

USER MANUAL

LA1K5

FULL AUTOMATIC SOLID STATE LINEAR
AMPLIFIER 1000 watts 1.8 - 54 MHz



CE



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1 INTRODUCTION

Thank you for purchasing our solid state linear amplifier **RFpower** model **LA1K5**. The visualization and setting of all the parameters, through a wide 5.0" TFT-LCD color touch screen, make it a state-of-art product and give it a unique practicality. This compact and lightweight amplifier employs the new generation of ruggedness and efficient **NXP™** 50 V RF power LDMOS MOSFETs. The amplifier is provided with built-in power supply according to the new European Rules about Energetic Efficiency and generate 1000 watts RF output power with 30 watts drive power covering all the radio amateur bands from 160 to 6 m, including WARC and 60 m band.

1.1 Important

Read the present manual carefully before attempting to operate the amplifier. This manual contains important safety and operating instructions; warranty will be invalidated in the case of non-observance of these instructions. This manual may be subject to changes and/or updates without notice.

1.2 Precautions



For your safety and to minimize local EMI/RFI, the amplifier must be properly grounded before operation.



Before connecting the amplifier to the general AC power line, verify that your AC power line is able to supply the electrical power needed by the amplifier.



Don't replace the AC power supply cord given with another one; if you replace it, there could be a risk of fire and/or electric shock.



Before opening the cover of the amplifier make sure that the AC power supply cord has been disconnected. Take out AC power supply cord from the outlet. Wait at least 1 minute for internal voltages to complete their discharge.



Don't turn ON the amplifier before having connected the ANTENNA; a hazardous RF voltage may be present on the antenna connector with no antenna connected.



Don't disconnect the antenna during transmission; fire and/or electric shock may be possible.



Don't expose the amplifier to rain, snow or any other liquids; fire and/or electric shock may be possible.



Don't touch the case of the amplifier with damp or wet hands; electric shock may be possible.



The amplifier may cause interference and it can influence other electrical appliances. In such cases the user must take proper actions to reduce the interference.



Before opening the cover of the amplifier wait at least one hour after the last transmission; the heat generated by the internal components of the amplifier may cause burns to your hands.



Don't install the amplifier in a place without a very good ventilation; the poor heat dissipation generated in this situation may damage the amplifier.



Don't obstruct the entries for cooling present in the cover of the amplifier; the poor heat dissipation generated in this situation may damage the amplifier.



Don't place the amplifier near walls or other obstacles; the poor heat dissipation generated in this situation may damage the amplifier.



Don't use the amplifier in places with temperatures below 0°C or above +35°C.



Don't place the amplifier in places exposed to direct sunlight, dusty or damp.



Keep the original boxes and packaging materials; if factory service is required, the amplifier must be shipped only using the original boxes and packaging materials.



This symbol, present on the products, packaging, documentation or other, mean that used electrical and electronics products should not be mixed with household waste (European Directive 2002/96/EC). Please consult your national legislation for treatment, recovery and recycling of this type of products.

2 SPECIFICATIONS

- Frequency Coverage:	1.8 - 54 MHz (All amateur radio frequencies, WARC and 60m included)
- Operation Mode:	All modes
- RF Input Drive Power:	160/80/40/30/20=20 watts - 17/15/12/10/6=30 watts
- Auto Band-change RF Sense Input:	Yes (by internal frequency counter)
- Input Circuit:	Broadband, VSWR 1.2:1 maximum
- VSWR Output Protection Value:	2.2 : 1
- Rated PA Output Power:	1000 watts PEP
- IMD3:	-32 dB or less below PEP @ 1000 watts RF output
- Harmonics Suppression:	HF = better than -50dB VHF = better than -60dB
- RF Output Filter:	7 pole low-pass type, High voltage mica and porcelain capacitors
- IN/OUT Impedance:	50 ohms unbalanced (Amphenol™ SO-239 connectors)
- RF POWER TRANSISTOR:	1x 1500 watts MRF1K50 NXP™ LDMOS MOSFETs
- Amplifier Circuitry:	Push pull AB class
- ALC:	0 Vdc to -10 Vdc ultra-fast time attack
- Microcontroller:	2x 8-Bit MCUs
- Cooling:	By temperature-controlled fans
- Acoustic Noise Level:	58 dB(A) maximum
- RX/TX Switching Time:	Adjustable
- RF Protections:	High antenna VSWR, Filter Wrong Band, Input Overdrive, Over temperature
- Main Power Supply Protections:	Short circuit, Over current, Over voltage, Over temperature, Power ON soft-start circuit
- Main Power Supply Rating:	100 Vac to 264 Vac 50/60 Hz
- Standard Rules:	According to EU Electromagnetic Compatibility and EU Electrical Safety - ROHS
- Dimensions:	35 x 40 x 17 cm (W x D x H)
- Weight:	12 kg (26.5 lb)

3 PRELIMINARY PRECAUTIONS

Before you start to install the amplifier, we recommend you to fully read this manual. Carefully remove the amplifier from its boxes and packaging materials and inspect for physical damage incurred during shipping. If you found any damage, contact immediately your supplier. Keep the original boxes and packaging materials; if factory service is required, the amplifier must be shipped using only the original boxes and packaging materials.

3.1 Amplifier location

The amplifier must be located in a cool and dry area with large space around the amplifier to allow good ventilation to all the surfaces and free flow of the air. Don't obstruct the entries for cooling present in the cover of the amplifier and don't place the amplifier near walls or other obstacles because reduced airflow conditions can severely damage the amplifier.

3.2 Connection to AC power supply

The amplifier features an internal high efficiency switching power supply according to the new European regulations in the field of energetic and saving. It accepts, automatically, the wide AC line voltage ranging from 100 VAC to 264 VAC 50/60 Hz. Before connecting the amplifier, verify that your mains supply is in accordance with the specifications of the amplifier. The amplifier must be connected directly to the mains supply with the supplied AC power cord, without the use of adaptors or other accessories.

3.3 Ground

Connect the ground terminal of the amplifier to the station's grounding system. A proper ground connection will result in reduced RF strays or noises and avoid points of RF high voltages during transmission on metallic objects that may come into contact with the operator.

3.4 Antenna

The amplifier is designed for use with antennas that present an impedance of 50 ohms at the operating frequency. Connect a coaxial cable from the amplifier output using a PL-259 plug to the antenna for the respective band. We recommend, that you use RG213 or better coaxial cable and to use antennas with the lowest possible ROS value.

4 FRONT PANEL DESCRIPTION



Switch

Touch screen

Switch

Operative switch for turning ON or OFF the amplifier.

Touch screen

Touch screen TFT-LCD 5.0" color 800x480 pixel resolution module.

5 REAR PANEL DESCRIPTION



ALC ADJ

Potentiometer to adjust the negative ALC Voltage to send to ALC circuit of the transceiver.

ALC OUT

RCA female connector to connect to ALC input of the transceiver.

AUTO A

D-SUB (9 pin) male connector for control cable from KENWOOD™ RS-232 COM port transceiver.

AUTO B

D-SUB (9 pin) male connector for control cable from ICOM™ - YAESU™ - ELECRAFT™ transceiver.

GROUND

Ground terminal.

POWER SUPPLY

IEC type C14 general AC Outlet/Mains Socket. It is provided with two 10A (5x20 fast type) protection fuses. For the connection to the AC power line, refer to what is written in the "Preliminary Precautions" section.

RELAY (PTT)

The RCA female connector center pin has to be connected to ground through the dedicated circuit of the transceiver to activate the amplifier; the total keying current is lower than 2 mA.

RF IN

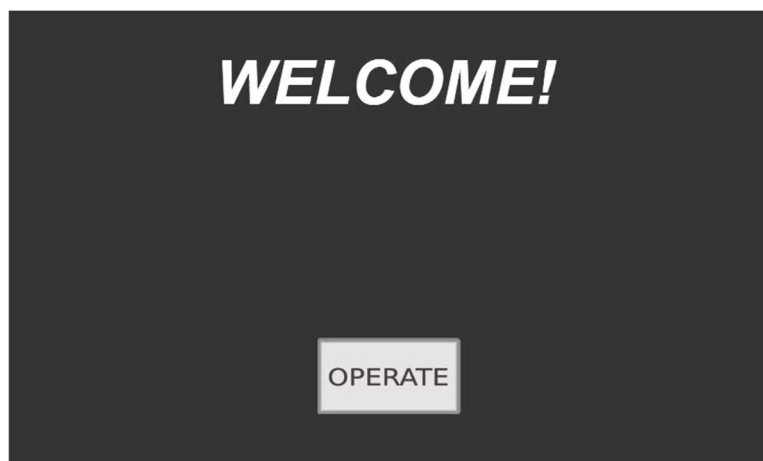
Amphenol™ SO-239 RF input connector to connect to the SO-239 RF output antenna connector of the transceiver.

RF OUT

Amphenol™ SO-239 RF output connector to connect the antenna.

6 Initial Setup - 1

When you turn ON the amplifier, the touch screen will appear like the image below; clicking on "OPERATE" button, the amplifier will move from "STAND-BY" condition (the amplifier is switched ON but it is not operative) to "OPERATE" condition.



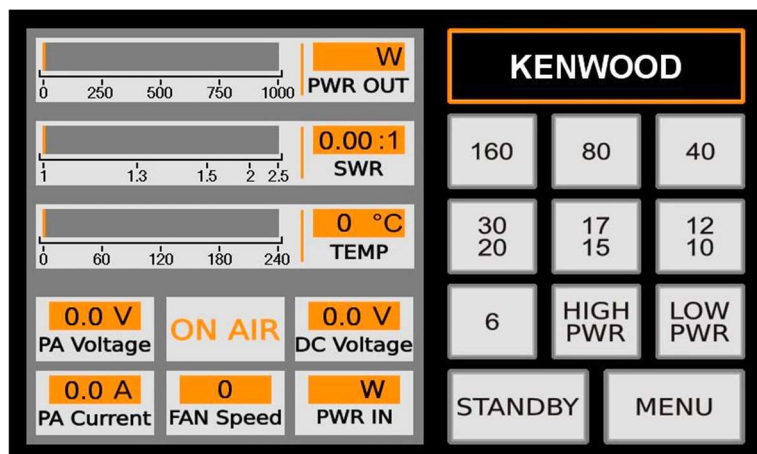
Notes:

- 1) Later 20 minutes from the last operation/command, the amplifier will automatically get ready for the "sleep-mode" modality (low power consumption) reporting it with the shutdown of the touch screen; a next pressure on the screen will exit the amplifier from this condition.
- 2) When the amplifier is in "STAND-BY" mode or it is turned OFF, the running RF power must not exceed 200 watts.

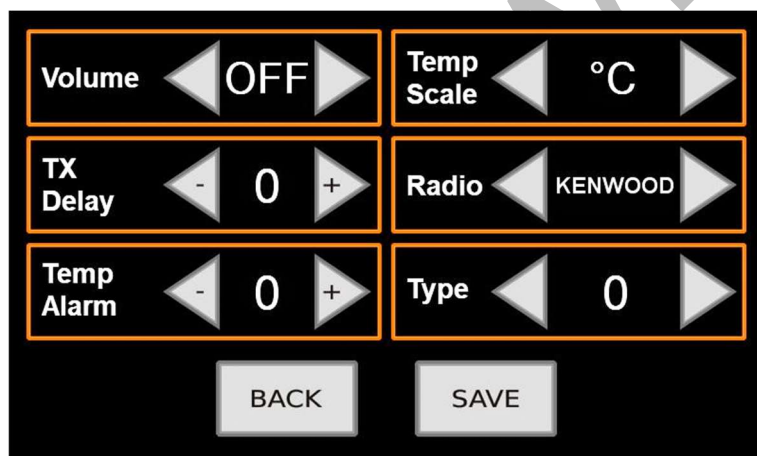
7 Initial Setup - 2

Once you have clicked on "OPERATE" button, a picture similar to the image below will appear on the touch screen.

Note: the image below is only as example.



The first operation to do is to click on the "MENU" button so that you can set the parameters that are necessary for the operativity of the amplifier; the setting menu is like the image below:



and it is composed of the following submenu:

- **Volume**
It allows to turn ON or OFF the acoustic buzzer.
- **Temp Scale**
It allows to change the unit of measure (°C - °F) of the temperature.

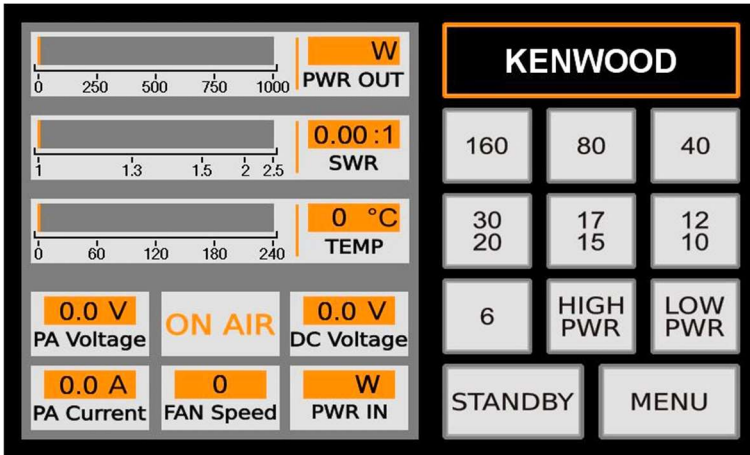
- **TX Delay**
It introduces an extra time delay in the activation of the amplifier; very useful in case of "TX RF spike" generated by a transmitter at the beginning of the transmission.
- **Radio**
It allows to select the type of transceiver and/or the operating mode of the amplifier.
- **Temp Alarm**
It allows to set the value of the maximum operative temperature of the RF power transistor thermal protection.
- **Type**
It offers a different basic design of the touch screen.

Important Notes:

- 1) Once you have entered in the setting menu, the correct setting sequence is:
 - a) Choice of the parameter clicking on the right or left arrow of the interested submenu;
 - b) Confirmation and saving of the parameter clicking on the "SAVE" button;
 - c) Exit from the setting menu clicking on the "BACK" button.
- 2) The missed turning ON of the "SAVE" button does not allow the saving of the information!
- 3) It will be always possible to change parameters, even in a following stage.

8 Initial Setup - 3

Once you have left the setting menu or going from "STAND-BY" condition to the operative condition of the amplifier (OPERATE), a picture similar to the image below will appear on the touch screen. Note: the image below is only as example.



In the detail of the image you can see:

- A meter (PWR OUT) with a bar and numeric indication for the RF output power reading;
- A meter (SWR) with a bar and numeric indication for the antenna's VSWR reading;
- A meter (TEMP) with a bar and numeric indication for the RF power transistor temperature reading;
- A meter (PA Voltage) with numeric indication for the RF power transistor voltage (Vdd) reading;
- A meter (DC Voltage) with numeric indication for the service-circuits voltage reading;
- A meter (PA Current) with numeric indication for the RF power transistor current (Idd) reading;
- A meter (PWR IN) with numeric indication for the RF input power reading.

Continuing with the description about the above image, you notice:

- An indicator (ON AIR – RX) of the amplifier's activity state;
- A sequential indicator (1 – 2 – 3 - 4) of the fan speed;
- An indicator (Kenwood – Icom - Yaesu – Automatic - Manual) of the mode/type of amplifier drive;
- A series of indicators/buttons (160 – 80 – 40 - 30/20 - 17/15 - 12/10 - 6) suitable for reporting the selected operative band;
- A button/indicator (HIGH PWR) to select when you want to get the amplifier work in High Power mode;
- A button/indicator (LOW PWR) to select when you want to get the amplifier work in Low Power mode (particularly indicated for high duty cycle transmissions like RTTY);
- A button/indicator (STANDBY) to set the amplifier in "STAND-BY" condition;
- A button (MENU) to enter in the settings of the amplifier.

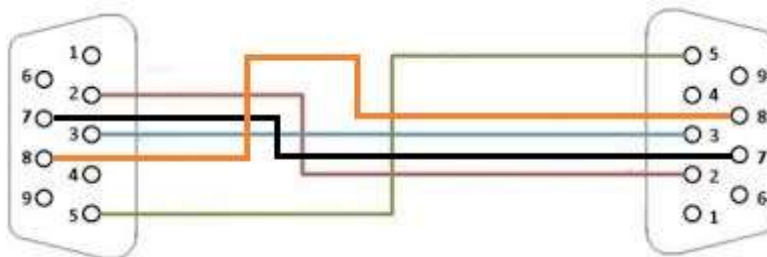
9 CONNECTION AND OPERATION with KENWOOD™ transceiver

9.1 Connect AC power cord and antenna's coax cables as mentioned on page 8. Connect a good shielded control cable from the remote terminal of the transceiver (usually called "REMOTE"), normally enabled for the driving of an amplifier, to the amplifier phono (RCA) female connector called "RELAY". The phono (RCA) female connector center pin (RELAY) is to be shorted to ground through the relay circuit of the transceiver; the total keying current is under 2 mA.

If this connection is not applied, the amplifier will not go into TX (amplification) mode.

9.2 Use a good 50 ohms coaxial cable to connect the antenna plug of the transceiver to the amplifier "RF IN" connector.

9.3 Connect a simple straight-through DSUB (9pin) female – DSUB (9pin) female high quality shielded cable, from RS-232 COM port of your transceiver to the amplifier "AUTO A" DSUB (9pin) male connector.



9.4 Set RS-232 COM port baud rate of your transceiver to 57600 bps.

9.5 Set "KENWOOD" from the setting menu of the amplifier.

9.6 Go in TX mode and set the transceiver RF output power to perform the desired amplifier RF output power.

9.7 With an high power transceiver in SSB mode, you can overdrive the amplifier in a distorted output signal. This can occur if you set the microphone gain and/or compressor too high. We recommend to not exaggerate with the microphone gain; you can reduce the RF output power or you can use the ALC output of the amplifier.

9.8 Protection circuits may work during operation depending on the conditions. For more details, see section 19. PROTECTION CIRCUITS.

10 CONNECTION AND OPERATION with ICOM™ transceiver

This section explains the connections of the amplifier with an ICOM™ transceiver provided of "Band Voltage Output" connector.

10.1 Connect AC power cord and antenna's coax cables as mentioned on page 8. Connect a good shielded control cable (for the connections see page 16) from the remote terminal of the transceiver, normally used for the driving of an amplifier and that is provided with "Band Voltage Output" pin, to the amplifier "AUTO B" D-SUB (9 pin) male connector.

10.2 Use a good 50 ohms coaxial cable to connect the antenna plug of the transceiver to the amplifier "RF IN" connector.

10.3 Set "ICOM" from the setting menu of the amplifier.

10.4 Go in TX mode and set the transceiver RF output power to perform the desired amplifier RF output power.

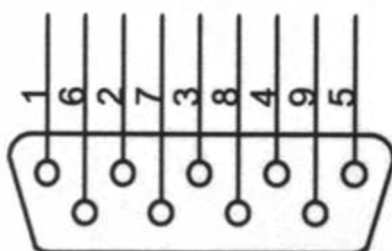
10.5 With an high power transceiver in SSB mode, you can overdrive the amplifier in a distorted output signal. This can occur if you set the microphone gain and/or compressor too high. We recommend to not exaggerate with the microphone gain; you can reduce the RF output power or you can use the ALC output of the amplifier.

10.6 Protection circuits may work during operation depending on the conditions. For more details, see section 19. PROTECTION CIRCUITS.

11 ICOM™ TRANSCEIVER SHIELDED CONTROL CABLE SCHEMATIC DIAGRAM

This section explains the electrical connections of the shielded control cable for ICOM™ transceivers provided with "Band Voltage Output" pin.

"AUTO B" D-SUB (9 pin) male connector



NOTE: as viewed from rear panel

D-SUB (9 pin)
Pin Number:

CONNECT TO ICOM™ REMOTE TERMINALS NAMED:
(ACC2 7 pole DIN - ACC 13 pole DIN)

1	N.C.
2	N.C.
3	N.C.
4	N.C.
5	BAND
6	SEND - HSEND
7	N.C.
8	N.C.
9	GND (GROUND)

Note: as cable use a two wire plus shield quality shielded cable.

12 CONNECTION AND OPERATION with YAESU™ transceiver

This section explains the connections of the amplifier with a YAESU™ transceiver provided with "Band Data" output pins.

12.1 Connect AC power cord and antenna's coax cables as mentioned on page 8. Connect a good shielded control cable (for the connections see page 18) from the remote terminal of the transceiver, normally used for the driving of an amplifier and that is provided with "Band Data" pin, to the amplifier "AUTO B" D-SUB (9 pin) male connector.

12.2 Use a good 50 ohms coaxial cable to connect the antenna plug of the transceiver to the amplifier "RF IN" connector.

12.3 Set "YAESU" from the setting menu of the amplifier.

12.4 Go in TX mode and set the transceiver RF output power to perform the desired amplifier RF output power.

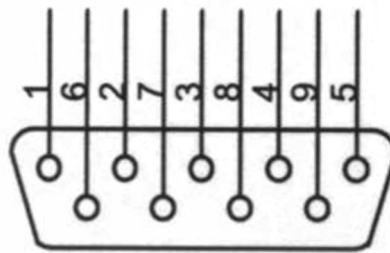
12.5 With an high power transceiver in SSB mode, you can overdrive the amplifier in a distorted output signal. This can occur if you set the microphone gain and/or compressor too high. We recommend to not exaggerate with the microphone gain; you can reduce the RF output power or you can use the ALC output of the amplifier.

12.6 Protection circuits may work during operation depending on the conditions. For more details, see section 19. PROTECTION CIRCUITS.

13 YAESU™ TRANSCEIVER SHIELDED CONTROL CABLE SCHEMATIC DIAGRAM

This section explains the electrical connections of the shielded control cable for YAESU™ transceivers provided with "Band Data" pin.

"AUTO B" D-SUB (9 pin) male connector



NOTE: as viewed from rear panel

**D-SUB (9 pin)
Pin Number:**

**CONNECT TO YAESU™ REMOTE TERMINALS NAMED:
(LINEAR – BAND DATA)**

1	BAND DATA A
2	BAND DATA B
3	BAND DATA C
4	BAND DATA D
5	N.C.
6	TX GND
7	N.C.
8	N.C.
9	GND (GROUND)

Note: as cable use a five wire plus shield quality shielded cable.

14 CONNECTION AND OPERATION with K3 ELECRAFT™ transceiver

This section explains the connections of the amplifier with a K3 ELECRAFT™ transceiver provided with D-SUBHD (15 pin) "ACC" connector.

14.1 Connect AC power cord and antenna's coax cables as mentioned on page 8. Connect a good shielded control cable (for the connections see page 20) from the D-SUBHD (15 pin) "ACC" connector of the transceiver to the amplifier "AUTO B" D-SUB (9 pin) male connector.

14.2 Use a good 50 ohms coaxial cable to connect the antenna plug of the transceiver to the amplifier "RF IN" connector.

14.3 Set "YAESU" from the setting menu of the amplifier.

14.4 Go in TX mode and set the transceiver RF output power to perform the desired amplifier RF output power.

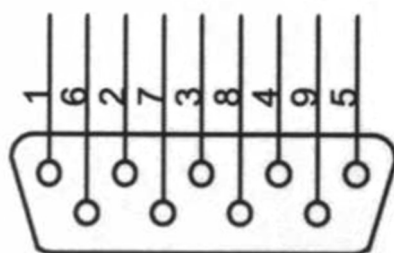
14.5 With an high power transceiver in SSB mode, you can overdrive the amplifier in a distorted output signal. This can occur if you set the microphone gain and/or compressor too high. We recommend to not exaggerate with the microphone gain; you can reduce the RF output power or you can use the ALC output of the amplifier.

14.6 Protection circuits may work during operation depending on the conditions. For more details, see section 19. PROTECTION CIRCUITS.

15 K3 ELECRAFT™ TRANSCEIVER SHIELDED CONTROL CABLE SCHEMATIC DIAGRAM

This section explains the electrical connections of the shielded control cable for K3 ELECRAFT™ transceivers provided with D-SUBHD (15 pin) "ACC" connector.

"AUTO B" D-SUB (9 pin) male connector



NOTE: as viewed from rear panel

**D-SUB (9 pin)
Pin Number:**

**CONNECT TO K3 ELECRAFT™ CONNECTOR NAMED:
(ACC)**

1	BAND0 OUT
2	BAND1 OUT
3	BAND2 OUT
4	BAND3 OUT
5	N.C.
6	KEYOUT-LP
7	N.C.
8	N.C.
9	GROUND

Note: as cable use a five wire plus shield quality shielded cable.

16 CONNECTION AND AUTOMATIC OPERATION with any transceiver

16.1 Connect AC power cord and antenna's coax cables as mentioned on page 8. Connect a good shielded control cable from the remote terminal of the transceiver (usually called "REMOTE"), normally enabled for the driving of an amplifier, to the amplifier phono (RCA) female connector called "RELAY". The phono (RCA) female connector center pin (RELAY) is to be shorted to ground through the relay circuit of the transceiver; the total keying current is under 2 mA.

If this connection is not made, the amplifier will not go into TX (amplification) mode.

16.2 Use a good 50 ohms coaxial cable to connect the antenna plug of the transceiver to the amplifier "RF IN" connector.

16.3 Set "AUTO" from the setting menu of the amplifier.

16.4 Go in TX mode and set the transceiver RF output power to perform the desired amplifier RF output power.

16.5 With an high power transceiver in SSB mode, you can overdrive the amplifier in a distorted output signal. This can occur if you set the microphone gain and/or compressor too high. We recommend to not exaggerate with the microphone gain; you can reduce the RF output power or you can use the ALC output of the amplifier.

16.6 Protection circuits may work during operation depending on the conditions. For more details, see section 19. PROTECTION CIRCUITS.

17 CONNECTION AND MANUAL OPERATION with any transceiver

17.1 Connect AC power cord and antenna's coax cables as mentioned on page 8. Connect a good shielded control cable from the remote terminal of the transceiver (usually called "REMOTE"), normally enabled for the driving of an amplifier, to the amplifier phono (RCA) female connector called "RELAY". The phono (RCA) female connector center pin (RELAY) is to be shorted to ground through the relay circuit of the transceiver; the total keying current is under 2 mA.

If this connection is not made, the amplifier will not go into TX (amplification) mode.

17.2 Use a good 50 ohms coaxial cable to connect the antenna plug of the transceiver to the amplifier "RF IN" connector.

17.3 Set "MANUAL" from the setting menu of the amplifier.

17.4 From the principal menu set the desired working band clicking on the respective button.

17.5 Go in TX mode and set the transceiver RF output power to perform the desired amplifier RF output power.

17.6 With an high power transceiver in SSB mode, you can overdrive the amplifier in a distorted output signal. This can occur if you set the microphone gain and/or compressor too high. We recommend to not exaggerate with the microphone gain; you can reduce the RF output power or you can use the ALC output of the amplifier.

17.7 Protection circuits may work during operation depending on the conditions. For more details, see section 19. PROTECTION CIRCUITS.

18 ON ALC ADJUST

On the back of the amplifier, you find a knob labeled "ALC ADJ" necessary to set the negative ALC Voltage that you have to send to ALC input of the transceiver. When this ALC Voltage is properly feedback to the ALC input terminal of the transceiver, it will help to prevent the occurrence of distortion due to the over driving. Also, by adjusting the ALC level properly, RF output power can be set at free level. Do not existing a specific voltage standard valid for all the transceiver, you can do a basic calibration using a 50 ohms dummy load and a RF power meter with maximum peak value reading; speaking in the microphone with a normal voice, slowly adjust the "ALC ADJ" knob as long as you read a decrease in the RF peak power value.

(Maximum ALC Voltage produced is -10Vdc when the amplifier RF output is over 1000 watts. Depending upon the manufacturer of the transceiver, the suitable ALC Voltage differs. ICOM may need 0 to -4Vdc, Yaesu may need 0 to -5Vdc and Kenwood may need 0 to -8Vdc maximum)

19 PROTECTION CIRCUITS

There are many protection circuits in this amplifier; in case of activity, they set immediately the amplifier in "STAND-BY" mode and reported via a message.

If, for any reason, the amplifier goes under protection, you have to verify immediately the cause and don't persist in the use of the amplifier in that condition. Once you have solved the problem, you can set the amplifier in operative mode clicking on the "RESTART" button.

19.1 Switching Power Supply Unit (PSU) protections

The internal switching power supply unit features the following automatic protections:

- Soft start
- Short circuit
- Over current
- Over voltage
- Over temperature

A built-in green LED check its normal activity. If the green LED is OFF (or red color) means that the PSU is in an auto-protect condition.

