

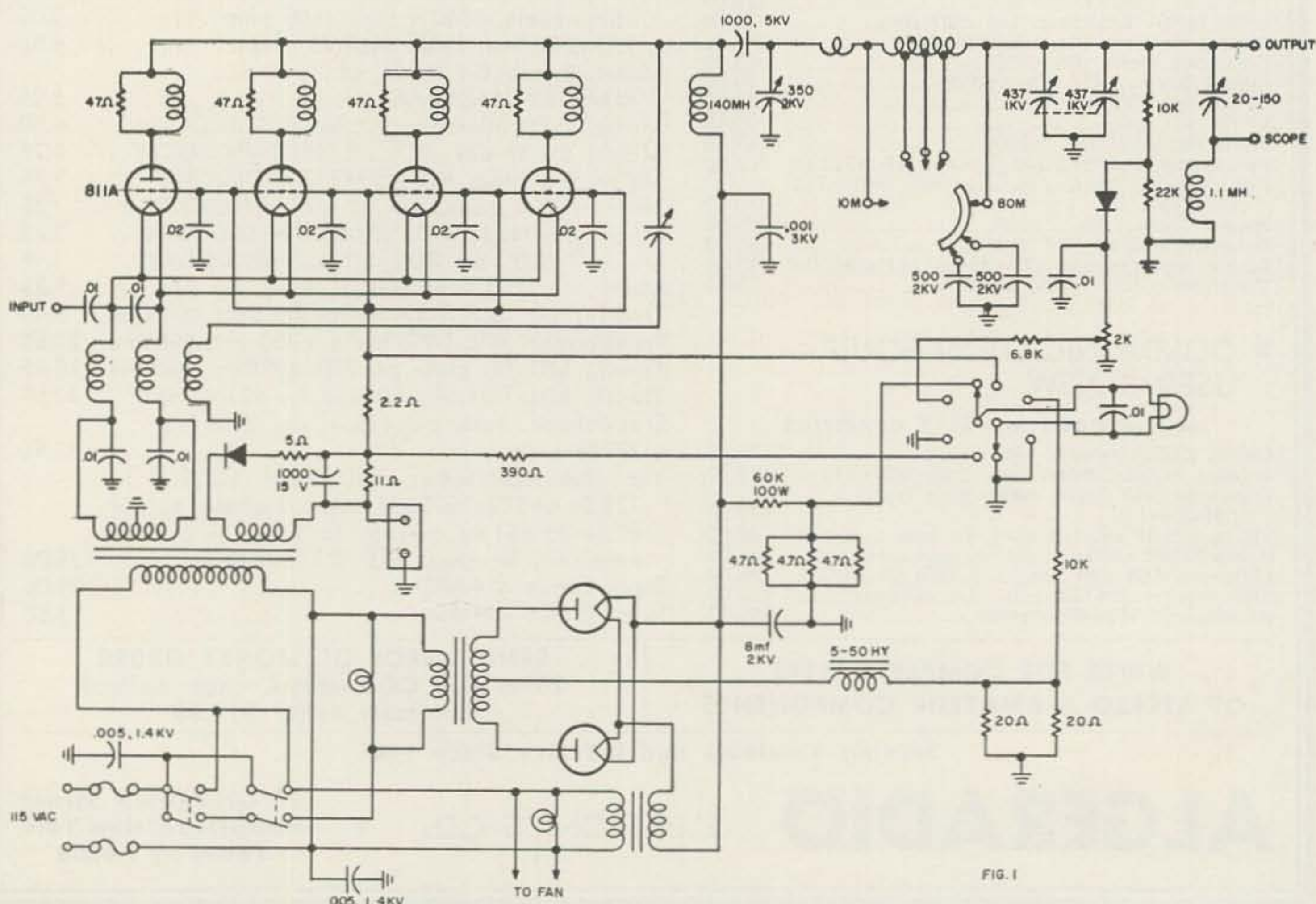
A Ham Looks at the Heath Warrior

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A RECENT EXAMINATION of the QSL cards received here at W6EUM during the past two years revealed an interesting fact—for the cards received, over 44% of the stations involved used some model of Heathkit transmitter. This fact struck your writer with some little impact. There must be some reason for such a situation and since he does possess a well known 140 watt SSB transmitter, the decision was made to look into it by the purchase of a Heathkit Warrior Linear Amplifier.

This article is an attempt to review this Warrior as Joe Blow ham might see it and not necessarily as an advertising agent for the Heath Company might.

When you, as the purchaser, receive the unit you will be impressed by one thing—it is heavy (shipping weight 99 pounds). This would immediately indicate rather solid construction and, upon unpacking, this belief is verified. The chassis is made from heavy gage steel, the panel and cabinet are solid construction and the transformers, while not oversize, seem to be adequate. The chassis, in fact, is outstanding in its solid, heavy construction. It is made in two parts, the sides and the top, with the top, for example, bolted to the sides with twenty-two machine screws and nuts. Not self tapping screws, but 22 machine screws—shades of military equipment.



The general parts, condensers, resistors, tubes, etc., are standard quality brands—RCA, Johnson, etc. No attempt at all was made to cut financial corners on parts.

The mechanical assembly was straightforward and offered no difficulty with but two exceptions. One machine screw holding the rf shield around the rf section was quite inaccessible, taking the special nut starting tool which they furnish, and the use of long nose pliers to start. The second exception was a little more serious. The front panel has two indicator light assemblies which go through the front escutcheon plate, the front panel and on through the chassis. In my unit the holes in the three pieces were not quite in line which necessitated a few judicious swipes with a round file. The material filed off probably amounted to only a couple thousandths of an inch, but if the assembly doesn't go together it might as well be an inch.

Electronically the circuit is a standard grounded grid linear amplifier. The drive is applied via a 50 ohm co-ax directly to the filaments of the four 811A tubes. The rf is coupled to both sides of the filament through disc ceramic capacitors. The rf choke in the filament leads is physically quite small—by B and W standards—and consists of a bifilar winding about 2½ inches long by 1 inch in diameter, wound around an iron core which apparently is made of normal slug material. The interesting part of this assembly is the feedback winding which is spaced over the filament portion and is connected in series with a neutralizing condenser to the plates of the 811A's.

The unit is very easy to drive, their statement of 50 watts needed to drive it to a full KW seems to be a perfectly safe statement if a reasonable SWR is present in the output co-ax. No exact measurements were made but on the lower frequency bands a full gallon was possible at something less than 50 watts. This is output from your exciter, of course, and not input. An input of around 75 watts seems to be a safe minimum figure. Of course if your exciter is a little short on power you can drive it to something less than a KW. It will operate fine at 700 watts, for example, with considerable less than the rated drive for a KW.

The plate circuit is also normal. Good symmetry is practiced around the four 811A tubes, each of which has their small parasitic suppressor mounted in a symmetrical setup. The tank coil is made of good size wire and appears to be adequate—especially the 10 meter coil which is heavy copper tubing. The band switch could be a little heavier. It looks a little small for a KW but again it works fine and in view of the low plate voltages used (1400 to

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1600) this is not really a serious problem. The contact spacing is good so no danger of rf arcing is present, especially since the peak voltages under SSB or CW are not nearly as severe as those with a KW using AM modulation.

The standard pi network is used for the output tank circuit. The ability to match an antenna load of 50 to 75 ohms is advertised and is a conservative figure. No loading problem should exist with any tolerable SWR in the feed co-ax.

An interesting adjunct to the rf output circuit is a small condenser and an rf choke from the output line to the ground. The midpoint is brought out to a small jack on the rear chassis apron for use as a feed for the vertical deflection plates of your scope—or your vertical input amplifier if your scope has good enough frequency response. This will allow you to watch your scope and get some indication of your modulation characteristics. It may not be exactly a laboratory method for modulation monitoring but it does help.

The neutralizing system, as mentioned earlier, uses a variable condenser from the plates of the 811A tubes, through the condenser to the coil which is wound around the filament choke to the ground. The neutralizing process

is described in the manual as simply spacing the condenser plates a prescribed distance apart. This seemed to be a very rough way to neutralize and some doubt existed in my mind as to the effectiveness of this method. However, upon operational test the amplifier is perfectly stable with no indication of regeneration on any frequency.

The metering system measures the grid current, plate current, relative power output and the high voltage. This is indeed fine—these are exactly the things the operator should know. The tendency of modern transmitter manufacturing concerns to simply meter the relative power output leaves me cold. For the added price of a switch and a few resistors it seems that the policy of metering only the output is very ill advised. I am of the opinion that the prime reason it is done that way is to conceal the fact that a fixed loading circuit does not always load your final the way you might wish. How many of us have a perfect 1:1 match to our antenna?

The bias supply is taken from a special ten volt winding on the filament transformer, half wave rectified, filtered and bled through a 5 ohm and a 11 ohm resistor. The voltage for the tube grids is taken from the junction of these two resistors and is very stiff, being held very

close to the 4.5 volts desired when under modulation. The grounded end of the bias supply is brought out to a terminal board on the rear chassis apron where it may be grounded directly or placed in series with an external (or internal for that matter) voltage of approximately 50 or more volts to furnish cutoff bias for standby or "no modulation" conditions. This is desirable because some modern exciters generate a hash while in the "on" status but with no output, such as is the case when no speech is present on SSB or the key is "up" on CW. This hash may be amplified by the final amplifier when it is not in a cutoff condition and can be very annoying. Odd as it may seem this hash, which another commercial rig of mine does generate to some extent, did not seem to get through the Warrior, even when only the normal 4.5 volts were used. In any event the addition of some VOX controlled external bias can remedy such a condition easily.

Now, while we are on the subject of bias let me digress from the original theme of this article for a moment and describe a modification which can be placed in the amplifier to furnish this cutoff voltage. Don't turn the page as this modification does not require alteration of the original amplifier, but only an addition. In other words if you might wish to sell the

unit at some later date you can return it to its original condition easily and quickly.

Fig. 2 shows a bias and switching arrangement which can be added to the linear to furnish cutoff bias and/or higher operating bias for class C CW operation. The small power supply in the unit furnishes voltage for the cutoff bias and for energizing the control relay—providing a low current plate relay is used. In case an ac relay is used omit R18 and bring out both coil leads as described later in Step 8 of the construction notes. This bias supply and relay will allow several transmitter conditions to exist i.e. 1) by connecting a jumper on the outside of the chassis from terminal 1 of T to the ground terminal on the chassis, normal operation of the amplifier will result regardless of the condition (open or closed) of relay Ry 1, 2) by grounding terminal 2 of T and actuating the relay for transmit, cutoff bias is applied for standby and the normal voltage of 4.5 volts is applied for transmit, 3) by removing jumper from T and actuating relay on transmit a cutoff bias is established for standby and a high operating bias is established for class C CW service, 4) by shorting terminal 1 and 2 of T and not actuating the relay a condition of no cutoff standby bias is established and a high operating bias for class C CW is established. These



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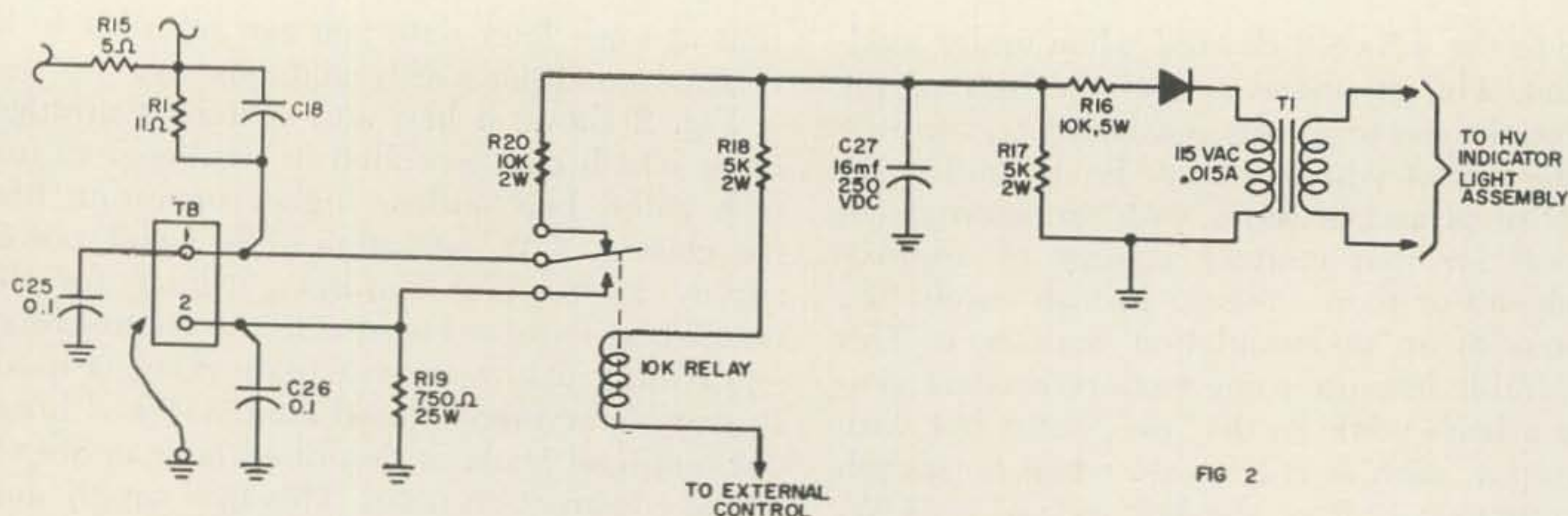
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four bias situations will cover any normal operating need and the unit, as can be seen later by the installation instructions, can be easily removed at some later date if desired.

A step by step method of constructing and mounting this unit is given here—

- | | | |
|------|---|--|
| Step | 1 | Bend an aluminum bracket as shown in Fig. 3. Mount under the nut that holds HV indicator light as indicated. |
| Step | 2 | Build circuit shown in Fig. 2. Suggest using printed circuit board or a piece of bakelite. Mount on bracket of Step 1. |
| Step | 3 | Remove ground from terminal 2 of terminal strip T and connect a 0.1 ceramic capacitor in its place. |
| Step | 4 | Connect center arm of relay to terminal 1 of terminal strip T. |
| Step | 5 | Connect normally open contact of relay to terminal 2 of T. Keep wire for step 4 and 5 clear of filter condenser terminal NN2. |
| Step | 6 | Connect primary of power transformer in parallel with HV indicator light. |
| Step | 7 | Fabricate jumper wire 7½ inches long and connect one end to ground lug on rear of chassis. Put spade lug on free end of this jumper. Use this jumper to ground either terminal 1 or 2 of strip T as described earlier. |
| Step | 8 | Bring out free wire from relay coil to outside of chassis by running through same grommet as 115 VAC power wires.* |

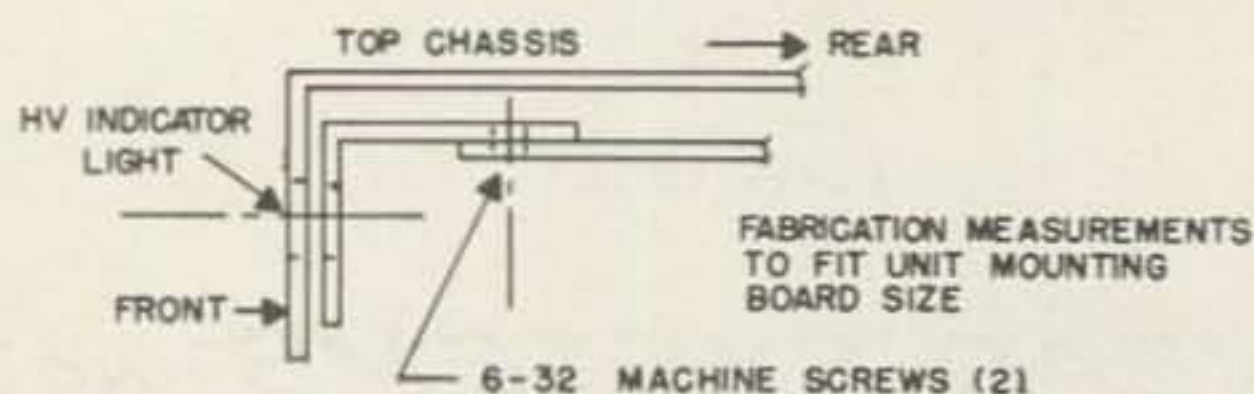


FIG. 3

Step 9 Connect 0.1 ceramic capacitor from terminal 1 of T to terminal 2 of terminal strip TA.

Step 10 Cut wire 3 inches long and put spade lugs on each end. To be used to short terminals 1 and 2 of terminal strip T when amplifier is to be used with no standby cut-off bias and with high operating bias for class C CW.

This completes the modification. Now of course this small unit can be mounted on a separate chassis and wired to the outside of terminal board T but it makes a cleaner job to do it on the inside. The relay of the unit can be connected to the VOX circuits of your exciter to be turned on or off with the antenna relay, receiver quieting, etc. If you use an ac relay for your antenna changeover switch it might be advantageous to use an ac relay in the unit and parallel it with the antenna one. Each individual case might be a little different.

Enough for the bias—the power supply is normal except for a slight novelty regarding the choke and power transformer—both which have very large cores. This, perhaps, was to allow fewer turns per volt on the windings and allow larger wire per given voltage. The choke is a swinging type which goes from 5 to 50 henrys, which is quite a swing. Both the power transformer and choke run at a normal warm temperature under both SSB and CW operation—in fact somewhat cooler than was expected or is the case in some other commercial equipment. One other interesting feature of the power supply is that of the switching. The transmitter has two switches—one to turn on the filaments and one to turn on the high voltage. This is to allow the filaments to heat up before the high voltage is applied. The interesting feature is that it does not make any difference which switch you turn on first; the filaments light first. This means that if you make a mistake in turning on the switches you still turn on the filaments first. They are marked Fil

Note * — If an ac relay is used instead of the plate type run both leads from the coil out with the 115 vac.

and HV of course, for those of us who watch what we are doing.

Double shielding is used—the rf section is in its own shielded enclosure which is mounted on the chassis and then the cabinet forms a good shield for the overall unit.

No special TVI precautions were practiced except for the good shielding. A linear running a little on the A side of class B is not much of a harmonic generator so if your exciter is clean your TVI should not be too much of a problem. In case you use the higher bias for class C CW you might run into more of a TVI problem but usually they can be cleaned up with enough effort. Also in the real fringe areas the problem of high power overloading nearby TV receivers will present itself but a good high pass filter on the receiver antenna input will cure that.

The unit comes with the cabinet painted a deep green. The escutcheon on the front panel is a matching green with the panel itself a light grey with a slight green tinge. It's real pretty—if you like green.

To summarize, it seems to your reviewer that Heath has done a very commendable job here—it's a lot of transmitter for \$229. The only wish here is that it could have been packaged a little smaller. Nothing about it is on the "skimpy" side, the operation is everything a KW should be and it really puts out a signal. This linear, if it's indicative of the rest of the Heath transmitting line, perhaps explains that 44% noted earlier.

... W6EUM

Parts List

R1—part of original unit
R15—part of original unit
R16—IRC 10K 5 Watt
R17—IRC 5K 2 Watt
R18—IRC 5K 2 Watt
R19—750 ohm 25 watt IRC type 2D
C25—Disc ceramic 0.1 ufd
C26—Disc ceramic 0.1 ufd
T1—115 volt .015 selenium rectifier type
Relay—See notes

Letter

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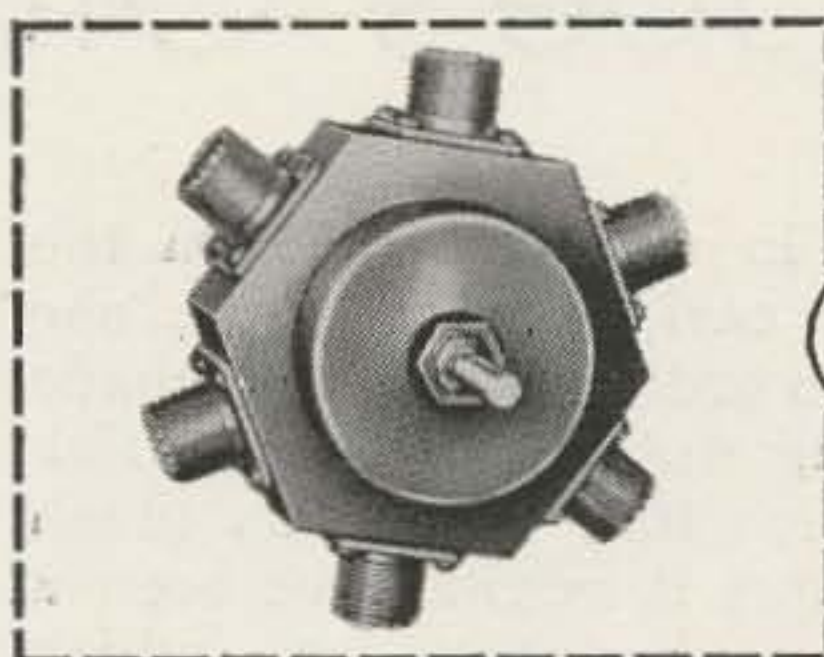
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