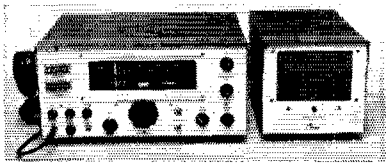
• Recent Equipment —

The Clegg Venus

50-Mc. S.S.B. Transceiver



With the transceiver becoming so popular in s.s.b. work on lower bands it can be assumed that this approach to sideband will enjoy increased acceptance among v.h.f. operators as well. This newest member of the Clegg Greekdeity v.h.f. family should accelerate the trend, at least as far as the 50-Mc. band is concerned.

The Venus is probably the first production sideband unit for v.h.f. service that goes all the way on the transceiver line. It is a sideband rig first of all; though it can be used on a.m. phone and it is fine for c.w., it was designed for and will find its principal acceptance in sideband communication. It is a true transceiver. Unless one is willing to do some considerable and careful dial spinning he will spend his time working stations on or very close to his own frequency, and nowhere else. This complete break with time-honored v.h.f. operating procedure may keep the Venus from being the top goddess in the v.h.f. market for a while, but it may also very well mark the beginning of a v.h.f. revolution.

Because it is a one-band design using many new techniques and circuit features, the Venus is compact, light in weight, and easy to use — but it will take some wordage to describe exactly what happens inside the boxes. The interior photographs appear deceptively simple, but a look at the block diagram, Fig. 1, will show that there is quite a bit to explain. The Venus instruction book takes the easy way and shows the transmitting and receiving functions separately, making little attempt to indicate portions of the lineup that do double duty. We have attempted to show the signal paths and stage functions in a single diagram, but we will describe the send and receive operations separately.

The Receiving Lineup

The receiver has a single grounded-grid r.f. stage, a 6CW4, V_1. It is worth emphasizing that this is all the r.f. amplification there is, yet the Venus does the 50-Mc. receiving job as well as it can be done. Double-tuned input and output circuits provide considerable selectivity and rejection of unwanted signals from outside the amateur band. Because the tuning range is restricted to the first 500 kc. of the band, the rejection obtainable outside the band is high, there being no need for extreme broad-banding of any circuits.

Next there is a 6EH7 mixer, V_2. Crystal-controlled injection on 36 Mc. is supplied by an 18-Mc. oscillator-doubler, V_{21A-B}, giving an intermediate frequency in the 14-Mc. range. The oscillator-doubler is also used in transmitting. A second 6EH7 mixer, V_3, has tunable injection from the variable local oscillator, and cathode follower, V_{18A-B}, a 6DJ8 dual triode. This oscillator range is 5 to 5.5 Mc., resulting in a fixed second i.f. of 9 Mc. The 9-Mc. signal then passes through the crystal filter, FL_1, which is the principal factor in the receiver's excellent selectivity.

Now comes the amplification, after the selectivity, which is as it should be if overloading problems are to be minimized. A 9-Mc. amplifier, a 12BA6, V_4, feeds a 12BE6 mixer, V_5. Injection 8550 kc. from one half of a 12AU6, V_{19B}, results in 450-kc. output from V_5. This is amplified by a 12BA6, V_6, and passed on to an a.m. detec-

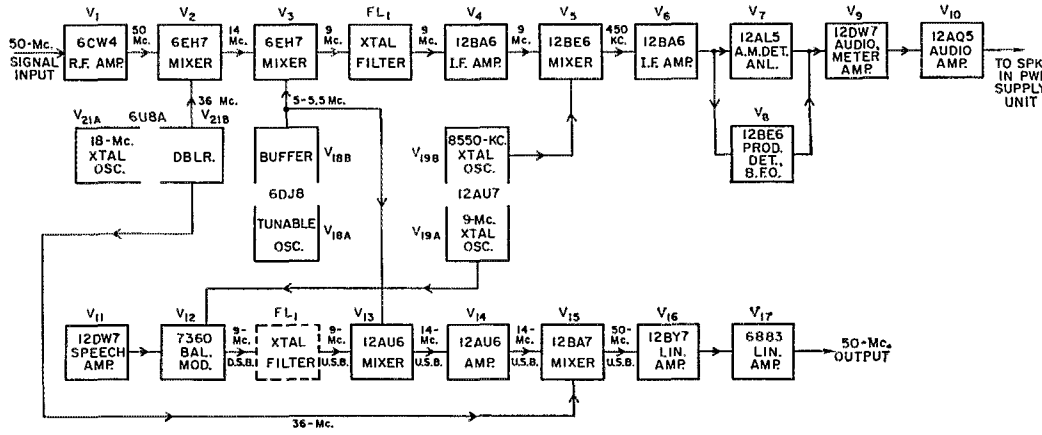


Fig. 1 — Block diagram of the Clegg Venus 50-Mc. Transceiver.

tor, V_7, or to a 12BE6 product detector, V_8, for c.w. or s.s.b. Also part of V_8 is a crystal-controlled b.f.o. on 448.5 kc. Audio amplification is handled by a 12DW7 triode, V_9, and a 12AQ5, V_{10}. V_7 and V_8 are multifunction tubes, also serving as automatic noise limiter and meter amplifier, respectively.

Transmitting Functions

Sideband with its heterodyning processes is a natural for the transceiver approach, since several stages can do the same job for both transmitting and receiving. The frequency control and selectivity circuits comprise some of the more critical elements in either transmitting or receiving, and fortunately these are among the items that can be made to perform a dual role in a transceiver. The economy of the transceiver approach becomes apparent when we trace the signal paths in the lower portion of Fig. 1.

Energy from the microphone is amplified by a 12DW7 dual triode, V_{11}, and fed to a 7360 balanced modulator, V_{13}. Also driving the 7360 is a 9-Mc. crystal oscillator, V_{19A}. Output from the 7360 is 9-Mc. double sideband, with carrier suppressed. This becomes upper-sideband s.s.b. after passing through the crystal-lattice filter, FL_1. No sideband switching is provided, and none is needed, since 50-Mc. sideband communication is concentrated at the low edge of the American phone assignment and upper sideband is thus the logical choice.

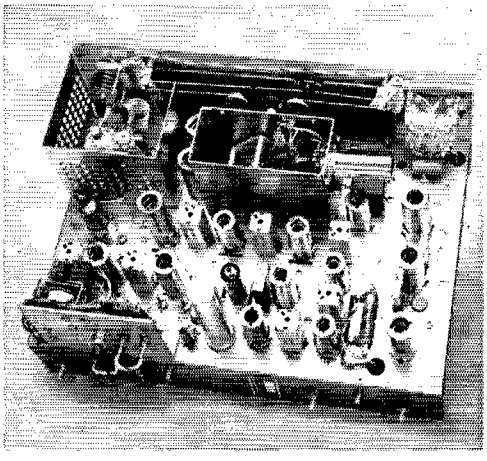
The filter is the first dual-function item, remaining in the transmitting and receiving circuits permanently. The tunable oscillator, V_{18A-B}, enters the picture again at this point. Its output on 5 to 5.5 Mc. beats with the 9-Mc. sideband signal in a 12AU6 mixer, V_{13}, producing 14-Mc. s.s.b. energy that is amplified by another 12AU6, V_{14}. Here the 6U8 oscillator doubler, V_{21A-B}, comes into play again, its 36-Mc. energy adding to the 14-Mc. signal in a 12BA7 mixer, V_{15}, to produce the 50-Mc. signal that is eventually transmitted. Linear amplifiers V_{16} and V_{17}, a 12BY7 and a 6883, bring the signal up to the 85-watt p.e.p. input that the final stage runs.

Operation

In the interest of clarity in description of the basic stage functions we have used round numbers to indicate the frequencies involved. Actually there is some latitude possible in setting the frequencies of both transmitter and receiver. Normally the transmitting frequency is left fixed, and the receiver can be varied plus or minus 1.5 kc. from the transmitting frequency by a front-panel control. This is handy in net operation and round-table QSOs, where there is often a small variation in the frequency of the participating stations. Being able to adjust the receiver slightly without affecting the transmitting frequency prevents such a group operation from gradually walking across the band, as can happen if there is no independent frequency control for the receivers.

The transmitting frequency can be shifted by a similar amount if it appears desirable. Separate transmitter and receiver offset controls shift the frequency of the variable oscillator, V_{18A}, by the desired amounts. The transmitter control is on the back of the r.f. unit, while the receiver offset is on the front panel. It is calibrated in 0.5-kc. intervals.

The main tuning control for both transmitter and receiver is a dual smooth-running vernier affair, reading directly in frequency. When properly calibrated, it is accurate to within less than 2 kc., and may be reset to well under 1 kc. Front panel controls in the upper row on the left side are for speech gain, carrier level, and receiver r.f. gain. Below the carrier level knob is another for carrier balance. Microphone and key jacks are mounted either side of the balance control.

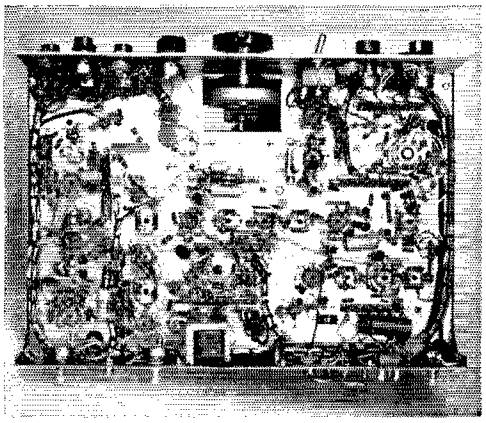


Interior of the Venus Transceiver. The rectangular section in the upper center is the v.f.o. assembly, with its cover removed. The transmitter output stage is at the upper left.

Toggle switches at the right of the main tuning knob are for fast-slow a.v.c. and receiver mode switching. Knobs at the lower right are the noise limiter and receiver audio gain controls. At the upper right are the final amplifier plate loading and tuning controls.

The tuning range is 49.975 to 50.475 Mc., though other ranges may be obtained on order. Very little readjustment of the transmitter is needed in covering this small segment of the band, and none at all in the receiver. In transmitting, once the loading has been set up for a 50-ohm load, only a slight retouching of the final plate tuning control is needed, and this only when the change in frequency is a major portion of the tuning range. Two meters are provided. One reads final amplifier cathode current and the other relative output. The latter doubles as an S-meter in receiving.

The Venus is supplied with a push-to-talk microphone, and all voice operating is done by this means. Shaped grid-block keying is provided, with a key jack on the rear wall. The transmitter is set up for c.w. operation by insert-



Bottom of the Clegg Venus. Despite complex circuitry, the layout has been kept open, with all parts accessible. A factor in this is inclusion of the power supply components in the speaker enclosure, a separate unit.

ing the key and turning the speech gain control to its off position. The switch on this control is used as the send-receive switch in c.w. work. The carrier level control may be used to set the power output at any convenient level for tuning or antenna adjustment purposes.

For a.m. service the carrier level is set so that the amplifier cathode current is approximately 60 ma., and the speech gain so that both meters show only very slight upward movement on voice peaks. Reception of a.m. involves merely placing the mode switch in the proper position. It should be noted that the Venus is designed for sideband and c.w. service. The receiver selectivity (2.7 kc. at 6 db. and less than 6 kc. at 50 db.) is such that the deficiencies of many a.m. signals currently heard on 50 Mc. show up very markedly. A stable well-modulated a.m. signal is quite readable, even at low signal levels, but the wobbly v.f.o. and the fuzzy modulation that so often characterize 50-Mc. a.m. operation fare very poorly indeed.

Venus 50-Mc. S.S.B. Transceiver

	R. F. Unit	Power Supply & Speaker
Height:	8 inches	8 inches
Width:	15 inches	7½ inches
Depth:	11 inches	11 inches
Weight:	18 pounds	21 pounds
Price Class:	$195	$110

Manufacturer: Squires-Sanders, Inc., Watchung, New Jersey.

Options

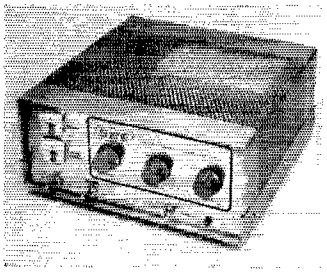
The power supply, which also contains the speaker, is normally supplied for a.c. operation, but a 12-volt version is available. The a.c. supply is an all-solid-state chokeless design which is compact and relatively light in weight. Being separate from the r.f. unit, it can be placed away from the operating position to conserve table space, if desired.

The Venus was designed with many contingencies in mind. It is a complete 50-Mc. station in its own right, with enough power to perform well, but it may be used effectively in conjunction with other gear. Provision is included for operation with a high-powered linear amplifier. The 14-Mc. output from the first mixer in the receiver, F_2, may be taken off and fed to a communications receiver, thus using the receiving front end as a converter and providing wider tuning range than the Venus tuning system affords. This also frees the operator for transmitting and receiving in widely separated frequencies, where this is desirable.

Though the prospect is not discussed in the instruction book, it takes no great amount of imagination to visualize the Venus as a frequency-control system for any and all higher bands, both transmitting and receiving. Some fairly simple transverter equipment for each additional band is all that would be required.

—*E. P. T.*

SBE Linear Amplifier SB1-LA



THIS is truly the age of miniaturization. SBE has managed to pack neatly an s.s.b. kilowatt linear amplifier, including power supply, into a ½-cubic foot package. Although the amplifier is designed to go with the SB-33[1] transceiver, it is compatible with other exciters that can furnish about 65 watts of drive. Since the SB-33 covers the 80-, 40-, 20-, and 15-meter bands, the SB1-LA also operates in the amateur bands between 3.8 and 21.5 Mc. The amplifier is rated at 1000 watts p.e.p. input on s.s.b. (750 watts on 15 meters), 400 watts on c.w., f.m., and f.s.k., and 300 watts on a.m.

[1] Recent Equipment, *QST*, Apr. 1964.

One secret that could account for the small size of the amplifier is the use of several relatively small tubes instead of one large kilowatt tube. SBE incorporates six 6JE6 TV sweep tubes in a grounded cathode circuit. With all of these high-perveance tubes in the circuit, it doesn't take a