

I. DESCRIPTION

A. General (See Figure 1)

The Clegg Venus is a high quality compact attractively styled SSB receiver and transmitter that puts you on 50 mc single sideband without all the fuss, bother and expense associated with adopting low frequency SSB exciters, crystal controlled converters, relays, linear amplifiers, etc.

Employing all the latest circuits techniques, the Venus, in one small package, provides a combination of advanced operating features and conveniences heretofore unavailable in rigs at any price.

B. Operating and Performance Features

1. A nuvistORIZED front end for maximum sensitivity and extremely low noise figure.
2. Crystal lattice filter in both receive and transmit positions.
3. Balanced beam tube modulator.
4. Receiver Offset control provides ± 1.5 KC tuning of the receiver frequency, independently of transmitter. This is especially desirable for net operation where many stations are frequently off frequency.
5. An effective peak noise limiter functions with the diode detector in AM operation while adjustable threshold limiting provides excellent rejection of impulse noise on SSB and CW.
6. The tuning dial assembly that drew raves from thousands of ZEUS and INTERCEPTOR users has been further refined for use in the VENUS, to accurately read 1 KC per division, so desirable for SSB operation. The Main tuning dial tunes 10 KC per revolution.
7. Slow AVC release is carefully designed to the special requirements of VHF SSB.
8. An expanded scale relative output meter permits simple and precise (front panel controlled) carrier balance adjustment, and output tuning indication. The same meter also serves as an accurate S meter on receive.
9. A second panel meter continuously monitors cathode current of transmitting output amplifier tube.

10. Broadband circuits throughout provide maximum simplicity and ease of tune-up. The only transmitter tuning requirement is re-peaking of the final amplifier plate when large frequency changes are made.
11. Shaped, blocked-grid keying combined with linear circuitry and extreme frequency stability insure unexcelled CW performance.
12. A separate front panel control provides for smooth injection of carrier for excellent quality AM operation and adjustable CW output.
13. Accessory connector is provided for connection and control of external linear amplifier and/or separate receiver.
14. Each Venus is equipped with a high quality 8-S #551-001 high oh output, shielded microphone matched to the transmitter input for maximum talk power.

C. Specifications

1. Electrical

a) Transmit

Frequency Range:	49,975 to 50,475 KC, Standard (other ranges available on special order).
Power Ratings:	85 watts PEP input -
SSB Performance (9 MC lattice filter)	Unwanted sideband down more than 50 db at 1000 cycles. Carrier suppression greater than 56 db. Distortion products down more than 30 db at full ratings.
Frequency Stability:	Less than 500 cycle warmup drift after first twenty minutes. Less than 100 cycle/hour drift after warmup.

b) Receive

Frequency Range:	Same as TRANSMIT
Frequency Stability:	Same as TRANSMIT
Sensitivity:	.25 uV for 6 db S/N on AM .1 uV for 6 db S/N on SSB
Selectivity:	2.7 KC at 6 db, less than 6 KC at 50 db.
Spurious Responses:	Images and IF leak through down more than 60 db

Overload Characteristics: Less than 5% cross modulation results from any two signals separated by more than 20 KC if stronger signal is less than 2 MV across 50 ohm input.

AVC Characteristics: Less than 10 db change in AF output for input change from 1 uV to 400 uV (52 db). Fast attack, panel selectable release times of .15 or 1.2 seconds.

AF Power Output to Speaker: More than 2 watts at 3.2 ohms.

c) Power Supply

Power requirements are met by the ~~Equinox Sonders~~ Venus AC #800-013, 115 Volts AC, 60 cps input Power Supply/speaker combination (as well as by other commercially available Power Supply/speaker packages (See Section II, Installation).

2. Tube Lineup (See Figure 2)

<u>Tube No.</u>	<u>Tube Type</u>	<u>Receive</u>	<u>Transmit</u>
V1	6CW4	RF Amp	--
V2	6EH7	1st Mixer	--
V3	6EH7	2nd Mixer	--
V4	12BA6	9 MC Amp	--
V5	12BE6	3rd Mixer	--
V6	12BA6	455 KC IF	--
V7A	12AL5/2	AM DET	--
V7B	12AL5/2	AM ANL	--
V8	12BE6	Prod. Det.	--
V9A	12DW7/2	1st Audio	--
V9B	12DW7/2	S-Meter Amp.	Relative Output Meter Amp.
V10	12AQ5	Audio Output	--
V11	12DW7	--	Speech Amp.
V12	7360	--	Bal. Mod.
V13	12AU6	--	1st Mixer
V14	12AU6	--	14 MC Amplifier
V15	12BA7	--	2nd Mixer
V16	12BY7	--	50 MC Driver/Amp.
V17	6883	--	Final Power Amp.
V18	6DJ8	5.0 to 5.5 MC Master	Osc. and Cathode follower
V19A	12AV7/2	--	8998.5 KC carrier, osc.
V19B	12AV7/2	3rd Mixer Osc.	--
V20	6A2	VOLTAGE	REGULATOR
V21	688A	36 MC Osc.	36 MC Osc.

3. Physical

15" wide by 7" high by 10-1/2" deep. Net shipping weight approx. 22 lbs.

II. INSTALLATION

A. Unpacking

The Venus has been packed with adequate internal carton bracing and cushioning to withstand normal handling in shipment on common carriers. Examine the carton exterior for signs of severe damage (crushing, piercing, etc.) In the event of obvious serious damage, examine the equipment carefully to determine the extent of internal damage, save packing material and make claim against transportation company.

Check all front panel controls for freedom of action and observe that all tubes and crystals are firmly seated in their sockets. Complete and mail the equipment registration card.

Many customers have found that saving the shipping carton and the internal cushioning is a great convenience in the event of subsequent need for reshipment or prolonged storage.

B. Installation (Fixed Station)

1. Power Supply/Speaker combination

~~Squires Sanders~~ Venus AC #800-013 or suitable commercial supply furnishing:

+275 volts at 125 Ma
+650 to 750 volts at 150 Ma
-100 volts at 10 Ma
12.6 volts at 5.5 ampere AC or DC with built in
4 ohm speaker

2. Antenna Connection

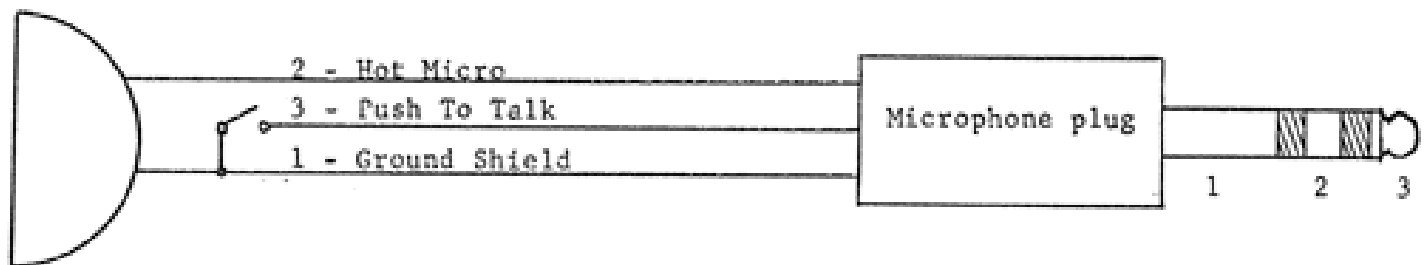
Type UHF (SO-239) to match with PL259 male plug. The Venus is designed for use with 50 to 75 ohm loads. Typical of all VHF equipment, its performance is very much influenced by the antenna system. A well matched three element beam located at least 20 feet above ground with RG-8AU or better cable, is considered minimum for satisfactory performance. For mobil operation, a carefully matched "halo" will be found satisfactory.

3. Speaker

Self contained and automatically connected with the Venus AC #800-013 Power supply. Speaker connections are pins #5 (GRD) and #7 on power supply Jones plug. A speaker of 3 to 6 ohms impedance should be used. An auxiliary speaker output jack is provided on the Venus AC #800-013 Power Supply.

4. Microphone

The Clegg audio circuits and the ~~Spice 8-11~~ #551-001 microphone furnished with the Venus have been carefully matched for maximum performance. Such other microphones as the Electro Voice #664, Astatic D-104 and similar high impedance units will provide satisfactory operation where a desk microphone is desired. Since normal TRANSMIT-RECEIVE switching of the Venus for SSB or AM is performed only via the PTT control system, any alternate microphone must be of the type that provides PTT operation. The microphone employs a three circuit plug wired per figure 3 below:



Microphone

FIG. 3

5. Key Jack is of the RCA or phono type and is located on the rear apron of the chassis. A matching plug is furnished (See Section III, A5).
6. Auxiliary connectors are provided for antenna switching and connection and control of an auxiliary linear amplifier and/or an external separate receiver.
7. Jacks are provided at the rear of the Venus (See Figure 4) for connecting the Clegg SS Booster. When the Booster is not used, the Jumper (supplied) must be in place.

RCA phono connectors adjacent to the antenna connector and the three circuit terminal strip adjacent to the power plug at the rear of the unit per figure 4 provide these facilities.

7. Adjust both AMPLIFIER PLATE TUNE and LOAD CONTROLS for maximum indication on upper meter (S Meter). The two controls will be found to interact, but with some small practice, it will be found that the TUNE control will principally affect the upper meter (RELATIVE OUTPUT) and the LOAD control will affect cathode current. The correct final adjustment will be that which yields a maximum reading on the top meter and a dip or minimum reading on the lower meter. If CATHODE CURRENT exceeds 130 Ma, the CARRIER LEVEL control should be backed down.

With a matched 50 ohm antenna load it should be possible to obtain nearly full scale reading on the output (upper) meter with approximately 120 Ma of CATHODE CURRENT. Tuned in this manner, the VENUS is ready for CW operation.

8. OPERATION-SSB:

To operate on SSB, the CARRIER LEVEL control is turned completely back (counter clockwise) past the switch position. The CARRIER BALANCE control is then adjusted carefully for lowest reading on the output meter. (This is easier to observe if the AVC switch is in the FAST position). This adjustment should be made by activating the transmitter either with the CW position on the SPEECH GAIN control or by using the push to talk microphone switch. In the latter case, it is important that the SPEECH GAIN be at minimum (not in CW Position). After balancing the carrier as above the SPEECH GAIN can be advanced while talking into the microphone until both CATHODE CURRENT Meter and OUTPUT meter both move up scale.

9. The preferred method for adjusting the SPEECH GAIN setting of any SSB transmitter is with an oscilloscope. However, in the absence of this instrument, the speech gain can be adjusted quite satisfactorily by observation of the two panel meters. During normal speech, with average male voice and with the AVC in the FAST position, the CATHODE CURRENT meter will normally swing up to 55 or 60 Ma and the OUTPUT meter will hover just above midscale. On sustained tones whistled into the microphone,

C. Maintenance Adjustments

1. TRANSMITTER OFFSET ADJUSTMENT (Control located on rear apron, See Figure 4). Adjustment of this control which is preset at the factory, should not normally be necessary unless several reliable reports indicate that your transmitter and receiver are not on exactly the same frequency.

The simplest procedure for making this adjustment is to engage in a three way QSO with two strong local SSB stations who are both on the same frequency. With the RECEIVER OFFSET control set exactly on 0, tune the two stations in for best intelligibility and most natural sound. Ask for a report as to whether your signal is high or low in frequency. (Your voice will sound excessively low if you are too low; it will sound excessively high pitched if you are high in frequency). Rotate the TRANSMITTER OFFSET control in small increments using push to talk break in to get a report for each increment. Continue this process until both stations report that you are on frequency.

2. DIAL CALIBRATION. The dial calibration of the VENUS has been factory adjusted to meet or exceed specifications. If, due to replacement of tubes or extremely rough handling, it becomes necessary to correct dial calibration, the following procedure should be followed:

- a) Remove SNAP-PLUG from left side of cabinet directly behind S Meter.
- b) Observe that there are two trimmer adjustments accessible through this hole on the side of the VLO (Variable Local Oscillator) Compartment. The adjustment toward the front is L15 and the one to the rear is C9.
- c) A reliable frequency standard at two known frequencies near 50.1 MC and 50.3 MC is required. Set RECEIVER OFFSET to 0, DETECTOR to CW/SSB.
- d) Capacitor C9 should be adjusted so that dial calibration is exactly correct on the lower of the two frequencies.
- e) Tune receiver to zero beat on the higher frequency. If the dial reading is in error by more than 2 KC, readjust C9 for a correct dial reading.
- f) Return to lower frequency standard and reset L15 for correct reading at that frequency.

- g) Repeat steps (e) and (f) as many times as necessary to achieve correct dial reading at both frequencies. This process will be hastened somewhat if each adjustment of L15 or C9 is overdone slightly each time. That is, if a 3 KC error exists on step 6, a 4 KC correction should be performed.

3. CARRIER BALANCE. The VENUS is capable of providing a stable carrier suppression in excess of 50 db. Normally full balance of carrier can be achieved with the CARRIER BALANCE panel control. It may become desirable, after several hundred hours of operation, to adjust the Balanced Modulator quadrature balance control, C4 located on top of the chassis immediately in front of V12. The procedure is as follows:

- a) Tune both the VENUS and a stable 6 meter receiver to any frequency between 50.1 and 50.3 MC. Operate the VENUS in the CW position (being certain to close the KEY JACK circuit) and with the LEVEL control switched into the 0 position, adjust the CARRIER BALANCE control for minimum S Meter reading on the auxiliary receiver. By means of a long (7") and thin (3/32") screwdriver inserted through one of the cabinet perforations adjust capacitor C4. It will be found that small adjustment of C4 performed in conjunction with readjustment of the panel BALANCE control will permit reduction of the residual carrier to an almost undetectable level. When performed with care and patience it is possible to achieve a suppressed carrier level down more than 70 db below maximum peak output.

D. Use of Accessory Equipment:

The generous use of plugs, spare terminals, patch cords, etc. permits the use of many accessories and operating aids with the VENUS. Most of these provisions are self-evident from examination of the schematic diagram.

A. RECEIVE MODE FUNCTIONS

Incoming signals at 50 to 50.5 MC are amplified by V1 and converted to 14 MC in V2 utilizing a 36 MC crystal derived signal from V21. The coupling between V2 and V3 is broadbanded for a 600 KC bandwidth. V3 is a mixer stage whose injection signal is derived from 5.0 to 5.5 MC variable local oscillator (VLO). Output of V3 is at 9 MC. A crystal lattice filter at 9 MC provides approximately 3 KC selectivity.

The filter output is amplified in V4 whose gain is adjustable by the RF Gain control. The amplified 9 MC output of V4 is converted to 450 KC in mixer stage V5 and this signal is amplified by V6. V7A is an AM detector and AVC diode. V7B is a peak limiter for noise reduction on AM. V8 is a product detector with 450 KC crystal controlled injection. Semiconductor diodes are employed as a manually controlled peak noise limiter for CW and SSB. Two stages of audio amplification are furnished by V9A and V10.

V9B functions as a non-linear VTVM monitoring the AVC voltage applied to V5 and V6. Panel control of the AVC discharge time constant permits selection of fast or slow AVC release time.

B. Transmit Mode Functions

9 MC RF from V19A and audio from V11 are both supplied to balanced modulator, V12. The resultant 9 MC double sideband signal is fed to the crystal lattice filter where the lower sideband is removed. The remaining upper sideband signal is heterodyned to the 14 MC region in V13 whose injection signal is derived from the 5 MC VLO. As in the receiver section, the 14 MC amplifier is broadbanded. After amplification in V14 the 14 MC USB signal is heterodyned in V15 to 50 MC, V21 furnishing the necessary 36 MC injection. 50 MC USB output is amplified by both V16 and V17.

V9B and the related S meter are employed as an output meter on transmit. The scale is expanded greatly at the bottom end to facilitate accurate carrier balance adjustment. This scale expansion is accomplished by the VARISTOR in the AVC line.

Section V

VOLTAGE

TABLE

SET UP

The measurements given in the Voltage Chart opposite are accurate to $\pm 10\%$. They are based upon an input voltage of 115 VAC 60 cycles to a power supply capable of delivering -80 VDC at 10 MA., 12.6 VAC at 6 Amps, + 280 VDC at 130 MA. and + 750 VDC at 130 MA. Properly connected to the power receptacle (J1) on the rear of the VENUS. A VOM with a sensitivity of 20 K ohms per volt DC or better should be used. The control settings are as follows:

RECEIVE

1. SPEECH GAIN -- Switched clockwise and set to minimum.
2. CARRIER LEVEL -- Switched counter -clockwise to "0".
3. BALANCE CONTROL -- Set for best carrier balance in transmit.
4. RECEIVER RF GAIN -- FULL CLOCKWISE (V4 voltages vary with the control settings).
5. RECEIVER OFFSET -- At "0".
6. AVC to FAST.
7. DETECTOR --To AM DET
8. DETECTOR --To SSB-CW to measure V8 voltages only.
9. NOISE LIMITER --To "OFF".
10. AMPLIFIER PLATE -- Tune and Load controls set to any position.
11. RECEIVER AUDIO -- Switched clockwise, thus tuning the VENUS on.
12. VENUS main tuning dial to 50.2 MCS.

TRANSMIT

1. Tune up the transmitter section per previous instructions for SSB operation into a suitable load.
2. Switch the Speech Gain fully counter-clockwise to turn the transmitter on when making measurements.
3. Be sure Carrier Level is set to "0".