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Associate Editor

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Tests

HEATHKIT

"Twoer" HW-30

Two Meter Transceiver

Size: 7" x 9³/₄" x 6" deep.

Weight: 6¹/₂ lbs.

Power: 115 vac @ 45 watts.

Transmitter: 8 mc xtals.

5 watts input.

Receiver: Super-regenerative.

RF amplifier.

Tunes 144-148 mc (CAP
& MARS).

Assembly Time: 7 hours, average.

Price: \$44.95 (including mike).

If you'd like to know more about a complete 2 meter station for less than \$45.00, read on! Latest in the Heath Company's line of low priced transceivers is the HW-30, a two meter model, similar to the ten and six meter models. The size, shape and color of all the units are the same, though the insides of the Twoer are somewhat different.

Transmitter

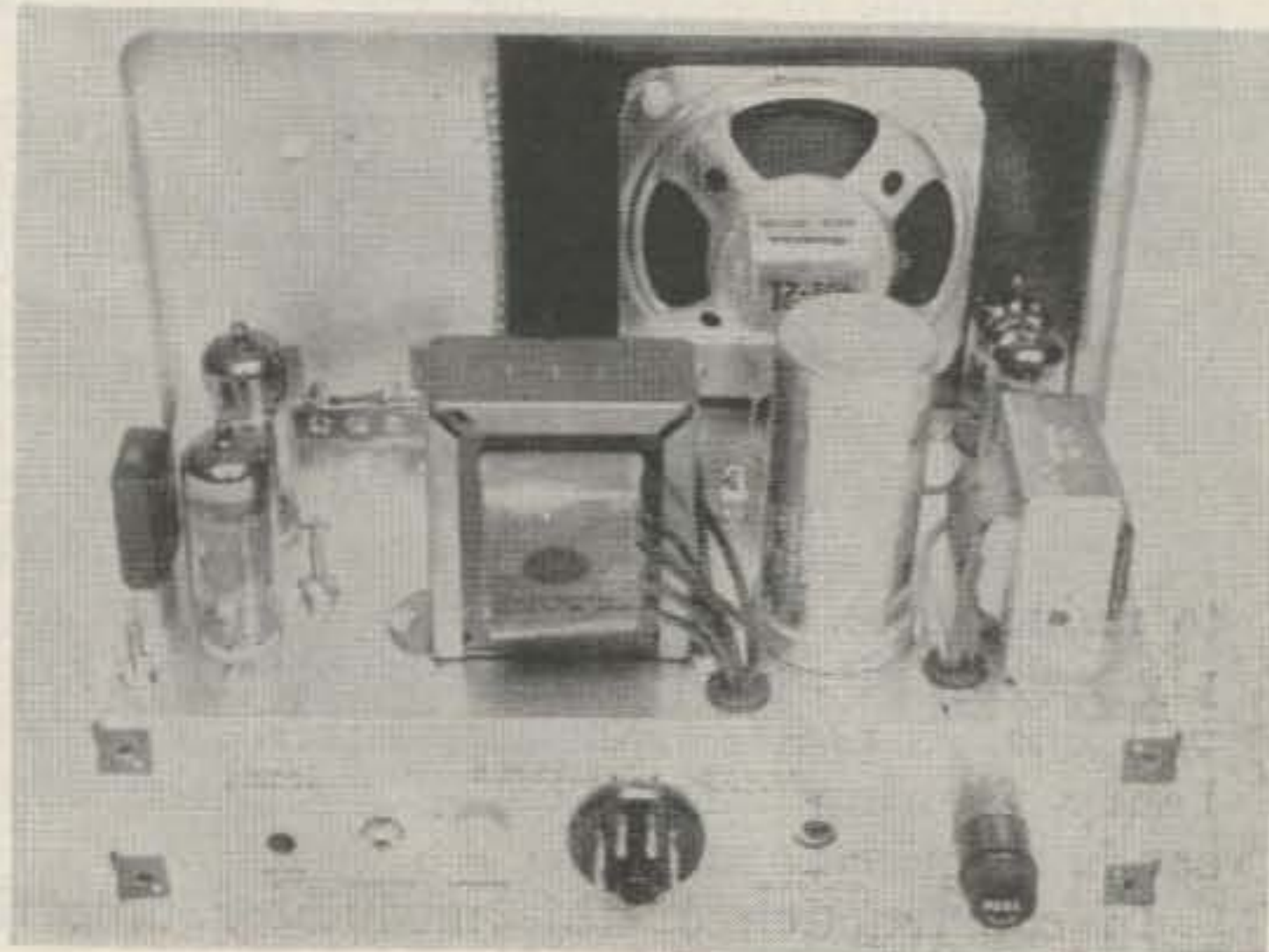
Regular 8 mc crystals with standard .500" pin spacing (FT-243 holders), are used in the oscillator. The pentode half of a 6BA8 tube is used as the oscillator in an electron coupled, Pierce oscillator circuit. The plate circuit of the oscillator is tuned to 24 mc, thus tripling in the oscillator. The second half of a 6BA8 (triode) takes the 24 mc output from the oscillator and triples it to 72 mc. The 72 mc signal is then fed to the triode half of another 6BA8 tube which doubles the signal to 144 mc and drives the final. The pentode half of a 6BA8 is the final, operating straight through on 144 mc.

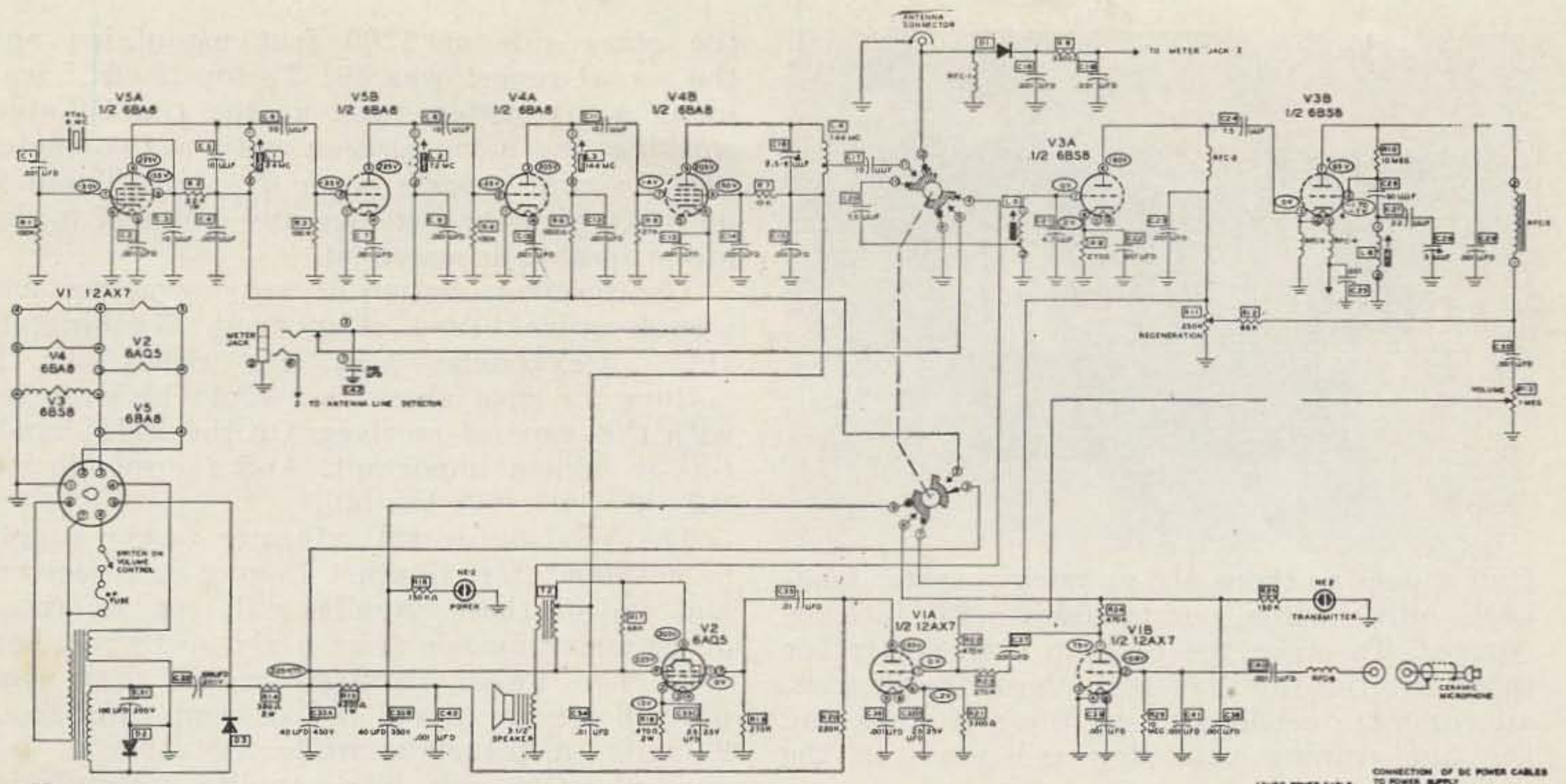
Bypassing in the transmitter is extensive, with over two dozen ceramic disk capacitors being used! All tuning in the rig is done with slug tuned coils, with the exception of the final, which is tuned with a 2.5 to 6 μ fd trimmer capacitor. The final coil is mounted right on the trimmer proper, to keep the lead length as short as possible.

Plate modulation is used, which gives you more "punch" than other types.

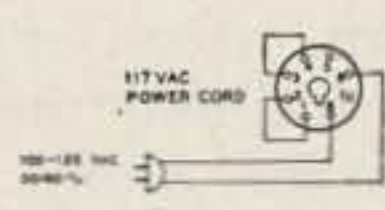
Receiver

The receiving section is very sensitive, even though a super-regenerative detector is used. Heath has improved on the standard super-regen by adding a tuned rf stage. A low noise 6BS8 tube is used in the receiver. One triode of the tube is used as the rf amplifier and the other triode as the super-regen detector. Some Amateurs have never used the super-regen, so I will mention that one of the problems with them that has always been annoying, is what is known as "suck-out." That is, as the receiving frequency is changed, the detector will drop out of oscillation.

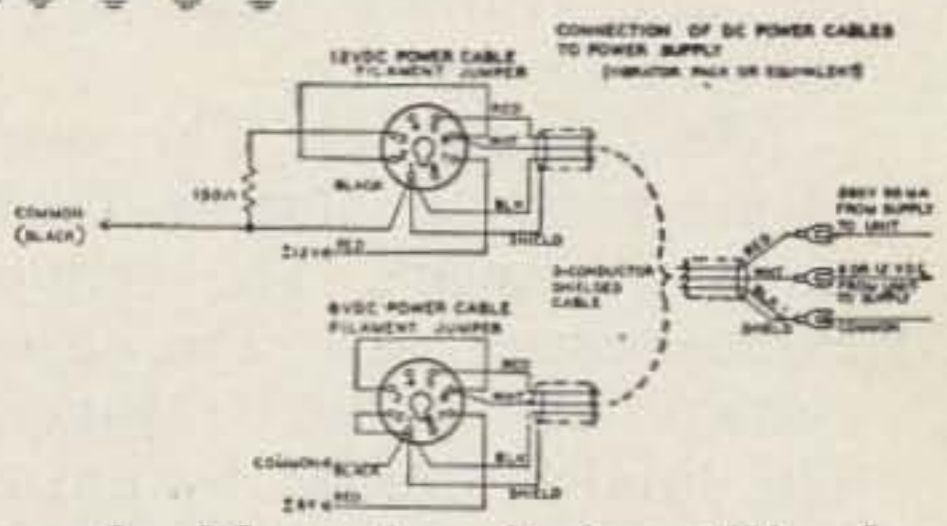




NOTE:
 ALL RESISTANCES IN OHMS, K = 1000.
 ALL CAPACITORS 1/2 WATT UNLESS OTHERWISE SPECIFIED.
 ALL VOLTAGE READINGS WITH RESPECT TO CHASSIS GROUNDING.
 ALL VOLTAGES TAKEN WITH 400 OHM METER.
 ALL VOLTAGES POSITIVE UNLESS OTHERWISE SPECIFIED.
 VOLTAGE READINGS TAKEN WITH UNIT OPERATING FROM NORMAL
 117 VOLT AC LINE WITH DUMMY LOAD PLUGGED IN AND CONTROLS
 SET AS FOLLOWS:
 VOLUME CONTROL - ANY POSITION ON
 TUNING CAPACITOR - ANY POSITION
 REGENERATION - ADJUSTED FOR NORMAL RECEPTION
 MICROPHONE - DISCONNECTED
 READINGS ON V1, V2, V4 AND V5 WITH SWITCH IN TRANSMIT,
 REGENERATION ON WITH SWITCH IN RECEIVE.
 PRESENCE OF METER PROBE IN TRANSMITTER SECTION WILL
 CAUSE DE-TUNING IN MANY CASES. VALUES SHOWN ARE
 APPROXIMATE ONLY AND DEPENDENT UPON TUNING AND
 CIRCUIT ACTIVITY.
 * VARIES WITH TUNING AND SETTING.
 ** 1.1/2 AMP FOR AC OPERATION.
 8 AMP FOR EXTERNAL POWER SUPPLY OPERATION.



HEATHKIT
 2 METER AMATEUR TRANSCEIVER
 MODEL HW-30



Heath has eliminated this problem in two ways. First, they use impedance coupling between the rf amplifier stage and the detector and secondly they made the feed point of the detector a very low impedance. Thus when the regeneration control has once been adjusted properly, you can tune between 144 mc and 148 mc without any further adjustment of the regen control. It should also be mentioned that the super-regen is famous for re-radiating signals from the receiving antenna. The rf stage minimizes this re-radiation.

Audio

On receive, the audio section includes one half of a 12AX7 as a voltage amplifier, feeding a 6AQ5 output tube. A 3 1/2 inch speaker is mounted on the front panel of the unit. One watt of undistorted audio is available in the receive position.

On transmit, the audio section becomes the modulator. One half of a 12AX7 tube is used as a mike pre-amplifier and the second half of the 12AX7 is used as a voltage amplifier, driving the 6AQ5 output tube. A tap on the output transformer is used to provide the proper impedance for the final rf amplifier, plate modulation being used. An rfc and .001 disk ceramic capacitor are used in the mike input to the modulator, preventing rf energy from re-entering the audio section during transmit.

Power Supply

A built-in ac power supply is included with the transceiver, using a power transformer.

A full-wave voltage doubler circuit is utilized, using two silicon diodes. B+ output is approximately 260 vdc @ 90 ma. The supply is wired in such a way that an external dc supply can be plugged into the rear of the unit and all necessary changes in the rigs circuitry are automatically changed over when the proper cable is plugged into the rear of the unit.

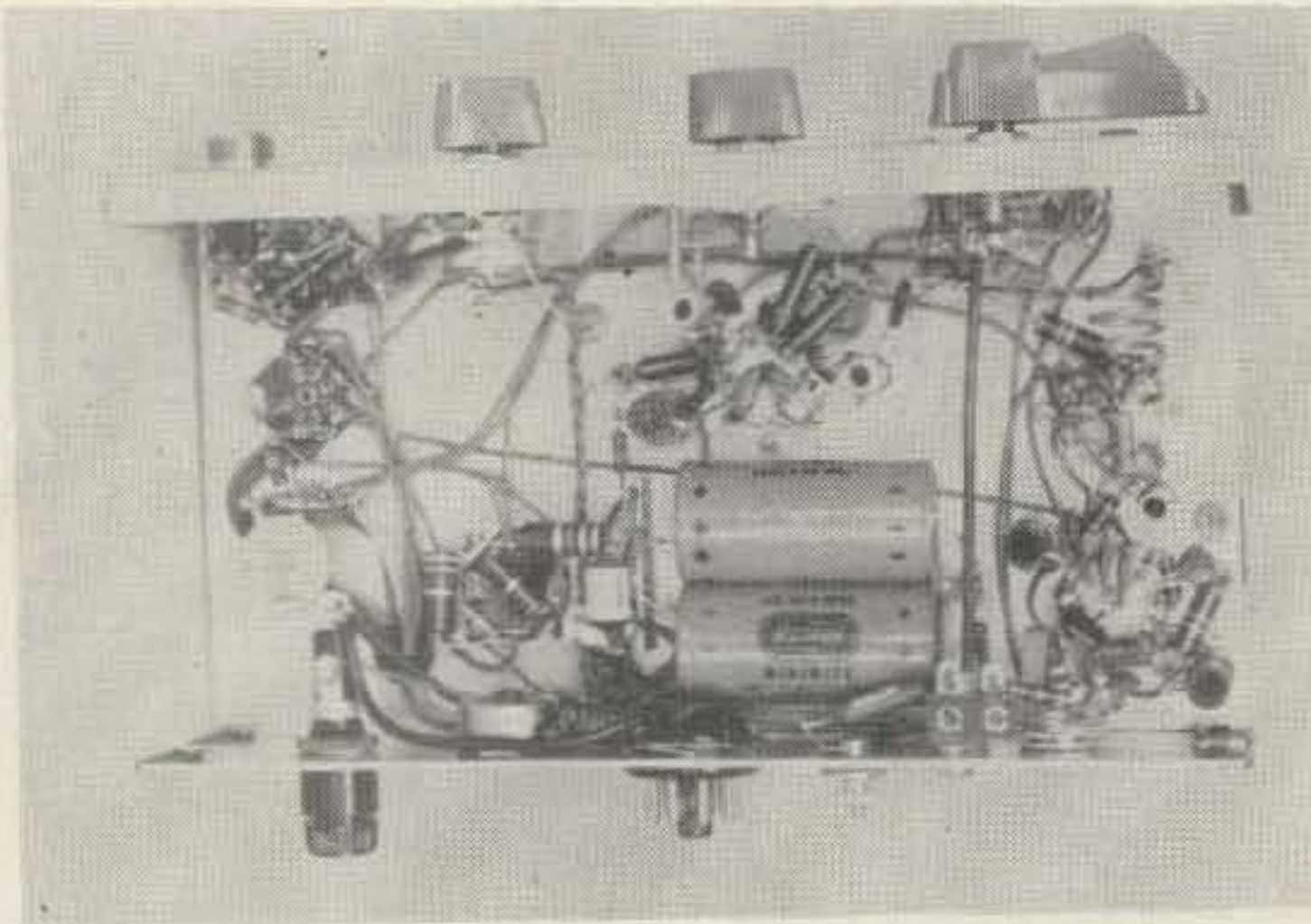
Building the Unit

Building the rig requires 6 or 8 hours to complete and should NOT be hurried. The design and layout has been carefully thought out, as long leads, parts placement and general layout become quite critical at these frequency. All capacitors used in the rf circuits (both receiving and transmitting sections), are disc ceramics and even tube sockets are of the ceramic, shielded types, for low loss. Note in the photos, that the bottom of the unit looks like there are hardly any parts used in the unit. It gives this appearance because the lead length was kept as short as possible. Actually there are 42 capacitors, 25 resistors, 8 terminal strips, 2 controls, 1 rotary switch, 6 rf coils and 6 rf chokes under there!

The filament circuit and the B+ wiring is done first, with the transmitter section following. The receiver section is then wired, with the power supply and front panel wiring done last. Parts are furnished for making one ac and one dc (6 or 12 volts), power cords.

Tune Up

The rig, as mentioned before, uses 8 mc xtals and when it comes to tuning up the rig, you're



glad it does as there are no tricky crystal feedback adjustments, or troubles with lack of "drive." To make the tune-up even easier for those not too familiar with these frequencies, approximate settings of all the coil slugs and the final tuning capacitor are given in the tune-up procedure.

(See diagram.) The oscillator is tuned to 24 mc with the slug in L1 being used to make the adjustment. The tripler is then brought to resonance with the adjustment of L2. The doubler can then be tuned by adjusting L3. The final is dipped by adjusting the final tuning capacitor, C16. There is only *one* dip possible in the final! The two meter model has a little different set-up on the meter plug than the other two models. The Twoer uses a two circuit jack, the first position being used to measure the rf output voltage with a standard dc VOM or VTVM. When the unit is tuned properly this voltage will be about 14 or 15 volts on a 20,000 ohms/volt meter. A diode and filtering circuit is built into the rig to provide this reading, which is helpful in tuning up the rig.

When the meter jack is pushed all the way in, (to the second position), the meter is placed in series with the final amplifier, permitting the final plate current to be read. Please NOTE that the meter can not be left plugged into the second position of the meter jack, unless the rig is actually switched to transmit (on the front panel), as the meter completes the final cathode circuit to ground and the final will be operating regardless of the front switch setting.

Receiver tune-up is very easy and a GDO, signal generator, or an on-the-air, two meter signal can be used. The adjustments include rf amplifier tuning, detector tuning and regeneration control adjustment. The receiver adjustments affect each other slightly, so the other adjustments must be checked after making any adjustments to the receiver coils or the regen control.

Checking Out the Rig

I have to admit, frankly, that I was really surprised at what the rig will do. The first station worked was about 45 miles away, on

the *other* side of 1200 foot mountains and the signal report was 59! To top it off, I was using a six meter beam at the time! Later, working the same station with a two meter beam, signal reports were 59+++ . There is no drift with the rig, nor any FM and modulation quality is excellent.

The receiver section is very sensitive and signals were heard often from Washington, D.C., Alexandria, Va., etc. Selectivity is nothing to rave about, as would be expected with this type of receiver. On the VHF bands this is seldom important. And for mobile use the rig really fills the bill.

The VP-1-6 (or 12), vibrator power supply is designed for Heaths' line of transceivers and one of these supplies will operate the 6 or 10 meter models from a six or 12 volt battery. The Twoer requires two of these supplies, however, as the B+ current runs about 90 mils on transmit, while the other models runs about 60 mils. The supplies are quite inexpensive, at 7.95 each in kit form, complete with tube and vibrator!

The six and ten meter transceivers can be bolted together, along with the Twoer to provide a complete 10, 6 and 2 meter VHF station for about \$130. A single meter can be used for all three units when they are connected together.

All in all, there is a lot of fun to be had with the little Twoer. At \$44.95 it sure is an inexpensive way to get on two meters. It is my personal hope that the rig will encourage others to come up on the higher bands.

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