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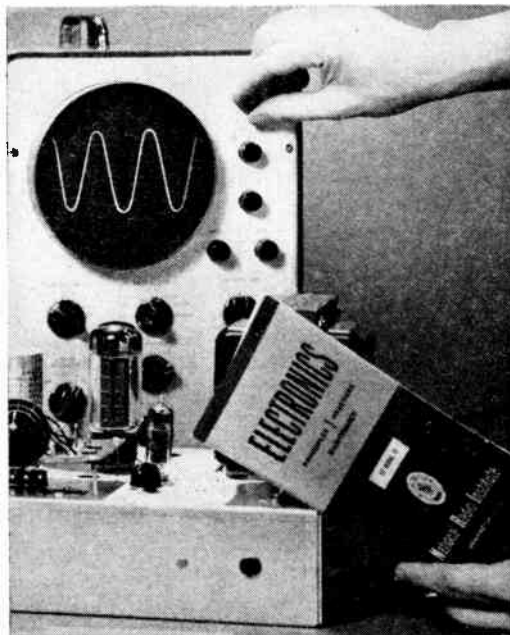
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VOLUME 27

AUGUST, 1967

NUMBER 2

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to Periodical Literature

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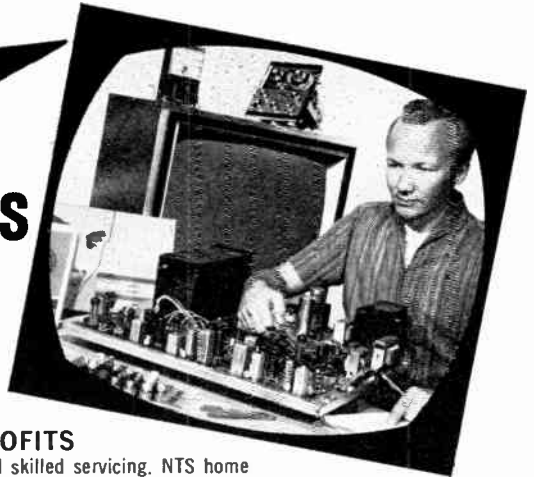
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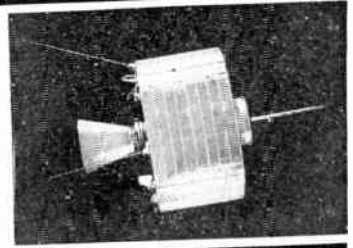
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8

LETTERS

FROM OUR READERS

Address correspondence for this department to:
Letters Editor, POPULAR ELECTRONICS
One Park Avenue, New York, N. Y. 10016

LIGHTHOUSE/PANIC BOX

After looking over the circuit for "A Lighthouse for Short People" (November, 1966), my friend and I came up with the idea of building the "lighthouse" into the "Panic Box" ("Don't Panic—Push the Button," January, 1966). We labeled the delay switch backwards, so that the switch is in the off position when the label says "on." When the "victim" sees the flashing light (the one from the lighthouse placed just above the other two), he thinks that someone has left the thing turned on. He then unwittingly turns it "off," whereupon the "panic" begins.

CRAIG SODERQUIST, WB6RTB
La Mirada, Calif.

MANUFACTURERS: TAKE NOTE

Many manufacturers have offered various "home use" video tape recorders (VTR's), all with different operating specifications. I would like to invest in a VTR, but the manufacturers seemingly have little or no sympathy for tape recording enthusiasts. Exchange of personal tapes and the purchase of pre-recorded ones is really very wasteful when the recorders have operating features and requirements that are completely incompatible. My plea is simple. Manufacturers and designers: please standardize tape speed and reel size, type of input and output, and above all, recording and playback methods.

MARK S. ELGIN
New Canaan, Conn.

I have a gripe and I am sure that a whopping big percentage of servicemen have the same gripe. It is the apparent disregard TV set manufacturers have concerning the tubes used in their individual models. It costs the general serviceman a young fortune to keep all of these new tubes in stock, since each company seems to use a different type in the same sort of circuit. Something should be done to standardize the tubes used.

W. GREEN
Long Island City, N.Y.

MODIFIED PICTURE TUBE TESTER

I constructed your "Picture Tube Tester and Rejuvenator" (October, 1965) with several modifications. Instead of the transformer specified, I used one with 570-volt and 12.6-volt secondaries. Correct voltage for the filament is obtained by the use of a potentiometer. The meter, switched across a shunt, doubles as a voltmeter. Instead of the solid-

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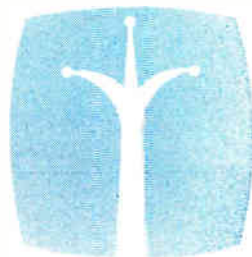
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August, 1967

World Radio History

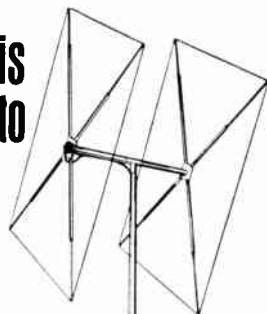


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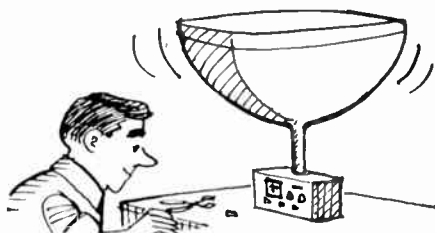
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LETTERS (Continued from page 8)

state rectifiers, I used two 5U4 tubes in parallel. The high-voltage a.c. from the transformer can be switched across any of the elements to clear interelement shorts. I also incorporated an electrolytic capacitor, charging through a resistor, to weld open cathodes and heaters. My rejuvenator has been able to



repair nearly every "sick" picture tube. One set, which previously had a "brightener" on the picture tube, still has excellent cathode emission after seven months of operation.

TED MONROE
Rosebush, Mich.

"BRUTE-70" CLARIFICATION

I would like to point out two apparent contradictions in the "Brute-70" power amplifier article (February, 1967). Potentiometers R10 and R13 are listed in the Parts List on page 43 as "½-watt trimmer potentiometers." Looking at the photo on page 86, the pots in question would seem to be of the miniature vertical P-C mounting type similar to Mallory's MTC series or IRC-CTS X-201, which are rated at ¼ and ½ watt respectively. Secondly, the Parts List specified Delbert Blinn X-010-D-3 heat sinks. On the unit pictured, it would seem that the X-113 or X-123 was actually used.

R. RUTILI
Industrial Design Dept.
Stewart-Warner Corp.
Chicago, Ill.

You are right on both counts. The potentiometers are ¼-watt units and the correct Delbert Blinn part number is X-123-D-3. The parts supplier named in the Parts List is aware of these errors and has been shipping the correct components.

PROJECT HANDBOOK?

One of the columns I follow with great interest is Lou Garner's "Solid State," and something I would greatly appreciate would be a "handbook" of some type containing all of the "Reader's Circuits" classified by type, with just enough info to get them built. It might be interesting to see what your other readers think of this idea. An anthology of this type would certainly be a valuable addition to any experimenter's library.

THOMAS ORDON, W2OLH
Amsterdam, N. Y.

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LETTERS (Continued from page 10)

NEVER A CHIMNEY

Please stop mentioning a chimney as a possible support for an antenna. You should never attach an antenna or a guy wire to a chimney. Look around on rooftops and you'll



see how many chimneys are damaged by antennas. Besides, you might find that the local building code forbids antennas on chimneys.

ERIC FRIS, Architect
Eagle River, Wis.

Eric, what we need are stronger chimneys.

"Q5'ER" ADAPTABLE

I tried your "Q5'er" (July, 1966) on my Collins TCS-9 receiver, and it worked like a charm. Incidentally, you can slightly detune

the Q5'er in either direction for use with a receiver which lacks a bandspread. Just how much you can detune it depends on the existing i.f. bandpass of the receiver.

RONNIE SCHMIDT
San Antonio, Texas

WIRELESS RE-BROADCASTER

After constructing your "Wireless Re-Broadcaster" project (January, 1965), I was amazed at the clarity of the signal. Using only a 10-foot length of wire, I was able to transmit throughout my entire home and a couple of the neighbors' homes as well. The only modification I made was to increase the filter capacitor to 50 μ F to reduce hum to a minimum. At present I am using the Re-Broadcaster to transmit music from my stereo to various locations around the house.

LOWELL LISKER
Warwick, R.I.

IMPROVED "OMNI-ALARM"

I recently constructed the "Ultrasonic Omni-Alarm" (April, 1966) for a Science Fair project. It worked very well, but I modified the transducers a bit. I took some floodlight reflectors and some old lamp sockets, put the transducers into the sockets and mounted them in the reflector. This increased both the distance covered and the sensitivity of the unit.

JEFF PAUL
Long Beach, Calif.

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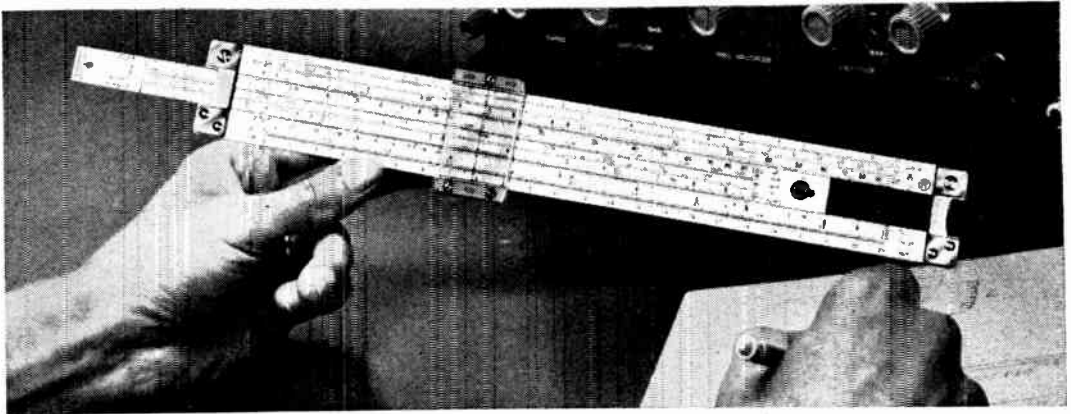
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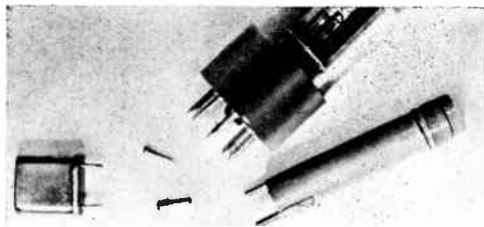
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REFLECTIVE STRIP SHOWS PARALLAX ERRORS

Most top quality meters have a mirror mounted on the meter face behind the pointer to help eliminate parallax errors. The user simply "sights" the pointer so that there is no pointer reflection in the mirror. Parallax error is thus eliminated, and the accuracy of the reading depends solely on the instrument's characteristics. You can easily install a strip of "Met Chrome" tape on the faces of meters that do not have mirrors to obtain the same results. Be sure the tape does not obscure any of the scale markings. "Met Chrome" tape is obtainable from most art supply stores in $\frac{1}{4}$ " width (about \$1.25) or $\frac{1}{2}$ " width (about \$1.50). Both rolls are approximately 360" long.

—Neal Belmuth

SALVAGED TUBE PINS ADAPT CRYSTALS AND COILS TO TUBE SOCKETS

A substitute part can present a problem if it has small wire-type connector pins and the

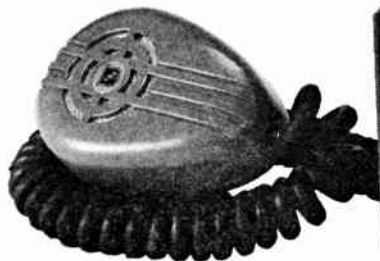
socket into which it is supposed to be plugged is designed to accept larger pins. Instead of changing the socket, simply modify the terminals on the part. The pins on an old octal tube will usually do the trick. After carefully breaking away the tube's Bakelite base, cut the connecting wires flush with the tops of the pins. Then slip the pins onto the component's terminals and solder them in place if necessary. This simple modification will work for coils, plug-in relays, crystals, and most other types of components.

—James S. Green

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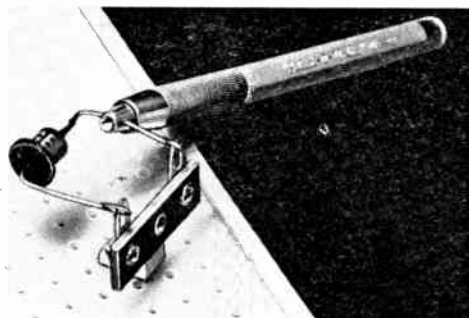


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transceiver is left unattended. Until you turn the switch *on*, no power can reach the transceiver, and unauthorized use will be impossible.
—Barry Beyley

MECHANICAL DRAFTING PENCIL LEND A THIRD HAND

A mechanical drafting pencil can be as useful a "tool" in electronics as it is on a drafting table. It will serve as a heat sink, a vise for small parts, or as a grasping tool for picking



up things. To use the "pencil," simply depress the plunger at the top, and when the gripper jaws extend, clamp them over the part to be heat-sinked or picked up. Then release the plunger. After the work is done, depress the plunger again to release the jaws. You'll find that this "tool" is a real time-saver when you're working on circuits that look like they should be handled with jeweler's tools and under a magnifying glass.
—Mike Rocha

TUBE SHIELD MAKES LOW-POWER TRANSISTOR HEAT SINK

A tube shield can often be used as an inexpensive heat sink for transistors in projects where space is not at a premium. Most shields for 7-pin tubes can be simply snapped over the crown (raised part) of a TO-3 transistor case. The split type of tube shield shown in the photo is perhaps your best bet, however, since it is inexpensive and its expansion springlike action makes for a good all-around snug fitting. It will effectively dissipate heat build-up in low- and most medium-power transistors. For high-power transistors, a much larger and more efficient heat sink is normally required.
—Richard Oram



PLUG-IN DUST COVER MAKES MODIFICATIONS SAFE AND EASY

When updating a power supply from tubes to silicon rectifiers, you can use a plug-in relay dust cover (similar to the Potter and Brumfield 35D070) to house the parts and protect

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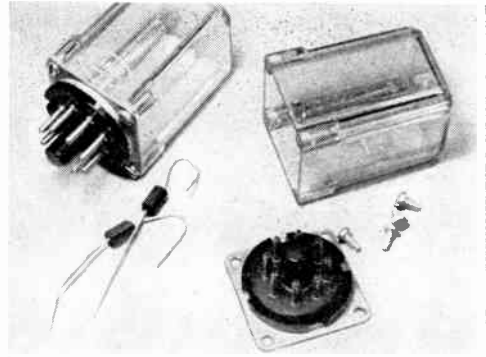
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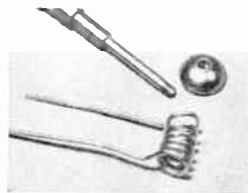
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against high voltage hazards. After removing the plastic case from the octal base as shown in the photo, solder the silicon rectifiers to the correct base pins. Then drill a few small holes in the plastic cover to allow for heat dissipation when the rectifiers are in operation, and replace the cover. This same type of dust cover can be used for housing small projects and other circuit modifications not associated with power supplies. —Fred H. Horan

TELESCOPING ANTENNA DOUBLES AS MULTIPLE COIL FORM

The next time you have to wind a coil and need a coil form, try using one of the sections of a telescoping antenna. Most telescoping antennas are made up of three or more con-



centrically fitted parts, or sections, each of which provides a different diameter. Select the section that has the most suitable diameter for the coil, and begin winding. When the job is done, unscrew the

plastic or metal cap from the antenna end as shown in the photo, remove the coil, and replace the cap on the antenna. Almost any type of TV "rabbit ears," short-wave receiver, walkie-talkie, etc., antenna can be used in this manner. —David N. Bascom

SIMPLE CONTINUITY CHECKER DOUBLES AS FLASHLIGHT

For about 65 cents, you can build a simple continuity checker in an empty Polaroid print coater container. Remove the container cover, and drill a hole through its center to force-fit a 1.5-volt indicator lamp. Drill another hole in the bottom of the container, and feed a pair of 8"-long stranded hookup wires through it. Solder one wire to the threaded part of the bulb's base and the other wire to the negative end of an "AA" battery. Then slide the battery into the container, replace the cover, and pull the excess wire through the bottom. Touch the free ends of the wires together—if the lamp doesn't light, press down on the lamp until it does. Then connect an alligator clip to each wire.

—Jonathan S. Simon

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NEW PRODUCTS

Additional information on products covered in this section is available from the manufacturers. Each new product is identified by a code number. To obtain further details on any of them, simply fill in and mail the coupon on page 15.

HAND TOOL KIT

Now being marketed by *Moody Machine Products* is the compact *Moody Master Kit* (MMK-6) which contains a total of some 30 precision hand tools. Each kit consists of a durable leather carrying case (only 8 1/4" x 3 1/2" x 1 1/2") and six precision hand tool sets: tiny screwdriver and awl set; Phillips driver and Allen type wrench set; nonmagnetic socket wrench set; tap drill set; tap set; and offset open-end wrench set. Each individual set contains five interchangeable tools.



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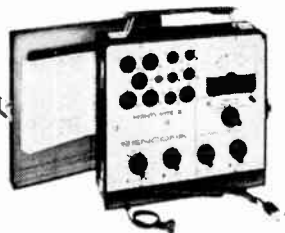
MINIATURE SOCKET WRENCH SET

A miniature socket wrench set consisting of five interchangeable box or socket wrenches is being offered by *Moody Machine Products Co., Inc.* Socket wrench sizes are 3/64", 3/32", 7/64", 1/8", and 3/16", all fitting interchangeably into the same knurled handle. The set is available either with a magnetic handle (as BW-5) or with a nonmagnetic handle (as SW-5).

Circle No. 76 on Reader Service Page 15

VERSATILE TUBE TESTER

Faster and more versatile than its predecessors, the TC142 "Mighty Mite V" tube tester from *Senorex* checks all the latest types—over 3000 foreign and domestic tubes. A new Magnoval socket has been added, plus a horizontal in-line switch arrangement for quicker setups. The *Mighty Mite V* makes full emission, grid leakage, and shorts tests. Its high sensitivity of 100 megohms or 1/2 μA of grid current make it possible to find borderline and "tough dog" types easily.



Compact and portable, the unit is furnished in a rugged vinyl-clad steel case with detachable hinged cover. An up-to-date setup booklet is included.

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SHORT-WAVE PORTABLE RECEIVER

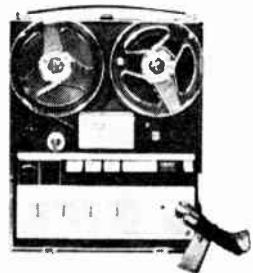
Eleven bands can be tuned with *Lafayette Radio Electronics'* imported "Globe-pacer" portable receiver: AM (550 to 1600 kHz); FM (88 to 108 MHz); long wave (150 to 400 kHz); and eight short-wave bands ranging from 2.0 to 17.9 MHz. Features include: horizontal slide rule dial with rotating cylindrical scale for precise tuning; tone control and a.f.c. to eliminate drift, a large ferrite bar antenna, and a multi-section whip. The two-way speaker system consists of a 4" woofer and a 1 1/2" tweeter. Eighteen transistors, 9 diodes and 1 thermistor are incorporated in the unit. An a.c. adapter/charger is optional.



Circle No. 78 on Reader Service Page 15

VOICE-ACTUATED TAPE RECORDER

The Model 2107 "Sound Sentry" transistorized portable tape recorder introduced by *Craig Panorama, Incorporated*, features a voice-actuation circuit, automatic change-over from battery to a.c. power and automatic stop at tape end. The recorder has three speeds—3 3/4, 1 1/2 and 1/4 in/s. Frequency response is 100 to 8000 Hz and 100 to 4000 Hz for the 3 3/4- and 1 1/2-in/s speeds, respectively. Wow and flutter is kept down to below 0.25%, and signal-to-noise ratio is better than 40 dB. The recorder's output power is rated at 2.5 watts peak. Recording and playback are both half-track. The recorder accepts up to 5"-diameter tape reels, and is furnished with carrying case, microphone, shoulder strap, and interconnecting cables.



Circle No. 79 on Reader Service Page 15

TWO- AND FOUR-WAY SPLITTERS

Two 75-ohm splitters have been announced by *JFD Electronics*, both designed for VHF, UHF, and FM transmission, for monochrome and color TV sets. The Model SC42*75 splits one 75-ohm line into two 75-ohm outputs; insertion loss is 3.2 dB, isolation 15 dB, frequency response ±1/2 dB, and VSWR 1.2:1. The Model SC72-75 splits one 75-ohm line into four 75-ohm outputs; insertion loss is 6.4 dB, isolation 12 dB, frequency response ±1/2 dB,

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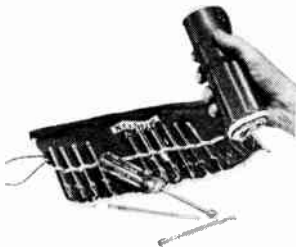
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and VSWR 1.3:1. Both units convert to 300-ohm impedance through use of matching transformers.

Circle No. 80 on Reader Service Page 15

NUTDRIVER/SCREWDRIVER ROLL KIT

A 14-piece combination nut- and screwdriver tool kit is now available from *Xcelite Incorporated*. Included in the kit are a Series 99 "Service Master" handle, nine nutdriver blades with from $\frac{3}{16}$ " to $\frac{1}{2}$ " hex openings, #1 and #2 Phillips screwdriver blades, and two single-ended blades. All blades and sockets will fit Series 99 "Junior" and "Tee" handles and can be used with 4" and 7" extensions.



The "Service Master" handle is made of a tough plastic and houses a spring device that holds the blades firmly in place. The durable plastic-coated canvas case can be either rolled up or hung on a wall, as preferred.

Circle No. 81 on Reader Service Page 15

VOICE-ACTIVATED MICROPHONE

Designed for use with battery-operated tape recorders which have a jack for a remote control mike, *Olson Electronics' Model M-253* voice-activated microphone contains six transistors and operates on a 9-volt battery. With it, your recorder will start automatically when any sound reaches the microphone, and will stop when the sound stops. The M-253 can also be used as a regular remote control mike. Sensitivity is adjustable.

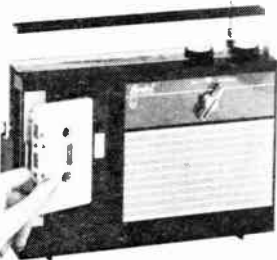
Circle No. 82 on Reader Service Page 15

RADIO AND TAPE CASSETTE PLAYER

North American Philips Company, Inc., has introduced a compact AM-FM/a.f.c. radio and tape cassette combination, the Norelco Model L573. Fully-transistorized, the radio-tape player operates on five "D" cell batteries or on a.c. power (with an adapter). Both AM

and FM sections offer a high degree of sensitivity and selectivity, and an automatic frequency control (a.f.c.) locks the radio in on FM stations. A ferrite antenna is used for the AM section and a 360°

swivel telescoping antenna for FM, both of which are built-in. The tape playback section will accept and reproduce both mono and stereo cassettes, and provide up to 90 min-

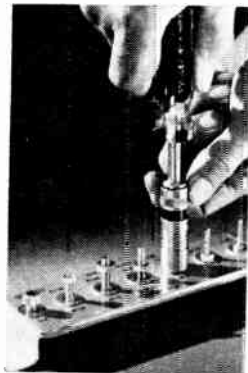


utes of playing time. The unit also has a jack for earphones and an input for a car antenna.

Circle No. 83 on Reader Service Page 15

"INFINITE RANGE" NUT DRIVER

Unlike tools that have multiple hex sockets, the *Stanley "Hex-a-Matic"* is a single tool that adjusts to fit 15 standard sizes of nuts and screws. A built-in collet chuck has six fingers which automatically adjust to the size of a nut or screw head and lock into position when pressure is applied to the tool handle. Five sizes of hex nuts from $\frac{1}{4}$ " to $\frac{7}{16}$ ", five sizes of hex head screws from #6 to $\frac{1}{4}$ ", and five sizes of socket head cap screws from #8 to $\frac{5}{8}$ " can be accommodated. The driver also fits metric fastener sizes up to 11 mm, is said to be the only tool of its kind that will fit 8-32 nuts.



Circle No. 84 on Reader Service Page 15

ELECTRONICS BREADBOARD

Fast and efficient breadboarding of electronic circuits is possible with *Berkeley Applied Research Corp.'s "Lectronic Peg Board."* The 9" x 12" board has brass eyelets that are conveniently spaced to accommodate most small electronic components. Included with the board is a generous supply of tapered pegs for securing component leads to the eyelets.

Circle No. 85 on Reader Service Page 15

IN-CIRCUIT TRANSISTOR CHECKER

Checks for a.c. beta can be performed with the Model 161 "Dynamic Transistor Analyst," made by the *B & K Division of Dynascan Corporation*, without removing the transistor

from the circuit. The Analyst also checks all transistors and solid-state rectifiers out of circuit for a.c. beta and Icbo leakage, and can identify a transistor as npn or pnp at the flick of a switch. Beta ranges are 2 to 100 and 10 to 500. A 0 to 5000 μ A expanded leakage range is also

provided for better readability. The rugged 7" meter movement has a built-in parallax-error eliminating mirror, and a special circuit protects devices under test from damage due to incorrect connections.

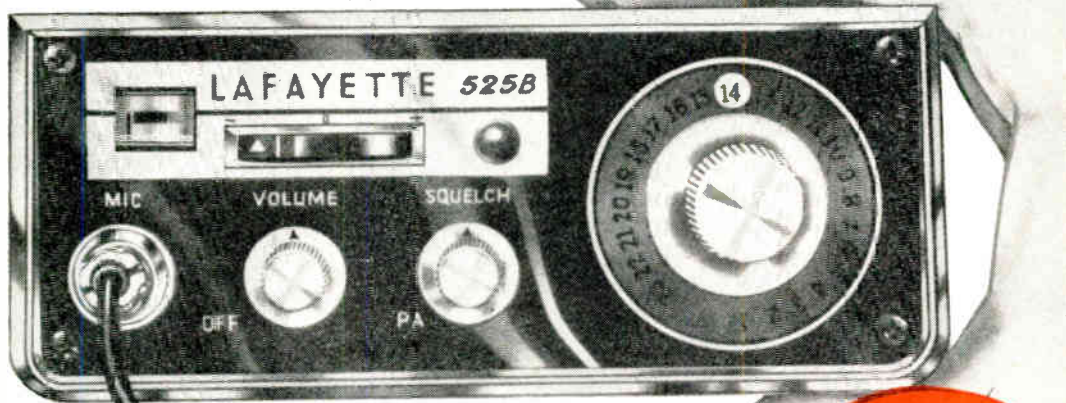
Circle No. 86 on Reader Service Page 15



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CIRCLE NO. 19 ON READER SERVICE PAGE

punchy galore



Was it possible to put *extra* punch, *extra* power and *extra* performance into a 5 watt CB mobile radio . . . and sell it for only \$99.95? B&K, creators of the famous Cobra CAM 88, thought so—and built the new Cobra V. The 5 channel Cobra V is solid state, all-the-way. Those who have heard it and tested it say it is a most remarkable achievement in miniaturization—in CB technology—in selectivity, sensitivity and 100% modulation. It's true; this one's got punch galore. We've proven it . . . now you can. At B&K Distributors.



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all about
POLICE/FIRE
 VHF converters

BOTH IN CARS, AND AT HOME, VHF LISTENING
 IS ATTRACTING A LARGE NEW AUDIENCE

By O. P. FERRELL

COVER STORY

MUCH to the frustration of local and state police and fire authorities, there are now more John Doe citizens "listening in" than in the 1930's when DX'ing police calls was the evening's principal entertainment.* Although some critics say that this is a sign of increased lawlessness, the real factor behind this renewed interest is the availability of low-cost VHF receivers and converters.

Specialized VHF receivers tuning the police and fire frequencies (30-50 and 152-174 MHz) have been offered to the public for several years.** However, in the past two years, a couple of new breeds of VHF receiving equipment have hit the marketplace. One of these is the

tunable transistorized VHF converter; the other is the crystal-controlled oscillator/converter loose-coupled to a broadcast-band AM receiver.

The "Loose Couplers." Although there may have been a predecessor, the first of the so-called "loose-coupled" VHF converters to be brought to the attention of POPULAR ELECTRONICS was manufactured by Skyway Radio, Inc. (1202 Arnold Ave., New Castle, Del. 19720). The Skyway converter tuned 108 to 136 MHz; the AM signals on this band are from planes and airports. Although somewhat touchy to operate and lacking the sensitivity of a specialized receiver costing five times as much, the Skyway converter represented the first real price breakthrough in VHF reception. The wiring diagram of an early model of the Skyway converter appears on page 31.

The logical extension of the loose-coupled converter was to make it tune the police/fire frequencies. The unfortunate

*Before switching to the VHF frequencies, police calls were broadcast on two bands—190 and 110 meters. The headquarters station of the New York City police could be heard 100 miles away in the daylight hours and 1000 miles away at night. The first switch to VHF—into the 8-meter band—only intensified DX'ing and the New York City Fire Department was soon QSL'ing reception reports from around the world!

**See "Hats Off to VHF," POPULAR ELECTRONICS, August 1965, p. 41.



All of the "loose-coupled" converters are about the same physical size and, roughly, have the same electronic circuitry. Those shown above were tested out on 155.3 MHz and all had about the same sensitivity. The "PRM" from Petersen and the "Listen-In" from Metrotek have provisions for switching between two crystal-controlled receiving frequencies. The Ameco Model CG can be used for mobile reception; the two holes in the top of the box are for Motorola-type auto antenna connectors. Below is a tunable Skyway converter used for aircraft reception.



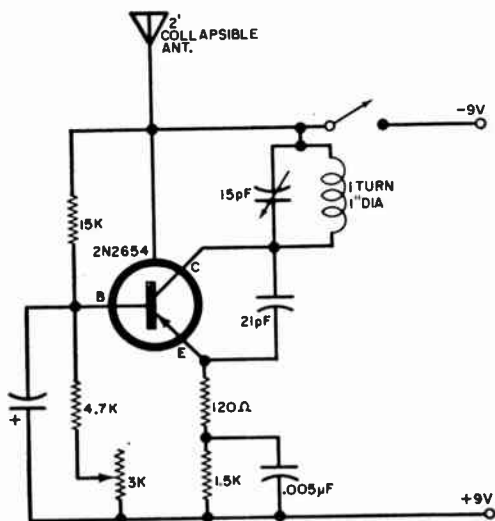
problem that practically every police/fire station transmits via narrow-band FM was fortunately resolved by the fact that police and fire stations all transmit on fixed frequencies. Instead of tuning the converter, the oscillator is made crystal-controlled and the AM broadcast band receiver operates as a tunable i.f. strip. Slope detection* in the AM receiver, although lacking the noise suppression qualities of FM, provides adequate reception of police/fire base stations over a range of 10-20 miles.

Two examples of the loose-coupled VHF converter now being marketed are the "Listen-In" by Metrotek Electronics, Inc. (7900 Pendleton Pike, Indianapolis, Ind. 46226—\$19.95) and the "PRM Compact Converter" by Petersen Radio Co., Inc. (2800 W. Broadway, Council Bluffs, Iowa—\$24.95). Both units are crystal-controlled and can be purchased from the manufacturer to receive a specified frequency in one of three ranges—25 to 50 MHz, 108 to 136 MHz, or 148 to 175 MHz.

Both of these units were recently tested by POPULAR ELECTRONICS. The nominal output frequency of the Metrotek converter was 535 kHz and that of the Petersen converter was 750 kHz. After some juggling of the broadcast-band receiver to eliminate severe local BCB interference, both converters provided adequate reception of a medium power police base station transmitter five miles away.

A third loose-coupled converter tested by POPULAR ELECTRONICS had several innovations. This converter—the "Model CG"—is manufactured by Ameco Equipment Corp. (178 Herricks Rd., Mineola, N. Y. 11501—\$21.95). When the short antenna was unplugged, the Ameco converter could be used with an outdoor antenna and the output of the converter could be directly coupled into any AM BCB receiver. With the proper choice of crystal frequency, the Ameco unit can be used to receive any narrow band of frequencies from 2 to 174 MHz. The manufacturer will also supply a special fused adapter to permit the use of an auto bat-

*FM signals can be demodulated in an AM receiver by tuning the receiver to either side of the carrier frequency. Slope detection—the slope is that of the i.f. selectivity curve—is used in practically all of the converters described in this article.



This is the wiring diagram of an early model of the Skyway VHF converter shown on the facing page. In this design, the autodyne oscillator was tunable and the AM broadcast receiver set on a clear channel. Because police and fire reception is usually restricted to a few local channels, the new loose-coupled converters are all crystal-controlled.

tery instead of the internal flashlight cells if the Model CG is to be used in a car.

Not tested for this report was a converter made by Electra Corp., Cumberland, Ind. 46229. Called the "Little Tiger," a single-frequency model (150-174 MHz) sells for \$19.95. Advertising literature from Electra claims that a model to pick up police signals in the new band between 450 and 470 MHz is available for \$26.50. If so, it would be the only unit presently marketed with

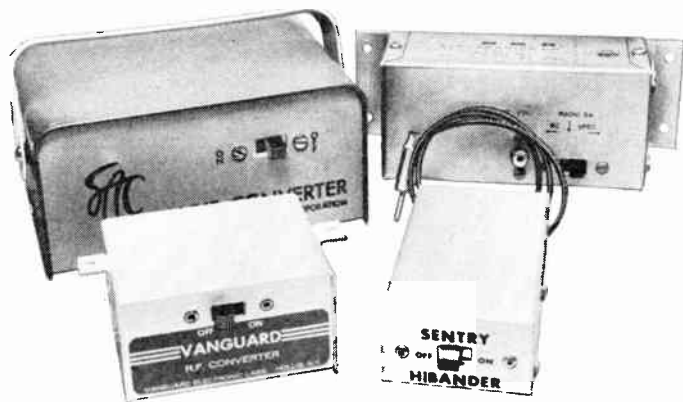
this capability. Judging from photographs, the "Little Tiger" has a marked resemblance to the Metrotek "Listen-In."

"Direct" Converters. There are three different types of "direct" converters. One is the tunable converter with the AM receiver set to a fixed frequency. A second type is the crystal-controlled converter which effectively screens out all broadcast-band signals and permits the AM receiver to be tuned over a 1-MHz segment of any part of the VHF spectrum. A third type is the fixed frequency converter that is actually a miniature narrow-band FM receiver which uses patented circuitry to achieve good squelch and limiting in the 1500-kHz strip before feeding the AM receiver.

Of all of the converters tested by POPULAR ELECTRONICS there is little doubt that the "TRP Tunaverter" (Herbert Salch & Company, Woodsboro, Texas 78393—\$29.95) is the most versatile. As the name implies, this is a straight-through tunable converter with an output tuned to 1500 kHz. Consisting of a transistorized autodyne converter plus a tuned r.f. stage, the Model 1564 "Tunaverter" afforded amazing reception of hundreds of VHF high-band signals in the metropolitan New York area. Automobile reception of the weather broadcasting station operating on 162.55 MHz was possible at distances up to 45 miles from mid-Manhattan.

It should not be assumed that use of the "Tunaverter" is restricted to those in need of only mobile VHF reception. Adequate plans accompany each converter to enable the listener to adapt the out-

The "direct" converters at right are designed for mobile operation. At the upper right is the new SSB Electronics Co. Model SSB-1 which includes squelch and NBFM limiter.



put of the converter to feed a household AM broadcast receiver. Various models of the "Tunaverter" design can be purchased to cover all of the VHF spectrum and most of the ham and short-wave bands.

Three crystal-controlled converters utilizing the AM BCB radio as a tunable i.f. strip were tested. Each of the three converters was set to the same 1-MHz VHF band and each performed so well that there was little to choose from in terms of sensitivity.

The first converter to be tested, from Scientific Associates Corp. (Box 276, South Glastonbury, Conn. 06073—\$29.95) was somewhat more bulky than the other two, but appeared to have a somewhat more extended battery life. As with all of the converters discussed in this article, the use of a printed circuit board in this converter added immeasurably to the stability required for VHF reception.

The "Sentry" converter (Sentry Mfg. Co., P.O. Box 12322, Oklahoma City, Okla. 73112—\$37.50) was one of the smallest and most solidly constructed converters tested by POPULAR ELECTRONICS. Broadcast band rejection—an important factor in achieving good VHF reception—appeared to be slightly better with the "Sentry" converter than with all other models tested.

The last converter in this group was the Vanguard "Model 303" (Vanguard Electronic Labs., 196-23 Jamaica Ave.,

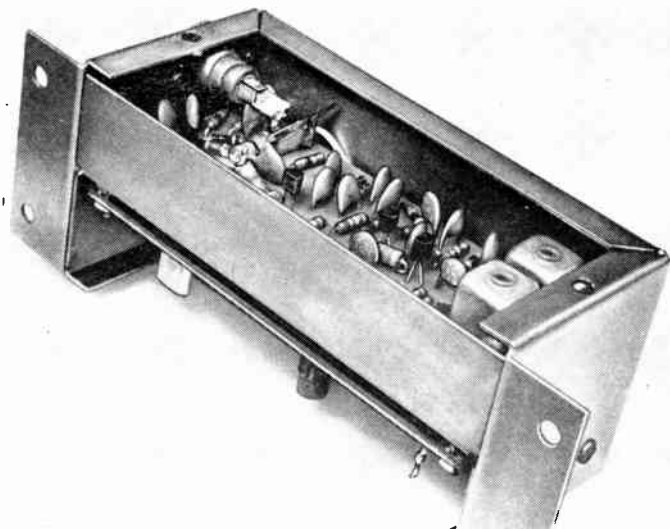
Hollis, N.Y. 11423—\$19.95) and was the only converter that distressed our testers because it employed coaxial receptacles rather than the usual Motorola-type plugs and sockets used on most of the other converters.

Just before this report was written, SSB Electronics Co. (P.O. Box 367, Rockville Centre, N.Y. 11571) introduced a new type of mobile converter—the "SSB-1" (\$44.95). Although also using slope detection in the AM BCB receiver, this converter incorporates a transistorized i.f. stage and limiting circuitry. Due to a patented arrangement in the i.f. strip, the converter is "squelched" when no signal is received. In preliminary tests at POPULAR ELECTRONICS, the sensitivity of this sturdily built converter was found to be exceptionally good.

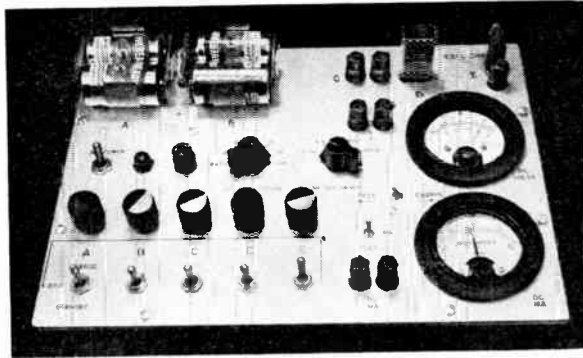
Various other manufacturers offer a variety of tunable or crystal-controlled VHF converters. These include Ameco, Kuhn Electronics, and Fred Meshna. All three of these companies are reported to offer converters in kit or wired models.

Personal Monitors. The next generation of VHF receiving equipment will probably be similar to the Sonar Model FR-103 (\$44.95, Sonar Radio Corp., 73 Wortman Ave., Brooklyn, N.Y. 11207). This 11-oz. unit is a complete receiver with a 2-channel crystal switch plus BCB receiving facilities.

-50-



In this inside view of the SSB Electronics Model SSB-1 converter, note the two decks and the more than adequate shielding. The SSB-1 features i.f. stage squelch and a limiter to insure best possible reception of the police/fire FM signals.



BUILD A COMBINATION BATTERY CHARGER AND TESTER

By HARLEY H. STOVER

YOU CAN CONTROL AND MONITOR
CHARGING CURRENT AND VOLTAGE,
AND TEST BATTERIES UNDER
ACTUAL WORKING CONDITIONS

WHY SHOULD you spend the time and money needed to build a battery charger and tester when you can buy a charger for less than \$5? Well, many of the low-priced chargers are brute-force types, having a single diode rectifier in series with the 117-volt power line and the dry cells. In addition to the possibility of getting no safe power line isolation on some of these chargers, you cannot control and monitor the charge cycle or determine beforehand, without the aid of a separate testing device or meter, if your dry cells will take a charge. With the Combination Battery Charger and

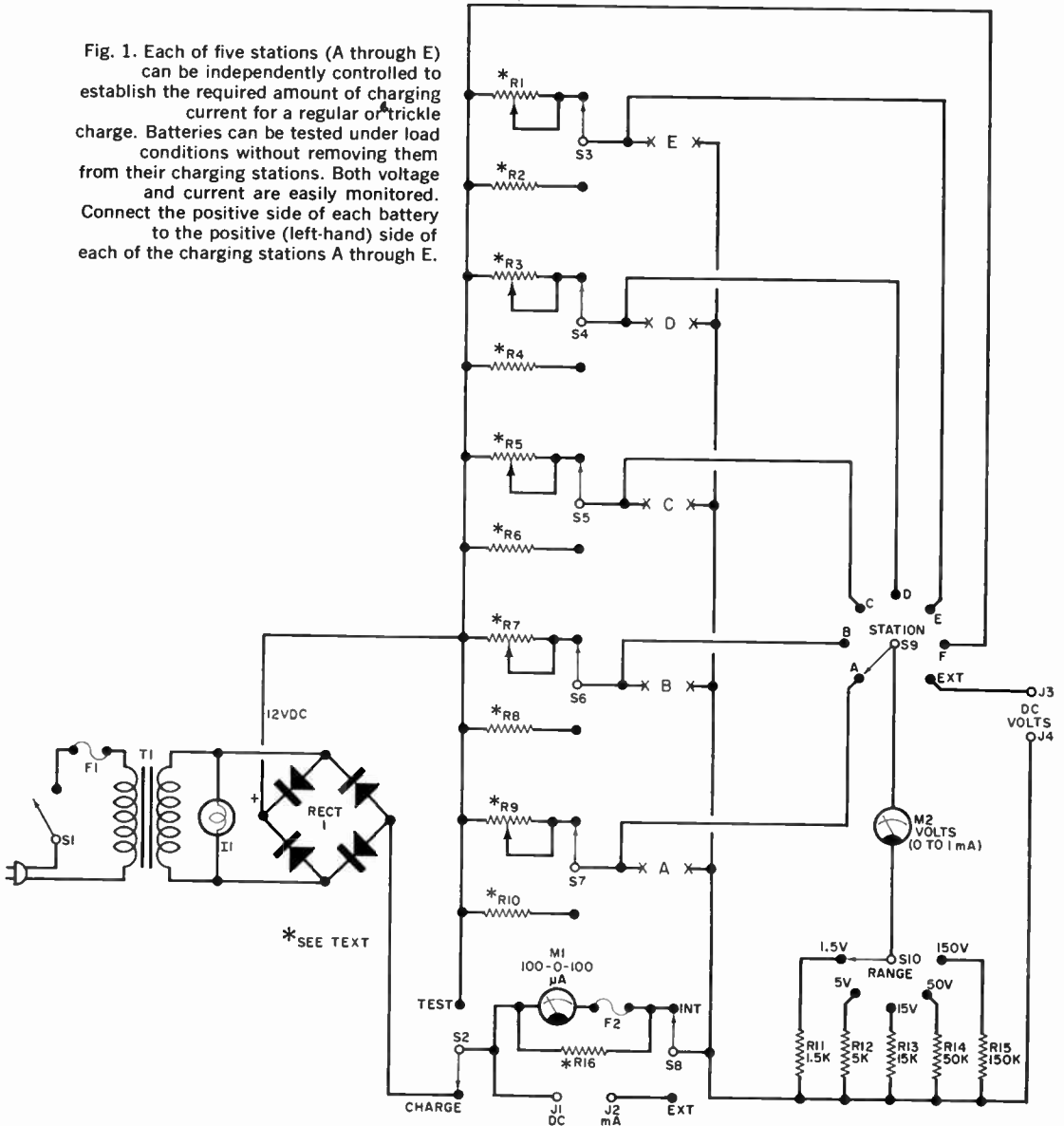
Tester, you can pretty much predict whether or not a particular cell will take a charge, as well as get an indication of the cell's service capability after you have charged it. It is not uncommon to find a dry cell (usually a low-priced 9-volt transistor type) that will, on its first discharge cycle, develop such high internal resistance that it won't take a charge.

A major advantage of the Combination Battery Charger and Tester is its ability to accurately recharge a battery on a current/time or ampere/hour basis. This is particularly desirable when you're us-

ing the more expensive cells and you don't want to risk damage from overcharging. With this charger, you have manual control and monitoring facilities of the charging current, as well as an ability to measure battery voltage under both varying load and charging conditions.

The test feature lets you observe the output voltage vs. load current characteristics. A zero-center milliammeter and the same variable load used to regulate the charging current is used to establish desired loading conditions even while the voltage is being observed on another meter built into the unit.

Fig. 1. Each of five stations (A through E) can be independently controlled to establish the required amount of charging current for a regular or trickle charge. Batteries can be tested under load conditions without removing them from their charging stations. Both voltage and current are easily monitored. Connect the positive side of each battery to the positive (left-hand) side of each of the charging stations A through E.



*SEE TEXT

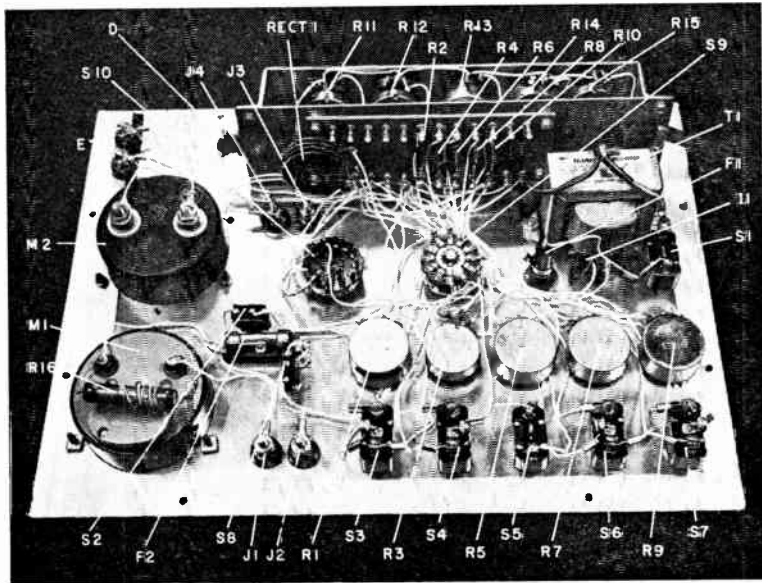


Fig. 2. The entire works is mounted on the front panel. Construction is not as complicated as it looks, nor is parts layout critical. Polarity of the rectifier stack should be observed for proper connections. It is a good idea to complete the wiring and assembly of all components before you mount the meters.

You can process all types of dry cells—ranging in size from the small hearing-aid to the large flashlight batteries. Dif-

ferent sizes of batteries and the variety of terminal configurations found on them present no problems. There are five different charging stations on the Combination Battery Charger and Tester that can be individually used and independent-

PARTS LIST

F1— $\frac{1}{8}$ -ampere fuse
F2— $\frac{1}{10}$ -ampere fuse, fast-acting
I1—12-volt pilot light
J1, J2, J3, J4—Jack (5-way binding post)
M1—100-0-100 μ A meter—see text
M2—0-1 mA meter
R1, R3, R5, R7, R9—Wire-wound potentiometer—see text
R2, R4, R6, R8, R10—Trickle-charge resistor—see text
R11—1500 ohms
R12—5000 ohms
R13—15,000 ohms
R14—50,000 ohms
R15—150,000 ohms
R16—Shunt—see text
RECT 1—Full-wave 300 mA bridge rectifier
S1—S.p.s.t. switch
S2, S8—S p.d.t. switch
S3, S4, S5, S6, S7—S.p.d.t. center-off switch
S9—S.p., 7-position rotary switch
S10—S.p., 3-position rotary switch
T1—Filament transformer: primary, 117 volts; secondary, 12.6 volts
 1—10" x 14" x 2½" chassis and cover
 Misc.—Battery holders (4), binding posts (4), knobs (7), pilot light holder and bezel, fuse holders (2), wire, solder, machine screws, nuts, etc.

ly controlled.

How It Works. A 12-volt filament type power transformer and a full-wave bridge rectifier provide power line isolation and a low d.c. voltage for charging, as shown in Fig. 1. The low d.c. voltage permits the use of low-power potentiometers and resistors.

The various charging stations (A to E) can be made to accept batteries of any size or shape within the capabilities of the power supply. In this project, Stations A and B are set up to handle "D" size cells; Station C can accommodate a pair of leads to connect to any battery; Station D takes a standard 9-volt transistor battery; and Station E is another general-purpose charging position outfitted with a special fixture to handle hearing-aid batteries.

Each charging station has a three-posi-

tion single pole switch (*S3* through *S7*) which provides a charging position, a standby or trickle charge position, and a center-off position. The trickle-charge resistors (*R2*, *R4*, *R6*, *R8*, and *R10*) are selected to allow a few milliamps of charge current for long-term battery storage on the charger. Potentiometers *R1*, *R3*, *R5*, *R7* and *R9* permit current adjustment for charging and load adjustment for testing.

Current measurements are made with microammeter *M1* shunted by *R16* to read out 100 milliamperes full scale on either side of 0. Switch *S8* and jacks *J1* and *J2* provide for the insertion of an external meter for heavier current work or for meter calibration purposes.

Voltage readings are obtained from the multirange voltmeter circuit. A set of jacks (*J3* and *J4*) lets you use *M2* as a general-purpose d.c. voltmeter. You can, with the use of these meters, simultaneously determine current drain of battery-operated devices and actual operating voltage. Station selector switch *S9* "throws" the voltmeter circuit across any one station at a time. Range switch *S10* lets you go from 150 volts full scale down to 1.5 volts full scale, in 5 ranges, in a conventional manner.

Construction. A standard 10" x 14" x 2½" chassis is used as a cabinet, and the entire unit is mounted on the front panel as shown in Fig. 2. Panel lettering can

be made from 3M Scotch-Cal photo sensitive decals and pressed into place (they have their own adhesive backing) after all punching and drilling is completed.

There are many types of battery holders available commercially. However, for the 9-volt transistor battery, don't overlook the idea of removing the terminal board on a used battery and cementing it (with epoxy) to the panel, for Station *D*.

A large ceramic resistor can be used as a form to wind your own meter shunt (*R16*). The size of the shunt depends upon the sensitivity of your ammeter. You can eliminate the shunt if the meter is already designed to operate within the desired range.

To avoid calculating and measuring a home-brew shunt, merely insert a VOM into *J1* and *J2*, set it on the 100-mA range, and add or take away turns of wire on the shunt until *M1* reads the same as the VOM. Be careful in the beginning not to overload *M1*. Start with about three turns of No. 22 AWG hook-up wire. If *M1* reads high, remove some wire or use a heavier gauge wire; conversely, if it reads low, add some wire. As you approach the proper calibration point, adjust the current through the meter to allow you to make the final shunt adjustment at a full-scale reading. It isn't difficult.

It is also a simple matter to build the voltmeter circuit. The resistance values

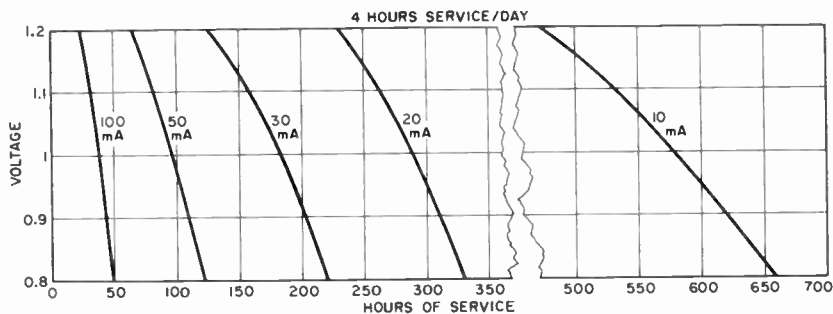


Fig. 3. Graph shows the approximate number of hours of use that can be expected from a certain 1.5-volt cell if the cell is used 4 hours per day. Battery life depends upon many factors, including temperature, current drain, and end voltage. Note that more hours of life can be expected when the current drain is small. This is true for ampere hours also. At the 0.8-volt level, a 100-mA load accounts for about 5 ampere hours. Compare the latter figure with the 10-mA load's approximate 6.6-ampere hour work capability.

given for *R11* through *R15* are for use with a 0 to 1 mA meter. Different voltage ranges can be set up, and different meters accommodated just by using resistors of proper values.

The values of the resistors and potentiometers *R1* through *R10* are a function of the battery voltage, charge rate, and source voltage. For example, if you want to charge a 9-volt transistor battery, and the source is 12 volts d.c., about 3 volts would have to be dropped by the resistor or potentiometer in the circuit. At 10 mA, about 300 ohms is needed. For 1½-volt batteries, about 10½ volts have to be dropped by the resistor in the circuit and its value would be on the order of 1050 ohms to obtain a 10-mA charging current. (It's Ohm's law at work.)

If two 1½-volt cells are placed in parallel for charging, as is possible with Stations *A* and *B*, and each cell is to receive 10 mA of current, 20 mA will have to flow through the appropriate resistor and the required value will be about 525 ohms.

Actual values needed to obtain a specified charging current vary from battery to battery, depending upon their internal resistance. Nominal values for the potentiometers are 1000 to 2000 ohms. The fixed resistors for trickle-charge purposes can be replaced with variable controls, or eliminated completely. You can set up any of the stations to provide a trickle charge just by adjusting the appropriate potentiometer. If you eliminate the fixed resistors, switches *S3* through *S7* can be s.p.s.t. types. Resistance values for trickle-charge purposes are considerably higher. To establish a 2 mA rate instead of 10 mA, approximately 5 times more resistance is needed.

Each station, except possibly *A* and *B*, may have a different set of values for the trickle-charge resistors and charge potentiometers. Of course, you have to avoid exceeding the wattage rating of the resistors and potentiometers. Determine the wattage to be dissipated simply by multiplying the voltage drop by the current and multiply by a factor of 2 to give yourself a margin of safety. About 2 to 4 watts is more than adequate for most applications.

Battery Testing. Batteries should be tested under load conditions. End life of batteries depends upon the equipment in use. For example, if a 9-volt battery is used in a transistor radio that can operate on 6 volts, the battery voltage can drop to 6 volts and still be considered adequate. On the other hand, the same battery, at 6 volts, with the same load, will be inadequate if the radio cuts out at 7 volts.

Open-circuit voltage tests are practically meaningless. While some conclusions can be made if the voltage is too high or very low, significant conditions can best be determined by actual charge and discharge behavior. You can check for high internal cell resistance and save yourself the job of charging a "dud."

To do this, first apply a 10-mA load and observe the voltage of the cell. Then apply a 10-mA charge and observe the cell's voltage again. With a high resistance "dud," the voltage will go to zero or very near to it with as little as a 10-mA load and will jump to an excessive value on charge. If you get these test results, discard the battery.

Battery Charging. Battery manufacturers supply Load Voltage/Current Discharge curves in their manuals. A typical set of curves is shown in Fig. 3. These can be used as a guide to get started, but you will soon develop an intuitive approach based on your own experience. A good safe rule of thumb is to charge at the same rate that the cell was discharged.

In general, carbon-zinc dry cells which have been in service over six months will not respond well to recharging. Mercury and alkaline batteries display better recharging characteristics than the carbon-zinc units, and of course, nickel-cadmium cells are best.

Don't let a battery get into a completely discharged condition prior to charging, and don't overcharge. All types of cells are susceptible to destruction from overcharging. Check the total ampere/hour capability of each battery.

As very little shelf life can be expected, recharged batteries should be put into use immediately or kept on a trickle charge.

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right now if he had
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REMOTE COMMANDER

IF YOU HAVE SHORT ARMS,
LET THIS
RADIO CONTROL SYSTEM
TURN ON AND OFF
YOUR RADIOS, TV'S,
LAMPS, ETC.,
UP TO 500 FEET AWAY

By **ELDEN C. MAYNARD**, K6SAI

THE "REMOTE COMMANDER" radio control (R/C) system can save you time and energy inside and near your home. It lets you take care of little jobs, like turning TV sets, radios and lights on and off from remote locations. Outside your home, the system is a real convenience; it can be rigged to a garage door opening and closing setup that can be controlled with the touch of a button—you don't have to get out of your car in even the stormiest weather.

The system is made up of a transmitter that is compact and light enough in weight to be carried in your shirt pocket and an equally compact receiver. In operation, the receiver remains in a fixed location near the device being controlled, while the transmitter can be moved to any location within range of the receiver. No physical link between the two units is required, so you are not limited to a few "strategic" locations—any location you happen to be at is strategic when you have the transmitter with you.

The "Remote Commander" R/C system was originally conceived as the controlling device for last month's (July 1967) featured "Pulse Command Responder." If used with the responder, it is connected as shown in Fig. 1. However, the responder is not required for operation of the system. The "Remote Commander" can be used with an inexpensive power relay to control a single device.

Of course, being a radio control system, the "Remote Commander" can also be used for controlling model airplanes, boats and racing cars.



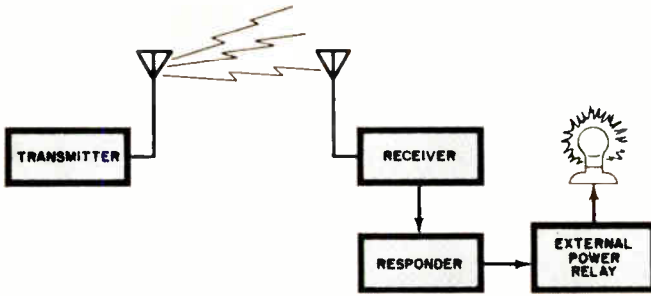


Fig. 1. "The Remote Commander" can be used as an R/C remote control device for the "Pulse Command Responder" (July, 1967) if setup is as shown above.

How The System Works. The two devices that make up the major elements of the system are reproductions of actual manufacturer circuits. (The schematic shown in Fig. 2 is a Mark II "Mule" tone transmitter, and Fig. 3 is a Model "4" superregenerative tone receiver, both made by Controlaire Division of World Engines, Incorporated.)

The transmitter circuits (Fig. 2) develop a 26.995-MHz carrier and an 800-Hz modulating tone, generated by crystal controlled oscillator *Q1* and blocking oscillator *Q4*, respectively. The modulating tone is amplified through *Q3* before it is passed on to *Q2* where it modulates the r.f. carrier. After amplification through *Q2*, the resulting tone-modulated signal is coupled through *C1* to the antenna and finally radiated into space.

The receiver's antenna (see Fig. 3) picks up this signal and passes it to superregenerative detector *Q1*. Transistor *Q1* operates as an interrupted oscillator that generates a quenching voltage and maintains the *Q* of tuned circuit *L1-C4* at maximum (on the border line just before *Q1* goes into oscillation).

The r.f. carrier is shorted to ground through *C6*, and the modulating tone is transformer-coupled *via T1* to audio amplifiers *Q2*, *Q3*, and *Q4*. When *Q4* conducts, *K1* energizes.

The input sensitivity of the receiver is 4 microvolts or better and is directly attributable to the use of a superregenerative detector.

When *K1* energizes, the load being controlled either receives or is denied power,

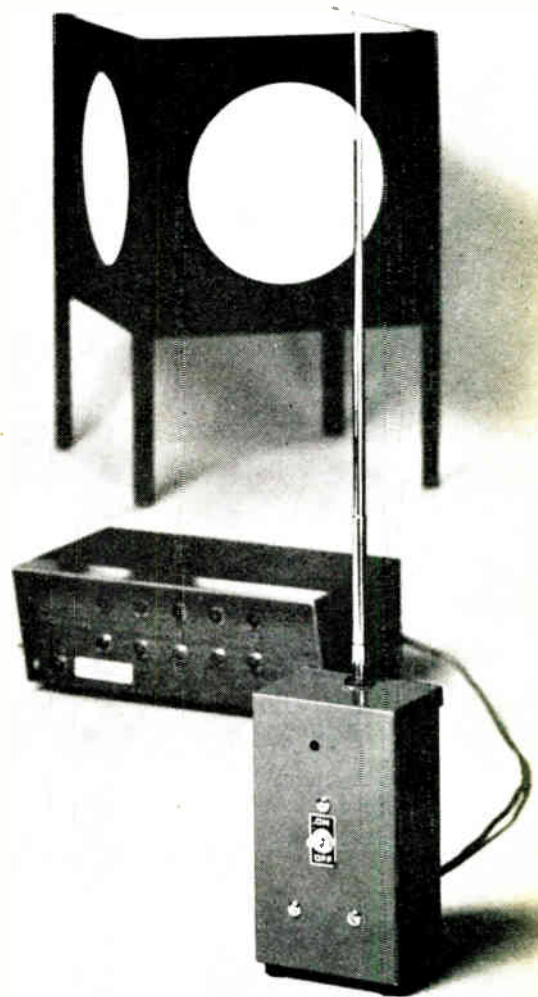


Fig. 2. Transmitter is crystal controlled to conform with the FCC specifications regarding carrier frequency stability. Output consists of a 26.995-MHz carrier signal, modulated with an 800-Hz tone.

TRANSMITTER PARTS LIST

- B1—9-volt battery
 - C1—100-pF ceramic capacitor
 - C2, C3, C5—0.02- μ F ceramic capacitor
 - C4—0.05- μ F ceramic capacitor
 - C6—62-pF ceramic capacitor
 - L1—R.f. coil assembly (See Text)
 - L2—12- μ H radio frequency choke
 - Q1, Q2—2N706 transistor
 - Q3—2N2924 transistor
 - Q4—2N229 transistor
 - R1—1500-ohm
 - R2, R4—100-ohm
 - R3—10,000-ohm
 - R5—47,000-ohm
 - R6—15,000-ohm
 - R7—27,000-ohm
 - R8—4700-ohm
 - S1—S.p.s.t. normally-open momentary action pushbutton switch
 - T1—10,000- to 1000-ohm impedance matching transformer
 - XTAL—26,995-MHz crystal (available from Texas Crystals, 1000 Crystal Dr., Fort Myers, Fla.)
- 1—Printed circuit board*
 1—Antenna (similar to Lafayette Radio electronics No. 99 C 3008)
- Misc.—Metal box, battery clip, $\frac{1}{2}$ " rubber grommet, hookup wire, solder, hardware, metal strip, insulator, etc.
- *See Receiver Parts List.

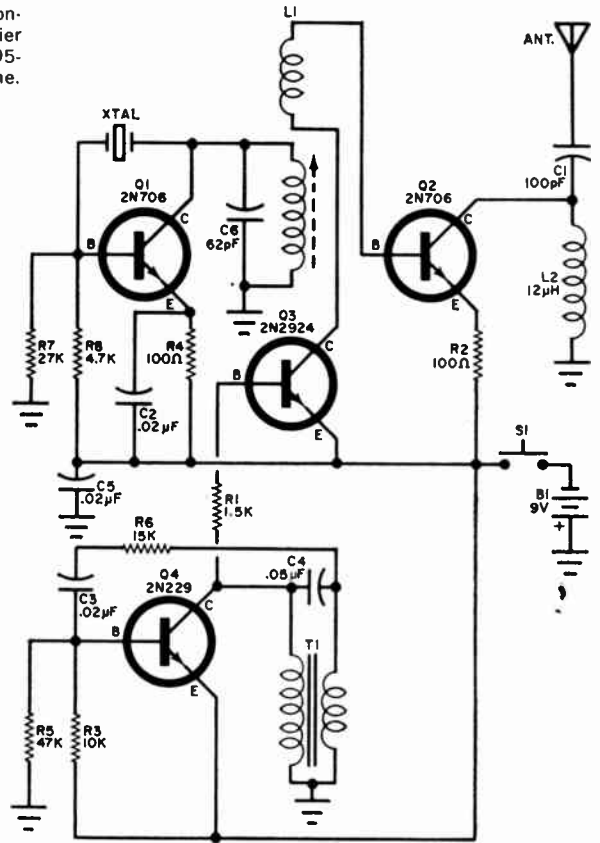
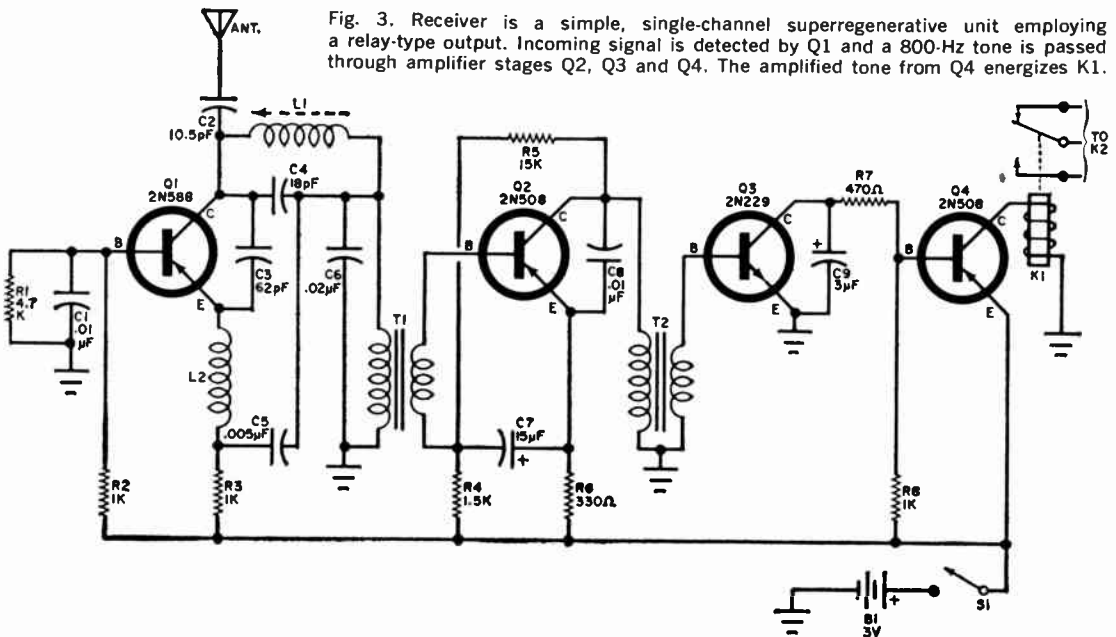


Fig. 3. Receiver is a simple, single-channel superregenerative unit employing a relay-type output. Incoming signal is detected by Q1 and a 800-Hz tone is passed through amplifier stages Q2, Q3 and Q4. The amplified tone from Q4 energizes K1.



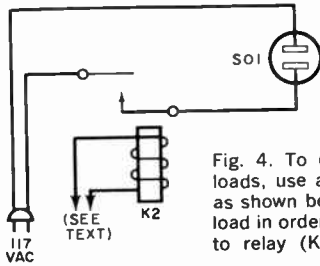


Fig. 4. To control high power loads, use a power relay wired as shown between receiver and load in order to prevent damage to relay (K1) in the receiver.

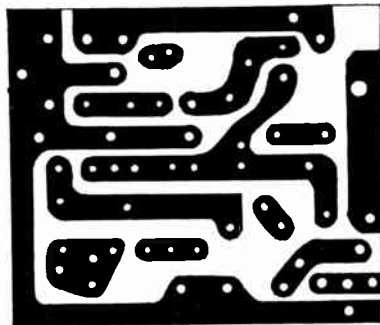
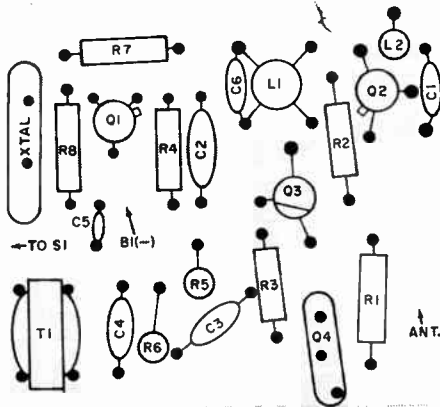
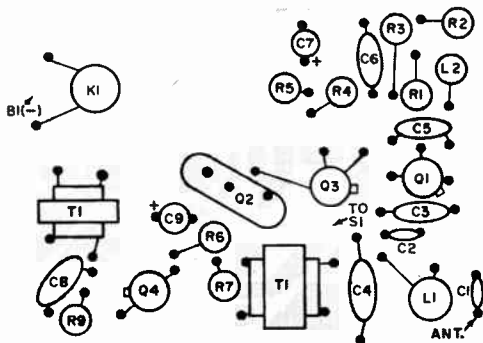


Fig. 5. Transmitter (directly above) and receiver (below right) etching guides are shown actual size. The layouts show parts location and orientation on the boards to facilitate easy component mounting.

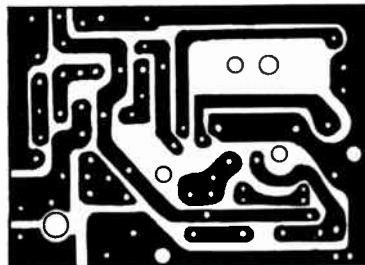


depending on the pair of contacts to which the load is connected. The contacts of *K1* are designed for low-voltage and low-power loads. Therefore, they must be protected against overloading and arcing through the use of low-voltage external power relay *K2* (Fig. 4) and a power source compatible with the requirements of *K2*'s solenoid winding.

For normally-on operation of the load being controlled, *K2* should be connected to the upper pair of *K1*'s contacts. Conversely, for normally-off operation *K2* should be connected to the lower contacts. When wiring *K2* and its power source across the contacts of *K1*, a con-

RECEIVER PARTS LIST

- B1—3-volt battery
 - C1, C8—0.01- μ F ceramic capacitor
 - C2—10.5-pF ceramic capacitor
 - C3—62-pF ceramic capacitor
 - C4—18-pF ceramic capacitor
 - C5—0.005- μ F ceramic capacitor
 - C6—0.02- μ F ceramic capacitor
 - C7—15- μ F, 15-volt electrolytic capacitor
 - C9—3- μ F, 15-volt electrolytic capacitor
 - K1—S.p.d.t., 50-ohm subminiature relay*
 - K2—See text
 - L1—R.f. coil (See Text)
 - L2—12- μ II radio frequency choke
 - Q1—2N588 transistor
 - Q2, Q4—2N508 transistor
 - Q3—2N229 transistor
 - R1—4700-ohm
 - R2, R3, R8—1000-ohm
 - R4—1500-ohm
 - R5—15,000-ohm
 - R6—330-ohm
 - R7—470-ohm
 - S1—S.p.s.t. switch
 - T1, T2—10,000- to 1000-ohm impedance matching transformer with tab mount*
 - 1—Printed circuit board*
 - 1—Telescoping antenna (see transmitter Parts List).
 - Misc.—Small metal box, 3 $\frac{1}{4}$ " x 2 $\frac{1}{8}$ " x 1 $\frac{1}{8}$ " utility box, $\frac{1}{2}$ " rubber grommet, a-lug terminal strip, hookup wire, solder, hardware, insulator, battery clip, etc.
- *These parts obtainable from Controlaire Electronics, World Engines, Inc., 8960 Rossash Rd., Cincinnati, Ohio 45236.



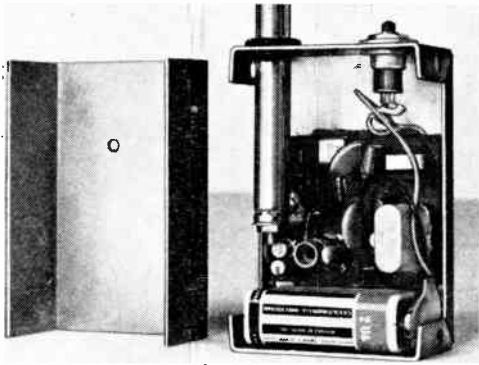


Fig. 6. Transmitter case should be smallest possible size, but large enough to house circuit board, battery and switch, and provide support for antenna.

tinuous series circuit should be obtained, so that $K1$'s contacts act as a switch between the low voltage supply and $K2$.

Construction. While small size and light weight are not important in the receiver, they are absolute necessities in the transmitter for maximum portability. Both circuits should be built on printed circuit boards, if for no other reason than to minimize construction time.

You can etch and drill your own printed circuit boards using the drawings in Fig. 5 to guide you, or you can buy them already etched and drilled (see Parts Lists). Coil $L1$ in both the transmitter and receiver can also be home brewed. The transmitter coil consists of $3\frac{1}{2}$ turns (upper winding) and $10\frac{3}{4}$

turns (lower winding) of ≈ 24 enameled wire. The receiver coil consists of 10 turns of ≈ 30 enameled wire. Both coils should be closely wound on $\frac{1}{4}$ "-diameter coil forms with adjustable high-frequency powdered iron cores.

Mount all parts as close to the circuit boards as possible, but allow enough lead length between transistors and boards to permit proper heat sinking when soldering. All the resistors in the transmitter and a few in the receiver should be mounted "on-end" to conserve space.

When all parts are in place, solder them to the boards' foil conductors, being careful to prevent solder bridges between the closely spaced conductors. Then cut away the excess component leads as close to the boards as possible.

Mount the transmitter circuit board in the smallest size metal box that will house the board, battery and switch and provide a support for the antenna as shown in Fig. 6. Place a piece of insulating material between the bottom of the board and the metal box.

Drill a $\frac{1}{2}$ " hole in the top of the metal box, place a grommet in it, and slide the antenna into place, securing it to the board with a metal strip. Finally, mount the switch on top of the box near the antenna, and drill a small access hole in the box directly over $L1$.

The size of the box you use to house the receiver and its associated parts is unimportant. The main circuits—minus power switch, antenna and batteries—
(Continued on page 100)

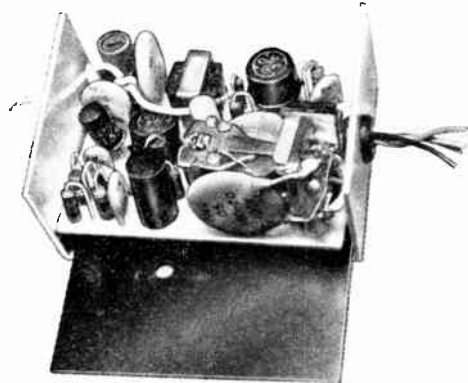
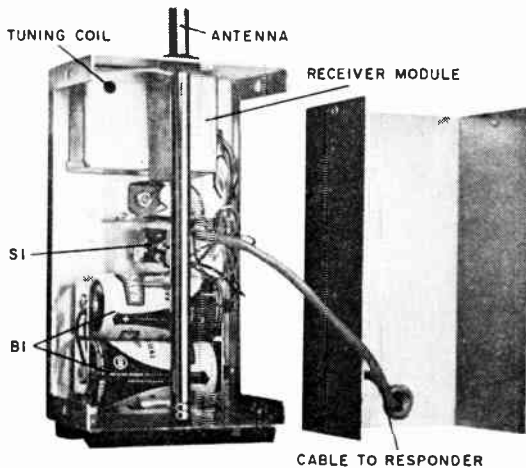


Fig. 7. For maximum shielding from outside interference, receiver circuit board should be mounted in separate metal case (above). Mount receiver module, switch, batteries and antenna in larger metal cabinet (left).

AMATEUR EQUIPMENT

JAMBOREE 1967

WITH AN ACCENT ON MORE AND BETTER,
THE HAM OPERATOR HAS A BIGGER CHOICE
OF QUALITY EQUIPMENT THAN AT ANY OTHER
TIME IN THE HISTORY OF AMATEUR RADIO

By **HERBERT S. BRIER**, W9EGQ

IF THE AMATEUR equipment on display these days at your electronics distributor does not make you drool, you are just not "with it" as far as amateur radio is concerned. Whether you are a soon-to-be-licensed Novice looking for equipment for your first station or an old-timer who has forgotten how many times your license has been renewed, you should have a picnic trying out the equipment illustrated on the following pages.

Some pieces of equipment listed in the Equipment Sampler (pages 50-53) are available in kit form only, some as either kit or wired units, and many only as finished goods. If you want to build your own rig, you will be hard pressed to beat the store-bought equipment.

Receivers. Traditionally, the first piece of equipment an amateur gets is a short-

wave receiver. If you want to listen outside the amateur bands to short-wave broadcast stations and eavesdrop on transmissions to and from our astronauts in orbit, etc., a good general-coverage receiver has much to offer. And if you are eligible for the \$1500-plus market, a deluxe general-coverage receiver like the National NC-500, Squires-Sanders SS-1BS, and ITT Mackay Marine 3010-B, etc., can do a superb reception job on all frequencies within its tuning range.

Dollar-for-dollar, *limited-coverage* receivers are easier to tune, more stable, more selective, and more sensitive than the general-coverage types. In fact, some general-coverage receivers are incapable of receiving Morse code and single-sideband signals. The general-coverage receivers listed in the Equipment Sampler, as well as many others, can receive amateur signals satisfactorily.

In between the super-quality, general-coverage receivers and strictly amateur-band receivers like the Heathkit HR-10 and SB-301 and Lafayette Radio's HA-350, are receivers like the Collins 75-S3, Drake R-4A and 2C, and Squires-Sanders SS-1R which permit plugging in addition-

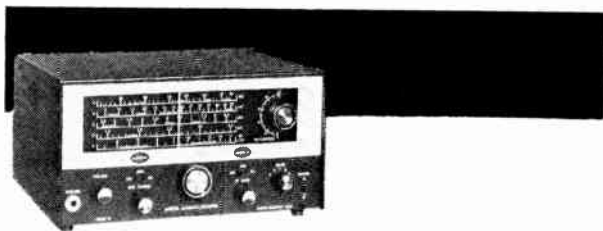
al crystals to tune desired segments of the short-wave spectrum outside of the amateur bands. The \$995 price tag of the SS-1R definitely puts it in the luxury class, especially if you add the cost of the optional noise silencer (\$135) and video band scanner (\$445) to the basic price. But the SS-1R is a lot of receiver.

Transmitters. Novices and other code enthusiasts have a choice of transmitters from the 5-watt Omega LT-5 up to the 100-watt Drake 2-NT, EICO 720, Hallcrafters HT-46, and Heathkit DX-60A. Transmitter power is not the most important factor in selecting a transmitter. A 20% change in power makes a barely perceptible change in received signal strength under controlled conditions, and a 4:1 power change makes a difference of only one "S" unit in signal strength.

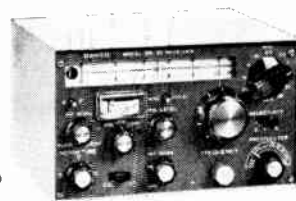
Thus, in comparison to a 75-watter, a 5-watter will be two points weaker. These figures mean that, as far as getting out is concerned, the difference between a 50-watter and a 75-watter is infinitesimal, and you don't sacrifice anything by dropping the input of a 100-watter to 75 watts to comply with the FCC Novice power regulations.

Don't sell the "beginner's" transmitters short. By and large, they are well designed, and many General Class license holders continue to use their Novice transmitters because they work so well. Of course, the General's usually add an external frequency oscillator so that they can shift frequency to any spot on the band instead of being "rockbound" and limited to the crystal frequencies that happen to be on hand.

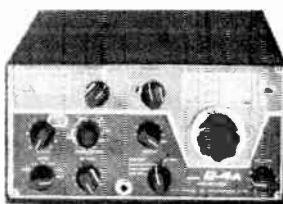
It is hard to imagine any U.S.A. amateur spending much money today for an AM transmitter for the frequencies below 30 MHz, because of the increasing shift to SSB. However, there is still a fair amount of AM activity on the lower-frequency amateur bands, especially during the hours when many hams are not on the air. Screen modulators built into basic CW transmitters are used in many units, like the Heathkit DX-60A and the Knight-Kit T-60, and can be thought of as a bonus feature by any code-happy ham who wants to make an occasional phone contact at minimum expense. Also, the T-60 covers the 6-meter band, where AM is still the vogue.



Ameco R-5



Davco DR-30



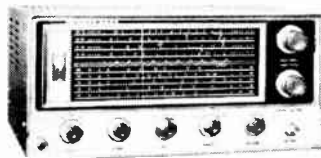
R. L. Drake R-4A



Heathkit HR-10



Hallicrafters SX-122



Lafayette HA-700

Sommerkamp FR-100B



RECEIVERS

Transceivers. Most of the amateur transmitting and receiving equipment sold today is in the form of transceivers. The functions of a separate receiver and transmitter are combined into a single unit and many of the components are used bilaterally in both functions.

Obviously, a transceiver occupies less space than two independent units—particularly important in mobile installations and in crowded ham shacks. And because of the fewer number of components, transceivers usually sell for ap-

proximately two-thirds of the total cost of a separate receiver and transmitter of equal quality. Even more important in the opinion of many transceiver users is the convenience of operation; when you tune in a signal, you are able to transmit on the same frequency without the need to make any further adjustments for frequency.

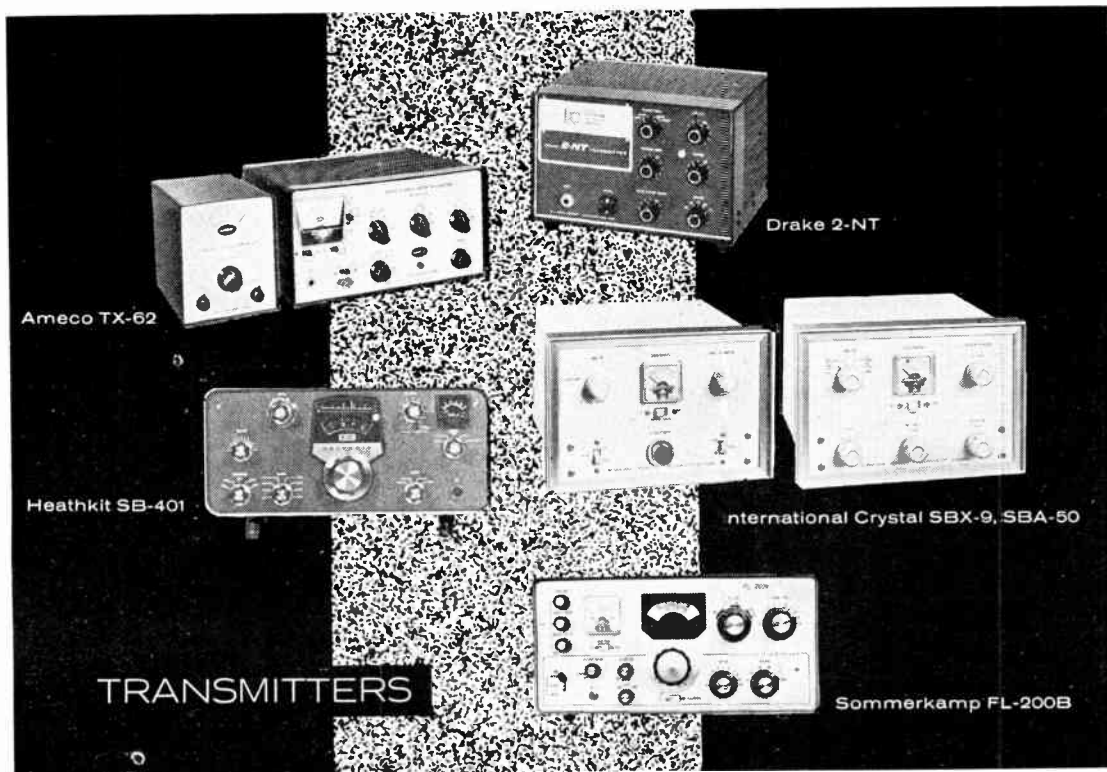
Most SSB transceivers are available for operation on one or more bands between 80 and 10 meters. There are 200-watt, single-band transceivers for the

80-, 40-, and 20-meter bands, such as the Heathkit HW-12A, HW-22A, and HW-32A, with power supply, selling for less than \$170.00. And there are 2-, 3-, 4-, and 5-band units ranging in power from 175 watts to 2000 watts. Also, with the 15- and 10-meter bands now wide open for DX a good part of the time because of the present sunspot activity, there is a much greater demand for transceivers covering these bands.

Except for the "economy" models, most transceivers operate on CW (and some-

times AM) as well as on SSB. Of particular interest to the Novice who would like to start his amateur career with an SSB transceiver are several that will operate crystal-controlled on transmit while retaining variable frequency control of the receive function. This feature is standard equipment in the Heathkit SB-101 and is available as an accessory function in the Collins KWM-2 and Galaxy V. Their power input can easily be cranked down to the Novice 75-watt level.

(Text continued on page 54)



RADIO AMATEUR EQUIPMENT SAMPLER

MANUFACTURER	MODEL	KIT OR WIRED	FUNCTION	TRANSMITTER CONTROL	BANDS	MODE	POWER, ETC.	PRICE
ALLIED RADIO 100 N. Western Ave. Chicago, Ill. ("Knight-Kit")	R-55A	Kit	Receiver		BCB to 10/6 m.	AM/CW/SSB	6 tubes	\$ 59.95
	R-100A	Kit	Receiver		BCB to 10/6 m.	AM/CW/SSB	9 tubes/117 V	99.95
	T-60	Kit	Transmitter	Xtal	80/6 m.	AM/CW	60 watts	54.95
	TR-106	Kit	Transceiver	Xtal	6 m.	AM	12 V/117 V	139.95
	V-107	Kit	VFO for TR-106/108		6/2 m.			19.95
	TR-108	Kit	Transceiver	Xtal	2 m.	AM	12 V/117 V	144.95
AMECO EQUIPMENT CORP. U.S. Highway 1, N. Raleigh, N.C.	AC-1	Kit	Transmitter	Xtal	80/40 m.	CW	117 volts	19.95
	TX-62	Wired	Transmitter	Xtal	2/6 m.	AM/CW	117 volts	149.95
	VFO-621	Wired	VFO for TX-62		1¼/2/6 m.		117 volts	59.95
	CB/CN	Kits	Converters		1¼/2/6 m.		Many models available	19.95 ¹
	PS-1W	Wired	Power Supply for CB/CN				117 volts	and up
R-5	Kit	Receiver		BCB to 6 m.	AM/CW	117 volts	64.95 ¹	
E. T. CLEGG ASSOCIATES Box 362 Morris Plains, N.J.	C-Line	Wired	Converters		VHF/UHF			2
COLLINS RADIO CO. Cedar Rapids, Ia.	KWM-2	Wired	Transceiver	VFO	80/10 m.	SSB/CW	180 watts	1150.00
	32S-3	Wired	Transmitter	VFO	80/10 m.	SSB/CW	180 watts	750.00
	MP-1	Wired	Power Supply for KWM-2				12 V d.c.	198.00
	516F-2	Wired	Power Supply for KWM-2/32S-3				117 V a.c.	115.00
	75S-3B	Wired	Receiver		80/10 m.	SSB/CW/AM	117 volts	620.00
	62S-1	Wired	Converter		2/6 m.	SSB/CW	150 watts	895.00
CONAR DIVISION OF NATIONAL RADIO INSTITUTE 3939 Wisconsin Ave. Washington, D.C.	400	Kit	Transmitter	Xtal	80/40/15 m.	CW	25 watts	32.50 ¹
	500	Kit	Receiver		80/40/15 m.	AM/CW/SSB	a.c.	37.50 ¹
DAYCO ELECTRONICS INC. P.O. Box 2677 Tallahassee, Fla.	DR-30	Wired	Receiver		80/10 m. + part of 6 m.	AM/CW/SSB	Solid-State	389.00
DELTA ELECTRONICS LTD. 70 Ronson Dr. Rexdale, Ont., Canada	KW-2000A	Wired	Transceiver	VFO	160/10 m.	SSB/CW	180 watts	589.00

R. L. DRAKE CO. 540 Richard St. Miamisburg, Ohio	2-C	Wired	Receiver		80/10 m.	AM/CW/SSB	Hybrid	229.00
	R-4A	Wired	Receiver		80/10 m.	AM/CW/SSB	117 V, Hybrid	399.95
	2-NT	Wired	Transmitter	Xtal	80/10 m.	CW	100 watts	129.00
	TR-4	Wired	Transceiver	VFO	80/10 m.	AM/CW/SSB	300 W PEP	599.95
	T-4X	Wired	Transmitter	VFO	80/10 m.	AM/CW/SSB	200 W PEP	399.95
	AC-4	Wired	Power Supply for TR-4/T-4X				117 volts	99.95
	SW-4A	Wired	Receiver		BCB/26MHz	AM		289.00
	SC-2	Wired	Converter		2 m.		Solid-State	69.50
	SC-6	Wired	Converter		6 m.		Solid-State	64.50
	CPS-1	Wired	Converter Power Supply				18 V d.c.	12.50
EICO ELECTRONIC INSTRUMENT CO., INC. 131-01 39th Ave. Flushing, N.Y.	720	Kit	Transmitter	Xtal	80/10 m.	CW	90 watts	89.95 ¹
	723	Kit	Transmitter	Xtal	80/10 m.	CW	50 watts	59.95 ¹
	753	Kit	Transceiver	VFO	80/40/20 m.	AM/CW/SSB	200 watts	189.95 ¹
	751	Kit	Power Supply for 753				117 volts	79.95 ¹
	752	Kit	Power Supply for 753				12 volts	79.95 ¹
	722	Kit	VFO for 720 and 723		80/10 m.		117 volts	44.95 ¹
730	Kit	Modulator for 720 and 723				50 watts	59.95 ¹	
GALAXY ELECTRONICS 10 S. 34th St. Council Bluffs, Ia.	V-Mark-2	Wired	Transceiver	VFO	80/10 m.	CW/SSB	400 watts	420.00
	AC-35	Wired	Power Supply for V-Mark-2				117 volts	79.95
	NOX-1	Wired	Novice Crystal Adapter		80/10 m.			24.95
GONSET, INC. LTV Ling Altec, Inc. 1515 S. Manchester Ave. Anaheim, Calif.	G-50	Wired	Transceiver	Xtal/VFO	6 m.	AM	117 volts	299.00
	GSB-II	Wired	Transceiver	Xtal/VFO	2 m.	AM/CW/SSB	20 watts	299.62
	GSB-VI	Wired	Transceiver	Xtal/VFO		AM/CW/SSB	20 watts	299.62
	901A	Wired	Power Supply for GSB-II				117 V a.c.	55.00
	911A	Wired	Power Supply for GSB-IV				117 V a.c.	55.00
HALLICRAFTERS 5th & Kostner Chicago, Ill.	HT-46	Wired	Transmitter	VFO	80/10 m.	SSB/CW	180 W PEP	369.95
	SR-42A	Wired	Transceiver	Xtal	2 m.	AM	12 V/117 V	199.95
	SR-46A	Wired	Transceiver	Xtal	6 m.	AM/CW	12 V/117 V	199.95
	SR-400	Wired	Transceiver	VFO	80/10 m.	SSB/CW	400 W PEP	2
	HA-26	Wired	VFO for SR-42A/SR-46A					49.95
	SR-2000	Wired	Transceiver	VFO	80/10 m.	SSB/CW	2000 W PEP	1095.00
	P-2000	Wired	Power Supply for SR-2000				117 V a.c.	450.00
	SX-122	Wired	Receiver		BCB/10 m.	AM/CW/SSB	11 tubes	289.95
	SX-130	Wired	Receiver		BCB/10 m.	AM/CW/SSB	7 tubes	169.95
	SX-146	Wired	Receiver		20/10 m.	AM/CW/SSB	9 tubes	269.95
HAMMARLUND MFG. CO. 73-88 Hammarlund Dr. Mars Hill, N. C.	HQ-170A-VHF	Wired	Receiver		160/2 m.	AM/CW/SSB		439.00
	HQ-100A	Wired	Receiver		BCB/10 m.	AM/CW/SSB	10 tubes	199.00
	HQ-110A	Wired	Receiver		160/2 m.	AM/CW/SSB		309.00
	HQ-145A	Wired	Receiver		BCB/10 m.	AM/CW/SSB	11 tubes	289.00
	HQ-180A	Wired	Receiver		BCB/10 m.	AM/CW/SSB	17 tubes	449.00
	HX-50A	Wired	Transmitter	VFO/Xtal	80/10 m.	AM/CW/SSB	180 watts PEP	95.00

(Continued on next page)

RADIO AMATEUR EQUIPMENT SAMPLER

MANUFACTURER	MODEL	KIT OR WIRED	FUNCTION	TRANSMITTER CONTROL	BANDS	MODE	POWER, ETC.	PRICE
HEATH COMPANY Benton Harbor, Mich.	SB-101	Kit	Transceiver	VFO/Xtal	80/10 m.	CW/SSB	180 W PEP	360.00 ¹
	SB-110	Kit	Transceiver	VFO/Xtal	6 m.	CW/SSB	180 W PEP	299.00
	HR-10	Kit	Receiver		80/10 m.	AM/CW/SSB	7 tubes	75.00
	SB-301	Kit	Receiver		80/10 m.	AM/CW/SSB	10 tubes	260.00
	SB-401	Kit	Transmitter	VFO	80/10 m.	CW/SSB	180 W PEP	285.00
	DX-60A	Kit	Transmitter	Xtal	80/10 m.	CW/AM	90 watts	79.95
	HG-10	Kit	VFO for DX-60		80/10 m.			34.95
	HW-12A	Kit	Transceiver	VFO	80 m.	SSB	200 W PEP	99.95
	HW-22A	Kit	Transceiver	VFO	40 m.	SSB	200 W PEP	104.95
	HW-32A	Kit	Transceiver	VFO	20 m.	SSB	200 W PEP	104.95
	HW-29A	Kit	Transceiver	Xtal	6 m.	AM	117 V a.c.	44.95
	HW-30	Kit	Transceiver	Xtal	2 m.	AM	117 V a.c.	44.95
	HP-23	Kit	Power Supply for HW/SB Receivers				117 V a.c.	49.95 ¹
	INDUSTRON INC. Whippany Labs, Inc. 77 Jefferson Ave. Westwood, N.J.	Li'l Lulu	Wired	Transmitter	VFO	6 m.	AM/CW	12 V d.c./ 117 V a.c.
Li'l Lulu		Wired	Receiver		6 m.	AM/CW/SSB	12/117 V	250.00
INTERNATIONAL CRYSTAL MFG. CO., INC. 18 N. Lee St. Oklahoma City, Okla. 73102	AOD-57	Wired	Transmitter	Xtal	6 m.	CW	5 watts	69.50
	SBA-50	Wired	Mixer/Amplifier		6 m.	SSB	Driven By SBX-9	145.00
	SBX-9	Wired	SSB Exciter	Xtal		SSB	4 tubes	125.00
	TRC-4	Wired	Converter		160/6 m.		Solid-State	16.50
	TRC-5	Wired	Converter		6/2 m.		Solid-State	22.50
ITT MACKAY MARINE 133 Terminal Ave Clark, N.J. 07066	3010-B	Wired	Receiver		70 kHz	AM/CW/SSB		1500.00
LAFAYETTE RADIO ELECTRONICS 111 Jericho Turnpike Syosset, L.I., N.Y. 11791	HA-144	Wired	Transceiver	Xtal	2 m.	AM	Solid-State	189.95
	HA-350	Wired	Receiver		80/10 m.	AM/SSB/CW	11 tubes	129.95
	HA-500	Wired	Receiver		80/6 m.		10 tubes	149.95
	HA-410/HA-460	Wired	Tranceivers	Xtal/VFO	10 or 6 m.	AM	20 W 12/117 V	149.95 each
	HA-650	Wired	Transceiver	Xtal	6 m.	AM	Solid-State	89.95
	HA-700	Wired	Receiver		BCB/10 m.	AM/CW/SSB	6 tubes	89.95
	HA-1200	Wired	Transceiver	Xtal/VFO	2 m.	AM	25W 12/117 V	189.95

NATIONAL RADIO CO. 37 Washington St. Melrose, Mass. 02176	NCX-5 Mark II	Wired	Transceiver	VFO	80/10 m.	AM/SSB/CW	200 watts	549.95
	NCX-A	Wired	Power Supply for NCX-5				117 volts	110.00
	200	Wired	Transceiver	VFO	80/10 m.	AM/CW/SSB	200 W PEP	359.00
	HRO-500	Wired	Receiver		5 kHz/30 MHz	AM/CW/SSB/ MCW/FSK	Solid-State	1650.00
	AC-200	Wired	Power Supply for 200				117 V a.c.	75.00
OMEGA ELECTRONICS CO. 10463 Roselle St. San Diego, Calif.	LT-5	Kit	Transmitter	Xtal	40/80 m.	CW	Solid-State	24.00 ¹
	PS-5	Kit	Power Supply				117 volts	22.00 ¹
PARKS ELECTRONICS LAB. 900 Burlington Ave. Beaverton, Ore.	50-1	Wired	Converter		6 m.		Nuvisor, 117 V Many other models available	38.00 & up
POLYTRONICS LABS, INC. 900 Burlington Ave. Silver Springs, Md.	PC-6/PC-6CD	Wired	Transceiver	VFO/Xtal	6 m.	AM	12/117 V	199.95
RAYTHEON CO. 213 E. Grand Ave. So. San Francisco, Calif.	SBE-34	Wired	Transceiver	VFO	80/15 m.	SSB	Hybrid, 12/117 V	395.00
SOMMERKAMP IMPORTED Barry Electronics Corp. 512 Broadway New York, N.Y.	FR-100B	Wired	Receiver		80/10 m.	AM/CW/SSB	12 tubes	250.00
	FL-200B	Wired	Transmitter	VFO	80/10 m.	AM/CW/SSB	130 watts	350.00
SQUIRES-SANDERS INC. Martinsville Rd. & Liberty Corners Millington, N.J. (Clegg Labs.)	SS-1R	Wired	Receiver		80/10 m.	AM/CW/SSB		995.00
	SS-1BS	Wired	Receiver		Int. BCB			1200.00
	22'er	Wired	Transceiver	Xtal	2 m.	AM	12/117 V	249.95
	66'er	Wired	Transceiver	Xtal	6 m.	AM	12/117 V	249.95
SWAN ELECTRONICS CORP. 417 Via Del Monte Oceanside, Calif.	350	Wired	Transceiver	VFO	80/10 m.	CW/SSB/AM	400 W PEP	420.00
	500	Wired	Transceiver	VFO	80/10 m.	CW/SSB/AM	480 W PEP	495.00
	250	Wired	Transceiver	VFO	6 m.	CW/SSB/AM	240 W SSB PEP	325.00
	117-XC	Wired	Power Supply for 350/500/250				117 volts	95.00
VANGUARD ELECTRONICS LABS. 190-48 99th Ave. Hollis, N.Y.	300 Series	Wired	Converters		40/20/6/2 m. & other		Solid-State	14.95 to 40.00
WORLD RADIO LABS., INC. 3415 W. Broadway Council Bluffs, Iowa	84	Wired	Transceiver	VFO	80/40 m.	SSB	300 W PEP	159.95
	AC-384	Wired	Power Supply for 84				300 W, 117 V	79.95

1. Also available in wired form

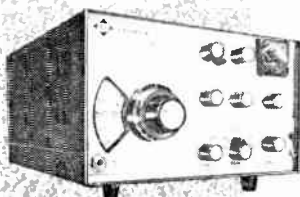
2. Information not available at press time

Note: Prices and availability of equipment are subject to change

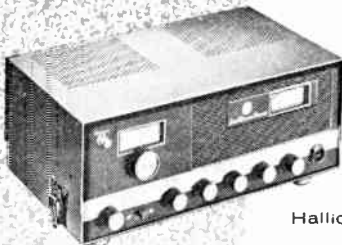
Allied TR-108



Galaxy V-Mark 2

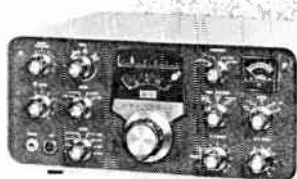


Gonset GSB-II



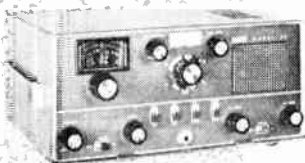
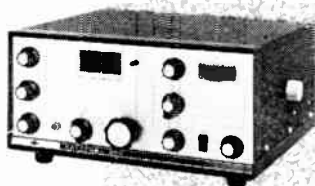
Hallicrafters SR-46A

Heathkit SB-101



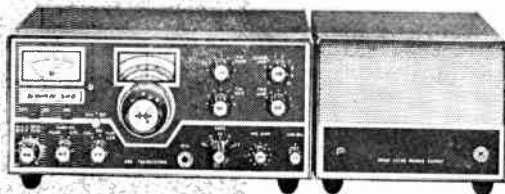
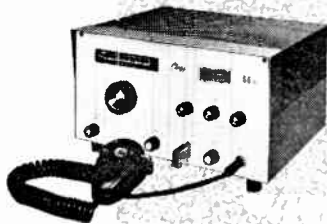
Lafayette HA-1200

National 200



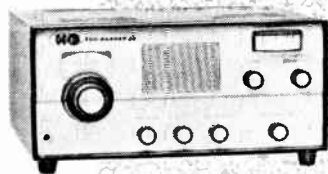
Raytheon SBE-34

Squires Sanders 66'er



Swan 500

WRL 84



TRANSCEIVERS

Until recently, a disadvantage of most transceivers for CW operation was their 2- to 3-kHz wide selectivity curve. This is much too broad for optimum CW work when adjacent interference is bad. But both the new Galaxy V and the Heathkit SB-101 now have provision for an auxiliary CW filter which makes the selectivity characteristic for CW compare favorably with other amateur receivers.

Special Features. When two operators work each other, it frequently happens that operator A touches up his tuning to make operator B sound more natural to him. In turn, when operator B receives he touches up his tuning to make A sound most natural to him. As a result, they continuously "waltz" around the frequencies, each accusing the other of drifting. EICO, Hallicrafters, and Raytheon combat this problem with an "off-set" or "incremental tuning" control, which permits shifting the receive frequency a few kHz without affecting the transmitted frequency. The British-manufactured KW-2000A (Delta) goes further—the operator can off-set either the received or the transmitted signal without affecting the other.

Imagine the crisis faced by the transceiver-equipped DX chaser when a rare DX station he wants to work transmits outside the U.S.A. phone band to avoid interference and listens for replies inside the U.S.A. phone band. The situation is really acute when the DX operator is working stations contest-style at the rate of a couple a minute. Several manufacturers, including Collins, Drake, Hallicrafters, and Swan, resolve the problems by offering auxiliary VFO's for their transceivers to permit either locked-or split-frequency operation, as desired.

Another solution to the problem of working out-of-the-band stations with a transceiver is to use an auxiliary receiver. The newly-announced Ameco PT wide-band transceiver r.f. preamplifier is a natural for this purpose, and is good for pepping up the receiver function of some transceivers on some bands. The preamp contains a voice-operated relay which automatically disconnects the preamp from the antenna circuit when the transceiver is in the transmit mode. Besides being able to pep up a transceiver, the preamp can be connected to a regu-

lar receiver which is automatically muted whenever the transceiver is transmitting. The price of this new unit is just under \$50, complete with built-in power supply.

Transmitter-Receiver Combinations. Possibly the greatest advantage of using a separate receiver and transmitter instead of a transceiver in a fixed station is versatility. If you have a matched pair of units, such as the Hallicrafters pair, Drake's R-4A/TX-4, Heath's SB-301/SB-401, or Collins' 75-S3/32-S3 combinations, you have the advantages of either locked- or split-frequency operation, plus the extra operating advantages built into most amateur receivers.

Oddly enough, the power input rating of independent SSB/CW transmitters is often less than the power input of a transceiver in the transmit mode. One reason for this is that it is assumed that the transceiver operator is fighting a space problem—he wants all the power he can get in a single package. But the operator using a separate receiver/transmitter combination usually has the room for an efficient, high-power, linear amplifier which he can drive with the transmitter. Of course, there is no reason why a linear amplifier cannot be driven by a transceiver, and this is often done as well.

Above 6 Meters. While the majority of amateur operation is on AM phone above 6 meters, there is a small but growing contingent of SSB operators on this band. CW operation is definitely a minority activity; and, in some areas, a fair number of amateurs operate on FM, using second-hand commercial communications equipment modified for amateur use.

The most popular equipment on the frequencies above 6 meters consists of single-band, low-power AM transceivers operating at power levels between 5 and 50 watts, with 15 to 25 watts being the most often used power. These transceivers range in cost from approximately \$45 for a 5-watt Heathkit "Twoer" or "Sixer" in kit form up to \$300 or a little more for the higher-grade units that are wired and ready to operate. The latter units are normally equipped with a dual-purpose, 12-volt d.c. 117-volt a.c. power

(Continued on page 98)

AUTOMATIC LIGHT BLINKER

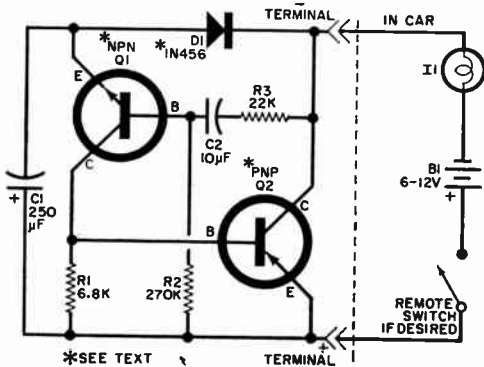
SIMPLE
TWO-TRANSISTOR CIRCUIT
CONVERTS IDIOT LIGHT
TO WARNING LIGHT

By MELVIN CHAN

HAVE YOU EVER driven many miles before noticing that your oil pressure warning lamp has been glowing dully . . . or had a cold, clammy feeling out on that deserted highway, after wondering just how long your low-fuel warning lamp had been lit . . . or found that your engine was acting up and then discovered that your parking brake was not fully off and you didn't see the lamp glowing down there? If any of these things have happened to you, you'll be interested in this automatic light blinker.

Because the circuit to be described is a true on/off switch, it can be inserted in series with almost any light bulb in the car (within electrical limits) and cause that bulb to blink at an attention-getting rate.

How It Works. Following the schematic diagram, assume that both $C1$ and $C2$ are completely discharged before power is applied to the switch. As power is applied, $C1$ charges through diode $D1$, while $C2$ charges through $R2$ and $R3$.



Flasher circuit is connected in series with the existing idiot light circuitry. Some parts values depend upon current load of light bulbs in use.

As $C2$ is charging, the voltage developed across $R2$ keeps $Q1$ in the off state. As $Q1$ draws no current, there is no voltage drop across $R1$; therefore, $Q2$ is also in the off condition. When $C2$ reaches full charge, $Q1$ starts to conduct and the voltage developed across $R1$ causes $Q2$ to go into saturation. When this happens, the collector-to-emitter resistance of $Q2$ is reduced to a very low value, producing a virtual short circuit across the switch output terminals.

At this time, diode $D1$ becomes back-biased and does not allow $C1$ to discharge through the effective short circuit. The voltage stored in $C1$ keeps $Q1$ conducting, and therefore maintains $Q2$ in a saturated condition. As $C1$ discharges, $C2$ is also discharging, and when the charge on $C1$ is exhausted, the circuit reverts to its original open-circuit condition.

Although no transistors are specified for $Q1$ and $Q2$, almost any available transistors will do, except that the $I_{c(max)}$ of $Q2$ (see transistor handbook) must be at least three times the current required by the lamp. Also, almost any diode can be used for $D1$ as long as it will pass the current requirements of $Q1$. The series light flasher will operate with any voltage that does not exceed the breakdown voltage of the transistors, the electrolytic capacitors, or the diode.

Using the Blinker. Open the circuit to the remote bulb, determine which lead is positive and which is negative and then connect them to the respective terminals on the solid-state blinker. When the power to the bulb is turned on, the blinker operates automatically.

If desired, the flashing rate may be altered by changing the value of $C1$ or $C2$. The higher the value, the slower the bulb repetition rate.



LO! THE RUSSIAN RADIO/TV SERVICEMAN

THE RUSSIAN WORD that looks like PЕМОHT is pronounced "remont" and means "repairs," or a place where you can get things repaired. Until very recently, the Soviet Government hadn't manufactured too much household electrical gadgetry, and the repair business—a private enterprise—had flourished on a "we-fix-anything" basis. There were a few specialized repair shops, for shoes for instance, but *remont* mostly means general repairs.

By **LEWIS A. HARLOW**

August, 1967

Remont shops are small, and rarely have any shop-owned transport for pick-up and delivery. They can fix what you can lug in. You probably won't have an *avtomobil*, and if you can't carry your repair job on the *metro*, you bring it in a *taksi*.

So you lug in your *televizor* which has gone dead, and you are greeted by the proprietor-operator of the shop who is a *mekhanik*, meaning mechanic. In America, the word "mechanic" has two meanings, one good and one bad. We have great confidence in the mechanic who is working somewhere under the shell of our car, but we hesitate to take our watch or even our pop-up toaster to someone who advertises as a mechanic. In Russia, the *mekhanik* is highly skilled, highly respected and highly inventive. In America, we'd call him a technician.

The Service Manual. Your Russian *mekhanik* will have the service manual for your government-manufactured *televizor*. He has no problem with innumerable brands and models which would require a Howard Sams file cabinet. The language in this manual is quite international, and an American technician who would spend a couple of hours in learning the Russian alphabet could follow it surprisingly well.

The picture language of the schematic is, of course, universal. So are the Greek letters used in the formulas. So are the numbers, originally Arabic but now used around the world, although the Russians use a comma instead of a period for the decimal point.

A lot of the words in the service manual for your *televizor* are borrowed from the West. The American reader must make allowances for the Russian tendency to simplify and adjust spelling, but the resulting words are quite recognizable. Here is a sampling of borrowed words: *Elektronniy* (electronic), *volt*, *amper*, *vatt*, *om*, *diod*, *triody*, *pentody*, *anod*, *katod*, *antenna*, *statika*, *batarea* or *akkumulator* (battery), *condensator*, *radio*, *telefon*.

Not all of the words are this easy. Some of the language used in electronics had basic meanings before the electronic era. Words of this kind the Russians already have in their language—and use them. A tube is an electronic lamp. A

knob is a round handle. A fuse is a melter-preventer. A coil is a reel, spool or bobbin. A resistor is a *soprotivlyeniye*, and that one would take serious dredging in the dictionary to find. A control grid is a *cel nizkovo naprazhyeniya* or network of lower tension, but the Russians usually simplify it and call it *cel* number one.

Where the naming of a new component or device is not obvious, the Russian falls back on his reliable all-purpose word *apparat*. An antenna-rotor is an *apparat* for twisting the antenna. A bar generator is an *apparat* for picture adjustment.

The Tools. Names are not borrowed for the tools in the Russian repair shop, and some of the tool names are as old as the language. *Molotok* and *noz* are hammer and knife and never anything else. *Pila* is a little confusing; it means saw or file, whichever is being used at the moment.

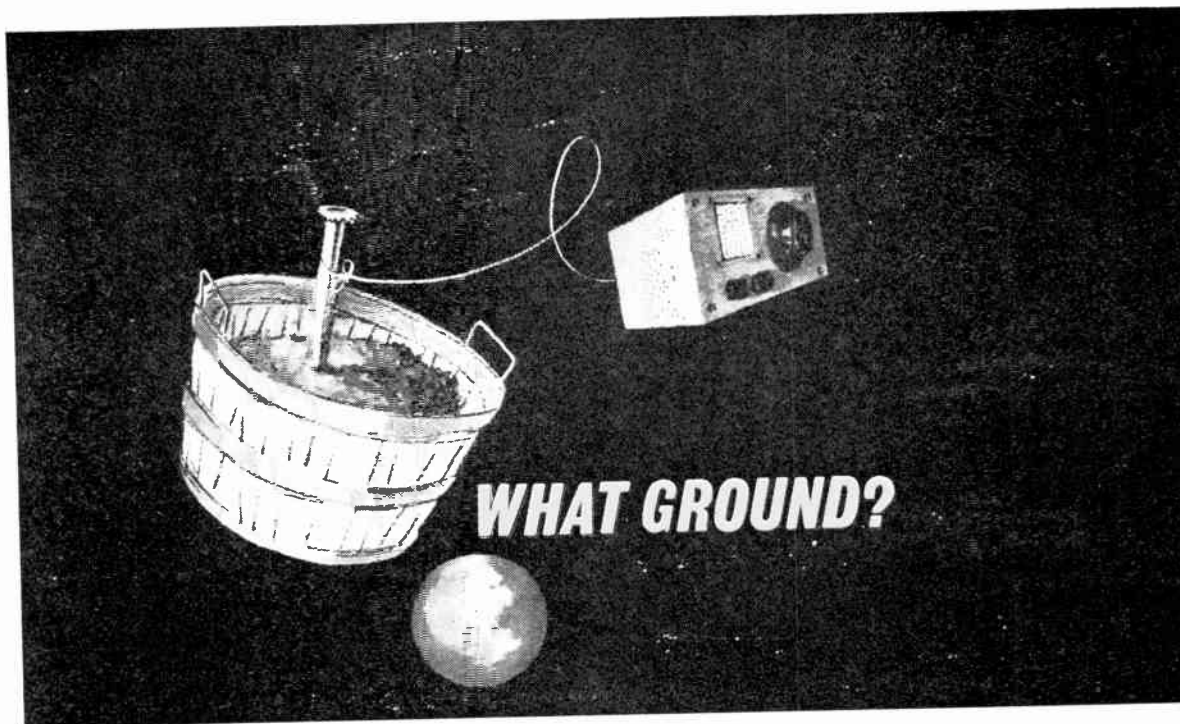
A screwdriver is a twister-outer, a strange name because the same tool is used when there is twister-in'ing to be done. A wrench is a screw-key or sometimes a nut-key. Small pliers have the same name as small bugs of the biting kind. Larger pliers are devices that talk slang with their lips. A *payalnik* is a soldering iron, and a *payalshchik* is the man who does the soldering.

For new tools, the specialized kind used on the electronic bench, the Russian often resorts to his convenient *apparat*. His wire-stripper is an *apparat* for undressing wire.

The Repair Job. But now you are in the *remont* with your *televizor* that doesn't play. You explain the one very simple symptom, and the *mekhanik* says that he will fix it and that you should *vozvratyityes v Pyatnitsoo*. So you come back Friday and your *televizor* is ready. You are told that three of the little electronic lamps have been replaced, and that the melter-preventer has been replaced, but that the big electronic lamp is OK. Also, several of the twister adjustments have been corrected.

Next comes the matter of price for the job, and here begins a ritual that has been going on in Russia for hundreds of years. You are told the price, and it is

(Continued on page 104)



A GROUND IS NOT ALWAYS A GROUND . . .

By **ROBERT L. RUYLE**

HAVE YOU noticed that both your transmitter and receiver seem to operate better on a wet, rainy day than on a dry day? The transmitter seems to "get out" a little better, and the receiver seems a little "hotter" during these times. The question we are about to answer is why the weather should have an effect on both these pieces of electronic equipment.

Of course you know that many types of electronic equipment, especially transmitters and receivers, require the use of a good ground for maximum operational efficiency. But, just what is a good ground? Too many people take a ground for granted. You cannot just drive a copper rod into the soil and expect your grounding problems to be solved. By pure luck they may be, but chances are that your problem is only partially solved. To establish a good ground, you must have a low-resistance area completely surrounding the grounding rod.

Actually, the resistance of a ground is determined by the resistance of the set-to-ground lead, the ground rod, the rod-to-

soil contact, and the resistivity of the soil surrounding the rod. The resistance of the lead, ground rod, and rod-to-soil contact is insignificant when compared to the resistance of the soil surrounding the rod. Tests have shown that if the rod is free of paint or grease and the soil is packed tight around the rod, contact resistance is negligible.

To understand soil resistance, picture the ground rod as being surrounded by successive shells of uniform-resistance soil of equal thickness, such as shown in Fig. 1. The first shell, nearest the rod, will have the smallest cross section of soil at right angles to the current flowing out from the rod; so it will have the most resistance. The next shell will have a larger cross section and will have less resistance. As the shells get farther away from the rod, the cross section of each increases and resistance goes down until finally a point is reached where the addition of more shells adds nothing to the ground resistance. Tests have shown that this point is usually reached between 6 and 10 feet

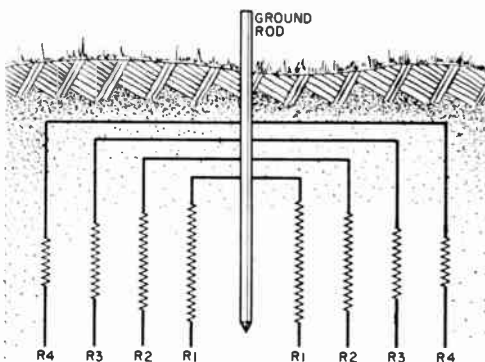


Fig. 1. The soil around a ground rod can be considered as a concentric array of resistance, becoming smaller as the distance from the rod is increased.

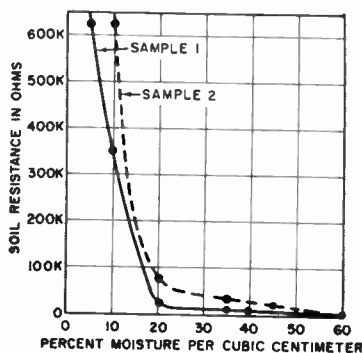


Fig. 2. When soil temperature is held at a constant 70°, its resistance increases as moisture decreases. The increase is rapid when moisture is below 20%.

around the rod. This answers one question which is frequently asked—Why not use more than one ground rod? The answer is simple—any other rod driven within the 6 to 10 foot circle will do little to lower the resistance of the original ground. It must be driven outside this circle so it will act like resistors in parallel and lower resistance.

Effect of Soil Composition. Tests show that the lowest resistance occurs in a soil made up of more or less refuse such as ashes, cinders, and brine waste. An average ground in this material measured 14 ohms. Clay, shale, adobe, gumbo, and loam soils came next with an average ground resistance of 24 ohms. Mixing these soils with sand, gravel, and ashes increased the resistance to 93 ohms. Finally, when only

sand, gravel, or rock were present, with little or no soil, the resistance rose to 550 ohms. All these measurements were made on a cubic centimeter of soil with the temperature held constant at 70° F and moisture held at a constant 30%.

Effect of Moisture. Another factor that has a great effect on soil resistance is moisture. When the moisture content of the soil falls below 20% the resistance goes up rapidly as can be seen in Fig. 2. For example, a given sample of soil with 10% moisture content has a resistance of 350,000 ohms per cm³. Increasing the moisture to 20% brings this resistance down to 10,000 ohms per cm³. If the moisture is increased to 35%, the resistance is cut to 5000 ohms per cm³.

Moisture content of typical soil varies

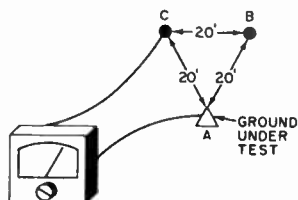


Fig. 5. When using an ohmmeter to determine ground resistance, two extra rods must be driven and compensation then made for stray a.c. and d.c. currents.

NEW 8' GROUND RODS
CONNECT WITH NO. 6 COPPER WIRE

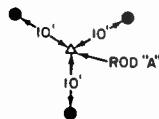


Fig. 6. Ground resistance can be reduced by driving three more rods, then interconnecting all four rods.

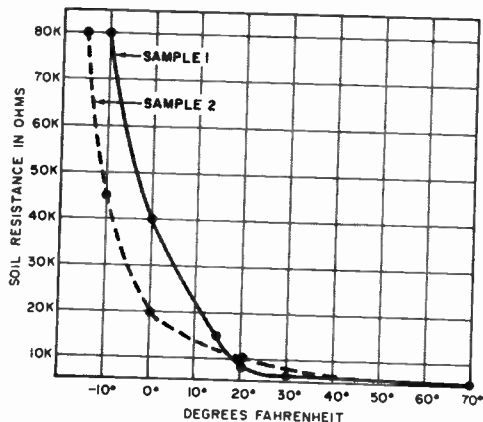


Fig. 3. When soil moisture is held at a constant 22% resistance increases with temperature reduction.

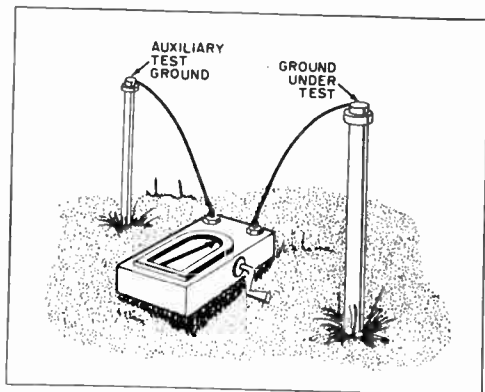


Fig. 4. A megger can be used to determine the resistance of the ground rod under test, as shown above.

from about 10% during dry seasons to about 35% during wet seasons, averaging out at about 18%. This is why the resistance of a ground rod driven into the earth will often more than double from a wet spring to a dry fall.

Effect of Temperature. Another item that greatly affects the resistance of ground is temperature. A great change takes place especially when the ground freezes. The resistance of a soil sample with a stable moisture content rose from 200 ohms per cm^3 to 500 ohms per cm^3 as the temperature fell from 70° to 35°F. When it suddenly dropped to 20°, the resistance rose to 6000 ohms per cm^3 , and at 0° the resistance had gone up to 40,000 ohms per cm^3 . Fig. 3 shows the results of some tests.

Where the ground freezes, it is especially important to be sure that the ground rod is long enough to reach about two feet below the frost line. This will usually put the rod into soil that has a reasonably permanent moisture level and temperature stability. The surface top soil is subject to wide variations in resistance with changing seasons. The greatest reduction in resistance is ordinarily encountered in going down the first 6 feet, but 8-foot rods have proven to reach permanent moisture levels in 90% of the test cases.

Rod Size. Thinking about the above-mentioned factors, one might surmise that the diameter of the rod might help in lowering the resistance. Test comparisons

made between a one-half inch and a one-inch ground rod under controlled moisture, temperature, and soil conditions revealed that the one-inch rod with twice the diameter and four times the surface area decrease the resistance by only 4.5%. In general, the rod need only be large enough and strong enough to withstand driving into the ground without bending.

Measuring the Ground. There are several methods of measuring ground resistance, and two will be explained.

Using a megger is one method. It is probably the easiest and most accurate. If you don't know someone who has one, you can sometimes borrow one from your local power or telephone company. Probably the most popular megger is the old military PSM-2. To use the megger, you attach one lead to the ground to be measured and attach the other lead to an auxiliary ground rod which is driven into the ground some distance away (depending on the type of megger used). Then operate the megger to generate the voltage that causes the instrument to indicate the resistance of the ground path on the meter. Fig. 4 shows this method.

Using an ohmmeter and two ground rods is another, although more cumbersome, method. Why two ground rods? Well, the ground that you are using now, whether it be a water pipe or an 8-foot ground rod driven into the earth, has an a.c. (caused by ground current) and a d.c. (caused by electrolytic action) compo-

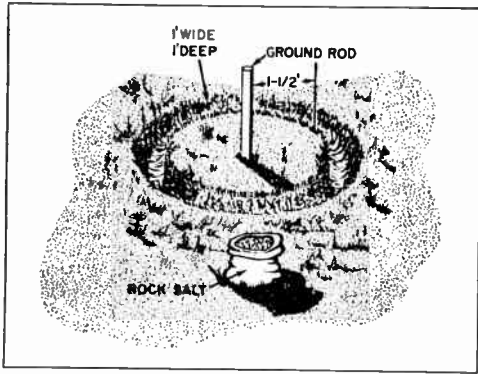


Fig. 7. Chemically treating soil can reduce ground resistance. However, the treatment must be renewed each year or so to maintain ohmic reduction.

ment. Therefore, we need two more rods so we can take a series of readings and eliminate both components to get a true reading. Fig. 5 shows placement of the extra rods with respect to the ground under test. After driving the ground rods, label the rods "A", "B", and "C", with "A" being the actual ground rod you are going to use and want to measure. Take a resistance reading between "A" and "B" with the ohmmeter set on the low ohms range (usually in the 100 to 150 ohm range), then reverse the leads and take the reading again. Reversing the test leads nullifies the effect of the d.c. component.

As an example of using this method, here are details of a typical test.

Step 1. The "A" to "B" reading was 93 ohms, and the "B" to "A" reading was 67 ohms. Adding the two values and dividing by 2 produces an "A+B" reading of 80 ohms.

Step 2. The "A" to "C" reading was 103 ohms and the "C" to "A" reading was 71 ohms. Adding the two values and dividing by 2 gives "A+C" reading of 87 ohms.

Step 3. The "B" to "C" reading was 83 ohms, and the "C" to "B" reading was 113 ohms. Adding the two values and dividing by 2 produces a "B+C" reading of 98 ohms.

Step 4. These values can now be substituted in the following equation: $[(A+B) + (A+C) - (B+C)]/2 = \text{value of A in ohms}$. Substitution of the values into the equation and working it out shows that the value of A is 34.5 ohms. For greater accuracy, the resistance of the auxiliary grounds should be near that of

the one being measured and both should be at least 20 feet from each other and the ground rod under test. This is to prevent overlapping their effective resistance areas. When measured with a megger, the reading was 35.7 ohms so the accuracy of the ohmmeter method is good, although more involved and requiring more work.

Lowering Ground Resistance. One might be thinking now, how do I go about lowering ground resistance if it is too high and, incidentally, what is "too high"? In most cities, the electrical code states that any electrode driven into the ground must read less than 25 ohms to ground. In the example previously given, note that the ground resistance value is too high (34.5 ohms.) Let's use it as an example to bring it down to 25 ohms or less.

One method is to drive more ground rods as previously explained, since it would be like putting resistors in parallel, thus lowering the total resistance if all are connected together. This was done by placing three more 8-foot ground rods, ten feet from the original, and then connecting them all together as shown in Fig. 6. After doing this and then checking ground resistance, it was found that in a wet spring the resistance was about 18 ohms, and in a dry fall (or when the ground was frozen in the winter) resistance was about 22 to 23 ohms.

Another method would be to drive the rod deeper into the ground. For instance, it has been found that a ground that measured 270 ohms at 8 feet measured only 10 ohms at 40 feet. However, if your ground is rocky, and more rods would not help a great deal, and the rods are very difficult to drive, one should consider treating the soil with chemicals. To do this, dig a circular trench about one-foot wide and one-foot deep having a 1½ foot radius, as shown in Fig. 7. Fill this trench with copper-sulfate, magnesium-sulfate, or plain ordinary rock salt. Wet it down and cover with about three inches of soil or sand. This method works well with ground that has a high resistance, but the improvement decreases with time and should be renewed every year. If you don't renew the treatment, the ground resistance will creep back up to its original high value. Also, the rod should be checked every three or so years as chemical action will eventually destroy it.

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Ham Radio Ain't What It Used To Be

By WALT MILLER



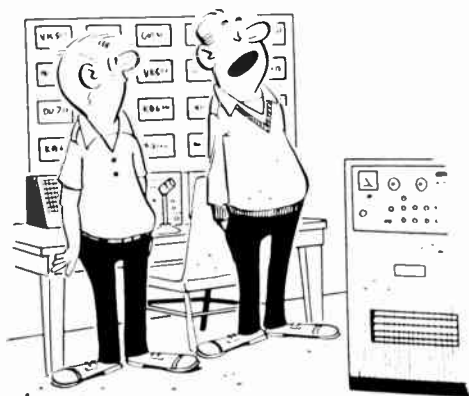
"Oh that's nothing, just my first QSL."



"Hey Bud, better ask your wife if she wants Green stamps."



"\$659.00 worth of equipment and I can't get a signal past the city limits."



"Built it myself—just the basic tools; pliers, money, soldering iron, money, screwdriver, money..."



"Congratulations! You've made the down payment—now that wasn't so difficult, was it?"

In today's electronics boom, the demand for men with technical education is far greater than the supply of graduate engineers. Thousands of real engineering jobs are being filled by men without engineering degrees—provided they are thoroughly trained in basic electronic theory and modern application. The pay is good, the future is bright...and the training can now be acquired at home—on your own time.

How to become a “Non-Degree Engineer”



The electronics boom has created a new breed of professional man—the non-degree engineer. Depending on the branch of electronics he's in, he may "ride herd" over a flock of computers, run a powerful TV transmitter, supervise a service or maintenance department, or work side by side with distinguished scientists on a new discovery.

But you do need to know more than soldering connections, testing circuits and replacing components. You need to really know the fundamentals of electronics.

How can you pick up this necessary knowledge? Many of today's non-degree engineers learned their electronics at home. In fact, some authorities feel that a home study course is the *best* way. *Popular Electronics* said:

"By its very nature, home study develops your ability to analyze and extract information as well as to strengthen your sense of responsibility and initiative."

Cleveland Method Makes It Easy

If you decide to advance your career through home study, it's best to pick a school that *specializes* in the home study method. Electronics is complicated enough without trying to learn it from texts and lessons that were designed for the classroom instead of the home.

The Cleveland Institute concentrates on home study exclusively. Over the last 30 years it has devel-

oped techniques that make learning at home easy, even if you once had trouble studying. Your instructor gives the lessons and questions you send in his undivided personal attention—it's like being the only student in his "class." He not only grades your work, he analyzes it. And he mails back his corrections and comments the same day he gets your lessons, so you read his notations while everything is still fresh in your mind.

Students who have taken other courses often comment on how much more they learn from CIE. Says Mark E. Newland of Santa Maria, Calif.:

"Of 11 different correspondence courses I've taken, CIE's was the best prepared, most interesting, and easiest to understand. I passed my 1st Class FCC exam after completing my course, and have increased my earnings by \$120 a month."

Always Up-to-Date

Because of rapid developments in electronics, CIE courses are constantly being revised. This year's courses include up-to-the-minute lessons in Microminiaturization, Laser Theory and Application, Suppressed Carrier Modulation, Single Sideband Techniques, Logical Troubleshooting, Boolean Algebra, Pulse Theory, Timebase Generators...and many more.

CIE Assures You an FCC License

The Cleveland method of training is so successful that better than 9 out

of 10 CIE men who take the FCC exam pass it—and on their first try. This is despite the fact that, among non-CIE men, 2 out of every 3 who take the exam fail! That's why CIE can promise in writing to refund your tuition in full if you complete one of its FCC courses and fail to pass the licensing exam.

This Book Can Help You

Thousands who are advancing their electronics careers started by reading our famous book, "How To Succeed in Electronics." It tells of many non-degree engineering jobs and other electronics careers open to men with the proper training. And it tells which courses of study best prepare you for the work you want.

If you would like to cash in on the electronics boom, let us send you this 40-page book free.

Just fill out and mail the attached card. Or, if the card is missing, write to:

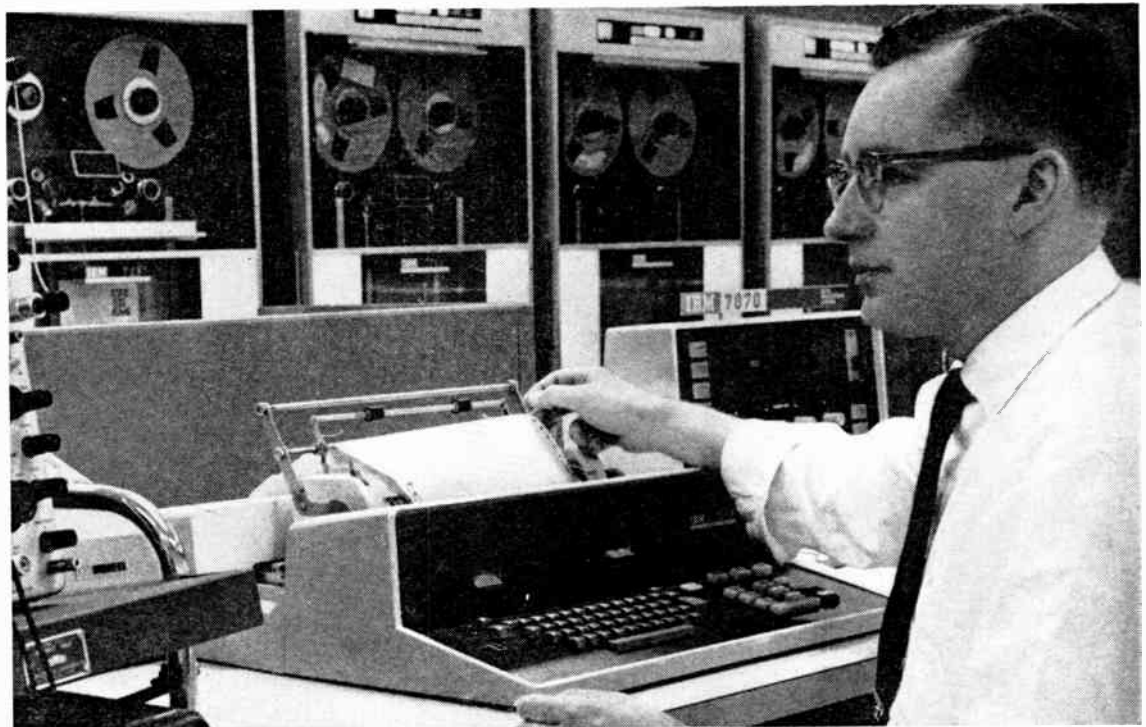
CIE Cleveland Institute of Electronics

1776 E. 17th St., Dept. PE-57
Cleveland, Ohio 44114

Accredited Member National Home Study Council

ENROLL UNDER NEW G.I. BILL

All CIE courses are available under the new G.I. Bill. If you served on active duty since January 31, 1955, or are in service now, check box on reply card for G.I. Bill information.



CIRCLE NO. 8 ON READER SERVICE PAGE

ELECTRONICS LIBRARY

101 WAYS TO USE YOUR SIGNAL GENERATOR, Second Edition

by Robert G. Middleton

Since the first edition of this book was published, multiplex generators have come of age. Although the multiplex signal is much more elaborate than ordinary AM generator signals, there is nothing really complicated about FM stereo-multiplex generators—according to the author. All that is basically necessary is a straightforward explanation of the test setups—which he provides, together with a discussion of normal and abnormal test results. Test procedures for simple signal injection and radio and TV alignment are also covered thoroughly of course.

Published by Howard W. Sams & Co., Inc., 4300 West 62 St., Indianapolis, Ind. 46206. Soft cover. 144 pages. \$2.95.

SERVICING TV RECEIVER CIRCUITS

Troubleshooting an ailing TV circuit is just a matter of knowing how it works and applying logical test procedures. But to know every circuit in every make of receiver, and to remember every test procedure for each one, is not so simple. This book is comprised of the best articles on both monochrome and color receiver troubleshooting that have appeared in *Electronic Technician* magazine. It contains the knowledge and know-how of dozens of practicing experts on the subject. Even if you're an "old pro," you should find the contents helpful in solving an occasional tough-dog problem—especially the comprehensive color section.

Published by Tab Books, 18 Frederick Rd., Thurmont, Md. 21788. Hard cover. 224 pages. \$6.95.

TEN-MINUTE TEST TECHNIQUES FOR ELECTRONICS SERVICING

by Elmer C. Carlson

Many time- and temper-savers are included in this book, which offers shortcuts and practical hints to help technicians solve servicing problems fast. The author feels that every circuit is essentially either an amplifier or a rectifier, and that common sense is the best tool to use in servicing. He decries the tendency to view complex circuits as complex circuits rather than as a group or series of interrelated simple circuits. Step-by-step techniques are presented here for localizing troubles and pinpointing defective components without delving into involved theoretic

cal discussion. However, although the book deals with basic circuits, it is not intended for the beginner.

Published by Tab Books, 18 Frederick Rd., Thurmont, Md. 21788. Hard cover. 176 pages. \$6.95.



INTRODUCTION TO RADIO ASTRONOMY

by R. C. Jennison

In less than two decades, astronomy—one of the oldest sciences—has recorded some of the most exciting discoveries since the invention of the optical telescope. Radio astronomy—the gathering and interpretation of radio noises from space—has stretched the universe to unimaginable dimensions. This book is a happy blend of facts, figures, and straight-from-the-shoulder text about these discoveries. Written by a Jodrell Bank researcher, *Introduction To Radio Astronomy* is not a Sunday supplement, nor is it a weighty, dry, mathematical treatise. Except for minor omissions regarding some significant American contributions, Dr. Jennison has written a valuable background study and reference guide.

Published by the Philosophical Library, Inc., 15 E. 40 St., New York, N.Y. 10016. 160 pages. Junior-size hard cover. \$4.75.



CIRCUIT DESIGN FOR AUDIO, AM/FM AND TV

by Engineering Staff, Texas Instruments, Inc.

This is a book that should be of particular interest to anyone involved in designing circuits using solid-state components in consumer products. Numerous design examples amply illustrate the transition from slide rule and scratch pad to hardware. Originally printed in two separate paperback volumes, this single hard-cover book will serve as a handy reference for numerous engineers.

Published by McGraw-Hill Book Company, 330 W. 42 St., New York, N.Y. 10036. 344 pages. Hard cover. \$14.50.

ELECTRONIC ENGINEERING MEASUREMENTS FILEBOOK, Second Edition

by Editorial Staff, EEE Magazine

Collecting and reprinting magazine articles in filebooks (or handbooks) has become quite fashionable. In this new book (the first edition appeared in 1965) the editors of *EEE Magazine* have used material originally published in their "Measurements File" department. All 60 measurement and test setups deal with slightly unusual or somewhat new methods of achieving a nominally high order of accuracy using commonly available electronic equipment.

Published by Tab Books, 18 Frederick Rd., Thurmont, Md. 21788. 248 pages. Hard cover. \$9.95.

—50—

CB'ers ARE WONDERING ABOUT—

If CB'ers Had Things to Think about Last Year, This Year They've Got Them in Spades

By KOD3631

SINCE MY LAST REPORT, I have been deluged with questions. A selection of these questions and my answers appear below. This is a summary of the state of CB as seen by POPULAR ELECTRONICS, June, 1967.

Is the growth of CB slowing down?

If you're speaking in terms of the number of license applications, the answer is no. The bar chart on this page shows the number of license applications received for the ten month period between July, 1966 and April, 1967. The growth pattern of CB is leveling off and is not as explosive, or dramatic as it was in 1964 when, for one month, there were 33,740 license applications and two months later only 12,800.

If "Type Acceptance" goes into effect will it hurt CB?

No. Type Acceptance of CB equipment will not affect the present-day equipment user. Nor will Type Acceptance curtail the use of your equipment which will be considered to have a useful life of five years, or more. Type Acceptance pertains to equipment that will be manufactured—probably in 1968—and not to the gear you're using at this moment.

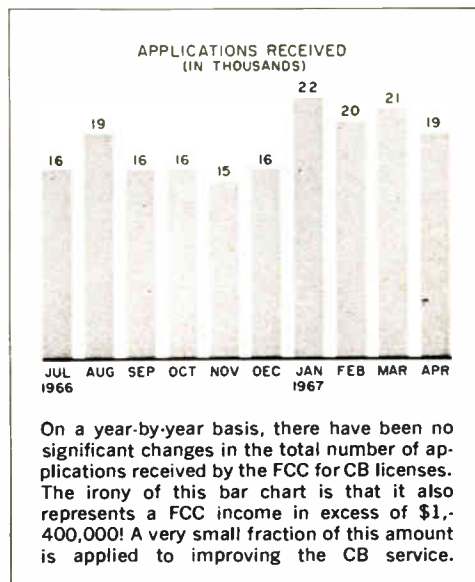
When is the FCC going to clean up CB?

Many of the faults regarding CB lie at the doorstep of the CB'er—not the FCC. The FCC operates on a limited monetary budget and policing CB has been a difficult "man-hour" problem. However, the FCC has recently applied directly to Congress for more money to try out a special

pilot enforcement program in a very limited unannounced geographical area.

Would a national CB association help strengthen CB?

To do what? There are only two common bonds of interest among CB'ers—the radio frequencies that they use and the eight-dollar license fee. You can't make a ham radio band out of the CB channels. The present CB mess is proof that CB'ers will not—or can not—police themselves, nor is the FCC likely to turn CB into a gossip band. There are only two reasons for a national association—public service and fraternalism. REACT does a good job in the first instance and



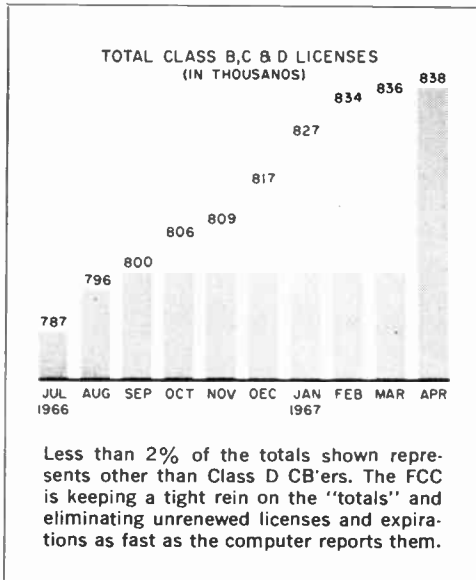
the fraternalism is more than adequately handled by the various CB publications.

What about the total number of CB'ers?

The bar chart on this page may answer your question better than a lot of words of explanation. The total number of active CB'ers is creeping up, even though the FCC is "cleaning" its files of non-renewed licenses. There are now close to 850,000 CB licenses—not one million as some inflated statements would make you believe.

I use CB; how can I help?

The CB rules are fair enough as they now stand—especially if you use CB for its intended purpose. If you do, you are helping out right there. Otherwise, write your Congressman that the FCC needs more funds to do a better job. You pay a



license fee; you are entitled to more protection of your CB privileges.



Spectacular is the word for the various mobile CB showrooms touring the nation. In the photo above is a trailer full of Pace Communications products which is currently on a 6-month tour. Below is the Regency "Communications Caravan" now believed to be touring the West Coast. Courier Communications, Pearce-Simpson, and International Crystal also have mobile showrooms on the road—or in the air. Check these companies when you plan your CB jamboree.



Why isn't there more support for the HELP program and Motorola's Community Radio Watch among CB'ers?

The problem with the HELP program is that the concept is good, but the execution bad. There is no insurance that the new CB channels required for HELP would be used as intended and many people feel that REACT and the establishment of Channel 9 as a national calling frequency would provide the same service. The Community Radio Watch is thought by some people to be a name tacked onto a public service that most mobile radio users perform anyhow. It publicizes two-way radio, and this seems to be its intended purpose.

Why don't we hear more CB'ers using SSB?

Probably because the really serious users of CB are the ones buying and using SSB gear—they are not the chit-chatters. They are there and from all reports read by POPULAR ELECTRONICS they are sold on SSB.

What can I do to get rid of the skip interference?

Sorry, nothing. This is just something you'll be forced to live with for the next few years. Blame it on the sunspots.

ANNUAL REPORT ON CB EQUIPMENT

UP-TO-THE-MINUTE ANALYSIS OF THE
CB MARKETPLACE—HIGHLIGHTING NEW
EQUIPMENT, PRICE AND MODEL CHANGES

PREPARED BY THE
POPULAR ELECTRONICS
EDITORIAL STAFF

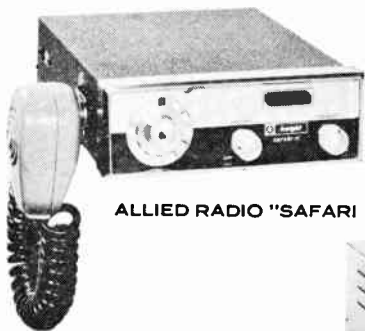
SEVERAL IMPORTANT DEVELOPMENTS have taken place since our last report in the August 1966 issue of POPULAR ELECTRONICS. Of greatest impact is the probability that the Federal Communications Commission will soon require "Type Acceptance" of all CB transmitters—or transmitting portions of all CB transceivers. Equipment now in use, or available for sale, will not be affected by this new ruling. Although the proposal will not constitute a significant hardship for most manufacturers, the effect on the CB equipment user is difficult to predict. Many so-called "frills" will be eliminated from transceivers, and in the long pull it is expected that CB signals will be cleaner, better modulated, and easier to read.

Strangely enough, many frills have disappeared from CB transceivers and it appears as though the CB equipment manufacturers second-guessed the FCC's intentions. In this "Report" you will note the increased number of solid-state transceivers with facilities for operating on 5 to 9 channels. Your reviewers cannot help but wonder if this presages the gradual phasing out of the demand for 23-channel transceivers. In addition to the influx of new models with less channels, also note the numerous price changes—mostly downward—with a wide selection of equipment available in the \$100-125 range.

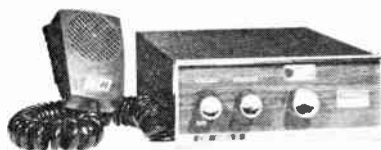
Continued in this "Report" is the use of a large (●) to identify new or restyled items, or price changes.

ALLIED RADIO CORP. (100 N. Western Ave., Chicago, Ill. 60680): A greatly expanded line of CB gear is now being offered in both wired and kit models. Continued from our 1966 report are the wired KN-2520 (\$79.95—5 channels, universal power) and KN-2522 (\$109.95—23 channels, universal power). Both of these units are solid state. Added to the Allied catalog of wired equipment ● are the KN-2507 (\$99.95—12 channels, ● 12-volt input only); KN-2530 (\$109.95—10 channels, universal power); KN-● 2533 (\$149.95—23 channels, either 117-

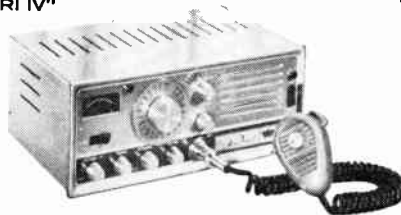
● or 12-volt input); and the KN-2567 (\$179.95—23 channels, universal power). All of the new equipment is solid state. The Knight-Kit division of Allied Radio has been busy and has added a fourth version to its popular "Safari" ● line—the "Safari IV" (\$79.95—12 channels, universal power). Continued in the kit line-up are the "Safari I" (\$139.95—23 channels); "Safari II" (\$69.95—5 channels); and the "Safari III" (\$89.95—23 channels). Dropped from the Knight-Kit line this year were the C-540 and C-560.



ALLIED RADIO "SAFARI IV"



B & K "COBRA 23"



COURIER "ROYALE"

AMPHENOL CORPORATION (2875 S. 25th Ave., Broadview, Ill. 60153): After the flurry of activity last year, the Amphenol line of CB gear seems fairly complete. Now being offered are Models 510-B (\$129.95—8 channels, universal power); 600 (\$129.95—10 channels, 12-volt power); 625 (\$169.95—10 channels, universal power); 650 (\$179.95—10 channels, variable tuner, universal power); 675 (\$159.95—10 channels, low profile styling, 12-volt power); and the 725 (\$109.95—8 channels, light weight, 12-volt power). In addition to the above there is a

- Model 500-1 (\$139.95, limited offer) which is a variation of the 510-B for self-contained portable use. Two walkie-talkies round out the line: Model C-75G (\$89.95—1½ watts, 2 channels) and Model 80 (\$119.95—3 watts, 2 channels).

B & K MANUFACTURING CO. (1801 West Belle Plaine, Chicago, Ill. 60613): The "CAM-88" (\$214.95—23 channels, universal power) and the "Cobra V" (\$99.95—5 channels, solid state, 12-volt power) are being continued in the lineup. A new

- item is the "Cobra 23" (\$169.95—23 channels, solid state, 12-volt power) which features an externally accessible transmitter tuning adjustment to peak the entire installation—commonly missing from many solid state transceivers.

BROWNING LABORATORIES, INC. (1269 Union Ave., Laconia, N.H. 03246): At

the time this report was prepared, the only CB unit being manufactured was the "Eagle" base station (\$359).

CONCORD ELECTRONICS CORP. (1935 Armacost Ave., Los Angeles, Calif. 90025): Continued in the lineup is the "Model TG-132B" (\$79.50—2 channels, 1 watt) walkie-talkie.

COURIER COMMUNICATIONS, INC. (56 Hamilton Ave., White Plains, N.Y. 10601): Now a part of the Whittaker Corp., Los Angeles, Calif., Courier will manufacture and market the e.c.i. line of

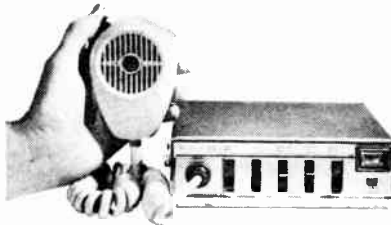
- CB gear. The well-known "Courier 23" (\$169.00) has dropped in price—it was formerly \$189.50. An improved receiver
- appears in the new "Courier 23 Plus" (\$189.00) for reaching into the noise to grab those weak CB stations. Rounding out the Courier tube-type CB units is
- the new "Courier Royale" (\$249). The "Royale" uses a Collins mechanical filter for optimum selectivity. It is universally powered for 117-volt and 12-volt operation. Balancing out the Courier line are three solid-state transceivers: the "Courier TR-5" (\$99.00) with 5-channel capability; the "Courier TR 23S" (\$169) with 23 crystal positions; and the top of the
- line, the "Courier Classic" (\$189). The "Classic" is a compact unit having a 10-year parts guarantee and 23-channel capability; designed for 12-volt mobile operation, it can be used with a self-contained battery pack (\$59.95).



EICO "NOVA-23"



HALLICRAFTERS CB-21



GENERAL RADIOTELEPHONE "FIELDMASTER CT-14"

CRAIG PANORAMA, INC. (2302 E. 15th St., Los Angeles, Calif. 90021): Just introduced is the "Craig 4301" (\$99.95—5 channels, solid state, 12-volt power) which may be adapted for base station use with the "Model 9212" power supply (\$24.95).

DEMCO ELECTRONICS, INC. (RR #1, Bristol, Ind. 46507): As promised in our last report, Demco released both the "Ravelle" (\$134.50) and the new "Satelite" base station (\$295) about eight months ago. The "Ravelle" is a 6-channel unit with universal power. A 23-channel companion unit, called the "Ravelle 23" (\$224.50), has just been introduced. Demco continues to market the "Chalet" (\$129.50) which is a solid-state transceiver for 12-volt operation—6 volts with d.c. converter (\$45), or 117 volts a.c. with base station power supply (\$35). The "Chalet" has 6-channel capability. Top of the Demco line is the "Satelite," available either in the standard model or more costly deluxe versions (up to \$395). Numerous accessories are available.

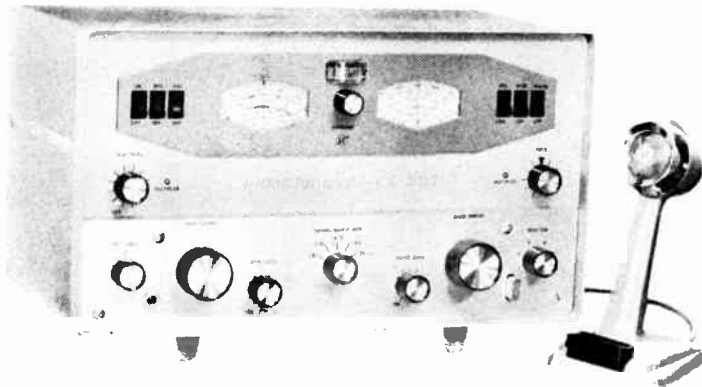
EICO ELECTRONICS INSTRUMENT CO., INC. (131-01 39th Ave., Flushing, N.Y. 11352): Brand-new from EICO within the past few months is the "Nova-23" (\$189.95). This 23-channel unit is fully transistorized and features a dual-lattice crystal filter for optimum selectivity. Primarily designed for 12-volt operation,

the "Nova-23" can be used as a base station in conjunction with a Model 791 power supply (\$24.95). EICO continues to offer two tube-type CB rigs, including the "Sentinel 12" (\$99.95) and the "Sentinel Pro" (\$169.95). The latter unit has 23-channel capability; the former has 12 channels. All of the EICO gear mentioned is available wired only.

GENERAL RADIOTELEPHONE CO. (3501 West Burbank Blvd., Burbank, Calif. 91505): The very popular "General" has been upgraded by the addition of a fine tuning control and an improvement in selectivity; it is now called the Model "MC-9" (\$189.50). Last year's MC-8 has been discontinued. The VS-6 (\$89.50—5 channels, universal power) is being kept in the line; this is a ruggedized transceiver that has been widely acclaimed. New in 1967 is the "CT-14 Fieldmaster" (\$79.50). This 2-channel, 12-volt mobile unit has a 2-watt output and can be converted to field pack use for only \$19.50.

- A companion unit, the "CT-12 Fieldmaster" (\$59.95) is a 1.5-watt-input handheld transceiver with 4-channel switching.

HALLICRAFTERS (5th and Kostner Ave., Chicago, Ill. 60624): Each year this manufacturer introduces several new CB transceivers and this year is no exception. Heading the new line-up are two top-quality units, the "CB-21" (\$139.95—8 channels, 12-volt power,



HAMMARLUND CB-205

- double conversion with ceramic filter)
- and the "CB-24" (\$199.95—23 channels, 12-volt power). These models also have code names, "Reacter II" and "Reacter III," respectively. New since our last report is a walkie-talkie called
- the "CB-18" (\$119.95—2 channels, 2-watt input, complete with rechargeable batteries and charger). It may be purchased with a single-channel crystal
- and without accessories as the "CB-181" (\$79.95). Continued in the Hallicrafters line-up are the "CB-8" (\$84.95—2 channels, 1-watt input walkie-talkie); "CB-17" (\$99.95—6 channels, universal power); "CB-19" (\$149.95—8 channels, universal power, variable tuning); and the "CB-20" (\$99.95—5 channels, 12-volt power). Hallicrafters is also offering a special power supply, "PS-20" (\$34.95), to convert Models 20, 21, or 24 to 117-volt base station use.

HAMMARLUND MFG. CO. (73-88 Hammarlund Drive, Mars Hill, N. C. 28754): This company has restyled its popular combination short-wave receiver and CB transmitter and is now calling it the

- "CB-205" (\$259.95). The transmitting section of the "CB-205" has 6 crystal positions—including one on the front panel. The receiver covers from 540 Hz to 30 MHz in 4 bands. For selectivity the receiver features a built-in O-multiplier.

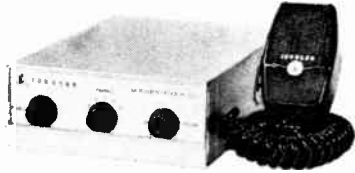
- HEATH COMPANY** (Benton Harbor, Mich. 49023): The popular top-of-the-
- line GW-14 kit (\$76.95—23 channels, 12-volt power) has been dropped in price—it was formerly \$89.95. The wired version remains at \$124.95. For 6-volt input, add a "GWA-14-4" converter (\$14.95), or for a base station a "GWA-14-1" (\$14.95) a.c. power supply. Continued in the Heathkit line-up are the "GW-12A" (\$34.95—1 channel, 117-volt power) and the "GW-22" (\$47.95 for 12-volt input and \$49.95 for 117 volts). Heath also offers a 1-watt walkie-talkie,
 - the "GW-52A" (\$64.95—a new low price), and the "GRS-65A" (\$99.95—1 channel, 2-watt input).

INTERNATIONAL CRYSTAL MFG. CO. INC. (18 N. Lee, Oklahoma City, Okla. 73102): Current CB production from this famous manufacturer is being restricted

- to the "Model MO-23" (\$210—23 channels, hybrid tube/transistor, 12-volt power). According to all the information at hand, this is the only CB transceiver featuring remote control—control head under dashboard, transceiver in trunk.

E. F. JOHNSON CO. (Waseca, Minn. 56093): One new member has been added to the popular Johnson line-up of CB transceivers since our last report. It

- is the "Messenger 110" (\$99.95—5 channels, solid state, 12-volt power). A base station 117-volt power supply



E. F. JOHNSON "MESSENGER 110"



LAFAYETTE 525C



KAAR "SKYLARK "

(\$32.95) is also available. Otherwise, all of the Johnson CB units are still being manufactured, including the "Messenger I" (\$99.95—5 channels, universal power); "Messenger II" (\$149.95—10 channels, universal power); "Messenger III" (\$159.95—12 channels, solid state, 12-volt power); "Messenger 100" (\$129.50—6 channels, solid state, 12-volt power); "Messenger 300" (\$189.50—12 channels, solid state, improved selectivity, 12-volt power); "Messenger 323" (\$229.95—23 channels, solid state, 12-volt power); and the one and only "Messenger 350" (\$299.95—single-side-band transmit/receive on 2 channels, solid state, 12-volt power). All of the "Messengers" can be converted to base station operation through the use of an outboard a.c. power supply. Johnson also offers a "Personal Messenger" (\$99.95—1.5-watt input walkie-talkie).

KAAR ELECTRONICS CORP. 1203 West St. Georges St., Linden, N.J. 07036):

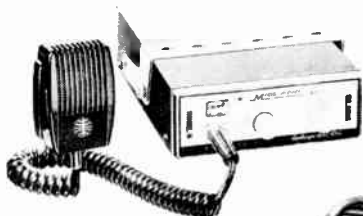
- The "Skylark 336" (\$179.95—11 channels, solid state, 12-volt power) is now available in a 117-volt model for \$219.90.
- New from Kaar is the "Skyhawk Mark 11" (\$219.95—23 channels, solid state, 12-volt power) which is also available in an a.c. model for \$259.90.

LAFAYETTE RADIO ELECTRONICS CORP. (111 Jericho Turnpike, Syosset, L.I., N.Y. 11791): Numerous items in

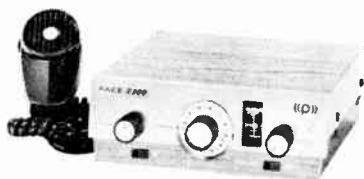
the Lafayette lineup of CB gear have

- undergone circuit improvements or price changes since our last report. The "Comstat 9" (\$54.95—9 channels, universal power, kit) has dropped \$5 in price.
- The companion unit "Comstat 19" (\$59.95—9 channels, 117-volt power) has been dropped \$10.
- Top of this particular lineup, the "Comstat 21A" (\$139.95—23 channels, universal power) has been revamped.
- For strictly mobile, the "HB-525C" (\$149.95—23 channels, solid state, 12-volt power) is a new design.
- The popular "HB-555" (\$89.95—12 channels, solid state, 12-volt power) has had \$10 knocked off the price.
- For base station or mobile use, the "HB-600" (\$219.95—23 channels, solid state, universal power) is still ranked among the top ten CB transceivers.
- Portables and walkie-talkies are receiving more attention at Lafayette. A whole series of powerful units are offered, including the "Dyna-Com 5" (\$89.95—3 channels, 5 watts); the "Dyna-Com 3" (\$64.95—3 watts); and the "Dyna-Com 2" (\$49.95—1½ watts).
- The "HA-300" has been deleted and the "HA-303" (\$54.95—3 channels, 2 watts) added to the lineup.
- The "HA-450" (\$69.95—6 channels, 2½ watts) has been further reduced in price. Several new 23 channel units are expected to be released this coming fall.

MIDLAND INTERNATIONAL CORP. (1909 Vernon St., N. Kansas City, Mo. 64116):



MIDLAND 13-870



PACE 2300



OLSON CB-8

- Numerous items have been added to the lineup of CB equipment offered by this importer. Top of the line is the "Model 13-870" (\$149.95—23 channels, solid state, 12-volt power) which is also usable as a base station with the Model 18-805 a.c. power supply. A new unit is the "Model 13-860" (\$99.95—12 channels, solid state, 12-volt power). The "Model 13-150" (\$89.95—8 channels, solid state, 12-volt power) is an attractive item at a reasonable price. Walkie-talkies are a big item at Midland and this year they include a very wide spread from the top of the line "Model 13-775" (\$99.95—6 channels, 5 watts) to the "Model 13-133C" (\$79.95—2 channels, 2 watts).

MULTI-ELMAC CO. (21470 Coolidge, Oak Park, Mich. 48237): All 3 favorite CB units are being continued in the Multi-Elmac lineup. These are: the "Citi-Fone 99" (\$99.95—8 channels, universal power); "Citi-Fone SS" (\$169.50—23 channels, universal power); and the "Citi-Fone II" (\$49.95—2 channel, solid state receiving converter and transmitter, 12-volt power).

OLSON ELECTRONICS, INC. (260 S. Forge St., Akron, Ohio 44308): The two new units mentioned at "Press Time" in our last report are now the mainstays of the Olson line-up. The "Olson 8" (\$80.00—8 channels, solid state, 12-volt power) can be converted

- to base station operation with a special power supply (\$19.95). The "Olson 12" (\$99.99—12 channels, solid state, 12-volt power) can also be used for p.a. work. Watch Olson for tie-in bargains on crystals and antennas.

PACE COMMUNICATIONS CORP.

(24049 S. Frampton Ave., Harbor City, Calif. 90710): Some general restyling and upgrading has established a new set of model numbers at Pace. The

- "Pace 100" (\$129.95—6 channels) replaces the older "Pace I." The "Pace 200" (\$159.95—12 channels) replaces the "Pace II-S." The "Pace Plus-23" (\$199.95—23 channels) is being continued, as is the "Auto-Mate" (\$69.95—transmitter/converter package working into your AM radio). Brand-new since our last report are the "Pace-Mate" (\$99.95—3 channels, 2 watts, solid state) and the "Pace 2300" (\$219.95—23 channels, solid state) which is fitted out with a number of "extras."

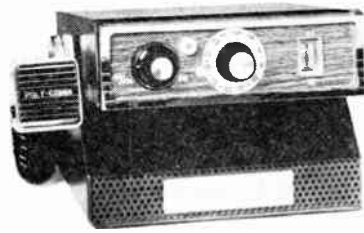
PEARCE-SIMPSON, INC. (P.O. Box 800,

Biscayne Annex, Miami, Fla. 33152): The

- very popular "Companion IV" (\$139.90—10 channels, solid state, 12-volt power) is an updated version. A handset (telephone style) is available at no extra cost. This model also features "tap tuning" and 2 r.f. stages in the receiver section. Also new from Pearce-Simpson is the



PEARCE-SIMPSON "COMPANION IV"



POLYTRONICS PC-23C



SONAR J-23

- "Director 23" (\$269.90—23 channels, solid state, 12-volt power) which includes numerous circuitry improvements over the earlier "Director". For base station operation, the "Guardian 23B" (\$269.90—23 channels, universal power) includes a new audio preamplifier enabling the use of a desk stand microphone. Maximum utility at a low price is stressed in
- the new "Sentry II" (\$99.90—5 channels, solid state, 12-volt power) which is also available with a telephone type handset.

POLYTRONICS LABORATORIES, INC.

- (900 Burlington Ave., Silver Spring, Md. 20910): Introduced within the past year is
- the exciting "Poly-Comm 23c" (\$199.50—23 channels, solid state, 12-volt power). Besides featuring extraordinary sensitivity and selectivity, the "Poly-Comm 23c" may be carried as a portable by adding the "Carry-Comm" (\$149.95) accessory package. The "Poly-Pup" (\$149.50—7 channels, solid state, 12-volt power) has been upgraded. An a.c. power supply (\$29.95) can be used to convert the "Poly-Pup" to base station use. Continued in the lineup are the "Poly-Comm 23" (\$299.50) and "Poly-Comm-30" (\$329.50). A walkie-talkie, the "Duo-Comm 123" (\$129.50) is the second generation of its popular predecessor the "Duo-Comm 120" (\$109.50—1 channel, 1.5 watt input). The "123" is set up for 2 channels and has a 3 watt input. Polytronics is also offering a wide varie-

ty of inverters and selective calling systems.

RADIO SHACK CORP. (730 Commonwealth Ave., Boston, Mass. 02215): Two new transceivers appear in the lineup.

- These are the "Model TRC-18" (\$99.95—12 channels, solid state, 12-volt power)
- and the "Model TRC-24" (\$139.95—23 channels, solid state, 12-volt power). In addition to the above, Radio Shack is now offering a variety of 1 and 2 watt walkie-talkies.

RAYTHEON COMPANY (213 East Grand Ave., South San Francisco, Calif. 94080):

A full line of CB gear—described in detail in last year's report—is being continued without price change. Included are the TWR-8 (\$119.95—2 channel, 2 watt walkie-talkie); TWR-9 (\$99.95—6 channels, 117-volt power); and the TWR-11 (\$159.95—11 channels, solid state, numerous options).

REGENCY ELECTRONICS, INC. (7900 Pendleton Pike, Indianapolis, Ind. 46226):

- New from Regency this year is the
- "Imperial" (\$299—23 channels, universal power) with the unusual feature of side-band selection—thus really providing 46 channel reception. The transmitter radiates a DSB signal. Except for the side-band selection feature, the "Imperial" is similar to the still very popular "Range Gain II" (\$235—23 channels, universal

power, DSB transmitter). For mobile use, Regency is offering the "Ranger" (\$175—11 channels, solid state, 12-volt power). Under the brand name, Metrotek, this manufacturer has 3 items in its inventory. These are the "Bronco" (\$89.95—8 channels, solid state, 12-volt power); the "Charger" (\$110—12 channels, solid state, 12-volt power); and the "Pacer II" (\$110—11 channels, universal power).

ROBYN COMPANY (4303 Kroes Road, Rockford, Mich. 49341): A variety of imported transceivers is being offered by this distributor/manufacturer. A new

- item, the "Bronco 7 Plus 4" (\$139.50—11 channels, solid state, 12-volt power) has a dual purpose mike that may also be used as a "private earphone" speaker.
- The "Robyn 24 Range Gainer" (\$189.50—23 channels, universal power) appears from the surface to be similar to the Realistic TRC-X20. Two walkie-talkies are in the lineup. They are the "Model R/T 700" (\$79.95—2 channels, 2 watts) and the "Model 270" (\$49.50—1 channel, 1 watt).

SEARS, ROEBUCK and Co. (Chicago, Ill 60607): In response to reader requests; yes, the CB gear in the Sears lineup is similar to the CB units sold by E. F. Johnson. Sears' "Model 6556" (\$93.95—5 channels, solid state, 12-volt power) is only a step below the "Messenger 100". The "Model 6558" (\$139.95—12 channels, solid state, 12-volt power) is similar to the "Messenger III". Top of the line is the "Model 6562" (\$209.95—23 channels, solid state, 12-volt power) which is a variant of the "Messenger 323". Various power supplies and accessories are available.

SONAR RADIO CORPORATION (73 Wortman Ave., Brooklyn, N.Y. 11207): Featured by Sonar in 1967 is the new "Model J-23" (\$239.95—23 channels, solid state, 12-volt power). This rugged unit includes a reverse polarity protection circuit and a special isolated series gate noise limiter. Continuing in the lineup is the "Model T-2" (\$139.95—2 channel, 2 watt, walkie-talkie).

SQUIRES-SANDERS, INC. (Martinville Rd., Millington, N.J. 07946): With the

firm conviction that there isn't any room for improvement—and it's difficult to see where there is—the "23'er" and the "S5S" are being continued. The "Model 23'er" (\$235.00—23 channels, solid state, 12-volt power) is adaptable to base station use with either a standard a.c. power supply (\$19.50), or "Master Model" (\$39.50)—the latter featuring special regulation. The "Model S5S" (\$185.00—5 channels, solid state, 12-volt power) may be used with either of the base station supplies.

TRAM ELECTRONICS, INC. (Lower Bay Rd., P.O. Box 187, Winnisquam, N.H. 03289): Both premium quality CB units are being continued. The "Titan" (\$434—23 channels, 117-volt power) is the acknowledged peer of base station transceivers. Its mate, the "XL-100" (\$318—23 channels, 12-volt power) has reaped many accolades in mobile operation.

WORLD RADIO LABORATORIES (3415 West Broadway, Council Bluffs, Iowa 51504): The "Spacemaster" (\$49.95—1 watt, walkie-talkie) is being continued in the lineup, but all house brand CB transceivers have been deleted.

EDITOR'S NOTE: In the above report the prices given are those reported to us by the manufacturer and in most instances represent the commonly accepted retail cost. Obviously, price changes are made without notice and it is best to double-check before buying. As mentioned on page 71, the general trend of CB equipment prices has been downward.

The expression "universal power" that appears in the listing may be interpreted to mean that the equipment can be powered by either 117 volts a.c. or 12 volts d.c. Generally speaking, the power choice is made by inserting the appropriate power cable between the source and the transceiver. There are some transceivers manufactured that can be powered from 6 volts d.c., but these are in the minority and are not identified in the above listing.

Most CB transceivers are sold with crystal(s) for a single channel. Some incorporate a synthesizing circuit to provide 23-channel operation. However, there are exceptions; it is best to check with the manufacturer as to what crystals are being supplied.

EICO MODEL 711 "SPACE RANGER" SHORT-WAVE RECEIVER



New kit features low price and 10-hour construction time

THERE ARE PERHAPS a dozen or so good short-wave receivers and receiver kits on the market. By virtue of its over-all performance, low price and short construction time, the new Model 711 "Space Ranger" short-wave receiver by EICO* can be added to this list.

The "Space Ranger" is a sensitive superheterodyne receiver that contains all the features required for good reception of AM, CW and SSB signals. It covers the radio spectrum from 550 kHz to 30 MHz in four overlapping bands.

Separate main tuning and bandspread controls mounted on the front panel make station-to-station hopping simple. The bandspread control comes in handy to separate closely spaced stations, and a front panel mounted "S" meter assures perfect tuning every time.

On the rear panel of the receiver are a headphone jack that accepts most commercial headphone impedances and an automatic noise limiter (ANL) switch that can be switched in and out of the circuit as needed. Two other standard features in the "Space Ranger" are the built-in ferrite loop antenna (for the standard AM broadcast band) and a pair of terminals for connecting an external Q-multiplier to the receiver.

Much of the time-consuming work ordinarily required in constructing a receiver is eliminated due to the use of a large printed circuit board. When the board is installed in the chassis, the interior of the "Space Ranger" has a neat, uncluttered appearance.

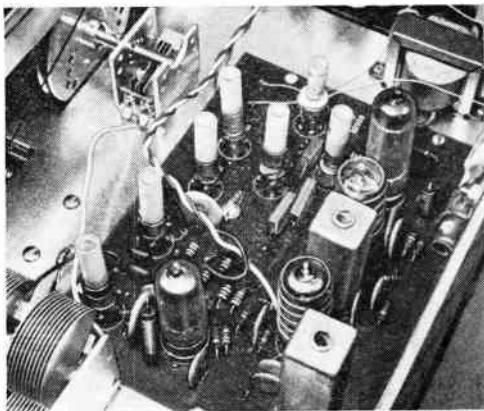
After construction is completed, all

that is left for you to do is align the receiver. Although the operating manual that comes with the kit suggests that a signal generator and VTVM be used for this operation, alignment can be accomplished with off-the-air signals by observing the "S" meter.

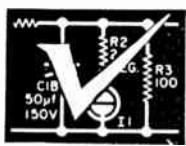
Once the black vinyl-clad cover is in place and the receiver is turned on, you'll find attractive styling and soft, indirect lighting of the dial and meter. The dial itself is indexed to show the settings for the standard and international broadcast bands, the marine and weather information services, WWV settings, and the ham and CB bands.

The "Space Ranger" short-wave receiver is available in either kit or wired form at \$49.95 and \$69.95, respectively. The factory-wired version comes completely prealigned. -30-

Top view of EICO Model 711 "Space Ranger" short-wave receiver shows easy-to-work-with layout of parts. A vinyl-clad cover is supplied.



*Eico Electronic Instrument Company, Inc., 131-01 39 Avenue, Flushing, N.Y. 11352.



OPERATION ASSIST

Through this column we try to make it possible for readers needing information on outdated, obscure, and unusual radio-electronics gear to get help from other P.E. readers. Here's how it works: Check the list below. If you can help anyone with a schematic or other information, write him directly—he'll appreciate it. If you need help, send a postcard to Operation Assist, POPULAR ELECTRONICS, One Park Avenue, New York, N.Y. 10016. Give maker's name, model number, year of manufacture, bands covered, tubes used, etc. State specifically what you want, i.e., schematic, source for parts, etc. Be sure to print or type everything legibly, including your name and address. Because we get so many inquiries, none of them can be acknowledged. POPULAR ELECTRONICS reserves the right to publish only those items not available from normal sources.

Delco Model BC 1335 transceiver, circa 1945; tunes 27 to 38.9 MHz on 2 of 120 crystal-controlled channels; has 19 tubes and magic eye. Source for OB3/VR90 voltage regulator tube and R-64 and R-65 plug-in resistors needed. (Danny Martin, 1311 State St., Emporia, Kan. 66801)

BC-1066-B receiver, made by Philco for Signal Corps, circa 1951; tunes on 2 bands; has 3 tubes. Schematic and conversion data to a.c. needed. (Carlos F. Arredondo, Condominios "Constitución," Edificio #12, Depto. #6, Monterrey, N.L., Mexico)

Airwa Model TP-50 tape recorder, Pictorial needed. (Greg Allen, 1 Barnes Ct., Cuba, N.Y.)

Heathkit Model W1AM amplifier, circa 1959. Schematic and operating manual needed. (Paul N. Hipple, 317 Linden Ave., Marysville, Pa. 17053)

Trans-Tronics Model S-25 stereo amplifier. **Video Products Model VICO 87** mono amplifier. Schematics and technical data needed. (Alan R. Kossack, 12S Bayard Ave., Hamden, Conn. 06518)

NRI Model 12 VTVM, manufactured by Paco. Source for parts needed. (John W. Jensen, Box 475, Aurora, Colo. 80010)

Link Model 11 UF-DC, 5FRX and MN5 receivers; tune 30 to 50 MHz. Schematics and technical data needed. (Leslie A. Folger, Sr., 8215 Water St., Garretttsville, Ohio 44231)

Mark II tank transceiver, made by Northern Electric, Z.A. 10178, P.C. 92049C, circa 1942. Schematic and operating manual needed. (Mark Wojciechowski, 42 Granite St., Weymouth, Mass. 02188)

Zenith Model 9H079R receiver; tunes FM. Cabinet and speaker needed. **Zenith** receiver, chassis 1005. Power transformer 95-630 needed. (Clyde E. Propso, R.D. #2, Sellersville, Pa., 18960)

AN-N6 camera gun, made by Lackner Co. for Air Force, ser. AF45-69904. Operating info needed. (c/SGGT Baker, 26413 Rose Rd., Westlake, Ohio 44145)

Superior Model TC-55 tube tester. Tube charts needed. (Paul Harris, Rt. 2, Box 274, Weatherford, Tex. 76086)

Atwater Kent Model 35 receiver, ser. 781708, circa 1928; has 6 tubes. Schematic and source for parts needed. (Robert Butler, Franklinville Rd., Box 330, Swedesboro, N.J. 08045)

Hickok Model OBQ-1 VTVM, ser. 1259. Schematic and operating manual needed. (Richard Humphrey, 7750 Lemon St., Fair Oaks, Calif. 95628)

Admiral Model P-17D-47 TV receiver, chassis 16X1; has 15 tubes. **Sparton Model 21CM11** TV receiver, chassis 15X215; has 16 tubes. Schematics needed. (Gery Zengion, Box 67, New Tripoli, Pa., 18066)

Executone Model 300S intercom. Schematic needed. (Neil Korb, 8357 Webster Rd., Cleveland, Ohio 44136)

Monarch Model 130N signal generator. Schematic and operating manual needed. (William F. Yockey, 224 Broadway, Santa Cruz, Calif. 95060)

E.H. Scott custom-built receiver, circa 1932; tunes 550 kHz to 50 MHz on 5 bands; has 24 tubes and 2 magic eyes. Schematic and operating manual needed. (Ronnie Thevenot, 3343 W. Montecito, Phoenix, Ariz. 85017)

Zenith Model 8G005Y "Trans-Oceanic" receiver; tunes BC and s.w.; has 8 tubes. Source for parts or new chassis needed. (Joe Garcia, 243 W. 109 St., Apt. 5E, New York, N.Y. 10025)

Philco Model 42-355 receiver, code 121, circa 1941; tunes 550 kHz to 99 MHz on 3 bands; has 2 tubes. Schematic and alignment data needed. (Matt. J. White, 6867 Sheffield, Baton Rouge, La. 70806)

TM-11-2601 tech manual, pertaining to T-14J/TRC-1 transmitter and R-19-1/TRC-1 receiver made by Transmitter Equip. Mfg. Inc. Manual needed. (Jim Montgomery, C.D. Director, Carroll Co., Worthville, Ky.)

Morse receiver, circa 1930; has 5 tubes (80, 47, and 3 24's). Schematic and technical data needed. (Ralph Haan, 4948 Hillcrest Dr., Waterford, Mich.)

Sargent Rayment Model 610TRF receiver, circa 1928. Schematic needed. (Robert S. Shelton, Hagensborg, B.C., Canada)

Philco Model 42-1008 floor model receiver, code 122; tunes BC and s.w. on two bands; has 9 tubes. Schematic needed. (Marshall Rohland, 4846 N. 21 Pl., Milwaukee, Wis. 53209)

Atwater Kent Model 20 receiver, ser. 58788; has 5 tubes. Schematic, parts list, and service data needed. (S.L. Grauel, Box 56, Buckingham, Ill. 60917)

Grundig-Majestic Model 4095 receiver. Schematic needed. (Seymour Fisher, V.A. Center, 11D, Los Angeles, Calif. 90073)

Advanced Electronics Mfg. Corp. Model 200 oscilloscope, circa 1955; has 18 tubes. Schematic and operating manual needed. (John Sloane, 9196 N. Emerson, Thornton, Colo. 80229)

Fisher 114/VRC4 receiver; tunes on 5 bands; has 9 tubes. Schematic, operating and frequency changing instructions needed. (Carl Creeger, Box 2, Middle Haddam, Conn. 06456)

Hammarlund Model HQ-129-X receiver, circa 1950; tunes 0.54 to 30 MHz on 6 bands. Schematic, operating manual, and alignment data needed. (Doug Aldrich, Mellette, S.D. 57164)

Webcor "Royal Cornet" LP2712-1 tape recorder. Motors and clutch wheels needed. (George F. Wilson, Box 221, Tropic, Utah)

National Model RAS-5 receiver, circa 1944; tunes 140 kHz to 30 MHz; has 9 tubes. Schematic and operating manual needed. (Larry Mueller, 12700 Elliott Ave., El Monte, Calif. 91732)

Heathkit Model AR-3 receiver; tunes 550 kHz to 30 MHz; has 5 tubes. Operating manual needed. (Jim Kleinstelber, 23099 Beechwood, E. Detroit, Mich. 48021)

Service Instruments Model 20-A "Rider-Volt Ohmyst," ser. 497, circa 1945; Schematic needed. (E. H. Hulst, 746 Merrick Rd., Baldwin, N.Y. 11510)

National Model FW-54 receiver; tunes on 4 bands; has 5 tubes. Cabinet needed. (Robert F. Roth, Jr., 1429 Wilmington Ave., Apt. 304, Dayton, Ohio 45420)

Sparton Model 766 receiver, type 716 chassis; tunes BC and 1.4 to 20 MHz on 3 bands; has 7 tubes. Schematic needed. (Travis Tilby, Box 265, Burley, Idaho 83318)

Heathkit Model DX-40 transmitter; covers 10-11, 15, 20, 40, 80 meter bands; has 6 tubes. **Halicrafters Model S-40** receiver; tunes 0.5 to 44 MHz; has 8 tubes. Operating manuals needed. (Paul Marquis, 10 Ross St., Nashua, N.H. 03060)

RCA receiver, series OC; tunes BC and s.w. from 5.9 to 18 MHz; has 10 tubes. 6D6 tube needed. (Jim Berry, Jr., 2863 W. 32 St., Erie, Pa. 16506)

Zenith "Trans-Oceanic" 8G005TZ1Y receiver, circa 1950; tunes s.w. on 6 bands; has 8 tubes. Schematic needed. (George Clement, 1 Shady Lane Crescent, Oakville, Ontario, Canada)



INFORMATION CENTRAL

By CHARLES J. SCHAUERS, W6QLV

I RECEIVE many requests for information on parts substitution in the various electronic construction projects published in **POPULAR ELECTRONICS**. While I realize that most experimenters like to use electronic components they have on hand, many readers do not appreciate the fact that the project designer frequently spends hours and hours in choosing his parts to obtain optimum results. It is my recommendation that, whenever possible, the constructor should use the exact parts called for by the author. Of course, there are many circuits which will tolerate slight value deviations, but there are other circuits where a substitution will result in project failure.

As a general rule, the electronic components that control any specific frequency are usually critical. You should never, for example, attempt to interchange ceramic and silver mica capacitors. Most resistor values in transistorized circuitry are critical, although parts value deviations of up to $\pm 15\%$ are generally allowable. Capacitor values in transistorized circuitry are also critical, but it is usually safe to go to a higher value electrolytic—even 100-200% greater—without expecting trouble.

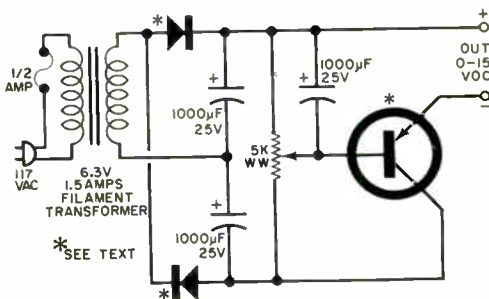
Coil and transformer substitutions are always very "tricky" and it is particularly wise to use the part recommended by the author. All solid-state components (transistors, diodes, etc.) have peculiarly individual characteristics, and it is best to use the units which were successfully employed by the project designer. However, some parts substitution among transistors is permissible—especially in audio and low frequency r.f. applications.

If you write me about a parts substitution, bear in mind that I cannot engage in correspondence on this subject since I rarely—if ever—have the particular project at hand, and time is just not available to redesign a circuit.

Experimenter's Power Supply. *I need a d.c. power supply that will give me about 15 volts output at 25 mA, and I would like the supply to be adjustable so that I can get 250 mA at around 4 volts output. Regulation is not a problem.*

The power supply shown in this diagram should suit your requirements. The power

transistor (provide a suitable heat sink) can be a 2N553, 2N618, 2N1535, 2N1536, 2N2869, or a GE-3. You can use any good silicon diode as long as it has a rating of 800 mA with a PIV of 50 or more volts.



Neper Decibel. *I know that the neper is a value used to measure power level differences, and is similar to the decibel. However, how do I convert from one to the other?*

It is really quite easy since 1 dB is equal to 0.115 neper and 1 neper is equal to 8.686 dB. The two systems are based on a different system of developing logarithms. The decibel is based on the use of a common logarithm and the neper is based on the neperian logarithm. The neper is rarely used in North America, although it is often found in European electronics textbooks.

GT Cut Crystal. *What is a GT crystal? Does this crystal have any special use?*

The initials "GT" refer to the cut of the crystal in relation to the grain—or, in this instance, the Z-axis. The GT cut crystal has a zero temperature coefficient and as a result makes the best possible secondary frequency standard crystal. Practically all of the 100-kHz bar crystals are GT cuts.

Stereo Hiss. *My recently assembled transistorized stereo amplifier has an annoying hiss on both channels. I replaced a defective electrolytic capacitor in the power supply which eliminated some bad a.c. hum. However, I can't find the source of the annoying hiss. Where should I look for it and what components should I suspect?*

Unlike tube-type stereo amplifiers, your

transistor amplifier—when noisy—is much more difficult to service. If you have eliminated the possibility that the noise is coming through the inputs (phono, tape recorder, etc.), suspect all of the power supply components. It is possible that the defective capacitor “strained” one of the low-voltage, high-wattage resistors. See if any resistor in the power supply has changed value beyond the tolerance indicated on the resistor body. When the noise is common to both channels, it is fairly safe to assume that the power supply is at fault. When noise occurs on only one channel, the power output transistors should be checked. In troubleshooting you should look for the most obvious cause first.

CB and Public Address. *My CB transceiver has a provision for the use of the modulator as a public address amplifier by simply adding a separate speaker. Are there any general rules on using such a system in a passenger vehicle?*

None that I know of, except that some cities have ordinances governing the use of mobile public address systems. Many CB'ers add a small outdoor loudspeaker under the hood (away from most of the heat) so that the equipment can be used in an emergency. Generally speaking, the power output of such a system is pretty low.

AR-3 Receiver for Ham Work. *Can I modify my Heathkit AR-3 receiver to cover all of the ham bands?*

I do not think this would be economically feasible. I would suggest you buy a converter for the band(s) that you are interested in receiving. Excellent single-band converters are available for \$15 and up.

Overseas TV. *I have served my tour of duty in Vietnam and will soon be reassigned to the Armed Forces in Germany. While on leave I bought a color TV set, and since I can take my family to Europe with me, I would like to take the TV receiver. There is no AFRS TV station, but I would guess that I could receive the German telecasts. What do you think?*

If you are going to be in Europe for two or three years, my personal advice to you would be to sell your set before going overseas. Modifying your receiver to tune the German black-and-white telecasts could cost over \$100. To modify your receiver for the German color system (called PAL) would be still more costly.

Hotter Tube Wanted. *I have a receiver that uses a 6BJ6 tube as a r.f. amplifier (front end). Is there any direct tube substitute that might work better?*

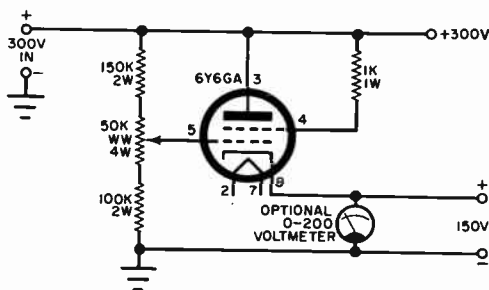
Depending upon the design of your receiver, you may be able to use the 6BH6. This tube will give you more gain, but you may find it necessary to reapek the input and output coils.

VTVM Troubles. *When I first got my VTVM, it was as steady as a rock. Now I have to adjust it constantly to keep the needle on scale. Something's wrong, but what?*

No doubt one section of the dual triode tube in your VTVM is going sour. Get a replacement tube—a premium quality tube if you can afford it. Also, when you have the VTVM open for inspection, check the filter capacitors and see if by any chance they are starting to leak.

Series Voltage Control. *I have a 300-volt d.c. power supply and I would like to get a 150-volt takeoff point without using a wattage consuming voltage divider. I also want to be able to control the output $\pm 10\%$ at around 150 volts. My current requirement is only a few mA.*

Try this circuit and your problems should be solved. I recommend the use of a 6Y6GA tube, but a General Electric 7355 tube will also work. However, if you use the latter tube, make sure that you revise the socket connections.



Component Failure. *What component in an electronic circuit should give me the least amount of trouble? Also, is there any single component that is the most frequent cause of circuit failure?*

Long-term studies of equipment maintenance show that switches fail least often—generally about once out of every 200 breakdowns. Vacuum tubes account for most electronic equipment failures; six times out of ten the tube is the cause of the breakdown.

Worldwide Voltage and Frequency. *I am having an argument in my high school class about the commercial power line frequencies throughout the world. Which frequency predominates? What are the lowest and highest a.c. frequencies in use, and what line volt-*

age is the most common around the world?

Many countries use 50 Hz rather than the 60 Hz preferred in the United States. Malta distributes power with a 100-Hz frequency and the Republic of Panama uses 25 Hz. Gibraltar uses the odd frequency of 76 Hz. The most commonly used voltages throughout the entire world are 110 and 220 volts. The lowest a.c. voltage—100 volts—is still being distributed in Japan.

Distress Call. *I am an SWL. If I hear a voice distress call on my short-wave receiver, what should I do?*

Call your nearest FCC office, and if the distress call seems to be local, call your police department. If you have a tape recorder, make a tape of the distress call. Be sure to write down important details, including the frequency, location of the station making the call, description of the trouble, etc. Voice distress calls are usually preceded by the expression "mayday" which is derived from the French equivalent of "help me."

DSB Fadeout. *About 10 years ago I had the impression that double-sideband (with suppressed carrier) was catching on in the ham bands. Recently there has been very little in the ham journals about DSB. How come?*

Single-sideband (SSB) has pushed both straight AM, and DSB out of the ham voice communications picture. Double-sideband signals waste as much frequency space as straight AM and DSB signals are more difficult to copy. About the only advantage DSB has is for the CB'er who is limited to a fixed power input. Single-sideband is here to stay until something better comes along.

Paralleling Final Amplifier Tubes. *My ham transmitter has been used for CW and now I want to increase the power output as I have passed my General exam. My final amplifier is a 6146. Can I add another 6146 in parallel with it without making major changes?*

No. Your power supply would need considerable beefing up for the extra current requirement, and since parallel tubes exhibit double input and output capacitances, the Q of your final would deteriorate—unless redesigned. Also, your driver stage might not be capable of handling two final amplifier tubes.

Walkie-Talkie Conversion. *How difficult would it be to convert my top-quality 27-MHz walkie-talkies to the proposed 6-meter walkie-talkie band?*

Quite difficult, but not absolutely impossible. It would depend on the design of the transceiver, but 25 MHz crystals could be used in the r.f. stages modified to double the

output to 49-50 MHz. Getting the receiver tuned up on the new band would be the most difficult problem. Aren't you jumping the gun, though? The FCC is only talking about making this change.

Colored Output Tubes. *I have an old EICO HF-87 hi-fi amplifier that functions beautifully, but I am wondering if there is something wrong with the EL34/6CA7 output tubes. The operating manual states that a slight red glow on the plates of the tubes is okay, but my tubes give off a blue-violet glow.*

You have nothing to worry about, although your tubes may be slightly gassy. The "blue-violet" is just an ionization glow. If the tubes were really bad, you would start hearing audible distortion.

Checking Capacitors. *I have a number of paper capacitors lying around my workshop which range in value from 0.5 μ F to 4.0 μ F. I have no capacitor checker and would like to know how to check these capacitors on my VOM.*

Put your ohmmeter on its highest scale (megohms) position. If you touch your test leads to the capacitor, the meter needle should indicate a full-scale reading if the capacitor is totally shorted, or a high resistance short will give you a partial reading. Reverse the leads and the meter needle will swing back and gradually come to rest on "zero" ohms. If the capacitor is open, you will get no readings at all in either direction.

X-Ray Detector. *Can I use an ordinary Geiger counter to detect x-rays?*

Yes, to a degree. Although designed to detect gamma rays, most counters can detect some x-rays.

Tube Tester. *What type of tube tester is best and why?*

A dynamic mutual conductance checker is the best one to use, as it checks out vacuum tubes under approximately normal operating conditions. Unfortunately, these are usually rather expensive and complex. Most experimenters are satisfied with the low-cost testers that primarily check grid emission and leakage.

Scope Spot. *Why does my scope screen have a dark blemish on it?*

Evidently you have allowed a stationary spot, or bright trace to remain on the screen for a long time, and the phosphor has been "burned." Such damage is permanent and cannot be repaired. When the scope is turned on, but not being used, it is always best to turn down the intensity until it is needed again. This will protect the CRT screen.

-50-



SOLID STATE

By LOU GARNER, Semiconductor Editor

THE "TIME GAP" between the announcement of a new semiconductor development and its availability in commercial devices may be as short as 3 or 4 months or as long as 5 years. It depends not only on production problems, but on such economic factors as user demand and relative costs. Some developments never go beyond the laboratory stage.

Quite some time ago, for example, one manufacturer announced the development of an intriguing device called a "double-base diode." Production versions were not sold until many months later, and then under a different name—the *unijunction transistor*! On the other hand, a very promising device, the "spacistor," has never been produced commercially and even its name has been forgotten—except by a few old-timers.

It should be interesting to see what happens to several new laboratory developments. The Electrical Engineering Department of the University of Minnesota has announced the device illustrated in Fig. 1. It has a characteristic curve roughly similar to that of a unijunction transistor, but with a much deeper negative resistance dip. Unnamed as yet, the device consists of one *n*-type and two *p*-type contacts alloyed to a germanium bar. In operation, a reverse bias is applied to the middle *p*-type contact and a negative resistance characteristic is de-

veloped between the outer *p*-type contact and the common *n*-type terminal.

An unusual semiconductor cold cathode for vacuum tubes is under development at the Stanford Research Institute. Dubbed a "transverse field semiconductor emitter," the cathode consists of alternate layers of metals, insulators, and semiconductor materials, subdivided into individual segments, as illustrated in Fig. 2. A pure silicon layer serves as one conductor, a silicon dioxide layer as an insulator, and a thin aluminum layer as the second conductor. The two conductors are bridged by a very thin (0.0001 inch) barium oxide semiconductor film. In operation, a voltage is applied to the two conductors. Current carriers (electrons) are

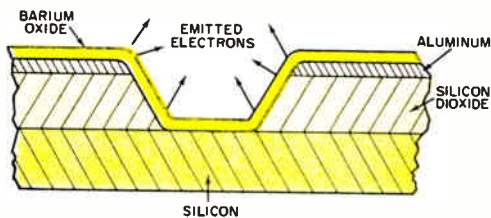


Fig. 2. Developed at Stanford Research Institute, this semiconductor cold cathode supplies a source of electrons (similar to the cathode of a conventional vacuum tube) without heat generation.

accelerated in a stream from one conductor to the other through the semiconductor film, with some escaping and attracted to a nearby anode (or plate).

A new type of photodetector—a metal semiconductor diode with an anti-reflection coating—has been developed at the Bell Telephone Laboratories. With a faster response time than *pn* or *pin* diodes, it is highly efficient, converting up to 70% of a light beam's photon energy into photoelectric current.

The new photodiode's initial application will be in the detection of modulated light energy from a helium-neon laser. The device itself consists of a silicon substrate which is first coated with a semitransparent gold film, then with an anti-reflective coat-

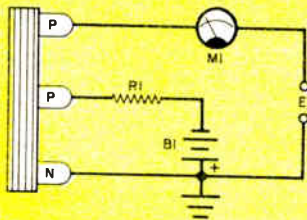


Fig. 1. With the correct bias and voltage applied to this new University of Michigan negative-resistance device, it acts like a unijunction transistor except that the *V/I* curve is much deeper. There are no practical applications for it at this time.

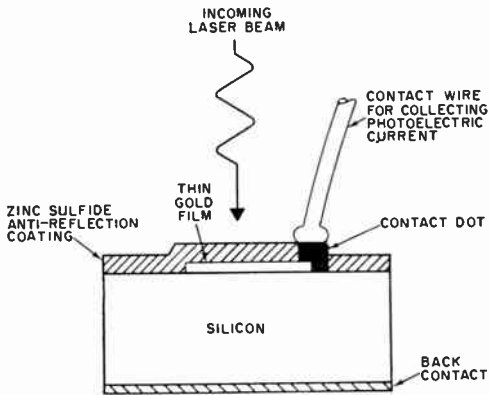


Fig. 3. In this Bell Labs photodetector, the photons that pass through the gold film create electron-hole pairs at the gold-silicon junction. Current then flows through the external circuit connected between the contact dot and back contact.

ing of zinc sulfide, as illustrated in Fig. 3. A gold contact dot and wire near the edge of the metal film collect the photoelectric current created within the semiconductor's depletion layer, a region of high electric field adjacent to the metal film.

When light strikes the coated metal surface of the new device, photons pass through it and create electron-hole pairs in the depletion layer. The released electrons and holes are immediately swept across the depletion layer to their respective contacts by the electric field, developing a current in the external circuit.

The new photodetector, when fully perfected and in production, may make laser beam communication systems practicable for low-cost commercial, industrial, consumer, and hobbyist applications.

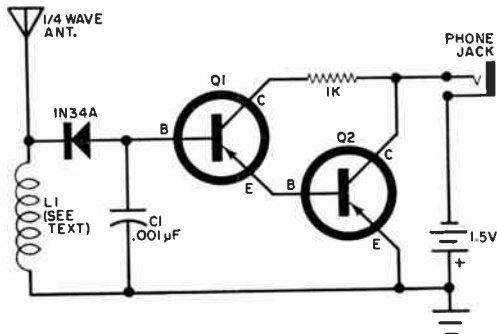


Fig. 4. Modulation monitor devised by Bill Waddington can be used at any frequency if the coil is wound for that frequency. A simple amplified crystal set, it provides ample headphone volume.

Readers' Circuits. Needing a simple monitor to check the modulation of his 2-meter SCR-522 transmitter, reader Bill Waddington, WA7BCD (716 Clover Court, Cheney, Washington 99004), first tried an untuned diode detector arrangement. Not realizing enough headphone volume, Bill devised the simple, but sensitive, circuit illustrated in Fig. 4. If other coils are used, the design should be adequate for most amateur radio or CB monitoring applications.

This circuit has a broadly tuned input coupled to the familiar diode with *C1* serving as an r.f. bypass. The detected output signal is applied to a modified Darlington stage, *Q1-Q2*. On 2 meters, *L1* is about 19 inches of #12 copper wire wound as a self-supporting coil. The transistors (*Q1* and *Q2*) are *pnp* general-purpose units.

Layout and wiring are not critical and the individual builder may follow his own inclinations as far as construction technique is concerned, using a breadboard, circuit board, or metal chassis base. Bill writes that he assembled his model in a small wood cylinder with the antenna and coil at one end, and the 'phone jack at the other end. The resulting "package" could be held conveniently in one hand.

Another of those ever-popular "wireless microphone" circuits is illustrated in Fig. 5. This version was designed by reader Mi-

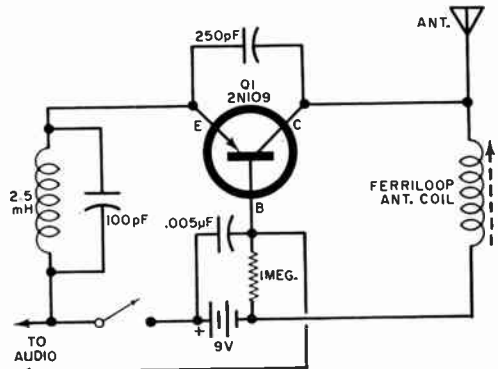


Fig. 5. According to Mike Mark, this broadcast-band wireless mike has high enough modulation quality to broadcast music from his hi-fi system.

chael Mark (220 Forest Drive, Jericho, New York) who uses his model to broadcast music from his hi-fi system.

Mike's circuit differs from the usual design in that he has used a modified common-base r.f. oscillator rather than the more familiar tickler-feedback, common-emitter configuration. The operating frequency is (Continued on page 104)



ON THE CITIZENS BAND

By **MATT P. SPINELLO**, KHC2060, CB Editor

ACCORDING to the *Chicago Tribune*, "Illinois, which averages 24 tornadoes a year, is located in the upper stretch of tornado alley, that strip of states running thru the midsection of the country. While tornadoes can occur at any time in any state, they are most frequent in tornado alley, the continental plains of North America."

Within recent years Midwesterners have become increasingly aware that the month of April is the start of the tornado season. This year was no exception. On Friday, April 21, the Midwest was bombarded with seven swirling twisters. In their wake thousands were left homeless, property damage was estimated at above \$34,000,000 and 54 persons died. Hardest hit were the Illinois communities of Belvidere, Oak Lawn, Lake Zurich, Barrington Hills, Stone Park, Woodstock, and Chicago. Extensive property damage was also recorded in 15 other areas.

Within minutes after each twister, thousands of volunteers poured into the disaster areas. In Rockford, Ill., the American Red Cross Headquarters became a communications central, in direct contact with the disaster site in Belvidere, 12 miles west. In charge was Jay Hart, K9QYY/KPK5855,

Communications Director, Rock River Chapter, American Red Cross, for Winnebago and Boone Counties; ARRL Emergency Coordinator for the same counties; and District Emergency Communications Chief, Ninth Navy MARS (Military Affiliate Radio System) District for 13 midwest states under the call, NØAJN.

Twenty minutes after notification, Jay was on the air for what turned out to be five days of emergency communications handling, with time out for about six hours sleep. In addition to the amateur radio installation at Red Cross Headquarters, Jay used CB emergency stations. All participating CB emergency vehicles were assigned mobile unit numbers under Jay's CB call, KPK5855.

Citizens Band operators were furnished by several groups, primarily the Rock River Valley Citizens Band Radio Emergency Squad; regular members of the R.R.V.C.B. Club; members of Rockford REACT; and groups from Skokie, Ill., Waukegan, Ill., and Milwaukee, Wisc. Approximately 70 CB mobiles were put into immediate operation. Twenty vehicles were used as two-man Red Cross first aid teams in the Belvidere area; five patrolled as damage survey teams in

MARS/CB TORNADO NET



Jay Hart, K9QYY/KPK5855, Communications Director for American Red Cross and District Emergency Communications Chief for MARS, had an emergency network going less than 30 minutes after notification that a tornado had struck Belvidere, Illinois.



Ham operators Gunnar Ohlson, K9WTS (foreground), and E. H. Storer, W9MAP, shared emergency operations duty with many other amateurs at Red Cross Headquarters station W9RGU in Rockford, Ill., for five long days and nights, as inquiries poured in from all over the country regarding the welfare of the people in the tornado area. Established basically for emergency and public service use, the station equipment is owned and operated by Hart, Storer, Marv Smith, K9RUK, and Bob Brand, W9HOA.



CB'er "Dutch" LaBounty, operating the Red Cross CB Control, had about four hours sleep during the first three days after the tornado struck. His emergency communications from the control center were relayed by Rockford operators to the CB communications van at the disaster site in Belvidere.

Southern Winnebago County; 40 others were used for transport and communications; and other disaster relief purposes including delivery of supplies, location of missing persons, transporting injured, and administrative work.

The Rockford Red Cross amateur station was complemented by two communications' vans and 10 mobile units from the Milwaukee Navy MARS unit, plus regular amateur radio operating on 75 meters, 6-meter base stations set up at disaster headquarters in Belvidere, and a 2-meter FM link.

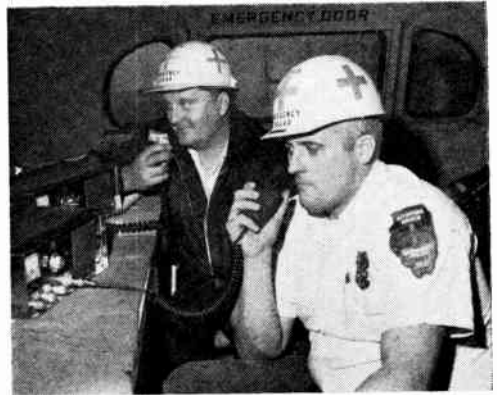
Over 300 health and welfare inquiries were received from 36 states (as distant as California) through amateur radio and Navy MARS. The bulk of inquiries were answered through Jay's Navy MARS station, NØAJN, with the cooperation of Navy MARS members nationwide. Yolanda Weisshappel, WA9CCP/NØWRC, acted as liaison between the Rockford chapter and the Mid-America chapter of the American Red Cross in Chicago and the Oak Lawn disaster area.

Your CB editor arrived in Rockford several hours after the tornadoes had torn their 75-mile path through the state. The next day, Saturday, we monitored the local and national news media. Local coverage not only reported the details of the disaster but made requests for food, clothing and shelter for the homeless. National Guardsmen, police, Civil Defense, telephone and electric utility personnel poured into the area on short order. Local radio station WROK suspended normal programming to allow friends and relatives of persons living in the Belvi-

dere area to call in with messages of inquiry. The callers gave their names and phone numbers, requesting that anyone knowing the whereabouts of individuals (or the individuals themselves) contact them by phone.

"Dutch" LaBounty, who was operating KLK5855, the CB link to Belvidere from the Red Cross Center, offered to take me to the Belvidere CB communications van. On the 12 mile trip Dutch mentioned a number of CB'ers who were still working with rescuers and area authorities after three days with little or no sleep. He drew special attention to Lois Coffin, KLL0460; and Mrs. Joe Troia, KHA5922. Both women had been involved with relays from Rockford to Belvidere with approximately four hours sleep.

It was hard to believe that it was an April day as we approached the communi-



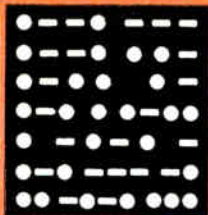
The Rock River Valley Citizens Band Radio Emergency Squad's communications van is shown being monitored by Jim Hedlund, KNK1752, and Pierre LaBounty, KPK3273. From this point, squad members and other CB'ers were dispatched to search for missing persons, check on property conditions, etc.

cations van. A heavy snow had blanketed the tornado swept area, hampering search and rescue procedures. But volunteers worked on as utility men and telephone linemen repaired downed lines; home owners searched through debris, and bulldozers moved mountains of plaster, brick and wood.

Inside the communications van we were met by a weary but diligent group of CB'ers, all members of the Rock River Valley Emergency Squad. Director Bill Bagley, KLL1418, told us that many of the squad members had gone without sleep since the van had been moved into the middle of the disaster area three days before.

Bill reported that minutes after the com-

(Continued on page 106)



AMATEUR RADIO

By **HERB S. BRIER, W9EGQ**
Amateur Radio Editor

HAM RADIO CHALKS UP RESCUE AT SEA

AT ABOUT 10:30 on the morning of May 5, a "Mayday" call came through to the Osan Air Base in Korea. Airman Second Class John Ferrara, stationed there, had decided to spend some off-duty time with his ham rig. By coincidence his set was tuned to the frequency on which the distress signal was being sent.

The "Mayday" call came from a sinking 87-foot schooner on Bombay Reef, between the Philippine Islands and South Vietnam. Thomas Kurth, of Milwaukee, Wis., heading a biological research mission in the South China Sea area, had run the "Donto Deo" aground on a coral reef. There were six other people on the schooner.

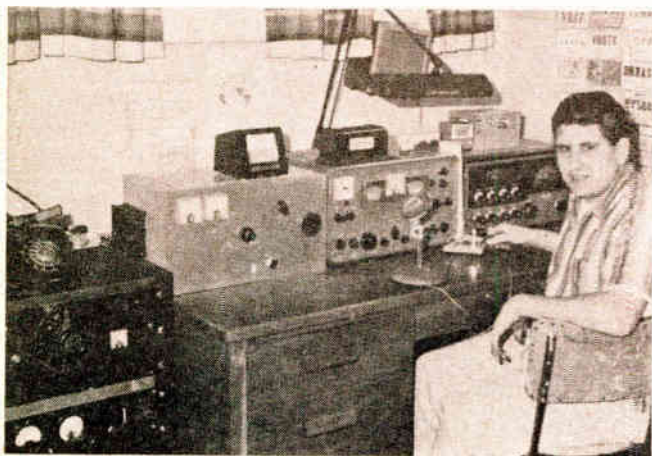
John Ferrara eventually was able to copy the ship's location precisely, and he proceeded to initiate a rescue operation. Through another ham in Japan, he contacted the air-sea rescue detachment at Fuchu, Japan. Then the Osan AB MARS station offered help in maintaining contact. Other hams joined in, and a rescue network was established which included HL9KH and HL9KO at Osan, KA8AB and KA8LM in Japan, KR6AF in Okinawa, and KG6IJ on Iwo Jima.

The Osan MARS station, having greater



Airman Second Class John Ferrara initiated rescue operation at sea with his Hallicrafters SR-150 transceiver, running 100 watts PEP, and a Mosley V-3 Junior vertical whip antenna. (USAF Photo)

AMATEUR STATION OF THE MONTH



Marty Hartstein, WB6NWW, of Long Beach, Calif., worked 9 countries and 45 states as a Novice. Then, with the same rig, he worked all states and 100 countries as a General. A Hallicrafters HT-32A CW/SSB exciter, driving a home-brew kW amplifier, and a Hammarlund HQ-170C receiver have brought in 50 more countries. WB6NWW will receive a free one-year subscription for submitting the winner for August in our Amateur Station of the Month contest. To enter the contest, send a clear picture of your station with you at the controls and some details on the equipment you use and your ham career to: Amateur Radio Photo Contest, c/o Herb S. Brier, P.O. Box 678, Gary, Ind. 46401.



The Japanese 24-hour clock atop a Heathkit HX-50 transmitter and the figurine behind Jan Jellema's shoulder are mementoes of his three-year hitch in Malaya as a Peace Corpsman. See "News and Views" (page 115) for details on WBSWN's amateur career.

transmission power than Ferrara (who was operating HL9TK), contacted Tan Son Nhut AB, Vietnam, and two U.S. Navy ships were dispatched in the direction of the sinking schooner. Soon a ship from the Philippines and several aircraft from both countries were also on the way. Even the hospital ship "Repose," which was in the area, was notified and steamed toward the trouble spot.

At about 2 p.m., Tan Son Nhut radioed Osan MARS that the craft was sighted and all parties appeared safe. A C-121 from Tan Son Nhut reached the area and dropped an MA-1 survival kit. The nearest ship was still 150 miles away.

Ferrara and his rescue network could only sit and wait, but the Air Force's Aerospace

Rescue and Recovery Service finally came through. Using the same techniques with which downed pilots in Vietnam are rescued, an amphibious aircraft set down and picked up the wet-but-well troupe.

Shortly after 5 p.m., Airman Ferrara was notified of the completed rescue. He, in turn, notified his makeshift-but-effective network: "Tom Kurth and party have been picked up. . . Thanks for your help. . . We can chalk another one up for ham radio. HL9TK off and clear."

WAHM Award. Certificate chasers, if you live outside of Cook, DuPage, and Lake County, Ill., and Lake County, Ind., you can work five members of the Hamfesters Radio Club, Inc., and earn a WAHM certificate. If you live within these counties, you'll need ten contacts; if outside the continental U.S.A., you'll need contacts with three Hamfesters Club members. Mail confirmations to the club at 6000 S. Tripp St., Chicago, Ill. 60629. A request and stamped reply envelope will get you the latest list of club members.

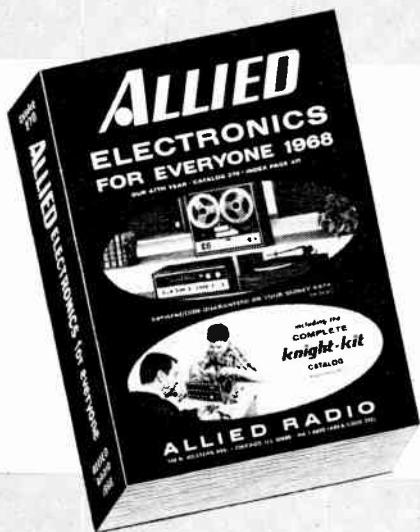
Incidentally, on August 13 the Hamfesters will hold their 33rd Annual Hamfest at Santa Fe Park, 91st and Wolf Rd., Willow Springs, Ill., from 9 a.m. until. . .

Volunteer Examiners, Take Heed. According to the Amateur Radio News Service "Bulletin," the FCC has taken action in Docket 17325 to revoke the amateur license of W4GNL. He was alleged to have requested examination material to administer the Technician exam to an applicant and never returned the material to the FCC.

A word to the wise: when an amateur acts
(Continued on page 113)

Those hams who are also college students will be interested in the two amateur radio club stations shown below. At left is the Indianapolis Campus, Purdue University, station which features a Heathkit "Apache" transmitter, and a Hallicrafters SX-115 receiver and SB-10 SSB exciter. At right is the Behrend Campus, University of Pennsylvania, station at Erie, WA3CHZ, which seems to feature Cindy Van Houton, W3???.





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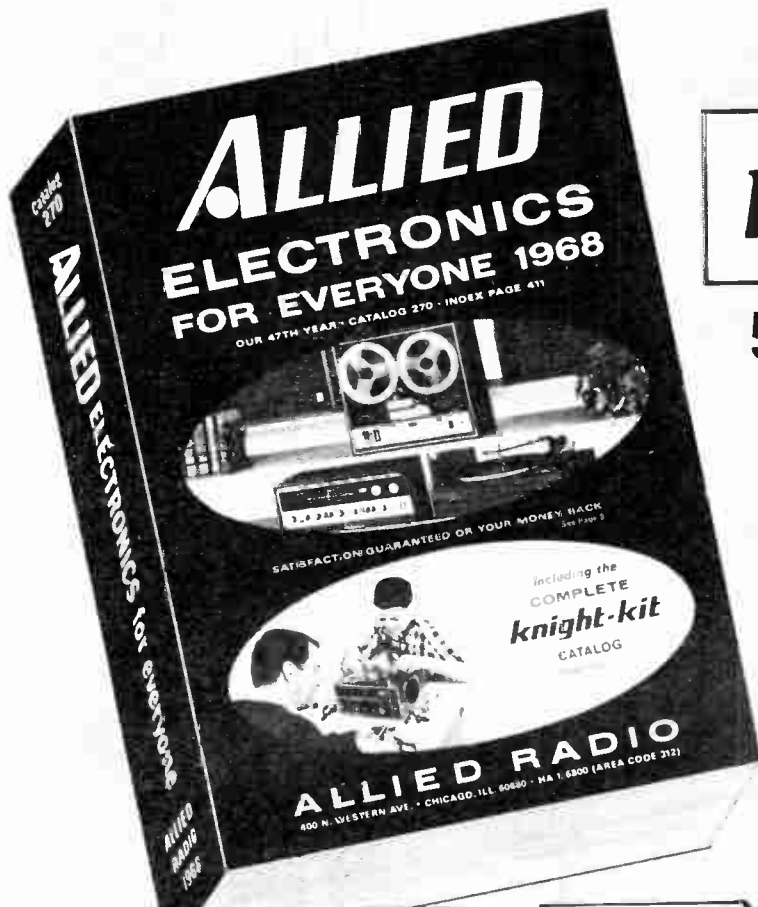
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CIRCLE NO. 1 ON READER SERVICE PAGE

ENGLISH-LANGUAGE BROADCASTS TO NORTH AMERICA

FOR THE MONTH OF AUGUST

Prepared by **ROBERT LEGGE**

TO EASTERN AND CENTRAL NORTH AMERICA			
TIME—EST	TIME—GMT	STATION AND LOCATION	FREQUENCIES (MHz)
6:15 a.m.	1115	Melbourne, Australia	11.71
7:15 a.m.	1215	Montreal, Canada	9.625, 11.72
3:15 p.m.	2015	Stockholm, Sweden	11.805
5:30 p.m.	2230	Vilnius, U.S.S.R. (Fri., Sun.)	11.79, 15.21, 15.46
6 p.m.	2300	Helsinki, Finland (Tues., Sat.)	15.185
		London, England	15.26, 17.79
		Moscow, U.S.S.R.	11.755, 11.90, 15.15
7 p.m.	0000	London, England	9.58, 11.78, 15.26
		Moscow, U.S.S.R.	11.88, 11.90, 15.15
		Sofia, Bulgaria	9.70
		Tirana, Albania	11.905
7:30 p.m.	0030	Budapest, Hungary	9.833, 11.91, 15.16
		Kiev, U.S.S.R. (Mon., Thurs., Fri.)	11.755, 11.90, 12.03
		Johannesburg, South Africa	9.705, 11.875
7:50 p.m.	0050	Vatican	9.69, 11.76, 15.285
8 p.m.	0100	Berlin, Germany	9.675, 9.73
		Havana, Cuba	15.34
		Madrid, Spain	6.13, 9.76
		Prague, Czechoslovakia	7.345, 11.99, 15.368, 17.84
		Rome, Italy	11.81, 15.41
8:30 p.m.	0130	Berne, Switzerland	6.12, 9.535, 11.715
		Bucharest, Rumania	11.94, 15.25
		Cairo, U.A.R.	9.475
		Cologne, Germany	9.64, 11.945
		Hilversum, Holland	
		(via Bonaire)	9.59
8:45 p.m.	0145	Copenhagen, Denmark	9.52
9 p.m.	0200	Lisbon, Portugal	6.025, 9.68, 11.84
		London, England	9.58, 11.78, 15.26
		Moscow, U.S.S.R.	9.70, 11.88, 15.15
		Stockholm, Sweden	11.805
9:30 p.m.	0230	Beirut, Lebanon	11.965
10 p.m.	0300	Bucharest, Rumania	9.57, 11.94, 15.25
		Budapest, Hungary	9.833, 11.91, 15.16
		Madrid, Spain	6.13, 9.76
TO WESTERN NORTH AMERICA			
TIME—PST	TIME—GMT	STATION AND LOCATION	FREQUENCIES (MHz)
6 p.m.	0200	Melbourne, Australia	15.32, 17.84
		Tokyo, Japan	15.135, 15.235, 17.825
7 p.m.	0300	Moscow, U.S.S.R.	
		(via Khabarovsk)	15.18, 17.775, 17.88
		Peking, China	9.457, 11.82, 15.095
		Seoul, Korea	15.43
7:30 p.m.	0330	Stockholm, Sweden	11.705
7:45 p.m.	0345	Berlin, Germany	11.875, 11.92
8 p.m.	0400	Sofia, Bulgaria	9.70
8:30 p.m.	0430	Budapest, Hungary	9.833, 11.91, 15.16
8:45 p.m.	0445	Cologne, Germany	9.735, 11.945
9 p.m.	0500	Moscow, U.S.S.R.	
		(via Khabarovsk)	15.14, 15.18, 17.775
9:15 p.m.	0515	Berne, Switzerland	9.695, 11.715



SHORT-WAVE LISTENING

By HANK BENNETT, W2PNA/WPE2FT
Short-Wave Editor

THE 1967 ANARC CONVENTION

THE Association of North American Radio Clubs (ANARC) has announced that its 1967 Convention will be held August 4-6 at the Essex Inn, on South Michigan at East 8 St., Chicago, Ill. All DX'ers, regardless of their club affiliations (as well as those who do not belong to any club) are cordially invited to attend.

Specific features are still in the formulative stages but there will be at least one banquet, talks, and discussions. Door prizes will include a portable tape recorder and a portable six-band radio receiver.

Make plans to check in on Friday, August 4; the festivities will begin the following morning. For reservations and other information, write to Warren Nordgren, 2129 Linden Ave., Waukegan, Ill. 60085.

Those who are unable to attend are invited to send a photograph of their listening posts to Mr. Nordgren, who will place them on display at the Convention.

WNYW Carries On. A disastrous general alarm fire completely destroyed the transmitting facilities of WNYW, *Radio New York Worldwide*, at Scituate, Mass., but the station was back on the air after just eight days of silence. At press time the provisional schedule lists only Eng. to Europe at 1800 on 21,530, 17,845, and 15,440 kHz, with the "DX'ing Worldwide" program at 2030.

No U.S.A. Veries From VOA. The *Voice of America* has announced that QSL's, or veries, will no longer be sent to listeners in the United States. In making this surprise announcement, the VOA said that the funds and staff time available did not permit acknowledging "local" reports. Although it is difficult to deny that the basic purpose of the VOA is overseas propaganda, U. S. SWL's feel that they are being cheated.

Postal Rate Changes. Postal rates for air-mail and surface mail to many foreign countries have been increased. Airmail letters to Central America and the Caribbean areas now take 15 cents, and those to Europe and Mediterranean Africa 20 cents. These rates are for *one-half ounce* letters. Ordinary first
(Continued on page 115)



Christa Van Sandwijk, WPE6GPO, Sunnyvale, Calif., constructed her equipment from scratch: the receiver is a 5-tube superhet with hand-wound coils. Her record: 17 countries and 11 states verified.

Ronald Luttrell, WPE9IVM, of Jacksonville, Ill., uses a Knight-Kit "Star Roamer" receiver and a 40'-long antenna. Ronald has logged 78 countries.



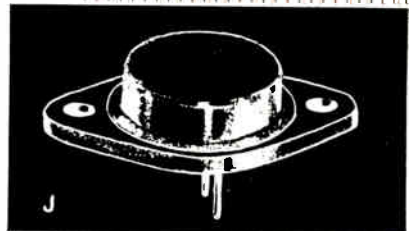
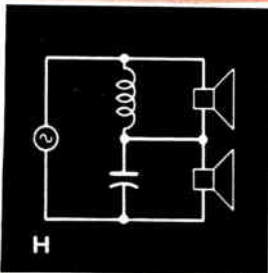
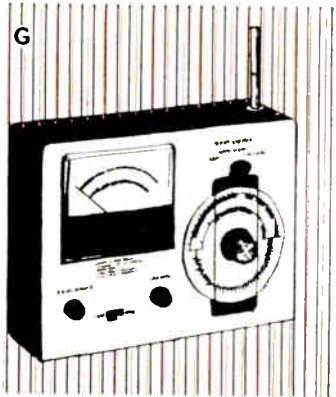
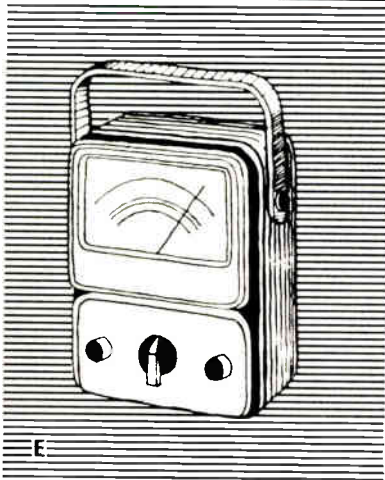
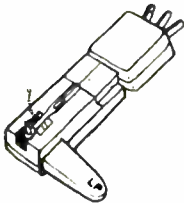
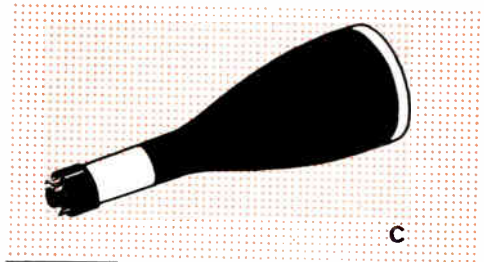
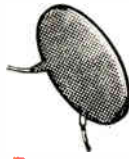
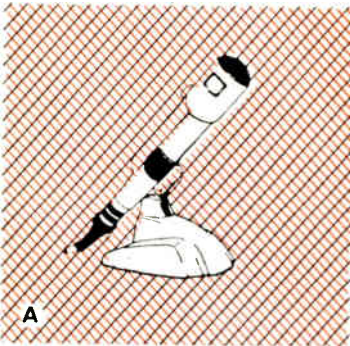
ELECTRONIC MEASUREMENTS QUIZ

By ROBERT P. BALIN

Commonly used electronic devices are described by one or more specialized units of measurement which define dimensions, quantities or rate of drift, temperature, voltage, current, impedance, sensitivity, compliance, and other characteristics. For example, a lamp may be rated in lumens per watt (lm/W). Test your ability to match the measurement designators (1-10) with the illustrations (A-J) below.

(Answers on page 114)

- | | | | |
|--------------|-------|--------------|-------|
| 1 °C/W | _____ | 6 pF/ft | _____ |
| 2 cm/dyn | _____ | 7 μ V/m | _____ |
| 3 dB/octave | _____ | 8 V/in | _____ |
| 4 -dB | _____ | 9 ohms/V | _____ |
| 5 μ A/fc | _____ | 10 p.p.m./°C | _____ |



*If you have gone
as far as
CB can take you,
step up to the*
COURIER

CLASSIC

A new world of CB awaits you in the incomparable solid-state Courier Classic. In its magnificently simple housing, with rich front panel designed to compliment the finest automobile interior, is every known feature that could be built into a CB transceiver. Start with Classic's push-pull adjustable noise limiter. New, fail-safe relay. The best squelch in the business. Circuitry designed to help pierce "skip". Add every known feature you ever looked for in CB, plus *total reliability*. In a compact 6½"W x 8½"D x 2½"H. Then cap it with the industry's biggest guarantee—*10 full years!*

Ready to step up to the Courier Classic? See it now at your Courier dealer, or write today!

\$189

Complete with mobile mounting bracket and crystals for all 23 channels.

Use your Courier Classic as a Base Station with exclusive Courier POWER CHARGER, Model PS-1.

\$29.95



COURIER COMMUNICATIONS, INC.
56 Hamilton Avenue, White Plains, New York

Yes! I'm ready to step up to the Courier Classic.

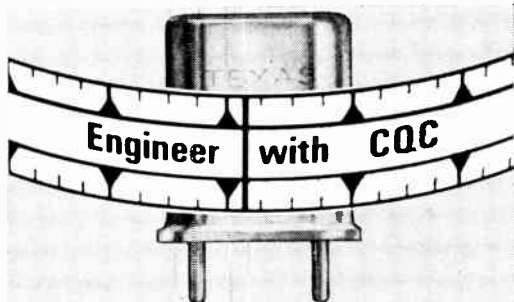
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City _____ County _____

State _____ Zip _____

PE-78



MORE CONTROL

Control of quality throughout precision manufacturing gives you crystals that assure exact frequency control.

MORE RELIABILITY

You'll stay on frequency better with CQC. And, you can rely on your CQC dealer to fill your needs promptly.

See your dealer for prices and data on CQC



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Div. of Whitehall Electronics

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Fort Myers, Fla. 33901

Plants in Fort Myers and Los Angeles

CIRCLE NO. 33 ON READER SERVICE PAGE



Striking contemporary art frame design in Dusk Walnut or Antique Birch. Mount traditionally or in diamond position. Special 8" dual cone speaker designed exclusively for Argos. Excellent for stereo or as extension speakers. Audiophile net \$13.95

Troubador model TSW-8S by

Argos

PRODUCTS COMPANY

Dept. C, 600 Sycamore St., Genoa, Illinois 60135

CIRCLE NO. 3 ON READER SERVICE PAGE

AMATEUR EQUIPMENT JAMBOREE

(Continued from page 55)

supply. Among the names represented in this group of equipment are Gonset, Allied Radio (Knight-Kit), Lafayette Radio, Polytronics, and Squires-Sanders.

Separate VHF transmitters available include Industron's "Li'l Lulu," a 6-meter, 20-watt complete with built-in VFO and power supply for \$250 (and matching receiver for \$225), and Ameco's TX-62 6- and 2-meter, 75-watt, AM/CW transmitter.

UHF/VHF Converters. Most 6- and 2-meter operators use low-power AM transceivers whose transmit function is often relatively better for fixed station operation than their receive function. As a result, it is quite common to use the transceiver as a transceiver only for portable and mobile operation, and to use it only as a transmitter in the base station.

Reception in this case can be handled by the regular, low-frequency station receiver in conjunction with a converter. All the built-in conveniences of the low-frequency receiver are available for VHF/UHF work for the price of a converter, which runs from less than \$20 to about \$80.

Both tube and solid-state converters are available. There is little difference between the two types on 6 meters, but the solid-state units may be slightly more sensitive on 2 meters. Transistor types are much more easily damaged by a shot of r.f. or a lightning flash in the immediate vicinity of the antenna, but it is no problem to provide adequate safeguards.

As a possible indication of things to come, three large companies are now offering amateur VHF SSB equipment. The Heathkit SB-110 and the Swan 250 transceivers are for 6-meter operation, and the Gonset GSB-VI and GSB-II transceivers are for 6- and 2-meter operation, respectively. The Gonset units use solid-state devices exclusively in the receiver circuits and in most of the transmitter circuits (the r.f. driver and r.f. output stages have tubes). These units are much improved over last year's models, and they cost \$100 less.

-50-

CIRCLE NO. 39 ON READER SERVICE PAGE →

Build your own motor speed control with RCA experimenter kits

**Control Motors With Name Plate Ratings Up to 6 Amperes.
Available from Your RCA Distributor**

Now, using two RCA Silicon Controlled Rectifier Experimenter Kits (KD2105) together with additional passive components, you can build a motor speed control for ac/dc universal motors (series wound) with name plate ratings up to 6 amperes.

RCA's twin-kit circuits offer you flexibility in that you may control any one of many individual tools or appliances such as half-inch power drills, jigsaws, buffers, floor polishers, and mixers.

The RCA Experimenter Twin-Kits are part of a complete program fully explained and illustrated in the new 136-page Experimenter's Manual KM-71 on sale at your RCA Distributor. In it you'll find detailed information on more than 24 different and useful circuits you can build including 6- and 12-Volt battery chargers, lamp dimmers, audio frequency operated switches, and heat and light-operated switches.

Check with your RCA Distributor on RCA Experimenter's Kits. Select the kit or kits for the solid-state circuits you have in mind. Do it today.

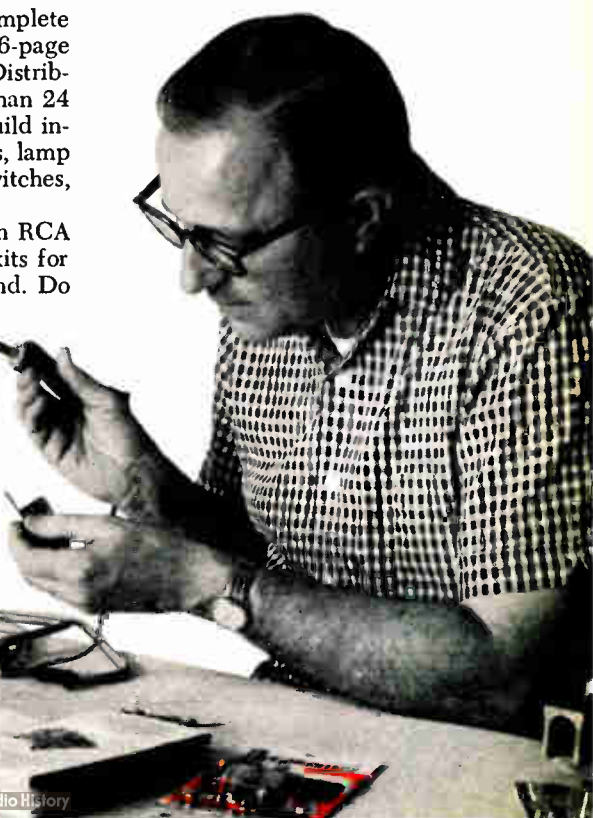
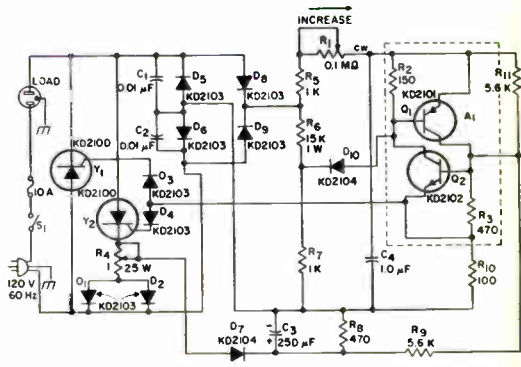


Technical Series KM-71

RCA Electronic Components and Devices, Harrison, N. J. 07029



The Most Trusted Name in Electronics



Thinking of college and a space age career?



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Learn how you can prepare for a dynamic career as an electrical or mechanical engineering technician or engineer in such exciting, growing fields as avionics, missiles, reliability control, fluid mechanics, data processing, metallurgy, microelectronics, and advanced aerospace research.

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I'm interested in

- Electrical fields Mechanical fields

Name.....Age.....

Address.....

City.....State.....ZIP.....

CIRCLE NO. 20 ON READER SERVICE PAGE

MS-284

REMOTE COMMANDER

(Continued from page 46)

should be mounted in a separate miniature metal box as shown in Fig. 7, and then the small metal box should be mounted in a larger box. The same precautions taken for the transmitter also apply to the construction of the receiver: insulator between board and box, rubber grommets to insulate antenna from box, etc. Then drill a small access hole in the module case directly over $L1$ in the receiver.

System Alignment. Either one or both of two methods can be used to tune the transmitter and receiver units in the "Remote Commander" R/C system for maximum range and sensitivity. The first method is the "seat-of-your-pants" technique requiring no test equipment of any kind. Simply tune the slugs in coil $L1$ in both units so that $K1$ in the receiver relay pulls in as soon as $S1$ in the transmitter is depressed. Continue tuning the coils for the desired results several times, each time putting a greater distance between both units.

The second alignment method requires the use of a 0- to 50-milliamp meter movement. Alignment is first performed in the transmitter, then the receiver.

Connect the meter in series with the negative side of $B1$ in the transmitter and $S1$. Depress $S1$, and tune $L1$ for a maximum meter indication; then back off slightly. Remove the meter from the transmitter, and reconnect the negative side of $B1$ to $S1$.

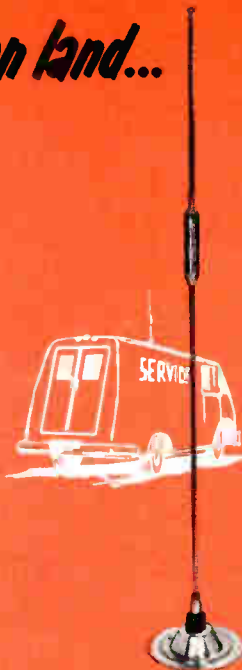
To tune the receiver, connect the meter movement between the positive side of the receiver's battery and $S1$. Depress the power switch on the transmitter and tune $L1$ in the receiver for a maximum indication on the meter.

Tuning of both the transmitter and the receiver should be performed with each unit completely enclosed in its respective metal case.

The "Remote Commander" R/C system is now ready to go to work saving you time and energy. Simply connect it to the devices you wish to control and keep the transmitter handy in your shirt or pants pocket.

*If it moves,
The Antenna Specialists have a great
new CB antenna to help it communicate!*

on land...



New "Grip-Stick" magnetic mount sticks to its business at all legal speeds! VSWR less than 1.5/1.0, capacity-matched. 16' cable. Less than 27" long. No-mar vinyl underside. Model M-168.

on water...



Fold away feature

New "Sea-Hook" half-wave-length marine antenna has exceptionally low radiation angle. No ground plate required! Spring-loaded fold-down feature. White cyclolac base, chrome-plated brass parts. VSWR less than 1.5/1.0. Model ASM-23.

in the air...



New "Sky-Hook" fiberglass airborne CB antenna—low-profile design, wind-rated over 250 mph. Temp. range: minus 50°F/plus 200°F. VSWR 1.5/1.0 or better. Only 24" long—reduces static, gives ample ground clearance. Model M-149.

Whatever your need, you can trust the "Stripes of Quality"!



**the antenna
specialists co.**

Div. of Anzac Industries, Inc.
12435 Euclid Ave., Cleveland, Ohio 44106

Expert: 64-14 Woodside Ave.
Woodside, N.Y., 11377

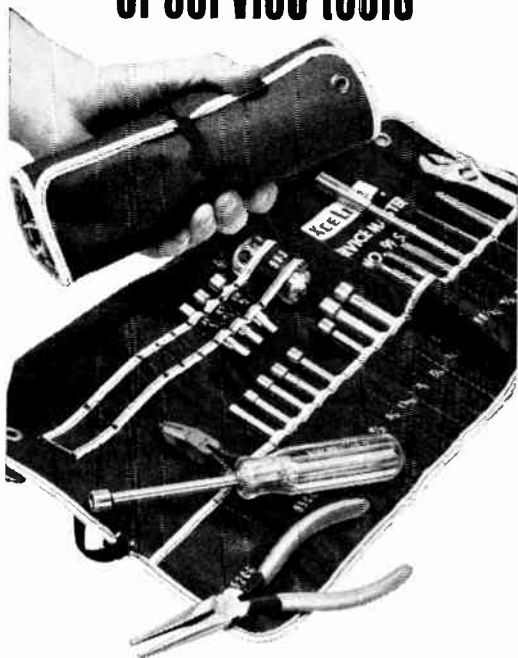
CIRCLE NO. 2 ON READER SERVICE PAGE

August, 1967

World Radio History

"Stripes of Quality"™

SERVICE MASTER HANDIEST HANDFUL of service tools



23 essential tools at your fingertips in this lightweight (only 2 3/4 lbs.), compact, easy-to-carry, roll-up kit. Contains long nose plier, diagonal plier, adjustable wrench, regular and stubby plastic handles with these interchangeable blades: 9 regular and 3 stubby ruddriver, 2 slotted and 1 Phillips screwdriver, 2 reamer, 1 extension. Eyelets in plastic-coated canvas case permit wall hanging. New elastic loop secures roll, eliminates need for tying.

many optional accessories:

Junior and Tee handles... Additional nutdriver, Phillips & slotted screwdriver, and extension blade sizes... Allen hex type, Bristol multiple spline, Frearson, Scrulox, and clutch head blades... Awl/Scraper... Chuck adaptors to use blades in spiral ratchet drivers.

XCELITE

Xcelite, Inc.
20 Bank St., Orchard Park, N. Y. 14127
Send Catalog I66 containing information on
Service Master kit and accessories.

name _____

address _____

city _____ state & zip _____

CIRCLE NO. 36 ON READER SERVICE PAGE

NEW LITERATURE

To obtain a copy of any of the catalogs or leaflets described below, simply fill in and mail the coupon on page 15.

A 12-page "Design Ideas for Engineers" catalog is available from *Alco Electronic Products, Inc.*, featuring miniature electronic switches, miniature remote control relays, miniature readout indicators, ceramic terminal strips, and machined aluminum knobs. Each product section contains prices, drawings, and engineering specifications.

Circle No. 87 on Reader Service Page 15

It's here, and just in time for summer fun. *Lafayette Radio Electronics Corporation* has released its 116-page Summer Sale catalog (No. 647) which lists the latest in electronic equipment. Included are hi-fi, marine, ham, CB, and test equipment units, plus Lafayette's brand-new line of VHF communications receivers. You'll find many money-saving bargains in these pages on microphones, stereo systems, two-way radios, and other hobby equipment.

Circle No. 88 on Reader Service Page 15

Just released by *Sencore, Inc.*, is a 12-page brochure (Bulletin No. 360) which describes this company's complete line of 23 test instruments. Included are two new picture tube checkers (the "CRT Cadet," Model CR13; and the "CRT Champion," Model CR143), plus a new line of substitution units.

Circle No. 89 on Reader Service Page 15

Mechanical and electrical specifications for the new Model 600 transistorized volt-ohmmeter are detailed in a 2-page product data bulletin available from *Triplet Electrical Instrument Company*. The bulletin also tells how d.c. voltages, resistance, and a.c. r.m.s. measurements are made; how one small compact probe can be used for all functions; and how a field effect transistor circuit is employed to obtain high input impedance and improved stability. The bulletin is punched to fit into a 3-ring loose-leaf binder.

Circle No. 90 on Reader Service Page 15

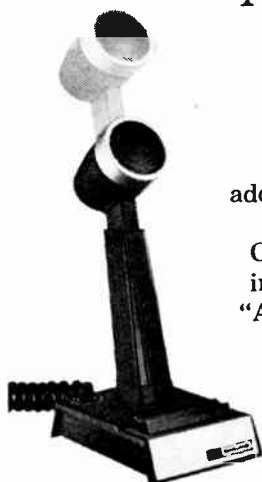
The *Hickok Electrical Instrument Company* has just published a quick-reference catalog covering its entire line of electronic test equipment. This 8-page brochure illustrates and describes all products and includes complete price information.

Circle No. 91 on Reader Service Page 15

THIS MIC MAINTAINS MAX MODULATION



- NEW! VARIABLE OUTPUT LEVEL
- TRANSISTORIZED



Built-in two-transistor preamplifier and volume control enables you to attain, and maintain 100% modulation — provides additional audio gain! Even compensates for equipment that lacks sufficient gain to attain 100% modulation. Ultra-reliable Controlled Magnetic element with specially tailored response insures highest "talk power". Adjustable height, super-rugged "Armo-Dur" case. For AM, FM, Sideband, CB. Only \$29.70 net.

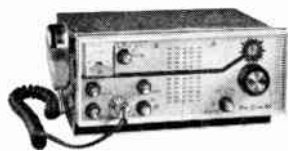
SHURE 444T
VARIABLE OUTPUT MICROPHONE

Shure Brothers, Inc., 222 Hartrey Avenue, Evanston, Illinois 60204

© 1967 Shure Brothers, Inc.

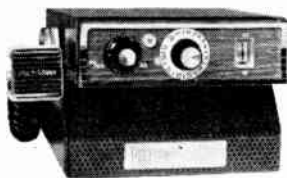
CIRCLE NO. 41 ON READER SERVICE PAGE

When You're Ready To Step Up . . . see **POLYTRONICS Two-Way CB Radios**



POLY-COMM 23-DELUXE BASE STATION. The Cadillac of the industry . . . most sensitive receiver on the market. Teflon covered wiring; weather-proof speaker; hand-wired, metal plug-in microphone; delta tuning; variable depth noise limiter; professional metering system; public address capability, optional built in selective call. Both 12 volt DC and 117 volt AC. **\$299.50**

PC-23C — SOLID STATE MOBILE OR BASE STATION. First solid state CB so sensitive that .00000015 volt signal strength can produce 3 watts audio at speaker with minimum of 90 db adjacent channel rejection. Double-conversion superheterodyne receiver, modulation indicator, signal strength meter, illuminated channel selector, custom colored trim (green, red, blue, beige). **\$199.50** with mounting bracket, microphone, crystals for 23 channels. 12 volt DC; optional AC power supply.



POLY-PUP—7 CHANNEL MOBILE OR BASE STATION. Smallest CB of its quality, only 4¼ lbs., under 2" tall; 6" wide, yet packs full 5 watt punch. All solid state. Low power drain ideal for car or boat. Each channel individually controlled by its own crystals. Adjustable squelch, AGC, noise limiter. **\$149.50** with mounting bracket, microphone, crystals for 1 channel. (Crystals for extra 5 channels \$10 with order). 12 volt DC; optional AC power supply.

Also 1.5 to 3 watt walkie-talkies; Poly-Call Tone Alerts; full range of accessories.

POLYTRONICS TWO-WAY RADIOS PE-87
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Please send more information on:

Poly-Comm 23 PC-23C Poly-Pup

Name

Address

City..... State..... Zip.....

DEALER INQUIRIES INVITED

CIRCLE NO. 28 ON READER SERVICE PAGE

OUT OF TUNE

Build the "Beachcomber" (July, 1967, page 32). The caption for Fig. 8 was incorrectly worded. This diagram shows the relative size of a buried object vs. depth to be detected by the "Beachcomber" metal locator, assuming average soil and a constant height of the search loop above ground level. Re Parts List (page 28): We have been informed that a punched chassis and a metal search coil are included in the \$15 kit.

Breakdown Reverse Voltage Transistor and Diode Tester (May, 1967, page 68). The polarity of battery B1 should be reversed.

PEMOHT

(Continued from page 58)

expected that you will say that the price is too high. You do. It isn't. It is. It isn't. And so on, with the audio gradually climbing to the level where you are calling him a robber (*vor*) and he is calling you a skinflint (*skupoy*).

It is immaterial whether you pay the asking price or whether you succeed in getting a reduction. You pay, and you lug home your *televisor*. You plug it in. You find that picture and sound are excellent. The repair job is a good one. —30—

SOLID STATE

(Continued from page 85)

established by collector load Loopstick coil.

Easily duplicated in the home workshop, this design requires relatively few components. Transistor Q1 can be a *pnp* type 2N109. The audio signal source may be a high impedance type microphone, a high level output crystal or ceramic phono cartridge, or a modular audio amplifier with a 10 μ F blocking capacitor.

As with any AM broadcast band wireless microphone, the unit's output frequency should be adjusted for pick-up at a "dead spot" on a nearby receiver.

Manufacturer's Circuit. Timer circuits are legion. But ultra-long delay designs are few and far between. As a general rule, if a time delay of an hour or more is needed,

Now Available For Immediate Delivery... Deluxe Heathkit Rectangular Color TV



Exclusive Features That Can't Be Bought In Ready-Made Sets At Any Price!

All color TV sets require periodic convergence and color purity adjustments. Both Heathkit Color TV's have exclusive built-in servicing aids, so you can perform these adjustments anytime . . . without calling in a TV serviceman . . . without any special skills or knowledge. Just flip a switch on the built-in dot generator and a dot pattern appears on the screen. Simple-to-follow instructions and detailed color photos in the manual show you exactly what to look for, what to do and how to do it. Results? Beautifully clean and sharp color pictures day in and day out . . . and up to \$200 savings in servicing calls throughout the life of your set.

Exclusive Heath Magna-Shield . . . surrounds the entire tube to keep out stray magnetic fields and improve color purity. In addition, **Automatic De-gaussing** demagnetizes and "cleans" the picture everytime you turn the set on from a "cold" start. **Choice Of Installation** . . . Another Exclusive! Both color TV's are designed for mounting in a wall or your own custom cabinet. Or you can install either set in a choice of factory assembled and finished Heath contemporary walnut or Early American cabinets.

From Parts To Programs In Just 25 Hours. All critical circuits are preassembled, aligned and tested at the factory. The assembly manual guides you the rest

of the way with simple, non-technical instructions **Plus A Host Of Advanced Features** . . . a hi-fi rectangular picture tube with "rare earth" phosphors for brighter, livelier colors and sharper definition . . . **Automatic Color Control** and **Gated Automatic Gain Control** to reduce color fading and insure jitter-free pictures at all times . . . deluxe **VHF Turret Tuner** with "memory" fine tuning . . . **2-Speed Transistor UHF Tuner** . . . **Two Hi-Fi Sound Outputs** for play through your hi-fi system or connection to the special limited-field speaker . . . **Two VHF Antenna Inputs** — 300 ohm balanced and 75 ohm coax . . . **1-Year Warranty** on the picture tube, 90 days on all other parts . . . plus many more deluxe features. For full details, mail coupon for FREE Heathkit catalog.

- ***Kit GR-295**, everything except cabinet, 131 lbs. **\$479.95**
- GRA-295-1**, walnut cabinet (shown above) 56 lbs. . . 19" D. x 31" H. x 34 1/2" W. **\$62.95**
- Deluxe contemporary walnut & Early American cabinets also available at \$94.50 & \$99.95
- ****Kit GR-180**, everything except cabinet, 102 lbs. Was \$379.95 **NOW ONLY \$349.95**
- GRA-180-1**, walnut cabinet (shown above) 41 lbs. . . 18 1/2" D. x 28 1/2" W. x 29" H. **\$49.95**
- Early American cabinet available at \$75.00



FREE 1967 CATALOG

Describes these and over 250 kits for stereo/hi-fi, color TV, amateur radio, shortwave, test, CB, marine, educational, home

and hobby. Save up to 50% by doing the easy assembly yourself. Mail coupon or write Heath Company, Benton Harbor, Michigan 49022.



HEATH COMPANY, Dept. 10-8
Benton Harbor, Michigan 49022

Enclosed is \$ _____, plus shipping.

Please send model (s) _____

Please send FREE Heathkit Catalog.

Name _____ (Please Print)

Address _____

City _____ State _____ Zip _____

Prices & specifications subject to change without notice.

CIRCLE NO. 16 ON READER SERVICE PAGE

common practice is to use a geared down motor fitted with a cam switch. Diagrammed in Fig. 6 is an all solid state design for delays up to 10 hours!

Described in Motorola's "Semiconductor Newsbriefs" (published by Motorola Semi-

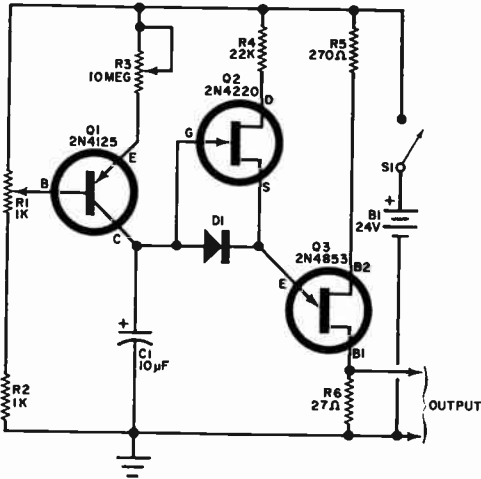


Fig. 6. Time delays of up to 10 hours are possible with circuit suggested by Motorola if C1 and D1 are high-quality, low-leakage components. A glass-epoxy PC board should be used for best results.

conductor Products Inc., P.O. Box 955, Phoenix, Arizona 85001), the circuit features a modified R-C arrangement as the basic timing mechanism, with the series resistive element replaced by a transistor-resistor (Q1-R3) network. This permits Q1 to act as a constant, very low current charging source for timing capacitor C1.

In operation, C1 is charged slowly through R3 and the Q1 emitter-collector circuit. Base bias of Q1 is established by voltage divider R1 and R2, with both R1 and emitter load R3 serving to adjust the timing period. The FET Q2 is normally at cut-off and acts as an open circuit. As C1 is charged, a positive gate bias is applied to Q2, permitting the FET to conduct and apply a firing signal to the UJT Q3 emitter. Then Q3 switches from an open to a conducting state and develops an output signal pulse across base load resistor R6.

Two components are somewhat critical, timing capacitor C1 and the biasing diode D1. High-quality, low-leakage units should be used here and the diode must be selected to have a leakage current of less than 10 μA. Leakage paths in the timing circuit must be avoided. If an etched circuit board is used for wiring, a glass-epoxy base is preferred over the more common paper-resin type.

Product News. General Electric is now offering individual samples of their solid state light source, type SSL-1, for only \$9.50 each. Emitting up to 40 footlamberts of visible light, the SSL-1 requires from 2 to 5 volts at approximately 50 mA. Details are available from General Electric Company, Miniature Lamp Department, P.O. Box 2422, Nela Park, Cleveland, Ohio 44112.

A new line of moderately priced circuit breakers designed to protect transistors and rectifiers against thermal runaway damage is being offered by Astro Dynamics, Inc. (Burlington, Massachusetts 01803). Dubbed TRAN-Z-FUZE, the devices are of single unit construction and designed to be mounted underneath a transistor or rectifier in place of the usual insulating mica washer. In operation, heat is transferred by conduction from the semiconductor's body through the TRAN-Z-FUZE body to a set of self-contained, hermetically sealed, thermally operated contacts. These contacts open automatically as critical temperatures are reached and thus may be used to remove transistor power or to actuate an interlock relay.

No technical details are available, but we've received word that Philips (Eindhoven, Holland) has developed a penlight-powered TV receiver measuring only 4½" long by 1¼" in diameter. An earphone is used for listening to the audio portion of the program, with the earphone lead serving as an antenna!

That's it for now—until next month,

—Lou.

ON THE CITIZENS BAND

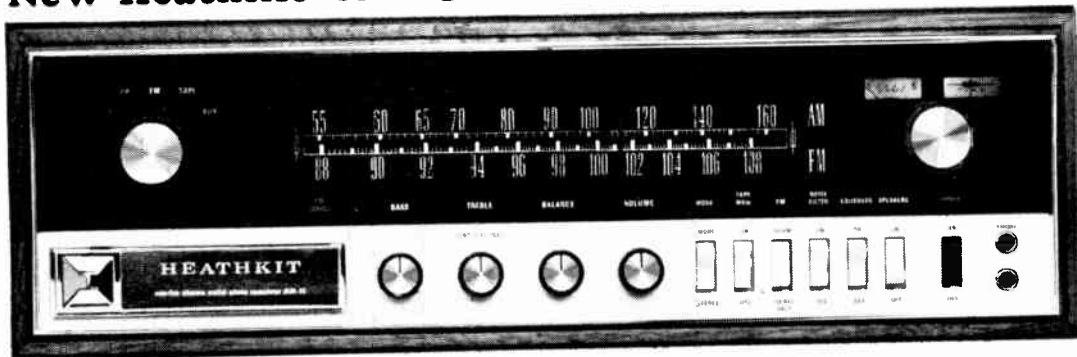
(Continued from page 87)

munications van had been set up for operation it was ordered to assist the Belvidere's Highland Hospital which had been badly damaged and left without power. CB'ers took patients—including babies, amputees and oxygen patients—from Highland to St. Anthony's Hospital in Rockford, Illinois.

Over 225 individual CB'ers and 70 mobile units supplemented the squad during the heaviest air traffic which pertained to inquiries of local residents. Bill Bagley explained how inquiries coming in on Jay Hart's MARS setup were relayed by Dutch LaBounty to the Coffin and Troia base stations, and then to the Belvidere communications van. CB'ers were dispatched from this point to search for missing persons and to check on property conditions.

(Continued on page 113)

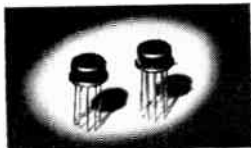
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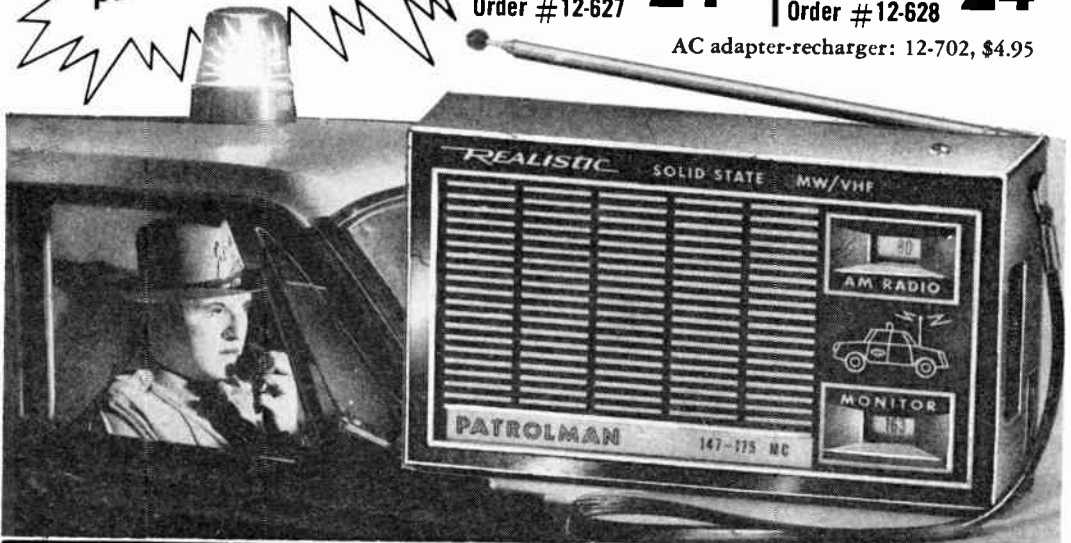
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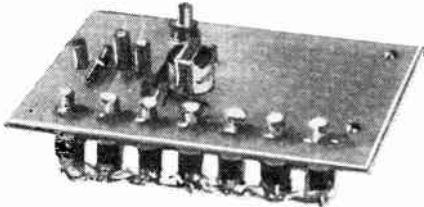
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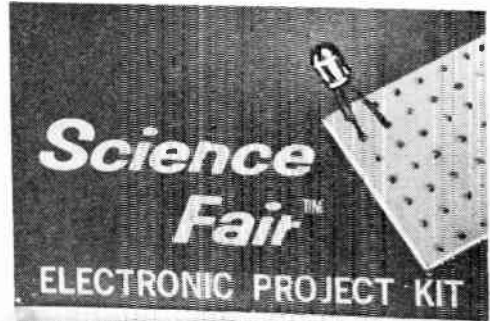
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HAM HOBBY CLEARINGHOUSE

If you have a hobby or interest in addition to amateur radio and would like to talk about it on the air, you can contact other hams with the same hobby through this column. To be listed here, just send a legibly printed postcard to Ham Hobby Clearinghouse, POPULAR ELECTRONICS, One Park Ave., New York, N.Y. 10016, including on it your call letters, other hobbies, the frequencies you use, mode of operation, when you operate, and your name and address.

WA1DUV—Stage lighting, CB operation, biology, guitar, music, SWL'ing; 20 or 10 meters, phone, on weekends; 2 meters, phone, nights. (Dick Abrams, Bayne St., Norwalk, Conn. 06851)

WB2SKP—Photography, biology, motorcycles, banjo, happenings, hi-fi; 6 and 2 meters, CW, AM, and SSB; evenings and weekends. (Barry A. Reich, 2020 Albermarle Rd., Brooklyn, N.Y. 11226)

WB2TCY—Electronics construction; 80, 40, and 15 meters CW, 75, 40, 15 and 10 meters AM; 4 to 9 p.m. daily, and any time Saturdays and Sundays. (Dave Schmarder, 4 Pinewood Circle, Corning, N.Y. 14830)

WA2THR—Cardinal Hayes High School Radio Club would like to have QSO's with other radio clubs; 15 and 20 meters, SSB; between 2:45 and 5 p.m. EST weekdays (650 Grand Concourse, Bronx, N.Y. 10452)

WB2TUT—Hockey, science, rockets, club station setups; 20 and 15 meters, AM, phone, or SSB; evenings and weekends. (Frank J. Lauri, 645 Van Nest Ave., Bronx, N.Y. 10460)

WB2UEQ—Inventing, astronomy, aeronautics, model railroading; 80 meters, CW; weekends. (Nick Leggett, Box 231, Somers, N.Y. 10589)

WN2WZK—Photography, chess, physics, biology; 146 MHz, phone; 0000 GMT, daily. (Hilary Miller, 98 Highview Pl., White Plains, N.Y. 10604)

WB2ZXB—Chess, electronics design, lasers and holography, space vehicle propulsion systems; 21,270 MHz, AM; 1630 EST weekdays. (Wesley A. Schneider, 34 Fendale St., Franklin Sq., L.I., N.Y. 11010)

WA5PDG—Current events, biology, mathematics and electronics theory; 40 meters, CW and AM; 10 meters soon; late at night or as per sked. (Rusty Chamberlain, Box 387, La Feria, Texas)

WN7HFH—Science, photography, jazz, electronics experimenting; 7164 kHz, CW; weekdays 7 to 11 p.m., weekends after 6 p.m. (Lester Garwood, 2901 N. Tindle, Flagstaff, Ariz. 86001)

WN9QZI—Rock and mineral collecting, CW practice and home-brew gear; 15 meters, CW, Friday nights; and 80 meters, CW, weekends. (Fred Rusch, 7320 W. Clarke, Wauwatosa, Wis. 53213)

(Continued from page 106)

CB'ers served as coordinators for state and local police, Red Cross, Civil Defense, the state highway department; and as communication liaison for all governmental agencies in the area. Mobile units also patrolled on the lookout for looters, and handled traffic control.

Several CB volunteers worked on foot searching for and aiding the injured or salvaging whatever personal property was still intact. "We even rescued a dog from a basement, and some parakeets from another home," a sleepy-eyed squad member informed us. Since all power had been cut off from the area, squad members were also charged with checking and refueling a portable gasoline generator that kept an iron lung operating. This vigil took place for three days. The unit was inspected every hour, 24 hours a day.

In a report to the Federal Communications Commission, amateur/CB'er Jay Hart praised Citizens Radio operators, Navy MARS members and all amateur operators with having performed "a magnificent job!" Our personal visit leads us to doubling the motion, without reservation!

I'll CB'ing you,

—Matt, KHC2060

AMATEUR RADIO

(Continued from page 89)

as a volunteer examiner for the Novice, Technician, or Conditional examination, he is responsible for returning the material to the FCC, even if the applicant does not take the examination. Many well-meaning hams may not have appreciated the fact that they cannot simply destroy unused license exams.

World Scout Jamboree. Boy Scouts of some 80 countries are expected to attend the World Scout Jamboree in Farragut State Park, Idaho, to be held from August 1 through August 9. The primary demonstration ham station will sign the call K7WSJ. Chief operator will be Al Kahn, W8DUS. President of Electro-Voice, assisted by Perry Williams, W1UED, of the ARRL.

The Jamboree station will operate CW on 3525, 7025, 14,025, 21,025 and 28,025 MHz. Phone operation will be on 3950, 7290, 14,290, 21,290, and 28,590 MHz. Most of the activity is expected to take place on either 40 or 80 meters.

(Continued on page 114)

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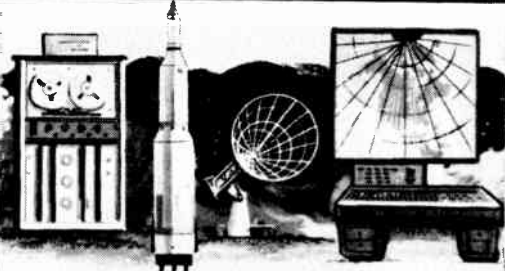
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Another station, K7BS, will be set up by Idaho hams, located off the Jamboree grounds. Frequencies for this station will be about 20 kHz off the K7WSJ spot.

NEWS AND VIEWS

Rex von Krohn, WN7FYE, 2182 N.W. Hoyt, Apt. #2, Portland, Ore., excites a multiband dipole on 80, 40, and 15 meters with a Heathkit DX-60A transmitter, and receives on a Heathkit HR-10. The trio has worked 35 states, Canada, Germany, and Japan. Rex's longest contact lasted 3½ hours, although that is not the one that got him his Rag Chewer's Club certificate. Probably when you read this, Rex will have his General ticket posted next to that RCC certificate. . . . **Dave Pospichal, WNØWJ**, 3620 Jaynes, Omaha, Nebr., is another Novice who is waiting for his big ticket to arrive. His Globe Chief 90A transmitter running the "Novice gallon" has worked 37 states and 5 Canadian provinces on 80 and 40 meters with the aid of a Hy-Gain 18-V vertical antenna and a "long wire." A war-surplus BC-348 receiver sits beside the transmitter. So does a Heath VF-1 VFO, waiting the arrival of the General ticket. . . . **Patrick Flynn, WN4ECA**, Cherry Plaza Hotel, Orlando, Fla., has worked 11 countries in 3 continents, plus 26 states, with a Heathkit DX-40 running 75 watts, on 40 and 15 meters. A 40-meter dipole, 60' high, does the radiating, and a Hallicrafters SX-111 does the receiving.

MEASUREMENTS QUIZ ANSWERS

(Quiz appears on page 96)

- 1 — J Thermal resistance in a power transistor is expressed in degrees centigrade per watt ($^{\circ}\text{C}/\text{W}$).
- 2 — D Phonograph cartridge compliance is expressed in centimeters per dyne (cm/dyn).
- 3 — H Slope of crossover network's frequency response curve (for speakers) is expressed in decibels per octave (dB/octave).
- 4 — A Microphone sensitivity is expressed in negative decibels ($-\text{dB}$) where 0 dB is equal to 1 V/dyn/cm².
- 5 — F A photocell's sensitivity to light is expressed in microamperes per foot-candle ($\mu\text{A}/\text{fc}$).
- 6 — I Capacitance of coaxial cable is measured in picofarads per foot (pF/ft).
- 7 — G R.f. signal strength is measured in microvolts per meter ($\mu\text{V}/\text{m}$).
- 8 — C Deflection sensitivity of a cathode-ray tube is often given in volts per inch (V/in).
- 9 — E Input impedance of multimeters is expressed in ohms per volt (ohms/V).
- 10 — B Temperature coefficient of ceramic capacitors is determined in parts per million per degree centigrade (p.p.m./ $^{\circ}\text{C}$).

John Jan Jellema, W8SWN, 9M2JJ, 1374 Harpst St., Ann Arbor, Mich., worked 47 states as a Novice on 3703 kHz. But that was back in 1954. He received his General ticket in 1955. After getting a degree in math in college, Jan signed up for a 3-year hitch in the Peace Corps, expecting to teach mathematics somewhere. Instead, when he arrived in Ipoh, Malaya, he was assigned to set up and teach a 3-year course in radio-TV servicing! Jan got on the air from Ipoh in 1962 using HX-20 and HR-20 Heathkits borrowed from Hock, 9M2FR, and worked over 100 countries. Now back in Michigan, Jan is furthering his education at Eastern Michigan University and operating all amateur bands between 3.5 and 29.7 MHz with a Hammarlund HX-50 transmitter and a Collins 75A3 receiver. . . In May "News and Views," **Art Malatsky, then WN2WFJ,** reported on the good results he obtained using an indoor 40-meter dipole. Now a General with a "Vacationeer" vertical antenna and 150 watts going into a Heathkit "Apache" transmitter, he has worked 40 states and 33 countries in three months on the higher frequencies, while the indoor dipole still does well on 40 meters. . . **Ray Eichman, WA6IVM,** whose story appeared in the April column, reports that our write-up was the push needed to get the "Lighthouse for the Blind" to authorize a complete amateur station for the handicapped students Ray is teaching. Judging from the number of people who told him they saw the story, Ray is sure everybody in California reads our column.

W. C. Spenn, WNSQVD, 104 South Carpenter, Mart. Tex., received an answer to his very first call as an amateur—but it was a month later before he made another contact! His very small yard made putting up a good antenna seem hopeless; but, after much work, he has both a 40-meter dipole and a 33' vertical located there. Forty-two states worked and a QSL card from England prove that the antennas work, and so does his EICO 720 transmitter. The frosting on the cake is a Hammarlund HQ-170A receiver—quite an improvement over the old relic he had been using. . . **Ed Gribi, WB6IZF,** reports that 25 miles from the nearest doctor in the mountains near Ojai, Calif., Mrs. Frances Carr suddenly started having a baby in her automobile. Fortunately, K6VDL was operating portable near the scene and immediately called for help on the West Coast Amateur Radio Service Net on 7255 kHz. Within two minutes, the Ventura Highway Patrol had the information and immediately dispatched a doctor and ambulance to the scene. Shortly afterward, a 7 pound 2 ounce boy was born to Mrs. Carr in the Ojai Valley Hospital. Already, Ed and the other net members are wondering how soon they can start teaching him the code for his Novice license.

Much too late for publication we received an announcement of the first annual convention of the Medical Amateur Radio Council held in New York in June. But we want to call the MARCO to the attention of those amateurs who are also doctors. A fairly new organization, the MARCO already has members in 20 countries on all continents. Write to **William L. Sprague, MD, WA6CRM, 433 N. 4th St., Montebello, Calif. 90640,** for membership information. . . **Tom Warren, WB2JYM, 699 Linden Ave., Teaneck, N.J.,** has worked 95 countries and all states with a Globe DSB-100 transmitter and a Drake 2-B receiver. Also, he has worked 16 states on 40-meter CW with a 1-watter.

Will we have your "News and Views," photograph, club bulletin, and information concerning your club's code and theory lessons soon? Mail all material to: **Herb S. Brier, W9EGQ, Amateur Radio Editor, POPULAR ELECTRONICS, P. O. Box 678, Gary, Ind. 46401.**

73, Herb, W9EGQ

SHORT-WAVE LISTENING

(Continued from page 95)

class surface mail rates to all foreign countries (except Canada and Mexico) are now 13 cents for the first ounce and 8 cents for each additional ounce. Air postcards and air letter forms are 13 cents, while surface mail postcards take 8 cents.

SWL Certificate Guide. A brand-new publication called "Illustrated Certificate Guide" has been received from Austria. Written by Christian Zangeri, OE9CZI, this paperback book is a synopsis of the author's experiences in collecting 55 SWL certificates, 11 contest and 7 ham certificates. Each certificate is "illustrated" and described in modest detail.

A glance through the book revealed that 90% of the certificates are probably unknown to North American SWL's. And, unfortunately, "Uncle Chris" doesn't include enough information on how the certificates are earned, or the addresses of the sponsors.

However, the "Certificate Guide" is better

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SHORT-WAVE ABBREVIATIONS

anmt—Announcement	QRN—Station interference
BBC—British Broadcast- ing Corporation	QRN—Atmospheric dis- turbance
B/C—Broadcasting	QSL—Verification
Eng.—English	R.—Radio
ID—Identification	s/off—Sign-off
IS—Interval signal	s/on—Sign-on
kHz—Kilohertz	VOA—Voice of America
kW—Kilowatts	xmsn—Transmission
N.A.—North America	xmtr—Transmitter

than nothing; so if you speak one or two foreign languages and are an avid SWL, get a copy. The cost is only \$1 (cash, please), or seven IRC's. Write to Christian Zangeri, OE9CZL, A-6850 Dornbirn I., Nachbauerstrasse, Austria.

No More MST. The National Bureau of Standards stations, WWV and WWVH, are now announcing time signals in Greenwich Mean Time (GMT), or Universal Time (UT). Heretofore, all time announcements were in the local standard time of the transmitting site.

CURRENT STATION REPORTS

The following is a resume of current reports. At time of compilation all reports are as accurate as possible, but stations may change frequency and/

SHORT-WAVE CONTRIBUTORS

William Horsch (WPE1GVP), Rockland, Mass.
 William Graham (WPE2LMU), Binghamton, N. Y.
 Roger Green (WPE2NFC), Bronx, N. Y.
 Bruno Colapietro (WPE2OWO), Endicott, N. Y.
 Bernard Lansing (WPE2PBA), Rochester, N. Y.
 John Banta (WPE2PIU), Bay Shore, N. Y.
 William Cangemi (WPE2PII), Staten Island, N. Y.
 William Via (WPE3FHB), Baltimore, Md.
 Bob Huber (WPE3GUN), Wilmington, Del.
 Warren Klein (WPE3HCB), Philadelphia, Pa.
 Grady Ferguson (WPE4BC), Charlotte, N. C.
 Chuck Edwards (WPE4BNK), Fort Lauderdale, Fla.
 Dan Henderson (WPE4GW), Laurel, Md.
 Jimmy Hale (WPE4JBU), Roanoke Rapids, N. C.
 Edward Shaw (WPE4JHP), Roanoke, Va.
 Henry Massey (WPE4JKH), Fayetteville, N.C.
 Larry Rab (WPE5EPG), Houston, Texas
 Don Kenney (WPE6AET), Westminster, Calif.
 Jim Young (WPE6ENA), Wrightwood, Calif.
 Trevor Clegg (WPE6FAF), Fresno, Calif.
 Harold Chavis (WPE6GOL), Monterey, Calif.
 Glen Whitney (WPE6GQV), Canoga Park, Calif.
 Philip Green (WPE6GRC), Northridge, Calif.
 John Sears, Jr. (WPE7CNZ), Bellevue, Wash.
 Andrew Cooper (WPE8JNC), Westland, Mich.
 Bill Vogt (WPE3IND), Tinsley Park, Ill.
 A. R. Niblack (WPE9KM), Vincennes, Ind.
 John Beaver, Sr. (WPE0AE), Pueblo, Colo.
 Richard Wendt (WPE0EY), Ittichinson, Minn.
 Ervin Ramos (KP4PE2O), San Antonio, P. R.
 Jack Perolo (PY2PE1C), Milwaukee, Wis.
 Don Wright (VE2PE1KZ), Pierrefonds, Que., Canada
 Michael Wilson (VE6PE4N), Calgary, Alta., Canada
 David Alpert, Morton Grove, Ill.
 Leo Alster, Rahway, N. J.
 Thomas Berhalter, Englewood, N. J.
 John Bigley, Lewistown, Mo.
 Michael Bishop, Chardon, Ohio
 Thomas Rohrs, Sacramento, Calif.
 B. L. Manohar, Lucknow, India
 Cliff Nyling, Diablo, Calif.
 Elliott Sharp, White Plains, N. Y.
 Radio Canada, Montreal, Que., Canada
 Radio Praha, Prague, Czechoslovakia
 Station HCJB, Quito, Ecuador
 Radio Budapest Short-Wave Club, Budapest, Hungary
 Sweden Calling DX'ers Bulletin, Stockholm, Sweden
 Radio Thailand, Bangkok, Thailand

POPULAR ELECTRONICS

or schedule with little or no advance notice. All times shown are Greenwich Mean Time (GMT) and the 24-hour system is used. Reports should be sent to **SHORT-WAVE LISTENING**, P.O. Box 333, Cherry Hill, N.J., 08034, in time to reach your Short-Wave Editor by the fifth of each month; be sure to include your WPE identification, and the make and model number of your receiver. We regret that we are unable to use all the reports received each month, due to space limitations, but we are grateful to everyone who contributes to this column.

Afghanistan—*R. Kabul* is noted on 15,265 kHz at 1730-1800 in German with news or commentary. According to one overseas source, the station has experimental xmsns to Europe at 1830-1930 in Eng., German and French, and at 1400-1430 and 1700-1730 in Russian, all on 6170 and 7225 kHz.

Australia—"DX Party Line" (HCJB, Ecuador) reports that *R. Australia* plans two new high-powered xmtrs in Darwin, Northern Territory, for use to N.A. on 15,320 and 17,840 kHz at 0100-0300 and to Africa at 0330-0515 on 15,320 and 17,820 kHz.

Austria—Vienna, 11,760 kHz, is heard at 0154 with IS of "Blue Danube" and ID in the usual four languages, and on 15,400 kHz at 1300-1310 with Strauss waltzes and German language to Japan. The 9770- and 6155-kHz channels are usually fair to good to Eastern N.A. from 0100 with classical and orchestral music and German language.

Belgium—DX'ers who find this country difficult to log should look for Brussels, 9615 kHz, at 2115-2300 with alternating French and Dutch to ships at sea in the North Atlantic.

Bolivia—A station being heard on 5975 kHz at 1045-1058 with Latin American pop music is believed to be CP44, *R. Nacional LAB*, Cochabamba, although it is not listed for operation at this time.

Canada—A portion of *R. Canada's* new schedule reads: to N. A. and the Antilles at 1215-1313 in Eng, on 11,720 and 9625 kHz, and at 1316-1342 on 11,720 kHz in French. The Caribbean and Latin American Service is at 2258-2330 in Eng., at 2330-0000 in Portuguese, at 0000-0046 in Spanish, all on 15,190, 11,945, and 9625 kHz. Service to Northern Canada is at 0058-0230 in Eng. and Eskimo on 15,190, 11,720, and 9625 kHz; at 0230-0706 in Eng., French and Eskimo on 9625 kHz (and on 11,720 kHz at 0230-0557 and 0632-0706); at 1055-1212 on 9625 kHz, at 1516-1529 and 1631-1659 on 15,365 kHz, and at 2158-2250 on 17,820, 15,190, and 11,720 kHz, all in Eng. and French.

Czechoslovakia—English from Prague is now scheduled to Europe at 1200-1230 on 9560, 11,960, & 15,285 kHz, and at 1900-1930 on 5930 and 7345 kHz; to Africa at 1530-1630 on 11,990, 15,285, 17,840, and 21,735 kHz (and on 6055 kHz to Europe), and at 1730-1830 on 5930, 7345, 11,990, 17,840, and 21,620 kHz; to the Far East and Australia at 0700-0800 on 9550, 15,310, 21,450, and 21,700 kHz (and on 6055 kHz to Europe). Xmsns to N.A. are scheduled at: 1330-1400 in Czech and Slovak and at 1400-1500 in Eng., both Sundays only, on 15,448, 17,705, and 21,450 kHz, at 0100-0200 in Eng. on 7345, 11,990, 15,368, and 17,840 kHz, at 0300-0330 in Czech and Slovak and at 0330-0430 in Eng. on 5930, 7345, 11,990, and 15,368 kHz. English xmsns on the medium waves are scheduled at 2200-2230 on 1286 kHz and at 2305-2330 on 1097 kHz.

Dominican Republic—Station *HIMS. R. Cristal*, 570 kHz, has begun operations on 5010 kHz, 800 watts, at 1100-0500. Mr. Nobel Alfonso, Director, wants reports, and return postage is not required. Tapes at 7½ or 3¼ inches per second are acceptable. The address is: *Radio Cristal*, Apartado 1322, Santo Domingo, D. R. This station was monitored in the Middle West on 5017 kHz and later on 5005 kHz.

Ecuador—A weak station on 4830 kHz, heard with typical native music around 0300, is tentatively listed as *Ondas del Angel*; further checks are being made. *R. Iris*, Esmeraldas, has moved up to 3379 kHz, with time checks, ads. and a lengthy

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DX COUNTRIES AWARDS PRESENTED

To be eligible for one of the DX Countries Awards designed for WPE Monitor Certificate holders, you must have verified stations in 25, 50, 75, 100, or 150 different countries. ("Letters of Certification" will be issued to those who have over 150 countries verified in steps of 10.) The following DX'ers recently received their awards.

ONE HUNDRED AND SIXTY COUNTRIES VERIFIED

Chuck Edwards (WPE4BNK), Fort Lauderdale, Fla.

ONE HUNDRED AND FIFTY COUNTRIES VERIFIED

William Sparks (WPE6EXV), San Francisco, Calif.
Paul Kilroy (WPE3FOB), Washington, D.C.

ONE HUNDRED COUNTRIES VERIFIED

James Neff (WPE2RS), Springville, N.Y.
Bernard Hughes (G2PE6D), Worcester, Worcester-shire, England
C. T. Ashley (WPE4ION), Ashland, Ky.

SEVENTY-FIVE COUNTRIES VERIFIED

John Sgrulletta (WPE2MXF), Bedford Hills, N.Y.
Mike Finigan (WPE4ISQ), Monroe, N. C.
Paul Slater (WPE1FRT), Medford, Mass.

FIFTY COUNTRIES VERIFIED

James Ritter (WPE8ICY), Willowick, Ohio
John Allen (WPE0DXW), Pueblo, Colo.
Mrs. Marion Lilienthal (VE3PE2DO), Waterloo, Ont., Canada

David Lalor (WPE5EIQ), Corpus Christi, Texas
John Shoptaw (WPE0EPO), Morehouse, Mo.
Tim Frost (G2PE6A), Goodmayes, Essex, England
Roger Vincent (VE2PE1GW), Tracy, Que., Canada
Bob Gross (WPE2NNH), South River, N. J.
Robert Harris (WPE2MHG), Syosset, N. Y.
Robert Mackintosh (VK2PE2K), Penrith, N.S.W., Australia

Robert Brandt (WPE2NQP), Madison, N. J.
Robert Getman (WPE9INA), Racine, Wis.
Jimmy Bell (WPE3CLM), Chester, Pa.
Wayne Harrell (WPE5EKB), El Dorado, Ark.
Charles Rasin (WPE2ORL), Bloomfield, N. J.
Harold Davis (WPE1GWU), Springfield, Mass.
Richard Ardini (WPE1GVT), Medford, Mass.
Charles Burgess (WPE5EQC), Little Rock, Ark.
Bert Pestor (VE3PE9L), Sudbury, Ont., Canada
Richard Sawyer (WPE6CFL), San Francisco, Calif.
Bill Migley (WPE8JEL), Lancaster, Ohio
Timothy Armstrong (WPE6GGJ), Suisun, Calif.
Jerry Hagen (WPE6AME), Covina, Calif.
Ronald Hartwig (WPE5ELA), Midland, Texas
Samuel Gold (WPE6DXA), San Francisco, Calif.
Dennis Eksten (WPE9DT), Loves Park, Ill.
George Sprout (WPE3GMW), Reading, Pa.
Edward Suffern (WPE4IUZ), Jacksonville, N. C.
Jay Hans (WPE2NGJ), White Plains, N. Y.
Dr. Kendall Porter (WPE0EVD), Overland Park, Kan.
Charles Milhans (WPE7COE), Tacoma, Wash.

TWENTY-FIVE COUNTRIES VERIFIED

W. E. Raczko (WPE8JBT), Toledo, Ohio
Ted Wozniak (WPE9INH), Chicago, Ill.
John Winman (WPE1GMZ), Providence, R. I.
Neil Browning (VE2PE1KL), Beaconsfield, Que., Canada
Juris Burkevics (WPE7CLJ), Fircrest, Wash.
William Pead (WPE1GTG), S. Hadley, Mass.
Dan Parrish (WPE5EEC), Ballinger, Texas
Douglas Byron (WPE4IWZ), Sarasota, Fla.
Paul Kadin (WPE2NPS), White Plains, N. Y.

J. R. Miller (WPE7CIA), Tigard, Ore.
Gerald Reid (VE6PE7E), Calgary, Alta., Canada
Tim Poe (WPE4HMU), Kingsport, Tenn.
Richard Spritz (WPE3GGE), Elkins Park, Pa.
Robert Holbrook (WPE2LQP), Laconia, N. H.
Gary Grove (WPE8IXN), Canton, Ohio
Marc Joseph (WPE8IOP), Lyndhurst, Ohio
Ernest Armstrong (WPE5OL), Odessa, Texas
Bill Lee (WPE0EJX), Neodesha, Kan.
Mitchell Hyman (WPE2OPK), Brooklyn, N. Y.
Arthur W. Peterson (WPE6FMV), San Pablo, Calif.
Bill Rainey (WPE2PGO), Scotch Plains, N. J.
Elwin Young (WPE1BYL), Dorchester, Mass.
Donald Hughes (WPE6GGB), San Francisco, Calif.
Allan Kachel (WPE2NBH), Flushing, N. Y.
Rick Charnes (WPE2PBV), Cherry Hill, N. J.
David Fleishman (WPE3GXN), Baltimore, Md.
Peter Macinta, Jr. (WPE2ORB), Kearny, N. J.
John Conant (WPE2PCN), Cresskill, N. J.
Rick McNees (WPE9IDN), Munster, Ind.
Kevin Slater (WPE7CNF), Salem, Ore.
Ervin Ramos (KP4PE20), San Antonio, P. R.
Edward Hula, Jr. (WPE4IKD), Merritt Island, Fla.
Larry Guthrie (WPE9IDY), Chicago, Ill.
Robert Willson (WPE1GUW), Allston, Mass.
Jimmy Bell (WPE3CLM), Chester, Pa.
James Hastie (VE3PE2JW), Don Mills, Ont., Canada
John Karien (WPE3GOC), Franklin, Pa.
Tim Mersky (WPE5EMA), Dallas, Texas
Robert Wright, Jr. (WPE8JCF), Brighton, Mich.
Dennis Goh (9V1PE1A), Singapore
James Smith (WPE4IJJ), Cynthia, Ky.
Kerry Plantenga (WPE9ITC), Lafayette, Ind.
Karl Purins (WPE9IJL), Waawatosa, Wis.
John Sawhill, Jr. (WPE1GPN), New Canaan, Conn.
Charles Milhans (WPE7COE), Tacoma, Wash.
William King (WPE4JGY), Panama City, Fla.
Danny Jamison (WPE4JEK), Richmond, Va.
Ron Sibbitt (VE3PE2HB), Cooksville, Ont., Canada
Douglas Hammock, Jr. (WPE0EOF), Morehouse, Mo.
Philip Jones (WPE2OMI), Vestal, N. Y.
N. Douglas Grant (WPE1GZQ), Canton, Mass.
David Green (WPE4IUM), Pensacola, Fla.
John Stevenson (WPE9GNU), Delavan, Wis.
John Kovac (WPE1GXI), Trumbull, Conn.
Steven Lipman (WPE2OYE), Vineland, N. J.
Sheldon Chorney (WPE2AWZ), Brooklyn, N. Y.
James Thornton (WPE6ATU), Venice, Calif.
Don Wright (VE2PE1KZ), Pierrefonds, Que., Canada
Glen Whitney (WPE6GQY), Canoga Park, Calif.
Harold Levy (WPE2PNN), Brooklyn, N. Y.
Alvin Pollock (WPE4IRE), Clinton, N.C.
Larry Garrett (WPE6GOV), Norwalk, Calif.
Donald Herbert (WPE3GGZ), Warmminster, Pa.
Charles Altschul (WPE4JAD), Greensboro, N. C.
John Barnes (WPE7CMJ), Harlem, Mont.
John Stevens (WPE9INP), Bloomington, Ill.
Wayne Walls (WPE8JKV), Dearborn, Mich.
Robert Platt (WPE9HZL), Elk Grove Village, Ill.
John Beckerle, Jr. (WPE0EZD), St. Charles, Mo.
Roger Thering (WPE6FUB), Barstow, Calif.
Wayne La Valla (WPE3HCC), Pittsburgh, Pa.
Steve Harper (WPE0FBT), St. Louis, Mo.
Jim Clark (WPE3HCU), Enon Valley, Pa.
H. M. Edwards, Jr. (WPE4JHV), Norfolk, Va.
Roger Dooley (WPE2PKT), Buffalo, N. Y.
Stanley Benson (WPE2PQH), Bronx, N. Y.
David Kaiser (WPE3HBK), Eighty Four, Pa.

news period from 0330 to 0400. Station HCVS6. *La Voz de Sasquisilí*, Sasquisilí, is audible on 4900 kHz after the Venezuelan s/off; they may have lengthy listener request programs to past 0600. Station HCAH3, *R. Trebol*, Zaruma, has been noted again with the usual Ecuadorian folkloristic music around 0300 on 4916 kHz.

El Salvador—A new relay station of *Deutsche Welle* (Cologne, West Germany) will be erected in this country. There will be two 250-kW xmtrs, one 150-kW unit (presumably for the short waves), and one 100-kW unit for the medium waves. No other details are currently available.

Ethiopia—*V. of Ethiopia*, Addis Ababa, is now on 7290 kHz and has a new opening time of 0330, with IS followed by native language and music.

Formosa—*Voice of Free China*, Taipei, on 7130, 15,125, 15,345, 17,720, 17,775, and 17,890 kHz, now opens in Eng. at 0200, making this xmsn 110 minutes in length.

France—Paris is heard with French to the Caribbean at 2100-2200 on 15,130 kHz, but generally is only weak to fair. A new frequency being used for Latin America is 17,730 kHz, noted at 2310 with news in Spanish, and from 2315 in Portuguese. News in Eng. can be heard around 0515-0535, with some sports results given.

Germany (East)—Two new frequencies in use by *R. Berlin International* are 9675 kHz to N.A. from 0300, and 11,785 kHz at 0000-0030 in German to Latin America.

Greenland—Godthaab is heard in Greenlandic on 3999 kHz under heavy ham radio QRM, with the signal peaking around 0100. They QSL with a colored picture folder of the station.

Hong Kong—*R. Hong Kong*, Hung Hom, was logged in the East on 3940 kHz around 1045 with Chinese vocal music and possibly a religious broadcast. You'll have to tune very carefully for this one!

India—*All India Radio*, New Delhi, has been heard on 9915 kHz at 1745-2230 daily with Eng. news and variety programs; on 11,810 kHz with news at 1339, a commentary to 1344, program

DX Award Honor Roll

The following DX'ers have qualified for the DX Award Honor Roll. The figures at the right indicate the number of countries, states, and Canadian provinces verified, in that order.

Chuck Edwards (WPE4BNK) Fort Lauderdale, Fla.	160	50	10
Ed Fellows (WPE7BLN) Seattle, Wash.	200	0	12
James Young (WPE6ENA) Wrightwood, Calif.	150	50	12
L. E. Kunej (WPE8AD) Detroit, Mich.	150	50	10
Paul Kilroy (WPE3FDB) Washington, D. C.	150	50	8
Richard Markell (WPE6DXC) Los Angeles, Calif.	150	50	0
Frank Scolaro, Jr. (WPE2LUZ) Yonkers, N. Y.	150	50	0
Nathan Rosen (WPE2CY) New York, N. Y.	150	50	0

schedules and chanting until 1356; and on 15,165 kHz with Indian music at 2205-2230.

Lebanon—Beirut has been noted opening at 2300 in Portuguese to South America on 15,325 kHz.

Malaysia—Kuala Lumpur broadcasts their overseas service on 6175 kHz at 1145-1215. The 11,910-kHz channel has been logged with Eng. news at 1130.

Mexico—Of present and future interest are test broadcasts by the Mexican Olympic Committee. These consist of a test tape in Spanish in the style of radiotelephone outlets. The tape does not mention Mexico City by name but makes it clear that the broadcasts originate there by referring to "la capital azteca"—the Aztec capital. The most

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recent xmsn was noted with a good signal on 5030 kHz at 0500. These xmsns are probably forerunners of direct broadcasts from the 1968 Olympics which will be held in Mexico City.

Netherlands Antilles—*Trans World Radio*, Bonaire, was noted at 2200-2215 on 11,780 kHz with a religious program in French; at 0000-0100 on 15,130 kHz to Central and South America in Portuguese (to 0010) & Spanish; and on 11,820 kHz at 0030-0100 in Eng. for the Western Hemisphere.

New Guinea—West Coast loggings include: Station VL8BD, *R. Daru*, 3305 kHz, with American "Western" tunes at 1018 and anmts in Indonesian or Pidgin; VL9CD, *Wewak*, 3335 kHz, just barely readable at 1010 due to poor modulation; and VL9BR, *R. Rabaul*, 3385 kHz, also barely audible under heavy teletype QRM at 1009-1015 with music and anmts in an unidentified language.

Philippines—The Far East B/C Co., Manila, has been making a special test xmsn in Eng. beamed to Great Britain on 11,855 kHz (dual to 15,160 kHz but not audible on that frequency) with band concert recorded music and a full ID every five minutes. This special xmsn has been closing at 1830 after a request for reports to be sent to FEBC, Box 2041, Manila, P. I.

The Philippines B/C Service has been tuned on 6165 kHz with a full hour of Eng. news at 1030-1130.

Qatar—An excellent Australian source states that this country will become the site of one 100-kW short-wave and one 10-kW medium-wave xmtr scheduled for operation in 1968, all Arabic. The sheikdom of Qatar, whose population is around 50,000, and whose capital city is Doha, is located in the Arabian Gulf area. Further details will be given when they are available.

Sao Tome—*R. Portugal*, Lisbon, has introduced its first relay station. Since April 1, all programs in Eng. and French to Africa are being rebroadcast by a 10-kW xmtr on the island of Sao Tome on 4807 kHz with Eng. at 2145. Reports may be sent to either Lisbon or Sao Tome; a special QSL card is being prepared. Many DX'ers will be able to add a new country to their log—Sao Tome.

Thailand—*R. Thailand*, Bangkok, operates in Eng. to N. A. at 0415-0515 on 11,910 kHz, although some DXers have logged this station as high as 11,922 kHz. News is given at 0425. The only other Eng. xmsn in the latest schedule is another news period in the General Overseas Service at 1030-1045 on 6160, 7185, and 11,910 kHz. The station is requesting reports and return postage is not required. The address is: Overseas Broadcasting Division, Public Relations Department, Bangkok, Thailand.

U.S.S.R. (Ukraine)—*R. Kiev* is using this summer schedule: to N. A. at 0030 on 15,460, 12,030, 11,980, 11,900, and 11,750 kHz, and at 0430 on 12,030, 11,900, 11,850, and 11,750 kHz. There is Eng. to Europe at 1900 on 12,020, 11,760, and 11,730 kHz. These xmsns are on Mondays, Thursdays and Saturdays only.

Zambia—Lusaka was logged at 0510 with Eng. news and a definite ID of "This news is coming to you from *Radio Zambia*." Following the news, there was pop and native music. Don't confuse this station with Accra, Ghana, with s/on at 0530 on 4915 kHz. You may have to tune carefully; the signal is generally weak and often suffers considerable QRN.

Clandestine—On around 0530, *Radiofonikos Stamos i Foni Alithias*, 6215 kHz, can be heard with excellent modulation, although it is often QRM'ed by a utility activity. According to one reliable overseas source, these Greek-speaking programs are produced in East Germany and probably transmitted from Bulgaria.

Azad Kashmir Radio signs on at 1130 on 3965 or 3980 kHz and signs off before 1745; on one occasion, it was noted as low as 3625 kHz. Location reportedly is Muzafferabad. The station relays news from *R. Pakistan* and occasionally plays Indian film records not using an ID.

DP 6-12

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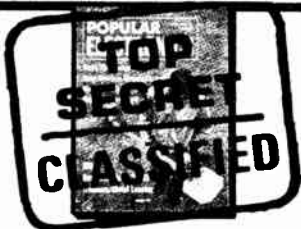
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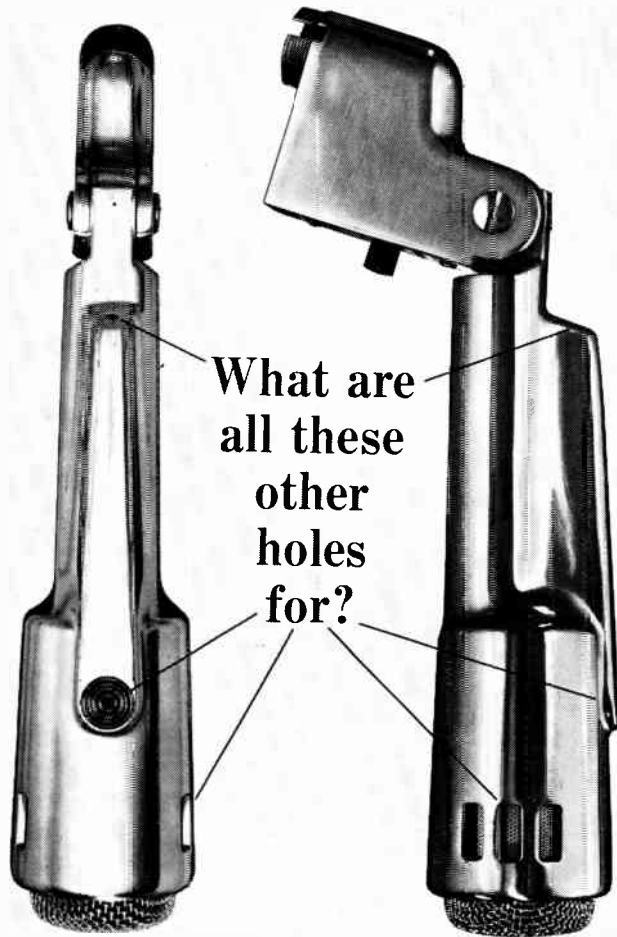
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