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1.0 SPECIFICATIONS

1.1 RF SPECIFICATIONS

**Frequency Range**
- 160 meters: 1.8 to 2.0 MHz
- 80 meters: 3.5 to 4.0 MHz
- 40 meters: 7.0 to 7.3 MHz
- 30 meters: 10.1 to 10.15 MHz
- 20 meters: 14.0 to 14.35 MHz
- 17 meters: 18.068 to 18.168 MHz
- 15 meters: 21.0 to 21.45 MHz
- 12 meters: 24.85 to 24.95 MHz
- 10 meters: 28.0 to 29.7 MHz*

*Not Available in U.S.A.

FCC rules permit any properly licensed amateur to modify his own amplifier for 10 meter use. Consult the factory for details. If this modification is done with reasonable skill and care, the warranty will not be void.

**Drive Power**
40 W nominal to 60 W maximum, 50 W for full output

**RF Input Power**
SSB 1.2 KW PEP continuous
CW/RTTY/AM/ATV/FM 1.0 KW Average

**Plate Voltage (Operate position)**
3000 VDC

**Efficiency**
60% minimum on all bands.

**Input Impedance**
50 ohms. Tuned impedance matching circuit, SWR <1.5:1 (26 dB return loss)

**Output Impedance**
50 ohms SWR <2:1

**Harmonic Suppression**
40 dB minimum

**Intermodulation Distortion Products**
33 dB down minimum

1.3 TUBE SPECIFICATIONS

**Filament**
Voltage ......................... 5.0V
Current ......................... 14.2A

**Direct Interelectrode Capacitances**
(grounded grid)
Input ......................... 8.3 pF
Output ......................... 4.7 pF
Feedback ...................... 0.07 pF

**Frequency of Maximum Rating**
CW ......................... 110 MHz
Operating-Position ........ Vertical base down or up

**Maximum Operating Temperature**
Plate Seal ..................... 225 degrees C
Base Seals .................... 200 degrees C
Cooling ....................... Radiation and forced air
Base ......................... 5 Pin Special

**Maximum Ratings**
DC Plate Voltage ............. 4000 Volts
DC Plate Current ............. 0.40 Ampere
Plate Dissipation ............ 500 Watts
Grid Dissipation ............. 20 Watts

SSB, CW, RTTY, AM, ATV, FM

**Duty Cycle**
Continuous duty in SSB, CW modes
50% duty cycle other modes

**ALC Circuit**
Negative, adjustable to -30 VDC

**Antenna Relay**
DC relay for hum-free operation

**Metering**
1 Meter measures plate current
2nd Meter measures plate voltage, grid current or relative output power

**Output Circuit**
Pi-L network (silver plated air coil)

**Input Circuit**
Pi network input for each band for maximum drive and linearity.

**Protective Devices**
AC line fuses, cathode zener fuse

**Safety Feature**
Interlock for AC line input

**Power Transformer**
Special Hammond power transformer. Rated at 600 VA 60 Hz.

**Dimensions**
14" W x 7-1/2" H x 16-1/1" D (Overall)
(36 x 19 x 42 cm)

**Weight**
35 lb. (17 kg). Shipped in two cartons.

1.2 GENERAL INFORMATION

**Power Tube**
Eimac 3-500Z zero bias triode

**Circuit Type**
Class AB2 grounded grid

**Tube Cooling**
Pressurized plenum and chimney cooling system. 30 cubic ft. per minute. Low noise squirrel cage blower.
2.0 INTRODUCTION

The PT-1000A Linear Amplifier is a one stage, class AB Linear Amplifier using one, glass envelope, high performance Eimac 3-500Z power tube. It is a completely self-contained table-top unit capable of 1200 watts PEP input, designed to provide reliable, stable, high RF output power. It is equipped with a pressurized plenum cooling system to ensure optimum operation for extended periods of continuous use. The circuit and components are conservatively designed and selected for effortless operation under all conditions.

2.1 FEATURES

2.1.1 Designed for SSB, CW, RTTY, AM, FM, or ATV operation on the amateur bands between 1.8 MHz and 21 MHz. * (Including WARC bands and MARS operation). May be customer modified to cover the 28 MHz band. Please consult the factory.

*Canadian and other non-U.S.A. models supplied with 10 meter band included.

2.1.2 Can be modified for frequencies outside the amateur bands for commercial or military use. Please consult the factory.

2.1.3 Fast heating high performance 3-500Z triode ensures rapid turn-on time.

2.1.4 Continuous duty squirrel cage blower.

2.1.5 The Pi-L output circuit features:
   a) Heavy duty rotary switch with silver plated contacts.
   b) High quality, loading and plate tuning capacitors.

2.1.6 Pi network input for each band.

2.1.7 The power supply features a special heavy duty “continuous” rated 600 VA power transformer and computer grade filter capacitors for maximum reliability.

2.1.8 Power transformer transient protected.

2.1.9 By-Pass/Standby switch on front panel.

2.1.10 Adjustable ALC delay control.

2.1.11 Dual backlit meter system to monitor all critical voltages and currents.

2.1.12 Verifier tuning for smooth and accurate settings on all bands.

2.1.13 Safety interlock disconnects AC line voltage when the top cover is removed.

2.1.14 Grid overload protection circuitry.

3.0 INSTALLATION

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

CAUTION: There are lethal voltages present inside the amplifier when the power is on. Two interlock switches will automatically disconnect the AC line voltage when the top cover is removed. Use the utmost caution and care if AC power must be on while the top cover is removed.

3.1 UNPACKING

Remove the amplifier from the shipping carton and examine for damage. Notify the transport company immediately if any damage is present. Save the carton for future shipment to another location or storage. The 3-500Z triode tube is shipped separately and must be installed before operating the amplifier in any way.

The following accessories are included with your PT-1000A amplifier:

1. Instruction Manual
2. Warranty Card
3. 3-500Z Tube
4. Glass Chimney (packed in amplifier)
5. ALC Control Cable, Relay Control Cable.
6. Plate Cap Heat Sink
7. Extra Fuses (One Zener — AGC 1/2 and two MDA-15)

3.2 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 source to minimize any AC voltage drop.
Cooled by 30 cfm Low-Noise Squirrel Cage Fan.

Computer Grade Filter Capacitors.

Factory Wired for 110 VAC
May Be User Re-Wired
For 230 VAC

Special Hammond Power Transformer
Rated at 600 VA 60Hz Weight 20 lb.

PI-L Output Network with Silver Plated Air Coils.

PI Network Input For Each Band.

EIMAC 3-500Z Zero Bias Triodes with Chimney Air Ducting.

Vernier Tuning for Accurate Settings on All Bands.
For the power tube installation you will need:

One 3-500Z tube (packed separately)
One glass chimney (packed inside the amplifier)
One plate cap heat sink (provided in accessory kit)

1. Unpack all items and inspect for damage. Any damage should be reported to the carrier.
2. Remove all cabinet screws and remove cabinet.
3. Carefully install the power tube in its socket. Be very careful not to exert lateral or twisting pressure on the glass portion of the tube. It is very easily damaged. Excessive pressure can cause a hairline fracture in the tube's glass envelope, destroying the tube. The pins are also particularly delicate and can easily break if the tube is not inserted and removed very carefully.
4. Carefully set the glass chimney in place over the power tube making sure all holding clips are inside the chimney.
5. Set the plate cap heat sink in place on the anode connector of the power tube. Gently tighten the set screw.
6. Remove the screw and lock washer from the top of the heat sink and attach the parasitic choke.
   CAUTION: Hold the heat sink firmly when attaching this lead to avoid transferring any twisting pressure to the power tube.
7. This completes the power tube installation.
8. You are now ready to re-assemble the cabinet.

9. **Re-assemble the cabinet**
   Before re-assembly, note the red safety lock microswitches mounted at the side of the rear panel. When positioning the cabinet over the amplifier, listen for the click of the microswitches to ensure they are engaged.

10. Attach the two cabinet screws near the microswitches first, then install the remainder of the screws.

---

### 3.4 Cabling

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

#### 3.4.1. AC Power Cable:

Your PT-1000A amplifier comes from the factory wired for operation from a 115 VAC single phase, 60 Hz power source. For 230 VAC operation, jumper connections on the power transformer terminal strip have to be changed. See Figure 1. **A 230 VAC plug is to be connected to the line cord. The green wire in the power cord is the ground wire and MUST BE CONNECTED TO THE GROUND PIN (GREEN SCREW) OF THE PLUG.**

**Figure 1**

230 VAC OPERATION

110 VAC OPERATION

**Figure 2** Tuning Chart (Typical Unit)

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>Tune Setting</th>
<th>Load Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8</td>
<td>74</td>
<td>24</td>
</tr>
<tr>
<td>2.0</td>
<td>28</td>
<td>50</td>
</tr>
<tr>
<td>2.5</td>
<td>78</td>
<td>16</td>
</tr>
<tr>
<td>4.0</td>
<td>55</td>
<td>39</td>
</tr>
<tr>
<td>7.2</td>
<td>37</td>
<td>54</td>
</tr>
<tr>
<td>14.2</td>
<td>28</td>
<td>78</td>
</tr>
<tr>
<td>21.2</td>
<td>16</td>
<td>85</td>
</tr>
<tr>
<td>28.0</td>
<td>7</td>
<td>89</td>
</tr>
<tr>
<td>29.7</td>
<td>2</td>
<td>90</td>
</tr>
</tbody>
</table>

**CAUTION:** The amplifier will be damaged if the green wire is connected incorrectly. Be sure to disconnect the AC plug before changing jumpers on the terminal strip.
Use only RG 8/U coax (or its equivalent) to connect the PT-1000A to the antenna. The antenna connector mates with the 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 antenna's SWR with an SWR meter or in-line Wattmeter and determine that the SWR is in fact less than 2:1.

With the STANDBY/OPERATE switch in the STANDBY position, (IN), the exciter output will bypass the amplifier and feed directly to the antenna.

3.4.3 **Input Cable:**
A cable must be connected from the output of your exciter to the RF IN connector on the back panel of the amplifier.

3.4.4 **ALC (Automatic Level Control) Cable:**
Plug the ALC cable into the phono jack located on the back 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 to the amplifier, then simply omit the use of the cable.

3.4.5 **Antenna Relay:**
A control cable should be plugged into the phono socket marked PTT on the back 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 equiv.) 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 PTT phono jack. The internal relay is activated by a self-contained power supply.
CONTROLS

FRONT PANEL CONTROLS:

4.1.1 Off/On Power Switch:
Used to turn the amplifier on and off.

4.1.2 Multimeter Switch:
Four section pushbutton switch selects the multimeter functions as described below. The STANDBY button is interlocked with the three multimeter buttons. When any one of these is pressed, the STANDBY button is released and the amplifier switches to the OPERATE mode.

HV: With this pushbutton depressed, the meter monitors the amplifier's plate voltage. The full scale reading in this mode is 4000 VDC. Normal plate voltage with the amplifier in the idle mode [no drive power] is about 3100 VDC. Line voltage variations will cause corresponding variations in the plate voltage. [Note: Reading for plate volts is X 1KV].

GRID: With this pushbutton depressed, the meter monitors the amplifier's grid current. The full scale meter reading in this mode is 200 ma DC. The nominal grid current during SSB on peaks is approximately 50 ma. Maximum grid current in SSB or CW single tone is 120 ma [marked on the dial as a red bar].

RF: In this mode, the meter monitors the relative output power of the amplifier.

Standby:
This pushbutton allows the exciter bypass feature i.e. in the STANDBY position, button in, the power of the exciter bypasses the linear amplifier and appears unchanged at the output connector. In the OPERATE mode, button out, the linear amplifier is ready for transmitting.

This pilot light marked "Operate" indicates the status of the linear amplifier. In the "Operate" mode, the light is on. In the Standby mode, the light is off.

4.1.4 Load Control:
This control matches the amplifier's output network to the load. Refer to Figure 2 for the approximate initial settings for the frequency range desired. A load setting of 0 corresponds to the maximum load capacitor mesh and 100 represents minimum capacitor setting.

4.1.5 Tune Control:
The TUNE control is a vernier dial connected to an air variable capacitor in the RF section. The disc dial is screened 100 to 0 indicating that maximum capacitance is at 100 and minimum at 0. Approximate setting for the tune control settings for the amateur bands are given in Figure 2 for your convenience.

4.1.6 Band Switch:
The band switch selects the applicable input and output circuits for the PT-1000A to operate in any one of the following bands:

(a) 160 meters
(b) 80 meters
(c) 40 meters
(d) 30 meters
(e) 20 meters
(f) 17 meters
(g) 15 meters
(h) 12 meters
(i) 10 meters

(applicable for PT-1000A in U.S.A.)

NOTE: The amplifier has the capability to transmit on many frequencies outside the above bands by switching the amplifier to the band closest in frequency to the desired operating frequency. For services other than amateur use, this may be applicable.

CAUTION: Never move the band switch while the linear amplifier is keyed or operating.
4.2.1 **Zener Fuse:**
Protects the cathode circuit from overcurrent. It is a 1/2 amp fast-blo type of fuse.

4.2.2 **ALC Adjust:**
Controls the delay of the PT-1000A's ALC circuit.

4.2.4 **GROUND:** This lug is provided to ground the amplifier. It should be connected to a good earth ground to minimize radiated interference or the danger of electrical shock.
NOTE: Use a 50 ohm dummy load only for all the following adjustments.

1. **PRELIMINARY SETTING**
   1. STANDBY/OPERATE switch
   2. ON/OFF

   Activate the ON switch and the meters should light. Look into the interior of the amplifier to make sure that the tube filament is lit and that there is a flow of air from the top of the cabinet. This can be done by putting your hand over the tube from the top to feel the flow of air.

2. **OPERATION**
   The 3-500Z requires no warm-up time.
   1. Set the BAND switch to the desired band.
   2. Pre-set the TUNE and LOAD vernier dials to that referred to in calibration chart, Figure 2.
   3. Push the HV pushbutton on the MULTIMETER switchboard. The meter should read approximately 3 indicating a plate voltage of 3000 VDC.
   4. Push GRID on the MULTIMETER switchboard. (Normal operating position).

5.2.1 **SSB/CW/RTTY Operation**
   1. With the exciter adjusted for zero output, press the PTT switch of the exciter causing the PT-1000A and the exciter to go into the transmit mode.
   2. The amplifier's plate current meter should register approximately 60 ma.
   3. Increase the RF output of the exciter until the amplifier's grid current is about 40 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 200 ma. If the plate current is less than 200 ma, increase the load slightly by moving the LOAD control to a higher number on the dial. If the plate current is more than 220 ma, decrease the load slightly by

The tuning, loading and exciter control adjustments may have to be repeated several times until the ratio of 40 ma grid to 200 ma plate current is obtained. Note that at higher frequencies, the adjustments are sharper while at lower frequencies they are broad.

4. To verify the peak power condition, increase the RF output of the exciter for a plate current reading of 400 ma. With the full drive, the grid current should be 120 ma. Single tone adjustments while tuning should be made such that the grid current NEVER exceeds 120 ma. This very quickly reduces the life of the tubes. (Use of a dummy load for these measurements is preferred).

5. 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 200 ma. (Since the meter is average reading and cannot follow the peaks which are about 400 ma), the meter will indicate the highest average plate current. The grid current peaks should be around 50 ma. Check for proper drive with a monitor scope if one is available.
3-500Z tube to show colour, glowing a pale red with 200 ma of plate current and a brighter cherry red at 400 ma. When operated in this manner, the tube is within its ratings and can be operated in this way only if the plate circuit is at 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.

**CAUTION:** Under no circumstances should the plate current exceed 400 ma nor the grid current exceed 120 ma.

5.2.2 **AM Operation:**

Do not apply modulation. Tune the amplifier as per 5.2.1, Step 4 with plate current at 320 ma max. and grid current at approximately 60 ma. Reduce the carrier output so that plate current is 1/2 of previous reading. Grid current will be approximately 30 ma. Apply 1000 Hz tone at 100% modulation. Plate current should not exceed previous maximum value. If it does, reduce the mic. gain, as necessary. If an oscilloscope or modulation monitor is available, check that the modulation does not exceed 100%.

5.2.3 **ALC Adjustment:**

Loosen the ALC control lock nut. The control should be in the fully clockwise position. Drive the amplifier to the desired output level and then rotate the ALC control (CCW) until the grid current just begins to decrease.

5.2.4 **Power Readings:**

When the RF push-button is depressed, the MULTIMETER reads the relative output power into a dummy load or antenna. The amplifier should never be operated into a load with an SWR greater than 2:1. The SWR should be regularly checked when connected to an antenna. If VSWR of less than 2:1 cannot be achieved, a Viewstar

NOTE: In PT-1000A amplifiers from serial #5008 onward, the unit will have a grid protection circuit installed. If during tune up or normal operation a momentary grid current of 200 ma is exceeded, the amplifier will shut down and automatically switch to the bypass mode. The operate pilot lamp will be extinguished. To restore amplifier operation, reduce input drive to the unit, press the standby/operate switch to standby and then back to operate.

**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 or 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 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 prorata basis. Any warranty claims must be accompanied by the tube warranty claim form packaged with your new tube. All claims must be filed with tube manufacturer. Warranty claims on the amplifier must be accompanied by proof of purchase and purchase date.

Specifications and/or changes/improvements to the product are subject to change without notice or obligation.
<table>
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<tr>
<th>Circuit Designation</th>
<th>Description</th>
<th>Circuit Designation</th>
<th>Description</th>
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<tbody>
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<td>Silver Mica Capacitor</td>
<td>C39</td>
<td>Disc Ceramic Capacitor, .001 MFD, 1.4KV</td>
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<td>Potentiometer, Locking, 100 KΩ</td>
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<td>Disc Ceramic Capacitor, .01 MFD, 100V</td>
<td>R12</td>
<td>Resistor, Carbon, 1MΩ, ½W, 5%</td>
</tr>
<tr>
<td>53</td>
<td>Film Capacitor, .1 MFD, 250V</td>
<td>R13</td>
<td>Resistor, Carbon, 1MΩ, ½W, 5%</td>
</tr>
<tr>
<td>54</td>
<td>Film Capacitor, .1 MFD, 250V</td>
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<td>55</td>
<td>Electrolytic Capacitor, 470 MFD, 40V, AX</td>
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<td>56</td>
<td>Disc Ceramic Capacitor, .001 MFD, 1.4KV</td>
<td>R16</td>
<td>Resistor, Carbon, 1MΩ, ½W, 5%</td>
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<td>R18</td>
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<td>59</td>
<td>Disc Ceramic Capacitor, .001 MFD, 1.4KV</td>
<td>R19</td>
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<td>Circuit Designation</td>
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<tr>
<td>S3</td>
<td>Switch, Micro, SPDT</td>
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<td>S4</td>
<td>Switch, Rocker, DPST</td>
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<td>S5</td>
<td>Switch, Push-Button, 4 Section, DPDT</td>
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<td>TB1</td>
<td>Terminal Strip, 5 Position</td>
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<tr>
<td>J1</td>
<td>Connector, UHF Type, Female, Bulkhead</td>
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<td>J2</td>
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<td>Connector, Phono Type, Female, Panel Mount</td>
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<tr>
<td>J4</td>
<td>Connector, Phono Type, Female, Panel Mount</td>
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**NOTE:** C1 through C12 Values may vary from unit to unit as determined by test.
<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>Tune Setting</th>
<th>Load Setting</th>
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<td>7.2</td>
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<td>14.2</td>
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