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# HENRY

## INSTRUCTION MANUAL

4 K-2 LINEAR AMPLIFIER

Serial #  
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9.52

HENRY ELECTRONICS, INC.

11240 W. Olympic Blvd.

Los Angeles, Calif. 90064

# **HENRY INSTRUCTION MANUAL**

## **4 K-2 LINEAR AMPLIFIER**

### **HENRY RADIO STORES**

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HENRY ELECTRONICS

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4K-2 "COMMERCIAL" FLOOR CONSOLE

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OPERATING INSTRUCTIONS FOR THE 4K-2

INTRODUCTION

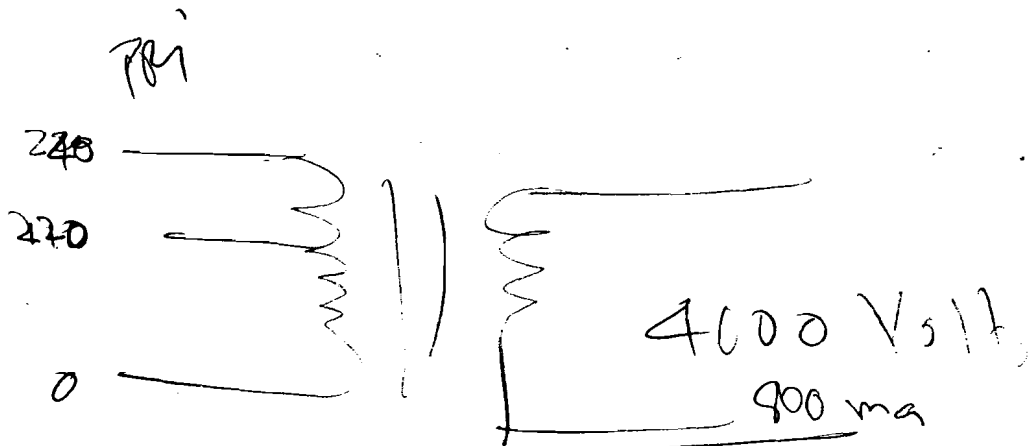
The 4K-2 Linear Amplifier is a one-stage amplifier designed for SSB, CW, FSK and AM operation with any exciter capable of 100 to 150 watts PEP output. The 4K-2 is capable of four thousand watts PEP input on SSB and two thousand watts DC input with carrier reinsertion on FSK, AM or CW. The amplifier can be operated throughout the frequency range of 3.5 to 29.7 megacycles, continuous coverage.

The 4K-2 employs an Eimac 5CX1500A power pentode operating with a passive grid circuit. The plate tank circuit offers continuous tuning throughout the operating range. The passive grid input circuit is matched to the 52 ohm input by the use of plug-in tunable Grid-Pi modules. These input modules are broad tuned and will normally provide less than 2 to 1 input SWR over a range of plus or minus 10% of the center tuned frequency. Unless alternate frequencies are specified, the 4K-2 is shipped from the factory with the input Pi circuits tuned to 3.8 mc., 7.2 mc., 14.2 mc., 21.3 mc and 28.6 mc. These input modules can easily be retuned either at the factory or in the field for frequencies more than 10% removed from the frequencies listed above. These five plug-in modules are located adjacent to the 5CX1500A power amplifier tube and carry the individual band designations 10 through 80 meters.

The 4K-2 is a one-piece floor console consisting of a complete RF deck and its power supplies. In the lower console the various Power Supply Circuits provide the following operating voltages:

- (a) High voltage 2500 volts DC for Tune and CW, or 3500 volts DC for SSB, both at 800 ma. plate current.
- (b) Screen voltage 400 volts DC for Tune, 600 volts DC for CW, and 800 volts DC for SSB.
- (c) Control grid bias 90 volts for Tune and CW, and 150 volts for SSB.
- (d) Relay power supply 12 volts DC at one ampere.

The amplifier is supplied for operation from a three wire 220-240 volt 50-60 cycle circuit. It can however be operated from a 240 volt two wire circuit. Because of the large amount of power required, the 4K-2 is not offered for operation from 115 volt circuits.



## INSTALLATION

Remove the 4K-2 Console from its shipping carton and place it in an upright position near its intended operating position. Inspect it visually for any signs of damage which might have been incurred in shipment. If such damage exists report it at once to the transportation company.

The 5CX1500A power amplifier tube has been shipped installed in its socket in the amplifier, permitting immediate connection of the operating cables. Should it become necessary to remove the 5CX1500A from its socket, or to remove the RF deck wrap-around for any adjustment or repair inside the RF deck, follow the specific instructions at the beginning of the section on service notes.

The four inter-connecting cables are attached to the amplifier as follows:

1. Plug your station's coaxial antenna lead into the SO-239 RF output connector at the lower left of the rear apron of the RF deck as viewed when facing the back of the cabinet. A PL-259 coax plug is provided in the accessory kit in case the antenna lead of the station does not already use such a plug.

2. Fasten the black RG-58A/U input cable to the INPUT connector on the rear of the amplifier RF deck. The other end of this cable is terminated by an RCA phono plug. The phono plug should be inserted in the RF output socket of the exciter. The RCA phono plug is the proper plug for use with the Collins "S" line or KWM-2. If the exciter in use does not employ such an output RF socket, it may be necessary to change this plug to the proper mating plug, or to use an appropriate adaptor.



3. Plug the grey relay control cable, provided in the accessory kit of the 4K-2, into the RCA phono receptacle marked RELAY CONTROL on the rear panel of the 4K-2. This cable provides for actuating the RF relay in the RF deck to the transmit condition.

IMPORTANT! DO NOT apply any voltage to this RELAY CONTROL circuit since the amplifier's internal relay is powered by the 4K-2's self-contained 12 volt DC relay supply. When used with the Collins "S" line or KWM-2, this relay cable can be plugged directly into the socket marked "ANTENNA RELAY". If the 4K-2 is excited by a driver unit other than Collins, it may be necessary to consult the circuit diagram of the exciter to find available unused relay contacts that are normally "open" in the receive condition and "closed" in the transmit condition. All current SSB transmitters and transceivers have such relay contacts available for amplifier control.

4. Connect the ALC OUTPUT from the amplifier to the appropriate ALC input socket on the exciter, using the cable provided for this purpose in the accessory kit. The ALC OUTPUT phono socket is at a lower corner of the rear apron of the RF deck.

5. Connect the power cable of the 4K-2 to the AC mains by means of the heavy-duty three-wire power cord. The amplifier comes from the factory connected for three wire 220 volt 50-60 cycle operation. Select a three-prong plug that matches that power receptacle at the station's operating position and install the plug on the amplifier's power cable, taking care to determine that 220 volts is applied to the black and

white wires, and that the neutral lead is connected to the green wire of the power cable.

CAUTION. Because the line power relay of the 4K-2 is a high reliability mercury unit that will automatically turn the amplifier ON whenever the amplifier is placed in a horizontal position, it is necessary to remove the 4K-2's power plug from the station's AC mains receptacle whenever the amplifier is to be placed in a horizontal position.

## OPERATION

To place the amplifier in operation, set the band selector switch to the desired band and set the TUNE and LOAD controls to the calibration readings for the indicated bands as shown on the final test sheet on the last page of these instructions.

When the 4K-2 amplifier is not turned on, its internal relay automatically connects the output of the exciter directly into the antenna transmission line, permitting independent use of the exciter. Tune and load the exciter in its normal fashion without turning on the 4-K amplifier, then place the exciter in stand-by position. Now turn on the 4K-2 by moving the function switch from the OFF to TUNE position. The dial lights should now be lighted and the blower should be operating. Listen for the whisper sound of the blower and hold your hand above the left hand rear corner of the RF deck to make certain that air is circulating in the cooling system. Place the multi-meter selector switch in the P.A. VOLT position. A reading between 260 and 280 should be obtained, indicating high voltage of 2600 to 2800 volts, depending on the existing line voltage at the operating position.

After checking the exciter to be certain that no RF drive will be applied to the 4K-2, set the function switch to the CW position and then close the push-to-talk switch of the exciter so that the amplifier is activated. The plate current meter with no RF drive applied should show a reading of about 225 to 300 ma, the resting current of the 5CX1500A power tube. If the resting

current does not fall in the 225 to 300 ma. range, the control grid bias must be adjusted. To make this adjustment, first turn the operate switch to the OFF position and allow at least five seconds for the high voltage to bleed down. Next remove the front door of the power supply compartment for access to the control grid and screen grid power supply mounted immediately behind this door at the top of the power supply compartment. On the front panel of this power supply chassis are located two potentiometers. The BIAS control on the left is marked CW. If the plate resting current is too high, turn this control slightly in the clock-wise direction. Replace the power supply door and turn the operate switch again to CW to ascertain if the proper resting current of approximately 260 ma has been attained. If not, repeat the process as described above, making certain that the operate switch is in the OFF position before the power supply door is opened. DO NOT at any time remove the power supply door when the operate switch is in the TUNE, CW or SSB position.

After the resting current in the CW position has been properly adjusted, place the operate switch in the SSB position and check the plate resting current. Repeat the process described above, but adjusting the SSB potentiometer, until the proper resting current of about 260 ma for SSB operation has been achieved.

When the proper plate resting current has been obtained in both the CW and SSB positions, the amplifier is ready to operate. For preliminary tune-up, set the Multimeter Switch on P.A. GRID and the function

switch on TUNE. Place the exciter in operation and increase the exciter drive until the 4K-2 multimeter reads 100, indicating 10 ma. grid current. Quickly check the plate ammeter and adjust the TUNE control for deepest dip, indicating resonance. If the load condenser is properly set, the plate ammeter will show a reading of 500 ma. If the current is less than 500 ma., increase the setting of the LOAD dial slightly. If it is more than 525 ma., decrease the LOAD setting slightly. Each time the LOAD control is changed, re-dip the TUNE control since the exact resonance point of the TUNE control is affected by a change in the setting of the LOAD control. Also check the P.A. GRID current reading to verify that it remains at about 10ma. It may be necessary to repeat this series of tuning and loading adjustments several times until the desired readings of 10 ma. on the grid meter and approximately 500 ma. on the plate meter are obtained. It will be noted that the higher the frequency band, the more precisely the LOAD and TUNE adjustments must be made, and conversly the lower the frequency band the less critical the exact adjustment.

For operation, set the function switch to CW, adjust TUNE and LOAD controls for plate current dip at 800 ma., with P.A. GRID current reading of 10 ma. (100 ma. on multimeter). The amplifier should now be ready for on-the-air operation. Activate the exciter in the normal manner after placing the 4K-2's function switch in the desired operating position. Use the CW position for CW, FSK or SSB at two kilowatts input. With the function switch at CW, the amplifier is rated for continuous duty at 2 KW input - 2500 volts at 800 ma. When operating SSB at these ratings, the indicated meter reading will be 400 ma. on voice, which is approximately 800 ma. peaks.

For high power SSB, set the function switch to the SSB position and excite the amplifier to indicated meter peaks of 600 ma. on voice. This will be two thousand watts indicated, - 3500 volts at 600 ma., which is 4000 watts PEP.

At this time, the ALC adjustment of the exciter-amplifier system should be checked. With the function switch at SSB, the 4K-2 is rated to operate on single sideband in ABL, with no grid current. A potentiometer at the lower center of the rear apron is marked ALC ADJUST. This potentiometer controls the amount of ALC voltage fed back to the exciter. If too little voltage is fed back, grid current may flow in the 5CX1500A grid circuit on voice peaks. If too much voltage is fed back to the exciter, the power output of the exciter will be so severely limited that the amplifier cannot be driven to full power. A satisfactory method of adjustment, with the function switch set to SSB, is to rotate the ALC ADJUST potentiometer fully counter-clockwise, which is off. Now, while driving the amplifier with voice peaks at 600 ma., slowly rotate the ALC ADJUST potentiometer clockwise until the amplifier grid meter gives only the slightest indication of grid current on voice peaks, and the exciter ALC meter indicates about 8 db. of ALC action.

DO NOT OPERATE THE 4K-2 IN THE SSB POSITION WHEN USING FSK OR CW.

When it is desired to operate the amplifier on linear AM, set the function switch to the SSB position and reinsert carrier until the plate meter rises to 600 ma. At this point it will be possible to run 2 KW input linear AM with an output in the range of 600 to 700 watts.

The operator will note that the multi-meter switch has "FORWARD POWER" and "REFLECTED POWER" positions. After all previously described adjustments have been completed, the switch may be set to the "FORWARD POWER" position and the outer concentric knob adjusted for full scale reading. When the switch is placed in the "REFLECTED POWER" position, the SWR of the antenna system may be ascertained. If the SWR of the antenna is good, there will be almost no reflected power. Most properly adjusted antennas will result in a reflected power reading under 100 and in no case should the amplifier be operated into an antenna with a reflected power reading of more than 200. If there is any real question in the operator's mind concerning the SWR of his antenna, the SWR can be measured with the output of the exciter alone, with the 4K-2 function switch at OFF.

#### PROTECTIVE SYSTEM

The 4K-2 has a number of separate overload protective systems. The high voltage circuit is monitored by an electrical re-set overload relay. Any high voltage short will automatically trip the overload relay K 4, de-energizing the primary power relay. The overload relay is re-set by turning OFF the 4K-2, then removing the front door of the power supply and momentarily pressing the red push button located on the front left corner of the power supply chassis, extinguishing the red indicator lamp.

IMPORTANT ! Do not remove the front door while the amplifier is turned on. Always set the function switch to OFF before opening the power supply door, and allow at least 5 seconds for the high voltage to fall off.

Certain high voltage shorts can occur which would allow the high voltage filter condenser to discharge through the plate meter. To prevent damage to the plate meter under these circumstances, a one-and-one-half ampere fuse has been inserted in series with the meter. If the meter should appear inoperative subsequent to such a short, replace the 1.5 AMP fuse in the upper rear apron of the RF deck.

The primary circuit of the 4K-2 is protected by a 30 ampere circuit breaker. This breaker is behind the front door and is located on the front center of the Power Supply Chassis. Normally the breaker will not be tripped by a high voltage short since the overload relay will trip before the circuit breaker is actuated. It is possible, however, that certain short circuit conditions in the power transformer, or elsewhere in the primary circuit, might occur in front of the overload relay and in this case the primary circuit breaker will afford protection.

The air system blower and the relay power supply are protected by two 3-ampere fuses located on the power supply chassis to the left of the circuit breaker.

The two fuses for the control-grid and screen-grid bias supplies are mounted on a separate chassis located at the top of the power supply compartment, immediately behind the removable front door. The 1/10 AMP slow-blow fuse protects the screen of the 5CX1500A from over-dissipation. The 4K-2 is not intended to run continuous carrier above 600 ma. plate current in the SSB position. Should the operator attempt such operation, especially in an underloaded condition, it is possible that damage to the 5CX1500A screen could occur. Under these conditions the 1/10 AMP screen fuse will blow and the tube will be protected. The 3 AMP fuse, in the primary circuit of the bias transformer, provides the normal protection from over-loads of any type.



SERVICE INSTRUCTIONS FOR THE 4K-2INTRODUCTION

The 4K-2 has been carefully designed to minimize service problems. Only the highest quality components have been employed throughout to further reduce the possibility of equipment failure. The following hints are offered in case service should be required. IMPORTANT: Whenever it is necessary to remove the RF shield, make certain that the high voltage is turned OFF. An automatic shorting bar located at the top of the center vertical panel grounds the high voltage whenever the top shield is removed. If the high voltage is ON when the top shield is removed, the meter fuse will blow and it is possible that damage to the meter could occur. In addition, the 50-ohm resistor, R12, on the underside of the power supply and accessible only by removing the bottom cover of the cabinet, might be blown open and require replacement.

If it should be necessary to operate the amplifier with the top shield removed, first disengage the shorting bar from its center pin before turning on the 4K-2. Do not make a practice of operating the amplifier with the top shield OFF and the high voltage exposed. Do so only for purposes of checking, adjusting or servicing and exercise the greatest possible caution at all times, since the high voltage present in the 4K-2 can cause injury or death.

REMOVING THE TOP COVER AND SHIELD

To accomplish service, testing or adjustment in the RF deck of the 4K-2, it is necessary first to remove the perforated wrap-around cover and the interior RF top shield. To remove the wrap-around, take out the six

screws (three on each side) at the bottom of the RF deck's side panels holding the cover in place. It is also necessary to remove the two countersunk screws on the top front of the cover which fasten the cover to the panel trim.

When all eight screws have been removed, grasp the cover firmly and spring the bottoms of the two side panels outward so that the cover can be lifted free of the amplifier proper. It may be necessary to insert a large screw driver between the wrap-around and the chassis itself to free the cover sufficiently for removal.

The interior top shield can be identified by its square perforations. It is held in place by nine securing screws. To remove the shield, loosen these screws so that the shield cover can be slipped free and lifted from the amplifier.

#### REPLACING 5CX1500A AMPLIFIER TUBE

The 5CX1500A is shipped in place in the amplifier, ready for operation, and is located at the left rear of the RF compartment. If it should become necessary to remove the 5CX1500A for replacement or checking:

- (1) Loosen the screw clamping the anode connector ring around the outside of the cooling fins of the 5CX1500A. It may be necessary to reach this screw by inserting a long screw driver through one of the holes in the left side panel of the RF deck. Lift this ring from the tube so that there will not interfere with removal of the tube from its socket.

- (2) Turn the 5CX1500A 120 degrees counter-clockwise in its bayonet-type socket to free the tube's base from the socket's various connecting clips. The counter-clockwise turn should free the tube so that it can be lifted easily from its socket. Do not force or jam the tube when removing or installing it in the socket, as such abuse can result in permanent damage to the tube, its socket, or both.

When re-inserting the tube in its socket, rotate it gently until it drops easily and fully into the bayonet socket. A short guide pin on the bottom plate of the socket mates with the hole in the center bottom of the tube when the tube has been properly seated in the socket. When so seated, more than half of the anode cooling fins will be below the top of the plastic cooling chimney. The tube can then be locked into operating position by a 120 degree clockwise rotation of the entire tube.

After the tube is in its correct operating position, place the anode connecting ring down over the cooling fins of the tube until the ring comes to rest against the plastic chimney. Insert a long screwdriver through one of the holes in the left side panel of the RF deck and tighten the screw in the connecting ring until the ring is firmly in contact with the cooling fins of the tube.

SERVICE NOTES

1. If amplifier does not come on when the function switch is placed in TUNE, CW, or SSB position:
  - a. Be certain the power cable is properly connected to AC mains.
  - b. Check the 3-amp fuses in main power supply chassis.
  - c. Measure voltage output from the 12-volt DC relay power supply.
  - d. Use an ohmmeter to verify that the power supply switch makes contact.
2. If amplifier comes on as soon as AC cable is plugged into mains and will not turn OFF when function switch is set to OFF, check for defective contact in the function switch.
3. If no high voltage shows on multimeter when function switch is set to TUNE, CW or SSB:
  - a. Check 3-amp fuses at left front of main power supply behind removable access door.
  - b. Check for possible kick-out of 30-amp circuit breaker on main power supply.
  - c. If overload relay is tripped, and red indicator light glowing, please press reset button, extinguishing indicator light.
4. If no plate current is indicated when function switch is set to CW or SSB with no RF drive applied and exciter is switched to transmit condition (for CW and SSB, resting current should be between 225 to 300 ma):

- a. Check continuity of RELAY CONTROL cable between exciter and 4-K.
  - b. Check for operation of 4K-2's antenna relay in the RF deck is switched to transmit condition.
  - c. If cable continuity and relay operation are satisfactory, suspect poor contact by center pole of antenna relay. Polish with relay burnishing tool (or sandpaper strip from match book will serve). Also try bending relay center arm slightly for increased pressure on contact when closed.
5. If ammeter indicates plate current when exciter is not switched to transmit, and the 4K-2's function switch is at CW or SSB:
- a. Check antenna relay position. If it is actuated, normal resting current of between 225 and 300 ma. will be indicated on ammeter. Fault is likely to be a short in relay control circuit. Unplug RCA phono plug from RELAY CONTROL jack to determine whether trouble is in the 4K-2, the exciter or in the cable.
  - b. If relay is not actuated, but plate current is indicated when function switch is at CW or SSB, suspect interelectrode short in 5CX1500A tube. (A good practice is to have a spare 5CX1500A on hand at all times.)
6. If no plate current is indicated, although amplifier seems to operate normally, replace the 1.5 ampere meter fuse on rear panel of the amplifier.
7. If overload relay will not remain set, try to determine if a

high voltage short is tripping the relay. If no evidence is found of such short, measure resistance directly across overload relay coil; this is the rear relay on the right side of the power supply chassis. When the calibrating resistor - the brown variable resistor just to the right of the power supply's circuit breaker - is properly connected and adjusted, the effective resistance across the relay coil will be between 2 and 3 ohms.

8. If obvious high voltage short is evidenced by audible arcing:
  - a. Unplug the high voltage lead at the left rear underside of the RF deck near the 15 contact connector, also 1/10 amp screen fuse, and turn function switch to TUNE. If short persists, it is in the power supply.

CAUTION:

- b. If short circuit is in the RF deck, remove cabinet wrap-around and shielded top screen after first being certain that the high voltage is turned OFF. By inspection, such a short can often be identified by a blackened or charred area. Make ohmmeter check between high voltage socket and ground to verify shorted condition, and eliminate short.
  - c. If the short circuit is in the power supply, and visual inspection does not reveal the short, use point-to-point check with ohmmeter by successively disconnecting the major components, starting with the filter condensers, and pro-

ceeding backward toward the power transformer. Next disconnect the filter choke from the two .1 mfd. resonating capacitors that are connected in parallel, check terminals for possible internal short to case, and check the appropriate interconnecting leads. Also, check the resistance of the four solid-state rectifiers; in the non-conducting direction, they should register infinite resistance when disconnected.

9. If the 30-ampere circuit breaker has kicked out because of a short-circuit condition, suspect a short in the primary circuit or in the power transformer itself, or possibly shorted rectifier diodes.
10. Should there be excessive grid current and no plate current, suspect a discontinuity in the high voltage circuit. Probably no voltage is reaching the 5CX1500A anode.
11. For no grid current, intermittent grid current, or low grid current:
  - a. If no drive shows on multimeter and ammeter shows no upward drive of plate current, set 4K-2's function switch to OFF, permitting exciter to operate directly into the antenna. Place multimeter in FWD. PWR. position, and apply exciter drive to determine if exciter is delivering its normal output.
  - b. If grid current is intermittent, check continuity of RF cable between exciter and 4K-2, and from BNC coax socket to the antenna relay. Trouble may be localized in the appropriate pi-cathode plug-in module; this can be checked by trying operation on other bands to determine if trouble is encountered on only one band. Also, suspect poor contact

in bandswitch; it will be necessary to remove the RF deck from the console's base for the purpose of removing the RF deck's bottom plate, permitting access to the 2-wafer input band switch located under the RF chassis near the socket for the 5CX1500A tube.

- c. With adequate carrier drive from the exciter, the P.A. GRID current will normally be at least 10 ma. (100 on multimeter). If 10 ma. cannot be attained, suspect low output from the exciter.

### ADJUSTMENT OF PI-CATHODE INPUT-MATCHING MODULES

The 4K-2 employs individual 50-ohm to 200-ohm pi-cathode input matching modules to achieve low input SWR and maximum drive efficiency. These modules, five in number, are labeled 10, 15, 20, and 75-80, and they are located adjacent to the 5CX1500A tube. The modules are individually adjusted at the factory for the center frequency on each band. They are broadly tuned and will not normally need re-tuning. The modules are plug-in and may be removed from their sockets for ease of disassembly if service should ever be required.

If the amplifier is to be operated on a frequency far removed from the amateur bands, it may be advisable to retune the appropriate input module. First place an SWR bridge in the drive cable between the exciter and the 4K-2 amplifier. Next, operating the 4K-2 with exciter drive adjusted for half-scale reading on the 4K-2's ammeter, use an insulated alignment tool to loosen the lock nut on the input module to be adjusted, and



adjust the tuning slug until the reflected power from the exciter reaches minimum. This will normally be less than 1.5 to 1 SWR. Be certain to use an insulated aligning tool and exercise great caution, because at least 2500 DC volts must be present on the nearby 5CX1500A anode while making this adjustment.

For frequencies between the amateur bands, it may be necessary to order special input modules from the factory that can be plugged in to replace the standard modules.

INSTRUCTIONS FOR REMOVING SCREEN AND CONTROL GRID BIAS SUPPLY

Remove the six screws in the bottom of the support shelf as shown in Figure 1 below.

Unplug the Cinch-Jones power plug on the rear apron of the bias supply chassis.

Slide the bias supply chassis from its shelf in the power supply compartment.

To re-install bias supply follow reverse procedure, step by step.

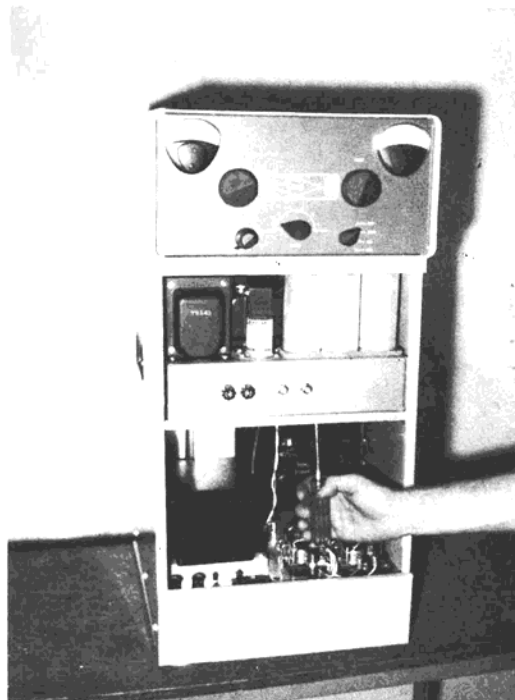


Figure 1. Removing Screen and Control Grid Bias Supply

### INSTRUCTIONS FOR SERVICE BELOW THE POWER SUPPLY CHASSIS

Remove the AC cable from the wall socket.

Tip the entire 4K-2 console on one side.

Remove the bottom plate after taking out 10 sheet metal screws which hold it in place, revealing components as in Figure 2 below.

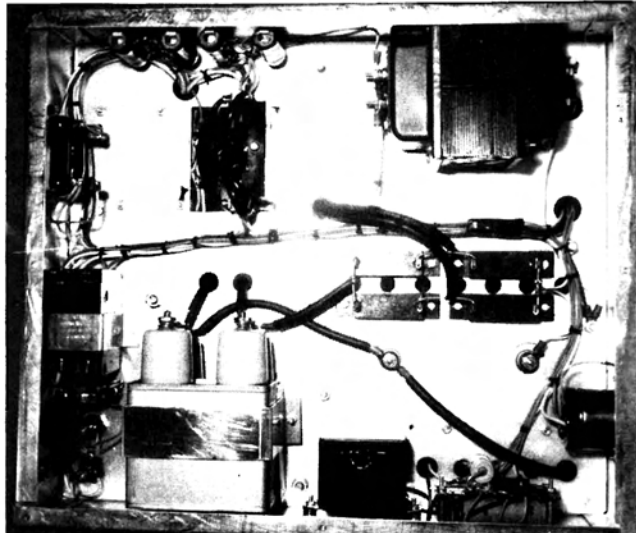


Figure 2. The Power Supply Chassis

### INSTRUCTIONS FOR REMOVING THE FRONT PANEL OF THE 4K-2

Remove the RF wrap-around cover.

Remove the 4 screws, 2 on each side of the cabinet, that hold the screen-bias supply shelf, lower the unit down so that it rests on the H. V. filter choke.

Reach in over the screen-supply and remove 2 screws on each outside edge of the cabinet on the bottom of the RF deck, leave the 4 screws on the back edge, 2 are behind the blower, in place.

Raise the front of the RF deck off the main cabinet a few inches as shown in Figure 3 on the next page.

Remove the 2 screws on the bottom of the panel trim frame,

and also the 2 on each side of the trim frame.



Figure 3. Removing the Front Panel

Remove the tune, load and band switch knobs, the panel will now slide off toward the front as in Figure 4 below

Remove the meter leads to give more working room.

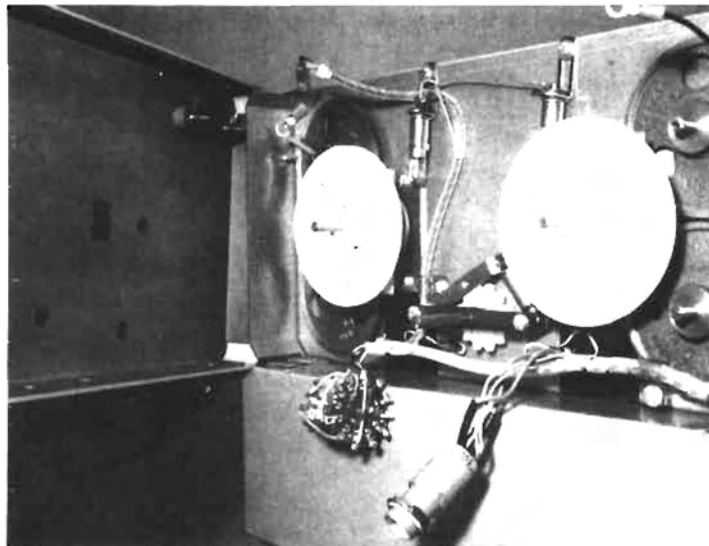


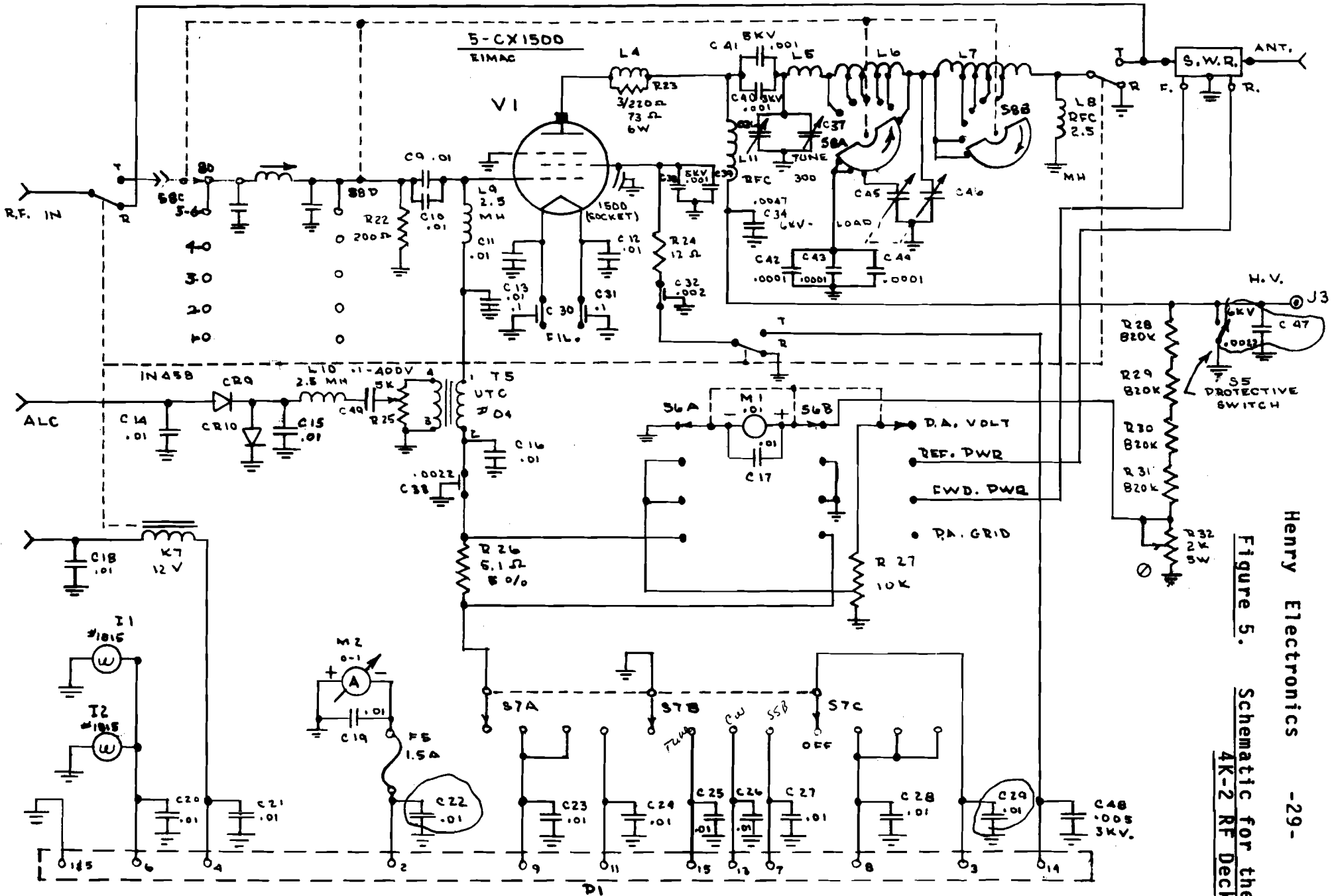
Figure 4. Inside the Front Panel

PARTS LIST FOR THE 4K-2

B1	Blower	240 VAC
C1-C2	Capacitor	.1 mfd, 7500 VDC
C3	Capacitor	Oil filled, 20 mfd, 3000 VDC
C4	Capacitor	Electrolytic, 500mfd, 25 VDC
C5-C7	Capacitor	325 mfd, 400 VDC
C8	Capacitor	150 mfd, 250 VDC
C9-C29	Capacitor	Disc, .01 mfd, 600 VDC
C30-C31	Capacitor	Feed Thru, .1 mfd, 600 VDC
C32-C33	Capacitor	Feed Thru, 2000 pf
C34-C35	Capacitor	2200 pf, 6 KV
C36-C37	Capacitor	Variable, 150 pf
C38-C41	Capacitor	1000 pf, 5 KV
C42-C44	Capacitor	100 pf, 5 KV
C45-C46	Capacitor	Variable, 350 pf
C47	Capacitor	2200 pf, 6 KV
C48	Capacitor	.005 mfd, 3 KV
C49	Capacitor	.1 mfd, 400 VDC
C50-C51	Capacitor	Silver Mica, 390 pf
C52	Capacitor	Silver Mica, 91 pf
C53-C55	Capacitor	Silver Mica, 82 pf
C56	Capacitor	Silver Mica, 820 pf
C57-C59	Capacitor	Silver Mica, 160 pf
C60-C61	Capacitor	Silver Mica, 470 pf
C62-C64	Capacitor	Silver Mica, 47 pf
C65	Capacitor	Silver Mica, 100 pf
C66-C68	Capacitor	Silver Mica, 120 pf
C69-C71	Capacitor	Silver Mica, 43 pf
CR1-CR4	Diode	7180
CR5-CR6	Diode	1N3491
CR7✓	Diode	Bridge Module, BR 820A
CR8✓	Diode	Bridge Module, BR 44
CR9-CR10	Diode	1N58
F1-F3	Fuse	3AG, 3 Amp
F4	Fuse	3AG, .1 Amp
F5	Fuse	8AG, 1.5 Amp
I1-I2	Lamp	#1815
J1	Socket	Jones, 15 contact
J2	Socket	Jones, 10 contact
K1	Relay	Mercury, EM-4 12 VDC
K2	Relay	PR7DY, 110 VDC, DPST
K3	Relay	PR11DY, 12 VDC, DPDT
K4	Relay	Assembly, KB17DG, 6 VDC
K5-K6	Relay	MR5D, 110 VDC, SPDT
K7	Relay	12 VDC, 3PDT

L1	Choke	Filter
L2	Choke	Filter, 6 H, 200 MADC
L3	Choke	Swinging
L4	Choke	Parasitic
L5	Coil	10 meter
L6	Coil	Tank
L7	Coil	L Section
L8-L10	Choke	RF, 2.5 MH
L11	Choke	RF, Plate
L12-L16	Coil	Module
M1	Meter	Ammeter, 0-1 Amp DC
M2	Meter	Multi-meter, DC
NE1	Lamp	Neon, 507-4537 cartridge
P1	Plug	Jones, 15 contact
P2	Plug	Jones, 10 contact
P3	Plug	High voltage
P4	Socket	High voltage
R1-R4	Resistor	10 ohm, 25 watt
R5-R8	Resistor	20 K ohm, 100 watt
R9	Resistor	10 K ohm, 25 watt
R10	Resistor	500 ohm, 25 watt
R11	Resistor	Adjustable, 7.5 ohm, 25 watt
R12	Resistor	50 ohm, 25 watt
R13	Resistor	Carbon, 150 ohm, 2 watt
R14-R16	Resistor	2.5 K ohm, 50 watt
R17	Resistor	Carbon, 4.7 K ohm, 2 watt
R18-R19	Potentiometer	250 ohm, 5 watt
R20	Resistor	350 ohm, 10 watt
R21	Resistor	1 K ohm, 25 watt
R22	Resistor	Bank, 200 ohm
R23	Resistor	Cluster, 220 ohm, 2 watt each
R24	Resistor	Carbon, 12 ohm, 2 watt
R25	Potentiometer	5 K ohm, 2 watt
R26	Resistor	Carbon, 5.1 ohm, $\pm 5\%$
R27	Potentiometer	10 K ohm, 2 watt
R28-R31	Resistor	Carbon, 820 K ohm, 2 watt
R32	Potentiometer	2 K ohm, 5 watt
S1	Circuit Breaker	30 Amp
S2	Switch	Re-set, momentary
S3	Switch	Protective, power supply
S4	Switch	Magnetic Interlock
S5	Switch	Protective, RF deck
S6	Switch	Multi-meter, rotary
S7	Switch	Function, rotary
S8	Switch	Banc, rotary
SWR	Standing Wave Ratio Bridge	

T1	Transformer	Filament
T2	Transformer	High voltage
T3	Transformer	Relay and Lamp, 220/12 VAC
T4	Transformer	Screen and Bias Supply
T5	Transformer	Automatic Level Control
TB1	Terminal Board	240 VAC
V1	Tube	Vacuum, 5CX1500



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Figure 5. Schematic for the 4K-2 RF Deck



232V 220V

# DANGER

DO NOT TILT POWER SUPPLY OR THIS RELAY WILL BE AUTOMATICALLY CLOSED. (MERCURY UNITS)

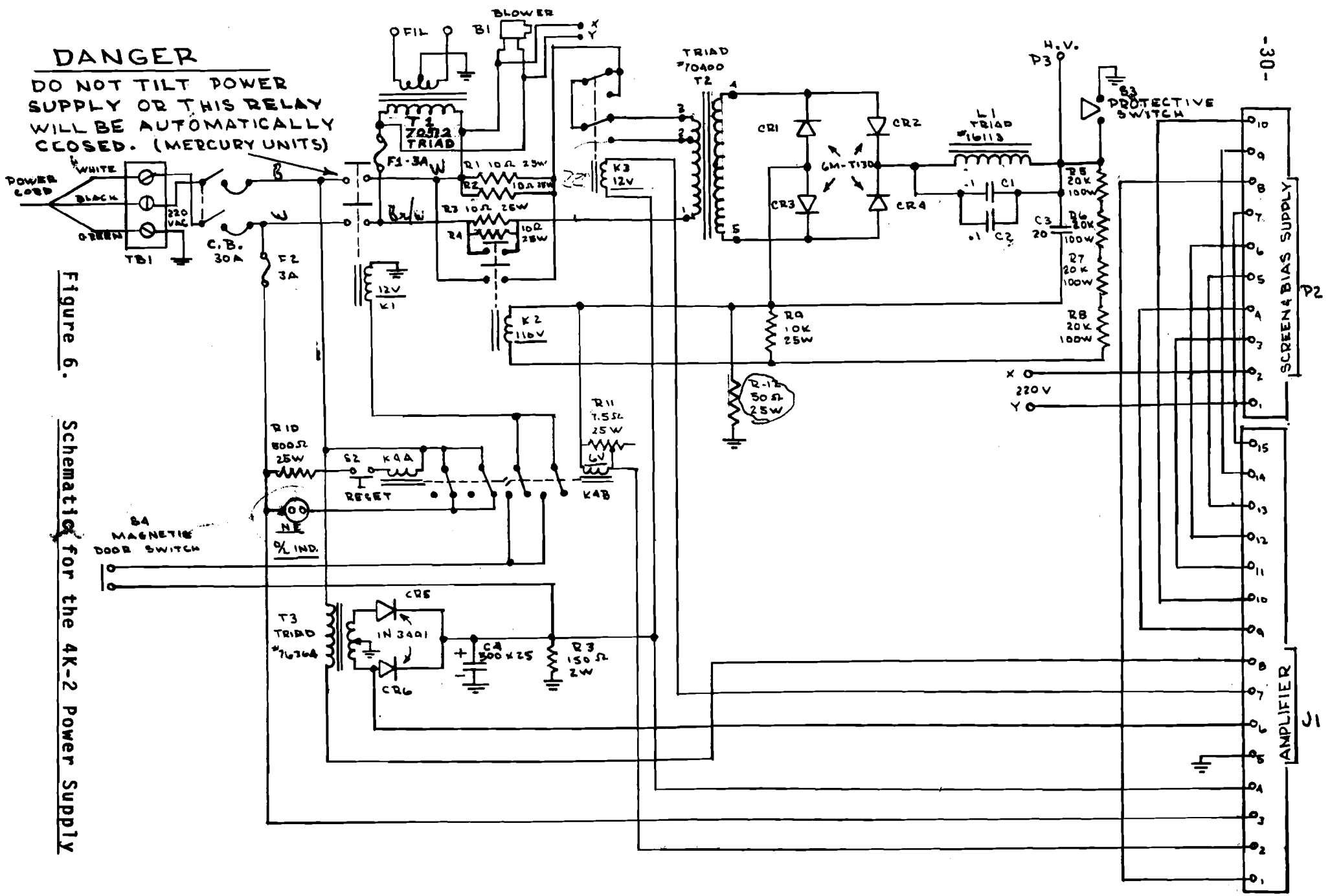


Figure 6. Schematic for the 4K-2 Power Supply

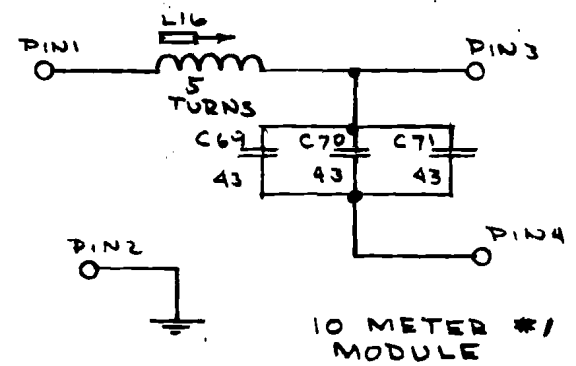
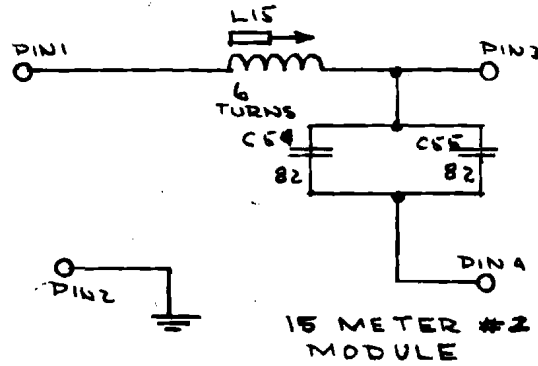
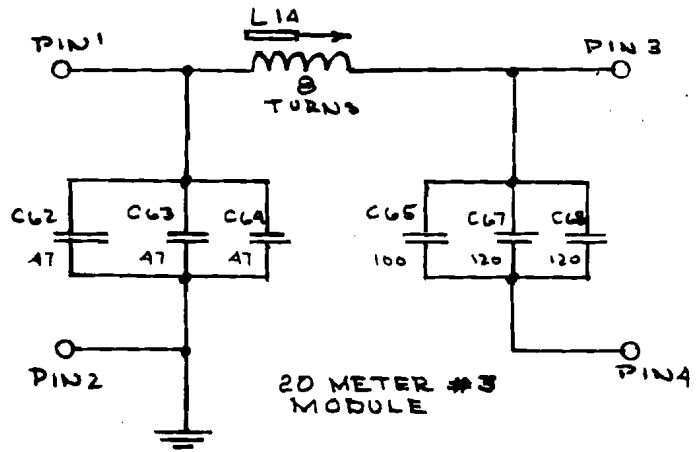
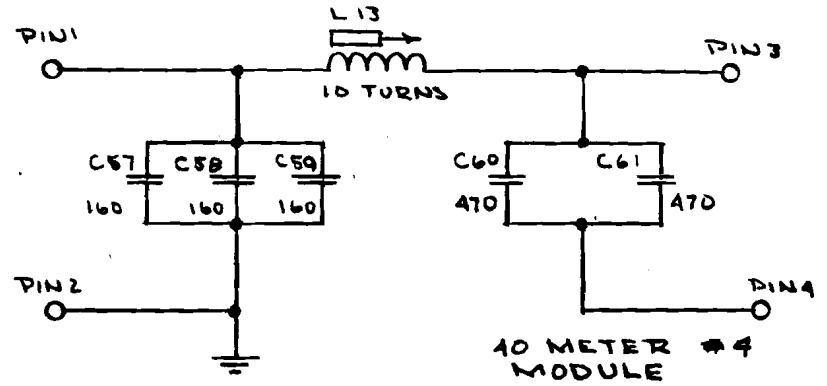
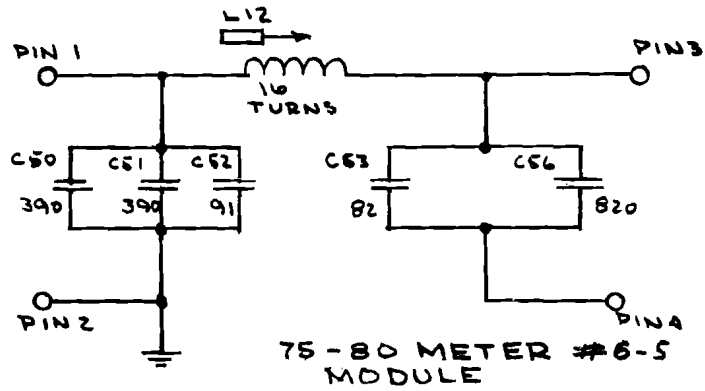
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SCREEN & BIAS SUPPLY

AMPLIFIER



8. Diagrams of Pi Cathode-Input Matching Modules.



ALL CAPACITORS ARE SILVER MICA,  
CAPACITY VALUES ARE IN PICOFARADS.

DIAGRAMS  
OF  
PI CATHODE-INPUT MATCHING MODULES