Accessories in GADGET RACK above are (left to right): (1) Power control panel; (2) CHANNEL SPOTTER Calibrater; (3) CONEL MONITOR; (4) COMBO MONITOR Deluxe 1; (5) VOX-O-MATIC Voice Controlled break-in unit 1; (6) AUDIO PREAMP/LIMITER/PATCH; and (7) Signal input panel. Also in view—and coming in future issues—HAM-SCOPE-MARK II, High-C Band-switching VFO, 200-watt double sideband transmitter and plug-in Signal Slicer inside HRO-60 receiver.

Have a rock-mounted station? This GADGET RACK model, designed for relay-rack mounting—plus another table model and two handy accessories—continues the GADGET RACK series which began in the September-October, 1958 issue.

—Lighthouse Barry
new G-E SERVICE DESIGNED receiving tubes

High-reliability techniques—long fa-
mous in the production of General Elec-
tric’s Five-Star and Computer tubes for
critical applications—have been ex-
tended to include the most-used tube
types in television and radio receivers.
Thus, the expanded G-E SERVICE DE-
SIGNED tube line now has many tube
types found in amateur radio gear.
The principal improvements are:
(1) “Snow-White” manufacturing
processes to minimize short circuits be-
tween tube elements.
(2) A new accelerated heater cycling
test to insure proper tube performance
under wide variations in line voltage.
(3) A new G-E developed method of
testing for shorts and opens.

<table>
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<th>183-C</th>
<th>3C86</th>
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<th>6C06-GA</th>
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<td>6C88-A</td>
<td>6G6F</td>
<td>12A06-A</td>
</tr>
</tbody>
</table>

(4) Building entertainment class
tubes to meet life tests twice as rigid
as Joint-Army-Navy specifications.
(5) A new method of applying uni-
form insulation coating on heater wire.
(6) Extending still military-type
glass strain specifications to all SERV-
ICE DESIGNED receiving tubes.
(7) Development of new materials,
including a new anode permitting
greater heat dissipation and longer life.
Many other improvements are being
made on individual tube types.
Ask for the G-E SERVICE DE-
SIGNED tubes listed below for when
you need replacements for the tubes in
your amateur gear.

Vocationally, WQFGS is a technical data
game with General Electric’s Receiving
Tube Department in Owensboro, Ky. So
when Phil devotes a weekend to designing
another gadget for his station, he’s another
of the thousands of radio hams who literally en-
joy a “busman’s holiday.”
A GADGET RACK frame—made from easily-worked aluminum angle and sheet—can be fitted into practically any type of relay rack or cabinet. The model shown is 8½ inches high, but could be any multiple of ½ inch in height.

THE AVAILABILITY of aluminum angle stock in most hardware stores is a boon to the home constructor of radio equipment. A surprisingly strong GADGET RACK frame was fabricated from angle ⅜ x ⅝ of an inch in size with a ⅛-inch-thick wall (Reynolds No. 7)—using ordinary hand tools. It shows no sign of sagging even with several pounds of power supply fastened to the rear panel.

Most constructional details show in the front and rear views of our model on this page. The assembly sketch, FIG. 1, illustrates how the pieces in the upper front corner joints overlap. The critical dimensions are marked on this diagram. Note that angle having 1-inch sides must be used if the minimum width between the relay rack uprights is between 17⅛ and 17⅜ inches.

Length of the side pieces will be dependent on the depth of the rack cabinet and the amount the power supply unit extends behind the frame.

FLAT-HEAD MACHINE SCREWS should be used to assemble all joints. Countersink all screw heads flush with the metal surface in order to clear the relay rack side rails.

The rear panel—⅞ x 17⅜ x 1/16 of an inch thick on this model—is fastened to the frame with small angle brackets cut from the aluminum angle stock. Holes were punched in this panel for the row of accessories interconnection sockets. The sockets were then wired according to the schematic diagram (FIG. 1, page 3) in the last issue and connections were made to the power supply unit before it was fastened in place. Circuit for the power supply also is identical.

THE POWER SUPPLY was constructed on a 1/16-inch-thick aluminum plate 4 x 15 inches in size. Corner posts of ⅛-inch square brass rod 3 inches long drilled and tapped at both ends, fasten the plate onto the rear panel. Side and end plates were cut from 1/16-inch-thick aluminum sheet, but perforated sheet or screening will provide more ventilation. Constructional details are shown in the view on page 4.

RACK MODEL of the GADGET RACK with most accessories removed. Socket at left on rear panel has eight contacts for power control panel; other sockets have eleven contacts for interconnection system between accessories. Signal input panel plugs into socket at right.

REAR VIEW of rack model, showing power supply fastened to rear panel. Socket between transformer and choke is for 5U4G rectifier. Power socket for external accessories is located below filter capacitor.

FIG. 1. SKETCH showing assembly of angles for sides, top and bottom, and rear panel supports. Table below gives dimensions.

<table>
<thead>
<tr>
<th>Size of aluminum angle</th>
<th>⅛&quot;</th>
<th>⅜&quot;</th>
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</thead>
<tbody>
<tr>
<td>Dim. &quot;A&quot;—overall width</td>
<td>19&quot;</td>
<td>19&quot;</td>
</tr>
<tr>
<td>Dim. &quot;B&quot;—rack clearance</td>
<td>17⅜&quot;</td>
<td>17⅜&quot;</td>
</tr>
<tr>
<td>Dim. &quot;C&quot;—panel space</td>
<td>17&quot;</td>
<td>17&quot;</td>
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</tbody>
</table>
FIG. 2. SCHEMATIC DIAGRAM for power control unit and octal socket in power supply. See FIG. 1 (page 3) of the September–October 1958 issue for parts values, except for P1 and J5.

FIG. 3. SCHEMATIC DIAGRAM for signal input panel shown in front view, FIG. 1. Connectors J2, J3, and J4 are phonograph jacks. J5 and J6 are standard open circuit phone jacks. Or, use jacks which match type of plugs already used in your station.

Of course, the power supply may be assembled with the components on the top deck, instead of extending rearward. A conventional chassis of similar proportions could then be used, with the accessory sockets mounted along the side wall facing forward. Other practical chassis are Miniboxes, or Seezak chassis plates and side rails.

THE CABINET GADGET RACK is adaptable to the rear-mounted power supply; the model below having been constructed to show this. Most utility cabinets have a slot about 2½ inches high extending across the rear wall. Thus, it is a simple matter to mount the accessory sockets on a plate large enough to overlap this opening by ¼ of an inch on all sides and fasten the power supply to it. The bottom surface of the power supply should be flush with the cabinet bottom or feet; otherwise, the weight of the power supply may cause the cabinet to "rear up" when it is devoid of accessories.

In both the cabinet and relay rack models, accessories may be held in place with self-tapping screws driven into small holes drilled in the flanges above and below the front opening. Or, these holes may be drilled and tapped for machine screws. The latter method is preferable in the aluminum angle. Our models will serve as a guide to planning a GADGET RACK tailored to your particular requirements. Conceivably, a unitized transmitter, receiver, or group of converters for the VHF bands could be assembled. But why say more; you may already have your GADGET RACK under construction!
CHANNEL SPOTTER

100/20-kilocycle calibrator

THE CHANNEL SPOTTER not only provides frequency markers at 100-kilocycle intervals, but equally important sub-markers every 20 kilocycles.

THE IMPORTANCE of having a 100-kilocycle frequency standard around the amateur station is well recognized. It's almost a necessity to identify edges of the amateur bands, and subdivisions in the bands, on your receiver, to avoid out-of-band operation of your transmitter.

Having additional frequency markers available at 20-kilocycle intervals, however, is handy for spotting frequencies for message handling and other prearranged schedules, local rag-chewing channels, and innumerable other uses. A specific frequency can be found within a kilocycle or two by interpolation, even on receivers having bandspread dials calibrated only from 0 to 100; or only every 50 or 100 kilocycles.

The circuit, shown in the schematic diagram, Fig. 1, has only two tubes. A 6AU6 pentode functions as a 100-kilocycle crystal oscillator. Output from the cathode circuit drives one section of a 12AT7 triode triode, operating in a frequency divider circuit.

This circuit is similar to a multivibrator in that 100-kilocycle signals in the left-hand triode are amplified and applied to the grid of the right-hand triode. When S1 is in the 20-KC position, a 10,000-ohm cathode resistance biases this section of the tube near cutoff plate current. An increasing positive bias, applied through the 2.2-megohm resistor and 2-megohm potentiometer, permits both sections of the tube to operate as a multivibrator. When the potentiometer is properly adjusted, the multivibrator produces one cycle of oscillation for every five 100-kilocycle oscillations and so divides this frequency by five. The output signal is applied to the antenna circuit of the GADGET RACK bus-bar system through pin 10 on P1.

When S1 is switched to the 100-KC position, the 12AT7 becomes a simple amplifier for the 100-kilocycle signal. This stage is disabled in the OFF position of S1, and very little signal feeds through from the oscillator.

Construction is quite simple; either a plate-and-post type chassis, or a Minibox drilled as illustrated in the parts layout diagram, Fig. 2, may be used. Locations of components are not critical, but should be generally similar to the diagram. All wiring can be insulated hookup wire, except the output signal lead running to pin 10 on P1; this should be shielded wire. Make the connecting cable whatever length is necessary to reach the proper accessory socket in the GADGET RACK.

FIG. 3. SCHEMATIC DIAGRAM of the CHANNEL SPOTTER calibrator. Pin 4 on P1 is for plate voltage; pin 10 is the muting antenna. All resistors are by watt; capacitors are in microfarads unless otherwise specified. Other parts values are: C2—50-mfd air trimmer, APC type; P1—11-pin male octal plug (Amphenol 86-Pfl11); S1—3-pole, 3-position, single section rotary tap switch (Radio Shack 32230); XTAL—100-kilocycle quartz standard frequency crystal.

FIG. 4. PANEL AND CHASSIS LAYOUT diagram for the CHANNEL SPOTTER. Holes marked "A" are No. 20 drill for corner posts on plate-and-post chassis. The crystal recessing will depend upon the type of holder.
NEED MORE AUDIO GAIN in your transmit-ter? If so, try this versatile unit which combines a preamplifier, level limiter and handy phone patch into a single package.

SOME TRANSMITTERS just don't have enough audio amplification to provide a highly read-able phone signal under today's crowded amateur band conditions. This unit over-comes these problems with a tube lineup selected for desired characteristics in each circuit. In addition, a phone patch for all-important public service work is built in.

THE SCHEMATIC DIAGRAM, FIG. 1, shows a high-impedance microphone input at J1, coupled to the left-hand section of a 12AX7 twin triode. This tube has been designed to have a very low hum level. The output of this preamplifier drives a 6BA6 remote-cutoff pentode in the limiter. A second 6BA6 pen-tode is the automatic gain control tube. Neg-ative bias for controlling the gain of the limiter stage is obtained by further amplify-ing the output signal in a 12AT7 twin triode and applying it to a 6AL5 twin diode. The bias is developed across the 1-megohm re-sistor and filtered by the .01-mfd capacitor shown just to the left of this tube.

This bias is applied to the number 3 grid of the 6BA6's and the right-hand section of the 12AX7. This triode works as a DC am-plifier and the variations in plate current cause the 0-1 DC milliammeter in series with the cathode to indicate the relative amount of compression.

The phone patch circuit utilizes a three-winding transformer from the vertical oscil-lator of a television receiver. The telephone line connects to the medium-impedance wind-ing, the 6BA6 limiter to the highest-impedance winding, and the speaker voice coil circuit to the lowest-impedance winding. In position "1" of S1, the patch circuit and telephone line are not connected. In position "2," the patch operated only in one direction; it feeds the telephone signal into the ampli-fier. In position "3," the circuit operates as a two-way patch, also feeding the signal from the speaker circuit back to the telephone line.

CONSTRUCTION practice for this unit is pretty much the same as for the previous GADGET RACK accessories. The recom-mended layout for a plate-and-post type chassis is shown in FIG. 2. The unit also could be built on a 4 x 6 x 3-inch aluminum chassis with a panel 4¼ inches wide.

The only critical components are the phone patch transformer, T1, which should be kept away from power transformers to minimize the noise picked up by the coil. The other transformers could be cut from a discarded television chassis. These transformers should be as small as possible in a height of 1 or 1½ inches. The transformers should have iron cores and about 14 turns of No. 20 or No. 22 wire wound on them.

(Continued on page 7)
CHANNEL SPOTTER

continued from page 5

THE TUNEUp is simply a matter of applying
heater power to check that circuit, and, if okay, applying plate voltage. Turn Si to the
100- KC position and check for signals at
multiples of 100 kilocycles on a broadcast
bench receiver. A broadcasting station on
one of these frequencies will serve as a
standard for adjusting the oscillator to pre-
cisely 100 kilocycles by turning C, Or, tune
100-KC position and check for signals at
in the 5-megacycle signal from WWV and
adjust C, until the fiftieth harmonic from the
100-kilocycle oscillator coincides with it.
Next, turn S, to the 20-KC position and
adjust the 2-megohm potentiometer until four
signals can be counted between each 100-kilo-
cycle marker signal on your receiver. Final-
ly, if an oscilloscope is available, connect the
hum pickup; and the meter. M. The meter
shown on page 1 has a flange only 1½ inches
square, but the layout allows space for
round or square meters having the standard
body diameter of 2½ inches. A rotary tap switch
can be substituted for the lever-action switch
shown for S, by drilling a hole ½ of an inch
diameter in place of the slot.

CONNECTIONS to this unit, other than
those made through P, consist of a two-wire
shielded lead from the telephone line to J9.

FIG. 1. SCHEMATIC DIAGRAM for the combination
microphone amplifier/receiver/phone patch unit. All re-
sistances not otherwise marked are 1/2-watt power-
nating, all capacitors values not otherwise marked
are in mm. Potentiometers should have a 10-turn
setting.

NOTE: If the meter A-3001 vertical oscillator trans-
former is used for T3, connections should be made
as follows: Brown and black leads to J, red and
blue leads to the PATCH GAIN potentiometer, and
the yellow and green leads to the speaker circuit.
Other standard transformers may have the same
color-coding on leads.

PARTS LIST

J1........female connector to 9-pin microphone plug.
J2........female connector to 3-pin jack.
J3........male phone type jack.
J4........male phone type jack.
M........2-1/2 DC milliammeter, 15-inch range; 1½-
inch-diameter body (lafayette 136-11 shown on
model G.E. type DW-F1 also suitable.
Pa........11-prong male octal plug (Amphenol 86-
11c or equiv.).
S........4-pole, 3-position, non-shorting lever action
switch (Moffett 6243) or one equivalent
with similar switch action.
T,........three-winding vertical output transformer
(Merit A-3001, or equivalent).

a microphone to pin 10 on P, setting the
horizontal sweep for two or three cycles
on the screen. The waveforms for both 20- and
100-kilocycle signals should approximate
those shown in FIG. 3.

If you already have a 100-kilocycle fre-
quency standard, try adding the frequency
divider stage to help spot that net frequency.
THREE SMILING RADIO AMATEURS, shown above just after receiving their trophies and checks for $500 at the 1958 ALL-AMERICAN AWARDS presentation, are: Vernon Townsend, W9YCY; Wayne Lemons, KOC2C; and Albert Kazukonis, ex-W1OBZ.

Townsend, of Menomie, Wis., while serving as Dunn County RACES Radio Officer, quickly organized emergency communications and operated his mobile station steadily for three days after a tornado devastated Western Wisconsin last June.

Lemons, of Buffalo, Mo., has conducted extra-curricular courses in electronics at several schools in Missouri, in addition to civic activities in the Little League, Boy Scouts and other youth groups; and Rotary and other community service agencies.

Kazukonis, Brockton, Mass., has aided technical programs in schools through donations of supplies, taught radio classes, and promoted better business ethics as an official of the Brockton chapter of the Electronic Technicians Guild of Massachusetts.

THREE RADIO AMATEURS, shown above just after receiving their trophies and checks for $500 at the 1958 ALL-AMERICAN AWARDS presentation, are: Vernon Townsend, W9YCY; Wayne Lemons, KOC2C; and Albert Kazukonis, ex-W1OBZ.

Three radio amateurs were among the candidates for the 1958 Awards. Three were winners; another, Henry Falconio, W9OIL, was awarded an honorable mention plaque. The others, who received certificates of commendation, are: W1AD, W3DYE, W3SCT, W6QPF, W7JMM, KN8LLA, K9IEY, W9RM, and W9ZVD.

The ALL-AMERICAN AWARDS program, to honor electronics service technicians who have distinguished themselves through community service, is sponsored annually by General Electric's Receiving Tube Department in Owensboro, Ky.

E. A. Neal, W2JZK—Editor

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