



2-700 CCS

VHF Linear Amplifier

Operational Guide



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Safety Information

WARNING: HIGH VOLTAGE

This amplifier has mains supply level voltages inside. Please do not remove covers with the mains power connected. There are no serviceable parts inside the unit.

Safety Precautions

- Ensure adequate ventilation
- Never operate without proper antenna connection
- Do not exceed maximum drive power
- Ensure proper RF grounding to prevent RF feedback and interference

Product Overview

The 2-700 CCS is a high-performance Continuous Commercial Service rated VHF linear amplifier designed for the 2-meter amateur radio band (144-146 MHz). Featuring advanced STM32-based control and web-accessible monitoring, this amplifier delivers up to 600W output power with exceptional linearity.

Key Features

- Output Power: Up to 600W P.E.P. on 144-146 MHz
- CCS rated for 500W output CW/Data/RTTY/SSB etc.
- Drive Requirement: 20-25W
- STM32 microcontroller with web interface for remote monitoring
- Fully sequenced preamplifier supply either to rear panel or Bias T injected
- OLED display showing P.E.P and Average RF output, VSWR and temperature
- Comprehensive fault protection and alarm systems
- Built-in ultra-quiet cooling system with temperature monitoring
- Automatic mains operation 100-260V AC 50/60Hz

Technical Specifications

Parameter	Specification
Frequency Range	144-146 MHz (2m band)
Output Power	Up to 600W PEP
Drive Power	25W
Gain	14 dB typical
Input/Output Impedance	50Ω nominal
Maximum SWR	2:1 (protection engages above 2:1)
Power Supply	90-264V AC 47-63Hz
Dimensions	288w x 140 h x 310d (excluding feet)
Weight	7.5Kg

Installation

Unpacking and Inspection

- Carefully remove the amplifier from packaging
- Inspect for any shipping damage
- Verify all accessories are included: power cable, documentation, spare fuses
- Allow unit to acclimatise at room temperature for 2 hours if cold

Physical Installation

- Place amplifier on stable, level surface with adequate ventilation
- Ensure minimum 100mm clearance above the amplifier and ensure the underside ventilation is not restricted
- Keep away from heat sources and direct sunlight
- Ensure ambient temperature remains below 40°C

RF Connections

⚠ Always use high-quality, low-loss coaxial cable rated for VHF frequencies and power levels

- Connect transceiver to TXR N-Type input socket
- Connect ANT N-Type output socket to antenna using appropriate low-loss coax

⚠ WARNING: HIGH VOLTAGE – peak rf voltages can exceed 220V at 500W CW into a 50R load – higher if the load is not 50R.

- Ensure all connectors are tight and properly seated
- Verify antenna SWR is below 1.5:1 across operating frequency range

Control Connections

- Connect PTT control from transceiver to amplifier PTT IN (RCA/Phono)
The amplifier has no RF sensed switching built in. To put the amplifier into transmit it is necessary to ground the centre pin of the PTT IN phono socket. Most rigs 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 rig or transverter 'ground on transmit' output.
- Connect Ethernet cable to RJ45 port for web interface access (if required)
- Configure network settings if required (default: DHCP enabled)
- The PTT Out connection can be used to daisy chain other equipment or can be used to key the rig to tx (see preamp section)

Power Connection

- Verify fuses fitted are suitable rated for the mains voltage that is being used. For 220V operation, 6A fuses are fitted. For 120V operation these should be changed to 10A. 220V operation is recommended where possible.
- Connect power cable to properly grounded mains outlet

Initial Power-Up

- Switch on mains power on the rear panel switch next to the mains input. The Red power LED will illuminate at this point. The amplifier logic is now powered up but nothing more.
- Pressing the power button will bring up the LINEARamp logo on the OLED display. After a couple of seconds, the stand STBY/OPER LED will light. If the amplifier is

connected to ethernet and the ethernet has connection to World Wide Web, then the amplifier display will change to show UTC time after a few seconds once it has connected.

- If the amplifier is in STBY (standby) then rf is passed barefoot straight through the amplifier from the transceiver to the ANT socket.
- Pressing the OPER button, the LED will go green, and the amplifier will then be ready for operation.
- When the OPER LED is green the PREAMP button can be used to turn on and off the pre-amp supply as needed. Note the preamp supply does not work when the amplifier is in STBY. This is deliberate so you do not power up a masthead preamp and then potentially transmit through it barefoot with the rig thus potentially causing damage to the preamp.

Preamplifier control and settings

The amplifier has a built-in sequencer to power and correctly sequence an external preamplifier. The DC power to the preamplifier can be software selected to output to a rear panel socket on the amplifier, or it can be Bias-T fed up the coax. Max 2A*.

The voltage fed to the preamplifier can be altered. It comes set at 13.8V but this can be altered in the software settings between 12V and 15V in 0.1V increments as required.

Similarly, the timing delay of the sequence for the preamp section can be altered in the software settings from 30ms to 100ms in 10ms increments as required to give sufficient time for the external preamplifier relays to switch over. The default is 30ms which is probably suitable for most pre-amplifiers without needing further adjustment.

* Please note that the preamp supply to Bias T or rear panel incorporates a 3A SMD non-resetting fuse. If you inadvertently short circuit the outputs the fuse will blow and will need replacement (back panel removal and soldering). Some antennas present a DC short across the driven element so be careful not to turn the preamp supply on when no masthead preamplifier is installed or the fuse will blow when it sees the antenna DC short.

NOTES ON SEQUENCING:

If you are using a masthead preamp (or any preamp on the output side of the amplifier) then sequencing is important to ensure the preamp or it's relays are not damaged by rf from the rig and/or amplifier.

The amplifier has in-built sequencing.

If you have an RF switched (even if you have hard wired it from the amplifier control) preamp, then the amplifier will sequence this correctly using the connections as standard. However, if you have a NON-RF switched preamp you need to sequence the RIG AS WELL AS THE AMPLIFIER or you will blow the preamplifier as the rig will be producing RF before the preamplifier is switched over.

To do this you need to do the following.

Connect PTT IN on the rear of the amplifier to a Footswitch or external switch – this is the way you will instigate transmit – NOT from the rig.

Connect your preamp supply to either the rear socket or via Bias-T.

Connect the RIG's PTT input line to the PTT-OUT socket on the amplifier. The rig's ptt INPUT connects to a pin on the rig that will put the rig into tx when it detects the line is grounded. Most rigs either have a dedicated pin for this or one they share with the normal output to linear amplifiers that you can configure in the set-up menus as an input rather than an output.

Transmit is then instigated by the Footswitch or external switch NOT THE RIG.

When you transmit the sequence will then be: PREAMPLIFIER – AMPLIFIER – RIG. As you go back to receive the sequence will be: RIG – AMPLIFIER – PREAMPLIFIER

This will ensure that the preamplifier switches over before RF is applied as you go into tx and will remove RF first as you go back into rx.

OLED Display and Menu options

In normal operation, the OLED display will show you the RF output of the amplifier when in transmit. The bar graph shows the average power output, and the number displays the P.E.P output of the amplifier. A moving line will also indicate P.E.P on the bar graph if different to the average power. Also displayed on the OLED are the VSWR and the amplifier temperature. The RF output will generally be accurate other than at very low power levels.

When the amplifier is in STBY, pressing the MENU button brings up the following options. In each case the functionality of the four buttons alters so you can move up and down **SELECT** the entry and **RET**urn back.

Power Up State:

This can be selected as either Standby or Operate. When the amplifier is powered on it will either come up in standby or it will come up straight into operate.

Blank Delay:

The time it takes after amplifier inactivity for the screen to go blank and it can be set either off so the screen stays on all the time or one minute, 10 minutes, or 60 minutes.

Preamp Volts:

Set the output voltage for the preamp feed. It is adjustable in 0.1 V increments between 10 and 15V. The default is 13.8V.

Preamp Outlet:

You can select to provide the external preamp DC supply on receive either to the rear panel socket or via bias T injection up the coax. Max supply is 2A.

Preamp Delay:

This can be adjusted from 30ms to 100ms in 10ms increments dependent on how long it takes for your preamp relays to energise and deenergise. Default is 30ms.

Audio Alarms:

Whether you want trip alarms to sound the internal audible sounder or not. Default is on. Useful if you're operating in an environment where you want minimal noise, so any trip does not disturb audibly.

Screen Dimming:

Select Bright (default) or Dim as required. Dim is useful if operating at night to reduce glare

Network:

This will show you the MAC address for the amplifier. If DHCP is selected, it will show you the IP address - assigned automatically. If fixed is selected, then you have the option to enter your IP and Gateway addresses

Info:

This shows the serial number of the machine and the software version currently in operation.

Time Display

When the amplifier is connected to a Network with NTP access then the screen will automatically display UTC time when the amplifier is on receive. A small icon top left of the display shows the that the network is connected. If you disconnect the network, then the icon disappears and time will continue to be displayed (with an accuracy limited by the processor internal clock only). There is no backup battery on this so when the amplifier power is cycled the time function is inactive until the next time an internet NTP source is available.

Web Interface Access



The amplifier can be remotely controlled by the local web interface. The buttons of the front panel are replicated on the interface and function in the same way except for the menu button. The display reports power out (P.E.P and average), VSWR and temperature as well as other parameters that are not shown on the OLED.

- Connect a computer to same network as the amplifier
- Determine amplifier IP address from OLED display or DHCP server
- Open a web browser and navigate to the amplifier IP address
- The web interface provides real-time telemetry and control and has a firmware update facility via the Menu button

Transmit Operation

- Set transceiver output power to maximum 25W
- Key transceiver - amplifier will automatically switch to transmit though the PTT cable
- Monitor as needed on the OLED display
- Verify SWR remains below 2.0:1 during transmission
- Monitor temperature - typical operating temperature 30-50°C

⚠ If SWR exceeds 2:1, protection will engage. Check antenna system!

Duty Cycle

The amplifier is rated for Continuous Commercial Service at 500 W out. This means you can use the amplifier at 500 W out on all amateur modes for as long as you want (the exception is AM where the maximum continuous power is 125 Watts)

Fault Conditions and Alarms

Automatic Protection Systems

The 2-700 CCS incorporates several protection systems. In the event of a fault trip, the OLED display will show the fault, and all four LEDs will flash. The sounder will also alarm if turned on.

Fault Type	Trigger Condition	Action
High SWR	SWR > 2:1	Amp to RX
Overtemperature	PA temp > 70°C	Amp to RX
Overdrive	Drive > 25W	Amp to RX
Fan failure	Fan RPM < threshold	Amp to RX

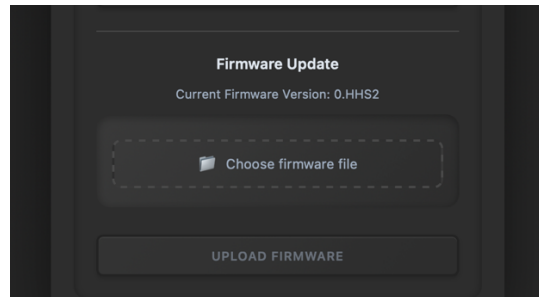
Fault Recovery

- Pressing any button will clear the trip. The amplifier will revert to standby and the STBY/OPER button will need to be pressed to get the amplifier back into operation. Please check the reason for fault is cleared before you attempt to transmit again.
- On the remote web interface, trips cause a pop-up to appear on the screen. Pressing this clears the pop-up and clears the fault. Again, the amplifier goes back into standby.

Maintenance

Firmware Updates

The controller supports over-the-air firmware updates via the web interface:

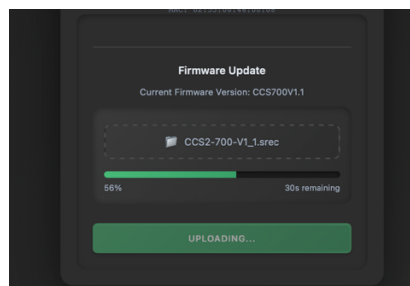


If new firmware is available and if the amplifier is connected by WAN Ethernet, then on power up the amplifier remote software will show a pop-up with the new firmware details and a link to download it.

Download the new firmware and save it locally on your computer. It will be an .srec file

Click the MENU button on the web interface and you'll see the firmware update section.

Click on 'Choose Firmware file'. This will open your local computer folders, and you can navigate to and select the .srec file you have just downloaded. Click UPLOAD FIRMWARE and the file transfer will begin.



Keep the webpage active until the download has completed and it says it's finished. A progress bar shows how far the transfer has progressed. The amplifier itself can be in any receive state or just powered on at the rear only – it does not matter.

Once the upload has finished power cycle the amplifier at the mains rear socket switch. On powering back up the amplifier will load the new firmware automatically (showing 'Loading new firmware' and then the loading Addr progress on the display) and then it will restart once this is completed.

Technical Support

For technical support, warranty service, or spare parts contact:

The DX Shop Limited

Website: www.linearamp.co.uk

Email: support@linearamp.co.uk

Warranty Information

- 24-month warranty on parts and labour. LDMOS 12 months.
- Warranty void if unit opened or modified by unauthorized persons
- Excludes damage from misuse, overvoltage, or environmental factors

CERTIFICATE OF CONFORMITY



The DX Shop Limited / Linear Amp UK hereby declare that the following product

Product: 144 MHz RF Linear Amplifier **Model / Type:** 2-700CCS

is in conformity with the relevant Union harmonisation legislation:

- **Radio Equipment Directive** 2014/53/EU (RED)
- **RoHS Directive** 2011/65/EU, as amended by (EU) 2015/863 (restriction of hazardous substances)

The following harmonised standards and specifications have been applied:

Health and safety (Art. 3(1)(a) RED)

- EN IEC 62368-1 – Audio/video, information and communication technology equipment – Safety requirements

Electromagnetic compatibility (Art. 3(1)(b) RED)

- EN 301 489-1 V2.2.3 (2019-11) – Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
- EN 301 489-15 V2.2.1 (2019-04) – EMC standard for radio equipment and services; Part 15: Specific conditions for commercially available amateur radio equipment

Efficient use of the radio spectrum (Art. 3(2) RED)

- EN 301 783 V2.1.1 (2016-01) – Commercially available amateur radio equipment; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

All necessary test procedures in accordance with the above standards have been successfully completed on representative samples of the product.

Manufacturer and authorized representative:

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Authorized representative of above:

Roger Banks
Director
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