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## GEMINI HF-1K 472KHz-50MHz Linear Amplifier



**SHORT FORM OPERATING MANUAL**

Congratulations on purchasing your UK made Linear Amp Gemini HF-1K linear amplifier.

The amplifier covers all Amateur bands from 472KHz\*\* to 50MHz (including 5MHz)

The amplifier is housed in an all aluminium chassis. Front and rear panels are anodised finish. Top and bottom chassis panels are epoxy powder coated. The major internal components sit on a 3mm internal aluminium baseplate that ensures a robust and rigid unit and provides additional heat sinking. This also enables the external panels to be largely free of any fixing screws thus enhancing its clean lines.

Control is via a full colour touchscreen display.

The amplifier has a diode switched tx/rx changeover circuit allowing full break-in CW operation (QSK) at full output up to 50wpm.

The current version of this manual is available to download on our website at

[http://www.linearamp.co.uk/ghf\\_software.html](http://www.linearamp.co.uk/ghf_software.html)

## Unpacking

The following items are included:

The linear amplifier itself

Mains power lead

Spare fuses

Phono plug for PTT

This manual

Please unpack all items on arrival and check carefully for any signs of damage in transit. Please report back to us immediately if there are any issues.

We recommend you keep the purpose made packaging in case you need to transport your amplifier or return it to us for repair in the future. The packaging is designed to allow transportation safely over standard courier and postal networks.

\*\*Operation on 472KHz requires the use of an external Low Pass Filter (not supplied)

# Quick Start Guide

This document is written to provide a quick overview of the amplifier sufficient to get you operational quickly.

## Getting going

The Gemini HF-1K is essentially a fully automatic amplifier. Specifically the amplifier automatically senses the frequency of transmission of the driving transceiver and band switches without requiring either user input or any CAT or other interface.

User control is via the touchscreen display. Behind the normal operating screen are sub-menus for setting up antenna /band usage, power up status, sounds, network control etc.

Other than physically connecting up and setting up which antenna socket should be used for which band there are no other procedures required before you use the amplifier for the first time.

## Before you power up

### Drive level

The most important consideration is drive level. In manufacture we will have configured the amplifier to your requested specification. This will be for either 10, 25 or 50W input drive level for maximum output.

It is most important that you do not exceed the input drive level. Whilst the amplifier has an input overdrive detector that will inhibit transmit if it detects overdrive this cannot ever be 100% guaranteed to protect the LDMOS devices. It is a fast acting circuit but damage can occur in a single frequency cycle if over-driven sufficiently.

Damage to the amplifier due to over-driving is not covered under warranty.

Please therefore ensure that your transceiver is configured correctly. We recommend getting into the habit of a quick tx with the amplifier off-line to check the output power of rig using your in-line power/vswr meter before then turning the amplifier on. If your rig is configured to provide different power levels for each band then take a minute to check that all bands are set to a level at or below the amplifier maximum drive input level.

## Positioning of the Amplifier

The amplifier should be positioned in such a way that cooling is not restricted and away from direct sunlight. Air is drawn into the underside of the unit and out of the rear and out of the top at the back. It is important that you do not, for instance, stand the unit on or put loose paper underneath or on top of the amplifier as this could cover the intake grills and restrict the cooling. Likewise please ensure that the rear of the unit is not obstructed.

## Connecting up

Connect the supplied mains power lead (note the amplifier is shipped with a 10A fuse fitted assuming operation will be on 200-260V AC. If you are operating at 120V then you will need to fit the 20A spare fuse supplied and ensure your supply is rated appropriately)



Connect your transceiver to the socket marked TRX.

Connect antenna(s) as required to the sockets marked A, B, C.

Take a ground on transmit connection from the transceiver to the phono connector marked PTT (see **PTT** below).

Connect a Network cable (optional).

Connect 0dBm output (optional).

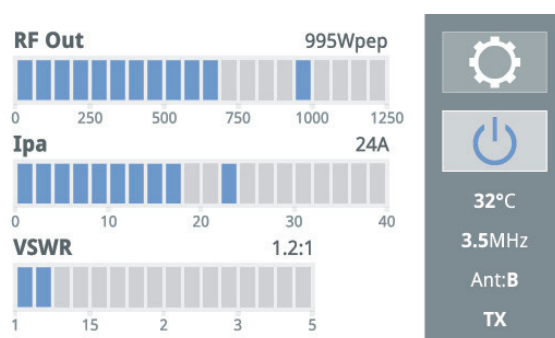
## PTT

The amplifier has no RF switching built in. To put the amplifier into transmit it is necessary to ground the centre pin of the PTT phono socket. Most transceivers have a 'Ground on transmit' output that will need to be connected to the PTT socket. The amplifier uses low level switching circuitry that will be compatible with any transceiver or transverter 'ground on transmit' output. A separate interface or relay circuit is not required.

## Powering up

Mains power switch on the front panel to on.

The amplifier will boot up. The screen will initialise with the Linear Amp logo and then after approximately 10 seconds 'DX' will be announced in CW and the screen will change to the operating screen.



(The amplifier will boot up either in Standby or Run mode depending on how you have set the software. If it powers up in Standby then press on the on.off button (top right on the screen) once).

## Antenna / Band set-up

The amplifier is supplied with three rear panel Antenna sockets marked A, B and C. Each band has an antenna assigned as required. When the amplifier is shipped all bands are set as default to use Antenna A.

Setting up of the band/antenna matrix is done via the touch screen.

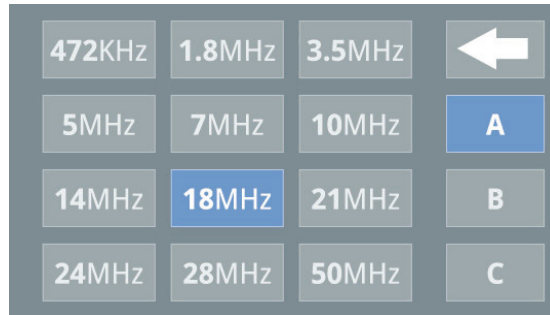
To set this up either:

Press the settings button on the main screen and then Band/Antenna button

Or:

Press the area on the main screen bottom right where the antenna in use is displayed (it will be showing A, B or C).

This will then open up the Band/Antenna selection screen:



Pressing on each band will show the Antenna currently set for that band. If you want to change the Antenna just press the appropriate Antenna A,B,or C as required. Settings are saved immediately.

Note this screen also serves as a manual band change screen allowing you to manually select the band you require (so, for instance, if you change bands on the transceiver and want to listen on another antenna without having actually transmitted you can do so manually from here).

When set-up is complete pressing the return button returns you to the main screen.

Once you start to tx then the amplifier will immediately change band automatically if the transceiver is on a different band to the amplifier. (Note tx is inhibited whilst you are in anything other than the main operating screen)

When the amplifier is turned off completely at the front panel power switch or disconnected from the mains then Antenna A is selected as default. The amplifier will allow up to 200W straight through operation (BUT remember to reset your drive level before you use the amplifier again!)

## Operation

Grounding the PTT line will put the amplifier into transmit. TX will be shown highlighted in red on the display. Note the nature of the solid state output switching circuit in the Gemini HF-1K is such that there is NO noise associated with going to tx. The only time you will hear relays click is during band change or antenna change.

Applying RF from the transceiver will result in RF output from the amplifier.

The display shows RF power out, Ipa (PA current) and VSWR as well as Band, Antenna and temperature. Both peak and average RFout and Ipa are shown. Numerically the peak value is shown.

## **Band selection**

The Gemini HF-1K has fully automatic band selection. As you transmit the amplifier detects the frequency of the transmission, checks to see if it is within the current band and if not changes the band of the amplifier automatically. The changeover procedure is cold switched and occurs in a few ms.

The amplifier contains a list of valid frequency ranges. If the transmit frequency is detected outside the valid range (ie out of band) then tx is inhibited and a pop up 'Out of Band' warning appears

Note that if you intend to operate on 472KHz then you will need to provide an external low pass filter with suitable performance and rating for the power output intended.

## **QSK**

The amplifier incorporates a diode switching circuit allowing silent full break in cw operation. The amplifier will maintain an undistorted CW keying envelope even at speeds in excess of 50wpm. QSK operation is an integral part of the amplifier design and does not need to be selected on or off manually.

## **Cooling**

The amplifier contains several temperature controlled cooling fans. In addition there is one low noise fan that runs all the time. The main fans will increase or decrease speed in linear fashion proportional to the temperature controlled over a temperature profile pre-programmed into the temperature control module in the amplifier. The main fans will not turn on until 40C and will then ramp up over a non-linear profile to be at maximum at 65C heatsink temperature. Fan speed control is automatic and independent of the tx/rx state of the amplifier.

## **Protection Circuits**

The amplifier has several protection circuits built in:

### **Overdrive**

The amplifier monitors input drive level. If drive level is exceeded then the overdrive circuit is activated inhibiting the PTT, causing the amplifier to lock out onto receive mode and an overdrive trip pop-up warning will be shown. You can clear the trip by touching the trip pop-up on the screen.

Check your rig!

## **VSWR**

The amplifier has a high VSWR lockout circuit built in. If the output VSWR exceeds 2.5:1 then this will be activated causing the high VSWR warning pop-up to appear on the screen. The amplifier will go to receive. You can clear the trip by touching the trip pop-up on the screen. PTT is inhibited until the reset is done. If the rig is still in tx then the amplifier will not turn back on until you turn the rig back to rx and then tx again.

Check why it tripped! - Antenna fault? Cabling fault? Wrong antenna selected? No antenna selected?

This trip has been designed to be deliberately invasive as VSWR faults should be investigated immediately.

## **Over Temperature protection**

If the temperature exceeds a higher threshold level that could potentially harm the amplifier then an Over Temp lockout will occur. This will inhibit the PTT, lock the amplifier on receive and the Over Temp warnign pop-up willl appear. Once the temperature drops sufficiently the amplifier will enable PTT again bus as with other trips you will have to cycle the rig off and back onto tx if it is still transmitting.

Note that if you are getting Over-Temp lockouts then the first thing to check is that the air intakes under the amplifier and/or the rear outlet are not obstructed.

## **Other Functions on the touchscreen**

There are various other functions available via the touchscreen. Pressing the settings button (below the on/off button on the RHS) enters a subscreen with a menu structure thus:

Band/Antenna

Options

- Power up either in Standby or Run mode
- Sound On or Off (default On)
- Brightness of display (default Maximum)

Network

- IP Address
  - Enter IP address
- IP Mask
  - Enter IP Mask
- DHCP Off or On - active network connection activity is shown.

## **0dBm output**

The Gemini HF-1K is fitted with a low level 50R signal output marked 0dBm on the rear panel. This samples the RF output from the amplifier and can be used to monitor signal quality or for integration as a predistortion output for SDR transceivers.

The level is set at 0dBm for 100W output. This level was chosen as it is intrinsically safe to use directly with signal analysis equipment and is also the correct level to be used directly as a Pure Signal predistortion source for Anan SDR's.

In order to maintain the accuracy of the main directional coupler in the amplifier the 0dBm output should be terminated in a 50R 1W or greater load when not in use (a 1W load is supplied and fitted).

## **Network / Remote operation**

The Gemini HF-1K amplifier is capable of full remote control operation and monitoring over a network. This allows the user to either monitor the amplifier locally on a computer in the shack or remotely from any other location with suitable network linking.

All functions and alarms are accessible using the remote software other than the main power on/off switch on the front panel.

The software runs on Windows 7 or higher and is available for download from our website:

[http://www.linearamp.co.uk/ghf\\_software.html](http://www.linearamp.co.uk/ghf_software.html)

## **Firmware Updates**

From time to time we may issue firmware updates for the amplifier to improve or enhance functionality and reliability of operation.

The firmware version currently in use is displayed on the amplifier under the Linear Amp logo during power up.

Firmware is updated over the network connection by placing the machine in 'Prog' mode and then using the remote software (see above) firmware upload function to select and upload the new firmware file.

To enter 'Prog' mode it is necessary to push and hold the 'Prog' button on the rear panel of the amplifier whilst powering on the computer. The amplifier then powers up in Prog mode and 'Set Network' is displayed on a blue background. Follow the instructions on the software for firmware uploading.

Once the firmware upload is complete the amplifier will reboot automatically and then can be used normally. Check that the correct Firmware version is shown on power up.

## **SPECIFICATIONS**

### **Gemini HF-1K**

Valid operating frequencies:	460 – 479kHz*
	1.8 – 2.0MHz
	3.5 – 4MHz
	5.0 – 5.5MHz
	7.0 – 7.3MHz
	10.1 – 10.2MHz
	14.0 – 14.4MHz
	18.0 – 18.2MHz
	21.0 - 21.5MHz
	24.8 – 25.0MHz
	28.0 – 29.7MHz
	50.0 – 54.0MHz

\*when used with an external low pass filter unit (not supplied).

Power output:	>1 kW at 1dB gain compression (400W+ on 460-479KHz)
Power input:	5, 10, 50W customer specified
3 <sup>rd</sup> order IMD distortion:	better than -30dB at 1kW
11 <sup>th</sup> order IMD distortion:	better than -70dB at 1kW
Harmonic suppression: products)	better than 70dB (all harmonic
Input VSWR:	better than 1.5:1
Load VSWR tolerance:	Max 2.5:1 high VSWR trip

# CERTIFICATE OF CONFORMITY



The DX Shop Limited / Linear Amp UK Ltd hereby declare that the following products,

## **Linear amplifier Gemini HF-1K**

fully meet technical specifications according to the following EU directives:

06/95/EC, 2004/108/EC and 99/5/EC:

EN 301 783-1 V1.1.1 (2000-09), EN 301 783-2 V1.1.1 (2000-09)

EN 301 489-1 V1.6.1 (2005-09), EN 301 489-15 V1.2.1 (2002-08)

EN 60950-1: 2006

All necessary test procedures have been successfully passed.

### **Manufacturer and authorized representative:**

**The DX Shop Limited  
Churchstoke  
Montgomery  
SY15 6TP**

Authorized representative of above

Roger Banks  
Director

May 2018

## **WARRANTY**

Linear Amp UK Ltd warrants to the original purchaser that this product shall be free from defects in material or workmanship for 24 months from the date of the original purchase. LDMOS devices are excluded from this warranty.

Notification should be given as soon as possible after discovering a possible defect. Carriage charges for any parts or units submitted for replacement or repair under this warranty must be paid by the purchaser.

Correct maintenance, repair and use are important to insure proper performance from this product. Carefully read this operating manual.

This warranty does not apply to any defect Linear Amp determines is caused by

- (1) improper maintenance or repair, including the installation of parts or accessories that do not conform to the quality and specification of the original parts;
- (2) misuse, abuse, neglect or improper installation;
- (3) accidental or intentional damage;
- (4) acts of God.

Linear Amp is not responsible for damage to other equipment or property or any other consequential or incidental damage of any kind.

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## **SUPPORT**

The DX Shop offer full aftersales support on this amplifier. Please contact us either by email to [esales@thedxshop.com](mailto:esales@thedxshop.com) or call is on +44 (0)1588 620126