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JANUARY 1964

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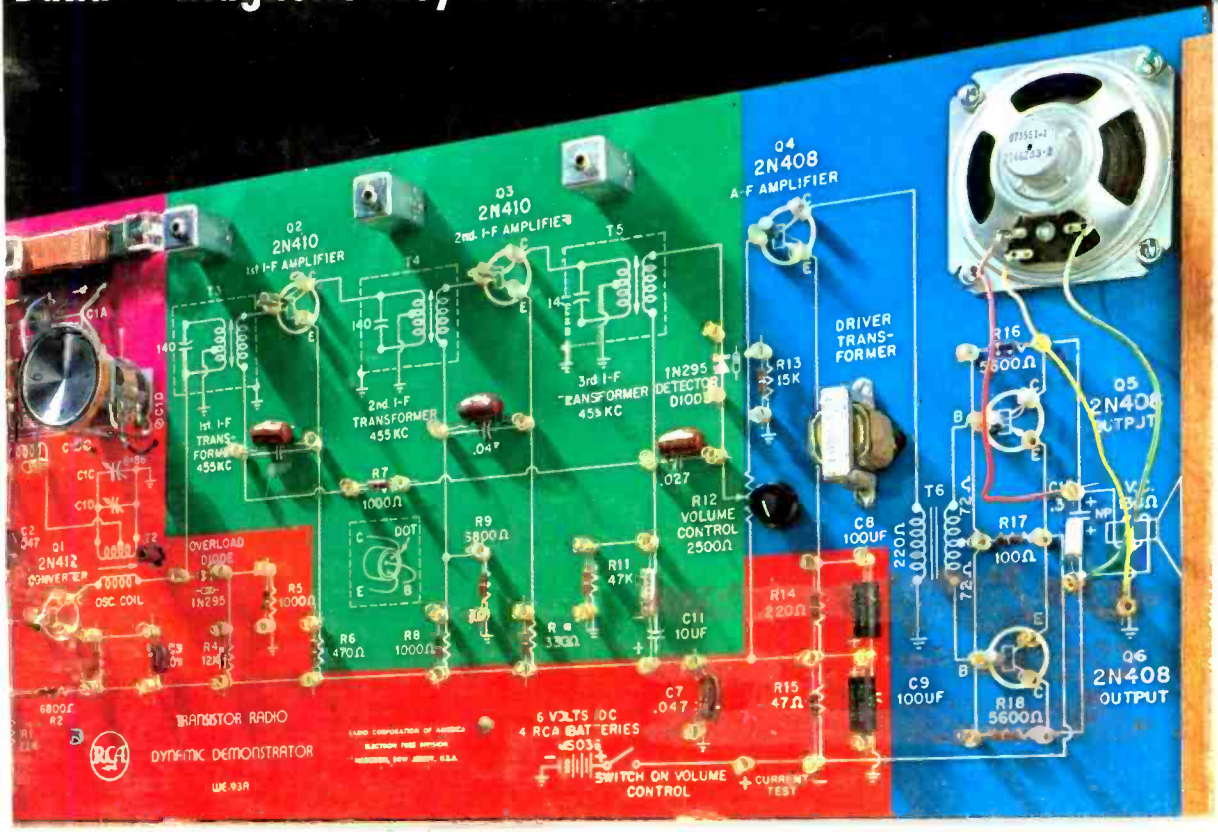

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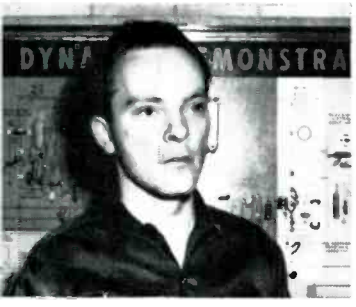

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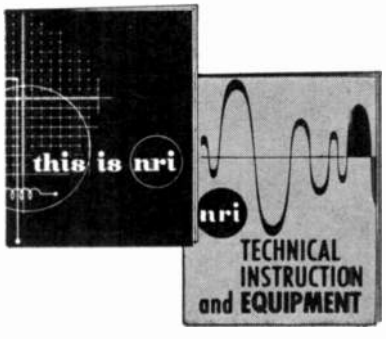

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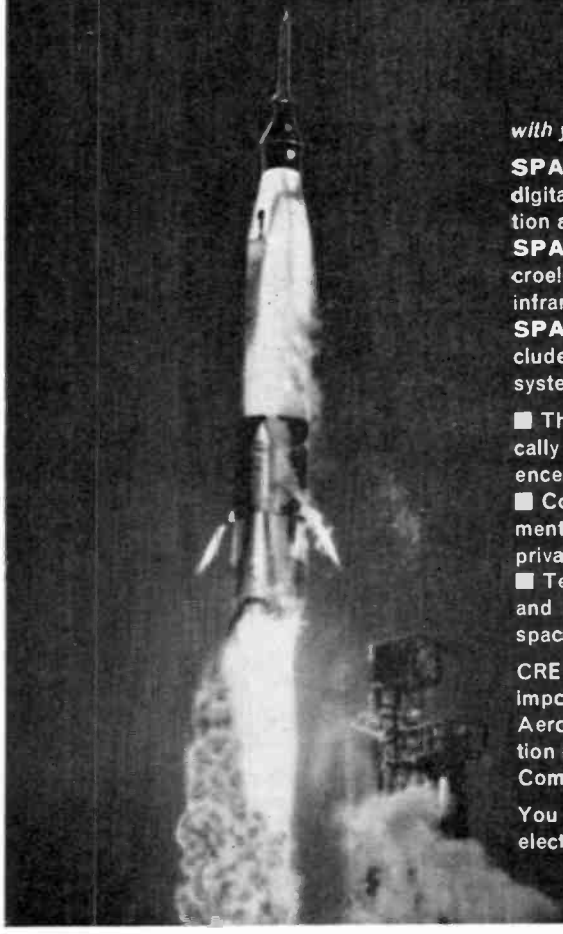

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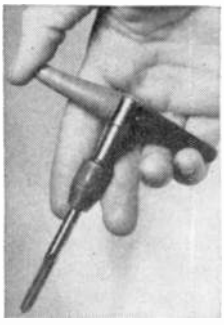
Tips and Techniques

FOOT PADS FOR HEADPHONES

Nothing beats a pair of ordinary, inexpensive magnetic headphones for general utility use, but they can become very uncomfortable if you wear them for any length of time. If copying code or trying to snag rare s.w. stations is your meat, get a couple of foam rubber callus cushions to attach to your headphones. Although these pads are intended to ease foot problems, they'll do a good job on your ears, too!

—John A. Comstock

IMPROVING COMFORT OF TAP WRENCH HANDLE



The ordinary tap wrench can be pretty wearing on the hands when many holes must be tapped in hard or tough metal. In a pinch, slide a pair of large rubber battery clip sleeves over the two halves of the wrench handle, as shown. They can be taped or tied in place if desired, and will help prevent the development of blisters when a lot of tapping must be done.

—Jerome Cunningham

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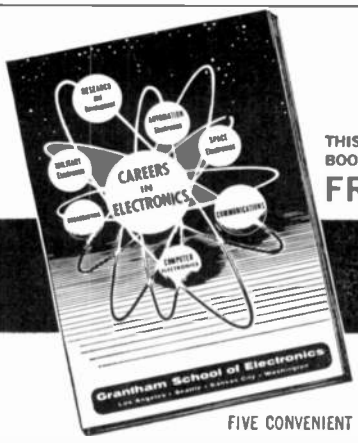

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Tips

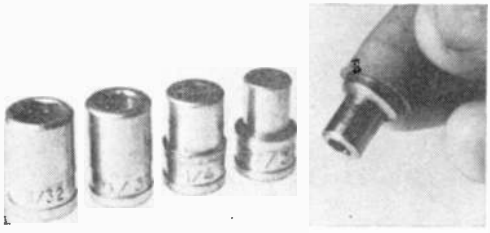
(*Continued from page* 6)

the burr, and insert a snug-fitting rubber grommet, such as General Cement #1042. Push an ordinary NE-2 neon lamp into the grommet hole from the rear of the panel. Now wire a 150,000- to 220,000-ohm resistor in series with the lamp, and put the combination across the a.c. line on the equipment side of the power switch. Be sure to use spaghetti sleeving to be safe from a possible short circuit. The lamp will fit snugly in the grommet, but you can increase permanence with a few drops of cement.

—H. E. Sanders

USING SOCKETS IN TIGHT SPOTS

Sometimes the only wrench available that will fit that inaccessible nut in a corner of the chassis is a socket type for which you have no ratchet drive. Polished metal

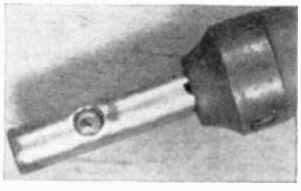


doesn't provide enough friction for a grip with the fingers, but you can increase your gripping power by slipping a rubber test clip insulator over the socket. Pick a size that makes a tight fit, and you'll be surprised at the extra force you can use.

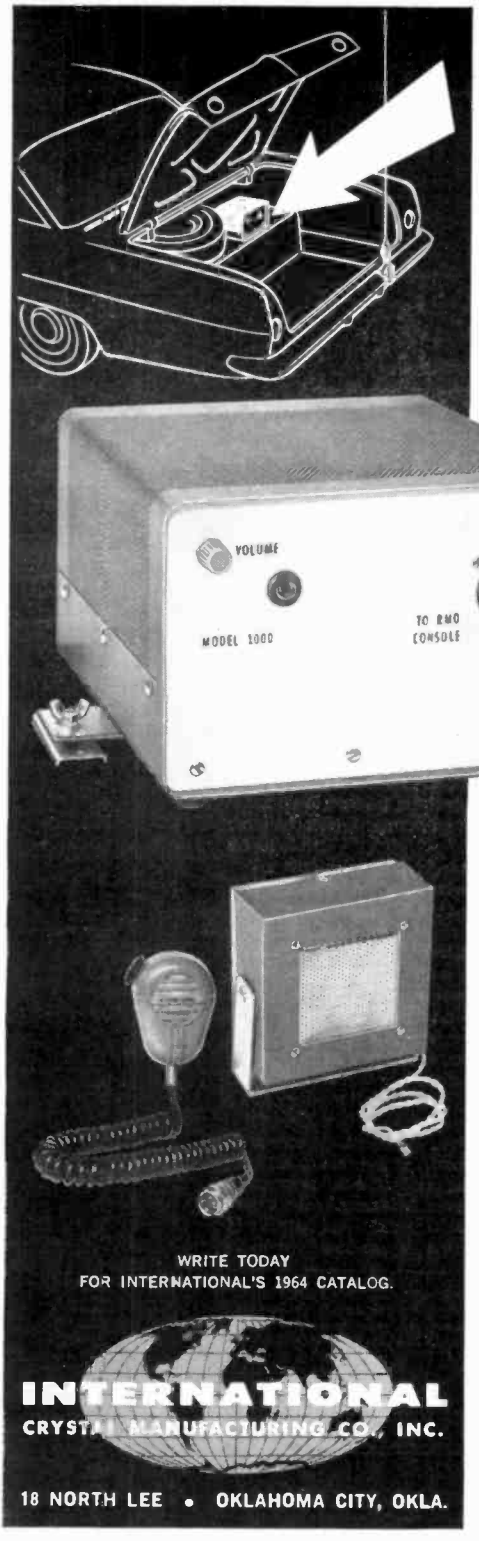
—John A. Comstock

MINIATURE SOLDER POT FOR WIRE TINNING

Ever wish you had a pot of hot solder handy to dip wire ends in when you're tinning them? Cut the pointed end off a discarded soldering tip with a hacksaw, and drill a 1/4" or 5/16" hole in one side as shown, taking care that the hole does not go through. If no old tip is on hand, use a piece of copper or even brass rod.



With the drilled tip in place in the soldering iron, clamp the handle to the bench with the hole vertical. Heat up the iron, fill



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***Model 500, similar features but does not contain delayed avc, speech clipper amplifier and crystal filter. Cat. No. 600-114 ..... $179.50**

Tips

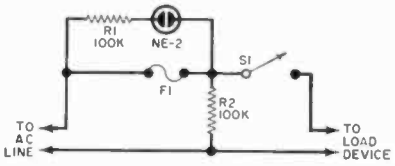
(*Continued from page* 8)

the hole with resin-core solder, and you're ready to go. Caution: Keep body of iron clear of bench to avoid fire hazard.

—*Milton F. Dickfoss*

IMPROVED BLOWN FUSE INDICATOR

The blown fuse indicating circuit given on page 16 of the December 1962 "Tips and Techniques" is effective, but won't work if the load device is not connected. Here's

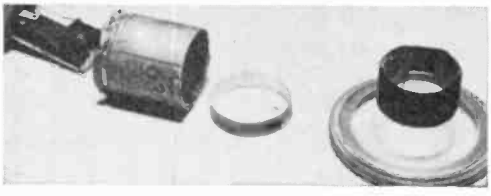


an improvement that's easy to make, and will give a visible indication of a fuse that's blown, whether or not the load is connected. Addition of the resistor across the line on the load side of the fuse is the only point of difference with the earlier circuit. With this arrangement, the tell-tale neon lamp will light if the fuse is blown, even if power switch *S1* is open, or the load is disconnected; and it will burn brighter when *S1* is closed, if the load is connected. Either way, the indication is positive.

—*Nicholas Bodley*

EMERGENCY REPAIR FOR TELEVISION TUNER KNOB

Some of those big plastic knobs on TV tuners have an annoying habit of cracking axially, so that the boss will no longer grip the fine tuning shaft firmly enough to turn it. You can solve the problem by cutting a continuous metal band from a discarded vibrator shield can or other similar metal



tube, and slipping it over a layer of tightly pulled tape. Use the kind of carton closing tape that has glass fiber reinforcement if you can get it, or regular friction tape. In either case, put on enough tape to make a snug fit when the metal is slid over the tape.

—*Homer L. Davidson*

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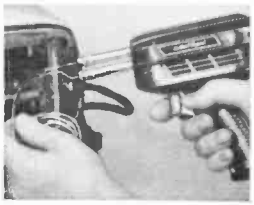

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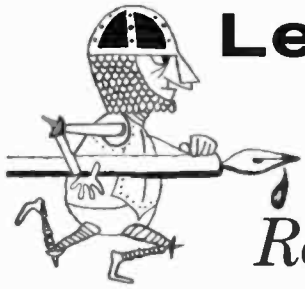

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Address correspondence for this department to: Letters Editor, POPULAR ELECTRONICS One Park Avenue, New York 16, N. Y.

Ham-CB Emergency Setup Proposed

■ Citizens Bander R. W. Hamilton says he can cite a good reason for CB for emergency use to counter every argument against it. Here's his chance to get busy. (1) For reliable 100 per cent communications under *all* conditions (such as a hurricane) you can count on 1 watt equaling 1 mile of range. While CB can be used as well, if not better than, amateur radio in *local* emergencies (i.e., a factory explosion or search and rescue), widespread emergencies and civil defense work require the ability to cover large areas. (2) Very few CB rigs can receive and transmit on all 23 channels, and chances are a CB net will have only one channel in common. Such a net would break down if considerable traffic had to be handled. In contrast, ham stations can cover a wide range of frequencies. (3) Most CB'ers do not have the technical competence to jury-rig a new antenna in a storm, and if something goes wrong beyond a blown fuse, they are out of business. (I said *most*, not all; I also know some hams who cannot replace a blown fuse.)

It would be ideal if the many mobile CB units could be used like "front line troops" in emergencies, with the hams providing the heavy "artillery." If Mr. Hamilton could organize his local CB net with two (one for backup) amateur-CB "comm centers," each with extensive capabilities in both fields and with the operators in the same room, it would provide the necessary ham-CB link. By inference and capability, however, this would put the CB'er somewhat "under the command" of the ham. Will the average CB'er operate in this fashion? If not, what do you suggest?

TOM VAN NATTA
Cocoa, Fla.

P.S. Hams, do you have any plans to coordinate your efforts with local CB'ers? While you're at it, why not get a CB license and put a peanut whistle on 11 meters?

We feel that the approach suggested by Reader Van Natta might be quite constructive. Incidentally, he holds three tickets—amateur, CB, and commercial.

Home TV Tape Recorders

■ I was very much interested in the article on "A Home Television Tape Recorder for Under $200" (September, 1963). To say the least, I was surprised by this figure, since prices quoted by other companies have put my owning one of these units totally out of the question. I would have given my

This is the beginning of the Fisher KX-200 StrataKit.

This is the end. The absolute end in stereo control-amplifiers.

You begin the Fisher KX-200 StrataKit with the most logically organized kit package and the clearest, most detailed assembly manual in the entire field of high fidelity kits.

The StrataKit method of kit construction is a unique Fisher development. Assembly takes place by simple, error-proof stages (Strata). Each stage corresponds to a *separate* fold-out page in the manual. Each stage is built from a *separate* packet of parts (StrataPack). Major components come *already mounted on the chassis*. Wires are *precut* for every stage—which means every page. All work can be checked stage-by-stage and page-by-page, before proceeding to the *next* stage.

As a result, you end up with an 80-watt stereo control-amplifier that is completely indistinguishable from a factory-built Fisher unit.

The KX-200 has enough power to assure peak performance with the most inefficient speakers and incorporates exclusive features like a laboratory-type d'Arsonval bias/balance meter and a third-speaker output with separate volume control. Price, $169.50.* The Fisher KX-100, a 50-watt stereo control-amplifier kit of advanced design, costs only $129.50.*

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*Walnut or mahogany cabinet, $24.95; metal cabinet, $15.95. All prices slightly higher in the Far West. Overseas residents write to Fisher Radio International, Inc., Long Island City 1, N. Y. Canadian residents write to Tri-Tel Associates, Ltd., Willowdale, Ont.

Letters

(*Continued from page* 12)

right arm to be able to have a video recording of the recent manned orbital space shots. How about a construction article on this type of recorder?

ARTHUR C. TRESS
Union City, N.J.

Thank you for the letter, Art. The precision engineering required seems to put a construction article on a TV tape recorder out of the question at this time. However, you will be interested to learn that Cinerama, Inc. is planning to market the "Telcan" unit in the U. S. in 1964, and that, according to reports, Fairchild Camera and Instrument Corp. has a relatively low-priced machine which is past the drawing-board stage, and which may be placed on the market in 1964-1965.

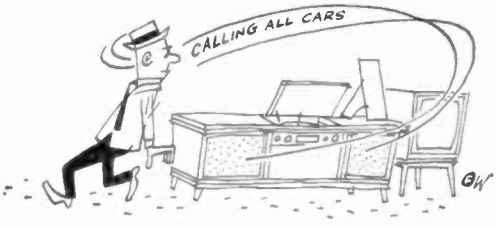
"Sweet Sixteen" In India

■ After much deliberation, I got down to building a "Sweet Sixteen" speaker system (January, 1961, issue and *1962 Electronic Experimenter's Handbook*) and I must admit that it sounds much better than expected. I used Philips 9766-M speakers with a range of 130-19,000 cps, and increased the depth of the cabinet by 3 inches. My next project will be a souped-up "Stereo Sixteen" version using 24 speakers and a larger enclosure. Please publish my address as I would like to correspond with audio hobbyists of my age (I am 16). I also like to tinker with transistors.

SUSHIL ANAND
% Soorya Mahal
1-5 Military Square Lane, Fort
Bombay, India

FM Set Receives Police Calls

■ I was walking through the radio-TV section of a large department store recently when I noticed a salesman adjusting the controls of an AM-FM port-



able. As he tuned across the 88-108 FM broadcast band, he suddenly began receiving local police broadcasts at 96 mc! Can you tell me why this should happen?

FRANK DELROY
Toronto, Ontario

There are several possibilities, Frank. A strong local signal can overload the "front end" of any kind of receiver, causing it to pick up signals it's not tuned to. Next, heterodyning (beating) of signals from various sources inside and outside the receiver can cause sum and difference signals which result in spurious responses such as you mention. Finally, there's the possibility that the set was picking up the second harmonic of a police transmitter operating at about 48 mc.

(*Continued on page* 20)

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The non-test side of this record consists of music recorded directly on the master disc, without going through the usual tape process. It's a superb demonstration of flawless recording technique. A demonstration that will amaze and entertain you and your friends.

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HiFi/STEREO REVIEW's Model 211 Stereo Test Record will give you immediate answers to all of the questions you have about your stereo system. It's the most complete test record of its kind—contains the widest range of check-points ever included on one test disc! And you need no expensive test equipment. All checks can be made by ear!

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The Model 211 Stereo Test Record is a disc that has set the new standard for stereo test recording. Due to the overwhelming demand for this record, only a limited number are still available thru this magazine. They will be sold by POPULAR ELECTRONICS on a first come, first serve basis. At the low price of $4.98, this is a value you won't want to miss. Make sure you fill in and mail the coupon together with your check ($4.98 per record) today.

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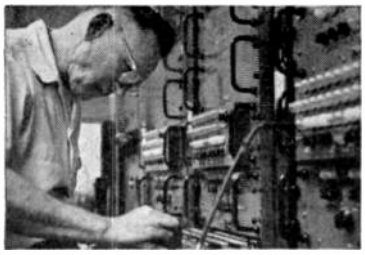
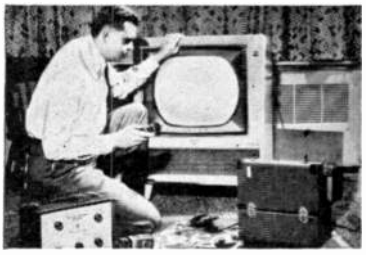
Sorry—No charges or C.O.D. orders! PE 14





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Letters

(*Continued from page* 14)

Amplifiers for Tape Recording

■ I have been trying to put together an inexpensive component stereo system, but it's discouraging to find that the least costly tape recording amplifier costs about $80. I can't see why a recording amplifier should cost so much—the only difference between them and other low-power amplifiers seems to be a couple of meters. Is it possible to build one?

CLYDE KANE
San Bernardino, Calif.

To take your last question first, Clyde, it is possible to build an amplifier for tape recording, but it wouldn't be a very practical project. Such amplifiers must be tailored to the recording heads used; the frequency response of tape heads is not linear, and highly specialized compensation networks are required in each case. You would also have to build a bias oscillator operating in the vicinity of 60 to 80 kc. to be able to record on tape.

"Fento" or "Femto," He Asks

■ In the handy little article on "New Nomenclature" (September, 1963) there is a reference to the prefix "femto" for 10^{-15}. As early as 1959, the prefix appeared as "fento," and this latter spelling may be older than that. I have not been able to find any Latin or Greek precursors, hence "femto" must be

an arbitrary combination. Priority should go to what was first suggested ("fento") unless the International Committee on Weights and Measures, final arbiter on these matters, has formally adopted "femto." One reason for preferring "fento" is that "nt" is a natural linguistic combination while "mt" is not.

PHILIP N. BRIDGES
Rockville, Md.

Sorry to disappoint you, Phil, but it appears that "femto" has been adopted by the International Committee on Weight and Measures. See the National Bureau of Standards Technical News Bulletin, *February, 1963, and* The Metric System of Measurement, *NBS Miscellaneous Publication 232.*

"Operation Assist" Applauded

■ Thank you for running my request for WD-11 tubes in the "Operation Assist" column. A gentleman in El Verano, Calif., was kind enough to send me two of them with his compliments. I have no fear of my radio—an RCA Radiola III-A of about 1924 vintage—blowing any more tubes, as I hook

FEATURE FOR FEATURE – DOLLAR FOR DOLLAR

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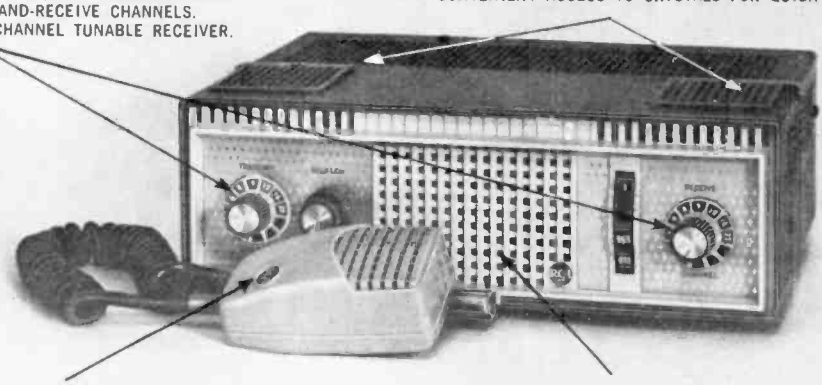
THE NEW RCA MARK VIII

27-Mc CITIZENS BAND 2-WAY RADIOPHONE

UP TO 9 FIXED, CRYSTAL-CONTROLLED TRANSMIT-AND-RECEIVE CHANNELS. PLUS ALL-CHANNEL TUNABLE RECEIVER.

CONVENIENT ACCESS TO CRYSTALS FOR QUICK CHANGING.



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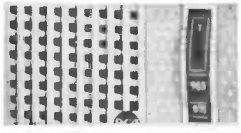
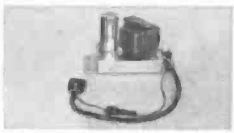
IMPROVED AUTOMATIC NOISE LIMITER reduces effects of ignition and similar interference.

COMPACT AND LIGHTWEIGHT 3½" high, 9 pounds. Fits easily under any auto dashboard.

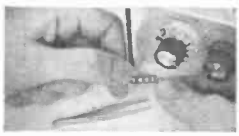


Continuously tunable receiver picks up any of the 23 C-B channels. Tunes either by channel number or frequency.

Illuminated working channel. Pilot lamps behind the fixed-channel dials show the channels being worked.



Separate mobile power supply. (Optional) 6- or 12-volt, for car or boat. All units contain AC power supply.



Channel-marker kit. Select channels best for your area, then mark them with the self-adhering labels included.

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Please send more information on the RCA Mark VIII C-B Radiophone

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Letters

(*Continued from page 20*)

it up only on special occasions such as open house at the local electronics school.

EDGAR JONES
Staunton, Va.

SWL Feature "Helpful"

■ Congratulations on your splendid article, "Calling All SWL DX'ers" (September, 1963). I found it very interesting and helpful—keep up the good work. Incidentally, I have seen the prefix "WPE," and would like to know what it means.

STEVEN DEVLIN
Ridgefield, Conn.

Thanks for the compliment, Steve. The newly-revised short-wave monitor ("WPE") program is just getting under way. See page 81 of this issue for details.

Transistor Ignition Roundup

■ I would appreciate it if you could inform me of any further developments on the "Operation PICKUP" transistor ignition system (June and October issues, 1963). Separate schematics for the various hookups, parts lists, and information on parts availability would also be helpful.

FRANK FUGEL
Clifton, N.J.

■ I have built and installed your transistor ignition system, and it works very well. "Operation PICKUP" was a fine article and a very practical one. Two questions concerning the system: Can a 400:1 coil be used with the unit to any advantage? Secondly, can an RCA 2N1412 be used instead of the Delco 2N1970?

PIERRE GRAVEL
Montreal, Quebec

"Operation PICKUP" fans will be pleased to learn that all up-to-date information on this transistor ignition system will be presented in POPULAR ELECTRONICS' 1964 Electronic Experimenter's Handbook *which goes on sale January 21. In answer to your questions, Pierre, a 400:1 coil cannot be used with the "PICKUP" as originally described. The whole idea here was to make use of the stock coil to keep the cost of the ignition system low. On paper, the RCA 2N1412 looks like a superior, if somewhat more costly, replacement for the 2N1970; we have not tested the 2N1412 in the "PICKUP" system, however.* —30—

Out of Tune

VHF ADVENTURER, Part 1 (*October,* 1963, *page* 44). There is a missing connection in the wiring diagram. A lead should be connected from pin 5 of the OA2 voltage regulator to pin 6 of *J6*. This supplies B-plus voltage to the noise limiter. —30—

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AMAZINGLY EASY TO CLEAN OR CHANGE COLORS...
Fill container with water or proper solvent, run gun for a minute or two. That's all there is to it! No mess, no bother!

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Oval spray and wide feathering around edges make precise work difficult, requires extensive masking.

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Send me your new Sloan-Ashland Rotary Paint Gun. I may use it for seven days free, and return it at your expense if I am not fully satisfied.

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POP'tronics Bookshelf

ABC'S OF HI-FI & STEREO

by Hans Fantel

EX-POPULAR ELECTRONICS staffer Hans Fantel has a talent for writing colorful, understandable prose. His series of articles on speakers and enclosures which appeared in 1956 still serve as models of clarity when it comes to turning difficult subjects into enjoyable reading material. Free-lance author Fantel has not lost his touch. Here the topic of high-fidelity sound reproduction is carefully disassembled so that terminology, specifications, and installation data all become very meaningful. This work is a cut above the usual "ABC books" published by Howard W. Sams—a good buy for someone just getting his feet wet in hi-fi/stereo.

Published by Howard W. Sams & Co., Inc., 4300 West 62 St., Indianapolis 6, Ind. Soft cover. 96 pages. $1.95.

ELECTRONICS IN BUSINESS MACHINES

by Tom Jaski

Since the principal application of electronics in this field is in calculators and computers, this is basically a book on calculators, computers, and some of their accessories. Covered are such topics as binary numbers, digital calculating electronics, machine logic and computing circuits, information storage, input, output and character recognition, card punchers and sorters, and analog computers. A final chapter is devoted to miscellaneous electronic devices such as dictating machines and closed-circuit TV systems. A helpful text for those interested in automation of data processing, the book should also find an audience among those interested in computer basics. The explanations of the

mathematics and electronics involved are clear and easy to follow.

Published by A. S. Barnes & Co., 11 E. 36 St., New York 16, N.Y. Including index, 309 pages. Hard cover. $5.95.

LEARN ELECTRONICS BY BUILDING

by John Schraeder

The flood of books designed to teach electronics painlessly continues unabated. This one follows the "learn by doing" approach, which can be most effective for home study without a teacher or other aid. Unfortunately, poor execution of the idea lowers the value of this book for self-study. For example, "ultra-short waves" do not begin at 10 meters as is stated; it is risky to operate earphones at full B+ voltage above ground (Fig. 1709); and shielded antenna lead-in used as in Fig. 1303 will bypass wanted as well as unwanted signals, and will probably greatly detune and load down the simple regenerative receivers described. Some practical circuits are included, but the effort to explain too much in too little space offsets the better features.

Published by Gernsback Library, Inc., 154 W. 14th St., New York 11, N.Y. 208 pages. Soft cover. $3.85.

GETTING STARTED IN ELECTRONICS

For many years, Allied Radio has published low-cost books for hobbyists, some filled with commonly needed reference material and others for beginners. This book definitely falls in the second category. Although it covers only the bare essentials of electronic theory and project building, it is more than worth its modest price as a first book for the complete neophyte. Included are a number of projects, many of which are available as "Knight-Kits."

Published by Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill. 112 pages. Soft cover. 50 cents.

BASIC RADIO REPAIR (Volumes 1 and 2)

by Marvin Tepper

The author of these two books—on practical servicing as opposed to theory—has followed the successful 'pictured-text' format used in his six-volume *Basic Radio*. The result is easily understood material that should be of considerable value to the would-be service technician. Volume 1 includes chapters on basic test instruments and servicing techniques applicable to "garden-variety" home, portable, and automobile receivers (transistorized receivers excluded). Volume 2 has as its subject FM receivers, transistor receivers, and transmitters. While there's no real substitute for actual bench experience, these two books are a good place to start.

Published by John F. Rider Publisher, Inc., 850 Third Ave., New York 22, N.Y. Each volume, 106 pages. Soft covers. $2.65 per volume.

MOST OFTEN NEEDED 1964 RADIO DIAGRAMS AND SERVICING INFORMATION

Each year this soft-cover book publisher selects a number of popular table and console radios to describe in a handy servicing manual. Complete alignment details and wiring diagrams are given for a variety of portables, auto, FM, stereo, and straight AM receivers. This is the 24th annual edition of this valuable handbook.

Published by Supreme Publications, 1760 Balsam Rd., Highland Park, Ill., Soft cover. 192 pages. $2.50 (postpaid).

Free Literature

Three new hi-fi catalogs are yours for the asking. H. H. Scott has come out with a 24-page handbook—the 1964 Guide to Custom Stereo—which consists of a buying guide of Scott audio equipment plus useful suggestions on the installation of stereo in the home. You can get it by writing to H. H. Scott, Inc., Dept. P, 111 Powdermill Rd., Maynard, Mass. . . . The newest in Jensen hi-fi loudspeakers, headphones, speaker components, and speaker system kits is described and illustrated in Catalog No. 165-J. Copies of this 24-page catalog are available from Jensen Manufacturing Co., 6601 S. Laramie Ave., Chicago, Ill. . . . Bulletin No. 910-2, a 12-pager, contains descriptions of and specifications for hi-fi, extended-range and general-purpose Clevite-Brush crystal headphones. For this one, write to Piezoelectric Division, Clevite Corp., 232 Forbes Rd., Bedford, Ohio. . . . On another subject, Jerrold-TACO's complete lines of TV and FM antennas are described in a 16-page brochure available from the Distributor Sales Division of Jerrold Electronics Corp., 15 St. and Lehigh Ave., Philadelphia 32, Pa. New broadband VHF log-periodic types are featured in the brochure, along with special sections devoted to UHF and FM antennas. Data is also given on antenna accessories. —30—

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Everything you ever wanted in a CB transceiver!

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Up to the minute in engineering, the "Messenger III" has 18 transistors and 5 diodes—offers compact size, a husky signal, extreme sensitivity, razor-sharp selectivity and complete adaptability for base station, mobile, or battery powered portable use! Way "out in front" in sophisticated engineering and styling, the "Messenger III" gives you everything that you've ever wanted in a Citizens Band transceiver!

- **MOBILE, BASE OR PORTABLE** — The same basic transceiver with accessories can be used in three different types of application.
- **P.A. SYSTEM**—Switch from front panel. 3 watts available through rear jack to external speaker or horn for Public Address use.
- **DOUBLE CONVERSION RECEIVER** — Sensitivity and selectivity is tops—double conversion with high 1st I.F. (4.3 mcs.) provides excellent spurious and image rejection.
- **"SET-AND-FORGET" VOLUME AND SQUELCH CONTROLS**—Eliminate the need for constant readjustment . . . work "close-in" or at extended range with your initial settings.
- **11 CHANNELS**—Instant selection with front panel control. Provision for numbered channel indicator avoids indexing problem—illuminates to show channel in use—flashes red on "transmit" as an "on the air" indicator.
- **SEALED RELAY** — "Space-Age" circuitry features a computer-quality, sealed, plug-in change-over relay . . . avoids problems caused by dust, grit, etc.
- **DYNAMIC MICROPHONE**—Equipped with "full-grip" push-to-talk bar and coiled cord. Mounts with hang-up stud or instant contact "Velcro" mount.
- **SELECTIVE CALLING SYSTEM AVAILABLE AS ACCESSORY**—Mutes units until one calls another—then automatically stations hear audio note and Indicator light flashes "on".

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Powered by self-contained, rechargeable nickel-cadmium batteries. Simply slide your "Messenger III" into rugged high-impact plastic carrying case—mate battery connections—attach antenna—and you've got a full 5-watt portable pack set that is ideal for any type of field application. Accepts two batteries—has built-in recharger! Meter function and rate-of-charge selected by separate front panel switches. Built-in meter indicates battery condition. Accessory cables furnished to permit operating from 12 volt vehicle battery through the cigarette lighter receptacle, or from any 117 volt AC outlet.

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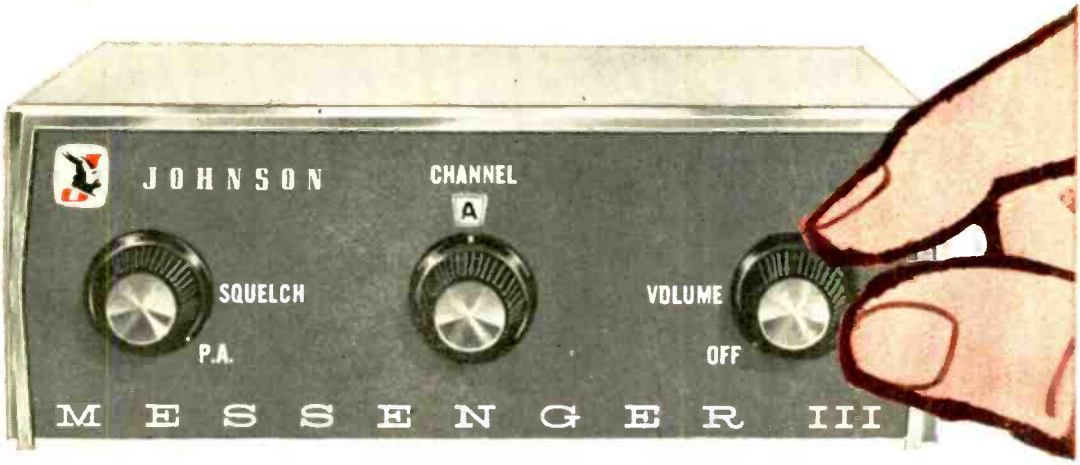
Cat. No. 250-828.....4 ft. Fiberglass Antenna
Cat. No. 250-829.....12 in. Fiberglass Antenna



The 11 Channel "Messenger III" will change every idea you ever had about what a Citizens Band unit should offer! Tiny, all transistor, it's really quiet, really hot! Interchangeable for base or mobile—use it as a full 5-watt battery powered portable pack set or a 3-watt PA system. Other transistor-type units equalled but didn't exceed the performance of tube-type units—but the "Messenger III", with an aero-space transistor developed for the "Relay" communications satellite, delivers more power output with maximum legal input! Double conversion receiver with high 1st IF provides excellent spurious and image rejection. Set-and-forget "Volume" and "Squelch" controls make it possible for the first time to work "close-in" or at extended range with your initial settings. Furnished with dynamic microphone with "full-grip" push-to-talk bar. Full line of accessories available for selective calling, portable field pack, or public address use!

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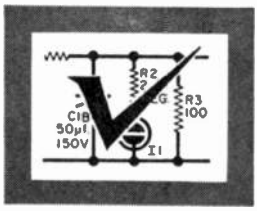

THROUGH THIS COLUMN we try to make it possible for readers needing information on out-dated, obscure, and unusual radio-electronics gear to get help from *other* readers. Here's how it works: Check over the list below. If you can help anyone with a schematic or other information, *write him directly*—he'll appreciate it. If *you* need help, send a post card to OPERATION ASSIST, POPULAR ELECTRONICS, One Park Avenue, New York 16, N.Y. Give the maker's name, the model number, year of manufacture, bands covered, tubes used, etc. Be sure to print or type everything legibly, including your name and address, and be sure to state specifically what you want, i.e., schematic, source for parts, etc. Remember, *use a post card;* we can handle them much faster than letters. And don't send a return envelope; your response will come from fellow readers. Because we get so many inquiries, none can be acknowledged, and POPULAR ELECTRONICS reserves the right to publish only those requests that normal sources of technical information have failed to satisfy.

Schematic Diagrams

TrueTone D-692 console, 10 tubes, BC and s.w., date unknown; **Stromberg-Carlson** 440 console, 10 tubes, BC and s.w., date unknown. (R. Schumsun, 1511 N. 2nd St., Rogers, Ark.)

Andrea Model C-VK126 TV FM/AM receiver, no other data. (Jack Shirley, 645 Reynard Ave., Cincinnati 31, Ohio)

Crosley Model 1516, 14-tube, 3-band receiver, l.f. and two h.f. bands, chassis #1223606, date unknown. (Jerry Carter, 456 Short St., Camden, Ark.)

King Radio Model 109, about 1930, made by Williams Piano Co., Ontario, Canada. (John Mowbray, 13 Haverson Blvd., Toronto 15, Ontario, Canada)

RCA Model 2BX63 BC receiver, ser. U085052. (R. M. Daniel, Jr., 623 University Pl., Swarthmore, Pa.)

Sonar Model MR-3 receiver, covering 10-, 20-, and 75-meter ham bands, date unknown, using 6U8, 6AL5, 6AV6, 12AT7, 6005, OB2, and two 6CB6 tubes. (Mario R. Natola, 36 Timson St., Lynn, Mass.)

Westinghouse Model H-126, no other data. (James L. Coston, Rte. 1, Box 225, Daingerfield, Texas)

E. H. Scott Model AFM Philharmonic FM radio, 25 tubes, all-wave, chrome chassis and separate power pack, ser. RR 417. (J. R. H. Bell, 4 Martin Ave., Auckland, S. E. 2, New Zealand)

Farnsworth Model GK-087, 8-tube, BC-FM radio-phonograph. (Larry Hughes, 1414 West Flora St., Ontario, Calif.)

Steelman Transitape tape recorder, ser. 1645; also a.c. adapter data. (Leonard A. Kerchner, 19 Howard Ave., Binghampton, N. Y.)

RCA Victor Model 211 BC and s.w.; and **Philco** Model 66, BG, S12 (no other data). (B. Graver, 75-17 64 Pl., Glendale, N.Y., 11227.)

(*Continued on page* 30)

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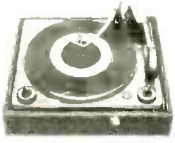

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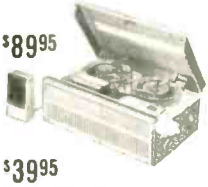

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Brandes Model B-15 8-tube superhet, ser. 16635. (Larry Stutzman, Box 294, Filer, Idaho)

Silvertone Model 7114, 4-tube, battery-powered BC radio, ser. 74812; **Atwater Kent** Model 82 7-tube superhet BC radio. (Barry Zimmerman, 1215 Bridge St., New Cumberland, Pa.)

BC-733 Army surplus unit, and BC-433F radio compass, also surplus. (B. Yeargan, 120 Westmore Rd., Rome, Ga.)

GE (Can.) Model A-87, 8 tubes, BC and two s.w. bands, ser. 123. (R. Silver, 411 Butler Ave., Ft. Frances, Ontario, Canada)

Midwest TV chassis CV-20, ser. 22520-0321, made by Midwest Radio & TV, of Cincinnati, Ohio. (Charles J. Eisen, Big Lake, Minn.)

Atwater Kent Model 55-FC, ser. 156872, pre-1935, no other data. (Murray Coppold, 223 Strathearn, N., Quebec, Canada)

Wireless Set No. 19, MkII, ZA 10178, DC 92049C. Signal Corps surplus. (Joseph G. Hagaman, Jr., 1405 Spruce St., Cheswick, Pa.)

Zenith Model 1103, 10-tube, BC, l.w., and s.w. radio, with push-button tuning; also 1232 tube or replacement needed. (J. F. Osbourne, 6 Enterprise Dr., Brunswick, Me.)

Philco Model 4, ser. A45553, 3-tube, 1.5- to 19-mc. radio, made by Philco of Canada about 1930. (Bruce Ward, Spruce Lake R.R. 1, Lancaster, N.B., Canada)

Atwater Kent Model 20, ser. 469500, set 7960, 5-tube radio, about 1928; and **Stewart Warner** Model 91-53 BC and s.w., 5-tube radio, about 1930. (Jack Holodnick, Caseville, Mich.)

Supreme Set Tester, Model 592, ser. 1180; also service data. (J. B. Kinley, MS 933, Beatty Hospital, Westville, Ind.)

U. S. Electronic Research & Development television tube checker, about 1957, no other data. (H. G. Jeffery, 114 Pollock Ave., Galt., Ontario, Canada)

Freed-Eismann Model 37 radio phonograph, receiver type CH-110. (R. E. Bonn, 1242 W. 25th St., San Bernardino, Calif.)

Stewart-Warner RPA-3 military surplus communications receiver, made in Canada about 1944, 21 tubes, 1.5 to 30 mc. in 4 ranges. (Hart Jackson, 2034 30 Ave., S. W., Calgary, Alberta, Canada)

Heath AR-3 all-wave receiver; also instruction book. (Alberto Ponce W, Violante 6, Mexico 3, DF, Mexico)

Webcor Model 2030-1 tape recorder, ser. 437201, no other data; also heads, any other data. (Reginald Rosevear, 2910 Reisterstown Rd., Baltimore, Md., 21215)

Philco Model 46-350 a.c.-d.c. portable, no other data. (Larry D. Barr, 7110 Reche Canyon Rd., Colton, Calif.)

E. H. Scott Model 515, BC and two s.w., 12-tube radio, about 1950. (Oscar Chapur, Cangallo 2540, Buenos Aires, Argentina)

Emud (West German) Model 923, BC, s.w., FM, phono, no other data. (J. J. Scott, 7913 Loretto Ave., Philadelphia 11, Pa.)

Echophone Model EC-1A 3-band receiver, no other data. (C. Gregory Paris, 70 E. 7th St., Williamsport, Pa.)

Philco type 38-2670A, code 325, using 6A8, 6K7, etc., no other data. (Gustow Albrecht, 5154 Tchendorp by Koln, Heerstrasse 201, W. Germany)

Special Data or Parts

BC-639A military surplus s.w. receiver, type R5032A, any technical data, also schematic. (Camilo A. Castillo, HP1-AC, c/o L.P.R.A., P.O. Box 1622, Panama, Republic of Panama)

Philco Model 37-640, code 121, chassis 3640A, 7-tube radio, about 1939, alignment data, schematic, and any other technical information needed. (Lynn Hilborn, 119 Buckingham Ave., Toronto 12, Ontario, Canada)

(*Continued on page* 32)

Operation Assist

(*Continued from page* 30)

Firestone Airchief receiver, any technical data. (Roger Attwell, Rte. 4, Box 500, Everett, Wash.)

RAL-7 military surp us receiver, manual, or data on power requirements, etc. (Charnar G. McInnish, 510 Sixth Ave., Childersburg, Ala.)

Triplett Model 1612 tube tester, ser. 10413, manual, scroll, and schematic. (Ronald R. Ridgeway, 304 N. Eighth St., Columbia, Mo.)

Westinghouse Type WR34 receiver, 150 kc. to 20 mc., 4 bands, about 1936, any technical data. (R. K. Burkhardt, Meadow Lane, S. Hadley Center, Mass.)

Freed-Eisemann Model NR-85 (1928), 10" speaker, 10,000-ohm field winding; **Kolster** Model K-44 (1929) round dial glass attachment. (F. P. Pagano, 1835 W. Seventh St., Brooklyn 23, N.Y.)

Bendix Type 800, Model 1, Style D motor generator, input 28 volts d.c., output 115 volts a.c., Navy surplus, any technical data. (Sid Kaplan, 9624-146 St., Edmonton. Alberta, Canada)

Hytron BM 49B ballast tube, replacement or equivalent. (G. Gurney, 2577 Elmwood Ave., Rochester, N.Y.)

Supreme Model 500 automatic tester, de luxe series, made in 30's, manual and schematic. (L. P. Sherwood, Box 79, N. Hoosick, N.Y.)

Philco Model 41-265, code 121, 7-tube, 4-band superhet, data on related FM or TV converter, also schematic. (H. Gerber, Middlefield Rd., Durham, Conn., 06422)

Supreme Model 546 oscilloscope; **Hickok** Model OS-10 a.f.-r.f. oscillator; manuals for both. (Jon S. Turpin, 740 E. Pleasant Rn. Pky. N. Dr., Indianapolis, Ind., 46203)

RCA Model 3-BX-671, ser. 020318, portable battery and line-operated receiver, technical information needed, and schematic. (J. H. Penry, Sr., 1718 Irving St., N.W., Washington 10, D.C.)

Breting 40 communications receiver, 14 tubes, BC and s.w. to 31 mc., about 1945, alignment and servicing data needed, also operating instructions. (Steve Bemis, 463 Evergreen St., Elmhurst, Ill., 60127)

Zenith Model 1207 radio, 4 bands, about 1939, power transformer, speaker, tone control assembly, other parts needed, also schematic. (Dennis C. Smith, 9201 Meyers Rd., Detroit, Mich., 48228)

Precision Series ES-520 oscilloscope, no date, manual or schematic needed. (Ray Carifio, 7855 S.W. 17th St., Miami 55, Fla.)

Panawade Model 5014 TV, made in Santa Monica, Calif., about 1950, maker's name needed, any technical data, and schematic. (Michael D. Zimmer, Box 7856, Vandenberg AFB, Calif.)

Stromberg-Carlson No. 420-H receiver, 3 bands, BC and s.w., date unknown, manual needed, or any other data. (K. M. Bromery, 1809 Monroe St., N.E., Washington 18, D.C.)

Wilcox-Gay Recordio, Model A94, disc recorder/BC and s.w. radio, ser. 636666, about 1940, microphone needed, operating instructions, any technical data. (Jesse French, Jr., 15 Stoneroad Court, Lewiston, Pa.)

BC-AL-230 transmitter, military surplus, any technical data, and schematic. (Ralph M. Reese, Box 38, Rte. 1, Niceville, Fla.)

WE-205 vacuum tube (Army VT-2), any data. (A2C Randall M. Keils, CMR Box 12159, Wright-Patterson AFB, Ohio)

Silvertone Model 4464 BC and s.w. receiver, main tuning dial needed. (E. Sims, Box 19, W. Newton, Ind.)

Afsco Amplimeter, Model M-10, tube line needed, also schematic. (Joseph J. Hinkelman, 4708 Hillside Rd., Harrisburg, Pa.)

GE Model LF-115, BC, s.w., and FM, about 1942, alignment data needed, schematic, any other data. (Ben Fulbright, 2380 Graham St., Paris, Texas, 75460)

TS-182/UP oscilloscope, Navy surplus, technical data needed, manual, or schematic. (Keith Higgins, 4315 Pepperwood Ave., Long Beach, Calif., 90808)

Philharmonic (?) Model RR14, BC and s.w. to 23 mc., using 6SA7, 6SK7, etc., any technical information. (Jim Watson, 15783 W. Dakota, Kerman, Calif.) —30—

THE GIRL DETECTOR

By
JOHN T. FRYE
W9EGV

A LATE HOUR of an evening in January found Carl and Jerry busy in the electronics laboratory of Parvoo University. Carl was seated in front of a TV set looking intently at the glowing screen. The picture that interested him so much was one of the back of his own head. He was cutting his own hair, aided by Jerry, who was manipulating the camera of the laboratory closed-circuit TV system so that it was kept focused on the point where Carl was gingerly and awkwardly using the electric clippers.

"How'm I doing?" Carl mumbled without raising his chin.

"I've seen worse jobs—I just can't remember where or when," Jerry replied. "What started you on this do-it-yourself haircutting kick?"

"Two things. First, the local barber shops have upped haircuts another two bits; second, my friend Ray Thompson gave me this idea for beating them out of it. I can't see paying a barber, who learns the business in nine months, more dough per hour than I'll be able to make when I finish four grinding, expensive years in college."

"Yeah, but don't forget that your extra work and education will start paying off fast as soon as you get a little experience, and there's no ceiling on how much you can make—if you're good, that is. The barber can only make so much—he's got a ceiling."

"A darned high ceiling, if you ask me! Well, I guess I'd better quit while I'm ahead. Let's see how it looks over my left ear. Hmmm. All kidding aside, this doesn't look too bad, does it?"

"Not if you keep your hat on," Jerry replied mercilessly. "Say, how about coming over to the Union with me and helping me check out my Girl Detector?"

"Your what? It sounded like you said 'Girl Detector.'"

"That's what I did say. While you were in Chicago at your cousin's

(Continued on page 38)

Why Fred got a better job . . .

I laughed when Fred Williams, my old high school buddy and fellow worker, told me he was taking a Cleveland Institute Home Study course in electronics. But when our boss made him Senior Electronic Technician, it made me stop and think. Sure I'm glad Fred got the break . . . but why him . . . and not me? What's he got that I don't. There was only one answer . . . his Cleveland Institute Diploma and his First Class FCC License!

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What a return on his investment! Fred should have been elected most likely to succeed . . . he's on the right track. So am I *now*. I sent for my three *free* books a couple of months ago, and I'm well on my way to Fred's level. How about you? Will you be ready like Fred was when opportunity knocks? Take my advice and carefully read the important information on the opposite page. Then check your area of most interest on the postage-free reply card and drop it in the mail *today*. Find out how you can move up in electronics too.

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(*Continued from page* 33)
wedding last week end, the Triangle fraternity boys asked me to dream up an interesting gadget for their dance tomorrow night. They wanted something scientific, but simple enough to intrigue the non-engineers in the crowd. Come along and see what I worked out."

A FEW MINUTES LATER the boys were standing in the nearly empty ballroom on the third floor of the Memorial Union Building. Four or five Triangle fraternity men were putting finishing touches on the decorations. Jerry led Carl over to a corner of the room in which a man-size *papier-mâché* "wolf" was seated on a raised platform.

"Walk up to the platform, stand there a few seconds, then push down on that button near the wolf's foot," Jerry instructed.

Carl did as he was told, and instantly the wolf's bulging eyeballs scanned Carl's figure up and down twice with deliberation. Then a voice that seemed to come from the lecherous-looking creature said contemptuously, "Go away, boy!"

Jerry turned to a hulking youth standing nearby and said pleadingly, "Please, Buzz; just once more?"

"Aw, not again, fellows!" the 240-pound varsity tackle protested, but he good-naturedly allowed himself to be propelled out of the room by his fraternity brothers who closed in on him. A few minutes later he came back, his powerful hairy legs protruding from beneath a skirt improvised from a towel. With one hand on his hip, he minced toward the wolf with a ludicrous, affected feminine walk that brought howls of laughter from the watchers. After standing at the edge of the platform for a few seconds, he reached over and pushed down on the button.

Instantly the *papier-mâché* creature's eyes began boldly sweeping up and down the brawny figure of the football player; then its eyes lighted up with a bright red glow, and it emitted the longest, most admiring, most libidinous wolf-whistle Carl had ever heard. As his fraternity brothers collapsed with laughter, the towel-clad youth turned around and

(*Continued on page* 94)

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2-way system 6½" woofer. HFS-10. W. $29.95 • 2-way system 8" woofer HFS-8. W. $44.95 • 3-way system 10" woofer HFS-6. K. $59.95; W. $89.95

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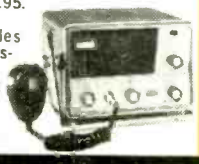
Dual Conversion CB Transceiver 777. Kit $119.95; W. $189.95.

770 Series CB Transceivers from Kit $79.95; Wired $109.95



60W CW Transmitter #723 Kit $59.95 Wired $89.95

Hand held Citizens Band Transceiver #740 incl. Gulton rechargeable battery & charger. Kit $54.95. Wired $79.95.

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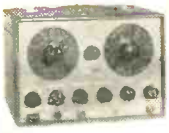

Deluxe Multi-Signal Tracer #147-A Kit $29.95; Wired $44.95

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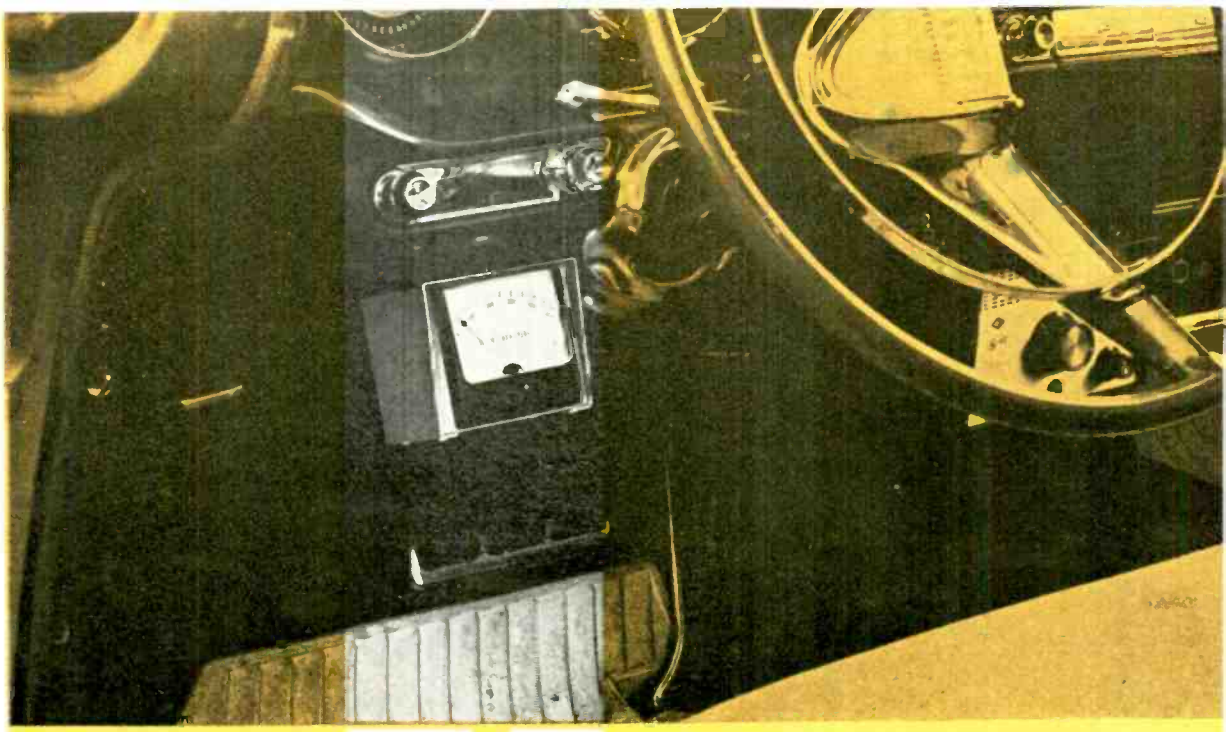


X-Line Tachometer

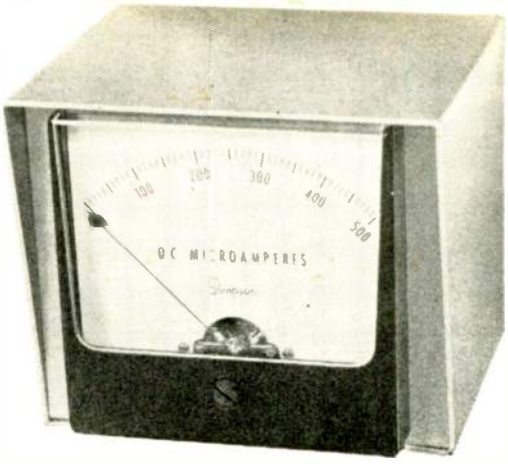
Pre-packaged low-cost semiconductors offer opportunity to build linear-scale, high-accuracy tach for automotive or marine use

By CHARLES CARINGELLA, W6NJV

MOUNTED under the dashboard in the photo above is a tachometer that would make any hot-rod enthusiast green with envy. The circuit and some of the semiconductors were taken from General Electric Company's brand-new "Experimenter Line" of control devices which come complete with schematics. These devices consist of zener diodes, transistors, reed switches, etc., and the "Line" is available throughout the United States. The tach described here uses two of the packaged devices. The remaining tach components can be purchased at prices ranging from about $20 to a high of $30.

How It Works. The tachometer input terminals are connected directly across the distributor breaker points. While the points are closed during the dwell time, the base of transistor Q1 is at ground potential. Since the Q1 emitter is biased positive through resistors R3 and R6, Q1 is held cut off, with its collector about 8 volts positive to ground. When the breaker points open, the inductive kick from the coil primary drives the tach input sharply pos-

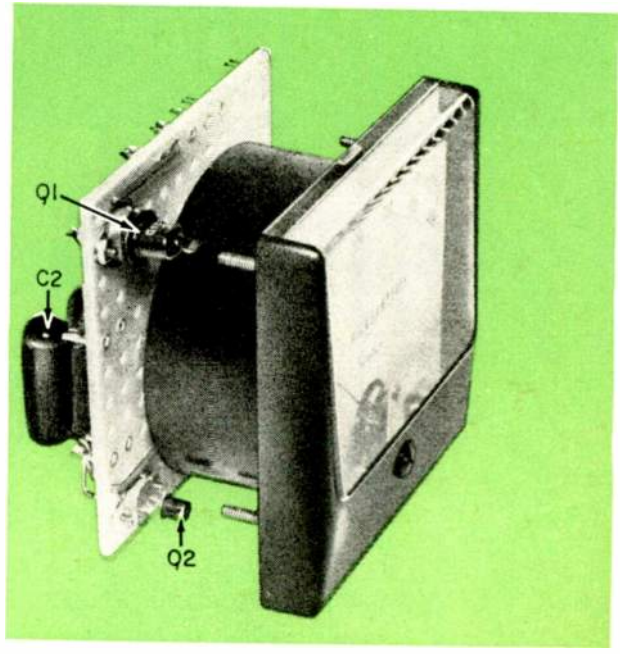
X-Line Tachometer



itive. Reduced by the input network (*R1*, *C1*, *R2*, and *R5*) to a safe value, this positive-going impulse turns *Q1* on, dropping its collector to about ground potential.

This negative-going pulse is coupled through *C2* to base 2 of *Q2*, which was held cut off until this time by positive bias through *R7*. The duration of the negative pulse at base *B2* is very short, since it exists only while *C2* is charging through *R7*. Transistor *Q2* is turned on by the short negative pulse, and becomes a short-circuit path to ground through which *C3* discharges. The discharge current from *C3* through base *B1* holds *Q2* on until the discharge is completed, regardless of the return of base 2 to a positive bias condition.

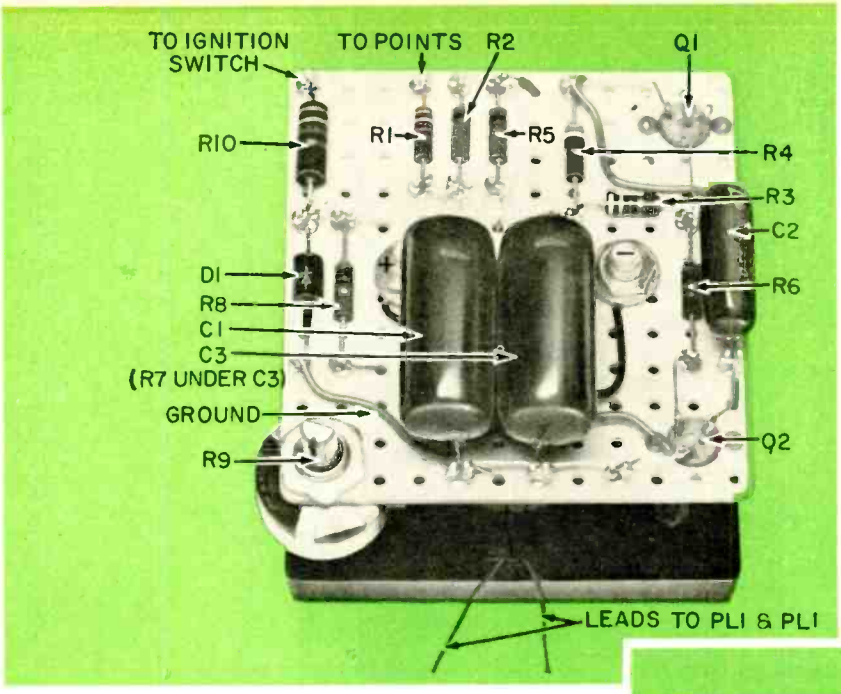
When *C3* has fully discharged, *Q2* again cuts off, and *C3* charges through *R8* and *R9*. Since the voltage at the plus end of *R8* is held at 8.2 volts by zener diode *D1*, the amount of current that flows each time *C3* is recharged is always the same. Since *C3* is recharged once each time the breaker points open, the average current through the meter is directly proportional to engine speed, despite changes in point dwell time and other factors. The required capacitance value for *C3* for different types of marine and automobile engines is given in the small table near the top of page 44.



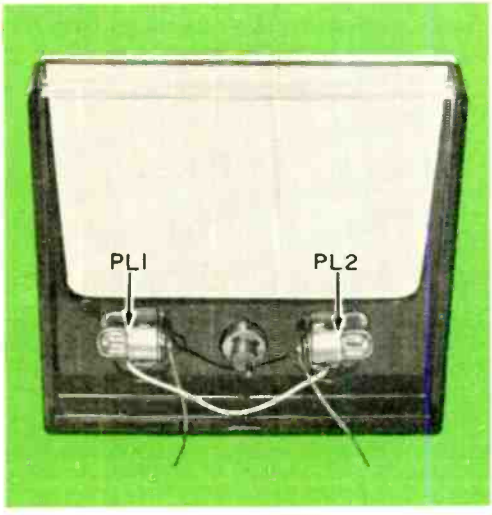
No effort has been made to draw up a new scale for the X-Line tachometer since many builders may not use this meter. The scale is perfectly linear, with 100 equal to 1000 rpm, 200 to 2000 rpm, etc.

Construction. Probably the easiest way to construct the X-Line Tach is to mount all components on a 3½" x 3¼" piece of Vectorbord. Component layout is not critical, however; the close-up view on the next page can be followed with assurance that everything will fit properly.

Regardless of the meter used on your tach, prepare to mount the Vectorbord on the meter terminals; use push-in terminals to hold the components rigidly in place. Both transistors are seated in sockets and calibration potentiometer *R9* is attached to the Vectorbord in one corner. Only three wires need exit from the metal cabinet—or two if the metal frame of the cabinet is grounded to the metal of the dashboard.



All components can be conveniently mounted on a small piece of Vectorbord. Push-in terminals (22 required) are used as tie points. Vectorbord is attached to terminal posts of 500-μa. meter.



Two miniature 6-volt bulbs—wired in series—are cemented to the back of the plastic meter face, providing nighttime illumination of dial. A dropping resistor (not shown) cuts down on brightness.

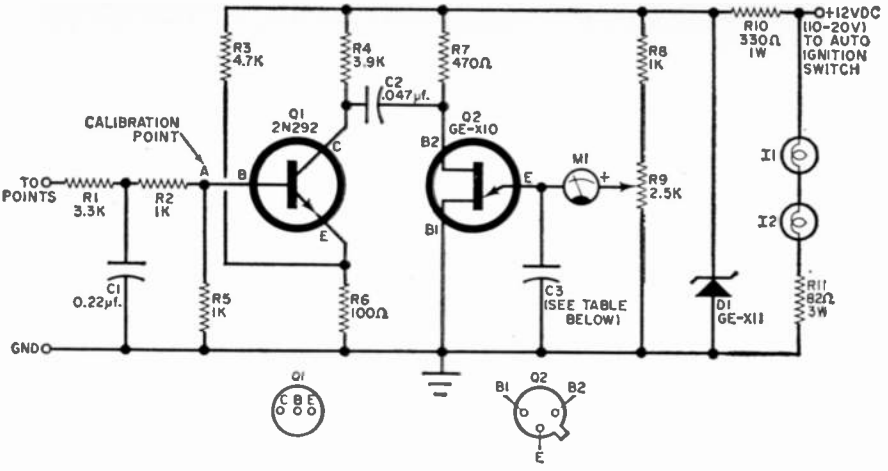
The most expensive item in the X-Line Tach can be the 0-500 μa. meter. To verify the linearity and accuracy of the circuit design, a high-quality Simpson Model 1327C meter was used in the author's prototype. While this meter has many admirable features, a substantial saving can be made by shopping around for meters costing $7-$8 less. An additional saving can be made by eliminating the special cabinet and mounting the meter—and Vectorbord—on a solid sheet of plain aluminum.

Meter Illumination. For convenience while driving at night, the meter used in this prototype has been provided with illumination by mounting two small lamps along the bottom edge of the meter scale. Similar illuminating methods can be devised using the same parts (*I1*, *I2*, and *R11*) with different meters.

If the Simpson meter is used, pry off the meter front cover with a penknife or thin screwdriver blade. Use epoxy cement to attach the lamp sockets to the plastic meter face (see photo). Then wire the two lamps in series—they are rated at 200 ma. and 6 volts—bringing thin wire connecting leads out through a small hole in the rear of the meter.

Resistor *R11* is used to cut down on the brilliance of the bulbs. It is not visible in any of the illustrations, but is soldered to the ground lug on the Vectorbord between *D1* and *R9*. If you want to adjust the brilliance with the car's dashboard control, there is no reason why the lead from *I1* cannot go to the dashboard rheostat.

Calibration. The range of the X-Line Tach can be set between 0-4500 and 0-7000 rpm by adjustment of *R9*. Practically all pre-1964 Detroit cars are covered in the range of 0-5000 rpm. This range has the advantage of not requir-



	No. of Cylinders		
	4	6	8
C3 in μf. for 2-cycle engine	0.33	0.22	0.15
C3 in μf. for 4-cycle engine	0.68	0.47	0.33

In this circuit capacitor C3 is discharged through unijunction transistor Q2. Charging up C3 depends upon the type of engine (2- or 4-cycle) and the number of cylinders. Select a value for C3 from the table above to match the engine. Calibration is accomplished by connecting 6.3 volts a.c. between ground and point "A". Potentiometer R9 is adjusted so that a reading of 900 rpm is obtained. The scale is linear; only one calibration point is needed.

PARTS LIST

C1—0.22-μf. Mylar capacitor
C2—0.047-μf. Mylar capacitor
C3—See table above
D1—8.2-volt, 1-watt zener diode (General Electric X-11 Kit)
I1, I2—No. 328 midget bulb (G.E. or equivalent)
M1—500-microampere d.c. meter—see text
Q1—2N292 transistor (G.E. or equivalent)
Q2—Unijunction transistor (G.E. X-10 Kit)
R1—3300 ohms
R2, R5, R8—1000 ohms
R3—4700 ohms
R4—3900 ohms
R6—100 ohms
R7—470 ohms
R9—2500-ohm potentiometer
R10—330 ohms, 1 watt
R11—82 ohms, 3 watts
T1—6.3-volt filament transformer
Misc.—Cabinet (LMB "Glamor" Type W-2A used), transistor sockets, Vectorbord, push-in Vector terminals, wire, solder, etc.

All resistors ½ watt unless otherwise stated

ing a new meter scale—if a 0-500 μa. meter is employed.

In any case, the linearity of this circuit is such that calibration need only be established at one point. The circuit above illustrates a simple bench method (provided a 12-volt d.c. supply is available). The output of the filament transformer is connected to calibration point "A" at the junction of *R2* and *R5*. Adjust *R9* to read 900 rpm, and the remainder of the linear scale will fall into line.

Calibration can also be done at your local service station or garage by tying the X-Line Tach in parallel with a tachometer of known accuracy.

The X-Line Tach has been used for the past two months in conjunction with a special transistor ignition system scheduled to appear in the February issue of POPULAR ELECTRONICS. It has had no adverse effect on the transistor system. The X-Line Tach can be mounted under the dash (as per the lead photo) or on the steering column. Use a worm drive hose clamp (available at most garages) to hold the cabinet securely. —30—

NOTE: The unijunction transistor is mainly responsible for the accuracy of the X-Line Tach. Once turned on by the negative pulse at B2, conduction through the emitter to the base 1 path maintains itself, regardless of the recovery of base 2, insuring a uniform time period for charging and discharging C3.

2-TUBE SUPERHET FOR 80 METERS

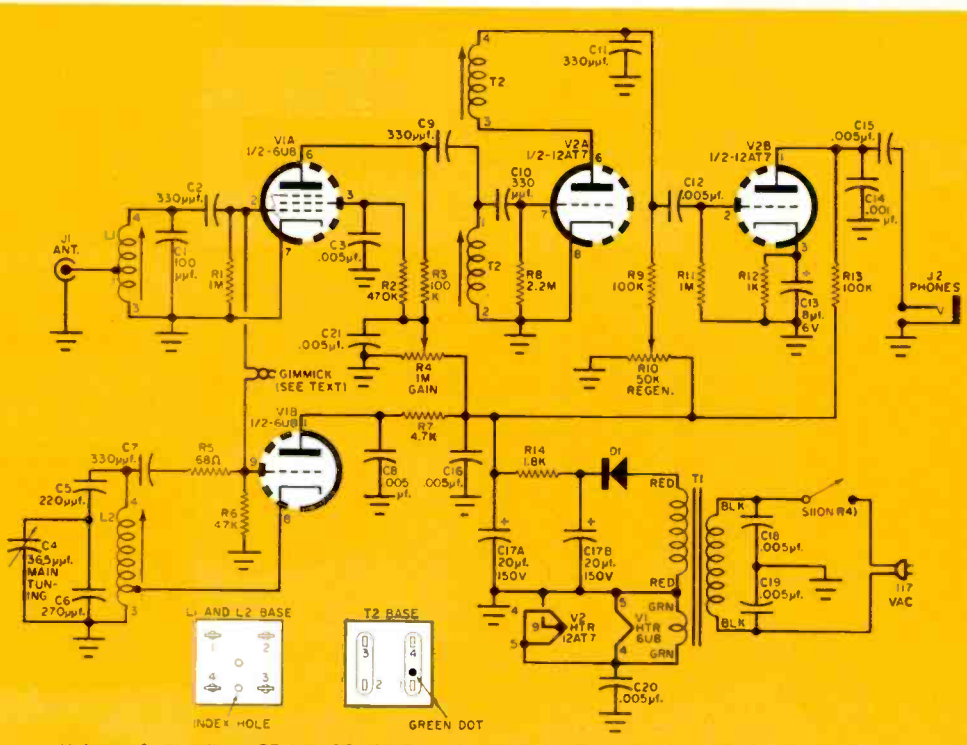
The 80-meter band remains a perennial favorite. Here's a receiver that will let you in on the fun with little outlay of hours and dollars

By **CHARLES GREEN,** W3IKH

HERE'S a simple, easy-to-build receiver for the 80-meter band that can do a real job for the novice, or as a standby receiver for the experienced old-timer. Costing less than $30 to build, even with all-new parts, it uses only two tubes in a superhet circuit, yet provides remarkable sensitivity and fully adequate headphone output, thanks to a regenerative second detector.

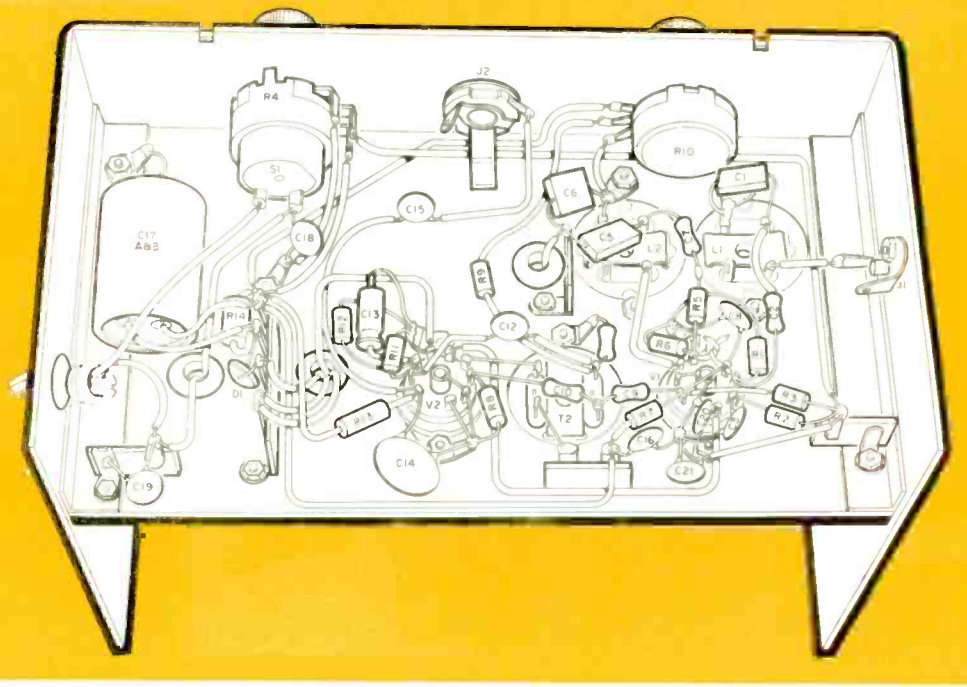
Use of regeneration with panel control also makes the receiver usable on either phone or c.w. signals, and the built-in power supply makes it unnecessary to "steal" power from other sets in the shack. Sharp-eyed P.E. readers will note a family resemblance to the 6-meter and 2-meter superhets published in past months. This is far from accidental, for the basic circuit is sound, and lends itself to construction by experimenters not blessed with a shop full of test equipment.

ABOUT THE CIRCUIT. Eighty-meter signals from the antenna enter via jack J2, and are fed to the fixed-tuned circuit made up of L1 and C1, and to the grid



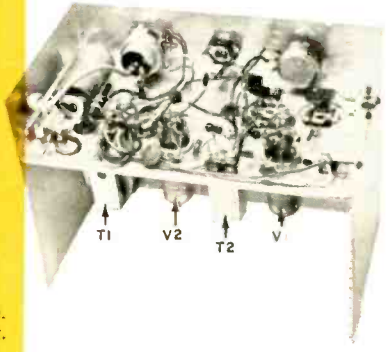
Values of capacitors C5 and C6 affect the bandspread. Reducing the value of C5 increases the arc of the dial occupied by the 80-meter band; increasing C5 reduces the bandspread.

Point-to-point wiring permits mounting most small parts on lugs of major parts as shown.



PARTS LIST

C1—100-μμf., 500-volt silver mica capacitor
C2, C7, C9, C10, C11—330-μμf., 600-volt ceramic tubular capacitor
C3, C8, C12, C15, C16, C18, C19, C20, C21—0.005-μf., 600-volt ceramic disc capacitor
C4—365-μμf. variable tuning capacitor (Lafayette MS-214 or equivalent)
C5—220-μμf., 500-volt silver mica capacitor
C6—270-μμf., 500-volt silver mica capacitor
C13—8-μf., 6-volt miniature electrolytic capacitor
C14—0.001-μf., 600-volt ceramic disc capacitor
C17—Dual 20-μf., 150-volt electrolytic capacitor
D1—400-PIV, 450-ma. silicon rectifier (International Rectifier Type 5E4 or equivalent)
J1—Phono jack, chassis type
J2—Earphone jack (to match your phones)
L1—Antenna coil (Stancor RTC-8762 or equivalent)
L2—Oscillator coil (Stancor RTC-8764 or equivalent)
R1, R11—1 megohm
R2—470,000 ohms
R3, R9, R13—100,000 ohms
All fixed resistors ½ watt, 10%, carbon unless otherwise noted
R4—1-megohm linear taper potentiometer (with switch S1)
R5—68 ohms
R6—47,000 ohms
R7—4700 ohms
R10—50,000-ohm linear taper potentiometer
R12—1000 ohms
R14—1800-ohm, 2-watt, 10% carbon resistor
S1—S.p.s.t. switch (part of R4)
T1—Power transformer: primary, 117 volts, a.c.; secondary 1, 125 volts, 15 ma.; secondary 2, 6.3 volts, 0.6 ampere (Knight 61G410 or equivalent)
T2—455-kc. slug-tuned i.f. amplifier input transformer (Meissner 16-6758 or equivalent)
V1—6U8A tube
V2—12AT7 tube
1—Dial (Eddystone #598)
1—Shaft coupling (National TX-10)
1—8" x 6" x 4½" aluminum utility box (LMB 146 or equivalent)
1—8" x 4⅜" aluminum sheet (for chassis shelf)
Misc.—"K Tran" mounting plates (Miller 181 or equivalent), tube sockets, angle brackets, grommets, terminal strips, knobs, ¼" metal spacers, line cord and plug, wire, etc.)



Position of tuning capacitor C4 is shown above. Other major parts placement is given at right.

of mixer tube *V1a*. Main tuning capacitor *C4* is connected in parallel with *C6*, and the combination is in series with *C5* to make up the total capacity that tunes oscillator coil *L2*. This arrangement gives a good spread of the 80-meter band over practically the whole dial arc.

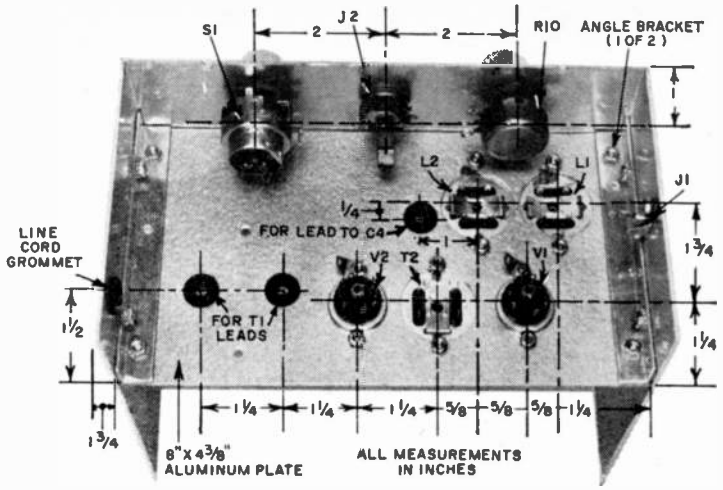
The "gimmick" capacitor made of two twisted insulated wires couples the output of oscillator *V1b* to the grid of *V1a*, and the resultant 455-kc. difference-frequency signals are connected by *C9* from the plate of *V1a* to *T2*. *GAIN* control *R4* varies the conversion gain of the mixer stage so the signal will not overload *V2a*, the detector stage. Coil *T2* is fixed-tuned by its adjustable core to 455 kc., and *REGEN* control *R10* varies the regenerative action of the detector stage.

The detected audio signals are fed through capacitor *C12* to *V2b* and amplified. Capacitor *C15* couples the amplified signals to phone jack *J2*. Power transformer *T1*, rectifier *D1*, and the filter circuit made up of resistor *R14* and capacitor *C17* provide the operating voltages for the receiver.

Construction. A metal 8" x 6" x 4½" utility box and a 8" x 4⅜" chassis shelf of aluminum sheet are used to house the components. The chassis shelf is mounted by a pair of angle brackets 10¼" from the base of the utility box.

The parts placement shown in the photographs is fairly critical, especially in the mixer-oscillator circuits of *V1*. Begin construction by mounting the chassis shelf and components as indicated.

Coils *L1* and *L2* are supplied with



Dimensions and orientation of parts should be followed closely to duplicate the author's results. All holes should be deburred before final assembly.

mounting clips only. The author used "K Tran" mounting plates, similar to the plate supplied with *T2*. If these mounting plates cannot be procured, duplicates of the *T2* plate can be made or spaced holes can be drilled in the chassis to mount the coils by their clips.

Short pieces of insulated sleeving should be placed over the coil terminals of *L1* and *T2* to prevent accidental shorting to the chassis, since the plates are not an exact fit and also may move a bit. The author enlarged the shield can clip holes to fit "K Tran" type mounting clips, but the clips supplied with the coils can be used as well.

Two *6-32* machine screws with spacers made of seven metal washers for each were used to mount tuning capacitor *C4* to the chassis. The spacing of the tuning capacitor, the shaft coupling, and the vernier dial must be fairly accurate, so use care in mounting these parts.

After wiring the mixer-oscillator stages of *V1*, form the "gimmick" capacitor by soldering two short pieces of insulated wire to pins 2 and 7 of *V1* and twisting the ends together two turns.

Make sure that you drill a series of holes in the back of the rear box cover, to provide a means of ventilation for the receiver.

Testing and Calibration. After the construction is finished, adjust the bottom iron core of coil *T2* all the way out, as far as it will go. This is necessary to limit the maximum regenerative feedback of the circuit of *V2a*. Install the tubes and connect the receiver to the a.c. line. Insert a pair of high-impedance earphones into *J2*, and warm up the receiver for a while.

Then turn up the *REGEN* control until you hear the typical regenerative hiss. Set the *TUNING* control to full capacity and the *GAIN* about midway. Connect a signal generator or other source with an output of 3.5 mc. to *J1*. Loosen the locking nut on the slug of coil *L2* and rotate the tuning slug downwards until it is almost flush with the nut; then adjust the slug upwards until you hear the test signal, and tighten the locking nut. In a pinch, you can use a signal you know is at the low end of the 80-meter band for this adjustment.

Disconnect the signal generator and connect a 15′ insulated wire to *J1*. Loosely couple the signal generator to the wire by twisting a small piece of insulated wire around it and connecting the end to the signal generator. Reset the signal generator to 3.75 mc., and rotate the *TUNING* control until the signal is heard. Loosen the locking nut on the slug of coil *L1* and adjust the slug for maximum signal, decreasing the *GAIN* control as necessary to prevent overloading the detector. Now reset the generator to 3.5 mc., and proceed with the calibration of the dial. The author calibrated the dial every 10 kc. to 4 mc.

A transmitter VFO or GDO can also be used for alignment and calibration. If *no* equipment is available, set the tun-

(*Continued on page* 107)

NEW ULTRASONIC RADAR for the Blind

By **W. STEVE BACON,** Feature Editor

A LONDON concern is making new electronic "eyes" for the blind based on a device designed by a prominent British electrical engineer, Dr. Leslie Kay. The new "radar blind-guide" emits high-frequency sound—much like a bat does—and receives the echoes from solid objects. Unlike a bat's "radar," however, Dr. Kay's blind-guide warns the sightless person through musical tones that he is approaching a staircase, a tree, a small bush, a gravel path, a wall, or a person standing on the sidewalk!

Thanks to the unique design of the device—it utilizes a continuous beam of frequency-modulated, high-frequency sound—the user can determine his distance from an object (or objects), something about its texture (hard, soft, etc.), and something about its shape (flat, sharp, irregular).

A sightless person can easily climb flight of stairs with "Ultra Sonic Aid for Blind Persons" which produces musical notes corresponding to each step. Blind persons have used guide to walk two miles through thick snow, distinguishing different noises reflected from trees, bushes, posts, walls, moving objects and persons, as well as calculating their distances. Flashlight-type probe contains receiving, transmitting transducers; small pack the batteries and circuitry. New models will have all of the circuitry contained in the probe.

"Lighting Up" the World. A flashlight-type probe contains two ultrasonic transducers, one for transmitting and one for receiving, and all of the required circuitry. On the transmitting side, a sweep-frequency oscillator generates 30 to 60 kc. audio. The receiving transducer receives the high-frequency echo.

If the transmitter operated on one frequency only, there would be no way to tell the difference between outgoing and incoming signals. However, since the transmitter sweeps continuously between 30 and 60 kc., any energy received back by the probe differs in frequency

(*Continued on page* 104)

CAN YOU TRUST A DRUG STORE TUBE TESTER

Yes and no, says our vacationing TV serviceman— it's all in knowing just what they can and can't do

By ART MARGOLIS

I WAS MUMBLING to myself as I walked across the highway with my eleven-year-old, Denny, and a bag of tubes in my hand, heading for a do-it-yourself tube tester in the drug store. "Fine state of affairs," I thought to myself. "After months of hard work, I end up doing on a vacation what I do for a living: fixing TV sets."

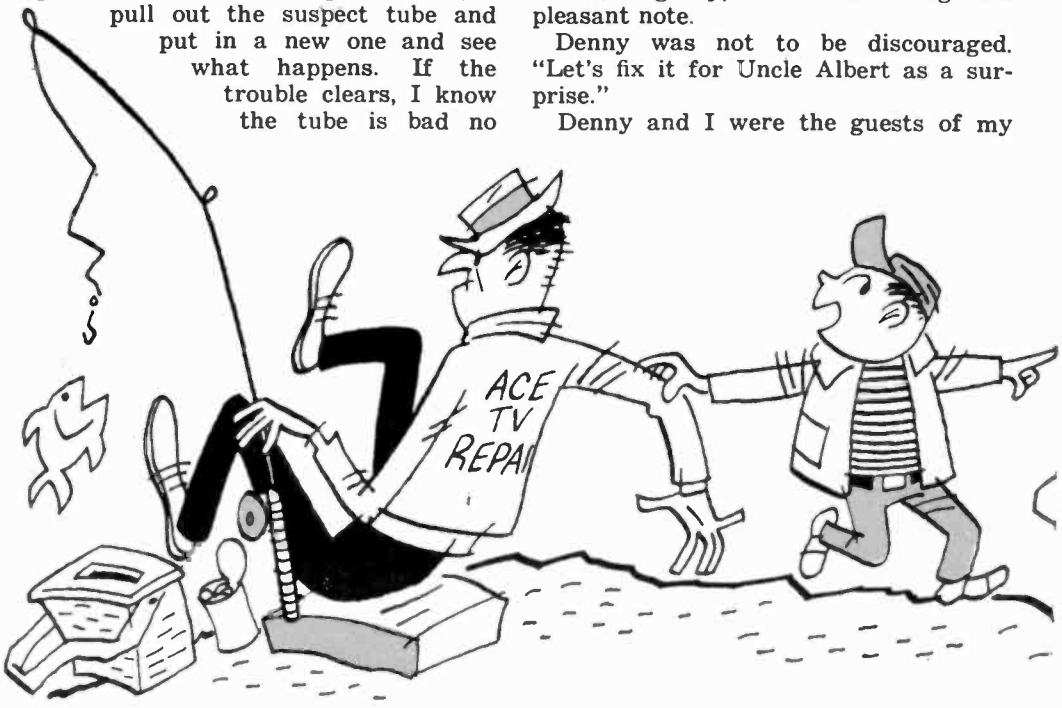
As any TV technician will tell you, the best way to test tubes is by direct replacement. In the shop at home, I pull out the suspect tube and put in a new one and see what happens. If the trouble clears, I know the tube is bad no matter what the tester might say. The only difference now was that I was stuck without my stock of replacement tubes; hence, the trip to the drug store.

I had been ignoring the typical motel TV picture till Denny, proud of his powers of observation, said, "I guess you didn't notice it, Dad, but there's a 60-cycle hum in the video."

"Glad you spotted it for me," I said as I settled back on the pillow. It had been a long day, and it was ending on a pleasant note.

Denny was not to be discouraged. "Let's fix it for Uncle Albert as a surprise."

Denny and I were the guests of my



bachelor Uncle Albert at his luxury highway motel in North Carolina, right in the heart of some real good fishing country.

"Let's not, buddy," I told him. "First of all, I would like to watch this science fiction movie. Second, I don't have any tubes here."

"You can fix it anyway, Dad! Besides, there's a drug store with a tester that sells tubes right across the road."

What could I do when he had so much faith in me? Also, Albert wouldn't take any room rent, and TV repairmen are a scarce commodity in this part of the woods, so I knew he would appreciate it. Denny gleefully began removing the back of the set with a scout knife, as I dragged myself off the bed.

Hum bars in the video, like those on our motel room set, are often caused by a heater-to-cathode short or leakage in one or more of the tubes that process the video signal from the tuner input to the picture tube. The two elements are close together, separated by a coating of aluminum oxide that passes heat but insulates electrically. When the coating deteriorates, it loses some of its insulating properties and the 60-cycle heater current leaks through into the cathode circuit. When this happens along the video pathway, hum bars appear on the screen.

Denny had the back of the set off. "Which tubes shall I take out, Dad?" he asked.

Following the layout pasted on the back cover, I told him to yank the video pathway tubes—a 2CY5 r.f. amplifier, a 5BR8 mixer-oscillator, all the 3CF6 i.f.'s, and the video output, an 8AW8. Then I found myself walking across the road trying to figure out how this could happen to me.

The typical drug store tube tester has an excellent test to reveal heater-to cathode shorts. It connects the various tube elements to an a.c. voltage source and a neon bulb. If any of the elements are touching, the a.c. finds a path and the bulb lights. Sometimes the elements short intermittently, or flakes of metallic substances lodge between them, so it's best to tap the tube gently with your finger to see if the neon indicator flickers.

Denny began testing the tubes for shorts. There were two neons on the tester, one labeled "short" and the other "gas." The "gas" test is really a grid current test. The plate is the only element in a tube that's supposed to draw appreciable current, and if the "gas" neon lights, it shows there's a grid defect, or the tube is gassy, causing grid current to flow.

All the tubes Denny tested read "good," till he got to the second i.f. It made both neons light brightly. The third i.f. produced a dull glow in the "gas" neon. I hauled out my wallet, bought two new tubes, and installed them. The picture was perfect, but when I looked around to show Denny the results of his persistence, he was gone.

Shaking my head over the vagaries of youth, I reinstalled the back on the TV set with my nail clippers and settled down to watch. The science fiction story was well along, and I was just starting to piece together the part I had missed when the junior TV repairman burst

into the room followed by the young couple from next door.

"Dad," he said exuberantly, "their set doesn't work at all! I told them you'd fix it."

Steeling myself and resuming control, I went next door to find a cold TV set with the exception of the pilot light in the channel selector. The light exonerated the wall socket and the line cord —the set was getting juice.

A quick look revealed the lack of a power transformer—a sure sign that the tube heaters were wired in series. When one of the heaters in a series-wired set opens up, none of the tubes light. Every one of the fifteen tubes in the TV would have to be tested to find the dead one—simple but tedious. However, our drug store "service shop" was ideal for this—it would easily show up a *dead* tube; a *weak* tube might be another matter.

One thing to remember when removing all of the tubes from a set is to make sure they are replaced in the same socket—and this holds even for tubes of the same type. As I pulled out each tube, I marked the socket with a number; the same number was marked on a bit of adhesive stuck on the bottom of the tube. Then Denny and I returned to the tester.

"I got it, Dad," Denny called excitedly. "It's this 12DQ6."

I looked at the tube carefully. It was a 17DQ6. Denny had tested it incorrectly—the reason for the "bad" reading. It's always a good idea to double-check any tubes that read "bad," and as a further check, test the new tube you purchase before taking it home. If the new tube performs like the suspect, chances are you have performed the test incorrectly, the new tube is bad, or the tube tester is out of whack.

"*This* one is it," Denny yelled again. I retested the tube for him, a 12BY7. He was right. We bought a new tube and threw the old one in a litter can on the way out so there wouldn't be any possibility of reinstalling the same trouble in a TV set.

By the time we fixed the second set and got profuse "thank-you's" from the couple next door, the science fiction movie was nearly over. A space battle was in progress, and the hero was about to make a U-turn at 250,000 miles an hour. I quickly became at peace with the world.

The hero and heroine were winging their way to one of the moons of Jupiter where they would live happily ever after and I was dropping off to sleep when little Mr. Energy burst into the room again.

"Dad, Dad," he shouted in my ear, "wait till you see Uncle Albert's TV. It's a mess. Let's fix it while he's out—he'll sure be pleased."

I sighed, but I knew there would be no letup until I at least looked at the third TV set, so we stumbled down to Albert's quarters.

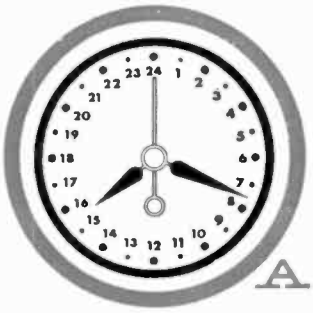
When Denny flicked it on, a narrow pictured appeared which took its time in filling out to less than full-screen width. There were black spaces on the sides, top, and bottom. As an extra added attraction, the bottom had a whitish vertical fold-over. To top it all off, there was more than the usual amount of interference and snow.

Denny pulled out the tubes as I read them off. Because the picture was slow in spreading out, we removed the horizontal output, a 6BQ6, and the damper, a 6AX4. Since there was a four-sided shrink, the 5U4 low-voltage rectifier was next on the list. We decided to test the vertical output, a 12BH7, in an effort to clear the vertical fold-over, and the 6BQ7 r.f. amplifier because of the snow in the TV picture.

(*Continued on page* 106)

THREE LETTER QUIZ

By ROBERT P. BALIN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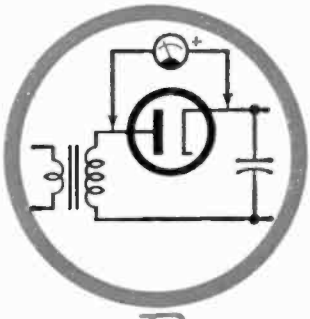
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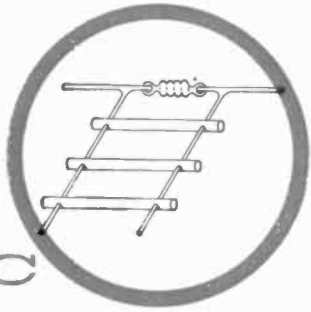
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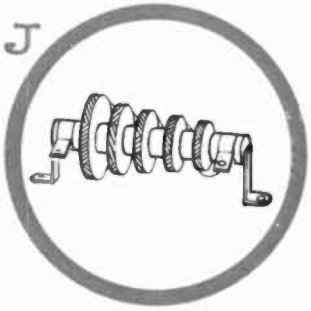
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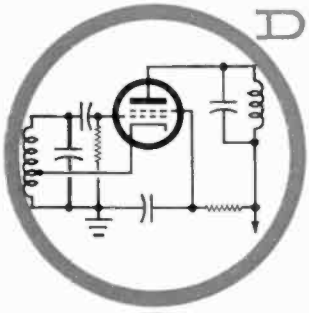
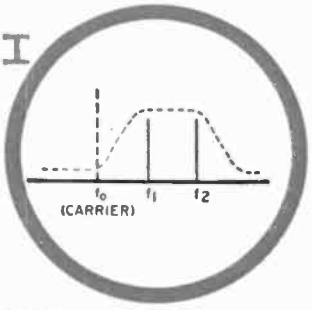
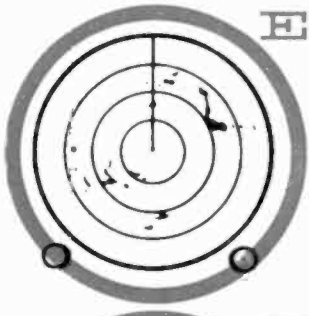

D

The special vocabulary of electronics includes many three-letter abbreviations that the technician and experimenter soon learn to recognize and interpret almost as readily as they do the language of the sports pages. Try your hand at matching up the numbered abbreviations below with the sketches that suggest the meaning of each one. Nine out of ten correct answers is a good score.

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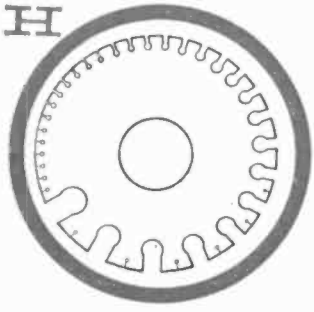
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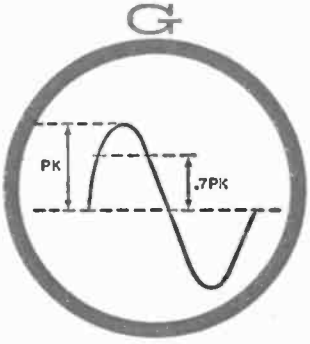
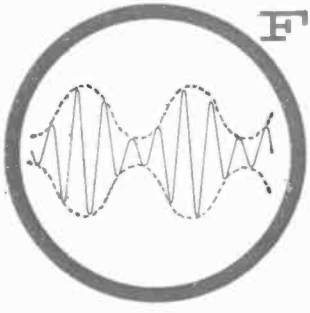
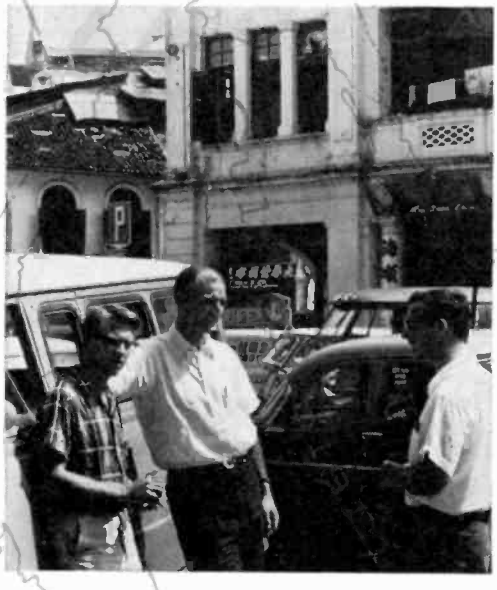



F

(*Answers on page* 105)

1 AWG____ **2 ECO ____** **3 GMT____** **4 MCW____** **5 PIV____**

6 PPI ____ **7 RFC ____** **8 RMS____** **9 SSB ____** **10 SWR____**



Above: A moment of relaxation for Peace Corps volunteer Al Horley, as he discusses the work at Kuala Lumpur Technical College with two of his colleagues.

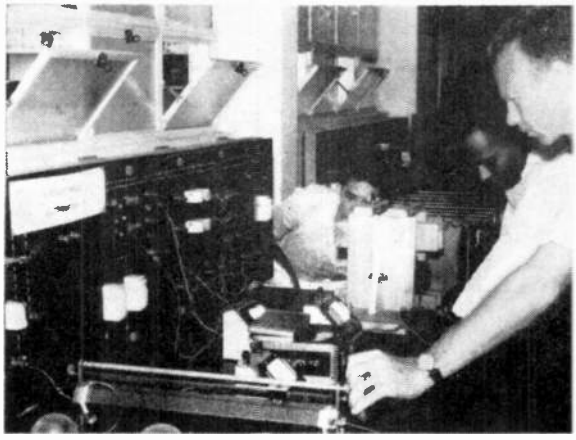
Story by Phil Hardberger, Peace Corps

Peace Corps

WHEN OSCAR I, the garrulous American amateur radio satellite, whirled over Malaya recently, it attracted a brand-new group of interested listeners. Students at the Kuala Lumpur Technical College, under guidance of U. S. Peace Corps volunteers, had built several special antennas and receivers to monitor it and other transmitting satellites far out in space.

The most popular receiving setup built by the Malayan students would look strangely familiar to readers of POPULAR ELECTRONICS. It consists of a Heathkit Mohican receiver and "The NASA-136" nuvistor converter which was constructed from plans appearing in the June, 1962, issue. Sensitivity of the combination is about half a microvolt—quite adequate for satellite tracking.

How It Started. The Peace Corps volunteers who organized the 80-member "Satellite Communication Society" at the college are Albert Horley, 26, of Pittsburgh, and Robert Weakley, 40, of



Operation of a helical antenna for satellite tracking is explained to a student by Al Horley (left). At right, Bob Weakley tests variable inductors he designed as additions to the school laboratory.

Volunteers Praise P.E. Project

Denver, both with extensive backgrounds in electronics. "We needed a project with unusual appeal," said Horley. "The satellite idea seemed to capture the imagination of the entire group."

When the volunteers first arrived, they found their work cut out for them. Horley reported that laboratory experiments were routine, poorly conceived, and of little interest to the students. He also felt there was a general tendency on the part of the students to look down on practical experimental work as being somehow below the dignity of a highly trained man. The prospect of establishing the college as an active participant in the space age helped change all this.

Project Satellite. The Satellite Communications Society at Kuala Lumpur Technical College set themselves three specific objectives: (1) Optical and radio observation of satellites with orbital prediction. (2) Reception of 136-mc. telemetery transmissions from various satellites. (3) Cooperation with Project OSCAR.

The first objective helped students acquire the specialized knowledge they needed to analyze the results of their experiments. The second provided the club with data on a variety of satellites in different orbits, and has proved helpful in analysis and prediction. It also provided practical experience in antenna and receiver design and construction; one of the second year students designed a helical antenna for this part of the project. The OSCAR section of the program was the most ambitious and interesting—it brought the students into contact with many other, similar groups all over the world, and local radio amateurs became enthusiastic supporters.

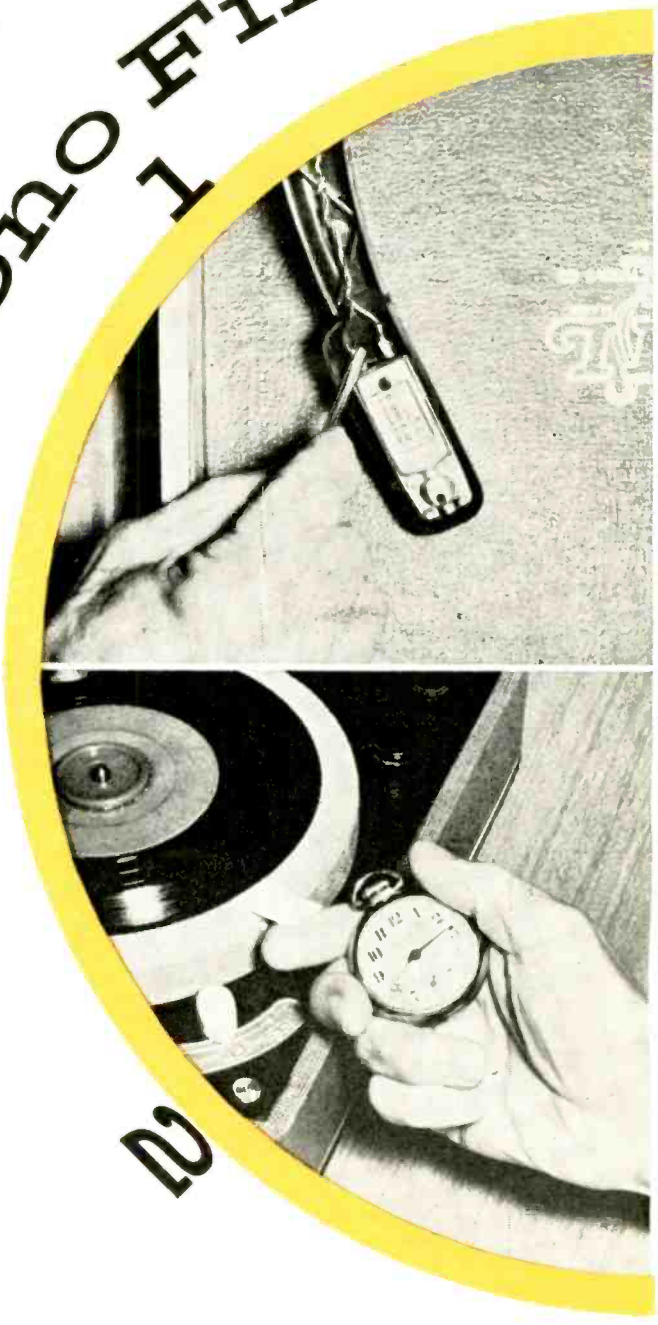
Bigger and Better Projects. Students are now working on several projects coordinated with their satellite observations. One is to produce a highly accurate digital clock incorporating tunnel diodes and frequency divider circuits.

High-gain antennas are also under construction. One design consists of eight log periodic arrays so mounted as to provide reception of horizontal, vertical and circularly polarized signals over a band extending from 100 to 450 mc. In addition, the arrangement and interconnection of the elements are such that elevation and azimuth error signals are produced to provide inputs for the automatic tracking system.

(*Continued on page* 100)

Got an inexpensive record player that's gathering dust? Here are five easy ways to cure five common problems

Phono Fillips



1

QUICK CHECK FOR RECORD PLAYERS—When a teen-ager's record player goes bad, it's the cartridge or amplifier 99 per cent of the time. Before going to the trouble of taking the player apart, simply turn it on, adjust volume to maximum, grasp a screwdriver blade, and touch it to the lugs of the cartridge. A loud a.c. hum at one lug indicates the amplifier is working; if the hum is weak or absent, take the player apart. Good hum indicates a new cartridge, but you can double-check by disconnecting the amplifier leads and connecting a high-impedance magnetic earphone. A good, clear signal when you play a record shows that the cartridge is O.K. Note: Do NOT make these tests while standing on a damp basement floor, or while touching a "ground" such as a radiator.

2

SIMPLE TURNTABLE TIMING—A stroboscopic disc and a fluorescent lamp, if you happen to have them handy, will tell you if your turntable is fast or slow, but not by how much. The photo shows a simple, exact, timing method. Place a strip of paper between a record and the turntable, allowing a little to stick out so it will brush against your finger tip. In this way, you can feel and count each revolution for one minute while watching the second hand of a watch or clock. An accurate count gives you exact turntable rpm. You might also be interested to find out how much the drag of the record player pickup arm reduces the speed of the turntable. Count the rpm's again with the pickup arm in place on the record, and compare.

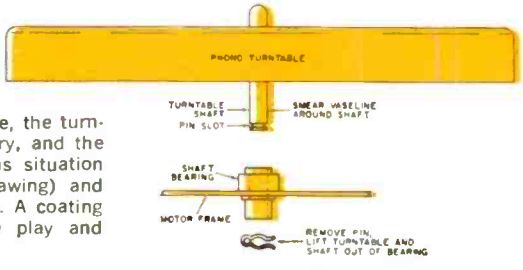
By ART TRAUFFER

3

NEW FELT FOR PHONOS—When the flocking on top of low-priced phono turntables wears off, it's a good idea to glue on a disc of felt or other material. Such a covering improves appearance and makes things easier on your records at the same time. Having turntables reflocked is more expensive, and small particles of fiber will sometimes adhere to your records. As shown in the photo, remove the turntable (in most cases it's held in place by a "C" washer that fits in a groove on the shaft), lay it over the felt, and cut around the edge with a razor blade. Before removing the turntable, mark the center of the felt disc by inserting a sharp, pointed instrument through the center hole. Punch out a ¼"-diameter hole in the felt for the center shaft. Spread glue (LePage's wood glue, Goodyear Pliobond, or a similar adhesive) over the turntable and position the new felt disc.

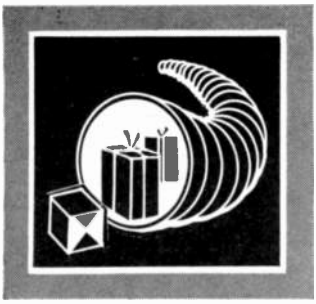
4

A "SAVE" FOR CENTERING DISCS—The recess in the center of some turntables is so low that plastic 45-rpm centering discs don't come up high enough to engage the center hole of 45-rpm records. Note in the photo that the top surface of the centering disc is about flush with the top surface of the record. The problem is easily solved by buying another plastic disc (about 25 cents), and cementing it on top of the old one, but the method used here was to grab a 1⅜"-O.D. iron washer from the junk box (a rubber washer can also be used) and cement it to the bottom of the centering disc. The thickness of the washer was enough to raise the disc to the required height.



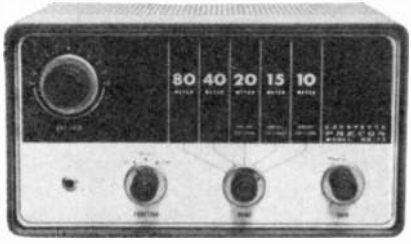
5

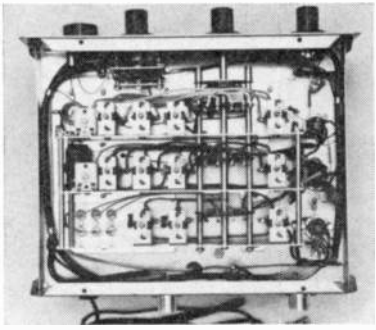
IMPROVING WORN BEARINGS—After long use, the turntable shaft and bearing become worn and dry, and the turntable teeters due to increased play. This situation can be improved by disassembling (see drawing) and cleaning the shaft and bearing with gasoline. A coating of Vasoline on the shaft will both reduce play and lubricate it.



Product Reviews

COMBINATION HAM PRESELECTOR-CONVERTER





Aptly named "Precon," the new Lafayette HE-73 provides two stages of r.f. amplification on 80 through 10 meters. As a converter (this feature is available only on 20, 15, and 10), the Precon gives the operator one stage of r.f. and a crystal-controlled converter stage with an output between 3.5 to 5.2 mc.

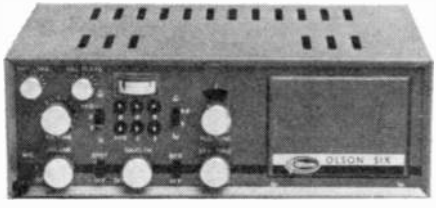
Tubes include a 6BA6 r.f., a 6BL8 r.f./converter stage, and a 6BA6 cathode follower which matches the low input impedance of the receiver. Both the input circuits of the 6BA6 r.f. stage and 6BL8 are tuned, with separate coil-capacitor combinations for each band (see photo). Controls include an "antenna trimmer" (a dual-section variable that peaks the inputs of the first two stages), a gain control in the first r.f., function and band switches. A transformer power supply with silicon rectifier is built into the unit, and a remote B-plus control socket is provided.

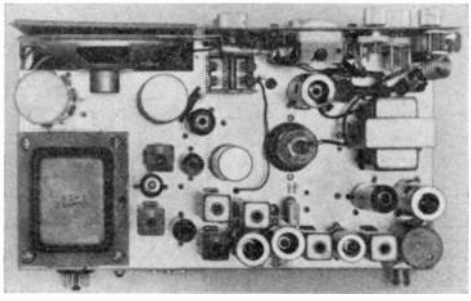
The Precon provides at least 20 db gain on all bands when used as a preselector. As a converter, it offers good sensitivity, stability, and image reduction. Priced at $49.50, the Precon should prove to be a popular accessory. *(Lafayette Radio Corp.,* 111 Jericho Turnpike, Syosset, L. I., N. Y.)

NEW AMATEUR TRANSCEIVER FOR SIX METERS

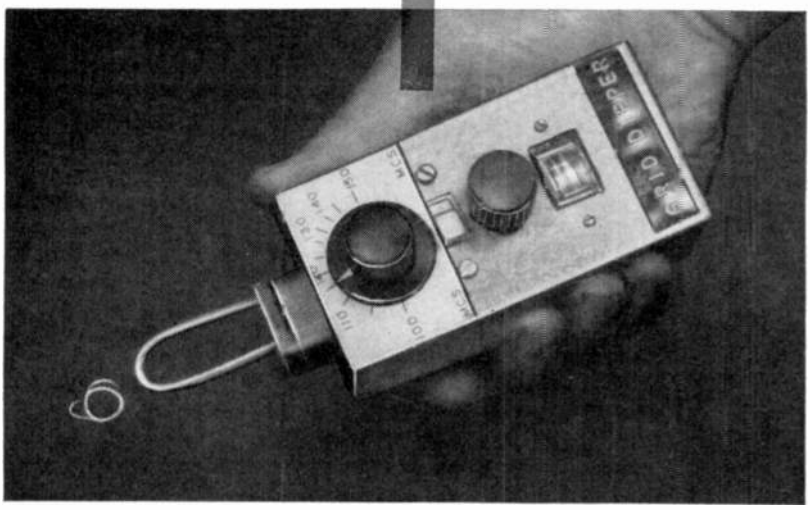
Designed for mobile or fixed-station use, the Olson RA-570 is a six-meter transceiver covering 50 to 52 mc. In the receiving end, a 6BZ6 is followed by two mixer-oscillator stages, the first crystal-controlled and the second tunable. Two i.f.'s, detector, audio, squelch, and tunable BFO complete the dual-conversion receiver. Good features include excellent sensitivity (rated by the manufacturer at 0.5 μv. for 6 db signal-to-noise ratio), good stability and selectivity. The tunable BFO makes possible c.w. and SSB as well as AM reception.

On the transmitting side, a 6CX8 functions as oscillator-doubler, driving the 2E26 final. The audio section is common to both receiver and transmitter, serving as a modulator on transmit. Although modulation was down somewhat, good signal reports were received during on-the-air tests, with transmitter input running at the rated 15 watts. Price, $139.98. *(Olson Electronics, Inc.,* 260 S. Forge St., Akron, Ohio)





VHF GRID-DIP METER



Going to build some gear for working the VHF bands? VHF project construction can be a real pleasure if you build this gadget first —cost is under $10 with all-new parts, and it's a one-evening job

By E. H. MARRINER, W6BLZ

MOST OF US would like to build equipment for the VHF part of the spectrum, such as the "VHF ADVENTURER," (October, November and December issues) but find ourselves blocked by lack of a suitable instrument for adjusting tuned circuits to the desired frequency. A good VHF signal generator will do the job, but its cost will cause sharp, shooting pains in the region of the wallet.

The author found a way around this snag with a transistor version of the familiar "grid-dip" oscillator, which, though grid-less, works on the same basic principle.

About the Circuit. The VHF Grid-Dip Meter is a simple, self-excited oscillator, with a diode and microammeter so connected as to give a reading proportional to the emitter-to-base r.f. current. When the tuned collector tank circuit consisting of *L1* and *C1* is coupled to an external tuned circuit that is resonant at the frequency of oscillation, there is a sharp dip in the meter indication, similar

to the dip in grid current of the tube version.

Construction. The VHF Grid-Dip Meter is assembled in an aluminum utility box with all parts mounted on the flanged half. This provides complete enclosure and shielding when the box halves are mated, but also permits easy access when a battery change is needed (which isn't often, incidentally).

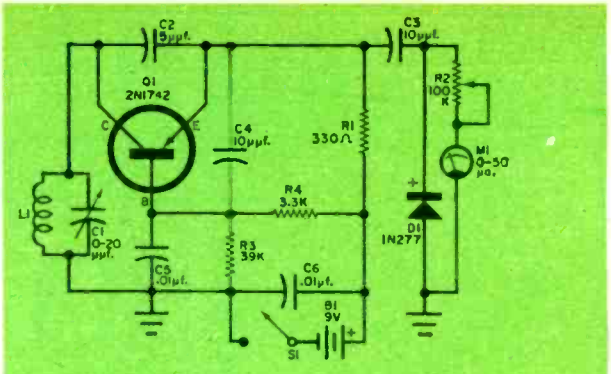
As in all VHF devices, placement of parts and length of leads is important. Take particular pains to center the hole for tuning capacitor *C1* ¾" from the end of the box, measured on the outside. Take equal care to center the coil socket in the end of the box ⅝" back from the front panel surface (outside measure). If you use the specified part for *C1*, and make the coil as described below, calibration of your unit will closely follow that shown on the dial of the author's unit.

Mount the coil socket, tuning capacitor *C1*, switch *S1*, potentiometer *R2*, and meter *M1* first, since lugs on these parts support many of the other parts.

Note that *S1* is held in place by an internally threaded insulated terminal and a binding head machine screw at each end. Wire the small parts according to the pictorial diagram. Be sure to use a heat sink *every* time you heat a transistor lead, either by soldering to it or its supporting lug; a small wad of wet facial tissue gripped around the lead with a small alligator clip is good.

Note that capacitor *C6* is not shown in the pictorial. In practice, the capacity to ground through the ceramic standoff supporting the junction of *R1* and *R4* at one end of *S1* was enough for proper operation in the author's unit. If you use a different insulated terminal, better play safe by using *C6*, as shown in the schematic. It may be wired from the hot end of the standoff terminal to the ground lug.

The sawed-off base of an FT-243 crystal holder serves as the base for *L1*, the tuning "coil," which is actually a loop of #16 solid copper wire. Make the loop ½" wide, with parallel sides, and trim the length to just 2" long from the end of the base pins to the end of the loop. Cover the exposed portion with sleeving of Teflon or polyethylene before soldering to the base pins.

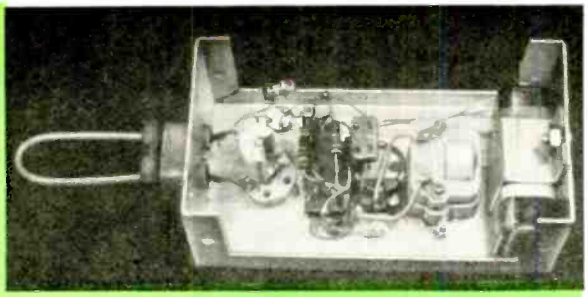


PARTS LIST

B1—9-volt transistor battery (RCA VS 323 or equivalent)
C1—4- to 20-μμf. variable capacitor (E. F. Johnson Type 20M11)
C2—5-μμf. NPO tubular ceramic capacitor
C3—10-μμf. silver mica capacitor
C4—10-μμf. NPO tubular ceramic capacitor
C5, C6—0.01-μf. disc ceramic capacitor
D1—1N277 VHF semiconductor diode
L1—VHF tuning inductor—see text
M1—TM-12 50-μa. tuning meter (Lafayette Radio Electronics, 111 Jericho Turnpike, Syosset, L.I., N.Y.)
Q1—2N1742 VHF transistor
R1—330-ohm, ½-watt carbon resistor
R2—50,000-ohm, linear-taper miniature potentiometer
R3—39,000-ohm, ½-watt carbon resistor
R4—3300-ohm, ½-watt carbon resistor
S1—S.p.s.t. slide switch (Lafayette SW-14 or equivalent)
1—4" x 2¼" x 2¼" aluminum utility box (LMB J-875 or equivalent)
Misc.—#16 solid copper wire (for L1), hookup wire, ceramic standoffs—see text, etc.

Adjustment. Plug in the coil and set switch *S1* to the "on" position. The meter should read up-scale at once, and the amount of the deflection should be controllable with potentiometer *R2*. If it does not, check for a wiring error, or defective transistor or diode.

Calibration near the low end of the range can be checked against an FM receiver. Tune in an FM station on a channel above 100 mc., hold the grid-dip unit loop close and parallel to one wire of the twin-lead at the FM receiver antenna posts, and tune the dipper slowly through its range. Near full engagement of capacitor *C1*, the output of the meter will be heard interfering with the FM station tuned in. Tune the meter exactly to the FM station signal, and mark the dial with the corresponding frequency. Do the same for other stations of known



Use of inexpensive but sensitive uncalibrated tuning meter as indicator helps keep cost down.

Values of C2 and C4 are critical for proper operation at VHF frequencies. Use heat sink when soldering D1 and Q1 leads for safety. Low-loss crystal socket serves as socket for L1. Physical layout of tuned circuit affects frequency band covered, should be followed closely

frequency that your receiver covers. Bear in mind that if your dipper tunes to an FM station on, say, 100.9 mc. with *C1* almost fully meshed, it can't be far from 150 mc. with *C1* fully unmeshed, if you have followed the construction data. If you are a 2-meter ham (or have a pal who is), check the dipper against the receiver calibration, and so on.

Operation. Once calibrated, your VHF Grid-Dip Meter serves both as a signal source and means for determining the resonant frequency of tuned circuits in its range. Want to trap out a local FM station on 106.9 mc. so you can receive that distant station on 107.3 mc.? A trap series-resonant at 106.9 mc. across the receiver input will do the job. A short length of small coil stock of the "Airdux" kind and a low-value trimmer capacitor (15- to 20-$\mu\mu$f. max.) will do.

Connect the coil and trimmer directly (no extra leads) in parallel with each other. Couple the loop of the dipper to the trap circuit by holding it near the end of the coil, and watch the meter while tuning the dipper slowly through its range. At the resonant frequency of the trap, the meter will show a sharp dip. Be sure to adjust *R2* as needed to keep the meter indicating nearly full scale, so the dip will show clearly.

When the dip is found, reduce the coupling between the dipper loop and the trap circuit, and carefully find the center of the dip; read the resonant frequency of the trap from the dipper

(*Continued on page* 105)

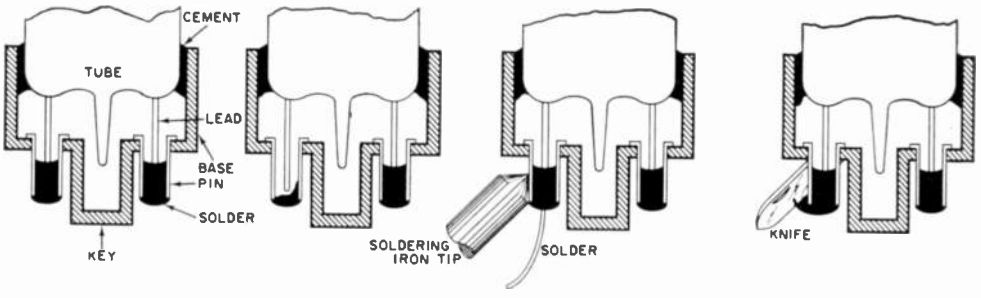
Octal Tube Pin Repairs

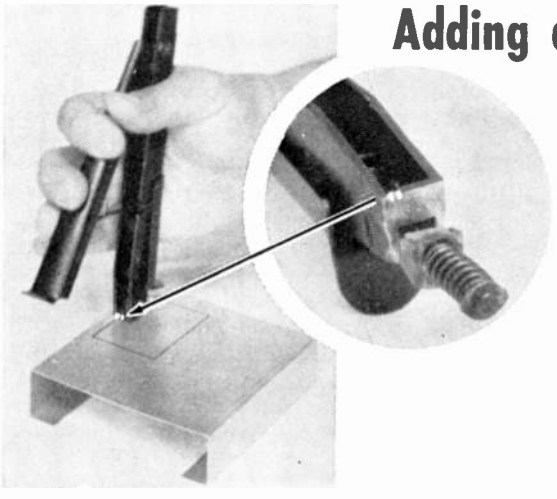
NEW LIFE FOR BAD TUBES? Surprisingly enough, there are a number of electrical and mechanical tube defects that can be easily fixed. Tubes with separate bases (including cathode-ray types) are made as shown in the first drawing below. Suppose a separate-base type tube stops working. Before you rush out and buy a new one, try this: As indicated in the drawings, reheat each pin and add a little solder; scrape excess flux off each pin with a knife. This remedy will cure tube manufacturing defects, corrosion within tube pins, and loosening of leads within pins due to the base being loose and subject to movement.

If the tube base is very loose, it will pay to unsolder the remaining pin connections and remove it. Extend tube leads with wire, and insulate the extended leads with sleeving. Thread the wires through the correct pins and resolder. Then glue the tube base in place with epoxy cement or with a special tube base cement available through suppliers. A good many expensive TV picture tubes, seemingly dead, can be successfully repaired using these simple techniques.

A broken key, another common problem, is easy to fix with an application of epoxy resin, Bakelite cement, or other adhesive. And finally, if the grid or plate cap on the top of a tube becomes detached, heat the cap to remove excess solder, fit the wire lead through the hole in the cap, resolder, and cement the cap back in place.

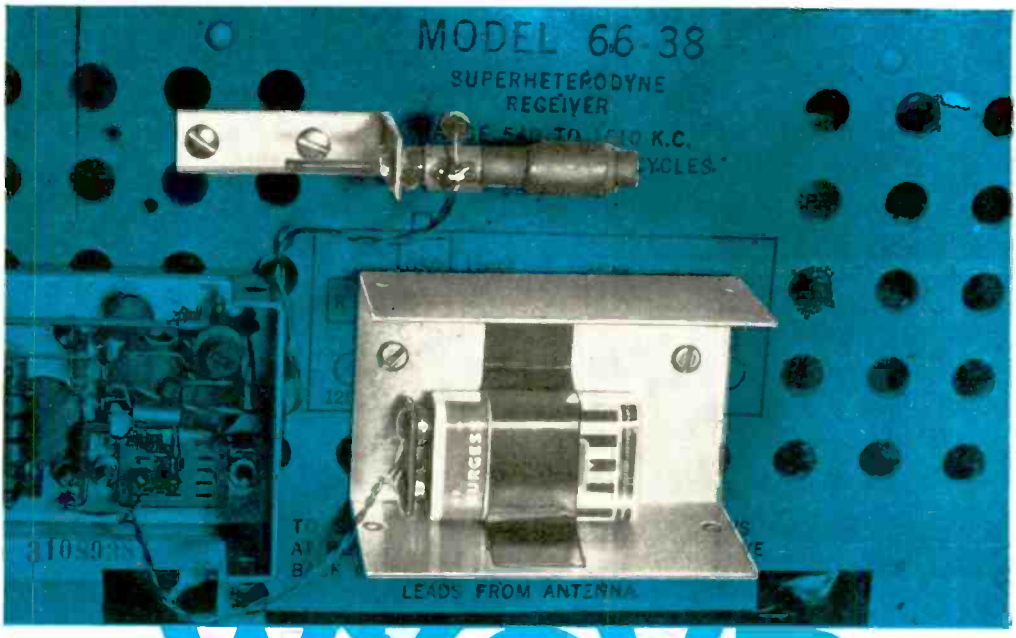
Try fixing those tubes before you toss them out! —*E. G. Louis*





Adding an Index Mark To The Adel Nibbling Tool

IF YOU own one of these nibbling tools and use it to cut chassis holes where there isn't enough room for normal operation, you'll find it helpful to mark an index pointer on the die part of the tool. Use a file to cut the index pointer in a direct line with one edge of the punch channel, and fill it with white paint on each side. Then, when you operate the tool as shown in the photo, you'll know exactly where the punch part of the nibbling device is cutting under the chassis.—*Charles Green*



THE WXCVR

If weather is important to you in your work or leisure, get the best information Uncle Sam can provide by tuning in the airline forecasts. The WXCVR lets you do it the easy way.

By **HARTLAND B. SMITH,** W8VVD

TIRED of being rained out at ball games, drowned out at picnics, and snowed in on trips? Thanks to the Federal Aviation Authority's continuously repeated weathercasts, you can now usually avoid disappointing and inconvenient happenings of this kind.

Twenty-four hours a day, seven days a week, the stations listed in the accompanying table transmit up-to-the-minute taped forecasts, and report the current temperature, humidity, barometric pressure, wind velocity and direction for major cities within a radius of several hundred miles. A few moments of eavesdropping on these transmissions will not only inform you of what to expect, locally, within the next twelve hours, but will also give you an excellent idea of the state of the weather in surrounding areas and neighboring states. Armed with this data, you'll be able to do a better job of planning both recreational and business activities.

These aeronautical weathercasts are transmitted in the low-frequency aviation band between 200 and 400 kc., and therefore cannot be picked up by ordinary broadcast-band or short-wave receivers. However, the WXCVR (radioese for "weather-receiver") described here provides an inexpensive answer to this reception problem. It converts low-frequency weather signals to an unused channel near the middle of the broadcast band for easy detection by any home or portable radio. Costing less than $7, the device can be assembled in a single eve-

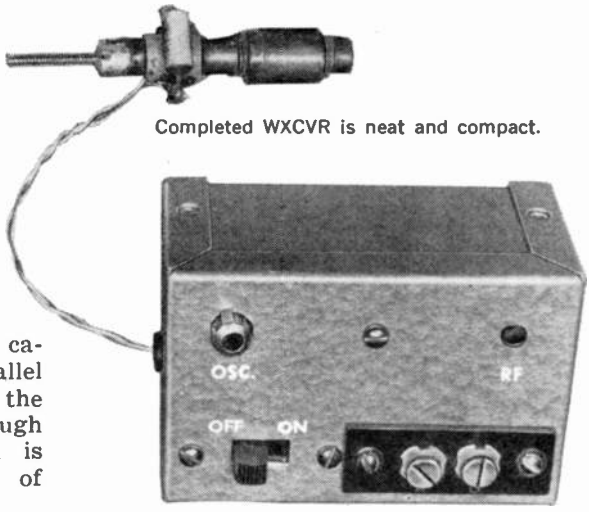
ning and will receive FAA stations as far as 250 miles away.

How It Works. As an example, suppose you want to hear the Denver forecast transmitted on 379 kc. Radio energy at this frequency intercepted by the antenna causes r.f. current to flow through coil *L1* and the primary of transformer *T1*. Inductive coupling between the transformer windings induces a signal in the secondary of *T1* which, together with the combined capacities of *C1* and *C2*, forms a parallel circuit resonant at 379 kc. From the tap on *T1*, the signal flows through the feedback winding of *L2* and is then applied, via *C1*, to the base of transistor *Q1*.

When switch *S1* is closed, *Q1* operates as an oscillating detector, due to positive feedback through oscillator coil *L2*. The exact frequency of oscillation is determined by the capacity of *C4* and the setting of *L2*'s variable slug. In this case, oscillation at 1529 kc. is desired.

The 379-kc. and 1529-kc. signals present at *Q1*'s base are mixed in the transistor to produce additional signals at the sum of the two frequencies, 1908 kc., and the difference frequency, 1150 kc. Loopstick *L3* and capacitor *C3* are resonated at 1150 kc. Direct connection between converter and broadcast receiver is normally unnecessary, since the strong 1150-kc. field surrounding *L3* can be readily picked up by the receiver's loop antenna.

The high impedance of *L1* to frequencies above 1 mc. minimizes such unwanted signals before they reach the base of *Q1*, where they might cause interference to a desired weathercast.



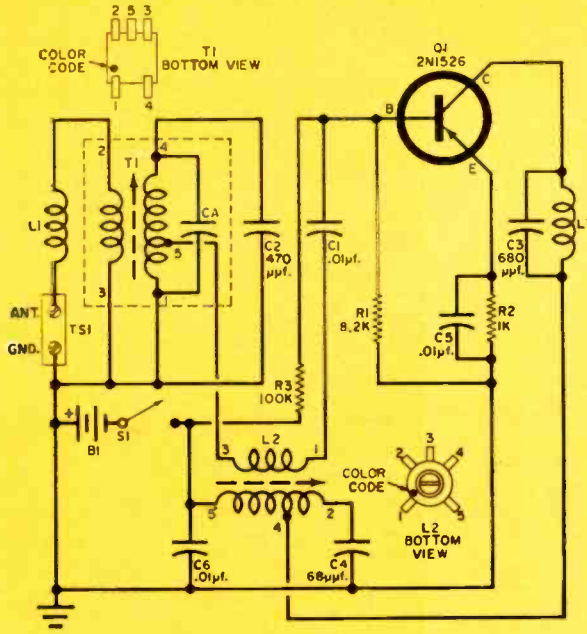
Completed WXCVR is neat and compact.

Construction. All parts, with the exception of *C3*, *L3* and *B1* are housed inside the cover of a 3¼" x 2⅛" x 1⅝" Minibox. Miniature components and a simple circuit result in plenty of working space inside the box, despite the small size. Parts layout is not critical although it is best to follow, in a general way, the arrangement shown.

Most capacitor and resistor leads go either to the coil and switch terminals, or to ground lugs. A three-terminal miniature insulated tie strip mounted near the center of the cover supports *Q1* and its associated components. When

FAA AUTOMATIC RADIO WEATHER BROADCASTS

Locality	Kc.	Locality	Kc.	Locality	Kc.	Locality	Kc.
Albuquerque, N. M.	230	Duluth, Minn.	379	Millinocket, Me.	344	Redmond, Ore.	368
Amarillo, Tex	251	Elmira, N. Y.	375	Milwaukee, Wis.	242	Roanoke, Va.	371
Atlanta, Ga.	266	El Paso, Tex.	242	Minneapolis, Minn.	266	Rock Springs, Wyo.	290
Big Spring, Tex.	326	Elko, Nev.	391	Missoula, Mont.	308	St. Louis, Mo.	338
Billings, Mont.	400	Ft. Worth, Tex.	365	Newark, N. J.	379	San Antonio, Tex.	254
Birmingham, Ala.	224	Fresno, Calif.	344	New Orleans, La.	338	S. Ste. Marie, Mich.	400
Blythe, Calif.	251	Garden City, Kans.	257	North Platte, Nebr.	224	Seattle, Wash.	260
Boise, Idaho	359	Great Falls, Mont.	371	Oakland, Calif.	362	Spartanburg, S. C.	248
Boston, Mass.	382	Houghton, Mich.	227	Oklahoma City, Okla.	350	Spokane, Wash.	365
Bozeman, Mont.	329	Houston, Tex.	332	Ogden, Utah	263	Tampa, Fla.	388
Burlington, Vt.	323	Idaho Falls, Idaho	350	Omaha, Nebr.	320	Texarkana, Ark.	329
Casper, Wyo.	269	Indianapolis, Ind.	266	Pendleton, Ore.	341	Tonopah, Nev.	221
Charleston, S. C.	329	Jacksonville, Fla.	344	Pensacola, Fla.	326	Traverse City, Mich.	365
Chicago, Ill.	350	Kansas City, Mo.	359	Pittsburgh, Pa.	254	Trinidad, Colo.	329
Cincinnati, Ohio	335	Knoxville, Tenn.	257	Portland, Ore.	332	Tucson, Ariz.	338
Cleveland, Ohio	344	Las Vegas, Nev.	206	Raleigh, N. C.	350	Tulsa, Okla.	245
Delta, Utah	212	Los Angeles, Calif.	332	Rapid City, S. D.	254	Washington, D. C.	332
Denver, Colo.	379	Miami, Fla.	365	Red Bluff, Calif.	338	Wichita, Kans.	332
Detroit, Mich.	388	Miles City, Mont.	320			Winslow, Ariz.	266



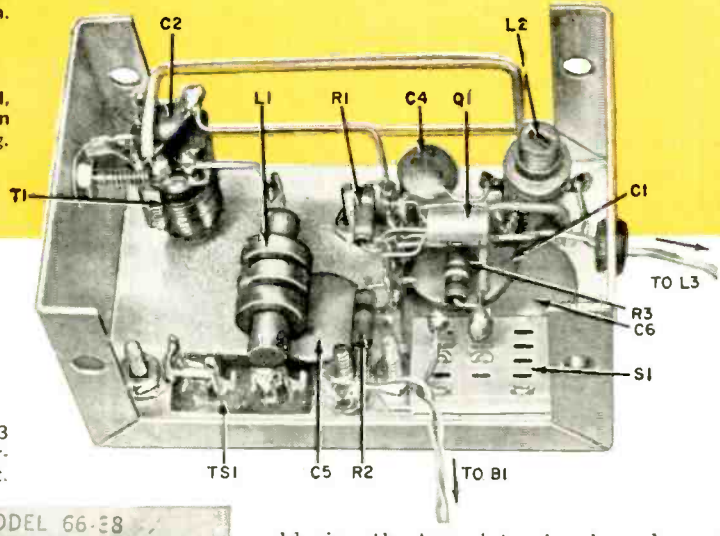
One-transistor converter circuit of WXCVR is simple and easy to get into operation.

PARTS LIST

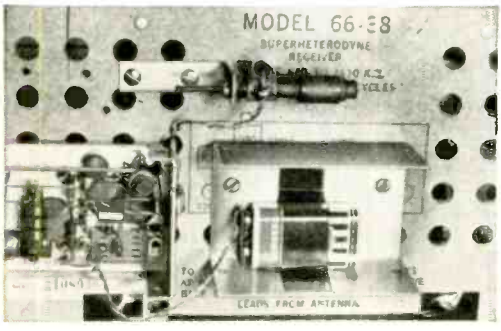
B1—9-volt transistor battery
C1, C5, C6—0.01-μf. ceramic disc capacitor
C2—470-μf. ceramic capacitor
C3—680-μμf. ceramic capacitor
C4—66-μμf. ceramic capacitor
L1—1-mh. r.f. choke (National R-50 or equivalent)
L2—455-kc. transistor oscillator coil (Miller 2020)
L3—Superex Vari-Loopstick (or Meissner 14-9015 coil)
Q1—2N1526 transistor
R1—8200 ohms
R2—1000 ohms
R3—100,000 ohms
All resistors ½-watt, 10% carbon
S1—S.p.s.t. slide switch
T1—455-kc. transistor input i.f. transformer (Miller 2041)*
TS1—Antenna-ground terminal strip
1—3¼" x 2⅛" x 1⅝" aluminum box (Bud CU-2101-A or equivalent)
Misc.—3-terminal miniature tie strip, battery connector, 4-36 machine screws and nuts, wire, solder, etc.

**Capacitor CA shown on the schematic diagram inside the shield can of T1 is part of the manufactured T1 assembly*

Parts placement is uncritical, but layout shown leaves room for easy assembly and wiring.



Find optimum position for L3 before mounting WXCVR permanently on back of BC set.

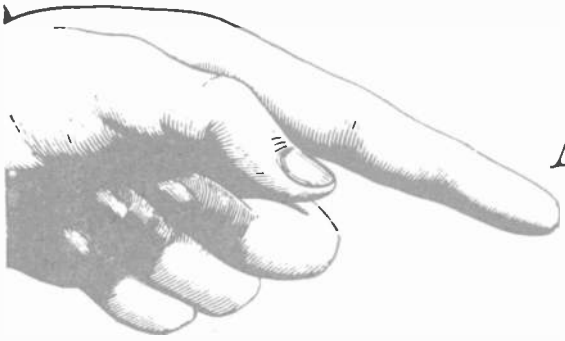


soldering the transistor in place, be sure to use a heat sink between the iron and the transistor body. A copper alligator clip or long-nosed pliers will do the job.

Carefully remove and discard the square aluminum can surrounding *T1*. Position the transformer as shown. Make certain that the slot in its tuning slug is directly behind the 3/16" "RF" tuning hole. Solder terminal 3 to a

(*Continued on page* 107)

HOW TO IDENTIFY SURPLUS GEAR



AN/ARC-3?
SCR/274-N?
R4/274-2?
TBX?
APS-13?

By KEN GREENBERG

MOST ELECTRONICS experimenters and hams recognize the letter-number nomenclatures that refer to common pieces of military surplus equipment, but how many know what these designations mean? Actually, the designations —although complicated and confusing— can usually tell you a great deal about what the equipment is and how it was originally used, so the various systems of nomenclature are well worth knowing.

Army Signal Corps System. Much surplus equipment available today is identified by the old U. S. Army Signal Corps system which has been discontinued. The small chart on this page gives some of the most common prefix letters used and their meanings.

One trouble with this system was that there was no way of knowing from equipment designations which pieces of gear belonged to a complete setup. For example, the nomenclature doesn't tell you that the BC-624 is the receiver in the SCR-522, or that the BC-625 is the transmitter in the same installation.

Navy Model System. Although this marking system is no longer used with newly-procured equipment, there is still much Navy surplus around that carries

Signal Corps System (Discontinued)

AN—Antenna
BC—Basic component
DM—Dynamotor
FT—Mount, rack or adapter
PL—Plug
RA—Rectifier power supply
SCR—Set, complete radio
TS—Test set
VT—Vacuum tube

Navy Model System

A—Airborne installation
B—IFF
CX—Commercial experimental
D—Radio direction finding
E—Emergency power
FS—Frequency shift keying
G—Aircraft transmitting (superseded by "A")
J—Sonar listening (receiving)
K—Sonar transmitting
L—Precision calibrating
M—Combined radio transmitting and receiving
MARK—Fire control radar
N—Sonar navigational aid (echo sounding)
O—Operator training and measuring
P—Automatic transmitting and receiving
Q—Sonar ranging
R—Radio receiving
S—Search radar
T—Radio transmitting
U—Remote control (automatic keyer)
V—Radar repeater
W—Combined sonar ranging and sounding
X—Experimental
Y—Navigational and landing aid
Z—Navigational and landing aid (superseded by "Y")
QA—Quartz steel*
QB—Rochelle salt*
QC—Magnetostriction*
QD—Depth determining*
QG—Magnetostriction (split-lobe)*

*In sonar equipment, these designations follow the first letter which indicates the general use of the equipment. The "Q" designations refer to the type of projector used.

Joint Nomenclature ("AN") System

Installation

A—Airborne (installed and operated in aircraft)
B—Underwater mobile (submarine)
C—Air transportable
D—Pilotless carrier
F—Ground, fixed
G—Ground, general ground use
K—Amphibious
M—Ground mobile
P—Ground pack or portable (man or horse)
S—Water surface craft
T—Ground transportable
V—Ground vehicular (tanks, jeeps, etc.)
U—General utility (airborne, shipboard, and ground)
W—Underwater, fixed

Type of Equipment

A—Invisible light, heat radiation
B—Pigeon
C—Carrier (wire)
F—Photographic
G—Telegraph or teletype (wire)
I—Interphone and public address
K—Telemetering
M—Meteorological
N—Sound in air
P—Radar
Q—Underwater sound
R—Radio
S—Special type (magnetic, etc.)
T—Telephone (wire)
V—Visual and visible light
X—Facsimile or television

Purpose

A—Auxiliary assembly (not complete set)
B—Bombing
C—Communication (receiving and transmitting)
D—Direction finder
G—Gun directing
H—Recording (sound, photographic, etc.)
J—Countermeasure (receiving and transmitting)
L—Searchlight control
M—Maintenance and test assembly (includes tools)
N—Navigational aid (altimeter, beacon, compass, instrument landing, and depth sounding)
P—Reproducing (sound and photographic)
Q—Special or combination of types
R—Receiving or listening
S—Detecting and/or range and bearing
T—Transmitting
W—Remote control
X—Identification and recognition

"AN" System Component Indicator Letters

AB—Support, antenna
AM—Amplifier
AS—Antenna assembly
AT—Antenna
BA—Battery, primary type
BB—Battery, secondary type
BZ—Signal device, audible
C—Control article
CA—Commutator assembly, sonar
CB—Capacitor bank
CG—Cable and transmission line, r.f.
CK—Crystal kit
CM—Comparator
CN—Compensator
CP—Computer
CR—Crystal
CU—Coupling device
CV—Converter (electronic)
CW—Cover
CX—Cord
CY—Case
DA—Antenna, dummy
DT—Detecting head
DY—Dynamotor
E—Hoist assembly
F—Filter
FN—Furniture
FR—Frequency measuring device
G—Generator
GO—Goniometer
GP—Ground rod
H—Head, hand, and chest set
HC—Crystal holder
HD—Air conditioning apparatus
ID—Indicating device
IL—Insulator
IM—Intensity measuring device
IP—Indicator, cathode-ray tube
J—Junction device
KY—Keying device
LC—Tool, line construction
LS—Loudspeaker
M—Microphone
MD—Modulator
ME—Meter, portable
MK—Maintenance kit or equipment
ML—Meteorological device
MT—Mounting
MX—Miscellaneous
O—Oscillator
OA—Operating assembly
OS—Oscilloscope, test
PD—Prime driver
PF—Fitting, pole
PG—Pigeon article
PH—Photographic article
PP—Power supply
PT—Plotting equipment
PU—Power equipment
R—Radio and radar receiver
RD—Recorder and reproducer
RE—Relay assembly
RF—Radio frequency component
RG—Cable and transmission line, bulk r.f.
RL—Reel assembly
RP—Rope and twine
RR—Reflector
RT—Receiver and transmitter
S—Shelter
SA—Switching device
SB—Switchboard
SG—Generator, signal
SM—Simulator
SN—Synchronizer
ST—Strap
T—Radio and radar transmitter
TA—Telephone apparatus
TD—Timing device
TF—Transformer
TG—Positioning device
TH—Telegraph apparatus
TK—Tool kit or equipment
TL—Tool
TN—Tuning unit
TS—Test equipment
TT—Teletypewriter and facsimile apparatus
TV—Tester, tube
U—Connector, audio and power
UG—Connector, r.f.
V—Vehicle
VS—Signaling equipment, visual
WD—Cable, two-conductor
WF—Cable, two-conductor
WM—Cable, multiple-conductor
WS—Cable, single-conductor
WT—Cable, three-conductor
ZM—Impedance measuring device

the Navy Model system nomenclature. The assignment of letters under this system depended on the primary function of the equipment, the first letter indicating its basic purpose. (One exception is the prefix "MARK" which applies to Bureau of Ordinance equipment.) The large chart on page 66 gives the meanings of these first letters.

The second (and third) letters in these naval designations simply indicate the order in which the designations were assigned (with the exception of "X" which means "experimental"). "TA," for example, would indicate the first transmitting equipment assigned, "TB" the next, and so on. Triple letters (e.g., TAA) are used when the alphabet is exhausted.

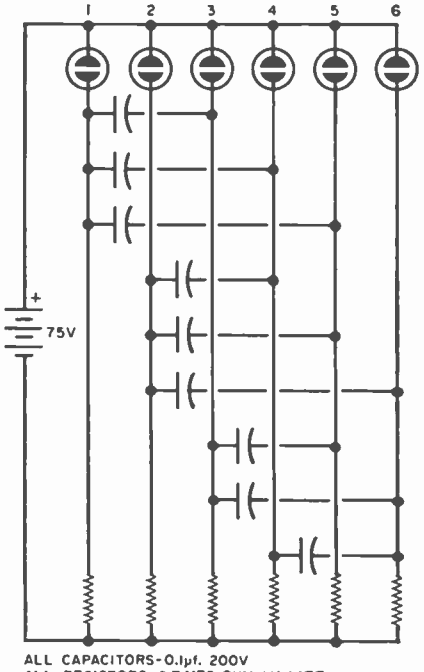
The "AN" System. Today, all services are using the Joint Nomenclature ("AN") system. Complete systems are designated by three equipment indicator letters that follow "AN/", and signify kind of installation, type of equipment, and its purpose (see chart at top of page 67).

As an example, the AN/ARC-3 can be identified as follows: "A" indicates an aircraft installation, "R" means that it's radio equipment, "C" shows that it is used for communication, and the number "3" tells you this was the third piece of equipment designated with the series of letters "ARC."

Incidentally, the "AN" indicators do not mean that the Army, Navy and Air Force all use the same equipment, but simply that the nomenclature was assigned using the "AN" system.

Component Indicators. Independent units that are not part of, or used with, specific sets, have a nomenclature that consists of a component indicator letter (see chart at bottom of page 67), a number, a slant (/), and whatever equipment indicator letters from the top chart on page 67 apply. For example, R65/APN-9 refers to a radar receiver used as airborne radar navigational equipment; this particular unit happens to be a LORAN receiver/indicator.

The next time you see some surplus equipment advertised only by the military designation, check the information presented here. Who knows? It may save you from buying a useless piece of junk, or may put you on the trail of a silk purse disguised as a sow's ear! -30-



ALL CAPACITORS-0.1μf. 200V
ALL RESISTORS-2.7 MEG OHM, 1/4 WATT
NEON LAMPS-NE-2

Do-Nothing Box

A "Nonsense Box" (see July, 1963, P.E.) with lights that flash in sequence rather than randomly, the "Do-Nothing Box" is wired as shown at left. The gadget can be built into any housing large enough to hold the six NE-2 neon bulbs, nine 0.1-μf. capacitors, six 2.7-megohm resistors, and a battery.

The circuit draws approximately 60 μa., and can be powered with discarded B-batteries from portable radios, hearing aids, etc. The battery should have a no-load output of 65 to 90 volts; 75 volts is optimum.

Place the neon bulbs in a circle, a straight line, or any desired configuration (the author's unit has them in a circle). Wiring is noncritical, but battery polarity will, of course, affect the direction of the firing sequence of the bulbs. The sequence can also be reversed by opening and closing the battery circuit. The author's Do-Nothing Box has been in continuous operation for more than five years! —*Carl W. Campbell*

Transistor Topics

By **LOU GARNER,** Semiconductor Editor

UNLESS our calendar is wrong, it is once again time for yours truly to don the robe and turban of the traditional soothsayer and dust off the old crystal ball. But before we climb out on a limb with predictions for 1964, let's review our score for last year. In January, 1963, we predicted:

● Increased use of field-effect transistors—*double*—some manufacturers are using these devices in greater quantities, and articles on them have appeared not only in the engineering journals, but even in advanced hobbyist and technician-level magazines.

● Introduction of fully transistorized FM-stereo tuner-amplifier combination units—*home run*—several well-known manufacturers offered such units in 1963, a natural consequence of the increasing interest in integrated hi-fi systems.

● Tunnel diodes selling for less than one dollar—*strike-out*—we were somewhat optimistic on this one, expecting a much greater use of tunnel diodes on the part of manufacturers with a resulting increase in production and over-all drop in cost.

● Production of a transistorized ultraviolet flashlight—*home run*—introduced by an Alexandria (Va.) firm, these instruments are now available to police and other investigative agencies.

● Development of a completely new semiconductor device—*home run*—a number of such devices were developed, including the interesting "camel diode" with the negative-resistance characteristics of a tunnel diode but with a double rather than single "hump."

● An upswing in the use of integrated and modular circuits—*home run*—compact transistorized receivers suitable for use as pendants or dress pins were hot sellers in 1963, while hearing aids were assembled in a variety of jewelry-type cases.

● Introduction of a variety of solid-state automobile accessories—*home run*—several such items were introduced, and their use has climbed steadily, as we anticipated. Public interest is also very high as witness the overwhelming response to P.E.'s construction articles on transistorized ignition.

● New semiconductor-operated appliances and controls for the home—*double*—we scored on this prediction, but not to the degree anticipated.

● Introduction of a transistorized intrusion alarm system utilizing an entirely new principle—*home run*—the Kalmus Electronic Sentry, developed by an Arlington (Va.) firm, depends on a change in the dielectric characteristics of the protected area to detect an intruder or burglar.

Total score: one strike-out, two doubles, and seven home runs in ten times at bat!

Things to Come. In 1964, watch for . . . *the development of a transistorized anti-collision radar system for passenger cars* . . . production of two new transistorized TV sets by major firms . . . *development of a transistorized color TV receiver* . . . introduction of special "experimenter" components and kits by several major manufacturers, following GE's lead . . . *commercial production of moderate-priced solid-state lasers* . . . use of integrated microminiature circuits in consumer products . . . *development of a semiconductor air-conditioner for automobiles* . . . a tunnel diode for under $1 (we're still trying!) . . . and *introduction of a semiconductor phono cartridge.*

Readers' Circuits. This month we are featuring a pair of circuits which should be of special interest to hams and SWL's. One is the ever-popular code practice oscillator (CPO), a "first" project for many beginners. The other is a necessary part of all true communications receivers but is often omitted from popular short-wave sets: the beat-frequency oscillator (BFO).

Submitted by reader William Halleron (2901 Cleveland Blvd., Louisville 6, Ky.) as his second contribution to this column, the *CPO circuit* illustrated in Fig. 1 requires relatively few components, yet should be capable of fine performance when used with a suitable PM loudspeaker or low-impedance headphones.

A *pnp* transistor, *Q1*, is used in the common-emitter configuration as a modified

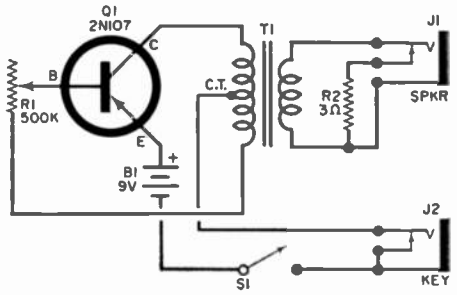


Fig. 1. In reader William Halleron's CPO circuit, a pnp transistor is used in the common-emitter arrangement as a modified Hartley-type oscillator.

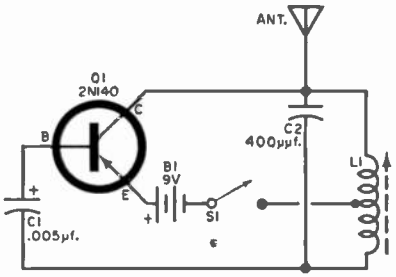


Fig. 2. Bob Snyder's BFO is intended for use with short-wave receivers having an i.f. of 455 kc. Here the transistor is an r.f. mixer-oscillator type.

Hartley-type oscillator. Transformer *T1* serves both to provide the necessary feedback and as an impedance-matching device for the output load—resistor *R2* or the voice coil of a small PM loudspeaker. Transistor *Q1*'s base bias and feedback are controlled simultaneously by potentiometer *R1*, permitting an optimum adjustment for best tone quality. Circuit operating power is supplied by *B1*, controlled by *S1* and a standard hand key, plugged into closed-circuit jack *J2*.

Standard components are used throughout. Transistor *Q1* is a 2N107, but almost any general-purpose *pnp* transistor should give acceptable performance. Potentiometer *R1* is ~ 500,000-ohm volume control type, while *R2* is a small ½- or 1-watt, 3- to 10-ohm resistor (*R2*'s value is not critical). Jacks *J1* and *J2* are the familiar closed-circuit phone jacks. Transformer *T1* is a standard transistor output type with a 500-ohm center-tapped primary and a 3-4 ohm secondary, such as the Argonne AR-119. Switch *S1* is a s.p.s.t. toggle, slide, or rotary switch. Battery *B1* may be either a 9-volt transistor battery, such as a Burgess 2N6 or 2U6, or can be assembled by connecting six penlight cells in series.

Actual construction should be simple, for neither layout nor lead dress is critical. The project may be assembled on a small chassis, in a Minibox or plastic case, or, if preferred, breadboarded on a piece of perforated Masonite.

Circuit wiring should be double-checked for errors before the power supply battery is connected, with *R1* turned to its maximum resistance position. In operation, a 3-4 ohm PM loudspeaker is connected to *J1* and a standard handkey to *J2*. The unit is switched "on," and, with the key closed, *R1* is adjusted for the most acceptable tone. If preferred, low- to medium-impedance phones may be plugged into *J1* in place of a loudspeaker.

Reader Bob Snyder, KN7YDM (6317 Nyanza Park Drive, Tacoma 99, Wash.), submitted the *BFO circuit* shown in Fig. 2. He designed it for use with short-wave receivers lacking such a circuit and having an i.f. of 455 kc. The BFO, of course, converts c.w. (code) signals into an audible tone.

Bob's basic circuit is very similar to William's CPO. Except for operating frequency, the only differences between the two circuits are: (a) output to an antenna instead of through a secondary winding; (b) feedback through a small capacitor, *C1*, rather than through a resistor; and (c) reliance on internal leakage for base bias.

Readily available components are used in the BFO. The transistor, *Q1*, is a r.f. mixer-oscillator type, such as the 2N140 or 2N411. Capacitor *C1* is a 0.005-μf. disc ceramic unit and *C2* a 400-μμf. (or pf.) ceramic or mica unit, although the latter can be replaced by an adjustable capacitor if desired. The coil, *L1*, is a tapped 455-kc. loopstick (typically, Allied Radio 64 G 401). Switch *S1* may be any s.p.s.t. switch, while the battery, *B1*, is a small 9-volt transistor type (such as a Burgess 2U6).

Although lead dress and wiring are noncritical, some thought should be given to layout and packaging for ease of installation and best performance. In general, a compact, but not crowded, layout should be used, with the entire circuit assembled in a small shielded box or can. The adjustment of *L1* (and *C1*, if a variable is employed) should be readily accessible.

The completed unit is used with a standard short-wave receiver. The BFO should be mounted at a convenient location within the receiver's cabinet. The "antenna" is a short lead which connects between the

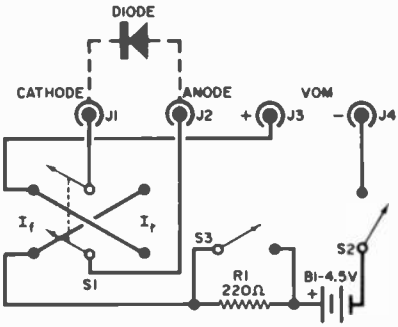


Fig. 3. Operation of Ronald Wilensky's tester for determining the condition of dubious diodes is detailed in Transitips.

Designed specifically for experimenters, International Rectifier's K-546 zener diode kit contains 12 assorted diodes. A photocell kit is also available—see page 101 for details.

BFO and an unused terminal near the receiver's i.f. amplifier.

In operation, the BFO is "preadjusted" by tuning the receiver to an AM broadcast station, which will provide a steady carrier signal. Coil *L1* (or capacitor *C2*) is then adjusted until an audio tone (beat note) is heard in the background. Afterwards, a c.w. (code) station is tuned in and *L1* is readjusted for the most pleasing tone. If difficulty is encountered, it may be necessary to add a fixed base bias; this can be done by connecting a ½-watt resistor across (in parallel with) feedback capacitor *C1*. The bias resistor's value can be determined experimentally, but will probably be something between 100,000 and 500,000 ohms.

Transitips. If you're a typical experimenter, chances are you have an assortment of diodes of dubious value. Many of these probably can be classed as okay for use if checked with a simple diode tester similar to the one used by reader Ronald Wilensky. The circuit he uses is illustrated in Fig. 3.

Ronald's tester includes a power source, *B1*, a limiting resistance, *R1*, a polarity reversing switch, *S1*, a test switch, *S2*, a high-current switch, *S3*, and pairs of test jacks for the diode (*J1*, *J2*) and an external meter (*J3*, *J4*). It is designed to check diodes for *opens*, *shorts* and *leakage* as well as to determine the ratio of forward (I_f) to reverse (I_r) currents.

Low-cost, easy-to-obtain components are used in the instrument. The polarity reversing switch is simply a d.p.d.t. toggle, slide, rotary, or lever switch. The test switch is a s.p.s.t., normally open, push-button unit, although a toggle, rotary or slide switch can be used here in a pinch. High-current switch *S3* is a momentary push-button type for shorting out *R1* when testing power rectifiers. Any of a variety of connectors can be used for the diode and meter terminals, banana jacks, phone tip jacks, or binding posts. The power supply is made up by connecting three penlight cells in series.

You can follow your own inclinations as far as construction is concerned, assembling the unit in a plastic case or metal Minibox, or even "breadboard" fashion, if desired. Neither layout nor lead dress is critical.

The tester's operation is a simple, step-by-step procedure, as follows:

(a) Adjust your VOM to the 100-ma. range (or higher, as appropriate) and connect to terminals *J3* and *J4*. Make sure polarity is correct.

(b) Connect the diode under test to terminals *J1* and *J2*, with proper electrode polarity.

(c) With *S1* set to read forward current (I_f), depress *S2* momentarily and note the meter reading—if more than full-scale or near the low end, switch the VOM to a higher or lower current range as appropriate, then repeat. If a power rectifier diode is being tested, depress *S3* to short out *R1*, making sure the VOM is on a suitable scale.

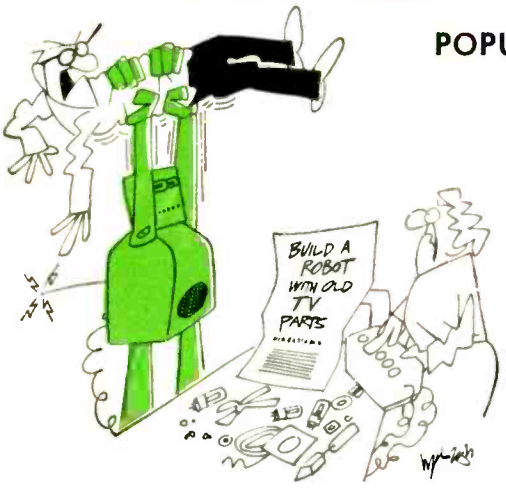
(d) Switch *S1* to read reverse current (I_r) and depress *S2* again, noting the meter reading. If little or no meter deflection is obtained, switch to progressively lower VOM ranges (10 ma., 1 ma., 100 microamperes, etc.) until a readable indication is obtained.

The diode's condition is determined by comparing the readings obtained in steps (c) and (d). If a "zero" current reading is obtained in both steps, the diode is *open*. If identical current readings are obtained in both steps, the diode is *shorted*. If the ratio of forward to reverse current (I_f/I_r) is less than 1000:1, the diode is *leaky*. If the ratio I_f/I_r is greater than 1000:1, the diode is *good*. When determining the I_f/I_r ratio, be

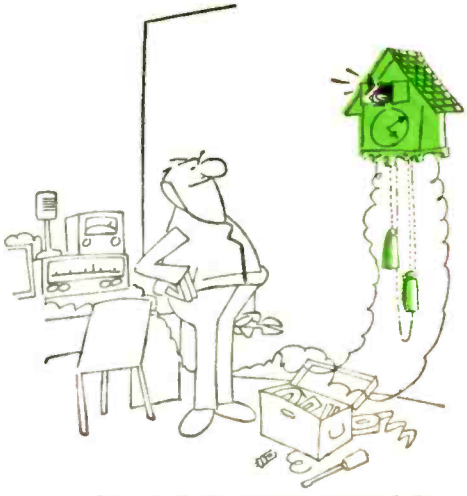
(*Continued on page* 101)

Hobnobbing with Harbaugh

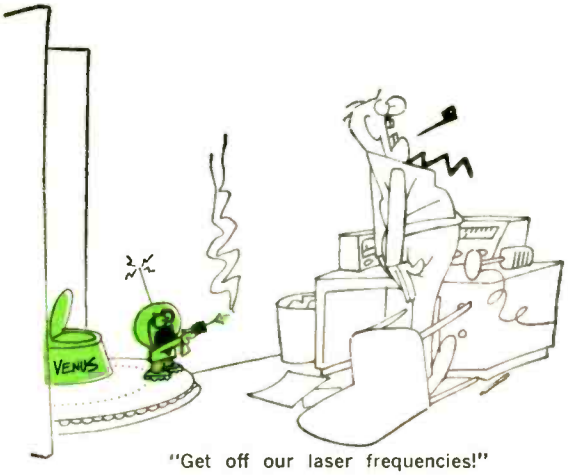
POPULAR ELECTRONICS
—upcoming contents?



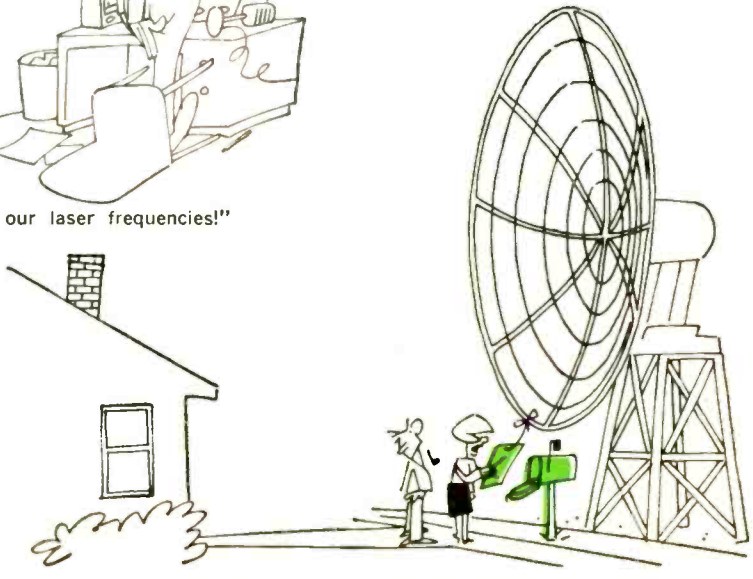
"That's the horizontal hold—I said the off switch!"



"Dahdidahdit, dididah, dahdidahdit, dahdidah, dahdahdah, dahdahdah."



"Get off our laser frequencies!"



"It's from P.E.—you've won another of their nutty contests."

On the Citizens Band

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

LAST YEAR at this time we briefly thumbed through the twelve months past to get some idea of the future standing and growth of the Citizens Band. Although we made no definite predictions, CB continued to take a course expected by those familiar with its growth and development.

In 1963, the FCC continued to be flooded by CB applications at the rate of 10,000 per month. They also—once again—dropped the current license form (FCC Form 505—1962 version) and replaced it with a 1963 revision that became available last October. Further, the agency issued a score of $100 citations in 1963 to be paid by habitual rules violators. And, the Commission initiated an $8 licensing fee (effective January 1, 1964) in connection with all applications for Class B, C or D licenses.

On an area and local basis, CB clubs probably contributed more to public service and emergency activities during 1963 than in any previous year since the Citizens Band was allocated. Eleven meters undoubtedly has more mobile and hand-held equipment available for these activities than other radio services. The year 1963 saw more licensees, better equipment, a consciousness and desire on the part of CB'ers to serve where needed, and the realization by Civil Air Patrol, Civil Defense, police, sheriff and other civic groups of the value of such efforts by CB'ers. Moreover, clubs and teams have been quick to pass on their operational ideas and activities to organizations across the country.

Conclusion? In 1963, many CB projects have lent themselves to increasing the safety of human life—a fact which gives them immeasurable value.

What to Look For in '64. Since this is the time of year for making resolutions, we take this opportunity to toss out a few positive, resolution-type predictions. Here goes!

1. The year 1964 will unite ham and CB operators in programs of public service and emergency communications. Interested CB'ers will be invited into the amateur fold to discuss ways and means by which the two services can aid one another and civic authorities that may need their combined efforts on short notice.

2. Amateur radio associations will be the first to offer help to CB'ers who are interested in procuring an amateur ticket. More classes will be made available to teach fivewatters the theory and code necessary for the license of their choice.

3. A "cooperative" instead of a "competitive" attitude will dawn on members of ham and CB ranks; both will realize the good to be derived from the proper use of either service.

4. More CB clubs will find more effective methods of policing their own areas. More volunteer projects will be incorporated into club activities, including first aid instruction and emergency stand-by teams on call at a moment's notice.

5. Violations will decrease as a new nationwide electronic method of detection puts the clamps on the violation-prone.

Too optimistic? Wouldn't all five predictions (put to use) eliminate most of the present entanglements that bind the Citizens Band and threaten to destroy it?

Have you made your resolutions yet?

Our Favorite "Bird." We finally got a look at our old friend (65 years young), S. Elliott Uhler (3Q0339 and WPE2FUY), the "old buzzard of Rancocas Woods!" Elliott is one of the old-time communications veterans we talked about via this colunm last April. He began his amateur days as "3MA" back in 1912; followed through with radio-operator jobs on freighters, tankers and sea-going tugs; was even a disc jockey on an eastern radio station.

Reflecting on some of his earlier experiences in radio, Elliott gave us a breakdown on what a wireless station consisted of back in the 1900's. In his words, "the more stuff you had on the table, the better you liked it, and believe me, I had a lot!" On the receiving end he had two loose couplers

hooked in series, together with loading coils, fixed capacitors, variable capacitors, "and to be sure," the cat-whisker detectors and Galena crystals.

Elliott claims to have used one of the first Audion detectors: a DeForest RJ9. The unit was mounted on a panel—a tube on top with wires coming out the top and bottom. Flash batteries were soldered in to obtain the proper voltage to the filament and grid circuits.

Elliott's transmitter was a half-kw. ("good old rotary gap"), open-core, Clapp-Eastman. For an antenna, he used two clothes props, glass insulators, and No. 18 stranded wire.

Today Elliott is highly active as an SWL and is "on guard" on the Citizens Band. His present shack contains a Poly "N" CB transceiver, an FM Monitoradio receiver, a Lafayette 30 and a Knight Span Master receiver and two walkie-talkies. It would appear he is just as interested and active in communications today as he was back in the "good old days of 1912!"

Tech Tips. Mr. R. J. Gail, service editor of Champion Spark Plug Company, has brought out some basic tips on how to minimize mobile radio intereference. Whether you already have a zip-dandy supression kit installed on your auto, or if you're one who's wondering where all the popping comes from in your receiver and why mom can't seem to get through to you at half-a-mile, it will pay you to consider the following.

To greatly reduce the amount of ignition interference being transmitted to the car's entire wiring system, a coaxial 0.1-μf. capacitor should be installed as close to the ignition coil's primary terminal as possible. (Do not use a conventional bypass capacitor, but a filter type, feed-through coaxial design.)

Removing the ignition coil and its mounting bracket and cleaning the paint off the bracket and engine block is another measure that will greatly reduce the amount of interference radiated from the ignition system. In the same vein, always connect the receiver or transmitter directly to the battery. Tapping into the accessory switch can result in feedback and intercoupling, with resultant interference between the car's electrical system and the radio circuit. Always establish a clean radio ground at the vehicle frame, and be sure to ground the battery to the frame. Engine ground is not enough!

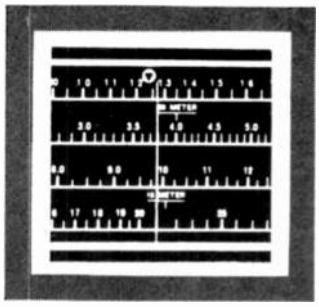
The last tip is to bond for best results. Bonding provides an easy route for radio interference currents to reach ground. This is of prime importance in two-way radio to keep interference signals generated by the ignition and charging systems from traveling throughout the vehicle. You can route troublesome interference to a common ground by either direct bonding or strap bonding. With either method, simply cleaning the surface is inadequate. Tooth-type lock washers must be used to cut into the surface layers of the metal. Bonding straps should be shock-mounted and as short as possible.

Some pretty good tips for we of the 5-watt league! As we've mentioned in the past—when you're working with "flea power"—an ounce of prevention may be worth an extra mile and a half!

Club Chatter. Jack Leach, KHG1227, publicity chairman of the South-Lynd Radio Club of Lyndhurst, Ohio, writes that the South-Lynders have found the secret to increasing membership and conducting year-long sessions with virtually no drop-outs. It seems that if you "keep 'em busy enough with activities," they're with you! Unlike

(*Continued on page* 102)

The "old buzzard of Rancocas Woods," S. Elliott Uhler, was a ham more than 50 years ago, operating as 3MA. A real communications veteran, Elliott now is an active CB'er and SWL (3Q0339 and WPE2FUY) and owns a shack full of equipment.



Across the Ham Bands

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

THE CURRENT STATE OF AMATEUR LICENSING PROCEDURES

EFFECTIVE November 1, 1963 (with little advance notice), the Federal Communications Commission changed the rules governing who can supervise the by-mail examinations for amateur Novice, Technician, and Conditional Class licenses, and how to obtain the license material. The examinations themselves have not been changed, however.

Under the new rules, only one volunteer examiner will administer both the code and the written tests. He must be at least 21 years old and hold a General, Advanced, or Extra Class amateur license, or a commercial radiotelegraph license, or be employed in the service of the United States as the operator of a manually operated radiotelegraph station.

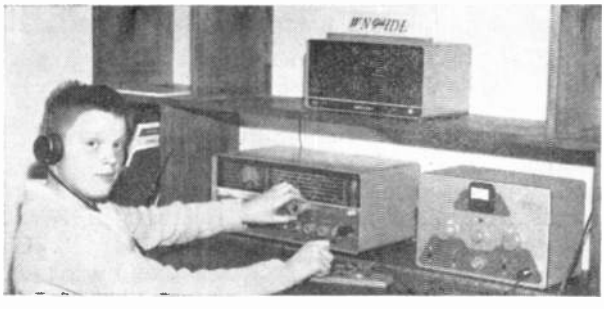
To obtain the examination material, either the applicant or the volunteer examiner must write to the Federal Communications Commission, Gettysburg, Pa., state the class of license desired, and give the names and permanent addresses of both the applicant and the volunteer examiner. In addition, when a Conditional Class license is desired, the qualifications of the volunteer examiner to conduct the examination must be included. The FCC will then forward the necessary papers directly to the volunteer examiner.

New Application Form. All amateur license applications (including applications for license renewals and changes of address) must now be made on the new, simplified, amateur application Form 610. Applications made on older forms are being returned without action. Look for "FCC Form 610" dated August, 1963, in the upper left-hand corner of the application form to be certain that you have the latest one.

Advanced Class License. In October, 1963, the ARRL submitted its long-expected request to the FCC to modify the amateur licensing structure so as to reinstate the availability of the Advanced Class license to new applicants who have held a Conditional or General Class li-

Novice Station of the Month

"Simple but efficient" describes the station of Dennis Daupert, WN9HDL, in Indianapolis, Indiana. His Heathkit DX-20 transmitter and Hallicrafters SX-110 spend most of their time on 80 meters, where Dennis has worked 13 states. For submitting this photo in our monthly Novice Station of the Month contest, Dennis will receive a one-year subscription to POPULAR ELECTRONICS. If you would like to enter the contest, send us a clear picture of your station—preferably showing you at the controls—along with some information about yourself, your equipment, and your operating achievements. If you don't win, we'll try to publish your picture anyway. Entries should be sent to Herb S. Brier, Amateur Radio Editor, POPULAR ELECTRONICS, Box 678, Gary, Indiana



Although Ron Ross, WNØGJL, Gray, Iowa, runs his Heathkit DX-20 at 40 watts to hold down possible harmonic radiation, he still gets out well. Ron uses a Heathkit GR-91 receiver and a long-wire antenna.

Every state except Vermont, plus 12 countries, is the record of Phil Kampe, WN5EAM, New Orleans, La. Phil operates with a Johnson Viking Ranger transmitter, a Hammarlund HQ-100 receiver, and a vertical antenna. His standby receiver is a Globe Scout.

cense for a year or more. The ARRL also requested that the 20-meter phone band be restricted to Advanced (and Extra) Class license holders after July 1, 1965; 15- and 40-meter phone after July 1, 1966; and 75-meter phone after July 1, 1967.

No formal suggestions as to the scope of the examination to be associated with the Advanced Class license have been made, except that no additional code test should be required and that the written examination should cover phone topics. Keep in touch with your local radio club for last-minute information as to when the FCC assigns a formal docket number to the matter and invites pro and con comments on it. There is little point in bombarding the FCC with comments until that time.

TECHNICAL TIP

If you use an EICO 772 (or 771) transceiver on the 11-meter Citizens Band or on the 10-meter ham band (see P.E., July, 1963) and are scratching for enough speaker volume on weak signals, make the following modification suggested by Patrick Electronics of Fort Smith, Ark., and listen to these signals agitate the speaker. You'll need a 100,000-ohm, ½-watt resistor to do the job.

Remove the 772 from its cabinet and refer to the instruction manual schematic diagram while making the following simple circuit changes. First, disconnect choke *L8* from pin 8 of socket *V7*, and move the shielded wire from pin 9 of socket *V6* to this socket pin. Now, disconnect the shielded wire from the 0.01-μf. capacitor *C46*, and solder the wire to the disconnected end of the choke. Then, move the capacitor (*C46*) until its disconnected lead will reach pin 9 of socket *V6*. Solder the lead to the pin.

Cut one lead of the 100,000-ohm, ½-watt resistor to a length of ½" and its other lead to a length of ¼", and bend the ½" lead at right angles to the resistor body. Now, disconnect the shielded wire from pin 8 of the relay, and solder the ½" lead of the resistor to the relay terminal. Be careful to position the resistor so that the wire will not short against the cabinet when the 772 is reassembled. Now, connect the shielded wire previously connected to the relay terminal to the remaining lead on the resistor. (The resistor is not always required, but some units oscillate if it is omitted; so it is good insurance against future trouble.)

The only change necessary in operating the modified unit is that you must be cautious in advancing the volume control, unless you want the speaker to jump out of the unit when a signal comes on.

CLASSIC HAM CIRCUITS

Although introduced less than a dozen years ago in the article "Flexible Selectivity for Communications Receivers," by O. G. Villard, Jr., (W6QYT) and W. L. Borden (*Electronics* magazine,

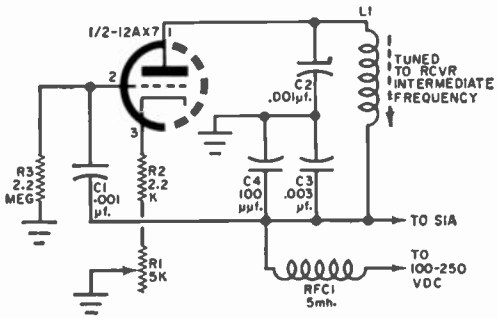


Fig. 1. When the basic Q-multiplier circuit shown here is connected through a small capacitor to the i.f. amplifier of an inexpensive communications receiver, the receiver's selectivity is much improved.

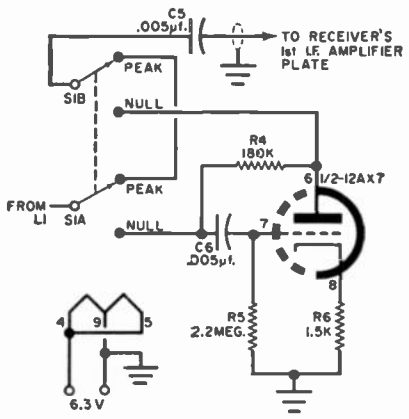


Fig. 2. If you add another triode to the circuit of Fig. 1, the Q-multiplier will reject a single interfering signal without affecting overall selectivity characteristics.

April, 1952), the Q-multiplier quickly earned the right to be called a classic ham circuit. It was widely copied, and also showed up in the design of at least one factory-built receiver within a few months time. It is available in kit form, but can also be assembled from junk box parts, an advantage not to be had with every useful circuit that comes along.

Before introduction of the Q-multiplier, sharp selectivity in communications receivers was usually provided by a filter embodying a quartz crystal resonant at the intermediate frequency of the receiver. This did provide good selectivity, but required that the receiver tune slowly and smoothly, and have very high stability. In practice, only the most expensive receivers were good enough in these respects to make regular use of the crystal filter easy and reliable. The high selectivity of the crystal made tuning of moderate-priced receivers so touchy and difficult that many hams seldom switched the filter in except as a desperate last resort, in which case the desired signal often disappeared along with the QRM.

Thus, when the Q-multiplier proved itself capable of doing much the same job as the crystal filter, with the advantages of lower cost and smooth, slow tuning (since it tunes only a few kc. above and below the i.f. frequency), it found a ready-made group of potential users waiting. And as an extra advantage, it's relatively easy to add an "outboard" Q-multiplier to an existing receiver, without altering the store-bought circuit.

How Q-Multiplier Works. Other things being equal, the selectivity of a tuned circuit depends upon the ratio of the effective resistance in the circuit to the reactance at and near the resonant frequency. This ratio is expressed as a

(*Continued on page* 98)

New Zealand Issues Code-Free Ham License

In a significant break with long-held traditions regarding c.w. examinations (sending and receiving) for an amateur radio license, New Zealand recently instituted a new "Technician Class" ham radio exam. Although limited to operation in the 144-148 mc. ham bands, and above, this Technician license is issued without a c.w. code test!

Applicants for the new license must pass all of the non-Morse requirements (theory and rules) of the usual license exam. They are issued distinctive call-signs starting with the letter "T" immediately after the district numeral—ZL1TAA, ZL3TBQ, etc. The duration of the license is not known by your Editors at this writing, but undoubtedly will be at least a year.

During the first few weeks that this new ham license classification has been in existence, VHF activity in New Zealand has perked up considerably, according to our reporter, ZL2CD. About 35 new calls have appeared on 2 meters, and new stations are going on the air daily.

Your Editors cannot help but wonder if this unprecedented step bodes a breakup of the "CB" bands in Canada and the U.S., and the introduction of a similar class license.

Short-Wave Broadcast Predictions

JANUARY 1964

BY STANLEY LEINWOLL, Radio Propagation Editor

IN ADDITION to the short-range propagation forecasts carried by WWV and WWVH, these stations now carry world geophysical alerts in slow Morse code. At 04 and 34 minutes after every hour, WWV transmits the letters AGI followed by another series of letters. The letters AAAA mean that a magnetic storm or an auroral display is in progress or expected. The letters SSSS mean that the general level of solar activity is high because of the presence of one or more active centers on the sun; to the listener, this indicates that conditions are, or very soon will be, below normal. The letters EEEEE mean that no alert has been declared; as a result, the probability of quiet and near normal radio conditions for at least the following 24 hours is high. Station WWVH transmits the same information at 14 and 44 minutes past the hour, and the alerts are revised daily at 0404 GMT for WWV and 0514 GMT for WWVH.

TIME (EST)

Between Eastern USA and:	00	02	04	06	08	10	12	14	16	18	20	22	24
Western Europe	6	6	7	9	15	17	17	11	9	7	6	6	
Eastern Europe	6	6	6	7	15	15	11	7	7	6	6	6	
South & Central America	11	9	9	15	17	17	17	17	17	15	11	11	
Near East	6	6	6	7	17	17	11	9	9	7	7	6	
North Africa	6	6	7	9	17	21	17	11	9	7	7	7	
South & Central Africa	9	9	9	11	21	21	21	21	17	11	9	9	
Australia & New Zealand	9	9	9	9	11	11	*	17	21	17	11	9	

TIME (CST)

Between Central USA and:	00	02	04	06	08	10	12	14	16	18	20	22	24
Western Europe	6	6	6	7	15	17	11	9	7	6	6	6	
Eastern Europe	6	6	6	7	11	11	9	7	6	6	6	6	
South & Central America	9	9	9	11	17	17	17	17	17	11	9	9	
North Africa	6	6	6	7	15	17	15	9	7	7	7	6	
South & Central Africa	7	7	7	9	15	21	21	21	17	11	9	7	
Far East	6	6	6	6	7	7	9	7	15	17	11	9	
Australia & New Zealand	9	9	9	9	11	11	*	21	21	21	11	11	

TIME (PST)

Between Western USA and:	00	02	04	06	08	10	12	14	16	18	20	22	24
Western Europe	6	6	7	9	15	11	7	7	6	6	6	6	
Eastern Europe	6	6	6	7	9	7	7	6	6	6	6	6	
South & Central America	9	9	9	17	17	17	17	17	15	11	9	9	
Africa	7	7	7	15	17	21	21	21	15	11	9	9	
Far East	7	7	7	7	9	9	9	21	21	11	7	7	
South Asia	6	6	6	7	9	9	9	9	9	11	7	6	
Australia & New Zealand	9	9	9	9	11	17	21	21	21	17	11	9	

To determine the frequencies and times for best short-wave reception in the United States, select the table for the area you are located in, read down the left-hand column to the region you want to hear, then follow the line to the right until you are under the figures indicating your approximate local time. The boxed numbers will tell you the frequency band (in megacycles) to listen to during any 2-hour interval. Asterisk (*) indicates that signals will probably not be heard.

Monthly Short-Wave Report

By **HANK BENNETT,** W2PNA/WPE2FT
Short-Wave Editor

THE MEDIUM WAVES

YOUR Short-Wave Editor is often asked why we do not cover the medium waves to a greater degree. We *have* mentioned various broadcast-band stations from time to time, but this is a short-wave column, and theoretically, should be directed to transmissions falling within the frequency ranges above two megacycles. However, when interesting items come to our attention that are not "short-wave" in the strictest sense, yours truly, along with thousands of others, will go for a spin through the broadcast band in hot pursuit of DX.

There are countries that can be heard only on the broadcast band; some of them have no short-wave outlets other than for the nearly-always-present amateur or aero stations. And let's face it—standard broadcast-band listening *is* an enjoyable hobby. So, let's make the most of it while sunspot activity is approaching the minimum cycle.

This month we're going to list a number of stations that can be and are being heard in wide areas of the United States. All of these countries are in Central or South America or the Caribbean area. European and trans-Pacific stations are also being widely heard but we do not have the space available to present a more comprehensive listing.

Virtually all of the following stations can be heard in the period from just a few moments before sunset to midnight (EST) or later, and, in some cases, from just before

DX Awards Presented

The following DX'ers have qualified for awards this month (100, 75, 50, and 25 countries verified). Congratulations, and welcome to the Awards List!

One Hundred Countries

James W. Young (WPE6ENA), Wrightwood, Calif.
Franklin F. Flore (WPE3NZ), Bethlehem, Pa.

Seventy-Five Countries

Douglas Benson (WPE2MI), Schenectady, N. Y.

Fifty Countries

Mark Northup (WPE2FFD), Philmont, N. Y.
Dave Siddall (WPE1EBN), Hyannis, Mass.
Irwin Belofsky (WPE2BYZ), Brooklyn, N. Y.
Ron P. Kusmack (VE4PE4U), Winnipeg, Manitoba, Canada
Winston C. Klontz (WPE6EYO), Culver City, Calif.
M. P. Frutchey (WPE4PC), Winter Park, Fla.

Twenty-Five Countries

Glen Wright (WPE9EQP), Findlay, Ill.
Tom McGuire (WPE6DYW), Atherton, Calif.
Larry Rector (WPE3DIG), Pittsburgh, Pa.
Bill Stanley (WPE5CVH), Deer Park, Texas
Norman Laurence Kleinberg (WPE2KGY), Brooklyn, N. Y.
Ron Reiring (WPE6EJC), Madera, Calif.
John Edward Fagyas (WPE2TQM), Buffalo, N. Y.
John Zelle (VE3PE1QZ), Amherstburg, Ont., Canada
Michael Bugaj (WPE1EZB), Middletown, Conn.
Walter M. Giordzno (WPE1FFE), Natick, Mass.
Tim C. Hartmann (WPEØBJS), St. Louis, Mo.
Charles L. Sarley (WPE3DNB), Alburtis, Pa.
Robert Lada (WPE3ECU), Wilkes-Barre, Pa.
Al Quaglieri (WPE2DMI), Albany, N. Y.
Lane Venardos (WPE9EEK), Alton, Ill.
Lavern P. Olsen (WPE6DKR), Montebello, Calif.
James Robert Pierce (WPE9EYQ), Mt. Vernon, Ill.
Craig Anderton (WPE2JHM), Ridgewood, N. J.
Jerry Haley (WPE4FNI), McMinnville, Tenn.
Alden Phaneuf (WPE2JPX), Champlain, N. Y.
Howard & Paul Brenner (WPE1EMC and WPE1EMD), Chestnut Hill, Mass. (Joint Award)
William A. Davy (WPE4GJH), Arlington, Va.
John Ball (WPE6DVT), Arcadia, Calif.
Gary Clark (WPE2JBR), Flushing, N. Y.
Hiram Hugh Whitehead (WPE4FON), Hampton, Va.
Joseph Tokarz (WPE2FQM), Wallington, N. J.
Frank J. Raftovich (WPE3BOG), Norfolk, Va.
Francis Domineske (WPE3EPB), Wellsboro, Pa.
Tim Kerfoot (VE3PE1TH), Toronto, Ont., Canada
Jerry Bond (WPE2FXO), Watertown, N. Y.
R. E. Perry (WPE5CCP), Inglewood, Calif.
Larry Tromblay (WPE5BOW), Opelousas, La.
Richard Jordan (WPE7QN), Seattle, Wash.
Galen L. Steele, Jr. (WPE6DFJ), Downey, Calif.
Grant T. Nicholls (WPE2GXU), Medford Lakes, N. J.
Marvin L. Brown (WPE2IJB), San Francisco, Calif.

ENGLISH-LANGUAGE NEWSCASTS TO NORTH AMERICA

All of the stations below specifically beam English-language newscasts to the U.S.A. The times may vary a few minutes from day to day.

COUNTRY	STATION	FREQUENCY *(kc.)*	TIMES *(EST)*
Australia	Melbourne	17,840, 15,220	2030, 2130, 2330
		9580	0745
Bulgaria	Sofia	6070 (and/or 9700)	1900, 2000, 2300
Canada	Montreal	11,720, 9625, 5970	1800 (Caribbean)
East Congo	Leopoldville	11,755	1630, 2100, 2230
West Congo	Brazzaville	11,725	2015
Czechoslovakia	Prague	11,990, 9795, 9550, 7345, 5930	2030, 2330
Denmark	Copenhagen	9520	2100, 2230
Finland	Helsinki	15,185	1530 (Mon., Fri.)
West Germany	Cologne	15,405, 11,795	1010
		9640, 6160	2035
		9735, 9575, 6145	0000
Hungary	Budapest	11,910, 9833, 7220	1900
		9833, 7220	2230
Italy	Rome	11,905, 9575	1930, 2205
Lebanon	Beirut	11,890	1630
Netherlands	Hilversum	15,220, 11,950	1030 (Tues., Fri.)
		17,810, 15,220	1415 (Tues., Fri.)
		11,800, 9715	1630 (exc. Sun.)
		9590, 5985	2030 (exc. Sun.)
Portugal	Lisbon	6185, 6025 (and/or 9740)	2105, 2305
Spain	Madrid	9360, 6130	2215, 2315, 0015
Sweden	Stockholm	17,840	0900
		11,805	2045, 2215
U.S.S.R.	Moscow	9740, 9730, 9700, 9680, 9660, 9650, 9620, 9610, 9570, 7320, 7310, 7240, 7200, 7150 (may not all be in use at any one time)	1730, 1900, 2000, 2100, 2300, 0040
Vatican City	Vatican City	9645, 7250, 6145	1950

sunrise to just after sunrise. Here they are, by frequency in kilocycles:

650 YVQO, Puerto La Cruz, Venezuela
655 YSS, Sal Salvador, El Salvador
700 Montego Bay, Jamaica
730 VP4RD, Port of Spain, Trinidad
760 ZFY, R. Demerara, Georgetown, British Guiana
835 R. Belize, British Honduras
855 PJC2, R. Curom, Willemstad, Curacao
910 YVPF, R. Aeropuerto, Maiquetia, Venezuela

1000 YVNM, R. Morón, Morón, Venezuela
1015 YSC, San Salvador, El Salvador
1035 Cap Haitien, Haiti
1075 Unidentified, possibly El Salvador
1120 YVMF, Ondas Del Lago, Maracaibo, Venezuela
1155 HIAS, Ondas Musical, Santo Domingo, D.R.
1180 CB118, Valparaiso, Chile, and YVOR, R. Maturin, Venezuela

1210 TGED, R. Mil Doscientos Diez, Guatemala City, Guatemala
1235 ZBM1, Hamilton, Bermuda
1570 XERF, San Carlos, Mexico

Your Short-Wave Editor has personally been able to find most of these stations, some of which are amazingly strong at times. One of the most outstanding signals that we have heard from the south was received recently on 1080 kc., when the 250-watt YVQJ, Barcelona, Venezuela, completely and thoroughly swamped WTIC, the 50,000-watt outlet in Hartford, Conn.

Many of the above stations carry English at one time or another, particularly those in Bermuda, Jamaica, Trinidad, and other British possessions or former possessions. Don't be fooled, however, if you hear the "Voice of Portugal" on ZBM1, because they reportedly carry it until 1930. If you hear Del Rio, Texas, mentioned on 1570 kc., you'll know you have XERF, for that is their mailing address. The French-language station on 1035 kc. will certainly be Haiti. And *R. Belize*, 835 kc., carries a *Voice of America* newscast at 2100.

Many of the others that are non-English speaking stations, especially those in Venezuela, generally give reasonably clear ID's in Spanish, so you should be able to catch

at least a few of them. We'd appreciate getting a positive ID on the 1075-kc. station; continued attempts to dig it out of the mud have been futile.

The next time you feel the urge to wander, take a trip through the broadcast band and see how many countries you can log in one evening. Chances are good that if you can find those split-channel stations, the others will be coming through, although you shouldn't expect to have an easy time of it. Many of the listed channels are loaded with American powerhouses, and you'll just have to dig around until you come up with a station. Let us know what you hear.

(*Continued on page* 108)

Glenn Belkin, WPE3DIM, has 27 countries logged, 15 verified. He DX'es with a Heathkit GC-1a Mohican, National NC-270, and a homemade trap antenna.

SHORT-WAVE MONITOR CERTIFICATE APPLICATION

ALL radio listeners interested in furthering the hobby of SWL'ing—regardless of whether you DX on the BCB, VHF, TV, SW, or FM bands—are eligible to apply for a POPULAR ELECTRONICS "Certificate of Registration." You must have verified (have QSL cards from) a minimum of five radio stations, of which one was outside the borders of the United States. There is no age limit, or special equipment qualification; the only requirement is that the applicant have a sincere interest in radio communications.

A new certificate processing procedure has just been introduced. All certificates are filled in and lettered before mailing. All certificates are now mailed flat and unfolded. If you want to register and receive your WPE identification sign, fill in the new application blank below before February 15, 1964. Mail with 25 cents in coin to: Monitor, POPULAR ELECTRONICS, One Park Avenue, New York 16, N. Y., 10016. Canadians should use their own currency. All other applicants not in the U S. A. should use five International Postal Reply Coupons. Allow 2-4 weeks for processing.

(Please Print) (Do not fill out)

Name . . . . . .

Street, City and Zone . . . . . .

State and Zip . . . . . .

Receivers in use Make . . . . . Model . . . . . .

Make . . . . . Model . . . . . .

Age Occupation . . . . . .

Ham/CB call-letter assignment(s) . . . . . .

I listen mostly to SW Broadcast Hams CB BCB VHF VLF . . . . . .

I use the following antennas . . . . . .

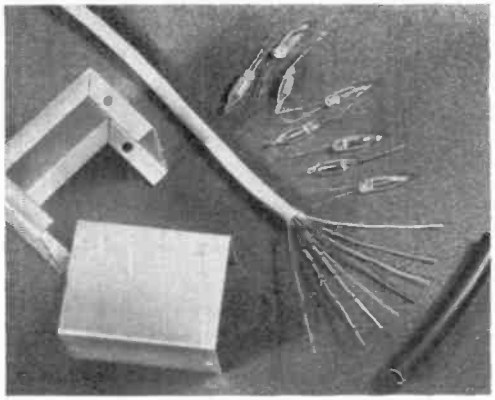
I have QSL cards and countries verified. Check if subscriber to P.E. . . . . .

Signature . . . . . Date . . . . . .

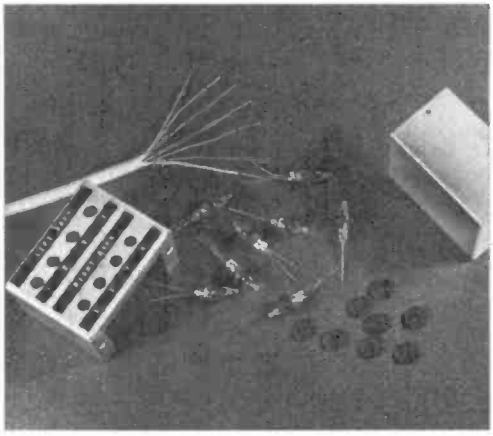
(Good only until February 15, 1964)

FOULED SPARK PLUG DETECTOR

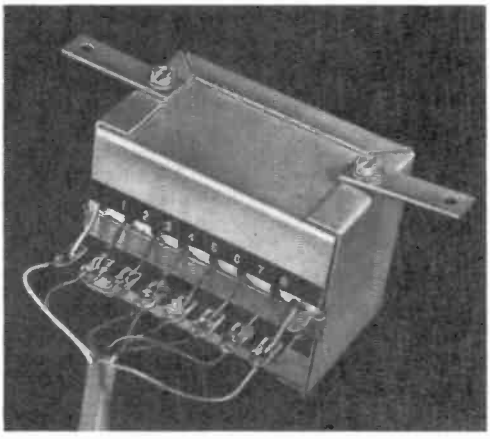
By JOHN F. AGEE



You can build this device for detecting misfiring spark plugs with the few parts shown, costing less than $2.00. Installed in the car in an hour or so, it lets you spot "fouled" plugs from driver's seat.

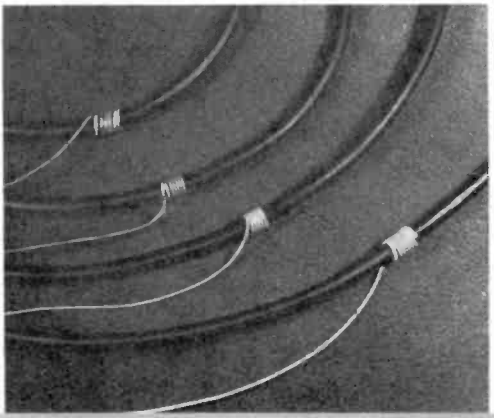


Eight NE-2 neon bulbs mount in numbered and labeled ¼" holes in chassis box. Rubber washers cut from tubing hold neon bulbs in place. Use one washer inside and one outside box wall on each bulb.



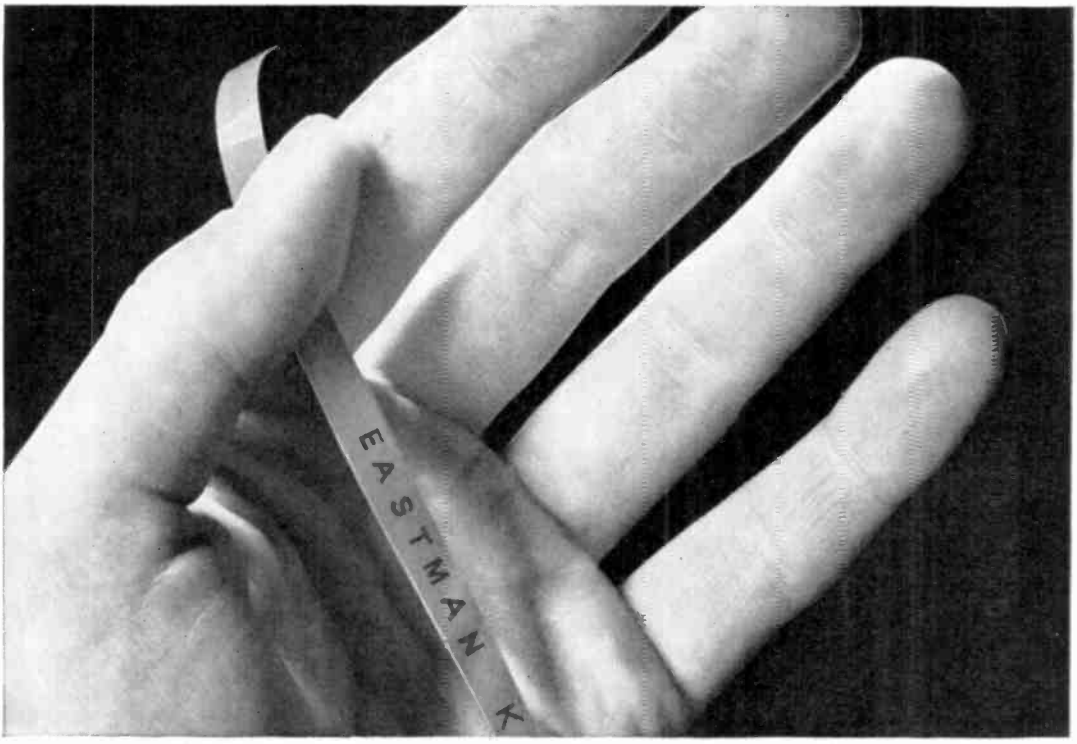
Ground one lead from each NE-2 within chassis box. Connect remaining lead from each NE-2 to a separate wire of the 8-conductor cable, insulate with tape. Terminal strip shown on rear of box is optional.

Strip jacket at engine end of cable. Wrap 6 to 8 turns of each wire on corresponding spark plug high-voltage lead as shown. Tape securely in place.



All NE-2's light steadily when engine is running above idling speed and plugs are firing properly. Unlit bulb shows trouble with corresponding plug.

Now...the new EASTMAN Sound Recording Tape



Mark well the coding shown here. You'll find it on the back of all EASTMAN Sound Recording Tapes.

Look! "Lifetime Coded" for Positive Identification!

"Lifetime Coding"—your assurance of highest quality! A permanent legend continuously repeated on the back of EASTMAN Sound Recording Tapes (1) identifies Eastman Kodak Company as the manufacturer; (2) provides positive batch-coating identification, thus assures the most closely matched sound characteristics, tape after tape, in the industry. The coding also provides a convenient means of cataloging tapes.

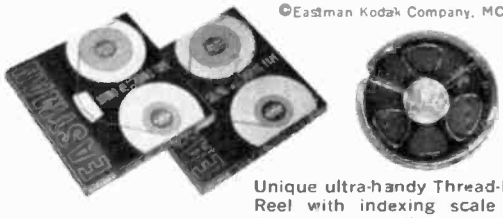
No stretch — thanks to new DUROL Base! A specially prepared form of cellulose triacetate, this support material is distinguished for its high strength, low elongation. When equipment accidents happen, the new Eastman tapes break clean with practically no stretch. As a result, splices are made quickly, easily, with minimum program loss.

New "R-type" binder provides a smoother, tougher surface to suppress tape noise and distortion. In addition, it is extremely abrasion-resistant, thus reducing oxide build-up. Even more important are the superb magnetic properties of "R-type" binder dispersions which make possible two great recording tapes—both available now...

At leading electronic supply houses: Type A303, a vastly superior low-print tape with output comparable to a fine general-purpose tape... also Type A304, a high-output tape with remarkably low print-through characteristics.

For information,
see your electronic supplier or write
Magnetic Products Sales

EASTMAN KODAK COMPANY
Rochester 4, N. Y.



Unique ultra-handy Thread-Easy Reel with indexing scale and built-in splicing jig.

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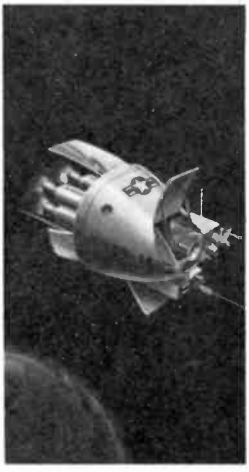
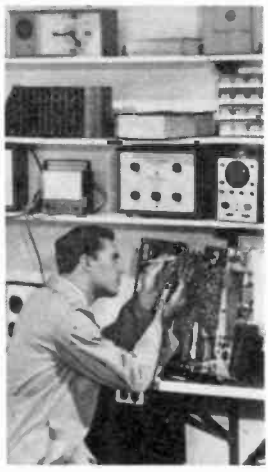


You can succeed in TV-Radio Communications . . . prepare for F.C.C. License, service advanced satellites for industry and defense.

You can service and repair the electronic "brains" of industry—computers, data processing, and other automation equipment.



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". . . My employers are expanding and plan to open a new department within the next 2 years . . . they have urged me to complete your course as soon as possible . . . my supervisor says that your course is by far the finest one he has seen . . ."
E. P. Gardner, No. Battleford, Canada

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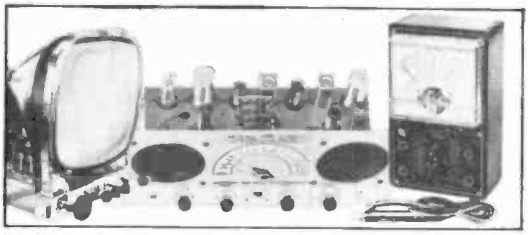

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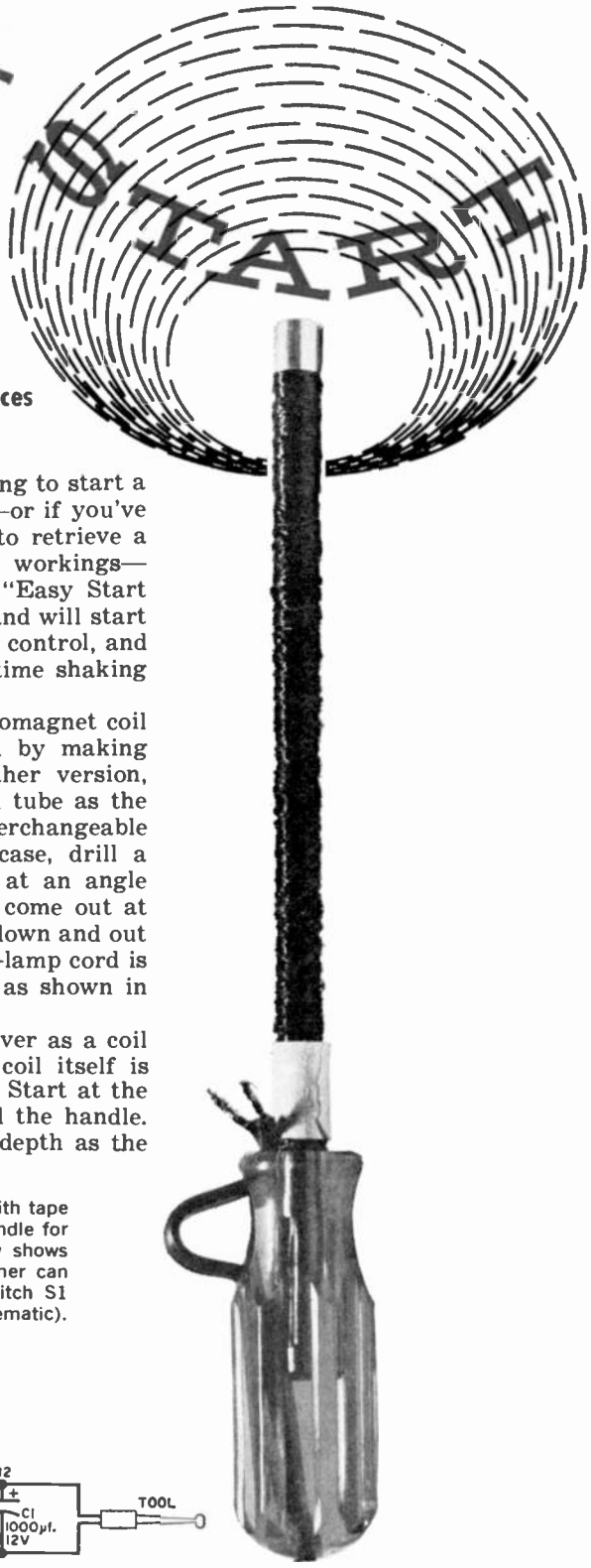
EASY START TOOL

A bolt and nut starter de luxe,

this one incorporates an electromagnet

for working in tight, hard-to-reach places

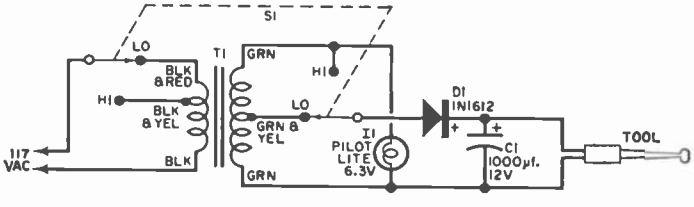


IF YOU'VE EVER fumbled around trying to start a screw or a nut in a difficult position—or if you've had to pick up a chassis and shake it to retrieve a part which has fallen into the inner workings—here's a gadget you'll appreciate. The "Easy Start Tool" will take sockets from ¼" to 7/16" and will start nuts or beveled screws. It has a "hi-lo" control, and when it's in high, you'll have a tough time shaking a metal object out of the socket.

A ¼" nut driver was used as an electromagnet coil form, and complete flexibility provided by making additional sockets to fit into it. Another version, not shown here, used a small cardboard tube as the coil form; it fits snugly over the interchangeable blades of a screwdriver kit. In any case, drill a ¼" hole in the plastic end of the tool at an angle to miss the metal blade. This hole will come out at the neck of the handle; extend the hole down and out toward the metal shaft. A rubber cord—lamp cord is good—is inserted through this channel as shown in the photo at right.

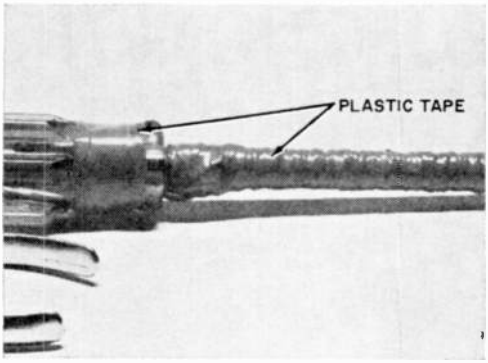
Winding the Coil. If you use a nut driver as a coil form, wrap it with plastic tape. The coil itself is about 1500 turns of #36 enameled wire. Start at the socket end of the tool and wind toward the handle. The winding should be about the same depth as the

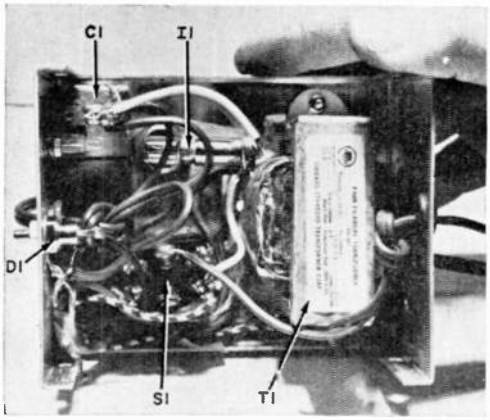
Nut driver becomes electromagnet when covered with tape and wound with a coil. A ¼" hole is drilled in handle for power cord (see photo at right) Schematic below shows control box circuit. Almost any filament transformer can be substituted for the tapped version shown. Switch S1 has a center-off position (not indicated in schematic).



TOOL

By HOMER L. DAVIDSON

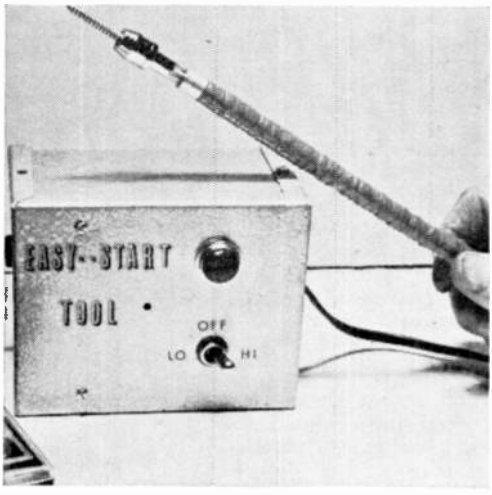




All parts fit snugly in control box as shown above, right. Pilot light is optional, and s.p.s.t. switch can be used with an untapped transformer. Cover the coil, wound on nut driver or cardboard tube, with plastic tape and coats of coil dope or lacquer.

PARTS LIST

C1—1000-μf., 12-volt electrolytic capacitor
D1—5-ampere, 50-PIV stud-mount silicon rectifier (RCA 1N1612 or equivalent)
I1—6.3-volt pilot light assembly and bulb
T1—Filament transformer, 117/107-volt primary, 6.3-volt secondary @ 6 amperes, center-tapped (Stancor P6456)
S1—D.p.d.t. switch, center-off position
1—¼" nut driver (XCELITE A-8 or equivalent)
1—3" x 4" x 5" Minibox
Misc.—Roll of #36 enameled wire, 10' a.c. line cord, plastic tape, hardware, etc.



socket end to get all the turns on the tool.

With the coil wound, scrape the enamel from the ends and solder each to one wire of the power cord. Tape the connections, and cover the coil with two layers of plastic tape. For a good hard finish, give the coil several thin layers of coil dope or clear lacquer, letting each coat dry before applying the next.

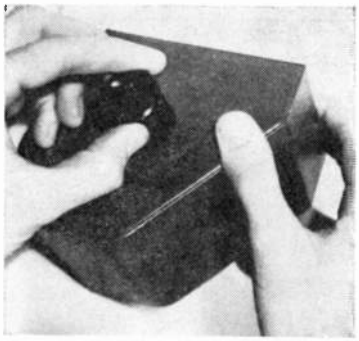
The Control Box. The other components of the Easy Start Tool fit nicely inside a 3" x 4" x 5" Minibox, and are mounted to the main section of it. Almost any filament transformer with a high enough current rating can be used—the Stancor transformer specified, however, does give a means of varying the strength of the electromagnet thanks to its tapped windings.

Wire unit as shown, observing diode and capacitor polarities. Connections are taped or made point-to-point; no tie strips are necessary. Drill a ¼" hole in each end of the box and line with rubber grommet. One hole is for the line cord, the other for the lead to the tool.

The author made interchangeable sockets for the ¼" nut driver by spending a dollar for a small socket set. The shank ends were cut short, and ground down to a hexagon to fit into the ¼" tool.

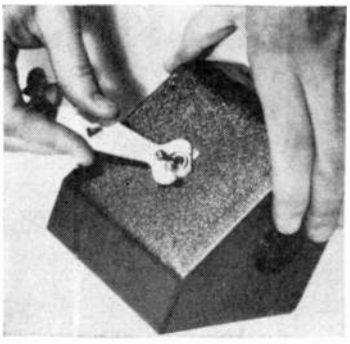
The Easy Start Tool is not required all the time, but when you need it, there's nothing like it! -30-

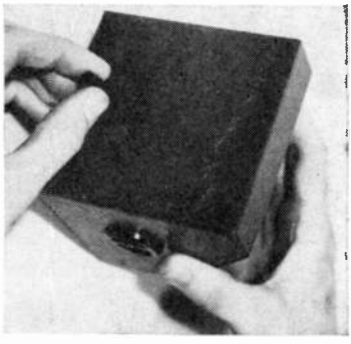
MOVIE PROJECTIONIST'S "FRIEND"



Run an a.c. line to the wall outlet through a grommet. Tie a strain relief knot in cord inside the box.

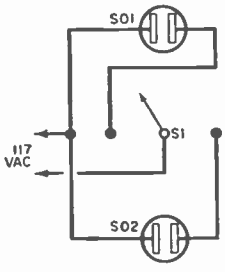
Punch holes in sides of box to mount two a.c. receptacles. Larger Amphenol receptacles handle projector load with much greater degree of safety than "electronic" receptacles.

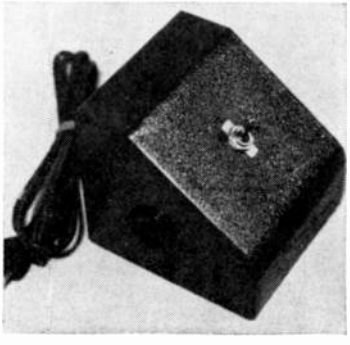




The author used a toggle switch with center-off position so that appliances can be plugged in without arcing even though their switches are turned on.

You can use a switch either with or without a "center-off" position. If your projector draws a lot of current, it might be a good idea to obtain a d.p.d.t. switch and wire the two sections in parallel.



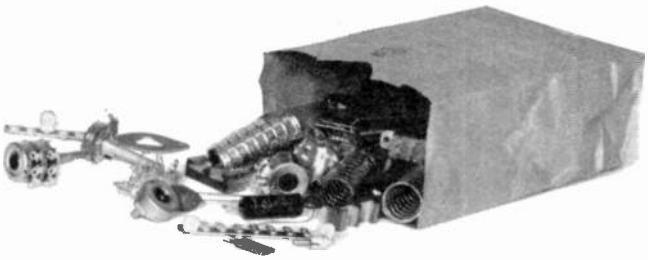


The finished "fabulous" black box.

IF YOU WANT to prove to your photographically minded friends that you're an electronic genius, build them a projectionist's "friend." Not too many movie or slide projectors have a built-in switch that enables the operator to simultaneously turn off the room lights and turn on the projector, and people often fall over furniture trying to get to the light switch when the show is over. You can eliminate that handicap with this simple switching arrangement.

The author built his unit in a Premier SPC-1200 metal box with a sloping front panel. On either side are mounted a.c. receptacles (*SO1* and *SO2*) that may be the "electronic type," selling for 15 cents, or regular round Amphenol MIP61F receptacles—the author used the latter because they handle more current safely. The s.p.d.t. switch (*S1*) may or may not have a "center-off" position; if you decide to use one, get either a JBT Type ST42E or a Cutler-Hammer 7503K13. A lamp plugs into one receptacle, the projector into the other. —*James R. Oswald*

Extra savings are "in the bag"...



When you buy and build a Heathkit!

"In the bag"? Yes, Heathkit parts come to you in simple brown paper bags surrounded by sturdy protective containers. No elaborate, *expensive* packaging. Not necessary. Just adds to the cost. When you receive your Heathkit, the parts are as *safe* and *sound* as they were when they left our factory. To you this represents a savings, since the difference in packaging costs is passed on to you in the form of better parts and lower prices. Simple efficient packaging is just one of the many reasons why you can count on Heathkit for extra value, extra savings.

The new Heathkit 16-watt Stereo Amplifier (illustrated above) represents not only "extra savings", but a superbly designed unit with plenty of versatile high fidelity/stereo capabilities for all-around performance.

Versatility!...has four stereo inputs for *magnetic phono* as well as ceramic phono cartridges, tuner and an auxiliary source such as a tape recorder. Ideal for use in a "second" music system, or for the beginner who wants an inexpensive, yet "up-to-date" unit.

Performance!... delivers a *continuous* power response of ± 1 db from 30 to 30,000 cps at 8 watts per channel! In addition, there's a mono/stereo switch; a dual concentric volume control for adjusting the level of both channels individually or simultaneously; full-range tandem-type controls for simultaneous adjustment of both channels; 7-tube amplifying circuit consisting of two 4-stage preamplifiers; and two push-pull power output stages. The power supply is a complete transformer operated full-wave silicon-diode circuit.

Styling!...the compact, "fit-anywhere" steel cabinet is richly fashioned in a new Heathkit color styling of mocha brown with black accents and beige trim.

Easy-to-build!... with simple-to-follow instructions and point-to-point wiring.

Extra Savings!...costs just $39.95—compare it to units costing twice this low price.

Kit AA-32..15 lbs.....$39.95

SPECIFICATIONS—Simultaneous power output per channel: 8 watts (16 watts total); IHFM music power output per channel: 10 watts (20 watts total). **Frequency response:** ± 1 db from 30 cps to 30,000 cps at rated output. **Harmonic distortion:** (at rated output) 2% @ 20 cps, 0.7% @ 1000 cps, 2% @ 15,000 cps. **Intermodulation distortion:** (at rated output) Less than 3% using 60 and 6000 cps, mixed 4:1. **Hum & noise:** Mag phono input 48 db below rated output. Aux. input, 65 db below rated output. **Channel separation:** 42 db @ 30 cps, 45 db @ 1000 cps, 30 db @ 15,000 cps. **Input sensitivity:** Mag phono, 6 mv; Cer. phono, 250 mv; Tuner, .25 V.; Aux. .25 V. **Input impedance:** Mag phono, 47 K ohm; Cer. phono, 2.2 meg.; Tuner, 470 K ohm; Aux. 470 K ohm. **Outputs:** 4, 8, and 16 ohm. **Damping factor:** 9. **Feedback:** 18 db. **Tube complement:** 3-6EU7 and 4-ECL-86 (6GW8). **Power requirements:** 105-125V, 50-60 cps AC, 85 watts at 120 volts. **Dimensions:** 13½"W x 4-11/16"H x 9½"D.

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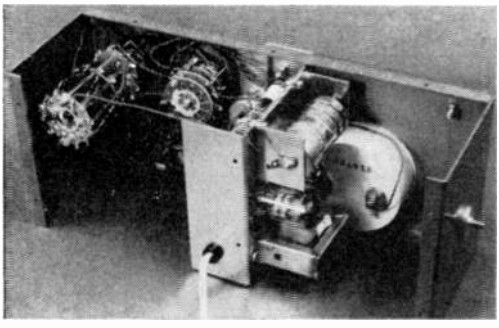
HF-156R

Product Reviews

SERVICE BENCH VTVM

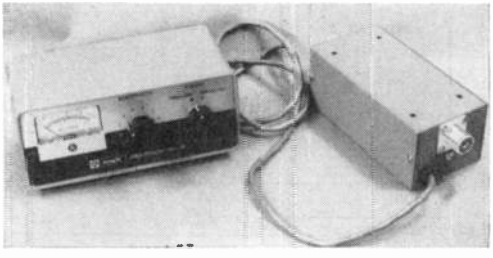
What was the most popular kit ever manufactured by the Heath Company (Benton Harbor, Mich.)? It was a VTVM, of course. Justifiably, Heath has found it difficult to change a winner, but the new IM-13 kit ($32.95) has functional styling, improved stability, and a larger, easier-to-read meter face. Wiring time for the IM-13 that was built by the POPULAR ELECTRONICS Editors was four and a half hours. The internal construction is wide-open for easy maintenance.



The fingers hold one of the special potentiometers in IM-13 kit. Ball bearings act as vernier reduction gear, making possible smooth, accurate adjustment of zero and ohms meter controls.

SWR/POWER METER

Knight-Kit engineering has made notable strides in the past 18 months. A good example of useful product engineering is the Knight-Kit P-2 offered for $15.95 (kit) and $22.95 (wired). Sold only by Allied Radio Corp. (100 N. Western Ave., Chicago 80, Ill.), the P-2 meter reads standing wave ratio and relative power throughout all of the frequencies and power levels used by hams and CB'ers.



The POPULAR ELECTRONICS Editors were particularly impressed by the P-2 because the antenna coupler and indicator unit were four feet apart and connected by a simple two-wire shielded cable. The convenience of such an arrangement should not be underestimated —especially if you have to route stiff 52-ohm coaxial cables around the bench.

Heathkit's great base station deserves

an equally fine working partner!

In a two-way radio communications system, overall performance is only as good as it's weakest link. The deluxe Heathkit GW-42 "Master Station" CB Transceiver teamed up with the powerful GW-52 1-watt "Walkie-Talkie" brings you Citizen's Band radio facilities of outstanding capability with complete freedom and mobility of operations. Check and compare the many features offered in Heathkit equipment with any other...see why Heathkit is your best buy in CB!

"Master Station" CB Transceiver

• 5 Crystal-controlled transmit & receive channels • Built-in 3-way power supply • Built-in 4-tone selective call circuitry • All-channel receiver tuning • Built-in tuning meter • Adjustable squelch control • Switchable automatic noise limiter • Push-to-talk microphone • Beautifully styled • Easy-to-build.

Kit GW-42....23 lbs.....$119.95
Assembled GWW-42....22 lbs.....$189.95

1 Watt Walkie-Talkie

• Rugged 10-transistor, 2-diode circuit • Long-range transmitter—1-watt input • Sensitive superheterodyne receiver with RF stage • Adjustable squelch control • Automatic noise limiter • Crystal-controlled transmit & receive channels • $20 rechargeable battery included • Built-in 117 v. AC battery charger • Built-in battery condition meter • Easy circuit board assembly.

Kit GW-52....4 lbs.....$ 74.95
Assembled GWW-52....4 lbs.....$124.95

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GX-124R

The Girl Detector

(*Continued from page* 38)

walked away, and in a few seconds the red light disappeared from the eyes of the wolf.

"Neat, neat!" Carl exclaimed. "How are you doing it? Is it really automatic, or is somebody hiding around here and pushing buttons?"

"It's automatic. Some of the guys taking art courses did the nice job on the wolf. His eyes are painted on the ends of little red light bulbs, and a motor and cam setup makes them sweep up and down a couple of times whenever the button is pushed. It works just like the motor arrangement on those Westminister doorbell chimes you have at home. Every time the button is pushed, the motor and cams make one complete cycle and stop."

"Tell him about the voice," one of the fraternity members suggested.

"Well," Jerry began, "at the end of the cam's movement, a vane passes through a beam of light and momentarily cuts it off. Normally, this beam of light shines through a hole in an endless loop of tape on a stereo tape recorder onto a photocell. As long as the light shines on the cell, current through it and a solenoid holds the recorder's 'pause' control depressed, and the tape doesn't move. When the light is interrupted, the solenoid releases the 'pause' button, and the tape recorder plays the tape loop through to the point where the light shines through the hole again and actuates the solenoid to stop it.

"The wolf-whistle and the brush-off speech are recorded on separate tracks of the loop of tape. One track amplifier or the other is selected by a relay to drive a small speaker mounted in the wolf's head. When a fellow pushes the button, the relay is not actuated, and the top contacts feed the brush-off bit into the speaker. But when a girl hits the switch, the relay closes, and the speaker is transferred to the wolf-whistle amplifier. Also, when this relay is actuated, an extra set of contacts cause the eyes to light up."

"But how does the wolf know whether a guy or a gal is pushing the button?" Carl demanded impatiently.

"That's the gimmick I'm proud of," Jerry said. "Notice that the bottom edge of the platform holding the wolf is just about level with the bottom of a skirt. A thermistor is mounted behind the front edge of the platform, and another matched thermistor is hooked up away back in the corner. The two thermistors and two resistors form a bridge, both legs of which have the same resistance as long as they are at the same temperature. When one thermistor gets warmer, the bridge is unbalanced, current flows, and is amplified by a transistor. This cuts in a sensitive relay that operates the speaker-transfer relay I was telling you about."

"But how on earth . . .?" Carl started to ask, but Jerry cut him short.

"It's simple. When a fellow stands in front of the platform, his heavy trousers keep his body heat from escaping and materially affecting the thermistor just in front of his knees; but this is not true when a girl wearing a dress and sheer stockings is standing there. When the temperature of the thermistor changes, the bridge—but you know what happens from there on."

"That's doggone clever—I couldn't have done better myself!" Carl said admiringly. "I'd like to see what happens at the dance."

"You will," Jerry promised. "As part payment for my help, the Triangle boys have invited us and our dates. I've already fixed things up with Jodi and Thelma—hey, are you listening to me? Why the faraway look?"

"Sure I'm listening," Carl retorted thoughtfully, feeling his rough, do-it-yourself haircut. "I was just wondering how I was going to squeeze in a visit to the barber shop between now and tomorrow night."

WHEN THE BOYS and their dates arrived at the dance the next evening, a red velvet curtain stretched across the corner hid the wolf from view. A card fastened to the front of the curtain said simply: "Girl Detector." Naturally this aroused considerable curiosity among the uninformed—especially among the female uninformed—but the few boys in on the secret would only

promise that the curtain would be pulled before the dance was over.

At ten o'clock the president of Triangle made a little speech explaining that the fraternity had created, at terrific expenditure of time and money, a creature "half-scientific, half-magic" that could unerringly tell girls from boys. The curtain was pulled, and a gasp went up from the crowd as they saw the leering wolf illuminated by a small spotlight. Ropes formed a narrow aisle that permitted access to the platform at only one spot—the spot where the front thermistor was concealed.

The president explained that those wishing to test the wolf were to approach it and to read aloud an invocation fastened to the platform. The invocation consisted of the word "ABRACADABRA" written as an inverted pyramid in which each lower word dropped the first letter of the word written above until the last word pronounced was only "A." The invocation was positioned and written in sufficiently small type so that the reader had to stand very close to the platform to see it. The time it took to read it, of course, gave the thermistors time to respond to minute temperature variations.

The wolf was an immediate hit. Each wolf-whistle and every curt dismissal was greeted with laughter. The engineers in the group immediately tried to figure out how the wolf determined the difference. Some thought the size of the hand pushing the button had something to do with it, so they tried pushing the button with a stick. Others decided that the pitch of the voice reading the invocation was the clue, and they tried reading the magic words in a high-pitched voice. Still others concluded that light beams were being cut off by the girls' wide skirts, so they improvised skirts out of suit coats. But none of these ruses, naturally, fooled the wolf. When the dance broke up, not a single person had guessed how the trick was performed.

CARL, Jerry, Jodi, and Thelma were scarcely back in the car when the girls went to work on the boys to learn the secret. Carl and Jerry held out teasingly for a while, but when the girls started delivering ultimatums, the boys gave in.

"You know," Jodi remarked in her rich Southern accent, "it's fun knowing things that other folks don't—I mean scientific things. When I go shopping in the supermarket and an electric eye opens the door at my approach, it makes me feel very superior to realize I know something probably not another woman in the store knows: exactly how the door operates."

"Listen to the confessions of a technical snob!" Jerry gibed. "I must admit, though, I feel a little the same way when I hear people marveling at the 'mystery' of how radio, color TV, radar, remote control, or even garage door openers work. I guess all of us have got a streak like that—just like the little boy shouting 'yah, yah, yah! I know something you don't know!' "

"When you stop to think about it," Carl chimed in, "you realize that somebody with no knowledge of electronics today is just about as puzzled by the gadgets he comes in contact with as the caveman must have been by thunder and lightning. It's O.K. to be proud about what you know, but, on the other hand, there are times when I feel very humble and grateful for the education I'm getting. I want to share my knowledge and do something with my education to deserve this privilege."

"Hear! hear!" Jerry exclaimed.

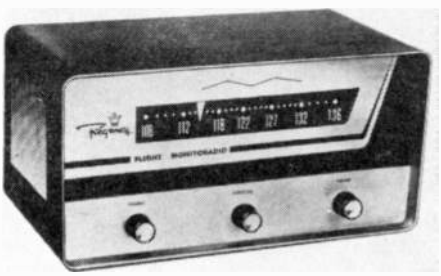
"So how do they share their knowledge?" Thelma asked rhetorically after a long silence. "They build Girl Detectors!"

The four of them immediately burst out laughing. -30-

New Products

AIRCRAFT-BAND RECEIVERS

Two new VHF aircraft receivers have been announced by Regency Electronics—the "Monitoradio" which covers 108-132 mc., and the "Flight Monitoradio" which also covers the civil transport frequencies (to 136 mc.). Features of the "Monitoradio" include 2 μv. sensitivity, .8 watt audio output, built-in antenna, and a temperature-compensated superheterodyne circuit. Price, $59.95. The "Flight Monitoradio" (shown in photo) boasts a nuvistor r.f. stage for



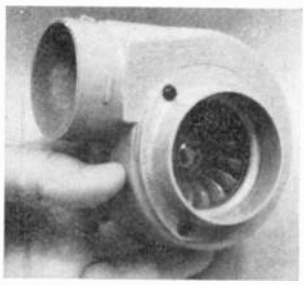
high sensitivity (1.0 μv.), a .5-100 μv. adjustable squelch, and 1-watt audio output with provision for an external speaker. Price, $79.95. (*Regency Electronics Inc.*, 7900 Pendleton Pike, Indianapolis 26, Ind.)

CONVERTIBLE GROUNDING PLUG

The new "Deflex" grounding plug can be used in either 2- or 3-hole wall outlets without adapters or grounding pigtails. An adapter and plug in one, it looks and operates like a conventional grounding plug when used in a grounding-type wall receptacle. To use it in a 2-hole (non-grounding type) outlet, you just press the blade latch and the grounding blade is deflected so that the two parallel blades can enter the receptacle. As an added bonus, automatic grounding is achieved when the deflected blade touches a grounded conductive face plate. The grounding plug is made of impact-resistant phenolic with a sturdy nylon shell, and is very simple to wire; full wiring instructions are included. Price, 98 cents, plus 12 cents for postage and handling; or three for $3, all charges paid. (*Morse Designs*, Box 472, Fort Lee, N.J.)

MINIATURE BLOWER

Measuring only $3\frac{19}{32}$" x $4\frac{1}{32}$" x $2\frac{1}{4}$", and weighing just a little more than half a pound, Rotron's low-cost "Nugget Blower" delivers 15 cfm of air for spot cooling. The Model CA-2 incorporates a completely new aerodynamic "Centraxial" wheel which



results in greater over-all blower efficiency than is available in other blowers of this size and price. Intended for use on 60-cycle power, the "Nugget" consumes only 7 watts at 3200 rpm. It can be operated in any position and many flexible mounting arrangements are possible. Price, $13.70. (*Rotron Mfg. Co., Inc.*, Woodstock, N.Y.)

TEST INSTRUMENT KITS

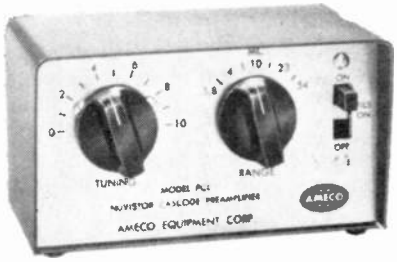
Featured in a series of Hallicrafters test instrument kits is the Model HO-1 precision 5" oscilloscope kit and the Model HM-1 vacuum-tube volt-ohm-milliammeter kit. The Model HO-1 is a wide-band oscilloscope —to 5 mc.—suitable for color TV servicing. Two preset sweep frequencies are switch-selected for automatic horizontal and ver-

tical synchronization. Price, $84.95. The HM-1, a versatile VOM, functions as an accurate milliamp meter providing ranges from 1.5 to 500 ma. in six steps. Seven a.c. or d.c. voltage ranges and seven ohm

ranges are also provided. Price, $29.95. Both of these instruments are also available factory-wired for $164.95 and $59.95 respectively, and there are five other test instrument kits in this series. (*Hallicrafters*, 5th & Kostner Aves., Chicago 24, Ill.)

ALL-BAND PREAMPLIFIER

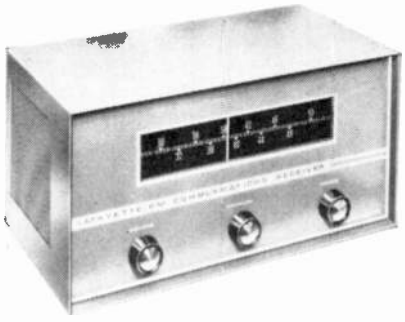
Hams and SWL's will be interested to know that Ameco's Model PCL all-band preamplifier improves reception on all frequencies between 1.7 mc. and 54 mc. Two nuvistors in cascode give noise figures of 1.5 to 3.4 db, depending upon the band, and over-all



gain is in excess of 20 db. The power requirements of 120 volts at 7 ma. and 6.3 volts at .27 ampere can be taken from any receiver. Price, $24.95. (*Ameco Equipment Corp.*, 178 Herricks Rd., Mineola, L.I., N.Y.)

FM COMMUNICATIONS RECEIVERS

Each of Lafayette Radio's two new 8-tube FM communication receivers offers 9-tube performance with a 3-gang capacitor tuning r.f., mixer, and oscillator stages, a de-



sign that really pulls in weak stations. The HB-75 tunes 30-50 mc., and the HB-76 tunes 152-174 mc. Both have a sensitivity of 4 μv. or less for 20 db quieting, built-in adjustable squelch circuit, built-in 5" PM speaker, illuminated 7¼" slide rule tuning dial, and a transformer-type power supply. An external speaker may be added if desired. Price, $59.95 each. (*Lafayette Radio Electronics Corp.*, 111 Jericho Turnpike, Syosset, L.I., N.Y.) -30-

Satellites On The Air

The following satellites, launched by the United States, were reported to have beacon and telemetry transmissions as of October 31, 1963. The satellites are listed by their code names, according to frequency; because some transmit on more than one frequency, they appear more than once.

Transit 4A	54.000 mc.
Vanguard 1*	108.017 mc.
Telstar 2	136.050 mc.
Alouette**	136.077 mc.
Relay 1	136.140 mc.
Explorer 16**	136.200 mc.
Transit 4A	136.200 mc.
Tiros 5	136.233 mc.
Tiros 6	136.233 mc.
Tiros 7	136.235 mc.
Ariel	136.406 mc.
1963 14C (US)	136.415 mc.
Explorer 14	136.440 mc.
Syncom II	136.470 mc.
1963 39B (US)*	136.530 mc.
Alouette**	136.594 mc.
Relay 1**	136.620 mc.
1963 38C (US)	136.650 mc.
OSO 1	136.744 mc.
Syncom II	136.770 mc.
Anna 1B	136.815 mc.
Explorer 16	136.860 mc.
Injun 3**	136.868 mc.
Solar Radiation	136.890 mc.
1963 30B (US)	136.891 mc.
1963 14B (US)	136.892 mc.
Tiros 6	136.921 mc.
Tiros 7	136.922 mc.
Tiros 5	136.923 mc.
Anna 1B	136.975 mc.
Alouette	136.978 mc.
Syncom II	136.980 mc.

*Transmits only while satellite is in sunlight
**Transmits only upon command from ground stations—not during every pass

Satellites of the Soviet Union have telemetry and tracking transmissions in the 19.990-20.010 mc. band. Whenever a Cosmos series satellite is launched, check Radio Moscow for an announcement of tracking frequencies. Most Cosmos series satellites re-enter the atmosphere in 60-90 days. Cosmos 2, 8, and 20 are in orbit at press time, but do not seem to be transmitting.

If you're interested in eavesdropping on satellites, and missed our June 1962 article on the NASA-136 converter, we recommend that you look it up. Easy to construct, this sensitive converter can intercept the satellites operating in the 136-137 mc. band.

Across the Ham Bands

(*Continued from page 77*)

Quality factor (*Q*), and in general, low losses mean high *Q* and high selectivity. Furthermore, when a device that has gain, such as a tube or transistor, is connected to a tuned circuit in a way that feeds some of the output back to the input in phase with the applied signal (regenerative feedback), the tuned circuit losses can be made up for by the fed-back energy. In effect, this multiplies the inherent *Q* of the tuned circuit many times (30 or 40 times is nominal), and thereby increases the selectivity. If the positive feedback is increased enough, a point will be reached where the losses are more than fully compensated for, and the circuit will oscillate; in fact, this is the basic principle of the oscillator.

If the positive feedback is held to a level a little below that producing oscillation, the Q-multiplication will be high, and the circuit will be sharply selective. And if we connect such a circuit in parallel with an i.f. stage of an ordinary receiver, we effectively add the selectivity of the Q-multiplier to that of the receiver. This is the way the basic "outboard" Q-multiplier works. If we add a second tube stage, we can also "invert" the effect, that is, produce a narrow, highly selective notch in the receiver's response curve, within which signals practically disappear. By adjusting the frequency of this rejection notch to the frequency of an interfering signal, we can wipe it out.

In the Q-multiplier circuit given here, Fig. 1 is the schematic for the basic multiplier, and Fig. 2 is the additional triode stage that inverts the selectivity effect to produce the rejection notch. The device can be built either as the simple high-selectivity circuit, or with the rejection feature.

In Fig. 1, *L1* resonates with *C2*, *C3*, and *C4*, and is adjusted to coincide with the center of the receiver passband by means of the coil tuning slug. Positive feedback to the grid is provided through *C1*, and the tube gain (and therefore the degree of selectivity) is controlled by potentiometer *R1*. If the circuit of Fig. 1 is to be used alone, be sure to include blocking capacitor *C5* in the lead to the i.f. amplifier tube plate pin.

The unit can be built on a small metal chassis and mounted within the receiver cabinet, or can go in a small aluminum box for outboard use. When the lead going to the i.f. amplifier plate pin will be more than a few inches long, a piece of small coax or other shielded wire should be used to minimize stray signal pickup. It will also be necessary to tune *L1* after this lead is in place, to compensate for the added capacitance.

In practice, the rejection feature of a Q-multiplier is of maximum value only when the receiver has relatively high selectivity without the Q-multiplier connected. Therefore, home-built Q-multipliers designed for use with inexpensive communications receivers sometimes omit this feature in the interest of simplicity. The *Across the Ham Bands* column in July, 1963, featured such a simplified Q-multiplier.

Types Available. Several modern communications receivers feature built-in Q-multipliers; some makers have optional "plug-in" Q-multipliers for use with their receivers, and a number of independent manufacturers offer accessory Q-multipliers in ready-to-operate or kit form for use with other receivers. And for transistor buffs, a transistorized Q-multiplier is described in recent editions of the *Radio Amateur's Handbook*.

Adding a Q-multiplier to an existing receiver decreases its gain slightly; this fact must be considered when the receiver gain is barely adequate to begin with. Also, most Q-multipliers are designed for i.f. amplifiers in the 450-470 kc. region, because most inexpensive communications receivers use i.f.'s in this region, and because, for technical reasons, Q-multipliers work best at comparatively low frequencies. But if your communications receiver doesn't provide all the selectivity you need, chances are a Q-multiplier will be a real help.

News and Views

Jon Nagy, WN2GFY, 245 Adelaide Ave., Highland Park, N.J., runs a "Novice gallon" (75 watts) to a Heathkit DX-60 transmitter. He takes his antennas standing up and laying down—with a Gotham V-80 vertical and a 40-meter, horizontal dipole. A National NC-105

handles the receiving chores, and Jon has a tape recorder which he uses to record many of his contacts. Twenty-four states and Canada worked on 80 and 40 meters are recorded in the WN2GFY logbook . . . **Daniel Rosenne, 4X4NSK,** 90 Sderot Herzl, Jerusalem, Israel, reports that he found his P.E. SWL (4X4PE1C) registration helpful in getting his Novice ticket. In Israel, Novices are allowed to run 10 watts input to a crystal-controlled c.w. transmitter between 7065 and 7085 kc. The Novice exam there consists of a 6-wpm code test and a theory test; higher class licenses require code at 16 wpm and passing an advanced theory exam. Dan's transmitter uses a 6C4 oscillator driving a 6V6 amplifier, and feeds (one at a time) two 40-meter dipoles, a "long wire," and a vertical antenna. His receiver is a modified Hallicrafters S-38 and a Geloso converter. As an SWL, he has logged hams in 45 countries. . . . **Ruth, WB6BNP,** forwarded a letter she received from Rashid Lawal, 15, Glover St., Lagos, Nigeria, Africa, as a result of her making "News and Views." Rashid is just finishing high school and would like to get a little info about SWL'ing and ham radio.

Nick Hudgen, WNØELR, 533 24th Ave. N.W., Minot, N. D., has convinced Novices in 28 states that there *are* hams in North Dakota by swapping QSL cards with them. If you need the state, Nick will sked you on 40 meters, where his Heathkit DX-40 transmitter shares time with a Drake 2B receiver on a dipole antenna. . . . **Steve Corbitt, WA4KXC,** 4055 Three Notch Rd., Mobile, Ala., feels slightly frustrated: in mentioning his Novice career in the October column, we gave his call letters as WN4KFC instead of WN4KXC! Since he got his General ticket, Steve's Heathkit DX-60 transmitter and Hallicrafters SX-110 receiver have pushed and pulled 48 states and 23 countries through his 40-meter dipole antenna. . . . **Dan Miller, WB6AGT,** 17755 Willard St., Reseda, Calif., passes on the info that JA1CUM (Japan) recently heard the following 7-mc. Novices in a half hour of listening: WH6EWP (Hawaii), KN7UJU, WN6CCW, WN6FJE, and WN6FYW. Dan himself worked over 500 stations in 40 states and five countries as a Novice, using a 15'-high dipole on 40 and 15 meters. A Heathkit DX-60 transmitter and a Heathkit HR-10 receiver were also involved.

Alan W. Hukle, WNØFMX, 903 Elm Ave., Norwalk, Iowa, prefers rag-chewing with the locals to chasing DX; as a result, he has only 37 states, Costa Rica, Puerto Rico, Canal Zone, Brazil, and many Canadians worked! A Johnson Viking Adventurer transmitter and two receivers—a Hallicrafters SX-28 and a National NC-98—plus 80-, 40-, and 20-meter dipole antennas are what Al uses when he "rag-chews". . . . **Cory K. Hamasaki, WH6FHN,** 2014 Round Top Terrace, Honolulu, Hawaii, hears many mainland Novices on 40 meters. He'd like to schedule a few of them to help them (and himself) get a Worked-All-States certificate. Cory uses a Heathkit DX-60 transmitter and a Hallicrafters SX-101A backed up with a Knight-Kit R-55 receiver. . . . **Dave Linderman, WN8IKP,** 576 Harlan N.E., Grand Rapids, Mich., credits the Grand

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A. Total No. copies printed (net press run)	510,054	470,404
B. Paid circulation		
1. To term subscribers by mail, carrier delivery or by other means	286,258	252,000
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I certify that the statements made by me above are correct and complete.

M. T. BIRMINGHAM, JR., Business Manager

Rapids Amateur Radio Association's Novice course for getting him his license. A Heathkit Apache transmitter choked down to the Novice limit, a Lafayette KT-320 receiver, and a 40-meter dipole have given him confirmations from 17 states. Last "Field Day," he and WN8IIK set up their own station in the "field," and ran up the tremendous score of 37 points! But they had fun. . . . **Bonnie Blake, WN2HOK,** 22 Foothill Rd., Bronxville 8, N.Y., has worked 26 states in two months on the air. As a YL, Bonnie says it is natural for her to be a rag-chewer; therefore, very few of her contacts are of the hello-and-goodby type. Her motto is "If I hear U and you hear me, expect a QSL." Look for Bonnie's Johnson Ranger-II on 40 and 15 meters; she'll listen to you on a Hallicrafters SX-101 receiver.

We hope the New Year will bring you success in our hobby. Keep your letters, comments and pictures coming. Send them to: Herb S. Brier, W9EGQ, Amateur Radio Editor, POPULAR ELECTRONICS, P. O. Box 678, Gary, Ind., 46401. 73,

Herb, W9EGQ

Peace Corps Volunteers

(*Continued from page* 55)

Perhaps the most spectacular of the group's ventures is "Project Teletek," a satellite tracking station which would be used to establish voice communication with Tokyo through the use of a satellite such as Relay or Telestar. This idea has so captured the imagination of technical people in Malaya that many engineers in non-academic circles are voluntarily contributing their time.

"Offing" a Switch. One of the things Horley and Weakley had to adjust to in Malaya was the blank stares they got when they used certain words in the classroom. For example, in Malaya, you don't "open" a switch, you "off" it. Students don't "take" exams; they "sit" for them. Last but not least, the new volunteer lecturer thinks twice before calling on a student for an answer when the student's name is something like "Baharudin bin Ahmad Khadir," or the even more familiar "Sivapakianathan."

Both Peace Corps volunteers are highly qualified teachers. Al Horley holds a B.S. in electrical engineering from Carnegie Tech, and an M.S. in applied physics from Harvard; he was working as an electronics consultant to the Rand Corporation before entering the Peace

Corps. Bob Weakley, who earned a B.S. and M.S. in electrical engineering from the University of California, was manager of the electrical machines section at Sundstrand Aviation.

Malaya: A Challenge. As Peace Corps volunteers, Al and Bob are paid on a level with their Malayan co-workers ($90 a month), and participate fully in college and community life. Both were making high salaries before going to Malaya. What have they received from the Peace Corps to justify their two years of service?

According to Al Horley, the work is its own reward. "The students we are training will be heading most of the public utilities in Malaya in a few years," he told an interviewer. "Helping Malayans build complex electronic projects in Malaya means a lot more than just a mere engineering accomplishment —it's a source of encouragement for people here and in other new countries who would like to participate in the space age but lack the confidence to do so.

"Speaking for myself, I'd say that both the professional and personal challenges and rewards have been much greater than I expected them to be. My Peace Corps service has been a real opportunity." -30-

Transistor Topics

(*Continued from page* 71)

sure to convert both meter readings [steps (c) and (d)] into the *same* terms—milliamperes or microamperes.

Product News. If current trends are any indication, 1964 may well prove to be the "year of the hobbyist," for more and more major manufacturers are recognizing the importance of the hobbyist-experimenter market. Last month, for example, we reported on the introduction of GE's "Experimenter Line" of electronic components designed specifically for the small buyer.

Another major manufacturer, the International Rectifier Corporation (233 Kansas St., El Segundo, Calif.), has introduced a pair of kits designed specifically for the experimenter. One is the Model K-546 zener diode kit; netting for only $6.50, this kit

contains an assortment of 12 zener diodes with a total value of approximately $30.00. The second item, the Model K-421 photocell kit, includes an assortment of seven silicon, cadmium sulphide and selenium cells, and nets for only $5.95. Both kits are offered through both local and mail order distributors.

The major semiconductor manufacturers are not the only ones recognizing the importance of *you*—the hobbyist. Two of the largest mail order distributors, Allied Radio (100 N. Western Ave., Chicago 80, Ill.) and Lafayette Radio Electronics (111 Jericho Turnpike, Syosset, L.I., N.Y.), list an assortment of low-priced semiconductor component kits in their latest catalogs.

It's the end of the line for now, fellows; back next month with the latest. . .

Lou

On the Citizens Band

(*Continued from page 74*)

many clubs that engage in a "summer siesta" as far as activities or meetings go, the S.L.R.C. continued to add members last summer, despite the heat. Among the activities were outdoor barbeques, a fishing trip, efficiency drills (on a hunt), and participation in the Lyndhurst Home Day. The club set up a display at the latter event to acquaint the townspeople with their operation and availability. The bearded gent in the picture is evidently Mr. X,

since Jack failed to shoot us his moniker. (Or is that *you*, Jack?) Present officers of the South-Lynd Radio Club are: Max Schneider, president; Jack Leach, vice president; Norm Leopprich, secretary; Ken Shimonek, treasurer.

The North Georgia CB Radio Club of Dalton, Ga., just spread the word that 3000 (wow!) licensees attended their CB jamboree last fall. Albert F. Orr, Jr. reports that 24 states were represented at the affair from as far west as California, as far north as New Jersey. Somehow, Alabama drew the honors with the most CB'ers in attendance.

The *CB Minutemen News,* official news vehicle of the CB Minutemen of (Seattle) Washington, reminded members in straightforward fashion recently of the FCC monitoring facilities now in effect throughout the state. The FCC field engineer of the Seattle office revealed that monitoring activity now includes the taping, photographing and transcribing of violations of FCC law to insure that both stations involved in any unlawful activity receive official notification. If deemed applicable by the local office, the Small Fines and Forfeiture Act will be imposed on *both* stations. It would appear that it will be the same in other states. 'Nuff said!

Four more clubs placed themselves on the OTCB roster this month. The first one in was the Chili-Ogden-Riga-Klub CB, P.O. Box 227, North Chili, N. Y. Organized late last year, it's headed by Alex McKay, president; Ted Henry, vice president; David Beatson, secretary-treasurer.

The Citizens Radio Club of Lombard, Ill., forwarded a well-organized edition of the *10-8'er,* the club's monthly. Edited by Jim Kaminski, KHA4705, with photography by Ray Meyer, KHC4746, the paper is interesting and worth-swapping-for! Contact club president Stan Mosher, 5715 W. Division St., Chicago, Ill., for more information.

The Middle Georgia Citizens Band Radio Club has also made a first report to the column with its paper, *The Little Beam.* The club serves Macon, Ga., Bibb County and vicinity. The group is CD-active; membership is nearing the half-a-hundred mark. More data on the M.G.C.B.R.C. may be had from John Hanson, KDD3644, P.O. Box 3335, Macon, Ga.

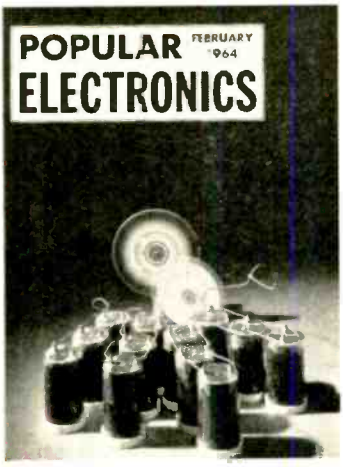
The Otter Valley Citizens Radio Club of West Central Vermont is back in the swing with its paper, *QRM,* which was on a hiatus over the summer and fall months. Latest project of the O.V.C.R.C.'ers is the voluntary monitoring of one another as a brush-up on proper operation and rule-abiding. Cards are furnished for mailing to those who have given permission to be monitored and notified if they are at fault CB-wise.

Quit stallin' and send us those pictures and activity schedules for 1964. The rest of the gang (all 450,000 of 'em) would like to hear about your operation—Citizens Band type!

—Matt, KHC2060

Coming In The Next Issue Of Popular Electronics:

- **WHAT'S YOUR INGENUITY QUOTIENT?**
- **ECONOMICAL FUEL CELLS FROM LIVE BACTERIA**
- **FOOLPROOF SINGLE TRANSISTOR IGNITION SYSTEM**
- **BARGAINS BY THE BAGFUL**



Four features that you won't want to miss in the February issue of ***Popular Electronics.***

Starting in the February issue, the Editors of POPULAR ELECTRONICS will publish one feature construction-project story that is "open-ended." It will be a new and original electronic circuit, that will lack final product engineering. We think that the project can be built better and/or differently. It will be a test of your ingenuity to come up with electronic or mechanical designs to utilize our circuit. If you do, your prototype will be featured in a subsequent issue—and you will be paid our editorial page rate. First project will be a "Light-Controlled Power Supply."

"Bug" Batteries? You may have heard of this far-out idea within the past year. The big news is that they're here: practical, economical fuel cells that generate electricity through the metabolic process of live bacteria. Here's how they work, what they can be used for, and how you yourself can build one.

Of 3,000 reader inquiries received since last June about transistorized ignition systems, over half asked for a foolproof, low-cost single transistor circuit. The February issue details just such a circuit. It is easily installed and may be constructed at a saving of $12 to $25 over manufactured systems now marketed. AND this one has a 400:1 turn ratio coil for that extra high voltage spark! A secondary feature of this ignition system is a dashboard mounted dwell angle meter that may be constructed for a few extra dollars.

Have you noticed that radio parts stores are loaded with plastic bag assortments of capacitors, resistors, potentiometers, etc. at bargain prices? We went out and bought all we could lay our hands on—and here's what we found. It's fascinating and informative—especially the part about one 99¢ "assortment" of 481 resistors of the same value. Anybody need a 220-ohm, ½-watt resistor?

BE SURE TO GET YOUR COPY OF FEBRUARY POPULAR ELECTRONICS—On sale January 21st —only 35¢ a copy

New Ultrasonic Radar

(*Continued from page* 49)

from the energy leaving it, at that instant, by an amount proportional to the time taken for the energy to travel out and be reflected back. The result is a continuous series of musical beat notes in the audible range that do a great deal to "light up" the world for the blind.

From Pulses to C.W.-FM. Many efforts have been made in the past to build blind-guides, such as Dr. Kay's device, using modulated and unmodulated ultrasonic pulses. The trouble with pulses is that they do not last long enough to tell the listener much about the surface from which they are being reflected. In addition, the length of time between pulses has to be carefully adjusted to avoid confusion between those going out and those reflected back.

Dr. Kay, who has studied the behavior of bats, noted that it was unlikely that these mammals use pulse-timing methods to guide them, since the "radar-like" resolution of which they are capable shows that echoes are received before transmission has ceased. From this observation, he was led to theorize that continuous FM sonic energy was utilized, and he incorporated the idea in his new blind-guide.

"Seeing" With Tones. What does a blind person hear when he points the ultrasonic probe at an object? First of all, he knows that the object is present, and approximately how far away it is. Up to three separate objects can be distinguished (unless they are very close together) through separate reflections. More than three echoes tend to merge into a musical sound or sound pattern. Each leaf or small branch of a bush, for example, produces its own weak signal. When these signals add together at the receiver, a characteristic noise is produced.

Ascending steps are an interesting example of sonic reflection. Many tones in an ascending scale are heard as the probe is pointed up the steps. The sound is musical, and each step can be counted as one note after another is heard to start. Descending steps are detected by the absence of a signal. The background from a path or floor ceases at about six feet, giving the user warning.

Pedestrians can be recognized by a rapid frequency change in the beat note as they approach or move on ahead. A smooth wall produces an almost pure tone of great intensity, while a corner of a room gives changing sounds as the sonic probe is rotated in the user's hand. A person wearing a woolen sweater produces a different echo than a hard surface such as a brick wall.

Said to be the first sensory blind-guide to pass beyond the prototype stage, Dr. Kay's device, made by Ultra Electronics Group, London, has been undergoing evaluation at British institutions for the blind, and ten of the instruments have been ordered by the Kentucky State Bureau of Rehabilitation for testing in this country.

Thanks to electronics and a cue from nature, the behavior of the bat, the blind may yet be made to "see." —30—

VHF Grid-Dip Meter

(*Continued from page* 61)

dial. Tune the trap trimmer over its range to resonate the trap at 106.9 mc. if possible. If necessary, trim the coil value, and try again, until you hit the frequency of the unwanted station. Now reconnect the trap coil and capacitor in *series* across the FM receiver input, and make final adjustment for minimum signal from the unwanted station.

Want to check the inductance of a VHF coil you're making for a project? Parallel it with a small capacitor of known value, say 10 $\mu\mu$f., and check the resonant frequency by use of the grid-dip meter. Then calculate the inductance required for resonance with the known capacitance value, or use a slide rule specially graduated for resonant frequency problems, such as the one distributed by Shure Bros., Inc., of 225 W. Huron St., Chicago, Ill.

No matter how you use it, the VHF Grid-Dip Meter is a big time- and sweat-saver when you're working on a VHF construction project. -30-

Three Letter Quiz

(*Quiz on page* 53)

1-H The American Wire Gauge (AWG) system is used to measure wire diameter in the United States.

2-D In Electron Coupled Oscillator (ECO) circuit, the screen is the oscillator anode. Output is coupled to plate via electron stream only.

3-A Greenwich Mean Time (GMT) is time at Greenwich, Eng., meridian, given in 24-hour system.

4-F Modulated Continuous Wave (MCW) is a type of tone-modulated carrier wave transmitted by some commercial radiotelegraph stations.

5-B Peak Inverse Voltage (PIV) is maximum voltage across a rectifier in the reverse polarity.

6-E A PPI is a radar display, Plan Position Indicator type, showing scanned area as a map.

7-J A radio-frequency choke (RFC) is a coil having relatively high inductive impedance within its usable frequency range, without self-resonance.

8-G The root-mean-square (RMS) value of a sine-wave a.c. is the value that will cause the same heating effect in a resistive load as a numerically equal value of d.c.

9-I In single-sideband (SSB) transmission, the carrier and one sideband are suppressed, and only the remaining sideband is radiated.

10-C The standing wave ratio (SWR) on a transmission line is maximum value of current or voltage to minimum value, as measured along line.

Drug Store Tube Tester

(*Continued from page* 52)

We placed the five suspects in a paper bag and crossed the road for the third time. Denny inserted the 5U4 into the tester.

Drug store-type tube testers provide an excellent test for 5U4's and other rectifiers since they are basically diodes. As a matter of fact, these testers test all tubes—triodes, pentodes, etc.—as if they were diodes. This is called an *emission test*. Control grids, screen grids, and other elements are tied together and attached to the plate. The right voltage is applied to the heater which warms the cathode, causing the emission of electrons.

A meter in series with the plate indicates the current flow, and if it approximates the amount of current an average tube of that type draws, the meter needle will rise into the "good" region.

The idea behind emission tube testers is that if cathode emission is satisfactory, it follows in most cases that all the rest of the complex characteristics of the tube are up to par. Since this may or may not be true, the accuracy of the tester is limited. There are plenty of ways for a tube to be bad and still read "good."

The rule to follow is that if a tester says a tube is "bad," you can be fairly certain it *is* bad. If the tester says a tube is good, it might be true, but it ain't necessarily so.

The 5U4 from Albert's TV set was getting a fine test since it was a diode. The needle rose very slowly, stopping short of the question mark. It needed replacing. Denny plugged in the 6AX4 damper, also a diode. The needle rose smartly into the "good" region. Denny tapped it gently with his finger. The neon lamp labeled "short" flickered.

"Uh-oh, another bad one," I told him.

The next tube was the 6BQ6 horizontal output. It lit brightly, in fact too brightly. Instead of burning with a reddish light, the heaters had a yellowish glow like a candle—a sure sign of burning carbon rather than glowing metal. It took about the same time for the meter needle to rise into the "good" region as it took the TV picture to spread out. This tube was the reason for the slow spread. Denny turned the tester off quickly.

"You've really got it down to a 'T'," I congratulated him. For most tubes, prolonged emission testing is bad. This is because, with all the elements tied together, there is no valve action on the tube like that normally exercised by the control grid, and the tube runs wide open. Sensitive elements can become hot, swell, and get loose. A good tube can end up bad if tested too long. It didn't matter in this case, however. The 6BQ6 was on its last legs.

Next to be tried was the 12BH7. The meter needle rose swiftly through red, yellow, and green, and hit the pin on the meter. Denny turned off the tester. The tube was running too hard. Too much uncontrolled emission, probably because of gas in the tube. This defect was causing excessive vertical sweep which was, in turn, responsible for the fold-over in the TV picture.

The last tube Denny tried was the 6BQ7, a dual triode. The first triode section tested perfectly. He tried the second section. The needle rose jerkily and vibrated in such a way that the pointer tip looked blurred. It never made the green, and the neon flickered on and off. The one good triode would have to be discarded, and the tube replaced. This is often the case with multiple section tubes—the important thing is not to forget to test each section.

Armed with five new tubes, we returned to Albert's TV set. When we were done the picture was full and bright, and the snow was gone.

I was really bushed now. I trudged back to our room and dozed off, leaving Denny to watch TV. The last thought I had was wondering whether or not the hero and heroine in the science fiction movie ever made it to Jupiter.

The next morning Denny was up bright and early. "Gee, Dad, you missed a nifty science fiction picture last night," he greeted me.

"Sure, you dragged us around fixing everybody's TV sets."

"No, Dad," he answered. "This was after you fixed them. That movie ran continuously all night!" -30-

Two-Tube Superhet

(*Continued from page* 48)

ing slug screw of *L1* to ½" above the shield can, and the slug screw of *L2* ¾" above the shield can; this should bring the adjustments in the vicinity of 80 meters, and you can readjust on received signals.

A ground connection will probably improve reception, and is also advisable if you use *C18* and *C19* across the power transformer primary, as otherwise the chassis will be slightly "hot" to ground. If you have no trouble with line noise or transmitter r.f. into the receiver, *C18* and *C19* can be omitted. The author used a hank of stranded insulated wire about 20 feet long as an antenna and an inexpensive imported type of crystal headset (Lafayette MS-369 or equivalent) for reception.

The c.w. signals are received with the detector *REGEN* control set just above the point of oscillation and the *GAIN* control low enough to prevent detector overloading. Phone signals are received by setting the *REGEN* control just below the point of oscillation. With a little trial and error, you'll find you can hear just about any signal on the band that anyone else can hear, and without straining your ears, either. -30-

The WXCVR

(*Continued from page* 65)

ground lug bolted on the left end of the cover. Run a fairly heavy, solid wire from terminal 1 to the grounded mounting foot of the 3-lug tie strip. Use similar wire for the balance of *T1*'s connections to insure adequate support for the transformer. A study of the illustrations will reveal how the rest of the components are mounted and wired.

Antenna Tips. Don't skimp on the skywire if you want topnotch performance from the WXCVR, for long wavelengths need long antennas. Within 50 miles of an FAA station, a 25' antenna will prob-

ably be sufficient. However, if you want to reach out for distance, put up at least 50 feet of wire, and install the antenna as high in the air as possible.

For best results, use a cold water pipe or a rod driven into moist earth for the ground connection. If you can't conveniently do this, simulate a ground by connecting 20 or 30 feet of wire to the ground terminal of *TS1*. Put this wire on the floor under a rug, or run it along the baseboard.

Adjustment. After temporarily taping *L3* to the case of the radio the WXCVR is to work with, adjust the slug until ¾" of the slug screw extends outside the coil form. Should the receiver have no built-in loop, but, instead, require an external antenna, wrap a couple of turns of insulated wire around *L3*, strip the opposite end of the wire, and connect it to the radio's antenna terminal.

Add 1150 kc. to the frequency of your nearest FAA station as listed in the table. Tune the receiver to the sum of the two frequencies, which will lie somewhere between 1350 and 1550 kc. With antenna, ground and battery connected to the WXCVR, and *S1* switched on, slowly adjust the slug of *L2* until the carrier generated by *Q1* is heard in the radio. If you hear more than one carrier during this adjustment, pick the strongest.

Now retune the receiver dial to 1150 kc. If a strong broadcast station occupies this spot, move over to 1140 kc. or 1160 kc. Adjust the slugs of *T1* and *L3* for maximum noise, hiss, or static. With ordinary luck, you will already be hearing the weathercaster's voice. If not, slowly move *L2*'s slug back and forth until you encounter the desired signal. Touch up *T1* and *L3* for maximum volume.

As you align the converter, you will probably hear what sound like slow speed code stations. These are airways and marine beacons, many of which operate on the low frequencies. You will also hear a Morse code identification signal under the voice of the weathercaster. Tweak the receiver dial slightly to accentuate the voice and discriminate against the beacon tone.

If you want to explore the band from 200 to 400 kc., slowly tune *L2*'s slug through its adjustment range. As you discover interesting signals, repeak *T1* for best reception.

Final Installation. With adjustment on the desired FAA station completed, machine screws can be used to fasten the rear cover of the converter to the back of the receiver. Fasten *L3* in place after finding the position which provides maximum signal transfer to the receiver's loop. To avoid the danger of shock when working with an a.c.-d.c. set, be sure that the converter's mounting screws and other parts do not make contact with any metal parts of the receiver. Apply plastic electrical tape to all screws that protrude from the receiver's case.

Readers located beyond the range of an automatic weathercaster need not despair. Similar information is transmitted at half-hour intervals on many other low-frequency channels. A complete list of all FAA radio facilities is contained in the *Airman's Guide*, available for about 75 cents (the price varies) from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.; since a new issue is published every two weeks, you may be able to wangle a copy for free at the local airport. The station list is also given in *Weather Services For Pilots*, also available from the Superintendent of Documents (for 10 cents), but this pamphlet is not so frequently updated as the *Airman's Guide*. -30-

Short-Wave Report

(*Continued from page* 81)

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/or schedule with little or no advance notice. All times shown are Eastern Standard and the 24-hour system is used. Reports should be sent to P.O. Box 254, Haddonfield, N.J., 08033, in time to reach your Short-Wave Editor by the eighth of each month; be sure to include your WPE Monitor Registration and the make and model number of your receiver. We regret that we are unable to use all of the reports received each month, due to space limitations, but we are grateful to everyone who contributes to this column.

Basutoland—Station ZRE41, Maseru, operates on 3824 kc. with 100 watts for private communications with school managers and mission stations. Once weekly, on Friday at 1230-1330 (repeated Saturday at 0130-0230), there is a special broadcast for the teachers. The language used is mostly Sesotho, the language of the country. Future plans call for a power increase to 500 watts. Other sources indicate that there will be a government station started in Basutoland this year.

Bolivia—A few stations being noted include: CP81, *R. Pio XII*, Llellagua, 5959 kc., from 0350 s/on with a prayer, news, and music; *R. Chorolque*, Tupizia, 6140 kc., at 0645-0700 with music; CP75, *La Cruz del Sur*, La Paz, 4985 kc., in Eng. at 2130-2145; CP5, *R. Illimani*, La Paz, 4955 kc. (a move from 5955 kc.) from 0600 to 2300; CP41, *R. Loyola*, 5995 kc., Sucre, at 0600-0830 and up to 2130 s/off; CP15, *R. El Condor*, La Paz, 6125 kc., scheduled at 0600-1300 and 1700-2330; and CP18, *R. El Condor*, Oruro, 6070 kc., from 0700. The latter station will verify correct reports with a radio pennant.

Brazil—Station ZYZ27, *R. Mayrinck Veiga*, Rio de Janeiro, 9575 kc., is strong at times from 2200 to 2300 when Rome's signal is down. News in Portuguese is given just prior to 2300 s/off.

A new station is *R. Educadora de Uberlandia*, 3295 kc. (Caixa Postal 401, Uberlandia, Minas Gerais), noted around 1915 with tests consisting of commercials and Brazilian music. Do not confuse this with *R. Difusora de Uberlandia*, ZYV30, which is on 3355 kc.

Canada—Long-inactive CFCX, Montreal, has returned to the air on 6005 kc., with 75 watts, and is heard at 1500-1655 relaying CFCF. The full schedule is not yet known. Do not confuse this station with CJCX, Sydney, on 6010 kc.

Here is the most recent schedule for the Canadian B/C Corporation. They broadcast to Europe at 0700-0730 (to 0815 on Sundays) for the Canadian Forces on 17,820, 15,320, and 5970 kc. (replacing 6120 kc.); the Polish xmsn at 1215-1300 and the German xmsn at 1300-1330 are now on 15,320, 11,720, and (from 1230) 9630 kc. (replacing 17,820 kc.). In the African Service, Eng. is given daily at 1332-1415 and French at 1415-1458 on 11,720 and 9630 kc. (replacing 17,820 kc.); also on 15,320 kc. at 1332-1445. Changes in the Europe II xmsn are as follows: French is aired at 1501-1544 daily and Eng. at 1545-1630 daily on 11,720, 9630, and 5970 kc. (replacing 15,320 kc.). The xmsn to the Caribbean and N.A. is broadcast daily at 1800-1830 in Eng., to 1900 in Portuguese, to 1945 in Spanish, all on 11,720, 9625, and 5970 kc. (replacing 15,190 kc.). French and Eng. news at 1700-1745 to Northern Canada can now be heard on 11,720, 9585, and 5970 kc. (replacing 6120 kc.). English to Northern Canada can also be heard daily at 2000-0200 on 9585 and 5970 kc. (replacing 6120 kc.), and on 11,720 kc. from 2000-2130. No changes have been made in the Australian and Western N.A. xmsns.

Chile—A cordial two-page letter was received from the general manager of *Cia. Chilena de Comunicaciones, S.A.*, Casilla 37-V, Valparaiso, stating that this reporter's

report was the first they had ever received from the midwestern area for their rotary broadcast over CE1190, 11,900 kc. They seemed to appreciate a detailed log of the program, including the name of the speaker and the topic, in addition to the usual signal strength and readability qualities. Other stations noted recently include CE1180, *R. Agricultura*, Santiago, 11,800 kc., at 2000-2030 with news and music, and CE970, *La Voz de Chile*, Santiago, 9700 kc., at 2235 with classical music.

Colombia—HJNE, *R. El Sol*, has moved from 6115 to 5040 kc. where the signal is much improved. Try for it around 2319-0003. Four years of reporting to them finally produced a verification!

Congo, West—Brazzaville has been noted on 15,235 kc. from 1425 with bell IS; ID at 1430; then French. They did not carry the Eng. news as on 15,190 kc. Noted to 1530, all-French.

R. Congo, Brazzaville, is scheduled as follows: Monday to Saturday at 2330-0130, 0600-0800, 1030-1600 (Saturdays to 1700), and Sundays at 2330-1600. Frequencies in use are 3364 and 4843 kc. (morning and evening, GMT) and 7175 kc. (midday, GMT).

Dominican Republic—HIN, Santo Domingo, 4913 kc., is strong to 2305 s/off.

Ecuador—*R. Rio Tarqui*, Cuenca, 3995 kc., is fair with music and Spanish anmts from 0200 to 0300 or later. Station HCMX4, *R. Cenit*, Portoviejo, 4770 kc., is fair in Spanish to 0000. Station HCWE1, *R. Nacional Espejo*, Quito, has moved from 4680 and 4630 kc. to 4880 kc., and is strong to 0100/close.

El Salvador—Station YSCB, *La Voz del Pacifico*, Sonsonate, 4840 kc., was tuned at 2046-2107 with music and numerous ID's. Station YSS, *R. Nacional*, San Salvador, 9555 kc., is heard well at 2100-2300 with symphonic music and frequent ID's; the IS is four notes on an xylophone.

England—A portion of the latest British B/C Corp. schedule reads: to Australia at 0400-0700 on 17,760, 15,435, and 15,070 kc.; to the Americas, the Atlantic and Pacific Isles at 1600-2200 on 12,040, 11,750, and 9510 kc.; to Antarctica at 1700-1830 on 11,820 and 9765 kc.; to Africa and the Mediterranean at 0400-1600 on 21,710, 21,470, and 15,070 kc.; to the Middle East and E. Africa at 0400-1600 on 21,470 and 15,070 kc. This schedule is subject to frequent change.

Ethiopia—Station ETLF, *Radio Voice of the Gospel*, Addis Ababa, was noted on 15,440 kc. with Eng. to W. Africa at 1830-1925; a newscast is given at 1900. The 15,315-kc. outlet is reported at 1330-1400 daily (Wednesdays to 1430) with a religious program, Eng. lessons, the program "Wide Wide World" and a newscast.

Fiji—Station VRH10, Suva, is a new one on 9715 kc., noted at 2345-0100 with songs and music in native language, a short talk in French, and, perhaps, a ball game.

Formosa—*Voice of Free China*, Taipei, was noted on 9720 kc. with talks and music in Eng. and Japanese. They issue a fine verification card.

Germany, West—*Deutsche Welle* is scheduled to N.A. (East Coast) in Eng. at 2035-2115

SHORT-WAVE ABBREVIATIONS

anmt—Announcement	N.A.—North America
B/C—Broadcast	QRM—Station interference
Eng.—English	R.—Radio
ID—Identification	s/off—Sign-off
IS—Interval signal	s/on—Sign-on
kc.—Kilocycles	xmsn—Transmission
kw.—Kilowatts	

and in French to 2155 on 6160 and 9640 kc. (replacing 6110 and 9545 kc.) and in German at 1900-2200 on 6100, 6175, and 9545 kc. (replacing 9640 kc.); to N.A. (West Coast) in Eng. at 2355-0035 on 6145, 9575, and 9735 kc. (replacing 11,735 kc.), at 1010-1050 on 11,795 and 15,405 kc. (replacing 9605 kc.), and in German at 2200-0100 on 6100, 6160, and 9640 kc. (replacing 9575 kc.).

Guatemala—TGRE (?), *R. Modelo, La Voz de Retalhuleu*, Retalhuleu, 11,750 kc., is noted from 1645 to 1700 s/off and from 1925 to 1945 with music and commercials.

Mexico—Station XETS, Tapachula, Chiapas, one of the newer ones, is noted on 6120 kc. with relays of RPM network until 2358 s/off. Their verification card shows two kittens playing with a harp. Reports go to Napoleon Correa, Concesionario.

Mozambique—For the DX hunters, here is the latest schedule on *R. Clube de Mocambique*, Lourenco Marques.

The "A" Program in Portuguese is broadcast daily on 3260 kc. at 1230-1600; weekdays on 4925 kc. at 2330-0100 and daily at 1230-1600; on 6115 kc. Monday to Friday at 2330-0700 and 1030-1600, Saturdays at 2330-1600, Sundays at 0015-1600; on 7210 kc. Monday to Friday at 2330-0700 and 1030-1230, Saturdays at 2330-1230, Sundays at 0015-1230; and on 11,835 kc. Monday to Friday at 0100-0700 and 1030-1230, Saturdays at 0100-1230, Sundays at 0015-1230.

The "C" Program in Portuguese is broadcast on 17,775 kc. daily at 1130-1500; the same channel is also used for special xmsns on Sundays at 0200-0400. Ronga and Shangane xmsns are aired daily at 1100-1400 on 3300 and 4865 kc. (on Sundays also at 0000-0400 on 4865 kc.). There is a religious program on 3300 and 4860 kc. daily at 1430-1600 and on Sundays at 1430-1615 and 2330-0000.

The "B" Program in Eng. and Afrikaans is broadcast on 3215 kc. at 1200-1800; on 4835 kc. at 2230-0000 and 0900-1600; on 6050 kc. at 2230-1000; on 7250 kc. at 0000-0900; and on 11,760 kc. at 0000-1200.

Regional stations also operating include Porto Amelia in Portuguese and Macua do Medo on 3395 and 7115 kc.; Nampula in Portuguese and Macua on 3300, 4855, 4975, and 7190 kc.; Quelimana in Portuguese on 4865 kc. (or 4940 kc.) and 7160 kc.; and in Chuabo on 3210 kc. A new station in Beira to open in 1964 will operate on 3355, 4895, 6040, 7265, and 9395 kc. This information is from *Sweden Calling DX'ers* bulletin.

Netherlands—*R. Nederland*, Hilversum, has made a change in its daily-except-Sun. xmsn to N.A.: the program at 1630-1720 is now transmitted on 11,800 kc. (replacing 15,445 kc.) and 9715 kc. to N.A. and on 6020 kc. to Europe. The 2030-2120 xmsn remains as is, i.e., on 9590

and 5985 kc. "Dutch By Radio" is broadcast on Sundays and Wednesdays at 1530-1550 on 11,730 and 9525 kc.

We are also in receipt of a report that *R. Nederland* is operating on 3280 kc. around 2130 in Dutch with classical music; this has not been confirmed by the station as yet and it may be only a test program.

New Guinea—According to the Japanese Shortwave Club bulletin, VLT has been noted testing on 4890 kc. at 1500-1700 (on Saturdays from 1530) and at 0200-0830 (on Saturdays to 0900). Station VLK3, on 3925 kc., was logged at 1500 s/on; their schedule is said to be 1500-1700 (Saturdays from 1530) and 0200-0830 (Saturdays to 0900). The station reports that VLT5, 5015 kc., has been dropped. *R. Wewak*, VL9CD, 3335 kc., 250 watts, located in Konedobu, is scheduled for 0230-0700 but has not, to our knowledge, been heard in N.A. as yet.

New Zealand—There are two changes from Wellington. The 9540-kc. outlet has been shifted to 9520 kc. to escape QRM from Moscow but tuning around 0100 s/on indicates that now there is QRM from *R. La Cronica*, Lima, Peru. The other change finds an outlet in use on 11,820 kc. from 2315 to 0045 s/off with Eng. to the Pacific Isles. The 6080-kc. channel is also noted at good level around 0100-0200 with news, music, and commentaries. The station welcomes reports.

Peru—Station CAX10, *R. Chiclayo*, Chiclayo, has moved from 5680 kc. to 5520 kc. and is good to 0000 s/off. *Radio Huarez*, Huarez, is fair on 5968 kc. with music and ads to 0000 s/off. Station OAX8V, *R. Echo*, Iquitos, is strong at 2230 with Spanish music. Station OAX4G, *R. Lima*, Lima, 6190 kc., is good from 0030 to 0055 s/off (may run to 0100) with music and ads. Station OAX1B, *R. Piura*, Piura, 6201 kc., has a varied program around 2210-2250 in Spanish without commercials. Station OAX4T, *R. Nacional*, Lima, 15,150 kc., is heard well from 1900 to past 0000, all-Spanish, and on 9562 kc. at 1930-2100.

A report from South America lists two Peruvians on the same channel at the same time: OZ4T (call-sign is doubtful), *R. Chanchamayo*, La Merced, on the air at 0600-0000, and *R. Villa Rica*, Huancavelica, operating from 0700, both on 4865 kc.

Reunion—A recent verie letter from *Radiodiffusion de la Reunion*, St. Denis, states that they are on 3380 kc. rather than 3385 kc. as listed in this column last September. Their power is 4000 watts and they broadcast at approximately 2130-2215.

Ruanda—*Deutsche Welle (Voice of Germany)* will operate a relay station in Kigali with 600 watts and this will eventually be increased to 100 kw. The schedule reads: 7225 kc. at 2330-0555 and 7260 kc. at 1055-1650.

Sao Tome—*R. Clube de Sao Tome* is operating on 4807 kc. until 1700/close. According to the station, this is the only short-wave outlet in use.

Thailand—The new program schedule reads: at 2315-0015 in Eng. to N.A. on 11,910, 7305, and 6160 kc.; and at 1200-1300, also in Eng. to N.A., on 11,910 kc. Reports wanted; no return postage is required.

U.S.A.—Station WINB, Red Lion, Pa., has moved from 11,785 kc. to 11,795 kc. and is heard at 1605-1730 with light and pop music, news, and variety music and talks.

U.S.S.R.—Moscow changes frequencies so often it is difficult to keep abreast of them. Here is what we have at press time: 1830-1930, 2000-2200, and 2230-0100 on 7150, 7320, 9620, and 9680 kc. (also on 9730 kc. to 2300); 1830-1930 and 2000-2200 on 9570 and 9650 kc.; 1730-1800 and 2230-0100 on 9610 and 9660 kc. Other channels: 7200 kc. at 1830-1930; 7240 kc. at 0000-0100; 7310 kc. at 1730-1800, 2100-2200, and 0000-0100; 9700 kc. at 2100-2200; and 9740 kc. at 1730-1800 and 2100-2200. *Novosibirsk*, 4430 kc., was heard in Russian at 1809 and with a Moscow relay at 1810-1830. *Radio Yerevan*, 15,490 kc., had exercises at 2318, baroque orchestra music at 2336, and by 0000 had faded.

Vatican City—According to announcements, *Vatican Radio* is also using 6145 kc. in addition to the regular channels (9645 and 7250 kc.) at 1950 in Eng. to N.A.

Unidentified—There is a station on 11,830 kc. from 2300 s/on that uses a song which resembles a chicken cackling. This was also noted several years ago being used by a station thought, at that time, to be a Belgian Congo station. -30-

SHORT-WAVE CONTRIBUTORS

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Wendell Craighead, Kansas City, Mo.
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Joe Piechuta, Meriden, Conn.
Clifford Riffel, Gleemoor, South Africa
Clark Walker, Erie, Pa.
Jim Wedewer, Dyersville, Iowa
Victor Whicher, Grand Forks, N.D.
Sweden Calling DX'ers, Stockholm, Sweden

SWL QSL Bureau

THE SWL QSL Bureau is a non-sponsored organization operating with the cooperation of the ARRL QSL Bureau and Newark News Radio Club. Its purpose is to handle incoming overseas SWL and QSL cards destined for W, K, and VE SWL's. When cards arrive with a complete address, the SWL is notified by post card and requested to send a 9½ x 4⅛ inch SASE (self-addressed, stamped envelope), with an extra stamp, to the Bureau so that the cards may be forwarded to him. Many SWL and QSL cards arrive incompletely addressed, however, or addressed only to a WPE call-sign. Such cards are being held for the call-signs listed at right.

If your call-sign appears in this list, and you have not already filed your name, address, and WPE call-sign with the Bureau, send an SASE to: LeRoy Waite, WPE2AK, Manager, SWL QSL Bureau, 39 Hannum St., Ballston Spa, N. Y. Upon receipt of the SASE, your card(s) will be forwarded to you.

WPE1CCS
WPE1DIA
WPE1DIP
WPE1DKI
WPE1EHJ

WPE2AAK
WPE2ADW
WPE2AQO
WPE2AWP
WPE2BJV
WPE2BNW
WPE2CBP
WPE2CFP
WPE2CRL
WPE2CSD
WPE2CSE
WPE2CSL
WPE2CT
WPE2DDZ
WPE2DEY
WPE2DNL
WPE2EAA
WPE2EC
WPE2EGX
WPE2EMG
WPE2FEN
WPE2GJD
WPE2HIH
WPE2HKT
WPE2ICG
WPE2IMK
WPE2JPZ
WPE2KK

WPE3AGB
WPE3AT
WPE3BDV
WPE3CCM
WPE3CQF
WPE3DTI
WPE3ELG
WPE3UY

WPE4CIA
WPE4CVN
WPE4EDP
WPE4EEJ
WPE4RX

WPE5ACB
WPE5AWK
WPE5AWV
WPE5BPX
WPE5CFE
WPE5CNR
WPE5CQF
WPE5DGW
WPE5RJ

WPE6AQT
WPE6BJW
WPE6CBQ
WPE6CRE
WPE6CRJ
WPE6CWY
WPE6COV
WPE6DYH
WPE6DYW
WPE6DYX
WPE6OT

WPE7AKB
WPE7AQB
WPE7AQZ
WPE7BEM

WPE8BAU
WPE8BGP
WPE8BTP
WPE8BXY
WPE8CBC
WPE8CBG
WPE8CMQ
WPE8DQF
WPE8EUI
WPE8PH

WPE9ATR
WPE9BOJ
WPE9CFZ
WPE9CQV
WPE9CXR
WPE9DKH
WPE9EQI
WPE9ETT
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TRANSISTORIZED Products Importers catalog, $1.00, Intercontinental, CPO, 1717, Tokyo, Japan.

INVESTIGATORS, free brochure, latest subminiature electronic listening devices. Ace Electronics, 11500-L NW 7th Ave., Miami 50, Fla.

CANADIANS—GIANT Surplus Bargain Packed Catalogs. Electronics, Hi-Fi, Shortwave, Amateur. Citizens Radio. Rush $1.00 (Refunded). ETCO, Dept. Z., Box 741, Montreal, CANADA.

TELEPHONE Voice Switch (LS-500). Actuates automatically and unattended any tape or wire recorder. Pictorial installation instructions included. $23.75. Post Paid US. WJS Electronics, 1525 No. Hudson, Hollywood 28, Calif.

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SAVE Money—Free catalog: Photography, Tape Recorders, Hi Fidelity, Electronics, Tools. Wholesale Radio & Camera Co., Box 3085, Phila. 50, Pennsylvania.

OHM'S law never forgotten with copyrighted tool. $2.00 Postpaid. Beck Radio, 6323 South Dale Mabry, Tampa, Florida 33611.

CB QSL Cards—Over 45 highly attractive designs, 2 colors on glossy white. Other CB novelties. Call Record Books, Plastic Card Holders, Warning Stickers and Gag Signs. Catalog Free! Woody, 2611 Shenandoah, St. Louis 4, Mo.

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1000 universally adaptable HAM/SWL QSL cards $6.00 postpaid. K6BX, Box 385, Bonita, California.

10 DISTANCE Crystal set plans—25¢; 20 different, 50¢. Includes Transistor experiments, catalog. Laboratories, 1131-L Valota, Redwood City, California.

TRANSISTORIZED Products Ukiyoe Stamps Other General Merchandise Catalogue $1.00, Gitai Shibamuro No. 10, Sendamachi Koto-Ku, Tokyo, Japan.

BUY From Factories! Appliances, cameras, watches, etc! Free details! Cam Company, 436PH Bloomfield Ave., Verona, N. J.

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SAMS Folders—Nos. 99 to 326, in excellent condition, $265.00 (Less than $1.20 each) In four metal cabinets. Joseph Wagner, 6146 Verona Road, Verona, Pa.

DC-DC Converter transformers. Write for free literature. Milwaukee Electromagnetics, Dept. A, Box 4476, Milwaukee, Wis. 53207.

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	3S4	.75		6CG8	.80		8EB8	.94		12SK7GT	.95
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	5V6	.56		6EA8	.79		12AX4	.67		25CU6	1.11
	5X8	.82		6EB5	.73		12AX7	.63		25DN6	1.42
	5Y3	.46		6EB8	.94		12AY7	1.44		25EH5	.55
	6AB4	.46		6EM5	.77		12AZ7	.86		25L6	.57
	6AC7	.96		6EM7	.82		12B4	.68		25W4	.68
	6AF4	1.01		6EU8	.79		12BD6	.50		32ET5	.55
	6AG5	.70		6EV5	.75		12BE6	.53		35C5	.51
	6AH4	.81		6EW6	.57		12BF6	.60		35L6	.60
	6AH6	1.10		6EY6	.75		12BH7	.77		35W4	.42
	6AK5	.95		6FG7	.69		12BK5	1.00		35Z5	.60
	6AL5	.47		6FV8	.79		12BL6	.56		36AM3	.36
	6AM8	.78		6GH8	.80		12BQ6	1.16		50B5	.69
	6AQ5	.53		6GK5	.61		12BR7	.74		50C5	.53
	6A55	.60		6GK6	.79		12BV7	.76		50EH5	.55
	6AT6	.49		6GN8	.94		12BY7	.77		50L6	.61
	6AT8	.86		6H6	.58		12BZ7	.86		70L7	.97
	6AU4	.85		6JSGT	.51		12CN5	.56		117Z3	.85
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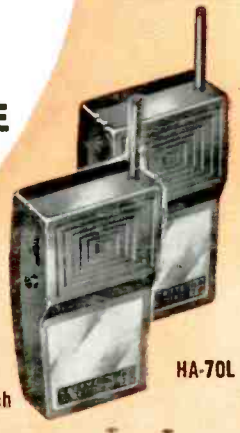

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