

H E N R Y R A D I O

Models 2-K, 2-KD and 2-KR

LINEAR AMPLIFIER

INSTRUCTION MANUAL

T A B L E O F C O N T E N T S

Henry Radio Models 2-K, 2-KD and 2-KR Linear Amplifiers

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H E N R Y R A D I O

2-K, 2-KD and 2-KR

LINEAR AMPLIFIER

1. DESCRIPTION

(a) Functional

The Henry 2-K Linear Amplifier is a one stage amplifier designed for SSB, CW, FSK and AM operation with any exciter capable of 80 to 160 PEP output. The 2-K is capable of maximum legal input in amateur bands between 3.5 and 29.7 megacycles. Utilizing parallel 3-400Z grounded-grid amplifier tubes and a unique band-switching network, the 2-K achieves maximum power and high stability with extreme simplicity of design.

(b) Physical

The Henry 2-K is a floor mounted console with the Radio Frequency module located in the upper cabinet section. The power supply is located in the lower cabinet.

The Henry 2-KD is a desk mounted unit with the power supply located externally. A cable is provided to connect the RF module with its power supply.

The Henry 2-KR is the RF module only as supplied with the 2-KD. To comprise a complete operating amplifier it must be associated with an external high voltage power supply.

1. DESCRIPTION (Continued)

The front panel of the 2-K contains the following meters and controls as shown in figure 1 (page 3):

- A -- Band change control linked by stainless steel cable to plate tank bandswitch S-4, L-Section bandswitch S-3 and cathode input selector switch S-5, all as indicated in the circuit diagram.
- B -- Plate tuning control linked to plate resonance condenser C-19. To be adjusted for minimum current reading on meter H.
- C -- Load control linked to L-Section load condenser C-20. To be adjusted for maximum desired current reading on meter H.
- D -- Filament switch S.P.S.T. noted as S-1 Low voltage switch on circuit diagram. Controls filament voltage for 3B28, 3-400Z tubes, air blower, and 115N020 time delay relay.
- E -- Filament indicator lamp. Displays green light when filament voltage is on.
- F -- High voltage plate switch D.P.D.T. noted as S-2, high voltage switch on diagram. Controls primary voltage to power transformer by means of step-start relays #1 and #2.
- G -- High voltage indicator lamp. Displays red light when primary voltage is applied to T-1.
- H -- Power amplifier current meter. Reads cathode current in amperes of the two 3-400z tubes.

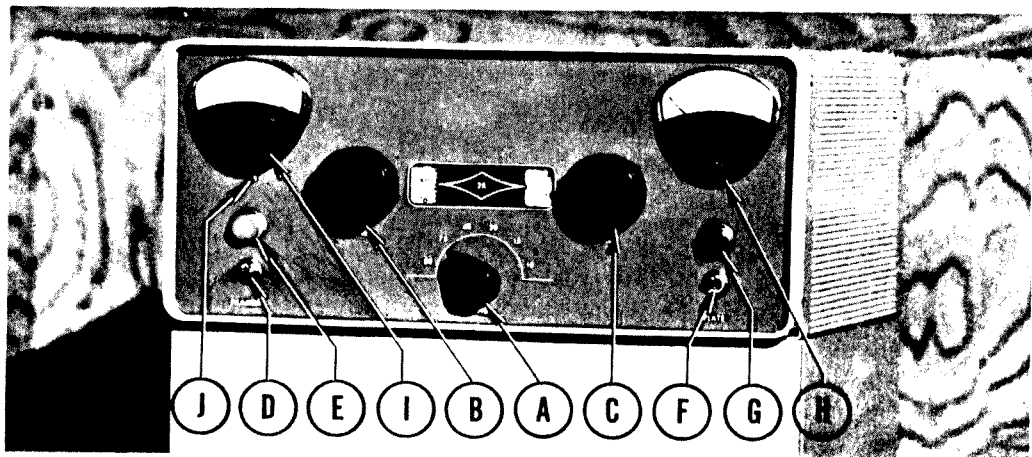
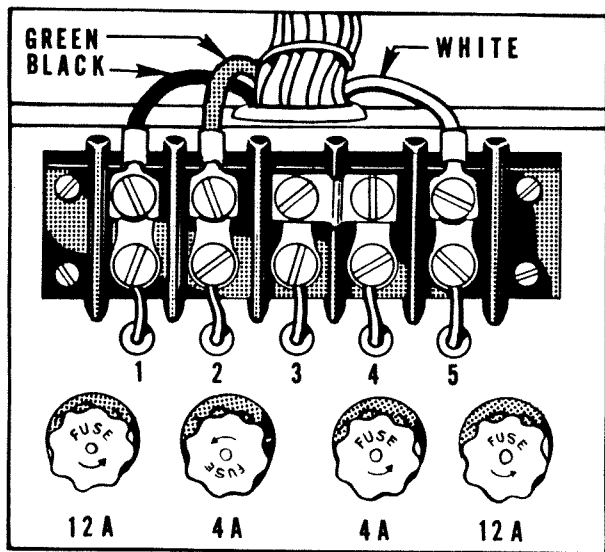
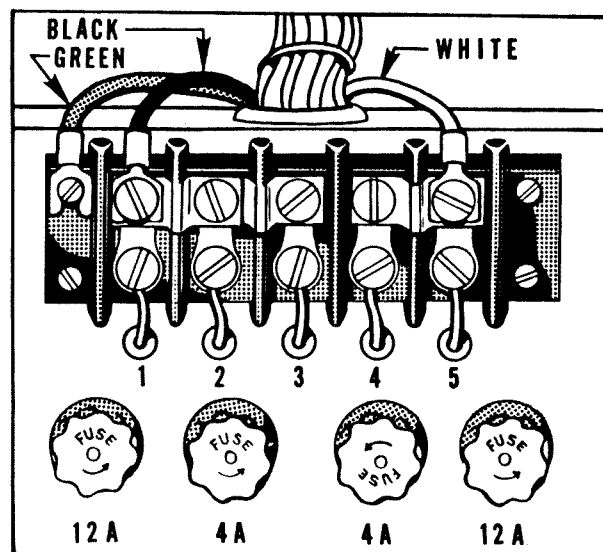


FIG. 1



220 V.A.C.



115 V.A.C.

FIG. 2

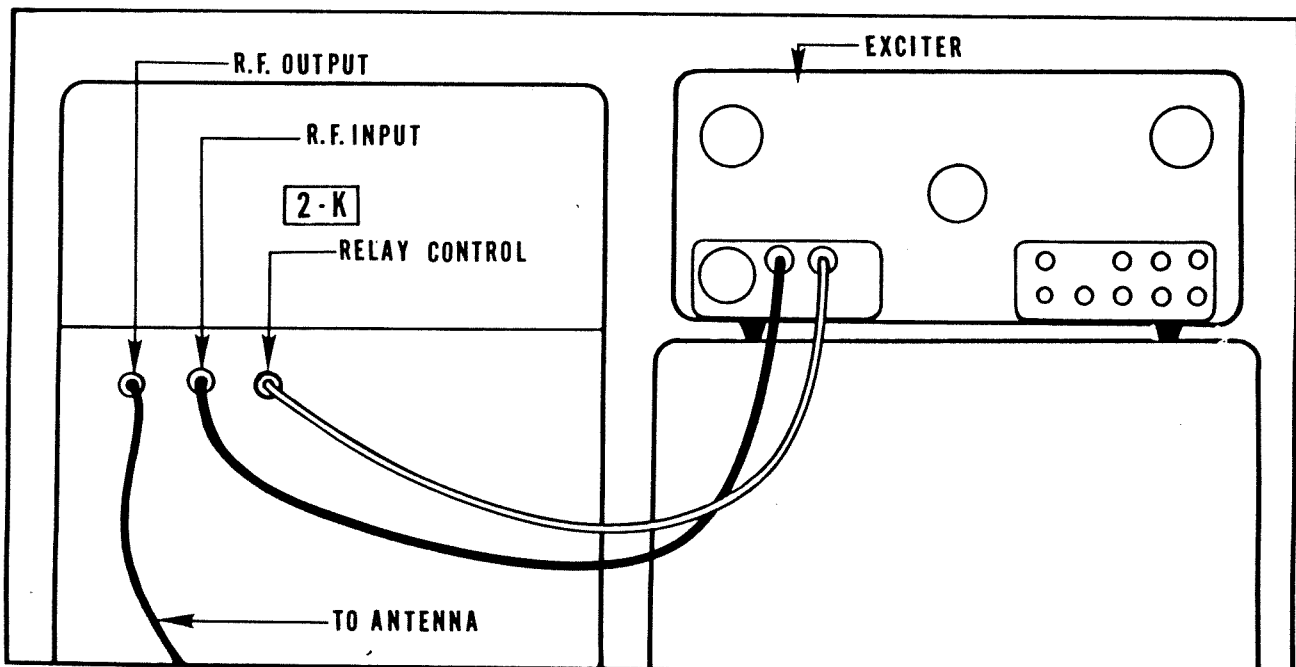


FIG. 3

1. DESCRIPTION (Continued)

I -- Multimeter. In normal operation the meter indicates grid current in milliamperes of the two 3-400Z tubes when driven by exciter. Noted as M-2 on the circuit diagram. See J below for alternative function.

J -- Momentary contact push-button switch noted S-6 on diagram. When button is depressed, multimeter (I above) indicates high voltage---computed as the indicated number times 10. Thus a reading of 250 indicates 2500 volts DC plate voltage.

(c) Specifications

Power Input	SSB 2,000 watts PEP CW 1,000 watts AM 1,000 watts
Drive Requirements	SSB 80-150 watts PEP CW 60-150 watts AM 40- 60 watts
Frequency Range	3.5 megacycles-29.7 Mc.
Power Requirements	115 VAC-50-60 cycle-30 amp 230 VAC-50-60 cycle-15 amp 3/wire/ single phase
Impedance	Input 52 ohms Output 52 ohms
Noise Level	40 db down from outgoing signal with 1 KW.
Intermodulation Distortion	More than 35 db below peak output.
Tubes	3-400Z (2 ea.) 3B28 (2 ea.)
Size	2-K 14 $\frac{1}{2}$ " x 13" x 29 $\frac{1}{2}$ " 2-KD 14 $\frac{1}{2}$ " x 13" x 12" 2-KR 14 $\frac{1}{2}$ " x 13" x 12"

1. DESCRIPTION (Continued)

Net Weight

2-K 154 lb.
2-KD 154 lb.
2-KR 40 lb.

Shipping Weight

2-K 180 lb.
2-KD 180 lb.
2-KR 52 lb.

2. INSTALLATION

(a) Remove the 2-K from its shipping carton and place in an upright position on the floor. Remove the power supply front door and install the two 3B28 rectifier tubes in the sockets provided for them at the left hand front of the power supply chassis. Seat them securely in their sockets and attach the insulated plate caps to the metal anodes protruding from the tops of the tubes. Remove the perforated metal top of the RF module and insert the two 3-400Z tubes in their sockets, located at the left hand side of the chassis. Be certain that the tubes are seated securely in their sockets. Install the air system chimneys over the 3-400Z tubes, taking care that they rest flush against the chassis so as to provide an effective air seal and so that each chimney is grasped securely by its retaining springs. The 3-400Z tubes are shipped with their proper heat radiating caps already in place. To connect the plate leads, first remove the flat head screw from the top of each cap. Release the two plate leads and their associated parasitic chokes from their secured position. You will note that they have been tied to the plate tuning condenser to prevent vibration during shipment. Flex each lead gently so that the punched hole in the end of the lead is positioned just above the screw hole in the top of the anode heat radiating connector. Now reinsert the

2. INSTALLATION (Continued)

flat head screws so that each plate lead is securely fastened to its proper anode connector.

If installing the 2-KD amplifier, the external power supply should now be connected to the RF module using the cable provided for this purpose. It should be noted that the cable is terminated both by an eleven prong socket, which must be seated on its matching plug, and by a two-wire AC cable terminated by solder lugs. This two-wire cable provides the 110 volt current to run the blower and light the filaments of the 3-400Z tubes. The terminating lugs are to be fastened to the two feed through condensers on the rear chassis, after first removing the black plastic insulating cover to gain access to the terminals. The Redmond air blower which is employed to cool the 3-400Z tubes may now be attached to the 2 inch air inlet duct located at the lower right hand corner on the rear apron of the RF module. At the same time plug the 115 volt cable attached to the blower motor into the AC receptacle provided for this purpose, adjacent to the air inlet duct.

(b) The standard power connection for the 2-K is for 230 volts 50-60 cycles AC. In the absence of contrary instructions, all new units are so delivered. To operate from 115 volts, the following changes must be made in the five terminal black plastic AC power block. This block is located in the right hand front corner of the power supply section, immediately at the top of the relay

2. INSTALLATION (Continued)

sub-chassis. Leave the black and white wires connected to terminals 1 and 5, remove a shorting jumper between terminals 3 and 4, and place it between 4 and 5. Then connect a shorting jumper between numbers 1, 2, and 3. Remove the green wire from number 2 and connect to ground. The normal configurations for both 230 volts and 115 volts are indicated in figure 2 (page 3).

(c) Figure 3 (page 3) shows a representative complete transmitting station consisting of an S line exciter, and the 2-K amplifier. Note that the RF output of the 32S is connected to the BNC, RF input connector of the 2-K. The antenna relay connector of the 32S is plugged into the RCA type relay control socket of the 2-K. Finally the antenna is attached to the SO-239 coax connector which is the RF output of the 2-K.

(d) After the above noted interconnections have been made, place the Filament switch in the UP or ON position. The green indicator light on the front panel will light, the dial lights will go on and the filaments of the 3-400Z tubes will light. At the same time the Redmond air blower will commence to move air. Verify this fact by holding your hand immediately above the chimneys of the 3-400Z tubes. It is extremely important that air be circulated whenever the filaments of the 3-400Z tubes are lighted. Failure to observe this precaution will permanently damage the tubes. The time delay relay will

2. INSTALLATION (Continued)

prevent the high voltage circuits from being energized for approximately 20 seconds after the Filament switch is placed in the ON position. During this time the Plate switch will be inoperative and should be left in the down or OFF position. After the time delay relay has operated, the Plate switch may be placed in the up or ON position and the red indicator lamp in the front panel will light, indicating that the 2-K is ready for operation. As a final determination that the high voltage has been actuated, the small black push-button switch below the Multimeter may be depressed. Depending on line voltage at the operating position, the meter should indicate between 250 and 300--that is between 2500 and 3000 volts DC. If the green filament indicator lights but the red high voltage indicator does not register high voltage, you may reasonably suspect that the interlock switch mounted under the front edge of the removeable lid on the RF module is not being actuated or that a similar interlock mounted behind the power supply door or the interlock located on the bottom plate of the power supply is not being actuated.

W A R N I N G

DO NOT BLOCK EQUIPMENT INTERLOCKS. HIGH VOLTAGES PRESENT IN THE 2-K AMPLIFIER ARE DANGEROUS TO LIFE. ALWAYS TURN HIGH VOLTAGE SWITCH TO OFF POSITION BEFORE MAKING ANY ADJUSTMENT INSIDE AMPLIFIER CABINET. TAKE PARTICULAR CARE TO NOTE THAT THE RED PLATE VOLTAGE PANEL LIGHT IS NOT LIGHTED. AS A FINAL PRECAUTION SHORT AN EXPOSED HIGH VOLTAGE POINT DIRECTLY TO GROUND USING A SCREW DRIVER HAVING AN INSULATED HANDLE.

3. OPERATION

- (a) Set High Voltage switch to OFF. Set Low Voltage switch to ON. (Green lamp lighted) In this condition the exciter bypasses the 2-K, and the exciter may be tuned to the desired frequency and loaded directly into the 52 ohm antenna or dummy load at the output of the 2-K linear amplifier.
 - (b) Set Bandswitch to the desired band. Set Load control fully counter clockwise.
 - (c) Set High Voltage switch to ON. (Red lamp lighted) Apply drive signal from exciter. Adjust exciter drive to obtain a reading of 300 milliamperes on the Plate Current meter.
 - (d) Adjust Tune Control to obtain Plate current meter dip. When dip is obtained, advance the exciter drive gradually in conjunction with step (e) below until the 2-K grid meter indicates 250 to 280 milliamperes maximum when Full plate loading has been achieved. Note if full drive is applied prior to achievement of full plate load, arcing may occur in the plate tuning condenser. Such arcing will not result in damage, but may blow the grid meter fuse, and can be quenched only by turning OFF the high voltage plate switch in the front panel.
 - (e) Advance Load Control, then re-dip with Tune Control. Repeat these steps alternately until the dip point is at the desired Plate Current meter reading. This reading should be 800 milliamperes for SSB or AM operation, and 400 milliamperes for CW. For AM operation the exciter drive must be reduced to 400 milliamps.
- NOTE: The 800 milliamp load accomplished in (a) through (e)

3. OPERATION (Continued)

above, at 2500 volts, equals 2 KW. This is twice the input power allowed by FCC regulations and can only be accomplished legally into a dummy load. To load the amplifier directly into the antenna without exceeding the 1 KW input limit, the alternative loading procedure below should be followed.

3.1. ALTERNATE LOADING PROCEDURE

(a) Proceed as in steps (a) through (d) above, except that in step (d) the exciter drive must be adjusted so that the amplifier Grid Current meter indicates 50 milliamperes.

(b) Advance Load Control, and re-tune with Tune Control, repeating as necessary until dip point is at 400 milliamperes on the Plate Current meter. CAUTION: During this procedure the grid current will vary so that it will be necessary to readjust the exciter drive control in order to maintain a constant grid current reading of 50 milliamperes.

(c) Once the exact calibration of Tune and Load dials have been determined for a specific frequency and antenna it will be convenient to record these calibrations so that the same settings may be quickly duplicated in the future. A table is provided at the back of this instruction book for this purpose.

(d) It will be observed by the user that the same settings of Tune and Load which provide 400 milliamperes of plate current at 50 milliamperes of grid current will also provide 800 milliamperes of plate current when the exciter drive is advanced to obtain approximately 280 ma of grid current.

3.1. ALTERNATE LOADING PROCEDURE (Continued)

(e) Maximum power may not be achieved with low power exciters. In this event, load the amplifier for the highest output possible with the available drive.

3.2. SECOND ALTERNATE LOADING PROCEDURE

One additional loading procedure may be of interest to those users who want maximum power output consistent with greatest linearity and lowest intermodulation distortion. Using this method the amplifier is connected to the antenna or dummy load through an RF wattmeter or SWR bridge. The method of resonating loading as described previously is employed. In this case, however, instead of loading to 800 milliamperes, continue to advance the load control, alternately adjusting the tuning control for minimum plate current, until maximum RF output is obtained. This may occur at 800 milliamperes or 900 milliamperes or possibly as high as 1 ampere depending on the local line voltage and the amount of RF drive available. Now continue to increase the load control as before retuning for minimum dip until the output drops by approximately 5%. Typical readings at maximum output might be 1200 watts, so the over coupled condition would then yield 1140 watts. In this condition the 3-400Z tubes will operate at maximum linearity and lowest intermodulation distortion.

4. CIRCUITRY

The 2-K curcuitry includes an RF amplifier section and a power supply section. In the 2-KD the power supply is located externally.

(a) Power Supply

The power supply is designed to operate from either a 115 VAC 50-60 cycle, or 230 VAC 50-60 cycle, power source. Two Xenon vapor 3B28 tubes (V1 and V2) supply high voltage for the RF amplifier section. A system of time-delay relays protects V1 and V2 during their required warmup period. Closing the Low Voltage switch (S1) provides time-delay relay voltage from T3 and supplies 115 VAC to filament transformer T2. A twenty second delay is obtainable by RY4, after which time the High Voltage switch (S2) may be closed, energizing RY1 and---after an additional 2 second delay---RY5 and RY2. V1 and V2 will now conduct and supply high voltage to the RF amplifier section.

(b) RF Amplifier

The RF amplifier section utilizes two parallel 3-400Z triodes (V3 and V4) which, operating with grounded grids and requiring no bias, permit simple and stable circuit design. Maximum legal input on SSB is achieved with 80 watt PEP driver power. Tube characteristics are such that flattopping will not occur when driven within legal limits. Filament voltage for V3 and V4 is supplied from T4 when the Low Voltage switch is closed (S1).

Rf input is through RY3, which is controlled by the

4. CIRCUITRY (Continued)

High Voltage switch (S2). When S2 is open, RF input bypasses the RF amplifier through the N/C contacts of RY3 and is coupled directly to the antenna. When S2 is closed, RF input is fed through the N/O contacts of RY3 to the pi-network cathode input circuit. Five pi-sections couple the RF input through the S5 section of the Bandswitch to the cathodes of V3 and V4. Plate tuning is accomplished by C19. Plate loading is controlled by C20 and output bandswitching is accomplished through L10 and L11 by bandswitch sections S3 and S4.

Plate meter M1 measures plate current from 0-1 amp. Multimeter (M2) normally measures grid current from 0-400 milliamperes, but when push-button switch (S6) is depressed M2 monitors high voltage from the power supply from 0-4000 volts. A blower is provided to dissipate heat from the 3-400Z tubes. Two #47 lamps illuminate the front panel dials.

5. PARTS LIST

<u>Item</u>	<u>Description</u>
C1, C2	Capacitor, filter 10 mfd x 2500 V <i>(20000-3000 WRDC)</i>
C3	Capacitor, tuning choke resonator, .1 mfd x 7500 V
C4	Capacitor, filter 500 mfd x 25 V
C5 thru C7	Capacitor, feed through 2000 mmf
C8 thru C11	Capacitor, feed through .1 mfd x 600 V
C12	Capacitor, filter 200 mmf x 6 KV
C13 thru C15	Capacitor, coupling .01 mfd x 600 V
C16	Capacitor, filter 1000 mmf
C17, C18	Capacitor, coupling 1000 mmf
C19	Capacitor, variable, plate tuning 240 mfd x 4500 V
C20	Capacitor, ganged, variable, plate loading
C21 thru C23	Capacitor, silver, mica, 620 mmf
C24	Capacitor, silver, mica, 560 mmf
C25, C26	Capacitor, silver, mica, 430 mmf
C27	Capacitor, silver, mica, 360 mmf
C28	Capacitor, silver, mica, 330 mmf
C29	Capacitor, silver, mica, 130 mmf
C30	Capacitor, silver, mica, 120 mmf
C31, C32	Capacitor, silver, mica, 90 mmf
C33	Capacitor, silver, mica, 12 mmf
C34	Capacitor, silver, mica, 15 mmf
C35	Capacitor, silver, mica, 5 mmf
C36	Capacitor, silver, mica, 12 mmf
C37, C38	Capacitor, silver, mica, 27 mmf
CR1, CR2	Diode, 600V, 600 ma.
F1, F2	Fuse, 12 amp, 3AB
F3, F4	Fuse, 4 amp, 3AG
F5	Fuse, 1½ amp, 2500 V
L1, L2	Chokes, parasitic
L3	Choke, filament
L4	Choke, tuning →
L5 thru L9	Coil forms
L10	Coil, Air Dux, L-section
L11	Coil, Air Dux, Pi-section
M1	Meter, plate current, 0-1 amp
M2	Meter, Multi, 0-400 scale
R1, R2	Resistor, 10 ohm, 25 W
R3	Resistor, 150 ohm, 2 W 10%
R4 thru R7	Resistor, 1 meg ohm, 2 W 1%
R8 thru R10	Resistor, 20 K ohm, 100 W
R11, R12	Resistor, 22 K ohm, 2 W 10%
R13	Resistor, 47 K ohm, 2 W 10%
R14	Resistor, 22 K ohm, 2 W 10%
R15, R16	Resistor, 470 K ohm, 2 W 10%
R17	Resistor, .5 ohm, 1 W
R18	Resistor, 50 ohm, 25 W
R19	Resistor, 10 K ohm, 25 W

*Electro Type E-6422
8Hy 600mA DC 4000WRDC
DC-Res. = 55-2
Electro Engineering Works
Oakland California
(ans Collins 305A)
6.7.1980*

5. PARTS LIST (Continued)

<u>Item</u>	<u>Description</u>	
RY1 thru RY3	Relay, DPDT TR-12VDC	
RY4	Relay, time delay, 20 seconds	
RY5	Relay, time delay, 2 seconds	
S1	Switch, low voltage, SPST	
S2	Switch, high voltage, DPST	
S3	Bandswitch, RF output, 23.1297 modified	
S4	Bandswitch, RF output, 23.1297	
S5	Bandswitch, RF input, two-section, 2510	
S6	Switch, H. V. - grid current, push-button	
T1	Transformer, power <i>22.415V/5000-0-5000V - 500mA I.A.S.</i>	
T2	Transformer, filament, 3B28 <i>part: 300-0-300V, I.A.S., CO</i>	
T3	Transformer, relay supply	
T4	Transformer, 3-400Z filament	
V1, V2	Tubes, rectifier, 3B28	
V3, V4	Tubes, amplifier, 3-400Z	
Bulbs	#47 Dial Illumination	2 each
Bulbs	1815	2 each
BNC Chassis	Female	1 each
Blower	Redmond	1 each
Caps, plate	For 3-400Z	2 each
Chimney	For 3-400Z	2 each
Connector	High Voltage	1 each
Drive, Planetary		1 each
Drive, Right angle		1 each
Jack, Phono		1 each
Knobs	Tuning - Loading	2 each
Lights	Pilot, red and green	2 each
Output connector	S0-239	1 each
Socket, tube	For 3-400Z	2 each
Socket, tube	For 3B28	2 each

Henry Klabe transp.

*Secondary (5-6-7) to de
liver 2500V at 500mA DC.
I.A.S. with FW-rectifier
choke input filter*

TR1AD 69856

*Triad transp. Coop.
Los Angeles Calif.*

OCTUBRE

22

2-K FINAL TEST DATA SERIAL # 514

Band	Tuning Dial	Load Dial	Grid Current ma.	Output Watts
80	86	70	280	1000+
40	64	48	"	"
20	26	38	"	"
15	24	34	"	"
10	16	28	"	"

147 3/10/84 Calibration Chart

Band	Tuning Dial	Load Dial	Grid Current ma.	Output Watts
80				
80				
80				
40 ¹⁰⁰⁰	64	48		
40				
40				
20				
14.2 20	26 ✓	38 ✓		
20				
15				
21.235 15	26 ✓	36 ✓		
15				
10				
10 ²⁰	22 ✓	28 ✓		
10				

TRANSFORMER SPECIFICATION SHEET

TYPE HENRY 2K PLATE TRANSFORMER

CORE A-480 12 Mil Hipersil

STYLE NO. 7

DIMENSIONS:

H 8 3/8 IN.

W 8 IN.

D 5 IN.

MD 3 1/2 IN.

MW 7 IN.

MH #10-32 Stud IN.

WEIGHT 33 LBS

PRIMARY 120/240 VAC 60 Hz

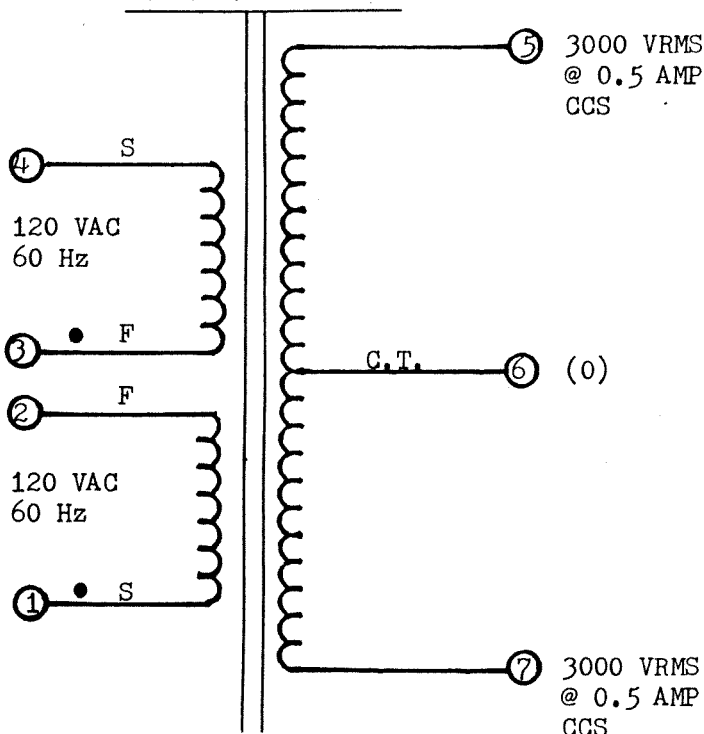
SECONDARY 3000-0-3000 VRMS

@ 500 MA CCS

TEMP RISE 50 °C

INSULATION 15 KV

WIRING DIAGRAM:



CONNECTIONS #10-32 studs for primary

and porcelain feed-thrus for secondary, all out bottom of transformer identical to original transformer.

VARNISH The transformer core and coil are potted in a high dielectric strength epoxy base potting compound.

NOTES This transformer is guaranteed for 1 year from date of purchase.

PETER W. DAHL CO., INC. • 4007 FORT BOULEVARD • EL PASO, TX. 79930 • (915) 566-5365

QUOTED TO _____

PRICE \$175.00/ea

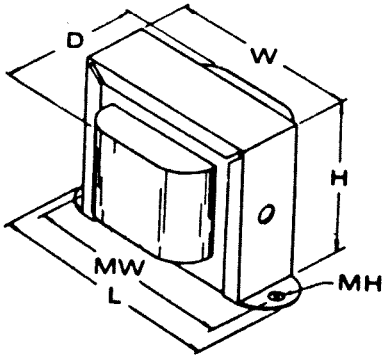
DELIVERY Stock Item

DATE QUOTED _____

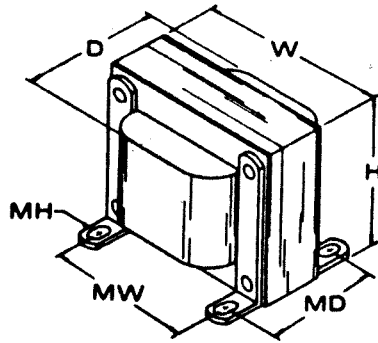
FOB El Paso, Texas

TERMS Check with Order, UPS COD Master Charge or VISA

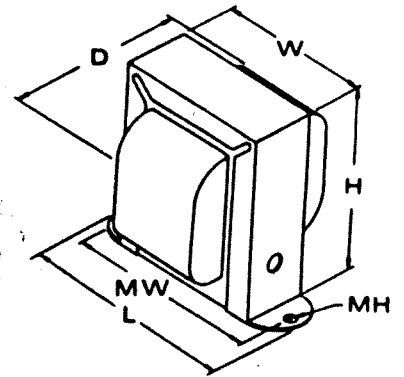
SPECIAL NOTES: This transformer is designed as a Heavy Duty Replacement for the Henry Model 2K Amplifier. This transformer uses a high quality low loss Hipersil core, and will run cooler and last longer than the original equipment transformer. This transformer has slightly higher output voltage 3000 vs 2800, but is otherwise identical to the original Henry 2K transformer, and will mount in the original chassis holes.



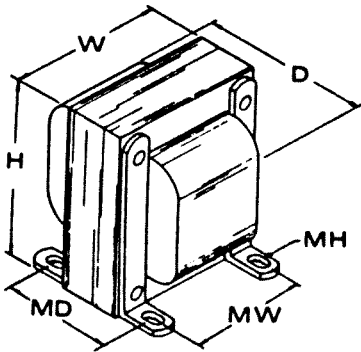
STYLE 1 HORIZONTAL CHANNEL



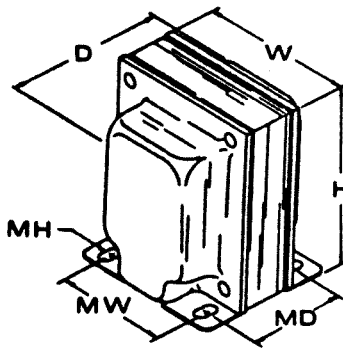
STYLE 2 HORIZONTAL BRACKET



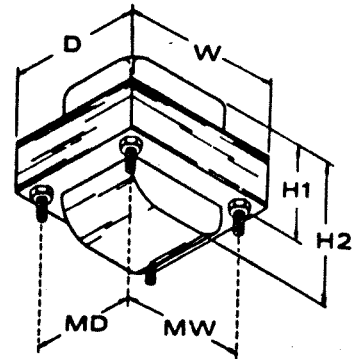
STYLE 3 VERTICAL CHANNEL



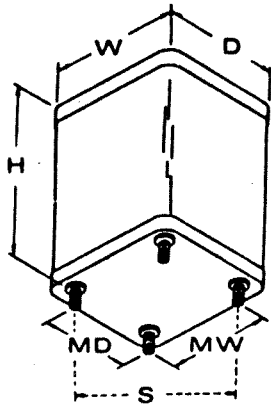
STYLE 4 VERTICAL BRACKET



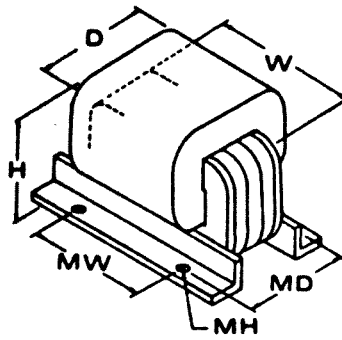
STYLE 5 ENDBELL



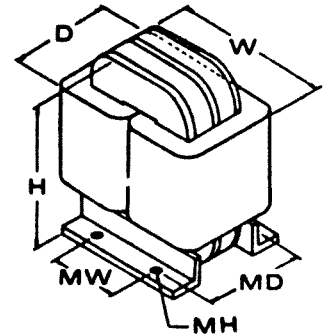
STYLE 6 HALFSHELL



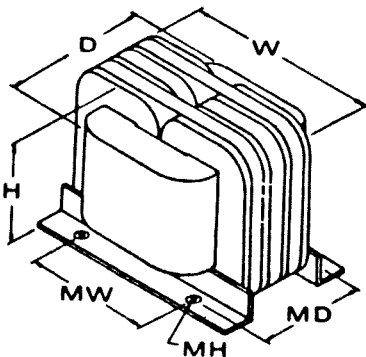
STYLE 7 METAL ENCASED



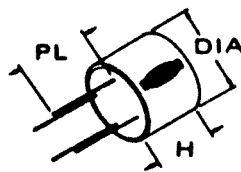
STYLE 8 SIMPLE TYPE



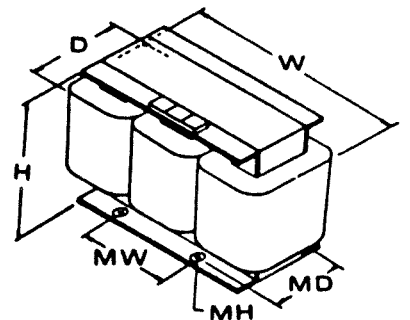
STYLE 9 CORE TYPE



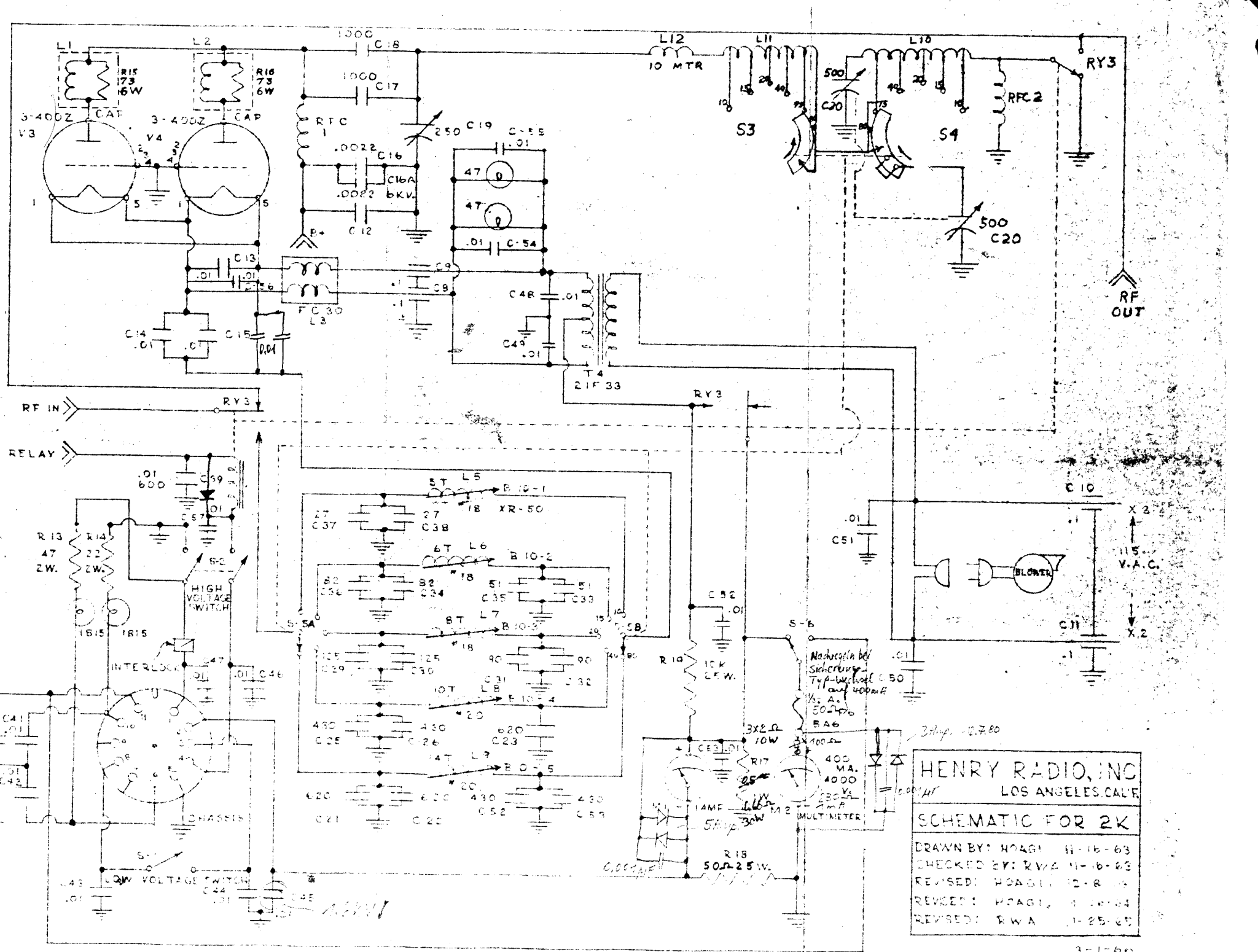
STYLE 10 SHELL TYPE



STYLE 11 CUP TYPE



STYLE 12 THREE-PHASE



HENRY RADIO, INC
 LOS ANGELES, CALIF.
SCHEMATIC FOR 2K
 DRAWN BY: HOAGI 11-16-63
 CHECKED BY: RWA 11-16-63
 REVISED: HOAGI 12-8-63
 REVISED: HOAGI 1-10-64
 REVISED: RWA 1-25-65