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**VHF-1200 / VHF-2000  
6 M LINEAR AMPLIFIER**

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***Owner's Manual***



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## INTRODUCTION

The Commander VHF-1200 and VHF-2000 are Grounded Grid class AB<sub>2</sub> linear power amplifiers that operate on the Amateur 6 Meter band.

Over-drive and over-grid current protection is provided by an auto-reset circuit that places the amplifier in standby if a preset grid current limit is exceeded.

Genuine CPI/Eimac 3CPX800A7 external anode triodes, with forced air cooling and modern circuitry, insure efficient and conservative operation. The VHF-1200 uses one tube, the VHF-2000 uses two.

6:1 Vernier reduction drives on all tuning controls allow smooth and easy tune-up.

A rear panel input tuning control allows a higher input circuit  $Q$  for excellent linearity and a low input VSWR across the 6 Meter band.

An automatic delay circuit, for proper cathode conditioning before RF drive can be applied, extends tube life. A 50 ohm resistor in the plate supply positive lead and a 200 ohm resistor in the negative lead protect the tube in the event of an arc.

The Commander VHF-1200 and VHF-2000 feature a full compliment of control and metering functions for easy on-the-air operation.

A dual primary power transformer allows 200/234 VAC operation.

## Specifications

### Commander VHF-1200

### 6 M Linear Power Amplifier

- **Modes:** USB, LSB, RTTY, FM, & CW
- **Power Requirements:** 200/234VAC 50/60 Hz.
- **RF Drive Power:** 15-25 W Nominal; 35-40 Watts Max. For Full Output (1.2 kW PEP on SSB)
- **RF Output:** 750 W maximum, FM or RTTY
- **Input Impedance:** 50 Ohm unbalanced; rear panel adjustable
- **Output Impedance:** 50 Ohm nominal
- **Antenna Load:** 2:1 VSWR maximum
- **Harmonic Suppression:** Better than -60 db down @ rated output
- **Intermodulation Distortion:** Better than -35 db down @ rated output
- **Weight:** 75 lbs (34 kg)
- **Cabinet Size:** 18" x 16" x 7.75" (45.7 cm x 40.6 cm x 19.7 cm)
- **Tube Compliment:** One 3CPX800A7 Ceramic Metal Triode
- **Cooling:** Forced air, pressurized chassis

# Specifications

## Commander VHF-2000

### 6 M Linear Power Amplifier

- **Frequency Range:** 50 to 54 MHz
- **Modes:** USB, LSB, RTTY, FM, & CW
- **Power Requirements:** 200/234VAC 50/60 Hz.
- **RF Drive Power:** 15-25 W nominal - 35-50 W Max. for full output (1.5 kW PEP on SSB )
- **RF Output:** 1500 W maximum, FM or RTTY
- **Input Impedance:** 50 Ohm unbalanced; rear panel adjustable
- **Output Impedance:** 50 Ohm nominal
- **Antenna Load:** 2:1 VSWR maximum
- **Harmonic Suppression:** Better than -60 db down @ rated output
- **Intermodulation Distortion:** Better than -35 db down @ rated output
- **Weight:** 75 lbs (34 kg)
- **Cabinet Size:** 18" x 16" x 7.75" (45.7 cm x 40.6 cm x 19.7 cm)
- **Tube Compliment:** Two 3CPX800A7 Ceramic Metal Triodes
- **Cooling:** Forced air, pressurized chassis

## UNPACKING

Carefully remove your VHF-1200/VHF-2000 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.

The 3CPX800A7 tube(s) are packed inside the cabinet in the area where the transformer will be installed.

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

See the illustrated procedure on page 7 to complete installation.

## TUBE INSTALLATION

Carefully remove the 3CPX800A7 tube(s) from the shipping carton. This carton was located in the area where the transformer was installed. Place the tubes in the tube socket with the proper pin alignment. If you have maintained the proper pin alignment, the tubes should go into their sockets easily. If you have to use undue force to insert the tubes, you may have the wrong pin alignment or one or more of the pins may be bent. If necessary, carefully straighten pins with needle nose pliers and reinstall. Install the anode straps on the tube caps as shown and replace the top and bottom covers. The unit is now ready for operation.

## 200/234 VAC Operation

The Commander VHF-1200 and VHF 2000 come factory wired for 234 VAC operation. For best operation, you should use a dedicated 234 VAC main capable of supplying 20 Amps of peak AC current.

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



Grip the transformer by the windings, as shown. There is not enough room for your hands inside the cabinet if you hold it by the base.



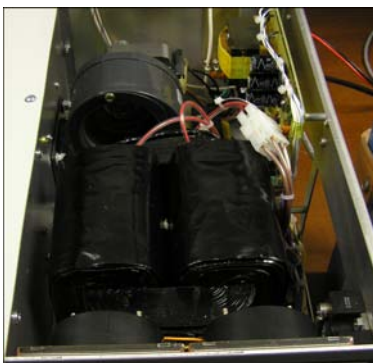
Carefully lower the transformer into the amplifier. **Be careful not to bump the backs of the meters and be sure the connector plug is out of the way and will not be trapped under the transformer.**



Position the transformer over the mounting holes in the cabinet and insert the provided carriage bolts in from the top, through the transformer mounting tabs and chassis slots. Next, slightly lift the chassis and place a flat washer and KEPS nut on the bottom side of each bolt and tighten.



Plug the connector on the transformer into the one on the 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.



This is the final position of the transformer and the connector plug.

**!! 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 60 MINUTES FOR THE HIGH VOLTAGE CAPACITORS TO BLEED OFF !**
- DO NOT operate this amplifier with the top or bottom covers removed. DO NOT operate this amplifier with the internal RF tube compartment covers removed. Never place any objects into the top ventilation holes. **CONTACT WITH VOLTAGES IN THE CABINET CAN BE FATAL ! EXPOSURE TO UNSHIELDED RF AT THESE POWER LEVELS IS HAZARDOUS TO YOUR HEALTH !**
- Never attempt operation without first connecting an appropriate antenna (2:1 VSWR Max) or a 50 ohm dummy load with sufficient rating or **SERIOUS DAMAGE TO THE AMPLIFIER MAY RESULT.**
- Never operate the amplifier with more drive than required to produce the rated output for the operating mode used.
- Do not place the VHF-1200 OR VHF-2000 in repeater operation. These amplifiers are not designed for unattended service. Never operate any amplifier using an extension cord.
- Never cover the top of the amplifier cabinet with books, papers or other equipment as **OVERHEATING MAY RESULT.**

**FOR ASSISTANCE CONTACT THE MANUFACTURER:**

Telephone: 800-773-7931

International: 937-773-6255

E-mail: [info@palstar.com](mailto:info@palstar.com)



## CONNECTING YOUR AMPLIFIER

Locate your Commander VHF-1200/2000 so that no equipment is directly above it, as air expelled from the tube exhaust on top can become quite hot. Allow at least 3 inches clearance on either side between the unit and other objects or equipment.

Connect the RF OUTPUT of your transceiver to the RF IN connector on the rear of the VHF-1200/2000 with 50 ohm coax.

Using RG8 or better coax, connect the RF OUT connector on the VHF-1200/2000 to a good quality thru-line Wattmeter, and connect the Wattmeter Output to the antenna, antenna tuner or dummy load.

Connect the RELAY phono jack on the rear of the VHF-1200/2000 to the Normally Open (NO) terminal of the RELAY jack on your transceiver. Read the manual that came with your transceiver to find the proper external connections. On some transceivers, this is not provided, and an alternate circuit will be required. Always use shielded cable for these connections. The RELAY jack on the VHF-1200/2000 has positive 12 VDC open circuit on the center pin and requires the sinking of 55 mA of current when pulled to ground.

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.

Connect a ground lead (as short as possible) from a good earth ground to the GROUND post on the rear panel.

The 12 VDC jack on the rear panel is an accessory for powering low current 12 VDC devices (less than 100 mA.). Do not connect an external voltage source to the jack.

## OPERATING PROCEDURE

After reading this manual and completing the Installation / Preparation Instructions, position the Commander VHF-1200/2000 front controls as follows:

ON / OFF	OFF
OPERATE / STANDBY	STANDBY
METER SWITCH	V <sub>p</sub> (PLATE VOLTAGE)
LOAD	50 - MIDDLE OF RANGE
TUNE MINIMUM	CAPACITANCE (POINTER TO LEFT)

After presetting these controls, switch the ON/OFF switch to the ON position. At this time you will hear the blower running and see an indication of Plate Voltage on the meter, (approximately 2650 VDC)

The 3CPX800A7 used in this amplifier require a warm-up period before RF drive may be applied, to prevent damage to the tube. A 2 minute warm-up is provided by a solid state timer circuit. At the end of the warm-up period, the green POWER LED on the front panel illuminates and the unit is ready for operation. Switch the meter switch to the I<sub>p</sub> (plate current) position.

Switch the OPERATE / STANDBY switch to OPERATE and key the exciter with **ZERO** RF drive applied. The red transmit light should come on, along with an indication of plate idling current on the meter (approx. 100-160 mA VHF-2000; 80-100 mA VHF-1200). Apply a low level of RF drive (5 W or less) and adjust the LOAD and then the TUNE control for maximum output as indicated on an external Wattmeter. **COMPLETE THESE ADJUSTMENTS AS QUICKLY AS POSSIBLE TO AVOID STRESSING THE TUBE(S).**

Again key the exciter and while increasing the RF drive, adjust the LOAD control **counter-clockwise** to obtain a peak in output power while keeping the grid current below 60mA. Readjust the TUNE control **clockwise** for maximum output. Repeat this procedure until the desired output is obtained. When increasing power output, the TUNE capacitance will increase (clockwise on the dial) and the LOAD capacitance will decrease (counterclockwise on the dial) When properly tuned, the grid current will be peaked at the TUNE setting and turning the LOAD counter-clockwise will decrease grid current and power output. If the grid current rises, keep turning LOAD counter-clockwise until it decreases. Do not exceed 600 mA (VHF-1200) or 1000 mA (VHF-2000) of plate current on key down (see typical operating conditions chart on next page). If you exceed 70 mA (VHF-1200) or 100 mA (VHF-2000) of grid current the amplifier will dropout to Standby. To reset it, you will have to un-key the transmitter and reduce RF drive.

With the meter switch in the Ip position and while monitoring grid current, the Commander VHF-1200/2000 is ready for on the air operation. Normal SSB operation is indicated by plate and grid current meter readings on voice peaks of approximately 1/3 to 1/2 of the CW key down value. For FM or other high duty cycle modes, limit output to 600 watts (VHF-1200) or 1000 watts (VHF-2000) maximum.

If your planned operation is on SSB, you should adjust the load control slightly counter-clockwise, reducing the output slightly by about 30 to 50 watts. This adjustment is necessary to insure that the amplifier has sufficient headroom to handle the plate current peaks caused by the complex voice patterns during SSB operation. Nominal 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.**

If you should need any further assistance tuning this amplifier, feel free to call us at 1-800-773-7931 and our staff will be happy to help you. If you are outside the United States we are available at 937-773-6255

**Typical Operating Conditions  
VHF-1200**

DRIVE	GRID CURRENT	PLATE CURRENT	POWER OUTPUT
12.5 Watts	20mA	400mA	450 Watts
18.5 Watts	30mA	500mA	650Watts
30 Watts	50mA	600mA	1000Watts

**Typical Operating Conditions  
VHF-2000**

DRIVE	GRID CURRENT	PLATE CURRENT	POWER OUTPUT
25 Watts	30mA	700mA	1000 Watts
40 Watts	45mA	1000mA	1500 Watts

## Circuit Description and Adjustments

The Commander VHF-1200/2000 uses Genuine Eimac 3CPX800A7 ceramic/metal triodes) in a class AB<sub>2</sub> grounded grid configuration. Nominal drive power of 35 to 50 Watts will deliver full rating of clean RF output power.

### Metering Functions

The Commander VHF-1200 and VHF-2000 have two illuminated panel meters. The Grid Current meter provides a continuous reading of the 3CX8QQ-A7s grid current. The meter scale is 2 mA per division and the range is 0 to 100 mA. **DO NOT EXCEED 60 mA OF GRID CURRENT PER TUBE (60 mA on the VHF-1200; 120 mA on the VHF-2000).** OTHERWISE, DAMAGE TO YOUR TUBES COULD RESULT. Under typical operating conditions the grid current will be 20-45 mA on the VHF-1200; 40-90 mA on the VHF-2000.

Plate voltage and Plate current are shown on the second meter. A function switch on the front panel switches the meter from plate voltage (Vp) to plate current (Ip). Plate current is shown on the top scale. Each division is 20 mA, and full scale is 1500 mA. (1000 mA VHF-1200)

The typical plate current under nominal rated output should range from 900 to 1100 mA. (500 to 600 mA on VHF-1200) with an absolute maximum of 1200 mA. for SSB. (600 mA VHF-1200) Plate voltage is indicated on the bottom scale with each division reflecting .06 kV. The scale has a range from 0-3.0 kV. The nominal no-load plate voltage should read approximately 2,600 V. Plate voltage under nominal full load should read approximately 2,300 V.

### Control

An adjustable automatic level control (ALC) circuit limits the peak output power. When properly set, this circuit insures that the amplifier can not be over driven. Rear panel access allows for easy manual adjustment . A sample of the RF input derives the ALC voltage. Additionally this amplifier has an RF negative feedback resistance in the cathode circuit to help cancel excessive RF drive without reducing the amplifier's gain.

### A.L.C. Adjustments

Your transceiver's internal ALC will maintain linearity. The amplifier's ALC will prevent over driving the amplifier. The VHF-1200/2000 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 desired frequency for full 1500 W output. (1200 W on the VHF-1200)
3. With your transceiver set for 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 control on the rear panel through the access hole. Adjust for 1500 W (1200 W on VHF-1200) maximum output as indicated on an external peak reading wattmeter. If an average reading wattmeter is used, adjust for approximately 600 W output on voice peaks. (400 W on VHF-1200)

## Tuned Input Circuits

The tuned input circuits utilize an L-C-L or "T" impedance matching circuit with a high  $Q$  design. These circuits employ RF phase compensating inductors to reduce intermodulation products. The use of mica trimmer type capacitors allows adjustments to precisely match the transceiver to the amplifier. The rear panel provides easy access to these trimmer capacitors.

## Tuned Input Adjustments

Your Commander amplifier has a mica trimmer capacitor which is easily accessed through the rear panel. The tuned input circuits are factory tuned and should not require any readjustment. 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 impedance between your transceiver and the tuned input circuitry of the amplifier.

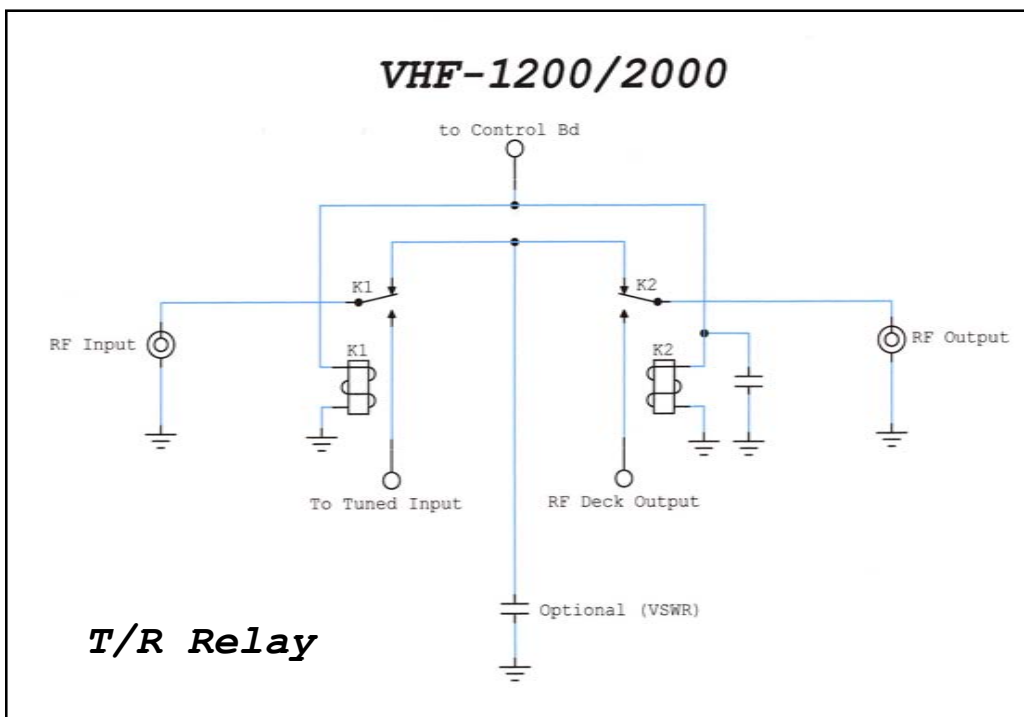
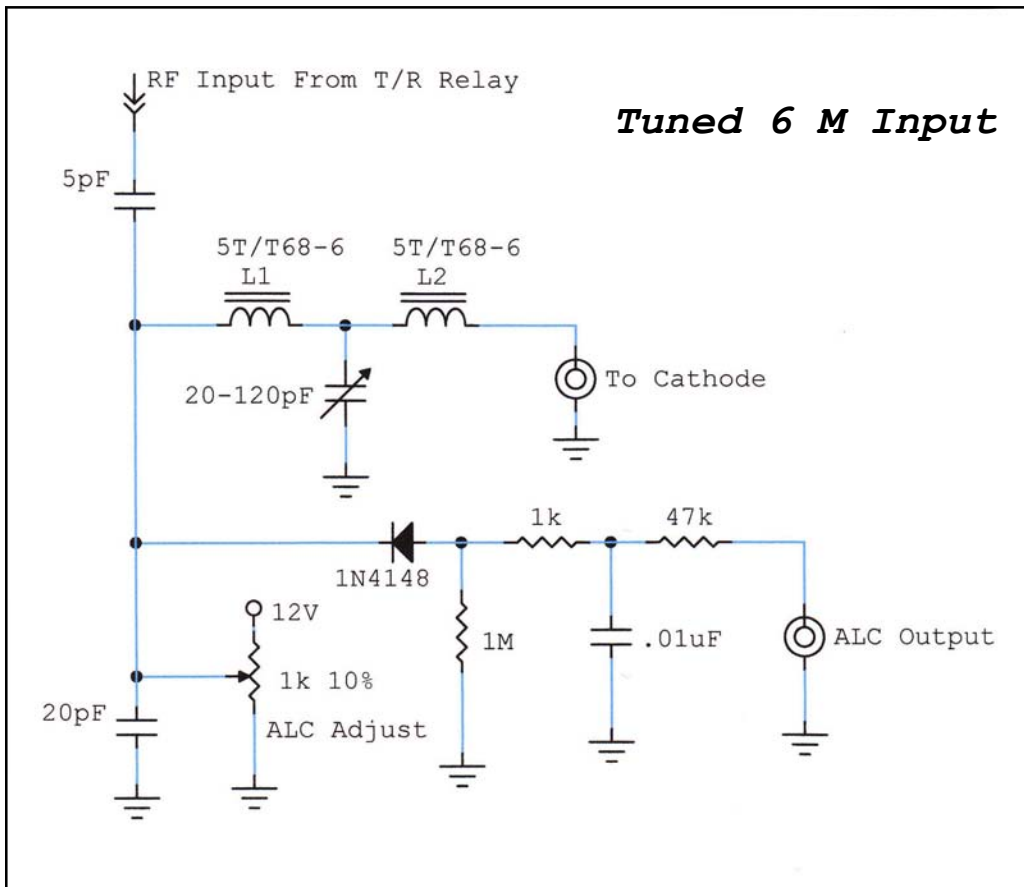
1. Install a SWR meter between the transceiver and the amplifier.
2. Make sure the Operate/Standby switch is in the operate position and Your amplifier should also be properly tuned and loaded.
3. Apply drive and observe the SWR, and adjust the trimmer capacitor for minimum SWR. Be careful not to overdrive the amplifier.

## Output Filter Circuit

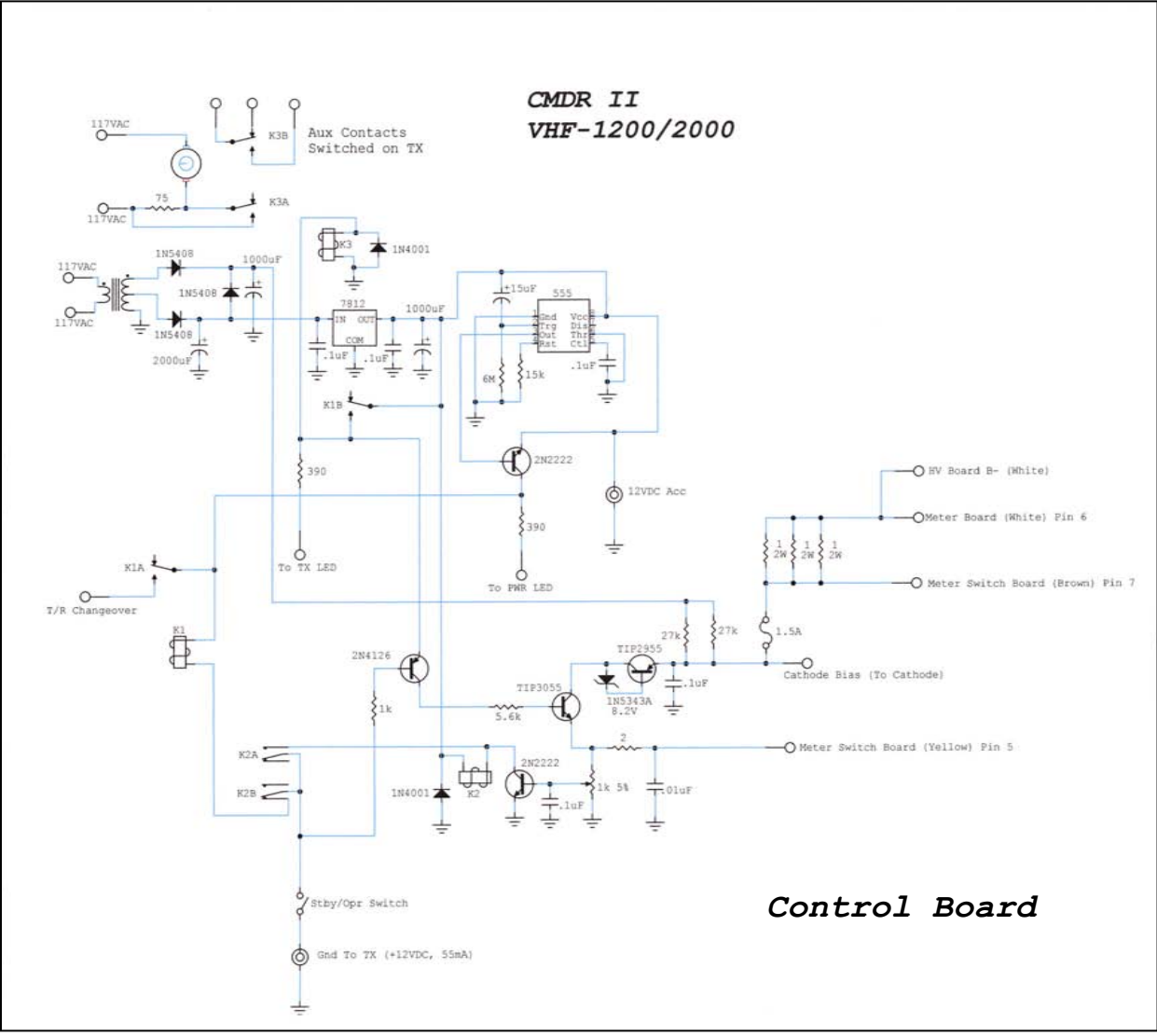
The  $\pi$  variable network filter transforms the plate load impedance from approximately 1600 ohms down to 200 ohms, Two air variable capacitors and an associated inductor accomplish this transformation. A design  $Q$  of 14 allows for good harmonic attenuation all across the band. The utilization of a special reactance tuned powdered iron core 4 to 1 transmission line transformer steps the nominal 50 ohm antenna impedance up to the 200 ohm output of the  $\pi$  circuit. This also achieves further harmonic attenuation of the output in the same manor as an "L" coil in a  $\pi$  - L network. Additional harmonic attenuation is accomplished with a bandpass filter on the output.

## High Voltage Supply

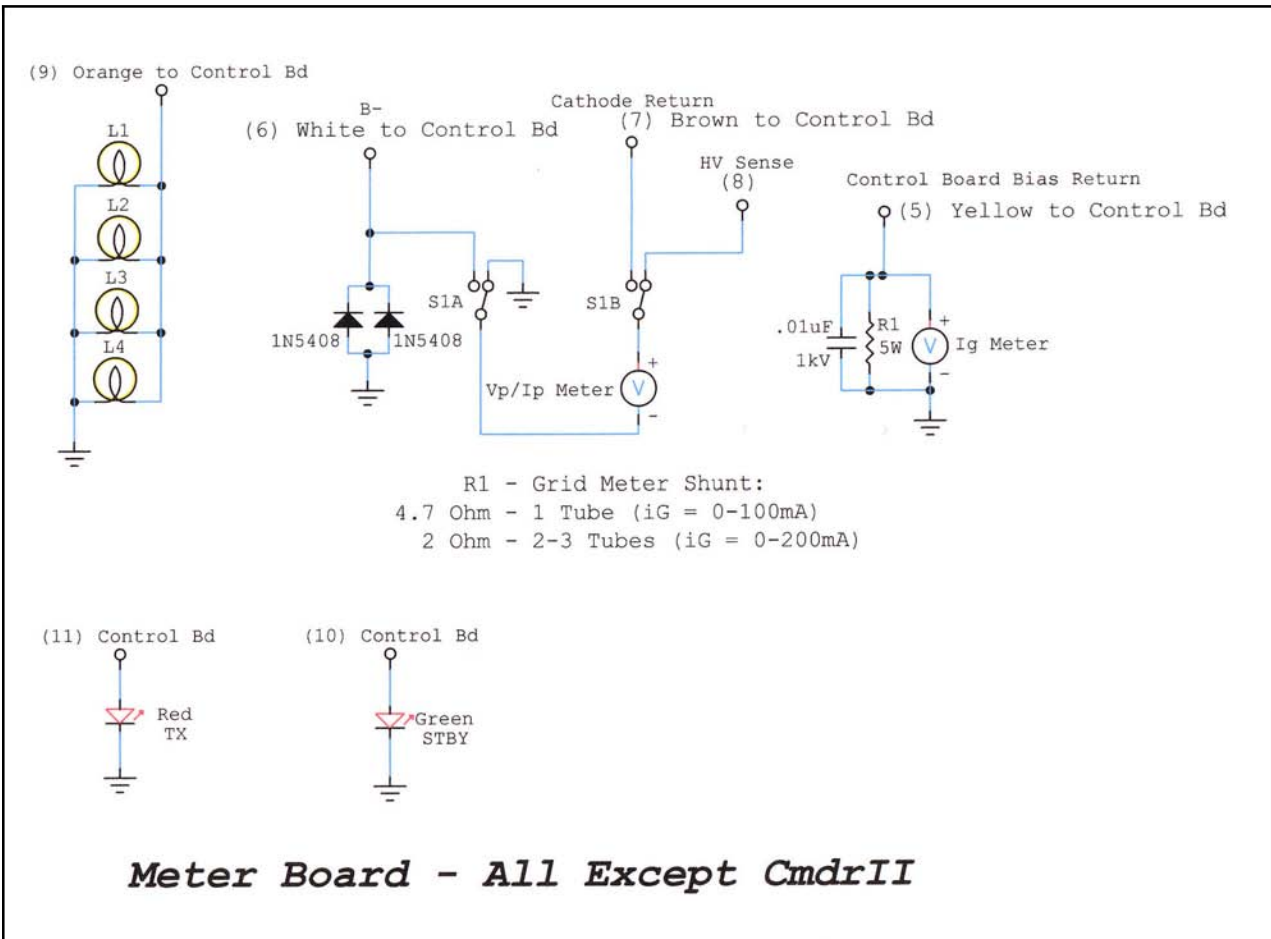
The high voltage supply operates from a 200/234 VAC 20 ampere line. The primary of the high voltage transformer is switched on/off with solid state relays that during power up only conduct when the phase angle of the AC power line is at the 0 to +30 degree crossover point. This minimizes line surge and inrush current while the high voltage filter capacitors charge. The front panel on/off switch activates the solid state relays with 2 mA AC to turn the unit on. Approximately 900 VAC is fed to a full wave voltage doubler rectifier circuit. This supplies approx. 2600 VDC to the 3CPX800A7's anodes. Metering of the tubes anode and grid current is accomplished by shunt resistors located in the negative return of the 3CPX800A7's cathodes. Plate voltage metering is accomplished by a resistor multiplier network in the B+ line of the high voltage circuit.



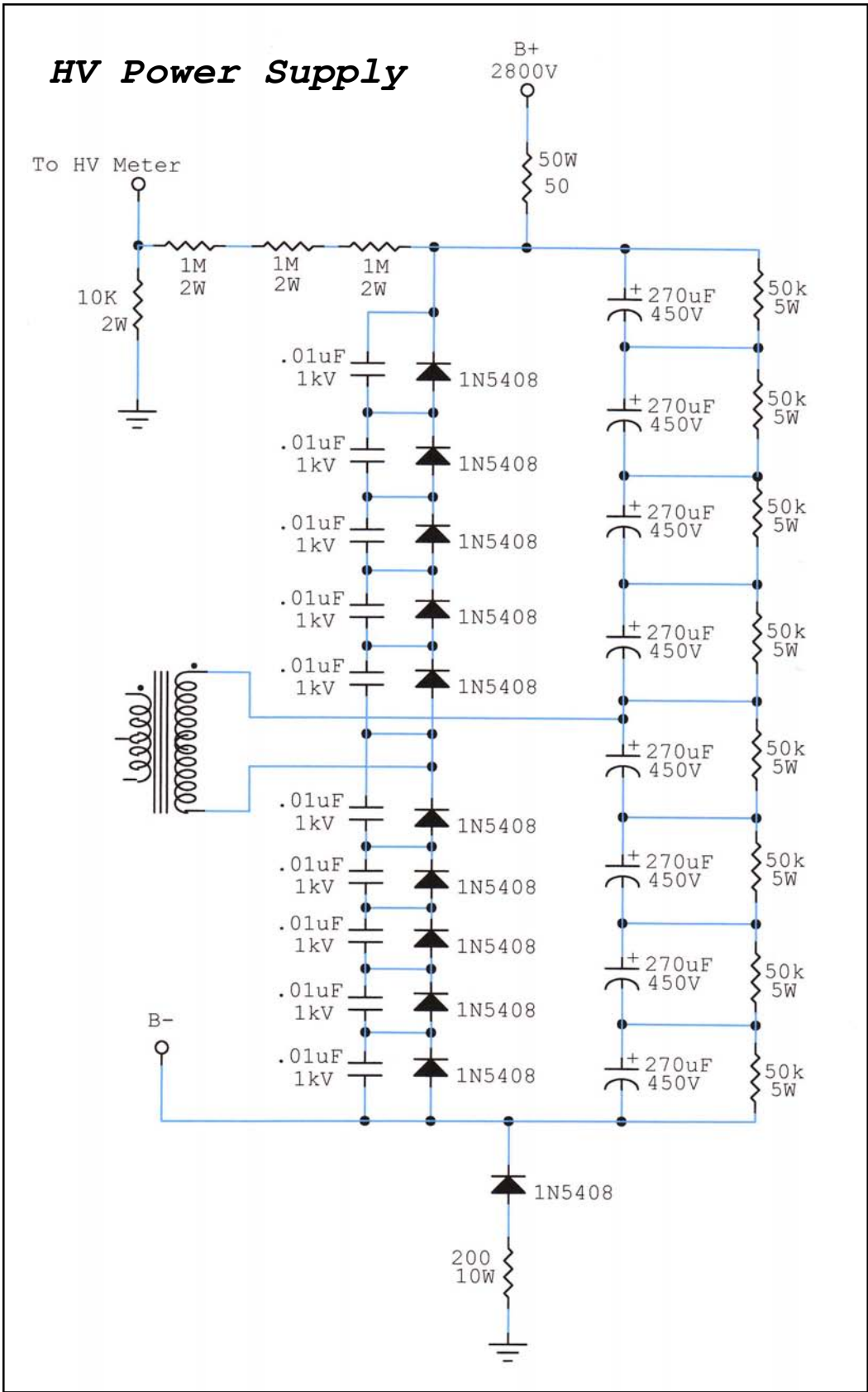
**CMDR II  
VHF-1200/2000**



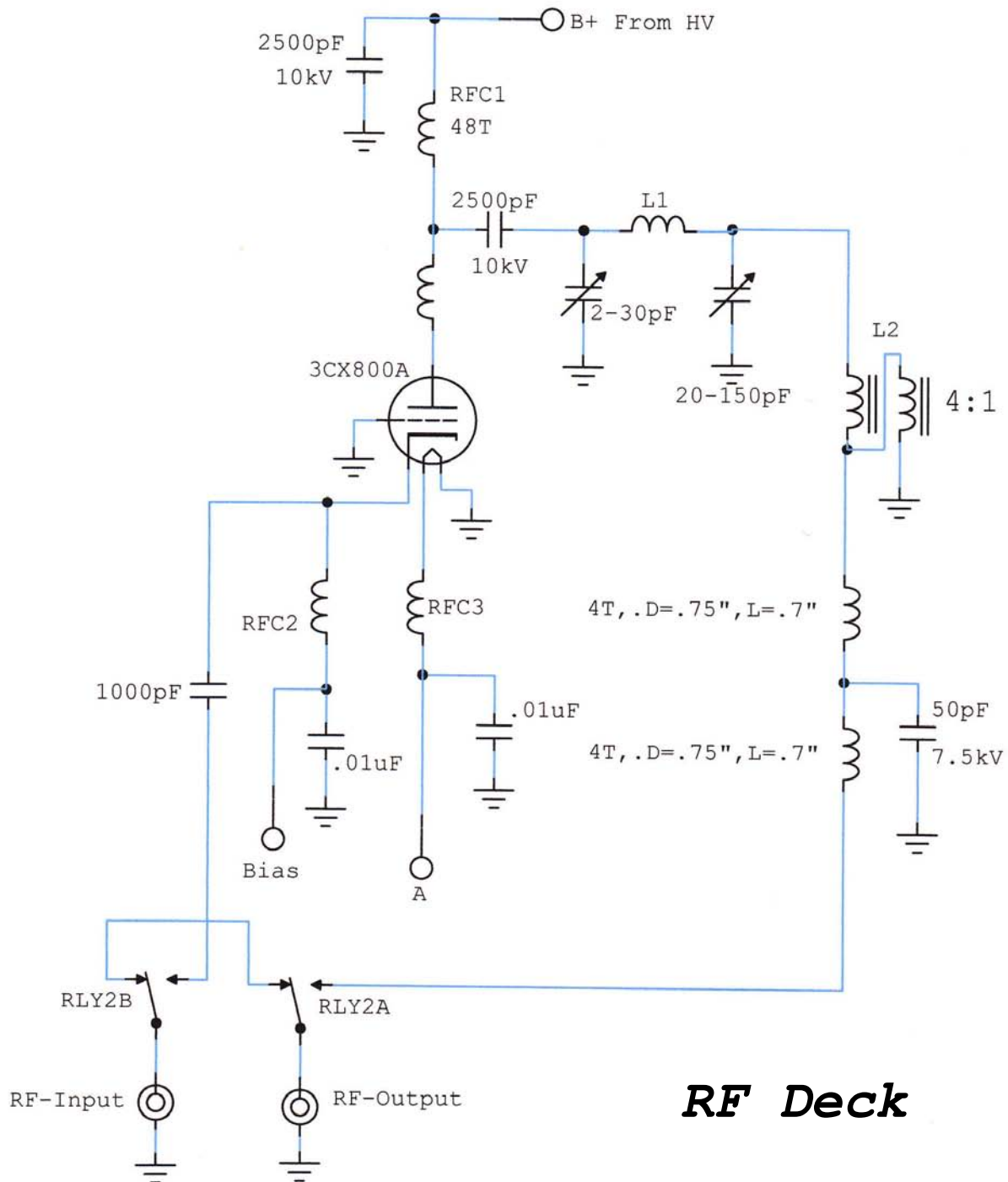
**Control Board**





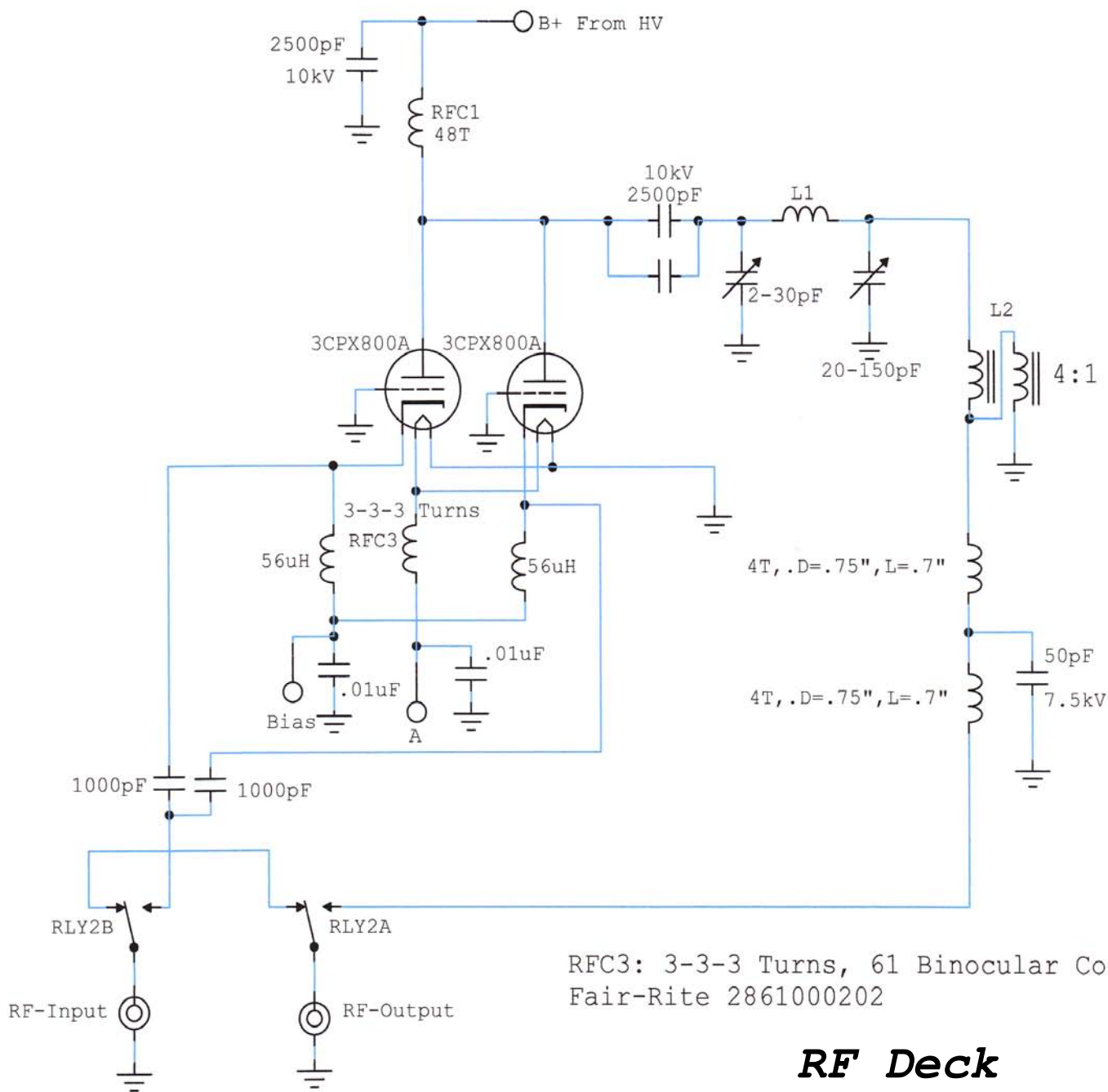


# VHF-1200



RFC3: 3-3-3 Turns, 61 Binocular Core  
 RFC2: 5-5-5 Turns, 61 Binocular Core  
 RFC2-RFC3: Fair-Rite 2861000202

# VHF-2000



## Limited Warranty

Palstar Inc. warrants the VHF-1200 and VHF-2000 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, preferably 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.