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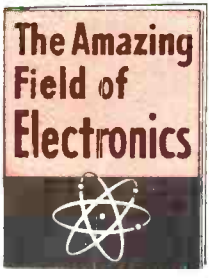

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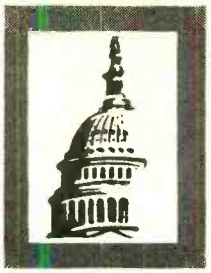

FCC Report

By ROBERT E. TALL
Washington Correspondent

WITH nineteen volumes of comments on the Federal Communications Commission's proposed Citizens Band rule changes undergoing analysis by the agency's staff, there is little likelihood that the Commission will take further action on these changes until after its customary August recess. Licensing of CB equipment, which fell off sharply when the Commission first released its proposals for drastic curbs and substantial rearrangement of the regulations for the service, soared to record figures again during the spring, and by the beginning of summer was rolling along as if CB'ers had never heard of the FCC's proposed cutbacks.

More than a few CB'ers, however, became aware that the Commission was not whistling in the dark, as the late spring and summer saw dozens of them get hit with the new "small forfeiture" authority of the agency. This permits the FCC to issue a "notice of apparent liability" to radio licensees for repeated or willful violations of its rules, and then collect fines ranging from $100 to $500 from the licensees.

Efforts To Band Users Together. Keeping pace with the increased tempo of FCC action were several major efforts around the country to mount stepped-up campaigns to get the Congress, the Commission, the nonbroadcast radio users as a whole, and the public generally, to wake up to the fact that mobile radio, including CB, needs more sympathetic treatment at the hands of the government than it has received in the past. FCC Commissioner Robert E. Lee, for one, took the bit in his teeth at a mid-June meeting of a radio user association by stating that "Everyone concerned is interested in some action that will spread the use of nonbroadcast radio to as many people and legitimate pursuits in our country as possible." He called for a meeting of all user organization representatives to sit down together and talk over the situation.

"Radio is a tool of industry as much as the shovel, the die and the crane," Mr. Lee declared, and the government must "give prompt attention" to its needs. According to the Commissioner, the main problem seems to be that under present conditions "we are party-lining the mobile radio users to the

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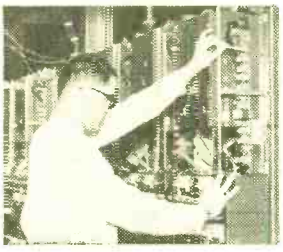

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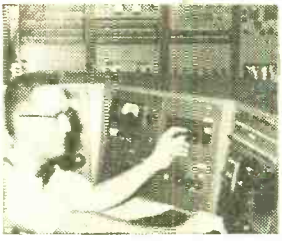

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FCC Report

(*Continued from page 6*)

extent that the radio systems are becoming nearly valueless in some services in some areas, and our growth indicators tell us that the situation is quickly worsening."

Commissioner Lee proposed that a government-industry advisory committee be formed for nonbroadcast radio, with functions similar to those of one the FCC sponsored to spur the development of UHF television, and he called for the assistance of all radio user organizations in its establishment. He suggested that a meeting be held in early fall, following preparatory work, and urged all radio organizations represented at the meeting "to be prepared to state the areas of possible scrutiny" which could lead to meaningful improvements for nonbroadcast radio.

"I would not expect that all of the problems of the land mobile radio field can be taken care of by the joint government-industry committee before it is dissolved," he noted. "However, I can certainly see—if the results of the committee's work are as worthwhile as I expect them to be—that the user groups would have become accustomed to working together more closely than has been the case in the past and would want to continue some form of central committee among themselves."

Henry Succeeds Minow. The nonbroadcast radio field as a whole took heart from President Kennedy's naming of Commissioner E. William Henry as chairman of the FCC following the resignation of Newton N. Minow. While Mr. Minow's two years at the helm of the Commission endeared him to the general public, even though his strong policies disturbed the broadcast station and network ranks at times, he had shown little interest in the land mobile communications field. Commissioner Henry, on the other hand, during the relatively few months he has been a member of the FCC, has stated several times that he considers the mobile radio field "one of the most important" areas faced by the Commission, and has pledged himself to work for improvements in it.

"Filing Fee" Situation At A Boil. No sooner had the FCC announced its "final" plan to charge people for filing applications for radio licenses, among other things, than work began among the various radio organizations—including those in the citizens and amateur radio fields—to have the plan scuttled either by Congress or by the courts.

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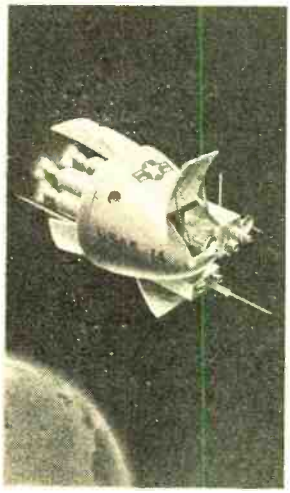

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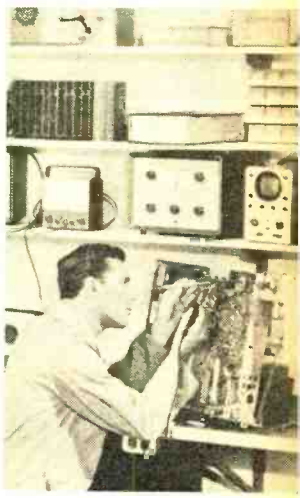

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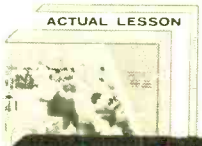

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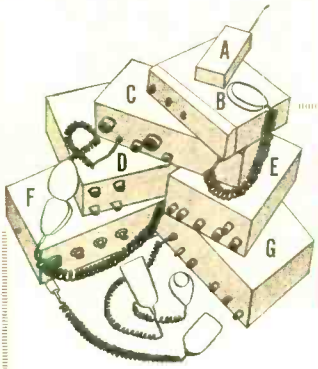
FCC Report

(*Continued from page* 8)

Each CB application filed with the Commission after Jan. 1, 1964, under the FCC's announced plan, would have to be accompanied by a payment of $8.00; amateur applications would cost $4.00; and applications in other radio services administered by the Commission would range from $10.00 to $100.00—the latter for new TV broadcast stations. These figures would cover initial licenses only, with modifications in some cases costing less. The fees would be charged by the Commission at the time the applications were filed, whether the applications were eventually granted or not.

At this writing, formal petitions to the FCC for reconsideration of its action in adopting the "filing fee" plan were expected, followed by appeal to the courts if the agency refused to take such a step. Simultaneous efforts to have the appropriate Congressional committees look into the matter were also under way, and appeared to be the best possibility for stopping the Commission's program. About ten years ago the Senate Commerce Committee stopped a similar plan of the FCC when it adopted a resolution asking the Commission to hold up on the matter. -30-



THIS MONTH'S COVER

When it came time to photograph the August cover, we sent a few representative CB sets to the photography studio. Reading from the top, they are: (A) EICO 100-milliwatt Model 740; (B) Hallicrafters transistorized mobile Model CB-5; (C) Utica Model T&C II; (D) Pearce-Simpson "Companion"; (E) Sonar Model G; (F) Metrotek "Metrostar"; and (G) Regency "Range Gain." Details on all of these sets, plus scores of others, start on page 66 of this issue.

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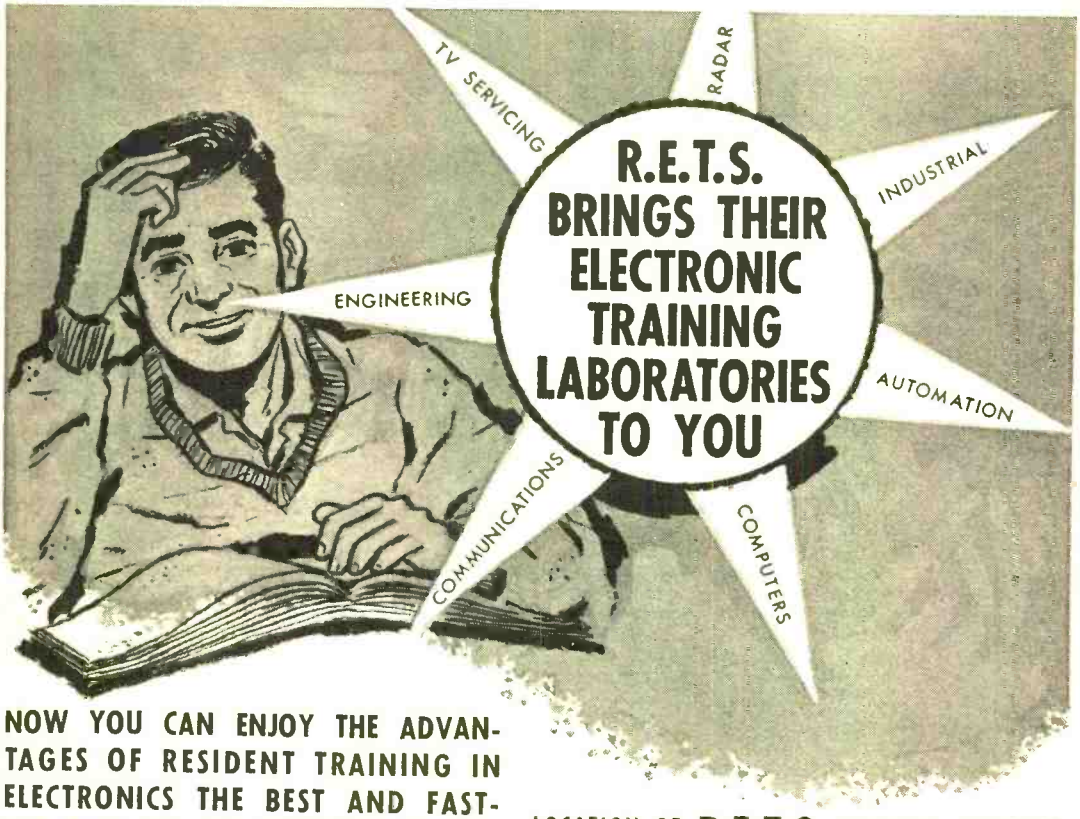

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BCB DX'ers Speak Up

■ I enjoyed reading your article on "DX'ing the Broadcast Band" (February, 1962, page 69). I have been monitoring broadcast stations since the fall of 1961, and have logged 322 stations with QSL's from KFI, Los Angeles, and KOA, Denver. My biggest accomplishment is bagging every clear-channel station in the U.S. (32 states and also Canada, Cuba, Mexico, and the controversial *Radio Americas*). I would like to hear from fellow BCB DX'ers in the New Jersey area and in neighboring states.

RUSSELL EDMUNDS
Little Silver, N. J.

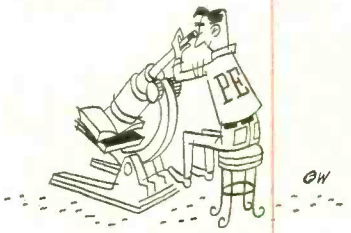
■ Of all the radio bands, I find the BCB the most interesting, and have logged 117 stations in North America and the Caribbean with my Hallicrafters S-120 receiver. The Medium-Wave report in the March, 1963, issue was very helpful ("Short-Wave Report," page 110). How about a regular column of information submitted by BCB DX'ers as to what time local stations and clear channel stations sign off, and what stations are audible when they do? When questions such as the location of *Radio Americas* come up, I am sure there would be many BCB DX'ers eager to report their findings.

LEONARD GOLDBERG
Brooklyn, N. Y.

Thank you for the letters. A column for broadcast band listeners may be considered if a substantial number of readers are interested.

Plaudits for Projects

■ I think P.E. gives a very complete and detailed description of each of its featured projects, and



I'm sure that anything that goes into print is carefully examined. Everyone is human, and a few errors are bound to show up once in a while,

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Letter Tray

(*Continued from page* 12)

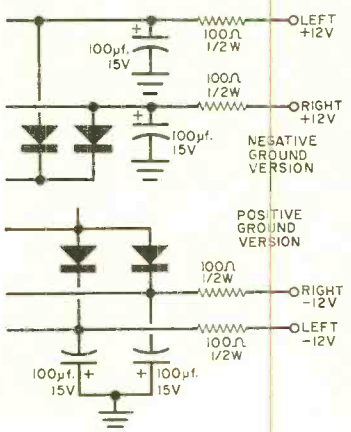
but all of the P.E. projects I have built have worked well.

RANDY AJAX, WV6ZSN
La Mirada, Calif.

Thanks, Randy. We'll continue to try to do the kind of job you and other P.E. readers expect.

Eliminating "Blinker Minder" Hash

■ Some readers have experienced difficulty with generator hash noise after construction and installation of "The Blinker Minder" (March, 1963, page 61). Some autos with worn commutators will cause a harsh, raspy note in the speaker when the



engine is running. A remedy is to add two RC filters to the device to filter out such "hash" as shown in the diagram.

FREDERICK J. HAINES
Syracuse, N. Y.

The Case of the Mystery Project?

■ What project do the three sentences behind the "Letter Tray" title refer to? One reads as follows: ". . . we changed L2 to 7 or 8 turns of #22 . . ."

JOHN REID
Winchester, Mass.

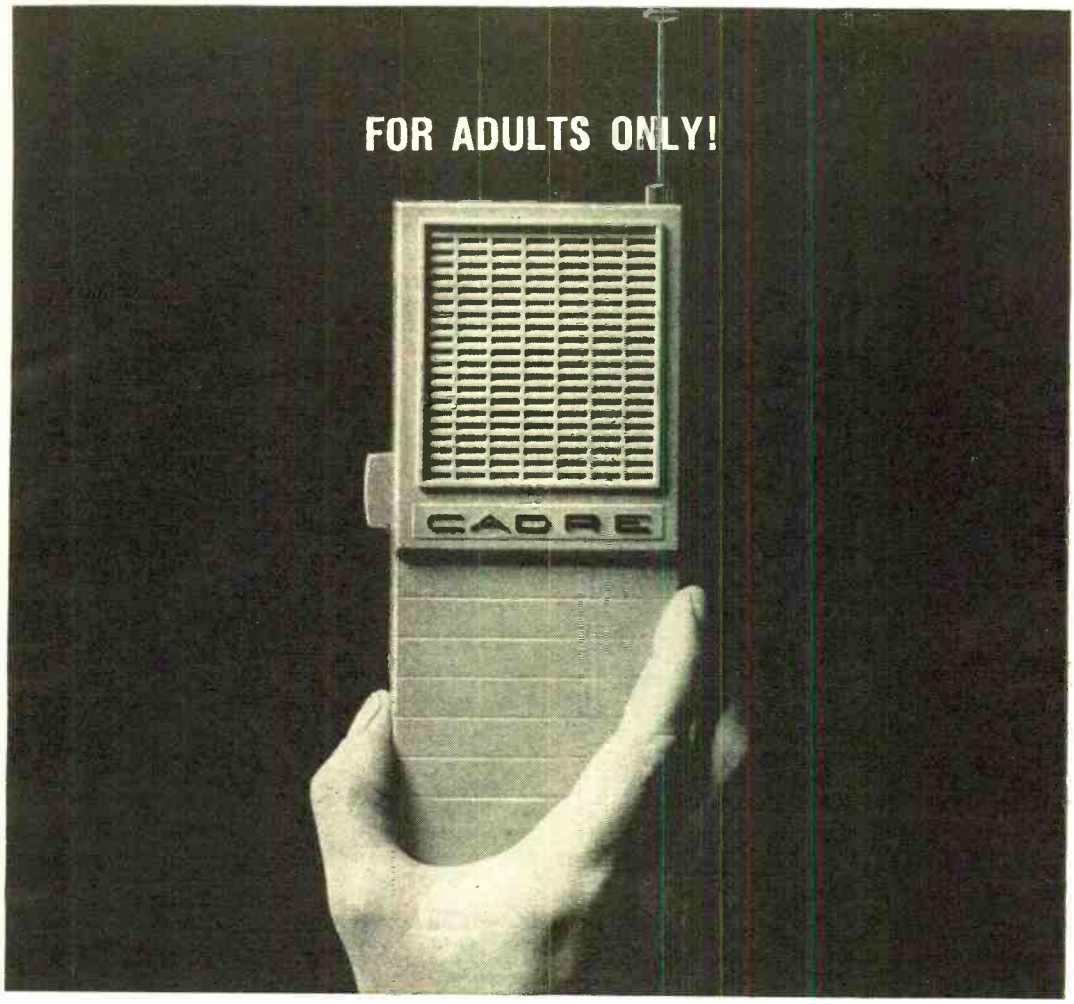
The sentences, as far as we can determine, John, are nonsense, and were composed especially for the "Letter Tray" logo. You will note that this month's column sports a new head.

Operation "Assist" Gets Results

■ Thank you for helping me locate a copy of the schematic and operating instructions for my Silver Vomax vacuum-tube voltmeter through the "Operation 'Assist'" column. The response was most gratifying—I had replies from POPtronics readers from British Columbia to Florida.

PAUL E. KLEIN
River Edge, N. J.

(*Continued on page* 16)



NEW CADRE C-75 CB TRANSCEIVER

The new Cadre C-75 1.5-watt, 2-channel transceiver is 15 times too powerful for youngsters (under 18 years of age) to operate, according to FCC regulations. Clearly, it's not a toy. It's designed for serious CBers who need 'big set' performance that can be used conveniently anywhere.

The new C-75, weighing less than 2 lbs; provides clear, reliable 2-way communications up to 5 miles and more. All solid state design creates an extremely rugged transceiver to absorb rough handling, stays on frequency. Two crystal-controlled channels spell perfect communications contact everytime. Sensitive superhet receiver (1μv for 10 db S/N ratio) brings in signals in poor reception areas. Powerful transmitter has one watt output to the antenna. Adjustable squelch silences receiver during standby. AGC assures proper listening level. In a word, the C-75 has all the features you'd look for in a quality full size CB unit.

The C-75 has all the portable conveniences you'd want, too: operates on alkaline or mercury penlite cells (8-hour rechargeable nickel-cadmium battery available); earphone and antenna jacks; built-in retractable antenna; jack for base operation while recharging.

Use the Cadre C-75 anywhere in the field, for vehicle, office, boat or plane. Use it constantly too, because its all-transistor modular circuit (11 transistors and 2 diodes) is virtually maintenance free. $109.95. Recharger and 2 nickel-cadmium batteries $31.85.

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Letter Tray

(*Continued from page* 14)

■ Within a month after my request for a schematic for a Belmont Model 525 receiver appeared in "Operation 'Assist,'" I had received 14 replies with the schematic or advice on where to get it. The letters came from all over the U.S. and Canada. I would like to take this opportunity to thank all those who offered assistance.

PAUL J. MONTLE
Arlington, Mass.

Electronics Correspondents Wanted

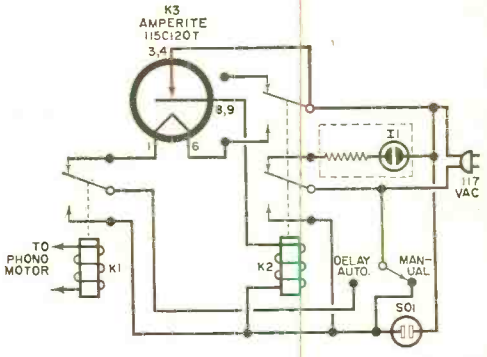
■ I would appreciate it if you would help me find pen friends in my field of interest—radio, television, and electronics. I will reply promptly to all letters received by me. Thank you for your help.

K. C. CHANDA
Electricity Department (Construction)
Damodar Valley Corporation
Anderson House, Alipore
Calcutta 27, India

Out of Tune

On the Beat Electronically (*May,* 1963, *page* 60). In the schematic diagram, the short bar for the negative plate of the last battery cell was left out. If you connected the negative terminal of the battery to ground, and the positive to *Q2*'s emitter, the unit should operate properly.

Hi-Fi Shutoff (*June,* 1963, *page* 51). Substitute a s.p.d.t. toggle switch for *S1* and rewire the unit as shown here. The original



circuit causes constant recycling of *K2* and *K3* with the switch in manual position.

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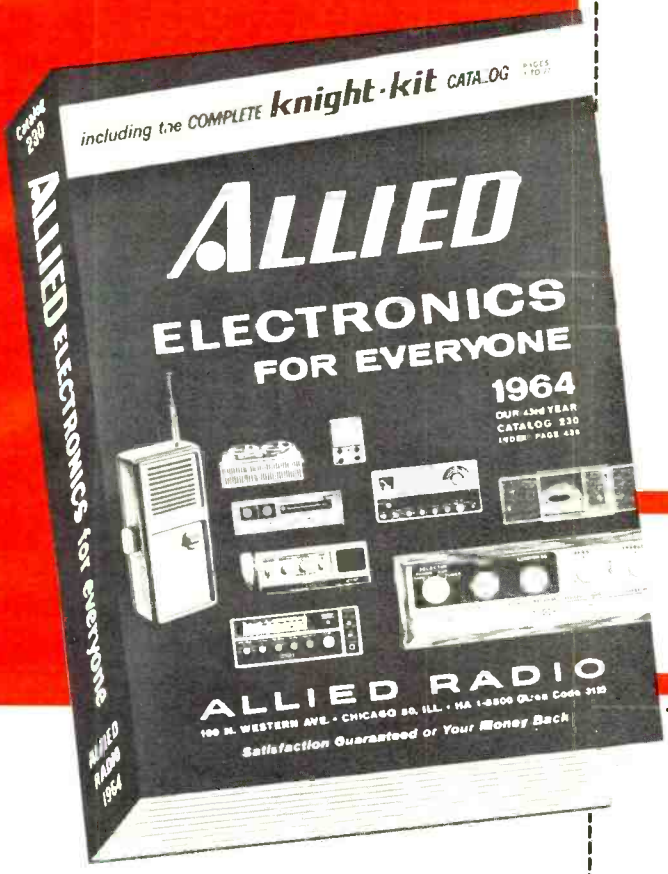

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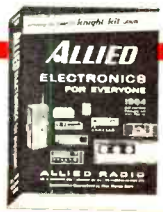

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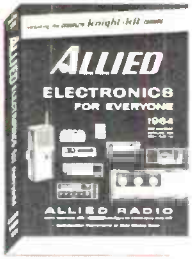

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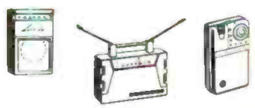

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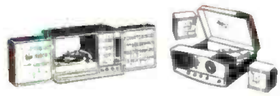

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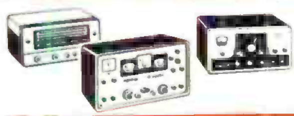

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Operation Assist

THIS column is the forum where our experimenter readers can meet to give or get information on those ancient or oddball pieces of electronic gear, when the regular sources of such data fail. Here's how it works: Check the items below to see if you can help out a fellow reader with information on the set or gadget that's got him stumped. *If you can help,* write him directly and give him the information or advice he needs. On the other hand, if *you need help,* mail a postcard or letter to OPERATION "ASSIST," POPULAR ELECTRONICS, One Park Avenue, New York 16, N.Y. State the type of set (broadcast receiver, military surplus transmitter, etc.), the maker's name, the model name or number, the serial number, approximate date of manufacture, and any other particulars that will help other readers identify the unit. It's better to give too much information than not enough. Also, carefully *print* or type your name and mailing address.

Because of your overwhelming response to the OPERATION "ASSIST" idea, it is impossible to print all the appeals for information we receive. The Editors therefore must reserve the right to select the more unusual and interesting requests, and those for which normal sources of technical information have failed.

Schematic Diagrams

G.E. Model A-75 superhet, chassis No. 7-12694. 540 to 19,500 kc. (Elmer J. Seibert, 5708 W. Greenfield Ave., West Allis 14, Wis.)

Atwater Kent Model 55C, 7-tube radio, type F-4 speaker. (L. J. Potter, 660 Union, N.E., Salem, Ore.)

RCA Radiola 20, floor model; also UX-199 and UX-120 tubes needed. (Lance Lee, Hendrum, Minn.)

Philco Model 38-3 console radio. (Harry W. Bratton, 15311 E. 44th Terr., Independence, Mo.)

Beam Industries (Chicago) Mark 1 recorder; also recording head needed. (R. E. Howard, 604 S. Vernon St., Dallas 8, Texas.)

BC-312-N receiver, (part of SCR-193); also manual TM-11-850. (C. L. Beardsley, Rte. #3, Jackson, Tenn.)

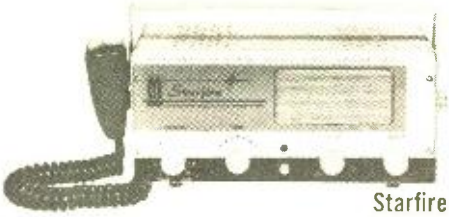
Metz (German??) Type 402 EKP KW 5-tube superhet, 1600 kc. to 23 mc.; parts info also needed. (Gerald Smith, 216 Old Hope Rd., Kingston 6, Jamaica, W.I.)

McMurdo Silver Model 906 signal generator; operating instructions also needed. (Elmer S. Hummel, Box 182, Fernley, Nev.)

Stromberg Carlson (radio?), chassis No. 112022. (David Haas, 6232 Chickasaw Dr., Westminister, Calif.)

Navy TBY transmitter-receiver, Type CRI-43007, and power unit type CLG-20206, made by Westinghouse, 1941; operating and maintenance data also needed. (H. H. Halperin, 9712 South Merrion Ave., Chicago 17, Ill.)

(*Continued on page* 22)



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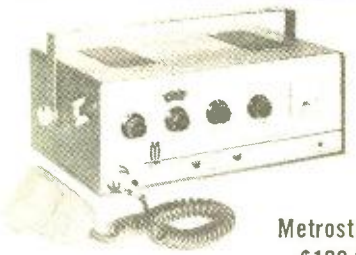

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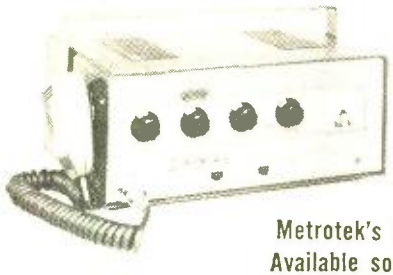

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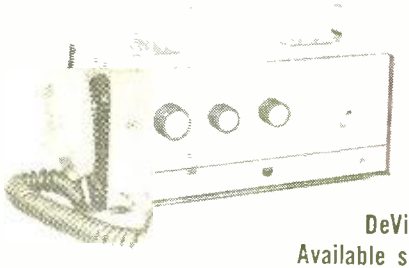

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Operation Assist

(*Continued from page 20*)

Majestic Model 50 screen grid superhet, and **Pfanstiel** Model 10, 6-tuber ('O1A's) dating from 1920's. (V. E. Lingbloom, Elsie, Nebr.)

Crosley Showbox Model 706-60, 8-tube neutrodyne receiver. (Fred Richardson, 600 Cypress St., Susanville, Calif.)

Telecraft Model 6 six-meter converter. No. 10035. (Harry Abell, 4405 Carlyle, Tampa, 3, Fla.)

Navy surplus transmitter T-350-XM; instruction manuals or any other information also requested. (Roger White, 428 West Sale Rd., Lake Charles, La.)

Army surplus BC 624A, BC 966A. **Detrola** Model 938 receiver; operating and service data also needed. (Larry Spann, 359 Flint St., Mobile 19, Ala.)

Army Signal Corps receiver BC 624A, transmitter BC 625A; modification data for amateur use also needed. (Edward Rymarz, W8TVP, 5446 Chase Rd., Dearborn 2, Mich.)

Zenith Model 12ST 925-E. No. G-25283. (Lyle Johnson, 1461 Norman Ave., San Jose 25, Calif.)

Hallicrafters SX-28 receiver; tips to improve performance also needed. **Jackson** Model 652 audio oscillator; calibration data also needed. **Precision** Model 9120 tube tester; data for adding European 8-pin sidelock, and noval sockets also needed. (Ramesh B. Parikh, 10 Phirozshah St., Santacruz West, Bombay 54, India)

Atwater Kent Model 447, about 1938; book also needed. (William J. Bender, 6613A Lucas St., Ft. Sill, Okla.)

Triumph Model 841 oscillograph ('scope?). (David Horn, 2400 Storey Ave., W. Midland, Texas)

Sonora electric organ. Model 200-400; service information also needed. (Wm. C. Rivers, 5411 Pembroke Ave., Baltimore 7, Md.)

E. H. Scott Labs receiver. Model SLR-M, a.c.-d.c. (G. H. Stetler, K4OIG, Box 1106, Lake Alfred, Fla.)

Philco Model 46-1203 radio-phonograph combination. (Scot Van Horn, Box 46, Delong, Ind.)

Sparton receiver, 6-tubes, BC and s.w. bands, about 1940. (A. A. Stephansky, 1069 Franklin Ave., Baden, Pa.)

Philco Model 37-630 receiver, BC and s.w., about 1940. (Mike Hintz, Rte. 1, Box 39, Grafton, Wis.)

Philco Model 40-180, radio with phono amp. **Zenith** Model 9-S-262, 8-tuber, motorized tuning. **Hallicrafters** Model EC713, 6-tubes, BC and s.w., "Echophone." (Charles T. Huth, 146 Schonhardt St., Tiffin, Ohio)

Silvertone 3-band receiver, chassis No. 101-653, about 1943. (E. E. Marz, Sr., 406 N. Schoenbeck Rd., Prospect Heights, Ill.)

Philco Model S26-62. (Larry Flagg, 404 W. 18th, Ft. Scott, Kan.)

Sparton phono oscillator and turntable, about 1939. (Mike Vanacore, 1211 26 Ave., Tampa 5, Fla.)

Triumph oscilloscope, Type CTU-60018, No. 1866; also Model 830 oscillograph wobbulator. (R. W. Walker, Rte. 1, Box 422C, Eureka, Calif.)

RCA marine receiver, Type RC 415-D1, issue 114-ST3B. (Pete Henricke, 200 Casserly Rd., Watsonville, Calif.)

Philco Model 38-8, code 121, about 1938; also need alignment data. (Al Carmenini, 52 Davis Ave., White Plains, N.Y.)

Kolster Model K-22 receiver (by Brandes), made in 1928. (Clyde Douglass, 8017 Takoma Ave., Silver Spring, Md.)

Zenith Model 1005, 10-tuber, BC and s.w. (Leland Bunch, Route 2, Wilder, Idaho)

Philco Model 37-610 receiver. (Willis Barta, Brownlee Stn., Star Route, Homestead, Ore.)

Silvertone Model 110.466-1 radio-phono-wire recorder; also need recording wire and service data. (George Weber, 1405 E. Polk, Harlingen, Texas)

(*Continued on page 24*)

Operation Assist

(*Continued from page 22*)

Dumont Type 208-B oscilloscope, No. 5270. (Mariano E. Masicampo, 94752 Kaakoa Pl., Waipahu, Hawaii)

Zenith Model 10S669 BC and s.w. receiver, about 1937. (L. J. Laurer, 405 Utica Rd., Utica, N.Y.)

Zenith Model 9S244 BC and s.w. receiver, 8 tubes, 1935. (Geo. Livingstone, 401 S. Colorado, Plainville, Kan.)

RCA Radiola 17; also manual for BC-348-Q. (Erik J. Thoresen, K1OGF, 28 Lookout Ave., Natick, Mass.)

Zenith BC and s.w. receiver, 7 tubes, serial No. T916070 (model number unknown), about 1940. (David Adcock, 2512 Humble, Midland, Texas)

Fairchild Compander kit, Model 510 (auto. sensing device). (S. S. Dowgiala, 141 Hopkins Ave., Jersey City 6, N.J.)

Howard Model 435, 7-tube communications receiver. (Barry Craps, 23 Gillis Rd., Portsmouth, Va.)

Philco Model 48-1282 (console), and Model F-1540 (car) radios; also **G.E.** Model C-404B receiver. (Mike Zuhajewski, c/o Adam Zuhajewski, Paw Paw, Mich.)

Harvey Wells Model MTR 2532 marine radiotelephone, age unknown. (James Pate, 2101 Frances St., Oakland, Calif.)

RCA Radiola 18, Model AR-936. (Jim Perrin, Rte. 1, Defiance, Ohio)

Philco Model 610 receiver. (Lloyd D. Keilers, Rte. 2, Box 5, Flatonia, Texas)

Silvertone BC and s.w. to 17 mc., 8 tubes, 6K7G's, etc. (model unknown). (Carl Harriman, 8955 Beatty St., N. W., Massillon, Ohio)

Millivac Model MV 25-S d.c. millivoltmeter. (R. C. Britton, 43 Landers Rd., E. Hartford, Conn.)

Capehart-Farnsworth Model 3001. (Lester Lamborn, Jr., Box 204, Clay Creek Rd., Avondale, Pa.)

Hudson American Model I-130-A signal generator. (Larry A. Wheelock, Crane, Ind.)

RCA AUT-15 transmitter; also conversion data. (Steve Ray, WA4DBS, Rte. 1, Box 133, Rockford, Ala.)

Atwater Kent Model 86F, BC superhet. (Wayne N. Lemcke, County Line Road, Hamlin, N.Y.)

E. H. Scott Model U-607 superhet, 23 tubes, about 1936. (C. W. Haussman, 1556 Brown St., Martinez, Calif.)

Supreme Model 570 signal generator; also manual. (J. O. Bonedeaux, 2921 Sumter Ave., S., Minneapolis 26, Minn.)

Philco Model 42-1013, radio-phono combination, 1942. (Howard L. Streit, 18603 Warrington, Detroit 26, Mich.)

Crosley Model 56, ECA 5992. (Leroy Humphries, 214 Cherry St., Bethel, Ohio

Philco Model 70 superheterodyne. (Edwin Smith, 101 Morewood Ave., Blairsville, Pa.)

Howard Communications Co. Model 435 receiver. (Donald Dresser, 927 Paulding St., Peekskill, N.Y.)

Radio City Products Co., Inc. (Models 447, 480) multitesters made in New York. (C. J. W. Smith, 725 Croton Ave., New Castle, Pa.)

Military equipment made by Westinghouse. High-freq. xmitter (CAY-52239); intermediate-freq. xmitter (CAY-52238); and rectifier and modulator (CAY-20084); all of W.W. II vintage. (West Yadkin High Electronics Club, c/o Mr. White, Hamtonville, N.C.)

Supreme Model AE volt-ohm-milliammeter. (Robert Ulschmid, 71-21 66th St., Glendale 27, N.Y.)

Duvox 4-tube a.c.-d.c. radio using 12AU6, 12AT6, 50C5, 35W4; no model or chassis no. (Alex Zeitlin, 88 Harriet St., Bridgeport, Conn.)

Triumph Chicago Model 841 oscilloscope used by the Army. (Wm. Freitag, 23023 Englehardt, St. Clair Shores, Mich.)

RCA radio marine receiver (Model AR 8503 C.R.M. 46092, No. 94949, Serial No. 41-301); Preselector (Model AR 8503, Serial 338). (H. Williamson, 3918 Imlay, Toledo 12, Ohio)

"HR" Model AMM 1 modulation monitor. (Frank Privette, Box 53, Zebulon, N.C.)

—30—

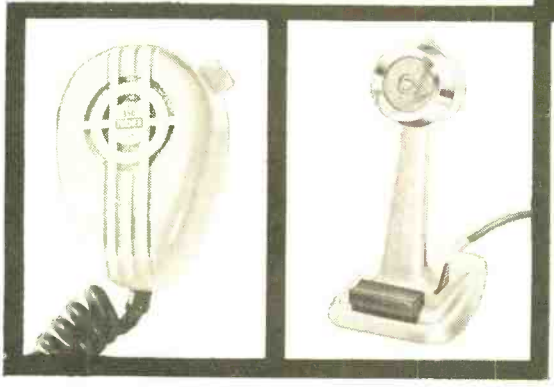
The three biggest names in CB microphones are

TURNER, TURNER and TURNER

(ONLY THE MODEL NUMBERS ARE DIFFERENT TO PREVENT CONFUSION)

THE TURNER MODEL 355C

The newest addition to the fine Turner line of top performing CB microphones. Turner's all new hand-ease switch is ideal for mobile rig mounting — comfortable to hold, convenient to operate. The 355C comes complete with hanger button and standard dash bracket for easy mounting. Equipped with an 11" retracted, five foot extended, rubber-jacketed, coiled cord, wired for relay operation. Smooth response from 80 to 7000 cps. Output level: —50db.



THE TURNER MODEL 254C

The matched companion to the fine Turner mobile microphones. You get the same Turner quality, performance and dependability in a base-station mike. Same performance specifications as 350C, but with an on-off push-to-talk and lock switch and 7 foot cable, three conductor (one shielded), wired for relay operation.

THE TURNER MODEL 350C

More Turner 350C's are used as original equipment in CB than any other microphone. There are three excellent reasons: top Turner performance, quality Turner sound reproduction and rugged Turner dependability.

THE TURNER MICROPHONE COMPANY
946 17th Street NE
Cedar Rapids, Iowa

IN CANADA:
Tri-Tel Associates, Ltd.
81 Sheppard Avenue West
Willowdale, Ontario

EXPORT:
Ad Auriema, Inc.
85 Broad Street
New York 4, New York

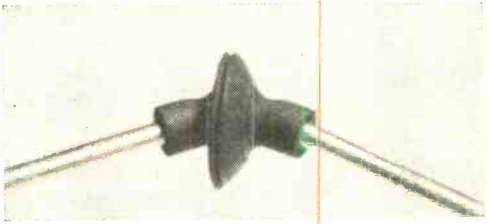
Tips and Techniques

EMERGENCY ANTENNA INSULATORS

Here's a type of insulator that's widely available, inexpensive, easy to put up, weatherproof, and adjustable to cope with any practical voltage. In addition, such insulators make it easy to hang up an emergency or Field Day antenna quickly and without partially grounding the ends. Just cut off two suitable lengths of nylon or Dacron fish line of adequate breaking strength for the weight of the antenna, tie them onto the ends of the wire, and hang the antenna up. These synthetic lines have excellent insulating properties, and negligible moisture absorption. —*Walter Peter*

EMERGENCY UNIVERSAL JOINT

Where the torque to be transmitted is small, you can improvise a universal joint quickly and easily with rubber suction cups. Use suction cups with holes in the ends so that they can be pushed over the ends of the shafts that you want to connect. Fasten the two suction faces together as shown by coating them with rubber cement, letting it dry thoroughly, and then pressing



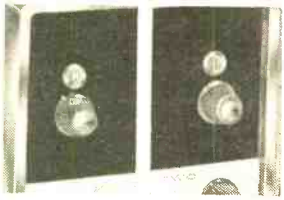
the two suction cups tightly together. Even shafts that are badly misaligned can be coupled with these quick universal joints. —*John A. Comstock*

DRESS UP THAT SLOPPY WIRING WITH "TWIST-EMS"

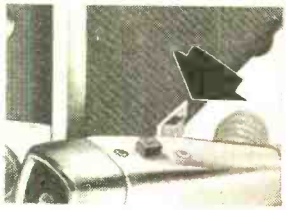
Loose wires flopping around inside a chassis not only look messy, but can cause real

Now! With Tunable Receiver and 10-Channel Crystal Control!

MESSENGER TWO



AT LEFT—illuminated indicator and selector knob for crystal control.
AT RIGHT—illuminated indicator and knob for tunable channel selection.



SLIDE SWITCH for selection of either crystal or tunable receiver control.

ACCESSORY SOCKET on rear panel (above power cord receptacle) for instant attachment of "Tone Alert".

High efficiency noise limiter—Excellent sensitivity! High adjacent channel rejection!

Everything you've ever wanted in a CB transceiver!

"TONE ALERT" SELECTIVE CALLING SYSTEM

Mutes speakers until one unit calls another—then automatically your stations receive audio note and indicator light flashes "on", remaining lighted until call is answered. Not a kit, ready to go! Plugs into "Messenger Two", fast hook-up to other transceivers!

Sharp selectivity guards against annoying random triggering. Wide range of tones permits 37 different systems to operate on same channel without overlap. Only 1½" x 4" x 7½"—wired and tested.

Cat. No. 250-810
115 VAC and 6 VDC
Cat. No. 250-811
115 VAC and 12 VDC
$59.95 NET

Available now—the new version of the popular "Messenger Two"! Pick any one of 10 channels for crystal controlled "transmit" or "receive"—instantly switch to all-channel tunable "receive" with handy slide switch. Channel indicators illuminate for either "crystal" or "tunable" settings—also serve as "off-on" indicators! Highly efficient circuit design makes full use of maximum legal power . . . delivers a penetrating signal that "outperforms 'em all!" Looking for maximum receiver sensitivity? This unit is hot—pulls in signals you wouldn't know were around with less sensitive equipment! New noise limiter circuit in the "Messenger Two" lets you know what QUIET really means in a CB rig! Positive acting "squelch" and automatic volume control circuits—push-to-talk microphone—crystals for 1 channel. 5⅝" x 7" x 11⅜", installs anywhere.

Cat. No. 242-162 . . . 115 VAC and 6 VDC
Cat. No. 242-163 . . . 115 VAC and 12 VDC
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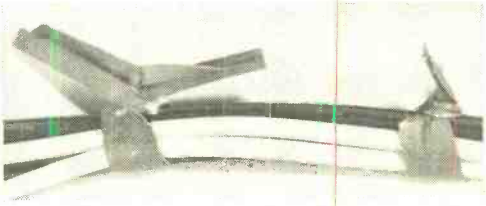
MANUFACTURERS OF THE WORLD'S MOST WIDELY USED PERSONAL COMMUNICATIONS TRANSMITTERS

Tips

(*Continued from page 26*)

trouble if the equipment must withstand vibration, or must work in several positions. When dressing leads together to form cables, you can save yourself the trouble of doing a cord-lacing job, but still get many of the benefits of such a job by using the little wire-reinforced paper or plastic "Twist-Ems" sold in dime stores and supermarkets. These are meant for closing plastic bags, tying plants to garden stakes, and the like,

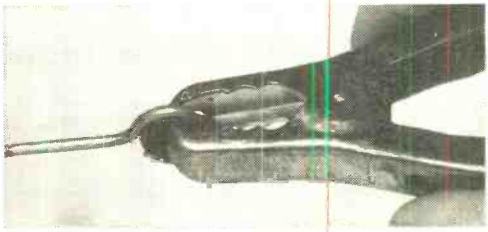


but will hold wire bundles just as readily. You can even color-code bundles if you wish. Be sure *not* to tie unshielded signal lines with other wires, and *never* cable the input and output leads of a stage or set together.

—Louis E. Garner, Jr.

BATTERY CLAMP SERVES AS SELF-GRIPPING PLIERS

A large battery clamp can be a handy tool for turning TV lead-in stand-off insulators; as a bonus, it will hang onto the stand-off if you have to let go. Such a clamp can also help in turning wing-nuts and thumb-screws, and in getting those pesky caps off



bottles of coil dope and speaker cement. And as a "third hand" for holding together two parts to be soldered, it's hard to beat.

—Jerome Cunningham

PANEL LABEL FROM MAGAZINE COVER

Unable to find a decal for a completed construction project? You can get around this problem by cutting the name of the unit out of the article title on the magazine cover, and sticking it on the panel under a strip of cellophane tape. Use a little rubber cement on the back of the trimmed "name

RAD-TEL'S

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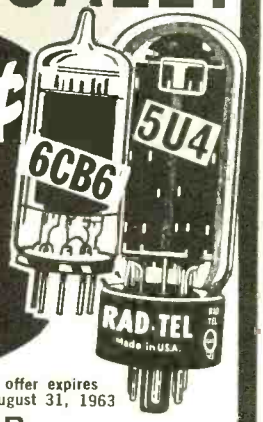

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Qty.	Type	Price	Qty.	Type	Price	Qty.	Type	Price	Qty.	Type	Price
	0Z4	.79		6AU8	.87		6K6	.63		12CU5	.58
	1AX2	.62		6AV6	.41		6S4	.52		12CU6	1.06
	1B3	.79		6AW8	.90		6SA7GT	.99		12CX6	.54
	1DN5	.55		6AX4	.66		6SH7	1.02		12D4	.69
	1G3	.79		6AX5	.74		6SJ7	.88		12DE8	.83
	1J3	.79		6BA6	.50		6SK7GT	.95		12DL8	.88
	1K3	.79		6BC5	.61		6SL7GT	.84		12DQ6	1.04
	1R5	.77		6BC8	1.04		6SN7	.65		12DS7	.84
	1S5	.75		6BE6	.55		6SQ7GT	.94		12DT5	.76
	1T4	.72		6BF5	.90		6T4	.99		12DT7	.79
	1U5	.65		6BF6	.44		6T8	.85		12DT8	.78
	1X2B	.82		6BG6	1.70		6U8	.83		12DW8	.89
	2AF4	.96		6BH8	.98		6V6GT	.54		12DZ6	.62
	3AL5	.46		6BJ6	.65		6W4	.61		12ED5	.62
	3AU6	.54		6BJ7	.79		6W6	.71		12EG6	.62
	3AV6	.42		6BK7	.85		6X4	.41		12EK6	.62
	3BC5	.63		6BL7	1.09		6X8	.80		12EL6	.50
	3BN6	.75		6BN6	.74		7A8	.68		12EZ6	.57
	3BU8	.78		6BQ6	1.12		7AU7	.65		12F8	.66
	3BY6	.58		6BQ7	1.00		7EY6	.75		12FA6	.79
	3BZ6	.56		6BU8	.70		7Y4	.69		12FM6	.50
	3CB6	.56		6BX7	1.11		8AU8	.90		12FR8	.97
	3CS6	.58		6BZ6	.55		8AW8	.93		12FX8	.90
	3DG4	.85		6BZ7	1.03		8BQ5	.60		12GC6	1.06
	3DK6	.60		6C4	.45		8CG7	.63		12J8	.84
	3DT6	.54		6CB6	.55		8CM7	.70		12K5	.75
	3GK5	.99		6CD6	1.51		8CN7	.97		12L6	.73
	3Q4	.63		6CG7	.61		8CS7	.74		12SF7	.69
	3S4	.75		6CG8	.80		8EB8	.94		12SK7GT	.95
	3V4	.63		6CL8	.79		8FQ7	.56		12SL7	.80
	4BQ7	1.01		6CM7	.69		9CL8	.79		12SN7	.67
	4C56	.61		6CN7	.70		11CY7	.75		12SQ7GT	.91
	4DT6	.55		6CQ8	.92		12A4	.60		12U7	.62
	4GM6	.60		6CR6	.60		12AB5	.60		12V6	.63
	5AM8	.79		6CS6	.57		12AC6	.55		12W6	.71
	5AN8	.90		6CS7	.69		12AD6	.57		12X4	.47

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	5AQ5	.54		6CU5	.58		12AE6	.50		17AX4	.67
	5AT8	.83		6CU6	1.08		12AE7	.94		17DQ6	1.06
	5BK7	.86		6CY5	.70		12AF3	.73		18FW6	.49
	5BQ7	1.01		6CY7	.71		12AF6	.67		18FX6	.53
	5BR8	.83		6DA4	.68		12AJ6	.62		18FY6	.50
	5CG8	.81		6DE6	.61		12AL5	.47		19AU4	.87
	5CL8	.76		6DG6	.62		12AL8	.95		19BG6	1.39
	5CQ8	.84		6DJ8	1.21		12AQ5	.60		19EA8	.79
	5EA8	.80		6DK6	.59		12AT6	.50		19T8	.85
	5EU8	.80		6DN6	1.55		12AT7	.76		21EX6	1.49
	5J6	.72		6DQ6	1.10		12AU6	.51		25AX4	.70
	5T8	.86		6DT5	.81		12AU7	.61		25C5	.53
	5U4	.60		6DT6	.53		12AV6	.41		25CA5	.59
	5U8	.84		6DT8	.94		12AV7	.82		25CD6	1.52
	5V6	.56		6EA8	.79		12AX4	.67		25CU6	1.11
	5X8	.82		6EB5	.73		12AX7	.63		25DN6	1.42
	5Y3	.46		6EB8	.94		12AY7	1.44		25EH5	.55
	6AB4	.46		6EM5	.77		12AZ7	.86		25L6	.57
	6AC7	.96		6EM7	.82		12B4	.68		25W4	.68
	6AF4	1.01		6EU8	.79		12BD6	.50		32ET5	.55
	6AG5	.70		6EV5	.75		12BE6	.53		35C5	.51
	6AH4	.81		6EW6	.57		12BF6	.60		35L6	.60
	6AH6	1.10		6EY6	.75		12BH7	.77		35W4	.42
	6AK5	.95		6FG7	.69		12BK5	1.00		35Z5	.60
	6AL5	.47		6FV8	.79		12BL6	.56		36AM3	.36
	6AM8	.78		6GH8	.80		12BQ6	1.16		50B5	.69
	6AQ5	.53		6GK5	.61		12BR7	.74		50C5	.53
	6AS5	.60		6GK6	.79		12BV7	.76		50EH5	.55
	6AT6	.49		6GN8	.94		12BY7	.77		50L6	.61
	6AT8	.86		6H6	.58		12BZ7	.86		70L7	.97
	6AU4	.85		6J5GT	.51		12CN5	.56		117Z3	.85
	6AU6	.52		6J6	.71		12CR6	.67		807	.75

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Tips

(*Continued from page* 28)

plate" and put it in position first; after it has dried, cover it with the tape. As a final touch, you can cover the tape edges with a thin coat of clear fingernail polish.

—*P. C. Walton*

CHANGING PANEL DECALS WITHOUT TEARS

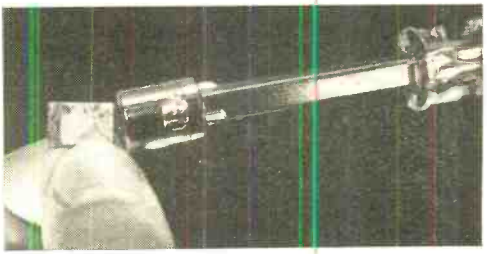
Ever wish you could change some of those decals you put on the panels of your home-brewed electronic masterpieces? It happens to all of us when we modify a unit, or think of a better name. If this is your problem,

place a strip of fresh cellophane tape over the decal and stick it down well, leaving one end free. Then remove the old decal by pulling the tape directly out and away from the panel. It may take two or three pieces of tape to remove stubborn old decals completely.

—*Stanley E. Bammel*

EMERGENCY OR SPECIAL SCREWDRIVERS

If you carry a screwdriver to fit every width and length of screw-slot you encounter, you'll find that they can crowd other items out of the tool box. Here's a way to obtain those special sizes you need without having them bulge over the sides of your tool kit. Cut some short driver blades from 1/16"



steel and grind the opposite edges parallel so that each blade is a snug push-fit in one of your hex-nut drivers. Then grind the end to leave 1/8" to 3/16" projecting. Finally, grind the tip to the thickness you need for those special narrow or broad screw-slots.

—*Ken Murray*

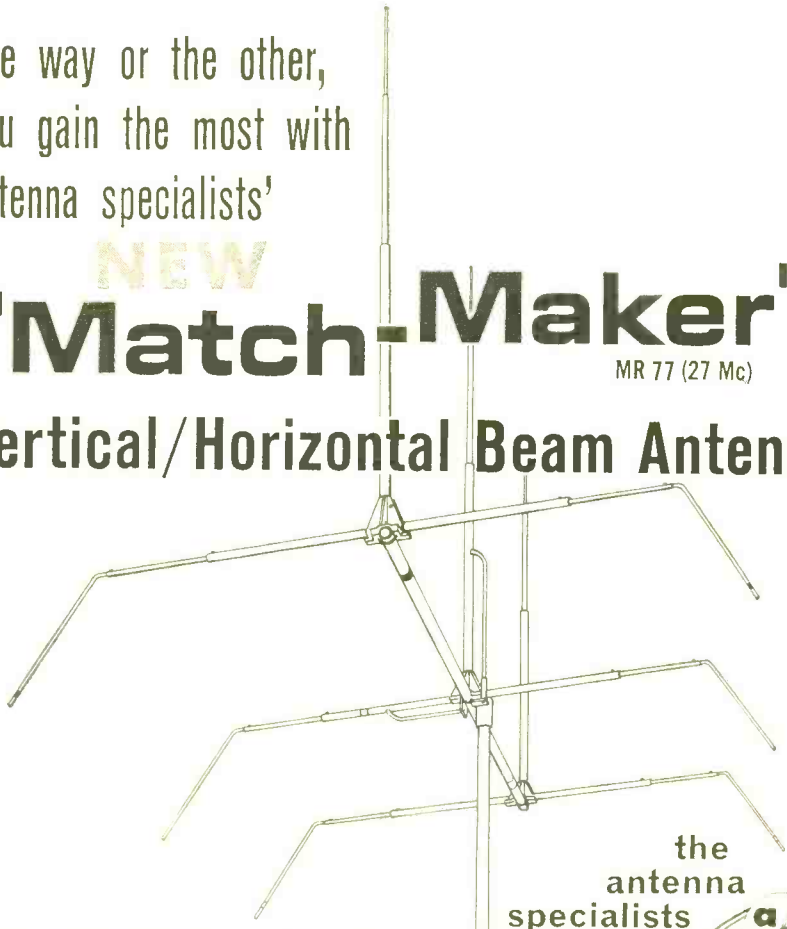
one way or the other,
you gain the most with
antenna specialists'

NEW

"Match-Maker"

MR 77 (27 Mc)

Vertical/Horizontal Beam Antenna



Now you can instantly match up your base antenna to work mobile and vertical bases or horizontal base beams by simply switching from vertical to horizontal polarization through separate coax feeders. The dual-direction versatility of the "Match-Maker" will give you a powerful 7 db. vertical forward gain. Switch to the horizontal beam and you get a 6 db. forward gain. Either way, you get a 15 db. front to back ratio.

Everything about the "Match-Maker" is rugged. Sturdy, heat-treated aluminum boom and elements plus oversize clamps to hold elements firmly in place give it the structural strength to withstand 100 mph winds. Only 12½' high with a boom length of 10', it weighs an easy-to-handle 24 lbs. If you're interested in VSWR, it's 1.5:1 or less, either horizontally or vertically. 50 ohms. gamma matched. All components are color-coded for simple, fast, accurate assembly.

the antenna specialists co.

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12435 Euclid Ave.. Cleveland 6, Ohio

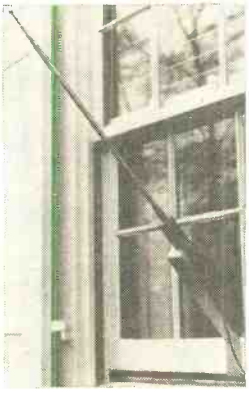
Manufacturers of Antenna Specialists brand base and mobile antennas for amateur, professional and CB. Custom design broadcast and professional installations.

The portable power generator with only one moving part. Alternator principle. 1000, 1250, 3000 watt models. Write for complete information.

New Products

PORTABLE ANTENNA SYSTEM

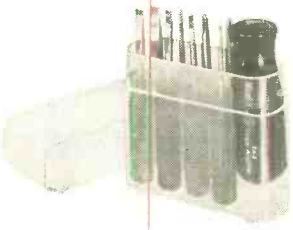
Vacationing hams and CB'ers now have a solution to the antenna problem thanks to "The Vacationer," a portable antenna recently introduced by D P Z Corporation.



The antenna operates on six different bands—2, 6, 11, 10, 15, and 20 meters—by virtue of a shorting bar for 2 and 6 meters, and small interchangeable coils for the other bands. Rated at 175 watts PEP and 100 watts for AM, the antenna extends to 60 inches. Included in the package are 10 feet of RG-58A/U transmission line, heavy-duty plastic base, coils and shorting bar, 15 feet of counterpoise with alligator clip, and a special aluminum window mount. A low SWR is claimed on all frequencies. Price, $22.50. (*D P Z Corporation*, 30 Broad St., New York 4, N.Y.)

COMPACT SCREWDRIVER KIT

A compact, convertible all-screwdriver tool kit is currently being offered by Xcelite. The PS88 set includes five slot-tip screwdrivers (3/32" through 1/4"), three Phillips screwdrivers (#0, #1, and #2), and a special hollow "torque amplifier" handle. The tools are housed in a plastic pocket case. (*Xcelite Inc.*, Orchard Park, N.Y.)



(*Continued on page* 34)

How can you be sure the speaker you own is really well-made?

Build it yourself!

(with the new KS-2 StrataKit)

NOT CONTENT with developing the world's first true slim-line speaker system in kit form (the KS-1), Fisher now presents the KS-2, the newest, most advanced 3-way slim-line speaker system available in *any* form at anywhere near the price.

By simply installing the drivers, connecting the crossover network and completing the pre-assembled cabinet, you'll be well on your way to hearing why.

The KS-2 features a 12" free piston woofer with a half-roll cotton surround, massive 6 lb. magnet structure, and a free-air resonance of 25 cycles. The 5" mid-range has a butyl-coated surround and is sealed off in back to avoid interaction with the woofer and tweeter. The 3" cone-type tweeter is a hemispherical dome bonded directly to a 1" voice coil with a big 2 lb. magnet structure. Highs are silky smooth and widely dispersed.

The full 3-way inductance-capacitance network crosses over at 1200 and 2800 cycles and has a continuously variable tweeter level control to compensate for room acoustics and variations in pickup characteristics.

Measuring 20" wide x 25" high and only 6½" deep, the completely sealed, fiberglass-packed cabinet weighs 35 lbs. when assembled.

Response of the KS-2 is 35 cycles to well beyond audibility. It requires as little as 10 watts of power and will handle up to 60 watts. Price, in unfinished sanded birch, $89.50*.

FREE! $1.00 VALUE! The Kit Builder's Manual: a new, illustrated guide to high fidelity kit construction.

The Kit Builder's Manual

Fisher Radio Corporation
21-52 44th Drive, Long Island City 1, N. Y.

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The Fisher

*IN UNFINISHED WALNUT, $94.50. FACTORY-ASSEMBLED, IN HAND-RUBBED AND FINISHED BIRCH, $114.50; IN OILED WALNUT, $119.50. PRICES SLIGHTLY HIGHER IN THE FAR WEST. EXPORT: FISHER RADIO INTERNATIONAL, INC., LONG ISLAND CITY 1, N.Y. CANADA: TRI-TEL ASSOCIATES, LTD., WILLOWDALE, ONT.

New Products

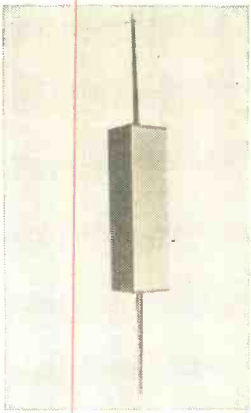
(*Continued from page* 32)

GENERAL-PURPOSE OSCILLOSCOPE

Kit builders who would like to put an oscilloscope together will be interested in EICO's general-purpose 3" unit, the Model 430. Vertical frequency response is flat from 2 cps to 500 kc., and horizontal response from 2 cps to 300 kc. Vertical sensitivity is 25 millivolts per centimeter, and the horizontal sensitivity is .25 volt r.m.s per centimeter. Synchronization is fully automatic on all ranges from 10 cps to 100 kc. Special features of the lightweight unit (11 pounds) include easy, direct connection to the vertical deflection plates (for modulation monitoring, for example) by simply plugging test leads into rear jacks and switching from "Amplifier" to "Direct Plates," and a regulated power supply for stable, drift-free operation. Price, $65.95 (kit); $99.95 (wired). (*EICO Electronic Instrument Co. Inc.*, 33-00 Northern Blvd., L.I. City 1, N.Y.)

POLE-MOUNTED SPEAKER ENCLOSURE

A unique solution to the problem of "where to put the speaker" has been incorporated in the pole-mounted "Stereo Master" enclosure currently being manufactured by Wald, Inc. Internal capacity of the 10¼" x 11" x 40" speaker enclosure is about 4620 cubic inches; acoustic lining is employed to prevent bass reverberation. Speaker hardware includes a Jensen 8" extended range woofer, 3½" tweeter, and precision crossover network. The spring-loaded top section of the pole keeps the enclosure, which is finished on all four sides, in place. Price, $66.90. (*Wald, Inc.*, 119 Prospect Ave., Burbank, Calif.) —30—



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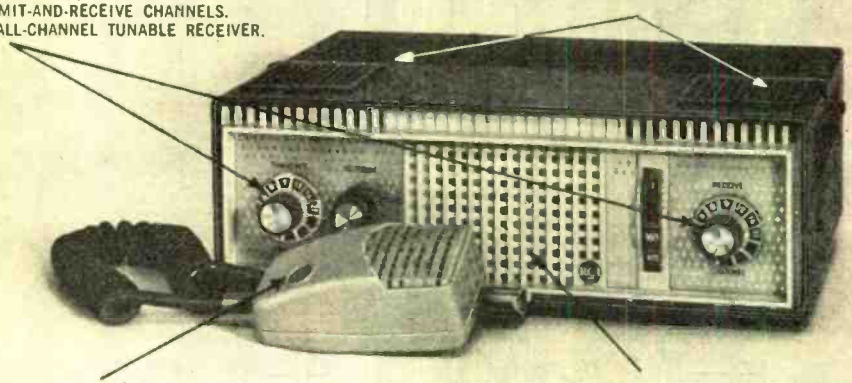

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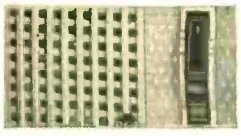

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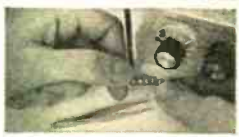

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Pop'tronics Bookshelf

BASIC INDUSTRIAL ELECTRONICS COURSE

by Alfred Haas

This is another in a series of books put on paper by the Gernsback Library that might be characterized as a "state-of-the-art" report. (The objective in these *course* books is to offer the reader a how-and-why understanding of complex apparatus and techniques. The current contribution by author Alfred Haas is his second; the first, on "Oscilloscope Techniques," was very well received, and this one should be equally successful. Although industrial electronics is an amazingly complicated and diversified field, it is part of tube and solid-state electronics at the hi-fi amplifier, ham transmitter, and power rectifier level of understanding. If you "savvy" these three categories, industrial electronics will be equally clear to you after you read this book.

Published by Gernsback Library, Inc., 154 West 14th St., New York 11, N.Y. Hard cover, $5.95; soft cover, $4.10.

BASIC SERVOMECHANISMS

by Ed Bukstein

Your reviewer particularly appreciated the very first sentence in this book: "The servomechanism is a self-correcting control system." It was a statement that laid the foundation for what followed—the explanation of a somewhat difficult subject *without* the use of mathematics. Of course, author Bukstein's magazine articles and other books on equally tacky topics have led us to expect a good job from him. This book is intended for the electronics technician who wants or needs an understanding of servos, amplidynes, choppers, saturable reactors, etc. It covers the subject of basic servomechanisms thoroughly, is well illustrated, and logically arranged. To test the reader's ability to absorb the subject, a

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You will receive training for the Novice, Technician and General Classes of F.C.C. Radio Amateur Licenses. You will build 20 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.

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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 use of these parts. Then you build a simple radio. With this first set you will enjoy listening to regular broadcast stations, learn the 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 twenty 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.

THE "EDU-KIT" IS COMPLETE

You will receive all parts and instruction necessary to build 20 different radio and electronics circuits, each guaranteed to operate. Our Kits contain tubes, tube sockets, variable, electrolytic, mica, ceramic and paper dielectric condensers, resistors, tie strips, coils, hardware, tubing, punched metal chassis, Instruction Manuals, hook-up wire, solder, selenium rectifiers, volume controls and switches, etc.

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.-type Questions and Answers for 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.

FROM OUR MAIL BAG

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 I 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.

Printed Circuitry is the basis of modern Automation Electronics. A knowledge of this subject is a necessity today for anyone interested in Electronics.

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Bookshelf

(*Continued from page* 18)

number of questions appear at the end of each chapter.

Published by Holt, Rinehart and Winston, Inc., 383 Madison Ave., New York 17, N.Y. 190 pages. Hard cover. $5.25.

MICROWAVE SYSTEMS FUNDAMENTALS

by F. Jonathan Mivec

To most electronics experimenters, the world of microwave techniques is shrouded in mystery. In this part of the spectrum, the everyday vacuum tube and transistor give way to klystrons, magnetrons, and wave guide plumbing. Septums, splash plates, and slots are a few of the terms one encounters in the discussion of antennas, for example. How can you find your way around this maze? Try reading *Microwave Systems Fundamentals* with its easy-to-understand, non-mathematical approach. It makes both a handy pocket guide and ready reference volume. It has our highest recommendation.

Published by Howard W. Sams & Co., 4300 West 62nd St., Indianapolis 6, Ind. Soft cover. 288 pages. $5.95.

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Look what they're doing to electronic components! POPULAR ELECTRONICS goes behind the scenes to see how miniaturization will affect experimenters and do-it-yourself fans.

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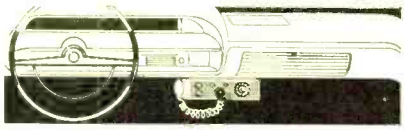
A brand new compact control unit that permits the installation of transceivers in the automobile trunk or other out-of-the way space. Unit mounts under auto dashboard and gives you complete remote control of transceiver.



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If you work with transistor circuits, EICO has the team for you: the 1020 Power and Bias Supply with 0.005% ripple; and the 680 Transistor & Circuit Tester which combines transistor parameter measurements with a 20kΩ/V multimeter for dc voltage (to 50v) and resistor measurements.

If you're interested in RF you'll need a good, wide coverage RF signal generator with built-in audio modulation such as the EICO 324 (150 kc-435 mc), and a good VTVM such as the EICO 222 or peak-to-peak VTVM the 232. Use either one with RF VTVM probe PRF-11.

If you're interested in audio, EICO has an excellent Sine and Square Wave Audio Generator ranging from 20 cps to 200 kc, the 377. You'll also need an AC VTVM. The 12-range EICO 250 (measures 100 μV to 300V) is an excellent choice. It has a panel switch that converts it to a broadband amplifier with 60 db gain and over 5V undistorted output. The EICO 261 AC VTVM and Wattmeter has 11 ranges (measures 1 mv to 1000V) and it includes a tapped 4, 8, 16 and 600 ohms power resistor handling up to 80 watts as well as load compensated wattmeter ranges. In general you will need an EICO 222 or 232 VTVM as well, for measuring up to 1500 VDC or AC, and for resistance measurements.

If you like to draw materials from a "junk" box, you'll need a Resistance-Capacitance Bridge, EICO 950B, which measures capacity from 10 μμf to 5000 μf, resistance from 0.5 ohm to 500 meg., and contains a continuously variable 0-500 VDC supply for a sensitive capacitor leakage test. Complementing it is the 955 for in-circuit capacitor short—open testing, and capacity measurements with unique shunt resistance balancing.

For trouble shooting audio, IF, and RF circuits, the 147A Multi-Signal Tracer has both RF & audio inputs with demod & direct probes, noise locator circuit, wattmeter, substitution tests, & eye-tube and speaker monitors. And for testing tubes nothing beats the economical EICO 628 Emission Type Tube tester. The new 667 Dynamic Conductance Tube and Transistor Tester is the best in the field. Both test all the new tube types including Nuvistor, Novar, 10-pin, Compactrons, etc.

Other handy items are EICO substitution and decade boxes: EICO 1100 covers EIA resistance values from 15 ohms to 10 meg.; the 1120 EIA capacitance values from 100 mmf to 0.22 mf. The 1140 combines both 1100 and 1120 in one box and permits series or parallel combinations as desired. The 1171, a Precision Decade Resistance Box, covers 1 to 99,999 ohms in 1-ohm steps; and EICO 1180, a precision Capacitance Decade Box, covers 100 mmf to 0.111 mf in 100 mmf steps.

If you want to know how a circuit performs with varying line voltage, or to correct for varying line voltage during an experiment, the EICO 1078 Metered Variable Auto-Transformer AC Bench Supply provides 0-140 VAC continuously variable, from 120 VAC line input with a 7½ amp. current rating. Output current and voltage are separately metered.

If you're an experimenter or technician, you'll find that EICO test equipment can make any job easier. You can also be sure, that when you select EICO instruments, as a kit or factory-wired, you get the most performance for your dollar.

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A guide to what the well equipped experimenters' workbench looks like

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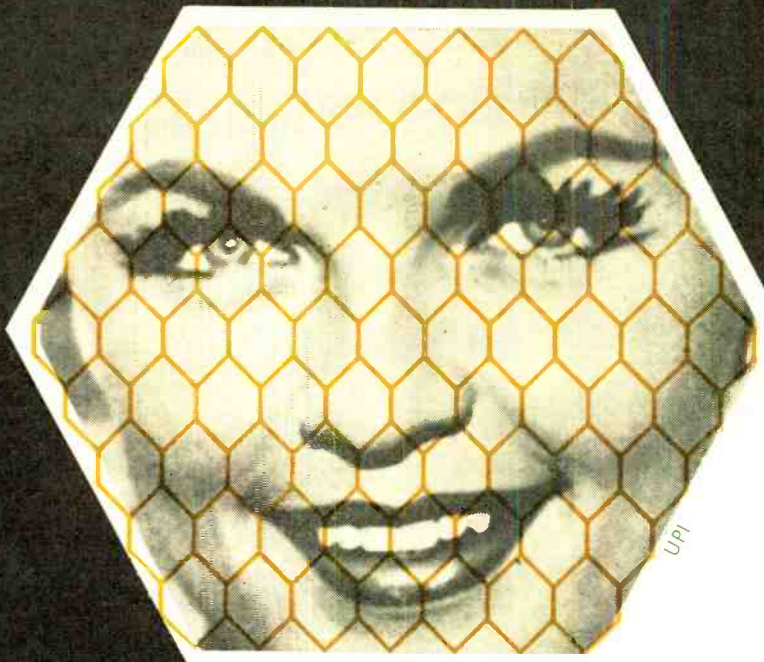


An Experiment in FIBER OPTICS

By Roy E. Pafenberg

Fiber optics—the transmission of optical images through thin glass fibers—is one of the most intriguing techniques used in modern electronics. This versatile new development has applications in just about every piece of equipment where optical images must be generated or processed. When a large number of fine glass fibers are properly

FIBER OPTICS

aligned in a bundle, they can be used to transfer an optical image—element by element—from one end to the other. If a glass fiber is coated with a thin layer of glass with a lower index of refraction, light entering into one end of the fiber travels down the length of it by means of a series of reflections from the walls.

Both flexible and inflexible fiber optic elements are being made. Small diameter flexible units for medical purposes may be used for viewing a patient's stomach, or even—with a new technique — inside a patient's heart! Flexible elements will permit engineers to observe the internal functioning of engines and other machines.

These versatile devices are made by enclosing a bundle of aligned fibers in a flexible plastic jacket and potting the ends in highly polished clear plastic for good light transmission.

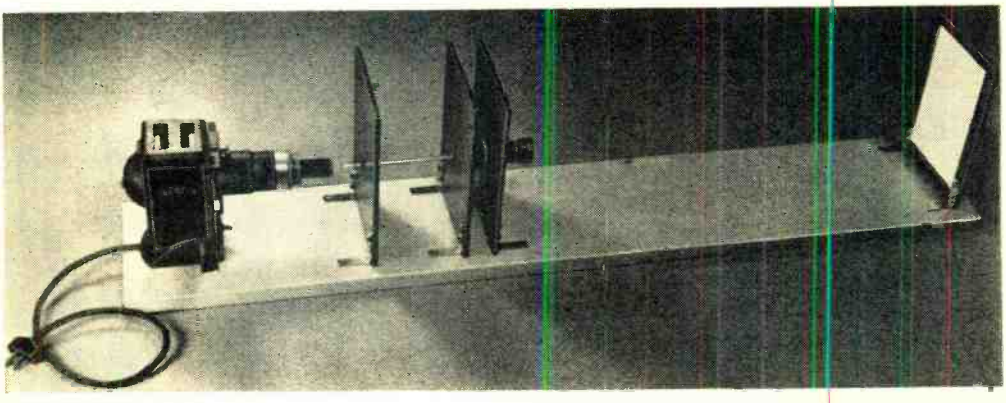
For other applications, the aligned glass fibers are fused into a solid mass. Examples of dramatic new developments resulting from this technique are high-resolution, fiber optic cathode-ray tube face plates and various types of image pickup tubes—all with extremely high efficiencies. The image on a fiber optic face plate is about 40 times brighter than with a conventional cathode-ray tube since the image is formed on one surface and transmitted, with very little loss, to the other surface.

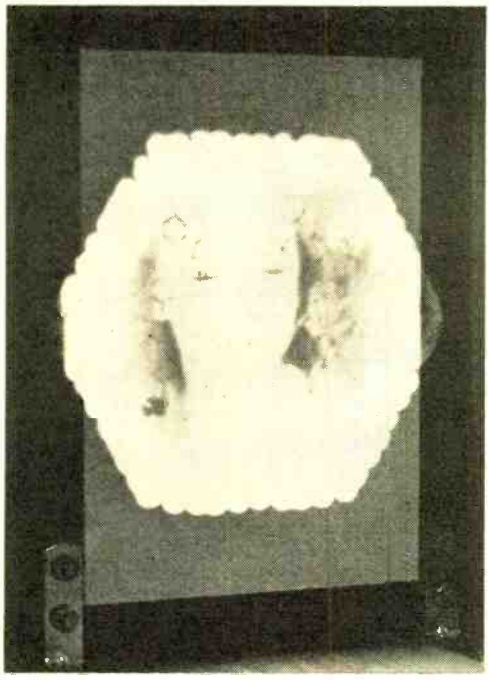
While the fiber optic element—a solid type—used in this experiment depends on a series of internal reflections to transmit light, suitably proportioned fibers perform in the visible spectrum exactly as do wave guides at microwave radio frequencies. In combination with laser beams with extremely wide usable bandwidths, fiber optic wave guides point to future communications systems with fantastic capacity. A single fiber optic "pipe" could easily carry a billion phone calls!

A Practical Experiment. Images can be transmitted through a fiber optic element by placing an illuminated object in direct contact with the polished ends of the fibers, or by optically focusing an image on this surface. The transmitted image can be directly viewed on the other end of the fiber optic element or may be projected—using conventional lenses—onto a viewing screen.

The setup used in this experiment is shown in detail in Fig. 1. The image from a 35-mm. photographic slide is

A 35-mm. slide projector is used to focus an image on the end of a 6" fiber optic element. Lens mounted on third panel projects the transmitted image on a small screen mounted at the end of the baseboard.





An image transmitted via Image Conduit and projected on small screen (left) reveals in outline fibrous structure of the 73,000-fiber optic element.

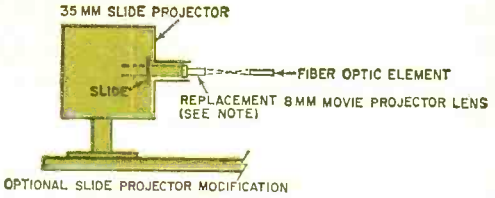


Fig. 2. Two methods can be used to modify a slide projector for the experiment. Use a mailing tube as in Fig. 1 below, or mount a replacement 8-mm. lens in the slide projector barrel as shown above.

projected—in reduced size—onto the polished end of a glass rod fiber optic element. The image is transmitted through the 6″ fiber optic path and then projected through an enlarging lens onto a small viewing screen.

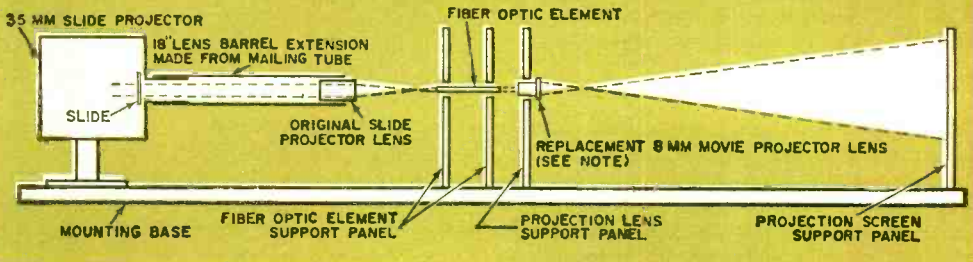
The fiber optic element is "Image Conduit," made by the American Optical Company, and consists of 73,000 twelve-micron (.0005″) fibers fused together to form a hexagonal-shaped, ⅛″-diameter rigid rod. Image Conduit is available in 6″ and 12″ lengths from Allied Electronics, a subsidiary of Allied Radio, 100 North Western Ave., Chicago 80, Ill. The 6″ length, Type 1C-1-6, is available under Allied catalog number 4E450 at $6.25. The 12″ element, Type 1C-1-12, catalog number 4E451, sells for $11.00.

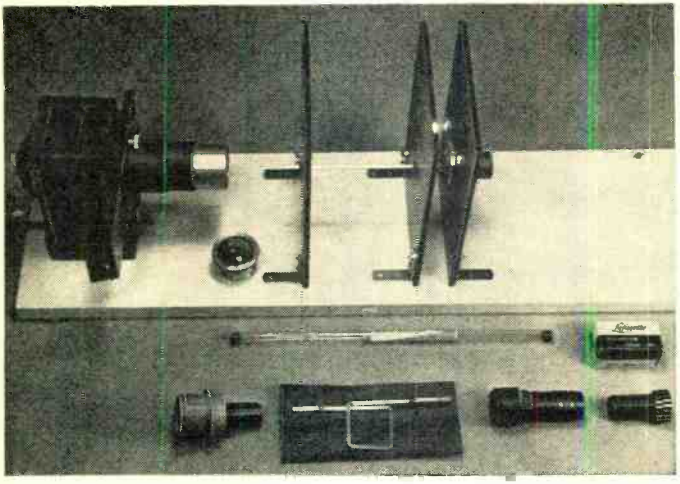
An Image Source. The image source used in this setup is an ordinary 35-mm. slide projector. Since projectors are designed to throw enlarged images on a screen some distance away, a different lens or lens-spacing system is necessary to get a reduced image which can be focused on the end of a fiber optic element.

The easiest way to modify the projector is to remove the lens and slide an 18″ length of tight-fitting mailing tube over the lens barrel (see Fig. 1). Secure the mailing tube in place with friction tape; also use tape to build up the size of the projector lens so it fits snugly in the tube's other end.

Fire up the projector and insert a slide. Move a white card back and forth in front of the lens. At a distance of a few inches, depending on the focal length of the lens, a very small, intense,

Fig. 1. Although a refined setup such as that described is not absolutely necessary for the experiment, a sturdy baseboard and panels to hold the optical elements make it easy to align conduit and lens system.





Lenses, a bent 12" optical conduit, and pipe adapter used to mount the projection lens are shown at left. The 12" element, bent as described in the text, provides an excellent demonstration of image transmission through a fiber optic path.

in-focus image will be observed. Make a note of this distance; the end of the fiber optic element will later be mounted exactly at this point.

A second method of modifying a projector involves replacing the original long-focal-length projection lens with one of a shorter focal length (see Fig. 2). Suitable lenses can be obtained from junked 8-mm. movie cameras and projectors, and most camera dealers will sell them at a very low price. Alternately, a replacement 8-mm. projector lens can be purchased reasonably.

Two Lafayette Radio 8-mm. movie projector zoom lenses were used in the setup shown in the photos, one for the projector image-reducing lens and the other for projecting the fiber-transmitted image on a screen. Each has an adjustable focal length of 15 to 25 mm.

Mounting the replacement lens in the projector barrel (in reversed position) takes a little ingenuity. The author used a military surplus electrical connector clamp bushed out with electrical tape.

As described before, find the best position for the end of the fiber optic element by determining where a sharp image falls with the lens in place.

Construction. A permanent setup (not absolutely necessary) was constructed by the author, and consists of a baseboard and four panels. The slide projector was mounted at one end of a 40" x 8" x 1" white pine board; a 58" long board should be substituted if the original lens is used with an extension tube. Four 6" x 8" panels of ¼" tempered Masonite were used to mount the fiber optic element, the projection lens, and the projection screen.

Using machine screws and nuts, mount two 1½" brass angle brackets on one 6" side of each Masonite panel. Cement a 5" x 7" white card to the center of the mounting bracket side of one of the panels. Using wood screws, mount this panel in the center of one end of the board as shown in the photographs. Center the modified slide projector at the other end of the board and mount it.

Adjusting the Panels. Turn on the slide projector and adjust its mounting so that it projects a beam parallel with and down the center of the base. Center one of the Masonite panels on the board in front of the slide projector lens and mark the center of the projected image. Drill a ¼" hole at exactly the same spot in each of the three remaining panels. Then install ¼" rubber grommets in two of the panels to hold the fiber optic element. Mount one of the panels 1" farther from the lens than the optimum focus point which you found earlier and mount the second panel 4" beyond the first.

Now install the fiber optic element in the grommets, and adjust it so that a sharp image from the projector falls on its end.

The Projection Lens. The mounting position of the projection lens depends on its focal length. A short-focal-length lens such as one salvaged from an 8-mm. movie camera or projector should

(*Continued on page* 117)

THE CODE BANDER

This stable "front-end" BFO makes CW and SSB sets out of marginal receivers

By HARTLAND B. SMITH, W8VVD

Despite the well-deserved popularity of c.w. and single-sideband among radio amateurs, both modes of operation—and especially sideband (SSB)—can create some annoying problems on the receiving end. They can't be copied on a receiver which lacks a beat frequency oscillator (BFO). Without some means for generating a stable local carrier (the function of a BFO), the prospective Novice finds it impossible to practice code reception, and the curious SWL has a hard time deciphering sideband QSO's. Furthermore, many inexpensive or elderly ham receivers, even when equipped with BFO's, drift so badly that the operator must constantly retune to keep from losing the desired signal.

Luckily, there is now a simple answer to these problems—an amazingly stable, simple gadget called the "Code Bander." This easily constructed receiver accessory will enable you to copy code and sideband on any receiver

THE CODE BANDER

that covers the amateur frequencies. If you're presently DX'ing with a broadcast/short-wave combination that lacks a BFO, or if you're struggling along with a simple regenerative set or a communications receiver that drifts badly, this useful little device will greatly improve your receiving capabilities.

How It Works. Unlike ordinary BFO's, the Code Bander does not operate at the receiver's intermediate frequency. Instead, it produces r.f. energy on or near the frequency of the desired station. It will turn a quacking sideband signal into easily understood AM phone, and will also supply a beat note for effective code reception. Designed for connection to the set's antenna terminals, it can be installed without tearing into your receiver's vitals.

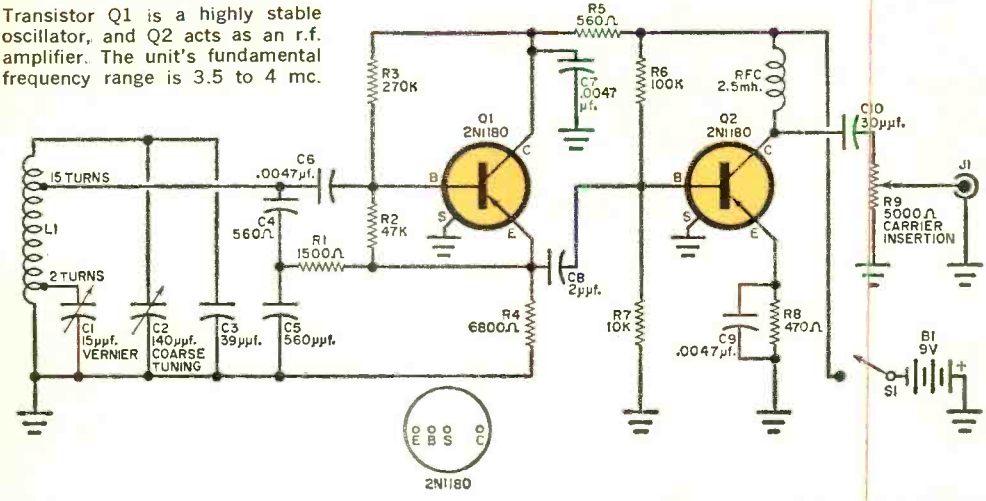
The Code Bander contains two inexpensive transistors: *Q1*, which serves as a highly stable oscillator, and *Q2*, which acts as an r.f. amplifier. The oscillator can be tuned to any frequency in the 3.5 to 4 mc. amateur band by adjusting the coarse tuning capacitor, *C2*. Vernier capacitor *C1* provides the extreme bandspread required to accurately zero on a specific signal.

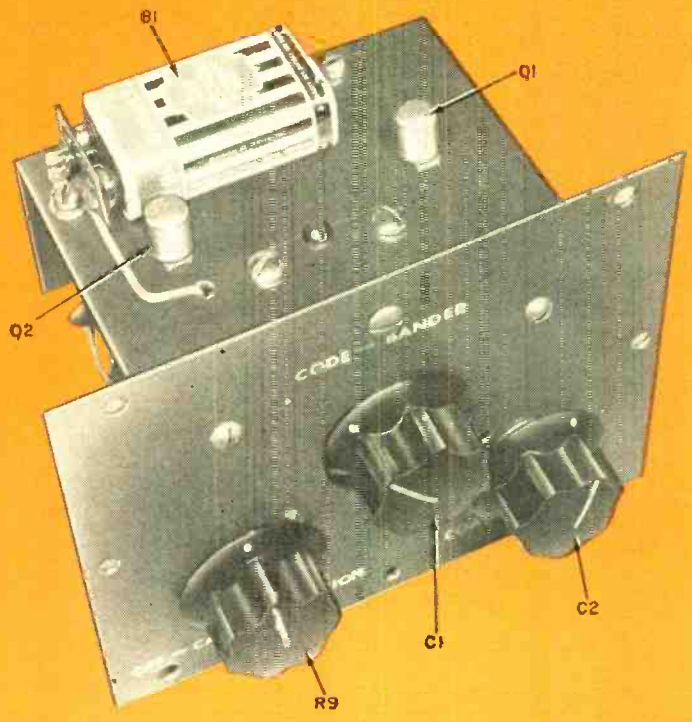
Both the fundamental and harmonics of the oscillator frequency are present at jack *J1*. Thus, the Code Bander can be used not only on 80 meters, but on 40,

PARTS LIST

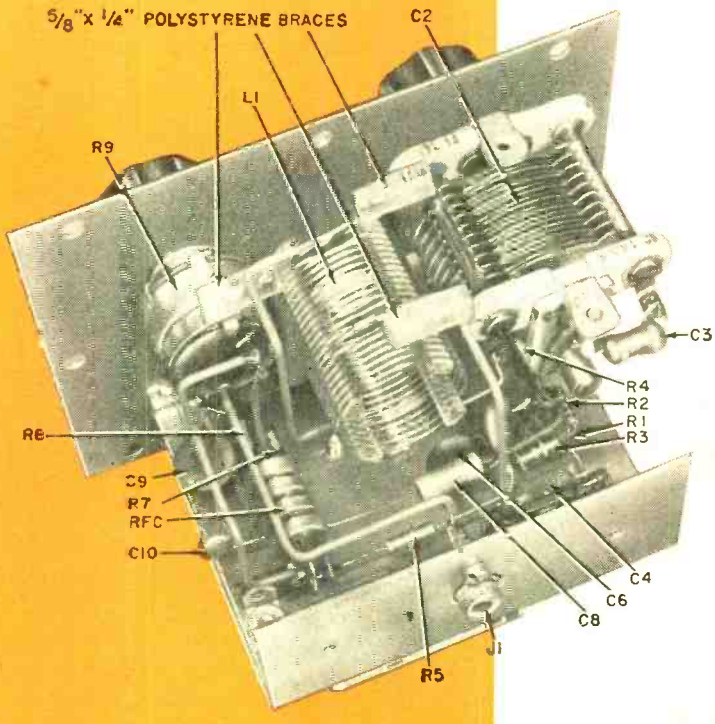
B1—9-volt transistor battery (Burgess 2U6 or equivalent)
C1—15-μμf. variable capacitor (Hammarlund HF-15-X or equivalent)
C2—140-μμf. variable capacitor (Hammarlund MC-140-S or equivalent)
C3—39-μμf. NPO ceramic capacitor (Centralab TCZ-39 or equivalent)
C4, C5—560-μμf. silver mica capacitor (Elmenco CM-20-D-561J or equivalent)
C6, C7, C9—.0047-μf. disc capacitor
C8—2-μμf. tubular ceramic capacitor (Erie CC20-CK-020C or equivalent)
C10—30-μμf disc ceramic capacitor (Centralab DD-300 or equivalent)
J1—Shielded phono jack
L1—22 turns of Barker and Williamson 3014 coil stock tapped 2 turns and 15 turns from the ground end
Q1, Q2—2N1180 transistor
R1—1500 ohms
R2—47,000 ohms
R3—270,000 ohms
R4—6800 ohms
R5—560 ohms
R6—100,000 ohms
R7—10,000 ohms
R8—470 ohms
All resistors ½-watt, 10%
R9—5000-ohm potentiometer with switch S1
RFC—2.5-mh. r.f. choke
S1—S.p.d.t. switch (part of R9)
2—Transistor sockets
1—3" x 5" x 4" aluminum utility cabinet (Bud AU-1028-H.G. or equivalent)
1—3" x 3¼" x 1½" (approx.) aluminum chassis
1—Transistor battery connector—see text
Misc.—One- and two-terminal tie strips, solder lugs, wire, hardware, knobs, etc.

Transistor Q1 is a highly stable oscillator, and Q2 acts as an r.f. amplifier. The unit's fundamental frequency range is 3.5 to 4 mc.





This top and front view of the Code Bander shows the general mechanical arrangement with the small chassis mounted to the front panel. Note that the transistors and battery are mounted on top of the chassis.



The small parts are mounted under the chassis, and tuning capacitors and insertion control to the front panel. Solid support for L1 is provided by cementing pieces of polystyrene rod in the places shown.

20, and 15 as well. Control *R9* adjusts the output so that optimum balance between the received signal and locally generated carrier can be achieved.

Oscillator stability is enhanced by tapping the base connection of *Q1* down from the top of *L1*, and by using high capacity at *C4* and *C5* to swamp out capacitance changes in *Q1*. A very low value coupling capacitor, *C8*, minimizes instability resulting from amplifier loading.

Construction. Putting the Code Bander together will be easier if you install *C1*, *C2*, *C3*, *L1*, and *R9* after wiring the other parts. A one-terminal tie strip supports the junction of *R5*, *R6*, and the r.f. choke (*RFC*). A two-terminal strip supports *C4* and one end of *C5*.

Most chassis grounds are made to solder lugs located under the nuts which hold the chassis to the front panel. Exceptions are the grounded end of *C5* which goes to the ground terminal of *J1*, and the cold ends of *L1* and *R9* which go to a lug bolted to the front panel midway between *R9* and *C1*. (The head of this bolt is visible in the top photo on page 47 behind *R9*'s knob.) Trim resistor and capacitor leads so they are just long enough to connect to the terminals.

SINGLE SIDEBAND

Single sideband (SSB) is basically a way of reducing the bandwidth an AM signal occupies, and increasing its effectiveness per watt of power radiated. A conventional AM signal has 50 percent of the power in the carrier and 25 percent in each sideband when 100 percent modulated. An SSB signal has all the radiated power in one sideband. Since a carrier of the correct frequency and amplitude is required for recovery of the modulation signal at the receiving end, it must be supplied in the receiver. The Code Bander is a low-cost device for providing this carrier to receivers lacking an adequate BFO or any BFO whatsoever for receiving both c.w. and SSB.

The connector for *B1* was salvaged from the top of a discarded 9-volt transistor battery. Solder one terminal of this connector to a ground lug and run a wire from the other terminal, through a hole in the chassis, to switch *S1* (a part of *R9*). Since the drain is less than 2 ma., the battery will last indefinitely.

Mechanical Stability. A number of precautions must be observed to insure ruggedness. Beef up the 3" x 5" x 4" aluminum utility cabinet by installing extra sheet metal screws around the edges of both front and rear panels. Most components are mounted on a small aluminum chassis which is bolted to the front panel and, after installation in the cabinet, fastened to the rear panel with two sheet metal screws.

Solid support must be provided for *L1*. Cut three ⅜" lengths of ¼"-diameter polystyrene rod and cement them between the coil and the bodies of *C2* and *R9*. These plastic braces are visible in the bottom photo on page 47.

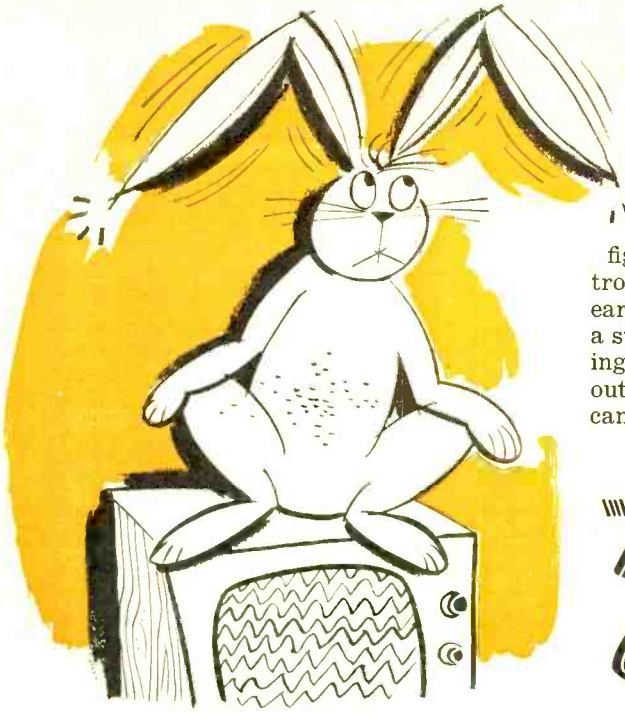
Code Bander Operation. To copy c.w., tune the receiver until you come across the familiar thump and hiss which denotes a code signal. Turn *R9* to midrange, and adjust *C2* until the Code Bander's carrier beats against the signal to produce a whistle each time code is sent. You can vary the pitch of the beat note by tuning *C1*. Finally, adjust *R9* for the best ratio between the signal and the locally generated carrier.

If *R9* is set too high, the c.w. station will be smothered. On the other hand, too low a setting of the injection control will cause the beat note to weaken or disappear entirely.

Copying Sideband. For sideband reception, tune the receiver until the incoming garbled speech is loudest. If you're using a regenerative set, turn down its regeneration to drop the detector out of oscillation. Run *C2* back and forth until the local carrier can be heard on top of the incoming signal. Slowly tune *C1* for normal sounding speech. Set *R9* just above the point where the signal tends to distort.

Although at first glance these instructions may appear complicated, once you're accustomed to operating the Code Bander, you'll find it easy to quickly tune in either a c.w. or sideband signal. If there is too much output with *R9* at minimum, connect a twisted wire gimmick in the lead to the receiver (a gimmick is two short pieces of insulated wire twisted together to form a small capacitance). The gimmick arrangement may be needed with some receivers on 80 meters.

One final tip: if *Q1* should refuse to oscillate, move the base tap on *L1* up a turn or two. —30—



In the chart on page 50 is the answer to TV's best guarded secret—the *electronically* right length for rabbit ears. Measurements to a small fraction of an inch may seem like lint-picking if you're entirely happy about the picture quality you are getting by adjusting your ears "esthetically." If, however, you're fighting to get a good picture out of a troublesome channel, exact-length rabbit ears will improve things. Measure with a steel tape or that cloth tape in the sewing basket, starting where the ears come out of the base. Small reference scratches can be made on each ear with a file so

"TV'S BEST GUARDED SECRET"

By LEWIS A. HARLOW

WHEN you took your original rabbit ears out of the box in which they came to you, it's almost certain that you did *not* find adequate instructions for their use. All of the manufacturers of rabbit ears, having built a very fine product, seem to have agreed that you must learn about it the hard way. So, they tell you nothing, or next to nothing, and your only recourse is to regard the adjustment of your ears as another of the "pleasant" mysteries of television.

Perhaps you have decided, after much experimenting, that you get best results with a long ear pointed at Chillicothe, Ohio, and a short ear pointed at the moon. Now this is all wrong—for several dull scientific reasons which can quickly be passed by. However, since the manipulation of rabbit ears is quite critical, producing either (and usually unexpectedly) a shocking improvement or degeneration in picture quality, a few helpful comments are in order.

As on the rabbit, the ears should be the same length, and if you need utmost sensitivity from your antenna, this length should be changed every time you switch channels.

that you can quickly retune them for best results on any channel.

Wide or Narrow Ears? There's a catch to the problem of adjusting rabbit ears. They do not do their best when pointed up in a wide or tight V—they should be extended out to the sides! Unfortunately, this introduces a situation which is socially impractical, and one which has an element of danger. An unsuspecting guest may back into a rabbit ear point and impale himself upon it.

What happens, you ask, when rabbit ears are turned up into a V position? How long should they be? The arithmetic for this can get very complicated because everything changes a little every time you change the angle of the V.

In general, when using rabbit ears in this unscientific position, they should be slightly longer (maybe 10 percent) than the exact figures given for horizontal ears in the chart. They should be as

widely spread as possible, and, of course, they should be the same length as one another.

Different Types of Ears. In addition to the ordinary, garden-variety rabbit ears, other types available include exact replacements for those built into portable TV sets (sold through electronics supply houses), and at least a dozen models that include a switching arrangement in addition to the basic adjustment of the ears. These switches, which perform a variety of matching and orienting functions, may have as few as three positions or as many as twelve, depending, seemingly, upon whim.

If the switch positions correspond to Channels 2-13, fine. If, however, the positions are numbered 1-12 or, as in one case, 1-9 followed by A, B, and C, the contribution of the switch is far more subtle, and the best position can be found only by "cut-and-try."

Guaranteed Method. Here is a three-step experiment that will guarantee absolute maximum performance with switches. Before starting, adjust the ears to exact length, and provide room to swing them around. It is necessary to carry out the steps in the order indicated. since you are dealing with three variables which are inter-related; if your method lacks scientific orderliness, your results will be confusing.

Step One: Set the rabbit ears selector switch to its lowest position.

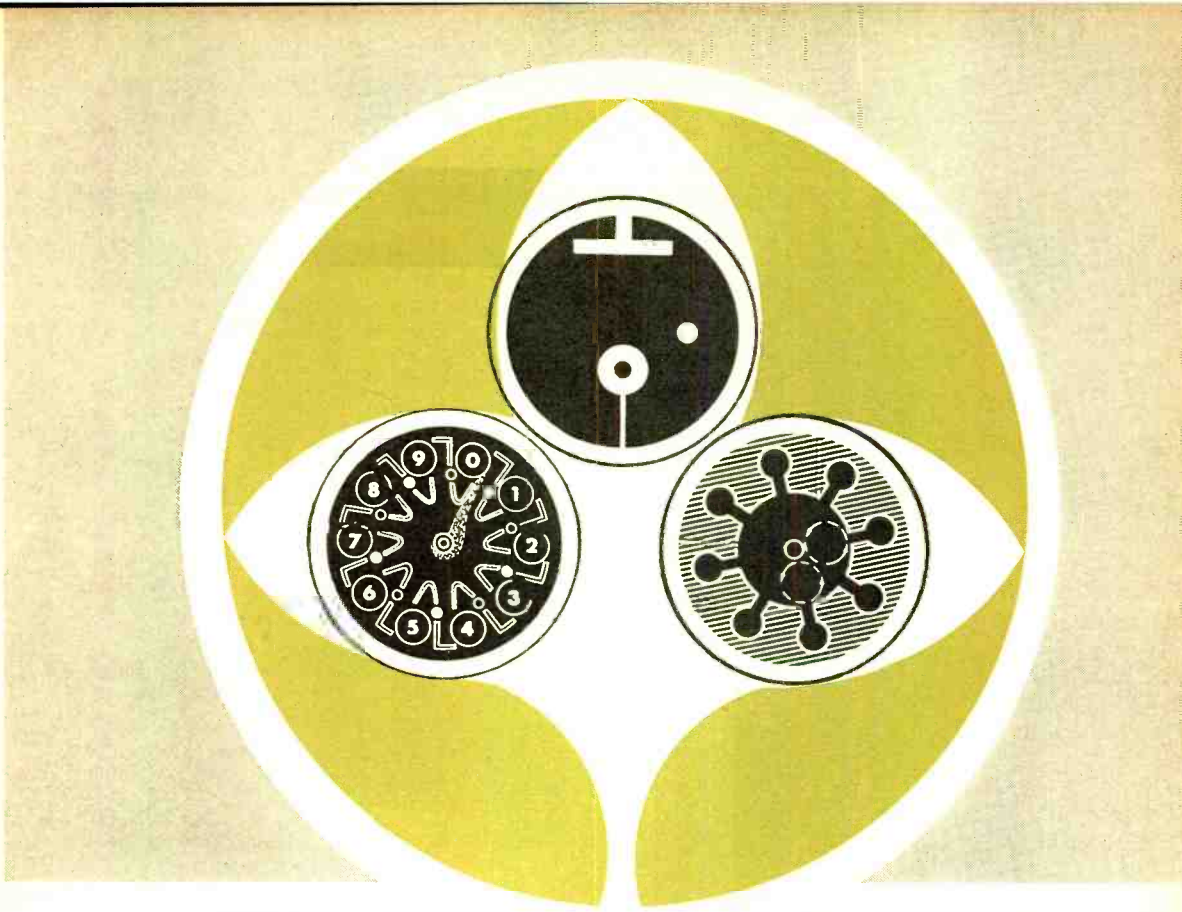
Step Two: Swing the ears in a circle to get the best picture. You are trying to do two unrelated things—strengthen the incoming signal and, secondly, eliminate "ghosts." If the main signal is strong enough so that the rabbit ears do not need to be positioned critically, the ears can then be set to reject ghosts. A compromise may be necessary.

Channel	Inches	Channel	Inches
2	50 7/8	8	15 1/2
3	45 7/8	9	15
4	41 3/4	10	14 1/2
5	36 3/8	11	14 1/8
6	33 3/4	12	13 5/8
7	16	13	13 1/4

Step Three: After obtaining the best possible results with the above steps, adjust the TV set's fine tuning control. Now move the selector switch on the rabbit ears to its next position, and repeat Steps Two and Three. And so on, *ad nauseam*.

The Rabbit Ears Test. Although rabbit ears tuning perfection is not recommended as standard practice, it is extremely useful in determining whether your present antenna and your use of it are as good as they could be. Rabbit ears can serve as a standard against which other antennas may be compared. By quickly connecting a pair of ears, you can determine if your roof antenna is pulling in a good signal or if it, or the TV lead-in, is defective.

Yours for the better picture. —30—



THE TUBE FAMILY TREE

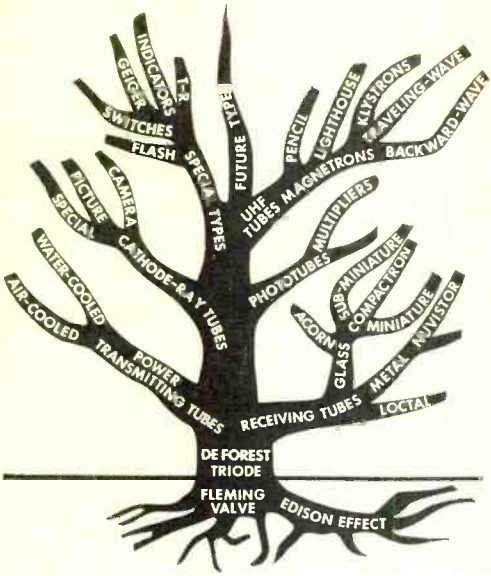
PART 3

By LOUIS E. GARNER, Jr.

Tubes amplify weak signals, but they also do many other vital electronic jobs, as this final Part shows

WHAT ABOUT THE FUTURE of the vacuum tube? Will designers continue to develop tubes based on new principles, and improve tubes employing already-known ones? The answer to this question is probably "yes," and a good look at the types discussed in this final portion of the tube "family tree" should convince anyone that the end is certainly not in sight. The family history of the cathode-ray tube alone ably illustrates how present-day tubes are built on past developments and discoveries. The first ancestor of the CRT was in actual operation in 1897, nine years before De Forest's triode put amplification into the hands of electronic researchers. Even so, practical television had to await development of more sophisticated CRT's, and particularly that much more unprecedented invention, the camera tube.

THE TUBE FAMILY TREE



Camera Tubes. Used in television cameras, these tubes produce a video signal corresponding to the light image of a picture or scene which is to be televised, recorded on tape, or transmitted over a wired installation. In general, camera tubes consist of an electron gun assembly, a means for deflecting the electron beam in a regular pattern, and a photosensitive *target* assembly of some type which can convert light patterns into electrical charges or signals when struck by the electron beam. The electron guns and deflection techniques used with camera tubes are basically like those used with display-type CRT's.

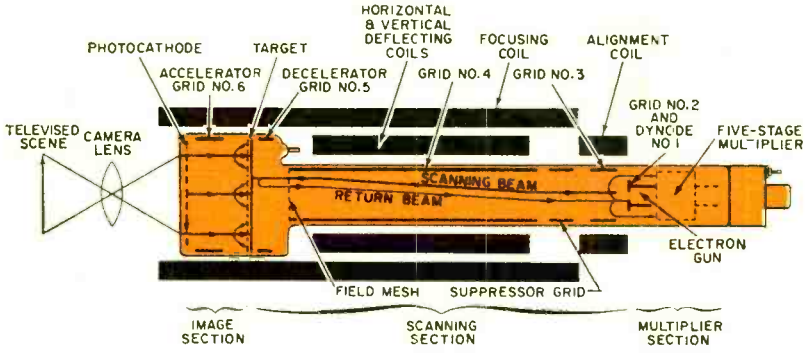
The *iconoscope* was, for a number of years, the most practical type of camera tube. The heart of this device is a sensitized target on which the scene to be televised is focused by a lens system. The target is of sandwich-like construction and consists of a conductive coating or *signal plate,* a layer of insulation, usually mica, and a mosaic pattern of tiny photoemissive globules. Each globule acts somewhat like a miniature photocell.

When light strikes a globule, it emits electrons to a greater or lesser extent depending on the intensity of the light. These electrons are picked up by a collector ring in front of the *photo-mosaic,* leaving a greater or lesser positive charge on each globule. The globules and the insulated signal plate behind them thus act as a capacitor. As the beam from the iconoscope's electron gun strikes each globule, it restores the electrons lost by photoemission, and, in effect, discharges the capacitor, developing an output signal at the signal plate. The signal corresponds to the image of the scene being televised.

The Image Orthicon. Today, the most sensitive and widely used type of camera tube is the *image orthicon.* It is made up of three principal parts: an image section; a scanning section; and an electron multiplier. The image section of the tube contains a semitransparent photocathode on the inside of the glass faceplate, an accelerating grid (No. 6), and a target which consists of a thin glass disc with a fine mesh collector screen positioned very close to it on the photocathode (front) side. Focusing is accomplished by means of a magnetic field produced by an external coil and by the proper selection of photocathode and accelerating grid voltages.

In operation, the scene to be televised is focused on the photocathode, which emits electrons proportional to the intensity of the light striking each of its areas. The electron streams are focused on the target and cause secondary electrons to be emitted by the glass disc. These secondary electrons are collected by the adjacent wire mesh, leaving the photocathode side of the disc with a pattern of positive charges corresponding exactly to the image being televised. Since the glass is quite thin, a similar charge pattern is set up on its opposite side.

The glass is scanned by a low-velocity electron beam produced by an electron gun and deflected by external electromagnetic coils. This beam is made to decelerate and to approach the glass vertically at essentially zero velocity by the potentials applied to the decelerator grid (No. 5) and the field mesh. Some of the electrons are deposited on the glass to neutralize its positive charge while others are repelled to form a return beam. The return electron beam, then, is *modulated* by the positive



The image orthicon is one of the most complex, precise vacuum tubes in common use.

charge pattern on the target and hence in accordance with the original light image.

On coming back to the electron gun area, the return beam passes through a five-stage electron multiplier similar to that employed in photomultiplier tubes, developing an output video signal. The dynodes in the multiplier section may amplify the modulated beam by 500 times or more, with the result that the image orthicon is basically more sensitive than the human eye in picking up faint light images.

The *monoscope* is a special type of camera tube. Its basic principle of operation is similar to that of other CRT's, for it incorporates essentially the same type of electron gun and deflection systems. However, it is fitted with a permanently installed *fixed* pattern—such as a TV test pattern—and develops only a repetitive video signal.

Special CRT's. In addition to the cathode-ray tubes we've discussed, there are a number of special types which depend on electron beams for their operation. Among these are a variety of discharge and demonstration tubes used for classroom study and laboratory experiments, but by far the most common type is the X-ray tube.

The basic X-ray tube consists of two principal electrodes: an electron source (cathode), and a target anode. The anode is of dense metal and set at an angle with respect to the electron source. In operation, extremely high voltages are applied to the two electrodes, accelerating the electron stream to tremendous velocities. On striking the target anode, the electron beam excites the metal atoms, causing them to emit ultrashort electromagnetic radiation—X rays. Since the target is set at an angle, the X rays are radiated out through the side of the tube's glass envelope, where they can be photographed and used to trace in outline the interior make-up of solid matter.

UHF Tubes. Conventional receiving and transmitting electron tubes cannot be used effectively at ultra-high and super-high radio frequencies, that is, from five hundred to tens of thousands of *megacycles*. At these frequencies, short lead lengths begin to have considerable inductive reactance and act like coils or even r.f. chokes. minute interelectrode capacities become short circuits, and even the time required for an electron to move from a cathode to a plate may represent several cycles of the frequency to be handled. When even higher frequencies are considered, familiar tuned circuits cannot be used and are replaced by *resonant cavities*—essentially hollow, metal-enclosed spaces which behave like tuned circuits.

Tube manufacturers have designed a number of special tubes for use at extremely high frequencies. In general, these tubes have close electrode spacing to reduce electron transit time and, often, disc-shaped electrodes to reduce terminal lead inductance. Interelectrode capacities are minimized by keeping electrode supports small and shaping them for maximum spacing with respect to other tube elements. Due to their construction, many UHF tubes take on strange and unusual shapes, and are often named after their physical appearance. Thus, one firm may offer long,

THE TUBE FAMILY TREE

slim "pencil" tubes, while others produce stepped tower-like "light-house" tubes, and so on. Quite frequently, the tubes are manufactured with resonant cavities as an integral part of their structure.

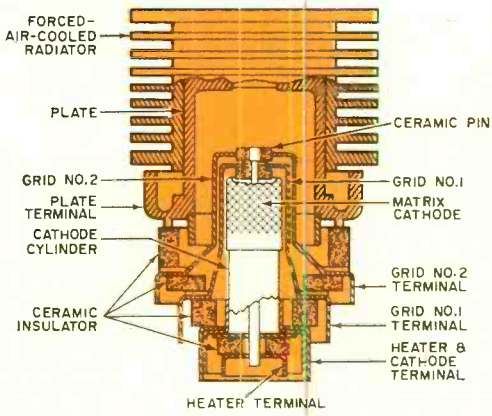
One pencil-type triode oscillator tube, the RCA 7533, is made with two built-in resonant cavities, one between grid and cathode and another between grid and plate. The tube looks very much like a small can. Designed for use as an oscillator in the 1660-1700 mc. band, the 7533 has a plate dissipation rating of 3.6 watts and can deliver approximately 500 milliwatts.

Another interesting UHF tube is the RCA 7457, a beam power type which can be used at frequencies up to 2000 mc. With a maximum plate dissipation rating of 115 watts, it can handle input powers as high as 180 watts up to 1215 mc. Used as a class C amplifier with 900 volts on its plate, it can deliver approximately 40 watts at 1215 mc. It is designed for forced-air cooling and has a built-in finned radiator. In general, the 7457 is used with external cavities, coaxial-cylinder, or parallel line circuits.

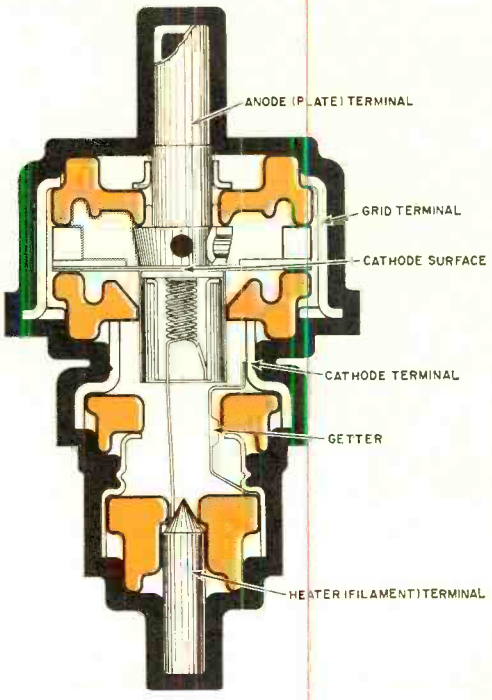
The GE GL-6299 is a co-planar triode suitable for use as an amplifier at frequencies as high as 3000 mc. Designed for use in receivers, it has an extremely low noise rating. As a rule, it is used with external cavities or coaxial circuits. Of ceramic construction, the GL-6299 generally resembles the "light-house" tube of a few years ago.

The UHF tubes we've just examined, as well as many similar types, operate on the same principles as more conventional electron tubes, except for their frequency of operation and the types of tuned circuits with which they are used. In addition, however, there is a group of high-frequency tubes which operate on entirely different principles: *magnetrons, klystrons, traveling-wave tubes,* and related types. We'll examine these next.

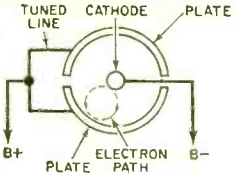
The Magnetron. Although used extensively since World War II as high-power oscillators in radar transmitters and other types of ultra-high frequency equipment, the *magnetron* is basically a diode. In its common form, it consists



The light-house design raises the upper frequency limit for conventional negative-grid vacuum-tube amplifiers.



High transconductance, close element spacing, and very low lead inductance are the design factors responsible for the good performance of the light-house tube at frequencies up to 3000 mc.



Magnetron operation depends upon interaction between the electron stream and a strong, constant magnetic field.

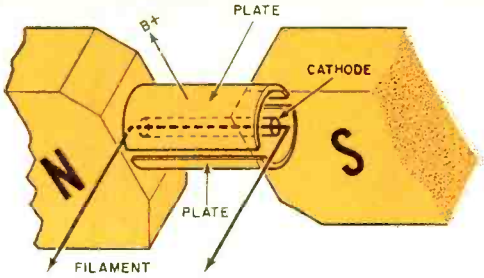
of a coaxial cathode and a circular anode (or plate) which may, or may not, be split into two or more segments. This assembly is placed between the poles of a powerful permanent or electromagnet and aligned so that the magnetic field is coaxial with the cathode and plate.

In operation, a high positive voltage is applied to the magnetron's plate. If it were not for the magnetic field, the electrons emitted by the cathode would travel in a straight, radial line directly to the plate. The magnetic field, however, forces the electrons to travel in a spiral or circular path; and if the field is made strong enough, most of the electrons swing in complete circles, returning to the cathode. These high-speed electrons, whizzing by the plate structure, induce high-frequency currents. To obtain oscillation, then, a proper balance between anode voltage and magnetic field strength is needed, for the *electron resonance* must approximate that of the resonant cavity formed by the plate structure.

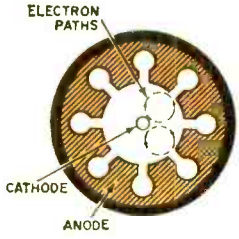
A split-anode magnetron can be made to oscillate at frequencies much below the natural electron resonant frequency by connecting the segments to a tuned circuit, such as a tuned line. In higher frequency types, the tuned circuit may be little more than a heavy bar of metal connecting the segments together to form a simple closed loop. Split-anode magnetrons need not be limited to two segments; four, six, eight, or more segments may be used.

A different type of magnetron employs a solid anode in which small resonant cavities have been formed. The high-speed electrons moving past the cavity openings shock the cavities into oscillation. The action is somewhat analogous to what happens when a person blows sharply across the open end of a small closed tube to produce a whistle.

Commercially available magnetrons



For efficient magnetron operation, a definite relationship between plate voltage and magnetic field strength in the interaction space must always be maintained.



The multi-cavity magnetron has advantages that are important in practical radar applications.

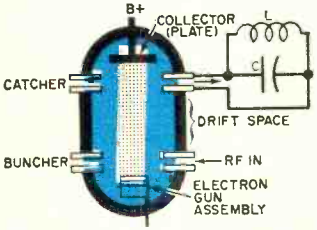
operate at frequencies from a few hundred to as high as 30,000 mc. and can deliver peak output powers ranging up to 2000 kw. (*2 megawatts!*) when used as pulse generators, or hundreds of watts when used as c.w. sources.

The Klystron. In one sense a special type of cathode-ray tube, for it utilizes an electron gun and a stream of electrons for its operation, the *klystron* can be used as an ultra-high frequency oscillator or amplifier. When first invented, the device was originally dubbed a *rhumbatron,* for the electrons were said to be made to "dance the rhumba" within the tube, since they were *velocity-modulated.*

The components of the basic klystron tube include an electron gun assembly, a pair of closely spaced grids called a "buncher," another pair of grids called a "catcher," and an anode or plate called, in this case, a "collector," since it receives the electron stream sent down the tube by the gun assembly. There is a narrow "drift space" between the buncher and catcher grid assemblies.

In operation, the electron beam is aimed down the tube by the electron gun, and an r.f. voltage is applied to the buncher grid. As the electrons approach the buncher and pass through it, they

THE TUBE FAMILY TREE

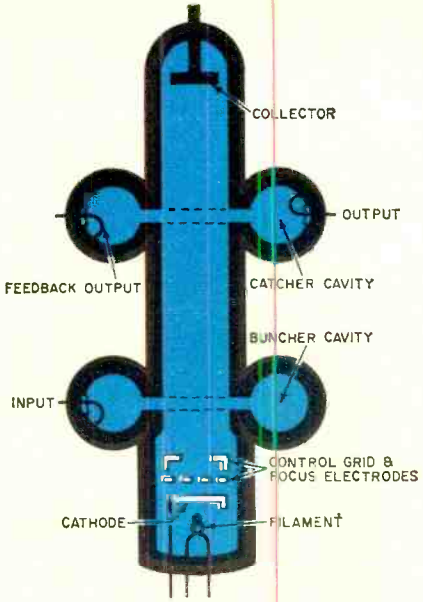


Bunching of groups of electrons as they move through tube is the basic principle of the klystron.

are alternately slowed and speeded up, that is, velocity-modulated. To visualize how this occurs, consider that the first buncher grid is momentarily negative and the second positive. Those electrons which are approaching the first grid are repelled and slowed down. Those which are between the first and second grids are repelled by the first and attracted to the second and hence speeded up. Those which have passed the second grid are attracted "backwards" and hence slowed down. On the next r.f. half-cycle, when the first grid is positive and the second negative, the action is reversed.

Thus, the net result is that the electron stream is separated into tiny bunches corresponding to the applied r.f. frequency. As the velocity-modulated stream moves along the drift space, the faster moving electrons in each bunch (or bundle, if you prefer) overtake the slower moving ones and the bunch, in one sense, becomes "stronger," for a greater number of electrons are compacted together. When these bunches pass the catcher grid assembly, they give up most of their energy, shock-exciting the tuned circuit into oscillation. Afterwards, the spent electrons are accumulated by the positive-charged collector.

In practice, klystrons are operated at such high frequencies that resonant cavities, rather than conventional tuned circuits, are used to tune the buncher and catcher grids. The electron stream is generally focused by a strong permanent magnet or electromagnet placed on the outside of the tube. A *tunable* klystron can be assembled by using a bellows-like arrangement for the cavities, permitting



Klystron plate voltage must be accurate and have good regulation for efficiency.

the cavity size to be reduced (to increase frequency) or expanded (to reduce frequency).

Since the output signal is much greater than the input signal applied to the buncher, due to the electron concentration which takes place in the drift space, the klystron may be used as an amplifier. It can also be used as an oscillator by coupling the catcher cavity back to the buncher.

While the two-cavity klystron is basic, it is not the only type produced. A single-cavity type, called a *reflex klystron,* uses the same cavity as both a buncher and catcher; here, a negative voltage is applied to the collector, repelling the electron stream back on itself so that it passes the double-grid assembly both "coming" and "going." More recently, a three-cavity electrostatically focused klystron has been developed.

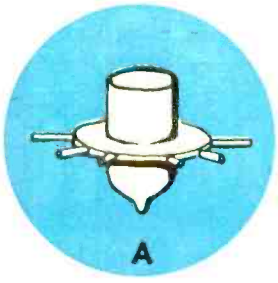
Commercially available klystrons operate at frequencies from a few hundred to over 120,000 mc. (120 gigacycles), delivering output powers from less than a milliwatt (for receiver applications) to many watts (for transmitters).

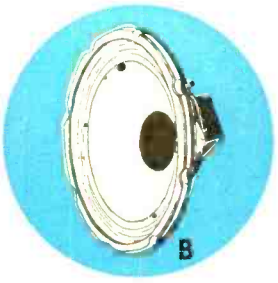
Traveling-Wave Tubes. Utilizing some of the basic operating principles of both magnetrons and klystrons, *traveling-*

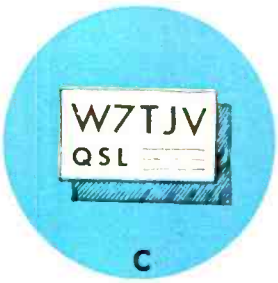
(*Continued on page* 110)

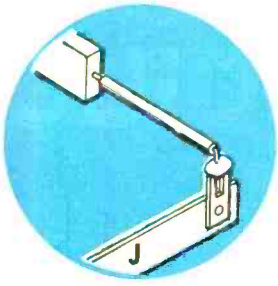
ELECTRONIC MENU QUIZ

By ROBERT P. BALIN

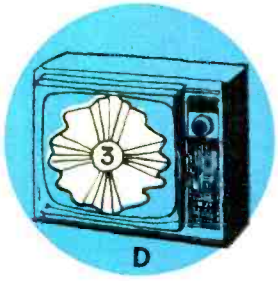


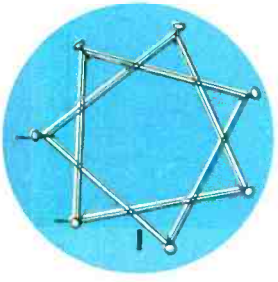


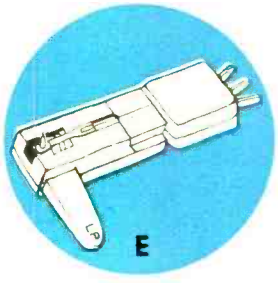


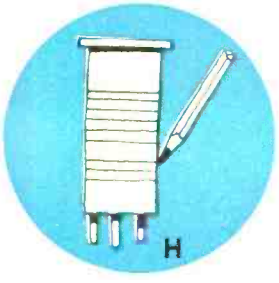


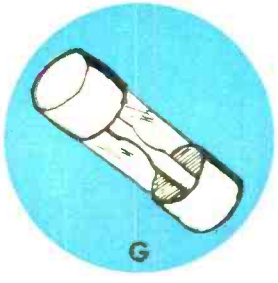
Many of the nicknames most technicians use for electronic parts, effects, or methods, are also names of common foodstuffs, such as those on the electronic menu below. Of course, any resemblance is purely a visual one! Nevertheless, see if you can match the electronic dishes (1-10) with the corresponding sketches (A-L).

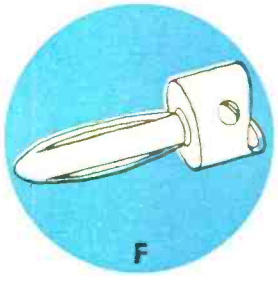










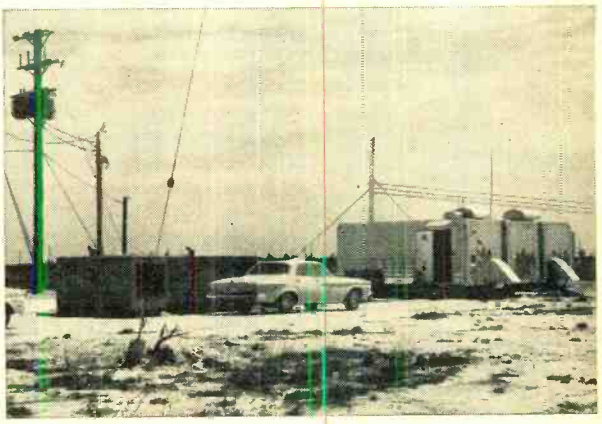


(*Answers on page* 108)

1 Spaghetti_____ 2 Ham_____ 3 Link_____ 4 Acorn____ 5 Prune____

6 Banana_____ 7 Honey____ 8 Pie_____ 9 Cone_____ 10 Salt____

RADIO MARATHON BROADCASTS



Three trailers—one housing the operations room and the others a 50-kw. transmitter—mark the site of Radio Marathon just 100 miles from Cuban coast.

IT IS 0545 local time on Sombrero Isle, one of the small Florida keys. The sun, which is just rising above the ocean horizon, is a cool red, and glints dimly on the hood of the small car that slowly scrabbles along a rough coral road that winds near the water's edge. The car stops in a swirl of coral dust at a chain blocking the road. A sign suspended from the chain warns: KEEP OUT! U.S. GOVERNMENT PROPERTY. The driver leaves the car motor running while he gets out and unlocks

TRUTH TO CUBA!

Three towers (one is shown above with its transmission line) are used in the highly directional Radio Marathon antenna array. Signal in U.S. is weak.

A way had to be found to get through. This is the story of the unusual radio station that's doing it

By WILLIAM I. ORR

the chain barrier. Returning to his car, he carefully drives down the dusty, windswept road and draws to a halt in front of a group of three large trailers elevated off their wheels in the sandy soil at the roadside. Ahead of him and to the side is the ocean, normally a bright blue, but now a dull red from the increasing glare of the early sun. Outlined against the sky are three huge steel antenna towers, forming a line to the south like accusing fingers . . .

Now inside the first trailer, the man snaps on the lights and busies himself with the intricate electronic apparatus. He is adjusting a huge, portable radio transmitter, cleverly built into the two adjoining trailers. The transmitter is in stand-by condition, the mercury rectifiers humming a 120-cycle tune. Within a few moments the carrier is on the air, and at 1100 hours GMT, the powerful radio transmitter springs to life, transmitting across 100 miles of ocean a program to the island of Cuba that originates a thousand miles away in Washington, D.C.

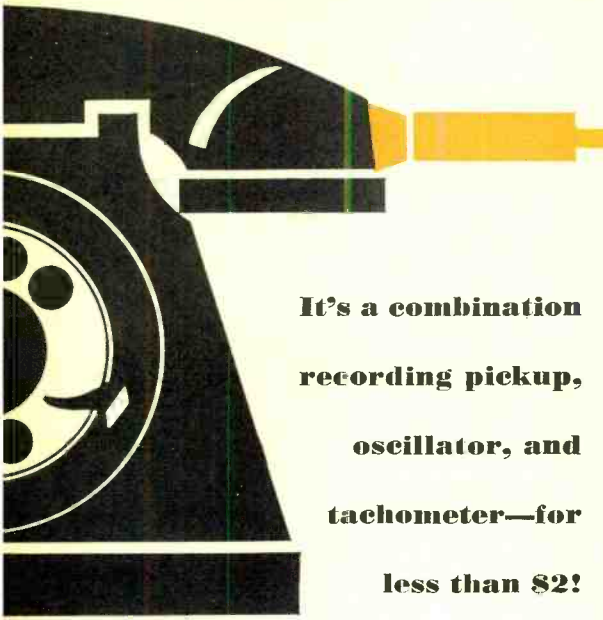
"This is the *Voice of America* station at Marathon, Florida. The following program is in the Spanish language . . ."

Birth of "Radio Marathon." Shortly after the U.S. blockade of Cuban waters and the subsequent removal of Soviet offensive missiles from that island, it was decided at the highest level in the United States Government that the whole story of the Soviet subversion of Cuba should be presented to the Cuban peoples in the Spanish language, and in depth. This task was assigned to the U.S. Information Agency, to be carried out by the facilities of the *Voice of America.*

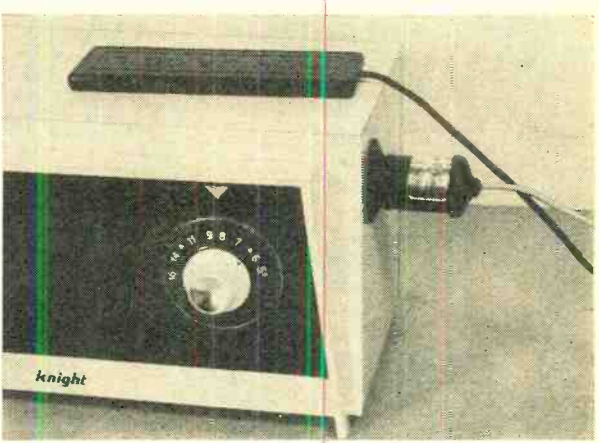
The existing powerful short-wave transmitters of the far-flung *VOA* network did not adequately cover Cuba, mainly because of the close proximity of that island to the United States. The usual short-wave broadcast channels in use by the *VOA,* intended for long distance communication with far-off lands, did not offer maximum reliability in an all-out communication effort aimed at a point only 100 miles off the Florida coast. Therefore, the "Voice" engineers decided that an operation of this nature called for a clear-channel transmitter

(*Continued on page* 125)

PICKUP



It's a combination recording pickup, oscillator, and tachometer—for less than $2!



Two types of pickups are shown above. To couple to a radio, simply place a pickup in the strong inductive field of the speaker or the audio output transformer.

ONE OF THE MOST fascinating and useful electronic gadgets in existence consists, quite simply, of several thousand turns of fine wire enclosed in a small plastic shell. Its price is low—under $2. What is this miracle item? As the illustrations reveal, it's the telephone pickup.

This flexible pickup can be used to make "clean" tape recordings from your radio or phonograph without any wiring changes or other alterations, to construct an inexpensive meter-readout tachometer, or an audible code-practice oscillator.

Two types of pickups are shown in the photographs—one is the flat, rectangular type which can be placed on top of a unit or under a telephone (Lafayette Radio MS-16 at $1.95 is one of these). The other kind of pickup is in the form of a small cylinder with a suction cup attached to one end (Allied Radio 59R047 at $1.50).

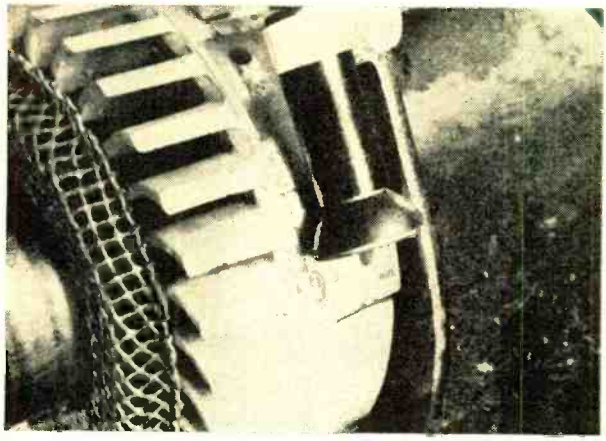
Basic Uses. When a pickup is mounted on the receiver end of a telephone handset (or, if it's the flat type, placed underneath), it picks up the telephone signals by induction. The output of the pickup depends on the strength of the inductive field it is in, and is quite low when used to pick up telephone conversations. However, almost any amplifier or tape recorder has sufficient gain to produce a good output. (Be sure to check federal, state, and telephone company regulations before *recording* telephone conversations; in many cases, it is illegal.)

The impedance of the pickup is several thousand ohms, and it can be connected directly to a hi-fi amplifier or simple transistor amplifier for group listening to long-distance family calls or business "conference" calls. The Lafayette Radio PK-543 transistor amplifier ($4.95) will provide sufficient gain with the pickup (100 mw.) to drive a speaker. If you have a tape recorder with a "monitor" function, it can also be used.

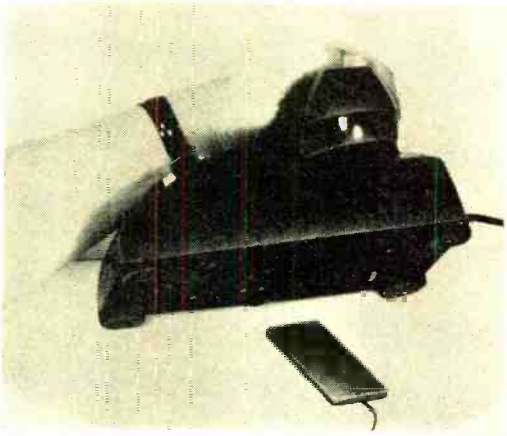
Tape Recording Techniques. Since the pickup is really nothing more than an "inductive sensor," why not use it to "sense" the inductive field of a speaker coil? This is very easy to do: The speaker field is so strong that it's not even necessary for the pickup to be in close proximity—the speaker grille of a radio or phonograph is usually close enough.

PRANKS

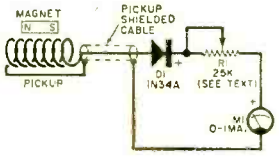
By Fred Blechman, K6UGT



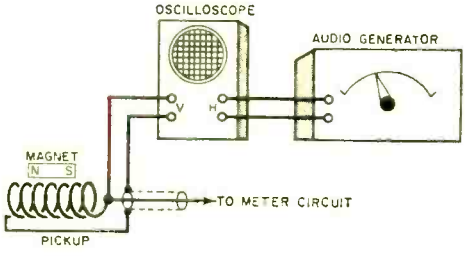
A tachometer based on a pickup is easy to construct following the information in the text. Either the relative or—with calibration—actual rpm can be read.



Flat type pickups can be placed under a telephone as above. By connecting the pickup to an amplifier, you can monitor family, business conference calls.



A circuit for reading relative rpm is shown at the left. A signal is picked up from rotating magnets on the engine or the motor.



A pickup tachometer can be calibrated with an oscilloscope and audio generator. With a bit of work, a meter scale can be drawn which shows actual rpm.

Just place the pickup against the speaker grille, plug the cable into the microphone jack of the recorder, and adjust speaker and recorder volume as desired. Unlike a microphone, the pickup will not record speaker distortion and room noise; this setup also allows you to monitor while recording.

The "Induc-Tach." It is very often desirable to know the speed of a motor or engine. "Go-Kart," quarter-midget racer, and hot-rod competitors, for example, need a means of determining whether a given engine modification results in higher engine speed or acceleration. The pickup, especially with magneto-operated engines, provides a simple, inexpensive way to read relative engine rpm, and, with a little extra trouble, can be calibrated to read actual rpm.

The photo above shows a pickup attached to a lawn mower magneto engine in such a position that the magnets on the flywheel pass by the pickup on each revolution. Relative rpm can be read by connecting a diode rectifier, potentiometer, and 0-1 ma. meter as shown in the schematic. The reading will depend on meter sensitivity, magnet strength, pickup proximity and orientation, rpm, and the value of the potentiometer (*R1*).

For slow speeds and small magnets, *R1* may not be needed. If required, *R1* should be adjusted to full scale at maximum rpm; it can be replaced with a fixed, ½-watt resistor if desired.

For spark engines or motors, it is necessary to place a magnet on the shaft

(*Continued on page* 113)

LAMP TOPS RADIO

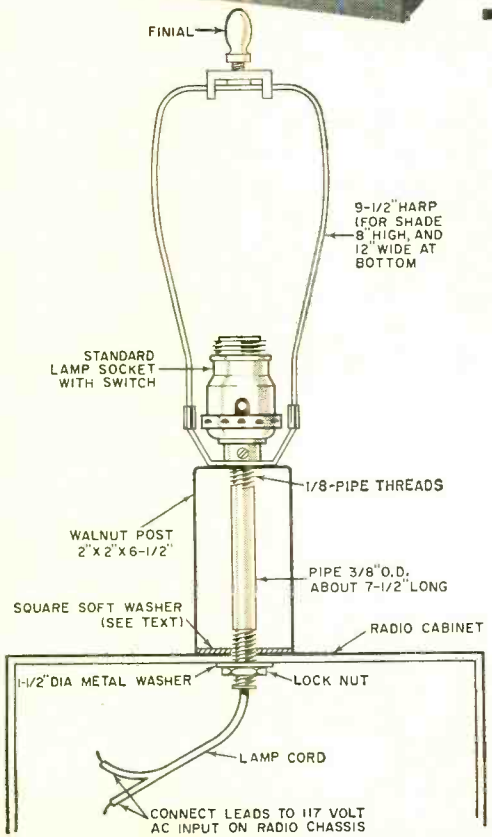
THIS IDEA can best be called a "space saver." It all started when I began to wonder why an AM radio and a bedside lamp *both* had to take up valuable space on a night table. Wasn't there some way they could be combined without destroying the usefulness of either object?

The answer turned out to be quite simple, as the photo shows. I took a 6½" length of a square walnut wood post that I had lying around my workshop, drilled a hole through the center, and pushed a threaded brass rod into the hole so that portions of it extended from either end. (This brass tubing—cut to certain lengths and already threaded—is available from practically any electrical supply house, and at a very reasonable price.) Then I cut a square of "Non-Skid" (an "under-the-rug" rubbery material) for use as a "washer" between the bottom of the post and the top of the plastic radio cabinet.

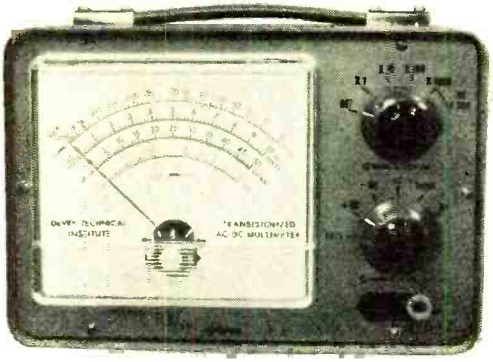
Before you "top" your radio with a lamp, check the thickness of the cabinet. If it's quite thin, it might be advisable to put a piece of Masonite under the metal washer inside the cabinet. This will relieve the strain on the cabinet in case someone should bump into the lamp.

The lamp is wired to the a.c. input of the radio and controlled by its own on/off switch. To eliminate a possible shock hazard, there should be no contact between the "harp" of the lamp and the radio chassis.

—*Art Trauffer*



Drill a hole through a wood post to hold the lamp the desired distance above the radio cabinet. Buy the brass pipe first, since every length may not be stocked at your local electrical supply house. The pipe is already threaded to fit the lamp socket, so you will only need one extra nut and metal washer.



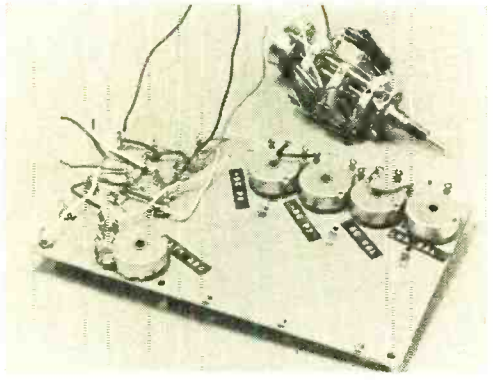
Transistorized VTVM KIT

Something new in a "vacuum-tube" voltmeter—battery operation permits complete freedom from power cord connection to 117 volts a.c.

A NEW instrument, which combines the sensitivity of a VTVM with the operational advantages of a conventional VOM, has been introduced by the Product Research Division of DeVry Technical Institute (4141 Belmont Ave., Chicago 41, Ill.). Known as a TRVM (transistorized voltmeter), the unit features compact size, complete portability and freedom from 117-volt a.c. lines, and an input resistance close to 10 megohms. Weighing only 4½ pounds, the TRVM is small (7¾" x 5½" x 4½") and will operate from its self-contained battery pack up to 1000 hours.

When used as an a.c. voltmeter, the TRVM has a response within 1.5 db from 10 cycles to 500 kilocycles. The a.c. ranges include 0-5, 0-50, 0-500, and 0-1000 volts; d.c. full-scale ranges are 1, 10, 100, and 1000 volts. Current-measuring (d.c.) capabilities are 0-50, 0-500, 0-5000, and 0-50,000 *microamperes*. External accessory shunts permit full-scale current readings of 500 milliamperes and 5 amperes.

On the a.c. voltage scale the input impedance is 650,000 ohms (5-volt scale) and 2.0 megohms (all other scales).

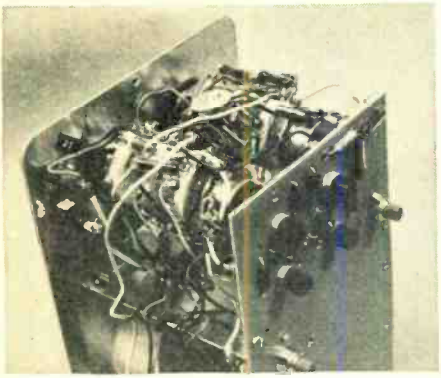


In wiring kit, the transistor mounting board comes first, then the Range and Battery Off switches.

The d.c. input resistance is about 10 megohms on all scales except the 1-volt range where it is 920,000 ohms.

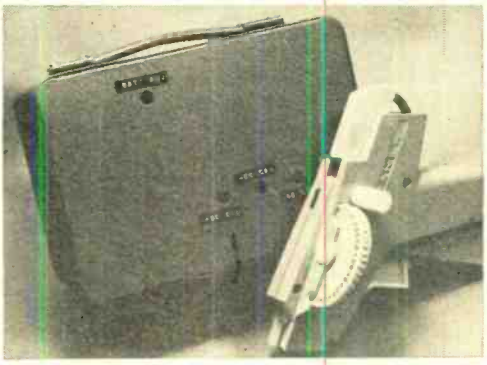
As an ohmmeter, the TRVM has ranges of 0-10,000 and 0-100,000 ohms, and 0-1 megohm and 0-10 megohms.

The Circuit. The TRVM has a unique circuit that provides burn-out protection for the meter movement. High-quality silicon transistors are used in a temperature-compensated differential



Although this behind-the-panel view makes the TRVM look like a hodgepodge, the kit goes together smoothly, with no problems.

If you have a Dymo tape imprinter, you can put it to work keeping track of the rear panel calibration adjustment holes.



The small size of the DeVry TRVM can be realized by comparing it with an ordinary wrist watch. Test lead input jacks are mounted just below the Function and Zero Adjust knobs.

amplifier arrangement. Each "side" of the amplifier utilizes two transistors—a common-emitter stage direct-coupled to, and driving, an emitter-follower. Adequate inverse feedback insures stable operation and good frequency response. Precision resistors are used in the voltage divider and calibration networks.

Kit or Wired. The TRVM is sold completely wired and tested for $89.50, but those who like to build equipment can save themselves $25.00 by investing in the kit version at $64.50. Two manuals accompany the kit: a carefully detailed "Assembly Manual," and a very useful "Operational Manual."

The kit is easily assembled in about six hours. Calibration is particularly important, and the builder should expect to spend at least an hour double-checking each step in the calibration procedure to insure accuracy. A TRVM built in the POPULAR ELECTRONICS lab was assembled in 5¼ hours while 45 minutes were spent in calibration. Its accuracy was comparable to a factory-wired VTVM selling at the kit price.

Applications. From the experimenter's viewpoint, the TRVM is ideal for general bench and service work. The meter is large, while the instrument itself is remarkably small. Complete freedom from 117-volt a.c. lines means operation in field, including on-the-spot tests of mobile radio equipment (CB or ham); shipboard installations, including marine radios, depth finders, etc.; and ordinary AM and FM auto radios.

Ease of operation is assured by only four front panel controls. The "Ohms Adjust" is coaxially mounted with the "Range" switch. The "Zero Adjust" control is coaxially mounted with the "Function" switch. A single pair of color-coded leads is used for all measurements, permitting switching of mode of operation with an absolute minimum of bother.

If you're thinking of replacing that VOM, or looking for a portable VTVM, the DeVry TRVM is worthy of your serious consideration. —30—

CB EQUIPMENT BUYER'S GUIDE

SEVERAL years ago, POPULAR ELECTRONICS' Editors decided to devote a part of each August issue to a directory of CB equipment. Throughout the intervening years, it has been fascinating to watch the rapid succession of technical improvement in CB gear. Despite the criticism leveled at CB today (sour grapes variety), its radio gear is somewhat more advanced technically than that of most other communications services. Since our last directory was published, great strides have been made in the use of selective calling, double-sideband with reduced carrier, and even single-sideband suppressed carrier. Receiver selectivity is being improved and antennas are more efficient. Cost has been held down and in some areas slightly reduced. In the following pages is a product-by-product listing of every item of interest to a CB'er—we hope you find it of value.

CB DIRECTORY

TRANSMITTERS AND TRANSCEIVERS

Equipment that may be licensed under Part 19 of the Federal Communications Commission's Rules and Regulations (more than 100 milliwatts input, but less than 5 watts input)

ALLIED RADIO CORPORATION

100 N. Western Ave., Chicago 80, Ill.

Model C-22 (Knight-Kit) $69.95 (kit, less crystals)

5-channel, crystal-controlled transmit and receive plus tunable receiver; universal power supply (117- and 12-volt); 9-tube performance superhet (no r.f. stage, 2 1650-kc. i.f. stages); series noise limiter; adjustable squelch; ceramic mike; pi-network output; 10¾ x 10½ x 4½; 12 lb.; available with only 117-volt power supply for $64.95; numerous accessories available.

Model KG-4000 (Knight-Kit) $59.95 (kit)

1-channel, crystal-controlled transmit and receive; 1-watt input; transistorized (9 transistors and 3 diodes); battery operated with 8 easily obtainable "C" cells (or rechargeable substitutions); superhet receiver (1 r.f. and 2 455-kc. i.f. stages); noise limiter; adjustable squelch; receiver has 'Local-Distance' switching to adjust sensitivity; 10⅜ x 3⅜ x 4½; about 1¾ lb. Accessories: additional plug-in crystals and rechargeable batteries.

Knight KN-2550 $99.95

6-channel; crystal-controlled transmit and receive plus panel-mounted crystal socket for extra transmit channel plus tunable receiver; 117-volt power supply; 10-tube performance superhet with 3 i.f. stages; Nuvistor r.f. stage; series noise limiter; adjustable squelch; ceramic mike; no relays—electronic switching; combination S-meter and output indicator; 5 x 11½ x 6⅝; 14 lb.; mobile 12- or 6-volt power supplies available for $11.95 (each).

KN-2550

Knight KN-2560 (not illustrated) $219.95

23-channel, crystal-controlled (frequency synthesis) transmit and receive; universal power supply (either 117- and 12-volt, or 117- and 6-volt); double-conversion superhet with crystal filter to achieve maximum selectivity; adjustable squelch; noise limiter; noise cancelling ceramic mike; transmitter is double-sideband with reduced carrier radiating equivalent of 10 watts PEP (peak-envelope-power); S-meter and switching to read voltage and current to final amplifier in transmitter; 5½ x 11½ x 9¾; 15 lb.

APELCO COMPANY

213 E. Grand Ave., So. San Francisco, Calif.

Model AR-10 $219.50

10-channel, crystal-controlled (frequency synthesis) transmit and receive plus tunable receiver; universal power supply (117- and 12-volt); 11-tube performance double-conversion superhet (1 r.f. stage, 1650-kc. conversion, 250-kc. conversion plus 1 i.f. stage); adjustable squelch (called "gate"); noise limiter; S-meter and modulation indicator; pi-network output; ceramic mike; 9½ x 5¼ x 11½; 18 lb.

B & K/MARK

1801 W. Belle Plaine, Chicago 13, Ill.

Model SSB-27 ("Sidewinder") price n.a.

This is a single-sideband suppressed-carrier transmitter; up to 5 of the 46 possible SSB channels may be selected; all frequency-controlling crystals are in a temperature-regulated oven—long term stability better then 0.00015%; undesired sideband is more than 40 db down; crystal lattice filter for 35 db carrier suppression; receiver has 3-kc. selectivity; "Voice Lock" control on panel allows plus or minus 200-cycle variation for precise SSB netting; 117- or 12-volt power supply.

BIGGS ELECTRONICS, INC.

1328 Pulaski St., Peru, Ill.

La Salle Model LA-101-AN $164.95 (net)

5-channel, crystal-controlled transmit and receive; universal

(117-, 12-, or 6-volt) power supply; 13-tube performance superhet (2 r.f. and 2 455-kc. i.f. stages) with Nuvistor front end; series noise limiter; adjustable squelch; ceramic mike; link-coupled output; 6 x 13 x 6.

LA-101-AN

A. J. BRISKIN, INC.

3252 F Street, San Diego 2, Calif.

Tele-Mate 500 price n.a.

5-channel, crystal-controlled transmit and receive; 12-volt power supply (117-volt supply available as Model Tele-Mate 500P); completely transistorized receiver and transmitter; receiver has r.f. stage and 3 455-kc. ceramic-filter i.f. stages; adjustable squelch; noise limiter always in circuit; pi-network output; ceramic mike.

BROWNING LABORATORIES, INC.

100 Union Ave., Laconia, N. H.

Compact (transmitter only) $84.50 (net)

11 crystal-controlled channels including special crystal socket on front panel permitting easy crystal change; 4 tubes; pi-network output; neon output indicator; ceramic mike; may only be used with units having "transmit" switching facilities; 7 x 5½ x 9½; 15 lb.

Model M-523 ("Drake") $260.00 (net)

23-channel, frequency-synthesis transmit and receive, also available as Model M-506 with 6 channels for $199.50; separate unit (not shown) 12-volt power supply for mobile use, buyer may substitute 117-volt base station supply, or buy as extra unit for $20.00; 13-tube performance double conversion superhet (cascade r.f. stage; 4.2-mc. conversion, 455-kc. conversion and 2 455-kc. i.f. stages); adjustable squelch; noise limiter always in circuit; tone control on speaker box (separate unit, not shown); pi-network output; TVI trap; ceramic mike; 3 x 3⅞ x 9½.

Model R-2700A *(receiver only)* $149.00 (net)

All-channel bandspread receiver calibrated in frequencies and channel numbers plus 5 crystal-controlled channels; 117 volts only; 15-tube performance double-conversion superhet; adjustable series noise limiter; adjustable squelch; S-meter; delayed a.v.c.; antenna tuning adjustment on front panel; 7 x 15½ x 9½; 25 lb.

Model 23 Over S9 *(transmitter only)* $144.00 with 1 crystal to $189.00 with all 23 crystals (net)

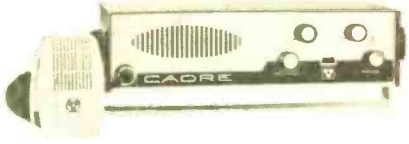
Provisions for 23-channel operation; 5 tubes, plus silicon rectifiers; metered for modulation percentage and SWR; "spotting" switch; speech clipper and splatter filter; ceramic mike; "on-the-air" indicator; 7 x 9¾ x 9½; 20 lb.

CADRE INDUSTRIES CORP.

20 Valley St., Endicott, N.Y.

Model C-75 $109.95 (suggested retail)

2-channel, crystal-controlled transmit and receive; rechargeable battery power supply; 1.0-watt output; 11 transistors and 2 diodes; noise limiter; adjustable squelch; 2 lb.; numerous accessories available including carrying strap, battery charger, special antennas, etc.



Model 510 $219.95 (suggested retail)

5-channel, crystal-controlled transmit and receive, plus tunable receiver (also available as Model 515 without tunable receiver feature for $199.50); solid-state 117- and 12-volt power supply (2 watts drain on receive and 8 watts drain on transmit), also available as Model 520 (12-volt power supply only at $187.50); NO tubes; 19 transistors and 8 diodes; double-conversion superhet; series noise limiter; adjustable squelch; pi-network output; TVI trap; ceramic mike; 4 x 12 x 6; 6 lb; accessory power pack with recharging network and carrying handle available as Model 500-1 ($34.95); batteries are $21.90, extra.

CB DIRECTORY

COMMAND ELECTRONICS MFG. CO.

3256 N. Pulaski Road, Chicago 41, Illinois

This company manufactures and distributes a wide variety of moderately-priced items. Included in their most recent product announcements were noise suppressors, channel selectors, antennas, body mounts, etc. Write the address above for details.

DAVIS MANUFACTURING CO.

2072 La Jolla Drive, Stockton, Calif.

Model 5W6 — $229.50 (list)

6-channel, crystal-controlled transmit and receive; universal power supply (either 117-, 12, or 6-volt); 10-tube performance superhet (1 r.f. stage and 1 455-kc. double-tuned i.f. stage); series gate noise limiter; adjustable squelch; carbon mike; pi-network output; modulation clipper and filter built-in; 5½ x 9¾ x 10¾.

DEMCO ELECTRONICS, INC.

Bristol, Ind.

Travelier — Price n.a.

23-channel, crystal-controlled transmit; 4-channel crystal-controlled receive, plus tunable receiver; 12-volt power supply (117-volt supply available as an accessory item); 14-tube performance double-conversion superhet (1 r.f. stage, 3.5-mc. conversion, 600-kc. conversion, plus 2 i.f. stages); receiver has "calibration control"; automatic noise limiter always in circuit; adjustable squelch; S-meter; link-coupled output; 9½ x 5¼ x 10½.

Satellite — Price n.a.

Identical to Sampson Model CB1A.

DeWALD (*United Scientific Labs., Inc.*)

35-15 37th Ave., Long Island City 1, N. Y.

Model S-1050 — $119.95 (list)

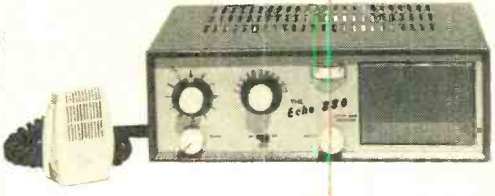
6-channel, crystal-controlled transmit and receive, plus tunable receiver; 117-volt power supply; 10-tube performance superhet with 3 i.f. stages and Nuvistor r.f. stage; series noise limiter; adjustable squelch; ceramic mike; S-meter and r.f. output meter; 6- and 12-volt power supplies are available ($19.95 list).

Model TR-910 B ("Radio-Phone") — $99.95 (list)

5-channel transmit; 117-volt supply; 10-tube performance, tunable superhet receiver (1 r.f. stage and 1 1750-kc. i.f. stage); series noise limiter; S-meter; adjustable squelch; ceramic mike; link-coupled output; plate current meter; TVI trap; 4¾ x 10¼ x 6⅜; 9 lb. Accessories: 6- or 12-volt mobile power supply ($19.95 list).

ECHO COMMUNICATIONS, INC.

Box 223, Cedarburg, Wisc.



Echo 880 — $139.00 (list)

12-channel crystal-controlled transmit (including 1 externally-mounted crystal socket); tunable receiver with "spotting" circuit; universal power supply (117-, 12- and 6-volt); 13-tube performance double-conversion superhet (1 r.f. stage, 3.5-mc. conversion, 595-kc. conversion and 2 i.f. stages); adjustable squelch; S-meter; noise clipper always in circuit; ceramic mike; link-coupled output; modulation indicator; 5 x 7 x 12; 9 lb.

Model 770

EICO *(Electronic Instrument Co., Inc.)*

33-00 Northern Blvd., Long Island City 1, N. Y.

Model 770/771/772

Model 770: $79.95 (kit) and $109.95 (wired). Others: $89.95 (kit) and $119.95 (wired)

4-channel, crystal-controlled transmit; 1-channel crystal-controlled receive, plus tunable receiver; 117-volt power supply; 10-tube performance superhet (1 r.f. and 2 1750-kc. i.f. stages); series noise limiter; adjustable squelch; ceramic mike; neon output indicator; pi-network output; 6 x 8½ x 9; 10 lb. Model 771 has 117- and 6-volt power supply. Model 772 has 117- and 12-volt power supply.

Model 777

Price n.a.

4-channel, crystal-controlled transmit and receive plus tunable receiver with spotting switch; universal power supply (117-, 12- and 6-volt); 10-tube performance double-conversion (1 r.f. stage, 1750-kc. conversion, plus 262-kc. conversion) superhet; series noise limiter, adjustable squelch; pi-network output; S-meter; ceramic mike.

ELECTRONICS COMMUNICATIONS INC. *(e.c.i.)*

325 No. Macquesten Pkwy., Mt. Vernon, N. Y.

Courier 1M

$229.50

12-channel, crystal controlled transmit; 4-channel fixed receive (no crystals) plus tunable receiver; 117- and 12-volt power supply; 15-tube performance triple-conversion superhet (1 r.f. stage, 10-.4-mc. conversion, 1505-kc. conversion, 2 262-kc. i.f. stages); r.f. gain control; series noise limiter; adjustable squelch; S-meter and output indicator; ceramic mike; 4¾ x 14¼ x 7¼; 14 lb. Accessories: 23 position crystal switch for transmit, base station mike.

Fleet Courier

$159.50

5-channel, crystal-controlled transmit and receive; 11-tube performance superhet (2 r.f. stages and 2 455-kc. i.f. stages); universal power supply (117- and 12-volt); noise clipper; adjustable squelch; ceramic mike; 4½ x 8¼ x 11.

GC ELECTRONICS CO.

400 South Wyman St., Rockford, Ill.

Globe Master

$229.95 (net)

11-channel, crystal-controlled transmit and receive plus tunable receiver; "spotting" switch; universal power supply (either 117- and 12-volt, or 117- and 6-volt available at the same price); 14-tube performance double-conversion superhet; series noise limiter; adjustable squelch; ceramic mike; speech clipping and filtering for effective modulation; pi-network output; S-meter; 11½ x 4½ x 10; 16 lb.

Globe Star

$159.95 (net)

5-channel, crystal-controlled transmit and receive; universal power supply (either 117- and 12-volt, or 117- and 6-volt available at the same price); 11-tube performance double-conversion superhet (1 r.f. stage, 1680-kc. conversion, and 1 262-kc. i.f. stage); series gate noise limiter; adjustable squelch; ceramic mike; pi-network output; 4½ x 9 x 9½; 13¼ lb.

GENERAL RADIOTELEPHONE CO.

3501 Burbank Blvd., Burbank, Calif.

Model MC-5

$199.95 (net)

6-channel transmit plus front panel connection for 7th crystal; 4 crystal-controlled receive channels plus tunable receiver; universal (117-, 12- and 6-volt) power supply; 10-tube performance superhet (2 r.f. and 2 452-kc. i.f. stages) including special crystal mixer; series noise limiter; adjustable squelch; ceramic mike; pi-network output, metered output indicator; output jack to remote speaker; sliding variable tone generator for "calling"; "Local-Dist" switch reduces receiver sensitivity; 4¼ x 8¼ x 10½; 15 lb. Accessories: 12- or 6-volt power cables ($4.95).

Model MC5-SB

$229.95 (net)

Similar to above, but capable of receiving SSB signals; no transmitting facilities other than regular AM; squelch control replaced by r.f. gain control; separate switch on front panel re-inserts carrier for SSB reception.

CB DIRECTORY

GEM ELECTRONICS

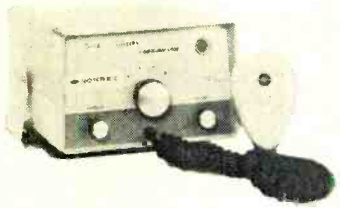
34 Hempstead Tpke., Farmingdale, L.I., N.Y.

Manhattan $124.95

Identical to Echo Model 880.

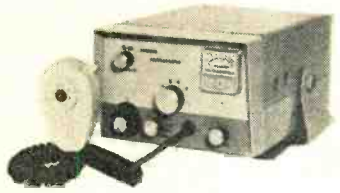
GONSET

801 South Main St., Burbank, Calif.



Model G-14 $149.50 (net)

4-channel, crystal-controlled transmit and receive; universal power supply (117 and 12 volts, but may be internally modified for 6-volt operation); 11-tube performance double-conversion superhet (1 r.f. stage, 1650-kc. conversion, and 2 455-kc. i.f. stages); series gate noise limiter; adjustable squelch; ceramic mike; pi-network output; TVI filter; output indicator; 4 x 7 x 11¼; 11 lb.



Model G-15 $199.50 (net)

4-channel, crystal-controlled transmit and receive, plus tunable receiver; built-in "spotting" switch; universal power supply (117 and 12 volts, but may be internally modified for 6-volt operation); 12-tube performance double-conversion superhet (1 r.f. stage, 1650-kc. conversion, and 2 455-kc. i.f. stages); series gate noise limiter; adjustable squelch; voltage regulator tube; ceramic mike; pi-network output; TVI filter; S-meter and output indicator; 4 x 7 x 11¼; 11 lb.

HALLICRAFTERS CO.

5th and Kostner Avenues, Chicago 24, Ill.

Model CB-3A $159.50

8-channel, crystal-controlled transmit and receive; universal power supply (either 117- and 12-volt, or 117- and 6-volt); 10-tube performance double conversion superhet (1 r.f. stage, 1650-kc. conversion, 1 262-kc. i.f. stage); series noise limiter, adjustable squelch; ceramic mike; S-meter is optional extra at $8.95; pi-network output; TVI filter; neon bulb output indicator; 5 x 12 x 8; 13 lb.

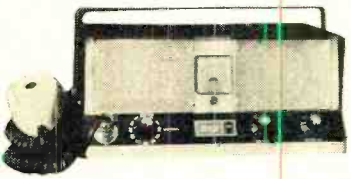
Model CB-5 $199.95

6-channel, crystal-controlled transmit and receive; 12-volt d.c. power supply only (optional a.c. power supply and base station pedestal is $49.95); 15-transistors in receiver section; 3 low drain tubes in transmitter section; double-conversion superhet (1650-kc. and 455-kc. i.f. stages); automatic noise clipping; adjustable squelch; ceramic mike; pi-network output; accessories include portable battery pack and tone-coded squelch; 10¼ x 3¼ x 8¼; 6¾ lb.

HALLMARK INSTRUMENTS

6612 Denton Drive, Dallas, Texas

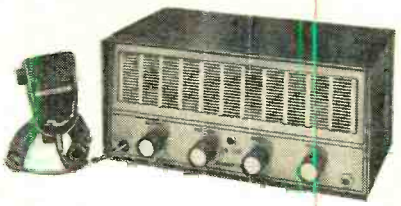
Hallmark 512 $149.50 (list)



12-channel, crystal-controlled transmit and receive; universal power supply (117- and 12-volt); 10-tube performance superhet (1 r.f. stage and 1 455-kc. i.f. stage); noise limiter, adjustable squelch; ceramic mike; pi-network output; S-meter; 12 x 7 x 5¾; 15 lb.

HAMMARLUND MFG. CO.

53 West 23rd St., New York 10, N. Y.



Model CB-Six $179.50

6-channel, crystal-controlled transmit and receive; superhet receiver with plus or minus 3-kc. vernier tuning adjustment on front panel; other details not released at press time.

Model CB-23 $249.50

23-channel, crystal-controlled transmit and receive using special crystal-fixed circuitry; universal power supply (117 and 12 volts); 11-tube performance double-conversion superhet (1 r.f. stage; 1650-kc. conversion, 1 262-kc. i.f. stage); series noise limiter; adjustable squelch; ceramic mike; S-meter and output indicator; headphone jack on front panel; plus or minus 3-kc. vernier tuning control on receive.

CB-23

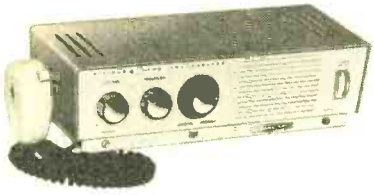
Model HQ-105 TRS $224.50 (built-in speaker)

1-channel transmit (see below); tunable communications-style receiver covering 540 kc. to 30.0 mc. (identical to standard receivers in the Hammarlund line), including bandspread, Q-multiplier, S-meter, noise limiter, etc. This model has built-in speaker (also available without); 9 7/16 x 16¼ x 9⅛; 30 lb. Accessories: see separate listing for OCT-X 8-channel crystal selector ($15.95), external speaker ($14.95), clock timer ($9.95).

HQ-105

HEATH CO.

Benton Harbor, Mich.



Model GW-11A $69.95 (kit)

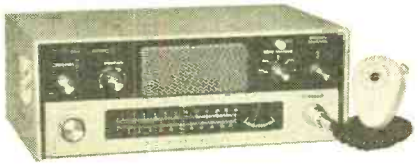
3-channel transmit and 1-channel crystal-control receive plus tunable receiver; 117-volt power supply (available for either 12- or 6-volts at same price); 9-tube performance superhet (no r.f. stage, 1 455-kc. i.f. stage); series noise limiter; adjustable squelch; ceramic mike; link-coupled output; transmit indicator; S-meter; 4½ x 13½ x 5¾; 7¾ lb.; available completely wired for $99.95 (117-volt power supply) or $104.95 (12- or 6-volt power supply).

Model GW-12A $39.95 (kit)

1-channel, crystal-controlled transmit and receive; 117-volt power supply (available for 117-volts only at this price; 117-, 12- and 6-volt version costs $44.95—unassembled kit); superhet receiver; series gate noise limiter; adjustable squelch; ceramic mike; 5⅜ x 8 x 8; 7¼ lb.; available completely wired for $79.95 (117-volt power supply) and $84.95 12- and 6-volt power supply).

Model GW-22A $59.95 (kit)
$99.95 (assembled)

5-channel, crystal-controlled transmit and receive; 117-volt power supply (available for either 12- or 6-volts at $89.95); 10-tube performance superhet (1 r.f. stage and 1 455-kc. i.f. stage); adjustable squelch; noise limiter always in circuit; link-coupled output; ceramic mike; 9¼ x 6¼ x 9½; 10 lb.; available with built-in selective calling for $84.95 (kit); or $136.95 (assembled). Appearance similar to GW-12A.



Model GW-42A $119.95 (kit)
$189.95 (assembled)

5-channel, crystal-controlled transmit and receive, plus tunable receiver; universal power supply (117-, 12-, and 6-volt); 11-tube performance superhet (1 r.f. stage and 2 455-kc. i.f. stages); built-in tone squelch system with 4 front-panel selected tones; noise limiter; adjustable squelch; ceramic mike; link-coupled output; S-meter and modulation indicator; 5⅞ x 17½ x 10½; 22 lb.

Model GW-52 $74.95 (kit)

1-channel, crystal-controlled transmit and receive; rechargeable battery power supply; superhet receiver (transistorized); adjustable squelch; 1-watt input to transmitter; earphone jack; TVI trap; 10 15/16 x 3⅝ x 1 11/16; 2½ lb.

Model MW-33 ("Marine") $89.95 (kit)

5-channel transmit and receive plus tunable receiver; universal power supply (117-, 12-, or 6-volt); 9-tube performance superhet (1 r.f. and 1 455-kc. i.f. stage); series noise limiter; adjustable squelch; S-meter or modulation indicator; link-coupled output; 4⅜ x 11⅜ x 11, 14½ lb.

INTER-MARK CORPORATION

80-00 Cooper Ave., Brooklyn 27, N. Y.

(specs overleaf)

CB DIRECTORY

Cipher 1000

2-channel, crystal-controlled transmit and receive; battery power supply (12 "D" cells—life about 120 hours); superhet receiver; adjustable squelch; noise limiter; 1-watt input to transmitter; ceramic mike; 5½ x 9 x 3¼; 7 lb.

INTERNATIONAL CRYSTAL MFG. CO., INC.

18 North Lee, Oklahoma City, Okla.

Model 10 — $79.50 (net)

3-channel, crystal-controlled transmit, plus tunable receiver; power supply sold separately for $19.50 (specify 117, 12 or 6 volts when ordering); 10-tube performance superhet; series noise limiter; squelch attachment sold separately for $4.95; ceramic mike; external speaker; 3⅜ x 8 x 7; 5 lb. Accessories: see text above, plus crystals, antennas, mounts, etc.

Model 50 — $159.50 (net)

3-channel, crystal-controlled transmit and 2-channel, crystal-controlled receive, plus tunable receiver; universal power supply (117, 12 and 6 volts); 12-tube performance double-conversion superhet; series noise limiter; adjustable squelch; ceramic mike; pi-network output; modulation indicator; 5½ x 8½ x 9; 12 lb. Accessories: crystals, antennas, mounts, etc.

Model 100-C — $209.50 (net)

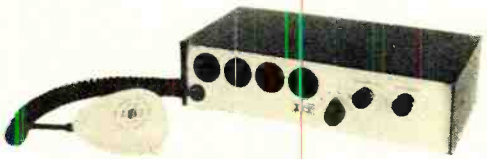
12-channel, crystal-cantrolled transmit and 2-channel, crystal-controlled receive, plus tunable receiver; universal solid-state power supply (117-, 12- and 6-volt); 13-tube performance double-conversion superhet (1 r.f. stage, 10-mc. conversion, 455-kc. conversian, 1 455-kc. i.f. stage); special a.v.c. circuit (called A.S.C.); crystal filter on receive; audio filter; series noise limiter; adjustable squelch; ceramic mike; pi-network output; built-in "calibrate" circuit; 5½ x 8½ x 9; 12 lb.; numerous accessories.

Model 100-D — $239.50 (net)

Similar in most respects to Model 100-C, except for speech filtering and clipping on transmit; illuminated dial for ease of channel identification.

INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.

Box 99, Lodi, New Jersey

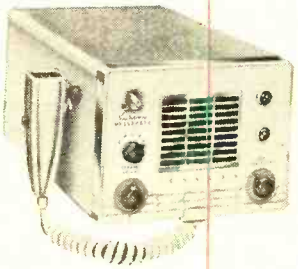


Model 320 — $199.95 (list)

5-channel, crystal-controlled transmit and receive; universal power supply (117- and 12-volt); NO tubes; 17 transistors and 8 diodes; double-conversion superhet (1 r.f. stage, 1680-kc. conversion, 455-kc. conversion and 3 455-kc. i.f. stages); adjustable squelch; noise clipper in circuit at all times; ceramic mike; pi-network output; TV trap; 11⅜ x 3⅛ x 5⅜; 6 lb.

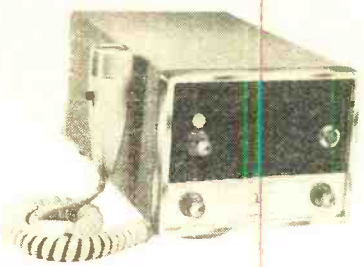
E. F. JOHNSON CO.

Waseca, Minn.



Viking Messenger — $139.95

5-channel, crystal-controlled transmit and receive; available in a variety of power supply arrangements for 230, 117, 24, 12, or 6 volts; 9-tube performance superhet (1 r.f. and 1 455-kc. i.f. stage); series noise limiter; adjustable squelch; ceramic mike; pi-network output; modulation indicator; 5⅜ x 7 x 11⅜; 12 lb.; numerous accessories available.



Messenger Two — $169.95

10-channel, crystal-controlled transmit and receive; available with either 117- and 12-volt, or 117- and 6-volt power supply; 9-tube performance superhet (1 r.f. and 1 455-kc. i.f. stage); series noise limiter; adjustable squelch; ceramic mike; pi-network output; modulation indicator; 5⅜ x 7 x 11⅜; 12 lb.; numerous accessories available.

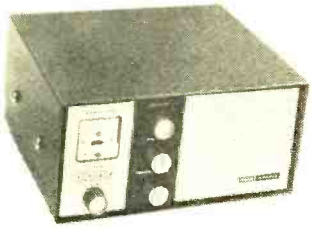
Personal Messenger — $129.50

1-channel, crystal-controlled transmit and receive; battery power supply (penlight cells

may be replaced with nickel-cadmium battery at extra charge); superhet receiver; 1-watt input to transmitter; noise limiter; adjustable squelch (labeled "Quiet" control); provisions to connect to external antenna; headphone jack; numerous accessories are available.

KAAR ENGINEERING CORP.

2995 Middlefield Rd., Palo Alto, Calif.



Model TR-327 $179.00 (FOB, Palo Alto)

4-channel, crystal-controlled transmit and receive; universal (117-, 12- or 6-volt) power supply; 14-tube performance superhet (1 r.f. and 2 455-kc. i.f. stages); series noise limiter; adjustable squelch; ceramic mike; pi-network output; TVI trap; "Power" tuning control on front panel used to tune transmitter to maximum output; S-meter; special 2-tube a.v.c. circuit varies gain of receiver to minimize effects of noise and interference; 5⅜ x 10¼ x 8½; 16 lb. Accessories: mounting hood ($3.90) and various antennas.

Model TR-327A & B $199.00 (FOB, Palo Alto)

Similar to above, but Model A will tune standard AM broadcast in addition to 4-channel crystal-controlled transmit and receive. Model B (sold for $189.00) has 5-channel, crystal-controlled transmit and 2-channel, crystal-controlled receive, plus tunable receiver.

KELTNER ELECTRONICS, INC.

1045 W. Hampden, Englewood, Colo.

Model 500 $249.95 (list)

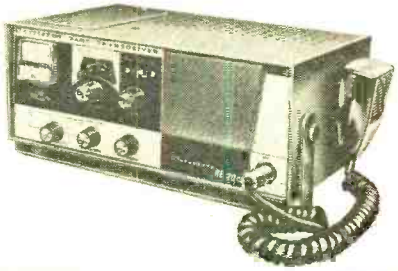
5-channel, crystal-controlled transmit and receive; 12-volt power supply (only); all transistor; superhet receiver (1 r.f. stage and 3 i.f. stages); adjustable squelch, S-meter; noise limiter always in circuit; pi-network output; ceramic mike; electronic switching—no relays; 2⅛ x 6 x 5½; 4½ lb.; same unit, but with built-in batteries and battery charger available for $299.95 (list).

LAFAYETTE RADIO ELECTRONICS CORP.

111 Jericho Turnpike, Syosset, L. I., N. Y.

Model HE-15B $54.50 (net)

8-channel transmit; 117-volt supply; 8-tube performance superhet (1 r.f. and 1 1750-kc. i.f. stage); adjustable series noise limiter; no squelch; ceramic mike (no push-to-talk); link-coupled output; neon tube output indicator; TVI trap; cathode current of transmitter metered from front panel jack; 5½ x 10¼ x 6⅜; 9 lb. Accessories: mobile power supplies for either 6 or 12 volts ($10.95) and various antennas.



Model HE-20C $109.50 (net)

8-channel, crystal-controlled transmit and receive plus tunable receiver; universal (117- and 12-volt) power supply; 10-tube performance superhet (1 r.f. and 2 1650-kc. i.f. stages); series noise limiter; adjustable squelch; built-in selective call circuitry; "spotting" switch; ceramic mike; link-coupled output; TVI trap; output indicator; S-meter; 5½ x 12½ x 8; 14 lb.; numerous accessories available.

Model HE-75 $66.50 (net)

1-channel, crystal-controlled transmit and receive; battery power supply (penlight cells may be replaced with nickel-cadmium battery at extra charge); superhet receiver; 1-watt input to transmitter; has "Local-Distance" switch to conserve power; noise limiter; adjustable squelch; earphone jack; 3 x 8 x 2; sold with earphone and carrying case.

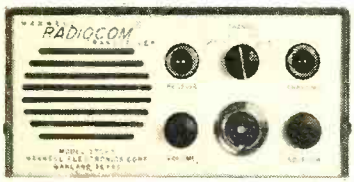
Model HE-90 (photo overleaf) $94.50 (net)

6-channel, crystal-controlled transmit and receive plus tunable receiver; 117-volt power supply (12-volt power supply available for $11.50); superhet receiver with 2 i.f. stages; Nuvistor r.f. stage; noise limiter; adjustable squelch; S-meter; "spotting" switch on front panel; pi-network output; TVI trap; panel jack for plate current metering; ceramic mike; 11½ x 5 x 6⅜; 14 lb.; numerous accessories available.

CB DIRECTORY

MAXWELL ELECTRONICS CORP.

229 Garvon St., Garland, Texas

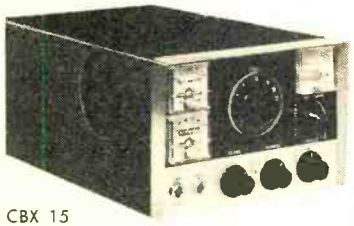


Model 27C-3 — $159.50 (net) or $149.50 (net) for single-channel model

3-channel, crystal-controlled transmit and receive; 117-volt power supply (other models available for 12 or 6 volts at same price); 13-tube performance superhet (2 high-gain r.f. and 1 455-kc. i.f. stage); noise clipper and series noise limiter; adjustable squelch; dynamic mike; link-coupled output; 3½ x 7⅛ x 11¼; 6 lb. Accessories: battery eliminator converting 12-volt model to 117 volts ($29.95) and various antennas.

MESUR-MATIC ELECTRONICS CORP.

Warner, New Hampshire



Saturn CBX 15 — $229.99

8-channel, crystal-controlled transmit and receive plus tunable receiver; universal power supply (117-, 12- and 6-volt); 11-tube performance double-conversion superhet (1 r.f. stage, 1650-kc. conversion, 1 262-kc. i.f. stage); r.f. gain control; noise limiter; adjustable squelch; "spotting" control; earphone jack on front panel; S-meter; modulation meter; power output meter; pi-network output; ceramic mike.

METROTEK ELECTRONICS, INC.

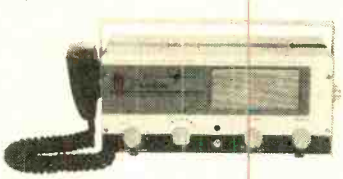
205 W. Cabarrus St., Raleigh, N. C.

Metrostar — $169.95

8-channel, crystal-controlled transmit and receive plus tunable receiver; universal power supply (117-, 12- and 6-volt); 9-tube performance double-conversion superhet (1 r.f. stage, 1650-kc. conversion, 455-kc. conversion and i.f. stage); crystal-controlled second oscillator; gated-audio noise-limiting squelch system; S-meter; ceramic mike; pi-network output; no relays—electronic switching; 12 3/16 x 5⅛ x 9 7/16; 13 lb.

Space Station — Price n.a.

5-channel, crystal-controlled transmit and receive, plus tunable receiver; 117-volt power supply; superhet receiver; S-meter; accessory socket for plug-in Monocell Selective Call System; adjustable squelch; electronic switching—no relays; ceramic desk mike; 12 lb.



Starfire — $124.95

5-channel, crystal-controlled transmit and receive plus tunable receiver; 117-volt power supply (12-volt mobile supply is available for $18.00; 6- and 12-volt supply is $22.70); 9-tube performance superhet (1 r.f. and 1 455-kc. i.f. stage); series noise limiter; adjustable squelch; pi-network output; ceramic mike; no relays—electronic switching; 11 3/16 x 6¾ x 8¾; 8¾ lb.

MIRATEL, INC.

Richardson St., New Brighton 12, Minn.

Model C/R-117 — $198.50 (suggested retail)

5-channel, crystal-controlled transmit and receive; universal solid-state power supply (117-, 12-, or 6-volt); 12-tube performance superhet (1 r.f. and 2 455-kc. i.f. stages); series noise limiter; adjustable squelch; ceramic mike; pi-network output with TVI trap; metered to read percentage of modulation and carrier output; S-meter; 5½ x 10½ x 10; 18 lb.

MULTI-ELMAC

21470 Coolidge Highway, Oak Park 37, Mich.

Model CD-5 *("Citi-fone")* $134.50 (suggested retail)

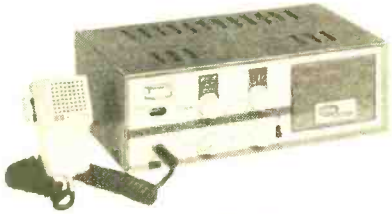
5-channel, crystal-controlled transmit and receive; universal (117- and 12-, or 117- and 6-volt) power supply; 10-tube performance superhet (1 r.f. and 2 455-kc. i.f. stages); series noise limiter; adjustable "noise immune" squelch; ceramic mike; pi-network output; TVI trap; 4¼ x 8 x 11; 15 lb. Accessories: various antennas.

Model CD-7 *("Citi-fone")* $189.50 (suggested retail)

5-channel, crystal-controlled transmit and receive, plus tunable receiver; universal power supply (117- and 12-volt); superhet receiver; series noise limiter; adjustable "noise immune" squelch; ceramic mike; pi-network output; TVI trap; jack for external speaker or headphones; S-meter and output indicator.

OLSON ELECTRONICS, INC.

840 S. Forge St., Akron 8, Ohio



Audio-Visual Spotter (Model RA-520) $119.95

12-channel crystal-controlled transmit (including 1 panel-mounted crystal socket); 23-channel tunable receive featuring special "spotting" circuitry; universal power supply (117-, 12- and 6-volt); 13-tube performance double-conversion superhet (1 r.f. stage, 3.5-mc. conversion, 595-kc. conversion and 2 i.f. stages); adjustable squelch; S-meter; noise clipper always in circuit; ceramic mike; link-coupled output; modulation indicator; 12- or 6-volt battery cables are $2.95 extras; 5 x 7 x 12; 9 lb.

PEARCE-SIMPSON, INC.

1385 N.W. 27th Ave., Miami 35, Fla.

Companion $189.50 (FOB, Miami)

5-channel, crystal-controlled transmit with extra crystal socket on front panel for 6th channel; 5-channel, crystal-controlled receive, plus tunable receiver; universal transistorized power supply (117 and 12 volts); 11-tube performance superhet (1 r.f. stage and 2 455-kc. i.f. stages); preset noise limiter; adjustable squelch; carbon mike; transmit indicator light; link-coupled with reactance 'tune-out' adjustment; durable plastic cabinet; 5 x 8¾ x 12¼; 8½ lb.

Escort $229.95 (tentative)

8-channel, crystal-controlled transmit and receive plus tunable receiver; universal power supply (117- and 12-volt); 11-tube performance superhet; adjustable squelch; noise limiter; "spotting" switch; S-meter; pi-network output; ceramic mike; 11½ x 4¾ x 9½; 15 lb.

POLYTRONICS LAB, INC.

388 Getty Ave., Clifton, N. J.

Poly-Compact $149.95 (net)

4-channel, crystal-controlled transmit and receive; universal power supply; superhet receiver; noise limiter; adjustable squelch; S-meter; electronic switching—no relays; 5 x 6½ x 11.

Poly-Comm "N" $189.50 (net)

4-channel, crystal-controlled transmit and receive; universal power supply (117, 12 and 6 volts); 12-tube performance double-conversion superhet (1 Nuvistor r.f. stage, 6.0-mc. conversion, 3 455-kc. i.f. stages); series gate noise limiter; adjustable squelch; ceramic mike; pi-network output; pilot bulb output indicator; TVI trap; extra rugged construction; 5 x 11 x 7½; 12¾ lb.; also available with 8-channel, crystal-controlled transmit and receive for $199.50.

Poly-Comm "Pro" $269.50 (net)

24-channel (1 channel for CAP), crystal-controlled transmit and receive; universal power supply; double-conversion superhet (1 r.f. stage, 6.0-mc. conversion, 455-kc. conversion, plus i.f. stages); built-in Q-Multiplier; adjustable squelch; noise limiter; S-meter and output indicator; pi-network output; ceramic mike; may be used for public address.

CB DIRECTORY

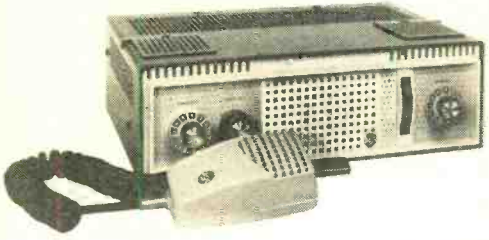
Poly "Pro"

Poly-Comm Senior "23" $349.50 (net)

23-channel, crystal-controlled frequency-synthesis transmit and receive; vernier tuning on receive; universal power supply (117- and 12-volt); 14-tube double-conversion superhet (1 r.f. stage, 6.0-mc. conversion, 455-kc. conversion and 2 i.f. stages); series gate noise limiter; adjustable squelch ceramic mike; pi-network output; S-meter and output indicator; electronic switching—no relays; built-in tone filter and selective calling system; message light; may be used as a public address system; 4½ x 12 x 8½; 14 lb.

RADIO CORPORATION OF AMERICA

Harrison, N. J.



Mark VIII $149.50 (list)

9-channel, crystal-controlled transmit and receive plus tunable receiver; 117-volt power supply (12- and 6-volt power supplies available as separate units for $19.95); 9-tube performance superhet (1 r.f. and 2 i.f. stages); series noise limiter; adjustable squelch; TVI trap; ceramic mike; no relays—electronic switching; 3½ x 11¼ x 8; 9 lb.

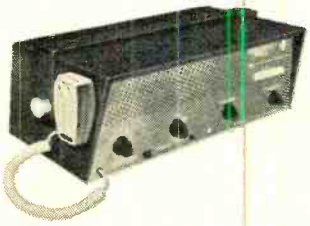
RADIO SHACK CORP.

730 Commonwealth Ave., Boston 17, Mass.

Model TRC-27A $89.95 (net)

Model TRC-27A

3-channel, crystal-controlled transmit and receive; universal (117- and 12-volt) transistorized power supply; 11-tube performance superhet (1 r.f. and 2 455-kc. i.f. stages); series noise limiter; adjustable squelch; ceramic mike; pi-network output. Accessories: field strength meter ($6.95) and various antennas.



Model TRC-5 $69.95 (net)

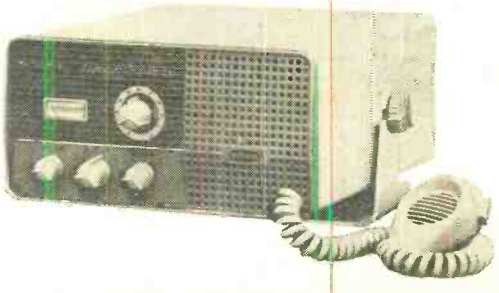
5-channel, crystal-controlled transmit; 1-channel crystal-controlled receive, plus tunable receiver; 117-volt power supply (see below); superhet receiver; noise limiter; adjustable squelch; ceramic mike; no relays—electronic switching; 10 lb.; 12-volt power supply available for $14.95.

Model TRC-8 $109.95 (kit net)

8-channel, crystal-controlled transmit and receive, plus tunable receiver; universal power supply (117- and 12-volt); 9-tube performance double-conversion superhet (1 r.f. stage, 1650-kc. conversion, 455-kc. conversion, plus 1 i.f. stage); adjustable squelch; noise limiter always in circuit; S-meter and power input meter; pi-network output, ceramic mike; 4½ x 12 x 8¼; 12 lb.; available as a completely wired unit for $139.95.

RAYTHEON COMPANY

213 East Grand Ave., So. San Francisco, Calif.



RayCom II — $220.00 (list)

10-channel, crystal-controlled (frequency synthesis) transmit and receive, plus tunable receiver; universal power supply (117- or 12-volt); double-conversion superhet (1 r.f. stage, 1650-kc. conversion, 250-kc. conversion plus 1 i.f. stage); noise limiter; adjustable squelch; carbon mike; pi-network output; S-meter and modulation indicator; 10⅛ x 5⅛ x 10⅞; 18 lb.

RAYTHEON COMPANY

Westwood, Mass.

Ray-Tel TWR-3 (appearance same as RayCom II) — $219.95 (list)

10-channel, crystal-controlled (frequency synthesis) transmit and receive plus tunable receiver; universal power supply superhet (1 r.f. stage, 1650-kc. conversion, 250-kc. conversion (117- and 12-volt); 11-tube performance double-conversion plus 1 i.f. stage); adjustable squelch; noise limiter; S-meter and modulation indicator; pi-network output; ceramic mike; 12 x 6 x 10⅞; 18 lb.

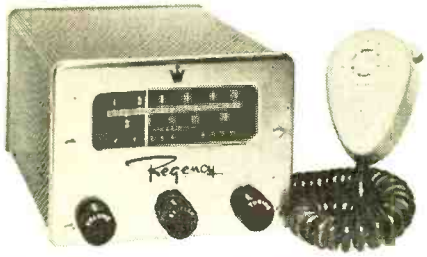
Ray-Tel TWR-2

Ray-Tel TWR-2 — $159.95 (list)

5-channel, crystal-controlled transmit and receive; universal power supply (117 and 12 volts); 10-tube performance double-conversion superhet; series noise limiter; adjustable squelch; special carbon mike; pi-network output; pilot-bulb output indicator; transmitter filaments may be switched off at front panel during "standby" periods; no relays—electronic switching; auxiliary speaker connections; 5 x 9½ x 8¼; 12½ lb.

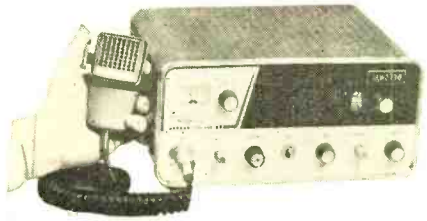
REGENCY ELECTRONICS, INC.

7900 Pendleton Pike, Indianapolis 26, Ind.



Model CB-27 — $124.95 (12- and 6-volt units available at same price)

2-channel transmit; tunable receiver; 117-volt power supply (other models available); 9-tube performance double-conversion superhet; series noise limiter; adjustable squelch; ceramic mike; pi-network output; neon-bulb output indicator; 4½ x 6½ x 8¾; 8¾ lb. Accessory: Model CS-6 crystal switch adds 5 more channels ($119.95, list).



Range Gain — $269.95

23-channel, crystal-controlled (frequency synthesis) transmit and receive with 3.5-kc. vernier tuning control on front panel; universal power supply (117- and 12-volt, or 117- and 6-volt); double-conversion superhet (1 r.f. stage; 7.5-mc. conversion; 260-kc. conversion, plus 2 i.f. stages, plus crystal filter in first conversion stage); adjustable squelch; adjustable noise limiter; S-meter; double-sidebond reduced carrier transmitter (approximately 6 db down); voltage and current to final amplifier read from panel meter, final tuning control of transmitter on front panel; pi-L network output; about 10 watts peak-envelope-power (P.E.P.) output; ceramic mike; 11½ x 5¼ x 9¾; 15 lb.

ROSS LABORATORIES, INC.

124 Lakeside Ave., Seattle 22, Wash.

Model 400 — $164.50 (net)

1-channel, crystal-controlled transmit and receive; hand-held battery-operated transceiver with 1.5 watts input; superhet receiver; automatic noise limiter; adjustable squelch; may be used with penlight cells; 9¼ x 3¼ x 1¼; under 2 lb. Accessories: rechargeable nickel-cadmium batteries and built-in charger ($45.00); alkaline battery pack ($4.00).

SAMPSON COMPANY

2244 S. Western Ave., Chicago 8, Ill.

Receiver, S-meter and Speaker

Transmitter

Model CB1A — $377.80 (complete station)

Base station; transmitter is 23-channel, crystal-controlled; 117-volt power supply; external crystal socket for test purposes; pi-network output; plate current and voltage meter; modulation indicator; 6 x 11 x 7¼; (may be purchased separately for $159.95). Receiver (separate unit) has 5-channel, crystal-controlled plus tunable receive; 117-volt power supply; 14-tube performance double-conversion superhet (2 r.f. stages, 10.7-mc. conversion, 2 455-kc. i.f. stages); series gate noise limiter; adjustable squelch; "Local-Distant" sensitivity switch; 6 x 11 x 7¼ (may be purchased separately for $159.95). Power-VSWR meter sits atop separate speaker ($15.95); measures power output into dummy load; measures VSWR (directly); available for $41.95.

CB DIRECTORY

Fonet 102B $109.50 (pair)

1 channel, crystal-controlled transmit and receive; battery power supply (6 penlight cells); superhet receiver; battery life indicator; earphone jack; 240 milliwatts input to transmitter; sold with carrying case and strap; 19 oz.

SONAR RADIO CORP.

3050 West 21st St., Brooklyn 24, N. Y.

Model "E" $179.50 (net)

8-channel, crystal-controlled transmit and receive plus tunable receiver; universal (117-, 12- and 6-volt) power supply; 11-tube performance superhet (1 r.f. and 2 455-kc. i.f. stages); series noise limiter; adjustable squelch; ceramic mike; pi-network output; pilot-bulb output indicator; 4¾ x 9½ x 11¼; 9 lb. Accessories: S-meter ($17.95) and various antennas.

Model "G" $229.50 (net)

8-channel, crystal-controlled transmit and receive, plus tunable receiver; universal power supply (either 117 and 12, or 117 and 6 volts); 10-tube performance double-conversion superhet; series noise limiter; adjustable squelch; transmit "spotting" switch on front panel; S-meter and output indicator; ceramic mike; pi-network output; TVI filtered; 4¾ x 9½ x 11¼; 9 lb. Accessories: antennas, noise suppression kits and mounts.

TECRAFT SALES CORP.

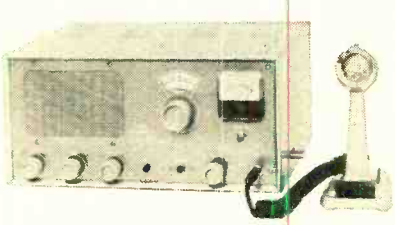
Box 84, South Hackensack, N. J.

Falcon Radiophone Mk V $169.95

5-channel transmit with tunable receiver, plus 1 crystal-controlled receive channel; universal (117-, 12- and 6-volt) power supply; 13-tube performance double-conversion superhet; series noise limiter; adjustable squelch; ceramic mike; pi-network output; plate current metered in transmitter; r.f. gain control may be purchased with special "TNS" noise-eliminating and squelch circuit built in ($20.00); 5½ x 11¼ x 9⅜; 12 lb.

TRAM ELECTRONICS, INC.

Box 187, Winnisquam, N. H.



Model TR-27B $265.00

8-channel, crystal-controlled transmit and receive, plus tunable receiver; 117-volt power supply; 14-tube performance double-conversion superhet (2 r.f. stages, 4.5-mc. conversion, 2 455-kc. i.f. stages); series noise limiter; adjustable squelch; ceramic mike; pi-network output; S-meter and modulation indicator; TVI trap; "spotting" switch; built-in speech compression; external speaker connections; 7¼ x 15½ x 9¾; 23 lb.

Model TR-27C $320.00

23-channel, crystal-controlled transmit; 1-channel crystal-controlled receive using panel-mounted socket; otherwise same as Model TR-27B.

Model TR-70B $246.50

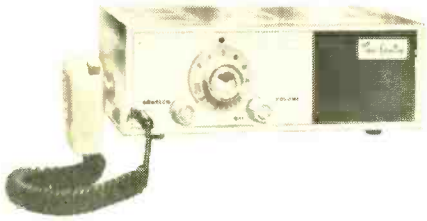
8-channel, crystal-controlled transmit including 1 channel through panel mounted external socket; 8-channel crystal-controlled receive plus tunable receiver; solid-state power supply for either 12 or 6 volts, positive or negative ground; 14-tube performance double-conversion superhet (2 r.f. stages, 4.5-mc. conversion, 2 455-kc. i.f. stages); noise limiter; adjustable squelch; ceramic microphone; pi-network output; S-meter; modulation indicator; TVI trap; 5⅝ x 11 x 9; 17 lb.

Model TR-70C $288.00

23-channel, crystal-controlled transmit, 1-channel crystal-controlled receive using panel-mounted socket, otherwise same as Model TR-70B.

UTICA COMMUNICATIONS CORP.

2917 W. Irving Park Rd., Chicago 18, Ill.



Model MC-27 $179.50

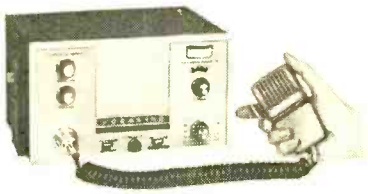
6-channel, crystal-controlled transmit and receive; universal power supply (117, 12 and 6 volts); 10-tube performance double-conversion superhet (1 r.f. stage, 1680-kc. conversion, 1 266-kc. i.f. stage); noise limiter; adjustable squelch; ceramic mike; link-coupled output; 4 x 11⅞ x 7; 11 lb. Accessories: antennas (see separate listing), mounting brackets ($4.95) and power cables ($4.80, each).

Model T&C II $199.95

6-channel, crystal-controlled transmit (1 channel is a spare socket on the front panel) and receive, plus tunable receiver; universal power supply (117, 12 and 6 volts); 13-tube-and-transistor performance double-conversion superhet (1 r.f. stage, 1680-kc. conversion, 1 266-kc. i.f. stage); noise limiter; adjustable squelch; S-meter and output indicator; link-coupled output; 4 x 13 x 7; 12 lb.

VOCALINE COMPANY OF AMERICA, INC.

Old Saybrook, Conn.



Model ED-276 $249.95 (list)

6-channel, crystal-controlled transmit (1 channel is a socket on the front panel) and receive, plus tunable receiver; universal solid-state power supply (117 and 12 volts); transistorized double-conversion receiver; noise limiter and combined adjustable squelch and sensitivity; receiver has fine-tuning front-panel adjustment when used for "Crystal Receive"; tubes used in transmitter section; 5⅜ x 9⅜ x 9⅜; 14½ lb.

ED-27M

Model ED-27M $189.50 (list)

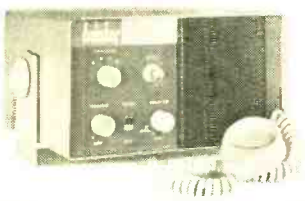
4-channel, crystal-controlled transmit and receive; universal transistorized power supply (117, 12, and 6 volts); 12-tube performance double-conversion superhet (1 r.f. stage, 4.0-mc. conversion, 1 455-kc. i.f. stage); noise pulse suppressor; patented "Vocatron" noise-immune adjustable squelch; ceramic mike; pi-network output; pilot-bulb output indicator; 5¼ x 9¼ x 8¼; 11 lb.

Model PT-27 ("Commaire") $199.95 (list)

4-channel, crystal-controlled transmit and receive—plus tunable CB receiver—plus standard broadcast-band AM reception; rechargeable dry-battery power supply; transistorized double-conversion superhet receiver; 2-tube transmitter with about 1-watt input; noise limiter; squelch switched "in" or "out"; ceramic mike; pi-network output; crystal diode rectifier operates special power meter attached to antenna circuit; built-in flashlight; 9 x 4 x 11; 11½ lb.

WEBSTER MANUFACTURING

317 Roebling Rd., South San Francisco, Calif.



Model "411" $169.95 (list)

4-channel, crystal-controlled transmit and receive; universal (117- and 12-volt) power supply; 9-tube performance superhet (1 r.f. and 1 455-kc. i.f. stage); series noise limiter; adjustable squelch; carbon mike; pi-network output; pilot-bulb output indicator; 5 x 9½ x 8¼; 12¼ lb. Accessories: various antennas.

Model 412 $174.50 (list)

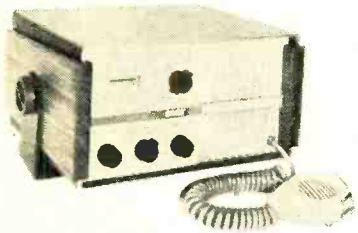
6-channel, crystal-controlled transmit and receive, including 1 channel crystal socket (transmit and receive) on front panel; universal power supply (117- and 12-volt); superhet receiver; noise limiter; adjustable squelch; pre-wired to accept manufacturers selective calling system; S-meter; restricted audio response on transmit; pi-network output; 9⅞ x 5¼ x 11½; 12½ lb.

Model "440" $219.50 (list)

10-channel, crystal-controlled transmit and receive, plus tunable receiver; universal (117- and 12-volt) power supply; double-conversion superhet (1 r.f. stage; 1650-kc. conversion, 1 250-kc. i.f. stage); noise limiter; adjustable squelch; carbon

CB DIRECTORY

mike; pi-network output; S-meter and power output indicator; requires only 1 crystal per channel since unit has built-in "frequency synthesizing" circuit.

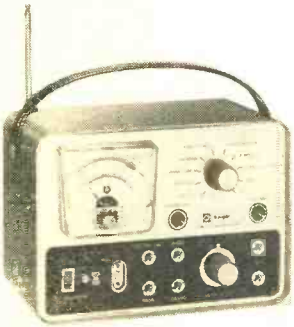


CB STATION ACCESSORIES

Included in this section of the Buyer's Guide are test instruments, selective-calling attachments, speech filters and compressors, etc. All product descriptions are necessarily short and the reader is urged to write the manufacturer for more detailed specifications.

ALLIED RADIO

100 N. Western Ave., Chicago 80, Ill.



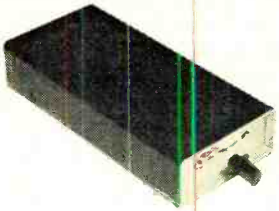
Model Ten-2 (Knight-Kit) $29.95 (kit)

Measures true power output to 5 watts (direct readings) with 50-ohm load; measures VSWR (direct readings); measures percentages of positive and negative modulation; with built-in antenna can be used as relative field strength meter; checks crystal activity; can be used as signal monitor, audio generator and code practice oscillator.

AQUASPACE DEVELOPMENT

Box 586, Canoga Park, Calif.

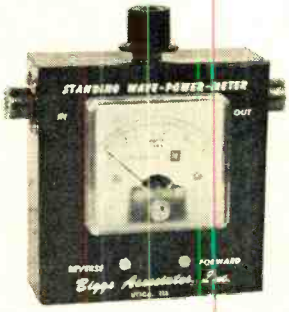
Citizen Converter (Model 6c) $19.95



For mobile use; converts CB band to AM auto radio band (840-1100 kc.); self-contained mercury battery power supply; uses auto radio antenna.

BIGGS ELECTRONICS, INC.

1328 Pulaski St., Peru, Ill.



Standing Wave-Power-Meter $24.95 (net)

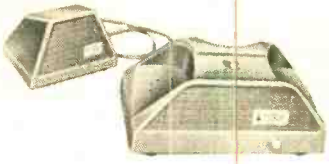
Measures VSWR (direct readings) and when terminated with non-inductive load will read power output in watts. Must be connected to transmitter with very short (not over 1 foot) piece of coax cable. May be left in transmission line at all times without ill effects.

BUSINESS RADIO CO., INC.

P.O. Box 5652, Minneapolis 17, Minn.

Noistop *(Model 612)* $16.95 (net)

Special noise-eliminating and squelch circuit mounted in 1½ x 2½ x 4 box; may be attached to any single- or double-conversion superhet (wiring instructions supplied for 18 different CB sets); ideal for mobile use; printed-circuit board, circuit is variation of famous TNS (Twin Noise Squelcher).



Patch-a-Call $74.95 (net)

Automatic, transistorized voice-operated phone patch; powered by 117-volt line; incoming voice activates transmitter—pauses make base station go back to receive; auxiliary speaker permits phone monitoring by base station operator; sold with complete wiring and installation instructions.

S-Master $11.95

Transistorized outboard meter to be connected to a.v.c. bus in transceiver; gives accurate proportionol reading of incoming signal strength; internal battery (NEDA-1064) has 9-12 month operotional life.

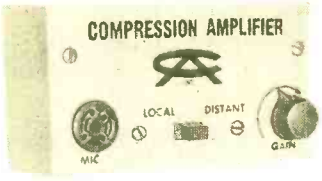
COMMAND ELECTRONICS MFG. CO.

3256 N. Puloski Road, Chicago 41, Ill.

This company manufactures and distributes o wide variety of moderately-priced items. Included in their most recent product announcements were noise suppressors, channel selectors, antennas, body mounts, etc. Write the address above for details.

COMTRAN ASSOCIATES INC.

2847 Cropsey Ave., Brooklyn 14, N.Y.



Comtran C-11 $29.95

Transistorized audio compression amplifier; self-contained; battery operated; gain control permits setting up for 100% modulation; frequency response 300-2000 cycles.

CONTINENTAL ELECTRONICS & SOUND CO.

6151 Dayton Liberty Road, Dayton 18, Ohio

CB-52-T

CESCO CB-52-C $19.95

Measures power output to 52-ohm load; may be used to approximate antenna feedline mismatch; this model sold with coaxial connectors, Model CB-52-S available for $18.95 has Motorola-type spade connectors.

CESCO CB-52-T $24.95

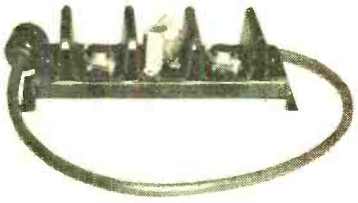
Measures VSWR (direct readings) at power levels up to 5 watts output; reads output power in watts; may be used as field strength meter; Model CB-75-T available at some price for 75-ohm coax lines; coaxial connectors.

ELECTRONICS COMMUNICATIONS INC. (e.c.i.)

325 No. Macquesten Pkwy., Mt. Vernon, N. Y.

Port-a-Lab $44.95

Measures VSWR (direct readings); meosures true power output (0-10 and 0-50 watt scales); measures percentage of modulation and provides aural test of modulation quality; may be used as relative field strength meter.

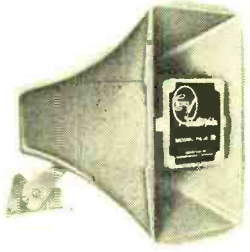


T-P-S $21.90

Vibrator substitute; may be plugged into vibrator socket of numerous transceivers to eliminate vibrator hash and improve voltage regulation; reduces battery current drain; 6- or 12-volts.

ELECTRO-VOICE, INC.

Buchanan, Mich.

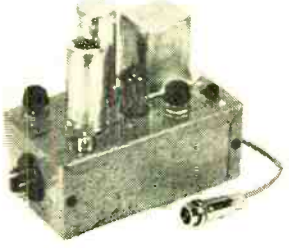


Communications Loudspeaker
(Model PA-15) $18.00 (net)

Rugged outdoor-type speaker suitable for an extension or in areas where projection of sound is required; emphasizes voice frequencies by cutting off below 350 cycles; swivel base; die-cast construction; 8-ohm voice coil impedance; 9 x 6 x 9½; 4½ lb. A model PA-7 is available made of Cycoloc plastic for $27.00 (list).

GC ELECTRONICS CO.

400 S. Wyman St., Rockford, Ill.

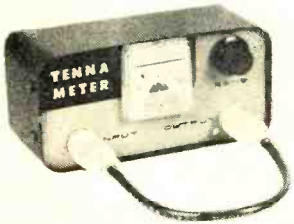


Speech Booster

CB DIRECTORY

Model 65-419 (*"Speech Booster"*) $24.95 (net)

Low-gain compressor amplifier with limited bandpass characteristics (300-2500 cycles); clips and filters speech frequencies exceeding preset amplitude level; must be adapted to CB equipment; requires 400-volt d.c. supply at 5 ma. and 6.3 volts a.c. at 0.6 ampere.



Model 65-512 (*"Tenna-Meter"*) $15.95 (net)

Inserted in coax line to measure relative power output and to assist in tune-up of transmitter.

Model 65-518 (*"Signal Optimizer"*) $47.50 (net)

Measures VSWR (direct readings); measures power output in watts (direct readings); checks crystal activity; can be used as field strength meter (built-in telescoping antenna); plug-in headphones permit check on modulation quality.

GAVIN INSTRUMENTS, INC.

Depot Square, Somerville, N. J.

Model CB-T $9.95 (net)

TVI filter; inserted in coax transmission line; provides 30 db attenuation above 28 mc.; only 1 db insertion loss; eliminates TV channel 2 interference.

GENERAL RADIOTELEPHONE CO.

3501 Burbank Blvd., Burbank, Calif.

Model SBT-3 (*"Sideband Generator"*) $99.95 (net)

Converts AM output of 5-watt input transceiver to double sideband with suppressed carrier; 117-volt power supply only; no connection to modulator required; effectively increases "talk power."

Model 615 (*"SWR Bridge"*) $39.95 (net)

Measures VSWR (direct readings) up to 54 mc.; measures true power output to 52-ohm load (self-contained) in two ranges—0-5.0 and 0-25.0 watts; measures relative field strength using attachable telescoping antenna; may be left permanently in coax line; adapter cables for connecting to Motorola plugs available at $1.95 each.

HALLICRAFTERS, INC.

Fifth & Kostner Avenues, Chicago 24, Ill.

Model HA-12 (*"Encoder/Decoder"*) $79.95

Selective calling system using 2-tone signalling; designed for use with manufacturers model CB-3A, but may be adapted to other transceivers; no power supply; requires high voltage from transceiver; automatically resets after 10 seconds; 6 possible codes; has call light feature; use on both transmit and receive; 2⅞ x 3⅜ x 5¼; 1¾ lb.

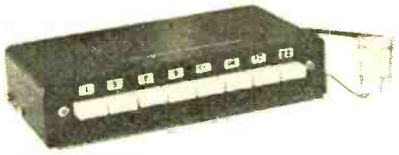
Model HA-12A (*"Encoder"*) $44.95

Selective calling system using 2-tone signalling; designed for

mobile use; transmitting only (no receiving features); 6 possible tone codes; 2⅞ x 3⅜ x 4½; 1 lb.

HAMMARLUND MFG. CO.

53 West 23rd St., New York 10, N. Y.

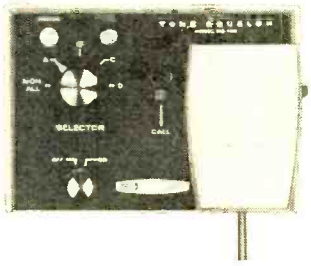


OCT-X Selector *(8 channel)* $15.95 (net, less crystals)

Push-button switch designed for use with Hammarlund HQ-105 TRS transmitter/communications receiver; plugs into existing crystal socket—8 new crystals plug into back of selector.

HEATH COMPANY

Benton Harbor, Mich.



Tone Squelch (Kit GD-162A) $33.95 (kit only)

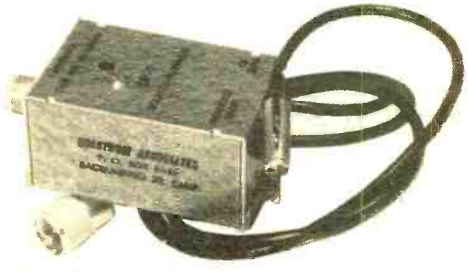
Selective calling system; one of 4 different audio tones chosen by front panel switch; variable "hold" adjustment; 117-volt, self-contained power supply; incoming call indicator; external connections to alarm devices provided at rear of chassis; each unit is complete tone generator as well as monitor with resonant-reed relay; 12-volt d.c. kit available ($37.95).

HOLSTROM ASSOCIATES

P.O. Box 8640, Sacramento 22, Calif.

Model AAA-1 ("Audio-Aid-All") $10.99 (kit)

Speech clipper and filter; restricts audio passband to 500-2500 cycles; uses zener diodes; must be connected internally to modulation circuit of transceiver; derives power from transceiver; improves "talk power" and percentage of modulation.

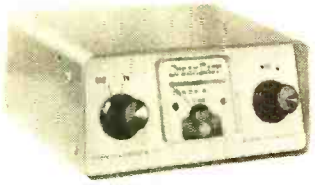


Model DP-2 (Coupler-Duplexer) $4.99 (kit)

Coupling network permitting use of CB antenna for regular AM broadcast reception through auto radio; complete with coax connectors; tuned circuit isolates BC receiver from CB transceiver.

INSTRUMENTS & COMMUNICATIONS, INC.

33 Danbury Road, Wilton, Conn.

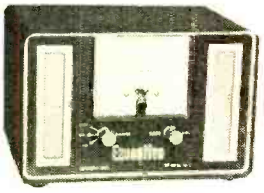


SpeakEasy $34.75 (net)

Audio compressor to increase so-called "Talk Power"; available for either 117- and 12-volt, or 117- and 6-volt operation; variable modulation control; easily attached to any CB transceiver; has front panel meter to show percentage of modulation.

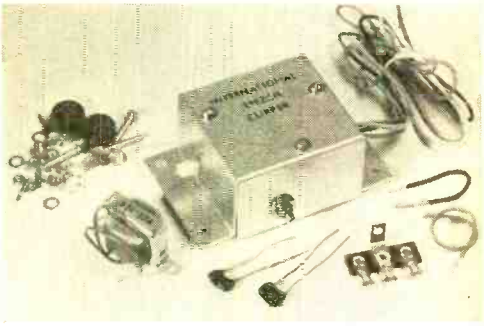
INTERNATIONAL CRYSTAL MFG. CO., INC.

18 North Lee, Oklahoma City, Okla.



Executive S/Meter Speaker $49.50 (net)

Designed especially for use with manufacturers Model 100 transceiver; VTVM circuit (3 ranges) for accurate S-meter readings; audio passband of speaker restricted to most useful voice frequencies.



International Speech Clipper/Filter $17.95 (net)

Audio filter restricts voice range to 300-2500 cycles; limits modulation peaks; increases percentage of modulation; designed for internal wiring to most CB transceivers, or specifically to all of manufacturers models except 100-D (has this circuit built-in).

CB DIRECTORY

Executive Speech Filter $36.50 (net)

Designed especially for use with manufacturers Model 100 transceiver; speech compressor and filter; limits voice range to 300-2500 cycles; increases percentage of modulation; increases "talk power."

E.F. JOHNSON COMPANY

Waseca, Minn.

Eliminoise (not illustrated) $11.50

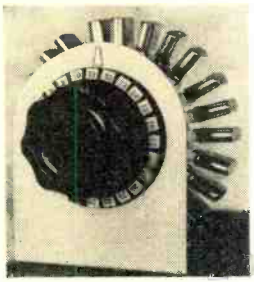
Kit of parts to suppress interference created by automotive generator-regulator, or alternator-regulator; includes spark plug shielding, distributor cap shielding, etc.

Tone Alert $59.95 (net)

Selective calling system; may be attached to most CB transceivers; self-contained power supply; each unit is both tone generator and monitor with resonant-reed relay; indicator call light stays on after proper incoming tone signal is received; 37 possible tones available; either 117- and 12-volt, or 117- and 6-volt models.

KAVIN ENGINEERING CO.

89 West Main St., Penacook, N. H.



23-Channel Switch $32.50 (FOB)

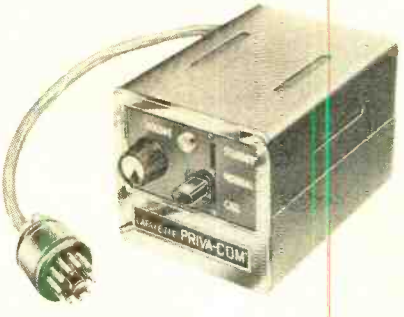
Rotary switch with bank of crystal sockets around perimeter; double-pole switching for crystal isolation; dial markings can be applied as crystals are purchased and installed; simple connection to most transceivers not using frequency synthesis.

LAFAYETTE RADIO ELECTRONICS CORP.

111 Jericho Turnpike, Syosset, L. I., N. Y.

Field Strength Meter (Model TM-16A) $15.95 (net)

Transistorized design permits sensitive tune-up of CB equipment; battery-operated (1.5-volt flashlight cell); has earphone jack for monitoring output modulation quality of transmitter; available with 3 ranges; external telescoping antenna.



Priva-Com (Model HA-100) $32.50 (net)

Selective calling system (both transmit and receive); 6 possible tone signal combinations; indicator light activated if call is unheeded; designed for use with manufacturers models HE-15, HE-20, or HE-90; may be adopted to any push-to-talk transceiver; 3⅝ x 3¼ x 5⅛.

Squelcher (Model HE-55) $10.95 (net)

Ignition or pulse-type noise eliminator with built-in squelch control; based on famous TNS circuit; 2 tubes; requires external filament and B-plus voltages; easily installed; sold with complete wiring instructions.

LAMPKIN LABORATORIES, INC.

Bradenton, Fla.

Frequency Meter (Model 105-B) $260.00

Professional-style frequency meter; conservatively guaranteed to be better than 0.0025% in accuracy; available without built-in crystal calibrator for $215.00; may be used to determine any transmitter frequency between 100 kc. and 175 mc.; higher range multipliers to 450 mc. are available as accessory items.

MARK HELIWHIP

1801 W. Belle Plaine Ave., Chicago 13, Ill.

CB-AM Radio Coupler (Model CBC-1) $8.95 (net)

Signal splitter enabling use of cowl-type CB antenna for regular AM auto radio reception; minimum signal loss; uses coax connector to transceiver; Motorola-type connector to auto radio.

METROTEK ELECTRONICS, INC.

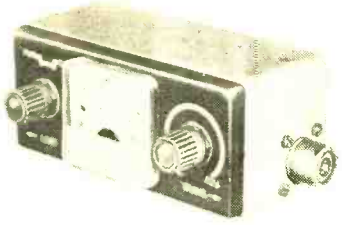
205 W. Cabarrus St., Raleigh, N. C.

Monocall $79.95

Selective calling system using 2-tone method; mechanical reeds with 6 possible code combinations; used both on transmit and receive; has 10-second "hold"; requires B-plus voltage only from transceiver; 2¾ x 3¼ x 5¼; 12 oz; also available as "encoder" for $39.95 (no receiving functions).

MICROWAVE DEVICES, INC.

Farmington, Conn.



Model 290 ("Micro-Match") $26.50

Measures VSWR (direct readings); measures true power output to 52-ohm load up to 4 watts; may be left in coax line; r.f. load resistor available ($2.95) and cable assembly for connecting to transceiver ($2.45).

MIRATEL ELECTRONICS, INC.

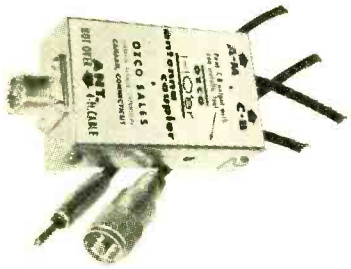
Richardson St., New Brighton 12, Minn.

Selectro $29.50 (Model "C") and $59.50 (Model "D")

Selective calling system; transistorized in 2 separate packages; Model "C" Coder has 9 tone channel possibilities; Model "D" is decoder for base station use (also requires 12 volts a.c. or d.c.); system operates by pressing "Call" button on "C" Coder for 3 seconds.

OZCO SALES

Granite Ave. Extension, Canaan, Conn.



1-10'er $6.95 (net)

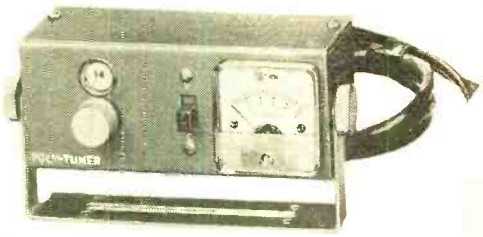
Coupling network permitting use of the cowl-type CB antenna as auto AM radio antenna; completely automatic—no switching; supplied with 2' output cables; peaked for operation near channel 11.

POLYTRONICS LABORATORIES INC.

388 Getty Ave., Clifton, N. J.

Poly-Call Price n.a.

Selective calling system; plugs into manufacturers models N, N-8, Pro, or Compact; spare relay contacts to control external devices; no wiring required by installer.



Poly-Tuner $34.95 (net)

Outboard accessory to provide 22-channel reception to owners of manufacturers' Poly-Comm N or Poly-Comm 11G CB transceivers; also contains S-meter (illuminated model S-meter available at slightly extra cost).

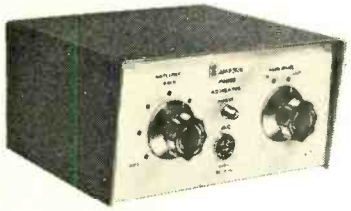
SAMPSON COMPANY

2244 S. Western Ave., Chicago 8, Ill.

Power Modulator (Model VM12-120) $49.95

Compressor/amplifier connected between microphone and transceiver; limits frequency response of audio system; clips and filters to build up overall modulation level; available with 117- and 12-volt power supply.

CB DIRECTORY



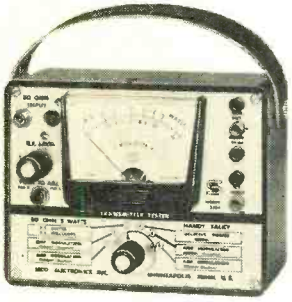
Sampson
VM12-120

SECO ELECTRONICS, INC.

1201 S. Clover Dr., Minneapolis 20, Minn.

Antenna Tester (Model 520A) $49.95 (net)

Measures VSWR (direct readings) up to 180 mc.; measures true power output to 50-ohm load up to 1000 watts—reads on 3 scales (0-10, 0-100, and 0-1000); may be left in coax line; scale especially divided in Good-Poor ranges to assist novice in obtaining peak results with equipment; does not require external shunts or correction charts.



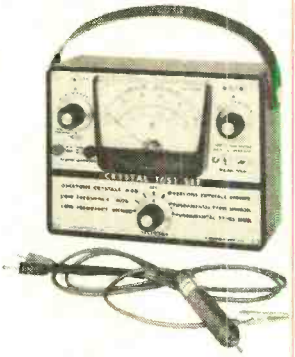
C/B Transmitter Tester (Model 510B) $48.95 (net)

Measures power output to 5 watts (direct readings with 50-ohm load); measures relative power output of 100-milliwatt hand-held transceivers; measures percentage of modulation (positive and negative); may also be used as field strength meter and remote r.f. indicator; optional accessory is attenuator to enable measurements with transmitters up to 50 watts output ($15.95).

CRYSTalignMETER (Model 500) $36.95 (net)

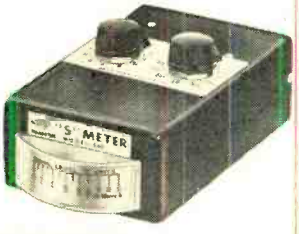
Valuable instrument for checking crystal activity; checks all crystal oscilloting modes; transistorized with self-contained

battery supply; can be used as crystal-controlled signal generator with tone modulation; built-in loop will detect r.f. fields near base of antenna; cable connections permit use as remote r.f. indicator; may also be used to check modulation; plate current, etc.



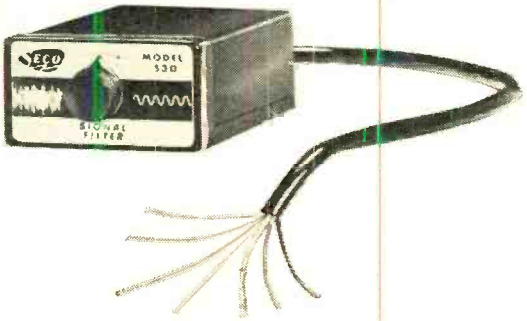
Crystal Test Set (Model 500A) Price n.a.

Improved version of the above; may be used to compare activity of low frequency crystals; when used with r.f. probe (Model 502) this set will measure r.f. volts and power output (separate meter scales); does not have built-in loop.



"S" Meter (Model 540) $15.88 (net)

Transistorized meter circuit easily connected to a.v.c. bus in any superhet; self-contained; battery-operated (standard 9 volts); 2 controls—sensitivity and zero set; size matches that of Model 540 Signal Filter.



Signal Filter (Model 530) $15.88 (net)

Pulse and ignition noise eliminator; adjustable squelch control; seems to be based on famous TNS circuit; requires filament and B-plus voltage connections to transceiver; easily wired into most superhet receivers; instructions supplied by manufacturer; 2 tubes; very rugged design.

SIMPSON ELECTRONICS, INC.

4212 Ponce de Leon, Coral Gables 46, Fla.

ELDECO Port-O-Gen $14.95

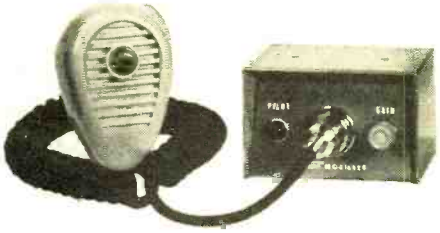
Transistorized battery-operated oscillator for checking crystal activity; may be used for "spotting" and alignment; tone modulated; accepts large and small pin crystals.

SMEA ENGINEERING

123 East Washington, Tipton, Ind.

Pow-R-Mike $39.95 (net)

Speech compressor to increase so-called "Talk Power"; 117-volt power supply built in; ceramic microphone mounted in front panel; can be made extremely sensitive and will pick up voices 25-50 feet away from mike; variable compression; 3½ x 8 x 5; 2¼ lb.



Mobileer (Model R) $39.95 (net)

Similar circuit to above; sold with noise cancelling mike (or Model RJ for $29.95 without microphone); powered from 12-volt car battery, no other connections but mike cable to transceiver; manufacturer claims 30% increase in modulation.

SPRAGUE PRODUCTS CO.

North Adams, Mass.

Suppressikit SK-1 *(not illustrated)* $17.85 (net)

Easily installed kit of 5 basic parts to suppress radio interference from generator, distributor, voltage regulator and high-voltage coil; uses well-known "Thru-Pass" Sprague capacitors; liberal use of shielded cabling.

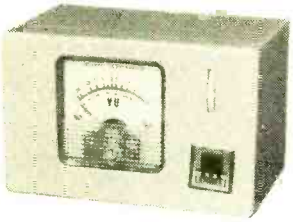
STONER ELECTRONICS

Box 7388, Alta Loma, Calif.

Auto-Patch (Model SE-104) $14.95 (net)

Connects telephone line to CB transceiver; requires connections

to microphone, speaker and telephone lines—can be done in about 5 minutes; fully automatic once installed; modulation level setting on rear apron of Auto-Patch.

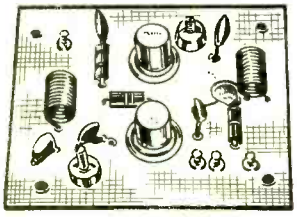


Audio Ram (Model SE-100) $34.95 (net)

Transistorized low-gain audio amplifier/compressor/speech clipper; operates from self-contained battery supply; deluxe model has VU meter and level control; also available in economy version (Model SE-101) without metering and level control for $24.95; also available as kit (Model SE-101K) for $14.95; provides about 12 db compression; increases so-called "talk power."

WORLD RADIO LABORATORIES

Council Bluffs, Iowa

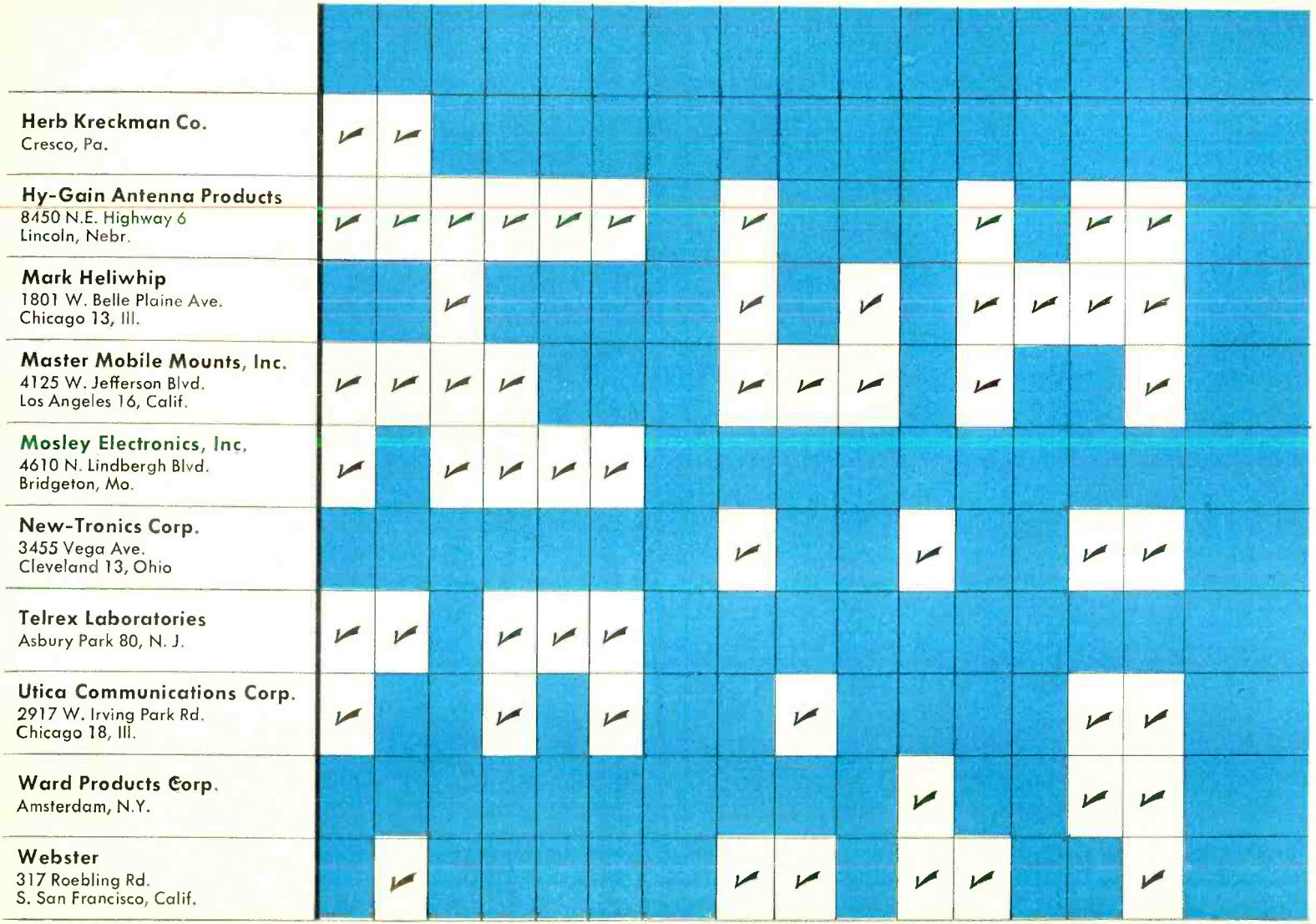


CB Preamplifier (Model NA-27) $11.95

R.f. preamplifier fixed-tuned (but sufficiently broad-banded) to 27-mc.; uses 2 Nuvistor tubes; printed-circuit wiring; easily installed—requires filament and low B-plus voltage; manufacturer claims gain of 20 db.; usable with either superhet or superregen receivers; manufacturer supplies wiring instructions.

Editor's Note

In preparing the above catalog section, every possible effort has been made to itemize representative CB products, or accessories especially designed for the CB operator. There are obviously a number of products in the ham radio field that can also be used for CB. The equipment above does not include such things as signal generators, tube testers, etc., that are of equal importance to the CB'er, the ham, SWL, and radio serviceman. Nor does it include crystals; CB crystals of uniform tolerance and quality are being supplied to almost every radio parts jobber and distributor throughout the country, and a listing of the crystal manufacturers would be superfluous.



ANTENNAS

Manufacturer	Base Station (all antennas vertically polarized)							Mobile Station (all antennas vertically polarized)								
	Ground Plane (types of)	Half-Wave Coaxial	End-Fed Half-Wave	2- or 3-Element Beam	4-, 5- or 6-Element Beam	Special Beam Antenna		Quarter-Wave Steel Whip	Quarter-Wave Fiberglass Whip	Short Whip (Base Loading)	Short Whip (Center Loading)	Short Whip (Top Loading)	Special Marine/ Aeronautical	Special Automotive	Automotive/ Marine Mounts	
Antenna Specialists Co. 12435 Euclid Ave. Cleveland 6, Ohio	✓	✓	✓	✓		✓		✓	✓	✓	✓		✓	✓	✓	
Browning Laboratories, Inc. 100 Union Ave. Laconia, N. H.					✓											
Continental Electronics 6151 Dayton Liberty Rd. Dayton 18, Ohio	✓			✓	✓										✓	
Columbia Products Co. RFD #3 Columbia, S. C.	✓	✓	✓						✓	✓		✓	✓	✓	✓	
Cubex Company 3322 Tonia Ave. Altadena, Calif.						✓										
Cush Craft 621 Hayward St. Manchester, N. H.	✓	✓		✓	✓											
GC Electronics Co. 400 S. Wyman St. Rockford, Ill.	✓		✓					✓				✓			✓	
General Electromagnetics 11719 E. Washington Blvd. Whittier, Calif.														✓		

CB DIRECTORY

MICROPHONES

Although microphones now supplied with transceivers have improved in quality, many CB'ers require different features—noise cancellation, base station with pedestal, more or less frequency response, etc. This listing should enable the CB'er to determine the characteristics of the microphones that are available.

AMERICAN MICROPHONE CO.

Galien, Mich.

Model B208S — $13.95 (list)

Ceramic element; rated output level —58 db; 50-8000 cycle response; 5' coiled cord; available without coiled cord for $1.45 less; has 'Slide-Lock' d.p.s.t. switch; molded case.

B208S

B213S

Model B213S — $16.75 (list)

Ceramic element; rated output of —58 db; 50-8000 cycle response; 5' coiled neoprene cord; available with or without d.p.s.t. switch; also available with crystal element for $2.50 less; sold with dash bracket; hi-impact Implex case.

ASTATIC CORP.

Conneaut, Ohio

Model 511 — $19.95 (list)

Ceramic element; rated output level —50 db; 200-4000 response not given; 5½' coiled cord; press-to-talk leaf-type d.p.s.t. switch; plastic case with spun-aluminum grill.

511

513

Model 513 — $34.50 (list)

Dynamic element; rated output level—50 db; 200-9000 response not given; 5½' coiled cord; press-to-talk leaf-type d.p.s.t. switch; plastic case with spun-aluminum grill.

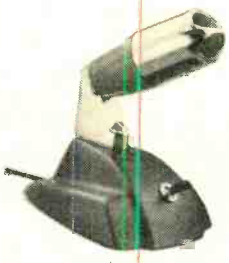
ELECTRO-VOICE, INC.

Buchanan, Mich.

Model 600E/602E — Model 600E: $39.00 (list); Model 602E: $57.50 (list)

Dynamic element; rated output level —55 db; 100-7000 cycle response; 6' coiled cord; available in hi-Z or lo-Z; d.p.s.t. switch; gray plastic finish; mounting bracket. Model 602E has the same response, but incorporates a noise-cancelling aperture to permit close-talking where high ambient noise is encountered.

600E



641

Model 641/634 — Model 641: $35.00 (list); Model 634: $31.50 (list)

Dynamic element; rated output level—57 db; 70-10,000 cycle response; 6' cord (base station mike); hi-Z or balanced 150 ohms; chrome case; Model 634 is furnished without fixed-tilt stand coupler; both models have on-off switch. Model pictured above is the 641 with 418-S stand ($15.00 list, extra).

Model 714SR — $16.50 (list)

Ceramic element; rated output level—55 db; 60-7000 cycle response; 5' coiled cord; d.p.d.t. switch; gray finish with Cycolac plastic body; supplied with hang-up bracket.

714

717

Model 717 — $19.50 (list)

Ceramic element; rated output level—55 db; 100-7000 cycle response; 5' coiled card; cardioid pattern; noise cancellation as high as 67% from back of microphone; d.p.d.t. switch; blue-gray finish with Cycolac plastic body; supplied with hangup bracket.

Model 727

Model 727: $18.00 (list); Model 727SR: $20.00 (list)
Model 729: $24.50 (list); Model 729SR: $26.50 (list)

Ceramic element, rated output level —55 db; 60-8000 cycle response; 8½' cord (base station mike); supplied with slip-in die-cast desk stand plus floor stand adapter; Model 727SR has d.p.d.t. leaf-type switch, gray finish; same mike with cardioid pattern called Model 729.

727

C47

EUPHONICS CORP.

Guaynabo, Puerto Rico

Model C47 ("Hothead") $16.00 (list)

Ceramic element; rated output —48 db; 300-4000 cycle response; 6' coiled cord; press-to-talk d.p.d.t. switch; Model C47D available for same price has differential to 600 cycles and cardiaid pattern to 4000 cycles supplied with hang-up bracket.

INSTRUMENTS AND COMMUNICATIONS, INC.

33 Danbury Road, Wilton, Conn.

Mark I "Big Mike" $33.50 (net)

Dynamic element with built-in transistor amplifier (mercury battery power supply); rated output level adjustable from zero to —39 db; variable frequency response; 5' coiled cord; d.p.d.t. switch; hangup bracket.

Mark I

201

SHURE BROTHERS, INC.

222 Hartrey Ave., Evanston, Ill.

Model 201/401 Model 201: $18.00 (list)
Model 401: $22.00 (list)

Ceramic element; rated output level —55 db; 200-4000 cycle response; 5' coiled cord; d.p.d.t. switch; supplied with mounting bracket; blue finish, plastic "Armo-Dur" case; Model 401 is similar, but has dynamic element and —49 db response.

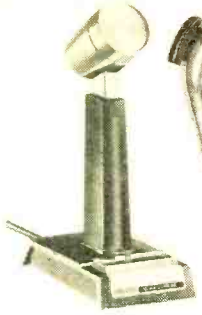
Model 275SK $16.50 (list)

Ceramic element; rated output level —59.5 db; 40-10,000 cycle response; 5' coiled cord; s.p.d.t. switch; supplied with mounting bracket; black finish, plastic "Armo-Dur" case; desk stand optional accessory.

Model 444 $42.50 (list)

Dynamic element; rated output —52.5 db; 300-3000 cycle response; 7' cord (uncoiled); base station microphone with adjustable height stand; d.p.d.t. switching with locking feature; gray finish; Model 460 "Dispatcher" similar in appearance, but has 100-9000 cycle response; available after August 1.

275



444

488

Model 488 Sonobar $57.50 (list)

Controlled reluctance with noise-cancelling features; rated output level —58 db; 200-4000 cycle response; 5½' coiled cord; d.p.d.t. switch; hi-Z or lo-Z models available; gray finish with lip guard; plastic "Armo-Dur" case.

SONOTONE CORPORATION

Elmsford, N. Y.

Model CM-30/CM-31

Model CM-30: $14.00; Model CM-30M: $16.50
Model CM-31: $13.50; Model CM-31M: $15.00.

Ceramic element; rated output level —49 db; 90-7000 cycle response; 6' coiled card; lightweight plastic case; d.p.s.t. switch; Model 31 does not have switch; either model available with magnetic dashboard mount (add letter "M") in place of bracket.

CM-30

254C

TURNER MICROPHONE CO.

909 17th St., N.E., Cedar Rapids, Iowa

Model 254C $23.50 (list)

Ceramic element; rated output level —54 db; 80-7000 cycle response; base station mike with fixed desk stand; touch bar on-off switch and lever-lock switch; 7' cable; also available with a dynamic or crystal element.

Model 350C $12.50 (list)

Ceramic element; rated output level —54 db; 80-7000 cycle response; d.o.s.t. switch; 5' cailed card; gray finish, polystrene case; supplied mounting bracket. A special combination of the 254C and 350C are sold in one package for $40.30 (list).

Model 355C $12.50 (list)

Ceramic element; rated output level —50 db; 80-7000 cycle response; d.p.s.t. switch; 5' coiled cord; heavy-duty plastic case; mounting bracket supplies.

(Continued overleaf)

CB DIRECTORY

UNIVERSITY LOUDSPEAKERS, INC.
80 S. Kensico Ave., White Plains, N. Y.

Model 61/61HF

Model 61: $24.95 (net)
Model 61HF: $27.95 (net)

Dynamic element; rated output level —55 db; 95-9500 cycle response (Model 61HF has a response of 70-14,000 cycles); 6' coiled cord; d.p.s.t. switch; gray finish; heavy-duty plastic.


350

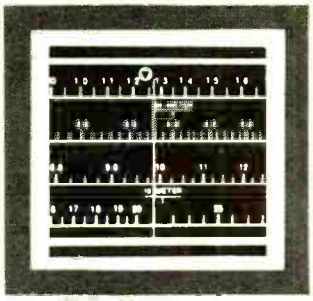

355


61

HAND-HELD TRANSCEIVERS

MANUFACTURER	MODEL	TYPE	WEIGHT	PRICE
Allied Radio Corp. 100 North Western Ave. Chicago 80, Ill.	Knight-Kit C-100 Knight-Kit C-555 Lincoln Walkie-Talkie	Superregen Superhet Superhet	9 oz. 16 oz. 24 oz.	$9.95 $19.95 $32.50
J. Briskin Inc. 14827 Ventura Blvd. Sherman Oaks, Calif.	Tele-Mate 200	Superhet	14 oz.	$99.50 (list per pair)
Concord Electronics Corp. 809 North Cahuenga Blvd. Los Angeles 38, Calif.	TG-093	Superhet	15 oz.	under $60
EICO 33-00 Northern Blvd. Long Island City, N.Y.	740	Superhet	19 oz.	$54.95 (kit) $79.95 (wired)
Electra International 1348 Foothill Blvd. LaCanada, Calif.	Miniphone 100 Miniphone 400 Mk. IA Miniphone 400 Mk. II Miniphone 600	Superhet Superhet Superhet Superhet	10 oz. 12 oz. 10 oz. 12 oz.	$39.95 (pair) $69.95 (pair) $149.95 (pair) $99.50 (net)
Electrosolids Corp. 12740 San Fernando Rd.No. Sylmar, Calif.	S-2100 S-2200 S-2300	Superregen Superhet Superregen	8 oz. 12 oz. 6 oz.	$9.95 (list) $32.95 (list) $ 9.95 (Retail)
Fanon-Electronic Industries, Inc. 439 Frelinghuysen Ave. Newark 14, N. J.	Fanon-Masco FCB-9A Fanon-Masco RCB-10	Superhet Superhet	14 oz. 16 oz.	$67.40 (list) $74.95 (list)
GC Electronics Co. Rockford, Ill.	Pocketphone	Superhet	14 oz.	$125.00 (net)
General RadiotelephoneCo. 3501 Burbank Blvd. Burbank, Calif.	Fieldmaster	Superhet	24 oz.	$39.95
Hallicrafters Co. 4401 West Fifth Ave. Chicago 24, Ill.	CB-6	Superhet	20 oz.	$59.95

(*Continued on page* 116)



Across the Ham Bands

By **HERB S. BRIER,** W9EGO
Amateur Radio Editor

SAFETY IN THE HAM STATION

WHAT'S WRONG with this little episode?

One of my friends marched proudly into my shack the other day carrying a new communications receiver. "Hi, Herb," he said. "Give a listen to my new receiver." Carefully placing it on the table, he unwound its power cord and inserted the plug in a nearby 117-volt, a.c. socket. Then he transferred the antenna lead-in from my receiver to his. Next, he connected the loudspeaker. "I don't think we'll need your ground wire," he said as he turned the receiver power switch on. In a half minute, signals began pouring out of the speaker.

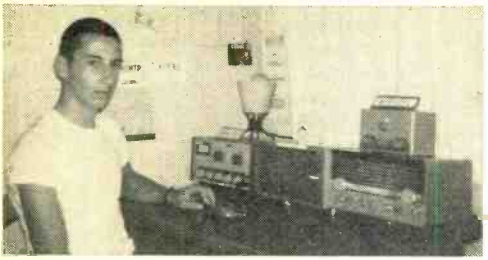
Nothing wrong? Think again. The flaw in the above story is that my friend carelessly violated two elementary safety rules when he hooked up his receiver, just as many licensed amateurs, SWL's, and CB operators do every day.

Let's take a real hard look at the dangerous habit of working on electrical apparatus with the power plug inserted in the wall socket. Obviously when you do so, you may be betting your life on a bit of insulation and a small spring in a switch—even if the power switch is in the *off* position. Also, while leaning over gear to work on it, your clothing could hook the switch and turn it on accidentally, maybe when your hands are in firm contact with a high-voltage point. These possibilities present no danger if you make sure that the power plug is out of the socket before you start to work.

Good Ground Connections. In modern electronic equipment, the 117-volt primary circuit is almost always bypassed to the metal chassis with capacitors of values between .001 and .01 μf. rated at 400 to 600 volts. This is done to prevent

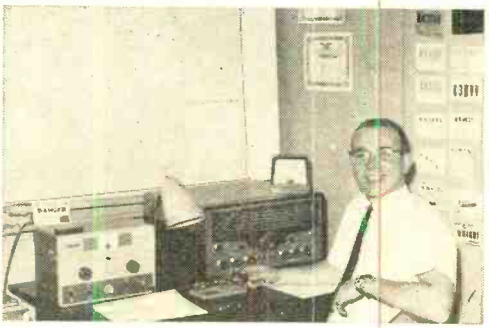
Novice Station of the Month

We are pleased to award a one-year subscription to Don Hutchins, of West Point, N.Y., (WN2CDV), for submitting the winning photo in our August contest. A Heathkit DX-35 transmitter, long-wire antenna, and Lafayette KT-320 receiver are Don's ham tools; with them, he has contacted 20 states, 3 Canadian provinces, and the Panama Canal, all on 80 meters. If you want to try for a similar award, send us a picture of your station—preferably showing you at the controls—with some information about yourself, your equipment and activities. All entries should go to Herb S. Brier, POPULAR ELECTRONICS, P. O. Box 678, in Gary, Indiana.



John Sanders, WV6YXT, Sunnyvale, Calif., operates mostly on 40 and 15 meters. John has made over 350 contacts in 33 states with equipment shown.

Tom Moore, WN9CLI, of Anderson, Ind., had worked 31 states when the picture below was taken; he expected to add to that total on his summer vacation.



unwanted r.f. signals picked up by the power line from getting into the equipment, or vice versa.

Naturally, a little 60-cycle current flows through these capacitors, but, *if the chassis is properly grounded,* this current flows harmlessly to ground. If the ground is omitted, however, the current will flow through *you* if you touch any metal part of the unit and some grounded metal object (such as your transmitter, the microphone, or the key) at the same time. This will give you an annoying and painful electric shock.

What happens if one of the bypass capacitors connected between the transformer primary and the chassis of a piece of equipment shorts out? A sudden surge of voltage on the power line—due, perhaps, to lightning striking it, or just to poor regulation—can easily jump the bypass capacitors. The end result is that one side of the power line is connected directly to the chassis.

If the equipment is properly grounded, this will immediately blow the line fuse and warn you that something is amiss. But if the ground connection is missing, your first clue that anything is wrong may be getting the full line voltage across your body. This warning may be too late!

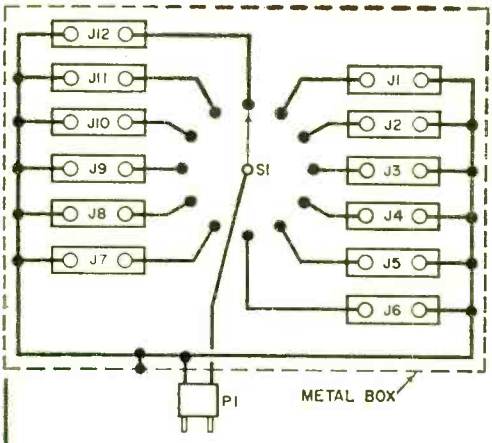
Installing a Safety Ground. An easily-installed "safety" ground can make your radio shack the safest room in the house. Run a heavy copper wire (at least #12) or better still a length of copper shielding braid from your operating desk to the nearest *cold water* pipe, connecting the wire or braid to the pipe with a standard ground clamp. Then bond the ground terminals of all your equipment to this grounding bus. If the run to a cold water pipe is long, you may find that the steam pipe feeding a radiator is well grounded and, therefore, usable, but *don't* ground to it unless a test proves that this is true. Your ground bus may be insulated or bare, but either way it is most important that it be installed so that it can't be accidentally broken or disconnected.

A "safety" ground does not replace any external signal ground system designed to improve the operation of your antenna or to protect it from lightning, but you can tie the two ground systems together.

Communications Handbook, 1963. We at POPULAR ELECTRONICS are proud of our new *Communications Handbook.* If you want to learn about short-wave listening, Citizens Band radio, business radio, or amateur radio, and how to get started in any of these branches of electronic communications, this handbook is for you. Hank Bennett, W2PNA/WPE2FT, Matt P. Spinello, 18W4689, and Robert E. Tall, all did outstanding jobs in their sections of the handbook, and we attempted to cover many of the facets of ham radio that newcomers and old-timers alike frequently ask about. You can pick up a copy of the 1963 *Communications Handbook* for $1.00 from most dealers that sell POPULAR ELECTRONICS, or by mail from Ziff-Davis Publishing Company, Dept. CH3, One Park Avenue, New York 16, N.Y. If you order by mail, add 25 cents extra for postage.

PLUG-IN TRANSMITTER CRYSTAL SWITCH

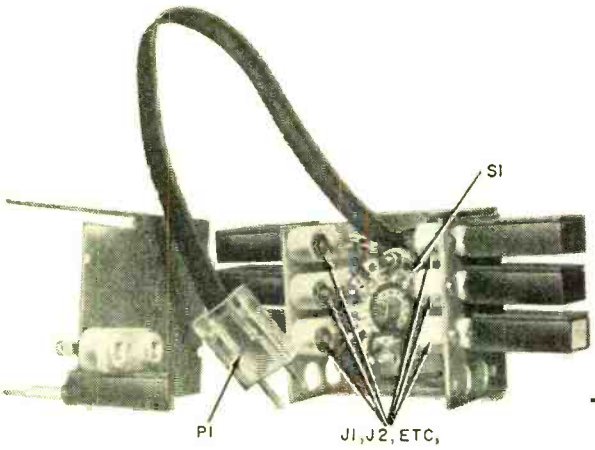
A sharp Novice operator soon recognizes the advantages of changing his



PARTS LIST

J1-J12—Jacks for FT-243 type crystal holders, 0.487" pin spacing, 0.095" dia. pins (Millen #33102 or equivalent)
P1—2-terminal plug (Mosley #301 or equivalent)
S1—Multi-position, s.p., ceramic rotary switch (Centralab PA-2000 or equivalent)
Box—For 8-crystal unit: 1⅝" x 2⅛" x 2¾" aluminum (Bud CU-2100A or equivalent); for 12-crystal unit: 1⅝" x 2⅛" x 4" aluminum (Bud CU-2102A or equivalent)
Misc.—18" length of 300-ohm TV lead-in, 4-32 round-head machine screws ⅜" long, etc.

Changing frequency with crystal control is easy with this multi-position switch. Plug P1 must be inserted in transmitter crystal jack in position that grounds common crystal lead.



Two crystal jacks were left out of the unit shown to clarify the construction details.

transmitter crystal to get out from under a strong interfering signal, or to move closer in frequency to a station he wishes to work. Unfortunately, even when the crystal socket is mounted on the transmitter front panel, it is not always easy to change crystals in a hurry, and when the crystal socket is recessed inside the transmitter, it is practically impossible. But by adding crystal switching to your transmitter, you can change crystals effortlessly.

The plug-in unit in the photograph will accommodate up to eight crystals, and by using the larger box specified in the Parts List and adding four more crystal sockets, 12 crystals can be accommodated.

Construction. Clearances are quite limited (unless you decide to mount the crystal sockets externally); therefore, be extra careful to mount the switch *S1* in the *exact* center of the box. Position the crystal sockets flush with the rear of the box, and space them approximately 9/16" apart, center to center. The ⅛" mounting holes are 13/32" apart, and the 5/16" holes to accommodate the crystal holder prongs are centered 5/16" from the adjacent mounting hole. Place an extra panel nut on the switch bushing before mounting the selector switch; adjust this nut to position the switch wafer between the terminals on the crystal sockets.

Wiring. Connect together the front terminals of all crystal sockets, and connect the rear terminal of each socket to the corresponding fixed terminal of the selector switch. Use a length of standard 300-ohm TV *lead-in* for the

(*Continued on page* 114)

Transistor Topics

By **LOU GARNER,** Semiconductor Editor

TODAY, with transistor radio receivers in the hands of nearly every teenager, with transistorized ignition about to become a standard feature in many new cars, and with transistorized controls used throughout industry, it is interesting to pause and look back over the developments of the past fifteen years.

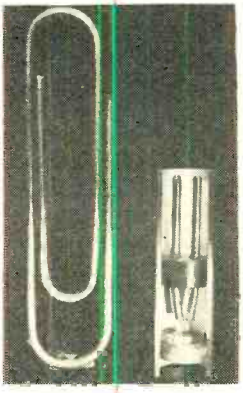
If you're under twenty, chances are you don't remember the announcement of a new kind of amplifying device—the transistor—invented by scientists of the Bell Telephone Laboratories, Doctors Shockley, Brattain and Bardeen. That announcement was made in the summer of 1948 and was received, at the time, with mixed emotions. Some engineers and scientists considered the new device little more than a laboratory curiosity—interesting, but not to be taken seriously. Others woefully predicted that the transistor would "kill" both the vacuum tube and vast industry based on it. Still others looked on it as a device that would supplement, rather than supplant, the tube.

In actual fact, all three predictions came true to some extent: The transistor *was* a laboratory curiosity for some time, it *has* "killed" some sections of the vacuum tube market, and, today, it *does* supplement the tube in many applications.

The first transistors were point-contact devices, and it was from these that the basic electrode names were taken. Each consisted of a small cube-like "base" of semiconductor material upon which rested two fine cat-whisker wire electrodes, one of which was said to "emit" current carriers into the base, while the other "collected" them. Three electrode names, *base*, *emitter*, and *collector*, were derived from this terminology.

These early devices had tremendously high gain, so high, in fact, that they were stable as amplifiers only when used in the grounded-base (or common-base) configuration (see Fig. 1). With this arrangement, the unit was *not* a current amplifier in the generally accepted sense. Rather, it amplified signals by virtue of the difference between its low input and high output impedances (or resistances), and it was from this fact that the *transistor* derived its name—a coined word from the expression *"trans-*

At left: The three inventors of the transistor, Drs. William Shockley, Walter H. Brattain, and John Bardeen, at the time the "new" device was announced by Bell Telephone Laboratories.



At right: A "cutaway" photograph of one of the original point-contact transistors shown with paper clip for size comparison.

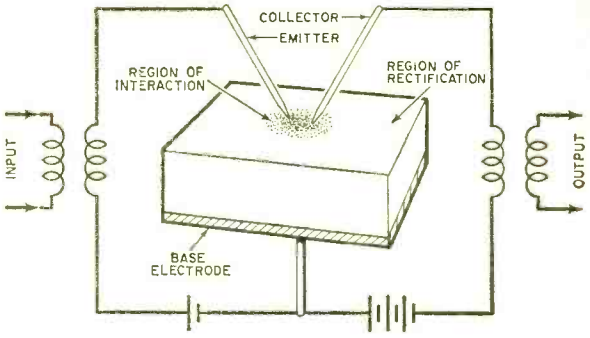


Fig. 1. Drawing used to explain action of the first point-contact transistor. A germanium wafer, which depended on ultra-purifying techniques developed by Bell for efficiency, was its "heart."

fer *resistor*." At the time, many engineers considered the transistor as simply a special version of such resistor-like devices as the *thermistor* and *varistor*.

Old-timers and those who have been interested in radio for a number of years will remember the first stir that the transistor caused among hobbyists, and may even recall when "low-cost" experimenter's transistors sold for *fifty dollars each*, and when Raytheon announced its first truly low-cost unit, the now famous CK722, at *only* $7.50.

The photographs shown here are of historical significance, and you may wish to save them for your scrapbook, for they were sent out with the very first news releases which announced the invention of the transistor.

Readers' Circuits. Many readers are fascinated by direct-coupled circuits. There are probably several reasons for this popularity. Such circuits are quite simple when compared to corresponding vacuum tube designs, and relatively few components are needed for multi-stage, direct-coupled projects. Direct-coupled circuits offer a means for achieving the experimenter's ultimate goal—maximum performance with minimum complexity and cost. This month we are featuring two direct-coupled projects which are based on a basic circuit described in this column some time ago.

The high gain audio amplifier illustrated in Fig. 2 was submitted by Edmund J. Burke (354 Darwin Drive, Snyder, N. Y.). He constructed the device by simply combining a basic direct-coupled circuit described several years ago (January, 1959) with a booster amplifier described in the December, 1962 issue.

Referring to the schematic diagram, a crystal microphone cartridge (XTAL MIC) serves as the primary signal source. The signal from the microphone is applied to the 100,000-ohm gain control (*R1*) and, from there, to a three-stage direct-coupled complementary amplifier, *Q1-Q2-Q3*. The amplified output signal from *Q3* is transformer-coupled to the power amplifier, *Q4*, by *T1*. Capacitor *C1* serves as a d.c. blocking capacitor to prevent a short of *Q4*'s bias (furnished through *R2*) by *T1*'s secondary winding, while *C2* provides inverse

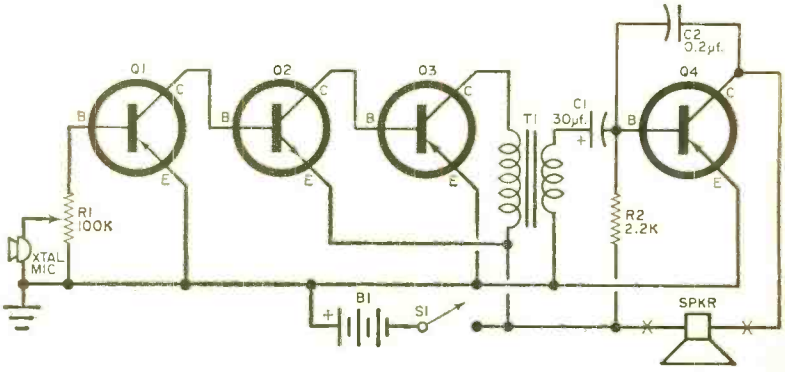


Fig. 2. High-gain audio amplifier circuit submitted by reader Edmund Burke utilizes direct coupling. If a transformer is used, center tap and primary winding are connected at the "X" points in the diagram.

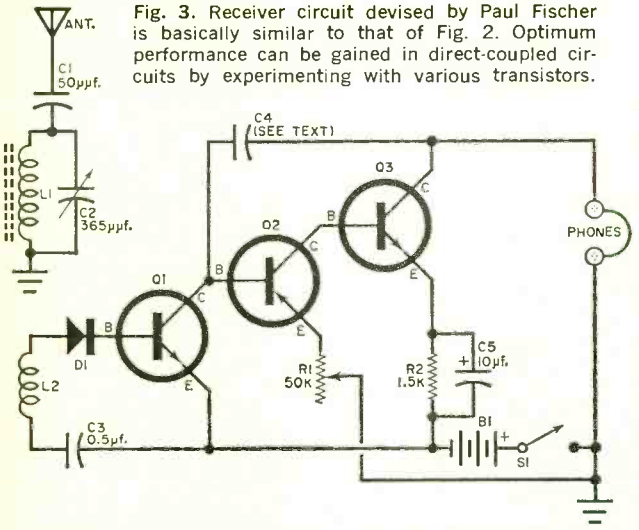


Fig. 3. Receiver circuit devised by Paul Fischer is basically similar to that of Fig. 2. Optimum performance can be gained in direct-coupled circuits by experimenting with various transistors.

feedback to minimize harmonic distortion in the output stage. A loudspeaker voice coil serves as *Q4*'s collector load. Operating power is supplied by *B1*, controlled by single-pole, single-throw switch *S1*.

Standard, readily available parts are used. Both *Q1* and *Q3* are type 2N107's, *Q2* a type 2N170, and *Q4* a Lafayette type SP-147 (although any standard power transistor should work here with *R2*'s value readjusted accordingly). Resistor *R1* is a conventional volume control with on-off switch (*S1*) attached, while *R2* is a half-watt resistor. Capacitor *C1* is a 30- to 50-μf., 20-volt electrolytic, and *C2* a 0.2 μf. paper or ceramic capacitor. The coupling transformer, *T1*, may be any output type with a 1000- to 4000-ohm primary and a 3.2- to 8-ohm secondary. A 6-volt battery (*B1*) is used, and may be made up of four flashlight cells connected in series.

The loudspeaker should have a voice coil impedance of from 3.2 to 8 ohms. For lower distortion at the same or greater output, insert an output transformer between *Q4* and the speaker voice coil. Connect the center tap and one end of the primary winding of the transformer (Lafayette AR-503 or AR-167 can be used) at the points marked "X" in the schematic. Connect the speaker voice coil to the transformer secondary, matching impedances.

The receiver circuit illustrated in Fig. 3 is basically similar to Edmund's audio amplifier, except that the microphone has been replaced by a tuned circuit (*L1-C2*), coupling coil (*L2*), and diode detector (*D1*), while the transformer-coupled power output stage has been replaced by a pair of moderate-impedance (2000-ohm) headphones. The reader who submitted the circuit, Paul Fischer, was inspired by a *Carl and Jerry* story which appeared in a recent issue of POPULAR ELECTRONICS.

In operation, signals picked up by the antenna (ANT) are coupled through *C1* to the selective tuned circuit *L1-C2*. The selected signal is picked up by *L2* and applied to the diode detector (*D1*), and then to the three-stage, direct-coupled amplifier, *Q1-Q2-Q3*. Resistor *R1* provides an adjustable bias for optimum performance, and serves a secondary role as a gain control, while *R2*, bypassed by *C5*, provides a stabilizing bias for the output stage. Capacitor *C4* is an optional component, serving to provide feedback around the last two stages.

Again, inexpensive, readily available components are used. Transistors *Q1* and *Q3* are 2N170's, while *Q2* is type 2N107. Capacitor *C1* is a small ceramic, *C2* a 365 μμf. variable, *C3* a 0.5 μf. ceramic or paper unit, and *C5* a 10-μf., 10-volt electrolytic. Capacitor *C4*'s value is determined experimentally. Start with a .001 μf. ceramic, and try smaller values if oscillation occurs. Resistor *R1* is a 50,000-ohm volume control, and *R2* a half-watt resistor. The tuning coil is a Superex ferrite loopstick (*L1*), while the coupling coil (*L2*) consists of four turns of #25 double cotton-covered wire wound over *L1* in the same direction as the original coil. Diode *D1* may be type 1N54 or 1N60. Operating power is supplied by a 3-volt battery (*B1*), controlled by a single-pole, single-throw toggle or slide switch (*S1*).

Either project may be assembled in

(*Continued on page* 118)

Monthly Short-Wave Report

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

THE SWL QSL BUREAU

ALTHOUGH much has been written from time to time on the subject of reporting to stations for verification purposes, little mention has been made of one important point: the *return* address.

There is an increasing tendency among many reporters, especially amateur radio monitors, to include the notation "QSL via ARRL" in their reports. For the uninitiated, this term simply means that the foreign station is asked to send a verification to WPE such-and-such in care of the American Radio Relay League, West Hartford, Conn.

The ARRL is the headquarters of the amateur fraternity in the United States, and, with the help of hams in all districts, acts as a clearing house for QSL's from foreign lands. Many American ham operators ask foreign stations to "QSL via ARRL" for the sake of convenience, especially if poor conditions are making reception difficult. The term "QSL via ARRL" is readily understood the world over, and is far simpler to send over the air than an address.

American hams who are members of the ARRL and who take advantage of the QSL Bureau are expected to comply with certain rules, such as keeping the Bureau supplied with a number of "SASE's" (self-addressed, stamped envelopes). When cards arrive, they are forwarded to the addressee in one of the SASE's.

WPE registration holders who have been including the "QSL via ARRL" notation in their reports should realize that they may not be complying with ARRL rules, especially that one covering SASE's. Many WPE monitors are not even ARRL members.

Although the ARRL would be quite within its rights in destroying foreign QSL's addressed to WPE registration holders, the organization has continually bent over backwards in an effort to get the cards to their rightful owners. We should be most grateful to them for their assistance.

But, let's not overdo this thing. The ARRL Bureau is set up purely for amateur radio QSL's and not for those of the SWL.

The ARRL periodically forwards quantities of cards which are bound for WPE registration holders (and other SWL's as well) to Roy Waite, 39 Hannum Street, Ballston Spa, N. Y. Roy has, for several years, been operating a QSL-SWL bureau as an unofficial part of his duties as amateur editor for the Newark News Radio Club. His services

Tom Reitze, WPE9EDO, does his logging in Evanston, Ill., using a National NC-125 receiver and a Wollensak tape recorder. His antenna is 75' long. His record: 18 countries verified. Note the neat-looking wallboard in Tom's shack which holds a map, QSL's, and WPE monitor certificate.

Official verification card of Radio Australia. The bird depicted is the kookaburra, whose laugh is heard at the beginning of all Radio Australia programs.

are available to anyone holding a WPE registration, and to other SWL's as well. He operates his bureau on a strictly nonprofit basis, and we know from personal contact with Roy that he often digs into his own pocket to keep the cards going out.

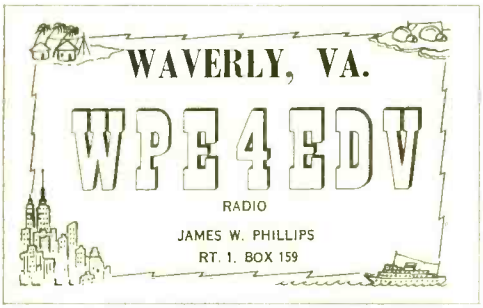
From time to time Roy publishes a list of WPE registrations for whom he has cards but no addresses. Many readers keep a few SASE's on hand at the

ENGLISH-LANGUAGE NEWSCASTS TO NORTH AMERICA

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

COUNTRY	STATION	FREQUENCY *(kc.)*	TIMES *(EST)*
Australia	Melbourne	17,840, 15,315, 9580	2030, 2130, 2230, 0745
Bulgaria	Sofia	6070	1900, 2000, 2300
Canada	Montreal	15,190, 11,720, 9625	1800 (Caribbean)
East Congo	Leopoldville	11,755	1630, 2100, 2230
West Congo	Brazzaville	11,725	2015
Czechoslovakia	Prague	11,990, 9795, 9550, 7345, 5930	2030, 2330
Denmark	Copenhagen	9520	2100, 2230
West Germany	Cologne	15,405, 11,795 9640, 6160 11,795, 9735, 6145	1010 2035 0000
Hungary	Budapest	11,890, 9833, 7220 9833, 7220, 5960	1900 2230
Italy	Rome	9575, 5960	1930, 2205
Netherlands	Hilversum	15,445, 11,950 17,810, 15,445 15,445, 9715 9590, 5985	1030 (Tues., Fri.) 1415 (Tues., Fri.) 1630 (exc. Sun.) 2030 (exc. Sun.)
Portugal	Lisbon	6185, 6025 (may use 9740)	2105, 2305
Spain	Madrid	9360, 6130	2215, 2315, 0015
Sweden	Stockholm	17,840 11,805	0900 2045, 2215
U.S.S.R.	Moscow	(announced) 9650, 9570, 7320, 7250, 7150, 7130; (also monitored on 7230, 7200, 7110, 7070, 7030)	1700, 1900, 2000, 2100, 2300, 0000 0040
Vatican City	Vatican City	9645, 7250	1950

Short-wave monitor card (below) is that of WPE4EDV. It's owner, Jim Phillips, of Waverly, Va., DX'es with two receivers: a Heath GR-91 and a General Electric J-620 (right).



QSL-SWL bureau in the event that cards come in for them.

It might be a good move on the part of WPE monitors, especially those who may have requested foreign stations to "QSL via ARRL," to check and see if Roy is holding any QSL cards. We would suggest that you include return postage in order to keep his expenses to a minimum. Write directly to him at the Ballston Spa, N. Y., address given above. And if you are a ham radio monitor and in the habit of sending reports to foreign hams, you might send an SASE or two to Roy to expedite the forwarding of cards to you in the future.

Please bear in mind that Roy Waite is doing this work on his own—a little help and cooperation on your end of the line will go a long way toward improving the SWL-QSL service.

Obituary. Just as we went to press we learned of the death of one of our veteran DX'ers, Anson Boice, WPE1BD, New Britain, Conn. "Ans" was an expert in DX'ing before yours truly even heard of it. Those who knew him will miss him—those who didn't know him will no longer be able to profit by his periodic reports: 30, Anson.

(*Continued on page* 121)

DX Awards Presented

Qualifying for awards this month (25, 50, and 75 countries verified) are the DX'ers listed below. Congratulations, and welcome to the Awards List!

Twenty-Five Countries

Mark Holton (VE2PE6Z), Drummondville, Quebec
S. C. Piersimoni (WPE2GAW), Bronx, N. Y.
Robert McCauley (WPE2HKL), Little Falls, N. Y.
Jack Warner (WPE9CML), So. Milwaukee, Wisc.
Marc Perlin (WPE1EFP), Mattapan, Mass.
Bruce Scott (WPE2HYD), Orchard Park, N. Y.
W. J. Dwyer (WPE3CKC), Little Silver, N. J.
Alan Imprescia (WPE2HUH), New York, N. Y.
Michael Flomp (WPE2IXH), Valley Stream, N. Y.
Richard McGlew (WPE6ACE), San Francisco, Calif.
Paul Cherry (WPE3AUM), Philadelphia, Pa.
H. N. Heydon (VE3PE1VK), Brampton, Ont.
Franck Lynch (WPE2GLW), Cape May Court House, N. J.
Colin Forbes (ZS5PE1DA), Durban, South Africa

Fifty Countries

Frank Diehl (WPE2GUJ), Buffalo, N. Y.
Danny Caplan (WPE4BXG), Atlanta, Ga.
Chuck Edwards (WPE4BNK), Fort Lauderdale, Fla.
James Whitworth (WPEØBZQ), Colorado Springs, Colo.
Lenny Olans (WPE1CMG), Dorchester, Mass.
Paul Harig (WPE2GCX), Auburn, N. Y.
Nick Vrettos (WPEØCEP), Fort Leonard Wood, Mo.
Robert Eddy (WPE8EQW), Newport, Ohio
David Skinner (WPE2GHO), Belleville, N. J.
Fred Essenwein (WPE2DVS), Mineola, N. Y.
Stanley Penc (WPE2HA), Utica, N. Y.
William Lund (WPE6CJ), Manhattan Beach, Calif.

Seventy-Five Countries

Richard Davis (WPEØARK), Denver, Colo.
Dave Listort (WPE2FGX), Elmont, N. Y.
T/Sgt. William R. Gardiner (WPE5BXB), Roswell, N. M.

Short-Wave Broadcast Predictions

AUGUST 1963

By STANLEY LEINWOLL
Radio Propagation Editor

AN ENGLISH-language program of particular interest to hams and SWL's, "The VOA Amateur Radio Program" is still popular. If it's new to you, it consists of 15-minute segments featuring interviews, propagation forecasts, general gossip, and news of recent developments. A special QSL card is available to listeners of the program which is written and announced by Bill Leonard, W2SKE, who is also a prominent newscaster for CBS. Broadcast times (GMT) include: Sunday at 0730, 0845, 2230, and Monday at 0330. Since the program is carried on a world-wide basis, frequencies range from 49 to 13 meters, depending on time and transmitter site. In general, the 0330 GMT (1130 EDST) program is most likely to be heard by domestic listeners from transmitters in the U.S. on the 49-, 31-, and 25-meter bands. Specific frequencies can be obtained by writing Amateur Radio, Box 922, Washington 4, D.C.

TIME (EST)

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

TIME (CST)

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

TIME (PST)

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

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

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325 watts minimum output • High level modulation transformer for unparalleled talk power • New High-Level Tone Signal • Illuminated "S" Meter • 6V, 12V, 115V operation • 15 Watt construction* Net price including microphone, crystal, 115V cord: $199.95. 6V or 12V cord ea $4.95. Crystal T or R, ea $2.95. 90 day warranty. F.O.B. Burbank, California.

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General VS2

*Under present rules part 19.32 the FCC does not provide for more than 5 (5) watt input in the Citizens Radio Service (26.965-27.225 MC Band)

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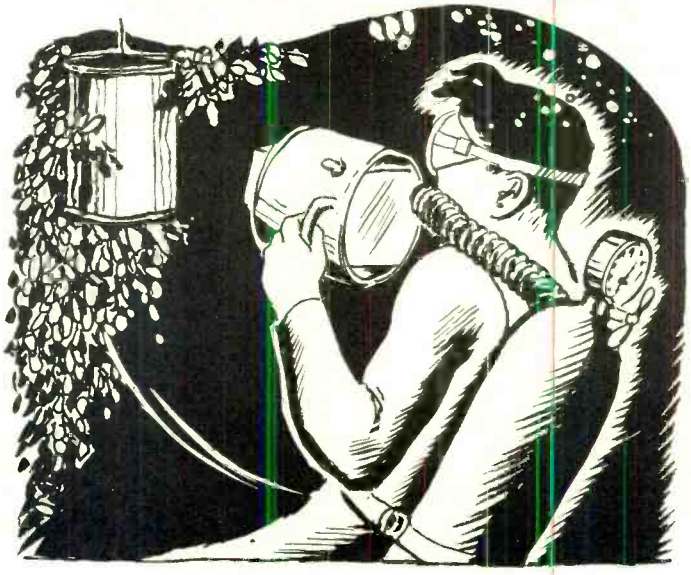
SONAR SLEUTHING



Jerry inched forward slowly, keeping his depth . . . suddenly the end of the sonar unit bumped into a large object in the water.

"UP PERISCOPE!" Jerry called to Carl, and the latter released the large cylindrical object he had been holding on the bottom of Jerry's full bathtub and watched it slowly rise to the surface.

The youths were checking out their latest "invention," a hand-held portable sonar unit for use in scuba diving. Actually it was just a crude copy of the *Hydro Probe* manufactured and sold by the Raymond Development Company of Watertown, Massachusetts. While the unit the boys had made was much larger and clumsier than the commercial version, it operated on the same general principle.

They had simply installed inside a large paint bucket a flashing-light type transistorized depth-finder. The depth-finder was the same kind they had used at Parvoo University to locate a metal plaque at the bottom of the river. A five-inch diameter circle had been cut from the center of the airtight lid, and a heavy sheet of Plexiglass had been cemented over this opening so that the depth-finder dial mounted just behind it could be seen. The transducer had been fastened to the outside bottom of the can, and the cable from it led inside through a waterproof seal.

Finally, the on-off/sensitivity control was connected through a speed-reducing gear train to a tiny permanent magnet reversible electric motor. The motor, in turn, was controlled by a spring-loaded, normally-off, double-pole, double-throw toggle switch mounted on the side of the paint bucket. An unpierced nursing bottle nipple, with its rim cemented to the bucket, slipped over the bat handle of this switch, and permitted control of the sonar device inside its waterproof seal.

"That does it," Carl said, lifting the dripping unit from the bathtub and holding it in front of his face by means of the two strong handles soldered to the sides of the can. "It barely floats, so it should be easy to maneuver under water, and it doesn't leak a drop. Let's take it to the old quarry and try it out."

"O. K.," Jerry agreed. "You load the scuba gear in the car while I dry this thing off. Mom'll kill us if we drip water on her floors."

A HALF HOUR LATER the boys left the highway and traveled a short distance along a side road until they reached the abandoned quarry. They were just getting out of their car when they were surprised by the voice of the county sheriff.

"Over here, fellows," he called, emerging from the undergrowth. They could

A Carl and Jerry Adventure in Electronics

By
JOHN T. FRYE
W9EGV

see the sheriff's car parked behind some bushes growing between the road and the edge of the steep-sided quarry.

He was an old friend, and Carl did not hesitate to ask, "Hey, what are you hiding from?"

"Remember that branch-bank holdup at the shopping center a little over a year ago?" he asked. "The two men we think did the job ran through a roadblock and came out on the highway with the state troopers on their tail. They took off on this road and lost the state police for a few minutes—about fifteen. The police closed in from both ends of this short road and took them not a quarter of a mile from here, but none of the bank loot was on them."

"We searched every inch of the road and a hundred yards either side," the sheriff continued. "The prosecutor didn't have enough on them to try them for the bank job, but they both did a year in the pen for possession of a stolen car. Their sentences were up last week, and I'm staked out here on a hunch those two birds stashed the dough away, and will try to come back for it."

"Maybe they threw the money in the quarry," Carl suggested.

"We thought of that, and state police divers spent two whole days exploring the bottom, yard by yard. They had to do most of their searching by touch because working of the sand pits along the little creek feeding into the quarry keeps the water riled up so you can't see more than a foot or so in front of you. The divers found old tires, empty beer cans, rolls of rusty fence wire, baby buggies—everything but money. But what devilment are you two . . ."

Before he could finish his question, an emergency call tripped the squelch of the radio installed in his car. The city police had just received a telephoned tip that a supermarket on the other side of town was to be held up, and the dispatcher relayed the information along with the message that all mobile units in the county were ordered to converge on the spot.

"Stick around, I'll be back," the sheriff said as he headed for the highway.

CARL AND JERRY walked down a slope to the edge of the quarry. Across and to the right, the sheer walls of the large pit went almost straight down to the surface of the muddy water some thirty feet below. Where they were standing, a thick curtain of vines grew over the edge and cascaded down until the vine ends trailed in the water. Over to the left, however, a steep path zigzagged down to a narrow ledge running around the quarry a foot or so above the water.

They lugged their gear down this path, and Carl helped Jerry put on the scuba outfit. In practically every other physical endeavor, Carl was easily Jerry's superior; but in swimming, the chubby youth was as much at home in the water as an otter. "Blubber floats better than muscle," was Carl's succinct and disparaging explanation.

With the diving equipment in place and checked out, Jerry picked up the portable sonar and slid beneath the murky water. Going down a few feet, he worked the rubber-covered switch handle to turn the unit on and adjust the sensitivity.

The two glowing spots of neon light on the dial of the depth-sounder were easily seen when the Plexiglass disk was held close to his eyes, and he was delighted to find the crude affair working exactly as anticipated. Not only did it indicate how far the bottom was beneath him, but the stone walls of the quarry also returned sharp echoes to indicate their distance from his location. Moreover, when he turned on his back and pointed the instrument straight up, an echo was returned from the air-water

interface that indicated how deep he was swimming.

He played with the instrument for several minutes, trying it out at different depths and "swimming blind" with only the sonar ranging indication of the instrument to tell him how deep he was swimming and to warn him when he approached the bottom or sides of the quarry. While he was swimming some fifteen feet below the surface toward the vine-covered wall of the pit, the distance-indicating spot of light suddenly jumped counterclockwise from the ten-foot to the five-foot position. Swinging the instrument slightly to either side or up or down returned the spot of light to the more distant indication.

Keeping his depth, Jerry inched slowly forward until the front end of his paint bucket bumped into something suspended in the water. Inspection with his hands revealed it was a large metal container of the kind pressure-gun grease is kept in at a filling station. A thin wire led straight up from the bail, and Jerry followed this upward with his hands until he came to the surface.

He discovered he was behind the screen of vines and that the thin strand of steel piano wire ran up through these vines to the top of the quarry. He was about to call to Carl, whom he could see through the leaves, when he was stopped by the sound of a man's voice above him yelling at Carl.

"Just stay where you are and keep your mouth shut, buddy, and you won't get hurt. My friend, Chauncey, and I just want to pick up something we left here a while back. When we get it, we'll go our way and you can go yours."

"Go on and pull up that grease bucket, Bert." Jerry heard another voice say. "I'll keep the gun on him. I can't wait to get my hands into that lovely green grease. You know, I'll bet that tricky sheriff was hiding out, waiting on us. Man, he was really flying low when we met him on the highway. That phony tip of yours was a real smart idea."

VERY QUIETLY Jerry eased himself up on the rock ledge. Then, after a short search, he picked up a piece of broken broom handle floating near his feet and twisted it in the piano wire so that a couple of turns went around it. A few seconds later he felt the man above fumbling and tugging at the wire.

"Come here and help me, Chauncey. The wire must be tangled in the leaves or something, and the footing ain't very good on this slope. I sure don't want to drop the end of the wire. That kid can't go anywhere with us watching him. Take hold of that side of the stick and help me pull."

A stronger tug came on the wire, and Jerry slowly rose to his feet, giving slack. Then, grasping the piece of broom handle with both hands, he leaped from the ledge throwing his full weight onto the wire. The result was startling. Two bodies came hurtling down from above and hit the water with great splashes. A third smaller splash was made by the revolver.

When Jerry surfaced, he saw Carl leaping up the steep path as if he were a mountain goat. Listening to the men behind him spluttering and cursing as they clawed their way up on the ledge, Jerry decided Carl had a good idea; he swam quickly to the foot of the path and climbed out of the water.

The two men were starting toward him along the ledge, and he didn't even take time to remove his air tanks or swimming fins as he started a clumsy ascent up the path. Carl said afterward, that, as he watched Jerry frantically slipping and floundering on the path, all he could think of was a circus seal climbing up a stepladder to get a fish.

When the two men started to follow Jerry, Carl pelted them with stones. Jerry struggled out of the diving equipment and joined the fight at the top of the path. Using only jagged chunks of rock for weapons, the two of them easily held the men at bay until the sheriff came back a half hour later.

After the boys had explained the situation and the law officer had Chauncey and Bert safely handcuffed to the steering wheel of his car, Jerry dove down and brought up both the revolver and the end of the piano wire. The grease bucket was hauled to the surface and opened. Inside, lying on sand used for ballast, were several neat packages of currency.

"Every dollar is here," the sheriff announced when he finished counting it. "All the time those police divers were

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groping around on the bottom, the money was hanging right over their heads waiting to be found by a gadget like that one of yours. Those two had this planned right from the start. Instead of taking off down this road to get away from the troopers, they were heading for this quarry to hide the dough. Well, boys, that little electronic doodad of yours sure did well by you today. The insurance company has a pretty good reward out for the recovery of this money, and it's all yours."

"How about you?" Carl demanded. "You should get a third of it. We would have been sunk if you hadn't come back when you did."

"Nope. A sheriff in this state can't accept a reward in cases like this. It's reward enough for me to see those two clowns get what's coming to them."

He paused while his eyes roved from the homemade sonar rig to the empty grease bucket. A mischievous grin spread over his face as he concluded: "So help me, when I write up my report, I'm going to call this *The Case of the Two Buckets!*" —30—

Menu Quiz Answers

(*Quiz on page 57*)

1 – J	SPAGHETTI is the slip-on sleeving used to insulate bare wiring.
2 – C	A HAM is a radio operator who has been granted an FCC amateur radio license and call letters.
3 – G	The part of a fuse that melts when the rated current is exceeded is the LINK.
4 – A	The ACORN is a type of vacuum tube for UHF applications, which has no base, and has its pins brought out through the sides of the glass envelope.
5 – H	To PRUNE a coil means to adjust the spacing between turns or to remove turns to alter its inductance.
6 – F	A BANANA plug has a segmented springy metal prong that maintains a low-resistance contact in the mating socket.
7 – I	A HONEYcomb coil has a pattern in which the position of adjacent turns is continuously shifted to minimize distributed capacitance.
8 – D	The PIEcrust effect is a kind of TV picture distortion due to a hunting action in the horizontal automatic frequency control circuit.
9 – B	A CONE is the conical paper diaphragm in a loudspeaker.
10 – E	Rochelle SALT crystals having the chemical name sodium potassium tartrate are used in phonograph cartridges.

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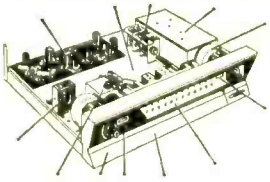

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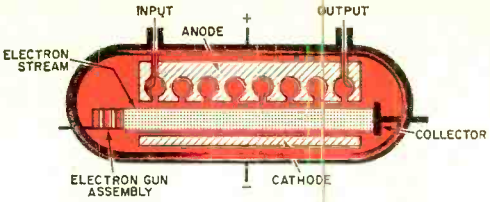
THE TUBE FAMILY TREE

(*Continued from page* 56)

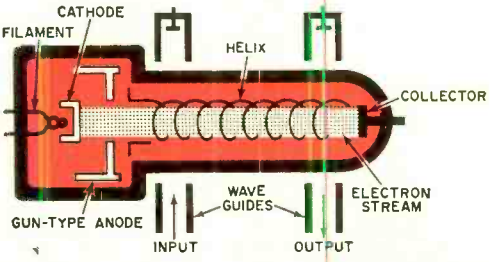
wave tubes (or, simply TWT's) may be used both as amplifiers and oscillators. Like the magnetron, these tubes depend on the interaction between moving electrons and a magnetic field, and, like the klystron, they employ the principle of velocity-modulation.

The *traveling-wave magnetron* is one type. Consider the multi-cavity magnetron in the drawing on page 55. Suppose the circular anode were split at one point and "straightened out." The result would be a multi-cavity anode similar to the tube shown on this page (top). To this we add a plane electrode to serve as a cathode plate, an electron gun, and a collector, plus a focusing magnetic field (not shown) to keep the electron stream projected by the gun from actually touching either the anode or cathode. The anode and plane cathode form a *wave guide*. If an r.f. signal is introduced at one end, it will travel to the other end. Now, if the velocity of the electron stream is adjusted to match the *phase velocity* (speed at which a constant phase progresses) of the electromagnetic wave moving down the tuned wave guide, the electron stream will be velocity-modulated and will transfer some of its energy to the traveling wave. The result, then, is that the output wave collected at the far end is stronger than the input signal, thus fulfilling the basic condition for amplification.

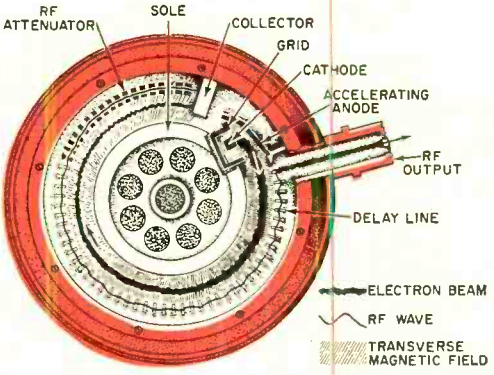
A different type of TWT consists of an electron gun, a wire helix, and a collector. A tube connects the input and output wave guides at each end of the helix. In operation, a stream of electrons is sent down the axis of the helix and the input signal is fed in. The helix, acting as a coiled transmission line, transmits the input signal to its far end at an axial velocity determined by the ratio of the pitch to the circumference of the helix. If the electron stream velocity matches the traveling wave's axial velocity, there is an interaction between the wave and electrons, transferring energy from the electron stream to the wave and thus amplifying it. Since the currents induced in the helix are displacement currents, the electron stream need not actually touch the helix and hence a strong magnetic field is generally used to focus the electron stream and to keep it from diverging over its relatively long path.



The traveling-wave magnetron combines functional principles of traveling-wave tube and a magnetron.



Traveling-wave tube provides broadband amplification in the 3000 to 50,000 mc. frequency range.



Wave motion in the backward-wave oscillator is in the opposite direction to wave motion in other traveling-wave tubes, but the principle is the same.

The *backward-wave oscillator* tube (or BWO) operates on general principles similar to those employed in conventional TWT's except that the traveling wave moves in a direction *opposite* to that of the electron stream (hence the name). In one sense, the tube serves to supply its own "input" signal. Sometimes, a strong transverse magnetic field is used to bend the electron stream in a

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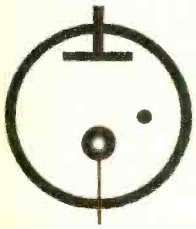
circular path and thus to reduce the over-all size of the tube.

Modified versions of magnetrons, klystrons, TWT's and BWO's are made by a number of manufacturers under special trade names, such as "Amplitron" and "Stabilotron."

Special-Purpose Tubes. In addition to the basic electron tube types we've discussed, the tube "family tree" has one branch which is literally "loaded" with twigs. These are the special-purpose tubes—those types designed for one or more specific functions and, therefore, of limited general application. A prime example is the electronic flash tube used in photographic equipment, essentially a gas-filled triode with a trigger electrode. A mere description of *all* the various special-purpose tubes would fill a book, so we'll just examine a few representative types.

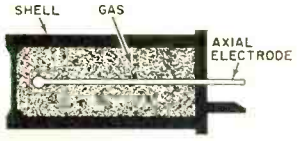
The *voltage-regulator* (or VR) tube is a diode filled with an inert gas having a specific ionizing potential, such as neon, argon or krypton. In operation, this tube acts like an open circuit until sufficient



The gas-filled regulator has a constant voltage drop between anode and cathode.

voltage is applied to ionize its gas. At this point, it "fires" and maintains a constant voltage drop, drawing a greater or lesser current (within its rated limits) as the applied voltage varies. The purpose is to hold the output or resultant voltage constant.

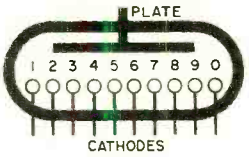
Used in radiation detectors, the *Geiger counter* tube is also a gas-filled diode. Generally, the tube is a thin metal shell with a coaxial wire or rod-like electrode. In use, a high d.c. voltage is applied to the two electrodes. If an *alpha* or *beta* particle or a *gamma* ray enters the tube,



The gas-filled radiation detector tube depends on ionization of gas by high-velocity atomic particles.

the gas is ionized momentarily, permitting conduction to take place and delivering a pulse of current. Each time another radioactive particle enters, the tube delivers another pulse. These pulses can be amplified and used to drive a loudspeaker or headphones or, if preferred, fed to an electronic counting circuit. The number of pulses in a given period of time (that is, the pulse rate) is proportional to the number of radioactive particles or rays which enter the tube, and hence to the intensity of the radioactivity measured.

There are a variety of *indicator* tubes, with the simple neon bulb being a prime example. Another type is the *Nixie* tube. A cold-cathode gas-filled type, this tube is equipped with a number of cathodes, each shaped to represent a numeral from



Nixie indicators are gas-filled tubes having cathodes that glow when passing current.

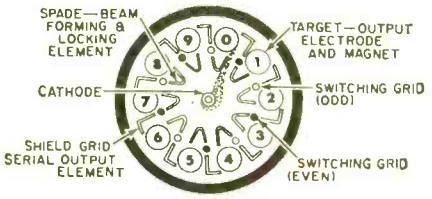
0 to 9. When an ionizing voltage is applied between one of the cathodes and the common plate, that cathode glows, rendering the numeral visible. *Nixies* are used as read-out devices in computers and counters.

The famous *tuning-eye* tube is another type of indicator tube. In its basic form, it consists of a cathode, control electrode, and fluorescent screen to which a positive voltage is applied. The electrons leaving the cathode are attracted to the fluorescent *target,* causing it to glow. When a negative voltage is applied to the control electrode, it repels these electrons, leaving a "shadow" on the target, with the shadow area proportional to the amplitude of the applied d.c. voltage. Sometimes, a tuning-eye type indicator tube and triode are combined in one envelope.

Used in computers, counters and similar equipment, the *beam-switching* tube is made up of a cathode, beam forming and holding spades, shield grids, switching grids, output (*target*) electrodes, and rod-type permanent magnets. In operation, the electrons emitted by the cathode are formed into a narrow beam

by a combination of magnetic and electrostatic fields. This beam is held in a fixed position by the potentials applied to the various electrodes, but can be switched from one target electrode to another, in rotation, by applying suitable voltages to the switching grids.

Other special-purpose tubes include ionization and thermocouple-type *vacuum-gauge* tubes; tubes in which one of the control elements is mechanically linked to an external pressure button so that the tube can be used as a *mechano-electronic transducer;* types with built-in fixed resistors used as *ballast* tubes; special *T-R* (transmit-receive) tubes to prevent the application of transmitter power to a receiver when both units share the same antenna system; and many, many other kinds.



In the beam-switching type of indicator tube, deflector electrodes direct the electron beam to the desired target anode. Such tubes may have 20 or more anodes.

The Future. Electron tube manufacturers are constantly seeking ways to improve their tubes and to develop new types to meet the needs of equipment designers and manufacturers. Great efforts are being expended in the development of UHF and microwave tubes. Several firms are working on tubes requiring low operating voltages which will be competitive with the transistor. One firm has developed a tube *without a filament* —it's designed to be used in an environment *so hot* that the cathode requires no additional heating. And an envelope-less tube has been developed for use in the vacuum of outer space.

How will the tube "family tree" branch out in the future? Even an educated guess is likely to be wrong. Only two things are certain: There will be many new types of tubes introduced in the next several years, and the "tree" will keep right on growing! -30-

Pickup Pranks

(*Continued from page 61*)

or other rotating member that can be reached with the pickup. The magnet need not be large—a more sensitive meter can be used if the signal is low. Care should be taken to anchor the magnet firmly as near as practical to the axis of rotation, since the centrifugal force developed at high speed could cause the magnet to break loose with consequent damage. Any clamps used to hold the magnet or pickup should be made from nonmagnetic aluminum.

Calibration. If you're interested in actual rpm rather than relative speed, calibration can be accomplished with an oscilloscope and audio generator hooked up as indicated on page 61. With the motor running at low speed, adjust the frequency of the audio generator until a *single* trace appears on the oscilloscope screen. Read the generator frequency and multiply by 60 to convert to rpm.

Increase engine speed and repeat for several readings: plotting the results should give you a "scatter" of points that fall on both sides of a straight line. The graph thus plotted may be used to convert any meter reading to rpm, or a new meter scale may be made to overlay the existing scale.

Code Practice Oscillator. Oscillation requires positive feedback. By placing the pickup in the inductive field of *its own amplifier,* oscillation will result and can clearly be heard through the speaker. By putting a key in series with the pickup, dots and dashes can be made. Here again, the transistor amplifier with its relatively low impedance requirement does a better job than a typical radio audio amplifier. It may be necessary to couple to the back of the speaker for better sensitivity. Also, changing the position of the pickup will very often change the pitch of the oscillation.

A pickup can also be used as a hum-finder. Simply connect it to a high-gain amplifier and use it to trace a.c.-carrying circuits.

There are, no doubt, many other practical applications for this simple inductive coil, and the price is low! -30-

Across the Ham Bands

(*Continued from page 95*)

connection to plug *P1*. Solder one conductor to the common crystal socket terminals, and connect the other conductor to the terminal for the switch rotor. Make the lead long enough to permit you to insert plug *P1* into the transmitter crystal socket when the unit is conveniently placed near the transmitter. Don't make the lead excessively long, however. Although length is not critical, too long a lead might make the transmitter operate erratically.

Operation. Transmitter operation should remain essentially the same except for the added convenience of crystal switching. In addition, if you tune the transmitter to a frequency near the center of the 80-, 40-, or 15-meter Novice bands, it probably won't be necessary to retune the buffer and final stages of the transmitter to operate on any other frequency within that Novice band. However, for best keying with some crystals, you may wish to touch up the oscillator tuning.

Warning. The distributed capacitances, etc., of the crystal switch may change the actual oscillating frequency of some crystals as much as 100 cycles or so from their marked values. This possibility is of no importance for normal Novice operation, but it is illegal for a CB operator to make any changes that will affect the output frequency. Therefore, the switch is not suitable for CB use.

News and Views

Roger B. Hallen, WN6BOW/WB6BOW, 7736 Day St., Tujunga, Calif., has his radio shack located in a guest house in the back yard—most convenient for cutting down on XYL interference. Rog works 80 meters with a Knight-Kit T-60 transmitter, R-55 receiver, and a Gotham vertical antenna; he has a total of 12 states. Rog also works 6-meter phone with his Technician license, but didn't mention his equipment . . . **Ray Thornton,** RFD #2, Lisbon, Conn., started his radio career as **WPE1CYR,** advanced to **KN1YFF,** and is now **K1YFF.** As a Novice, Ray racked up 34 confirmed states using an EICO 723 transmitter and Lafayette KT-320 receiver. As a General, he works phone and c.w. on 80 through 10 meters with the same equipment, plus the modulator described in "Across the Ham Bands" some time ago. His states total

is up to 40; he has also worked England, Puerto Rico, and Canada . . . **Gary Boyles, WN4MCY,** 331 Lindsey St., Fayette, Alabama, runs 15 watts to an AMECO AC-1 transmitter feeding a three-band doublet antenna 30′ high; he receives with a Hallicrafters S-38. Gary worked five states his first week on the air.

Marvin Born, WA8CKN, Reedsville, W. Va., worked 25 states as a Novice on 80 meters using a 75-watt, home-built transmitter to feed an inverted-V antenna. A Hammarlund HQ-145X receiver did the rest. Marv now works SSB with a Johnson Invader-200 . . . **Tom Hall, WA6YYQ,** 2020 Yosemite St., Seaside, Calif., celebrated the arrival of his hard-earned Conditional license by writing us a letter. Tom feeds a dipole antenna with a Knight-Kit T-60 transmitter and receives on a Knight-Kit R-55 receiver. This equipment, plus several of the items described in our construction projects, has given him 32 states, Canada, and Japan.

Keith Moe, KN7VRS, 2038 W. Monte Vista, Phoenix 9, Ariz., has a word of warning to prospective hams. Don't do as he did and neglect your code practice after passing your examination and while waiting for your license to come. As a result, Keith had to relearn the code before he could get on the air and work anyone. But now his Heathkit DX-60 transmitter, Heathkit GR-91 receiver, and the shortened vertical antenna, described in the October, 1962 column, keep him on 80 meters almost every night, where he likes to ragchew rather than chase DX . . . **S. Sgt. Richard W. Lewis,** Co. B, 10th Special Svc. Group, APO 108, New York, N. Y., is **K1QFA** when he is home in Springfield, Mass., but for the past three years he has been **DL4HN** stationed in Germany. His receiver is a German "lightweight," the Blaupunkt FE-52, which totals up to a mere 350 pounds! His transmitter is a homemade SSB 50-watter for 80 and 20 meters built mostly from scrounged parts; it feeds a 300′ end-fed antenna, which puts a strong signal into the States. He has also worked all continents. . . . **Harold King, WN4JOB,** 268 Rockyford Rd., N.E., Atlanta 17, Ga., has two horizontal 40-meter dipoles and a vertical on his antenna farm. He drives them with an EICO-723 transmitter and receives on a Hallicrafters

Keith Moe, KN7VRS, has something valuable to say to would-be amateurs in text at left.

SX-99 aided with a Heathkit Q-Multiplier. Twenty-seven states (25 confirmed) and Canada are listed in Hal's log; he QSL's 100 percent and averages an 80 percent return. Hal pays for his equipment with the proceeds of his paper route.

Richard Alter, WN2ERK/WPE2KCO, 178 Main St., Fort Plain, N.Y., runs 50 watts input to a Heathkit DX-20 transmitter to feed an 80-meter dipole antenna 55′ high. Rich uses a Hammarlund HQ-129X receiver for ham work and SWL's with a Heathkit AR-3. Besides having 20 states confirmed out of 20 worked, Rich lists a 10-wpm code certificate, being the net control station for a net, and working a YL in Delaware on his "brag" list . . . **Terry Hackworth, WNØDOR,** 115 West Rogers St., Clinton, Mo., figures he wasted four months of his Novice time; he ordered a certain transmitter, and, after waiting four months for delivery, he canceled the order and got a WRL SB-175. With it, an RME-4300 receiver, and a Hornet vertical antenna, Terry has worked 34 states and several Canadians, mostly on 40 meters, his favorite band.

Will we soon see *your* "News and Views" or picture in this space? The first step is up to you, you know. Send your letters, etc., to Herb S. Brier, W9EGQ, Amateur Radio Editor, POPULAR ELECTRONICS, P. O. Box 678, Gary, Indiana. 73,

Herb, W9EGQ

HAND-HELD TRANSCEIVERS (*Continued from page 92*)

MANUFACTURER	MODEL	TYPE	WEIGHT	PRICE
Heath Co. Benton Harbor, Mich.	GW-21	Superhet	32 oz.	$44.95 (kit) $71.95 (wired)
	GW-31	Superhet	32 oz.	$19.95 (kit) $29.95 (wired)
International Crystal 18 North Lee Oklahoma City, Okla.	Executive 1500	Superhet		$299.50
This is a special unit described in POPULAR ELECTRONICS, JULY, 1963, Page 70.				
Keltner Electronics 1045 W. Hampden Englewood, Calif.	HT-2	Superregen	12 oz.	$59.95 (list)
Lafayette Electronics Corp. 111 Jericho Turnpike Syosset, L.I., N.Y.	HA-60	Superhet	20 oz.	$33.95
	HE-82	Superhet	12 oz.	$19.95
	HE-100	Superhet	21 oz.	$39.95
Monarch Electronics, Inc. North Hollywood, Calif.	TC-900B	Superhet	14 oz.	$39.95
Radio Shack Corp. 730 Commonwealth Ave. Boston 17, Mass.	TRC-2	Superhet	32 oz.	$34.95 (net)
R. C. A. Electron Tube Div. Harrison, N. J.	Personal-Com 300	Superhet	16 oz.	$99.50 (list)
The Sampson Company Communications Equip. Div. Chicago 8, Ill.	Fonet 101	Superhet	19 oz.	$63.50 (per pair)
Sony Corp. of America 580 Fifth Ave. New York 36, N.Y.	Sony 9	Superhet	16 oz.	$149.95 (list per pair)
Standard Radio Corp. 350 Broadway New York 13, N.Y.	SR-Q10X	Superhet	28 oz.	$149.95 (per pair)
Vanguard Electronic Labs. 190-48 99th Ave. Hollis 23, N.Y.	Mark I	Superregen	48 oz.	$59.98 (net)
	Mark II	Superhet	52 oz.	$79.98 (net)

Fiber Optics

(*Continued from page 44*)

be used to get a reasonably large image on the screen. The Lafayette Radio zoom lens described previously is ideal since it allows adjustment of the size of the projected image.

How you mount the projection lens in its Masonite panel will depend on its dimensions, but the mounting used should both support it firmly and allow for easy focus adjustment. Enlarge the ¼" hole in the panel as necessary.

In the author's unit, the Lafayette lens was mounted in a 1" plastic-to-standard pipe adapter. The inside of the adapter was filed out slightly to accept the barrel of the lens.

When the lens is mounted, set the focus adjustment in the center, and position the assembled panel between the end of the fiber optic element and the viewing screen. Move the panel back and forth for optimum focus of the projected image and mount it in the best position.

Making a Bent Element. Although this basic unit (which uses a straight 6" fiber optic element) gives a dramatic demonstration of the principles of fiber optics, an even more startling show can be put on by replacing the straight element with a formed one like that in the photo on page 44.

To keep its end-to-end length the same as that of a 6" element, a 12" element is bent at four points to form a square 1½" on a side. By keeping the ends aligned, the formed 12" element can be substituted directly for the 6" element.

Mark points on the 12" rod for bending with a pencil, and *very carefully* heat it at these points, and *carefully* make the required 90-degree bends. Heat the rod only as much as is absolutely necessary to avoid complete fusing of the fiber bundle.

The project described here is relatively simple, and many variations are possible. Whether you are a serious experimenter, a science fair entrant, or just a tinkerer, you'll find these fiber optic elements fascinating to work with. —30—

a small plastic, metal, or wooden case. Neither lead dress nor layout are critical, but good wiring practice should be followed with all signal leads kept short and direct. As is common with direct-coupled circuits, transistor leakage is important, and it may be necessary to experimentally select transistors for optimum performance.

Transitips. Push-pull amplifiers are extremely popular for audio output applications. Although simple and efficient, they can still present problems, even to experienced hobbyists.

A typical push-pull circuit is illustrated in Fig. 4. The stage is driven by *T1*. Base bias for the push-pull transistors, *Q1-Q2*, is supplied by voltage divider *R1-R2*, with the stage matched to its load (typically, a loudspeaker) by output transformer *T2*. Capacitor *C1*, an optional component, is used as a high frequency bypass and thus serves to reduce the effects of harmonic distortion.

Perhaps the most critical single factor in push-pull amplifier performance is the *class* of operation. Three principal classes are used: Class A, where a moderate bias is applied and the *entire* input signal is amplified by both transistors; Class AB, where a small bias is used, and where slightly more than half the applied signal is amplified by each transistor (one handles positive half-cycles, the other negative half-cycles); and, finally, Class B, where cut-off bias is used and where each transistor responds to only half the input signal.

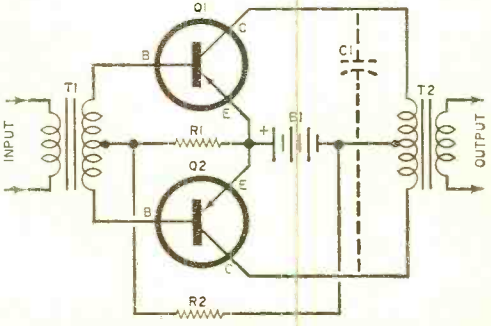


Fig. 4. Typical push-pull amplifier stage.

Of these, Class A delivers the "cleanest" signal (least distortion) but is the least efficient and most easily overloaded. Class B is the most efficient, can deliver greater power output, but tends to introduce more distortion. Class B is also the most critical as far as transistor characteristics are concerned. Class AB operation has performance characteristics falling between those of Class A and Class B and, in general, is the most popular class.

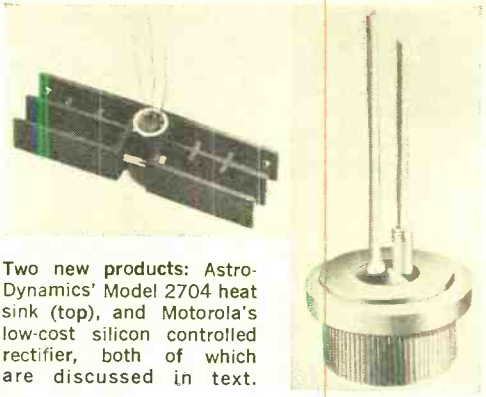
When the stage is operated Class A, *R1* and *R2* are chosen to deliver a moderate base bias. Since both transistors amplify the entire signal, they need not be matched closely, and either will deliver a fairly "clean" output even if the other transistor opens—although at reduced power. The stage has a fairly low input impedance.

With either Class AB or Class B operation, the stage has a much higher input impedance, and *T1* must be chosen accordingly to provide a proper match. Resistors *R1* and *R2* are chosen to deliver a small (or zero) bias. And, for best performance, the two transistors must be *matched* as far as both leakage and gain are concerned. If either transistor fails, the output signal will become weak and distorted.

If, for one reason or another, it is impossible to obtain matched pairs for use in Class AB or B stages, several alternate techniques may be employed. The most common is to connect small resistors in series with *each* emitter lead. These may range in value from a fraction of an ohm for power transistors to 100 ohms or more for small-signal types. The best values to use in a particular case can be determined experimentally.

Inverse feedback will help improve the performance of a Class AB or B stage in many cases. This can be introduced by using a resistor and coupling capacitor in series between *T2*'s secondary and *T1*'s primary or by changing the bias method, removing *R2* and using resistors between each transistor's collector and base electrodes—but don't cross-couple. Again, determine the best values to use by experimenting.

If trouble is encountered with a push-pull stage, *first* check base bias (as well



Two new products: Astro-Dynamics' Model 2704 heat sink (top), and Motorola's low-cost silicon controlled rectifier, both of which are discussed in text.

as collector voltage). Then make sure that the two transistors are matched with respect to gain and leakage. Finally, check the remaining components: *C1*, *T1* and *T2*.

Product News. Our news this month is concerned primarily with new components and semiconductor devices. Here's a quick review.

● Astro Dynamics, Inc. (Second Ave., Northwest Industrial Park, Burlington, Mass.) has introduced a new printed circuit board transistor heat sink. Identified as Model 2704, the unit will accommodate both TO-5 and TO-9 cases.

● General Electric (West Genesee St., Auburn, N. Y.) is now producing a series of 300-ampere silicon controlled rectifiers. Known as the 6RW71 series, the new units are available with peak reverse ratings from 50 to 400 volts.

● Motorola, Inc. (5005 East McDowell Rd., Phoenix 8, Ariz.) has introduced a series of low-cost SCR's intended for consumer applications; type numbers range from MCR 808-1 to MCR 808-6, depending on voltage ratings. Also from Motorola comes news of a new power transistor specifically designed for use in low-voltage, high-current power converters: type number 2N2728.

● Siliconix, Inc. (1140 West Evelyn Ave., Sunnyvale, Calif.) has developed a line of unipolar field-effect transistors suitable for 3- to 6-volt battery operation (in contrast to earlier units, which required relatively high voltages). Types numbers range from U-106 to U-109. All are P-channel planar diffused types.

That closes the book for now, fellows —back next month.

—Lou

Short-Wave Report

(*Continued from page* 101)

Current Station Reports

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

Algeria—According to a verification letter, the current schedule of the *Radio-Tele Algerienne* is as follows: 0130-0430, 0630-0930, and 1230-1600 on 9685 and 11,835 kc., and 0130-0400, 0700-1000, and 1300-1600 on 6160 kc.

Angola—Stations noted in Brazil: CR6RD, *R. Clube do Huambo*, Nova Lisboa, 5060 kc., at 1615-1632 s/off; CR6RI, *R. Diamang*, Dundo, 9612 kc., at 1401-1431 closing with nonstop music; CR6RN, *R. Clube da Angola*, Luanda, 4869 kc., at 1640-1702 s/off; and CR6RV, *R. Clube do Moxico*, Luso, 5137 kc., at 1550-1604 s/off and from 0029 s/on. Portuguese is noted on all stations.

Australia—Melbourne has made some changes: 11,740 kc. replaces 11,835 kc. for transmissions to Indonesia at 0430-0600 and for the Chinese program that follows; Eng. to Africa at 1200-1400 has moved up to 9600 kc. The dual 11,955 kc. outlet remains as is. Eng. to S. E. Asia on 11,880 kc. has been extended one hour and now is heard at 0330-0900. Other xmsns noted: to N.A. at 0714-0815 on 9580 kc. and 1955-2300 on 17,840 and 15,220 kc.

Austria—Vienna has an xmsn to Japan on Mondays, Wednesdays and Fridays only at 0700-0730 on 15,155 kc. The N.A. xmsn is aired at 1700-2300 on 6155 kc. and 1900-2100 on 9770 kc., the S. A. xmsn at 1800-2100 on 11,785 kc.

Bolivia—CP75, *La Cruz del Sur*, La Paz, 4985 kc., reportedly has an Eng. xmsn daily at 2130 parallel to CP39, 11,765 kc.

R. Nacional Lab, Cochabamba, 5025 kc., has been testing in Spanish around 2100 with closing at 2120 or later. CP38, *R. Altiplano*, La Paz, 9505 kc., opened last March and can be heard at times around 2000 when *R. Record* is off.

Brazil—PRL7, *R. Nacional*, Rio de Janeiro, 9720 kc., has been tuned at 0215-0330 with continuous music. The normal s/on time is 0250; whether this earlier xmsn is a s/on schedule change or a test xmsn is not yet known.

Cambodia—According to *R. Australia*, *R. Phnom-Penh* operates at 1800-2100 and 2300-0300 on 3241 kc. (1 kw.) and 1900-1915 on 4907 kc.

Canada—CKFX, Vancouver, 6080 kc., with only *ten watts* is noted in Alaska from 0300-

0330 with a weak to fair signal and recorded music and commercials.

Ceylon—The Commercial Service of *R. Ceylon*, Colombo, can be heard on 9560 kc. from 0740 to past 0930 in all Eng. A London news relay is given at 0800; otherwise mostly pop music.

China—Here is a listing of Chinese native language stations: Amoy, 4835 kc. (5 kw.), Canton, 2360, 3205, and 5050 kc. (all 50 kw.), Changsha, 2420 kc. (5 kw.), Chungking, 2330 kc. (10 kw.) and 3250 kc. (5 kw.), Foochow, 3375 kc. (1 kw.), Kiungshan, 3315 kc. (5 kw.), Kunming, 2390, 3232, and 4770 kc. (all 20 kw.), Kweiyang, 3385 kc. (5 kw.), Nanchang, 2460 kc. (1 kw.), Nanning, 5030 kc. (20 kw.), Sichang, 2480 kc. (1 kw.), and Yungning, 2310 and 3268 kc. (both 20 kw.). Possible new channels for Peking include 5320 kc., noted in Eng. to 0730, and 8265 kc. (dual to 7480 kc.) with Eng. news at 0700-0721.

Dahomey—A recent verification lists this schedule for *R. Cotonou*: Monday to Friday at 0015-0145, 0615-0730 (Thursdays to 0800) and 1200-1700; Saturdays 0015-0145 and 0700-1800; Sundays 0200-1700; all on 4870 kc.

Ecuador—HCJB, Quito, is back on air after a recent storm in which lightning reportedly destroyed its antennas.

England—The first commercial station in England, *R. Manx*, has been granted a license to operate on either 980 or 1180 kc. Operations may already have commenced.

Ethiopia—Addis Ababa has been noted on two new channels: 11.765 kc. at 1510-1520 with Eng. news; to 1530 with native music; to 1540 with pop music and French announcements; to 1550 s/off with French news; and on 15,228 kc. with apparently the same programming. The latter is a move from 15,240 kc.

Federation of Rhodesia and Nyasaland—The Gwelo station is scheduled as follows: 2425 kc. (2.5 kw.) in Commercial and General Service Monday thru Friday at 1120-1605 (Saturdays to 1700, Sundays to 1515); 3396 kc. (20 kw.) Monday through Fridays at 2255-0045 and 1000-1605 (Saturdays to 1700), Sundays 0900-1515; on 6020 kc. (20 kw.) Monday through Friday at 0045-0700 (Saturdays to 1000), Sundays 0055-0700 (to 0900 on the first Sunday of each month); 9505 kc. (2.5 kw.) Monday through Friday at 0045-0700 and 1000-1115, Saturdays 0045-1115, Sundays 0055-0700 and 0900-1115 (0055-1115 on the first Sunday of each month); 3306 kc. (10 kw.) with the African "C" program Monday through Saturday at 2300-0110 and 1035-1500 (Sundays 1035-1500 only); and on 5975 kc. (10 kw.) Monday through Saturday at 0500-1030 (Sundays 0557-1030). The Zomba station is listed for 3955 kc. (10 kw.) for the African "D" program broadcast to Nyasaland daily at 0900-1500.

Formosa—*Voice of Free China*, New Park, Taipei, has Eng. daily at 0510-0555; Japanese from 0555; Eng. again noted 0720-0800 on 11,860, 9720, 7130, and 6095 kc.

Germany (East)—*R. Berlin International* has Eng. to Africa daily at 0730-0800 with a mailbag on Sunday; on 11,795 kc. at 0430-0450 in Eng. to Africa; on 6060 and 9730 kc. from 1700-1745 in Eng.; on 9560 kc. at 2030 and 2100 in Eng.; and to N.A. at 2000-2100 in Eng. on 6080 kc.

SHORT-WAVE ABBREVIATIONS

annt—Announcement	R.—Radio
Eng.—English	S.A.—South America
ID—Identification	s/off—Sign-off
kc.—Kilocycles	s/on—Sign-on
kw.—Kilowatts	VOA—Voice of America
N.A.—North America	xmsn—Transmission

Germany (West)—*Deutsche Welle* has a new xmsn to Indonesia daily at 0745-0825 on 17.815 and 15.405 kc.

Greece—We have just received this schedule from one of the men aboard the U.S. Coast Guard Cutter *Courier*, the VOA station located at Rhodes: 0100-0230 on 6185 and 7130 kc., 0900-0930 on 9530 and 7130 kc., 1100-1130 and 1600-1745 on 6015 and 7130 kc. The "Amateur Notebook" program is aired Sundays only at 1730-1745.

Honduras—*Radio 1 de Mayo*. Tela, a new station, has been found on 4790 kc. at 1920 with news. *R. Juventud*, Tela, was noted in the 11-megacycle band (frequency not otherwise given) with tests at 2020-2028. Apparently a low-powered xmtr. it quickly faded out. This one has a dual outlet on 4995 kc., rated at 500 watts. Further details requested.

Hong Kong—ZEN41. Cable and Wireless, Ltd., will verify correct reports by letter for their 9244 kc. outlet.

Italy—Rome has an Italian xmsn beamed to the Near East and Africa at 0735-0755 on 17,800 kc. Eng. xmsns. mostly unchanged. remain as follows: to N.A. at 1930-1950 and to United Kingdom and Ireland at 1420-1440, both on 9575 and 5960 kc.

Korea (North)—*R. Pyongyang* is scheduled to broadcast to the Near East at 1500-1600 on 7225 and 9752 kc., to Europe at 2200-2300 on 15,240 and 9725 kc., and to S. E. Asia at 0700-0900 on 9752 and 5044 kc. The latter xmsn (0700-0800. at least) is in Eng. and heard well on the West Coast on 5044 kc.

Luxembourg—*The Station of the Stars. R. Luxembourg*, is noted from 1645-1730 with pop music, ads, and ID's each 15 minutes on 6090 kc.

Malaya—Kuala Lumpur, 7142 kc., s/on in Malayan at 1830 with ID and a world news bulletin. Eng. is given from 1930.

Morocco—Rabat has been found on 15,408 kc. from 1540-1556 with Eng. ID and music.

Nepal—*R. Nepal*. Kathmandu, broadcasts in the Home Service three xmsns in Hindi and Gorkhali on 4800 kc. at 2120-2320, 0220-0420, and 0820-1020. There is an Eng. newscast at 2200.

Netherlands—The current schedule from *R. Nederland*, Hilversum, to N.A. in Eng. reads: 1030-1045 on 15.445 and 11,950 kc. (Tuesdays and Fridays only), 1415-1430 on 17.810 and 15.445 kc. (Tuesdays and Fridays only), 1625-1720 on 15.445 and 9715 kc. (excluding Sundays), and 2025-2120 on 9590 and 5985 kc. (excluding Sundays). *R. Nederland* recently used the article "Look How They're Packaging Power" which appeared in the Dec., 1962 POP'tronics.

New Guinea—VLT9. Port Moresby, operates on 9520 kc. at 1815-0245; VLT6, 6130 kc., is noted from 0315-0415 with ship and weather

reports, time checks, sports, and, at 0400, a London news relay. This is all in Eng.

Norway—*R. Norway,* Oslo, has a new xmsn to N.A. and the Caribbean area at 1000-1130 on 15,175, 11,850 and 9610 kc. The remainder of the summer schedule reads thusly: 0100-0135 (Sun. 0200-0230) to Europe, Africa, and Middle East on 17,850, 15,175, 11,850, and 6130 kc.; 0525-0535 weekdays to North and Middle Atlantic on 17,825, 15,175, 11,850, and 9610 kc.; 0600-0730 to Far East; N.Z., E. Australia, and Europe, 0800-0930 to India, Indonesia, W. Australia, and Europe, both on 15,175, 11,850, and 9610 kc.; 1200-1330 to Africa, Madagascar, and Europe and 1400-1530 to Middle and W. Africa, Middle and S. Atlantic, and Europe, both on 21,730, 17,825, 15,175, 11,850, and 6130 kc.; at 1800-1930 to S. A., Middle and S. Atlantic on 15,175, 11,850, and 6130 kc.; 2000-2130 to N.A., North Atlantic, and Caribbean and 2300-0030 to N.A. (West Coast), Pacific areas, and E. Africa, both on 11,850, 9610, and 6130 kc. "Norway This Week" is presented at 0700, 0900, 1100, 1300, 1500, 1800, and 2100 on Sundays and at 0000 on Mondays in the above mentioned xmsns.

Spain—Madrid is well heard on 9360 kc. at 2215-2300 to Atlantic Coast, 2315-0000 to Pacific Coast, and 0015-0100 in General service. A Spanish xmsn to the Canary Islands is noted at 1525-1550 on 9370 kc.

Sweden—Stockholm's summer schedule includes these changes: to the Far East at 0730-0845 on 9620 kc. (replacing 11,805 kc.), and 17,845 kc.; to Europe in French at 1530-1600, Spanish, French and Portuguese at 1715-1845 on 5990 kc. (replacing 6095 kc.); and to the Americas at 2000-2115, 2130-2245, and 2300-2330 on 11,805 kc. (replacing 7270 kc.).

Turk Islands—DX'ers needing this country should try for VSI on 4560 kc. They operate daily (excluding Sunday) at 1600 with local news, shipping and weather information. Reports are welcomed and should be sent to British Cable & Wireless Co., Ltd., Grand Turk.

U.S.A.—The RCA point to point telephone station at Kahuku Point, Hawaii, specifically states that they are *not* interested in reception reports and will not verify. This one is noted afternoons on approximately 16,050 kc.

USSR—Here is a list of definitely identified Siberian stations: Khabarovsk on 9750, 9377, 7210, 6195, and 4090 kc. The 4010 kc. channel seems to be inactive. Magadan is on 9500, 5940, and 4995 kc. Vladivostok is on 5015 kc. Blagoveshchensk is on 6005, 6115, and 4050 kc. Moscow (via Komsomolsk) is on 6020 and 6050 kc. Relays from Khabarovsk, Blagoveshchensk, and Magadan are heard mostly between 0300 and 0700. Ulan Bator, 5067 kc., is noted with native music to 0815; from 0815 to 0855 with a Moscow relay dual to 5960 kc. Kiev reports a change in their Eng. to N.A. with the schedule now reading Monday, Thursday, and Saturday at 2150 on 9650, 9710, 11,790, and 11,960 kc., and 0450 on 9710, 11,790, and 11,960 kc. Alma Ata, 10,530 kc., can be heard at 1930-2030 in Russian and Kazakh.

Vatican City—The Vatican's N.A. xmsn at 1950-2010 on 9645 and 7250 kc. is also reported as being on 6450 kc., although this is unconfirmed. The 9645 kc. outlet, according to a late report, has moved up to 9675 kc. The Eng. xmsn to Australia and N.Z. can be well heard at 1700-1718 on 11,740 and 9645 kc., on Mondays, Wednesdays, and Fridays only.

Yemen—*R. Sana* is operating on 15,725 kc. (15,560 and 15,700 kc. as alternates) at 2300-0100, 0600-1000, and 1100-1530. The power seems to be in the 100 kw. range. Noted on 15,720 kc. at 1100, 15,785 kc. dual to 5955 kc. at 1100; and 15,780 kc. at 1310 in Arabic to 1602 s/off.

—30—

SHORT-WAVE CONTRIBUTORS

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Michael Leff *(WPE2HRA)*, Bronx, N. Y.
Daniel Grumet *(WPE1IMF)*, Toms River, N. J.
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Robert French *(WPE8FGH)*, Bellaire, Ohio
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John Pirnat *(WPE8FWO)*, Euclid, Ohio
Alexander Chytra *(WPE8FZY)*, Campbell, Ohio
Mike Kander *(WPE8MS)*, Dayton, Ohio
Tom Reitze *(WPE9EDO)*, Evanston, Ill.
Phil Cutler *(WPE9EFL)*, Barrington, Ill.
Glen Wright *(WPE9EQP)*, Findlay, Ill.
John Beaver, Sr. *(WPEØAE)*, Pueblo, Colo.
Bill Holscher *(WPEØATE)*, Webster Groves, Mo.
J. W. Harre *(WPEØCSJ)*, Marshall, Mo.
Jim Martin *(WPEØDJO)*, Minneapolis, Minn.
George Henley *(G2PE3Y)*, Watford, England
Edward Tilbury *(KL7PE1K)*, Eagle River, Alaska
Jack Perolo *(PY2PE1C)*, Sao Paulo, Brazil
R. K. Spicer *(VE1PE8A)*, Amherst, N. S.
Ron Kusmack *(VE4PE4U)*, Winnipeg, Man.
Margaret Hinkson *(VP4PE1B)*, Port of Spain, Trinidad and Tobago
Bernard Brown, Derby, England
Cary Green, Bowling Green, Va.
Rulon Guymon, Orem, Utah
Mike Ryan, Redwood City, Calif.
Paul Tydelski, Alexander, N. Y.
Julius Wachtel, Los Angeles, Calif.
Bill Wilson, Folcroft, Pa.
Radio Australia, Melbourne, Australia
Sweden Calling DX'ers Bulletin, Stockholm, Sweden

Radio Marathon

(*Continued from page 59*)

operating in the *standard broadcast band* which would be located at a suitable site in Southern Florida and equipped with a highly directional antenna array. Once the necessary formalities had been completed and a suitable site located, the brand-new portable "Voice" transmitter, operating on a frequency of 1180 kc., was placed on the air in the record-breaking time of 12 days.

The portable *VOA* Marathon relay station consists of a Gates Radio 50,000-watt transmitter suitably modified for portable operation and built into air-conditioned trailers. Power is obtained from a temporary power line, with two 250-kilowatt stand-by generators at hand. A three-element vertical directional antenna array fed by an open wire coaxial line beams the signal at the "Pearl of the Antilles."

Goal for BCB DX'ers. And here is your challenge! Can you hear "Radio Marathon"? This DX catch of the year is on the air daily, from 6 a.m. to 9 a.m., and from 5:30 p.m. to 11:30 p.m. EST. By special arrangement with the Federal Communications Commission, "Radio Marathon" operates on the same channel as WHAM in Rochester, N.Y., and protects the coverage of that station by virtue of the highly directional antenna array which aims over 99 percent of the radiated power at Cuba. As a result of of the extremely high concentration of "fire power," the signal of "Radio Marathon" is very weak in the continental United States.

Another rare catch for the DX'er is provided by a second *VOA* station operating on 1040 kc. and located on a Florida key in the same area as "Radio Marathon." Also radiating 50,000 watts into a directional antenna, the second station operates in parallel with the Marathon installation.

Transmitting entirely in the Spanish language except for "station break" announcements in English, these two unusual portable stations are an example of modern technology used to carry the message of freedom and democracy. —30—

ELECTRONICS MARKET PLACE

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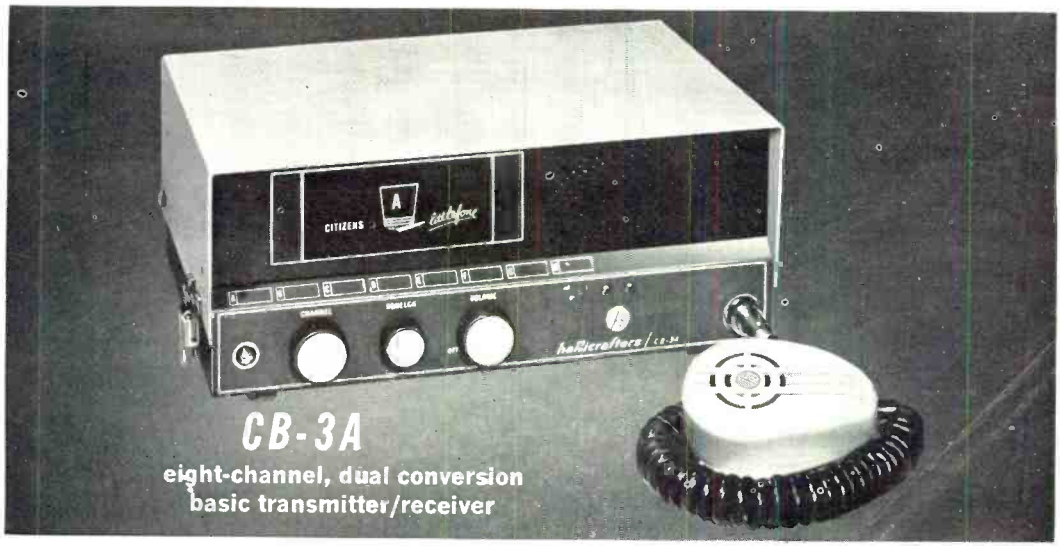
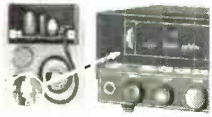
hallicrafters gives you the basic superior performance you need for just $159.95...

All the gadgets ever invented wouldn't improve the tremendous basic performance and reliability of the CB-3A. You get 8-channel, crystal controlled convenience . . . 100% modulation capability . . . 40 db. min. adjacent channel rejection . . . less than 1 μv. sensitivity . . . 6 kc. selectivity . . . removable accessory panels and built-in accessory jack—plus a reliability record unequalled in the field.



...and lets you decide which extras you want

HA-9 S-Meter Kit. Illuminated. Complete hardware; installs in minutes in removable CB-3A front panel. Universal. $8.95.



HA-11 Noise Eliminator. "Racket Buster" deluxe. Mounts completely hidden on back of CB-3A; front panel thumb control. $15.95.

HA-3 Noise Suppressing K... condensors, grou... mize elec... SP-3...

the new ideas in ...

ar...

RaTtLe RaTtLe RaTtL

Hum-m-m-m-m-m-m-m-m-m-m-

! BOOM! BOOM

stops noise!

CLATTER!

murmur murmur murmur murmur

CLATTER!

G! BANG!

Honk! Honk! Honk!

! THUMP!

POP! POP

Noise-Cancelling Microphone $19.50 List (less normal trade discounts)

...er and get up to ...Not just big ...ess of ...717.

HERE'S HOW THE 717 STOPS NOISE