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AUTOMATIC CONELRAD ALARM

Provides Constant Guard for Conelrad 'Alert'

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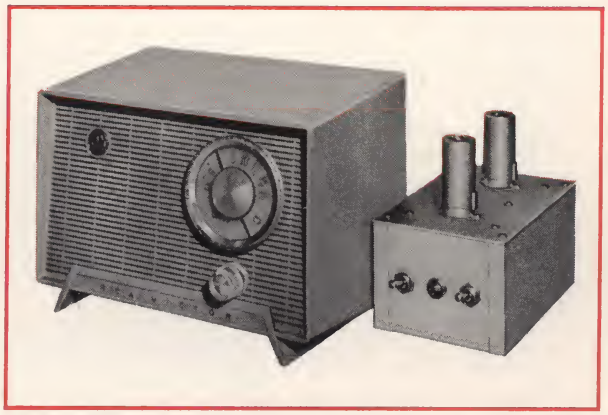
The recent rulings by the Federal Communications Commission on Conelrad provide an excellent opportunity for amateurs who are interested in practical gadgetry. The writer, being one of those practical gadgeteers, and desiring to comply with the recent FCC ruling, constructed the automatic Conelrad alarm unit described in this article. This alarm unit can be used with any of the popularly-priced, five-tube, ac-dc broadcast receivers. Only one minor modification of the receiver is required, and this modification in no way affects its utility as a home receiver.

This Conelrad alarm unit does not require the use of relays. In addition, it emits a sound which is distinctive—there can be no mistake when the Conelrad "Radio Alert" is in effect.

The alarm unit consists of an oscillator of approximately 400 cps, which is keyed by a multivibrator at about 1 pulse per second. The multivibrator is controlled by a dc amplifier operated by the automatic-volume-control voltage of the broadcast receiver. Heater power is obtained from a miniature 6.3-volt, 1.0-ampere transformer. The "B" voltage (120 volts minimum, 250 volts maximum) is borrowed from the receiver.

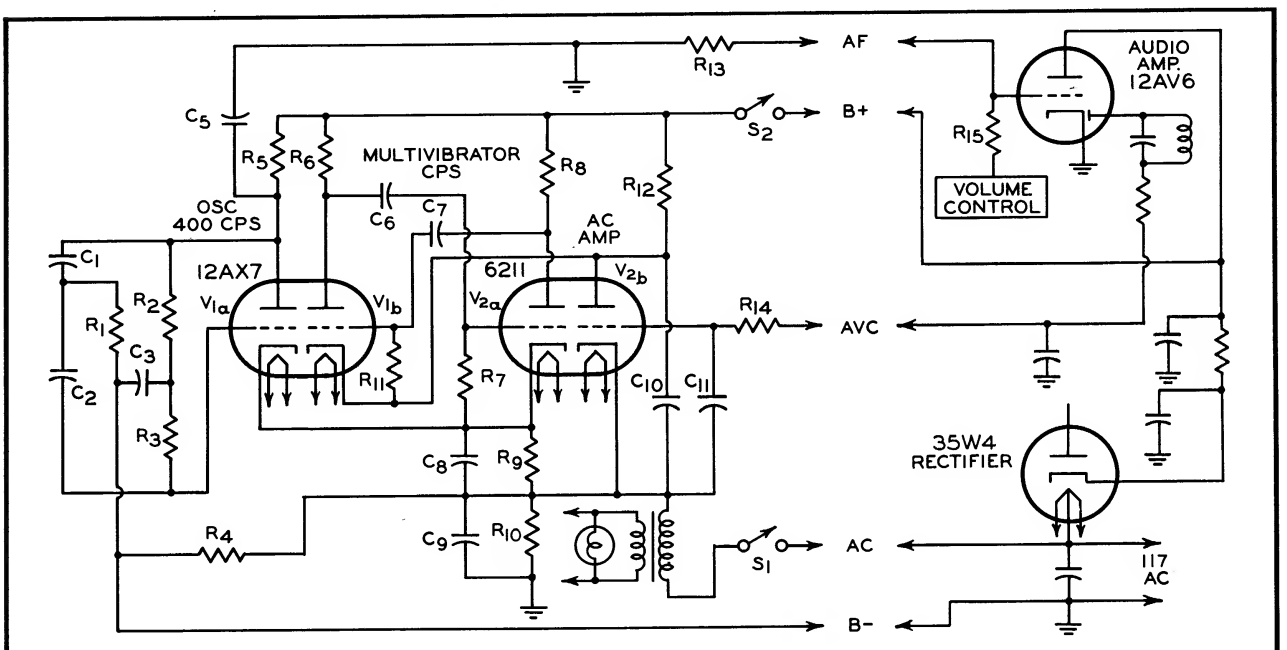
When the receiver is tuned to a broadcast station which provides 4 volts or more of avc voltage, the multivibrator triode section (V_{1b}) in series with the dc amplifier is held nonconducting. The second triode section (V_{2a}) of the multivibrator, consequently conducts continuously. Because the cathode resistor of the second triode of the multivibrator is in common with the cathode of the audio oscillator triode section (V_{1a}), the voltage drop across the cathode resistor is sufficient to cut off the audio oscillator and no audio tone is generated.



The automatic Conelrad alarm unit shown with the RCA model 6X5 series broadcast receiver. All components, except those visible in this view, are mounted on the underside of the cover plate.

When the Conelrad "Alert" is in effect, or when the broadcast station's carrier leaves the air and there is no avc voltage, the dc amplifier starts to conduct and sets the multivibrator into oscillation.

The multivibrator RC constants were picked so that it will oscillate at approximately one cycle per second. Therefore, the audio oscillator is keyed "on" and "off" at this rate. The output of the oscillator is connected to the control grid of the audio amplifier of the receiver and a series of "beeps" is emitted.



Parts list:
C_1—0.001 μf
C_2—0.001 μf
C_3—0.002 μf
C_4—0.01 μf
C_5—0.001 μf
C_6—0.25 μf
C_7—0.25 μf
C_8—0.25 μf
C_9—0.05 μf
C_{10}—0.1 μf
C_{11}—0.01 μf
L—indicator lamp, 6.3 volts, RCA-40

R_1—68,000 ohms
R_2—680,000 ohms
R_3—680,000 ohms
R_4—2.2 megohms
R_5—220,000 ohms
R_6—47,000 ohms
R_7—3.3 megohms
R_8—47,000 ohms
R_9—4,700 ohms
R_{10}—270,000 ohms
R_{11}—1 megohm
R_{12}—68,000 ohms

R_{13}—500,000 ohms
R_{14}—1 megohm
R_{15}—500,000 ohms
S_1—heater voltage switch
S_2—plate voltage switch
T—miniature transformer, 6.3 volts, 1.0 ampere
V_{1a}, V_{1b}—RCA-12AX7 (½ audio oscillator, ½ multivibrator)
V_{2a}, V_{2b}—RCA-6211 (½ multivibrator, ½ dc amplifier)

Schematic and parts list for automatic Conelrad unit.

Construction

Any broadcast receiver which will produce at least 4 volts avc can be used. The author used the popular RCA model 6X5C radio. This receiver is a 5-tube, ac-dc set which utilizes printed-wiring manufacturing techniques. Conversion is extremely simple.

The grid lead to the first audio amplifier, 12AV6, should be opened and a 500,000-ohm resistor (R_{15}) inserted, across which the audio output from the oscillator is impressed. This resistor permits the Conelrad alarm to operate regardless of the position of the volume control. Aside from this resistor and the external connections, no other alterations are required.

For convenience, an octal socket is placed in the center of the back of the receiver. This socket is used for connecting or disconnecting the Conelrad alarm unit without affecting normal operation of the receiver.

Wires from the ac, avc, B+, B— and grid of the first audio amplifier are connected to this socket. Shielded wires are, of course, used for all audio connections.

One triode section of a 12AX7 (V_{1a}) is used as the audio oscillator, while the other section of the 12AX7 (V_{1b}), together with one section of a 6211 (V_{2a}) is used as the multivibrator. The remaining section of the 6211 (V_{2b}) is used as the dc amplifier.

This tube arrangement was chosen because the audio oscillator needed a high-mu tube, and the dc amplifier needed a tube which has good control for cutoff characteristics. The 6211 was chosen because it is a twin triode especially designed for accurate "on-off" control of signals in applications such as electronic computers. Its grid cutoff characteristics are accurately controlled in manufacture. A 12AU7 could also be used in this socket, but the 6211 is designed to provide considerably superior performance in applications of this kind which may involve long periods of operation under cutoff conditions.

The alarm unit is constructed on a piece of aluminum 4″x6″, and mounted on a 4″x6″x 3″ chassis. All tube parts and components are attached to the cover with the exception of the control switches and pilot light.

The right-hand switch (S_1) turns on the heaters of the alarm unit, while the left-hand switch (S_2) controls the plate voltage. The heater switch enables the operator to activate the Conelrad alarm unit whenever he desires. The plate voltage switch is provided to eliminate the annoyance of an audible alarm signal as the receiver is tuned between stations. This feature is especially useful when it is desirable to have the alarm ready for instant use after tuning in a different station.

Since nearly all plastic-case, ac-dc sets have "hot-chassis" construction, a 0.05 μf capacitor (C_5) and a 270,000-ohm resistor (R_{10}) are connected between the B— and the metal chassis to eliminate the possibility of shock. If a transformer-type radio receiver is used, these components can be omitted and the B— can be connected directly to the metal chassis.

The components (R_1, R_2, R_3, R_4, C_1, C_2, and C_3) of the "T bridge" audio oscillator were selected to produce a frequency of approximately 400 cycles. Other frequencies can be obtained by increasing or decreasing the values of the resistors or the capacitors. Increasing the values of both types of components or decreasing these values, respectively decreases or increases the frequency.

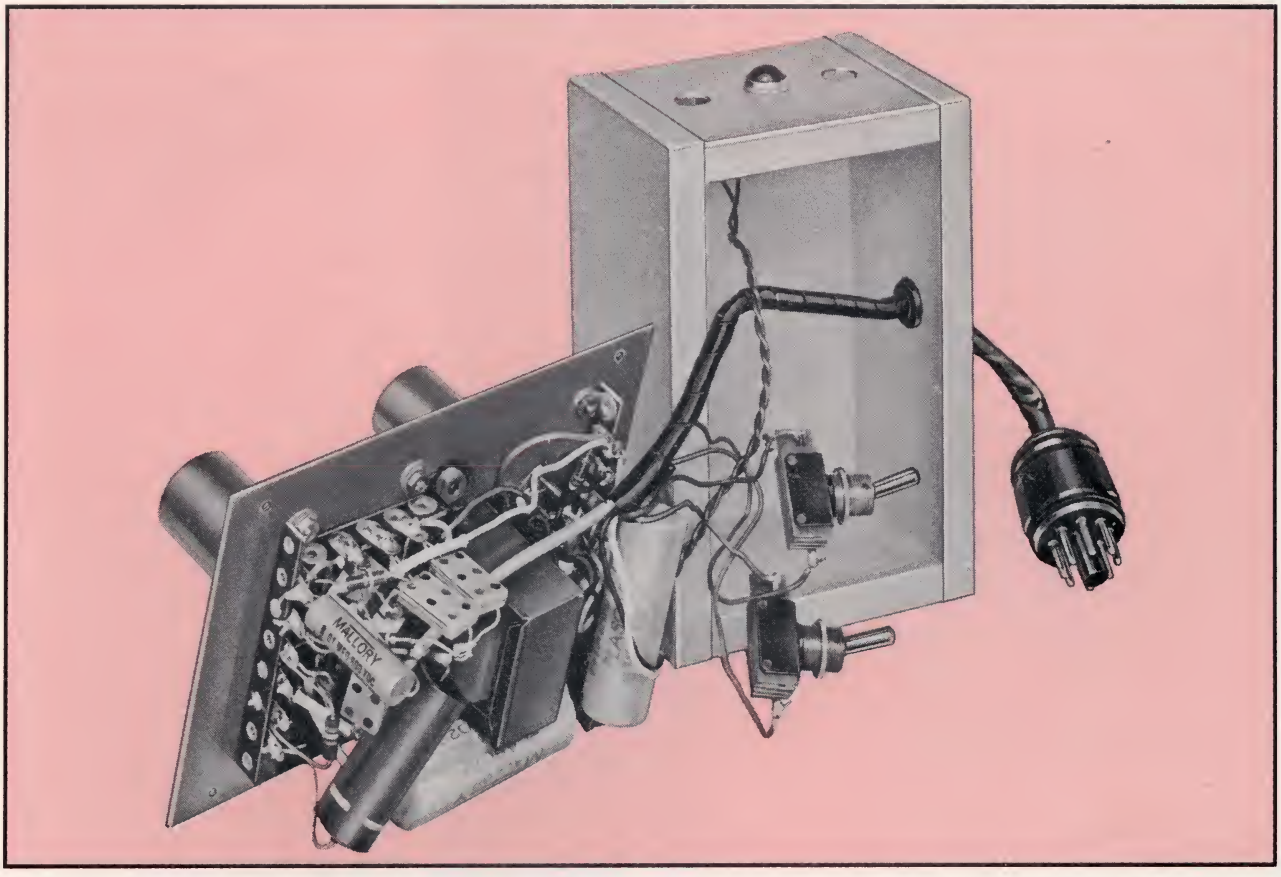
The rate at which these 400-cycle "beeps" will be produced is controlled by the time constant of the multivibrator (R_{11} C_7 and R_7 C_6). Again, increasing or decreasing the RC time constant will, respectively, decrease or increase the repetition rate.

A 68,000-ohm resistor (R_{12}) across that section of the 12AX7 used as a multivibrator insures that leakage currents from the 6211 will not start the system in operation.

This all-electronic, automatic Conelrad alarm unit fully satisfies the recent ruling (Docket 11488) of the Federal Communications Commission. It is simple, inexpensive, and easy to construct.

New Mike Box

The "make-your-own microphone" article by G. D. Hanchett, appearing in the September, 1956, issue of HAM TIPS (Vol. XVI, No. 3) described the construction of an aluminum box for housing the microphone. Bud Radio, Inc., manufactures a box which is ideally suited to the requirements of the transistorized microphone. Measuring 4" x 2¼" x 2¼", the box is available in gray (CU-2103) or etched (CU-3003) finish. Using this box, the base response of the microphone will be slightly higher than that described in the original article.



Placement of components under the cover plate. Note position of transformer. Resistors and capacitors are mounted on three terminal strips as shown.

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