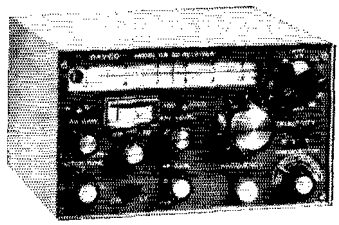
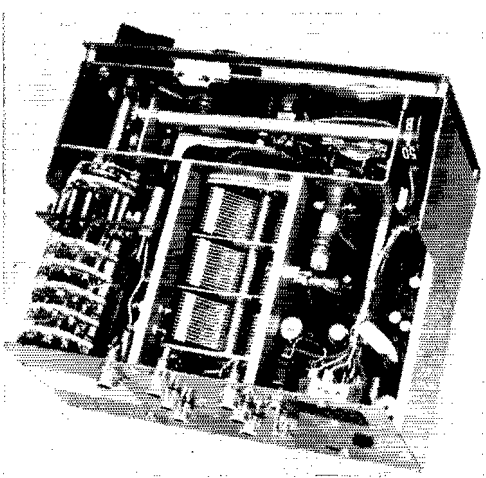
Recent Equipment

To acquaint you with the technical features of current amateur gear.

Davco DR-30 Receiver



THE DR-30 is a miniature solid-state receiver that employs 25 transistors and 13 diodes in a modern-day circuit. It tunes all of the ham bands from 3.5 through 50.5 Mc. There are three additional bandswitch positions, one for monitoring WWV and two blank positions that can be used to tune additional 540-kc. sections of the h.f. spectrum. The receiver was designed with portability and compactness in mind and it is small enough to be held, easily, in one hand. Included in the design are such features as upper and lower sideband selection, variable selectivity, notch filtering, and a blanker-type noise limiter. A further reflection of Davco's state-of-the-art approach is seen in panel-controlled variable a.g.c. attack times, fast, medium, and slow. The likelihood of front-end overload, cross-modulation, and poor image rejection has been greatly reduced by the use of field-effect transistors (FETs) at the r.f. and first-mixer points in the circuit. The early-model Davco receivers used conventional transistors in that part of the circuit and strong-signal difficulty was experienced in certain areas of the country.



Topside view of the Davco DR-30. The three-section variable at the center is the main tuning control. Bandswitching is done with the 6-section ceramic rotary switch at the left of the chassis.

The good frequency stability of the receiver is due, in part, to the use of a crystal-controlled first-conversion oscillator, Q_2 of Fig. 1. Because crystal oscillators of good design are innately stable, the receiver's overall stability is determined to a greater degree by the v.f.o., Q_9, which tunes from 1960 to 2500 kc. The latter is the second-conversion oscillator in the double-conversion lineup.

Returning to the input section of the receiver, Fig. 1, front-end transistor Q_1 is protected from strong-signal burnout by two back-to-back connected diodes, CR_1 and CR_2. The diodes are bridged between the antenna tap on the input inductor and ground. When an incoming r.f. signal reaches approximately 0.5 volt, the diodes short circuit the input signal to ground, protecting the input transistor. The use of FETs at Q_1 and Q_3 helps to eliminate the overload problems mentioned earlier. When compared to ordinary transistors, FETs offer the advantages of near square-law operation. This feature is particularly beneficial in reducing cross modulation. Also, FETs are voltage-operated like vacuum tubes, permitting the use of high-impedance tuned circuits. Since no compromise between power transfer and Q is required, as would be the case if conventional transistors were used, the selectivity of the tuned circuits can be made better. This means that the image rejection should be comparable to that of a vacuum-tube front end of similar design. Further, FETs are far less noisy than conventional transistors, offering a better signal-to-noise ratio.

The first i.f. is produced at the mixer stage, Q_3, and covers the range from 2405 to 2955 kc. The signal is amplified by Q_{4A} before reaching the second mixer, Q_5. The v.f.o. output, 1960-2500 kc., is amplified by Q_{10} and is then heterodyned with the first i.f. energy to produce the second i.f. of 455 kc. at Q_5. The 455-kc. signal is ampli-

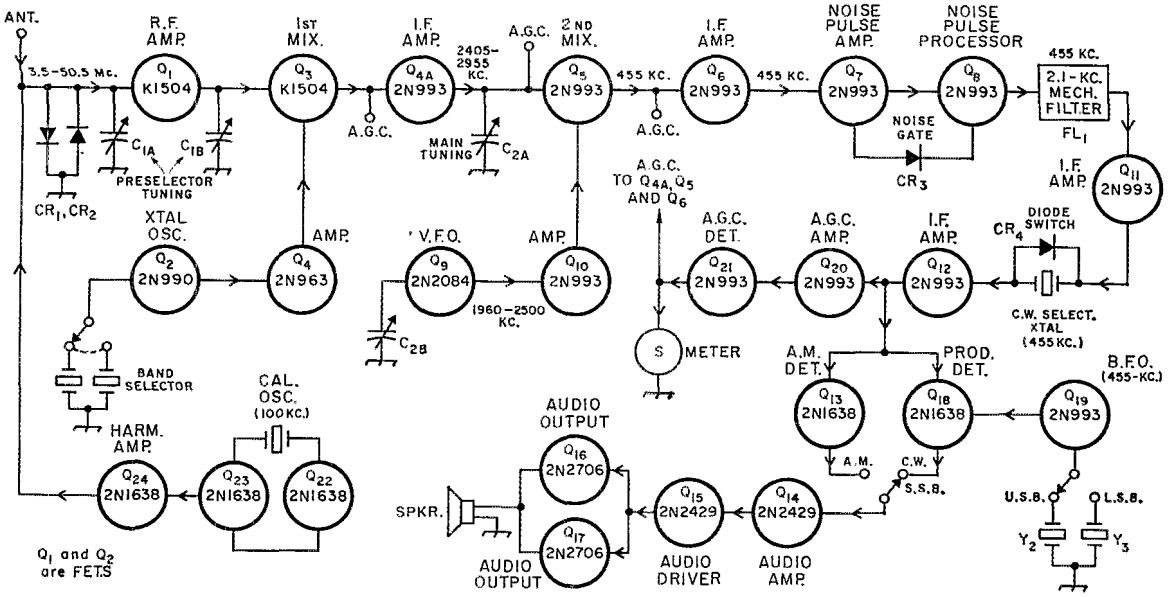
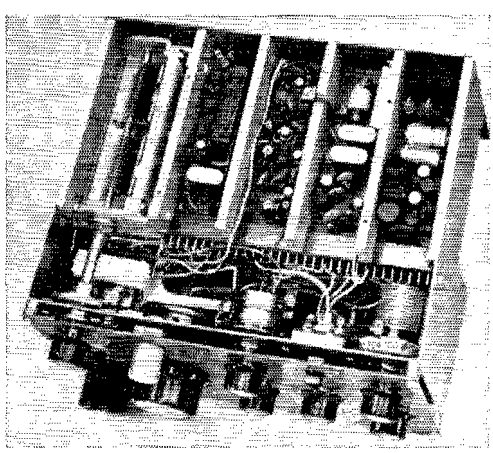


Fig. 1—Block diagram of the Davco DR-30 receiver.

fied by Q_6 and is then fed to the noise-pulse amplifier/processor circuit which consists of Q_7 and Q_8. At Q_7 the noise pulses are amplified and their rise time is increased. The noise pulses are not significantly lengthened, however, as would be the case if they were removed *after* the highly selective i.f. filters. Further processing of the noise energy is effected by Q_8 which produces a pulse that operates the diode gate, CR_3. This diode acts as a switch and mutes the receiver when it is turned off by a noise pulse that is riding through the i.f. channel. The philosophy behind locating the noise-limiting circuitry in the early stages of the i.f. system is to prevent the reduction in receiver sensitivity brought about by high values of noise-derived a.g.c. voltage. Receivers that use conventional a.n.l. circuits at the second detector are not protected in this way. The degree of noise limiting is set by a front-panel control (A.N.L. LEVEL) which adjusts the bias on CR_3, establishing the level at which noise pulses will trigger the diode switch.

Additional diodes (not shown in the block diagram of Fig. 1) following the circuit of Q_8 are used as switches to establish any one of three degrees of selectivity available in the DR-30. The diodes are made to switch by applying d.c. bias to them from a front-panel selectivity control. In the broad-selectivity position three ceramic filters are used to establish a 5-kc. bandwidth. This setting is used for a.m. reception. The medium-selectivity position results in a bandwidth of 2.1 kc. which is set up by the mechanical filter, FL_1, placed in the i.f.-signal path by one of the switching diodes. This setting is useful for a.m., s.s.b., and c.w. reception. In the 0.5-kc. selectivity condition, the width of the i.f. passband is determined by a 455-kc. crystal, Y_1, Fig. 2, through which the signal must travel. Diode switch CR_4 acts as a short circuit across Y_1 when biased into conduction by an external d.c. voltage, thereby removing Y_1 from the circuit. When the bias is removed from CR_4, the switch opens and the 455-kc. crystal is in the circuit.

The i.f. signal is given additional amplification by Q_{12} after which it is routed to the a.g.c. amplifier, Q_{20}, to the a.m. detector, Q_{13}, and to the product detector, Q_{18}. Output voltage from the a.g.c. detector, Q_{21}, is used to operate the S



An under-chassis look at the DR-30. The two-section variable at the upper left is the preselector peaking control. A planetary drive is used with it to slow down the tuning rate. The Collins mechanical filter and the 455-kc. c.w. selectivity crystal are mounted in the chassis compartment to the right of the variable. The tuning capacitor at the lower right of the photo is used to tune the rejection notch across the i.f. passband.

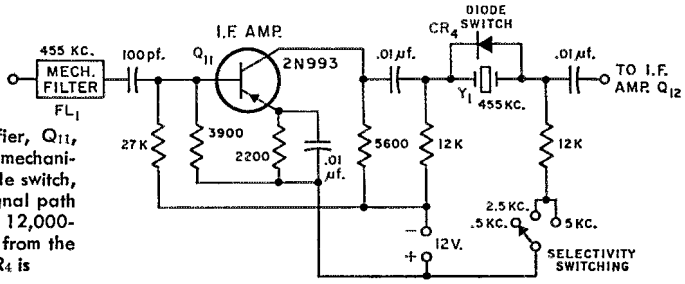


Fig. 2—Schematic of the i.f. amplifier, Q_{11}, showing the relationship between the mechanical filter and the crystal filter. A diode switch, CR_4, places the crystal, Y_1, in the signal path when the d.c. bias is changed. Two 12,000-ohm resistors serve to isolate the r.f. from the d.c. supply. The operation of CR_4 is discussed in the text.

meter and to control the gain of stages Q_{4A}, Q_5, and Q_6. A front-panel switch selects the proper detector for s.s.b./c.w. reception (Q_{18}), or for a.m. (Q_{13}). When Q_{18} is switched into the circuit, the b.f.o. is activated by the mode switch and furnishes the necessary injection signal for upper- or lower-sideband reception. The b.f.o., Q_{19}, is crystal-controlled by Y_2 for upper-sideband. When Y_3 is switched into the circuit, the lower sideband can be received. Audio output from the detector in use is amplified to loudspeaker level by the audio-channel transistors Q_{14}, Q_{15}, Q_{16}, and Q_{17}.

A bonus feature in the DR-30 is a variable notch filter which follows i.f. amplifier Q_{12}. The depth of the rejection notch is factory-set by means of a rear-panel adjustment. The notch is tunable across the i.f. passband by using a front-panel control, labeled NOTCH TUNE. The manufacturer states that up to 60 decibels of rejection is possible with the circuit. Another feature of the Davco receiver is its built-in 100-kc. crystal calibrator. Transistors Q_{22} and Q_{23} function as the oscillator. Output from this circuit is fed into the harmonic amplifier, Q_{24}, which builds up the strength of the marker signals to a satisfactory level for use in the upper h.f. range of the receiver.

Mechanically, the DR-30 resembles the Rock of Gibraltar. An aluminum extrusion, 3/16 of an inch thick, serves as the main chassis for the receiver. The printed-circuit boards are securely attached to the heavy chassis, contributing to better-than-average mechanical stability. As a test, the writer tuned in a weak c.w. signal with the selectivity at 0.5 kc., then dropped the receiver from a height of approximately 10 inches. There was no significant shift in the pitch of the c.w. note when the DR-30 hit the desk. It would seem that this type of construction would be ideal for mobile work. The tuning capacitor is gear driven and the drive assembly is mounted on another heavy-gauge aluminum extrusion, a further aid to the mechanical stability of the receiver.

The power requirements call for a well-filtered d.c. supply that is capable of delivering between 11.5 and 16 volts. The maximum current drain will be approximately 300 milliamperes with the panel lights switched on. If the lamps are turned off, the drain will drop to about 150 milliamperes. The critical voltages in the receiver are regulated by Zener diodes; therefore there can be some latitude in the value of supply voltage to the receiver without impairing its performance. The DR-30 can be operated from a dry-battery pack, from wet cells, or from an a.c.-operated d.c. supply. The instruction book gives a circuit for the latter, should the owner wish to build one.

The slide-rule dial is calibrated in 5-kc. steps,

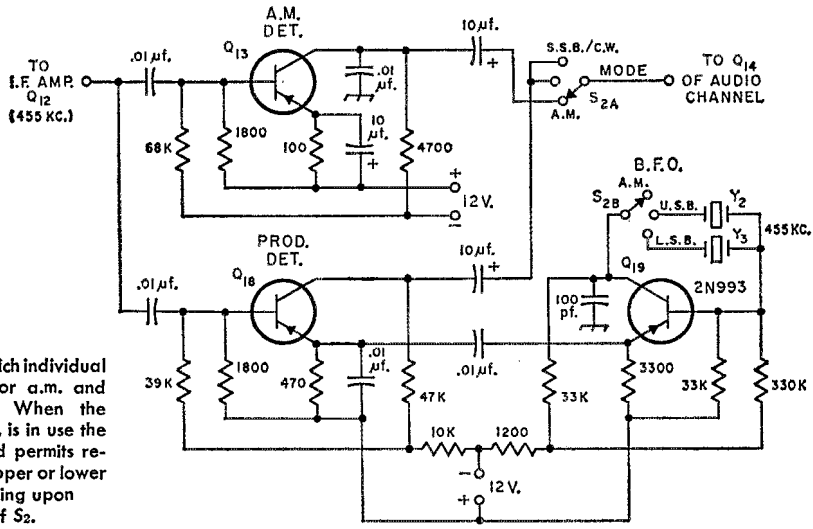


Fig. 3—Method by which individual detectors are used for a.m. and s.s.b./c.w. reception. When the product detector, Q_{18}, is in use the b.f.o. is activated and permits reception of either the upper or lower sideband, depending upon the position of S_2.

with the skirt on the main tuning marked off in 2-kc. increments. It took a bit of "getting used to" when operating so small a receiver, but after an hour or so of tuning the DR-30, we grew accustomed to handling the controls and the operation felt quite comfortable.

Two-tone cabinetry is used on the DR-30. The outer case is finished in light gray and the panel is painted a darker gray and has a gloss finish. Black knobs with chrome satin inserts are used on the various controls, contrasting nicely with the color of the front panel. — *W1CER*

Davco DR-30

Height: 4 inches.
Width: 7⅛ inches.
Depth: 6 inches
Weight: 7 pounds.
Power Requirements:
11.5 to 16 volts d.c. at 300 ma. maximum.
Price Class: $400.
Manufacturer: Davco Electronics, Inc., P.O. Box 2677, Tallahassee, Florida 32304

Heath HD-10 Keyer

C.w. buffs haven't been forgotten as far as the Heath Company is concerned. Proof of this can be seen in the Model HD-10 transistorized keyer. Complete with power supply and paddle, the keyer features its own built-in monitor, permitting the operator to listen to side tone with headphones, or by monitoring with the miniature built-in speaker on the top panel of the HD-10.

Making the keyer even more flexible, a terminal block is mounted on the rear apron of the cabinet, permitting external connections for various functions. An outboard paddle can be connected to the terminals, allowing the operator to select between the built-in key or the externally-connected unit. Some other terminals make possible the addition of dry batteries for powering the keyer during emergency or portable operation. A straight hand key can be connected to the rear terminals too, making the HD-10 useful for that type of c.w. operation.

Assembly time is minimized because the greater part of the circuit is on a printed-circuit board. Since there is little mechanical work to be done, the keyer goes together rapidly and without some of the head-scratching episodes experienced when wiring up the more complex kits. Actually, it was a pleasurable experience in kit building for this writer.

One of the most emotion-mixed moments for a kit builder comes when the project has been completed and it is time to turn the equipment

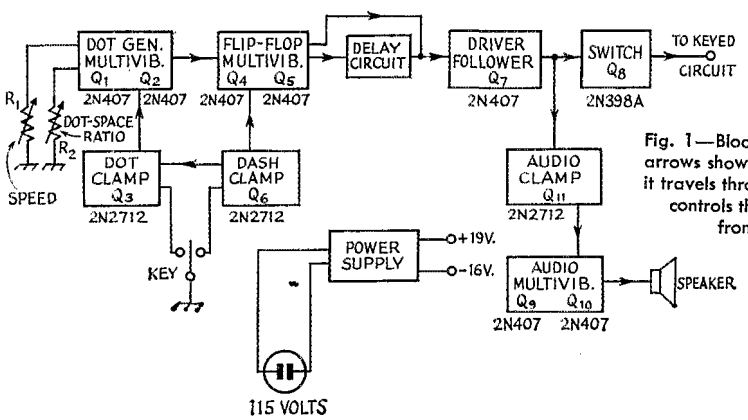


Fig. 1—Block diagram of the keyer. The arrows show the direction of the signal as it travels through the circuit. R_1 and R_2 are controls that are accessible from the front panel of the keyer.