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# COMMANDER HF-2500 EXPORT

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## Owner's Manual



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## Introduction

The Commander HF-2500 Export is class AB<sub>2</sub> linear power amplifier. It has been designed for operation on all amateur frequencies from 1.80 MHz to 29.7 MHz, excluding the 30 meter band.

Three Eimac 3CPX800A7 pulse rated ceramic-metal triodes configured in a grounded grid circuit allow for conservative operation at 2800 watts continuous carrier output. A pressurized forced air cooled chassis, including the high voltage supply insures cool operation with high duty cycle emission modes.

The output circuit utilizes extra heavy duty components with vernier reduction drives on all tuning controls. Easily accessed rear panel controls allow for operator adjustment of input VSWR and ALC.

An automatic time delay circuit, insures proper cathode conditioning before RF drive can be applied. A protective circuit shuts down the amplifier in the event of excessive grid current. A resistor located in the high voltage B+ circuit protects the tube in the event of an internal tube arc. Metering functions includes plate voltage, plate current, grid current and relative output.

**!! WARNING !!**

**CONTACT WITH VOLTAGES IN THIS AMPLIFIER CAN BE**

**!!! FATAL!!!**

**CAUTION:**

- DO NOT attempt any type of service or repair on this amplifier without first removing the AC power and allowing **AT LEAST 10 MINUTES FOR THE HIGH VOLTAGE CAPACITORS TO BLEED OFF !**
- DO NOT operate this amplifier with the top or bottom covers removed. **THE VOLTAGES INSIDE THE CABINET ARE DEADLY ! EXPOSURE TO UNSHIELDED RF AT THESE POWER LEVELS IS HAZARDOUS TO YOUR HEALTH !**
- Never attempt operation without first connecting your amplifier to an appropriate antenna or dummy load. The antenna SWR should not exceed 2:1. The dummy load should have an impedance of 50 Ohms with sufficient power handling capability. **DAMAGE TO THE AMPLIFIER MAY RESULT IF OPERATED WITHOUT A CONNECTION TO A PROPER LOAD.**
- **NEVER OPERATE THIS AMPLIFIER WITHOUT AN EARTH GROUND CONNECTED TO THE REAR PANEL GROUND TERMINAL.**
- Do not obstruct the ventilation holes located on the top, bottom, and sides of the cabinet. These holes provide sufficient intake and exhaust of cooling air. **SEVERE OVERHEATING AND SERIOUS DAMAGE WILL RESULT IF SUFFICIENT VENTILATION IS NOT PROVIDED.**
- Never operate any amplifier using an extension cord.

## UNPACKING

Carefully remove the Commander HF2500 EXPORT Amplifier from its shipping carton making sure there is no damage evident from shipping. If there is any damage, notify the delivering shipper immediately, fully describing the damage.

The HV power transformer was shipped separately, as its weight would damage the cabinet in transit.

Do not destroy the packing material since it may be reusable later, should you require factory service or need to transport the Amplifier for any other reason.

## TRANSFORMER INSTALLATION

Remove the top cover from the amplifier chassis. Install the transformer following the illustrated procedure beginning on next page.

## SHIPPING BLOCK

The 3CPX800A7 tubes are shipped installed in the amplifier, held in place by a Styrofoam block. Remove the block before use.



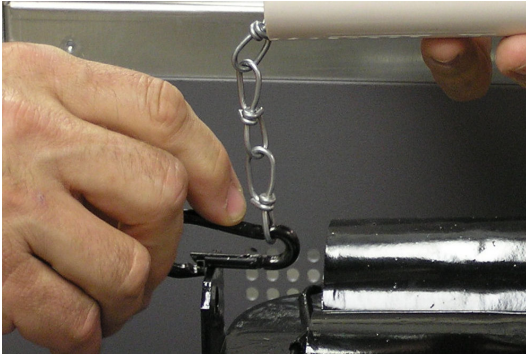
## 200/234 VAC Operation

The Commander HF2500 EXPORT comes factory wired for 234 VAC operation. For best operation, you should use a dedicated 234VAC main capable of supplying 30 Amps of peak AC current.

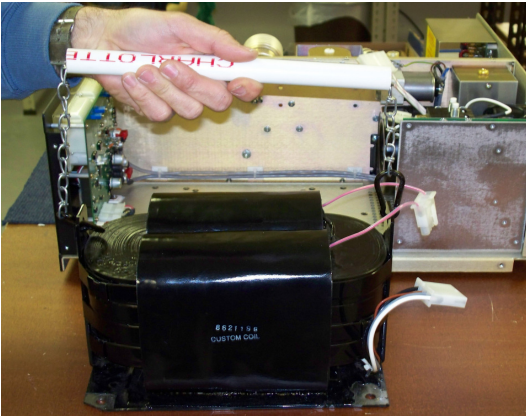
Commander Amplifiers manufactured for export are wired for 234 VAC or 200 VAC depending on the final destination.

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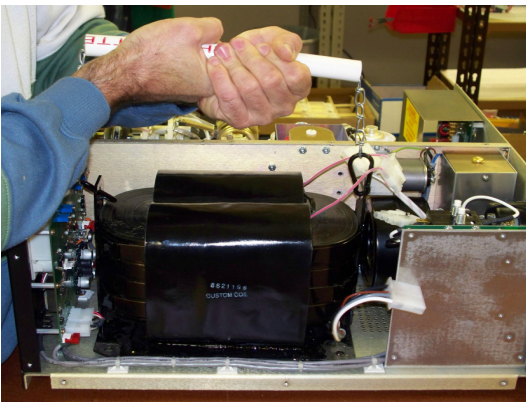
## HF-2500 EXPORT Transformer Installation



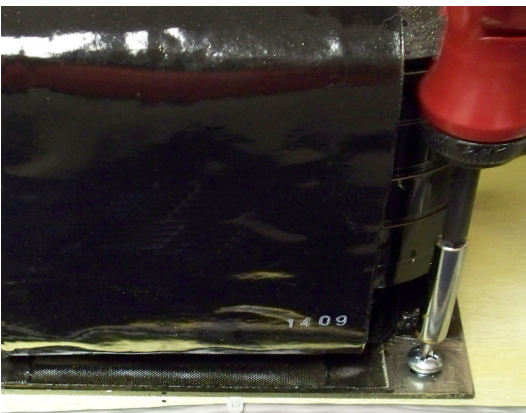
Hook the snap rings on the provided lifting handle into the holes in the tabs on either end of the transformer



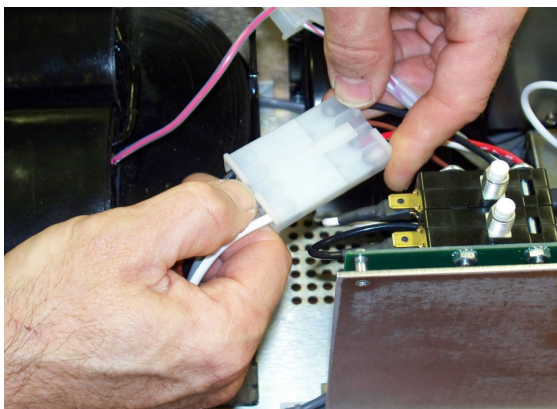
Here is the lifting handle attached and ready for use.



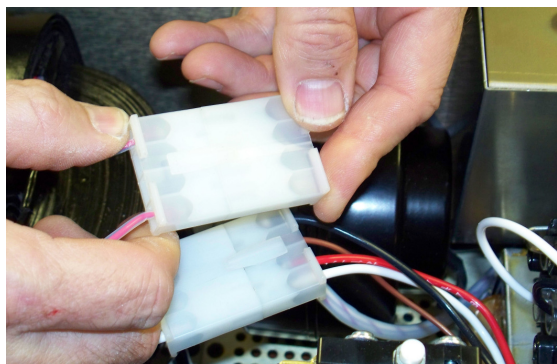
The transformer is **HEAVY**, so carefully lift it into place in the chassis. **BE CAREFUL NOT TO BUMP THE PC BOARD ON THE BACKS OF THE METERS.**



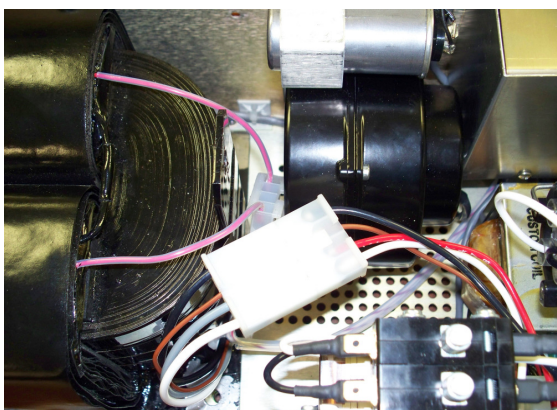
Position the transformer over the mounting holes in the chassis and insert the four provided 1/4-20 Phillips head screws through the transformer mounting tabs and into the threaded inserts in the chassis plate and tighten.



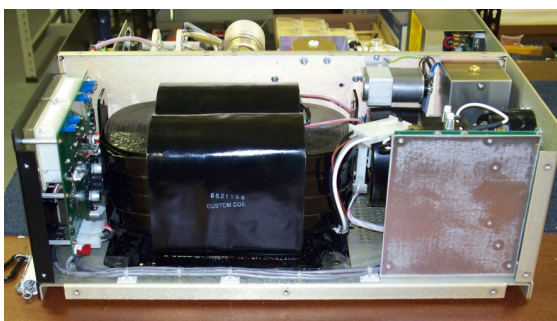
Plug the first connector on the transformer into the mating one on the chassis wiring harness. It is keyed so that it cannot be plugged in backwards. Make sure that the connector halves are pressed together until the lock tabs snap in place.



Plug the second connector on the transformer into the mating one that comes from the AC control board. It is keyed so that it cannot be plugged in backwards. Make sure that the connector halves are pressed together until the lock tabs snap in place.



Dress the wires and connectors down out of the way as shown.

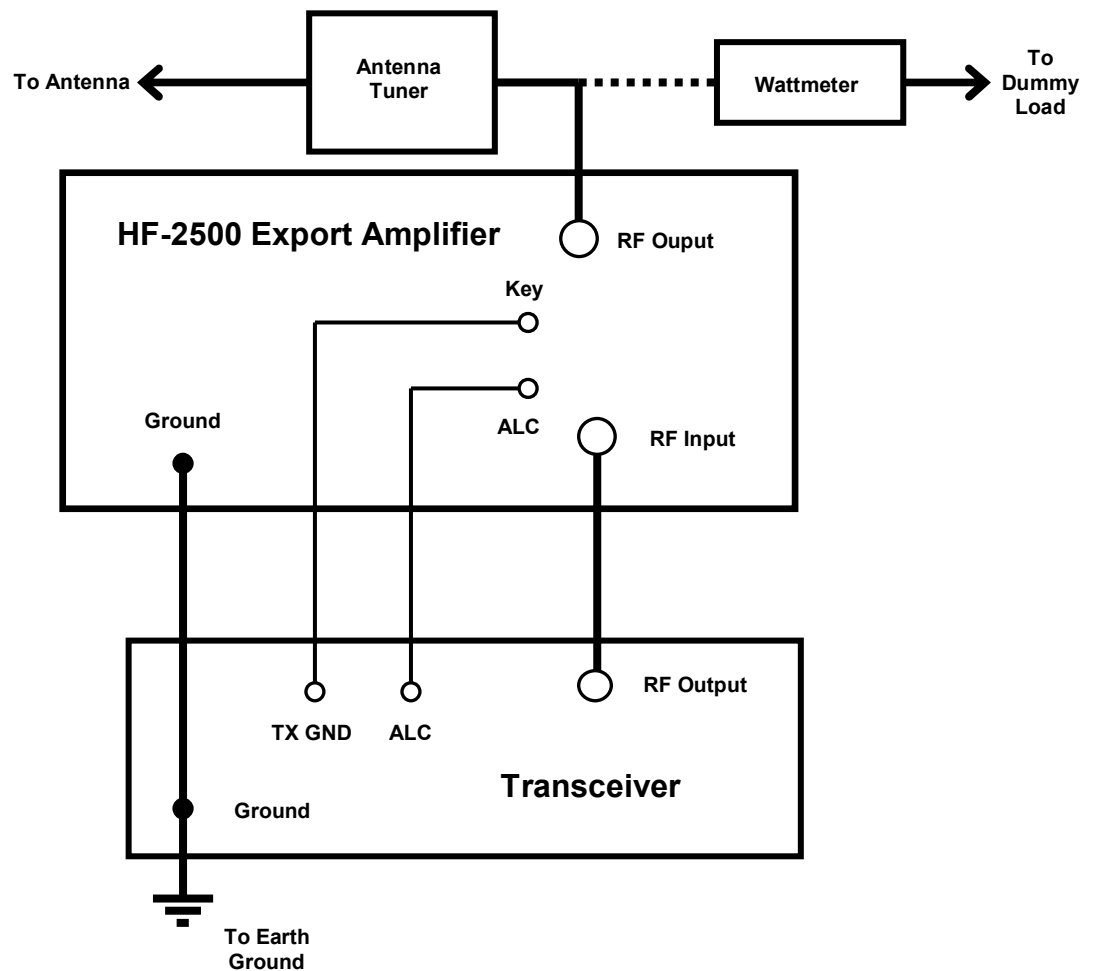


View of the completed transformer installation

**This completes HF-2500 EXPORT  
transformer installation.**

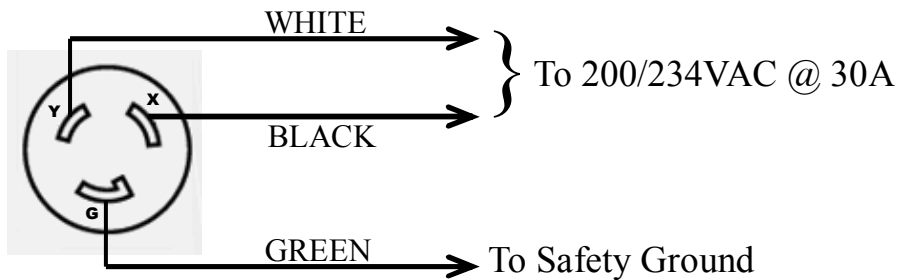
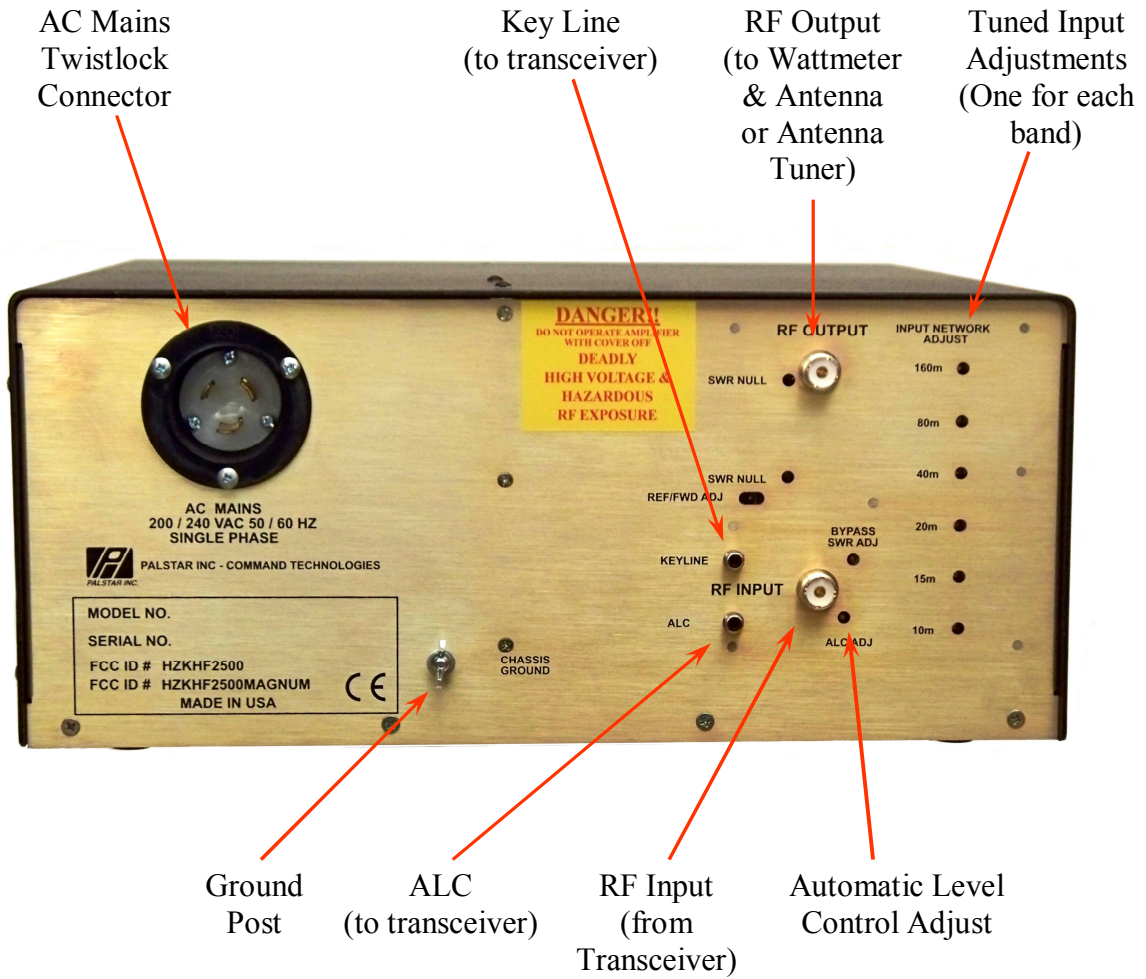
## Connecting Your Amplifier

- Connect the RF output of your transceiver to the RF Input connector on the rear of the HF-2500 EXPORT with 50 Ohm coaxial cable.
- Connect the existing station antenna tuner or a Wattmeter and dummy load to the RF Output connector on the HF-2500 EXPORT with RG-8 or better coaxial cable.
- Connect the Keyline jack on the rear of the HF-2500 EXPORT to the normally open terminal of the relay jack on your transceiver. The Key jack on the HF-2500 EXPORT has positive 5 VDC open circuit and requires the sinking of 15 mA of current when pulled to ground.
- Connect as short a ground lead as possible from a good RF ground to the Ground Post on the HF-2500 EXPORT.
- Connect the ALC phono jack to the ALC connection on your transceiver using a shielded cable. Consult your transceiver manual for proper ALC connection details.

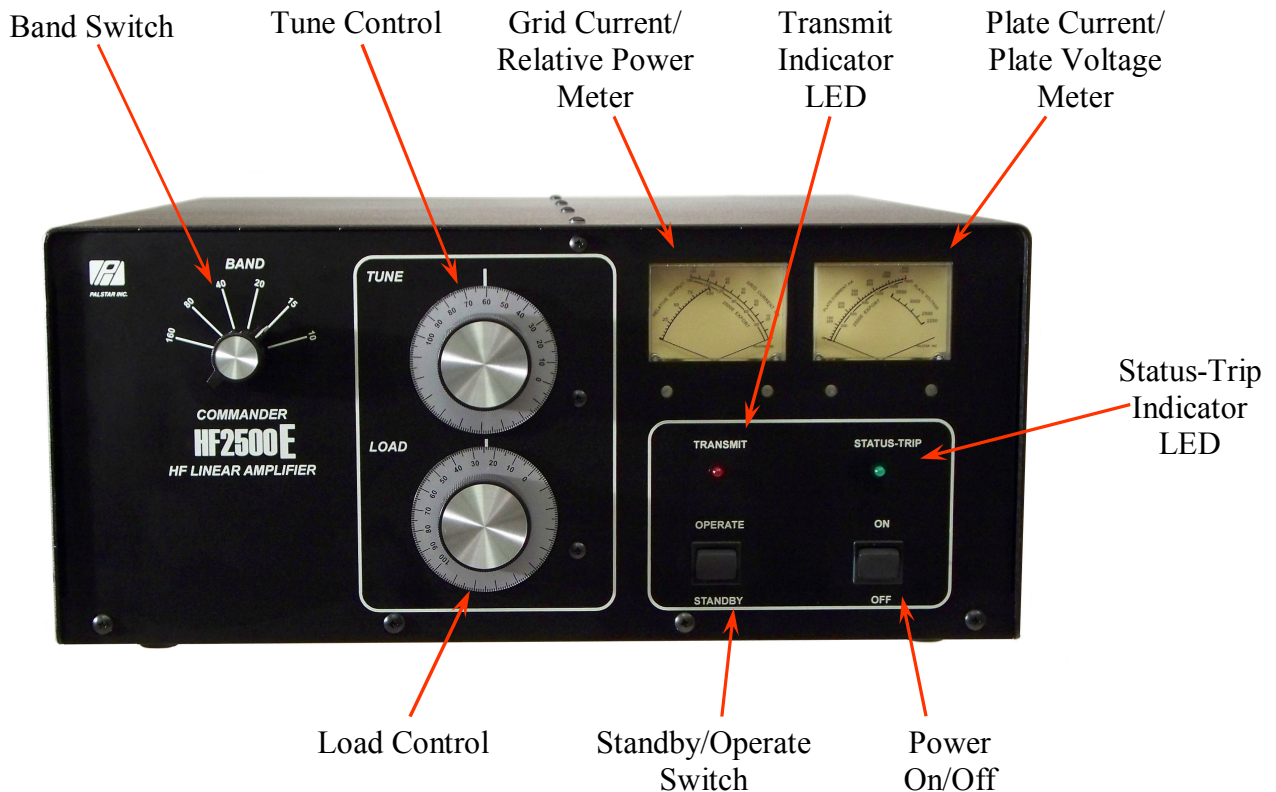




# Rear Panel View



**AC Power Twistlock Connector Wiring**  
(View looking at rear panel)



## TUNING PROCEDURE

Set the front panel controls to the following positions:

ON - OFF Switch.	OFF
STANDBY - OPERATE	STANDBY
BAND SWITCH	DESIRED BAND
TUNE CONTROL	PRESET TUNE SETTINGS (See test sheet)
LOAD CONTROL	PRESET LOAD SETTINGS (See test sheet)

After the controls have been preset and the amplifier is connected to a suitable RF load, switch the On/Off switch to the On position. The following will occur:

- The meters will illuminate.
- The step-start relay will actuate and the HV will begin to ramp up.
- After 2 seconds the step-start relay will disengage and the HV will now be at its normal no-load voltage level.
- The 3 minute filament timer will start. The green "Status-Trip" LED will flash (1Hz rate) during the 3 minute warm-up interval.
- After 3 minutes the "Status-Trip" LED stops flashing and the amplifier is ready for use.

Place the Standby/Operate switch in the Operate position. The amplifier will not switch to the "Operate" state if the Keyline is active when the switch is thrown (this protects the amp in

case it is inadvertently keyed when the switch is thrown). Key the exciter with no RF drive applied. The red transmit LED should illuminate, and the meter should indicate approximately 150 mA of plate current. Apply 5 to 10 watts of RF drive, the plate current should rise slightly. If the plate current rises above 1800 mA, reduce drive. Adjust the **TUNE** control to peak the grid current and achieve maximum output power as indicated on an external Wattmeter.. **COMPLETE THESE ADJUSTMENTS AS QUICKLY AS POSSIBLE TO AVOID STRESSING THE TUBES.**

Adjust the **LOAD** control to reduce grid current while maintaining output power as indicated on their relative output meter or an external Wattmeter. Next, increase the drive in small increments and **adjust the LOAD control for maximum output while keeping the grid current low.** Under normal conditions the grid current should not exceed 60mA.

Readjust the **TUNE** control to again peak the reading on the grid meter. If the meter rises above 150mA. quickly reduce drive and adjust the **LOAD** control counterclockwise to reduce grid current. Repeat these adjustments as required to achieve the desired output up to 2800 Watts.

*Generally expect to tune by peaking grid current and simultaneously dipping plate current.*

[NOTE: If the grid current is allowed to reach or exceed 180mA, the controller will immediately un-key the amplifier and the “Status-Trip” LED will flash rapidly, indicating that a grid current limit (a “Grid-Trip”) has occurred.

In order to reset the Grid-Trip circuitry, the exciter must be un-keyed and the “Standby-Operate” switch must be switched to “Standby” and then back to “Operate.” Once the Grid-Trip has been reset, the “Status-Trip” LED will stop flashing and remain illuminated.

Do NOT exceed 1800mA plate current.]

Note that when increasing output power the tune scale will always read higher and the load will read lower. Also, the supplied inspection sheet has all of these settings and they should be used as a guide for this procedure. If your settings vary widely from these you have something wrong and should start over.

If your planned operation is on SSB, you should reduce the load control slightly counterclockwise, reducing the TOTAL output slightly about 30 to 50 Watts. This adjustment is necessary to insure that the amplifier is sufficiently loaded to handle the plate current peaks caused by the complex voice patterns during SSB operation. **Nominal plate and grid current readings during SSB operation will be about 30 to 40% of the key down CW readings.**

**CAUTION: THE TUNE AND LOAD AIR VARIABLE CAPACITORS MAY ARC IF MAXIMUM DRIVE IS APPLIED BEFORE THE AMPLIFIER IS PROPERLY TUNED. ALWAYS FOLLOW THE DESCRIBED TUNE-UP PROCEDURE TO AVOID CAPACITOR ARCING. ARCING MAY ALSO OCCUR IF YOU ATTEMPT TO TUNE INTO AN ANTENNA WITH A VSWR GREATER THAN 2:1.**

## Theory Of Operation

The Commander HF-2500 EXPORT uses three C.P.I. Eimac 3CPX800A7 pulse rated ceramic/metal triodes in a class AB<sub>2</sub> grounded grid configuration. Nominal drive power of 20 to 65 Watts.

This amplifier will operate on the following amateur bands: 160, 80, 40, 20, 15, 17, 12 and 10 meters.

## Metering Functions

The Commander HF-2500 EXPORT has two illuminated cross-needle panel meters. The left-hand meter continuously displays 3CPX800A7 grid current and relative output power. Under typical operating conditions the grid current will be 20-60mA.

Plate voltage and Plate current are continuously displayed on the right-hand meter. The typical plate current under nominal rated output (2800 Watts) should range from approximately 1000mA to 1800mA, with an absolute maximum of 1800mA.

## Tuned Input Circuits and Adjustments

The tuned input circuits utilize an  $\pi$  impedance matching circuit with a high  $Q$  design. These circuits employ RF phase compensating capacitors to reduce intermodulation products. The use of mica trimmer capacitors allows adjustments to match the transceiver to the amplifier. The rear panel provides easy access to these trimmer capacitors. A front panel band switch selects the appropriate input filter.

Your Commander amplifier has mica trimmer capacitors which are easily accessed thru holes located on the rear panel. The tuned input circuits are factory tuned and should not be re-adjusted unless necessary. You can easily make adjustments for any change in your preference for operating frequency range. Also, slight adjustments may be necessary because of slight variances in impedances between your transceiver and the tuned input circuitry of the amplifier.

1. Install a SWR meter between the transceiver and the amplifier.
2. Make sure the Standby/Operate switch is in the Operate position and the band switch is set to the same band as the one for which you are making adjustments. Your amplifier should also be properly tuned and loaded (preferably onto a dummy load of sufficient capacity).
3. Apply drive, observe the SWR, and adjust the trimmer capacitor for minimum SWR. Be careful not to overdrive the amplifier.
4. Repeat this procedure for each band.

## Automatic Level Control and Adjustments

An adjustable Automatic Level Control (ALC) circuit limits the peak output power. When properly set, this circuit insures that the amplifier can not be overdriven. Rear panel access allows for easy manual adjustment. A sample of the RF input derives the ALC voltage.

Your transceiver's internal ALC will maintain linearity. The amplifier's ALC will prevent overdriving the amplifier. The HF-2500 EXPORT's ALC circuit was designed for negative going ALC voltage. Proper adjustment is as follows:

1. Use an insulated tool when making these adjustments.
2. Tune the amplifier for operation on the 20 meter band for full 2800 watts output.
3. With your transceiver set for 20 meter SSB operation, set the transceiver's microphone

gain for normal operation as specified in its owners manual.

4. While speaking louder than normal into the microphone, adjust the ALC pot through the access hole on the rear panel . Adjust for 2800 Watts maximum output as indicated on an external peak reading Wattmeter.
5. On some newer model transceivers this adjustment can be made in the CW position. On these models (with your output at 1500 Watts) simply adjust for a slight drop in output.

### **Output Filter Circuit**

The  $\pi$  variable network filter transforms the plate load impedance from approximately 2500 Ohms down to 200 Ohms, Two air variable capacitors and an associated inductor accomplish this transformation. A heavy duty band switch selects the proper inductance from high  $Q$  inductors with appropriate taps for the desired band of operation.

A design  $Q$  of 14 allows for good harmonic attenuation on all bands. A special reactance-tuned ferrite core 4 to 1 transmission line transformer steps down the 200 Ohm output of the  $\pi$  circuit to the 50 Ohm nominal antenna impedance. This also provides further harmonic attenuation of the output in the same manner as an L coil in a  $\pi$ -L network.

### **High Voltage Supply**

The high voltage supply operates from 200/234 VAC, 30 Ampere line. The primary of the high voltage transformer is switched on and off with relays and incorporates a step-start circuit to limit in-rush current while the high voltage filter capacitors charge. The front panel On/Off switch applies AC mains power to the controller circuitry which then controls AC power to the filament and HV transformers. 2400 VAC from the transformer is applied to a full wave bridge rectifier. Metering of the tube anode and grid current is accomplished by shunt resistors located in the negative return of the 3CPX800-A7 cathode. Plate voltage metering is accomplished by a resistor divider network in the B+ line of the high voltage circuit.

## Limited Warranty

Palstar Inc. warrants the Commander HF-2500 EXPORT to be free from defects in material and workmanship under normal use and service to the **original buyer for a period of one (1) year from the date of delivery to that buyer** (the “Warranty Period”). Palstar Inc.’s obligation under this warranty is limited to repair or replacement of the product at it’s option at the Palstar factory in Piqua, OH.

This warranty is effective only when the product is returned to the factory with all transportation charges prepaid and examination of the product discloses the product, in Palstar’s judgment, to have been defective during the Warranty Period.

The Warranty Period shall not extend beyond its original term with respect to interim in-warranty repairs by Palstar. This Warranty Period shall not apply to any product which has been repaired or altered by anyone other than Palstar without prior written authorization. Warranty does not extend to any products which have been subject to damage from improper installation, application or maintenance in accordance with the operating specifications. Palstar neither assumes nor authorizes any person to assume for it any obligation or liability other than herein stated.

## Shipping Your Amplifier Back to the Factory

Due to the necessity of shipping the amplifier with the HV transformer removed, please contact the factory for instructions before sending an amplifier back to us. There are circumstances in which it may not be necessary to return the HV transformer, thereby saving you shipping charges. When you call, Palstar will inform you if transformer return is necessary. If transformer return is necessary, remove it from the amplifier cabinet and ship it separately, and must be in its original packing.

## Repair Policy

When sending in a product for service, see the section above. If not using the original packing materials, please “double” box it carefully with suitable padding and ship it insured for your protection. Please include a note clearly describing the problem, how you wish the item returned and how you wish to pay for the service. Package your unit properly. Palstar, Inc. is not responsible for merchandise damaged in shipment. Our service rate is \$30 per hour (1/2 hr. minimum).

## Return Policy

All returns must receive prior authorization from Palstar. Returned items must be received in original—AS SHIPPED—condition including the original box, manuals, accessories, and copy of sales receipt. Returns must be within 14 days of purchase. Returned items are subject to a 25% restocking fee. Shipping is not refundable.

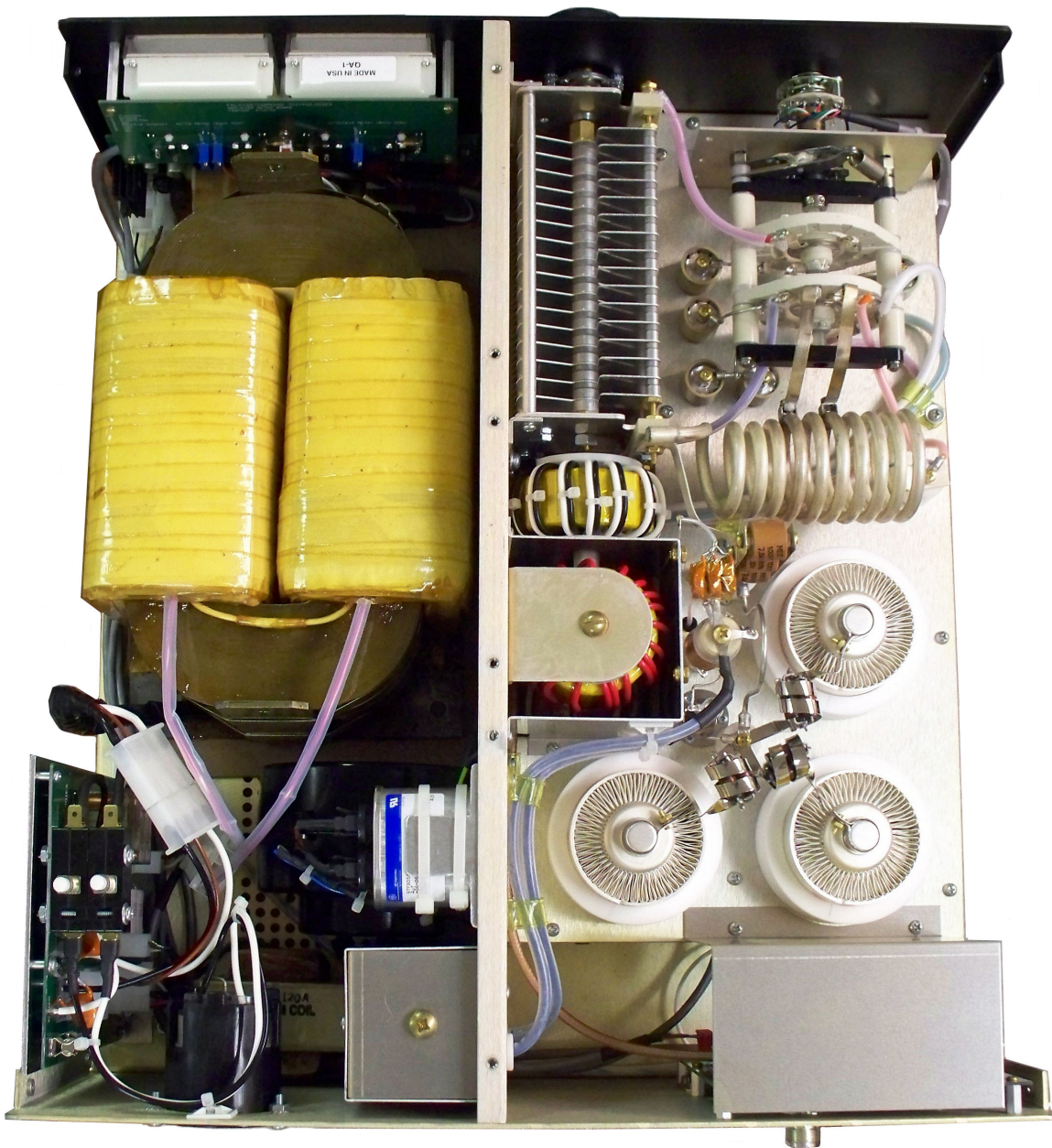
## **Specifications**

### **COMMANDER HF-2500 EXPORT**

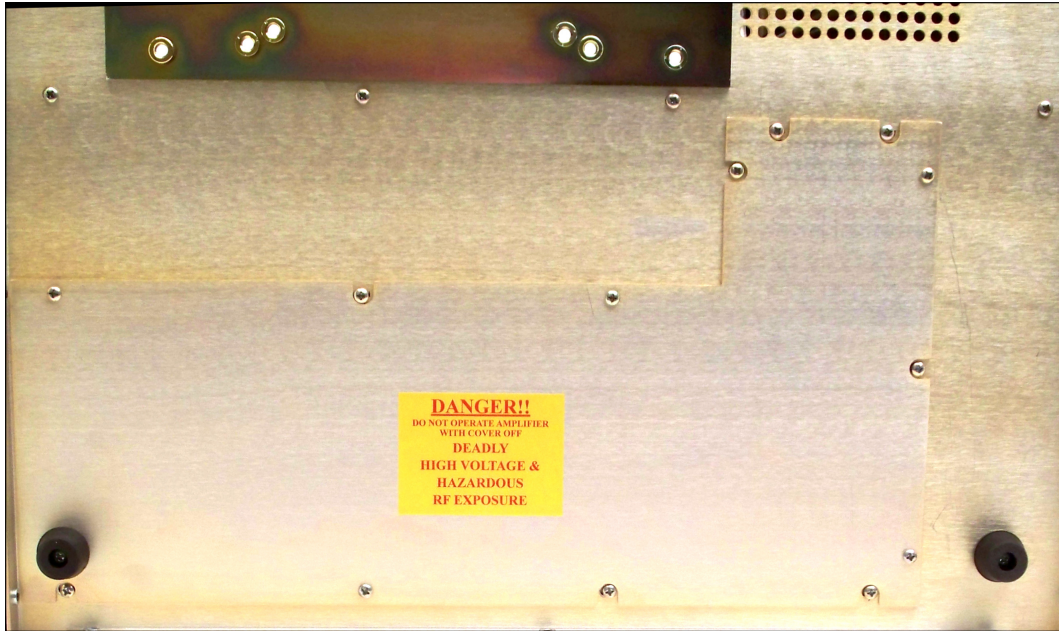
### **HF Linear Power Amplifier**

- **Band Coverage:** 160, 80, 40, 20, 17, 15, 12, and 10 meter amateur radio bands.
- **Types of Emissions:** SSB, FM, CW, AM, RTTY, SSTV.
- **Driving Power Required:** 20 to 90 Watts nominal at rated continuous carrier output.
- **Maximum Output Power:** 2800 Watts Continuous Carrier.
- **Duty Cycle:** 50 percent in Amateur service at 2800 watts output power
- **Input impedance:** 50 Ohm unbalanced
- **Output Impedance:** 50 Ohm unbalanced: SWR 2:1 or less
- **Harmonic Suppression:** Exceeds all FCC requirements
- **Keying:** Requires contact closure capable of sinking +5 VDC at 15 mA
- **Metering:** Plate voltage, plate current, grid current, and relative power
- **A.L.C.:** Negative going, adjustable from rear panel
- **Front Panel Controls:** On/Off switch; Standby/Operate switch; Tune; Load; Band selector switch.
- **Rear Panel Controls:** Tuned input adjustment; ALC adjustment; RF input; RF output; ALC output; Keying; ground connection; AC power inlet.
- **Tube Complement:** Three Eimac 3CPX800A7 pulse rated ceramic/metal triodes.
- **Cabinet Size:** 18.25" W x 8.5" H x 20.75" D (46.3cm x 21.6 cm x 52.7 cm)
- **Weight:** 120lbs. ( 54.6 kg. ) (including transformer)
- **Power Requirement:** 200/234 VAC, 50/60 Hz, 30 Amperes

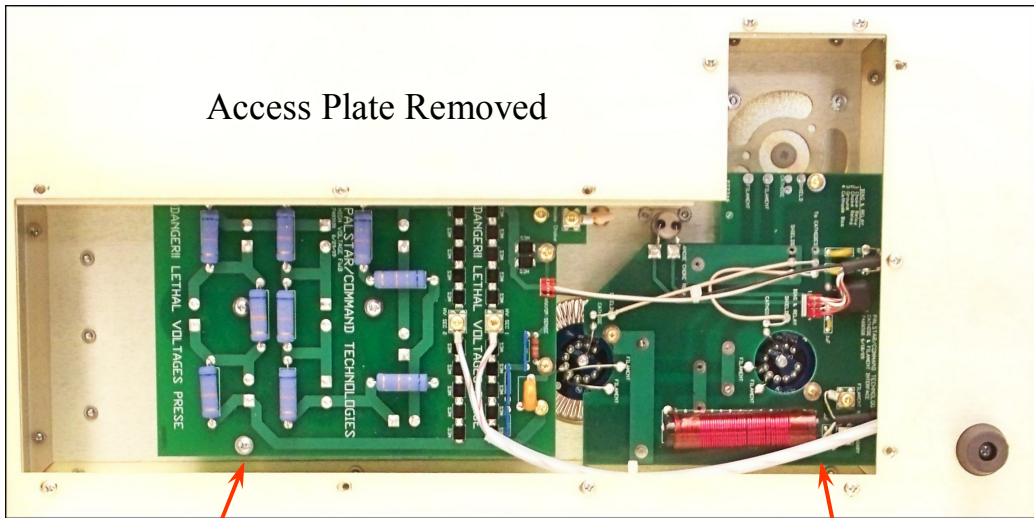
# HF-2500 Export TOP VIEW







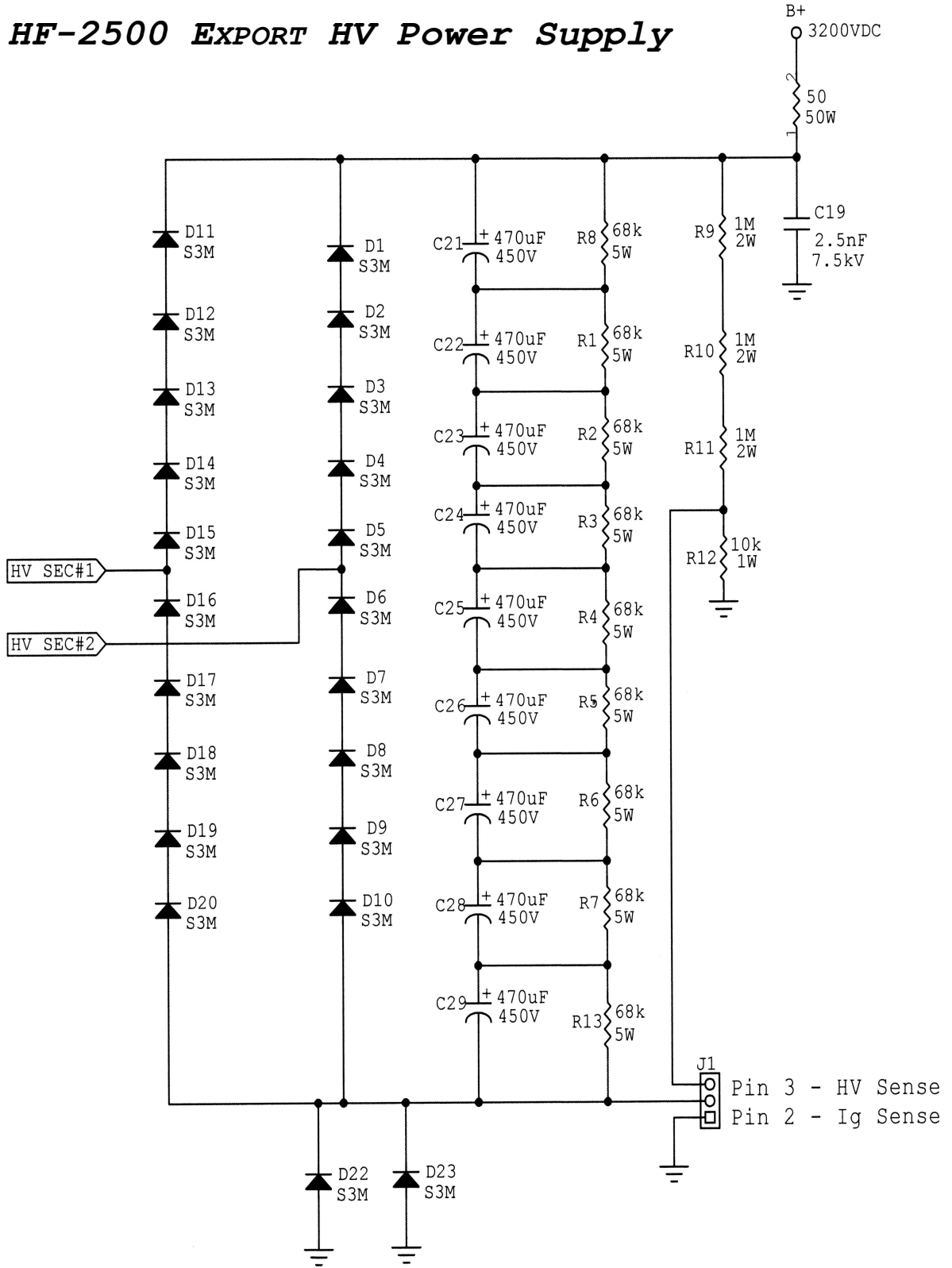
Bottom View showing access plate



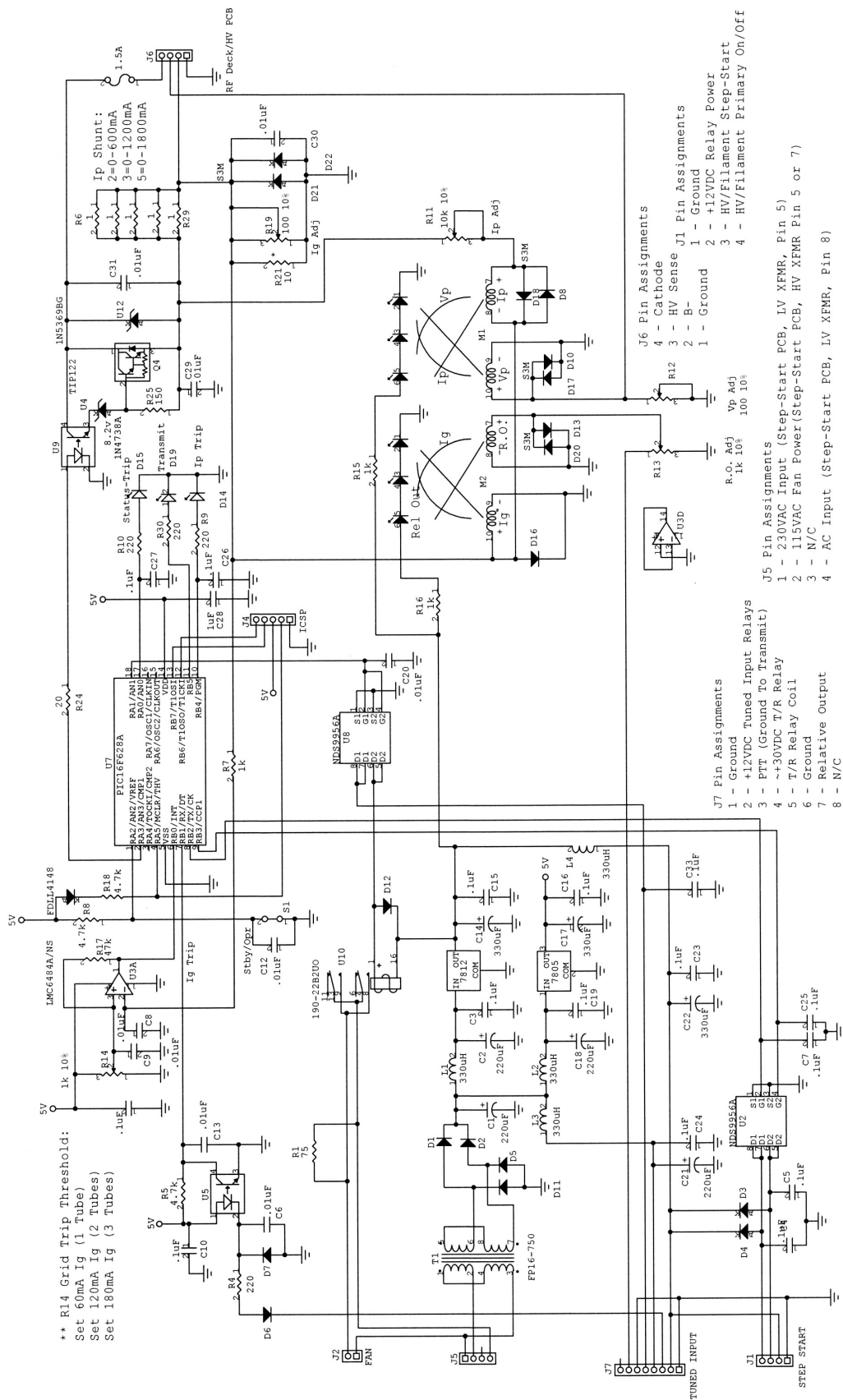
HV Power Supply PCB

Cathode and Filament Interface PCB

# HF-2500 EXPORT HV Power Supply







# Control and Metering Board