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M HAMMOND
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W COMMUNICATIONS
PRODUCTS DIVISION

VERN
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SERIES

HL

HF LINEAR AMPLIFIER HL-1000A



**HF LINEAR AMPLIFIER
HL-1000A**

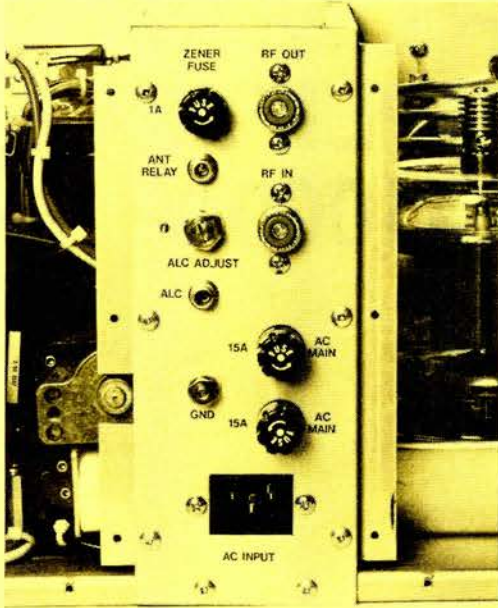


Fig. 3

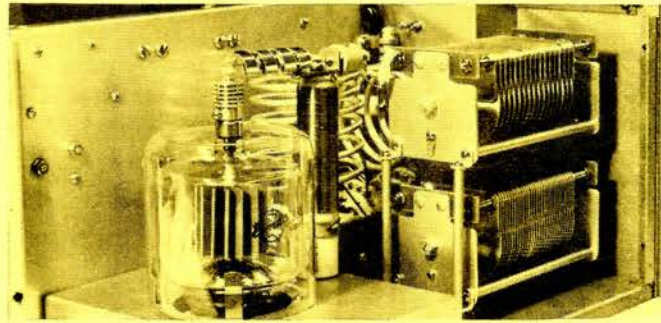
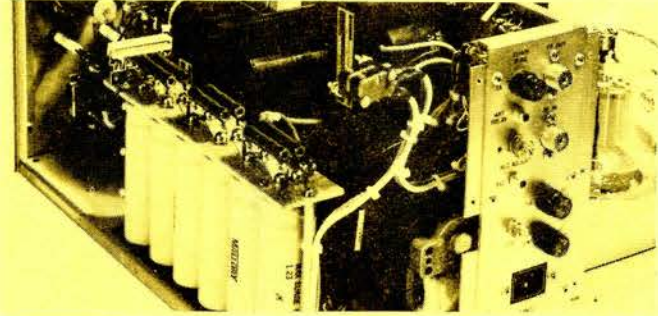


Fig. 4

FEATURES

- BAND COVERAGE** 10M, 15M, 20M, 40M, 80M, Amateur Bands
May be expanded for Mars, Government or other services (Consult Factory)
- TUBE COMPLIMENT** (1) 3—500Z Zero Bias Triodes
- COOLING** Forced Air Chimney Cooling (Continuous Duty Squirrel Cage Blower)
- ALC** Adjustable, (Negative)
- SAFETY** Interlock for Input AC 100% Fused AC Line and Cathode Circuit
- POWER TRANSFORMER** Special Hammond Transformer 120171 designed for continuous duty operation rated at 800VA — 60 Hz — Weight 21.5 Lbs.
- POWER SUPPLY** Computer Grade Capacitors for Max. Reliability
- INPUT CIRCUIT** PI—Input Circuitry for each band
- OUTPUT CIRCUIT** Full Pi-L Network
- LINE VOLTAGE** 120VAC or 240VAC
- METERING** Plate Current
Grid Current
Plate Voltage
Relative Output
- TRANSIENT PROTECTION** Primary, HV and Filament Surge Suppression

SPECIFICATIONS

- FREQUENCY RANGE** 3.5 HMz to 29.5 HMz (Amateur Bands)
- DRIVE POWER** 75W to 125W
- MODE & DUTY CYCLE** SSB
CW — Continuous
RTTY
- RF INPUT POWER** SSB — 1 KW PEP Continuous
CW — 1 KW Continuous Input
RTTY — 1 KW Continuous Input
- PLATE VOLTAGE** SSB — With Resting Current 2400VDC
- CIRCUIT CONFIGURATION** AB₂ Grounded Grid
- INPUT MATCH** 50 Ω (16 dB Return Loss)
- HARMONIC SUPPRESSION** Depending on Exciter -40dB
Utilize RF Inverse Feed-Back
- INTERMODULATION DISTORTION PRODUCTS** In excess of -33dB
- ALC** Negative, Adjustable (-8VDC Max.)
- TUBES** One 3-500Z Zero Bias Triodes
- POWER REQUIREMENTS** 120/240VAC,
Primary current at standby, 4.5A
Primary current at full load 14.0A
- DIMENSIONS** 8" High x 16" Wide x 15¾" Depth
- WEIGHT** 65 Lbs. or 30 Kg.

INTRODUCTION

The Hammond HL1000A HF Linear Amplifier is a one-stage linear amplifier using one glass envelope 3-500Z Eimac Triode. The unit is a completely self-contained table top unit capable of 1000 watts input. In keeping with the past tradition of the HL500 and HL750 series amplifiers, only the highest quality components were used in the design of this amplifier. The amplifier is designed for SSB, CW, RTTY or AM operation on the amateur bands between 3.5 and 29.7MHz. The amplifier can be factory modified for frequencies outside the amateur bands for commercial or military applications.

The HL1000A comes factory wired for 115 vac but can be re-wired for 230 vac operation.

PLEASE READ INSTRUCTIONS carefully and fully before attempting to operate the amplifier.

CAUTION: There are very dangerous voltages present inside the amplifier when the power is in ON position. Removing the top cover while the AC power is connected must be done cautiously and with the utmost care.

INSTALLATION

1. Remove the amplifier from the shipping carton and examine for damage, (notify the transport company immediately if any damage is present.)

2. Save the carton for future shipment to another location or storage.
3. The 3-500Z triode tube is shipped separately and must be installed before operating amplifier in any way.
4. The following accessories should be included with your HL1000A amplifier:
 - (a) Instruction Manual
 - (b) Warranty Card
 - (c) Shielded Control Cable
 - (d) Extra Fuses (Cathode 1 A) (ABC-15)

OPERATING LOCATION

The amplifier must be located in an open area such that the flow of air from the top is unrestricted. Location should be as close as possible to a reliable 115/230 vac AC source to minimize any AC voltage drop.

INSTALLING TUBE (See Figure 4)

1. Remove 4 bolts from bottom of linear cabinet and carefully slide the inner part of the unit from the rear of the cabinet.
2. Remove the perforated top cover of the amplifier giving access to the interior of the RF section of the amplifier.
3. Put the 3-500Z tube in the socket. Be very careful not to exert any lateral or twisting pressure on the glass portion of the tube. The tube is easily damaged. Fasten the plate lead to the anode connector. Remove the screw in the top of the anode connector on top of the tube and flex the parasitic choke and plate lead until the mounting hole in the plate is positioned directly above the screw hole in the anode connector. Insert the screw and hold the plate lead firmly while tightening the screw.

CAUTION: Do not, under any circumstances, exert too great a pressure or twisting, bending motion in the anode connector or glass portion of the tubes. Excessive pressure can cause a hair-line fracture in the tubes' glass envelope, destroying the tube. The tubes' pins are also particularly delicate, and can easily break if the tube is not inserted and removed very carefully.

4. Replace the top shield but leave the outside cabinet off until the amplifier has been connected and tested.

CABLING

All the following cables must be connected before the amplifier is operated.

AC POWER CABLE

The HL1000A amplifier comes from the factory wired for operation from a 120 vac single phase, 60 Hz power source. The green wire in the power cord is the ground wire and must be connected to the neutral primary of the plug that you select for connection into the power line. The black and white wires must be connected to the other two pins for the 120 vac operation. The other lead of the Belden AC cord plugs directly into the rear panel AC input socket.

For ²²⁰115 vac operation, it is only necessary to change several jumper connections on the terminal strip located on the power transformer in the power supply compartment.

See Figure 1.

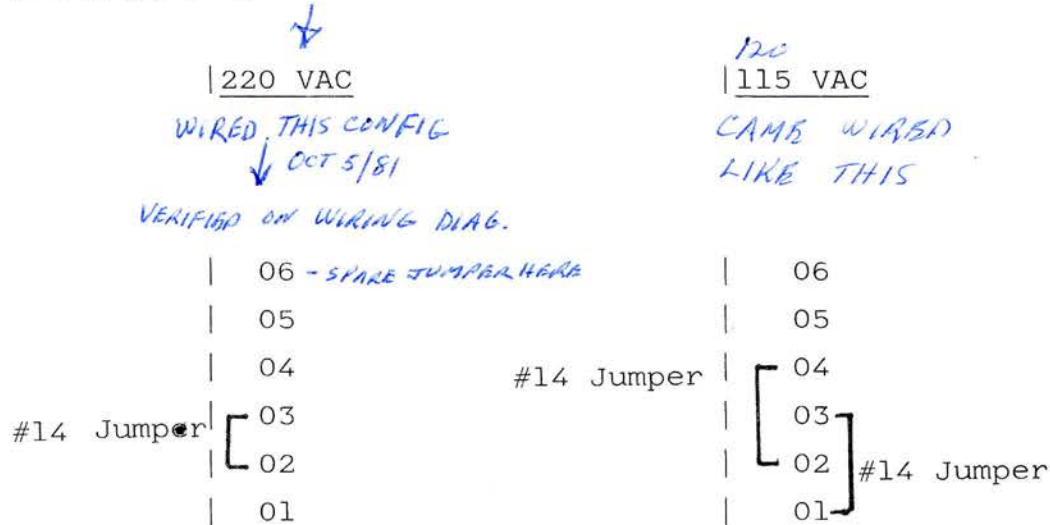


FIGURE 1 - Power line terminal strip connections

CAUTION: The amplifier will be damaged if the orange jumper wire (s) is connected incorrectly. Be sure to disconnect AC plug from the amplifier before changing jumpers on the terminal strip.

ANTENNA COAX

Use only RG 8/u coax (or its equivalent) to connect the HL1000A to the antenna. The antenna connector mates with the amphenel connector marked RF out, on the rear panel of the amplifier.

CAUTION: Do not operate the amplifier without a load or into a load with SWR greater than 2:1. Measure the antennas' SWR with an SWR meter or in-line Watt-meter and determine that the SWR is in fact less than 2:1.

With standby/operate switch in the STANDBY position, the exciter output will pass through the amplifier directly to the antenna. The amplifier does not have to be off to accomplish this bypass.

INPUT CABLE

A cable must be connected from the output of your exciter to the SO-239 RF input connector on the rear panel of the amplifier.

ALC (AUTOMATIC LEVEL CONTROL) CABLE

Plug the ALC cable into the phono jack located on the rear panel (marked ALC) and into the ALC feedback connection (or equivalent) on the exciter. If the exciter does not have provision for feedback of ALC voltage from the amplifier, then simply omit the use of the cable.

ANTENNA RELAY

A control cable should be plugged into the phono socket marked antenna relay on the rear panel of the amplifier. This cable connects the keying signal from the exciter to switch the amplifier to the transmit condition and must be plugged into the socket or connector marked antenna relay (or equivalent) on the exciter. The exciter need only supply a shorting relay contact (during transmit) to key the amplifier.

CAUTION: Do not apply any voltage to the antenna relay phone jack. The internal relay is activated by a self-contained power supply.

OPERATING CONTROLS

Refer to Figure 2.

OFF/ON POWER SWITCH

This switch is used for turning the amplifier on and off.

MULTIMETER SWITCH

This 4-position pushbutton switch selects the function of the multimeter as described below.

HV

With the switch in this position, the meter monitors the amplifiers' plate voltage. The full scale reading in this position is 3000 VDC. Normal plate voltage with the amplifier in the standby position (unkeyed) is about 2500 VDC for SSB and CW operation. Line voltage variations will cause corresponding variations in the plate voltage. (Note: Reading for plate volts is $\times 10^0$).

GRID

With the switch in this position, the meter monitors the amplifiers' grid current. The full scale meter reading in this position is 150 ma DC. The nominal grid current during SSB on peaks is approximately 100 ma. Maximum tune-up grid current in SSB or CW single tone is 140 ma marked on the dial as a red bar.

RF

The meter monitors the output power. It is useful during tune-ups for verifying resonance on each band.

STANDBY/OPERATE SWITCH

This switch allows the exciter bypass feature, i.e. in the standby position, the power of the exciter feeds through the linear and appears at the output connector. In the operate mode the linear is ready for transmitting.

STANDBY/OPERATE LIGHTS

These pilot lights marked standby and operate indicate the status of the standby/operate switch. In the standby mode the light is red and in the operate mode green.

ZENER FUSE

This .5 amp fast-blo fuse is the cathode fuse. Never use a higher amperage fuse than the one specified.

TUNE CONTROL

The tune control is a vernier dial connected to an air variable in the RF section. The disc dial is screened 100 to 0 indicating that maximum capacitance is at 100 and minimum at zero. Approximate settings for the tune control settings for the amateur bands are given in Figure 3 for your convenience.

LOAD CONTROL

This control matches the amplifiers output network to the load. Refer to Figure 3 for the approximate initial settings for the frequency range desired. A load setting of 100 corresponds to maximum load capacitor mesh and 0 represents minimum capacitor setting.

BAND

The band switch selects the applicable input and output circuits for the HL1000A to operate in any one of the following bands:

- (a) 80 meters 3.5 to 4.0 MHz
- (b) 40 meters 7.0 to 7.3 MHz
- (c) 20 meters 14.0 to 14.35 MHz
- (d) 15 meters 21.0 to 21.45 MHz
- (e) 10 meters 28.0 to 29.7 MHz

CAUTION: Never move the band switch while the linear amplifier is keyed or operating.

REAR PANEL CONTROLS

See Figure 3.

RF OUT:

Nominal output impedance is 50 ohms. Do not operate this equipment without a load or into a load where the SWR is greater than 2:1. Use only RG-8/u coax or its equivalent to connect to an appropriate antenna or dummy load.

RF IN:

This amphenol type SO-239 connector accepts the drive coax from an exciter.

ZENER FUSE:

This fuse protects the cathode circuit from over-current. It is a 1 amp fast-blo type of fuse.

ANT RELAY:

This is a phone jack input that when shorted to ground the amplifier antenna relay closes.

ALC ADJUST:

This potentiometer controls the sensitivity of the HL-1000A's ALC circuit.

ALC:

The ALC feedback (negative) to the exciter is available to this socket.

AC MAIN:

These are the two fuses for the main 115/230 VAC mains. They are ABC ceramic type and must not be substituted for any other types.

GND:

This lug is provided to ground the amplifier. This should be connected to a good earth ground to minimize radiated interference or the danger of electrical shock.

AC INPUT:

This is the main input AC socket that accepts a heavy duty Belden power cord. Note the 3 pin arrangement on the socket and the fact that the centre pin is ground. Push the plug of the power cord when ready for use until it is fully seated in the socket. No other cord is recommended for use with this socket.

OPERATION:

<u>Preliminary Settings</u>	<u>Settings</u>
(1) Standby/operate switch	Standby

(2) On/off switch	On
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As soon as the ON switch is activated the standby pilot lamp should light RED and the meter's a soft yellow. Look into the interior of the linear to make sure that the tube filaments are lit and that there is a flow of air from the top of the cabinet. This can be done by putting your hand over each tube from the top to feel the flow of air.

The 3-500Z require no warm-up time.

- (3) Push HV on the multimeter switch. It should read approximately 24 - 26 indicating a plate voltage of 2400-2600.
- (4) Switch multimeter switch to GRID.
- (5) Switch "band" switch to desired band.
- (6) Pre-set tune and load vernier dials to that referred to in calibration chart figure 3.

SSB OPERATION:

- (7) With exciter adjusted for zero output press the PTT switch of the exciter causing the HL-1000A and the exciter to go into the transmit mode.
- (8) The amplifier's plate current meter should register approximately 90 ma.
- (9) Increase the RF output of the exciter until the amplifier's grid current is about 110 ma. Adjust the tune control for a minimum plate current reading indicating resonance. If the load control is set properly, the plate current will be approximately 400ma. If the plate current is less than 400 ma, increase the load slightly by moving the load control to a higher number on the dial. If the plate current is say more than 420 ma decrease the load slightly by moving the load control to a lower number.

Do not forget to re-dip the tune control each time the load control is changed.

Check that the grid ma reading is approximately 120 - 140 ma, if not, re-adjust the exciter output to give the required $140 \text{ ma} \pm 10\%$ grid current reading.

NOTE: The tuning, loading and exciter control adjustments may have to be repeated several times until the ratio of 140 ma grid to 400 ma plate current is obtained. Note that the higher the frequency the more precise these adjustments will become apparent. Also the lower the frequency, the broader are these adjustments.

NOTE: The 3-500Z tube should show colour, glowing a dull cherry red with 400 ma of plate current. When operated in this manner, the tubes are within their ratings and can be operated in this way only if the plate circuit is a resonance (plate current dipped to a minimum with tune control). The amplifier should never be operated for any length of time in an off resonance condition.

(10) Release the PTT switch of the exciter to allow the amplifier and exciter to go into the unkeyed status. Place the exciter into the SSB mode and while speaking into a microphone, adjust the audio gain control for voice peak plate current readings of around 250ma. The grid current peaks, should be around 100 ma. Check for proper drive with a monitor scope if one is available.

CW OPERATION:

Tune amplifier as above --

except that the plate current should be no greater than 400 ma. Grid current will be approximately 120 ma.

AM OPERATION:

Tune and load as above except that:

- (a) grid current = 100 ma
- (b) plate current to give approximately 500 watts output.

FSK OPERATION:

The HL-1000A is designed to operate the 1 kilowatt input level continuously and tune adjust as required for 120 ma grid current and 400 ma of plate current.

ALC ADJUSTMENT:

Drive the amplifier to 400 ma of plate current and then rotate the alc control until the grid current just begins to decrease. If the exciter cannot drive the HL-1000A to 400 ma of plate current (single tone) it is not necessary to adjust or use the ALC control.

WARRANTY:

All goods sold hereunder are warranted to be free from defects in material and workmanship, for a period of one year from date of shipment, and this express warranty is in lieu of and excludes all other warranties whether expressed or implied by operation of law or otherwise including any warranty on the merchantability or fitness for a particular purpose. Defective material may be returned to the seller after inspection by the seller and upon receipt of definite shipping instructions by the seller. Goods so returned will be replaced or repaired without charge, but the seller shall not be liable for loss, damage or expense directly or indirectly arising from the use of material or from any other cause, the exclusive remedy against the seller being to require the replacement or repair of defective material. Every claim on account of defective material or workmanship or from any other cause shall be deemed waived by the purchaser unless made in writing prior to the expiry date of the warranty.

NOTE: The 3-500Z tube is warranted on a one year pro-rated basis. Any warranty claims must be accompanied by the Eimac warranty claim form packaged with your new tube. All claims must be filed with the company from which you bought the tubes. Warranty claims on the amplifier must be accompanied by proof of purchase and purchase date.

TUNE AND LOAD SETTINGS:

Serial Number _____

These are approximate settings for a 50 ohm load.

Factory Data

SSB Settings

$I_p = 400 \text{ ma}$

FIGURE 3

<u>BAND</u>	<u>TUNE</u>	<i>* @ MID BAND 50 OHM LOAD 80W DRIVE CW MODE</i>	<u>ACTUAL READING</u>	<u>LOAD</u>	<i>*</i>	<u>ACTUAL READING</u>
80	70	78		81	81	
40	40	42		52	47	
20	27	25		30	27	
15	14	14		22	18	
10	08	6		13	10	