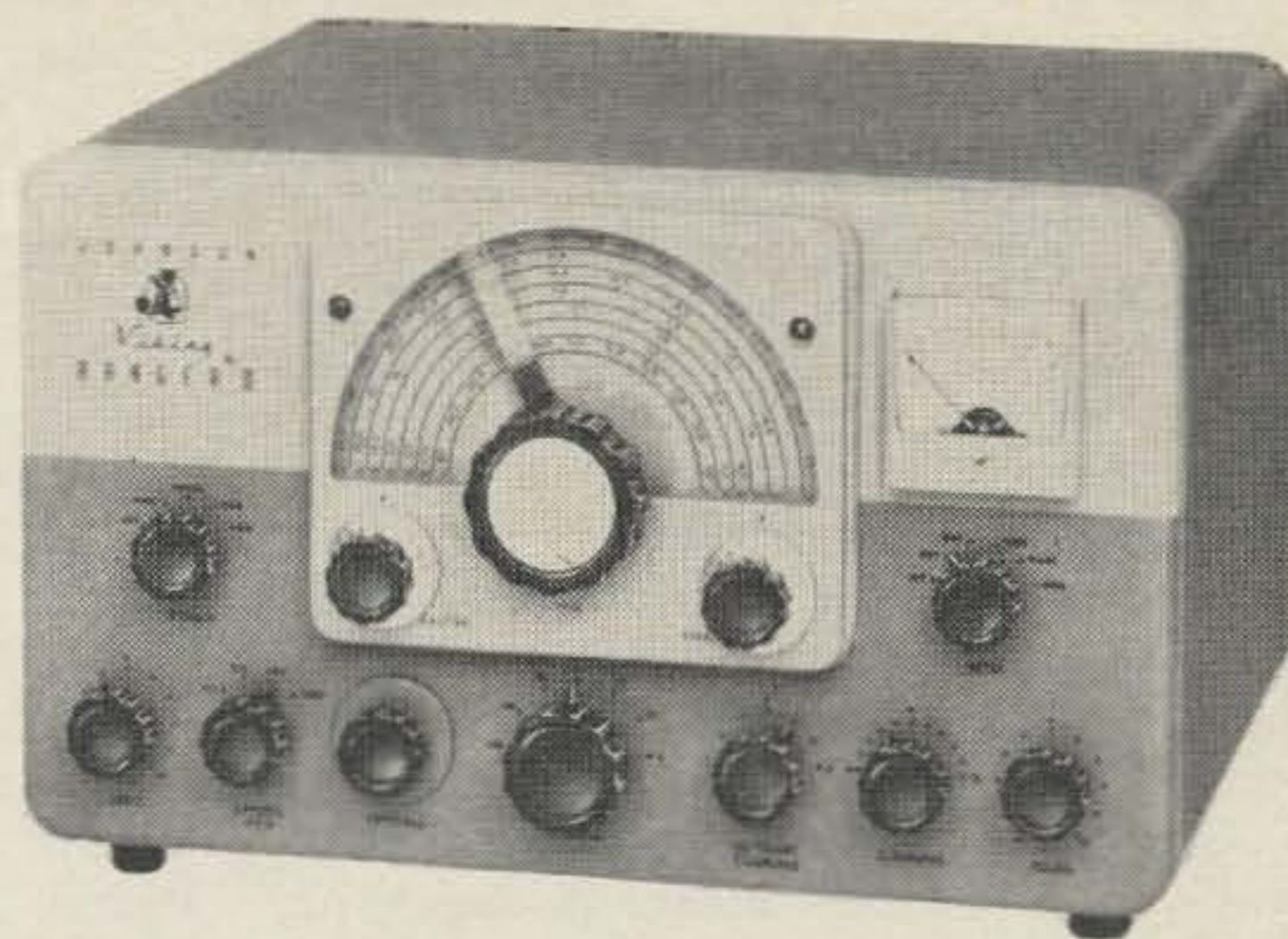


73 Tests

The

Viking Ranger II



THE Viking Ranger probably needs less introduction to the amateur fraternity than most any other piece of gear. It was the creator of the trend towards making a small and complete transmitter package by the incorporation of an integral VFO. No outboard gadgets other than your mike, key, (crystal if you desire), or antenna relay is required to put you on the air on any band from 160 to 6 meters. The Ranger II incorporates all of the modifications and improvements brought out for the basic Ranger to date, wrapped up within a new two tone grey ventilated steel cabinet.

The Ranger II is designed to meet the needs of the greatest possible number of amateurs; General, Technician or Novice, CW or AM phone, the 6 meter enthusiast or the 160 meter specialist—and all of the bands in between, all as a fixed station or portable. In addition, the rf section may be used as an rf exciter to drive anything in the kilowatt class, and the audio section will drive any high power modulator. Physically it is small, being 15½ inches wide by 9⅝ inches high, and 14 inches deep, weighing in at 43 lbs. The input of 65 watts on AM phone and 75 watts for CW will work anything in the world.

Oscillator Circuitry

It would be well to follow the block diagram of Fig. 1 to clearly picture the whole of the transmitter system and its component parts. The oscillator is the heart of the Ranger II. Separate calibrated bandspread dial scales are provided for each of the seven bands and 6 to 1 ratio planetary drive mechanism results in excellent tuning accuracy and smooth control. The plexiglass dial is edgelighted. Ten kilocycle calibration increments on each band provide uniform and accurate dial interpolation.

Although frankly not designed for frequency meter accuracy, checks with a 100 kc crystal oscillator will excite your admiration. The VFO employs a series tuned Colpitts circuit with a 6AU6, using two separate tanks. One covers the 1.75 mc to 2.0 mc frequency range and the other the 7.000 mc to 7.425 mc range. The VFO tank circuits and the output circuits are controlled by the front panel switch indicating the band of transmitter output. Temperature compensation, optimum circuit design, rigid construction and voltage regulation result in a high order of stability. There is freedom from "wobulation" under modulation, or "yooping" when keyed. On the 160 meter and 80 meter bands, the VFO output remains on the 160 meter tank. On the 40, 20, 15 and 10 meter bands the VFO changes to the 40 meter oscillator tank. On the 6 meter band, additional capacitors are switched across this tank to lower the VFO frequency to a harmonic relation to the 6 meter band and add additional "C" to the oscillator to enhance stability.

A 6CL6 acts as an isolation stage and broad tuned frequency multiplier when the VFO is used. During crystal oscillator operation, however, it functions as a hot cathode oscillator. Grid-block keying is employed for the oscillator, the 6CL6 isolation stage and an additional 6CL6 buffer-multiplier, utilizing a 12AU7 as the keying tube. This system is called "Timed Sequence Keying." To avoid adjacent channel interference, a wave-shaping filter is used in the 6CL6 circuits. To avoid chirp when the VFO is keyed, the 12AU7 permits the VFO to start before the 6CL6s conduct and continues oscillation until after the 6CL6s stop conducting. There is a VFO keyer adjust control which permits adjustment of the "hold" time in order to permit rapid CW break-in operation to suit the operator.

When operating break-in, a slight arcing at the key may be noticed in your receiver. This is not transmitted over the air, and may be eliminated by installing a $2\frac{1}{2}$ millihenry rf choke in each key lead right at the key. On the lower frequency bands, the rf stages are sufficiently broad as to permit a change of frequency within a CW or Phone portion of a band by means of the VFO alone. Obviously this would be more difficult on 10 and 6 due to the size of the bands. For greater excursions, the dial marked "exciter," final dip and loading will of course have to be touched up. Practice will quickly indicate the degree of latitude in this respect that you will have for the bands you use the most. A "spotting" switch position permits you to observe your transmitting frequency without unnecessary radiation on the air and to "zero" in on a transmitting station.

RF Circuit Operation

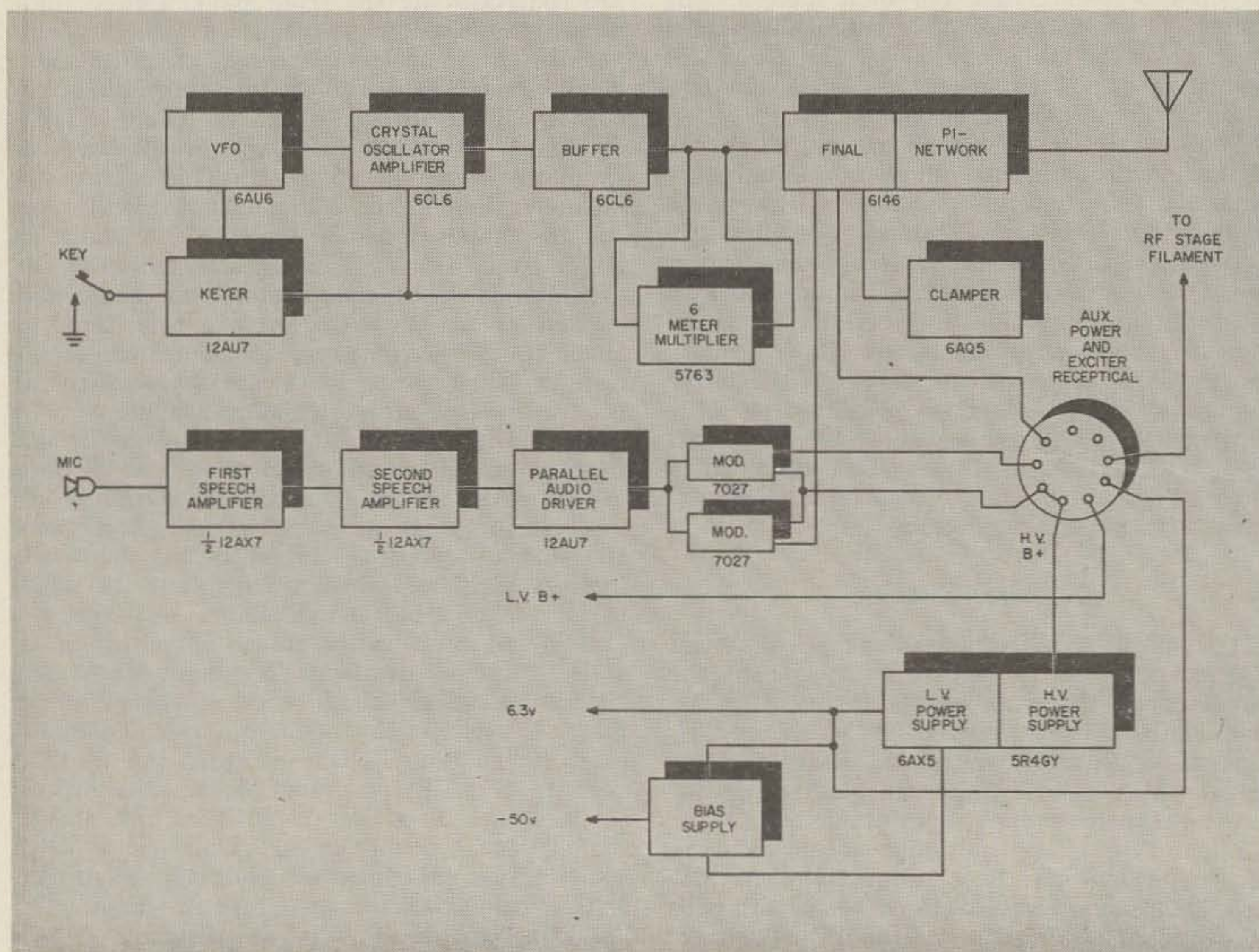
The 6CL6 stage used as a buffer-multiplier, mentioned earlier when the keying action was described, uses a tuned high Q plate circuit which is tuned to the same frequency as the final on all bands. Protection against excitation failure is derived from a cathode resistor. The band switch and coils are fully shielded to avoid any possible interaction, insuring clean circuit isolation and preventing instability. The output of this stage is controlled by a potentiometer which controls its screen volt-

age. This permits precision in adjusting final grid drive. An additional multiplier stage, not present in the original Ranger, uses a type 5763 tube. It is switched in to drive the 6CL6 buffer-multiplier when operation is to be on 6 meters.

The final stage uses a 6146 with a completely band switch pi-network of Hi Q design. The range of antenna impedances which may be matched on all bands is 50 to 500 ohms, plus the tuning out of a wide range of inductive or capacitive reactance. The range of antenna impedance which may be matched at frequencies above 7 mc extends, roughly, from 25 to 2000 ohms. The 6146 is protected from excitation failure by a 6AQ5 which is connected in shunt with its screen dropping resistor. When excitation failure is encountered from any cause, the 6AQ5 conducts and lowers the 6146 screen potential to approximately plate current cutoff. The screen of the 6AQ5 clamper is connected to a voltage divider making the stage continue to conduct even at extremely low plate potential values. Under this cutoff condition the 35 to 40 ma current is indicated on the transmitter multimeter. It is not the plate current of the 6146 but is the plate current drawn by the clamper tube.

The Audio System

All triodes are employed in the speech and driver stages. The first and second amplifier is



the high gain 12AX7, ample for any crystal or high impedance dynamic microphone. A three circuit microphone jack is provided to accommodate the addition of a push-to-talk relay if PTT operation is desired. A 12AU7, parallel connected to a driver transformer is the source of low impedance drive for the modulator. The modulator, employing a pair of 7027 tubes in push-pull class AB can deliver more than enough audio for 100% amplitude modulation. Plate saturation limiting prevents large swings beyond full modulation thereby providing some limiting to reduce distortion and spurious output. The modulation transformer has a tertiary feed-back winding coupled to the grid of the audio power driver. This provides damping for improved regulation, stability and a flattened frequency response. This method also enhances the direct driving of external modulators when the Ranger II is used as an exciter.

The secondary of the modulation transformer is center tapped, to fill the requirements of an audio driver permitting it to work directly into the grids of external high power Class B modulators. The leads are filtered and by-passed, and made available at the exciter-auxiliary plug at the rear of the chassis. By using one half of the secondary winding, a nominal 500-600 ohm output can be obtained for driving large speakers used in paging or public address work. Thirty-three watts of audio are available at the output of the modulators for any application required. The frequency response range of the modulator section is flat within 3 db from 250 to 3000 CPS with a very pronounced roll off above and below these frequencies. The passed range is sufficient for pleasing quality yet confines the audio power within these frequency limits for a noticeable audio punch.

The Power Supply

This is a conventional dual plate voltage

supply, employing a 5R4GY high voltage rectifier tube and a 6AX5GT low voltage rectifier. Choke input filtering is used in both supplies. The high voltage is 525 volts dc for the final and modulators, and the low voltage 320 for the rf exciter and low level speech stages. A 6AL5 rectifier for bias for the keying circuits and the modulator is fed from a third set of terminals on the power transformer secondary. If you want to power other equipment in the shack, you can use the rig as a power supply, from the exciter-auxiliary plug. In addition to the audio at this terminal, there is available 6.3 volts at 5.5 amperes for filaments, 300 VDC at 50 ma and 500DC at 210 ma. When the auxiliary plug is wired to tap off for external power, the complete rf section of the Ranger, including filaments, is de-energized, as the power supplies cannot provide the normal Ranger full power requirements and external power use simultaneously.

Operation

The E.F. Johnson Company did extensive research when amateur radio first faced the threats of TVI. This is reflected in minute detail throughout the Ranger II. The cabinet is electrically sealed with flexible monel braid on the inside of the front panel and large cabinet overlap. A cup type shield seals the meter, and spring type contract washers on the front panel shafts prevent possible radiation from shaft clearance openings. The power line and relay jack circuits have double L type filters; all auxiliary socket, meter, dial lamp, key, and meter lamp leads are equipped with L filter networks. To minimize harmonics, interior harness leads and filaments are by-passed to the chassis. Careful by-passing of the final and design of the output circuit were aimed at reducing harmonics. This deep interest in TVI led to the investigation of causes beyond the well engineered transmitter. Improper grounding in the shack, as well as improper impedance matching, turned out to be another major source of trouble. This affliction troubles many an installation, regardless of the equipment, so if you are one who is being so deviled, beg, borrow, steal or buy a Viking Ranger II Operating Manual. There is a great deal of common sense procedures within it which could be applied to your shack, both on the subject of TVI prevention and proper loading and matching of your antenna system.

One panel meter serves as a multimeter, providing ample indication of tuned circuit operation, switching between oscillator, buffer, grid, final plate and modulator. The manual tuneup instructions are a little confusing in that when told to tune the "buffer" your control is marked "exciter" on the panel. I would have preferred a slightly different turn-on, turn-off sequence in mode switching, but I

Specifications of the Viking Ranger II

Frequency Range: 160, 80, 40, 20, 15, 10 and 6 meter bands.

Power Input: 65 Watts AM Phone, 75 Watts CW.

Power Requirements: 105-120 VAC, 50/60 cycles, 260 watts.

Frequency Control: Integral VFO, or two switched crystal positions.

Utilization: All-round portable or fixed transmitter, RF Exciter, Speech or power amplifier, or power supply source.

Form and Price: Kit No. 240-162-1.....\$249.50
Wired No. 240-162-2.....\$359.50

Maker: E. F. Johnson Company, Waseca, Minnesota.

guess you can't please everyone in every detail.

Putting the equipment on the air was revealing. I had a warmed up BC-221 and a 75A4 ready to check calibration, but had little to do since the VFO dial markings fell right into the slots they were supposed to. The first firing up was late in the afternoon on 75 meters, with the initial CQ answered by a chap two states away who said his xtmr had been on 15 meters, but I sounded so good on 75 that he bust his buttons changing bands to call. Equally flattering remarks were produced on six and then the other bands. With scope and panadaptor on, the bug contacts were polished up, but no fault had shown up there either. The design and bugs on this equipment had

been worked out so long ago that it might have been presumptuous to hope to dig up flaws thousands had been unable to find. The unsolicited flattering remarks were in themselves outstanding. I even tried to QRM my color TV receiver on 3.579545 mc with no luck!

There is the Ranger II for you. It covers a whale of a lot of amateur bands in a day when many people specialize in just one of them. It gives you long or short range communications to fit any geographic requirement or environment or skip, and is a good basic piece of equipment to use as a standard for the measurement of other gear which you can be sure will be hard put to meet it. . . . W4API

Zerobeatnick

Gus Gercke K6BIJ

THE main difference between an expensive modern receiver and a cheap old one is:

1. Stability of its oscillators.
2. Price.

If, while listening to a *good* SSB station (be sure it is not just someone talking thru a garbage disposal unit), you have to retune every few minutes to take the "Donald Duck" out—you better meet Zerobeatnick.

Z-B is just a transistor oscillator used to zero-beat the incoming signal at its frequency (or a CW signal a little off its frequency), and mix with it *in the front end* of your receiver with your BFO off.

Z-B does not drift, as it does not generate any of its own heat (it operates on 1 ma 3v), it does not pick up heat generated in the receiver (separate box), and it works into a constant "load"; you can leave it for hours on a SSB group and watch *them* drift in all directions. The drift of your mixer oscillator is still there (BFO is OFF), but all it can do now—is cause the signal to get weaker; you cannot change the voice pitch, using your receiver controls, even if you want to do so (remember the BFO is off).

There is only one trick in using Z.B.: to be effective it must supply a signal of about the same strength* (at the point of mixing) as the signal you are listening to.

The mixing point can be the antenna terminal, or some point on your rf or mixer stage, and will differ from receiver to a receiver. It must be found experimentally, as too much input will result in a blocking action (only very strong signals will get thru); too little input will cause only weak SSB signals to sound normal, strong ones will sound as SSB sounds with BFO off.

There are dozens of transistor oscillator circuits, I used just one of them, you may find a better one.

With the 2N169A use fundamentals on 80 & 40 and harmonics higher, you may raise the voltage to 6 or 9 volts if you need higher output.

In some cases you will be able to use your VFO as a Z-B, this will give you an additional advantage of staying on another guy's frequency (or drifting with him) during a long listening period.

. . . K6BIJ

*Ratio of about 1:5 is acceptable.

Parts List

- SW1—OFF: for 40M (C1 covers the band).
Om: for 80M (use iron slug to cover band).
Set R1 for smooth regeneration over both bands. This can be a screwdriver adjustment.
L1—3 turns #18, 1/2" long on a slug tunes coil form.
L2—5 turns #24 over L1.
C1—365 mmfd variable.
C2—Bunch of silver micas totalling about 2000 mmfd.
C3—Same, about 8000 mmfd.
C4—.05 mfd disc ceramic.
C5—100 mmfd mica. or ceramic.
R1—1/2 meg pot.
SW2

