



USER MANUAL

MERCURYIIIS

Features

- Operating Bands 160m – 6m (Ham Bands)
- RF Auto Band Decoding.
- 7-inch Color Touch Screen.
- FWD/REF/SWR Meter.
- DI Voltage/DI Current Meter.
- All Protection.
- Selection for 3 Antennas w/Memory..
- 1200 watts SSB/CW.
- 700 watts DIGI mode.
- FCC ID: 2A3P6MERCURYIIIS.

mercuryIIIS
LDMOS POWER AMPLIFIER

Designed and Manufactured in the USA
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WHAT IS AN LDMOS?

- LDMOS (laterally diffused metal oxide semiconductor) transistors are used in microwave/RF power amplifiers. These transistors are often fabricated on p/p+ silicon epitaxial layers. The fabrication of LDMOS devices mostly involves various ion-implantation and subsequent annealing cycles. As an example, the drift region of this power MOSFET is fabricated using up to three ion implantation sequences in order to achieve the appropriate doping profile needed to withstand high electric fields.
- Silicon-based LDMOS FETs are widely used in RF power amplifiers for base-stations as the requirement is for high output power with a corresponding drain to source breakdown voltage usually above 60 volts. Compared to other devices such as GaAs FETs they show a lower maximum power gain frequency.
- We use the **ART1K6FHU** from Ampleon USA Inc:
- We have performed a test of ruggedness with a controlled load mismatch through all phases, enabled by the test fixture. The mismatch unit is connected to a network analyzer. Through a network control, we can set it to work through all phases of the Smith chart. This mismatch unit will create voltage standing waves with ratios from 55: 1 up to a maximum of 125: 1. With the normal situation (standard, 50 volts 1200 watts into a 50-watt load) the amp is operating at full power. The mismatch unit now replaces the dummy load connected to the output of the amp and the test set up is powered up again. We then vary the mismatch unit to expose the LDMOS transistor to a range of extreme mismatch conditions and positions on the Smith chart. The extreme conditions range from a VSWR of 55: 1 to 125: 1. The transistor is still alive by going back to the original load and showing the 1200-watt output power. It still works! Would you ever treat a transistor worse than this? Check out the next test.
- Even though the transistor is normally used at 50 volts, we then test it at 55 volts to challenge the extremely rugged LDMOS. The transistor was powered at 55 volts 1200 watts into 50 ohms when we suddenly disconnect the output load, creating a very unfriendly open circuit situation. Then, we powered up the transistor to 1200 watts. A short was introduced to the output of the amp while the transistor is powered up. When placed back into the 50-ohm load and powered up to 1200 watts, we see that it again survives and works perfectly. This is what we mean by extremely rugged. This transistor seems to be unbreakable, this does not mean that proper operations procedures and suggestions should be avoided as damage may occur.

FEATURES & SPECIFICATIONS

FEATURES

- Maintains linearity under full output power (1200watts).
- Low harmonic content (below -43dBc on HF & -65dBc on VHF bands) thanks to an efficient Chebyshev filter.
- Fast and effective protection systems maintain the amplifier's safety from operational damage. If operational guidelines are observed.
- Compact linear amplifier with 1200 watts SSB/CW & 700 watts DIGI-MODE of output power on all amateur bands from 1.8 to 54MHz (<800watts 50 to 54MHz)
- Auto sensing power supply from 120 to 240VAC.
- Full power on 120VAC or 240VAC – SSB. **CW MODE AC LINE 240V REQUIRED, NOT CW FULL BREAK-IN CAPABLE.**
- Generous power and great dynamics with the proven **ART1K6FHU** by Ampleon Inc.
- Easy to read 7", 165x100mm, high-resolution touch screen color display w/800x480 pixels and 24-bit colors.
- Compatible with all transceiver models available on the market - ground on transmit (PTT) and 50W of RF drive power should be sufficient.
- The amplifier monitors the frequency of the input signal through the built-in RF Band decoder chip and automatically switches bands accordingly.
- Monitors itself during operation with full-time protection circuits in all modes so the operator does not need to monitor.
- Convenient for expeditions and field operation: extremely compact and light construction, mains voltage range (100V÷240V), protects operation from unstable mains, generators etc. These features are achieved thanks to the built-in switching mode power supply (SMPS).
- Exceeds electromagnetic compatibility (EMC) both for the highly-sensitive as well as with the powerful appliances in the radio station.

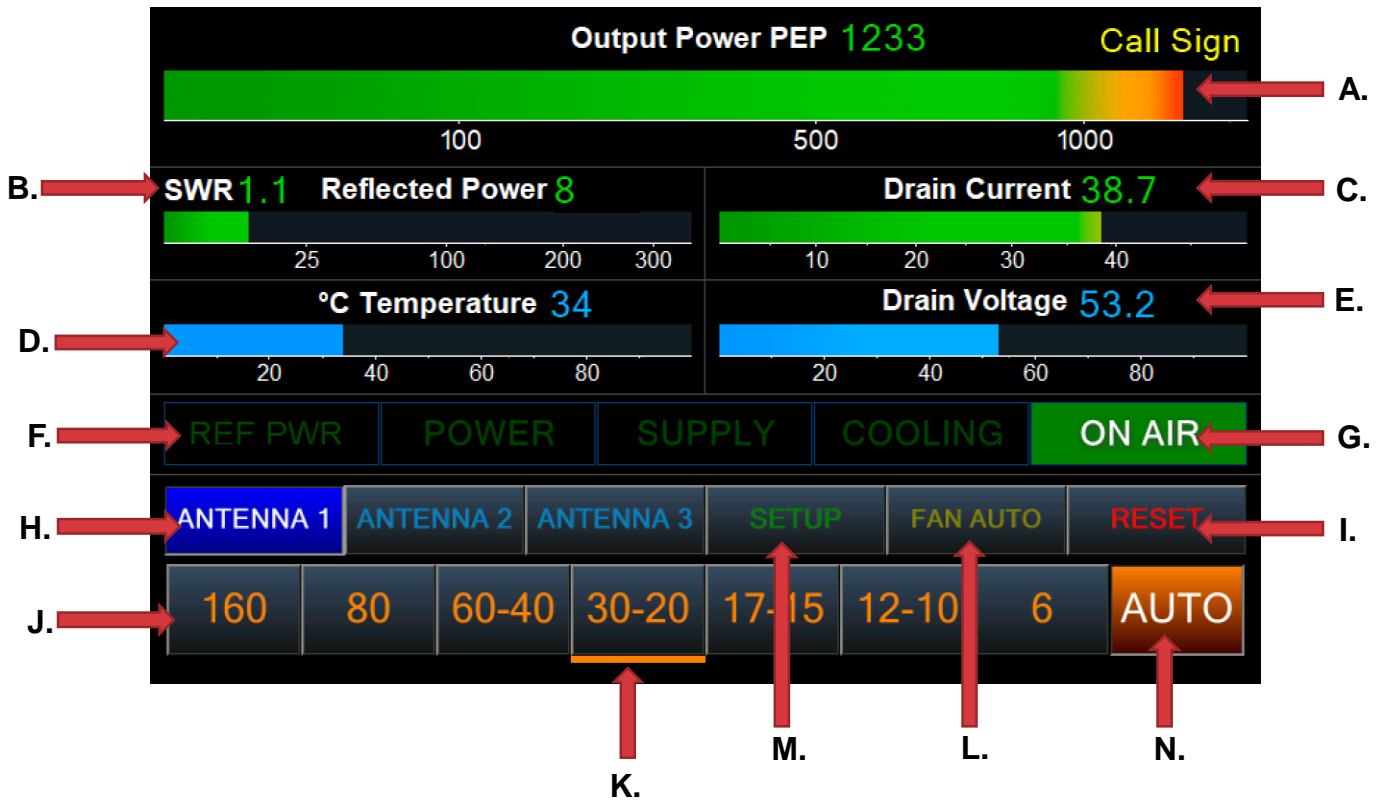
SPECIFICATIONS

- Intermodulation distortions (IMD3): better than 30dB below the rated PEP output.
- 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.
- Temperature range: 14 F to 149 F (-10 C to +65 C)
- Dimensions (projections not included) and weight, operating: (W x H x D) 12 x 5.5 x 13.5 In (305 x 140 x 343 mm); 27Lbs (12.2 kg).
- **This unit complies with the FCC RF Exposure limits for an uncontrolled environment. To comply with FCC RF exposure limit requirements, antennas must be operated at a minimum distance of 740.25 cm or 24.29' between the radiator and any person's body.**

QUICK START GUIDE

1. Connect the Amplifier to a 120 or 240-volt AC outlet; the Power Supply is AUTO sensing. *We recommend using the Amplifier at 240 volts, although at 120 volts our Power Supply has performed well, at 240 volts the Power Supply fan runs at a lower RPM and is quieter and more efficient.*
2. Connect the output of the amplifier ANT-1 to a 50-ohm load or the corresponding antenna.
3. Connect the RF-IN of the amplifier to the RF-OUT of transceiver.
4. Connect the RCA PTT terminals from amplifier and to transceiver.
5. Do NOT connect ALC unless it has been adjusted...(not needed for quick startup).
6. Set the transceiver to the minimum power.
7. Gradually increase power by SSB modulation, while checking for output power.
8. **WARNING:** Input power less than 35-watts for (RTTY, CW, AM, FM, DATA) Modes.

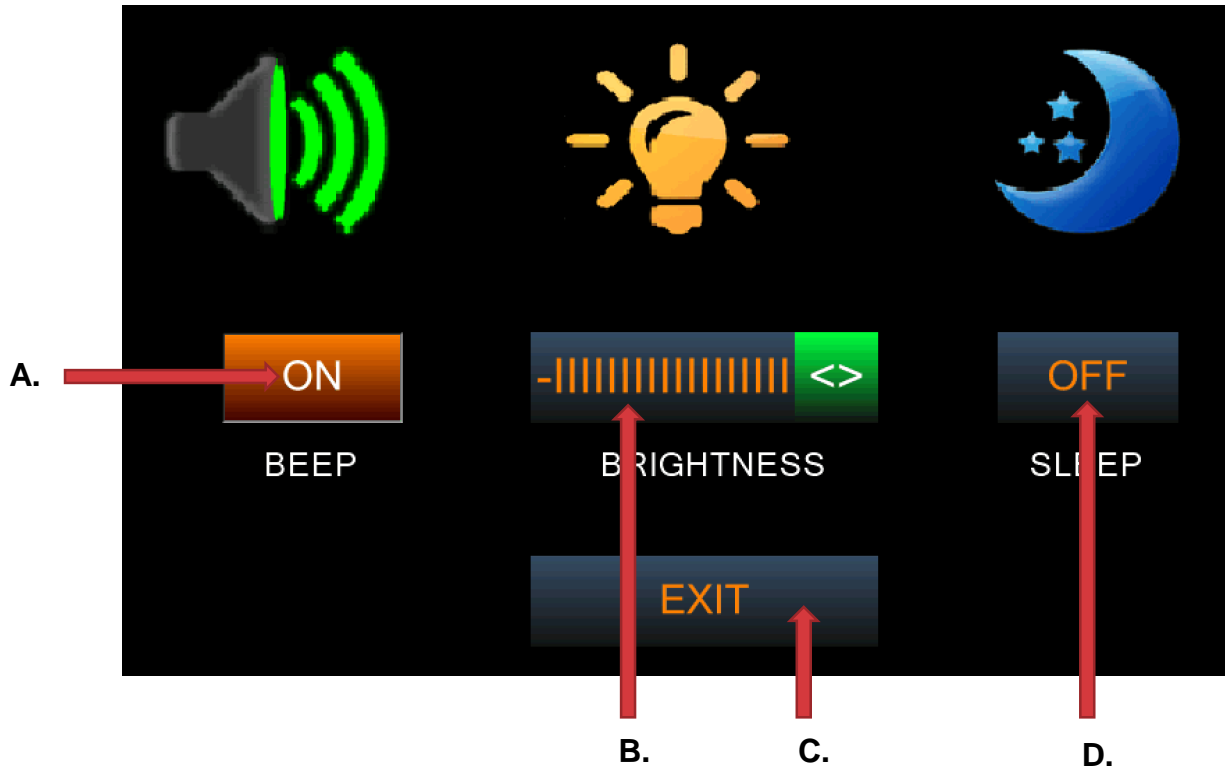
MAIN SCREEN



- A. FWD Power Meter Output. (pep)
- B. SWR/REF Meter Output.
- C. Drain Current Meter.
- D. Temperature Indicator °C.
- E. Drain Voltage Meter.
- F. Alarm Indicators Zone.
- G. Transmission Indicator.
- H. Antenna Switch zone.
- I. Protections and Alarms Reset Button.
- J. Manual Band Select Buttons zone.
- K. Automatic Segment Indicator.
- L. Automatic or Manual Fan Control Button.
- M. Configuration.
- N. Automatic Band Mode.

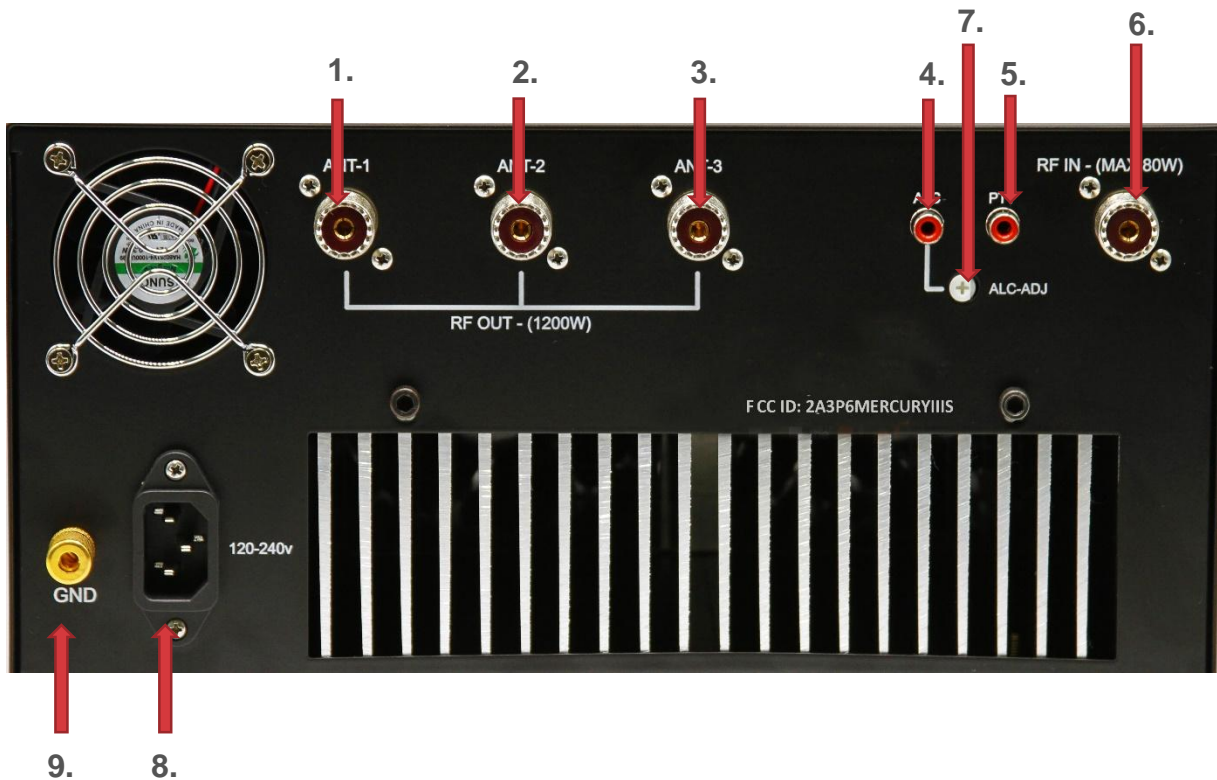
DISPLAY SETTING SCREEN

Main screen / Setup button / Display button



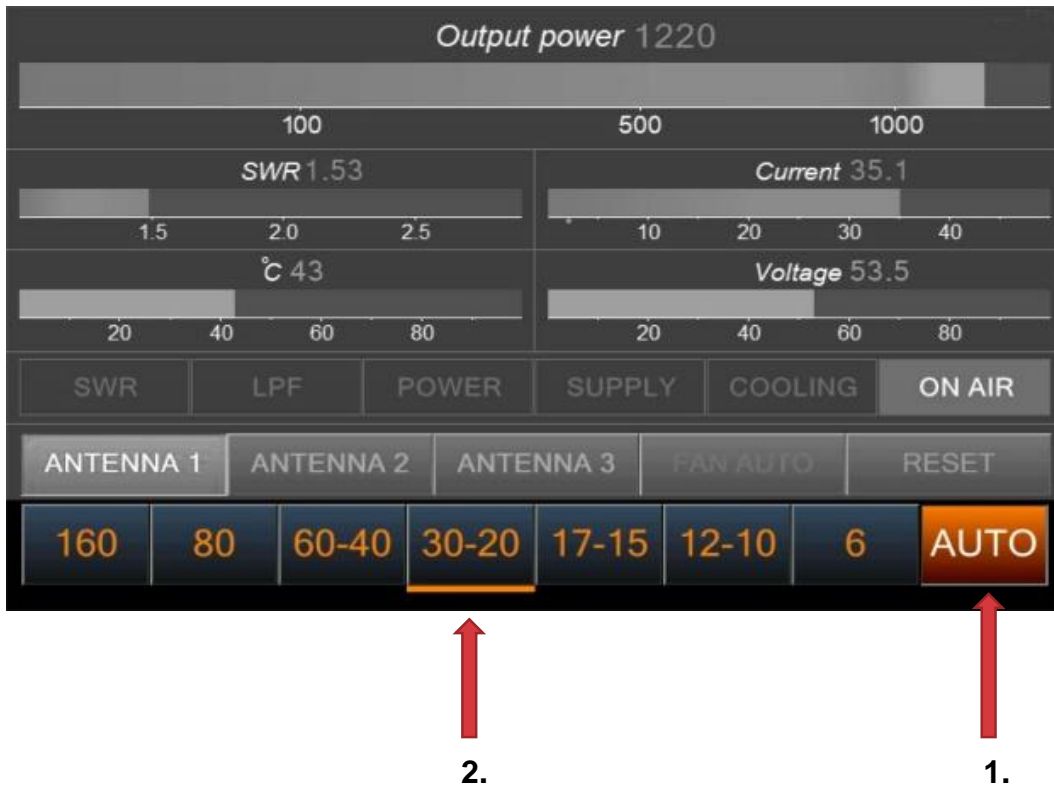
- A. ON / OFF Sound.
- B. Screen Brightness Slider.
- C. Exit to Main Screen.
- D. Turns off the display after 15 minutes; touch the display to turn on.

REAR PANEL LAYOUT



1. SO239 Antenna -1 (default)
2. SO239 Antenna -2
3. SO239 Antenna -3
4. RCA Plug ALC to Radio.
5. RCA Plug PTT Key to Radio.
6. SO239 RF Input Driver.
7. ALC adjustment fits Philips.
8. IEC 320 C14 AC Outlet.
9. Ground connection.

BAND SELECTOR



RF Band Decoder will be in AUTO when amplifier starts-up (1).

A signal emitted by the transceiver selects the appropriate Low Pass Filter segment. Display sample (2) shows automatically selected segment indicator.

Keep in mind that in SSB mode the radio will not emit RF until it modulates; 200 milliwatts is necessary to detect the current frequency. It is worth noting that some radios make a small click when you press PTT which is enough to detect the appropriate segment quickly.

If you manually select an incorrect band above the frequency in use, the protection shut the amplifier down, the display shows ERROR LOW PASS FILTER (3)



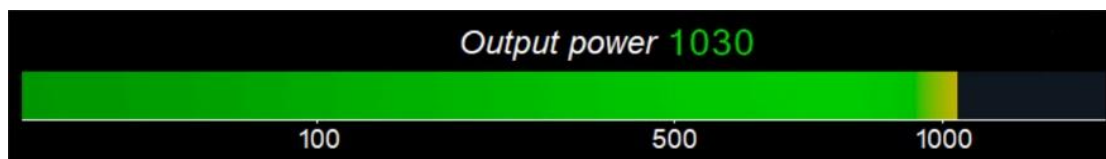
OUTPUT POWER ALC (optional)



The amplifier provides an output power of 1000 - 1200 watts in HF bands. For 50 MHz, the output power does not exceed 900 watts. The input level is different in each segment; the use of ALC is for constant output in all bands without regulating the input power.

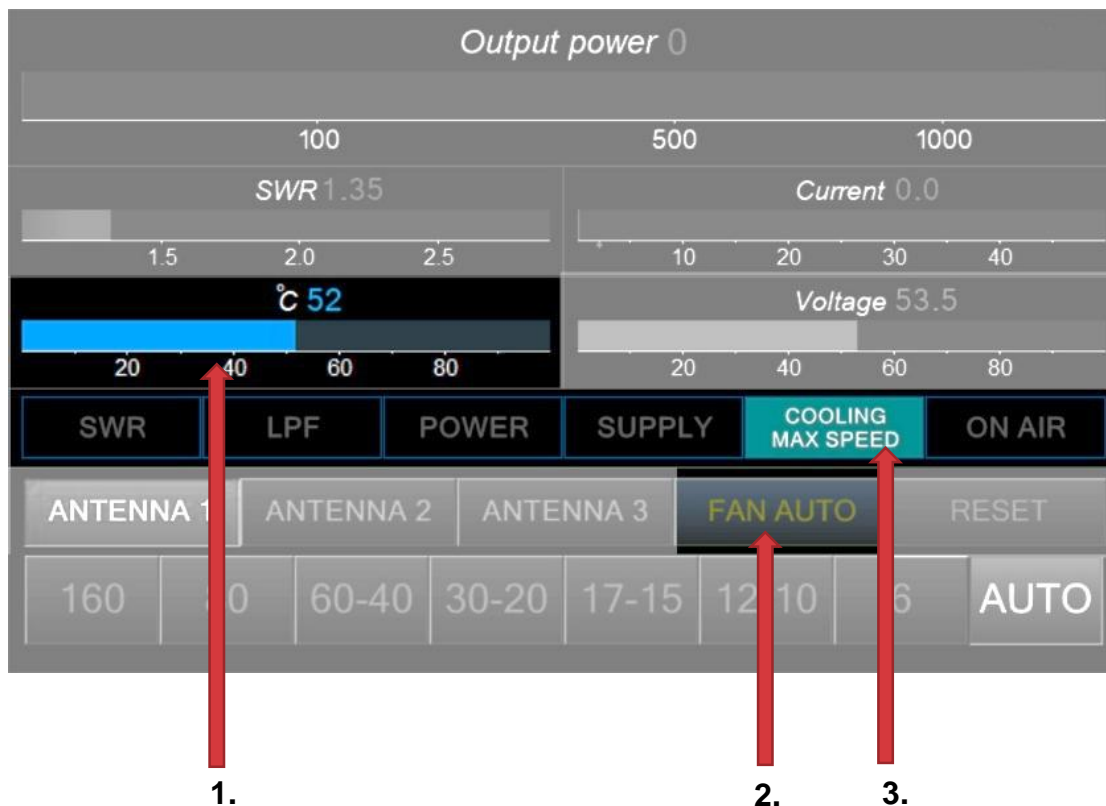
How to adjust ALC for maximum power:

1. Connect an RCA-type cable from the ALC port on the amplifier (1) to the ALC port on the transceiver. Note; some Transceivers do not have an RCA-type for ALC.
2. Turn the regulator completely to the **left, counter-clockwise**.
3. Set the transceiver output to 40-60 watts. The 20-meter band is recommended for this adjustment.
4. Begin to modulate and turn the regulator to the **right, clockwise**, noting that the power will be low and will begin to rise (2).
5. Stop when you see the level bar in approximate peaks of 1000 watts. Note; some Transceivers have a narrow adjustment.



WARNING: Use an input power less than 35-watts for (RTTY, CW, AM, FM, DATA) Modes.

TEMPERATURE & COOLING FANS



The temperature is constantly monitored and shows on the Display (1). If the temperature is $<50^{\circ}\text{C}$ the cooling fans will turn constantly at 30% of their speed. When the temperature is $>50^{\circ}\text{C}$, the fans automatically accelerate to 100% and return to 30% when the temperature is $\leq 45^{\circ}\text{C}$.

Maximum fan speed is recommended for prolonged operations (contests, Digi mode, etc.)

The fan control button (2) sets the fan to AUTO/MAX.

When the fan speed is 100%, it is shown in the area of the display indicator (3).

If the temperature is $>65^{\circ}\text{C}$, the system goes to Cool Down (4), the recovery is $\leq 55^{\circ}\text{C}$.



ALL PROTECTION

Despite the robust build of an LDMOS PA, it is necessary to protect the circuits to avoid damage caused either by user error or accidents. This ensures correct handling by the user and extends the life of the device.

The error indicator area (1) shows several errors on the same tab (2).

SWR	LPF	POWER	SUPPLY	COOLING
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1.



SWR-LPF	POWER	SUPPLY	COOLING	ON AIR
ERROR SWR >2.0	ERROR PWR 700W >8S	ERROR HI CURRENT	COOLING MAX SPEED	ON AIR
ERROR LP FILTER	ERROR PWR>1300W	ERROR HI VOLTAGE	ERROR TEMP WAIT <65C	ON AIR

2.

ERROR REF: The Amplifier will stop transmitting when REF is >125 Watts. For recovery, decrease power input or check the antenna - press RESET.

ERROR LP FILTER: The Amplifier will stop transmitting when lower segment is selected in error. For recovery, check the selected segment and press **RESET**.

ERROR PWR 700 WATTS: With continuous carriers of >700 watts for more than 8 seconds, the amplifier stops transmitting. For recovery, reduce RF input and press **RESET**.

ERROR PWR: The amplifier will stop transmitting if the output power is >1400 watts. For recovery, reduce RF input and press **RESET**.

ERROR HI CURRENT: The amplifier will stop transmitting if the drain current is >41 amps, or REF is high. For recovery, reduce RF input and press **RESET**.

ERROR HI VOLTAGE: The solid-state switch does not deliver if the voltage is >55 volt. For recovery, turn amplifier off/on; if the problem persists, there is a fault in the device.

ERROR TEMP: If the temperature is >65°C, the system goes to Cool Down; the recovery point is <55°C.

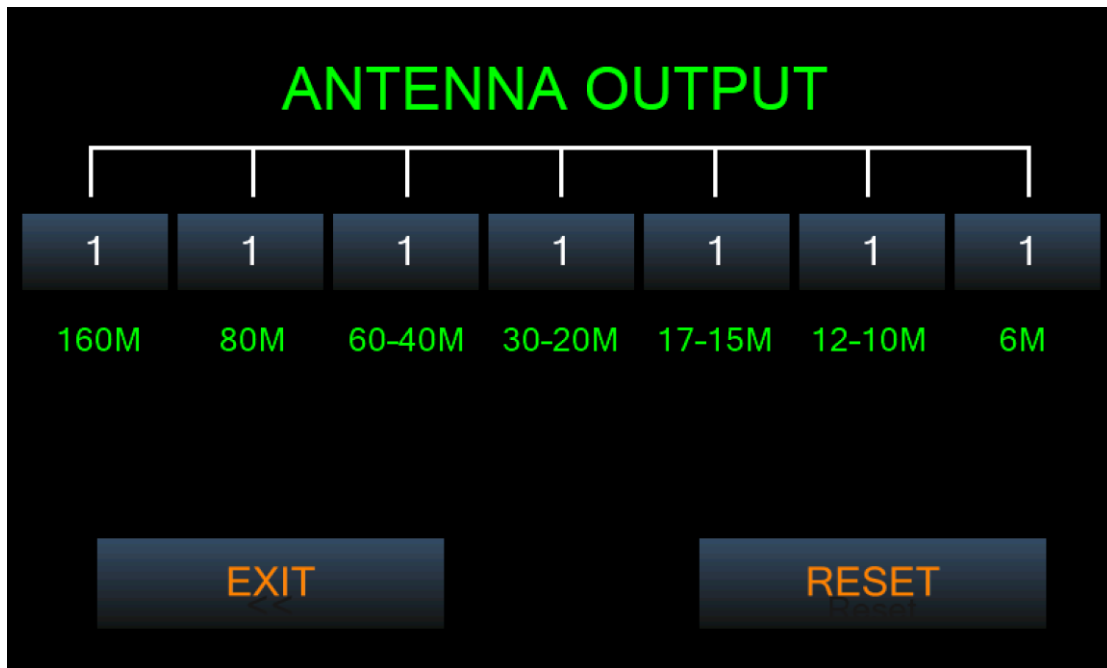
ANTENNA SWITCHES

You can manually select one of three antenna outputs (1). This selection is not kept in memory once the amplifier is turned off.



The setup button (2) displays the automatic antenna selection board. Configure the three antenna outputs with your antennas. The configuration remains in memory. At powerup Antenna 1 is the default. Reset button restores all bands to antenna -1.

Main screen / Setup button / Ant config button.



NOTE: Even though the PA's protection will trigger a REF POWER alarm, it is always recommended to have an antenna, or 50-ohm load connected to the programmed output in order to avoid probable severe damage to components.

DISCLOSURE

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION

NOTE: THE **GRANTEE** IS NOT RESPONSIBLE FOR ANY CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.