HAM NEWS

SEPTEMBER-OCTOBER, 1958

Featuring—

GADGET RACK

For your shack

PROBLEM . . . How best to house the many accessory units in the average amateur radio station.

SOLUTION . . . Place each unit on a narrow strip panel, house them all in one large cabinet—and call it the GADGET RACK!

THE GADGET RACK offers a partial—but important—solution to arranging accessories in the amateur station for maximum operating convenience and best appearance. Although specific cabinet and accessory dimensions are illustrated, the idea can be applied to any convenient and available material.

A station that has been in operation for several years usually has the following accessories:

1. keying monitor
2. frequency standard
3. conelrad receiver
4. selective audio system
5. outboard IF system
6. intercom set
7. modulation monitor

If these units have been accumulated on a one-at-a-time basis, they probably comprise a collection of miscellaneous size boxes and chassis—some with power supplies and some that obtain their power from the receiver—all of them interconnected with unsightly dangling wires.

One solution to the problem is to construct the above units on one large chassis with its own power supply. This produces a unit which lacks flexi-

Continued on page 3

CONTENTS

GADGET RACK . . . . . Page 1
Scanning the Spectrum . . . . . Page 2
1958 Edison Award . . . . . Page 2
COMBO MONITOR . . . . . Page 5
CONEL MONITOR . . . . . Page 6

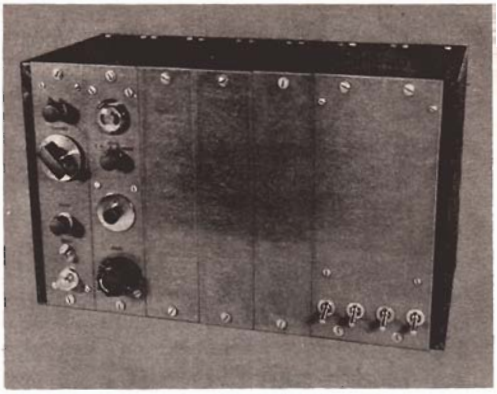
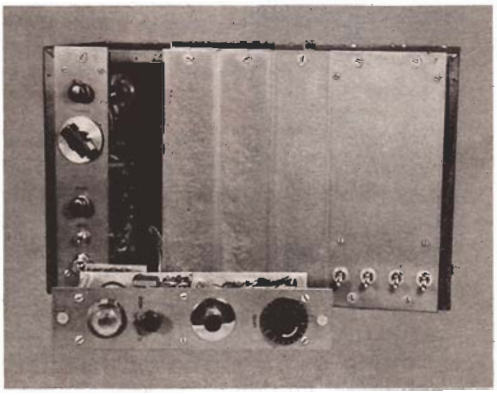
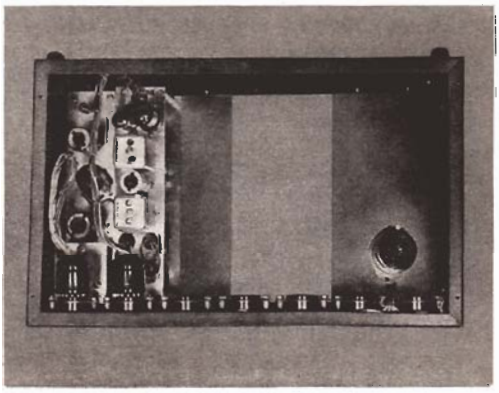


TABLE MODEL GADGET RACK, and accessories ready for action at W9GFS. Left to right: COMBO MONITOR, CONEL MONITOR, blank panels, and power supply.



GADGET RACK with COMBO MONITOR removed to illustrate ease of access to units.



INSIDE VIEW of GADGET RACK with rear cover removed.

SCANNING the SPECTRUM

SURPRISE! *A new format for G-E HAM NEWS begins with this issue, including—clean, fresh mastheads and titles—in the text, a larger type size with greater spacing between lines—and even a new printing process—surely you've noticed by now!*

We didn't announce the change ahead of time, but ye olde editor hopes you'll be pleased with the increased array of build-it-yourself data—witness the GADGET RACK and accessories herein.

1958 EDISON AWARD

For the seventh consecutive year, General Electric is sponsoring the Edison Radio Amateur Award for outstanding public service.

A U.S. RADIO AMATEUR who has distinguished himself through noteworthy public service will receive the Edison Award trophy and a check for $500 at a public ceremony in Washington, D. C., early next year.

ONLY CANDIDATES nominated by letter from any individual, club or association can be considered by the judges. Full details of the public service rendered, as well as the candidate's name, complete address and amateur call letters, should be included in a letter postmarked not later than January 5, 1959.

BASIS FOR JUDGING will be (1) the greatest benefit to an individual or group, and (2) the amount of ingenuity and sacrifice displayed in performing the service. A panel of distinguished and impartial judges will review all entries.

JUDGES WILL BE:

E. ROLAND HARRIMAN, Chairman, The American National Red Cross.

ROSEL H. HYDE, Commissioner, Federal Communications Commission.

GOODWIN L. DOSLAND, President, American Radio Relay League.

WINNER OF THE AWARD will be announced on or before Thomas A. Edison's birthday, February 11, 1959.

EMPLOYEES of the General Electric Company may nominate candidates for the Edison Radio Amateur Award, but are not permitted to receive the Award.

FOR YOUR ELECTRONICS BOOKSHELF . . .

While we're talking about publications, three new booklets on amateur radio, and an operating aid for DX'ers, are now available.

G-E TRANSISTOR MANUAL—A revised and expanded *third* edition of this most-used book in the transistor field; 168 pages stuffed with semiconductor theory, applications, circuitry and specifications. A plastic binding allows the book to lie flat when open, just like our equally famous Essential Characteristics tube handbook.

See for yourself when you pick up your copy ($1.00) from your local G-E Tube distributor, or directly from G.E.'s Semiconductor Products Department, Section S-5898, Electronics Park, Syracuse, N. Y.

SINGLE SIDEBAND FOR THE RADIO AMATEUR—Published by the American Radio Relay League, has blossomed out in a new revised and enlarged second edition. This 250-plus page handbook covers the history, theory and practical aspects of single sideband—generation, detection, modulation, linear amplifiers—and related station accessories. It's an indispensable—repeat, indispensable—reference to keep you well informed on sideband techniques for only $1.50 in the United States, $1.75 elsewhere.

A BRAND-NEW BOOK—CQ-YL, by Louisa B. Sando, W5RZJ, tells an amazing tale of the YL's contribution to the history of amateur radio, from 1913 to date. Louisa, in announcing the book, says it is profusely illustrated—more than 500 photographs—and that it can be ordered directly from her ($3.50, postpaid) at 212 Sombrio Drive, Santa Fe, New Mexico. She'll personally autograph your copy if you request it.

RME DX COMPUTER—A handy, slide-rule type operating aid and DX guide for radio amateurs. Just announced by Electro-Voice, the device lists the following items for each call letter prefix: Country, continent, zone, time differential, international postal rates, and great circle bearing for beam antenna headings.

The call letter prefix column has extra spaces to fill in your own QSL records, sent and received. The DX COMPUTER, measuring about 13 x 5 inches over-all, is available from most electronic parts distributors for $1.00, amateur net.

HOW TO GET *G-E HAM NEWS*—It's free of charge from your G-E Tube distributor. A subscription plan at $1 per year is available to persons with mail addresses in the United States, Alaska, Hawaii, Panama Canal Zone, or APO and FPO numbers. Write to the address on the back page.

Subscriptions in Canada—at $1 per year—are available from the Canadian General Electric Co., Ltd., Electronic Tube Marketing Section, 189 Dufferin St., Toronto 3, Ont.

In other countries, ***G-E HAM NEWS*** may be obtained through International General Electric distributors and representatives.

—Lighthouse Larry

PARTS LIST

NOTE: All capacitances are in mmf, 500 volts working, all resistances in ohms, ½ watt, unless otherwise specified.

F_1. . . . . 3-ampere fuse and holder, type 3AG or 8AG.

I_1. . . . . miniature pilot lamp bracket.

J_1. . . . 2-prong female, recessed chassis power connector.

J_2 to J_4. . . 11-pin phenolic octal sockets (Amphenol type 78-RS11).

L_1. . . . 10 henry filter choke, 100 to 150 ma rating.

P_1, P_2. . . . . male 11-pin phenolic octal plugs (Amphenol 86-PM11).

S_1 to S_4. . . . . single pole, single throw toggle switches.

T_1. . . . power transformer, 600 volts, center tapped, 100 to 150 ma; 6.3 volt, 4-ampere and 5 volt, 3 ampere heater windings; 115 volt, 60-cycle primary.

CABLE SIZES:

"A" . . . No. 16 stranded insulated wire.
"B" . . . No. 20 stranded insulated wire.
"C" . . . No. 18 stranded shielded wire.

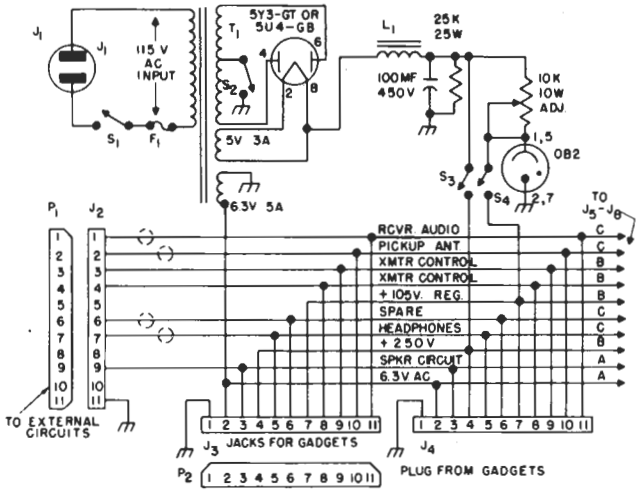


FIG. 1. SCHEMATIC DIAGRAM showing the bus-bar system of interconnections for power and signal circuits between accessory units in the GADGET RACK. The circuit for a suggested power supply also is included.

GADGET RACK

Continued from page 1

bility. If one is foresighted and includes everything he will ever want—or if radio magazines ever stop printing descriptions of desirable auxiliary units—this combined unit will prove satisfactory.

Try to add another unit and there is seldom sufficient chassis room. Mechanical work on the chassis is difficult to do without damaging components and wiring previously installed. And, finally, the unit will probably be unusable for a period dependent upon the time one has to devote to construction.

As a better solution, the author decided to consider a large accessory unit with built-in flexibility by virtue of interchangeable unit construction. This, of course, is not a new idea, as a number of manufacturers produce specialized chassis which may be used in this fashion.

The first step was to list the requirements for a satisfactory system, namely:

(1) basic enclosure easily obtainable;
(2) construction using hand tools;
(3) two or more enclosures stackable without affecting accessibility of individual units;
(4) individual units readily removable for adjustment or repair;
(5) interconnection made between units with a minimum of effort;
(6) unit positions interchangeable without disturbing the interconnections;
(7) remove units removable from the enclosure for repair or adjustment, but still connected to the system;
(8) units removable from the front of the enclosure without access to the rear.

The first requirement ruled out the use of any case or box obtained as surplus equipment, for availability at a given time or place or in the future is always doubtful. The enclosure finally selected was the 7" x 9" x 15" crackle-finished still box with removable covers—shown in the views on page 1—produced by several chassis manufacturers. This enclosure is inexpensive and lends itself to stacking if the removable covers are used as the front and back of the unit.

(Editor's note: Any convenient and available cabinet will serve as the GADGET RACK, if it will house your accessories. A GADGET RACK designed for mounting in a standard relay rack—and a different table cabinet model—will be described in the next issue of *G-E HAM NEWS*.)

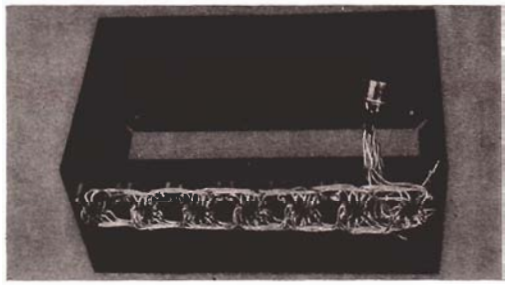


FIG. 2. ACCESSORY SOCKETS were first fastened to the outside of the cabinet bottom, wired and then mounted inside the box. Cut metal spacers to length that allows lugs on sockets to clear metal box.

THE INTERCONNECTION PROBLEM among the accessory units, external circuits and power supply was solved with a *bus-bar* system. After listing all the required connections—and allowing for a spare or two—11-pin octal plugs and sockets were selected. Several sockets, J5-J8 wired according to the schematic diagram, Fig. 1, were mounted along the bottom rear corner of the cabinet. The Assembly Procedure is outlined under the view of these sockets, Fig. 2. Still another 11-pin socket, J2, mounted in any convenient location inside or outside the cabinet, is used for external connections.

External connections on each accessory unit are brought out through a short cable terminating in an 11-pin octal plug (P_2), as shown in Fig. 3. Thus, a unit at any location in the enclosure can connect to the power and other external circuits simply by soldering cable wires into the proper plug pins. If more bus-bar connections are required, other connectors having more pins may be substituted (Amphenol, Cannon, Jones, Elco Varicon, etc.).

SEVERAL TYPES OF CHASSIS may be used for the individual units, but the models described in this issue utilize plate-and-post chassis. Dimensions of a typical chassis are shown in Fig. 4. If a unit requires shielding, strips of perforated aluminum sheet may be cut to fit the side openings and fastened to the corner posts.

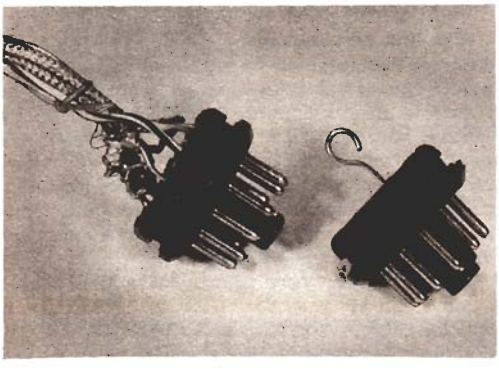


FIG. 3. CONNECTION PLUG for accessory units. Loop made from tinned wire, soldered into pin 1, provides chassis connection for outer conductor of shielded wires in cable.

Corner posts may be cut from aluminum or brass rod, whatever is available. Round rod should be $\frac{3}{8}$ of an inch in diameter; square rod, $\frac{3}{8}$ of an inch on a side.

Panel widths were cut in multiples of one-half of an inch. Corresponding rear chassis plates were cut one-quarter of an inch narrower to provide clearance between adjacent units when installed in the rack. Although the plates can be cut with a hacksaw (or tinshears if they do not bend the panel), better appearance will result if all the plates can be sheared at a local sheet metal shop. An assortment of panels and chassis can be cut at one time to anticipate future needs; next month's *QST* or *CQ* may carry a story on a gadget that you must have in your station.

Other gadget chassis may be made from utility boxes, *Miniboxes, Channel-lock* boxes, small open end chassis—even a flat aluminum plate fastened to the panel with a strip of aluminum angle stock—whatever fits the requirements of the unit to be constructed.

Commercially made gadgets also can be incorporated into a GADGET RACK. Either drill a rack panel to match the controls, or cut a hole in the panel so that the front of the unit can be seen. Small angle brackets will help support a gadget mounted in this manner.

Gadget rack construction possibilities are limited only by your imagination. Even a metal bread box might make a good enclosure!

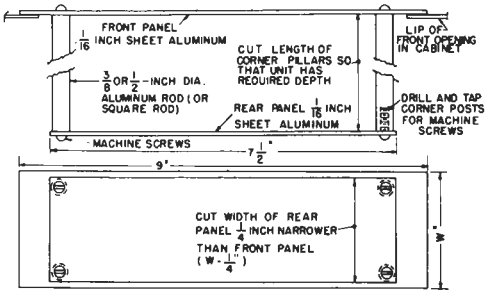


FIG. 4. BASIC PLATE-AND-POST CHASSIS for accessory units. COMBO MONITOR and CONEL MONITOR use this type chassis.

COMBO MONITOR

THE FIRST GADGET RACK ACCESSORY is a combination keying monitor, modulation indicator and field strength measuring instrument.

CONTINUOUSLY CHECKING your transmitter signal—and your *fist* too—is easy with this versatile unit. It requires only three tubes and two germanium diodes. A plate and post chassis, shown in the side view, Fig. 1, automatically provides a thru-panel mounting for the 6E5 indicator *eye* tube.

The signal to be monitored is fed into the unit from an external pickup antenna on pin 10 of the interconnecting cable system, as shown in the schematic diagram, Fig. 2. A 100-ohm potentiometer adjusts the signal level applied to the 6BE6 mixer tube. The position of the function switch, S_1, determines the operation of the remaining circuits, as follows:

CW—An NE-51 neon lamp relaxation oscillator generates an audio tone which is mixed with the RF signal from the transmitter. This produces a modulated RF signal in the 6BE6 plate circuit, tuned to the transmitter frequency.

After detection by a 1N34 diode, the resulting audio signal is amplified in the left-hand 12AX7 triode and appears in the headphone circuit (pin 5 of the bus-bar system). Signals from the station receiver, applied on pin 11, are also fed into the headphone circuit by the right-hand 12AX7 triode. However, whenever the transmitter key is pressed, rectified RF voltage from the 1N34 is applied to this stage as a negative bias, disabling it.

Thus, receiver audio is present in the headphone circuit when the key is *up*, and the NE-51 audio tone is heard when the key is *down*. This function is similar to the popular *Monitone* circuit[1].

CARRIER LEVEL—In this position of S_1, an RF signal from the transmitter results in application of negative bias from the 1N34 to the grid of the 6E5 *eye* tube. This causes the unlighted portion of the circular fluorescent target on the end of the 6E5 to narrow or close entirely, indicating relative carrier level.

MODULATION—In this position of S_1, modulation on a transmitter signal, detected by the 1N34 diode, appears in the headphone circuit. This audio signal also is rectified by a second 1N34 (located between S_1 and the 6E5 in Fig. 2), applied as a negative bias on the 6E5 grid and causes the *eye* to close in accordance with the modulation on the transmitter signal.

THE MODEL SHOWN was constructed on a 2½-inch-wide panel and a 2¼-inch-wide chassis plate. Parts locations on the chassis layout diagram, Fig. 3, are not critical and may be changed to suit available components. Good construction practice—short leads, isolation of signal and AC power circuits, related components grouped together, etc.—should be followed, however.

Continued on page 8

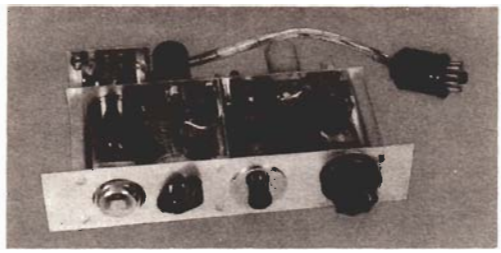


FIG. 1. SIDE VIEW of the COMBO MONITOR unit. Corner posts connecting the panel and chassis are 3 inches long. Those for the 2 x 2¼-inch mounting plate for the 1-megohm potentiometer are 1½ inches long. All posts are tapped for 6–32 screws at both ends.

COIL TABLE—COMBO MONITOR

All coils wound with No. 24 enameled wire on 1-inch diameter, 4-prong coil forms (Millen, No. 45004; ICA, No. 1108B). On 3.5- and 7-megacycle coils, L_2 is wound over the pin-2 end of L_1, with a layer of plastic insulating tape between. On 14-, 21- and 28-megacycle coils, L_2 is wound next to pin-2 end of L_1.

BAND (MC)	uh	L_1 turns	length	L_2 turns	C_1 (mmf)
3.5	42	52 (closewound)	1⅛"	16	4—50
7	13	24 (closewound)	½"	12	4—50
14	7	16 (closewound)	⅜"	8	3—12
21	3.6	12 (spaced wire dia.)	⅜"	6	3—12
28	2	7 (spaced wire dia.)	⅜"	4	3—12

PARTS LIST

C_1. . . . Midget mica-insulated trimmer capacitors connected across L_1 in each coil; see COIL TABLE for values.

C_2. . . . 100-mmf mica (Or, 75 to 150 mmf, see text, page 8).

NE-51. . . . 1/25th-watt neon glow lamp; requires miniature bayonet socket.

P_1. . . . Male 11-pin octal plug (Amphenol 86-PM11).

S_1. . . . 2-circuit, 3-position, single section, non-shorting tap switch (Mallory 3223J).

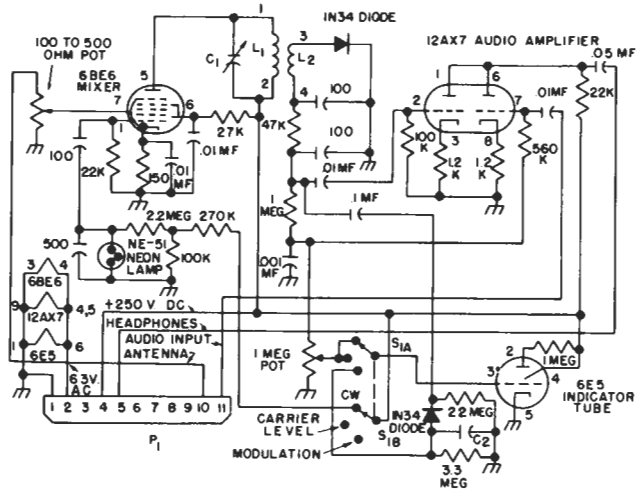


FIG. 2. COMPLETE SCHEMATIC DIAGRAM for the COMBO MONITOR. Chassis grounds in the model were made at the points indicated. All capacitances are in mmf; all resistors ½-watt composition, unless otherwise specified.

CONEL MONITOR

SOLVE YOUR CONELRAD MONITORING PROBLEMS with this combination Conelrad receiver and WWV Converter accessory unit.

Makeshift Conelrad monitoring arrangements have no place in the modern amateur radio station. The simplest circuits are usually blocked or triggered by your own transmitter and thus are not reliable.

It's easy to build this dual-purpose unit from old broadcast receiver parts. Or, insert our alarm and WWV converter circuits into a receiver you may now be using as a Conelrad monitor and have the following features:

1. Self-contained; no external receiver required.
2. Sufficiently selective to prevent blocking from nearby transmitters.
3. Little external antenna required.
4. Tunable over entire broadcast band.
5. Has sufficient audio output for speaker reception, when needed.
6. Monitors signal from WWV to check frequency standards, clocks, etc.

THE BASIC RECEIVER CIRCUIT, shown in the schematic diagram, Fig. 1, is a conventional AC-powered superheterodyne up to the audio section. With S_1 in the *CONELRAD* position, local broadcast band signals from a short antenna on pin 10 of the bus-bar system are applied to the 6BE6 mixer (upper left-hand corner of Fig. 1) through L_1 and L_2—C_{1A}. If this circuit is tuned to 1000 kilocycles, for instance, the local oscillator circuit, L_3—C_{1B}, will be tuned to 1455 kilocycles.

Transformers T_1 and T_2 are peaked at 455 kilocycles and permit the 6BA6 to amplify this frequency, the difference between 1455 and 1000 kilocycles. Modulation on the 455-kilocycle signal is demodulated in a 1N34 diode. The diode also rectifies the RF signal, developing a negative bias (AVC voltage) which is applied to the control grid of the 6BA6, controlling its amplification in inverse proportion to the signal level.

The bias also holds a 2D21 miniature Thyratron tube nonconducting whenever the station signal is present. When the signal is interrupted (as it would be in a Conelrad alert), the 2D21 conducts. This causes the NE-51 neon lamp, I_1, to light, giving visual indication of the signal interruption.

The cathode circuit of the 6CX8 (triode section) first audio amplifier is also completed when the 2D21 conducts. This permits audio to be heard in the headphone and speaker circuits, including miscellaneous noises, or, the modulation on the broadcast signal when it reappears. Open S_2 to mute the audio system and turn off I_1.

THE WWV CONVERTER section of the receiver (lower left-hand corner of Fig. 1) is activated by turning S_1 to the *WWV* position. The 10-megacycle signal from *WWV* is fed from the pickup antenna through L_4 and L_5 to the signal grid of a second 6BE6 mixer. The crystal oscillator, operating at 8.5 megacycles, beats with the 10-megacycle signal and produces a 1.5-megacycle difference signal at the plate of the 6BE6. The WWV signal will be heard with the Conelrad receiver tuned to 1.5 megacycles.

A PLATE-AND-POST CHASSIS was also used for the Conel Monitor model shown in the side view, Fig. 2, and in the GADGET RACK on page 1. A panel width of at least 3 inches is recommended[1], but this will depend upon the sizes of the components actually used in constructing the unit.

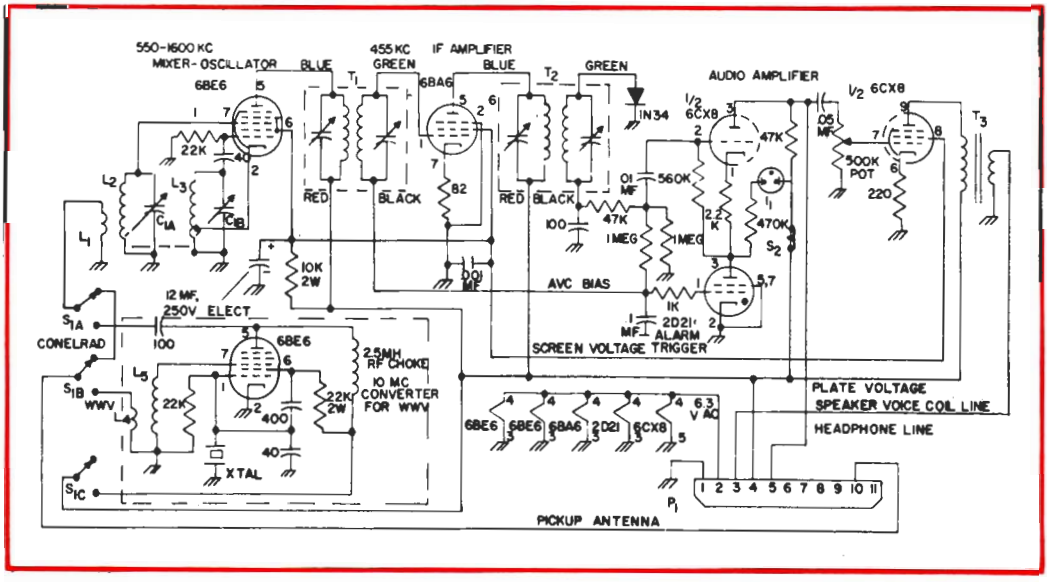


FIG. 1. COMPLETE SCHEMATIC DIAGRAM of the combination Conelrad monitor and WWV converter. The latter circuit, enclosed within dotted lines, can be eliminated or incorporated into an existing receiver. All capacitances are in mmf; all resistances ½ watt, unless otherwise specified.

When planning the over-all size of your monitoring unit, first lay out the larger components, including tubes, at the approximate positions indicated in the layout sketch, Fig. 3. If T_1 and T_2 are 1⅜ inches square or larger, move them close together near one edge of the chassis and shift the 6BA6 off center next to them. If the 6BE6 converter tube will not be included, the 6BE6 Conelrad mixer tube can be placed in the center of the chassis.

Signal carrying leads in the 6BE6 and 6BA6 stages should be cut as short as possible. Generous use of terminal strips provides tie points for junctions between wires and the smaller components. Most small parts and wiring around the tube sockets should be assembled before the chassis plate is fastened to the panel. Leads running to controls on the panel can be cut to length by holding the panel in position temporarily while measuring them. Lengths of No. 22 hookup wire and No. 18 shielded single conductor wire were used for the interconnecting cable.

ALIGNING THE CONEL MONITOR follows the standard procedure for any superhet receiver. First apply power and check for heater and plate voltages in each stage. If the 6BE6 oscillator section is working, a local broadcast signal should be located when tuning C_1. Adjust the trimmer capacitors (or tuning slugs) in T_2 and T_1, in that order, for maximum signal.

Next, adjust the small trimmer capacitor on C_{1B} (not shown on the schematic diagram) so that the receiver will tune from about 550 to 1600 kilocycles. Locate a weak signal near 1400 kilocycles and adjust the trimmer on C_{1A} for maximum signal. Recheck the adjustments in T_1 and T_2 for maximum signal. A signal generator can be used for alignment instead of broadcast signals.

CONEL MONITOR PARTS LIST

C_1....Two-section broadcast receiver variable; C_{1A}, 10–365 mmf; C_{1B}, 8–130 mmf.
I_1.....NE-51 neon lamp.
L_1, L_2.....broadcast receiver antenna coil.
L_3....broadcast receiver oscillator coil, with cathode tap, for 455-kilocycle IF.
L_4....10 turns, No. 28 enameled wire over chassis-connected end of L_5.
L_5....16 uh, 44 turns, No. 28 enameled wire, closewound 11/16 of an inch long on ½-inch diameter iron slug tuned coil form (National XR-50 or equivalent).
P_1....male 11-pin octal plug (Amphenol 86-PM11 or equivalent).
S_1....3-pole, 2-position, single section rotary tap switch (Mallory No. 3223J).
S_2....1-pole, normally closed push-button switch.
T_1, T_2.....455-kilocycle IF transformers.
T_3....Universal output transformer, tube to speaker voice coil.
XTAL.....quartz crystal, 8.5 megacycles.

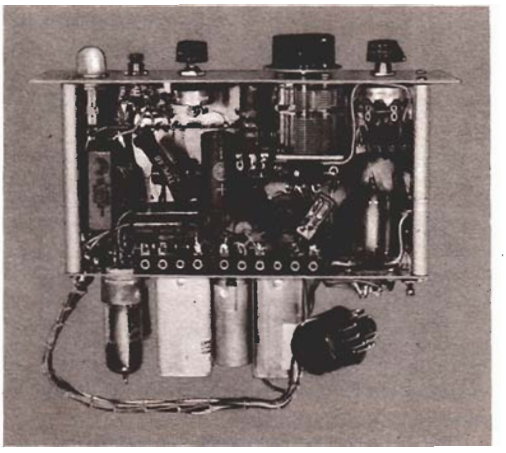


FIG. 2. SIDE VIEW of the Conelrad monitor unit. Locations of principal components have been marked. The corner posts are 4 inches long, made from 1 ⅜-inch diameter aluminum rod, threaded at both ends.

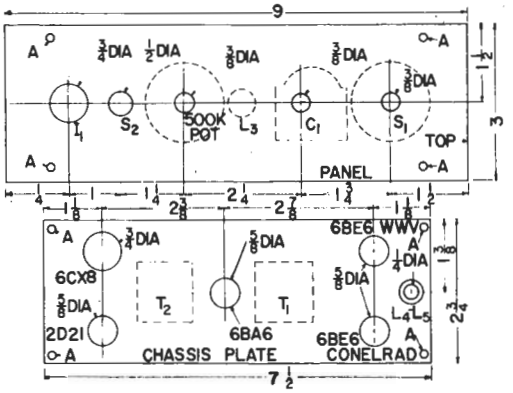


FIG. 3. PANEL AND CHASSIS parts layout for the Conelrad monitor. The IF transformers on this model are 1⅛ inches square. The 6BE6 mixer tube for the Conelrad receiver con be centered on the chassis plate if the 6BE6 WWV converter tube and L_4—L_5 will not be included in the unit.

ALIGNING THE WWV CONVERTER is very simple. Turn S_1 to the *WWV* position, tune the Conelrad receiver around 1.5 megacycles and the characteristic signal from WWV should be heard[2]. Adjust the tuning slug in L_5 for maximum signal. It should be possible to hear a number of short wave broadcast signals in the 9.5–10-megacycle range by tuning the Conelrad receiver between 1.0 and 1.5 megacycles.

[1] Sharp-eyed readers probably have noted that a narrower panel—only 2 inches wide—appears on the model on page 1. However, the author heartily recommends the 3-inch panel width. The layout sketch, Fig. 3, was drawn for this size of panel.
[2] See the "Measuring Equipment" chapter, *The Radio Amateur's Handbook* (ARRL), for a detailed description of the coded signals broadcast over WWV.

COMBO MONITOR

Continued from page 5

ADJUSTMENT IS SIMPLE, once all circuits in the COMBO MONITOR are working properly. Plug in a coil for the band on which the transmitter is operating before applying power to the unit. Modulate the transmitter 100 percent (check this with an oscilloscope, borrowed or otherwise), turn S_1 to *MODULATION* and adjust the 100-ohm signal lever potentiometer until the 6E5 *eye* barely closes.

Remove the modulation from the transmitter, turn S_1 to *CARRIER LEVEL*, and adjust the 1-megohm potentiometer so that the 6E5 *eye* just closes, but does not overlap. The monitor is now calibrated to indicate 100-percent amplitude modulation of a transmitter. The 1-megohm potentiometer can now be locked in position.

Each time the monitor is used on a different band, simply turn S_1 to *CARRIER LEVEL* and adjust the 100-ohm signal level control so that the 6E5 *eye* barely closes. Then return S_1 to the *MODULATION* position and the monitor is ready for use on a modulated signal.

[1] J. W. Paddon, "The Monitone," September, 1948, *QST*, page 22; also C. V. Chambers, "The Monitone—Model 1951B," May, 1951, *QST*, page 29.

SEPTEMBER—OCTOBER, 1958

VOL. 13—NO. 5

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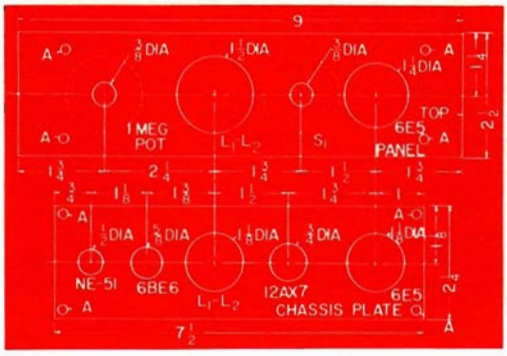

FIG. 3. PANEL AND CHASSIS PARTS LAYOUT used for this model. Small holes for socket and terminal strip hardware are not shown and should be located from those parts.

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