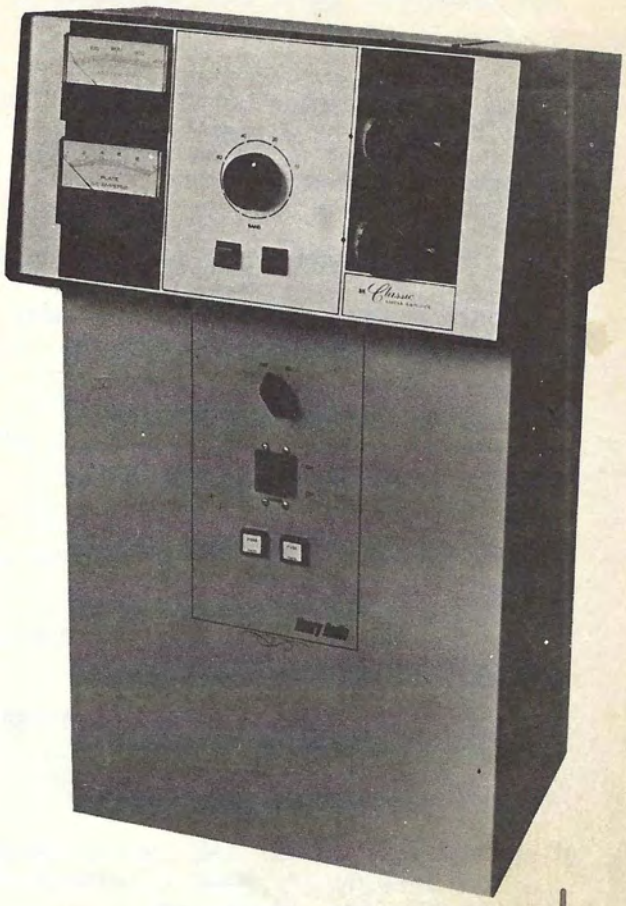
HENRY RADIO

LINEAR AMPLIFIERS



Henry 3K-Classic

Henry 3K-Classic X

Operating and Maintenance Manual

SER. NO. 53-227

3K Classic and 3K Classic-X Specifications

TYPE AND FUNCTION OF EQUIPMENT: A 2000 watt (3000 watt for X model) PEP input RF linear amplifier, operating in the 3.5 to 30.0 MHz range. Designed for amateur, commercial, military, or industrial communications.

TYPE OF EMISSION: SSB, AM, CW, FM, RTTY.

OUTPUT POWER: 1200 watts PEP nominal (2000 watts PEP nominal for X model).

DRIVE POWER: 60 to 100 watts.

DIMENSIONS: 32¾" High x 16½" Deep x 15" Wide.

SHIPPING WEIGHT: 190 lbs approximate.

DUTY CYCLE: Continuous duty operation at rated output.

POWER REQUIREMENTS: 230 VAC, 3 wire, single phase, 50/60 Hz, 30 amps.

ALC CIRCUIT: Prevents overdrive from high power exciters and boosts average talk power.

COOLING: Forced air cooling.

PLATE POWER INPUT: SSB - nominal average input of 2000 watts PEP with speech. Distortion products are at least 35 dB down from the signal.

FREQUENCY RANGE:

80 meters - 3.5 - 4.0 MHz
40 meters - 7.0 - 7.5 MHz
20 meters - 14.0 - 14.5 MHz
15 meters - 21.0 - 21.5 MHz
10 meters - 28.0 - 30.0 MHz

10 meters available on the X model only. Amplifier will work on all WARC bands and most frequencies between 3.5 and 30 MHz.

OUTPUT IMPEDANCE: 52 ohms unbalanced with SWR not to exceed 2:1.

TUBE COMPLEMENT: Eimac 8877 ceramic triode.

INPUT IMPEDANCE: 52 ohms, tuned input circuits.

HARMONIC AND SPURIOUS RADIATION: Second harmonic better than -50 dB. Third order distortion better than -35 dB at full power output.

NOISE LEVEL: -40 dB or better below one tone carrier at 1000 watts output.

CONTROLS: Band selector, load control, tune control, meter switch, standby switch, SSB/CW switch, circuit breaker, primary fuse, and combined power on/off and CB switch.

INDICATING DEVICES: Two panel meters monitor plate voltage, plate current, and grid current.

REAR PANEL CONNECTIONS: RF input (BNC type connector), RF output (UHF type connector), ALC (RCA type jack), Relay (RCA type jack).

PROTECTIVE DEVICES: High voltage shorting switch, interlocked panel, air flow switch, primary fuse, primary circuit breaker, and cathode fuse.

PLATE VOLTAGE:
SSB: 2200 - 2400 VDC
(X Model) SSB: 3700 - 3900 VDC
CW: 1700 - 1900 VDC
(X Model) CW: 2700 - 2900 VDC

SPECIAL FEATURES:

Resonant choke input and oil filled capacitor in the power supply for superb dynamic regulation in the high voltage supply.

The antenna automatically transfers to the exciter when the switch is in the standby position or the power is off.

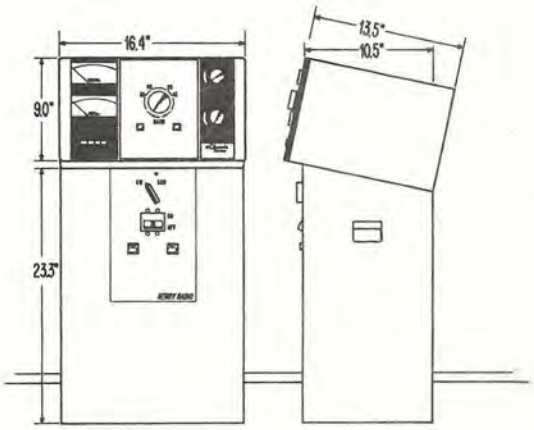
Semiconductor diode rectifiers guaranty long and reliable life.

Advanced, fast-acting relay circuits for semi-break-in CW operation.

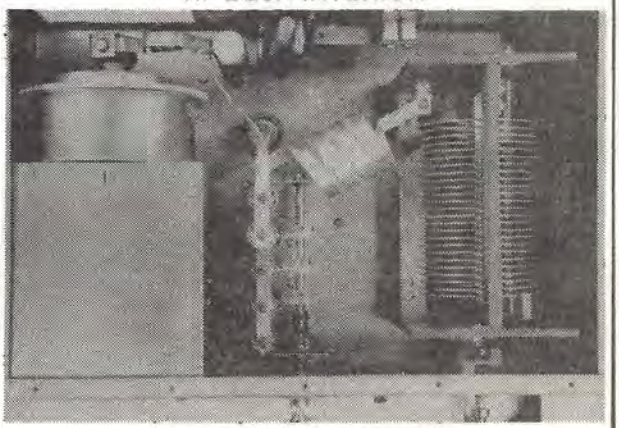
DC relay system for hum free operation.

Pi-L plate circuit with silver plated tank coil guaranty cleanest most efficient output.

All aluminum cabinetry with double shielding in the RF areas guaranty minimum cabinet radiation.



RF DECK INTERIOR*



*shown with 10 meter coil
(for export only)

HENRY 3K-CLASSIC AND 3K-CLASSIC X OPERATING AND MAINTENANCE MANUAL

SECTION 1 INTRODUCTION

The 3K-Classic amplifier is a high-quality, one-stage linear amplifier using one rugged, high-gain Eimac 8877 ceramic triode operating in a grounded grid circuit. The equipment is a completely self-contained floor model 2000 watt PEP input amplifier (3300 watts for the X model) using only the highest quality components that are available. In the tradition of Henry amplifiers, the 3K-Classic is designed for complete linearity and conservative operation, resulting in clean signals with no RF interference. The amplifier is designed for SSB, CW, or RTTY (AFSK or FSK) operation in the amateur bands between 3.5 and 30 MHz. The amplifier can be modified for frequencies outside the amateur bands for commercial or military operation. The 3K-Classic is factory wired for 220 VAC operation. Please read the operating instructions to familiarize yourself with the equipment before attempting operation. Please note the following operating cautions:

CAUTION: There are lethal high voltages present inside the amplifier whenever the amplifier is in the POWER mode. Never remove the top cover or back panel without excercising utmost caution!

CAUTION: The 8877 requires 90 seconds of warmup, regardless of how long the amplifier has been turned off. Under normal operating conditions the delay relay will indicate the warmup period. However if the amplifier is turned off after it is warm and turned on again within a few seconds the delay relay may not indicate warmup. THE TUBE STILL REQUIRES 90 SECONDS WARMUP, AND WILL BE DAMAGED IF IT IS OPERATED BEFORE IT HAS WARMED UP!

NOTE: The 8877's performance is very sensitive to filament voltage. Before operating the amplifier check that the filament voltage is correct as described in the manual.

NOTE: The 8877 may be damaged if grid current exceeds approximately 80 ma.

SECTION 2 INSTALLATION

SECTION 2.1 UNPACKING

Remove the amplifier from its shipping carton and packing material, and examine it carefully for visible damage. If the linear has been damaged in shipment, save the box and packing material and notify the transportation company immediately. It is wise to save the box in any case because it is expensive to replace and will be useful in protecting the 3K-Classic should you ever decide to ship or move it to another location. The amplifier is shipped ready to operate with the exception of a power plug. A power plug that mates with the power socket at the operating location must be properly installed as described in Section 2.3 before the unit can be operated.

The following accessories should be included with each amplifier:

1 Instruction Manual
1 Warranty Card
1 PL-259 Coax Connector
1 Drive Cable (RG-58)
2 Shielded Control Cables
5 3AG, 1.5 amp Fuses
5 8AG, 1.5 amp Fuses
1 Tube Puller

SECTION 2.2 OPERATING LOCATION

The amplifier may be located wherever desired provided there is adequate air flow from the bottom of the unit up through the top and back of the amplifier. Do not restrict the airflow of the amplifier, and do not place it too close to a wall which might restrict the airflow out of the back of the unit.

You will require a location that has an appropriate 220 VAC power source. A location which avoids environmental extremes of heat, humidity, and dust will keep the amplifier new looking and assure years of reliable operation.

SECTION 2.3 CABLING

All of the following cables must be connected before operation of the amplifier.

POWER CABLE - The 3K-Classic is equipped with a 3 wire power cable that is connected for 220 VAC, single phase, 60 Hertz operation. A factory modification is required for 50 Hertz operation.

The three wires in the power cable are black, white, and green. The green wire is the chassis ground and the neutral on the 220 volt plug. The black and white wires connect to the "hot" 220 VAC circuits. A power plug is not supplied because there are many different types of 220 VAC outlets. We suggest that you consult with a local electrician for the proper connection of your plug type.

CAUTION: The amplifier will be damaged if the green wire is connected incorrectly. Make sure that the green wire is connected to the neutral connection.

ANTENNA COAX - Use only RG-8/U coax (or its equivalent) to connect the 3K-Classic to the antenna. A PL-259, UHF type coax connector, is included in the accessory kit. Prepare the cable and connector as described in Figure 1 below. The PL-259 mates with the coax jack marked OUTPUT on the rear panel of the amplifier.

CAUTION: Do not operate the amplifier without a load or into a load with an SWR greater than 2:1 (reflected power 1/10 of forward power). Measure the antenna's SWR with an SWR meter, using only the exciter, before operating the amplifier. With the 3K-Classic turned off, the exciter's output will pass through the amplifier directly to the antenna.

DRIVE CABLE - The RG-58/U drive cable connects to the INPUT connector on the rear panel of the amplifier. This connector is the BNC type coax connector. The other end of the cable is terminated by a PL-259 plug and should be connected into the RF output connector of the exciter. An adaptor may have to be used if the exciter does not have a matching connector.

ALC (Automatic Level Control) CABLE - Plug the grey ALC cable into the ALC OUT phono socket on the rear panel of the amplifier and into the ALC feedback connection on the exciter. If the exciter does not have provision for feedback of ALC voltage from an amplifier, simply ignore the amplifier's ALC socket and cable.

RELAY CABLE - The gray relay control cable should be plugged into the RCA phono socket marked RELAY CONTROL on the rear panel of the amplifier. This cable conducts 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 its equivalent) on the exciter. The exciter needs to supply only a shorting relay contact (closed to ground during transmit) to key the amplifier.

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

When the 3K-Classic is driven by an exciter without an antenna relay socket it may be necessary to examine the circuit diagram of the exciter to find an available unused relay contact that is normally open in the receive condition. All current transmitters and transceivers currently manufactured for amateur operation have such a relay contact at a terminal board or connector on the rear panel.

SECTION 2.4 200/208 VAC OPERATION

The 3K-Classic is normally factory wired for 220 VAC unless otherwise ordered. The following transformer terminal changes must be made if the amplifier is to be operated at a lower line voltage.

FILAMENT TRANSFORMER - The filament transformer is marked EAC-1116 and is located on the upper deck of the power supply section. For 220 VAC operation the primary should be tapped on terminals "C" (common) and "3".

For 200 VAC or 208 VAC operation the wire on tap 3 should be moved to tap number 1.

HIGH VOLTAGE TRANSFORMER - The high voltage transformer for the 3K-Classic is marked ECA-1120. The primary connections for 220 VAC operation should be:

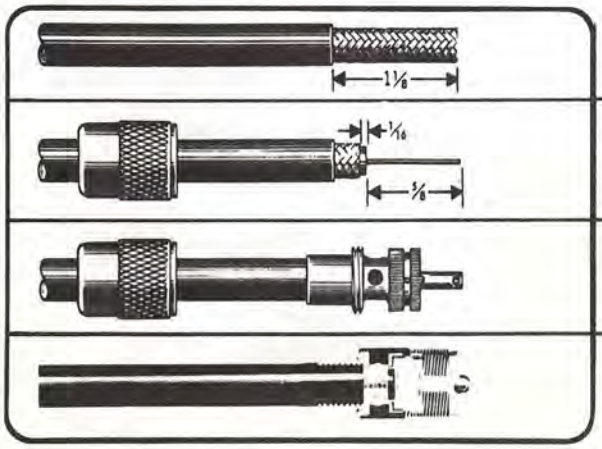
Tap 1 - 200 VAC
Tap 2 - jump to tap 4
Tap 3 - n/c
Tap 4 - jump to tap 2
Tap 5 - n/c
Tap 6 - 200 VAC

The high voltage transformer for the 3K-Classic X is marked ECA-1171 and is located on the bottom level of the power supply section. The primary connections for 220 VAC operation should be:

Tap 1 - 220 VAC
Tap 2 - n/c
Tap 3 - 220 VAC

The primary connections for 200 VAC or 208 VAC operation should be:

Tap 1 - n/c
Tap 2 - 200 VAC
Tap 3 - 200 VAC



Cut end of cable even. Remove vinyl jacket 1⅛", except 83-1SP plug remove vinyl jacket 1¼".

Bare ⅛" of center conductor. Trim braided shield. Slide coupling ring on cable. Tin exposed center conductor and braid.

Screw the plug sub-assembly on cable. Solder assembly to braid through solder holes, making a good bond between braid and shell. Solder conductor to contact. Do not use excessive heat.

For final assembly, screw coupling ring on plug sub-assembly.

Figure 1. PL-259 Installation Instructions.

SECTION 3 OPERATING CONTROLS

SECTION 3.1 FRONT PANEL CONTROLS

OFF/ON POWER SWITCH - This switch is used for turning the amplifier on and off. It is also a circuit breaker for overload protection on the AC lines. When the 3K-Classic is turned off or the amplifier is in standby, the output of the exciter passes through the amplifier directly to the antenna.

MULTIMETER AND RELAY CONTROL SWITCHES - These push switches are located below the multimeter. There are two interlocked pairs. The two on the left allow the operator to use either the 10,000 volt scale or the 100 ma scale for grid current on the multimeter. The right pair enables or disables the control circuitry of the amplifier. This makes it possible for the operator to use the exciter alone without turning off the power switch of the amplifier.

CW/SSB SWITCH - this 2-position rotary switch selects between two plate voltages to assure correct loading and output for each type of emission.

PLATE CURRENT METER - This meter monitors the plate current of the 8877 tube. Nominal plate current is between 800 and 900 ma for full output.

PILOT LIGHTS - When the amplifier is turned on, the dial lights will come on indicating that the POWER switch is on.

FUSES - There are (2) 3AG 1½ amp fuses. One is for the meter circuit. The other is for the blower and low voltage control circuit.

LOAD CONTROL - This control matches the amplifier's output network to the load. Refer to the calibration table for appropriate initial settings for the frequency range desired. A LOAD setting of 0 (zero) corresponds to minimum loading and a LOAD setting of 100 corresponds to maximum load capacitor mesh.

TUNE CONTROL - The TUNE control is a 20-turn vernier dial connected to the variable inductance tank coil. The TUNE control reading can be used in conjunction with the setting given in the calibration table to adjust the tank coil for the approximate tuning range to be used.

BAND SWITCH - The BAND switch selects the necessary input and output circuits for the amplifier to operate in any one of the following frequency ranges:

80	3.500 to 4.000 MHz
40	7.000 to 7.500 MHz
20	14.000 to 14.500 MHz
15	21.000 to 21.500 MHz
10	28.000 to 30.000 MHz (Export and military sales only)

The amplifier can be operated on many frequencies outside these bands by switching the amplifier to the band closest in frequency to the desired operating frequency. Never move the BAND switch when the amplifier is keyed.

SECTION 3.2 REAR PANEL CONTROLS

ALC JACK - This socket accepts an RCA phono plug (an ALC cable is provided in the accessory packet of the amplifier). The ALC feedback to the exciter is available at this socket.

ALC ADJUSTMENT POTENTIOMETER - This potentiometer controls the sensitivity of the 3K-Classic circuit. Refer to the operating instructions for the adjustment procedure.

RELAY CONTROL JACK - The RELAY CONTROL jack accepts an RCA phono plug (a relay cable is provided in the accessory packet of the amplifier). When the socket is shorted to ground, the amplifier's antenna relay closes. If the amplifier is turned off the relay will not key. Never apply any voltage to this socket.

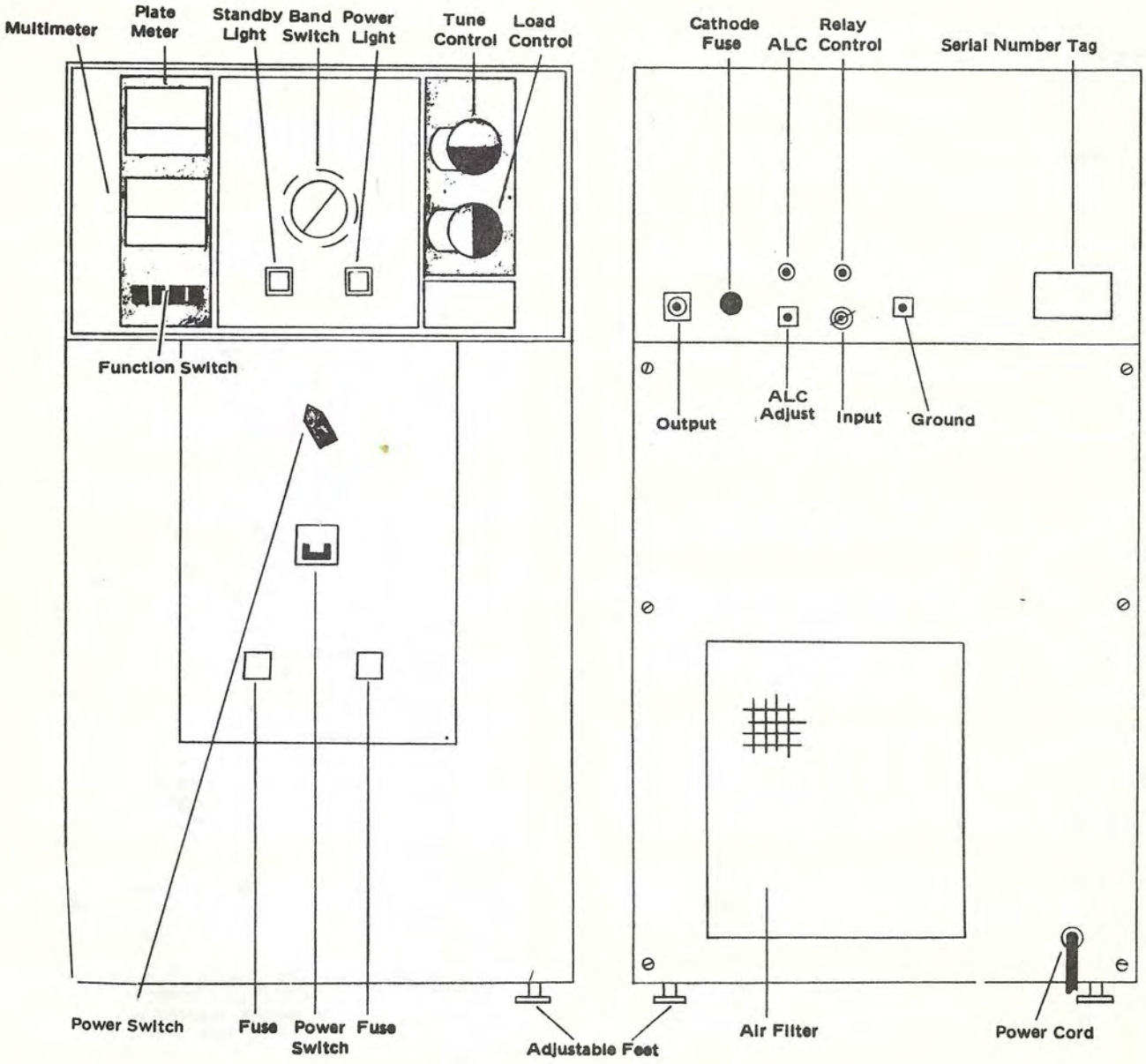
RF INPUT CONNECTOR - This BNC coax connector accepts the drive line from the exciter. The input impedance of the amplifier is 50 ohms.

RF OUTPUT CONNECTOR - The nominal output impedance of the amplifier is 50 ohms. Do not operate the equipment without a load, or into a load with an SWR of more than 2:1. Use only RG-8/U coax (or its equivalent) to connect this SO-239 connector to appropriate antenna or dummy load.

GROUND LUG - This lug is provided to ground the amplifier. Connecting the amplifier to a standard 3 pin electrical system is usually adaquate grounding. If such a system is not used, it is wise to ground the unit using the ground lug and connecting it to a good earth ground to prevent radiated interference or the danger of electrical shocks.

CATHODE FUSE - This 8 AG, 1.5 amp fuse protects the cathode circuit from shorts. Never exceed the recommended current rating when replacing the fuse.

POWER CORD - The power cord must be connected to an appropriate power source. No power plug is provided. Be certain that the power transformer is jumpered correctly for the appropriate line voltage. See Figure 1.


Multimeter
Plate Meter
Standby Light
Band Switch
Power Light
Tune Control
Load Control
Function Switch
Power Switch
Fuse
Power Switch
Fuse
Adjustable Feet
Cathode Fuse
ALC
Relay Control
Serial Number Tag
Output
ALC Adjust
Input
Ground
Air Filter
Power Cord

SECTION 4 OPERATION

SECTION 4.1 PRELIMINARY SETTINGS

Turn on the 3K-Classic by the circuit breaker on the lower half of the front of the cabinet. The dial lights will glow and the blower will turn on. There is a 90 second warm-up timer for the 8877 tube. When the timer activates, one of the two indicator lamps will light, depending upon whether the "stand-by" or the "power" switch is actuated.

Until the 8877 tube is warmed up, no operation, other than "barefoot," is possible. Set the multimeter switch to HV. It should read approximately 2400 VDC in the SSB position and approximately 1600 VDC in the CW position. With no drive applied from the exciter but with the exciter in transmit in the "CW" position, the resting current should be approximately 60 ma. The output of the amplifier should be connected to a 50 ohm, 1000 watt dummy load.

NOTE: The 8877 tube will not show color even at its highest output. The maximum plate current is approximately 1000 ma. The maximum grid current is approximately 40 ma. When the amplifier is tuned properly, the grid current should always be less than 40 ma. The grid current is a good way to show that the amplifier is tuned properly. It will be as low as 20 ma under a good tune-up. Do not operate the amplifier higher than 400 plate ma until you are satisfied that the amplifier is tuned up properly. Always use a good wattmeter as it is an excellent "health meter" and makes tune-up easy.

SECTION 4.2 SSB OPERATION

Set the CW/SSB switch to SSB and connect a 1000 RF wattmeter to 1000 watts of RF output. Set the amateur band that you desire on the exciter and the amplifier. Switch the exciter to the CW mode. Turn the output of the exciter to zero. The resting current of the 8877 tube should be approximately ~~20 to 30~~ 150 ma.

STEP 1. Gradually turn up the exciter power until about 400 ma of plate current is showing on the amplifier. If the factory dial settings noted in the back of this manual have been followed, some output should be seen. Tune for maximum on the wattmeter, alternating tuning between the load and tune dials for maximum output.

STEP 2. Watch the grid meter. If it is more than half scale or 50 ma, reduce the "load" dial numbers for a lower reading and retune the "tune" dial for maximum output. Do not drive the amplifier for more than 10 seconds if there is no output. Ten (10) seconds tune and ten (10) seconds off is a good idea.

STEP 3. After 500 watts output has been reached at the reduced current of 400 ma on the plate, increase the drive for more output. Remember that every time the plate current is changed by more drive, the impedance has changed. Hence, the tuning will change.

STEP 4. When the amplifier has been tuned to frequency, note the dial readings so that the operator can return to that frequency again without retuning. The dial readings will stay the same for that frequency.

STEP 5. Return the exciter to the SSB mode and speak into the amplifier through the microphone attached to the exciter. The output power peaks for speech should be about 1/2 of the meter reading during tuneup. The output reading will not follow the speech pattern.

SECTION 4.3 CW OPERATION

Follow the tuning procedures above for SSB with the exception that the CW/SSB switch will be on "CW" and the meter readings will be about 60 per cent of the SSB readings.

SECTION 4.4 ALC ADJUSTMENT

The amplifier is shipped with the "ALC ADJUST" potentiometer fully counter-clockwise (off). If the ALC feedback is used, the adjustment need be made only once, unless a new exciter is used. After the ALC adjustment is made, use the locknut on the potentiometer shaft to lock the control in place.

With the "ALC ADJUST" control fully counter-clockwise, tune the amplifier for SSB operation. Drive the amplifier to about 800 ma of plate current, and then rotate the "ALC ADJUST" control clockwise until the grid current just begins to decrease. If the exciter cannot drive the 3K-Classic to 800 ma of plate current, leave the "ALC ADJUST" potentiometer in the fully counter-clockwise position.

The ALC circuit will prevent over-drive from high powered exciters when it is adjusted properly. However, if your exciter does not put out much more than 100/120 watts, it is suggested that the ALC connection is not necessary as the 8877 tube is difficult to overload.

SECTION 4.5 ALTERNATE TUNING METHOD

When the "TUNE" and "LOAD" dial calibrations have been verified for each band, and the operator feels comfortable with the amplifier, the entire tuning procedure can be completed in a few seconds.

This alternate method (tuning for maximum output) is done by applying RF drive from the exciter to the amplifier, and bringing the RF reading of the wattmeter up to about two-thirds of full scale. Then adjust the "TUNE" and "LOAD" controls to peak the amplifier output reading as indicated on the multimeter. The amplifier will now be tuned to resonance for proper operation.

CAUTION: ANYTIME THAT THE BOTTOM BACK COVER OR THE TOP COVERS ARE OFF, LETHAL VOLTAGES ARE PRESENT. PLEASE BE CAREFUL. DISCONNECT THE POWER PLUG BEFORE DOING ANY WORK INSIDE THE CABINET.

The following chart will possibly give the operator some hints in the event of problems.

TABLE 1 TROUBLESHOOTING

PROBLEM	CAUSE	REPAIR
The amplifier does not come on when the selector switch is turned on.	Improperly connected AC line. A fuse is blown. The power switch is not closing.	Reconnect the line properly. Replace the blown fuse. Check it with an ohm meter.
The amplifier turns on as soon as the cable is plugged in and will not turn off.	The switch is shorted or inoperative.	Replace the switch.
There is no high voltage indication on the multimeter.	The meter circuit is inoperative.	Check the circuit for malfunction.
No plate current indicated when the amplifier is on and the exciter is transmitting with no RF Drive applied.	The relay control cable from the exciter to the 3K-CLASSIC may be bad. RY may not be operating. If the exciter operates RY, suspect a poor contact by the center pole of the relay.	Check the cable's continuity. Check for component malfunction. Burnish it, and bend the relay center arm slightly to increase the closed pressure.
The plate meter shows current as soon as the high voltage is turned on and the exciter is not transmitting.	RY is probably actuating, showing a resting current of 150-100 ma on the plate meter, caused by a short in the relay control circuit. If RY is not activated, suspect a grid filament short in one tube.	Unplug the relay control cable. If RY stays activated, the trouble is not in the exciter. Check the relay circuit. Replace the tube.
Excessive plate current.	Bad tube. Cathode Zener shorted.	Replace the tube. Replace Zener.
The 3K-CLASSIC operates normally, but no plate current shows.	Bad meter circuit.	Check the meter circuit for any malfunction.
An arc indicates a high voltage short: Unplug the high voltage plug from the RF deck and exciter. If the short persists, it is located in the power supply.	A power supply high voltage short. High voltage shorting switches in the RF deck may not be properly set causing a high voltage short.	Check for visible evidence, an arc usually chars or blackens an area. Make an ohm meter check. Start with the filter condenser, and check through the circuit toward the power transformer. Check interconnecting leads for a ground short. Check the reverse resistance of D1-D2. When disconnected, good diodes have infinite resistance, and bad diodes read less than 2 ohms resistance in either direction.
If the short is in the RF deck.	An RF deck high voltage short.	Check for visible evidence. Make an ohm meter check. Check the high voltage leads.
The circuit breaker is activated by a short.	Shorted powertransformer primary. A shorted rectifier diode. Safety switches (H.V.).	Check for a short and replace. Check with an ohm meter as above and replace.
No plate current and excessive grid current.	Open high voltage circuit.	Examine the circuit and repair.
No grid current and the plate meter does not drive up.	Exciter malfunction.	Turn the 3K-CLASSIC off. Operate the exciter to the antenna and check its operation.
Intermittant grid current.	Cable between exciter and 3K-CLASSIC bad. Bad socket connection in that Bad input module.	Check cable continuity. Repair the socket connection. Operate on a different band to isolate the problem.
Low grid current.	Low output from the exciter.	Check the exciter output.

SECTION 7. DISASSEMBLING YOUR AMPLIFIER

The description of this procedure uses screw numbers which are shown on Figure 4. Therefore refer to that diagram as necessary.

REMOVE THE TOP PANEL - Remove screws 2, 3, 6, and 7 and pull the top perforated painted panel off of the amplifier.

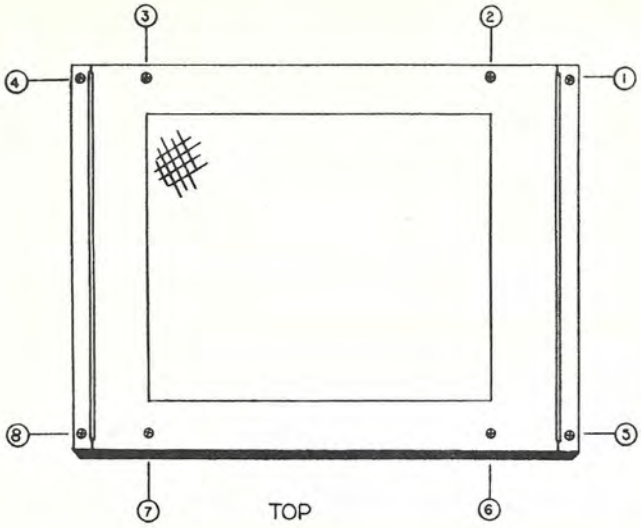
REMOVE THE POWER SUPPLY BACK PANEL - Remove screws 13, 14, 15, 16, 17 and 18 and pull the back panel away from the power supply section. You must unplug the power cord from the amplifier.

REMOVE CABLES - Disconnect all of the cables be tween the RF section and the power supply section.

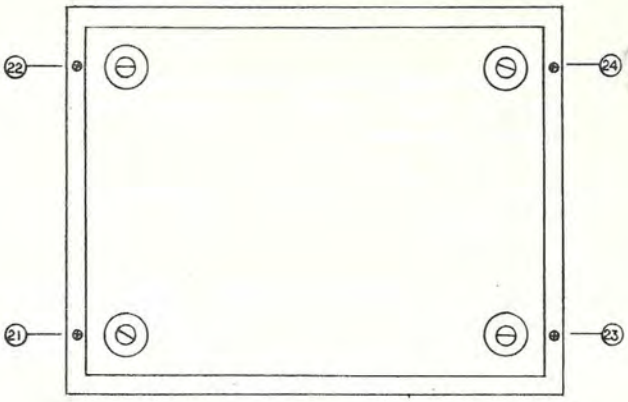
REMOVE THE RF DECK - First remove the BAND, TUNE and LOAD knobs from the front panel. A spline wrench is provided with the accessory kit to remove the knobs. Then remove the two screws from the bottom of the back of the top wraparound. These are accessed by reaching up from the back of the power supply section and they are not shown on the diagram. Remove two screws from the the bottom of the front of the RF wraparound, on the bottom of the overhang. These are shown as screws 19 and 20 on the diagram. The RF section should now slide out of the back of the wraparound. If you should need to send the RF section back to the factory for repair you should just send the RF chassis, not the entire painted wraparound. Most service of the amplifier can be accomplished without any further disassembly. The front panel can now be accessed from the rear, the blower from the top and bottom, and the power supply from the back.

REMOVING THE RF WRAPAROUND - Should you find it necessary to romove the top wraparound, remove the seven screws spaced around the inside bottom lip of the wraparound. The are accessed through the top of the amplifier. Next, disconnect the metering harness and the wiring to the blower (below the wraparound). The cabinet will then lift off of the power supply.

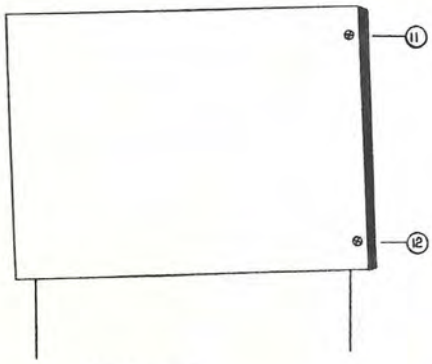
REMOVING THE POWER SUPPLY WRAPAROUND - Tip the power supply over carefully and remove the four screws (21, 22, 23 and 24) holding the painted power supply wraparound on to the bottom plate of the power supply. Tip the power supply back upright and VERY CAREFULLY spread the back edges of the wraparound and slide it off the front of the frame. The wiring to the circuit breaker, SSB/CW switch, and fuses is attached to the wraparound so be very careful. The 2 level power supply frame is welded and does not come apart.



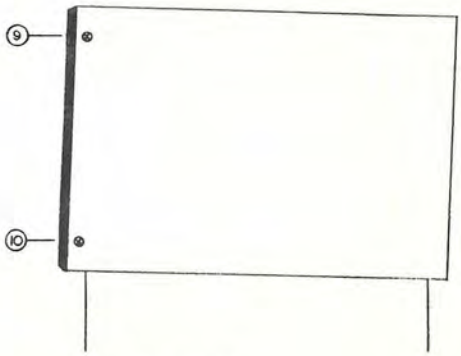
TOP



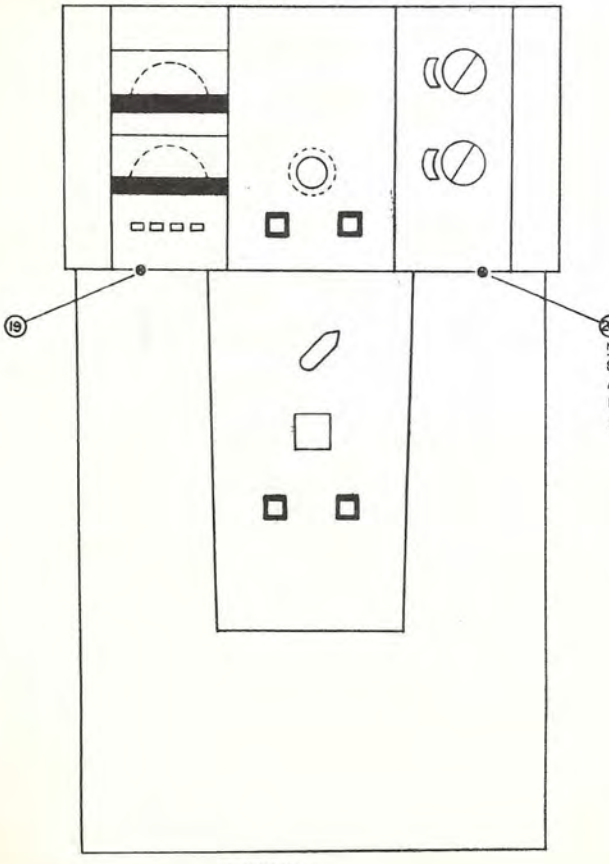
BOTTOM



LEFT SIDE

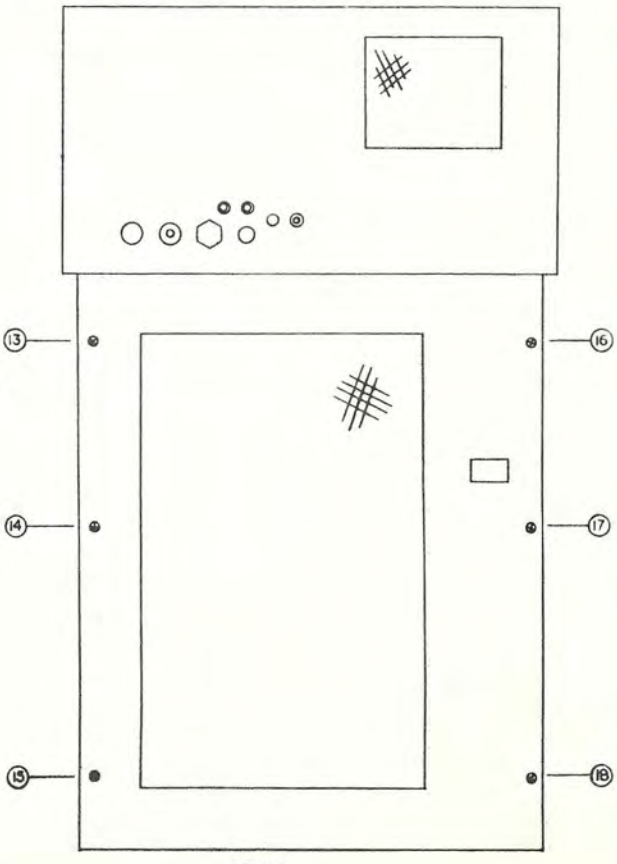


RIGHT SIDE

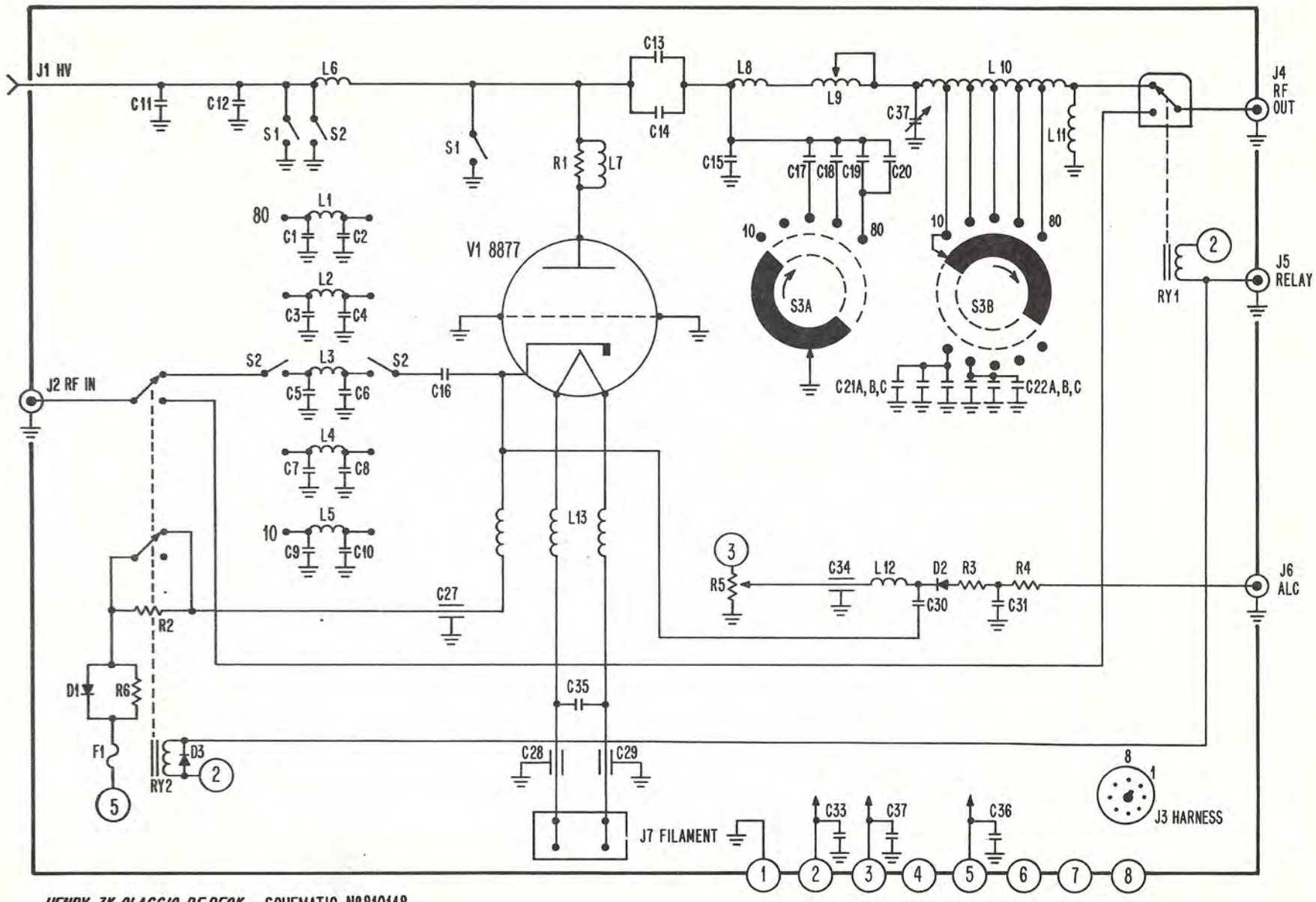


NOTE
SCREWS 19 AND 20 ARE LOCATED ON THE BOTTOM OF THIS SURACE.

FRONT

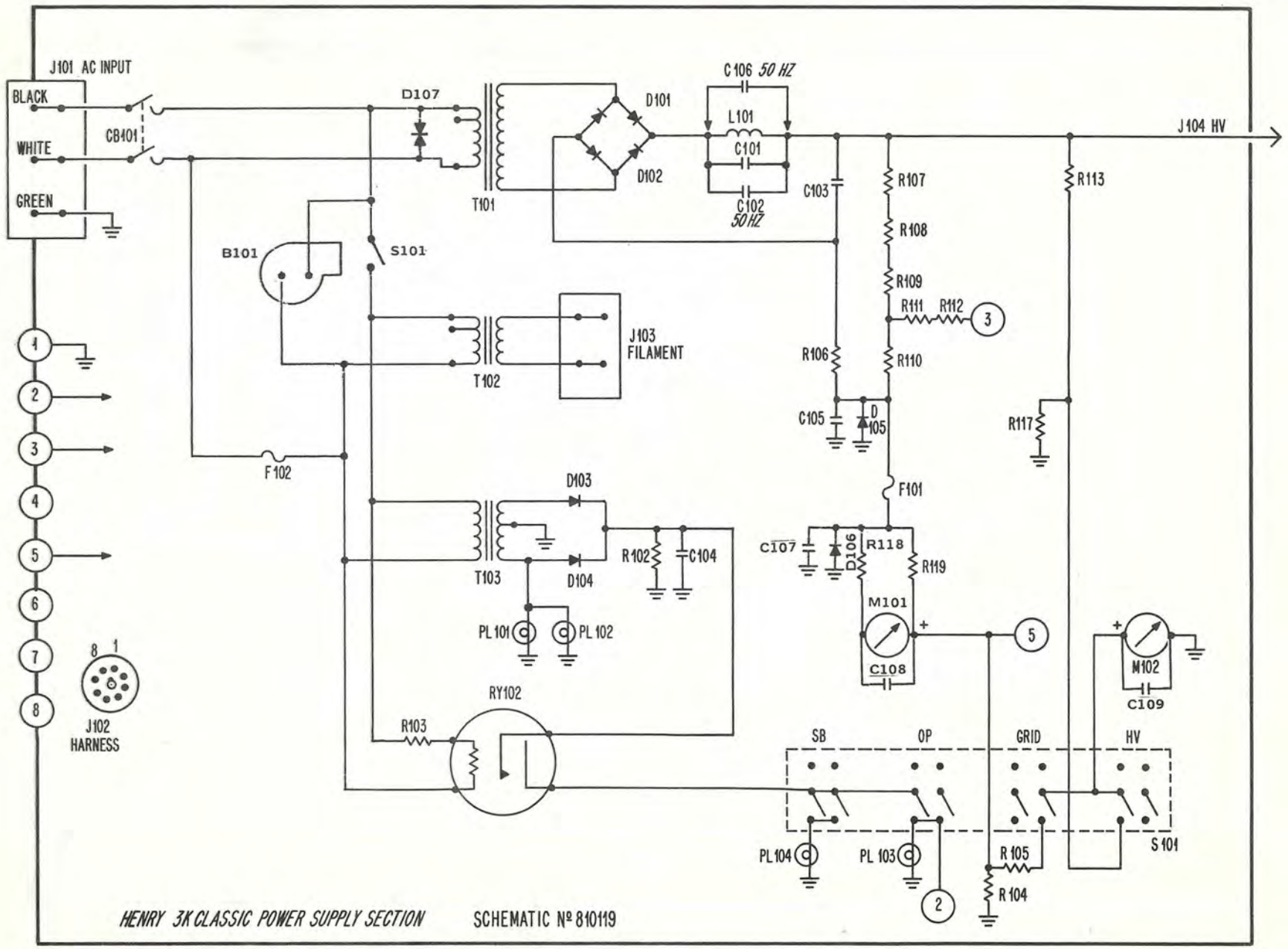


REAR



HENRY 3K CLASSIC RF DECK SCHEMATIC №810118

RELAYS SHOWN IN TRANSMIT POSITION


J101 AC INPUT
BLACK
WHITE
GREEN
CB401
D107
T101
D101
D102
C106 50 HZ
L101
C101
C102 50 HZ
J104 HV
C103
R107
R108
R109
R111
R112
3
R106
R110
R113
B101
S101
T102
J103 FILAMENT
C105
D105
R117
F102
F101
D103
T103
D104
R102
C104
C107
D106
R118
R119
M101
C108
5
M102
C109
PL 101
PL 102
RY102
R103
J102 HARNESS
SB
OP
GRID
HV
S101
PL 104
PL 103
2
R 105
R 104
HENRY 3K CLASSIC POWER SUPPLY SECTION
SCHEMATIC Nº 810119

SECTION 8. PARTS LIST

BLOWER

B101	220 VAC	Dayton 2C915A

CAPACITORS

C1A, B, and C	Mica, 470 pf, 500 VDC	Arco DM15-471J
C2A and B	Mica, 820 pf, 500 VDC	Arco DM15-821J
C2C	Mica, 620 pf, 500 VDC	Arco DM15-621J
C3A and B	Mica, 430 pf, 500 VDC	Arco DM15-431J
C4A	Mica, 220 pf, 500 VDC	Arco DM15-221J
C4B and C	Mica, 390 pf, 500 VDC	Arco DM15-391J
C5A and B	Mica, 160 pf, 500 VDC	Arco DM15-161J
C6A and B	Mica, 160 pf, 500 VDC	Arco DM15-161J
C7A and B	Mica, 100 pf, 500 VDC	Arco DM15-101J
C8A and B	Mica, 91 pf, 500 VDC	Arco DM15-910J
C9A	Mica, 75 pf, 500 VDC	Arco DM15-750J
C9B	Mica, 82 pf, 500 VDC	Arco DM15-820J
C10A and B	Mica, 68 pf, 500 VDC	Arco DM15-680J
C11 and C12	Ceramic disc, .0047 mf, 6 KV	Sprague 60GAD47
C13 and C14	Ceramic transmitting, 1000 pf, 5 KV	ITT Jennings 700002
C15	Ceramic transmitting, 25 pf, 15 KV	ITT Jennings 700014
C16A and B	Ceramic disc, .01 mf, 1000 VDC	Centralab DD-104
C17	Ceramic transmitting, 25 pf, 7.5 KV	ITT Jennings 700024
C18, C19, and C20	Ceramic transmitting, 75 pf, 7.5 KV	ITT Jennings 700018
C21A, B, C, and D	Ceramic transmitting, 100 pf, 7.5 KV	ITT Jennings 700066
C22A, B, and C	Ceramic transmitting, 100 pf, 7.5 KV	ITT Jennings 700066
C23	Ceramic disc, .01 mf, 600 VDC	Centralab DD6-103
C27	Ceramic feedthrough, 2000 pf, 500 VDC	Trusonix 202M
C28A and C29A	Ceramic disc, .003 mf, 1000 VDC	Centralab DD-302
C28B and C29B	Ceramic disc, .1 mf, 50 VDC	Centralab DD-104
C30 and C31	Mica, 47 pf, 500 VDC	Arco DM15-470J
C33	Ceramic disc, .01 mf, 600 VDC	Centralab DD6-103
C34	Ceramic feedthrough, 2000 pf, 500 VDC	Trusonix 202M
C35 and C36	Ceramic disc, .01 mf, 600 VDC	Centralab DD6-103
C37	Variable air type, LOAD control, 3 KV	All Star 73-1-75-75
C38	Ceramic disc, .01 mf, 600 VDC	Centralab DD6-103
C101 and C102	Oil filled, .01 mf, 7.5 KV	Plastic Capacitors LK80-104
C103	Oil filled, 16 mf, 8 KV	Aerovox BX0015D0008A
C104	Electrolytic, 470 mf, 50 VDC	Arco ME-470-50
C105	Ceramic disc, .05 mf, 16 VDC	Centralab UK16-503
C106	Oil filled, .01 mf, 7.5 KV (50 Hz models only)	Plastic Capacitors LK80-104
C107	Ceramic disc, .05 mf, 16 VDC	Centralab UK16-503
C108 and C109	Ceramic disc, .01 mf, 600 VDC	Centralab DD6-103

CIRCUIT BREAKER

CB101	30 amps	P&B W92X11-2-30

CONNECTORS

J1	High voltage socket and plug	Millen 37501
J2	RF in, BNC type coax connector	Amphenol UG647/U
J3	Harness connections, 8-pin keyed socket	Amphenol 78S8
J4	RF out, UHF type coax connector	Amphenol SO-239
J5	Relay control, RCA type phono jack	Switchcraft 3501FP
J6	ALC feedback, RCA type phono jack	Switchcraft 3501FP
J7	Filament, 4-pin Jones plug	Cinch P404AB
J101	AC input, 4-pin Jones plug	Cinch P404AB
J102	Harness interconnect, 8-pin keyed plug	Amphenol 86CP8
J103	Filament, 4-pin Jones socket	Cinch S404CCT
J104	High voltage plug and socket	Millen 37501
J105	AC input, 4-pin Jones socket (on power cord)	Cinch S404CCT

DIODES

D1	Biasing diode, 10 VDC, 1.2 amps	Semtech SA-5534
D2	Rectifier, 1.0 amp, 200 PIV, ALC	Motorola 1N458
D101 and D102	Rectifier, 1.2 amps, 15 KV	CSdC 45XV246
D103 and D104	Rectifier, 1.0 amps, 1000 VDC	GE-509
D105	Rectifier, 3.0 amps, 100 PIV	Motorola 1N4720
D106	Rectifier, 1.0 amps, 400 PIV	Motorola 1N4004
D107	Voltage spike protector, 250 VAC	GE V250LA40A

FUSES

F1	.8 AG, 1.5 amps, 250 VAC.	.Littelfuse 361 001.5
	.Fuseholder, 8 AG	.Littelfuse 372 001A.
F101 and F102	.3 AG, 1.5 amps, 250 VAC.	.Littelfuse 312 001.5
	.Fuseholder, 3 AG	.Littelfuse 348 875.

KNOBS

	.BAND switch, TUNE and LOAD controls	.Raytheon 175-1-2G
	.SSB/CW Switch.	.Raytheon 70-7WL-2G

INDUCTORS

L1	.Input coil, 3.5 MHz	.Henry L1-3K-Classic
L2	.Input coil, 7.0 MHz	.Henry L2-3K-Classic
L3	.Input coil, 14.0 MHz	.Henry L3-3K-Classic
L4	.Input coil, 21.0 MHz	.Henry L4-3K-Classic
L5	.Input coil, 28.0 MHz	.Henry L5-3K-Classic
L6	.High voltage RF plate choke	.Henry L6-3K-Classic
L7	.Parasitic suppressor coil	.Henry L7-3K-Classic
L8	.15 meter RF coil.	.Henry L8-3K-Classic
L8	.10 meter RF coil (Export models)	.Henry L8-3K-Classic X.
L9	.TUNE control rotary inductor	.Henry L9-3K-Classic
L10	.L-Section tapped coil	.B&W 1608-002
L11	.RF antenna choke, 2.5 mH, 150 ma	.Miller 4555
L12	.RF choke.	.Miller 6302
L13	.Filament choke.	.Miller B5344
L14	.Filament center tap choke.	.Miller 6302
L101.	.Resonating filter choke, 8 H, 800 ma	.ECA5020.

METERS

M101	.Plate current meter, 0 to 1 amp movement.	.Beede 913105.
M102	.Multimeter, 0 to 1 ma movement	.Beede 913104.

PILOT LAMPS

PL101 and PL102	.TUNE and LOAD dial lights	.Sylvania 1815.
	.Light holder assembly	.Smith 1931
PL103 and PL104	.Standby and Power light, 12 VDC	.Sylvania 330.
	.Light holder assembly	.Compulite 621-1-B

RELAYS

RY1 and RY2.	.Antenna changeover, 12 VDC, 2PDT.	.Guardian 1365PC-2C-12D.
	.Relay socket.	.Guardian 1365
RY102	.Warmup delay relay, 90 seconds.	.Amperite 115NO90

RESISTORS

R1A, B, and C	.Carbon, 150 ohms, 2 watts, 10%	.Resistor.
R2	.Wirewound, 10 K ohms, 10 watts, 5%	.Resistor.
R3	.Carbon, 1 K ohms, 1 watt, 10%	.Resistor.
R4	.Carbon, 68 K ohms, 1 watt, 10%	.Resistor.
R5	.Wirewound, 100 K ohms, 5 watts, 5%	.Resistor.
R6	.Carbon, 220 ohms, 2 watts, 10%	.Resistor.
R102	.Carbon, 150 ohms, 2 watts, 10%	.Resistor.
R103	.Wirewound, 5 K ohms, 25 watts, 5%	.Resistor.
R104A and B	.Precision, .1 ohms, 1 watt, 1%	.Resistor.
R105	.Carbon, 30 ohms, 2 watts, 5%	.Resistor.
R106	.Wirewound, 25 ohms, 25 watts, 5%.	.Resistor.
R107 through R110.	.Wirewound, 20 K ohms, 100 watts, 5%	.Resistor.
R111 and R112	.Carbon, 47 K ohms, 2 watts, 10%.	.Resistor.
R113	.Precision, 10 M ohms, 7.5 watts, 1%	.Resistor.
R117	.Carbon, 10 K ohms, 2 watts, 10%.	.Resistor.
R118	.Carbon, 150 ohms, 1 watt, 10%	.Resistor.
R119	.Carbon, 50 ohms, 1 watt, 10%	.Resistor.

SWITCHES

S1A, B, and C.	.High voltage shorting switches	.Henry S1-3K-Classic.
S2	.BAND switch, input section	.Centralab 2504
S3A	.BAND switch, TUNE circuit section	.Henry S3A-3K-Classic
S3B	.BAND switch, L-Section circuit	.Radio Switch Model 80
S101.	.Function switch	.Switchcraft 65041K206.
S102.	.Air flow protection switch	.Rotron 2A-1000

TRANSFORMERS

T101	High voltage power transformer - Domestic models	ECA1120
T101	High voltage power transformer - Export models	ECA1171
T102	Filament transformer	ECA1116
T103	Relay power supply transmformer	ECA1161

TUBE

V1	Ceramic power triode	Eimac 8877 (3CX1500A7)
	Tube socket	Johnson 122-0247-202
	Tube chimney	Henry 3K-Classic Chimney

SECTION 9. TUNE AND LOAD SETTINGS

Serial Number _____

These are approximate settings for a 52 ohm load.

900 ma.

FACTORY DATA I_p ~~800 ma~~

BAND	TUNE DIAL	LOAD DIAL	GRID MA	OUTPUT WATTS
80	144	73	10-20 ma	
40	78	88	"	
20	42	118 102	"	
15	26	72	"	
10	10	66		

USER DATA

BAND	TUNE DIAL	LOAD DIAL	GRID MA	OUTPUT WATTS
6 80	144 (3785)	113		
5				
17m	18.138	18.138		
	36	74	18 MA	1700+
50 W DRIVE	3420 W INPUT = 1700+ OUTPUT [RMS]		I_P 900 MA 3800 V	50%
10m	10	66	LESS THAN	2000+
3			.10 MA	
90 W DRIVE				
70 W. DRIVE	78	88	LESS THAN	2000+
2	7200 78	90	.10 MA	
40				
	14235 40	144		
1				
20				

TECHNICAL DATA

8877
3CX1500A7

HIGH-MU
POWER TRIODE

The EIMAC 8877/3CX1500A7 is a rugged ceramic/metal power triode designed for use as a cathode driven Class AB_2 or Class B amplifier, in audio or rf applications including the UHF band, or as a cathode driven plate modulated Class C rf amplifier. As a linear amplifier, high power gain may be obtained without sacrifice of low intermodulation characteristics.

Low grid interception and high amplification factor combine to make the 8877/3CX1500A7 drive power requirements exceptionally low for a tube of this power capacity.

GENERAL CHARACTERISTICS[1]

ELECTRICAL

Cathode: Oxide Coated, Unipotential		
Heater: Voltage	5.0 ± 0.25	V
Current, at 5.0 volts	10.5	A
Transconductance (Average):		
I_b = 1.0 Adc	55,000	μmhos
Amplification Factor (Average)	200	
Direct Interelectrode Capacitance (grounded cathode)[2]		
Cin	38.5	pF
Cout	0.1	pF
Cgp	10	pF
Direct Interelectrode Capacitance (grounded grid)[2]		
Cin	38.5	pF
Cout	10	pF
Cpk	0.1	pF
Ck-htr	9.7	pF
Frequency of Maximum Rating:		
CW	250	MHz

1. Characteristics and operating values are based upon performance tests. These figures may change without notice as the result of additional data or product refinement. EIMAC Division of Varian should be consulted before using this information for final equipment design.

2. Capacitance values are for a cold tube as measured in a special shielded fixture in accordance with Electronic Industries Association Standard RS-191.

(Revised 7-1-75) Printed in U.S.A.

MECHANICAL

Maximum Overall Dimensions:	
Length	4.02 in;102.16 mm
Diameter	3.38 in; 85.85 mm
Net Weight	25.0 oz; 708.8 gm
Operating Position	Any
Maximum Operating Temperature:	
Ceramic/Metal Seals, Anode Core	250°C
Cooling	Forced Air
Base	Special 7-pin
Recommended Air System Socket	
(Grounded Grid)	SK-2210
(Grounded Cathode)	SK-2200
Recommended Air Chimney	
(Teflon)	SK 2216

RANGE VALUES FOR EQUIPMENT DESIGN

	Min.	Max.	
Heater: Current at 5.0 volts	9.5	11.5	A
Cathode Warmup Time	90	---	sec
Interelectrode Capacitance (grounded grid circuit)[1]			
Cin	36.0	41.0	pF
Cout	9.2	11.2	pF
Cpk	---	0.2	pF

1. Capacitance values are for a cold tube as measured in a special shielded fixture in accordance with Electronic Industries Association Standard RS-191.

RADIO FREQUENCY LINEAR AMPLIFIER CATHODE DRIVEN Class AB_2

ABSOLUTE MAXIMUM RATINGS:

DC PLATE VOLTAGE	4000	VOLTS
DC PLATE CURRENT	1.0	AMPERE
PLATE DISSIPATION	1500	WATTS
GRID DISSIPATION	25	WATTS

TYPICAL OPERATION (Frequencies to 30 MHz)
Class AB2 Cathode Driven, Peak Envelope or Modulation Crest Conditions

Plate Voltage	2700	3500	Vdc
Cathode Voltage[1]	+8.2	+8.2	Vdc
Zero-Signal Plate Current[3]	92	182	mAdc
Single-Tone Plate Current	740	1000	mAdc
Two-Tone Plate Current	480	675	mAdc
Single-Tone Grid Current[3]	40	74	mAdc
Two-Tone Grid Current[3]	16	25	mAdc
Peak rf Cathode Voltage[3]	68	81	v
Peak Driving Power[3]	40	64	w
Single-Tone Useful Output Power[3]	1085	2075	W
Resonant Load Impedance	1820	2000	Ω
Intermodulation Distortion Products[2]			
3rd Order	-40	-38	dB
5th Order	-41	-41	dB

1. Positive cathode bias provided by zener diode.
2. The intermodulation distortion products are referenced against one tone of a two equal tone signal.
3. Approximate values.

TYPICAL OPERATION (220 MHz)
Class AB_2 Cathode Driven

Plate Voltage	2500	Vdc
Cathode Voltage[1]	+8.2	Vdc
Plate Current	1000	mAdc
Grid Current[2]	10	mAdc
Useful Output Power[2]	1520	W
Driving Power[2]	57	W
Power Gain[2]	14	dB

1. Positive cathode bias provided by zener diode.
2. Approximate value.

RADIO FREQUENCY POWER AMPLIFIER

Class B Telegraphy or FM
(Continuous Operating Conditions)

ABSOLUTE MAXIMUM RATINGS:

DC PLATE VOLTAGE	4000	VOLTS
DC PLATE CURRENT	1.0	AMPERE
PLATE DISSIPATION	1500	WATTS
GRID DISSIPATION	25	WATTS

TYPICAL OPERATION (88-108 MHz) Measured Values
Class B, Cathode Driven

Plate Voltage	2000	2500	3000	4000	Vdc
Cathode Voltage[1,2]	+9	+12	+15	+20	Vdc
Plate Current	1.0	1.0	1.0	1.0	Adc
Grid Current[2]	60	58	42	25	mAdc
Driving Power[2]	64	54	65	78	W
Useful Power Output[3]	1330	1670	1960	2600	W
Efficiency[4]	66.5	66.7	65.5	65.2	%
Power Gain[4]	13.2	14.2	14.8	15.3	dB

1. For measured case, idling anode current was set for 10 mAdc.
2. Approximate.
3. Approximate, delivered to the load.
4. For the measured case; may vary from tube to tube.

RADIO FREQUENCY POWER AMPLIFIER

Class C - Cathode Driven, Plate Modulated

ABSOLUTE MAXIMUM RATINGS:

DC PLATE VOLTAGE	3200	VOLTS
DC PLATE CURRENT	0.8	AMPERE
PLATE DISSIPATION	1000	WATTS
GRID DISSIPATION	25	WATTS

TYPICAL OPERATION Carrier Conditions, Frequencies to 30 MHz, Cathode Driven

Plate Voltage	2400	Vdc
Cathode Voltage[1]	+22	Vdc
Plate Current[2]	600	mAdc
Grid Current[2]	45	mAdc
Plate Load Resistance	2000	Ω
Driving Power[3]	41	W
Plate Output Power	1000	W
Power Gain	14	dB

1. Bias may be obtained from a fixed supply of 15.8 volts in series with a 9.5 ohm resistor. The resistor & supply should be bypassed for audio frequencies.
2. Approximate.
3. Approximate, and driver must be modulated approximately 83%.

APPLICATION

MECHANICAL

MOUNTING - The 8877/3CX1500A7 may be mounted in any position.

SOCKET - The grid of the 8877/3CX1500A7 terminates in the cylindrical grid ring about the base of the tube. This may be contacted by multiple clips or flexible finger stock. Connections to the heater and cathode are made via the 7-pin base.

COOLING - The maximum temperature limit for external tube surfaces and the anode core is 250°C. Tube life is prolonged if these areas are maintained at lower temperatures. For full 1500 watt anode dissipation 38.0 cfm of air is required at a back pressure of 0.60 inches to hold tube temperature below 225°C with 50°C ambient temperature at sea level. At frequencies higher than 30 MHz, or at high altitudes, the air quantity must be increased.

Base-to-Anode Air Flow (sea level)		
Anode Dissipation (watts)	Air Flow (CFM)	Pressure Drop In./H 0
500	7.5	0.10
1000	22.5	0.20
1500	35.0	0.41
Base-to-Anode Air Flow (10,000 ft.)		
Anode Dissipation (watts)	Air Flow (CFM)	Pressure Drop In./H 0
500	11.0	0.15
1000	32.5	0.29
1500	51.0	0.60

Note: 1) Tube mounted in SK-2200 Socket with SK-2216 Chimney.
2) An allowance of 25 watts has been made for grid dissipation and 50 watts for filament power.

ELECTRICAL

FILAMENT OPERATION - Rated filament voltage for the 8877/3CX1500A7 is 5.0 volts. Filament voltage, as measured at the socket optimum performance and maximum tube life. In no case should it be allowed to deviate from 5.0 volts by more than plus or minus five per cent.

INPUT CIRCUIT - When the 8877/3CX1500A7 is operated as a cathode driven rf amplifier, the use of a resonant circuit in the cathode is recommended. For best results with a single-ended amplifier it is suggested that the cathode tank circuit operate at a Q of two or more.

ZERO-BIAS OPERATION - Operation at zero-bias is not recommended with plate potentials over 3000 volts, since plate dissipation may be exceeded. Higher plate voltage may be used with the proper protective bias.

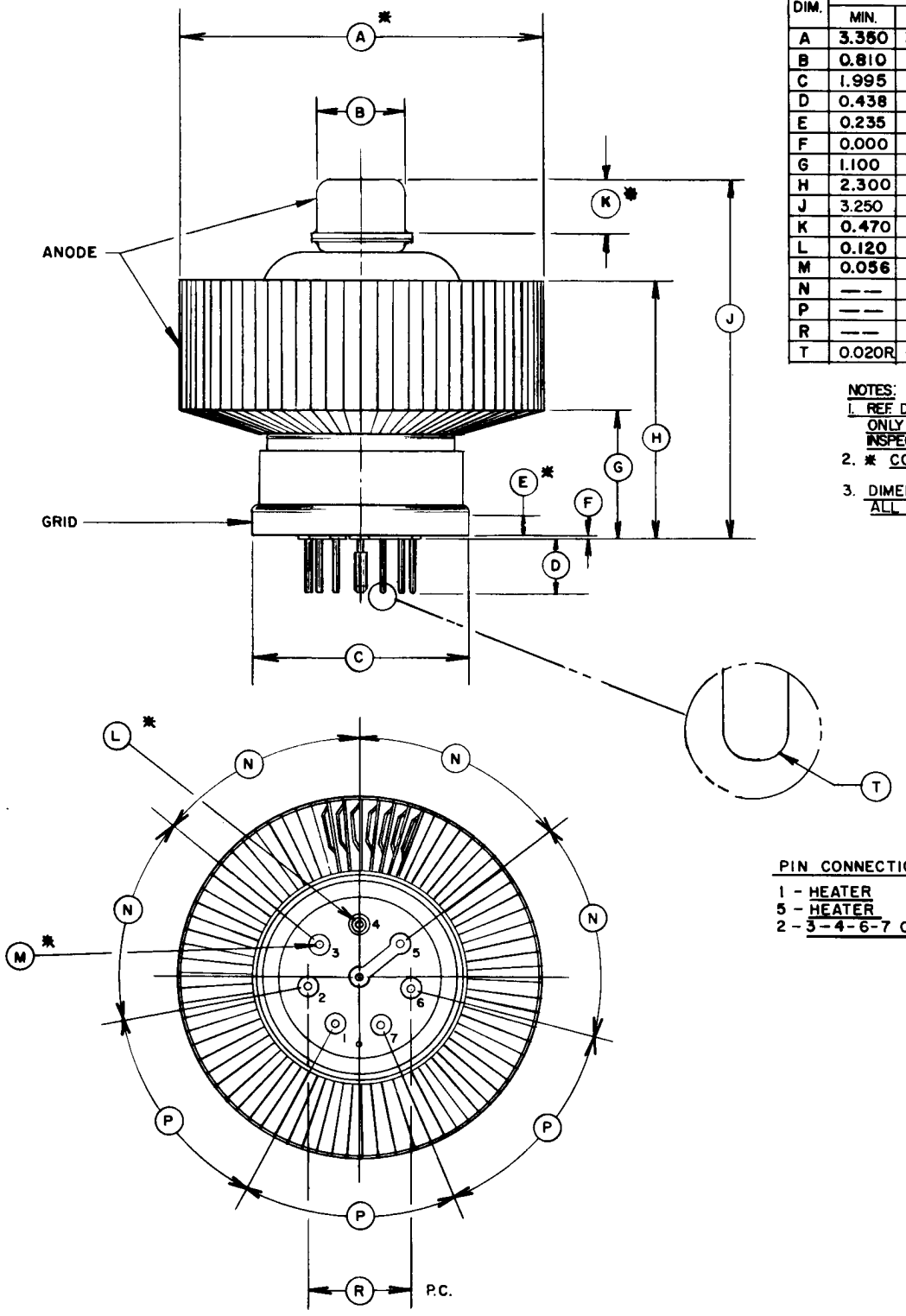
HIGH VOLTAGE - The 3CX1500A7 operates at voltages which can be deadly, and the equipment must be designed properly and operating precautions must be followed. Equipment must be designed so that no one can come in contact with high voltages. All equipment must include safety enclosures for high-voltage circuits and terminals, with interlock switches to open the primary circuits of the power supplies and to discharge high voltage condensers whenever access doors are opened. Interlock switches must not be bypassed or "cheated" to allow operation with access doors open. Always remember that HIGH VOLTAGE CAN KILL.

RADIO FREQUENCY RADIATION - Avoid exposure to strong rf fields even at relatively low frequency. Absorption of rf energy by human tissue is dependent on frequency. Under 30 MHz, most of the energy will pass completely through the human body with little attenuation or heating effect. Public health agencies are concerned with the hazard, however, even at these frequencies, and it is worth noting that some commercial dielectric heating units actually operate at frequencies as low as the 13 and 27 MHz bands.

INTERELECTRODE CAPACITANCE - The actual internal interelectrode capacitance of a tube is influenced by many variables in most applications, such as stray capacitance to the chassis, capacitance added by the socket used, stray capacitance between tube terminals, and wiring effects. To control the actual capacitance values within the tube, as the key component involved, the industry and the Military Services use a standard test procedure as described in Electronic Industries Association Standard RS-191. This requires the use of specially constructed test fixtures which effectively shield all external tube leads from each other and eliminates any capacitance reading to "ground". The test is performed on a cold tube. Other factors being equal, controlling internal tube capacitance in this way normally assures good interchangeability of tubes over a period of time, manufacturer's technical data, or test specifications, normally are taken in accordance with Standard RS-191.

The equipment designer is therefore cautioned to make allowance for the actual capacitance values which will exist in any normal application. Measurements should be taken with the socket and mounting which represent approximate final layout if capacitance values are highly significant in the design.

SPECIAL APPLICATIONS - If it is desired to operate this tube under conditions widely different from those given here, write to Power Grid Tube Division, EIMAC, Division of Varian, 301 Industrial Way, San Carlos, California 94070 for information and recommendations.

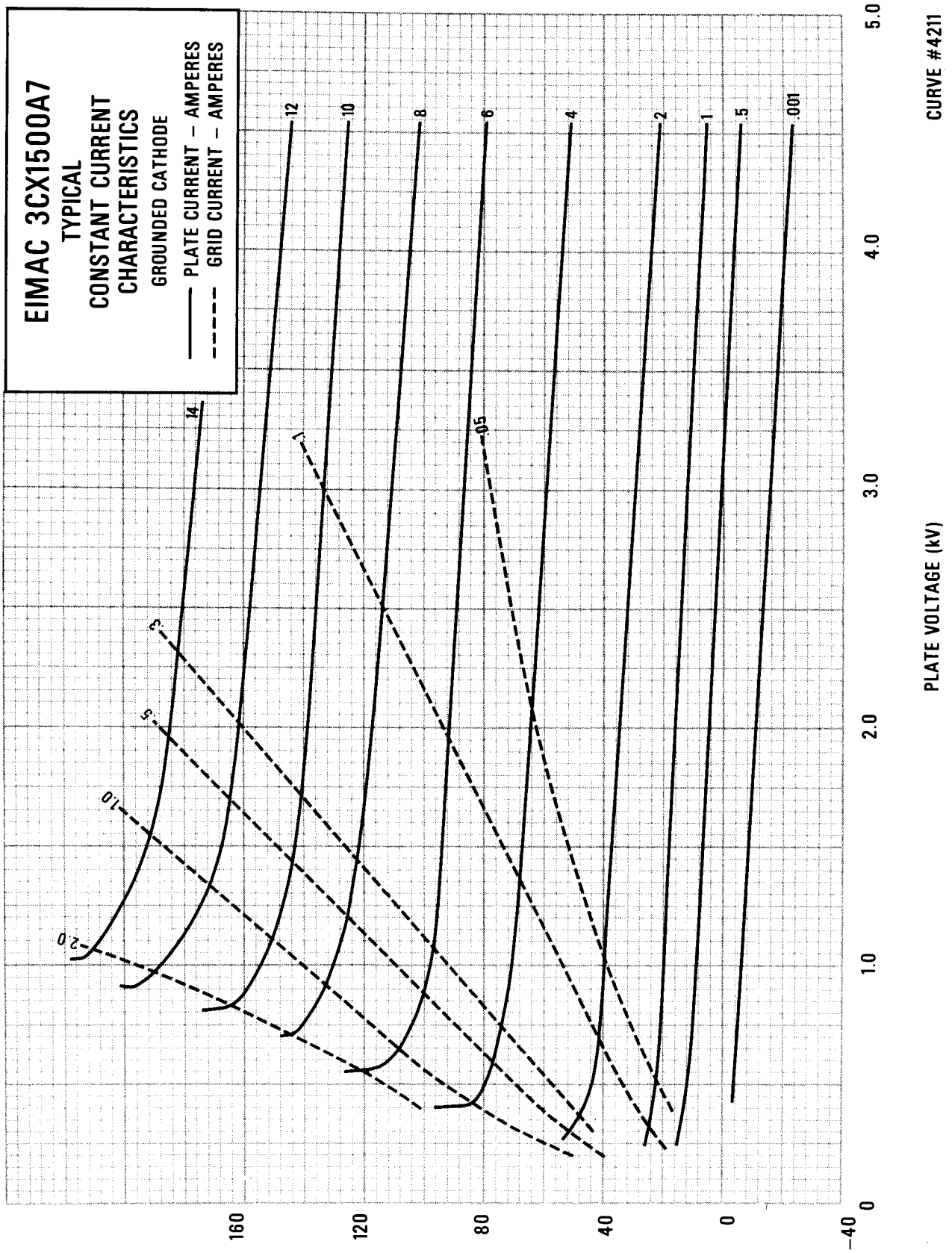


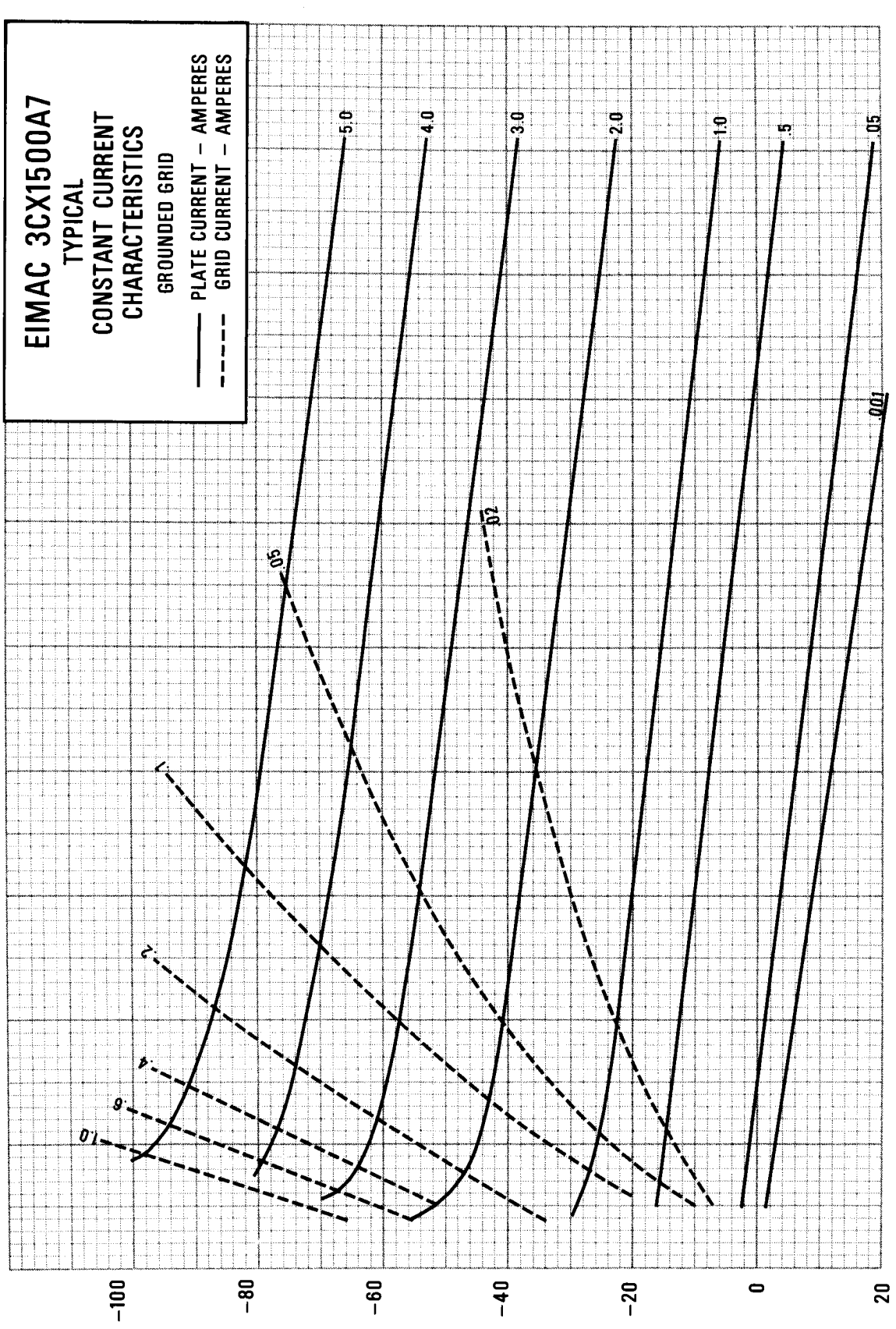
DIMENSIONAL DATA						
DIM.	INCHES			MILLIMETERS		
	MIN.	MAX.	REF.	MIN.	MAX.	REF.
A	3.350	3.380	— —	85.09	85.85	— —
B	0.810	0.820	— —	20.57	20.83	— —
C	1.995	2.015	— —	50.67	51.18	— —
D	0.438	0.562	— —	11.13	14.27	— —
E	0.235	— —	— —	5.97	— —	— —
F	0.000	0.040	— —	0.00	1.02	— —
G	1.100	1.225	— —	27.94	31.12	— —
H	2.300	2.425	— —	58.42	61.60	— —
J	3.250	3.420	— —	82.55	86.87	— —
K	0.470	0.530	— —	11.94	13.46	— —
L	0.120	0.127	— —	3.05	3.23	— —
M	0.056	0.062	— —	1.42	1.57	— —
N	— —	— —	51°	— —	— —	51°
P	— —	— —	52°	— —	— —	52°
R	— —	— —	1.000	— —	— —	25.40
T	0.020R	— —	— —	0.51R	— —	— —

NOTES:
1. REF. DIMENSIONS ARE FOR INFO. ONLY & ARE NOT REQUIRED FOR INSPECTION PURPOSES.
2. * CONTACT SURFACE.
3. DIMENSION T APPLIES TO ALL BUT CENTER PIN.

PIN CONNECTIONS

1 - HEATER
5 - HEATER
2 - 3-4-6-7 CATHODE


EIMAC 3CX1500A7
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
GROUNDED CATHODE
PLATE CURRENT – AMPERES
GRID CURRENT – AMPERES
14
12
10
8
6
4
2
1
.5
.05
.001
3
1.5
1.0
.7
2.0
160
120
80
40
0
-40
0
1.0
2.0
3.0
4.0
5.0
GRID VOLTAGE (V)
PLATE VOLTAGE (kV)
CURVE #4211


EIMAC 3CX1500A7
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
GROUNDED GRID
PLATE CURRENT – AMPERES
GRID CURRENT – AMPERES
5.0
4.0
3.0
2.0
1.0
.5
.05
.001
.05
.02
1.0
.6
.4
.2
CATHODE TO GRID VOLTAGE (V)
-100
-80
-60
-40
-20
0
20
0
1.0
2.0
3.0
4.0
5.0
PLATE TO GRID VOLTAGE (kV)
CURVE #4250