

The Viking 6N2 Transmitter

NOW AND THEN a piece of commercial equipment comes along that is an ideal subject for a *QST* write-up, because it contains circuit features or mechanical innovations that are of interest to readers who like to build their own gear, as well as those who are concerned mainly with ready-made packages. The Viking 6N2 r.f. unit recently introduced by the E. F. Johnson Company is such an item. V.h.f. men who never expect to own a commercial transmitter will find that the 6N2 has ideas worth looking into.

As its name implies, the 6N2 operates on 50 and 144 Mc. Designed as an accessory for use with the Ranger, the Vikings I and II, or the Valiant (Johnson rigs for lower frequencies), the 6N2 may be used as the v.h.f. r.f. section of any other station that has the necessary power supply

work effectively on both 50 and 144 Mc., with proper operating conditions for all stages on both bands. As anyone who has attempted to work out a simple layout for a 6- and 2-meter transmitter can testify, this takes some doing!

Two-band operation begins in the plate circuit of the 6360, where coils are switched at the hot ends of the push-pull circuit. The proper amount of drive to the amplifier is assured by cutting in a bleeder resistor from the 6360 screen to ground, when the band switch is in the 6-meter position. This reduces the input to the stage, and holds its output to a point where the grid current in the final stage is the same on both bands.

The band switch is a neat trick, too. It is actuated by a simple mechanical linkage on the shaft of the butterfly capacitor that tunes the



The Viking 6N2 is a compact r.f. unit for 50 and 144 Mc. Completely shielded and filtered for TVI protection, it is housed in a metal case only 8 by 9 by 13 inches in size.

and modulator equipment. When hooked up to the Ranger the 6N2 requires no modifications in the low-frequency package. Minor changes are required with the other Johnson rigs. The power and audio equipment of the "parent" transmitter are used in the operation of the 6N2. Since it contains only the r.f. circuitry, the 6N2 is a compact assembly, measuring only 8 by 9 by 13 inches in size. Its external finish is designed to harmonize with other Johnson transmitters.

Tubes employed are a 6U8, a 6360 and a 5894A, plus a 6AQ5 clamper tube. The oscillator is the pentode section of the 6U8. Crystals in the 8-Mc. range are used, with the plate circuit doubling. The triode portion of the 6U8 is a tripler, with output between 48 and 54 Mc. This drives the 6360, tripling to 144 Mc., or working straight through on 50 Mc. The final amplifier works straight through on either band.

The elements of novelty are the means by which this straightforward lineup is made to

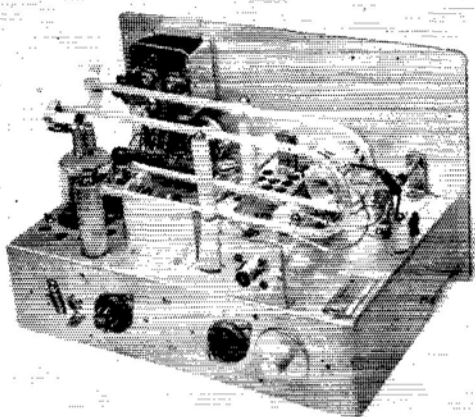
6360 plate circuit. Using a butterfly-tuned circuit, there are two 90-degree tuning ranges, of course. The tuning capacitor shaft is brought out to the front panel, where its ranges are marked "6" and "2". On one side the 6-meter plate and grid coils are switched in position, and the screen circuit includes the bleeder to ground. This is removed from the circuit, and the 2-meter coils are switched into place in the driver plate and amplifier grid, when the tuning capacitor is rotated to the 2-meter side.

The final plate circuit requires no band switching. It borrows an idea from Lighthouse Larry's "Bonus 100-Watter"¹ and carries it one step further. The final plate circuit is a half-wave line for 144 Mc., with its tuning capacitor at the far end of the line from the tube. The 50-Mc. plate coil is connected to the line at the point where the r.f. voltage is at zero for 144 Mc. It thus has no effect on the operation of the line at the higher frequency, and the line acts like good low-loss plate leads at 50 Mc.

Effective coupling to this dual tank circuit is

¹ Lighthouse Larry, "Bonus 100-Watt Transmitter," *G-E Ham News*, Nov.-Dec., 1955.

Some interesting plate circuit features in the 6N2 show in this interior photograph. Final tuned circuit works on either 50 or 144 Mc., without band switching. Output coupling circuit, a combination of hairpin loop and 1-turn coupling coil, is seen at the bend in the plate line.



provided by a combination of hairpin loop and coupling coil that is plainly visible in the rear-view photograph. The small turn of wire at the middle of the loop couples to the 50-Mc. tank circuit, and the sides of the loop couple to the 144-Mc. line. Both are at the point of lowest r.f. voltage, which is as it should be, for minimum capacitive coupling. A variable capacitor is in series with the coupling loop for tuning out its reactance on either frequency, and to serve as an auxiliary loading adjustment.

The entire r.f. plate circuit is silver plated. A novel parasitic-suppression arrangement is used at the plate end of the line. The flexible straps connected between the heat-dissipating connectors and the tuning of the plate lines are visible in the photograph. Soldered across the first inch or so of these straps are 47-ohm 2-watt resistors. These load the circuit sufficiently at the parasitic frequency so that no oscillation is possible, yet they have substantially no effect at either desired operating frequency. Parasitic oscillations can be found in many v.h.f. amplifier circuits if you go looking for them with some care. They may not always be there, but potentially they are a lively source of TVI, and other forms of interference often blamed on harmonics.

Extensive precautions against TVI are taken in the 6N2. Shielding is complete, and all leads leaving the case are filtered. Even the power connectors are housed in shields, as may be seen in the bottom view. The crystals are inside the cabinet, accessible through a plugged hole in the rear wall of the chassis. They are selected by a switch on the front panel, which also has a position for v.f.o. input. The meter on the front panel is housed in a metal container.

Shielding and compartmentation of the 6N2. Final amplifier stage is at the upper left. Note that power cable connectors are shielded. Crystals, upper right, mount inside case.

Front panel controls on the 6N2 are, bottom row: the crystal switch, oscillator tuning, multiplier tuning, and the combination driver plate capacitor and band switch. The upper row includes the two output coupling controls, the final plate tuning, the meter switch and the tune-standby-transmit switch. Provisions for keying and the operation of an antenna change-over relay are made on the back of the transmitter.

Keying is done in the cathode of the 6360, and the keying circuit has a built-in click filter. A 6AQ5 clamper tube holds the final stage plate current down when the drive is keyed or otherwise removed. The meter can be switched to read the oscillator, multiplier, driver or final plate currents, as well as the final grid current. There is also an off position to save the meter from excessive activity during c.w. operating.

The maximum input that can be run to the 5894A final stage is 100 watts on voice, or 150 watts on c.w. This will not be obtainable with the Ranger power supply, which delivers only about 450 volts under load. Testing with the Ranger in the lab, we got best efficiency at about 75 to 80 watts input. With the Vikings or the Valiant, the higher voltage power supplies allow operation of the 6N2 nearer the maximum ratings of the tube.

— E. P. T.

