SPECIAL "COMMUNICATIONS" ISSUE

POPULAR ELECTRONICS

AUGUST 1965

35 CENTS

- How to Add a Mechanical Filter
- What's Available in Police Receivers
- What's New in CB Transceivers
- Build Transistorized Ham Rig for Camping
- Ham Equipment for the Newcomer
- We Test Out the HRO-500

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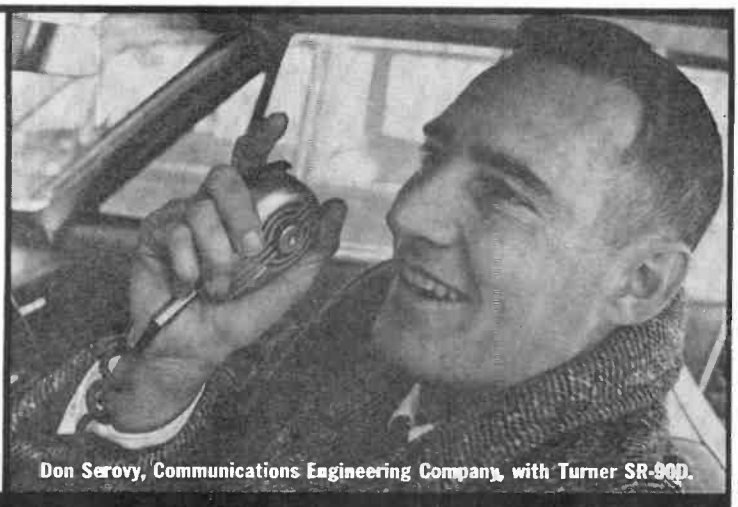
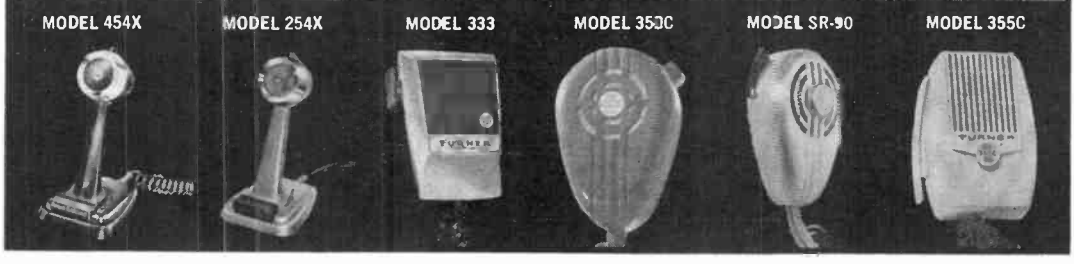


Don Serovy, Communications Engineering Company, with Turner SR-90D.



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

This month's cover photo by Dan Rubin

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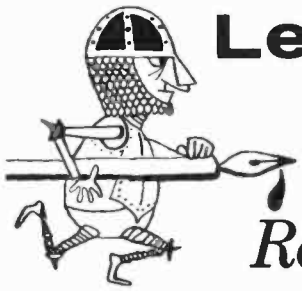

Letters *from our Readers*

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

Hobby Frequencies Proposed For CB

■ Because of your articles in the October and November, 1964, and the January, 1965, issues on the subject of the Citizens Radio Service, I thought you might be interested in a bill I introduced recently, House Resolution 377. I am enclosing a copy along with a press release explaining my position on the subject.

FRANK T. BOW, M.C.
Washington, D.C.

Our readers will be interested to know that in his bill Rep. Frank T. Bow (R-Ohio) proposed assignment to the Citizens Radio Service of all or part of the 28-mc. band now assigned to the Amateur Radio Service. He also asked for an investigation of the recent FCC order which restricts CB operations. In his press release Bow said that thousands of persons throughout the country have obtained CB licenses primarily for hobby operation, and that FCC failure to explain or enforce limitations on hobby operation encouraged its development. He wants to find a means of continuing to permit CB hobby-type operation.

"Re-Broadcaster" Gets Blue Ribbon

■ I thought you might be interested in hearing about an unusual use for the "Wireless Re-Broadcaster" (January, 1965). I am the assistant leader of a Cub Scout Pack and we used the unit as the heart of a broadcast station in our exhibit at a Scout Cavalcade Exhibition For Nassau County.

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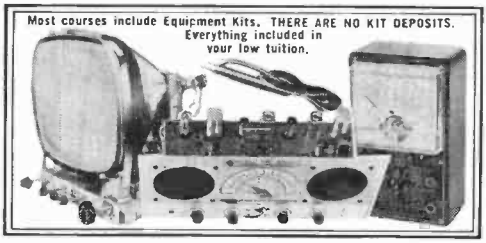

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Letters

(*Continued from page* 8)

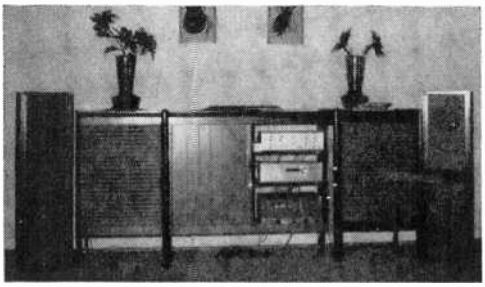
hams. I enjoy building and experimenting as much as the next guy, but I also have other hobby interests (photography, astronomy, hi-fi, to name a few) and would enjoy discussing them with others who share them with me. But where do I meet such people on the ham bands? Must I continue calling CQ with the hope that maybe one out of a hundred will provide an enjoyable and profitable contact for me? Why can't P.E. act as a "clearinghouse" for hams like myself and help us get together on the air? I'll bet there are a great many hams who would make their other interests known, and increase their on-the-air activity, if such a "clearinghouse" were provided. What do you say?

ART TAYLOR, WØEYC
Lincoln, Nebr.

Art, we couldn't agree with you more. Too much time is being spent in some circles worrying about ham radio two or three years from now, while activity today gradually declines. The idea of a "clearinghouse" is a good one and POPULAR ELECTRONICS *would be honored to serve in such a capacity. So how about it, hams? Drop us a postcard itemizing your favorite "second" or "third" hobby, what bands you operate, what mode, when you are on the air, and when you would be willing to join a net or discussion group. We will make your response known and publish calls, bands, and interests starting in our November issue.*

"Slim Twosome" Boosts Hi-Fi

■ I enjoyed building the "Slim Twosome" (December, 1964). I installed Norelco AD-3800 8" speakers in the cabinets and have received many



compliments on the setup. The speakers have been used outdoors and as part of my regular hi-fi system indoors.

SSGT. DON K. MAXON
Cherry Point, N.C.

Slipped Tweeter Control

■ I have just finished reading the article entitled "Bantam Hi-Fi Speaker Systems Ride On Air Cushion," May, 1965. I realize the job it is to put

CIRCLE NO. 31 ON READER SERVICE PAGE →

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Letters

(*Continued from page* 10)

together an article of this type. There are bound to be slip-ups of some kind or other. Sonotone's Sonomaster, Model RM-1, a unit featured in this article, seems to be an example. Checking over your Comparison Table on page 43, the Sonotone system is listed as not having a tweeter control, when in truth it does. This error could have influenced the statement, ". . . at least the sample we heard—had a trace of harshness in the highs and needed a little bass boost from the amplifier to bring out the bottom notes." I discussed the point with our engineers and they feel, since we were listed as not having a tweeter control, and since the listener was most likely unaware of it, that this factor could very well cause a misreading on the system's performance.

ROLAND GRAY
Sonotone Corporation
Elmsford, N.Y.

Slips don't count, Roland, but tweeter controls do. The tweeter control can be adjusted to cover a wide range, from completely eliminating the high-frequency speaker's output to boosting frequencies above 5000 cycles by 10 db. The control should be adjusted by the listener to obtain the most pleasing sound.

We Said It Was a Giant Size

■ In your May, 1965, issue, page 49, you featured a new color TV antenna, "Colormagic," made by GC Electronics. Your specifications for this antenna were 190 feet by 110 feet. If I purchase one of these signal-grabbing monsters, what shall I use to support it, Washington Monument?

TED OSBORN
Danville, Ill.

Yes . . . if you can get the monument moved to Danville. However, Ted, you should be able to use a regular mast as the antenna actually measures 190 inches by 110 inches.

Video Tape Too Big For Texan

■ I have followed enthusiastically your running reports concerning the up-and-coming Home Video Tape Recorders, and have been awaiting the day when prices would become low enough for me to afford one. Now it appears that all my waiting may have been in vain. You see, I live in a Mobile Home, and with space at a premium, I just don't have room for a 6½-foot by 9-foot piece of equipment as described in "At Last! A Home TV Tape Recorder Kit," April, 1965.

GENE L. GRAHAM
El Paso, Tex.

Despair not, Gene, because the Wesgrove Video Tape Recorder is only 20" x 14" x 8" and it weighs only 35 pounds. Somebody must have mixed up meters and inches. The article was written in Germany about a product made in England and sold in the U.S.A. What can you expect? Gene, meet Ted (above); maybe if you help him with his monument, he'll help you with your tape recorder. —30—

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SPECIAL ENDORSEMENTS SHIP RADAR ENDORSEMENT - SEPTEMBER 11, 1963 - BUFFALO, NEW YORK

ISSUING OFFICER

Federal Communications Commission

Tommy Willis Duffy (Licensee)

(Issuing Officer)

Ben F. Waple (Secretary)

NOT VALID UNTIL SIGNED

SPECIMEN

Employers are paying good money for men holding FCC tickets. Read how to get yours:

When you hold a Commercial License issued by the FCC (Federal Communications Commission) you have written proof that you know and understand basic electronic theory and fundamentals. It's worth plenty . . . particularly to companies on the lookout for qualified electronics technicians. Here's how one of the country's leading office machine manufacturers rates men with FCC Licenses:

> "An FCC License is an asset to any man looking to enhance his career in the field of electronics. At our Company, a licensed man is well-rewarded because an FCC License attests to his knowledge of electronics theory . . ."

Thousands of employers will tell you the same thing. Licensed men get the good jobs. They make more money . . . move ahead faster . . . enjoy exciting, challenging work. What's more, they're needed badly in every field of electronics. Industrial electronics. Radio-TV Broadcasting. Aerospace. Electronics Servicing . . . including mobile and marine radio *plus* CB.

Yes . . . your opportunities are unlimited once you're carrying that FCC Commercial Ticket. AND CLEVELAND INSTITUTE OF ELECTRONICS CAN GET ONE FOR *YOU!* On the facing page, read how four ambitious men just like you have cashed in on CIE's sure-fire FCC Licensing Program. Read about CIE's exclusive money-back offer. And then send in the postage paid reply card. CIE will quickly send you complete FREE information. You will soon be on *your* way to a Commercial FCC License and the many rewards that go with it!

These CIE men have good jobs
(they have Commercial FCC Licenses)

Matt Stuczynski, Senior Transmitter Operator, Radio Station WBOE. "I give Cleveland Institute credit for my First Class Commercial FCC License. Even though I had only 6 weeks of high school algebra, CIE's AUTO-PROGRAMMING teaching method makes electronics theory and fundamentals easy. After completing the CIE course, I took and passed the 1st Class Exam. I now have a good job in studio operation, transmitting, proof of performance, equipment servicing. Believe me, CIE lives up to its promises!"

Ted Barger, Electronic Technician, Smith Electronics Co. "I've been interested in electronics ever since I started operating my own Ham rig (K8ANF). But now I've turned a hobby into a real interesting career. Cleveland Institute of Electronics prepared me for my Commercial FCC License exam . . . and I passed it on the first try. I'm now designing, building and testing all kinds of electronic equipment . . . do a lot of traveling, too. It's a great job . . . and thanks to CIE and my FCC License, I'm on my way up."

Chuck Hawkins, Chief Radio Technician, Division 12, Ohio Dept. of Highways. "Cleveland Institute Training enabled me to pass *both* the 2nd and 1st Class License Exams on my *first* attempt . . . even though I'd had no other electronics training. (Many of the others who took the exam with me were trying to pass for the eighth or ninth time!) I'm now in charge of Division Communications and we service 119 mobile units and six base stations. It's an interesting, challenging and extremely rewarding job. And incidentally, I got it through CIE's Job Placement Service . . . a free lifetime service for CIE graduates."

Glenn Horning, Local Equipment Supervisor, Western Reserve Telephone Company (subsidiary of Mid-Continent Telephone Company). "There's no doubt about it. I owe my 2nd Class FCC License to Cleveland Institute. Their FCC License Program really teaches you theory and fundamentals and is particularly strong on transistors, mobile radio, troubleshooting and math. Do I use this knowledge? You bet. We're installing more sophisticated electronic gear all the time and what I learned from CIE sure helps. Our Company has 10 other men enrolled with CIE and take my word for it, it's going to help every one of them just like it helped me."

FCC LICENSE WARRANTY

A CIE FCC License Course will quickly prepare you for a Commercial FCC License. If you don't pass the FCC exam . . . on the first try . . . after completing your course, CIE will refund all your tuition. You get an FCC License . . . or your money back!

Two out three men who took the 1st Class Commercial FCC License exam in 1964, failed.

Nine out of ten CIE-TRAINED men who take this exam, pass . . . the very first try!

And that's why CIE can back their courses with the warranty you see at the left. CIE-trained men know their stuff . . . because CIE AUTO-PROGRAMMED Home Study *works!*

Get started now. Send postage-paid reply card for free information about a plan that gets you an FCC License *or costs you nothing!*

CIE **Cleveland Institute of Electronics**

1776 East 17th Street, Dept PE-31, Cleveland, Ohio 44114

1965 OTCB JAMBOREE CALENDAR

Planning a jamboree, get-together, banquet or picnic? Send all the details to: 1965 OTCB Jamboree Calendar, POPULAR ELECTRONICS, One Park Avenue, New York, N.Y. 10016. For more information on the jamborees listed below, contact the clubs or club representatives at the addresses given.

Toledo, Ohio July 24-25
Event: First International CB Jamboree. Location: Lucas County Recreation Center. Sponsor: Ohio Michigan Screwdriver Club, Inc. Contact: Jamboree, Box 38, Pemberville, Ohio.

Columbus, Ohio July 25
Event: Fifth Annual CB Picnic. Location: Ohio State Fairgrounds. Sponsor: Central Ohio CB Assn., Inc. Contact: Jamboree, Box 92, Columbus, Ohio.

Lewistown, Pa. July 31-Aug. 1
Event: Statewide CB Jamboree. Location: Kishacoquillas Park. Sponsor: Lewistown Circle 11 CB Club. Contact: Galen M. Bratton, R.D. #2, McVeytown, Pa.

Grayslake, Ill. Aug. 13-15
Location: Lake County Fairgrounds. Sponsor: Citizens Radio Assn. of Lake County, Ill. Contact: Jack Diamond, Jamboree Chairman, Box 251, Waukegan, Ill.

Pleasanton, Calif. Aug. 14-15
Event: Third Annual West Coast CB Jamboree. Location: Alameda County Fairgrounds. Contact: Jamboree, Box 1152, Mt. View, Calif.

Jacksonville, Fla. Aug. 14-15
Event: Northeast Florida CB Jamboree. Location: Jax Ball Park. Sponsors: Citizens Radio Operators Organization, Inc., and the Gateway Monitors. Contact: Adv. Chairman, Rt. 4, Box 225, Jacksonville.

Costa Mesa, Calif. Aug. 15
Event: Third Annual Buy & Swap Meet. Location: Orange County Fairgrounds, Costa Mesa, Calif. Sponsor: REACT of Orange County, Inc. Contact: Jamboree, Box 26, Midway City, Calif.

Denver, Colo. Aug. 21-22
Event: Rocky Mountain CB Jamboree. Location: Jefferson County Fairgrounds. Contact: Bill Hudson, Jamboree Chairman, 3550 S. Penn St., Englewood, Colo.

Lebanon, Ohio Aug. 21-22
Event: Third Annual S.W.O.C.B.A. Nationwide CB Jamboree. Location: Warren County Fairgrounds. Contact: S.W.O.C.B.A., Box 231, Mason, Ohio.

Norwalk, Ohio Aug. 21-22
Event: Third Annual "Weekend for CB'ers." Location: Huron County Fairgrounds. Sponsor: Sheriff's Huron Co. Emergency Net, Inc. Contact: S.H.C.E.N., Box 201, Norwalk, % Jesse Wade.

Quincy, Ill. Aug. 22
Location: Eagles Alps. Sponsor: Quincy Area CB Radio Club. Contact: W. Simonson, 1223½ Broadway, Quincy.

Beaver Falls, Pa. Aug. 28-29
Event: Sociable 5 Watts CB Family Jamboree (Fourth Annual). Location: Big Beaver Fire Hall and Grounds. Sponsor: Sociable 5 Watts CB Club. Contact: Roy Shetler, R.D. #1, Enon Valley, Pa.

Wichita, Kansas Aug. 28-29
Event: Second Annual Air Capitol CB Jamboree. Sponsor: Wichita CB Club, Inc., Box 441, Wichita.

Fall City, Wash. Sept. 4-6
Event: International CB Radio Camp Out. Location: Snoqualmie River Park. Sponsor: North End CB Radio Club. Contact: Jim Bossart, 2411 S. 260th, Kent, Wash.

Maryville, Tenn. Sept. 4-6
Event: Fourth Annual Hillbilly CB Jamboree. Location: Maryville Fairgrounds. Contact: G. H. Tarpley, Rt. 4, Maryville.

Fort Wayne, Ind. Sept. 19
Event: CB Roundup. Location: Coliseum. Sponsor: Maumee Valley CB Club.

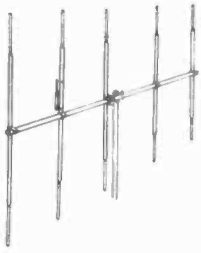
MOSLEY DEPENDABLE CB ANTENNAS

Mosley Shakes CB World, Scotch-Master Beams Boost Performance

The outstanding Scotch-Master line includes the popular A-311-S, just one of the outstanding antenna values to appear on the two-way communication market in many years..

perfect for economy minded CB'ers who want the utmost in dependable communications. This 3-element beam is an impressive, lightweight and extremely durable antenna incorporating features such as a 12' boom, 18' 8¾" element length, yet weighs just 12½ lbs. Performance of the Mosley A-311-S is just what the CB'er needs, 8 db forward gain, 20 db front-to-back and a standing wave ratio of 1.5/1 over the entire band. This antenna is designed and produced in the true Mosley tradition recognized by engineers and amateur radio operators as "The Antenna Standard Of Quality."
The remarkable A-311-S has a 65 lb vertical wind load and just 35 lbs horizontally. It offers a uni-directional radiation pattern and a feed point impedance of 52 ohms. The Low Low price is only $35.00.

Another quality Scotch-Master beam by Mosley, a leader in the communication field, is the A-511-S... a Big Brother to the A-311-S. The



A-511-S has 2 more elements than the A-311-S plus an additional 1.5 db. forward gain. Specifically, the A-511-S has 5 elements which are wide spaced, a forward gain of 9.5 db. and weight of 16 ½ pounds. The boom length is 12 feet more than the A-311-S...24 feet. The maximum element extends 18' 8¾". This beam gives Top Performance due to a front-to-back ratio of 20 db. and a standing wave ratio of 1.5/1 or less over full bandwidth. The Mosley A-511-S is a sturdy, durable antenna with a vertical wind load of 112 lbs. and a horizontal wind load of 62 lbs. It offers a uni-directional radiation pattern and a feed point impedance of 52 ohms. The A-511-S is just another of the many superior antennas by Mosley. The very reasonable price of this outstanding beam is only $55.00.

Mosley has a wide variety of other CB antennas including a Standard line, Deluxe line and the All-New Devant. For complete information write Code PE-1, Mosley Electronics, Inc., 4610 N. Lindbergh Blvd., Bridgeton, Missouri, 63044

Mosley Electronics Inc. 4610 N. Lindbergh Blvd. • Bridgeton, Mo. 63044

CIRCLE NO. 23 ON READER SERVICE PAGE

New Products

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

TACHOMETER/DWELL-ANGLE METER

Does your car need tuning up? Electronic tune-up of any automobile can be readily performed with the Model 100 tachometer and dwell-angle meter which comes both wired and *in kit form* from *Electronic Measurement Corporation*. The compact, self-powered device is connected to the ignition system of the vehicle through a single pair of external leads for all measurements of dwell angle or engine r.p.m. No switching of lead connections is necessary. Three direct-reading scales for all 4-, 6-, and 8-cylinder cars, regardless of make or country of origin, permit adjustment of distributor points for optimum dwell angle, and two r.p.m. scales (0-1200 and 0-6000 r.p.m.) facilitate carburetor adjustment for optimum engine speed. The accompanying instruction book includes step-by-step procedures for making adjustments.

Circle No. 75 on Reader Service Page 15

BATTERY CHARGER DELUXE

All types of dry cell batteries in all common sizes, and 9-volt transistor batteries as well, can be recharged with "PLUG 'N CHARGE DELUXE," an improved version of the *Dynamic Instrument* home battery charger. From one to four batteries of different types and sizes can be charged simultaneously, and batteries can be recharged from 15 to 50 times, depending upon type and condition. The PNC-12D is attractively styled in turquoise and beige high-impact styrene with textured silver trim. A free battery tester and a timer-reminder dial are included.

Circle No. 76 on Reader Service Page 15

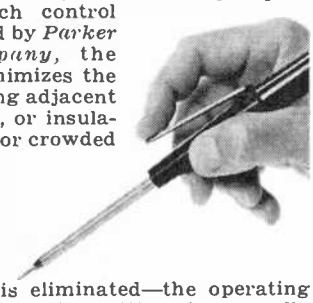
DYNAMIC LAVALIER MICROPHONE

Designed for any application requiring freedom and mobility, the Model S-58 dynamic lavalier microphone introduced by the *Turner Microphone Company* features a slide on-off switch. Frequency response of the S-58 is 60-13,000 cycles; output level is —60 db; and impedance is a combination high or 150 ohms. A 25-foot cable and lavalier assembly are furnished.

Circle No. 77 on Reader Service Page 15

INSTANT SOLDERING IRON

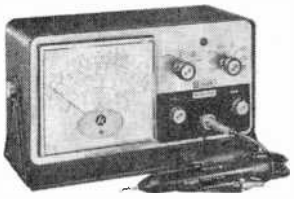
Four seconds is the time it takes the "Miniscope" soldering iron to heat up. The current is switched on or off by the user's fingertip on the feather-touch control lever. Announced by *Parker Trading Company*, the "Miniscope" minimizes the danger of burning adjacent wires, terminals, or insulation in cramped or crowded spaces, since the tip can remain cold until it touches the soldering point. The possibility of overheating is eliminated—the operating voltage is only 2 volts. Although normally used with a transformer, the "Miniscope" can be battery-operated for mobile use. It comes with a spare copper tip, two spare carbon elements, plastic case, and transformer.



Circle No. 78 on Reader Service Page 15

VACUUM-TUBE VOLTMETER

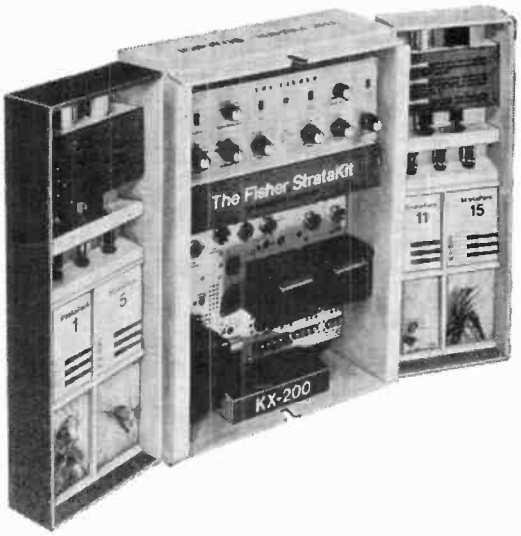
Available both in kit form and wired from *Allied Radio*, the Knight-Kit KG-625 6" VTVM features a ½-volt full-scale d.c. range. The meter used has a 200-microamp movement with a fluorescent knife-edge pointer, ten separate color correlated scales and 100° meter arc for larger scale area and easy viewing from all angles, plus a gimbal mounting bracket. The instrument reads peak-to-peak a.c. volts directly. Precision 1% resistors are used as multipliers. Accuracy on d.c. ranges is ±3% of full-scale reading; accuracy on a.c. ranges is ±5%.



Circle No. 79 on Reader Service Page 15

"DUO-BEAM" CB ANTENNAS

Two rotatable "Duo-Beam" base station antennas for the Citizens Band have been announced by *Hy-Gain Electronics*, both of which use horizontally stacked twin-driven beams, each with its own director. Model 114DB uses two-element beams and multiplies



Build the Fisher KX-200 StrataKit and own a $250 stereo control-amplifier for $169.50.

It's almost absurdly easy. You need no experience whatsoever. The superbly detailed kit construction manual prepared by Fisher StrataKit engineers tells you absolutely everything you need to know to build this magnificent 80-watt stereo control-amplifier. The language is simple; the diagrams are huge and crystal-clear; the exclusive StrataKit method itself is uniquely 'beginner-proof.'

You build your StrataKit in ingeniously simplified stages (Strata). Each stage corresponds to a *separate* fold-out page in the instruction manual. Each stage is built from a *separate*, clearly identified packet of parts (StrataPack). The major parts come already mounted on the extra-heavy-gauge steel chassis. Wires are *pre*cut 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. There is no possibility of last-minute 'surprises.'

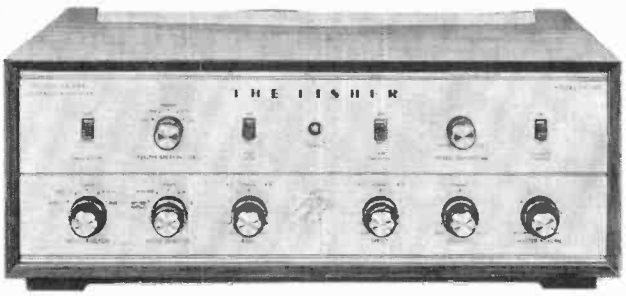
When you have built the Fisher KX-200, you are the owner of one of the world's finest amplifiers, easily worth $250.00. Its 80-watt (IHF) stereo power amplifier section will drive the least efficient speakers at extremely low distortion. Its preamplifier section provides a virtually unlimited range of input and control facilities. It even incorporates exclusive features like a laboratory-type d'Arsonval bias/balance meter and a power-derived third-speaker output with separate volume control.

All this is yours in a kit priced at $169.50. The Fisher KX-100, a 50-watt stereo control-amplifier kit of advanced design, costs only $129.50. (Walnut cabinet for either model, $24.95; metal cabinet, $15.95.)

"I personally guarantee that any Fisher StrataKit you assemble, as directed, will be fully equal in performance and reliability to its laboratory-wired prototype."

Avery Fisher

Founder and President
Fisher Radio Corporation



FREE! $1.50 VALUE!
Send for *The New Kit Builder's Manual*, an illustrated guide to high fidelity kit construction, complete with detailed specifications of all Fisher StrataKits.

Fisher Radio Corporation
21-40 44th Drive
Long Island City, N. Y. 11101

Name_____

Address_____

City_____ State_____ 108

OVERSEAS RESIDENTS PLEASE WRITE TO FISHER RADIO INTERNATIONAL, INC., LONG ISLAND CITY, N. Y. 11101. CANADIAN RESIDENTS WRITE TO TRI-TEL ASSOCIATES, LTD., DOWNSVIEW, ONT.

CIRCLE NO. 12 ON READER SERVICE PAGE

New Products

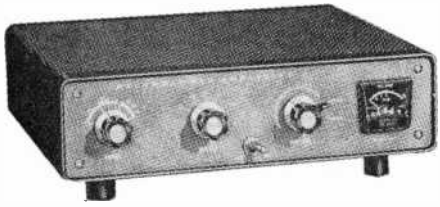
(*Continued from page 22*)

the effective radiated power of an efficient 5-watt CB transceiver to 42 watts, while Model 116DB uses three-element beams which raise the ERP to 93 watts. Both antennas are designed for 360° mechanical rotation—the 114DB with a standard TV rotator, the 166DB with a heavy-duty TV rotator. Heavy-gauge all-aluminum construction insures maximum mechanical reliability in winds up to 100 m.p.h.

Circle No. 80 on Reader Service Page 15

"KW KOMPACT" FOR HAMS

The *Heathkit* "KW Kompact" is a full-kw. SSB linear amplifier in a cabinet that measures just 3 3/16" x 12 13/16" x 10"—it's intended to fit in any size car or practically any size

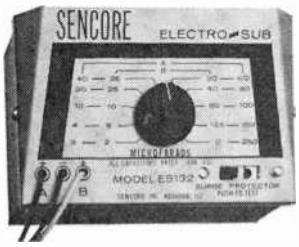


operating space you might have at home. A 5-band linear amplifier (80 through 10 meters), the "KW Kompact" develops 1000 watts PEP to a pair of 572-B's (T160-L's) in parallel. It has provisions for ALC, a tuned input circuit, a built-in antenna changeover relay, and a built-in SWR meter. Two special power supplies are available—the HP-14 for mobile operation, and the HP-24 (which can be remotely located) for fixed operation.

Circle No. 81 on Reader Service Page 15

ELECTROLYTIC SUBSTITUTOR

Ever waste a lot of time hunting in your junk box or on your workbench for a particular electrolytic capacitor, only to find that you don't have the right value or working voltage? *Sencore's* ES132 "Electro-Sub" provides 10 dual electrolytics from 2 μf. to 250 μf., to operate from 2 to 450 volts, d.c. The electrolytics can be used singly, as duals, or paralleled for up to 32 different combinations. You simply hook up the leads and set the selector switch to the value you want, then push the "push to test" switch. A surge protection switch prevents arcing, sparking, or accidental healing of the electrolytic under test; it also discharges the capacitor after it is used, to prevent possible shock. The ES132 can be employed in all types of transistor and vacuum-tube circuits.



Circle No. 82 on Reader Service Page 15

TV COLOR GENERATOR

Receiver alignment time can be cut by 40% through the use of the *Amphenol* "Color Commander." Compact enough to fit easily into a tube caddy, the "Color Commander" offers *nine* test patterns, including three never before available in a color generator. With these three new patterns, a serviceman can completely converge and adjust chroma of a TV receiver in 20 minutes —even if he is unfamiliar with the set. The "Color Commander" normally works on battery power, but can be operated from an optional a.c. supply which fits into the battery holder.

Circle No. 83 on Reader Service Page 15

MICROPHONE PREAMPLIFIER

Marlboro Engineering's "MikeAmp" was designed to permit the use of a long cable between microphone and tape recorder—the transistorized, battery-operated unit is capable of driving as much as 2000 feet of typical single-conductor shielded cable with no measurable losses or hum pickup. Its low-noise, high-input impedance circuit provides either 0 db or 20 db voltage gain, each at an impedance level of less than 200 ohms. When in use, the MikeAmp is located near the microphone, which can be either a crystal or dynamic type. The low-impedance output connects via the long cable directly to the normal high-impedance input of the recorder or p.a. amplifier.

Circle No. 84 on Reader Service Page 15

TAPE SPLICING AIDS

If you do much tape editing or splicing, you'll be interested in two new products announced by Elpa Marketing Industries, Inc., and manufactured by the *Tall Company*. The "EDITall' is a tape splicing block that can easily be fastened to any tape machine. It enables the owner to splice standard ¼" tape professionally and accurately, including small sections hitherto considered impossible to splice. When "EDItabs" tape splices are used in connection with the EDITall block, the result is said to be a spliced tape that is as flexible, as uniform, and as sturdy as the original tape. An EDITall KP-2 editing kit is available

(*Continued on page 98*)

SEE THE U.S.A.

Traveling by car to the distant corners of this great country of ours is becoming easier and takes less time than ever before. This year see the U.S.A. Visit the great national parks, the towering and majestic Rocky Mountains, historic New England, the seashore or the broad expanse of the midwest. No matter where you travel, International Citizens Radio transceivers can provide rapid emergency communication. International transceivers are designed and engineered to give reliable mobile service day in and day out under all kinds of conditions. The 1965 International transceivers have hybrid circuits which combine transistors and tubes for greater dependability. There is even one model which has built-in test circuits. You will have more fun traveling and a feeling of security with an International transceiver installed in your car for mobile communication. Write today for our catalog of Citizens Radio transceivers and accessories. Then see your nearest International dealer. He will assist you in selecting the best transceiver for your particular requirements.

MODEL 440
Citizens Radio Transceiver

MODEL 660
Citizens Radio Transceiver

MODEL 880
Citizens Radio Transceiver

FCC Citizens Radio license required. All use must conform with Part 95, FCC Rules and Regulations.

INTERNATIONAL
CRYSTAL MFG. CO., INC.
18 NORTH LEE — OKLA. CITY, OKLA.

CIRCLE NO. 17 ON READER SERVICE PAGE

POP'tronics Bookshelf

ELECTRONIC MOTOR CONTROL

by Allan Lytel

This book describes many of the electronic control circuits in use today. It provides circuit details on a wide range of vacuum-tube equipped controllers, as well as the newer solid-state versions. A brief summary of the operation of each individual piece of equipment is given, along with descriptions and functions of the various devices included in the equipment. Many of the circuits are of the simple type that can be built even by a novice. The book is well illustrated and easy to read. If you get involved with electric motors and want to know how to control them, you'll find it a handy reference.

Published by Howard W. Sams & Co., Inc., 4300 West 62 St., Indianapolis 6, Ind. Soft cover. 224 pages. $3.95.

HI-FI TROUBLES

by Herman Burstein

If you are about to make your first attempt at installing a stereo hi-fi system—and if you have absolutely no electronics experience—this book is for you! We must congratulate the publisher and author of this surprisingly comprehensive book—it couldn't have been made any plainer or simpler. Practically every possible problem in conjunction with hi-fi is discussed in two-syllable words, and appropriate cures are carefully diagrammed.

Published by Gernsback Library, Inc., 154 West 14 St., New York, N.Y. 10011. 160 pages. Soft cover. $3.95.

FUNDAMENTALS OF RADIO

by Murray P. Rosenthal

Books on "getting started" in radio or electronics are deceptive. On one hand, a

LIVE BETTER ELECTRONICALLY with LAFAYETTE RADIO ELECTRONICS

HI-FI AND CB EQUIPMENT Headquarters

Model HB-500
139.50
99-3027WX

Small . . . quiet . . . Powerful!

NEW! LAFAYETTE 70-WATT COMPLETE AM-FM STEREO RECEIVER

Just Add Speakers and Enjoy FM, FM Stereo and High-Quality AM Reception

■ A powerful 70-Watt Amplifier plus Complete Preamplifier Control Facilities plus a Standard AM Tuner plus a sensitive FM Tuner plus an FM Stereo Tuner—all on One Compact chassis ■ Amazing FM "Stereo Search" Circuit Signals Presence of Stereo Broadcasts ■ Tuned Nuvistor "Front End" provides Greater Sensitivity, Lower Noise ■ Bar-Type Tuning Indicator for AM and FM ■ Variable AFC Control ■ Imported

Model LR-800
199.50
99-0005WX

NEW! LAFAYETTE SOLID-STATE DUAL CONVERSION 5-WATT CB TRANSCEIVER

With Authentic Mechanical Filter

- Only 3" high—fits easily in any car
- Special multi-stage noise limiting circuit ends problem of mobile noise
- The same output as the most powerful tube unit yet uses only 1/50th of the battery power

The Perfect Unit For Mobile!

• 12 Crystal Transmit and Receive Positions • 23 Channel Tunable Receiver With Spotting Switch • 3-Stage Transmitter Rated For Full Legal Power • Dual Conversion Receiver with 5/10 μV Sensitivity • Multi-Stage Automatic Noise Limiting Circuit • Rugged Silicon Mesa Transistors • Compact—3"Hx11⅞"Wx6¹¹⁄₁₆"D • 12V DC Mobile Operation (Negative or Positive ground) • 117V AC operation when used with Matching Solid-State AC Power Supply (Optional at $16.95)

‡ adaptable to stereo playback

DYNAMIC MICROPHONE

Model RK-137A
89.50
99-1511WX

Model HB-405
169.50
99-3001WX

THE WIDELY ACCLAIMED LAFAYETTE RK-137A TAPE RECORDER

FEATURING **4**– TRACK STEREO PLAYBACK‡
– TRACK MONAURAL RECORD PLAYBACK

With Electronic Track Selector Switch, VU Recording Level Meter and Pause Switch For Instant Editing

Includes Lightweight carrying case, dynamic microphone, output cable, 7 inch empty tape reel.

• Two Speeds—3¾ & 7½ ips • Pause Lever Provides Instant Stop for Editing • Record—Erase Safety Switch • Fast, Rugged Shift Lever Control • Extension Speaker Jack • High Impedance Monitoring Jack • VU Meter Recording Level Indicator • Electronic Track Selector Switch • Specially Designed Heavy-Duty 6x4" PM Speaker • Separate Erase and Record Heads • Imported

NEW! LAFAYETTE 23-CHANNEL 5-WATT CB TRANSCEIVER

Double Side Band Full Carrier

With Advanced "Range-Boost" Circuit

- 17-Tube Performance with 13 Tubes
- Low Noise Nuvistor "Front End"
- 5 Double-Tuned If Transformers
- Meets All FCC Requirements

• Frequency Synthesized Circuit Provides 23 Crystal-Controlled Transmit & Receive Channels—No Extra Crystals to Buy • Continuous One-Control Channel Tuning • Full 5-Watt Input • Push-To-Talk Microphone & Electronic Switching • Dual Conversion Receiver With 3/10 μv Sensitivity • Delta Tuning Offers "Fine Tuning" of ±2.5Kc on Receive • Illuminated "S" and RF Output Meter • Variable Squelch, Variable Noise Limiter, AGC • Built-in 117V AC & 12V DC Power Supply • "Vari-Tilt" Mounting Bracket for Easy Mobile Installation • Plug-in Facilities For Lafayette Selective Call Unit

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- Citizens Band Equipment
- Tape Recorders
- Ham Gear
- Radio's, TV's and Accessories
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- Test Equipment
- Optical Goods
- Auto Accessories
- Musical Instruments

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Syosset, L.I., N.Y. 11791

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☐ $..... enclosed; send me .....
(Prices do not include shipping charges).

Name.....

Address.....

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

CIRCLE NO. 21 ON READER SERVICE PAGE

Bookshelf

(*Continued from page 26*)

book in this category may be too simple; on the other, some books are just too difficult for beginners. Unfortunately, this book falls in the latter group. It covers radio and electronics theory from magnetism to antennas, but the pace is so rapid and the subject matter is treated in such an offhand fashion that you begin to wonder what the author is doing. Some subjects are discussed too well and other vital topics are glossed over in a few words or paragraphs. All of this is complicated by what seem to be a number of obvious errors, misstatements, and inclusion of out-of-date information.

Published by John F. Rider Publisher, Inc., 116 West 14 St., New York, N.Y. 10011. Hard cover. 318 pages. $8.95.

SELECTED SEMICONDUCTOR CIRCUITS

by Editorial Staff of TechPress Publications

Here's a book that technicians, experimenters, and hobbyists will find very handy. It contains a compilation of standard semiconductor circuits taken directly from manufacturers' transistor design sheets. The material has been well organized and is presented in a simplified manner. The book has seven sections and presents such easy-to-build projects as a.f. and r.f. oscillators, i.f. amplifiers, power supplies and regulators, and commercial and industrial preamplifiers. Also included are a frequency divider, relay driver, time-delay circuit, and transistor-gain test circuits. Because of the wide selection of circuits, the book is well worth its modest price.

Published by TechPress Publications, Brownsburg, Ind. 46112. Soft cover. 80 pages. $1.25.

TRANSISTOR SPECIFICATIONS MANUAL

by Howard W. Sams Engineering Staff

Over 5000 transistor types have been made since transistors were first introduced. Many of them are no longer available, and many of them have no type numbers. There is much confusion when the need for replacement arises. One redeeming factor when trying to find a replacement is that a transistor can usually be selected by estimating voltage, current, wattage, and frequency response, and then relating these figures to

Bookshelf

(*Continued from page* 28)

the types available. This manual lists the electrical and physical specifications for more than 3500 transistors. A section listing older types which are now available under a new type number is also included, and there are more than 300 illustrations that show dimensions and lead locations. The book should prove useful to electronic hobbyists, technicians, and engineers.

Published by Howard W. Sams & Co., Inc., 4300 West 62 St., Indianapolis 6, Ind. Soft cover. 159 pages. $2.95.

COLOR TV REPAIR

by Martin Clifford

As the number of color TV sets spirals upward, TV-service writers are making great efforts to simplify color TV service techniques. This book is one of the best in that category. The writing is informal and fast-paced. The material in the book was collected by Clifford from Radio-Electronics magazine and contains practical hints from Bob Middleton, Jack Darr, Art Margolis, and other well-known TV servicing experts. Included in the book are sections on picture tube replacement, troubleshooting with a bar generator, unexpected causes of color failure, etc. This is a good book for service technicians.

Published by Gernsback Library, Inc., 154 West 14 St., New York, N.Y. 10011. Soft cover. 160 pages. $2.95.

Free Literature

Two new bulletins on crystals are available for the asking. An 8-pager published by Texas Crystals, 1000 Crystal Drive, Fort Myers, Fla., features this company's line of crystals for CB and amateur radio equipment, plus many low-frequency crystals. Included is a discussion of how crystals are manufactured . . . All of the crystals listed in the 4-pager put out by Jan Crystals, 2400 Crystal Drive, Fort Myers, Fla., were made for the armed forces by leading crystal manufacturers to rigid specifications, and released by the government (unused, and in the original packing) as excess equipment . . . Three quality microphones particularly suitable for installation in churches are described and illustrated in a 4-page brochure available from the Turner Microphone Company, Cedar Rapids, Iowa. Gold mounting accessories are also covered. —30—

BREAKTHROUGHS

Brief news flashes on recent important developments in the field of electronics

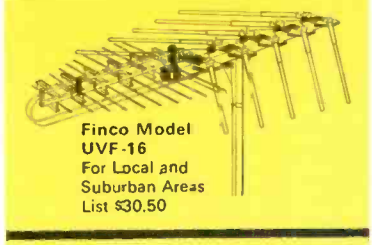
• A machine that learns from its own mistakes is being developed by the U.S. Air Force to cope with unexpected and unknown flight conditions encountered by satellites and high performance aircraft. To be incorporated into a self-organizing flight controller, the machine makes use of what scientists refer to as the Artron, or artificial neuron. Researchers at the Air Force's Avionics Laboratory, in an effort to seek machines which perform in a manner similar to living entities, have recreated the function of a nerve cell in the Artron, and a vast network of Artrons is able to achieve memory and problem-solving ability. They respond to punishment and reward by learning desired behavior and capitalizing on their own mistakes. They make decisions and actively seek new and better ways of doing a given task. Knock out some of the Artron network's tools for doing that task, and it will "dream up" an altogether new approach. Researchers say that even with 70% electronic failures, the new apparatus could still find a solution. Thus, it's easy to see the value of its future use in space programs . . .

• CBS-TV added a silent "commentator"—an electronic computer—to the broadcast staff for its nationally televised "Yankee Baseball Game of the Week." The General Electric computer figures out, and flashes on a screen, the probability of a batter "coming through" in various clutch situations based on performance during the first part of the season. A company spokesman reported that there are about 52,800 possible "situations" in a game that a batter could face. Designed to give viewers more of a feeling of participating in the game, it is hoped that the system will also spark an interest in young fans for careers in the computer field . . .

• Ultrasound—signals in the frequency range from about 18,000 cycles to 200 megacycles—is proving to be a valuable aid in "photographing" internal tissues and in treating certain neurological disorders. It is employed in two ways in medicine, according to Dr. Floyd Dunn, Associate Professor of the Biophysical Research Laboratory at the University of Illinois. The first is in a passive sense in which the acoustic field does not alter body structure and function. The second is in an active sense in which either permanent or temporary alteration of the body is the objective. Examples of passive applications are compound scanning of internal tissue in the eye, neck, and other parts of the body by a transducer, and examination of the dynamic

(*Continued on page* 38)

Finco Model
UVF-10
For Metropolitan Areas
List $18.50



Finco Model
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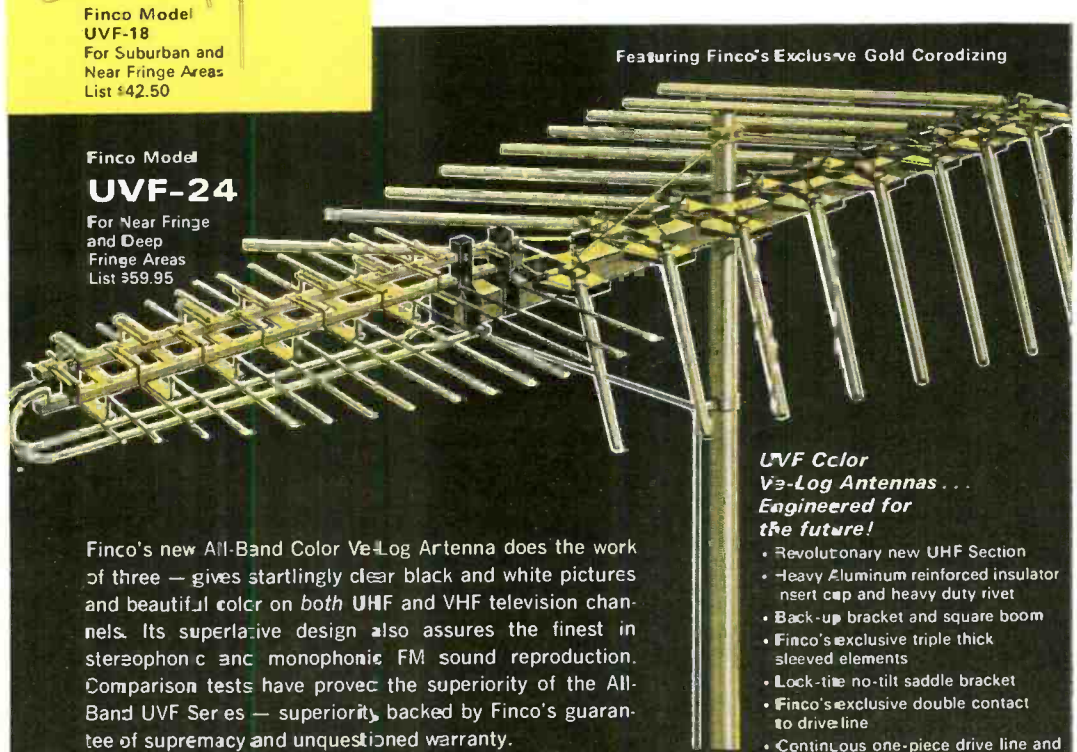

Finco's new All-Band Color Ve-Log Antenna does the work of three — gives startlingly clear black and white pictures and beautiful color on *both* UHF and VHF television channels. Its superlative design also assures the finest in stereophonic and monophonic FM sound reproduction. Comparison tests have proved the superiority of the All-Band UVF Series — superiority backed by Finco's guarantee of supremacy and unquestioned warranty.

UVF Color Ve-Log Antennas . . . Engineered for the future!

- Revolutionary new UHF Section
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CIRCLE NO. 10 ON READER SERVICE PAGE

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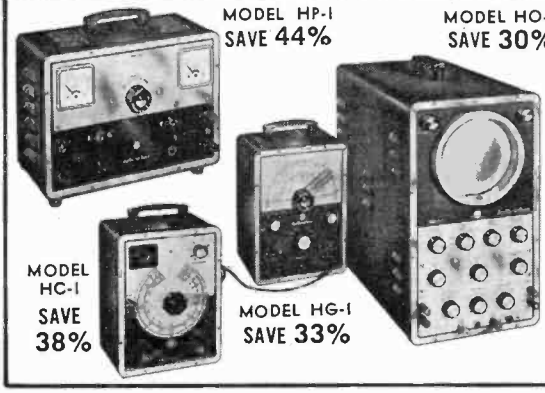

MODEL HO-1 PRECISION 5" OSCILLOSCOPE kit — 5 mc bandwidth for TV color servicing. Two preset sweep freqs. for automatic horizontal and vertical synch. Retrace blanking; 1 V peak-to-peak calibrator; automatic synch. Hallicrafters' $84.95. **SALE 59.47**

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SACRAMENTO — 600 Fulton Ave., 483-2707

CONNECTICUT
HAMDEN — Hamden Mart Shop. Ctr.
MANCHESTER — Manchester Shopping Parkade
NEW HAVEN — 92 York St., 787-7121
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STAMFORD — 29 High Ridge Rd., 325-4371
WEST HARTFORD — 39 So. Main St., 236-5441

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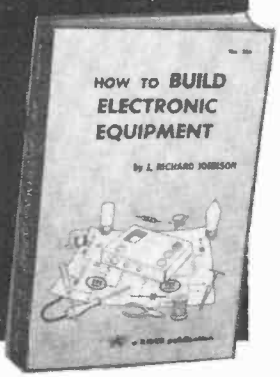

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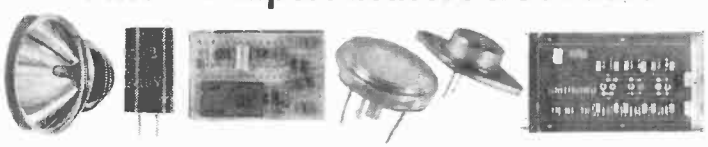

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2⅝x3⅞" TRANSISTOR BOARDS. 2 or more transistors, capacitors, resistors, modules, diodes, etc. USA made. Parts alone are worth over $7.00!
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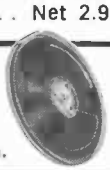

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Paks as checked $_____
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TOTAL ENCLOSED $_____
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CIRCLE NO. 32 ON READER SERVICE PAGE

BREAKTHROUGHS

(*Continued from page* 32)

characteristics of the heart. Active applications include alleviating tremor and muscular rigidity in neurological disorders such as Parkinson's disease, and the selective destruction of the vestibular portion of the inner ear in the treatment of Meniere's disease in order to preserve hearing . . .

• A laser rangefinder produced in Scotland by Barr and Stroud Ltd., the first available commercially, gives fast, accurate ranging on objects up to six miles away. Weighing only 30 pounds, it's light enough to be carried and operated by one man. Range accuracy is ± 11 yards or better, and range resolution is 16 feet. Minimum range is 328 yards, and maximum range depends upon weather conditions. The transmitter uses a ruby laser with an output of more than 1 mw. and a maximum beam divergence of 0.5 milliradian. Range readout is in digital form. At least 50 shots can be obtained from the batteries that come with the instrument before recharging is necessary . . .

• Sylvania Electric Products Inc. recently developed a one-man command post radio with which artillery, planes, and naval units can be directed against terrorist forces. Weighing 48 pounds, the two-way unit operates on 18 preset channels and employs all frequencies throughout the military bands. Called the AN/PRC-71 Forward Air Controller Command Pack, it has a range of up to 500 miles and works even after being submerged in water. It replaces approximately 300 pounds of conventional radio equipment—it can be operated while attached to a lightweight harness strapped to a man's back—and makes use of plug-in circuit cards to facilitate maintenance . . .

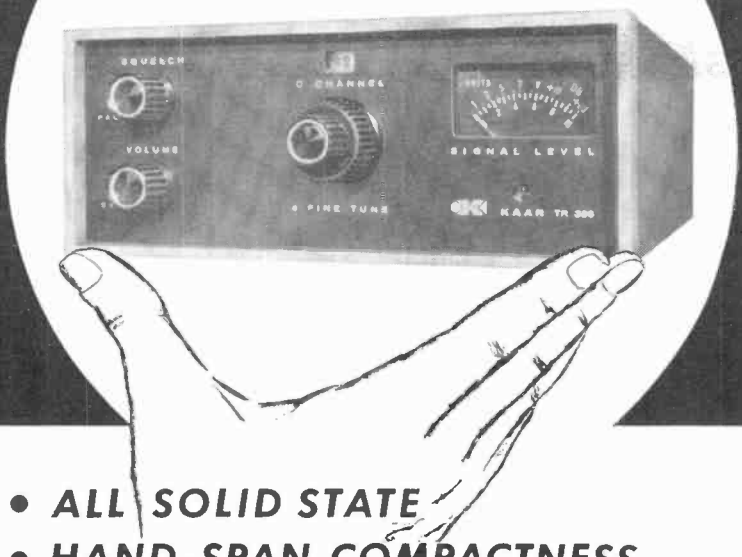
• A tiny device that plugs into any Army radio and makes Morse code as easy to read as an electric signboard has been developed by Regency Electronics for the Army. No bigger than a pack of cigarettes, this code translator transforms dots and dashes into English letters. It contains 350 diodes and 75 transistors, a display panel that frames letters with 17 tiny incandescent lamps, and a power pack of four nickel cadmium penlight batteries. The translator plugs into an Army radio through a tiny jack, and all the operator has to do is to copy down the sequence of letters as they appear on a viewing screen. Advantages of this device are that soldiers don't have to know code to use it and the low CW frequencies on which Morse is carried are better able to penetrate jungle and cover longer distances than voice radios . . . -30-

CIRCLE NO. 19 ON READER SERVICE PAGE →

KAAR MOVES CB AHEAD 5 YEARS...OVERNIGHT

...with the most exciting CB unit ever built

KAAR SKYHAWK-335



- ***ALL SOLID STATE***
- ***HAND-SPAN COMPACTNESS***
- ***23 CHANNELS*** **(no limit on channel choice)**
- ***ONLY CB TRANSCEIVER WITH A 2 YEAR GUARANTEE***

SEE THE SKYHAWK-335 . . . hand span compact with more features than any CB Unit ever introduced!

SEE THE SKYHAWK-335 . . . 23 channels — or 1-2-3 or more — with specially priced optional added crystal packs.

SEE THE SKYHAWK-335 . . . space age components are GUARANTEED FOR TWO YEARS! Silicon planar transistors and tantalum capacitors, developed for rugged space exploration, make the unit completely reliable on truck, jeep, boat or car.

YOU GET ALL THESE SKYHAWK FEATURES *NOW*

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SPECIAL FEATURES

- Tantalum capacitors
- Sealed plug-in relay
- Filtered power leads
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- External speaker jack
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- Glass epoxy circuit board
- Provision for plug-in selective call
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- Fine tuning (Varactor-technique) on channel selector
- External metering socket
- Inter-station and system channels identified
- Smart chrome and charcoal gray epoxy finish

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complete with power cable, mounting bracket, crystal for channel 9 "Help" Channel

**OPTIONAL*

6 pack crystals (for Channels 10-11-12-13-14-23) 19.95

22 pack crystals — all 23 channel operation 69.95

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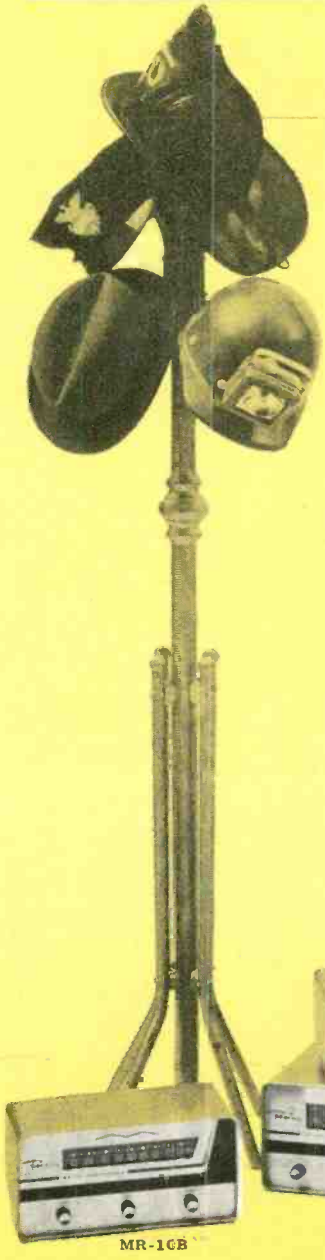
HATS OFF TO VHF

Capture the excitement of a police call . . . listen in on weather reports and CD activities . . . eavesdrop on business, industry, maritime broadcasts . . . these are but a few of the adventures awaiting you on VHF

By **CHRISTOPHER SHERIDAN**
Associate Editor



EVER HEAR the wail of a distant siren and wonder what's happening . . . or how police cars and fire trucks communicate with one another during emergencies? You can eavesdrop on this action simply by tuning in on the Land Mobile radio frequencies, particularly the 30- to 50-mc. and 152- to 174-mc. VHF bands. There's never a dull moment here, and with the fine selection of receivers available, you'll find it easy to add some excitement to your everyday life.

What's on VHF? Land Mobile frequencies were established for radio transmissions necessary to business and emergency activities. Four categories of users share these FM bands: business, industrial, public safety, and transportation systems. With more than 300,000 licensed fixed transmitters and countless numbers of mobile units scattered throughout the United States, plus more than 50,000 new ones joining these ranks

every year, you shouldn't have any trouble tuning in a wide variety of broadcasts.

The greatest concentration of users is found in the business category. They include manufacturers, business services, telephone company and other miscellaneous common carriers such as radio dispatchers, paging services, and the like. In the industrial category, industries and utilities make up a large percentage of users, as do the maritime services. You'll also find some 150 wire services, newspapers, and publishing houses using the VHF frequencies. And in the transportation category, you can tune in on taxis, motor carriers, towing and other auto emergency services, and even railroads.

But your most exciting listening will come from tuning in on public safety broadcasts made by police, fire, and emergency crews. You'll find about 90% of all police broadcasts and 95% of fire broadcasts on the 152- to 174-mc. band. Other emergency services in this category include ambulances, civil defense, and rescue squads. Highway maintenance, forest rangers, and local government offices are also heavy users.

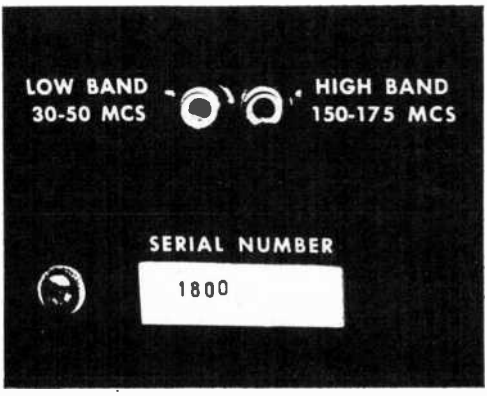
As a free service of the U. S. Government, year-round weather information is broadcast by the Weather Bureau on 162.55 mc. in principal cities throughout the country. These broadcasts consist of regional and local forecasts, state of the sea and visibility information obtained from radar surveillance, and reports from Coast Guard lightships and shore installations. Mariners, aviators, farmers, and the like will find these continuous broadcasts indispensable.

Which Receiver to Buy? There are many types of VHF receivers on the market. The accompanying Guide to Tunable VHF Receivers lists manufacturers, models, prices, and features of some 20 tunable units. Many of these same manufacturers also market non-tunable, crystal-controlled models, but since they are fixed-frequency units and designed for special applications, they are not included in the guide.

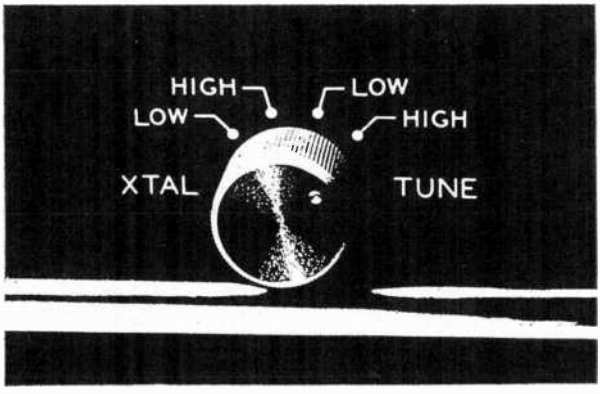
Designed to fit almost any budget, the units listed range in price from under $60 to over $170. Naturally, the more expensive ones feature added circuitry and conveniences, such as double or triple conversion, and both fixed and variable tuning. Volunteer firemen, policemen, civil defense workers and others who are primarily interested in listening to one or two special frequencies will find it to their advantage to select one of the units featuring both crystal-controlled-channel (push-button type) and manual tuning.

Crystal costs were not considered in the prices given; figure on spending about $10 for one cut to the desired frequency. Squelch controls—designed to mute the recever during periods of non-transmission—are incorporated in all units, regardless of price.

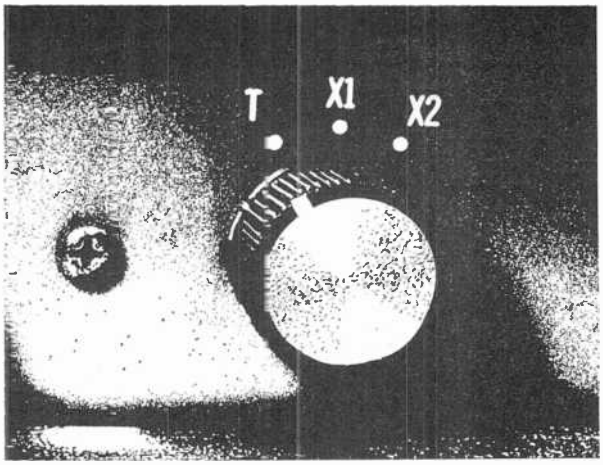
Although some of these receivers are dual-band, most of them tune in either the 30- to 50-mc. or 152- to 174-mc. range; so determine beforehand which



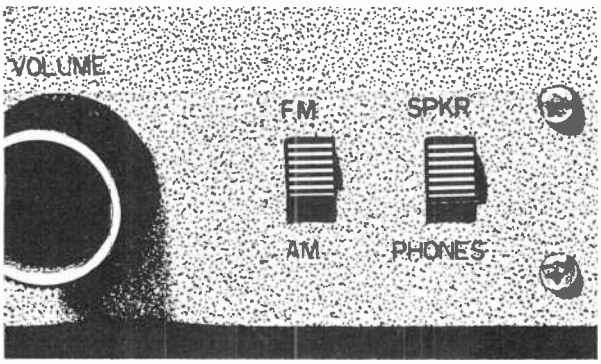
Two-band receivers work best with separate antennas for the high and low bands. In this Utica receiver, the antenna jacks are of the RCA phono type.



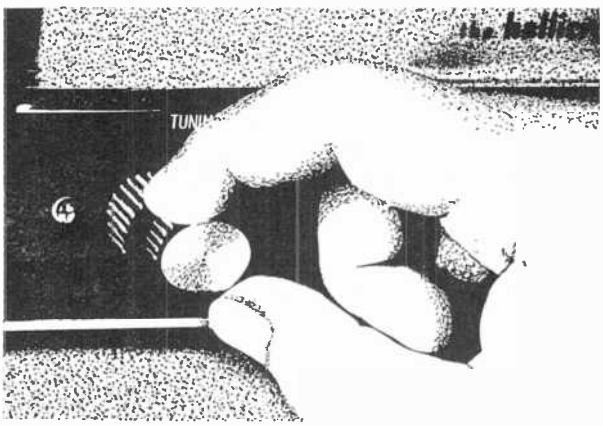
Some of the police/fire receivers offer a crystal-controlled tuning position. You can obtain specially ground crystals for use on specific channels.



Note the two crystal-controlled receive positions in this Hallicrafters unit. "T" is for manual tuning.



Although most of the high-band VHF stations are FM, there are a few straight AM stations. Radio Shack has switched detector to catch both signals.



Dual knobs indicate a two-speed tuning mechanism, a handy item missing from many receivers but really necessary in the selective Hallicrafters units.

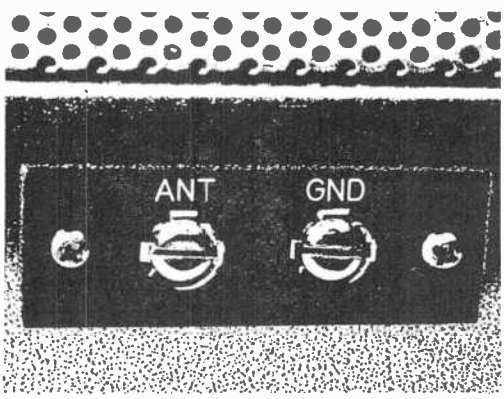
frequencies you'll be working. Two companies, Regency Electronics and Sonar Radio, market mobile units. Before using vehicle-installed police radios, check with local ordinances as there may be laws designed to eliminate ambulance-chasing activities. Also, remember that you must preserve the secrecy of all communications overheard on these bands.

What About an Antenna? Since a base or mobile unit is no more efficient than its antenna, it's important that you select the right type for the right job. This is especially true so far as VHF is concerned, as transmission is essentially line of sight. Under typical conditions, reception range of the 30- to 50-mc. band is between 25 and 50 miles, and that of the 152- to 174-mc. band between 15 and 25 miles. The distance is a function of transmitter power, receiver quality, antenna elevation, terrain, etc.

If you plan to use your receiver for fixed point-to-point reception, it's best to employ a directional antenna since it usually has more gain in one or two directions and reduces interference. But, for general coverage, use a vertical ground plane or other type of omnidirectional antenna.

Selection of a mobile antenna is equally as important as selection of a base unit antenna. A whip is generally employed on the lower VHF frequencies; for the higher frequencies, a roof-top unit can be used.

See "Guide to Tunable VHF Receivers" on next page



There is no standardization on the type of connector between the antenna and receiver. Not only are phono jacks used, but terminal strips are common.

Guide To Tunable VHF Receivers

Manufacturer	Model	Frequency (mc.)	Price	Features
Allied Radio 100 N. Western Ave. Chicago, Ill.	Knight VHF-FM	30-50 or 152-174	$59.95	Single-conversion; manual tuning only; built-in speaker
Hallicrafters 5th & Kostner Ave. Chicago, Ill.	CRX-1	30-50	99.95	Triple-conversion; manual tuning plus two crystal-controlled channels; built-in speaker; external speaker switch and connector
	CRX-2A	151-174	109.95	Same as CRX-1
	CRX-4	30-50	79.95	Single-conversion; manual tuning only; logging scale on tuning dial; headphone and external speaker jack; built-in speaker
	CRX-5	151-174	79.95	Same as CRX-4
Lafayette Radio Electronics 111 Jericho Turnpike Syosset, L.I., N.Y.	HA-50	30-50	59.95	Single-conversion; manual tuning only; built-in speaker; phone jack
	HA-52	152-174	59.95	Same as HA-50
Radio Shack 730 Commonwealth Ave. Boston, Mass.	Realistic RP-30/50	30-50	59.95	AM/FM; manual tuning plus crystal control; built-in speaker; headphone switch and provisions for using external audio amplifier
	Realistic RP-148/175	148-175	59.95	Same as RP-30/50 but without crystal control
Regency Electronics Corp. 7900 Pendleton Pike Indianapolis, Ind.	MR-33B	30-50	79.95	Single-conversion; manual tuning; built-in speaker; provisions for using external speaker and hookup to two-way radio systems using selective tone-controlled dispatching equipment
	MR-10B	152-174	79.95	Same as MR-33B
	M-40	30-50	114.95	Mobile; double-conversion; two-stage limiting; built-in speaker; 4½" × 6½" × 8¾"; 12-volt, 3.9-amp. power source required
	M-160	152-174	114.95	Same as M-40
	DR-200A	30-50 and 152-174	169.50	Two-band; manual tuning; dual-conversion; 1-watt audio output; no built-in speaker; DRS-1 matching speaker available for $14.95
	PR-35B	30-50	59.95	Single-conversion; manual tuning; built-in speaker; transistorized squelch circuit
	PR-155B	152-174	59.95	Same as PR-35B
Sonar Radio Corp. 73 Wortman Ave. Brooklyn, N.Y.	FR-101	25-50	99.95	Double-conversion; manual tuning plus crystal control; built-in speaker; 2-tone-operated squelch; deluxe model available for both mobile and base use
	FR-102	150-175	99.95	Same as FR-101
Squires-Sanders Inc. Martinsville Rd./ Liberty Corner Millington, N.J.	FM:ALERT	30-50 or 152-174	79.95	Single-conversion; manual tuning plus two crystal-controlled channels; 3 watts audio; speaker available for $9.95
Utica Communications Corp. 2917 W. Irving Park Rd. Chicago, Ill.	DUO-BAND	30-50 and 152-174	164.95	Two-band; dual-conversion; temperature-compensated drift circuit; manual tuning plus two crystal-controlled channels; matching speaker available for $12.95

IS THE HRO-500 THE GREATEST RECEIVER EVER MADE?

By JOHN D. DRUMMOND
Technical Editor

All solid-state, pinpoint dialing, and drift-free performance certainly help

ARE YOU AN SWL who has everything but still wants more? Then take a good look at the new HRO-500 solid-state communications receiver put out by National Radio Company (Melrose, Mass.). Priced at a whopping $1295 (less speaker and optional preselector), the HRO-500 covers the entire VLF and HF spectrums (5 kc. to 30 mc.) continuously in *sixty* 500-kc. bands, and provides excellent reception of SSB, CW, FSK, and AM signals.

Frequency Determination and Synthesizer. The unit uses a single highly stable 500-kc. master crystal oscillator from which 60 crystal-stable HF oscil-

lator inputs are synthesized. Between 5 kc. and 4 mc., the HRO-500 operates as a triple-conversion receiver. Incoming signals in this region are up-converted to 26 mc., plus the signal frequency. The synthesizer output is then used to convert these signals to the i.f. range of 2750-3250 kc., where they are mixed with the 2980-3480 kc. VFO to produce the last i.f. of 230 kc. Signals in the 4- to 30-mc. range are directly converted by the synthesizer to the tunable i.f. without the necessity for an intermediate up-conversion.

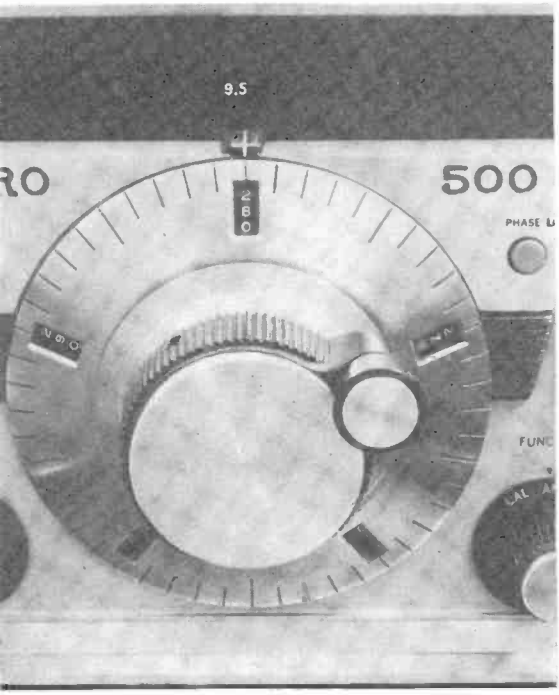
Frequency Stability. We, at POPULAR ELECTRONICS, gave the HRO-500 a thorough going over and frankly were quite impressed. For example, in our tests the HRO-500 was found to be remarkably drift-free over relatively long periods of continuous operation. The manufacturer claims a frequency stability to within 100 cycles from turn-on through any 10-minute interval, including a 30° C change in ambient temperature, and a 40-volt change in the a.c. input voltage. Typical long-range frequency drift is said to be on the order of a few hundred cycles per week. You can't beat that for stability.

Antenna Requirements. Proper antenna matching was found to be very critical, and the HRO-500 does not have an adjustment to compensate for antenna mismatch. The receiver *must* have a 50-ohm antenna impedance if you are to get all the sensitivity built into the equipment. If your antenna happens to be of the high-impedance type, you can use a separate high-impedance input which is provided.

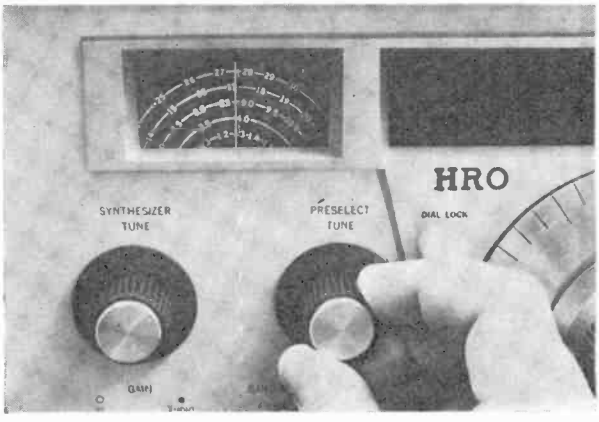
In our tests we used both a Hy-Gain Model SWO antenna and a Mosley Model ID-3 Jr. multi-trap dipole antenna, and got excellent results at frequencies down to 4 mc. Below 4 mc. a 100-foot long wire was employed which also provided good signal strength; but when the wire was switched over to the low-frequency antenna input and tuned below 500 kc., there was a noticeable degradation in receiver performance.

Tuning Very Low Frequencies. The manufacturer recommends that a preselector be used when operating at frequencies in the 5-kc. to 500-kc. range, and it didn't take us long to see why. Without the preselector, literally scores of aeronautical beacons were picked up in addition to a considerable amount of 500-kc. marine traffic. At night the 60-kc. signal from WWVB came in; and frequency-shift keying signals were heard loud and clear

Exact frequency to which the receiver is tuned is determined by adding the tuning dial indication (in kilocycles) to the synthesizer tune indication (in megacycles) in the window above the tuning dial.



The PRESELECT TUNE control is shown being adjusted for peak performance of the receiver. This control tunes three r.f. circuits in the HRO-500's front end. Left window above PRESELECT TUNE control indicates resonant frequency of preselector.



between 16 and 22 kc., probably from the U. S. Navy communications network. The manufacturer tells us that they are coming out this month with a VLF Preselector (Model LF-10) that will practically quadruple receiver sensitivity in the low-frequency range.

Operating the Tuning Dial. The receiver was found quite easy to tune, although it does take a bit of twiddling around with the controls to get the knack of it —tuning, that is. You will find the epicyclic tuning control (main tuning) exceptionally smooth to turn. Aside from easy tuning, another feature worth mentioning is the fact that the receiver will operate from a 12-volt d.c. source (approximately at 200 ma.) as well as from any 117/230-volt, 50/60 cycle source.

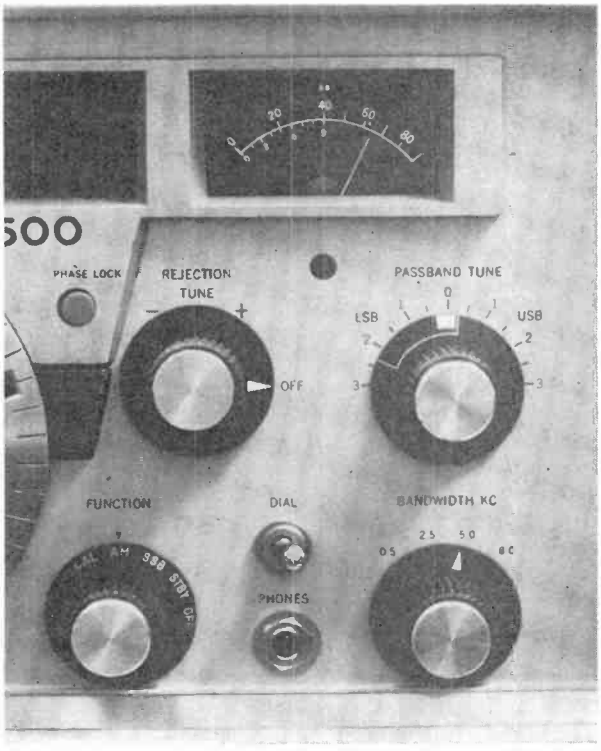
Conclusion. Is the HRO-500 the greatest receiver ever built? We don't know . . . but it could very well be. -30-

SPECIFICATIONS*

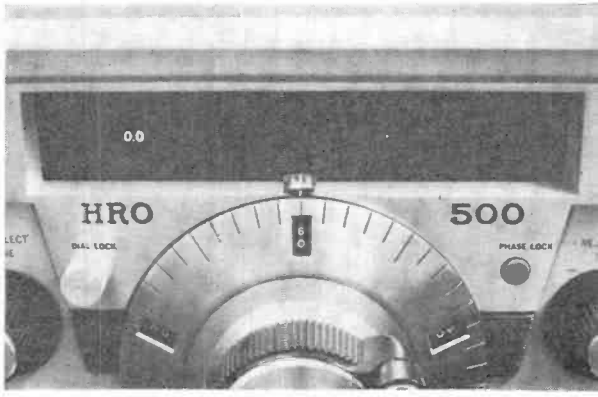
Frequency Range:	5 kc. to 30 mc.
Modes:	Upper Sideband, Lower Sideband, AM, CW
Frequency Stability:	Within 100 cycles in any 10-minute period from turn-on
R.F. Input Impedance:	50 ohms unbalanced; separate high-impedance unbalanced input
Receiver Sensitivity (nominal for 10 db S/N)	
AM:	2 μv. with preselector; 25-50 μv. without preselector from 5 kc. to 500 kc.
SSB/CW:	Better than 1.0 μv. from 500 kc. to 30 mc.
Calibration Accuracy:	Within 1.0 kc. over entire tuning range of VFO; within 250 cycles when zeroed to nearest calibration point
Power Requirements:	200 ma. at 12 volts d.c., or 100 ma. at 24 volts d.c.; 115/230 volts, 50/60 cycles, 15 watts
Size (inches):	7 5/8 H, 16 1/2 W, 12 3/4 D
Weight:	32 pounds
Semiconductor Complement:	37 transistors; 20 diodes

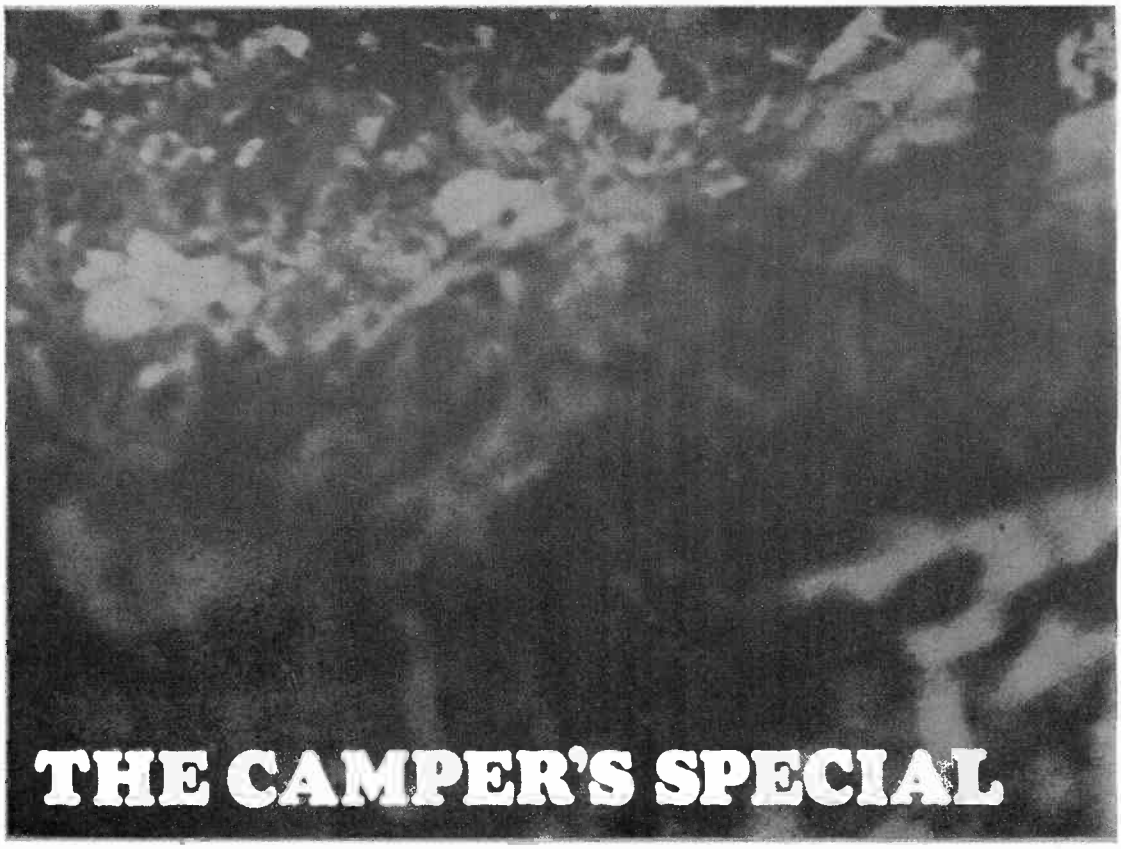
**Partial listing*

These receiver controls and S-meter enable the operator to (1) select upper or lower sideband without changing the frequency of the incoming signal; (2) select any one of four bandwidths; (3) eliminate interfering heterodynes; (4) select stand-by, SSB/CW, amplitude modulation or calibration mode. S-meter is calibrated in db above a 1-μv. signal.



Epicyclic tuning dial, used to tune each 500-kc. band, is calibrated with linear 1-kc. divisions from zero to 500 kc.; it can be locked in position by DIAL LOCK at left. At right is a PHASE LOCK warning lamp which flashes when receiver synthesizer is not locked properly to a 500-kc. frequency increment.





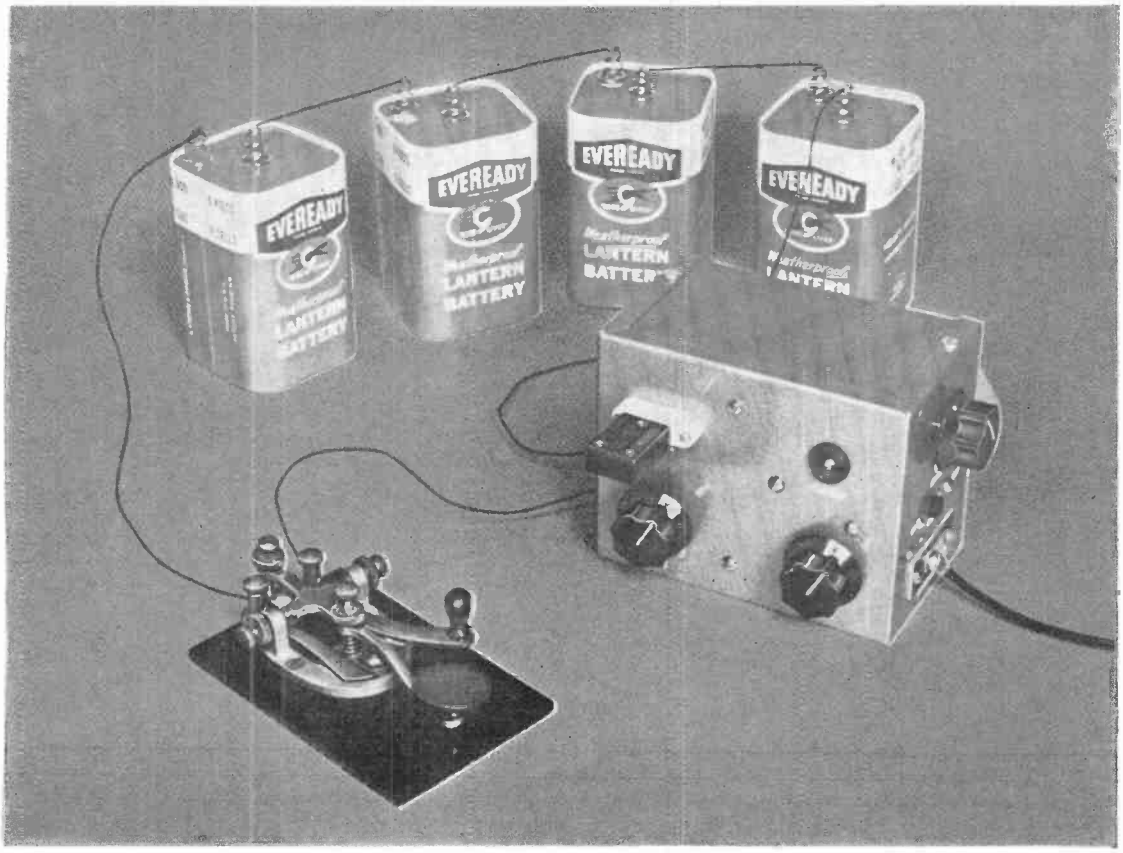
THE CAMPER'S SPECIAL

By **HARTLAND B. SMITH**
W8VVD

Battery-operated 80-meter CW transmitter for use in the field, or as a standby back in the shack, can be built for less than $10.00

INEXPENSIVE medium-power r.f. transistors make it possible to construct a low-cost but effective dry-battery-powered c.w. transmitter. The "Camper's Special" is a 3.5-mc. portable rig with an input rating of almost 5 watts, yet it can be built for less than $10, plus batteries, key, and crystal. Operating expense is insignificant, running in the neighborhood of three cents per hour when ordinary lantern batteries are used as a power source.

While the transmitter is especially well suited to operate miles from a conventional power source, it also is a worthwhile addition to the shack of the conscientious ham who has been searching for a simple rig for emergency backup. Its signal is strong enough to provide reception of solid copy at a distance of 20 miles or more on ground wave, and up to 1000 miles when skip conditions are optimum. Keep in mind that a 5-watter is only two S-units weaker than a 100-watter. Performance, if the QRM isn't excessive, can be surprisingly good.



How It Works. Resistors *R1* and *R2* form a voltage divider to provide a small amount of forward bias for the base of *Q1*. Current flows in the emitter-collector circuit and through *L1* when the key is closed. The application of power causes the crystal to vibrate at its resonant frequency and varies the emitter bias at an r.f. rate. If *L1* and *C1* are now resonated near the crystal frequency and *Q1* amplifies sufficiently to overcome circuit losses, the stage will go into sustained oscillation.

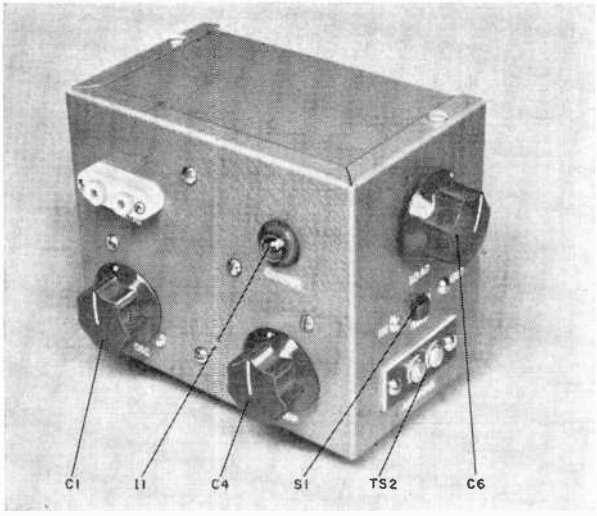
Capacitor *C3* couples the signal from *Q1* to *Q2*. Transistor *Q2* and its tank circuit (*L2* and *C4*) amplify the signal. Resonant tank circuit *L3, C6* picks off the signal and couples it to the antenna. This is a basic master oscillator, power amplifier (MOPA) configuration.

A tap on *L3* matches the low impedance of the antenna feed line to the high impedance of the tank. When *S1* is open, current flowing to the antenna passes through pilot light *I1*, which serves as a relative indicator of transmitter tuning and power output. Tune all stages for maximum brightness. Keep the switch closed when on the air.

Construction. The larger half of a 5″ x 4″ x 3″ Minibox is both chassis and front panel for the transmitter. Since lead length and parts layout aren't overly critical on the 80-meter band, you needn't worry about precisely duplicating the component arrangement. As long as your version resembles the prototype, it should perform satisfactorily.

In order to save both space and money, mica trimmer capacitors are used for *C1, C4* and *C6*. Mount these capacitors behind ⅜″ holes drilled in the Minibox cover. Note that one trimmer terminal is fastened to the plate which is directly beneath the adjusting screw in each case; fasten this terminal to a grounded solder lug. Support the other terminal on a one-terminal insulated tie strip. If you don't like to do your tuning with a screwdriver, solder ¾″ lengths of ¼″ brass shafting, salvaged from old volume controls, to the capacitor adjusting screws.

Larger half of box serves both as chassis and front panel. Shafts mounted on capacitors C1 and C4 accommodate knobs to eliminate screwdriver tuning.



Then you can put knobs on the shafts, as shown. A large soldering iron is needed for this particular job. Don't let excess solder dribble down and short out the trimmer plates or damage the mica insulation.

No socket is required for *I1*. Merely press the bulb into a ⅜" grommet and solder leads from *S1* directly to the base and tip.

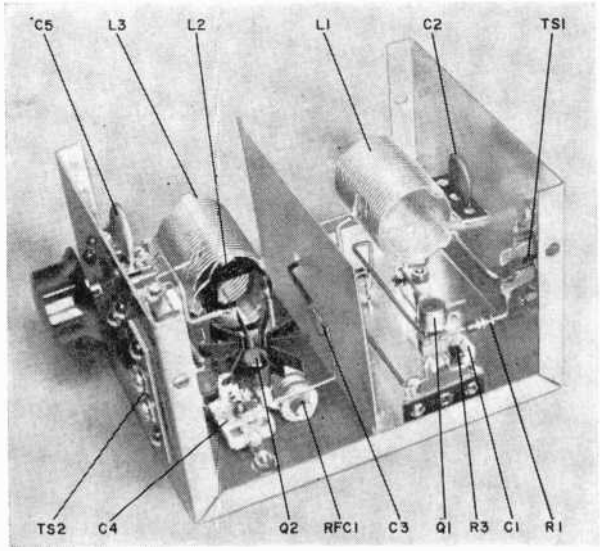
Cover *L2* with a layer of plastic electrical tape and slide it part way into *L3*. The exact position of the coil will be determined later when the transmitter is adjusted. As you wire the coils, make sure that the collector end of *L2* and the ground end of *L3* are nearest *Q2*. This arrangement minimizes capacitive coupling, thus keeping harmonic radiation at a minimum. Put spaghetti over the lead at the *C5* end of *L2*. Thread this wire through the center of the coil and then run it over to the capacitor.

Since the transistor cases are 24 volts above ground, be certain that the fins on *Q2*'s heat sink do not contact nearby uninsulated objects. Bend the fins near *TS2* and the edge of the chassis at right angles so that there will be no chance of them shorting out the batteries. For the same reason, position *Q1* where it will clear the side of the assembled Minibox.

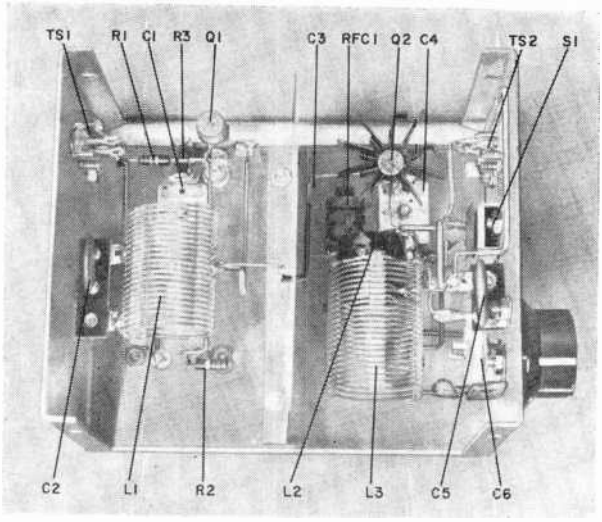
Before plugging the transistors into their respective sockets, trim the leads to a length of ⅜". Grip the wires tightly with a pair of long-nosed pliers, close to the transistor body, to take up the mechanical shock that results from the snipping action. Failure to do this can sometimes fracture the silicon wafer inside the transistor.

PARTS LIST

B1—Four 6-volt lantern batteries in series
C1, C4, C6—80-480 pf. mica trimmer capacitor
C2, C5—0.01-μf. ceramic disc capacitor
C3—100-pf. ceramic disc capacitor
I1—#47 pilot light
L1—22 turns of #20 wire, 1" diameter x 1⅜" long, tapped 11 turns from C2 end (B. & W. 3015 Miniductor, or equivalent)
L2—14½ turns of #24 wire, ¾" diameter x ½" long—see text (B. & W. 3012 Miniductor or equivalent)
L3—23 turns of #20 wire, 1" diameter x 1⅜" long, tapped 7 turns from ground end (B. & W. 3015 Miniductor, or equivalent)
Q1, Q2—2N3053 transistor
R1—82,000-ohm, ½-watt resistor



Center shield isolates oscillator from amplifier. Coil L2 is suspended inside L3 and cemented in place after it has been tuned for maximum output.



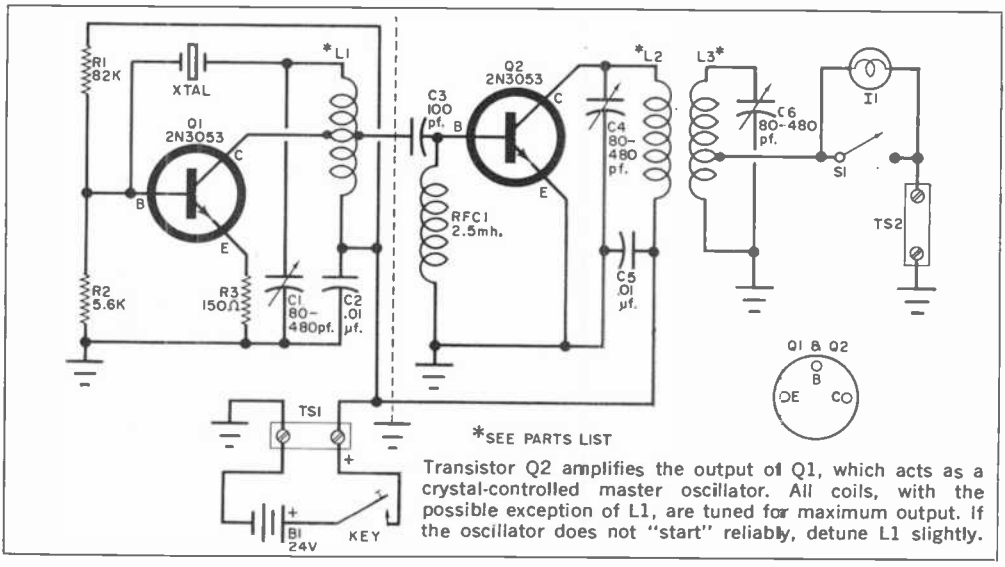
Bend fins on Q2's heat sink to avoid contact with cabinet and leads. For best results, locate components as shown. Lead dress is not too critical.

R2—5600-ohm, ½-watt resistor
R3—150-ohm, ½-watt resistor
RFC1—2.5-mh. r.f. choke
S1—S.p.s.t. slide switch
TS1, TS2—Two-screw terminal strip
KEY—Telegraph key
XTAL—3.5- to 3.8-mc. quartz transmitting crystal
1—5" x 4" x 3" Minibox (Bud CU-2105-A, or equivalent)
1—Transistor heat sink (Wakefield Engrg. NF-209)
Misc.—Knobs (3), crystal socket, 2¾" x 3¾" shield (aluminum or tin), 1-terminal insulated tie points (4), 2-terminal insulated tie points (2), transistor sockets (2), grommet, solder lugs, machine screws and nuts, wire, solder, spaghetti, etc.

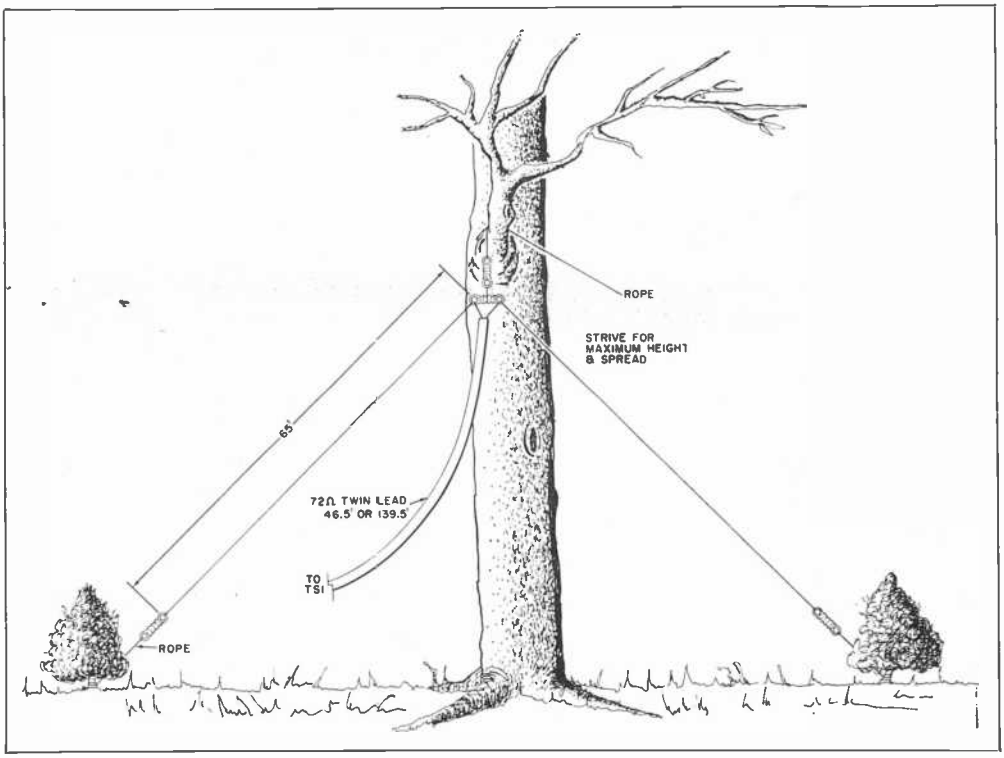
A 2¾" x 3¾" metal shield with a ¼" mounting flange isolates the amplifier from the oscillator stage. Either thin aluminum or coffee can tin may be used for the purpose. Drill a small hole near the center of the shield to pass the spaghetti-covered lead of *C3*.

Precautions: The amplifier transistor generates quite a bit of heat during normal operation. Consequently, never use the rig unless a heat sink is slipped over *Q2*, and don't hold the key down for more than 15 seconds at a time while tuning up. Watch the battery polarity, too; accidentally reversing the battery leads can destroy the transistors.

Adjustment. Connect a 100-ohm, 1-watt composition resistor across the terminals of *TS2* to act as a dummy antenna. Attach a key and battery to *TS1*. Set *C1* at low capacity and tighten down *C4* and *C6*. Then open *S1*. Tune your receiver to



Transistor Q2 amplifies the output of Q1, which acts as a crystal-controlled master oscillator. All coils, with the possible exception of L1, are tuned for maximum output. If the oscillator does not "start" reliably, detune L1 slightly.



Sling the center of the antenna over the highest limb of a tree, and spread it as much as possible. The more horizontal the line, the better. Radiation angle is north and south if the wire runs east and west.

the crystal frequency, and depress key.

Slowly tighten *C1* until the oscillator can be heard in the receiver. Do not advance *C1* beyond the point where consistent oscillation occurs each time the key is pushed. Adjust *C4* and *C6* for maximum volume on the receiver. By now, *I1* should start to glow. Slide *L2* in and out of *L3*, while adjusting *C4* and *C6* for the brightest indication. Then cement *L2* in place.

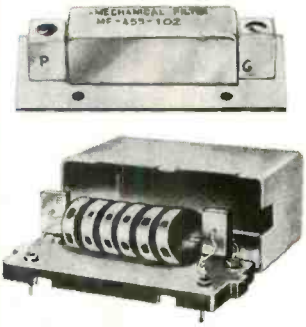
A milliammeter temporarily connected in series with the key should read somewhere between 175 and 225 ma. with both transistors plugged in. Removal of *Q2* should drop the reading to 10 or 15 ma.

Now remove the dummy load and hook up the regular antenna. Stick to the specified dimensions. Do not attempt to use a random length of end-fed wire, as it will load the transmitter incorrectly and will radiate a very poor signal. The most important part of the antenna is its center so far as height is concerned. Consequently, as long as you have the center at least 30 feet off the ground, you can tie the ends to any convenient tree or bush.

If possible, use a 46½-foot feeder, rather than a 139½-footer. In either case, however, do not coil up the excess line. Instead, let it "meander" back and forth on its way to the transmitter with no sharp bends.

Operation. Working with low power on a crowded band requires a certain amount of skill. When arranging schedules with stations back home, try to choose a time when conditions are optimum between the two locations. If skeds are impractical, pick a net frequency where the gang has been previously alerted to listen for your signals.

During random operation, don't bother to call CQ. Wait for a strong station to come on the air within 3 or 4 kc. of your frequency and then tap out a reply. With a little patience, and operating know-how, you'll be surprised and pleased at the number of QSO's that the Camper's Special will produce. -30-



SUPER SELECTIVITY FOR YOUR RECEIVER

By CHARLES CARINGELLA
W6NJV

Mechanical filter sharpens bandwidth for optimum reception of AM, CW, and SSB

IF your receiver or transceiver employs a 455-kc. i.f. strip, sharp selectivity can be achieved by substituting a recently introduced mechanical filter (Lafayette 99 K 0123) for the first i.f. transformer to help you cope with today's crowded radio bands. Several important advantages make this installation highly desirable.

Steep skirt selectivity makes it possible to overcome the masking effects of strong or local signals as little as 5 kc. away. Once the filter is installed, it doesn't need to be adjusted while the receiver is in operation. No objectionable effects such as ringing or hollow sounds commonly associated with crystal filters are present. The filter can be installed in most vacuum-tube-type amateur, commercial, or CB equipment. Finally, it works well in AM, CW, and SSB receivers.

How It Works. The mechanical filter is basically an electromechanical device. It consists of an input transducer, a resonant mechanical section having several metal discs, and an output transducers, as shown above. Both transducers are crystal types. An electrical signal applied to the input transducer is converted into mechanical vibrations which travel through the resonant mechanical section to the output transducer, where they are reconverted to electrical signals.

The selectivity characteristics of the filter are determined by the resonant metal discs. Each disc is carefully machined to extremely close tolerances to make it vibrate at a desired frequency, such as 455 kc. The discs are made of a ferro-nickel chromium alloy for extreme hardness and resistance to corrosion. Each is supported by—and coupled to the others with—a thin rod. The rod runs the entire length of the filter, and is attached to the transducer at each end. Only those signals within the filter's passband can get through.

Nominal bandpass characteristics of the filter used in this project are shown

in Fig. 1. At 6 db down on the response curve, the bandwidth is approximately 2 kc.; and at 60 db down, the bandwidth is approximately 6 kc.

It is natural for mechanically resonant elements, such as metal discs, to have multiple resonances which allow spurious transmissions through the filter at frequencies other than those in the primary passband. By employing conventional type i.f. transformers at the input and output ends of the filter, these spurious signals are attenuated. Signal frequencies of plus or minus 20 kc. from the i.f. (435 kc. and 475 kc.) are cut by a minimum of 40 db. Frequencies above 475 kc. and below 435 kc. are far enough away from the rest of the receiver's passband to be blocked, and thus be of no consequence.

Input and output impedance is 10,000 ohms. Capacitive coupling is required to prevent B+ on the input side from getting to the output side, which is in the grid circuit of the next stage, and to prevent B+ from shorting to ground. In order to minimize the number of connections to the filter, the bottom leads of the windings in both transformers are already connected to the ground foil on the filter's printed circuit board. Only three connections are needed: plate, grid, and ground.

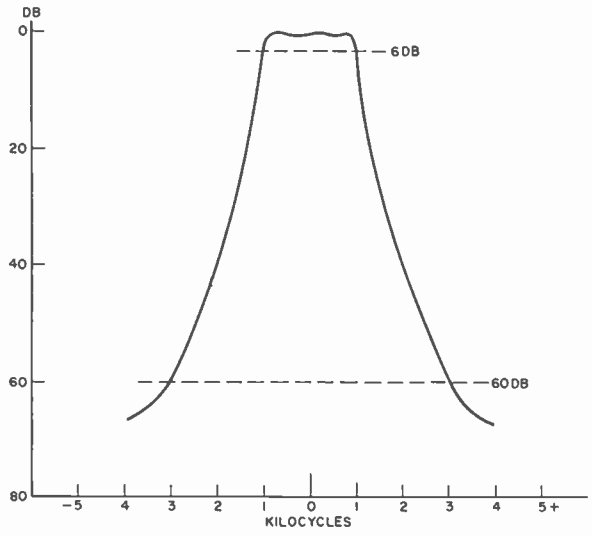


Fig. 1. Bandwidth of 2 kc. at 6 db expands slowly to 6 kc. at 60 db. Steep skirt characteristic makes it possible to separate closely spaced stations.

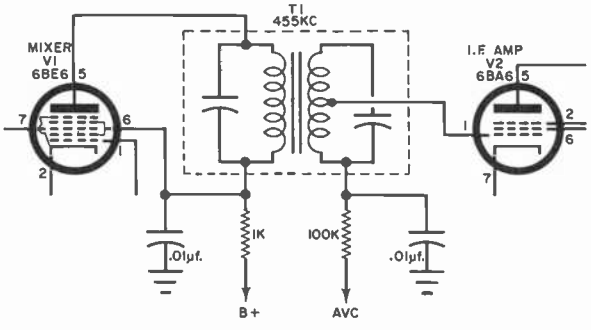


Fig. 2. Typical receiver first i.f. stage before modification. Internal circuitry of transformer can be ignored. However, the frequency of the mechanical filter should be the same as the transformer to be replaced.

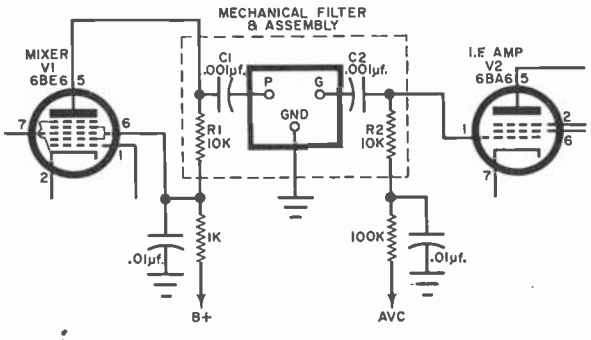


Fig. 3. In addition to the mechanical filter, only two capacitors and two resistors are added (within the dotted lines). Once the filter is installed and the remaining i.f. transformers have been peaked, no further adjustments need be made.

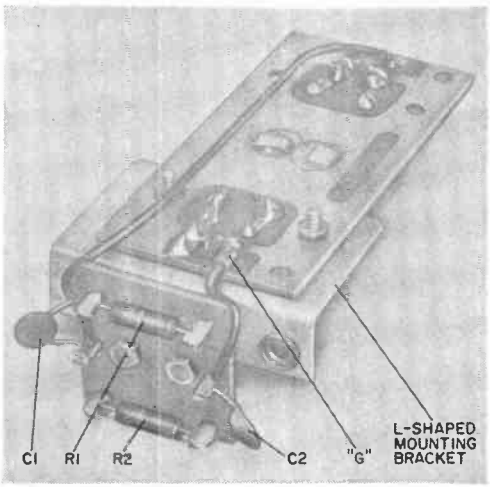


Fig. 4. Mechanical filter and added components are grouped together into a subassembly and mounted in the same manner as the original i.f. transformer.

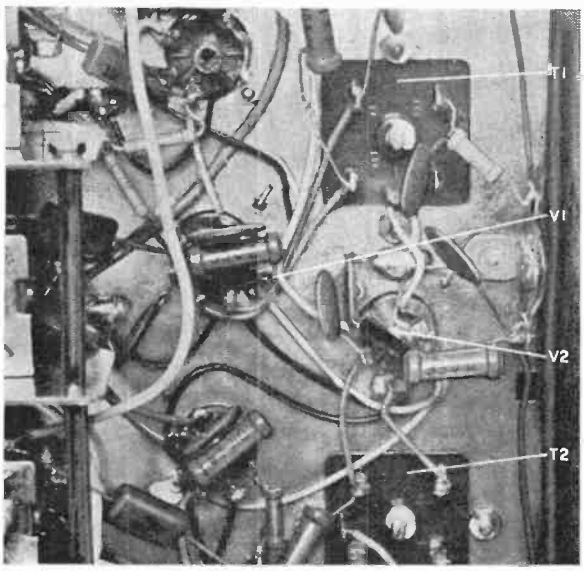


Fig. 5. Bottom view of receiver before the first i.f. transformer (T1) is removed. It is not necessary to disturb any other part of the receiver.

Construction. The only parts you will need, in addition to the mechanical filter, are two 10,000-ohm, ½-watt resistors, (*R1* and *R2*), two 0.001-μf. ceramic disc capacitors (*C1* and *C2*), a 1″ x 1″ piece of Vectorbord or other suitable material, six push-in terminals, and an L-shaped mounting bracket.

Except for the removal of the first i.f. transformer, all components and connections in your receiver or transceiver remain the same. A typical circuit before modifications is shown in Fig. 2. Variations in component values or in i.f. transformer design in different receivers are not critical and will not adversely affect the installation of the filter. Figure 3 shows the same portion of the receiver after the filter has been installed.

The actual filter and additional components are mounted on a subassembly as shown in Fig. 4. While it is not necessary to shield the filter—its components are already housed in metal cans which have been grounded to the printed circuit board—it *is* necessary to have a good ground connection between the board and the receiver's chassis.

The one-inch-square piece of Vectorbord is bolted to the bottom of the L-

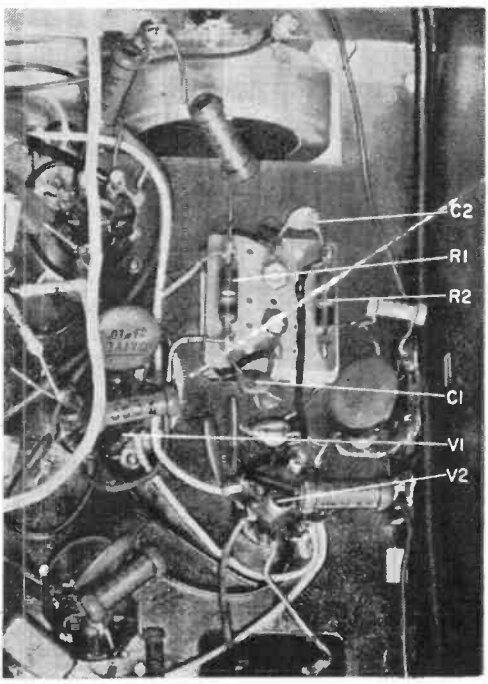


Fig. 6. After the first i.f. transformer is removed, the mechanical filter subassembly is installed, and held in place by two screws. The board should be made small enough to pass through chassis opening.

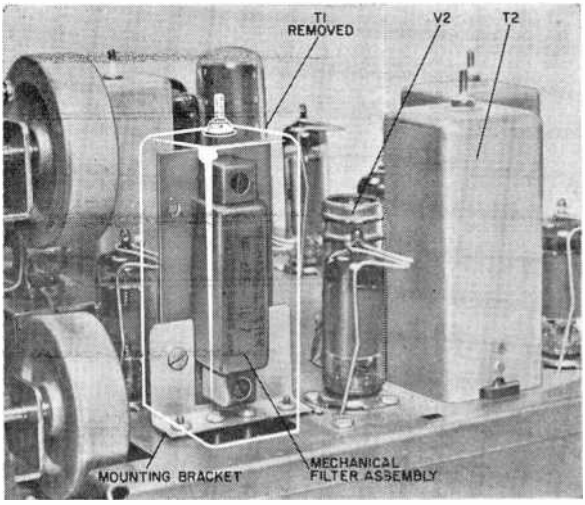
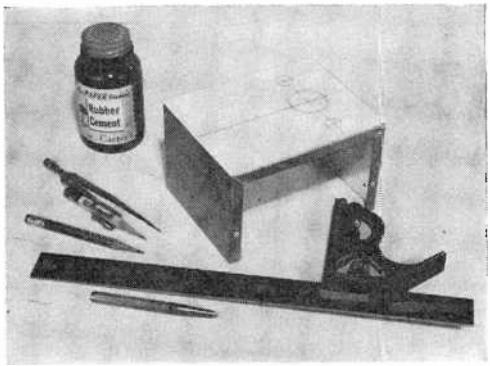


Fig. 7. Above-the-chassis view of mechanical filter mounted in place of T1. Insertion loss is on the order of 1.5 to 3 db.

shaped bracket. Resistors *R1* and *R2* and capacitors *C1* and *C2* are mounted on the board. The push-in terminals serve to hold the components and the connections to the receiver. Before and after photos show how the subassembly is mounted on the chassis. Check to see that the board fits in the chassis opening, to fully seat the bracket.

Alignment. Generally, once the filter assembly has been installed, no further alignment is necessary. However, you might try to peak the remaining i.f. transformers in the receiver. Just in case the two transformers on the filter have been diddled with, they too should be aligned for maximum output at the designated intermediate frequency. -30-

CLEAN LAYOUT TECHNIQUE



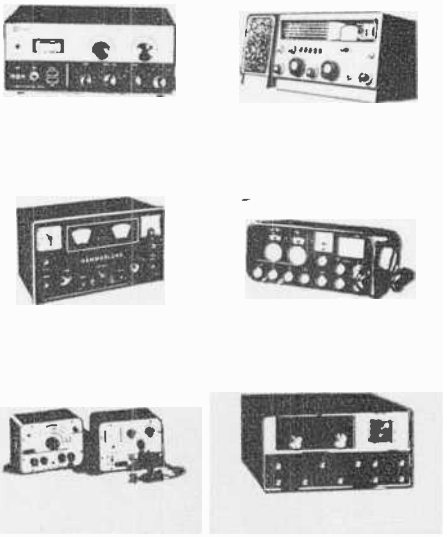
TO GIVE your finished project that professional look, take care not to damage the painted surface of the cabinet when you locate the various mounting holes. Cut a piece of graph paper to cover the area to be drilled or punched and seal it down temporarily with rubber cement. Then lay out your drilling pattern using a sharp-pointed, soft-lead pencil. Centerpunch hole locations and drill (or punch) through the graph paper. When all machine work—including deburring— is finished, simply peel off the paper pattern. Excess cement can be removed by rubbing the surface with a finger or a soft eraser. The resulting surface should be smooth and clean. If you use decals or painted labels, protect them with two or three coats of clear lacquer or acrylic plastic.

—E. G. Louis

HAM GEAR FOR THE NEWCOMER

BY HERBERT S. BRIER, W9EGQ
Amateur Radio Editor

A sampler of what's available and what to look for



WHEN IT COMES to choosing equipment, a new radio amateur is in almost the same position as a youngster with a dime to spend in a candy store. There are so many goodies to choose from! Should his first transmitter include both CW and phone? What bands should it cover? How much power output should it have?

What about the ham receiver? Should it cover all frequencies from the broadcast band up, or should it cover just the amateur bands? How good is amateur equipment assembled from kits? How difficult are kits to assemble?

Of course, the type of license held and the ultimate aims of the individual amateur have a large bearing on the answers to these questions. In this article we will discuss the various factors involved, and list specific details of selected amateur equipment.

Transmitters. A Novice whose aim is to obtain his General Class license as soon as possible has clear guide lines for choosing his first transmitter. It must be crystal-controlled, key well, and operate on the 80-, 40-, and 15-meter Novice bands within the Novice power limit of 75 watts. From a practical standpoint, a 50- to 60-watter is virtually as effective as a 75-watter. With such transmitters, the average Novice works around 30 states and makes a few foreign contacts, and many Novices with good antennas work all states and a lot more DX. Then, when they get their General tickets and spread their wings, they run up fantastic DX records, still using the same, simple transmitters.

All but the simplest one-tube transmitters cover the 20-, 10-, and sometimes the 6-meter band, in addition to the 80-, 40-, and 15-meter bands. Also, some of them include a simple screen modulator for low-power AM phone work. A transmitter covering the bands between 80 and 6 meters and containing a modulator as well makes an excellent transmitter for a Novice, Technician, *or* a General Class operator. The latter two can add an external VFO to the unit for increased versatility.

If you want to start out with a somewhat more elaborate first transmitter, there are a number of them available with power ratings up to 150 watts and optional VFO or crystal control. (Transmitters with a rated power input of no more than 150 watts can be throttled down to the Novice 75-watt power limit, and a Novice can reserve the VFO for later use.)

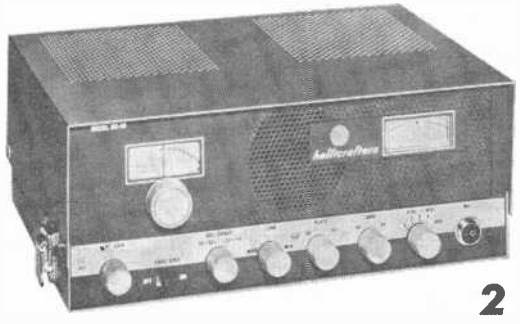
Some amateurs would doubt the wisdom of investing much money in AM equipment because AM is being rapidly

TRANSCEIVERS

1 This all-in-one package is the Poly-Comm 6. Consisting of an 18-watt input transmitter and dual-conversion receiver, the transceiver has great appeal for Technicians.

2 The Hallicrafters' SR-46 is rated at a power input of 12 watts. Splitting the 6-meter band into two segments, it has four crystal positions or may be driven by a VFO.

1



2

1 The Conar Novice ham station consists of two units: a receiver tuning only the 80-, 40-, and 15-meter bands, and a 25-watt input transmitter.

2 EICO's compact Model 723 draws an input of 60 watts—ideally suited for Novices. An AM phone modulator can be added to the rig at a later date.

3 Technicians can jump on 6 meters for only a few dollars if they build the WRL "Tech-Ceiver 6A." This transceiver kit draws about 5 watts input.

4 This Knight-Kit can be used on six different bands—80 through 6 meters. Drawing 60 watts input, the T-60 has built-in phone modulator for Generals.

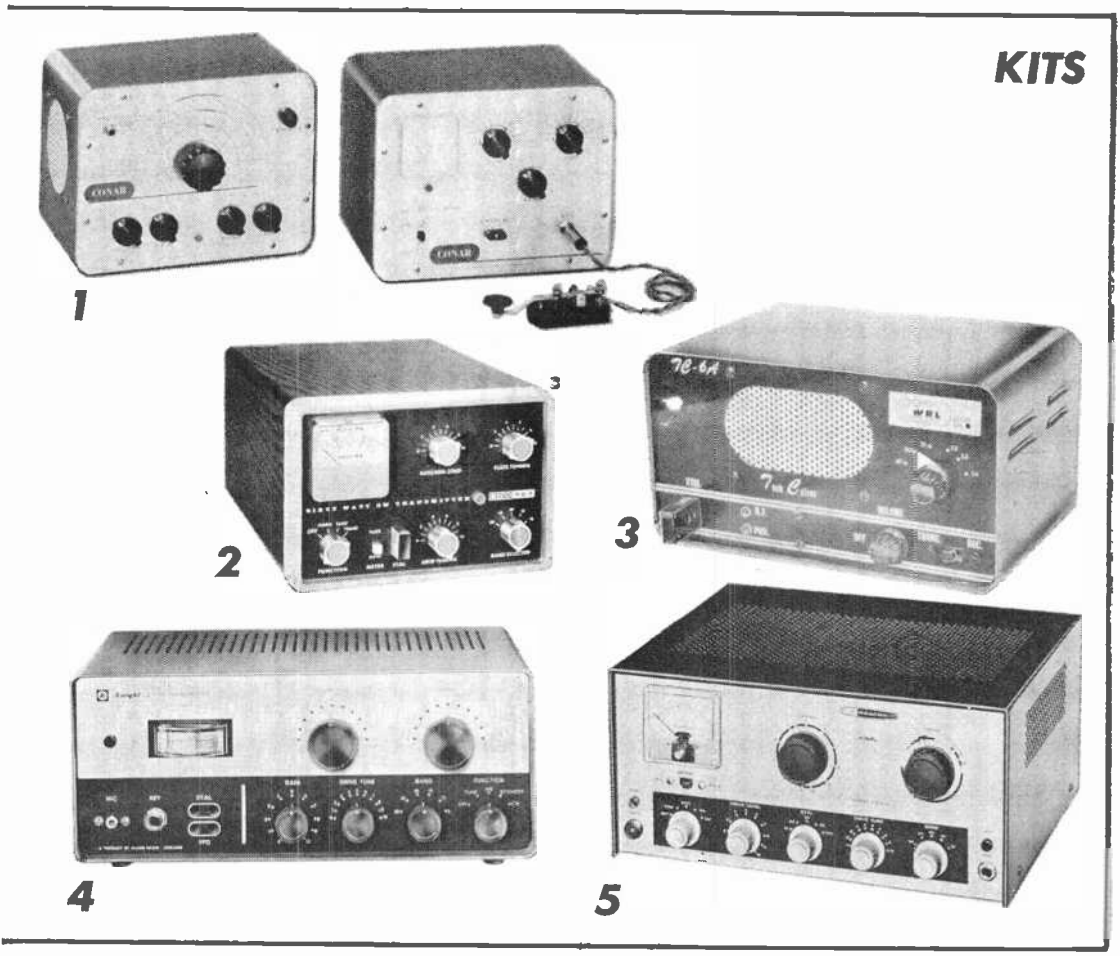
5 The 90-watt input of the Heathkit DX-60A can be dropped to the Novice limit of 75. A controlled carrier modulator is used for phone operation.

Note: Not shown here is the popular E.F. Johnson "Ranger II" with coverage from 160 to 6 meters, 65-75 watts, phone-c.w.

replaced by single-sideband (SSB) phone. Frankly, we would not advise spending large sums for lower-frequency AM equipment for this reason. Nevertheless, there is still considerable AM operation in the 160- through 10-meter bands, especially in the less crowded operating hours. Consequently, a moderate expenditure for AM equipment for these bands is not necessarily a foolish investment for a dollar-shy Novice who would like to operate a little phone when his General ticket comes through, but who cannot afford the higher cost of SSB gear. Also, let us stress that CW is still very much alive—as a little listening in the low-frequency CW bands will verify.

A typical wide-range, Novice, Technician, General AM/CW transmitter is the E. F. Johnson "Ranger II." Selling for $249.50 in kit form and $359.50 ready to go, the "Ranger II" is rated at 75 watts, CW, and 65 watts, plate-modulated phone, on all amateur bands from 160 through 6 meters, using either crystal or built-in VFO control.

For those who are interested in a CW/SSB transmitter that can be operated as a crystal-controlled Novice CW transmitter, we are breaking the news of the Hallicrafters HT-46 CW/SSB transmitter. Scheduled for fall delivery, the HT-46 has a tentative price of approximately $295, complete with built-in power supply. Hallicrafters' engineers report that the HT-46 will operate on crystal-controlled CW at the 75-watt Novice power limit and VFO control on SSB and CW at the 100-watt output level. In addition, this new transmitter can be "slaved" with the Hallicrafters SX-146 receiver (also just announced) for transceiver-type operation if desired.



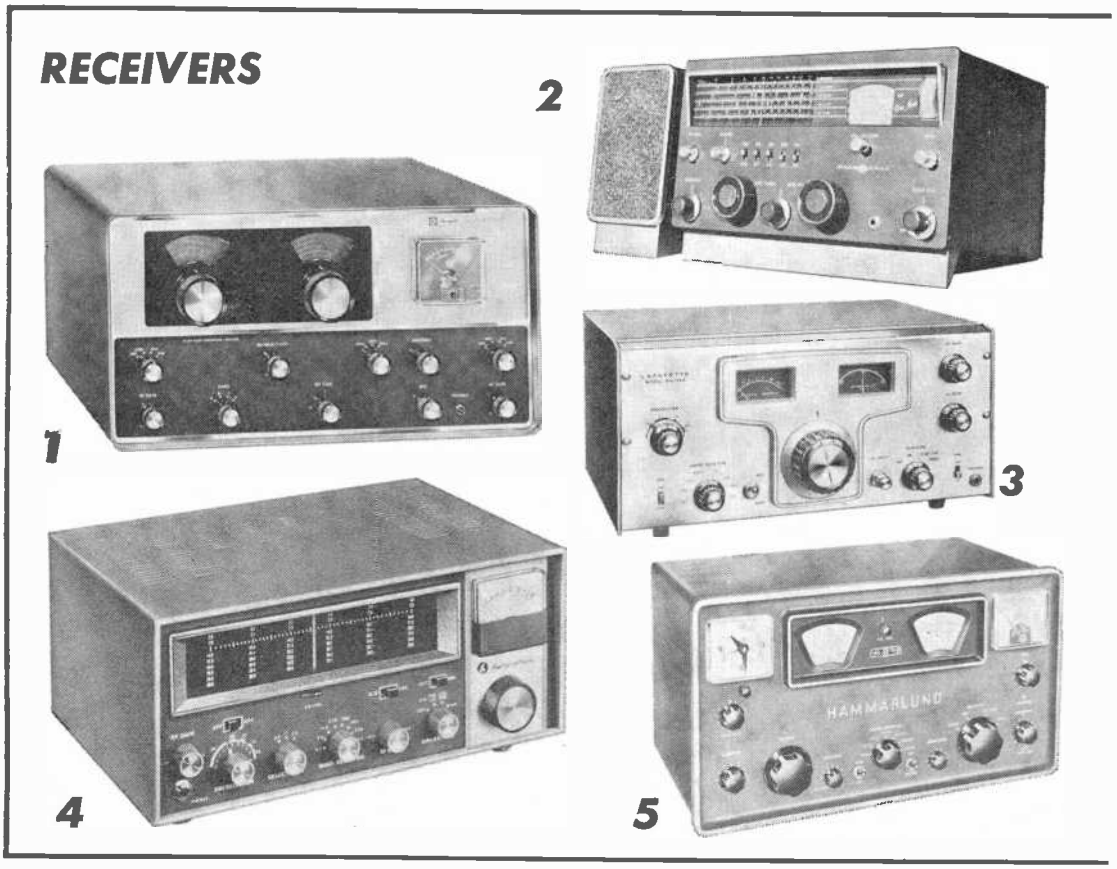
Novices interested in this type of equipment for future expansion might also check with the Hammarlund Manufacturing Co. about the possibilities of operating its Model HX-50A 10-through-80-meter AM/CW/SSB transmitter on reduced-power, crystal-controlled CW. And the Hallicrafters Company will furnish fairly simple instructions for modifying its Model HT-44 AM/CW/SSB transmitter for crystal-controlled operation upon request.

Receivers. The most important requirement for an amateur receiver is high selectivity. To combat the heavy interference in the lower-frequency amateur bands, optimum selectivity figures run under 5 kc. for AM phone, 2 to 3 kc. for SSB, and under 500 cycles for CW work, although selectivity in the 2- to 3-kc. region does a good job for all three modes of operation.

High receiver selectivity is obtainable in several ways. Among them is the use of dual (or triple) conversion, starting with a high intermediate frequency (i.f.) for good image rejection and ending with an i.f. in the 50- to 100-kc. region. Another method is the addition of a crystal or mechanical filter to obtain high selectivity at a fairly high i.f.

Also used are electronic "*Q*-multipliers." Available as an accessory from Heath and WRL in kit form for about $15, a *Q*-multiplier can make a dramatic improvement in the effective selectivity of an inexpensive receiver with an i.f. in the 455-kc. region. Along the same line is Galaxy's just-announced solid-state, tunable, audio-frequency "Rejector," which connects in the speaker leads of a receiver or transmitter and knocks out annoying whistles and heterodynes.

In selecting a ham receiver, buy the best one you can afford; and, if you don't care particularly what goes on outside the ham bands, a ham-band-only receiver results in superior fre-



quency stability and ease of tuning. But don't sell the less-expensive "general-coverage" receivers too short, especially on 80 and 40 meters.

The VHF Region. Although the frequencies above 50 mc. are the home of the Technician operators, there is really very little difference in the equipment used by the average Novice, Technician, or General Class licensee in this region. Most VHF activity is on AM phone on the 50- and 144-mc. bands. Many of the transmitters are crystal-controlled, and power is seldom over 500 watts. In fact, a very large percentage of 50- and 144-mc. work is done with 5- to 20-watt transceivers.

The majority of VHF gear works on only a single band; and, except for Novices who must operate 145-147 mc., local conditions usually determine whether the 50-mc. or 144-mc. band is more popular in an area. The normal communications range is somewhat greater on 50 mc. than on 144 mc., and there are occasional chances for DX contacts on the 50-mc. band, especially in May, June, July, August, and December. But these advantages are often counterbalanced in television Channel 2 areas by the greater likelihood of neighborhood TVI complaints being generated by 50-mc. operation.

Single-sideband operation on the VHF bands is still at a fairly low level, but it is increasing as suitable equipment becomes more readily obtainable. We doubt, however, that SSB will achieve the popularity on VHF for general operation that it enjoys on the lower frequencies for years to come, if for no other reason than that there is more room to move around on the VHF bands. Also, except for serious workers who use every possible means to stretch their communications range to the utmost, the amount of CW on the VHF bands is pitifully small. Many VHF transmitters do not even have a key jack!

Converters. With a transceiver, one's receiving problems are automatically taken care of for mobile and portable operation. But for the operator who already possesses a good, low-frequency ham receiver, a good crystal-controlled VHF converter ahead of it offers the most economical means of obtaining excellent VHF reception in the home station. It is common, in fact, for VHF operators with transceivers to use them as transceivers for mobile and portable operation, and as transmitters only at home, depending on the converter-receiver combination for reception, especially when interference is bad and signals are weak.

Hammarlund's HQ-110A and HQ-170 receivers actually contain built-in 6- and 2-meter converters, and both receivers cover all the ham bands from 160 meters through 2 meters. Squires-Sanders, Inc. attacks the problem from the opposite end in the "Clegg Interceptor B" receiver, which covers the 6- and 2-meter bands directly; an accessory all-band HF tuner is available to extend the coverage to the lower-frequency amateur bands.

Solid-State Equipment. Except for power supplies and some accessories, the

(*Continued on page* 101)

1 The Knight-Kit R-100A is one of the few general-coverage receiver kits usable on the ham bands. Features include bandspread on 10-80 meters and a built-in Q-multiplier. The S-meter is $12.95 extra and a crystal calibrator is also available, at $10.95.

2 National Radio's NC-190 is tipped back to put the operating controls at a more convenient angle. Tuning from the broadcast band through 10 meters, the ham bands are spread on half of a rotary dial and six short-wave broadcast bands on the other half.

3 Tuning the ham bands only, the Lafayette HA-350 is a crystal-controlled double-conversion receiver of excellent selectivity and stability. A product detector has been built in for ease of SSB reception. Upper or lower sideband choice is made from panel.

4 About to be released this fall is the new Hallicrafters SX-146 amateur band receiver. Five hundred kc. segments of the ham bands are spread linearly over a slide rule dial; SSB reception and variable selectivity are but two of the more important features.

5 The Hammarlund HQ-110A is unique among ham-band-only communications receivers in that the dial is precalibrated for the 6- and 2-meter bands. Outboard converters feed appropriate low frequencies into the receiver to take advantage of the dial.

See Ham Equipment Sampler on p. 62 to 64

SAMPLER OF EQUIPMENT FOR THE HAM NEWCOMER

Manufacturer	Model	Type	Function	Transmitter Control	Bands	Mode	Power, etc.	Price
Allied Radio 100 N. Western Ave. Chicago, Ill. ("Knight-Kit")	P-2	Kit	SWR Meter		All	Any	Any	$ 15.95[1]
	R-55A	Kit	Receiver		BCB/6 m.	AM/CW	8 tubes	59.95
	R-100A	Kit	Receiver		BCB/10 m.	AM/CW/SSB	9 tubes	99.95
	T-60	Kit	Transmitter	Xtal	80/6 m.	AM/CW	60 watts	49.95
	T-150A	Kit	Transmitter	Xtal/VFO	80/6 m.	AM/CW	150 watts	99.95
AMECO Equipment Corp. 178 Herricks Rd. Mineola, L.I., N.Y.	AC-1T	Kit	Transmitter	Xtal	80/40 m.	CW	15 watts	19.95
	TX-62	Wired	Transmitter	Xtal	6/2 m.	AM/CW	75 watts	149.95
	TX-80	Kit	Transmitter	Xtal	80/10 m.	AM/CW	90 watts	89.95
	PS-3	Wired	Power supply for TX-80				117 volts	44.95
	CN Series	Kits	Converters		6, 2, or 1¼ m.			34.95 and up
	PS-1K	Kit	Power supply for CN series				117 volts	10.50
Conar Division of National Radio Institute 3939 Wisconsin Ave. Washington, D.C.	400	Kit	Transmitter	Xtal	80/40/15 m.	CW	25 watts	32.50[1]
	500	Kit	Receiver		80/40/15 m.	AM/CW/SSB	4 tubes	37.50[1]
R. L. Drake Company Miamisburg, Ohio	R-4	Wired	Receiver		80/10 m.	AM/CW/SSB		379.95
	TV-1000-LP		Low-Pass Filter		80/6 m.		1000 watts	
							200 w.—6 m.	16.95
	TV-100-LP		Low-Pass Filter		80/6 m.		100 watts 20 w.—6 m.	5.95
EICO Electronic Instrument Co., Inc. 1311-01 39th Ave Flushing, N.Y.	720	Kit	Transmitter	Xtal	80/10 m.	CW	90 watts	89.95[1]
	723	Kit	Transmitter	Xtal	80/10 m.	CW	60 watts	59.95[1]
	722	Kit	VFO for 720 and 723		80/10 m.			44.95[1]
	730	Kit	Modulator for 720 and 723					59.95[1]
Galaxy Electronics 10 S. 34th St. Council Bluffs, Iowa		Wired	CW Monitor for any transmitter				Solid-state	29.95
		Wired	Microphone Compression Amp.				Solid-state	24.95
		Wired	"Rejector" Audio Notch Filter				Solid-state	34.95

Gonset, Inc. Altec Lansing Corp. 1515 S. Manchester Ave. Anaheim, Calif.	900A 901A 910A 911A G50	Wired Wired Wired Wired Wired	Transceiver Power supply for 900A Receiver Power supply for 910A Receiver	VFO Xtal Xtal/VFO	2 m. 6 m. 6 m.	AM/CW/SSB AM/CW/SSB AM	20 watts 117 volts	399.50 73.50 399.50 73.50 367.30
Hallicrafters 5th & Kostner Ave. Chicago, Ill.	HT-46 SX-130 SX-146 SR-42 SR-46	Wired Wired Wired Wired Wired	Transmitter Receiver Receiver Transceiver Transceiver	VFO/Xtal Xtal Xtal	80/10 m. 80/10 m. 80/10 m. 2 m. 6 m.	CW/SSB AM/CW/SSB AM/CW/SSB AM AM	100 watts 7 tubes 9 tubes 12 watts 12 watts	295.00[2] 179.95 249.95[2] 189.95 189.95
Hammarlund Mfg. Co. 73-88 Hammarlund Dr. Mars Hill, N.C.	HX-50A HQ-110A HQ-170A	Wired Wired Wired	Transmitter Receiver Receiver	Xtal/VFO	80/10 m. 160/2 m. 160/2 m.	AM/CW/SSB AM/CW/SSB AM/CW/SSB	200 watts	495.00 309.00 429.00
Heath Company Benton Harbor, Mich. ("Heathkit")	DX-60A HG-10 HR-10 HW-29A HW-30 HW-10 HW-12 HD-11	Kit Kit Kit Kit Kit Kit Kit Kit	Transmitter VFO for DX-60 Receiver Transceiver Transceiver Transceiver Transceiver Q-Multiplier	Xtal VFO Xtal Xtal Xtal/VFO Xtal/VFO	80/10 m. 80/2 m. 80/10 m. 6 m. 2 m. 6 m. 2 m. 450-460 kc.	AM/CW AM/CW/SSB AM AM AM/CW AM/CW	90 watts 7 tubes 5 watts 5 watts 18 watts 18 watts 117 volts	79.95 34.95 79.95 44.95 44.95 199.95 119.95 14.95
International Crystal Mfg. Co., Inc. 18 N. Lee St. Oklahoma City, Okla.	AOD-57 AOA-144 AMD-10	Wired Wired Wired	Transmitter Amplifier Modulator for above units	Xtal	6 m. 2 m.	CW CW	5 watts	69.50 39.50 24.50
E. F. Johnson Co. Waseca, Minn.	Ranger II Ranger II 250-20 250-23-1	Kit Wired Wired Wired	Transmitter Transmitter Low-Pass Filter "Match Box" Antenna Coupler	Xtal/VFO Xtal/VFO	160/6 m. 160/6 m. 160/10 m.	AM/CW AM/CW	65-75 watts 65-75 watts 1000 watts 275 watts	249.50 359.50 14.95 64.95
Lafayette Radio Electronics 111 Jericho Turnpike Syosset, L.I., N.Y.	HA-225 HA-350 99-2501 99-2536	Wired Wired Wired Wired	Receiver Receiver VFO VFO		.15/54 mc. 80/10 m. 80/10 m. 6/2 m.	AM/CW/SSB AM/CW/SSB	14 tubes 11 tubes 117 volts 117 volts	139.50 189.50 34.50 29.95
National Radio Co., Inc. 37 Washington St. Melrose, Mass.	NC-190	Wired	Receiver		BCB/10 m.	AM/CW/SSB	10 tubes	239.95

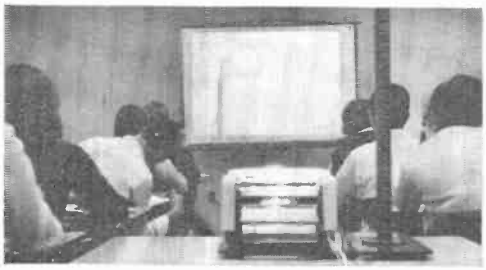
(Continued on next page)

SAMPLER OF EQUIPMENT FOR THE HAM NEWCOMER

Manufacturer	Model	Type	Function	Transmitter Control	Bands	Mode	Power, etc.	Price
Polytronics Laboratories, Inc. 88 Clinton Rd. West Caldwell, N.J.	PC-2 AC/DC	Wired	Transceiver	Xtal/VFO	2 m.	AM	18 watts	349.50
	PC-6 AC/DC	Wired	Transceiver	Xtal/VFO	6 m.	AM	18 watts	329.50
Squires-Sanders, Inc. Martinsville Rd./ Liberty Corner, Millington, N.J. ("Clegg")	22'er	Wired	Transceiver	Xtal	2 m.	AM	18 watts	239.50
	99'er	Wired	Transceiver	Xtal	6 m.	AM	18 watts	179.95
	Thor VI	Wired	Transceiver	Xtal/VFO	6 m.	AM/CW	60 watts	399.95
	Inter-ceptor B	Wired	Receiver		2/6 m.	AM/CW/SSB		495.00
		Wired	HF Tuner		80/10 m.			129.95
	372	Wired	Low-Pass Filter		160/6 m.		60w-6m.	14.95
The Equipment Crafters Box 84 Hackensack, N.J. ("Tecraft")	TR-20/50	Wired	Transmitter	Xtal	6 m.	AM/CW	20 watts	65.95
	TR-20/144	Wired	Transmitter	Xtal	2 m.	AM/CW	20 watts	65.95
	PTR-2	Wired	Power supply for above				117 volts	39.95
	50	Wired	Converter		6 m.		117 volts	54.95
	144	Wired	Converter		2 m.		117 volts	54.95
Utica Communications Corp. 2917 W. Irving Park Chicago, Ill.	650	Wired	Transceiver	Xtal/VFO	6 m.	AM	22 watts Less VFO	189.95 169.95
Vanguard Electronic Labs. 19-48 99th Ave. Hollis, N.Y.	300	Wired	Converter		6 m.		Solid-state	10.95
	300	Wired	Converter		2 m.		Solid-state	12.95
Whippany Laboratories, Inc. 1275 Bloomfield Ave. Fairfield, N.J.	Li'l Lulu	Wired	Transmitter	VFO	6 m.	AM/CW	17 watts	225.00
	Li'l Lulu	Wired	Receiver		6 m.	AM/CW/SSB		250.00
World Radio Laboratories 3415 Broadway Council Bluffs, Iowa	TC-6A	Kit	Transceiver	Xtal	6 m.	AM	5 watts	39.95
	TCA	Kit	Power supply for TC-6A				117 volts	15.95
	CA-27	Wired	Microphone Compressor Amp.				Solid-state	14.95
	MM-100	Kit	Antenna Tuner		80/10 m.	AM/CW	100 watts	10.95
	SS-3	Kit	Q-Multiplier		455 kc.		117 volts	15.95

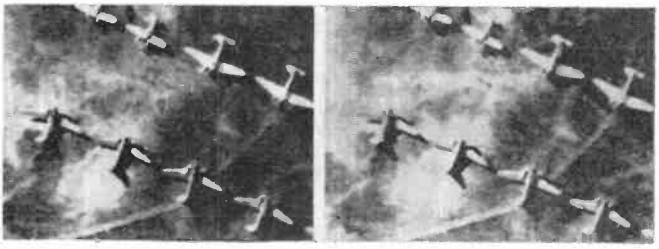
1. Available from manufacturer as a wired unit at increased price. *2. Tentative price at press time.*

POPULAR ELECTRONICS news



ONE TEACHER FOR MANY SCHOOLS—Five New York State schools are among the first in the nation where students receive instructions simultaneously from one lecturer through equipment and facilities provided by General Telephone & Electronics Corporation. The "blackboard" handwriting and voice of lecturer (left) are transmitted to distant classes (above) through conventional telephone circuits.

PHOTO STORAGE—Photo at far right is the output of a computer. A transparency of the original (right) was scanned and digitalized by a flying spot scanner at Cornell Aeronautical Laboratory. Photo was stored on magnetic tape, then transferred back to the flying spot scanner, which converted the information as shown. Computer indicates elements of a picture in 64 shades of gray.



PHONOVID—Westinghouse's "Phonovid" system plays television pictures as well as voice and music from a phonograph record. Up to 400 still pictures and 40 minutes of sound can be recorded on the two sides of a 12", 33⅓-rpm record called a "Videodisc." The record is not just an audio recording that triggers pictures from a slide projector; both audio and video signals are present in the grooves of the record and are picked up by the needle. The "pictures" can be line drawings, charts, printed text, etc. Unit works with standard TV sets.

BATTLEFIELD TERMINAL — Mobile communications terminals that provide battlefield commanders with virtually instantaneous worldwide communications via satellites are being developed by Sylvania Electric Products Inc. Each terminal will contain tracking equipment, a control console, a transmitter, and a receiver. It will be possible to transport an entire unit, including a 12'-diameter collapsible dish antenna, on a medium-sized truck.

BUILD PLUG-IN MODULES TO SIMPLIFY YOUR PROJECTS

Prefabricated circuits leave more time for actual experimenting

ELECTRONIC CIRCUITS that are used repeatedly as experimental building blocks can be modularized to save time and provide flexibility. Plug-in modules containing standardized circuits have been used by industrial laboratories for many years; they eliminate repetitive labor in the construction of commonly used circuits such as power supplies, voltage amplifiers, power amplifiers, etc. Hobbyists can also use the plug-in module principle to speed construction of an experimental circuit.

Although commercial plug-in modules are available, they may be a little expensive. You can construct your own and save money. Bases from old octal tubes can be cleaned out and made to hold components. Terminal strips and small perforated boards with push-in terminals can be mounted on the tube bases to achieve proper lead dress and to accommodate more components. Or octal plugs can be used instead of the bases; with proper brackets or spacers, they will hold small power and output transformers.

Plug-in modules such as those shown in Fig. 1 can be easily connected together on a breadboard to form a complete functional circuit. Input and output connections, and operating power, are made through Fahnestock clips. Figure 2 shows the schematic of a transistor amplifier stage along with its suggested modular layout. The components are mounted on a small board, which is then secured to the base with epoxy cement. Follow the examples shown—it's easy.

—Charles Green, W3IKH

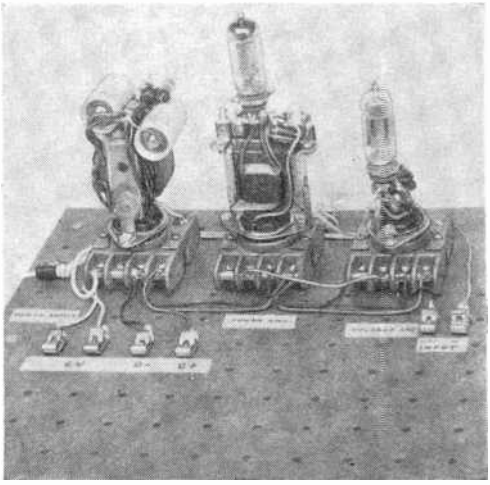


Fig. 1. Modules plugged into convenient sockets mounted on a breadboard quickly form a two-stage audio amplifier complete with its own power supply.

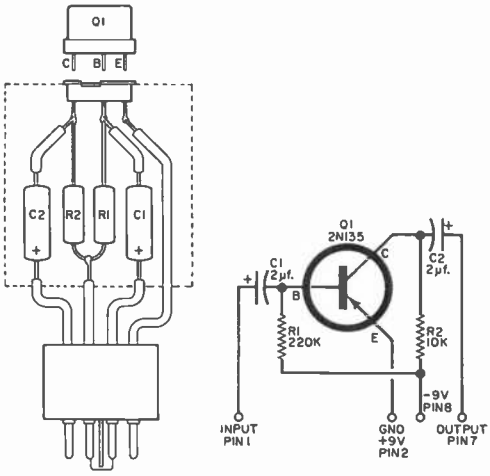


Fig. 2. A modularized transistor amplifier can be made by mounting components on a small perforated board cemented into a salvaged octal tube base.

ANNUAL REPORT ON CB EQUIPMENT

what's selling, what's new, what's upcoming

By J. D. GILLESPIE

THE YEAR 1965 will be remembered in the history of the Citizens Radio Service (CB) as the year of "maturity." Implementation of the new CB Rules governing permissible use of the 23 channels gave most of the band back to legitimate users. Ham-style chit-chat activity has rapidly declined, and "round tables" that blocked channels for hours are being dispersed. Small businesses, husbands and wives, doctors, garage owners, etc., are finding that CB provides communication facilities between homes and offices and mobile units at a modest investment. Contrary to many claims that the "hobbyists" supported CB growth, the legitimate users are filling up any vacuum that might have been created.

For the fourth year in succession, CB dominated the Federal Communications Commission rolls of newly licensed radio stations. From May 1964 to the end of April 1965, the FCC granted 130,000 CB licenses. During the previous similar twelve months in 1963-64, approximately 241,000 licenses were granted, and between May 1962 and April 1963, the number of licenses issued was 208,000.

The grand total of CB licenses on the books at the end of April 1965 was an astonishing 801,000.

H.E.L.P. Bursting on the CB scene in 1965 was a publicity program called H.E.L.P. (Highway Emergency Locating Plan). Initiated by the Automobile Manufacturers Association, H.E.L.P. was described as a means of providing radio communications from automobiles on the roads to fixed stations in case of emergency. The natural choice of frequencies fit perfectly into the CB picture and the concept of H.E.L.P. was tied in with the REACT monitoring network.

So powerful was the impetus of the H.E.L.P. project and its backer, the A.M.A., that a petition was filed with the FCC requesting assignment of two new CB channels exclusively for H.E.L.P. services. The philosophy of H.E.L.P. is incontrovertible and CB'ers have been doing yeoman work in times of emergency and disaster for several years—largely organized under the auspices of REACT and MCEU. The A.M.A. has provided resources and funds not previously available to popularize the "good" of CB.

Within weeks after the petition for these channels was filed, a variety of safety and insurance foundations announced their support of the project. CB equipment manufacturers are obviously interested in H.E.L.P. and several have filed supporting statements recommending the granting of exclusive channels. However, whether the requested channels will be made available to H.E.L.P. has not been resolved at press time.

Equipment—New, Or Upcoming. On the following pages, the Editors of POPULAR ELECTRONICS have summarized —manufacturer by manufacturer—the CB equipment marketplace. This summary is designed to give the new or potential buyer an idea of what's available and at what price. The CB operator wanting to upgrade his communications system will find the summary useful in determining the type of gear currently manufactured and what to expect in the near future.

Although the overall number of manufacturers producing CB equipment has remained at the same level for the past three years, the variety of gear available has markedly increased. Transceivers are offered at prices ranging from $70 to close to $400.00. As the price spread expands, manufacturers are about equally divided on just what the CB operator wants—more channels and more versatility, or fewer channels and simpler operation. Prices of many transceivers have come down in the past few months and the best bargains are in the kits. Dozens of new transceivers are scheduled for appearance this fall.

An overwhelming number of the new models will be transistorized, or hybrid —combining tubes and transistors. Prices of transistorized gear are still high, although not disproportionately so. The advantages more than offset the extra cost—lower current drain from the car battery, and minimum possible size cabinets.

The "Power" Switch. Something new in CB gear this year has been the "Power" switch on the front panel of transceivers. This switch alters the internal circuits so that input power can be dropped from 5 watts to 100 milliwatts. With 5 watts input, the CB'er operates under Part 95 of the FCC Rules and must have a license. At 100 milliwatts input, the operator—theoretically—could be unlicensed since the transmitter would fall under Part 15 of the Rules. With 100 milliwatts, two-way contacts at any distance are permitted, and several more channels are available. However, the FCC has questioned the intent of the "Power" switch and indicated that the operator must be licensed regardless of whether or not the transceiver draws 5 watts or 100 milliwatts.

Although the FCC Rules are not clear on the specifics of the "Power" switch, the Editors stress that the Commission's interpretations of the "intent" of the Rules are not clear-cut on this point either.

What Else Is New? The enigma of whether or not single-sideband (SSB) transmission can become a useful CB tool is still up in the air. However, General Radiotelephone is forging ahead and has a 48-channel SSB transceiver on the market. The 48 channels are made up of the regular 23 assigned to Part 95, Class D service (splitting the upper and lower sidebands for two channels) plus the

(*Continued on page* 100)

ALLIED RADIO CORP. (100 N. Western Ave., Chicago, Ill. 60606) Price-breakers will be the order of business in the Knight-Kit line for 1966. Two transceivers will be announced. A Knight-Kit Model C-540 is new at $44.95 (a.c., only) and $49.95 (universal supply). This kit will have noise limiting, squelch, and transmit crystal plug-in from the front panel. Receiver is tunable over all 23 channels. The second new kit is the "Safari I," a 23-channel synthesized circuit selling for $129.95. Specs call for 19-tube performance with a double-conversion receiver and low-noise Nuvistor r.f. stage. The popular Knight-Kit C-560 will be continued, but reduced to $84.95 (a.c., only). A universal power supply model of the C-540 goes for $94.95. In the Allied regular wired line sold under the Knight brand name, the KN-2565 has been up-dated with an audio compression system. Price remains at $169.85. A new addition is the Knight KN-2585 with eight channels plus tunable receive at $119.95. Last but not least in the line is the new KN-2590 ($79.95); this 8-channel unit has a tunable receive section and provisions to operate at either 5 watts or 100 milliwatts input.

AMPHENOL-BORG ELECTRONICS CORP. (2875 S. 25th Ave., Broadview, Ill.) Having purchased the CB manufacturing facilities of Cadre Industries, Amphenol now distributes the Model C-75 ($114.50), a hand-held 1.5-watt transceiver, and the Model 510-B ($199.50), a 5-watt transistorized fixed or mobile unit. The latter can be converted to portable operation with a battery field pack ($37.95). A new transceiver just being introduced is the Model 600 ($179.50); it is fully transistorized, with 10 channels for 12-volt d.c. operation. A similar unit, Model 625 ($189.50), is for base station use with 117 volts a.c. All of the larger Amphenol transceivers use tuned ceramic filters for good adjacent-channel rejection. Either the Model 510-B or 600 can be used with the Model 524 selective calling adapter. The Model 524 permits 24 tone signal combinations.

B&K MANUFACTURING CO. (1801 W. Belle Plaine, Chicago, Ill. 60613) The "Cobra" introduced last year has been improved through the addition of "Dyna-Boost"—a speech compression circuit controlled from the front panel. Price remains at $214.95.

BROWNING LABORATORIES, INC. (1269 Union Ave., Laconia, N. H. 03246) Birds continue to fly at Browning with the popular "Drake" ($260.00) and "Eagle" ($359.00) being very hot items. Two new units will be offered this fall. The "Raven," a luxurious 10- or 23-channel transceiver, will be aimed at the mobile market, and a second unit (unnamed) will be announced shortly.

BURSTEIN-APPLEBEE CO. (1012 McGee St., Kansas City, Mo.) The Model BA-22 ($119.95) is being continued. This is a universally powered unit with 12 channels and tunable receiver.

CONCORD ELECTRONICS CORP. (1935 Armacost Ave., Los Angeles, Calif. 90025) New for 1966 is the Model TG-132B, a 1-watt hand-held transceiver. Loaded with eight type C cells, the TG-132 weighs in at 2.5 lb. There are provisions for external antenna and use on 12 volts d.c. or 117 volts a.c. List price, $99.95.

DEMCO ELECTRONICS (Bristol, Ind. 46507) A 4-piece base station called the "Satelite" ($295.00, plus microphone) is still at the top of the Demco line. A matching cabinet speech compressor is an extra $41.00. For mobile operation, the "Travelier" ($180.00, plus microphone) is still offered. New unit just out is the "Ravelle" ($124.50), fitted for 12-volt d.c. or 117-volt a.c. power. Featured in the "Ravelle" is a low-noise triode mixer and six crystal-controlled channels. A Model CH-300 control head ($29.50, extra) permits 23-channel receiver tuning, use of the audio amplifier for p.a., and incorporates an S-meter.

E.C.I. ELECTRONICS COMMUNICATIONS, INC. (56 Hamilton Ave., White Plains, N.Y.) The popular "Courier 23" ($189.50) has been improved through the addition of a "Range Boost" speech clipper. The "23" is frequency-synthesized for 23-channel operation. New from e.c.i. is the "Courier 12" ($109.50), a 12-channel crystal-controlled transmit and receive unit with provisions to drop output power to 100 milliwatts. Universally powered, the "Courier 12" can also be used for p.a. work.

EICO ELECTRONIC INSTRUMENT CO., INC. (131-01 39th Ave., Flushing, N.Y. 11352) Still in the EICO line are the Models 772 ($69.95, kit; $99.95, wired) and 777 ($99.95, kit; $149.95, wired). Just being announced is the Model 779 "Sentinel-23" ($169.95, wired only). Universally powered, the "Sentinel-23" has frequency-synthesis circuitry for 23-channel operation. This unit can also be used for p.a. work. Coming up from EICO for late 1965 will be a 12-channel transceiver and a special transistorized kit with 10 or 11 channels.

FANON-MASCO INDUSTRIES, INC. (439 Frelinghuysen Ave., Newark, N.J. 07114) Two medium-power walkie-talkies are being intro-

KNIGHT 2585

AMPHENOL 600

EICO "SENTINEL-23"

HALLICRAFTERS CB-14

GENERAL RADIOTELEPHONE SB-72

HEATHKIT MW-34

HAMMARLUND CB-205

INTERNATIONAL CRYSTAL 660

KAAR 335

duced this fall. The Model FCB-12 "Pathfinder" ($37.50) has an input of 240 milliwatts, it uses 11 transistors and weighs 19 oz with batteries. The second unit, the Model FCB-13 "Commander" ($64.95), has an input of 750 milliwatts, it uses 13 transistors and weighs 24 oz with batteries.

GC ELECTRONICS CO. (400 South Wyman St., Rockford, Ill.) All three popular transceivers manufactured by GC Electronics are being continued. The 11-channel "Globe Master" sells for $229.95. Price of the "Globe Star" has been dropped to about $139.50, this is a 5-channel crystal-controlled unit. The versatile "President" ($169.50) is still available also.

GENERAL RADIOTELEPHONE CO. (3501 W. Burbank Blvd., Burbank, Calif.) An entirely new lineup of transceivers has been developed for the 1965-66 market. Heading the list is the Model SB-72 ($399.50), a single-sideband unit with compatible AM double-sideband transmission. Universally powered, the SB-72 has a 24-channel "Turretuner" for double sideband, or 48 channels of single sideband. Upper or lower sideband can be selected from the panel. A Collins Radio mechanical filter is used for sideband selection. The new VS-6 ($99.50) is a universally-powered straight AM transceiver with 5-channel crystal-controlled receive and transmit. This unit is weatherproofed and can be used in p.a. work. Last of the new ones is the "Super MC-8" ($199.50), a straight AM unit with a 24-channel "Turretuner" (24th channel is for CAP). Universally powered, the MC-8 can be attached to the "Silent Service" selective calling adapter ($39.95). This unit may also be used for p.a. or, as the manufacturer calls it, "bull horn" work.

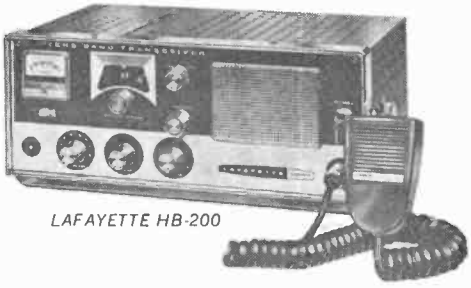
HALLICRAFTERS (Fifth & Kostner Avenues, Chicago, Ill. 60624) Three brand-new transceivers have been announced since our August 1964 equipment directory was published. All three units are transistorized. The CB-10 ($149.95, list) is a 5-channel, crystal-controlled transceiver for 12-volt d.c. mobile operation. Fourteen transistors, six diodes and two zener diodes are used in the CB-10. A pedestal power supply (Model P-10) has been designed to permit operation of the CB-10 at a 117-volt a.c. base station. The new CB-12 ($179.95) is somewhat similar to the CB-10, but has provisions for 12-channel operation and p.a. use. Both the CB-10 and CB-12 are compact and draw minimal current from the car battery. An a.c. power supply pedestal (Model P-12) is available at $34.95. Not yet in production as this is written is the CB-14 (price n.a.), a deluxe unit with a 23-channel crystal-controlled synthesizer. An a.c. pedestal will be available and the CB-14 can be used in p.a. work.

HALLMARK INSTRUMENTS (2620 Freewood, Dallas, Texas 75220) Both the Model 512 ($149.50, list) and Model 1250 ($169.50, list) are being continued. The latter unit now has a transistorized vibrator substitute built in. Both transceivers are 12-channel with universal power supplies.

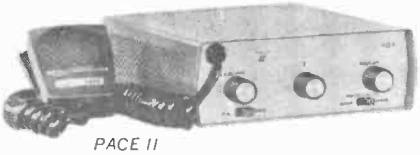
HAMMARLUND MFG. CO. INC. (73-88 Hammarlund Drive, Mars Hill, N.C. 28754) Three new units have been produced for CB'ers. The CB-205 ($249.50) is an all-band short-wave receiver with 6-channel transmit added. It is roughly similar in concept to the popular HQ-105 short-wave receiver CB transmitter that is now discontinued. The CB-212 ($134.95) is a new 6-channel transceiver with universal power, the identical model is available in an a.c.-only version for $119.95. Third in the string of new gear is the CB-214 ($114.95) for 12-volt d.c. mobile operation. It is similar to the CB-212, but lacks the latter's S-meter.

HARMON MORSE RADIO (Holton, Kansas 66436) This is a new company just going into the CB business. First off the line is a 6-channel unit, called the CB-15 ($175.00), fully transistorized, and set for 12 volts d.c. power. There are provisions for p.a. use.

HEATH COMPANY (Benton Harbor, Mich. 49023) Plenty of things have happened, or are about to happen, at Heath. The single-channel GW-12A kit has been cut in price to $34.95 and the GW-22A kit (a.c. only) got a reduction to $47.95. The GW-22D is a similar 5-channel unit, but for 6 or 12 volts d.c. It has been dropped in price to $49.95. The 22 series is available with selective calling provisions for $69.95 (GW-32A, a.c. only) and $74.95 (GW-32D, 6 or 12 volts d.c.). The deluxe Heathkit "Master Station" GW-42 kit is now down to $99.95. The modified 1-watt walkie-talkie kit becomes the GW-52A this month and drops in price to $69.95. Brand-new from Heath in October will be the GW-14 kit, an all-transistorized unit for 23-channel operation. While it is primarily designed for 12-volt d.c. operation, an accessory 117-volt a.c. power supply will be available at extra cost. This kit will be sold at $89.95. The MW-33 has been replaced by the MW-34. Selling at $84.95, the MW-34 has a tunable receiver and four crystal-controlled channels built in, and a crystal plug-in socket on the front panel.

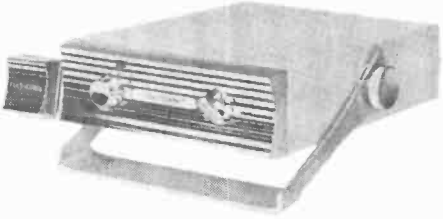


LAFAYETTE HB-200



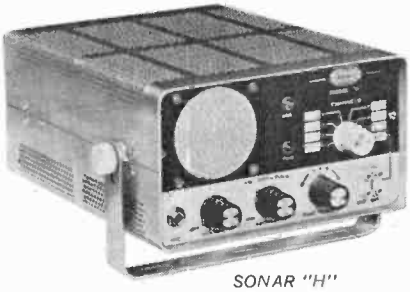
PACE II

METROTEK "MUSTANG"



POLYTRONICS "POLY-COMPACT"

PEARCE-SIMPSON "GUARDIAN 23"



SONAR "H"

RCA "MARK 10"

WEBSTER 550

SQUIRES-SANDERS "23'ER"

INTERNATIONAL CRYSTAL MFG. CO. INC. (18 N. Lee, Oklahoma City, Okla.) Two brand-new transceivers have been announced. The Model 440 ($259.50) is a 23-channel unit mixing tubes and transistors in the jobs they do best. Universally powered, the Model 440 has a double-conversion receiver with all of the usual squelch, noise limiting, and operating convenience features. The second new unit, the Model 660 ($279.50), is somewhat similar in circuitry design although it includes metering on the front panel and zener diode speech clipping. Both of these transceivers have the robust construction associated with this company's CB products.

E.F. JOHNSON CO. (Waseca, Minn.) One of the pioneers in the CB field, E.F. Johnson will continue to market its five extremely popular units. These include the "Messenger" ($114.95), the "Messenger II" ($169.95), the "Messenger III" ($189.95), the "Personal Messenger" ($129.50), and the "Messenger III" in a field pack ($169.95 extra). The first two units in the line are tube-type transceivers (5 and 10 channels, respectively). The latter units are all transistorized. Both the "Messenger" and "Messenger II" may be used with the "Tone Alert" ($59.95) selective calling system.

KAAR ENGINEERING CORP. (2989 Middlefield Rd., Palo Alto, Calif. 94302) The Models D333 ($194.50) and D333B ($229.50) are being continued. A new transceiver, the "Skyhawk 335," is being introduced this fall. Fully transistorized, the "Skyhawk" has a frequency translator that permits one crystal to serve both on transmit and receive. The user can arrange to keep initial cost at a minimum by installing only those channels required—up to a maximum of 23. Kaar has been a winner in various styling contests, and from the looks of the "Skyhawk," it may have another strong contender.

LAFAYETTE RADIO ELECTRONICS CORP. (111 Jericho Turnpike, Syosset, L.I., N.Y.) This major supplier of CB gear has many new items coming up this fall. First, the HB-111, HB-222, HB-333 and that old favorite, the HE-20C, have been discontinued. A new one is the HA-450. This is a portable 6-channel unit rated at 2½ watts input. Nickel-cadmium batteries will be an optional extra. Price will include carrying case and shoulder strap. Possibly replacing the HE-20 will be the new HB-200 ($109.50). This is a universally powered transceiver with eight channels and a double-conversion tunable receiver. The HA-300 ($99.95) is a new hand-held unit rated at 2 watts input. Sold with nickel-cadmium rechargeable batteries, the HA-300 operates on either of two channels selected by a thumb switch. Top of the Lafayette tube-type line is the popular HB-400 ($169.50). Introduced several months ago, the HB-400 has 23-channel operation using frequency synthesis, "Range Boost," and double-conversion receiver. Added to the Lafayette line early this year was the HB-500 ($139.50). This is a fully transistorized unit with 12 channels and tunable receiver. A mechanical filter is used in the receiver for maximum selectivity. While the HB-500 is designed for 12-volt d.c. use, a separate 117-volt a.c. power supply, Model HB-501 ($16.95), is available. Coming out this fall will be the HB-555 (under $100), also transistorized and set for 12-volt d.c. use. Specs call for 12 channels, mechanical filter, series-gate noise limiting, etc. Top of the transistorized line at Lafayette will be the brand-new HB-600 ($219.95). With 26 crystals, the HB-600 can cover everything including the proposed H.E.L.P. frequencies outside the present band. The receiver will be double-conversion with a mechanical filter. Last but not least from Lafayette is the HE-20D (under $90) which will feature switching from 100 milliwatts to 5 watts input. Universally powered, the HE-20D will also have a mechanical filter for selectivity and may be used for p.a. work. Practically all Lafayette transceivers have provisions for plugging in the "Priva-Com" selective calling system.

MAXWELL ELECTRONICS CORP. (229 Garvon St., Garland, Texas) A 5-watt hand-held transceiver is the major item being produced at this time. Incorporating 20 transistors, the Model 54C-1 ($169.50) weighs 2½ lbs. The rechargeable battery snaps off the bottom of the unit and is good for 75 hours of receiver-only operation, or 50 hours of average transmit-receive usage.

METROTEK ELECTRONICS, INC. (205 W. Cabarrus St., Raleigh, N.C.) An all-new line has been introduced at Metrotek since its purchase by Regency Electronics. The "Mustang" ($74.95) is available with six channels and tunable receiver. While it is designed for 117-volt a.c. operation, a 12-volt d.c. power supply, mobile mounting bracket and hardware cost $14.75 extra. The second new unit, the "Pacer II" ($99.95), is universally powered and features 11 channels plus a tunable receiver. Both units have built-in speech clipping and the "Pacer II" has an S-meter.

MIDLAND INTERNATIONAL CORP. (1519 Atlantic St., North Kansas City, Mo.) This im-

porting concern is offering a variety of CB units. The Model 13-133 ($89.95) is being continued at a price reduction. It is also being sold with a "Shoulder-Talk" microphone/speaker/antenna combination for hands-free operation. Model 13-143 (price n.a.) is new. This is an 18-transistor mobile unit with five channels and tunable receiver. A solid-state 117-volt a.c. power supply will be made available shortly. The Model 13-160 ($99.95) is being continued at a $10 price reduction.

MULTI-ELMAC CO. (21470 Coolidge, Oak Park, Mich. 48237) The "Citi-Fone SS" is being continued at $169.50. A new transceiver is the "Citi-Fone 99". This unit is crystal-controlled on eight channels and sells for $99.00. Fitted for universal power, the "Citi-Fone 99" has special noise-immune transistorized squelch circuitry.

OLSON ELECTRONICS, INC. (260 S. Forge St., Akron, Ohio) The "Sidebander" ($214.95) is being continued. This unit features 23-channel operation and double-sideband transmissions with reduced carrier. New this summer is the "Olson 717" ($79.98). Universally powered, the "717" has seven channels built in and a crystal plug-in socket on the front panel. The receiver is fully tunable over 23 channels.

PACE COMMUNICATIONS CORP. (520 W. 182nd St., Gardena, Calif. 90247) The popular Model 5000 is being continued, and purchasers are reminded that the transistorized module construction of this transceiver permits updating. As the manufacturer changes or improves receiver or audio modules, users can exchange their older modules—for a nominal charge—to bring their units up to date. A new portable Model 5000P ($320.00) has been announced. This field pack holds both batteries and transceiver and weighs only 7 lbs. Brand-new from Pace is the "PACE II" ($169.50). Like the two models above, this unit uses silicon transistors in a 5-watt input circuit. The "PACE II" has 12 channels, but uses printed circuit boards rather than the modules of the Model 5000.

PEARCE-SIMPSON, INC. (P.O. Box 308, Riverside Station, Miami, Fla. 33135) The "Companion II" ($189.50) and the "Escort" ($229.50) are being continued. Both units have been very popular. Introduced earlier this year was the "Guardian 23" ($299.50). This 23-channel unit has a special frequency synthesis circuit to provide maximum rejection of spurious signals. The universal-power, double-conversion receiver, corrosion-proof construction with an epoxy finish, and full metering round off this unit. About to be released from Pearce-Simpson is the "Sentry" (low price, n.a.). This unit will combine hybrid tubes and transistors to secure a low standby current drain. It will be set up for six channels. In line with its marine interests, Pearce-Simpson is also offering the "Sea-B-Mate" ($189.90) which can be coupled to the manufacturer's "Catalina" marine radiotelephone. This adds six CB channels to the five marine channels available.

POLYTRONICS LABORATORIES, INC. (88 Clinton Rd., West Caldwell, N.J. 07007) The most versatile CB transceiver, the "Poly Comm Sr. 23" ($349.50) is being continued. The same model without built-in selective calling circuitry sells for $299.50. For an additional $30, either unit can be obtained with a crystal filter for maximum receiver selectivity. Brand-new from Polytronics is the "Poly-Comm-30" ($329.50). Using frequency synthesis, the "Poly-Comm-30" can be set up on any one of the 23 Part 95 CB channels or the seven Part 15 channels. Output power is automatically reduced from 5 watts input to 100 milliwatts input during the switching operation. Universally powered, the "Poly-Comm-30" is also available with a factory-installed crystal filter at $358.45. Both the "Poly-Comm Pro" ($269.50) and the "Poly-Comm N" ($199.50) are being continued. A 4-channel version of the "Poly-Comm N" is available for $189.50. Replacing the Osborne 320 is the "Poly-Compact" ($199.50). This 12-volt d.c. power unit has 11 channels and is fully transistorized. It is probably one of the smallest CB transceivers ever made.

RADIO CORPORATION OF AMERICA (Harrison, N.J. 07029) The "Mark VIII" ($114.75, a.c. only) is being continued. Six or 12-volt d.c. power supplies are $19.95 extra. The "Mark Nine" ($134.75) is also being continued and the d.c. supplies are the same as above. These two units are somewhat similar, although the "Mark Nine" has a tunable receiver, S-meter, and other features. Just coming up from RCA is the "Mark 10" ($189.95). Designed for 12-volt d.c. operation, the "Mark 10" has 12 channels, tunable receiver, separate a.g.c. amplifier, and may be used for p.a. work.

RADIO SHACK CORP. (730 Commonwealth Ave., Boston, Mass.) The Model TRC-X23 ($169.95) is being continued. A new transceiver just added to the line is the Model TRC-X20 ($109.50). Universally powered, the Model TRC-X20 is set for 12 channels and has a tunable receiver. Another new unit from Radio Shack is the TRC-6 ($69.95) with five

crystal channels on transmit, one on receive, plus tunable receiver.

RAY-TEL PRODUCTS (Raytheon Co., 213 East Grand Ave., South San Francisco, Calif.) Three models are being offered. The TWR-5 ($179.50) is all solid-state (14 transistors and 5 diodes) designed for 12-volt d.c. operation. A separate 117-volt a.c. power supply is available as an optional extra. The "Ray-Call" selective calling system can be plugged into the back of the TWR-5. A hand-held transceiver Model TWR-6 ($119.50)—has been announced. It will be set up for two-channel operation. Introduced several months ago was the TWR-7 ($129.95) aimed at the motorist (with Ford Motor Co. distribution) wanting a H E L.P. installation. This unit is all-transistorized and set for five channels.

REGENCY ELECTRONICS INC. (7900 Pendleton Pike, Indianapolis, Ind. 46226) Both the very popular "Range Gain" ($269.95)—first of the double-sideband suppressed-carrier transceivers—and the "Romper" ($189.95) are being continued. The only announced change at press time is that the "Romper" has been upgraded to 23-channel operation.

SONAR RADIO CORP. (73 Wortman Ave., Brooklyn, N.Y. 11207) All models introduced in the past 15 months are being continued. These include the Model E ($179.50), Model FS-23 ($299.95), and Model G ($229.50). Just appearing on dealer shelves is the Model H ($159.95). Featured in the Model H is a fine tuning control usable with internal receiving crystals. Universally powered, the Model H has seven internal crystal positions and two panel-mounted sockets (transmit and receive) for additional coverage.

SQUIRES-SANDERS, INC. (Martinsville Rd./ Liberty Corner, Millington, N.J. 07946) One of the few companies to enter the CB field in the past year, Squires-Sanders manufactures the "23'er" ($235.00). This unit s all-transistorized (frequency synthesis for 23-channel operation) and set for 12-volt d.c. power. A separate base station 117-volt a.c. supply ($24.50) is available. The "23'er" has a built-in speech clipper, crystal filter for selectivity, and can be used for p.a. work.

TECRAFT SALES CORP. (P. O. Box 84, South Hackensack, N.J.) The popular Falcon "Mark V" is being continued at $169.95. A special model with T.N.S. noise limiting is available for $20 extra.

TRAM ELECTRONICS INC. (Box 187, Winnisquam, N.H.) The TR-27E ($273) is being continued. New from Tram is the Model XL-100 ($318). Custom-designed into three separate units (control, modulator and speaker), the XL-100 has frequency-synthesis circuitry and 23-channel capability. While in mobile use, the control unit can be locked to the mounting bracket. The power switch is also key-operated for safety. Receiver is double-conversion and speech compression has been built in.

UNITED SCIENTIFIC LABS. (35-15 37th Ave., Long Island City, N.Y.) Two new units are being offered by this company. At the top of the line is the "Contact 23" ($199.50) with frequency synthesis and set for 23-channel operation. Universally powered, the "Contact 23" features a built-in speech compressor, double-conversion receiver, and switching for p.a. use. The "Contact 8" ($149.50) is also new from U S.L. With seven internal crystal positions, the "Contact 8" has a tunable receiver and a pair of panel-mounted crystal sockets (transmit and receive) for additional coverage. Universally powered, this unit can also be used for p.a. work.

UTICA COMMUNICATIONS CORP. (2917 W. Irving Park Rd., Chicago, Ill. 60618) Both of the popular models, MC27 ($142.50), and "Town & Country II" ($162.50), are being continued as is. The top of the Utica line, the "Town & Country III" ($259.95), with 23 channels, has been modified and improved. Receiving stability is excellent, the built-in clipper has been dropped to improve audio quality, and power line consumption is lower.

VOCALINE COMPANY OF AMERICA, INC. (Old Saybrook, Conn.) No information received at press time.

WEBSTER MANUFACTURING. (317 Roebling Rd., South San Francisco, Calif.) Buyers will see some similiarity between the transceivers marketed by Raytheon (Ray-Tel Products) and Webster. The "Band Spanner 550" is almost a carbon copy of the Raytheon TWR-5 and the "Band Spanner 565" resembles the Raytheon TWR-7. Both are sold at the Raytheon prices ($179.50 and $129.95, respectively). New and different from Webster is the "575 Com-Pac" (price n.a.) which incorporates a TWR-7 and rechargeable batteries in a field-pack carrying case.

WORLD RADIO LABORATORIES. (3415 West Broadway, Council Bluffs, Iowa.) New from WRL is a 1-watt hand-held transceiver. Cataloged as the 66P004 ($64.95, plus batteries), this unit has built-in squelch and noise-limiting circuitry. Being continued is the "DX'er" ($119.95), a universally powered unit with tunable receiver and 12-channel operation.

Transistor Topics

By **LOU GARNER,** Semiconductor Editor

IN THE PAST, relatively complex circuits were needed to develop vibrato, tremolo and percussion effects in electronic organs, guitars, and other electronically assisted instruments. Typical circuits generally included one or more variable gain amplifier stages, input and output coupling circuits, isolation filters, bypass switches, a low-frequency oscillator, etc. Today, such complex circuits are no longer required. Emotion-filled trembling and throbbing musical effects can be obtained by using nothing more complicated than a simple photoconductor optically coupled to an incandescent lamp which, in turn, is powered from a suitable low-frequency source on the order of 6 cycles.

A block diagram of a typical "photo-tremolo" circuit developed by Sylvania Electric Products (1100 Main St., Buffalo, N.Y. 14209) is shown in Fig. 1. The photoconductor is used as one leg of a simple resistive voltage divider between the tone generator and the audio amplifier. The photoconductor's resistance varies with the intensity of the light applied to the lamp to which it is coupled. Thus, the audio signal delivered to the amplifier can be varied at the desired rate by applying low frequency a.c. to the lamp. In practice, the tremolo "speed" is varied by changing the frequency of the lamp power, while "weight" is adjusted by controlling lamp current.

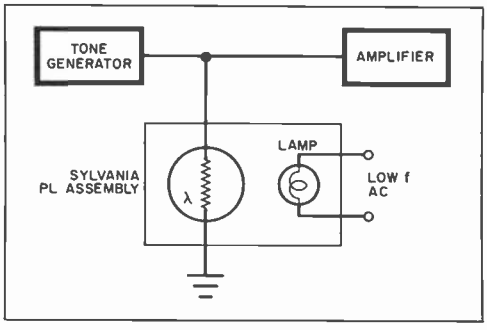


Fig. 1. Simple photo-tremolo circuit from Sylvania creates sound effects for electronic instruments.

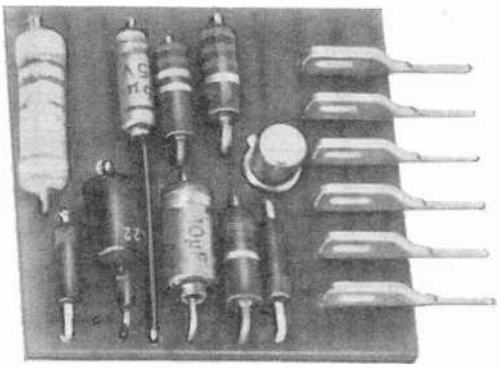


Fig. 2. A series of five matchbook-size unijunction transistor modules, made by Midland Standard, satisfies a wide range of timing and control needs.

Sylvania has introduced two self-contained photoconductor-lamp assemblies for tremolo circuit applications. Identified as "PL assemblies," each unit consists of a 50-mw. cadmium sulfide photocell and a low-current incandescent lamp packaged in a sealed, lightproof metal cylinder approximately 1½" long by 5/16" in diameter. Type PL-8224C is equipped with a 24-volt, 15-20 ma. lamp; type PL-8212E comes with a 12-volt, 35-45 ma. lamp.

Versatile UJTO. The unijunction transistor oscillator, or UJTO, is one of the most versatile basic oscillator circuits. It can be used as a pulse or tone generator, as a code practice oscillator, as a timer, or as a control element for SCR's, in a host of general control applications. Recognizing this fact, a midwest manufacturer, Midland Standard (161 E. Chicago St., Elgin, Ill. 60120), is now producing a series of small preassembled—but low-cost—UJTO modules. A typical unit, the Model 5100-X-B, is shown in Fig. 2. The module's overall size is only 1½" square by a little over ¼" thick.

Designed for operation on a standard 117-volt a.c. or d.c. line, the entire series of modules uses the same basic circuit, with individual units differing only in exact component values and hence in frequency range.

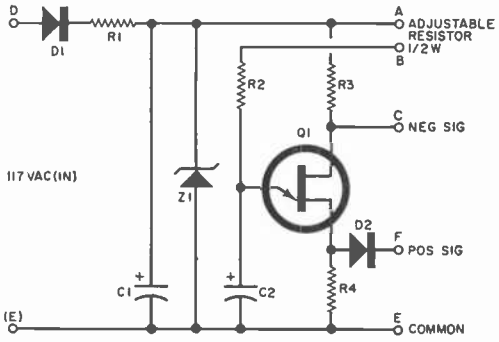


Fig. 3. Frequency of operation of UJTO depends upon values of R2, C2 and adjustable external resistor. Unit works off a 115- to 117-volt a.c. or d.c. line.

The circuit used, a direct adaptation of a patented GE design, is shown in Fig. 3.

The line voltage is rectified by *D1* and filtered by an L-type filter (*R1* and *C1*). The resulting d.c. voltage is regulated to a fixed value by zener diode *D1* and applied to the unijunction transistor (*Q1*), which is hooked up in a relaxation oscillator circuit.

In operation, *Q1* is normally in a non-conducting or "open" state. Timing capacitor *C2* is charged through *R2* and an external resistance connected to terminals *A* and *B*. As the voltage across *C2* increases (building up *Q1*'s emitter potential), *Q1* switches to a conducting state, discharges *C2* through *R4*, and develops signal pulses of opposite polarity across load resistors *R3* and *R4*. Output diode *D2* serves as a simple unilateral coupling element. The circuit's repetition rate, or frequency, is determined by the time constant of the capacitor charging circuit (*C2*, *R2*) and the external resistance across points *A* and *B*.

There are five modules covering frequency ranges from 1 to 100 cycles per minute to as high as 100 to 10,000 cycles per second. Prices vary also, of course, but in general, are between $5 and $6 for each module.

A few of the UJTO's many potential applications are shown in semi-block diagram form in Fig. 4. The terminal letters given correspond to those of the schematic diagram in Fig. 3.

A simple audible timer or metronome is shown in Fig. 4(A). Potentiometer *R1* serves as a rate control while the output device is a standard loudspeaker.

The temperature controller circuit in Fig. 4(B) uses the UJTO in conjunction with a potentiometer, a thermistor, and an SCR to control the power applied to a heavy-duty heater element, or other load.

A variation of the metronome circuit is shown in Fig. 4(C). Simply by employing a different UJTO module and adding a bypass capacitor, *C1*, the device can be used as a tone generator or code practice oscillator. In practice, a handkey (or "bug") would be connected in series with one of the loudspeaker leads.

Finally, a full-wave manual incandescent lamp dimmer circuit is shown in Fig. 4(D). Here, the basic UJTO module is used in conjunction with a potentiometer (*R1*), an SCR, and a full-wave bridge rectifier to control the power applied to the lamp.

Readers' Circuits. The interesting *electronic latching circuit* in Fig. 5 was submitted by reader Charles D. Rakes (Oak

(Continued on page 102)

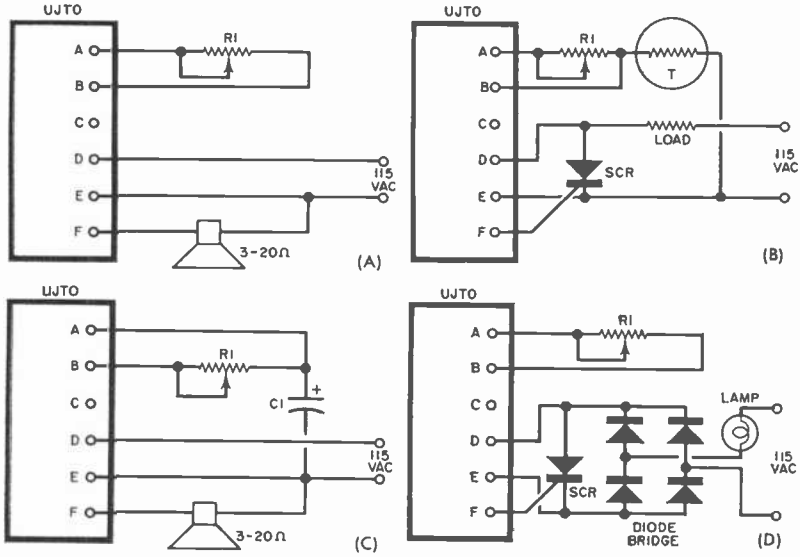
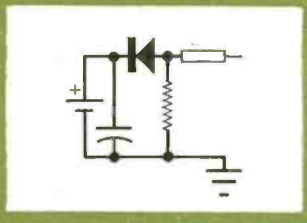


Fig. 4. The UJTO module has many uses. External circuits (A) and (C) are audible timers equipped with variable rate control (R1); circuit (B) serves as temperature controller; and circuit (D) is manual incandescent lamp dimmer.

DIODE FUNCTION QUIZ

By ROBERT P. BALIN

The versatile semiconductor diode serves in many different ways in electronic circuits. See if you can match the diode functions (1-10) listed below with the commonly used circuits (A-J) illustrated.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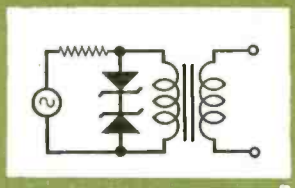
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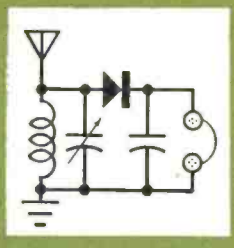
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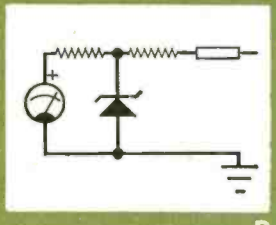
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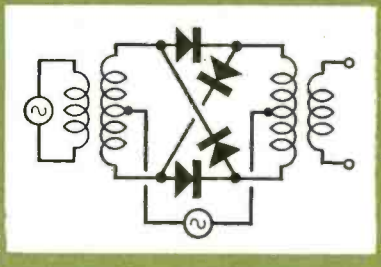
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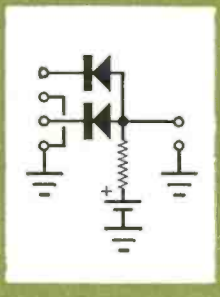
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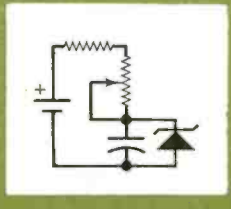
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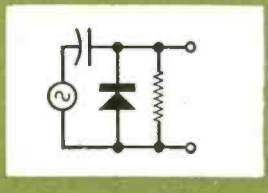
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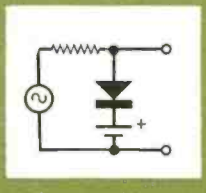
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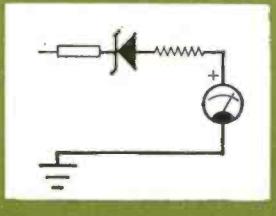
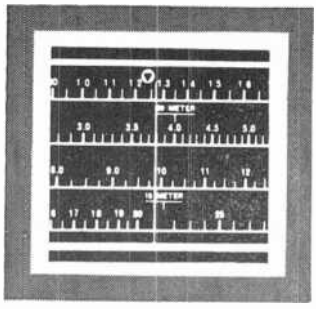

J

1 Clamper	___	6 Noise Generator	___
2 Detector	___	7 Oscillator	___
3 Gate	___	8 Overload Protection	___
4 Limiter	___	9 Regulation	___
5 Modulator	___	10 Scale Expander	___

(*Answers on page 99*)



Across the Ham Bands

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

LEARNING THE CODE AND INCREASING SPEED

RENEWED INTEREST in the radio code has been created by the FCC's recent tightening of the CB regulations and its proposals to (1) cut in half the phone frequencies available to General Class licensees, (2) initiate a new First Class license with a 16-wpm code test and full phone privileges, and (3) implement the Extra Class license with its 20-wpm code test for full CW privileges. Of course, getting an amateur license has always required learning the code. In recent years, however, some operators have evaded this requirement by doing their hamming on the CB channels. But now that the FCC has specifically outlawed all CB hobby operations, there is a greater incentive for obtaining an amateur license.

Too many prospective amateurs believe that learning the code is extremely difficult. Well, maybe, but literally millions of people have already learned it, and thousands more are doing so right now.

The first step is to learn the alphabet. If you have a teacher (or a friend who will serve as a teacher), he will send the code characters while you write down the corresponding letter—never the *dit*'s and *dah*'s—every time it is sent. The teacher will introduce new letters in random sequence until you have mastered them all. He will undoubtedly send each letter at a speed equivalent to approximately 15 wpm, with long spaces between letters, to force you to learn them by sound, rather than by counting *dit*'s and *dah*'s.

Learning the code in this manner usually takes five or six 1-hour sessions, plus another couple of sessions for the numbers, comma, period, question mark, and slant bar. (Only the alphabet is required for the Novice code test, but the numbers are needed to copy call letters and signal reports on the air. Both numbers and punctuation marks appear in the higher-grade code tests.) Once you have learned to recognize the letters

Amateur Station of the Month

It took Roger Smalley, WA9JMG, Alton, Ill., ten months to go from Novice to General Class license. His Heathkit "Apache" transmitter and SB-10 SSB adapter, Drake 2-B receiver, and Mosley V-4-6 antenna have worked 23 states on 40, 20, 15, and 10 meters; a Heathkit "Twoer" feeds a 10-element beam on 2 meters for local contacts. Roger, a student at Southern Illinois University, will receive a one-year subscription for submitting the winning photograph in our Amateur Station of the Month contest for August. If you would like to enter the contest, send us a clear picture of your station, preferably showing you at the controls, with some information about your equipment and your ham career. Mail all entries to: Amateur Photo Contest, c/o Herb S. Brier, W9EGQ, Amateur Radio Editor, P.O. Box 678, Gary, Ind.

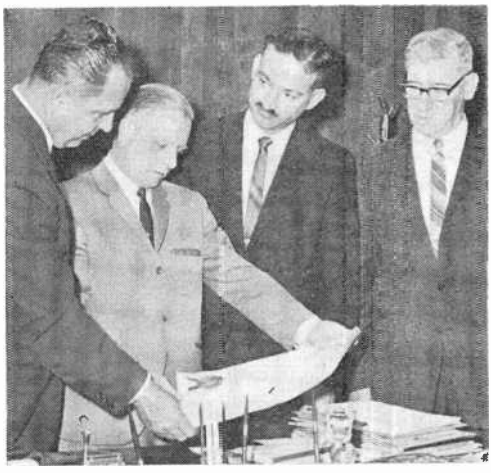
Father David Reddy, K2BUI, (at left), calls this one of the newest, smallest, and weakest radio stations in the world. But young Bob Gray, WN2SCY, couldn't be prouder of it if it were a 1000-watter instead of just a 15-watter with a record of 6, 2, and 2 (six contacts in two states in two weeks).

and numbers by their sound, you will probably be able to copy at a speed of six or seven words per minute.

If you cannot find a local code class or an individual to teach you the code, a recorded course available from any of the amateur supply houses and from other sources will do the job for you—if you carefully follow the instructions that come with it. Don't assume, however, that the records (or tapes) will furnish all the practice material you will need. After playing a code recording several times, the average student has half memorized it, which gives him an exaggerated opinion of his copying ability. As a result, he falls flat on his face when he has to copy unfamiliar material.

Whether you are a beginner or an old-timer who has allowed his code speed to drop off from long disuse, only regular practice copying new material at a speed slightly faster than you can copy 100% will build up your copying speed. A wonderful source of code practice material is the ARRL's Station W1AW. Every night of the year, W1AW transmits code practice at 7:30 p.m. and 9:30 p.m. (EST in the winter, EDT in the summer) on 1805, 3555, and 7080 kc. and on 14.1, 50.7, and 145.6 mc. During the earlier sessions, the transmitting speeds are 10, 13, and 15 wpm daily. During the later sessions, the speeds are 5, 7½, 10, and 13 wpm on Sunday, Tuesday, Thursday and Saturday; on Monday, Wednesday, and Friday, the speeds are 15 to 35 wpm.

When you can consistently copy W1AW's transmissions without error at the next higher speed than the speed required for the class of license you are shooting for, you are ready for the code test. Once you get your license, your regular c.w. contacts will automatically improve your code ability. But continue copying W1AW, because its perfect, machine-sent code is an accurate yardstick with which to measure progress.



The week of August 2 through 8 will be Amateur Radio Week in Illinois. Shown here looking over the governor's proclamation to that effect is Tony Seckus, WA9EOC; state senator Morgan Finley; Jordan Kaplan, W9QKE; and Phillip Haller, W9HPG.

Amateur Radio Week. The Honorable Otto Kerner, governor of Illinois, has proclaimed the week of August 2 through August 8 as official Amateur Radio Week in Illinois, in recognition of the great service amateur radio performs by providing emergency communications in time of need.

Phillip E. Haller, W9HPG, ARRL Central Division Director, has announced that many amateur activities and demonstrations are planned throughout the state during the week. And a gala celebration at the annual Hamfesters Radio Club's Midwest Hamfest at Santa Fe Park, 91st Ave. and Wolf Rd., Chicago, on Sunday, August 8, will be the high point of the activities.

For information on the hamfest, contact Tony J. Seckus, WA9EOC, president of Hamfesters Radio Club, Inc., 2152 West 49th Place, Chicago, Ill. 60609. Attendance at this annual affair is usually around 5000.

Emergency Communications. Early this spring a tornado practically wiped out the towns of Crystal Lake, Illinois, Russiaville and Dunlap, Indiana, and caused widespread death and destruction in other towns in

(*Continued on page* 105)

Monthly Short-Wave Report

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

RADIO NEW YORK WORLDWIDE

RADIO New York Worldwide is the only station of its kind in the United States. Founded on an experimental basis in 1933 as W1XAL, it began programming as the *World Radio University* in December, 1934, disseminating educational courses on a regular basis. In 1939 the station became known as WRUL. Since 1963, it has been owned and operated by the International Broadcasting Corporation under its present name.

What makes *Radio New York Worldwide* unique? The station operates five interconnected short-wave transmitters on as many as 15 different frequencies, yet there are more than 3000 such frequencies in daily use all over the world. Nearly every country has at least one short-wave station. But most of these long-distance short-wave radio stations are owned and operated by governments and must serve as official spokesmen. *Radio New York Worldwide* speaks for itself. It is a privately owned, independent, international broadcasting station—a commercial radio service which offers program time for private commercial sponsorship.

The studios and offices of *Radio New York Worldwide* are located in the New Worldwide Communications Center at 4 West 58th Street in New York City. The programs are produced, for the most part, by members of the station staff. News services are based on United Press International, Reuters, and other wire facilities, direct telephone reports, short-wave pickups from around the world, and a large group of specially picked foreign correspondents. In addition, since *Radio New York Worldwide* is the only international affiliate of the American Broadcasting Corp. radio network, the station has access to ABC's worldwide reporting and news analysis.

Radio New York Worldwide maintains its own broadcasting facilities at the United Nations to keep up to the minute on UN activities. In 1962 the top broadcasting honor in the U. S.—the George Foster Peabody Award for "Outstanding Contribution to International Understanding By Radio"—was given to this station for its unprecedented coverage of the UN 16th General Assembly. It is also a two-time winner of the coveted Freedoms Foundation Medal for its weekly series called "Great Moments In History."

Letters and tapes indicating reception conditions are invited by the station. Frequently these letters and tapes are featured on various programs. Descriptions of any phase of life in the listener's country (music, hobbies, occupations, etc.) are also wel-

Every week 144 hours of English-language and 42 hours of Spanish-language programs originate in Radio New York Worldwide's studios in New York City; the control rooms are shown here. These programs are broadcast over powerful transmitters in Scituate, Mass., and beamed to Europe, Africa, and Latin America.

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)*
Argentina	Buenos Aires	11,780, 9690, 6090	2200, 0100 (Mon.-Fri.)
Australia	Melbourne	17,780, 15,220	2030, 2130, 2230
		9580	0745
Bulgaria	Sofia	6070	1900, 2300
Canada	Montreal	15,190, 11,760, 9625	1800 (E. Coast
		9625, 5970	0230 (W. Coast)
Congo (East)	Leopoldville	11,755	1630
Congo (West)	Brazzaville	15,370, 11,930	1430
Czechoslovakia	Prague	11,990, 9795, 7345, 7120, 5930	2000, 2230
Denmark	Copenhagen	15,165	0730
		9520	2100
West Germany	Cologne	11,925, 11,795, 9735	1010
		9640, 6075	2040
		9735, 6145	0000
Hungary	Budapest	9833, 9540, 7305, 6234	1930, 2030
		9833, 7305, 7215, 6234	2200, 2330
Italy	Rome	9575, 5960	1930, 2205
Japan	Tokyo	15,135, 11,780	1900
Jordan	Amman	9560	2000
Lebanon	Beirut	9660	2030
Netherlands	Hilversum	15,425, 11,950	1235 (Tues., Fri.)
		15,425, 11,730	1535 (Tues., Fri.)
Netherlands Antilles	Bonaire	9690	2030
Portugal	Lisbon	6185, 6025	2100, 2245
Romania	Bucharest	11,940, 11,810, 9590, 9510, 6190, 6150 (9570 not used at 2030)	2330, 2200, 2030
Spain	Madrid	11,715, 9615, 6140	2200, 2100, 2000
Sweden	Stockholm	15,195	0900
		9705	2215, 2045
Switzerland	Berne	9665, 9535, 6120	2015
		9665, 9535	2315
Turkey	Ankara	15,165	1700
United Kingdom	London	15,300, 11,860	1100
		9610, 6195	1700, 1800, 1900, 2100
U.S.S.R.	Moscow	15,180, 15,140, 9730, 9660, 9640, 9630, 9570, 9540, 7360, 7330, 7320, 7310, 7290, 7250, 7240, 7230, 7200, 7150, 7130, 6070 (all channels not in use at any one time)	1730, 1900, 2000, 2100, 2300, 0040
Vatican City	Vatican City	9645, 7250, 5985	1950

comed, and QSL cards are sent to all who request them. The station encourages comments and suggestions on all programs.

At press time, *Radio New York Worldwide* is scheduled to broadcast to Europe at 0700-1900 on 15,440 kc., at 0745-1100 on 17,845 kc., and at 1100-1645 on 17,840 kc.; to Latin America at 0700-1900 on 15,440 kc. and at 0945-1700 on 17,730 kc.; and to Africa at 1000-1645 on 17,730 kc. The "DX'ing Worldwide" program is aired on Saturdays at 1400 and once a month a special Norwegian DX report is included. "Club de Radioaficionados," the Spanish version of "DX'ing Worldwide," is broadcast twice weekly, on Thursdays at 0745 and 2145.

News Items. The Antilles Radio Corporation, Ltd., is opening a new 200,000-watt medium-wave station on the Caribbean island of Montserrat which will operate on 930 kc. with programs in English, French, and Spanish. Look for it.

Word has just been received from the *Voice of America* that its "Radio Amateur Notebook" has been discontinued. No reason was given in the announcement.

(*Continued on page* 108)

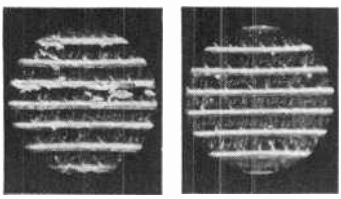
Some plain talk from Kodak about tape:

Slitting accuracy and skew angle

Tape is made in wide rolls which are slit to width—¼" for most audio tapes. There are three main considerations in this process: cleanliness, dimensional accuracy and trueness of cut. Cleanliness cannot be given too much consideration. When the tape is slit, particles of the oxide and the base can flake off. This condition arises from poor oxide adhesion and poor quality-control standards on slitters. Slitting dirt is virtually nonexistent in Kodak tapes because of our "R-type" binder and our unique slitting techniques.

Tape dirt clogs the recording gap and prevents the tape from making intimate contact with the head, thus causing dropouts and high-frequency losses. Oxide dirt can also cause a phenomenon known as re-deposit. During tape transport operation, gummy oxide dirt can actually re-deposit on the magnetic layer and fuse in position.

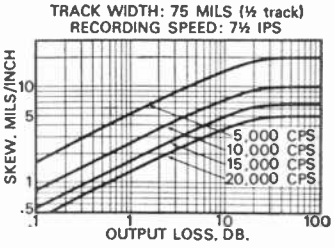
To get some idea about how Kodak tape slitting compares to ordinary slitting, take a look at these two photomicrographs. The dirt you see between the turns on the left is oxide dirt. Compare it to the virtually spotless edges of Kodak recording tape on the right.



It's like splitting hairs, only more critical

From our 42-inch-wide master web, we have to cut 160 ¼-inch ribbons of tape—each almost two miles long. That's a lot of total mileage, especially when you think how straight and true those edges must be to assure optimum tracking on your recorder. In terms of slitting accuracy the standard specs call for a tolerance on width of ± .0020 inches. We decided that that was just about double what it really should be, so we hold ours to ± .0010 inches.

But the really critical part of slitting is a bad guy known as weave. When a tape weaves, it passes the head at a continuously changing skew angle. Look at the graph.



Note how losses pile up as skew angle increases. As you'd guess, the losses are in proportion to frequency. Higher frequencies, higher losses. Same principle, really, as an azimuth loss.

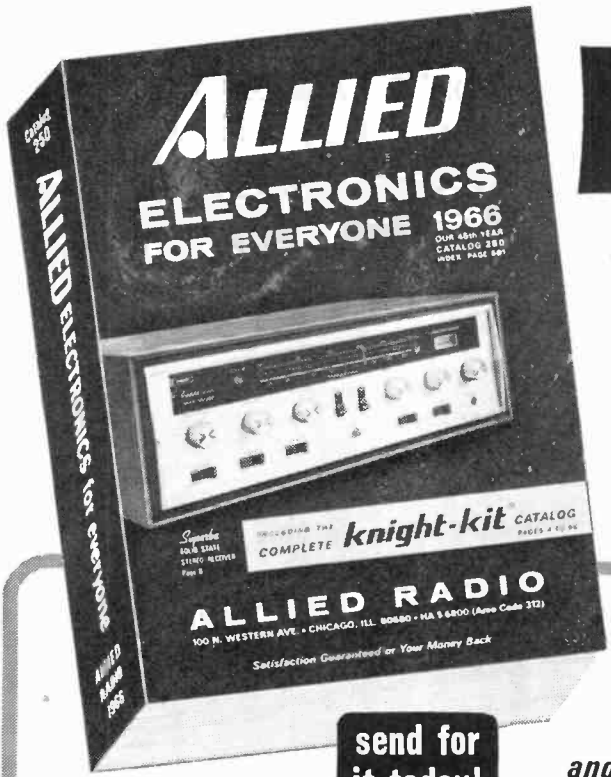
Proper tape tension is important in order to prevent "stepping." Stepping usually takes place about ⅓ of the way from the core of the reel. (That's the point at which there are no clockwise or counterclockwise forces acting upon the tape.) You can visualize it as a lateral shearing of a roadway during an earthquake. Shades of old San Francisco. This sets up stresses which cause fluted edges and prevent proper head contact. From winding billions of feet of motion picture film, Kodak has developed some pretty specialized tension-control techniques. The end result, of course, is that when you get Kodak tape on a roll, you know it's wound properly, not too loose, not too tight. Just right. Our Thread-Easy Reel is part of the story, too. Because it is dynamically balanced, we get a good wind right off the bat and you get a good rewind, too.

KODAK Sound Recording Tape in a complete variety of lengths and types is available at most tape outlets: electronic supply stores, specialty shops, department stores, camera stores . . . everywhere.

FREE! New comprehensive booklet covers the entire field of tape technology. Entitled "Some Plain Talk from Kodak about Sound Recording Tape," it's yours on request when you write Department 8, Eastman Kodak Company, Rochester, N. Y. 14650.

EASTMAN KODAK COMPANY, Rochester, N.Y.

CIRCLE NO. 8 ON READER SERVICE PAGE



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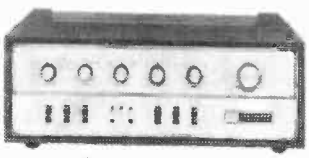

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Lloyd's Deluxe 9-Transistor Walkie-Talkie

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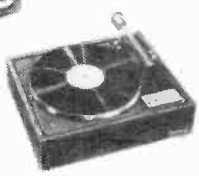
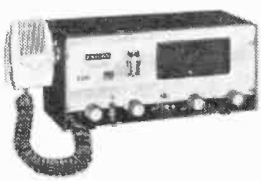


Garrard Lab 80 Automatic Turntable

Hallicrafters S-200 5-Band Short-Wave & AM Receiver

B & K CRT 445 Picture Tube Checker-Rejuvenator



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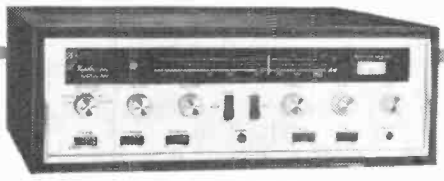
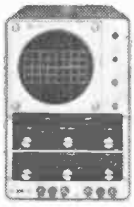


KG-964 Superba Series 64-Watt Solid-State FM-AM Stereo Receiver Kit. $189.95



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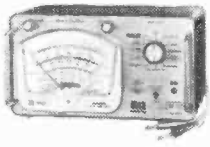
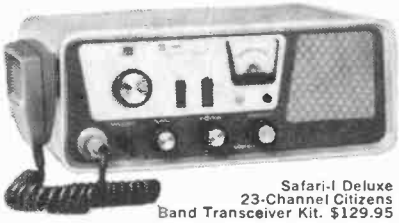


KG-375 Solid-State Universal Auto Analyzer Kit. $49.95



Safari-I Deluxe 23-Channel Citizens Band Transceiver Kit. $129.95

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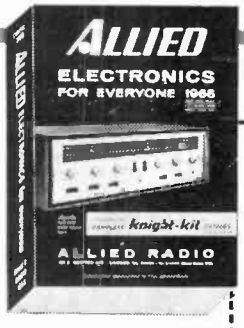

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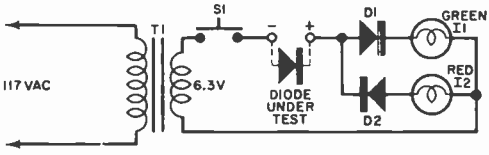
CIRCLE NO. 2 ON READER SERVICE PAGE

SIMPLE GO NO-GO DIODE TESTERS

Pilot Light Method

HERE'S an inexpensive diode tester with colored lamps which instantly tells you the condition of a diode. It costs less than $5 to build and can be housed in a small utility box. To operate, simply plug in a diode with the polarity as shown below. If only the green lamp lights, the diode is okay; if only the red lamp lights, the diode under test is reversed. If both lamps light, the diode is shorted; and if neither lamp lights, the diode is opened. Parts required include two No. 1493 lamps (General Electric or equivalent) and sockets, two 750-ma. diodes, a 6.3-volt, 1-ampere transformer, a push-button switch, and a utility box.

—James R. Barela & E. Edward Cook

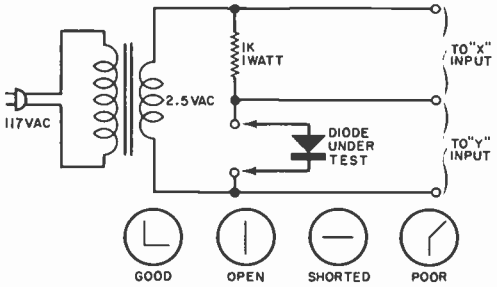


Diode polarity as well as open and short conditions can be predicted with the use of two colored pilot lights. If the diode is good, the green light goes on when the cathode is connected to the test terminal marked with the plus sign. A red light only shows a good diode but with its leads reversed.

Scope Technique

YOU CAN use your oscilloscope to check diode operation as shown in the diagram at right, below. The circuit checks the forward-to-backward resistance ratio of the diode under test, thus giving an indication of its worth. Adjust the scope gain controls to provide vertical and horizontal deflection in the presence of signal in the respective scope input. If the "good" and "poor" rectification indications appear inverted, the conclusions are still valid, since the diode connections or scope polarity may be reversed. Connect the common "X" and "Y" terminal to the low side of the scope's vertical and horizontal input terminals.

—A 2/C George Wlodarski, K8ABR



Signals across the "Y" and "X" inputs cause vertical and horizontal deflection respectively. A shorted diode will kill the vertical signal and an open diode removes horizontal deflection. A good diode provides a right-angle display. Adjustment of the scope's gain and position controls is not critical.

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CIRCLE NO. 14 ON READER SERVICE PAGE

WHEN IT'S 6 AM IN TOKYO—

By HOWARD S. PYLE **—what time is it in GMT or in your own time**

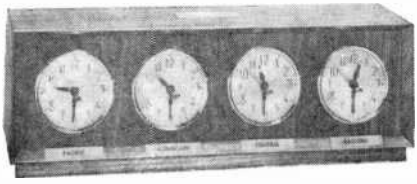
ARE you a DX ham with a sked coming up in Zanzibar? Suppose your contact gave you the time in GMT or in his time zone? Would you have to go through a maze of mental gymnastics to find GMT or the local time in his zone? Or say you're an SWL who particularly wants to pick up an English-language broadcast from Tokyo, and the short-wave broadcast listing indicates either the local time in Tokyo or the GMT time. If you add a 24-hour world time indicator to your DX'ing equipment, you won't have any trouble.

Since short-wave stations are scattered around the world, it has become the custom to report time in terms of Greenwich Mean Time, or as it is sometimes called, Universal Time, rather than in local time. This method of time-keeping has long been a favorite of hams as well, and you'll find the large majority of government agencies and the military using it exclusively.

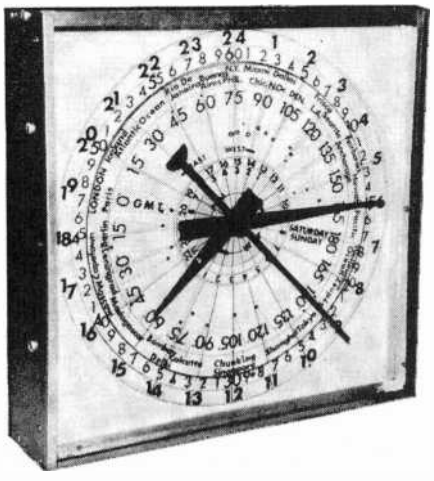
To equate your local 24-hour day with the rest of the surface of the earth, keep in mind that an increment of one hour occurs at each 15° of change in longitude. And GMT is simply the time at the point of 0 longitude, which happens to pass through Sussex, England. The word "Greenwich" in the term results from the fact that the Royal Greenwich Observatory is located in Sussex.

The Greenwich zone is called the "zero" zone; each of the other zones is numbered from 1 to 12 according to the hourly difference from Greenwich. Zones to the east are called "minus" zones since in each of them the zone number must be subtracted from standard time to obtain GMT. Conversely, zones to the

Local standard time in over 100 areas of the world as well as the GMT is provided by the time indicator at left. Manufactured by International Time Indicator Co., it sells for $11.95.



Leeds of California offers the combination above, enabling instant reading in four zones simultaneously. Name plates are supplied for local and international zones.



The Novelty Clock Co. makes this big 12" x 12" world time indicator. Intended for wall- or table-top mounting, it gives GMT and local times in every time zone. It is calibrated in longitude as well as hours with easy-to-read numerals.

A must item for the ham, the Call-Ident Tymeter contains a buzzer which sounds off at 10-minute intervals. Marketed by Pennwood Numechron, it sells for about $22.50.

zone? You can find the answers fast with a world time indicator!

west are called "plus" zones. The 12th zone is divided by the 180th meridian and the terms "minus" and "plus" are used in the halves of this zone which lie in east longitude and west longitude, respectively. For example, New York—which is east of London—is five hours behind GMT, while Moscow—located more than 2000 miles west of London—is three hours ahead of GMT.

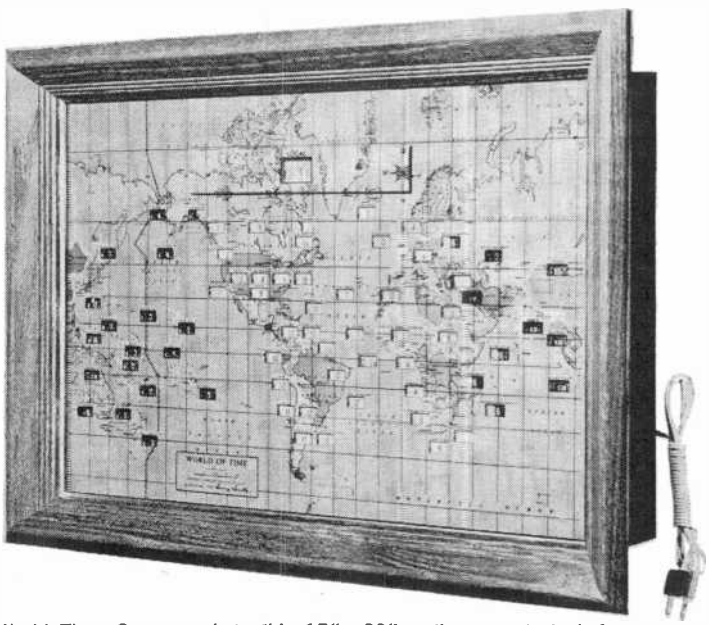
With the 24-hour clock, the hours from 1 a.m. to 11 a.m. are expressed as 0100 to 1100. Noon is referred to as 1200. From 1 p.m. to 11 p.m., times are expressed as 1300 to 2300. Midnight is referred to as 2400 or 0000. So far as minutes GMT-wise are concerned, 5:15 p.m. converts to 1715, 2:07 a.m. to 0207, etc. When it's 6 a.m. in Tokyo, it's also 2100 GMT, as well as 1600 EST.

Sure you can figure time conversion using a regular clock—but how much easier it is merely to glance at a 24-hour clock. Most of the 24-hour clocks on the market are fitted with an adjustable disc or a hand in the center of the dial which you set manually for your time zone. From the data on the clock you can tell the time in any other time zone.

If you are a ham. remember that the FCC requires you to have an accurate clock of some sort in your shack in order to keep an accurate log and to make the necessary 10-minute station breaks.

Wall- and desk-type clocks, such as those shown here, are available from many manufacturers. Ranging in price from a few dollars to over $180 for deluxe models, they come in many sizes and shapes—and represent one of the most important accessories you can add to your shack. -30-

For the mobile ham who has everything, here's a 24-hour pocket watch made by Hamilton Watch Co. Employing a 22-jewel precision movement, it costs $180.

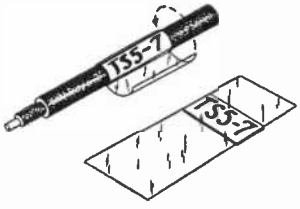


World Time Corp. markets this 15" x 22" wall-mounted clock for $60.00. Featuring a five-color map set in a walnut frame, it simultaneously indicates time in 70 locations, covering every time zone.

Tips and Techniques

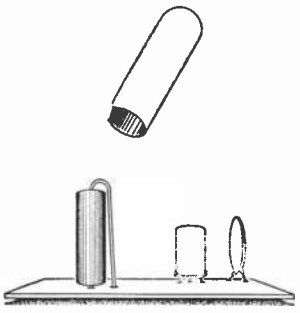
"MAGIC" TAPE MARKS CABLES LIKE MAGIC

A professional-looking lead or cable marker can be made with Scotch "Magic" tape. You just print the desired information on the tape using almost any medium and wrap it around the cable. For durability, the tape should be long enough to cover the printing a couple of times when wrapped around the cable. Better contrast can be obtained by sticking a small strip of paper on the tape behind the printing. *—Don E. Watson*



HEAT-SHRINKABLE PLASTIC COVERS COMPONENTS COMPLETELY

We often run the risk of short circuits for the sake of miniaturization. For instance, when mounting a capacitor or resistor on a printed circuit board, it's a common practice to bend the lead parallel to the component and mount the component standing erect. A real space-saver—but that long lead is a potential troublemaker! One neat way of preventing a short is to cover the component and the lead with a plastic "Fit-Cap," such as manufactured by the Alpha Wire Co., and apply a bit of heat. The shrinkable plastic reduces in size, grips and insulates the component.



—Byron G. Wels, K2AVB

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You will learn the basic principles of radio. You will construct, study and work with RF and AF amplifiers and oscillators, detectors, test equipment. You will learn and practice code, using the Progressive Code Oscillator. You will learn and practice trouble shooting, using the Progressive Signal Tracer, Progressive Signal Injector, Progressive Dynamic Radio & Electronics Tester, Square Wave Generator and the accompanying instructional material.

You will receive training for the Novice, Technician and General Classes of F.C.C. Radio Amateur Licenses. You will build Receiver, Transmitter, Square Wave Generator, Code Oscillator, Signal Tracer and Signal Injector circuits, and learn how to operate them. You will receive an excellent background for television, Hi-Fi and Electronics.

Absolutely no previous knowledge of radio or science is required. The "Edu-Kit" is the product of many years of teaching and engineering experience. The "Edu-Kit" will provide you with a basic education in Electronics and Radio, worth many times the low price you pay. The Signal Tracer alone is worth more than the price of the kit.

THE KIT FOR EVERYONE

You do not need the slightest background in radio or science. Whether you are interested in Radio & Electronics because you want an interesting hobby, a well paying business or a job with a future, you will find the "Edu-Kit" a worth-while investment.

Many thousands of individuals of all ages and backgrounds have successfully used the "Edu-Kit" in more than 79 countries of the world. The "Edu-Kit" has been carefully designed, step by step, so that you cannot make a mistake. The "Edu-Kit" allows you to teach yourself at your own rate. No instructor is necessary.

PROGRESSIVE TEACHING METHOD

The Progressive Radio "Edu-Kit" is the foremost educational radio Kit in the world, and is universally accepted as the standard in the field of electronics training. The "Edu-Kit" uses the modern educational principle of "Learn by Doing." Therefore you construct, learn schematics, study theory, practice trouble shooting—all in a closely integrated program designed to provide an easily-learned, thorough and interesting background in radio.

You begin by examining the various radio parts of the "Edu-Kit." You then learn the function, theory and wiring of these parts. Then you build a simple radio. With this first set you will enjoy listening to regular broadcast stations, learn theory, practice testing and trouble shooting. Then you build a more advanced radio, learn more advanced theory and techniques. Gradually, in a progressive manner, and at your own rate, you will find yourself constructing more advanced multi-tube radio circuits, and doing work like a professional Radio Technician.

Included in the "Edu-Kit" course are Receiver, Transmitter, Code Oscillator, Signal Tracer, Square Wave Generator and Signal Injector Circuits. These are not unprofessional "breadboard" experiments, but genuine radio circuits, constructed by means of professional wiring and soldering on metal chassis, plus the new method of radio construction known as "Printed Circuitry." These circuits operate on your regular AC or DC house current.

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In addition, you receive Printed Circuit materials, including Printed Circuit chassis, special tube sockets, hardware and instructions. You also receive a useful set of tools, a professional electric soldering iron, and a self-powered Dynamic Radio and Electronics Tester. The "Edu-Kit" also includes Code Instructions and the Progressive Code Oscillator, in addition to F.C.C. Radio Amateur License training. You will also receive lessons for servicing with the Progressive Signal Tracer and the Progressive Signal Injector, a High Fidelity Guide and a Quiz Book. You receive Membership in Radio-TV Club, Free Consultation Service, Certificate of Merit and Discount Privileges. You receive all parts, tools, instructions, etc. Everything is yours to keep.

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You will learn trouble-shooting and servicing in a progressive manner. You will practice repairs on the sets that you construct. You will learn symptoms and causes of trouble in home, portable and car radios. You will learn how to use the professional Signal Tracer, the unique Signal Injector and the dynamic Radio & Electronics Tester. While you are learning in this practical way, you will be able to do many a repair job for your friends and neighbors, and charge fees which will far exceed the price of the "Edu-Kit." Our Consultation Service will help you with any technical problems you may have.

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J. Stataitis, of 25 Poplar Pl., Waterbury, Conn., writes: "I have repaired several sets for my friends, and made money. The "Edu-Kit" paid for itself. I was ready to spend $240 for a Course, but I found your ad and sent for your Kit."

Ben Valerio, P. O. Box 21, Magna, Utah: "The Edu-Kits are wonderful. Here I am sending you the questions and also the answers for them. I have been in Radio for the last seven years, but like to work with Radio Kits, and like to build Radio Testing Equipment. I enjoyed every minute I worked with the different kits; the Signal Tracer works fine. Also like to let you know that I feel proud of becoming a member of your Radio-TV Club."

Robert L. Shuff, 1534 Monroe Ave., Huntington, W. Va.: "Thought I would drop you a few lines to say that received my Edu-Kit, and was really amazed that such a bargain can be had at such a low price. I have already started repairing radios and phonographs. My friends were really surprised to see me get into the swing of it so quickly. The Trouble-shooting Tester that comes with the Kit is really swell, and finds the trouble, if there is any to be found."

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At no increase in price, the "Edu-Kit" now includes Printed Circuitry. You build a Printed Circuit Signal Injector, a unique servicing instrument that can detect many Radio and TV troubles. This revolutionary new technique of radio construction is now becoming popular in commercial radio and TV sets.

A Printed Circuit is a special insulated chassis on which has been deposited a conducting material which takes the place of wiring. The various parts are merely plugged in and soldered to terminals.

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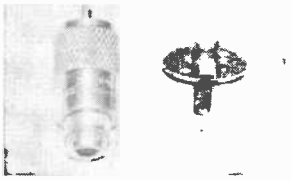
CIRCLE NO. 30 ON READER SERVICE PAGE

Tips

(*Continued from page 92*)

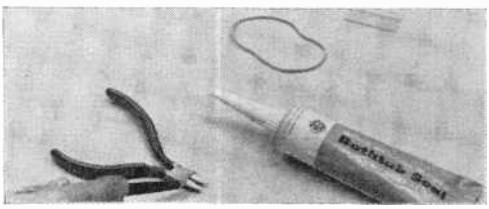
nals of the SO-139 type, thus avoiding hum and stray r.f. pickup from exposed leads. The necessary adapter is constructed from a Cinch-Jones 81A or Switchcraft 3501F phono jack, and an Amphenol PL-259 coaxial plug. Straighten the lugs of the phono jack and remove the fiber base. Grind the base down to a diameter of ½" and remount it—but leave the lugs extended. Then solder a 2" wire to the jack's center lug and cover with protective tubing. Insert the wire into the plug's center connection and solder. Finally, bend the outer lugs of the socket against the plug's outer shell and solder. Be sure not to short out the inner connections to the shell.



—F. W. Chesson

SILICONE RUBBER HOLDS POPPED CLIPPINGS

Wire clippings won't pop out of your diagonal cutters if you fabricate some rubber pads for the jaw opening with a new Bathtub Seal made by General Electric Company. Holding the cutters shut with rubber bands, you squeeze the sealant out of a tube



into the opening, and let it set for 24 hours. Trim off the excess rubber neatly, and center-cut the jaw opening with a razor. Clippings will then be held by the pads until you can dump them in a safe place.

—Bob Sheridan

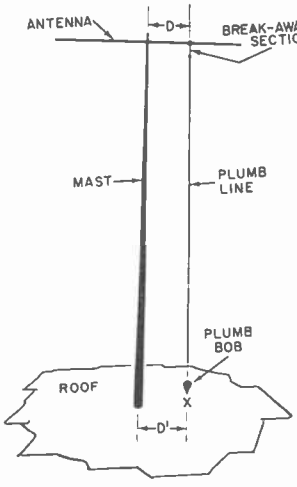
ADJUSTABLE RESISTOR KEEPS MODEL RACER ON TRACK

Racing model cars has become a popular indoor sport for grown-ups as well as for the kids, but Pop usually winds up repeatedly replacing cars that Junior lets fly end over end as he cranks the rheostat control to full throttle. Such "accidents" can be prevented by inserting a 20-ohm, 10-

watt, variable-tap resistor in series with the rheostat, thus limiting the speed of the car. The resistor is adjusted to keep the racer on the track at full throttle. A switch connected in parallel with the resistor will eliminate it from the circuit if Pop and his friends want to get down to some serious racing. —*Ken Greenberg*

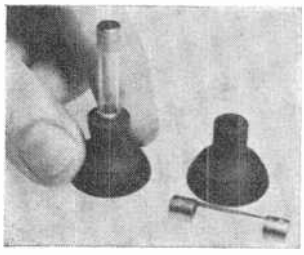
A "PLUMB" IN TIME KEEPS A MAST IN LINE

You can use a "break-away" plumb line for easy and precise alignment of your antenna mast. Before hoisting the antenna, tie a short length of thread to it at a selected distance (D) from the mast. Then attach a plumb line to the thread. When the antenna is up and the mast temporarily guyed, adjust the plumb bob so that it just swings clear of the roof. Adjust the tilt of the mast so that the distance from the mast to the plumb line is the same on the bottom (D^1) as on the top. If the mast can be rotated, it is possible to align it without tilt in any direction. When alignment is complete, a slight tug on the plumb line will break it away from the antenna. —*Wm. B. Rasmussen*

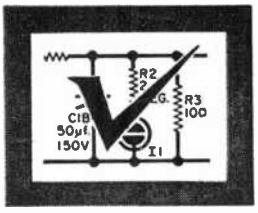


OLD SUCTION CUP HOLDS NEW FUSES

Keeping a spare fuse handy near the chassis of a TV set, line amplifier, radio, or hi-fi offers a certain amount of insurance against interrupted service. Press a rubber suction cup to the chassis or to the inside of the cabinet. Then place the fuse into the cup opening as shown. A drop of cement underneath the cup will fasten it indefinitely. —*John A. Comstock*



Operation Assist



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

Schematic Diagrams

RCA Model 158 oscilloscope. **Magnolia Electronics** "Town & Country" Model TC27 transceiver. (Robert M. Smith, 3534 1st Ave., N.E., Cedar Rapids, Iowa 52402)

Emerson Model BU230 receiver, ser. BU-1878919, circa 1936. Has 6 tubes and magic eye. (Earl Lindow, 3920 Brookwoods, Houston, Texas 77018)

Bendix Radio Model CRR 74028 frequency meter, circa WWII. Tunes 125 kc. to 20 mc. Part of LM-20 radio equipment. (Pete Vitello, 1198 E. Turkeyfoot Lake Rd., Akron, Ohio 44312)

Grunow Model 700 superhet receiver, circa 1940. Tunes 550 to 3800 kc. Has 1 80 tube, 1 6F6, 3 78's, 1 75 and 1 37. (John Harry, 4244 N.E. Washington, Minneapolis, Minn. 55421)

Zenith Model 6S222 or 8S222 receiver. Tunes BC, 1.5 to 18 mc. Has 6 tubes. (James E. Halpin, 13176 Gina Ave., Riverside, Calif. 92508)

Philco Model 41-290 receiver, circa 1940. Tunes BC and s.w. Has 10 tubes. (Dan Waterstroat, 1418 W. Bloomfield Rd., Honeoye Falls, N. Y. 14472)

GE Model 428 receiver, circa 1946. Tunes BC. Has a 12BE6, 12BA6, 12AV6, and 50C5. (James H. Rea, 172 Burrill St., Swampscott, Mass. 01907)

Farnsworth Model CC-90 receiver, ser. 901448(?). Tunes AM, FM, and s.w. (William Valcarcel, 822 Elsmere Place, Bronx 60, N. Y.)

Solar Manufacturing Model CE "Exam-eter," capacitor analyzer, circa 1950. (Ross R. Sherman, Main St., Schaghtriske, N. Y.)

Philco Model 38-40 receiver, code 121. Tunes BC and s.w. Has 5 tubes. (Lou Tureikas, 29 Rocky Pool La., Levittown, Pa.)

Class "B" modulator for phone operation. 500-watt output transmitter (c.w.). (William Taylor, 325 Riverside Dr., Ormond Beach, Fla. 32074)

Hallicrafters "Sky Champion" Model S-20-R receiver. (George Stevenson, 4711 Tennessee, St. Louis, Mo.)

Bendix Model TA-12 D aircraft transmitter. (Chandrakumar C. Piprani, 47 East Periaswamy Rd., R. S. Puram, Coimbatore-2. Madras, India)

Scott Model SLRM marine receiver. Tunes BC to 18 mc. (Robert M. Smith, 3534 1st Ave., N.E., Cedar Rapids, Iowa)

Sony Model 101 transistorized tape recorder. Has 2 tubes. (Nicholas Racsok, 33 Dorothy St., Carteret, N. J. 07008)

Carron Model CCH signal tracing amplifier. (George L. Wasko, Box 134, Lucernemines, Pa. 15754)

Stromberg Carlson Model 17897 TRF receiver, ser. 156101. Tunes BC. Has 5 27 tubes, 1 71A and 1 80. (Otto C. Andrews, 634 Beaumont Rd., Fairless Hills, Pa. 19030)

Harvey Wells "Bandmaster Z-Match" receiver, circa 1955. (R. B. Wolfe, 8771 45th St., Riverside, Calif. 92509)

"All-Star Jr." kit-built s.w. receiver, circa 1936. Tunes s.w. bands. (Henry Bess, 200 Lynn St., Washington, Ill.)

Meissner superhet receiver kit, circa 1949. Tunes BC and s.w. (6 to 18 mc.). Has 6 tubes. (Ed Lawlor, 5 Pauline St., Carteret, N. J. 07008)

Shepard-Potter "Thermiodyne," T.F. 6, Model 2564 receiver, circa 1926. Tunes 500 to 1100 kc. Has 6 tubes. (C. K. Bird, Rt. 1, Clendenin, W. Va.)

American Bosch "Magneto" Model 28 receiver, ser. 17499. Tunes 550 to 1440 kc. Has 8 tubes. (John Van Oosbree, 2508 7th St., Emmetsburg, Iowa 50536)

Stewart Warner Model A61P3 portable receiver, circa 1948(?). Tunes BC band. Has 6 tubes. (Von J. Taylor, 1847 S. 16 East, Salt Lake City, Utah)

Western Electric Model AM-129/U amplifier. Mixes 4 mikes; output, 150/600 ohms. Has 4 tubes. (Paul W. Miller, 150 S. Franklin, Red Lion, Pa.)

Special Data or Parts

Hallicrafters Model S-76 receiver, circa 1951; tunes 538 kc. to 34 mc. Translucent dial scale and main tuning part 83B387 needed. (H. Waitz, Jr., 7437 S. Boulder Rd., Boulder, Colo. 80302)

Zenith Model 12H090 receiver; tunes AM, FM and s.w. bands. Transformer S12252 or equivalent wanted. (P. Austin, 4944 W. 91 Place, Oak Lawn, Ill. 60453)

"Electrical Appliance Servicing" book by William Crouse. (R. E. Henning, 110 N. Front St., Darby, Pa. 19023)

Atwater Kent receiver, ser. 5862283, circa 1930; type H chassis; has 9 tubes. Schematic and parts source needed. (Fred O. Bridges, USPHS Hospital, Carville, La. 70721)

Atwater Kent Model 33 receiver, ser. 2012586, circa 1926. Tubes and schematic needed. (Henry Rodzen, Jr., 287 Buffinton St., Fall River, Mass.)

American Bosch Model 48 receiver, circa 1930; has 7 tubes. Speaker and schematic needed. **Philco** Model 20 receiver. Parts values and schematic needed. (Gary Hunt, 1115 San Luis Rey Dr., Glendale, Calif.)

Packard Bell "Phonocord" receiver, circa 1946; tunes AM and FM; has 12 tubes, phono input and recording output. Glass tuning scale and schematic needed. (Craig Radich, 44041 N. 3rd St. E., Lancaster, Calif.)

Freshman Masterpiece receiver, ser. C72267. Tube source, schematic, and power supply source needed. (Walter Lane, Box 2321, Bell Gardens, Calif.)

Atwater Kent Model 84 superhet receiver; 110-120 volts, 80 watts. Power supply needed. (C. W. Sutherland, 1243 Whitney Ave., New Orleans, La. 70114)

Superior Instrument Model 670-A VOM. Source for selenium and copper oxide rectifiers needed. (G. Harris, 2924 Palmyra St., New Orleans, La.)

Airline Model 14BR-913A receiver; tunes BC and s.w. bands. UV-199 tube and schematic needed. (Hubert Siegel, Shambo Route, Havre, Montana 59501)

Regal receiver, ser. 176020; tunes AM and FM; has 9 tubes. Alignment instructions and schematic needed. (Alvin N. Nelson, 65 S. Madison, Denver, Colo. 80209)

Pierson Electronic Model KP-81 receiver. Manual, schematic, and manufacturer's address wanted. (Dick Margavich, 406 E. Elm St., Hazleton, Pa. 18201)

Hallicrafters Model BC-669B receiver, ser. 3240; order 15536, Phila-43; tunes 2000 to 5000 kc. Operating manual, schematic, and service instructions needed. (P. J. Mann, C.M.R. 4403, Webb A.F.B., Texas 79721)

RCA Model AR-88 receiver; tunes 535 to 32,000 kc. in 6 bands; has 14 tubes. Parts source and schematic wanted. (SP/5 Jimmy J. Cheek, 82nd Ordnance Battalion, APO, New York 09189)

Radio City Products Model 123 flyback transformer and yoke tester, ser. 4421. Operating instructions or address of manufacturer needed. (Dave's Radio & TV Service, 500 Cottonwood St., Ardmore, Okla.)

Link Model 2210 transceiver; tunes FM, 150 to 170 mc. Crystal data and schematic or servicing manual needed. (Stanley S. Dowgiala, 141 Hopkins Ave., Jersey City, N. J. 07306)

Hansen Electric Products Model M-70 vacuum-tube voltmeter, ser. P8232. Schematic and/or address of manufacturer needed. (Leonard Shustek, 166-15 17th Rd., Whitestone 57, N. Y.)

Zenith Model 39A TRF receiver, circa 1929. Two UX-281 rectifier tubes needed for power pack. (Vic Molek, RD 1, Box 312, New Salem, Pa. 15468)

Westinghouse receiver, chassis assembly V-2105; tunes AM, FM and s.w.; has 14 tubes. Tube layout and schematic needed. **RCA** "Radiola III" receiver, circa 1922. Battery info, schematic, and source for tubes needed. (Richard Easton, 947 Armstrong Ave., St. Paul, Minn. 55102)

Bush & Lane receiver, chassis 12932. Schematic and date of manufacture wanted, plus kind of tubes used. (Allen R. Harris, 390 Sternberg Rd., Muskegon, Mich.)

Solar Model CE capacitor analyzer, ser. 80527, type 160; 115 volts, 60 cycles. Instruction booklet needed. (William Cardani, 3538 Atlantic Ave., Atlantic City, N. J.)

Zenith Model 8G00YT "Trans-Oceanic" receiver; tunes BC and s.w. bands. Tubes needed, plus servicing info and schematic. (Walt Szatkowski, 118 Evelyn Ave., Amsterdam, N.Y.)

Philco Model 41-230 receiver, code 121; tunes BC and s.w. bands; has 7 tubes. Parts list, schematic, pictorial and any other available info wanted. (Andrew Irving, 736 Harvard Ave., Swarthmore, Pa. 19081)

Atwater Kent Model 89 receiver; has 8 tubes. Service and operating data needed. (Anthony S. Kogut, Frankfort 2, N.Y.)

-30-

New Products

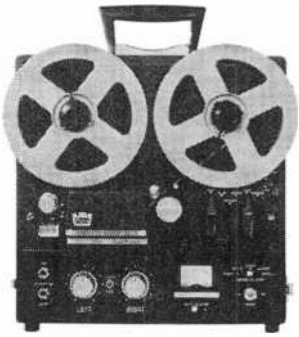
(*Continued from page 24*)

which contains an EDITall block, 30 EDItabs, a marking pencil, a specially treated demagnetized razor blade, and complete instructions for use. Additional packages of 50 EDItabs are sold separately.

Circle No. 85 on Reader Service Page 15

STEREO TAPE RECORDER

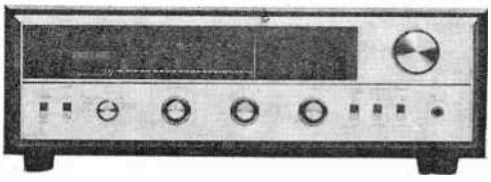
A new stereo tape recorder, the Model 1620, has been released by *Roberts Electronics*, a division of Rheem Mfg. Co. It features 4-track stereo/mono record/play, record interlock, edit-pause control, automatic shutoff, and a professional vu meter. There are stereo mike inputs, FM multiplex inputs, and separate stereo tone and volume controls. In addition to the stereo 7-inch oval speakers, outputs for extension speakers and outputs for stereophones are included. The Model 1620 operates at three tape speeds: 3¾ ips and 7½ ips are built-in, and 15 ips can be obtained with an optional accessory.



Circle No. 86 on Reader Service Page 15

FM STEREO TUNER-AMPLIFIER

The tuner section of the new *H. H. Scott* 344 tuner-amplifier incorporates a silver-plated four-nuvistor front end for 2.2-μv. sensitivity (IHF) with 80 db cross modulation rejection; flat line limiting makes the 344 impervious to ignition pulse noises and overloading



caused by strong local stations. The stereo multiplex section utilizes solid-state time-switching multiplex circuitry, and separation is over 35 db. Automatic stereo switching is accomplished by means of a computer-like device which compares the incoming signal with a fixed noise signal. The solid-state amplifier stage of the 344 delivers a conservative 25 watts music power per channel into an 8-ohm load.

Circle No. 87 on Reader Service Page 15

Diode Function Quiz Answers

(*Quiz appears on page 78*)

1 — H In a positive clamping circuit, diode conduction during the negative half cycle permits the capacitor to charge up to a voltage nearly equal to the peak value of the input signal, but the output is zero. On the positive half cycle, the diode stops conducting. The voltage across the capacitor adds to the signal voltage and the output is approximately twice the peak voltage.

2 — C A diode detector passes only one-half of the input signal's waveform to recover the audio portion of the signal.

3 — F In an "And" or "Coincidence" gate, used in logic circuits, two simultaneous input signals of proper polarity and sufficient amplitude to overcome the forward bias of both diodes are required to produce an output signal.

4 — I In limiter circuits, a single reverse-biased diode can be used to clip one side of the waveform at a preselected voltage level.

5 — E In a double-sideband modulator, the carrier is suppressed while upper and lower sidebands are developed.

6 — A A small current passed through a silicon crystal diode in the reverse direction creates a noise or hiss, which can be used to test a radio receiver and other equipment.

7 — G In a zener diode relaxation oscillator, a charging capacitor increases the reverse voltage across the diode until its zener breakdown point is reached. The capacitor then discharges through the diode. When the diode stops conducting, the charging cycle repeats itself.

8 — D A reverse-biased zener diode is often connected in parallel with a meter to provide overload protection. When the preselected diode breakdown voltage is exceeded, the diode acts as a shunt.

9 — B Two zener diodes connected back-to-back are used to regulate an a.c. supply voltage by alternately clipping the voltage peaks at a preselected level.

10 — J In a depressed-zero meter, a reverse-connected zener diode in series with the meter prevents any indication until the breakdown voltage is reached. Input voltages ranging from the diode's breakdown point to the meter's limit can then be spread to fill the entire scale, from one end to the other.

Annual Report on CB Equipment

(*Continued from page* 68)

CAP channel on 26.62 mc. (used by authorized CAP members only). This transceiver has "compatibility," meaning that it can be used to transmit a suppressed-carrier signal suitable for contacting regular AM stations.

Several manufacturers (including Sonar and U.S.L.) are putting a "receive" crystal socket on the front panel. This is a feature that is long overdue; transmit crystal sockets on the panel have been common, but few companies have given serious consideration to the necessity for a similar socket for receiving. U.S.L. has an unusual speech compression system involving a "Rayistor" that may be a harbinger of things to come—simple and possibly very effective.

What appears to be the very first 23-channel transceiver using synthesis circuitry, and available as a kit, is upcoming from Allied Radio. Heath is aiming at a different 23-channel unit to be offered at a very low price. EICO plans to compromise on the number of necessary channels and will also offer a transistorized unit—as will Heath.

Transceivers with control heads are on their way, according to Tram. Putting the main body of the transceiver in the trunk is common practice in the $600-plus Business Radio transceivers. This arrangement has never been used successfully in CB, but legitimate users are now asking for it. Besides reducing the amount of space required under the dash, the separate-unit transceiver is generally much more convenient to operate. And speaking of convenience, the Editors note a distinct change in CB toward eliminating frills. Amphenol, Raytheon, and others are working in this direction.

Last but not least, don't forget to investigate the tremendous variety of base station and mobile antennas being offered. With the CB power limitation at 5 watts, your only method of boosting your radiated signal is with a good antenna. A feature story containing basic information on CB antennas appeared in the May issue (page 62). —30—

Ham Gear for the Newcomer

(*Continued from page* 61)

transistor revolution has been quite slow in reaching amateur equipment. The reason is not hard to find: transistorized ham gear has not been able to equal the performance of tube units at competitive prices. Today, however, hybrid SSB transceivers, using transistors and other solid-state devices in the low-level stages and vacuum tubes in the transmitter output stages, are available for operation in both the HF and VHF amateur bands.

One such unit is the 135-watt SBE-24 SSB transceiver, covering 80 through 10 meters. Another pair is the Gonset 900-A and 901-A VHF SSB transceivers rated at 20 watts on 50 and 144 mc., respectively. The latter units should be of interest to the advanced Technician.

Kits vs. Assembled Units. The advantages of factory-assembled and guaranteed equipment are obvious. Nevertheless, any amateur kit on the market today produces a piece of gear that performs exactly as it is supposed to, if carefully constructed according to the instructions furnished with it. In addition, it should cost substantially less than an equivalent factory-assembled unit.

Accessories. For hams using crystal-controlled transmitters, crystals are very important accessories. While you can occasionally pick up a good bargain in crystals, you will never go wrong by paying a few pennies more for the best. Also, when a Novice gets his General license, or a Technician wants to shake free of crystal control, a good external VFO rates as a desirable accessory.

Then there are low-pass filters to be connected between the transmitter and its antenna system for protection against TV interference. They come in two types. If you work 50 mc., as well as the lower-frequency bands, make certain that the low-pass filter you select will pass 50-mc. signals. If you are not interested in 50 mc., a low-pass filter with a cutoff frequency below 50 mc. offers more protection against TVI.

The equipment "sampler" on pages 62-64 contains information on transmitters, receivers, and other products which should be of interest to the newly licensed Novice or Technician. Do not hesitate to write to any manufacturer for further information. -30-

"The book says you can get a good ground by connecting your equipment to a water pipe."

Transistor Topics

(Continued from page 77)

Grove, Mo.). An electronic equivalent of a self-latching electromagnetic relay, it can be used as a steady "on until reset" indicator in alarm, control, and call systems. Transistor *Q2*'s bias is a function of *Q1*'s collector-to-ground voltage, and is applied through *R3* and *S2*.

When *Q2* is in an "off" state, its collector draws relatively little current. Its collector-to-ground potential approaches the battery voltage. There is little or no voltage drop across the indicator lamp *I1* and series resistor *R5*. As a result, a moderately high bias is applied to *Q1*, causing it to conduct heavily. When *Q1* conducts, most of the supply voltage appears across *Q1*'s collector load (*R4*) and a more positive voltage is applied to the base of *Q2*, which keeps *Q2* in a cutoff condition.

If, at this point, a positive pulse is applied to the base of *Q1*, this transistor's collector current decreases, swings *Q2*'s bias voltage in the negative direction, and causes *Q2* to conduct. The resulting current flow through *Q2*'s collector-emitter circuit lights *I1* and drops the voltage below *D1*'s zener point. The diode stops conducting and cuts off *Q1*'s bias. The entire circuit is now stabilized . . . *Q1* is cut off and *Q2* is conducting. To stop this action and extinguish the light, and to reset the circuit, it is only necessary to momentarily open *S2*, a normally-closed, push-to-open switch.

Parts arrangement and wiring is not critical, and the circuit can be assembled on a small chassis or board. It can be housed in its own plastic or metal case, or installed with other equipment as an additional circuit. The resistors are all half-watters.

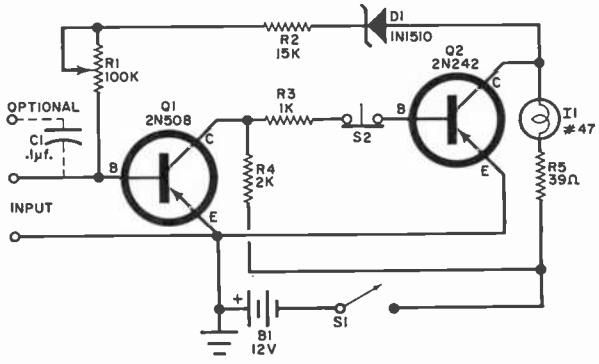


Fig. 5. Electronic latching circuit sent in by reader Charles Rakes goes on when a positive pulse is applied to Q1's base, and stays on until reset.

To operate the unit, close *S1* and set *R1* to its minimum resistance value. Then press and release *S2*. The lamp should go off and remain off. Slowly increase *R1*'s resistance until *I1* lights, then back off slightly from this setting. Press and release again. The lamp should go out and remain dark until a positive trigger pulse is applied to *Q1*'s base.

The *AM wireless microphone circuit* illustrated in Fig. 6 was submitted by reader Gerry S. Franklin (Arlington, Texas). A single untapped coil (*L1*) is used and no feedback winding is required. Transistor *Q1* is a *pnp* unit in a common-base arrangement and differs from the common-emitter circuit in that signals in its input and output circuits are in phase. As a result, oscillation

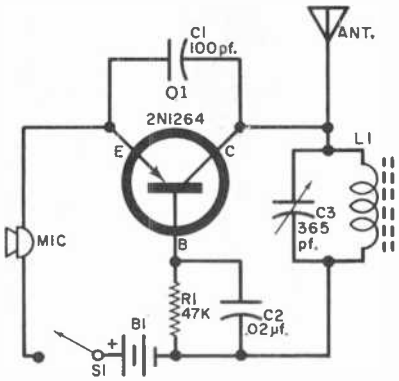


Fig. 6. Reader Gerry Franklin's AM wireless microphone takes advantage of in-phase signal condition at collector and emitter to sustain oscillation.

can be obtained by adding a simple feedback capacitor *C1* between the collector and emitter circuits.

Transistor *Q1*'s base bias is supplied through *R1*. The circuit's frequency of operation is determined by the tuned circuit (*L1*, *C3*), which also serves as the collector load. Modulation is introduced in the emitter circuit by means of a carbon microphone.

Standard parts are used. Resistor *R1* is a half-watt unit and *C1* and *C2* are small ceramic capacitors. Capacitor *C3* is a 365-pf. variable or padder type. Coil *L1* is wound on a two-inch length of ¼" ferrite core and consists of 70 turns of #20 enameled wire, close-wound. A high impedance carbon microphone cartridge is used.

Gerry chose a 2N1264 for *Q1*, but indicates that a 2N508, CK722 or 2N107 should work as well if *R1*'s value is changed—the best value being determined experimentally. Switch *S1* can be either a slide or push-button switch, while *B1* can be any combination of batteries supplying from 6 to 20 volts.

Capacitor *C3* should be adjusted so that

the unit's output signal is picked up at a "dead" spot on the AM dial of a nearby receiver. Maximum range will vary, of course, but Gerry says that he obtained a range of about 30 feet with his model, using a two-foot antenna.

Transitips. If you assemble a fair number of projects each year, you may find it worthwhile to take a tip from computer design engineers and consider "modular" construction, i.e., the preassembly and use of the same basic circuitry for a variety of projects. While there are, of course, many circuits that are unique to specific projects, there are just as many which are essentially the same in various types of equipment.

The audio amplifier is a prime example. An amplifier capable of delivering, say, from 500 milliwatts to several watts, can be used in such projects as electronic guitars, radio receivers, phonographs, tape recorders, power megaphones, intercoms, theremins, signal "sniffers," voice-controlled relays, intrusion detectors, and signal tracers.

High-powered engineering is not required. Simply pick a circuit that you have tried successfully in the past, choose one from back issues of POPULAR ELECTRONICS, or select one from any of the circuit manuals offered by such manufacturers as RCA, General Electric or Motorola.

Assemble your first circuit breadboard-fashion to check operation, adjusting component values experimentally, if necessary, for optimum performance. Next, work up a tentative layout, either for an etched circuit board or on a small chassis. You may have to try two or three layouts before you find the one best suited to your needs.

Finally, assemble two or three duplicates of your completed design. Use these, as needed, in future projects in much the same way as you would use components such as loudspeakers or batteries.

The "ideal" audio amplifier for general-purpose applications should have moderate to high gain and a moderate to high input impedance. It should be capable of delivering sufficient power for good room volume, and should have a standard output impedance . . . typically, 4 or 8 ohms. The components used should be standard "off-the-shelf" items rather than surplus or salvaged parts. And, naturally, the circuit should operate on readily available power sources: 6-, 9- or 12-volt batteries.

With a suitable assortment of basic circuit "modules" on hand, you can complete a greater number of projects each year, can reduce your trouble-shooting time, and can concentrate on the unique features of new projects rather than on familiar circuitry.

More next month. . .

—Lou

Across the Ham Bands

(*Continued from page* 80)

Indiana. Within minutes after the tornado had passed, however, amateurs were in operation on the Indiana c.w. and phone net frequencies handling emergency and welfare messages in and out of the disaster areas. Your Amateur Radio Editor personally logged over 100 other amateurs who helped provide emergency communications for three days until regular forms of communications could be restored to the disaster areas.

Undoubtedly, the most surprised ham taking part in the operation was Art, K8MET/9, who was set up in the emergency communications center at the fire station in Dunlap, Indiana. Art looked up from his receiver at one point and saw the President of the United States standing a few feet away drinking a cup of coffee. This incident occurred during Mr. Johnson's inspection of the tornado destruction.

Notes from Club Bulletins. Phyllis Denham, W8GJW/EP2AB, reports in the Marion, Ohio, *High Banders Log* that when she and her husband, John, arrived in Iran in June, 1962, for a two-year stay, you could only get an Iranian license if you already held an amateur license from some other country, because there were no Iranian radio laws or examinations. Phyllis, licensed in the U.S.A. as W8GJW, was issued the call of EP2AB, and she was drafted into the job of secretary for a radio club in Iran. The club drew up a set of radio regulations based on the best features of other regulations around the world as a guide for the Iranian government. (One feature of the regulations is that anyone, regardless of national origin, is eligible for an Iranian

B. Bobbit, WA5GOW/5, and D. Gannon, WA5ANF/5, operate at Saint Mary's Seminary, in Houston, Texas. They would like skeds with similar institutions.

amateur license.) The radio club then started code and theory lessons—Phyllis was one of the instructors—and in April, 1963, the first Iranian ever to be licensed in his own country received his ham ticket. Phyllis's husband also graduated from the class and qualified both for a U.S. Conditional license and an Iranian license.

In the *RSGB Bulletin* published last November, there was a breakdown of the latest complaints of radio and TV interference in England. Of the 15,134 complaints investigated, amateur transmitters were guilty only 82 times! Fifty-four of these were TVI complaints. But over the same period of time 343 causes of TVI were traced back to radiation from other TV receivers. Sewing machines took the rap 824 times and neon signs 366 times.

News and Views

Brad Tillery, WN4YHP, 1302 Hawthorne Rd., Wilmington, N.C., is a 2-band man—80 and 40 meters. His Knight-Kit T-60 transmitter and R-100A receiver share an 80/40-meter dipole 20 feet high. Brad's log shows 21 states worked in six weeks on the air . . . **Alan Cieluszak, WB2LRE,** 3713 Moyer Rd., North Tonawanda, N. Y., put 26 states and Canada in his logbook on 80 meters using a 30-watt transmitter and an old, old Hallicrafters SX-24 receiver. Now, with a new General Class license, a new rig—a Heathkit "Cheyenne"—and a new band—40 meters, he has 47 states and six more countries worked . . . **Arthur Castrup, Jr., WN9NKV,** R 2, Bretz St., Huntingburg, Ind., has made 32 contacts with a home-brew 19.5-watt transmitter feeding a Hy-Gain 14AVQ vertical antenna. But he spends most of his time studying for his General ticket, and a commercial one, too, and building an operating console to house his gear. So far, the console contains a Heathkit HR-10 receiver, a converted ARC-4 surplus receiver for two meters, two "Command" transmitters for 80 and 40 meters, and four power supplies.

Charles A. Rankin, WA2HMM/5, 222 E. Curtis Dr., Midwest City, Okla., and his wife, **WB2NSI/5,** will sked anyone needing Oklahoma on any band from 80 through 10 meters, phone or c.w. Their equipment consists of a Collins 32V1 transmitter, a Hammarlund R-274D receiver, a Mosley TA-32 beam, and an 80/40-meter dipole . . . **James Melby, WNØJIA,** Box 236, Dalton, Minn., receives on a Heathkit GR-91 and transmits on a Knight-Kit T-50. He didn't mention his antenna, but he probably has one, because he worked 23 states and two Canadian provinces in six weeks on the air . . . In between hamming and other activities, **John Zuris, WB6MEQ,** 18252 Bermuda, Northridge, Calif., studies Russian and Spanish in school. He reports that it helps in working DX, as indicated by his record of 31 countries, 50 JA's (Japan) and 25 UAØ's (Russia) worked in two months. John didn't say whether he spoke Spanish or Russian to the JA's. An EICO 720 transmitter, Knight VFO, Hallicrafters SX-99 receiver, and Hy-Gain 14-AVQ vertical antenna are John's weapons.

Dave Wojcinski, WA9FDQ, 8556 Hohman, Munster, Ind., describes how a traffic handler is born. When he got his license nine months ago, he worked 40-meter c.w. and then phone. Later, he tried 15 meters, working a handful of DX stations and many U.S. stations. Getting tired of "just talking," Dave moved to 80 meters and started reporting into the Indiana phone and c.w. nets, where he often acts as net control station now. He finds keen satisfaction in delivering messages he has received. Dave suggests that other new hams try traffic handling; he thinks they will like it . . . **Ken Orton, VE3CCB,** 1593 Dale St., London,

Ontario, Canada, likes c.w. contests, chasing DX on 20-meter SSB and c.w., and rag-chewing on 2 meters. A Heathkit "Apache" transmitter with an SB-10 SSB adapter, feeding a Cubical Quad antenna, and a Hallicrafters SX-117 receiver handle the lower frequencies; a converted war-surplus "522" and a 10-element beam cover 2 meters. QSL cards from 83 countries and 42 different certificates cover the VE3CCB shack walls . . . **Kenneth Snyder, WA3CHY,** P.O. Box 367, Penn Run. Pa., got a "hot" start in radio. He put together a Heathkit GR-91 receiver, which began to smoke when he turned it on. Removing the short in the power supply cooled off that problem. Then he put together a Heathkit DX-60 transmitter, which he still uses in conjunction with a National NC-109 receiver. Ken worked 21 states as a Novice and has the total up to 35 states now. He offers to sked stations needing a Pennsylvania contact and to help prospective hams get their tickets.

Stanley, WN5JKW, and **Stephen Clark, WN5KIX,** 808 West 11th St., Plainview, Texas, are identical twins. They keep their EICO 720 transmitter and Hammarlund HQ-110 receiver on the air every spare moment. Stanley has 44 states worked and confirmed, plus several Canadians and a Mexican, while Stephen has 39 states worked—36 confirmed —and a couple of VE3's. Look for them on 80 and 40 meters almost every evening and on 15 meters weekends and holidays . . . **Gary Clark, WN3BSU,** 537 W. Diamond Ave., Hazleton, Pa., spreads his operating over the 80-, 40-, and 15-meter Novice bands, but he prefers 80 meters. His score is five countries and 33 states worked using an EICO 720 transmitter feeding a multiband dipole. He receives on a Hammarlund HQ-100. Gary made W9EGQ a member of the "Non Lids Anonymous," complete with a Code "Deficiency" Certificate.

Send your "News and Views," pictures, and comments to: Herb S. Brier, W9EGQ, Amateur Radio Editor, POPULAR ELECTRONICS, P.O. Box 678, Gary, Indiana 46401. We would appreciate receiving your club paper, too. Until next month, 73,

Herb, W9EGQ

ODDS 'N' ENDS

The Federal Aviation Agency recently stated that radio-controlled garage doors are becoming a menace to aviation in some parts of the country. In the Los Angeles area alone, some 58 offenders were tracked down in one week and taken off the air. According to the agency, main offenders are units operating illegally in the 230- to 290-mc. band. This band includes the military emergency frequency of 243 mc. Signals from some receivers activating the door-opening devices are strong enough to be picked up by aircraft as far away as 16 miles. Thus, it is possible for a pilot to inadvertently "home in" on a garage door signal and fly directly toward it with great accuracy and with possible disastrous results. According to Norman Ackerman, president of Perma-Power Co., a Chicago manufacturer of radio-controlled garage door controllers, units in the 27-mc. band *do* meet government regulations and were not among the culprits apprehended.

Short-Wave Report

(*Continued from page 82*)

Gilfer Associates is now selling an SWL log sheet punched for a three-ring binder. All of the columns pertain to SWL activities. Samples are available, or supplies at $1.89 per hundred, from Gilfer Associates (Box 239, Park Ridge, N.J. 07656).

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 SHORT-WAVE REPORT, P.O. Box 333, Cherry Hill, N.J., 08034, in time to reach your Short-Wave Editor by the fifth of each month; be sure to include your WPE identification, and the make and model number of your receiver.

Andorra—*R. Andorra* is noted on 5995 kc. around 1800 with an ID in French. This station is rarely heard except along the East Coast.

Bolivia—Station CP39, *La Cruz del Sur*, La Paz, is definitely operating on 11,765 kc.; it was noted at 2145 s/off in Spanish and English asking for reports.

A new station is *R. Universo*, Casilla 232, La Paz, heard around 2000 and later on 5013-5015 kc.

Brazil—Station ZYE2, *R. Difusora Macapa*, Territorio do Amapa, 4911 kc., verified after two reports, stating that they have been operating since last October with 750 watts (they are listed for 1500 watts—Ed.). Reports from abroad evidently are not appreciated.

Station ZYR57, Sao Paulo, 9745 kc., has been logged at 1755 mixing with *R. Mali* and *La Voz de Andes*. *Radio Excelsior* is often very strong on 9585 kc. at 1855, with news items.

SHORT-WAVE ABBREVIATIONS

anmt—Announcement	QSL—Verification
Eng.—English	R.—Radio
ID—Identification	s/off—Sign-off
IS—Interval signal	s/on—Sign-on
kc.—Kilocycles	VOA—Voice of America
N.A.—North America	xmsn—Transmission
QRM—Station interference	xmtr—Transmitter

Canada—Here are some late frequency and schedule changes from Montreal: to Australasia in Eng. at 0230-0330 on 9625 and 5970 kc.; to Africa in Eng. and French at 1330-1500 on 17,820, 15,320, and 11,720 kc.; to Europe in Eng. for Canadian Armed Forces at 0100-0130 on 9625 kc. English to N. A. is currently running at 1800-1830 on 15,190, 11,720, and 9625 kc.

Ceylon—*R. Ceylon*'s Commercial Service has been noted since April at 2115 on 15,230 kc. with pop music and numerous commercials in English.

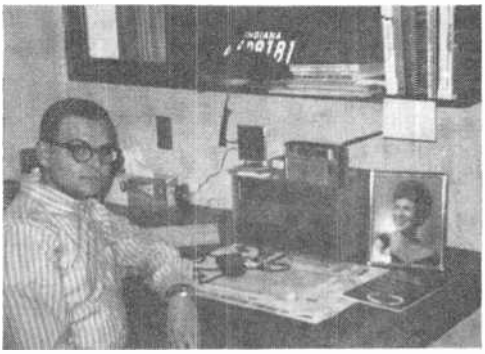
Congo (West)—*R. Brazzaville* now operates on the following schedule: 3240 kc. at 0000-0230, 0600-0800, and 0900-1600; 4765 kc. at 0000-0230; 5970 kc. at 0000-0230, 0600-0800, and 1200-1600; 7105 kc. at 0000-0230, 0600-0800, and 0900-1600; 9730 kc. at 0000-0230 and 0900-1600; 11,710 kc. at 0000-0230, 0600-0800, and 0900-1200; 11,725 kc. at 1200-1330; 11,935 kc. at 1330-1600; 11,975 kc. at 0600-0730; 15,190 kc. at 0600-0800 and 1230-1500; 15,445 kc. at 0000-0230 and 0600-0730; 17,720 kc. at 0730-1200; 21,500 kc. at 0600-1600. News bulletins in Eng. are given at 0015, 0115, 0600, 0700, 0800, and 1415. A xmsn from Paris is relayed at 0800-0900 on 17,720 and 21,500 kc.

Cook Islands—Station ZK5, *R. Rarotonga*, 5046 kc., was noted on a Thursday at 2333 with Eng. news and an interview until 0000 ID. This has been heard only once to date.

Cuba—At press time, Havana was scheduled in Eng. at 1510-1640 to Northern Europe on 15,155 kc., to N.A. at 2200-2330 and 0000-0100 on 11,865 kc., and to South America at 1550-1650 on 15,135 kc.; in French to the Mediterranean at 1610-1640 on 15,300 kc., to Europe at 1400-1510 on 15,155 kc., and to N.A. at 2330-0000 on 11,865 kc.; in Portuguese to South America at 1800-1900 on 15,340 kc.; in Creole to the Caribbean at 0600-0700 and 2100-2200 on 6060 kc.; and in Arabic to the Mediterranean at 1530-1610 on 15,300 kc.

Dahomey—Still being logged on the West Coast is *R. Cotonou*, 4875 kc., from 0030 to 0130 fade. The only Eng. observed is a language lesson at 0055; all other programs are in French.

Denmark—The new schedule from Copenhagen reads: to N.A. daily at 2000-2030 (to Danish ships), at 2030-2100 in Danish, and to 2130 in Eng. on 9520 kc.; to South America daily at 1615-1645 (to Danish ships) on Mondays, Wednesdays and Fridays at 1645-1725 in Danish and to 1745 in Spanish; to S. Africa daily at 1330-1400 in Danish and to 1430 in English; to N. Africa and the Middle East daily at 1445-1515 in Danish and to 1545 in English; to S. Asia daily at 0900-0930 (to Danish ships) on Tuesdays, Thursdays, and Saturdays at 0930-1000 in Danish to 1030 in English, and to Greenland daily at 0815-0845 and 1230-1310, all on 15.165 kc.; to the Far East, Australia, and New Zealand at 0130-0200 daily on 15,165 kc., and at 0400-0430 in Danish and to 0500 in Eng. on Tuesdays, Thursdays, and Saturdays on 9520 kc.



Richard Hardt, WPE9HQR, lives in Crown Point, Ind., but this picture shows his listening post at Ball State University in Muncie, Ind. Richard's receiver is a Knight-Kit R-55A, and his antenna at the university is a 35' vertical long-wire mounted against the side of the dormitory. As of now Richard has 19 verifications from 25 countries heard.

Ecuador—*La Voz de Esmeraldas* has been noted on 4875 kc. from 2330 to 2355 s/off. all-Spanish. They feature—in addition to the usual Latin American music—time checks that are evidently spoken by a little girl. We have no other information on this station.

Egypt—The latest schedule on hand from Cairo lists Eng. on 7075 kc. at 0130-0200 to the Middle East, N. Africa, and Europe; on 9475 and 11,915 kc. at 1630-1730 to Europe; on 15,210 kc. at 1545-1645 to W. Africa; on 17,920 kc. at 0830-0930 to East Asia and at 1245-1530 to East and Central Africa.

England—London has been heard with a single-sideband xmsn on 6930 kc. from 2218 to 2245 s/off. "From the Weeklies" runs to 2230, and is followed by program anmts.

Ethiopia—Station ETLF, *The Radio Voice of the Gospel*, Addis Ababa, has adopted the following schedule, effective until early September. Xmtr #1: 0815-1000 on 15,410 kc., 1000-1045 on 9755 kc., 1045-1155 on 6010 kc., 1200-1325 on 11,875 kc., and 1330-1445 on 11,755 kc.; alternate channels are 6015, 9765, 11,745, 11,950 and 15,355 kc. Xmtr #2: 0815-0900 on 9645 kc., 1200-1215 on 9695 kc., and 0900-1200 and 1300-1415 on 9705 kc.; alternates are 9685, 9705 and 9765 kc.

Germany (East)—*R. Berlin International* has been logged on 9650 kc. at 2350 to N.A.; on 9600 kc. in Portuguese at 1800; and on 9560 kc. with Eng., closing at 0010. A xmsn to S. E. Asia is given from 0700 to 0800 s/off on 11,765 kc., mostly news and music.

Guatemala—*R. Nacional Tikal*, Peten Flores, has moved from 6190 to 6205 kc. S/off is at 2330.

Honduras—Listed in the May column was HRRZ, *R. Tegucigalpa*, 4960 kc. However, a recent QSL lists this station as HRTL on 4950 kc., noted well around 0600. They operate in Spanish in parallel to 9655 kc. Reports go to Apartado Postal #376, Tegucigalpa.

India—*All India Radio*, Delhi, was observed on 11,940 kc. from 2030 in native language, and on 9530 kc. from 1815 s/on at good level but QRM'ed by a *VOA* outlet.

Israel—*Kol Zion*, Tel Aviv, is noted on 9725 kc. daily with news in Eng. and Israeli music at 1515-1545, dual to 7189, 9009, and 9625 kc.

Luxembourg—A long-wave station recently noted is *R. Luxembourg I* on 233 kc. This station was heard in New England as early as 1820 with rock-and-roll music during a period when beacon *SQT*, Squantum, Mass., was off the air for repairs.

Malaysia—*R. Malaysia*, Kuala Lumpur, has been heard on 7304 kc., dual to 4983 kc., in Eng. to 1130

s/off. The Singapore outlet was heard at the same time on 11,940 kc. in English. These are West Coast loggings.

Maldive Islands—The Maldive Islands B/C Service gives news at 2200, 0400, and 1000 on 7450 kc. They are also testing on 9650 kc. around 0000 with Western and Oriental music; each selection is followed by short whistles, and there is an ID every half hour.

Mozambique—Station CR7RA, *R. Pax,* Beira, 5024 kc., opens at 2300 with clock chimes and an ID.

Netherlands—Hilversum was tuned with its Dutch service to Africa and Europe at 1300-1420, and Eng. to the same areas at 1500-1550 on 11,960 kc. The 9690-kc. outlet was heard closing in Eng. at 2115.

Netherlands Antilles — *Trans World Radio,* Bonaire, now has an official schedule for the short-wave outlets: 15,290 kc. at 1500-1550 in Eng. and at 1600-1720 in Dutch, both to W. Africa, and at 1720-1830 in Spanish to southern South America; 9690 kc. at 2030-2120 in Eng. and at 2130-2250 in Dutch, both to N.A., and at 2300-2350 in Spanish to Mexico.

New Zealand—Wellington was found on 11,850 kc. in Spanish with an Eng. ID at 2130-2200. This xmsn does not appear in recent schedules.

Peru—A station announcing as *R. Programas del Peru* has been heard on 9540 kc. after 2000 with dramatic presentations. This may be a new station or it could possibly be a program service of *Radio La Hora.*

Station OAX3P, *R. Tingo Maria,* Departamento de Huanuco, is a new one on 3325 kc. that has been noted after 2200 with Latin American vocals and commercials. They verify by card and pennant.

Somali Republic—*R. Mogadiscio* is definitely being heard in midwestern areas on 7160 kc. at 2230 with Arabic news and from 2245 in English.

South Africa—Paradys is noted on a new frequency of 3285 kc. in the Eng. service with setting-up exercises at 2345, a chime time signal and news at 0000, and talks from 0010.

Sudan—Omdurman, 9480 kc., is readable at 2330-0000 with talks in Arabic and some Arabic music. You'll have to dig for it, though, for there are teletype and other stations on top of it.

Sweden—Stockholm, 9705 kc., is strong around 2045 to N.A. They are asking for support of their new feature, "Record Request," which is aired on the last Thursday of each month. The station is heard around 0625 with a DX bulletin, and Eng. to N.A. is given on 15,195 kc. at 0900-0930.

DX States Awards Presented

To be eligible for one of the DX States Awards designed for WPE Monitor Certificate holders, you must have verified stations (any frequency or service) in 20, 30, 40, or 50 different states in the U. S. The following DX'ers have qualified for and received the 20 States Verified Award.

Twenty States Verified

Kenneth Coyne (WPE2LSI), Long Beach, N. Y.
J. Sidney Downey (WPE9CPG), Anderson, Ind.
Paul Meyers (WPE1HV), Bethel, Ohio
Gordon Amey, Jr. (WPE3FUP), Baltimore, Md.
John B. Preston (WPEØESH), Spencer, Iowa
John Thompson (WPE9HMW), Wilmette, Ill.
Jeffrey R. Cobb (WPE2CRS), Westboro, Mass.
Robert Beaudoin (WPE1GGC), Manchester, N. H.
F. Cooperstein (WPE1GCF), New Bedford, Mass.
Thomas M. Barker (WPE2MMK), Yonkers, N. Y.
Dan Knepper (WPE8HGR), Toledo, Ohio
Bob DuBuisson (WPE1GGL), Longmeadow, Mass.
Alvan E. Fisher (WPE1GHE), Newton, Mass.
Gary Davis (WPE5ECG), Jennings, La.
Robert S. Fleming (WPE3GFC), Havertown, Pa.
Greg Wilt (WPE3GOW), Hollidaysburg, Pa.
John C. Peterman (WPE9HRY), Kenosha, Wis.
Cliff Goodlet (WPE4HXF), Chattanooga, Tenn.
Phillip Swingley (WPE9HLR), Muncie, Ind.
Victor Reindl (WPE2MNX), Brooklyn, N. Y.
Tom Weiss (WPE8IGN), Cuyahoga Falls, Ohio
Larry Zigrang (WPE9HLM), South Bend, Ind.
Thomas Winfield (WPE9GMB), Bristol, Wis.
Bill Block (WPE7BZY), Portland, Ore.
Joe Wade (WPE6FXB), Northridge, Calif.
Charles Keller (WPE8IHU), Port Huron, Mich.
Chuck Johnson (WPE9GSY), Chicago, Ill.
Ray Drozs (WPE9EYU), Chicago, Ill.
Lawrence W. Whitehead (WPE5EEI), Wewoka, Okla.
Walter L. Palmer (WPEØEIN), Webster Groves, Mo.
Kenneth M. Schabelski (WPE9HPV), Chicago, Ill.
Joel Frensdorf (WPE8IHR), Cleveland, Ohio
Jim Petersen (WPE9HOW), Hales Corners, Wis.
Sammy Saracino (WPEØEJK), Denver, Colo.
Bill Marple (WPE6FVU), Los Angeles, Calif.
James B. Pesek (WPE9ENO), N. Riverside, Ill.
Richard Earl Smith (WPE9HMJ), Calumet City, Ill.
Bill Jarvis (WPE1GEP), Lebanon, N. H.
Craig A. Huey (WPE6FBN), El Segundo, Calif.
Gordon Ernest Randall (WPE1GGJ), New Bedford, Mass.
Silvio A. Marini, Jr. (WPE4IIQ), East Point, Ga.
Alan R. Marote (WPE1GAC), New Bedford, Mass.
Jim Milligan (WPE8IGE), Cambridge, Ohio
Bill Caffyn (WPE7CER), Great Falls, Mont.
Norman Lederman (WPE1EBZ), Boston, Mass.
Gale Shafer (WPE7CGB), Deming, Wash.
Dennis Ashworth (WPE7BZB), Corvallis, Ore.
Steve Kunkel (WPE3GIM), Randallstown, Md.
Kenneth Rosen (WPE8HSZ), Detroit, Mich.
George W. Thompson, Jr. (WPE9HQA), Orland Park, Ill.
Edward Kalin (WPE1GEL), West Hartford, Conn.
Thomas A. Solomon (WPE1GCO), Methuen, Mass.
George Masny (WPE2JPN), New York, N. Y.
Darrell Anderson (WPE7CEA), Seattle, Wash.
Joseph V. Liberatore (VE7PE4R), Victoria, B. C., Canada
Paul R. Schildgen (WPE5BZU), Tacoma, Wash.
Edward J. Szumski (WPE8IGK), Strettsboro, Ohio
C. H. Andrews, Jr. (WPE4IIK), Rocky Mount, N. C.
Albert Krizan (WPE1GCZ), Bridgeport, Conn.
Ronald A. Dohmen (WPEØEGH), New Prague, Minn.
Vincent Anyzeski (WPE1GFH), East Haven, Conn.
Robert Johnson (VE3PE1SX), Oshawa, Ont., Canada
Terry Morton (VE3PE2DY), London, Ont., Canada
Steve Schneider (WPE6EER), Fresno, Calif.
David Smith (WPE1GBC), Everett, Mass.
Robert M. O'Dell (WPE8IEZ), Lansing, Mich.
William France (WPE6DOV), La Puente, Calif.
John F. Condron (WPE1KX), Pittsfield, Mass.
Marvin E. Robbins (WPEØMW), Broomfield, Colo.
Robert Wechsler (WPE2IGE), Brooklyn, N. Y.
Harold Forman (WPE2NGF), Margate, N. J.
Bruce Harrison (WPE6FFZ), Long Beach, Calif.
Theodore Templeton (WPE5DLU), Sagertown, Pa.
Doug Storey (WPEØEBP), Leon, Iowa
Wm. Windscheif (WPE8HSL), Walled Lake, Mich.
Arman Dolikian (WPE8IIO), Detroit, Mich.
Phil Marx (WPE6OQ), Costa Mesa, Calif.
Richard F. Jemison (WPE9HLZ), Des Plaines, Ill.
John Hubbell (VE3PE2EU), Port Credit, Ont., Canada
Alan Raylesberg (WPE2MKW), Bayside, N. Y.
David Thompson (WPE6FHP), Suisun, Calif.
David Nager (WPE2NLK), Bronx, N. Y.
Charles Husinko (WPE2NJV), New York, N. Y.
Thomas Frame (WPE8IJC), Bethel, Ohio
Lawrence J. Bennett (WPE2NEU), Forest Hills, N. Y.

SHORT-WAVE CONTRIBUTORS

George Hemingway *(WPE1DYC)*, Taftville, Conn.
Henry Brown, Jr. *(WPE1EXZ)*, Falmouth, Mass.
Bill Smith *(WPE1FZ)*, Exbridge, Mass.
David Smith *(WPE1GBC)*, Everett, Mass.
Perry Brainen *(WPE2KVK)*, Bronx, N. Y.
William Graham *(WPE2LMU)*, Binghamton, N. Y.
Stephen Dionne *(WPE2LOU)*, Binghamton, N. Y.
Marvin Jacobson *(WPE2MAO)*, Brooklyn, N. Y.
Jim Matis, Jr. *(WPE2MHL)*, Fords, N. J.
Robert Kaplan *(WPE2MJR)*, Bronx, N. Y.
Bernard Greene *(WPE2MNJ)*, Brooklyn, N. Y.
Paul Mayo *(WPE2NJG)*, Brooklyn, N. Y.
Grady Ferguson *(WPE4BC)*, Charlotte, N. C.
Kenneth Alyta, Jr. *(WPE4FXB)*, Charlotte, N. C.
Bobby Conder *(WPE4HQT)*, Winston-Salem, N. C.
Dan Brinson *(WPE4HXC)*, Dade City, Fla.
John Day *(WPE4IDA)*, Key West, Fla.
Bruce Wildstein *(WPE4IED)*, Jacksonville, Fla.
Joseph Alaya *(WPE4III)*, Key West, Fla.
Marion Ely *(WPE4IJO)*, Delray Beach, Fla.
Edward Bowerman *(WPE5BCH)*, Rogers, Ark.
Jack Keene *(WPE5BMP)*, Houston, Texas
Del Hirst *(WPE5CFU)*, Snyder, Texas
Gerald Clough *(WPE5ECF)*, Galveston, Texas
Ernest Armstrong *(WPE5OL)*, Gwinn, Mich.
Shaler Hanisch *(WPE6BPN)*, Pasadena, Calif.
Robert Sabin *(WPE8DB)*, Wilmington, Ohio
Paul Meyers *(WPE8IHV)*, Bethel, Ohio
Steve Morgan *(WPE8IKU)*, Dayton, Ohio
Larry Balzer *(WPE8IMX)*, Conneaut, Ohio
R. D. Palmer *(WPE9AST)*, Decatur, Ill.
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Gregg Smith *(VE1PE5T)*, Fredericton, N. B., Canada
Richard Langley *(VE3PE2CA)*, Scarborough, Ont., Canada
Hector Davila, Bayamon, P. R.
Lyle Galloway, Vineland, N. J.
Bert Pryor, Athens, Ga.
Bob Ulmer, Vancouver, B. C.
Brad Wall, San Bernardino, Calif.
Station ETLF, Addis Ababa, Ethiopia
R. Nederland, Hilversum, Netherlands
Sweden Calling DX'ers Bulletin

Switzerland—The complete Eng. schedule from Berne is as follows: to Eastern N.A. at 2015-2115 on 9655, 9535, and 6120 kc.; to Western N.A. at 2315-0015 on 9655 and 9535 kc.; to United Kingdom and Ireland at 0700-0800 on 9665 and 7110 kc., and at 1345-1445 on 9665 and 6055 kc.; to Africa at 0330-0430 on 17,830, 15,305, and 15,225 kc.; to Japan, S. E. Asia, China, India, and Pakistan at 0815-0915 on 17,845, 15,320, 15,305, and 15,255 kc.; to the Near and Middle East at 1000-1100 on 17,830, 15,305, 15,255, and 11,865.; and to Australia and New Zealand at 1600-1700 on 11,865 and 9545 kc. Except for the xmsns to western N.A. and to the United Kingdom and Ireland (at 2315 and 0700), all xmsns are 30 minutes longer on Sunday.

U.S.S.R.—*R. Baku*, Azerbaijan SSR, is heard on 9490 kc. at 2030-2205; a drama is given to 2100, then news, symphonic music, and some talks. Clock strikes eight hours ahead of EST on the hour.

Ulan Bator, Mongolia, is being heard in some areas of the U.S. around 1700 on 11,850 kc. in English.

R. Minsk, Belorussian SSR, is heard on 5940 kc. at 1640-1740 with operatic and classical music; no ID is given at 1700 but a Moscow IS is given at 1730.

A Russian speaker was noted on 4930 kc. at 2150-2200. At 2200 there were clock chimes, an anthem, time check, and an ID which was not that of Moscow.

Vatican City—*Radio Vaticano*'s latest schedule reads: Portuguese to Brazil at 1800 on 9645 and

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"Good morning, dear. How did you like your eggs?"

11,740 kc.; Spanish to southern Latin America at 1830 on 9645 and 11.740 kc.; Eng. to U.S.A. at 1950. French to Canada at 2010. Spanish to central Latin America at 1900 and at 1930 to northern Latin America, and Eng. to Europe. United Kingdom. and Ireland at 1000, all on 5985, 7250, and 9645 kc. (also on 11,740 for the last xmsn), and at 1315 on 6190, 7250 and 9645 kc.; French to France, Switzerland, Belgium. and Luxembourg at 0645 and 0930 on 7250, 9645. and 11.740 kc., and at 1415 on 6190. 7250. and 9645 kc.; Eng. to Australia and New Zealand at 0630 on 11,770 and 15,155 kc. and at 1700 on 7250 and 9630 kc.

Venezuela—To clarify the call-sign situation for *Escuelas Radiofonicas*, it's YVPM on 2430 kc. and YVPN on 6110 kc. At press time, only the 6110-kc. outlet was in operation; an announcement will be made in due time if they decide to reopen 2430 kc.

Windward Islands—St. Georges, Grenada, is heard on 11,950 kc. around 1200; they seem to have stabilized on this channel. On 15,100 kc. the station is noted from 1645 to 1730 s/off with local news being given just prior to s/off. -30-

Distribution of electricity for the past 60 years has been almost entirely with alternating current. Prior to the adoption of Tesla's a.c., Thomas Edison had proclaimed that d.c. was the best method of electrical distribution. In what might appear to be a step backwards, the U. S. Air Force, Booneville Power Administration, and Geoscience, Inc., are experimenting with d.c. transmission lines. Tests with currents of 90 to 400 amperes over distances up to 240 miles are being conducted. An advantage of d.c. is that one-half the rated power of a line can be transmitted with one conductor out of service, allowing the current of the remaining conductor to return through the earth. As the ghost of Edison says "I told you so," tests must prove that no bad effects result from passing huge currents through the earth.

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ELECTRONIC Ignition Kits, Components. Free Diagrams. Anderson Engineering, Epsom, New Hampshire 03239.

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CB WPE QSL Cards, Samples Free. Radio Press, Box 24, Pittstown, New Jersey.

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WEBBER Labs. Transistorized converter kit $5.00. Two models using car radio 30-50Mc or 100-200Mc, one Mc spread. Easily constructed. Webber, 40 Morris. Lynn, Mass.

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

CANADIANS, TRANSISTORS AND PARTS. Free catalogue contains reference data on 300 transistors. J. & J. Electronics, Dept. PE, Box 1437, Winnipeg, Manitoba.

CB-WPE-QSL CARDS. New **"FROSTALEEN"** Paper. **16 SAMPLES,** 25¢. Dick, W8VXK, 1996P N, M-18 Gladwin, Michigan 48624.

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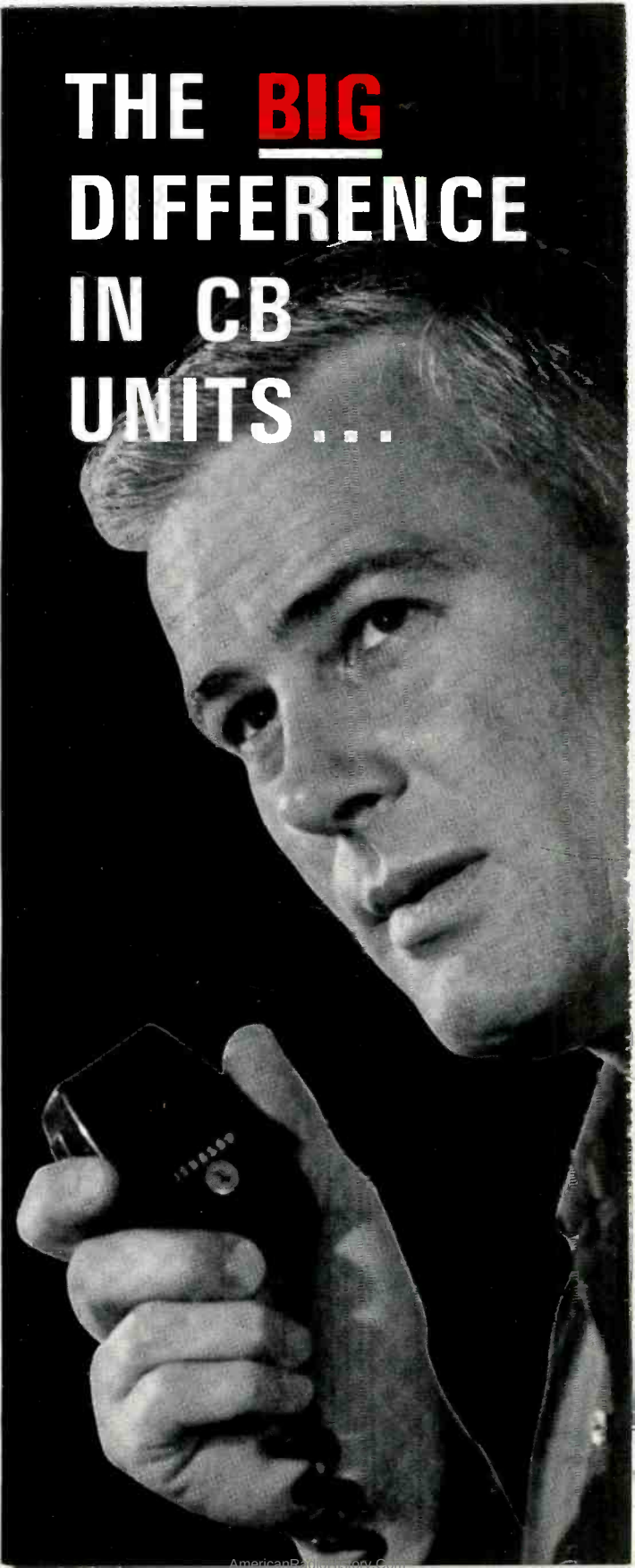

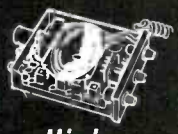

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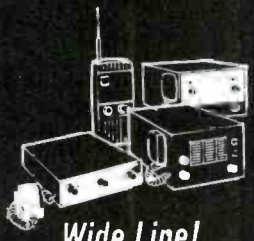

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100 milliwatt and 1½ watt hand-held units. Twice the sensitivity and 40% more range than similar units with conventional circuitry!

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"Tone Alert" keeps your system quiet until one unit calls another. Receivers operate at maximum sensitivity.

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See your Dealer / Distributor for demonstration

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CIRCLE NO. 11 ON READER SERVICE PAGE

New Low Cost! E-V SONOCASTER I™

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The Sonocaster I boasts such true component-quality features as an 8" Radax dual-cone speaker, high compliance cone suspension, long-throw voice coil and acoustically damped enclosure.

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SPECIFICATIONS Sonocaster: 70-15,000 cps Frequency Response; 8 Ohms Impedance; 30 Watts Peak Power Handling; 120° Dispersion; 16-3/4" H x 17" W x 5-7/8" D; Net Weight 7 lbs.; Dune Beige color.

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