

Heathkit VFO. Model HG-10

Height: 6½ inches.

Width: 9⅜ inches.

Depth: 9⅛ inches.

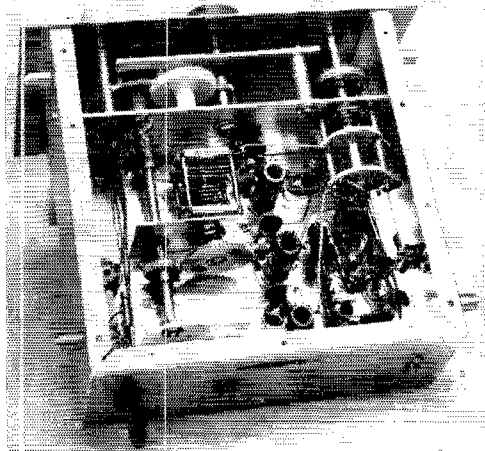
Weight: 9½ pounds.

Power Requirements: 108 volts d.c. or more, at 25 ma.; 6.3 volts a.c. or d.c., at 0.75 amp.

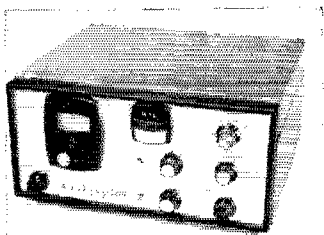
Price Class: \$35 in kit form.

Manufacturer: Heath Company, Benton Harbor 9, Michigan.

good, and the quality of the note was acceptable. The critical listener would not need to be told that a v.f.o. was in use, but there was no buzz-saw effect, so commonly heard on the v.h.f. bands these days. Even with 54 times frequency multiplication, on 432 Mc., there was little drift, and the note was only slightly fuzzy. It was considerably less than T9 at this frequency, but if there's a v.f.o. that wouldn't be, we've yet to see it. — E.P.T.



Bottom of the v.f.o., with its cover plate removed. The dial-driven main tuning capacitor is at the left center, with the three coils at its right. At the upper right is the band switch



WRL Galaxy 300

S.S.B. Transceiver

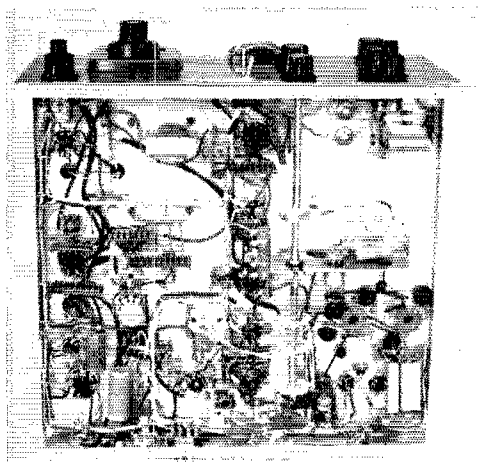
WRL's contribution to the current s.s.b. transceiver craze is the Galaxy 300. Rated at 300 watts p.e.p. input, it covers the phone portions (3.8-4.0 Mc., 7.05-7.35 Mc., 14.2-14.4 Mc.) of the 80-, 40-, and 20-meter bands. The transmitter and receiver sections use a common 9-Mc. crystal filter and share some of the same tubes, including a few of the new compactron types. The transceiver is supplied for push-to-talk operation with an optional plug-in voice-operated break-in (VOX) unit. A matching power-supply console and a linear amplifier are available from the manufacturer.

For simplicity of explanation, the block diagrams of the transceiver shown in Figs. 1 and 2 have been broken down to show the transmitter and receiver sections as separate units. A star alongside a tube in the diagrams indicates that the tube is used for both transmitting and receiving.

Transmitter

Fig. 1 shows the line-up of major components when transmitting. Audio from any high-impedance microphone (with a push-to-talk switch and a PI-68 3-circuit small-barrel plug) is amplified in two triode stages of a 6D10 compactron, V₁₄, and fed to a 7360 balanced modulator. Also arriving at the balanced modulator is

9.1-Mc. energy from a crystal-controlled oscillator, V_{5A}, a 6MI1 compactron. The oscillator frequency is controlled by either of two crystals, Y₁, Y₂, which are selected by a panel sideband switch, S_{2A} in Fig. 1.



Bottom view of the Galaxy 300 transceiver. The figure-eight belt drive coming off the shaft that runs down the chassis from the front panel is for the final amplifier band switch.

TRANSMITTER

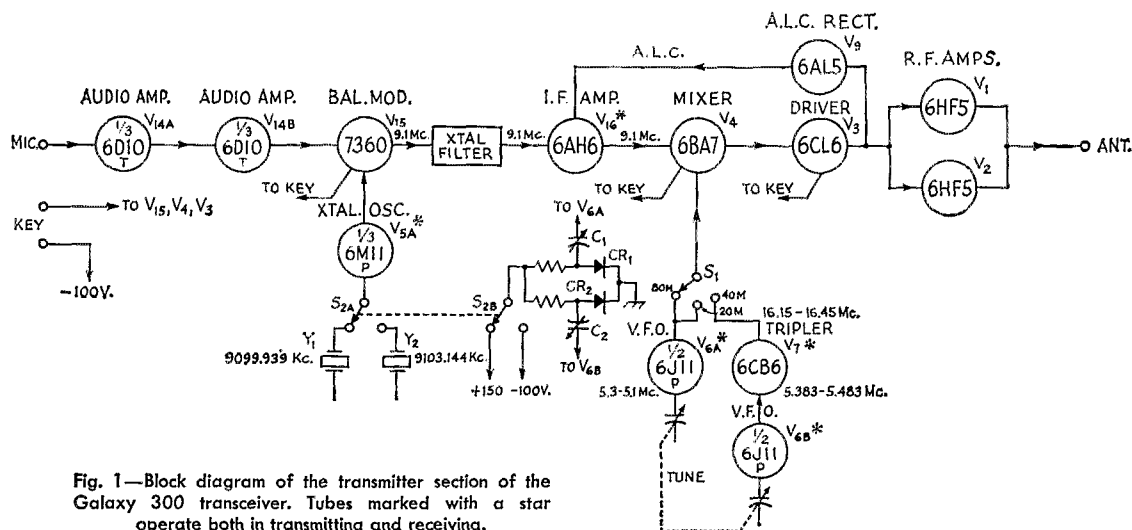


Fig. 1—Block diagram of the transmitter section of the Galaxy 300 transceiver. Tubes marked with a star operate both in transmitting and receiving.

Output from the balanced modulator is double sideband, and when it passes through the crystal filter, one sideband or the other is suppressed, depending upon the frequency of the suppressed carrier with respect to the bandpass of the filter. Rated carrier and unwanted sideband suppression for the transmitter is "better than 45 db."

The 9.1-Mc., single-sideband signal is amplified by V_{16} and fed to the 6BA7 mixer, V_4 , along with the v.f.o. signal, which is in the 5-Mc. range. Actually, there are two v.f.o.s in the Galaxy 300. One is used for 80- and 20-meter operation, with output in the 5.1- to 5.3-Mc. range; the other is used for 40-meter operation

and has output in the 5.3- to 5.5-Mc. range. The 40-meter v.f.o. is followed by a tripler stage, V_7 , so that injection to the mixer, V_4 , is between 16.15 and 16.45 Mc.

Although there are two separate v.f.o. circuits, the tuning control is common to both oscillators. Tuning is done through a single drive mechanism which is a dual-planetary drive. Fast tuning gives a 12 to 1 ratio; vernier tuning is 72 to 1. Dial accuracy is rated at 5 kc. and drift is noted at less than 100 cycles in any 15-minute period after warm-up. Because of the frequency combinations used in the Galaxy, the dial scale reads down in frequency on 80 meters with clockwise knob rotation, and up in frequency on 40 and 20 meters. On 80 and 20 meters, one turn of the vernier knob moves the dial about 5 kc., and on 40 meters about 10 kc.

Also associated with the v.f.o. is the sideband switching circuit. Ganged to the sideband switch S_{2A} is another switch, S_{2B} , that applies a d.c. bias to a pair of crystal diodes, CR_1 and CR_2 . The diodes act as gates to switch capacitors C_1 and C_2 in or out of the v.f.o. tuned circuits. When changing sidebands, the v.f.o. frequency is shifted an amount equal to the frequency difference between the crystals Y_1 and Y_2 in the oscillator, V_{5A} . This scheme keeps the v.f.o. dial calibration the same even when switching sidebands. Because of the frequency combinations, the switch position that gives u.s.b. on 40 meters gives l.s.b. on 80 and 20 meters.

Output from the mixer, V_4 , is in the selected amateur band (on 20 meters the injection signals are added; on 80 and 40 meters they are subtracted) and is fed to the 6CL6 driver, V_3 . The signal is then amplified by the two 6HF5 final r.f. tubes, which are TV horizontal-sweep tubes operated in class AB_1 . The plate tank is a pi network designed for non-reactive loads between 25 and 100 ohms.



This top view of the Galaxy 300 shows the final amplifier components grouped at the left of the shield plate. Attached to the shield plate are drawings showing rear apron connections and tube and component placement. The optional VOX unit plugs into the socket on top of the chassis at the lower right in this photograph. A jumper plug is in the socket in this shot.

Automatic load control (a.l.c.) protection for the amplifiers is used in the Galaxy 300. Bias for controlling the gain of an earlier amplifier, V_{16} , is obtained by rectifying audio generated by rectification in the grids of the r.f. amplifiers when they go into grid current.

C.w. operation is possible with the Galaxy 300, although the equipment as supplied won't operate outside the phone bands except on 40 meters, where it's possible to go down to 7050 kc. V_{15} , V_4 , and V_3 are grid-block keyed on c.w.

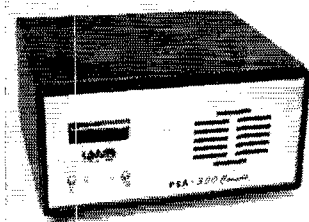
A panel meter with two calibration and color scales reads either transmitter final-amplifier cathode current or relative signal strength when receiving.

As supplied, push-to-talk switching changes the Galaxy from transmit to receive. Either a panel send-receive switch or remote switch on the microphone can be used to operate the circuit. The send-receive relay is a plug-in type that can be removed for easy adjustment and cleaning.

Receiver

The receiver section of the Galaxy 300 is shown in the block diagram in Fig. 2. The front-end tuned circuit is the same pi-network used in the transmitter's final r.f. amplifier. Signals are amplified in the 6BZ6 and then mixed in V_{11A} with the v.f.o. output. The v.f.o. arrangement here is similar to that used when transmitting, except that the cathode-follower stage, V_{11B} , helps to isolate the v.f.o. circuit from the mixer.

Selectivity is furnished by the same 9.1-Mc. crystal filter (2.7 kc. at 6-db. points), followed by two stages of i.f. amplification. Signals are detected in the product detector, V_{5C} , where injection is provided by the crystal oscillator, V_{5A} .



The PSA-300 power supply console furnishes the necessary operating voltages for the Galaxy 300 transceiver. The box also contains a speaker and an optional 24-hour clock.

Sideband switching, including v.f.o. shift by diode switching, is accomplished here in the same manner as described for transmitting. Three stages of audio follow the detector to give a maximum of about 2 watts output.

Gain of the r.f. amplifier, V_{10} , and the i.f. amplifier, V_{17} , is controlled by an a.g.c. bias derived from rectified audio obtained at the plate of the audio amplifier, V_{14C} . The audio signal is rectified by a semiconductor diode, CR_3 , and applied to the grids of V_{10} and V_{17} .

Accessories

A companion power-supply unit, shown in the accompanying photograph, is styled to match the Galaxy 300 in size and appearance. Also included in the power-supply package is a 5 X 7-inch speaker and an optional 24-hour digital readout clock. A panel "knock-out" fills the hole to be occupied by the clock. The power supply unit furnishes all the necessary operating voltages for the Galaxy and utilizes silicon diodes in a bridge circuit to give 315 and 800 volts

RECEIVER

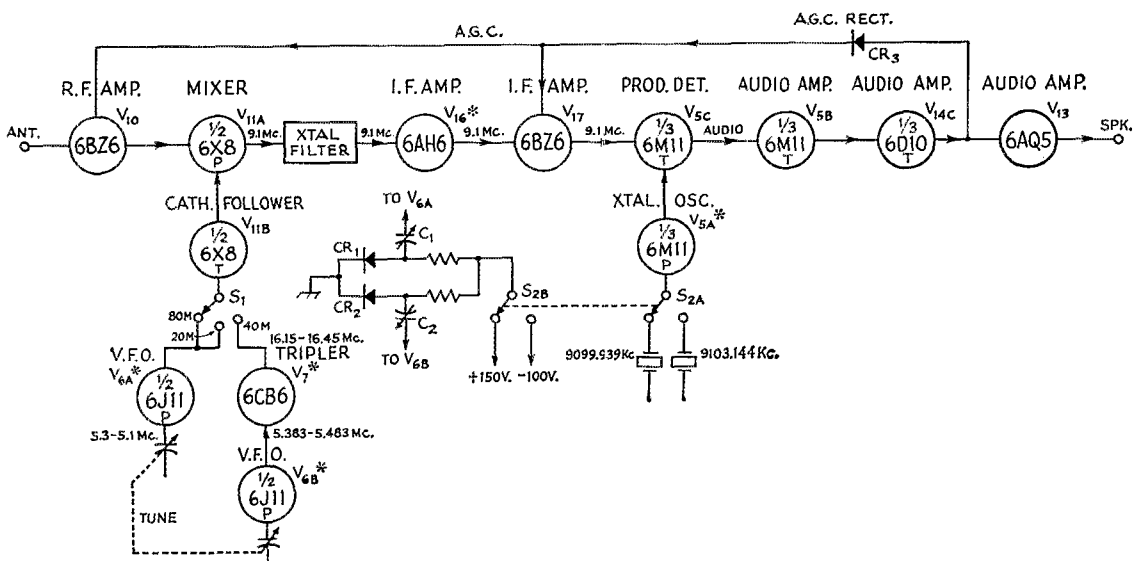


Fig. 2—Block diagram of the receiving section of the Galaxy 300 transceiver.

Height: 7 inches
Width: 15 inches
Depth: 13½ inches
Weight: 27 pounds

Power requirements: 800 v.d.c. at 400 ma., 315 v.d.c. at 200 ma., —120 v.d.c. at 15 ma., and 12.6 v.a.c./d.c. at 4 amps.

Price class: \$300

Manufacturer: World Radio Laboratories Inc., Council Bluffs, Iowa

output. The 800-volt supply uses a choke-capacitor combination that the manual says is "tuned to approximately 120 cycles." However, using

the constants given in the circuit diagram, it calculates out to be about 240 cycles.

Other accessories for the Galaxy 300 are a linear amplifier, mobile power supply and mobile mount. The mobile power supply is designed to operate from 12 volts d.c. and is transistorized. An optional plug-in VOX (voice operated break-in) is available; it simply plugs into a socket provided at the rear of the chassis. Controls are provided for VOX sensitivity, anti-VOX sensitivity, and VOX hold-in time. A kit of plugs for the microphone, key, speaker and external control circuits is also available.

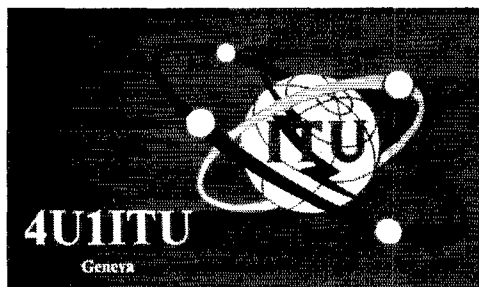
The Galaxy 300 cabinet is perforated steel; the front panel is gold-anodized aluminum.

— E. L. C.

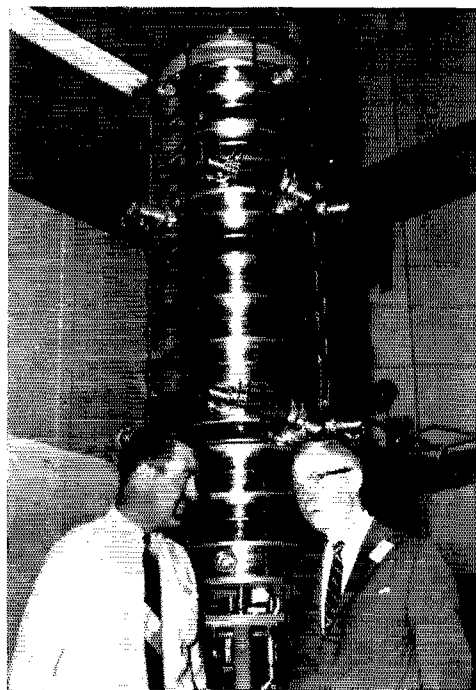
Strays



Pictured at a recent Explorer Scout Conference are eight of the ten hams attending. Left to right, they are K3VBC, K3OPL, K3TEZ, K3UGR, K3TXP, K3NXO, K3OMI, and KN3UYR. Missing when the picture was snapped were KN3YEP and K3KTF.



A grand international hamfest will be held in Geneva Switzerland October 19 and 20, under the auspices of the International Amateur Radio Club and 4U1ITU. It will coincide with the first Extraordinary Administrative Radio Conference on Space Communications of the ITU. Among the guests will be some of the world's most eminent authorities on space communications. This is a sample of the special 4U1ITU QSLs.



Here are ARRL Technical Director George Grammer, W1DF, and George Badger, W6RXW, of Eitel-McCullough, Inc. They are shown next to the huge new Eimac experimental tube, the X-3030, which is being designed to produce a megawatt of c.w. at 8 Gigacycles (8000 Mc.), with 40% efficiency and a gain of 30 db. Other operating data for the X-3030 are:

Beam voltage	150 kv.
beam current	16.7 a.
beam power density	12.4 megawatts/cm ²
coolant water flow	400 gal. per min.

The tube acts as an extended-interaction klystron. It stands eleven feet high and weighs 2000 pounds, and the lead x-ray shield which covers the tube weighs two and a half tons.