concerning the electromagnetic compatibility see also S. 3-6(g).

a) GND stud - external grounding connection of the amplifier. After having made strictly all check-ups described above, first connect the grounding stud of the amplifier (located on the rear panel and marked GND – Fig. 2-1) to the grounding system of the shack.

b) KEY-IN jack - amplifier input for receive/transmit control from the transceiver.

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

Connect a shielded cable from the respective control output of your transceiver, providing “ground on transmit” (PTT), to the KEY-IN input on the amplifier rear panel (RCA PHONO jack socket – Fig. 2-1). Use a standard “RCA PHONO” jack plug for connection to the amplifier.

The manufacturers of transceivers give different names to this output, for example: TX-GND, SEND, T/R LINE, RELAY, PTT, and others. At some transceivers “ground on transmit” output should be activated by a software command, a menu or via changing a switch on the rear panel or inside the transceiver. See instructions in the manual of your transceiver.

C A U T I O N

Before connecting the KEY-IN input verify the electrical specifications of the transceiver control output (from its own manual) to make sure of their compatability. The signal voltage applied by the amplifier KEY-IN jack to the transceiver control output “ground on transmit” does not exceed +12.6V against ground and its closed-circuit current is below 6mA. See also S. 8-2(a).

N O T E

Your amplifier will not work if the KEY-IN input is not connected correctly. If you experience any difficulty consult your dealer.

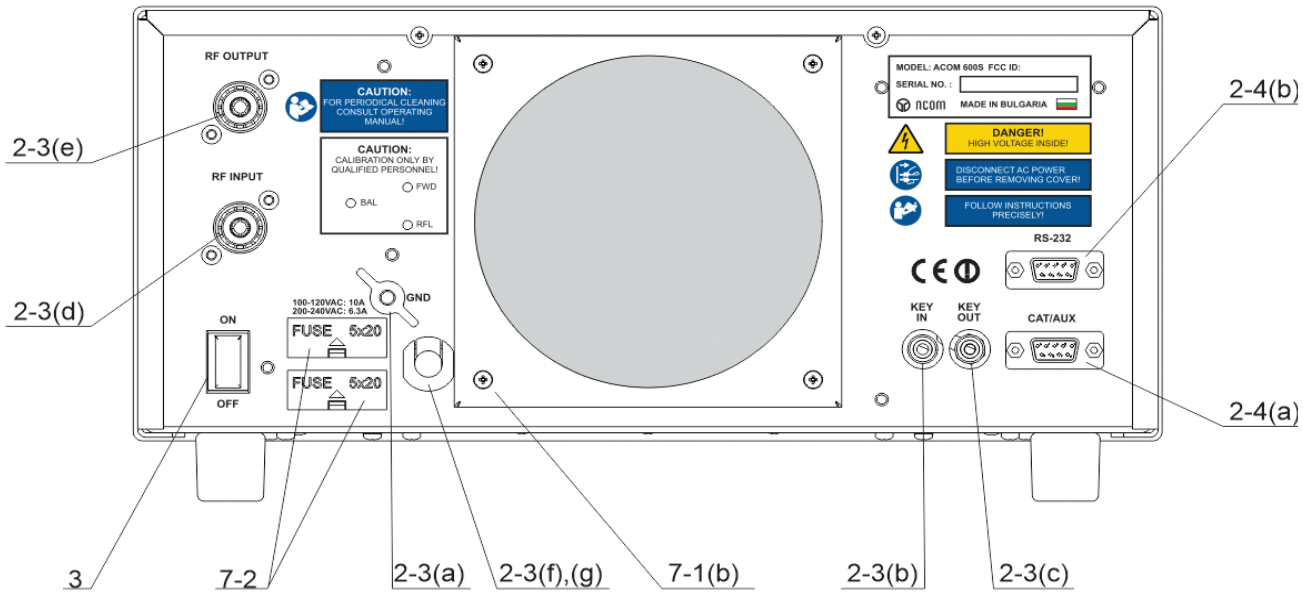


Fig. 2-1 Rear panel connections

c) KEY-OUT jack - transmit-enabling control output from amplifier to the transceiver.

The KEY-OUT jack on the rear panel provides an additional control signal from amplifier toward transceiver. It can be used for improving reliability of the receive/transmit (RX/TX) switching.

When the amplifier is not powered up, KEY-OUT is connected internally to KEY-IN through the contacts of a relay inside the amplifier, thus always enabling transceiver transmission. Also, in Stand-by mode KEY OUT unconditionally follows the state of the KEY-IN input. When in Operate mode however, KEY-OUT follows KEY- IN only when all conditions for safe transmission have been found OK by the amplifier control circuit. At detection of any risk, transmission is quickly disabled by means of opening the KEY-OUT circuit constrainedly.

C A U T I O N

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

If your transceiver has a suitable input, which disables transmission unless it is grounded externally, we recommend that you connect it to the KEY-OUT jack of the amplifier. Use shielded cable terminated with a standard “RCA PHONO” jack plug.

The manufacturers of transceivers give different names to this transceiver input, for example: TX-INHIBIT, MUTE, LINEAR, and others. Check the manual of your transceiver. Approach your dealer for details. If your transceiver has no such input, do not worry – ACOM 600S will operate normally without it as well – then KEY-OUT jack can remain not connected.

d) RF INPUT – should be connected to the antenna input/output of the transceiver.

Connect a 50-Ohm coaxial cable with a connector type PL-259 from the transceiver output (antenna jack) to the RF INPUT jack on the rear panel of the amplifier.

N O T E

When operating with the amplifier, do not turn on the transceiver built-in antenna tuner (if present).

e) RF OUTPUT – should be connected to the antenna, antenna switch or tuner.

Connect a 50-Ohm coaxial cable with a connector type PL-259 from RF OUTPUT on the rear amplifier panel to the antenna switch, tuner or antenna intended for the respective frequency band.

C A U T I O N

If you use an amplifier for the first time in your shack, pay serious attention to the size of coaxial cable from your amplifier output to the antenna. The cable must be capable of handling the increased power safely, particularly on the 10m and 6m bands. This warning refers equally to the antenna switch, tuner, and the whole antenna system, for example, for multi-band antennas with resonance circuits (traps etc).

We recommend that you use coaxial cable sized as a minimum similarly to the following types: RG8x, RG8MINI, RK50-4-11, RK50-4-13 or better still - RG213 or RK50-7-11. Consult your local supplier of coaxial cables to make the right choice.

f) Preparation of the mains outlet for the amplifier, requirements for the installation and the mains voltage.

C A U T I O N

Before connecting your amplifier to the mains, check-up with a licensed electrician if it is properly wired and if your mains is adequate for the current which the amplifier can consume at an emergency (up to10A from 200/240VAC mains and up to 15A from 100/120VAC mains). Also, make sure that the grounding lead is connected properly in the wall mains outlet intended for the amplifier. If subsequently you connect the amplifier to a different outlet, make sure about it as well.

It is preferable for the amplifier to use the closest mains outlet. Make sure that the respective

fuses, the voltage, and the frequency of your power mains match the ACOM 600S amplifier specifications (see S. 8-1(g)).

g) Mains cord – installation of mains plug and main fuses suitable for your nominal mains voltage.

C A U T I O N

If your amplifier has only one mounted mains fuse (Fig. 2-1 / S. 7-2), it is suitable ONLY for power mains networks of the type 0-220/240VAC, which are standard in the EU.

C A U T I O N

Make sure you check whether the main fuses installed in your amplifier correspond to your mains nominal voltage and if necessary replace them as described in Section 7-2!

Because of differences among standards in the different countries, the mains plug is supplied and mounted by your dealer. He connects a standard mains plug for device Class I of protection against electric shock corresponding to the national and local electrical code, safety rules, and regulations in force in your country.

C A U T I O N

The lead colored in yellow with two green stripes in the mains cord is the grounding, while the blue and brown leads are active. When the amplifier is only fitted with one mains fuse, then the fuse is connected in series with the brown lead, which must be the active.

If you have any doubt if the mains-cord leads are connected correctly in your mains plug, please consult your dealer immediately. Using a licensed electrician, the user must implement the checks mentioned above each time the amplifier is to be connected to a mains network outside the country in which it was purchased.

2-4. Installing options and connecting to external devices (transceiver, computer etc)

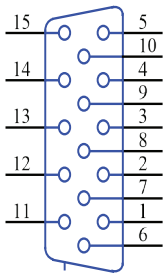
a) CAT/AUX interface - connecting and operation with various transceiver models (see table 2-1 below and the respective menu in S. 5-3 and Fig. 5-3).

Most of the modern transceivers that provide output data of their working frequency by a serial or parallel port or as an analogue signal (0 to 8V depending on the frequency) can be connected to the CAT/AUX interface connector of ACOM 600S. This will allow the amplifier to follow the changes of the frequency bands automatically and without any transmission, while the operator is operating with the transceiver.

For control of the amplifier through the CAT/AUX interface you need a special cable between the transceiver and CAT/AUX connector (type HD-15) on the rear panel of the amplifier – Fig. 2-1. Such a cable can be supplied as an option along with the amplifier or you can buy it from your dealer additionally, but you can assemble it yourself as well, using information from table 2-1 and your transceiver's manual.
Schematics of cables for connecting to many transceiver models are readily available on the ACOM Internet page (S. 1-2).

Table 2-1 shows the signals and the pin out of the CAT/AUX connector - rear panel of the amplifier.

Table 2-1

CAT/AUX interface	PIN NO.	PIN NAME	DESCRIPTION	SPECIFICATIONS
 Rear panel view	1	RxD	Received Data	TTL input
	2	RxD	Received Data	RS232 input
	3	TxD	Transmitted Data	RS232 output
	4	TxD	Transmitted Data	TTL output
	5	GND	Ground	0 Volt
	6	BAND voltage	Analogue input	0 to +8V
	7	B. data 0	Bit 0	TTL input
	8	B. data 1	Bit 1	TTL input
	9	B. data 2	Bit 2	TTL input
	10	B. data 3	Bit 3	TTL input
	11	ON RMT	Remote Pwr On	+4.5 to +15V / 3mAmax 1 to 2 seconds pulse
	12	Debug mode	CPU only Power Input	+8 to + 15V / 0.4A
	13	KEY-IN	Transmit Request	Rx/Tx control input Less than +12.6V Less than 6mA
	14	KEY-OUT	Transmit Enable	O.C. output, 0 to +50V 20mA maximum
	15	GND	Ground	0 Volt

N O T E

Due to the variety of existing CAT protocols for different transceivers, the amplifier response may be different for some transceiver models, as described below.

- Some older transceivers employ a rather slow protocol or send frequency data with a delay of several seconds – then the amplifier response will be delayed respectively;

- In some cases, when the transceiver is powered on after the amplifier, you may need to press and hold up for one second the button BAND of the amplifier, up or down (Fig. 3-2), to make the transceiver inform the amplifier about its frequency; in other occasions, the transceiver transmits its frequency only on changes and you may need to move slightly the main frequency dial knob or change it in another way in order to announce it to the amplifier after an initial power turn on;

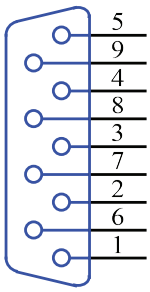
- in “split” operation, not all transceivers provide frequency data of VFO A and VFO B correctly; if your receive and transmit frequencies fall in different frequency bands (Cross Band Operation) and the amplifier unnecessarily switches between them at

each transition receive/transmit (RX/TX), you may deactivate the amplifier's CAT/AUX interface control while operating "split" (S. 5-3 and Fig. 5-3).

b) RS232 Interface. Table 2-2 shows signals and pin out of the RS232 connector on the rear panel of the amplifier.

This connector can remain unconnected until you decide to use the amplifier with remote control.

Table 2-2

RS 232 interface	PIN NO.	PIN NAME	DESCRIPTION	SPECIFICATIONS
 Rear panel view	1	-	Not connected	-
	2	TxD	Transmitted Data	RS232 level output
	3	RxD	Received Data	RS232 level input
	4	-	Not connected	-
	5	GND	Ground	0 Volt
	6	DSR	Data Set Ready	RS232 level input
	7	-	Not connected	-
	8	CTS	Clear To Send	RS232 level input
	9	-	Not connected	-

3. INITIAL POWER ON AND SETTING INTO OPERATION

C A U T I O N

Do not turn on the amplifier for at least two hours after it is unpacked and installed in its operating position. Pay particular attention whenever the amplifier is moved from a very cold place to a very warm one because unseen condensation may develop and this could result in damage to the high voltage circuits of the amplifier. Under these circumstanves, do not turn on the amplifier for at least 4 hours. A similar effect could occur following a rapid warming of the room, such as winter use of a powerful electric heater.

After having mounted and connected the amplifier according to the instructions in Section 2 INSTALLATION and have followed all requirements, check whether mains switch on the rear panel is in turned-off position – in Fig. 2-1 the rocker of the POWER ON switch must be protruding from the side of the "ON" inscription. Afterwards insert the mains plug of the amplifier into the mains outlet prepared for it. For now the amplifier remains turned off.

3-1. Low-energy (waiting) mode of the power supply

Now you can put the mains switch on the rear panel in a turned-on position, pushing its rocker so that it sinks from the side of the "ON" inscription (Fig. 2-1). This will activate only the low-energy (waiting) mode of the power supply and will illuminate the red LED above button ON/OFF on the front panel, while the main power supply is still inactive and the display is dark.

3-2. Front panel - controls and indication

a) ON/OFF button – serves for manual (local) start up of the power supply from low-energy (waiting) mode of the power supply (S. 3-1) into working mode, i.e. for activating of the main power supply and starting operation with the amplifier. The same button is used also for main power supply deactivation – return into the low-energy (waiting) mode of the power supply at ceasing operation with amplifier.

b) LED indicator above the ON/FF button. The red LED indicator glowing above the ON/OFF button at a dark display shows that mains voltage is fed from the plug, the POWER ON switch on the rear panel (Fig 2-1) is in a turned-on position, but the power supply is in its low-energy (waiting) mode (S. 3-1). In this mode activation of the main power supply is expected to start operation with the amplifier.



Fig. 3-1 Front panel

During operation with the amplifier the display is illuminated and the red LED above the ON/OFF button indicates the button location which can be very useful in case of fast switching off in poor light conditions.

c) Keyboard with 6 buttons for manual (local) control of the amplifier. The function of each button is prompted on the display above it. Depending on the menu displayed, the buttons may have different functions.

d) The color display shows all the relevant information about the status of the amplifier.

3-3. Initial turning on – activation of the main power supply

In order to activate the main power supply at starting amplifier operation, press and hold on the ON/OFF button on the front panel for one or two seconds - about three seconds later the display will flash and show the **basic screen** showing the amplifier status and operation - Fig. 3-2.

After turning on, the amplifier stands in Stand-by or Operate mode – it depends on whether the AUTO OPERATE option has been activated – see S. 5-4 USER PREFERENCES.

3-4. Basic screen

There are 9 information areas on the basic screen as follows:

a) Information area for the frequency band – the borders of the currently selected BAND are displayed.

If at start up of the amplifier there is no information about the operating frequency (neither the CAT/AUX nor the RS232 interface is connected), ACOM 600S will switch to the last used frequency.

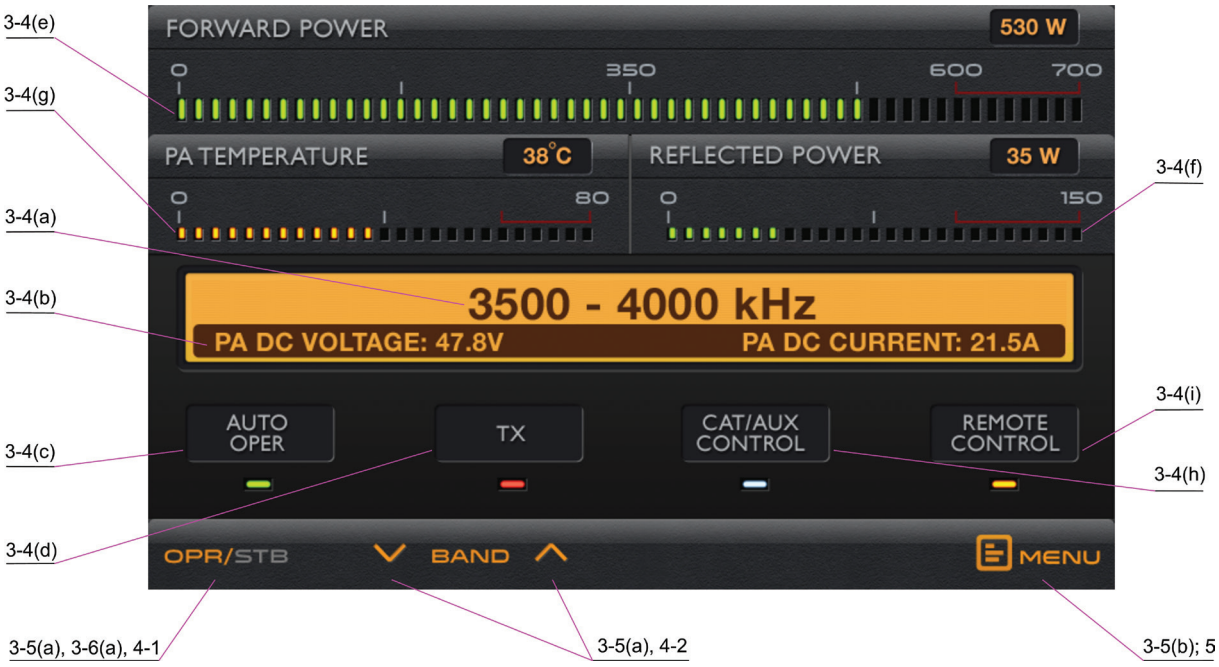


Fig. 3-2 Basic screen

b) Information area for measurements or alarm messages.

Any two operator-chosen parameters will be normally displayed in this area on black background – see the list in S. 5-1 Measurements in the amplifier – AMP MEASURE.

The alarm messages (either type WARNING or SOFT FAULT) appear with black font on yellow background on the area for measurements and are flashing frequently in order to attract the operator's attention (Fig. 4-1).

The WARNING type of messages appear only temporarily (for about three seconds), afterwards the indication of the measurements is restored automatically (S. 4-6(a)).

The SOFT FAULT type of messages appear in the same field (on the area for measurements) however they remain and persist on the screen until the AUTO OPERATE time is elapsed (S.4-1(c)) or until the operator presses any button, then the measurements indication is restored, too.

c) Indicator for the working mode - OPR, STB or AUTO OPER (S. 4-1).

d) Indicator RX/TX reflects the state of the request for transmit (KEY-IN input). The RX indication is green and the TX is red. When a request is present but it could not be performed for any reason, the respective indicator RX or TX is flashing frequently.

e) Bar-graph and digital indicator for forward power at the output. Reads the power fed from the amplifier to the antenna.

f) Bar-graph and digital indicator for output reflected power. Entering the red zone is inadmissible.

g) Bar-graph and digital indicator for temperature of the final stage. Entering the red area is inadmissible.

h) Information label for activated CAT/AUX interface. When CAT/AUX is deactivated, this label is shaded.

i) Information label for activated REMOTE CONTROL – flashes after feeding one or more commands by the RS232 interface. Dies out (remains shaded) after feeding one or more manual (local) commands from the buttons or by the CAT/AUX interface from the transceiver.

3-5. Control system – buttons and menus

a) The OPR/STB and the BAND (up and down) buttons are used for manual (local) control of the amplifier in the basic screen (Fig. 3-2):

- the left-most button – OPR/STB is for alternative switching of the amplifier mode between Operate and Stand-by;

- the next two buttons – BAND up and down arrows – serve for manual change of the frequency bands in ascending or descending order; pressing and holding on either up or down arrow for one second will refresh the information about the operating frequency on the CAT/AUX INTERFACE;

b) The right-most button – MENU (Fig. 3-2) – serves for access to the list of menus.

All necessary instruments, as well as the control and service options of the amplifier are structured in six menus. Each of them has only one hierarchical level (menu depth) – Section 5 and Fig. 5. This simplified structure gives the operator maximum clarity and possibility of easy navigation. More handiness is provided by the uniform approach to the different menus:

- in each screen (the menu list and all tools in them) the left-most button is always HELP and the right-most – always EXIT;

- the HELP button can be used at any time for obtaining of auxiliary information concerning

the currently activated screen (context sensitive help);

- the currently chosen menu title (for example AMP MEASURE) is always present at the top of the menu;

- the EXIT button can be used at any time to leave the currently used menu or the menu list for possibly easiest and fastest “return” to the basic screen (Fig. 3-2).

For more details on the control system and use of the menus see Section 5. MENUS – USEFUL INSTRUMENTS AND OPTIONS.

3-6. Test transmission

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

a) Check of RF by-pass path at non-driven amplifier.

For this check the amplifier must be completely installed and connected withing the shack according to Section 2, but not powered by the mains, i.e. the mains power plug must be pulled out from the mains outlet or the POWER ON switch on the rear panel must be in turned off position. In any case the LED above ON/OFF button must be dark for this test.

First, check if the transceiver reception is normal. If you observe a significant worsening of reception, search for the problem first in the coaxial connections to the amplifier (S. 2-3(d),(e)).

If reception is normal, prepare the transceiver as follows:

- select a continuous carrier mode (CW, RTTY, FM);

- switch the microphone off (decrease the mic gain), ban the FSK respectively;

- 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 an incorporated antenna tuner – switch it off.

Now in receive mode select a frequency which is not occupied at the moment and press shortly the transmit actuator (the PTT or the TX key) while observing the output power and the SWR indicators. If the power or the SWR at the transceiver output are too high (over 5W or SWR over 2:1) immediately release the actuator and search for the reason as follows:

- check again whether the output control is set at minimum;

- check whether the frequency on which you are transmitting is within the operating range of the selected antenna;

- check the good working order of the connecting coaxial cables, connectors, and feed

lines from the transceiver antenna jack through the amplifier, the antenna switch or external tuner (if there is one) to the BALUN transformer, and the antenna itself (S. 2-3(e)).

In case of difficulty use antenna measurement instruments or contact your dealer.

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

If SWR remains below 2:1 (preferably below 1.5:1) at the last test, decrease the power from the transceiver to minimum again and continue with the next check. Otherwise you will have to make corrections on the antenna and / or feed-line matching or use an external tuner for this antenna. The tuner should handle the maximum output power of the amplifier (S. 8-1(b)) at the respective antenna SWR.

b) Check in Stand-by mode.

After a successful check-up with non-powered amplifier, item (a), turn it on and run it to the basic screen, as described in Sections 3-1 to 3-4 (Fig. 3-2).

For this check it is necessary that the amplifier is in the Stand-by mode. If the AUTO OPER option has been activated at any previous switching on of the amplifier, it will automatically start in the AUTO OPER mode (Fig. 3-2 and S. 5-4) immediately after turning power on. In such a case, press once the OPR/STB button to return the amplifier manually to the Stand-by mode.

In this state repeat the receive and transmit tests with the transceiver through the amplifier RF by-pass path, as it was described in the preceding item (a). During these tests note also whether the bar-graphs and digital indicators for forward and reflected power in the basic screen (S. 3.4(e),(f)) show respective RF power presence. If the reflected power exceeds the forward power, verify that you have not interchanged involuntarily the input and output coaxial cables to the amplifier (S. 2-3(d),(e)).

N O T E

The power indication is optimized around the 600W level and normally it is unreliable below 50W.

c) Entering Operate mode.

After a successful check in Stand-by mode, item (b), while you are in the basic screen, press the MENU button. From the list select menu AMP MEASURE (Fig. 5-1). In the left-side of the screen select PA DC VOLTAGE and in the right-side – PA DC CURRENT (use the ITEM1 or ITEM2 buttons to scroll the list if needed). Press twice the rightmost EXIT button to return to the basic screen. The two selected parameters – PA DC VOLTAGE and PA DC CURRENT - will be indicated in the basic screen as well – S. 3-4(b). In Stand-by mode they must be zero.

Now press the OPR/STB button to put manually the amplifier in Operate mode (S. 3-2 and Fig. 3-2). The OPER or the AUTO OPER indicator must flash and the indicator RX/TX must remain in condition RX. Besides this, PA DC VOLTAGE must become 48-52V while PA DC CURRENT must remain zero.

At entering the Operate mode the receiving of the transceiver should not suffer. If it worsens

and together with this the indicator RX changes into TX and any current appears on the drain (PA DC CURRENT) although the transceiver is in the receive mode, check if they normalize at return to the Stand-by mode.

If the problem occurs only at transition into the Operate mode and disappears at return to Stand-by, check the control cable connected to the KEY-IN input – S. 2-3(b) – it is possible that the conductor is shorted to the shield (ground) or the connection to the transceiver is wrong, thus wrongly requesting transmit mode toward the amplifier during transceiver reception.

d) Check of the RX/TX switching and the amplifier idling current without RF power.

Put the transceiver in such a mode that at pressed PTT or TX button a transmit request is applied to the amplifier but with no RF power on the transceiver output. For example, select SSB mode with microphone gain control reduced to zero or CW mode with Morse key up to avoid any RF power while requesting transmit mode to the amplifier by pressing the PTT or the TX button (do not use automatic CW keyer or VOX).

At pressing the PTT or the TX button without RF drive at the amplifier input, the green label “RX” on the basic screen must become red “TX”. Note that the indicator reflects the TX request and not its performance. Neither forward, nor reflected power must appear at the output.

If at pressing the PTT or the TX button and without RF drive at the amplifier input any indication of RF power at the output still appears, it might be due to self-oscillation or it may be externally induced by co-sited powerful transmitters. If you suspect self oscillation, check-up the coaxial cables to the input and output of the amplifier, in particular the contact of their shields to the coaxial connectors (S. 2-3(d),(e)). To check for externally induced RF power (especially if the reflected power is higher than the forward power) connect the antenna to a dummy load via an external RF wattmeter - it should read zero RF power.

e) Test transmission.

In the basic screen (Fig. 3-2) check whether the currently selected frequency band of the amplifier and the transceiver frequency match the antenna band. If needed (when the CAT/AUX interface between the amplifier and the transceiver is not connected), use BAND buttons (up and down) of the amplifier to switch to the desired frequency band manually.

In order to continue with the test transmission, prepare the transceiver mode in the same way as it was done in item (a) above: with continuous carrier mode and minimum power. Now in the Operate / RX mode choose a frequency which is presently not occupied and press the actuator for transmit (PTT) briefly, while watching the following indicators of the amplifier:

- RX mode must be changed to TX;
- the reflected power must be below 20W;
- the forward power must be between 20 and 150W with minimum drive power from the transceiver (between 1 and 5W expected with the power control set at minimum);
- PA DC VOLTAGE must be within 48-52V;
- PA DC CURRENT must be between 1 and 8A (depending on the transceiver power with its power control set at minimum).

If the above test goes normally, push briefly the transmit actuator (PTT) once again, this time

watching the transceiver SWR indicator (i.e. the input SWR of the amplifier) – it must be below 1.2:1.

f) Setting of drive level and typical operation.

After the successful passing of tests (a) to (e), in the same mode with continuous carrier and minimum power, press the transmit actuator (PTT) for several seconds, observing the forward and reflected power at the output, as well as the direct current drawn by the final stage – PA DC CURRENT. Increase the drive power gradually – from minimum until the forward power at the amplifier output reaches 600W. Observe at the same time that none of the indicators of the amplifier or the transceiver enters the colored alarm areas.

Reaching 600W forward power, check-up the following parameters (continuous carrier operation):

- the reflected power must not exceed 70W (for SWR 2:1) or better still to be below 25W (for SWR 1.5:1);

- PA DC CURRENT must be between 20 and 26A; it is normal that the current varies within these limits at changing of the operating frequency and the antenna impedance;

- PA DC VOLTAGE must be within 48 – 52V;

- the SWR indication of the transceiver must be below 1.2:1.

Enter menu MEASURE and check-up additionally:

- the drive power from the transceiver must be between 20 and 30W;

- PA BIAS must be between 2.5 and 2.9V (typically 2.8V);

- PA TEMPERATURE must be between the ambient and 80ºC (176ºF) depending on the power level and the duration of transmission.

When possible, listen to the quality of the amplified signal using a monitoring receiver or ask some regular correspondents for signal evaluation and comparison with and without amplifier.

g) Elimination of electromagnetic compatibility (EMC) problems.

If you use an amplifier for the first time in your shack, you may need to make some improvements in the set-up. It is possible you might find tingling from metallic objects due to the stronger radiated RF field. It could affect the operation of your station or systems outside it, if the latter are too sensitive – typical examples are the microphone, the Morse keyer, the computer keyboard / mouse, as well as domestic radio / TV receivers, Hi-Fi, intercom or telephone setups and others.

For instance, induction of RF currents into the microphone, Morse keyer or computer keyboard, may lead to rough distortions in the peaks or self-oscillation in SSB mode, “sticking” or breaking off the dots or dashes from the Morse keyer, or garbles on the computer screen, coming from the keyboard or mouse. For the elimination of similar problems we recommend that you take the following general measures:

- minimize the radiation from the feed lines by reducing the common mode currents in them; improve the balance of the antennas themselves and how they are fed;

- in case you use asymmetric antennas (GP and similar) install as many radials as practical (a more developed counterpoise system);

- ground the coaxial cable shield additionally on at least one spot between the antenna and the shack or if it is possible run the greater part of the feed line under ground;

- add current BALUN transformers in the coaxial feeders at the antenna itself, as well as at the feeder entering the building (although this may seem unnecessary at GP);

- take away as far as possible (also by height) the radiating elements of the antennas from the premises where the affected apparatus is located; in this sense, asymmetrical antennas without a feeder (type Long Wire, simple Windom, and other similar) may cause more interference because their radiating element begins immediately from the shack (it is the feeder itself);

- if the use of asymmetrical directly fed “wire” antennas is inevitable, use mainly half wave or half wave multiple – they have a high input impedance, operate respectively with a small current in the feed point, and in the grounding of the shack; thus you can reduce the strength of the disturbing RF fields in the whole 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 strips instead of flexible braids are preferred;

- thread ferrite beads with medium permeability (800-4000) over the power cord, the feeder and the signal cables leading to the affected devices (TV etc); there are suitable “split” ferrites on the market for this purpose with different sizes, shapes and parameters, inserted in locking plastic shells, which do not need to be threaded through the connectors on the cable ends and are simply put and locked over it; 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;

- screen (at least partly) the disturbed apparatus, for example, put under the keyboard, the mouse, the desk microphone or the Morse keyer a large metal sheet, connected to the grounding system of the shack;

- the addition of even quite simple low pass L/C or R/C filters directly to the disturbed inputs or outputs of the apparatus is very effective, provided it is practically applicable.

Last but not least, have 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 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.

4. OPERATION WITH THE AMPLIFIER

4-1. Change of modes RX / TX and Operate / Stand-by; option AUTO OPERATE

a) In **Stand-by** mode, as well as with un-powered amplifier, receiving and transmitting with the transceiver is implemented via RF by-pass between RF INPUT and RF OUTPUT of the amplifier. At transmission in Stand-by, RF power of the transceiver is not amplified by the amplifier, the control KEY-IN input does not influence over its operation, and the KEY-OUT output (S. 2-3(c)) follows the state of the KEY-IN input unconditionally.

b) In **Operate** mode the final stage of the amplifier is powered and it is fully functioning; 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 through which receiving is done with amplifier turned off or in Stand-by mode;

- at grounded KEY-IN (Operate/TX mode) the amplifier input relay connects the RF INPUT connector (drive from the transceiver) toward the final stage input and the output relay feeds the amplified signal from the final stage output to the antenna through the RF OUTPUT connector.

C A U T I O N

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

In Operate mode the KEY-OUT output (S. 2-3(c)) follows the state of the KEY-IN input only after all conditions for safe transmission have been satisfied and found OK by the amplifier control unit. The KEY-OUT output duly disables transmission, if this is inadmissible or there is a potential risk for the amplifier or the transceiver.

The two modes - **Operate** and **Stand-by** - may alternatively be changed in three different,

independent ways as described below:

- manually (locally) – by successive pressing the OPR/STB button – Fig. 3-2;

- remote control – through the respective command “OPR” or “STB”, received through the serial RS232 Interface;

- automatic control – if the AUTO OPERATE option is activated – see next item and S. 5-4(b).

N O T E

Access to the Operate mode can be banned in the menu AMP SERVICE, the OPERATE ACCESS option (S. 5-2 and Fig. 5-2). The ban is universal.

c) **<u>AUTO OPERATE</u>** option - can be activated or deactivated by the operator in the USER PREFERENCES menu – S. 5-4 and Fig. 5-4 - or through remote commands by the RS232 interface.

When the AUTO OPERATE option is deactivated, the two modes Operate and Stand-by can be changed alternatively via the OPR/STB button or by commands OPR and STB by the RS232 interface. Besides this, at a protection trip of the type SOFT FAULT, the amplifier returns to and remains in Stand-by mode, waiting for external intervention. For restoring of the operation, the operator must press the OPR/STB button manually or to feed remote command OPR by the RS232 interface.

When AUTO OPERATE is active (S. 5-4), the amplifier goes automatically to Operate mode immediately after power on without waiting for an OPR command by the interface or pressing the STB/OPR button by the operator. At a protection trip of the type SOFT FAULT, the amplifier will first go to Stand-by mode (same as at the deactivated option), but afterwards it will return automatically to Operate mode after about 4 seconds without need of the operator to press any button. Thus, the amplifier will automatically seek to “support” Operate mode always when this is admissible.

Anyway, even at activated AUTO OPERATE option, the operator can return to and remain in the Stand-by mode also manually – through the OPR/STB button or by STB command by the serial RS232 interface. This will suppress temporarily the AUTO OPERATE function and the amplifier will go to and remain in the Stand-by mode. The next pressing of the OPR/STB button or sending OPR command by the interface will turn the amplifier in the Operate mode and will restore the normal operation of the AUTO OPERATE option (provided this had been active before the command).

4-2. Band change, standard and expanded frequency coverage

When the amplifier is connected to a transceiver with the CAT/AUX interface or to a computer with the RS232 interface, the change of the frequency bands (i.e. change of the amplifier output filters) occurs automatically, following the operating frequency changes from the transceiver or from the computer.

N O T E

In the Stand-by mode the change of bands through the CAT/AUX interface is deactivated temporarily; It is restored at returning to the Operate mode.

The RS232 band change commands operate continuously. If the amplifier gets a band change command during transmission, the transmission is blocked temporarily while the command is being performed; the amplifier operation is restored after the change of the low-pass filters for the new band.

When the amplifier is not connected to any interface, the band changes can be accomplished manually or again automatically – through the built-in frequency counter in the amplifier.

Manual changes of the frequency bands can be done from the basic screen (Fig. 3-2) by the BAND buttons – up and down. They can be done also in the Stand-by mode as well in the Operate mode, but only at RX mode.

Automatic change of a frequency band via the built-in frequency counter of the amplifier or with CAT/AUX is performed only in the Operate mode. In the Stand-by mode the frequency changes are continuously followed (with the frequency counter – only during transceiver transmissions) but are not performed physically by the low-pass filters. The latest frequency change is performed at entering the Operate mode.

When you rely on an automatic change with the built-in frequency counter, you have to make a one quite short “preliminary” transmission (100ms is enough - a CW dit, or s sound on SSB) and leave a pause (also short) before the main transmission. During this pause the amplifier will change the band according to the new frequency without RF power, after which the operator can continue his operation as usual.

If the new frequency is within the range admissible for the amplifier but outside the currently selected band, the amplifier control unit temporarily blocks transmission while the change of the harmonics filter for the respective new band lasts, after which the transmission continues on the new frequency as usual.

If the new frequency is out of the range admissible for the amplifier (S. 8-1(a)), the transmission request is denied and the following fault message appears on the screen:

“FREQUENCY OUT OF RANGE”

The standard frequency bands within which all amplifier parameters are guaranteed are listed in S. 8-1(a)). Extension or changes of the bands could be negotiated with the manufacturer.

4-3. Change of antennas and operation with an external antenna tuner

At a band change or moving frequency from one to the other end of the band it may be necessary that you change the antenna and eventually retune the antenna tuner (unless your antenna is a multibander and / or is broadband enough).

At antenna SWR over 1.5:1, it is preferable that you use an external tuner. Usually the procedure for retuning the tuner requires a continuous carrier signal and small power. In such a case, go to the STBY mode of the amplifier and feed the power necessary for tuning from the

transceiver only. After you have retuned the antenna tuner on the new operating frequency or with the new antenna, return to the Operate mode and adjust again the drive power according to the operating mode used – S. 3-6(f)).

4-4. Cooling and fans operation; modes with increased heat loading

During operation in modes with increased heat loading (continuous carrier, RTTY, SSTV, some digital modes, and others), the amplifier itself will monitor its temperature, automatically increasing or decreasing fans speed depending on the loading and ambient conditions (temperature, humidity, atmospheric pressure etc.).

4-5. Monitoring the amplifier operating regime

Because of the availability of a continuously operating protection system in the amplifier (S. 4-6), the operator is not required to monitor its regime regularly. However, whenever he wishes, he can digitally measure the 11 most important parameters connected with the amplifier operating regime. Besides this, the operator can select two of them arbitrarily for indication also in the basic screen (Fig. 3-2, S. 5-1).

4-6. Automatic protection system

The control unit (S. 7-3(b)) keeps track with most amplifier analogue and logic signals in all modes. Monitored are, for example, the control signal receive/transmit, the output relay contact status and switching times, the RF drive frequency and drive power (the input power), the DC current and the DC voltage on the drains of the final transistors, the bias voltage of their gates and the temperature of their heat sink, the temperature of the main components in the power supply unit, the forward and reflected power at the RF output, and others. Besides this, monitored and assessed are some derivative parameters, such as the power gain, the SWR, the heat power dissipated by the final transistors dynamically etc.

If anything abnormal has been found out in an arbitrary moment, the amplifier will assess the risk of the situation and can use three levels of protection according to the problem nature and seriousness, as described in items (a) to (c) below. Every event is accompanied by a warning text on the screen (Fig. 4-1), which is blinking to attract the operator's attention. Besides this, a sound signal is produced, whose volume, can be reduced by the operator if he so wishes – menu "USER PREFERENCES" – Fig. 5-4.



Fig. 4-1 – Appearance of an alarm message

a) The first protection level is the WARNING type. Only a warning message appears on the screen accompanied by a sound signal, but without any physical reaction from the amplifier – Fig. 4-1. This occurs when some of the values monitored by the control unit approach too close the threshold of tripping the respective protection. The transmission is not interrupted, but a message appears – for example “Drive Power too High”, “Drain Current too High”, or another.

You can continue to transmit in these conditions, but you also have to take some measures, for example, to reduce a little the drive power from the transceiver, because the respective protection trip will be too close. The warnings for the first level remain on the screen for at least three seconds so that they can be read through and they disappear by themselves after the reason has dropped off.

b) The second protection level is the SOFT FAULT type – it trips at crossing the threshold of some protection, as long as it had not been fatal (then the third level trips – see item (c) below).

At the second level (SOFT FAULT) the amplifier itself does not turn off fully but only returns into Stand-by mode for four seconds or permanently - depending on whether the “AUTO OPERATE” option had been activated. Return into Stand-by mode is accompanied with the respective message on the screen, for example “Excessive Reflected Power”, “Excessive Drain Current”, and others, as well as with a sound signal (unless its volume had not been decreased to zero – S. 5-4).

Unlike those for a WARNING, the SOFT FAULT messages remain on the screen and persist until the operator presses any button (including the two unused in the basic screen) - thus it is understood that he has read the message - or until the AUTO-OPERATE function returns automatically the OPERATE mode if the option is active – S. 5-4.

SOFT FAULTs presume performing fast and simple correcting actions by the operator, such as, for example, reducing the drive power, improving of load SWR through retuning of the antenna tuner, selection of another antenna, another frequency etc.

c) The third and most serious protection level is the HARD FAULT type, which turns off the amplifier automatically to avoid possible further damages.

At tripping the third level of protection, the amplifier turns off its main power supply automatically, stores all data about the fault in its nonvolatile memory, the front panel screen blanks and a specific sound signal is emitted (namely a series of Morse letters F, which continues until the control unit still has residual energy).

If it is not obvious due to what reason the protection has tripped, you can try to turn on the amplifier again. If the amplifier allows turning on after the fault, the display will be lit but instead of the basic screen, a fault message will appear with information about the reason for the latest automatic turning off (for example, overheating of the power supply unit or of the final stage and others).

After pressing any button, the fault message will disappear; the display will show the basic screen – Fig. 3-2, and if there are no current problems (for example, the overheated unit has already cooled down), the amplifier operation will restore. If any problem is being found out again, a new message will appear on the screen, or the protection will trip again immediately, after the attempt.

If the problem persists, refer to your dealer – S. 1-2.

At each “HARD FAULT” turning off in the nonvolatile memory of the amplifier is stored data concerning its control and values, the problem occurrence time, and others. Your dealer or his service may ask you to read through this data (by RS232 interface or from the amplifier screen) and store it in a computer file – see menu FAULTS LOG, Sections 5-5 and 7-4.

5. MENUS – USEFUL INSTRUMENTS AND OPTIONS

From the basic screen (Fig. 3-2), pressing of the same-name MENU button (the rightmost), the list with the six menus appears (Fig. 5). Each of them can be selected by means of buttons ITEM (up and down) and SELECT. Each menu contains one group of topically related “items” – these are some useful instruments and options for control and operation of the amplifier – Fig. 5-1 to FIg. 5-6.

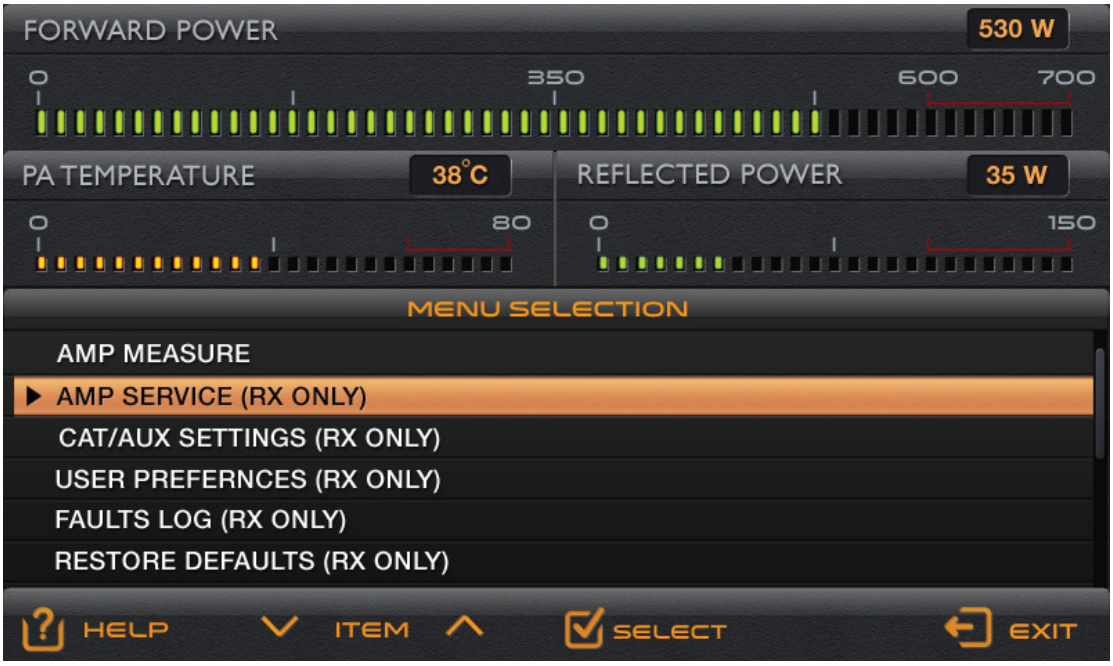


Fig. 5 - MENU SELECTION

The items in each menu are selected and controlled by the same six buttons as in the menu, but on the display above them appear inscriptions for their new functions. Through activation and deactivation of the options in the menu, the operator can adapt the amplifier to the set up and the specifics of his shack, in order to maximize its potential.

Service operations can be performed in the AMP MEASURE and the AMP SERVICE menus: measurements, functional and parametric tests, as well as reading the faults log from the nonvolatile memory (if such have been registered during operation) etc.

5-1. Menu “Measurements in the amplifier” – AMP MEASURE

The menu AMP MEASURE (Fig. 5-1) is accessible from the MENU SELECTION screen (Fig. 5) in all modes. It is possible to measure digitally 11 parameters in it, characterizing the amplifier operator.

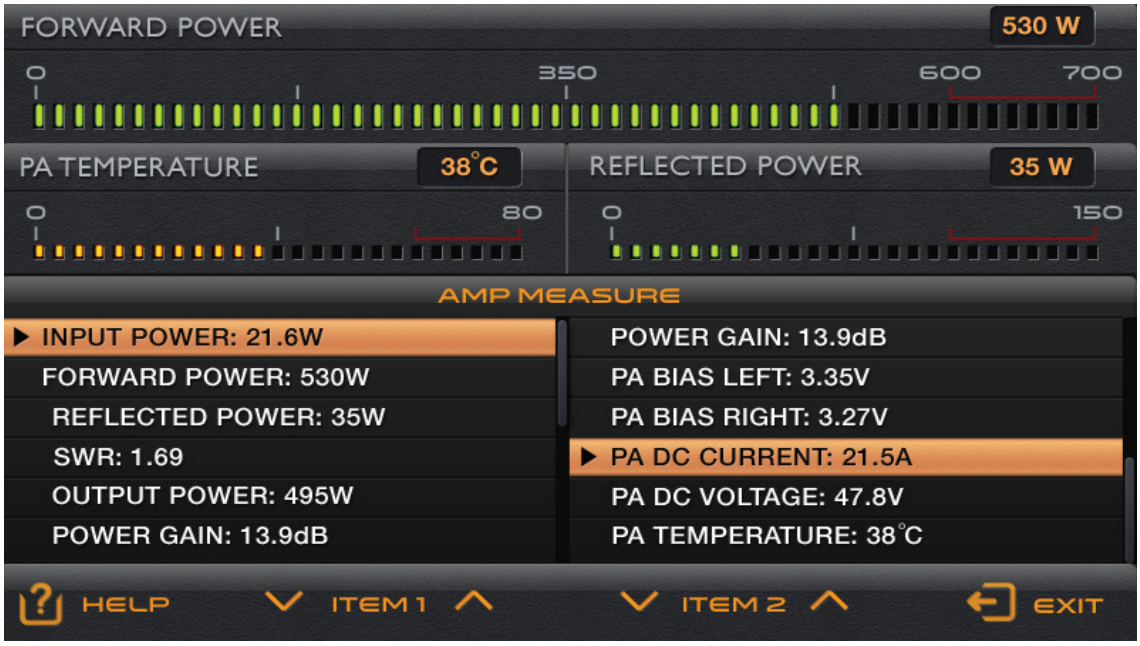


Fig. 5-1 Menu “Measurements in the amplifier” – AMP MEASURE

Two identical lists appear on the left and the right halves of the screen, each one having the 11 parameters, whose values are refreshed continuously.

An arbitrary parameter can be selected in each screen half. Using buttons ITEM1 and ITEM2 (up and down) select the desired item (parameter) – it will be marked with color. Upon reaching either the top or bottom edge of any half-screen, further movement in the same direction will cause the screen to scroll up or down, respectively, so you can reach all the items in the list. The two marked parameters will be indicated continuously in the digital measurements area on the basic screen (S. 3-2(b), Fig. 3-2) - after leaving this menu (EXIT button).

5-2. Menu “Service functions in the amplifier” – AMP SERVICE.

The amplifier service menu (Fig. 5-2) is accessible from the MENU SELECTION screen (Fig. 5) only during reception (RX mode).

C A U T I O N

The AMP SERVICE menu is used for check and adjustment of the zero-signal (idling) drain current of the final transistors and for tests of some functions and circuits in the amplifier during repair. We recommend these procedures are carried out only by a trained service technician!

With the ITEM buttons (up and down) the necessary service function is selected – it is colored. With the SELECT buttons (left or right) the selected function or test item is turned ON or OFF.

The inactive functions are grey and the active - red. At leaving a function, its parameters are turned off and deactivated automatically. Pressing the EXIT button all service functions (except for the OPERATE ACCESS) are turned off (deactivated), menu AMP SERVICE is abandoned,

and the MENU SELECTION screen comes back (Fig. 5). At another pressing of the EXIT button, the basic screen returns (Fig. 3-2).

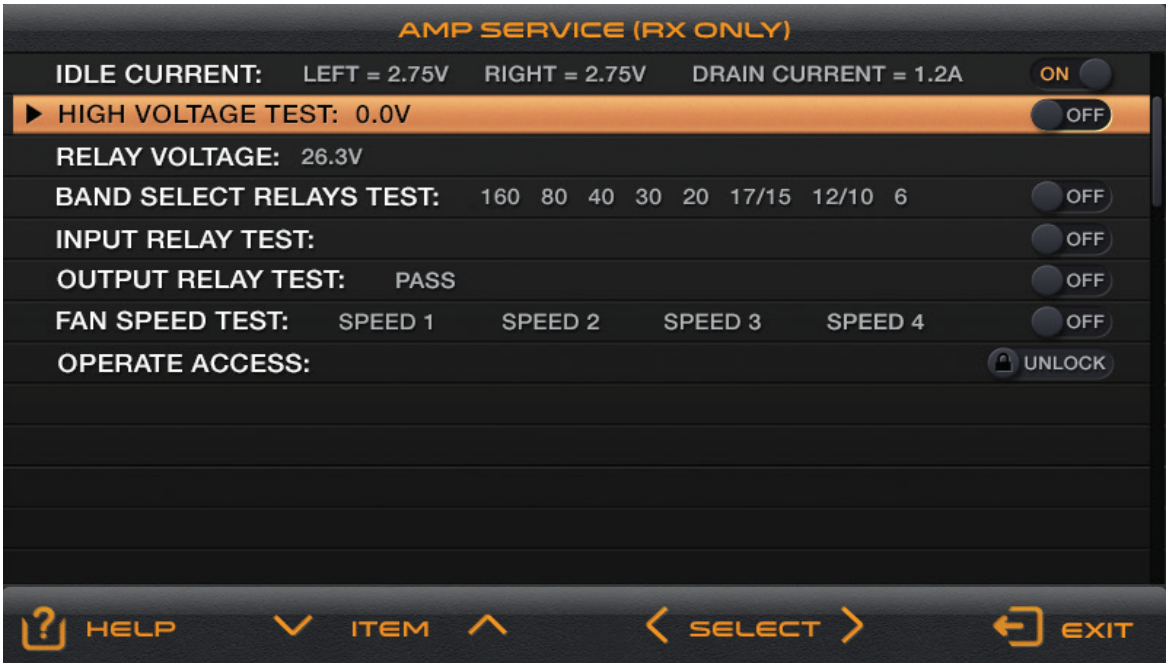


Fig. 5.2 Menu “Service functions in the amplifier” – AMP SERVICE

Blocking access to the Operate mode can be controlled using the OPERATE ACCESS option. When the amplifier is locked (LOCK is selected), it remains in the Stand-by mode and cannot be turned to Operate mode by random actions unless unlocked by the selection of UNLOCK before that. Passwords are not used - only simple protection is envisaged against possible child actions, or involuntary switching to Operate mode. While locked, an attempt for entering Operate mode will trigger a reminder:

“OPERATE MODE IS LOCKED”

The status of the OPERATE ACCESS option can be changed manually as well as with remote commands by the RS232 interface.

5-3. Menu “Selection of CAT/AUX interface” – CAT/AUX SETTINGS

The type and parameters of the CAT/AUX interface for your transceiver are assigned here. If your transceiver has no CAT interface control, nor parallel or analogue voltage output (BCD / VOLTAGE BAND DATA), you should select [OFF] at the uppermost row which will disable the amplifier CAT/AUX interface.

The manual selection of CAT/AUX interface (CAT/AUX SETTINGS) is accessible only during reception – Fig. 5 and 5-3. After entering the menu, with the ITEM buttons (up and down) the operator can mark the group of parameters which he will set (top to bottom, as listed on the screen). The selected group is marked with color. Afterwards with the SELECT buttons (left or right) the desired parameter is set – it is enclosed within square brackets.

First choose the type of interface: Serial (RS232 or TTL levels), Parallel (BCD band data) or VOLTAGE (analogue band data).

Choosing a serial interface requires additional settings according to the transceiver model. The different transceiver brands and models have a great variety of controls and settings of their CAT/AUX interfaces. For maximum flexibility and clarity, they are divided into several groups - 1 to 5. In order to select the command set and protocol parameters (BAUD RATE, BYTE SPACING, and POLLING TIME) suitable for your transceiver, see the attached to this manual list of brands and models.

If your transceiver is not presented in the published list, it could still be connected with CAT/AUX to the ACOM 600S if its commands set and protocol are compatible with those proposed in the CAT/AUX SETTINGS menu. If needed, consult your dealer.



Fig. 5-3 Menu “Selection of CAT/AUX interface” – CAT/AUX SETTINGS

At leaving the menu (by pressing the EXIT button), the parameters enclosed currently within square brackets remain selected (become effective).

5-4. Menu “USER PREFERENCES”

Here the operator can adjust some secondary (minor) functions of the amplifier according to his personal preferences.



Fig. 5-4 – Menu USER PREFERENCES

In order to select the user preference which has to be changed, first with the ITEM buttons (up and down) position the large colored window. Afterwards with the SELECT buttons (left or right) position the marker onto the desired value – Fig. 5-4.

a) AUTOMATIC MENU EXIT.

To activate or deactivate the option, first select menu USER PREFERENCES (S. 5-4 and Fig. 5-4) and position the large colored window upon the AUTOMATIC MENU EXIT option with the ITEM buttons (up and down). Select ON or OFF with the SELECT buttons (left or right). Finally, exit the menu with the EXIT button – this will activate the currently selected state ON or OFF.

When the option is activated (ON), the amplifier exits the currently selected menu if no button has been pressed for more than 5 minutes.

If the option is deactivated (OFF), the amplifier remains in the currently selected menu until operator's intervention.

b) Activation and deactivation of option AUTO OPERATE.

The AUTO OPERATE option can be activated manually, as well as by remote commands on the RS232 interface.

To control it manually, first select the USER PREFERENCES menu (S. 5-4 and Fig. 5-4) and in it – the AUTO OPERATE option by means of the ITEM buttons (up and down).

The option is activated or deactivated by selecting ON or OFF through the SELECT buttons (left or right). Finally, exit the menu by pressing the EXIT button – the currently selected value will be accepted.

For the role and functioning of the AUTO OPERATE option see Sections 3-3, 4-1(c), and 4-6(b).

c) CALL SIGN edit.

To compose an arbitrary text (for instance the operator's call sign), after the row CALL SIGN is selected with the ITEM button, the small pointer must be set with the SELECT button (right) on the position you wish to be edited. Afterwards, again with the ITEM button, the symbol for this position is changed – they appear one after another in the order of the ASCII code. Then with SELECT (right) the next symbol for editing is selected etc. Finally, again with SELECT (left) the small pointer returns backwards until it comes out of the cells for editing and only then with ITEM can be selected another row (user preference). When the EXIT button is pressed the edited values are memorized. The call sign entered will appear only in the amplifier Fault Log and will not be displayed at the start up.

The other preference items need no explanation.

5-5. Reading the FAULTS LOG

When selected from the menus list (Fig. 5), the FAULTS LOG function provides a possibility to read and/or download the information from the nonvolatile memory of the amplifier, registered at the last 28 automatic protection trips of the type "serious failure" (HARD FAULT - S. 4-6(c)). The information can be read or pictures can be taken from the amplifier display, or more comfortably – it can be downloaded and archived in a plain-text format file through the RS232 interface and a computer using a standard terminal emulating program (TTY). The RS232 protocol is: 9600, 8 N 1 (9600bit/s, 8 information bits, no parity check, 1 stop bit).
An example view of the screen is shown in Fig. 5-5.

In the file title individual information about the amplifier and the options is given: model, user call sign, serial number, revisions of the hardware, the firmware, and the boot loader, number of worked hours, availability and model of an automatic antenna tuner and/or antenna selector.

Further on, for each of the stored faults hexadecimally coded information is given about the values of the 55 monitored parameters, concerning the regime and the state of the amplifier, including: the number of worked hours, the operating frequency, the parameter which has caused the protection trip, the regime in which the amplifier has been in, as well as the values of all analogous and logic inputs and outputs of the control unit at the time of the event.

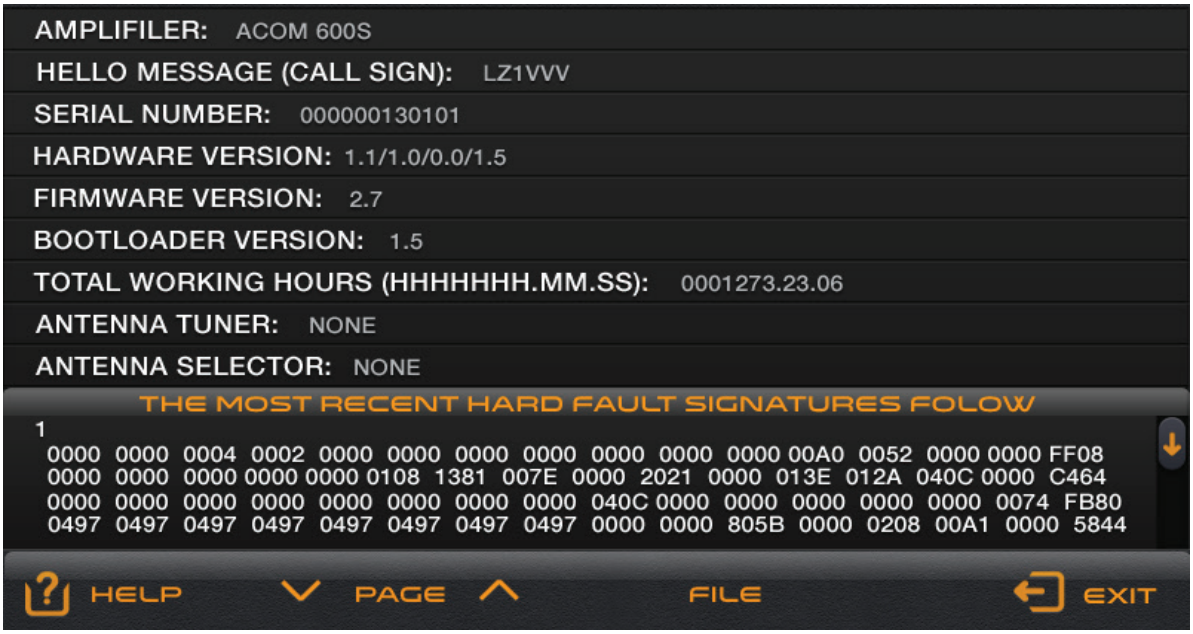


Fig. 5-5 Function FAULTS LOG

Pressing the button FILE, the data can be downloaded in a plain text format through the built-in RS232 interface - see S. 7-4 for details.

5-6. Menu “RESTORE DEFAULT SETTINGS”

The factory default settings for the user preferences and some other data can be reset here.

While selecting the menu (Fig. 5-6) the bottom part of the screen is empty (no warning). The colored window is moved with the ITEM buttons (up or down) to select the position for which you want to restore the default settings.

All proposed actions initially are set on “NO” for all positions and nothing happens at re-confirming “NO” (i.e. pressing the ACTION - right arrow button). At pressing EXIT this menu is left without changing anything and the control goes back to the MENU SELECTION screen (Fig. 5).

At first pressing of the ACTION - left button, “YES” for the selected row is proposed and at the bottom of the display a warning text appears about the action that would be implemented after confirming it. At this stage, the operator still has the opportunity to quit the execution of the prepared action - he can press either the ACTION - right (NO) or the EXIT button.

The time for confirmation of the prepared action (by selecting “YES”) is limited to 60 seconds in this state regardless of the current status of the AUTOMATIC MENU EXIT option (S. 5-4(a)). If nothing is pressed within 60 seconds, “ NO “ (ACTION - right) is automatically selected.

In order to confirm the selected action the operator must press the ACTION - left (YES) button once more. After its implementation the control returns to the MENU SELECTION screen - Fig. 5. If instead the ACTION - right (NO) button is pressed, the selection “NO” is selected again, and the control does not leave the current position. At pressing the EXIT button in this position, the control leaves this menu without changing anything and returns in the previous window (the MENU SELECTION screen – Fig. 5). At repeated pressing the EXIT button, it returns to the basic screen of the amplifier (Fig. 3-2).



Fig. 5-6 Menu : RESTORE DEFAULT SETTINGS

6. REMOTE MONITORING AND CONTROL

6-1. General information

Remote monitoring and control can be done with a computer connected to the RS232 interface of the amplifier. This can control and monitor the main amplifier functions as follows:

- activation (turn on) of the main power supply from the Low Energy (waiting) mode through simultaneous activation of the RTS and the DTR signals;
- deactivation (turn off) of the main power supply and return to the Low Energy (waiting) mode using a serial command OFF;
- change of the Operate / Stand-by mode; this and next serial commands are accessible only when the main power supply is running;
- change of the receive / transmit (RX/TX) mode;
- change of the operating frequency (BAND);
- upgrade of the firmware;

- change, activation, and deactivation of some options, such as AUTO OPERATE, OPERATE ACCESS, the temperature scale unit ºC/ºF;

- reading the FAULTS LOG, and others.

6-2. Commands set

Details of the RS232 interface and a full list of commands, as well as the protocol and rules for using them for amplifier control are available on www.acom-bg.com.

7. MAINTENANCE

W A R N I N G **HIGH VOLTAGE!**

The mains line voltage plus a high DC voltage up to 500V inside the ACOM 600S amplifier are LETHAL! For your safety, pull the amplifier power plug out of the mains wall outlet and WAIT AT LEAST three minutes EACH TIME BEFORE servicing the amplifier!

7-1. Periodic maintenance; general checks and cleaning

a) Periodically (but not less than once per year) check the connection reliability, contacts cleanliness and the tightening of all connectors, in particular the coaxial ones – including their outer conductors.

Check the integrity of the cables, in particular if they are lying 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 for it – if you have any doubts consult with an electrician.

Periodically check the SWR of the antennas and whether it is changing over time. Problems could occur more often in poor weather conditions – rain, snow, strong wind etc.

b) Periodically (more often in a dusty environment, but at least once per year) clean the air filter without opening the amplifier.

W A R N I N G

The air filter may be too dusty - be careful how you clean it so that you DO NOT INHALE (BREATHE IN) neither spill the dust over! Wrap it, for instance, in a wet cloth before cleaning!

Use a Philips-1 screwdriver to remove the square filter cover from the rear panel center – see the four screws in Fig. 2-1. Remove the cover and take out gently the foam-like plastic filter. Clean up the filter and the cover carefully from dust, wash them with tap water and leave them to dry up before you mount them back.

While the air filter is drying, clean the fan propeller and its body with a vacuum cleaner and a soft brush. Clean also (as far as possible from outside without opening the amplifier) all ventilation apertures on the cover and the chassis, including at the bottom. Finally, mount the air filter in reverse order and screw in its four screws tightly.

C A U T I O N

Do not use solvents for cleaning – they can be dangerous to you, as well as to the coating or the amplifier plastic parts.

In case of need, clean the outside amplifier surfaces also without opening it. Use a soft piece of cotton cloth, slightly moistened with clean water.

7-2. Replacement of fuses

W A R N I N G **HIGH VOLTAGE!**

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

The main mains fuses of the amplifier are located on the rear panel – Fig. 2-1. Your amplifier may be fitted with one or two main fuses – see S. 2-3(g).

The fuses must be of the fast type, European size 5x20mm, rated for 250VAC and a current as follows:

C A U T I O N

The fuses must be rated for a current corresponding to your mains nominal voltage: 10A for operation from 100-120VAC mains voltage or 6.3A for operation from 200-240VAC. Use only standard fuses!

C A U T I O N

Never replace any fuses inside the amplifier without special instructions from your dealer! Blown internal fuses can be a symptom of a more serious problem, which should be resolved beforehand. Unauthorized replacement of inside fuses infringes the warranty conditions!

7-3. Simplified schematic diagram; theory of operation

a) Power Amplifier Module.

See Fig. 7-1 – ACOM 600S Simplified Schematic Diagram.

The “heart” of the power amplifier module comprises two pieces of dual N-channel field-effect (LDMOS) transistors (Q101-Q101A and Q102-Q102A) type MRFE6VP6300H. The pair of transistors in each housing is paralleled, and the two housings operate in a push-pull configuration with a common grounded source. In order to provide minimum intermodulation distortions (IMD), the transistors operate in a linear AB class.

The transistors manufacturer (Freescale Semiconductor) guaranties their endurance to mismatch with an arbitrary phase and SWR up to 65:1. Besides this, each device is capable to produce 300W (total 600W) RF power in a continuous carrier mode. These transistors have excellent temperature conductivity which allows the amplifier to operate in continuous carrier mode with only 30% of their maximum allowed heat load. This guarantees the high reliability of the amplifier.

The input signal enters connector J403 (RF INPUT), passes through the contacts of the input relay on the Wattmeter board (turned in transmit – upwards the schematic diagram) and through connectors J405 and J101, reaches the input attenuator ATT101 (10 dB). Besides reducing the input signal level to the gates, the attenuator provides a significant improvement of the input SWR toward the transceiver.

From the attenuator output, the input signal is passed on to a balanced broadband matching circuit comprising the transformer T101 and several R-L-C networks which compensate the input capacitance of the transistors through the whole frequency range and provides two driving voltages for the transistors gates with equal amplitude but 180º phase shift.

The balanced choke/transformer T102 in the power supply, through its two main windings T102 and T102B feeds DC supply voltage +50V from Power Supply Unit (connectors J103 and J104), to the drains of the transistors Q101 and Q102 (the Power Supply Unit is described in (c) below).

The choke/transformer T102 contains yet one – third winding – T102A, which serves for creation of a local negative feed back. Through the R-L-C networks R113-114, L105-106, and C115-116, it returns a small part of the output voltage toward the gates of the transistors, but in anti-phase. It not only flattens the amplifier frequency response through the operating frequency range, but also guarantees the amplifier parameters irrespective of possible transistor tolerances.

The signal amplified by the transistors Q101 and Q102 is transferred from their drains through the matching transformers T103–T103B, balun transformer T104, and connector J102, through connector J301 toward the Filters unit input.

The Filters unit serves to provide the necessary harmonics and parasitic suppression in the output signal. It allows the signal of the main operating frequency to pass to its output (connector J302) and at the same time suppresses the signals with second and all higher harmonic frequencies (which are normally generated by the final transistors). For covering the whole operating frequency range, the Filters unit includes eight separate low-pass filters, one of which is selected by switching of several relays, controlled by the Control unit (described in (b) below) depending on the current operating frequency band.

For a correct selection of the necessary filter, a small part of the input signal is diverted through connectors J405 – J504 to be fed to the Control unit frequency counter input. According to the measured frequency or the commands coming through the CAT/AUX or the RS232 interfaces, the Control unit selects the necessary filter through the relay-coils control signals fed via connectors J503-J303.

From The Filters unit output (connector J302) and through connector J401, and the output relay contacts (located on the Wattmeter PCB), the amplified and filtered signal reaches the amplifier output - J402.

The Wattmeter unit is based on a bridge circuit which comprises the current transformer T401 and some other components (not shown in the block diagram). It measures the forward and the reflected power at the amplifier output and feeds information to the Control unit for indication and development of the protection functions of the amplifier.

The DC bias voltages for the gates of the final transistors are produced by the “Bias control and Measurement” circuit.

b) The Control unit of the amplifier is based on a digital signal processor (DSP) manufactured by MICROCHIP. The Control unit implements the following functions:

- controls the operating modes: Stand-by, Operate/RX, Operate/TX etc.;

- measures and monitors the analogue and digital signals in the amplifier;

- protects the amplifier from overloading and the critical regimes at wrong operation or abnormal ambient conditions;

- files in the amplifier nonvolatile memory a log of the last 28 switching offs type “serious failure” (HARD FAULT) and the amplifier parameters registered at the moment of faults rise. They can be visualized or downloaded in a plain-text format file by the operator’s wish;

- by means of the system interfaces the Control unit monitors the staus and controls the operation of all modules in the amplifier: display and keyboard, frequency counter, wattmeter, power supply unit, FSK/ATU (for control of external Automatic Antenna Tuner or Antenna Selector from ACOM – ready for a future development), Power Amplifier Module (PAM), and low-pass filters unit (LPF).

The user interfaces of the Control unit allow connection with additional external devices:

- CAT/AUX interface for connection with various transceivers;

- RS232 interface for connection with computer or Remote Control Unit.

In order to facilitate the diagnostics of possible failure, after which the amplifier modules should not be powered before the failure has been repaired, a special regime is designed. By means of a low power DC external source only the Control unit can be powered, so that the data from its nonvolatile memory can be downloaded and saved in a computer plain-text format file for further analysis and troubleshooting (the FAULTS LOG with the history of the last 28 protection trips of the type HARD FAULT). See also Sections 4-6(c), 5-5, and 7-4.

c) Power Supply Unit

The main power switch (POWER ON) is located on the rear panel of the amplifier. This interrupts the mains cable right after the main fuses and cuts off supply to all internal circuits. When switched ON it starts only an extra- low-power AC-DC converter providing the Low Energy (waiting) mode of the power supply with a negligible consumption (below 1VA). There are three different ways to activate the amplifier from waiting in the working mode:

- locally (manually) – by pressing the “ON-OFF” button on the front panel (Fig. 3-1) for 1-2s;

- remotely - by applying a low-power DC pulse to the remote turn-on and turn-off line “ON_RMT”: +4.5 to +15V DC towards ground for 1-2s – see S. 2-4(a); this line is brought to connector CAT/AUX pin 11 and its consumption does not exceed 3mA;

- remotely – by the serial RS232 interface – through the simultaneous activation of the RTS and DTR hand-shake signals for 1-2s (normally they do not overlap while they serve for control of the serial data flows exchange).

Irrespective of how the amplifier has been activated, this can be de-activated - returned to the Low Energy (waiting) mode of the power supply - in any of the above three ways or using the “OFF” serial command by the RS232 interface. At tripping a protection of the HARD FAULT type, the amplifier is self-protected, returning to the same Low Energy (waiting) mode of the power supply and only the extra-low-power AC-DC converter remains running with a consumption below 1VA.

The main Power Supply Unit (PSU) consists of two main assemblies:

- a rectifier and switching mode stage, not insulated from the mains; they provide a preliminary regulation at 390V and power factor correction (PFC); the latter serves to minimize the mains-frequency harmonics currents, thus ensuring a high power factor of the consumed current, and also limiting the start-up mains current during shifting of the amplifier to the operating mode;

- mains-separated switching mode converter “390/50V” which supplies the power amplifier module with +50V, insulated from the mains and regulated DC voltage; this is the main power supply of the amplifier and is protected against excessive consumption over 1200W; this is controllable ON and OFF by a logic signal from the Control unit in the amplifier Operate and Stand-by modes respectively.

In addition to the low-power and the main (+50V/1200W) power supplies, the PSU produces also three auxiliary voltages:

- +13V DC voltage (non-insulated from the mains) for PS unit’s own needs: primary turning on and supporting the “PFC control” assembly in the Power Supply unit;

- +5V regulated DC voltage, insulated from the mains: for power supply of the Control unit, the low-power circuits in the Power amplifier module, Filters, and Wattmeter units of the amplifier;

- +26V regulated DC voltage, insulated from the mains: this is the operating voltage for the relays coils, fans, and other low-power circuits in the amplifier.

Very efficient symmetrical L-C filters are placed at the input and output of the power supply unit. They suppress the interferences in the radio frequency spectrum, providing perfect electromagnetic compatibility (EMC) with both receivers and transmitters in the shack, exceeding the worldwide adopted standards. They also give the power supply an extra resistance against external interferences propagating along the power network.

7-4. Using the fault codes (signatures) for diagnostics

In the nonvolatile memory of the Control unit there is a room for the data of the last 28 protection trips of the type “serious fault” (HARD FAULT) – see S. 4-6(c). These are the values of all logic and analogous signals, concerned to the regime and control of the amplifier, as well as the time when a problem has occurred (in worked hours), and others. The information can be presented on the amplifier screen or it can be downloaded and archived in a plain-text format file. See also the menu FAULTS LOG - S. 5-5.

The data can be downloaded from nonvolatile memory of the amplifier through the built-in RS232 interface and stored in a computer file even when the amplifier cannot or should not be turned on after a serious fault – it is only needed to apply external power to the Control unit in either way as described below:

- through the connector for the CAT/AUX interface on the amplifier rear panel; without dismantling the amplifier, on the “Debug mode” input (Table 2-1) a DC voltage between +8 and +15V towards ground is applied. The consumed current is up to 0.4A in this mode;

- if the Control board has already been removed from the amplifier for another reason, it can be powered directly with +5V and the faults log also downloaded via the RS232 interface the consumption from +5V is the same: up to 0.4A.

In the FAULTS LOG reading mode (Fig. 5-5), the Control board automatically begins to transmit the data from its nonvolatile memory through the RS232 interface. 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 the end of data transmission which resumes again. The data can be archived in a plain-text format through a computer using a standard program emulating a terminal (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.

7-5. Firmware updates

C A U T I O N

Before you change the built-in firmware version, check its compatibility with the revisions of the hardware and of the boot loader in your amplifier - see S. 5-5 for establishing the proper version. If you have any doubts about the versions, please consult your dealer before you undertake any action.

When ACOM publishes a new version of the built-in firmware, the user can upload it in the amplifier after he checks their compatibility – see the note above.

When compatibility is confirmed a return to an earlier version is also possible.

Changes of the built-in firmware are done through the RS232 interface of the amplifier, following a special procedure, described in detail in a help file accompanying the respective version.

8. SPECIFICATIONS

8-1. Parameters

a) Standard frequency coverage (*):

1.800 - 2.000 MHz
3.500 - 4.000 MHz
7.000 - 7.300 MHz.
10.100 - 10.150 MHz
14.000 - 14.350 MHz
18.068 - 18.168 MHz
21.000 - 21.450 MHz
24.890 - 24.990 MHz
28.000 - 29.700 MHz
50.000 - 54.000 MHz

(*) Extensions or changes of the frequency coverage are possible on request.

b) Rated output power: 600W +/-0.5dB, PEP or continuous carrier, without mode limitation.

c) Intermodulation distortions (IMD3): better than 28dB (30dB typically) below the rated PEP output.

d) Harmonic and parasitic emissions output suppression: better than 60dB (65dB typically).

e) Input and output impedances:

- nominal value: 50 Ohm unbalanced, UHF (SO239) type connectors;

- input circuit: broadband, SWR below 1.2:1 (1.1:1 typically); 1.8 – 54 MHz continuous range without retuning or switching;

- RF by-pass path SWR - below 1.1:1, 1.8-54 MHz;

- admissible SWR at the output load (the antenna): up to 3:1 with proportional power reduction and up to 1.5:1 for full output power;

f) RF power gain: 14dB +/-1dB (typically 25W for 600W output power);

g) Mains power supply voltage: 93-265V;

h) Mains power consumption at full output power: 1500VA or less with a power factor of 0.95 or higher;

i) Mains power consumption in Low Energy (waiting) mode: less than 1VA;

j) Complies with EU safety regulations and electromagnetic compatibility standards, as well as with the US Federal Communications Commission (FCC) rules;

k) Environment working conditions:

- temperature range: -10ºC to +40ºC (14ºF to 104ºF);

- relative air humidity: up to 95% @ 35ºC (95ºF);

l) Dimensions (projections not included) and weight, operating: (W x H x D) 330 x 165 x 380 mm (13 x 6.5 x 15 In); 12 kg (26.5 Lbs).

8-2. Functions

a) Receive / transmit control:

- KEY-IN input – type Phono (RCA) jack socket; voltage applied to the open transceiver keying output: not exceeding +12.6V; current drawn by the the closed transceiver keying output: not exceeding 6mA;

- not obligatory KEY-OUT output – type Phono (RCA) jack socket; output resistance: not more than 120 Ohm; maximum admissible input voltage from the transceiver (across an open KEY-OUT output): +50V; maximum admissible current through a closed KEY-OUT output: 20mA;

- minimum dead time, necessary for safe amplifier switching from receive to transmit: 10ms between transmit request at the KEY-IN input jack and the RF drive appearance at the RF INPUT connector.

b) Frequency control directly from CAT interface of the transceiver – connector CAT/AUX (connector type DB-15).

c) Remote control through RS232 interface (connector type DB-9).

d) Remote turn on through simultaneous activation of the signals DSR/DTR and CTS/RTS on the RS232 (type DB-9) connector.

e) Remote turn on / turn off line – “ON_RMT” input on the CAT/AUX (DB-15) connector; DC voltage pulse: +4.5 to +15V DC towards ground for 1-2s; input current: 3mA maximum.

8-3. Storage and shipment

a) Environment conditions for storage and shipment:

- temperature range: -40ºC to +70ºC (-40ºF to 158ºF);

- relative air humidity: up to 75% @ 35ºC (95ºF);

- above sea-level: up to 12000m, including the luggage compartment of aircraft.

b) Dimensions and weight at transportation (max): (W x H x D) 480 x 290 x 450 mm (18.9 x 11.42 x 17.72 In); 14.5kg (32 Lbs).

9. DISCLAIMER of LIABILITY

All ACOM 600S specifications and descriptions are based on the latest information available at the time of this document's printing. As we always strive to constantly improve and update our products, ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE and ACOM reserves the right to make changes and improvements at any time without further notice or obligation to notify any person or organization of such revisions or changes, made in order to improve the reliability, function, quality and design, and/or performance of the ACOM 600S. Further, this Operating Manual is provided "as is" and ACOM shall not be liable for possible errors contained herein.

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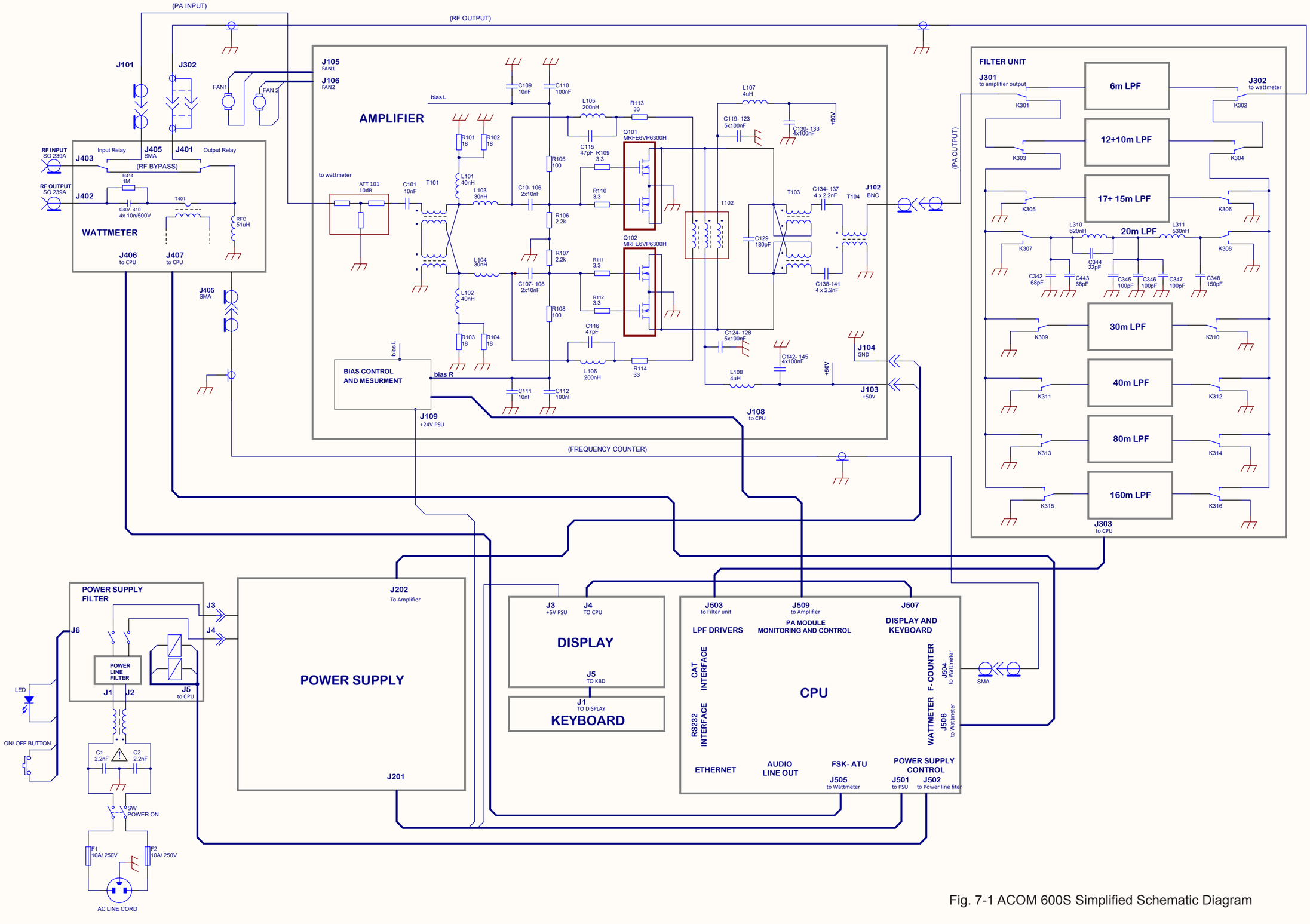


Fig. 7-1 ACOM 600S Simplified Schematic Diagram

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