SPECIAL COMMUNICATIONS ISSUE

POPULAR ELECTRONICS

AUGUST 1967

50 CENTS

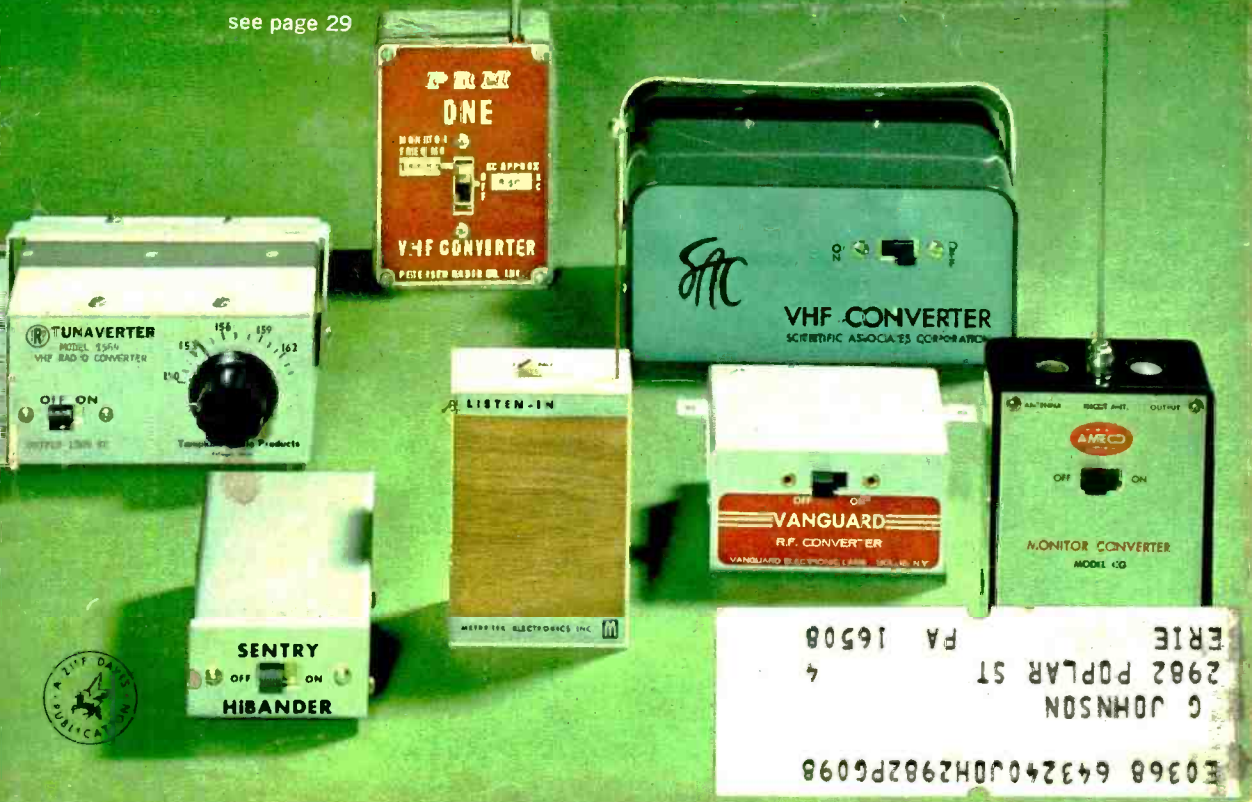
all about **POLICE** converters

- What's New in CB Gear
- Ham Equipment Report

plus:

- Build Dry Cell Recharger
- Build R/C Commander
- Grounding Improves DX

see page 29



GET A FASTER START IN THE COURSE YOU CHOOSE WITH NRI'S REMARKABLE ACHIEVEMENT KIT

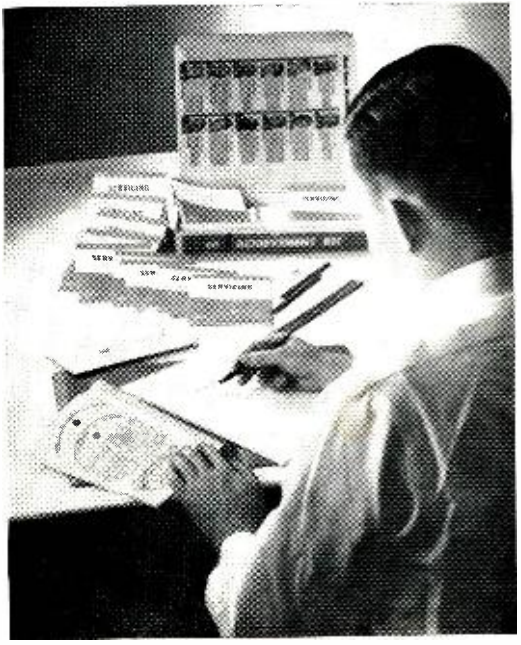
When you enroll with NRI we deliver to your door everything you need to make a significant start in the Electronics field of your choice. This remarkable, new starter kit is worth many times the small down payment required to start your training. And it is only the start . . . only the first example of NRI's unique ability to apply 50 years of home-study experience to the challenges of this Electronics Age. Start your training this exciting, rewarding way. No other school has anything like it. What do you get? The NRI Achievement Kit includes: your first set of easy-to-understand "bite-size" texts; a rich, vinyl desk folder to hold your training material in orderly fashion; the valuable NRI Radio-TV Electronics Dictionary; important reference texts; classroom tools like pencils, a ball-point pen, an engineer's ruler; special printed sheets for your lesson answers—even a supply of pre-addressed envelopes and your first postage stamp.

Learning electronics at home is faster, easier, more interesting with new achievement kit

Only NRI offers you this pioneering method of "3 Dimensional" home-study training in Electronics, TV-Radio . . . a remarkable teaching idea unlike anything you have ever encountered. Founded more than half a century ago—in the days of wireless—NRI pioneered the "learn-by-doing" method of home-study. Today, NRI is the oldest, largest home-study Electronics school. The NRI staff of more than 150 dedicated people has made course material entertaining and easy to grasp. NRI has simplified, organized and dramatized subject matter so that any ambitious man—regardless of his education—can effectively learn the Electronics course of his choice.

DISCOVER THE EXCITEMENT OF NRI TRAINING

Whatever your reason for wanting knowledge of Electronics, you'll find the NRI "3 Dimensional" method makes learning exciting, fast. You build, test, experiment, explore. Investigate NRI training plans, find out about the NRI Achievement Kit. Fill in and mail the postage-free card. No salesman will call. NATIONAL RADIO INSTITUTE, Electronics Division, Washington, D. C. 20016



ELECTRONICS COMES ALIVE AS YOU LEARN BY DOING WITH CUSTOM TRAINING EQUIPMENT

Nothing is as effective as learning by doing. That's why NRI puts so much emphasis on equipment, and why NRI invites comparison with equipment offered by any other school, at any price. NRI pioneered and perfected the use of special training kits to aid learning at home. You get your hands on actual parts like resistors, capacitors, tubes, condensers, wire, transistors and diodes. You build, experiment, explore, discover. You start right out building your own professional vacuum tube voltmeter with which you learn to measure voltage and current. You learn how to mount and solder parts, how to read schematic diagrams. Then, you progress to other experimental equipment until you ultimately build a TV set, an actual transmitter or a functioning computer unit (depending on the course you select). It's the practical, easy way to learn at home—the priceless "third dimension" in NRI's exclusive Electronic TV-Radio training method.

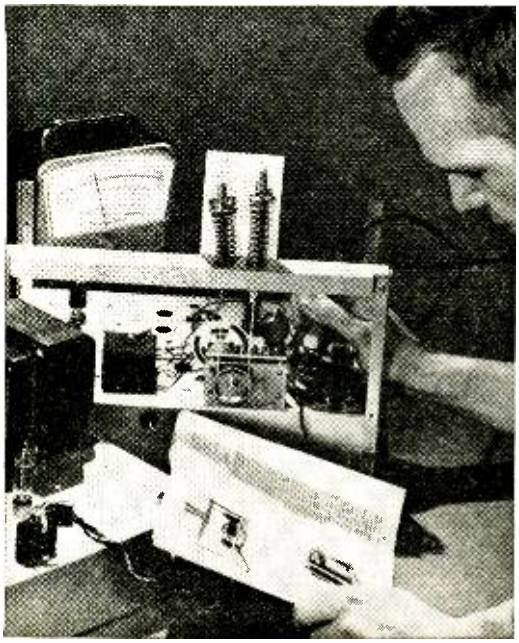
SIMPLIFIED, WELL-ILLUSTRATED "BITE-SIZE" LESSON TEXTS PROGRAM YOUR TRAINING

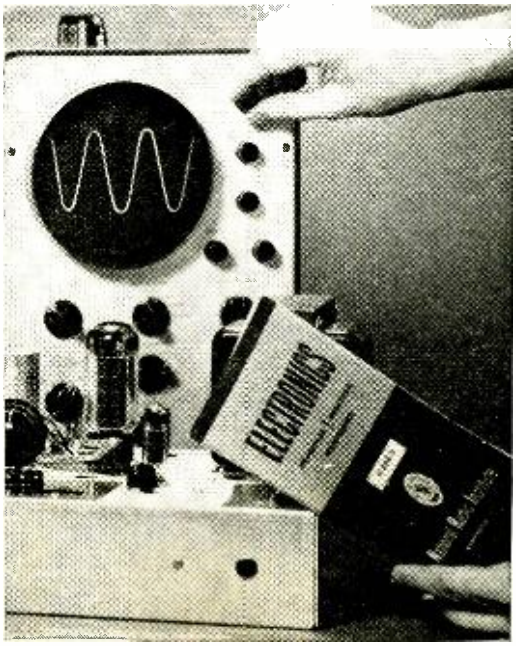
Lesson texts are a necessary part of training, but only a part. NRI's "bite-size" texts are as simplified, direct and well-illustrated as half a century of teaching experience can make them. The amount of material in each text, the length and design, is precisely right for home-study. NRI texts are programmed with NRI training kits to make things you read come alive. As you learn, you'll experience all the excitement of original discovery. Texts and equipment vary with the course. Choose from major training programs in TV-Radio Servicing, Industrial Electronics and Complete Communications. Or select one of seven special courses to meet specific needs. Check the courses of most interest to you on the postage-free card and mail it today for your free catalog.

Available Under NEW GI BILL

If you served since January 31, 1955, or are in service, check GI line in postage-free card.

custom training kits "bite-size" texts





POPULAR ELECTRONICS

WORLD'S LARGEST-SELLING ELECTRONICS MAGAZINE

VOLUME 27 **AUGUST, 1967** NUMBER 2

SPECIAL AMATEUR RADIO SECTION

SPECIAL CITIZENS BAND SECTION

FEATURE ARTICLES

DEPARTMENTS

POPULAR ELECTRONICS is indexed in the Readers' Guide to Periodical Literature

This month's cover photo by Conrad Studios, Inc.

POPULAR ELECTRONICS, *August 1967, Volume 27, Number 2. Published monthly at 307 North Michigan Avenue, Chicago, Illinois 60601. One year subscription rate for U.S., U.S. Possessions and Canada, $5.00; all other countries, $6.00. Second class postage paid at Chicago, Illinois and at additional mailing offices. Authorized as second class mail by the Post Office Department, Ottawa, Canada and for payment of postage in cash. Subscription service: Portland Place, Boulder, Colorado 80302. Editorial: One Park Ave., New York, N.Y. 10016.*

POPULAR ELECTRONICS

PHILLIP T. HEFFERNAN
Publisher

OLIVER P. FERRELL
Editor

LESLIE SOLOMON
Technical Editor

WILLIAM GALBREATH
Art Director

MARGARET MAGNA
Associate Editor

ALEXANDER W. BURAWA
Assistant Editor

ANDRE DUZANT
Technical Illustrator

NINA KALAWSKY
PATTI MORGAN
Editorial Assistants

H. BENNETT, W2PNA
H. S. BRIER W9EGQ
L. E. GARNER, JR.
CHARLES J. SCHAUERS, W6QLV
M. P. SPINELLO, KHC2060
Contributing Editors

LAWRENCE SPORN
Advertising Sales Manager

ARDYS C. MORAN
Advertising Service Manager

ZIFF-DAVIS PUBLISHING COMPANY

Editorial and Executive Offices
One Park Avenue, New York, New York 10016
212 679-7200
Eastern Advertising Manager, RICHARD J. HALPERN

Midwestern Office
307 North Michigan Avenue, Chicago, Illinois 60601
312 726-0892
Midwestern Advertising Manager, JAMES WEAKLEY

Western Office
9025 Wilshire Boulevard, Beverly Hills, California 90211
213 CRestview 4-0265; BRadshaw 2-1161
Western Advertising Manager, BUD DEAN

Japan: James Yagi
Ishikawa Mansion
#4, Sakuragaoka
Shibuya-ku, Tokyo
462-2911-3

Circulation Office
Portland Place
Boulder, Colorado 80302

William B. Ziff, Chairman of the Board (1946-1953)
William Ziff, President
W. Bradford Briggs, Executive Vice President
Hershel B. Sarbin, Senior Vice President
Philip Sine, Financial Vice President
Walter S. Mills, Jr., Vice President, Circulation
Stanley R. Greenfield, Vice President, Marketing
Phillip T. Heffernon, Vice President, Electronics Division
Frank Pomerantz, Vice President, Creative Services
Arthur W. Butzow, Vice President, Production
Edward D. Muhlfeld, Vice President, Aviation Division
Irwin Robinson, Vice President, Travel Division

Ziff-Davis also publishes Airline Management and Marketing, Boating, Business & Commercial Aviation, Car and Driver, Cycle, Electronics World, Flying, HiFi/Stereo Review, Modern Bride, Popular Aviation, Popular Photography, Skiing, Skiing Area News, and Skiing Trade News. (Travel Weekly is published by Robinson Publications, Inc., a subsidiary of Ziff-Davis Publishing Company.)

All subscription correspondence should be addressed to POPULAR ELECTRONICS, Circulation Department, Portland Place, Boulder, Colorado 80302. Please allow at least six weeks for change of address. Include your old address, as well as new—enclosing if possible an address label from a recent issue.

EDITORIAL CONTRIBUTIONS must be accompanied by return postage and will be handled with reasonable care; however, publisher assumes no responsibility for return or safety of art work, photographs or manuscripts.

Member Audit Bureau of Circulations

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 prerecorded 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.

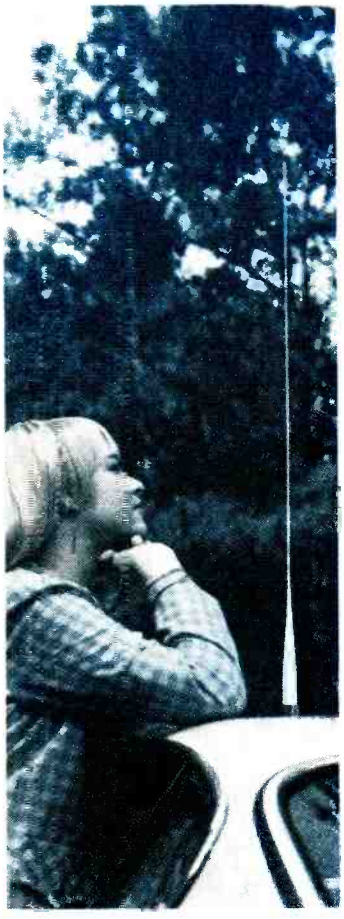
W. GREEN
Long Island City, N.Y.

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-

The PERFECT 36

BOLD...REVOLUTIONARY



The PERFECT 36 is a citizen's band breakthrough by Shakespeare's internationally famous engineer-designers. The easily installed, performance-shaped, 36-inch fiberglass roof-top mobile antenna has rugged solid-state construction and handsome rocketry design. And our patented parallel fiber process completely encloses this ultra-sensitive, space-age circuitry in a power-pack unit providing the maximum performance and range-expansion which "turns country miles into city blocks." Fiberglass perma-durability eliminates problems caused in other antennas by moisture, rain, dust, salt air, extreme cold, vibrations, abrasions, and other physical hazards. Fiberglass' flex-strength inhibits "set" damage on impact with doors, frames, low limbs, etc., insuring that our non-corrosive, anti-static antenna never gets "out of tune." In bringing this bold, new shape to the market, we made no compromise between performance and structural make-up. With The PERFECT 36 we have created tomorrow's finest antenna today.

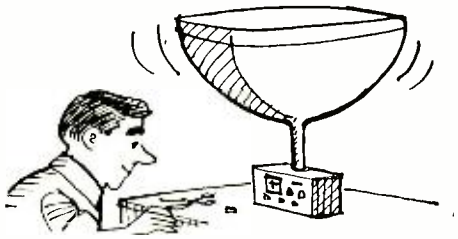
...count on Shakespeare GLASS FIBER WONDERSHAFT ANTENNAS

C/P Corporation — A Subsidiary of Shakespeare
RFD 3 Columbia, S. C. 29205

CIRCLE NO. 40 ON READER SERVICE PAGE

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 ⅛ 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.

CIRCLE NO. 12 ON READER SERVICE PAGE→

EICO innovation engineering creates a new breed of solid-state CB.

"Nova 23" All Solid State 23 Channel CB Transceiver—$189.95

WIRED ONLY

Two Years Ahead Of Its Time . . . EICO innovation engineering brings you a host of space-age advances — plus 4 exclusive engineering innovations — to give you a 1969 rig — in '67.

☐ EXCLUSIVE *Dual-crystal lattice filter* for advanced *razor-sharp selectivity* of reception.

☐ EXCLUSIVE Highly efficient *up-converter frequency synthesizer* provides advanced stability and freedom from trouble in all 23 crystal-controlled transmit-receive channels. You never need to buy any additional crystals.

☐ EXCLUSIVE Use of *precision series-mode fundamental crystals* for superior transmit and receive stability.

☐ EXCLUSIVE *New look for* '67. A perfect marriage of professionalisms — modern styling and human-engineering.

☐ For 12 VDC negative or positive ground for car/boat operation, or 117 VAC with optional solid state power supply (Model 791).

☐ Full 5 watts input — more than 3.2 watts RF output.

☐ Converts to 3.5 watt PA at the flick of a switch.

☐ All-silicon solid-state transmitter insures highest reliability.

☐ Automatic highly-efficient lossless noise limiter always in operation.

☐ Ruggedized military-type modular PC construction is proof against mobile vibration and shock.

☐ Rugged, removable "computer type" sealed relay for reliable burn-out proof switching.

☐ Advanced sensitivity; less than .5u V for 10db S/N ratio. (Hear those weak ones!)

☐ Advanced sensitivity squelch adjustable to 1u V. (No more missed calls!)

☐ Both driver and RF power amplifier 100% modulated for advanced maximum range, minimum distortion.

☐ Instant push-to-talk crystal-controlled operation. No warmup whatsoever required.

☐ Noise-cancelling mike and improved audio techniques make for superior "broadcast type" modulation.

☐ Extremely compact and lightweight — fits anywhere — base or mobile. Only 8" W, 3" H, 8¼" D. Weighs only 7 lbs.

EICO "Sentinel-Pro" (Model 779A) 23-channel dual conversion 5-watt CB Transceiver. New advanced big-reach **"Range Plus"** circuitry lengthens "talk-power" reach. Features include automatic noise limiter, "finger tip" antenna loading and transmitter tuning controls. 23 crystal-controlled transmit and receive channels — all crystals supplied. Transistorized 12VDC and 117 VAC dual power supply. **Wired only $169.95.**

FREE 1967 EICO CATALOG

PE-8

EICO Electronic Instrument Co., Inc.
131-01 39th Ave., Flushing, N.Y. 11352

Send me **FREE** catalog describing the full EICO line of 200 best buys, and name of nearest dealer. I'm interested in:

- ☐ test equipment
- ☐ stereo/hi-fi
- ☐ automotive electronics
- ☐ ham radio
- ☐ Citizens Band radio
- ☐ EICOCRAFT Kits

Name_____

Address_____

City_____

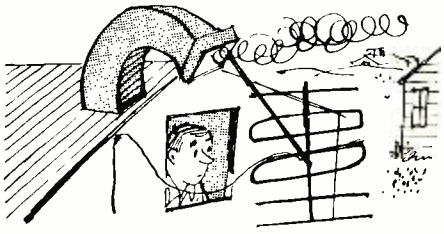
State_____ Zip_____

EICO Trans/Match (Model 715) is a professional test set that's designed for complete checking of both ham and CB equipment, enables you to obtain constant visual and/or audio indications of transmitter performance. Self-powered, it's excellent for both professional and hobbyist. Measure R.F. power output to 50 watts; Standing wave ratio (fwd. & ref. power); Ideal for antenna adjustment; Built-in dummy load. **Kit $34.95; Wired $44.95**

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 FRIIS, 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 μF 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.

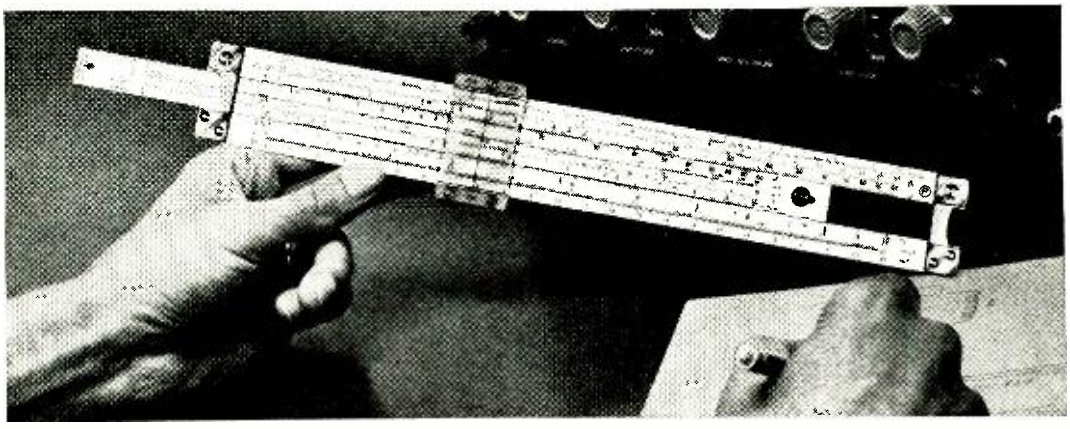
LOWELL LISKER
Warwick, R.I.

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.

Even if you've never had a slide rule in your hands before



...you can now start solving electronics problems fast with this new electronics slide rule and course

EVER ENVIED the way some fellows whip out a "slip stick" to solve a problem...instead of struggling through it with pad and pencil?

Now *you* can "outshine" them—even if you've never used a slide rule before.

With our exclusive new Electronics Slide Rule, you can do not only common mathematical calculations but also special *electronics* problems in resonance and reactance.

This is a professional slide rule in every detail, made for us by Pickett, Inc. It has two special scales for solving resonant frequency and inductive or capacitive reactance problems—or any problem involving the factor 2π. On the other side...a unique decimal point locator plus useful electronics formulas and conversion factors. Handsome leather carrying case has heavy-duty plastic liner, removable belt loop, flip-open cover.

With it you get four full-length AUTO-PROGRAMMED™ lessons which teach you with actual examples how to use it. These lessons are carefully designed to meet the same high educational standards as our famous electronics career courses. Each lesson will be personally graded, if you wish, by one of our expert instructors the same day it is received and returned with his comments.

To make friends with career-minded electronics men, we have deliberately underpriced the CIE Slide Rule and Course. The low cost will really surprise you.

Find out more. Send for free booklet. No obligation, of course. Mail coupon or write Dept. PE-135 at the address below.

CIE Cleveland Institute of Electronics
1776 East 17th Street, Cleveland, Ohio 44114

Acclaimed by Electronics Experts

"It opens a whole new era of quick calculations. Even if you never had a slide rule in your hands before, the four-lesson instruction course that is included takes you by the hand and leads you from simple calculations right through resonance and reactance problems with hardly a hitch."
—WAYNE LEMONS, *Radio-Electronics*

"Why didn't someone think of this before?...the slide rule saved me time the very first day. The 'refresher' course is a marvel of clarity. I couldn't help being amazed at how many standard formula functions I was performing the hard way."
—OLIVER P. FERRELL, Editor, *Popular Electronics*

"I was very intrigued by the 'quickie' electronics problem solutions. It is an ingenious technique. The special scales should be of decided value to any technician or engineer."
—JOSEPH J. DeFRANCE, Head of Electrical Technology Dept., New York City Community College

Mail this coupon for **FREE BOOKLET**

Cleveland Institute of Electronics
1776 East 17th Street, Cleveland, Ohio 44114

Please send me without charge or obligation your booklet describing the CIE Electronics Slide Rule and Instruction Course. ALSO FREE if I act at once: a handy pocket-size Electronics Data Guide.

Name_____
(please print)

Address_____

City_____ State_____ Zip_____

Accredited Member National Home Study Council
A Leader in Electronics Training...Since 1934.
PE-135

CIRCLE NO. 7 ON READER SERVICE PAGE

PARTS
METHODS
IDEAS
GADGETS
DEVICES

TIPS & TECHNIQUES

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 ¼" width (about $1.25) or ½" 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*

"SECRET SAFEGUARD SWITCH" PREVENTS UNAUTHORIZED USE OF CB TRANSCEIVER

Do you have friends who use your CB transceiver without your knowledge? If so, you can put a stop to it (and perhaps even prevent yourself from receiving a citation from the FCC) with an SSS (Secret Safeguard Switch). Just install an s.p.s.t. switch in series with the power switch in your transceiver and the power source, and mount it where it can't be seen or won't be noticed. Then all you need do is set the switch to *off* when your

POPULAR ELECTRONICS
READER SERVICE PAGE

You can get
additional information promptly
concerning
products advertised or mentioned
editorially
in this issue

1

Circle the number on the coupon below which corresponds to the key number at the bottom of the advertisement or is incorporated in the editorial mention that interests you.

2

Mail the coupon to the address indicated below.

3

Please use this address only for Product Service requests.

POPULAR ELECTRONICS
P. O. BOX 8391
PHILADELPHIA, PA. 19101

Please send me additional information about the products whose code numbers I have circled

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75
76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

NAME *(Print clearly)*_____

ADDRESS_____

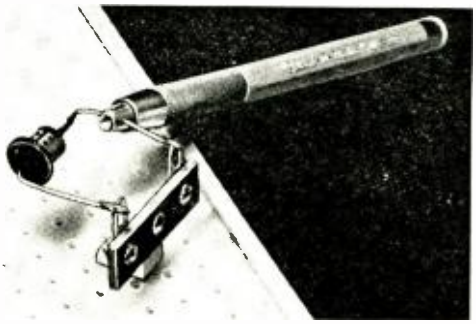
CITY_____ **STATE**_____ **ZIP CODE**_____

VOID AFTER SEPTEMBER 30, 1967 8

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

MECHANICAL DRAFTING PENCIL LENDS 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



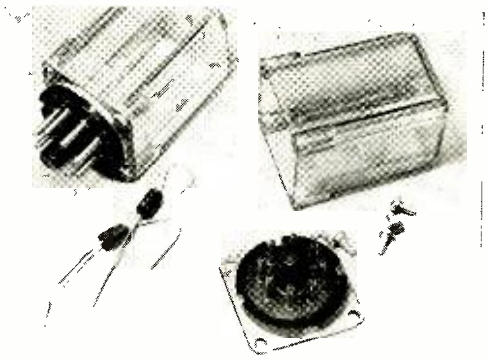
up things. To use the "pencil," simply depress the plunger at the top, and when the gripper jaws extend, clamp them over the part to be heat-sinked or picked up. Then release the plunger. After the work is done, depress the plunger again to release the jaws. You'll find that this "tool" is a real time-saver 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

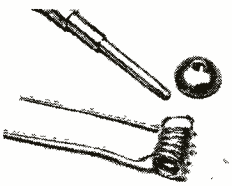
When updating a power supply from tubes to silicon rectifiers, you can use a plug-in relay dust cover (similar to the Potter and Brumfield 35D070) to house the parts and protect



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 concentrically 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*

CIRCLE NO. 18 ON READER SERVICE PAGE→

Kaar moves CB 2-way radio ahead... by 5 years

KAAR SKYHAWK MARK II / *and the new* KAAR SKYLARK

now!

SEVEN COLOR OPTIONS

MOVE UP to SKYHAWK

ALL SOLID-STATE HAND-SPAN CB UNIT WITH 23 CHANNELS

Sleek chrome and epoxy wood-grain beauty right at your finger-tips. Does a round-the-clock, workhorse job on commercial pick-up trucks, farm tractors or bouncing jeep, yet enhances any personal car for a life-time.

Complete with power cable, mounting bracket, crystal for channel 9 ..... 219.95
Optional: 6-pak crystals 15.95
22-pak crystals 49.95
(Only one crystal required per channel)

Only from Kaar Dealers! These exciting color panel options to match your interior at home, office, or vehicle dashboard.

Wood grain panel (as shown) standard on Skyhawk
Black panel (as shown) standard on Skylark
Color panels, optional $1.95

MOVE AHEAD to SKYLARK

ALL SOLID-STATE HAND-SPAN CB UNIT WITH 11 CHANNELS

Get all the features of the Skyhawk in this 11-channel powerhouse. Has the famed Skyhawk power-packed transmitter and ultra-efficient receiver. Instantly ready for commercial truck or personal use, farm tractor work or cross-country jeep workouts.

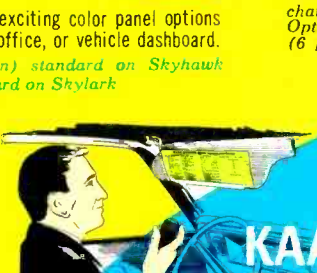
Complete with power cable, mounting bracket, crystal for channel 9 ..... 179.95
Optional: 6-pak crystals (6 pair) 31.95

GUARANTEED by KAAR for TWO FULL YEARS

"For two years after purchase, Kaar Electronics Corporation will repair a KAAR 336 Skylark or 337 Skyhawk Mark II transceiver without cost to the original purchaser when returned to a factory service center, provided the failure has occurred in normal use due to faulty materials or workmanship."

NO OTHER TRANSCEIVER GIVES YOU ALL THESE SPACE AGE COMPONENTS...

- Tantalum capacitors
- Sealed plug-in relay
- Filtered power leads
- Paging
- External speaker jack
- Illuminated signal level meter with dynamic modulation indication (Skyhawk)
- Glass epoxy circuit board
- Provision for plug-in selective call
- Amplified Zener diode voltage regulator
- 2⅝" high x 6½" wide 9¼" deep



now yours!

This exciting new

KAAR CB VISOR COMMUNI-CARD

MAIL COUPON TODAY WITH 25¢ (coin only)

PRINTED ON HEAVY PLASTIC. Fits neatly on your visor—ready for instant use. Includes 10 CODE (from 10-1 to 10-99) plus space to write in CALL LETTERS and NAMES . . . plus EMERGENCY OPERATING RULES and CHANNEL NOTATION SPACE.

Kaar Electronics Corporation
2250 Charleston Rd. PE
Mountain View, California 94040

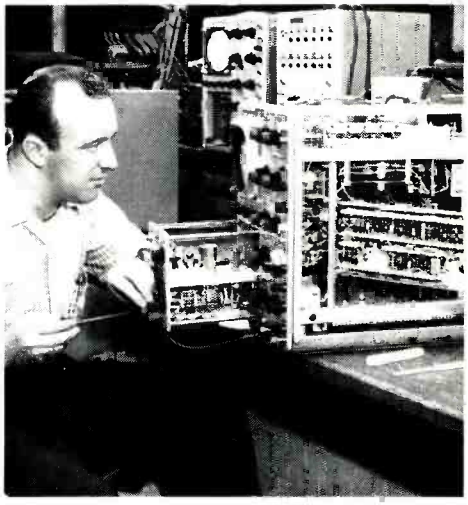
Gentlemen: I enclose 25¢ in coin to cover mailing and handling cost of my plastic **CB VISOR COMMUNI-CARD.**
I use CB as follows: Personal ☐ Business ☐

NAME_____

STREET_____

CITY_____ STATE_____ ZIP_____

TAKE THE FIRST BIG STEP TOWARD A REWARDING CAREER IN ELECTRONICS



Mail card to RCA Institutes today

Thousands of well paid jobs for Electronics Technicians are unfilled now

RCA Institutes Can Train You— At Home—And Help You Qualify For This Work

It's a sad, but true, fact that today, with so many men yearning for better jobs and better incomes, thousands of well paid jobs are unfilled in the vast electronics industry.

Many of the men who could fill these jobs — that is, men with the aptitude and native interest to enjoy a career in electronics—are handicapped because for one reason or another they have not had the opportunity to train themselves for these lucrative positions.

NOW— THANKS TO RCA INSTITUTES HOME STUDY— YOU CAN TRAIN FOR A CAREER IN ELECTRONICS

Realizing that thousands of technical jobs—well paid jobs—in electronics are going unfilled each week, RCA Institutes has done something positive about the problem. To benefit the electronics industry, with its crying need for trained men . . . and to help men who really want to move into a well paid electronics job, RCA Institutes offers an ideal home training program!

HOME STUDY CAN PROVIDE CAREER OPPORTUNITIES!

To help meet the need for qualified men in the electronics field, RCA Institutes has created a wide variety of Home Training Courses, all aimed toward a profitable, exciting electronics career in the shortest possible time. Included are exclusive "Career Programs" designed to train you quickly for the job you want! Your study program is supervised by RCA Institutes experts who work with you, help guide you over any "rough spots" that may develop along the way.

OFF TO A FLYING START WITH AMAZING RCA "AUTOTEXT" METHOD

Each "Career Program" starts with the amazing "AUTOTEXT" Programmed Instruction Method — the new, faster way that's almost automatic! "AUTOTEXT" helps even those who have had trouble with conventional learning methods in the past. It is truly the "Space Age" way to learn everything you need to know with the least amount of time and effort.

RCA INSTITUTES ENGINEERED KITS SPEED YOUR PROGRESS

To speed you on your way to a successful electronics career, your "Career Program" will include a variety of RCA Institutes engineered kits at no extra cost—each complete in itself. As a bonus, you will also receive and build a valuable Oscilloscope. You'll get the new Programmed Electronics Breadboard for limitless experiments, including building a working signal generator and a fully transistorized superheterodyne AM receiver and Multimeter.

CHOOSE YOUR CAREER PROGRAM NOW

To get a head start today on the electronics career of your choice, look over this list of RCA Institutes "Career Programs", pick the one that appeals most to you, and check it off on the attached card:

- Television Servicing
- Telecommunications
- FCC License Preparation
- Automation Electronics
- Automatic Controls
- Digital Techniques
- Industrial Electronics
- Nuclear Instrumentation
- Solid State Electronics
- Electronics Drafting

To meet other specific needs, RCA Institutes also offers a wide variety of separate courses which may be taken separately from the "Career Programs". These range from Electronics Fundamentals to Computer Programming. They are described in the material you receive.

ADVANCED TRAINING TOO

If you are already working in electronics or have some experience but want to move on up, you may start RCA Institutes training at an advanced level. No tedious repetition of work you already know!

UNIQUE TUITION PLAN

With RCA Institutes, you learn *at your own pace*, and you pay only as you learn. There are no long term contracts to sign . . . no staggering down-payments to lose if you decide to stop...no badgering bills. You pay for lessons only as you order them, and should you decide to interrupt your training at any point, you may do so and not owe one cent.

CLASSROOM TRAINING AVAILABLE

RCA Institutes Resident School is one of the largest schools of its kind in New York City with classroom and laboratory training available in day or evening sessions. Coeducational classes start four times a year. Just check "Classroom Training" on the attached card for more details.

FREE PLACEMENT SERVICE, TOO!

In recent years, 9 out of 10 Resident School students who used the Free Placement Service have been placed before or shortly after graduation. This Service is now available to Home Study students.

ALL RCA INSTITUTES COURSES AVAILABLE UNDER NEW GI BILL.

SEND ATTACHED POSTAGE PAID CARD TODAY FOR COMPLETE INFORMATION. NO OBLIGATION, NO SALESMAN WILL CALL.

RCA INSTITUTES Inc. Dept. PE-87
A Service of Radio Corporation of America
350 West 4th Street, New York, N.Y. 10014

The Most Trusted Name in Electronics

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 8⅛" x 3½" x 1½") 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.

Circle No. 75 on Reader Service Page 15

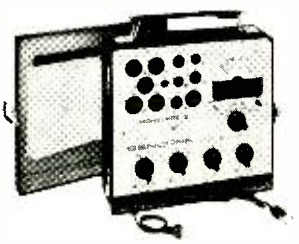
MINIATURE SOCKET WRENCH SET

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 5/64", 3/32", 7/64", ⅛", and 5/32", 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 *Sencore* 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 ½ 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.

Circle No. 77 on Reader Service Page 15

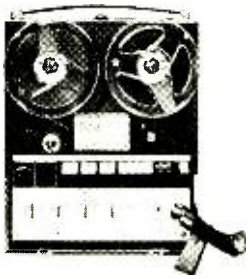
SHORT-WAVE PORTABLE RECEIVER

Eleven bands can be tuned with *Lafayette Radio Electronics'* imported "Globepacer" 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 1½" 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 changeover from battery to a.c. power and automatic stop at tape end. The recorder has three speeds—3¾, 1⅞ and 15/16 in/s. Frequency response is 100 to 8000 Hz and 100 to 4000 Hz for the 3¾- and 1⅞-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 ±½ 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 ±½ dB,

We admit it. We're tough to work for.

But we get results.

The brand new Companion IV, for instance. It's smaller. [2¼ (h) x 8½ (w) x 6⅜ (d)]

And lighter in weight. [3¾ pounds]

But it's jam-packed full of the good things a good radio should be full of. Sample:

Front, bottom *and* telephone handset speakers which, for the first time, guarantee unobstructed sound no matter where the radio is mounted. And which give an extra measure of tone fidelity, plus increased volume with less distortion than ever before.

Four more channels than its predecessor. Ten in all.

Touch-tap tuning which allows you to change channels just like that.

A greatly improved noise limiting circuit. And we mean greatly improved.

Electronic switching.

Receive and transmit indicator light.

L-C filter for razor-sharp selectivity.

Two R-F stages in the receiver.

And a choice of either palm microphone or telephone handset at no extra cost.

The price: $139.90.

The point: Buy it. It's a great little radio.

See the Companion IV at your authorized Pearce-Simpson Dealer Showroom. Or mail this coupon for a free brochure on the entire line of Pearce-Simpson Citizens Band Radios and a list of dealers in your area.

The Companion IV

Our Motto: If you can't put 10 channels and 3 speakers into a $139.90 radio, you're not Pearce-Simpson material.

PEARCE-SIMPSON, INC.
P.O. Box 800/Biscayne Annex, Miami, Fla. 33152
Gentlemen: I like your motto. Please send your brochure. PE-867

Name

Address

City

State Zip

Overseas military personnel may write for special price list.

F.C.C. Type Acceptance pending

CIRCLE NO. 27 ON READER SERVICE PAGE

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 ½" 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 minutes 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 ¼" to $\frac{7}{16}$", five sizes of hex head screws from #6 to ¼", and five sizes of socket head cap screws from #8 to $\frac{5}{16}$" 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 μA 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

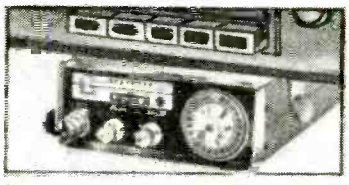
LAFAYETTE HB-525B Solid State Mobile 2-Way Radio

Now! with "S/RF" Meter

23 CB Crystal Controlled Channels
— ALL CRYSTALS Supplied!

- Size: 2⅜" by 6¼"

99-3076WX*



Now...Accepts Priva-Com®
Plug-in Private Tone Caller

149.95
NO MONEY DOWN

- 19 Transistors, 9 Diodes, Thermistor
- Dual Conversion for Extra Selectivity and Sensitivity
- 3-Position Crystal Delta Tune for Accurate Fine Tuning
- Transmit Model Indicator Light
- Pi-Network for Optimum RF Output
- Mechanical 455 KC Filter for Superior Selectivity
- Variable Squelch Plus Series Gate Automatic Noise Limiting
- Range Boost Circuitry for Added Talk Power
- Serves As A Public Address Amplifier with External Speaker
- 12 Volt DC Operation (Positive or Negative Ground)

FREE
Over 500 Pages

1968 Catalog Coming Off Press! Send Today for the Most Complete Buying Guide in Two-Way Radio CB Communications from the World's Largest CB Manufacturer...

LAFAYETTE Radio ELECTRONICS
Dept. IH-7 P.O. Box 10 Syosset, L.I., N.Y. 11791

☐ Send me the FREE 1968 LAFAYETTE Catalog 680 IH-7

Name _____

Address _____

State _____ City _____ Zip _____

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.

B&K

A DIVISION OF DYNASCAN

1801 W. Belle Plaine, Chicago, Illinois 60613

WHERE ELECTRONIC INNOVATION IS A WAY OF LIFE

CIRCLE NO. 5 ON READER SERVICE PAGE

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.

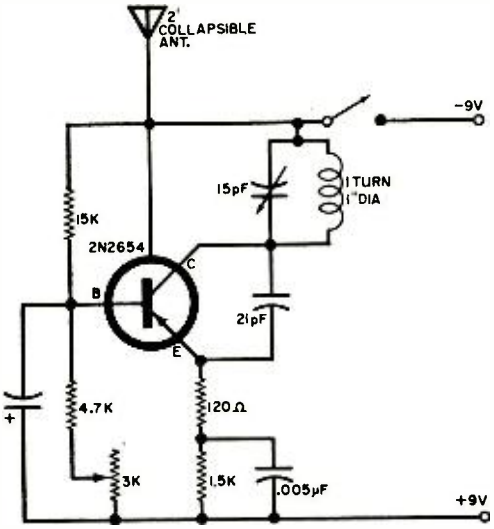
problem that practically every police/fire station transmits via narrow-band FM was fortunately resolved by the fact that police and fire stations all transmit on fixed frequencies. Instead of tuning the converter, the oscillator is made crystal-controlled and the AM broadcast band receiver operates 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 BCB 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.

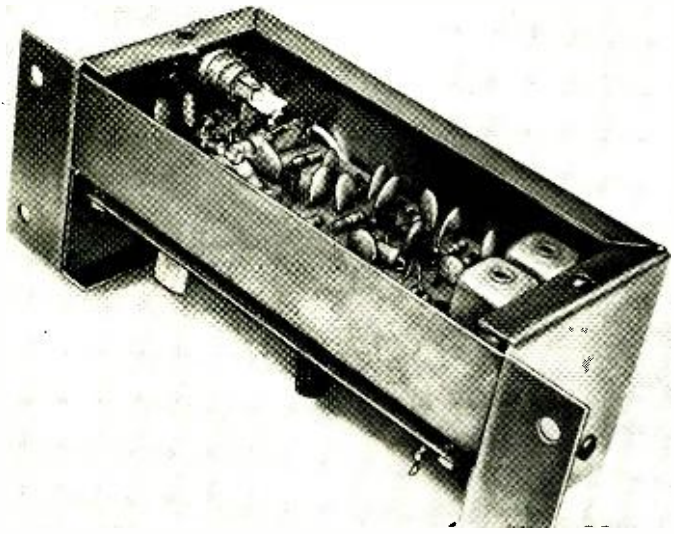
The "Sentry" converter (Sentry Mfg. Co., P.O. Box 12322, Oklahoma City, Okla. 73112—$37.50) was one of the smallest and most solidly constructed converters tested by POPULAR ELECTRONICS. Broadcast band rejection—an important factor in achieving good VHF reception—appeared to be slightly better with the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

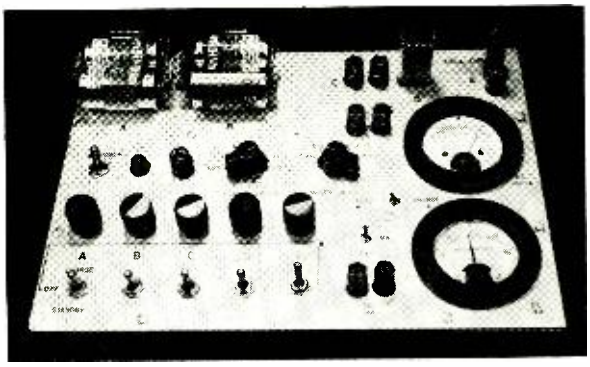
Just before this report was written, SSB Electronics Co. (P.O. Box 367, Rockville Centre, N.Y. 11571) introduced a new type of mobile converter—the "SSB-1" ($44.95). Although also using slope detection in the AM BCB receiver, this converter incorporates a transistorized i.f. stage and limiting circuitry. 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. —30—



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.

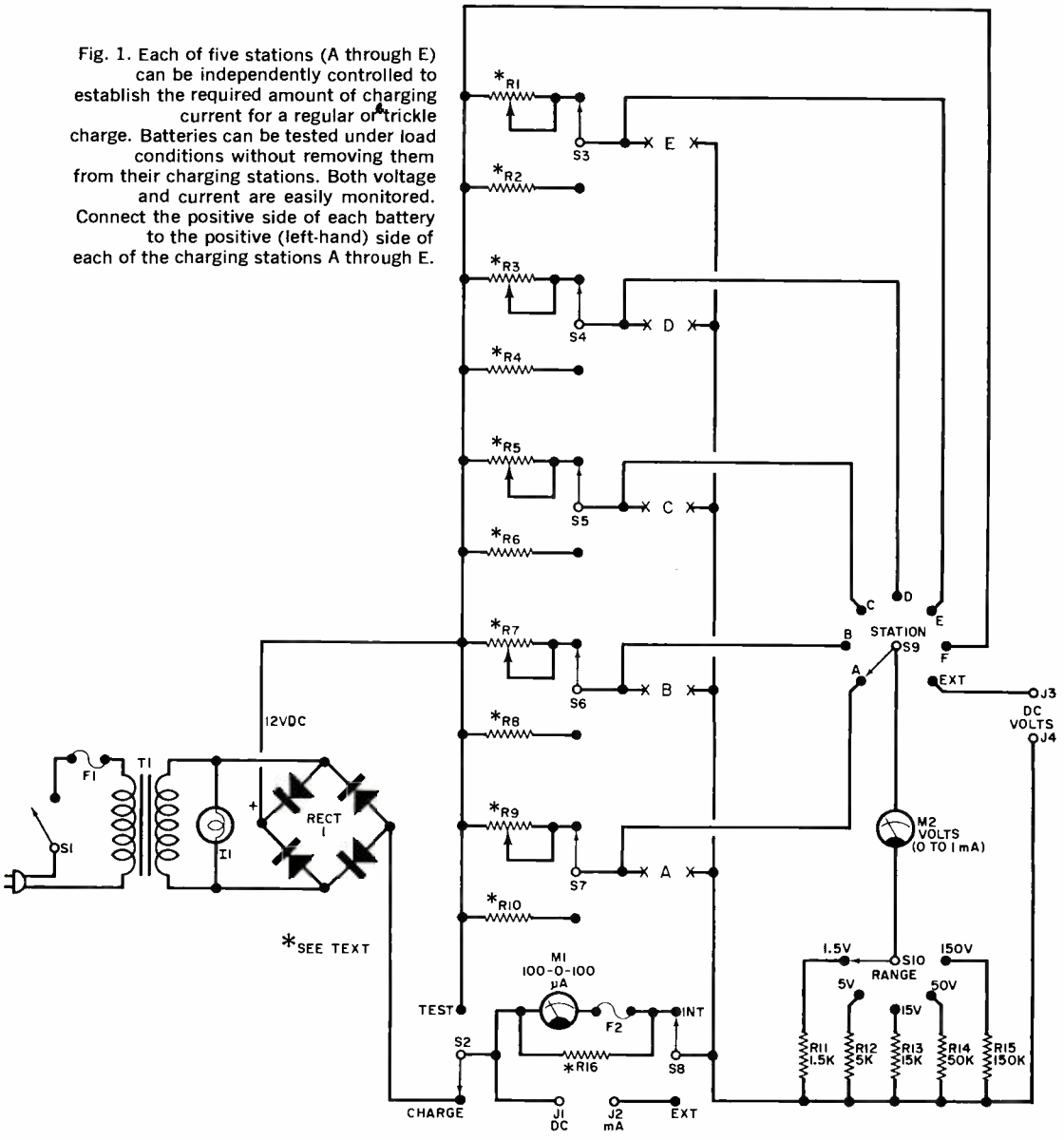


Fig. 1. Each of five stations (A through E) can be independently controlled to establish the required amount of charging current for a regular or trickle charge. Batteries can be tested under load conditions without removing them from their charging stations. Both voltage and current are easily monitored.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

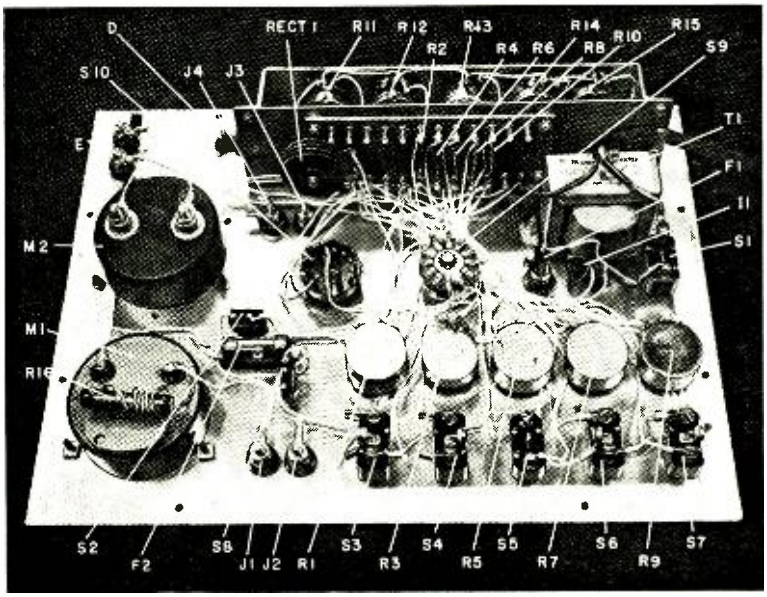


Fig. 2. The entire works is mounted on the front panel. Construction is not as complicated as it looks, nor is parts layout critical. Polarity of the rectifier stack should be observed for proper connections. It is a good idea to complete the wiring and assembly of all components before you mount the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

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

PARTS LIST

F1—⅛-ampere fuse
F2—1/10-ampere fuse, fast-acting
I1—12-volt pilot light
J1, J2, J3, J4—Jack (5-way binding post)
M1—100-0-100 μA 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
(All ½-watt, ± 5% resistors)
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., 5-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.

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 charge 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 hookup 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

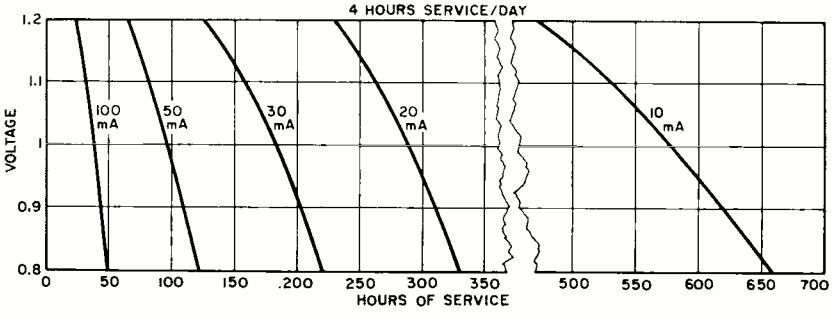


Fig. 3. Graph shows the approximate number of hours of use that can be expected from a certain 1.5-volt cell if the cell is used 4 hours per day. Battery life depends upon many factors, including temperature, current drain, and end voltage. Note that more hours of life can be expected when the current 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.

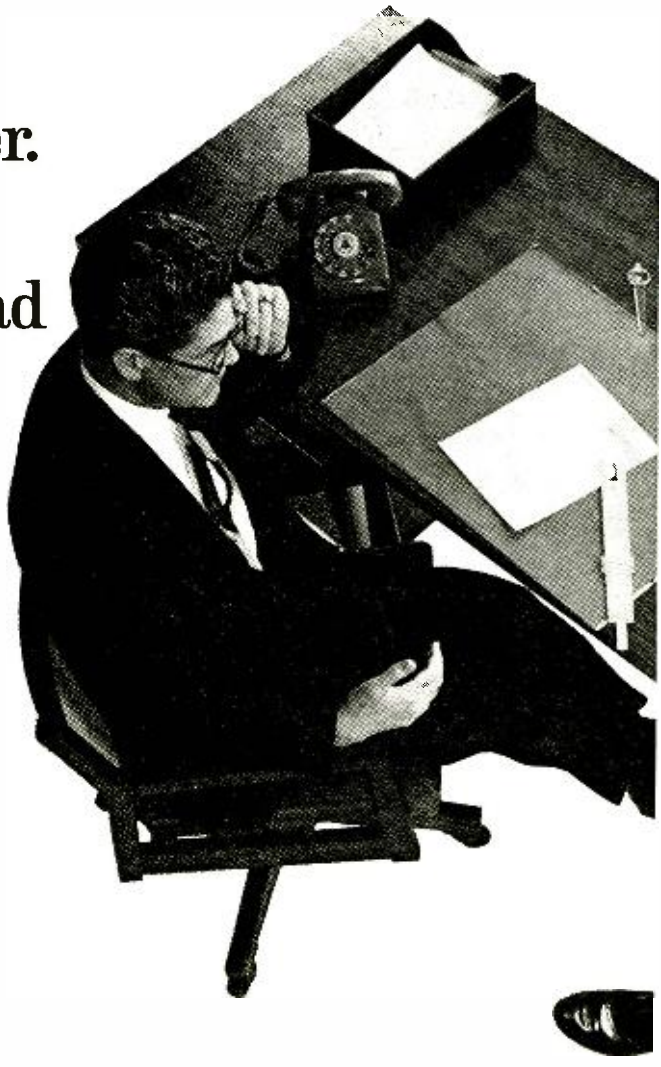
Battery Charging. Battery manufacturers supply Load Voltage/Current Discharge curves in their manuals. A typical set of curves is shown in Fig. 3. These can be used as a guide to get started, but you will soon develop an intuitive approach based on your own experience. A good safe rule of thumb is to 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. -30-

"He's a good worker. I'd promote him right now if he had more education in electronics."



Could they be talking about you?

You'll miss a lot of opportunities if you try to get along in the electronics industry without an advanced education. Many doors will be closed to you, and no amount of hard work will open them.

You can build a rewarding career if you supplement your experience with specialized knowledge of one of the key areas of electronics. As a specialist, you will enjoy security, excellent pay, and the kind of future you want for yourself and your family.

Going back to school isn't easy for a man with a full-time job and family obligations. But CREI Home Study Programs make it possible for you to get the additional education you need without attending classes. You study at home, at your own pace, on your own schedule. You study with the assurance that what you learn can be applied to the job immediately.

CREI Programs cover all important areas of electronics including communications, radar and sonar, even missile and spacecraft guidance. You're sure to find a program that fits

Founded 1927

CREI

Accredited Member
of the National Home Study Council

your career objectives.

You're eligible for a CREI Program if you work in electronics and have a high school education. Our FREE book gives complete information. Airmail postpaid card for your copy. If card is detached, use coupon at right or write: CREI, Dept. 1208E, 3224 Sixteenth Street, N.W., Washington, D.C. 20010.

40

1927 1967 Fortieth Anniversary

The Capitol Radio Engineering Institute
A Division of McGraw-Hill, Inc.
Dept. 1208E, 3224 Sixteenth Street, N.W.
Washington, D.C. 20010

Please send me FREE book describing CREI Programs. I am employed in electronics and have a high school education.

NAME_____ AGE_____

ADDRESS_____

CITY_____ STATE_____ ZIP CODE_____

EMPLOYED BY_____

TYPE OF PRESENT WORK_____ ☐ G.I. BILL

I am interested in ☐ Electronic Engineering Technology
☐ Space Electronics ☐ Nuclear Engineering Technology
☐ Industrial Electronics for Automation
☐ Computer Systems Technology

APPROVED FOR TRAINING UNDER NEW G.I. BILL

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.

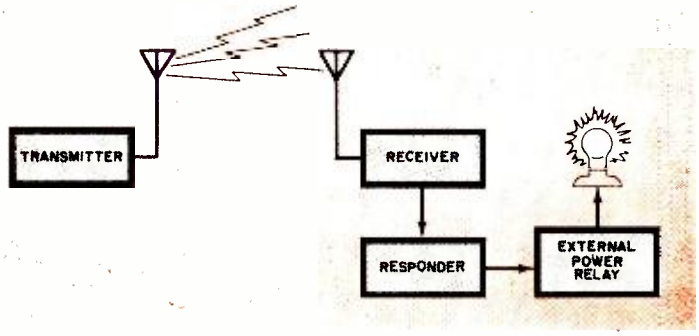


Fig. 1. "The Remote Commander" can be used as an R/C remote control device for the "Pulse Command Responder" (July, 1967) if setup is as shown above.

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,

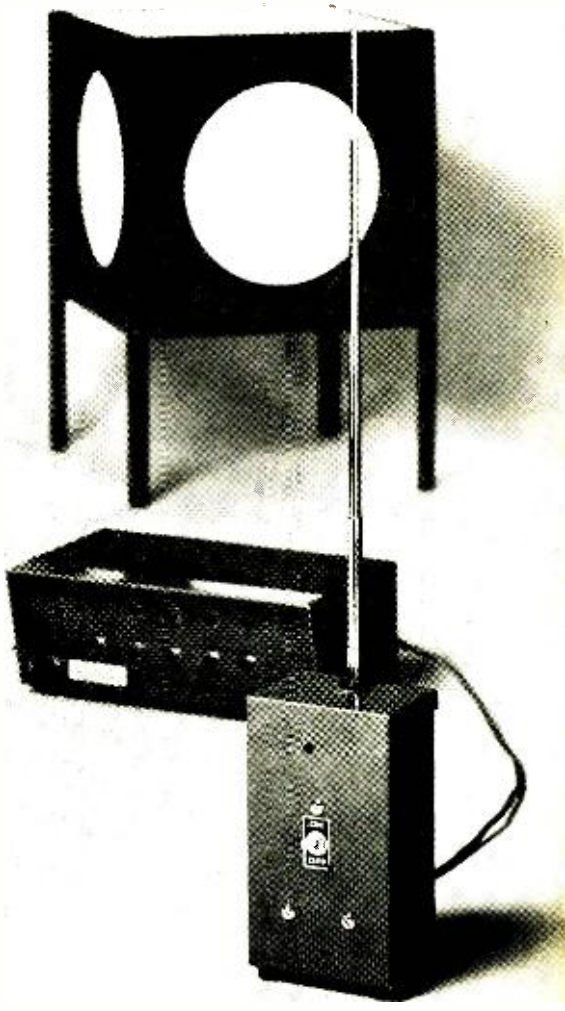


Fig. 2. Transmitter is crystal controlled to conform with the FCC specifications regarding carrier frequency stability. Output consists of a 26.995-MHz carrier signal, modulated with an 800-Hz tone.

TRANSMITTER PARTS LIST

B1—9-volt battery
C1—100-pF ceramic capacitor
C2, C3, C5—0.02-μF ceramic capacitor
C4—0.05-μF ceramic capacitor
C6—62-pF ceramic capacitor
L1—R.f. coil assembly (See Text)
L2—12-μH 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
All resistors ½ watt
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, ½" rubber grommet, hookup wire, solder, hardware, metal strip, insulator, etc.
**See Receiver Parts List.*

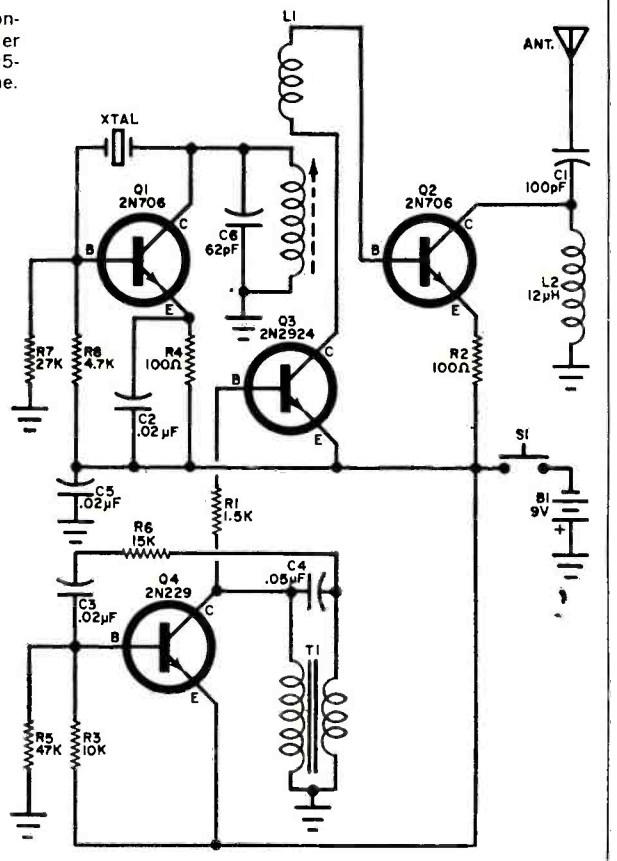
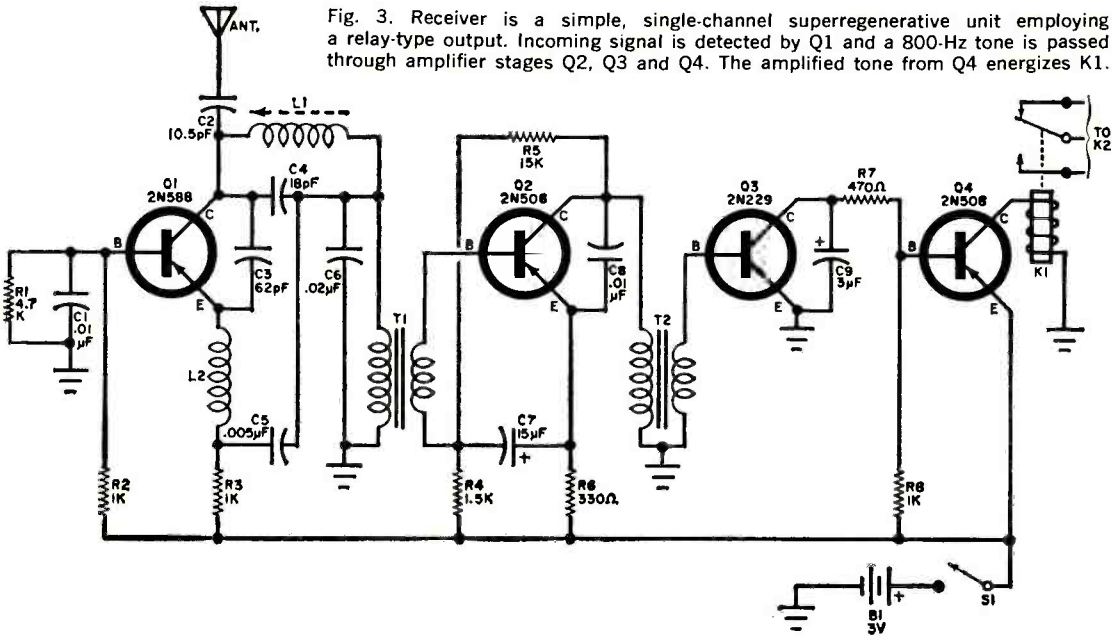


Fig. 3. Receiver is a simple, single-channel superregenerative unit employing a relay-type output. Incoming signal is detected by Q1 and a 800-Hz tone is passed through amplifier stages Q2, Q3 and Q4. The amplified tone from Q4 energizes K1.



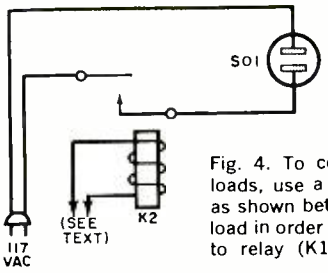
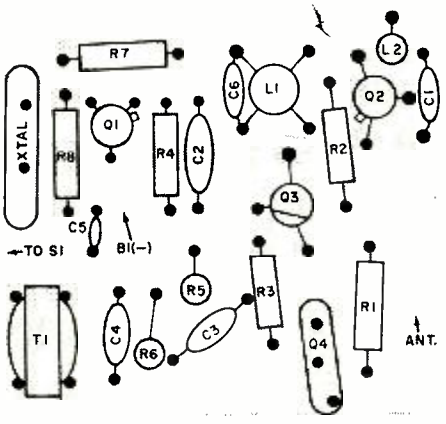


Fig. 4. To control high power loads, use a power relay wired as shown between receiver and load in order to prevent damage to relay (K1) in the receiver.



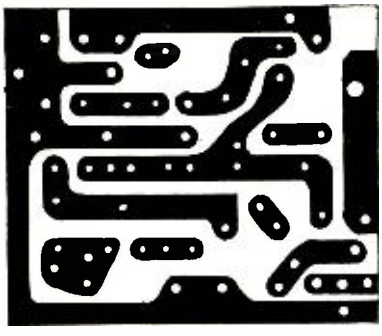
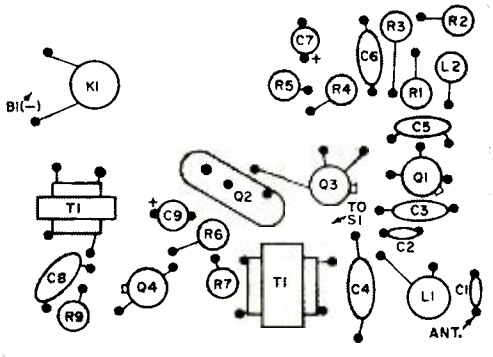


Fig. 5. Transmitter (directly above) and receiver (below right) etching guides are shown actual size. The layouts show parts location and orientation on the boards to facilitate easy component mounting.

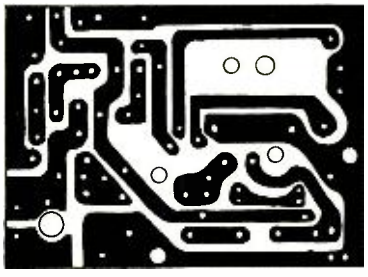


depending on the pair of contacts to which the load is connected. The contacts of *K1* are designed for low-voltage and low-power loads. Therefore, they must be protected against overloading and arcing through the use of low-voltage external power relay *K2* (Fig. 4) and a power source compatible with 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-μF ceramic capacitor
C2—10.5-pF ceramic capacitor
C3—62-pF ceramic capacitor
C4—18-pF ceramic capacitor
C5—0.005-μF ceramic capacitor
C6—0.02-μF ceramic capacitor
C7—15-μF, 15-volt electrolytic capacitor
C9—3-μF, 15-volt electrolytic capacitor
*K1—S.p.d.t., 50-ohm subminiature relay**
K2—See text
L1—R.f. coil (See Text)
L2—12-μH 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
(*All resistors ½ watt*)
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, 3¼" x 2⅜" x 1⅛" utility box, ½" rubber grommet, 3-lug terminal strip, hookup wire, solder, hardware, insulator, battery clip, etc.
**These parts obtainable from Controlaire Electronics, World Engines, Inc., 8060 Rossash Rd., Cincinnati, Ohio 45236.*



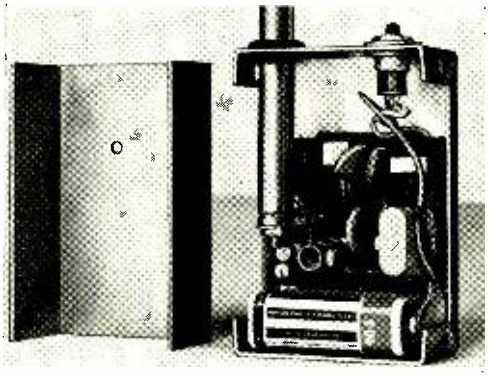


Fig. 6. Transmitter case should be smallest possible size, but large enough to house circuit board, battery and switch, and provide support for antenna.

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 3½ turns (upper winding) and 10¾ 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 ¼"-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.

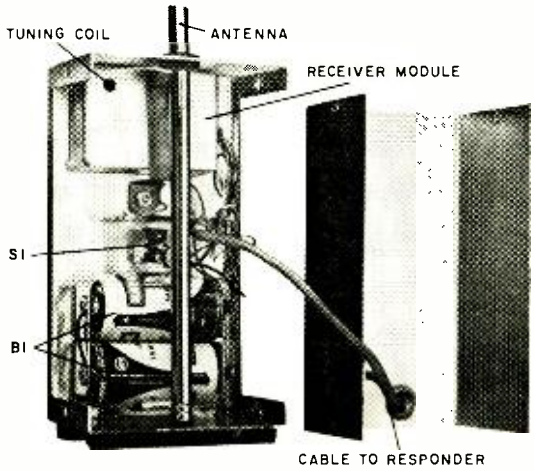
When all parts are in place, solder them to the boards' foil conductors, being careful to prevent solder bridges between the closely spaced conductors. Then cut away the excess component leads as close to the boards as possible.

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 ½" 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)



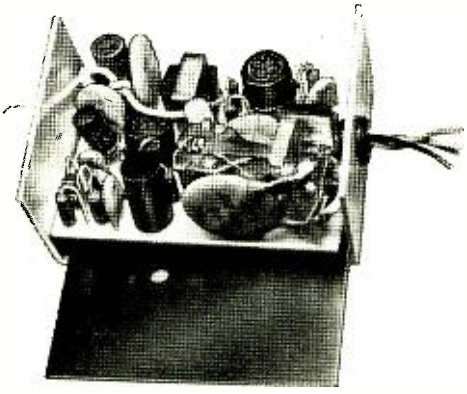


Fig. 7. For maximum shielding from outside interference, receiver circuit board should be mounted in separate metal case (above). Mount receiver module, switch, batteries and antenna in larger metal cabinet (left).

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.

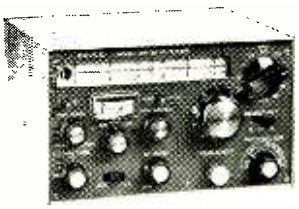
Transmitters. Novices and other code enthusiasts have a choice of transmitters from the 5-watt Omega LT-5 up to the 100-watt Drake 2-NT, EICO 720, Hallicrafters HT-46, and Heathkit DX-60A. Transmitter power is not the most important factor in selecting a transmitter. A 20% change in power makes a barely 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.

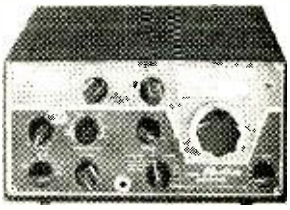
Don't sell the "beginner's" transmitters short. By and large, they are well designed, and many General Class license holders continue to use their Novice transmitters because they work so well. Of course, the General's usually add an external frequency oscillator so that they can shift frequency to any 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

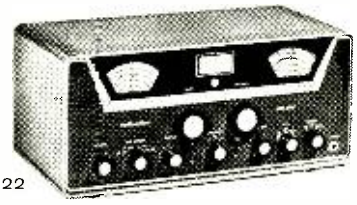


Davco DR-30

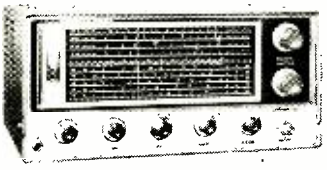


R. L. Drake R-4A

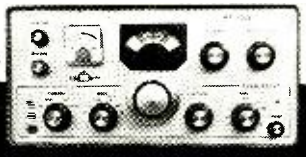
Heathkit HR-10



Hallicrafters SX-122



Lafayette HA-700



Sommerkamp FR-100B

RECEIVERS

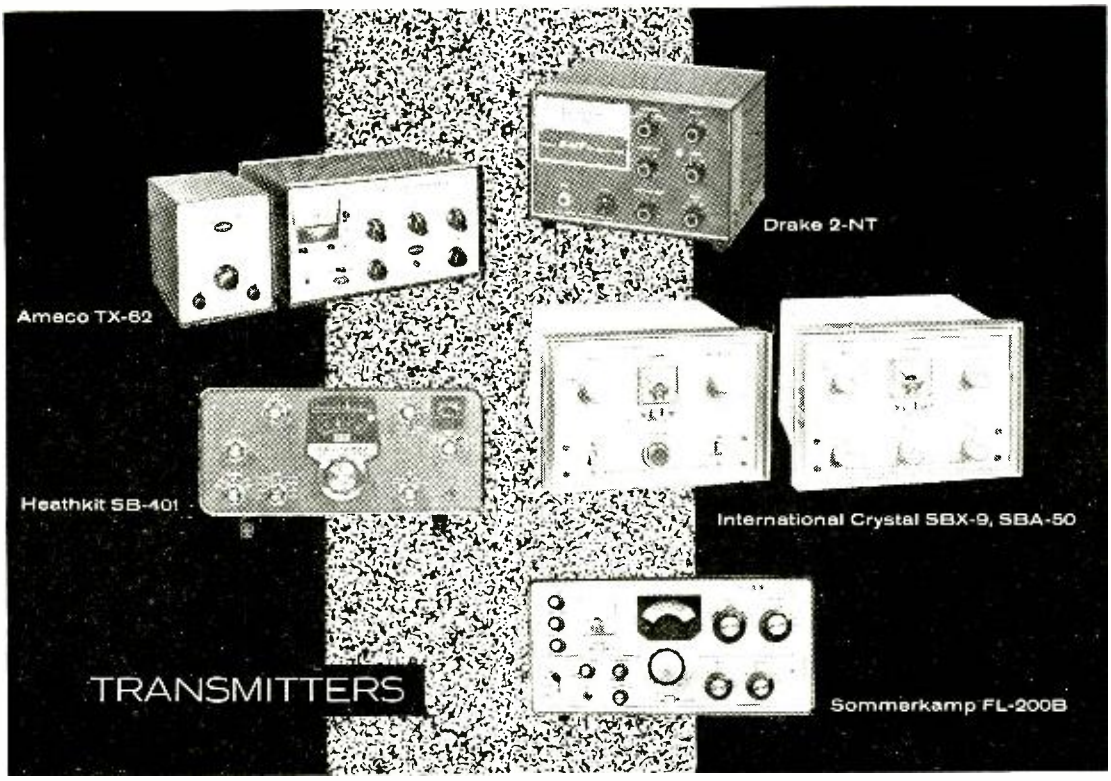
Transceivers. Most of the amateur transmitting and receiving equipment sold today is in the form of transceivers. The functions of a separate receiver and transmitter are combined into a single unit and many of the components are used bilaterally in both functions.

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 approximately 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 sometimes 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] and up
	PS-1W	Wired	Power Supply for CB/CN				117 volts	12.50
	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]
DAVCO 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.	2-C	Wired	Receiver		80/10 m.	AM/CW/SSB	Hybrid	229.00
540 Richard St.	R-4A	Wired	Receiver		80/10 m.	AM/CW/SSB	117 V, Hybrid	399.95
Miamisburg, Ohio	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	720	Kit	Transmitter	Xtal	80/10 m.	CW	90 watts	89.95[1]
INSTRUMENT CO., INC.	723	Kit	Transmitter	Xtal	80/10 m.	CW	50 watts	59.95[1]
131-01 39th Ave.	753	Kit	Transceiver	VFO	80/40/20 m.	AM/CW/SSB	200 watts	189.95[1]
Flushing, N.Y.	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	V-Mark-2	Wired	Transceiver	VFO	80/10 m.	CW/SSB	400 watts	420.00
10 S. 34th St.	AC-35	Wired	Power Supply for V-Mark-2				117 volts	79.95
Council Bluffs, Ia.	NOX-1	Wired	Novice Crystal Adapter		80/10 m.			24.95
GONSET, INC.	G-50	Wired	Transceiver	Xtal/VFO	6 m.	AM	117 volts	299.00
LTV Ling Altec, Inc.	GSB-II	Wired	Transceiver	Xtal/VFO	2 m.	AM/CW/SSB	20 watts	299.62
1515 S. Manchester Ave.	GSB-VI	Wired	Transceiver	Xtal/VFO		AM/CW/SSB	20 watts	299.62
Anaheim, Calif.	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	HT-46	Wired	Transmitter	VFO	80/10 m.	SSB/CW	180 W PEP	369.95
5th & Kostner	SR-42A	Wired	Transceiver	Xtal	2 m.	AM	12 V/117 V	199.95
Chicago, Ill.	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.	HQ-170A-VHF	Wired	Receiver		160/2 m.	AM/CW/SSB		439.00
73-88 Hammarlund Dr.	HQ-100A	Wired	Receiver		BCB/10 m.	AM/CW/SSB	10 tubes	199.00
Mars Hill, N. C.	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

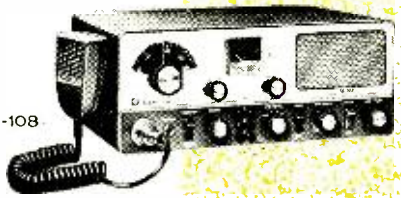
MANUFACTURER	MODEL	KIT OR WIRED	FUNCTION	TRANSMITTER CONTROL	BANDS	MODE	POWER, ETC.	PRICE
HEATH COMPANY Benton Harbor, Mich.	SB-101	Kit	Transceiver	VFO/Xtal	80/10 m.	CW/SSB	180 W PEP	360.00[1]
	SB-110	Kit	Transceiver	VFO/Xtal	6 m.	CW/SSB	180 W PEP	299.00
	HR-10	Kit	Receiver		80/10 m.	AM/CW/SSB	7 tubes	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.	$ 225.00
	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 NCX-A 200 HRO-500 AC-200	Wired Wired Wired Wired Wired	Transceiver Power Supply for NCX-5 Transceiver Receiver Power Supply for 200	VFO VFO	80/10 m. 80/10 m. 5 kHz/30 MHz	AM/SSB/CW AM/CW/SSB AM/CW/SSB/ MCW/FSK	200 watts 117 volts 200 W PEP Solid-State 117 V a.c.	549.95 110.00 359.00 1650.00 75.00
OMEGA ELECTRONICS CO. 10463 Roselle St. San Diego, Calif.	LT-5 PS-5	Kit Kit	Transmitter Power Supply	Xtal	40/80 m.	CW	Solid-State 117 volts	24.00[1] 22.00[1]
PARKS ELECTRONICS LAB. 900 Burlington Ave. Beaverton, Ore.	50-1	Wired	Converter		6 m.		Nuvistor, 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 FL-200B	Wired Wired	Receiver Transmitter	 VFO	80/10 m. 80/10 m.	AM/CW/SSB AM/CW/SSB	12 tubes 130 watts	250.00 350.00
SQUIRES-SANDERS INC. Martinsville Rd. & Liberty Corners Millington, N.J. (Clegg Labs.)	SS-1R SS-1BS 22'er 66'er	Wired Wired Wired Wired	Receiver Receiver Transceiver Transceiver	 Xtal Xtal	80/10 m. Int. BCB 2 m. 6 m.	AM/CW/SSB AM AM	 12/117 V 12/117 V	995.00 1200.00 249.95 249.95
SWAN ELECTRONICS CORP. 417 Via Del Monte Oceanside, Calif.	350 500 250 117-XC	Wired Wired Wired Wired	Transceiver Transceiver Transceiver Power Supply for 350/500/250	VFO VFO VFO	80/10 m. 80/10 m. 6 m.	CW/SSB/AM CW/SSB/AM CW/SSB/AM	400 W PEP 480 W PEP 240 W SSB PEP 117 volts	420.00 495.00 325.00 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 AC-384	Wired Wired	Transceiver Power Supply for 84	VFO	80/40 m.	SSB	300 W PEP 300 W, 117 V	159.95 79.95

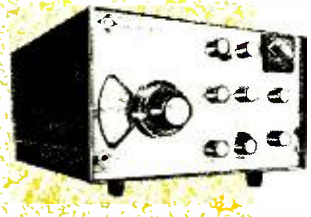
1. Also available in wired form

2. Information not available at press time

Note: Prices and availability of equipment are subject to change

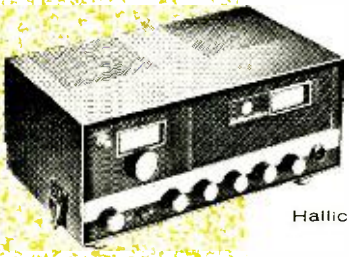


Allied TR-108

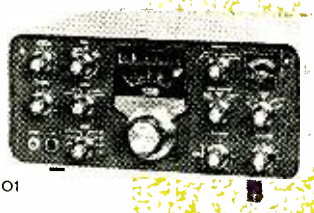


Galaxy V-Mark 2

Gonset GSB-II



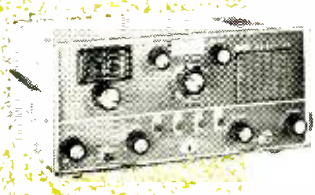
Hallicrafters SR-46A



Heathkit SB-101

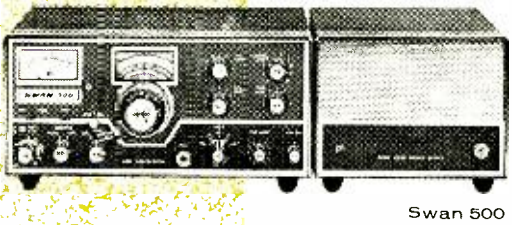
Lafayette HA-1200

National 200

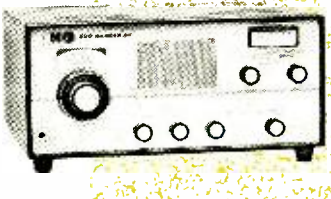


Raytheon SBE-34

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 regular 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

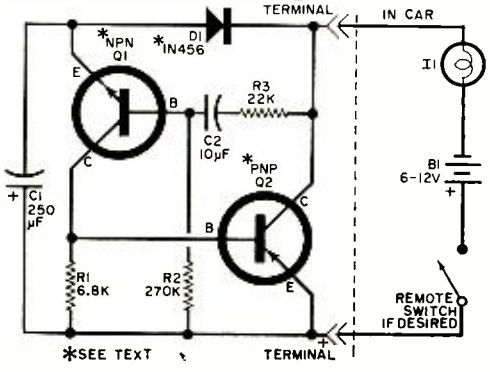
SIMPLE TWO-TRANSISTOR CIRCUIT CONVERTS IDIOT LIGHT TO WARNING LIGHT

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 backbiased 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. -30-

LO! THE RUSSIAN RADIO/TV SERVICEMAN

THE RUSSIAN WORD that looks like PEMOHT 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

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 *televisor* 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 *televisor*. 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 *televisor* 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, triod, pentod, 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 *nozh* 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 *televisor* 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 *televisor* 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

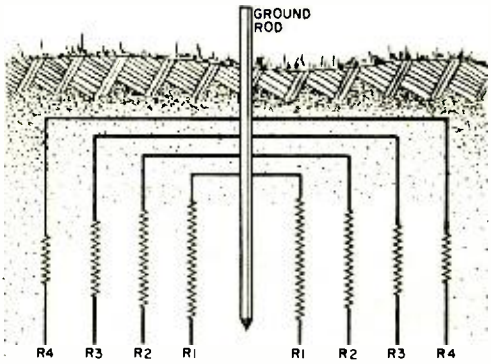


Fig. 1. The soil around a ground rod can be considered as a concentric array of resistance, becoming smaller as the distance from the rod is increased.

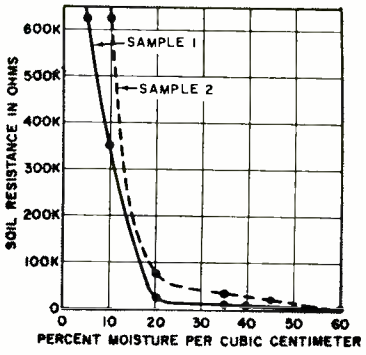


Fig. 2. When soil temperature is held at a constant 70°, its resistance increases as moisture decreases. The increase is rapid when moisture is below 20%.

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 cm^3. Increasing the moisture to 20% brings this resistance down to 10,000 ohms per cm^3. If the moisture is increased to 35%, the resistance is cut to 5000 ohms per cm^3.

Moisture content of typical soil varies

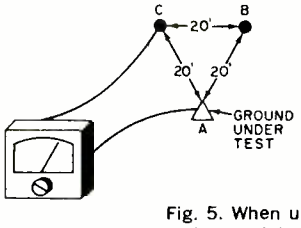


Fig. 5. When using an ohmmeter to determine ground resistance, two extra rods must be driven and compensation then made for stray a.c. and d.c. currents.

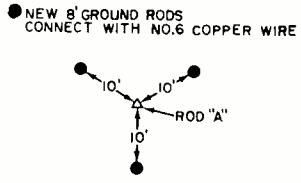


Fig. 6. Ground resistance can be reduced by driving three more rods, then interconnecting all four rods.

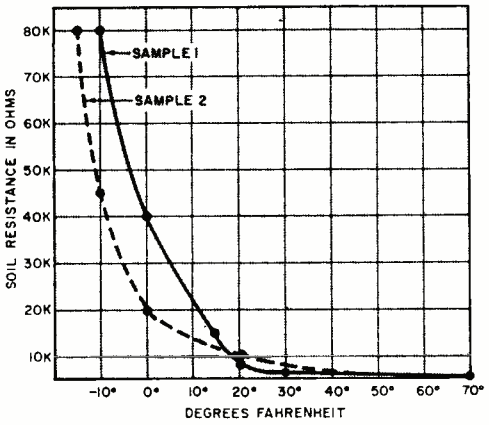


Fig. 3. When soil moisture is held at a constant 22%, resistance increases with temperature reduction.

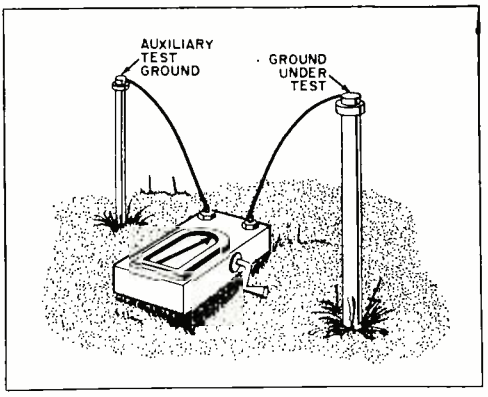


Fig. 4. A megger can be used to determine the resistance of the ground rod under test, as shown above.

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-

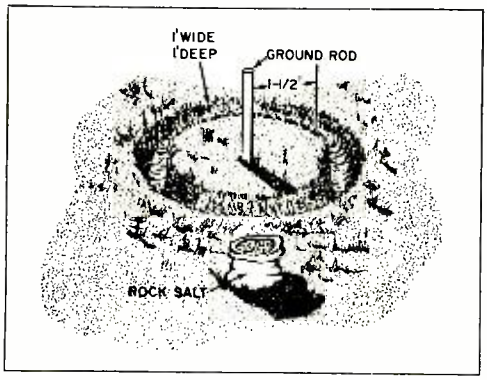


Fig. 7. Chemically treating soil can reduce ground resistance. However, the treatment must be renewed each year or so to maintain ohmic reduction.

nent. 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: $[(A+B) + (A+C) - (B+C)]/2 =$ 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. -30-

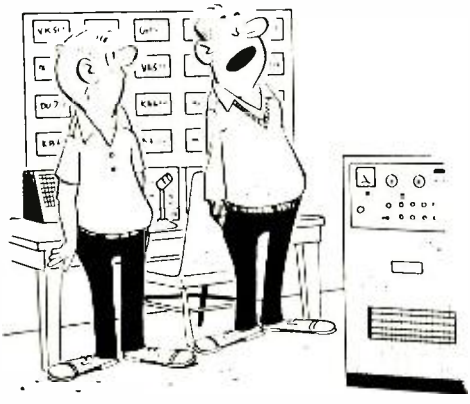
Ham Radio Ain't What It Used To Be

By WALT MILLER

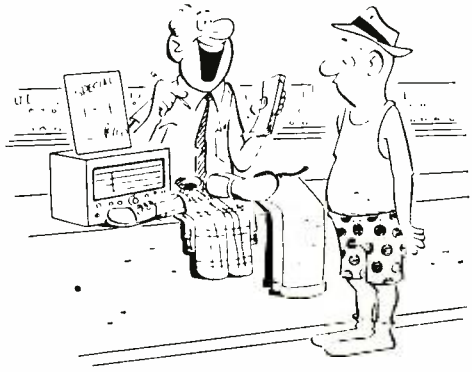
"Oh that's nothing, just my first QSL."

"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 developed 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 theoretical 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.

—30—

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?

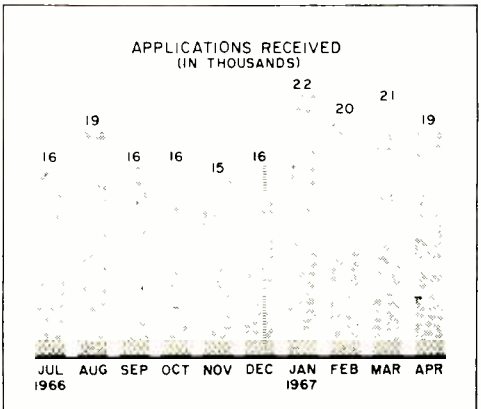
No. Type Acceptance of CB equipment will not affect the present-day equipment user. Nor will Type Acceptance curtail the use of your equipment which will be considered to have a useful life of five years, or more. Type Acceptance pertains to equipment that will be manufactured —probably in 1968—and not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



On a year-by-year basis, there have been no significant changes in the total number of applications received by the FCC for CB licenses. The irony of this bar chart is that it also represents a FCC income in excess of $1,400,000! A very small fraction of this amount is applied to improving the CB service.

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

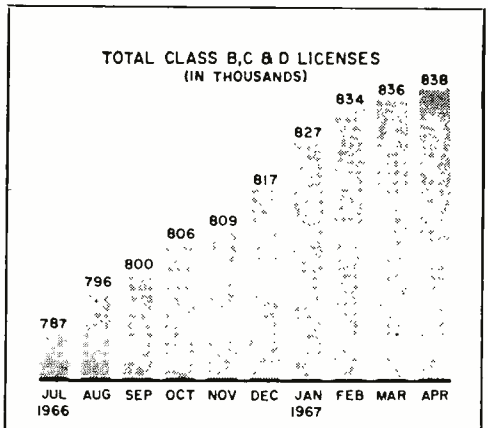
What about the total number of CB'ers?

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.



Less than 2% of the totals shown represents other than Class D CB'ers. The FCC is keeping a tight rein on the "totals" and eliminating unrenewed licenses and expirations as fast as the computer reports them.

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.

-30-

ANNUAL REPORT ON CB EQUIPMENT

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

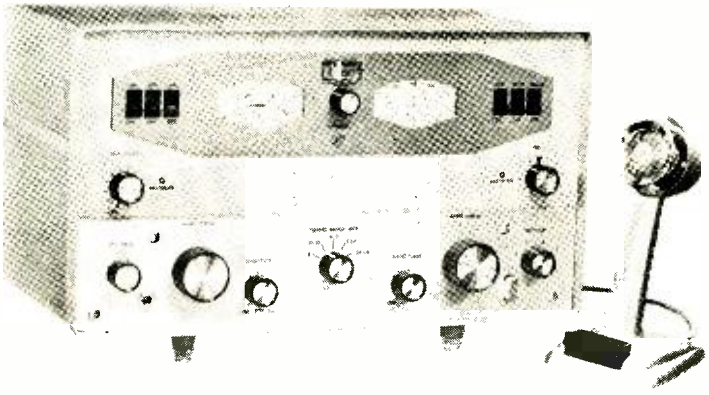
PREPARED BY THE
POPULAR ELECTRONICS
EDITORIAL STAFF

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.



HAMMARLUND CB-205

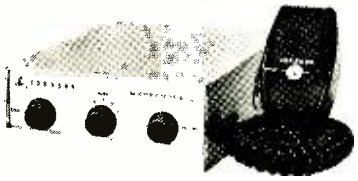
double conversion with ceramic filter) and the "CB-24" ($199.95—23 channels, 12-volt power). These models also have code names, "Reacter II" and "Reacter III," respectively. New since our last report is a walkie-talkie called the "CB-18" ($119.95—2 channels, 2-watt input, complete with rechargeable batteries 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).

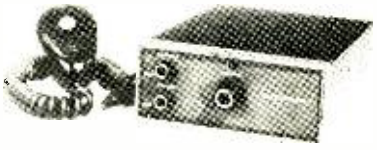
INTERNATIONAL CRYSTAL MFG. CO. INC. (18 N. Lee, Oklahoma City, Okla. 73102): Current CB production from this famous manufacturer is being restricted to the "Model MO-23" ($210—23 channels, hybrid tube/transistor, 12-volt power). According to all the information at hand, this is the only CB transceiver 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-sideband 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).

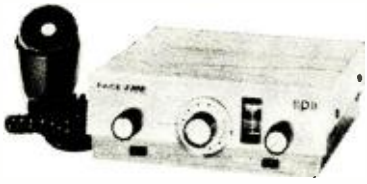
KAAR ELECTRONICS CORP. 1203 West St. Georges St., Linden, N.J. 07036):

- 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 II" ($219.95—23 channels, solid state, 12-volt power) which is also available in an a.c. model for $259.90.

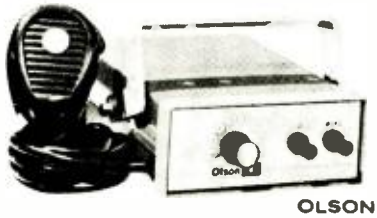
LAFAYETTE RADIO ELECTRONICS CORP. (111 Jericho Turnpike, Syosset, L.I., N.Y. 11791): Numerous items in the Lafayette lineup of CB gear have undergone circuit improvements or price changes since our last report. The "Comstat 9" ($54.95—9 channels, universal power, kit) has dropped $5 in price. The companion unit "Comstat 19" ($59.95—9 channels, 117-volt power) has been dropped $10. Top of this particular lineup, the "Comstat-25A" ($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).

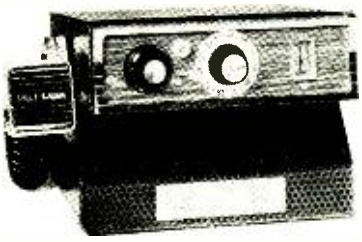
MULTI-ELMAC CO. (21470 Coolidge, Oak Park, Mich. 48237): All 3 favorite CB units are being continued in the Multi-Elmac lineup. These are: the "Citi-Fone 99" ($99.95—8 channels, universal power); "Citi-Fone SS" ($169.50—23 channels, universal power); and the "Citi-Fone II" ($49.95—2 channel, solid state 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 uprated 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 variety 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 sideband selection—thus really providing 46 channel reception. The transmitter radiates a DSB signal. Except for the sideband 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.

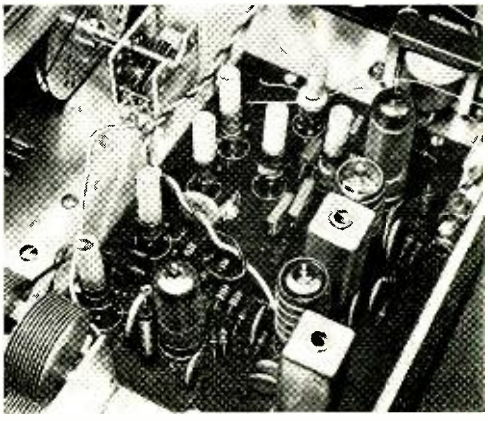
Much of the time-consuming work ordinarily required in constructing a receiver is eliminated due to the use of a large printed circuit board. When the board is installed in the chassis, the interior of the "Space Ranger" has a neat, uncluttered appearance.

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.

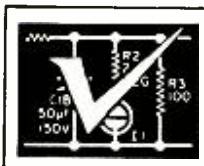
Once the black vinyl-clad cover is in place and the receiver is turned on, you'll find attractive styling and soft, indirect lighting of the dial and meter. The dial itself is indexed to show the settings for the standard and international broadcast bands, the marine and weather information services, 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 0B3/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 W4AM 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, 128 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., Garrettsville, Ohio 14231)

Mark II tank transceiver, made by Northern Electric, Z.A. 10178, P.C. 92049C, circa 1942. Schematic and operating manual needed. (Mark Wojciechowski, 12 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 44115)

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

Atwater Kent Model 35 receiver, ser. 78170S, circa 1928; has 6 tubes. Schematic and source for parts needed. (Robert Butler, Franklinville Rd., Box 330, Swedesboro, N.J. 08085)

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-I/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. 24 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 Kleinsteiber, 23099 Beechwood, E. Detroit, Mich. 48021)

Service Instruments Model 20-A "Rider-Volt Ohmyst," ser. 497, circa 1945; Schematic needed. (E. H. Hults, 716 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. **Hallicrafters** 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)

—30—

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.

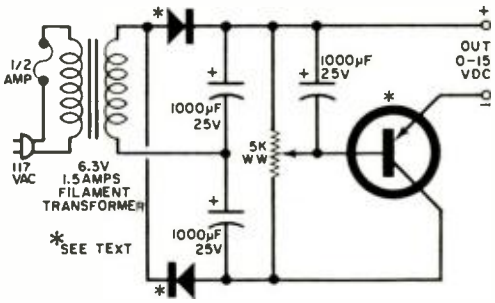
As a general rule, the electronic components that control any specific frequency are usually critical. You should never, for example, attempt to interchange ceramic and silver mica capacitors. Most resistor values in transistorized circuitry are critical, although parts value deviations of up to ± 15% 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?*

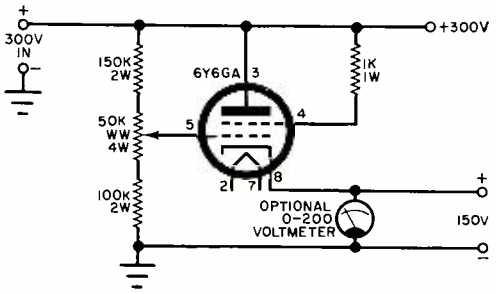
Depending upon the design of your receiver, you may be able to use the 6BH6. This tube will give you more gain, but you may find it necessary to repeak the input and output coils.

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 ± 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 in 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 μF to 4.0 μF. 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. -30-

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

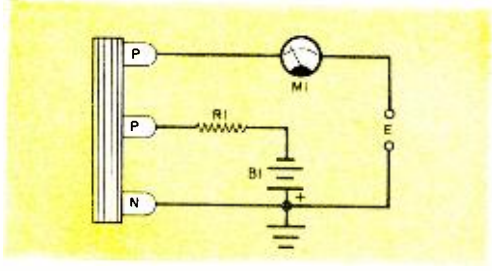


Fig. 1. With the correct bias and voltage applied to this new University of Michigan negative-resistance device, it acts like a unijunction transistor except that the V/I curve is much deeper. There are no practical applications for it at this time.

An unusual semiconductor cold cathode for vacuum tubes is under development at the Stanford Research Institute. Dubbed a "tranverse 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

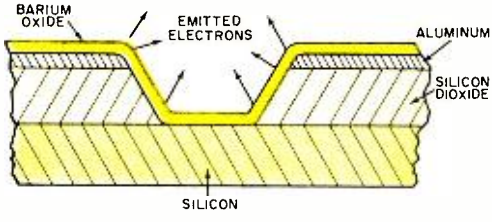


Fig. 2. Developed at Stanford Research Institute, this semiconductor cold cathode supplies a source of electrons (similar to the cathode of a conventional vacuum tube) without heat generation.

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-

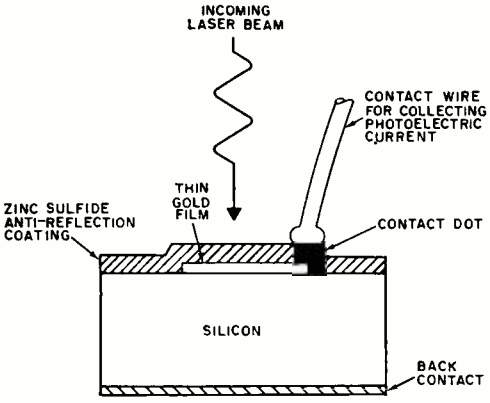


Fig. 3. In this Bell Labs photodetector, the photons that pass through the gold film create electron-hole pairs at the gold-silicon junction. Current then flows through the external circuit connected between the contact dot and back contact.

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.

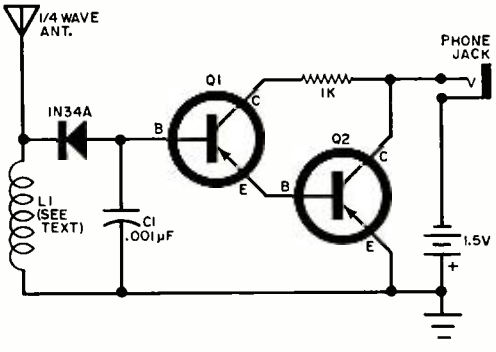


Fig. 4. Modulation monitor devised by Bill Waddington can be used at any frequency if the coil is wound for that frequency. A simple amplified crystal set, it provides ample headphone volume.

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-

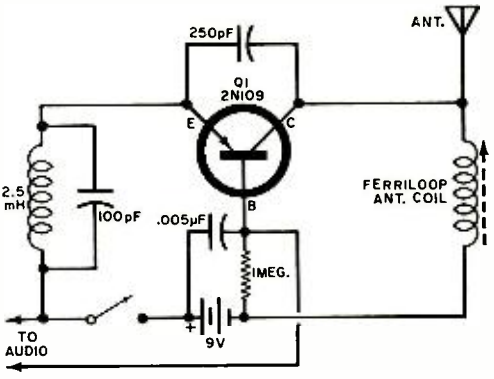


Fig. 5. According to Mike Mark, this broadcast-band wireless mike has high enough modulation quality to broadcast music from his hi-fi system.

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.

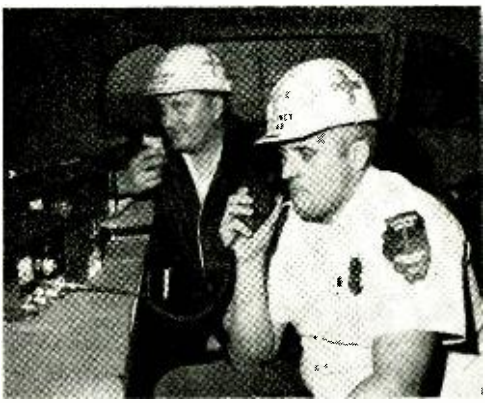
The Rockford Red Cross amateur station was complemented by two communications' vans and 10 mobile units from the Milwaukee Navy MARS unit, plus regular amateur radio operating on 75 meters, 6-meter base stations set up at disaster headquarters in Belvidere, and a 2-meter FM link.

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 Belvidere 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.

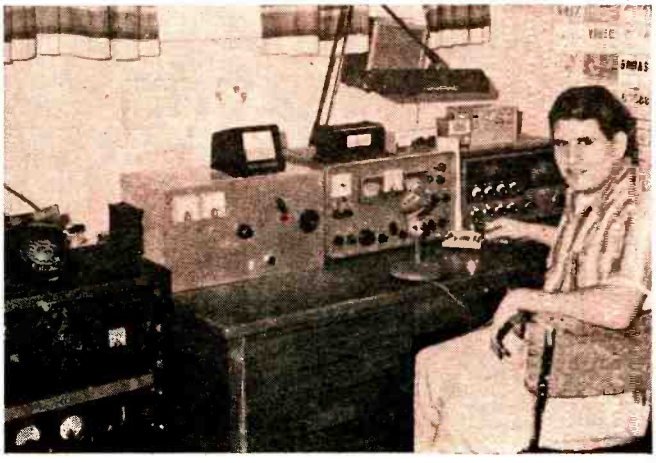
The "Mayday" call came from a sinking 87-foot schooner on Bombay Reef, between the Philippine Islands and South Vietnam. Thomas Kurth, of Milwaukee, Wis., heading a biological research mission in the South China Sea area, had run the "Donto Deo" aground on a coral reef. There were six other people on 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 W8SWN'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.

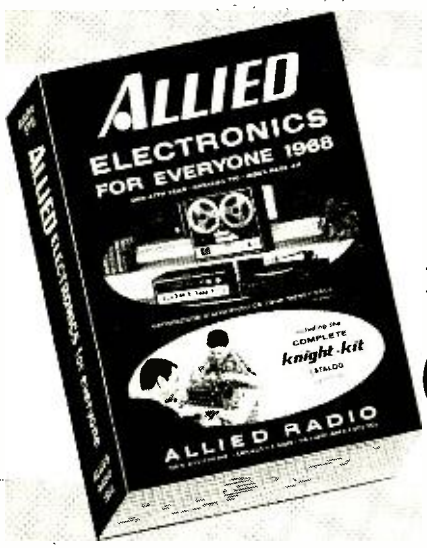
Incidentally, on August 13 the Hamfesters will hold their 33rd Annual Hamfest at Santa Fe Park, 91st and Wolf Rd., Willow Springs, Ill., from 9 a.m. until. . . .

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???.



What has this new 1968 ALLIED catalog got for you?

everything!

send for your FREE copy

WHY BUY BY MAIL FROM *ALLIED?*

Each year Allied fills more than a million orders by mail. That's because only the complete facilities of the world's largest electronics supply house can satisfy all the needs of hi-fi enthusiasts, CB users, engineers, Hams, and experimenters.

WORLD'S LARGEST SELECTIONS
Shop through the pages of this complete 518 page electronics buying guide. It gives you full descriptions and low prices on thousands upon thousands of items.

MANY PRODUCTS NOT AVAILABLE ANYWHERE ELSE
Allied stocks thousands of unusual and special items not available elsewhere. Many are specially designed and built to Allied's specifications to save you money.

FIRST WITH THE LATEST FOR 47 YEARS
Allied has always been the first to offer the latest developments in Electronics. See them now in Allied's new 1968 Catalog.

No Money Down
Up to 2 Years to Pay

WE QUALITY-TEST WHAT WE SELL
It it's from Allied – you can depend on it.

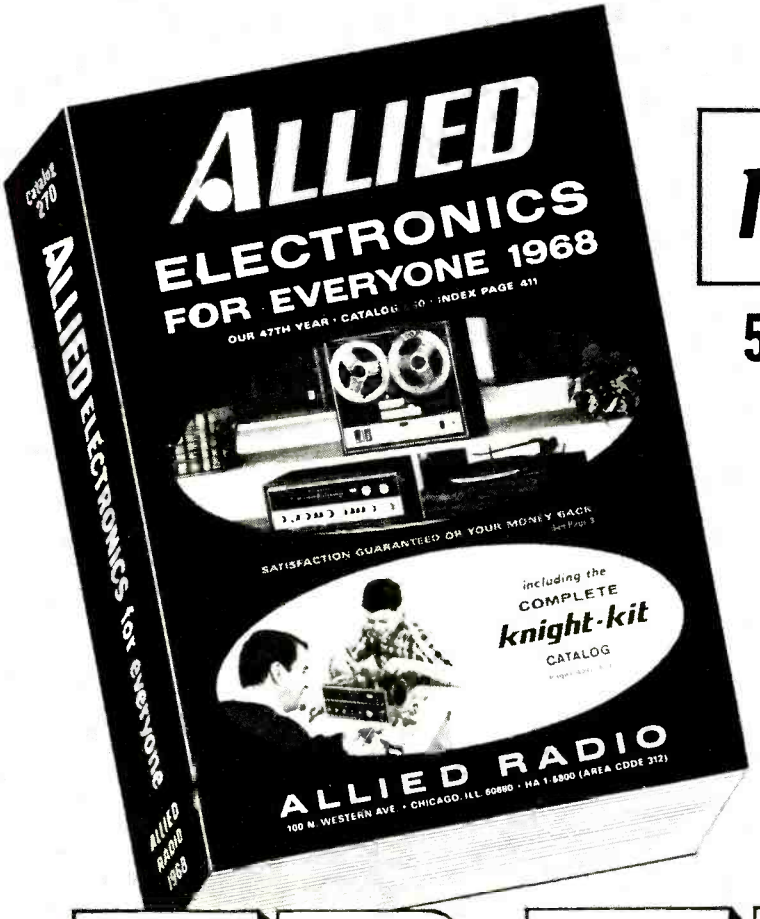
COUNT YOUR SAVINGS AT ALLIED
Check Allied's lower prices. Look for the special values available only in the Allied catalog.

IMMEDIATE SHIPMENT
Orders are filled promptly–usually the same day they're received.

Satisfaction Guaranteed or Your Money Back!

ENJOY "EASY-CHAIR" SHOPPING
Shopping's easier at Allied. You always know exactly what you get. And, the selection of merchandise is so vast no single store could ever assemble and stock it all.

ALLIED RADIO, DEPT. 3-H, P.O. BOX 4398, CHICAGO, ILL. 60680



new!

518 PAGES

Stereo Hi-Fi
Famous Knight-Kits
Tape Recorders & Tape
CB 2-way Radios
Walkie-Talkies
FM-AM & AM Radios
Short Wave Receivers
Portable TV
Phonographs
Amateur Gear
Intercoms & PA
Automotive Electronics
Test Instruments
TV Antennas & Tubes
Power Tools, Hardware
Tubes, Transistors
Parts, Batteries, Books

FREE

1968 ALLIED CATALOG

MAIL THIS COUPON IF CARD HAS BEEN REMOVED

ALLIED RADIO, DEPT. 3-H, P.O. BOX 4398
CHICAGO, ILLINOIS 60680

Send me your free 1968 Catalog

NAME *(Please Print)* _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

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.

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.

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 airmail 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)

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

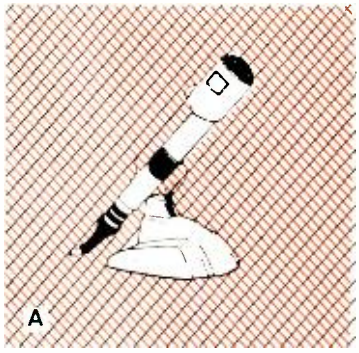
ELECTRONIC MEASUREMENTS QUIZ

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.

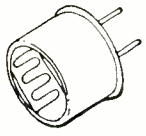
(*Answers on page* 114)

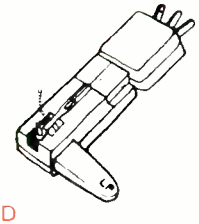
1 °C/W ____
2 cm/dyn ____
3 dB/octave ____
4 —dB ____
5 μA/fc ____
6 pF/ft ____
7 μV/m ____
8 V/in ____
9 ohms/V ____
10 p.p.m./°C ____

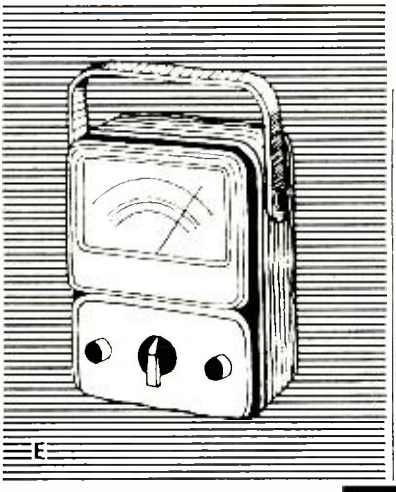

A

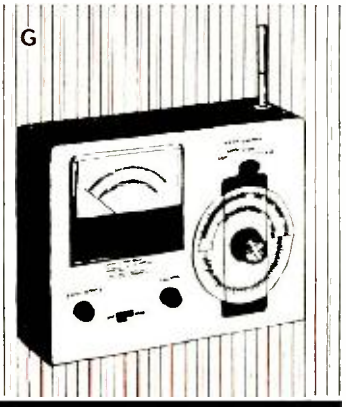

B

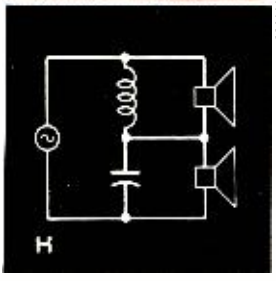

C


F

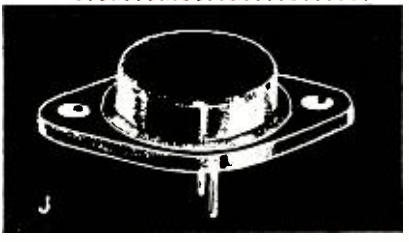

D


E


G


H


I


J

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.

Name_____

Address_____

City_____ **County**_____

State_____ **Zip**_____

PE-78

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-watter 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.

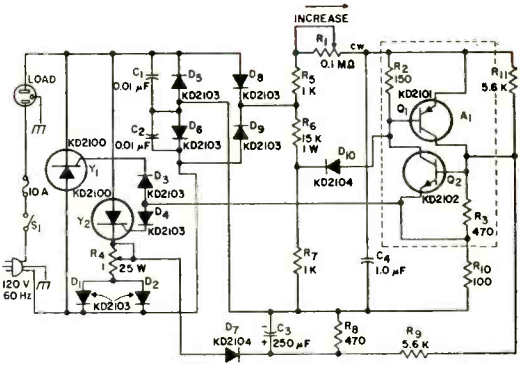
UHF/VHF Converters. Most 6- and 2-meter operators use low-power AM transceivers whose transmit function is often relatively better for fixed station operation than their receive function. As a result, it is quite common to use the transceiver as a transceiver only for portable and mobile operation, and 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. -30-

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.

Technical Series KM-71

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.

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

RCA ® **The Most Trusted Name in Electronics**

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. -30-

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...

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

in the air...

New "Sky-Hook" fiberglas 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

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

"Stripes of Quality" TM

CIRCLE NO. 2 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 *Triplett 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.

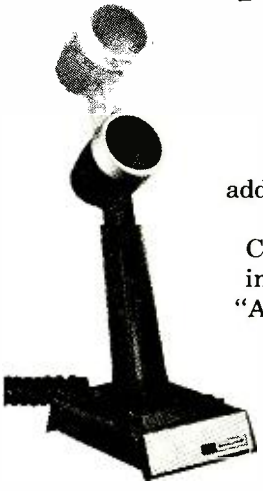
Circle No. 90 on Reader Service Page 15

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

CIRCLE NO. 41 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 μF 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

Kit GR-295
$479.95*
(295 sq. inch viewing area)

Kit GR-180
SAVE $30 NOW ONLY **$349.95****
(180 sq. inch viewing area)

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 Degaussing** 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 34½" 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...18¼" D. x 28¼" 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.

HEATHKIT

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-

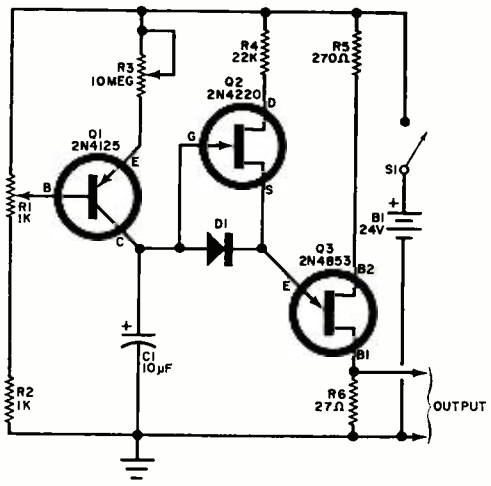


Fig. 6. Time delays of up to 10 hours are possible with circuit suggested by Motorola if C1 and D1 are high-quality, low-leakage components. A glass-epoxy PC board should be used for best results.

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 1⅛" 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

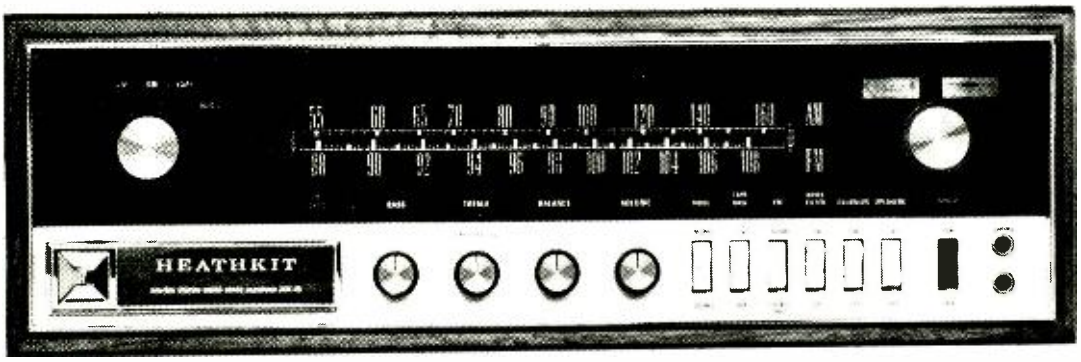
(*Continued from page 87*)

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.

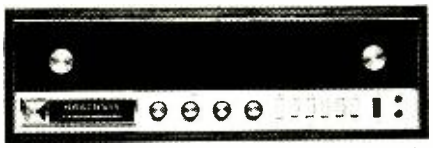
Over 225 individual CB'ers and 70 mobile units supplemented the squad during the heaviest air traffic which pertained to inquiries of local residents. Bill Bagley explained how inquiries coming in on Jay Hart's MARS setup were relayed by Dutch LaBounty to the Coffin and Troia base stations, and then 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*)

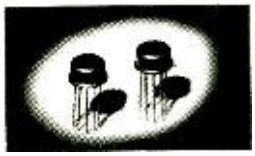
New Heathkit® AR-15 Solid-State Stereo Receiver



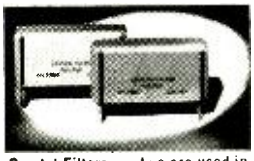
150 Watts . . . AM-FM Stereo . . . $329.95†



"Black Magic" Panel Lighting A touch of the power switch and presto! . . . The black magic panel lights up with a slide-rule dial for easy tuning, and instant identification of all controls.



Integrated Circuits . . . two are used in the IF amplifier for hard limiting excellent temperature stability, increased reliability. Capture ratio is 1.8 db. Each IC is the size of a tiny transistor, yet each contains 10 transistors, 7 diodes, and 11 resistors.



Crystal Filters . . . two are used in the IF amplifier to replace the usual transformers . . . Heath hi-fi exclusive. Provide near-perfect bandpass characteristics, (70 db selectivity) yet no adjustment is ever needed!

Now From The World's Most Experienced Solid-State Audio Engineers Comes The World's Most Advanced Stereo Receiver . . . The New Heathkit AR-15. There's nothing like it anywhere in the transistor stereo market place. Besides the use of space-age integrated circuits and exclusive crystal filters in the IF section, it boasts other "state-of-the-art" features like these:

150 Watts Dynamic Music Power . . . the highest power output of any transistor stereo receiver . . . delivers the coolest, most natural sound you've ever heard.

All-Silicon Transistor Circuitry . . . a total of 69 transistors, 43 diodes and 2 IC's for maximum reliability.

Positive Circuit Protection . . . four Zener diodes and two thermal circuit breakers protect the driver and output transistors from overload and short circuits of any duration.

Field Effect Transistor FM Tuner . . . cascode 2-stage FET RF amplifiers and an FET mixer provide high overload capability, excellent cross modulation and image rejection. Sensitivity 1.8 uv. Features 4-gang variable capacitor and 6 tuned circuits for extreme selectivity under the most adverse conditions. Completely shielded . . . completely assembled.

Two Calibrated Tuning Meters . . . for signal levels, for center tuning — doubles as a VOM for check-out during or after kit assembly. Plus automatic switching to stereo, transformerless design, filtered outputs and a host of other deluxe features. Full details in FREE catalog.

† Kit AR-15, (less cabinet) 28 lbs. **$329.95**
AE-16, assembled wrap-around walnut cab., 7 lbs. **$19.95**

AR-15 SPECIFICATIONS — AMPLIFIER SECTION: Dynamic Power Output Per Channel (Music Power Rating): 8 ohm load; 75 watts. **Continuous Power Output, Per Channel*:** 8 ohm load; 50 watts. **Power Bandwidth For Constant 0.5% Total Harmonic Distortion*:** 6 Hz to 25 kHz. **Frequency Response (1 watt level):** ±1 db, 6 to 50,000 Hz. ±3 db, 4 to 70,000 Hz. **Harmonic Distortion:** Less than 0.5% from 20 to 20,000 Hz at 50 watts output. Less than 0.2% at 1,000 Hz with 50 watts output. Less than 0.2% at 1,000 Hz with 1 watt output. **Intermodulation Distortion (60 Hz: 6,000 Hz=4:1)** Less than 0.5% with 50 watts output. Less than 0.2% with 1 watt output. **Damping Factor:** 45. **Hum & Noise:** Volume control at minimum position; —80 db. PHONO; **Channel Separation:** PHONO; 45 db. TAPE & AUX.; 55 db. **Output Impedance (each channel):** 4, 8 & 16 ohms. **FM SECTION (Mono): Sensitivity:** 1.8 uv*. **Frequency Response:** ±1 db; 20 to 15,000 Hz. **Antenna:** Balanced input for external 300 ohm antenna, unbalanced, 75 ohm. **Volume Sensitivity:** Below measurable level. **Selectivity:** 70 db*. **Image Rejection:** 90 db. **IF Rejection:** 90 db minimum*. **Capture Ratio** 1.5 db*. **AM Suppression:** 50 db*. **Harmonic Distortion:** 0.5% or less*. **Intermodulation Distortion:** 0.5% or less*. **Hum & Noise:** 65 db*. **Spurious Rejection:** 100 db*. **FM SECTION (Stereophonic): Channel Separation:** 40 db or greater. **Frequency Response:** ±1 db, 20 to 15,000 Hz. **Harmonic Distortion:** Less than 1% at 1,000 Hz with 100% modulation. **19 & 38 kHz Suppression:** 55 db or greater. **SCA Suppression:** 50 db. **AM SECTION: Sensitivity:** 12 microvolts at 1,000 kHz. **Image Rejection:** 60 db at 600 kHz. 40 db at 1400 kHz. **IF Rejection:** 70 db at 1,000 kHz. **Harmonic Distortion:** Less than 1.5% at 400 Hz, 90% modulation. **Hum & Noise:** 45 db. **Power Requirements:** 105-125 or 210-250 volt 50/60 Hz AC. **Dimensions:** Overall, 16⅞" wide x 4¾" high x 14½" deep.

*Rated IHF (Institute of High Fidelity) Standards.

FREE 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

HEATHKIT

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. HF-201

CIRCLE NO. 16 ON READER SERVICE PAGE

RADIO SHACK®

2-BAND POLICE RADIOS!

Now — a pocket-sized portable that tunes police as well as standard AM radio. Hear the news while it's happening! Brilliant VHF reception of police, CD, Fire, Airlines, Railroads and Mobile Telephones!

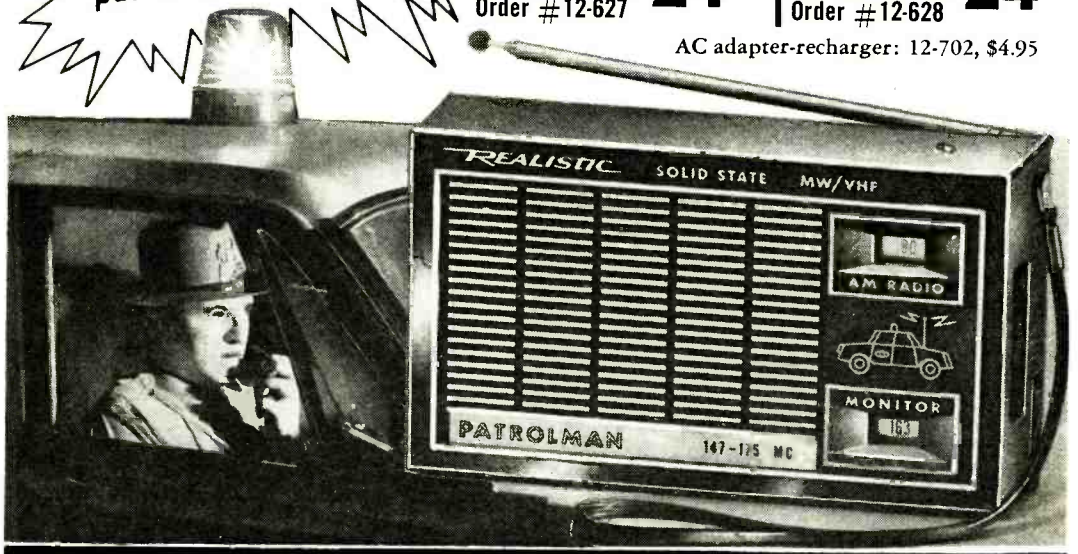
Listen to the live drama of crisis on a VHF radio you can put in your pocket!

The solid state REALISTIC PATROLMAN(tm) is the *original*—beware of possibly inferior imitations! Features continuous, no-drift tuning, built-in AM and VHF antennas, batteries, AC adapter jack, earphone. Performance proven by the 1,000's in use now! Size 6x3½x1½". Net wt. 1 lb. Ship wt. 3 lbs.

HIGH BAND
VHF: 147-174 MC
AM: 535-1605 KC
Order #12-627
24.95

LOW BAND
VHF: 30-50 MC
AM: 535-1605 KC
Order #12-628
24.95

AC adapter-recharger: 12-702, $4.95



SOLD ONLY BY RADIO SHACK! 158 STORES IN 32 STATES!

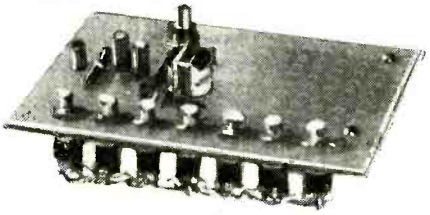
ARIZONA — Phoenix
ARKANSAS — Little Rock
CALIFORNIA — Anaheim, Bakersfield, Covina, Downey, Garden Grove, Glendale, Inglewood, La Habra, Long Beach, Los Angeles, Mission Hills, Mountain View, Oakland, Pasadena, Pomona, Reseda, Sacramento, San Bruno, San Diego, San Francisco, Santa Ana, Santa Monica, Torrance, West Covina
COLORADO — Denver
CONNECTICUT — Hamden, Manchester, New Britain, New Haven, New London, Orange, Stamford, West Hartford
FLORIDA — Jacksonville, Orlando
GEORGIA — Atlanta
ILLINOIS — Belleville, Chicago, Harvey
KANSAS — Wichita
LOUISIANA — Gretna, New Orleans
MAINE — Portland
MARYLAND — Langley Park
MASSACHUSETTS — Boston, Braintree, Brockton, Brookline, Cambridge, Dedham, Framingham, Lowell, Medford, Natick, Quincy, Saugus, Springfield, Waltham, West Springfield, Worcester
MICHIGAN — Detroit
MINNESOTA — Minneapolis, St. Paul
MISSOURI — Kansas City, St. Joseph, St. Louis
NEBRASKA — Omaha
NEW HAMPSHIRE — Manchester
NEW JERSEY— Pennsauken
NEW MEXICO — Albuquerque
NEW YORK — Albany, Binghamton, Buffalo, New York, Schenectady, Syracuse
NORTH CAROLINA—Charlotte
OHIO — Cincinnati, Cleveland, Lima
OKLAHOMA — Oklahoma City, Tulsa
OREGON — Portland
PENNSYLVANIA — Greensburg Philadelphia, Pittsburgh
RHODE ISLAND — Providence, East Providence
TENNESSEE — Memphis, Nashville
TEXAS — Abilene, Arlington, Austin, Brownsville, Corpus Christi, Dallas, El Paso, Fort Worth, Houston, Lubbock, Midland, San Antonio, Sherman, Waco
UTAH — Salt Lake City
VIRGINIA — Arlington, Virginia Beach
WASHINGTON — Seattle

RADIO SHACK®

Science Fair™

ELECTRONIC PROJECT KITS

At last! Build kits the way professional engineers build them — by "breadboarding"! Each Science Fair Electronic Kit shown below is centered around the technique of perf-board construction. This means you can solder or not, as you choose. Move or interchange parts — make additional experiments! The fabulous new Science Fair perf-board project line was designed by Radio Shack engineers based on the philosophy of "learning by doing." All kits are complete. Line cords, potentiometers and other components are supplied when required. Each kit includes step-by-step numbered instructions, pictorials, schematics, add-on ideas and additional uses for the project. All parts are first quality. New kits are in development for release this year. Hobbyists, students and educators all agree that Science Fair is tops in electronic kits.



TUBE RADIO KIT 3.95

Safe battery operation! Build a breadboard one-tube radio that receives the entire AM band. Includes earphone and tube. Kit No. 28-100

WIRELESS MIKE KIT 3.95

Broadcast through any radio like a real station to 20 feet away! A real "fun" project for years, now re-engineered in solid state. Kit No. 28-103

ELECTRONIC ORGAN KIT 5.95

Build a real solid-state 7-key electronic organ! Embodies the basic principles of feedback and time constant networks. Battery operation. 28-101

TRANSISTOR RADIO KIT 3.95

A hot little transistor radio for the entire AM band. Use it as a tuner, too! Professional perf-board construction, earphone. 28-102

FREE 1968 RADIO SHACK CATALOG!

RADIO SHACK { East: 730 Commonwealth Ave., Boston, Mass. 02215
West: 1515 So. University Dr., Ft. Worth, Tex. 76107

- ☐ Send me FREE 1968 Radio Shack catalog.
- ☐ 12-627, High-Band Police/AM Radio
- ☐ 12-628, Low-Band Police/AM Radio
- ☐ 12-702, AC Adapter
- ☐ 28-100, Tube Radio Kit
- ☐ 28-103, Wireless Mike Kit
- ☐ 28-102, Transistor Kit
- ☐ 28-101, Organ Kit

NAME_____

STREET_____

CITY_____ STATE_____ ZIP_____

Add 50¢ per item for postage and handling. Dept. ST

CIRCLE NO. 29 ON READER SERVICE PAGE

POPULAR ELECTRONICS SUBSCRIBER SERVICE

Please include an address label when writing about your subscription to help us serve you promptly. **Write to:** Portland Place, Boulder, Colo. 80302

CHANGE OF ADDRESS: Please let us know you are moving at least four to six weeks in advance. Affix magazine address label in space to the right and print new address below. If you have a question about your subscription, attach address label to your letter.

TO SUBSCRIBE: Check boxes below.

☐ New ☐ Renewal
☐ 5 years $20
☐ 3 years $13
☐ 1 year $5

SPECIFY:

☐ Payment enclosed —You get 1 extra issue per year as a BONUS!
☐ Bill me later.

AFFIX LABEL

If you have no label handy, print OLD address here.

please print

name
address
city
state
zip-code

Add'l postage: $1 per year outside U.S., its possessions & Canada.

name (please print) 0217

address

city

state zip-code

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)

WN7FHF—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)

—30—

(*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)

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, WN0OWJ,** 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 (°C/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 (—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 (μA/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 (μV/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./°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, WN5QVD, 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, WA6CRN,** 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

SHORT-WAVE ABBREVIATIONS

anmt—Announcement
BBC—British Broadcasting Corporation
B/C—Broadcasting
Eng.—English
ID—Identification
IS—Interval signal
kHz—Kilohertz
kW—Kilowatts
N.A.—North America
QRM—Station interference
QRN—Atmospheric disturbance
QSL—Verification
R.—Radio
s/off—Sign-off
s/on—Sign-on
VOA—Voice of America
xmsn—Transmission
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, OE9CZI, 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 *(WPE1GNP)*, 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 *(WPE2PHU)*, 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 *(WPE4BVK)*, 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 *(WPE6GOY)*, Canoga Park, Calif.
Philip Green *(WPE6GRC)*, Northridge, Calif.
John Sears, Jr. *(WPE7CNZ)*, Bellevue, Wash.
Andrew Cooper *(WPE8JNC)*, Westland, Mich.
Bill Vogt *(WPE3IND)*, Tinley Park, Ill.
A. R. Niblack *(WPE9KM)*, Vincennes, Ind.
John Beaver, Sr. *(WPE0AE)*, Pueblo, Colo.
Richard Wendt *(WPE0EVV)*, Hutchinson, Minn.
Ervin Ramos *(KP4PE2O)*, San Antonio, P. R.
Jack Perolo *(PV2PEIC)*, 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 Nivling, 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

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 3¾ 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

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, Worcestershire, 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 (WPEØDXW), Pueblo, Colo.
Mrs. Marion Lilienthal (VE3PE2DO), Waterloo, Ont., Canada
David Lalor (WPE5EIQ), Corpus Christi, Texas
John Shoptaw (WPEØEPO), 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 Brandle (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 Shawyer 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 (WPEØEVD), 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 (WPEØEJX), 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 Guther (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 (WPE4IZJ), Cynthiana, Ky.
Kerry Plantenga (WPE9ITC), Lafayette, Ind.
Karl Purins (WPE9IJL), Wauwatosa, 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. (WPEØEOF), 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), Warminster, 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. (WPEØEZD), St. Charles, Mo.
Roger Thering (WPE6FUB), Barstow, Calif.
Wayne La Valla (WPE3HCC), Pittsburgh, Pa.
Steve Harper (WPEØFBT), 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 Sasquisili,* Sasquisili, 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 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

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. Kuney (WPE8AD) Detroit, Mich.	150	50	10
Paul Kilroy (WPE3FOB) 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

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.

Netherland 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 Statmos 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. —30—

ELECTRONICS MARKET PLACE

COMMERCIAL RATE: For firms or individuals offering commercial products or services. $1.00 per word (including name and address). Minimum order $10.00. Payment must accompany copy except when ads are placed by accredited advertising agencies. Frequency discount: 5% for 6 months; 10% for 12 months paid in advance.
READER RATE: For individuals with a personal item to buy or sell. 60c per word (including name and address). No Minimum! Payment must accompany copy.

GENERAL INFORMATION: First word in all ads set in bold caps at no extra charge. Additional words may be set in bold caps at 10¢ extra per word. All copy subject to publisher's approval. Closing Date: 1st of the 2nd preceding month (for example, March issue closes January 1st). Send order and remittance to: Hal Cymes, POPULAR ELECTRONICS, One Park Avenue, New York, New York 10016.

FOR SALE

FREE! Giant bargain catalog on transistors, diodes, rectifiers, SCR's, zeners, parts. Poly Paks, P.O. Box 942, Lynnfield, Mass. 01940.

GOVERNMENT Surplus Receivers, Transmitters, Snooperscopes, Radios, Parts, Picture Catalog 25¢. **Meshna,** Nahant, Mass. 01908.

WEBBER LAB'S Police—Fire Transistorized Converter kit 30-50mc, & 100-200mc. (1 mc. spread) $5.00 each. 26-200mc, on broadcast band using any type radio, crystal controlled $23.00 wired pp. tunable—crystal controlled $11.00 kit. 72 Cottage Street, Lynn, Mass. 01905.

JAPAN & Hong Kong Electronics Directory, Products, components, supplies. 50 firms—just $1.00. Ippano Kaisha Ltd., Box 6266, Spokane, Washington 99207.

INVESTIGATORS, FREE BROCHURE, LATEST SUBMINIATURE ELECTRONICS SURVEILLANCE EQUIPMENT, ACE ELECTRONICS, 11500-L NW 7TH AVE., MIAMI, FLA. 33168.

CB-WPE-QSL CARDS. Same High Quality, Beautiful, Glossy multi-color cards. New **LOW PRICES. SAMPLES,** 25¢. Dick, W8VXK, 19QA0625, Gladwin, Mich. 48624.

R.F. CONVERTERS. World's largest selection. Also CCTV cameras, etc. Lowest factory prices. Catalog 10¢. Vanguard 196-23 Jamaica Ave., Hollis, N.Y. 11423.

TELEPHONE VOICE SWITCH: (LS-500). ACTUATES AUTOMATICALLY AND UNATTENDED ANY TAPE OR WIRE RECORDER. PICTORIAL INSTALLATION INSTRUCTIONS INCLUDED. $23.75. POST PAID USA, WJS ELECTRONICS. 737 NORTH SEWARD, HOLLYWOOD, CALIF. 90038.

INVESTIGATORS: KEEP IN STEP WITH ADVANCEMENTS IN THE ART OF ELECTRONICS FOR THE PROFESSIONAL. SEND $1.00 FOR EQUIPMENT BROCHURE. WJS ELECTRONICS, 737 NORTH SEWARD, HOLLYWOOD, CALIF. 90038.

BUG DETECTOR: WILL DETECT AND LOCATE SURREPTITIOUS TRANSMITTING DEVICES IN CONFERENCE ROOMS, HOME AND OFFICES, ETC. WRITE FOR DETAILS. WJS ELECTRONICS, 737 NORTH SEWARD, HOLLYWOOD, CALIF. 90038.

DETECTIVES! Free Brochures! Electronics Surveillance Devices. **SILMAR ELECTRONICS,** 3476 N.W. 7th Street, Miami, Fla. 33125.

CIRCUIT Boards, Parts for "Poptronics" projects. Free catalog. **DEMCO,** Box 16297, San Antonio, Texas 78216.

ROCKETS: Ideal for miniature transmitter tests. New illustrated catalog, 25¢. Single and multistage kits, cones, engines, launchers, trackers, rocket aerial cameras, technical information. Fast service. Estes Industries, Penrose 18, Colorado 81240.

LOWEST Prices Electronic Parts. Confidential Catalog Free. **KNAPP,** 3174 8th Ave. S.W., Largo, Fla, 33540.

CB-QSL CARDS, New Designs, Record Books, Blabbermouth Awards, Gag Signs, Warning Decals, Novelties. Free Brochure. **WOODY,** 8474 Watson, St. Louis, Mo. 63119.

RADIO—T.V. Tubes — 33¢ each. Send for free catalog. Cornell, 4213 University, San Diego, Calif. 92105.

FREE ELECTRONICS (new and surplus) parts catalog. We repair multimeters. Bigelow Electronics, Bluffton, Ohio 45817.

SURVEILLANCE EQUIPMENT — NEW HIGH PERFORMANCE SUBMINIATURE MODELS. ELECTRONIC COUNTERMEASURE DEVICES TO PROTECT PRIVACY. FREE DATA: SECURITY ELECTRONICS-PE, 15 EAST 43RD STREET, NEW YORK, N.Y. 10017.

CONVERT any television to sensitive, big-screen oscilloscope. Only minor changes required. No electronic experience necessary. Illustrated plans, $2.00. Relco-A33, Box 10563, Houston, Texas 77018.

MUSIC LOVERS, CONTINUOUS, UNINTERRUPTED BACKGROUND MUSIC FROM YOUR FM RADIO, USING NEW INEXPENSIVE ADAPTOR. FREE LITERATURE. ELECTRONICS, 11500-Z NW 7th AVE., MIAMI, FLORIDA 33168.

CLOSED-CIRCUIT TV — Industrial, educational. Factory-direct prices. Write for particulars. **ATV RESEARCH,** Box 396P, Industrial Division, South Sioux City, Nebr. 68776.

TV CAMERA PLANS. Best available. Tube model, vidicon —$3.00; transistor—$5.00 (deductible). Flying spot scanner—$2.50. **ATV RESEARCH,** Box 396P, So. Sioux City, Nebr. 68776.

SEE YOURSELF ON TV! Exciting hobby lets you televise live pictures right in your own home. Kits from $18.95 to $149.50. Catalog 10¢. **ATV RESEARCH,** Box 396P, Amateur Division, South Sioux City, Nebr. 68776.

SUDYMONT acoustic baffles. Plans $5.95; Baffle $26.95; with cabinet from $39.95. Send speaker size. **SUDYMONT,** 120 Liberty Str. NYC. 10006.

FREE CATALOG—LOADS OF ELECTRONIC BARGAINS. R. W. ELECTRONICS, INC. 2244 So. Michigan Avenue, Chicago, Illinois 60616.

CRYSTALS . . . largest selection in United States at lowest prices. 48 hr. delivery. Thousands of frequencies in stock. Types include HC6/**U,** HC18/**U,** FT-241, FT-243, FT-171, etc. Send 10¢ for catalog with oscillator circuits. Refunded on first order. Jan Crystals, 2400F Crystal Dr., Fort Myers, Fla. 33901.

EXPERIMENTERS Having trouble understanding **TRANSISTOR** Terminology? Our pamphlet can help you. Includes **FIELD EFFECT.** Only $1.00. Williams, Box 2131, Lehigh Valley, Penna. 18001.

COURSES: TELEPHONE ENGINEERING, $39.50. Detective Electronics $22.50. Security Electronics $27.50. **AMAZING NEW SUPER HOBBY CATALOG** 25¢. Construction Plans: **TELEPHONE;** Answering Machines, Speakerphones, Automatic Dialers, Central Dial Systems, Call Diverters, Voice Scramblers, Legal Connectors. **TELEVISION:** Cameras, 3DTV Converters, Color TV Converters, Video Recorders. **HOBBYIST:** Transistorized Teletypes, Electron Microscopes, Tranquilizers, Private Eye Tail Transmitter, Electronic Fingerprint Identifier. Plans $4.95 each. Silent Listening Device Dynamiter Plans $8.50. **KNOW YOUR TELEPHONE RIGHTS,** a study of the Telephone Tariffs $9.50. Don Britton Enterprises, 7906 Santa Monica Blvd., Hollywood, Calif. 90046.

POLICE RADIO. Hear all police calls, fire departments, Sheriffs, taxis, ambulances, Highway Patrol. New 5 Band portable radio and direction finder. Free Booklet. Nova-Tech, Dept. 239, Redondo Beach, Calif. 90278.

JAPANESE PRODUCTS CATALOG by air mail $5, sea $3. Intercontinental, CPO 1717, Tokyo, Japan.

TREASURE Hunters! Prospectors! Relco's new instruments detect buried gold, silver, coins. Kits, assembled models. Transistorized. Weighs 3 pounds. $19.95 up. Free catalog. Relco-A33, Box 10836, Houston, Texas 77018.

SEND FOR FREE CATALOG, featuring transistors, rectifiers, zeners. SCR's, biswitches and other semiconductor devices in large and small quantities. **ALL DEVICES ARE CHECKED AND GUARANTEED. INTEGRATED CIRCUITS** (JK, SR, SRT FLIP FLOPS AND GATES), with checked inputs and diagrams are available. Solid State Sales, Box 74F, Somerville, Mass. 02143.

LINEAR AMPLIFIERS: $119.95; "Raider" — 100 watts — $139.95; "Maverick—250"—250 watts—$244.95. For AM and SSB. Frequency range 20-35 megacycles (illegal) for Class D 11 meters.) Dealer inquiries invited. D & A Manufacturing Co., 1217 Avenue C, Scottsbluff, Nebraska 69361.

ELECTRONIC PARTS! Components, transistors, diodes, kits, relays, and many special items. Guaranteed. Send 25¢ for 100 page catalog. General Sales Co. P.O. Box 2031 D, Freeport, Texas 77541.

MESHNA'S TRANSISTORIZED CONVERTER KIT. Converts car radio to receive police and fire. 30-50MHz and 100-200 MHz (one MHz Tuning). $5.00 with easy to follow step instructions. Meshnas, No. Reading, Mass. 01864.

DIAGRAMS——Radios $1.00, Television $2.50. Give make and model. Diagram Service, Box 1151PE, Manchester, Conn. 06042.

EXPERIMENTERS Latest Transistorized Projects Catalog 10¢, Hazleton Scientific, Box 163, Hazel Park, Michigan 48030.

ELECTRONIC, mechanical devices catalog 10¢. Transistor boards bonanza $5.95, **FERTIK'S,** 5249 "D," Phila., Pa. 19120.

WEATHERCASTER—Portable crystal controlled radio receiver for U.S. Weather Bureau's new instant weather channel (162.55 MHz). New York, Chicago, Honolulu, Kansas City, Miami and New Orleans now broadcasting. Inquire at other local Weather Bureaus before ordering. $39.95. Shaw Electronics, Roper Building, Miami, Florida 33131.

LIKE-NEW! 24 SPDT microswitches, $2.25—sample 25¢. Hansen Electronics, P.O. Box 6106, Elmwood Park Station, Omaha, Nebraska 68106.

PROXIMITY switch. Detects nearness of human body! Free information. Claremont Products, 860 Reed Drive, Claremont North, Calif. 91711.

SAVE ON DIODES. If you use germanium or silicon diodes in quantities of 5000 to a million, get our low, low prices. Send specs or request samples. Ruland Manufacturing Co, Watertown, Mass. 617-924-8000.

VHF FM Converter 156-163 MHz, output in broadcast band, name brand, special $35. Postpaid, satisfaction guaranteed, Research, Box 334A, Cape Canaveral, Fla. 32920.

OSCILLOSCOPE, Waterman S-14-B wideband. New. $140. Maisner, 2163 Ronsard, Eastview, California 90732.

ELECTRONIC Ignition. Kits, components, systems. Diagrams. Anderson Engineering, Epsom, N.H. 03239.

PRINTED circuit artwork and boards. Free lists, Dirck Spicer, 11 Ridgeland Road, Wallingford, Connecticut 06492.

JAPANESE or **EUROPEAN DIRECTORY** 200 firms $1.00. **SURVEILLANCE EQUIPMENT,** wireless **SNOOPERMIKE** $25.00, **SUBMINNIMIKE** 3/8 x 3/8 x 3/16 $4.00, Brochure 25¢, **SIERRATRONICS,** Box 7497, Las Vegas, Nev. 89101.

RECTIFIERS, transistors, other components. Catalog free. Electronic Components Co., Box 2902C, Baton Rouge, La. 70821.

PLANS AND KITS

ALLWAVE RADIO KIT. Tube, transistor included $5.00. Headset $2.50. Ekeradio, Box 131, Temple City, Calif. 91780.

"CRYSTAL EXPERIMENTERS" Handbook—50¢. Catalog. Laboratories, 12041-L Sheridan, Garden Grove, Calif. 92640.

ULTRA MINIATURE CB TRANSMITTER. Under 2" long. Easy and inexpensive to build. Complete Plans—$2.00. Electronics, Box 262, Stuyvesant Station, New York, N.Y. 10009.

CLASSIFIED ADVERTISING ORDER FORM

Please refer to heading on first page of this section for complete data concerning terms, frequency discounts, closing dates, etc.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35

_____ Words { @ 60¢ (Reader Rate) / @ $1.00 (Commercial Rate) } = $_____

Insert _____ time(s) Total Enclosed $_____

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

Signature _____

WORD COUNT: Include name and address. Name of city (Des Moines) or of state (New York) counts as one word each. Zone or Zip Code numbers not counted. (Publisher reserves right to omit Zip Code if space does not permit.) Count each abbreviation, initial, single figure or group of figures or letters as a word. Symbols such as 35mm, COD, PO, AC, etc., count as one word. Hyphenated words count as two words.

PE-867

INTEGRATED CIRCUIT KITS; COMPUTER LOGIC; Parts; Others. Catalogue free. Kaye Engineering, Box 3932, Long Beach, California 90803.

INTEGRATED Circuit experimenters kit. Two IC's, 2 transistors, several circuits. Kit $12.50; Wired, $17.00. Adams, Box 399, Hazelwood, Missouri 63042.

SHORTWAVE LISTENING

ANTENNA SPACE PROBLEMS? Solve with **JOTSTICK!** Mosley SWL-7. All Books for SWLs. SWL Guide, 218 Gifford, Syracuse, N.Y. 13202.

HIGH FIDELITY

FREE! Send for money saving stereo catalog #P8E and lowest quotations on your individual component, tape recorder, or system requirements. Electronic Values, Inc., 200 W. 20th St., New York, N.Y. 10011.

HI-FI Components, Tape Recorders, at guaranteed "We Will Not Be Undersold" prices. 15-day money-back guarantee. Two-year warranty. No Catalog. Quotations Free. Hi-Fidelity Center, 239 (P) East 149th Street, New York 10451.

"LOW, Low quotes: all components and recorders. HiFi, Roslyn, Penna. 19001.

TAPE RECORDERS, Hi-Fi, components, Sleep Learning Equipment, tapes. Unusual Values Free Catalog. Dressner, 1523R, Jericho Turnpike, New Hyde Park, N.Y. 11040.

EVERYONE can afford **HIGH FIDELITY** components—because of our **DISCOUNT** policy. Insured guaranteed shipments—Factory sealed cartons—**FRANCHISED.** Send for our **LOW-LOW** quote today. Sound and Sight Audio, Inc. 106 West 32 Street, New York, N.Y. 10001.

WANTED

CASH Paid! Unused tubes, electronic equipment. Barry, 512 Broadway, NYC 10012.

QUICKSILVER, Platinum, Silver, Gold. Ores Analyzed. Free Circular. Mercury Terminal, Norwood, Mass. 02062.

$1.00—SENDS your name to wholesalers, importers, etc. Many **FREE SAMPLES.** Shopper, 1727 State, Santa Barbara, Calif. 93101.

PHOTOGRAPHY—FILM, EQUIPMENT, SERVICES

MEDICAL Film—Adults Only—"Childbirth"—1 reel 8mm $7.50—16mm $14.95. International-E, Greenvale, L.I., New York 71548.

SCIENCE Bargains—Request Free Giant Catalog "CJ" — 148 pages — Astronomical Telescopes, Microscopes, Lenses, Binoculars, Kits, Parts. War surplus bargains. Edmund Scientific Co., Barrington, New Jersey 08007.

EDUCATIONAL OPPORTUNITIES

WANTED! TV–Radiomen to learn aircraft electronics servicing. Numerous job openings everywhere. Write: Academy Avionics, Reno/Stead Airport, Reno, Nevada 89506.

LEARN WHILE ASLEEP. Miraculously build Mind Power, achieve Self-Confidence, improve Health, gain Success. Method 92% effective. Details free. ASR Foundation. Box 7021EG Henry Clay Sta., Lexington, Kentucky 40502.

TAPE AND RECORDERS

TAPE RECORDER SALE. Brand new, latest models, $10.00 above cost. Arkay Sales, 1028-C Commonwealth Ave., Boston, Mass. 02215.

TAPE transport. NAB recording studio quality. Build yourself for amazingly low cost. Detailed plans $5.00. Free particulars. Pepke Laboratories, 309-B West 19 Street, New York, N.Y. 10011.

BEFORE Renting Stereo Tapes try us. Postpaid both ways —no deposit—immediate delivery. Quality—Dependability —Service—Satisfaction—prevail here. If you've been dissatisfied in the past, your initial order will prove this is no idle boast. Free Catalog. Gold Coast Tape Library, Box 2262, Palm Village Station, Hialeah, Fla. 33012.

RENT 4-TRACK STEREO TAPES—Dependable service our keynote — **ALL MAJOR LABELS — FREE CATALOG** (48 States)—**TRIMOR** Company, P.O. Box 748, Flushing, N.Y. 11352.

STEREO TAPES. Save up to 60% (no membership fees, postpaid anywhere U.S.A.). Free 60 page catalog. We discount batteries, recorders, tape accessories. Beware of slogans "not undersold," as the discount information you supply our competitor is usually reported to the factory. **SAXITONE,** 1776 Columbia Road, Washington, D.C. 20009.

AUTOMATIC telephone connection for Concord and other transistorized recorders. **SURVEILLANCE** and Privacy Protection Devices. Free Data: Security Electronics-PER, 15 East 43rd Street, New York, N.Y. 10017.

RENT Stereo Tapes—over 2,500 different—all major labels—free brochure. Stereo—Parti, 1616-PE Terrace Way, Santa Rosa, California 95404.

HI-FI Components. Tape Recorders, at guaranteed "We Will Not Be Undersold" prices. 15-day money-back guarantee. Two-year warranty. No Catalog. Quotations Free. HiFidelity Center, 239 (PT) East 149th Street, New York 10451.

RENT STEREO TAPES — 75¢ WEEK. CATALOG. ART'S, 1442 BLAZE, SIMI, CALIF. 93065.

EXCHANGE, rent Stereo Car Tapes. Autotapes, Box 19086-D, Indianapolis, Ind. 46219.

REPAIRS AND SERVICES

TV Tuners rebuilt and aligned per manufacturers specification. Only $9.50. Any make UHF or VHF. We ship COD. Ninety day written guarantee. Ship complete with tubes or write for free mailing kit and dealer brochure. JW Electronics. Box 51C, Bloomington, Indiana 47401.

MICROPHONES rebuilt to manufacturers response curve. All brands, all types expertly repaired. All Audio Service, Box 16, Deer Park, New York.

INSTRUCTION

LEARN While Asleep, hypnotize with your recorder, phonograph. Astonishing details, sensational catalog free! Sleep-Learning Association, Box 24-ZD, Olympia, Wash. 98501.

LEARN ELECTRONIC ORGAN SERVICING at home all makes including transistors. Experimental kit—trouble-shooting. Accredited NHSC, Free Booklet. **NILES BRYANT SCHOOL,** 3631 Stockton, Dept. A, Sacramento, Calif. 95820.

ASSOCIATE Degree in Electronics Engineering earned through combination correspondence-classroom educational program. Free brochure. Grantham Technical Institute, 1505 N. Western Ave., Hollywood, Calif. 90027.

HIGHLY—effective home study course for FCC commercial phone exams. Free literature! Cook's School of Electronics, P.O. Box 36185, Houston, Texas 77036.

HIGH SCHOOL DIPLOMA at home. Qualified instructors. Send age, highest grade completed, for free details. No salesman. **SOUTHERN STATES ACADEMY,** Professional Bldg., Dept. 5, Decatur, Ga. 30000.

REI First Class Radio Telephone License in (5) weeks Guaranteed. Tuition $295.00. Job placement free. (KANSAS CITY) R.E.I., 3123 Gillham Road, Kansas City, Missouri, Telephone WE1-5444. (SARASOTA) R.E.I., 1336 Main Street, Sarasota, Florida 33577. Telephone 955-6922.

HIGHLY EFFECTIVE home study course in Electronics Engineering Mathematics with circuit application. Earn your Associate in Science Degree. Free Literature. Cook's Institute of Electronics Engineering, P.O. Box 36185 Houston Texas 77036. (Established 1945.)

FCC First Class License in six weeks—nation's highest success rate — approved for Veterans Training. Write Elkins Institute, 2603B Inwood Road, Dallas, Texas 75235.

FCC LICENSE THROUGH TAPE RECORDED LECTURES at home plus one week personal instruction in Washington, Minneapolis, Memphis or Hollywood. Bob Johnson Radiotelephone License Training, 1060 D Duncan, Manhattan Beach, Calif. 90266.

PERSONALS

INVESTIGATORS, FREE BROCHURE, LATEST SUBMINIATURE ELECTRONIC SURVEILLANCE EQUIPMENT. ACE ELECTRONICS, 11500-K NW 7th AVE., MIAMI, FLA. 33168.

BORROW $1,205 AIRMAIL! Repay $47 for 36 months. State licensed. Postal Finance, Dept. 84-N, 200 Keeline Building, Omaha, Nebraska 68102.

BILL PROBLEMS? Poor credit no trouble. Not a loan company. Send for free application. Nationwide Acceptance, Dept. PE, 930 F St. N. W., Washington, D. C. 20017, or 1326PE Plainfield St., Cranston, R. I. 02919.

INVENTIONS WANTED

PATENT Searches including Maximum speed, full airmail report and closest patent copies, $6.00. Quality searches expertly administered. Complete secrecy guaranteed. Free Invention Protection forms and "Patent Information." Write Dept. 9, Washington Patent Office Search Bureau, 711 14th Street, N.W., Washington, D.C. 20005.

INVENTORS! Outright cash sale or royalties for your inventions. Patented. Unpatented. Active demand from our client manufacturers. Financial assistance available. Write Dept. 35, United States Invention Brokerage, 78 Wall Street, New York, N.Y. 10005.

INVENTORS. We will develop, help sell your idea or invention, patented or unpatented. Our national manufacturer clients are urgently seeking new items for outright cash sale or royalties. Financial assistance available. 10 years proven performances. For free information, write Dept. 41, Wall Street Invention Brokerage, 79 Wall Street, New York, N.Y. 10005.

INVENTIONS wanted. Patented; unpatented. Global Marketing Service, 2420-P 77th, Oakland, Calif. 94605.

INVENTIONS—IDEAS developed: **CASH/ROYALTY SALES.** Member: United States Chamber of Commerce, Raymond Lee, 230-GR PARK AVENUE, NEW YORK CITY 10017.

PATENT SEARCHES $6.00! FREE "INVENTION RECORD"/ Information. Miss Hayward, 1029HR Vermont, District of Columbia 20005.

INVENTORS! Sell your invention for cash or royalties! Our client manufacturers eagerly seek new items. Patented. Unpatented. Financial assistance if needed. 25 years proven performances. For free information, write Dept. 20, Gilbert Adams, Invention Broker, 80 Wall St., New York, N.Y. 10005.

INVENTORS! Don't sell your invention, patented or unpatented, until you receive our offer. Eagle Development Company, Dept. P, 79 Wall Street, N.Y., N.Y. 10005.

INVENTORS Needing Help with any problem, financial, development, securing manufacturer, obtaining patent. Write the organization that delivers action and results—not promises. Pioneer Invention Service, Dept. 79, 150 Broadway, New York, N.Y. 10038.

GOVERNMENT SURPLUS

JEEPS Typically From $53.90 . . . Trucks From $78.40 . . . Boats, Typewriters, Airplanes, Electronics Equipment, Photographic Equipment, used. 100,000 Bargains Direct From Government. Complete Sales Directory and Surplus Catalog $1.00 (Deductible First $10.00 Order). Surplus Service, Box 810-J, Holland, Mich. 49424.

BOOKS

FREE CATALOG. Adult Books. **POSTAL PE,** 2217 Lackland, St. Louis, Missouri 63114.

FREE Book. Prophet Elijah Coming Before Christ. Wonderful Bible Evidence. PE Megiddo Mission, Rochester, New York 14619.

FREE CATALOG HOW-TO-DO-IT BOOKS. Extensive lists all publishers, including home improvements, furniture repairs, carpentry, electric wiring, masonry, plumbing, gardening, boating, sewing, needlework, alterations. Handyman Books, Box 52H, Westbury, N.Y. 11590.

UNUSUAL Books! Catalog free! International, Box 7798(PE), Atlanta, Georgia 30309.

MOVIE FILMS

ACTION SPORTS FILMS—VIVID COLOR . . . SUPER 8, STANDARD 8. Catalog. **SPORTLITE FILMS-PE,** 20 North Wacker Drive, Chicago, Illinois 60606.

MAGAZINES

"JAPANESE Electronics Industry." Monthly Magazine. Sample $1.00. Subscription $10.00. "Oriental Electronics Directory." 200 Firms, $2.00, Dee, Box 211, Beverly Hills, Calif. 90213.

AUTHORS' SERVICES

AUTHORS! Learn how to have your book published, promoted, distributed. FREE booklet "ZD," Vantage, 120 West 31 St., New York 10001.

POEMS WANTED for new song hits and recordings by America's most popular studio. Tin Pan Alley, 1650-ZD Broadway, New York 10019.

MUSIC

POEMS wanted for new songs. Nashville Music Institute, Box 532-E, Nashville, Tennessee 37202.

SONGS, POEMS WANTED! For publishing, recording at our expense! Ted Rosen, 17PE Longwood Road, Quincy, Mass.

STAMPS

FREE Wonderful New United States Catalog! Postage and Airmails Complete, 786 Illustrations. Special offers. Bargains Galore—Everything! Send Today. H. E. Harris, Dept. FC-1, Boston, Mass. 02117.

HYPNOTISM

FREE Hypnotism, Self-Hypnosis, Sleep Learning Catalog! Drawer H400, Ruidoso, New Mexico 88345.

"FEMALE HYPNOTISM" Exposed, explained! "Secret Method"—they never know! $2, rushed. Guaranteed! Isabella Hall, Silver Springs, Florida 32688.

FREE TRIAL!! Sensational! self-hypnosis record kit improves memory, concentration, personality. Results guaranteed! Forum, 333-AA8, Michigan, Chicago 60601.

HYPNOTIZE FEMALES!—Unnoticed! Instantly! Nerves! Exciting! Send $2.25. Research Enterprises, 29-SN21 Samoset, Woburn, Mass.

FEMALE HYPNOTISM!! Easily! Instantly! Secret Nerve Centers! $2.20. Brugenheimer Publishers, Box 158-E30, Lexington, Mass.

RUBBER STAMPS

RUBBER ADDRESS STAMP $1.50. SIGNATURE $2.88. FREE CATALOG. JACKSON PRODUCTS, 1433 WINNEMAC, CHICAGO, ILL. 60640.

TUBES

TUBES "Oldies", latest. Lists free. Steinmetz, 7519 Maplewood, Hammond, Indiana 46324.

TUBE Headquarters of World! Send 10¢ for Catalog (tubes, electronic equipment) Barry, 512 Broadway, N.Y.C. 10012.

FREE Catalog. Electronic parts, tubes. Wholesale. Thousands of items. Unbeatable prices. Arcturus Electronics ZD, 502-22 St., Union City, N.J. 07087.

RADIO & T.V. Tubes—33¢ each. Sand for free list. Cornell, 4213 University, San Diego, Calif. 92105.

RECEIVING & INDUSTRIAL TUBES, TRANSISTORS. All Brands—Biggest Discounts. Technicians, Hobbyists, Experimenters—Request **FREE** Giant Catalog and **SAVE! ZALYTRON,** 469 Jericho Turnpike, Mineola, N.Y. 11501.

DON'T BUY TUBES—Radio, TV-Xmitting, special-purpose types until you get our price list! Lowest prices in U.S.A. 5,000 types—Guaranteed Brand New. Send postcard for TV—Special Purpose Price List. **UNITED RADIO COMPANY, P.O. BOX 1000, NEWARK, N.J. 07101.**

RAYTHEON, SYLVANIA AND RCA. 70% off list, send 10¢ for catalog. T & T Sales, 4802 Ave K, Brooklyn 11234.

TUBES—SYLVANIA—RCA. Send for discount schedule. Foto-Radio Co., 257 Huntington Ave., Boston, Mass. 02115.

DO-IT-YOURSELF

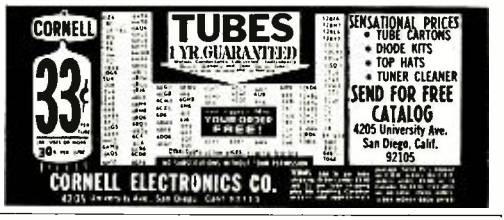
BUILD your own telephone intercom—complete—less battery. Write Telephones, Box PE67, Simpson, Penna. 18407.

BUSINESS OPPORTUNITIES

INVESTIGATE ACCIDENTS! Earn up to $1,000 and more a month in your own business. Work spare time with average earnings of $5 to $8 per hour. No selling. Send for Free booklet. No obligation. No salesman will call. Write: Universal Schools, CZ-7, 6801 Hillcrest, Dallas, Texas 75205.

RAISE Rabbits for us on $500 month plan. Free details. White's Rabbitry, Mt. Vernon, Ohio 43050.

FREE CATALOGS. Repair air conditioning, refrigeration. Tools, supplies, full instructions. Doolin, 2016 Canton, Dallas, Texas 75201.



PIANO TUNING learned quickly at home. Tremendous field! Musical knowledge unnecessary. GI Approved. Information free. Empire School of Piano Tuning, Miami, Florida 33145.

ELECTROPLATING Equipment and supplies. All types for home workshops and industrial. Send $1.00 (refundable) for equipment guide formulas, operating data, catalog. HBS Equipment Division 90. 3543 East 16th, Los Angeles, California 90023.

I MADE $40,000.00 Year by Mailorder! Helped others make money! Start with $10.00—Free Proof. Torrey, Box 318-N, Ypsilanti, Michigan 48197.

FREE Book "990 Successful little-known Businesses." Work home. Plymouth 145H, Brooklyn, N.Y. 11218.

HOW AND WHERE TO GET CAPITAL. Start or expand any electronics or photography business. Write: Counselor-48, Harlingen, Texas.

PRINTING

FREE Booklet "Secrets of Cutting Printing Cost." Dept. 1, 305 S. 4th, Springfield, Illinois 62701.

EMBOSSED business cards, $2.99—1,000, free samples. Gables—405T Clifton, Glenshaw, Pa. 15116.

REAL ESTATE

FREE!!! Illustrated 168 page catalog! Describes hundreds of farms, ranches, homes, businesses, vacation, retirement and waterfront properties coast to coast! Specify type property and location preferred. Zip code, please. **UNITED FARM AGENCY,** 612-EP West 47th St., Kansas City, Mo. 64112.

EQUIPMENT

FREE ELECTRONICS Catalog. Tremendous bargains. Send postcard: Electrolabs, Department C-680D, Hewlett, New York 11557.

EMPLOYMENT INFORMATION

FOREIGN and **USA** job opportunities available now. Construction, all trades. Earnings to $2,000.00 monthly. Paid overtime, travel, bonuses. Write: Universal Employment, Woodbridge, Connecticut 06525.

FOREIGN EMPLOYMENT. Construction, other work projects. Good paying overseas jobs with extras, travel expenses. Write only: Foreign Service Bureau, Dept. D, Bradenton Beach, Florida 33510.

MISCELLANEOUS

WINEMAKERS: Free illustrated catalog of yeasts, equipment. Samples, Box 7208, Minneapolis, Minn. 55412.

SPARE TIME OPPORTUNITY—MONEY—WE PAY $10 hr. for **NOTHING** but your opinions, written from home about our clients' products and publications, sent you free. Nothing to buy, sell, canvass, or learn. **NO SKILL. NO GIMMICKS.** Just honesty. Details from **RESEARCH,** ZD2, Box 669, Mineola, N.Y. 11501.

COLLAPSIBLE farm pond fish traps. Animal traps. Bargains galore. Free catalog and trapping secrets. Sensitronix, 2225-F62 Lou Ellen, Houston, Texas 77018.

KARATE—Judo complete line, new 44 page catalog, 35¢. Nozawa Trading, 2534 West Pico, Los Angeles, Calif. 90006.

PROTECT your driver's license in plastic. Send 25 cents each and stamped self-addressed envelope to United Consumers, P.O. Box 264, College Park, Maryland 20742.

TEN Winemaking Recipes and Winemaking Supplies catalog 10¢. Country Winemaker, Box 243EGA, Lexington, Massachusetts 02173.

EMPLOYMENT Resumes. Get a better job & earn more! Send only $2.00 for expert, complete Resume Writing Instructions. J. Ross, 80-34 Kent St., Jamaica, N.Y. 11432, Dept. PE.

BEERS, PEACH BRANDY, WINES—Strongest Formulas, $2.25. (complete brew supplies hydrometers catalog included)—Research Enterprises, 29-D Samoset, Woburn, Mass. 01801.

STAMMER — Stutter — No More. (Dr. Young.) Write: Gaucho, Box 9309-E8, Chicago 60690.

STOP BURGLARS THE EASY WAY!! Affix authentic "Protected by Electronic Sentry Alarm" Decals to auto windows, doors & windows of home, retail stores, vending machines, etc. Whether you have an alarm or not—thieves stay away! Only $1.00 each set of two. J. Ross, 80-34 Kent St., Jamaica, N.Y. 11432 Dept. PE.

BILLS PAID Without Borrowing—Nobody refused up to $18,000. Bad credit no problem—Not a loan co. Write for **FREE** Application—**INTERNATIONAL ACCEPTANCE CO.**, Dept. 50A-5133 N. Central, Phoenix, Arizona 85012, or 119 Ann St., Hartford, Conn. 06103.

POPULAR ELECTRONICS AUGUST 1967 ADVERTISERS INDEX

Printed in U.S.A.

Now, famous JOHNSON high quality at a new low price!

New Messenger 110 costs only $99.95!*

Never before has so much quality been offered in a CB Transceiver priced **so** low. It's the same Johnson quality you'd normally find **only** in expensive models. Now you can have it and save, too! You get 5 channels; solid-state construction throughout . . . 14 transistors and 7 diodes for greatest reliability, lowest current drain. You also get speech compression for greater audio power and temperature compensation for year-round operation, anywhere. (Transmitter power is 5 watts, of course.)

More versatility, too, is yours with the new Messenger 110. Accessory base station power supply and rechargeable field pack enable you to use it whenever, wherever you want.

Why settle for less than the best, in **both** performance and price? See the New Messenger 110 at your Johnson Dealer or write for complete details.

*Only set in this price range that's FCC Type Accepted and DOT Approved!

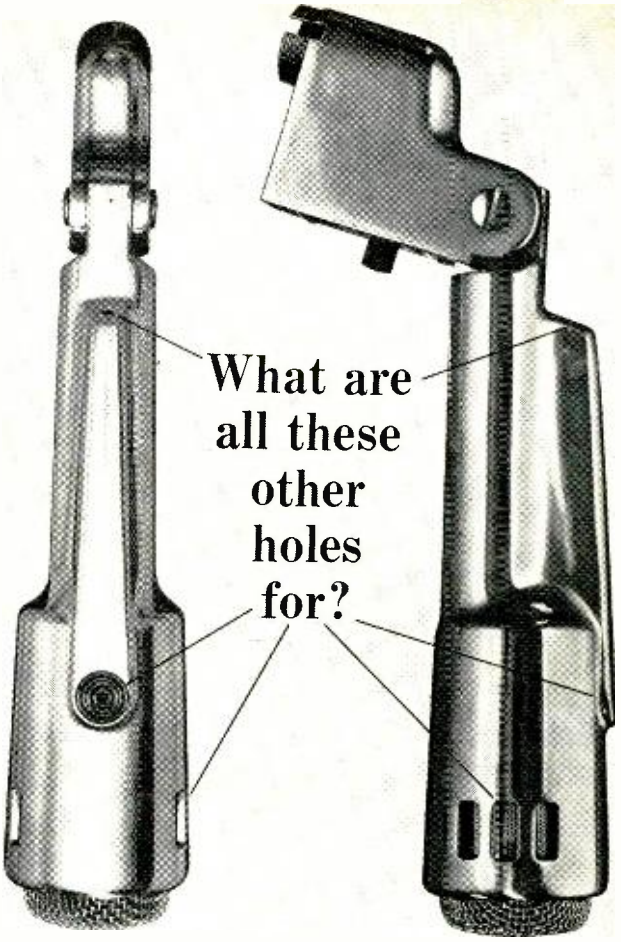
E. F. JOHNSON COMPANY

2441 Tenth Ave. S.W., Waseca, Minn. 56093

First choice of CBers everywhere

CIRCLE NO. 23 ON READER SERVICE PAGE

If the Electro-Voice Model 664 picks up sound here...



The holes in the top, sides and rear of the Electro-Voice Model 664 make it one of the finest dynamic cardioid microphones you can buy. These holes reduce sound pickup at the sides, and practically cancel sound arriving from the rear. Only an Electro-Voice Variable-D® microphone has them.

Behind the slots on each side is a tiny acoustic "window" that leads directly to the back of the 664 Acoustalloy® diaphragm. The route is short, small, and designed to let only highs get through. The path is so arranged that when highs from the back of the 664 arrive, they are cut in loudness by almost 20 db. Highs arriving from the front aren't affected. Why two "windows"? So that sound rejection is uniform and symmetrical regardless of microphone placement.

The hole on top is for the mid-range. It works the same, but with a longer path and added filters to affect only the mid-frequencies. And near the rear is another hole for the lows, with an even longer path and more filtering that delays only the bass sounds, again providing almost 20 db of cancellation of sounds arriving from the rear. This "three-way" system of ports insures that the cancellation of sound from the back is just as uniform as the pickup of sound from the front—without any loss of sensitivity. The result is uniform cardioid effectiveness at every frequency for outstanding noise and feedback control.

Most other cardioid-type microphones have a single cancellation port for all frequencies. At best, this is a compromise, and indeed, many of these "single-hole" cardioids are actually omnidirectional at one frequency or another!

In addition to high sensitivity to shock and wind noises, single-port cardioid microphones also suffer from proximity effect. As you get ultra-close, bass response rises. There's nothing you can do about this varying bass response—except use a Variable-D microphone with multi-port design* that eliminates this problem completely.

Because it works better, the E-V 664 Dynamic Cardioid is one of the most popular directional microphones for demanding communications applications. To learn more about Variable-D microphones, write for our free booklet, "The Directional Microphone Story." Then see and try the E-V 664 at your nearby Electro-Voice microphone headquarters. Just $85.00 in satin chrome or non-reflecting gray.

*Pat. No. 3,115,207

ELECTRO-VOICE, INC., Dept. 872P
630 Cecil St., Buchanan, Mich. 49107

Electro-Voice®
SETTING NEW STANDARDS IN SOUND

CIRCLE NO. 13 ON READER SERVICE PAGE